

Exhibit 1010

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WILSON ELECTRONICS, LLC,
Petitioner

v.

CELLPHONE-MATE, INC.,
Patent Owner.

Patent 9,402,190

DECLARATION OF PATRICK COOK

1. I, Patrick Cook am over the age of 18 years, of sound mind, and am under no legal disability. I have personal knowledge of the facts set forth herein and, if called as a witness, could and would competently testify thereto.

2. I am currently working as the Chief Technical Officer at Wilson Electronics, LLC (“Wilson”) and have been employed at Wilson for over 23 years. As part of my employment, I am called upon to know and understand the development and design of signal booster products, including the history of problems associated with those products and the history of the solutions to those problems.

3. I have a degree in Electrical Engineering from University of Nevada, Las Vegas. A copy of my CV is attached hereto. (Ex. 1020).

4. I am familiar with the technology and invention described in U.S. Patent No. 9,402,190 (‘190 Patent) and consider myself to be a person of ordinary skill with the technology disclosed therein. It is my understanding that the ‘190 Patent centers around a cell phone signal booster that is allegedly novel because it amplifies both bands XII and XIII. Below, I discuss the designation of different frequency bands by the federal government and their evolution over time.

5. Wilson Electronics was started by Jim Wilson out of a need to enhance radio signals in a rural Utah. During the beginning of my career, I worked on radio signal boosters and antenna products ranging from cell-phones to satellite TV to CB radios. In 1999, Wilson narrowed its focus to cell phone boosters. Since that time, I have seen and/or worked on or designed hundreds of devices intended to support and boost radio signals for cell phones.

6. In the 1980s, mobile technology continued to be developed with 1G (or 1st Generation) wireless connectivity. (Ex. 1021, “The Evolution of Mobile Technologies,” at 10, *available at* <https://www.qualcomm.com/media/documents/files/the-evolution-of-mobile-technologies-1g-to-2g-to-3g-to-4g-lte.pdf> (last visited Sep. 5, 2018)). 1G allowed for analog voice transmissions. (*Id.* at 5). In the early 1990s, 2G (or 2nd Generation) was developed, which increased voice capacity by enabling more users per channel. (*Id.* at 10-11). By the late 1990s, code division multiple access (CDMA) was developed, establishing a foundation for 3G (or 3rd Generation) technology which facilitated expanded wireless data and voice transmission. (*Id.* at 18-19). In the mid 2000s, Long-Term Evolution (LTE) 4G (or 4th Generation) technology was developed that permitted faster and better mobile broadband capacity. (*Id.* at 28).

7. LTE was first proposed in 2004 with studies on the standard officially commenced in 2005. (Ex. 1022, “UTRA-UTRAN Long Term Evolution (LTE) and 3GPP System Architecture Evolution (SAE),” at 6, *available at* ftp://ftp.3gpp.org/Inbox/2008_web_files/LTA_Paper.pdf (last visited Sep 5, 2018)). In May 2007, the LTE/SAE (System Architecture Evolution) Trial Initiative (LSTI) alliance was founded as a global collaboration between vendors and operators with the goal of verifying and promoting the new standard in order to ensure the global introduction of the technology as quickly as possible. (Ex. 1023, “LSTI job complete,” at 1, *available at* <http://www.3gpp.org/news-events/press-clippings/1324-LSTI-job-complete> (last visited Sep 5, 2018)). The LTE standard was finalized in December 2008, and the first publicly available LTE service was launched by TeliaSonera in Oslo and Stockholm on December 14, 2009. (Ex. 1024, “TeliaSonera launches world’s first commercial LTE networks in Sweden and Norway,” *available at* <https://www.telegeography.com/products/commsupdate/articles/2009/12/14/telia-sonera-launches-worlds-first-commercial-lte-networks-in-sweden-and-norway/> (last visited Sep. 5, 2018)).

8. The Federal Communications Commission (FCC) has designated several different spectrum bands over the years. Those spectrum bands consist of specific radio frequencies that are dedicated to specific radio signal functions,

namely the directional transmission of a signal (i.e., downlink) from one device to another or reception of a signal (i.e., uplink) from one device to another.

9. For example, the Specialized Mobile Radio (SMR) service was first established by the Commission in 1979 to provide land mobile communications on a commercial basis. Over time, frequency allocations and spectrum bands are modified by the FCC to suit the public's needs. (See Ex. 1025, FCC 04-168, at 22-28).

10. Another spectrum, broadband Personal Communications Service (PCS), dates back to 1989 when the FCC received several petitions for rulemaking for additional spectrum for emerging technologies, including the spectrum in the 1850 – 1990 MHz range. In 1993, the FCC announced service rules for Broadband PCS. Initially, Broadband PCS included 120 MHz of licensed spectrum and 20 MHz of unlicensed spectrum. Later, 10 MHz of the unlicensed spectrum in the 1910 – 1915 and 1990 – 1995 MHz range (sometimes referred to as the G Block) became available for licensed use. (See Ex. 1026, FCC 02-304, at 4-5 n.19).

11. In 2002, the FCC released an Order that allocated 90 MHz of spectrum for Advanced Wireless Services (AWS) in the 1710-1755 and 2110-2155 MHz spectrum range. (See Ex. 1026, FCC 02-304, at 4-5). These spectrum bands are known as AWS-1. In 2003, the FCC released an Order that

established rules to license AWS in the 1710-1755 and 2110-2155 MHz spectrum range. (See Ex. 1027, FCC 03-251, at 1).

12. The United States 700 MHz FCC wireless spectrum auction, officially known as Auction 73, was started by the FCC on January 24, 2008 for the rights to operate the 700 MHz radio frequency band in the United States. *See* Public Notice (Ex. 1028, FCC-07-72, at 3 and Ex. 1029, DA-07-3415, at 1-3). The 700 MHz frequency band is part of the 698-806 MHz band which was occupied by television broadcasters and was made available for new commercial and public safety services as a result of the digital television transition. (Ex. 1029, DA-07-3415, at 5).

13. After the auction, the 3rd Generation Partnership Project (3GPP), an industry standards-setting body, created four band classes within the 700 MHz band—12, 13, 14, and 17. Band class 13 was designated for Verizon's upper C Block spectrum; band class 17 for AT&T's lower B and C Block spectrum; and band class 12 for the smaller operators' lower A, B, and C Block spectrum. Band class 14 was created for the upper D Block spectrum allocated for public safety use. (Ex. 1030, 3GPP CR 36.101-0004, at 2, Ex. 1031, 3GPP CR 36.101-0048, at 2, and Ex. 1032, 3GPP CR 36.101-0052, at 2).

14. At least as early as September of 2008, the uplink and downlink frequencies for Band 12 were designated as ranging from 698 MHz to 716 MHz

and 728 to 746 MHz, respectively. The uplink and downlink frequencies for Band 13 were designated as ranging from 777 MHz to 787 MHz and 746 to 756 MHz respectively. (Ex. 1033, 3GPP TS 36.101 V8.11.0, at 14, and Ex. 1034, 3GPP TS 36.101 V8.3.0, at 12).

15. The FCC allocated the spectrum for Lower 700 MHz (with frequencies ranging from 698 MHz to 746 MHz) and Upper 700 MHz (with frequencies ranging from 746 MHz to 806 MHz) in a way to minimize the potential for interference among the licensees, so it aligned downlinks to achieve this goal, as having the bands reversed and adjacent could become problematic in some cases. (Ex. 1035, FCC 12-31, at 3-4). They really started the process from the top of the Upper 700 MHz and worked down. The upper part of Upper 700 had to interface with the SMR800 MHz spectrum that was uplink, so the upper part is uplink, and this uplink spectrum extended down to 776 MHz. From there, the FCC started designation of the downlink spectrum to 716 MHz and then uplink to 698 MHz. (Ex. 1035, FCC 12-31, at 3-4, and Ex. 1028, FCC 07-72, at 43-45).

16. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false

statements and the like so made are punishable by fine or imprisonment, or both,
under Section 1001 of Title 18 of the United States Code.

DATED this 19 day of September, 2018.

A handwritten signature in cursive script, appearing to read "Patrick Cook", written in black ink.

Patrick Cook

Exhibit 1020

PATRICK COOK

EXPERIENCE

- 3/2013-Present** Chief Technical Officer, *Wilson Electronics, LLC*
- Directed the development of new products and IP.
 - Guided the engineering department in best practices and RF layout design.
 - Worked with regulatory requirements for booster applications in various frequencies, and provided input on the formal FCC definition of a booster.
- 2000-2013** Senior Design Engineer, *Wilson Electronics, LLC*
- Cellular antenna design for new products.
 - Began first RF booster designs and first Basic, C, and C+ booster program developments.
 - Started and designed production manufacturing, managed production employees, and implemented shipping and production software.
 - Worked on mechanical designs, including antenna housings and booster housings.
 - Developed supply chains including antennas, injection molds, and part supply for circuit board production.
 - Designed and implemented booster testing and manufacturing.
 - Started engineering department and implemented a customer service department.
 - Member of Telecommunication Certification Body (TCB) Council.
 - Participated in the ANSI C63.26 group to develop booster testing requirements.
 - Maintained various patents on antennas and boosters.
- 5/1995-2000** Engineer, *Wilson Electronics, LLC*
- Designed CB antennas and production equipment for Wilson CB.
 - Began designs on coupling devices (ring couplers and patch antennas for passive connections) for cellular phones.
- 1984-1988** CPL Second Echelon Mechanic, U.S. *Marines*

EDUCATION

- 1/1995-5/1995** Master's Program, Las Vegas, NV, *University of Nevada, Las Vegas*
Antenna Theory and Design class sponsored by Jim Wilson.

- 1/1995-5/1995 Master's Program, Las Vegas, NV, *University of Nevada, Las Vegas*
Antenna Theory and Design class sponsored by Jim Wilson.
- 9/1990-12/1994 BSEE, Las Vegas, NV, *University of Nevada, Las Vegas*
- 1/1989-5/1990 Associate Degree, Las Vegas, NV, *Clark County Community College*

Exhibit 1021

June 2014

The Evolution of Mobile Technologies:

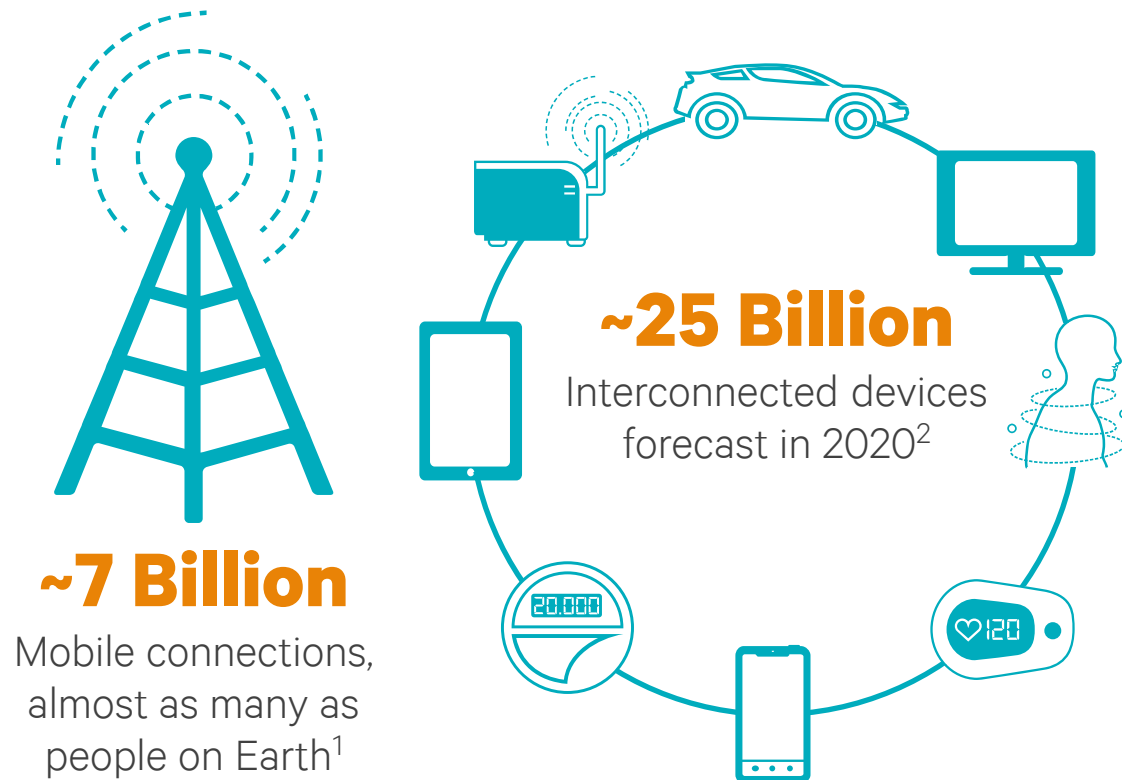
1G ⇌ 2G ⇌ 3G ⇌ 4G LTE

QUALCOMM®



The mobile experience is expanding everywhere

Billions of Mobile Connections



Billions of Mobile Experiences



>100 Billion

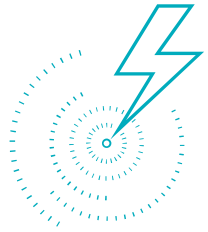
App downloads
completed in 2013³



~270 Billion

App downloads
expected in 2017³
Wilson Exhibit 1010

Mobile is an amazing technical achievement



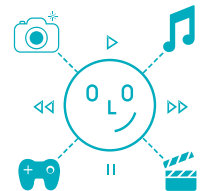
Mind-blowing Performance

with processing power greater than the most advanced super computers of the early 1990s¹



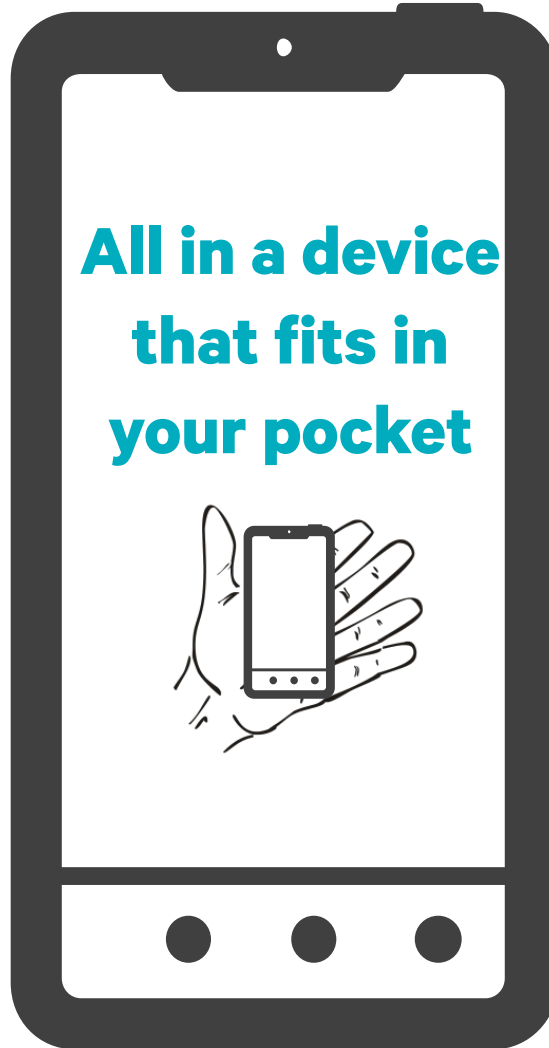
Jaw-dropping Graphics

with capability to process several thousand megapixels per second²



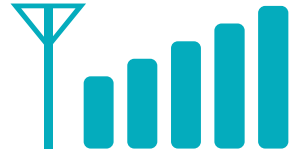
High Quality Multimedia²

4K UltraHD video player/recorder
HD gaming console
5.1/7.1 surround sound system
High resolution digital camera



Reliable Connectivity

overcoming signal loss resulting in receiving signal 100 trillion times weaker than when it originated³



Broadband Speeds

with blazing fast data rates capable of 300+ Mbps⁴

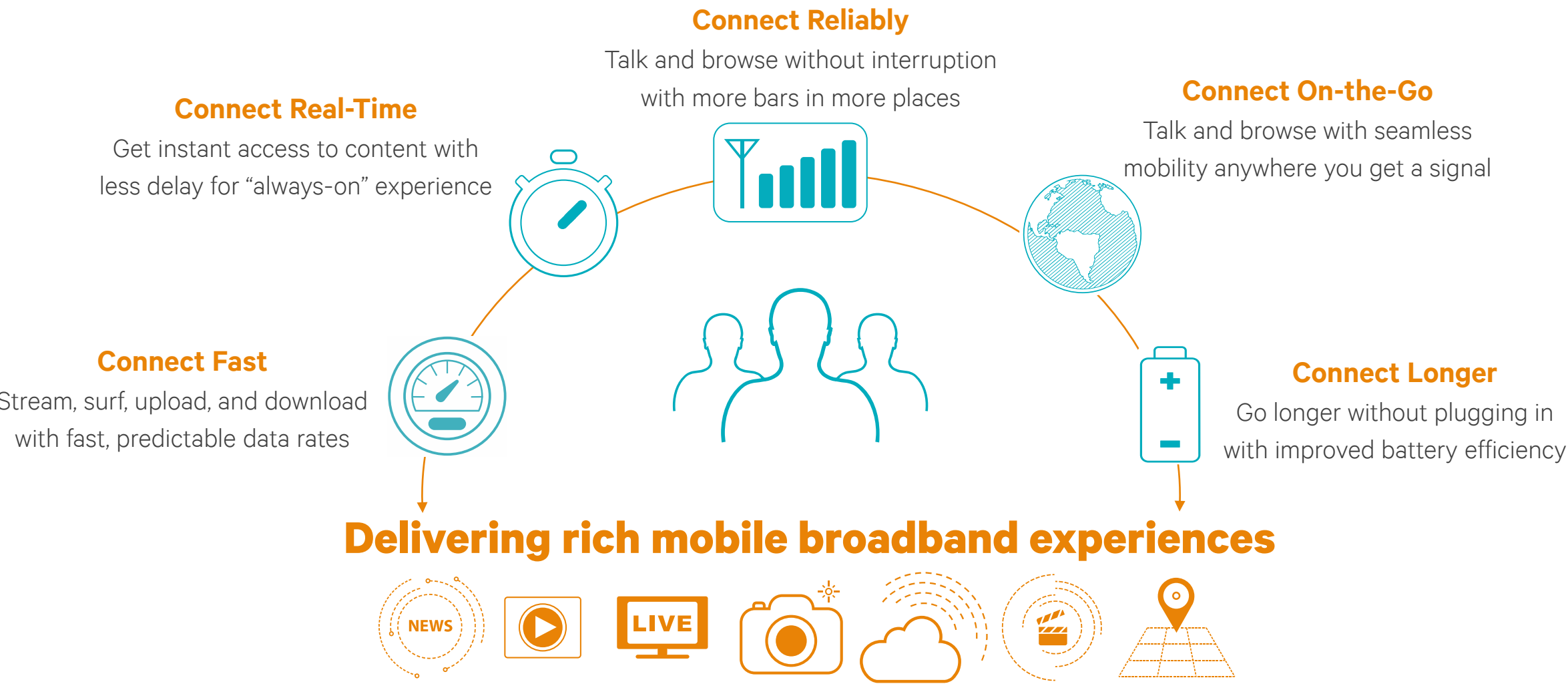


Long Battery Life

with ability to power all these amazing experiences with less energy than it takes to power a light bulb for 15 minutes⁵



Connectivity is the foundation of a great mobile experience



Powered by evolving mobile technologies for better experiences

Mobile 1G

AMPS, NMT, TACS



Mobile 2G

D-AMPS, GSM/GPRS, cdmaOne



Mobile 3G

CDMA2000/EV-DO, WCDMA/HSPA+, TD-SCDMA



Mobile 4G LTE

LTE, LTE Advanced



N/A

Analog Voice



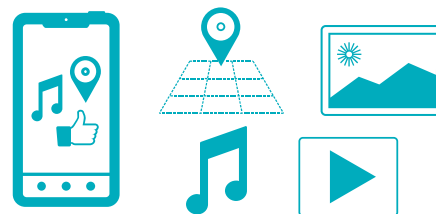
<0.5 Mbps¹

Digital Voice + Simple Data



63+ Mbps²

Mobile Broadband



300+ Mbps³

Faster and Better



Evolving mobile technologies deliver great mobile experiences

Appreciating the magic of mobile requires understanding the evolution from 1G to 4G LTE

1



1G established seamless mobile connectivity introducing mobile voice services

3



3G optimized mobile for data enabling mobile broadband services, and is evolving for faster and better connectivity

2



2G digital wireless technologies increased voice capacity delivering mobile to the masses

4



4G LTE delivers more capacity for faster and better mobile broadband experiences, and is also expanding in to new frontiers

5



Qualcomm has been at the forefront of this evolution, pushing wireless boundaries to enable the best mobile experiences

Mobile 1G established the foundation of mobile

1

Licensed Spectrum

Cleared spectrum for exclusive use by mobile technologies

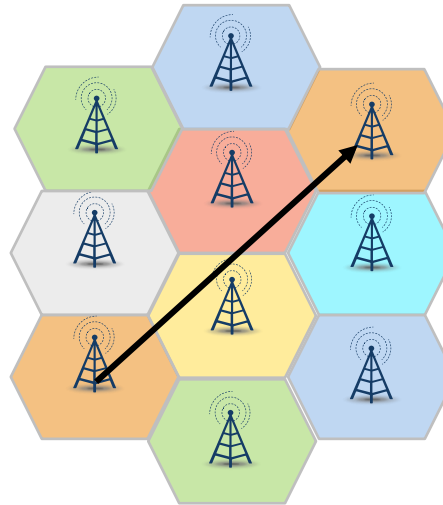


Operator-deployed **base stations** provide access for subscribers

2

Frequency Reuse

Reusing frequencies without interference through geographical separation

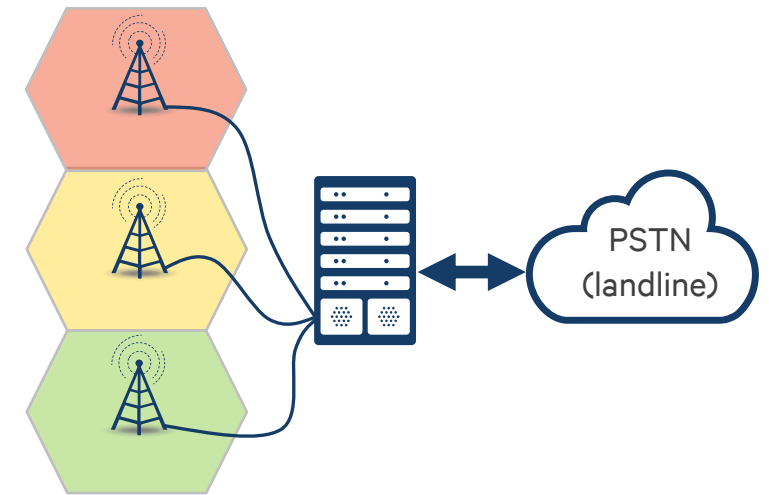


Neighboring **cells** operate on different frequencies to avoid interference

3

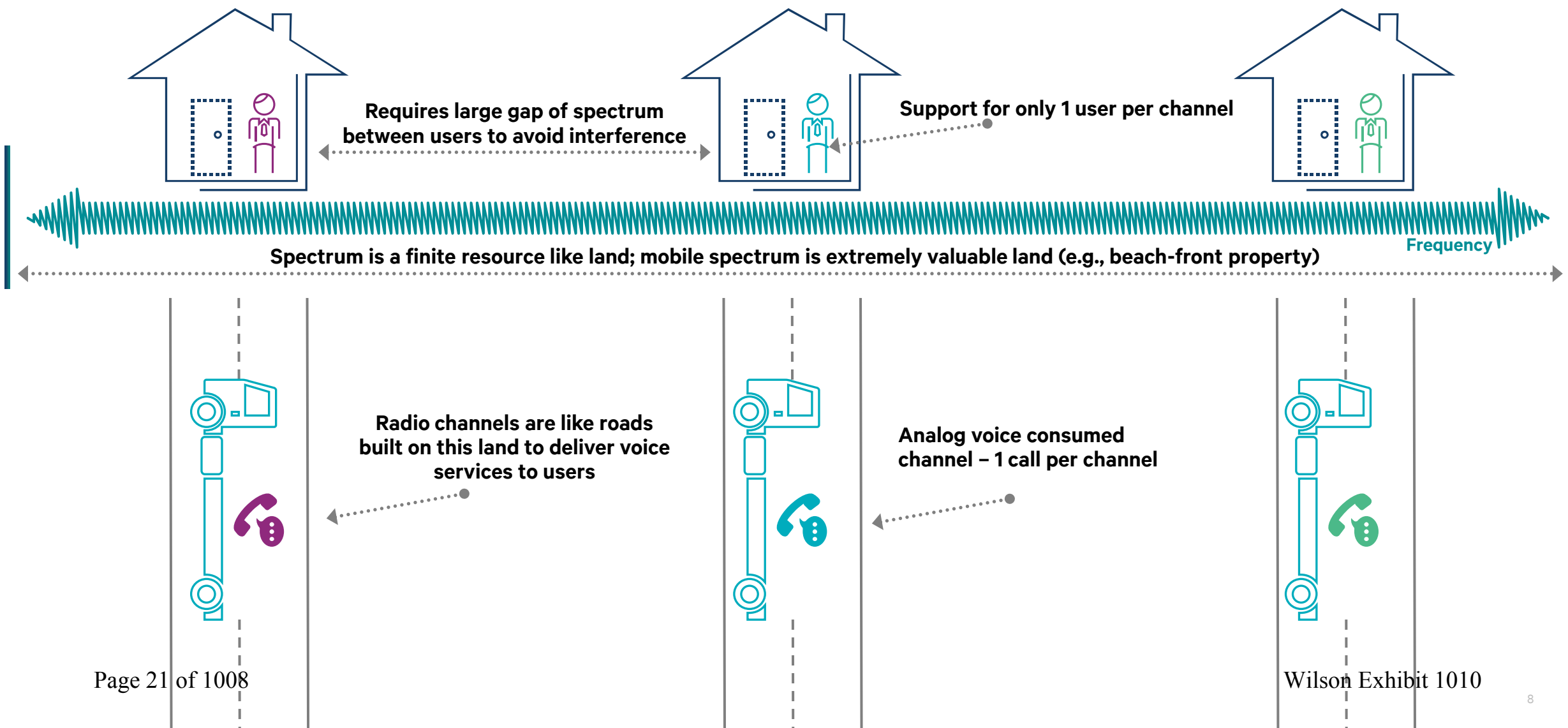
Mobile Network

Coordinated network for seamless access and seamless mobility



Integrated, transparent **backhaul network** provides seamless access

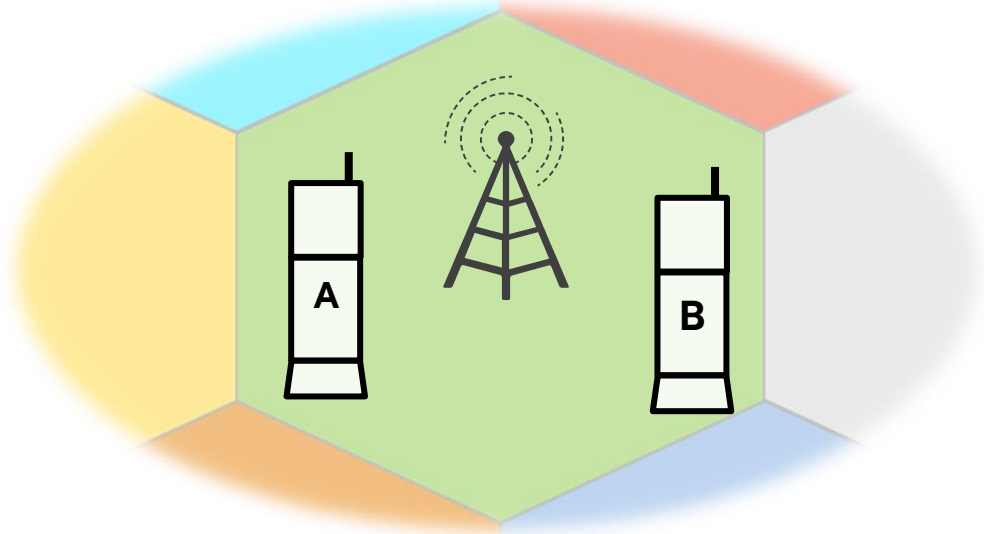
Mobile 1G was amazing, but limited



1G analog voice was amazing, but limited

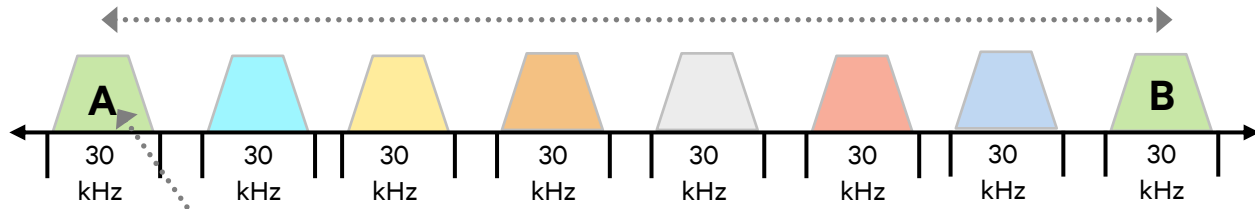
Limited Capacity

Analog transmissions are inefficient at using limited spectrum



Frequency Division Multiple Access (FDMA)*

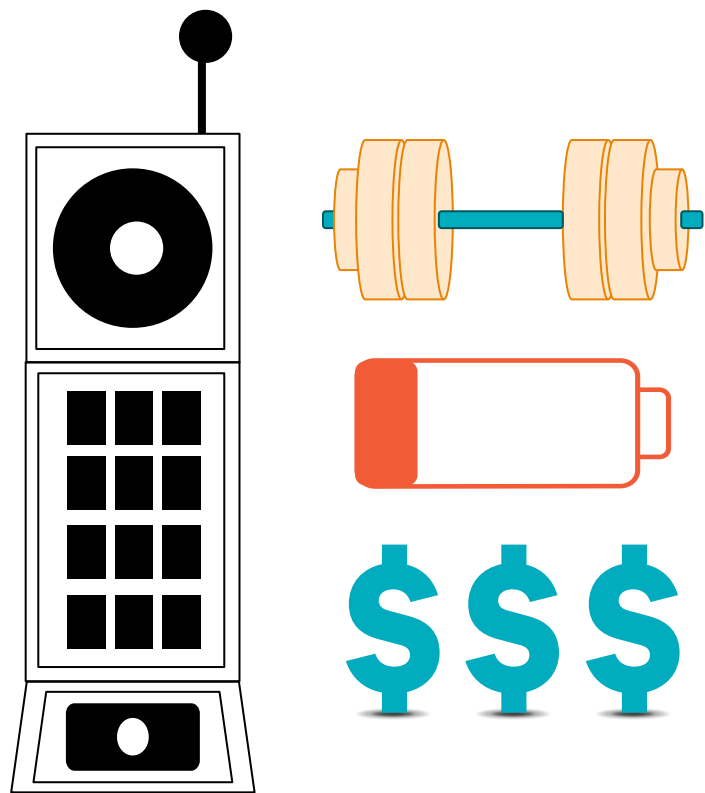
Large frequency gap required between users to avoid interference



Support for only 1 user (analog phone call) per channel

Limited Scalability

Analog devices are large/heavy, power inefficient, and high cost



* Example shown based on AMPS 1G technology

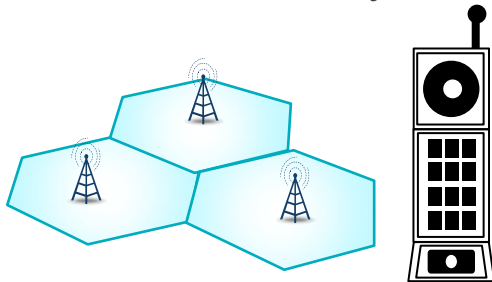
Mobile 2G digital technologies increased voice capacity

Delivering mobile voice services to the masses – more people, in more places

Mobile 1G

AMPS, NMT, TACS

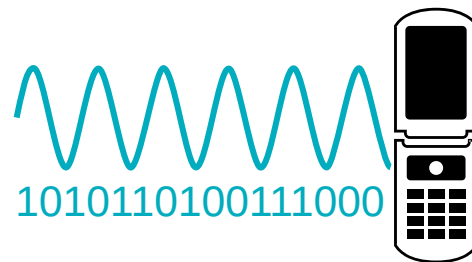
Foundation of Mobile
Seamless Mobility



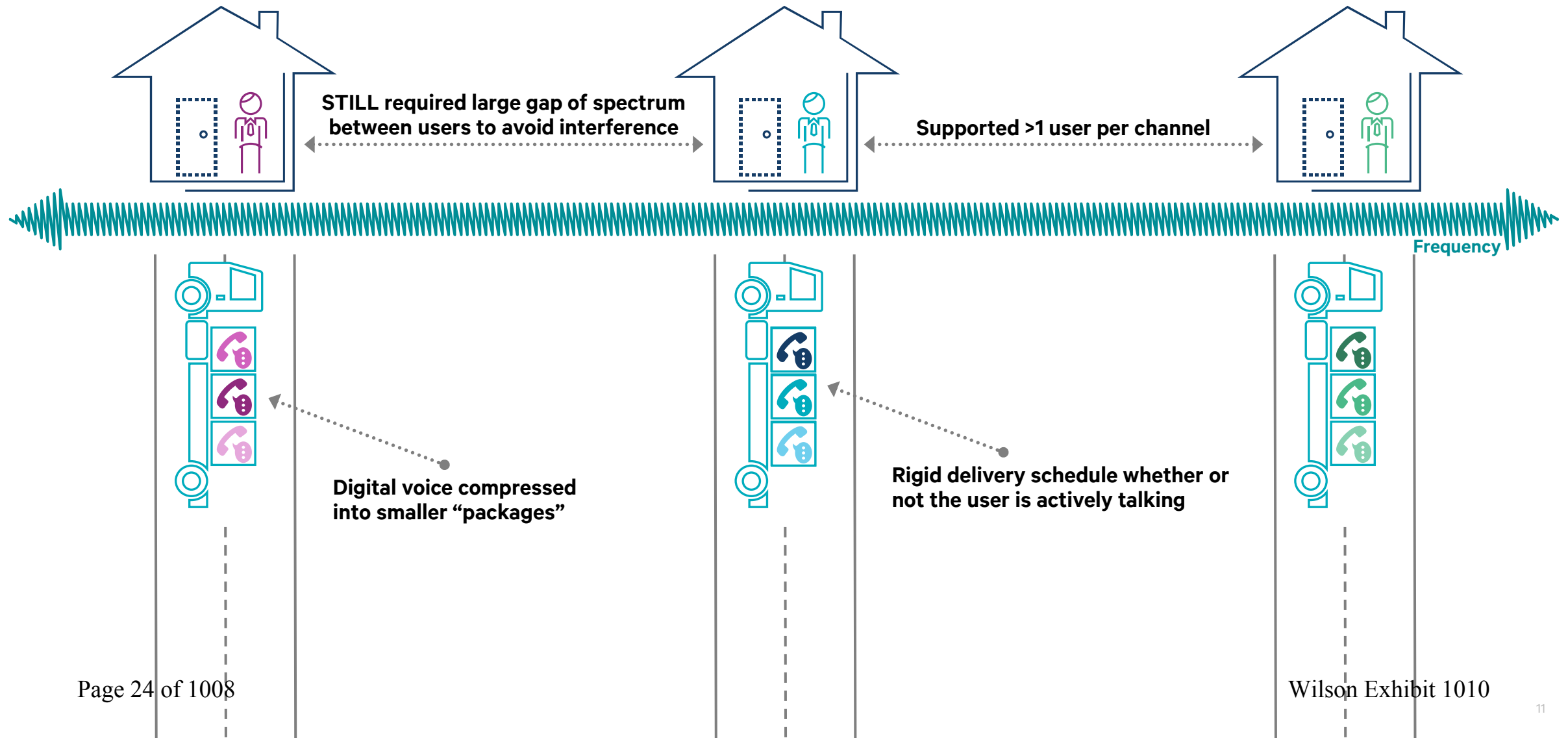
Mobile 2G

D-AMPS, GSM/GPRS,
cdmaOne

Mobile for the Masses
More Voice Capacity



Early Mobile 2G technologies enabled more users per channel

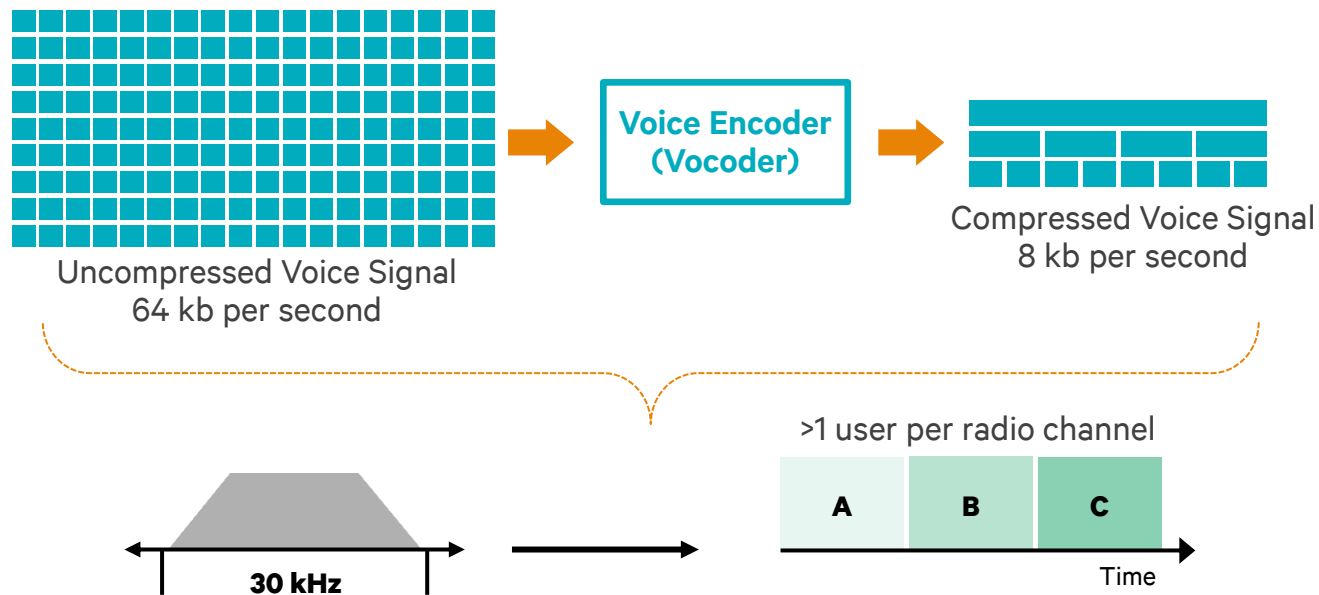


Mobile 2G digital wireless technologies enabled more users

Initial 2G technologies (D-AMPS, GSM) based on TDMA

More Voice Capacity

Digital transmissions enable compressed voice and multiplexing multiple users per channel

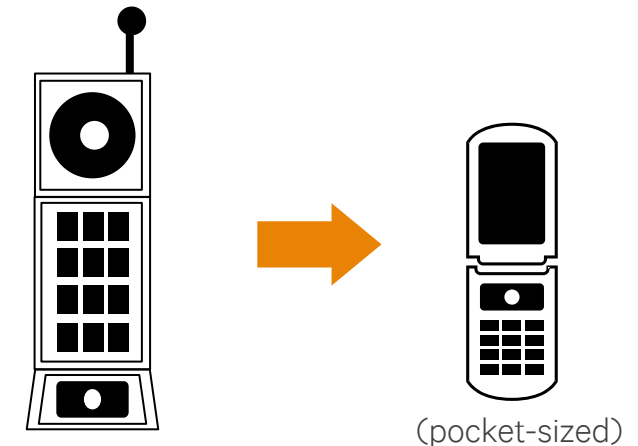


Time Division Multiple Access (TDMA)

Allows multiple users per radio channel with each user talking one at a time

Scalable Technology

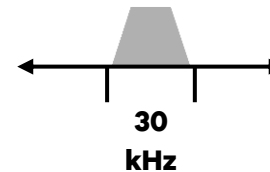
Digital components cost/weight far less plus deliver more secure signal



Different Mobile 2G TDMA techniques were standardized

Mobile 1G (Analog)

AMPS, NMT, TACS



Only one user per radio channel



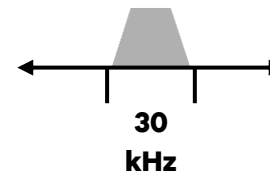
Mobile 2G (Digital)

D-AMPS

Standardized as IS-54 by TIA in 1992

Mainly in North America

No longer utilized



Three users per radio channel



Mobile 2G (Digital)

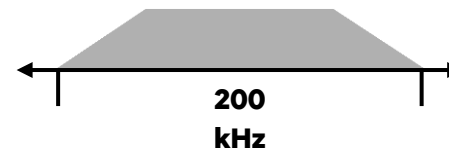
GSM

Standardized by ETSI in 1990 (phase 1)

Initiated in Europe

Still widely used today (>4B connections WW¹)

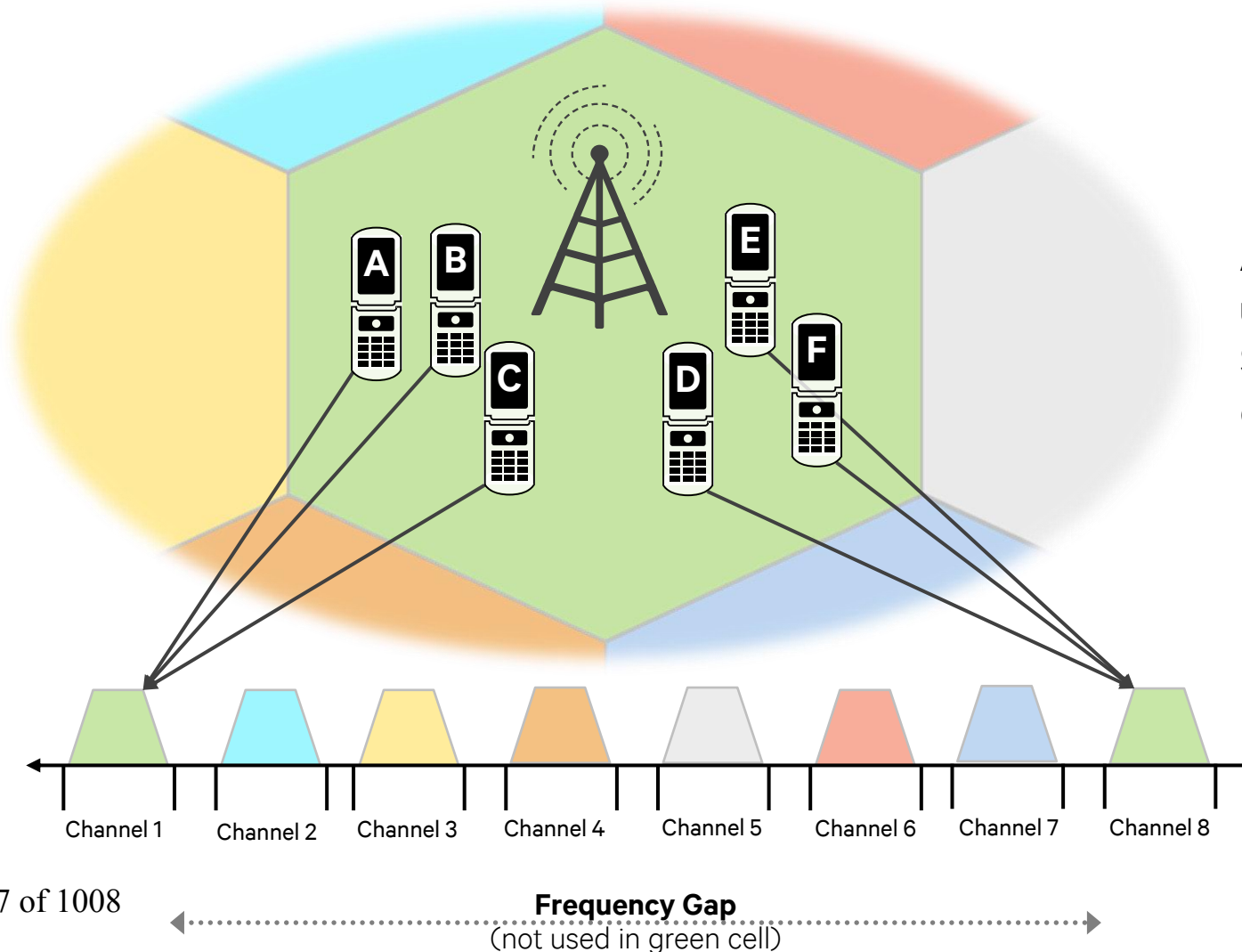
Simple data services with GPRS



Eight users per radio channel



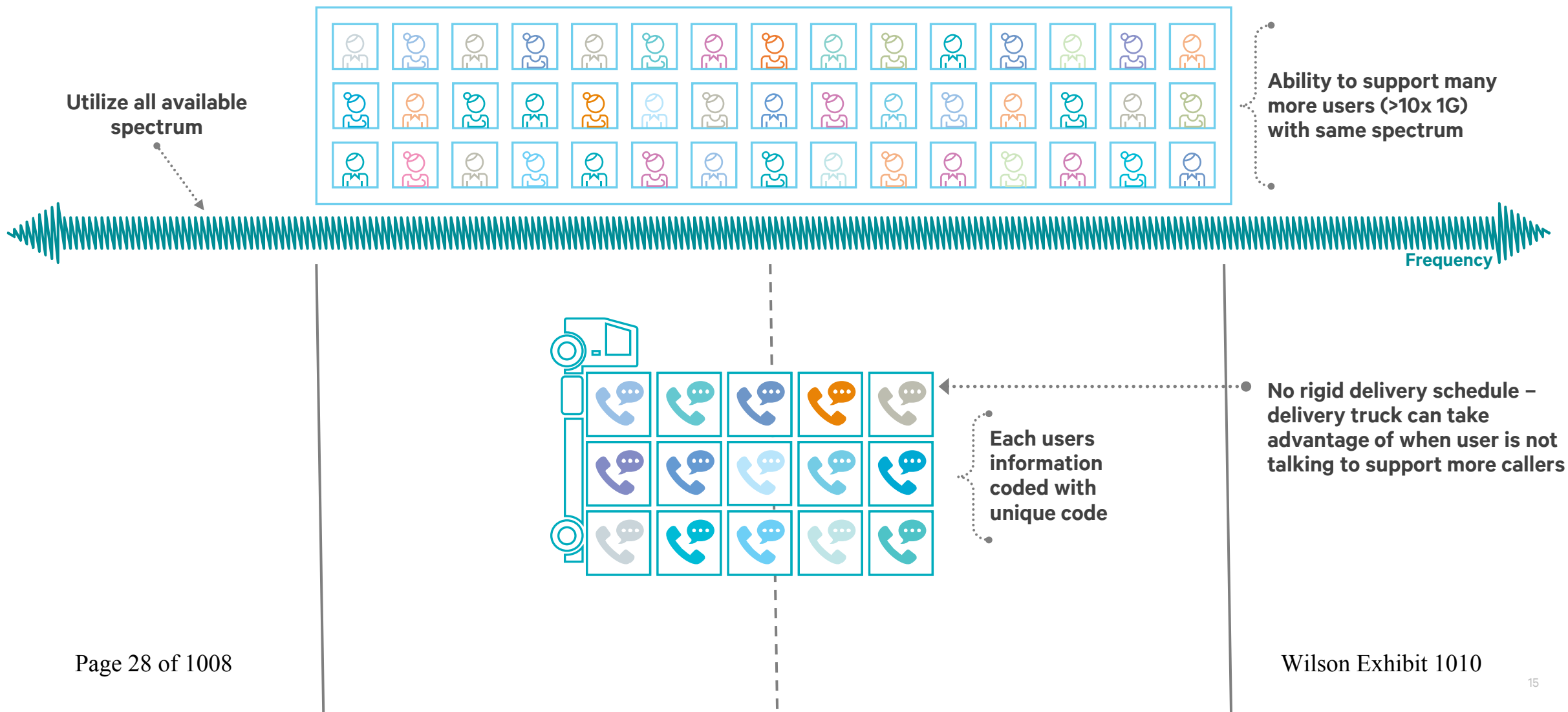
TDMA still required large frequency gaps to reduce interference



Also required potentially unreliable “hard” handoffs

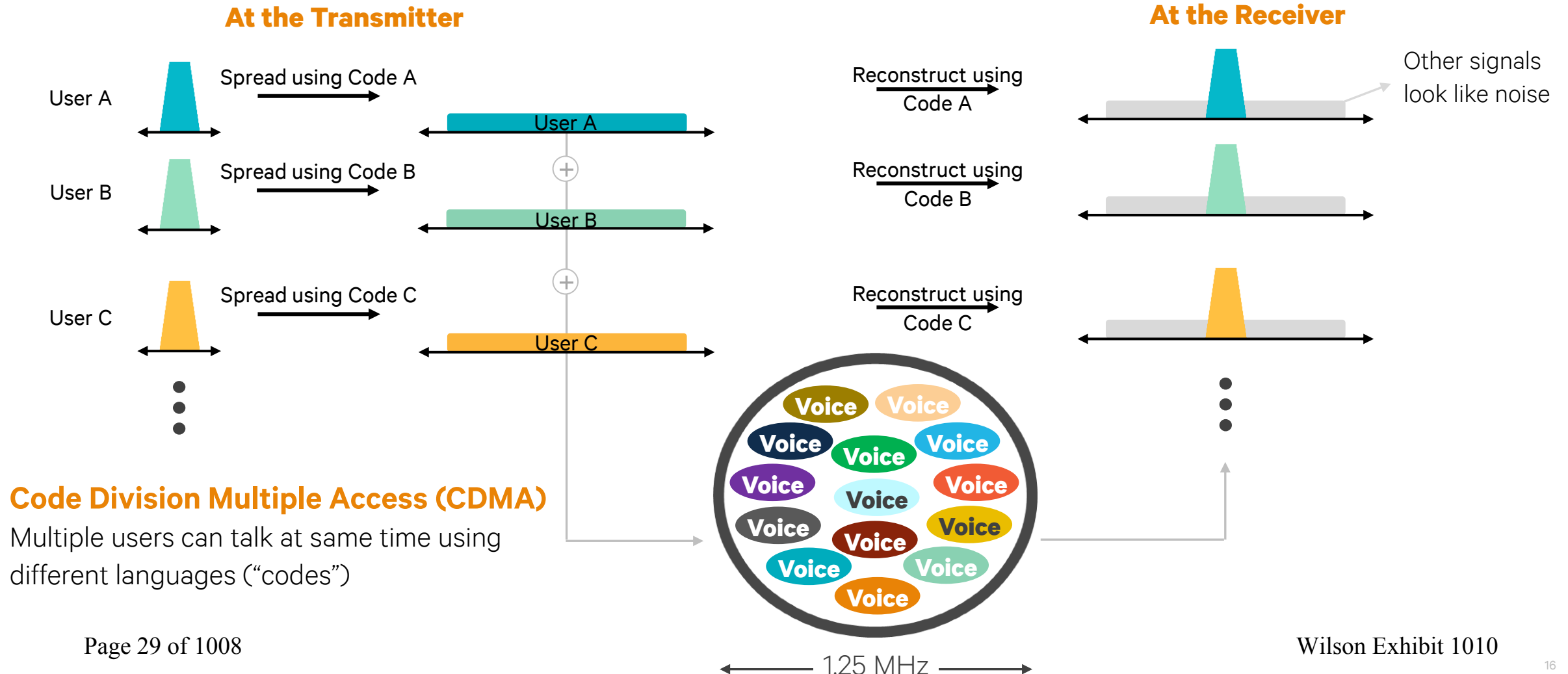
Switch channels between adjacent cells – potential for dropped calls

CDMA utilizes all the available spectrum to support more users



Qualcomm solved the seemingly impossible wireless challenge

CDMA enables users to share the same frequency and communicate at the same time



Qualcomm solved complex challenges to commercialize CDMA

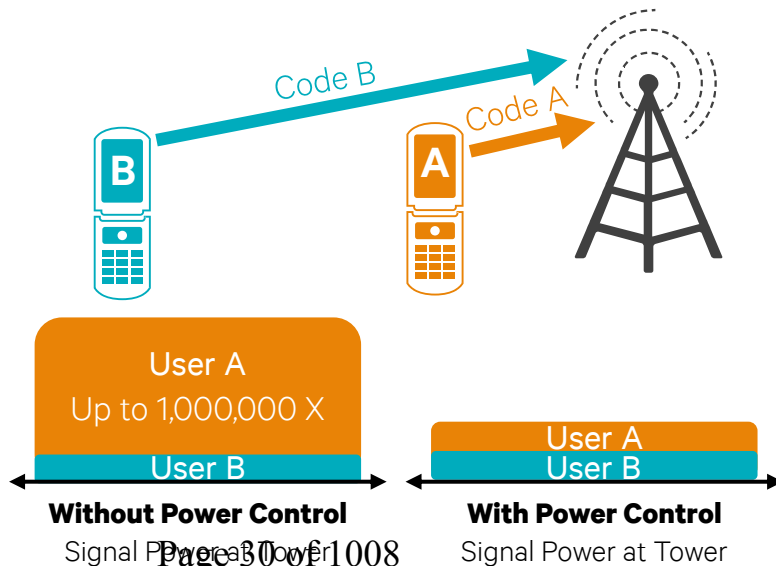
1

Near-Far Power Challenge

Users close to the tower overpower the uplink signal minimizing capacity on the shared channel

Solution:

Continuous control of transmit power based on signal strength



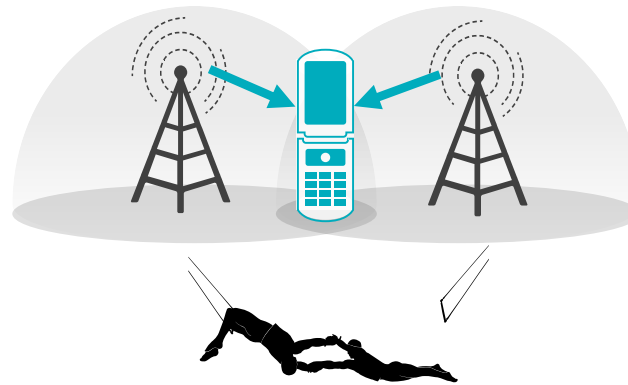
2

Cell-Edge Challenge

Interference caused by users in close proximity, on the same frequency, and communicating with different towers

Solution:

Users simultaneously communicate with multiple towers at cell edge



+ Soft (vs. Hard) Handoffs

Additional benefit of simultaneous connections – more reliable handoffs

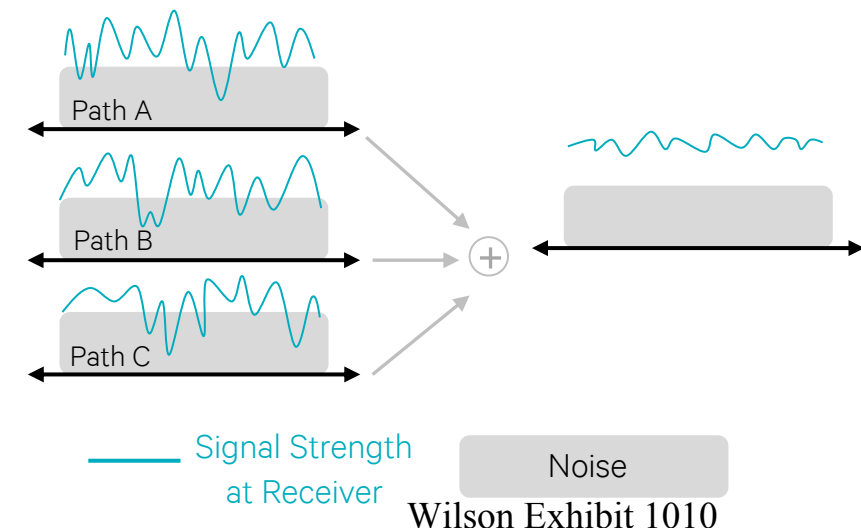
3

Multipath Fading Challenge

Interference caused by the reception of the same signal over multiple paths resulting in poor signal-to-noise ratio

Solution:

Advanced (“rake”) receivers combine energy of multiple signal paths



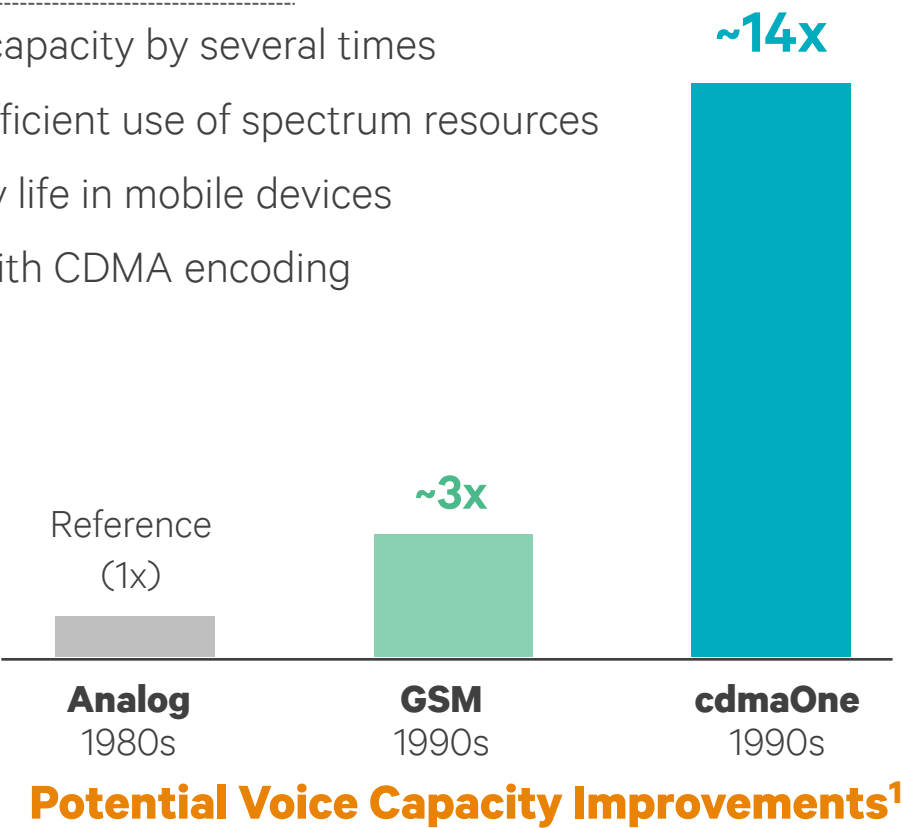
Wilson Exhibit 1010

CDMA delivered unprecedented voice capacity and much more

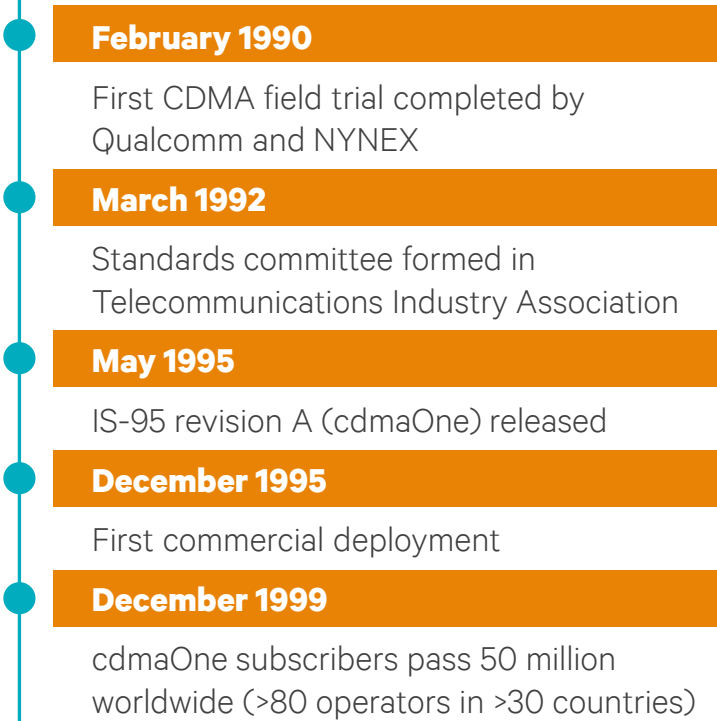
Qualcomm efforts lead to new CDMA standard (IS-95) referred to as cdmaOne

CDMA Benefits

- Increased voice capacity by several times
- Provided more efficient use of spectrum resources
- Increased battery life in mobile devices
- Better security with CDMA encoding



CDMA Timeline²

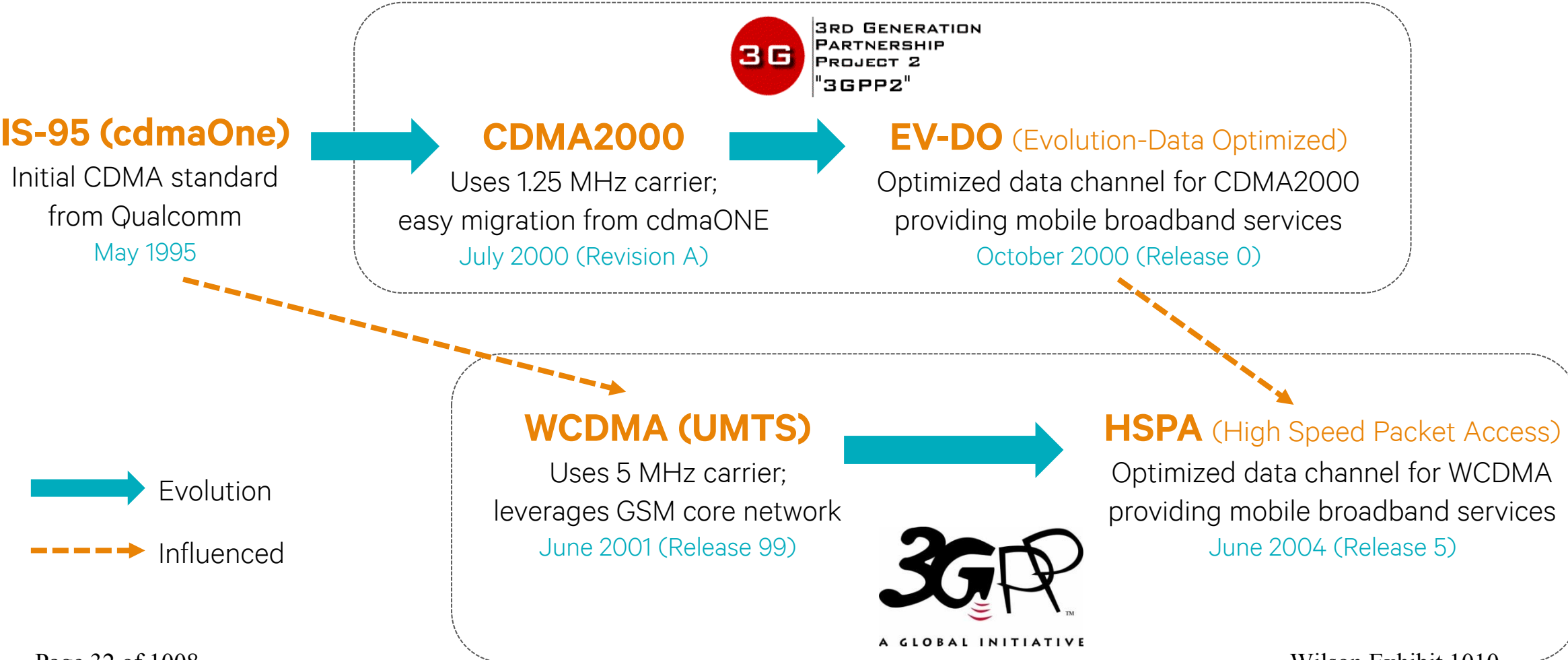


CDMA is the foundation for Mobile 3G technologies

¹ Approximate total number of subscribers serviced within same spectrum based on AMPS (1G), GSM and cdmaOne technology commercial deployed in 1990s; ² Source: CDG, www.cdg.org

CDMA established the foundation for 3G technologies

Mobile 3G evolved into two competing standards both based on CDMA



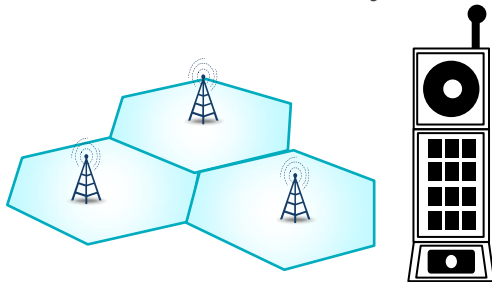
Mobile 3G evolved mobile for data

Introducing high-speed internet access for the first time

Mobile 1G

AMPS, NMT, TACS

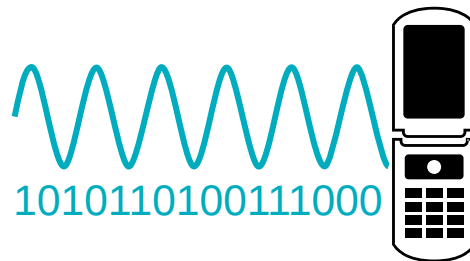
Foundation of Mobile
Seamless Mobility



Mobile 2G

D-AMPS, GSM/GPRS,
cdmaOne

Mobile for the Masses
More Voice Capacity



Mobile 3G

CDMA2000/EV-DO,
WCDMA/HSPA+, TD-SCDMA

Mobile Broadband
Data Optimized



1980s

Page 33 of 1008

1990s

2000s

Wilson Exhibit 1010

Mobile voice was amazing, but consumers wanted more

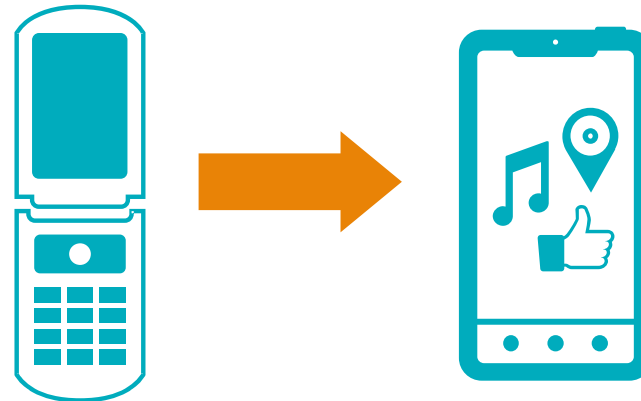
A new, insatiable demand for internet access and data services emerges

Broadband Internet



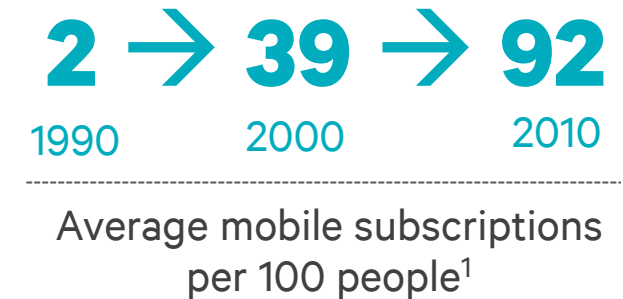
Consumers introduced to broadband internet access in the home/office

The Smartphone



Amazing innovations in device technology resulted in the era of the smartphone

Mobile Everywhere



Thanks to 2G technologies, more and more people had a mobile subscription

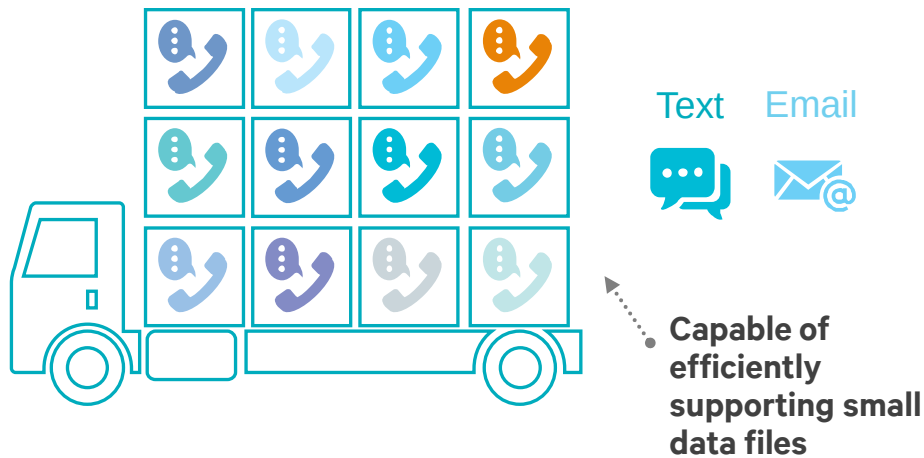
EV-DO optimized 3G for data enabling mobile broadband

Data Enabled

Simple Data Services

Mobile 2G

<0.5 Mbps¹

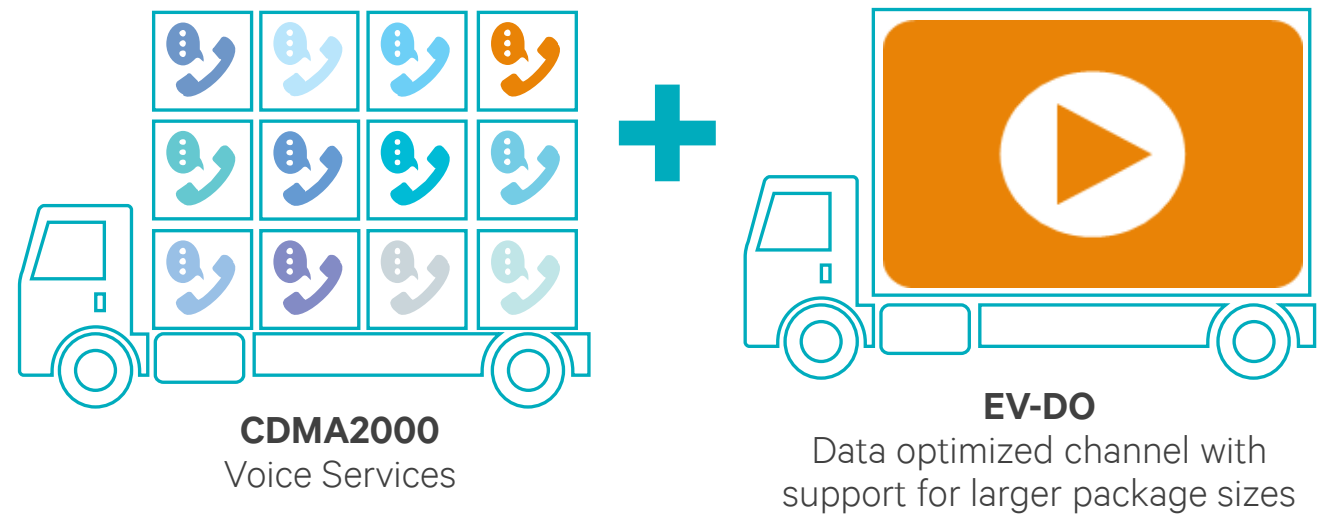


Data Optimized

Mobile Broadband

CDMA2000/EV-DO

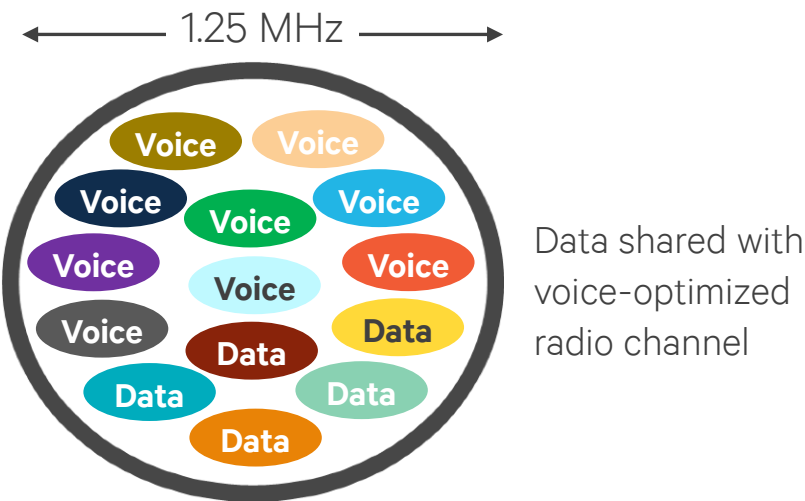
14.7 Mbps²



Qualcomm pioneered EV-DO introducing mobile broadband

Mobile 2G

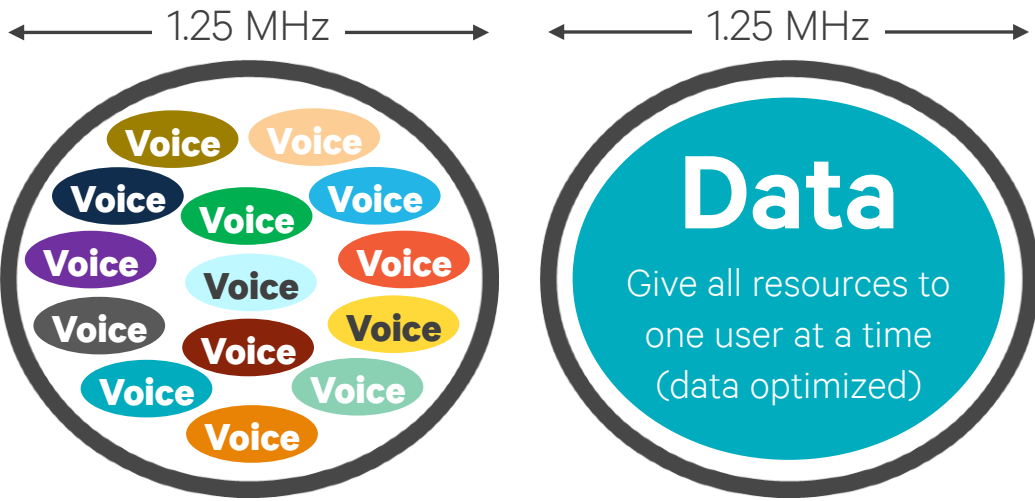
Data Enabled



Simple Data Services

CDMA2000/EV-DO

Data Optimized



Mobile Broadband Services

Wilson Exhibit 1010

EV-DO inventions are the foundation to mobile broadband

1

Data Optimized Channel

Splits channel into time intervals enabling a single user to get all the resources at once

Enables richer content

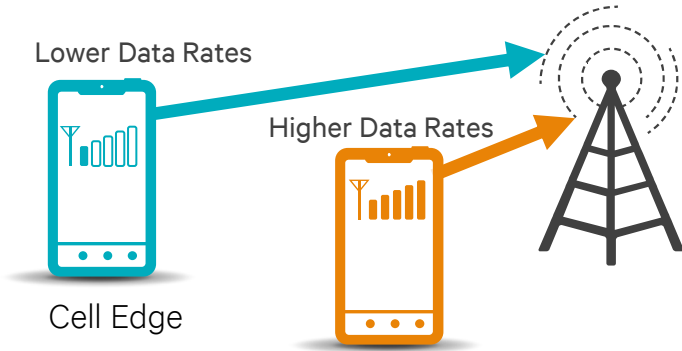


2

Adaptive Modulation

Uses higher order modulation to get more bps per Hz for users with good signal quality

Increases peak data rates

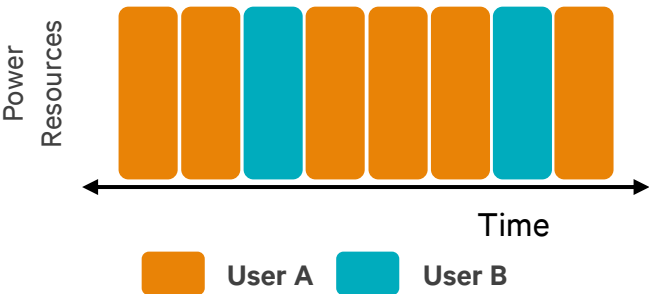


3

Opportunistic Scheduling

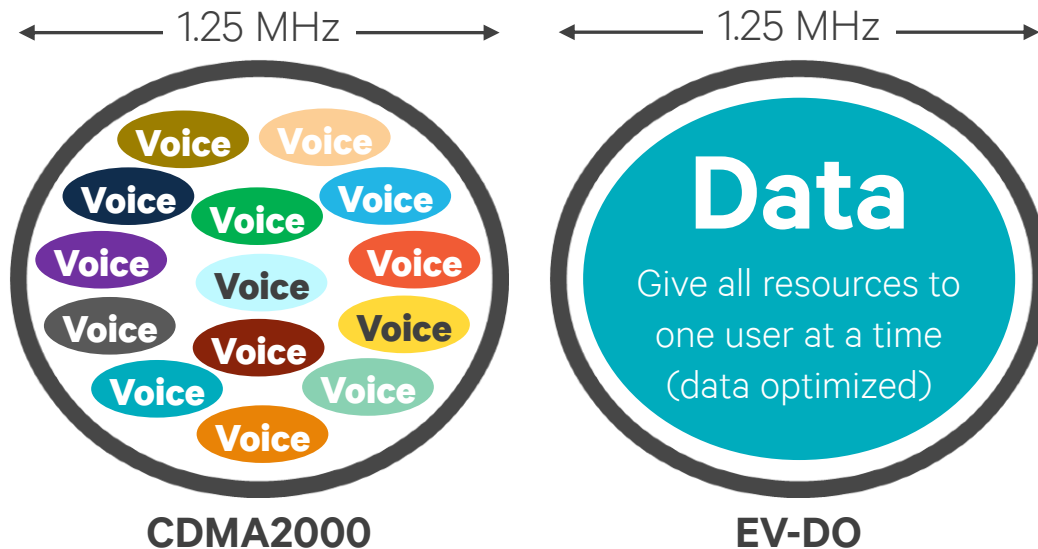
Optimizes channel by scheduling users at the time instances when users have good radio signal conditions (with fairness)

Increases overall capacity

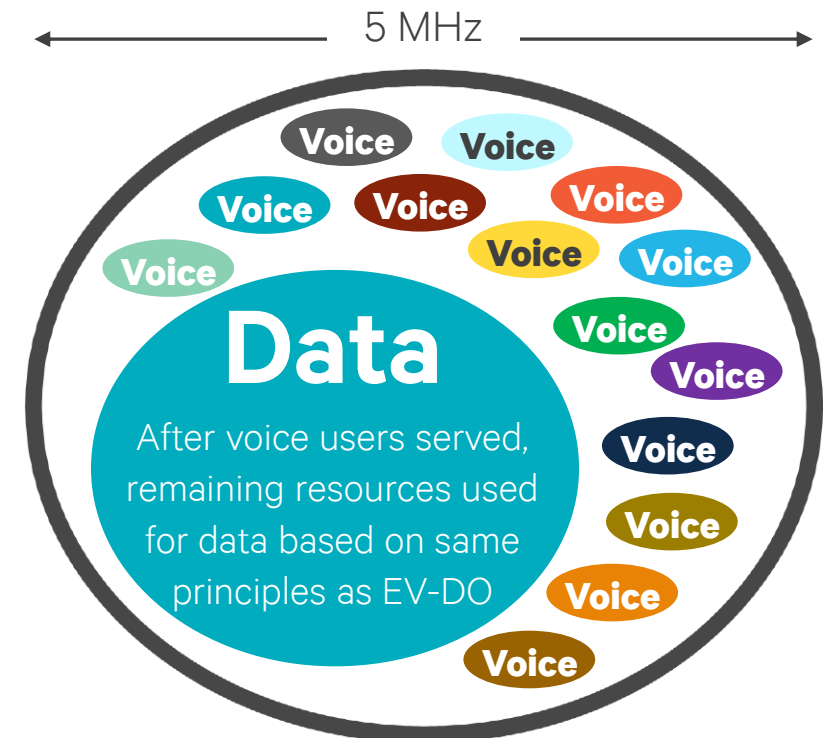


CDMA2000/EV-DO blazed the trail for WCDMA/HSPA

CDMA2000/EV-DO



WCDMA/HSPA



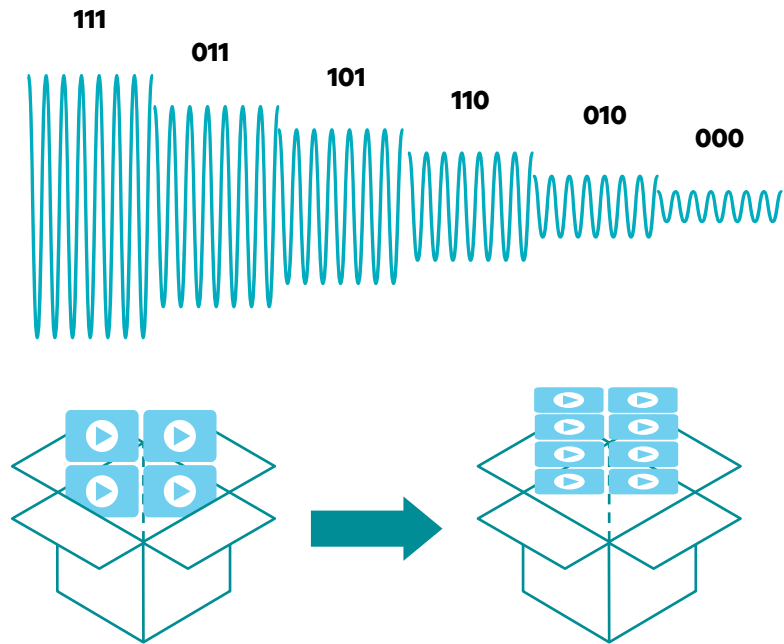
3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

Mobile 3G evolved to HSPA+ and EV-DO Rev. B

Delivering higher data rates, more capacity, and enhanced mobile broadband experiences

Higher Order Modulation (HOM)

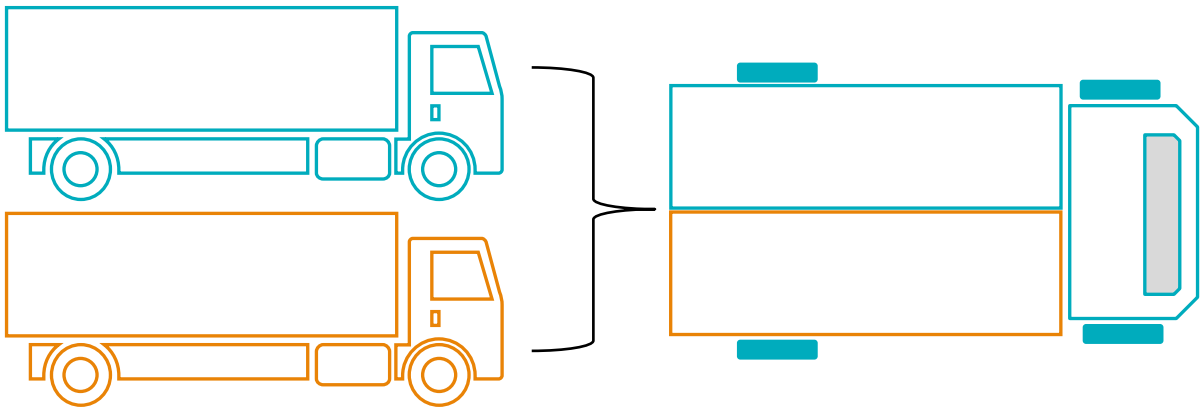
Introduces 64-QAM enabling 50% more bits per second per Hz (bps/Hz)



Enabling packing 50% more data into packages

Carrier Aggregation

Aggregating spectrum enabling increased user and peak data rates

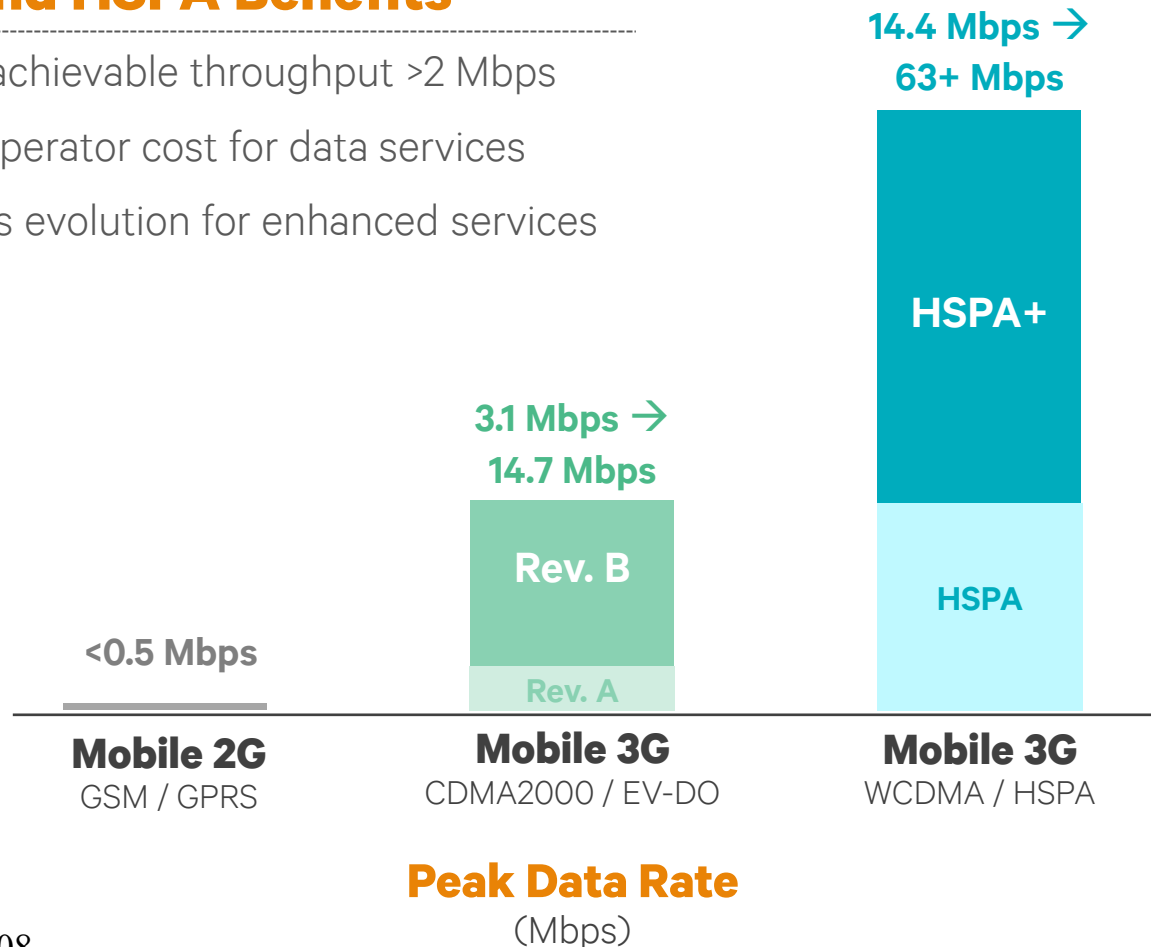


Aggregate channels for higher data rates

3G technologies optimized mobile for data

EV-DO and HSPA Benefits

- Delivered achievable throughput >2 Mbps
- Reduced operator cost for data services
- Continuous evolution for enhanced services



Mobile Broadband Timeline¹

1999

Qualcomm introduces EV-DO

January 2002

First EV-DO commercial launch

Q4 2004

3GPP release 6 with HSPA is published based on WCDMA technology

Q1 2007

EV-DO passes 50 million connections

Q108

HSPA passes 50 million connections

June 2008

First HSPA+ (21 Mbps) commercial launch

September 2010

First DC-HSPA+ (42 Mbps) commercial launch

3G technologies continue to evolve

Surpassed 2B connections in 2013²

Wilson Exhibit 1010

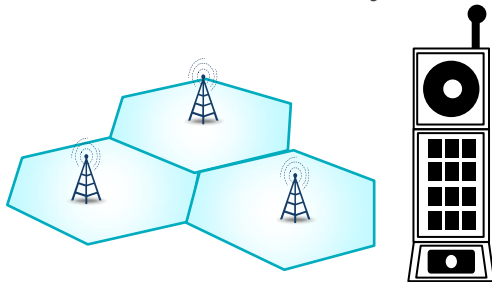
Mobile 4G LTE is evolving to provide more data capacity

Delivering faster and better mobile broadband experiences

Mobile 1G

AMPS, NMT, TACS

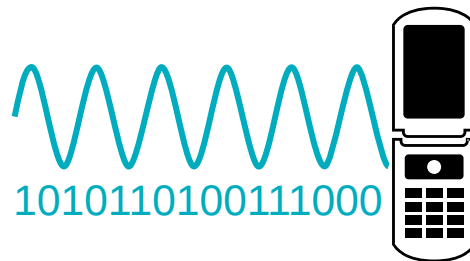
Foundation of Mobile
Seamless Mobility



Mobile 2G

D-AMPS, GSM/GPRS,
cdmaOne

Mobile for the Masses
More Voice Capacity



Mobile 3G

CDMA2000/EV-DO,
WCDMA/HSPA+, TD-SCDMA

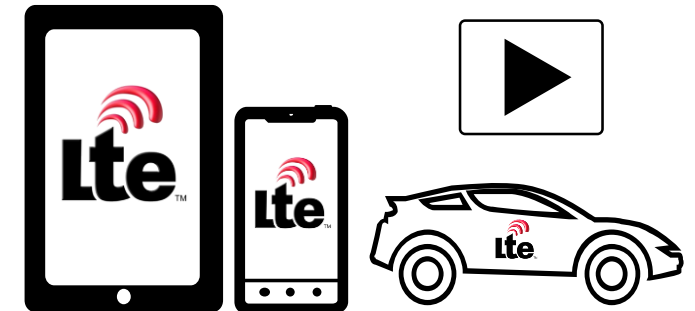
Mobile Broadband
Data Optimized



Mobile 4G LTE

LTE, LTE Advanced

Faster and Better Mobile Broadband
More Data Capacity



1980s

Page 41 of 1008

1990s

2000s

2010s

Wilson Exhibit 1010

Mobile 4G LTE complements 3G to boost data capacity

Multimode 3G/LTE is the foundation for successful 4G LTE

4G LTE

Providing more data capacity for richer content and more connections

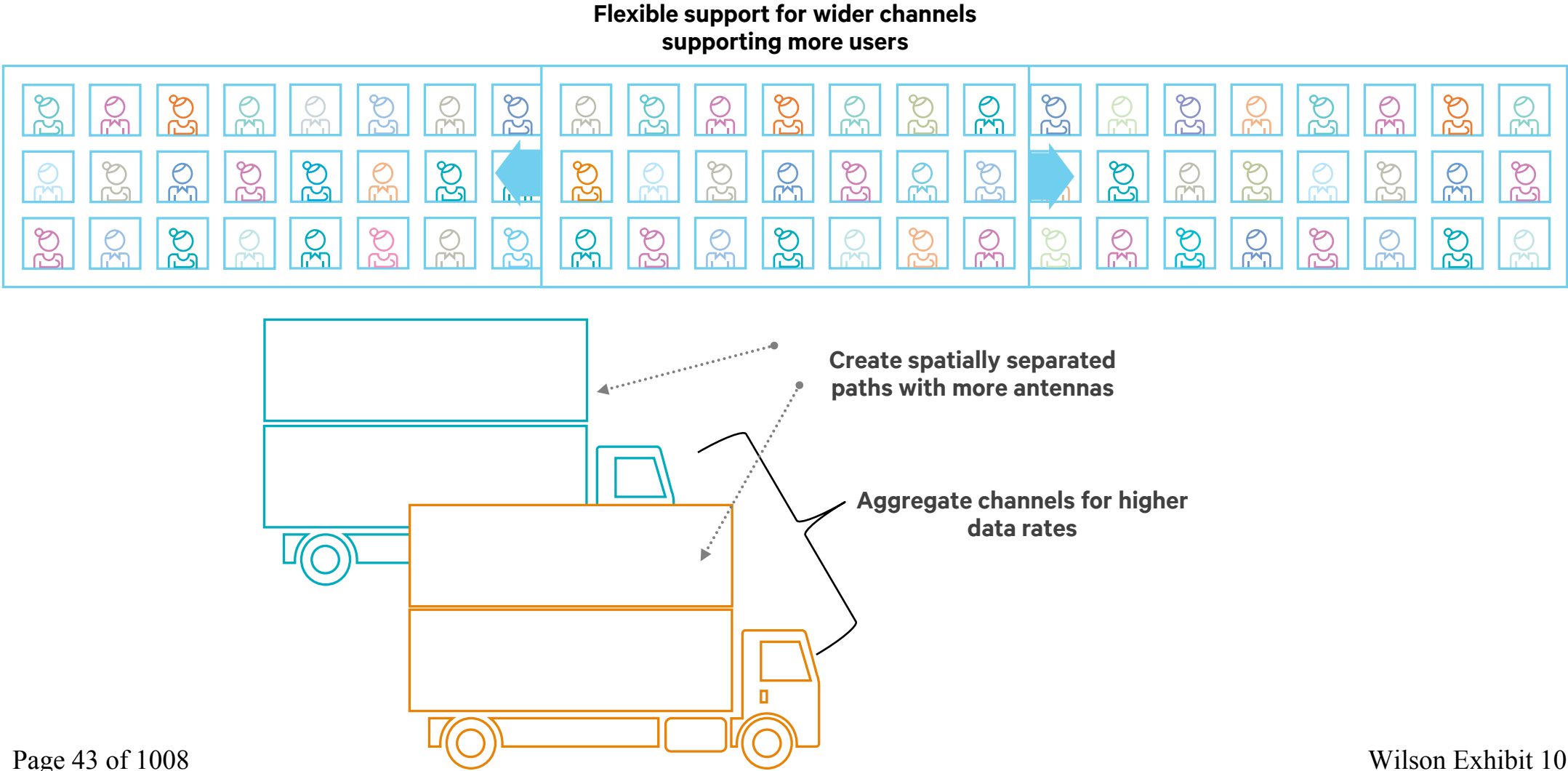
3G

Enabling a consistent broadband experience outside 4G LTE coverage
Delivering ubiquitous voice services and global roaming

Multimode

LTE FDD/TDD
WCDMA/HSPA+
CDMA2000/EV-DO
TD-SCDMA
GSM/GPRS

Mobile 4G LTE delivers more data capacity



Mobile 4G LTE delivers more data capacity

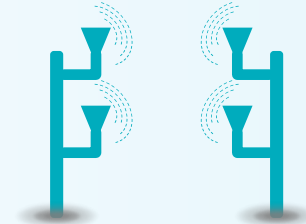
Download, browse, stream, and game faster than ever with faster and better connectivity

Connect Faster



Wider Channels

Flexible support for channels up to 20 MHz enabled with OFDMA



More Antennas

Advanced MIMO techniques to create spatially separated paths; 2x2 MIMO mainstream



Carrier Aggregation

Aggregate up to 100 MHz for higher data rates – 2 carrier (2C) commercial; 3C announced¹

Connect Real-time



Simplified Core Network

All IP network with flattened architecture resulting in less equipment per transmission



Low Latencies

Optimized response times for both user and control plane improves user experience

Mobile 4G LTE is the first global standard for mobile broadband



Global LTE network launches

279
Launches

101
Countries

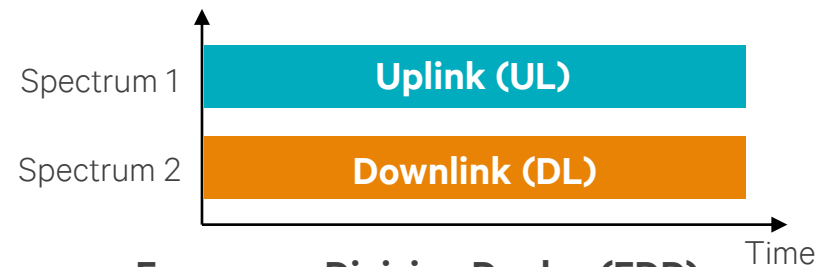
Large device ecosystem

1,563
Devices

>100
Vendors

LTE FDD & LTE TDD

Two modes, common standard, same ecosystem



Frequency Division Duplex (FDD)

Paired spectrum enables better coverage

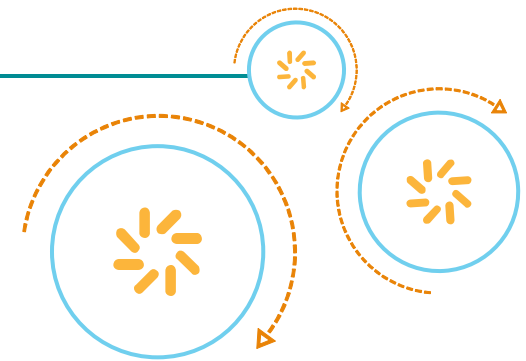


Time Division Duplex (TDD)

Unpaired spectrum enables asymmetrical DL/UL for more DL capacity



Mobile 3G and 4G technologies continue to evolve to deliver faster and better mobile broadband experiences



Mobile 3G and 4G LTE continue to evolve

Delivering a faster and better mobile broadband experiences

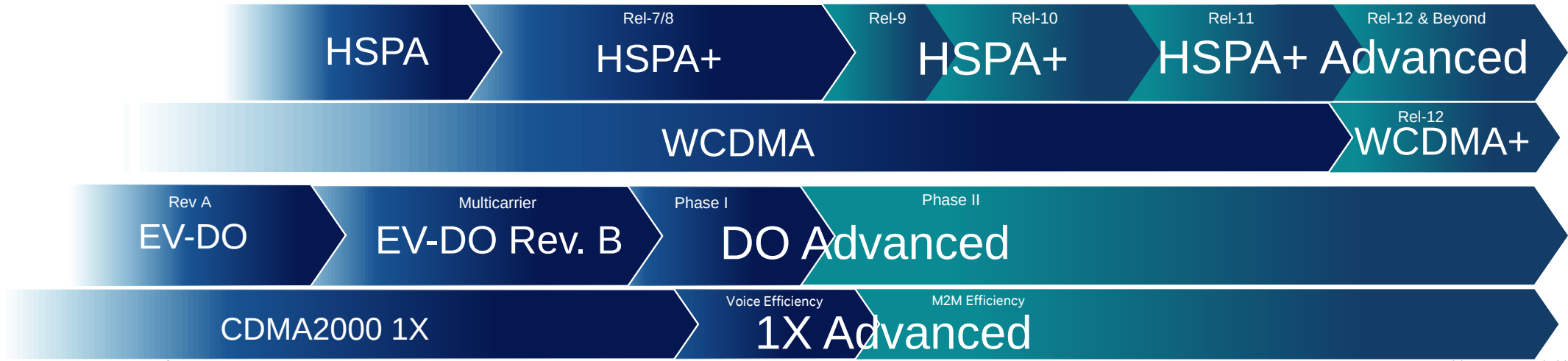
4G LTE has evolved to LTE Advanced

Providing more data capacity and expanding into new frontiers

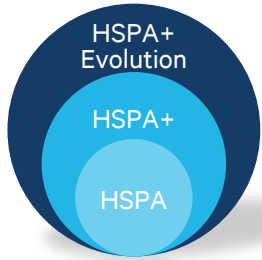


3G networks have continued to evolve and improve—so much so some call it 4G

Providing a consistent broadband experience outside LTE coverage



Mobile 3G/4G technologies are evolving for more data capacity



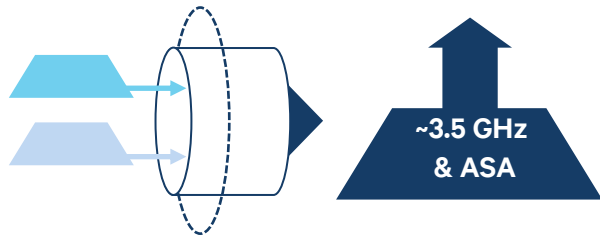
Shannon's Law

$$C \approx W \cdot n \cdot \log_2(1 + SNR)$$

Capacity **Spectrum** **Antennas** **Signal Quality**



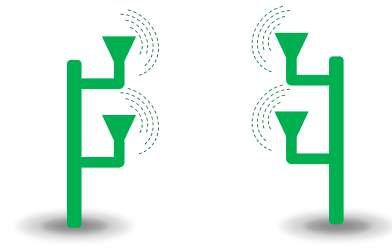
More Spectrum



Making the best use of all spectrum types with more licensed spectrum as the top priority, e.g., ASA, ~3.5 GHz, unlicensed spectrum

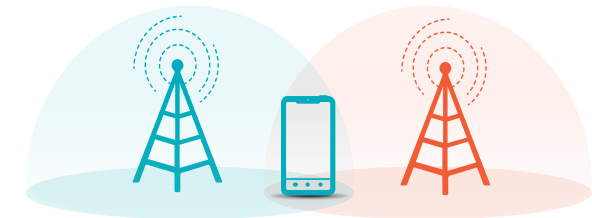
Page 48 of 1008

More Antennas



Advanced multiple antenna techniques to create spatially separated data paths, e.g., 4 way receive diversity, 4x4 MIMO

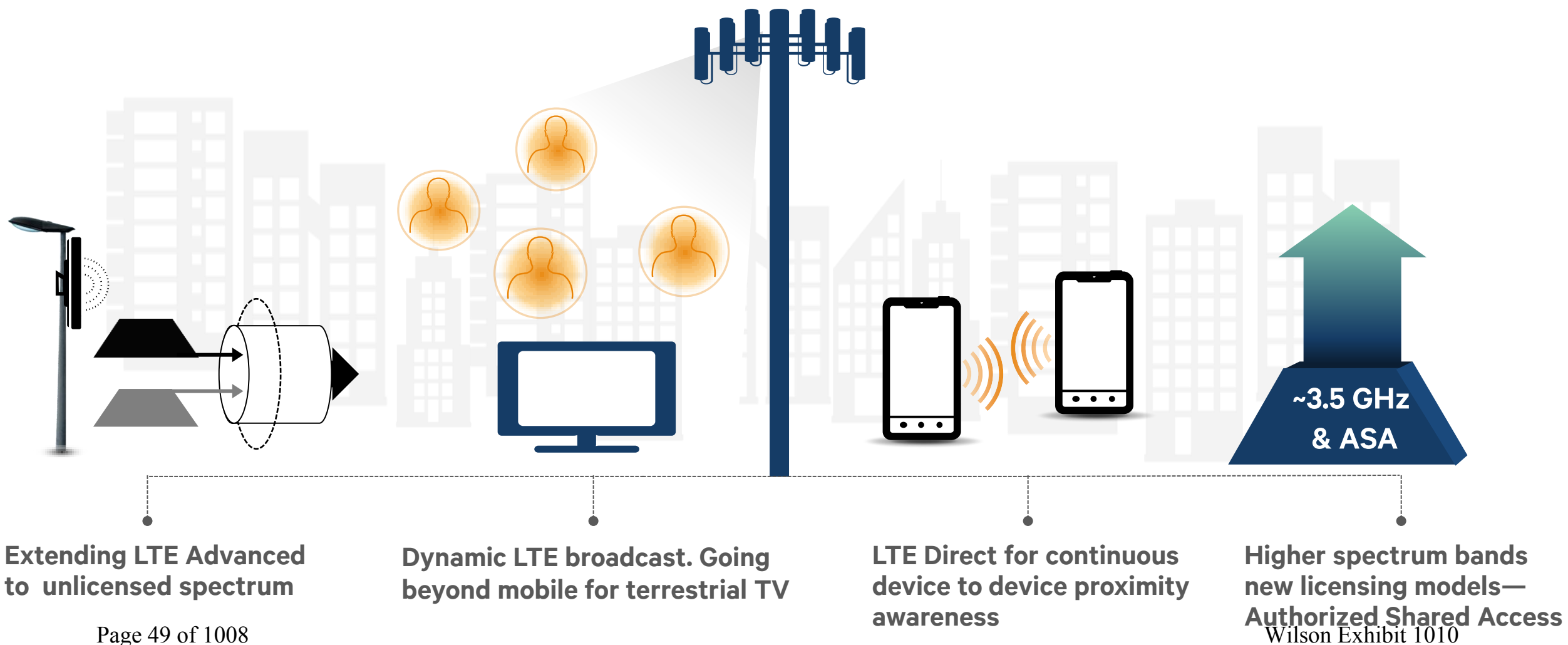
Interference Mitigation



Advanced receivers and antenna techniques, e.g., LTE FeICIC/IC, HSPA+ advanced device receiver

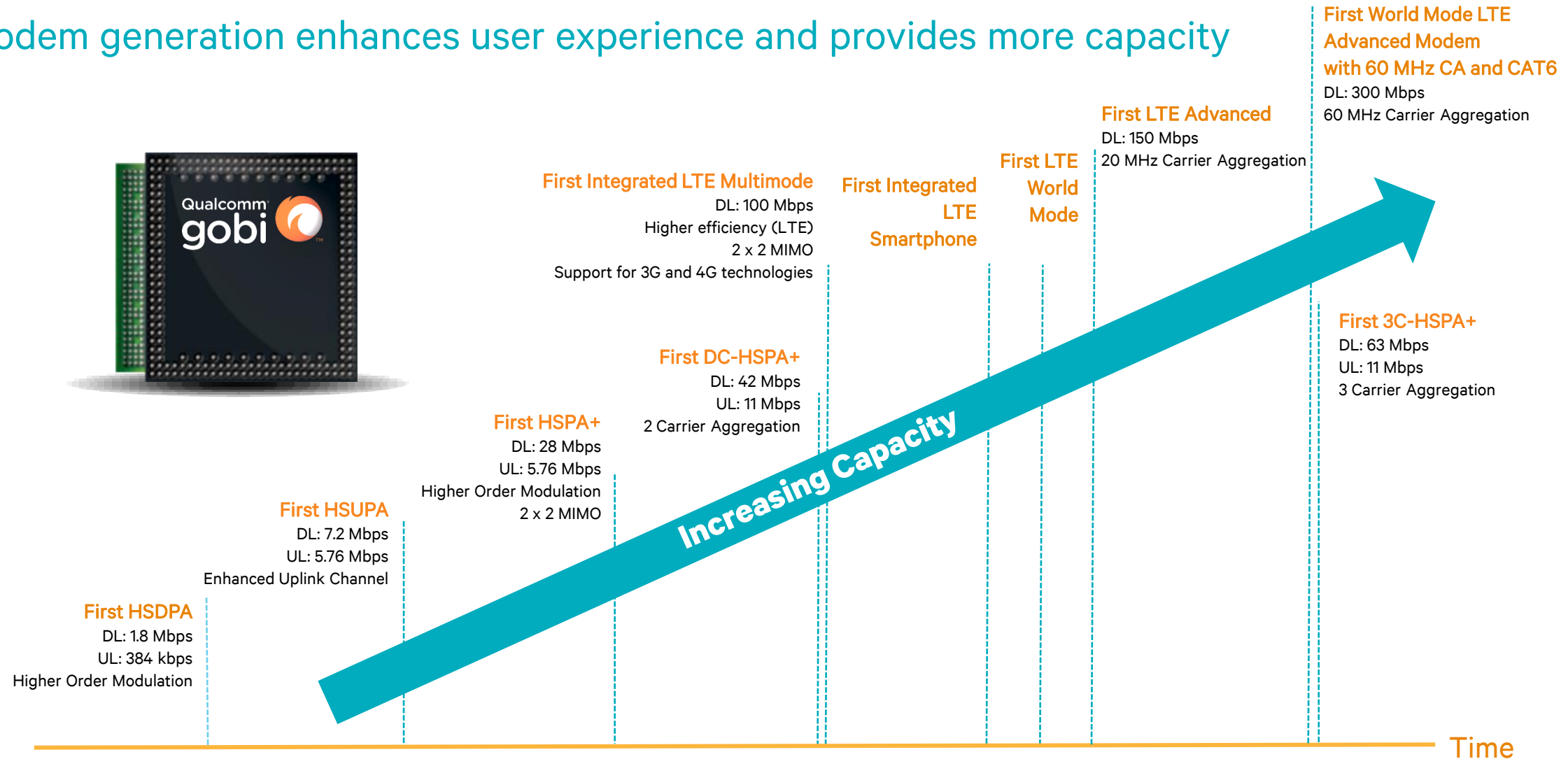
Wilson Exhibit 1010

LTE Advanced is evolving and expanding into new frontiers



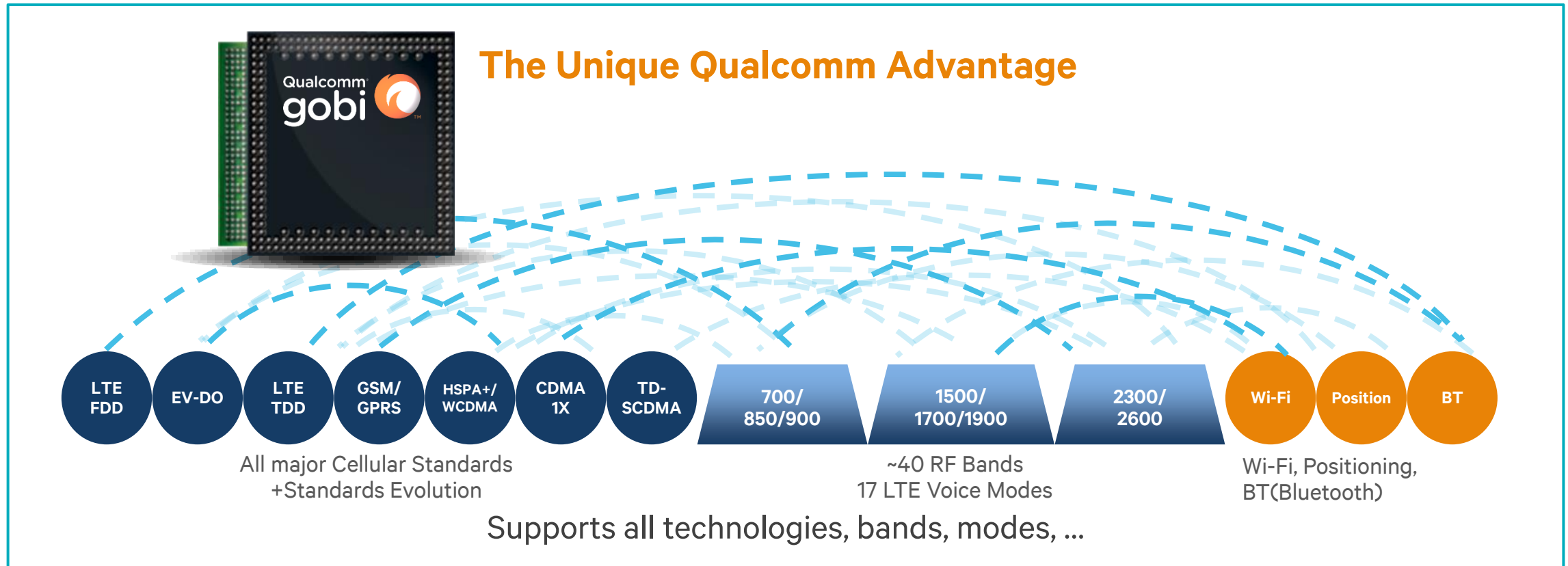
Qualcomm is the leader in Mobile 3G/4G technologies

Each modem generation enhances user experience and provides more capacity



Qualcomm is the leader in Mobile 3G/4G technologies

Hiding the complexity underneath the most seamless mobile connectivity



Evolving mobile technologies deliver great mobile experiences

1



1G established seamless mobile connectivity introducing mobile voice services

3



3G optimized mobile for data enabling mobile broadband services, and is evolving for faster and better connectivity

2



2G digital wireless technologies increased voice capacity delivering mobile to the masses

4



4G LTE delivers more capacity for faster and better mobile broadband experiences, and is also expanding in to new frontiers

5



Qualcomm has been at the forefront of this evolution, pushing wireless boundaries to enable the best mobile experiences

Questions? - Connect with Us



www.qualcomm.com/technology



<http://www.qualcomm.com/blog/contributors/prakash-sangam>



@Qualcomm_tech



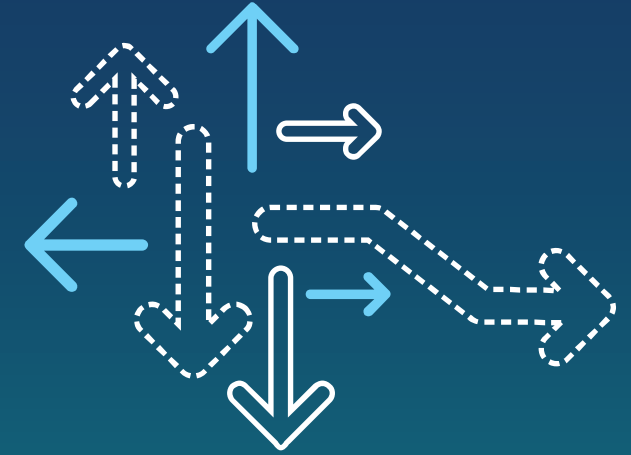
<http://www.youtube.com/playlist?list=PL8AD95E4F585237C1&feature=plcp>



<http://www.slideshare.net/qualcommwirelessevolution>



http://storify.com/qualcomm_tech



Thank you

Follow us on:  

For more information on Qualcomm, visit us at:
www.qualcomm.com & www.qualcomm.com/blog

© 2014 QUALCOMM Incorporated and/or its subsidiaries. All Rights Reserved.

Qualcomm is a trademark of Qualcomm Incorporated, registered in the United States and other countries. Other products and brand names may be trademarks or registered trademarks of their respective owners.

References in this presentation to “Qualcomm” may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Gobi is a product of Qualcomm Technologies, Inc.

Qualcomm Incorporated includes Qualcomm’s licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm’s engineering, research and development functions, and substantially all of its product and services businesses, including its semiconductor business, QCT.



Wilson Exhibit 1010

Exhibit 1022

UTRA-UTRAN Long Term Evolution (LTE) and 3GPP System Architecture Evolution (SAE)

Long Term Evolution of the 3GPP radio technology

3GPP work on the Evolution of the 3G Mobile System started with the RAN Evolution Work Shop, 2 - 3 November 2004 in Toronto, Canada. The Work Shop was open to all interested organizations, members and non members of 3GPP. Operators, manufacturers and research institutes presented more than 40 contributions with views and proposals on the evolution of the Universal Terrestrial Radio Access Network (UTRAN).

A set of high level requirements was identified in the Work Shop:

- Reduced cost per bit
- Increased service provisioning – more services at lower cost with better user experience
- Flexibility of use of existing and new frequency bands
- Simplified architecture, Open interfaces
- Allow for reasonable terminal power consumption

It was also recommended that the Evolved UTRAN should bring significant improvements to justify the standardization effort and it should avoid unnecessary options. On certain aspects, the collaboration with 3GPP SA WGs was found to be essential: the new split between the Access Network and the Core Network, and the characteristics of the throughput that new services would require demanded close architectural coordination.

With the conclusions of this Work Shop and with broad support from 3GPP members, a feasibility study on the [UTRA & UTRAN Long Term Evolution](#) was started in December 2004. The objective was "to develop a framework for the evolution of the 3GPP radio-access technology towards a high-data-rate, low-latency and packet-optimized radio-access technology" The study focused on supporting services provided from the PS-domain, involving:

- Related to the radio-interface physical layer (downlink and uplink):
 - e.g. means to support flexible transmission bandwidth up to 20 MHz, introduction of new transmission schemes and advanced multi-antenna technologies
- Related to the radio interface layer 2 and 3:
 - e.g. signalling optimization
- Related to the UTRAN architecture:
 - identify the optimum UTRAN network architecture and functional split between RAN network nodes
- RF-related issues

In addition, the Next Generation Mobile Networks (NGMN) initiative, led by seven network operators (*) provided a set of recommendations for the creation of networks suitable for the competitive delivery of mobile broadband services. The NGMN goal is "to provide a coherent vision for technology evolution beyond 3G for the competitive delivery of broadband wireless services".

The NGMN long-term objective is to "establish clear performance targets, fundamental recommendations and deployment scenarios for a future wide area mobile broadband network". In a white paper (March 2006), they provided relative priorities of key system characteristics, System recommendations and detailed requirements.

Emphase was also on the IPR side, where the goal was "to adapt the existing IPR regime to provide a better predictability of the IPR licenses (...) to ensure Fair, Reasonable And Non-Discriminatory (FRAND) IPR costs" (NGMN White paper, March 2006).

All RAN WGs participated in the study, with collaboration from SA WG2 in the key area of the network architecture. The first part of the study resulted in agreement on the requirements for the Evolved UTRAN.

As a result, Technical Report (TR) 25.913 contains detailed requirements for the following criteria:

Peak data rate

- Instantaneous downlink peak data rate of 100 Mb/s within a 20 MHz downlink spectrum allocation (5 bps/Hz)
- Instantaneous uplink peak data rate of 50 Mb/s (2.5 bps/Hz) within a 20MHz uplink spectrum allocation)

Control-plane latency

- Transition time of less than 100 ms from a camped state, such as Release 6 Idle Mode, to an active state such as Release 6 CELL_DCH
- Transition time of less than 50 ms between a dormant state such as Release 6 CELL_PCH and an active state such as Release 6 CELL_DCH

Control-plane capacity

- At least 200 users per cell should be supported in the active state for spectrum allocations up to 5 MHz

User-plane latency

- Less than 5 ms in unload condition (ie single user with single data stream) for small IP packet

User throughput

- Downlink: average user throughput per MHz, 3 to 4 times Release 6 HSDPA
- Uplink: average user throughput per MHz, 2 to 3 times Release 6 Enhanced Uplink

Spectrum efficiency

- Downlink: In a loaded network, target for spectrum efficiency (bits/sec/Hz/site), 3 to 4 times Release 6 HSDPA)
- Uplink: In a loaded network, target for spectrum efficiency (bits/sec/Hz/site), 2 to 3 times Release 6 Enhanced Uplink

Mobility

- E-UTRAN should be optimized for low mobile speed from 0 to 15 km/h
- Higher mobile speed between 15 and 120 km/h should be supported with high performance
- Mobility across the cellular network shall be maintained at speeds from 120 km/h to 350 km/h (or even up to 500 km/h depending on the frequency band)

Coverage

- Throughput, spectrum efficiency and mobility targets above should be met for 5 km cells, and with a slight degradation for 30 km cells. Cells range up to 100 km should not be precluded.

Further Enhanced Multimedia Broadcast Multicast Service (MBMS)

- While reducing terminal complexity: same modulation, coding, multiple access approaches and UE bandwidth than for unicast operation.
- Provision of simultaneous dedicated voice and MBMS services to the user.
- Available for paired and unpaired spectrum arrangements.

Spectrum flexibility

- E-UTRA shall operate in spectrum allocations of different sizes, including 1.25 MHz, 1.6 MHz, 2.5 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz in both the uplink and downlink. Operation in paired and unpaired spectrum shall be supported

- The system shall be able to support content delivery over an aggregation of resources including Radio Band Resources (as well as power, adaptive scheduling, etc) in the same and different bands, in both uplink and downlink and in both adjacent and non-adjacent channel arrangements. A "Radio Band Resource" is defined as all spectrum available to an operator

Co-existence and Inter-working with 3GPP Radio Access Technology (RAT)

- Co-existence in the same geographical area and co-location with GERAN/UTRAN on adjacent channels.
- E-UTRAN terminals supporting also UTRAN and/or GERAN operation should be able to support measurement of, and handover from and to, both 3GPP UTRAN and 3GPP GERAN.
- The interruption time during a handover of real-time services between E-UTRAN and UTRAN (or GERAN) should be less than 300 msec.

Architecture and migration

- Single E-UTRAN architecture
- The E-UTRAN architecture shall be packet based, although provision should be made to support systems supporting real-time and conversational class traffic
- E-UTRAN architecture shall minimize the presence of "single points of failure"
- E-UTRAN architecture shall support an end-to-end QoS
- Backhaul communication protocols should be optimised

Radio Resource Management requirements

- Enhanced support for end to end QoS
- Efficient support for transmission of higher layers
- Support of load sharing and policy management across different Radio Access Technologies

Complexity

- Minimize the number of options
- No redundant mandatory features

As a consequence the WGs have dedicated normal meeting time to the Evolution activity, as well as separate ad hoc meetings.

RAN WG1 assessed six possible radio interface schemes (evaluations of these technologies against the requirements for the physical layer are collected in TR 25.814).

The wide set of options initially identified by the early LTE work was narrowed down, in December 2005, to a working assumption that the downlink would use Orthogonal Frequency Division Multiplexing (OFDM) and the uplink would use Single Carrier – Frequency Division Multiple Access (SC-FDMA). Although opinions were divided, it was eventually concluded that inter-Node-B macro-diversity would not be employed. More information is given in the [report of RAN#30](#).

Supported downlink data-modulation schemes are QPSK, 16QAM, and 64QAM. The possible uplink data-modulation schemes are ($\pi/2$ -shift) BPSK, QPSK, 8PSK and 16QAM.

The use of Multiple Input Multiple Output (MIMO) scheme was agreed, with possibly up to four antennas at the mobile side, and four antennas at the Cell site.

Re-using the expertise from the UTRAN, the same channel coding type than for UTRAN was agreed (turbo codes).

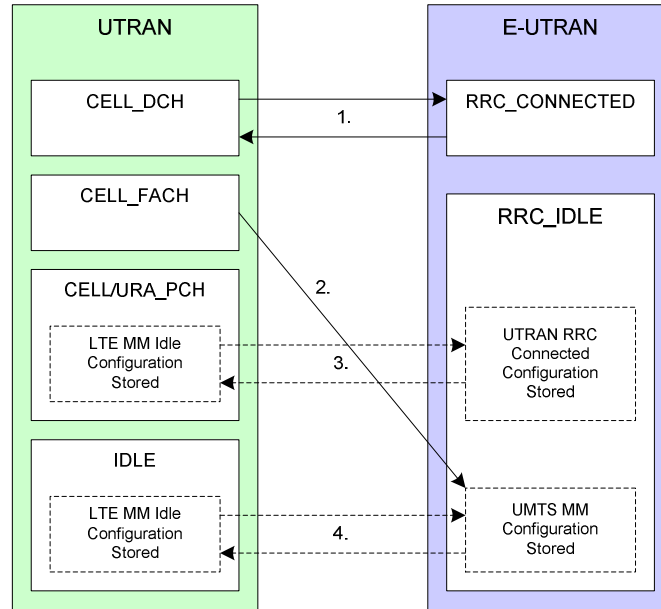
RAN WG2 has also held a first meeting to approach the radio interface protocols of the Evolved UTRAN ([link](#)). The initial assumptions were:

- Simplification of the protocol architecture and the actual protocols
- No dedicated channels, and hence a simplified MAC layer (without MAC-d entity)

- Avoiding similar functions between Radio and Core network.

A Transmission Time Interval (TTI) of 1ms was agreed (to reduce signalling overhead and improve efficiency).

RRC States were restricted to RRC_Idle and RRC_Connected States. They are depicted below, in conjunction with the possible legacy UTRAN RRC States (extract of TR 25.813):

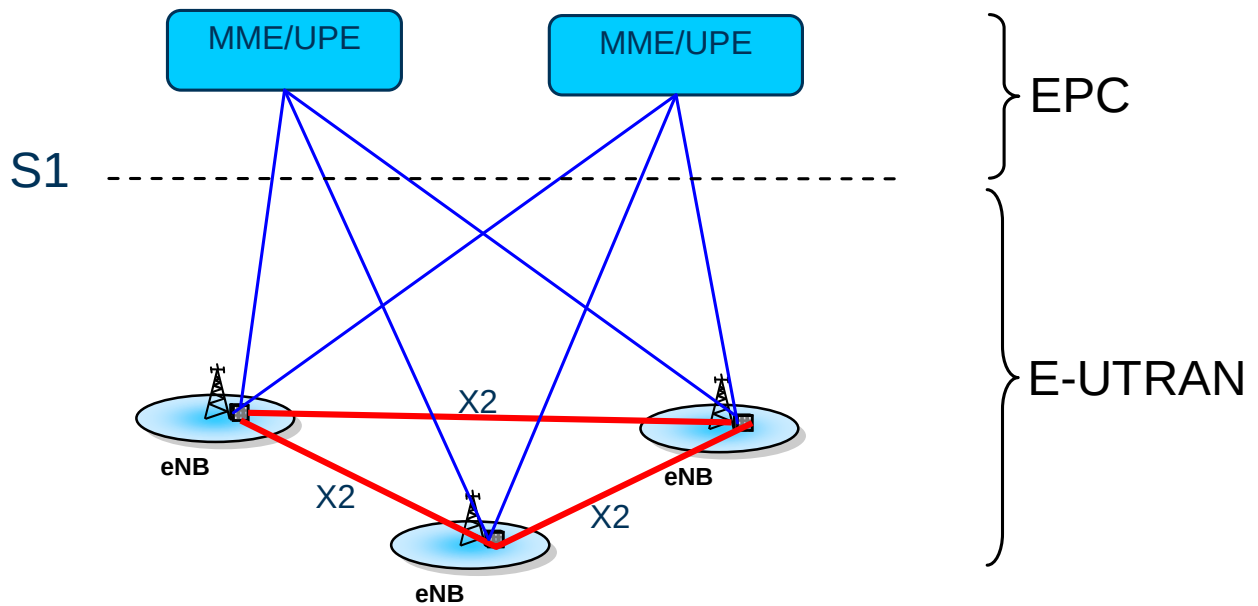


RAN WG3 worked closely with SA WG2 in the definition of the new architecture:

The evolved UTRAN consists of eNBs, providing the evolved UTRA U-plane and C-plane protocol terminations towards the UE. The eNBs are interconnected with each other by means of the *X2 interface*. It is assumed that there always exist an X2 interface between the eNBs that need to communicate with each other, e.g. for support of handover of UEs in LTE_ACTIVE.

The eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core). The *S1 interface* support a many-to-many relation between aGWs and eNBs.

E-UTRAN architecture (extract from TR 25.912):



Functional split:

The eNB host the following functions:

- Functions for Radio Resource Management: Radio Bearer Control, Radio Admission Control, Connection Mobility Control, Dynamic Resource Allocation (scheduling).

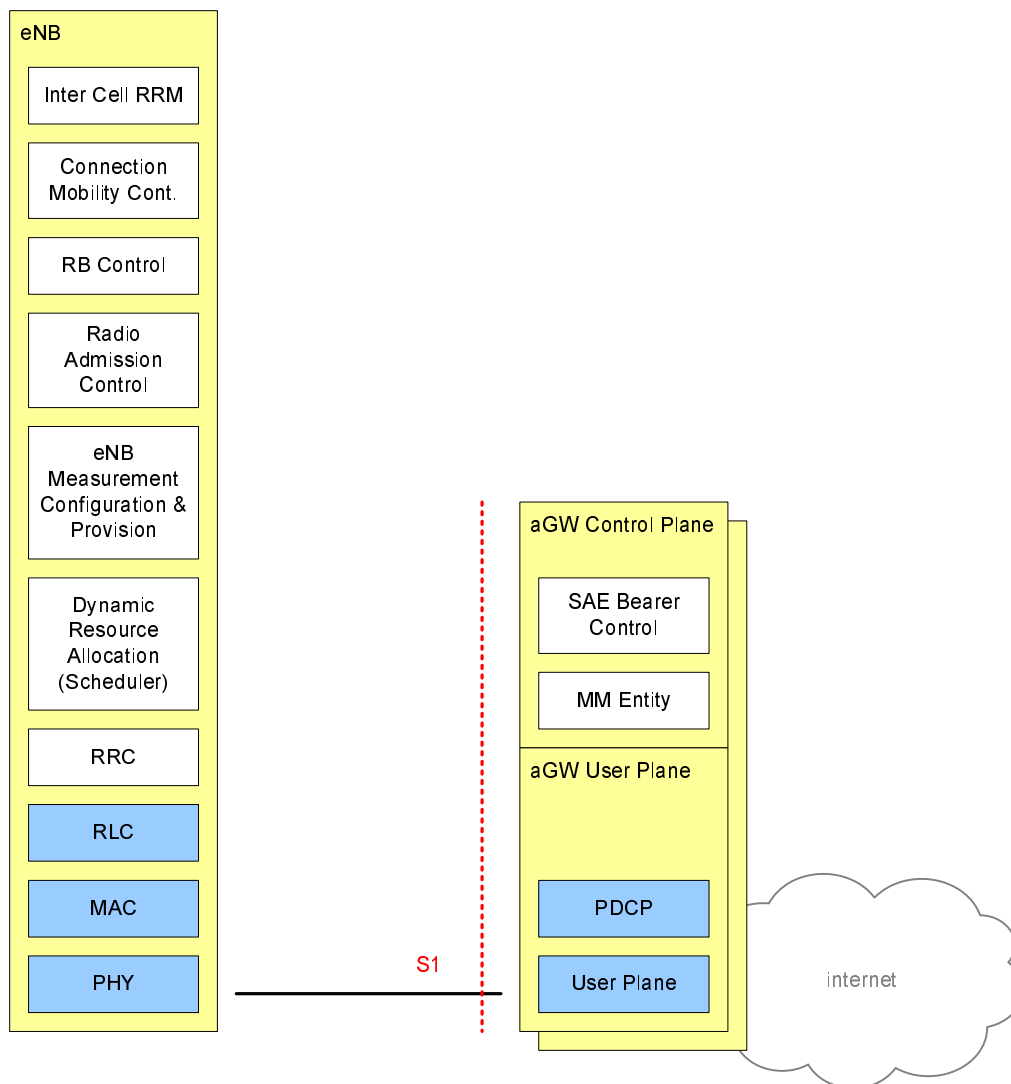
Mobility Management entity (MME):

- Distribution of paging messages to the eNBs.

User Plane Entity (UPE):

- IP Header Compression and encryption of user data streams;
- Termination of U-plane packets for paging reasons;
- Switching of U-plane for support of UE mobility.

This resulted, in conjunction with work in RAN WG2, into the following protocol stack and the following function split (extract of TR 25.813):



The Study Item phase was concluded in September 2006. As expected, in particular the E-UTRA system will provide significantly higher data rates than Release 6 WCDMA. The increase in data rate is achieved especially through higher transmission bandwidth and support for MIMO.

In particular, the study showed that simultaneous support for UTRA and E-UTRA UEs in the same spectrum allocation was possible.

It became clear that the solutions chosen for the physical layer and layers 2/3 showed a convergence between paired spectrum and unpaired spectrum solutions for the Long Term Evolution (e.g. initial access, handover procedures, measurements, frame and slot structures).

At that point, the Work Item was created to introduce the E-UTRAN into the 3GPP Work Plan.

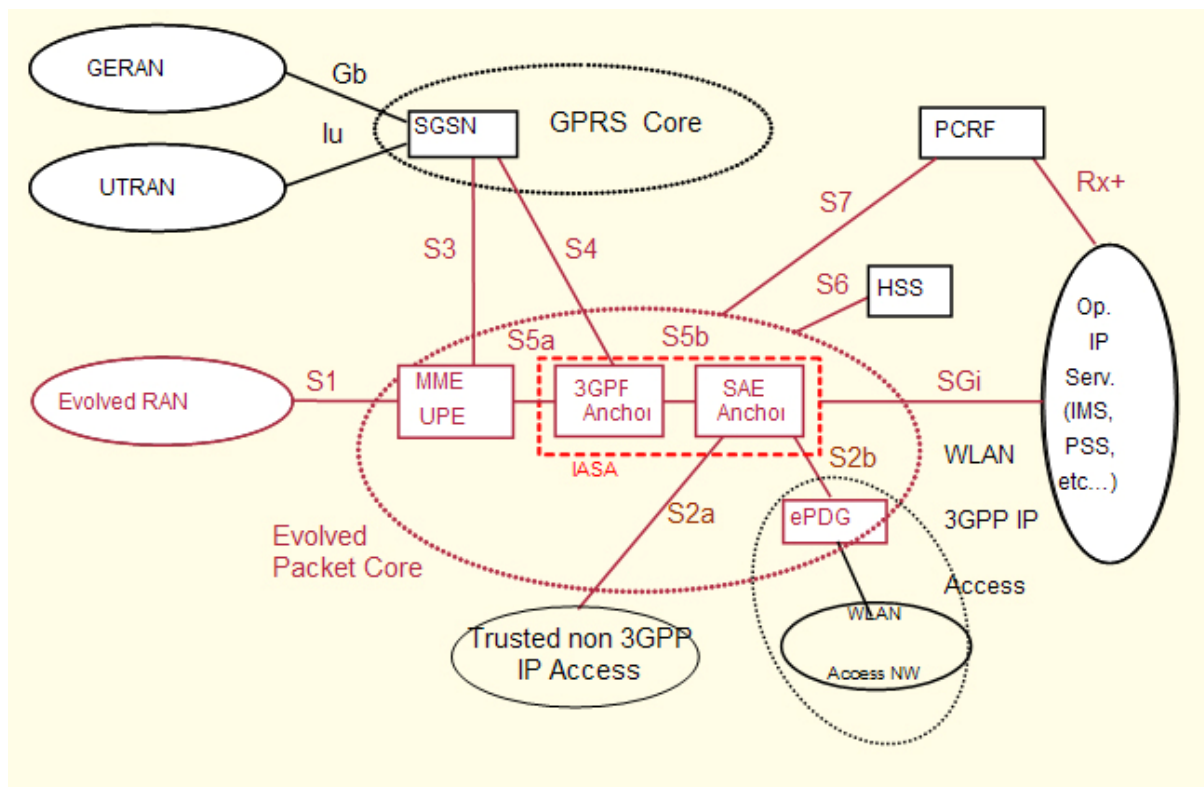
System Architecture Evolution

SA WG2 started its own Study for the System Architecture Evolution (SAE) whose objective is "to develop a framework for an evolution or migration of the 3GPP system to a higher-data-rate, lower-latency, packet-optimized system that supports multiple RATs. The focus of this work [is] on the PS domain with the assumption that voice services are supported in this domain". SA2's SAE work is conducted under Work Item "[3GPP system architectural evolution](#)", approved in December 2004. It was initiated when it became clear that the future was clearly IP with everything (the "all-IP" network, AIPN - see [TS 22.978](#)), and that access to the 3GPP network

would ultimately be not only via UTRAN or GERAN but by WiFi, WiMAX, or even wired technologies. Thus SEA has as its main objectives:

- Impact on overall architecture resulting from RAN's LTE work
- Impact on overall architecture resulting from SA1's AIPN work
- Overall architectural aspects resulting from the need to support mobility between heterogeneous access networks

The figure below shows the evolved system architecture, possibly relying on different access technologies (extract of TR 23.882):



New reference points have been defined:

S1: It provides access to Evolved RAN radio resources for the transport of user plane and control plane traffic. The S1 reference point shall enable MME and UPE separation and also deployments of a combined MME and UPE solution.

S2a: It provides the user plane with related control and mobility support between a trusted non 3GPP access and the SAE Anchor.

S2b: It provides the user plane with related control and mobility support between ePDG and the SAE Anchor.

S3: It enables user and bearer information exchange for inter 3GPP access system mobility in idle and/or active state. It is based on Gn reference point as defined between SGSNs.

User data forwarding for inter 3GPP access system mobility in active state (FFS).

S4: It provides the user plane with related control and mobility support between GPRS Core and the 3GPP Anchor and is based on Gn reference point as defined between SGSN and GGSN.

S5a: It provides the user plane with related control and mobility support between MME/UPE and 3GPP anchor.

It is FFS whether a standardized S5a exists or whether MME/UPE and 3GPP anchor are combined into one entity.

S5b: It provides the user plane with related control and mobility support between 3GPP anchor and SAE anchor. It is FFS whether a standardized S5b exists or whether 3GPP anchor and SAE anchor are combined into one entity.

S6: It enables transfer of subscription and authentication data for authenticating/authorizing user access to the evolved system (AAA interface).

S7: It provides transfer of (QoS) policy and charging rules from PCRF to Policy and Charging Enforcement Point (PCEP).
The allocation of the PCEP is FFS.

SGi: It is the reference point between the Inter AS Anchor and the packet data network. Packet data network may be an operator external public or private packet data network or an intra operator packet data network, e.g. for provision of IMS services. This reference point corresponds to Gi and Wi functionalities and supports any 3GPP and non-3GPP access systems.

The interfaces between the SGSN in 2G/3G Core Network and the Evolved Packet Core (EPC) will be based on the GTP protocol. The interfaces between the SAE MME/UPE and the 2G/3G Core Network will be based on the GTP protocol.

Future plans

The LTE work should conclude at the September 2007 TSG plenary meetings. The conclusion of the SAE work (item) should follow.

* NGMN members: China Mobile Communications Corporation, KPN Mobile NV, NTT DoCoMo Inc., Orange SA, Sprint Nextel Corporation, T-Mobile International AG & Co KG and, Vodafone Group PLC.

Last update:

2006-10-04: Large revision following the results of the Study Item phase. Functional splits, architecture, functions and results.

2006-01-23: revision to take into account latest developments in 23.882.

2006-01-11: LTE and SAE update completed, bringing this page up to date with latest developments

2006-01-03: updates and inclusion of SAE info (started).

2005-09-19 10h30-CET

Exhibit 1023



The Mobile Broadband Standard W-CDMA

[About 3GPP](#)
[Specifications Groups](#)
[Specifications](#)
[3GPP Calendar](#)
[Technologies](#)
[News & Events](#)
[Home](#)
[Sitemap](#)
[Contact](#)

LSTI job complete

The LTE/SAE Trial Initiative (LSTI) has now called time on its successful mission to accelerate the availability of fully inter-operable LTE mobile systems. The Initiative was formally launched in May 2007 and today boast 42 of the leading telecommunications companies in its membership.

In their Press release, dated the 26th January 2011, the LSTI looked back at four years of achievement to establish a solid base for the success of LTE :

 The LTE SAE Trial Initiative has completed all important workstreams, Proof of Concept (PoC), Interoperability Development (IODT), Interoperability Tests (IOT) and Friendly Customer Trials (FCT), for both FDD (Frequency Division Duplex) and TDD (Time-Division Duplex). With these milestones complete, LSTI will wrap up all activities and publish the final results at Mobile World Congress in Barcelona. 

Full details of the progress that the LSTI have made and for the full text of the Press release, go to www.lstforum.com.

Search

3GPP Website:

Search and download specs, docs, CRs and more from the 3GPP FTP Server:

ADVANCED FTP SEARCH

Recent news stories

Links to some of the news stories that were recently on the home page and news pages:

A COLLECTION OF ARTICLES ON 3GPP 5G - August 2018

REL-15 ANNOUNCEMENT ON STAND-ALONE NR

5G SECURITY FOR NR (WG SA3 PERSPECTIVE)

3GPP 5G DESCRIPTION FOR IMT-2020 (1 OF 3)

SYSTEM ARCHITECTURE MILESTONE OF 5G PHASE 1 IS ACHIEVED

MISSION CRITICAL SERVICES IN 3GPP

MANAGEMENT, ORCHESTRATION AND CHARGING FOR 5G NETWORKS

News Feeds

[3GPP News](#)

[3GPP tweets](#)

[3GPP webinars](#)

ABOUT RELEASES

Release 16
Release 15
Release 14
Release 13
Release 12
Release 11
Release 10
Release 9
Release 8
Release 7
Release 6
Release 5
Release 4
Release 1999

CT	81	Gold Coast	10-11 Sep 2018
RAN	81	Gold Coast	10-13 Sep 2018
SA	81	Gold Coast	12-14 Sep 2018
CT	82	Sorrento	10-11 Dec 2018
RAN	82	Sorrento	10-13 Dec 2018
SA	82	Sorrento	12-14 Dec 2018
CT	83	TBD	18-19 Mar 2019
RAN	83	TBD	18-21 Mar 2019
SA	83	TBD	20-22 Mar 2019
CT	84	US	03-04 Jun 2019
RAN	84	US	03-06 Jun 2019
SA	84	US	05-07 Jun 2019
CT	85	US	16-17 Sep 2019
RAN	85	US	16-19 Sep 2019
SA	85	US	18-20 Sep 2019

BROWSE KEYWORDS & TECH.

Carrier Aggregation Explained
Coordinated Vulnerability Disclosure (CVD)
Control and User Plane Separation of EPC nodes (CUPS)
The Evolved Packet Core
GPRS & EDGE
HetNet/Small Cells
HSPA
LTE-Advanced
LTE
UMTS
W-CDMA
...more keywords

©3GPP 2018

Exhibit 1024


TeleGeography

AUTHORITATIVE TELECOM DATA

[COMMSUPDATE](#) [PRESS](#) [ABOUT](#) [PURCHASE](#) [SIGN IN](#)

 RESEARCH
SERVICES

 CUSTOM
RESEARCH

 TELECOM
MAPS

 TELECOM
RESOURCES

[HOME](#) > [RESEARCH SERVICES](#) > [COMMSUPDATE](#)

TeliaSonera launches world's first commercial LTE networks in Sweden and Norway

14 Dec 2009

[Norway](#) [Sweden](#)

Today TeliaSonera launched the world's first commercial Long Term Evolution (LTE) mobile services in Stockholm and Oslo, over networks supplied by Ericsson and Huawei, respectively. Downtown Stockholm is now covered by the Ericsson LTE network, making it the largest LTE deployment to date, according to the Swedish vendor's press release. TeliaSonera Sweden's subscribers have access to the LTE service via Samsung LTE laptop dongles. Meanwhile, Huawei announced that TeliaSonera's Norwegian subsidiary NetCom's new Oslo network offers maximum speeds of up to 100Mbps, approximately ten times faster than existing 3G networks.

Carl-Henric Svanberg, President and CEO of Ericsson, said of the Swedish launch: 'The new era of mobile broadband has just begun today.' Kenneth Karlberg, President and Head of Mobility Services, TeliaSonera said: 'We are very proud to be the first operator in the world to offer our customers 4G services. Thanks to the successful cooperation with Ericsson we can offer 4G to our customers in Stockholm earlier than originally planned.' LTE is designed for transferring very large packets of data efficiently, optimising the use of frequencies and realising speeds similar to fixed fibre access over the air. With decreased latency, consumers can access applications such as online high definition (HD) video and networked games whilst on the move. Ericsson has provided TeliaSonera Sweden with an LTE system (4G), including LTE radio base stations, which are part of the new RBS6000 series, an Evolved Packet Core network, a mobile backhaul solution including SmartEdge 1200 routers, the latest EDA multi-access aggregation switch and an operation and management system. The LTE system is based on 3GPP standards for LTE radio technology and Evolved Packet Core (EPC) technology.

In Huawei's press release, it says it delivered both network infrastructures and services to TeliaSonera ahead of schedule, including access network, core network, operation support system, and network planning and optimisation. The Chinese vendor implemented its fourth-generation base stations and System Architecture Evolution (SAE) solution to ensure the stability of the network and enable fast deployment. Yu Chengdong, President of Huawei Europe, said: 'In partnership with TeliaSonera, Huawei began this journey eleven months ago to introduce the world's most advanced mobile broadband technology to the residents of Oslo. This milestone reflects Huawei's unwavering commitment towards accelerating the commercialisation of LTE/SAE solutions. Operators such as TeliaSonera are now able to fully realise economic benefits from the many new applications that can only be made possible with ultra broadband services.'

Norway, Sweden, [Ericsson](#), [Huawei Technologies](#), [Telia Company](#), [Telia Norge \(formerly NetCom\)](#), [Telia Sweden](#), [Wireless](#), [LTE](#)

Subscribe

Email Address

Subscribe

Feedback

Have feedback, corrections, or story ideas? Send them to editors@commsupdate.com.

Browse Past Issues

Dec

▼

2009

▼

Su

Mo

Tu

We

Th

Fr

Sa

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

Today

Filter

Filter CommsUpdate by the following categories or use the search.

[Wireless](#)
[LTE](#)
[5G](#)
[MVNO](#)
[M2M/IoT](#)
[Broadband](#)
[IPTV](#)
[WiMAX](#)
[Submarine](#)
[Wireline](#)
[VoIP](#)
[Mergers/Acquisitions](#)
[Corporate/Financial](#)

Search

Visit our [help page](#) information on performing advanced searches, including how to restrict the results by country or company.

Advertise

CommsUpdate is an outstanding advertising venue for companies seeking to reach:

International carriers
Wholesale service providers
Equipment and software vendors
Telecom investors
Regulators

[Learn more about advertising on CommsUpdate.](#)

Share

Email

Tweet

Like

- [Research Services](#)
- [Custom Research](#)
- [Telecom Maps](#)
- [Telecom Resources](#)
- [CommsUpdate](#)
- [Press](#)
- [About](#)
- [Purchase](#)
- [Sign In](#)

TeleGeography
A Division of PriMetrica, Inc.
Washington D.C. / San Diego / Exeter / Singapore
U.S. East Coast: +1 (202) 741 0020
U.S. West Coast: +1 (760) 651 0030
U.K.: +44 (0) 1392 493626
Singapore: +65 6534 9685
sales@telegeography.com
© Copyright 2018 PriMetrica, Inc.
All Rights Reserved.

Exhibit 1025

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
Improving Public Safety Communications in the	)	
800 MHz Band	)	WT Docket 02-55
	)	
Consolidating the 800 and 900 MHz	)	
Industrial/Land Transportation and Business Pool	)	
Channels	)	
	)	ET Docket No. 00-258
Amendment of Part 2 of the Commission's Rules	)	
to Allocate Spectrum Below 3 GHz for Mobile	)	
and Fixed Services to Support the Introduction of	)	
New Advanced Wireless Services, including Third	)	RM-9498
Generation Wireless Systems	)	
	)	
Petition for Rule Making of the Wireless	)	
Information Networks Forum Concerning the	)	RM-10024
Unlicensed Personal Communications Service	)	
	)	
Petition for Rule Making of UT Starcom, Inc.,	)	
Concerning the Unlicensed Personal	)	ET Docket No. 95-18
Communications Service	)	
	)	
Amendment of Section 2.106 of the Commission's	)	
Rules to Allocate Spectrum at 2 GHz for use by	)	
the Mobile Satellite Service	)	

**REPORT AND ORDER, FIFTH REPORT AND ORDER, FOURTH MEMORANDUM OPINION
AND ORDER, AND ORDER**

Adopted: July 8, 2004

Released: August 6, 2004

**By the Commission: Chairman Powell, Commissioners Abernathy, Copps, and Adelstein issuing
separate statements.**

TABLE OF CONTENTS

Heading	Paragraph #
I. INTRODUCTION	1
II. EXECUTIVE SUMMARY	8
III. MAJOR FINDINGS AND DECISIONS	13
A. The 800 MHz Interference Problem and Solutions	13

B. Entitlement to Interference Protection	19
C. 800 MHz Band Reconfiguration	21
D. Band Reconfiguration Process	26
E. Guarantee of Sufficient Funds for Band Reconfiguration	29
F. Equitable Compensation for Band Reconfiguration	31
IV. REGULATORY BACKGROUND	36
A. 800 MHz Band	36
B. 700 MHz Band	40
C. 900 MHz Band	42
D. 1.9 GHz Band	47
1. 1910-1915 MHz Band	50
2. 1990-1995 MHz Band	55
3. Band Pairing	59
V. RECORD OVERVIEW OF THE 800 MHZ PUBLIC SAFETY INTERFERENCE PROCEEDING	61
VI. DISCUSSION	62
A. The Commission's Spectrum Management and Legal Authority	62
B. Interference Abatement	88
1. Types of Interference	89
2. Entitlement to Interference Protection	92
a. Introduction	93
b. Interference Protection Standard	96
(i) Signal Strength Threshold for Interference Protection	105
(ii) Signal Measurement Techniques	108
c. Minimum Receiver Performance Criteria	109
3. Overall Approach to Interference Abatement	115
a. Role of Enhanced Best Practices	115
b. Interference Abatement Rules and Procedures	124
(i) Mutual Notification Requirements Applicable to 800 MHz Licensees	124
(ii) Responsibility for Mitigation Pre- and Post- Band Reconfiguration	128
(iii) Interference Resolution Procedures	132
C. Band Reconfiguration	142
1. Technical Issues Addressed by Band Reconfiguration	143
2. New 800 MHz Band Plan	149
a. Band Plan Overview	149
b. Expansion Band	154
c. Guard Band	157
d. Relocating ESMR Operations in 800 MHz Band	159
(i) Relocation Options	162
(ii) Expanded ESMR Spectrum	164
e. Permitting Additional Non-ESMR Cellular Architecture Systems in the 800 MHz Band	170
3. Border Regions	175
4. Cost Responsibility	177
a. Relocation Costs and Remuneration	179
b. Continued Availability of Funds	180
5. Logistics of Band Reconfiguration	188
a. Transition Administrator	190
b. Scheduling and Implementation	201
c. Freeze on the Acceptance of 800 MHz Applications	204
d. Tolling of 800 MHz Site-Based Construction Requirements	205

6. Disposition of Nextel's 900 MHz SMR and 700 MHz Guard Band Block B Spectrum	207
D. Appropriate Compensation for Band Reconfiguration	210
1. Public Interest Considerations for Granting Spectrum Rights to Nextel.....	213
2. Choice of 1.9 GHz Replacement Spectrum.....	217
3. Assignment of Spectrum Rights at 1.9 GHz to Nextel.....	223
a. Redesignation of the 1910-1915 MHz Band	224
b. Pairing the 1910-1915 MHz and 1990-1995 MHz Bands	236
c. Relocation and Cost Sharing Obligations in the 1910-1915 MHz Band	239
d. Relocation and Cost Sharing Obligations in the 1990-1995 MHz Band	250
(i) Nextel-BAS Plan	251
(ii) MSS-BAS Plan.....	264
4. Method for Determining Equitable Compensation	277
a. Valuation of 1.9 GHz Spectrum.....	279
b. Offsets.....	298
(i) Relocation and Band-Clearing Costs	299
(ii) 800 MHz Spectrum Relinquished to Public Safety and Other 800 MHz Incumbents	307
(iii) 700 MHz Guard Band Spectrum	324
5. Financial Aspects of Band Reconfiguration.....	325
6. Financial Reconciliation Process.....	329
VII.....SERVICE POOL CONSOLIDATION – THE PCIA PETITION	
VIII. OPERATIONAL FLEXIBILITY IN THE 900 MHZ BAND	335
IX. CONCLUSION	338
X. ORDERING CLAUSES.....	340
XI. PROCEDURAL MATTERS.....	365
A. Regulatory Flexibility Act	365
B. Paperwork Reduction Act.....	366
APPENDIX A: FINAL REGULATORY FLEXIBILITY ANALYSIS	168
APPENDIX B: PAPERWORK REDUCTION ANALYSIS.....	181
APPENDIX C: FINAL RULES.....	25
APPENDIX D: ENHANCED BEST PRACTICES.....	234
APPENDIX E: ILLUSTRATIVE FORM OF LETTER OF CREDIT	238
APPENDIX F: NPSPAC REGIONS	250
APPENDIX G: SOUTHEAST ESMR BAND PLAN	252

333

I. INTRODUCTION

1. The Homeland Security obligations of the Nation's public safety agencies make it imperative that their communications systems are robust and highly reliable.¹ Accordingly, in this *Report and Order*, we adopt technical and procedural measures designed to address the ongoing and growing problem of interference to public safety communications in the 800 MHz band.² In reaching our decisions herein, we are fulfilling the Commission's obligation to "promote safety of life and property through the use of wire and radio communication."³ We also reiterate our continuing commitment to "ensuring that essential public health and safety personnel have effective communications services available to them in emergency situations."⁴

¹ 47 U.S.C. § 337(f) defines "public safety services" as services:

(continued....)

2. With many of our Nation's first responders using the 800 MHz band for critical public safety communications (*e.g.*, to communicate with their respective dispatchers and each other at the scene of an incident), this band has become a linchpin in their ability to communicate effectively. In recent years, however, public safety systems in this band have encountered increasing amounts of interference from commercial mobile radio service (CMRS) providers. The interference problem in the 800 MHz band is caused by a fundamentally incompatible mix of two types of communications systems: cellular-architecture multi-cell systems—used by ESMR and cellular telephone licensees⁵—and high-site non-cellular systems—used by public safety, private wireless, and some SMR licensees and stems primarily from the operations of Nextel Communications, Inc. (Nextel), an “Enhanced” Specialized Mobile Radio (ESMR) provider in the 800 MHz band,⁶ as well as the operations of cellular telephone providers in the Cellular A and B bands.⁷ Throughout this proceeding, we have sought a solution to the interference problem that achieves the following paramount goals:

- a solution that abates “unacceptable interference” caused by ESMR and cellular systems to

(Continued from previous page) _____

(A) the sole or principal purpose of which is to protect the safety of life, health, or property;

(B) that are provided

- (i) by State or local government entities; or
- (ii) by nongovernmental organizations that are authorized by a government entity whose primary mission is the provision of such services; and

(C) that are not made commercially available to the public by the provider.

² For purposes of this proceeding, “800 MHz band” refers to spectrum from 806-824/851-869 MHz, which is licensed to public safety, commercial, and private wireless operators pursuant to Part 90 of the Commission's rules.

³ 47 U.S.C. § 151.

⁴ Federal Communications Commission Strategic Plan FY 2003-FY2008, p.5 (2002).

⁵ For the purposes of this proceeding, the term “800 MHz cellular system” will refer to systems which employ a “high-density cellular” architecture. *See* ¶ 172 *infra* for a definition of “800 MHz cellular systems.”

⁶ Specialized Mobile Radio (SMR) systems provide land mobile communications services (other than radiolocation services) in the 800 MHz and 900 MHz band on a commercial basis. *See* 47 C.F.R. §§ 90.7, 90.601 *et seq.* ESMR is a term coined by Nextel to describe SMR systems, such as Nextel's, that use cellular architecture, *i.e.*, systems that use multiple, interconnected, multi-channel transmit/receive cells and employ frequency reuse to serve a larger number of subscribers than is possible using non-cellular technology. The particular ESMR technology used by Nextel—the Motorola iDEN system—is capable of using cellular architecture in non-contiguous spectrum. A similar, derivative Motorola technology, known as “Harmony,” is also in limited use. Although the term “ESMR” does not appear in the Commission's rules, it has appeared in the Commission's case law. *See* Request of Fleet Call, Inc. *Memorandum Opinion and Order*, FCC 91-56, 6 FCC Rcd 1533 ¶ 13(1991). More recently, the Wireless Telecommunications Bureau has defined ESMR as an alternative method to provide wireless service that is based on digital TDMA technology and operates with individual base stations. *See* “Wireless Telecommunications Bureau Seeks Comment on Qualcomm Inc.'s Petition,” *Public Notice*, 15 FCC Rcd 2580, 2619 (WTB 2000).

⁷ Cellular telephone providers are licensed in the Cellular Radiotelephone Service, pursuant to Part 22 of the Commission's rules, and operate cellular architecture systems in the Cellular A and B bands (824-849/864-894 MHz), which lie immediately above the 800 MHz band. *See* 47 C.F.R. § 22.99. Hereinafter, for brevity's sake, we refer to these systems as “cellular telephone” or “cellular” systems. While cellular telephone systems are similar to ESMR systems, they operate in contiguous spectrum and employ somewhat different technology.

800 MHz public safety systems;⁸

- a solution that is both equitable and imposes minimum disruption to the activities of all 800 MHz band users, including public safety, non-cellular⁹ SMR, and Business, Industrial and Land Transportation (B/ILT) systems;¹⁰
- a solution that results in responsible spectrum management; and
- a solution that provides additional 800 MHz spectrum that can be quickly accessed by public safety agencies and rapidly integrated into their existing systems.

3. Based on the extensive record of this proceeding and the goals we seek to accomplish, we conclude that the most effective solution to the public safety interference problem in the 800 MHz band is a Commission-derived plan, which is comprised of both long-term and short-term components. As the short-term vehicle by which we ensure a more effective response to the ongoing interference problem, we implement technical standards defining unacceptable interference in the 800 MHz band as well as procedures detailing who bears responsibility for abating this interference and what steps responsible parties must take. For the long-term, we reconfigure the 800 MHz band to address the identified root cause of the interference by separating generally incompatible technologies.

4. To achieve this new 800 MHz band plan, we establish a transition mechanism by which (1) there is minimal disruption to the operations of all affected 800 MHz incumbents during the transition period; (2) the associated reconfiguration costs are funded; and (3) the public safety community and, later, critical infrastructure industries (CII),¹¹ obtain access to an average additional 4.5 megahertz of 800 MHz

⁸ “Unacceptable interference” is a term of art adopted for the limited purposes of this proceeding. See ¶¶ 97-107 *supra*. It defines a bright-line test for interference protection that takes into account, among other factors, the strength of the desired signal and the characteristics of the receiver being employed. It is not intended to determine what level of interference is unacceptable for any other purpose or in any other band.

⁹ “Non-cellular” systems are systems that provide service to their mobile users or subscribers from one or a small number of base stations, which are typically “high site” (*i.e.*, located at high elevations, on towers, mountains, hill tops, or tall buildings) multiple, interconnected, multi-channel transmit/receive cells and employ frequency reuse to serve a larger number of subscribers. For the purposes of this proceeding, the term non-cellular will refer to systems which do not employ a “high-density cellular” architecture. See ¶¶ 170-174 *infra*.

¹⁰ Business and Industrial/Land Transportation (B/ILT) licensees are licensed in the Private Land Mobile Radio Service pursuant to Part 90 of the Commission’s Rules and utilize their systems for private, internal needs in a variety of commercial applications (e.g., factories, taxis). B/ILT typically use “high-site, high power” systems in the 800 MHz and 900 MHz. See 47 C.F.R. 90.35. See also n. 9 for a description of high site, high power systems.

¹¹ For purposes of this *Report and Order*, we define as CII licensees those entities, outside of the scope of the “public safety service” definition of 47 U.S.C. § 337(f), see n. 1 *supra*, but which operate “public safety” radio services within the scope of Section 309(j)(2) of the Act. 47 U.S.C. § 309(j)(2) defines “public safety radio services” as including private internal radio services used by State and local governments and non-government entities, and including emergency road services provided by not-for profit organizations, that: (i) are used to protect the safety of life, health, or property; and (ii) are not made commercially available to the public.

Examples of CII licensees include 800 MHz systems that provide private internal radio services used by utilities, railroads, metropolitan transit systems, pipelines, private ambulances, volunteer fire departments, and not-for-profit organizations that offer emergency road services, such as the American Automobile Association (AAA).

We recognize that the section 309(j)(2) definition is more encompassing than that proposed by Nextel in the “White Paper.” See Promoting Public Safety Communications, Realigning the 800 MHz Land Mobile Radio (continued....)

band spectrum. We believe that the totality of these measures will both eliminate unacceptable interference currently encountered by 800 MHz public safety and CII systems¹² and reflect sound spectrum management principles. Our plan incorporates essential elements of a proposal developed by Nextel, the major public safety organizations, and various private wireless organizations (the so-called “Consensus Parties”).¹³

(Continued from previous page)

Band to Rectify Commercial Mobile Radio - Public Safety Interference and Allocate Additional Spectrum to Meet Critical Public Safety Needs, Nextel Communications, Inc., submitted by Robert S. Foosaner, Nextel Communications, Inc., to Thomas J. Sugrue, Chief, Wireless Telecommunications Bureau, FCC (cover letter dated Nov. 12, 2001) (White Paper) at 46. In this regard, we observe that in the White Paper, Nextel cites a study undertaken by the Department of Commerce, National Telecommunications and Information Administration, which requested comment on a broader definition of CII, including pipelines and railroads. *See* White Paper at n. 60; Request for Comment on Energy, Water and Railroad Service Providers’ Spectrum Use Study, 66 Fed Reg. 18447 (2001). Section 309(j)(2) also is broader than the definition proposed by the Critical Infrastructure Communications Council (CICC), which is composed of the following organizations: The American Gas Association, the American Petroleum Institute, the American Public Power Association, the American Water Works Association, the Association of American Railroads, the Edison Electric Institute, the Interstate Natural Gas Association of America, the National Association of Water Companies, the National Rural Electric Cooperative Association, and the United Telecom Council (UTC). *See* UTC Comments at n. 2. We nonetheless believe that this expanded definition is appropriate in this context because it recognizes that the very nature of the services provided by the included entities involves potential hazard to life and property and that CII entities often work hand in hand with public safety officials at the scene of an incident. Indeed, reliable CII radio communications have long proven essential in speeding recovery from natural or man-made disasters. Our decision to define CII is confined to this proceeding and does not represent a Commission decision that CII entities are public safety entities.

¹² Although we focus on the benefits to public safety and CII, we do not intend to imply that other 800 MHz radio systems will not be beneficiaries of the actions we take today. Except where specifically stated otherwise, the interference protections we afford today inure to the benefit of all 800 MHz non-cellular licensees. “Non-cellular 800 MHz licensees,” as used herein, refers to public safety, CII, B/ILT and non-cellular SMR licensees.

¹³ The proponents of this proposal have referred to themselves as the “Consensus Parties” and we use that term for reference purposes in this *Report and Order*. The Consensus Parties’ members are the Association of Public Safety Communications Officials-International (APCO), International Association of Chiefs of Police (IACP), International Association of Fire Chiefs, Inc. (IAFC), International Municipal Signal Association (IMSA), Major Cities Chiefs Association (MCCA), Major County Sheriffs’ Association (MCSA), National Sheriffs’ Association (NSA), Aeronautical Radio, Inc. (ARINC), American Mobile Telecommunications Association (AMTA), American Petroleum Institute (API), Association of American Railroads (AAR), Forest Industries Telecommunications (FIT), Industrial Telecommunications Association (ITA), PCIA - The Wireless Infrastructure Association (PCIA), Taxicab, Limousine and Paratransit Association (TLPA), National Stone, Sand and Gravel Association (NSSGA), and Nextel. *See* Letter, dated October 29, 2002, from Robert M. Gurss, Esq., Counsel for APCO to Marlene H. Dortch, Secretary, Federal Communications Commission. *See* n. 172 *infra*. However, while the Consensus Parties represent a broad coalition of commercial and public safety entities, we recognize that their position does not reflect a consensus of all of the various parties to this proceeding, including some public safety entities that object to the Consensus Parties’ proposal or elements thereof. *See, e.g.*, Letter, dated March 24, 2004, from Chuck Canterbury, National President, Fraternal Order of Police (FOP) to George W. Bush, President, United States of America; Letter, dated March 25, 2004 from Art Gordon, National Executive Vice President, Federal Law Enforcement Officers Association to George W. Bush, President, United States of America. With regard to the Fraternal Order of Police letter, we observe that on July 1, 2004, the FOP indicated that their concerns over the Consensus Plan have been addressed and that they now support the Consensus Plan. *See* Letter dated July 1, 2004, from Chuck Canterbury, National President, Fraternal Order of Police, to Michael K. Powell, Chairman, Federal Communications Commission.

5. In recognition of the public interest benefit derived from robust and reliable public safety communications coupled with the spectrum rights Nextel will surrender as well as financial commitments that Nextel will incur in connection with band reconfiguration, upon acceptance of Nextel of the conditions and obligations that we place on it in this R&O, we will modify certain Nextel licenses to provide it with rights to operate on ten megahertz of spectrum in the 1.9 GHz band, conditioned on fulfillment of the obligations we place on it in this *Report and Order*.¹⁴ As a necessary predicate for the license modifications, we also take action by this Order in ET Docket No. 00-258 and ET Docket No. 95-18 to redesignate the spectrum for the provision of licensed Fixed and Mobile services to be used for Advanced Wireless Services (AWS).¹⁵ To ensure that by these actions Nextel, other licensees and the public are treated equitably, and that Nextel does not realize any windfall gain, we confer these 1.9 GHz spectrum rights on a “value for value” basis. Under this approach, we credit Nextel for (1) the net value of spectrum rights that Nextel is relinquishing to public safety, CII, and other 800 MHz band licensees; (2) the actual cost of 800 MHz band reconfiguration (including both Nextel’s costs to support relocation by other licensees and Nextel’s own relocation costs); and (3) costs incurred by Nextel to clear the 1.9 GHz band, less any reimbursed expenses. If these combined offsets ultimately total less than the value determined by this *Report and Order* for the 1.9 GHz spectrum rights, we require Nextel to make a payment to the U.S. Treasury at the conclusion of the transition process equal to the difference.¹⁶

6. In complying with the obligations we place upon it in this *Report and Order*, we recognize that Nextel may have to shift some of its operations from the 800 MHz band to 900 MHz band frequencies in order to provide the “green space” necessary to effect reconfiguration of the 800 MHz band. Moreover, in some areas, Nextel may have to share spectrum in the 817-824 MHz/862-869 MHz segment of the reconfigured band with other ESMR licensees.¹⁷ To the extent that such sharing may reduce the amount of 800 MHz spectrum available to Nextel, we believe we should provide the regulatory flexibility necessary for Nextel to make up the shortfall by using 900 MHz band channels. We therefore amend our rules to allow 900 MHz band licensees to initiate CMRS operations on their currently authorized spectrum or to assign their authorizations to others for CMRS use.¹⁸

7. The totality of the actions we take today are based on unique and compelling public interest considerations in the record before us regarding the serious and continuing public safety interference problems in the 800 MHz band. These considerations require that we take the most effective actions, in the short-term and long-term, to promote robust and reliable public safety communications in the 800 MHz band to ensure the safety of life and property. While we are mindful of our statutory obligations under Section 309(j) of the Act regarding the use of competitive bidding procedures for the assignment of

¹⁴ We make these modifications under the authority granted us by Sections 4, 301, 303 and 316 of the Act, 47 U.S.C. §§ 316, 303, 301, and 154(i). We set forth a detailed description of our legal authority in ¶¶ 62-87 *infra*.

¹⁵ See ¶¶ 223-276 *infra*. AWS is the collective term we use for new and innovative fixed and mobile terrestrial wireless applications using bandwidth that is sufficient for the provision of a variety of applications, including those using voice and data (such as Internet browsing, message services, and full-motion video) content. Although AWS is commonly associated with so-called third generation (3G) applications and has been predicted to build on the successes of such current-generation commercial wireless services as cellular and Broadband PCS, the services ultimately provided by AWS licensees are only limited by the fixed and mobile designation of the spectrum we allocate for AWS and the service rules we ultimately adopt for the bands.

¹⁶ See ¶¶ 210-212 *infra*.

¹⁷ See ¶¶ 159-163 *infra*.

¹⁸ See 47 C.F.R. § 90.621(f) in Appendix C *infra*.

spectrum, we nonetheless believe the license modifications we approve today are consistent with Section 309(j) of the Act and our other spectrum management obligations. This action does not signal any change in the Commission's policy of using competitive bidding as a licensing tool in other contexts, consistent with statutory requirements.

II. EXECUTIVE SUMMARY

8. In this *Report and Order*, we adopt a two-prong solution to the public safety interference problem in the 800 MHz band, with each prong having several components. First, to more adequately respond to individual interference events immediately, we establish an objective standard for defining "unacceptable interference" to 800 MHz non-cellular systems, establish rules and procedures for the expeditious implementation and enforcement of this standard, and endorse a variety of technical solutions and mechanisms, defined as "Enhanced Best Practices," to address interference abatement in the short-term. Second, to provide a better spectrum environment for public safety in the long-term, we adopt a plan for reconfiguration of the 800 MHz band and provide for a thirty-six-month transition by incumbent licensees from their current frequency assignments to new frequency assignments in the band.

9. Based on the extensive and comprehensive record of the proceeding, we are convinced that neither band reconfiguration alone, nor application of "technical fixes" on a case-by-case basis would adequately address the interference to 800 MHz public safety communications systems. Thus, we have adopted a Commission-derived solution which, in addition to decisions we have reached independently, incorporates both recommendations made by the proponents of case-by-case "technical fixes" and the proponents of band reconfiguration. In reaching this solution, we were aided by technical and economic studies, research data and legal analyses contained in the record.¹⁹ We believe that the approach we adopt is technically and legally sound, logistically achievable, and representative of the collective expertise of all of the various interests which have addressed this significant issue.

10. In the first prong of this *Report and Order*, we take a number of steps to provide for immediate abatement of interference to 800 MHz band public safety and other non-cellular systems:

- We adopt a new, objective definition of "unacceptable interference," for purposes of this proceeding only, to determine when public safety and other non-cellular 800 MHz band licensees are entitled to interference protection.²⁰
- We assign strict responsibility for eliminating unacceptable interference to the ESMR or cellular telephone operator(s) implicated in the interference occurrence, and assign joint responsibility to all involved commercial operators if unacceptable interference results from a combination of signals from multiple systems.²¹
- We require ESMR and cellular telephone licensees, on request, to notify public safety and

¹⁹ A detailed overview of the record is set forth in ¶ 61 *infra*. For citation purposes, we refer to comments received to the *Notice of Proposed Rulemaking* in this proceeding using the following format: [Party Name] Comments/Reply Comments at [Page or Paragraph Number]. We refer to comments received in response to the Consensus Parties Reply Comments using the following format: Comments of [Party Name] to the Consensus Parties Reply Comments at [Page or Paragraph Number]; we refer to comments received in response to the Supplemental Comments of the Consensus Parties using the following format: Comments/Reply Comments of [Party Name] to Supplemental Comments of the Consensus Parties at [Page or Paragraph Number].

²⁰ See ¶ 107 *infra*.

²¹ See ¶ 130 *infra*.

CII licensees prior to activating new or modified cells, and require public safety and CII licensees receiving such information to notify ESMR and cellular telephone licensees of changes in system parameters.²²

11. Under the second prong of the *Report and Order*, we take steps to reconfigure the 800 MHz band to separate public safety, CII, and other non-cellular systems on the one hand, and ESMR systems, such as Nextel's, on the other:

- We designate fourteen megahertz in the upper portion of the 800 MHz band (817-824 MHz/862-869 MHz) for ESMR systems, while designating eighteen megahertz in the lower portion of the 800 MHz band (806-815 MHz/851-860 MHz) for use by public safety, CII, and other non-cellular systems.²³ Between the upper and lower band segments, we establish an Expansion Band and a Guard Band to separate ESMR operations from public safety and CII operations and protect the latter from interference.
- As part of band reconfiguration, we require Nextel to relinquish all of its 800 MHz band spectrum holdings below 817 MHz/862 MHz.²⁴ This will result in an additional average of 4.5 megahertz of 800 MHz band spectrum becoming available to the public safety community, particularly in the major markets where the shortage of public safety spectrum is most acute.
- We require band reconfiguration to be completed through a phased transition process within thirty-six months of release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region.²⁵ We provide for an independent Transition Administrator to oversee the band reconfiguration process.²⁶
- We assign financial responsibility to Nextel for the full cost of relocation of all 800 MHz band public safety systems and other 800 MHz band incumbents to their new spectrum assignments with comparable facilities, *i.e.*, systems with comparable technological and operational capability.²⁷ We adopt financial, licensing, and administrative safeguards to ensure completion of band reconfiguration regardless of Nextel's financial condition.²⁸

12. In connection with the reconfiguration of the 800 MHz band, as described above, we take the following additional spectrum-related actions:

- We accept Nextel's relinquishment of its current spectrum rights in the 700 MHz Guard Band and contemplate a future *Further Notice of Proposed Rulemaking* to determine the

²² See ¶¶ 124-127 *infra*.

²³ See ¶ 151 *infra*.

²⁴ See ¶ 198 *infra*.

²⁵ See ¶ 201 *infra*.

²⁶ See ¶¶ 190-200 *infra*.

²⁷ See ¶¶ 177-178 *infra*.

²⁸ See ¶¶ 180-187 *infra*.

disposition of this spectrum.²⁹

- In exchange for the spectrum rights Nextel is surrendering, coupled with the obligations it is incurring to accomplish 800 MHz band reconfiguration, we will modify certain Nextel licenses to provide Nextel with nationwide authority to operate in ten megahertz of spectrum at 1910-1915 MHz/1990-1995 MHz.³⁰ We require Nextel to reimburse UTAM Inc. (UTAM) for the cost of clearing the 1910-1915 MHz band, and to clear the 1990-2025 MHz band of BAS incumbents within thirty months of the effective date of this *Report and Order*.³¹
- To ensure that Nextel is treated equitably but does not realize an undue windfall, we condition the grant of 1.9 GHz band spectrum rights to Nextel on its meeting the obligations imposed by this *Report and Order*, and on its payment to the U.S. Treasury of any difference between the value of the 1.9 GHz band spectrum rights, the value of spectrum rights relinquished by Nextel, and Nextel's costs incurred in reconfiguring the 800 MHz band and clearing the 1.9 GHz band.³²
- We reject Nextel's proposed relinquishment of 900 MHz spectrum as part of the Consensus Parties' proposal,³³ but allow 900 MHz band Private Land Mobile Radio (PLMR) service licensees to initiate CMRS operations on their currently authorized spectrum or to assign their authorizations to others for CMRS use.³⁴

III. MAJOR FINDINGS AND DECISIONS

A. The 800 MHz Interference Problem and Solutions

13. In the *NPRM*, the Commission documented the increasing incidence of interference to 800 MHz band public safety systems from high density ESMR and cellular telephone systems.³⁵ We tentatively concluded that interference to public safety represented "a sufficiently serious problem that a solution must be found."³⁶ We find that the record in this proceeding supports the following findings:

- The public safety interference problem described in the *NPRM* is serious and will only increase in severity as private, public safety and commercial use of the 800 MHz band

²⁹ See ¶¶ 207-209 *infra*.

³⁰ See ¶¶ 217-222 *infra*.

³¹ See ¶¶ 239-263 *infra*.

³² See ¶ 212 *infra*.

³³ See ¶ 207 *infra*.

³⁴ See ¶¶ 335-337 *infra*.

³⁵ See Improving Public Safety Communications in the 800 MHz Band; Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels, WT Docket No. 02-55, *Notice of Proposed Rulemaking*, 17 FCC Rcd 4873, 4482 ¶ 16 (2002), as modified in *Erratum*, 17 FCC Rcd 7169 (PSPWD 2002) (*NPRM*).

³⁶ *Id.* at 4882 ¶ 16.

intensifies.

- Public safety agencies are becoming increasingly dependent on the 800 MHz band to meet their communications needs as spectrum used by public safety in lower bands has become congested, particularly in urban areas.³⁷
- Although many ESMR and cellular telephone licensees have been commendably cooperative in bearing the responsibility for identifying and promptly curing interference at their own expense, their ability to continue to do so effectively will become problematic as more intense use is made of 800 MHz band and cellular telephone spectrum.
- Despite the claims by some that licensees in the cellular telephone bands cause little interference to 800 MHz band public safety systems,³⁸ strong evidence exists to the contrary.³⁹
- We must take the actions necessary to ensure that first responders—both public safety and CII personnel—have communications channels free of unacceptable interference and thereby suitable for mission-critical operations including rapid response to major incidents that threaten Homeland Security.

14. Until now, the Commission's approach to interference resolution in the 800 MHz band has been to urge the involved parties to make voluntary technical changes to prevent or reduce interference at particular sites.⁴⁰ This is consistent with the policy reflected in current rules that require affected licensees to resolve interference through mutually satisfactory arrangements.⁴¹ While these measures have helped to alleviate interference in some instances, the record leads us to conclude that the interference problem will only intensify as cellular-architecture licensees make more intensive use of their spectrum and that voluntary measures alone will not stem the growth of unacceptable interference. We thus are convinced that unacceptable interference will be stemmed in an efficient and effective manner, only by the actions we take today to establish mandatory interference-abatement rules.

³⁷ Although the Commission has designated spectrum for public safety use in the spectrally adjacent 700 MHz band (764-776 MHz and 794-806 MHz), that band currently is not usable by public safety in most of the population centers of the United States because of the presence of high-power television station incumbents. *See* Section 337(a) of the Communications Act, 47 U.S.C. § 337(a), as amended by § 3004 of the Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997). *See also* Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010, WT Docket 96-86. As a result, the potential for the public safety community to access the 700 MHz band in the near future is limited.

³⁸ *See, e.g.,* Verizon Comments at 3; Cingular and Alltel Comments at 2-3. Some parties argued that reports of interference were anecdotal in nature, and for that reason, did not represent a true evaluation of the problem. *See* Cinergy Comments at 7-9.

³⁹ *See, e.g., ex parte* comments, dated June 10, 2003, from City and County of Denver (Denver June 10 *Ex Parte*); *ex parte* comments, dated July 29, 2003, from Anne Arundel County (Anne Arundel July 29 *Ex Parte*).

⁴⁰ In 2000, public safety and CMRS entities incorporated many of these technical changes into a *Best Practices Guide*. *See* Avoiding Interference Between Public Safety Wireless Communications Systems and Commercial Wireless Communications Systems at 800 MHz, a Best Practices Guide, December 2000 at 5 (*Best Practices Guide*).

⁴¹ *Cf.* 47 C.F.R. § 90.173(b); *see also* 47 C.F.R. § 90.403(e).

15. In this proceeding, parties have presented us with two long-term alternatives for addressing the 800 MHz interference problem:

- The Consensus Parties have proposed a band reconfiguration plan that would move ESMR systems—most notably Nextel—to the upper portion of the 800 MHz band, move all public safety and “high site” operators to the lower portion of the band, and make additional spectrum in the band available for public safety use.⁴²
- Other parties, including cellular telephone licensees and their representatives, utilities and even some public safety agencies, have questioned the need for band reconfiguration, and aver that technical changes accompanied by certain mandatory procedural requirements, such as prior coordination of cell sites, would suffice to solve the interference problem without the need to reconfigure the 800 MHz band. One group of entities, the 800 MHz User Coalition, refers to this alternative as the “Balanced Approach.”⁴³

16. We agree, in part, with the suggestion by proponents of the Balanced Approach and other parties that we should augment the technical and procedural changes contained in the *Best Practices Guide* and apply certain of them on a mandatory basis. While we do not adopt all of the suggested technical restrictions, we have carefully considered various technical measures suggested by the parties and supplemented them with certain procedural rules. Hereinafter, we refer to this Commission-derived set of practices and procedures as Enhanced Best Practices.

17. On this record, however, we disagree with those parties that contend that exclusive reliance on Enhanced Best Practices on a case-by-case basis is the best long-term solution to the interference problem.⁴⁴ Although case-by-case treatment of potential and actual interference under an Enhanced Best Practices regime provides clear benefits over the current voluntary regime, we conclude that that approach, by itself, does not provide the best long-term answer to the problem of interference to public safety and other non-cellular operations in the 800 MHz band. Our finding in that regard rests on the following facts:

⁴² The designations “high-site” and “low-site” are often used to distinguish cellularized from non-cellularized systems. Thus, for example, the typical public safety 800 MHz system will employ one, or only a few, base stations with antennas located on high terrain, towers, buildings, etc. to provide wide-area coverage from the base station. Cellular-architecture systems, by comparison, make use of multiple, localized coverage, base stations whose antennas generally are mounted on low towers or other structures. We note, however, that the term “low-site” is often used to denominate cells *within* a cellularized system that have *very low* antenna elevations, e.g. thirty-feet and, accordingly, have a greater potential to cause interference than high-elevation cells in the system. See ¶¶ 170-174 *infra*.

⁴³ See http://www.fix800mhznow.com/documents/800_MHz_COALITION_10_29_03.pdf. The 800 MHz Users Coalition consists of: ALLTEL Communications, Ameren Corporation, American Electric Power (AEP), Applied Technology Group, Inc., AT&T Wireless Services, Inc., Cinergy Corporation, City of Baltimore, Maryland, City of Colorado Springs, Colorado, Consumers Energy Co., Edison Electric Institute (EEI), Fresno Mobile Radio, Inc., Holy Cross Electric Association, Mobile Relay Associates, National Rural Electrical Cooperative Association (NRECA), Palomar Communications, Preferred Communication Systems, Small Business in Telecommunications, Southern Company/Southern LINC, Supreme Radio Communications, Inc., U.S. Cellular Corp., UTC, and Western Wireless.

⁴⁴ See, e.g., Letter, dated May 29, 2003, from Jill Lyon, Esq., Vice President and General Counsel, UTC to Marlene H. Dortch, Secretary, Federal Communications Commission (800 MHz Users Coalition May 29, 2003 *ex parte*).

- Addressing interference on a case-by-case basis is both labor-intensive and expensive.⁴⁵
 - The transactional costs of applying Enhanced Best Practices as an exclusive remedy would increase as new public safety and other non-cellular systems were implemented and ESMR and cellular licensees increased the capacity of their systems by adding more cells.
 - The increased costs and labor burden disproportionately affects public safety agencies, many of which operate with very limited human, technical, and financial resources.
 - Some interference situations respond poorly, if at all, to the use of the techniques contained in the Enhanced Best Practices.
 - ESMR and cellular systems will continue to expand. This will increase congestion in the 800 MHz band as well as the attendant interference to public safety systems operating in the band. We would disserve the public interest if we allowed unacceptable interference to become ubiquitous before addressing the fundamental causes of this interference.
18. In contrast, band reconfiguration confers the following greater benefits over the long-term:
- Band reconfiguration addresses interference comprehensively and proactively by eliminating the current interleaving of public safety and commercial channels in the 800 MHz band and separating cellularized multi-cell and non-cellularized high-site systems within the band.
 - Although there are significant short-term costs associated with band reconfiguration, it is the solution most likely to yield maximum interference protection benefits for the least cost over the long run.⁴⁶
 - Once implemented, a reconfigured band will reduce both the upfront amount of coordinated engineering work necessary to prevent interference and the burden of troubleshooting interference incidents on a case-by-case basis.
 - Eliminating interleaving of public safety and commercial channels will reduce the number of “band edges” between spectrum utilized by the two different network architectures thus significantly reducing the risk of interference to public safety systems.
 - With adoption of band reconfiguration, public safety entities will have access, on average, to 4.5 megahertz of additional 800 MHz spectrum, which they can readily incorporate into existing systems to enhance their ability to protect the safety of life and property. Moreover, public safety entities that wish to do so will have the option of using spectrum in the Expansion Band or the Guard Band, subject to the technical and operational limitations on those bands.
 - The relocation of the current NPSPAC channels from their current position to the lowest

⁴⁵ We also note that the record reflects instances in which, despite diligent effort on the part of all concerned, technical changes have been unable to abate interference. *See e.g.*, Denver June 10 *Ex Parte* at 12 -13; Anne Arundel July 29 *Ex Parte*.

⁴⁶ We note that the interference abatement measures used prior to band reconfiguration will remain necessary even after band reconfiguration is completed. Thus, although we expect instances of interference to be far less frequent under the reconfigured band plan, the availability of Enhanced Best Practices will ensure the quick and effective abatement of any residual interference that may occur.

segment of the 800 MHz band will result in a greater potential for interoperability with public safety systems in the spectrally adjacent 700 MHz public safety band.

- The adoption of a reconfigured 800 MHz band plan will provide certainty to licensees planning to implement new 800 MHz systems or modify existing systems.

B. Entitlement to Interference Protection

19. We are adopting a new objective technical standard for determining whether a public safety or other non-cellular 800 MHz band licensee is entitled to interference protection. We adopt this standard to more finely adapt our rules to the technologies being deployed in the 800 MHz band. Specifically:

- “Unacceptable interference” is defined, for the limited purpose of this proceeding, as a function of threshold median received power levels of desired signals. Specifically, “unacceptable interference” occurs when the signals from a cellular architecture station or stations, cause the carrier-to-noise plus interference ratio of a radio meeting TIA-equivalent Class A standards to degrade below 20 dB in an area in which the median measured received signal power of the desired signal is equal to or greater than -104 dBm for mobile units or -101 dBm for portable units.⁴⁷ In the case of data radios, unacceptable interference occurs when the received signal power criteria, above, are met and the bit error rate of the radio exceeds the value specified by the radio’s manufacturer for reliable operations.⁴⁸
- Under the rules adopted in this Order, desired signals from systems operating in the 806-816 MHz/851-861 MHz band segment that equal or exceed the threshold are entitled to protection from unacceptable interference as defined above. Non-cellular systems operating from 816-817 MHz/861-862 MHz in the Guard Band are also provided interference protection, but to a lesser degree.⁴⁹
- In recognition of the role that receiver characteristics play in the interference calculus, we are affording full protection against unacceptable interference only to systems whose mobile or portable receivers are capable of satisfactory operation at the threshold signal power in the absence of interference.⁵⁰ Other systems will receive lesser protection as a function of the degree to which their receivers exhibit inferior performance.

20. The method of interference abatement we adopt herein leaves to the involved parties—and not the Commission—the choice of how best to ensure that their systems do not cause unacceptable interference. Thus, a given party may choose from a variety of methods encompassed in the Enhanced Best Practices in each area where interference occurs, including, but not limited to, modification of the cell that is the source of interference or technical improvements to the affected public safety system or other non-cellular 800 MHz systems (at the commercial operator’s expense).⁵¹ In addition, to the extent that

⁴⁷ See ¶¶ 105-107 *infra*.

⁴⁸ *Id.*

⁴⁹ See ¶ 158 and Figure 1 *supra*.

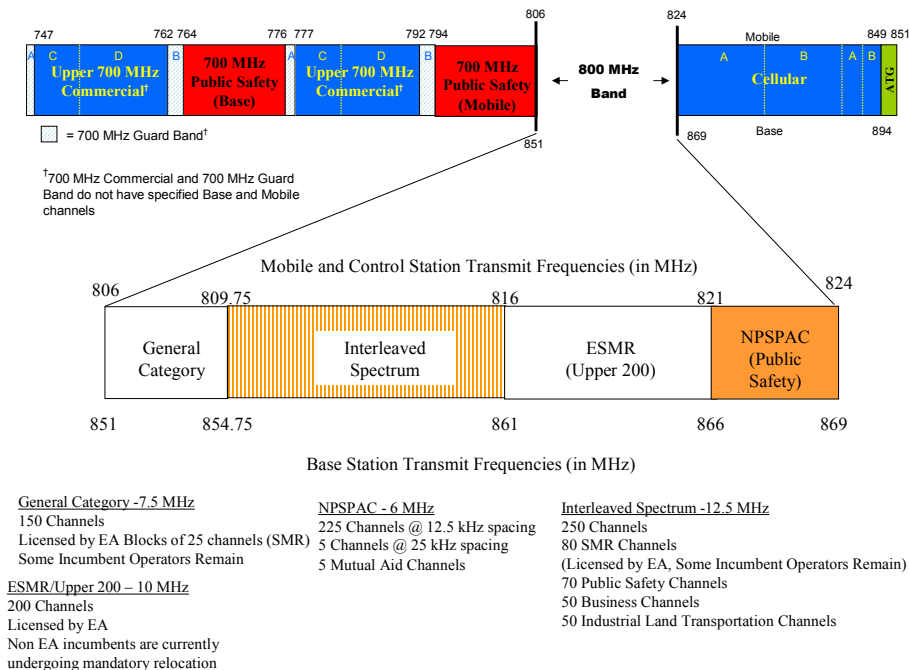
⁵⁰ In this *Report and Order*, we are relating entitlement to full interference protection to conformance with certain sensitivity, selectivity, and intermodulation-rejection performance standards typical of TIA “Class A” receivers. See ¶ 109 *infra*.

⁵¹ We stress, however, that we expect parties to vigorously implement Enhanced Best Practices to abate interference even if this involves implementing a “channel swap” prior to official rebanding. See ¶ 123 *infra*.

interference results from the combination of signals from multiple transmitters, and potentially multiple licensees, we place joint and several responsibility on such CMRS licensees to eliminate unacceptable interference using the remedies of their choice. In not imposing new, across-the-board emission limitations that would necessitate highly expensive technical changes to most, if not all, ESMR and cellular systems nationwide, we have heeded the filings of those parties who have decried the expense of such technical micromanagement and urged that the same goal can be achieved otherwise, for example, by the less intrusive means we adopt today.⁵²

C. 800 MHz Band Reconfiguration

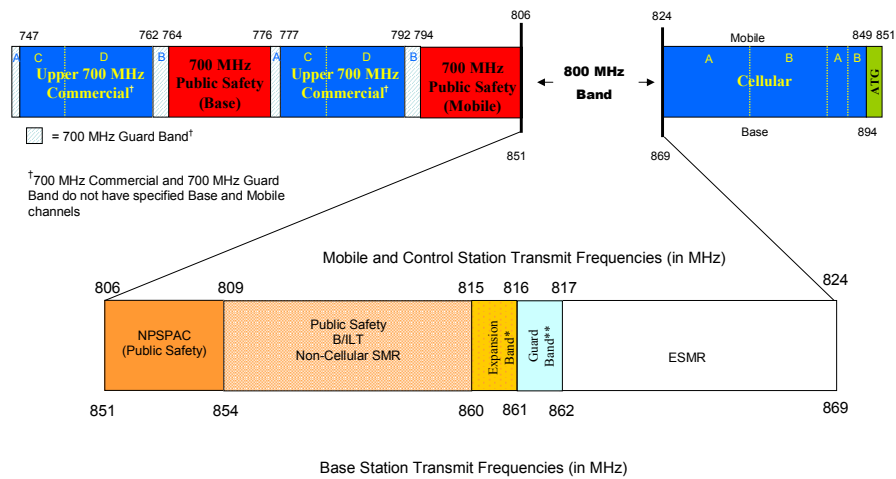
21. The 800 MHz band is currently configured as follows:



22. Our plan for reconfiguration of the 800 MHz band is designed to spectrally segregate public safety systems from ESMR and cellular telephone systems. In reaching this spectrum management decision, we are guided by the principle that we can minimize unacceptable interference in the 800 MHz band by placing similar system architectures in like spectrum and isolating dissimilar architectures from one another.⁵³ Under the new band plan adopted in this *Report and Order*, the 800 MHz band will be configured as follows:

⁵² See Public Safety Wireless Network Comments at 18. See also Reply Comments of Rural Telecommunications Group to Supplemental Comments of the Consensus Parties.

⁵³ See FCC Staff Report, Spectrum Policy Task Force Report in ET Docket No. 02-135, 4, 22 (released Nov. 22, 2002).



*No public safety system will be required to remain in or relocate to the Expansion Band; although they may do so if they choose.

**No public safety or CII licensee may be involuntarily relocated to occupy the Guard Band.

23. The new band plan will have the following impact on existing licensees in the band:

- Systems in the current NPSPAC band will be relocated to 806-809/851-854 MHz in the current General Category band.⁵⁴ To accommodate NPSPAC relocation, Nextel will relinquish its General Category licenses and other existing General Category systems will be relocated elsewhere in the 800 MHz band.⁵⁵
- Existing public safety systems and non-cellular B/ILT and SMR systems operating on interleaved channels between 809.75-816 MHz/854.75-861 MHz will continue to operate on those channels.
- Nextel will relocate to the 817-824 MHz/862-869 MHz band, and will vacate all channels it now uses in the 806-817 MHz/851-862 MHz band segment. Public safety, and later CII agencies will have exclusive access to all channels vacated by Nextel in the interleaved portion of the band below 815 MHz/860 MHz for a limited-year period of time.⁵⁶
- No public safety licensee will be required to operate in the 815-816 MHz/860-861 MHz Expansion Band. Any public safety system currently located in the Expansion Band will be relocated to spectrum below the Expansion Band unless it exercises its option to remain in the

⁵⁴ See ¶ 37 *infra*.

⁵⁵ In some circumstances, public safety and CII systems operating in the 809-809.75 /854-854.75 MHz portion of the General Category band will not have to be relocated. Public safety will also have exclusive access to spectrum vacated by Nextel in this portion of the General Category Band for five years, and CII licensees will have access from year three to year five.

⁵⁶ These channels will be restricted to public safety eligibles for three years from the effective date of this *Report and Order*. Thereafter, for an additional two-year period, only public safety and CII eligibles may apply for said channels. At the end of this five-year period, any eligible applicant may apply.

Expansion Band.⁵⁷

- No public safety or CII licensee will be required to operate in the 816-817 MHz/861-862 MHz Guard Band. Only licensees who voluntarily choose to relocate to the Guard Band will occupy this portion of the band.⁵⁸
- Unless the subject of mutual agreement among affected parties, non-Nextel ESMR operations below 816/861 MHz may stay where they are, subject to a stringent non-interference obligation.⁵⁹

24. Providing public safety with additional spectrum rights in the 800 MHz band, instead of elsewhere as others have proposed,⁶⁰ has significant advantages. First, spectrum rights in the 800 MHz band are currently more valuable to public safety licensees than spectrum rights in the 700 MHz public safety band which can be subject to interference from incumbent television stations. This interference may foreclose extensive use of the 700 MHz public safety band in certain markets for several years. Second, 800 MHz band spectrum rights are of particular value to public safety licensees because new channels can be integrated into their existing infrastructure at little additional cost: the additional channels can be added to existing base station sites with, typically, only minor hardware changes; and most existing public safety mobile and portable radios can be adapted to receive the additional channels with only minor modification or reprogramming. In sum, providing public safety with access to additional spectrum in the 800 MHz band can provide a virtually instant capacity increase for public safety systems and will facilitate interoperability with other agencies—an important capability for Homeland Security operations. To the extent that band reconfiguration may require extensive replacement of existing 800 MHz band public safety equipment, manufacturers likely will achieve economies of scale in the process. We urge manufacturers to pass on such savings to public safety agencies.

25. In crafting the band plan adopted herein, we examined all proposals submitted in the course of this proceeding. While we did not adopt any proposal in its entirety, we did extract elements from several proposals and adopted a modified version of the only band plan that with an effective, comprehensive approach for resolving the interference problems that jeopardized public safety.⁶¹ We nonetheless

⁵⁷ Under the relocation provisions we adopt today, public safety licensees will generally be located outside of the Expansion Band, except when a public safety licensee currently operating in these bands either explicitly declines to relocate or requests a channel therein. Those public safety systems operating in the Expansion Band will receive the same interference protection as if they were located outside of this band. See ¶¶ 154-156 *infra*.

⁵⁸ The Guard Band is carved from current EMSR spectrum. Therefore, no public safety licensees currently occupy the Guard Band and no public safety licensees will need to be relocated from this portion of the band. Systems that choose to relocate to the Guard Band will be entitled to limited interference protection as described at ¶¶ 158 and Figure 1 *infra*.

⁵⁹ In some Southeastern markets where both Southern LINC and Nextel offer ESMR service, insufficient spectrum exists in the 816-824/861-869 MHz band segment to accommodate existing ESMR systems and ESMR systems that may seek to exercise their option to relocate from the lower channels. In order not to unduly restrict ESMR operations in this region, we define the ESMR band in these markets as the band segment 813.5-824 MHz/858.5-869 MHz. The Expansion Band in this region will extend from 812.5-813.5 MHz/857.5-858.5 MHz. All licensees operating below 813.5 MHz/858.5 MHz in this region will be afforded full protection against unacceptable interference as specified in the *Report and Order*. See ¶¶ 164-169 *infra*.

⁶⁰ See Comments of Preferred Communications to Supplemental Comments of the Consensus Parties at 19-20.

⁶¹ For example, only one proposal contained a feasible means of paying for band reconfiguration. See Supplemental Comments of the Consensus Parties at ii (Nextel commitment to provide up to \$850 million for band (continued....))

recognize that the band plan we adopt is in some respects inconsistent with current international agreements. As a result, implementing the band plan in areas of the United States bordering Mexico and Canada will require modifications to international agreements for use of the 800 MHz band in the border areas. Since we value highly our agreements with these countries we intend to promptly pursue those modifications during our bilateral discussions with those countries' relevant regulatory bodies.⁶² During the pendency of such modifications, all 800 MHz band operations (both cellular and non-cellular alike) must continue to be consistent with current international agreements. Consequently, if a region containing a border area is reconfigured, all 800 MHz band operations within the border area must conform to all international agreements unless and until such international agreements are amended to reflect a reconfigured 800 MHz band. We envision and intend that interference-free cross-border mutual-aid capability remain paramount during this interim period preceding modification of the applicable international agreements.

D. Band Reconfiguration Process

26. We recognize that our decision to reconfigure the 800 MHz band raises significant transition issues, particularly with respect to the relocation of public safety and other non-cellular licensees from old to new frequency assignments. We are sensitive to the concerns raised about service and operational disruption and are committed to ensuring that the band reconfiguration process does not result in degradation of existing service or an adverse effect on public safety communications and operations. We therefore have adopted rules that ensure both continuity of service and that relocating licensees receive "comparable facilities" on their new frequency assignments, whether this requires retuning existing equipment or providing replacement equipment.⁶³

27. In an effort to further ensure a smooth transition to the new 800 MHz band plan, the relocation process will be managed by an independent Transition Administrator.⁶⁴ A committee of major 800 MHz band stakeholders will select the Transition Administrator who will perform a variety of administrative functions and mediate, or refer to mediation, any disputes that may arise in connection with band reconfiguration. Should any such disputes not be resolved by mediation, the Transition Administrator will compile a record and transmit it to the Commission. The Commission then will review the disputed matter *de novo*.⁶⁵

28. We are committed to having band reconfiguration completed through a phased transition process within thirty-six months of release of a Public Notice announcing the start date of reconfiguration

(Continued from previous page) _____

reconfiguration). We note, also, that, later in this proceeding, the proponents of the Balanced Approach said that certain of their members were committed to pay the cost of implementing Best Practices applied on a case-by-case basis when their facilities were involved. We commend that commitment, which is consistent with the interference abatement responsibility policy we adopt herein. *See* ¶¶ 128-131 *infra*.

⁶² Commission staff meet periodically, and whenever needed, with their regulatory counterparts from Mexico and Canada to discuss cross border issues and, when duly authorized, to derive recommended changes to existing international agreements. When formal amendments to agreements are needed, they are made through a process that requires the sanction of the government entity officially designated with the responsibility for international treaty consultations, which in the case of the United States is the Department of State.

⁶³ *See* ¶ 201 *infra*.

⁶⁴ *See* ¶¶ 190-200 *infra*.

⁶⁵ Such *de novo* Commission review is anticipated only after all other avenues have been exhausted, *e.g.*, mediation, arbitration or other alternative dispute resolution techniques based on the good faith effort of the parties.

in the first NPSPAC region. To ensure timely completion, we require Nextel to meet both an interim benchmark and a final benchmark. As an interim benchmark, within eighteen months of release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region Nextel must complete, and the Transition Administrator must certify that Nextel has completed, the retuning of Channels 1-120 for twenty NPSPAC Regions. If Nextel fails to meet this interim benchmark, for reasons that Nextel, with the exercise of due diligence, could reasonably have avoided, the Commission may consider and exercise any appropriate enforcement action within its authority, including assessment of monetary forfeitures or, if warranted, license revocation.⁶⁶ At thirty-six months, Nextel must complete, and the Transition Administrator must certify, all relocation of 800 MHz incumbents required by this Report and Order. If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.

E. Guarantee of Sufficient Funds for Band Reconfiguration

29. Nextel has committed to pay up to \$850 million for retuning and replacement expenses associated with its own relocation and the related relocations discussed in this *Report and Order*, an amount it claims is sufficient to cover all such costs. We do not believe, however, that Nextel should be able to cap its obligation to pay relocation costs, because doing so could leave public safety and other relocating entities without the means to complete the relocation process in the event that Nextel's estimates prove low and relocation costs exceeded any such cap. Therefore, we decline to "cap" Nextel's obligations at \$850 million or any other amount but instead require Nextel to pay all costs of band reconfiguration, as defined in this *Report and Order*.

30. In addition, to protect against possible changes to Nextel's financial condition, we require Nextel to secure its commitment by means of an irrevocable letter of credit in the amount of \$2.5 billion, within sixty days of the date this *Report and Order* is published in the Federal Register.⁶⁷ We believe this letter of credit strikes the appropriate balance between Nextel's estimate that band reconfiguration would cost \$850 million and others' contention that Nextel's estimates were unrealistically low. We further note that Nextel may be required to obtain additional letters of credit if ongoing experience with band reconfiguration show the initial letter of credit to be inadequate.

F. Equitable Compensation for Band Reconfiguration

31. Nextel proposes that, as compensation for its relinquishment of some of its spectrum rights in the 700, 800 and 900 MHz bands and its commitment to pay 800 MHz band incumbent relocation costs, it should receive a nationwide license for ten megahertz of spectrum in the 1.9 GHz band.⁶⁸ We conclude that it is in the public interest to compensate Nextel for the surrendered spectrum rights and costs it incurs

⁶⁶ We note that the Commission has issued Notices of Apparent Liability for Forfeiture assessing substantial penalties on carriers that have failed to comply with Commission rules intended to enhance the safety of life and property. See *In re T-Mobile USA, Inc., Notice of Apparent Liability for a Forfeiture*, 18 F.C.C.R. 3501 (EB 2003); see also *In re AT&T Wireless Services, Inc., Notice of Apparent Liability for a Forfeiture*, 17 F.C.C.R. 9903 (EB 2002).

⁶⁷ See ¶ 182 *infra*.

⁶⁸ This modification of Nextel's original White Paper position was first put forth in December 2001 in an *ex parte* filing by the Consensus Parties. See n. 172 *infra*. We note that other parties contend that the value of the spectrum rights Nextel seeks substantially exceeds the value of spectrum rights it has offered to give up, and therefore would constitute an unwarranted windfall to Nextel. See n. 661 *infra*.

as a result of band reconfiguration. By facilitating band reconfiguration, giving up spectrum rights, and bearing the financial burden of the relocation process for all affected incumbents, Nextel will play a critical role in solving the 800 MHz band public safety interference problem.⁶⁹

32. However, we agree with the parties who have urged us to reject modifying Nextel's licenses on a "megahertz-for-megahertz" basis whereby Nextel would receive rights to ten megahertz of spectrum in the 1.9 GHz band region in exchange for the rights to approximately ten megahertz of combined spectrum it offers to surrender in the 700, 800, and 900 MHz bands.⁷⁰ We reject this approach, *inter alia*, because we perceive insufficient benefit to public safety,⁷¹ and do not find the spectrum rights offered to be comparable in value to the spectrum rights sought. Instead, to ensure that the public and our licensees including Nextel are treated equitably, and that Nextel does not gain undue advantage, we will compensate Nextel on a "value for value" basis.

33. Accordingly, by means of a *Fifth Report and Order* in ET Docket No. 00-258 we designate two paired five megahertz blocks in the 1910-1915 MHz and 1990-1995 MHz bands for the provision of new services, including AWS, which we make available to Nextel as part of the public safety rebanding approach described above. In addition, we adopt a *Fourth Memorandum Opinion and Order* in ET Docket No. 95-15 to provide for clearing of incumbents from this spectrum. More specifically:

- We make the 1910-1915 MHz block available by redesignating the band from Unlicensed Personal Communications Services (UPCS) use to licensed fixed and mobile services to be used for AWS, and adopt a plan that provides reimbursement compensation to UTAM for relocation expenses it has incurred in relocating incumbents from the band and allows for the relocation of remaining incumbent licensees.
- In the 1990-1995 MHz block, which has already been reallocated for fixed and mobile services, we make the band available to Nextel subject to the condition that it relocate incumbent BAS licensees in the 1990-2025 MHz band within thirty months.⁷² We also address several petitions for reconsideration and clarification regarding the existing relocation and reimbursement plan for incumbent BAS licensees in the 1990-2025 MHz band.

⁶⁹ We provide this compensation under the authority granted us by Sections 4, 301, 303 and 316 of the Act, 47 U.S.C. §§ 316, 303, 301, and 154(i). We set forth a detailed description of our legal authority in ¶¶ 62-87 *infra*.

⁷⁰ See, e.g., Comments of Access Spectrum to Supplemental Comments of Consensus Parties at 11-12; Comments of Boeing to Supplemental Comments of Consensus Parties at 19; Comments of CTIA to Supplemental Comments of Consensus Parties at 15-16.

⁷¹ We note that the Commission has previously designated twenty-four megahertz of spectrum to public safety in the 700 MHz band. See ¶ 40 *infra*. We note that a "megahertz for megahertz" comparison of the spectrum currently held by Nextel and the spectrum it seeks is unjustified, *inter alia*, because the bands differ in spectral characteristics, operating parameters, the number and kind of incumbent licensees and the number of markets in which Nextel holds its spectrum. Moreover, under the band reconfiguration plan we adopt today, Nextel may require its 900 MHz band spectrum in order to make up for spectrum it may need to vacate in the 800 MHz band in order to accommodate other ESMR licensees in the ESMR segment of the 800 MHz band. See ¶¶ 159-163 *infra*.

⁷² If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.

34. Nextel will receive rights to the 1.9 GHz band spectrum conditioned on its meeting the obligations imposed by this *Report and Order*, and on its payment to the U.S. Treasury of any difference between the value of 1.9 GHz band spectrum rights and Nextel's costs incurred in reconfiguring the 800 MHz band and clearing the 1.9 GHz band. Specifically, the amount due the U.S. Treasury will be the net of our estimate of the current value of the 1.9 GHz band spectrum rights, discounted by the actual cost of 800 MHz band reconfiguration (including Nextel's own relocation costs), clearing the 1.9 GHz band, and the value of the additional 800 MHz band and 700 MHz band spectrum rights that Nextel will relinquish.

35. At the conclusion of the thirty-six month band reconfiguration process specified herein, but no later than six months thereafter, the following financial reconciliation will be made:

- Nextel will be allotted a \$1.607 billion credit⁷³ for relinquishing rights to an average of 4.5 megahertz of spectrum in the 800 MHz band.
- Nextel will provide the Transition Administrator an accounting of the funds spent:
 - to reconfigure its own systems in the 800 MHz band;⁷⁴ and
 - to clear the 1.9 GHz band of incumbents and to reimburse UTAM.
- Nextel will also provide the Transition Administrator an accounting of the funds received as reimbursement for clearing the 1.9 GHz band.
- The Transition Administrator shall provide an accounting of the funds spent to reconfigure the systems of incumbent operators in the 800 MHz band, including its own salary and expenses.^{74A} This accounting shall include certifications from each relocated licensee that all necessary reconfiguration work has been completed and that Nextel and said licensee agree on the sum paid for such work.
- Upon verification of these accountings, Nextel will be allotted an appropriate credit.
- To the extent that those combined credits total less than the value of the 1.9 GHz band spectrum, Nextel shall be obligated to make a payment to the United States Treasury at the conclusion of the relocation process equal to the difference.
- Within ten days of the calculation of the amount of this payment, the Wireless Telecommunications Bureau will issue a Public Notice specifying the amount that Nextel will pay the United States Treasury. If Nextel does not make payment of any amount that it owes within thirty days of issuance of this Public Notice, the amount Nextel owes will be paid from the letter(s) of credit. If the letter(s) of credit do not secure sufficient funds, then the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, included, but not limited to its 1.9 GHz licenses, should be revoked.

⁷³ "Credit," as used in this context, means the amount that will be deducted from the sum that Nextel will be required to deposit with the U.S. Treasury after completion of band reconfiguration. The calculation of the credit is discussed at ¶ 323 *infra*.

⁷⁴ Nextel's credit for this category of expenditure shall be strictly limited to those costs absolutely essential to implement band reconfiguration and shall not include any costs for improvement, by way of equipment replacement or otherwise, of the capacity or features of Nextel's infrastructure or subscriber units.

^{74A} See n. 510A, *infra*.

IV. REGULATORY BACKGROUND

A. 800 MHz Band

36. In the mid-1970's, the Commission reallocated spectrum in the 806-947 MHz band for land mobile operations and designated portions of this spectrum for high capacity common carrier mobile communications (*i.e.* cellular systems) and PLMR; and reserve spectrum for future land mobile communications needs.⁷⁵ The Commission allotted one-third of the spectrum for conventional operation and the remaining two-thirds for trunked operation.⁷⁶ By the close of the 1970's, the Commission had released a portion of reserve 800 MHz spectrum to alleviate spectrum shortages confronting users of conventional channels.⁷⁷ In the early 1980's, the Commission adopted rules for the release of the remaining reserve spectrum according to radio service categories and established the 800 MHz Public Safety, B/ILT, and SMR service categories.⁷⁸ The specific channel pairs allotted to the various services differ along the U.S. border areas with Mexico and Canada.⁷⁹ The Commission did not make contiguous spectrum available to each radio service because technology limitations at that time did not readily accommodate the use of contiguous spectrum at a single base station site.⁸⁰ Instead, the channel pairs made available to each radio service were "interleaved" between channels allotted to the other radio services.⁸¹ The Commission provided for inter-category sharing (*i.e.*, sharing between radio services) to

⁷⁵ See Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz and Amendment of Parts 2, 18, 21, 73, 74, 89, 91, and 93 of the Rules Relative to Operations in the Land Mobile Service Between 806 and 960 MHz, Docket No. 18262, *First Report and Order and Second Notice of Inquiry*, 19 Rad. Reg. 2d (P&F) 1663 (1970). See also Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz and Amendment of Parts 2, 18, 21, 73, 74, 89, 91, and 93 of the Rules Relative to Operations in the Land Mobile Service Between 806 and 960 MHz, Docket No. 18262, *Second Report and Order*, 46 FCC 2d 752 (1974), *reconsidered*, *Memorandum Opinion and Order*, 51 FCC 2d 945 (1975).

⁷⁶ *Id.*

⁷⁷ See Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz and Amendment of Parts 2, 18, 21, 73, 74, 89, 91, and 93 of the Rules Relative to Operations in the Land Mobile Service Between 806 and 960 MHz, Docket No. 18262, *Order* (on further reconsideration), FCC 78-854 (1978); *aff'd sub nom. NARUC v. FCC*, 525 F.2d 630 (D.C. Cir. 1976), *cert. denied* 425 U.S. 992 (1976).

⁷⁸ The initial allotment to public safety was fifty channels. See Amendment of Part 90 of The Commission's Rules to Designate Frequencies in the 806-821 and 851-866 MHz Bands for Slow-Growth Land Mobile Radio Systems of Utilities and Public Safety Agencies, PR Docket No. 79-191 *Report and Order*, 48 Rad. Reg. 2d (P&F) 837, FCC 80-663 (1980). This was later increased to seventy channels. See Amendment of Part 90 of the Commission's Rules to Release Spectrum in the 806-21/851-866 MHz Bands and to Adopt Rules and Regulations Which Govern Their Use; Amendment of Part 90 of the Commission's Rules to Facilitate Authorization of Wide-Area Mobile Radio Communications Systems; An Inquiry Concerning the Multiple Licensing of 800 MHz Radio Systems (community repeaters); Amendment of Section 90.385(c) of the Commission's Rules to Allow Transmission of Non-Voice Signals at 800 MHz, PR Docket No. 79-191, PR Docket No. 79-334, PR Docket No. 79-107, PR Docket No. 81-703, *Second Report and Order*, 90 FCC 2d 1281, 52 Rad. Reg. 2d (P&F) 11, FCC 82-338 (1982) (*Pool Order*). Subsequently, the Commission added 225 25 kHz channels spaced 12.5 kHz apart and five 25 kHz channels spaced 25 kHz apart at 866-869 MHz—the so-called "NPSAP Channels." See ¶ 37 *infra*.

⁷⁹ See, *e.g.*, 47 C.F.R. §§ 90.617, 90.619.

⁸⁰ See *NPRM*, 17 FCC Rcd at 4877.

⁸¹ *Id.*

permit licensees access to spectrum in instances in which the channels assigned to a licensee's particular radio service had been exhausted.⁸² At the time, the Commission contemplated that the radio service categories could be phased out in three years.⁸³ However, the categories proved to have continuing utility and remain in use today. In 1986, based on experience with the radio service category structure in the 800 MHz band, the Commission adopted a similar structure for the 900 MHz band land mobile spectrum.⁸⁴

37. In 1986, the Commission designated six megahertz of spectrum at 821-824 MHz/866-869 MHz for public safety use and established the NPSPAC to advise the Commission on rules for this spectrum.⁸⁵ After the NPSPAC filed its Initial Report, the Commission issued rules for the new public safety spectrum, which became known as the "NPSPAC Band," including five channels devoted to mutual aid (interoperability) use.⁸⁶ Thereafter, many jurisdictions began planning and implementing wide-area (often state-wide) 800 MHz band public safety systems that utilize NPSPAC and Public Safety Category channels.⁸⁷

38. In 1990, the Commission established the General Category Radio Service at 806-809.75 MHz/851-854.75 MHz for either conventional or trunked operation by any eligible 800 MHz licensee.⁸⁸ A year later, the Commission waived its rule requiring SMR licensees to complete system construction in one

⁸² *Id.*

⁸³ See *Pool Order*, 90 FCC 2d 1303-1304 ¶ 66. In 1995, the Commission imposed a freeze on intercategory sharing, because, after the Commission elected to auction SMR licenses on a wide-area geographical basis, SMR applicants filed a disproportionate number of requests for intercategory sharing. See Amendment of Part 90 Of The Commission's Rules To Facilitate Future Development Of SMR Systems in the 800 MHz Frequency Band, PR Docket No. 93-144, *Second Report and Order*, 12 FCC Rcd 19079 (1997). This resulted in a shortage of channels for applicants in the other pools. See in the Matter Of Inter-Category Sharing Of Private Mobile Radio Frequencies in the 806-821/851-866 MHz Bands, *Order*, 10 FCC Rcd 7350 (WTB 1995) (*Intercategory Freeze Order*). To date, the freeze on intercategory sharing in the 800 MHz band remains in effect.

⁸⁴ See Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems Amendment of Parts 2, 15, and 90 of the Commission's Rules and Regulations to Allocate Frequencies in the 900 MHz Reserve Band for Private Land Mobile Use Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, GEN Docket No. 84-1231 RM-4812, GEN Docket No. 84-1233 RM-4829, GEN Docket No. 84-1234, *Report and Order*, 2 FCC Rcd at 1825 ¶ 46 (1986).

⁸⁵ *Id.* at 1837.

⁸⁶ See Development and Implementation of a Public Safety National Plan and Amendment of Part 90 to Establish Service Rules and Technical Standards for Use of the 821-824/866-869 MHz Bands by the Public Safety Services, GEN Docket No. 87-112, *Report and Order*, 3 FCC Rcd 905 (1987).

⁸⁷ See, e.g., State of Ohio, *Memorandum Opinion and Order*, 17 FCC Rcd 439 (WTB, PS&PWD 2002); State of Florida, *Memorandum Opinion and Order*, 16 FCC Rcd 2174 (WTB 2001); Commonwealth of Pennsylvania and GPU Energy, *Order*, 14 FCC Rcd 14029 (WTB, PS&PWD 1999); New Jersey Transit Authority, *Order*, 14 FCC Rcd 4334 (WTB 1999); State of South Carolina and Scana Communications, Inc., *Order*, 13 FCC Rcd 8787 (WTB 1997); State of Florida, *Order*, 12 FCC Rcd 11567 (WTB 1997); Seminole County, Florida, *Order*, 11 FCC Rcd 4105 (WTB 1996).

⁸⁸ See Trunking in the Private Land Mobile Radio Services for More Effective and Efficient Use of the Spectrum, PR Docket No. 87-213, *Report and Order*, 5 FCC Rcd 4016 (1990).

year, to accommodate SMR licensees' interest in accumulating large numbers of 800 MHz channels and using advanced technology to increase spectrum reuse by employing cellular-type architecture to efficiently serve wide areas and large numbers of subscribers.⁸⁹ Thereby, it afforded Fleet Call, the predecessor of Nextel, sufficient time to develop and implement an SMR system offering wide-area digital voice and data service.⁹⁰

39. In 1994, the Commission proposed a new licensing framework for SMR systems in the 800 MHz band.⁹¹ After release of the *Further Notice*, there was a significant increase in the number of requests for General Category channels made by SMR applicants and licensees.⁹² On October 4, 1995, the Wireless Telecommunications Bureau imposed a freeze on acceptance of new applications for the General Category channels to ensure that resolution of the spectrum allocation issues raised in the *Further Notice* would not be compromised.⁹³ In December 1995, the Commission established geographic area licensing and new service rules for the "upper 200" 800 MHz SMR channel pairs at 816-821 MHz/861-866 MHz where such wide-area digital voice and data services eventually proliferated.⁹⁴ The Commission subsequently redesignated the General Category channels exclusively to the 800 MHz SMR service, whereby mutually exclusive initial applications would be subject to competitive bidding, and excluded PLMR licensees from eligibility for this spectrum.⁹⁵ On reconsideration, however, the Commission reversed its decision concerning eligibility and reinstated the eligibility of PLMR applicants for General Category channels.⁹⁶ The Commission also partially lifted the freeze on General Category channels to permit Economic Area (EA) applicants⁹⁷ to relocate incumbents from the upper ten megahertz block of 800 MHz spectrum to the

⁸⁹ See *NPRM*, 17 FCC Rcd at 4878 ¶ 9.

⁹⁰ See, e.g., *Fleet Call, Inc., Memorandum Opinion and Order*, 6 FCC Rcd 1533, *recon. dismissed*, 6 FCC Rcd 6989 (1991).

⁹¹ Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *Further Notice of Proposed Rule Making*, PR Docket No. 93-144, PP Docket No. 93-253, 10 FCC Rcd 7970 (1994) (*Further Notice*).

⁹² The General Category is comprised of 150 contiguous twenty-five megahertz channels in the 800 MHz band. See 47 C.F.R. § 90.615.

⁹³ Licensing of General Category Frequencies in the 806-809.750/851-854.750 MHz Bands, *Order*, 10 FCC Rcd 13190 (WTB 1995).

⁹⁴ See Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, PR Docket No. 93-144, *First Report and Order*, *Eighth Report and Order*, and *Second Further Notice of Proposed Rule Making*, 11 FCC Rcd 1463 (1995) (*800 MHz Report and Order*). Geographic licensing was also adopted for the General Category SMR channels.

⁹⁵ Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *First Report and Order*, *Eighth Report and Order* and *Second Further Notice of Proposed Rulemaking*, PR Docket No. 93-144, GN Docket No. 93-252, PP Docket No. 93-253, 11 FCC Rcd 1463 (1995) (*800 MHz SMR Report and Order*); *Memorandum Opinion and Order on Reconsideration*, PR Docket No. 93-144, GN Docket No. 93-252, PP Docket No. 93-253, 12 FCC Rcd 9972 (1997) (*800 MHz SMR Memorandum Opinion and Order*).

⁹⁶ *800 MHz SMR Memorandum Opinion and Order*, 12 FCC Rcd at 9975 ¶ 4.

⁹⁷ In the *800 MHz SMR Report and Order*, the Commission adopted geographic licensing based on EAs for the upper ten megahertz of the 800 MHz SMR service. See *800 MHz SMR Report and Order*, 11 FCC Rcd at 1484 ¶¶ 24-25. The U.S. Department of Commerce Bureau of Economic Analysis has established 172 EAs which (continued....)

General Category channels.⁹⁸ In all other respects, the Commission maintained the freeze so as not to frustrate its efforts regarding future licensing of General Category channels.⁹⁹

B. 700 MHz Band

40. Prior to 1997, the 700 MHz band (TV Channels 60-69) was exclusively used by broadcasters. In the Balanced Budget Act of 1997, Congress directed the Commission to reallocate twenty-four megahertz of this spectrum for public safety use and to auction thirty-six megahertz of this spectrum for commercial use.¹⁰⁰ Incumbent analog television stations on the 700 MHz band frequencies are allowed to remain in operation until December 31, 2006, and, under certain circumstances, well beyond that date.¹⁰¹ These stations render the 700 MHz band unusable for public safety systems in the majority of metropolitan areas at this time.

41. In January 2000, the Commission established two paired 700 MHz guard bands (the 700 MHz Guard Bands), one of four megahertz and one of two megahertz, in the commercial use spectrum immediately adjacent to the public safety spectrum to insulate public safety operations from unacceptable interference from 700 MHz commercial services.¹⁰² In the *Upper 700 MHz Second Report and Order*, the Commission adopted technical, operational, and licensing requirements for the 700 MHz Guard Bands,¹⁰³ including a ban on cellular operations.¹⁰⁴ The Commission's restriction on cellular operations stems from its experience in the 800 MHz land mobile band in which the incompatibility of "high-site" operations and cellular operations led to the instant rule making.¹⁰⁵ The Commission determined that the 700 MHz Guard Bands would be licensed by competitive bidding to a new class of commercial user called a Guard Band

(Continued from previous page) _____

cover the continental United States. See Final Redefinition of the BEA Economic Areas, 60 Fed. Reg. 31114 (Mar. 10, 1995).

⁹⁸ See *800 MHz SMR Report and Order*, 11 FCC Rcd at 1508 ¶¶ 74-75.

⁹⁹ *Id.* at 1509 ¶ 76.

¹⁰⁰ See Section 337(a) of the Act, 47 U.S.C. § 337(a), as amended by § 3004 of the Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997). The Commission's Wireless Telecommunications Bureau subsequently set a June 19, 2002, date for this auction. See Auction of Licenses in the 747-762 and 777-792 MHz Bands (Auction Nos. 31 and 44) scheduled for June 19, 2002, DA 01-2394, *Public Notice*, 16 FCC Rcd 18510 (2001). The spectrum assigned for public safety use corresponds to Television Channels 63-64 and 68-69.

¹⁰¹ See 47 U.S.C. §§ 309(j)(14) and 337(e). See also *Advanced Television Systems and Their Impact Upon Existing Television Broadcast Service*, MM Docket No. 87-268, *Reconsideration of Fifth Report and Order*, 13 FCC Rcd 6860, 6887 (1998).

¹⁰² The Guard Bands consist of paired one megahertz sub-bands at 746-747 MHz and 776-777 MHz and two paired two megahertz sub-bands at 762-764 MHz and 792-794 MHz. See *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, WT Docket No. 99-168, *First Report and Order*, 15 FCC Rcd 476, 489-91 ¶¶ 30-34 (2000) (*Upper 700 MHz First Report and Order*).

¹⁰³ See *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, WT Docket No. 99-168, *Second Report and Order*, 15 FCC Rcd 5299 (2000) (*Upper 700 MHz Second Report and Order*).

¹⁰⁴ See 47 C.F.R. §§ 27.2(b); 27.601(a).

¹⁰⁵ See *Upper 700 MHz Second Report and Order*, 15 FCC Rcd 5299.

Manager who would lease the spectrum for value to third parties on a for-profit basis.¹⁰⁶ The Commission believed this process would allow third parties to more readily acquire spectrum for varied uses, enable these parties to take advantage of the efficiencies of site-by-site licensing, and streamline the Commission's spectrum management responsibilities.¹⁰⁷ In September 2000, the Commission completed the auction of the 700 MHz Guard Band spectrum.¹⁰⁸ However, in the Auction Reform Act of 2002, Congress directed the Commission to postpone auctioning the remaining thirty megahertz of the upper 700 MHz spectrum (747-762 MHz/777-792 MHz) until resolution of the 800 MHz public safety interference issues that are the subject of the instant rule making proceeding.¹⁰⁹

C. 900 MHz Band

42. In 1986, based on experience with the pool structure in the 800 MHz band, the Commission adopted the same pool structure for the 900 MHz band land mobile spectrum and established the SMR, B/ILT Pools.¹¹⁰ Given that success of inter-category sharing in the 800 MHz band, the Commission concluded that inter-category sharing should be implemented in the 900 MHz pool channels.¹¹¹

43. The 900 MHz SMR service¹¹² was established in order to alleviate congestion in the 800 MHz SMR band.¹¹³ To expedite service in major markets where demand for SMR service was greatest, the

¹⁰⁶ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5311-13 ¶¶ 26-28. The Commission determined that this licensing scheme was consistent with the provisions of 47 U.S.C. § 337(a)(2) requiring that this spectrum be allotted for commercial use. *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5316 ¶ 36; 47 U.S.C. § 337(a)(2).

¹⁰⁷ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5312-13 ¶¶ 27-28.

¹⁰⁸ *See* 700 MHz Guard Band Auction Closes; Winning Bidder Announced, *Public Notice*, 15 FCC Rcd 18026 (WTB 2000) (Auction No. 33).

¹⁰⁹ The Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715, § 2(4) (2002). Pub.L. 107-195 § 2(4) (Auction Reform Act of 2002) provided that: "The Federal Communications Commission is also in the process of determining how to resolve the interference problems that exist in the 800 megahertz band, especially for public safety. One option being considered for the 800 megahertz band would involve the 700 megahertz band. The Commission should not hold the 700 megahertz auction before the 800 megahertz interference issues are resolved or a tenable plan has been conceived." Previously, Section 309(j)(14) of the Communications Act required the Commission to assign spectrum recovered from broadcast television using competitive bidding and envisioned that the Commission would conduct an auction of this spectrum prior to September 30, 2002. *See* 47 U.S.C. § 309(j)(14).

¹¹⁰ *See* Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems Amendment of Parts 2, 15, and 90 of the Commission's Rules and Regulations to Allocate Frequencies in the 900 MHz Reserve Band for Private Land Mobile Use Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, GEN Docket No. 84-1231 RM-4812, GEN Docket No. 84-1233 RM-4829, GEN Docket No. 84-1234, *Report and Order*, 2 FCC Rcd 1825 ¶ 46 (1986). We observe that the Commission suggested that the pool framework would only be for a limited time period. *Id.*

¹¹¹ *Id.* at ¶ 52.

¹¹² The "900 MHz" SMR band refers to spectrum allocated in the 896-901 and 935-940 MHz bands. *See* 47 C.F.R. § 90.603.

¹¹³ *Id.* at ¶ 46.

Commission elected to use a two-phase licensing process. In Phase I, licenses were assigned in forty "Designated Filing Areas" (DFAs) comprised of the top fifty markets. Following Phase I, the Commission envisioned licensing facilities in areas outside these markets in Phase II. In the meantime, however, licensing outside the DFAs was frozen after 1986, when the Commission opened its filing window for the DFAs.¹¹⁴

44. In 1993, the Commission adopted a *First Report & Order and Further Notice of Proposed Rulemaking* in PR Docket 89-553, modifying its Phase II proposal and seeking comment on whether to license the 900 MHz SMR band to a combination of nationwide, regional, and local systems.¹¹⁵ Shortly after the *First Report & Order/Further Notice*, Congress amended the Communications Act to reclassify most SMR licensees as CMRS providers and establish the authority to use competitive bidding to select from among mutually exclusive applicants for certain licensed services.¹¹⁶ Accordingly, the Commission deferred further consideration of Phase II and incorporated the 900 MHz docket (as well as the companion docket relating to 800 MHz SMR),¹¹⁷ into its CMRS proceeding to ensure that the regulation of all SMRs would be consistent with the regulation of competing CMRS services such as cellular and PCS¹¹⁸ and to consider the impact of auction authority on the record of the pending 900 MHz proceeding.¹¹⁹

45. In the *CMRS Third Report & Order*, the Commission further revised its Phase II proposals and established the broad outlines for the completion of licensing in the 900 MHz SMR band. The Commission concluded that (1) the 900 MHz SMR band would be licensed in twenty ten-channel blocks using MTAs as service areas; (2) licensing of mutually exclusive applicants for this spectrum would be based on competitive bidding; and (3) incumbent licensees in the band would retain the right to operate under their existing authorizations, but would be required to obtain the relevant MTA license (or obtain the consent of

¹¹⁴ See Private Land Mobile Application Procedures for Spectrum in the 896-901 MHz and 935-940 MHz Bands, Public Notice, 1 FCC Rcd 543 (1986). In 1989, the Commission adopted a Notice of Proposed Rule Making in PR Docket 89-553, proposing to begin Phase II licensing of SMR facilities nationwide. The NPRM contained proposals intended to add flexibility to SMR systems. The Commission continued its freeze on licensing outside the DFAs while the rulemaking was pending, but some DFA licensees elected to become licensed for secondary sites (i.e., facilities that may not cause interference to primary licensees and must accept interference from primary licensees) outside their DFAs to accommodate system expansion. Amendment of Parts 2 and 90 of the Commission's rules to Provide for the Use of 200 Channels Outside the Designated Filing Areas in the 896-901 MHz and 935-940 MHz Bands Allotted to the Specialized Mobile Radio Pool, *Notice of Proposed Rulemaking*, PR Docket No. 89-553, 4 FCC Rcd 8673 (1989).

¹¹⁵ See Amendment of Parts 2 and 90 of the Commission's Rules to Provide for the Use of 200 Channels Outside the Designated Filing Areas in the 896-901 MHz and 935-940 MHz Bands Allotted to the Specialized Mobile Radio Pool, *First Report and Order and Further Notice of Proposed Rulemaking*, PR Docket No. 89-553, 8 FCC Rcd 1469 (1993) (*Phase II First Report & Order & Further Notice*).

¹¹⁶ Omnibus Budget Reconciliation Act of 1993, Pub.L. No. 103-66 (Budget Act), § 6002(b), 107 Stat. 312, 392 (1993) (codified at 47 U.S.C. § 332).

¹¹⁷ Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *Further Notice of Proposed Rulemaking*, PR Docket No. 83-144, FCC 94-271, 59 Fed.Reg. 60,111 (Nov. 22, 1994) (*800 MHz Further Notice*).

¹¹⁸ See Implementation of Sections 3(n) and 332 of the Communications Act-- Regulatory Treatment of Mobile Services, Second Report and Order, 9 FCC Rcd 1411 (1994) (*CMRS Second Report & Order*); *CMRS Third Report & Order*, 9 FCC Rcd 7988 (1994).

¹¹⁹ *Id.*

the MTA licensee) to be able to expand their systems.¹²⁰ In 1996 the Commission completed its auction of 900 MHz SMR licenses and announced the winning bidders to use 900 MHz SMR in major MTAs.¹²¹

46. In the Balanced Budget Act proceeding, the Commission amended its rules to permit CMRS use of PLMRS frequencies in the 800 MHz land mobile band and allowed PLMRS licensees to transfer their licenses to CMRS entities.¹²² In the *BBA R&O and FNPRM*, the Commission asked comment on whether, in the interest of regulatory symmetry, it should extend the same rules to 900 MHz band land mobile spectrum.¹²³ In the *NPRM* initiating this proceeding we sought comment on this issue in light of Nextel's proposal to accommodate 800 MHz incumbents in the 900 MHz band.¹²⁴

D. 1.9 GHz Band

47. The Commission identified a large number of potential bands to support the types of innovative mobile services that it has broadly described as AWS in the January 2001 *Notice of Proposed Rulemaking and Order*,¹²⁵ and in the August 2001 *Memorandum Opinion and Order and Further Notice of Proposed Rule Making* in the ET Docket No. 00-258 proceeding.¹²⁶ Collectively, in the *Notice* and the *Further Notice*, the Commission sought comment on the suitability for use by AWS of frequency bands that included the 1910-1930 MHz band (designated for UPCS), the 1990-2025 MHz band (allocated for Mobile-Satellite Service (MSS)) and other bands. Subsequent decisions have narrowed the spectrum bands under consideration. In the September 2001 *First Report and Order and Memorandum Opinion and Order*, the Commission modified the existing allocation in the 2500-2690 MHz band to provide additional

¹²⁰ *CMRS Third Report & Order* at ¶ 119. The Commission noted that some licensees had been granted authorizations to construct facilities outside of the DFAs, so they could link facilities in different markets. With respect to those unprotected sites (i.e., "secondary sites"), the Commission stated that those that were licensed on or before August 9, 1994, would be entitled to primary site protection. *Id.* The Commission also eliminated loading requirements for future MTA licensees, but retained them for incumbent 900 MHz SMR licensees that do not obtain MTA licenses. *Id.* at ¶ 194.

¹²¹ In FCC Auction No. 7, the Commission auctioned 1,019 900 MHz SMR licenses in 51 MTAs. The FCC granted most of the licenses on August 12, 1996. *See Public Notice*, "FCC Announces Grant of 900 MHz Specialized Mobile Radio MTA Licenses," 12 FCC Rcd 13055 (1996).

¹²² *See Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of the American Mobile Telecommunications Association, Report and Order and Further Notice of Proposed Rule Making*, WT Docket No. 99-87, RM-9332, RM-9405, RM-9705, 15 FCC Rcd 22709, 22760-22761 (1999) (*BBA R&O and FNPRM*).

¹²³ *Id.* at 22773-22774.

¹²⁴ *NPRM*, 17 FCC Rcd at 4918 ¶ 86.

¹²⁵ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Notice of Proposed Rulemaking and Order*, 16 FCC Rcd 596 (2001) (*AWS Notice*).

¹²⁶ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, ET Docket No. 95-18, and IB Docket No. 99-81, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, 16 FCC Rcd 16043 (2001) (*AWS Further Notice*).

flexibility, but did not reallocate the band to AWS.¹²⁷ In the November 2002 *Second Report and Order*, the Commission allocated ninety megahertz of spectrum for AWS, consisting of forty-five megahertz of Federal Government-use spectrum in the 1710-1755 MHz band and forty-five megahertz in the 2110-2155 MHz band.¹²⁸

48. Most recently, in its February 2003 *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, the Commission considered use of spectrum in the 1910-1930 MHz band, as well as spectrum allocated to the 2 GHz MSS service in the 1990-2025 MHz and 2165-2200 MHz bands.¹²⁹ In the *Third R&O*, the Commission reallocated the 1990-2000 MHz, 2020-2025 MHz, and 2165-2180 MHz bands for Fixed and Mobile services.¹³⁰ In the *AWS Third NPRM*, the Commission identified a portion of the UPCS band at 1910-1920 MHz band as spectrum that could be made available for AWS or other purposes and sought comment with regard to using it for paired or unpaired operations—including entirely new AWS applications, expansion of existing Broadband PCS operations to support new and innovative mobile services, and as relocation spectrum for existing services.

In a separate proceeding, ET Docket No. 95-18, the Commission had established the procedures by which 2 GHz MSS licensees would relocate BAS and FS licensees from the 1990-2025 MHz and 2165-2200 MHz bands, respectively. In light of the reallocation of a portion of this spectrum to support new fixed and mobile services, we issued a *Third Report and Order* in ET Docket No. 95-18 revising these relocation procedures to account for the new entrants into the band.¹³¹

49. Although the decisions we have made in the larger AWS and related proceedings directly affect the decisions we make today, the instant action focuses exclusively on allocations we make in the 1910-1915 MHz and 1990-1995 MHz bands. Accordingly, we address each of those bands individually, and then address the merits of creating a paired allocation consisting of the two bands.

¹²⁷ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *First Report and Order and Memorandum Opinion and Order*, 16 FCC Rcd 17222 (2001) (*AWS First R&O and MO&O*).

¹²⁸ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Second Report and Order*, 17 FCC Rcd 23193 (2002) (*AWS Second R&O*).

¹²⁹ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, IB Docket No. 99-81, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003) (*AWS Third R&O, Third NPRM, and Second MO&O*).

¹³⁰ *Id.* at 2238 ¶ 28. We note that there are pending petitions for reconsideration that request changes to decisions made in the *AWS Third R&O*. The thirty megahertz was reallocated as follows: fourteen megahertz of spectrum that was held in "reserve" from the 2 GHz MSS licensees, and sixteen megahertz of spectrum that was "abandoned" as a result of 2GHz MSS licensees not meeting initial milestones. *Id.* at 2239 ¶ 32.

¹³¹ See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for use by the Mobile Satellite Service, ET Docket No. 95-18, *Third Report and Order and Third Memorandum Opinion and Order*, 18 FCC Rcd 23638 (2003) (*MSS Third R&O*).

1. 1910-1915 MHz Band

50. The 1910-1915 MHz band is a subset of a larger twenty megahertz band at 1910-1930 MHz that is allocated to the fixed and mobile services on a primary basis,¹³² and is designated for use by UPCS devices.¹³³ Under the current rules, the 1910-1920 MHz portion of the band may be used for asynchronous (generally data) UPCS devices and the 1920-1930 MHz portion may be used for isochronous (generally voice) UPCS devices.¹³⁴

51. Before the 1910-1930 MHz band was made available for UPCS applications, this band was used by fixed point-to-point microwave links. To facilitate the introduction of UPCS systems, the Commission established policies in the *Emerging Technologies* proceeding for the relocation of incumbent microwave systems from this band and designated a single entity, UTAM, to coordinate and manage the transition.¹³⁵ Unlike Broadband PCS, the record for UPCS deployment has been mixed. Currently, the most widespread application of the 1920-1930 MHz UPCS band is for wireless PBX systems.¹³⁶ A search of our equipment authorization database reveals no UPCS equipment authorized for the 1910-1920 MHz band.

52. In the *AWS Third NPRM*, we revisited the issue of redesignating all or a portion of the 1910-1930 MHz band for fixed and mobile services with the intent of promoting AWS use, pairing this band with spectrum in the 1990-2000 MHz band, and establishing reimbursement procedures for UTAM's relocation of incumbent microwave links in the UPCS band. As an initial matter, we decided to retain the 1920-1930 MHz band for isochronous UPCS use, given the existing voice applications that have been deployed in that band segment.¹³⁷ In the *AWS Third NPRM*, we also sought comment on reallocation options for the 1910-1920 MHz band. Specifically, we noted that asynchronous UPCS applications had not been developed since the service was authorized in 1994, and concluded the public interest would not be served if the ten megahertz of spectrum designated for asynchronous use in the 1910-1920 MHz band

¹³² See 47 C.F.R. § 2.106.

¹³³ See 47 C.F.R. Part 15 – Radio Frequency Devices. Subpart D of Part 15 is titled “Unlicensed Personal Communications Service Devices.”

¹³⁴ Asynchronous devices are defined as those “that transmit RF energy at irregular time intervals, as typified by local area network data systems,” and isochronous devices are defined as those “that transmit at a regular interval, typified by time-division voice systems.” See 47 C.F.R. § 15.303(a)-(d). To minimize the potential of systems in each band interfering with other systems operating in the same band, the Commission adopted rules requiring UPCS devices to monitor the spectrum prior to transmitting. Specific requirements for the operation of asynchronous devices in the 1910-1920 MHz band are codified at 47 C.F.R. § 15.321 and specific requirements for the operation of isochronous devices in the 1920-1930 MHz band are codified at 47 C.F.R. § 15.323.

¹³⁵ See Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, *Fourth Memorandum Opinion and Order*, 10 FCC Rcd 7955 (1995). UTAM is the Commission's frequency coordinator for UPCS devices in the 1910-1930 MHz band. The UPCS band relocation policies are codified at 47 C.F.R. §§ 101.69-101.81.

¹³⁶ *AWS Third NPRM*, 18 FCC Rcd 2223 ¶ 40.

¹³⁷ *Id.* at ¶ 46.

remained fallow when there were many applications that could put it to good use.¹³⁸

53. In conjunction with its proposal to redesignate as much as ten megahertz in the 1910-1920 MHz band, the Commission recognized that new licensees in the band would reap the benefits of UTAM's band clearing efforts and concluded that UTAM should be adequately reimbursed for its efforts. Therefore, we sought comment on proposals for reimbursing UTAM. In particular, we proposed that UTAM be entitled to a percentage of the total reimbursement expenses incurred for the 1910-1930 MHz band as of the effective date of any final rules adopted in the AWS proceeding.¹³⁹

54. We also note that there are several outstanding petitions that relate to use of the 1910-1915 MHz band segment. There are four petitions for waiver filed by Lucent, UTStarcom & Drew University, Ascom, and Alaska Power;¹⁴⁰ and two petitions for rulemaking filed by WINForum¹⁴¹ and UTStarcom,¹⁴² most of which request various unlicensed uses of the band. In the *AWS Further Notice*, the Commission sought comment on whether a portion of, or the entire, 1910-1930 MHz band should be redesignated for AWS or as relocation spectrum for incumbents in other frequency bands that are displaced by new AWS licensees.¹⁴³

2. 1990-1995 MHz Band

55. The 1990-2110 MHz band (2 GHz BAS band) is currently used extensively by the BAS for mobile TV pickup (TVPU) operations, including electronic newsgathering (ENG) operations to cover

¹³⁸ In 1994, the Commission anticipated that the 1910-1920 MHz band would be used for data applications such as high-speed, high-capacity LANs. See Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, *Second Report and Order*, 8 FCC Rcd 7700 (1993).

¹³⁹ For example, the redesignation of five megahertz of the twenty megahertz band would entitle UTAM to twenty-five percent of its total.

¹⁴⁰ In its petition for waiver, Lucent requests that it be allowed to use the 1910-1920 MHz band for its Definity PBX voice system within the confines of Cook County, Illinois. Also, UTStarcom & Drew University request permission to use the 1910-1920 MHz band to install the UTStarcom Personal Access System (PAS) on the campus of Drew University in Madison, New Jersey, in order to provide wireless telephone service to the students and staff, as an extension of the university's wired telephone system. In addition, Ascom requests that it be allowed to use the 1910-1920 MHz band for its Freeset DCT 1900 PBX voice system within the confines of Cook County, Illinois; New York City; and San Francisco County, California, because several of its customers, which are boards of trade or stock exchange entities, need high-capacity indoor wireless communications. Finally, Alaska Power requests a waiver of Part 15 asynchronous spectrum etiquette to operate a community wireless voice system over the 1910-1920 MHz (data) band, in order to serve small rural areas in Alaska that are currently unserved or underserved by wireless service providers.

¹⁴¹ In its petition for rulemaking, WINForum asks the Commission to allow isochronous UPCS devices to use the 1910-1920 MHz band and to phase out asynchronous use in this band, thereby providing twenty megahertz of spectrum (1910-1930 MHz) for isochronous devices, and also to modify certain technical requirements for UPCS devices in Part 15.

¹⁴² In its rulemaking petition, UTStarcom requests that the 1910-1920 MHz band be made available for licensing via competitive bidding to permit the establishment of community wireless network service, using the UTStarcom PAS which is based on Japan's RCR-28 Personal Handy Phone System (PHS) standard.

¹⁴³ *AWS Further Notice*, 16 FCC Rcd 16043 ¶ 9.

events of interest.¹⁴⁴ The original 2 GHz BAS channel plan divided the band into seven channels, each consisting of between 16.5 and 18 megahertz.¹⁴⁵ In the *MSS Second R&O*, the Commission reallocated the 1990-2025 MHz segment to the MSS and established a relocation plan for incumbent BAS.¹⁴⁶ The Commission adopted a two-phase relocation plan with a cutover schedule based on market size in which the BAS would eventually have access to seven 12 megahertz channels in the 2025-2110 MHz band at the end of the transition.¹⁴⁷ The Commission also identified four broad categories of BAS markets—“LA” (Los Angeles television market), “Metro” (remaining top 30 television markets), “Light” (television markets 31-100), and “Rural” (television markets 101 and above).¹⁴⁸ The Commission specified different relocation schedules for BAS facilities based on the size of the market.¹⁴⁹ For example, BAS incumbents in markets 1-30 were to be relocated on an earlier schedule than incumbents in markets 31-100.

56. In the *MSS Third R&O*, the Commission modified the plan that 2 GHz MSS licensees were to follow when relocating incumbent BAS licensees to the 1990-2025 MHz band.¹⁵⁰ The modified plan provides for the relocation of BAS licensees to the 2025-2110 MHz band in a single step, retains the distinction of BAS licensees by market size, and requires the relocation of those licensees within the time periods specified for their respective market categories.¹⁵¹ The Commission also noted that, subsequent to its establishment of the BAS relocation plan, it had reallocated fifteen megahertz of spectrum in the 1990-

¹⁴⁴ A TVPU station is a land mobile station used for the transmission of TV program material and related communications from scenes of events back to the TV station or studio. *See* 47 C.F.R. § 74.601(a) (listing classes of TV broadcast auxiliary stations). The band is also used by fixed BAS operations such as studio-transmitter link (STL) stations, TV relay stations, and TV translator relay stations, but the majority of those operations are in higher frequency bands allocated to the BAS. *See* 47 C.F.R. § 74.601(b). *See generally* 47 C.F.R. § 74.600 (“Eligibility for license”). In addition, BAS spectrum in the 2 GHz band is authorized for use by the Cable Television Relay Service (CARS) and the Local Television Transmission Service (LTTS). *See* 47 C.F.R. §§ 74.602, 78.18(a)(6) and 101.801. We will refer to these services collectively as “BAS,” and all decisions apply to CARS and LTTS operations in the band, as well as to BAS.

¹⁴⁵ The original 2 GHz BAS channel plan, which is still in use, is as follows: Channel 1 (1990-2008 MHz), Channel 2 (2008-2025 MHz), Channel 3 (2025-2042 MHz), Channel 4 (2042-2059 MHz), Channel 5 (2059-2076 MHz), Channel 6 (2076-2093 MHz), and Channel 7 (2093-2110 MHz).

¹⁴⁶ *See* Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum at 2 GHz for use by the Mobile-Satellite Service, ET Docket No. 95-18, *Second Report and Order and Second Memorandum Opinion and Order*, 15 FCC Rcd 12315 (2000) (*MSS Second R&O*).

¹⁴⁷ The Phase I channel plan—an interim channel plan using 102 megahertz of spectrum at 2008-2110 MHz during the transition—consisted of seven channels (six 14.5-megahertz wide channels and one 15-megahertz wide channel). The Phase II channel plan consisted of seven channels (six 12.1-megahertz wide channels and one 12.4-megahertz wide channel) within the final 85 megahertz of spectrum at 2025-2110 MHz.

¹⁴⁸ *MSS Second R&O*, 15 FCC Rcd at 12323 ¶ 19.

¹⁴⁹ *Id.* at 12326-27 ¶¶ 29-32.

¹⁵⁰ *MSS Third R&O*, 18 FCC Rcd 23638. In the *MSS Third R&O*, the Commission also modified the plan for relocating incumbent FS microwave licensees in the 2180-2200 MHz band to specify appropriate interference standards and relocation guidelines that new fixed and mobile licensees should use when entering the band. Any 2 GHz MSS system that can share spectrum with BAS and/or FS incumbents is exempt from relocation obligations in the band it can share. *Id.* at 23669-70 ¶¶ 62-63, 23671 ¶ 68.

¹⁵¹ The new BAS channel plan consists of seven twelve-megahertz channels and two 500-kilohertz data return link (DRL) channels. *Id.* at 23666 ¶ 55.

2025 MHz band for new AWS entrants.¹⁵² The Commission concluded that it was necessary to give these new AWS entrants a realistic opportunity to seek early use of the band in exchange for the relocation of incumbent users, while minimizing the disruption to BAS incumbents to the extent possible.¹⁵³ The Commission found that given the need to provide for rapid introduction of AWS in the 2 GHz BAS band a two-phase relocation was no longer appropriate.¹⁵⁴

57. In order to provide early access to the 1990-2025 MHz spectrum for MSS licensees while maintaining the integrity of the BAS system, the Commission set up a negotiation structure that provided for a one-year mandatory negotiation period, consistent with those procedures established in the *Emerging Technologies* proceeding.¹⁵⁵ Under this structure, incumbent BAS licensees in television markets 1-30 are required to negotiate in good faith with the new MSS entrant to facilitate relocation from the band.¹⁵⁶ Upon expiration of the mandatory negotiation period, the new MSS entrant may involuntarily relocate incumbent BAS licensees to the seven narrower channels in the 2025-2110 MHz band that make up the revised BAS channel plan.¹⁵⁷ Once BAS licensees in markets 1-30 and all fixed BAS stations, regardless of market size, have been relocated, MSS licensees may begin their nationwide operations in the 2000-

¹⁵² Specifically, the fifteen megahertz of spectrum was reallocated from MSS in the 1990-2025 MHz band to support new fixed and mobile services—ten megahertz occupy the lower end (1990-2000 MHz) of the band and five megahertz are situated at the upper end (2020-2025 MHz). See *AWS Third R&O, Third NPRM, and Second MO&O*, 18 FCC Rcd 2223 ¶ 15.

¹⁵³ *MSS Third R&O*, 18 FCC Rcd at 23653-61 ¶¶ 29-44. The Commission noted that, although some time will be required to establish service rules and license new fixed and mobile entrants before they can secure entry into the band, the entry of these new AWS licensees may occur relatively quickly. Thus, the Commission expected the band to be used more fully and more quickly by the combination of the remaining MSS licensees and new AWS licensees than was anticipated in the *MSS Second R&O*, when the band was to be exclusively used by MSS licensees whose systems were expected to be deployed and to grow consistent with then distant milestones.

¹⁵⁴ The Commission determined that the initiation of the Phase I relocation and a subsequent quick transition to Phase II would undercut the principal rationale for a two-phase transition—that the potential to leave substantial amounts of spectrum unused for a long period of time would result in inefficient use of valuable 2 GHz spectrum. See *MSS Second R&O*, 15 FCC Rcd at 12327 ¶ 34 (stating that a phased approach will “assur[e] efficient use of the spectrum”). In addition, the Commission reasoned that, if Phase II of the transition was initiated during the time in which Phase I relocations are taking place, BAS operations could be on three different band plans, and some BAS licensees would face the disruption and down time associated with being twice relocated in a short period of time. See *MSS Third R&O*, 18 FCC Rcd at 23655 ¶ 33.

¹⁵⁵ *MSS Second R&O*, 15 FCC Rcd at 12328-31 ¶¶ 38-49. See generally, 47 C.F.R. § 101.73 (good faith negotiation requirement).

¹⁵⁶ For purposes of the relocation plan, BAS markets consist of Nielsen Designated Market Areas (DMAs) as they existed on June 27, 2000. *MSS Second R&O*, 15 FCC Rcd at 12331 ¶ 42.

¹⁵⁷ *MSS Second R&O*, 15 FCC Rcd at 12331 ¶ 48. See generally, 47 C.F.R. § 101.75. Under involuntary relocation, the new MSS entrant may, at its own expense, make necessary modifications to or replace the incumbent licensee’s BAS equipment such that the BAS licensee receives comparable performance from the modifications or replaced equipment. The current mandatory negotiation periods adopted in the *MSS Third R&O* are as follows: MSS licensees and BAS incumbents in markets 1-30 and all BAS fixed stations, regardless of market size, begin a mandatory negotiation period that lasts for one year from December 8, 2003. *MSS Third R&O*, 18 FCC Rcd at 23659-60 ¶ 42. The Commission also provided for a sunset date, December 8, 2013, after which a new licensee’s obligation to relocate an incumbent BAS operator in the 1990-2025 MHz band will end. At that time, BAS operations in the band (if any remain) will operate on a secondary basis. See *MSS Third R&O*, 18 FCC Rcd 23661-62 ¶¶ 45-47.

2020 MHz band. On the date the first MSS licensee begins operations, all BAS licensees in markets 31-210 must immediately cease operations on existing channels 1 and 2 (1990-2025 MHz), and BAS operations will no longer be permitted in that spectrum. Also on this date, a one-year mandatory negotiation period will begin between MSS licensees and BAS incumbents in markets 31-210. Although MSS licensees may involuntarily relocate BAS incumbents at any time after the expiration of the one-year mandatory negotiation period, BAS incumbents in markets 31-100 must be relocated to the seven narrower channels in the 2025-2110 MHz band that make up the revised BAS channel plan within three years of the date the first MSS licensee begins operations, and BAS incumbents in markets 101-210 must be relocated within five years of this date.¹⁵⁸

58. Petitions for reconsideration or clarification of BAS relocation decisions made in the *MSS Third R&O* were filed by the Association for Maximum Service Television (MSTV), National Association of Broadcasters (NAB), Society of Broadcast Engineers (SBE) and Boeing Company (Boeing). The Radio-Television News Directors Association (RTNDA) filed comments in support of the petition filed by the other broadcast parties. MSTV/NAB and Boeing filed oppositions. ICO Global Communications Limited (ICO), NAB/MSTV/SBE and Boeing filed reply comments. We will address the BAS relocation issues raised in these petitions in this proceeding.¹⁵⁹

3. Band Pairing

59. In the *AWS Third NPRM*, we noted that the 1910-1920 MHz band (or a portion thereof) and the 1990-2000 MHz band (or a portion thereof) were well suited to be part of a paired spectrum allocation, and tentatively concluded that it would serve the public interest to adopt a five + five megahertz or a ten + ten megahertz pairing within these bands.¹⁶⁰ We noted that such a pairing would allow for a number of new uses, including an expansion of systems using the adjacent Broadband PCS bands. Moreover, both Nextel and parties representing MDS licensees in the 2150-2160 MHz band have expressed interest in obtaining this paired spectrum. In both instances, these parties proposed to make use of paired spectrum in the 1910-1920 MHz and 1990-2000 MHz band to offset spectrum they would no longer use, in order to address public safety interference concerns (in the case of Nextel) or would lose because the spectrum had been reallocated as part of the AWS proceeding (in the case of MDS licensees).

60. We noted that such an allocation might allow for quicker design and deployment of new equipment because existing Broadband PCS systems operate on adjacent bands, and that because the 1910-1920 MHz band lacks incumbent UPCS users, new licensees need only address relocation as it pertains to the relocation of incumbent point-to-point microwave systems in the band. We also noted that a five + five megahertz block pairing could accommodate the design specifications of both existing high-power mobile applications (such as Broadband PCS) and systems (such as WCDMA and CDMA-2000) that have commonly been proposed for AWS deployment.¹⁶¹

¹⁵⁸ *MSS Third R&O*, 18 FCC Rcd at 23657 ¶ 38.

¹⁵⁹ See ¶¶ 264-276 *infra*. We note that there is an additional pending petition for clarification and reconsideration of FS relocation decisions made in the *MSS Third R&O* filed jointly by the American Petroleum Institute and UTC, but we will address the FS issues raised in this petition at a later date.

¹⁶⁰ *AWS Third NPRM*, 18 FCC Rcd 2223 ¶ 48.

¹⁶¹ *Id.* at ¶¶ 48-49.

V. RECORD OVERVIEW OF THE 800 MHZ PUBLIC SAFETY INTERFERENCE PROCEEDING

61. Our decisions in this *Report and Order* stem from a record that extends well beyond the typical comment/reply comment cycle. The record of over 2200 filings depicts an evolving understanding among the parties of how interference occurs in the 800 MHz band and how best to attack it at its source. Parties to the proceeding have contributed engineering, economic, legal and policy analyses, enabling us to craft a solution that is technically sound, effective, and equitable to the parties, consistent with precedent and in all respects realizable. Although we carefully reviewed all submissions in this docket, we list some of the major milestones on the road to that solution below:

- In April 2000, the Commission convened a meeting of representatives from APCO, Nextel, the CTIA, Motorola and the Public Safety Wireless Network (PSWN) to address the growing problem of interference to 800 MHz public safety systems. As an outcome of the meeting, the parties published the *Best Practices Guide*, which contained technical modifications and procedures to reduce interference.¹⁶²
- On November 21, 2001, Nextel filed a White Paper proposing reconfiguration of the 800 MHz band to abate the interference being caused to 800 MHz public safety systems.¹⁶³ The White Paper proposed moving all non-cellular SMR and B/ILT licensees to other bands.¹⁶⁴ The 800 MHz spectrum available to public safety would double.¹⁶⁵ Nextel was to pay up to \$500 million of the costs incurred by public safety entities in changing channels to facilitate band reconfiguration.¹⁶⁶ Other 800 MHz licensees were to bear their own cost of relocation to other bands.¹⁶⁷ Nextel also would relinquish its 700 MHz and 900 MHz band spectrum rights.¹⁶⁸ In return, Nextel would receive a nationwide allotment of ten megahertz of spectrum in the 2.1 GHz band.¹⁶⁹
- On December 21, 2001, the National Association of Manufacturers (NAM) and MRFAC, one of the Commission's certified frequency coordinators, made a joint filing wherein they advanced a band reconfiguration plan which they claimed could be implemented without the need to give Nextel the requested 2.1 GHz spectrum.¹⁷⁰

¹⁶² See n. 40 *supra*.

¹⁶³ See generally White Paper.

¹⁶⁴ *Id.* at 7-8.

¹⁶⁵ *Id.* at 25.

¹⁶⁶ *Id.* at 8.

¹⁶⁷ *Id.* at 41 n. 54.

¹⁶⁸ *Id.* at 28-30.

¹⁶⁹ *Id.* at 8.

¹⁷⁰ See Letter, dated Dec. 21, 2001, from Jerry Jasinowski, President National Association of Manufacturers and Clyde Morrow, Sr., President, MRFAC, Inc. to Michael Powell, Chairman, Federal Communications Commission (NAM/MRFAC Proposal).

- On March 15, 2002, the Commission issued the *NPRM* seeking comment on the two band reconfiguration proposals (Nextel and NAM/MRFAC) and on a variety of other issues, all related to abatement of interference to 800 MHz public safety systems.
- The Commission received 139 comments in response to the *NPRM* during the comment period of April 5, 2002, to May 6, 2002; and seventeen reply comments during the thirty-day reply comment period which ended on June 4, 2002.¹⁷¹ In those comments, several parties advanced alternative band reconfiguration proposals. Other parties argued that technical measures short of band reconfiguration would remedy the interference problem. Some B/ILT and non-cellular SMR licensees objected to being required to relocate to other bands at their own expense.
- Although most of the reply comments were rebuttals to the comments, the Consensus Parties filed an extensive new proposal that effectively superseded the White Paper.¹⁷² The new proposal included a band reconfiguration plan that would not displace B/ILT and non-cellular SMR licensees from the 800 MHz band. Nextel continued its commitment to pay up to \$500 million for relocation of 800 MHz public safety systems and proposed to relinquish certain of its 700 MHz, 800 MHz, and 900 MHz spectrum rights. Nextel argued that it should be “made whole” for doing so as part of a “spectrum swap” that would net it ten megahertz of spectrum rights at 1.9 GHz.
- Because the reply comments contained new matters on which other parties had not had the opportunity to comment, a public notice establishing a September 23, 2002 deadline for the submission of comments addressing the new proposal was issued.¹⁷³ We received sixty-five comments, including one late-filed comment, in response to the *September 6th Public Notice*.
- On December 24, 2002, the Consensus Parties filed a supplement to their proposal in which Nextel agreed to pay up to \$850 million of the costs of relocating any system—public safety, ESMR, non-cellular SMR or B/ILT—as necessary to implement the previously submitted band reconfiguration proposal.¹⁷⁴ Non-cellular 800 MHz systems were to be afforded protection against ESMR and cellular telephone interference, provided the desired signal was adequate in the area in which interference was being encountered.¹⁷⁵ The supplement also

¹⁷¹ Two additional reply comments were filed on June 5, 2002.

¹⁷² See ITA Reply Comments filed Aug. 7, 2002 (Consensus Party Reply Comments). Although ITA filed the comments, the comments represented the views of the Consensus Parties. *Id.* at iii.

¹⁷³ See Wireless Telecommunications Bureau Seeks Comment on “Consensus Plan” filed in the 800 MHz Public Safety Interference Proceeding, WT Docket 02-55, *Public Notice*, 17 FCC Rcd 16755 (2002) (*September 6th Public Notice*). Following the *September 6th Public Notice*, interested parties inquired whether comments could also be filed on the other band plans or proposals advanced in reply comments. On September 17, 2002, the Bureau released a *Public Notice* clarifying that all such comments were welcomed in the interest of developing a complete record. See Wireless Telecommunications Bureau Clarifies Scope of Comments Sought in 800 MHz Public Safety Proceeding, WT Docket 02-55, *Public Notice*, 17 FCC Rcd 17226 (2002) (*September 17th Public Notice*).

¹⁷⁴ See Supplemental Comments of the Consensus Parties, *ex parte* filing dated Dec. 24, 2002 (Supplemental Comments of the Consensus Parties).

¹⁷⁵ *Id.* at 39-44.

contained a proposed band plan for use in the Canadian and Mexican border areas.¹⁷⁶

- Because the revisions to the proposal were so extensive, on January 3, 2003, another pleading cycle was initiated, inviting comment on the Supplemental Comments of the Consensus Parties.¹⁷⁷ Sixty-four comments and thirty-nine reply comments were filed in response to the *January 3rd Public Notice*. Comments were received on February 3, 2003; reply comments on February 18, 2003, at which time the record was closed. However, as discussed below, we received an exceptionally large number of filings made pursuant to our rules allowing *ex parte* communications in a permit but disclose rulemaking proceeding such as this.¹⁷⁸
- On April 18, 2003, the Chief of the Commission's Office of Engineering and Technology wrote to equipment manufacturers inquiring whether there were any recent developments in receiver technology that would aid in the reduction of interference to 800 MHz public safety systems.¹⁷⁹
- On May 6, 2003, Motorola filed a letter reporting that it had developed an improved receiver with enhanced capability for rejecting intermodulation interference using switchable attenuators;¹⁸⁰ provided the receiver was presented with a sufficiently strong public safety signal.
- On May 29, 2003, a new party—the 800 MHz Users Coalition¹⁸¹—filed an *ex parte* document characterized as a “Balanced Approach” to interference abatement. The Balanced Approach was a set of specific procedures for identifying and eliminating interference to incumbent users and suggesting specific changes to the technical rules for the 806-824 MHz/851-869 MHz band to prevent future harmful interference to public safety and other licensees operating there. The 800 MHz Users Coalition claimed that the Balanced Approach would solve the interference problem completely and, therefore, that band reconfiguration was unnecessary.
- On July 29, 2003, Anne Arundel County, Maryland filed an *ex parte* letter confirming that the County reached a “channel swap” agreement with Nextel.¹⁸² The County observes that the

¹⁷⁶ *Id.* at 35-39.

¹⁷⁷ See Wireless Telecommunications Bureau Seeks Comment on “Consensus Plan” filed in the 800 MHz Public Safety Interference Proceeding, WT Docket 02-55, *Public Notice*, 18 FCC Rcd 30 (2003) (*January 3rd Public Notice*) (comments and reply comments were due February 3, 2003, and February 18, 2003, respectively).

¹⁷⁸ 47 C.F.R. § 1.1200 *et. seq.*

¹⁷⁹ See, e.g., Letter, dated Apr. 18, 2003, from Edmond J. Thomas, Chief, Office of Engineering and Technology, Federal Communications Commission, to Steve Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc.

¹⁸⁰ See Letter, dated May 6, 2003, from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (Motorola May 6 *Ex Parte*).

¹⁸¹ See Letter, dated May 29, 2003, from Jill Lyon, Vice President and General Counsel, UTC to Marlene H. Dortch, Secretary, Federal Communications Commission (800 MHz Users Coalition May 29, 2003 *Ex Parte*).

¹⁸² See Anne Arundel *ex parte* letter dated July 29, 2003; see also Letter, dated May 21, 2003, from James R. Hobson, Esq., Counsel for Anne Arundel County to Marlene H. Dortch, Secretary, Federal Communications Commission (describing frequency exchange discussions between the County and Nextel) (Anne Arundel *ex parte* letter dated May 21, 2003).

frequency exchange agreement will relocate the County from the “middle portion” of the interleaved spectrum to slightly lower in the 800 MHz band. While the County believes that the exchange will improve the County’s spectrum access and coverage, the County states that it will still be “interleaved” and near Nextel and cellular carrier’s operations. Accordingly, the County submits, the channel swap, alone, cannot sufficiently eliminate all intermodulation and out-of-band emission (OOBE) interference;¹⁸³ and a permanent interference solution will require de-interleaving the channels used for noise-limited public safety systems from those allocated for high-capacity, multi-cell cellular systems.

- On August 7, 2003, the Consensus Parties filed an *ex parte* document which contained a rebuttal to the 800 MHz Users Coalition May 29, 2003 *Ex Parte* and an analysis purporting to show that the improved Motorola receivers, discussed *supra*, would not themselves provide sufficient relief from unacceptable interference; but that they would be a valuable adjunct to band reconfiguration.¹⁸⁴
- On October 27, 2003, Verizon Wireless filed an economic study purporting to show that adoption of the Consensus Plan, including the allocation of ten megahertz of 1.9 GHz spectrum to Nextel, would increase the value of Nextel’s spectrum rights by \$7.2 billion.¹⁸⁵
- On October 29, 2003, the Commission received comments from Industry Canada on the Consensus Parties’ Plan. These comments addressed what Industry Canada perceived as shortcomings in the proposal for reconfiguring the 800 MHz band in the border area.¹⁸⁶
- On November 3, 2003, Motorola filed an *ex parte* description of the embedded base of Motorola products in the 800 MHz band indicating which Motorola radios could be supplied with, or converted to, switchable attenuator circuitry.¹⁸⁷

¹⁸³ See ¶¶ 90-91 *infra*.

¹⁸⁴ See Ex Parte Submission of the Consensus Parties, *ex parte* filing dated August 7, 2003 (Consensus Parties August 7 *Ex Parte*).

¹⁸⁵ See “Determination of the Fair Market Value of the Certain Portions of FCC Licensed Wireless Spectrum Proposed For Realignment by Nextel Communications, Inc. under FCC WT Docket No. 02-55 as of December 31, 2002,” by Kane Reece Associates, Inc., attached to Letter, dated Oct. 27, 2003, from John T. Scott, III, Esq., Vice President and Deputy General Counsel, Verizon Wireless to Marlene H. Dortch, Secretary, Federal Communications Commission (Kane Reece Study). See also Letter, dated May 27, 2004, from John T. Scott, III, Vice President and Deputy General Counsel, to Marlene H. Dortch, Secretary, Federal Communications Commission (arguing that contiguous spectrum is more valuable than non-contiguous spectrum).

¹⁸⁶ The Industry Canada comments were dated March 26, 2003. Industry Canada did not include an identifying docket number when it filed the document with the Commission’s Secretary. Consequently, the filing was not associated with the docket file until October 29, 2003, when a Wireless Telecommunications Bureau attorney discovered a copy of the comments and directed that they be entered them into the record as an *ex parte* filing. See 47 C.F.R. § 1.1200 *et. seq.*

¹⁸⁷ See Letter, dated November 3, 2003, from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc. and Dr. Robert Kubik, Manager, Spectrum and Standards Policy, Motorola, Inc. to Edmond Thomas, Chief, Office of Engineering and Technology, Federal Communications Commission and John Muleta, Esq., Chief, Wireless Telecommunications Bureau, Federal Communications Commission (Motorola November 3 *Ex Parte*).

- On November 6, 2003, the City of Denver filed a “channel swap” agreement it had reached with Nextel. Nextel and Denver entered into this agreement because implementation of the technical fixes identified in the *Best Practices Guide* had been ineffective in completely abating interference to Denver’s 800 MHz public safety system.¹⁸⁸
- On November 20, 2003, Nextel filed an *ex parte* economic evaluation of the Consensus Plan, the Motorola Plan, the July 9, 2003 CTIA economic estimates and the CTIA/UTC plan.¹⁸⁹
- On December 24, 2003, the City and County of San Diego filed a “channel swap” agreement that the City and County reached with Nextel due to their belief that the Consensus Plan, as designed, in and of itself, will not work in San Diego.¹⁹⁰ The City and County agreement incorporates certain aspects of the Consensus Plan (*i.e.* Appendix F, as amended August 2003) and some revisions to the Balanced Approach Plan¹⁹¹ in order to adequately address the City and County’s concerns for reliable communications, mutual aid NSPAC channels, and interoperability.
- On February 10, 2004, Verizon Wireless filed a study by Kane Reece Associates contesting the spectrum evaluation contained in the Nextel Sunfire *ex parte*.¹⁹²
- On February 19, 2004, Verizon Wireless filed a document entitled “Determination of the Fair Market Value of the Spectrum Proposed for Realignment by Nextel Communications, Inc.” which reiterated their claim that adoption of the Consensus Plan, including the allocation of ten megahertz of 1.9 GHz spectrum rights to Nextel, would increase the value of Nextel’s spectrum rights by \$7.2 billion.¹⁹³ In addition, Verizon filed the following documents:
 - Pro Forma Analysis of Cingular/AT&T Wireless Transaction as of February 17, 2004, by Kane Reece;
 - Legg Mason, Spectrum Swap Looks Headed Nextel’s Way, But With Wrinkle,

¹⁸⁸ See Letter, dated November 3, 2003, from Alan S. Tilles, Esq., Counsel to the City and County of Denver to John Muleta, Esq., Chief, Wireless Telecommunications Bureau, Federal Communications Commission. Because this filing contains a Statement of Work the parties refer to it as the Denver SOW.

¹⁸⁹ See Letter, dated November 20, 2003, from Lawrence R. Krevor, Esq., Vice President-Government Affairs, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission. Attached to one letter is an economic study authored by Dr. Gregory L. Rosston (Nextel Rosston *Ex Parte*). Attached to the second letter is “The Consensus Plan: Promoting the Public Interest,” by Sun Fire Group, LLC, in which the value of the 1.9 GHz spectrum was inferred from the prices of recent secondary market transactions, asserted to be comparable spectrum licenses (Sun Fire Study).

¹⁹⁰ See *ex parte* comments, dated December 24, 2003, from City and County of San Diego (San Diego *Ex Parte*). The “San Diego Solution” described negotiations between the County, City, Nextel, APCO, UTC and representatives of the 800 MHz Users’ Coalition.

¹⁹¹ See *id.* at Attachment 1 (Balanced Approach – San Diego City and County Revision).

¹⁹² See Kane Reece Analysis of Sunfire Study, dated February 9, 2004, attached to Letter, dated February 10, 2004, from John T. Scott III, Esq., Vice President and Deputy General Counsel – Regulatory Law, Verizon Wireless to Marlene Dortsch, Secretary, Federal Communications Commission (Kane Reece Study II).

¹⁹³ See Determination of the Fair Market Value of the Spectrum Proposed for Realignment by Nextel Communications, Inc., filed February 19, 2004.

January 22, 2004; and

- Goldman Sachs, NXTL (U/C) & FCC moving towards negotiated agreement on spectrum issues, October 5, 2003.
- On March 18, 2004, Nextel filed an analysis of the Kane Reece Spectrum Valuation challenging that valuation's conclusion that adoption of the Consensus Plan would result in a windfall to Nextel.¹⁹⁴
- On March 31, 2004, Verizon Wireless filed a petition requesting that the Commission auction spectrum rights in the 1910-1915 MHz and 1990-1995 MHz bands.¹⁹⁵ On April 8, 2004, Verizon Wireless informed the Wireless Telecommunications Bureau that it is prepared to submit an initial opening round bid of \$5 billion in such an auction.¹⁹⁶
- On April 14, 2004, Verizon Wireless filed a letter indicating that Nextel had originally sought replacement spectrum in the 2.1 GHz band, instead of 1.9 GHz.¹⁹⁷
- On April 22, 2004, Nextel filed a letter stating that it could not accept spectrum rights in the 2.1 GHz band in exchange for its commitment to fund the reconfiguration of the 800 MHz band.¹⁹⁸
- On April 29, 2004, CTIA filed a proposal in which Nextel would establish a Public Safety Trust Fund with a minimum deposit of \$3 billion. An independent trustee would administer

¹⁹⁴ See Economic Analysis of the Kane Reece Spectrum Valuation by Dr. Gregory R. Rosston, dated March 18, 2004, attached to Letter, dated February 10, 2004, from Lawrence R. Krevor, Esq., Vice President-Government Affairs, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission. See also Analysis of the Kane Reece Spectrum Valuation by American Appraisal Associates, dated May 6, 2004 attached to Letter, dated May 6, 2004, from Lawrence R. Krevor, Esq., Vice President-Government Affairs, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission. But see Letter, dated April 8, 2004, from John T. Scott, III, Verizon Vice President and Deputy General Counsel to Marlene H. Dortch, Secretary, Federal Communications Commission (critique of Rosston Study); Letter, dated May 24 from Kane Reece Associates, Inc., to Donald C. Brittingham, Verizon, Director of Wireless Spectrum Policy attached to Letter, dated May 27, 2004, from John T. Scott, III, Verizon Vice President and Deputy General Counsel to Marlene H. Dortch, Secretary, Federal Communications Commission (critique of American Appraisal Associates analysis of Kane Reece Spectrum Valuation).

¹⁹⁵ Petition of Verizon Wireless for Expedited Action to License 1.9 GHz Spectrum for Personal Communications Services through Competitive Bidding, filed March 31, 2004.

¹⁹⁶ See Letter, dated April 8, 2004, from Margaret P. Feldman, Vice President Business Development, Verizon Wireless to John B. Muleta, Chief, Wireless Telecommunications Bureau, Federal Communications Commission.

¹⁹⁷ See Letter, dated April, 14, 2004, from R. Michael Senkowski, to Marlene H. Dortch, Secretary, Federal Communications Commission.

¹⁹⁸ See Letter, dated April 22, 2004, from Robert S. Foosaner, Senior Vice President and Chief Regulatory Officer, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission. See also Letter, dated May 11, 2004, from Timothy M. Donahue, Chief Executive Officer and President, Nextel to Michael K. Powell, Chairman, Federal Communications Commission; Letter, dated May 14, 2004, from Robert S. Foosaner, Senior Vice President and Chief Regulatory Officer, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission.

this fund, which would fund band reconfiguration.¹⁹⁹ In exchange, CTIA proposes the Commission grant Nextel spectrum rights to ten megahertz in the 2.1 GHz band.

- On May 3, 2004, Nextel submitted a plan for relocating BAS licensees out of the 1990-2025 MHz band. Under this plan, Nextel would commit to funding the entire cost of relocating all BAS incumbents nationwide from the 1990-2025 MHz band, subject to Nextel's being assigned replacement spectrum in the 1910-1915/1990-1995 MHz band and receiving full credit for its contributions to the BAS relocation costs, which MSTV, NAB and Nextel estimate at \$512 million.²⁰⁰
- On May 7, 2004, CTIA filed an analysis of the band clearing costs, propagation characteristics, equipment costs and valuation of the 2.1 GHz band.²⁰¹
- On June 4, 2004, Nextel offered to surrender its rights to an additional two megahertz of 800 MHz spectrum as well as its rights to 700 MHz Guard Band Spectrum in forty markets, thus estimating that Nextel's spectrum and financial contributions would total \$5.1 billion.²⁰²
- On June 16, 2004, Nextel modified its June 4 submission to include a sliding scale of interference protection in the 816-817 MHz/861-862 MHz band segment.²⁰³

¹⁹⁹ See Letter, dated April 29, 2004, from Steve Largent, President and Chief Executive Officer, CTIA to Kevin J. Martin, Commissioner, Federal Communications Commission (CTIA April 29 *Ex Parte*).

²⁰⁰ See Joint Proposed BAS Relocation Plan, dated May 3, 2004, from David Donovan, MSTV, Edward O. Fritts, President and CEO, NAB, and Roberts S. Foosaner, Senior Vice President and Chief Regulation Officer, Nextel. (MSTV/NAB/Nextel May 3, 2004 *Ex Parte*). See also Letter dated May 12, 2004, from Jack Goodman, Senior Vice President and Council, NAB to Marlene H. Dortch, Secretary, Federal Communications Commission (expressing support for Nextel/BAS relocation plan).

²⁰¹ See Letter, dated April 29, 2004, from Diane J. Cornell, Vice President, Regulatory Policy, CTIA to Marlene H. Dortch, Secretary, Federal Communications Commission. See also Letter, dated May 13, 2004, from Diane J. Cornell, Vice President, Regulatory Policy, CTIA to Marlene H. Dortch, Secretary, Federal Communications Commission (arguing that CTIA compromise plan is superior than Consensus Plan). See also Letter, dated May 27, 2004, from Helgi Walker, Council to Verizon Wireless to Marlene H. Dortch, Secretary, Federal Communications Commission (concurring with CTIA proposal). See also Letter dated May 19, 2004 from Steve Largent, President and Chief Executive Office, CTIA, to Michael K. Powell, Chairman, Federal Communications Commission (responding to Nextel May 14 letter).

²⁰² See Letter, dated June 4, 2004, from Robert S. Foosaner, Senior Vice President and Chief Regulatory Officer, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission (Nextel June 4, 2004 *Ex Parte*); Letter, dated June 21, 2004, from Regina Keeney, Counsel to Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission (revising estimate to \$5.4 billion to reflect increased filter costs) (Nextel June 24, 2004 *Ex Parte*). See generally, Letter dated June 14, 2004, from Vincent R. Stiles, APCO President, to Michael Powell, Chairman, Federal Communications Commission (supporting 4.5 MHz proposal). But see Letter, dated June 9, 2004, R. Michael Senkowski, Counsel to Verizon Wireless to Marlene H. Dortch, Secretary, Federal Communications Commission; Letter, dated June 16, 2004, R. Michael Senkowski, to Marlene H. Dortch, Secretary, Federal Communications Commission (criticizing 4.5 MHz proposal) (Nextel June 9, 2004 *Ex Parte*).

²⁰³ See Letter, dated June 16, 2004, from Lawrence R. Krevor, Vice President-Government Affairs, Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission. See also Letter, dated June 9, 2004, from Robert S. Foosaner, Senior Vice President and Chief Regulatory Officer, to Marlene H. Dortch, Secretary, Federal Communications Commission (describing technical details of 4.5 MHz proposal).

- On June 30, 2004, Verizon Wireless submitted a legal analysis claiming that awarding Nextel spectrum rights in the 1.9 GHz band violated the Anti Deficiency Act (ADA)²⁰⁴ and the Miscellaneous Receipts Act (MRA).²⁰⁵
- On July 1, 2004, Verizon Wireless supplemented its June 30, 2004 legal analysis to further contend that the Nextel/BAS relocation plan violates the ADA and MRA.²⁰⁶
- On July 1, 2004, Nextel submitted a legal analysis claiming that awarding Nextel spectrum rights in the 1.9 GHz band would not violate the ADA and MRA.²⁰⁷
- On July 27, 2004, Nextel filed confirmations of its earlier record estimates of the costs it will incur installing filters in order to limit emissions into the lower-adjacent band and its retuning costs in order to complete band reconfiguration. The filing also discussed the eighteen month milestone.²⁰⁸

VI. DISCUSSION

A. The Commission's Spectrum Management and Legal Authority

62. Section I of the Act charges the Commission with “promoting safety of life and property through the use of wire and radio communication.”²⁰⁹ In the face of this mandate, we cannot fail to take effective action to address the untenable situation that has developed in the 800 MHz band—the fact that the safety of life and property is placed at risk daily when 800 MHz public safety radios fail due to interference from ESMR and cellular systems, thereby severing the communications link that public safety officers rely upon to summon help, coordinate actions with their fellow officers, request emergency medical services, and respond to incidents that threaten our Homeland Security. If unacceptable interference in the 800 MHz band were to remain unabated, this Commission would fail to achieve one of its prime directives: to manage the spectrum in a manner that promotes safety of life and property.

²⁰⁴ 31 U.S.C. § 1341.

²⁰⁵ 31 U.S.C. § 3302. See Letter, dated June 28, 2004, from William Barr, Verizon to Michael Powell, Chairman, Federal Communications Commission; Letter dated June 30, 2004, from Walter Dellinger to Michael Powell, Chairman, Federal Communications Commission. See also Letter dated April 8, 2003, from Helgi C. Walker, Counsel to Verizon Wireless to Marlene H. Dortch, Secretary, Federal Communications Commission.

²⁰⁶ See Letter, dated July 1, 2004, from Helgi Walker, Counsel to Verizon Wireless to Michael K. Powell, Chairman, Federal Communications Commission.

²⁰⁷ See Letter, dated July 1, 2004, from Regina M. Keeney, Counsel to Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission, accompanied by Letter, dated July 1, 2004, from Richard Thornburgh to Michael Powell, Chairman, Federal Communications Commission.

²⁰⁸ See Letter, dated July 27, 2004, from Regina M. Keeney, Counsel to Nextel to Marlene H. Dortch, Secretary, Federal Communications Commission.

²⁰⁹ 47 U.S.C. § 151. See also 4.9 GHz Band Transferred from Federal Government Use, WT Docket No. 00-32, *Memorandum Opinion and Order and Third Report and Order*, 18 FCC Rcd 9152 (2003) (allocating spectrum for public safety in furtherance of Commission's Section 1 obligation to promote safety of life and property); E911 Accuracy Standards Imposed on TIER III Carriers for Locating Wireless Subscribers Under Rule Section 20.18(H), WT Docket No. 02-377, Order, FCC 03-297, (2003) (denying a petition for forbearance from certain E911 requirements because of the strong connection between such requirements and the Commission's obligation to promote safety of life).

63. We conclude that in order to abate the interference in the 800 MHz band, the Commission has the authority to modify licenses so as to locate licensees in other portions of the spectrum. Indeed, in the Auction Reform Act of 2002, Congress found that one "option" available to the Commission to resolve the interference problem that exists in the 800 MHz band would involve the use of spectrum outside of the 800 MHz band.²¹⁰ Clearly Congress indicated its approval of our consideration of allocating spectrum in the Upper 700 MHz band, as well as other options, to resolve the interference problems in the 800 MHz band. As we discuss *infra*, over the course of this proceeding, we have considered several bands, including the Upper 700 MHz band, to facilitate the restructuring of the band. While the Upper 700 MHz band has not proven to be a viable option because of the inherent fluidity of the transition to DTV, we have found that the 1.9 GHz band is an option, and, in fact, the most viable and best option, to facilitate the restructuring of the 800 MHz band as contemplated by Congress.

64. We find we have legal authority under the Communications Act to implement the spectrum management plan set forth in this *Report and Order* including the authority to (i) modify Nextel's licenses to permit operations in the 1.9 GHz band and (ii) include relocation and potential "anti-windfall" payments from Nextel within the rebanding plan. Pursuant to Sections 316, 303, 301, and 4(i) of the Act,²¹¹ we have broad authority to effectuate a spectrum management plan that includes license modifications to serve the public interest. Further, the courts have recognized and deferred to our policy responsibilities in assessing the public interest and exercising this authority.²¹²

65. The Commission has the authority to modify licenses pursuant to Section 316 to solve the interference problems in the 800 MHz band. Specifically, Section 316(a)(1), provides that "[a]ny station license . . . may be modified by the Commission . . . if in the judgment of the Commission such action will promote the public interest, convenience and necessity."²¹³ As the D.C. Circuit recently explained in *California Metro Mobile Communications v. FCC (CMMC)*, "Section 316 grants the Commission broad power to modify licenses; the Commission need only find that the proposed modification serves the public interest, convenience and necessity."²¹⁴ The D.C. Circuit has held that such modifications do not have to

²¹⁰ The Auction Reform Act of 2002. See n. 109 *supra*

²¹¹ 47 U.S.C. §§ 316, 303, 301, and 154(i).

²¹² See, e.g., *Teledesic LLC v. Federal Communications Commission*, 275 F.3d 75, 84 (D.C. Cir. 2001) ("[W]hen it is fostering innovative methods of exploiting the spectrum, the Commission 'functions as a policymaker and, inevitably, a seer—roles in which it will be accorded the greatest deference by a reviewing court.'") (citation omitted).

²¹³ 47 U.S.C. § 316 (a)(1).

²¹⁴ *California Metro Mobile Communications v. FCC*, 365 F.3d 38, 45 (D.C. Cir.2004) (*CMCC*). In *CMCC*, the court upheld the authority of the Commission to modify CMMC's license by deleting a frequency which had the potential to cause interference to an existing licensee. The Commission undertook the action to correct an error of a frequency coordinator, who recommended that the Commission grant CMMC a license after the coordinator had incorrectly determined that the requested frequencies would not cause interference to any existing licensee. Among other things, the court found that section 316 is not unambiguous and therefore deferred to the Commission's interpretation that "section 316 contains no limitation on the time frame within which it may act to modify a license and that its action under the section is not subject to the limitations on revocation, modification or reconsideration imposed by [s]ection 405." 365 F.3d at 45 (*citations omitted*). The court also found that the Commission's modification served the public interest, even though the modification was based on potential rather than actual interference, and it caused a minor disruption in CMMC's operations. *Id.* at 46.

be consensual²¹⁵, that license holders may be moved on a service-wide basis, without license-by-license consideration,²¹⁶ and that eliminating harmful interference is an accepted basis for ordering license modifications.²¹⁷

66. Furthermore, the D.C. Circuit has upheld the Commission's authority to allocate the relocation costs associated with license modifications among the affected licensees. In *Teledesic, LLC v. FCC*, 275 F.3d 75, n. 212 *supra*, the court upheld the Commission's rules requiring satellite owners to pay the relocation costs of terrestrial users that they chose to displace as part of a rebanding of shared spectrum. The court noted that the approach to allocating relocation costs was similar to approaches that the Commission had adopted in both the Emerging Technologies and 2 GHz MSS relocation proceedings.²¹⁸

67. The D.C. Circuit also has upheld license modifications that involve relocating existing licensees to new spectrum, outside of the auction process. Specifically, the court found that the Commission may approve spectrum swaps between existing licensees, without offering the swapped spectrum to alternative users.²¹⁹ The Commission also has moved licensees to unassigned spectrum under its modification authority. In the *MSS Order* the Commission, citing *Rainbow Broadcasting*, exercised its authority under Section 316 to assign open spectrum in the upper and lower L-bands to Motient Services (Motient).²²⁰ The spectrum replaced spectrum that the Commission had assigned to Motient in the upper L-band that the United States had been unable to coordinate internationally for use by a U.S. licensee.²²¹ The Commission found that it was in the public interest to ensure that the existing MSS licensee was afforded sufficient spectrum to provide a viable service to remote and sparsely populated areas expeditiously, before opening up this spectrum to additional applications.²²² Similarly, in the *DEMS*

²¹⁵ *Peoples Broadcasting Co. v. United States*, 209 F.2d 286, 288 (D.C. Cir. 1953). In *People's Broadcasting*, the court upheld the Commission's authority to modify a television station license without an application by the licensee for such a modification, noting that "if modification of licenses were entirely dependent upon the wishes of existing licensees, a large part of the regulatory power of the Commission would be nullified."

²¹⁶ *Community Television, Inc. v. FCC*, 216 F.3d 1133, 1140 (D.C. Cir. 2000). In *Community Television*, the court upheld the FCC's rules establishing procedures and timetable under which television broadcasting would migrate from analog to digital technology.

²¹⁷ See *CMCC*, 365 F.3d 38, n. 214 *supra*.

²¹⁸ *Teledesic LLC v. Federal Communications Commission*, 275 F.3d at 86.

²¹⁹ See *Rainbow Broadcasting v. FCC*, 949 F.2d 405, 410 (D.C. Cir. 1991) (*Rainbow Broadcasting*), in which the court held the Commission had the authority to allow noncommercial and commercial television licensees to exchange channels without exposing licensees to competing applications, despite third-party interest in acquiring swapped license. We disagree with commenters who assert that subsequent amendments in the Balanced Budget Act of 1997, which generally requires auctions whenever mutually exclusive applications for initial licenses are filed, change the applicability of these cases. See Attachment to Letter, dated April 2, 2004 from R. Michael Senkowski, Esq. to John Rogovin, General Counsel, Federal Communications Commission at 6. For the reasons we discuss at ¶ 73 *infra*, we believe that Section 309(j), as amended by the Balanced Budget Act, is consistent with our conclusion that we have the authority to avoid mutual exclusivity in this context if it is in the public interest to do so.

²²⁰ Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-Band, *Report and Order*, 17 FCC Rcd 2704 (2002) (*MSS Order*).

²²¹ *MSS Order*, 17 FCC Rcd at 2795 ¶ 1.

²²² *MSS Order*, 17 FCC Rcd at 2713-2714 ¶ 25.

Relocation Order,²²³ the Commission, pursuant to Section 316, modified licenses to relocate the operations of certain Digital Electronic Message Service (DEMS) licensees from the 18 GHz band to the 24 GHz band, in order to accommodate Department of Defense military systems.

68. Here, we have determined that the subject license modifications clearly serve the public interest, convenience and necessity, as required by Section 316, because—as the record in this proceeding establishes—these modifications are essential components of the most effective and equitable band restructuring plan required to resolve serious and heretofore intractable interference problems—problems that have impaired and continue to impair public safety operations in the 800 MHz band.²²⁴ As we stated at the outset of this *Report and Order*, to ensure that the Nation’s public safety agencies can effectively carry out their Homeland Security obligations, we must remedy the problem of interference in the 800 MHz band and ensure that public safety agencies have access to sufficient spectrum. Relocating public safety users out of the 800 MHz band is not a viable option, for the reasons discussed at ¶ 207, *infra*. Without the removal of all of Nextel’s 800 MHz spectrum below 817 MHz and the relocation of other licensees in the band (including public safety licensees), the spectrum-based problems facing public safety agencies in the 800 MHz band cannot be satisfactorily resolved. For practical reasons, we cannot place the financial burden of relocation on the thousands of incumbent non-cellular 800 MHz licensees, including state and local public safety agencies with very limited resources, and expect that the interference problem would be resolved in either a timely or acceptable manner. And, we would be failing to carry out our statutory duties as spectrum manager if we were to allow the current interference crisis to languish. By modifying Nextel’s licenses to authorize operations in the 1.9 GHz band, we have created a mechanism to enable the band restructuring to occur without despite the significant, spectral, operational, financial and other obstacles. As the record demonstrates, this is the best option available to us.²²⁵

69. We also find that public safety rebanding does not trigger an auction requirement. We disagree with parties who argue that the *Ashbacker* doctrine and Section 309(j) of the Communications Act preclude us from granting the 1.9 GHz spectrum rights to Nextel pursuant to Section 316. In *Ashbacker*,²²⁶ the Supreme Court held that under Section 309(a) of the Act,²²⁷ in cases in which there are mutually exclusive applications for a license, the Commission must provide a hearing for each applicant. *Ashbacker*, however, did not preclude the Commission from adopting licensing mechanisms through its rulemaking process that foreclose competing applications. Subsequent to *Ashbacker*, Congress enacted Section 309(j) of the Act, which generally requires the Commission to dispose of mutually exclusive applications by auction.²²⁸ Nothing in Section 309(j) requires the Commission to accept mutually

²²³ Amendment of the Commission’s Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz band and to Allocate the 24 GHz Band for Fixed Service, *Order*, 12 FCC Rcd 3471 (1997).

²²⁴ See ¶ 61 *supra* and ¶¶ 213-216 *infra*.

²²⁵ See ¶¶ 217-222 *infra*.

²²⁶ *Ashbacker v. FCC*, 326 U.S. 327 (1945).

²²⁷ 47 U.S.C. § 309(a). This provision authorizes the Commission, upon examination of an application for a station license, to grant it if the Commission determines that the public interest, convenience, and necessity would be served by the grant.

²²⁸ 47 U.S.C. § 309(j)(1) provides “[i]f, consistent with the obligations described in paragraph (6)(e), mutually exclusive applications are accepted for any initial license or construction permit, then . . . the Commission shall grant the license or permit to a qualified applicant through a system of competitive bidding that meets the requirements of this subsection.”

exclusive applications in the first place. Moreover, Section 309(j) applies only to initial licenses. As noted above, the D.C. Circuit has found that reassignments to new spectrum are not fundamental changes to the original licenses that themselves trigger the requirements for license revocation and reissuance.²²⁹ Here, our order changing the frequency of licensees' facilities neither triggers a right to file competing applications under *Ashbacker* nor compels an auction pursuant to Section 309(j). As the court found in the *Rainbow* case,²³⁰ the Commission is not required to open all frequencies for competing applications, as long as it provides a reasoned explanation of its decision not to do so. These principles are consistent with other Commission decisions where we modified licenses pursuant to Section 316. For example, in the *MSS Order*, where the Commission exercised its authority under Section 316 to assign to one licensee the rights for up to twenty megahertz of open spectrum, the Commission found that the proceeding "did not involve initial applicants and the hearing rights of eligible new applicants under Section 309."²³¹

70. We also disagree with parties who argue that the 1.9 GHz spectrum to be assigned to Nextel is so much more valuable than the spectrum it is currently authorized to operate that the difference elevates the modification process to a "grant of an initial license, which under Section 309(j) [must] be subject to auction procedures."²³² To support this position, CTIA cites the Commission's *Competitive Bidding Second Report and Order* in which it adopted rules for competitive bidding pursuant to Section 309(j):

Where a modification would be so major as to dwarf the licensee's currently authorized facilities and the application is mutually exclusive with other major modifications or initial applications, the Commission will consider whether these applications are in substance more akin to initial applications and treat them accordingly for purposes of competitive bidding.²³³

71. As a preliminary matter, the modification of Nextel's licenses does not create a circumstance in which an "application is mutually exclusive with other major modifications or initial applications." The Commission has accepted no other applications for the 1.9 GHz spectrum.²³⁴ At least one commercial provider has stated its intention to participate in an "immediate auction of the 1.9 GHz spectrum."²³⁵

²²⁹ See *Community Television, Inc. v. FCC*, 216 F.3d 1133, n. 229 *supra*.

²³⁰ *Rainbow Broadcasting*, 949 F.2d at 409-410.

²³¹ *MSS Order* 17 FCC Rcd at 2175 ¶ 27. See also Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz band and to Allocate the 24 GHz Band for Fixed Service, *Memorandum Opinion and Order*, 13 FCC Rcd 15147 at 15173 ¶ 59 (1998) ("Because its actions [to relocate DEMS licensees to new spectrum] were license modifications under authority of Section 316, and did not involve the grant of initial licenses, the Commission was not authorized under 309(j) of the Act to use auction procedures.").

²³² See, e.g., U.S. Cellular Comments at 5; CTIA December 4, 2003 *Ex Parte* at 8.

²³³ CTIA December 4, 2003 *Ex Parte* at 8-9, citing *Implementation of Section 309(j) of the Communications Act—Competitive Bidding*, PP Docket No. 93-253, *Second Report and Order*, 9 FCC Rcd 2348, 2355 ¶ 37 (1994).

²³⁴ Verizon Wireless submitted a ULS application and a Form 175 application for the 1910-1915 MHz/1990-1995 MHz band but these applications were dismissed on July 7, 2004. See Letter, dated July 7, 2004, from Kathryn Garland, Deputy Chief, Auctions and Spectrum Access Division, Wireless Telecommunications Bureau, Federal Communications Commission to John T. Scott, III, Cellco Partnership d/b/a Verizon Wireless; Letter, July 7, 2004, from Wireless Telecommunications Bureau to John T. Scott, III, Cellco Partnership d/b/a Verizon Wireless.

²³⁵ Verizon Wireless White Paper at 9 (April 1, 2004) citation omitted

Nevertheless, we have not authorized the filing of applications for this spectrum, have never proposed to do so, and, for the reasons set forth herein relating to important public safety concerns, conclude that it is not in the public interest to open the spectrum for competitive applications.

72. The above-quoted language from the *Competitive Bidding Second Report and Order* also indicates that the Commission “will consider” the nature of the modification if it works a major change, and this is exactly what we have done here. The plan we adopt today places Nextel in a comparable position to that which it now occupies and contains a cash payment mechanism that would become effective if necessary to ensure that Nextel does not reap a windfall from savings in reconfiguration costs. As detailed elsewhere in this *Report and Order*, we have found that the license modifications that we are ordering in this proceeding clearly promote the public interest, convenience, and necessity, as required by Section 316, and that an alternative process that does not assign the 1.9 GHz band for use in connection with the public safety rebanding would, at best, provide fewer and less effective public interest benefits²³⁶

73. Moreover, Section 309(j) supports our conclusion that we have the authority to avoid mutual exclusivity in this context when it is in the public interest to do so. Although 309(j) generally requires auctions whenever mutually exclusive applications for initial licenses are filed, Section 309(j)(6)(E) provides that “[nothing in this subsection shall] be construed to relieve the Commission of the *obligation in the public interest* to continue to use engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity *in application and licensing proceedings*.”²³⁷ Thus, in Section 309(j)(6)(E), Congress recognized that the Commission can determine

²³⁶ Similarly, we disagree with parties who assert that under *Fresno Mobile Radio v. FCC*, 165 F.3d 965 (D.C. Cir. 1999), the grant of the 1.9 GHz spectrum must be considered an “initial license” subject to auction under Section 309(j). See *Verizon White Paper at 10-11 and CTIA Ex Parte* (December 4, 2003) at 8-9. In *Fresno*, a group of incumbent licensees challenged the Commission's decision to auction newly established geographic-area SMR licenses in the upper 200 channels of the SMR band, arguing that, to the extent the new licenses did not cover a new service, new territory or previously unused spectrum, the Commission should have treated the SMR authorizations as modifications of the incumbents' existing licenses and not as auctionable “initial licenses” within the meaning of Section 309(j)(1). The court disagreed, upholding the Commission's determination that it could classify a new license as an “initial” one, even if the initial and preexisting licenses have such overlap, “if it is the first awarded for a particular frequency under a new licensing scheme, that is, one involving a different set of rights and obligations for the licensee.” *Fresno*, 165 F.3d at 970. As explained above, we do not consider the authorizations that Nextel will hold as a result of the restructuring process to differ significantly enough—in terms of rights and responsibilities—from Nextel's existing authorizations so as to warrant treatment as the issuance of an initial license rather than as a modification of license. Moreover, even if we were to classify the 1.9 GHz authorization as a matter of initial licensing, we have not authorized the filing of mutually exclusive applications; none are, in fact, on file; and, as discussed in ¶ 73, *infra*, we have the authority—and obligation—to impose threshold qualifications that preclude the filing of such mutually exclusive applications if we determine that the public interest requires such an approach.

²³⁷ 47 U.S.C. §309(j)(6)(E) (*emphasis added*). The legislative history of the Balanced Budget Act of 1997 also makes clear that Congress did not want the Commission to interpret its expanded auction authority in a way that would reduce its Section 309(j)(6) (E) obligation: “[T]he conferees emphasize that, notwithstanding its expanded auction authority, the Commission must still ensure that its determinations regarding mutual exclusivity are consistent with the Commission's obligations under section 309(j)(6)(E). The conferees are particularly concerned that the Commission might interpret its expanded competitive bidding authority in a manner that minimizes its obligations under section 309(j)(6)(E), thus overlooking engineering solutions, negotiations, or other tools that avoid mutual exclusivity.” H.R. Conf. Rep. No. 105-217, 105th Cong., 1st Sess., at 572 (1997). See also Commission's Rules Regarding Multiple Address Systems, *Report and Order*, 15 FCC Rcd 11956, 11962-63 (2000) (“Section 309 (j)(6) (E) has been construed to give the Commission broad authority to create or avoid mutual exclusivity in licensing, based on the Commission's assessment of the public interest,” citing *DirectTV, Inc. v. FCC*, 110 F.3d 816, 828 (D.C. Cir. 1997)). Cf. *Benkelman Telephone Co. v. FCC*, 220 F.3d 601, 605-606 (D.C. (continued....))

that its public interest obligation warrants action that avoids mutual exclusivity, and that this obligation extends to “application and licensing proceedings” (which include license modifications), not just initial licensing matters. Other provisions of the Act confirm our conclusion that the auction requirements of Section 309(j), with their statutory limitations and qualifications that recognize the existence of potentially higher public uses for spectrum, do not preclude our furtherance of the public interest by adopting a band restructuring approach that avoids mutual exclusivity, promotes public safety, and provides Nextel access to substitute spectrum with which it may continue the development of its services.²³⁸

74. We also note that, as an alternative licensing approach toward the same end, we could have exercised our authority to grant rights to the ten megahertz of spectrum to Nextel as an initial license, without subjecting the spectrum to competitive bidding procedures. The auction requirement of Section 309(j)(1) applies only when the Commission has accepted mutually exclusive applications for an initial license. As with a license modification approach, under an initial licensing scenario, eligibility for the 1.9 GHz spectrum would have to be limited to Nextel for the restructuring plan to address satisfactorily the public interest imperatives that we have identified. That eligibility restriction would be justified in the initial licensing context on the same public interest grounds that we have discussed above in connection with our authority to modify licenses under Section 316.²³⁹

75. Our authority to require a cash payment from Nextel in the future if needed to prevent a windfall that otherwise might flow from its new rights to use the 1.9 GHz spectrum derives from Sections 4(i) and 303(r) of the Act.²⁴⁰ Consistent with the public interest and Nextel’s own proposal, Nextel has agreed to assume financial responsibility for reconfiguring the 800 MHz band. As explained below, however, we cannot be certain what Nextel’s ultimate costs of fulfilling that obligation will be.²⁴¹ If those

(Continued from previous page) _____

Cir. 2000) (Section 309(j)(6)(E) neither requires the Commission to avoid mutual exclusivity, nor to create it; the touchstone is what best serves the public interest).

²³⁸ See 47 U.S.C. § 151 (listing as one of Act’s central purposes “promoting safety of life and property through the use of wire and radio communication”). See also 47 U.S.C. §§ 303(c) (instructing the Commission to assign frequencies to individual stations as the public convenience, interest or necessity requires), 309(j)(6)(C) (providing 309(j) should not be construed to diminish the authority of the Commission to regulate or reclaim spectrum licenses); 309(j)(7) (prohibiting Commission from basing the decision whether to auction spectrum on a desire for federal revenue); 309(j)(2)(A) (setting out auctions exemption for public safety radio service licenses, thus recognizing that auctions may not always serve the public interest in connection with public safety licensing), and 309(j)(6)(G) (providing that Section 309(j) shall not be construed to prevent the Commission from awarding licenses to persons who make significant contributions to the development of new telecommunications services or technologies).

²³⁹ The Supreme Court upheld the Commission’s authority to limit eligibility to apply for a license where the Commission was able to demonstrate that doing so furthered the public interest. See *United States v. Storer Broadcasting Company*, 351 U.S. 192, 202 (1956). See also 47 U.S.C. § 309 (j)(3), which directs that “in specifying eligibility [. . .] the Commission shall include safeguards to protect the public interest in the use of the spectrum and shall seek to promote the purposes specified in section 1 of this Act.”

²⁴⁰ Section 4(i) of the Act provides that “[t]he Commission may perform any and all acts, make such rules and regulations, and issue such orders, not inconsistent with this Act, as may be necessary in the execution of its functions.” 47 U.S.C. § 154. Section 303(r) provides that “the Commission . . . as public convenience, interest, or necessity requires shall [m]ake such rules and regulations and prescribe such restrictions and conditions, not inconsistent with law, as may be necessary to carry out the provisions of this Act.” 47 USC § 303 (r). See *United States v. Storer Broadcasting*, 351 U.S. 192, 202 (1956) (finding that these provisions “grant general rulemaking power not inconsistent with the Act or law”).

²⁴¹ See ¶ 179 *infra*.

reconfiguration costs are unexpectedly high, then Nextel nevertheless will be obligated to incur them. The cash payment mechanism we adopt here addresses the converse possibility that reconfiguration costs will be relatively low. In that situation, the terms of the spectrum exchange with Nextel will reflect those savings, maintaining an equitable exchange. In this way, savings in reconfiguration expenses will be realized as a public benefit (*i.e.*, a payment to the U.S. Treasury), rather than providing Nextel an unwarranted windfall from the license modification.

76. The situation here is analogous in key regards to that addressed in the *Mtel* case,²⁴² where the court upheld the Commission's authority under Section 4(i) to impose a payment requirement on a licensee holding a pioneer's preference license that the Commission had originally awarded without a payment requirement. Specifically, the court upheld the Commission's authority to require payment under Section 4(i) to "ensure the achievement of the Commission's statutory responsibility to grant a license only where the grant would serve the public interest, convenience and necessity [pursuant to Section 309(a)]."²⁴³ The court "accord[ed] substantial deference to the Commission's judgment regarding how the public interest is best served" and cited with approval specific public interest concerns that the Commission Order suggested that the payment requirement would satisfy, including elimination of the possibility of unjust enrichment and "predation by a deep-pocketed Mtel."²⁴⁴ Similar to the payment requirement that was upheld in *Mtel*, in this *Report and Order* we impose a payment requirement pursuant to Section 4(i) and Section 303(r) to ensure that we fulfill our statutory responsibility to modify a license only where the grant would promote the public interest, convenience and necessity. Here, the public interest rationale is at least as compelling as in *Mtel*. In this case, requiring a payment allows us to address the interference problems in the 800 MHz band and provide public safety agencies with additional spectrum rights in a way that places Nextel in a comparable position to that which it now occupies. While addressing public safety concerns is a priority of the highest order, it is in the public interest to do so in a way that does not result in a windfall for Nextel. The anti-windfall payment addresses uncertainty about the exact amount of relocation costs for the 800 MHz band and the 1.9 GHz band. The plan obliges Nextel to pay the costs in the 800 MHz band and its share of the costs in the 1.9 GHz band, no matter how low or high they are. For example, if the costs are at the low end of Nextel's estimates,²⁴⁵ we find that it is in the public interest that the savings benefit the public, rather than Nextel. And similar to the *Mtel* case, the windfall payment also addresses concerns that assigning Nextel spectrum rights in another band as part of this comprehensive solution is unfair because Nextel is receiving free spectrum while its competitors must bid for spectrum at auction.²⁴⁶ For the reasons discussed elsewhere in this *Report and Order*, reducing the amount of 1.9 GHz spectrum granted to Nextel is not a reasonable way of protecting against such a windfall.²⁴⁷ By contrast, the alternative approach of requiring a payment from Nextel to maintain an exchange commensurate with the value of the spectrum it is receiving furthers the public interest objectives of the Communications Act and is consistent with the policy Congress articulated in Section 309(j) of "recover[ing] for the public of a portion of the value of the public spectrum resource made available for commercial use and avoidance of

²⁴² *Mtel v. FCC*, 77 F.3d 1399 (D.C. Cir. 1996).

²⁴³ *Id.* at 1406.

²⁴⁴ *Id.*

²⁴⁵ See ¶ 299 *infra*.

²⁴⁶ See ¶ 214 *infra*.

²⁴⁷ See ¶¶ 236-238 *infra*.

unjust enrichment through the methods employed to award uses of that resource.”²⁴⁸

77. Some parties in this proceeding have addressed the intersection of the Commission’s authority under the Communications Act and the Commission’s responsibilities under other federal statutes. In particular, we received several *ex parte* presentations²⁴⁹ addressing the question of whether the spectrum management plan and license modifications that we approve above violate appropriations statutes including the Anti-Deficiency Act (ADA),²⁵⁰ the Miscellaneous Receipts Act (MRA)²⁵¹ and 18 U.S.C. § 641.²⁵² The Comptroller General has agreed at the request of a U.S. Senator to review the appropriations issues that parties have raised.²⁵³

78. In light of the substantial importance of these issues, we have carefully reviewed the arguments raised in the various presentations and conducted our own, independent analysis of the various legal constraints under which the Commission operates. After this deliberate consideration, we have determined that our statutory obligation to ensure the public safety through our administration of spectrum justifies this order even in the face of the opposition of certain participants in this proceeding. Having reviewed these parties’ arguments, we conclude, as discussed below, that appropriations law does not bar the course we pursue in this order. Indeed, we conclude that we would be remiss in our obligations to the public safety community—and indeed to the public at large—if we did not adopt the plan in the form discussed below.²⁵⁴

79. The ADA prohibits any “officer or employee of the United States Government or of the District of Columbia government” from “involv[ing] either government in a contract or obligation for the payment of money before an appropriation is made unless authorized by law.”²⁵⁵ The object of this provision is to prevent executive officers from involving the government in expenditures or liabilities beyond those contemplated and authorized by the lawmaking power.²⁵⁶ The first government-wide ADA

²⁴⁸ 47 USC § 309 (j)(3)(C). Since an auction of 1.9 GHz licenses is incompatible with the approach adopted herein for solving the 800 MHz band interference problems that compromise the public safety, we have fashioned an alternative that is consistent with our competitive bidding authority and otherwise within our statutory authority.

²⁴⁹ See Letter, dated June 28, 2004, from William Barr, Verizon to Michael Powell, Chairman, Federal Communications Commission (Verizon Wireless June 28 *Ex Parte*); Letter dated June 29, 2004, from Walter Dellinger to Michael Powell, Chairman, Federal Communications Commission; Letter, dated July 1, 2004, from Richard Thornburgh to Michael Powell, Chairman, Federal Communications Commission.

²⁵⁰ The Anti-Deficiency Act, 31 U.S.C. § 1341(a)(1)(B).

²⁵¹ The Miscellaneous Receipts Act, 31 U.S.C. § 3302(b).

²⁵² Section 641 of Title 18 concerns the embezzlement and theft of public money, property or records and imposes criminal liability on “whoever . . . without authority, sells, conveys, or disposes of anything of value of the United States or of any department or agency thereof.” Our actions today are authorized and clearly do not implicate this provision.

²⁵³ See Verizon Wireless June 28 *Ex Parte* at 6.

²⁵⁴ See ¶¶ 151-158, *infra*.

²⁵⁵ 31 U.S.C. § 1341(a)(1)(B).

²⁵⁶ 21 Atty.Gen. Op. 248 (1895).

was passed in 1870.²⁵⁷ The MRA provides that a government official “receiving money for the Government from any source shall deposit the money in the Treasury as soon as practicable without deduction for any charge or claim.”²⁵⁸ Congress passed the statute in 1849 to address its concern that some executive branch officers, such as customs officers, were failing to deposit all the money they collected in the course of their duties into the treasury, making deductions for their expenses and salaries as they saw fit.²⁵⁹ Neither of these statutes has ever been found applicable to the exercise of the Commission’s spectrum management responsibilities.

80. Opponents who have raised challenges under appropriations law have essentially claimed that we are selling spectrum to Nextel in a private sale and using the proceeds to address the public safety interference problems in the 800 MHz band. In fact, what the Commission is doing is proceeding, under its broad section 316 license modification authority, to restructure the 800 MHz band in order to serve significant public interest concerns. In doing so, we set forth a spectrum management plan that provides additional spectrum for public safety and leaves Nextel and the other licensees in a comparable position to where they were before the band restructuring. Courts have repeatedly upheld our authority to implement a new spectrum management plan by modifying licenses when it is in the public interest to do so and to allocate the relocation costs associated with license modifications among the affected licenses.²⁶⁰ And, as noted at ¶ 69 *supra*, neither the *Ashbacker* doctrine nor Section 309(j) poses a barrier to the implementation of our public safety rebanding plan.

81. The appropriations laws do not limit the Commission’s power to accomplish rebanding for public safety or to recognize and facilitate Nextel’s role in that rebanding. Critically, radio spectrum is not appropriated by Congress and it cannot be obligated, expended, or deposited in the Treasury under those laws. Radio spectrum is a public resource of the United States that Congress has authorized and directed the Commission to manage in the public interest. Indeed, the Commission’s most basic spectrum-management power is to assign spectrum to achieve public interest benefits *other than* monetary recovery. Until the enactment of Section 309(j) in Omnibus Budget Reconciliation Act of 1993,²⁶¹ the Commission never obtained cash payments for spectrum. Through spectrum allocation and license assignments, it accomplished public interest objectives such as encouraging the provision of particular types of service, fostering new technologies, or promoting services for underserved customers.²⁶² Even after the

²⁵⁷ Act of July 12, 1870, ch. 251, § 7, 16 Stat. 251.

²⁵⁸ 31 U.S.C. § 3302(b).

²⁵⁹ See *Scheduled Airlines Traffic Offices, Inc. v. Department of Defense*, 87 F.3d 1356, 1360 (1996).

²⁶⁰ See ¶¶ 64-67 *supra*.

²⁶¹ Pub. L. No. 103-66, § 6002, 107 Stat. 312, 387-397.

²⁶² See, e.g., Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, *First Report and Order and Third Notice of Proposed Rulemaking*, 7 FCC Rcd. 6886 (1993) (reallocating 220 MHz spectrum for emerging technologies); Amendment of Part 90 of the Commission’s Rules to Create the Emergency Medical Radio Service, *Report and Order*, 71 Rad. Reg. 2d 1305 (1993) (assigning frequencies to improve the communications capabilities of entities providing life support activities); Basic Exchange Telecommunications Radio Service *Report and Order*, 3 FCC Rcd 214 (1988) (establishing a rural radio service designed to make basic telephone service more accessible to household and businesses); and Educational Television, *Report and Order*, 39 FCC 846 (1963) (establishing Instructional Television Fixed Service (ITFS) for the transmission of instructional material to schools). See also 303(g) (“[T]he Commission ... as public convenience, interest, or necessity requires shall ... [s]tudy new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective uses of radio in the public interest.”)

Commission was given auction authority, section 309(j)(7) prohibits the Commission from basing the decision whether to auction spectrum on a desire for federal revenue.²⁶³ Even when the Commission does use the auction mechanism, moreover, monetary recovery is just one of several factors the Commission must consider in establishing bidding qualifications and license conditions.²⁶⁴

82. Allocating spectrum to establish a long-term solution to the public safety interference problem and support the associated rebanding is a valid use of spectrum in the public interest. As already noted, the Commission is *required* under Sections 1 and 303 of the Act to use its spectrum assignment powers to promote public safety. And as discussed at ¶ 63 *supra*, the Auction Reform Act of 2002 specifically identified the interference problem in the 800 MHz band as one that the Commission might resolve by allocating spectrum from outside the 800 MHz band.

83. We also conclude that the anti-windfall payment from Nextel directly to the United States Treasury does not raise appropriations laws issues. As discussed in ¶ 76 *supra*, the D.C. Circuit upheld in the *Mtel* case the Commission's authority to require payment under Section 4(i) to "ensure the achievement of the Commission's statutory authority to grant a license only where the grant would serve the public interest, convenience and necessity" (*citations omitted*). Here, the anti-windfall payment is a valid regulatory requirement that serves the public interest because it addresses uncertainty about the exact amount of relocation costs for the 800 MHz and 1.9 GHz bands and obligates Nextel to pay the relocation costs in the 800 MHz band and its share of the costs in the 1.9 GHz band. If the relocation costs are at the low end of the projected range, the anti-windfall payment would ensure that the savings would benefit the public, rather than Nextel.

84. Thus, we conclude that the situation here differs from the facts in a 1963 Comptroller General decision on which Verizon heavily relies in opposing the plan we adopt today. In the 1963 decision, which was overruled in 1972, the Comptroller General reviewed an arrangement in which a non-profit organization raised funds to finance a teacher training program and zoo guidebook by installing a coin-operated audio tour system on government property; the Comptroller General concluded that the arrangement violated both the ADA and the MRA.²⁶⁵ Specifically, the Comptroller General found that Congressional authorization was needed for such an arrangement because the applicable public contracts statute provided that the use of government property by outside parties "shall be for money only."²⁶⁶ Thus, the Comptroller General concluded that the grant of the concession to the non-profit organization would be permissible "only for a solely monetary consideration; if, on the other hand, a monetary consideration were provided, the money would be required to be deposited in the Treasury and would not be available for the proposed uses [for teacher training and a zoo guidebook] unless appropriated therefore by the Congress."²⁶⁷ Here, the Commission's action does not involve a concession or privilege subject to the government contracts statute in the zoo case, nor does it involve a "contract or other obligation for the payment of money" pursuant to the ADA.²⁶⁸ Furthermore, even if the ADA were otherwise implicated, Sections 1, 4(i), 301, 303, 309(j), and 316 of the Communications Act provide the Commission with the authority necessary to adopt the public safety rebanding plan. Accordingly, today's spectrum management

²⁶³ See 47 U.S.C. 309(j)(7).

²⁶⁴ See 47 U.S.C. 309(j)(3).

²⁶⁵ *To the Sec'y, Smithsonian Inst.*, 42 Comp. Gen. 650 (1963), *overruled*, 51 Comp. Gen. 506 (1972).

²⁶⁶ *Id.* at 652-653 (*citations omitted*).

²⁶⁷ *Id.* at 653.

²⁶⁸ See 31 U.S.C. 1341.

plan is “authorized by law” under the ADA.²⁶⁹

85. With respect to the MRA, the Communications Act does not require the Commission to auction the 1.9 GHz spectrum. Rather, as discussed *supra* at note 237, section 309(j)(6)(E) gives the Commission broad authority to create or avoid mutual exclusivity in licensing, based on the Commission’s assessment of the public interest. The MRA does not nullify the discretion that Congress gave to the Commission and preserved in Section 309(j).²⁷⁰ Here, the principle that funds received for the government should be deposited in the Treasury is fully satisfied, because any cash payment that may be required to protect against a windfall in favor of Nextel will be made to the Treasury, and there are no other government receipts.

86. The Commission has determined that the public interest requires the dedication of new spectrum to addressing the 800 MHz interference problem, and the 1.9 GHz spectrum is uniquely suited to that purpose. Those are public interest judgments for the Commission to make, and they are not changed by the possibility of a greater dollar recovery for the government from auctioning the 1.9 GHz spectrum. Given the vital public safety interest served by this *Report and Order*, moreover, we believe that it is essential to act promptly in this matter. Nonetheless, we recognize that parties have raised novel issues regarding appropriations law and that the Comptroller General is reviewing those issues. Should the Comptroller General unambiguously conclude that our order violates the appropriations statutes, we will address—either on our own motion or on that of moving parties—whether it is appropriate to stay the effect of some aspects of today’s order pending a final decision by the court of appeals on any application for review.

87. Furthermore, we will ensure that the public is protected against potential claims by Nextel relating to any 800 MHz reconfiguration costs that it chooses to incur. Specifically, as a condition precedent to commencing operations with the 1.9 GHz band pursuant to any of its licenses modified pursuant to this *Report and Order*, Nextel shall file with the Commission an acknowledgement acceptable to the Commission. The acknowledgement shall state that, by accepting the license modification under the terms of the Order, Nextel acknowledges that it has studied the law and the facts and has made its own estimate of the risks that implementation of the Order may be delayed by judicial review and the Order may, in fact, be declared invalid. Nextel shall further acknowledge that the Commission has not participated in its assessment and is not privy to it, and does not in any way warrant any of the premises upon which Nextel’s assessment may be based. Nextel shall acknowledge that it has accepted the risk of delay and invalidity and that, therefore, it cannot recover its costs or any damages associated with implementation or non-implementation of the Order from the Commission or any governmental entity.

²⁶⁹ See *PLC Construction Services, Inc. v. United States* 96 Fed. Appx. 672 (April 7, 2004) (U.S. Bureau of Reclamation did not violate ADA even though contract obligated Bureau to pay more than \$33 million for reclamation project before Congress appropriated the funds because Bureau was separately authorized to enter into contracts under other provisions providing for the reclamation and irrigation of lands by the federal government); *cf. Association of Civilian Technicians v. Federal Labor Relations Authority*, 269 F.3d 1112 (D.C. Cir. 2001) (court vacated finding by Federal Labor Relations Authority that collective bargaining agreement that would reimburse employees for out-of-pocket losses resulting from agency cancellation of previously approved leave would violate the Anti-Deficiency Act and remanded the decision for the Authority to consider whether the disputed provisions are “authorized by the collective bargaining law”).

²⁷⁰ *Cf. Brazos v. U.S.*, 49 Fed. Cl. 398, 411 (Fed. Cl. 2001) (pre-existing contracts – not the MRA – govern whether the Rural Utilities Service (RUS) should assess a \$16.5 million penalty against an electric utility for prepayment of a promissory note; the MRA merely required the RUS to deposit prepayment funds with Treasury once they were received).

B. Interference Abatement

88. Two basic approaches to interference abatement have emerged from the extensive record in this proceeding:

- Application of a variety of technical techniques including those in the *Best Practices Guide* as well those contained in Motorola's *Technical Toolbox*²⁷¹ and the 800 MHz User's Coalition Balanced Approach filing.²⁷²
- Reconfiguration of the 800 MHz band to segregate non-cellular systems from systems using cellular architecture, *i.e.* ESMR and cellular systems.

We do not find these two approaches mutually exclusive; indeed, our ultimate conclusion is that achieving satisfactory interference abatement will require both band reconfiguration and application of Enhanced Best Practices. Moreover, we believe Enhanced Best Practices will play a vital role in protecting the integrity of public safety communications during the transition period to a new 800 MHz band plan and after reconfiguration is complete. Our decisions today on how to best abate unacceptable interference rest on the record as well as on analyses of the nature of interference being encountered and the conditions under which a non-cellular 800 MHz licensee should be able to claim entitlement to interference protection.

1. Types of Interference

89. The predominant types of interference encountered by public safety and other 800 MHz non-cellular systems are intermodulation interference and OOB interference.²⁷³ Some parties claim that most of the interference is of the intermodulation type; others contend that the division between intermodulation

²⁷¹ Motorola described its *Technical Toolbox* in a series of *ex parte* letters to the Commission. *See, e.g.*, Motorola May 6 *Ex Parte*, Letter, dated May 30, 2003, from Mary E. Brooner, Motorola, to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 02-55 (attaching May 29, 2003 presentation to the Office of Engineering and Technology) (Motorola May 30 *Ex Parte*); Letter, dated June 20, 2003, from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc. to James D. Schlichting, Esq., Federal Communications Commission, WT Docket No. 02-55 (Motorola June 20 *Ex Parte*).

²⁷² Collectively, Enhanced Best Practices. *See* ¶ 16 *supra*.

²⁷³ Various parties have divided OOB into more specific categories such as adjacent channel interference, sideband noise, and phase noise. *See, e.g.*, Cingular Comments at 7; Ameren Reply Comments at 4. Except where the context requires otherwise, we will subsume all of these categories under OOB. Some interference encountered by public safety mobiles or portables is caused by what commenting parties have variously characterized as receiver "overload," "desensing," or gain compression. Motorola defines both overload and desensing as, "[a]n informal term often used to describe a scenario where a receiver is functioning other than expected, presumably due to excessive signal power at the receiver RF input port." Motorola July 18 *Ex Parte* at 3. Gain compression occurs when a nearby undesired signal or signals are so exceptionally strong that they exceed the amplification capability of the first active devices in the radio receiver, such that the gain of these active devices begins to decrease with increasing levels of undesired signal(s). It is often defined by the 1 dB compression point—the point at which undesired strong signals reduce the gain of an active device by 1 dB. In some instances of these modes of interference, other circuits in the radio are implicated, such as automatic gain control (AGC) circuits.

interference and OOB interference is approximately equal.²⁷⁴ This disparity in opinion may be due to the difficulty of identifying the exact interference mode under field conditions with limited measurement apparatus and the fact that interfering channels may or may not be simultaneously active at a given time.²⁷⁵

90. *OOB Interference.* No radio transmitter can confine its emissions to an assigned channel; some signals invariably “spill over” into adjacent spectrum, i.e., all transmitters create some degree of OOB. The Commission’s rules specify the maximum permissible OOB of single ESMR and cellular transmitters. However, there is no Commission rule governing the maximum OOB that a multiple-channel cell can radiate. Moreover, cell OOB increases cumulatively as a function of the number of channels active in a given cell or in nearby cells, e.g., a public safety receiver could receive cumulative OOB from an ESMR cell and a nearby cellular cell. Filters on ESMR and cellular transmitters are effective in reducing OOB. However, as with all such filters, they are less effective on frequencies close to the transmitter frequency; e.g., a filter may not be as effective in significantly reducing OOB interference to a public safety receiver attempting to receive a signal on a channel immediately adjacent to the channel being used by a nearby ESMR or cellular cell.

91. *Intermodulation Interference.* This kind of interference occurs in 800 MHz receivers when signals in use at a given cell—or a nearby cell—have a given, readily calculable, mathematical relationship²⁷⁶ and are strong in an area in which a public safety mobile or portable unit is attempting to communicate.²⁷⁷ When strong signals with the appropriate mathematical relationship are presented to the public safety receiver, they cause the active elements in the first stages of the receiver to operate in a non-linear manner.²⁷⁸ The incoming undesired signals mix in the receiver and produce a third frequency—an intermodulation product—which can either correspond or fall near the frequency on which the user of the radio is attempting to communicate.²⁷⁹ If the resultant new signal generated in the first stages of the receiver is sufficiently strong, it can effectively block the incoming signal, rendering the radio unusable at

²⁷⁴ See, e.g., New York State Comments at 7, 9 (adjacent channel interference is primary cause); Fort Lauderdale Comments at 5 (signal overload is the primary problem); Motorola Comments at 18 (5th order intermodulation interference is the most common type of interference).

²⁷⁵ Recently, Motorola recommended a measurement technique that allows a more refined analysis of the source of interference. However, even with use of this technique, Motorola’s own field tests showed that it was not always possible to characterize interference. See Motorola June 20 *Ex Parte* at 8.

²⁷⁶ Intermodulation products are categorized according to “order” and can result from the interaction of two or more frequencies. Thus, in the case of two-frequency (F1 and F2), third-order, intermodulation, the intermodulation products (P) within the 800 MHz band are calculated by: $P_{\text{intermod.}} = 2 \cdot F1 - F2$ and $P_{\text{intermod.}} = 2 \cdot F2 - F1$. The fifth order, two frequency intermodulation products within the 800 MHz band are calculated by: $P_{\text{intermod.}} = 3 \cdot F1 - 2 \cdot F2$ and $P_{\text{intermod.}} = 3 \cdot F2 - 2 \cdot F1$. Intermodulation products can also be generated by interaction of three or more transmitters, for example, some third-order, three frequency (F1, F2 and F3) intermodulation products falling in the 800 MHz band can be calculated by $P_{\text{intermod.}} = F1 + F2 - F3$ and $P_{\text{intermod.}} = F2 - F1 + F3$. In general, within the 800 MHz band, fifth order and higher intermodulation products are less significant than third-order products. The greater the number of frequencies involved, the greater the number of intermodulation products generated.

²⁷⁷ See Nextel Comments at 19.

²⁷⁸ *Id.* The first stage of a receiver is usually an amplifier. See also *Best Practices Guide* at 9.

²⁷⁹ See Nextel Comments at 19.

that location.²⁸⁰ The concept of mixing occurring in non-linear devices is sometimes analogized to color mixture. Thus, if a receiver were presented with a strong “blue” ESMR signal and a strong “yellow” cellular signal, the two colors could mix in the first stage of the receiver and form an interfering “green” signal that fell on a public safety frequency. The “mixing” concept is important to the understanding of intermodulation interference because it explains how two or more signals, widely separated (in frequency) from a public safety channel can still generate interference. It is significant here, because locating public safety channels in the lower portion of the band—as far as possible from the ESMR and cellular channels—would provide significant relief from interference on the public safety channels. However, it still leaves open the possibility that ESMR and cellular channels, separated from public safety channels by as much as ten megahertz, could mix in the first stage of the public safety radio and form an intermodulation product—that could fall within the channel the public safety radio is tuned to. Under this scenario, if the two ESMR and cellular signals are strong enough, and the radio does not have good intermodulation rejection capability, interference could still result.

2. Entitlement to Interference Protection

92. In order to implement technical and procedural rules for interference abatement, we must first determine the criteria by which licensees will be entitled to interference protection. At the core of this determination is how to define exactly what constitutes “unacceptable interference” to public safety and other non-cellular 800 MHz systems. With an objective standard for unacceptable interference established, all 800 MHz licensees would have certainty regarding their respective rights and obligations. As a result, licensees will be able to readily identify in what circumstances they can reasonably expect to operate free from unacceptable interference. We emphasize, however, that our determination on what constitutes “unacceptable interference” applies solely to this proceeding.

a. Introduction

93. Historically, the Commission has imposed limits on the area in which land mobile communications systems with given characteristics—effective radiated power (ERP), frequency, antenna height, geographical separation, *etc.*—can expect substantially interference-free operation from other systems. For instance, in some bands, our Rules define these areas geographically, *e.g.*, a public safety system in certain bands can expect interference protection because our Rules prohibit co-channel stations within seventy-miles of the protected station.²⁸¹ In other bands, public safety has a “protected contour” that defines the area in which interference protection from other co-channel or adjacent channel systems can be expected, *e.g.* a 37 dBμV/m contour (VHF) or a 39 dBμV/m contour (UHF).²⁸² Under either protection scheme—distance separation or protected contours—the signal level at which the public safety

²⁸⁰ See Island SMR Comments, Exhibit A at 10. However, receiver components are not the only source of intermodulation products. A junction of dissimilar metals, when presented with strong signals, can generate intermodulation products. For example, some parties have identified corroded bolts on base station towers as a source of intermodulation products. If a base station combiner allows signals from the final amplifier of one transmitter to enter the final amplifier of another transmitter, the two signals can mix, due to non-linearities in the final amplifiers, and the resultant intermodulation product is radiated from the cell antenna. See *ex parte* communication, dated May 27, 2003, from RACOM, Inc. and I.E. Communications to Michael J. Wilhelm, Esq., Federal Communications Commission. It also has been suggested that ferrite used in base station isolators has nonlinear properties that support generation of intermodulation products. See, *e.g.*, Motorola June 20 *Ex Parte* at 1.

²⁸¹ See 47 C.F.R. § 90.621(b).

²⁸² See 47 C.F.R. § 90.187(b)(2)(iii).

system no longer can expect interference protection is well above the typical receiver noise floor.²⁸³

94. Consequently, when frequencies are assigned based on distance separations or protected contours, the area in which a licensee may operate is limited by the potential of interference from nearby systems, *e.g.* the potential for interference defines the area within which a public safety signal is intelligible, not merely by the strength of the public safety signal above the receiver noise floor. Given this fact, we believe that it would be inappropriate, as a matter of responsible spectrum management, to afford public safety systems the noise-limited coverage that some proponents have recommended.²⁸⁴ For example, were we to do so for a given public safety system in the 800 MHz band, it would not only restrict the availability of public safety spectrum in adjoining areas but also would make it virtually impossible for CMRS systems to use channels that contributed the slightest amount of noise to a public safety receiver in the far fringes of its noise-limited coverage area. Such an outcome would result in inefficient utilization of CMRS spectrum. Moreover, the substantial set of measures we are adopting here will provide public safety systems with strong protections against interference, rendering this particular measure unnecessary.

95. We also conclude we should adopt an interference protection standard in the 800 MHz band based on measured, rather than predicted signal strength. While one approach would be to define the coverage area of public safety system by a predicted signal contour, signal level prediction is an inexact science and 800 MHz radio signal propagation can be affected by multiple factors such as buildings and other obstructions, reflection of signals from nearby man-made surfaces, terrain, and foliage. Moreover, system designers frequently predict signal strengths in terms of statistical probability, *e.g.*, the charts and algorithms used for coverage determinations predict the distance from a transmitter at which a given level of signal will be equaled or exceeded at fifty percent of the locations fifty percent of the time.²⁸⁵ Thus, while signal strength predictions are useful for obtaining an overall picture of system coverage, we believe they are of limited utility in predicting the strength of an 800 MHz public safety signal in a localized and relatively small area, which is exactly the type of area in which interference may be encountered from an ESMR or cellular system. Consequently, we conclude that we need to use a basis other than distance separations or predicted signal contours in establishing the threshold determination of entitlement to interference protection.

b. Interference Protection Standard

96. In their August 7, 2003 *ex parte* filing, the Consensus Parties proposed a bright-line test for determining non-cellular 800 MHz licensees' entitlement to interference protection.²⁸⁶ The recommended test procedure relies on measured—rather than predicted—minimum median signal strength levels, which, if met or exceeded, would entitle a licensee to interference protection.²⁸⁷ Moreover, the proposal

²⁸³ The “noise floor” is the cumulative value of noise generated internally in the receiver and environmental noise, such as that created by automobile ignition systems, high voltage electrical transmission lines and a host of other “incidental radiators.” *See* 47 C.F.R. § 15.3.

²⁸⁴ Some commenting parties suggested the Commission adopt a “zero tolerance” policy whereby any radio system interfering with a public safety signal in the 800 MHz band would immediately have to cease operation until interference-free operation of the public safety system was assured. *See* City of New York Comments at 5; IACP Comments at 4; City of New York Comments to Supplemental Comments of the Consensus Parties at 8.

²⁸⁵ *See, e.g.*, 47 C.F.R. § 73.699, Figures 9, 10 and 10b.

²⁸⁶ Consensus Parties Aug. 7 *Ex Parte* at 45-50 and Appendix F at 2, § 1.2.

²⁸⁷ *Id.* Appendix F at 3, § 2.1.1.

contemplated providing full interference protection only to non-cellular 800 MHz systems that use receivers meeting minimum performance standards.²⁸⁸

97. The proposal defines interference in terms of a parameter known as the carrier²⁸⁹ to interference plus noise ratio $[C/(I+N)]$ of a receiver. The proposal recommended 20 dB as the minimum acceptable $C/(I+N)$ ratio for voice systems;²⁹⁰ and suggested that the equipment manufacturer supply the “information value” for non-voice public safety communications systems.²⁹¹

98. The Consensus Parties’ proposal requires that a public safety or other non-cellular radio in the band segment be presented with a signal from the desired station that is greater than or equal to a specified minimum before the licensee of the desired station may claim entitlement to interference abatement.²⁹² As proposed in their filing, the threshold desired signal power in the case of portable units in the 806-816 MHz/851-861 MHz band segment is -101 dBm, or greater, as measured at the radio frequency (R.F.) input to the portable radio’s receiver.²⁹³ The corresponding value for mobile units is -104 dBm or greater.²⁹⁴ A specific measurement technique was proposed for determination of the threshold signal powers.²⁹⁵

99. The Consensus Parties proposed that full interference protection would be provided only for systems using receivers that satisfy TIA Class A specifications.²⁹⁶ Receivers not conforming to these

²⁸⁸ *Id.* Appendix F at 8, § 4.1.1a.

²⁸⁹ “Carrier” in the sense used here, equates with “desired signal;” *i.e.* the signal from the public safety, CII or other non-cellular base station.

²⁹⁰ Consensus Parties Aug. 7 *Ex Parte* Appendix F at 2, § 1.2.1.

²⁹¹ *Id.* Appendix F at 2, § 1.2.2.

²⁹² The median received power level for interference protection in the Guard Band at 816-817/861-862 MHz that Nextel later proposed to be designated for non-ESMR operations increases as a function of frequency. *See* ¶¶ 157-158 & Figure 1 *infra*.

²⁹³ Consensus Parties Aug. 7 *Ex Parte* Appendix F at 3, § 2.1.1a. This level is the power in decibels above one-milliwatt at the R.F. input terminals of a receiver. The Consensus Parties originally proposed a measured desired signal power of -98 dBm, but lowered these values in response to parties who expressed concern that this level was too stringent and that the resultant area of interference free operation would be smaller than the area in which many public safety systems expect reliable coverage. *See* Comments of Motorola to Supplemental Comments of the Consensus Parties at 11; Comments of NY OIT to Supplemental Comments of the Consensus Parties at 12-14; Comments of San Diego to Supplemental Comments of the Consensus Parties at 7; Comments of Xcel to Supplemental Comments of the Consensus Parties at 6-7; Comments of Con-Ed to Supplemental Comments of the Consensus Parties at 6; Comments of Entergy Reply to Supplemental Comments of the Consensus Parties at 7-8; Reply Comments of NY OIT to Supplemental Comments of the Consensus Parties at 9-10; Reply Comments of San Diego to Supplemental Comments of the Consensus Parties at 7-8; Reply Comments of Xcel to Supplemental Comments of the Consensus Parties at 5-6.

²⁹⁴ *Id.*

²⁹⁵ *Id.*, Appendix F at 9-10, § 5.0. The Consensus Parties made this amendment in response to one commenting party which argued that the Commission should not set a minimum received power level for interference protection unless and until an agreed-upon procedure for measuring the power level had been established. *See* Comments of New York OIT to Supplemental Comments of the Consensus Parties at 13; Reply Comments of NY OIT to Supplemental Comments of the Consensus Parties at 10-11.

²⁹⁶ *See* Consensus Parties Aug 7 *Ex Parte*, Appendix F at 8, § 4.1.1. Class A receivers are those intended for (continued....)

specifications would be protected only to some higher desired signal threshold power level.²⁹⁷ Several parties supported the Consensus Parties in this regard;²⁹⁸ while others disagreed, pointing out that some of the TIA standard parameters, for example, operating temperature range of the radio are irrelevant to 800 MHz interference and therefore that the Commission should not require compliance with the entire standard but, instead, should simply adopt minimum intermodulation rejection ratios for receivers.²⁹⁹

100. On June 16, 2004, Nextel filed a revised band plan for the 816-817 MHz/861-862 MHz band segment proposing that this additional 2 MHz be designated for non-ESMR use rather than for ESMR, as had been proposed in the August 2003 *ex parte* filing. In that band plan, Nextel proposes that the minimum received signal power threshold necessary for interference protection in the 816-817 MHz/861-862 MHz band segment increase as a function of increasing frequency.³⁰⁰

101. As discussed in greater detail below, we conclude, based on the record in this proceeding, that a readily identifiable objective standard should be established to determine what constitutes unacceptable interference, and which systems are entitled to protection from such interference.³⁰¹ We also believe that both unacceptable interference and the scope of protection afforded to eligible systems should be subject to objective measurement criteria. In this connection, we note that almost all participants in this proceeding agree that the *status quo*—addressing interference to public safety systems on an *ad hoc* basis and reactive fashion—is no longer workable in the 800 MHz band. We agree, and find that certain interference definition and measurement procedures contained in the record allow us to establish a reasonable standard for determining when public safety and other non-cellular systems can expect to operate free from unacceptable interference.³⁰² Specifically, we believe that the operational parameters

(Continued from previous page) _____
an urban environment; Class B receivers are suitable only for rural environments.

²⁹⁷ *Id.* Appendix F at 8, § 4.1.1b. The amount of the increase above the levels described above would be determined by the amount of desired signal power necessary to restore the receiver in question to the same C/(I+N) ratio as a Class A receiver in the same environment. We note that Motorola has reported that approximately 93 percent of its recent portable receiver inventory meets Class A standards. *See* Motorola November 3 *Ex Parte* at 5, Table 3. Motorola further reported that eighty-five percent of their 2003 year-to-date shipments of mobile radios met Class A standards. *Id.* The most significant difference between the two classes of receivers lies in their intermodulation rejection performance. Class A portable receivers must have at least a 70 dB intermodulation rejection ratio (Class A mobiles must achieve at least 75 dB of intermodulation rejections); Class B portable receivers must have at least a 50 dB intermodulation rejection ratio (Class B mobile receivers must have at least a 70 dB intermodulation rejection ratio). *See* TIA/EIA -603-A, August 2001 at 124. *See also* TIA/EIA TSB102.CAAB, August 1994, at 6 and 7. TIA is an American National Standard Institute-accredited standards development organization and provides technical expertise to the telecommunications industry in a wide range of areas, including system performance, interference abatement, compatibility and interoperability. *See* <http://www.tiaonline.org/about/overview.cfm>.

²⁹⁸ *See* Comments of Alliant to Supplemental Comments of the Consensus Parties at 1; Comments of Ameren to Supplemental Comments of the Consensus Parties at 14.

²⁹⁹ *See* Ameren Reply Comments at 4; UTC Reply Comments at 19; Comments of Preferred to Consensus Parties Reply Comments at 11; Comments of UTC to Supplemental Comments of the Consensus Parties at 15.

³⁰⁰ *See* ¶¶ 157-158 and Figure 1 *infra*.

³⁰¹ *See* ¶ 105-107 *infra*.

³⁰² This stems from the questions raised in the *NPRM* seeking comment on whether to abate interference by requiring increased public safety signals or by reducing CMRS signals. *See NPRM*, 17 FCC Rcd at 4914 ¶¶ 76-77.

and system characteristics identified by the Consensus Parties are relevant factors in establishing such a standard. However, in determining the final values we drew not only from the Consensus Parties' proposal but also from proposals submitted by equipment manufacturers, industry associations, 800 MHz licensees, as well as our own technical expertise. We further believe that adoption of the unacceptable interference definition and associated measurement procedures is in furtherance of our goal to employ sound spectrum management principles in resolving the 800 MHz interference problem. In addition, we rely, in part, on the methodology derived by the Telecommunications Industries Association TR-8 Subcommittee.³⁰³ Based on this analysis, we believe that the measures we adopt here will meet our goal of ensuring that 800 MHz communications critical to the safety of life and property will not be impaired by unacceptable interference.

102. The Consensus Parties recommended that the proposed procedures for defining unacceptable interference and establishing licensees' entitlement to be protected against such interference should not be put into place until reconfiguration of the 800 MHz band had been completed. We disagree. Indeed, it appears to us that establishing an interference abatement entitlement standard must be the very first step in attacking the problem of unacceptable interference to public safety, CII and other non-cellular 800 MHz systems.³⁰⁴ In short, we cannot afford the luxury of awaiting completion of band reconfiguration—and putting critical public safety communications at continued significant risk in the interim—before we determine the conditions under which licensees are entitled to interference protection. Accordingly, our rules for interference protection entitlement and the assignment of responsibility for the abatement of unacceptable interference will become effective sixty days after publication of this *Report and Order* in the Federal Register.

103. We are persuaded by the record that our goals in this proceeding are best met by our bright-line test for interference protection entitlement, coupled with a standardized technical means of determining that entitlement and assigning the task of abating unacceptable interference to the parties best capable of doing so. This approach is, we believe, far preferable—for all concerned—to our attempting to micro manage the technology utilized by the ESMR and cellular industries. Thus, by eschewing imposition of across-the-board new technical standards on the industry, we avoid imposing that unnecessary expense and afford the ESMR and cellular licensees optimum flexibility to design and operate their systems in a manner that will optimize service to subscribers and avoid unacceptable interference to other users of the 800 MHz band. Thus, although we have discussed herein the technical means disclosed in the record to avoid unacceptable interference—especially those that come within the definition of Enhanced Best Practices—we reject as unnecessary, the recommendations of some parties for mandatory restrictions on all ESMR and cellular systems with respect to such parameters as maximum cell ERP,³⁰⁵ combiner technology,³⁰⁶ and specific antenna pattern characteristics.³⁰⁷

³⁰³ See ¶ 108, *infra*. See also Consensus Parties Aug. 7 *Ex Parte* at 48. The TIA TR-8 subcommittee is responsible for mobile and personal private radio standards. See <http://www.tiaonline.org>.

³⁰⁴ See Consensus Parties Aug. 7 *Ex Parte* at Attachment 1.

³⁰⁵ See Motient Comments at 4; Cascade Radio Comments at 2; Supreme Radio Comments at 7; Florida Comments at 8; Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties at 12, 18; Comments of Pinnacle to Supplemental Comments of the Consensus Parties at 9; Comments of UTC to Supplemental Comments of the Consensus Parties at 15; Reply Comments of San Diego to Supplemental Comments of the Consensus Parties at 7.

³⁰⁶ Alliant Energy Comments at 1; UTC Comments at 19; Entergy Reply Comments at 2; Pinnacle Reply Comments at 3-4.

104. We also decline to adopt the recommendation of the Consensus Parties that we establish more strict OOB limits for base station transmitters in the 861-895 MHz band.³⁰⁸ Instead, we agree with parties such as the Rural Cellular Association, which point out that, in many instances, the additional filtering needed to achieve the Consensus Parties' proposed OOB standards would add cost and complexity—but no benefit—to those cells in a system in which, because of their location, or otherwise, unacceptable OOB interference would not occur.³⁰⁹ In short, although we recognize the efficacy of such technical changes, we are reticent to impose them on every cell of every system in the country; particularly if only a handful of cells in a system might require them. In the final analysis, it is the question of whether unacceptable interference exists or not that is controlling here; not the specific means by which licensees abate it. The technical filings made in this proceeding convince us that licensees are the best stewards of interference abatement technology and are best capable of determining when and to what degree that technology must be applied. However, we reserve the discretion to revisit this issue promptly and impose more specific technical requirements on carriers should our decisions to adopt an objective interference standard and place strict responsibility on carriers to fix any unacceptable interference prove inadequate.

(i) Signal Strength Threshold for Interference Protection

105. In the rules we adopt today, we specify that public safety, CII, and other non-cellular 800 MHz systems must receive at least a minimum measured input signal power of -101 dBm for portable (*i.e.*, hand-held) units and -104 dBm for vehicular mobile units in order to be eligible for protection from interference in the 806-816.35 MHz/851-861.35 MHz band segment.³¹⁰ As an initial matter, we note that these signal strengths are quite low. For instance, a signal strength of -98 dBm is the threshold average radiation sensitivity for a Class A “Project 25”³¹¹ portable receiver with an external antenna.³¹² A signal strength of -101 dBm is about one-half that of a signal strength of -98 dBm, and a signal strength of -104 dBm is about one-quarter that of a signal strength of -98 dBm. Some non-cellular 800 MHz licensees contend that they have designed systems to work with a signal strength less than -98 dBm, and we wish, at the margin, to protect such systems providing they provide, at a minimum, a median -101/-104 dBm

(Continued from previous page)

³⁰⁷ With regard to antenna designs, we note that the Commission's Spectrum Policy Task Force (SPTF) recommended that we consider “[p]romoting the use of advanced antenna technology and system design techniques that would enhance the uniformity of transmitted signal strength levels through a service area.” See SPTF Report, ET Docket No. 02-135, November 2002, at 32.

³⁰⁸ Consensus Parties Aug. 7 *Ex Parte*, Appendix F at 9 § 4.1.2.

³⁰⁹ See Reply Comments of Rural Cellular to Supplemental Comments of the Consensus Parties at 2.

³¹⁰ Note that the signal powers are specified in decibels below one milliwatt and thus are negative numbers. Therefore, for example, a -90 dBm signal is stronger than a -100 dBm signal. For our discussion of 816-816.35 MHz/861-861.35 MHz band segment, see ¶¶ 157-158 *infra*.

³¹¹ “Project 25” was an APCO initiative that resulted in a digital standard which was substantially incorporated into the ANSI/TIA/EIA 102 suite of standards. The TIA standard has been adopted as the mandatory standard for public safety radios operating on narrowband interoperability voice and data channels in the 700 MHz public safety band.

³¹² See TIA/EIA-102.CAAB, November 2002, § 3.1.14. Manufacturers' sensitivity specifications indicate that many Class B receivers meet this limit. The average radiation sensitivity of a receiver is the power received by a halfwave dipole measured into a 50 Ω load when substituted for a receiver that is receiving a signal at the reference sensitivity. See TIA-102.CAAA-A, November, 2002 §2.1.14.1.

received signal power.³¹³ However, we do not agree with parties who aver that their systems operate satisfactorily with signal strengths at or below -120 dBm and should be protected to that low level.³¹⁴ In light of the fact that the reference sensitivity of 800 MHz receivers is typically on the order of -116 to -119 dBm.³¹⁵ We find that mandatory protection of systems to a level below -104 dBm would impose an excessive burden on ESMR and cellular telephone carriers to protect an extremely weak signal. We note that such signal levels are so weak that normal statistical variation, especially at the periphery of service areas, would result in limited service reliability even in the absence of interference or high levels of ambient noise. Nevertheless, ESMR and cellular telephone licensees must respond to complaints of interference even at these low signal levels; and, when possible, voluntarily assist the affected licensee if to do so does not cause the ESMR or cellular telephone licensee undue cost or capacity limitations.

106. In sum, to provide clarity and transparency to all involved parties, we specify that the public safety or other 800 MHz non-cellular signal will be entitled to protection only if the median power of the received signal is greater than or equal to -101 dBm (portable) or -104 dBm (mobile),³¹⁶ in the 806-816 MHz/851-861 MHz band segment. In the band segment 816-817 MHz/861-862 MHz, measured median signal powers for interference abatement increases as a function of frequency, as described in paragraphs 157-158 and Figure 1, *infra*.

107. In defining the term interference within the specific context of “unacceptable interference” as defined for purposes of this proceeding only and as used herein, we examined the filings in the record, standard technical publications and manufacturers’ specification sheets. Our analysis closely tracks that of the Consensus Parties and we define unacceptable interference as any impairment to the desired signal that causes the C/(I+N) ratio of a voice radio receiver to drop below 20 dB. However, because the technical parameters necessary for acceptable performance by non-voice systems vary significantly by system, we will use the value(s) reasonably designated by the manufacturer of the equipment.³¹⁷ We recognize that a manufacturer specification may vary from manufacturer to manufacturer and could well change over time as particular equipment evolves.³¹⁸

³¹³ See Comments of San Diego to Supplemental Comments of the Consensus Parties at 7; Comments of Con-Ed to Supplemental Comments of the Consensus Parties at 6-7; Reply Comments of N.Y. OIT to Supplemental Comments of the Consensus Parties at 10; Reply Comments of San Diego Reply to Supplemental Comments of the Consensus Parties at 7.

³¹⁴ See Comments of Palomar Comm. to Supplemental Comments of the Consensus Parties at 7-8; Comments of Consumers Energy to Supplemental Comments of the Consensus Parties at 18; Reply Comments of Xcel to Supplemental Comments of the Consensus Parties at 5; Peak Relay, February 6, 2004 *ex parte* filing.

³¹⁵ See TIA-102.CAAB-A September 2002, § 3.1.4. (minimum reference sensitivity -116 dBm) See also Typical Performance Specifications for Motorola Astro XTS 5000 transceiver. http://www.motorola.com/cgiss/docs/xts5000_service.pdf (reference sensitivity of 0.25 microvolts = -119 dBm).

³¹⁶ Although the Consensus Parties’ filings are not clear on the subject, we assume the threshold to be used (-101 or -104 dBm) will be determined by the kind of radio that was in use when interference was encountered. Thus, if the interference complaint originated from a party using a hand-held portable radio, the -101 dBm criterion would apply. However, if the party encountering interference was using a mobile unit, the -104 dBm criterion would apply.

³¹⁷ See Consensus Parties Aug 7 *Ex Parte*, Appendix F at 2, § 1.2.2.

³¹⁸ We note that manufacturers of non-voice equipment generally rely on bit error rate (BER) to specify acceptable system performance, rather than the C/(I+N) ratio used for voice systems. We therefore expect that most manufacturers will specify a BER for non-voice systems.

(ii) Signal Measurement Techniques

108. As an initial matter, all parties involved in a determination of unacceptable interference are free to agree among themselves on how interference protection threshold levels are to be measured. For example, in many cases, it may be possible to measure the desired signal directly because it is not masked by noise or interference to the degree that direct measurement is unreliable. In other instances, it may be possible to conduct a direct measurement reliably if nearby ESMR or cellular telephone transmitters are turned off briefly. However, whenever it is not possible to perform reliable measurements of desired signal received power directly; or in the event there are disputes between or among the parties involved in an interference complaint, the following protocol for indirect measurement of the desired signal power may be used. These measurement procedures are based on the recommendations of the Consensus Parties with a few minor changes.³¹⁹ Consistent with existing practice, the Office of Engineering and Technology is hereby delegated authority to make changes to this protocol as needed.³²⁰

(a) *Area to be measured.* The area of measurement shall be no less than 91.44 meters x 91.44 meters (300 feet x 300 feet). Local obstructions may determine the size, as well as how large the reported affected area is. If the affected area is quite large, a location of reported problems shall be selected that is large enough to be consistent with coverage predictions and our dBu contour limitations.

(b) *Data collection.* A measurement route shall be defined through the area to be measured that distributes data collection points relatively uniformly across the area being tested. A constant velocity along the route shall be maintained to prevent oversampling in any given location. The sampling rate shall be high enough to ensure multiple samples per wavelength.

(c) *Use of filters.* A lowpass or bandpass filter shall be inserted between the test receiver and its antenna to allow differentiation between receiver-generated IM and OOBE noise by attenuating potential IM contributors from the CMRS portion of the band. The filter's loss on the desired frequency shall be included in all calibrations.

(d) *First test procedure.* With all potentially-interfering channels and the desired signal transmitting constantly, gather "continuous" data over a route that covers the measurement area defined in (a) above, using the data-collection requirements in (b) above. Use this data to determine the median C+I+N. Modulate the desired channel with a test signal to verify whether or not the target receiver unmutes. For digital receivers this occurs at a C/(I+N) of approximately 5 dB. For analog radios adjust the manual squelch setting to cause the receiver to unmute at a C/(I+N) of 5 dB.

(e) *First test threshold.* If the median C+I+N is greater than or equal to 2 dB above the median target value and the receiver was unmuted, then the first threshold test is passed and the public safety/CII system is eligible for interference mitigation. If the median C+I+N is not greater than or equal to 2 dB above the median target value, conduct the second test procedure below to establish eligibility for interference mitigation.

³¹⁹ See Consensus Parties Aug 7 *Ex Parte*, at Appendix F, §§ 5.0-5.8.

³²⁰ Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) devices in the 5 GHz band, FCC 03-287, ET Docket No. 03-122 ¶ 39 (released Nov. 18, 2003).

(f) *Second eligibility test.* Repeat (d) with the desired signal not transmitting. At this point the test receiver is measuring only I+N. This test should be run as soon as possible to be sure conditions are similar to the initial test. If the test receiver has automatic frequency control, disable it so it remains on the test frequency and is not pulled toward one of the potential interference contributors. Use this data to determine the median I+N. Since the value of N should be a constant (the thermal noise of the receiver) all else will be interference (I). If OOB noise is present it will be captured in this data as I.

(g) *Second test threshold.* Determine the median C based on the median C+I+N and I+N. If the calculated median C is close to the target value, repeat (f) to ensure that I+N has not changed.

c. Minimum Receiver Performance Criteria

109. In order for non-cellular 800 MHz licensees to be entitled to full protection against unacceptable interference, they must use mobile and portable voice radios with performance that equals or exceeds the minimum performance standards described *infra*:

- Voice units intended for mobile use: 75 dB intermodulation rejection ratio; 75 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.
- Voice units intended for portable use: 70 dB intermodulation rejection ratio; 70 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.

110. We derived the foregoing values from manufacturers' technical filings contained in the record,³²¹ standard reference works and manufacturers' specification sheets for voice equipment. The data appear to represent the state of the art in affordable public safety and CII radios.³²² We also evaluated the Consensus Parties' recommendation that we require public safety licensees to use receivers which meet TIA Class A standards in order to receive full protection against unacceptable interference.³²³ We decline, however, to adopt the Class A standards on a wholesale basis because: (a) we wish to avoid incorporating technical specifications contained in these standards unless they relate directly to rejection of signals that interfere with 800 MHz public safety communications; and (b) the TIA-102 standard for digital transceivers applies to radios operating with 12.5 kHz bandwidth and thus is inapplicable to radios operating with 25 kHz bandwidth, as is common in the 800 MHz band. Thus, although we did rely, in part, on the TIA-102 standard, we did so only with those portions of the standard that affect

³²¹ See Motorola Comments at 21; Motorola November 3 *Ex Parte* at 4.

³²² As with most technical equipment, such radios' performance is bounded by cost and other considerations. For example, the intermodulation rejection ratio of a portable radio is directly tied to the amount of power that the radios' battery can supply. Thus, although a portable radio with an intermodulation rejection ratio better than that specified *supra* could be manufactured; it would either have a battery so heavy that it would not be practical to carry the radio on the person of a public safety official; or, if the battery were light enough to be carried, its amp-hour capacity would not be sufficient for the radio to operate through an entire eight-hour, or more, shift. See Motorola Comments at 20-21; Public Safety 800 MHz Interference, FCC Briefing September 19, 2002 attached to Letter, dated September 20, 2002, from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission at 13 (Motorola September 20 *Ex Parte*).

³²³ Supplemental Comments of the Consensus Parties, Appendix F at F-7-8, § 4.1.1.

intermodulation rejection, adjacent channel selectivity, and receiver sensitivity.³²⁴

111. In setting our criteria for voice receiver performance, we were mindful of the comments of parties which observed that the TIA intermodulation interference testing protocols may not simulate real-world conditions.³²⁵ Thus, although the standards specify that intermodulation interference rejection should be tested with the desired signal at the reference sensitivity of the receiver,³²⁶ under actual operating conditions the desired signal is usually considerably above the reference sensitivity of the receiver. Therefore, we recommend, but do not require, that TIA and other standards-setting organizations revisit current testing procedures in light of the interference environment in which 800 MHz receivers must currently operate.

112. We note that Motorola data show that approximately seventy-four percent of the receivers that it has shipped to public safety agencies over the past decade meet Class A intermodulation rejection specifications and that this percentage is even higher for receivers shipped in 2003.³²⁷ Accordingly, we believe that public safety agencies predominantly already employ receivers which satisfy the criteria above.³²⁸ However, we are not restricting entitlement to unacceptable interference protection only to radios that meet the standards described *supra*. We recognize that some users, particularly public safety agencies, may be using older radios that do not conform to the standards. Accordingly, we are specifying that 800 MHz licensees asserting an entitlement to interference protection, but which employ receivers that fail to satisfy the criteria above will be afforded interference protection only at higher power levels than -104 dBm (for mobiles), -101 dBm for portables.³²⁹ For example, if a radio meeting the above criteria provided a 20 dB C/(I+N) ratio when presented with a -104 dBm signal, but a non-compliant radio delivered only a 15 dB C/(I+N) ratio when presented with a -104 dBm signal in the same environment, then the interference entitlement for the licensee using the non-compliant radio will be based on receipt of a -99 dBm measured signal power instead of -104 dBm. The net result would be that the licensee with the non-compliant radio would have less interference protection because, to claim entitlement to protection, the licensee would have to show that, in the area in which interference was encountered, the licensee's system would have to provide a 5 dB higher received power level, *i.e.* -104 dBm – (-99 dBm) = 5 dB.

113. Finally, we note Motorola's announcement of prototype receivers with switchable attenuators.³³⁰ In brief, the Motorola prototype senses the signal strength of the incoming desired signal

³²⁴ Based in part on an absence of evidence in the record suggesting there are issues regarding minimum receiver performance criteria for non-voice equipment, we find it unnecessary at this time to specify any such criteria.

³²⁵ See CTIA Reply Comments at 9-10; Supplemental Comments of the Consensus Parties, Appendix F at F-7, Item 4.1; Comments of CTIA to Supplemental Comments of the Consensus Parties at 10; Comment of Motorola to Supplemental Comments of the Consensus Parties at 20-21.

³²⁶ See TIA- TSB102.CAAA at 2.1.9.2 and TIA/EIA-603-A at 2.1.9.2.

³²⁷ See Motorola November 3 *Ex Parte* at 4-5.

³²⁸ We also note that, in some important respects, there is no difference between Class A and B receiver specifications. For example, the recommended delivered audio quality ("DAQ") for both is 3.4, and that DAQ requires a ratio of C/(I+N) of approximately 20 dB for analog receivers and 17.7 dB for digital receivers. See Table A-1, Annex A of TSB-88A.

³²⁹ See Supplemental Comments of the Consensus Parties, Appendix F at F-8, § 4.1.1b.

³³⁰ See Motorola May 6 *Ex Parte*.

and determines when the signal is sufficiently strong that it can tolerate a given amount of attenuation, e.g. 10 dB, without compromising the intelligibility of the incoming communication.³³¹ At that point, attenuation is automatically introduced between the radio's antenna and the first active device in the input chain (the "R.F. preamplifier" or "low noise amplifier") of the receiver.³³² With the signal so attenuated, a significant improvement is realized in the effective intermodulation rejection ratio of the receiver.³³³ Although the information submitted to date is encouraging, it is inconclusive as to the degree of overall interference protection the use of such receivers would provide in a typical system. The attenuator circuitry does not address OOB interference and is able to abate intermodulation interference only in areas in which the desired signal is strong enough to activate the attenuator.

114. Motorola stated that it could incorporate switchable attenuators in new products without a significant cost penalty; that it could retrofit switchable attenuators in certain of its earlier radios; and that the attenuation circuitry is not proprietary.³³⁴ However, it has not provided diagrams of the circuitry and no other manufacturer has come forward to endorse use of such radios, much less commit to producing them. Nonetheless, we believe that the potential for improved intermodulation interference rejection through use of switchable attenuators is sufficiently promising that we will continue to monitor manufacturers' development of radios with improved intermodulation rejection ratio—whether by use of switchable attenuators or otherwise—and, if the facts so indicate, will consider reviewing our rules governing intermodulation rejection standards for 800 MHz public safety receivers. We note the statement by Motorola that more interference resistant receivers can be produced at little or no additional cost.³³⁵ With respect to these receivers and other 800 MHz public safety equipment, we strongly encourage the industry as a whole not to seek excessive profits when offering suitable equipment to public safety agencies. In so doing, equipment manufacturers can make a significant contribution to providing first responders with the affordable communications equipment necessary to meet their Homeland Security obligations.

3. Overall Approach to Interference Abatement

a. Role of Enhanced Best Practices

115. As an initial matter, we recognize that some unacceptable interference can originate from multiple sources, e.g., two or more cells, (ESMR, cellular telephone, or both) each contributing to OOB or intermodulation interference. In such cases, all involved ESMR and/or cellular telephone licensees are jointly and severally responsible for abating the interference, no matter how small their contribution to the problem. In this regard, we believe that adopting rules and policies expressly imposing such responsibilities on such licensees operating in the 800 MHz spectrum is consistent with the mandate in Section 1 of the Act to enhance the safety of life and property.³³⁶ In addition, we emphasize that a reactive

³³¹ *Id.* at 5.

³³² *Id.*

³³³ *Id.* at 7, Figure 1.

³³⁴ See Letter, dated June 20, 2003, from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc. to James Schlichting, Deputy Chief, Office of Engineering and Technology, Federal Communications Commission at 7-8 (Motorola June 20 *Ex Parte*).

³³⁵ *Id.*

³³⁶ 47 U.S.C. § 151. See also 4.9 GHz Band Transferred from Federal Government Use, WT Docket No. 00-32, *Memorandum Opinion and Order and Third Report and Order*, 18 FCC Rcd 9152 (2003) (allocating (continued....))

approach to interference abatement is per se undesirable because of the concomitant adverse impact on public safety, CII and other 800 MHz communications. Thus, we encourage all 800 MHz licensees, in designing new systems or modifying existing systems, to anticipate and avoid potential interference before it occurs. This encouragement extends to designers of non-cellular 800 MHz systems as well; inasmuch as providing a more robust desired signal contributes significantly to interference abatement. To facilitate system designs that take the relevant interference environment into account, we are adopting rules that require mutual prior notification, on request, of changes or additions to ESMR, cellular telephone, public safety and CII 800 MHz systems;³³⁷ and are encouraging other voluntary and cooperative interference abatement solutions, such as “channel swaps.”

116. As noted earlier, the majority of the comments in this proceeding support abating harmful interference to public safety systems operating in the 800 MHz band by one of two methods: relying exclusively on Best Practices³³⁸ or by reconfiguring the 800 MHz band. Following publication of the *Best Practices Guide* in 2000, and throughout this proceeding, the Commission has given careful thought to whether Enhanced Best Practices, alone, would suffice to reduce unacceptable interference to the extent necessary to provide reliable 800 MHz public safety communications. In particular, we have carefully analyzed the filings by the Balanced Approach parties which urge adoption of a rule that would essentially codify many of the *Best Practice Guide* remedies and which would contain additional requirements—primarily procedural—to be followed when interference is encountered.³³⁹

117. We recognize that the development of the technical measures described in the *Best Practices Guide*, and subsequent related documents such as the Motorola *Technical Toolbox* represent an enormous amount of work and an almost unprecedented level of cooperation within the 800 MHz user community. We commend both the effort involved in developing these measures and the cooperative spirit they represent. We encourage continued research into interference abatement measures so that Enhanced Best Practices can become even more effective as a tool for remedying unacceptable interference. In so saying, however, we note that the voluntary use of Best Practices to date has abated many, but by no means all, instances of interference to public safety communications.

118. Voluntary Best Practices have often proven effective in abating interference on a case-by-case basis and will continue to be valuable—in the form of Enhanced Best Practices—even after band reconfiguration. Although there are several interference abatement strategies subsumed under the Enhanced Best Practices rubric, they fall into three basic categories: (1) changing the technical parameters of ESMR and/or cellular cell sites; (2) improving the equipment, including portable and mobile units, of the licensee encountering interference; and (3) establishing interference abatement procedures such as, prior notification of cell activation or modification. Details on these three categories of Enhanced Best Practices and the advantages and disadvantages thereof are contained in Appendix D *infra*. Enhanced Best

(Continued from previous page) _____

spectrum for public safety in furtherance of Commission's Section 1 obligation to promote safety of life and property); E911 Accuracy Standards Imposed on TIER III Carriers for Locating Wireless Subscribers Under Rule Section 20.18(H), WT Docket No. 02-377, *Order*, FCC 03-297 (2003) (denying a petition for forbearance from certain E911 requirements because of the strong connection between such requirements and the Commission's obligation to promote safety of life).

³³⁷ See ¶¶ 124-127 *infra*.

³³⁸ “Best Practices” as used herein refers to the recommendations for voluntary interference abatement contained in the *Best Practices Guide*. See n. 40 *supra*.

³³⁹ See, e.g., Letter, dated May 29, 2003, from Jill Lyon, Esq., Vice President and General Counsel, UTC to Marlene H. Dortch, Secretary, Federal Communications Commission.

Practices procedures formalize the cooperative efforts that some ESMR and cellular telephone licensees have undertaken to promptly identify and abate unacceptable interference. In furtherance of such efforts we are adopting rules today that require 800 MHz licensees to share technical data on request,³⁴⁰ and that set specific schedules for the identification, notification, assessment and abatement of unacceptable interference.³⁴¹

119. We note, however, that, as with almost any engineering solution, there are technical tradeoffs associated with most Enhanced Best Practices. For example, abating unacceptable interference using Enhanced Best Practices can sometimes be done only at the expense of affecting the coverage and subscriber capacity of ESMR and cellular systems, *e.g.*, Enhanced Best Practices that rely on restricting ESMR or cellular channel use or making significant reductions in cell ERP. Proposals advancing the use of Enhanced Best Practices—however defined—as the sole remedy for interference abatement have a significant drawback that makes them problematic as a long-term solution: they incur high transactional costs for all parties and would have to continuously be applied to an increasing number of interference incidents that are inevitable as use of the 800 MHz band intensifies.³⁴² Several parties also note that most of the remedies described in the *Best Practices Guide* are fundamentally reactive because interference must first be encountered before abatement efforts commence.³⁴³ We regard this as another serious drawback. It would be scant consolation for a public safety officer subjected to a life-threatening communications failure to know that he or she could report the problem so that technical fixes could eventually be applied to fix it—or not.

120. The record supports our conclusions about the high transactional costs of employing case-by-case remedies alone to abate harmful interference to public safety systems in the 800 MHz band. Nextel, one of the few parties that submitted comments detailing the costs of implementing Best Practices techniques, asserts that it employs between ten to fifteen full-time employees devoted to coordinating the company's interference abatement measures nationwide and employs over twenty additional technicians to resolve each interference problem.³⁴⁴ Nextel further asserts that it spends at least \$10,000 investigating and temporarily mitigating interference at a single site and that this cost can increase by as much as \$25,000 if additional equipment is required.³⁴⁵ Moreover, according to Nextel, implementing these measures can take from six to ten weeks with no guarantee that the particular technique being implemented will cure the interference problem.³⁴⁶ We further note that the record shows that it is not only CMRS licensees that incur interference mitigation costs. For example, both Anne Arundel County and Denver state that they have spent significant amounts of money and employee time attempting to mitigate

³⁴⁰ See ¶ 124 *infra*.

³⁴¹ See ¶¶ 132-141 *infra*.

³⁴² This is due to the increased use of this band by public safety licensees as well as the increased use necessitated by the expanding subscribership of ESMR and cellular systems.

³⁴³ See Comments of APCO at 9-10; IACP *et. al.* Comments 4-5; Nextel Reply Comments at 58; Reply Comments of Consensus Parties to Supplemental Comments of Consensus Parties at 13.

³⁴⁴ See Letter, dated December 19, 2003, from Regina M. Keeny, Counsel to Nextel to Michael J. Wilhelm, Esq., Federal Communications Commission at 12.

³⁴⁵ *Id.* at 10-11.

³⁴⁶ *Id.* at 10.

interference on a case-by-case basis.³⁴⁷

121. Against this backdrop, we are concerned that the inevitable increase in the number of potential and actual interference situations that will arise, in the 800 MHz band, as currently configured, could strain the effectiveness of the mitigation techniques and increase their cost, possibly rendering interference abatement ineffective and unaffordable. Thus, while we do not question the short-term efficacy of Enhanced Best Practices, we conclude that licensees in the 800 MHz band would be better served by a long-term solution that minimizes this burden. Indeed, in the 700 MHz Guard Band proceeding, the Commission recognized early on the necessity of spectrally separating incompatible technologies in order to avoid the incidence of interference to non-cellular public safety from cellular operations.³⁴⁸ In drafting up its 700 MHz band plan, the Commission essentially recognized the significance of grouping technically compatible public safety systems in close spectrum proximity and that spectrally separating incompatible systems such as through the use of guard bands required direct regulatory intervention. The Commission further adopted a package of technical rules and interference mitigation procedures to ensure that Guard Band operations would not cause interference to adjacent public safety operations. The Commission's experience in 700 MHz provides ample evidence that combining a forward looking band plan with a customized package of interference avoidance techniques can be successful. Further, the record in this proceeding supports that reconfiguration of the 800 MHz band, while expensive in the short-term, will, over time, minimize the transaction costs incurred by 800 MHz licensees by reducing reliance on Enhanced Best Practices.³⁴⁹ Thus, although Enhanced Best Practices must remain the remedy of first resort until band reconfiguration is complete—and will remain necessary for otherwise intransigent cases of unacceptable interference, their high transactional cost indicates that it would be unwise to rely on Enhanced Best Practices as the exclusive remedy for interference abatement over the long term.

122. Again we emphasize that Enhanced Best Practices remain powerful parts of the interference abatement arsenal. We agree with the Consensus Parties that all feasible remedies—including band reconfiguration and Enhanced Best Practices³⁵⁰—must be applied to the problem if our goal is to be reached. Therefore, we expect 800 MHz ESMR and cellular telephone licensees will continue to use Enhanced Best Practices to abate harmful interference until the completion of band reconfiguration. We do recognize that instances of residual harmful interference will crop up even after band reconfiguration but are confident that ESMR and cellular licensees can apply Enhanced Best Practices to resolve these cases. But, in our judgment, in the final analysis, the best long term solution requires a restructuring of the 800 MHz band to substantially reduce the need for case-by-case interference management.

123. In this connection, we recognize that some interference incidents may not be effectively

³⁴⁷ *Id.* at 12. Denver contends that it has spent in excess of \$130,000 to mitigate interference and Anne Arundel County estimates these costs to be “hundreds of thousands of dollars.” *See* Letter, dated November 3, 2003 from Alan Tilles, Esq., Counsel to the City and County of Denver to John Muleta, Esq., Chief, Wireless Telecommunications Bureau, Federal Communications Commission. *See also* Application for Review in WT Docket 02-100, filed August 6, 2003, by Anne Arundel County at 6.

³⁴⁸ *See* ¶ 41 *supra*.

³⁴⁹ *See* Letter, dated May 16, 2003, from Robert Foosaner, Senior Vice President and Chief Regulatory Officer to Nextel Marlene Dortch, Secretary, Federal Communications Commission at 14-15; Sun Fire Group Study at 11-13; Denver SOW at 1-2; Letter, dated December 19, 2003, from Regina M. Keeny, Counsel to Nextel to Michael J. Wilhelm, Esq., Federal Communications Commission at 10-11.

³⁵⁰ *See* Supplemental Comments of the Consensus Parties at 39.

addressed through use of Enhanced Best Practices. As a result some alternative redress may be needed prior to the completion of reconfiguration of the 800 MHz band. Given that channel swapping is essentially band reconfiguration on a micro scale, we anticipate looking favorably upon proposals mirroring the band plan set forth in this *Report and Order*. Conversely, we anticipate being less inclined to approve proposals that deviate from the band plan. We also delegate to the Chief of the Wireless Telecommunications Bureau the authority to grant whatever waivers are necessary to implement channel swap proposals.

b. Interference Abatement Rules and Procedures

(i) Mutual Notification Requirements Applicable to 800 MHz Licensees

124. We are adopting rules requiring ESMR and cellular telephone licensees to furnish to those public safety and CII agencies who request it, prior notice of at least ten business days before new cells are constructed or existing cells are modified.³⁵¹ Public safety and CII agencies which receive this information have the reciprocal obligation to inform ESMR and cellular telephone licensees whenever the public safety or CII licensee changes its system parameters. We take these steps in general agreement with those parties who believe that prior notice has a prophylactic effect on interference avoidance. Thus, if the characteristics of a proposed new cell are known in advance, it is possible to analyze the cell's potential for interference and make any necessary revisions to cell parameters before the cell is activated. For example, an ESMR or cellular telephone licensee could furnish the public safety or CII licensee or its representative, *e.g.* a frequency coordinator, the proposed parameters of a new cell sufficiently far in advance to allow these parties to analyze the cell's potential for interference and suggest any necessary changes that should be made before the cell is activated. This exchange of information can be performed in any manner agreeable to all parties involved. We decide to limit this notification entitlement to only public safety and CII licensees; and then only if they request ESMR and cellular telephone licensees to furnish them the information on a regular basis. We decline the alternative—requiring ESMR and cellular licensees to furnish the information whether requested or not—in the interest of avoiding the burden of producing and receiving unnecessary paperwork, and in fulfillment of our obligations under the Paperwork Reduction Act.³⁵² We do not require notification of other non-cellular 800 MHz licensees in consideration of the fact that their communications are unlikely to be of a mission-critical nature and because of the burden that could be imposed on the ESMR and cellular telephone carriers were it necessary to furnish information to large numbers of licensees, especially in urban areas. However, we do endorse, but do not require, ESMR and cellular telephone licensees furnishing notification information to any 800 MHz licensee requesting it; *e.g.*, because of frequent instances of interference. Finally, we impose a reciprocal obligation on public safety and CII licensees to provide notification of their facilities, and any modifications thereto, to ESMR and cellular telephone licensees requesting same.

125. The 800 MHz Users Coalition argues we should require prior coordination—rather than just notification—using the standards contained in TIA TSB-88A; but they have not stated precisely how TSB-88A would be useful in effecting prior coordination of cell sites.³⁵³ We note that TSB-88A was the result of studies of the impact of spectrum refarming and digital modulation on the frequency coordination

³⁵¹ We will not require ESMR or cellular telephone licensees to furnish prior notice information to non-public safety or non-CII licensees although we encourage the exchange of such information when specifically requested by a non-public safety or non-CII licensee.

³⁵² See Appendix B *infra*.

³⁵³ See 800 MHz Users Coalition May 29, 2003 *Ex Parte* at 6.

of land mobile radio systems and deals primarily with potential co-channel and adjacent channel interference.³⁵⁴ However, in the case of 800 MHz public safety systems, co-channel interference has not been identified as a significant problem. Although adjacent channel interference can be a factor—particularly in the interleaved 800 MHz channels—the interference mechanisms at work in most instances of 800 MHz public safety systems differ from those covered in TSB-88A. Moreover, although TSB-88A makes a passing reference to “noise generated by non-wireline cell sites”³⁵⁵ in its discussion of “Environmental RF Noise”³⁵⁶ the document is primarily directed to interference between high-site systems. Accordingly, although we believe that some parts of TSB-88A might be useful in 800 MHz interference analysis, *e.g.* the document’s discussion of coverage reliability;³⁵⁷ we do not think it wholly applicable to the environment in which 800 MHz public safety systems operate. We are aware of no agreed-upon coordination standards that address the OOBE and intermodulation interference that occurs in the immediate vicinity of cell sites; and thus are not mandating prior coordination of cell sites. However, we believe that notification of cell site parameters will allow some inferences to be drawn, on a case by case basis, relative to the cell’s potential for generating unacceptable interference.

126. The parameters most relevant to prior notification of a cell are its location, the effective radiated power, the antenna height, and the channels in use.³⁵⁸ Accordingly, we believe that non-cellular 800 MHz licensees should have such information available on request from ESMR and cellular telephone licensees and so require. We impose a similar requirement on public safety licensees (*i.e.*, to, upon request, provide their operating parameters to ESMR and cellular telephone licensees operating within the public safety systems’ coverage areas.). We are aware that some ESMR and cellular telephone licensees regard their operating parameters as proprietary and encourage such licensees to use non-disclosure agreement whereby third parties will not be given access to such information. Failing that, the affected parties may seek a protective order from the Commission.³⁵⁹ We also encourage, but do not require, that the matter be submitted to arbitration, mediation, or other alternative dispute resolution mechanism.

127. We stress that the prior notification provided to the public safety licensee is for informational purposes only: we are not affording public safety or CII licensees the right to accept or reject the activation of a proposed cell or to unilaterally require changes in its operating parameters. The principal purposes of notification are to: (a) allow a public safety or CII licensee to advise the ESMR or cellular telephone licensee whether it believes a proposed cell will generate unacceptable interference; (b) permit ESMR or cellular telephone licensees to make voluntary changes in cell parameters when a public safety or CII licensee alerts them to possible interference; and (c) rapidly identify the source if interference is encountered when the cell is activated. Thus, at the very least, the knowledge that a new ESMR or

³⁵⁴ See TSB-88A, June 1999 at vii (Introduction). The TIA document does not contemplate interference from low site ESMR and cellular telephone systems of the kind discussed herein. For example, intermodulation interference is discussed only in the context of base station receivers, not mobile or portable receivers. See *id.* at § 5.4.2-5.4.4.

³⁵⁵ TSB-88A, June 1999 at 36 ¶ 5.1.

³⁵⁶ *Id.*

³⁵⁷ *Id.* at 86.

³⁵⁸ See, *e.g.*, Project 39, Interference to Public Safety 800 MHz Radio Systems, *Interim Report to the FCC*, December 24, 2001 at 12-21. See also *Best Practices Guide* at 7-8; Motorola Comments at 20.

³⁵⁹ See Digital Output Protection Technology and Recording Method Certifications, *Order*, MM Docket 04-68, DA 04-716 (rel. Mar 17, 2004). See also 47 C.F.R §§ 0.457, 0.459.

cellular telephone cell was going to be activated on a given date would allow a public safety or CII representative to attribute interference to that cell if new interference were encountered where it had not existed before.

(ii) Responsibility for Mitigation Pre- and Post- Band Reconfiguration

128. The Consensus Parties envisioned that their unacceptable interference threshold provisions would go into effect only after band reconfiguration was complete. However, the severity of interference currently being encountered is such that we cannot responsibly let it go unaddressed in the interim. Given the demonstrated utility of Enhanced Best Practices, and the extensive other resources—technical, financial and otherwise—available to ESMR and cellular licensees, they currently are capable of eliminating unacceptable interference pending completion of band reconfiguration, albeit at the occasional expense of subscriber capacity limitations or the need to fund improvements to non-cellular systems. Although many ESMR and cellular licensees have been commendably cooperative in bearing the responsibility for identifying and promptly curing interference at their own expense; we believe it prudent to codify this previously voluntary effort into strict responsibility. Under that policy, any ESMR or cellular telephone licensee that causes, or contributes to, unacceptable interference to a non-cellular licensee is responsible for abating it promptly at its own expense. In so assigning responsibility, we place it on the party or parties best qualified and situated to take the actions necessary to ensure that first responders—both public safety and CII personnel—have communications channels free of unacceptable interference and which thus are suitable for mission-critical operations including rapid response to major attacks that threaten Homeland Security. Accordingly, as of the effective date of this *Report & Order*, ESMR and cellular carriers are strictly responsible for abating unacceptable interference as defined *supra*.³⁶⁰

129. We carefully considered alternatives to strict responsibility, including those discussed in the *NPRM* but found them either insufficiently effective or overly burdensome on the ESMR and cellular telephone industries. For example, we considered the comments of parties which advocated across-the-board limits on such cell parameters as maximum power flux density in the immediate vicinity of the cell, reduced effective radiated power, antenna vertical pattern restrictions, limits on the cumulative OOB from cell transmitters and the like.³⁶¹ However, we recognized that such limits would impose heavy burdens on ESMR and cellular telephone licensees, and that the restrictions would require modifications of cells that had little, if any, potential for generating unacceptable interference. Therefore, in lieu of adopting what could be draconian rules, we are affording ESMR and cellular telephone licensees the discretion to make any necessary changes to their own systems—or changes to non-cellular systems affected by unacceptable interference—as may be necessary to eliminate unacceptable interference.³⁶²

130. We assign strict responsibility for eliminating unacceptable interference when an ESMR

³⁶⁰ In imposing strict responsibility for the abatement of unacceptable interference we are doing no more than formalizing the interference-abatement responsibilities underlying the Commission's initial approval of cellular-architecture systems operating in the 800 MHz band. See *Fleet Call, Inc., Waiver Request* at 32-33. There the Commission noted that Fleet Call's statement about interference potential "firmly guides our consideration of Fleet Call's proposal." *Id.*

³⁶¹ See n. 305 and n. 306 *supra*.

³⁶² We decline to specify what remedies may be necessary in a particular circumstance, but observe that they could include responsibility for furnishing affected non-cellular systems with additional base stations or more interference-resistant mobile and portable radios.

or cellular telephone signal is solely implicated in an interference incident. In circumstances in which two or more ESMR or cellular telephone signals are implicated, strict responsibility must be reflected in the sources' joint and several responsibility for interference abatement. We say this in the knowledge that the interfering licensees are in the best position to determine their relative contributions to interference problems and to agree upon what specific measures must be undertaken by each licensee in order for interference abatement efforts to be effective. We wish it understood, however, that such responsibility does not attach merely because a licensee's cell is in the immediate vicinity of the locus of interference. Thus, we will not assign joint and several responsibility to ESMR and cellular telephone licensees that can demonstrate that their signals are not involved in a given interference case.³⁶³ However, in so saying, we emphasize that we have discounted claims, made earlier in this proceeding, categorically denying that licensees in the cellular telephone bands cause interference to 800 MHz public safety systems.³⁶⁴ There is strong evidence to the contrary.³⁶⁵ We will, therefore, require all involved parties, ESMR and cellular telephone licensees alike—and each of them severally—to respond to every complaint of interference to a non-cellular 800 MHz system with full cooperation and utmost diligence to abate objectionable interference in the shortest practicable time.

131. In sum, rather than impose stringent, across-the-board emission limits at this time, we are adopting rules that require ESMR and cellular telephone licensees to act only when and where it is evident that unacceptable interference is or will be caused to non-cellular 800 MHz systems, thereby affording such licensees a high degree of technical flexibility and minimizing the cost of interference avoidance.³⁶⁶ However, we will not extend the same level of flexibility to the procedures, and associated time limits, necessary to ensure that ESMR and cellular telephone licensees respond to complaints of interference to public safety/CII systems. Although some ESMR and cellular telephone licensees have been commendably cooperative in abating interference; the record shows that this has not always been the case.³⁶⁷ Thus, we assign ESMR and cellular telephone licensees strict responsibility for effectively curing actual or potential unacceptable interference to 800 MHz public safety/CII systems in the shortest practicable time.³⁶⁸ To a degree, this approach will test the wisdom of our forbearing system-wide stringent regulation of the technical aspects of ESMR and cellular telephone systems pending an assessment of whether licensees can successfully abate interference under the less stringent regulatory regime we establish today.

³⁶³ See 47 C.F.R. §§ 22.971(b)(2) and 90.673(b)(2) in Appendix C *infra*.

³⁶⁴ See, e.g., Verizon Comments at 2; Southern LINC Comments at 11; and Cingular Comments at 2-3. Some parties argued that reports of interference were anecdotal in nature, and for that reason, did not represent a true evaluation of the problem. See Cinergy Comments at 7-9.

³⁶⁵ See, e.g., Anne Arundel County *ex parte* letter dated July 29, 2003 at 2 (indicating that, in addition to Nextel, both Cingular and Verizon contribute to interference). See also Denver June 10 *Ex Parte* at 1 (stating that field measurements and analysis implicate AT&T Wireless as a source of interference).

³⁶⁶ See 47 C.F.R. §§ 22.972 and 90.674 in Appendix C *infra*.

³⁶⁷ See e.g., City of Portland, Oregon Comments at 3 (describing difficulty in securing Nextel's cooperation in resolving interference); Department of Information Technology, Fairfax County, Virginia Comments (indicating that Nextel causes interference but has implemented no mitigation measures); Attachment to Letter, dated September 17, 2003, from Alan H. Tilles, Counsel for City and County of Denver to Marlene H. Dortch, Secretary, Federal Communications Commission at 4 (stating that AT&T has taken no steps to mitigate ongoing interference).

³⁶⁸ See 47 C.F.R. §§ 22.972(c) and 90.674(c) in Appendix C *infra*.

(iii) Interference Resolution Procedures

132. We agree with those commenting parties that urged adoption of standardized procedures for reporting 800 MHz interference, identifying its source and implementing a solution.³⁶⁹ We believe the effectiveness of such procedures is optimized if they are associated with specific compliance deadlines and the industry's use of a common method of disseminating interference complaint information and related communications.

133. *Initial Notification.* We will require licensees operating cellular-architecture systems in or adjacent to the 800 MHz band (ESMR, Cellular A Band and Cellular B Band) to establish, within thirty days of the effective date of this *Report and Order*, a common electronic means of receiving initial notification of interference complaints from non-cellular 800 MHz licensees. Although we do not specify the means to be used, we do require that it be a single, common point (for example, a single, nationwide email address or web page) so that an affected entity need not provide multiple notices to different ESMR or cellular telephone licensees.³⁷⁰ We concur with the commenting parties who believe that, at a minimum, the initial interference complaint should include:

- the specific geographical location where the interference occurs, and the time or times at which the interference occurred or is occurring;
- a description of the scope and severity of the interference;
- the source of the interference if known;
- the relevant FCC licensing information of the party suffering the interference; and
- a single point of contact for the party suffering the interference.³⁷¹

134. The notification system shall be established on a strict "need-to-know" basis: the general public will not be able to access the system; only parties to a given interference complaint will have access to information concerning that complaint; and parties using the system will be required to agree to non-disclosure provisions. The Commission's Enforcement Bureau, however, will have unrestricted access to all information in the system and will not be bound by any non-disclosure provisions.

135. The Consensus Parties, in their proposed "Policies and Procedures for Post-Realignment Interference Mitigation,"³⁷² recommended that we require any ESMR or cellular telephone licensee within

³⁶⁹ See, e.g., Supplemental Comments of the Consensus Parties, Appendix F at F-5-6; Comments of Alltel, *et al.* to Supplemental Comments of the Consensus Parties, Appendix A at A-2-3; Comments of Consumers Energy to Supplemental Comments of the Consensus Parties, Appendix A at A-2-3; McDermott, Will and Emery *ex parte* presentation dated March 12, 2003, (McDermott, Will and Emery March 12 *Ex Parte*), Appendix A at A-2-3; 800 MHz User Coalition May 29 *Ex Parte*, Appendix A.

³⁷⁰ We note that Nextel currently has such a mechanism in place. Parties claiming that Nextel systems are causing interference to their systems can email public_safety@Nextel.com. See Attachment to Nextel October 22, 2003 *Ex Parte* at 3.

³⁷¹ See Comments of Cinergy to Supplemental Comments of Consensus Parties, Appendix A at A-2-3; Comments of Consumers Energy to Supplemental Comments of Consensus Parties, Appendix A at A-2-3; 800 MHz Users Coalition June 11, 2003 *Ex Parte* at 4.

³⁷² See Supplemental Comments of the Consensus Parties at Appendix F.

a 5,000 foot radius of an interference site to respond to an interference complaint within a maximum of two days. Other parties recommended similar distances and response times.³⁷³ We believe the 5,000 foot radius is reasonable for purposes of identifying those parties that must respond to an interference complaint;³⁷⁴ but note that we will not absolve parties with cell sites outside that radius from the responsibility for eliminating unacceptable interference if it is demonstrated that they are the source thereof.

136. We are less sanguine about the recommendation that a response to an interference complaint could be delayed for up to two days.³⁷⁵ An unresolved incident of unacceptable interference impairs the ability of the affected public safety or CII licensee to respond to an emergency, large or small. Given the ease of communicating interference complaints electronically, and the fact that many, if not most, ESMR and cellular telephone licensees have technical staff available or on call on an around-the-clock basis in the normal course of business, we believe that a response must come in a matter of hours, not days. We thus conclude that it is not unduly burdensome to require a response to complaints from public safety or CII licensees with all possible speed, and under no circumstances, in more than twenty-four hours. In the case of other non-cellular 800 MHz licensees, (*i.e.*, B/ILT and non-cellular SMR licensees), the maximum response time shall be forty-eight hours, acknowledging that, for the most part, communications on these latter systems are not safety-related.

137. *Interference Analysis.* We will require licensees receiving an initial notification of interference to perform a timely analysis and identification of the interference, including, whenever necessary, an immediate on-site visit if they have cellular architecture equipment operating within 5,000 feet of the interference incident. Licensees must complete this analysis and initiate corrective action within forty-eight hours of the initial complaint if the licensee is a public safety or CII licensee. In the case of other non-cellular 800 MHz licensees, the time to complete the analysis and initiate corrective action shall be ninety-six hours. In both cases the time period may be extended if the affected licensee reasonably agrees, in writing (including e-mail or other electronic means which creates a record), to a longer period.

138. We disagree with those parties that suggest that the analysis or on-site visit could safely be delayed for up to five working days of the date of the original complaint.³⁷⁶ We assume that an ESMR or cellular telephone operator would not allow a failure in a critical element of its network to remain uncorrected for five working days, and thus believe that forty-eight hours (ninety-six hours in the case of other than public safety and CII systems) is a generous allowance for ESMR or cellular telephone carriers to determine (including making any necessary site visits), whether their operations are interfering with public safety, CII or other 800 MHz communications. In focusing on the obligations of ESMR and

³⁷³ *Id.* at F 5-6; Comments of Alltel, *et. al* to Supplemental Comments of the Consensus Parties, Appendix A at A-2; McDermott, Will and Emery March 12 *Ex Parte*, Appendix A at A-2, item B.2; 800 MHz User Coalition May 29 *Ex Parte*, Appendix A at 5.

³⁷⁴ See *e.g.*, Motorola *ex parte* presentation dated October 30, 2002 (Using data taken in the Chicago area, Motorola demonstrates that—beyond 5,000 feet—the signal strength from ESMR base stations would be insufficient to cause intermodulation interference to a radio with 70 dB intermodulation rejection ninety-percent of the time).

³⁷⁵ See *e.g.*, Supplemental Comments of the Consensus Parties at Appendix F, § 3.2; 800 MHz User Coalition June 11, 2003 *Ex Parte* at 5.

³⁷⁶ See Supplemental Comments of the Consensus Parties at Appendix F at F 6; Comments of Alltel, *et. al.* to Supplemental Comments of the Consensus Parties, Appendix A at A-3; McDermott, Will and Emery March 12 *Ex Parte*, Appendix A at A-3, item 3; 800 MHz User Coalition May 29 *Ex Parte* presentation, Appendix A at 5.

cellular telephone licensees we do not mean to imply that similar obligations do not attach to public safety, CII and other non-cellular 800 MHz licensees. They are bound by the good-faith obligation to exhibit the utmost cooperation with the ESMR and cellular telephone representatives, including, without limitation, the obligation to timely meet appointments and provide whatever technical assistance is appropriate under the circumstances.

139. *Mitigation Steps.* Although we leave the means whereby interference is abated to the discretion of the involved ESMR and cellular telephone licensees, we couple this discretion with an obligation on such licensees to provide all test equipment (and technical personnel skilled in the operation of such equipment) necessary to determine the most appropriate means of timely eliminating the interference. The record contains considerable guidance concerning techniques that parties can apply to the problem, including those described in the *Best Practices Guide*, the separately issued Motorola *Technical Appendix* thereto,³⁷⁷ and the recently described measurement protocol for ascertaining the exact interference mechanisms involved in a given complaint.³⁷⁸ We expect parties to resolve interference in the shortest practicable time; however, should all short-term measures prove inadequate, we recognize that parties sometime cannot readily or rapidly implement other remedial measures—for example, “channel swaps” or the installation of new or modified base stations.³⁷⁹ In such cases, we believe a rule of reason should apply and that the licensee affected by interference, while not compromising safety, should make all necessary concessions to accepting the interference until the implementation of longer-term remedies.³⁸⁰ However, we will consider the failure to timely implement an interference abating remedy—whether it be near term or long term—as evidence of bad faith and will deal with it accordingly.

140. We also provide public safety licensees a “safety valve” for use when the continued presence of interference constitutes a clear and imminent danger to life or property.³⁸¹ Under such circumstances, we will require the interference source(s) to immediately discontinue operation, pending the identification and application of corrective measures. The request for this action: (a) must be made by affidavit or statement under penalty of perjury,³⁸² from an officer or executive of the affected public safety

³⁷⁷ See generally Appendix D *infra*.

³⁷⁸ See Motorola April 11, 2003, *ex parte* presentation to Federal Communications Commission Office of Engineering and Technology at 15-17.

³⁷⁹ In cases in which intractable interference problems have not yielded to other technical remedies, Nextel and public safety licensees have entered into agreements for “channel swaps,” whereby Nextel moves its 800 MHz ESMR operations to the public safety licensees’ channels and the public safety licensee relocates its operations to Nextel’s ESMR frequencies. Under these agreements, Nextel would pay all or most of the expense associated with equipment retuning or replacement. The Commission has granted several applications implementing channel swaps in Anne Arundel County, Maryland. See, e.g., Application for Modification of License of Station KNJU756, File No. 476003. The Commission is also reviewing another such agreements between Nextel and the City of Denver. We also have been informed that the city and county of San Diego, California are considering similar agreements. See generally, Denver SOW and San Diego *Ex Parte*. As yet, insufficient information exists on the results of channel swaps to allow us to assess their efficacy. However, we believe that the swaps will provide a test bed for band reconfiguration, to the extent they yield valuable information on process; *i.e.*, the time required to negotiate the agreements; the determination and apportionment of costs and responsibilities, the time required to make the necessary technical changes, and the disruption, if any, of public safety services.

³⁸⁰ Should disputes arise in connection with such matters, parties are encouraged to resolve them using arbitration, mediation or other alternative dispute mechanisms.

³⁸¹ We stress that we only provide this “safety valve” to public safety licensees.

³⁸² See 47 C.F.R. § 1.16.

licensee; (b) shall completely describe the basis of the claim of clear and imminent danger; (c) must be stated to be on personal knowledge or on belief after due diligence; (d) may not be made by a contractor or other third party; and (e) will not be effective until approved by an official of the Commission's Wireless Telecommunications Bureau or other authorized Commission official. The public safety party must serve the statement on the ESMR and/or cellular telephone licensee by hand-delivery or receipted fax and transmit a copy by fastest available means to the Washington, D.C., office of the Wireless Telecommunications Bureau.³⁸³ If the Wireless Telecommunications Bureau determines that the claim of imminent and present danger is valid, it will immediately refer the matter to the Enforcement Bureau for appropriate action. Any party alleging intentional or negligent misrepresentation or omission in such an affidavit or statement made under penalty of perjury may submit documentation thereof to the Commission's Enforcement Bureau; whereupon the Enforcement Bureau may institute an enforcement action which could result in, without limitation, forfeitures and license revocation. Such Commission action would be in addition to, and not to the exclusion of, other remedies available under local, state or federal law.

141. Finally, we note that we will monitor interference complaint data on an ongoing basis to ensure the interference abatement objectives addressed in this proceeding will continue to be accomplished both before and after band reconfiguration. We emphasize that our responsibility to ensure that 800 MHz non-cellular licensees do not suffer from unacceptable interference from CMRS carriers will be complaint-driven, and we urge affected licensees to carefully monitor their systems and promptly report any incidents of unacceptable interference to the relevant CMRS carrier(s).³⁸⁴ To the extent that our experience reveals that the interference abatement procedures we adopt today require refinement to ensure high-quality 800 MHz public safety or CII service, we will do so as necessary.

C. Band Reconfiguration

142. As noted in the Introduction to this *Report & Order*, the root of the instant problem lies in fundamentally incompatible mix of two types of communications systems in the 800 MHz band: cellular-architecture multi-cell systems—used by cellular telephone and ESMR licensees—and high site systems—used by public safety, private wireless and non-cellular SMR licensees. For the reasons discussed below,³⁸⁵ we believe reconfiguring the 800 MHz band to separate these incompatible technologies, supplemented, when necessary with, Enhanced Best Practices provides the best long-term solution to the problem of interference in the 800 MHz band.³⁸⁶

1. Technical Issues Addressed by Band Reconfiguration

143. Segregating ESMR systems from non-cellular systems by placing them in opposite segments of the 800 MHz band will make it possible for ESMR and cellular telephone licensees to avoid some intermodulation interference. However, in some instances, consolidating ESMR channels into a single band segment may not—in and of itself—sufficiently reduce unacceptable intermodulation

³⁸³ The Washington, D.C. office of the Wireless Telecommunication Bureau is: 445 12th Street SW, Washington, D.C. 20554. Complaints should be addressed to the Public Safety and Critical Infrastructure Division.

³⁸⁴ We recommend, but do not require, that the affected parties keep records of interference complaints and the resolution thereof; and make such records available to the Commission on request.

³⁸⁵ See ¶¶ 143-146 *infra*.

³⁸⁶ We take these steps pursuant to our authority under Sections 316, 303, 301 and 154(i) of the Act. See ¶¶ 62-87 *supra* for our legal authority to address this issue.

interference. The Radio Frequency (R.F.) carriers of systems in a consolidated ESMR band segment (and at least a portion of the R.F. carriers in cellular telephone systems), would still fall within the passband of all current public safety portable and mobile receivers. Thus, even in a reconfigured 800 MHz band, ESMR channels, or ESMR and cellular telephone channels could still, when combined in the receiver, generate intermodulation products. Therefore, as we discuss below, we believe that abatement of unacceptable intermodulation interference will require more than segregating cellular architecture systems from non-cellular systems.³⁸⁷ Thus, for example, ESMR licensees will have to make careful choice of channel selection such that two or more channels at a cell do not produce an intermodulation product falling on a public safety or CII channel.

144. Consolidating ESMR systems into one continuous segment in the upper portion of the 800 MHz band will provide ESMR licensees with greater flexibility in selecting channel pairs. The spacing between ESMR channels determines where intermodulation products will fall in the band. With closely spaced ESMR channels, the intermodulation products fall into—or just below—the upper portion of the ESMR segment of the reconfigured band. As the cell channel spacing increases, the intermodulation products become further removed from the ESMR band segment, extending further down into the non-cellular channels—including channels used by public safety systems. In the reconfigured band, a careful ESMR channel choice could reduce the potential for intermodulation interference generated between the ESMR channels in a given cell. Given careful coordination among licensees, it will also be possible, in some instances, to avoid intermodulation products formed by a combination of ESMR channels and cellular telephone channels. However, considerably more care is required when two licensees are involved. Close-spacing of channels is often not an option in that circumstance;³⁸⁸ however, it still may be possible to avoid channel combinations that result in intermodulation products falling on specific frequencies used by public safety/CII systems. This latter solution may be more difficult to implement when cellular telephone systems use dynamic channel allocation whereby the channels in a given cell can change frequently, *e.g.*, on an hourly basis, in response to traffic loads. Moreover, some cellular telephone systems may make more use of technology, such as CDMA, in which wider bandwidth carriers produce IM products with a wider bandwidth thus potentially affecting more frequencies.

145. We believe that a reconfigured 800 MHz band will permit future public safety radios to be more interference resistant. Because there currently are public safety channels scattered throughout the 800 MHz band, from the bottom of the General Category band segment at 806 MHz/851 MHz to the top of the NPSPAC channels at 824 MHz/869 MHz, the device called, variously, the “preselector” or “input filter” of the public safety radio must be sufficiently wide to cover the complete 851-869 MHz range, including the current ESMR channels which fall at 861-866 MHz. Narrowing the range of Public Safety frequencies allows equipment manufacturers to utilize narrower filters that will attenuate potentially interfering signals higher in the band.³⁸⁹

³⁸⁷ See ¶ 144 *infra*.

³⁸⁸ For example, the Consensus Parties propose relocating all ESMR channels to the 862-869 MHz band segment while all cellular telephone channels would remain in the adjacent 869-894 MHz band segment. Thus ESMR and cellular telephone channels could be closely spaced only in the upper portion of the ESMR band segment, which corresponds to the lower portion of the cellular telephone band segment.

³⁸⁹ In a sense, the preselector or input filter is the “front door” of the radio which currently must be open wide enough that potentially interfering ESMR signals can enter unimpeded. However, when the 800 MHz band is reconfigured, the “front door” need be opened only widely enough to admit signals from 851-862 MHz. With the door not open as wide, signals above 862 MHz—including ESMR and cellular telephone signals—would have a difficult time squeezing through and causing interference.

146. In sum, while band reconfiguration, in conjunction with careful engineering of cell sites, will reduce intermodulation interference between ESMR channels *inter sese*, it is apparent that particular care will have to be exercised when both ESMR and cellular telephone channels are implicated. In the long term, however, band reconfiguration will result in a net reduction in both unacceptable OOB and intermodulation interference for the following reasons:

- Nextel will completely relinquish rights to all of the interleaved channels, relieving OOB interference to licensees operating non-cellular systems on the interleaved portion of the band.³⁹⁰
- Nextel will relocate its systems operating on General Category channels to the upper portion of the 800 MHz band, therefore relieving OOB interference that these systems currently can cause to non-cellular systems operating on channels immediately above the General Category channels.³⁹¹
- Reconfiguring the 800 MHz band to separate cellular systems from non-cellular systems will substantially reduce interference to public safety created by OOB by allowing ESMR licensees to replace current base station transmitter duplexers with new duplexers that will “roll-off” RF energy immediately below 862 MHz.³⁹²
- Consolidation of Nextel channels in the upper portion of the band will give ESMR operators and cellular telephone licensees greater flexibility to make a judicious choice of channel selection and channel spacing, thereby either confining potential ESMR intermodulation interference to a smaller portion of the non-cellular segment of the band, or limiting intermodulation products that fall on given CII or public safety channels.³⁹³
- We anticipate that, after band reconfiguration, equipment manufacturers will design public safety radios to cover only the portion of the 800 MHz band below 817/862 MHz because no public safety system will be operating in the ESMR spectrum above 817 MHz/862 MHz.³⁹⁴ Thus, with public safety radios no longer required to cover the entire 800 MHz band, the first R.F. amplifier (“preselector”) of the public safety radio can be designed to attenuate the potentially interfering ESMR and cellular telephone signals originating from systems that operate above 817 MHz/862 MHz.

147. Although reconfiguration of the 800 MHz band will eliminate the interference-prone interleaving of ESMR and public safety systems in the 800 MHz band, it will require changing the operating frequencies of many 800 MHz public safety, CII and other non-cellular licensees. This will be done incrementally in the fifty-five Regional Planning areas in the United States. In general, more modern

³⁹⁰ See Supplemental Comments of the Consensus Parties at 14.

³⁹¹ *Id.*

³⁹² *Id.* at Appendix F, F-8 § 4.1.2.

³⁹³ See Attachment to Letter, dated September 17, 2002 [sic], filed September 22, 2003 from Alan S. Tilles, Esq. Counsel to the City and County of Denver to Marlene H. Dortch, Secretary, Federal Communications Commission at 7.

³⁹⁴ We expect that most public safety systems will operate below 814/859 MHz, but public safety systems will have the option of operating in the Expansion Band or Guard Band segments between 814-817/859-862 MHz should they elect to do so.

800 MHz systems can be changed in frequency with only minor changes, most of which can be implemented in software.³⁹⁵ Older systems may require part changes, and, in some instances, replacement of entire transmitters and receivers. The overall band reconfiguration process will also require spectrum “green space,” for example, Nextel systems in the General Category band segment would be moved temporarily into Nextel spectrum at 900 MHz, thereby “clearing” the General Category band segment. Next, the current NPSPAC channels would be moved into the cleared space at 806-809 MHz/851-854 MHz. Nextel has accomplished band reconfiguration before, albeit on a smaller scale, when it cleared the Upper 200 channels of incumbent users. Based on data derived from inspection of sixteen public safety systems of varying complexity, Nextel has estimated the total cost of band reconfiguration at \$850 million and has pledged to pay up to that amount. There is some disagreement over Nextel’s estimates; but no real basis of choosing among competing band reconfiguration proposals on the basis of price: Nextel is the only party to this proceeding that has made a firm commitment to absorb the cost of band reconfiguration, including reconfiguration of its own systems, a factor not included in the \$850 million estimate.³⁹⁶

148. We are sensitive to the concerns of those parties, including some public safety agencies whose systems do not now receive interference from ESMR and cellular telephone cells, who assert that reconfiguring the 800 MHz band could unnecessarily disrupt their communications while their operating frequencies are changed, or that their new channels would not be comparable to their original channels.³⁹⁷ We are committed to ensuring that band reconfiguration will not result in degradation of existing service. We believe the rules we adopt today will ensure both continuity of service and “comparable facilities.” With respect to the latter, we note that the rules we adopt today track rules the Commission has successfully used to accomplish previous band reconfigurations.³⁹⁸

2. New 800 MHz Band Plan

a. Band Plan Overview

149. In evaluating the various band reconfiguration plans submitted in this proceeding, we sought to identify, in each plan, five principal components that we deemed essential to the final “Commission Band Plan”:

³⁹⁵ On July 30, 2003, the Consensus Parties conducted a live demonstration of base station and portable retuning using both Motorola and Kenwood equipment. The retuning was accomplished within a brief period without the need to change any system components. The “down-time” of the equipment was minimal. In one instance, the technicians demonstrated use of a portable base station that was substituted, temporarily, for the equipment being retuned. In the latter demonstration, the only “down-time” was the few seconds required to disconnect and reconnect the system antennas. The Consensus Parties do not claim, nor do we believe, that all systems could be retuned with equal facility; however the demonstration suggests that retuning time need not be a concern when modern equipment is involved.

³⁹⁶ The Consensus Plan envisions that Nextel would fund the reconfiguration of its own systems separately. See Attachment to Letter, dated March 14, 2004, from Regina M. Keeney, Esq., Counsel to Nextel to Marlene H. Dortch, Secretary Federal Communications Commission.

³⁹⁷ Some such concerns were directed to the Nextel *White Paper* proposal in which B/ILT and non-cellular SMR facilities all were to be relocated to the 700 MHz Guard Band and the 900 MHz land mobile band. That proposal was superseded by the band plan proposed by the Consensus Parties, which retains incumbents in the 800 MHz band, excepting those electing a “2 for 1” proposal whereby they would obtain double their existing spectrum if they relocated from 800 MHz to 900 MHz. See Supplemental Comments of the Consensus Parties at 13.

³⁹⁸ See, e.g., 47 C.F.R. § 90.699(d).

- The extent to which a plan would abate unacceptable interference to non-cellular systems operating in the 800 MHz band.
- The extent to which incumbents would be treated most fairly, including the degree of disruption associated with channel changes, the ability to provide relocated incumbents with truly comparable spectrum and minimum interruption of critical public safety and CII communications. These factors weighed heavily in our rejection of proposed band plans that contemplated using the Upper 700 MHz spectrum for public safety systems.³⁹⁹
- A configuration of 800 MHz cellular-architecture channels that would make intermodulation interference less likely—a factor that argued in favor of plans that placed ESMR spectrum in a contiguous block.⁴⁰⁰
- A configuration that would allow effective filters to attenuate signals that fell in the portion of the reconfigured band used by public safety and CII systems.⁴⁰¹
- The amount of additional 800 MHz spectrum in which public safety would have a right to operate.⁴⁰²

³⁹⁹ The proposal to use the Upper 700 MHz band for public safety was advanced by, among others, AT&T Wireless, Cingular, Alltel, Southern LINC and CTIA. *See* AT&T Wireless Comments at 7-14; Cingular and Alltel Comments at 16-19; CTIA Comments at 9-10; Alltel, *et al.* Reply Comments at 15-18; CTIA Reply Comments at 4-7; Southern LINC Reply Comments at 14-25. We find these plans inferior to most of the other band plans submitted. As an initial matter, the 700 MHz spectrum is unusable in most parts of the country because it is encumbered by television stations—a condition likely to persist for several years. In addition, some of these commenting parties envisioned that, when public safety is moved to the Upper 700 MHz band, the 800 MHz spectrum vacated by public safety licensees could be auctioned to pay for relocation costs. *See* Cingular and Alltel Comments at 17-18; CTIA Reply Comments at 7. However, no party advancing this proposal has provided either estimates of the cost of relocating the 800 MHz public safety licensees or the revenue that might be obtained from auctioning vacated 800 MHz spectrum. Thus, the economic feasibility of implementing these plans is highly problematic.

⁴⁰⁰ For instance, Nextel states that once it vacates the interleaved spectrum and consolidates its systems in the 816-824 MHz /861-869 MHz band segment, it will be better able to control the spread of intermodulation products from its cell sites. *See* Nextel Reply Comments, Appendix II at 3; Comments of Nextel to Consensus Parties Reply Comments, Appendix I at 3. By limiting the span between the highest and lowest frequency at any given cell site, Nextel indicates that it will be able to avoid producing third-order intermodulation products that fall on portions of the band occupied by public safety systems. Because an instance of two-tone third-order intermodulation interference is defined by the relationship $F_{\text{INTERMOD}} = 2 \cdot F_1 - F_2$, limiting the difference between the highest and lowest frequency at a cell site correspondingly limits the range over which third-order intermodulation products will fall. *See* Motorola Comments at 18-19.

⁴⁰¹ *See* Supplemental Comments of the Consensus Parties at 43 and Appendix F at F-8, item 4.1.2. Nextel believes that reconfiguring the 800 MHz band to separate cellular systems from non-cellular systems will substantially reduce interference to public safety created by OOBE. Nextel states that if the 800 MHz band is reconfigured, it can replace current base station transmitter duplexers with new duplexers that will “roll-off” RF energy immediately below 861 MHz. *See* Comments of Nextel to Consensus Parties Reply Comments, Appendix I at 1-2.

⁴⁰² The Consensus Plan offers additional spectrum rights to public safety by giving it exclusive access to channels below 816/861 MHz that are either vacated by Nextel or by licensees who relocate above 816MHz/861 MHz as described in ¶¶ 152, 158 *infra*. This exclusive access will last for a five-year period after the completion of band reconfiguration. *See* Consensus Parties Reply Comments at 25. By contrast, Motorola and Preferred proposed plans which provide no additional spectrum rights for public safety after band reconfiguration. *See* (continued....)

150. Although the thrust of our analysis was centered on the 800 MHz band, we also took into account the technical and economic fallout that a given 800 MHz band plan would have on other bands such as the Upper 700 MHz band, the 700 MHz Guard Band, the 700 MHz Public Safety Band, the 900 MHz band, and bands in the 1.5 GHz to 2.1 GHz region; all of which, in one fashion or another, came into play in the overall band reconfiguration proposals evaluated.

151. Of the various plans considered, the Consensus Plan offered benefits in each of the foregoing categories discussed in ¶ 149 *supra* and pointed us to the development of a Commission Band Plan consistent with our goals in this proceeding:

- abating harmful interference currently being encountered by 800 MHz public safety systems;
- minimizing disruption to existing services;
- responsibly managing the spectrum involved—constituting portions of the 700 MHz, 800 MHz, 900 MHz and 1.9 GHz bands⁴⁰³; and
- providing additional spectrum rights for public safety.

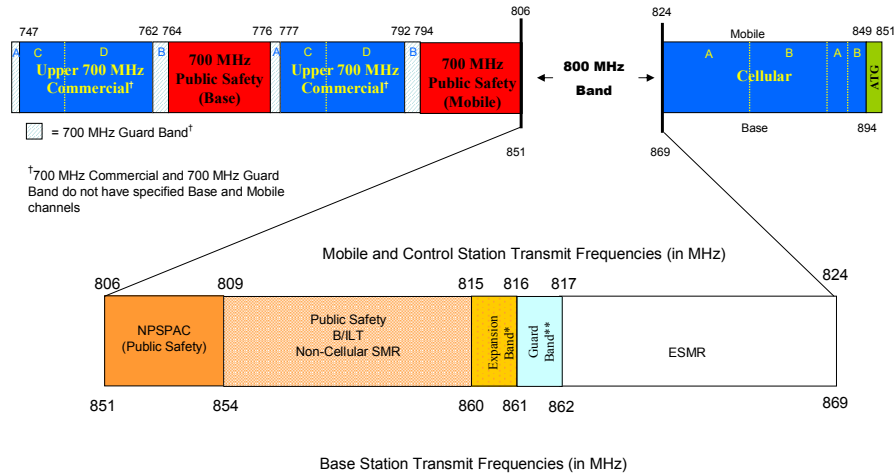
Consequently, we are adopting the following plan for the 800 MHz band.

(Continued from previous page) _____

Motorola Reply Comments at 8; Comments of Preferred to the Consensus Parties Reply Comments at 17. NAM and M/A COM propose plans whereby public safety will likely lose spectrum rights in markets where public safety currently operates systems in the General Category (Ch 1-150). For instance, under NAM's original plan, public safety receives only 0.25 x 0.25 MHz of spectrum rights to relocate systems from the General Category. Therefore, under that plan, public safety would lose spectrum rights in any market where it currently occupies more than ten channels in the General Category. M/A COM's proposal offers no spectrum rights for relocating public safety systems from the General Category. Therefore, under M/A COM's proposal, public safety would lose spectrum rights in markets where public safety occupies any spectrum in the General Category. *See NPRM*, 17 FCC Rcd at 4885 ¶ 22; M/A COM comments at 10. UTC proposed a plan which appears to substantially reduce the amount of spectrum public safety would have access to after band reconfiguration. UTC would allow licensees in the "lower 80" SMR channels to exchange rights with public safety licensees in the NPSPAC band. Under UTC's plan, however, public safety would exchange 3 x 3 MHz of contiguous NPSPAC spectrum rights for rights to 2 x 2 MHz non-contiguous spectrum in the interleaved portion of the band. *See UTC Comments* at 26-28.

The OH MARCS, DC OCTO and the original Nextel White Paper plans offer public safety rights to more spectrum after band reconfiguration than the Consensus Plan. *See OH MARCS Comments* at 5-9; DC OCTO Comments at 6-11 and *NPRM* at 4886-87 ¶¶ 23-25. Nonetheless, the OH MARCS's plan is inferior from an interference mitigation standpoint because it would leave NPSPAC systems immediately adjacent to cellular telephone A-band systems. The DC OCTO plan and the original Nextel White Paper proposals are inferior because of their excessive cost and disruption. Thus, the DC OCTO plan would require almost every non-cellular licensee to relocate within the 800 MHz band. The original Nextel White Paper proposal would require moving all B/ILT and Non-cellular SMR systems out of the 800 MHz band into the 700 MHz and 900 MHz bands.

⁴⁰³ *See NPRM*, 17 FCC Rcd 4887 ¶ 26. With regard to our management of the 1.9 GHz band, we note that we are rededicating five megahertz of spectrum from UPCS—a service for which no equipment has been verified by the Commission—to land mobile communications, thus making more efficient use of the spectrum by bringing new service to the public and rededicating five megahertz of spectrum to land mobile use from "reserve" MSS spectrum, thus providing the opportunity for initiation of a service that may be more immediately and widely used by the public.

New 800 MHz Band Plan⁴⁰⁴

*No public safety system will be required to remain in or relocate to the Expansion Band; although they may do so if they choose.

**No public safety or CII licensee may be involuntarily relocated to occupy the Guard Band.

Non-Cellular Portion (806-817 MHz/851-862 MHz)

- **NPSPAC:** Only NPSPAC systems will eligible to operate in the 806-809 MHz/851-854 MHz band segment (Channels 1-230, 25 kHz channels spaced every 12.5 kHz).
- **Interleaved:** The interleaved portion of the band at 809-815 MHz/854-860 MHz (Channels 231-470 spaced every 25 kHz) will consist of public safety, B/ILT and SMR channels interleaved. Public safety and CII agencies will have exclusive access to the 809-809.75 MHz/854-854.75 MHz band segment (Channels 231-260 spaced every 25 kHz) and the channels vacated by Nextel below 815 MHz/860 MHz.⁴⁰⁵
- **Expansion Band:** The Expansion Band at 815-816 MHz/860-861 MHz (Channels 471-510 spaced every 25 kHz) will consist of B/ILT and SMR channels interleaved.⁴⁰⁶ The Expansion Band may also be used to house non-Nextel ESMR systems, as discussed *infra*.⁴⁰⁷ No public safety system will be required to remain in or relocate to the Expansion Band; although they

⁴⁰⁴ As with the current 800 MHz band plan, adjustments will be necessary in the areas bordering Canada and Mexico to provide for an equitable distribution of channels with those countries. See ¶¶ 175-176 *infra*.

⁴⁰⁵ See ¶¶ 152-153 *infra*.

⁴⁰⁶ We believe that, under most circumstances, the Expansion Band offers B/ILT, CII and non-cellular SMR licensees equivalent capacity and quality of service as defined in 47 C.F.R. § 90.699(d).

⁴⁰⁷ See ¶ 162 *infra*.

may elect to do so.⁴⁰⁸

- Guard Band: The Guard Band at 816-817 MHz/861-862 MHz (Channels 511-550 spaced every 25 kHz) will consist of forty channels available to any 800 MHz licensee. Any licensee operating below 817 MHz/862 MHz may elect to relocate to the Guard Band. The Guard Band may also be used to house non-Nextel ESMR systems, as discussed *infra*.⁴⁰⁹ No 800 MHz licensee may be involuntarily relocated into the Guard Band. Licensees in the Guard Band will receive less interference protection than licensees operating in lower portions of the non-cellular portion of the band as discussed *infra*.⁴¹⁰

Cellular Portion: (ESMR systems at 817-824 MHz/862-869 MHz)

152. As we discuss *infra*, we decline to adopt those portions of the Consensus Plan that contemplate relinquishment of Nextel's 900 MHz spectrum rights.⁴¹¹ With regard to the "running average" of 2.5 megahertz of spectrum rights that Nextel is surrendering in the interleaved segment of the 800 MHz band, we restrict eligibility for this spectrum to public safety licensees for three years from the effective date of this *Report and Order* and to public safety/CII licensees for an additional two years from that date.⁴¹² We make an identical provision for channels vacated by licensees that voluntarily relocate to the 816-817 MHz/861-862 MHz band segment. We believe providing these windows of limited eligibility meets our spectrum management goals by accommodating the generally slow budgetary process of public safety agencies and the express needs of CII licensees, before making the spectrum generally available to other 800 MHz non-cellular licensees, *i.e.* B/ILT and non-cellular SMR licensees.⁴¹³

153. Furthermore, in order to relocate NPSPAC systems to the bottom portion of the band, the Consensus Plan calls for clearing only the 806-809 MHz/851-854 MHz portion of the General Category (Channels 1-120 prior to band reconfiguration). We will require, however, that all non-public safety or non-CII licensees operating in the General Category (Channels 1-150 prior to band reconfiguration) relocate to the Guard Band, Expansion Band or interleaved portion of the band. The thirty remaining General Category channels available after the NPSPAC band is relocated will be available only to public safety licensees for three years from the effective date of this *Report and Order* and to public safety/CII

⁴⁰⁸ See ¶ 154-155 *infra*.

⁴⁰⁹ See ¶ 162 *infra*.

⁴¹⁰ See ¶ 158 and Figure 1 *infra*.

⁴¹¹ See ¶ 207 *infra*.

⁴¹² This time period is a modification of the Consensus Parties' original proposal to only allow public safety access to this spectrum for a five-year period. See Supplemental Comments of the Consensus Parties at 12. Our modification comes in response to the comments of CII parties who found this too restrictive. See, *e.g.*, Comments of Alliant Energy to Supplemental Comments of the Consensus Parties at 4, and Comments of Amaren to Supplemental Comments of the Consensus Parties at 10-11. If Nextel does not surrender its rights to operate on this spectrum, Nextel channels would remain adjacent to public safety channels potentially causing adjacent channel OOB interference, one of the major types of interference we are seeking to abate in this proceeding.

⁴¹³ See "Public Safety and Sound Spectrum Management Go Hand in Hand," Keynote Address by Federal Communications Commission Commissioner Kathleen Q. Abernathy to the National Forum on Public Safety Spectrum Management, February 10, 2004. We make these modifications under the authority granted us by Sections 4, 301, 303 and 316 of the Act, 47 U.S.C. §§ 316, 303, 301, and 154(i). We set forth a detailed description of our legal authority in ¶¶ 62-87 *supra*.

licensees for an additional two years from that date.⁴¹⁴ Therefore—regardless of how much spectrum Nextel occupies in any given region—public safety and then CII licensees will have nationwide access to thirty channels or 1.5 megahertz of spectrum immediately adjacent to the relocated NPSPAC band.

b. Expansion Band

154. We establish an “Expansion Band” in the 815-816 MHz/860-861 MHz segment of the 800 MHz band to provide public safety licensees spectral separation from the cellular portion of the band. Although occupants of the Expansion Band will receive full interference protection, we note the Consensus Parties comments indicating that those licensees who operate in the 2 x 2 MHz segment of the band immediately adjacent to the cellular portion of the band should employ “campus-type” or other interference-resistant type systems.⁴¹⁵ Therefore, we believe it prudent to allow all public safety licensees the option to relocate from this portion of the band and no public safety licensee will be forced to relocate to this portion of the band. Nonetheless, any public safety licensee who willingly chooses to remain or relocate to the Expansion Band may do so.

155. The establishment of the Expansion Band required us to revise the chart in our rules that specifies channels for public safety use in the 800 MHz band.⁴¹⁶ Specifically, twelve channels currently designated for public safety use are located within the newly created Expansion Band. Because we are allowing public safety licensees to relocate out of the Expansion Band, we needed to find a new “home” for these twelve public safety channels. Therefore, we “exchanged” these twelve public safety channels for twelve SMR channels located below the Expansion Band. As a result of this exchange, all public safety channels will now be located below the Expansion Band. In order to ensure that non-cellular SMR licensees lose no spectrum in this “exchange,” licensees from this category will now have access to the former twelve public safety channels located in the Expansion Band.⁴¹⁷

156. The current chart designating public safety channels, lists the channel in groups with channels separated by one megahertz⁴¹⁸ as a concession to the fact that the combiners used in a trunked system to combine the output of multiple transmitters into a single antenna can introduce excessive loss if used with channels that are too closely spaced.⁴¹⁹ In modern systems, however, combiners suffer negligible loss even when the input channels are spaced as little as 250 kHz apart;⁴²⁰ thus in the revised table, we

⁴¹⁴ See 47 C.F.R. § 90.615 in Appendix C *infra*.

⁴¹⁵ See Consensus Parties Reply Comments at 9.

⁴¹⁶ See 47 C.F.R. § 90.617(a), Table 1 in Appendix C, *infra*.

⁴¹⁷ Because we “exchanged” all public safety channels in the Expansion Band with SMR channels, the Expansion Band will consist of a mix of B/ILT and SMR channels. Nonetheless, we will allow public safety licensees to remain in the Expansion Band if they so choose. In addition, any public safety licensee who chooses to relocate to the Expansion Band may do so through inter-category sharing. See 47 C.F.R. §§ 90.621(e) and 90.677 in Appendix C *infra*.

⁴¹⁸ See 47 C.F.R. § 90.617(a), Table 1.

⁴¹⁹ “Loss” in this context refers to the attenuation of the transmitter carrier when it passes through the combiner. The loss is dissipated in the form of heat and the net result is that the ERP—and hence the coverage—of a system can be reduced significantly if the combiner introduces excessive loss.

⁴²⁰ See Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010; Establishment of Rules (continued....)

separate grouped public safety channels by 500 kHz.⁴²¹ Since the new twelve public safety channels were pulled from the SMR pool, there will be non-cellular SMR licensees operating on these channels. Therefore, we hereby grandfather those non-cellular SMR licensees that are operating on the new public safety channels for an indefinite period, and we will permit the filing of modification applications by these grandfathered licensees.⁴²² These grandfathered licensees will operate on a strict non-interference basis, subject to pre-coordination of any new or modified operations.⁴²³

c. Guard Band

157. We establish a “Guard Band” in the 816-817 MHz/861-862 MHz segment of the 800 MHz band to guarantee public safety licensees an additional one megahertz spectral separation from the cellular portion of the band. Nextel will vacate the Guard Band. No licensee—including public safety and CII—will be involuntarily relocated to the Guard Band. We will grandfather all non-Nextel CMRS licensees who currently operate within the Guard Band. These grandfathered licensees will be permitted to continue operating on current frequencies, with currently authorized facilities, on a strict non-interference basis, subject to pre-coordination of any new or modified operations.⁴²⁴ However, we will not accept new non-public safety applications on any of the twelve new 800 MHz public safety frequencies.

158. Once Nextel has vacated the Guard Band any 800 MHz band licensee currently operating below 816 MHz/861 MHz may apply for channels there. Any channel below 816 MHz/861 MHz vacated by a licensee relocating to the Guard Band will be available only to public safety licensees for three years from the effective date of this *Report and Order* and to public safety/CII licensees for an additional two years from that date. Licensees who voluntarily relocate to the Guard Band after Nextel has vacated will be required to tolerate increasing levels of interference from cellular-architecture systems as a function of increasing frequency.⁴²⁵ The minimum median received power level required for interference protection (-104 dBm for mobile units or -101 dBm for portable units) will increase as shown in Figure 1, below. The channels these licensees vacate in the spectrum below 816 MHz/861 MHz will be available to public

(Continued from previous page) _____

and Requirements for Priority Access Service, WT Docket No. 96-86, *Third Memorandum Opinion and Order and Third Report and Order*, 15 FCC Rcd 19844, 19857 (2000).

⁴²¹ See 47 C.F.R. § 90.617(a), Table 1 in Appendix C, *infra*.

⁴²² We believe that there is little risk of interference to public safety from these grandfathered non-cellular SMR incumbents. These incumbents will be prohibited from operating cellular systems in the non-cellular portion of the 800 MHz band. See 47 C.F.R. § 90.614 in Appendix C, *infra*. Further, any grandfathered site-based B/ILT or non-cellular SMR licensee who chooses to modify its license on one of these new public safety channels will be required to obtain frequency coordination and receive concurrence from a certified public safety coordinator. See 47 C.F.R. §§ 90.175(c) and (e). EA-based non-cellular SMR licensees who are grandfathered on these new public safety channels and choose not to relocate—while not subject to frequency coordination—will nonetheless be limited to operating within the EA of their license. See 47 C.F.R. § 90.683(a).

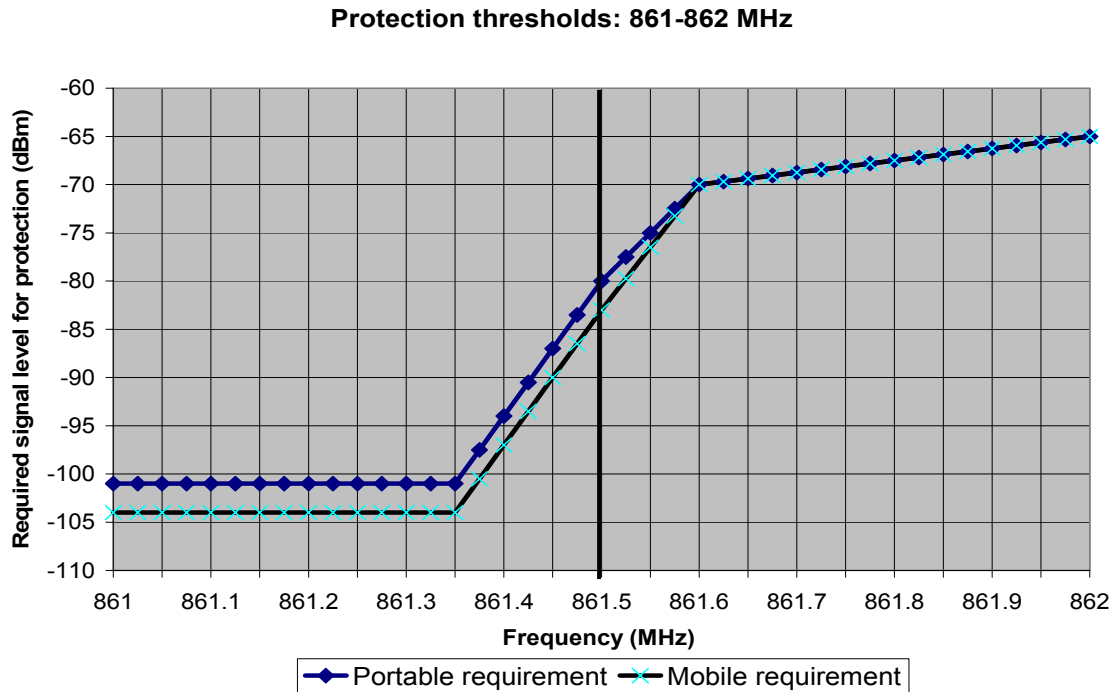
⁴²³ See 47 C.F.R. § 90.617(j) in Appendix C *infra*.

⁴²⁴ *Id.*

⁴²⁵ The Guard Band would serve a purpose similar to the guard band channels developed to protect public safety systems from interference from commercial systems in the 700 MHz band. Cellular operations are prohibited in the 700 MHz guard band channels (746-747 MHz, 776-777 MHz, 762-764 MHz, and 792-794 MHz) to provide a buffer between public safety and commercial spectrum allocations. See 47 C.F.R. § 27.2(b).

safety licensees for five years and to CII licensees during years four and five of the five-year period.⁴²⁶

FIGURE 1: Required Received Signal Levels for Interference Protection



d. Relocating ESMR Operations in 800 MHz Band

159. We recognize that there are CMRS licensees other than Nextel using iDEN or iDEN-like ESMR technology in the 800 MHz band. For example, Southern LINC, a Nextel competitor, operates ESMR systems using Motorola iDEN technology in Georgia, Mississippi, Alabama and Florida.⁴²⁷ Airtell Wireless, LLC, and Nevada Wireless, LLC, operate an iDEN derivative, the Harmony system, on the interleaved channels in areas of Montana and Nevada, and represent that they will be constructing Harmony systems in other markets.⁴²⁸ Preferred Communications, Inc. holds spectrum rights in various areas of the continental United States and has extensive 800 MHz band spectrum rights in the Commonwealth of Puerto Rico and the U.S. Virgin Islands.⁴²⁹ Some of these parties operating cellular-architecture systems in the 800 MHz band note that their systems have already created interference to public safety systems.⁴³⁰

160. The Consensus Parties did not discuss these other CMRS cellular-architecture systems,

⁴²⁶ See 47 C.F.R. § 90.617(h) in Appendix C *infra*.

⁴²⁷ See Southern LINC Comments at 4.

⁴²⁸ See Letter, dated November 7, 2003, from Elizabeth Sachs, counsel for Airtell Wireless and Nevada Wireless to Marlene H. Dortch, Secretary, Federal Communications Commission.

⁴²⁹ See Comments of Preferred to the Consensus Parties Reply Comments at 8.

⁴³⁰ *Id.*

supra, but did propose that the Commission should grandfather Southern LINC's operations in the 809-821 MHz/854-866 MHz block while relocating Southern LINC's systems that currently operate in the 806-809 MHz/851-854 MHz block to the upper portion of the non-cellular segment as close as possible to the ESMR segment.⁴³¹ The Consensus Parties proposed allowing Southern LINC to operate its cellularized systems in the non-cellularized portion of the band without a waiver but with a requirement to notify all affected licensees before implementing low-site cells.⁴³² Under the Consensus Plan, Southern LINC would be required to pre-coordinate such operations to prevent unacceptable interference to non-cellular licensees and would be responsible for eliminating any interference.⁴³³ The Consensus Parties did not discuss other ESMR licensees such as those mentioned *supra*. For its part, Southern LINC contends that it should be relocated to the ESMR segment, without loss of channels, where it would share spectrum with Nextel.⁴³⁴

161. We find the Consensus Parties' proposal for relocation of Southern LINC's facilities⁴³⁵ too incomplete—to the extent it does not address other similarly situated licensees—and too limited. With respect to the proposal to grandfather Southern LINC's existing operations, we note that there is no evidence that these operations currently cause interference to other 800 MHz band licensees.⁴³⁶ However, we can foresee that Southern LINC, in order to meet increasing subscriber demands, may desire to deploy “low site” cells which could be a source of interference to public safety and other non-cellular licensees. The interference potential is heightened because many of Southern LINC's channels are immediately adjacent to channels used by non-cellular licensees in the interleaved portion of the band. As a general proposition, ESMR systems operating in the 817-824 MHz/862-869 MHz segment of the band are less likely to cause interference than ESMR systems operating in the interleaved portion of the band. We therefore believe that the overall interference environment at 800 MHz would improve were we to allow licensees such as Southern LINC to relocate their systems to the ESMR portion of the band where they have less potential for interference to public safety and other non-cellular 800 MHz band licensees. Confining licensees such as Southern LINC to operation below 817 MHz/862 MHz is not optimal from an interference protection standpoint and could adversely affect such licensees' ability to provide adequate service to its subscribers in the future.

(i) Relocation Options

162. In order to provide an incentive for ESMR licensees to relocate their systems, we are affording them the flexibility of three options:

- Relocate all of their systems in a market into the ESMR portion of the band where they will share spectrum with Nextel; or

⁴³¹ See Supplemental Comments of Consensus Parties at 44-46.

⁴³² *Id.*

⁴³³ *Id.* at 45-46. Thus, for example, Southern LINC would be strictly responsible, financially and otherwise, for immediately abating any unacceptable interference; or would have to discontinue operation on the offending frequency or frequencies. *Id.* at 46.

⁴³⁴ See Letter, dated April 5, 2004, from Christine M. Gill, Counsel for Southern LINC to Michael K. Powell, Chairman, Federal Communications Commission.

⁴³⁵ See ¶ 160 *supra*.

⁴³⁶ It attributes the lack of interference to the fact it currently operates few high-channel-density low-elevation sites. See Southern Comments at 6. See also Motorola Comments at 14, n. 24.

- Relocate their systems as close as possible to the ESMR portion of the band but remain in the non-cellular portion of the band, *i.e.* in order of preference: (a) the 816-817 MHz/861-862 MHz Guard Band;⁴³⁷ (b) the 815-816 MHz/860-861 MHz Expansion Band;⁴³⁸ and (c) channels below 815 MHz/860 MHz if necessary. These licensees will operate on a strict non-interference basis, subject to pre-coordination of any new or modified operations;⁴³⁹ or
- Remain on their current channels in the non-cellular portion of the band on a strict non-interference basis, subject to pre-coordination of any new or modified operations.⁴⁴⁰

163. If non-Nextel ESMR licensees elect to relocate to the ESMR portion of the band, their EA licenses will transfer on a channel-by-channel basis, such that they have exclusive, incumbent-free, use of the new channels in the EA.⁴⁴¹ We recognize, however, that many of these non-Nextel ESMR licensees employ a patchwork of EA-based and site-based licenses. Therefore, we will give these licensees the option to relocate their site-based licenses along with their EA-licenses to the ESMR portion of the band. In order to transfer a site-based channel into the ESMR segment, a licensee must: (a) currently hold an EA license in the relevant market; and (b) be using the site-based license as part of a cellular-architecture system in that market as of the date of publication of this *Report and Order* in the Federal Register. Furthermore, to create a more uniform licensing scheme, the transferred site-based license will be converted to an EA-wide, incumbent-free license in the ESMR portion of the band. If non-Nextel ESMR licensees elect not to relocate to the ESMR portion of the band, but volunteer to relocate to the Guard Band or must be relocated to the Expansion Band or to the spectrum immediately below, when necessary, they must be provided comparable facilities, in the case of their site-based licenses; and, in the case of EA licenses, exclusive use of their new channels in the EA.⁴⁴²

(ii) Expanded ESMR Spectrum

164. We are aware that, in some markets, there may be insufficient spectrum in the 816-824 MHz/861-869 MHz band segment to accommodate both incumbent ESMR licensees already operating there and new ESMR entrants migrating from the lower channels. This is particularly true of certain markets in which both Southern LINC and Nextel currently are offering service. In those markets, Southern LINC holds a large number of licenses in the interleaved portion of the band, and also holds licenses for some General Category channels. Consequently, there are an inadequate number of channels in the 816-824 MHz/861-869 MHz band segment to replicate the existing channel capacity of both Southern LINC and Nextel. We note recent *ex parte* filings in which Southern LINC and Nextel recite a preliminary agreement in which they propose that the 816-824 MHz/861-869 MHz ESMR segment be widened by five megahertz, such that the lower band edge would start at 813.5 MHz/858.5 MHz.⁴⁴³ With the ESMR

⁴³⁷ See ¶¶ 157-158 *supra*.

⁴³⁸ See ¶¶ 154-156 *supra*.

⁴³⁹ See 47 C.F.R. § 90.617(j) in Appendix C *infra*.

⁴⁴⁰ *Id.* These operators, however, would be subject to possible frequency moves as necessary in order to implement reconfiguration of the 800 MHz band.

⁴⁴¹ These non-Nextel ESMR licensees must state their option in the realignment schedule that the Transition Administrator will transmit to the Commission. See ¶ 201 *infra*.

⁴⁴² See ¶ 201 *infra*.

⁴⁴³ See Letter, dated June 30, 2004, from James B. Goldstein, Esq., Senior Attorney, Nextel Communications, Inc. to Michael Wilhelm, Deputy Chief - Legal, Public Safety and Critical Infrastructure (continued....)

portion of the band so widened, Southern LINC and Nextel would engage in a channel exchange that would result in the configuration of channels shown in Appendix G, which also includes a map of the area in which the ESMR portion of the band would be increased, and the list of counties within the area shown on the map.

165. We note from the *ex parte* filings that the Southern LINC and Nextel agreement is not final and that the parties have not been able to agree on a final apportionment of channels in the Atlanta, Georgia market. Because of the preliminary nature of the agreement, we need not address it further here, but encourage the parties to come to an agreement that is equitable for all licensees involved.

166. Although we do not rule on the acceptability of the provisions contained in the preliminary agreement, the filings inform us that the distribution of cellular-architecture and non-cellular systems in the area shown in Appendix G is atypical. Moreover, we believe that we should change the band plan for that region now, before band reconfiguration commences, so that the overall band reconfiguration process takes the revised band plan into account. Accordingly, on our own motion, we define the ESMR band in the area shown in Appendix G as the band segment 813.5 - 824 MHz/858.5-869 MHz. The Expansion Band in this area shall extend from 812.5-813.5 MHz/857.5-858.5 MHz. All licensees operating in the band segment 806-813.5 MHz/851-858.5 MHz shall be afforded the same protection against unacceptable interference as specified in ¶¶ 96-141, *supra*.

167. Moreover, because Southern LINC's recent *ex parte* submission indicates that it intends to exercise the option of relocating into the ESMR portion of the band, we will give Nextel and Southern LINC the opportunity to finalize their agreement and recommend a channel distribution that equitably reflects the interests of all 800 MHz licensees in the area shown in Appendix G. That agreement shall be completed and submitted to the Commission for review no later than thirty days following the publication of this *Report and Order* in the Federal Register. The agreement must include mutual non-disclosure provisions and a clear delineation of the costs to be borne by each party. It shall also include a proposed band reconfiguration schedule consistent with the obligations we have imposed on Nextel in this *Report and Order*. The agreement also shall contain an engineering analysis demonstrating that the channel plan can be implemented consistent with public safety and B/ILT licensees retaining the spectrum necessary to accommodate them. We delegate to the Chief of the Wireless Telecommunications Bureau, the authority to review the agreement, and to resolve any disputed matters submitted to the Commission for *de novo* review.

168. In the event the parties fail to reach agreement by the date specified *supra*, they shall submit their differences to the Transition Administrator who will attempt to facilitate a final agreement. If the disputed matters are not resolved within thirty days, the Transition Administrator will submit the entire record to the Commission for *de novo* review. Parties are hereby put on notice that disputed matters concerning ESMR channels in any area of the country, including the area shown in Appendix G may be resolved by the Commission making a *pro rata* distribution of ESMR channels.⁴⁴⁴ In the case of the area

(Continued from previous page)

Division, Wireless Telecommunications Bureau, Federal Communications Commission. See also Letter, dated June 30, 2004, from Christine M. Gill, Esq., Counsel to Southern LINC to Michael Wilhelm, Esq., Federal Communications Commission.

⁴⁴⁴ When the ESMR spectrum is not adequate to accommodate all eligible licensees that wish to relocate to the ESMR block, and parties are unable to agree, we may apportion the ESMR block as a function of the relative spectrum rights each licensee holds in a given EA. For example, in a hypothetical market, outside the area shown in Appendix G, in which licensee "A" currently has rights to 150 channels and licensee "B" has rights to 250 channels, the 320 channels in the ESMR block would be apportioned by giving licensee "A" access to 128 channels (40%) and licensee "B" access to 192 channels (60%).

shown in Appendix G, a *pro rata* apportionment could reduce the current number of channels available to Nextel. However, we observe that Nextel has additional spectrum at 900 MHz which can be used to offset the shortfall and is receiving spectrum at 1.9 GHz. With respect to Southern LINC, we observe that its relocation to the ESMR block would provide Southern LINC with clear, contiguous spectrum arguably of greater value and capacity than the spectrum it now occupies. This would occur because, in some instances, Southern LINC would receive clear spectrum, in exchange for site-based channels which cannot currently be used in the entire EA because of the need to protect incumbents.

169. Finally, because we are extending the ESMR band to 813.5 MHz/858.5 MHz in the counties listed in Appendix G, some coordination between licensees will be necessary at the edge of these counties. Specifically, ESMR licensee operating within these counties will be required to maintain minimum co-channel spacing distances to incumbent non-cellular licensees operating just outside these counties.⁴⁴⁵ In addition, there may be instances where a non-cellular licensee operating just outside these counties may need to relocate above 813.5 MHz/858.5 MHz in order to complete band reconfiguration. In these instances, the ESMR licensees operating within the counties listed in Appendix G will make all necessary accommodations in order to provide the non-cellular licensee with the minimum required co-channel spacing on the new channel.⁴⁴⁶

e. Permitting Additional Non-ESMR Cellular Architecture Systems in the 800 MHz Band

170. Some CII parties, such as utilities, contend that excluding cellular systems from the non-cellular portion of the 800 MHz band (806-817 MHz/851-862 MHz) will impose a hardship on CII licensees whose communications needs require a transition of their systems to cellular architecture.⁴⁴⁷ We wish to proceed cautiously in this area out of concern over replicating the unacceptable interference problem we are attacking through band reconfiguration; but we also wish to avoid unnecessarily constraining the use of innovative technology in the process. The record suggests that CII cellular systems, with well-designed network architecture, can operate without causing unacceptable interference so long as they avoid the high-density cell operations that have been a frequent source of interference to date. We reach this finding in part because we do not anticipate that such CII or public safety systems will require high density, high user-capacity systems such as those used by CMRS licensees. The “non-CMRS” nature of these systems would suggest that they would not grow to have such high user demand that extensive deployment of low site cells would be required.⁴⁴⁸

⁴⁴⁵ See 47 C.F.R. § 90.621.

⁴⁴⁶ We note that co-channel spacing may be reduced through short-spacing agreements. See 47 C.F.R. § 90.621(b)(5).

⁴⁴⁷ See Comments of Cinergy to Supplemental Comments of Consensus Parties at 19; Comments of AMTA to Supplemental Comments of Consensus Parties at 4; Comments of Baltimore to Supplemental Comments of Consensus Parties at 7; Comments of Entergy to Supplemental Comments of Consensus Parties at 29; Comments of Scott C. Macintyre to Supplemental Comments of Consensus Parties at 1; Reply Comments of Cinergy to Supplemental Comments of Consensus Parties at 28; Reply Comments of Con-Ed to Supplemental Comments of Consensus Parties at 10; letter, dated May 6, 2004, from Shirley Fujimoto, Council for Entergy Corporation, Consumers Energy and Cinergy Corporation, to John Muleta Chief, Wireless Telecommunications Bureau, Federal Communications Commission (Entergy, Consumers and Cinergy May 6 *Ex Parte*).

⁴⁴⁸ We note that, because we are affording CII licensees a special status because of their safety-related communications, we believe it would be anomalous to allow CII licensees to convert their systems to CMRS operation in which communications seldom are safety-related. Accordingly, we limit our definition of CII to those (continued....)

171. In this regard, the Consensus Parties offer a definition for the type of “high-density cellular” system they believe should be prohibited from operating in the non-cellular portion of the 800 MHz band.⁴⁴⁹ The Consensus Parties would define a “high-density cellular” system as any system with (1) five or more overlapping interactive sites featuring hand-off capability; (2) any one of such sites having an antenna height of less than 100 feet above ground level with an antenna height above average terrain (HAAT) of less than 500 feet; (3) and any one of such sites having more than twenty paired frequencies.⁴⁵⁰

172. Several CII licensees, however, believe that the Consensus Parties definition is overly broad and would unduly limit the operation of many non-CMRS systems that pose little or no likelihood of harmful interference to other licensees in the 800 MHz band.⁴⁵¹ For instance, these CII licensees contend that the Consensus Parties definition would prohibit systems where any of these characteristics are present even though no individual site exhibits all of these characteristics.⁴⁵² Therefore, these CII licensees suggest applying the Consensus Parties definition on a site-by-site basis rather than on a system-wide basis.⁴⁵³ We agree. The Consensus Parties were unclear about whether their definition should be applied system-wide or on a site-by-site basis. We believe that only sites which exhibit all of the characteristics described by the Consensus Parties would likely cause interference to other licensees in the 800 MHz band. Therefore, we will permit licensees to operate cellular-architecture systems in the non-cellular portion of the band without need for waiver so long as those systems are not high-density cellular systems under the following definition of “800 MHz cellular system”:⁴⁵⁴

- a system having more than five overlapping interactive sites featuring hand-off capability; and
- any one of such sites has an antenna height of less than 100 feet above ground level with an antenna height above average terrain (HAAT) of less than 500 feet and more than twenty paired frequencies.⁴⁵⁵

173. If a licensee does wish to operate an 800 MHz cellular system, it will be required to obtain waivers for any and all sites that meet the second of our two criteria. In that case, a CII or public safety system licensee may avail itself of the Commission’s waiver process pursuant to the waiver criteria set out

(Continued from previous page) _____

entities who operate radios systems for private internal use. *See* n. 11 *supra*. Any licensee who converts to CMRS will fall outside our definition of CII and no longer be eligible for any of the benefits we extend to CII licensees

⁴⁴⁹ *See* Reply Comments of Consensus Parties to Supplemental Comments of Consensus Parties at 28.

⁴⁵⁰ *Id.*

⁴⁵¹ *See* Entergy, Consumers and Cinergy May 6 *Ex Parte* at 1.

⁴⁵² *Id.* at 1.

⁴⁵³ *Id.*

⁴⁵⁴ We emphasize that this definition of “800 MHz cellular system” applies only for this purpose in the 800 MHz band, and is not intended as a basis for making cellular/non-cellular distinctions for other purposes.

⁴⁵⁵ We recognize that this definition encompasses operations where the overlapping interactive sites comprise only a portion of the overall communications “system” of a licensee. The licensee needs to obtain a waiver, however, only with respect to particular sites in the overlapping site clusters that satisfy the second criterion.

in Section 1.925 of the Commission's Rules.⁴⁵⁶ Any such request shall contain both a persuasive showing of need and a demonstration of non-interference. Any waiver granted, will contain a continuing non-interference condition.⁴⁵⁷ As stated above, cellular-architecture systems that do not come within the foregoing "800 MHz cellular" definition may be operated without need for a rule waiver; nonetheless, they must not cause unacceptable interference to 800 MHz "high-site" non-cellular systems. Our reason for requiring waivers for sites in high-density cellular systems is, in one respect, a means to ensure that system designers "do their interference abatement homework" before seeking Commission authorization for a facility in the non-cellular portion of the band. Moreover, proceeding only pursuant to waiver will allow us to more carefully gauge the effect that such high-density cellular technology in the non-cellular portion of the 800 MHz band would have. We can then revisit the matter at a later date before serious harm is done if new systems proliferate and cause unacceptable interference. Most importantly, were we to decide, here, to allow unrestricted, high density cellular operation in the non-cellular portion of the band, we would undo four years of intensive study and terminate this proceeding by virtually issuing an invitation for a high-density, multi-cell operator to construct interference-generating systems in incompatible spectrum and potentially put our first responders at risk and threaten their ability to adequately address Homeland Security threats. We will monitor this cellular restriction carefully and revisit it if necessary. As with any of our rules, waivers are available to accommodate special circumstances. However, there would be a high burden to surmount for any party seeking a waiver for CMRS operation.

174. As stated above, our definition of "800 MHz cellular system" should not be interpreted to allow cellular-configuration systems that do not come within the cellular definition to cause unacceptable interference or to relieve them from the cost and other responsibility for promptly abating unacceptable interference in the 800 MHz band should it occur. Rather, our cellular definition in the 800 MHz band context serves only as a demarcation between systems that can operate in the non-cellular portion of the 800 MHz band without a waiver and those that require a waiver.

3. Border Regions

175. Several parties note, and we concur, that no feasible band plan suggested in this proceeding comports with the current arrangement the United States has with Canada or with the protocols it has with Mexico for use of the 800 MHz band in the border areas. The existing border band plans, contained in Section 90.619 of our rules have evolved from periodic negotiations with these countries and have been adjusted from time to time. The border band plans are not consistent along the border; there are different distributions of channels in given border regions, primarily because of demographic considerations. The Consensus Parties were the only party to file a band plan for the border area; and several commenting parties, including Industry Canada—pointed out that the border area plan proposed by the Consensus Parties' had multiple flaws, including:

- *Mutual Aid Channels.* The border area plan fails to maintain channels designated by international agreements for mutual aid with Canada and Mexico.⁴⁵⁸ The Consensus Parties

⁴⁵⁶ 47 C.F.R. § 1.925.

⁴⁵⁷ Any cellular architecture system operating in the non-cellular portion of the band, whether authorized by waiver or otherwise, must strictly comply with the provisions of Section 90.673 as adopted in this *Report and Order*.

⁴⁵⁸ See Comments of King County RCB to Supplemental Comments of the Consensus Parties at 4; Comments of MI DIT to Supplemental Comments of the Consensus Parties at 5; Comments of NY OIT to Supplemental Comments of the Consensus Parties at 6-8; Reply Comments of NY OIT to Supplemental Comments of the Consensus Parties at 5-6. Current international agreements designate five channels in the NPSPAC portion of the band (821-824/866-869 MHz) for public safety mutual aid between the U.S. and Canada and Mexico. These (continued....)

suggest relocating these channels to the lower portion of the 800 MHz band.⁴⁵⁹ The Consensus Parties, however, fail to explain how users in Mexico or Canada would be compensated for retuning or replacement of equipment needed to operate on the new mutual aid channels.

- *Maintaining Spectrum for Various Pools.* The Consensus Parties' border area plan fails to maintain comparable spectrum for various 800 MHz band pools (public safety, B/ILT, SMR).⁴⁶⁰ For instance—in certain regions—public safety loses channels after band reconfiguration while ESMR licensees gain channels after band reconfiguration.⁴⁶¹
- *Public Safety Spectrum in Mexico Border Area.* Many of the channels in the Consensus Parties' border plan, designated for public safety use in the Mexico Border Region—after band reconfiguration—may be unusable because of short-spacings to co-channel incumbents outside of the border area.⁴⁶² For instance—due to co-channel spacing requirements—incumbent non-border licensees may “block” numerous channels designated for public safety use in San Diego, CA and Tucson, AZ.⁴⁶³
- *U.S. Operations on Canada/Mexico Primary Channels.* The Consensus Parties' border area plan is silent on relocation of U.S NPSPAC systems currently operating on Canada or Mexico primary channels.⁴⁶⁴

(Continued from previous page) —————

five channels are intended to facilitate interoperability between Canadian, Mexican and U.S. public safety licensees. The mutual aid channels are 821.0125/866.0125 MHz (calling), 821.5125/866.5125 MHz, 822.0125/867.0125 MHz 822.5125/867.5125 MHz and 823.0125/868.0125 MHz. *See U.S.–Mexico Agreement*, Appendix C at Section 1 and *1990 U.S.-Canada Agreement* at Section 2.1c.

⁴⁵⁹ See Supplemental Comments of the Consensus Parties, Appendix G-4.

⁴⁶⁰ See Comments of American Elec. to Supplemental Comments of the Consensus Parties at 15-16; Comments of Boeing to Supplemental Comments of the Consensus Parties at 5-8; Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties at 6-8; Comments of Consumers to Supplemental Comments of the Consensus Parties at 11-12; Comments of NY OIT to Supplemental Comments of the Consensus Parties at 4-6; Comments of Pinnacle to Supplemental Comments of the Consensus Parties at 6; Reply Comments of Boeing Reply to Supplemental Comments of the Consensus Parties at 9; Reply Comments of Central ME Power to Supplemental Comments of the Consensus Parties at 2-3; Reply Comments of Consumers Energy to Supplemental Comments of the Consensus Parties at 5-6; Reply Comments of NY OIT to Supplemental Comments of the Consensus Parties at 4-5; Reply Comments of San Diego Reply to Supplemental Comments of the Consensus Parties at 2-5.

⁴⁶¹ See Comments of American Elec. to Supplemental Comments of the Consensus Parties at 16; Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties, Exhibit B at 3; Comments of Pinnacle to Supplemental Comments of the Consensus Parties at 6; Comments of NY OIT to Supplemental Comments of the Consensus Parties at 6.

⁴⁶² See Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties, Exhibit A at 1-2, Exhibit B at 1-2, 7-8; Comments of San Diego to Supplemental Comments of the Consensus Parties at 2-4. Co-channel stations are generally required to maintain a fixed distance separation of 70 miles (113 km). *See* 47 C.F.R. § 90.621(b).

⁴⁶³ *Id.*

⁴⁶⁴ See Comments of Snohomish County ERS to Supplemental Comments of the Consensus Parties at 2-3.

- *Channel Spacing.* The Consensus Parties' border area plan would reduce the span of frequencies available to B/ILT and non-cellular SMR licensees thus greatly reducing the span of frequencies which can be combined into a trunked system.⁴⁶⁵
- *Exacerbating the "Double Border."* Border area licensees currently need to coordinate both with licensees outside the U.S (Mexico/Canada) and U.S licensees in the non-border area. The Consensus Parties' reconfiguration plan exacerbates this problem due to the extensive channel relocations involved in band reconfiguration.⁴⁶⁶
- *Canada/Mexico NPSPAC Licensees.* The Consensus Parties make no mention of whether their reconfiguration proposal will negatively affect NPSPAC operations in Canada and Mexico.⁴⁶⁷ Under the Consensus Parties band plan, after band reconfiguration, ESMR operations on the U.S. side of the border would operate on the same channels as NPSPAC operations in Canada and Mexico.
- *iDEN Arrangement.* The border area plan will affect a current agreement between the U.S. and Canada to reserve certain channels in the 800 MHz band for iDEN digital networks.⁴⁶⁸

176. We note that our agreements with Mexico and Canada establish a distance beyond which U.S licensees need not consider border stations when selecting channels. The distance is 140 km (87 mi.) and 110 km (68.4 mi.) from the border for Canada and Mexico, respectively.⁴⁶⁹ Depending on how the border band plans develop, there is the possibility of a "double border." The second border would be created if the overall U.S. band plan differs from a band plan for the border regions. For example, the overall U.S. band plan may assign a given channel for public safety use, e.g. Channel 88 and the border band plan may assign the same channel for ESMR use. In this example, the strict responsibility regime we establish today requires the ESMR Channel 88 licensee to protect the non-cellular 800 MHz system against unacceptable interference. In instances in which a border band plan results in different uses of a given channel for non-cellular systems, e.g. a U.S. SMR system operating in the Mexican border area and a public safety channel operating beyond the 110 km line, *supra*, our current coordination procedures would come into play and the two users would be protected against mutual unacceptable interference by required distance spacings.⁴⁷⁰ The details of the border band plans will be determined in our ongoing discussions with the Mexican and Canadian governments. One principal goal of these discussions will be to ensure that the capability for cross-border mutual aid communications is maintained. Thereafter, we will address any "double border" issues. Until border agreements are reached, however, 800 MHz licenses in the border area will be conditioned on compliance with international agreements. We further note that Nextel will bear the financial responsibility for the completion of any system modifications necessitated by

⁴⁶⁵ See Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties, Exhibit D at 2-3; Comments of Consumers Energy to Supplemental Comments of the Consensus Parties at 9.

⁴⁶⁶ See Comments of Boeing to Supplemental Comments of the Consensus Parties at 10-11; Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties, Appendix D at 3; Comments of Pinnacle to Supplemental Comments of the Consensus Parties at 3-4; Reply Comments of Boeing to Supplemental Comments of the Consensus Parties at 8-9.

⁴⁶⁷ See Comments of Industry Canada to Supplemental Comments of the Consensus Parties at 7.

⁴⁶⁸ *Id* at 6.

⁴⁶⁹ See, e.g., 47 C.F.R. § 90.619 in Appendix C *infra*.

⁴⁷⁰ *Id*.

any future international agreements.⁴⁷¹

4. Cost Responsibility

177. Band reconfiguration will be costly. We believe, however, that sole reliance on Enhanced Best Practices to abate unacceptable interference would entail a continuing expense that—over the long term—would eclipse the admittedly high initial cost of band reconfiguration.⁴⁷² Under the Consensus Proposal, and the rules that we adopt today, the cost of band reconfiguration can be accommodated to successfully address the critical interference problems faced by public safety providers. Moreover, we are confident that Nextel is capable of fulfilling its central role in achieving this result, given its demonstrated ability to bear the upfront costs of band reconfiguration.⁴⁷³ The record does not reveal any effective alternative to the one we fashioned here—either by band reconfiguration or otherwise—to solve the instant problem. No other spectrum management approach provided the same assurances of success. Furthermore the plan we are adopting today will preserve the abilities that public safety licensees are likely to need in order to meet their increased Homeland Security obligations.

178. Under the band reconfiguration plan, the principle cost component will be borne by Nextel, which will pay for all channel changes necessary to implement the reconfiguration.⁴⁷⁴ Nextel is obligated to ensure that relocated licensees receive at least comparable facilities when they change channels.⁴⁷⁵ Moreover, a licensee electing to relocate to the ESMR block voluntarily, must receive clear, incumbent-free replacement spectrum. Thus, Nextel shall be responsible for the clearance of any incumbents affecting the replacement channel. If disputes arise concerning the cost allocation, the matter may be referred to the Transition Administrator for resolution; and, failing that, to the Chief of the Wireless Telecommunications Bureau for *de novo* review.⁴⁷⁶

a. Relocation Costs and Remuneration

179. The Consensus Parties estimated the cost of reconfiguring the 800 MHz band at \$850 million. Nextel committed to pay up to that amount conditioned on Commission approval of the Consensus Plan without material change.⁴⁷⁷ We conclude, however, that we cannot reasonably “cap” the amount required for band reconfiguration if completing the reconfiguration process requires more than

⁴⁷¹ In the event that the requisite border area agreements are not reached within thirty-six months of the release date of the Public Notice announcing the start of reconfiguration of the first NPSPAC Region, Nextel shall elect to extend the life of the letter of credit or secure a separate letter of credit for a sum of money equal to that which would have been incurred had the Commission band plan been implemented along the borders without regard to international agreements.

⁴⁷² See ¶¶ 120-121 *supra*.

⁴⁷³ See ¶ 29 *supra*. See also n. 478 *infra*.

⁴⁷⁴ We note that 800 MHz licensees may divide relocation costs with Nextel if they so choose. For instance, we observe that Southern LINC and Nextel are working on an agreement whereby costs for relocating Southern LINC’s facilities may be divided between the two parties. See ¶¶ 164-168 *supra*.

⁴⁷⁵ See ¶ 201 *infra*.

⁴⁷⁶ See ¶ 194 *infra*.

⁴⁷⁷ Supplemental Comments of the Consensus Parties at iv-v.

\$850 million.⁴⁷⁸ First, as discussed above, our band reconfiguration plan differs from that of the Consensus Parties, most particularly with respect to considerations affecting efficient use of the spectrum. In light of these changes, we place less reliance on the assumptions Nextel made when it estimated the cost of band reconfiguration. We did not undertake an *ab initio* analysis of the cost of band reconfiguration but instead carefully analyzed the data contained in the record. In that regard we have taken careful notice of certain sensitive assumptions in Nextel's analysis, which, if varied by only a few percent, greatly affect Nextel's cost estimate.⁴⁷⁹ The one certainty that we derive from our analysis is that it would be unwise in the extreme to proceed with band reconfiguration without making it clear that Nextel is obligated to cover the entire cost thereof, with no "cap."⁴⁸⁰ Thus, if we accepted any cap on Nextel's reconfiguration cost obligations and its estimates proved low—*i.e.*, if we capped costs at \$850 million and that amount was exhausted before the completion of nationwide band reconfiguration—a balkanized 800 MHz band would likely result, in which public safety agencies in one section of the country would operate pursuant to a revised band plan and other agencies would operate pursuant to the current, interference-ridden, band plan. This could seriously diminish public safety interoperability between NPSPAC Regions, and could also impair the ability of non-NPSPAC public safety systems to develop interoperable networks. We also observe that the Consensus Parties themselves admit the possibility that \$850 million may prove inadequate.⁴⁸¹ Thus, when discussing the assurance that the exhausted funds would not result in a half-reconfigured 800 MHz band, they state that: "no incumbent licensees will be required to relocate within a Region...unless funding is available for all licensee relocations required in that Region."⁴⁸² While this addresses the possibility of the incomplete reconfiguration of a single Region, the Consensus Parties are silent on the greater hazard resulting from the funds evaporating before the reconfiguration of all Regions: *e.g.*, a negative effect on inter-region interoperability.

b. Continued Availability of Funds

180. In the *NPRM*, the Commission sought comment on how to guarantee the availability of funding to complete the reconfiguration of the 800 MHz band regardless of the financial status of the contributing party or parties.⁴⁸³ In response, parties suggested how to ensure the completion of band reconfiguration notwithstanding the inability of the funding entity to continue to furnish funds for reasons of bankruptcy or otherwise.⁴⁸⁴ The Consensus Parties, for example, initially proposed that Nextel could secure its ability to fund retuning costs by setting up a separate corporate entity to hold assets securing the Nextel funding obligation. The stock of the entity would be pledged to an escrow agent/trustee, with the power to sell the assets and hold the cash proceeds in escrow for the benefit of the Fund Administrator in

⁴⁷⁸ We take this step pursuant to Section 4(i) of the Communications Act. 47 U.S.C. § 154(i).

⁴⁷⁹ See n. 489 *infra*.

⁴⁸⁰ This is consistent with the Commission's actions in the Upper 200 and Microwave Relocation proceedings. See Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, PR Docket No. 93-144 and Amendment to the Commission's Rules Regarding a Plan for Sharing Costs of Microwave Relocation, WT Docket No. 95-157.

⁴⁸¹ Supplemental Comments of the Consensus Parties at 6 (noting estimate of total costs for relocating public safety licensees is subject to several significant variables such as the number of total radios which will need to be replaced).

⁴⁸² See Supplemental Comments of the Consensus Parties at 12.

⁴⁸³ See *NPRM*, 17 FCC Rcd at 4899 ¶ 45.

⁴⁸⁴ See, *e.g.*, Supplemental Comments of the Consensus Parties at 8; Nextel Nov 3 *Ex Parte*.

the event Nextel failed to meet its payment obligations.⁴⁸⁵ However, this proposal was superseded on November 3, 2003, when Nextel committed to deposit \$100 million in cash into an escrow account created and designated for paying 800 MHz band reconfiguration costs pursuant to the Consensus Plan and securing up to an additional \$750 million for this purpose through an irrevocable stand-by letter of credit.⁴⁸⁶ Nextel claims that this proposal would insulate band reconfiguration funds from any financial reversals that Nextel might encounter, including bankruptcy.⁴⁸⁷

181. Nextel's escrow deposit and irrevocable stand-by letter of credit appear better capable of assuring continued relocation funding than the Consensus Parties' earlier proposal, although we prefer to rely solely on the Letter of Credit. However, we remain mindful of those parties who questioned the Consensus Plan cost estimates, both with respect to the number of systems that would have to be relocated and whether equipment in those systems could be retuned or would have to be replaced.⁴⁸⁸ We also recognize that even small errors in certain sensitive parameters could dramatically increase total relocation costs.⁴⁸⁹ We are therefore faced with the question of who should assume the risk if relocation cost projections prove to be inadequate: Nextel, which made the estimates, or the public, which would suffer the consequences of incomplete implementation of a nationwide 800 MHz band plan. In resolving that question, we note that Nextel has stated that it is "highly confident" in the accuracy of its estimates, which suggests that it perceives little risk in assuming the entire band reconfiguration obligation. However, we

⁴⁸⁵ See Supplemental Comments of the Consensus Parties at 8.

⁴⁸⁶ See Nextel Nov. 3 *Ex Parte* at 3.

⁴⁸⁷ See *id.* at 3; Supplemental Comments of the Consensus Parties at 7-8; *cf. NPRM*, 17 FCC Rcd at 4899 ¶ 45 (seeking comment on safeguards to guarantee that the "then state of finances of a contributing party or parties" would not hinder the completion of band reconfiguration).

⁴⁸⁸ See Comments of Mobile Relay Associates to Supplemental Comments of the Consensus Parties at 6; (no way to determine whether Consensus Plan adequately estimates overall funding needs); Comments of Border Area Coalition to Supplemental Comments of the Consensus Parties at 12 (Consensus Plan does not take into account additional costs that border area licensees would incur); Comments of Small Business in Telecommunications to Supplemental Comments of the Consensus Parties at 2-4 (questioning estimate of \$17,000 per channel for relocation and \$12,000 per channel for rebanding.). See also Comments of CTIA to Supplemental Comments of the Consensus Parties at 10 and Comments of Michigan DIT to Supplemental Comments of the Consensus Parties at 3 (Consensus Plan underestimates number of small public safety systems that would be relocated).

⁴⁸⁹ Nextel's estimates are based on replacing one percent of public safety portable and mobile radios. However, the City and County of San Diego provided estimates that more than thirty percent of its units would have to be replaced. See Comments of San Diego to Supplemental Comments of the Consensus Parties at 12-13. Subsequently, Nextel filed a letter stating that the San Diego estimates were overstated; but that, nonetheless, more than one percent of the units in the San Diego system would have to be replaced. See Letter, dated February 20, 2004, from Larry Krevor, Esq., Nextel to Michael Wilhelm, Esq. Public Safety and Critical Infrastructure Division, Wireless Telecommunications Bureau, Federal Communications Commission. The San Diego system may not be representative inasmuch as it was constructed in 1991 and is still using radios of that vintage. See also, *e.g.* Reply Comments of ALLTEL *et. al.* to Supplemental Comments of the Consensus Parties at 6-7 (the cost of receiver replacement increases \$78 million for every one percent increase in number of receivers that must be replaced.) See also Comments of Verizon Wireless to Supplemental Comments of the Consensus Parties at 10 and Comments of Preferred Communications to Supplemental Comments of the Consensus Parties at 9-10 (Questioning Consensus Plan estimate that one percent of public safety receivers would need to be replaced) Comments of Ameren to Supplemental Comments of the Consensus Parties at 5 (Consensus Plan proposal of \$150 million to relocate B/ILT incorrectly assumes that relocation would only require the replacement of only five percent of B/ILT equipment).

also believe it is important to protect against the risk of Nextel experiencing an unanticipated financial crisis or insolvency that would impair its ability to fully fund relocation.

182. Because the Commission Plan requires Nextel to shoulder a greater financial obligation than the financial obligation envisioned in the Consensus Plan, we will require Nextel to increase the amount of money irrevocably available to ensure completion of band reconfiguration. Specifically, we will require Nextel to provide an irrevocable letter of credit securing \$2.5 billion.⁴⁹⁰ This letter of credit will serve as the funding source for the costs involved in reconfiguring the 800 MHz systems for non-Nextel licensees and possibly as the source for any payment to the United States Treasury.⁴⁹¹ Nextel must directly pay its own relocation costs as well as such obligations such as the reimbursement of UTAM, the relocation of BAS incumbents and the compensation of the Transition Administrator and the Letter of Credit Trustee. We have provided a model letter of credit at Appendix E, *infra*, and expect that the letter of credit will be issued in substantially the same form set forth therein.⁴⁹² While we require that only one financial institution, acceptable to the Commission,⁴⁹³ issue the letter of credit, we have no objection to the indirect participation of other financial institutions, acceptable to the Commission, if necessary.⁴⁹⁴

183. As described more fully at ¶¶ 198-200 *supra*, the Trustee will draw upon the letter of credit those funds necessary to accomplish band reconfiguration. As part of the process by which the Transition Administrator will certify that band reconfiguration in a particular NPSPAC region is complete—or at Nextel’s reasonable request, the Transition Administrator will evaluate the sum remaining available under the initial letter of credit and any subsequent letter(s) of credit issued pursuant to this *Report and Order*. If, at any time, the Transition Administrator documents that the letter(s) of credit does not retain sufficient undrawn funds to ensure completion of band reconfiguration, Nextel will be required to open an additional letter of credit. If, however, the Transition Administrator documents that the letter(s)

⁴⁹⁰ We emphasize that the required \$2.5 billion security is not a “cap” on Nextel’s obligations hereunder, whether for 800 MHz band reconfiguration or 1.9 GHz band clearance. We further emphasize that this determination does not represent a finding by the Commission that 800 MHz band reconfiguration can, in fact, be accomplished for \$2.5 billion.

⁴⁹¹ See ¶¶ 186 *infra*.

⁴⁹² The model letter of credit provides that the letter will be issued for five years unless it contains an “evergreen” clause. If such a clause is included in the letter of credit and the issuing institution gives notice of non-renewal, Nextel shall ensure that a replacement letter is issued no later than thirty days prior to the expiration date of the letter of credit. A failure to do so shall entitle the Commission to instruct the Trustee to make a draw on the letter of credit for the entire remaining balance thereof.

⁴⁹³ A bank that is acceptable to the Commission to issue the Letter of Credit is a) any United States Bank that (i) is among the 50 largest United States banks, determined on the basis of total assets as of December 31, 2003, (ii) whose deposits are insured by the Federal Deposit Insurance Corporation, and (iii) has a long-term unsecured credit rating issued by Standard & Poor’s of A- or better (or an equivalent rating from another nationally recognized credit rating agency); and b) any non-U.S. bank that (i) is among the 50 largest non-U.S. banks in the world, determined on the basis of total assets as of December 31, 2003 (determined on a U.S. dollar equivalent basis as of such date), (ii) has a branch office in New York City or such other branch office agreed to by the Commission, (iii) has a long-term unsecured credit rating issued by a widely-recognized credit rating agency that is equivalent to an A- or better rating by Standard & Poor’s, and (iv) issues the Letter of Credit payable in United States dollars. Should the bank’s credit rating fall below A- or equivalent rating, the Commission may require Nextel to procure the issuance of a letter of credit in an amount equivalent to that remaining on the current letter of credit by a bank that meets the criteria set forth herein.

⁴⁹⁴ *Id.*

of credit secures funds in excess of those needed to ensure completion of band reconfiguration, Nextel will be allowed to reduce the amount of the letter(s) of credit. At no point, however, will the Transition Administrator allow Nextel to reduce the total aggregate secured by the letter(s) of credit below \$850 million. We believe that allowing reductions in the letter(s) of credit will relieve Nextel of an unnecessary financial burden and anticipate that Nextel may use the monies freed by the reduction to improve or expand its network, including its operations in the 1.9 GHz band. This would not only improve its service to the public, but the revenues derived from this improved service would strengthen its financial position and serve as an additional hedge against financial reversals that might affect band reconfiguration. At the conclusion of the true-up process, including securing the funds necessary to ensure reconfiguration of the band in border areas, Nextel's obligation to provide security for the cost of 800 MHz band reconfiguration shall terminate and the letter(s) of credit will terminate.⁴⁹⁵

184. The letter(s) of credit shall specify a trustee, acceptable to the Commission, as the beneficiary, which shall administer the funds from the letter of credit and receive the funds from the letter of credit in the event of a Nextel default. Nextel and the Letter of Credit Trustee shall formalize the terms of their relationship with a written contract and/or a trust deed, drafts of which shall be submitted for Commission final review and approval.⁴⁹⁶ On the occasion of a material breach by Nextel of its obligations hereunder, as declared by the Commission, said trustee shall be entitled to draw on the letter of credit as specified in such instrument. The funds shall be devoted to reconfiguration of the 800 MHz band and possibly payment to the United States Treasury.⁴⁹⁷ Neither the Transition Administrator nor the Letter of Credit Trustee will be compensated from funds available under the letter of credit, but will be compensated directly by Nextel.

185. If Nextel is unable or unwilling to fulfill its obligations pursuant to this *Report and Order*, the Commission can approve the use of letter of credit funds to compensate the Transition Administrator and the Letter of Credit Trustee for their services. The trustee shall stand as a fiduciary to the Commission. Letter of credit funds shall be applied first to band reconfiguration of non-Nextel licensees; and then to the relocation of Nextel's facilities as required to conform to the new 800 MHz band plan. Should the funds be insufficient to complete relocation of Nextel's facilities, the licenses of un-relocated Nextel facilities shall automatically revert to secondary status. Pursuant to such secondary status, such unfinished Nextel facilities must not interfere with, and must accept interference from, any other 800 MHz licensee.

186. As described in paragraph 330 *infra*, the Wireless Telecommunications Bureau will issue a Public Notice specifying the amount that Nextel will pay the United States Treasury. If Nextel does not make payment of any amount that it owes within thirty days of issuance of this Public Notice, the amount Nextel owes will be paid from the letter(s) of credit. If the letter(s) of credit do not secure sufficient funds, then, in addition to debt collection remedies that the government may employ, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, included, but not limited to its 1.9 GHz licenses, should be revoked.

187. Because the Commission does not engage in deciding debtor-creditor matters, including

⁴⁹⁵ See Appendix E-Annex C, *infra* (Termination of Letter of Credit form).

⁴⁹⁶ The contract will authorize the formation of the "800 MHz Relocation Trust" and the corpus of the trust will be the letter or letters of credit issued pursuant to the terms of this Order. The trust will be permitted to receive and hold draws under the letter of credit to facilitate multiple payments to particular licensees, vendors, contractors, etc., to pay for approved relocation costs. An outline of the key terms envisaged by the Commission are attached hereto as Appendix E-Annex D.

⁴⁹⁷ See ¶¶ 186, 329-332 *infra*.

those relating to bankruptcy, we, *inter alia*, will not permit Nextel to operate within the 1.9 GHz band without first providing the Commission with a legal opinion letter, at Nextel's cost, from bankruptcy counsel chosen by Nextel. This restriction is a condition of Nextel's modified license. In order to meet this condition, the opinion letter must clearly state, subject only to customary assumptions, limitations and qualifications, that in a proceeding under Title 11 of the United States Code, 11 U.S.C. Section 101 et seq. (the "Bankruptcy Code"), in which Nextel is the debtor, the bankruptcy court would not treat the Letter of Credit or proceeds of the Letter of Credit as property of Nextel's bankruptcy estate under Section 541 of the Bankruptcy Code. The scope of the opinion letter must also cover such other opinions as the Commission shall request. The opinion letter must contain detailed legal analysis of the basis of counsel's opinion. A draft opinion letter must be submitted for review and approval by the Commission's Office of General Counsel prior to issuance of the opinion. Bankruptcy counsel, and, if applicable, counsel's firm, must have a Martindale-Hubbell rating of "A/V" and must satisfy the Commission in all other respects.

5. Logistics of Band Reconfiguration

188. In the *NPRM*, the Commission acknowledged that any band restructuring proposal would require incumbents to relocate.⁴⁹⁸ We therefore sought comment on how to implement reconfiguration of the 800 MHz band with minimum disruption to incumbent licensees. We did not endorse or propose any specific transition plan, but instead sought comment on several proposals that would help inform our decision regarding relocation and which reflected our underlying goal that relocation plans should appropriately balance the interests of all licensees.

189. In the *NPRM*, the Commission sought comment on the best mechanism to collect and administer funds and to resolve disputes with respect to the relocation of public safety systems.⁴⁹⁹ The Consensus Parties recommend creation of a five member Relocation Coordination Committee (RCC) to oversee the relocation process.⁵⁰⁰ For example, the RCC would first prioritize the NPSPAC regions for relocation according to population and greatest incidence of interference.⁵⁰¹ They also proposed a Planning Committee—separate from the RCC—to review each new relocation channel assignment to ensure that the relocated licensee would not cause or receive unacceptable co-channel interference on the new channel(s).⁵⁰² The RCC certification of a relocation plan would trigger a mandatory nine-month negotiation period between affected licensees and Nextel.⁵⁰³ If an agreement were not reached by the end of the nine-month period, the parties would submit to binding arbitration by an RCC-established arbitration panel.⁵⁰⁴ The RCC would be certified as a frequency coordinator by the Commission and—after selecting channels for a relocated system and obtaining approval of the relevant frequency coordinator—would file the applications with the Commission. They also proposed cancellation of the

⁴⁹⁸ See *NPRM*, 17 FCC Rcd at 4891 ¶ 31.

⁴⁹⁹ *Id.* at 4898 ¶ 45.

⁵⁰⁰ See Supplemental Comments of the Consensus Parties at 14-17.

⁵⁰¹ *Id.* at 16. Appendix E of the Supplemental Comments of the Consensus Parties provides a sample prioritization scheme.

⁵⁰² *Id.* at 18.

⁵⁰³ *Id.* at 21.

⁵⁰⁴ *Id.* at 21-22.

licenses of any licensee that failed to relocate within thirteen months, absent special circumstances.⁵⁰⁵

a. Transition Administrator

190. In the *NPRM*, the Commission sought comment on the best mechanism to collect and administer funds and to resolve disputes with respect to the relocation of public safety systems.⁵⁰⁶ No other party filed a proposal giving details of how its band plan would be implemented; although several commenting parties criticized the Consensus Parties implementation plan as excessively Nextel-centric and unduly complex.⁵⁰⁷ We are in general agreement with the parties who raised those issues. Although we fully appreciate the significant effort that band reconfiguration will entail, we believe the administrative structure proposed by the Consensus Parties would delay, rather than facilitate, timely completion of band reconfiguration. Moreover, we are sensitive to the comments of those parties who expressed concern about the potential conflict of interest inherent in the proposed RCC and questioned whether the Commission could legally grant the RCC the powers envisioned by the Consensus Parties.⁵⁰⁸

191. Accordingly, we believe that using an independent individual or company, who, or which, will serve as a Transition Administrator subject to oversight by the Commission is the best approach for ensuring that band reconfiguration proceeds on schedule. The Transition Administrator may also serve to mediate disputes that may arise in the course of band reconfiguration.⁵⁰⁹ As contemplated by the Consensus Parties in their proposal for a RCC, Nextel will pay for the services of the Transition Administrator and staff as one of the transactional costs borne by Nextel in connection with band reconfiguration. We will follow a selection process similar to that suggested by the Consensus Parties; *i.e.*, the Transition Administrator will be an independent party with no financial interest in any 800 MHz licensee; and will be selected by a committee representative of 800 MHz licensees. We direct the following organizations to designate a representative to serve on the search committee for the Transition

⁵⁰⁵ *Id.* at 24.

⁵⁰⁶ *See NPRM*, 17 FCC Rcd at 4998-99 ¶ 45.

⁵⁰⁷ *See, e.g.*, Comments of Carolina Power and Light to Supplemental Comments of the Consensus Parties at 3, 7-8; Comments of Cinergy to Supplemental Comments of the Consensus Parties at 16; Comments of Consumers Energy, Inc. to Supplemental Comments of the Consensus Parties at 25-26.

⁵⁰⁸ *See, e.g.*, Comments of Alliant Energy to Supplemental Comments of the Consensus Parties at 3, Comments of Ameren Corp. to Supplemental Comments of the Consensus Parties at 12-13, Comments of Boeing to Supplemental Comments of the Consensus Parties at 25-26.

⁵⁰⁹ We will make this appointment pursuant to the authority given to us under Section 4(i) of the Act. *See* 47 U.S.C. § 154(i). The Commission has used similar third-party solutions in the past. In 1994, the Commission appointed an independent, non-governmental entity, UTAM, as the coordinating body to oversee the transition from fixed microwave operations to UPCS and to manage the transition to full band clearing. *See* Amendment of the Commission's Rules to Establish New Personal Communications Services, *Memorandum Opinion and Order*, 9 FCC Rcd at 4957 ¶ 209 (1994). In 1996, the Commission appointed the Personal Communications Industry Association (PCIA) and the Industrial Telecommunications Association, Inc. (ITA), two private non-governmental entities, to administer the microwave clearinghouse cost-sharing plan. *See* Amendment of the Commission's Rules Regarding a Plan for Sharing the Costs of Microwave Relocation, WT Docket No. 95-157, *Memorandum Opinion and Order*, 11 FCC Rcd 9394 (WTB 1996).

Administrator:⁵¹⁰

- Nextel Communications, Inc.;
- The Association of Public Safety Communications Officials-International;
- The Industrial Telecommunications Association;
- Southern LINC; and
- United Telecom Council;

192. Should any of the organizations, *supra*, decline to designate a representative; the Commission will designate a substitute organization. The Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau is hereby delegated the authority to choose such substitute organization. The search committee shall convene within fifteen days of the date this *Report and Order* is released, and shall select the Transition Administrator within forty-five days of the date this *Report and Order* is released. The search committee should proceed by consensus; however if a vote on selection of a Transition Administrator is required, it shall be by a supermajority of the representatives of four of the organizations, *supra*. The search committee shall notify the Commission of its choice for Transition Administrator. This notification shall: (a) fully disclose any perceived potential conflicts of interest or appearance of conflicts of interest of the Transition Administrator or his or her staff; and (b) set out in detail the salary and benefits associated with each position.^{510A}

193. On receipt of this notice regarding selection of a Transition Administrator, the Commission will issue a public notice to that effect. The Chief of the Public Safety and Critical Infrastructure Division is hereby delegated the authority to issue said Public Notice. During the course of the Transition Administrator's tenure, the Commission will take such measures as are necessary to ensure timely compliance with this *Report and Order*, including, should it become necessary, convening another search committee to choose a replacement Transition Administrator.

194. The Transition Administrator will serve both a ministerial role and a function similar to a special master in a judicial proceeding.⁵¹¹ In the latter role, the Transition Administrator may mediate any disputes that may arise in the course of band reconfiguration; or refer the disputant parties to alternative dispute resolution fora. Any dispute submitted to the Transition Administrator, or other mediator, shall be decided within thirty days after the Transition Administrator has received a submission by one party and a response from the other party. Any party thereafter may seek expedited non-binding arbitration which

⁵¹⁰ We chose these parties because we believe they closely represent a cross-section of the viewpoints presented in the proceeding by parties having a vested interest in the manner in which the 800 MHz band is to be reconfigured.

^{510A} Should the selected Transition Administrator be a company or other entity providing services to multiple clients, the salaries of the principals of such a company are not relevant to our inquiry. In such a case, the Transition Administrator shall report the billing rates of those persons performing the Transition Administrator function; which rates shall be no more than the billing rates charged for similar services in a project of similar complexity.

⁵¹¹ Courts often appoint special masters as a means of addressing, *inter alia*, judicial limitations such as time constraints, lack of expertise in esoteric areas and lack of skill in certain roles, such as the facilitation of settlement negotiations. See Wayne D. Brazil, *Special Masters in Complex Cases: Extending the Judiciary or Reshaping Adjudication?*, 53 U. Chi. L. Rev. 394-394-395 (1986).

must be completed within thirty days of the Transition Administrator's, or other mediator's recommended decision or advice. The parties will share the cost of this arbitration.⁵¹² Should issues still remain unresolved they may be referred to the Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau within ten days of the Transition Administrator's, or other mediator's recommended decision or advice. When referring an unresolved matter to the Chief of the Public Safety and Critical Infrastructure Division, the Transition Administrator shall forward the entire record on any disputed issues, including such dispositions thereof that the Transition Administrator has considered. Upon receipt of such record and advice, the Commission will decide the disputed issues based on the record submitted. The authority to make such decisions is hereby delegated to the Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau who may decide the disputed issue or designate it for an evidentiary hearing before an Administrative Law Judge. If the Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau decides an issue, any party to the dispute wishing to appeal the decision may do so by filing with the Commission, within ten days of the effective date of the initial decision, a Petition for *de novo* review; whereupon the matter will be set for an evidentiary hearing before an Administrative Law Judge. Parties seeking *de novo* review of a decision by the Wireless Telecommunications Bureau are advised that, in the course of the evidentiary hearing, the Commission may require complete documentation relevant to any disputed matters; and, where necessary, and at the presiding judge's discretion, require expert engineering, economic or other reports or testimony. Parties may therefore wish to consider possibly less burdensome and expensive resolution of their disputes through means of alternative dispute resolution.

195. The duties of the Transition Administrator will include, but not be limited to:

- Obtaining estimates from licensees regarding the cost of reconfiguring their systems and ensuring that estimates contain a firm work schedule and other matters set forth in Appendix E-Annex E, *infra*. The Transition Administrator will retain copies of all estimates and make them available to the Commission on request.
- Resolving disputes between Nextel and licensee on cost estimates for reconfiguring a system.
- Issuing the Draw Certificate to authorize and instruct the Letter of Credit Trustee to draw down on the Letter of Credit to pay relocation costs in connection with reconfiguring a licensee's system.⁵¹³ See Appendix E-Annex B2.
- Establishing a relocation schedule on a NPSPAC region-by-region basis, prioritizing the regions on the basis of population.⁵¹⁴ However, should a given region be encountering unusually severe amounts of unacceptable interference, that region may be moved up in priority. Any party disputing such a change in priority may refer the matter to the Chief of the Public Safety and Critical Infrastructure Division, who hereby is delegated the authority to resolve such disputes. The Transition Administrator may direct that adjoining regions be reconfigured simultaneously when conditions so require.

⁵¹² We note, however, that some government agencies can not engage in mediation or arbitration.

⁵¹³ The Transition Administrator will devise a suitable payment system with respect to each system that is reconfigured, including, if appropriate, instructing the Letter of Credit Trustee to make stage payments to licensees, vendors, *etc.*

⁵¹⁴ In developing such a schedule, the Transition Administrator has the discretion to exclude certain non-public safety licensees from a NPSPAC region relocation schedule, provided that they are eventually relocated prior to the end of band reconfiguration.

- The Transition Administrator will coordinate relocation of a NPSPAC Region's NPSPAC channels with the relevant Regional Planning Committee(s) prior to commencing band reconfiguration in a NPSPAC Region.

196. Once band reconfiguration commences in a given NPSPAC Region, the Transition Administrator will serve primarily an oversight function as necessary to implement band reconfiguration. For example the Transition Administrator will:

- Monitor the retuning schedule and resolve any schedule delays or refer same to the Public Safety and Critical Infrastructure Division for resolution.
- Coordinate with adjoining NPSPAC Regions to ensure that interference is not being caused to their existing facilities from relocated stations.
- Provide quarterly progress reports to the Commission in such detail as the Commission may require and include, with such reports, certifications by Nextel and the relevant licensees that relocation has been completed and that both parties agree on the amount received from the Letter of Credit proceeds in connection with relocation of the licensees' facilities. The report shall include description of any disputes that have arisen and the manner in which they were resolved. These quarterly reports need not be audited.
- Provide to the Public Safety and Critical Infrastructure Division, on each anniversary of the effective date of this Report and Order, an audited statement of relocation funds expended to date, including salaries and expenses of Transition Administrator.⁵¹⁵
- Facilitate resolution of disputes by mediation; or referral of the parties to alternative dispute resolution services.

197. The Transition Administrator may not serve as the repository of funds used in band reconfiguration, excepting such sums as Nextel may pay for the Transition Administrator's services. Moreover, the Transition Administrator will not be certified by the Commission as a frequency coordinator.

198. We envision the relocation process in a particular region unfolding as follows:

- 1) Nextel shuts down its General Category channels and relocates all non-Nextel General Category licensees.⁵¹⁶ It temporarily shifts many of its operations to "green space" at 900 MHz.
- 2) NPSPAC licensees relocate to six megahertz of spectrum in the former General Category space at Nextel's expense.
- 3) Nextel relocates its systems from the green space and from the interleaved portion of the band into the vacated NPSPAC channels; surrendering its rights to spectrum below 817 MHz/862 MHz spectrum in the process.
- 4) Any remaining relocations necessary to effect complete reconfiguration of the band in that region

⁵¹⁵ An audited statement is one that comports to the relevant Financial Accounting Standards Board (FASB) standards. See n. 510A, *supra*.

⁵¹⁶ In this connection, we observe that during band reconfiguration the provisions of Section 90.157 will not apply to Nextel and non-Nextel stations that have been shut down in order to accommodate our rebanding plan. See 47 C.F.R. § 90.157.

are made at Nextel's expense, e.g. moving public safety systems out of the Expansion Band.⁵¹⁷

We envision system relocation involving the following steps:

- 1) The Transition Administrator notifies a licensee that its system needs to be relocated in order to complete band reconfiguration. The Transition Administrator will specify a replacement channel for each channel in the licensee's system that needs to be changed to a new channel.^{517A}
- 2) The licensee obtains an estimate of the cost to reconfigure its system and provides that estimate to the Transition Administrator. The submission to the Transition Administrator shall contain the licensee's certification that the funds requested are the minimum necessary to provide facilities comparable to those presently in use.
- 3) The Transition Administrator will review the estimate—including an analysis to ensure that the estimate does not exceed the cost of providing comparable facilities. If the review indicates the need for additional support, or is otherwise deficient, the licensee will be so informed and will be required to furnish a revised estimate.
- 4) The Transition Administrator will submit the estimate to Nextel, which will have the opportunity to review the details of the estimate and, if appropriate, dispute the estimate.
- 5) The Transition Administrator will facilitate resolution of any such disputes, acting as an intermediary between the licensee and Nextel. We envision that all licensees will exercise good faith and we strongly encourage licensees to cooperate in resolving disputes so as not to unreasonably frustrate band realignment.⁵¹⁸
- 6) Once Nextel's concurrence, which shall not unreasonably be withheld, has been obtained, the Transition Administrator will issue a Draw Certificate to the Letter of Credit Trustee who will draw down funds as appropriate from the letter of credit and disburse them, in accordance with the Transition Administrator's instructions, to the entity(ies) contracted to reconfigure the system (for example, the licensee, a local contractor and an equipment manufacturer—Nextel personnel will not be involved in reconfiguring a licensee's system.⁵¹⁹)
- 7) At the conclusion of system configuration the Transition Administrator will audit the amount expended and either issue a second Draw Certificate to the Letter of Credit Trustee to cover any reasonable expenditures reasonably agreed to by Nextel and the licensee that were not covered by the first Draw Certificate or direct the Letter of Credit Trustee to obtain reimbursement for any excess funds (with any disputes as to final amounts to be resolved following the dispute resolution procedures set forth in ¶ 194.
- 8) The licensee begins operating on the new channel(s).

⁵¹⁷ In this regard, we will allow inter-category sharing for the limited purpose of this proceeding. See 47 C.F.R. § 90.677 in Appendix C, *infra*.

^{517A} Although the Transition Administrator will specify replacement channels, the Transition Administrator is not necessarily required to select these replacement channels itself. The Transition Administrator may rely on a third party or parties for the selection of replacement channels.

⁵¹⁸ Licensees that fail to act in good faith or unreasonably decline to cooperate may be subject to enforcement action.

⁵¹⁹ The Trustee will disburse funds in accordance with the Transition Administrator's instructions which may include directions to pay contractors in a lump sum or over time in accordance with milestone payments set forth in the contractor's contract with the licensee.

199. We expect that the Transition Administrator, the Trustee appointed to administer the Letter of Credit, and Nextel will formalize the matters set forth herein in a contract, a draft of which shall be submitted to the Commission for review and approval prior to execution. Attached hereto as Appendix E Annex D is a non-exhaustive outline of provisions that the Commission would expect to be contained in such a contract.

200. In sum, we believe that reliance on the expertise of our existing frequency coordinators, together with our use of the services of an independent Transition Administrator is preferable to the Consensus Parties' proposed RCC and multiple committees.⁵²⁰ Moreover, given the detailed guidelines under which the coordinators and Transition Administrator will operate, coupled with the procedures for ongoing Commission review described *infra*, we conclude that Commission use of such expertise and services is well within our authority.⁵²¹

b. Scheduling and Implementation

201. In assigning oversight of the logistics of band reconfiguration to a Transition Administrator, we allow all parties involved in the relocation process a degree of flexibility that would not be achievable if we set rigid rules for the relocation process. However, we do impose the following obligations on the parties:

- All parties, including Nextel, are held to a high standard of utmost good faith in their transactions with Nextel, or its designee, the Transition Administrator, other licensees, and the Commission. In particular, and without limiting the generality of the foregoing obligation, representations made to the Transition Administrator will be held to the same standard of truth and candor as representations made to the Commission.
- Within thirty days of the Commission approval of the Transition Administrator, the Transition Administrator will provide the Commission with a schedule detailing when band reconfiguration shall commence for each NPSPAC Region. The plan should also detail—by NPSPAC Region—which relocation option each non-Nextel ESMR licensee has chosen.⁵²² The Chief of the Public Safety and Critical Infrastructure Division of the Wireless

⁵²⁰ In this connection, we strongly encourage frequency coordinators to complete any necessary review within thirty days.

⁵²¹ See, e.g., *Batterton v. Francis*, 97 S.Ct. 2399, 2407 (1977) (Secretary of Health, Education, and Welfare had authority to tie AFDC benefits to state unemployment compensation determinations since in doing so the Secretary “incorporated a well-known and widely applied standard.”) and *R. H. Johnson & Co. v. SEC*, 198 F.2d 690, 695 (2nd Cir. 1952), *cert. denied* 344 U.S. 855, 73 S.Ct. 94, 97 L.Ed. 664 (1952) (SEC did not unconstitutionally delegate powers to National Association of Securities Dealers because it retained power to approve or disapprove rules and to review disciplinary actions). Compare *United Black Fund, Inc. v. Hampton*, 352 F.Supp. 898, 904 (D.D.C. 1972) (Civil Service Commission Chairman may permit private entities preliminarily to determine eligibility of local health and welfare agencies for participation in the Combined Federal Campaign where Chairman set standards local agencies must meet, and where the Chairman retained final review authority) with *National Park and Conservation Ass’n v. Stanton*, 54 F. Supp.2d 7, 20 (D.D.C.1999) (National Park Service’s (“NPS”) delegation of management of national scenic river to a private council constitutes unlawful delegation because “NPS retains no oversight over the [c]ouncil, no final reviewing authority over the council’s actions or inaction, and the [c]ouncil’s dominant private local interests are likely to conflict with the national environmental interests that NPS is statutorily mandated to represent.”); cf. *USTA v. FCC* (DC Cir. Mar. 2, 2004) (holding that the Commission had impermissibly subdelegated its authority to the states.)

⁵²² See ¶ 162 *supra*.

Telecommunications Bureau is hereby delegated the authority to finalize and approve such a plan. The schedule shall provide for completion of band reconfiguration in no more than thirty-six months following the release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region. In addition, as an interim benchmark, the schedule must provide for retuning of Channels 1-120 in twenty NPSPAC Regions within eighteen months. Relocation will commence according to the schedule set by the Transition Administrator but all systems must have commenced reconfiguration within thirty months of the release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region.

- The schedule shall specify a start date for the reconfiguration of each Region. Thirty days before the start date, the Commission will issue a Public Notice initiating a three-month voluntary negotiation period between Nextel and all relocating incumbents. Nextel and relocating incumbents may agree to conduct face-to-face negotiations or either party may elect to communicate with the other party through the Transition Administrator. The Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau is hereby delegated the authority to issue such Public Notices. The release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region starts the thirty-six month band reconfiguration period.
- If voluntary negotiations do not yield an agreement by the date specified in the Commission Public Notice, the parties are required to enter into three-month mandatory negotiation period and shall have obligations patterned after those specified in our *Upper 200 SMR* and *Microwave Cost-Sharing* proceedings.⁵²³ Again, the parties may agree to conduct face-to-face negotiations or elect to communicate through the Transition Administrator. The Transition Administrator may schedule mandatory settlement negotiations and mediation sessions and the parties must conform to such schedules.
- If, after the three-month mandatory negotiation period, the parties have not reached an agreement, disputed issues shall be identified in writing by both parties, and the matter referred to the Transition Administrator who shall mediate an agreement, or refer the parties to mediation. If disputed issues remain thirty days after the end of the mandatory negotiation period, the Transition Administrator shall forward the record to the Chief of the Public Safety and Critical Infrastructure Division, together with advice on how the matter(s) may be resolved. The Chief of the Public Safety and Critical Infrastructure Division is hereby delegated the authority to rule on disputed issues, *de novo*. Any party wishing to appeal the decision of the Chief of the Public Safety and Critical Infrastructure Division may avail themselves of an evidentiary hearing as discussed in ¶ 194 *supra*.
- In the alternative, parties who are unable for technical reasons or otherwise to relocate according to the schedule may petition the Commission for a waiver of the relocation obligation. Such a waiver would only be granted on a strict non-interference basis. Moreover, there would be a high burden to surmount for any party seeking a waiver of this obligation.

⁵²³ See 47 C.F.R. § 90.699(b)(2). See also Comments of NAM/MRFAC to Supplemental Comments of Consensus Parties at 11-12; Cinergy Corp., Consumers Energy Corp., Entergy Corp, Entergy Services March 12, 2003 *Ex Parte*.

- All parties are charged with the obligation of utmost good faith in the negotiation process.⁵²⁴ If any licensee fails to negotiate in good faith, its facilities may be involuntarily relocated and its license modified accordingly by the Commission. We hereby delegate to the Wireless Telecommunications Bureau the authority, pursuant to Section 316 of the Act,⁵²⁵ to modify licenses under such circumstances.
- All relocating licensees shall be relocated to comparable facilities. Comparable facilities are those that will provide the same level of service as the incumbent's existing facilities, with transition to the new facilities as transparent as possible to the end user.⁵²⁶ Specifically, (1) equivalent channel capacity;⁵²⁷ (2) equivalent signaling capability,⁵²⁸ baud rate and access time; (3) coextensive geographic coverage;⁵²⁹ and (4) operating costs.⁵³⁰ If the reconfiguration of a licensee will entail a significant interruption of service during the relocation process, Nextel will fund the installation of a redundant system.⁵³¹
- Absent agreement between parties, the Transition Administrator will be responsible for determining the information that relocating incumbents must supply in support of a relocation agreement.

202. In setting the above framework for implementing band reconfiguration, we have considered but rejected some of the Consensus Parties' detailed proposals, *e.g.* a rule incorporating the lengthy list of equipment that incumbents would be required to submit to Nextel within a time certain.⁵³²

⁵²⁴ Among the factors relevant to a good-faith determination are: (1) whether the party responsible for paying the cost of band reconfiguration has made a *bona fide* offer to relocate the incumbent to comparable facilities; (2) the steps the parties have taken to determine the actual cost of relocation to comparable facilities; and (3) whether either party has unreasonably withheld information, essential to the accurate estimation of relocation costs and procedures, requested by the other party. *See* Amendment to the Commission's Rules Regarding a Plan for Sharing the Costs of Microwave Relocation, *First Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 8825, 8837-8838 ¶ 21.

⁵²⁵ 47 U.S.C. § 316.

⁵²⁶ *See generally*, Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *Second Report and Order*, 12 FCC Rcd 19079, 19112-19113 ¶ 89-95 (1997) (*Upper 200 SMR Second Report and Order*).

⁵²⁷ Our rules define channel capacity as the same number of channels with the same bandwidth that is currently available to the end user. *See Upper 200 SMR Second Report and Order*, 12 FCC Rcd 19079, 19112-13 ¶ 92. *See also* 47 C.F.R. § 90.699(d)(2). For example, if an incumbent's system consists of five 25 kHz channels, the replacement system must also have five 25 kHz channels. Our rules do not, however, mandate identical channel configuration. *See Upper 200 SMR Second Report and Order*, 12 FCC Rcd 19079, 19112-13 ¶ 92.

⁵²⁸ *See Upper 200 SMR Second Report and Order*, 12 FCC Rcd 19079, 19112-13 ¶ 92. *See also* 47 C.F.R. § 90.699(d)(2).

⁵²⁹ *Id.*

⁵³⁰ *See Upper 200 SMR Second Report and Order*, 12 FCC Rcd 19079, 19113 ¶ 94. *See also* 47 C.F.R. § 90.699(d)(4). These costs will be estimated and paid as part of the relocation costs.

⁵³¹ In this regard we observe that our definition of comparable facilities is limited to already existing facilities.

⁵³² *See* Supplemental Comments of the Consensus Parties at 15-19 and Appendix C.

We have done so with the knowledge that relocation of some systems will not require information to that degree of detail, and that some degree of flexibility will better serve the parties. The overriding requirement of our framework is the good faith requirement. While parties must first bring disputes over the utmost good faith requirement to the Transition Administrator, disputing parties may subsequently bring breaches of the good faith requirement to the Commission and similarly bring there, any instance in which a party frivolously or without substantiation, charges another party with failure to negotiate in good faith.⁵³³ As the Commission has noted previously there is no “one size fits all” rule that can be applied to the good faith issue, which is largely fact-dependent and likely to vary from case-to-case.⁵³⁴

203. We also have heeded the concern of some commenting parties that information relative to band reconfiguration could be sensitive from a security standpoint. We encourage, but do not require, the parties and the Transition Administrator to exercise discretion in disclosing any security-sensitive information; but note that there is a balance between the public’s need to know and the need to withhold sensitive information. Thus, for example, the Commission has struck the balance in favor of public disclosure in making its Universal Licensing System (ULS) data available on the Internet. A large amount of information on existing 800 MHz facilities is contained in the ULS and the ULS also will contain information on the license modifications necessary to implement band reconfiguration. Similarly, we are not persuaded by the argument that furnishing information necessary for band reconfiguration would somehow result in a competitor gaining access to information it could use to its advantage.⁵³⁵ We do not foresee any party having access to competitively-sensitive information such as the identity and other details of an incumbent’s customers.

c. Freeze on the Acceptance of 800 MHz Applications

204. The Consensus Parties requested that we freeze the acceptance of applications for 800 MHz public safety, non-cellular SMR and Business and Industrial/Land Transportation authorizations pending band reconfiguration.⁵³⁶ We strongly agree with the parties who point out the adverse effects such a three-year freeze could have on their companies’ business plans.⁵³⁷ Nonetheless, we see no alternative to a freeze if band reconfiguration is to be timely accomplished. There is a middle ground, given the incremental implementation of band reconfiguration Region by Region. Therefore we will freeze 800 MHz applications for a region when we issue the *Public Notice* announcing the date when voluntary negotiation of relocation agreements must be concluded. This freeze will last until thirty working days after the completion of mandatory negotiations for a given Region.⁵³⁸ However, such a freeze would not include the modification applications filed in order to implement band reconfiguration. Moreover, we will

⁵³³ See, e.g., 47 U.S.C. §§ 312, 503.

⁵³⁴ See, e.g., *Upper 200 SMR Second Report and Order*, 12 FCC Rcd 19079; *Petition For Declaratory Ruling Concerning The Requirement For Good Faith Negotiations Among Economic Area Licensees And Incumbent Licensees In The Upper 200 Channels Of The 800 MHz Band*, *Memorandum Opinion and Order*, 16 FCC Rcd 4882 (2001) (*Good Faith MO&O*).

⁵³⁵ See Supplemental Comments of the Consensus Parties at Appendix C, C-4-5.

⁵³⁶ See Supplemental Comments of Consensus Parties at 26.

⁵³⁷ See, e.g., Letter, dated November 13, 2003, from R. David Laurell, County Administrator, County of Campbell, Virginia Board of Supervisors to Marlene H. Dortch, Secretary, Federal Communications Commission; Comments of American Electric Power Company, Inc. to Supplemental Comments of the Consensus Parties at 9-10.

⁵³⁸ The mandatory negotiation period essentially ends six months after voluntary negotiations begin.

do everything possible to minimize the effect the incremental freezes may have on incumbent licensees and new applicants, and direct the Transition Administrator to make accommodations in the implementation plan that will avoid such adverse effects. Moreover, we will not freeze the acceptance of modification applications that do not change the frequency or expand the coverage area of existing systems. Finally, we remind potentially affected parties of the availability of the Commission's waiver process and Special Temporary Authorizations when needed in order to avoid prejudice to any applicant during the band reconfiguration process.

d. Tolling of 800 MHz Site-Based Construction Requirements

205. Since the 800 MHz band reconfiguration process will take place incrementally in fifty-one geographic regions, some site-based incumbent 800 MHz licensees may face construction deadlines prior to their being scheduled for relocation.⁵³⁹ To resolve this issue we will allow licensees which are ready to construct and waiting only for assignment of their new channel to submit a waiver request demonstrating that they have commenced construction, *e.g.* have on hand, or have placed a firm order for, non frequency-sensitive equipment, have erected a tower, obtained a commitment for tower space, etc.

206. If the Transition Administrator has specified said licensee a new channel and the licensee can immediately use the channel without causing interference to other systems, it must construct within its currently applicable deadline. Otherwise, the licensee may submit a waiver request for extension of the construction period until: (a) six months after the Transition Administrator has specified it a channel, if that channel can be used, in advance of band reconfiguration in the region, without causing interference; or (b) if its channel cannot be activated without interference to other systems, six months after the completion of band reconfiguration in its NPSPAC region. The Commission's waiver rules⁵⁴⁰ will apply and the waiver requests will be evaluated on a good cause basis *e.g.* on a showing by the licensee that it would have constructed but for the fact that band reconfiguration would affect its proposed facilities. Licensees whose construction deadline passed before the release of this *Report and Order*, and which do not have an extension of time request already pending, will have a particularly high evidentiary standard to meet when they submit a waiver request. These provisions also apply to EA licensees facing construction deadlines pursuant to Section 90.685 of the Commission's Rules.⁵⁴¹

6. Disposition of Nextel's 900 MHz SMR and 700 MHz Guard Band Block B Spectrum

207. The Consensus Plan contemplated that, at the end of band reconfiguration, Nextel would relinquish its rights to 900 MHz SMR spectrum as an incentive for non-cellular SMR and B/ILT licensees to vacate 800 MHz band channels on a "two for one" basis, *i.e.* each 800 MHz licensee that relocated to 900 MHz spectrum would get rights to twice the spectrum it occupied in the 800 MHz band.⁵⁴² We are not persuaded that Nextel's abandoning service to the public in the 900 MHz band in order to provide non-cellular SMR and B/ILT licensees with 900 MHz spectrum for which there is no demonstrated need is in the public interest. We are further dissuaded from accepting Nextel's proffer of relinquishment of its 900 MHz spectrum rights because Nextel likely will need to use this spectrum to accommodate subscriber

⁵³⁹ For example, this may include licensees with extended implementation authority, new licensees, or licensees with pending requests for extension of current authorization.

⁵⁴⁰ See 47 C.F.R. § 1.925.

⁵⁴¹ See 47 C.F.R. § 90.685(b).

⁵⁴² See Supplemental Comments of the Consensus Parties at 13.

demand during 800 MHz band reconfiguration; and, possibly thereafter.⁵⁴³ Even if the 900 MHz spectrum went to public safety, there are no "rebanding" benefits to using this spectrum for public safety because it is isolated from the consolidated block of 800 and 700 MHz spectrum that will be available for public safety after rebanding. In this regard, 900 MHz can be distinguished from the 700 MHz Guard Band spectrum, which could be added to the consolidated block if we decided to make the 700 MHz Guard band spectrum available for public safety use. From an interference perspective, our decision to permit operational flexibility (*i.e.* cellular architecture) in the 900 MHz band effectively precludes use of 900 MHz by public safety at this time.⁵⁴⁴ While public safety would benefit from B/ILT and SMR licensees relocating to 900 MHz as it would provide "green-space" in the 800 MHz band, to the extent Nextel wants to offer 900 MHz spectrum to B/ILT on a 2-for-1 basis, as it has proposed, it can do so through private transactions without returning this spectrum to the Commission.

208. As noted at paragraph 61 *supra*, Nextel also has proposed to surrender certain 700 MHz guard band Block B spectrum, which it holds in 40 markets; and recommends that the Commission rededicate that spectrum to public safety use. We note that the 700 MHz Guard Band's use for public safety applications, as proposed, is problematic. The 700 MHz Guard Band spectrum was established specifically to buffer 700 MHz public safety systems from interference by commercial systems operating in the Upper 700 MHz band. It would be anomalous in our view, to place public safety systems in the very interference-prone spectrum that we established to protect public safety.

209. We nonetheless will accept Nextel's 700 MHz Guard Band spectrum, but decline to redesignate it to public safety use at this time. Instead, we will consider the ultimate disposition of this spectrum in a future rule making proceeding. In this connection, we note that there are several potential public safety and public interest benefits that may be realized by a redesignation or reassignment of the 700 MHz Guard Band spectrum that Nextel offers to relinquish. However, we do not believe that the ultimate decision on how best to use the surrendered 700 MHz spectrum should be resolved in the context of this *Report and Order*. Rather, any such decision should rest on a record developed in a subsequent rule making proceeding. There, we may consider such issues as whether there are public safety applications that could exist satisfactorily in such spectrum consistent with our statutory authority; whether there is a demand for additional B/ILT spectrum that would be satisfied by access to the 700 MHz Guard Band spectrum; whether providing B/ILT licensees access to such spectrum would create opportunities for public safety to get access to additional 800 MHz band frequencies; whether there are other, new uses that may arise; and whether the 700 MHz Guard Band spectrum should be re-auctioned.

D. Appropriate Compensation for Band Reconfiguration

210. In the *NPRM*, the Commission discussed the "replacement spectrum" construct advanced by Nextel in its White Paper, *i.e.*, that if Nextel were to pay the cost of band reconfiguration and vacate certain 700 MHz, 800 MHz and 900 MHz spectrum, it should be compensated on a "megahertz for megahertz" basis with spectrum nominally in the 2 GHz range. We sought comment on the relative value of the spectrum that Nextel proposed to surrender vs. the value of its desired replacement spectrum. In the Consensus Plan, Nextel proposed that, as compensation for its relinquishment of 700, 800 and 900 MHz

⁵⁴³ Nextel's need for the 900 MHz spectrum may arise if there are two 800 MHz ESMR licensees in a market, *e.g.* Nextel and Southern LINC, and both cannot be accommodated in the 817-824 MHz / 862-869 MHz cellular-architecture spectrum segment. In that instance, Nextel must surrender the additional spectrum necessary to accommodate the non-Nextel cellular-architecture system. The 800 MHz spectrum that Nextel loses in such a case may be compensated for by Nextel shifting some of its operations to its 900 MHz SMR frequencies. *See* ¶ 159 *supra*.

⁵⁴⁴ *See* ¶¶ 335-337 *infra*.

spectrum rights and its commitment to pay 800 MHz incumbent relocation costs, it should receive a nationwide license for ten megahertz of spectrum in the 1.9 GHz band.⁵⁴⁵ Other parties contend that the value of the spectrum rights Nextel seeks substantially exceeds the value of spectrum rights it has offered to give up, and therefore would constitute an unwarranted windfall to Nextel.

211. We conclude that it is in the public interest to compensate Nextel for the surrendered spectrum rights and costs it will incur as a result of band reconfiguration. By facilitating band reconfiguration, giving up spectrum rights and bearing the financial burden of the relocation process for all affected incumbents, we believe that Nextel has provided the quickest, most comprehensive and most cost-effective means of solving the 800 MHz public safety interference problem of all the alternatives presented or available to the Commission. In light of these substantial public interest benefits, we conclude that it is appropriate for Nextel to receive equitable compensation in the form of spectrum rights to the 1910-1915 MHz and 1990-1995 MHz bands, conditioned on its meeting the obligations imposed by this *Report and Order*. We specifically reject the proposal by some parties to grant Nextel rights to spectrum in the 2.1 GHz band as opposed to the 1.9 GHz band.⁵⁴⁶ Accordingly, we take those steps necessary to designate the 1.9 GHz spectrum for Nextel's use, and to provide for relocation and reimbursement by Nextel of incumbent users of the band.

212. We are sensitive to the argument made by several parties that granting Nextel spectrum rights in the 1.9 GHz band could result in an undeserved "windfall" to Nextel. To ensure that Nextel is treated equitably but does not realize any windfall gain, we provide for compensation of Nextel on a "value for value" basis. Under this approach, we first make a determination of the market value of the 1.9 GHz spectrum, based on valuation data provided by the parties and on our own analysis. Second, we provide that as offsets against this value, Nextel will receive credit for (1) the net value of the spectrum rights that Nextel is relinquishing to public safety, CII, and other 800 MHz licensees, (2) the actual cost of 800 MHz band reconfiguration (including both Nextel's costs to support relocation by other licensees and Nextel's own relocation costs), and (3) costs incurred by Nextel to clear the 1.9 GHz band, less any reimbursed expenses. Third, because we do not know at present what the costs of 800 MHz relocation and 1.9 GHz band-clearing will ultimately be, we provide for an accounting at the end of the transition period to determine the amount of these offsets and balance them against the value of Nextel's 1.9 GHz spectrum rights as determined by this *Report and Order*.⁵⁴⁷

1. Public Interest Considerations for Granting Spectrum Rights to Nextel

213. We recognize that the granting of valuable spectrum rights to Nextel—or to any party—without recourse to the competitive bidding process is highly unusual. However, given the extraordinary circumstances present in this proceeding, including issues involving the safety of life and property—and absent harm to other interests of the public—we are convinced that our decision in this regard is consistent with the public interest. In reaching this decision, we are mindful that Congress has expressed a strong statutory preference in the vast majority of circumstances for use of auctions to assign spectrum rights. However, Congress has also established a clear exception for public safety services that protect life and property, exempting them from the requirement that they obtain spectrum on the auction block. We believe the same rationale applies to our decision here, where we are reconfiguring spectrum for non-

⁵⁴⁵ See ¶ 61 *supra*.

⁵⁴⁶ See ¶¶ 217-222 *infra*.

⁵⁴⁷ See ¶¶ 329-332 *infra*.

economic reasons to benefit public safety and the public as a whole.⁵⁴⁸ This is not to say that economic factors are irrelevant—we regard economic analysis as germane to the question of whether our action today could inadvertently impair the public’s access to affordable wireless communications services. We believe the record conclusively demonstrates that there will be no such unintended consequences.

214. Nevertheless, we reject the claim that assigning Nextel spectrum rights in another band as part of this comprehensive solution is unfair because Nextel is receiving “free” spectrum while its competitors must bid for spectrum at auction. First, given the obligations we place on Nextel in this *Report and Order*, and the mechanism we have established to prevent an undue windfall, its access to other spectrum is hardly “free.” Second, Nextel is taking the very substantial risk that it could end up incurring costs that are greater than the value of the spectrum rights it receives. This is because we have not merely rubber-stamped the Consensus Parties’ proposal, but have imposed significant obligations beyond what the parties proposed to ensure that the public receives full benefit in exchange for making other spectrum available to Nextel. Under this restructured solution, we are requiring Nextel to assume the following substantial—and to a large degree unpredictable—risks:

- Nextel must complete reconfiguration of the 800 MHz band regardless of the ultimate cost. Although Nextel estimated it will cost up to \$850 million to reconfigure the 800 MHz band, other parties contend that the actual cost will be far higher, *e.g.* CTIA claims that 800 MHz band reconfiguration cost could exceed \$3 billion.⁵⁴⁹ Thus, we are requiring Nextel to assume the risk that the cost of 800 MHz band reconfiguration could exceed any value Nextel ultimately realizes from the other spectrum.
- In order to ensure that the 800 MHz band will be reconfigured, we are requiring Nextel to obtain a \$2.5 billion letter of credit to both fund the reconfiguration and to serve as insurance against a Nextel default, including bankruptcy. The cost of such a letter of credit is substantial and was not factored into the Consensus Parties’ estimates.
- Should experience as band reconfiguration progresses show that the ultimate cost is likely to exceed even the \$2.5 billion sum, *supra*, Nextel may be required to obtain additional letters of credit.⁵⁵⁰ Again, the financial risk associated with such additional letters of credit would be borne by Nextel.
- Nextel must meet the interim benchmark of the retuning Channels 1-120 in twenty NPSPAC Regions.⁵⁵¹ If Nextel fails to meet the interim benchmark, for reasons that Nextel, with the exercise of due diligence, could reasonably have avoided, the Commission may consider and exercise any appropriate enforcement action within its authority, including assessment of

⁵⁴⁸ These benefits may also have an economic component, though it is difficult to quantify. One study in the record posits that if improved public safety communications reduced the societal loss from crime and fire by one-tenth of one percent, the nation would save \$1 billion every year. *See* Nextel Sunfire *Ex Parte* at 10.

⁵⁴⁹ *See* Letter, dated April 29, 2004, from Steve Largent, President and CEO CTIA to Michael Powell, Chairman, Federal Communications Commission at 2-3. *See also* n. 488-489 *supra*.

⁵⁵⁰ We note that Nextel’s cost for such additional letters of credit likely would increase if Nextel’s band reconfiguration progress did not meet projections, thus affecting the risk-analysis of the issuing bank(s).

⁵⁵¹ *See* ¶ 201 *supra*.

monetary forfeitures or, if warranted, license revocation.⁵⁵²

- Nextel must complete band reconfiguration within thirty-six months. If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.

215. We also consider the assignment of spectrum rights to Nextel to be necessary to achieve our paramount goal of abating interference to 800 MHz public safety systems. As discussed in ¶ 61 *supra*, after more than two years spent examining a record of over 2200 filings, many of them incorporating detailed technical and economic studies, we are convinced that 800 MHz band reconfiguration is the only reliable and affordable means of achieving this goal. Moreover, only the Consensus Parties have proposed a band reconfiguration mechanism that guarantees public safety and other 800 MHz licensees the funds necessary to relocate themselves out of their current inter-leaved operational environment. We do not believe that our solution—which is adapted from the Consensus Parties’ proposal—can be legally or equitably imposed without a compensatory assignment of spectrum rights to Nextel. We also note that many of Nextel’s cellular competitors conduct their operations on spectrum they acquired at no cost, and that some of these same parties will benefit—at no cost to themselves—from reduced interference mitigation costs as a result of the band configuration carried out at Nextel’s expense.

216. In sum, although our determination may not reflect complete financial exactitude, it is firmly grounded in our statutory authority as well as our agency expertise. The public interest that we are required to uphold often rests on such unquantifiable imperatives as those recited in the preamble of our organic statute; that we exist to regulate communications “for the purpose of the national defense, for the purpose of promoting safety of life and property.”⁵⁵³ Thus, we find utmost consistency between our statutory charge and the certain value of Nextel’s unique ability to abate the unacceptable interference that hinders our Nation’s first responders in their supremely difficult task of defending against terrorism and ensuring the safety of our life and property. We believe the balance we have struck here is fair and equitable.

2. Choice of 1.9 GHz Replacement Spectrum

217. As discussed in the *NPRM*, we are applying two basic criteria in selecting replacement spectrum for Nextel, and in considering the proposal in the Consensus Plan that Nextel be granted spectrum rights at 1910-1915/1990-1995 MHz: (1) the segment selection would have to be consistent with the highest and best possible use of the spectrum; and (2) there would have to be an acceptable plan for relocating incumbent licensees or reimbursing other users, *e.g.* BAS, FS licensees and UPCS.⁵⁵⁴ In making our selection, we also must decide whether to redesignate 1910-1915 MHz to permit the provision of licensed fixed and mobile services, an issue noticed in ET Docket 00-258. Based on the record evidence, in WT Docket 02-55 and in ET Docket 00-258, we are assigning the 1910-1915/1990-1995 MHz band segment as paired replacement spectrum for Nextel for the provision of licensed Fixed and

⁵⁵² We note that the Commission has issued Notices of Apparent Liability for Forfeiture assessing substantial penalties on carriers that have failed to comply with Commission rules intended to enhance the safety of life and property. See *In re T-Mobile USA, Inc., Notice of Apparent Liability for a Forfeiture*, 18 F.C.C.R. 3501 (EB 2003); see also *In re AT&T Wireless Services, Inc., Notice of Apparent Liability for a Forfeiture*, 17 F.C.C.R. 9903 (EB 2002).

⁵⁵³ Communications Act of 1934, Title I, Section 1, 47 U.S.C. § 151.

⁵⁵⁴ See *NPRM* at 17 FCC Rcd at 4904 ¶ 57.

Mobile services on a primary basis. In so doing, we have carefully balanced the competing recommendations for use of this band segment.⁵⁵⁵ We have determined that the need to facilitate the rebanding to remedy interference to 800 MHz public safety and CII communications systems, now and in the future, and to restore spectrum capacity lost by Nextel in the course of band reconfiguration, far outweighs the benefits of other potential use of this 1.9 GHz spectrum.⁵⁵⁶ We find that providing replacement spectrum rights for Nextel is a *sine qua non* for elimination of unacceptable interference in the 800 MHz band.⁵⁵⁷

218. In several recent *ex parte* filings in this proceeding, CTIA argues that if the Commission is to award replacement spectrum rights to Nextel as part of this order, it should select spectrum in the 2.1 GHz band rather than the 1.9 GHz spectrum proposed by the Consensus Parties.⁵⁵⁸ CTIA points out that Nextel in its 2002 White Paper originally identified 2.1 GHz spectrum as potential replacement spectrum. CTIA further contends that the 2.1 GHz band is sufficiently comparable to the 1.9 GHz band that it would be suitable spectrum for Nextel's needs, although it may be slightly lower in value.⁵⁵⁹ In response, Nextel contends that 2.1 GHz would not be suitable replacement spectrum because of technical and operational deficiencies in comparison to 1.9 GHz.⁵⁶⁰

219. We conclude that the record does not support substituting 2.1 GHz for 1.9 GHz as proposed by CTIA. We recognize that the Nextel White Paper identified 2.1 GHz as a potential replacement band, and that the Commission sought comment on this and other potential bands in the NPRM. However, when the Consensus Parties filed their initial proposal in August 2002, they specifically identified spectrum in the 1.9 GHz band as the proposed replacement spectrum for Nextel. During the comment and reply period, numerous commenters debated the Consensus Parties' proposal to use 1.9 GHz, but no commenter proposed further consideration of 2.1 GHz as an alternative or provided information regarding the characteristics or suitability of the band. CTIA's proposal to consider substituting 2.1 GHz for 1.9 GHz was not made until more than two years after we initiated this proceeding. Although several additional *ex parte* submissions have been filed in response to the CTIA proposal since then, we find that they have primarily raised additional issues and questions that would require further development of the record to resolve.

220. For example, Nextel cites a number of differences between 2.1 GHz and 1.9 GHz that Nextel contends significantly reduce the former's comparative utility and value. Nextel contends that developing 2.1 GHz subscriber equipment will be time-consuming and costly because it cannot readily be adapted from existing equipment designs, whereas existing PCS equipment can be adapted quickly with

⁵⁵⁵ See ¶¶ 224-235 *infra*.

⁵⁵⁶ For a discussion of our legal authority to take this step in furtherance of the public interest see ¶¶ 62-87 *supra*.

⁵⁵⁷ We reach this conclusion based upon our assessment of the state of communications technology and its current deployment, and cognizant of our obligations pursuant to 47 U.S.C. § 151. See ¶ 211 *supra*.

⁵⁵⁸ See CTIA April 29 *ex parte* at 2; CTIA May 7 *ex parte* at 2. CTIA proposed that Nextel not receive 2.1 GHz spectrum until the rebanding process is complete. As discussed in ¶¶ 213-216 *supra*, we conclude that it is appropriate to grant spectrum rights to Nextel at the commencement of the rebanding process with those rights conditioned on the successful and timely completion of rebanding.

⁵⁵⁹ CTIA May 7 *ex parte* at 5.

⁵⁶⁰ Nextel May 14 *ex parte* 3-4.

only minor changes to operate in adjacent 1.9 GHz spectrum.⁵⁶¹ Nextel also points to different incumbency and band-clearing issues in the two bands, particularly the presence of fixed microwave incumbents in the 2.1 GHz band (some of them licensed to Nextel's competitors), which it contends will lead to greater cost and more uncertain time frames for clearing the band in comparison to 1.9.⁵⁶² CTIA contends that these differences do not have as significant an impact on the value of 2.1 GHz as Nextel contends, or that if they do lower the value of 2.1 GHz in comparison to 1.9 GHz, this merely serves to reduce the risk that Nextel will receive a windfall.⁵⁶³ However, neither CTIA nor any other party has presented additional data or analysis to support these contentions.⁵⁶⁴

221. We believe that Nextel has raised legitimate questions with respect to technical and operational differences between the 2.1 GHz band and the 1.9 GHz band.⁵⁶⁵ However, because of the late-developed and limited nature of the record regarding the 2.1 GHz band, we lack sufficient information from which to draw conclusions on how these differences might affect the relative suitability or value of the 2.1 GHz band. Therefore, further consideration of this option would require additional development of the record, which would significantly delay action in this proceeding. Given the already lengthy nature of this proceeding, and the urgency of the public safety interference problem we are addressing, such delay would not be in the public interest. In contrast to the limited record on 2.1 GHz, the record regarding the 1.9 GHz band is well-developed, and we are satisfied based on this record that awarding 1.9 GHz spectrum rights to Nextel, subject to the conditions and safeguards of this order, is fully consistent with our public interest goals and obligations. Accordingly, we see no reason to delay our decision to gather additional information on an uncertain alternative.

222. We also do not believe that issuing Nextel a bidding credit or auction discount voucher for unspecified future spectrum is an acceptable alternative to awarding it 1.9 GHz spectrum rights.⁵⁶⁶ We recognize that Nextel may need to apply revenues derived from 1.9 GHz service to meet its obligation to timely complete 800 MHz band reconfiguration. It can do so only if it is afforded timely and certain access to 1.9 GHz spectrum rights in exchange for vacating certain 800 MHz spectrum and assuming the cost of 800 MHz band reconfiguration. Reconfiguration of the 800 MHz band is essential to our goal of timely abating unacceptable interference to public safety, CII and other 800 MHz systems. Given the unique facts of this case, there is an inextricable connection between quick abatement of unacceptable 800 MHz interference and Nextel's quick access to additional spectrum. Neither a bidding credit nor an auction discount voucher would assure timely and certain access to the needed additional spectrum or the associated revenue.

⁵⁶¹ *Id.* at 4.

⁵⁶² *Id.* at 4.

⁵⁶³ CTIA May 7 *Ex Parte* at 5-6.

⁵⁶⁴ Verizon states that would be prepared to bid a "substantial" amount for 2.1 GHz spectrum, but less than what it would bid for 1.9 GHz spectrum. Verizon May 27 *Ex Parte* at 3.

⁵⁶⁵ In addition to equipment costs and band-clearing issues, Nextel cites inferior propagation characteristics at 2.1 GHz in comparison to 1.9 GHz as reducing the relative value of 2.1 GHz spectrum. Nextel May 14 *Ex Parte* at 3-5. We accord very little weight to this factor: the differential free space path loss between 1.9 GHz and 2.1 GHz is less than one-tenth of a dB, and the attenuation due to foliage, precipitation, and other environmental factors is essentially identical for the two bands.

⁵⁶⁶ See *Ex Parte* presentation of James Kay, dated June 25, 2003, at 11.

3. Assignment of Spectrum Rights at 1.9 GHz to Nextel

223. We here take the necessary actions to assign to Nextel a ten-year license to the 1910-1915 MHz and 1990-1995 MHz bands. For the reasons described in detail below, we take action in ET Docket No. 00-258 to redesignate the 1910-1915 MHz band for licensed Fixed and Mobile services, to be used for AWS, and to pair that spectrum with the 1990-1995 MHz band. For the public interest reasons described above, we here also assign to Nextel a ten-year license by taking the necessary action in WT Docket No. 02-55. In light of this redesignation and assignment, we then adopt a UTAM reimbursement plan, and discuss how Nextel, as a new entrant, will participate in our existing relocation procedures for the 1990-2025 MHz band (in ET Docket No. 95-18).

a. Redesignation of the 1910-1915 MHz Band

224. We here redesignate the 1910-1915 MHz Band for licensed Fixed and Mobile services for AWS use on a primary basis, as opposed to continuing to dedicate this five megahertz band to unlicensed PCS or providing for an alternative licensed allocation. We also consider and deny various pending Petitions for Waiver and Petitions for Rulemaking that would instead have us waive or modify our current UPCS rules that apply to 1910-1915 MHz.

225. *Redesignation.* In the *AWS Third NPRM*, we sought comment as to whether we should redesignate all or a portion of the 1910-1930 MHz band, which is currently designated for UPCS, for licensed fixed and mobile services. Many commenting parties to the *AWS Third NPRM* endorse the introduction of higher power licensed services into all or a portion of the band. For example, Ericsson states that by allocating the spectrum at 1910-1915 MHz as part of a paired band the Commission can increase the value of this spectrum by putting it to a higher-value use. Ericsson predicts that such a redesignation, in conjunction with regulation pursuant to the Part 24 rules we have used for Broadband PCS, are likely to promote industry investment in the band, promote competition, and foster technological innovations in the 1910-1915 MHz band.⁵⁶⁷ Commenting parties also assert that the 1910-1920 MHz band, or a portion thereof, would be best utilized for new and innovative services or as relocation spectrum for existing services. For example, Nextel states that it should be assigned rights to a portion of the spectrum (1910-1915 MHz) as replacement spectrum in conjunction with its Consensus Plan for the 800 MHz realignment.⁵⁶⁸ Nextel reiterated its contention that relocating to this band from the public safety band at 800 MHz will help resolve public safety interference in the private land mobile bands and can be implemented without causing harmful interference to adjacent Broadband PCS operations. As another option, commenting parties including CTIA and Verizon assert that rights to the 1910-1915 MHz band should be allocated for PCS-like services, as part of a paired block.⁵⁶⁹ Proponents of this redesignation also state that it would provide efficient use of spectrum, improve global harmonization of spectrum, and achieve economies of scale. Finally, proponents of MDS state the 1910-1916 MHz band (as part of a pairing with the 1990-1996 MHz band) would provide suitable replacement spectrum rights for MDS operations in the 2.1 GHz band.⁵⁷⁰ We note that many of the commenting parties who endorse high-power

⁵⁶⁷ Ericsson Comments to *AWS Third NPRM* at 3-4.

⁵⁶⁸ Nextel Comments to *AWS Third NPRM* at 5-12.

⁵⁶⁹ See, e.g., CTIA Comments to *AWS Third NPRM* at 2; Verizon Comments to *AWS Third NPRM* at 5. See also Ascom Comments to *AWS Third NPRM* at 2 (agreeing with re-designation of 1910-1920 MHz for fixed and mobile uses); Motorola Comments to *AWS Third NPRM* at ii, 3 (agreeing with re-designation of 1915-1920 MHz for PCS use).

use of the 1910-1915 MHz band also discuss the extent to which we could reduce the existing separation between the Broadband PCS bands at 1850-1910 MHz and 1930-1990 MHz without causing harmful interference to existing Broadband PCS operations or requiring the use of filters, power reduction, or other protective measures that would increase the cost of deploying new high-powered licensed systems within the 1910-1930 MHz band or otherwise limit its usefulness.⁵⁷¹ Generally, the commenting parties supporting reallocating this five megahertz portion for high-power operations also state that it would be feasible to leave a fifteen megahertz separation between Broadband PCS bands without causing mobile-to-mobile and base-to-base interference.⁵⁷²

226. Rather than redesignate the 1910-1920 MHz band for new licensed mobile services, some commenting parties state that isochronous UPCS should be redesignated for use throughout the whole UPCS band. For example, UTAM and Peñasco Valley Telephone Cooperative (PVT) state that the public interest supports retaining the entire 1910-1930 MHz band for UPCS with technical modifications to enable isochronous devices to use the asynchronous band.⁵⁷³ Commenting parties state that retaining this ten megahertz of spectrum for unlicensed use would both maintain an adequate separation between the licensed PCS mobile and base transmit bands and meet the growing demands for UPCS devices.⁵⁷⁴ Specifically, ICO Global Communications (ICO) and Motorola indicate that the growing demand for UPCS devices and need for more isochronous UPCS spectrum supports the expansion of isochronous spectrum.⁵⁷⁵ JSM Electronics, Inc., and UTStarcom have proposed use of the 1910-1915 MHz spectrum for the deployment of community wireless network systems.⁵⁷⁶ We also note that some commenting parties ask that we extend isochronous UPCS use to an additional five megahertz in the 1915-1930 MHz

(Continued from previous page)

⁵⁷⁰ See, e.g., Ad Hoc Comments to *AWS Third NPRM* at 4-5; Cingular Comments to *AWS Third NPRM* at 4 (stating that allocation will add flexibility for MDS to provide fixed and mobile services); DCT Los Angeles (DCT) Comments to *AWS Third NPRM* at 14; Nucentrix Comments to *AWS Third NPRM* at 11-13 (asserting that MDS proponents have worked to provide technically viable solution for displaced MDS that no other proponents of various allocation schemes have submitted); WCA Comments to *AWS Third NPRM* at 13, 18. In the Second R&O, we reallocated MDS spectrum at 2150-2155 MHz for AWS. MDS Channels 1 and 2/2A consist of the 2150-2160/62 MHz band. While our recent decision to relocate MDS channels 1 and 2 to the 2.5 GHz band, discussed *infra*, makes these proposals moot, we believe that they continue to be of value to this proceeding insofar that they illustrate commenters' beliefs that high-powered services could occupy the band.

⁵⁷¹ See, e.g., Motorola Comments to *AWS Third NPRM* at 4; Verizon Comments to *AWS Third NPRM* at 5, Ericsson Comments to *AWS Third NPRM* at 3, Lucent Reply Comments to *AWS Third NPRM* at 2.

⁵⁷² See, e.g., Ad Hoc Comments to *AWS Third NPRM* at 5; CTIA Comment to *AWS Third NPRM* at 3; Nextel Comments to *AWS Third NPRM* at 11-12; UTAM Comment to *AWS Third NPRM* at 4; Verizon Comments to *AWS Third NPRM* at 5-6.

⁵⁷³ UTAM Comments to *AWS Third NPRM* at 2; PVT Reply Comments to *AWS Third NPRM* at 2-3; See also UTStarcom Comments to *AWS Third NPRM* at 3-4 (proposes community wireless systems in UPCS extended band); Inventel Reply Comments to *AWS Third NPRM* at 2; Midstate Communications (Midstate) Reply Comments to *AWS Third NPRM* at 2 ("Leaving UCPS spectrum for unlicensed use will encourage deployment of niche services and local mobility applications that show great promise to benefit consumers in rural, underserved and tribal areas"); PBC Reply Comments to *AWS Third NPRM* at 2.

⁵⁷⁴ See, e.g., UTAM Comments to *AWS Third NPRM* at 4-5 (stating record does not show evidence that reduction of spectrum by ten megahertz is feasible, and evidence shows something to the contrary).

⁵⁷⁵ Ericsson Comments to *AWS Third NPRM* at 5; ICO Comments to *AWS Third NPRM* at 5; Motorola Comments to *AWS Third NPRM* at 8-10.

⁵⁷⁶ JSM Comments to *AWS Third NPRM* at 2; UTStarcom Comments to *AWS Third NPRM* at 4-5.

band, particularly in the event that we redesignate the 1910-1915 MHz band segment. Proponents of this option claim that isochronous UPCS should be extended because the current asynchronous designation has not resulted in service, continued low power (UPCS) use would reduce potential interference to high power adjacent band Broadband PCS licensees, and demand exists to expand unlicensed voice applications beyond the existing ten megahertz.⁵⁷⁷ Siemens, for example, suggests that by extending isochronous UPCS use to the 1915-1920 MHz band and implementing several technical changes to the Rules, the Commission could allow for the introduction of products using DECT technology into the United States.⁵⁷⁸

227. Based on the record, we conclude that the public interest would be best served by redesignating five megahertz of spectrum in the 1910-1915 MHz band for licensed Fixed and Mobile services on a primary basis to support the types of high-powered mobile applications associated with AWS, Broadband PCS expansion, and Nextel's mobile operations. We note that there is strong support for such a designation in the record, and we agree with those parties that assert that such a designation will promote efficient use of the spectrum, allow for the rapid introduction of high-value services, and otherwise serve the public interest.

228. We find that such a designation is preferable to continued unlicensed uses of the band. Even if the demand for isochronous devices is growing or similar unlicensed voice applications (such as those associated with community wireless networks) could be deployed in the band, we cannot conclude that such use would be preferable to the types of higher powered licensed applications that the band could support. The proven public demand for licensed mobile services and the need to provide additional spectrum to support their continued deployment leads us to conclude that designation of this spectrum to licensed Fixed and Mobile services will allow us to put this spectrum to a higher use than it can serve as unlicensed spectrum. Moreover, no commenter has suggested that asynchronous applications for the band will be developed or deployed in the near future and those parties that promote expanded voice applications in the band would only offer deployment in limited geographic areas or urban locations where the 1920-1930 MHz band is already put to high use. By contrast, the redesignation of this band to licensed use would promote the rapid and widespread introduction of services into spectrum that heretofore has lain fallow.

229. We note that by assigning these spectrum rights to Nextel we preclude other AWS-like use, on which we sought comment in the *AWS Third NPRM*, including expansion of the existing Broadband PCS bands and allocation of this spectrum to MDS as replacement spectrum. However, such use does not offer us the ability to resolve the critical public safety issues that we will be able to address by assigning the spectrum to Nextel.⁵⁷⁹ Also, we note that the proposal by MDS proponents to redesignate

⁵⁷⁷ See, e.g., Ascom Comments to *AWS Third NPRM* at 2; Siemens Comments to *AWS Third NPRM* at 2; Verizon Comments to *AWS Third NPRM* at 6; WCA Comments to *Third NRPM* at 17, 20; See also Ericsson Comments to *AWS Third NPRM* at 5 (stating that such an expansion is consistent with current use of spectrum); Siemens Comments to *AWS Third NPRM* at 3 (noting that expansion improves spectrum efficiency and reduces levels of interference, thereby enhancing quality of service); Cingular Comments to *AWS Third NPRM* at 2-3 (support retaining 1916-1930 MHz for UPCS).

⁵⁷⁸ See *ex parte* Comments of Siemens Corp., et. al. filed in ET Docket 00-258 on December 12, 2003. DECT is a digital wireless technology that originated in Europe and is used in a variety of wireless applications, including cordless telephones and wireless office telecommunications products.

⁵⁷⁹ See, e.g., Ad Hoc Comments to *Third NPRM* at 4; Cingular Comments to *Third NPRM* at 4; WCA Comments to *Third NPRM* at 12-13. Because this decision exclusively considers the resolution of allocation matters in the 1910-1915 and 1990-1995 MHz bands, we make no decision herein with respect to relocation of MDS operations other than to conclude that assignment of this spectrum to Nextel best serves the public interest

the 1910-1916 MHz band paired with the 1990-1996 MHz band as replacement spectrum for MDS channels 1 and 2 has been rendered moot by our recent decision in which we established a relocation plan for those MDS channels in conjunction with the restructuring of the 2.5 GHz band.⁵⁸⁰

230. Finally, we note that while we are re-designating the 1910-1915 MHz band segment for Fixed and Mobile services, we do not address the 1915-1920 MHz band segment at this time. Commenting parties generally concur that Broadband PCS mobile and base transmit bands will be able to continue to operate with a duplexer gap of fifteen megahertz without causing interference to each other. Because we are not modifying the existing designation for the 1915-1920 MHz band, we need not consider at this time those comments that discuss whether or how we could preserve an adequate separation gap between the Broadband PCS bands if we were to redesignate spectrum above 1915 MHz for high-power licensed services. Furthermore, we are retaining the option to, *inter alia*, use the 1915-1920 MHz band for AWS use or in conjunction with an expansion of our UPCS rules to allow for expanded voice-based applications, but will address these matters in a subsequent action.

231. Accordingly, we find ample support in the record for allowing high-powered use of the 1910-1915 MHz band segment and that such use can occur without causing interference to existing Broadband PCS operations. For the reasons stated above, we are re-designating the 1910-1915 MHz band for licensed Fixed and Mobile services and updating our Part 15 rules to remove the 1910-1915 MHz band from asynchronous UPCS use.

232. *Petitions for Rulemaking and Petitions for Waiver Regarding the 1910-1930 MHz Band.* As mentioned, *supra*, the under-utilization by unlicensed devices of the 1910-1920 MHz band has prompted the filing of four petitions for waiver from Lucent, UTStarcom & Drew University, Ascom, and Alaska Power; and two petitions for rulemaking from WINForum and UTStarcom, which all request certain rule changes to these bands.

233. In its petition for waiver, Lucent requests that it be allowed to use the 1910-1920 MHz band for its Definity PBX voice system within the confines of Cook County, Illinois. It claims that several of its customers need high-capacity indoor wireless communications and that the existing ten megahertz of spectrum reserved for voice in the 1920-1930 MHz band is insufficient to meet those needs. Also, UTStarcom & Drew University request permission to use the 1910-1920 MHz band to install the UTStarcom Personal Access System (PAS) on the campus of Drew University in Madison, New Jersey, in order to provide wireless telephone service to the students and staff, as an extension of the university's wired telephone system. It states that the PAS system complies with Japan Personal Handy Phone System (PHS) Standard RCR-28 but does not meet Part 15 requirements for either isochronous or asynchronous devices and typically operates at higher power levels than mandated by Part 15. It further states that once Broadband PCS Block C licensees are selected in Auction #35 (for the 1895-1910 MHz band paired with the 1975-1990 MHz band) it would be possible to negotiate use of that spectrum on the Drew University campus with the winning licensee. In addition, Ascom requests that it be allowed to use the 1910-1920 MHz band for its Freeset DCT 1900 PBX voice system within the confines of Cook County, Illinois; New York City; and San Francisco County, California, because several of its customers, who are boards of trade or stock exchange entities, need high-capacity indoor wireless communications. Ascom submits that the ten megahertz of spectrum reserved for voice in the 1920-1930 MHz band is, again, insufficient to meet such needs. Finally, Alaska Power requests a waiver of Part 15 asynchronous spectrum etiquette to

⁵⁸⁰ Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *et al.*; WT Docket Nos. 03-66, *et al.*, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 04-135 (rel. Jul. 29, 2004) (*2.5 GHz MDS Restructuring R&O and NPRM*).

operate a community wireless voice system over the 1910-1920 MHz (data) band, in order to serve small rural areas in Alaska that are currently unserved or underserved by wireless service providers.

234. In its petition for rulemaking, WINForum asks the Commission to allow isochronous UPCS devices to use the 1910-1920 MHz band and to phase out asynchronous use in this band, thereby providing twenty megahertz of spectrum (1910-1930 MHz) for isochronous devices, and also to modify certain technical requirements for UPCS devices in Part 15. WINForum further requests that the Commission modify the frequency stability requirements for asynchronous UPCS data devices.⁵⁸¹ In its petition, UTStarcom requests that the 1910-1920 MHz band be made available for licensing via competitive bidding to permit the establishment of community wireless network service, using its PAS which is based on Japan's RCR-28 Personal Handy Phone System (PHS) standard.⁵⁸² Subsequently, UTStarcom modified its requests to seek changes to the Part 15 rules for coordinated unlicensed operation in the 1910-1920 MHz band for its PAS system, with coordination performed by UTAM, using the existing UTAM coordination infrastructure.⁵⁸³

235. As a consequence of our decision to redesignate the 1910-1915 MHz band for licensed Fixed and Mobile services for AWS use, we deny in part the waiver petitions from Lucent, Ascom, Alaska Power, and UTStarcom and Drew University insofar as they request use of spectrum in the 1910-1915 MHz band. We also deny in part the petitions for rulemaking from WINForum and UTStarcom. Again, our decision to deny in part the rulemaking petitions is made only with respect to the 1910-1915 MHz band, and is based on the fact that re-designation of this band precludes the petitioners' requests to use the entire 1910-1920 MHz band for expanded unlicensed applications. At this time we are not deciding the disposition of the 1915-1920 MHz band, and so we do not address the petitions for waivers and petitions for rulemaking with respect to this five megahertz band segment. To the extent that these parties can operate without use of spectrum in the 1910-1915 MHz band, we will further address their petitions when we consider the disposition of the 1915-1920 MHz band.

b. Pairing the 1910-1915 MHz and 1990-1995 MHz Bands

236. As part of our proposal in ET Docket 00-258 to redesignate the 1910-1920 MHz band (or a portion thereof) in the *AWS Third NPRM* for Fixed and Mobile Services, we also proposed options for pairing the 1910-1920 MHz band with the 1990-2000 MHz band for the redesignation of AWS, expansion of Broadband PCS, or the relocation of existing services.⁵⁸⁴ Such a pairing was made possible because, in the *Report and Order* portion of that decision, we redesignated the 1990-1995 MHz band to the Fixed and Mobile Services as part of our restructuring of the 2 GHz MSS band.⁵⁸⁵

237. Those parties that support use of the 1910-1915 MHz band for high power licensed services generally agree with our proposal to pair the band with an equal amount of spectrum from the

⁵⁸¹ *Id.* at 15-16. Currently, 47 C.F.R. §15.321(e) requires the measurement of the carrier frequency in order to ensure its frequency stability. WINForum believes that for asynchronous data devices that transmit in short bursts, explicit measurement of the carrier frequency as a function of time for a short modulated burst is inherently problematic. WINForum's proposal would allow for a more realistic measurement of the frequency stability of the device.

⁵⁸² See UTStarcom Petition at 2.

⁵⁸³ See UTStarcom Reply Comments to *AWS Third NPRM* at 3.

⁵⁸⁴ *AWS Third NPRM*, 18 FCC Rcd 2223 ¶¶ 47-49.

⁵⁸⁵ *AWS Third R&O*, 18 FCC Rcd 2223 ¶ 28.

1990-1995 MHz band. For example, CTIA (which supports pairing 1915-1920 MHz with 1990-1995 MHz for a PCS-like terrestrial wireless service), notes that such a pairing would benefit from the design of high-power PCS equipment in the adjacent Broadband PCS bands, which in turn would promote the rapid design and deployment of new systems and result in economies of scale.⁵⁸⁶ Proponents of the CTIA proposal also assert that this pairing would maximize the value of the spectrum by achieving greater spectrum efficiency. For example, Cingular states that a pairing of the 1910-1916 MHz and 1990-1996 MHz bands would provide flexibility for MDS licensees to provide fixed and mobile services.⁵⁸⁷

238. We agree with Nextel, CTIA, and other parties that a pairing of the 1910-1915 MHz with 1990-1995 MHz bands would allow for the rapid introduction of terrestrial wireless services.⁵⁸⁸ Many potential high-power licensed mobile service providers—including Nextel—are designed to operate on distinct base station transmit and mobile receive bands that incorporate adequate frequency separation between the bands. Thus, paired use of these two five megahertz blocks is consistent with many possible technologies, such as the IMT-2000 standards being considered for AWS and the request of Nextel and WCA for relocation spectrum. These paired bands are located immediately upper adjacent to the existing Broadband PCS bands and is therefore consistent with both the band location and frequency separation between bands that has allowed for the successful design and deployment of Broadband PCS systems. In addition, because the 1910-1915 MHz band lacks incumbent UPCS users, new licensees will only need to address relocation as it pertains to the relocation of incumbent point-to-point microwave systems in the band.⁵⁸⁹ For these reasons, we will license the 1910-1915 MHz and 1990-1995 MHz bands as a pair to promote the most efficient use of this spectrum.⁵⁹⁰

c. Relocation and Cost Sharing Obligations in the 1910-1915 MHz Band

239. Since we have assigned Nextel spectrum rights to the 1910-1915 MHz band, *supra*, we are imposing on Nextel an obligation to relocate remaining incumbent microwave links anywhere in the 1910-1930 MHz band operating on a primary basis wherever commencement of Nextel operations in the 1910-1915 MHz band would cause harmful interference to such links. We also consider, in more detail, Nextel's cost sharing obligations in the 1910-1915 MHz band.

⁵⁸⁶ CTIA Comments to *AWS Third NPRM* at 2. See also Ericsson Comments to *AWS Third NPRM* at 3; Nextel Comments to *AWS Third NPRM* at 10.

⁵⁸⁷ Cingular Comments to *AWS Third NPRM* at 4-5. See also DCT Los Angeles Comments to *AWS Third NPRM* at 14.

⁵⁸⁸ Nextel Comments to *AWS Third NPRM* at 10; CTIA Comments to *AWS Third NPRM* at 2.

⁵⁸⁹ Microwave systems operating with paired frequencies use the 1910-1930 MHz band paired with the 2160-2180 MHz band. We note that UTAM previously relocated certain microwave incumbents from the 1910-1920 MHz band in conjunction with the designation of the 1910-1930 MHz band for UPCS use. We discuss relocation and reimbursement procedures for the 1910-1915 MHz band to account for the re-designation in ¶¶ 239-249, *infra*. We observe that the rules adopted in the 1992 *Emerging Technologies* proceeding apply to this band. *Emerging Technologies First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd at 6890 ¶¶ 23-24. This relocation right was affirmed in the *Emerging Technologies Memorandum Opinion and Order and Third Notice of Proposed Rulemaking and Order*, 13 FCC Rcd 23949 (1998). The rules are codified in 47 C.F.R. §§ 101.69-101.99. Because these procedures are well known, parties can move expediently to initiate any relocation deemed necessary (to the extent that UTAM has not already completed such work). For these reasons, we believe that service providers can roll out service in this band quickly.

⁵⁹⁰ As discussed *supra*, we further conclude that it serves the public interest to assign this paired spectrum block to Nextel in conjunction with our efforts to resolve public safety interference issues in the 800 MHz band.

240. The Commission's relocation policies with respect to PCS spectrum, including UPCS spectrum, has generally been to require new entrants to relocate, before commencing operations in a location, any existing incumbent microwave links that would otherwise experience harmful interference from those operations.⁵⁹¹ In its comments Nextel has committed to fund its *pro rata* share of any additional band clearing if it were provided spectrum at 1910-1915 MHz.⁵⁹² Therefore, we here impose an obligation on Nextel to relocate any such incumbent links operating on a primary basis.⁵⁹³

241. With respect to cost sharing obligations, in the *AWS Third NPRM*, we proposed that if we were to redesignate all or a portion of the 1910-1920 MHz band, we would implement a reimbursement plan that would repay UTAM a percentage of the expenses it incurred in clearing the UPCS band of microwave links.⁵⁹⁴ We sought comment on this proposal and the method by which UTAM should be repaid. Those parties that commented on this issue generally agree with our proposal, and support the adoption of a reimbursement plan that would compensate UTAM for its expenses.⁵⁹⁵

242. UTAM, which supports retention of the entire 1910-1920 MHz band for UPCS, also states that in the event we redesignate spectrum in this band, we must ensure that new licensees fully and fairly compensate UTAM for the relocation of incumbent microwave users. In its comments, UTAM generally concurs that the reimbursement plan we proposed—which is based on the cost-sharing model we previously adopted for the relocation of microwave incumbents to allow for the introduction of licensed PCS—would provide such compensation.

243. In addition, UTAM raises several points as to how we should implement a reimbursement plan for redesignated UPCS spectrum. First, UTAM states that its compensation must be adjusted to include the base *pro rata* percentage of total costs it has incurred. To do this, UTAM notes that certain of its microwave relocation cost-sharing obligations are being paid in installments for links that have been moved by third parties, and asks that it be compensated for the pro-rata share of the present value of these future costs in one lump sum.⁵⁹⁶ Second, UTAM states that new licensees should be required to follow the same cost-sharing rules as existing licensees that are adjacent to the UPCS band. In other words, if UTAM relocates a microwave link that accrues to the benefit of a new licensee, UTAM believes that the new licensee should be responsible for paying the relocation costs proportionate to the number of licenses benefiting from the relocation. This same cost-sharing obligation would apply to UTAM paying for reimbursement if a licensee relocated a link that accrued to the benefit of UTAM's members.⁵⁹⁷ Also, UTAM states that a new licensee should, as a precondition to the grant of a license, be required to make its reimbursement payment to UTAM. This precondition, UTAM claims, would be similar to that of the payment of auction funds as a prerequisite to licensing. New licensees would therefore be able to factor the microwave relocation payment into a licensee's bidding strategy, in the event the spectrum is

⁵⁹¹ 47 C.F.R. § 24.239.

⁵⁹² See Nextel Comments to the Third NPRM at 16.

⁵⁹³ This obligation ends on the sunset date, at which time individual operations in the band will become secondary. See 47 C.F.R. § 101.79.

⁵⁹⁴ *AWS Third NPRM*, 18 FCC Rcd 2223 ¶¶ 29-30.

⁵⁹⁵ UTAM Comments to *AWS Third NPRM* at 6-7; Nextel Comments to *AWS Third NPRM* at 15-16; PCIA Comments to *AWS Third NPRM* at 4-5.

⁵⁹⁶ UTAM Comments to *AWS Third NPRM* at 6.

⁵⁹⁷ *Id.*

auctioned.⁵⁹⁸ Finally, UTAM suggests that we consider allocating reimbursement costs among multiple new licensees entering the band by POPs as an effective, simple, and manageable means of cost recovery.⁵⁹⁹

244. Nextel also agrees with our proposal for reimbursing UTAM incurred relocation costs. Nextel states that if it were relocated to 1910-1915 MHz, it will reimburse UTAM the band-clearing costs related to relocating incumbent microwave facilities from this five megahertz block of spectrum. Specifically, Nextel states that it agrees that UTAM should be entitled to receive a proportional share of the total expenses UTAM will have incurred to relocate microwave incumbents from the 1910-1930 MHz band as of the effective date of any final rules adopted in this proceeding.⁶⁰⁰ Nextel also states that it would fund a *pro rata* share of any additional band clearing costs that are incurred following assignment of the spectrum block.⁶⁰¹ PCIA, which also supports our general relocation proposal, proposes that we establish a band-clearing cost-sharing clearinghouse to manage the relocation compensation in the allocation of UPCS bands to AWS.⁶⁰² PCIA states that many AWS licensees would benefit from UTAM relocating incumbent microwave links from the UPCS bands, because AWS licensees licensed in different geographic service areas could cause interference to or receive interference from a single incumbent licensee. PCIA therefore submits that a band-clearing cost-sharing clearinghouse needs to be developed to fairly reimburse UTAM, similar to the cost-sharing procedures for PCS in Part 24 of the Commission's Rules.⁶⁰³

245. In conjunction with our re-designation of the 1910-1915 MHz band for licensed Fixed and Mobile services, we find that UTAM must be fully and fairly reimbursed for relocating incumbent microwave users that operate on a primary basis in this band. We agree with commenting parties, such as Nextel, that UTAM should be made whole for the investments it has made in clearing the UPCS bands. We also find that in view of our assignment of this spectrum to Nextel, it is appropriate to require Nextel to reimburse UTAM twenty-five percent of UTAM's total relocation costs associated with relocation of incumbents from the 1910-1930 MHz band as of the date of assignment of the 1910-1915 MHz spectrum block to Nextel. We also agree with UTAM that we should apply the same cost-sharing obligations to Nextel that we have imposed on licensees on channels that are adjacent to the UPCS bands.⁶⁰⁴ Thus, we will allow Nextel or UTAM to seek reimbursement for the proportion of its relocation costs that benefits spectrum whose relocation obligations would otherwise be borne by the party that uses or is otherwise responsible for that spectrum band. For example, if in order to make spectrum in the 1910-1915 MHz band available for use, Nextel relocates microwave links in both the 1910-1915 MHz and the 1915-1930 MHz bands, Nextel may seek reimbursement from UTAM for the actual costs associated with the

⁵⁹⁸ *Id* at 7.

⁵⁹⁹ *Id.* POP is an abbreviated term for population used by the Commission. One pop equals one person. The Commission currently uses the 1990 census as a measure of population. *See* <http://wireless.fcc.gov/auctions/glossary.html>.

⁶⁰⁰ Nextel Comments to *AWS Third NPRM* at 15.

⁶⁰¹ *Id.* at 15-16. *See also* Nextel Reply Comments to *AWS Third NPRM* at 6.

⁶⁰² Cost-sharing procedures for relocation of microwave incumbents are found in § 24.239 through § 24.253 of the Commission's Rules.

⁶⁰³ PCIA Comments to *AWS Third NPRM* at 4-5.

⁶⁰⁴ UTAM Comments to *AWS Third NPRM* at 6.

relocation of the microwave links in the 1915-1930 MHz band.⁶⁰⁵

246. Our decision to require Nextel to reimburse UTAM a *pro rata* share of costs, in addition to being consistent with the comments supporting a reimbursement mechanism for UTAM, offers a fair and easy procedure to implement. Because UTAM has already cleared most of the incumbent microwave links deployed across the entire 1910-1930 MHz band, this reimbursement plan represents the most reasonable and easiest approach to address the relocation costs that UTAM has already incurred. We believe that such a course is superior to the difficult and complex prospect of making retroactive calculations for apportionment and represents an equitable and administratively efficient means of compensating UTAM. We note that no party has objected to this approach.

247. Our decision to assign the 1910-1915 MHz band to Nextel makes several portions of UTAM's comments and PCIA's clearinghouse proposal unnecessary to implement a reimbursement plan for the band. UTAM states in its comments that a new licensee should be required to make its reimbursement payment to UTAM as a precondition to the grant of its license. We are requiring Nextel to reimburse UTAM as condition precedent to commencing operations in the 1.9 GHz band. Our decision to provide Nextel a nationwide license for the 1910-1915 MHz block obviates our need to consider UTAM's suggestion to allocate reimbursement costs among multiple licensees entering the band by POPs. This decision also renders moot evaluation of PCIA's proposal to adopt a band-clearing cost-sharing clearinghouse for bands allocated for AWS with respect to the 1910-1915 MHz band because there will be no complex sharing issues among multiple new entrants or among entities operating in less-than-nationwide service areas.

248. We also do not believe that it is necessary for us to require Nextel to immediately pay UTAM a share of the present value of UTAM's future installment payment obligations made to third parties. Again, because Nextel will be the sole nationwide license in this band, UTAM and Nextel will be able to address such matters as part of the overall process of accounting for and funding relocation obligations.⁶⁰⁶ Finally, we note that the decisions made today only apply to the 1910-1915 MHz band. Therefore, we are not addressing how the proposals by UTAM and PCIA regarding reimbursement and cost-sharing would affect any future proceeding that considers redesignation of the 1915-1920 MHz band.

249. Accordingly, we adopt a reimbursement plan that entitles UTAM to twenty-five percent—on a *pro rata* basis—of its total costs incurred as of the date that Nextel gains access to the 1910-1915 MHz spectrum band. Nextel must pay this amount before it begins operations in the band.⁶⁰⁷ Afterward we will allow Nextel and UTAM to seek reimbursement for the proportion of its relocation costs incurred in clearing incumbent fixed microwave systems that benefits spectrum whose relocation obligations would

⁶⁰⁵ Thus, Nextel's future relocation obligations will not necessarily represent a twenty-five percent share of any future microwave relocation costs in the 1910-1930 MHz band. If UTAM funds the relocation of a paired microwave link where only one half of the paired link operates in the 1910-1915 MHz band and the relocation costs are evenly divisible between both links, then Nextel would be liable to reimburse UTAM for one half of the total relocation costs associated with that paired link. Because we are not altering the current allocation of the 1915-1920 MHz band at this time, we are not modifying the existing procedure whereby UTAM is responsible for costs associated with the relocation of incumbent microwave facilities in that band.

⁶⁰⁶ We do not suggest that Nextel is not obligated to reimburse UTAM a *pro rata* share of such expenses—only that the timing and means of this reimbursement is best left to the parties to negotiate within the thirty-six month band reconfiguration process.

⁶⁰⁷ Nextel must also meet other conditions precedent to the commencement of operations in the 1.9 GHz band. See ¶¶ 344,347 *infra*.

otherwise be borne by the party that uses or is otherwise responsible for that spectrum band. UTAM and Nextel shall reimburse those based on the actual costs associated with the relocation of these facilities.

d. Relocation and Cost Sharing Obligations in the 1990-1995 MHz Band

250. In this section, we address Nextel's obligations, as a new entrant, to relocate incumbent BAS systems in the 1990-1995 MHz band. As an initial matter, we are not altering the underlying relocation rules that we established for MSS entrants that undertake the relocation of BAS incumbents from the 1990-2025 MHz band and MSS licensees will continue to follow the procedures that the Commission adopted in the *MSS Third R&O* when relocating BAS incumbents.⁶⁰⁸ We are, however, modifying on reconsideration one aspect of the existing MSS plan to relocate BAS incumbents in order to allow Nextel to enter into the band and to address BAS relocation issues raised in the petitions for reconsideration of the *MSS Third R&O*. By retaining the existing MSS relocation rules but also overlaying procedures by which Nextel may relocate BAS incumbents, we will be able to ensure the continuity of BAS during the transition. It is essential that we do so, because BAS is a critical part of the broadcasting system by which emergency information and entertainment content is provided to the American public. Therefore, we expect that Nextel and MSS licensees will work together to minimize the disruption BAS licensees will experience in the transition.

(i) Nextel-BAS Plan

251. *MSTV-NAB-Nextel BAS Relocation Plan.* On May 3, 2004, MSTV, NAB, and Nextel submitted a proposed BAS relocation plan, which offered a means to clear BAS licensees from the 1990-2025 MHz band.⁶⁰⁹ Under this proposal, Nextel would commit to funding the entire cost of relocating all BAS incumbents nationwide from the 1990-2025 MHz band.⁶¹⁰ Specifically, Nextel proposes to complete the relocation of all BAS licensees in the 1990-2025 MHz band in all markets in two stages—stage one within eighteen months and stage two within thirty months after the effective date of a Commission order in this proceeding.⁶¹¹

252. We will require Nextel, as a condition on Nextel's 1.9 GHz licenses, to follow a relocation procedure based on its proposed BAS relocation plan and relocate all BAS licensees in the 1990-2025 MHz band within thirty months after the effective date of this *Report and Order*, as described below. We believe that the parties' proposed BAS relocation plan is sufficiently similar to the BAS relocation plan the FCC adopted for MSS entrants, which was modeled on the policies set forth in our earlier *Emerging*

⁶⁰⁸ See ¶ 56 *supra*. As noted earlier, we will address the petitions for reconsideration or clarification of BAS relocation decisions made in the *MSS Third R&O* in this proceeding. We will, however, address the FS relocation issues raised in the pending joint petition for reconsideration or clarification of the *MSS Third R&O* at a later date.

⁶⁰⁹ See MSTV/NAB/Nextel May 3, 2004 *Ex Parte*. This plan was also supported by SBE. See *ex parte* comments, dated May 7, 2004, from SBE (SBE May 7, 2004 *Ex Parte*).

⁶¹⁰ In return, Nextel requests that the Commission assign to Nextel replacement spectrum in the 1910-1915/1990-1995 MHz bands and receive credit for BAS relocation costs. MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 2.

⁶¹¹ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 2-3. The parties also note that "these targets may be adjusted to take into account issues regarding the availability of equipment, tower crews and other installation technicians." *Id.* at 3.

Technologies proceeding,⁶¹² and which requires MSS entrants to provide comparable facilities to BAS incumbents that are relocated prior to the sunset dates specified in the *MSS Third R&O*.⁶¹³ Accordingly, we will also require Nextel to provide comparable facilities to BAS incumbents that are relocated.⁶¹⁴ Further, Nextel and MSS licensees, each of which individually are authorized to operate on a fraction of the band, will mutually benefit from the clearance of all BAS licensees in the band.⁶¹⁵ Nextel is therefore obligated to participate in the relocation of all BAS operations from 1990-2025 MHz, as discussed immediately below, even if it ultimately does not build its own facilities in some geographic areas. As we determined in the *MSS Third R&O*, a one-phase relocation plan avoids the possibility of BAS operations on three different band plans, and eliminates the potential disruption and down time to BAS associated with being relocated under two different phases in a short period of time.⁶¹⁶ We also note that our decision to accommodate Nextel's entry into the band does not alter our need to minimize the disruption to incumbent BAS operations during the transition. Therefore, we believe that including Nextel as a participant in the relocation of all BAS operations from the 1990-2025 MHz band strikes an appropriate balance that is not unreasonably burdensome upon Nextel as an entrant in the band, while also fair to the incumbents and MSS entrants.

253. *Relocation Schedule.* Under the BAS relocation plan, MSTV, NAB, Nextel, SBE and other interested broadcast parties will develop a joint relocation schedule and implementation plan to be submitted to the Commission. The joint implementation plan would address the timing of individual market relocations within the two-stage plan that will be completed within thirty months, measures to minimize disruption to ENG services during the transition, and measures to facilitate an expeditious and efficient relocation process. The joint relocation schedule will be based on the following criteria: during stage one, Nextel will relocate all BAS incumbents in markets where it chooses to deploy immediately, as well as any adjacent markets that raise inter-market coordination and interference problems; and during stage two, Nextel will relocate all remaining markets. Throughout this process (including after the initiation of stage two), BAS licensees that have not been relocated would be permitted to continue operation on their existing seven channels until they are relocated to the new band plan at 2025-2110 MHz.⁶¹⁷ According to the parties, this relocation proposal would therefore minimize disruption to

⁶¹² See *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, ET Docket No. 92-9, *First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992); *Second Report and Order*, 8 FCC Rcd 6495 (1993); *Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd 6589 (1993); *Memorandum Opinion and Order*, 9 FCC Rcd 1943 (1994); *Second Memorandum Opinion and Order*, 9 FCC Rcd 7797 (1994); *aff'd Association of Public Safety Communications Officials-International, Inc. v. FCC*, 76 F.3d 395 (D.C. Cir. 1996) (collectively, "*Emerging Technologies* proceeding").

⁶¹³ *MSS Third R&O*, 18 FCC Rcd 23638.

⁶¹⁴ See 47 C.F.R. §§ 74.690, 101.73.

⁶¹⁵ Each authorized 2 GHz MSS licensee receives an equal share of the available frequencies in which its primary service operations will take place, to be chosen at the time it has launched one satellite into its intended orbit. Each authorized 2 GHz MSS system may also operate at other frequencies in the 2 GHz MSS band, provided it does not cause harmful interference to other assigned satellite networks or incumbent terrestrial services that have not been relocated. See *In The Matter Of The Establishment Of Policies And Service Rules For The Mobile Satellite Service In The 2 GHz Band*, IB Docket 99-81, *Report and Order*, 15 FCC Rcd 16127, 16138-140 ¶¶ 16-21 (2000).

⁶¹⁶ *MSS Third R&O*, 18 FCC Rcd at 23654-57 ¶¶ 32-35.

⁶¹⁷ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 3-6.

incumbent BAS operations as well as serve the public interest by preserving the ability of broadcasters to provide the public with timely coverage of emergencies and other news events. The parties further contend that the thirty-month timeframe for relocating all BAS incumbents under the proposed Nextel-BAS relocation plan “should ensure that the 1990-2025 MHz band is cleared nationwide before MSS entrants are ready to begin service in the 2000-2025 MHz band.”⁶¹⁸

254. We will require Nextel to file progress reports within twelve months and twenty-four months after the effective date of this *Report and Order* on the status of the transition, including identifying the markets that will be relocated during stage one and all remaining markets that will be relocated during stage two. This filing also should include the other information the parties stated they would provide as part of the joint implementation plan described in the Nextel-BAS relocation plan.⁶¹⁹ Nextel also will be required to certify to the Commission that all BAS facilities have been relocated within thirty months after the effective date of this *Report and Order*. We note that Nextel’s obligation to relocate BAS incumbents must not interfere with its obligation to relocate public safety users in the 800 MHz band.

255. Nextel, which uses a terrestrial network, has a different interference potential between its service and BAS than that of MSS and BAS. Unlike satellites, whose signals can blanket the whole country simultaneously, a terrestrial network is limited to discrete geographic areas served by multiple base stations. Thus, the terrestrial nature of Nextel’s service allows for the gradual relocation of incumbents during a geographically-based build-out period. Consequently, we will allow Nextel to determine its own schedule for relocating incumbent BAS facilities in a TV market as follows: Nextel must relocate incumbent BAS licensees before beginning operation in a particular BAS market, but Nextel may determine the markets it wishes to serve. Thus, whereas we had established a relocation process based on specific markets (1-30, 31-100, and 101-210) for MSS, Nextel’s operations will only affect those markets where Nextel chooses to deploy its service. Unlike MSS, which may take up to five years to relocate BAS services in markets 31 and above, Nextel must relocate incumbent BAS operations in every BAS market it wishes to serve—including markets 31 and above—prior to beginning operations, and all BAS markets within the thirty-month timeframe proposed in the Nextel-BAS relocation plan. We conclude that the differences between the terrestrial nature of Nextel’s service and the ubiquitous service that will be provided by MSS warrant these distinctions in the relocation procedures.

256. Further, the integrated nature of BAS operations also makes isolated, link-by-link relocation infeasible. Therefore, as a practical matter, we note that it may be necessary for Nextel to relocate more BAS facilities than an interference analysis might indicate as technically necessary in order to meet the comparable facility requirement for relocating BAS operations.⁶²⁰ Nextel has agreed to relocate BAS licensees across multiple TV markets to avoid inter-market coordination and interference problems.⁶²¹ We also recognize that Nextel is likely to deploy its service in some locations in a manner that does not correspond to the geography of the BAS market areas, and note that Nextel will be obligated to relocate all incumbent BAS operations in all BAS markets, as proposed in the Nextel-BAS relocation plan, including those markets where Nextel provides partial, minimal, or no service.

⁶¹⁸ *Id.* at 7.

⁶¹⁹ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 3-4. *See also* ¶ 253 *supra*.

⁶²⁰ *See* 47 C.F.R. §§ 74.690(d) and 78.40(d-e). For example, a BAS licensee’s operations in an adjacent market may need to be relocated even though Nextel does not initiate operations in that adjacent market.

⁶²¹ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 5.

257. Nextel, MSTV, and NAB argue that if one or more MSS entrant is prepared to launch service before the spectrum is cleared in all markets, a “key principle” of the Nextel plan should continue to apply—namely that Nextel will remain responsible for paying the upfront relocation costs.⁶²² We disagree to the extent that this principle is intended to prevent MSS licensees from clearing BAS incumbents earlier. Under this *Report and Order*, MSS licensees will retain the option of accelerating the clearing of those markets so that they could begin operations before Nextel has completed nationwide clearing. We recognize that the parties will have to work cooperatively to ensure a smooth transition for BAS incumbents. To facilitate this process, we will require Nextel to file with the Commission and copy the MSS licensees, within thirty days after the effective date of this *Report and Order*, its plan for the relocation of BAS operations in the markets that will be relocated during stage one (*i.e.*, within eighteen months). MSS licensees will have thirty days to review the Nextel plan⁶²³ and identify to Nextel and the Commission which of the top thirty TV markets and fixed BAS operations, if any, they intend to invoke involuntary relocation.⁶²⁴ If MSS licensees choose not to trigger involuntary relocation, Nextel will proceed under its plan to relocate BAS incumbents.

258. *Negotiation Schedule.* The Nextel-BAS relocation plan proposes mandatory negotiation periods between Nextel and BAS licensees ending February 28, 2005 for stage-one relocations and December 31, 2005 for stage-two relocations, thus providing nine months for negotiations for each stage.⁶²⁵ We note that these dates were contingent on the Commission releasing its decision in this proceeding on May 31, 2004. Because of the time that has passed between May 31st and the release of this *Report and Order*, we will extend the negotiation periods to May 31, 2005 for stage-one relocations and March 31, 2006 for stage-two relocations. MSS licensees may voluntarily join in these negotiations in order to relocate BAS operations in markets 31 and above. We encourage MSS licensees to work cooperatively with Nextel in these negotiations because all parties will collectively benefit from the expeditious relocation of BAS incumbents to the new band plan. We also note that we will entertain requests filed by MSS licensees requesting that their voluntary participation in the negotiations between Nextel and BAS incumbents initiate their mandatory negotiation period.⁶²⁶

259. *Cost sharing.* In the *MSS Third R&O*, we noted that with the redesignation of the 1990-2000 MHz and 2020-2025 MHz bands in the AWS proceeding, non-MSS licensees that may begin service later will benefit from the band clearing paid for by MSS licensees. We therefore stated that we will provide an equitable mechanism by which MSS licensees can recover some of the relocation costs incurred from other licensees who will benefit from the band clearing of incumbent BAS operations from the 1990-2025 MHz band. However, we deferred setting forth comprehensive procedures that new Fixed and Mobile service providers (including AWS entrants) in these bands must follow to reimburse MSS licensees

⁶²² *Id.* at 7-8.

⁶²³ See ¶ 253-254 *supra*.

⁶²⁴ The one-year mandatory negotiation period for MSS and BAS licensees in markets 1-30 and all BAS fixed stations, regardless of market size, is already in effect and lasts until December 8, 2004. After this date, any MSS entrant may involuntarily relocate incumbent BAS operations. See ¶ 57, *supra*.

⁶²⁵ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 3-4.

⁶²⁶ Because BAS incumbents would already be in relocation negotiations with Nextel, allowing MSS licensees to accelerate the mandatory negotiation period under the MSS plan for markets 31 and above may satisfy the intent of the mandatory negotiation requirement.

that will have incurred relocation costs.⁶²⁷

260. As noted above, under the Nextel-BAS relocation plan, Nextel offers to pay the upfront BAS relocation costs, which MSTV and NAB estimate will be \$512 million. Nextel also requests that the Commission require MSS licensees in the 1990-2025 MHz band to pay their *pro rata* share of the cost of clearing this spectrum.⁶²⁸

261. We have decided to generally follow the cost-sharing principle that the licensees that ultimately benefit from the spectrum cleared by the first entrant shall bear the cost of reimbursing the first entrant for the accrual of that benefit, except as discussed below. Therefore, the first entrant may seek reimbursement from subsequently entering licensees for a proportional share of the first entrant's costs in clearing BAS spectrum, on a *pro rata* basis according to the amount of spectrum each licensee is assigned. Consequently, Nextel is entitled to seek *pro rata* reimbursement of eligible clearing costs incurred during the 36-month reconfiguration period from MSS licensees that enter the band prior to the end of that period. Nextel will be required to inform the Commission and MSS licensees on whether it will or will not be seeking reimbursement from the MSS licensees 12 months after the effective date of this *Report and Order*.⁶²⁹ Under this plan, Nextel would pay all upfront costs and receive credit for BAS relocation in the 800 MHz true-up process, less any MSS-reimbursed expenses. Thus, Nextel would no longer be entitled to reimbursement from other entrants to the band after receiving credit for its relocation costs at the 800 MHz true-up. Further, Nextel's right to seek reimbursement from any MSS entrants entering before the end of the 36-month reconfiguration period will be limited to costs Nextel incurred for clearing the top thirty markets and relocating all fixed BAS facilities, regardless of market size, and to an MSS licensee's *pro rata* share of the 1990-2025 MHz spectrum. We believe that limiting the amount of Nextel's reimbursement in this manner strikes an appropriate balance that is not unreasonably burdensome on Nextel or MSS licensees.⁶³⁰

262. Similarly, Nextel is also obligated to reimburse MSS licensees for Nextel's *pro rata* share of the MSS licensees' relocation expenses, should the MSS licensee trigger involuntary relocation or otherwise participate in the relocation process before Nextel has completed its nationwide clearing of the band. Any reimbursement by Nextel to MSS licensees must occur before the 800 MHz true-up period ends, so that these reimbursement expenses can be accounted for at the 800 MHz true-up. Both Nextel and MSS licensees under the MSS plan must clear the entire 1990-2025 band (a total of thirty-five megahertz of spectrum) while only operating in 1990-1995 MHz (a total of five megahertz of spectrum) and in 2000-2020 MHz (a total of twenty megahertz of spectrum), respectively. Therefore, Nextel's *pro rata* share

⁶²⁷ *MSS Third R&O*, 18 FCC Rcd at 23644 ¶ 10.

⁶²⁸ Nextel proposes that the payments by other entrants are made to the U.S. Treasury because, unlike Nextel, which would be receiving replacement spectrum, these other entrants would be receiving initial licenses. See MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 8. We decline to adopt this proposal. By allowing Nextel to relocate incumbent BAS licensees and retaining our existing rules that allow MSS licensees to also relocate BAS incumbents, we meet the key objective of providing BAS licensees with relocation to comparable facilities. Adoption of the proposal would not further these core relocation objectives.

⁶²⁹ This deadline coincides with the date Nextel is required to submit its first status report on its BAS relocation efforts.

⁶³⁰ Under the MSS plan, MSS licensees are required to clear the top 30 BAS markets and all fixed BAS stations, regardless of market size, before beginning operations. The accounting among MSS licensees to settle relocation expenditures would not occur until after the end of the MSS relocation process. *MSS Second R&O*, 15 FCC Rcd at 12338 ¶ 68.

represents the costs to relocate one-seventh of the spectrum.

263. *Interference Issues/Technical Standards.* In order to minimize interference from systems in the 1910-1915 MHz/1990-1995 MHz blocks, we are requiring Nextel to conform to the same technical standards applicable to licensed PCS systems.⁶³¹ The Commission adopted TIA Bulletin TSB 10-F previously as the criteria for determining PCS to FS interference.⁶³² Due to the technical similarity of Nextel's service to PCS, which operates in nearby bands and for which TSB 10-F is well-suited, we conclude that the criteria specified in TSB 10-F should be equally suitable to determine where sharing would be possible between BAS and Nextel operations in the 1990-2025 MHz band. However, procedures other than TSB 10-F that follow generally acceptable good engineering practices may also be acceptable.⁶³³ Our conclusion is consistent with the *MSS Second R&O* wherein the Commission determined that, in the case of new ancillary terrestrial component (ATC) service/FS interference in the 2165-2200 MHz band, TIA Bulletin 10-F would be the relevant standard.⁶³⁴ In the *MSS Third R&O*, we affirmed that TSB 10-F, or its successor standard, is an appropriate standard for purposes of triggering relocation obligations by new terrestrial (ATC or AWS) entrants in the 2 GHz band to relocate FS incumbents.⁶³⁵ For computing interference between satellite and fixed services, the Commission relies on the methodology and criteria in TIA Bulletin TSB-86.⁶³⁶

(ii) MSS-BAS Plan

264. In this section, we address MSS licensee obligations to relocate incumbent BAS operations in the 1990-2025 MHz band and address petitions for reconsideration and clarification of the *MSS Third R&O*. We grant in part and deny in part the petitions for reconsideration and clarification filed by MSTV, NAB, SBE, and Boeing. We have discussed, above, the process by which Nextel may enter the band and relocate incumbent BAS licensees, and how that process relates to the existing relocation procedures that we adopted for MSS licensees. Now, we turn our attention to the existing relocation rules that have already been established for MSS. Except as discussed below, those rules will remain in effect.

265. Under the MSS plan, BAS facilities in the top-thirty TV markets and all fixed BAS operations, regardless of market size, will be cleared first and the remaining markets in two segments (markets 31-100 within three years after commencement of MSS operations and markets 101-210 within

⁶³¹ See generally, 47 C.F.R. § 24 *et. seq.* We will ensure that Nextel's base/mobile operations conform to lower-adjacent broadband PCS operations. Specifically, we will require Nextel to operate its mobile/portable stations in the 1910-1915 MHz block and operate its base stations in the 1990-1995 MHz block. See 47 C.F.R. § 24.229(c) in Appendix C *infra*.

⁶³² See 47 C.F.R. § 24.237. See also Amendment of the Commission's Rules to Establish New Personal Communications Services, *Second Report and Order*, 8 FCC Rcd 7700, 7762 ¶ 150 (1993); *Memorandum Opinion and Order*, 9 FCC Rcd 4957, 5029 ¶ 186 (1994). Bulletin TSB 10-F describes interference criteria for microwave systems in public fixed radio services and private operational fixed microwave service bands.

⁶³³ 47 C.F.R. § 101.105 (c).

⁶³⁴ See *MSS Second R&O*, 15 FCC Rcd at 12346 ¶ 97, n.160. See also 47 C.F.R. § 101.79 (a).

⁶³⁵ See *MSS Third R&O*, 18 FCC Rcd at 23672 ¶ 70.

⁶³⁶ TSB-86 was developed by a Joint Working Group comprised of the Telecommunications Industry Association (TIA) Engineering Subcommittees on Spectrum and Orbit Utilization, the TIA Engineering Subcommittee on Interference Criteria for Microwave Systems, and the National Spectrum Managers Association. *MSS Second R&O*, 15 FCC Rcd at 12340-41 ¶ 78, n.131.

five years). The Commission recognized that the services offered via the MSS satellites, once operational, will cover all of the United States simultaneously. Therefore, BAS facilities in the band would have to be relocated or cease operation in order to minimize interference between the two services.⁶³⁷ The Commission instituted this gradual approach to balance the needs of the incumbents and future MSS users of the band, notwithstanding the added challenges to BAS operations.⁶³⁸

266. *Comments.* The broadcast parties contend that the Commission's decision to require MSS licensees to relocate BAS incumbents to the final channel plan in one step (rather than in two steps under the original plan), resulting in the temporary vacating of two BAS channels (rather than one channel under the original plan) until all BAS operations are relocated, will "significantly curtail" the ability of BAS incumbents in TV markets 31 and above to provide electronic news gathering (ENG) services to the public.⁶³⁹ According to the broadcast parties, the Commission's decision underestimates the harm to BAS operations, particularly in the local coverage of emergencies, news, and sporting events, outside the top 30 markets because these markets will lose two channels for up to five years before being relocated. The broadcast parties further contend that dual band plans during the transition will cause interference and inter-market coordination problems.⁶⁴⁰ MSTV and NAB also argue that the Commission's decision to modify the BAS relocation plan to immediately begin Phase II is contrary to precepts of administrative law and the public interest.⁶⁴¹ The broadcast parties request, in part, that the Commission devise an alternative relocation plan that would not require BAS incumbents in markets 31 and above to cease operations on two channels without receiving compensation prior to vacating the spectrum and further that the Commission consider various means to ensure that MSS licensees pay their *pro rata* share of BAS relocation.

267. Alternatively, Boeing maintains that the Commission should reinstate the original two-phase plan, with the modifications it proposes to Phase I, and not trigger Phase II immediately.⁶⁴² Boeing argues that the benefits to retaining the two-phase BAS relocation process are that it: 1) reduces the upfront costs for BAS relocation before MSS operators begin service; 2) is a more efficient use of spectrum; 3) provides the Commission with more time to resolve regulatory uncertainties about the types of new services and the procedures for the new entrants in the 1990-2025 MHz band; and 4) gives BAS manufacturers more time for the design and development of digital BAS equipment.⁶⁴³

⁶³⁷ Since the 1990-2025 MHz band is the MSS uplink band, BAS receivers would be subject to interference from nearby MSS handsets.

⁶³⁸ *MSS Second R&O*, 15 FCC Rcd at 12325-26 ¶¶ 25-28.

⁶³⁹ See MSTV/NAB Joint Petition at 6-9 & 12-15; SBE Petition at 1-2; see also RTNDA Comments at 3-6. But see Boeing Opposition at 4-7 & 9-10; Boeing Reply at 2-3; ICO Reply at 3-4.

⁶⁴⁰ See SBE Petition at 3; MSTV/NAB Joint Petition at 10-12. But see Boeing Opposition at 11-14.

⁶⁴¹ In addition, the broadcast parties contend that the revised relocation plan is inconsistent with the Commission's localism, diversity, public safety, and homeland security initiatives. See MSTV/NAB Joint Petition at 15-21; RTNDA Comments at 4. But see Boeing Opposition at 10-11.

⁶⁴² See Boeing Petition at 3-8; see also ICO Reply at 4-6.

⁶⁴³ See Boeing Petition at 5-8. But see MSTV/NAB Joint Opposition 3-7; MSTV/NAB/SBE Joint Reply at 3-8. In their opposition and reply, the broadcast parties object to the aforementioned Boeing proposal by arguing that Phase II compensation would be delayed until after the sunset date. Therefore, they request that the Commission eliminate the ten-year sunset period and "create incentives that tie the ability of entrants to continue their own operations to timely fulfillment of their relocation compensation obligations to BAS incumbents." See (continued....)

268. In addition, the broadcast and MSS parties request that the Commission address unresolved questions regarding the relocation obligations (*e.g.*, the timing and scope of reimbursement) of new entrants to the 2 GHz band, as well as new services that are relocated from other spectrum bands (*e.g.*, Nextel).⁶⁴⁴ Specifically, the commenters propose that the Commission require reimbursement of BAS relocation expenses by later entrants, on a *pro rata* basis, before these new entrants begin operation in the 2 GHz band.⁶⁴⁵ Finally, Nextel, MSTV and NAB argue that in the event an MSS entrant begins operations before all BAS incumbents have been relocated by Nextel, no BAS incumbent will be required to vacate any spectrum at 1990-2025 MHz until after it has been relocated to the new band plan at 2025-2110 MHz.⁶⁴⁶

269. *Decision.* On reconsideration, we will no longer require BAS licensees in TV markets 31-210 to cease operations on channels 1 and 2 until they have been relocated to their final channel plan at 2025-2110 MHz, unless licensees in a BAS market indicate as part of the relocation negotiation process that they do not wish to be relocated, in which case they must immediately restrict their operations to the 2025-2110 MHz band. We are making this modification to the MSS plan to accommodate Nextel's entry into the band consistent with the Nextel-BAS relocation plan, as described herein, which does not require BAS incumbents in markets 31 and above to cease operations on two channels without receiving compensation prior to vacating the spectrum.

270. We find that as a result of our actions here the two relocation plans will complement each other and expedite BAS relocation in the band. Under the Nextel-BAS relocation plan, the relocation of all BAS incumbents will be completed by May 2007. Under the MSS plan, MSS licensees may begin operations once the top thirty BAS markets and all fixed BAS stations, regardless of market size, have been cleared⁶⁴⁷ and must certify that their systems are operational by no later than July 2007.⁶⁴⁸ Nextel will likely relocate most BAS licensees before MSS licensees begin operations under their milestone requirements. In addition, as described previously, MSS operators will have an opportunity to work with Nextel to relocate BAS licensees in some additional markets. If MSS licensees begin operations before all BAS incumbents are relocated, we expect that MSS and BAS licensees will work together to minimize interference; however, MSS licensees would have to accept interference from the remaining BAS users

(Continued from previous page) _____

MSTV/NAB/SBE Joint Reply at 8. In its reply, Boeing argues that no justification exists to eliminate the ten-year sunset deadline and points to the Commission's decision in the *MSS Third R&O*, which states that "we continue to believe that a sunset date is a vital component of the *Emerging Technologies* relocation principles." See Boeing Reply at 4 (citing ¶ 46 of the *MSS Third R&O*). Because we are not adopting Boeing's plan, we need not address MSTV, NAB and SBE's request to eliminate the sunset period.

⁶⁴⁴ See Boeing Petition at 8-13; Boeing Opposition at 8; MSTV/NAB/SBE Joint Reply at 9; ICO Reply at 7.

⁶⁴⁵ *Id.*

⁶⁴⁶ MSTV/NAB/Nextel *May 3, 2004 Ex Parte* at 7-8.

⁶⁴⁷ Under the MSS plan, MSS licensees may invoke involuntary relocation of BAS operations in the top 30 TV markets and fixed BAS stations, regardless of market size, after December 8, 2004. As we stated earlier, MSS licensees will have an opportunity to coordinate with Nextel on which top 30 BAS markets and fixed BAS stations the MSS licensees plan to invoke involuntary relocation. See ¶ 257 *supra*.

⁶⁴⁸ This deadline applies to all 2 GHz MSS licensees except TMI. TMI must certify that its system is fully operational by November 2008. See TMI Communications and Company, Limited Partnership and TerreStar Networks, Inc. Application for Review and Request for Stay, *Memorandum Opinion and Order*, FCC 04-144 (released June 29, 2004).

until they are relocated. Further, the Nextel-BAS relocation plan would substantially shorten the time period during which adjacent BAS markets would operate on different channel plans, thereby mitigating the broadcast parties' concerns regarding interference and inter-market coordination problems resulting from prolonged dual band plans. Finally, we believe that adoption of a relocation plan that is based on the proposed Nextel-BAS relocation plan, as described herein, provides certain benefits to MSS licensees. In particular, Nextel has agreed to clear BAS nationwide within thirty months and to pay the upfront costs for BAS relocation.

271. We deny Boeing's petition with respect to its request for the reinstatement of the original two-phase MSS plan for BAS relocation. As we discussed in the *MSS Third R&O*, we found that given the need to provide for rapid introduction of AWS in the 2 GHz BAS band, a two-phase relocation was no longer appropriate.⁶⁴⁹ We affirm this finding. We note that our decision herein to allow Nextel to enter the band requires that BAS incumbents be relocated expeditiously to the final Phase II channel plan. We also find that adoption of the Boeing plan is not necessary to address its concerns (*e.g.*, lower MSS upfront relocation costs) because these concerns will be satisfied by implementation of the Nextel-BAS relocation plan, as revised herein.

272. We now address the remaining arguments proffered by the parties. We find that our decision to adopt a relocation plan that is based on the Nextel-BAS relocation plan, as described herein, renders moot MSTV and NAB's procedural and public interest arguments.⁶⁵⁰ Further, our decision today addresses the relocation obligations of Nextel, a new entrant into the 1990-2025 MHz band. With respect to the broadcast and MSS parties' request to resolve the relocation obligations of other new entrants in the 2 GHz band, we defer resolution of these issues to the appropriate docket.⁶⁵¹

273. *Issues for Clarification.* Pointing to Paragraph 58 of the *MSS Third R&O*, SBE, MSTV and NAB request that the Commission clarify the relationship between BAS licensees operating on different channel plans to avoid causing coordination problems within and between TV markets.⁶⁵² Paragraph 58 of the *MSS Third R&O* states in part that:

[b]ecause the continued use of the existing channel plan could disrupt BAS licensees that have relocated to the Phase II channel plan and lead to the difficulties in coordination that SBE describes, we will permit continued use of the 'old' channel plan only if all BAS licensees in a market will agree to such operation.⁶⁵³ Moreover, BAS licensees in such markets must operate on a secondary basis to other BAS licensees using the Phase II channel plan and must be prepared for the potential disruption associated with secondary operation, such

⁶⁴⁹ *MSS Third R&O*, 18 FCC Rcd at 23653-61.

⁶⁵⁰ MSTV and NAB state that the *MSTV/NAB/Nextel May 3, 2004 Ex Parte* addresses the concerns raised in their joint petition. *See MSTV/NAB/Nextel May 3, 2004 Ex Parte* at 5; *see also* SBE May 7, 2004 *Ex Parte* at 2.

⁶⁵¹ *See* Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258.

⁶⁵² MSTV/NAB Joint Petition at 22; SBE Petition at 4-5.

⁶⁵³ In the *MSS Second R&O*, we permitted BAS licensees the choice of surrendering BAS channel 1 during Phase I or relocating to the 14.5 MHz- and 15 MHz-wide Phase I channels. To facilitate an orderly coordination process and to prevent interference, we required all BAS licensees within the same Nielsen DMA to coordinate and chose one of these channel plans. *MSS Second R&O*, 15 FCC Rcd at 12330 ¶ 45.

as the interference likely to be caused by a BAS licensee operating on the Phase II channels that enters the market to cover a sporting event or breaking news story.⁶⁵⁴

274. According to SBE, there is a conflict between Section 74.24(c) and Paragraph 58 of the *MSS Third R&O*⁶⁵⁵. Under Section 74.24(c), a top-thirty market TV pickup station that has converted to digital and operating on the new band plan but is temporarily operating outside its licensed area to respond to a major news event would be secondary to the local TV pickup station where the major news event is occurring.⁶⁵⁶ SBE contends that, under Section 74.24(c), if the local TV pickup station is in a market that has not converted to digital and the new band plan, it would have primary status over any visiting TV pickup station. However, we stated in the *MSS Third R&O* that a visiting TV pickup station that had converted to the Phase II channel plan would have primary status over the local TV pickup station that had not converted. Thus, SBE seeks clarification on whether Section 74.24(c) trumps Paragraph 58 of the *MSS Third R&O* or vice versa. Further, MSTV/NAB claim that it is unclear whether this applies to all broadcasters operating on the old channel plan or only in markets that elect to remain on the old channel plan even after they are entitled to relocation compensation.⁶⁵⁷

275. SBE also requests that the Commission clarify what it means by the “if all BAS licensees in a market will agree” language in Paragraph 58 of the *MSS Third R&O* mentioned above.⁶⁵⁸ Specifically, SBE seeks clarification on whether: 1) a single station would be able to block or force the conversion to the new band plan of other stations in the market; or 2) the station that chooses not to convert becomes secondary to the stations that do convert.⁶⁵⁹ According to MSTV and NAB, it is also unclear whether the primary status of BAS licensees operating on the new channel plan would allow a single broadcaster in a small or medium market to essentially compel other broadcasters in the market to convert to the new channel plan before receiving compensation by self-relocating during the transition period.⁶⁶⁰

276. We clarify that Paragraph 58 does not alter the operation of Section 74.24(c), *i.e.*, that any local TV pickup station will have primary status over any visiting TV pickup station, even if the local market as a whole or the individual local TV pickup station itself has not converted to the Phase II channel plan. We believe this outcome is consistent with the overall purpose of the short-term use rule, which will continue to operate after the BAS relocation is completed. Further, although we believe it would be best if all stations in a market agree to use the same channel plan, an individual station that chooses to remain on the old channel plan will be secondary to other stations within the same market that convert to the Phase II plan and also to any TV pickup station that has converted to the Phase II plan and is visiting the local market. This should encourage parties to convert to the final channel plan expeditiously.

⁶⁵⁴ *MSS Third R&O*, 18 FCC Rcd at 23668 ¶ 58.

⁶⁵⁵ SBE Petition at 4.

⁶⁵⁶ 47 C.F.R. §74.24(c). Section 74.24(c) states that a BAS station operating under short-term authority does so on a secondary, non-interference basis to regularly authorized stations.

⁶⁵⁷ MSTV/NAB Joint Petition at 22.

⁶⁵⁸ SBE Petition at 4-5.

⁶⁵⁹ *Id.*

⁶⁶⁰ MSTV/NAB Joint Petition at 22.

4. Method for Determining Equitable Compensation

277. The record reflects considerable disagreement among the parties on whether the grant of 1.9 GHz spectrum rights to Nextel constitutes equitable compensation or an unwarranted windfall.⁶⁶¹ Initially, the Consensus Parties proposed that Nextel would relinquish approximately ten megahertz of 700, 800 and 900 MHz spectrum, pay for band reconfiguration, and receive ten megahertz of 1.9 GHz spectrum.⁶⁶² Other parties, however, argue that the Commission should determine whether the value of the spectrum being relinquished by Nextel, when added to the costs Nextel incurs in band reconfiguration, is equal to the fair market value of the 1.9 GHz spectrum.⁶⁶³ Many of these parties further argue that the market value (FMV) of the 1.9 GHz spectrum far exceeds the value of relinquished spectrum and other costs that Nextel would incur under the Consensus Parties' proposal.⁶⁶⁴ Nextel responds that the 1.9 GHz spectrum is equitable compensation even under a value-for-value approach.⁶⁶⁵

278. We conclude that a "value for value" approach is the most appropriate for determining equitable compensation in this instance. We reject the approach proposed by the Consensus Parties because we do not regard the combined 700, 800, and 900 MHz spectrum that Nextel offered to relinquish as being equivalent to the 1.9 GHz spectrum. First, as discussed in ¶ 207 *supra*, we are excluding Nextel's 900 MHz spectrum from consideration in this order, so it does not help to "balance" the bandwidth exchange. Second, while we are accepting Nextel's offer to relinquish its 700 MHz Guard Band spectrum, we regard the value of this spectrum as *de minimis* because it cannot be made available to public safety in the near term and any potential long-term benefit it might afford to public safety or any value it might have in the marketplace is purely speculative at this point. Having excluded 700 MHz and 900 MHz from consideration, the remaining 800 MHz spectrum that Nextel is relinquishing—even as recently augmented to an average of 4.5 megahertz—does not equate on a megahertz-for-megahertz basis with ten megahertz of 1.9 GHz spectrum, absent some further balancing of the equities. We also reject the option of adjusting the megahertz-for-megahertz "balance" by providing Nextel with a smaller bandwidth increment, *e.g.*, 4.5 megahertz in the 1.9 GHz band. We believe this approach would segment the 1.9 GHz band in a fashion that does not make sense from a technical standpoint and would result in inefficient use of the spectrum. We believe that providing Nextel uniform nationwide access to ten megahertz in the 1.9 GHz band not only helps to ensure that Nextel receives comparable value for its loss of spectrum rights and expenses it will incur, but also will promote efficient use of the 1.9 GHz band. To account for these and other differences, therefore, we conclude that the comparative value of spectrum and other costs incurred by Nextel to support rebanding must be considered under a "value for value" approach.

⁶⁶¹ See Comments of Alltel, et. al. to Consensus Parties Reply Comments at 12-13; Comments of Verizon to Consensus Parties Reply Comments at 10; Comments of Access Spectrum to Supplemental Comments of the Consensus Parties at 13-14; Comments of Alltel, et. al. to Supplemental Comments of the Consensus Parties at 7; Comments of Verizon to Supplemental Comments of the Consensus Parties at 11-12; (claiming that the grant of 1.9 GHz spectrum to Nextel would result in a windfall). *But see* Comments of Nextel to Consensus Parties Reply Comments at 24-27; Comments of Nextel to Supplemental Comments of the Consensus Parties at 15-17; Reply Comments of the Consensus Parties to Supplemental Comments of the Consensus Parties at 50; Reply Comments of Nextel to Supplemental Comments of the Consensus Parties at 15-17 (claiming that grant of 1.9 GHz spectrum to Nextel will make Nextel whole in return for substantial spectral contributions).

⁶⁶² See Consensus Parties Reply Comments at 17-19.

⁶⁶³ See Kane Reece Study; Kane Reece Study II; CTIA April 29 *Ex Parte*.

⁶⁶⁴ See Kane Reece Study at 41-58; Kane Reece Study II at 8-12.

⁶⁶⁵ See Sun Fire Study at 13-33.

a. Valuation of 1.9 GHz Spectrum

279. We begin with the value of the ten megahertz of spectrum at 1910-1915 MHz/1990-1995 MHz. Three parties—Verizon, CTIA, and Nextel—have submitted valuation studies of the 1.9 GHz spectrum, using different analytical methods and yielding different conclusions:

280. *Verizon Wireless – Kane Reece Study.* On October 27, 2003, Verizon Wireless submitted a valuation report prepared by Kane Reece Associates, a national appraisal firm.⁶⁶⁶ The Kane Reece study concludes that “[i]f the Consensus Plan were adopted, the value of Nextel’s spectrum would increase by \$7.2 billion.”⁶⁶⁷ The Kane Reece study avers that “[a] giveaway of the 1.9 GHz PSC band ... would result in a significant windfall to Nextel while denying the public the value of this public resource.”⁶⁶⁸ The Kane Reece study further estimates that “[t]he FMV of 10 MHz at 1.9 GHz is appraised at nearly \$ 5.3 billion,”⁶⁶⁹ which would equate to approximately \$1.82 per MHz per person (MHz-pop). This estimate is based primarily on an approach which estimates (using several different approaches) the enterprise value (EV) of mobile wireless operators and then subtracts the value of physical assets and identifiable intangible assets. The remaining residual is then interpreted as the value of the spectrum licenses.

281. *CTIA.* In a July 9, 2003, *ex parte* letter, CTIA proposed that the Commission use two private market transactions involving PCS licenses to estimate the value of the 1.9 GHz G block that would be assigned to Nextel as replacement spectrum under the Consensus Plan.⁶⁷⁰ In the first transaction, Verizon Wireless acquired PSC licenses and other assets from Northcoast Communications for \$750 million.⁶⁷¹ In the second transaction, Cingular seeks to acquire PCS licenses from NextWave Telecom for \$1.5 billion.⁶⁷² Based on these transactions, CTIA estimates the value of the 1.9 GHz spectrum at between

⁶⁶⁶ See generally Kane Reece Study n. 185 *supra*; Letter from John Scott, Vice President and Deputy General Counsel – Regulatory Law, Verizon Wireless, WT Docket No. 02-55 at 2 (dated Feb. 26, 2004) (Verizon Feb. 26, 2004 *Ex Parte* Letter).

⁶⁶⁷ Verizon Feb. 26, 2004 *Ex Parte* Letter at 2.

⁶⁶⁸ *Id.*

⁶⁶⁹ *Id.*

⁶⁷⁰ See Letter from Diane Cornell, Vice President, CTIA, WT Docket No. 02-55 (filed July 9, 2003) (CTIA Filing).

⁶⁷¹ The data used by CTIA in its evaluation of the Verizon-North Coast Transaction are as follows:

Purchase Price	\$750,000,000
POPS	47,400,000
MHz	10
Price/POP/MHz	\$1.58

See *Id.*

⁶⁷² The data used by CTIA in its evaluation of the Cingular-NextWave Transaction are as follows:

Purchase Price *	\$1,500,000,000
POPS	80,700,000
MHz	10
Price/POP/MHz	\$1.86

*We note that CTIA bases the purchase price estimate on press and analyst reports. See *id.*

\$4.5 billion and \$5.3 billion.⁶⁷³

282. *Nextel*. In a November 20, 2003 filing, Nextel, through the Sun Fire Group LLC, asserts that a reliable estimate of the value of a nationwide G block license would use a representative selection of large, medium, and small market transactions to better account for market size value variations in constructing a nationwide value estimate.⁶⁷⁴ The following transactions were used by Nextel to calculate an average national spectrum price:

- Verizon-North Coast Transaction⁶⁷⁵
- Pittsburgh, PA BTA Transaction⁶⁷⁶
- Lebanon, NH Transaction⁶⁷⁷

Based on these three transactions, Nextel estimates that the value of ten megahertz of spectrum at 1.9 GHz is worth \$1.25 per MHz-pop, or approximately \$3.5 billion.⁶⁷⁸

283. As an initial matter, we note that the valuing of spectrum is not an activity in which the Commission typically engages. We know from experience that the value of spectrum is seldom static and hinges on multiple variables, some of them intangible, which exist at the moment a willing buyer and willing seller agree to a transaction, or when an informed bidder places its bid at an auction. When attempts are made to value a spectrum asset prospectively, the estimator must choose a model and employ underlying assumptions that serve as proxies for multiple variables. Given these approximations and limitations, any single figure derived cannot be exact; it necessarily has an associated uncertainty.

284. In our analysis of the three major valuations in the record, the models and assumptions differed and, in many instances, appeared tailored to reach a desired result. We believe that no strictly economic analysis can satisfactorily resolve the ultimate question of whether interference-free public safety communications—a largely unquantifiable benefit—has a dollar value commensurate with the fair market value of the 1.9 GHz spectrum Nextel will receive. However, we still believe such financial analyses are relevant to the extent that they provide a benchmark for determining whether the costs incurred and benefits received by Nextel reflect an equitable balance for the public and our licensees, or a windfall to Nextel. We further note that to the extent the possibility of a windfall may have existed under the Consensus Proposal, it is eliminated by the plan we adopt and the safeguards we impose today.

285. The studies all provide evidence relevant to determination of the FMV of the 1.9 GHz spectrum. The task of evaluating this evidence to reach a specific monetary value for the spectrum license asset, however, is complex, and any single figure derived is inherently uncertain. The standard approaches to valuation all have strengths and weaknesses, and appraisal experts often find that the best estimate of

⁶⁷³ *Id.*

⁶⁷⁴ See Sun Fire Study at 32-33 and Appendix G.

⁶⁷⁵ According to Nextel, the Verizon-Northcoast Transaction consisted of fifty BTAs with an average value of \$1.58 per MHz-pop. *Id.*

⁶⁷⁶ Nextel states that the average value per MHz-pop was \$0.42. *See id.*

⁶⁷⁷ The average value per MHz-pop was \$0.25. *See id.*

⁶⁷⁸ *See id.*

value is one that is a synthesis of several approaches.⁶⁷⁹

286. Because they reasonably apply standard and valid asset appraisal techniques, we conclude that the Verizon Wireless and Nextel studies, taken together, define a reasonable range for the value of a ten megahertz nationwide spectrum license of \$1.25 to \$1.82 per MHz-pop. One estimate provided in the CTIA filing exceeds \$1.82 per MHz-pop; however that estimate relies on information in a press account of a spectrum sale transaction that later proved to be inaccurate.⁶⁸⁰ Further, although Verizon Wireless presents several other figures as being consistent with its preferred estimate, all such figures are less than \$1.82 per MHz-pop. That is, Verizon Wireless applied a discounted cash flow analysis to a hypothetical firm by adding ten megahertz of spectrum to its ongoing business value; and, on that basis estimated the ten megahertz of spectrum at \$1.73 per MHz-pop.⁶⁸¹ A market approach of looking at guidelines from publicly traded companies values the spectrum at \$1.61 per MHz-pop,⁶⁸² and a comparable spectrum sales approach values the spectrum at \$1.51 per MHz-pop.⁶⁸³

287. In order to identify an appropriate value amount that is attributed to Nextel for receipt of the 1.9 GHz spectrum rights, one must go beyond identifying a reasonable valuation range and place a specific value on the 1.9 GHz license. As further explained below, in reviewing the detailed application of the valuation methods used in the Kane Reece Study and Sun Fire Study, and also considering all the subsequent filings on valuation, we find that the \$1.82 estimate likely overstates the true value of this spectrum, and the \$1.25 estimate likely understates the true value.⁶⁸⁴ Thus, neither end point in the reasonable value range likely represents the best point estimate for this value. We identify a best point estimate by focusing on several recent comparable secondary market transactions.

288. We believe the Verizon Wireless application of an EV-based calculation results in an uncertain and likely overestimated value of the spectrum license. A significant degree of uncertainty arises for several reasons. First, the EV approach inherently requires making a large number of assumptions. This is particularly true when, as is the case with the Kane Reece Study, enterprise value is estimated by a mix of “income” (or discounted cash flow) and “market” approaches. Thus, for example, under the market approach, the EV and license value estimates are very sensitive to the stock prices taken as starting points,

⁶⁷⁹ See, for example, Shannon P. Pratt, Robert F. Reilly, and Robert P. Schweihs, *Valuing a Business: The Analysis and Appraisal of Closely Held Companies*, Fourth Edition, McGraw-Hill (2000), at 437-448.

⁶⁸⁰ The CTIA Filing, made at a time that the Cingular acquisition of certain NextWave spectrum was only “Proposed/Reported,” uses a \$1.5 billion purchase price, citing as sources the New York Times and three analyst reports (Bear Stearns 6/12/03, Credit Suisse/First Boston (5/28/03, and Goldman (5/28/03). As the Sun Fire Study points out (at 31, footnote 73), the correct purchase price was later disclosed to be \$1.4 billion. See Cingular Press Release, Aug. 5, 2003 (http://www.cingular.com/about/latest_news_/03_08_05).

As the Sun Fire Study also points out (at 31), the CTIA Filing additionally errs in not recognizing that Cingular is acquiring twenty megahertz, rather than ten megahertz in two cities. Finally, we note that the CTIA Filing’s estimate of population living in the areas included in the transaction differs slightly from the official U.S. Census figures for 2000, which we use below in determining the price per MHz-pop for this transaction.

⁶⁸¹ Kane Reece Study at 21 and Exhibit B.

⁶⁸² *Id.* at 26 and Table 2.

⁶⁸³ *Id.* at 40 and Exhibit F.

⁶⁸⁴ See ¶¶ 288-292 *infra*.

and stock prices in this sector have fluctuated significantly over the recent past.⁶⁸⁵ In addition, the calculations rely upon a mix of market values (such as the current equity prices) and book values (such as the values placed on firm debt and many tangible assets). Combining market and book figures in this way might result in overstating or understating the residually determined value of spectrum, depending on exactly how the various book values differ from true market values. Further, under the income approach, the result is also dependent on a large number of assumptions such as forecasts of future streams of revenues and costs, the choice of the appropriate discount rate to employ, and the choice of long term, or “terminal,” growth rate to employ in the analysis. The exact assumptions made can greatly influence the outcome of an analysis,⁶⁸⁶ and yet it can be difficult to determine the appropriate choices or justify choices made as most reasonable. Finally, as shown in a study submitted by Nextel, when the Kane Reece Study approach is applied to each wireless company individually, the result is a wide range of estimates of spectrum license values.⁶⁸⁷ These estimates vary from a low of \$0.41 per MHz-pop for T-Mobile to a high of \$3.74 for Verizon Wireless. Nextel argues “Across all companies in its report, the Kane Reece values for spectrum vary by a factor of nearly nine. These wide variations in spectrum values further demonstrate that Kane Reece’s methodology is unreliable.”⁶⁸⁸ Because the appropriateness and impact of the many detailed assumptions is unclear, and because of the great variation in resulting spectrum value estimates across companies, we believe there is considerable uncertainty about the resulting average license value estimate resulting from the EV based approach in this instance.

289. More significantly, we believe Verizon Wireless’s application of the EV method introduces an upward bias to the valuation of the spectrum licenses. This occurs in two basic ways. In part, EV itself is overstated, and this overstatement flows through to overstate license value. And in part, too little value is subtracted from EV, so that again license value is overstated. One step in the analysis likely causes an overstatement in enterprise value. This occurs with the use of a “control premium” adjustment when computing the EV of the publicly traded firms in the group Verizon Wireless analyzes. That is, after determining the market capitalization of each of these firms (essentially the stock price times the number of outstanding shares), the Kane Reece Study increases the totals by thirty percent. This is said to produce the value that results from the ability to exert control of the assets and firm’s operations.⁶⁸⁹ Applying a control premium is standard and appropriate when, for example, attempting to value an entire corporation in order to determine a reasonable acquisition price for the entire firm.⁶⁹⁰ The Sun Fire Study and the American Appraisal Report argue that it is inappropriate to employ a control premium when calculating the EV of an entire industry or when placing a value on an asset, the spectrum rights.⁶⁹¹ We agree with Nextel that a control premium adjustment is inappropriate when valuing assets such as spectrum

⁶⁸⁵ Morgan Stanley, “Wireless Operator Valuation Table,” Dec, 19, 2003, at 1.

⁶⁸⁶ See the analysis by American Appraisal Associates (American Appraisal Report), submitted in Nextel ex parte filing, May 6, 2004, at 6-7.

⁶⁸⁷ “Economic Analysis of the Kane Reece Spectrum Valuation,” by Gregory L. Rosston, submitted in Nextel ex parte filing, Mar. 18, 2004, Exhibit A.

⁶⁸⁸ *Id.* at 14.

⁶⁸⁹ See, for example, Frank C. Evans, Evans and Evans, Certified Public Accountants, “Valuation of Companies: The Practical Aspects,” Copyright 1994, American Management Association, at 100-105.

⁶⁹⁰ “Source of Control Premium Data & What It Doesn’t Tell Us,” Mercer Capital, Transaction Advisor, Vol. 11, No. 3, 1999, available at <http://www.bizval.com/publications/articlelibrary/SourceControlPremiumData.htm>.

⁶⁹¹ Sun Fire Study at 24, American Appraisal Report at 8-9.

licenses. The valuation/appraisal literature associates the use of control premiums with firm ownership values, not asset values.⁶⁹²

290. Even if the Verizon Wireless analysis has computed EV correctly, we believe it likely subtracts away too little of this value, and so attributes too much of the measured EV to the residual, the spectrum licenses. First, and most fundamentally, it is well recognized that the value of ongoing businesses may—and often does—exceed the sum of the values (or costs to replace) the capital stock.⁶⁹³ It has been estimated that market values for U.S. industries in general have significantly exceeded the replacement costs of their assets in recent years.⁶⁹⁴ Second, other intangible elements may have value and thus should also be subtracted from EV. The Kane Reece Study does not account for the fact that market values may exceed the sum of the asset values, and it makes an adjustment for only one other intangible asset, the value of the current customer base. In so doing, it does not address factors such as brand equity firms may possess or any unique assets firms may have that create value (such as a uniquely strong management team or an important patent). At least one study has found, however, that in the mobile wireless sector intangible assets arising from advertising expenditures and research and development expenditures are important and statistically significant in explaining firms' market values.⁶⁹⁵ Thus, the EV approach as applied by Verizon Wireless would be expected to leave as the residual not only the value of the spectrum licenses, but also the value of other important intangible contributors to firm value, as well as the synergies created by bringing all the assets together in an ongoing business. As a result, this approach attributes to the spectrum licenses value that is due to other critical factors and accordingly overstates the value of these licenses.

291. Turning to the Nextel's \$1.25 per MHz-pop estimate, we find this likely understates the true value of a ten megahertz spectrum license. Nextel argues that the two comparable secondary market transactions employed by CTIA—the Verizon Wireless acquisition of fifty Northcoast licenses and the Cingular acquisition of NextWave spectrum in thirty-four cities—overstate the average value of a nationwide license because both of those transactions principally involved large markets.⁶⁹⁶ Therefore, Nextel derives its figure using a “tiered pricing model” that relies on three comparable sales benchmarks: the Verizon Wireless/Northcoast acquisition and two other single-license transactions (Pittsburgh, PA and Lebanon, NH). This model, in effect and in intent, places a lower price per MHz-pop on spectrum in smaller cities. We find, first, however, as argued by Verizon Wireless, that this approach places undue reliance on the two single-license sales, and that this is particularly worrisome when those sales may not have been true arms-length transactions.⁶⁹⁷

⁶⁹² See Pratt, Reilly, and Schweihs at 25-26, 48-49, and 354-361; “Goodwill Hunting: Part II,” Mercer Capital, Transaction Advisor, Vol. 4. No. 3, 2001, available at <http://www.bizval.com/publications/articlelibrary/GoodwillHuntingPart2.htm>.

⁶⁹³ See, for example, James Tobin, *Money Credit and Capital*, McGraw Hill (1998) at 147-155. The ratio of the market value of the firm to the replacement costs of its assets is known as “Tobin's q.”

⁶⁹⁴ That is, Tobin's q has been estimated as significantly greater than one. See “A New Bull, or a Bear Market Rally?” by David Edwards, in *TheStreet.com*, June 3, 2003, available at: <http://thestreet.com/funds/managerstoolbox/10090875.html>.

⁶⁹⁵ “Measuring and Valuing Intangible Capital in the Wireless Communications Industry,” by Mark Klock and Pam Megna, *The Quarterly Review of Economics and Finance*, 40 (200) 519-532.

⁶⁹⁶ Sun Fire Study at 22, 26-27, 32-33.

⁶⁹⁷ Kane Reece Study at 18-19.

292. Second, while we agree with Nextel in principle that the average value derived from the comparables used by CTIA need not equal the value of a nationwide license, and that some geography-based value adjustment may be required, we find that in this instance the tiered pricing model likely results in an exaggerated downward adjustment. We have investigated the difference in value between the average of each of the comparable transactions and a true nationwide average by reviewing data from Auction No. 11, for the D, E, and F Block PCS licenses, which closed in January, 1997. This auction provides the most recent complete set of data on how PCS license prices vary across geographic areas.⁶⁹⁸ Specifically, we have compared the average price, in terms of dollars per MHz-pop, that the license areas encompassed in each comparable transaction sold for in Auction No. 11 to the overall average for all licenses in that auction. We find no support for a downward adjustment to \$1.25 per MHz-pop based on variations in value across geographic areas.⁶⁹⁹

293. Having concluded that the \$1.82 estimate is higher than, and the \$1.25 estimate lower than, the best point estimate of the FMV of the G Block, we compute the best estimate as follows. Given the problems with application of the EV-based approach, we find that an approach based on comparable spectrum sales is most reliable. Two recent benchmark secondary market transactions—those identified by CTIA—provide strong evidence of the current FMV of the 1.9 GHz spectrum. These are:

- the December 2002 purchase by Verizon Wireless of fifty Northcoast licenses at a price equating to approximately \$1.58 per MHz-pop; and
- the Fall 2003 agreement to purchase by Cingular Wireless of NextWave spectrum in thirty-four cities at a price equating to approximately \$1.66 per MHz-pop.⁷⁰⁰

294. These two transactions are compelling benchmarks for several reasons. Both are relatively recent, and represent arms-length transactions. Both transactions essentially involve spectrum licenses alone, as opposed to spectrum bundled with other assets, thus obviating the need to estimate the proportion of the purchase price that represents the value of the spectrum. Finally, since both transactions involve a relatively large number of licenses spanning a representative range of small to large markets, they should reasonably reflect the value of a nationwide license.

295. More recently, Qwest Communications and Verizon Wireless agreed to another transaction involving a large number of licenses. Verizon Wireless will acquire from Qwest sixty-two spectrum licenses in fifty-seven areas in Qwest territory for \$418 million. While this transaction does not solely involve spectrum licenses, however it appears to place an average value on the licenses themselves

⁶⁹⁸ While these auction data are seven years old, and are not useful for estimating the absolute value of spectrum today, we are using them here only to estimate the relative level of prices across geographic areas. While different geographic areas, of course, have grown at different rates over the last seven years, we do not believe that the relative pattern of values across licenses today is significantly different from that at the time the auction closed.

⁶⁹⁹ While we find the Auction No. 11 evidence sufficient to conclude that the estimate resulting from the tiered pricing model is too low, we do not attempt to use Auction No. 11 results to make any alternative value estimates. Differences among the three auctioned license blocks in how prices varied across license areas suggest that the Auction No. 11 results should not be relied upon to produce an adjustment to the result of the tiered pricing model.

⁷⁰⁰ Throughout our analysis here of secondary market transactions, where we compute per MHz-pop values we employ population counts for the appropriate geographic areas from the 2000 Census. See the data at: http://wireless.fcc.gov/auctions/data/maps/cntysv2000_census.xls

of about \$1.36 per MHz-pop.⁷⁰¹ While this is somewhat lower than our other two comparables, we believe it is consistent with them given the different mix of markets included in this transaction: a greater preponderance of small and mid-sized markets, and a lesser preponderance of very large metro areas. In general, licenses for large metropolitan areas are more highly valued per MHz-pop than licenses for the smaller cities and rural areas.

296. Secondary market transactions that involve only small numbers of licenses are more likely to reflect values that are specific to local conditions, and therefore may be inappropriate models for valuation of nationwide spectrum. Notwithstanding the limited data provided by such transactions, two other recently announced agreements also provide some relevant evidence of current value. First, in late May of this year, as part of a larger transaction between the two firms, it was announced that T-Mobile USA will acquire from Cingular Wireless ten megahertz of PCS spectrum in three BTAs, San Francisco-Oakland-San Jose, Sacramento, and Las Vegas. The agreed price is \$180 million,⁷⁰² which corresponds to approximately \$1.67 per MHz-pop. Second, on July 8 NextWave Telecom, Inc. sold three PCS licenses for a total of \$973.5 million.⁷⁰³ A ten megahertz license in the New York BTA was purchased by Verizon Wireless for \$4.74 per MHz-pop. And ten megahertz licenses in two Florida BTAs were purchased by MetroPCS: Sarasota-Bradenton for \$1.37 per MHz-pop and Tampa-St. Petersburg-Clearwater for \$1.33 per MHz-pop. While not yet consummated, both of these transactions appear to be firm, arms-length transactions between willing buyers and sellers.

297. We view all these more recently announced transactions as confirming our two primary comparables, which yield an average value of \$1.62 per MHz-pop. However, we believe that this value may understate the current FMV of a nationwide 1.9 GHz spectrum because a nationwide license—or a near-nationwide license that encompasses the great majority of areas where mobile telephony service coverage would be desired—may command a small value premium. We do not expect such a premium to be large, because today many likely buyers of spectrum already hold large spectrum footprints, and may be most interested in filling holes in those footprints or adding to capacity in local areas. Nonetheless, some firms would likely still see added value in having a nationwide license for a single set of frequencies, for example because such a license could enable less costly equipment development and deployment. Accordingly, we make a five percent upward adjustment in the average price of our primary comparable transactions. Our final point estimate of the value of the 1.9 GHz spectrum is \$1.70 per MHz-pop, or approximately \$4.86 billion.⁷⁰⁴

b. Offsets

298. Having determined the value of the 1.9 GHz spectrum, we must balance it against the costs that will be incurred by Nextel pursuant to this *Report and Order*. We conclude that the following categories of costs to Nextel merit compensation, and therefore should be offset against the above-determined value of the 1.9 GHz spectrum: (1) Nextel's costs to relocate incumbents within the 800 MHz

⁷⁰¹ "Sale of Wireless Assets Positive for both VXW and Q," Analyst Comment, Goldman Sachs, July 2, 2004.

⁷⁰² "T-Mobile USA to End Network Venture with Cingular and Acquire California/Nevada Network and Spectrum," Press Release, May 25, 2004.

⁷⁰³ "NextWave Auction Attracts Winning Bids Totaling \$973.5 Million," News Release, NextWave Telecom, July 8, 2004.

⁷⁰⁴ For the calculation of the total dollar amount, we use the total year 2000 population for the United States including possessions, or 285.62 million.

band, including payments Nextel has made for the services of the Transition Administrator; (2) Nextel's own relocation costs; (3) Nextel's costs to clear the 1.9 GHz spectrum; and (4) the net value of the 800 MHz spectrum that Nextel will relinquish for public safety use.⁷⁰⁵ We also assign *de minimis* value to the 700 MHz Guard Band spectrum that Nextel will relinquish.

(i) Relocation and Band-Clearing Costs

299. *Cost to Relocate 800 MHz Incumbents.* In the Consensus Parties proposal, Nextel has estimated the cost of relocating public safety, CII, and other 800 MHz incumbents at \$850 million.⁷⁰⁶ Nextel asserts that these costs should be credited to Nextel because they are integral to accomplishing band reconfiguration without imposing a prohibitive cost burden on public safety.⁷⁰⁷ Verizon Wireless argues that Nextel should not receive credit for the cost of relocating other 800 MHz licensees on the grounds that these are "necessary costs of doing business" to remedy interference that has been caused by Nextel itself.⁷⁰⁸ Verizon also asserts that Nextel has not provided documentation to support its \$850 million relocation cost estimate.⁷⁰⁹

300. We reject Verizon's argument that Nextel should not receive credit for these relocation costs. First, we disagree with Verizon's premise that Nextel is legally responsible as the sole "cause" of the interference problem being remedied, and therefore could be compelled to pay these costs without compensation. The record in this proceeding has documented that while Nextel has been implicated in great number of interference incidents, the interference problem has not been not "caused" by any single party—Nextel, cellular, or public safety—but rather has been caused collectively by the proximity of all of these parties to one another in the 800 MHz band, even though all parties are operating in compliance with Commission rules. Moreover, Nextel is not only bearing the entire cost of solving the problem, but is supporting the optimal solution to the problem—band reconfiguration—even though this is considerably more costly to Nextel than other, less optimal solutions, such as exclusive reliance on Enhanced Best Practices. Based on these considerations, crediting Nextel for the cost of relocating other incumbents is consistent with equitable principles and furthers the public interest goals of this proceeding in achieving a comprehensive long-term solution to the interference problem. Finally, we do not require documentation of Nextel's estimate, as Verizon contends, because the offset will be calculated based on actual relocation costs, not estimated costs, as verified by the Transition Administrator.

301. *Nextel's Own 800 MHz Relocation Costs.* Nextel identifies two categories of costs associated with relocation of its own operations in the reconfigured 800 MHz band. First, to protect non-cellular systems below 816/861 MHz from OOB, Nextel will install improved filters for all of its 800 MHz base station transmitters to achieve a sharper OOB roll-off.⁷¹⁰ Nextel previously projected these filter costs at \$150 million, but in conjunction with the revised band plan under which Nextel will relinquish an additional two megahertz of spectrum at 816-817/861-862 MHz, Nextel has revised its

⁷⁰⁵ We provide these offsets pursuant to our authority under Section 4(i) of the Act. 47 U.S.C. § 154 (i). See ¶¶ 75-76 *supra*.

⁷⁰⁶ See Supplemental Comments of the Consensus Parties at 5-6.

⁷⁰⁷ See Comments of Nextel to Supplemental Comments of the Consensus Parties at 15-17.

⁷⁰⁸ Verizon June 30 ex parte at 3-4. See also Verizon June 9 ex parte at 6.

⁷⁰⁹ *Id.* at 4.

⁷¹⁰ Nextel July 27 ex parte at 1-2. See n. 401 *supra*.

projected filter costs to \$407 million.⁷¹¹ Second, to implement band reconfiguration, Nextel will need to relocate its own operations to new channels. In some instances, this will require Nextel equipment to be retuned more than once in order to provide a seamless transition for other licensees.⁷¹² Nextel estimates the cost at \$400 million. Nextel seeks credit for both of these cost categories, while Verizon contends that Nextel should be required to bear these costs without credit or compensation.⁷¹³

302. Verizon's argument that Nextel should not receive credit for its own relocation costs also fails. The costs that Nextel is incurring to relocate its own system are just as integral to the optimized solution of band reconfiguration as are the costs of relocating other 800 MHz licensees. The installation of new filters in Nextel's system will provide needed interference protection to public safety, CII, and other 800 MHz licensees on the additional spectrum that is being provided to them by Nextel under the new band plan. With respect to retuning costs, Nextel is paying for multiple relocations of its own operations to ensure that other incumbents can operate seamlessly while band reconfiguration is taking place. Thus, giving credit to Nextel for these costs is not tantamount to paying a "polluter" to stop polluting, as Verizon contends.⁷¹⁴ Instead, it is recognizing that Nextel—alone among the parties to this proceeding—is paying to support a comprehensive solution to a collective "pollution" problem even though this will require more expensive changes to its own system than would otherwise be required. We conclude that Nextel should be entitled to credit for these costs, as verified by the Transition Administrator. These costs will include payments Nextel has made for the services of the Transition Administrator.

303. *Cost of Clearing 1.9 GHz Spectrum.* As discussed in ¶¶ 239-263, *supra*, as a condition of receiving 1.9 GHz spectrum rights, Nextel is required (1) to pay UTAM for the cost of clearing the 1910-1915 MHz band and (2) to clear BAS from the 1990-2025 MHz band within thirty months. Nextel seeks credit for these costs as an offset against the value of the 1.9 GHz spectrum.⁷¹⁵ Verizon objects to this offset on the same grounds as the 800 MHz relocation cost offsets discussed above. In addition, Verizon argues that Nextel should not receive credit for clearing BAS from the entire 1990-2035 MHz band when clearing of the 1990-1995 MHz band is all that is required for Nextel's purposes.⁷¹⁶

304. We conclude that Nextel should receive credit for all BAS relocation costs, less any MSS-reimbursed expenses incurred prior to the end of the thirty-six month reconfiguration period, when the

⁷¹¹ Nextel June 21, July 27 *ex partes*. Nextel states as a result of giving up the additional 2 megahertz, it will require more expensive filters so that it can operate closer to the band edge while still protecting the relinquished spectrum from OOB. In addition, Nextel will need to install filters at a greater number of base station sites than under the previous plan. Nextel July 27 *ex parte* at 2.

⁷¹² Nextel July 27 *ex parte* at 2. Although Nextel will ultimately relocate from the current General Category and interleaved channels to the old NPSPAC block, it will not do so directly. Instead, it will need to relocate many of its operations to temporary channels in the 800 MHz band or to spectrum in the 900 MHz band while it is clearing the General Category block and moving non-Nextel General Category licensees to channels it has vacated in the interleaved bands. Only after the new NPSPAC block is cleared of incumbents and NPSPAC operations can be relocated there will Nextel be able to move its operations back from the 900 MHz band to the old NPSPAC block.

⁷¹³ Nextel June 21 *ex parte* at 2; Verizon June 30 *ex parte* at 3-4.

⁷¹⁴ Verizon June 9 *ex parte* at 6.

⁷¹⁵ MSTV/NAB/Nextel May 3, 2004 *Ex Parte* at 4; Nextel June 21 *ex parte* at 2.

⁷¹⁶ Verizon June 9 *ex parte* at 6.

offsets will be calculated.⁷¹⁷ First, the value we have determined for the 1.9 GHz spectrum is based on comparable transactions that involved unencumbered spectrum. Because the 1.9 GHz is encumbered, however, it is appropriate to consider the costs of clearing the band as an offset against this value. Second, we disagree with Verizon's contention that Nextel should not receive credit for the full cost of clearing BAS from the 1990-2025 MHz band. Although Nextel will only have spectrum rights in the 1990-1995 MHz portion of this band, as discussed in ¶¶ 251-263, *supra*, we are requiring Nextel to clear the entire band as a condition on those spectrum rights. We impose this requirement because it promotes responsible use by Nextel of the 1.9 GHz spectrum we are granting as part of our solution to the public safety interference problem, and because it provides a rapid and efficient band-clearing solution at 1.9 GHz that benefits all parties—Nextel, BAS, MSS, other prospective users of the band above 1995 MHz, and the public. Having required Nextel to incur these costs as an integral component of this order, we conclude that it is reasonable to allow Nextel to obtain credit for these same costs. Moreover, there is no risk in our decision of double recovery by Nextel because it cannot claim credit for any BAS relocation expenses for which it seeks or obtains reimbursement from MSS licensees.

305. We recognize that giving Nextel credit for the costs it incurs in clearing the 1.9 GHz band, differs from the Commission's usual practice of auctioning spectrum "as is," *i.e.*, a typical auction winner acquires spectrum rights subject to encumbrances such as incumbent users. We decline to take the "as is" approach in the instant situation, however, because the comparable transactions used above to determine the value of the 1.9 GHz band involved unencumbered spectrum. Thus, we believe it more accurate to grant Nextel credit for the verifiable costs of clearing the 1.9 GHz band instead of incorporating an estimate of these costs into our spectrum valuations.

306. *Combined Relocation and Band-Clearing Costs.* Nextel has estimated the cost of relocating 800 MHz incumbents at \$850 million, its own relocation costs (retuning and additional filters) at \$807 million, and the cost of clearing or relocating 1.9 GHz incumbents (UTAM and BAS) at \$527 million.⁷¹⁸ If these estimates prove to be accurate, Nextel will be credited with combined offsets for these costs totaling \$2.184 billion against the value of the 1.9 GHz spectrum. However, it is unnecessary to rely on Nextel's estimate, because the final offsets will be based on actual relocation and band-clearing costs incurred by Nextel, as verified by the Transition Administrator at the conclusion of the thirty-six month transition period for 800 MHz band reconfiguration. Thus, if the combined relocation and band-clearing costs prove to be higher than Nextel's estimate, Nextel will receive a correspondingly larger offset; similarly, if its costs are lower than this estimate, the offset will be correspondingly lower.

(ii) 800 MHz Spectrum Relinquished to Public Safety and Other 800 MHz Incumbents

307. As noted above, Nextel is relinquishing all of its spectrum in the 800 MHz General Category and interleaved bands, and two megahertz of spectrum at 816-817/861-862 MHz from the Upper 200 SMR channel block, for relocation and use by public safety and other non-ESMR incumbents. At the same time, once band reconfiguration and relocation are complete, Nextel will hold the rights to the six megahertz of contiguous spectrum in the current NPSPAC band (821-824/866-869 MHz). Nextel states that through its relinquishment of 800 MHz General Category and interleaved spectrum, it is giving up an average of 8.5 megahertz of bandwidth, resulting in an average net gain of 2.5 megahertz to public

⁷¹⁷ In the event that Nextel were to incur any BAS-related relocation expenses after the thirty-six month reconfiguration period, they are outside the scope of this proceeding and Nextel may not claim credit for them, under the band clearing expense offset process we have established herein.

⁷¹⁸ Nextel June 21 ex parte at 2.

safety.⁷¹⁹ Combined with the two megahertz of spectrum that Nextel is giving up from its spectrum holdings in the Upper 200 block, the average net amount of spectrum being relinquished by Nextel is 4.5 megahertz.⁷²⁰

308. Nextel's relinquishment of these spectrum rights to public safety accomplishes an important public interest objective of this proceeding by increasing the amount of 800 MHz spectrum available for public safety use. Parties to this proceeding differ, however, on whether it also imposes a cost on Nextel, because the General Category and interleaved spectrum that Nextel is relinquishing is non-contiguous, while the NPSPAC band is contiguous. Verizon contends that Nextel's gain of rights to contiguous 800 MHz spectrum exceeds the value of the rights to non-contiguous 800 MHz spectrum being relinquished by Nextel.⁷²¹ Thus, Verizon contends that Nextel's exchange of spectrum rights in the 800 MHz band constitutes a windfall gain, notwithstanding the net loss of bandwidth. Nextel, on the other hand, contends that there is no difference in the per-megahertz value of the non-contiguous spectrum rights it is relinquishing and the contiguous spectrum rights it is gaining, so that the net loss of bandwidth imposes a substantial net cost on Nextel.⁷²²

309. As discussed more fully below, we do not agree with Verizon's contention that Nextel will realize a windfall gain from the net loss of spectrum rights at 800 MHz. While we conclude that Nextel will realize some technical efficiency benefit from being able to operate its network on contiguous 800 MHz spectrum, that benefit is relatively small and does not translate into a windfall for Nextel. We further conclude that the gain that Nextel will realize from the exchange of non-contiguous for contiguous spectrum rights at 800 MHz is more than offset by the total value of the 800 MHz spectrum rights being relinquished by Nextel, and the fact that Nextel will be unable to fully utilize the additional contiguous 800 MHz spectrum until the end of the transition. On balance, the result is a net cost to Nextel—though not as great a cost as Nextel contends—for which compensation is appropriate.

310. Verizon argues that the exchange of spectrum at 800 MHz is a windfall for Nextel based on the disparate valuations of contiguous and non-contiguous spectrum rights presented in the Kane Reece report. First, the Kane Reece report uses the same "enterprise valuation" method that Kane-Reece applied to the 1.9 GHz spectrum to value the rights to the contiguous six-megahertz NPSPAC band at \$1.82/MHz-pop, or about \$3.2 billion. Then, using an engineering analysis that compares non-contiguous spectrum used for mobile voice and data against contiguous spectrum in a CDMA 1xRTT use, the Kane-Reece report values the non-contiguous spectrum rights given up by Nextel at \$.45/MHz-pop, or about \$.9 billion—approximately twenty-five percent of the value Kane-Reece claims for rights to contiguous spectrum.⁷²³ Combining these two figures, the Kane-Reece report asserts that Nextel will realize a \$2.3 billion net benefit from the exchange of spectrum rights at 800 MHz.⁷²⁴

311. We believe Verizon's analysis is unpersuasive in several respects. First, Verizon asserts that Nextel will derive significantly increased value from exchanging contiguous for non-contiguous

⁷¹⁹ See Nextel Reply Comments at 7. See also Consensus Parties Reply Comments at 18.

⁷²⁰ Nextel June 9 *Ex Parte* at 2.

⁷²¹ See Kane Reece Study at Table 7; Kane Reece Study II at 2.

⁷²² See Sun Fire Study at 27-28.

⁷²³ See Kane Reece Study at 43-52.

⁷²⁴ *Id.* at 42, Table 7.

spectrum at 800 MHz because contiguous spectrum affords flexibility to use wideband technologies, such as CDMA, that cannot be deployed on non-contiguous spectrum. In Nextel's case, however, such flexibility is more theoretical than real. The record indicates that, as a practical matter, Nextel is unlikely to abandon its iDEN network and switch to wideband technology as a result of this exchange of contiguous for non-contiguous spectrum.⁷²⁵ Given Nextel's existing investment in iDEN and its large customer base, it is more cost-effective for Nextel to extend its existing network into the additional six megahertz than to switch to an alternative technology such as CDMA, which would be very costly and time-consuming for Nextel and would impose significant burdens on its customers. In addition, to ensure continued service to its twelve million iDEN customers, Nextel will need to use the six megahertz for added spectrum capacity in its system to compensate for the lost capacity associated with spectrum rights being relinquished to public safety pursuant to rebanding. Thus, while we agree with Verizon that under most circumstances, contiguous spectrum offers more technical flexibility and is more highly valued by the marketplace, we believe the analysis here must focus on the practical effect of this specific exchange of spectrum rights on Nextel's existing network and service. In this context, the highest-value use that Nextel is likely to derive from the six megahertz it will acquire is to use it for iDEN expansion. This would not create a significant increase in value for Nextel because iDEN does not require contiguous spectrum.

312. For similar reasons, we find that Verizon's analysis understates the value of the non-contiguous spectrum rights being given up by Nextel. While the market value of non-contiguous spectrum is generally lower than that of contiguous spectrum, Verizon's analysis does not sufficiently account for Nextel's highly effective use of iDEN technology to maximize the capacity that it derives from non-contiguous spectrum. Using iDEN, Nextel can and does provide interconnected mobile voice and data at current-generation speeds on the spectrum it currently uses.⁷²⁶ In fact, Nextel has been able to achieve capacity and throughput levels that are superior to many providers that operate on contiguous spectrum. Therefore, from a technology perspective, Nextel does not gain significant new capability to provide these services as a result of converting from non-contiguous spectrum to contiguous spectrum in the 800 MHz band.⁷²⁷

313. While we conclude that Verizon has not taken Nextel's efficient use of non-contiguous spectrum into account, we do not agree with Nextel's contention that its use of iDEN means that non-contiguous and contiguous spectrum rights should be valued equally. Even in an iDEN configuration, Nextel will realize some increase in technical efficiency as a result of using contiguous spectrum. For example, moving to contiguous spectrum will give Nextel somewhat more flexibility to optimize frequency reuse in its iDEN network, and Nextel will have fewer constraints on spectrum use because once relocation is complete, the contiguous band will be cleared of non-Nextel incumbents. Because Nextel has not taken these variables into account in its valuation of the 800 MHz spectrum it is relinquishing, we have conducted our own analysis to determine the appropriate offset for contiguous and non-contiguous spectrum.

314. *Contiguous Spectrum at 800 MHz.* We start by estimating the value to Nextel of the spectrum rights to the six megahertz of contiguous spectrum currently occupied by NPSPAC. We believe that Verizon's proposed market valuation of the six megahertz at \$1.82 MHz-pop, for a total of \$3.2 billion, is overstated. This valuation figure is derived using the same "enterprise valuation" method that

⁷²⁵ See Rosston Study at 7-9.

⁷²⁶ See Sun Fire Study at 17.

⁷²⁷ See Letter dated Dec. 19, 2003 from Regina Keeney, Esq. Counsel for Nextel to Michael J. Wilhelm, Esq., WTB at 16. See also Nextel Communications, Inc. Proposed Spectrum Swap: Working Through the Noise, UBS Investment Research Report dated April 15, 2004 at 6 (*April 15 UBS Report*).

Verizon uses to value the 1.9 GHz spectrum. As noted above, we find that this method results in an inflated value for the 1.9 GHz spectrum, and accordingly, it overstates the value of 800 MHz spectrum to at least an equal degree.

315. We believe that our above-determined \$1.70/MHz-pop valuation of the 1.9 GHz spectrum represents a more appropriate baseline for determining the value of the contiguous 800 MHz spectrum being acquired by Nextel. Although Nextel asserts a higher value for 800 MHz spectrum (both contiguous and non-contiguous) based on propagation characteristics, based on our analysis of comparable sales discussed above, we have not found that this factor adds appreciable value to 800 MHz spectrum in comparison to 1.9 GHz spectrum. Moreover, to the extent that it may add value, there are other factors that tend to cancel out any such difference as applied to the 800 MHz spectrum that Nextel will acquire. First, we assume that the market value of six megahertz of spectrum would not be proportional on a per-megahertz basis to the market value of ten megahertz of spectrum. Where we have established new bands for advanced wireless services, we have never established licensing blocks smaller than ten megahertz. In addition, a six megahertz block provides no more capacity than a five megahertz block for the typical CDMA configuration based on 1.25 MHz channels, *i.e.*, only four channels can be accommodated in either case.

316. We also find that an offset should be made against the six megahertz of contiguous 800 MHz spectrum that Nextel is gaining because it is also relinquishing two megahertz of contiguous spectrum at 816-817 MHz/861-862 MHz. This reduces Nextel's net gain of contiguous spectrum from six megahertz to four megahertz. We also make an adjustment for operational restrictions that Nextel is accepting under this order at the new lower edge of its contiguous 800 MHz ESMR spectrum. As described by Nextel, these restrictions will effectively limit Nextel's use of half a megahertz of its ESMR spectrum after rebanding.⁷²⁸ Based on all of the above factors, we conclude that Nextel should be credited with the net gain of 3.5 megahertz of contiguous 800 MHz spectrum as opposed to six megahertz. Applying our baseline of \$1.70/MHz-pop to this amount of spectrum on a nationwide basis yields an approximate value of \$1.739 billion.⁷²⁹

317. *Non-Contiguous Spectrum at 800 MHz.* In addition to determining the value of contiguous spectrum at 800 MHz, we also must consider the value of the non-contiguous 800 MHz spectrum rights being relinquished by Nextel in the General Category and interleaved spectrum bands. Again, we are presented with a range of values by the parties. Verizon values Nextel's non-contiguous spectrum rights at \$.45/MHz-pop—one quarter the value it ascribes to contiguous spectrum—which we regard as too low.⁷³⁰ Nextel, on the other hand, argues for a valuation of \$2.02/MHz-pop, which we regard as thinly supported, since it is based on a single secondary market transaction.⁷³¹ As in our discussion of

⁷²⁸ Nextel June 4, 2004 *Ex Parte* at 3. This record statement by Nextel, as with all such statements in the record, is governed by Section 1.17 of the Commission's rules governing accuracy in written statements to the Commission. See 47 C.F.R. § 1.17.

⁷²⁹ We make a small downward adjustment to the two megahertz offset because while Nextel is giving up all of its spectrum holdings at 816-817/861-862 MHz, our records indicate that there are seventeen EA licenses in this band licensed to parties other than Nextel, which these licensees are not required to relinquish. Accordingly, in calculating the MHz-pop (11.56 million pops) value of the two megahertz of spectrum given up by Nextel, we have deducted the population of those non-Nextel EAs from the calculation.

⁷³⁰ Kane Reece Report at Table 7.

⁷³¹ See Sun Fire Study. The Sun Fire valuation is based on Nextel's acquisition of Chadmoore Communications. Although this transaction is a useful data point, we do not believe it provides sufficient support in and of itself for the valuation proposed in the report.

contiguous spectrum above, we focus our analysis of non-contiguous spectrum on its specific use in Nextel's existing network and service, which we consider more relevant than its hypothetical market value to other parties. In particular, we focus on the differences in technical efficiency that affect iDEN operation on contiguous versus non-contiguous spectrum. While these differences are difficult to quantify with precision, we have identified variables that we believe provide a reasonable measure of the increase in efficiency that Nextel will realize as a result of obtaining rights to contiguous spectrum, and which can be used to provide an appropriate discount on the value of the non-contiguous spectrum rights it is relinquishing. We set forth this analysis below.

318. *Interleaved Channels.* In the 809.75-816/854.75-861 MHz band, 80 SMR channel pairs totaling 4 megahertz of bandwidth are interleaved with public safety and B/ILT channels. The interleaved nature of the band plan puts twenty of these channels at band edges adjacent to non-SMR spectrum, including public safety spectrum. Using the OOB limits applicable to EA licenses,⁷³² we assume that if Nextel is operating on one of its band-edge channels in the vicinity of an adjacent-channel non-SMR licensee, Nextel must limit use of its band-edge channel to avoid interference. We estimate that this reduces the utility of the band edge channels by fifty-percent, because they can still be used in areas where the adjacent non-SMR licensee is operating on a non-band-edge channel. A fifty-percent impairment to one quarter of the eighty interleaved channels translates to a 12.5 percent reduction in capacity—effectively one out of every eight channels that Nextel is unable to use on interleaved spectrum but could use if the same channels formed a single contiguous block. Thus, we believe a 12.5 percent discount is an appropriate benchmark for the technical efficiency loss in an iDEN configuration from the spectrum being non-contiguous.

319. Applying this analysis to the interleaved spectrum rights being given up by Nextel, we have reviewed Nextel's interleaved spectrum holdings in eleven top US markets.⁷³³ We believe that focusing on Nextel's spectrum holdings in top markets is appropriate because these are the markets where Nextel's gains and losses of spectrum are likely to have the most significant impact on efficiency. In less populated markets, efficiency gains from using contiguous as opposed to non-contiguous spectrum are less likely to translate into an economic benefit for Nextel, and the net loss of bandwidth is less likely to translate into an economic loss. In these markets, Nextel holds an average of 3.84 megahertz of interleaved SMR spectrum—in fact, in all but two of these markets, it holds all eighty available interleaved SMR channels.⁷³⁴ On average, non-Nextel incumbents occupy only 0.08 megahertz of spectrum in the interleaved EA blocks licensed to Nextel. Because these non-Nextel incumbents must be protected by Nextel, we attribute an average of 3.76 megahertz of interleaved spectrum to Nextel.

320. To determine the value of this spectrum, we start with our \$1.70/MHz-pop baseline value for contiguous 800 MHz spectrum, and discount it by 12.5 percent, resulting in a MHz-pops value of

⁷³² 47 C.F.R. § 90.683.

⁷³³ For purposes of this review, we have analyzed eleven of the top fifteen US markets, excluding three border markets—Detroit, Seattle, and San Diego—as well as Atlanta. The border markets are excluded because under band reconfiguration, Nextel will both give up and receive smaller amounts of 800 MHz spectrum in these markets, so they are not representative. We have excluded Atlanta because Southern LINC may receive a significant portion of the contiguous 800 MHz spectrum in that market if it elects ESMR status. See ¶¶ 164-169 *supra*. Thus, it is also not a representative market.

⁷³⁴ See Exhibits attached to Letter, dated July 26, 2002, from Michael K. Powell, Chairman, Federal Communications Commission to the Honorable W.J. (Billy) Tauzin, Chairman, Committee on Energy and Commerce, U.S. House of Representatives (2002 Report to Congress).

\$1.49.⁷³⁵ In addition, because Nextel does not have full nationwide coverage on interleaved spectrum, we adjust the population coverage figure from 286 million to 234 million.⁷³⁶ This results an approximate valuation of \$1.309 billion for Nextel's interleaved spectrum rights.

321. *General Category.* The 806-809.75/851-854.75 MHz General Category band more closely resembles contiguous spectrum than the 800 MHz interleaved band, because it is not divided into interleaved band segments specifically assigned to SMR, public safety, and B/ILT. Instead, the General Category band is segmented into six contiguous twenty-five channel blocks licensed on an EA basis.⁷³⁷ The vast majority of these EA licenses are held by Nextel. The band is not fully contiguous, because EA licensees must protect grandfathered site-based licenses in the General Category band. Thus, in markets where there are non-Nextel incumbents, Nextel must maintain a seventy-mile spacing for co-channel interference protection,⁷³⁸ which will likely prevent Nextel from employing that channel in that same market. To account for this circumstance, we discount Nextel's spectrum rights in the General Category by the number of channels that it is prevented from using because of the need to protect co-channel incumbents. But in contrast to the interleaved band, we do not consider it necessary to discount Nextel's General Category spectrum rights holdings based on the presence of adjacent channel non-SMR incumbents. Most of the General Category incumbents are single-channel conventional systems rather than the five-channel trunked systems found in the interleaved block. In addition, over the past several years Nextel has purchased the spectrum rights of many of these incumbents in order to clear and consolidate its General Category spectrum rights. This affords Nextel more channels to choose from in the General Category band than it has in the interleaved band, even where incumbents in adjacent non-SMR bands that must be protected.

322. Using the same markets that we have reviewed to assess Nextel's interleaved spectrum rights, our licensing records indicate that Nextel holds an average of 6.9 megahertz of General Category spectrum in these markets (out of a total of 7.5 megahertz) through EA licenses. On average, non-Nextel incumbents occupy 1.78 megahertz of spectrum in the EA blocks licensed to Nextel in these markets.⁷³⁹ Because these co-channel incumbents prevent Nextel from using all of its General Category channels in a particular market, Nextel is on average only able to use 5.12 megahertz of its total 6.9 megahertz of General Category spectrum. We therefore apply our \$1.70/MHz-pop baseline to 5.12 megahertz, and use the same adjusted population figure (234 million) applied to the interleaved spectrum, resulting in an approximate valuation of \$2.037 billion for Nextel's General Category spectrum rights.

323. *Combined 800 MHz Spectrum Offsets.* Offsetting the valuation amounts for Nextel's contiguous and non-contiguous spectrum rights as determined above results in an offset to Nextel of

⁷³⁵ We recognize that the \$1.70 MHz-pops value we have derived for 1.9 GHz is based in part on the nationwide nature of that spectrum block, whereas the 800 MHz spectrum being given up by Nextel does not cover 100 percent of the population. However, the coverage afforded by Nextel's 800 MHz interleaved and General Category spectrum is substantial: Nextel covers approximately 234 million pops (about eighty-one percent of the national population) and virtually all major markets. We regard this as sufficiently close to nationwide coverage that applying the same valuation is appropriate.

⁷³⁶ See Kane Reece Study at 36, Table 5B. Kane Reece bases the estimate of Nextel's coverage on Commission licensing records.

⁷³⁷ See 47 CFR § 90.615

⁷³⁸ See 47 C.F.R. § 90.621.

⁷³⁹ See 2002 Report to Congress.

approximately \$1.622 billion for its net loss of 800 MHz spectrum. We note that our calculation is based on a spectrum amount that is slightly higher than the 4.5 megahertz identified by Nextel as the average amount of 800 MHz net bandwidth it is giving up in the exchange.⁷⁴⁰ However, we believe this amount also provides a reasonable basis for valuation if we were to use 4.5 megahertz as our benchmark. By relinquishing 4.5 megahertz of spectrum on a nationwide basis, Nextel is giving up forty-five percent of the bandwidth it is gaining at 1.9 GHz. But our \$1.607 billion valuation of Nextel's relinquished 800 MHz spectrum is approximately one third of the \$4.86 billion value we attribute to the 1.9 GHz spectrum. Thus, on a per-MHz basis, this spectrum has a value twenty-seven percent lower than the 1.9 GHz spectrum. We regard this as an appropriate discount to account for the non-contiguous nature of some of the spectrum and for the somewhat lower population coverage. Accordingly, in the financial reconciliation to be made by the Transition Administrator at the end of the band reconfiguration process, Nextel will receive a credit of \$1.607 billion for its relinquishment of 800 MHz spectrum rights.⁷⁴¹

(iii) 700 MHz Guard Band Spectrum

324. Nextel submits that it paid \$350 million at auction for its 700 MHz Guard Band spectrum and thus should be credited that amount as part of the Commission's determination of compensation that is equitable to Nextel. We disagree. Given the slow development of services in the 700 MHz Guard Band, and the presence of incumbent television stations that may remain there beyond the period contemplated in the 700 MHz Guard Band licensees' business plans, there is no assurance that the Guard Band spectrum is worth today what Nextel paid for it in 2001. Moreover, as noted, *supra*, this spectrum cannot be made available to public safety in the near term and any potential long-term benefit it might afford to public safety or any value it might have in the marketplace is purely speculative at this point.⁷⁴² That said, however, we have no basis to conclude, absolutely, that the record in the future rule making proceeding will not inform us that the 700 MHz Guard Band spectrum may be used to benefit of public safety. The above factors considered, we have determined that Nextel's relinquishing its 700 MHz Guard Band spectrum—although its present worth cannot legitimately be quantified in monetary terms—it does add *de minimis* value to the overall bundle of spectral and financial benefits that Nextel brings to the table to justify giving it access to the 1.9 GHz spectrum. Thus, Nextel's surrender of this spectrum has weighed, albeit not heavily, in the equities that undergird our determination that the balance we establish today is equitable to all concerned.

5. Financial Aspects of Band Reconfiguration

325. The financial and other aspects of band reconfiguration will be conducted in a manner that provides optimum transparency and protection of affected licensees and the public. The first step in the process will be Nextel's delivery to the Commission the following set of documents. The items listed in the first three bullets below ensure that funds for band reconfiguration will remain available until the project is completed. The item in the fourth bullet governs companies related to Nextel such as Nextel Partners, which will be required to perform certain acts, *e.g.*, reconfiguration of their own facilities, in connection with band reconfiguration. Moreover, certain of such companies and, it is believed, Nextel,

⁷⁴⁰ Our calculations based on the top markets show Nextel giving up an average of 4.96 megahertz in these markets rather than the 4.5 megahertz that Nextel identified based on a running average of all markets nationwide. Because the top markets are where demand for spectrum capacity is likely to be highest, we see them as providing an appropriate measure of the value of spectrum that Nextel is giving up, even if the average amount of spectrum on a nationwide basis is slightly lower.

⁷⁴¹ See ¶ 35 *supra*.

⁷⁴² See ¶ 278 *supra*.

have operations in Canada and Mexico, which operations may have to be modified in order to derive suitable border band plans.⁷⁴³ The document referenced in the fourth bullet binds all such entities to the obligations assumed hereunder by Nextel to the extent necessary to implement 800 MHz band reconfiguration, nationwide. Specifically,

- Within sixty days of the publication of this *Report and Order* in the Federal Register, Nextel shall comply with the following conditions precedent commencing any operations within the 1.9 GHz band:
 - Certify that it has obtained an irrevocable letter of credit, in all material respects identical to that contained in Appendix E hereto, which provides assurances that \$2.5 billion will be available for band reconfiguration, notwithstanding the financial condition of Nextel, or its successor(s).
 - Specify on the initial letter of credit and any subsequent letters of credit, a Trustee, acceptable to the Commission, which shall draw upon and disburse funds in accordance with the terms thereof and the Transition Administrator's instructions. Further, on the occasion of a material breach by Nextel of its obligations hereunder, as declared by the Commission, said trustee shall receive the remaining balance of the letter(s) of credit to hold in trust and disburse in accordance with the terms of this *Report and Order*. Said funds shall be devoted exclusively to reconfiguration of the 800 MHz band except as otherwise provided in this *Report and Order*.
 - Deliver an opinion letter from counsel clearly stating, subject only to customary assumptions, limitations and qualifications, that in a proceeding under Title 11 of the United States Code, 11 U.S.C. Section 101 et seq. (the "Bankruptcy Code"), in which Nextel is the debtor, the bankruptcy court would not treat the Letter of Credit or proceeds of the Letter of Credit as property of Nextel's bankruptcy estate under Section 541 of the Bankruptcy Code. The scope of the opinion letter must also cover such other opinions as the Commission shall request. The opinion letter must contain detailed legal analysis of the basis of counsel's opinion. A draft opinion letter must be submitted for review and approval by the Commission's Office of General Counsel prior to issuance of the letter. Bankruptcy counsel, and, if applicable, counsel's firm, must have a Martindale-Hubbell rating of "A/V" and must satisfy the Commission in all other respects.
 - Supply a letter or letters, in content satisfactory to the Commission, from any and all parties having a financial or equitable interest in any existing or proposed 800 MHz system, whether in the United States, Mexico or Canada, and connected in any way to Nextel by way of being a subsidiary, partner, or otherwise; to the effect that such parties are bound to perform the obligations imposed on Nextel herein to the extent such obligations are necessary or desirable in the completion of reconfiguration of the

⁷⁴³ Nextel Partners (Partners) is an affiliate of Nextel Communications, Inc. (Nextel.) Nextel holds about a thirty-percent non-controlling interest in Partners which is separately listed and traded on NASDAQ. Nextel and Partners have an agreement concerning the branding of Partner's service as Nextel and associated quality, marketing, switch sharing and related standards and provisions. Partners, an independent FCC licensee, was created for the express purpose of speeding the deployment of Nextel's iDEN service in secondary, tertiary and rural markets. Partners filed in this proceeding confirming its support of the Consensus Plan and agreement to contribute its spectrum to and participate in the 800 MHz realignment along with Nextel. Accordingly, Nextel's commitments include Partners' service areas as well.

800 MHz band.

326. With this *Report and Order*, the Commission is hereby modifying the licenses of certain 800 MHz band licensees, as specified herein. As indicated above, once the details of the band reconfiguration become clear (e.g., the specific relocation channel and any other necessary operating parameters are identified), affected licensees will file applications for further modification with the Commission, which will be acted upon by the Wireless Telecommunications Bureau under its delegated authority. As conditions precedent to Nextel's commencement of any operations under its 1.9 GHz licenses, however, (a) Nextel shall provide the documents specified in the previous paragraph within the required sixty day timeframe, (b) the Commission must approve these documents,⁷⁴⁴ (c) Nextel must pay to UTAM the amount of required reimbursement specified in paragraph 249 *supra*; and (d) Nextel shall file such additional applications, notifications, *etc.* as the Commission's Rules may require. In addition, the 1.9 GHz licenses, which shall be for a ten-year term, are subject to the following license conditions:⁷⁴⁵

- Operations on the 1.9 GHz spectrum shall be discontinued in any EA region where Nextel fails to timely abate unacceptable interference to any 800 MHz public safety or CII system as described in ¶¶ 139-141, *supra*.
- Nextel must reconfigure the 800 MHz band within thirty-six months as described herein. If Nextel fails to meet the final benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.
- Nextel shall certify to the Commission that all BAS facilities have been relocated within 30 months after the effective date of this *Report and Order*. If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.
- The 1.9 GHz licenses shall not be assigned to any person or entity who or which has not demonstrated to the satisfaction of the Commission that it will, and has the capacity to, assume all of Nextel's obligations hereunder.

327. The Transition Administrator will provide to the Commission a quarterly report, in form and substance satisfactory to the Commission, describing the progress of band reconfiguration. This report shall include a disclosure of the Transition Administrator's expenses and salary. Salary of Transition Administrator and staff shall be reasonable and customary with salary of employee having analogous responsibilities.^{745A} Nextel shall pay the Transition Administrator's salary and reasonable expenses within thirty days of the presentation of an invoice therefore and may not condition payment in any way nor may it delay or deny payment without prior Commission approval. "Reasonable expenses" will be determined according to standards provided by the Commission. Such standards shall be informed by expenses that are reasonable and customary with similar projects entailing similar responsibilities as those envisioned for

⁷⁴⁴ We hereby delegate to the Wireless Telecommunications Bureau this approval authority.

⁷⁴⁵ The expiration of the 1.9 GHz licenses shall be ten years from the date this *Report and Order* is published in the Federal Register. In the event that the Commission must revoke Nextel's license for failing to complete reconfiguration in a timely fashion, the Commission will provide Nextel a Special Temporary Authorization to allow its customers a reasonable amount of time to migrate to other CMRS providers.

^{745A} See n. 510A, *infra*.

the Transition Administrator.

328. Nextel shall keep accurate records of the labor and material reasonably expended or acquired in connection with clearance of the 1.9 GHz band. An annual audit of these expenses shall be made, at Nextel's expense, by an auditing firm satisfactory to the Commission. All Nextel claims for labor and equipment shall be at Nextel's actual cost, without markup.

6. Financial Reconciliation Process

329. As noted above, we seek to ensure that Nextel is treated equitably in facilitating 800 MHz band reconfiguration but does not realize an undue windfall.⁷⁴⁶ To this end, we condition the grant of 1.9 GHz band spectrum rights to Nextel on its meeting the obligations imposed by this *Report and Order*, and on its payment to the U.S. Treasury of any difference between the value of the 1.9 GHz band spectrum rights and the net sum of: (a) the value of spectrum rights relinquished by Nextel, and (b) Nextel's costs incurred in reconfiguring the 800 MHz band and (c) Nextel's costs incurred in clearing the 1.9 GHz band.⁷⁴⁷ In this regard, we recognize the importance of setting forth a procedural framework to determine whether Nextel must make a payment to the Treasury to cover any difference between the value of its credits and the value of spectrum rights in the 1.9 GHz band and to ensure that such payment flows to the Treasury in a timely and orderly manner. In this connection, we fashion certain procedural steps to afford certainty to this "true-up" process, while still providing Nextel with flexibility in the manner in which it effects any required payment. We also provide measures to ensure that funding is available for 800 MHz band reconfiguration throughout the nation, including the areas bordering Mexico and Canada. Overall we believe that the measures we detail below are reasonable and necessary to ensure that first responders and the public receive the full benefit of our realignment plan.

330. At the conclusion of the thirty-six month band reconfiguration process specified herein, but no later than six months thereafter—essentially no later than forty-two months after commencement of the band reconfiguration process—the following financial reconciliation will be made:

- Nextel will be allotted a \$1.607 billion credit for relinquishing rights to an average of 4.5 megahertz of spectrum in the 800 MHz band.
- Nextel will provide the Transition Administrator an accounting of the funds spent:
 - to reconfigure its own systems in the 800 MHz band;⁷⁴⁸ and
 - to clear the 1.9 GHz band of incumbents and to reimburse UTAM.
- Nextel will also provide the Transition Administrator an accounting of funds, if any, Nextel receives as reimbursement for clearing the 1.9 GHz band.
- The Transition Administrator shall provide an accounting of the funds spent to reconfigure the systems of incumbent operators in the 800 MHz band, including its own salary and expenses.^{748A} This accounting shall include certifications from each relocated licensee that all

⁷⁴⁶ See ¶ 212 *supra*.

⁷⁴⁷ See ¶¶ 12, 34-35, 212 *supra*.

⁷⁴⁸ See ¶¶ 298-323 *supra*.

^{748A} See n. 510A, *infra*.

necessary reconfiguration work has been completed and that Nextel and said licensee agree on the sum paid for such work.

- Upon compliance with the foregoing requirements, Nextel will be allotted appropriate credits.
- To the extent that those combined credits total less than the value of the 1.9 GHz spectrum, Nextel shall make a payment equal to the difference to the United States Treasury at the conclusion of the relocation process.
- Should a payment to the Treasury prove necessary, we direct the Wireless Telecommunications Bureau to release a *Public Notice* announcing the amount to be paid to the Treasury. Thirty days following release of such Public Notice, Nextel shall make such payment to the Treasury.
- Nextel may use monies separate and apart from the letter of credit to make such payment. However, should a balance remain on any letter(s) of credit after band reconfiguration has been completed, Nextel may elect to apply such excess funds to the payment to the Treasury.

331. We remain vigilant to our central purpose in this proceeding—alleviating interference to public safety—and therefore take steps to ensure that the security for funding reconfiguration remains available until the conclusion on the relocation process. Thus, the letter of credit shall remain open until the true-up process has been completed. At no time during the life of the letter(s) of credit shall the balance fall below \$850 million. Nextel may terminate the letter(s) of credit only after band reconfiguration is complete and after the financial reconciliation process is complete, including any payments to the Treasury.

332. In the event that reconfiguration of the 800 MHz border areas is not completed at the end of the thirty-six month reconfiguration process due to circumstances outside of Nextel's control, the Transition Administrator shall estimate how much completing the reconfiguration will cost. Within thirty days of the completion of this estimate Nextel shall elect to either extend the life of the letter(s) of credit or secure a separate letter of credit to cover the costs of border area reconfiguration. The estimated cost of reconfiguring the 800 MHz band in the border areas shall be included as a credit in the computations described in paragraph 330 *supra*.

VII. SERVICE POOL CONSOLIDATION – THE PCIA PETITION

333. In the *NPRM*, the Commission sought comment on PCIA's petition for rulemaking to consolidate the B/ILT Pools in the 800 MHz and 900 MHz band.⁷⁴⁹ The majority of comments received in response to PCIA's petition for service pool consolidation in the 800 MHz and 900 MHz bands were from utilities and other CII entities⁷⁵⁰ most of which opposed consolidation.⁷⁵¹ Some CII interests argued that

⁷⁴⁹ See *NPRM*, 17 FCC Rcd at 4917-18 ¶¶ 84-85.

⁷⁵⁰ See, e.g., Ameren Comments at 6; API Comments at 16-17; Cinergy Comments at 58-60; Entergy Comments at 53; Exelon Comments at 9; FL P&L Comments at 5; Scana Comments at 42.

⁷⁵¹ See, e.g., API Comments at 16-17; Cinergy Comments at 58-60; Entergy Comments at 53; FL P&L Comments at 5; Scana Comments at 42; *but see*, e.g., Ameren Comments at 6; Exelon Comments at 9; API Comments at 16-17 (noting, for reasons explained below, that API is not "strictly opposed" to the proposed consolidation of the two frequency pools).

consolidation would hinder their access to needed spectrum,⁷⁵² because business radio users—with eligibility rules less stringent than those applicable to Industrial/Land Transportation users—would dominate a consolidated band.⁷⁵³ Cinergy, Entergy, and Scana also opposed, for the same reasons, lifting the freeze on intercategory sharing.⁷⁵⁴ Boeing averred that the current service pool division in the band and the freeze on intercategory sharing protects against the incursions of CMRS operations into Private Land Mobile Radio spectrum.⁷⁵⁵ However, a contrary view was expressed by parties who argued that allowing CMRS operations would be beneficial to the extent that it affords additional flexibility in spectrum use.⁷⁵⁶ Others support consolidation, *inter alia* because they believe it would promote spectrum-sharing.⁷⁵⁷ One commenting party urged that we prohibit cellularized operation in the consolidated 900 MHz band lest the interference problem currently encountered by 800 MHz systems be replicated at 900 MHz.⁷⁵⁸

334. We are consolidating the 800 MHz and 900 MHz B/ILT Pools. Any eligible Business or Industrial/Land Transportation entity will be eligible to be licensed on the consolidated channels.⁷⁵⁹ We agree with the parties, *supra*, who note that our recent “refarming” efforts in consolidating the service pools in bands below 512 MHz have resulted in improved spectrum efficiency without undue burden on licensees.⁷⁶⁰ Thus, we are not persuaded by the arguments from some CII interests that today’s action will impair their access to spectrum.⁷⁶¹ Also, because consolidation makes intercategory sharing moot, licensees and the Commission will be spared the resource burdens associated with intercategory sharing

⁷⁵² API Comments at 16; Cinergy Comments at 58-60; Entergy Comments at 53; FL P&L Comments at 5; Scana Comments at 42.

⁷⁵³ Compare 47 C.F.R. § 90.35(b) (Business Pool) with 47 C.F.R. § 90.617(b) (Industrial//Land Transportation Pool).

⁷⁵⁴ Cinergy Comments at 58-60; Entergy Comments at 53; Scana Comments at 42; *see also* API Comments at 16.

⁷⁵⁵ “If the freeze were lifted, it is likely that history would repeat itself and SMR applicants will inundate the Commission with requests for intercategory sharing with a view towards converting increasingly scarce private radio spectrum to commercial services.” Boeing Comments at 12.

⁷⁵⁶ Cascade Two Way Radio Comments at 4.

⁷⁵⁷ Exelon Comments at 9. In addition to consolidating the 800 MHz and 900 MHz Business and Industrial/Land Transportation services into one pool, Exelon also recommends that we “permit new intercategory sharing.” *Id.* Exelon contends that the only restriction on this new intercategory sharing should be a strict prohibition against the operation of cellularized systems in the expanded pools in order to protect them from the same interference problems currently being experienced by Business and Industrial/Land Transportation licensees. *Id.*

⁷⁵⁸ *See* Exelon Comments at 9.

⁷⁵⁹ *See* 47 C.F.R. § 90.35.

⁷⁶⁰ *See generally* In The Matter Of Replacement Of Part 90 By Part 88 To Revise The Private Land Mobile Radio Services And Modify The Policies Governing Them And Examination Of Exclusivity And Frequency Assignments Policies Of The Private Land Mobile Services, PR Docket No. 92-235 (*Refarming*).

⁷⁶¹ API Comments at 16; Cinergy Comments at 58-60; Entergy Comments at 53; FL P&L Comments at 5; Scana Comments at 42.

requests.⁷⁶² Finally, although we note the concern expressed about the effects of cellularized operation in a consolidated 900 MHz band, we believe that proscribing cellularized operation in a band in which interference to public safety communications is not an issue could unnecessarily hinder realization of the efficiencies inherent in cellular-architecture and other advanced technologies.

VIII. OPERATIONAL FLEXIBILITY IN THE 900 MHZ BAND

335. In the Balanced Budget Act Proceeding⁷⁶³ the Commission amended its rules to permit CMRS use of PLMR frequencies in the 800 MHz land mobile band and allowed PLMR licensees to transfer their licenses to CMRS entities.⁷⁶⁴ The Commission sought comment on whether, in the interest of regulatory symmetry, similar rules should apply in the 900 MHz land mobile spectrum.⁷⁶⁵ In the *NPRM* in this proceeding, the Commission sought further comment on this issue in light of Nextel's White Paper proposal to accommodate displaced 800 MHz B/ILT licensees in the 900 MHz land mobile band.⁷⁶⁶

336. In general, parties supported the proposal to allow CMRS operations on 900 MHz PLMR spectrum.⁷⁶⁷ Although the proposal to relocate all 800 MHz B/ILT and SMR licensees to the 900 MHz band is no longer germane, we find that other factors merit our making the 800 MHz and 900 MHz CMRS rules complementary. In particular, we note that Nextel will have to shift some of its operations from the 800 MHz band to 900 MHz in order to provide the "green space" necessary to effect reconfiguration of the 800 MHz band. Moreover, as noted above,⁷⁶⁸ Nextel may have to share spectrum in the 816-824 MHz segment of the reconfigured band with other ESMR licensees. To the extent that such sharing may reduce the amount of 800 MHz spectrum available to Nextel, we believe we should provide the regulatory flexibility necessary for Nextel to make up the shortfall by using 900 MHz channels. We have less

⁷⁶² Under the existing rules, there are provisions that allow entities establishing eligibility under one radio service to obtain a license for a frequency in another radio service under certain conditions (interservice sharing). Because we are consolidating the Business and Industrial/Land Transportation Pools into one pool and eliminating the individual radio service categories, interservice sharing rules will no longer be necessary with regard to applicants from either service seeking frequencies previously allotted to the other service. Under consolidation, applicants will have the opportunity to apply directly for in-pool frequencies that were previously allocated to either the Business or Industrial/Land Transportation service. We will modify the Commission's Rules accordingly. However, our action does not otherwise affect the current freeze on intercategory sharing with respect to applicants from the newly consolidated Business/Industrial Land Transportation Pool seeking intercategory sharing of those frequencies specifically allocated to Public Safety Pool. *See Inter-Category Sharing of Private Mobile Radio Frequencies in the 806-821/851-866 MHz Bands, Order*, 10 FCC Rcd 7350 (WTB 1995) (*Intercategory Freeze Order*).

⁷⁶³ *See generally*, Implementation of Sections 309(j) and 337 of Communications Act of 1934 as Amended, WT Docket 99-87 (*BBA Proceeding*).

⁷⁶⁴ *See* Implementation of Sections 309(j) and 337 of Communications Act of 1934 as Amended, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket 99-87, 15 FCC Rcd 22709, 22761 ¶¶ 110-111 (FCC 2000) (*BBA R&O and FNPRM*).

⁷⁶⁵ *Id.*, 15 FCC Rcd at 22773-22774 ¶¶ 143-144.

⁷⁶⁶ *NPRM*, 17 FCC Rcd 4918 at ¶ 86. This essentially transferred the issue from WT Docket 99-87 to the instant proceeding. *See* Implementation of Sections 309(j) and 337 of Communications Act of 1934 as Amended, *Second Report and Order and Second Further Notice of Proposed Rulemaking*, 18 FCC Rcd 3034, 3047 n. 5.

⁷⁶⁷ *See* Nextel Comments at 65. *See also* Ad Hoc Wireless Alliance Comments at 8-10.

⁷⁶⁸ *See* ¶ 159 *supra*.

concern about unacceptable interference resulting from such 900 MHz ESMR use because there are no public safety channels allocated in the 900 MHz band. Moreover, because there currently is no extensive ESMR use of the 900 MHz band, ESMR licensees designing systems “from the ground up” in the 900 MHz band will be better able to take interference abatement into account when designing their systems. However, we will not hesitate to act should it appear that the interference environment in the 900 MHz band is becoming unfavorable.

337. We therefore will allow 900 MHz PLMR licensees to initiate CMRS operations on their currently authorized spectrum or to assign their authorizations to others for CMRS use. In the *BBA R&O and FNPRM*, the Commission inquired whether to impose a holding period requirement on all new 900 MHz applications, thereby to avoid trafficking in 900 MHz licenses.⁷⁶⁹ Although the Commission, in the *BBA Proceeding*, put parties on notice that it might impose a holding period in the future we decline to do so since we observed no speculative runs on 900 MHz PLMR spectrum after the release of the *BBA R&O and FNPRM*.⁷⁷⁰

IX. CONCLUSION

338. There may be no matter within our jurisdiction more crucial to Homeland Security and the overall general safety of life and property than assuring that public safety communications systems are free from unacceptable interference and have adequate capacity. Indeed, one of the express purposes of this agency’s creation was for the “purpose of promoting safety of life and property through the use of wire and radio communications,”⁷⁷¹ and we thus would be derelict were we to ignore an opportunity—such as that represented by 800 MHz band reconfiguration—that allows us to increase the reliability and capacity of 800 MHz public safety communications systems.

339. We stress, however, that the actions we take today in response to a unique set of circumstances regarding interference to public safety communications in the 800 MHz band are consistent with our statutory obligations generally to use competitive bidding in the allocation of spectrum. Although our emphasis herein has been on public safety requirements, the far more favorable interference environment in the post-reconfiguration 800 MHz band will ensure other 800 MHz licensees will also benefit from the band reconfiguration plan and related policies that we have adopted. Underlying the policies we enunciate today is the tenet put forth by many of the commenting parties in this proceeding: parties must work together to abate interference and endure an occasional hardship as a necessary concession to the nation’s overall Homeland Security obligations.

X. ORDERING CLAUSES

340. IT IS ORDERED that, pursuant to the authority of Sections 1, 4(i), 303(f) and (r), 309, 316, and 332 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 303(f) and (r), 309, 316, and 332, the rule changes specified in Appendix C are adopted.

⁷⁶⁹ *BBA R&O and FNPRM*, 15 FCC Rcd 22709, 22774 ¶ 144.

⁷⁷⁰ Moreover, we believe our existing rules also provide necessary safeguards. See 47 C.F.R. § 90.155 (requires licensees to have stations placed in operation within twelve months from the date of grant to avoid automatic cancellation; 47 C.F.R. § 90.609 (requires complete construction of a radio facility prior to any transfer or assignment) and 47 C.F.R. 90.157 (licenses will cancel automatically if there is a discontinuance of station operation for twelve months or more).

⁷⁷¹ See 47 U.S.C. § 151.

341. IT IS FURTHER ORDERED that the rule changes set forth in Appendix C WILL BECOME EFFECTIVE sixty days after publication in the Federal Register. This action is taken pursuant to Sections 1, 4(i), 303(f) and (r), 309, 316 and 332 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 303(f) and (r), 309, 316, and 332.

342. IT IS FURTHER ORDERED that, pursuant to Section 309 and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 309, and 316, the licenses of all 800 MHz band licensees (including, but not limited to, Nextel Communications, Inc.), are hereby modified as specified in this *Report and Order*; provided, however, that in the event Nextel rejects any of the conditions for modification required in this *Report and Order*, all the modifications of all the 800 MHz licenses specified in this *Report and Order* are suspended unless and until the Commission orders otherwise. Nextel will be deemed to have rejected such conditions (a) unless it files with the Commission a written acceptance of all such conditions within thirty days of the publication of this *Report and Order* in the Federal Register, or (b) if it files a judicial appeal of this *Report and Order* within thirty days of the publication of this *Report and Order* in the Federal Register. Pursuant to Section 316(a)(1) of the Communications Act of 1934, as amended, 47 U.S.C. § 316(a)(1), publication of this *Report and Order* in the Federal Register shall constitute notification in writing of our Order modifying Nextel's 800 MHz licenses and those of all other 800 MHz licenses, and of the grounds and reasons therefore, and Nextel and these other 800 MHz licensees shall have thirty days from the date of such publication to protest such Order.

343. IT IS FURTHER ORDERED that, pursuant to Section 309 and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 309 and 316, the Wireless Telecommunications Bureau shall further modify such licenses as are necessary in order to implement band reconfiguration in the manner specified in this *Report and Order*.⁷⁷²

344. IT IS FURTHER ORDERED that within sixty days of the publication of this *Report and Order* in the Federal Register, Nextel shall comply with the following conditions precedent to its operations on the 1.9 GHz band:

- Nextel shall certify that it has obtained an irrevocable letter of credit, in all material respects identical to that contained in Appendix E hereto, which provides assurances that \$2.5 billion will be available for band reconfiguration, notwithstanding the financial condition of Nextel, or its successor(s).
- Nextel shall specify on the initial letter of credit and any subsequent letters of credit, a Trustee, acceptable to the Commission, which shall draw upon and disburse funds in accordance with the terms thereof and the Transition Administrator's instructions. Further, on the occasion of a material breach by Nextel of its obligations hereunder, as declared by the Commission, said trustee shall receive the remaining balance of the letter(s) of credit to hold in trust and disburse in accordance with the terms of this *Report and Order*. Said funds shall be devoted exclusively to reconfiguration of the 800 MHz band except as otherwise provided in this *Report and Order*.
- Nextel shall deliver an opinion letter from counsel clearly stating, subject only to customary assumptions, limitations and qualifications, that in a proceeding under Title 11 of the United States Code, 11 U.S.C. Section 101 et seq. (the "Bankruptcy Code"), in which Nextel is the

⁷⁷² The expiration of each said further modified license shall be the date specified thereon. Provided, however, that if such a specified date is less than five years from the date this *Report and Order* is published in the Federal Register, then, notwithstanding the expiration date specified on the license, the license shall expire five years after the date this *Report and Order* is published in the Federal Register.

debtor, the bankruptcy court would not treat the Letter of Credit or proceeds of the Letter of Credit as property of Nextel's bankruptcy estate under Section 541 of the Bankruptcy Code. The scope of the opinion letter must also cover such other opinions as the Commission shall request. The opinion letter must contain detailed legal analysis of the basis of counsel's opinion. A draft opinion letter must be submitted for review and approval by the Commission's Office of General Counsel prior to issuance of the letter. Bankruptcy counsel, and, if applicable, counsel's firm, must have a Martindale-Hubbell rating of "A/V" and must satisfy the Commission in all other respects.

- Nextel shall provide a letter or letters, in content satisfactory to the Commission, from any and all parties having a financial or equitable interest in any existing or proposed 800 MHz system, whether in the United States, Mexico or Canada, and connected in any way to Nextel by way of being a subsidiary, partner, or otherwise; to the effect that such parties are bound to perform the obligations imposed on Nextel herein to the extent such obligations are necessary or desirable in the completion of reconfiguration of the 800 MHz band.
- Nextel shall obtain the Commission's approval of all documents it submits pursuant to this paragraph.

345. IT IS FURTHER ORDERED that Nextel's 1.9 GHz modified licenses do not authorize Nextel to begin operations in the band until Nextel files with the Commission an acknowledgement that meets the requirements of paragraph 87 *supra*.

346. IT IS FURTHER ORDERED that within thirty days of the publication of this *Report and Order* in the Federal Register, Nextel and Southern LINC shall deliver to the Commission an agreement for the channel distribution for all 800 MHz licensees in the areas shown in Appendix G.

347. IT IS FURTHER ORDERED that, in addition to the license conditions set forth above and below in this *Report and Order*, and also in addition to such other conditions as the Commission may, in its discretion, deem necessary to ensure reconfiguration of the 800 MHz band and timely clearance of the 1.9 GHz band, Nextel's modified licenses authorizing operations within the 1.9 GHz band are conditioned on the following:

- Nextel must complete, and the Transition Administrator must certify that Nextel has completed, the retuning of Channels 1-120 in twenty NPSPAC Regions within eighteen months after the release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region. If Nextel fails to meet this benchmark, for reasons that Nextel, with the exercise of due diligence could reasonably have avoided, the Commission may consider and exercise any appropriate enforcement action within its authority, including assessment of monetary forfeitures or, if warranted, license revocation.
- The 1.9 GHz licenses shall not be assigned to any person or entity who or which has not demonstrated to the satisfaction of the Commission that it will, and has the capacity to, assume all of Nextel's obligations hereunder.
- Nextel shall certify to the Commission that all BAS facilities have been relocated within thirty months after the effective date of this *Report and Order*. If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.
- If 800 MHz band reconfiguration is not complete, in accordance with the certification

of the Transition Administrator, thirty-six months following release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.

- The 1.9 GHz licenses shall be for a ten-year term, subject, however to the foregoing termination provisions; and renewal will be conditioned on Nextel supplying substantial service⁷⁷³ within the ten-year period.

348. IT IS FURTHER ORDERED that Nextel, the Association of Public Safety Communications Officials-International, the Industrial Telecommunications Association, Southern LINC and the United Telecom Council, shall form a Transition Administrator search committee within fifteen days of the date of the release of this *Report and Order*, and shall recommend a Transition Administrator to the Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau no later than forty-five days after the release of this *Report and Order*.

349. IT IS FURTHER ORDERED that the Transition Administrator, within ten days of a request from Nextel, will request funds necessary for band reconfiguration of a given NPSPAC Region as the need therefore arises, from the Letter of Credit Trustee which shall disburse such funds within five business days of receipt thereof from the issuing bank, or at such later time as the Transition Administrator shall specify in writing.

350. IT IS FURTHER ORDERED that the Transition Administrator will provide to the Commission a quarterly report, in form and substance satisfactory to the Commission, describing the progress of band reconfiguration. This report shall include a disclosure of the Transition Administrator's salary and reasonable expenses.^{773A}

351. IT IS FURTHER ORDERED that Nextel shall keep accurate records of the labor and material reasonably expended or acquired in connection with clearance of the 1.9 GHz band. An annual audit of these expenses shall be made, at Nextel's expense, by an auditing firm satisfactory to the Commission. All Nextel claims for labor and equipment shall be at Nextel's actual cost, without markup.

352. IT IS FURTHER ORDERED that (a) as a condition of its 1.9 GHz modified licenses, Nextel shall reimburse UTAM twenty-five percent, on a *pro rata* basis, of UTAM's total relocation costs incurred as of the date that Nextel gains access to the band, (b) Nextel's 1.9 GHz modified licenses do not authorize Nextel to begin operations in the band until it pays this amount to UTAM, and (c) Nextel shall be entitled to seek reimbursement from UTAM for the actual proportional cost associated with Nextel's relocation of any remaining microwave links in the band.

353. IT IS FURTHER ORDERED that, as a condition on Nextel's 1.9 GHz licenses, Nextel SHALL, as described herein, relocate all BAS licensees in the 1990-2025 MHz band within thirty months after the effective date of this *Report and Order*, and in this connection, comply with the following requirements:

- Nextel shall file with the Commission and copy the MSS licensees within thirty days after the

⁷⁷³ "Substantial service" is defined as service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal.

^{773A} See n. 510A, *infra*.

effective date of this *Report and Order* its plan for the relocation of BAS operations in the markets that will be relocated during stage one (*i.e.*, relocations made within eighteen months after the effective date of this *Report and Order*).

- Nextel shall follow a negotiation period for stage one relocations that ends May 31, 2005 and that ends March 31, 2006 for stage two relocations (*i.e.*, relocations made within thirty months after the effective date of this *Report and Order*).
- Nextel shall provide comparable facilities to BAS incumbents that are relocated.
- Nextel shall file progress reports within twelve months and twenty-four months after the effective date of this *Report and Order* on the status of the transition, including identifying the markets that will be relocated during stage one, and all remaining markets that will be relocated during stage two.
- Nextel shall certify to the Commission that all BAS facilities have been relocated within thirty months after the effective date of this *Report and Order*. If Nextel fails to meet this benchmark, for reasons that Nextel could reasonably have avoided, the Commission will determine whether forfeitures should be imposed and/or whether Nextel licenses, including, but not limited to, its 1.9 GHz licenses, should be revoked.
- Nextel shall be entitled to seek reimbursement from MSS licensees that have entered the band for the MSS licensee's pro rata share of Nextel's costs to clear the top thirty markets and relocate all fixed BAS facilities, regardless of market size, incurred during the thirty-six month reconfiguration process. Nextel shall be required to inform the Commission and MSS licensees on whether it will or will not seek reimbursement from MSS licensees within twelve months after the effective date of this *Report and Order*.
- Nextel shall have an obligation to reimburse MSS licensees for Nextel's pro rata share of the actual costs associated with the relocation of BAS incumbents in the band incurred by MSS licensees during the thirty-six month reconfiguration period.
- Nextel shall conform to the technical criteria specified in TSB 10-F or generally acceptable good engineering practices for determining interference potential between BAS and Nextel operations.

354. IT IS FURTHER ORDERED that, at the conclusion of band reconfiguration, Nextel will provide to the Transition Administrator an accounting of the funds:

- Spent to reconfigure its own systems in the 800 MHz band;
- Spent to clear the 1.9 GHz band of incumbents and to reimburse UTAM; and
- Received as reimbursement, if any, for clearing the 1.9 GHz band.

355. IT IS FURTHER ORDERED that, at the conclusion of band reconfiguration, the Transition Administrator shall provide an accounting of the funds spent to reconfigure the systems of incumbent operators in the 800 MHz band. This accounting shall include certifications from each relocated licensee that all necessary reconfiguration work has been completed and that Nextel and said licensee agree on the sum paid for such work.

356. IT IS FURTHER ORDERED that, as a condition of its 800 MHz and 1.9 GHz modified licenses, Nextel shall, within thirty days of the completion of the thirty-six month band reconfiguration

process, as certified by the Transition Administrator and if band reconfiguration has not been completed in the border areas, elect to extend the life of the letter of credit or elect to secure a separate letter of credit, in an amount sufficient to ensure the reconfiguration of the 800 MHz licensees operating in the border area, as detailed herein.

357. IT IS FURTHER ORDERED that, as a condition of its 800 MHz and 1.9 GHz modified licenses, in the event that the computations described in paragraphs ¶ 329-332 *supra* disclose that the credits afforded Nextel thereunder are less than the value of the 1.9 GHz spectrum rights that Nextel is receiving hereunder, Nextel SHALL DEPOSIT the difference in the United States Treasury; and Nextel SHALL NOT discontinue the letter(s) of credit it is required to maintain hereunder until such deposit has been received and acknowledged.

358. IT IS FURTHER ORDERED that, within thirty days of Commission approval of the Transition Administrator, the Transition Administrator will provide the Commission with a schedule detailing when band reconfiguration shall commence for each NPSPAC-Region. The plan should also detail—by NPSPAC Region—which relocation option each non-Nextel ESMR licensees has chosen

359. IT IS FURTHER ORDERED that the Petition for Rulemakings filed by the Wireless Information Networks Forum and UTStarcom Inc., and the Petition for Waivers filed by Lucent Technologies Inc., Ascom Wireless Solutions Inc., Alaska Power & Telephone Company Inc., and UTStarcom Inc. and Drew University ARE DENIED IN PART.

360. IT IS Further ORDERED that the PCIA Petition for Rulemaking IS GRANTED to the extent stated herein and denied in all other respects. This action is taken pursuant to Sections 4(i), 303(f) and (r), and 332 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 303(f) and (r), and 332.

361. IT IS FURTHER ORDERED that the Petitions for Reconsideration and Clarification filed by the Association for Maximum Service Television and the National Association of Broadcasters, and the Society of Broadcast Engineers ARE GRANTED to the extent described herein.

362. IT IS FURTHER ORDERED that the Petition for Reconsideration and Clarification filed by the Boeing Company IS DENIED to the extent described herein.

363. IT IS FURTHER ORDERED that the Final Regulatory Flexibility Analysis, required by Section 604 of the Regulatory Flexibility Act, 5 U.S.C. 604, and as set forth in Appendix B is ADOPTED.

364. IT IS FURTHER ORDERED that the Commission's Consumer Information and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch,
Secretary

XI. PROCEDURAL MATTERS

A. Regulatory Flexibility Act

365. As required by the Regulatory Flexibility Act (RFA), the Commission has prepared a Final Regulatory Flexibility Analysis (Supplemental FRFA) of the possible impact on small entities of the changes in its rules adopted in this Report and Order. The FRFA is set forth in Appendix B. The Office of Public Affairs will send a copy of the *Report and Order*, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with the RFA.

B. Paperwork Reduction Act

366. This *Report and Order* contains a new information collection, which has been submitted to the Office of Management and Budget (OMB) for approval. As part of our continuing effort to reduce paperwork burdens, we invite the general public to take this opportunity to comment on the information collection contained in this *Report and Order*, as required by the Paperwork Reduction Act of 1995, Pub. L. No. 104-13. Public comments should be submitted to OMB and the Commission, and are due thirty days from date of publication of this *Report and Order* in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

APPENDIX A: FINAL REGULATORY FLEXIBILITY ANALYSIS

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),⁷⁷⁴ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making (NPRM)*.⁷⁷⁵ The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA.⁷⁷⁶ Three commenting parties specifically addressed the IRFA.⁷⁷⁷ We discuss those comments below. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.⁷⁷⁸

A. Need for, and Objectives of, the Report and Order:

2. In this *Report and Order*, we have concluded that reconfiguration of the 800 MHz band is essential, over the long term, to assure that critical public safety communications may be accommodated without unacceptable interference, as that term is defined in the *Report and Order*. Because increasing instances of interference to 800 MHz public safety communications systems made it imperative that we act to stem such interference without delay, we adopted rules that hold the involved ESMR and cellular telephone licensees strictly responsible for abating interference by application of a variety of technical remedies which have been subsumed in this proceeding under the rubric of *Enhanced Best Practices*. Specifically, the Commission took the following actions:

- adopted a new 800 MHz band plan that, after a transition period, will separate high-density ESMR systems in the band, principally those operated by Nextel, from public safety and other non-cellular 800 MHz operations.
- require Nextel to relinquish all of its 800 MHz spectrum holdings below 817 MHz/862 MHz resulting in an additional average of 4.5 megahertz of 800 MHz band spectrum becoming available to the public safety community, particularly in the major markets where the shortage of public safety spectrum is most acute;
- established a transition mechanism for band reconfiguration with minimal disruption to the operations of all affected 800 MHz incumbents during the transition period;
- required Nextel to pay all band reconfiguration costs of public safety and other 800 MHz incumbents that result from transition to the new band plan;
- defined unacceptable interference as a function of threshold received power levels of desired signals;
- placed strict responsibility for abatement of unacceptable interference on the licensees whose

⁷⁷⁴ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

⁷⁷⁵ See Improving Public Safety Communications in the 800 MHz Band; Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels, WT Docket No. 02-55, *Notice of Proposed Rulemaking*, 17 FCC Rcd 4873, 4927 (2002) (*NPRM*).

⁷⁷⁶ See *id.* at 4920 ¶ 93.

⁷⁷⁷ Business Autophones, Inc., Comments on IRFA (May 6, 2002) Skitronics, LLC, Comments on IRFA (May 6, 2002); Small Business in Telecommunications, Comments on IRFA (May 6, 2002).

⁷⁷⁸ See 5 U.S.C. § 604.

systems are the source of such interference;

- required prior notification, upon request, of the activation or modification of ESMR and cellular telephone cells;
- established firm rules—including response times of twenty-four hours and abatement initiation time of forty-eight—for procedures to be used to identify, report and remedy instances of unacceptable interference;
- modified certain Nextel licenses to accommodate a nationwide allocation in the 1910-1915 MHz/1990-1995 MHz paired spectrum block, in exchange for Nextel's surrendering spectrum, and bearing the financial burden and risk of reconfiguring the 800 MHz band;
- consolidated the Business and Industrial/Land Transportation Pools in the 800 MHz and 900 MHz bands, and
- allowed 900 MHz Private Land Mobile Radio (PLMR) licensees to initiate CMRS operations on their currently authorized spectrum or to assign their authorizations to others for CMRS use.

3. The Commission has taken these actions to immediately stem increasing instances of interference to 800 MHz public safety communications systems. The Commission has long recognized that the nation's public safety community requires effective radio communications systems free of unacceptable interference if public safety agencies are to adequately protect the safety of lives and property. The actions taken by the Commission in this *Report and Order* create a suitable spectrum environment for public safety and Critical Infrastructure Industries systems operating in the 800 MHz band.

4. In the *Fourth Memorandum Opinion and Order*, we both grant and deny petitions for reconsideration and clarification of the *Third Report and Order* and *Third Memorandum Opinion and Order*. We grant petitions to the extent described herein and clarify several points relating to BAS operations by licensees operating on different channel plans during the transition to the new BAS channel plan at 2025-2110 MHz. We otherwise deny the petitions relating to BAS relocation issues in the 1990-2025 MHz band. We also no longer require BAS licensees in TV markets 31-210 to cease operation on channels 1 and 2 (1990-2008 MHz and 2008-2025 MHz, respectively) until they have been relocated to their final channel plan in the 2025-2110 MHz band, but otherwise retain our previously adopted relocation rules for MSS licensees. The changes we adopt are necessary to allow Nextel, as a new entrant in the 1990-2025 MHz band, to participate in the relocation process we had previously established for BAS incumbents.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA:

5. Three parties submitted comments specifically in response to the IRFA: Business Autophones, Inc. (Business Autophones), Small Business in Telecommunications (SBT), and Skitronics, LLC (Skitronics).⁷⁷⁹ Business Autophones opines that the Nextel Plan, which contemplated relocating B/ILT licensees from the 800 MHz band to the 700 MHz and 900 MHz at their own expense, would be financially devastating to small business B/ILT licensees and urges the Commission to either abate interference on a case-by-case basis or adopt the plan proposed by NAM/MRFAC which reconfigured the

⁷⁷⁹ Business Autophones, Inc., Comments on IRFA (May 6, 2002) Skitronics, LLC, Comments on IRFA (May 6, 2002); Small Business in Telecommunications, Comments on IRFA (May 6, 2002).

band but did not relocate B/ILT licensees.⁷⁸⁰ For the reasons described *infra* we have adopted a band plan that does not relocate B/ILT licensees to the 700 MHz and 900 MHz band and requires Nextel to finance any necessary relocation of B/ILT licensees.

6. Skitronics posits on the impact of four separate alternatives set forth in the *NPRM* on small businesses.

- Skitronics echoes Business Autophones concerns about the effect of the proposal to relocate B/ILT licensees from the 800 MHz band to the 700 MHz and 900 MHz at their own expense.⁷⁸¹ As we discuss at ¶ 27 *infra*, we did not choose this alternative.
- Skitronics argues that Nextel's alternative proposal, one that would allow incumbent 800 MHz operators to remain in the band on a secondary status, would deleteriously affect small business SMR operators by impacting these business' growth prospects as well as their ability to guarantee continuous service to their customers.⁷⁸² We note that although Nextel offered this alternative in its original *White Paper* proposal, Nextel removed it as part of the plan it submitted as a member of the Consensus Parties. Therefore, we ceased to consider this alternative at that time and we have not chosen to enact that alternative as a rule.
- Skitronics argues that the Commission's consideration of moving 800 MHz incumbents to the 2.1 GHz imposes significant costs on small business SMR licensees since the propagation qualities of the 2.1 GHz spectrum make it unsuitable for SMR use and there is a lack of available equipment suitable for SMR operations in this band.⁷⁸³ As in the case of the alternative of allowing SMR licensees to remain in the 800 MHz band on a secondary basis, this alternative was superseded by the alternative set forth by the Consensus Parties in the Consensus Plan and we have not chosen to move 800 MHz incumbents to the 2.1 GHz band.
- Skitronics contends that the alternative mentioned in the *NPRM* that has the least impact on small business is enforcement of existing rules against those licensees responsible for causing interference to public safety on a case-by-case basis.⁷⁸⁴ For the reasons discussed at ¶ 29 *infra*, we declined to adopt this alternative.

7. Unlike the two other comments received in response to the IRFA, SBT focuses its comments on the adequacy of the IRFA in terms of its compliance with the RFA. Specifically, SBT makes the following arguments:

- the IRFA does not describe the significant or potential economic impact of the *NPRM* on small entities as required by the RFA;⁷⁸⁵
- the IRFA omits any description of the problem to be rectified by the regulation to be

⁷⁸⁰ See Business Autophones Comments on IRFA at 2-3.

⁷⁸¹ Skitronics Comments on IRFA at 6-10.

⁷⁸² *Id.* at 10-11.

⁷⁸³ *Id.* at 11-13.

⁷⁸⁴ *Id.* at 4, 16.

⁷⁸⁵ SBT Comments at 3-4 (*citing* 5 U.S.C. § 603(a)).

promulgated or an objective for any proposed rule as required by the RFA;⁷⁸⁶

- the Commission either relied on outdated statistical sources in calculating the number of affected small licensees or failed to cite to the source(s) entirely;⁷⁸⁷
- SBT agrees with the IRFA's conclusion that the *NPRM* does not propose a rule that will entail additional reporting, record-keeping, and other compliance requirements because the *NPRM* does not, in fact, propose any rules.⁷⁸⁸ However, in Section D *infra* we add new reporting and other requirements.
- SBT urges the Commission to amend the *NPRM*'s IRFA in any subsequent IRFA or FRFA if a substantive rule emerges from this proceeding.⁷⁸⁹
- SBT contends that the Commission should convert the *NPRM* to a Notice of Inquiry (NOI) and issue a second *NPRM* to propose specific rules.⁷⁹⁰

8. With regard to SBT's comments, as an initial matter we believe that we do not need to issue a NOI in this proceeding because the IRFA's description of the problem of interference to public safety systems in the 800 MHz band is a sufficient description of the problem to be rectified in this proceeding.⁷⁹¹

Moreover, we believe our description of the two plans under consideration in the *NPRM* adequately described the rules under consideration.⁷⁹² We also note that the Consensus Parties filed a plan superseding one of the plans discussed in the *NPRM* on September 23, 2002 and the major revision of that new plan on December 24, 2002. Both of these plans, as well as the comments received in response to these plans, proposed substantive rules. Moreover, in the interest of ensuring a complete record, the Commission opened two additional notice and comment rounds to obtain public comment on these two plans. Our position, therefore, is that the Commission clearly stated its proposals either in the *NPRM* and IRFA or fully clarified them in the two subsequent notice and comment rounds that permitted full comment on subsequently proposed plans. Indeed, the Commission received the bulk of all comments in this proceeding subsequent to the comment period initiated in the *NPRM*. Finally, we note that in Section C, *infra*, we are using updated statistical sources to assess the impact of the rules we adopt today on small

⁷⁸⁶ *Id.* at 4. According to SBT, the Commission's tentative conclusion that spectrum reallocation serves the public interest because it would resolve harmful interference to 800 MHz public safety licensees "falls far short" of satisfying the requirements of 5 U.S.C. § 603(b)(1). *See id.*

⁷⁸⁷ *Id.* at 5-10.

⁷⁸⁸ *Id.* at 10-11. For the same reason, SBT concurs with the IRFA's conclusion that the *NPRM* does not propose any rule that duplicates, overlaps, or conflicts with other federal rules. *See id.* at 12.

⁷⁸⁹ *Id.* at 11, 12. In addition, SBT recommends that the Commission amend the IRFA to comply with 5 U.S.C. § 603(c)(3) by discussing alternatives to rules proposed by the Commission. *See id.* at 11. Once again, SBT reiterates that the Commission has not proposed any rules and therefore could not have discussed alternatives to such rules. *Id.* To the extent that the IRFA discusses alternative proposals for rule changes that were *submitted to* the Commission, SBT contends that such "alternatives" do not qualify as alternatives *proposed by* the Commission. *Id.*

⁷⁹⁰ *Id.* at 12-13. SBT believes that the Commission should use a NOI "whenever it lacks information about the industry to be regulated or the exact nature of the problem to be addressed." *Id.* at 13.

⁷⁹¹ *See NPRM* at 4927.

⁷⁹² *Id.*

businesses.

C. Description and Estimate of the Number of Small Entities To Which the Rules Will Apply:

9. The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁷⁹³ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁷⁹⁴ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁷⁹⁵ A “small business concern” is one that is: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁷⁹⁶ Below, we further describe and estimate the number of small entity licensees and regulatees that may be affected by the rule changes adopted herein.

10. A “small organization” is generally any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.⁷⁹⁷ Nationwide, there are approximately 1.6 million small organizations.⁷⁹⁸ We note that, according to SBA data, there are approximately 22.4 million small businesses nationwide.⁷⁹⁹ We describe and estimate, below, the number of small entities—applicants, licensees, and radio equipment manufacturers—that may be affected by this *Report and Order*.

11. *Governmental Entities.* The term “small governmental jurisdiction” is defined as “governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”⁸⁰⁰ As of 1997, there were approximately 87,453 governmental jurisdictions in the United States.⁸⁰¹ This number includes 39,044 county governments, municipalities, and townships, of which 37,546 (approximately 96.2%) have populations of fewer than 50,000, and of which 1,498 have populations of 50,000 or more. Thus, we estimate the number of small governmental jurisdictions overall to be 84,098 or fewer.

12. *Wireless Telecommunications.* The SBA has developed a small business size standard for

⁷⁹³ 5 U.S.C. § 603(b)(3).

⁷⁹⁴ 5 U.S.C. § 601(6).

⁷⁹⁵ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

⁷⁹⁶ 15 U.S.C. § 632.

⁷⁹⁷ 5 U.S.C. § 601(4).

⁷⁹⁸ Independent Sector, *The New Nonprofit Almanac & Desk Reference* (2002).

⁷⁹⁹ See SBA, *Programs and Services*, SBA Pamphlet No. CO-0028, at page 40 (July 2002).

⁸⁰⁰ 5 U.S.C. § 601(5).

⁸⁰¹ U.S. Census Bureau, *Statistical Abstract of the United States: 2000*, Section 9, pages 299-300, Tables 490 and 492.

wireless firms within the broad economic census category “Cellular and Other Wireless Telecommunications.”⁸⁰² Under this SBA category, a wireless business is small if it has 1,500 or fewer employees. For the census category Cellular and Other Wireless Telecommunications firms, Census Bureau data for 1997 show that there were 977 firms in this category, total, that operated for the entire year.⁸⁰³ Of this total, 965 firms had employment of 999 or fewer employees, and an additional 12 firms had employment of 1,000 employees or more.⁸⁰⁴ Thus, under this category and size standard, the majority of firms can be considered small.

13. *Public Safety Radio Licensees.* As a general matter, Public Safety Radio Pool licensees include police, fire, local government, forestry conservation, highway maintenance, and emergency medical services.⁸⁰⁵ The SBA rules contain a definition for cellular and other wireless telecommunications companies which encompasses business entities engaged in radiotelephone communications employing no more than 1,500 persons.⁸⁰⁶ There are a total of approximately 127,540 licensees within these services.⁸⁰⁷ With respect to local governments, in particular, since many governmental entities as well as private businesses comprise the licensees for these services, we include under public safety services the number of government entities affected.

14. *Business, Industrial and Land Transportation Licensees.* At present, there are 3239 Business and Industrial/Land Transportation (B/ILT) licensees that may be affected by this Report and Order.⁸⁰⁸ The Commission does not require B/ILT licensees to disclose information about number of employees, so the Commission does not have information that could be used to determine how many B/ILT licensees

802 13 C.F.R. § 121.201, NAICS code 513322 (changed to 517212 in October 2002).

803 U.S. Census Bureau, 1997 Economic Census, Subject Series: “Information,” Table 5, Employment Size of Firms Subject to Federal Income Tax: 1997, NAICS code 513322 (issued October 2000).

804 U.S. Census Bureau, 1997 Economic Census, Subject Series: “Information,” Table 5, Employment Size of Firms Subject to Federal Income Tax: 1997, NAICS code 513322 (issued October 2000). The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is “Firms with 1000 employees or more.”

⁸⁰⁵ See subparts A and B of Part 90 of the Commission's Rules, 47 C.F.R. §§ 90.1-90.22. Police licensees include 26,608 licensees that serve state, county, and municipal enforcement through telephony (voice), telegraphy (code), and teletype and facsimile (printed material). Fire licensees include 22,677 licensees comprised of private volunteer or professional fire companies, as well as units under governmental control. Public Safety Radio Pool licensees also include 40,512 licensees that are state, county, or municipal entities that use radio for official purposes. There are also 7,325 forestry service licensees comprised of licensees from state departments of conservation and private forest organizations that set up communications networks among fire lookout towers and ground crews. The 9,480 state and local governments are highway maintenance licensees that provide emergency and routine communications to aid other public safety services to keep main roads safe for vehicular traffic. Emergency medical licensees (1,460) use these channels for emergency medical service communications related to the delivery of emergency medical treatment. Another 19,478 licensees include medical services, rescue organizations, veterinarians, persons with disabilities, disaster relief organizations, school buses, beach patrols, establishments in isolated areas, communications standby facilities, and emergency repair of public communications facilities.

⁸⁰⁶ See 13 C.F.R. § 121.201 (NAICS Code 517212).

⁸⁰⁷ There is no information currently available about the number within the 127,540 that have less than 1500 employees.

⁸⁰⁸ This number is based on the Commission's licensing database.

constitute small entities under this definition. Moreover, we note that B/ILT licensees generally are not in the business of providing cellular or other wireless telecommunications services but instead use the licensed facilities in support of other business activities.

15. *Specialized Mobile Radio Licenses.* The Commission awards "small entity" and "very small entity" bidding credits in auctions for Specialized Mobile Radio (SMR) geographic area licenses in the 800 MHz and 900 MHz bands to firms that had revenues of no more than \$15 million in each of the three previous calendar years, or that had revenues of no more than \$3 million in each of the previous calendar years, respectively.⁸⁰⁹ In the context of both the 800 MHz and 900 MHz service, the SBA has approved the definitions of "small entity" and "very small entity."⁸¹⁰ These bidding credits apply to SMR providers in the 800 MHz and 900 MHz bands that either hold geographic area licenses or have obtained extended implementation authorizations. The Commission does not know how many firms provide 800 MHz or 900 MHz geographic area SMR service pursuant to extended implementation authorizations, nor how many of these providers have annual revenues of no more than \$15 million. One firm has over \$15 million in revenues. The Commission assumes, for purposes here, that all of the remaining existing extended implementation authorizations are held by small entities, as that term is defined by the SBA. The Commission has held auctions for geographic area licenses in the 800 MHz SMR band. In the 800 MHz auction, 38 of the 524 licenses won were won by small and very small entities.

16. *Wireless Communications Equipment Manufacturers.* The SBA has established a small business size standard for radio and television broadcasting and wireless communications equipment manufacturing. Under the standard, firms are considered small if they have 1000 or fewer employees.⁸¹¹ Census Bureau data for 1997 indicates that, for that year, there were a total of 1,215 establishments⁸¹² in this category.⁸¹³ Of those, there were 1,150 that had employment under 500, and an additional 37 that had employment of 500 to 999. The Commission estimates that the majority of wireless communications equipment manufacturers are small businesses.⁸¹⁴

17. *Broadcast Auxiliary Service (BAS).* BAS involves a variety of transmitters, generally used to relay broadcast programming to the public (through translator and booster stations) or within the program distribution chain (from a remote news gathering unit back to the stations). The Commission has not

⁸⁰⁹ 47 C.F.R. § 90.814(b)(1).

⁸¹⁰ See Letter, dated Aug. 10, 1999, from A. Alvarez, Administrator, Small Business Administration to Tom Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission.

⁸¹¹ 13 C.F.R. § 121.201, NAICS code 334220.

⁸¹² The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the number given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census break-out data for firms or companies only gives the total number of such entities for 1997, which was 1,089.

⁸¹³ U.S. Census Bureau, *1997 Economic Census*, Industry Series: Manufacturing, "Industry Statistics by Employment Size," Table 4, (issued August 1999) NAICS code 334220. We note, however that the predominant manufacturers of 800 MHz equipment, Motorola and M/A COM Private Radio Systems, Inc. are not considered small businesses.

⁸¹⁴ We note, however that the predominant manufacturers of 800 MHz equipment, Motorola and M/A COM Private Radio Systems, Inc. are not considered small businesses.

developed a definition of small entities specific to broadcast auxiliary licensees. The U.S. Small Business Administration (SBA) has developed small business size standards, as follows: 1) For TV BAS, we will use the size standard for Television Broadcasting, which consists of all such companies having annual receipts of no more than \$12.0 million;⁸¹⁵ 2) For Aural BAS, we will use the size standard for Radio Stations, which consists of all such companies having annual receipts of no more than \$6 million;⁸¹⁶ 3) For Remote Pickup BAS we will use the small business size standard for Television Broadcasting when used by a TV station and that for Radio Stations when used by such a station.

18. According to Commission staff review of BIA Publications, Inc. Master Access Television Analyzer Database as of May 16, 2003, about 814 of the 1,220 commercial television stations in the United States had revenues of \$12 million or less. We note, however, that, in assessing whether a business concern qualifies as small under the above definition, business (control) affiliations⁸¹⁷ must be included.⁸¹⁸ Our estimate, therefore, likely overstates the number of small entities that might be affected by our action, because the revenue figure on which it is based does not include or aggregate revenues from affiliated companies. There are also 2,127 low power television stations (LPTV).⁸¹⁹ Given the nature of this service, we will presume that all LPTV licensees qualify as small entities under the SBA size standard. According to Commission staff review of BIA Publications, Inc., Master Access Radio Analyzer Database, as of May 16, 2003, about 10,427 of the 10,945 commercial radio stations in the United States had revenue of \$6 million or less. We note, however, that many radio stations are affiliated with much larger corporations with much higher revenue, and, that in assessing whether a business concern qualifies as small under the above definition, such business (control) affiliations⁸²⁰ are included.⁸²¹ Our estimate, therefore, likely overstates the number of small businesses that might be affected by our action.

19. *Cable Antenna Relay Service (CARS)*. CARS includes transmitters generally used to relay cable programming within cable television system distribution systems. The SBA has developed a small business size standard for Cable and other Program Distribution, which consists of all such companies having annual receipts of no more than \$12.5 million. According to Census Bureau data for 1997, there were 1,311 firms within the industry category Cable and Other Program Distribution, total, that operated for the entire year.⁸²² Of this total, 1,180 firms had annual receipts of under \$10 million, and an additional fifty-two firms had receipts of \$10 million to \$24,999,999.00.⁸²³ Thus, under this standard, the majority of

⁸¹⁵ 13 C.F.R. § 121.201, NAICS code 515120.

⁸¹⁶ *Id.* NAICS code 515112.

⁸¹⁷ “Concerns are affiliates of each other when one concern controls or has the power to control the other or a third party or parties controls or has to power to control both.” 13 C.F.R. § 121.103(a)(1).

⁸¹⁸ “SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic concern’s size.” 13 C.F.R. § 121.103(a)(4).

⁸¹⁹ FCC News Release, “Broadcast Station Totals as of September 30, 2002” (Nov. 6, 2002).

⁸²⁰ “Concerns are affiliates of each other when one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.” 13 C.F.R. § 121.103(a)(1).

⁸²¹ “SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic and foreign affiliates, regardless of whether the affiliates are organized for profit, in determining the concern’s size.” 13 C.F.R. § 121.103(a)(4).

⁸²² 13 C.F.R. § 121.201, NAICS code 517510 (changed from 513220 in October 2002).

⁸²³ *Id.*

firms can be considered small.

20. *Geostationary, Non-Geostationary Orbit, Fixed Satellite, or Mobile Satellite Service Operators (including 2 GHz MSS systems).* The Commission has not developed a definition of small entities applicable to geostationary or non-geostationary orbit, fixed-satellite or mobile-satellite service operators. The SBA has developed a small business size standard for Satellite Telecommunications Carriers, which consists of all such companies having \$12.5 million or less in annual receipts.⁸²⁴ According to Census Bureau data for 1997, there were 324 firms that operated for the entire year.⁸²⁵ Of this total, 273 firms had annual receipts under \$10 million, and an additional twenty-four firms had annual receipts of \$10 million to \$24,999,990.⁸²⁶ Thus, under this size standard, the majority of firms can be considered small.

21. *Fixed Microwave Services.* Microwave services include common carrier,⁸²⁷ private-operational fixed,⁸²⁸ and broadcast auxiliary radio services.⁸²⁹ At present, there are approximately 36,708 common carrier fixed licensees and 59,291 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services. The Commission has not yet defined a small business with respect to microwave services. For purposes of the FRFA, we will use the SBA's definition applicable to wireless and other telecommunications companies—*i.e.*, an entity with no more than 1,500 persons.⁸³⁰ According to Census Bureau data for 1997, there were 977 firms in this category, total, that operated for the entire year.⁸³¹ Of this total, 965 firms had employment of 999 or fewer employees, and an additional twelve firms had employment of 1,000 employees or more.⁸³² Thus, under this size standard, majority of firms can be considered small.

22. We note that the number of firms does not necessarily track the number of licensees. We estimate that all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify

⁸²⁴ 13 C.F.R. § 121.201, NAICS code 517410 (changed from 513340 in October 2002).

⁸²⁵ U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Receipt Size of Firms Subject to Federal Income Tax: 1997," Table 4, NAICS code 513340 (issued October 2000).

⁸²⁶ *Id.*

⁸²⁷ 47 CFR Part 101 *et seq.* (formerly, part 21 of the Commission's Rules).

⁸²⁸ Persons eligible under Parts 80 and 90 of the Commission's rules can use Private-Operational Fixed Microwave services. *See* 47 CFR parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

⁸²⁹ Auxiliary Microwave Service is governed by Part 74 of Title 47 of the Commission's Rules. *See* 47 CFR Part 74 *et seq.* Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

⁸³⁰ 13 C.F.R. § 121.201, NAICS code 517212 (formerly 213322).

⁸³¹ U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Employment Size of Firms Subject to Federal Income Tax: 1997," Table 5, NAICS code 217212 (issues Oct. 2000).

⁸³² *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is "Firms with 1,000 employees or more."

as small entities under the SBA definition. Of these licenses, approximately fourteen are issued for frequencies in the Emerging Technology bands affected by this proceeding. This, assuming that these entities also qualify as small businesses, as many as fourteen small business licensees could be affected by the rules we adopt. We note that these entities have been subject to relocation by UTAM under rules originally adopted in the Commission's *Emerging Technologies* proceeding. UTAM is the Commission's frequency coordinator for UPCS devices in the 1910-1930 MHz band. The *Fifth Report and Order* anticipates that these general relocation rules will continue to apply to FS microwave licensees and does not propose to modify the class of licensees that are subject to these relocation provisions.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

23. We expect that, at most, the rules adopted herein will result in nominal new reporting, recordkeeping, or other compliance requirements imposed on entities affected in this proceeding, as discussed Appendix B and ¶¶ 355-356, *infra*. The rules we adopt herein require that any Cellular Radiotelephone and/or ESMR licensee that receives an interference complaint from a public safety/CII licensee shall promptly respond to such complaint. Cellular Radiotelephone licensees, in conjunction ESMR licensees, shall establish an electronic means of receiving the initial complaint and shall respond on an "as soon as possible" basis and no later than twenty-four hours after receipt of initial notification. The purpose of this notification rule is to provide public safety/CII licensees a means to communicate to Cellular Radio Telephone and/or ESMR licensees instances of interference and for Cellular Radiotelephone and/or ESMR licensees to immediately initiate corrective action.

24. Additionally, the rules we adopt today provide that, upon request by a public safety/CII licensee, Cellular Radiotelephone and/or ESMR licensees must provide to the public safety/CII licensee the following information before any new cell sites are constructed or any existing cells are modified: (1) location; (2) effective radiated power; (3) antenna height; and (4) channels in use. The purpose of this rule is for informational purposes only and does not entitle the public safety/CII licensee to approve or disapprove the activation of a proposed cell site or to demand changes to the proposed technical parameters. The principal purpose of this rule is to facilitate a dialogue between Cellular Radiotelephone licensees and public safety/CII licensees regarding potential interference, identification of interference, and voluntary corrective measures.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered:

25. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.⁸³³

26. Our decision to reconfigure the 800 MHz band is generally size-neutral, but some aspects are beneficial to small entities for the following reasons:

- Although there are significant short-term costs associated with band reconfiguration, it is the solution most likely to yield maximum interference protection benefits for the least cost over the long run. This cost savings are significant for small entities with limited resources.

⁸³³ See 5 U.S.C. § 603(c)(1-4).

- Once implemented, a reconfigured band will reduce both the upfront amount of coordinated engineering work necessary to prevent interference and the burden of troubleshooting interference incidents on a case-by-case basis. This will allow small entities to utilize their scarce engineering resources more effectively.

27. We also considered proposals to reallocate (1) Nextel's 700 MHz Guard Band Block B spectrum, and the Upper 700 MHz band to public safety use; and (2) provide private radio licensees 2:1 access to 900 MHz spectrum. Our decision to decline to adopt these proposals was generally size-neutral but has the following impact on small entities:

- Since the Upper 700 MHz band is designated for auction, our decision not to utilize this band will allow small entities to bid on it in the future.
- Because we contemplate a future rulemaking proceeding to determine the ultimate disposition of Nextel's 700 MHz Guard Band spectrum, we afford small businesses an opportunity to comment on the future use of this spectrum.

28. We have considered the costs of realignment and the limited resources of small entities, including public safety, in effectuating band realignment. We believe that our decision will not have a significant economic impact on small entities in this regard because the cost of 800 MHz realignment will be borne by Nextel (*i.e.*, Nextel will pay relocation costs). We reject the alternative of deferring final action on band reconfiguration, because deferral would increase the potential for increased interference to public safety systems because ESMR and Cellular telephone licensees would remain in close proximity to such systems while expanding their operations.

29. Although we have not codified the *Best Practices Guide*, we endorse the interference abatement strategies therein. However, when we considered the sole use of Enhanced Best Practices as an alternative to reconfiguring the 800 MHz band in its entirety, we found this alternative less effective and more costly over the long term than band reconfiguration, and therefore more likely to be harmful to smaller entities. Our finding in that regard rests on the following facts:

- Addressing interference on a case-by-case basis is both labor-intensive and expensive, which puts smaller entities at risk due to their more limited resources.
- The transactional cost of applying Enhanced Best Practices as an exclusive remedy would increase as new public safety and other non-cellular systems came on line and ESMR and cellular telephone licensees increased the capacity of their systems by adding more cells.
- The increased cost and labor burden disproportionately affects public safety agencies, many of which are small entities operating with very limited human, technical and financial resources.

30. We have determined not to require public safety licensees to increase their signal strength. Such a requirement would impose a substantial burden on public safety licensees, including small entities, which would often continue to suffer from interference until the causes could be identified and until appropriate channels and sites for the construction of new base station facilities could be obtained.

31. Regarding our decision to permit negotiated agreements to swap or exchange channels as a means to resolve interference to public safety systems, we do not foresee any adverse impact on small entities. The channel swapping proposals to date have specified that Nextel will bear the costs thereof. To the extent that small entities bear channel swap expenses not assumed by Nextel, we believe, for the reasons discussed at ¶ 29 *supra*, the financial burden of these small-scale band reconfigurations should be less than the cost of reliance on Enhanced Best Practices for the long term abatement of unacceptable

interference.

32. Regarding our decision to hold Cellular Radio Telephone and ESMR licensees strictly responsible for effectively abating actual or potential unacceptable interference to 800 MHz public safety systems in the shortest practicable time, we do not anticipate a significant burden on small entities. We recognize that our rule does not exempt small entities from its ambit. However, in eliminating the interference we afford licensees the flexibility to determine which system—ESMR, Cellular Telephone or CII/public safety—to modify and what particular technical parameters to change on these systems; and impose on the interfering licensee(s), the obligation to promptly implement such changes. Moreover, we note that small entities were generally not among the interfering parties in those instances of interference that were brought to our attention by parties in this proceeding. We considered the alternative of imposing system-wide, stringent technical limitations on ESMR and Cellular Telephone licensees; however, we found selection of that alternative unwarranted at this time. Such rules would have imposed a burden on all licensees, including small entities, which were not among those causing interference to 800 MHz public safety systems. In particular, we have heeded the filings of rural cellular telephone carriers who opposed imposition of out-of-band emission standards that would require them to add expensive equipment to their cell sites.

33. Regarding our adoption of rules establishing general standards and procedures to govern the abatement of interference to public safety systems, we recognize that they will apply equally to all licensees, including small entities, which cause interference to 800 MHz public safety systems. However, we do not anticipate any significant adverse impact on small entities. We adopted rules that were intentionally general in nature to confer considerable discretion on the parties involved in abating instances of interference to public safety systems. Moreover, as noted above, small entities were generally not among the interfering parties in those instances of interference that were brought to our attention by parties in this proceeding. To the extent that they can demonstrate that they are not contributing to the interference to the public safety systems, they will not be responsible for abating the interference. Therefore, the burden should be minimal for those small entities not contributing to the public safety interference problem in the 800 MHz band. The minimal burden imposed by these rules is necessary to ensure that critical public safety communications may be accommodated without unacceptable interference.

34. In this respect, we are mindful that a number of the public safety systems that are experiencing interference are small entities. We believe that the rules will impose a minimal burden on small public safety entities. First, because we will only require them to furnish certain necessary information to all licensees that may be responsible for causing the interference. Second, because this provision will assure them of timely responses to and analyses of their interference complaints. Ultimately, the burden of supplying this information will be significantly less than that associated with identifying each source of unacceptable interference and contacting such sources individually.

35. Regarding our decision to require notification of the activation of new or modified ESMR or cellular radiotelephone cells, we do not perceive any adverse impact on small entities. Indeed, the prior notification requirement will enable small entities, such as public safety/CII licensees, to take proactive, anticipatory steps to address potential interference. Without this requirement, public safety/CII licensees would first have to experience interference before taking recourse. Similarly, the requirement that Cellular Radiotelephone and/or ESMR licensees promptly initiate corrective actions after having been notified of interference by public safety/CII licensees minimizes the burden on small entities of having to endure prolonged periods of interference. Moreover, as noted above, small entities were generally not among the interfering parties in those instances of interference that were brought to our attention by parties in this proceeding.

36. Regarding our decision to consolidate the 800 MHz and 900 MHz Business and

Industrial/Land Transportation Pools, we perceive no adverse impact on small entities. This decision will allow any eligible Business or Industrial/Land Transportation entity to be licensed on the consolidated channels. This consolidation will improve spectrum efficiency, promote the use of advanced technologies by affording licensees more contiguous spectrum, and reduce regulatory burdens on all licensees, including small entities. The alternative of retaining separate pools for each service would subject licensees to the unnecessary burden of seeking waivers to permit intercategory sharing, which may have been comparatively more onerous for smaller entities to prepare and file.

37. Regarding our decision to allow 900 MHz PLMR licensees to initiate CMRS operations on their currently authorized spectrum or to assign their authorizations to others for CMRS use, we perceive no adverse impact on small entities. This decision will improve spectrum efficiency, promote the use of advanced technologies by affording licensees access to additional spectrum.

38. Regarding our decision to allocate the 1910-1915 MHz/1990-1995 MHz paired spectrum blocks to Nextel, we perceive no adverse impact on small entities. Redesignating this spectrum for Nextel's use, for example, will facilitate 800 MHz realignment, by, among other things, introducing an additional entity that can participate in funding the relocation costs of public safety, critical infrastructure, and private wireless entities, including small entities. Alternatively, maintaining this spectrum without applying our relocation principles will expose such entities to continued interference without sufficient spectrum and funding to achieve realignment. Further, we are satisfied that our decision will not adversely impact BAS, UPCS, MSS, and microwave interests on account of expenditures in this spectrum. As noted in the *Report and Order*, Nextel has agreed to reimburse these interests or pay the upfront costs to relocate incumbents in the manner provided by our Rules, and we will hold Nextel to that agreement.

39. **Report to Congress:** The Commission will send a copy of the *Report and Order*, *Fifth Report and Order*, *Memorandum Opinion and Order*, and *Order*, including this FRFA, in a report to be sent to Congress and the General Accounting Office pursuant to the Congressional Review Act.⁸³⁴ In addition, the Commission will send a copy of the *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.⁸³⁵

⁸³⁴ See 5 U.S.C. § 801(a)(1)(A).

⁸³⁵ See 5 U.S.C. § 604(b).

APPENDIX B: PAPERWORK REDUCTION ANALYSIS

1. This document contains new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies are invited to comment on the information collection requirements contained in this document. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might “further reduce the information collection burden for small business concerns with fewer than 25 employees.” This *Report and Order* contains several new information collections. We describe our new information collections as follows:

2. In this *Report and Order* we require that any Cellular Radiotelephone and/or ESMR licensee that receives an interference complaint from a public safety/CII licensee shall respond to such complaint. To facilitate receipt of complaints, Cellular Radiotelephone licensees, in conjunction with Part 90 ESMR licensees, must establish an electronic means of receiving the initial notification and shall respond to such notification on an “as soon as possible” basis and no later than 24 hours after receipt of initial notification. The purpose of this notification rule is to provide prompt notification to ESMR and Cellular Radiotelephone licensees that their transmissions are interfering with public safety/CII transmissions, some of which are crucial to protection of life and property. These requirements constitute new “collections of information” within the meaning of the Paperwork Reduction Act of 1995, 44 U.S.C. §§ 3501-3520. Implementation of this requirement is subject to approval by the Office of Management and Budget as prescribed by the Paperwork Reduction Act.

3. Additionally, the rules we adopt today provide that upon request by a public safety/CII licensee, Cellular Radiotelephone and/or ESMR licensees must provide to the public safety/CII licensee the following information before any new cell sites are constructed or any existing cells are modified: (1) location; (2) effective radiated power; (3) antenna height; (4) channels in use. The purpose of this rule is for informational purposes only and does not entitle the public safety/CII licensee to approve or disapprove the activation of a proposed cell site or to demand changes to the proposed technical parameters. The principal purpose of this rule is to forestall activation of facilities that have the potential to cause interference to communications, some of which may be crucial to the safety of life and property. These requirements constitute new “collections of information” within the meaning of the Paperwork Reduction Act of 1995, 44 U.S.C. §§ 3501-3520. Implementation of this requirement is subject to approval by the Office of Management and Budget as prescribed by the Paperwork Reduction Act.

4. In this present document, we have assessed the effects of the above-mentioned information collection requirements on small business concerns, and find that these information collection requirements will not adversely affect businesses with fewer than twenty-five employees.

APPENDIX C: FINAL RULES

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation for Part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 302, 303, 304, 307, 336, and 544A.

2. Section 15.301 is amended as follows:

§ 15.301 Scope.

This subpart sets out the regulations for unlicensed personal communications services (PCS) devices operating in the 1915-1930 MHz and 2390-2400 MHz frequency bands.

3. Paragraph (g) of Section 15.303 is amended as follows:

§ 15.303 Definitions.

* * * * *

(g) *Personal Communications Services (PCS) Devices [Unlicensed]*. Intentional radiators operating in the frequency bands 1915-1930 MHz and 2390-2400 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.

* * * * *

4. Section 15.311 is amended as follows:

§ 15.311 Labeling requirements.

In addition to the labeling requirements of §15.19(a)(3), all devices operating in the frequency band 1915-1930 MHz authorized under this subpart must bear a prominently located label with the following statement: * * *

5. Paragraph (a) of Section 15.319 is amended as follows:

§ 15.319 General technical requirements.

(a) The 1915-1920 MHz and 2390-2400 MHz bands are limited to use by asynchronous devices under the requirements of § 15.321. * * *

* * * * *

6. Paragraphs (a) and (b) of Section 15.321 is amended as follows:

§ 15.321 Specific requirements for asynchronous devices operating in the 1915-1920 MHz and 2390-2400 MHz bands.

(a) Operation shall be contained within either or both of the 1915-1920 MHz and 2390-2400 MHz bands. * * *

(b) All systems of less than 2.5 MHz emission bandwidth shall start searching for an available spectrum window within 3 MHz of the band edge at 1915, 1920, 2390, or 2400 MHz while systems of more than 2.5 MHz emission bandwidth will first occupy the center half of the band. * * *

* * * * *

Part 22 of title 47 of the Code of Federal Regulations is revised to read as follows:

PART 22 – PUBLIC MOBILE SERVICES

7. The authority citation for Part 22 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 222, 303, 309 and 332.

8. The following sections are added immediately after the text of Section 22.969:

§ 22.970 Unacceptable interference to Part 90 non-cellular 800 MHz licensees from cellular radiotelephone or Part 90 ESMR systems.

(a) *Definition.* Except as provided in 47 C.F.R. §90.617(k), unacceptable interference to non-cellular Part 90 licensees in the 800 MHz band will be deemed to occur when the below conditions are met:

(1) A transceiver at a site at which interference is encountered:

(i) Is in good repair and operating condition, and is receiving:

(A) A median desired signal of -104 dBm or higher, as measured at the R.F. input of the receiver of a mobile unit; or

(B) A median desired signal of -101 dBm or higher, as measured at the R.F. input of the receiver of a portable *i.e.* hand-held unit; and, either

(ii) Is a voice transceiver:

(A) with manufacturer published performance specifications for the receiver section of the transceiver equal to, or exceeding, the minimum standards set out in Section (b), below; and;

(B) Receiving an undesired signal or signals which cause the measured Carrier to Noise plus Interference ($C/(I+N)$) ratio of the receiver section of said transceiver to be less than 20 dB, or,

(iii) Is a non-voice transceiver receiving an undesired signal or signals which cause the measured bit error rate (BER) (or some comparable specification) of the receiver section of said transceiver to be more than the value reasonably designated by the manufacturer.

(2) Provided, however, that if the receiver section of the mobile or portable voice transceiver does not conform to the standards set out in paragraph (b), below, then that transceiver shall be deemed subject to unacceptable interference only at sites where the median desired signal satisfies the applicable threshold measured signal power in paragraphs (a)(1)(i) after an upward adjustment to account for the difference in receiver section performance. The upward adjustment shall be equal to the increase in the desired signal required to restore the receiver section of the subject transceiver to the 20 dB $C/(I+N)$ ratio of paragraph (a)(1)(iv)(a) above. The adjusted threshold levels shall then define the minimum measured signal power(s) in lieu of paragraphs (a) (1) (i) at which the licensee using such non-compliant transceiver is entitled to interference protection.

(b) *Minimum Receiver Requirements.* Voice transceivers capable of operating in the 806-824

MHz portion of the 800 MHz band shall have the following minimum performance specifications in order for the system in which such transceivers are used to claim entitlement to full protection against unacceptable interference. (See paragraph (a) (2) above.)

(1) Voice units intended for mobile use: 75 dB intermodulation rejection ratio; 75 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.

(2) Voice units intended for portable use: 70 dB intermodulation rejection ratio; 70 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.

§ 22.971 Obligation to abate unacceptable interference.

(a) *Strict Responsibility.* Any licensee who, knowingly or unknowingly, directly or indirectly, causes or contributes to causing unacceptable interference to a non-cellular Part 90 licensee in the 800 MHz band, as defined in § 22.970 of this chapter, shall be strictly accountable to abate the interference, with full cooperation and utmost diligence, in the shortest time practicable. Interfering licensees shall consider all feasible interference abatement measures, including, but not limited to, the remedies specified in the interference resolution procedures set forth in § 22.972 of this chapter. This strict responsibility obligation applies to all forms of interference, including out-of-band emissions and intermodulation.

(b) *Joint and Several Responsibility.* If two or more licensees knowingly or unknowingly, directly or indirectly, cause or contribute to causing unacceptable interference to a non-cellular Part 90 licensee in the 800 MHz band, as defined in § 22.970 of this chapter, such licensees shall be jointly and severally responsible for abating interference, with full cooperation and utmost diligence, in the shortest practicable time.

(1) This joint and several responsibility rule requires interfering licensees to consider all feasible interference abatement measures, including, but not limited to, the remedies specified in the interference resolution procedures set forth in § 22.972(c) of this chapter. This joint and several responsibility rule applies to all forms of interference, including out-of-band emissions and intermodulation.

(2) Any licensee that can show that its signal does not directly or indirectly, cause or contribute to causing unacceptable interference to a non-cellular Part 90 licensee in the 800 MHz band, as defined in this chapter, shall not be held responsible for resolving unacceptable interference. Notwithstanding, any licensee that receives an interference complaint from a public safety/CII licensee shall respond to such complaint consistent with the interference resolution procedures set forth in this chapter.

§ 22.972 Interference resolution procedures.

(a) *Initial Notification.* (1) Cellular Radiotelephone licensees may receive initial notification of interference from non-cellular Part 90 licensees in the 800 MHz band pursuant to § 90.674(a) of this chapter.

(2) Cellular Radiotelephone licensees, in conjunction with Part 90 ESMR licensees, shall establish an electronic means of receiving the initial notification described in § 90.674(a) of this chapter. The electronic system must be designed so that all appropriate Cellular Radiotelephone licensees and Part 90 ESMR licensees can be contacted about the interference incident with a single notification. The electronic system for receipt of initial notification of interference complaints must be operating no later than **[Thirty days from effective date of Report and Order]**.

(3) Cellular Radiotelephone licensees must respond to the initial notification described in § 90.674(a) of this chapter, as soon as possible and no later than 24 hours after receipt of notification from a Part 90 public safety/CII licensee. This response time may be extended to 48 hours after receipt from other Part 90 non-cellular licensees provided affected communications on these systems are not safety related.

(b) *Interference Analysis.* Cellular Radiotelephone licensees – who receive an initial notification described in § 90.674(a) of this chapter – shall perform a timely analysis of the interference to identify the possible source. Immediate on-site visits may be conducted when necessary to complete timely analysis. Interference analysis must be completed and corrective action initiated within 48 hours of the initial complaint from a Part 90 public safety/CII licensee. This response time may be extended to 96 hours after the initial complaint from other Part 90 non-cellular licensees provided affected communications on these systems are not safety related. Corrective action may be delayed if the affected licensee agrees in writing (which may be, but is not required to be, recorded via e-mail or other electronic means) to a longer period.

(c) *Mitigation Steps.* (1) All Cellular Radiotelephone and Part 90 ESMR licensees who are responsible for causing unacceptable interference shall take all affirmative measures to resolve such interference. Cellular Radiotelephone licensees found to contribute to unacceptable interference, as defined in § 22.970, shall resolve such interference in the shortest time practicable. Cellular Radiotelephone licensees and Part 90 ESMR licensees must provide all necessary test apparatus and technical personnel skilled in the operation of such equipment as may be necessary to determine the most appropriate means of timely eliminating the interference. However, the means whereby interference is abated or the cell parameters that may need to be adjusted is left to the discretion of the Cellular Radiotelephone and/or Part 90 ESMR licensees, whose affirmative measures may include, but not be limited to, the following techniques:

- (i) increasing the desired power of the public safety/CII signal;
 - (ii) decreasing the power of the Part 90 ESMR and/or Cellular Radiotelephone system signal;
 - (iii) modifying the Part 90 ESMR and/or Cellular Radiotelephone system antenna height;
 - (iv) modifying the Part 90 ESMR and/or Cellular Radiotelephone system antenna characteristics;
 - (v) incorporating filters into Part 90 ESMR and/or Cellular Radiotelephone transmission equipment;
 - (vi) permanently changing Part 90 ESMR and/or Cellular Radiotelephone frequencies; and
 - (vii) supplying interference-resistant receivers to the affected public safety/CII licensee(s).
- If this technique is used, in all circumstances, Cellular Radiotelephone and/or Part 90 ESMR licensees shall be responsible for all costs thereof.

(2) Whenever short-term interference abatement measures prove inadequate, the affected Part 90 non-cellular licensee shall, consistent with but not compromising safety, make all necessary concessions to accepting interference until a longer-term remedy can be implemented.

(3) *Discontinuing operations when clear imminent danger exists.* When a Part 90 public safety licensee determines that a continuing presence of interference constitutes a clear and imminent danger

to life or property, the licensee causing the interference must discontinue the associated operation immediately, until a remedy can be identified and applied. The determination that a continuing presence exists that constitutes a clear and imminent danger to life or property, must be made by written statement that:

(i) is in the form of a declaration, notarized affidavit, or statement under penalty or perjury, from an officer or executive of the affected public safety licensee;

(ii) thoroughly describes the basis of the claim of clear and imminent danger;

(iii) was formulated on the basis of either personal knowledge or belief after due diligence;

(iv) is not proffered by a contractor or other third party; and

(v) has been approved by the Chief of the Wireless Telecommunication Bureau or other designated Commission official. Prior to the authorized official making a determination that a clear and imminent danger exists, the associated written statement must be served by hand-delivery or receipted fax on the applicable offending licensee, with a copy transmitted by the fastest available means to the Washington, D.C. office of the Commission's Wireless Telecommunications Bureau.

§ 22.973 Information exchange.

(a) *Prior Notification.* Public safety/CII licensees may notify a Part 90 ESMR or cellular radiotelephone licensee that they wish to receive prior notification of the activation or modification of Part 90 ESMR or cellular radiotelephone cell sites in their area. Thereafter, the Part 90 ESMR or cellular radiotelephone licensee must provide the following information to the public safety/CII licensee at least 10 business days before a new cell site is activated or an existing cell site is modified:

(1) location;

(2) effective radiated power;

(3) antenna height;

(4) channels available for use.

(b) *Purpose of Prior Notification.* The prior coordination of cell sites is for informational purposes only: public safety/CII licensees are not afforded the right to accept or reject the activation of a proposed cell or to unilaterally require changes in its operating parameters. The principal purposes of notification are to: (a) allow a public safety licensee to advise the Part 90 ESMR or Cellular Radiotelephone licensee whether it believes a proposed cell will generate unacceptable interference; (b) permit Cellular Radiotelephone or Part 90 ESMR licensees to make voluntary changes in cell parameters when a public safety licensee alerts them to possible interference; and (c) rapidly identify the source if interference is encountered when the cell is activated.

Part 24 of title 47 of the Code of Federal Regulation, is amended to read as follows:

PART 24 – PERSONAL COMMUNICATIONS SERVICES

9. The authority citation for Part 24 continues to read as follows:

AUTHORITY: Sections 47 U.S.C. 154, 301, 302, 303, 309 and 332.

10. Paragraph (b) of Section 24.203 is amended as follows and an new paragraph (d) is added:

§ 24.203 Construction requirements.

* * * * *

(b) Licensees of 10 MHz blocks except for the 1910-1915 MHz and 1990-1995 MHz, including 10 MHz C block licenses reconfigured pursuant to Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees, WT Docket No. 97-82, Sixth Report and Order, FCC 00-313, and 15 MHz blocks resulting from the disaggregation option as provided in the Commission's Rules Regarding Installment payment Financing for Personal Communications Services (PCS) Licensees, Second Report and Order and Further Notice of Proposed Rule Making, WT Docket 97-82, 12 FCC Rcd 16436 (1997), as modified by Order on Reconsideration of the Second Report and Order, WT Docket 97-82, 13 FCC Rcd 8345 (1998), must serve with a signal level sufficient to provide adequate service to at least one-quarter of the population in their licensed area within five years of being licensed, or make a showing of substantial service in their licensed area within five years of being licensed. Population is defined as the 1990 population census. Licensees may elect to use the 2000 population census to determine the five-year construction requirement. Failure by any licensee to meet these requirements will result in forfeiture of the license and the licensee will be ineligible to regain it.

* * * * *

(d) Licensees in the paired 1910-1915 MHz and 1990-1995 MHz bands must make a showing of "substantial service" in their license area within ten years of the date of initial issuance or renewal. "Substantial service" is defined as service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal. Failure by any licensee to meet this requirement will result in forfeiture of the license and the licensee will be ineligible to regain it.

* * * * *

11. A new paragraph (c) is added to Section 24.229 as follows:

§ 24.229 Frequencies.

* * * * *

(c) The paired frequency blocks 1910-1915 MHz and 1990-1995 MHz are available for assignment in the 175 Economic Areas defined in § 90.7 of this chapter. The 1910-1915 MHz block shall be used for mobile/portable station transmissions while the 1990-1995 MHz block shall be used for base station transmissions.

* * * * *

12. A new paragraph (c) is added to Section 24.247 as follows:

§ 24.247 Triggering a reimbursement obligation.

* * * * *

(c) Any new entrants granted licenses for the 1910-1915 MHz band must reimburse UTAM a pro rata share of its total expenses incurred by UTAM as of the date that the new entrants gain access to the

band. The percent required by new entrants to pay shall be calculated based upon the amount of spectrum granted to the new entrant as compared to the total amount of spectrum UTAM is responsible for clearing of incumbents (20 megahertz), and must be paid before a new entrant begins operations in the band. For example, if a new entrant obtains a license for 5 megahertz of spectrum in this band, it is required to reimburse UTAM one-quarter of UTAM's total costs to date on a pro rata shared basis. New entrants will be responsible for the actual costs associated with future relocation activities in their licensed spectrum, but will be entitled to seek reimbursement from UTAM for the proportion of those band clearing costs that benefit users of the 1915-1930 MHz band.

13. For the reasons discussed above, the Federal Communications Commission amends 47 CFR parts 74 and 78 as follows:

PART 74 – EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCASTING AND OTHER PROGRAM DISTRIBUTIONAL SERVICES

14. The authority citation for Part 74 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 303, 307, 336(f), 336(h) and 554.

15. Part 74.602(a)(3)(iii) is amended to read as follows:

§ 74.602 Frequency assignments.

(a) * * *

(3) * * *

(iii) Broadcast Auxiliary Service, Cable Television Remote Pickup Service, and Local Television Transmission Service licensees will be required to use the Band A channel plan in paragraph (a)(3)(i) of this section after completion of relocation by an Emerging Technologies licensee in accordance with § 74.690 or § 78.40 of this chapter. Licensees declining relocation may continue to use their existing channel plan but must discontinue use of the 1990-2025 MHz band when they indicate to an Emerging Technologies licensee, acting pursuant to § 74.690 or § 78.40 of this chapter, that they decline to be relocated.

16. Section 74.690 is amended to amend sections (a), (b), (c)(2), (c)(3), (d) and (e), and to remove and reserve section (e)(1)(ii) to read as follows:

§ 74.690 Transition of the 1990-2025 MHz band from the Broadcast Auxiliary Service to emerging technologies.

(a) New Entrants, collectively defined as those licensees proposing to use emerging technologies to implement Mobile Satellite Services in the 2000-2020 MHz band (MSS licensees), and those licensees authorized after July 1, 2004 to implement new fixed and mobile services in the 1990-1995 MHz band, may negotiate with Broadcast Auxiliary Service licensees operating on a primary basis and fixed service licensees operating on a primary basis in the 1990-2025 MHz band (Existing Licensees) for the purpose of agreeing to terms under which the Existing Licensees would relocate their operations to the 2025-2110 MHz band, to other authorized bands, or to other media; or, alternatively, would discontinue use of the 1990-2025 MHz band.

(b) An Existing Licensee in the 1990-2025 MHz band allocated for licensed emerging technology services will maintain primary status in the band until the Existing Licensee's operations are relocated by a New Entrant, are discontinued under the terms of paragraph (a) of this section, or become secondary under the terms of paragraph (e)(6) of this section or the Existing Licensee indicates to a New Entrant that it declines to be relocated.

(c) * * *

(2) The New Entrant completes all activities necessary for implementing the replacement facilities, including engineering and cost analysis of the relocation procedure and, if radio facilities are used, identifying and obtaining, on the incumbents' behalf, new microwave or Local Television Transmission frequencies and frequency coordination.

(3) The New Entrant builds the replacement system and tests it for comparability with the existing system.

(d) The Existing Licensee is not required to relocate until the alternative facilities are available to it for a reasonable time to make adjustments, determine comparability, and ensure a seamless handoff. If, within one year after the relocation to new facilities the Existing Licensee demonstrates that the new facilities are not comparable to the former facilities, the New Entrant must remedy the defects.

(e) Subject to the terms of this paragraph (e), the relocation of Existing Licensees will be carried out by MSS licensees in the following manner:

(1) * * *

(ii) [removed and reserved]

* * * * *

17. PART 78 – CABLE TELEVISION RELAY SERVICE

1. The authority citation for Part 78 continues to read as follows:

AUTHORITY: Secs. 2, 3, 4, 301, 303, 307, 308, 309, 48 Stat., as amended, 1064, 1065, 1066, 1081, 1082, 1083, 1084, 1085; 47 U.S.C. 152, 153, 154, 301, 303, 307, 308, 309.

2. Section 78.40 is amended to amend sections (a), (b), (c)(2), (c)(3), (e) and (f), and to remove and reserve section (f)(1)(ii) to read as follows:

§ 78.40 Transition of the 1990-2025 MHz band from the Cable Television Relay Service to emerging technologies.

(a) New Entrants, collectively defined as those licensees proposing to use emerging technologies to implement Mobile Satellite Services in the 2000-2020 MHz band (MSS licensees) and those licensees authorized after July 1, 2004 to implement new fixed and mobile services in the 1990-1995 MHz band, may negotiate with Cable Television Relay Service licensees operating on a primary basis and fixed service licensees operating on a primary basis in the 1990-2025 MHz band (Existing Licensees) for the purpose of agreeing to terms under which the Existing Licensees would relocate their operations to the 2025-2110 MHz band, to other authorized bands, or to other media; or, alternatively, would accept a sharing arrangement with the New Entrants that may result in an otherwise impermissible level of

interference to the Existing Licensee's operations.

(b) Existing Licensees in the 1990-2025 MHz band allocated for licensed emerging technology services will maintain primary status in the band until a New Entrant completes relocation of the Existing Licensee's operations [or the Existing Licensee indicates to a New Entrant that it declines to be relocated](#).

(c) * * *

(2) The New Entrant completes all activities necessary for implementing the replacement facilities, including engineering and cost analysis of the relocation procedure and, if radio facilities are used, identifying and obtaining, on the incumbents' behalf, new microwave or Cable Television Relay Service frequencies and frequency coordination.

(3) The New Entrant builds the replacement system and tests it for comparability with the existing system.

(d) * * *

(e) If, within one year after the relocation to new facilities the Existing Licensee demonstrates that the new facilities are not comparable to the former facilities, the New Entrant must remedy the defect.

(f) Subject to the terms of this paragraph (e), the relocation of Existing Licensees will be carried out by MSS licensees in the following manner:

(1) * * *

(ii) [removed and reserved]

* * * * *

Part 90 of title 47 of the Code of Federal Regulations, is amended to read as follows:

PART 90 – PRIVATE LAND MOBILE RADIO SERVICES

18. The authority citation for Part 90 continues to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), and 302(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7).

19. The following definitions are added to the text of Section 90.7.

§ 90.7 Definitions.

800 MHz Cellular System. In the 806-817 MHz/ 851-862 MHz band, a cellular system is defined as high-density system which:

(1) has more than five overlapping interactive sites featuring hand-off capability; and

(2) any one of such sites has an antenna height of less than 30.4 meters (100 feet) above ground level with an antenna height above average terrain (HAAT) of less than 152.4 meters (500 feet) and twenty or more paired frequencies.

* * * * *

Critical Infrastructure Industry (CII). Private internal radio services operated by State, local governments and non-government entities, including utilities, railroads, metropolitan transit systems, pipelines, private ambulances, volunteer fire departments, and not-for-profit organizations that offer emergency road services, provided these private internal radio services (i) are used to protect safety of life, health, or property; and (ii) are not made commercially available to the public.

* * * * *

Enhanced Specialized Mobile Radio System (ESMR). A specialized mobile radio (SMR) system operating in the 800 MHz band which employs an 800 MHz cellular system as defined in this section.

* * * * *

20. The text in Section 90.16 is revised to reflect the location of the NPSPAC spectrum after band reconfiguration.

§ 90.16. Public Safety National Plan.

The Commission has established a National Plan which specifies special policies and procedures governing the Public Safety Pool (formally Public Safety Radio Services and the Special Emergency Radio Service). The National Plan is contained in the Report and Order in General Docket No. 87–112. The principal spectrum resource for the National Plan is the 806–809 MHz and the 851–854 MHz bands at locations farther than 110 km (68.4 miles) from the U.S./Mexico border and 140 km (87 miles) from the U.S./Canadian border (“border regions”). In the border regions, the principal spectrum for the National Plan may be different. The National plan establishes planning regions covering all parts of the United States, Puerto Rico, and the U.S. Virgin Islands. No assignments will be made in the spectrum designated for the National Plan until a regional plan for the area has been accepted by the Commission.

21. Section 90.20 is amended by revising the table in paragraph (c)(3) and by revising the text in paragraph (d)(69).

§ 90.20 Public Safety Pool.

* * * * *

(c) * * *

(3) * * *

PUBLIC SAFETY POOL FREQUENCY TABLE

Frequency or band	Class of station(s)	Limitations	Coordinator
* * * * *	* * * * *	* * * * *	* * * * *
806 to 817	do.....	69.	
851 to 862	Base or mobile	69.	
* * * * *	* * * * *	* * * * *	* * * * *

(d) * * * * *

(69) Subpart S of this part contains rules for assignment of frequencies in the 806–816 MHz and 851–861 MHz bands.

22. Section 90.35 is amended by revising the table in paragraph (b)(3) and by revising the text in paragraph (c)(71).

§ 90.35 Industrial/Business Pool.

* * * * *

(b) * * *

(3) * * *

INDUSTRIAL/BUSINESS POOL FREQUENCY TABLE

Frequency or band	Class of station(s)	Limitations	Coordinator
* * * * *	* * * * *	* * * * *	* * * * *
809 to 824	Mobile.....	71.	
854 to 869	Base or mobile	71.	
* * * * *	* * * * *	* * * * *	* * * * *

(c) * * *

(71) Subpart S of this part contains rules for assignment of frequencies in the 809–824/854–869 and 896–901/935–940 MHz bands.

§ 90.209 Bandwidth limitations.

* * * * *

(b) * * *

(5) * * *

STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
*****	*****	*****
806-809/851-854	12.5	20
809-824/854-869.....	25	20
*****	*****	*****

* * * * *

23. The table in Section 90.210 is amended to reflect the 800 MHz band after band

reconfiguration.

§ 90.210 Emission masks.

* * * * *

APPLICABLE EMISSION MASKS

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
*****	*****	*****
806-809/851-854	B	H
809-824/854-869 ³	B	G
*****	*****	*****

¹ Equipment using single sideband J3E emission must the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.

² Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth Must meet the requirements of Emission Mask E.

³ ESMR systems shall comply with the emission mask provisions of §90.691.

* * * * *

24. The table in Section 90.213 is updated to reflect the 800 MHz band after band reconfiguration.

§ 90.213 Frequency stability.

(a) * * *

MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
*****	*****	*****	*****
806-809	¹⁴ 1.0	1.5	1.5
809-824.....	¹⁴ 1.5	2.5	2.5
851-854.....	1.0	1.5	1.5
854-869.....	1.5	2.5	2.5
*****	*****	*****	*****

* * * * *

25. Paragraph (e) of Section 90.607 is amended to exempt applicants for ESMR frequencies from frequency coordination requirements:

§ 90.607 Supplemental information to be furnished by applicants for facilities under this subpart.

* * * * *

(e) All applicants for frequencies governed by this subpart are subject to the frequency coordination requirements of § 90.175(b) except applicants requesting frequencies for EA-based SMR operations in the 806-824 MHz /851-869 MHz band or 896-901 MHz /935-940 MHz band.

26. Paragraph (c) of Section 90.609 is amended to eliminate references to Spectrum Block D which will no longer exist after band reconfiguration:

§ 90.609 Special limitations on amendment of applications for assignment or transfer of authorizations for radio systems above 800 MHz.

* * * * *

(c) Licensees of constructed systems in any category are permitted to make partial assignments of an authorized grant to an applicant proposing to create a new system or to an existing licensee that has loaded its system to 70 mobiles per channel and is expanding that system. An applicant authorized to expand an existing system or to create a new system with frequencies from any category obtained through partial assignment will receive the assignor's existing license expiration date and loading deadline for the frequencies that are assigned. A licensee that makes a partial assignment of a station's frequencies will not be authorized to obtain additional frequencies for that station for a period of one year from the date of the partial assignment.

* * * * *

27. Section 90.613 is amended to indicate the channel designations after band reconfiguration:

§ 90.613 Frequencies available.

The following tables indicate the channel designations of frequencies available for assignment to eligible applicants under this subpart. Frequencies shall be assigned in pairs, with mobile and control station transmitting frequencies taken from the 806–824 MHz band with corresponding base station frequencies being 45 MHz higher and taken from the 851–869 MHz band, or with mobile and control station frequencies taken from the 896–901 MHz band with corresponding base station frequencies being 39 MHz higher and taken from the 935–940 MHz band. Only the base station transmitting frequency of each pair is listed in the following tables.

TABLE OF 806-824/851-869 MHZ CHANNEL DESIGNATIONS

Channel No.	Base Frequency (MHz)
1	851.0125
2	.0375
3	.0500
4	.0625
5	.0750
6	.0875
7	.1000
8	.1125
9	.1250
10	.1375
11	.1500
12	.1625
13	.1750

14	.1875
15	.2000
16	.2125
17	.2250
18	.2375
19	.2500
20	.2625
21	.2750
22	.2875
23	.3000
24	.3125
25	.3250
26	.3375
27	.3500
28	.3625
29	.3750
30	.3875
31	.4000
32	.4125
33	.4250
34	.4375
35	.4500
36	.4625
37	.4750
38	.4875
39	.5125
40	.5375
41	.5500
42	.5625
43	.5750
44	.5875
45	.6000
46	.6125
47	.6250
48	.6375
49	.6500
50	.6625
51	.6750
52	.6875
53	.7000
54	.7125
55	.7250
56	.7375
57	.7500
58	.7625
59	.7750
60	.7875
61	.8000
62	.8125

63	.8250
64	.8375
65	.8500
66	.8625
67	.8750
68	.8875
69	.9000
70	.9125
71	.9250
72	.9375
73	.9500
74	.9625
75	.9750
76	.9875
77	852.0125
78	.0375
79	.0500
80	.0625
81	.0750
82	.0875
83	.1000
84	.1125
85	.1250
86	.1375
87	.1500
88	.1625
89	.1750
90	.1875
91	.2000
92	.2125
93	.2250
94	.2375
95	.2500
96	.2625
97	.2750
98	.2875
99	.3000
100	.3125
101	.3250
102	.3375
103	.3500
104	.3625
105	.3750
106	.3875
107	.4000
108	.4125
109	.4250
110	.4375
111	.4500

112.....	.4625
113.....	.4750
114.....	.4875
115.....	.5125
116.....	.5375
117.....	.5500
118.....	.5625
119.....	.5750
120.....	.5875
121.....	.6000
122.....	.6125
123.....	.6250
124.....	.6375
125.....	.6500
126.....	.6625
127.....	.6750
128.....	.6875
129.....	.7000
130.....	.7125
131.....	.7250
132.....	.7375
133.....	.7500
134.....	.7625
135.....	.7750
136.....	.7875
137.....	.8000
138.....	.8125
139.....	.8250
140.....	.8375
141.....	.8500
142.....	.8625
143.....	.8750
144.....	.8875
145.....	.9000
146.....	.9125
147.....	.9250
148.....	.9375
149.....	.9500
150.....	.9625
151.....	.9750
152.....	.9875
153.....	853.0125
154.....	.0375
155.....	.0500
156.....	.0625
157.....	.0750
158.....	.0875
159.....	.1000
160.....	.1125

161.....	.1250
162.....	.1375
163.....	.1500
164.....	.1625
165.....	.1750
166.....	.1875
167.....	.2000
168.....	.2125
169.....	.2250
170.....	.2375
171.....	.2500
172.....	.2625
173.....	.2750
174.....	.2875
175.....	.3000
176.....	.3125
177.....	.3250
178.....	.3375
179.....	.3500
180.....	.3625
181.....	.3750
182.....	.3875
183.....	.4000
184.....	.4125
185.....	.4250
186.....	.4375
187.....	.4500
188.....	.4625
189.....	.4750
190.....	.4875
191.....	.5000
192.....	.5125
193.....	.5250
194.....	.5375
195.....	.5500
196.....	.5625
197.....	.5750
198.....	.5875
199.....	.6000
200.....	.6125
201.....	.6250
202.....	.6375
203.....	.6500
204.....	.6625
205.....	.6750
206.....	.6875
207.....	.7000
208.....	.7125
209.....	.7250

210.....	.7375
211.....	.7500
212.....	.7625
213.....	.7750
214.....	.7875
215.....	.8000
216.....	.8125
217.....	.8250
218.....	.8375
219.....	.8500
220.....	.8625
221.....	.8750
222.....	.8875
223.....	.9000
224.....	.9125
225.....	.9250
226.....	.9375
227.....	.9500
228.....	.9625
229.....	.9750
230.....	.9875
231.....	854.0125
232.....	.0375
233.....	.0625
234.....	.0875
235.....	.1125
236.....	.1375
237.....	.1625
238.....	.1875
239.....	.2125
240.....	.2375
241.....	.2625
242.....	.2875
243.....	.3125
244.....	.3375
245.....	.3625
246.....	.3875
247.....	.4125
248.....	.4375
249.....	.4625
250.....	.4875
251.....	.5125
252.....	.5375
253.....	.5625
254.....	.5875
255.....	.6125
256.....	.6375
257.....	.6625
258.....	.6875

259.....	.7125
260.....	.7375
261.....	.7625
262.....	.7875
263.....	.8125
264.....	.8375
265.....	.8625
266.....	.8875
267.....	.9125
268.....	.9375
269.....	.9625
270.....	.9875
271.....	855.0125
272.....	.0375
273.....	.0625
274.....	.0875
275.....	.1125
276.....	.1375
277.....	.1625
278.....	.1875
279.....	.2125
280.....	.2375
281.....	.2625
282.....	.2875
283.....	.3125
284.....	.3375
285.....	.3625
286.....	.3875
287.....	.4125
288.....	.4375
289.....	.4625
290.....	.4875
291.....	.5125
292.....	.5375
293.....	.5625
294.....	.5875
295.....	.6125
296.....	.6375
297.....	.6625
298.....	.6875
299.....	.7125
300.....	.7375
301.....	.7625
302.....	.7875
303.....	.8125
304.....	.8375
305.....	.8625
306.....	.8875
307.....	.9125

308.....	.9375
309.....	.9625
310.....	.9875
311.....	856.0125
312.....	.0375
313.....	.0625
314.....	.0875
315.....	.1125
316.....	.1375
317.....	.1625
318.....	.1875
319.....	.2125
320.....	.2375
321.....	.2625
322.....	.2875
323.....	.3125
324.....	.3375
325.....	.3625
326.....	.3875
327.....	.4125
328.....	.4375
329.....	.4625
330.....	.4875
331.....	.5125
332.....	.5375
333.....	.5625
334.....	.5875
335.....	.6125
336.....	.6375
337.....	.6625
338.....	.6875
339.....	.7125
340.....	.7375
341.....	.7625
342.....	.7875
343.....	.8125
344.....	.8375
345.....	.8625
346.....	.8875
347.....	.9125
348.....	.9375
349.....	.9625
350.....	.9875
351.....	857.0125
352.....	.0375
353.....	.0625
354.....	.0875
355.....	.1125
356.....	.1375

357.....	.1625
358.....	.1875
359.....	.2125
360.....	.2375
361.....	.2625
362.....	.2875
363.....	.3125
364.....	.3375
365.....	.3625
366.....	.3875
367.....	.4125
368.....	.4375
369.....	.4625
370.....	.4875
371.....	.5125
372.....	.5375
373.....	.5625
374.....	.5875
375.....	.6125
376.....	.6375
377.....	.6625
378.....	.6875
379.....	.7125
380.....	.7375
381.....	.7625
382.....	.7875
383.....	.8125
384.....	.8375
385.....	.8625
386.....	.8875
387.....	.9125
388.....	.9375
389.....	.9625
390.....	.9875
391.....	858.0125
392.....	.0375
393.....	.0625
394.....	.0875
395.....	.1125
396.....	.1375
397.....	.1625
398.....	.1875
399.....	.2125
400.....	.2375
401.....	.2625
402.....	.2875
403.....	.3125
404.....	.3375
405.....	.3625

406.....	.3875
407.....	.4125
408.....	.4375
409.....	.4625
410.....	.4875
411.....	.5125
412.....	.5375
413.....	.5625
414.....	.5875
415.....	.6125
416.....	.6375
417.....	.6625
418.....	.6875
419.....	.7125
420.....	.7375
421.....	.7625
422.....	.7875
423.....	.8125
424.....	.8375
425.....	.8625
426.....	.8875
427.....	.9125
428.....	.9375
429.....	.9625
430.....	.9875
431.....	859.0125
432.....	.0375
433.....	.0625
434.....	.0875
435.....	.1125
436.....	.1375
437.....	.1625
438.....	.1875
439.....	.2125
440.....	.2375
441.....	.2625
442.....	.2875
443.....	.3125
444.....	.3375
445.....	.3625
446.....	.3875
447.....	.4125
448.....	.4375
449.....	.4625
450.....	.4875
451.....	.5125
452.....	.5375
453.....	.5625
454.....	.5875

455.....	.6125
456.....	.6375
457.....	.6625
458.....	.6875
459.....	.7125
460.....	.7375
461.....	.7625
462.....	.7875
463.....	.8125
464.....	.8375
465.....	.8625
466.....	.8875
467.....	.9125
468.....	.9375
469.....	.9625
470.....	.9875
471.....	860.0125
472.....	.0375
473.....	.0625
474.....	.0875
475.....	.1125
476.....	.1375
477.....	.1625
478.....	.1875
479.....	.2125
480.....	.2375
481.....	.2625
482.....	.2875
483.....	.3125
484.....	.3375
485.....	.3625
486.....	.3875
487.....	.4125
488.....	.4375
489.....	.4625
490.....	.4875
491.....	.5125
492.....	.5375
493.....	.5625
494.....	.5875
495.....	.6125
496.....	.6375
497.....	.6625
498.....	.6875
499.....	.7125
500.....	.7375
501.....	.7625
502.....	.7875
503.....	.8125

504.....	.8375
505.....	.8625
506.....	.8875
507.....	.9125
508.....	.9375
509.....	.9625
510.....	.9875
511.....	861.0125
512.....	.0375
513.....	.0625
514.....	.0875
515.....	.1125
516.....	.1375
517.....	.1625
518.....	.1875
519.....	.2125
520.....	.2375
521.....	.2625
522.....	.2875
523.....	.3125
524.....	.3375
525.....	.3625
526.....	.3875
527.....	.4125
528.....	.4375
529.....	.4625
530.....	.4875
531.....	.5125
532.....	.5375
533.....	.5625
534.....	.5875
535.....	.6125
536.....	.6375
537.....	.6625
538.....	.6875
539.....	.7125
540.....	.7375
541.....	.7625
542.....	.7875
543.....	.8125
544.....	.8375
545.....	.8625
546.....	.8875
547.....	.9125
548.....	.9375
549.....	.9625
550.....	.9875
551.....	862.0125
552.....	.0375

553.....	.0625
554.....	.0875
555.....	.1125
556.....	.1375
557.....	.1625
558.....	.1875
559.....	.2125
560.....	.2375
561.....	.2625
562.....	.2875
563.....	.3125
564.....	.3375
565.....	.3625
566.....	.3875
567.....	.4125
568.....	.4375
569.....	.4625
570.....	.4875
571.....	.5125
572.....	.5375
573.....	.5625
574.....	.5875
575.....	.6125
576.....	.6375
577.....	.6625
578.....	.6875
579.....	.7125
580.....	.7375
581.....	.7625
582.....	.7875
583.....	.8125
584.....	.8375
585.....	.8625
586.....	.8875
587.....	.9125
588.....	.9375
589.....	.9625
590.....	.9875
591.....	863.0125
592.....	.0375
593.....	.0625
594.....	.0875
595.....	.1125
596.....	.1375
597.....	.1625
598.....	.1875
599.....	.2125
600.....	.2375
601.....	.2625

602.....	.2875
603.....	.3125
604.....	.3375
605.....	.3625
606.....	.3875
607.....	.4125
608.....	.4375
609.....	.4625
610.....	.4875
611.....	.5125
612.....	.5375
613.....	.5625
614.....	.5875
615.....	.6125
616.....	.6375
617.....	.6625
618.....	.6875
619.....	.7125
620.....	.7375
621.....	.7625
622.....	.7875
623.....	.8125
624.....	.8375
625.....	.8625
626.....	.8875
627.....	.9125
628.....	.9375
629.....	.9625
630.....	.9875
631.....	864.0125
632.....	.0375
633.....	.0625
634.....	.0875
635.....	.1125
636.....	.1375
637.....	.1625
638.....	.1875
639.....	.2125
640.....	.2375
641.....	.2625
642.....	.2875
643.....	.3125
644.....	.3375
645.....	.3625
646.....	.3875
647.....	.4125
648.....	.4375
649.....	.4625
650.....	.4875

651.....	.5125
652.....	.5375
653.....	.5625
654.....	.5875
655.....	.6125
656.....	.6375
657.....	.6625
658.....	.6875
659.....	.7125
660.....	.7375
661.....	.7625
662.....	.7875
663.....	.8125
664.....	.8375
665.....	.8625
666.....	.8875
667.....	.9125
668.....	.9375
669.....	.9625
670.....	.9875
671.....	865.0125
672.....	.0375
673.....	.0625
674.....	.0875
675.....	.1125
676.....	.1375
677.....	.1625
678.....	.1875
679.....	.2125
680.....	.2375
681.....	.2625
682.....	.2875
683.....	.3125
684.....	.3375
685.....	.3625
686.....	.3875
687.....	.4125
688.....	.4375
689.....	.4625
690.....	.4875
691.....	.5125
692.....	.5375
693.....	.5625
694.....	.5875
695.....	.6125
696.....	.6375
697.....	.6625
698.....	.6875
699.....	.7125

700.....	.7375
701.....	.7625
702.....	.7875
703.....	.8125
704.....	.8375
705.....	.8625
706.....	.8875
707.....	.9125
708.....	.9375
709.....	.9625
710.....	.9875
711.....	866.0125
712.....	.0375
713.....	.0625
714.....	.0875
715.....	.1125
716.....	.1375
717.....	.1625
718.....	.1875
719.....	.2125
720.....	.2375
721.....	.2625
722.....	.2875
723.....	.3125
724.....	.3375
725.....	.3625
726.....	.3875
727.....	.4125
728.....	.4375
729.....	.4625
730.....	.4875
731.....	.5125
732.....	.5375
733.....	.5625
734.....	.5875
735.....	.6125
736.....	.6375
737.....	.6625
738.....	.6875
739.....	.7125
740.....	.7375
741.....	.7625
742.....	.7875
743.....	.8125
744.....	.8375
745.....	.8625
746.....	.8875
747.....	.9125
748.....	.9375

749.....	.9625
750.....	.9875
751.....	867.0125
752.....	.0375
753.....	.0625
754.....	.0875
755.....	.1125
756.....	.1375
757.....	.1625
758.....	.1875
759.....	.2125
760.....	.2375
761.....	.2625
762.....	.2875
763.....	.3125
764.....	.3375
765.....	.3625
766.....	.3875
767.....	.4125
768.....	.4375
769.....	.4625
770.....	.4875
771.....	.5125
772.....	.5375
773.....	.5625
774.....	.5875
775.....	.6125
776.....	.6375
777.....	.6625
778.....	.6875
779.....	.7125
780.....	.7375
781.....	.7625
782.....	.7875
783.....	.8125
784.....	.8375
785.....	.8625
786.....	.8875
787.....	.9125
788.....	.9375
789.....	.9625
790.....	.9875
791.....	868.0125
792.....	.0375
793.....	.0625
794.....	.0875
795.....	.1125
796.....	.1375
797.....	.1625

798.....	.1875
799.....	.2125
800.....	.2375
801.....	.2625
802.....	.2875
803.....	.3125
804.....	.3375
805.....	.3625
806.....	.3875
807.....	.4125
808.....	.4375
809.....	.4625
810.....	.4875
811.....	.5125
812.....	.5375
813.....	.5625
814.....	.5875
815.....	.6125
816.....	.6375
817.....	.6625
818.....	.6875
819.....	.7125
820.....	.7375
821.....	.7625
822.....	.7875
823.....	.8125
824.....	.8375
825.....	.8625
826.....	.8875
827.....	.9125
828.....	.9375
829.....	.9625
830.....	.9875

* * * * *

28. A new section 90.614 is added immediately after the text of Section 90.613 as follows:

§ 90.614 Cellular and non-cellular portions of 806-824/851-869 MHz band for non-border areas.

The 806-824/851-869 MHz band (“800 MHz band”) will be divided as follows at locations farther than 110 km (68.4 miles) from the U.S./Mexico border and 140 km (87 miles) from the U.S./Canadian border (“non-border areas”)

(a) 800 MHz cellular systems – as defined in § 90.7 – are prohibited from operating on channels 1-550 in non-border areas.

(b) 800 MHz cellular systems – as defined in § 90.7 – are permitted to operate on channels 551-830 in non-border areas.

(c) In the following counties and parishes, 800 MHz cellular systems – as defined in § 90.7 – are permitted to operate on channels 411-830:

Alabama

Autauga, Baldwin, Barbour, Bibb, Blount, Bullock, Butler, Calhoun, Chambers, Cherokee, Chilton, Choctaw, Clarke, Clay, Cleburne, Coffee, Colbert, Conecuh, Coosa, Covington, Crenshaw, Cullman, Dale, Dallas, DeKalb, Elmore, Escambia, Etowah, Fayette, Franklin, Geneva, Greene, Hale, Henry, Houston, Jackson, Jefferson, Lamar, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Madison, Marengo, Marion, Marshall, Mobile, Monroe, Montgomery, Morgan, Perry, Pickens, Pike, Randolph, Russell, Shelby, St Clair, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, Washington, Wilcox, Winston

Florida

Bay, Calhoun, Escambia, Franklin, Gadsden, Gulf, Holmes, Jackson, Jefferson, Leon, Liberty, Madison, Nassau, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton, Washington

Georgia

Appling, Atkinson, Bacon, Baker, Baldwin, Banks, Barrow, Bartow, Ben Hill, Berrien, Bibb, Bleckley, Brantley, Brooks, Bryan, Bulloch, Burke, Butts, Calhoun, Camden, Candler, Carroll, Catoosa, Charlton, Chatham, Chattahoochee, Chattooga, Cherokee, Clarke, Clay, Clayton, Clinch, Cobb, Coffee, Colquitt, Columbia, Cook, Coweta, Crawford, Crisp, Dade, Dawson, Decatur, DeKalb, Dodge, Dooly, Dougherty, Douglas, Early, Echols, Effingham, Elbert, Emanuel, Evans, Fannin, Fayette, Floyd, Forsyth, Franklin, Fulton, Gilmer, Glascock, Glynn, Gordon, Grady, Greene, Gwinnett, Habersham, Hall, Hancock, Haralson, Harris, Hart, Heard, Henry, Houston, Irwin, Jackson, Jasper, Jeff Davis, Jefferson, Jenkins, Johnson, Jones, Lamar, Lanier, Laurens, Lee, Liberty, Lincoln, Long, Lowndes, Lumpkin, Macon, Madison, Marion, McDuffie, McIntosh, Meriwether, Miller, Mitchell, Monroe, Montgomery, Morgan, Murray, Muscogee, Newton, Oconee, Oglethorpe, Paulding, Peach, Pickens, Pierce, Pike, Polk, Pulaski, Putnam, Quitman, Rabun, Randolph, Richmond, Rockdale, Schley, Screven, Seminole, Spalding, Stephens, Stewart, Sumter, Talbot, Taliaferro, Tattnall, Taylor, Telfair, Terrell, Thomas, Tift, Toombs, Towns, Treutlen, Troup, Turner, Twiggs, Union, Upson, Walker, Walton, Ware, Warren, Washington, Wayne, Webster, Wheeler, White, Whitfield, Wilcox, Wilkes, Wilkinson, Worth

Louisiana

Catahoula, Concordia, Madison, Tensas

Mississippi

Adams, Alcorn, Amite, Attala, Calhoun, Carroll, Chickasaw, Choctaw, Claiborne, Clarke, Clay, Copiah, Covington, Forrest, Franklin, George, Greene, Grenada, Hancock, Harrison, Hinds, Holmes, Itawamba, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lee, Lincoln, Lowndes, Madison, Marion, Monroe, Montgomery, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Pontotoc, Prentiss, Rankin, Scott, Simpson, Smith, Stone, Tippah, Tishomingo, Union, Walthall, Warren, Wayne, Webster, Wilkinson, Winston, Yazoo

North Carolina

Cherokee, Clay, Graham, Jackson, Macon

South Carolina

Abbeville, Aiken, Allendale, Anderson, Bamberg, Barnwell, Beaufort, Edgefield, Greenwood, Hampton, Jasper, McCormick, Oconee

Tennessee

Bledsoe, Bradley, Franklin, Giles, Hamilton, Hardin, Lawrence, Lincoln, Marion, McMinn

29. Section 90.615 is amended to read as follows to reflect the General Category after band reconfiguration.

§ 90.615 Individual channels available in the General Category in 806-824/851-869 MHz band.

The General Category will consist of channels 231-260 at locations farther then 110 km (68.4 miles) from the U.S./Mexico border and 140 km (87 miles) from the U.S./Canadian border.

(a) Channels 231-260 will be available only to eligible applicants in the Public Safety Category until **[Three years from effective date of Report and Order]**. These same channels will be available only to eligible applicants in the Public Safety or Critical Infrastructure Industry Categories from **[Three years from effective date of Report and Order]** until **[Five years from effective date of Report and Order]**.

(b) All entities will be eligible for licensing on Channels 231-260 after **[Five years from effective date of Report and Order]**.

30. Section 90.617 is amended to read as follows to reflect the channels available after band reconfiguration.

§ 90.617 Frequencies in the 809.750-824/854.750-869 MHz, and 896-901/935-940 MHz bands available for trunked, conventional or cellular system use in non-border areas.

Except for the counties and parishes listed in § 90.614(c), the following channels will be available at locations farther then 110 km (68.4 miles) from the U.S./Mexico border and 140 km (87 miles) from the U.S./Canadian border (“non-border areas”). The channels in the counties and parishes listed in § 90.614(c) will be available in accordance with an agreement between Southern LINC and Nextel Communications, Inc. The agreement will be approved by the Chief of the Wireless Telecommunications Bureau.

(a) The channels listed in Table 1 and paragraph (a)(1) of this section are available for non-cellular operations to eligible applicants in the Public Safety Category which consists of licensees eligible in the Public Safety Pool of subpart B of this part. 800 MHz cellular systems as defined in § 90.7 are prohibited on these channels. These frequencies are available in non-border areas. Specialized Mobile Radio Systems will not be authorized in this category. These channels are available for intercategory sharing as indicated in §90.621(e).

TABLE 1 – PUBLIC SAFETY POOL 806-816/851-861 MHZ BAND CHANNELS (70 CHANNELS)

Group No.	Channel Nos.
269	269-289-311-399-439
270	270-290-312-400-440
279	279-299-319-339-359
280	280-300-320-340-360
309	309-329-349-369-389
310	310-330-350-370-390
313	313-353-393-441-461
314	314-354-394-448-468
321	321-341-361-381-419
328	328-348-368-388-420

351	351-379-409-429-449
332	352-380-410-430-450
Single Channels	391, 392, 401, 408, 421, 428, 459, 460, 469, 470

(1) Channels numbers 1–230 are also available to eligible applicants in the Public Safety Category in non-border areas. The assignment of these channels will be done in accordance with the policies defined in the Report and Order of Gen. Docket No. 87–112 (See §90.16).

(b) Unless otherwise specified, the channels listed in Table 2 are available for non-cellular operations to applicants eligible in the Industrial/Business Pool of subpart C of this part but exclude Special Mobilized Radio Systems as defined in §90.603(c). 800 MHz cellular systems as defined in § 90.7 are prohibited on these channels. These frequencies are available in non-border areas. Specialized Mobile Radio (SMR) systems will not be authorized on these frequencies. These channels are available for inter-category sharing as indicated in § 90.621(e).

TABLE 2 – BUSINESS/INDUSTRIAL/LAND TRANSPORTATION POOL 806-816/851-861 MHZ BAND CHANNELS (100 CHANNELS)

Group No.	Channel Nos.
322	322-362-402-442-482
323	323-363-403-443-483
324	324-364-404-444-484
325	325-365-405-445-485
326	326-366-406-446-486
327	327-367-407-447-487
342	342-382-422-462-502
343	343-383-423-463-503
344	344-384-424-464-504
345	345-385-425-465-505
346	346-386-426-466-506
347	347-387-427-467-507
Single Channels	261, 271, 281, 291, 301, 262, 272, 282, 292, 302, 263, 273, 283, 293, 303, 264, 274, 284, 294, 304, 265, 275, 285, 295, 305, 266, 276, 286, 296, 306, 267, 277, 287, 297, 307, 268, 278, 288, 298, 308

(c) The channels listed in Table 3 are available to applicants eligible in the Industrial/Business Pool of subpart C of this part but exclude Special Mobilized Radio Systems as defined in §90.603(c). These frequencies are available in non-border areas. Specialized Mobile Radio (SMR) systems will not be authorized on these frequencies. These channels are available for intercategory sharing as indicated in §90.621(e).

TABLE 3 – BUSINESS/INDUSTRIAL/LAND TRANSPORTATION POOL 896-901/935-940 MHZ BAND CHANNELS 199 CHANNELS

For multi-channel systems, channels may be grouped vertically or horizontally as they appear in

the below table.

Channel Nos.

11-12-13-14-15	211-212-213-214-215
16-17-18-19-20	216-217-218-219-220
31-32-33-34-35	231-232-233-234-235
36-37-38-39-40	236-237-238-239-240
51-52-53-54-55	251-252-253-254-255
56-57-58-59-60	256-257-258-259-260
71-72-73-74-75	271-272-273-274-275
76-77-78-79-80	276-277-278-279-280
91-92-93-94-95	291-292-293-294-295
96-97-98-99-100	296-297-298-299-300
111-112-113-114-115	311-312-313-314-315
116-117-118-119-120	316-317-318-319-320
131-132-133-134-135	331-332-333-334-335
136-137-138-139-140	336-337-338-339-340
151-152-153-154-155	351-352-353-354-355
156-157-158-159-160	356-357-358-359-360
171-172-173-174-175	371-372-373-374-375
176-177-178-179-180	376-377-378-379-380
191-192-193-194-195	391-392-393-394-395
196-197-198-199-200	396-397-398-399

(d) Unless otherwise specified, the channels listed in Tables 4A and 4B are available for non-cellular operations only to eligibles in the SMR category – which consists of Specialized Mobile Radio (SMR) stations and eligible end users. 800 MHz cellular systems as defined in § 90.7 are prohibited on these channels. These frequencies are available in non-border areas. The spectrum blocks listed in Table 4A are available for EA-based services (as defined by § 90.681 of this chapter) prior to **[Effective date of Report and Order]**. No new EA-based services will be authorized after **[Effective date of Report and Order]**. EA-based licensees who operate non-cellular systems prior to **[Effective date of Report and Order]** may choose to remain on these channels in the non-cellular portion of the 800 MHz band (as defined in § 90.614 of this chapter.) These licensees may continue to operate non-cellular systems and will be grandfathered indefinitely. The channels listed in Table 4B will be available for site-base licensing after **[Effective date of Report and Order]** in any Economic Area where no EA-based licensee is authorized for these channels.

TABLE 4A – EA-BASED SMR CATEGORY 806-816/851-861 MHZ BAND CHANNELS FOR CELLULAR OPERATIONS AVAILABLE PRIOR TO **[Effective date of Report and Order]** (80 CHANNELS.)

Spectrum Block	Channel Nos.
G	311-351-391-431-471
H	312-352-392-432-472
I	313-353-393-433-473
J	314-354-394-434-474
K	315-355-395-435-475
L	316-356-396-436-476
M	317-357-397-437-477

N	318-358-398-438-478
O	331-371-411-451-491
P	332-372-412-452-492
Q	333-373-413-453-493
R	334-374-414-454-494
S	335-375-415-455-495
T	336-376-416-456-496
U	337-377-417-457-497
V	338-378-418-458-498

TABLE 4B – SMR CATEGORY 806-816/851-861 MHZ BAND CHANNELS FOR CELLULAR OPERATIONS AVAILABLE FOR SITE-BASED LICENSING AFTER [Effective date of *Report and Order*] (80 CHANNELS.)

Group No.	Channel Nos.
315	315-355-395-435-475
316	316-356-396-436-476
317	317-357-397-437-477
318	318-358-398-438-478
331	331-371-411-451-491
332	332-372-412-452-492
333	333-373-413-453-493
334	334-374-414-454-494
335	335-375-415-455-495
336	336-376-416-456-496
337	337-377-417-457-497
338	338-378-418-458-498
Single Channels	431, 432, 433, 434, 471, 472, 473, 474, 479, 480, 481, 488, 489, 490, 499, 500, 501, 508, 509, 510

(e) The Channels listed in § 90.614(b) and (c) of this chapter are available to eligibles in the SMR category – which consists of Specialized Mobile Radio (SMR) stations and eligible end users. ESMR licensees which employ an 800 MHz cellular system as defined in § 90.7 are permitted to operate on these channels in non-border areas. ESMR licensees authorized prior to [Effective date of *Report and Order*] may continue to operate, if they so chose, on the channels listed in Table 5. These licensees will be grandfathered indefinitely.

TABLE 5 – ESMR CATEGORY 816-821/861-866 MHZ BAND CHANNELS FOR CELLULAR OPERATIONS IN NON-BORDER AREAS AVAILABLE PRIOR TO [Effective date of *Report and Order*]. (200 CHANNELS)

Spectrum Block	Channel Nos.
A	511 through 530
B	531 through 590
C	591 through 710

(f) The channels listed in Tables 6 are available for operations only to eligibles in the SMR category – which consists of Specialized Mobile Radio (SMR) stations and eligible end users. These frequencies are available in non-border areas. The spectrum blocks listed below are available for EA-based services according to § 90.681.

TABLE 6 – SMR CATEGORY 896-901/935-940 MHZ BAND CHANNELS (200 CHANNELS)

Block	Channel Nos.
A	1-2-3-4-5-6-7-8-9-10
B	21-22-23-24-25-26-27-28-29-30
C	41-42-43-44-45-46-47-48-49-50
D	61-62-63-64-65-66-67-68-69-70
E	81-82-83-84-85-86-87-88-89-90
F	101-102-103-104-105-106-107-108-109-110
G	121-122-123-124-125-126-127-128-129-130
H	141-142-143-144-145-146-147-148-149-150
I	161-162-163-164-165-166-167-168-169-170
J	181-182-183-184-185-186-187-188-189-190
K	201-202-203-204-205-206-207-208-209-210
L	221-222-223-224-225-226-227-228-229-230
M	241-242-243-244-245-246-247-248-249-250
N	261-262-263-264-265-266-267-268-269-270
O	281-282-283-284-285-286-287-288-289-290
P	301-302-303-304-305-306-307-308-309-310
Q	321-322-323-324-325-326-327-328-329-330
R	341-342-343-344-345-346-347-348-349-350
S	361-362-363-364-365-366-367-368-369-370
T	381-382-383-384-385-386-387-388-389-390

(g) Channels below 470 listed in Tables 2 and 4B which are vacated by ESMR licensees after **[Effective date of Report and Order]** are available only to eligible applicants in the Public Safety Category until **[Three years from effective date of Report and Order]**. These same channels will be available only to eligible applicants in the Public Safety or Critical Infrastructure Industry Categories from **[Three years from effective date of Report and Order]** until **[Five years from effective date of Report and Order]**. After **[Five years from effective date of Report and Order]** these channels will revert back to their original pool categories.

(h) Channels below 470 listed in Tables 2 and 4B which are vacated by licensees relocating to Channels 511-550 after **[Effective date of Report and Order]** are available only to eligible applicants in the Public Safety Category until **[Three years from effective date of Report and Order]**. These same channels will be available only to eligible applicants in the Public Safety or Critical Infrastructure Industry Categories from **[Three years from effective date of Report and Order]** until **[Five years from effective date of Report and Order]**. After **[Five years from effective date of Report and Order]** these channels will revert back to their original pool categories.

(i) Special Mobilized Radio Systems licensees who operate non-cellular systems on any of the public safety channels listed in Table 1 prior to **[Effective date of Report and Order]** are grandfathered and may continue to operate on these channels indefinitely. These grandfathered licensees will be prohibited from operating 800 MHz cellular systems as defined in § 90.7. Site-based licensees who are grandfathered on any of the public safety channels listed in Table 1 may modify

their license only if they obtain concurrence from a certified public safety coordinator in accordance with § 90.175(c). Grandfathered EA-based licensees, however, are exempt from any of the frequency coordination requirements of § 90.175 as long as their operations remain within the Economic Area defined by their license in accordance with the requirements of § 90.683(a).

(j) Licensees operating ESMR systems in the non-cellular portion of the band (as defined in § 90.614) prior to **[Effective date of Report and Order]** may elect to continue operating in the non-cellular portion of the band. These licensees will be permitted to continue operating 800 MHz cellular systems (as defined in § 90.7) in the non-cellular portion of the band. These licensees will be grandfathered indefinitely subject to the provisions of §§ 90.673, 90.674 and 90.675.

(k) Licensees may operate systems other than 800 MHz cellular systems (as defined in § 90.7) on Channels 511-550 at any location vacated by an EA-based SMR licensee. For operations on these channels, unacceptable interference (as defined in §§ 22.970 & 90.672) will be deemed to occur only at sites where the following median desired signals are received (rather than those specified in §§ 22.970(a)(1)(i) & 90.672(a)(1)(i)). The minimum required median desired signal, as measured at the R.F. input of the receiver, will be as follows:

(1) Mobile units:

(i) For channels 511 to 524 – the minimum median desired signal levels specified in §§ 22.970(a)(1)(i) & 90.672(a)(1)(i) shall apply;

(ii) For channels 524 to 534 – the minimum median desired signal level shall increase linearly from the values specified in §§ 22.970(a)(1)(i) & 90.672(a)(1)(i) to -70 dBm;

(iii) For channels 534 to 550 – the minimum median desired signal level shall increase linearly from -70 dBm to -65 dBm.

(2) Portable units:

(i) For channels 511 to 524 – the minimum median desired signal levels specified in §§ 22.970(a)(1)(i) & 90.672(a)(1)(i) shall apply;

(ii) For channels 524 to 530 – the minimum median desired signal level shall increase linearly from the values specified in §§ 22.970(a)(1)(i) & 90.672(a)(1)(i) to -80 dBm;

(iii) For channels 530 to 534 – the minimum median desired signal level shall increase linearly from -80 dBm to -70 dBm;

(iv) For channels 534 to 550 – the minimum median desired signal level shall increase linearly from -70 dBm to -65 dBm.

31. Section 90.619 is amended to read as follows.

§ 90.619 Operations within the U.S./Mexico and U.S./Canada border areas.

(a) *Use of Frequencies in 800 MHz Band in Mexico Border Region.* All operations in the 806-824/851-869 MHz band within 110 km (68.4 miles) of the U.S./Mexico border (“Mexico border region”) shall be in accordance with international agreements between the U.S. and Mexico. Channels 231-710 are offset 12.5 kHz lower in frequency than those specified in the table in §90.613. Stations located on Mt. Lemmon, serving the Tucson, AZ area, will only be authorized offset frequencies.

(b) *Use of Frequencies in 900 MHz Band in Mexico Border Region.* All operations in the 896-

901/935-940 MHz band within the Mexico border region shall be in accordance with international agreements between the U.S. and Mexico.

(1) The channels listed in Table 1 below are available to applicants eligible in the Industrial/Business Pool of subpart C of this part but exclude Special Mobilized Radio Systems as defined in §90.603(c). These frequencies are available within the Mexico border region. Specialized Mobile Radio (SMR) systems will not be authorized on these frequencies.

TABLE 1 – UNITED STATES/MEXICO BORDER AREA, BUSINESS/INDUSTRIAL/LAND TRANSPORTATION POOL 896-901/935-940 MHZ BAND (199 CHANNELS)

For multi-channel systems, channels may be grouped vertically or horizontally as they appear in the following table. Channels numbered above 200 may be used only subject to the power flux density limits stated in paragraph (a)(2) of this section:

<i>Channels Nos.</i>	
11-12-13-14-15	131-132-133-134-135
16-17-18-19-20	136-137-138-139-140
31-32-33-34-35	231-232-233-234-235
36-37-38-39-40	236-237-238-239-240
51-52-53-54-55	171-172-173-174-175
56-57-58-59-60	176-177-178-179-180
71-72-73-74-75	271-272-273-274-275
76-77-78-79-80	276-277-278-279-280
91-92-93-94-95	211-212-213-214-215
96-97-98-99-100	216-217-218-219-220
111-112-113-114-115	311-312-313-314-315
116-117-118-119-120	316-317-318-319-320
151-152-153-154-155	351-352-353-354-355
156-157-158-159-160	356-357-358-359-360
191-192-193-194-195	391-392-393-394-395
196-197-198-199-200	396-397-398-399
251-252-253-254-255	331-332-333-334-335
256-257-258-259-260	336-337-338-339-340
291-292-293-294-295	371-372-373-374-375
296-297-298-299-300	376-377-378-379-380

(2) The channels listed in Table 2 below are available for operations only to eligibles in the SMR category – which consists of Specialized Mobile Radio (SMR) stations and eligible end users. These frequencies are available in the Mexico border region. The spectrum blocks listed below are available for EA-based services according to § 90.681.

TABLE 2 – UNITED STATES-MEXICO BORDER AREA, SMR CATEGORY 896-901/935-940 MHZ BAND (200 CHANNELS)

Block	Channel Nos.
Channels numbered above 200 may only be used subject to the power flux density limits at or beyond the Mexico border as stated in paragraph (4) of this section.	
A	1-2-3-4-5-6-7-8-9-10
B	21-22-23-24-25-26-27-28-29-30

C	41-42-43-44-45-46-47-48-49-50
D	61-62-63-64-65-66-67-68-69-70
E	81-82-83-84-85-86-87-88-89-90
F	101-102-103-104-105-106-107-108-109-110
G	121-122-123-124-125-126-127-128-129-130
H	141-142-143-144-145-146-147-148-149-150
I	161-162-163-164-165-166-167-168-169-170
J	181-182-183-184-185-186-187-188-189-190
K	201-202-203-204-205-206-207-208-209-210
L	221-222-223-224-225-226-227-228-229-230
M	241-242-243-244-245-246-247-248-249-250
N	261-262-263-264-265-266-267-268-269-270
O	281-282-283-284-285-286-287-288-289-290
P	301-302-303-304-305-306-307-308-309-310
Q	321-322-323-324-325-326-327-328-329-330
R	341-342-343-344-345-346-347-348-349-350
S	361-362-363-364-365-366-367-368-369-370
T	381-382-383-384-385-386-387-388-389-390

(3) The specific channels that are available for licensing in the band 896–901/935–940 MHz within the Mexico border region are subject to Effective Radiated Power (ERP) and Antenna Height limitations as indicated in Table 3 below.

TABLE 3 – LIMITS OF EFFECTIVE RADIATED POWER (ERP) CORRESPONDING TO ANTENNA HEIGHTS OF BASE STATIONS IN THE 896-901/935-940 MHZ BANDS WITHIN 110 KILOMETERS (68.4 MILES) OF THE MEXICAN BORDER

Antenna height above mean sea level		ERP
Meters	Feet	Watts (maximum)
0-503.....	0-1650.....	500
504-609.....	1651-2000.....	350
610-762.....	2001-2500.....	200
763-914.....	2501-3000.....	140
915-1066.....	3001-3500.....	100
1067-1219.....	3501-4000.....	75
1220-1371.....	4001-4500.....	70
1372-1523.....	4501-5000.....	65
Above 1523.....	Above 5000.....	5

(4) All channels in the 896–901/935–940 MHz band are available for assignment to U.S. stations within the Mexico border region if the maximum power flux density (pfd) of the station's transmitted signal at any point at or beyond the border does not exceed $-107 \text{ dB(W/m}^2\text{)}$. The spreading loss must be calculated using the free space formula taking into account any antenna discrimination in the direction of the border. Authorizations for stations using channels allotted to Mexico on a primary basis will be secondary to Mexican operations and conditioned to require that licensees take immediate action to eliminate any harmful interference resulting from the station's transmitted signal exceeding $-107 \text{ dB(W/m}^2\text{)}$.

(c) *Use of 800 MHz Band in Canada Border Region.* All operations in the 806-824/851-869 MHz band within 140 km (87 miles) of the U.S./Canada border ("Canada border region") shall be in accordance with international agreements between the U.S. and Canada.

(d) *Use of 900 MHz Band in Canada Border Region.* All operations in the 896–901/935–940 MHz band within the Canada border region shall be in accordance with international agreements between the U.S. and Canada. The following criteria shall govern the assignment of frequency pairs (channels) in the 896–901/935–940 MHz band for stations located in the U.S./Canada border area. They are available for assignments for conventional or trunked systems in accordance with applicable sections of this subpart. * * *

32. Paragraphs (a), (b), (c), (e), (f), (g) and (h) of Section 90.621 are amended to reflect the combining of the Business and Industrial/Land Transportation categories into one pool; to allow CMRS operations on 900 MHz PLMR channels; to allow 900 MHz PLMR licensees to transfer their licenses to CMRS licensees; to reflect the new channel numbers after band reconfiguration and to remove all references to spectrum blocks D through F1 which will no longer exist after band reconfiguration.

§ 90.621 Selection and assignment of frequencies.

(a) Applicants for frequencies in the Public Safety and Business/Industrial/Land Transportation Categories must specify on the application the frequencies on which the proposed system will operate pursuant to a recommendation by the applicable frequency coordinator. Applicants for frequencies in the SMR Category must request specific frequencies by including in their applications the frequencies requested.

* * * * *

(b) Stations authorized on frequencies listed in this subpart, except for those stations authorized pursuant to paragraph (g) of this section and EA-based and MTA-based SMR systems, will be assigned frequencies solely on the basis of fixed distance separation criteria. The separation between co-channel systems will be a minimum of 113 km (70 mi) with one exception. For incumbent licensees in Channel Blocks G through V, that have received the consent of all affected parties or a certified frequency coordinator to utilize an 18 dBμV/m signal strength interference contour (see §90.693), the separation between co-channel systems will be a minimum of 173 km (107 mi). The following exceptions to these separations shall apply:

(1) Except as indicated in paragraph (b)(4) of this section, no station in Channel Blocks A through V shall be less than 169 km (105 mi) distant from a co-channel station that has been granted channel exclusivity and authorized 1 kW ERP on any of the following mountaintop sites: Santiago Peak, Sierra Peak, Mount Lukens, Mount Wilson (California). Except as indicated in paragraph (b)(4) of this section, no incumbent licensee in Channel Blocks G through V that has received the consent of all affected parties or a certified frequency coordinator to utilize an 18 dBμV/m signal strength interference contour shall be less than 229 km (142 mi) distant from a co-channel station that has been granted channel exclusivity and authorized 1 kW ERP on any of the following mountaintop sites: Santiago Peak, Sierra Peak, Mount Lukens, Mount Wilson (California).

* * * * *

(3) Except as indicated in paragraph (b)(4) of this section, stations in Channel Blocks A through V that have been granted channel exclusivity and are located in the State of Washington at the locations listed below shall be separated from co-channel stations by a minimum of 169 km (105 mi). Except as indicated in paragraph (b)(4) of this section, incumbent licensees in Channel Blocks G through V that have received the consent of all affected parties or a certified frequency coordinator to utilize an 18

dBµV/m signal strength interference contour, have been granted channel exclusivity and are located in the State of Washington at the locations listed below shall be separated from co-channel stations by a minimum of 229 km (142 mi). Locations within one mile of the geographical coordinates listed in the table below will be considered to be at that site.

Note: Coordinates are referenced to North American Datum 1983 (NAD83).

Site Name	North Latitude	West Longitude
Mount Constitution.....	48° 40' 47.4"	122° 50' 28.7"
Lyman Mountain.....	48° 35' 41.4"	122° 09' 39.6"
Cultus Mountain.....	48° 25' 30.4"	122° 08' 58.5"
Gunsite Ridge.....	48° 03' 22.4"	121° 51' 41.5"
Gold Mountain.....	47° 32' 51.3"	122° 46' 56.5"
Buck Mountain.....	47° 47' 05.3"	122° 59' 34.6"
Cougar Mountain.....	47° 32' 39.4"	122° 06' 34.4"
Squak Mountain.....	47° 30' 14.4"	122° 03' 34.4"
Tiger Mountain.....	47° 30' 13.4"	121° 58' 32.4"
Devils Mountain.....	48° 21' 52.4"	122° 16' 06.6"
McDonald Mountain.....	47° 20' 11.3"	122° 51' 30.5"
Maynard Hill.....	48° 00' 58.3"	122° 55' 35.6"
North Mountain.....	47° 19' 07.3"	123° 20' 48.6"
Green Mountain.....	47° 33' 40.3"	122° 48' 31.5"
Capitol Peak.....	46° 58' 21.3"	123° 08' 21.5"
Rattlesnake Mountain.....	47° 28' 09.4"	121° 49' 17.4"
Three Sisters Mountain.....	47° 07' 19.4"	121° 53' 34.4"
Grass Mountain.....	47° 12' 14.1"	121° 47' 42.4"
Spar Pole Hill.....	47° 02' 51.4"	122° 08' 39.4"

* * * * *

(c) Conventional systems authorized on frequencies in the Public Safety (except for those systems that have participated in a formal regional planning process as described in §90.16) and Business/Industrial/Land Transportation categories which have not met the loading levels necessary for channel exclusivity will not be afforded co-channel protection.

* * * * *

(e) Frequencies in the 809–817/854–862 MHz bands listed as available for eligibles in the Public Safety and Business/Industrial/Land Transportation Categories are available for inter-category sharing under the following conditions:

(1) Channels in the Public Safety and Business/Industrial/Land Transportation categories will be available to eligible applicants in those categories only if there are no frequencies in their own category and no public safety systems are authorized on those channels under consideration to be shared.

(2) Notwithstanding paragraph (e)(5) of this section, licensees of channels in the Business/Industrial/Land Transportation category may request a modification of the license, see §1.947 of this part, to authorize use of the channels for commercial operation. The licensee may also, at the same time or thereafter, seek authorization to transfer or assign the license, see §1.948 of this part, to any person eligible for licensing in the General or SMR categories. Applications submitted pursuant to this paragraph must be filed in accordance with the rules governing other applications for

commercial channels, and will be processed in accordance with those rules. Grant of requests submitted pursuant to this paragraph is subject to the following conditions:

(i) A licensee that modifies its license to authorize commercial operations will not be authorized to obtain additional 800 MHz Business/Industrial/Land Transportation category channels for sites located within 113 km (70 mi.) of the station for which the license was modified, for a period of one year from the date the license is modified. This provision applies to the licensee, its controlling interests and their affiliates, as defined in §1.2110 of this chapter.

(ii) With respect to licenses the initial application for which was filed on or after November 9, 2000, requests submitted pursuant to paragraph (e)(2) of this section may not be filed until five years after the date of the initial license grant. In the case of a license that is modified on or after November 9, 2000 to add 800 MHz Business/Industrial/Land Transportation frequencies or to add or relocate base stations that expand the licensee's the interference contour, requests submitted pursuant to paragraph (e)(2) of this section for these frequencies or base stations may not be filed until five years after such modification.

* * * * *

(f) Licensees of channels in the Business/Industrial/Land Transportation Categories in the 896–901/935-940 MHz bands may request a modification of the license, *see* § 1.947 of this part, to authorize use of the channels for commercial operation. The licensee may also, at the same time, or thereafter, seek authorization to transfer or assign the license, *see* § 1.948 of this part, to any person eligible for licensing in the General or SMR categories. Applications submitted pursuant to this paragraph must be filed in accordance with the rules governing other applications for commercial channels, and will be processed in accordance with those rules.

(g) Applications for Public Safety systems (both trunked and conventional) in the 806–809/851–854 MHz bands will be assigned and protected based on the criteria established in the appropriate regional plan. See §90.16 and the Report and Order in General Docket 87–112.

(h) Channel numbers 511–520, 551–560, 591–600, 631–640, and 671–680 are allocated for Basic Exchange Telecommunications Radio Service as described in § 22.757 of this chapter. NOTE: the FCC has proposed to remove these channels from the rural radiotelephone service in WT Docket No. 03-103 (FCC 03-95) released April 28, 2003 (68 FR 4403) which is pending.

* * * * *

33. The text in paragraph (d) of Section 90.629 is removed because the Business and Industrial/Transportation categories have been combined into one pool.

§ 90.629 Extended implementation period.

* * * * *

(d) [Reserved]

* * * * *

34. Paragraph (b) of Section 90.631 is amended to reflect the interleaved portion of the 800 MHz band after band reconfiguration and to remove references to Spectrum Block D which will no longer exist after band reconfiguration.

§ 90.631 Trunked systems loading, construction and authorization requirements.

* * * * *

(b) Each applicant for a non-SMR trunked system must certify that a minimum of seventy (70) mobiles for each channel authorized will be placed into operation within five (5) years of the initial license grant. Except for SMR systems licensed in the 809–816/854–861 MHz band and as indicated in paragraph (i) of this section, if at the end of five (5) years a trunked system is not loaded to the prescribed levels and all channels in the licensee's category are assigned in the system's geographic area, authorizations for trunked channels not loaded to seventy (70) mobile stations cancels automatically at a rate that allows the licensee to retain one channel for every one hundred (100) mobiles loaded, plus one additional channel. If a trunked system has channels from more than one category, General Category channels are the first channels considered to cancel automatically. All non-SMR licensees initially authorized before June 1, 1993, that are within their original license term, or SMR licensees that are within the term of a two-year authorization granted in accordance with paragraph (i) of this section, are subject to this condition. A licensee that has authorized channels cancelled due to failure to meet the above loading requirements will not be authorized additional channels to expand that same system for a period of six months from the date of cancellation.

* * * * *

35. Paragraph (g) of Section 90.645 is amended to reflect the interleaved portion of the 800 MHz band after band reconfiguration.

§ 90.645 Permissible operations.

* * * * *

(g) Up to five (5) contiguous 809–816/854–861 band channels as listed in §§90.615, 90.617, and 90.619 may be authorized after justification for systems requiring more than the normal single channel bandwidth. If necessary, licensees may trade channels amongst themselves in order to obtain contiguous frequencies. Notification of such proposed exchanges shall be made to the appropriate frequency coordinator(s) and to the Commission by filing an application for license modification.

* * * * *

36. The following sections are added immediately after the text of Section 90.671:

PROCEDURES AND PROCESS - UNACCEPTABLE INTERFERENCE**§ 90.672 Unacceptable interference to non-cellular 800 MHz licensees from ESMR or Part 22 Cellular Radiotelephone systems.**

(a) *Definition.* Except as provided in 47 C.F.R. §90.617(k), unacceptable interference to non-cellular licensees in the 800 MHz band will be deemed to occur when the below conditions are met:

(1) A transceiver at a site at which interference is encountered:

(i) Is in good repair and operating condition, and is receiving:

(A) A median desired signal of -104 dBm or higher, as measured at the R.F. input of the receiver of a mobile unit; or

(B) A median desired signal of -101 dBm or higher, as measured at the R.F. input of the receiver of a portable *i.e.* hand-held unit; and, either

(ii) Is a voice transceiver:

(A) with manufacturer published performance specifications for the receiver section of the transceiver equal to, or exceeding, the minimum standards set out in Section (b), below; and;

(B) Receiving an undesired signal or signals which cause the measured Carrier to Noise plus Interference (C/(I+N)) ratio of the receiver section of said transceiver to be less than 20 dB, or,

(iii) Is a non-voice transceiver receiving an undesired signal or signals which cause the measured bit error rate (BER) (or some comparable specification) of the receiver section of said transceiver to be more than the value reasonably designated by the manufacturer.

(2) Provided, however, that if the receiver section of the mobile or portable voice transceiver does not conform to the standards set out in paragraph (b), below, then that transceiver shall be deemed subject to unacceptable interference only at sites where the median desired signal satisfies the applicable threshold measured signal power in paragraphs (a)(1)(i) after an upward adjustment to account for the difference in receiver section performance. The upward adjustment shall be equal to the increase in the desired signal required to restore the receiver section of the subject transceiver to the 20 dB C/(I+N) ratio of paragraph (a)(1)(iv)(a) above. The adjusted threshold levels shall then define the minimum measured signal power(s) in lieu of paragraphs (a) (1) (i) at which the licensee using such non-compliant transceiver is entitled to interference protection.

(b) *Minimum Receiver Requirements.* Voice transceivers capable of operating in the 806-824 MHz portion of the 800 MHz band shall have the following minimum performance specifications in order for the system in which such transceivers are used to claim entitlement to full protection against unacceptable interference. (See paragraph (a) (2) above.)

(1) Voice units intended for mobile use: 75 dB intermodulation rejection ratio; 75 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.

(2) Voice units intended for portable use: 70 dB intermodulation rejection ratio; 70 dB adjacent channel rejection ratio; -116 dBm reference sensitivity.

§ 90.673 Obligation to abate unacceptable interference.

(a) *Strict Responsibility.* Any licensee who, knowingly or unknowingly, directly or indirectly, causes or contributes to causing unacceptable interference to a non-cellular licensee in the 800 MHz band, as defined in this chapter, shall be strictly accountable to abate the interference, with full cooperation and utmost diligence, in the shortest time practicable. Interfering licensees shall consider all feasible interference abatement measures, including, but not limited to, the remedies specified in the interference resolution procedures set forth in this chapter. This strict responsibility obligation applies to all forms of interference, including out-of-band emissions and intermodulation

(b) *Joint and Several Responsibility.* If two or more licensees knowingly or unknowingly, directly or indirectly, cause or contribute to causing unacceptable interference to a non-cellular licensee in the 800 MHz band, as defined in this chapter, such licensees shall be jointly and severally responsible for abating interference, with full cooperation and utmost diligence, in the shortest practicable time. This joint and several responsibility rule requires interfering licensees to consider all

feasible interference abatement measures, including, but not limited to, the remedies specified in the interference resolution procedures set forth in this chapter. This joint and several responsibility rule applies to all forms of interference, including out-of-band emissions and intermodulation

(1) This joint and several responsibility rule requires interfering licensees to consider all feasible interference abatement measures, including, but not limited to, the remedies specified in the interference resolution procedures set forth in § 90.674(c) of this chapter. This joint and several responsibility rule applies to all forms of interference, including out-of-band emissions and intermodulation.

(2) Any licensee that can show that its signal does not directly or indirectly, cause or contribute to causing unacceptable interference to a non-cellular licensee in the 800 MHz band, as defined in this chapter, shall not be held responsible for resolving unacceptable interference. Notwithstanding, any licensee that receives an interference complaint from a public safety/CII licensee shall respond to such complaint consistent with the interference resolution procedures set forth in this chapter.

§ 90.674 Interference resolution procedures before, during and after band reconfiguration.

(a) *Initial Notification.* Any non-cellular licensee operating in the 806-824/851-869 MHz band who reasonably believes it is receiving harmful interference, as described in § 90.672, shall provide an initial notification of the interference incident. This initial notification of an interference incident shall be sent to all Part 22 Cellular Radiotelephone licensees and ESMR licensees who operate cellular base stations ("cell sites") within 1,524 meters (5,000 feet) of the interference incident.

(1) The initial notification of interference shall include the following information on interference:

(i) the specific geographical location where the interference occurs, and the time or times at which the interference occurred or is occurring;

(ii) a description of its scope and severity, including its source, if known;

(iii) the relevant Commission licensing information of the party suffering the interference;
and

(iv) a single point of contact for the party suffering the interference.

(2) ESMR licensees, in conjunction with Part 22 Cellular Radiotelephone licensees, shall establish an electronic means of receiving the initial notification described in subsection (a)(1) above. The electronic system must be designed so that all appropriate 800 MHz ESMR and Part 22 Cellular Radiotelephone licensees can be contacted about the interference incident with a single notification. The electronic system for receipt of initial notification of interference complaints must be operating no later than **[Thirty days after effective date of Report and Order]**.

(3) ESMR licensees must respond to the initial notification described in paragraph (a)(1) of this section, as soon as possible and no later than 24 hours of receipt of notification from a public safety/CII licensee. This response time may be extended to 48 hours after receipt from other non-cellular licensees provided affected communications on these systems are not safety related.

(b) *Interference Analysis.* ESMR licensees – who receive an initial notification described in paragraph (a) above – shall perform a timely analysis of the interference to identify the possible source. Immediate on-site visits may be conducted when necessary to complete timely analysis. Interference analysis must be completed and corrective action initiated within 48 hours of the initial complaint from a public safety/CII licensee. This response time may be extended to 96 hours after the

initial complaint from other non-cellular licensees provided affected communications on these systems are not safety related. Corrective action may be delayed if the affected licensee agrees in writing (which may be, but is not required to be, recorded via e-mail or other electronic means) to a longer period.

(c) *Mitigation Steps.* (1) All ESMR and Part 22 Cellular Radiotelephone licensees who are responsible for causing unacceptable interference shall take all affirmative measures to resolve such interference. ESMR licensees found to contribute to harmful interference, as defined in § 90.672, shall resolve such interference in the shortest time practicable. ESMR and Part 22 Cellular Radiotelephone licensees must provide all necessary test apparatus and technical personnel skilled in the operation of such equipment as may be necessary to determine the most appropriate means of timely eliminating the interference. However, the means whereby interference is abated or the cell parameters that may need to be adjusted is left to the discretion of involved ESMR and/or Part 22 Cellular Radiotelephone licensees, whose affirmative measures may include, but not be limited to, the following techniques:

- (i) increasing the desired power of the public safety signal;
- (ii) decreasing the power of the ESMR and/or Part 22 Cellular Radiotelephone signal;
- (iii) modifying the ESMR and/or Part 22 Cellular Radiotelephone systems antenna height;
- (iv) modifying the ESMR and/or Part 22 Cellular Radiotelephone system antenna characteristics;
- (iv) incorporating filters into ESMR and/or Part 22 Cellular Radiotelephone system transmission equipment;
- (v) permanently changing ESMR and/or Part 22 Cellular Radiotelephone system frequencies; and
- (vi) supplying interference-resistant receivers to the affected public safety licensee(s). If this technique is used, in all circumstances, the ESMR and/or Part 22 Cellular Radiotelephone licensees shall be responsible for all costs thereof.

(2) Whenever short-term interference abatement measures prove inadequate, the affected licensee shall, consistent with but not compromising safety, make all necessary concessions to accepting interference until a longer-term remedy can be implemented.

(3) *Discontinuing operations when clear and imminent danger exists.* When a public safety licensee determines that a continuing presence of interference constitutes a clear and imminent danger to life or property, the licensee causing the interference must discontinue the associated operation immediately, until a remedy can be identified and applied. The determination that a continuing presence exists that constitutes a clear and imminent danger to life or property, must be made by written statement that:

- (i) is in the form of a declaration, notarized affidavit, or statement under penalty or perjury, from an officer or executive of the affected public safety licensee;
- (ii) thoroughly describes the basis of the claim of clear and imminent danger;
- (iii) was formulated on the basis of either personal knowledge or belief after due diligence;

(iv) is not proffered by a contractor or other third party; and

(v) has been approved by the Chief of the Wireless Telecommunication Bureau or other designated Commission official. Prior to the authorized official making a determination that a clear and imminent danger exists, the associated written statement must be served by hand-delivery or receipted fax on the applicable offending licensee, with a copy transmitted by the fastest available means to the Washington, D.C. office of the Commission's Wireless Telecommunications Bureau.

§ 90.675 Information exchange.

(a) *Prior Coordination.* Public safety/CII licensees may notify an ESMR or Part 22 Cellular Radiotelephone licensee that they wish to receive prior notification of the activation or modification of ESMR or Part 22 Cellular Radiotelephone cell sites in their area. Thereafter, the ESMR or Part 22 Cellular Radiotelephone licensee must provide the following information to the public safety/CII licensee at least 10 business days before a new cell site is activated or an existing cell site is modified:

- (1) location;
- (2) effective radiated power;
- (3) antenna height;
- (4) channels available for use.

(b) *Purpose of Prior Coordination.* The coordination of cell sites is for informational purposes only: public safety/CII licensees are not afforded the right to accept or reject the activation of a proposed cell or to unilaterally require changes in its operating parameters. The principal purposes of notification are to: (a) allow a public safety/CII licensee to advise the ESMR or Part 22 Cellular Radiotelephone licensee whether it believes a proposed cell will generate unacceptable interference; (b) permit ESMR or Part 22 Cellular Radiotelephone licensees to make voluntary changes in cell parameters when a public safety licensee alerts them to possible interference; and (c) rapidly identify the source if interference is encountered when the cell is activated.

(c) *Public Safety Information Exchange.* (1) Upon request by an ESMR or Part 22 Cellular Radiotelephone licensee, public safety/CII licensees who operate radio systems in the 806-824/851-869 MHz shall provide the operating parameters of their radio system to the ESMR or Part 22 Cellular Radiotelephone licensee.

(2) Public safety licensees who perform the information exchange described above must notify the appropriate ESMR and Part 22 Cellular Radiotelephone licensees prior to any technical changes to their radio system.

§ 90.676 Transition administrator for reconfiguration of the 806-824/851-869 MHz band in order to separate cellular systems from non-cellular systems.

The Transition Administrator will be an independent party with no financial interest in any 800 MHz licensee; and will be selected by a committee representative of 800 MHz licensees. The Transition Administrator will serve both a ministerial role and a function similar to a special master in a judicial proceeding.

- (a) The duties of the Transition Administrator will include, but not be limited to:

(1) Obtaining estimates from licensees regarding the cost of reconfiguring their systems and ensuring that estimates contain a firm work schedule. The Transition Administrator will retain copies of all estimates and make them available to the Commission on request.

(2) Mediating disputes regarding cost estimates for reconfiguring a system.

(3) Issuing the Draw Certificate to authorize and instruct the Letter of Credit Trustee to draw down on the Letter of Credit to pay relocation costs in connection with reconfiguring a licensee's system.

(4) Establishing a relocation schedule on a NPSPAC region-by-region basis, prioritizing the regions on the basis of population. However, should a given region be encountering unusually severe amounts of unacceptable interference, that region may be moved up in priority. Any party disputing such a change in priority may refer the matter to the Chief of the Public Safety and Critical Infrastructure Division, who hereby is delegated the authority to resolve such disputes. The Transition Administrator may direct that adjoining regions be reconfigured simultaneously when conditions so require.

(5) The Transition Administrator will coordinate relocation of a NPSPAC Region's NPSPAC channels with the relevant Regional Planning Committee(s) prior to commencing band reconfiguration in a NPSPAC Region.

(b) Once band reconfiguration commences in a given NPSPAC Region, the Transition Administrator will;

(1) Monitor the retuning schedule and resolve any schedule delays or refer same to the Public Safety and Critical Infrastructure Division for resolution;

(2) Coordinate with adjoining NPSPAC Regions to ensure that interference is not being caused to their existing facilities from relocated stations;

(3) Provide quarterly progress reports to the Commission in such detail as the Commission may require and include, with such reports, certifications by Nextel and the relevant licensees that relocation has been completed and that both parties agree on the amount received from the letter of credit proceeds in connection with relocation of the licensees' facilities. The report shall include description of any disputes that have arisen and the manner in which they were resolved. These quarterly reports need not be audited;

(4) Provide to the Public Safety and Critical Infrastructure Division, on the anniversary of **[Effective date of Report and Order]**, an audited statement of relocation funds expended to date, including salaries and expenses of Transition Administrator;

(5) Facilitate resolution of disputes by mediation; or referral of the parties to alternative dispute resolution services;

(c) The Transition Administrator may not serve as the repository of funds used in band reconfiguration, excepting such sums as Nextel may pay for the Transition Administrator's services. Moreover, the Transition Administrator will not be certified by the Commission as a frequency coordinator.

§ 90.677 Reconfiguration of the 806-824/851-869 MHz band in order to separate cellular systems from non-cellular systems.

In order to facilitate reconfiguration of the 806-824/851-869 MHz band ("800 MHz band") to separate cellular systems from non-cellular systems, Nextel Communications, Inc. (Nextel) may relocate incumbents within the 800 MHz band by providing "comparable facilities." For the limited purpose of band reconfiguration, the provisions of § 90.157 shall not apply and inter-category sharing will be permitted under all circumstances. Such relocation is subject to the following provisions:

(a) Within thirty days of Commission approval of the Transition Administrator, the Transition Administrator described in § 90.676 will provide the Commission with a schedule detailing when band reconfiguration shall commence for each NPSPAC Region. The plan should also detail – by NPSPAC Region – which relocation option each non-Nextel ESMR licensee has chosen. The Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau will finalize and approve such a plan. The schedule shall provide for completion of band reconfiguration in no more than thirty-six months following release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region. Relocation will commence according to the schedule set by the Transition Administrator but all systems must have commenced reconfiguration within thirty months of release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC region.

(b) *Voluntary negotiations.* Thirty days before the start date for each NPSPAC region, the Chief of the Public Safety and Critical Infrastructure Division of the Wireless Telecommunications Bureau will issue a Public Notice initiating a three-month voluntary negotiation period. During this voluntary negotiation period, Nextel and all incumbents may negotiate any mutually agreeable relocation agreement. Nextel and relocating incumbents may agree to conduct face-to-face negotiations or either party may elect to communicate with the other party through the Transition Administrator.

(c) *Mandatory negotiations.* If no agreement is reached by the end of the voluntary period, a three-month mandatory negotiation period will begin during which both Nextel and the incumbents must negotiate in "good faith." Nextel and relocating incumbents may agree to conduct face-to-face negotiations or either party may elect to communicate with the other party through the Transition Administrator. All parties are charged with the obligation of utmost "good faith" in the negotiation process. Among the factors relevant to a "good-faith" determination are: (i) whether the party responsible for paying the cost of band reconfiguration has made a *bona fide* offer to relocate the incumbent to comparable facilities; (ii) the steps the parties have taken to determine the actual cost of relocation to comparable facilities; and (iii) whether either party has unreasonably withheld information, essential to the accurate estimation of relocation costs and procedures, requested by the other party. The Transition Administrator may schedule mandatory settlement negotiations and mediation sessions and the parties must conform to such schedules.

(d) *Transition Administrator.* If no agreement is reached during either the voluntary or mandatory negotiating periods, all disputed issues shall be referred to the Transition Administrator who shall mediate and attempt to resolve them within thirty working days. If disputed issues remain thirty days after the end of the mandatory negotiation period, the Transition Administrator shall forward the record to the Chief of the Public Safety and Critical Infrastructure Division, together with advice on how the matter(s) may be resolved. The Chief of the Public Safety and Critical Infrastructure Division is hereby delegated the authority to rule on disputed issues, *de novo*.

(e) *Waiver Requests.* Incumbents who wish not to relocate according to the schedule may petition the Commission for a waiver of the relocation obligation. Such a waiver would only be granted on a strict non-interference basis.

(f) *Comparable Facilities.* The replacement system provided to an incumbent must be at least equivalent to the existing 800 MHz system with respect to the four factors described in § 90.699(d).

(g) *Information Exchange.* Absent agreement between parties, the Transition Administrator will be responsible for determining the information that relocating incumbents must supply in support of a relocation agreement.

(h) The relevant Regional Planning Committee shall be informed of any proposed changes to any NPSPAC channel.

* * * * *

37. The heading above Section 90.681 is amended to describe the portion of the band where EA-based SMR systems may occupy after band reconfiguration. The cross reference in Section 90.681 is updated as follows:

**POLICIES GOVERNING THE LICENSING AND USE OF EA-BASED SMR SYSTEMS IN
THE 809–824/851–869 MHZ BAND**

Source: 61 FR 6158, 6159, Feb. 16, 1996, unless otherwise noted.

§ 90.681 EA-based SMR service areas.

EA licenses in for channels 711 through 830 and Spectrum Blocks A through V listed in Tables 4 and 5 of §90.617 are available in 175 Economic Areas (EAs) as defined in §90.7.

38. Paragraph (a) of Section 90.683 is amended to reflect the portion of the band where EA-based SMR systems may occupy after band reconfiguration.

§ 90.683 EA-based SMR system operations.

(a) EA-based licensees authorized in the 809–824/854–869 MHz band pursuant to §90.681 may construct and operate base stations using any of the base station frequencies identified in their spectrum block anywhere within their authorized EA, provided that:

* * * * *

39. Paragraphs (a) and (b) of Section 90.685 are amended to reflect the portion of the band where EA-based SMR systems may occupy after band reconfiguration. References to EA Block D are also removed since this block will no longer exist after band reconfiguration.

§ 90.685 Authorization, construction and implementation of EA licenses.

(a) EA licenses in the 809–824/854–869 MHz band will be issued for a term not to exceed ten years. Additionally, EA licensees generally will be afforded a renewal expectancy only for those stations put into service after August 10, 1996.

(b) EA licensees in the 809–824/854–869 MHz band must, within three years of the grant of their initial license, construct and place into operation a sufficient number of base stations to provide coverage to at least one-third of the population of its EA-based service area. Further, each EA licensee must provide coverage to at least two-thirds of the population of the EA-based service area within five years of the grant of their initial license. Alternatively, EA licensees in Channel blocks G through V in the 809–824/854–869 MHz band must provide substantial service to their markets within five years of the grant of their initial license. Substantial service shall be defined as: “Service which is sound, favorable, and substantially above a level of mediocre service.”

* * * * *

40. Section 90.687 is updated to reflect the portion of the band where incumbent SMR licensees may remain after band reconfiguration. Cross references are also updated.

§ 90.687 Special provisions regarding assignments and transfers of authorizations for incumbent SMR licensees in the 809–824/854–869 MHz band.

An SMR license initially authorized on any of the channels listed in Table 4 and 5 of §90.617 of this part may transfer or assign its channel(s) to another entity subject to the provisions of §1.948 of this chapter and §90.609(b) of this part. If the proposed transferee or assignee is the EA licensee for the spectrum block to which the channel is allocated, such transfer or assignment presumptively will be deemed to be in the public interest. However, such presumption will be rebuttable.

* * * * *

41. Paragraphs (a), (c), and (d)(2) of Section 90.693 are updated to reflect the portion of the band where grandfathered licensees may remain after band reconfiguration. References to spectrum blocks which will no longer exist after band reconfiguration are also removed.

§ 90.693 Grandfathering provisions for incumbent licensees.

(a) *General provisions.* These provisions apply to “incumbent licensees,” all 800 MHz licensees authorized in the 809–821/854–866 MHz band who obtained licenses or filed applications on or before December 15, 1995.

* * * * *

(c) *Special provisions for spectrum blocks G through V.* Incumbent licensees that have received the consent of all affected parties or a certified frequency coordinator to utilize an 18 dBμV/m signal strength interference contour shall have their service area defined by their originally-licensed 36 dBμV/m field strength contour and their interference contour shall be defined as their originally-licensed 18 dBμV/m field strength contour. The “originally-licensed” contour shall be calculated using the maximum ERP and the actual HAAT along each radial. Incumbent licensees seeking to utilize an 18 dBμV/m signal strength interference contour shall first seek to obtain the consent of affected co-channel incumbents. When the consent of a co-channel licensee is withheld, an incumbent licensee may submit to any certified frequency coordinator an engineering study showing that interference will not occur, together with proof that the incumbent licensee has sought consent. Incumbent licensees are permitted to add, remove or modify transmitter sites within their original 18 dBμV/m field strength contour without prior notification to the Commission so long as their original 18 dBμV/m field strength contour is not expanded and the station complies with the Commission's short-spacing criteria in §§90.621(b)(4) through 90.621(b)(6). Incumbent licensee protection extends only to its 36 dBμV/m signal strength contour. Pursuant to the minor modification notification procedure set forth in 1.947(b), the incumbent licensee must notify the Commission within 30 days of any changes in technical parameters or additional stations constructed that fall within the short-spacing criteria. See 47 CFR 90.621(b).

* * * * *

(d) * * *

(2) *Special Provisions for Spectrum Blocks G through V.* Incumbent licensees that have received the consent of all affected parties or a certified frequency coordinator to utilize an 18 dBμV/m signal strength interference contour operating at multiple sites may, after grant of EA licenses has been completed, exchange multiple site licenses for a single license. This single site license will authorize

operations throughout the contiguous and overlapping 36 dB μ V/m field strength contours of the multiple sites. Incumbents exercising this license exchange option must submit specific information on Form 601 for each of their external base sites after the close of the 800 SMR auction. The incumbent's geographic license area is defined by the contiguous and overlapping 18 dB μ V/m contours of its constructed and operational external base stations and interior sites that are constructed within the construction period applicable to the incumbent. Once the geographic license is issued, facilities that are added within an incumbent's existing footprint and that are not subject to prior approval by the Commission will not be subject to construction requirements.

* * * * *

APPENDIX D: ENHANCED BEST PRACTICES**A. Introduction**

1. Enhanced Best Practices have been an effective tool in the voluntary interference abatement efforts undertaken to date. The term Enhanced Best Practices has no precise definition but can be understood to mean all effective means of abating unacceptable interference other than “channel swaps” or wholesale reconfiguration of the band. The effort to develop Enhanced Best Practices began in 2000 when a team of ESMR and Cellular Telephone licensees, public safety organizations, private radio organizations, equipment manufacturers and others produced the Best Practices Guide. Those best practices have been added to and enhanced in the intervening years, leading us to characterize them today as Enhanced Best Practices. We commend those parties that urge that a new Enhanced Best Practices Guide be prepared to update the original document. Below, we discuss the principal techniques comprehended by Enhanced Best Practices and discuss their relative advantages and disadvantages as reflected by our analysis of the record.

B. Interference Abatement at the Cell Site

2. *Modification of Antenna Pattern, Height and Orientation.* Commenting parties have observed that the ESMR and Cellular Telephone licensees often employ cell antennas with significant minor lobes in their vertical patterns mounted at very low elevations—e.g., twenty-five feet—and tilted down so that the main lobe of the antenna is directed “on the street,” as opposed to the horizon.⁸³⁶ Use of such antennas results in a very strong, e.g., -25 dBm, signal in the immediate vicinity and creates high levels of OOB and intermodulation interference to nearby public safety receivers. ESMR and Cellular Telephone interests claim that this “low-site” cell configuration is necessary to prevent a cell from interfering with nearby cells operating on the same frequency, i.e., that the ESMR or Cellular Telephone operator uses low-site cell configuration in order to avoid interference internal to its own system and to improve in-building coverage from the cell.⁸³⁷ However this low-site cell configuration also greatly increases the potential for the cell to cause interference to nearby public safety radios.⁸³⁸ REMEC, an antenna manufacturer, contends that ESMR and Cellular Telephone licensees could substantially reduce interference if the vertical patterns of their antennas distributed R.F. energy evenly on the ground as a function of the distance from the cell site.⁸³⁹ Use of such “smooth pattern” antennas is an Enhanced Best Practices that could contribute to abatement of unacceptable interference.

3. *Effective Radiated Power Limitation.* Several parties noted the correlation between the effective radiated power (ERP) of a cell and the level of interference that cell creates.⁸⁴⁰ These parties contend that reducing ERP, either system wide or on a case-by-case basis, to levels as low as ten watts

⁸³⁶ See Undated Letter from Allen Rosenzweig, REMEC, Inc.; Motorola Comments at 20.

⁸³⁷ See *Best Practices* Guide at 7, Technical Appendix to Island Cellular Comments at 7.

⁸³⁸ See Nextel Oct. 31, 2003 *ex parte* submission at 9. See also Motorola Comments at 20; C&M Comments at 3.

⁸³⁹ REMEC claims that antennas could generate these patterns by approximating a cosecant squared function. See Undated Letter from Allen Rosenzweig, REMEC, Inc.

⁸⁴⁰ See, e.g., Project 39, Interference to Public Safety 800 MHz Radio Systems, *Interim Report to the FCC*, December 24, 2001 at 12-21, *Best Practices* at 7-8; Motorola Comments at 20. See also Alltel, *et al.*, Comments at 14; Alltel, *et al.*, Reply Comments at 31; Delmarva P&L Reply Comments at 22.

would remedy intermodulation interference and, to a lesser extent, OOB interference.⁸⁴¹ However, ESMR interests contend that significantly reducing ERP at a cell would impair subscriber service and necessitate constructing additional cells in a system to compensate for the reduced coverage of the system's other cells. This, they aver, would only serve to create additional interference in the vicinity of the new cells.⁸⁴²

4. ERP reduction can provide significant abatement of intermodulation interference because, for example, when third-order intermodulation interference occurs, a three dB reduction in intermodulation interference can be attained for every one dB reduction in the ERP of a contributing ESMR or Cellular Telephone channel.⁸⁴³ However an across-the-board reduction of the ERP of ESMR or Cellular Telephone systems to ten watts would have serious consequences in the form of impaired ESMR or Cellular Telephone service in areas in which interference to public safety systems is not being caused; and because it would result in coverage "holes" in existing systems, which holes would have to be filled using additional cells which themselves could be a source of intermodulation or OOB interference. Accordingly, in our accompanying *Report and Order* we decline to impose ERP limits, recognizing, however, that ESMR or Cellular Telephone carriers may well elect to reduce ERP as an Enhanced Best Practices to abate unacceptable interference occurring at particular cells during band reconfiguration and thereafter.

C. Limitation on Use of Low Sites

5. Low elevation of cell site antennas has been the reported cause of high on-the-street signal levels and several parties argue that licensees should increase antenna height to avoid unacceptable interference.⁸⁴⁴ However, it is not the differential path length between high and low sites that causes the problem. For example, the path attenuation difference between a 200 foot antenna height and a 20 foot antenna height is negligible.⁸⁴⁵ Instead, the low-site problem most frequently arises from two factors. First, all other things being equal, the vertical "main beam" of a low-site cell will fall closer to the cell than the main beam of a higher antenna,⁸⁴⁶ as will minor lobes in the vertical pattern of the antenna. Second, ESMR and cellular licensees make widespread use of mechanical or electrical beam tilt which causes the vertical main beam of the antenna to fall directly "on the street" in the immediate vicinity of the cell.⁸⁴⁷

⁸⁴¹ *Id.*

⁸⁴² See PSWN Comments at 18; Consensus Parties' Aug. 7 *Ex Parte* at 40-41.

⁸⁴³ See Motorola Interference Technical Appendix to the Best Practices Guide at 11.

⁸⁴⁴ See, e.g., Project 39, Interference to Public Safety 800 MHz Radio Systems, *Interim Report to the FCC*, December 24, 2001 at 12-21, Best Practices Guide at 7-8, Motorola Comments at 20.

⁸⁴⁵ For example, at a distance of 305 meters (1000) feet from a cell site, the free space loss for antennas mounted at 61 meters (200 feet) AGL and 6 meters (20 feet) AGL differs by only 0.17 dB, calculated as follows: The distance (D) over a straight line from a receiving antenna to the radiation center of the transmitting antenna is defined for particular heights (H) by $(D^2 + H^2)^{0.5}$. The path loss over the distance (D) is defined by $53.3 + 20 \log(D_{\text{meters}}) + 20 \log(F_{\text{MHz}})$.

⁸⁴⁶ Thus, for example, given an antenna having a 10 degree 3 dB beamwidth, the main beam of the antenna will intersect the ground at 1134 feet from the cell when mounted on a 200 foot tower, but only at 113 feet from the cell when mounted on a 20 foot tower.

⁸⁴⁷ See Motorola Interference Technical Appendix to Best Practices Guide at 11. See also Motorola Comments at 20.

This appears to be a design choice when localized building penetration is important or when the wide coverage characteristic of high-site cells with little or any beam tilt—is either not required or would impair system subscriber capacity by limiting frequency reuse in nearby cells.⁸⁴⁸ Thus, given this correlation between low-site cells, especially those with beam tilted antennas, and interference to public safety and other non-cellular radios in the vicinity of the cell it can be concluded that: (1) avoiding low-site cell configurations is an effective Enhanced Best Practice, albeit one that can limit subscriber capacity and building penetration; and (2) the low-site/high-site distinction is useful as one means of defining what constitutes a “cellular system” in the context of 800 MHz technology.⁸⁴⁹

D. Filtering of Cumulative OOB Interference

6. Several parties have noted that a significant reduction in OOB interference results when ESMR and Cellular Telephone licensees avoid the use of devices known as hybrid combiners. A combiner, as the name implies, feeds multiple transmitters into a single antenna. Hybrid combiners are not frequency-selective, and thus pass all frequencies fed into them. A cavity combiner, by comparison, uses frequency-selective resonant cavities which pass individual channels, but reject noise that falls outside those channels, *i.e.* OOB.⁸⁵⁰ Hybrid combiners are less expensive than cavity combiners and may be suitable in cases where OOB is not likely to be a problem, *e.g.* in high-site cells or cells in which external filtering equipment is installed. The use of cavity combiners, alone or in combination with outboard filters is another useful Enhanced Best Practice available to ESMR and Cellular Telephone licensees. Use of cavity combiners and outboard filters is an Enhanced Best Practice that can be made proactive, rather than reactive; *e.g.* by integrating the devices into system design before unacceptable interference develops.

E. Cell Site Channel Selection.

7. Cells may be configured to avoid using channels that can cause intermodulation products to fall on specific public safety and other non-cellular 800 MHz channels. Changing channels was a remedy initially discussed in the *Best Practices Guide* and often has proven effective in addressing intermodulation interference to public safety systems.⁸⁵¹ However, the utility of the technique must be viewed against the fact that restricting channel selection can impair the subscriber capacity of the ESMR or Cellular Telephone system.⁸⁵² Moreover, since the channels used at cells change frequently, channel changes sometimes provide only a temporary solution to an interference problem, especially when the intermodulation product is produced by signals from both an ESMR cell and a Cellular Telephone cell. Moreover, as Cellular Telephone licensees convert from analog to digital technology—such as code division multiple access (CDMA)—it may no longer be possible to abate intermodulation interference by changing the channels in a cell or cells.⁸⁵³

⁸⁴⁸ See *Best Practices Guide* at 7, Island SMR Comments, Exhibit A at 7.

⁸⁴⁹ Thus, we have decided to exclude systems using transmitting antennas 200 feet above ground level or higher from our definition of an 800 MHz cellular system. See Section VI.C.2.e *supra*.

⁸⁵⁰ See UTC Comments at 19-20; Motient Comments at 4-5; Southern LINC Comments at 20.

⁸⁵¹ See Consensus Parties' Aug 7 *Ex Parte* at 23.

⁸⁵² *Id.*

⁸⁵³ See *e.g.*, recent articles indicating that Nextel is testing CDMA technology in the 1.9 GHz band: <http://phx.corporate-ir.net/phoenix.zhtml?c=63347&p=irol-newsArticle&t=Regular&id=492688&>, http://www.flarion.com/newsroom/about_06_14a_02.html and Communications Daily Feb. 9, 2004 at 9.

F. Proper Operation of Cell Site Transmitters.

8. Motorola included proper operation of base stations as one of the interference mitigation techniques in its *Technical Toolbox*. ESMR and Cellular Telephone base station equipment can malfunction and cause increased interference, notably, excessive OOB. Any attempt to abate interference through application of Enhanced Best Practices, or otherwise, should consider malfunction of base station transmitters as a possible interference culprit.

G. Increasing the strength of the affected non-cellular signal

9. Improving the signal strength of the desired signal is another Enhanced Best Practice that is frequently difficult to implement. It is clear that most public safety agencies lack the resources to make immediate coverage improvements to their systems. The funding cycle for public safety systems often is measured in multiples of years. It is likewise clear that where coverage improvements are needed most—in areas served by high density ESMR and cellular telephone systems—the requisite additional frequencies are less likely to be available. However, with the appropriate engineering design, otherwise intractable interference problems can sometimes be addressed by use of such technology as simulcasting and the use of signal boosters to provide “spot coverage” in areas affected by unacceptable interference.

10. Unacceptable interference is most frequently a function of the ratio of the desired (non-cellular) signal to the potentially interfering (ESMR or Cellular Telephone) signal. From a strictly technical standpoint, a licensee can achieve meaningful improvements in its signal strength by increasing the base station transmitter power, antenna gain or antenna elevation,⁸⁵⁴ or by constructing additional base stations.⁸⁵⁵ From a practical standpoint, however, there are several obstacles to improving signal strength; the most serious being cost and the availability of frequencies if base stations are added. A rule requiring licensees to place a minimum predicted service contour, *e.g.* 50 dBμV/m, over their desired coverage area has been advanced as an effective interference abatement Enhanced Best Practice. Under such a scheme stations would be protected against interference within that contour.⁸⁵⁶ However, in many circumstances, this could require 800 MHz non-cellular licensees to increase power by a factor of ten or more; or to resort to constructing additional base stations. In the accompanying *Report and Order* substantially the same interference-protection goal has been reached by establishing the measured, rather than predicted, threshold signal level that a public safety signal must attain in areas in which unacceptable interference is encountered or predicted.

⁸⁵⁴ See *Best Practices Guide* at 12.

⁸⁵⁵ *Id.*

⁸⁵⁶ See TIA Comments at 4.

APPENDIX E: ILLUSTRATIVE FORM OF LETTER OF CREDIT

[Subject to Issuing Bank Requirements]

No. _____

[Date of Issuance]

[Trustee]

[Address]

Ladies and Gentlemen:

We hereby establish, at the request and for the account of Nextel Communications, Inc., in your favor, as required under the [Report and Order and Fifth Report and Order and Fourth Memorandum Opinion and Order, and Order dated as of _____, 2004] issued by the Federal Communications Commission ("FCC") in the matter of Improving Public Safety Communications in the 800 MHz Band (the "Order"), our Irrevocable Letter of Credit No. _____, in the amount of \$2,500,000,000 (Two Billion Five Hundred Million United States Dollars), expiring at the close of banking business at our office described in the following paragraph, on [the date which is five years from the date of issuance/ or the date which is one year from the date of issuance, provided the Issuing Bank includes an evergreen clause that provides for automatic renewal unless the Issuing Bank gives notice of non-renewal to the Trustee, with a copy to the FCC, at least sixty days but not more than ninety days prior to the expiry thereof], or such earlier date as the Letter of Credit is terminated by the Trustee (the "Expiration Date"). Capitalized terms used herein but not defined herein shall have the meanings accorded such terms in the Order.

Funds under this Letter of Credit are available to you against your draft in the form attached hereto as Annex A, drawn on our office described below, and referring thereon to the number of this Letter of Credit, accompanied by your written and completed certificate signed by you substantially in the form of Annex B-1 attached hereto and, if applicable, the Transition Administrator's written and completed certificate signed by the Transition Administrator substantially in the form of Annex B-2 attached hereto. Such draft and certificates shall be dated the date of presentation or an earlier date, which presentation shall be made at our office located at [BANK ADDRESS] and shall be effected either by personal delivery or delivery by a nationally recognized overnight delivery service. We hereby commit and agree to accept such presentation at such office, and if such presentation of documents appears on its face to comply with the terms and conditions of this Letter of Credit, on or prior to the Expiration Date, we will honor the same not later than the first banking day after presentation thereof in accordance with your payment instructions.

Payment under this Letter of Credit shall be made by [check/wire transfer of Federal Reserve Bank of New York funds] to the payee and for the account you designate, in accordance with the instructions set forth in a draft presented in connection with a draw under this Letter of Credit.

Partial drawings are permitted under this Letter of Credit, and the amount of this Letter of Credit shall be reduced by each such partial draw hereunder.

This Letter of Credit shall be subject to automatic amendment by a decrease in the amount available hereunder to the amount specified in a Transition Administrator's certificate purportedly signed by the Transition administrator or, if not an individual, by two authorized representatives of the Transition Administrator, and countersigned by an authorized signatory of the FCC in the form attached as Annex C, which amendment shall automatically become effective upon receipt of such certificate.

This Letter of Credit shall be canceled and terminated upon receipt by us of the Transition Administrator's certificate purportedly signed by the Transition Administrator or, if not an individual, by two authorized representatives of the Transition Administrator, and in either case countersigned by an authorized signatory of the FCC in the form attached as Annex D.

This Letter of Credit is not transferable or assignable in whole or in part, except that this Letter of Credit may be assigned or transferred to any successor trustee succeeding you upon **[insert Issuing Bank's standard practice language, such as language regarding requirements for timely notification and supplemental documentation.]**

This Letter of Credit sets forth in full the undertaking of the Issuer, and such undertaking shall not in any way be modified, amended, amplified or limited by reference to any document, instrument or agreement referred to herein, except only the certificates and the drafts referred to herein and the ISP (as defined below); and any such reference shall not be deemed to incorporate herein by reference any document, instrument or agreement except for such certificates and such drafts and the ISP.

This Letter of Credit shall be subject to, governed by, and construed in accordance with, the International Standby Practices 1998, International Chamber of Commerce Publication No. 590 (the "ISP"), which is incorporated into the text of this Letter of Credit by this reference, and, to the extent not inconsistent therewith, the laws of the State of New York, including the Uniform Commercial Code as in effect in the State of New York. Communications with respect to this Letter of Credit shall be addressed to us at our address set forth below, specifically referring to the number of this Letter of Credit.

[NAME OF BANK]
[BANK SIGNATURE]

APPENDIX E-ANNEX AForm of Draft

To: [Issuing Bank]

DRAWN ON LETTER OF CREDIT No: _____

AT SIGHT

PAY TO THE ORDER OF _____ [insert name of
Trustee] BY [CHECK/WIRE TRANSFER OF FEDERAL RESERVE BANK OF NEW
YORK]

FUNDS TO: _____

Account (_____)

AS 800 MHz RELOCATION and TRANSITION PAYMENTS

[AMOUNT IN WORDS] DOLLARS AND NO/CENTS

\$(AMOUNT IN NUMBERS)

[TRUSTEE]

By: _____

APPENDIX E-ANNEX B-1Draw Certificate

The undersigned hereby certifies to [Name of Bank] (the "Bank"), with reference to (a) Irrevocable Standby Letter of Credit No. [Number] (the "Letter of Credit") issued by the Bank in favor of the [Trustee] and (b) [paragraph 332] of the [Report and Order and Fifth Report and Order and Fourth Memorandum Opinion and Order, and Order] dated as of _____, 2004] issued by the Federal Communications Commission in the matter of Improving Public Safety Communications in the 800 MHz Band (the "Order"), pursuant to which Nextel Communications, Inc. (the "LC Provider") has provided the Letter of Credit (all capitalized terms used herein but not defined herein having the meaning stated in the Order), that:

[i. The Transition Administrator has certified to the Trustee that pursuant to the Order, a payment in the amount of \$_____ is appropriate to be made to the Trustee to hold in trust and disburse in payment of the expenses for _____, and further certifying that the Transition Administrator instructs the Trustee to make such payment via draw on Letter of Credit No. _____; and

ii. A copy of the signed certification referred to in clause (i) above and in the form of Annex B-2 to Letter of Credit No. _____, purportedly signed by or on behalf of the Transition Administrator is attached hereto.]

OR

[The FCC has certified to the Trustee that pursuant to the Order and the Commission's finding that Nextel is in material breach of the terms of the Order, the Trustee is entitled to receive payment of \$_____ representing the remaining undrawn amount of Letter of Credit No. _____, to hold in trust and disburse in accordance with the terms of the Order.

OR

[The FCC has certified to the Trustee that given notice of non-renewal of Letter of Credit No. _____ and failure of the account party to obtain a satisfactory replacement thereof, pursuant to the Order, the Trustee is entitled to receive payment of \$_____ representing the remaining amount of Letter of Credit No. _____, to hold in trust and disburse pursuant to the Order.]

IN WITNESS WHEREOF, the undersigned has executed this certificate as of [specify time of day] on the ____ day of _____, 200__.

[TRUSTEE]

By: _____

Name:

Title:

APPENDIX E-ANNEX B-2Draw Certificate of Transition Administrator

The undersigned hereby certifies to the [Trustee] (the "Trustee"), with reference to [paragraph 332 of the [Report and Order and Fifth Report and Order and Fourth Memorandum Opinion and Order, and Order dated as of _____, 2004] issued by the Federal Communications Commission in the matter of Improving Public Safety Communications in the 800 MHz Band (the "Order"), pursuant to which Nextel Communications, Inc. (the "LC Provider") has provided the Letter of Credit (all capitalized terms used herein but not defined herein having the meaning stated in the Order), that:

i. _____ [Name of licensee] is an 800 MHz licensee that has obtained a quotation for [estimated expenses/final expenses] in the amount of \$ _____ in connection with transition from _____ [specify spectrum] to _____ [specify spectrum] which are appropriately reimbursable under the Order, and such amount is appropriately payable for relocation expenses on behalf of [Name of licensee], and **[either (i) there has been no dispute regarding the amount of such payment, or (ii) any dispute regarding the amount of such payment has been resolved in accordance with the Order]**, and

ii. The undersigned has established and will maintain for [specify time period] a file containing documents and records that demonstrate with reasonable specificity according to industry standards and [financial standards for expense documentation / other standards or standards contained in the Order] conclusions stated in its certification in clause (i) above, and such file shall be available during regular business hours for inspection or audit by [who will audit (or specify auditors for) the Transition Administrator?]

Based on the foregoing, the Transition Administrator hereby directs the Trustee to draw on the Letter of Credit in the amount and for the benefit of the party specified in clause (i) above, payable as follows: [Insert Payment Instruction/payment instructions to follow in separate documentation]

IN WITNESS WHEREOF, the undersigned has executed this certificate as of the ____ day of _____, 200__.

[TRANSITION ADMINISTRATOR]

[TWO SIGNATURES REQUIRED IF TRANSITION ADMINISTRATOR IS AN ENTITY; ONE SIGNATURE REQUIRED IF TRANSITION ADMINISTRATOR IS A NATURAL PERSON]

By: _____
Name:
Title:

[By: _____]
Name:
Title:

APPENDIX E-ANNEX CCertificate Regarding Reduction of Letter of Credit

The undersigned hereby certifies to [Name of Bank] (the "Bank"), with reference to (a) Irrevocable Standby Letter of Credit No. [Number] (the "Letter of Credit") issued by the Bank in favor of the [trustee], and (b) [paragraph 332] of the [Report and Order and Fifth Report and Order and Fourth Memorandum Opinion and Order, and Order] dated as of _____, 2004] issued by the Federal Communications Commission ("FCC") in the matter of Improving Public Safety Communications in the 800 MHz Band (the "Order"), (all capitalized terms used herein but not defined herein having the meaning stated or described in the Order), that:

(1) the undersigned Transition Administrator has documented, pursuant to the Order, that the amount of the Letter of Credit (prior to adjustment as set forth in clause (2) below) exceeds the amount needed to ensure completion of band configuration; and

(2) the amount of the Letter of Credit shall be reduced to the amount equal to \$_____ [_____Dollars].

IN WITNESS WHEREOF, the undersigned has executed this certificate as of the ____ day of _____, 200__.

[TRANSITION ADMINISTRATOR]

[TWO SIGNATURES REQUIRED IF TRANSITION ADMINISTRATOR IS AN ENTITY; ONE SIGNATURE REQUIRED IF TRANSITION ADMINISTRATOR IS A NATURAL PERSON]

By: _____

Name:

Title:

[By: _____]

Name:

Title:

COUNTERSIGNED:

Federal Communications Commission

By: _____

Name:

Its Authorized Signatory

APPENDIX E-ANNEX DCertificate Regarding Termination of Letter of Credit

The undersigned hereby certifies to [Name of Bank] (the "Bank"), with reference to (a) Irrevocable Standby Letter of Credit No. [Number] (the "Letter of Credit") issued by the Bank in favor of the [trustee], and (b) [paragraph 332] of the [Report and Order and Fifth Report and Order and Fourth Memorandum Opinion and Order, and Order] dated as of _____, 2004] issued by the Federal Communications Commission ("FCC") in the matter of Improving Public Safety Communications in the 800 MHz Band (the "Order"), (all capitalized terms used herein but not defined herein having the meaning stated or described in the Order), that:

(1) [include one of the following clauses, as applicable]

(a) The Order has been fulfilled in accordance with the provisions thereof;

(b) Nextel Communications, Inc. has paid to the appropriate parties all amounts it is required to pay pursuant to the terms of the Order; or

(c) Nextel Communications, Inc. has provided a replacement letter of credit satisfactory to the FCC.

(2) By reason of the event or circumstance described in paragraph (1) of this certificate, and effective upon the receipt by the Bank of this certificate (countersigned as set forth below), the Letter of Credit is terminated.

IN WITNESS WHEREOF, the undersigned has executed this certificate as of the ____ day of _____, 200__.

[TRANSITION ADMINISTRATOR]

[TWO SIGNATURES REQUIRED IF TRANSITION ADMINISTRATOR IS AN ENTITY; ONE SIGNATURE REQUIRED IF TRANSITION ADMINISTRATOR IS A NATURAL PERSON]

By: _____
Name:
Title:

[By: _____]
Name:
Title:

COUNTERSIGNED:

Federal Communications Commission

By: _____
Name:
Its Authorized Signatory

APPENDIX E-ANNEX ETerms for Documents Establishing the 800 MHz Relocation Trust and the Relationship between Nextel and the Letter of Credit Trustee (the "Trustee")

Basic Terms related to the Establishment of the 800 MHz Relocation Trust. The Letter of Credit trustee (the "Trustee") shall incorporate language to fully effectuate the following summary terms into each item of documentation establishing (i) the trust to receive proceeds of the letter of credit contemplated by the Report and Order (the "800 MHz Relocation Trust") and (ii) the relationship between Nextel and the Trustee of said trust with respect thereto. Each such document shall be subject to Commission review and approval prior to execution.

- acknowledgment of purpose to effect the 800 MHz transition in support of public safety, and agreement to work in good faith with the other parties pursuant to the Report and Order
- representation and warranty by the Trustee that such entity (not an individual) meets the qualifications set forth in the Report and Order (e.g., independence and absence of conflicts of interest)
- designation of the Commission as an intended third-party beneficiary; no other party to be an intended third-party beneficiary
- definition of completion of the reconfiguration
- term—five years, or until the 800 MHz transition is complete, whichever is earlier
- successor Trustee requires approval of the Commission
- replacement of Trustee at Nextel's request—define "cause" and require showing of cause and 14 days advance notice to the parties and to the Commission
- election by Trustee to withdraw from arrangement—requires 14 days advance notice to the parties and to the Commission; may require ongoing monetary obligation or duty of Trustee, as applicable (for example, to support transition)
- change of control of Trustee—requires approval of Nextel (so long as Nextel is not then in Default under the Report and Order) and the Commission, which approval shall not be unreasonably withheld but which may be conditional
- notice procedure - specifies which notices shall be copied to the Commission

Terms Specific to the Establishment of the 800 MHz Relocation Trust. At the option of the Trustee, the following points may be covered in one or more agreements (for example, there may be a separate fee letter).

- corpus of trust to be proceeds of one or more LOCs issued for the account of Nextel pursuant to the Report and Order
- Trustee agrees to hold money as fiduciary for 800 MHz licensees and for the Commission; fiduciary obligations fulfilled via handling of funds according to standards applied to

corporate trustees, and via disbursement of funds pursuant to instructions issued by the Transition Administrator. The Trustee should be a fiduciary of the Transition Administrator

- specifies record-keeping obligations pursuant to the Report and Order
- specifies reporting obligations pursuant to the Report and Order
- specifies audit and inspection rights of Nextel and the Commission, including allocation of costs thereof
- specifies details concerning fees to be paid by Nextel to the Trustee
- specifies that the trust agreement may not be amended, modified or rescinded without approval of the Commission
- specifies that the corpus of the trust(s) shall be forfeit to the United States Treasury to the extent that Nextel fails to make any of the payments owed to the Treasury by the date specified in the Commission's Report and Order
- specifies additional terms of a customary nature for agreements establishing a corporate trust

Terms for Tri-Party Agreement among Nextel, the Transition Administrator and the Letter of Credit Trustee (the “Trustee”)

Basic Terms. The Tri-Party Agreement among Nextel, the Transition Administrator (sometimes referred to herein as the “TA”) and the Trustee shall incorporate language to fully effectuate the following summary terms and shall be subject to Commission review and approval prior to execution:

- acknowledgment of purpose to effect the 800 MHz transition in support of public safety, and agreement to work in good faith with the other parties pursuant to the Report and Order
- representation and warranty by each of the Transition Administrator and the Trustee that such person (individual or entity) meets the qualifications set forth in the Report and Order (e.g., independence and absence of conflicts of interest)
- designation of the Commission as an intended third-party beneficiary; no other party to be an intended third-party beneficiary
- definition of completion of the reconfiguration
- term—five years, or until the 800 MHz transition is complete, whichever is earlier
- successor Transition Administrator/Trustee requires approval of the Commission
- replacement of Transition Administrator/Trustee at Nextel’s request—define “cause” and require showing of cause and 14 days advance notice to the parties and to the Commission
- election by Transition Administrator/Trustee to withdraw from arrangement—requires 14 days advance notice to the parties and to the Commission; may require ongoing monetary obligation or duty of Transition Administrator/Trustee, as applicable (for example, to support transition)
- change of control of Transition Administrator/Trustee—requires approval of Nextel (so long as Nextel is not then in Default under the Report and Order) and the Commission, which approval shall not be unreasonably withheld but which may be conditional
- replacement/successor Transition Administrator to be selected by the search committee pursuant to this *Report and Order*
- notice procedure - specifies which notices shall be copied to the Commission
- Note: language to be harmonized as appropriate if the Transition Administrator is a natural person rather than an entity

Terms Specific to Tri-Party Agreement

- tasks the TA with working with the Trustee to set up the trust
- tasks the TA with designing the payment system subject to reasonable approval of Nextel and the Trustee (up front payments vs. progress payments; timing and logistics of payments in conjunction with the LOC system [for example, a draw would be made under the LOC for the estimated amount of a licensee’s transition project; at the TA’s direction, the Trustee would disburse those proceeds to the appropriate vendors, or to the licensee,

according to payment criteria such as product delivery or project milestones]; how to handle true-ups [either a payment made in excess of an estimate, or a refund collected if the estimate exceeded actual cost]; logistics for obtaining payment approvals, including the approval of Nextel, and for resolving disputes related to payment amounts)

- states the Transition Administrator will not handle any project funds; specifies procedures for the TA to turn over funds it may receive in connection with the project to the Trustee
- specifies how the Trustee will dispose of any refunds it may receive during or after the relocation process
- specifies the Trustee will follow the details of the payment system devised by the TA pursuant to the Tri-Party Agreement
- tasks the TA with developing a system to ensure vendors are not filing mechanics liens or equipment financing liens against the licensees in connection with the transition (or, in the alternative, tracking the release of liens in connection with payments to vendors)
- tasks the TA, as the project manager, with creating a standardized bid package for use by the municipality licensees—including a standardized scope of project, and a standardized documentation package. NOTE: The standardized documentation package could contain the requirement that the vendor obtain a performance bond, which bond would be paid for via the LOC proceeds as part of the cost of the transition. The standardized bid package would be subject to Nextel's reasonable approval.
- tasks the TA with developing standardized bidding procedures for the municipal licensees to follow
- specifies that neither the Trustee nor the Transition Administrator bears the risk that a particular vendor fails to perform, and allocates such risk between Nextel and the licensees—since the municipality/licensees will have control over the award of the contract, it is reasonable they would bear the risk (and where appropriate, the risk could be managed via the performance bond mentioned above)
- specifies additional terms of a customary nature in agreements for management of a project by a third party Project Administrator
- specifies additional terms of a customary nature in agreements for management of payments by a third party Paying Agent (to the extent not covered in the documentation establishing the trust)
- specifies details of dispute resolution mechanisms, including time frames and escalation procedures
- specifies the rights of Nextel vis-à-vis the relocation process absent an event of default by Nextel under the Report and Order
- during the continuance of an event of default by Nextel under the Report and Order, specifies the remedies of the TA and the Trustee (i.e., the consequences to Nextel, such as Nextel losing veto rights concerning a project's cost)
- specifies record-keeping and reporting obligations of each party pursuant to the Report and Order

- specifies audit and inspection rights of Nextel and the Commission, including allocation of costs thereof
- specifies details concerning fees and expenses to be paid by Nextel to the TA and to the Trustee; fees and expenses of the Transition Administrator to conform to notification of Search Committee pursuant to the *Report and Order*
- specifies how the TA and Trustee may be paid in the event of a default by Nextel in the payment of fees to the TA and/or the Trustee -- including a mechanism whereby relief may be sought from the Commission authorizing the proceeds of the LOC be applied against such fees
- specifies that the Tri-Party Agreement may not be amended, modified or rescinded without approval of the Commission
- specifies an order of precedence—that the Tri-Party Agreement would govern in the event of a conflict between the terms of the Tri-Party Agreement and the terms of a bilateral agreement among two of the parties
- specifies a procedure and criteria for Transition Administrator to certify that the 800 MHz relocation is complete, which certification shall allow TA, with Commission's concurrence to seek termination of the Letter(s) of Credit. Termination will also trigger early termination of the Trust and Tri-Party Agreement
- specifies items for which the Transition Administrator may properly seek draws under the Letter of Credit, consistent with the *Report and Order*
- specifies items for which the Transition Administrator may not seek draws under the LOC (such as reimbursement of UTAM, relocation of BAS incumbents) consistent with the *Report and Order*
- specifies that the corpus of the trust(s) shall be forfeit to the U.S. Treasury in the event that Nextel fails to make any of the payments to the Treasury specified in the Commission's *Report and Order*
- specifies responsibilities and guidelines for record-keeping, accounting and dispute resolution related to calculation of the offset described in the *Report and Order*.
- specifies responsibilities and timeliness related to certification of project completion by the Transition Administrator and rendering of the final accounting required in the Report and Order.

APPENDIX F: NPSPAC REGIONS

Region 1: Alabama	Region 2: Alaska
Region 3: Arizona	Region 4: Arkansas
Region 5: Southern California	Region 6: Northern California
Region 7: Colorado	Region 8: Metropolitan, NYC Area (NY, NJ, & CT)
Region 9: Florida	Region 10: Georgia
Region 11: Hawaii	Region 12: Idaho
Region 13: Illinois (except Southern Lake Michigan counties)	Region 14: Indiana (except Southern Lake Michigan counties)
Region 15: Iowa	Region 16: Kansas
Region 17: Kentucky	Region 18: Louisiana
Region 19: New England	Region 20: District of Columbia, Maryland, & Northern VA
Region 21: Michigan	Region 22: Minnesota
Region 23: Mississippi	Region 24: Missouri
Region 25: Montana	Region 26: Nebraska
Region 27: Nevada	Region 28: Eastern Pennsylvania (east of Harrisburg, southern NJ & DE)
Region 29: New Mexico	Region 30: Eastern Upstate New York
Region 31: North Carolina	Region 32: North Dakota
Region 33: Ohio	Region 34: Oklahoma
Region 35: Oregon	Region 36: Western Pennsylvania
Region 37: South Carolina	Region 38: South Dakota
Region 39: Tennessee	Region 40: Texas (Central & Northeast)
Region 41: Utah	Region 42: Virginia
Region 43: Washington	Region 44: West Virginia
Region 45: Wisconsin (except Southern Lake Michigan counties)	Region 46: Wyoming
Region 47: Puerto Rico	Region 48: US Virgin Islands
Region 49: Texas - Central (Austin Area)	Region 50: Texas - West & Central (Midland Area)
Region 51: Texas - East (Houston Area)	Region 52: Texas - Panhandle, High Plains & Northwest (Lubbock Area)
Region 53: Texas - Southern (San Antonio Area)	Region 54: Southern Lake Michigan (Great Lakes inc. WI, IL, & IN)
Region 55: Western Upstate New York	

APPENDIX G: SOUTHEAST ESMR BAND PLAN

The ESMR band in the following counties and parishes is the band segment 813.5 - 824 MHz / 858.5-869 MHz. The Expansion Band in these areas shall extend from 812.5-813.5 MHz / 857.5-858.5 MHz. All licensees operating in the band segment 806-813.5 MHz / 851-858.5 MHz shall be afforded the same protection against unacceptable interference as specified in the *Report and Order*.

Alabama

Autauga, Baldwin, Barbour, Bibb, Blount, Bullock, Butler, Calhoun, Chambers, Cherokee, Chilton, Choctaw, Clarke, Clay, Cleburne, Coffee, Colbert, Conecuh, Coosa, Covington, Crenshaw, Cullman, Dale, Dallas, DeKalb, Elmore, Escambia, Etowah, Fayette, Franklin, Geneva, Greene, Hale, Henry, Houston, Jackson, Jefferson, Lamar, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Madison, Marengo, Marion, Marshall, Mobile, Monroe, Montgomery, Morgan, Perry, Pickens, Pike, Randolph, Russell, Shelby, St Clair, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, Washington, Wilcox, Winston

Florida

Bay, Calhoun, Escambia, Franklin, Gadsden, Gulf, Holmes, Jackson, Jefferson, Leon, Liberty, Madison, Nassau, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton, Washington

Georgia

Appling, Atkinson, Bacon, Baker, Baldwin, Banks, Barrow, Bartow, Ben Hill, Berrien, Bibb, Bleckley, Brantley, Brooks, Bryan, Bulloch, Burke, Butts, Calhoun, Camden, Candler, Carroll, Catoosa, Charlton, Chatham, Chattahoochee, Chattooga, Cherokee, Clarke, Clay, Clayton, Clinch, Cobb, Coffee, Colquitt, Columbia, Cook, Coweta, Crawford, Crisp, Dade, Dawson, Decatur, DeKalb, Dodge, Dooly, Dougherty, Douglas, Early, Echols, Effingham, Elbert, Emanuel, Evans, Fannin, Fayette, Floyd, Forsyth, Franklin, Fulton, Gilmer, Glascock, Glynn, Gordon, Grady, Greene, Gwinnett, Habersham, Hall, Hancock, Haralson, Harris, Hart, Heard, Henry, Houston, Irwin, Jackson, Jasper, Jeff Davis, Jefferson, Jenkins, Johnson, Jones, Lamar, Lanier, Laurens, Lee, Liberty, Lincoln, Long, Lowndes, Lumpkin, Macon, Madison, Marion, McDuffie, McIntosh, Meriwether, Miller, Mitchell, Monroe, Montgomery, Morgan, Murray, Muscogee, Newton, Oconee, Oglethorpe, Paulding, Peach, Pickens, Pierce, Pike, Polk, Pulaski, Putnam, Quitman, Rabun, Randolph, Richmond, Rockdale, Schley, Screven, Seminole, Spalding, Stephens, Stewart, Sumter, Talbot, Taliaferro, Tattnall, Taylor, Telfair, Terrell, Thomas, Tift, Toombs, Towns, Treutlen, Troup, Turner, Twiggs, Union, Upson, Walker, Walton, Ware, Warren, Washington, Wayne, Webster, Wheeler, White, Whitfield, Wilcox, Wilkes, Wilkinson, Worth

Louisiana

Catahoula, Concordia, Madison, Tensas

Mississippi

Adams, Alcorn, Amite, Attala, Calhoun, Carroll, Chickasaw, Choctaw, Claiborne, Clarke, Clay, Copiah, Covington, Forrest, Franklin, George, Greene, Grenada, Hancock, Harrison, Hinds, Holmes, Itawamba, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lee, Lincoln, Lowndes, Madison, Marion, Monroe, Montgomery, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Pontotoc, Prentiss, Rankin, Scott, Simpson, Smith, Stone, Tippah, Tishomingo, Union, Walthall, Warren, Wayne, Webster, Wilkinson, Winston, Yazoo

North Carolina

Cherokee, Clay, Graham, Jackson, Macon

South Carolina

Abbeville, Aiken, Allendale, Anderson, Bamberg, Barnwell, Beaufort, Edgefield, Greenwood, Hampton,

Jasper, McCormick, Ocone

Tennessee

Bledsoe, Bradley, Franklin, Giles, Hamilton, Hardin, Lawrence, Lincoln, Marion, McMinn

**STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

*Re: Improving Public Safety Communications in the 800 MHz Band (WT Docket No. 02-55), et al.,
Report and Order and Fourth Report and Order*

Congress has imposed many important obligations on the Commission. One of the Commission's most important commitments is to promote safety of life and property using wire and radio communications. Today, it is more important than ever before that public safety agencies have access to reliable, robust, interference-free communications systems. To protect our communities, our citizens, and our Nation, we must take every action at our disposal to achieve the seamless communications necessary for emergency preparedness and response.

The 800 MHz band has become increasingly crucial to public safety communications. Because of the interleaved nature of the band and the close proximity of incompatible technologies, over the years, these systems have encountered escalating amounts of interference from commercial cellular systems. In response, the Commission released a Notice of Proposed Rulemaking to reconfigure the 800 MHz band to abate the interference caused to public safety systems. This proceeding's extensive record of over 2,200 filings depicts the complexity of the issue and difficulty in constructing a solution that is technically sound, effective and equitable to all parties. Although today's Order incorporates proposals and suggestions from various parties on record, it is a Commission-derived solution that represents the most comprehensive and effective means of solving the 800 MHz public safety interference problem.

Our decision fulfills our mandate to promote public safety by reconfiguring the 800 MHz public safety band to segregate systems causing unacceptable levels of interference to public safety communications. Without these measures, countless lives are at risk because our Nation's first responders cannot rely on their radios in emergencies. In the short term, the Order establishes technical rules and procedures that define and alleviate "unacceptable interference" to public safety systems. Longer term, the Order adopts a restructuring plan that spectrally separates incompatible technologies to maximize interference protection for present and future public safety systems and provides a smooth transition to the new band with minimal disruption to public safety systems and other affected parties.

The Commission-derived plan requires Nextel to relinquish spectrum and reband 800 MHz and relocate incumbents in 800 MHz and 1.9 GHz. Nextel must also complete the reconfiguration within three years and obtain a letter of credit to guarantee its completion for public safety licensees. It is important to emphasize that Nextel is responsible for all costs of relocating public safety licensees.

This decision is by far one of the most complex matters to come before the Commission; however, it is unquestionably one of the most important decision affecting public safety and the American people. We will carefully monitor the progress of public safety relocation and will take all necessary steps to ensure full compliance of the plan we adopt today.

**STATEMENT OF
COMMISSIONER KATHLEEN Q. ABERNATHY**

*Re: Improving Public Safety Communications in the 800 MHz band,
WT Docket No. 02-55*

For three years we have struggled to identify the best way to resolve public safety interference problems in the 800 MHz band. After reviewing the voluminous record it became clear to me that: 1) the adoption of enhanced best practices alone would be inadequate to protect critical public safety communications; and 2) any rebanding solution would be costly, complex and controversial. I embrace today's decision because it puts public safety's interests first. While I recognize that the rebanding plan is costly, complex and, in some respects, controversial, it is the only the solution that adequately addresses the needs of public safety while realigning other uses of the 800 MHz band.

When we initiated this proceeding, I stated that there were four key considerations which would likely guide my analysis. First, the plan must aggressively attack the public safety interference issues. Second, our approach should strive to minimize costs. Third, if possible, we should attempt to minimize the disruption to other bands. And fourth, if we were to consolidate public safety into a contiguous band and there is a demonstrated need in the record, we should identify additional interoperability channels for public safety. Today's order addresses each of these considerations.

As an initial step we adopt mandatory best practices that will diminish, but not eliminate, the potential for harmful interference to public safety. Over the longer term, we are implementing a rebanding plan that completely eliminates harmful interference and provides additional spectrum for public safety. Rebanding will be paid for by Nextel, thus ensuring that public safety does not incur any new costs, and the processes we have adopted will minimize service disruptions.

Because of the importance of achieving a workable solution for public safety and the American public, and the complex technical issues, this has not been an easy proceeding to resolve. I believe, however, that the plan we are adopting is the best mechanism available to us to solve the public safety interference problem in the 800 MHz band and I appreciate all of the time, effort and brain power devoted to this proceeding by public safety, industry and the FCC staff.

**STATEMENT OF
COMMISSIONER MICHAEL J. COPPS**

RE: Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55.

Today we take a giant leap forward to protect public safety. Title I of our enabling statute charges the Federal Communications Commission to promote the national defense and the safety of life and property through the wise use of our country's communications systems. Indeed, a public servant has no higher obligation than tending to the safety of the people.

It took a long time and a lot of hard work to get us here today. Along the way we discovered that no plan is perfect, no plan is supported by all parties, and no plan is guaranteed to deliver everything that it promises. Challenging technical questions were accompanied by equally challenging questions of policy and of law. At the end of two years of study, analysis and stakeholder input, we have now come to a decision that can fix the problems it addresses, advance public safety and serve the public interest.

Today we approve a reconfiguration of the 800 MHz band so that public safety spectrum is insulated from interference from Nextel operations and public safety is given access to additional spectrum to do its job. We mandate that Nextel pay all relocation costs, even if they are above the \$850 million figure that the company has discussed. We mandate that Nextel secure an irrevocable letter of credit for \$2.5 billion so that the public safety community knows that it will have the money it needs to relocate. We establish a transition manager that will be independent of any one interest, and that I hope will work to make the transition serve the public interest of minimizing interference and getting public safety operations to a stable place as soon as possible. We state that upon receiving the Comptroller General's analysis of appropriations statutes, we can stay relevant portions of the Order if appropriate. And finally, we establish a mechanism to protect tax-payers against private sector windfall.

It's a good day for public safety, a good day for America. I think the citizens of our country now are looking to us—all of us—to get on with the job of putting this plan into action. Time and delay are not our friends here.

I want to express my thanks to my colleagues, particularly the Chairman, to the Bureau and to our hard-working staffs for the extraordinary time, skill and energy they put into this long-running proceeding. And I want to express my deep thanks to the public safety community that worked so hard, traveled so far and thought so creatively to bring us to where we are today. The perseverance of all is certainly appreciated by this Commissioner.

**STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

*Re: Improving Public Safety Communications in the 800 MHz Band; WT Docket
No. 02-55*

The interference situation in the 800 MHz band is one of the most challenging wireless issues the Commission has ever faced. We are trying to untangle years of actions that have created unacceptable and dangerous interference problems for our nation's first responders. I am pleased to support today's item because it puts in place the necessary components to greatly minimize, and hopefully eliminate, the interference currently experienced by our nation's first responders who communicate on land mobile radio systems in the 800 MHz band, particularly during times of emergency. This interference is an unacceptable crisis that must be fixed. Today we give our licensees what they asked for – the regulatory tools to solve the problem both through rebanding and enhanced best practices.

The urgent needs of the public safety community is one of the top priorities of the Commission, and certainly this Commissioner. Public safety officials put their lives on the line for all of us every day, and their situation commands the highest level of attention and priority at the Commission. The very first paragraph of the Communications Act charges the Commission to promote “the safety of life and property through the use of wire and radio communication.”

Today we step up to that responsibility, and it is important that in doing so we speak with one voice as a Commission. The stakes here are as high as in any proceeding we consider. We simply have to get this right. Throughout this proceeding, I have worked very hard with my colleagues to explore all aspects of rebanding, including different mechanisms for funding and a variety of spectrum configuration options. We worked tirelessly through countless options to find the approach that met the concerns of public safety while remaining within the bounds of the authority granted to us by Congress.

I know that some may say that the Commission moved too slowly to take this action. But I want to emphasize that the time has been very well spent. Since early this year, my staff and I, in conjunction with some of the other Commissioner offices, have worked extensively with the Commission staff to ensure that this item provides the best blueprint possible for 800 MHz rebanding. There simply is too much at stake to get this wrong. It is especially important that we put in place an appropriate mechanism to ensure that all necessary resources are provided to meet the needs of public safety agencies, and that any incentives to limit assistance are minimized. I also am pleased that the item puts in place procedures to minimize as much as possible the impact of our decision on 800 MHz licensees not directly implicated by the interference problem.

Finally, while this proceeding likely impacted every Bureau and Office in the Commission, I want to acknowledge the extraordinary efforts of the staff of the Wireless Telecommunications Bureau in tackling this once in a lifetime challenge. I want to specifically thank Michael Wilhelm, who managed this project from the beginning, and the staff of the Public Safety and Critical Infrastructure Division for their outstanding work on this project – it truly has been a fine performance of government service.

This decision's primary goal is to protect the nation's police, fire and emergency medical personnel who are on the front lines of our country's public safety efforts. Our decision today puts that priority front and center, right where it belongs.

Exhibit 1026

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
Amendment of Part 2 of the Commission's Rules	)	
to Allocate Spectrum Below 3 GHz for Mobile	)	
and Fixed Services to Support the Introduction of	)	ET Docket No. 00-258
New Advanced Wireless Services, including Third	)	
Generation Wireless Systems	)	

SECOND REPORT AND ORDER

Adopted: November 7, 2002

Released: November 15, 2002

By the Commission: Chairman Powell and Commissioners Copps and Martin issuing separate statements.

TABLE OF CONTENTS

<u>Heading</u>	<u>Paragraph #</u>
I. INTRODUCTION.....	1
II. BACKGROUND.....	2
III. DISCUSSION.....	9
A. Need for Additional Spectrum for AWS	9
B. Spectrum for AWS.....	22
1. 1710-1755 MHz.....	22
2. 2110-2150/2150-2155 MHz.....	27
3. Other Bands.....	48
IV. CONCLUSION.....	51
V. PROCEDURAL MATTERS.....	53
VI. ORDERING CLAUSES.....	55

APPENDIX A: FINAL RULES

APPENDIX B: LIST OF COMMENTING PARTIES

APPENDIX C: FINAL REGULATORY FLEXIBILITY ANALYSIS

APPENDIX D: ANALYSIS OF INTERFERENCE IMPACT OF GOLDSTONE, CA DEEP SPACE
NETWORK FACILITY

I. INTRODUCTION

1. In this Second Report and Order (Second R&O), we take significant steps in our continuing effort to identify and allocate spectrum to support new advanced wireless services (AWS), the collective term we use for new and advanced wireless applications, such as voice, data and broadband services provided over a variety of high-speed fixed and mobile networks, and which are popularly

referred to as “third generation” (3G) systems.¹ The substantial amount of spectrum we allocate today will promote the development and deployment of these advanced systems, which are anticipated to provide widespread consumer benefits, both within the United States and throughout the world. Specifically, we allocate 90 MHz of spectrum in the 1710-1755 MHz and 2110-2155 MHz bands that can be used for AWS. This spectrum comes from bands that the Commission previously identified as candidate bands for the provision of AWS, and includes spectrum used by Federal Government entities that is slated for transfer to non-Federal Government use, spectrum currently used by fixed microwave services and designated for emerging technologies, and spectrum currently used by the Multipoint Distribution Service (MDS).²

II. BACKGROUND

2. We initiated this proceeding in January 2001 with the issuance of a *Notice of Proposed Rulemaking*³ that examined spectrum in both government and non-government use bands that could support AWS. In the *Notice*, we observed that the International Telecommunication Union (ITU) has identified a number of frequency bands that could be used to implement advanced wireless systems internationally, and established a set of standards – International Mobile Telecommunications-2000 (IMT-2000) – for these systems.⁴ In an August 2001 *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*,⁵ we expanded the frequency bands under consideration to include additional spectrum currently allocated to various radio services.

3. Collectively, in the *Notice* and the *Further Notice*, we sought comment on the suitability of AWS use of the 1710-1755 MHz band (slated for transfer from Federal Government to non-Federal Government use and identified by the ITU for worldwide IMT-2000 use); the 1755-1850 MHz band (a

¹ The “3G” nomenclature is based on the popular view that analog cellular systems represent the first generation of advanced wireless devices, that digital cellular and broadband Personal Communications Service systems represent the second, and that the next deployment of wireless technologies (which we include in the collective term “AWS”) represents the third generation.

² MDS channels in the 2500-2690 MHz band are identified as the Multichannel Multipoint Distribution Service (MMDS). 47 C.F.R. § 21.2. We use the single term “MDS” in reference to both MDS and MMDS operations.

³ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Notice of Proposed Rulemaking and Order*, 16 FCC Rcd 596 (2001) (*Notice*). The *Notice* also addressed a petition for rulemaking filed by the Cellular Telecommunications Industry Association (now known as the Cellular Telecommunication and Internet Association) in July 2000 requesting that the Commission begin the process of designating additional spectrum for AWS. See *Notice*, 16 FCC Rcd at 600, ¶ 9. We incorporated comments filed in response to the CTIA Rulemaking Petition into this proceeding. *Id.*, 16 FCC Rcd at 601, ¶ 10.

⁴ See *Provisional Final Acts of the World Radiocommunication Conference (Istanbul, WRC-2000)*. ITU identified the 806-960 MHz, 1710-1885 MHz, and 2500-2690 MHz bands for possible terrestrial use for IMT-2000 systems and recognized that some administrations will use the 698-806 MHz for these purposes. The ITU recognized that jurisdictions will need to protect existing services operating in the spectrum, that not all bands will be allocated for advanced wireless systems in all jurisdictions, and that advanced services will not have priority over other allocated services.

⁵ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, ET Docket No. 95-18, and IB Docket No. 99-81, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, 16 FCC Rcd 16043 (2001) (*Further Notice*).

Federal Government-use band identified by the ITU for worldwide IMT-2000 use); the 2110-2150 MHz and 2160-2165 MHz bands (used for point-to-point fixed microwave services and identified in the Commission's *Emerging Technologies* proceeding as suitable for advanced services); the 2500-2690 MHz band (used by Instructional Television Fixed Services (ITFS) and MDS and identified by the ITU for worldwide IMT-2000 use); the 2150-2160 MHz band (used by MDS); the 1990-2025 and 2165-2200 MHz bands (allocated and licensed for the Mobile-Satellite Service (MSS)); and the 1910-1930 MHz and 2390-2400 MHz bands (designated for unlicensed Personal Communications Services (UPCS) use). In the *Notice*, we also explored the possibility of introducing AWS in the 806-960 MHz and 1850-1910/1930-1990 MHz bands that are currently used for cellular, Broadband PCS, and Specialized Mobile Radio (SMR) services, as well as bands that were reallocated as part of the transition to digital television.⁶

4. We also sought comment on the effect of the allocation proposals on existing and prospective users of the bands and on global compatibility. We noted that ITU adopted a set of standards for IMT-2000 to define key characteristics of advanced radio systems and projected the amount of spectrum required to meet anticipated IMT-2000 demands in those areas where the traffic is projected to be highest by 2010.⁷

5. Because some of the potential spectrum that can be used by AWS falls under the spectrum management responsibilities of both the Executive Branch and the Commission, this proceeding could not have moved forward without the cooperative efforts of stakeholders within the Federal Government. Prior to the *Notice*, the President had executed an Executive Memorandum that directed the Secretary of Commerce to work with the Commission to develop a plan to select spectrum for AWS and to issue a report on the current spectrum uses and potential for reallocation or sharing of the Federal Government bands identified by the ITU as suitable for 3G systems.⁸ Following development of a plan to identify spectrum for AWS,⁹ NTIA completed a study of the 1755-1850 MHz band – which is used by many Federal agencies including the Department of Defense (DOD) – in March, 2001.¹⁰ Commission staff completed a study of the 2500-2690 MHz band in March 2001.¹¹ Both reports identified obstacles to viable AWS use of these bands. More recently, an intra-government working group identified the 1710-

⁶ *Notice*, 16 FCC Rcd at 610-13, §§ 34-38.

⁷ These standards are intended to maximize the commonality of radio interfaces and provide a transition path to advanced systems from existing technologies. Resolution 223 of the World Radiocommunication Conference states that up to 160 megahertz of additional spectrum will be in all three ITU regions, including Region 2, which includes the United States. See *Notice* 16 FCC Rcd at 598-99, ¶¶ 3-4 for additional background.

⁸ See Memorandum For the Heads of Executive Departments and Agencies, Subject: Advanced Mobile Communications/ Third Generation Wireless Systems, October 13, 2000. (Presidential Memorandum) (available at <http://www.ntia.doc.gov/ntiahome/threeg/3gmemo.htm>).

⁹ U.S. Department of Commerce, National Telecommunications and Information Administration, "Plan to Select Spectrum for Third Generation (3G) Wireless Systems in the United States," rel. Oct. 20, 2000, revised Jan. 22, 2001 (available at http://www.ntia.doc.gov/ntiahome/threeg/3g_plan14.htm).

¹⁰ U.S. Department of Commerce, National Telecommunications and Information Administration, "The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts," *Final Report*, rel. March 30, 2001 (*NTIA Final Report*). NTIA had issued a preliminary report on Nov. 15, 2000.

¹¹ See FCC Staff Report Issued by the Office of Engineering and Technology, Mass Media Bureau, Wireless Telecommunications Bureau, and International Bureau: "Spectrum Study of the 2500-2690 MHz Band: The Potential for Accommodating Third Generation Mobile Systems" *Final Report*, ET Docket No. 00-232, 16 FCC Rcd 10272 (2001) (*FCC Final Report*). See also *Interim Report*, 15 FCC Rcd 22310 (2000).

1770 MHz and parts of the 2110-2170 MHz bands as holding the greatest potential for possible AWS use without significantly conflicting with Federal Government operations. A July 2002 study of these bands released by NTIA concluded that 90 megahertz of spectrum consisting of the 1710-1755 MHz band and a matching 45 megahertz from the 2110-2170 MHz band can be reallocated without disrupting critical national security communications systems if certain specific actions are accomplished.¹² Moreover, the report also concluded that there is adequate spectrum available to relocate users from the 2110-2170 MHz band, and thus the band could be made available for AWS.¹³ This report did not anticipate reallocation of the 1755-1770 MHz band due to difficulties in sharing with or relocating incumbent defense systems in this band.¹⁴ We incorporated the 2002 *Viability Assessment* into this proceeding and invited comment on its findings.¹⁵

6. The Commission addressed use of the 2500-2690 MHz band in the September 2001 *First Report and Order and Memorandum Opinion and Order* in this proceeding.¹⁶ In the *First R&O*, the Commission found that ITFS and MDS licensees operating in that band provided important services and would be difficult to relocate, and therefore decided not to relocate these incumbent licensees.¹⁷ The Commission also added a mobile allocation to the 2500-2690 MHz band to provide additional near-term and long-term flexibility for use of this spectrum.¹⁸ In light of our decision in this Second R&O to reallocate 5 megahertz of spectrum in the 2150-2155 MHz band, we will conduct further analysis of MDS operations, including relocation options for MDS licensees that currently operate in the 2150-2160 MHz band.

7. We reserve for further analysis the possible AWS use of the 1910-1930 MHz band (designated for UPCS use), the 2160-2165 MHz band (designated under the *Emerging Technologies* proceeding); and portions of the 1990-2025 and 2165-2200 MHz bands (allocated for MSS). We note that several parties to this docket have suggested alternate uses of some of these bands, some bands are subject to consideration in separate ongoing Commission proceedings, and some bands have been proposed for alternate uses in petitions filed before the Commission.¹⁹

¹² U.S. Department of Commerce, National Telecommunications and Information Administration, "An Assessment of the Viability of Accommodating Advanced Mobile Wireless (3G) Systems in the 1710-1770 MHz and 2110-2170 MHz Bands," *Report*, rel. July 22, 2002 (2002 *Viability Assessment*) (incorporated into the docket of this proceeding and available from NTIA at <http://www.ntia.doc.gov/ntiahome/threeg/va7222002/3Gva072202web.htm>).

¹³ *Id.* at 23.

¹⁴ *Id.* at 2.

¹⁵ See "FCC seeks comment on the National Telecommunications and Information Administration's Report 'An Assessment of the Viability of Accommodating Advanced Mobile Wireless (3G) Systems in the 1710-1770 MHz and 2110-2170 MHz Bands,'" *Public Notice*, 17 FCC Rcd 14390 (2002).

¹⁶ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket 00-258, *First Report and Order and Memorandum Opinion and Order*, 16 FCC Rcd 17222 (2001) (*First R&O*).

¹⁷ *Id.* This decision was consistent with findings in the *FCC Final Report*.

¹⁸ *Id.* The Commission also affirmed its prior determination not to reallocate a portion of the 2.5 GHz band to MSS. *Id.*, 16 FCC Rcd at 17241, ¶¶ 35-36.

¹⁹ For example, within this docket, we have asked for comment on two petitions for rulemaking to expand UPCS use of the 1910-1930 MHz band. The Wireless Communications Association International (WCA) suggests that in the
(continued....)

8. Finally, we note that certain bands identified in this proceeding are subject to additional legislative requirements. The 1710-1755 MHz band was identified by NTIA for transfer from Federal Government use to mixed Federal Government/non-Federal Government use in conjunction with Omnibus Budget Reconciliation Act of 1993 (OBRA-93).²⁰ Primary allocations were maintained for federal operations at a number of protected facilities and sites. In the Balanced Budget Act of 1997 (BBA-97),²¹ the Congress authorized Federal Government entities to accept compensation for the costs associated with relocating their operations.²² Furthermore, the Strom Thurmond National Defense Authorization Act of Fiscal Year 1999 (NDAA-99)²³ requires that “[a]ny person on whose behalf a Federal entity incurs costs...shall compensate the Federal entity in advance for such costs.”²⁴ NTIA recently adopted specific relocation and reimbursement rules, which will affect new licensees in the 1710-1755 MHz band.²⁵ Under these rules, a Federal user retains its primary status until relocation is complete

(...continued from previous page)

event the Commission deems relocation of MDS from the 2150-2160 MHz band is necessary, an acceptable compromise would be to relocate MDS Channels 1 and 2/2A to the 1910-1916 MHz (now UPCS use) and the 1990-1996 MHz (allocated for MSS use) bands. *See* Letter from WCA, *et. al.*, to FCC Chairman Powell, July 11, 2002, in ET Docket 00-258, concerning “Compromise Solution for Relocating MDS from 2150-2162 MHz.” (*WCA Letter*) (This letter was sent jointly by WCA, Bellsouth, Nucentrix, Sprint, and Worldcom. WCA is the trade association of the MDS industry. The other parties hold the majority of licenses in the 2150-2160 MHz band.) We note that the 1910-1916 MHz UPCS band and the 1990-1996 MHz MSS band that the MDS parties have identified as relocation spectrum is the same spectrum (1910-1915 MHz/1990-1995 MHz) that Nextel has asked for in a spectrum swap where it would relinquish spectrum at 800 MHz and 900 MHz to provide a more interference-free environment for public safety licensees. *See* Nextel *ex parte* filing in WT Docket 00-258, Aug. 9, 2002. Satellite entities have also requested permission to operate an ancillary terrestrial component in conjunction with their mobile satellite operations in the 1990-2025 MHz and 2165-2200 MHz bands. The Commission issued a *Notice of Proposed Rule Making* seeking comments on providing this flexibility to the MSS band. *See* In the Matter of Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band, IB Docket No. 01-185, *Notice of Proposed Rule Making*, 16 FCC Rcd. 15532 (2001).

²⁰ Pub. L. No. 103-66, 107 Stat. 312 (1993). In OBRA-93, the Congress directed the Secretary of Commerce to identify at least 200 megahertz of Federal Government primary spectrum below 5 GHz that is not required for the Federal Government’s present or identifiable future needs for transfer to non-Federal Government services. *Id.* at § 6001(a).

²¹ Pub. L. No. 105-33, 111 Stat. 251 (1997).

²² *Id.* at, § 3002(d). The BBA-97 relocation model is similar to the Commission’s relocation policy for emerging technology services, such as the relocation procedures associated with deployment of Broadband PCS. *See generally*, Redevelopment of Spectrum to Encourage the Establishment of Services Using New and Innovative Technologies, ET Docket No. 92-9, *First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992); *Second Report and Order*, 8 FCC Rcd 6495 (1993); *Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd 6589 (1993); *Memorandum Opinion and Order*, 9 FCC Rcd 1943 (1994); *Second Memorandum Opinion and Order*, 9 FCC Rcd 7797 (1994), *aff’d*, Association of Public Safety Communications Officials-International, Inc. v. FCC, 76 F.3d 395 (D.C. Cir. 1996) (collectively, “*Emerging Technologies* proceeding”).

²³ Pub. L. No. 105-261, 112 Stat. 1920 (1998).

²⁴ NDAA-99 at § 1064(c)(3) (codified at 47 U.S.C. § 923(g)(1)(B)). Such compensation may take the form of a cash payment or in-kind compensation. *Id.* *See also* National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106-65, 113 Stat. 512 (1999) (making additional modifications to the relocation procedures for Federal Government transfer spectrum).

²⁵ NDAA-99 required NTIA to establish these relocation reimbursement rules. *Id.* (codified at 47 U.S.C. § 923(g)(1)(A)). NTIA adopted these rules in 2002 and codified them at 47 C.F.R. §§ 301.1-301.150. U.S. Department of Commerce, National Telecommunications and Information Administration, Mandatory
(continued....)

and the NTIA limits or terminates the Federal user's operating license.²⁶ We also note that the Administration has proposed legislation to facilitate the reimbursement process by creating a relocation fund using auctions proceeds.²⁷

III. DISCUSSION

A. Need for Additional Spectrum for AWS

9. Commenters expect the services that make up AWS will employ bandwidth-intensive functions, including high-speed data transfer and internet access,²⁸ and will offer multimedia applications, such as full-motion video.²⁹ For example, Siemens describes a seamless integration of voice and data elements, such as a message that contains pictures, short video clips, and/or short audio pieces, and that may change communications types (*e.g.* from voice to data) one or more times over the course of a communication session.³⁰ Commenters are also skeptical that existing spectrum currently deployed for commercial mobile wireless applications will be sufficient to support widescale AWS deployment, because they expect AWS use will develop in addition to current voice traffic, which is already at saturation in the highest-use areas;³¹ because they expect AWS demand to grow dramatically once applications are made available to the public;³² or because they envision the creation of new non-voice

(...continued from previous page)

Reimbursement Rules for Frequency Band or Geographic Relocation of Federal Spectrum-Dependent Systems, *Final Rule*, 67 Fed. Reg. 41182-01 (June 17, 2002) (*NTIA Relocation Rules*). The rules require, *inter alia*, the identification of (i) a comparable facility to which the Federal user can relocate and (ii) the costs that will be incurred by a Federal entity to achieve comparable capability for its relocated systems, and establish negotiation and dispute resolution procedures.

²⁶ See 47 C.F.R. § 301.140(a) (outlining the conditions that must be met before NTIA limits or terminates a Federal user's authority). We note that the 2002 *Viability Assessment* offers a procedure that may substantially reduce federal incumbencies in the 1710-1755 MHz band, but that some federal systems will continue to remain in use on a primary basis for an indefinite period.

²⁷ See *Notice*, 16 FCC Rcd at 614, ¶ 43. See also U.S. Department of Commerce, National Telecommunications and Information Administration, "Commerce Department Asks Congress to Create Spectrum Relocation Fund for Federal Agencies Whose Spectrum is Reallocated to Commercial Use," NTIA Press Release, rel. July 23, 2002 (available at <http://www.ntia.doc.gov/ntiahome/press/2002/relocationfund7242002.htm>). The proposed legislation is available on the NTIA Web site at: <http://www.ntia.doc.gov/ntiahome/congress/2002/legistransmittal7232002.htm>. See also CTIA Comments to the 2002 *Viability Assessment* at 3 (supporting these efforts).

²⁸ Nokia Comments to the CTIA Rulemaking Petition at 2; Universal Wireless Communications Corporation (UWCC) Comments to the CTIA Rulemaking Petition at 3; Personal Communications Industry Association (PCIA) Comments to the *Notice* at 5.

²⁹ See, *e.g.*, UWCC Comments to the CTIA Rulemaking Petition at 3.

³⁰ Siemens Comments to the *Notice* at 8.

³¹ See, *e.g.*, Cingular Wireless Comments to the *Notice* at 3-4.

³² Radio Advisory Board of Canada Comments to the *Notice* at 4; Orange Group Comments to the *Notice* at 1. See also Qualcomm Comments to the *Notice* at 3 (predicting that consumer acceptance will be high due to current widespread internet use); Verizon Wireless Reply Comments to the *Notice* at 7 (predicting that mobile data – which it claims represented 2 percent of traffic at the time it filed its comments – will grow at a rate of 25-30 percent and will result in more than 100 million wireless data customers by 2007).

applications that will develop independently of existing voice and voice-and-data models and that will use entirely new technologies.³³ We note that view is not unanimous, as Sprint Corporation (Sprint) claims it can provide AWS using existing spectrum.³⁴ We also distinguish the claim that existing spectrum may be used to launch AWS but additional spectrum will ultimately be required to support AWS,³⁵ from those comments that claim we must allocate an additional 160 MHz or more spectrum that can be used for AWS.³⁶ Although the ITU previously predicted 160 MHz of spectrum will be necessary by 2010 to meet demand in those areas where the traffic is highest,³⁷ several commenters note that there is evidence that worldwide AWS growth has been slower than expected.³⁸ Moreover, the Educational Community of the United States notes that no commenter has provided original research or studies to show that this additional spectrum is needed.³⁹

10. As discussed *infra*, we conclude that additional spectrum is necessary for AWS. We immediately allocate 90 megahertz of spectrum that can be used for these services. We also note that additional spectrum will likely be available in the future. For example, we previously reallocated spectrum as part of the migration to digital television. Spectrum in these bands will be available for new uses – including AWS – once incumbent television operations cease.⁴⁰ In the *First R&O*, we added a mobile allocation to the 2500-2690 MHz band to provide additional near-term and long-term flexibility, thereby making the band potentially available for advanced mobile and fixed wireless services.⁴¹ In addition, we are still considering other bands in this docket, and we may decide to make additional spectrum available for AWS.

11. Commenters identify numerous benefits associated with the deployment of AWS. The Information Technology Industry Council claims that AWS can provide a broadband alternative, promote

³³ LinkAir Reply Comments to the *Notice* at 8.

³⁴ Sprint Comments to the *Notice* at 37. Sprint launched its 3G-style “Vision PCS” services across its national network in late August 2002. *See also* Harold Nadel Comments to the *Further Notice* at 1.

³⁵ *See, e.g.*, AT&T Wireless Services (AT&T Wireless) Comments to the *Notice* at 10; *See also* Qualcomm Reply Comments to the *Notice* at 4.

³⁶ *See, e.g.*, Cingular Wireless Comments to the *Notice* at 4. *But see* Spectrumlink Networks Comments to the *Notice* at 15 (claiming that the uncertain wireless marketplace makes determining AWS spectrum needs a “very uncertain science”). Many commenters reiterate their support in pleadings filed in response to the 2002 *Viability Assessment*. *See, e.g.*, Telecommunications Industry Association (TIA) Comments to the 2002 *Viability Assessment* at 2-3; Ericsson Comments to the 2002 *Viability Assessment* at 4.

³⁷ *See* Resolution 223 of the *Final Acts of the World Radiocommunication Conference (Istanbul, WRC-2000)*.

³⁸ Nucentrix Broadband Networks Reply Comments to the *Notice* at 7-8 (labeling commenters’ support of 160 MHz as “suspect” because of a “growing consensus” that consumer demand for advanced services may have been grossly overstated); Celsat America (Celsat) Reply Comments to the *Further Notice* at 5-6 (stating that 3G networks have been slow to roll out worldwide and many carriers have encountered numerous problems to date). *See also* DoCoMo to cut i-mode service rate, Reuters, Aug. 20, 2002 (noting that DoCoMo’s 3G subscriber levels in Japan are substantially behind projections, and the carrier is expected reduce its projections).

³⁹ *See* Educational Community of the United States Reply Comments to the *Notice* at 7.

⁴⁰ *See* Reallocation of Television Channels 60-69, The 746-806 MHz Band, *Report and Order*, ET Docket No. 97-157, 12 FCC Rcd 22953 (1998); *See also* Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Report and Order*, GN Docket No 01-74, 17 FCC Rcd 1022 (2002).

⁴¹ *First R&O*, 16 FCC Rcd at 17223, ¶ 2.

competition, foster innovation, and reach new service areas.⁴² Telephone and Data Systems asserts that no other prospective service for which we could make an allocation promises the economic benefits of AWS,⁴³ and TIA claims that the development of AWS is vital to the United States' ability to remain globally competitive.⁴⁴

12. Although the record reflects an expectation that bandwidth-intensive wireless applications will proliferate, we have found that a shift towards the development of wireless data applications is already occurring domestically,⁴⁵ and note that mobile telephone carriers in other countries are deploying next-generation mobile services that support data applications.⁴⁶ Accordingly, we agree with the commenters and conclude that AWS development in the U.S. is likely to build on the overall growth of wireless data services.⁴⁷ We also agree that the development of AWS will promote economic and public policy benefits.⁴⁸ For example, the provision of additional spectrum can foster the development of new and innovative service offerings that, in turn, have the potential to increase consumer demand. This process aids the development of competitive markets and provides the types of economic benefits that can promote economic recovery of telecommunications markets.⁴⁹ Finally, because of intensive use of existing commercial wireless spectrum, predictions that wireless data use will grow in addition to existing voice use, and the bandwidth-intensive nature of certain data applications, we conclude that current spectrum allocations may, in most cases, support only the introduction and limited growth of AWS. Moreover, additional spectrum will be necessary for new entrants who have no pre-

⁴² Information Technology Industry Council Reply Comments to the *Notice* at 2.

⁴³ Telephone and Data Systems Comments to the *Further Notice* at 4-5; *See also* Motorola Comments to the *Further Notice* at 2 (citing a prediction that AWS will generate \$38-47 billion in additional service revenues per year).

⁴⁴ TIA Reply Comments to the CTIA Rulemaking Petition at 2.

⁴⁵ *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 [and] Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, *Seventh Report*, 17 FCC Rcd 12985, 13038 n.367 & 13052 (*Seventh Competition Report*) (estimating the number of mobile Internet users at the end of 2001 at 8 to 10 million, up from 2 to 2.5 million at the end of 2000 and finding that an increasing number of mobile devices offered voice and data service).

⁴⁶ For example, The "FOMA" service offered by NTT DoCoMo in Japan provides high-speed 3G data transmission capabilities. *See* "i-mode and the 3G network" NTT DoCoMo, www.nttdocomo.com/top.html (visited Nov. 6, 2002).

⁴⁷ We note that some commenters question how strongly we should draw conclusions about mobile data service usage based on the experiences of other countries, but conclude that, due to overall record data growth both domestically and world-wide, there is a demonstrated need for additional spectrum to support AWS. *See* Nucentrix Broadband Networks Reply Comments to the *Notice* at 10 (claiming that European wireline and internet access costs are higher than U.S. costs, which may drive greater wireless data use in Europe); National ITFS Association Comments to the *Notice* at 19 (claiming that because Americans spend far less time on public and mass transit, U.S. mobile data usage will trail that of Europe).

⁴⁸ *See generally* 47 U.S.C. §§ 157 & 303(g); *Emerging Technologies First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992) (finding that the allocation of spectrum that can be used for new services encourages the larger and more effective use of radio in the public interest).

⁴⁹ *See* Written Statement of Michael K. Powell, Chairman, Federal Communications Commission, on *Financial Turmoil in the Telecommunications Marketplace: Maintaining the Operations of Essential Communications*, before the Committee on Commerce, Science, and Transportation, United States Senate (July 30, 2002).

existing spectrum licenses that can be used to support AWS. Accordingly, we conclude that additional spectrum allocations are necessary to support the development of AWS.

13. We distinguish our approach in the identification and allocation of spectrum that is suitable for the provision of AWS from the approach taken by other countries – particularly many of those in Europe, where the rollout of advanced services has been slower and more difficult than anticipated. Carriers entering the European market had no choice but to compete for the only spectrum in which advanced services could be offered which, as a result, led to extremely high bids that in retrospect have impeded the availability of capital to actually construct the systems. Under our flexible use policies, current operators can make decisions that allow them to continuously improve the efficiency of their own systems and make choices as to the value of additional spectrum to enhance these services.⁵⁰

14. There are a variety of factors that can help us determine whether any particular band under study in this proceeding is suitable for the provision of AWS. These factors include harmonization of the AWS frequencies with other countries' allocations, as well as the amount of contiguous spectrum available that can be used to accommodate advanced technologies, and the effect of band reallocation on incumbent operations.

15. In the *Notice*, we sought to develop a record on the use of internationally harmonized spectrum,⁵¹ which can be used to facilitate global roaming.⁵² Several commenters find global roaming vital to the success of advanced services and claim that harmonized spectrum is the only way to effectively accomplish this goal.⁵³ Other commenters believe harmonization within the Americas is more important than finding common worldwide bands.⁵⁴ In contrast, WorldCom doubts whether international roaming represents a very large market,⁵⁵ and Sprint and WorldCom claim that complete global harmonization is neither likely nor feasible given the conflicting worldwide use of the bands identified by the ITU.⁵⁶ Others note that the lack of global harmonization has not stopped the provision of international roaming on existing networks, particularly through the use of multi-mode/multi-band phones.⁵⁷ In

⁵⁰ See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 [and] Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, *Sixth Report*, 16 FCC Rcd 13350, 13397-402 (*Sixth Competition Report*) (examining this difference between the U.S. and European licensing approach as part of an overall discussion of AWS/3G developments).

⁵¹ See *supra* n.4 (listing the frequencies bands the ITU has identified as suitable for IMT-2000).

⁵² *Notice*, 16 FCC Rcd at 607, ¶ 24. Roaming, generally, is the ability to use a single wireless unit in a place distant from a user's "home" network.

⁵³ AT&T Wireless Comments to the *Notice* at 2; AT&T Wireless Reply Comments to the *Notice* at 3; CTIA Reply Comments to CTIA Rulemaking Petition at 1; Chilean Telecommunications Administration Reply Comments to the *Notice* at 2; UWCC Comments to the *Notice* at 2. See also Orange Group Comments to the *Notice* at 1 (claiming that roaming is a vital selling point regardless of whether consumers actually use the service).

⁵⁴ Radio Advisory Board of Canada Comments to the *Notice* at 2; Canadian Wireless Telecommunications Association Comments to the *Notice* at 4; Nucentrix Broadband Networks Reply Comments to the *Notice* at 12. See also Chilean Telecommunications Administration Reply Comments to the *Notice* at 2; National ITFS Association Comments to the *Notice* at 24; Nortel Comments to the *Notice* at 10.

⁵⁵ WorldCom Reply Comments to the CTIA Rulemaking Petition at 10.

⁵⁶ Sprint Comments to the *Notice* at 33; WorldCom Reply Comments to the CTIA Rulemaking Petition at 8-9.

⁵⁷ Lockheed Martin Corporation Comments to the *Further Notice* at 4; Nucentrix Broadband Networks Reply Comments to the *Notice* at 11. But see Radio Advisory Board of Canada Comments to the *Notice* at 6 (claiming that
(continued....))

addition, some commenters claim that it will be impossible to avoid the use of multi-mode/multi-band handsets completely.⁵⁸ Those who disfavor such equipment cite the added cost and complexity versus phones that use a single spectrum band.⁵⁹

16. The record also identifies general benefits of large contiguous blocks of harmonized spectrum, including economies of scale in equipment development and quicker deployment of advanced services.⁶⁰ These benefits are not directly related to whether carriers actually provide roaming capabilities or whether consumers use roaming features.

17. We conclude that it is beneficial to allocate spectrum for AWS use in the United States that has been identified by the ITU for AWS use globally, both because doing so will facilitate roaming and because there are other benefits of harmonized spectrum (such as lower equipment costs). However, because multi-band devices have been used successfully in the U.S.,⁶¹ we find that AWS does not need to be deployed exclusively on harmonized spectrum.⁶²

18. It is also important to identify spectrum that can accommodate appropriate technologies. In the *Notice*, we noted that the ITU has developed worldwide standards for IMT-2000 wireless devices designed to provide broadband services at high data rates up to 2 Mbps,⁶³ and asked whether these standards are sufficient to meet wireless system spectrum requirements in the U.S.⁶⁴ Siemens claims that the data rates of the IMT-2000 interfaces will serve the market need “for the foreseeable time.”⁶⁵

(...continued from previous page)

people like to roam, and that roaming usage would be higher if the service were more readily available). Multi-band phones operate across different spectrum bands; multi-mode phones operate on different network technologies. See Qualcomm Comments to the *Notice* at 11.

⁵⁸ Qualcomm Reply Comments to the *Notice* at 4-5 (documenting existing multi-mode and multi-band equipment as evidence that it is possible to produce such devices without great cost or difficulty, and claiming that multi-band and multi-mode handsets will be necessary for global roaming due the different bands and technical standards the IMT-2000 standards support); See also Lockheed Martin Corporation Comments to the *Further Notice* at 3.

⁵⁹ TIA Comments to the *Notice* at 12; Ericsson Comments to the *Notice* at 12; Lucent Technologies Comments to the *Notice* at 5. (suggesting that, as a general principle, multi-band and multi-mode units are more technically complex, larger, heavier, costlier to develop and produce, and consume more power than similar single mode and single band devices).

⁶⁰ See, e.g., Verizon Wireless Reply Comments to the *Further Notice* at 7-8.

⁶¹ See, e.g., *Sixth Competition Report* 16 FCC Rcd at 13367 (describing the convergence of cellular and PCS, and noting that the AT&T Wireless holds interests in both types of licenses); *Seventh Competition Report*, 17 FCC Rcd at 13011 (describing Cingular’s current mix of TDMA and GSM networks).

⁶² We also note that several commenters said that while harmonized spectrum is important, it should not serve to limit the amount of spectrum we ultimately decide is required for the provision of advanced services nor delay its allocation. Cingular Comments to the *Notice* at 11; CTIA Reply Comments to the *Notice* at 13.

⁶³ The IMT-2000 standards provide for the capabilities to support circuit and packet data at high bit rates at 144 kbps or higher in high mobility (vehicular) traffic environments; 384 kbps for pedestrian traffic; and 2 Mbps or higher for indoor traffic. The *Notice* describes other aspects of the ITU standards (such as interoperability and common billing/user profiles) in greater depth.

⁶⁴ *Notice*, 16 FCC Rcd at 604, ¶ 17.

⁶⁵ Siemens Comments to the *Notice* at 12.

19. Most carriers in the U.S. have indicated plans to provide service that meet the IMT-2000 data rates by deploying systems based on cdma2000 and W-CDMA technologies.⁶⁶ These technologies use paired channels of 1.25 to 7.5 MHz.⁶⁷ In order to support multiple channels and capabilities, we conclude that small amounts of noncontiguous spectrum (*i.e.*, blocks less than about 5 MHz in size) are apt to be less beneficial for the provision of AWS than are larger allocations.

20. In the *Further Notice*, we noted that spectrum efficiencies are inherent in the allocation of contiguous frequency blocks for AWS.⁶⁸ The record reflects support for such allocations.⁶⁹ For example, Motorola claims that if we allocate only 45 MHz of spectrum in the 2110-2170 MHz band for AWS, we should allocate a contiguous 45 MHz block within the band to maximize spectrum efficiencies.⁷⁰

21. Finally, any decision to provide additional spectrum for the provision of AWS has the potential to affect incumbent uses of the reallocated bands. Many commenters also contend that key characteristics of any spectrum we find to be suitable for the provision of AWS are our ability to readily identify incumbent users and to provide a clear and comprehensive procedure to migrate incumbent users to suitable alternate bands.⁷¹ We agree. The easier it is to readily identify and clear incumbent users from a band, the more useful the band is likely to be for the provision of AWS.

B. Spectrum for AWS

1. 1710-1755 MHz

22. The 1710-1755 MHz band was initially identified in 1995 for transfer from Federal Government use to mixed Federal Government/non-Federal Government use.⁷² At that time, NTIA determined that this band could be made available to non-Federal Government users in 2004.⁷³ NTIA also identified certain incumbent Federal Government facilities that may continue to operate in the band and must be protected from interference.⁷⁴ In its *2002 Viability Assessment*, NTIA outlined additional

⁶⁶ See *Seventh Competition Report*, 17 FCC at 13038 n.368. See also “Wireless Missionary Qualcomm fighting uphill battle to convert cell customers to use its CDMA technology,” San Diego Union-Trib., June 9, 2002 at H1.

⁶⁷ Cdma2000 requires a 1.25 megahertz channel (1x) to meet the vehicular performance value, a 3.75 megahertz channel (3x) to meet the pedestrian performance value and a 7.5 megahertz (6x) channel to meet the indoor performance value. W-CDMA meets the standards using paired channels of a minimum size of 5 megahertz each. See ITU Rec. ITU-R M.1455-1 at 16.

⁶⁸ *Further Notice*, 16 FCC Rcd at (16043) ¶ 38.

⁶⁹ See, e.g., AT&T Wireless Comments to the *Further Notice* at 5-6; Verizon Wireless Comments to the *Further Notice* at 7-8.

⁷⁰ Motorola Reply Comments to the *Further Notice* at 5.

⁷¹ Cingular Wireless Comments to the *Notice* at 11; Cook Inlet Region Comments to the *Notice* at 5.

⁷² See U.S. Department of Commerce, National Telecommunications and Information Administration, “Spectrum Reallocation Final Report; Response to Title VI – Omnibus Budget Reconciliation Act of 1993,” NTIA Special Publication 95-32, rel. Feb. 1995 (*1995 Spectrum Reallocation Final Report*) at §5, p. 3.

⁷³ *Id.* at §4, p. 7.

⁷⁴ OBRA-93 stated that microwave communications facilities operated by Federal power agencies are not required to relocate. OBRA-93, § 113(c)(4) (codified at 47 U.S.C. § 923). These facilities are discussed in Appendix E of the *1995 Spectrum Reallocation Final Report*. In addition, NTIA identified a number of fixed microwave sites as well as 16 sites operated by the Department of Defense as “Essential Federal Operations” subject to indefinite continued primary use in the band. See Appendix F & figure F-3 of the *1995 Spectrum Reallocation Final Report*

(continued....)

steps for reaccommodating existing Federal Government users in the band segment, including some that have a right to remain in the band indefinitely.⁷⁵ The NTIA plan offers a mechanism that could largely clear the band of Federal Government users no later than December 31, 2008.

23. Specifically, the 2002 *Viability Assessment* proposes that 1) Federal Government non-military systems and DOD fixed microwave systems be relocated; 2) existing facilities at 16 sites where DOD has the right to continued primary use also be relocated; 3) DOD ground systems remain on a primary basis at two of these 16 sites – Cherry Point, N.C., and Yuma, Ariz., but operate on a secondary, coordinated basis at all other sites;⁷⁶ and 4) precision guided munitions (PGM) systems continue to operate on a primary basis in the 1710-1720 MHz band segment until the current inventory is exhausted or until the end of 2008, whichever occurs first.⁷⁷ We note that this band is subject to the provisions of NDAA-99 and all Federal Government systems therein that are relocated are entitled to reimbursement, and that such systems can continue to operate in the band on a primary basis until or unless they are relocated. In addition, the 2002 *Viability Assessment* envisions that the Commission would conduct a rulemaking that would reallocate other spectrum to accommodate Federal systems that otherwise would remain in the 1710-1755 MHz band indefinitely on a primary basis. We note that any relocation of Federal Government systems from the 16 protected sites is subject to the reimbursement and relocation rules of NDAA-1999.⁷⁸ Many commenters urge us to adopt a quick and efficient means to relocate incumbent Federal Government users from the 1710-1755 MHz band,⁷⁹ and overwhelmingly support the 2002 *Viability Assessment* as a mechanism for reducing Federal Government operations in the band.⁸⁰

24. Commenters note that the 1710-1755 MHz band enjoys many characteristics that make it suitable for AWS. They note it is already being used in many countries for 2G-style wireless services⁸¹ so it is likely to promote global spectrum harmonization in the long term,⁸² which in turn will foster roaming,⁸³ and economies of scale that can translate into lower development costs and manufacturing

(...continued from previous page)

(identifying these sites); OBRA-93, § 113(b)(2) (allowing for the designation of such facilities within the bands designated for Federal Government/non-Federal government mixed use).

⁷⁵ We note that NTIA's Reimbursement Order states that "[d]uring the transition period, all incumbent Government systems will remain on a primary basis and must be protected by the non-Government licensee." See *NTIA Relocation Rules*, *supra* n. 25, at ¶18.

⁷⁶ 2002 *Viability Assessment* at 3.

⁷⁷ *Id.* at 17.

⁷⁸ We further note that if a future transfer of spectrum should require subsequent relocation of these Federal Government systems, additional provisions contained in the National Defense Authorization Act for Fiscal Year 2000 may also apply to these systems. See Pub. L. No. 106-65, 113 Stat. 512 (1999), § 1062(b).

⁷⁹ CTIA Comments to the 2002 *Viability Assessment* at 3-4; Nokia Comments to the 2002 *Viability Assessment* at 3; TIA Comments to the 2002 *Viability Assessment* at 5.

⁸⁰ See, e.g., Ericsson Comments to the 2002 *Viability Assessment* at 1-2; ArrayComm Comments to the 2002 *Viability Assessment* at 2; Verizon Wireless Comments to the 2002 *Viability Assessment* at 2.

⁸¹ AT&T Wireless Reply Comments to the *Notice* at 5; Motorola Comments to the *Notice* at 13.

⁸² Nokia Comments to the *Notice* at 5; Motorola Comments to the *Notice* at 12; Information Technology Industry Council Reply Comments to the *Notice* at 3.

⁸³ Siemens Comments to the *Notice* at 20.

efficiencies.⁸⁴ They further state that this band can also help ensure that United States residents enjoy the same level of advanced services as in other countries.⁸⁵ The parties observe that the 1710-1755 MHz band is slated to be made available for non-Federal Government commercial use,⁸⁶ and that the 2002 *Viability Assessment* offers a plan that can make the band even more useful for AWS. Catholic Television Network also states that the band “offers better propagation characteristics,” than other bands under consideration.⁸⁷ We also note that the band size – 45 megahertz – is large enough to support IMT-2000 protocols and would provide flexibility to accommodate a variety of channelization plans.

25. For the above reasons, we find that it serves the public interest to allocate the 1710-1755 MHz band segment for mobile and fixed services on a co-primary basis contingent on its becoming available for non-Federal Government mixed use January 1, 2004.⁸⁸ In addition, we are deleting the fixed and mobile allocations from the Federal Government Table in the 1710-1755 MHz band, except as specified in the new United States footnote US378, which codifies Federal Government residual rights. We also retain and modify footnote US311 in the Table of Frequency Allocations. This footnote identifies certain pre-existing radio astronomy activities that exist between 1718.8 MHz and 1722.2 MHz at observatories set forth in Appendix F of the *Notice*. Because radio astronomy facilities in this band operate on an unprotected basis, we conclude that it is not necessary to add rules setting forth coordination procedures and exclusion zones, as the National Academies of Science (NAS) suggests.⁸⁹ The footnote, modified to update the list of radio astronomy facilities,⁹⁰ will serve to apprise parties of these operations.

⁸⁴ Information Technology Industry Council Reply Comments to the *Notice* at 4; WorldCom Reply Comments to the *FCC Staff Report* at 5.

⁸⁵ CTIA Comments to the *FCC Staff Report* at 4-5.

⁸⁶ Network for Instructional TV Reply Comments to the *Notice* at 6. *See also* National ITFS Association Comments to the *Notice* at 22; AT&T Wireless Reply Comments to the *Notice* at 5.

⁸⁷ Catholic Television Network Reply Comments to the *Notice* at 10. *See also* Nortel Networks Reply Comments to the *Notice* at 3 (stating that the 1.7 MHz band in general has “technical and practical advantages” over the 2.5 MHz band that was initially identified as a candidate band).

⁸⁸ BBA-97 designated the 1710-1755 MHz band for assignment to commercial use by competitive bidding. BBA-97 § 3002(b). More generally, BBA-97 amended Section 309(j) of the Act to require the Commission to grant licenses through the use of competitive bidding when mutually exclusive applications for initial licenses are accepted for filing, unless certain specific statutory exemptions apply. BBA-97 § 3002(a) (codified at 47 U.S.C. § 309(j)). Section 309(j)(2) exempts from auctions licenses and construction permits for public safety radio services, digital television service licenses and permits given to existing terrestrial broadcast licensees to replace their analog television service licenses, and licenses and construction permits for noncommercial educational broadcast stations and public broadcast stations described in section 397(6) of the Communications Act. We will address the requirements of BBA-97 with respect to the 1710-1755 MHz band in greater depth in conjunction with our service rules proceeding for the band.

⁸⁹ NAS Comments to the *Notice* at 3-4 (late filed).

⁹⁰ *See id.* (asking that Haystack Observatory be deleted from the list and that the National Radio Astronomy Observatory’s Very Large Array at Socorro, New Mexico, Very Long Baseline Array stations, and the Goldstone Observatory in California be added to the list). We also include the Allen Telescope Array in Hat Creek, California, pursuant to our recent decision in *The 4.9 GHz Band Transferred from Federal Government Use*, WT Docket No 00-32, *Second Report and Order and Further Notice of Proposed Rulemaking*, 17 FCC Rcd 3955, 3963 ¶ 13 n.73 (2002).

26. We believe that the steps outlined in the *2002 Viability Assessment* offer a roadmap for addressing the encumbrances on the band in a timely and predictable manner, and we anticipate exploring its proposals in a further reallocation proceeding that we expect to initiate in the near future.⁹¹ At that time, we will also consider what, if any, mitigating techniques are necessary for new licensees to protect remaining incumbent Federal Government users of this band segment.

2. 2110-2150/2150-2155 MHz

27. The 2110-2150 MHz band is among those frequency bands the ITU has identified for use, on a worldwide basis, by administrations wishing to implement IMT-2000 services.⁹² Currently, this band is used in the United States primarily for non-Federal Government fixed and mobile services licensed under the Fixed Microwave Service in Part 101 of the Rules, the Public Mobile Services under Part 22 of the Rules, and the Domestic Public Fixed Radio Services under Part 21 of the Rules.⁹³ Federal Government use of this band is generally on a secondary basis and is limited to space research earth stations for earth-to-space transmissions in the 2110-2120 MHz portion of the band.⁹⁴

28. The 2110-2150 MHz band is currently allocated for non-Government use for fixed and mobile services on a co-primary basis. The Commission originally identified this band for new advanced fixed and mobile services in the 1992 *Emerging Technologies* proceeding and adopted rules and procedures to permit new licensees to relocate existing fixed service microwave licensees from this spectrum band.⁹⁵

29. In the *Notice*, we proposed to make this band available for advanced mobile and fixed communication services.⁹⁶ Commenters endorse use of the band for AWS, particularly due to the fact that the band possesses many of the harmonization characteristics that can support global roaming capabilities. AT&T Wireless, WCA, and Ericsson describe the lower development and equipment costs that are expected to be associated with this spectrum, given the fact that it has already been designated by

⁹¹ Several comments we received in response to the *2002 Viability Assessment* are best addressed in this subsequent proceeding. For example, Verizon asks us to continue to work with NTIA to make spectrum available for commercial use in the Arizona and North Carolina locations that DOD anticipates it will operate on a primary basis for the indefinite future, and that suggests that Federal Government users should anticipate ultimate relocation once advanced services are deployed widely. Verizon Wireless Comments to the *2002 Viability Assessment* at 8. Cingular asks for a clarification of the “secondary coordinated basis” concept. Cingular Wireless Comments to the *2002 Viability Assessment* at 3. See also CTIA Comments to the *2002 Viability Assessment* at 4.

⁹² International footnote 5.388 reads as follows: “The bands 1885-2025 MHz and 2110-2200 MHz are intended for use, on a worldwide basis, by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000). Such use does not preclude the use of these bands by other services to which they are allocated. The bands should be made available for IMT-2000 in accordance with Resolution 212 (Rev.WRC-97).” See 47 C.F.R. § 2.106, footnote 5.388.

⁹³ See 47 C.F.R. Parts 21, 22, and 101.

⁹⁴ See 47 C.F.R. § 2.106 footnote US111. This footnote lists specific locations where these earth stations can be located. See also, 47 C.F.R. § 2.106 footnote US252 which authorizes such use at Goldstone, CA for the 2110-2120 MHz band on a primary basis.

⁹⁵ *Emerging Technologies First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd at 6890, ¶¶ 23-24. This relocation right was affirmed in the *Emerging Technologies Memorandum Opinion and Order and Third Notice of Proposed Rulemaking and Order*, 13 FCC Rcd 23949 (1998).

⁹⁶ See *Notice*, 16 FCC Rcd at 618, ¶ 52.

the ITU as a 3G terrestrial base station transmit band.⁹⁷ In reply comments, Nucentrix Broadband Networks notes that commenters in this proceeding “fundamentally concluded” that the spectrum in the band is the “most viable” candidate for provision of the advanced services.⁹⁸ NEC America submits that the 2110-2150 MHz band is already available and designated for commercial use,⁹⁹ and the record broadly supports its use for the provision of the AWS.¹⁰⁰

30. The 2110-2150 MHz band is already allocated to the fixed and mobile services on a primary basis, and thus it is not necessary that we reallocate this spectrum in order to make it available for AWS use. Instead we re-designate the band for new uses consistent with the general outline of our *Emerging Technologies* proceeding. The amount of spectrum in the band is suitable for the provision of AWS by multiple licensees, based on our evaluation of the spectrum characteristics necessary to support appropriate AWS technologies. We also note that BBA-97 identifies the 2110-2150 MHz band for advanced wireless use and specifies that the band must be assigned under the competitive bidding procedures.¹⁰¹

31. In addition, we note that the National Aeronautical and Space Administration (NASA) operates on a primary basis a station in the 2110-2120 MHz band at Goldstone, California as part of the Space Research service. This station, which is authorized via United States footnote US252, is used by NASA’s Deep Space Network (DSN) for uplink transmissions to interplanetary spacecraft.¹⁰² In the *Notice*, we proposed not to relocate this facility.¹⁰³ Moreover, the DSN earth station transmits with a nominal EIRP of 105.5 dBW.¹⁰⁴ In the *Notice*, we noted that during command link operations it is likely that mobile receivers on the 2110-2120 MHz segment (and possibly in adjacent bands above 2120 MHz)

⁹⁷ AT&T Wireless Reply Comments to the *Notice* at 6; WCA Reply Comments to the *Notice* at 11; Ericsson Comments to the *2002 Viability Assessment* at 3.

⁹⁸ Nucentrix Broadband Networks Reply Comments to the *Notice* at 16 (also discussing the 1710-1850 MHz band). See also Motorola Reply Comments to the *Notice* at i; CDMA Development Group Reply Comments to the *Further Notice* at 3; AT&T Wireless Comments to the *Notice* at 9.

⁹⁹ NEC America Comments to the *Further Notice* at 23.

¹⁰⁰ Many commenters support allocation of the 2110-2150 MHz band as part of a request for the allocation of a larger amount of spectrum between 2110 MHz and 2170 MHz. See, e.g., Cingular Wireless Comments to the *2002 Viability Assessment* at 2 (supporting allocation of the entire 60 MHz in the 2110-2170 MHz band to promote AWS development).

¹⁰¹ See BBA-97 § 3002(c)(1)(D). We note that the 2110-2150 MHz band was previously subject to Section 3007 of BBA-97, which required us to auction it in a manner that ensured that proceeds were deposited in the Treasury by September 30, 2002. See BBA-97 § 3007 (codified in notes to Section 309 of the Communications Act of 1934, as amended, 47 U.S.C. § 309). This deadline was recently rescinded. See Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715 (2002).

¹⁰² See 47 C.F.R. § 2.106 footnote US252. Internationally, the 2110-2120 MHz band is allocated in all three ITU Regions to the Fixed, Mobile and Space Research (deep space) (Earth-to-space) services and is used by NASA at DSN facilities in Spain and Australia.

¹⁰³ *Notice*, 16 FCC Rcd at 618, ¶ 53.

¹⁰⁴ The DSN, under emergency conditions, transmits with EIRP up to 118 dBW.

will not be able to operate within the areas surrounding Goldstone.¹⁰⁵ We sought comment on how we can best accommodate AWS and account for continued DSN use of the band segment.¹⁰⁶

32. The 2002 *Viability Assessment* concluded that advanced wireless mobile receivers “will probably experience service disruption in the 2110-2120 MHz band when attempting to operate in areas surrounding the Goldstone site during uplink transmissions,” although the severity and duration of the disruption will vary depending on a number of factors.¹⁰⁷ The Jet Propulsion Laboratory (JPL) states that its interference calculations¹⁰⁸ show that receivers complying with IMT-2000 specifications would be disrupted during Goldstone’s uplink transmissions, and proposes establishment of a protected operating zone in the 2110-2120 MHz band of approximately 200 km in radius around the Goldstone facility where AWS operations would not be permitted.¹⁰⁹ JPL states that this area has an overall low population density and is largely comprised of the Mojave Desert and Death Valley areas. This proposed protected area also includes the city of Las Vegas, the I-15 corridor between Cajon Pass and Las Vegas, and portions of other major thoroughfares.¹¹⁰ In contrast to JPL, AT&T Wireless suggests that sharing is a better option,¹¹¹ and Motorola urges us not to reject use of the frequency band outright but to instead examine the timing of Goldstone’s transmissions in order to affect some sort of sharing.¹¹²

33. We examined the interference characteristics of the Goldstone DSN facility and based on its typical operation pattern, which is intermittent, the amount of its signal that would be blocked by terrain in many directions, and the low population density in the areas near Goldstone, we conclude that a significant amount of interference should not occur to AWS.¹¹³ Therefore, we will not formally restrict use of the 2110-2120 MHz band in the vicinity of Goldstone. However, we anticipate that this band will be unusable for advanced services at certain times in the immediate vicinity of Goldstone, and expect that potential licensees will take this fact into account and will develop their business and service plans accordingly. We believe that such an approach is practical, given the comments of the AWS proponents that discussed Goldstone interference, and we will work cooperatively with JPL and other interested parties to insure that our approach does in fact achieve its goals.

34. The 2150-2160 MHz band is allocated internationally to the fixed and mobile services on a primary basis.¹¹⁴ Domestically, the 2150-2160 MHz band is allocated to the fixed service on a primary

¹⁰⁵ The Australian government, faced with a similar situation, excluded the 2110-2125 MHz portion of the spectrum in areas around the DSN facility at Canberra in a recent auction of spectrum for IMT-2000. *Notice*, 16 FCC Rcd at 618, ¶ 53; *See also* http://auction.fcc.gov.au/auction_results/2ghz_results_page/pdf/3gpaper2.pdf.

¹⁰⁶ *Notice*, 16 FCC Rcd at 618, ¶ 53.

¹⁰⁷ 2002 *Viability Assessment* at 23.

¹⁰⁸ JPL defined interference as the receiver experiencing an unacceptable level of interference more than 1% of the time. *See* JPL Comments to the *Notice* at 5.

¹⁰⁹ JPL Comments to the *Notice* at 2.

¹¹⁰ These include I-40, I-10, and the Golden State Freeway (I-5). *See* JPL Comments to the *Notice* at 7, fig.2.

¹¹¹ AT&T Wireless Comments to the *Notice* at 12.

¹¹² Motorola Comments to the *Notice* at 18-19.

¹¹³ *See* Appendix D for details of the analysis. We also note that our analysis did not account for the significant processing gain expected by the use of CDMA-type technologies.

¹¹⁴ In Region 2 (the Americas) this band is also allocated for MSS downlinks on a secondary basis.

basis¹¹⁵ and is regulated under Part 21 of our Rules as part of MDS.¹¹⁶ This band is generally operated as two channels - Channel 1 (2150-2156 MHz) and Channel 2A (2156-2160 MHz).¹¹⁷ In addition, licensees may use channel 2 (2156-2162 MHz) on a limited basis in 50 cities.¹¹⁸ MDS may also use spectrum in the 2500-2690 MHz band.¹¹⁹

35. In the *Further Notice*, we requested comment on whether the 2150-2160 MHz band should be reallocated for AWS, and if so, how this band might be used with other spectrum being considered for AWS.¹²⁰ We solicited comment on the impact of reallocating this band from MDS operations to AWS. In this regard, we proposed that if relocation were deemed necessary MDS incumbents would be entitled to comparable facilities and/or adequate replacement spectrum and sought comment on the relocation policies and procedures that should apply.¹²¹ In addition, we requested comment on whether the spectrum sharing conclusions of the *FCC Final Report* on MDS use of the 2500-

¹¹⁵ We note that prior to February 25, 1974, footnote NG23 made the 2150-2162 MHz band available for assignment to stations in the International Fixed Public Radiocommunication Services in the Caribbean. A review of our licensing database finds that there are no such licensees. In a separate proceeding, we are proposing to delete footnote NG23. See Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range, ET Docket No. 02-305, *Notice of Proposed Rule Making*, FCC 02-261, rel. Oct. 7, 2002, at ¶ 103.

¹¹⁶ See 47 C.F.R. Part 21—Domestic Public Fixed Radio Services. Subpart K of Part 21 is titled “Multipoint Distribution Service.”

¹¹⁷ Under an informal agreement among MDS licensees, the principal use of the 2150-2160/2 MHz band is for response stations transmitting to hub stations, which is generally known as upstream communications. See generally Sprint Comments to the *Notice* at 21 and WCA Comments to the *Notice* at 42-43. A response station in a two-way system is a customer-premises transceiver used for the reception of downstream and transmission of upstream signals as part of a large system of such stations licensed under the authority of a single license. A maximum e.i.r.p. of 33 dBW (2000 watts) per 6 MHz is permitted. A hub station is a receive-only station licensed as part of a system of response stations in a two-way system and used for the purpose of receiving the upstream transmissions of those response stations.

¹¹⁸ The 2 megahertz at 2160-2162 MHz can only be assigned where there is evidence that no harmful interference would occur to any authorized co-frequency point-to-point facility. See 47 C.F.R. § 21.901(c). We collectively refer to MDS channels 1, 2, and 2A in our discussion of MDS use of the 2150-2160 MHz band.

¹¹⁹ There are other MDS channels in the 2596-2644 MHz, 2650-2656 MHz, 2662-2668 MHz, and 2674-2680 MHz bands, as well as response channels in the 2686-2690 MHz band. In addition, MDS licensees often lease spectrum in the 2500-2690 MHz band from ITFS licensees. Historically, the 2150-2162 MHz and 2500-2690 MHz bands were predominantly used for one-way analog video transmission. Increasingly, MDS operators are using these bands for two-way digital broadband services. In October 1996, the Commission decided to allow high-speed digital data applications, including Internet access. Then, in 1998, the Commission approved the use of two-way transmissions, effectively enabling the provision of voice, video, and data services. In 2001, a mobile, except aeronautical mobile, service allocation was added to the 2500-2690 MHz band. See *First R&O*, 17 FCC Rcd at 17235, ¶ 21 (describing these regulatory developments).

¹²⁰ See *Further Notice* 16 FCC Rcd at 16060-61, ¶¶ 38-41.

¹²¹ *Id.*, 16 FCC Rcd at 16061, ¶ 40. We likewise asked for a suggested timeframe for clearing the band as well as the types and magnitude of costs that would be involved. *Id.*

2690 MHz band apply to the 2150-2160 MHz band.¹²² We invited comment on the public interest costs and benefits of adding a mobile allocation to the 2150-2160 MHz band.¹²³

36. In general, wireless carriers believe that the 2150-2160 MHz band should be reallocated to allow AWS and that the MDS operators should be relocated.¹²⁴ Such an action, they contend would have many benefits for AWS. For example, Telephone and Data Systems claims that the 2150-2160 MHz band is vital as part of a large contiguous allocation for AWS in the 2.1 GHz band.¹²⁵ The Wireless Communications Division of the Telecommunications Industry Association states that the reallocation of the 2150-2160 MHz band “offers the only practical opportunity” to create a global downlink band for AWS.¹²⁶ The Radio Advisory Board of Canada states that a significant step towards the objective of ensuring maximum worldwide commonality would be the adoption of a common base station transmit band that includes the 2150-2160 MHz band.¹²⁷ In addition, some AWS proponents argue that continued MDS transmissions in the 2150-2160 MHz band would cause harmful interference to AWS systems and therefore must be relocated.¹²⁸ Verizon states that continued MDS operations in this band could completely preclude AWS operations in the 2110-2150 MHz band.¹²⁹ However, it also comments that if more stringent emission limits are adopted for MDS, then a guard band may be able to protect 3G receivers from interference.¹³⁰

37. MDS licensees have generally expressed a strong desire to retain the 2150-2160 MHz band for MDS operations.¹³¹ However, they express a desire for a mobile allocation to be added to the 2150-2160 MHz band, or to any replacement spectrum they might be allocated.¹³² To facilitate sharing in

¹²² The *FCC Final Report* concluded that MDS and AWS sharing would not be possible in the 2500-2690 MHz band, and that it would not be possible to relocate MDS users on the band without jeopardizing the unique and valuable services that MDS users provide.

¹²³ See *Further Notice* at 16 FCC Rcd at 16061, ¶ 40.

¹²⁴ See, e.g., Cingular Wireless Comments to the *Further Notice* at 11; Ericsson Comments to the *Further Notice* at 2.

¹²⁵ See Telephone and Data Systems Comments to the *Further Notice* at 8.

¹²⁶ See Telecommunications Industry Association – Wireless Communications Division (TIA-Wireless) Comments to the *Further Notice* at 4.

¹²⁷ See Radio Advisory Board of Canada Comments to the *2002 Viability Assessment* at 4.

¹²⁸ Motorola Reply *Notice* at 11 and Appendix.

¹²⁹ Verizon Wireless Comments to the *Notice* at 14. Verizon states that with the out-of-band emission limits for MDS, an MDS transmitter operating at maximum power would preclude 3G mobile receiver operation regardless of the amount of guard band. For example, Verizon provides an analysis showing that at a separation distance of 300 meters with a guard band of 3 megahertz, an MDS base station would exceed the 3G handsets interference criteria by about 7 dB. *Id.* at Appendix. See also Motorola Comments to the *Notice* at 11 and Appendix.

¹³⁰ Verizon Wireless Comments to the *Notice* at 15.

¹³¹ See, e.g., Sprint Comments to the *Further Notice* at 2; WorldCom Comments to the *Notice* at 24.

¹³² See, e.g., Nucentrix Broadband Networks Comments to the *Further Notice* at 6-7; WorldCom Comments to the *Further Notice* at 10-11. Nucentrix avers that the same public interest benefits of new technology development and efficient use of spectrum that were articulated in the *Further Notice* would be achieved by the addition of a flexible use allocation for MDS Channels 1 and 2A. It also states that the record in this proceeding clearly demonstrates that
(continued....)

the band, WCA states that under certain conditions MDS and AWS can co-exist in the 2110-2165 MHz band.¹³³ First, WCA states that a modest guard band between MDS and AWS would be necessary.¹³⁴ However, alleging flaws in Verizon's analysis, WCA refutes the assertion that the entire band would be unusable.¹³⁵ Second, WCA states that to enable band sharing an appropriate spectral mask must be imposed on AWS and AWS power levels must be limited.¹³⁶

38. Commenters advocating the relocation of MDS operations offer several approaches. AT&T states that moving MDS to the 2155-2165 MHz band would provide 45 megahertz of contiguous spectrum for 3G and require only one guard band.¹³⁷ Likewise, Verizon argues that MDS operations in the 2150-2160 MHz band could be shifted up to the 2155-2165 MHz band or alternatively moved to spectrum within or adjacent to the MDS spectrum at 2500-2690 MHz.¹³⁸ Cingular presents a plan recommending that MDS operations be relocated to the MSS spectrum at 2010-2025 MHz.¹³⁹ Ericsson argues that the MDS spectrum should be reallocated for AWS, but replacement spectrum for MDS should only be considered if market developments indicate a clear need. In that case, Ericsson suggests that replacement spectrum could come from the 2385-2400 MHz band, in abandoned MSS spectrum below 2025 MHz, or in the 700 MHz spectrum bands.¹⁴⁰

39. WCA argues that each of these options poses difficulties for MDS operations. With respect to moving MDS to the 2155-2165 MHz band, it notes that in 50 markets, MDS licensees may use up to 12 megahertz which must be accommodated, that such relocation would eliminate the *de facto*

(...continued from previous page)

MDS Channels 1 and 2A and the 2500-2690 MHz band are used together to deliver the same broadband services and, therefore, that the same service rules should apply to both bands. Nucentrix Broadband Networks Comments to the *Further Notice* at 6-7.

¹³³ WCA Reply Comments to the *Notice* at 27-31.

¹³⁴ WCA states that further analysis is needed to determine the correct size for a guard band. *Id.* at 30.

¹³⁵ WCA states that Verizon's analysis fails to consider the elevation angles between MDS base stations and 3G-style handsets and unrealistically assumes that downstream MDS stations would operate with an attenuation of 60 dB on all frequencies more than 3 MHz from the channel edge. WCA points out that the MDS base station emissions continue to roll off to a level of -67 dBc at ± 5 MHz away from the band edge, which is enough to meet Verizon's desired interference criterion. WCA also maintains that the antenna height differential between MDS base and AWS mobile stations is enough to reduce interference to levels below Verizon's interference limit at distances up to 1.6 km. See WCA Reply Comments to the *Notice* at 29-30 and Appendix A.

¹³⁶ See WCA Reply Comments to the *Notice* at 30. WCA states that if the stated conditions are adopted, it would not be opposed to a modification to the MDS base station emission mask to reflect actual equipment performance. *Id.* at 29-30. See also Joint Comments of The Cellular Telecommunications & Internet Association, Telecommunications Industry Association, and Personal Communications Industry Association at Attachment I: Report of the Working Group on 3G Characteristics. The report indicates that mobile stations would operate with a typical transmitter power of 100 mW, and a maximum transmitter power of 250 mW for cdma2000, TD-CDMA, and W-CDMA, and 1 W for UWC-136 (TDMA) EDGE. The report also indicates that base stations would operate with a transmitter power of 10 W.

¹³⁷ AT&T Wireless Comments to the *Notice* at 12.

¹³⁸ Verizon Comments to the *Notice* at 15.

¹³⁹ Cingular Comments to the *Further Notice* at 11.

¹⁴⁰ Ericsson Comments to the *Further Notice* at 10-11.

guard band between MDS and MSS,¹⁴¹ and that such a transition would have to be accomplished without disrupting service to customers and all costs must be reimbursed.¹⁴² WCA further states that other options proposed are also lacking. It states that moving MDS into the MSS bands is problematic because it would reduce the size of the MSS spectrum.¹⁴³ Additionally, WCA states that the 2385-2400 MHz band is not suitable for MDS relocation because the 2385-2390 MHz band is not readily available and because there is a likelihood of adjacent channel interference from Federal Government airborne telemetry operations and co-channel interference to amateur operations in the 2390-2400 MHz band.¹⁴⁴ WCA does however, offer a relocation solution, stating that in the event the Commission deems relocation necessary, an acceptable compromise would be to relocate MDS Channels 1 and 2/2A to the 1910-1916/1990-1996 MHz bands and allow fixed or mobile use.¹⁴⁵

40. We conclude that the record supports reallocation of 5 megahertz of spectrum at 2150-2155 MHz to add a mobile allocation to support the provision of AWS.¹⁴⁶ Because this spectrum is contiguous to the 2110-2150 MHz band, this reallocation will allow efficiencies in deploying new AWS. For example, there will be only one point where AWS and MDS bands are adjacent and interference issues will need to be addressed.¹⁴⁷ We note that the 2150-2155 MHz band is part of the “worldwide” IMT-2000 base station transmit band that extends from 2110 MHz to 2170 MHz. Thus our action here more closely aligns U.S. spectrum with allocations in the rest of the world and could lead to lower equipment costs and promote global roaming. Furthermore, this action will provide two contiguous 45 megahertz blocks of paired spectrum (*i.e.*, 1710-1755 MHz paired with 2110-2155 MHz), and provide more options for assigning large spectrum blocks suitable for AWS use.

41. We recognize that our decision here to reallocate the 2150-2155 MHz band from MDS to AWS use requires that we address certain issues regarding MDS operations. In particular, we will have to consider relocation spectrum and propose relocation procedures for MDS, keeping in mind the need to avoid disruption to existing customers. Because we do not anticipate licensing the band for new services until after we adopt service rules,¹⁴⁸ and because the companion Federal Government transfer spectrum in

¹⁴¹ WCA notes that it has filed a Petition for Reconsideration of the *Report and Order* in IB Docket No. 99-81 seeking to revise the MSS spectral mask to limit the power flux density into the MDS band. WCA Reply Comments to the *Notice* at 32.

¹⁴² *See id.* at 31-33.

¹⁴³ *See WCA Letter, supra* n.19. This letter was sent jointly by WCA, Bellsouth, Nucentrix, Sprint, and Worldcom. WCA is the trade association of the MDS industry. The other parties to the letter hold the majority of licenses in the 2150-2160 MHz band.

¹⁴⁴ *Id.* at 8-9.

¹⁴⁵ *Id.* at 2.

¹⁴⁶ *See, e.g.*, Verizon Wireless Comments to the 2002 *Viability Assessment* at 3 (supporting allocation of a contiguous 45 MHz block of spectrum at 2110-2155 MHz and claiming that large contiguous blocks are necessary to promote the economic deployment of advanced services and to limit the mitigation of harmful interference necessary to account for services on adjacent bands). *See also* Motorola Comments to the 2002 *Viability Assessment* at 5 and TIA Comments to the 2002 *Viability Assessment* at 4 (advocating a 60 MHz allocation that includes a 45 MHz contiguous block in the 2110-2155 MHz band but suggesting that 15 MHz between 2155 and 2170 be held in reserve until a matching 15 MHz block can be made available).

¹⁴⁷ In the *Notice*, we had proposed to designate 45 megahertz of spectrum at 2110-2150 MHz and 2160-2165 MHz for AWS. Were we to adopt this proposal, MDS would be between two AWS allocations. This would raise adjacent band interference issues on both sides of the MDS allocation. *Notice*, 16 FCC Rcd at 618, ¶ 52.

¹⁴⁸ Concurrent with the adoption of this Second R&O, we adopt a Notice of Proposed Rulemaking to examine service rules for the newly allocated bands.

the 1710-1755 MHz band will not be available until 2004, there is sufficient time for us to identify in a separate proceeding to be initiated in the near future any necessary relocation spectrum for MDS licensees and to craft appropriate relocation procedures. In addressing relocation, however, we recognize the importance of avoiding unnecessary delay so as to minimize uncertainty to existing licensees.

42. We now turn to the relocation procedures for incumbent fixed microwave service licensees that currently operate in the 2110-2150 MHz band. Because this band was identified and reallocated for new uses in the *Emerging Technologies* proceeding, a mechanism already exists to clear these incumbent licensees. In the *Notice*, we noted that fixed microwave service incumbents holding primary status¹⁴⁹ in the 2110-2150 MHz band are entitled to compensation for relocation of facilities under these policies.¹⁵⁰ We further noted that certain fixed microwave incumbents in the 2110-2150 MHz band segment consist of links that are paired with frequencies in the 2165-2200 MHz band, which was previously reallocated to support MSS.¹⁵¹ Moreover, some microwave licensees at 2110-2115 MHz have paired links in the 2160-2165 MHz band.¹⁵²

¹⁴⁹ Only those incumbent fixed facilities that were licensed or had pending applications as of January 16, 1992 may have primary status. See *Emerging Technologies First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd at 6891-2, ¶ 31. See also 47 C.F.R. § 101.147(a). In addition, under the rules any major modifications or extension to an existing fixed system after April 25, 1996, is authorized only on a secondary basis to Emerging Technology stations. See 47 C.F.R. § 101.81. As of September 2002, the licensing database includes the following:

Band (MHz)	Number of Licensees	Service
2110-2130	3454.....	Common carrier point-to-point licenses (Part 101)
	3.....	Private non-public safety point-to-point licenses (Part 101),
	56.....	Paging and Radiotelephone Service licenses (Part 22)
	47.....	Local Television Transmission Service Licenses (Part 101)
	1.....	General Aviation and Air-Ground Radiotelephone license (Part 22)
2130-2150	2448.....	Private non-public safety point-to-point licenses (Part 101)
	1326.....	Public safety point-to-point licenses (Part 101)
	2.....	Common carrier point-to-point licenses (Part 101)
2160-2165	890.....	Common carrier point-to-point licenses (Part 101)
	13.....	Paging and Radiotelephone Service licenses (Part 22)
	40.....	Local Television Transmission Service Licenses (Part 101)

¹⁵⁰ See *Emerging Technologies Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd 6589 (1993). New licensees may relocate incumbent licensees' systems at their option. In general, a new licensee will relocate an incumbent system if it determines that the incumbent system will cause interference to the new licensee's system. The main elements of the relocation process include a set negotiation period or periods, usually triggered at the request of the new licensee; a requirement that the parties negotiate in good faith during the mandatory negotiation period; and the right of the incumbent to be relocated to comparable facilities at the expense of the new licensee. The relocation compensation includes all engineering, equipment, site, and FCC fees. The new licensee must complete all activities necessary for implementing the replacement facilities, and must test the new facilities to ensure comparability with the existing facilities. See generally 47 C.F.R. §§ 101.69-101.99.

¹⁵¹ *Notice*, 16 FCC Rcd at 617-18, ¶ 51. Specifically, these microwave incumbents are paired in the 2130-2150 MHz and 2180-2200 MHz bands. Other parts of the *Notice* erroneously discuss microwave channels at 2165-2200 MHz being paired with spectrum at 2110-2115 MHz. See *Notice*, 16 FCC Rcd at 618-19, ¶¶ 54 & 55.

¹⁵² *Notice*, 16 FCC Rcd at 617-18, ¶ 51.

43. In the MSS proceeding, which affected bands used by both fixed microwave incumbents and the Broadcast Auxiliary Service (BAS), the Commission adopted modified relocation procedures that, *inter alia*, imposed a single, shortened mandatory negotiation period in lieu of distinct voluntary and mandatory negotiation periods, and eliminated an incumbent's right of return to its original spectrum.¹⁵³ For paired microwave links, the Commission adopted a procedure by which the first new licensee would relocate both microwave links – including the “second” link that was not in the new licensee's licensed band. Once a subsequent licensee sought to begin operations on frequencies formerly used by this second link, that licensee would be obligated to reimburse the first licensee that relocated the paired microwave facilities half of the total relocation costs.¹⁵⁴ We note that this procedure applies to the first licensee to displace a microwave incumbent with paired facilities, regardless of whether the licensee is a MSS license in the 2165-2200 MHz band or a new service license in the 2110-2150 MHz band.¹⁵⁵

44. In the *Notice*, we noted that it would be possible for both relocation procedures to apply to the same new entrant in the 2110-2150 MHz band – the modified MSS relocation procedure for a link paired between the 2110-2150 MHz and 2165-2200 MHz bands and the *Emerging Technologies* procedure for all other relocations (including the relocation of a link paired between the 2110-2150 MHz and 2160-2165 MHz bands).¹⁵⁶ We thus proposed to use the modified procedure for the relocation of any incumbent user in order to provide a single relocation process for this band.¹⁵⁷ For microwave links paired in the 2110-2150 and 2160-2165 MHz bands, a new licensee would be required to relocate both paths (if such a relocation had not yet been done), but would retain a right to seek reimbursement of 50 percent of its relocation costs from the licensee that ultimately uses frequencies in the second path. All new licensees, regardless of whether they relocate paired or unpaired microwave incumbents, would be subject to the modified relocation rules (such as the shortened mandatory negotiation period) discussed above.

45. Blooston opposes the proposed modification and says that the distinctions that led us to adopt a revised relocation procedure in the MSS proceeding do not justify extension of that procedure to the entire Emerging Technologies band.¹⁵⁸ It claims that the modified procedures will remove much of the negotiating leverage between incumbents and new entrants, which in turn will diminish the likelihood

¹⁵³ Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, *Second Report and Order and Second Memorandum Opinion and Order*, ET Docket No. 95-18, 15 FCC Rcd 12315 (*MSS Second R&O*); 47 C.F.R. §§ 101.69(d), 101.73(d), and 101.75(d). During the voluntary negotiation period, parties are encouraged to negotiate and reach agreement, but are not required to do so. During the involuntary negotiation period, parties must negotiate relocation terms in good faith. *See Emerging Technologies Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd at 6595, ¶ 15. Only if these negotiations fail can a new licensee force an incumbent to relocate. Under involuntary relocation, an emerging technology service provider must 1) guarantee payment of all relocation costs; 2) complete all activities necessary to bring the facilities into operation; and 3) build and test the new system. *Emerging Technologies Memorandum Opinion and Order*, 9 FCC Rcd at 1944, ¶ 3.

¹⁵⁴ *MSS Second R&O*, 15 FCC Rcd at 12345-6, ¶¶ 95-96.

¹⁵⁵ *See* 47 C.F.R. § 101.99.

¹⁵⁶ *Notice*, 16 FCC Rcd at 618-19, ¶ 54.

¹⁵⁷ *Id.*, 16 FCC Rcd at 618-19, ¶¶ 54-55 (noting that, otherwise, “it is possible that a new entrant in the 2110-2150 MHz band could be assigned spectrum that would have two sets of relocation procedures in effect”).

¹⁵⁸ Blooston Comments to the *Notice* at 2 & 5.

that incumbents will obtain adequate replacement facilities.¹⁵⁹ Furthermore, it claims that the unique needs of the BAS incumbents (which required a unified, integrated relocation) are wholly different from the fixed microwave services (which can be relocated on a case-by-case basis), and, therefore, that the specialized relocation procedures should not be expanded to additional fixed services outside the MSS relocation bands.¹⁶⁰ Several commenters also expressed concern that incumbent licensees might not be adequately relocated under the procedures we proposed to adopt.¹⁶¹

46. We conclude that the modified relocation procedures, as proposed, represent the best course. A unified approach to our rules and procedures serves the public interest,¹⁶² and can promote the rapid development of AWS, which many commenters support.¹⁶³ Moreover, if the demand for the advanced services is as robust as commenters claim, incumbent licensees should find new licensees particularly eager to reach relocation agreements so as not to be competitively disadvantaged by a delay in their service deployment. This, in turn, would appear to mitigate Blooston's concerns that the proposal would skew the negotiating leverage in favor of the new licensee.¹⁶⁴ Finally, we note that under our basic relocation principles, incumbents retain a right to comparable facilities. We stress that we are not altering this process, nor an incumbent's right to seek relief if it believes the relocation process has not been conducted in good faith.¹⁶⁵ We observe, however, that we may need to modify the reimbursement provisions if MDS is reassigned to the 2155-2165 MHz band because Fixed Service microwave operations in the 2160-2165 MHz band would have to be relocated. Under the current rules, for example, MDS would have to reimburse a new AWS entrant who is trying to clear paired microwave links at 2110-2115 and 2160-2165 MHz.

47. In the *Emerging Technologies* proceeding, we identified the 4 GHz, 6 GHz, 10 GHz, and 11 GHz bands as relocation spectrum for fixed microwave operations.¹⁶⁶ This action was taken to provide

¹⁵⁹ *Id.* at 6-7.

¹⁶⁰ *Id.*

¹⁶¹ See The Rural Telecommunications Group Comments to the *Notice* at 3-4; Pinnacle West Capital Corporation Comments to the 2002 *Viability Assessment* at 2.

¹⁶² See, e.g., Biennial Regulatory Review – Amendment of Parts 0, 1, 13, 22, 24, 26, 27, 80, 87, 90, 95, 97, and 101 of the Commission's Rules to Facilitate the Development and Use of the Universal Licensing System in the Wireless Telecommunications Services, WT Docket No. 98-20, *Report and Order*, 13 FCC Rcd 21027, 21054-5 ¶ 56 (1998) (finding that the consolidation and unification of disparate rules for different wireless services would speed wireless service to the public).

¹⁶³ If a licensee is subject to varying relocation time periods, and the licensee is unable to begin service until it relocates incumbents across its entire licensed service area, then it may be unable to deploy AWS until it relocates those incumbents that are subject to the latest relocation time period – particularly if those incumbents do not readily reach a relocation agreement. Thus, it makes sense to unify the time frame for relocation to the greatest extent possible, and to favor the shortened time periods reflected in the modified procedures. See also *Emerging Technologies Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd at 6594-95, ¶ 14 (stating that “[u]ndue delay would be inconsistent with the public interest in fostering and implementing new services that utilize emerging technologies as quickly as possible.”)

¹⁶⁴ See Blooston Comments to the *Notice* at 8.

¹⁶⁵ The burden of providing comparable facilities and paying relocation costs rests on the new licensee. See Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, PR Docket No 93-114, *Third Order on Reconsideration*, 16 FCC Rcd 2866, 2877 ¶ 10 (2001).

¹⁶⁶ See *Emerging Technologies Second Report and Order*, 8 FCC Rcd 6495 (1993).

spectrum relocation options to incumbent users. Pinnacle West Capital Corporation states that suitable spectrum must be available in the event it needs to relocate facilities,¹⁶⁷ while Cingular Wireless states that it would not be too difficult to accommodate many of the incumbents in the 2110-2150 MHz band in the 4 GHz, 6 GHz, 10 GHz, and 11 GHz bands.¹⁶⁸ In addition, no party refuted our observation that incumbents may also be able to be relocated using other mediums, such as fiber or through existing commercial services.¹⁶⁹ In the absence of specific evidence to the contrary, we continue to believe that the replacement spectrum first identified in the *Emerging Technologies* can be used to provide adequate relocation facilities and will provide suitable spectrum for any microwave incumbent licenses that are ultimately relocated.

3. Other Bands

48. *1755-1850 MHz.* In the *Notice*, we identified the 1755-1850 MHz band for consideration for the provision of AWS. The 1755-1770 MHz band segment was considered as part of the initial NTIA studies, and was again evaluated in the *2002 Viability Assessment*. In this most recent review, NTIA concluded that the 1755-1850 MHz band is not viable for use by AWS due to the extensive and critical Federal Government operations in the band, including DOD mobile systems operating in the 1755-1850 MHz range that “have recently been elevated in importance due [to] the war on terrorism, homeland defense, and possible requirements for ballistic missile defense.”¹⁷⁰ Moreover, NTIA was unable to identify alternative spectrum bands that could readily accommodate many of these systems, including air combat training systems, the Land Warrior systems, and DOD satellite telemetry, tracking and command facilities that operate in the 1761-1842 MHz band segment and which cannot be easily re-tuned.¹⁷¹ The 1770-1850 MHz band segment was previously rejected by NTIA as incompatible for shared use and was not included in the most recent band evaluation process.¹⁷² Throughout the evaluation process, Federal Government users have consistently expressed skepticism that any portion of the 1755-1850 MHz band segment can be made available for advanced commercial wireless systems, either through relocation of Federal users or by shared use.¹⁷³ Moreover, NTIA anticipates that the process that will allow it to relocate Federal users from the 1710-1755 MHz band segment will result in system relocations to spectrum above 1755 MHz, as well as a generally more intensive use of the 1770-1850 MHz band segment for existing, relocated, and new systems.¹⁷⁴ We note that some commenters identify benefits

¹⁶⁷ Pinnacle West Capital Corporation Comments to the *2002 Viability Assessment* at 3.

¹⁶⁸ Cingular Wireless Comments to the *Notice* at 22-24.

¹⁶⁹ See Blooston Comments to the *Notice* at 6 (stating that “some of the best solutions to a microwave relocation situation may be non-traditional solutions, such as the use of commercial services”).

¹⁷⁰ See *2002 Viability Assessment* at 18-19.

¹⁷¹ *Id.* at 19. NTIA did suggest that it would be possible to relocate non-military users of the band segment.

¹⁷² This band was discussed in the *NTIA Final Report*. See *supra* n.10 and accompanying text.

¹⁷³ See, e.g., *NTIA Final Report* at xv. (concluding that full band sharing was not feasible in the 1755-1850 MHz band segments, that some systems may not be able to vacate until 2030, and that compatible relocation spectrum may not even be available). Notably, the most recent cooperative investigation into spectrum reallocation – which resulted in the *2002 Viability Assessment* – did not even consider the 1770-1855 band segment.

¹⁷⁴ See *2002 Viability Assessment* at 10-11 and 19-20. In addition, NTIA anticipates increased government spectrum needs in this band segment for homeland security and related missions. See *Id.* at 5-6.

from the use of this band for AWS, including regional harmonization¹⁷⁵ and the possibility that allocation of the 1755-1850 MHz band (in conjunction with the 1710-1755 MHz band) would serve as a catalyst for making these frequencies as globally accepted as the core bands identified in IMT-2000.¹⁷⁶

49. Given the statements by NTIA regarding the intense use of this band by military users and other Federal Government agencies that provide critical safety-of-life operations, and the concern expressed by many commenters about clearing existing government users,¹⁷⁷ we conclude that this band is too encumbered to be used for the provision of AWS. We note that while some comments suggest that we explore a combination of sharing and migration for incumbent users,¹⁷⁸ NTIA and other commenters do not believe that co-channel sharing is possible.¹⁷⁹ We acknowledge the *2002 Viability Assessment's* conclusion that "[a] leap forward in technology may permit extensive sharing in all bands below 3 GHz in the future," but that until such developments occur, it appears that use of the 1755-1770 MHz band for advanced wireless applications is not technically viable.¹⁸⁰ Accordingly, we conclude that the 1755-1850 MHz band is not suitable for the provision of AWS at this time.

50. *Currently Allocated Spectrum.* In the *Notice*, we noted that currently allocated spectrum may also be suitable for the provision of AWS.¹⁸¹ This spectrum includes television bands that were reallocated to commercial fixed, mobile, and broadcast services and are in the process of being vacated as part of the transition to digital television.¹⁸² We note that the disposition of these bands has taken place in separate proceedings. The record in the instant proceeding contains nothing that would cause us to revisit these decisions, nor to reassess our general conclusion that the reallocated television bands will be available for new uses, including AWS.¹⁸³ However, we reach an opposite conclusion with respect to the 2390-2400 MHz band. The record reflects little support for AWS use of this band, which is designated for UPCS and Amateur Service use, and the *2002 Viability Assessment* identified this spectrum as suitable

¹⁷⁵ Canadian Wireless Telecommunications Association Comments to the *2002 Viability Assessment* at 2-3.

¹⁷⁶ Siemens Comments to the *Notice* at 2. *See also* Orange Group Comments to the *Notice* at 4.

¹⁷⁷ *See, e.g.*, Cingular Wireless Comments to the *Notice* at 20; Verizon Wireless Comments to the *2002 Viability Assessment* at 7-8.

¹⁷⁸ *See, e.g.*, Motorola Comments to the *FCC Staff Report* at 2; Motorola Comments to the *Notice* at 14, 17-19; WorldCom Reply Comments to the *FCC Staff Report* at 11; TIA-Wireless Comments to the *Further Notice* at 8.

¹⁷⁹ *See* Verizon Wireless Comments to the *2002 Viability Assessment* at 7-8; Cingular Wireless Comments to the *Notice* at 19.

¹⁸⁰ *2002 Viability Assessment* at 4.

¹⁸¹ *Notice*, 16 FCC Rcd at 610-12, ¶¶ 34-38.

¹⁸² *See* Reallocation of Television Channels 60-69, The 746-806 MHz Band, *Report and Order*, ET Docket No. 97-157, 12 FCC Rcd 22953 (1998) (making 30 MHz of spectrum in the 747-762 MHz and 777-792 MHz bands available for commercial use); *See also* Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59) *Report and Order*, GN Docket No 01-74, 17 FCC Rcd 1022 (2002) (making 48 MHz of spectrum in the 698-746 MHz band available for flexible use).

¹⁸³ Because of television incumbencies that are likely to continue for some time, and because these bands were not part of the ITU's bands designated for worldwide use, some commenters do not believe that these bands will meet near-term AWS needs. *See, e.g.*, Verizon Wireless Reply Comments to the *Notice* at 11. *But see* CTIA Comments to the *Notice* at 9; NEC America Comments to the *Further Notice* at 23; Illinois Institute of Technology Reply Comments to the *Notice* at 4 (supporting the ultimate use of these bands for commercial use and expressing preferences over the use of other bands under consideration).

replacement spectrum for some Government systems currently operating in the 1710-1755 MHz band. Therefore, we will not further examine the possible use of the 2390-2400 MHz band for the provision of AWS.

IV. CONCLUSION

51. The 90 megahertz of spectrum that we are identifying for AWS is a sizeable amount of spectrum that compares favorably with previous spectrum allocations for commercial wireless applications. For example, this is more than twice the 40 MHz of spectrum that the Cellular Radiotelephone Service was initially allocated when the service was initiated,¹⁸⁴ and represents three quarters of the amount of spectrum allocated to Broadband PCS.¹⁸⁵ Including the spectrum we make available today, the total spectrum allocated for commercial wireless services is approximately 280 MHz.¹⁸⁶

52. Under the criteria discussed *supra*, the 90 megahertz of spectrum we allocate today will promote the robust deployment of AWS, and we will continue to strive to make allocation decisions that can lead to the widescale deployment of innovative new services. Moreover, technological developments may foster further efficiencies in the deployment of AWS. These technologies include software defined radio (SDR)¹⁸⁷ and adaptive antenna technology (increasing directionality) or new modulation or coding techniques (more information in the same spectrum) that may allow for greater spectral efficiency than that which is typically associated with current wireless systems.¹⁸⁸ Finally, we stress that this action is part of a continuing effort to identify and evaluate both the current and future spectrum needs for AWS. The further decisions that we make in this continuing proceeding may well result in the allocation of additional spectrum for commercial use, including the provision of AWS.

V. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Analysis

53. As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) of the possible significant economic impact on small entities of the proposals suggested in this document. The FRFA is set forth in Appendix C.

¹⁸⁴ See 47 C.F.R. § 22.900 *et seq.* The Cellular Radiotelephone Service initially was titled the Domestic Public Cellular Radio Telecommunications Service. See Revision of Part 22 of the Commission's Rules Governing the Public Mobile Services, CC Docket No. 92-115, *Report and Order*, 9 FCC Rcd 6513, 6538 (1994) (changing name). The service was subsequently expanded to meet a growth in demand, and now consists of a 50 MHz total allocation. See <http://wireless.fcc.gov/services/cellular/data/bandplan.html>.

¹⁸⁵ See 47 C.F.R. § 24.229.

¹⁸⁶ This includes the 90 MHz allocation in this proceeding, 50 MHz for cellular services, 120 MHz for broadband PCS, and an estimated 20 MHz of Specialized Mobile Radio (SMR) spectrum that is used to provide commercial services that compete with cellular and PCS providers. As a general rule, United States licensees may use their existing spectrum allocations, as well as any additional spectrum we allocate in this proceeding, for the provision of advanced services.

¹⁸⁷ SDR is projected to allow carriers to deploy AWS flexibly across different frequency bands. See Software Defined Radio Forum Comments to the *Notice*. But see AT&T Wireless Comments to the *Notice* at 9 (stating that SDR is still "years away").

¹⁸⁸ See, e.g., ArrayComm comments to the *Further Notice* at 1, n.1.

B. Contact Person

54. For further information concerning this rule making proceeding contact Jamison Prime at (202) 418-7474, jprime@fcc.gov, Office of Engineering and Technology.

VI. ORDERING CLAUSES

55. Accordingly, IT IS ORDERED that pursuant to Sections 1, 4(i), 7(a), 301, 302(a), 303(f), 303(g), 303(r), 307, 308, 309(j), 316, and 332 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 157(a), 301, 302(a), 303(f), 303(g), 303(r), 307, 308, 309(j), 316, and 332 the SECOND REPORT AND ORDER is hereby ADOPTED.

56. IT IS FURTHER ORDERED that the rules set forth in Appendix A WILL BECOME EFFECTIVE 30 days after publication in the Federal Register.

57. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this SECOND REPORT AND ORDER, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: FINAL RULES

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 2, 21, and 101 as follows:

PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for Part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:

- a. Revise pages 47 and 49.

- b. In the list of United States (US) Footnotes, remove footnote US256, revise footnote US311, and add footnote US378.

- c. In the list of non-Federal Government (NG) Footnotes, revise footnote NG153 and add footnote NG176.

§ 2.106 Table of Frequency Allocations.

The revisions and additions read as follows:

* * * * *

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
1670-1675 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE 5.380			1670-1675	1670-1675 FIXED MOBILE except aeronautical mobile	Wireless Communications (27)
5.341			5.341 US211 US362	5.341 US211 US362	
1675-1690 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE except aeronautical mobile	1675-1690 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE except aeronautical mobile MOBILE-SATELLITE (Earth-to-space)	1675-1690 METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE except aeronautical mobile	1675-1700 METEOROLOGICAL AIDS (radiosonde) METEOROLOGICAL-SATELLITE (space-to-Earth)		
5.341	5.341 5.377	5.341			
1690-1700 METEOROLOGICAL AIDS METEOROLOGICAL-SAT- ELLITE (space-to-Earth) Fixed Mobile except aeronautical mobile	1690-1700 METEOROLOGICAL AIDS METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE-SATELLITE (Earth-to-space)	1690-1700 METEOROLOGICAL AIDS METEOROLOGICAL-SAT- ELLITE (space-to-Earth)			
5.289 5.341 5.382	5.289 5.341 5.377 5.381	5.289 5.341 5.381	5.289 5.341 US211		
1700-1710 FIXED METEOROLOGICAL-SAT- ELLITE (space- to-Earth) MOBILE except aeronautical mobile	1700-1710 FIXED METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE except aeronautical mobile MOBILE-SATELLITE (Earth-to-space)	1700-1710 FIXED METEOROLOGICAL-SAT- ELLITE (space-to-Earth) MOBILE except aeronautical mobile	1700-1710 FIXED G118 METEOROLOGICAL-SAT- ELLITE (space-to-Earth)	1700-1710 METEOROLOGICAL-SAT- ELLITE (space-to-Earth) Fixed	
5.289 5.341	5.289 5.341 5.377	5.289 5.341 5.384	5.289 5.341	5.289 5.341	
1710-1930 FIXED MOBILE 5.380 5.384A 5.388A			1710-1755	1710-1755 FIXED MOBILE	
			5.341 US311 US378	5.341 US311 US378 NG176	

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
2110-2120 FIXED MOBILE 5.388A SPACE RESEARCH (deep space) (Earth-to-space)			2110-2120	2110-2155 FIXED NG23 MOBILE	Public Mobile (22) Fixed Microwave (101)
5.388			US252		
2120-2160 FIXED MOBILE 5.388A	2120-2160 FIXED MOBILE 5.388A Mobile-satellite (space-to-Earth)	2120-2160 FIXED MOBILE 5.388A	2120-2200	US252	
5.388	5.388	5.388		2155-2160 FIXED NG23	Domestic Public Fixed (21) Fixed Microwave (101)
2160-2170 FIXED MOBILE 5.388A	2160-2170 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth)	2160-2170 FIXED MOBILE 5.388A		2160-2165 FIXED NG23 NG153 MOBILE	Domestic Public Fixed (21) Public Mobile (22) Fixed Microwave (101)
5.388 5.392A	5.388 5.389C 5.389D 5.389E 5.390	5.388		2165-2200 MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25)
2170-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A				NG23 NG168	
5.388 5.389A 5.389F 5.392A					
2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space)			2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION- SATELLITE (space-to- Earth) (space-to-space) FIXED (line-of-sight only)	2200-2290	

* * * * *

UNITED STATES (US) FOOTNOTES

* * * * *

US311 Radio astronomy observations may be made in the bands 1350-1400 MHz, 1718.8-1722.2 MHz, and 4950-4990 MHz on an unprotected basis at the following radio astronomy observatories:

Allen Telescope Array, Hat Creek, California	Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W.	
NASA Goldstone Deep Space Communications Complex, Goldstone, California	80 kilometers (50 mile) radius centered on latitude 35° 18' N, longitude 116° 54' W.	
National Astronomy and Ionosphere Center, Arecibo, Puerto Rico	Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W.	
National Radio Astronomy Observatory, Socorro, New Mexico	Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W.	
National Radio Astronomy Observatory, Green Bank, West Virginia	Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W.	
National Radio Astronomy Observatory, Very Long Baseline Array Stations	80 kilometer radius centered on:	
	Latitude (North)	Longitude (West)
	Brewster, WA	48° 08' 119° 41'
	Fort Davis, TX	30° 38' 103° 57'
	Hancock, NH	42° 56' 71° 59'
	Kitt Peak, AZ	31° 57' 111° 37'
	Los Alamos, NM	35° 47' 106° 15'
	Mauna Kea, HI	19° 48' 155° 27'
	North Liberty, IA	41° 46' 91° 34'
	Owens Valley, CA	37° 14' 118° 17'
	Pie Town, NM	34° 18' 108° 07'
	Saint Croix, VI	17° 46' 64° 35'
Owens Valley Radio Observatory, Big Pine, California	Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40' W and 118° 30' W and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00' W and 118° 50' W.	

In the bands 1350-1400 MHz and 4950-4990 MHz, every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed and mobile services that could interfere with radio astronomy observations within the geographic areas given above. In addition, every practicable effort will be made to avoid assignment of frequencies in these bands to stations in the aeronautical mobile service which operate outside of those geographic areas, but which may cause harmful interference to the listed observatories. Should such assignments result in harmful interference to these observatories, the situation will be remedied to the extent practicable.

* * * * *

US378 In the band 1710-1755 MHz, Federal Government stations in the fixed and mobile services shall operate on a primary basis until reaccommodated in accordance with the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999. Further, Federal Government stations may continue to operate in the band 1710-1755 MHz as provided below:

(a) Federal fixed microwave and tactical radio relay stations may operate indefinitely on a primary basis at the sites listed below:

Location	Coordinates	Radius of Operation (km)
Cherry Point, NC.....	34° 58' N 076° 56' W	80
Yuma, AZ.....	32° 32' N 113° 58' W	80

(b) Federal fixed microwave and tactical radio relay stations may operate on a secondary basis, and shall not cause harmful inference to, and must accept harmful interference from, primary non-Federal Government operations at the sites listed below:

Location	Coordinates	Radius of Operation (km)
China Lake, CA.....	35° 41' N 117° 41' W	80
Eglin AFB, FL.....	30° 29' N 086° 31' W	80
Pacific Missile Test Range/Point Mugu, CA..	34° 07' N 119° 30' W	80
Nellis AFB, NV.....	36° 14' N 115° 02' W	80
Hill AFB, UT.....	41° 07' N 111° 58' W	80
Patuxent River, MD.....	38° 17' N 076° 25' W	80
White Sands Missile Range, NM.....	33° 00' N 106° 30' W	80
Fort Irwin, CA.....	35° 16' N 116° 41' W	50
Fort Rucker, AL.....	31° 13' N 085° 49' W	50
Fort Bragg, NC.....	35° 09' N 079° 01' W	50
Fort Campbell, KY.....	36° 41' N 087° 28' W	50
Fort Lewis, WA.....	47° 05' N 122° 36' W	50
Fort Benning, GA.....	32° 22' N 084° 56' W	50
Fort Stewart, GA.....	31° 52' N 081° 37' W	50

(c) In the sub-band 1710-1720 MHz, precision guided munitions shall operate on a primary basis until inventory is exhausted or until December 31, 2008, whichever is earlier.

* * * * *

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG153 The band 2160-2165 MHz is reserved for future emerging technologies on a co-primary basis with the fixed and mobile services. Allocations to specific services will be made in future proceedings. Authorizations in the band 2160-2162 MHz for stations in the Multipoint Distribution Service applied for after January 16, 1992 shall be on a secondary basis to emerging technologies.

* * * * *

NG176 The allocations to the fixed and mobile services in the band 1710-1755 MHz shall come into effect on January 1, 2004.

PART 21—DOMESTIC PUBLIC FIXED RADIO SERVICES

3. The authority citation for Part 21 continues to read as follows:

AUTHORITY: Secs. 1, 2, 4, 201-205, 208, 215, 218, 303, 307, 313, 403, 404, 410, 602, 48 Stat. as amended, 1064, 1066, 1070-1073, 1076, 1077, 1080, 1082, 1083, 1087, 1094, 1098, 1102, 47 U.S.C. 151, 154, 201-205, 208, 215, 218, 303, 307, 313, 314, 403, 404, 602,; 47 U.S.C. 552, 554.

4. Remove Section 21.50 and reserve the section number for future use.

§ 21.50 [Reserved].**PART 101—FIXED MICROWAVE SERVICES**

3. The authority citation for Part 101 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 303.

4. Section 101.69 is amended by revising paragraph (d) to read as follows:

§ 101.69 Transition of the 1850-1990 MHz, 2110-2150 MHz, and 2160-2200 MHz bands from the fixed microwave services to personal communications services and emerging technologies.

* * * * *

(d) Relocation of FMS licensees in the 2110-2150 and 2160-2200 MHz bands will be subject to mandatory negotiations only. Mandatory negotiation periods are defined as follows:

* * * * *

5. Section 101.73 is amended by revising paragraphs (d) and (d)(3) to read as follows:

§ 101.73 Mandatory negotiations.

* * * * *

(d) Provisions for Relocation of Fixed Microwave Licensees in the 2110-2150 and 2160-2200 MHz bands. Mandatory negotiations will commence when the ET licensee informs the fixed microwave licensee in writing of its desire to negotiate. * * *

* * * * *

(3) *Operating Costs.* Operating costs are the cost to operate and maintain the FMS system. ET licensees would compensate FMS licensees for any increased recurring costs associated with the replacement facilities (*e.g.*, additional rental payments, and increased utility fees) for five years after relocation. ET licensees could satisfy this obligation by making a lump-sum payment based on present value using current interest rates. * * *

* * * * *

4. Section 101.75 is revised by amending paragraph (d) to read as follows:

§ 101.75 Involuntary relocation procedures.

* * * * *

(d) *Twelve-month trial period.* If, within one year after the relocation to new facilities, the FMS licensee demonstrates that the new facilities are not comparable to the former facilities, the ET licensee must remedy the defects or pay to relocate the microwave licensee to one of the following: its former or equivalent 2 GHz channels, another comparable frequency band, a land-line system, or any other facility that satisfies the requirements specified in paragraph (b) of this section. This trial period commences on the date that the FMS licensee begins full operation of the replacement link. If the FMS licensee has retained its 2 GHz authorization during the trial period, it must return the license to the Commission at the end of the twelve months. FMS licensees relocated from the 2110-2150 and 2160-2200 MHz bands may not be returned to their former 2 GHz channels. All other remedies specified in paragraph (d) are available to FMS licensees relocated from the 2110-2150 MHz and 2160-2200 MHz bands, and may be invoked whenever the FMS licensee demonstrates that its replacement facility is not comparable, subject to no time limit.

* * * * *

5. Section 101.99 is revised by amending paragraph (a) to read as follows:

§ 101.99 Reimbursement and Relocation expenses in the 2110-2150 MHz and 2160-2200 MHz bands.

(a) Whenever an ET licensee (including Mobile-Satellite Service licensees) in the 2110-2150 or 2160-2200 MHz bands relocates an incumbent paired microwave link with one path in the 2110-2150 MHz band and the paired path in the 2160-2200 MHz band, the ET licensee is entitled to reimbursement of 50% of its relocation costs from any subsequently entering ET licensee which would have been required to relocate the same fixed microwave link.

APPENDIX B: LIST OF COMMENTING PARTIES[†]**Commenters to the *Notice of Proposed Rule Making*****Comments (due February 22, 2001):**

Ad Hoc MDS Alliance	Eureka College
Alan Dixon	Halifax Community College
American Association of School Administrators	Henry County Board of Education
American Association of Community Colleges	Illinois Institute of Technology
American Federation of Teachers	IPWireless
American Petroleum Institute	ITFS Spectrum Development Alliance
Arizona Board of Regents for Arizona State University	Jet Propulsion Laboratory, California Institute of Technology
ArrayComm	Joint Comments of CTIA, TIA, and PCIA
Association of America's Public Television Stations	K-12 Community
AT&T Wireless Services	Lee County School District
Austin Community College	LinkAir Communications
Baypoint TV	Lucent Technologies
Black Hawk College	MMDS Mankato
Blooston	Motorola
Board of Regents of the University of Wisconsin System	National Academy of Science
Burlington County College	National ITFS Association
Canadian Wireless Telecommunications Association	National Telecommunications and Information Administration
Catawba Valley Community College	Network for Instructional TV
Catholic Television Network	Nokia
CDMA Development Group	Nortel Networks
CelPlan Technologies	Northern Arizona University Foundation
Central Dakota Telecommunications Consortium	Nucentrix Broadband Networks
Champion Industries	Oklahoma States Regents for Higher Education
Cingular Wireless	Orange Group
Cisco Systems	Personal Communications Industry Association
Clearwire Technologies	Petroleum Communications
Community Telecommunications Network	Public Utility Commission of Texas
Cook Inlet Region	Qualcomm
Council of the Great City Schools	Qwest Wireless
CTIA	Radio Advisory Board of Canada
DCT Los Angeles	Rebekah E. Adams
Digital Broadcast Corporation	Red Partnerships
Dutchess Community College	Richardson Independent School District
Education Community of the United States	The Rural Telecommunications Group
Education Service Center Region 9	San Diego County Office of Education
Ericsson	San Diego County Superintendent of Schools
	San Jose State University/William D. Nance
	Siemens
	SkyCable TV of Madison
	Sprint Corporation
	Software Defined Radio
	South Carolina Educational Television Commission

[†] A list of commenting parties to the CTIA Petition was included in the *Notice*. *Notice*, 16 FCC Rcd at 628-29, Appendix A.

Spectrumlink Networks
Superintendent of Huntsville City Schools
Tarrant County College
Telephone and Data Systems
Telecommunications Industry Association
Treacy Lau
University of Colorado
University of North Carolina
Verizon Wireless
Virginia Communications
VoiceStream Wireless Corporation
Wireless Communications Association
International
Wireless One of North Carolina
WorldCom
Yuba Community College District

Reply Comments (due March 9, 2001):

Adams Telecom
ArrayComm
AT&T Wireless Services
Baypoint TV
Brown University
Catholic Television Network
Chilean Telecommunications Administration
Cingular Wireless
Cisco Systems
Clearwire Technologies
Council of the Great City Schools
CTIA
Education Community of the United States
Illinois Institute of Technology
Information Technology Industry Council
ITFS Spectrum Development Alliance
LinkAir Communications
Microband Corporation of America
Motorola
National ITFS Association
Network for Instructional TV
Nortel Networks
Nucentrix Broadband Networks
Orange Group
Qualcomm
Red Partnerships
Siemens
Spectrumlink Networks
Sprint Corporation
Telephone and Data Systems
The University of North Carolina
Verizon Wireless
VoiceStream Wireless Corporation

Wireless Communications Association
International
Wireless One of North Carolina
WorldCom

***Commenters to the Further Notice of
Proposed Rule Making*****Comments (due October 9, 2001):**

21st Century Telesis/Robert Hart
Ad Hoc MDS Alliance
American Petroleum Institute
APCO
ArrayComm
ARRL, The National Association for Amateur
Radio
AT&T Wireless Services
Avaya
Aviatel Communications
Blackfoot Telephone Cooperative
Blooston
The Boeing Company
Bryan P. King
CTIA
Celsat America
Cingular Wireless
Constantine Fantanas
Constellation Communications Holdings
Ericsson
Globalstar
iBee Communications
Iridium Satellite
Lockheed Martin Corporation
Orange Group
Midstate Communications
Midvale Telephone Exchange
Mobile Satellite Users Association
Motorola
MSTV and NAB
NEC America
New ICO Global Communications
Nickolaus E. Leggett
Nokia
Nortel Networks
Nucentrix Broadband Networks
Panasonic
Paul Toth-NA4AR
Penasco Valley Telephone Cooperative
PHS MoU Group
The Progress & Freedom Foundation

Qualcomm
 Quantum Communications
 RNI Communications
 The Rural Telecommunications Group
 Satellite Industry Association
 Siemens
 Skycross
 Society of Broadcast Engineers
 Sprint Corporation
 TDD Coalition
 Telecom Consulting Associates
 Telecommunications Industry Association-
 Satellite Communications Division
 Telecommunications Industry Association-
 Wireless Communications Division
 Telephone and Data Systems
 TMI Communications and Company, Limited
 Partnership
 UTAM
 UTStarcom
 Verizon Wireless
 Wireless Communications Association
 International
 Wireless Information Networks Forum
 WorldCom

Reply Comments (due November 5, 2001):

2 GHz Broadcast Group
 Ad Hoc MDS Alliance
 ArrayComm
 ARRL, The National Association for Amateur
 Radio
 Avaya
 The Boeing Company
 Blackfoot Telephone Cooperative, Midstate
 Communications, Midvale Telephone
 Exchange, and Penasco Valley Telephone
 CDMA Development Group
 CTIA
 Celsat America
 Cingular Wireless
 Constellation Communications Holdings
 Cox Broadcasting and Cosmos Broadcasting
 Corporation
 DCT Los Angeles
 Globalstar
 Meredith Corporation
 Motorola
 MSTV and NAB
 National Telephone Cooperative Association
 New ICO Global Communications

Nucentrix Broadband Networks
 Orange Group
 Public Safety Wireless Network
 Siemens
 Society of Broadcast Engineers
 Space Enterprise Council
 Sprint Corporation
 TDD Coalition
 Telephone and Data Systems
 TMI Communications and Company, Limited
 Partnership
 UTAM and Wireless Information Networks
 Forum
 UTStarcom
 VoiceStream Wireless Corporation
 Wireless Communications Association
 International
 WorldCom

Commenters to the 2002 Viability Assessment

Comments (due August 8, 2002):

Ad Hoc MDS Alliance
 Aerospace and Flight Test Radio Coordinating
 Council
 ArrayComm
 Bell South Corporation, Nucentrix Broadband
 Networks, Inc., Sprint Corporation,
 Worldcom, Inc., and Wireless
 Communications Association International,
 Inc. (collectively, the “MDS Commenters”)
 Canadian Wireless Telecommunications
 Association
 CTIA
 Cingular Wireless
 DCT Los Angeles
 Ericsson
 ICO Global Communications (Holdings) Ltd.
 Maximum Service Television, Inc. and the
 National Association of Broadcasters
 (collectively, “Joint Broadcasters”)
 Motorola
 Nokia
 Pinnacle West Capital Corporation
 Radio Advisory Board of Canada
 Siemens
 Sirius Satellite Radio Inc. and XM Radio Inc.
 (collectively, the “Satellite Radio
 Licensees”)
 Telecommunications Industry Association
 Verizon Wireless

APPENDIX C: FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act (RFA)¹⁸⁹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rulemaking and Order (Notice)*,¹⁹⁰ as well as the *Memorandum Opinion and Order and Further Notice of Proposed Rule Making (Further Notice)*.¹⁹¹ The Commission sought written public comments on the proposals in the *Notice* and *Further Notice*, including comment on each IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.¹⁹²

Need for, and Objectives of, the Second Report and Order

The goal of the *Second Report and Order (Second R&O)* is to promote the provision of advanced wireless services (AWS) to the public, which in turn supports our obligations under Section 706 of the 1996 Telecommunication Act¹⁹³ and, more generally, serves the public interest by promoting rapid and efficient radio communication facilities.

The *Second R&O* discusses the need for spectrum allocations of sufficient size and with particular characteristics so as to allow for the provision of AWS, and evaluates spectrum that could be allocated to support these services. Specifically, the *Second R&O* allocates spectrum that is suitable for advanced services in the 1710-1755 MHz, 2110-2150 MHz, and 2150-2155 MHz bands.

Summary of Significant Issues Raised by Public Comments in Response to the IRFA.

There were no comments filed that specifically addressed the rules and policies proposed in the IRFA.

Description and Estimate of the Number of Small Entities to Which the Rules Will Apply.

The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by the rules adopted herein.¹⁹⁴ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”¹⁹⁵ In addition, the term “small business” has the same meaning as

¹⁸⁹ See 5 U.S.C. § 603. The RFA (codified at 5 U.S.C. § 601-612) has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

¹⁹⁰ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Notice of Proposed Rulemaking and Order*, 16 FCC Rcd 596 (2001)

¹⁹¹ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, ET Docket No. 95-18, and IB Docket No. 99-81, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, 16 FCC Rcd 16043 (2001).

¹⁹² See 5 U.S.C. § 604.

¹⁹³ Section 706 of the Communications Act of 1934, as amended, codified at 47 U.S.C. § 157.

¹⁹⁴ 5 U.S.C. § 604(a)(3).

¹⁹⁵ 5 U.S.C. § 601(6).

the term “small business concern” under the Small Business Act.¹⁹⁶ A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).¹⁹⁷

A small organization is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹⁹⁸ Nationwide, as of 1992, there were approximately 275,801 small organizations.¹⁹⁹ “Small governmental jurisdiction” generally means “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than 50,000.”²⁰⁰ As of 1992, there were approximately 85,006 governmental entities in the United States.²⁰¹ This number includes 38,978 counties, cities, and towns; of these, 37,566, or 96%, have populations of fewer than 50,000.²⁰² The Census Bureau estimates that this ratio is approximately accurate for all governmental entities. Thus, of the 85,006 governmental entities, we estimate that 81,600 (96%) are small entities.

Fixed Microwave Services. Microwave services include common carrier,²⁰³ private-operational fixed,²⁰⁴ and broadcast auxiliary radio services.²⁰⁵ At present, there are approximately 22,015 common carrier fixed licensees and 61,670 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services. The Commission has not yet defined a small business with respect to microwave services. For purposes of this FRFA, we will use the SBA’s definition applicable to wireless and other telecommunications companies – *i.e.*, an entity with no more than 1,500 persons.²⁰⁶

¹⁹⁶ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

¹⁹⁷ 15 U.S.C. § 632.

¹⁹⁸ 5 U.S.C. § 601(4).

¹⁹⁹ Department of Commerce, U.S. Bureau of the Census, 1992 Economic Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration).

²⁰⁰ 5 U.S.C. § 601(5).

²⁰¹ U.S. Dept. of Commerce, Bureau of the Census, “1992 Census of Governments.”

²⁰² *Id.*

²⁰³ 47 CFR 101 *et seq.* (formerly, part 21 of the Commission's Rules).

²⁰⁴ Persons eligible under parts 80 and 90 of the Commission's rules can use Private Operational-Fixed Microwave services. See 47 CFR parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

²⁰⁵ Auxiliary Microwave Service is governed by Part 74 of Title 47 of the Commission's Rules. See 47 CFR Part 74 *et seq.* Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

²⁰⁶ 13 C.F.R. § 121.201, NAICS code 517212 (formerly 513322).

According to Census Bureau data for 1997, there were 977 firms in this category, total, that operated for the entire year.²⁰⁷ Of this total, 965 firms had employment of 999 or fewer employees, and an additional 12 firms had employment of 1,000 employees or more.²⁰⁸ Thus, under this size standard, the great majority of firms can be considered small.

We note that the number of firms does not necessarily track the number of licensees. We estimate that all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify as small entities under the SBA definition. Of these licenses, approximately 8,210 are issued for frequencies in the *Emerging Technologies* bands affected by this proceeding. In addition, these bands contain approximately 70 licenses in the paging and radiotelephone service and the general aviation and air-ground radio telephone services. Thus, assuming that these entities also qualify as small businesses, as many as 8,280 small business licensees could be affected by the rules we adopt. We note that these entities have been subject to relocation under rules originally adopted ten years ago in the Commission's *Emerging Technologies* proceeding. The *Second Report and Order* anticipates that these general relocation rules will continue to apply to FS microwave licensees and does not modify the class of licensees that are subject to these relocation provisions.

Multipoint Distribution Service (MDS). This service has historically provided primarily point-to-multipoint, one-way video services to subscribers, and Local Multipoint Distribution Service (LMDS).²⁰⁹ The Commission recently amended its rules to allow MDS licensees to provide a wide range of high-speed, two-way services to a variety of users.²¹⁰ In connection with the 1996 MDS auction, the Commission defined small businesses as entities that had annual average gross revenues for the three preceding years not in excess of \$40 million.²¹¹ The Commission established this small business definition in the context of this particular service and with the approval of the SBA.²¹² The MDS auction resulted in 67 successful bidders obtaining licensing opportunities for 493 Basic Trading Areas (BTAs).²¹³ Of the 67 auction winners, 61 met the definition of a small business. At this time, we estimate that of the 61 small business MDS auction winners, 48 remain small business licensees. In addition to the 48 small businesses that hold BTA authorizations, there are approximately 392 incumbent

²⁰⁷ U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Employment Size of Firms Subject to Federal Income Tax: 1997," Table 5, NAICS code 517212 (issued Oct. 2000).

²⁰⁸ *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is "Firms with 1,000 employees or more."

²⁰⁹ For purposes of this item, MDS includes single channel Multipoint Distribution Service (MDS) and the Multichannel Multipoint Distribution Service (MMDS). See 66 Fed. Reg. 36177.

²¹⁰ Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, MM Docket No. 97-217, *Report and Order*, 13 FCC Rcd 19112 (1998), *recon.*, 14 FCC Rcd 12764 (1999), *further recon.*, 15 FCC Rcd 14566 (2000).

²¹¹ 47 C.F.R. §§ 21.961 and 1.2110.

²¹² Amendment of Parts 21 and 74 of the Commission's Rules with Regard to Filing Procedures in the Multipoint Distribution Service and in the Instructional Television Fixed Service and Implementation of Section 309(j) of the Communications Act - Competitive Bidding, MM Docket No. 94-131, *Report and Order*, 10 FCC Rcd 9589, 9670 (1995), 60 Fed. Reg. 36524 (July 17, 1995).

²¹³ Basic Trading Areas (BTAs) were designed by Rand McNally and are the geographic areas by which MDS was auctioned and authorized. See *id.* at 9608.

MDS licensees that are considered small entities.²¹⁴ After adding the number of small business auction licensees to the number of incumbent licensees not already counted, we find that there are currently approximately 440 MDS licensees that are defined as small businesses under either the SBA or the Commission's rules. Because the Commission's action only affects MDS operations in the 2150-2155 MHz band, the actual number of MDS providers who will be affected by the *Second Report and Order* will only represent a small fraction of those 440 small business licensees.

Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

The *Second R&O* addresses the possible use of frequency bands below 3 GHz to support the introduction of new AWS, but does not propose service rules. Thus, the item contains no new reporting, recordkeeping, or other compliance requirements. Because the item does not establish procedures for the relocation of MDS incumbents from the 2150-2155 MHz band, there are no new compliance requirements for MDS at this time.

Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant alternatives that it has considered in developing its approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.”²¹⁵

Providing spectrum to support the introduction of new advanced mobile and fixed terrestrial wireless services is critical to the continuation of technological advancement. First and foremost, the Commission believes that our proposal to explore the possible use of several frequency bands that could offer a wide range of voice, data, and broadband services over a variety of mobile and fixed networks may provide substantial new opportunities for small entities.

However, we realize that some entities must be displaced to clear a sufficient quantity of contiguous spectrum to support new services. We endeavored to avoid this effect by identifying unencumbered spectrum, but spectrum in the suitable frequency range is heavily used already and a sufficient amount of unencumbered spectrum simply does not exist. We have therefore sought to minimize an adverse impact by proposing to reallocate frequency bands for those incumbents, including small entities, which might be accommodated in other spectrum and could be relocated more easily. The spectrum we allocate in the 1710-1755 MHz band is currently used for Federal Government services, and therefore there are no non-Federal Government incumbent small entities that will be displaced by the reallocation of this band. Similarly, as noted in paragraph 28, the 2110-2150 MHz band was previously identified as an Emerging Technology band, and relocation procedures already exist for incumbents in this band. These existing procedures (as modified in the *Second R&O*) should serve to ease the relocation

²¹⁴ 47 U.S.C. § 309(j). (Hundreds of stations were licensed to incumbent MDS licensees prior to implementation of Section 309(j) of the Communications Act of 1934, 47 U.S.C. § 309(j)). For these pre-auction licenses, the applicable standard is SBA's small business size standard for “other telecommunications” (annual receipts of \$12.5 million or less). See 13 C.F.R. § 121.201.

²¹⁵ 5 U.S.C. § 603(c)(1)-(c)(4).

of small entity incumbents in the 2110-2150 MHz band, and make reallocation of this band preferable to the reallocation of other bands where we would have to establish new relocation rules.

Finally, the Commission has already received extensive comments in this proceeding on issues related to the possible reallocation of the 2150-2160 MHz (2.1 GHz) spectrum for advanced wireless purposes. Comments filed by the multipoint distribution/instructional television fixed services industry and several equipment manufacturers argue that the 2.1 GHz band is necessary for the continued roll-out of fixed wireless services across the country. Other commenters support the use of 2.1 GHz for advanced wireless services. Although many commenters ask that we reallocate a large contiguous spectrum block to include the entire 2150-2160 MHz band, we instead decide to reallocate 5 megahertz in the 2150-2160 MHz band as part of a 45 megahertz block of contiguous spectrum that can be used to provide advanced services. By doing so, we satisfy the need to designate a large block of contiguous spectrum that can be paired in order to allow for the deployment of advanced services (and thus, serve the goals of this proceeding). However, by allocating 5 megahertz of existing MDS spectrum, we retain greater flexibility to accommodate small entities that are MDS licensees than had we redesignated the entire 2.1 GHz MDS spectrum. For example, paragraph 39 notes that we retain the option to realign MDS spectrum to a 10 megahertz block in the 2155-2165 MHz band. Had we reallocated the entire 2.1 GHz MDS spectrum, as some commenters had suggested, this option would not have been available.

Report to Congress:

The Commission will send a copy of the Second Report and Order including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.²¹⁶ In addition, the Commission will send a copy of the Second Report and Order, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Second Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.²¹⁷

²¹⁶ See 5 U.S.C. § 801(a)(1)(A).

²¹⁷ See 5 U.S.C. § 604(b).

**APPENDIX D: ANALYSIS OF INTERFERENCE IMPACT ON GOLDSTONE, CA
DEEP SPACE NETWORK FACILITY**

Given the concern expressed by the commenters, staff from the Commission's Office of Engineering and Technology conducted an analysis of the possible impact of the Goldstone, California Deep Space Network ("DSN") Facility. This facility is operated by NASA and is an international network of antennas that supports interplanetary spacecraft missions and radio and radar astronomy observations for the exploration of the solar system and the universe. The DSN provides the two-way communications link that guides and controls these interplanetary missions, and brings back the images and new scientific information they collect. The Goldstone DSN facility has a 70-meter and a 34 meter steerable, high-gain, parabolic reflector antennas.²¹⁸ The DSN 70-meter antenna has a mainbeam gain of 62.7 dBi and can be connected to either a 20 kW or a 400 kW transmitter. The 400kW power level is generally used under emergency conditions, which are expected to be rare. The 34-meter antenna has a gain of 55 dBi. However, since the 70-meter dish is the worst case, our results consider primarily the 400 kW transmitter with the 70-meter antenna. Both of these dishes have minimum elevation angles of 10 degrees from horizontal.²¹⁹

We input these parameters, the antenna pattern of the 70-meter antenna, and the latitude and longitude of the antenna facility into a software package called RFCAD.²²⁰ RFCAD uses the Longley-Rice propagation model to produce propagation studies and displays the results over topographic maps for to show predicted signal strengths. We selected a confidence level of 99% for 99% of the locations and 99% of the levels to ensure the most accurate results possible. We also assumed that the antenna could be pointing in any direction in azimuth and above 10 degrees in elevation. We rotated the 70-meter antenna 360 degrees in azimuth to get a composite plot of the power levels in all azimuths.

The analysis showed that for the 70-meter DSN antenna using the 400 kW transmitter, power levels that could cause 3G handset receiver burn-out are limited to within about 15 kilometers of the DSN transmitter. This area is almost entirely within the bounds of Ft Irwin and the Naval Weapons Center. In the remaining directions where there is significant terrain blockage, power levels above -94 dBm²²¹ in the main beam are limited to about 45 km away from the antenna.²²² However, power levels in the mainbeam

²¹⁸ See Document 7B/14-E, *Characteristics of SRS stations operating in the 2110-2120 MHz band for use in the development of IMT-2000 frequency arrangement*, Submitted by the United States of America, 2 April, 2001.

²¹⁹ See ITU-R RR 21.10 and 21.15. Under these constraints, the DSN station is limited to a minimum elevation angle of 10 degrees and a power limit of 55 dBW/4kHz in the horizontal direction.

²²⁰ RFCAD is a software package produced by SiteSafe. See <http://www.rfcad.com> for more details.

²²¹ This level is the 3G interference threshold for a desired signal 10 dB above the sensitivity for a 10^{-3} BER. See *FCC Final Report*, page A-26. However, we note that intrasystem noise would be considerably higher, thus negating any interference impact of a -94 dBm signal.

²²² Most of this area is also within the Ft. Irwin Military Reservation or the U.S. Naval Weapons Center. Based upon computations using RFCAD software, power levels in Barstow, California, the closest city to Goldstone, are expected to be below -110 dBm. Power levels at the closest approach to I-15 are also in the same range. The 20 kW transmitter generates power levels above -110 dBm within 32 km of the antenna in the mainbeam and 8 km in the sidelobes.

greater than -110 dBm²²³ can be expected up to approximately 150 km away from the antenna on the highest terrain in the southwest direction where there is little terrain blockage.²²⁴ These peaks are typically located away from populated areas and roads. The only large road found to the southwest of Goldstone is California Route 58. Based upon computations using RFCAD software, the maximum power that a vehicle traveling on this road is likely to see is -94 dBm. Since the highway is 66 kilometers away, the width of this -94 dBm “spot” on Highway 58 is 161 meters wide. A car traveling at 100 kilometers per hour (60 miles per hour) would transit this area in about 6 seconds. However, the road would only “see” these levels if the Goldstone antenna were pointing between 190 and 200 degrees from North.²²⁵ The 20 kW transmitter also generates power levels above -110 dBm within 150 km of the antenna in the mainbeam in the southwesterly direction, but the maximum power levels are about 8 dB lower than with the 400 kW transmitter and affect a much smaller segment of Route 58. Outside of the southwesterly direction, power levels above -94 dBm are contained within a circle centered at the transmitter with a radius of approximately 35 km.

²²³ In a pristine interference-free environment, this is the interference level for a 3G mobile receiver for a 10% degradation in range. *See FCC Final Report*, page A-26. However, we note that intrasystem noise would be considerably higher, thus negating any interference impact of a -110 dBm signal.

²²⁴ The mountains surrounding Los Angeles block the transmitted energy from Goldstone from reaching the metropolitan Los Angeles area.

²²⁵ Maximum power levels outside of this 10-degree wide arc should not exceed -102 dBm. Approximately 24 kilometers of Route 58 could see these power levels, but only if the mainbeam of the DSN antenna was pointed in that direction.

STATEMENT OF CHAIRMAN MICHAEL K. POWELL

Re: *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems* (adopted November 7, 2002).

Re: *Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands* (adopted November 7, 2002).

I previously identified new revenue sources and new services as among the key steps to recovery in the telecommunications sector. By our action today, we will make available spectrum resources that carriers and the consuming public demand – a major step in creating an environment hospitable to the introduction of new and innovative products and services. Access to new spectrum is not a cure for today's financially ailing wireless industry, but it is a key pre-condition to the long term health of the industry.

Today's decisions on the allocation and proposed service rules lay the groundwork for future innovation. We have allocated a significant slice of spectrum – two, contiguous 45 MHz blocks capable of being paired. Moreover, we have proposed few limitations on its use. Our service rules *NPRM* proposes affording future licensees the maximum possible flexibility in deciding how to put this resource into service for the public benefit. Within this framework, service providers can be expected to move spectrum quickly to its highest and best use.

We have not acted alone in taking this significant step toward making advanced wireless services a reality. Throughout this proceeding, the Commission has coordinated closely with NTIA, particularly since the release of its *3G Viability Study* this summer. I am grateful for Assistant Secretary Victory's leadership and support, and look forward to working with NTIA in carrying this process forward.

STATEMENT OF COMMISSIONER MICHAEL J. COPPS

RE: In the Matter of Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems (Second Report and Order).

In the Matter of Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands (NPRM).

I commend the Commission for moving forward with these critical proceedings. 3G has been a hot issue since I arrived at the Commission, and before, I'm certain. Like my colleagues, I am very excited about what the future holds for wireless technologies in these frequencies.

This Commission has, of course, a large and important role in promoting innovative and efficient uses of the American people's spectrum. It is our responsibility in allocating spectrum and setting service rules to place the highest value on what new uses of spectrum will mean to consumers. I mention this because I hope that no one will think the FCC can magically make the current woes of the wireless industry go away by merely allocating new spectrum. Life is not that simple! More importantly, we should always keep in mind that our job is to create a landscape where Americans can know that the spectrum that they have entrusted to us is used in their best interest, and that the endgame here goes beyond business interests to serve the public interest. If we do our job right here, I believe it will be a win-win for everyone.

I also hope that we will study the European experience with 3G very carefully. Various European countries moved ahead with 3G allocations before we did. Many of these countries allocated large amounts of spectrum to 3G. Despite that, 3G has been less than a success in Europe. What role did government allocations and service rules play? What other factors were at work? We need to know. Those who don't study history are condemned to repeat it.

But all that comes in the future. Today, the Commission has done the right thing, and has started the ball rolling on making spectrum available for exciting new technologies. I know that the negotiations over 3G spectrum were tough, and that the wireless industry was under some heavy pressures regarding things it may have wanted, and I hope those negotiations ended with the right result. We'll see.

What I can't wait to see is what all the amazing innovators in the communications industry come up with for these frequencies. From cellular to PCS to satellite to Wi-Fi, they have consistently brought us exciting new technologies that pushed the envelope. We will have done our job well if our actions today result in more such advances.

Thank you.

**CONSOLIDATED SEPARATE STATEMENT OF
COMMISSIONER KEVIN J. MARTIN**

Re: Amendment of Part 2 of the Commission's Rules To Allocate Spectrum Below 3 GHz for Mobile and Fixed Services To Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Services, Second Report and Order, ET Docket No. 00-258; Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands, Notice of Proposed Rulemaking, WT Docket No. 02-353

I am pleased to support these items, which allocate spectrum and seek comment on service rules for advanced wireless services in the 1.7 GHz and 2.1 GHz bands. These items provide two 45 MHz blocks of contiguous spectrum which, we propose, can be used for a range of advanced wireless services. While the wireless industry is already on the forefront in offering innovative new services, advances in technology are developing that will provide consumers exciting new applications such as truly high-speed Internet access on their mobile phones and the ability to use their mobile phones as cameras, sending digital pictures to other phones or computers at the touch of a button. A crucial ingredient to these services, however, is sufficient spectrum. These items provide some of that spectrum, making available a significant amount of spectrum that can be used for services such as expanded voice, data, and broadband applications provided over high-speed fixed and mobile networks – applications often called “third generation” (“3G”) or, internationally, “International Mobile Telecommunications-2000” (“IMT-2000”). These items should thus lead to substantial consumer benefits, as new and better quality services develop in the 1.7 GHz and 2.1 GHz bands.

I commend all of the different parts of government for working together to make this happen. In particular, the National Telecommunications and Information Administration deserves praise for spearheading this effort. NTIA, working with the Department of Defense, the State Department, the Office of Management and Budget, and the FCC's staff, developed a plan that serves as the blueprint for making this spectrum available. They accomplished a major step in ensuring that new and innovative wireless services will be available to American consumers.

These items also mark an important move toward a more predictable spectrum policy at the FCC. In the past, spectrum decisions have often been made ad hoc, leading to short bursts of spectrum being made available in response to specific exigencies. These items, in contrast, are part of a longer-range plan, in which we will make a significant amount of spectrum available over a period of several years. Spectrum users thus should have the certainty to develop business plans in advance of critical needs. They can be assured that when spectrum is needed it will be there.

These items are a step in the right direction, and I look forward to continuing our efforts to provide new and better services to consumers and certainty and predictability to the spectrum community.

Exhibit 1027

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
Service Rules for Advanced Wireless Services	)	WT Docket No. 02-353
in the 1.7 GHz and 2.1 GHz Bands	)	

REPORT AND ORDER

Adopted: October 16, 2003

Released: November 25, 2003

By the Commission: Chairman Powell, Commissioners Martin and Adelstein issuing separate statements;
Commissioner Copps approving in part, concurring in part and issuing a separate statement.

TABLE OF CONTENTS

Heading	Paragraph #
I. INTRODUCTION.....	1
II. BACKGROUND.....	3
A. AWS Allocation Order	4
B. AWS Service Rules NPRM	8
III. DISCUSSION	12
A. In General	12
1. Flexible Use.....	12
2. Regulatory Framework.....	16
3. Assignment of Licenses.....	22
B. Band Plan.....	27
1. Geographic Area Licensing.....	30
2. Size of Geographic Areas.....	35
3. Spectrum Blocks and Pairing	41
C. Band Clearance and Reimbursement	47
1. The 1710-1755 MHz Band.....	48
2. The 2110-2150 MHz Band.....	52
3. The 2150-2155 MHz Band.....	55
D. Licensing and Operational Rules	57
1. Regulatory Status	57
2. Ownership Restrictions	61
(a) Foreign Ownership	61
(b) Spectrum Aggregation Limits; Eligibility Restrictions	64
3. License Term; Renewal Expectancy	69
4. Performance Requirements	73
5. Disaggregation and Partitioning of Spectrum	80
6. Other Operating Requirements.....	84
E. Technical Rules.....	87

1. Co-Channel Interference Between AWS Licensees Operating in Adjacent Regions	88
2. Adjacent Channel Interference Between AWS Licensees.....	91
3. Power Limits	95
4. Spectrum Location of Base and Mobile Transmissions	104
5. Protecting Incumbent Systems from Interference	112
(a) The 2110-2155 MHz Band	112
(i) Protection of Part 101 Systems	113
(ii) Protection of Part 21 Systems	115
(iii) Goldstone, California Facility.....	116
(b) The 1710-1755 MHz Band	117
(i) Department of Defense Operations	118
(ii) Non-Department of Defense Operations.....	124
(c) Below 1710 MHz.....	125
(d) Above 1755 MHz	126
(e) Below 2110 MHz.....	127
(f) Above 2155 MHz.....	131
6. RF Safety.....	132
7. Canadian and Mexican Coordination	134
F. Competitive Bidding.....	136
1. Incorporation by Reference of the Part 1 Standardized Auction Rules.....	137
2. Provisions for Designated Entities	144
IV. PROCEDURAL MATTERS.....	150
A. Regulatory Flexibility Analysis	150
B. Paperwork Reduction Analysis.....	151
C. Further Information.....	154
V. ORDERING CLAUSES.....	155
Appendix A: List of Commenters	
Appendix B: Final Regulatory Flexibility Analysis	
Appendix C: Final Rules	
Appendix D: Propagation Formulas	

* * * * *

I. INTRODUCTION

1. In this Report and Order, we adopt service rules for Advanced Wireless Services (AWS) in the 1710-1755 and 2110-2155 MHz bands, including provisions for application, licensing, operating and technical rules, and for competitive bidding.¹ Licensees in these bands will have the flexibility to

¹ AWS is the collective term the Commission uses for new and advanced wireless applications, such as voice, data and broadband services provided over a variety of high-speed fixed and mobile networks, and which are popularly referred to as International Mobile Telecommunications-2000 (IMT-2000) or “third generation” (3G) systems. The “3G” nomenclature is based on the popular view that analog cellular systems represent the first generation of advanced wireless devices, that digital cellular and broadband Personal Communications Service systems represent the second, and that the next deployment of wireless technologies (which we include in the collective term “AWS”) represents the third generation. The characteristics of IMT-2000/3G systems are described more fully in SPECTRUM STUDY OF THE 2500-2690 MHz BAND, FINAL REPORT, at 7-10 (OET/MMB/WTB/IB, Mar. 30, 2001) (*FCC Final Spectrum Study*). A copy of this report has been placed in the docket file of ET Docket No. 00-258, and is available on the Internet at <<http://www.fcc.gov/3G>>.

provide any fixed or mobile service that is consistent with the allocations for this spectrum.² We will license this spectrum under our market-oriented Part 27 rules and, in order to accommodate differing needs, our band plan includes both localized and regional geographic service areas and symmetrically paired spectrum blocks with the pairings being composed of different bandwidths. Our licensing plan will allow the marketplace rather than the Commission to ultimately determine what services are offered in this spectrum and what technologies are utilized to provide these services. The licensing framework that we adopt today for these bands will ensure that this spectrum is efficiently utilized and will foster the development of new and innovative technologies and services, as well as encourage the growth and development of broadband services.

2. Our actions today bring us closer to our goals of achieving the universal availability of broadband access and increasing competition in the provision of such broadband services both in terms of the types of services offered and in the technologies utilized to provide those services. The wide spread deployment of broadband will bring new services to consumers, stimulate economic activity, improve national productivity, and advance many other objectives – such as improving education, and advancing economic opportunity for more Americans. By encouraging the growth and development of broadband, our actions today also foster the development of facilities-based competition. We achieve these objectives by taking a market-oriented approach to licensing this spectrum that provides greater certainty, minimal regulatory intervention, and leads to greater benefits to consumers.

II. BACKGROUND

3. The 1710-1755 and 2110-2155 MHz bands have previously been used for a variety of Government and non-Government services. The National Telecommunications and Information Administration (NTIA) identified the 1710-1755 MHz band for transfer from exclusive use by the Federal Government to the Commission for mixed use, effective in 2004, pursuant to the Omnibus Budget Reconciliation Act of 1993 (OBRA-93).³ The 2110-2150 MHz band was formerly used by private and common carrier fixed microwave services, but in 1992 was identified by the Commission for reallocation to services using new and innovative technologies under its *Emerging Technologies* proceeding.⁴ The 2150-2155 MHz band is currently used by the Multipoint Distribution Service (MDS).

² The service rules that we adopt today for this spectrum build on the policy objectives set forth in the *Spectrum Policy Task Force Report*. Spectrum Policy Task Force, ET Docket No. 02-135, *Report* (rel. Nov. 15, 2002) (*Spectrum Policy Task Force Report*).

³ Spectrum Reallocation Final Report, Response to Title VI – Omnibus Budget Reconciliation Act of 1993, NTIA Special Publication 95-32 (Feb. 1995) (*1995 Reallocation Final Report*); see also Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 107 Stat. 312 (1993) (OBRA-93). Under OBRA-93, “mixed use” means that some of the spectrum transferred from exclusive Government use can be partially retained for use by Federal Government stations. See 47 U.S.C. § 923(b)(2).

⁴ See generally *Redevelopment of Spectrum to Encourage the Establishment of Services Using New and Innovative Technologies*, ET Docket No. 92-9, *First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992); *Second Report and Order*, 8 FCC Rcd 6495 (1993); *Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd 6589 (1993); *Memorandum Opinion and Order*, 9 FCC Rcd 1943 (1994); *Second Memorandum Opinion and Order*, 9 FCC Rcd 7797 (1994), *aff'd*, *Association of Public Safety Communications Officials-International, Inc. v. FCC*, 76 F.3d 395 (D.C. Cir. 1996) (collectively, “*Emerging Technologies proceeding*”).

A. AWS Allocation Order

4. In November of last year, we adopted a *Second Report and Order* in ET Docket No. 00-258 that allocated spectrum for advanced services in the 1710-1755, 2110-2150 and 2150-2155 MHz bands and combined these latter two bands into a single 45-megahertz allocation (*i.e.*, 2110-2155 MHz).⁵ Specifically, in the *AWS Allocation Order*, we allocated the 1710-1755 MHz band for fixed and mobile services on a co-primary basis contingent on the spectrum becoming available for mixed use by January 1, 2004. The 2110-2150 MHz band was already allocated to the fixed and mobile services on a primary basis. In order to create a second contiguous 45-megahertz band for advanced services, we added five megahertz of spectrum to the 2110-2150 MHz band from the upper adjacent band.⁶ We reallocated the 2150-2155 MHz band from MDS, added a mobile allocation to this segment, and combined it with the 2110-2150 MHz band. As a result, we created two contiguous 45-megahertz bands, both allocated to the fixed and mobile services, and made this spectrum available for AWS.

5. By providing two 45-megahertz blocks of contiguous spectrum that could be paired, we allocated a significant amount of spectrum that can be used to support a wide variety of AWS applications, including though not limited to those associated with “3G” and “IMT-2000” technologies. In keeping with our flexible use policies, this allocation could be used by current service providers to expand their capacity for offering wireless voice and data services. Alternatively, it could be used by either current providers or new entrants to support the development of entirely new applications that are distinct from existing wireless offerings.

6. Before these bands can be put to effective use, however, incumbent licensees in these bands must be relocated to other spectrum. The 1710-1755 MHz band is currently used for Federal Government operations. As indicated above, NTIA originally identified the 1710-1755 MHz band for transfer in 1995 and indicated that the band could be made available to non-Federal Government users on a mixed-use basis in 2004.⁷ NTIA noted, however, that Federal Government use of this band would have to be protected indefinitely at 333 fixed microwave stations used by Federal Power Agencies, at 111 stations used for aviation-related safety communications, and at 16 sites used by Department of Defense for fixed microwave, tactical radio relay, and aeronautical mobile stations.⁸

7. In July 2002, NTIA offered a plan that, if fully implemented, could largely clear this band of Federal Government users by no later than December 31, 2008.⁹ The plan indicates that in order for

⁵ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, *Second Report and Order*, 17 FCC Rcd 23193 (2002) (*AWS Allocation Order*), *recons pending*.

⁶ This spectrum was part of a 10-megahertz block (12 megahertz in the top fifty markets) that was allocated to MDS in the 2150-2160/2162 MHz band. MDS stations licensed after 1992 to use the 2160-2162 MHz band are on a secondary basis.

⁷ 1995 *Reallocation Final Report*, *supra* n.3.

⁸ *Id.* at App. E and p. F-4.

⁹ U.S. Department of Commerce, National Telecommunications and Information Administration, “An Assessment of the Viability of Accommodating Advanced Mobile Wireless (3G) Systems in the 1710-1770 MHz and 2110-2170 MHz Bands,” *Report*, at 2-4, rel. July 22, 2002 (*NTIA AWS Assessment*). The Commission sought comment on the *NTIA AWS Assessment*. FCC Seeks Comment On The National Telecommunications and Information Administration’s Report, *An Assessment Of The Viability Of Accommodating Advanced Mobile Wireless (3G) Systems In The 1710-1770 MHz and 2110-2170 MHz Bands*, ET Docket No. 00-258, *Public Notice*, (continued....)

the time line to be achieved certain actions would be required to be accomplished.¹⁰ Any significant delays in the availability of relocation funds or delays in the other assumptions upon which the December 31, 2008 clearance date is based could require the predicted clearance time line to be revised.¹¹ Along with requiring commercial users to reimburse Federal users' relocation costs, part of this plan requires the Commission to conduct a rulemaking that would reallocate other spectrum to accommodate Federal systems that otherwise would remain in the 1710-1755 MHz band indefinitely. We initiated this rulemaking proceeding with the issuance of a *Fourth Notice of Proposed Rulemaking* in ET Docket No. 00-258 this past July.¹²

8. As discussed above, we created the 2110-2155 MHz band by combining two adjacent band segments. The 2110-2150 MHz segment of this band is currently used by incumbent point-to-point fixed microwave licensees. In the *AWS Allocation Order*, we stated that we will use existing relocation rules to provide for the migration of these licensees to other spectrum.¹³ The 2150-2155 MHz segment of the 2110-2155 MHz band is currently used by MDS, and we are considering relocation spectrum and procedures for MDS operations in this band in another proceeding.¹⁴

B. AWS Service Rules NPRM

9. Concurrently with adoption of the *AWS Allocation Order*, we also adopted a *Notice of Proposed Rulemaking* in WT Docket No. 02-353 that sought comment on licensing, technical and operational rules to govern the use of the 1710-1755 and 2110-2155 MHz bands.¹⁵ In the *AWS Service Rules NPRM*, we proposed licensing and service rules that would permit maximum licensee flexibility and sought to remove regulatory barriers to innovation. Consistent with this approach, we proposed that the 1710-1755 and 2110-2155 MHz bands could be used to provide any service, including AWS, that is consistent with the bands' fixed and mobile allocations. We proposed to license these bands under Part 27 of the Commission's rules. Part 27 provides a flexible regulatory framework that we have applied to multiple bands and services, which includes basic licensing requirements and sets out certain technical requirements to prevent interference. We also proposed to assign licenses in these

(Continued from previous page) _____

17 FCC Rcd 14390 (2002). The *NTIA AWS Assessment* was incorporated into Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, *Fourth Notice of Proposed Rulemaking*, ET Docket No. 00-258, 18 FCC Rcd 13235 (2003).

¹⁰ *NTIA AWS Assessment* at 2.

¹¹ *Id.* at 2-4 (detailing the assumptions upon which NTIA predicted clearance by December 31, 2008).

¹² Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Fourth Notice of Proposed Rulemaking*, 18 FCC Rcd 13235 (2003).

¹³ *AWS Allocation Order*, 17 FCC Rcd at 23215 ¶ 46.

¹⁴ See *AWS Allocation Order*, 17 FCC Rcd at 23212-13 ¶ 41; see also Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003); Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Use of the Universal Licensing System in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 03-66, *Notice of Proposed Rule Making and Memorandum Opinion and Order*, 18 FCC Rcd 6722 (2003).

¹⁵ Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Notice of Proposed Rulemaking*, 17 FCC Rcd 24135 (2002) (*AWS Service Rules NPRM*).

bands through competitive bidding and sought comment on a number of auction-related issues, including the use of bidding credits, in connection with these licensing procedures.

10. In addition, we asked what geographic areas should be used to license this spectrum, whether the bands should be divided into particular blocks of spectrum, and, if so, what size the blocks should be and what pairings would be appropriate for this spectrum. Among other proposals, we proposed ten-year license terms, proposed to permit post-auction disaggregation and partitioning, and sought comment on possible construction requirements. We also sought comment on a variety of technical issues, including on how best to control in-band and out-of-band interference, appropriate power limits, RF safety limits, and Canadian and Mexican coordination.

11. Comments on the *AWS Service Rules NPRM* were due by February 7, 2003, and reply comments were due by March 14, 2003. Eighteen comments and eight reply comments were filed in response to the *AWS Service Rules NPRM*. A list of commenters and reply commenters can be found in Appendix A. In addition, as permitted under our rules, there have been *ex parte* presentations.

III. DISCUSSION

A. In General

1. Flexible Use

12. *Background:* In the *AWS Service Rules NPRM*, we proposed to allow licensees in the 1710-1755 and 2110-2155 MHz bands flexibility to provide any fixed or mobile or combination of fixed and mobile services permitted by the United States Table of Frequency Allocations. We concluded that this approach was consistent with Section 303(y)(2) of the Communications Act, as amended by the Balanced Budget Act of 1997, which grants the Commission authority to permit flexible use of spectrum if it finds that such use: (1) is in the public interest; (2) would not deter investment in communications services and systems, or technology development; and (3) would not result in harmful interference among users.¹⁶ We sought comment on our tentative conclusion to permit flexible use of this spectrum.

13. *Discussion:* In order to promote innovative services and encourage the flexible and efficient use of the 1710-1755 and 2110-2155 MHz bands, we permit licensees to use this spectrum for any use permitted by the United States Table of Frequency Allocations contained in Part 2 of our rules (*i.e.*, fixed or mobile services). All of the comments we received on this issue support permitting flexible use of this spectrum.¹⁷ CTIA states “flexibility in spectrum regulation can improve access to spectrum, promote efficiency and allow spectrum to migrate to the most highly-valued uses.”¹⁸ Cingular observes that “[l]icensees need flexibility to deploy new technologies, implement service innovations, expand capacity in response to growing demand, and otherwise respond to market forces.”¹⁹ PetroCom states that flexibility gives “licensees the freedom to determine the services the public desires.”²⁰ Flexibility thus allows spectrum to move to its highest valued use without regulatory

¹⁶ Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997) (BBA-97); 47 U.S.C. § 303(y); *see AWS Service Rules NPRM*, 17 FCC Rcd 24135, 24140-41 ¶ 12.

¹⁷ CTIA Comments at 2-3; Ericsson Comments at 2; Nokia Comments at 1; PetroCom Comments at 6-8; Cingular Reply Comments at 3-4; TDD Coalition Reply Comments at 2-5.

¹⁸ CTIA Comments at 2.

¹⁹ Cingular Reply Comments at 3.

²⁰ PetroCom Comments at 7.

lag, an economically efficient result.²¹ Given the expected use of the 1710-1755 and 2110-2155 MHz bands, permitting flexible use of these bands is clearly in the public interest.

14. In fact, we believe flexibility will spur investment in communication services and systems and technology development. We find that permitting licensees to use this spectrum for any use permitted by the spectrum's allocation will not deter investment in communications services and systems, or technology development. The record in this proceeding supports this determination. Ericsson states that flexibility "is imperative to ensure the successful development and deployment of AWS."²² CTIA observes that flexibility "fosters the development of innovative, state-of-the-art service offerings."²³ Cingular asserts that flexibility permits licensees "to deploy new technologies, implement service innovations, expand capacity in response to growing demand, and otherwise respond to market forces."²⁴ Our experience with licensing the Personal Communications Services (PCS) supports the conclusion that flexibility spurs investment and service innovations. In the PCS bands, flexibility has encouraged industry investment, promoted competition, and fostered technology innovations. We believe, as PetroCom observes, that flexibility "will promote investment in different technologies . . ."²⁵

15. We also find that permitting licensees to employ this spectrum for any fixed or mobile use permitted by the United States Table of Frequency Allocations will not result in harmful interference among spectrum users. The technical rules we adopt below reflect careful consideration of potential interference scenarios, both during the transition period before incumbents relocate and as the spectrum becomes developed.²⁶ Further, potential for interference between different services and technologies is mitigated by our decision to adopt geographic area licensing and a band plan that takes interference considerations into account. Finally, the flexibility we are permitting will itself provide licensees the ability to adjust their operations to minimize any interference that might occur. As the TDD Coalition states, "flexibility in choosing various technologies for spectrum allocation will negate any significant potential interference that occurs when differing technologies are permitted to co-locate within the same spectrum band."²⁷ Our technical rules for the 1710-1755 and 2110-2155 MHz bands will therefore permit licensees to provide a wide variety of services in these bands with a minimum of interference, and will permit both in-band and adjacent band licensees to operate with sufficient certainty and clarity regarding their rights and responsibilities.²⁸ In this case, licensees will be able to

²¹ The *Spectrum Policy Task Force Report* found that "[f]lexibility enables spectrum users to make fundamental choices about how they will use spectrum (including whether to use it or transfer their usage rights to others), taking into account market factors such as consumer demand, availability of technology, and competition." *Spectrum Policy Task Force Report* at 16.

²² Ericsson Comments at 2.

²³ CTIA Comments at 3.

²⁴ Cingular Reply Comments at 3.

²⁵ PetroCom Comments at 7.

²⁶ The *Spectrum Policy Task Force Report* cautioned that clear technical rules (e.g., power limits, interference standards) are necessary in order to facilitate the co-existence of multiple spectrum uses in common and adjacent bands. *Spectrum Policy Task Force Report* at 16; see also Nokia Comments at 1.

²⁷ TDD Coalition Reply Comments at 4-5.

²⁸ See Verizon Wireless Comments at 1-3; Cingular Reply Comments at 1-3.

provide any service that is consistent with the spectrum's allocation and the operating and technical rules.²⁹

2. Regulatory Framework

16. *Background:* In the *AWS Service Rules NPRM*, we proposed to license the 1710-1755 and 2110-2155 MHz bands under Part 27 of the Commission's rules.³⁰ We reasoned that the flexibility that these rules provide is consistent with our proposal that licensees in these bands could use this spectrum for any service consistent with the bands' fixed and mobile allocations. Alternatively, we sought comment on whether the bands should be licensed under Parts 22, 24, some other rule part, or a newly created rule part.

17. *Discussion:* We will license the 1710-1755 and 2110-2155 MHz bands under Part 27 of the Commission's rules, as those rules are modified below to reflect certain characteristics of this spectrum. Our Part 27 rules reflect a market oriented approach to licensing, and the flexibility these rules provide will encourage the deployment of a wide variety of fixed and mobile services in these bands. We agree with the TDD Coalition that "Part 27 is sufficient to govern these bands due to its flexible nature, and the fact that it was created for miscellaneous wireless services, and their interoperability."³¹ We note, however, that as with other Part 27 licensees, licensees in these bands will be required to comply with rules of general applicability contained in other parts of the Commission's rules.³²

18. AT&T Wireless, Cingular, CTIA, Ericsson, Motorola, and Verizon Wireless oppose licensing this spectrum under Part 27. They argue that the bands should be licensed under Part 24 of the Commission's rules, which was used to license broadband and narrowband PCS.³³ These commenters state that this spectrum will be used for services similar to services already being offered in the PCS bands. They assert that applying the same regulatory framework to both the PCS and AWS bands will avoid imposing disparate regulatory and technical requirements on carriers offering the same or similar advanced wireless services in both bands.

19. We disagree with the assertion that these bands should be licensed under the Commission's Part 24 rules. While both Part 27 and Part 24 provide substantial flexibility, our Part 24 rules are service-specific and focus exclusively on PCS, whereas our Part 27 rules provide a broader and more flexible regulatory framework that has been applied to different services in multiple spectrum bands (*i.e.*, the upper and lower 700 MHz bands and the 2.3 GHz band).³⁴ There are also several differences between the two rules parts that provide slightly greater flexibility to Part 27 licensees. For example, the Part 24 rules permit fixed and mobile services, while the Part 27 rules

²⁹ The *Spectrum Policy Task Force Report* recommended that our approach to licensing should be to allow licensees to do anything not explicitly prohibited by the Communications Act, the Commission's rules, Commission orders, licenses or authorizations. *Spectrum Policy Task Force Report* at 18.

³⁰ *AWS Service Rules NPRM*, 17 FCC Rcd at 24141 ¶ 13.

³¹ TDD Coalition Reply Comments at 5.

³² 47 C.F.R. § 27.3; *see infra* ¶¶ 84-86.

³³ AT&T Wireless Comments at 9-11; CTIA Comments at 3-4; Ericsson Comments at 2, 10; Motorola Comments at 3-5; Verizon Wireless Comments at 3; Cingular Reply Comments at 4-5; Motorola Reply Comments at 5.

³⁴ Compare 47 C.F.R. § 24.1 with 47 C.F.R. § 27.1.

permit any service consistent with a band's allocation.³⁵ Part 27 is also more flexible in terms of build out requirements, and indeed many commenters supporting Part 24 regulation actually advocate that we apply more flexible build out requirements like those in Part 27.³⁶

20. Based on these considerations, we regard Part 27 as more suitable than Part 24 for regulation and licensing of new spectrum to which we intend to apply flexible, market-oriented rules. We do not believe that proponents of Part 24 licensing will be disadvantaged by licensing these bands under Part 27 and, in fact, we see benefits to licensing this spectrum under Part 27. The Part 27 rules are designed to promote flexibility and permit market forces rather than the Commission to determine what services are offered in the spectrum licensed under this rule part. Hence, the Part 27 rules permit a licensee to provide any services for which its frequency bands are allocated.³⁷ This light-handed regulatory approach means that licensees in the 1710-1755 and 2110-2155 MHz bands will not be restricted to providing Commission-defined services. Spectrum licensed under Part 27 can be used in a multiple of ways by the same or different licensees, and the spectrum can be put to different uses across the country. As a result, the marketplace rather than the Commission will determine how this spectrum is to be used, and this should not only encourage research and investment but also spur the development and deployment of innovative services to consumers. Licensing this spectrum under Part 27 also means that licensees in these bands will be free to change the services they provide and the technologies that they utilize as market conditions change.³⁸

21. In addition, the technical requirements that we adopt below are consistent with the technical requirements for broadband PCS, and therefore PCS licensees who acquire spectrum in the 1710-1755 and 2110-2155 MHz bands will not be subject to disparate treatment. For example, we adopt the same out-of-band emission limits for AWS transmitters that are currently used for broadband PCS.³⁹ As a result, only a minimum amount of design modification will be needed by PCS equipment manufacturers in producing AWS equipment.

3. Assignment of Licenses

22. *Background:* In the *AWS Service Rules NPRM*, we acknowledged that Section 3002 of the Balanced Budget Act of 1997 requires the Commission to assign certain spectrum, including the majority of the AWS bands, through competitive bidding.⁴⁰ We recognized, however, that one portion of the AWS bands -- 2150-2155 MHz -- is not subject to a band specific directive to assign by competitive bidding.⁴¹ We noted that the 2150-2155 MHz band was only subject to the general section 309(j) requirement that the Commission assign licenses through the use of competitive bidding when mutually exclusive applications for initial licenses are accepted for filing, unless certain specific statutory exemptions apply.⁴² We also tentatively concluded that it serves the public interest to assign

³⁵ Compare 47 C.F.R. § 24.3 with 47 C.F.R. § 27.2(a).

³⁶ See *infra* ¶¶ 73-79; see also Verizon Wireless Comments at 3-4.

³⁷ 47 C.F.R. § 27.2(a).

³⁸ See *infra* ¶¶ 84-86 (discussing other rule parts that may apply to licensees in the 1710-1755 and 2110-2155 MHz bands).

³⁹ See *infra* ¶¶ 92-94.

⁴⁰ *AWS Service Rules NPRM*, 17 FCC Rcd at 24141-42 ¶ 15 (citing Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251, § 3002(b), (c)(1)(D), (c)(3)).

⁴¹ *Id.*

⁴² *Id.*

licenses for all portions of the AWS bands by the same mechanism.⁴³ Consequently, we explained that if we adopt a licensing scheme for all portions of the AWS bands that permits the filing of mutually exclusive applications, consistent with both statutory obligations, we would resolve such applications through competitive bidding.⁴⁴ However, we also sought comment on other approaches to assign licenses that include the 2150-2155 MHz portion of the AWS bands.⁴⁵ In suggesting other approaches, commenters were requested to use the analytical framework established in the *BBA Report and Order* regarding the Commission's exercise of its 309(j) auction authority.⁴⁶

23. *Discussion:* One commenter supports our tentative conclusion to assign all portions of the AWS bands by the same mechanism.⁴⁷ Other commenters also generally concur that, to the extent that we adopt a licensing scheme that permits the filing of mutually exclusive applications, consistent with statutory obligations, we should resolve such applications through competitive bidding.⁴⁸ In addition, most commenters agree with our proposal to adopt a geographic area licensing scheme for the 1710-1755 and 2110-2155 MHz bands.⁴⁹ However, two commenters believe that we should assign licenses through other mechanisms or that the Commission should not utilize competitive bidding.⁵⁰

24. Specifically, one commenter, Mizelle, urges the Commission to adopt an application process coupled with yearly fees based upon gross revenue.⁵¹ Another commenter, Goldstein, requests that the Commission offer licenses to "eligible local exchange carriers" in rural areas and not subject such licenses to competitive bidding.⁵² Both commenters fail to explain how their proposals would comply with the Commission's statutory obligations under Section 3002 of the Balanced Budget Act

⁴³ *Id.*

⁴⁴ 47 U.S.C. § 309(j).

⁴⁵ *AWS Service Rules NPRM*, 17 FCC Rcd at 24141-42 ¶ 15.

⁴⁶ See Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended, WT Docket No. 99-87, *Report and Order and Further Notice of Proposed Rule Making*, 15 FCC Rcd 22709, 22717-35 ¶¶ 18-50 (1999) (*BBA Report and Order*). Section 309(j)(2) exempts from competitive bidding licenses and construction permits for public safety radio services, digital television service licenses and permits given to existing terrestrial broadcast licensees to replace their analog television service licenses, and licenses and construction permits for noncommercial educational broadcast stations and public broadcast stations described in section 397(6) of the Communications Act. 47 U.S.C. § 309(j)(2). Section 647 of the Open-Market Reorganization for the Betterment of International Telecommunications Act prohibits the Commission from employing competitive bidding to assign spectrum or orbital locations used for the provision of international or global satellite communications services. Pub. L. No. 106-180, 114 Stat. 48 § 647. In this instance, because there is no broadcast or satellite allocation, the noncommercial educational broadcast station and Orbit Act exemptions are plainly inapplicable. Similarly, because we have not designated the 1710-1755 and 2110-2155 MHz bands as public safety radio service spectrum, the public safety radio services exemption does not apply.

⁴⁷ See TDD Coalition Reply Comments at 6.

⁴⁸ See, e.g., CTIA Comments at 15 (supporting the Commission's tentative conclusion to license the AWS bands through competitive bidding pursuant to Section 309(j) of the Communications Act); Cingular Reply Comments at 1.

⁴⁹ See *infra* ¶ 30.

⁵⁰ See, e.g., Mizelle Comments at 1-2; Goldstein Comments at 1; see also RCA Comments at 2 (arguing that the use of auctions "inherently favors entities with access to money from the public markets").

⁵¹ Mizelle Comments at 1-2.

⁵² Goldstein Comments at 1.

of 1997 and Section 309(j) of the Communications Act.⁵³ We note that neither Mizelle nor Goldstein specified whether they were addressing all portions of the AWS bands or the 2150-2155 MHz band. In addition, they also fail to address basic questions that would arise when contemplating an alternative mechanism for assigning licenses. For example, Mizelle fails to indicate how the Commission might choose between mutually exclusive applicants under its proposal. Goldstein's proposal is also flawed because there is no indication of the circumstances under which a local exchange carrier would be eligible for a license. Nor does Goldstein indicate what would occur if a local exchange carrier was not interested in a reserved license or if the local exchange carrier decided to subsequently sell the license for a profit. Thus, in addition to statutory infirmities, both proposals raise some of the same policy concerns the Commission encountered in prior licensing regimes, *i.e.*, comparative hearings or lotteries.⁵⁴

25. As explained below, we are adopting a geographic area licensing scheme that permits the filing of mutually exclusive applications.⁵⁵ Accordingly, pursuant to Section 309(j) of the Communications Act and Sections 3002(b), (c)(1)(D), and (c)(3) of the Balanced Budget Act of 1997, we must resolve mutually exclusive applications for licenses in these bands through competitive bidding.⁵⁶ We will address the particular competitive bidding rules in a subsequent section.⁵⁷

26. While initial licenses for this spectrum will be assigned through competitive bidding, it also will be possible for entities to acquire spectrum in these bands through such post-auction mechanisms as disaggregation and partitioning and secondary markets.⁵⁸ In our recently released *Secondary Markets Report and Order*, we took action to remove unnecessary regulatory barriers to the development of secondary markets.⁵⁹ We adopted new policies and procedures that enable most wireless licensees, including Part 27 licensees, to lease some or all of their spectrum usage rights to

⁵³ We note that adoption of the assignment mechanisms suggested by Mizelle and Goldstein would require an amendment to Section 309(j) of the Communications Act.

⁵⁴ The comparative hearing process was complex and often led to proceedings that substantially delayed the award of licenses. *See, e.g., Ranger Cellular and Miller Communications, Inc. v. FCC*, 2003 WL 21495159, 1 (D.C. Cir. July 1, 2003) ("*Ranger*") (citations omitted); *see also* Implementation of Section 309(j) of the Communications Act – Competitive Bidding, *Second Report and Order*, 9 FCC Rcd 2348, 2359 ¶ 64 (1994) (finding that comparative hearings are lengthy, contentious and complex). Lotteries, by contrast, did not compare applicants' qualifications, and sometimes resulted in the disqualification of the winner, necessitating a new lottery and raising the concern about lottery winners being unjustly enriched. *Ranger*, at 1; *see also* Reexamination of the Comparative Standards for Noncommercial Educational Applicants, *Report and Order*, 15 FCC Rcd 7386, 7391 ¶¶ 13, 14 (2000). The disadvantages of these two systems were recognized in a 1993 report by the House Committee on Energy and Commerce, which stated that, "in many respects the FCC's current licensing methods for assigning spectrum have not served the public interest." H.R. Rep. No. 111, 103d Cong., 1st Sess. 248 (1993), reprinted in 1993 U.S.C.C.A.N. 378 at 575, 580.

⁵⁵ *See infra* ¶ 30-34.

⁵⁶ 47 U.S.C. § 309(j); Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251. § 3002(b), (c)(1)(D), (c)(3)).

⁵⁷ *See infra* ¶¶ 136-149.

⁵⁸ *See infra* ¶¶ 80-82 (discussing disaggregation and partitioning).

⁵⁹ Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 00-230, FCC 03-113 (rel. Oct. 6, 2003) (*Secondary Markets Report and Order*).

third-party spectrum lessees.⁶⁰ The spectrum leasing policies established in that proceeding will be applied to the new AWS services established in this proceeding in the same manner that those policies apply to other Part 27 services (with the exception of Guard Band Manager licensing which has its own set of spectrum leasing policies and rules), and all other exclusive use Wireless Radio Services.⁶¹ The flexible policies adopted in that proceeding and with respect to the AWS bands will allow more entities access to the AWS spectrum and permit the marketplace to decide what use is made of this spectrum.

B. Band Plan

27. *Background:* In the *AWS Service Rules NPRM*, we proposed to license the 1710-1755 and 2110-2155 MHz bands using a geographic area licensing scheme (instead of station-defined site-by-site licensing) and sought comment on this proposal. In addition, we sought comment on the related issue of what size geographic licensing area or areas should be used to license this spectrum. We asked whether nationwide, regional, local, or some combination of these approaches should be used to license this spectrum. We also sought comment on the amount of spectrum that should be included in each license, and the associated issue of whether the spectrum should be paired.

28. *Discussion:* We adopt a geographic area licensing approach to license spectrum in the 1710-1755 and 2110-2155 MHz bands. This approach will use both regional and localized service areas. We will employ symmetrically paired spectrum blocks with the pairings being comprised of different bandwidths. In total, we will make available 946 licenses for spectrum in the 1710-1755 and 2110-2155 MHz bands. The table below summarizes our band plan for these two bands.

<u>Blocks</u>	<u>Pairings</u>	<u>Amount</u>	<u>Area</u>	<u>Licenses</u>
A	1710-1720 and 2110-2120	2x10	EA	176
B	1720-1730 and 2120-2130	2x10	REAG	12 ⁶²
C	1730-1735 and 2130-2135	2x5	REAG	12
D	1735-1740 and 2135-2140	2x5	RSA/MSA	734
E	1740-1755 and 2140-2155	2x15	REAG	12

29. We believe this band plan best implements the auction objectives and other guidance set forth in section 309(j), and also best comports with the record evidence regarding likely uses of this spectrum. Of course, bidders will be able to aggregate (*i.e.*, acquire multiple) licenses during the auction. In addition, after the licenses are awarded, licensees may engage in a variety of secondary market transactions (*i.e.*, aggregation, disaggregation, partitioning, or spectrum leasing). Therefore, if we have specified license dimensions that do not directly meet the needs of certain auction applicants, the secondary market will provide them with the opportunity to acquire the geographic and bandwidth footprints required to implement their business plans. As we note in the Competitive Bidding section of this Report and Order, the Wireless Telecommunications Bureau (“WTB”), consistent with statutory obligations,⁶³ will seek comment on auction-related procedural issues,

⁶⁰ *Id.* at ¶ 84.

⁶¹ *Id.*

⁶² Of the 12 REAGs, the first six cover the continental United States and the other six cover smaller areas (*i.e.*, Alaska, Hawaii, the islands, and the Gulf of Mexico). 47 C.F.R. § 27.6(a)(1).

⁶³ See 47 U.S.C. § 309(j)(3)(E)(i)(obligation to permit notice and comment on proposed auction procedures before issuance of bidding rules).

including auction design, prior to the start of the AWS auction pursuant to WTB's existing delegated authority.⁶⁴ This will provide WTB with an opportunity to weigh the benefits and disadvantages of any particular bidding design, prior to the start of the auction.

1. Geographic Area Licensing

30. We will license the 1710-1755 and 2110-2155 MHz bands using geographic area licensing. The record supports this decision with only one commenter voicing concern with this approach. None of the commenters advocate site-by-site licensing. CTIA states that it "strongly supports the Commission's proposal to adopt a geographic area -- rather than a site-by-site -- licensing scheme for the AWS bands."⁶⁵ Cingular observes that "[g]eographic area licensing is especially beneficial where spectrum is likely to be used for services, such as CMRS, that require ubiquity and mobility over wide areas."⁶⁶ AT&T Wireless asserts that "the AWS spectrum should be licensed on a geographic area basis."⁶⁷ Ericsson states that it supports geographic area licensing.⁶⁸ Other commenters implicitly agree that geographic area licensing should be used to license these bands because their comments address what size geographic areas should be used to license this spectrum.⁶⁹

31. Our experience has been that geographic area licensing offers many advantages over site-by-site licensing for the types of services expected in these bands. It affords licensees substantial flexibility to respond to market demand, which results in significant improvements in spectrum utilization. In particular, geographic area licensing permits economies of scale because it allows licensees to coordinate usage across an entire geographic area to maximize the use of spectrum. It also reduces regulatory burdens and transaction costs, because licensees do not require site-by-site approval and can aggregate their service territories without incurring the administrative costs and delays associated with site-by-site licensing. This is especially advantageous where spectrum is likely to be used for services that require ubiquity and mobility over wide areas. As a result, licensees can more rapidly roll out their services, which was our experience with PCS.

32. In addition, as noted above, section 3002 of the Balanced Budget Act of 1997 requires the Commission to assign licenses for the majority of the 1710-1755 and 2110-2155 MHz spectrum through competitive bidding.⁷⁰ A geographic licensing scheme is likely to result in the acceptance of mutually exclusive license applications, which under section 309(j) must be assigned through

⁶⁴ See 47 C.F.R. §§ 0.131(c) (functions of WTB); 0.331 (authority delegated to WTB); 0.332 (actions taken under WTB's delegated authority); 1.2103 (competitive bidding design options, including simultaneous multi-round and combinatorial bidding auctions, among others); 1.2104 (competitive bidding mechanisms). See also Amendment of Part 1 of the Commission's rules—Competitive Bidding Procedures, *Order, Memorandum Opinion and Order, and Notice of Proposed Rule Making*, 12 FCC Rcd 5686, 5697-98 ¶ 16 (1997). See, e.g., Auction of Regional Narrowband PCS Licenses Scheduled for September 24, 2003, Comment Sought on Package Bidding Procedures, Reserve Prices or Minimum Opening Bids, and Other Auction Procedures, 18 FCC Rcd 6366 (2003).

⁶⁵ CTIA Comments at 5.

⁶⁶ Cingular Reply Comments at 9.

⁶⁷ AT&T Wireless Comments at 1.

⁶⁸ Ericsson Comments at 3.

⁶⁹ See Motorola Comments at 6; RCA Comments at 2-4; U.S. Cellular Comments at 3-8; Verizon Wireless Comments at 8-10; Cingular Reply Comments at 9; TDD Coalition Reply Comments at 7.

⁷⁰ See *supra* ¶ 24.

competitive bidding. Accordingly, a geographic area licensing scheme serves the Commission's statutory obligation to assign licenses for the majority of these bands through competitive bidding. For this additional reason, therefore, we will use a geographic area licensing scheme for this spectrum.

33. The National Radio Astronomy Observatory (NRAO) opposes the use of geographic area licensing for the 1710-1755 and 2110-2155 MHz bands to the extent that such licensing would permit AWS fixed stations to operate within the National Radio Quiet Zone without prior coordination.⁷¹ NRAO requests that the 1718.8-1722.2 MHz band remain available for radio astronomy use outside the National Radio Quiet Zone and that this spectrum not be made available for use by AWS.

34. The Commission has long recognized the National Radio Quiet Zone in its rules. Specifically, applicants and licensees planning to construct and operate a new or modified station at a permanent fixed location within a 13,000 square mile rectangular area must coordinate with the NRAO site located at Green Bank, West Virginia and the Naval Radio Research Observatory (NRRO) located at Sugar Grove, West Virginia.⁷² We find that the requirement to protect NRAO and NRRO is in no way compromised by our adoption of geographic area licensing for AWS because Section 1.924 applies to applicants and licensees regardless of whether they are licensed on a site-by-site or geographical area basis. With regard to the other radio astronomy observatories listed in footnote US311 of section 2.106, we note that RAS facilities located outside the National Radio Quiet Zone observe in the band 1718.8-1722.2 MHz on an unprotected basis.⁷³ We continue to believe that this status is appropriate for these facilities.⁷⁴ Therefore, we will not adopt formal coordination procedures to protect these RAS observatories. Where practicable, we do, however, recommend that AWS licensees make reasonable efforts to avoid the use of frequencies at stations in the fixed and mobile services that could interfere with the RAS observatories listed in footnote US311.

2. Size of Geographic Areas

35. In order to meet competing needs and to provide maximum flexibility, we will license the 1710-1755 and 2110-2155 MHz bands using a range of geographic licensing areas. These include large regional licensing areas, smaller regional licensing areas, and local licensing areas. The approach we adopt will foster service to rural areas⁷⁵ and tribal lands, and will promote investment in and rapid deployment of new technologies and services.⁷⁶ By including these varied-sized geographic licensing areas in our band plan for this spectrum, we promote the policy goal of disseminating licenses among a wide variety of applicants.⁷⁷ The record in this proceeding supports this approach. While some of the commenters request that this spectrum be licensed using nationwide or large regional geographic licensing areas,⁷⁸ others request smaller localized licensing areas,⁷⁹ and still others

⁷¹ See NRAO Comments at 9.

⁷² See 47 C.F.R. § 1.924(a).

⁷³ See 47 C.F.R. § 2.106, footnote US311. Greenbank is listed in footnote US311 as means of reminding applicants and licensees of its existence. However, this listing does not alter the requirement for AWS licensees to comply with 47 C.F.R. § 1.924(a).

⁷⁴ See, e.g., *AWS Allocation Order*, 17 FCC Rcd at 23205 ¶ 25.

⁷⁵ See 47 U.S.C. § 309(j)(3)(A).

⁷⁶ See 47 U.S.C. § 309(j)(4)(C)(iii).

⁷⁷ See 47 U.S.C. § 309(j)(3)(B), (4)(C).

⁷⁸ Verizon Wireless Comments at 8-10.

request a combination of large and small geographic licensing areas.⁸⁰ We believe that there is enough spectrum available in these two bands to accommodate the competing need for both large and small geographic licensing areas and that by including these varied-sized areas in our band plan for this spectrum we are providing carriers with the flexibility to tailor their licensing areas to meet their individual business needs and goals.

36. Offering the three geographic license sizes we have chosen will implement the objectives of section 309(j) given the record before us. Offering only a single, large geographic license size would not meet the needs of many prospective bidders and could lead to post-auction disaggregation and partitioning costs. On the other hand, offering only small geographic licenses intended to be used as building blocks would in effect impose unneeded, excess aggregation costs (either during an auction or in post-auction secondary transactions). However, specifying three different geographic sizes will best directly meet the various expressed needs of prospective entrants. It will also best meet the needs of incumbents who have varying spectrum positions today and likely varying needs for added spectrum. However, we have also chosen our license definitions so that if they do not directly meet the needs of bidders, then combining them is facilitated.

37. Economic Areas (EAs) and Regional Economic Area Groupings (REAGs) are related to each other.⁸¹ EAs can be aggregated to form REAGs. As a result of being related to each other, EAs and REAGs can be combined to form specific service territories or existing service providers can acquire a licensing area in order to supplement their existing spectrum capacity. MSAs and RSAs, however, cannot be combined to form EAs because several MSAs/RSAs cross EA borders. These licensing areas can either be acquired through the competitive bidding process, or through post-auction, secondary market mechanisms (*e.g.*, partitioning and disaggregation, leasing, etc.). Either way, the licensing areas we have chosen will allow licensees to make adjustments to suit their individual needs.

38. By utilizing REAGs, we meet the needs of those carriers interested in creating regional or nationwide service territories.⁸² For instance, a carrier interested in providing this type of service could combine the REAGs to create a nationwide service territory. Alternatively, a REAG could be combined with geographically related EA or MSA to create a regional service area with aggregated spectrum. In addition, an existing service provider could choose to increase its spectrum capacity by acquiring a REAG or acquire EAs in particular areas where it has a need for additional capacity. These types of large licensing areas permit carriers to take advantage of economies of scale and they allow service providers greater flexibility in the build-out of their services, since they are less constrained by geographical license limits. These types of licensing areas also require less coordination because there are fewer adjacent licensees.

39. While some carriers may desire regional or nationwide service territories, others are interested in localized service areas. Our band plan meets this need by including licensing areas based on MSAs and RSAs.⁸³ These local service areas will be optimal for incumbent operators who may

(Continued from previous page) _____

⁷⁹ ATT Wireless Comments at 4; RCA Comments at 2-4; TDD Coalition Reply Comments at 7.

⁸⁰ CTIA Comments at 5-7; U.S. Cellular Comments at 3-8; Cingular Reply Comments at 8-9.

⁸¹ See 47 C.F.R. § 27.6.

⁸² See, *e.g.*, CTIA Comments at 6; U.S. Cellular Comments at 5-8; Verizon Wireless Comments at 8.

⁸³ MSAs and RSAs are collectively referred to as Cellular Market Areas (CMAs). MSAs and RSAs were originally used to license cellular service. 47 C.F.R. § 22.909. They have more recently been refined and used for (continued....)

need spectrum capacity only in limited areas. These local service areas also favor smaller entities, such as rural telephone companies and small service providers, with localized business plans and no interest in providing large-area service. As RCA observes, MSAs and RSAs permit entities who are only interested in serving rural areas to acquire spectrum licenses for these areas alone and avoid acquiring spectrum licenses with high population densities that make purchase of license rights too expensive for these types of entities.⁸⁴ These types of service providers could acquire a RSA and create a new service area or they could expand an existing service territory or supplement the spectrum they are licensed to operate in by adding a RSA. They could also combine a few MSAs and RSAs to create a larger but localized service territory. MSAs and RSAs allow entities to mix and match rural and urban areas according to their business plans. By being smaller, these types of geographic service areas provide entry opportunities for smaller carriers, new entrants, and rural telephone companies. Their inclusion in our band plan will foster service to rural areas and tribal lands and thereby bring the benefits of advanced services to these areas.⁸⁵

40. API and PetroCom assert that the Gulf of Mexico should be licensed as a separate service area or areas.⁸⁶ PetroCom states that “[t]he Commission should separately license one or more service areas to cover the Gulf rather than including the Gulf as part of larger land based service areas.”⁸⁷ PetroCom is concerned that if the Gulf is included in a land based service area the licensee of that service area could meet its coverage requirements without providing service to the Gulf.⁸⁸ We have addressed the issue of licensing the Gulf of Mexico in other proceedings and we will follow established policy on this issue. Consistent with API’s and PetroCom’s request and with established policy, for Blocks A, B, C, D, and E we will separately license the Gulf of Mexico as EA licensing area 176,⁸⁹ REAG licensing area 12,⁹⁰ and MSA licensing area 306.⁹¹ As we did in licensing other Part 27 services, the Gulf of Mexico service area is comprised of the water area of the Gulf of Mexico starting 12 nautical miles from the U.S. Gulf coast and extending outward.⁹²

3. Spectrum Blocks and Pairing

41. We will license the 1710-1755 and 2110-2155 MHz bands using symmetrically paired spectrum blocks of five, ten, and fifteen megahertz. Most of the commenters support licensing this

(Continued from previous page)

licensing the lower 700 MHz band. 47 C.F.R. § 27.6(c)(2). For purposes of the 1710-1755 and 2110-2155 MHz bands, we will use the same MSAs and RSAs used for licensing the lower 700 MHz band.

⁸⁴ RCA Comments at 2-3; *see also* U.S. Cellular Comments at 5-7.

⁸⁵ While we did not receive any comments from Tribal governments, we remain interested in ensuring that the communication needs of these communities are met. *See AWS Service Rules NPRM*, 17 FCC Rcd at 24146-47 ¶ 25; *see also* Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes, *Policy Statement*, 16 FCC Rcd 4078 (2000).

⁸⁶ API Comments at 8; PetroCom Comments at 3-5.

⁸⁷ PetroCom Comments at 3.

⁸⁸ *Id.* at 4.

⁸⁹ *See* 47 C.F.R. § 27.6(a)(1).

⁹⁰ *See id.*

⁹¹ *See* 47 C.F.R. § 27.6(c)(2)(ii).

⁹² 47 C.F.R. § 27.6(a)(2) and (c)(2)(ii).

spectrum using spectrum blocks of five, ten, or fifteen megahertz.⁹³ No one advocates licensing this spectrum using spectrum blocks smaller than five megahertz and none argue for spectrum blocks larger than 15 megahertz. Most of the commenters advocate licensing this spectrum using symmetrically paired 10 and 15 megahertz blocks.⁹⁴ Two commenters advocate licensing this spectrum using unpaired spectrum.⁹⁵

42. As with our approach to geographic areas, our approach here is to offer multiple bandwidth amounts in order to enable the various efficient uses of the spectrum suggested by the record without, in so far as possible, requiring substantial aggregation during an auction or substantial secondary market transactions. Also as with our approach to geographic dimension, however, we have chosen bandwidth dimension and arrangement to facilitate aggregation during the auction, should individual bidders in fact find that valuable. This flexibility will allow carriers to tailor their acquisition of spectrum in these bands to meet their individual business plans and it will allow market forces rather than the Commission to ultimately determine how this spectrum is licensed.

43. Along with allowing licensees to tailor their acquisition of licenses to meet their individual business plans, our spectrum block arrangement provides licensees with maximum flexibility to resolve adjacent band interference issues and issues related to the relocation of existing licensees in the 1710-1755 and 2110-2155 MHz bands.⁹⁶ By placing the larger 10 and 15 megahertz blocks at either end of the two bands, licensees in these segments will have sufficient bandwidth and maximum flexibility to resolve adjacent band interference concerns. In addition, by placing the smaller blocks toward the middle of these two bands, we have made aggregation easier. Our band plan allows licensees to acquire spectrum in a manner that takes into account existing incumbents in these bands and accommodates their eventual relocation out of these bands.

44. The record in this proceeding indicates that a bandwidth of at least five megahertz is required to accommodate all of the 3G radio interfaces.⁹⁷ Five megahertz blocks can be used for new technologies and can be used for some data services, including Internet access. Paired five megahertz blocks enable a single wideband CDMA channel, which is sufficient to provide some forms of Internet access. Five megahertz blocks also provide entry opportunities for small and rural service providers. The larger ten and fifteen megahertz blocks should enable a broader range of broadband services, including Internet access at faster speeds. These larger blocks should also accommodate future, higher data rates, and provide operators with additional capacity, and, importantly, with greater flexibility. The larger blocks should also be of interest to those service providers contemplating a large regional or nationwide service. We believe that the availability of blocks of different sizes will allow operators to better accommodate their needs, particularly the capacity they need to serve and the mix of services (*e.g.*, data/voice) they may wish to offer.

⁹³ AT&T Wireless Comments at 7; CTIA Comments at 4-5; Ericsson Comments at 4; Lucent Comments at 2; Motorola Comments at 6; Nokia Comments at 2; RCA Comments at 4; U.S. Cellular Comments at 3; Verizon Wireless Comments at 10; Cingular Reply Comments at 8.

⁹⁴ *Cf.* Goldstein Comments at 1-3 (advocating blocks of 6.5 megahertz, 5.625 megahertz, and five megahertz).

⁹⁵ ArrayComm Reply Comments at 2-4; TDD Coalition Reply Comments at 8, 15.

⁹⁶ *See* Verizon Wireless Comments at 5-7.

⁹⁷ Lucent Comments at 2. Worldwide spectrum for advanced wireless services have not been licensed using anything less than five megahertz blocks.

45. In the *AWS Service Rules NPRM*, we noted that most carriers in the U.S. have indicated plans to provide service that meets the IMT-2000 data rates by deploying systems based on CDMA2000 and W-CDMA technologies.⁹⁸ The record in this proceeding supports this observation.⁹⁹ CDMA2000 and W-CDMA technologies employ a frequency division duplex (FDD) transmission mode that requires a paired-channel architecture and operates in symmetric paired blocks of spectrum. FDD is the most commonly used transmission procedure for PCS, cellular, and other mobile telephony applications and the record indicates it is the technology most likely to be employed in this spectrum. As a result, we will license all of the spectrum in the 1710-1755 and 2110-2155 MHz bands using symmetrically paired spectrum blocks.

46. Our band plan does not include unpaired spectrum that might be suitable for use by entities interested in using time division duplexing (TDD) transmissions. The TDD Coalition asserts that unpaired five megahertz blocks could be used by small carriers to offer wireless local area network (WLAN)-type products.¹⁰⁰ While we remain committed to allowing new and innovative technologies to develop in this spectrum, there are certain technical constraints that do not allow us at this time to include unpaired spectrum in our band plan for this spectrum that might be suitable for TDD.¹⁰¹ We note that if proponents of TDD can conclusively demonstrate that portions of this spectrum could be used for such transmissions without causing interference to Federal government users or other licensees, we could revisit this issue at a future date. In the meantime, we will make every effort to provide spectrum opportunities for TDD systems in future allocation and spectrum proceedings, such as in the *AWS Allocation* proceeding.¹⁰² Our commitment to finding additional spectrum for TDD is supported by our decisions to allocate unpaired spectrum in the 1670-1675 MHz band and the lower 700 MHz band.¹⁰³

C. Band Clearance and Reimbursement

47. As we explained in the *AWS Service Rules NPRM*, the 1710-1755 MHz band, the 2110-2150 MHz band, and the 2150-2155 MHz band each have incumbents who will be covered by different clearance and reimbursement plans. As detailed below, the reimbursement plan for the 2110-

⁹⁸ *AWS Service Rules NPRM*, 17 FCC Rcd at 24148 ¶ 30.

⁹⁹ AT&T Wireless Comments at 7-8; CTIA Comments at 4-5; Ericsson Comments at 4-5; Goldstein Comments at 2-3; Lucent Comments at 1-3; Motorola Comments at 5; Nokia Comments at 1-2; Cingular Reply Comments at 8.

¹⁰⁰ TDD Coalition Reply Comments at 22; *see also* ArrayComm Comments at 2.

¹⁰¹ *See infra* ¶¶ 104-111.

¹⁰² *See* Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003). We note that among other alternatives, one possible way this might be accomplished is by creating spectrum blocks that are unpaired but appropriately spaced so that they are also suitable for paired use, and then auctioning using a package bidding design. This could effectively allow bidders desiring unpaired spectrum to bid for licenses on that basis, while others could bid on a package that pairs the spectrum. The result could be an effective market test that determines whether FDD or TDD is the highest valued use.

¹⁰³ *See* 47 C.F.R. §§ 27.5(c)(2), 27.5(f).

2150 MHz band was addressed in the *AWS Allocation Order*.¹⁰⁴ Further, we note that the clearance and reimbursement plans for the other portions of the AWS bands will not be resolved in this order. Accordingly, potential applicants and other interested parties are strongly encouraged to monitor the separate proceedings and legislative proposals discussed below. Finally, as explained below, while we conclude that the public interest supports adopting final service rules before all relocation issues have been resolved, we are not deciding the timing for licensing or auctions in this order.¹⁰⁵

1. The 1710-1755 MHz Band

48. *Background:* The transfer of the 1710-1755 MHz band from Federal Government use to non-Government commercial use is subject to the provisions of the National Telecommunications and Information Administration Organization Act,¹⁰⁶ as amended by the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (NDAA-99).¹⁰⁷ NDAA-99 requires new non-Government licensees to reimburse Federal users for their relocation costs.¹⁰⁸ NDAA-99 requires Federal users to notify NTIA prior to auction of the “marginal costs anticipated to be associated with such relocation or with modifications necessary to accommodate prospective licensees.”¹⁰⁹ NTIA is directed, in turn, to provide such cost information to the Commission so that it can make such information available to potential auction applicants.¹¹⁰ A Federal user retains its primary status until relocation is complete and NTIA limits or terminates the Federal user’s operating license.¹¹¹ NDAA-

¹⁰⁴ *AWS Allocation Order*, 17 FCC Rcd at 23213-15 ¶¶ 42-46 (also noting that certain fixed microwave incumbents in the 2130-2150 MHz band segment consist of links that are paired with frequencies in the 2180-2200 MHz band allocated to MSS).

¹⁰⁵ The Wireless Telecommunications Bureau, consistent with statutory obligations will determine the timing for licensing and auctions pursuant to its delegated authority. See 47 U.S.C. § 309(j)(3)(E)(i)(ii); 47 C.F.R. §§ 0.131(c) (functions of WTB); 0.331 (authority delegated to WTB); 0.332 (actions taken under WTB’s delegated authority); 1.2103 (competitive bidding design options, including simultaneous multi-round and combinatorial bidding auctions, among others); 1.2104 (competitive bidding mechanisms); see also Amendment of Part 1 of the Commission’s rules—Competitive Bidding Procedures, *Order, Memorandum Opinion and Order, and Notice of Proposed Rule Making*, 12 FCC Rcd 5686, 5697-98 ¶ 16 (1997).

¹⁰⁶ Pub. L. 102-538, 106 Stat. 3533 (1992).

¹⁰⁷ Pub. L. 105-261, 112 Stat. 1920 (1999), as codified at 47 U.S.C. § 923(g) (section 923(g)(1)(F) specifically notes that the 1710-1755 MHz band is subject to NDAA-99); see 47 C.F.R. § 301.10(a)(iii) (notes that the 1710-1755 MHz band is subject to the reimbursement rules promulgated by NTIA pursuant to NDAA-99).

¹⁰⁸ 47 U.S.C. § 923(g)(1)(A) (“[a]ny person on whose behalf a Federal entity incurs costs . . . shall compensate the Federal entity in advance for such costs. Such compensation may take the form of a cash payment or in-kind compensation.”). We note that NTIA previously provided a summary of the Federal incumbents in the 1710-1755 MHz band. *NTIA AWS Assessment* at 1-2.

¹⁰⁹ 47 U.S.C. § 923(g)(1)(A). Previously, NTIA issued a report estimating the costs of relocation for Federal operations in the 1710 -1755 MHz band to alternate frequency bands. NTIA’s Special Publication 01- 46, *The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts - Final Report*, at 5-1 – 5-13 (Mar. 2001) (*NTIA AWS Report*). NTIA has stated that the final cost estimates for the 1710-1755 MHz band may differ from prior estimates based upon the receipt of additional data. *NTIA AWS Assessment* at 8.

¹¹⁰ 47 U.S.C. § 923(g)(1)(A); 47 C.F.R. § 301.110 (NTIA shall provide the Federal entity’s estimated marginal cost information to the Commission at least 180 days prior to the date on which the auction is scheduled to commence).

¹¹¹ 47 U.S.C. § 923(g)(2); *Mandatory Reimbursement Rules for Frequency Band or Geographic Relocation of Federal Spectrum-Dependent Systems*, Department of Commerce, National Telecommunications and (continued....)

99 also grants the Federal user a limited right to reclaim spectrum.¹¹² We note, however, that the Department of Commerce has proposed legislation to change the reimbursement process by creating a relocation fund using auction proceeds (“relocation trust fund”).¹¹³

49. Pursuant to NDAA-99’s direction, NTIA adopted rules governing the reimbursement process.¹¹⁴ The *NTIA Reimbursement Order*, however, did not adopt rules that would allow for the sharing of relocation costs where more than one licensee benefits from the relocation of the federal incumbents.¹¹⁵

50. *Discussion:* As noted above, although this Order will not directly address the existing reimbursement scheme and other band clearance issues, we received a comment directly related to these issues. Specifically, RCA requests that the Commission develop dispute resolution procedures when parties cannot agree on relocation cost or timing issues.¹¹⁶ In support of its request, RCA asserts that incumbents must not be permitted to impede use of the 1710-1755 MHz band by unreasonable reimbursement demands or delay.¹¹⁷ We note, however, that with respect to Federal incumbents, the

(Continued from previous page)

Information Administration, 67 Fed. Reg. 41182, 41184 ¶ 18 (June 17, 2002) (*NTIA Reimbursement Order*); *AWS Service Rules NPRM*, 17 FCC Rcd at 24149 ¶ 33. We also note that not all Federal incumbents in the 1710-1755 MHz band are required to relocate. Exempt entities, however, may voluntarily relocate and negotiate relocation costs in the same manner as non-exempt entities. *Id.* at 41186 ¶¶ 34-35; *see also AWS Allocation NPRM*, 16 FCC Rcd 596, 613 ¶ 40, 650-653 App. E and F (providing information regarding exempt entities).

¹¹² 47 U.S.C. § 923(g)(3) (“If within one year after the relocation the Federal entity demonstrates to the Commission that the new facilities or spectrum are not comparable to the facilities or spectrum from which the Federal Government station was relocated,” the new licensee “shall take reasonable steps to remedy any defects or pay the Federal entity for the expenses incurred in returning the Federal Government station to the spectrum from which such station was relocated”); *see also AWS Service Rules NPRM*, 17 FCC Rcd at 24149 ¶ 33.

¹¹³ U.S. Department of Commerce, National Telecommunications and Information Administration, “Commerce Department Asks Congress to Create Spectrum Relocation Fund for Federal Agencies Whose Spectrum Is Reallocated to Commercial Use,” NTIA Press Release, July 23, 2002 (available at <http://www.ntia.doc.gov/ntiahome/press/2002/relocationfund7242002.htm>). The proposed legislation is available on the NTIA Web site at <http://www.ntia.doc.gov/ntiahome/congress/2002/legistransmittal7232002.htm>; *see also* <http://www.ntia.doc.gov/ntiahome/congress/2003/spectrum0319.htm>. Commenters generally support the proposed legislation to change the reimbursement process through the use of a relocation trust fund. *See, e.g.,* CTIA Comments at 16; Ericsson Comments at 3; Motorola Comments at 9; and Motorola Reply Comments at 13-14. In addition, some commenters suggest that the relocation trust fund proposal should be expanded to pay for the relocation of incumbents in the other AWS bands at issue here. RCA Comments at 8. Other commenters urge the Commission to oppose proposals to use auction proceeds for alternative purposes. AT&T Wireless Reply Comments at 5, referencing, among others, CTIA Comments at iii, 15-16; Ericsson Comments at 3; Motorola Comments at 9-10; RCA Comments at 7-8.

¹¹⁴ 47 U.S.C. § 923(g)(1)(A); *NTIA Reimbursement Order*, 67 Fed. Reg. at 41186 ¶¶ 34-35.

¹¹⁵ *NTIA Reimbursement Order*, 67 Fed. Reg. at 41188 ¶ 46 (NTIA stated that through a further Notice of Proposed Rulemaking, it would develop a cost-sharing plan and seek proposals for a clearinghouse or some other mechanism for administering a cost-sharing plan).

¹¹⁶ RCA Comments at 8.

¹¹⁷ *Id.*

reimbursement procedures, including dispute resolution, are governed by rules adopted by NTIA in the *NTIA Reimbursement Order*.¹¹⁸

51. Some commenters also request that the release of a final order in this proceeding should not occur until there is finality as to the relocation and reimbursement plan for Federal incumbents.¹¹⁹ Alternatively, if the Commission does not delay release of this order pending conclusion of the related proceedings, other commenters request that the Commission note that, until comparable spectrum is allocated for Federal incumbents, the 1710-1755 MHz band will be significantly encumbered by Federal operations.¹²⁰ While we are sympathetic to the concerns expressed by the commenters regarding the uncertainties relating to the reimbursement scheme that will finally be implemented, delay in adopting the band plan and service rules will not serve to expedite resolution of those issues. Further, delay in the adoption of service and competitive bidding rules could serve to delay the eventual deployment of AWS spectrum. Moreover, by taking this substantial step toward the goal of full deployment of AWS spectrum, we increase the likelihood that potential applicants and others with an interest in the AWS bands will work to ensure that the reimbursement and relocation process is expedited.¹²¹ Thus, our action here should facilitate resolution of the relocation and reimbursement process.¹²² With respect to the request to note significant incumbency in the 1710-1755 MHz band, as noted above, Federal incumbents retain their primary status until relocation is complete and NTIA limits or terminates the Federal incumbent's operating license.¹²³

2. The 2110-2150 MHz Band

52. *Background:* The *AWS Allocation Order* specified that those incumbents in the 2110-2150 MHz band who have primary status would be entitled to compensation for relocation under policies based on the *Emerging Technologies* proceeding.¹²⁴ Specifically, we noted that these

¹¹⁸ *NTIA Reimbursement Order*, 67 Fed. Reg. 41182 at ¶ 66 (adopting a requirement for non-binding arbitration where parties have not reached agreement after the negotiation/mediation period), 47 C.F.R. §§ 301.120, 301.130.

¹¹⁹ NTIA Comments at 3 (arguing that release of a final order in this proceeding should occur simultaneously with the release of a final order regarding allocation actions for comparable relocation spectrum for Federal incumbents); Verizon Wireless Comments at 7 ("it would be premature to adopt spectrum-clearing rules until the Commission has given Congress sufficient time to enact a Spectrum Relocation Fund").

¹²⁰ NTIA Comments at 3, n.4; *see also* TDD Reply Comments at 16 (supporting NTIA's position).

¹²¹ *See* Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, Carriage of the Transmissions of Digital Television Broadcast Stations, Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 20845, 20865, ¶50, ¶53 (acknowledging the benefits of voluntary agreements to assist in band clearing).

¹²² We note, however, that once the final reimbursement and band clearance schemes for all portions of the AWS bands are finalized, if we believe it appropriate to modify the rules adopted here, we will do so in a separate order.

¹²³ *See supra* ¶ 48 and n.111; *AWS Allocation Order*, 17 FCC Rcd at 23197-98 ¶ 8.

¹²⁴ *AWS Allocation Order*, 17 FCC Rcd at 23213 ¶ 42; *AWS Allocation NPRM*, 16 FCC Rcd at 618 ¶ 54 n.102; *see also* Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, ET Docket No. 92-9, *First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992). In the *Emerging Technologies* proceeding, we allowed new entrants to provide incumbents with comparable facilities using any acceptable technology. *Emerging Technologies Third R&O*, 8 FCC Rcd 6589, 6591, 6603 ¶¶ 5, 36 (1993). Under this policy, incumbents must be provided with replacement facilities that allow (continued....)

incumbents are entitled to compensation for relocation of any links that may pose an interference threat to new fixed or mobile system licensees, including all engineering, equipment, site, and Commission fees.¹²⁵ We note that certain fixed microwave incumbents in the 2130-2150 MHz band segment consist of links that are paired with frequencies in the 2180-2200 MHz band allocated and licensed to MSS. The relocation and reimbursement obligations of these paired segments was discussed and resolved in the *AWS Allocation Order*.¹²⁶

53. *Discussion:* As noted above, although this Order will not directly address the reimbursement and band clearance issues regarding 2110-2150 MHz band, we received some comments directly addressing such issues.¹²⁷ In addition, one commenter, RCA, requests that certain information be provided to auction applicants regarding 2110-2155 MHz band incumbents prior to auction. Specifically, RCA requests that information regarding all incumbent licensees in the 2110-2155 MHz band and maximum reimbursement liability of the new licensees should be disclosed to potential auction applicants not less than 90 days prior to the deadline for submission of the FCC Form 175 (“short-form application”) for any AWS auction.¹²⁸ In support of its request, RCA states that interested parties need sufficient time to develop business plans, and knowledge of relocation costs and related timing issues are important components of those plans.¹²⁹ RCA also requests the Commission to determine the maximum reimbursement payable to non-Federal incumbents.¹³⁰ API opposes both requests.¹³¹ With respect to the disclosure of information regarding the incumbents, API argues that there is already a wealth of pertinent information regarding fixed service incumbent licensees in the 2.1 GHz band and potential auction applicants may access such information via the Commission’s Universal Licensing System (“ULS”) and other licensing databases.¹³² Thus, API argues that RCA’s request would unnecessarily and unfairly shift auction participants’ burden of due diligence to

(Continued from previous page) _____

them to maintain the same service in terms of throughput, reliability and operating costs. *See, e.g.*, 47 C.F.R. § 101.91.

¹²⁵ *AWS Allocation Order*, 17 FCC Rcd at 23213-15 ¶¶ 42-46; *AWS Allocation NPRM*, 16 FCC Rcd at 618 ¶¶ 54-55.

¹²⁶ *AWS Allocation Order*, 17 FCC Rcd at 23213-15 ¶¶ 42-46.

¹²⁷ For example, API requests that the Commission resolve petitions for reconsideration and/or clarification of the Commission’s *Second Report and Order* in ET Docket No. 95-18 and restates its concerns in the comments filed in this proceeding. API Comments at 4 -6 (referencing the Joint Petition for Clarification and Reconsideration, filed by the Fixed Wireless Communications Coalition, the Critical Infrastructure Communications Coalition, API, the Association of American Railroads, the Association of Public Safety Communications Officials International, Inc. and the United Telecom Council, in ET Docket No. 95-18 on September 6, 2000); *see also* PCIA Comments at 1 (proposing the establishment of a band-clearing cost-sharing clearinghouse for the 2110-2150 MHz band to facilitate the relocation of point-to-point microwave incumbents and also proposing the amendment of section 101.99 to allow a cost sharing among all licensees that benefit from the same path clearance). PCIA’s comments on a cost-sharing clearinghouse mirror points subsequently made in a February 24, 2003 Petition for Partial Reconsideration of the *AWS Allocation Order*. PCIA Petition for Partial Reconsideration in ET Docket No. 00-258, filed February 24, 2003.

¹²⁸ RCA Comments at 7-8 (requesting information regarding all incumbent licensees in the 2110-2155 MHz band and maximum reimbursement liability of the new licensees).

¹²⁹ RCA Comments at 8.

¹³⁰ *Id.* at 7.

¹³¹ API Reply Comments at 4-5.

¹³² *Id.* at 2-4.

incumbent licensees. API also argues that a pre-auction determination of the maximum reimbursement would unfairly cap incumbents' costs.¹³³

54. We deny RCA's request to have incumbents provide auction applicants with additional information. Our action here is consistent with our actions in prior proceedings.¹³⁴ For example, we denied the request of a Mobile Satellite Service ("MSS") provider that urged the Commission to collect extensive technical, operational, and equipment inventory data from fixed service incumbents in the 2 GHz band so that MSS operators could better assess the cost of relocating such incumbents.¹³⁵ In support of its decision, the Commission stated, "enough information is currently available, both in our databases and from commercial sources, to permit sufficient estimates [of relocation costs] for business planning."¹³⁶ While we recognize that the due diligence burden on auction applicants in encumbered services is not inconsequential, we concur with API in that it would be inequitable to shift the burden of due diligence onto the incumbents. Further, as we stated in the MSS proceeding, we believe that there is sufficient information currently available to permit sufficient estimates of relocation costs by potential auction applicants.¹³⁷ Similarly, we believe that a Commission determination of maximum reimbursement liability prior to auction would be contrary to the policy favoring negotiation adopted in the *Emerging Technologies* proceeding.¹³⁸ Further, such pre-auction determination may inject unnecessary administrative delay to any auction because incumbents or interested parties might dispute the Commission's determination of maximum reimbursement liability.¹³⁹

3. The 2150-2155 MHz Band

55. *Background:* In the *AWS Allocation Order*, we reallocated 5 megahertz at 2150-2155 to the AWS service from MDS but deferred to a later proceeding issues relating to MDS licensees, including the disposition of the remaining MDS spectrum and identification of replacement spectrum and relocation procedures.¹⁴⁰ Subsequently, we adopted a *Third Notice of Proposed Rulemaking* in ET

¹³³ *Id.* at 4-5.

¹³⁴ Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, ET Docket No. 95-18, *Second Report and Order and Second Memorandum Opinion and Order*, 15 FCC Rcd 12315, at ¶¶ 114-121 (2000) ("*MSS Second Report and Order*").

¹³⁵ *MSS Second Report and Order* at ¶ 119.

¹³⁶ *Id.* at ¶ 120.

¹³⁷ Relevant information regarding incumbents can be found in the Commission's databases, including our Universal Licensing System. In contrast, certain information regarding unclassified Federal incumbents will only be available after NTIA provides such information to the Commission prior to auction. 47 C.F.R. § 301.110 (b) (detailing the type of information to be provided). We note, however, that for sensitive or classified assignments such information will not be available prior to the auction. For those assignments, the auction winner or new licensee can only have access to classified information after obtaining the required security clearances, consistent with the National Industrial Security Program Operating Manual. 47 C.F.R. § 301.110 (c) and (d).

¹³⁸ *AWS Allocation Order* at ¶¶ 44-46. See also 47 C.F.R. § 101.99 (c) (capping the reimbursement obligation for a subsequent new entrant where the initial new entrant relocates a paired link of a microwave incumbent).

¹³⁹ 47 U.S.C. § 309(j)(3)(A) (providing that the Commission shall seek to promote the development and rapid deployment of new technologies, products, and services for the benefit of the public without administrative or judicial delays).

¹⁴⁰ *AWS Allocation Order*, 17 FCC Rcd at 23214 ¶ 41; *AWS Service Rules NPRM*, 17 FCC Rcd at 24150 ¶ 35.

Docket No. 00-258¹⁴¹ that, among other things, proposed that if relocation were deemed necessary,¹⁴² MDS incumbents would be entitled to comparable facilities or adequate replacement spectrum.¹⁴³ In the *Third Notice of Proposed Rulemaking*, we also asked for a suggested timeframe for clearing the band, the types and magnitude of costs that would be involved,¹⁴⁴ and the amount and location of spectrum needed to relocate MDS operations at 2150-2160/2162 MHz. In particular, we sought to minimize disruption to existing services and to minimize the economic impact on MDS licensees providing those services.

56. *Discussion:* As noted above, although this Order will not directly address the reimbursement and band clearance issues regarding 2150-2155 MHz band, we received one comment related to these issues. Specifically, WCAI requests that the Commission resolve the pending proceedings relating to MDS channels 1 & 2/2A (occupying the 2150-2160/2162 MHz band)¹⁴⁵ at one time.¹⁴⁶ Consistent with our decision above, we determine that the public interest is best served by proceeding with the adoption of service and competitive bidding rules for all portions of the AWS band.

D. Licensing and Operational Rules

1. Regulatory Status

57. *Background:* In the *AWS Service Rules NPRM*, we observed that Part 27 licensees may render any kind of communications service consistent with the regulatory status indicated in its license

¹⁴¹ Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003) (*Third Notice of Proposed Rulemaking*).

¹⁴² Under our relocation policies only stations with primary status are entitled to relocation. *Third Notice of Proposed Rulemaking*, 18 FCC Rcd at 2256-57 ¶ 72. Because secondary operations, by definition, cannot cause harmful interference to primary operations, new entrants are not required to relocate secondary operations. *Id.*; 47 C.F.R. § 2.105(c)(2). Before the adoption of the *AWS Allocation Order*, the 2150-2160 MHz band was allocated domestically to the Fixed Service on a primary basis. *Third Notice of Proposed Rulemaking*, 18 FCC Rcd at 2253-54 ¶ 66. As previously stated, MDS stations licensed after 1992 to use the 2160-2162 MHz band are on a secondary basis. We also note that our relocation policies do not dictate that systems be relocated to spectrum-based facilities or even to the same amount of spectrum as they currently use, only that comparable facilities be provided. *See, e.g.*, Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, ET Docket No. 95-18, *Second Report and Order and Second Memorandum Opinion and Order*, 15 FCC Rcd 12315 (2000).

¹⁴³ *Second R&O*, 16 FCC Rcd at 16061 ¶ 40; *Third Notice of Proposed Rulemaking*, 18 FCC Rcd at 2256 ¶ 71. This would be similar to the approach followed in the *Emerging Technologies* proceeding.

¹⁴⁴ *Third Notice of Proposed Rulemaking*, 18 FCC Rcd at 2256 at ¶¶ 71-72.

¹⁴⁵ MDS licensees may operate in the 2160-2162 MHz band only in the country's top 50 markets. *See supra* n.6.

¹⁴⁶ WCAI defines the related proceedings as including those that address reallocating additional spectrum for AWS, relocating incumbent licensees displaced by AWS to comparable spectrum, reallocating spectrum in the 1990-2000/2020-2052/2165-2180 MHz band from MSS for AWS or displaced incumbents, allowing MSS licensees to utilize their remaining spectrum for an ancillary terrestrial component (ATC), and imposing service rules on AWS and ATC operations. WCAI Comments at 1-2.

and with the Commission's rules applicable to that service.¹⁴⁷ In this case, we indicated that licensees in the 1710-1755 and 2110-2155 MHz bands would be free to provide common carrier, non-common carrier, or private internal communications or any combination of these services in a single license. Under this approach, along with being authorized to provide private internal communications, applicants would be permitted to select common carrier status as well as non-common carrier status for authorization in a single license, rather than having to choose between common and non-common carrier status. We proposed that applicants and licensees in the 1710-1755 and 2110-2155 MHz bands be required to indicate a regulatory status based on any services they choose to provide, and that if a licensee were to change the service or services it offers such that its regulatory status would change, the licensee must notify the Commission.

58. *Discussion:* We adopt our regulatory status proposal and require licensees in the 1710-1755 and 2110-2155 MHz bands to comply with the regulatory status provisions of section 27.10 of the Commission's rules.¹⁴⁸ Under this flexible regulatory approach, licensees in the 1710-1755 and 2110-2155 MHz bands may provide common carrier, non-common carrier, or private internal communications or any combination of these services under a single license at any time anywhere within their licensed service areas.¹⁴⁹ Similarly, licensees may use this spectrum to provide public safety services, although this spectrum has not been designated as exclusive public safety radio service spectrum. This broad licensing framework will encourage licensees to develop new and innovative services with minimal regulatory restraint. However, since the 1710-1755 and 2110-2155 MHz bands have not been allocated for broadcast services, licensees may not use these bands for broadcast services.

59. To fulfill our enforcement obligations and to ensure compliance with Titles II and III of the Communications Act, we will require all licensees to identify the regulatory status of the service(s) they intend to provide. Consistent with section 27.10 of the Commission's Rules, licensees in the 1710-1755 and 2110-2155 MHz bands will not be required to describe their particular services, but only to designate the regulatory status of the service(s). We remind potential applicants that an election to provide service on a common carrier basis requires that the elements of common carriage be present;¹⁵⁰ otherwise the applicant must choose non-common carrier status.¹⁵¹ If potential applicants are unsure of the nature of their services and their classification as common carrier services,

¹⁴⁷ *AWS Service Rules NPRM*, 17 FCC Rcd at 24150-51 ¶ 36.

¹⁴⁸ 47 C.F.R. § 27.10.

¹⁴⁹ See FCC Form 601.

¹⁵⁰ See 47 U.S.C. § 153(44) ("A telecommunications carrier shall be treated as a common carrier under this Act . . ."); see also 47 U.S.C. § 332(C)(1)(A) ("A person engaged in the provision of a service that is a commercial mobile service shall, insofar as such person is so engaged, be treated as a common carrier for purposes of this Act . . .").

¹⁵¹ See Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service (WCS), GN Docket No. 96-228, *Report and Order*, 12 FCC Rcd 10785, 10848 ¶¶ 121-22 (1997) (*Part 27 Report and Order*). The Commission examined services in the *LMDS Second Report and Order* and explained that any video programming service would be treated as a non-common carrier service. Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, CC Docket No. 92-297, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking*, 12 FCC Rcd 12545, 12639-41 ¶¶ 213-15 (1997) (*LMDS Second Report and Order*); *aff'd*, *Melcher v. FCC*, 134 F.3d 1143 (D.C. Cir. 1998).

they may submit a petition with their applications, or at any time, requesting clarification and including service descriptions for that purpose.¹⁵²

60. We also determine that if a licensee elects to change the service or services it offers such that its regulatory status would change, the licensee must notify the Commission.¹⁵³ A change in a licensee's regulatory status will not require prior Commission authorization, provided the licensee is in compliance with the foreign ownership requirements of section 310(b) of the Communications Act that apply as a result of the change.¹⁵⁴ We require notification within 30 days of a change made without prior Commission approval. We note, however, that a different time period may apply, as determined by the Commission, where the change results in the discontinuance, reduction, or impairment of the existing service.¹⁵⁵

2. Ownership Restrictions

(a) Foreign Ownership

61. *Background:* In the *AWS Service Rules NPRM*, we observed that sections 310(a) and 310(b) of the Communications Act, as modified by the Telecommunications Act of 1996, impose foreign ownership and citizenship requirements that restrict the issuance of licenses to certain applicants.¹⁵⁶ We noted that section 27.12 of our rules implements these restrictions. In terms of filing applications, we proposed that common carriers and non-common carriers be subject to the same reporting obligations. We sought comment on this proposal.

62. *Discussion:* Based on our statutory responsibilities, we determine that the provisions of section 27.12 of the Commission's rules apply to applicants applying for licenses in the 1710-1755 and 2110-2155 MHz bands.¹⁵⁷ Section 27.12 implements section 310 of the Communications Act, as modified by the Telecommunications Act of 1996.¹⁵⁸ All applicants are subject to section 310(a), which prohibits licenses from being "granted to or held by any foreign government or the representative thereof."¹⁵⁹ In addition, as applicable here, an applicant requesting authorization for a common carrier, aeronautical en route or aeronautical fixed service station license would also be subject to the foreign ownership requirements of section 310(b).

63. We did not receive any comments opposing our proposal that common carriers and non-common carriers be subject to the same reporting obligations. In filing applications, therefore, common carriers and non-common carriers will not be subject to varied reporting obligations. By establishing parity in reporting obligations, however, we do not establish a single, substantive standard for compliance. For example, we do not and would not deny a license to an applicant requesting authorization exclusively to provide services not enumerated in section 310(b), solely because its foreign ownership would disqualify it from receiving a license if the applicant had applied for a license

¹⁵² *Part 27 Report and Order*, 12 FCC Rcd at 10848 ¶ 121.

¹⁵³ See 47 C.F.R. § 27.10(d). See also 47 C.F.R. § 27.66(a)-(b).

¹⁵⁴ 47 U.S.C. § 310(b); see *infra* ¶¶ 61-63.

¹⁵⁵ See 47 C.F.R. § 27.66(a)-(b).

¹⁵⁶ *AWS Service Rules NPRM*, 17 FCC Rcd at 24151-52 ¶ 39.

¹⁵⁷ 47 C.F.R. § 27.12.

¹⁵⁸ 47 U.S.C. § 310(a),(b).

¹⁵⁹ 47 U.S.C. § 310(a).

to provide the services enumerated in section 310(b). Because we are adopting a flexible approach to licensing these bands, we determine that all licensees will be subject to the same requirements to file changes in foreign ownership information to the extent required by our Part 27 rules.

(b) Spectrum Aggregation Limits; Eligibility Restrictions

64. *Background:* In the *AWS Service Rules NPRM*, we noted that the Commission had previously decided in 2001 to “sunset” the Commercial Mobile Radio Service (CMRS) spectrum aggregation limit, or “spectrum cap,”¹⁶⁰ effective January 1, 2003.¹⁶¹ At the time it decided to sunset the cap, the Commission also stated that it would continue to pursue the objectives of “discourag[ing] anticompetitive behavior while at the same time maintaining incentives for innovation and efficiency,”¹⁶² but would do so by performing case-by-case reviews of proposed CMRS spectrum transactions rather than by applying a prophylactic rule.¹⁶³ The Commission also found that “to the extent that the initial distribution of spectrum through auction is an issue in the future, that is also amenable to case-by-case review, in the sense that [the Commission] can shape the initial distribution through the service rules adopted with respect to specific auctions.”¹⁶⁴

65. Since the CMRS spectrum cap was designated to sunset prior to the auctioning of spectrum in the 1710-1755 and 2110-2155 MHz bands, we observed in the *AWS Service Rules NPRM* that these bands would not be subject to any generalized limits on spectrum aggregation, and tentatively concluded that we would not need to adopt any band-specific service rules addressing spectrum aggregation limits applicable to the initial licensing of these bands.¹⁶⁵ However, we did seek comment on whether any such limits are necessary or appropriate.¹⁶⁶ In particular, we sought comment on whether we should limit the amount of spectrum in these bands that any one entity (or related entities) may acquire at auction in the same geographic licensing area.¹⁶⁷

66. We further noted that in the initial licensing of some major new services, the Commission has limited eligibility beyond the requirements of section 310, in order to maximize competition by ensuring that at least some licenses go to new entrants.¹⁶⁸ However, we noted that given the current

¹⁶⁰ See 47 C.F.R. § 20.6.

¹⁶¹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24152 ¶ 40 (citing 2000 Biennial Regulatory Review: Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, *Report and Order*, 16 FCC Rcd 22668 (2001) (*recon. pending*) (*Spectrum Cap Order*)).

¹⁶² *Id.* at 24152 ¶ 40 (citing *Spectrum Cap Order*, 16 FCC Rcd at 22679 ¶ 26 n.71 (citing Implementation of Sections 3(n) and 332 of the Communications Act—Regulatory Treatment of Mobile Services, GN Docket No. 93-252, *Third Report and Order*, 9 FCC Rcd 7988, 8105 ¶ 251 (1993))).

¹⁶³ *Id.* at 24152 ¶ 40 (citing *Spectrum Cap Order*, 16 FCC Rcd at 22693-94 ¶ 50).

¹⁶⁴ *Id.* at 24152 ¶ 40 (citing *Spectrum Cap Order*, 16 FCC Rcd at 22696 ¶ 54).

¹⁶⁵ *Id.* at 24152 ¶ 41.

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

¹⁶⁸ *Id.* at 24152-53 ¶ 42. For example, the Commission limited eligibility for the PCS A and B blocks to entities that were not licensees of cellular systems in the same area. See Amendment of the Commission’s Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, *Second Report and Order*, 8 FCC Rcd 7700, 7744-45 ¶ 105 (1993). In granting the Commission authority in section 309(j) of the Communications Act to auction wireless spectrum and to impose eligibility requirements as appropriate, Congress also directed the (continued....)

state of competition in the CMRS industry, we did not believe that such restrictions were necessary for the 1710-1755 and 2110-2155 MHz bands and sought comment on this view.¹⁶⁹ We also inquired as to whether there should be any set-asides for new entrants or other types of applicants or whether there should be any restrictions barring entities (such as incumbent cellular or PCS providers) from acquiring licenses in these bands, other than the foreign ownership requirements set forth in section 310 of the Communications Act.¹⁷⁰

67. *Discussion:* We agree with those commenters who oppose a spectrum aggregation limit for the 1710-1755 and 2110-2155 MHz bands,¹⁷¹ and we will impose no specific aggregation limitations on this spectrum. We do not agree with U.S. Cellular and RCA, who argued in favor of restricting the initial aggregation of spectrum by any winning bidder to 20 or 30 megahertz in the same geographic licensing area.¹⁷² We believe that entities should have the unrestricted flexibility to aggregate spectrum in these bands. Parties should be afforded the flexibility at auction and in the secondary market to aggregate sufficient unencumbered spectrum for them to make available new and innovative service to the public. As we recently recognized in the *Eighth Annual CMRS Competition Report*, the CMRS industry continues to experience “increased service availability, lower prices for consumers, innovations, and a wider variety of service offerings,”¹⁷³ and thus we concluded that there is effective competition in the CMRS market.¹⁷⁴ We also concluded that competition for mobile data products is developing successfully, as evidenced by the “multitude of mobile data services, service providers, pricing plans and devices available to consumers.”¹⁷⁵ Given the robust state of competition in the CMRS market, we do not feel it is necessary to impose an initial aggregation limit on these spectrum bands. We prefer to provide potential licensees with maximum flexibility in these allocations.

68. We also will not set aside spectrum for designated entities or other categories of bidders. Our objectives of ensuring both efficient use of spectrum and diversity of licensees can best be achieved by adopting a variety of license areas and spectrum block sizes, and ensuring the ability of licensees to partition and disaggregate their licenses and fully participate in the secondary spectrum markets. The adoption of spectrum leasing policies with respect to this spectrum should facilitate the ability of wireless licensees to lease spectrum usage rights to third parties.¹⁷⁶ In addition, by adopting some smaller geographic licensing areas and some smaller spectrum block sizes, we believe we will

(Continued from previous page) _____

Commission to exercise that authority so as to “promot[e] . . . economic opportunity and competition.” See 47 U.S.C. § 309(j)(3).

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ See AT&T Wireless Comments at 12; CTIA Comments at ii, 7-8; Ericsson Comments at 5; AT&T Wireless Reply Comments at 3-4; Cingular Reply Comments at 8.

¹⁷² See US Cellular Comments at 3, 10-12; RCA Comments at 5.

¹⁷³ Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, WT Docket No. 02-379, *Eighth Report*, at ¶ 17, FCC 03-150, rel. July 14, 2003 (*Eighth Annual CMRS Competition Report*).

¹⁷⁴ *Id.* at ¶ 12.

¹⁷⁵ *Id.* at ¶ 219.

¹⁷⁶ See *supra* ¶ 26 for a discussion of the application of spectrum leasing policies adopted in the *Secondary Markets Report and Order*.

encourage participation by smaller and rural entities, without the necessity of adopting set-asides or eligibility restrictions, because such licenses will be less expensive and should more closely mirror such bidders needs. We do not see a need to supplement the incentives for small business participation provided elsewhere in this order by foreclosing any of the licenses to other bidders. As we stated in the *AWS Service Rules NPRM*, “opening these bands to as wide a range of applicants as possible would encourage entrepreneurial efforts to develop new technologies and services, while helping to ensure efficient use of this spectrum.”¹⁷⁷ We also believe that the bidding credits that we are adopting below will encourage participation by small businesses and entities intending to serve rural areas (including tribal lands), and that these bidding credits further mitigate the need for adopting set-asides or eligibility restrictions.¹⁷⁸

3. License Term; Renewal Expectancy

69. *Background:* In the *AWS Service Rules NPRM*, we proposed a 10-year license term for licensees in the 1710-1755 and 2110-2155 MHz bands, with a renewal expectancy similar to that afforded PCS, cellular, and Part 27 licensees.¹⁷⁹ We stated that a 10-year license term, combined with a renewal expectancy, would help to provide a stable regulatory environment that would be attractive to investors, and thereby encourage development of these frequency bands. We sought comment, however, on whether a license term of longer than 10 years would be appropriate to achieve these goals and better serve the public interest.

70. *Discussion:* Based on the record in this proceeding, we will establish an initial license term for licensees in the 1710-1755 and 2110-2155 MHz bands of 15 years and subsequent renewal terms of 10 years, and will modify section 27.13 of our rules to reflect this determination.¹⁸⁰ AT&T Wireless, Cingular, CTIA, Ericsson, RCA, and Verizon Wireless argue that given the relocation and band clearance issues associated with these bands, it makes sense to adjust our usual ten-year license term.¹⁸¹ We agree with these commenters that the circumstances surrounding the future development and deployment of services in these bands warrant an initial license term longer than 10 years in order to encourage the investment necessary to develop these bands. We believe that an initial 15-year license term followed by 10-year renewal terms will provide investors with the necessary assurances that a sufficient amount of time will be available to recoup the initial costs of developing and deploying advanced wireless networks in the these bands.¹⁸²

71. We also agree with the commenters that licensees in the 1710-1755 and 2110-2155 MHz bands should have the right to the same renewal expectancy as other Part 27 licensees and, therefore, will apply the renewal expectancy provisions of section 27.14 of our rules applicable to these licensees.¹⁸³ This section provides that a renewal applicant receives a preference or renewal

¹⁷⁷ *AWS Service Rules NPRM*, 17 FCC Rcd at 24153 ¶ 42.

¹⁷⁸ See *infra* ¶¶ 144-149.

¹⁷⁹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24153-54 ¶ 43.

¹⁸⁰ 47 C.F.R. § 27.13.

¹⁸¹ CTIA Comments at 8-9; Ericsson Comments at 5; RCA Comments at 8; Verizon Wireless Comments at 4-5; AT&T Wireless Reply Comments at 6-7; Cingular Reply Comments at 6. See also *supra* ¶¶ 47-56.

¹⁸² Since the relocation process is expected to be completed over the next few years, the 15-year license term will only apply to initial licenses issued before December 31, 2009. After this date the reason for having an initial license term longer than the usual 10-year license term will no longer be valid.

¹⁸³ CTIA Comments at 8-9; Ericsson Comments at 5; RCA Comments at 8; Cingular Reply Comments at 6.

expectancy if the applicant has provided substantial service during its past license term and has complied with the Communications Act and applicable Commission rules and policies.¹⁸⁴ According to this section, substantial service is defined as “service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal.”¹⁸⁵ An initial 15-year license term, with subsequent 10-year license renewal periods, combined with the renewal expectancy provisions of section 27.14, will help to provide a stable regulatory environment that will be attractive to investors, and thereby encourage development of these frequency bands.

72. In the event that a license in the 1710-1755 and 2110-2155 MHz bands is partitioned or disaggregated, any partitionee or disaggregatee will be authorized to hold its license for the remainder of the partitioner's or disaggregator's license term, and will be eligible for a renewal expectancy on the same basis as other licensees. This approach is similar to the partitioning provisions the Commission adopted for MDS,¹⁸⁶ for the Upper 700 MHz licensees,¹⁸⁷ and for broadband PCS licensees.¹⁸⁸ Specifically, we do not believe that a licensee, by partitioning or disaggregation, should be able to confer greater rights than it was awarded under the terms of its license grant.

4. Performance Requirements

73. *Background:* In the *AWS Service Rules NPRM*, we sought comment on whether licensees in the 1710-1755 and 2110-2155 MHz bands should be subject to any performance requirements in addition to a substantial service requirement at license renewal.¹⁸⁹ We noted that in some services the Commission has imposed minimum coverage requirements on licensees to ensure that spectrum is used effectively and service is implemented promptly, and in other services the Commission has identified specific coverage criteria as meeting a substantial service requirement, but has allowed licensees to make alternative showings of substantial service if they do not meet these criteria.¹⁹⁰ We therefore sought comment on whether specific coverage requirements should be established for these bands, or whether coverage criteria should be adopted as one means, but not the exclusive means, of meeting a substantial service requirement.¹⁹¹ We also sought comment on whether licensees should be subject to interim performance requirements prior to the end of the license term.¹⁹²

¹⁸⁴ 47 C.F.R. § 27.14.

¹⁸⁵ 47 C.F.R. § 27.14(a).

¹⁸⁶ See Amendment of Parts 21 and 74 of the Commission's Rules With Regard to Filing Procedures in the Multipoint Distribution Service and in the Instructional Television Fixed Service, MM Docket No. 94-131, *Report and Order*, 10 FCC Rcd 9589, 9614 ¶ 46 (1995).

¹⁸⁷ Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, *First Report and Order*, 15 FCC Rcd 476, 506-08 ¶ 73-78 (2000) (*Upper 700 MHz First Report and Order*).

¹⁸⁸ See Geographic Partitioning and Spectrum Disaggregation by Commercial Mobile Radio Services Licensees and Implementation of Section 257 of the Communications Act—Elimination of Market Barriers, WT Docket No. 96-1148, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 21831, 21870 ¶¶ 76-77 (1996).

¹⁸⁹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24154 ¶ 47.

¹⁹⁰ *Id.* at 24154 ¶ 47.

¹⁹¹ *Id.*

¹⁹² *Id.*

74. With respect to partitioned or disaggregated licenses, we sought comment on whether a partitionee or disaggregatee should be bound by the standard the Commission adopts in this proceeding. We further asked for comment on whether an adjustment to either a substantial service requirement or a minimum coverage requirement must be made in order to account for the Federal government's continued use of the 1710-1755 MHz band until 2004, or its operation of certain in-band facilities after that date.¹⁹³ We sought the views of commenters as to what action the Commission should take if a licensee does not comply with the adopted performance requirements. We proposed to apply Section 1.946(c),¹⁹⁴ which provides for the automatic termination of an authorization if a licensee fails to commence service or operations by the expiration of its license term. Lastly, in discussing the consequences that would flow from a licensee's failure to comply with its coverage requirements, we sought comment on whether the licensee should be prohibited from bidding on the geographic area license for the same territory in the future.¹⁹⁵

75. *Discussion:* We will apply the substantial service requirement in section 27.14(a) of the Commission's rules to the 1710-1755 and 2110-2155 MHz bands.¹⁹⁶ According to that provision, by the end of its license term a licensee must provide "substantial service," that is, service that is sound, favorable and substantially above the level of mediocre service that just might minimally warrant renewal. Compared to a construction standard, Section 27.14(a)'s substantial service requirement will provide licensees greater flexibility to determine how best to implement their business plans based on criteria demonstrating actual service to end users. This requirement provides the flexibility required to accommodate the new and innovative services that we believe will be forthcoming in these bands.

76. Furthermore, this substantial service standard is particularly appropriate here because the incumbency of federal and other current licensees in these bands would make specific benchmarks for all new licensees inequitable. In contrast, the standard we adopt today provides us with the flexibility to consider the particular circumstances of each licensee and how the level of incumbency has had an impact on a particular licensee's ability to build-out and commence service in its licensed area.¹⁹⁷

77. With respect to interim performance requirements, we agree with RCA, who was the sole commenter on this issue, and determine that a mid-license term requirement is not needed.¹⁹⁸ RCA points out that in many instances, licensees may meet an interim population coverage requirement by installing a small number of cell sites in a urban market, with few cell sites in rural markets. RCA argues that the public is not well served under such scenarios.¹⁹⁹ Therefore, in keeping with our desire to provide flexibility to licensees to implement their business plans, we will not adopt interim performance requirements.

¹⁹³ *Id.* at 24155 ¶ 48.

¹⁹⁴ *Id.* at 24155 ¶ 49.

¹⁹⁵ *Id.*

¹⁹⁶ 47 C.F.R. § 27.14(a).

¹⁹⁷ See Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, WT Docket No. 02-381, *Notice of Proposed Rulemaking*, FCC 03-222, ¶ 38, rel. Oct. 6, 2003 (*Rural Services NPRM*) (if new wireless services are licensed using geographical areas, the Commission will examine the appropriateness of adopting a substantial service or alternative construction requirement for the new service at that time).

¹⁹⁸ See RCA Comments at 5-6.

¹⁹⁹ See *id.* at 5.

78. Only one commenter responded to the Commission's request for comments on applying section 1.946(c) to those licensees who fail to meet their performance requirement. We agree with Petrocom and find that such a failure to meet the performance requirements should result in the automatic termination of the license.²⁰⁰ This will serve the public interest by providing a clear and expeditious procedure for dealing with such licenses. In the event that a licensee loses its license for failure to comply with the Commission's performance requirements, in addition to forfeiting the license, the licensee will be ineligible to regain it. The adoption of such a rule is in the public interest and is consistent with the rules we have adopted for other services.²⁰¹

79. Finally, having received no comments on this issue, we adopt our proposal that in the event a license is partitioned or disaggregated, the partitionee or disaggregatee should also be bound by the substantial service requirement we adopt today. We will apply Section 27.15 of the Commission's rules, under which parties to partitioning or disaggregation agreements are provided with options as to how they may satisfy the requirements set forth in Section 27.14.²⁰²

5. Disaggregation and Partitioning of Spectrum

80. *Background:* In the *AWS Service Rules NPRM*, we noted that geographic partitioning and spectrum disaggregation is a tool utilized by the Commission that is intended to promote efficient spectrum use and economic opportunity for a wide variety of applicants, including small business, rural telephone, minority-owned, and women-owned applicants.²⁰³ We sought comment on whether licensees in the 1710-1755 and 2110-2155 MHz bands should be able to partition their service areas and disaggregate their spectrum and, if so, whether the partitioning and disaggregation provisions of section 27.15 of the Commission's rules should apply to these licensees.

81. *Discussion:* We determine that licensees in the 1710-1755 and 2110-2155 MHz bands should have the same ability to partition their service territories and disaggregate their spectrum as other wireless licensees and, therefore, we will allow them to partition their service territories and disaggregate their spectrum to the extent permitted by section 27.15 of our rules.²⁰⁴ Section 27.15(a)(2) provides that licensees may apply to partition their licensed geographic service areas or disaggregate their licensed spectrum at any time following the grant of their licenses.²⁰⁵ In addition, this section provides, among other obligations, that the partitioning licensee must include with its request a description of the partitioned service area and a calculation of the population of the partitioned service area and the licensed geographic service area.²⁰⁶ This section also contains provisions against unjust enrichment.²⁰⁷

²⁰⁰ See Petrocom Comments at 9.

²⁰¹ See 47 C.F.R. §§ 24.103(h), 24.203(b), and 27.14(a).

²⁰² 47 C.F.R. § 27.15.

²⁰³ *AWS Service Rules NPRM*, 17 FCC Rcd at 24155 ¶ 50. "Partitioning" is the assignment of geographic portions of a license along geopolitical or other boundaries. "Disaggregation" is the assignment of discrete portions of "blocks" of spectrum licensed to a geographic licensee or qualifying entity. Disaggregation allows for multiple transmitters in the same geographic area operated by different companies on adjacent frequencies.

²⁰⁴ CTIA Comments at 11-12; Cingular Reply Comments at 9-10; TDD Coalition Reply Comments at 19.

²⁰⁵ 47 C.F.R. § 27.15(a)(2); see also *Part 27 Report and Order*, 12 FCC Rcd at 10836-39 ¶¶ 96-103.

²⁰⁶ 47 C.F.R. § 27.15(b)(1).

²⁰⁷ 47 C.F.R. § 27.15(c)(1)(2); see also 47 C.F.R. § 1.2111.

82. The comments the Commission received on this issue support allowing licensees in the 1710-1755 and 2110-2155 MHz bands to partition and disaggregate. Cingular states that “the Commission should allow partitioning and disaggregation so that licensees may fine-tune their licenses to satisfy their individual spectrum needs.”²⁰⁸ CTIA states that it “strongly supports permitting partitioning and disaggregation in the AWS bands.”²⁰⁹ CTIA asserts that “partitioning and disaggregation will allow licensees to use spectrum more efficiently, speed service to underserved areas, stimulate competition, provide increased flexibility to licensees and facilitate the acquisition of spectrum by a wide variety of entities, both large and small.”²¹⁰ As the commenters recognize, the Commission has permitted partitioning and disaggregation in other wireless services, including both Broadband and Narrowband PCS,²¹¹ Multipoint Distribution Service (MDS),²¹² 800 and 900 MHz Specialized Mobile Radio Service (SMR),²¹³ 39 GHz fixed point-to-point microwave,²¹⁴ Local Multipoint Distribution Service (LMDS),²¹⁵ Maritime Services,²¹⁶ and paging.²¹⁷ In addition, the Commission has permitted other Part 27 licensees, including 700 MHz and 2.3 GHz licensees, to partition and disaggregate.²¹⁸ Allowing licensees in the 1710-1755 and 2110-2155 MHz bands to have the same partitioning and disaggregation rights as other wireless licensees, including other Part 27 licensees, ensures regulatory parity among licensees.

83. While the comments support allowing licensees in the 1710-1755 and 2110-2155 MHz bands to partition and disaggregate, RCA expresses concern that small rural carriers have insufficient bargaining power when negotiating partitioning and disaggregation agreements.²¹⁹ Our band plan, however, should make it easier for small businesses and rural carriers to acquire spectrum. Specifically, we meet the needs of these types of providers by utilizing small licensing areas (*i.e.*, RSAs and MSAs) and by including small blocks of spectrum. We shall also make every effort, in future allocation decisions, to establish a home for TDD systems. We remain concerned about ensuring that small businesses and rural carriers have access to spectrum. At the end of last year, we released a *Notice of Inquiry* that, among other issues, examined the effectiveness of our current regulatory tools, including partitioning and disaggregation, in facilitating delivery of wireless service

²⁰⁸ Cingular Reply Comments at 9-10.

²⁰⁹ CTIA Comments at 11.

²¹⁰ *Id.* at 11; *see also* TDD Coalition Reply Comments at 19 (stating support for CTIA’s position).

²¹¹ 47 C.F.R. § 24.104 (Narrowband PCS); 47 C.F.R. § 24.714 (Broadband PCS).

²¹² *See* Amendment of Parts 1, 21, 73, 74 and 101 of the Commission’s Rules to Facilitate the Use of the Universal Licensing System in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 03-66, *Notice of Proposed Rule Making and Memorandum Opinion and Order*, 18 FCC Rcd 6722 (2003) (proposing 47 C.F.R. § 101.1506).

²¹³ 47 C.F.R. § 90.813 (900 MHz SMR); 47 C.F.R. § 90.911 (800 MHz SMR).

²¹⁴ 47 C.F.R. § 101.56.

²¹⁵ 47 C.F.R. § 101.1111.

²¹⁶ 47 C.F.R. § 80.60.

²¹⁷ 47 C.F.R. § 22.513.

²¹⁸ 47 C.F.R. § 27.15.

²¹⁹ RCA Comments at 6-7.

to rural areas.²²⁰ Based on the record developed in that proceeding, we have recently released a *Notice of Proposed Rulemaking* seeking comments on various proposals to effectuate service to rural areas and communities.²²¹ In addition, we have recently adopted the *Secondary Markets Report and Order*.²²² These proceedings should help ensure that small businesses and rural carriers can acquire spectrum to meet their business needs.

6. Other Operating Requirements

84. *Background:* In the *AWS Service Rules NPRM*, we cautioned that even though licenses for the 1710-1755 and 2110-2155 MHz bands may be issued pursuant to one rule part, licensees in these bands may be required to comply with rules contained in other parts of the Commission's rules by virtue of the particular services that they offer.²²³ We sought comment on any provisions in existing, service-specific rules that may require specific recognition or adjustment to comport with the supervening application of another rule part, as well as any provisions that may be necessary in this other rule part to fully describe the scope of covered services and technologies.

85. *Discussion:* As we stated above, even though licenses for spectrum in the 1710-1755 and 2110-2155 MHz bands will be issued pursuant to Part 27 of the our rules, the licensees in these bands will be required to comply with other rule parts.²²⁴ Section 27.3 of our rules lists some of the other rule parts that maybe applicable to licensees in the 1710-1755 and 2110-2155 MHz bands. Some of these rule parts will be applicable by virtue of the fact that they apply to all licensees and others will apply depending on the type of service these licensees provide. For example:

- All applicants and licensees in the 1710-1755 and 2110-2155 MHz bands will be subject to the application filing procedures for the Universal Licensing System, set forth in Part 1 of our rules.²²⁵
- Licensees in the 1710-1755 and 2110-2155 MHz bands will be required to comply with the practices and procedures listed in Part 1 of our rules for license applications, adjudicatory proceedings, etc.
- Licensees in the 1710-1755 and 2110-2155 MHz bands will be required to comply with the Commission's environment provisions, including section 1.1307.²²⁶
- Licensees in the 1710-1755 and 2110-2155 MHz bands will be required to comply with the antenna structure provisions of Part 17 of our rules.
- To the extent a licensee in the 1710-1755 and 2110-2155 MHz bands provides a Commercial Mobile Radio Service (CMRS), such service would be subject to the provisions of Part 20 of

²²⁰ Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, WT Docket No. 02-381, *Notice of Inquiry*, 17 FCC Rcd 25554 (2002).

²²¹ *Rural Services NPRM*, *supra* n.197.

²²² See *Secondary Markets Report and Order*, *supra* n.59.

²²³ *AWS Service Rules NPRM*, 17 FCC Rcd at 24156 ¶ 52.

²²⁴ See *supra* ¶ 17.

²²⁵ See 47 C.F.R. Part 1, Subpart F.

²²⁶ 47 C.F.R. § 1.1307.

the our rules, along with the provisions in Part 27.²²⁷ Part 20 applies to all CMRS providers, even though the stations may be licensed under other parts of our rules.

- The application of general provisions of Part 27 includes rules related to equal employment opportunity, 911 service, etc.

86. In the *AWS Service Rules NPRM*, we sought comment on whether there are any specific provisions in Part 101 of the Commission's rules²²⁸ that should apply to licensees in the 1710-1755 and 2110-2155 MHz bands if they provided fixed services even though their stations would be licensed under Part 27.²²⁹ In response to this question, CTIA notes that "CMRS licensees (like PCS licensees) are permitted to provide fixed services without being subject to additional Part 101 requirements."²³⁰ CTIA expresses concern "that imposing additional Part 101 requirements on licensees offering fixed services in the AWS bands will subject those licensees to disparate regulatory treatment."²³¹ While as discussed above licensees in the 1710-1755 and 2110-2155 MHz bands will be subject to rules of general applicability and certain other rule parts depending on the services that they offer, these licensees will not be subject to the provisions contained in Part 101. The Part 101 rules are service specific rules and apply to licenses issued under that rule part.

E. Technical Rules

87. Under the United States Table of Frequency Allocations, both Mobile Service and Fixed Service operations are permitted for the 1710-1755 and 2110-2155 MHz bands. While we do not know the specific nature of the communications services that will ultimately be offered in this spectrum, our intent is to craft technical rules that will enable a broad range of services to be provided. In so doing we must also have rules that will minimize interference to incumbent co-channel and adjacent channel Government and non-Government users. With these considerations in mind, we establish, in the following sections, the technical rules for operations in the 1710-1755 and 2110-2155 MHz bands.

1. Co-Channel Interference Between AWS Licensees Operating in Adjacent Regions

88. *Background:* We must provide a means for limiting potential interference between AWS systems operating on the same spectrum in different geographic areas. In the *AWS Service Rules NPRM*, we tentatively concluded that either the "boundary limit"²³² or "coordination"²³³ approaches could be used to satisfy this requirement.²³⁴ We noted that both approaches have advantages and disadvantages. Coordination, for example, would likely minimize the potential for interference to

²²⁷ 47 C.F.R. Part 20; *see also* 47 C.F.R. § 27.3(g).

²²⁸ 47 C.F.R. Part 101.

²²⁹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24156 ¶ 52.

²³⁰ CTIA Comments at 12-13.

²³¹ *Id.* at 13.

²³² With this method, licensees would be required to limit the field strength of their station's transmissions to some prescribed level at their geographic border.

²³³ Under this approach, licensees operating on the same spectrum in adjacent areas would coordinate the location of their stations to control interference.

²³⁴ *AWS Service Rules NPRM*, 17 FCC Rcd at 24157 ¶ 56.

coordinated stations; but it could also impose unnecessary costs in coordinating facilities that have a low potential for interference, and could result in undesirable strategic or anti-competitive behavior on the part of competing licensees. The use of a boundary limit would establish an accepted standard, which would enable licensees to deploy facilities in boundary areas without the need for coordination; but this approach could still require some planning between licensees to ensure that spectrum is used efficiently and that potential interference does not occur.²³⁵ If a boundary limit methodology is used, we sought comment as to what signal level should be allowed at the border.²³⁶ We also asked whether, if the boundary limit method is adopted, we should permit licensees operating in adjoining areas to employ alternative, agreed-upon signal limits at their common border.

89. *Discussion:* We conclude that the boundary limits should be used to address co-channel interference. Both CTIA and Motorola favor the use of boundary limits, with Motorola noting that the use of boundary limits has “proven to be effective in the deployment of PCS service.”²³⁷ Ericsson, on the other hand, suggests “a cooperative approach to the resolution of in-band interference issues” and contends that agreements between licensees, independent of the Commission “are a particularly effective tool that allows adjacent operators to set appropriate emission limits” and “facilitate the highest and best use of the spectrum.”²³⁸ We believe that the use of boundary limits is the best approach for limiting interference in border areas of AWS licensees operating on common spectrum bands.²³⁹ It is a method that we have adopted and employed in other wireless services, and it is an approach that we believe satisfies the requirement in Section 337(d)(1) that we establish “interference limits at the boundaries of the spectrum block and service area.”²⁴⁰ The coordination method also has merit because it could, as Ericsson points out, allow carriers to agree to signal limits, which could lead to more efficient use of the spectrum.²⁴¹ We feel, however, that the most effective way of ensuring protection to co-channel licensees in adjoining areas is to adopt a standard signal limit for all licensees, at all geographic borders. But we shall also permit licensees operating in adjoining areas to agree to alternative signal limits at their common borders, if they choose to do so. In this way, while a standard signal limit will provide a default interference level in the absence of specific agreements between parties, alternative limits could enable a higher level of service to areas near their borders, which will enable licensees to make most efficient use of their spectrum.

90. As to the particular signal limit that should apply under our rules, those commenting on this issue favor the use of a 47 dB μ V/m field strength limit. Motorola, for example, suggests that the 47 dB μ V/m limit used under Part 24 for Broadband PCS is more appropriate than the 40 dB μ V/m limit prescribed for the 700 MHz band “because it would generally allow for more reliable communications

²³⁵ For example, if the base stations of two licensees provide the same signal level at a particular location along the border, interference could result to the receiving stations of both licensees operating at that location. Conversely, if a licensee is required to limit its signal to a prescribed level along the border and its neighboring licensee does not offer service to that particular location, then the level of service the licensee could provide in that area could be restricted unnecessarily.

²³⁶ We noted that a 40 dB μ V/m field strength limit is used in the 700 MHz services, and that a 47 dB μ V/m field strength limit is used in Broadband PCS and WCS. See 47 C.F.R. §§ 24.236 and 27.55.

²³⁷ See CTIA Comments at 13-14; Motorola Comments at 10.

²³⁸ Ericsson Comments at 7.

²³⁹ No commenters indicated a concern that the boundary limit approach would lead to anti-competitive behavior among licensees, and we are confident that under this approach such behavior will not occur.

²⁴⁰ 47 U.S.C. § 337(d)(1).

²⁴¹ Ericsson Comments at 7.

in boundary regions.”²⁴² We agree. Because the types of services that will be provided in the AWS band are likely to be similar to the services offered in the nearby PCS band, we see no reason to deviate from the field strength that has been adopted for that service. We conclude that the appropriate field strength limit for the Advanced Wireless Service is 47 dBμV/m. We therefore require AWS licensees to limit the signals from their base and fixed stations operating in the 2110-2155 MHz band to a predicted²⁴³ or measured²⁴⁴ field strength level of 47 dBμV/m at their geographic border.

2. Adjacent Channel Interference Between AWS Licensees

91. *Background:* In the *AWS Service Rules NPRM*, we sought comment on whether AWS licensees should be required to protect adjacent block AWS systems through the use of an out-of-band emission (OOBE) limitation.²⁴⁵ We noted that the OOBE limit that requires licensees to attenuate power levels (P) by at least $43 + 10 \log_{10}(P)$ dB at the edges of their spectrum blocks is commonly employed in other wireless services, and it has generally been found to be adequate in preventing adjacent channel interference.²⁴⁶ No commenters disagreed with the adoption of this out-of-band emission limit to protect adjacent AWS operations.²⁴⁷

92. *Discussion:* We conclude that the $43 + 10 \log_{10}(P)$ out-of-band emission limit is appropriate for protecting wireless systems that will operate in the AWS bands. We anticipate that AWS systems will be similar in design to cellular and PCS systems, and the $43 + 10 \log_{10}(P)$ limit has been used effectively in these services in limiting adjacent channel interference. We therefore adopt this out-of-band emission limit for all transmitters operating in the AWS bands. In the event that, once individual systems are deployed and operational, it is determined that this limitation does not prevent an AWS transmitter from causing harmful interference, we shall, at our discretion, require the licensee of that transmitter to provide greater emission attenuation.

93. Lucent agrees with the use of the $43 + 10 \log_{10}(P)$ OOBE limit to protect adjacent channel operations. However, Lucent proposes a modification to the way we traditionally measure out-of-band emissions. Lucent refers to its comments to the Commission’s *Year 2002 Biennial Review* proceeding, where it noted that our rule in Part 24 describing the procedure for measuring out-of-band emissions states that “in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.”²⁴⁸

²⁴² Motorola Comments at 10.

²⁴³ Licensees should calculate the 47 dBμV/m field strength at their border using a predictive model that is appropriate to the environment and terrain that exists in their geographic area. Appendix D contains a sampling of predictive models that could be used in this calculation.

²⁴⁴ Licensees will be allowed to satisfy the required field strength limitation by providing a measured 47 dBμV/m signal at their borders. They could elect to use this approach in areas where, for example, extreme terrain blockage could enable base or fixed stations to be located closer to a geographic border than indicated by a predictive model.

²⁴⁵ *AWS Service Rules NPRM*, 17 FCC Rcd at 24160 ¶ 64.

²⁴⁶ See 47 C.F.R. § 27.53(a)(3); see also *Part 27 Report and Order*, 12 FCC Rcd at 10857 ¶ 144 (citing 47 C.F.R. §§ 22.359(iii), 22.917(e), 24.238).

²⁴⁷ AT&T Wireless Comments at 9-10; CTIA Comments at 13-14; Ericsson Comments at 7; Lucent Comments at 3-4; Motorola Comments at 14.

²⁴⁸ Lucent Comments at 4.

94. Lucent had sought modification to rule 24.238(b) in the context of the Wireless Telecommunications Bureau's recent periodic review of its rules.²⁴⁹ The Bureau considered the proposal at that time, but declined to modify rule 24.238(b).²⁵⁰ We continue to believe that the existing rule, as adopted in the recent *Cellular Biennial Review First Report and Order*,²⁵¹ provides the most appropriate way of measuring out-of-band emissions into adjacent spectrum. Our goal in developing out-of-band emission standards is to provide for a minimal and predictable level of interference into adjacent spectrum. Our existing rule serves that purpose. The modification proposed by Lucent, however, could enable licensees with emission bandwidth greater than 1.25 MHz to potentially place greater amounts of energy into adjacent bands.²⁵² We therefore decline to adopt this proposal to modify our rules.

3. Power Limits

95. *Background:* In the *AWS Service Rules NPRM*, we sought comment on what power limits should be established for AWS transmitters.²⁵³ The Commission observed that transmitters used in the private land mobile service, cellular radio service, and fixed microwave services typically employ substantially different transmitter power levels. The Commission also noted that the output powers of potential Government co-channel users could range much higher than typical non-Government users. Accordingly, the Commission invited comment as to what these limits should be and the basis for the suggested limits. The Commission also solicited views as to whether we should establish power limits for all transmitters, or just mobile equipment, or just base station equipment.

96. *Discussion:* We shall adopt the same 1640 watts peak equivalent isotropically radiated power (EIRP) limit for AWS base stations in the 2110-2155 MHz band that is currently provided for base stations operating in broadband PCS under Part 24 of our rules. For AWS mobile stations operating in the 1710-1755 MHz band, however, we shall adopt a power limit of 1 watt peak EIRP, which is lower than the 2 watt peak EIRP limit currently prescribed for mobile stations operating in broadband PCS. Most commenters support the application of the same power limits for AWS that currently apply to broadband PCS. AT&T Wireless, for example, states that “[s]ince current CMRS carriers will almost certainly be the primary initial licensees in the AWS bands, and since the AWS spectrum will most likely be used to augment existing wireless offerings, applying the Part 24 [PCS] rules would promote the most efficient and rapid utilization of newly available spectrum by allowing

²⁴⁹ In its comments in the *Year 2002 Biennial Review* proceeding (WT Docket No. 02-310), Lucent proposed that Section 24.238(b) be modified to state that “in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of either 12.5 kHz or one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.” See Lucent Comments at 3 (unpaginated).

²⁵⁰ In its decision the Bureau found that “Lucent [did] not argue that the underlying purpose of the rules (to provide an adequate measure of interference protection to other licensees) no longer exists or is not necessary in the public interest . . .” See Federal Communications Commission 2002 Biennial Review, Staff Report of the Wireless Telecommunications Bureau (WT Docket No. 02-310, GC Docket No. 02-390), December 31, 2002, at p. 57, Appendix IV.

²⁵¹ See *Year 2000 Biennial Review – Amendment of Part 22 of the Commission’s Rules to Modify or Eliminate Outdated Rules Affecting the Cellular Radiotelephone Service and other Commercial Mobile Radio Services*, WT Docket No. 01-108, *Report and Order*, 17 FCC Rcd 18401, 18410-11 ¶ 46 (2002) (*Cellular Biennial Review First Report and Order*).

²⁵² That is, licensees with emission bandwidths greater than 1.25 MHz could meet specified emission limits within the first 12.5 kHz of adjacent spectrum, but could potentially place greater emissions into the spectrum beyond 12.5 kHz than a licensee employing a lesser emission bandwidth.

²⁵³ *AWS Service Rules NPRM*, 17 FCC Rcd at 24160-61 ¶ 65.

carriers to utilize existing infrastructure, technologies, and expertise.”²⁵⁴ Cingular, however, proposes that the output power for AWS mobile stations should be measured at the radiofrequency port, rather than based on EIRP. Cingular argues that this “would create harmonization between the Commission’s rules and the ETSI, which, in turn, would facilitate research regarding, and deployment of, directive antennas at the mobile station.”²⁵⁵

97. Although the goals of creating harmonization between our rules and those used in Europe and of improving directive antenna technology are laudable, we decline to adopt this proposal. A more important goal in this proceeding is to, to the extent possible, try to provide the same technical criteria for AWS equipment as currently exist for broadband PCS. We therefore find that it would be best to establish the same method for measuring power in the AWS bands that we currently use for measuring power in the broadband PCS bands.²⁵⁶

98. In determining the appropriate EIRP limit for the 1710-1755 MHz band we must be mindful of the presence of incumbent Government operations in that band.²⁵⁷ While the majority of the Government systems will be relocated to other spectrum, there will continue to be Government operations at 16 military facilities for some time, including two sites indefinitely. In analyzing the potential for interference to the continued Government operations, coordination processes would be simplified if mobiles operate with a maximum power of 1 watt EIRP. While this is lower than the power currently authorized for broadband PCS mobiles, we note that most PCS mobiles operate at substantially less power than one watt and thus this limit should not be a hindrance to AWS operations. We therefore establish the power limit for base and fixed stations operating in the 2110-2155 MHz bands as 1640 watts peak EIRP and 100 watts peak output power. Fixed, mobile and portable stations operating in the 1710-1755 MHz band shall be limited to 1 watt EIRP peak power, and mobile and portable stations must employ a means for limiting power to the minimum necessary for successful communications.²⁵⁸

99. Motorola in its comments notes that under our broadband PCS rules, power limits for PCS base stations “are applied irrespective of the bandwidth utilized by the licensee’s deployed technology.”²⁵⁹ This, according to Motorola, allows technologies using narrower bandwidths to “radiate a higher power per unit bandwidth.”²⁶⁰ Motorola therefore suggests that we adopt power limits for the AWS bands that are associated with a transmitter’s emission bandwidth. Specifically, Motorola proposes that for base stations operating in the AWS bands with bandwidths less than 1 MHz, our adopted EIRP limit would apply. But for base stations with operating bandwidths greater than 1 MHz, the EIRP limit would be applied to a 1 MHz bandwidth -- *i.e.*, for bandwidths greater than 1 MHz, the power limit would be 1640 w/MHz EIRP. Motorola indicates that this would “ensure

²⁵⁴ AT&T Wireless Comments at 9. AT&T Wireless indicates as well that if we were to adopt substantially different technical rules for AWS, it would force carriers, in areas where both CMRS and AWS spectrum is used, to “construct and maintain two parallel radio interface networks, including cell sites, towers, and antennas, in order to maintain the same level of service coverage and quality.” *Id.* at 10.

²⁵⁵ Cingular Reply Comments at 7 (ETSI is the European Telecommunications Standards Institute).

²⁵⁶ See 47 C.F.R. § 24.232.

²⁵⁷ See *infra* ¶¶ 117-123.

²⁵⁸ When the relocation of DOD operations from the 1710-1755 MHz band is completed, we may consider raising the power limit for fixed, mobile, and portable stations in that band to 2 W EIRP peak power.

²⁵⁹ Motorola Comments at 14.

²⁶⁰ *Id.*

that all wideband systems would radiate the same power per unit bandwidth, regardless of the technology utilized.”²⁶¹

100. We do not favor the adoption of this proposal. As an initial matter, we are concerned that adopting a rule that permits greater power levels for systems using wider bandwidths would create an inconsistency between our AWS rules and those of wireless mobile services on nearby spectrum, such as PCS and ATC, with the result being a loss of regulatory parity among these different services. We continue to believe that our focus should be toward decreasing power levels whenever possible.²⁶² Such efforts will enable us to better manage, and make more efficient use of the spectrum.

101. While we do not adopt this proposal in this proceeding, we recognize that, as wideband technologies become more prevalent in wireless systems, analyzing and determining appropriate power levels for such technologies could be a worthwhile undertaking. We believe, however, that this issue is more appropriately considered in the context of petition for rulemaking, where its impact could be considered in the context of not just the AWS band, but other wireless bands as well. We therefore invite Motorola, or any other interested party, to seek additional consideration of this matter through such a petition.

102. We also sought comment on whether to permit higher power limits in rural areas than in urban areas, and if so, what those limits might be. Motorola recommended that base stations located in rural areas be exempted from power limits. In support of this proposal, Motorola argues that in exempting rural base stations from power limits, we would enable licensees to provide greater geographic coverage with fewer base station transmitters, which would “[reduce] the cost of building out systems in [rural] areas.”²⁶³ Motorola suggests that this would enable faster deployment of 3G services in rural America, which would be “consistent with Congress’s statutory directive to promote ‘the development and rapid deployment of new technologies, products, and services for the benefit of the public, including in rural areas.’”²⁶⁴ We believe that the power limits we have established are sufficient to enable licensees operating in rural areas to provide coverage throughout their service areas. The power limit of 1640 EIRP has been used effectively for base stations in PCS and furthermore, any excessive power level could cause potentially harmful overload interference to nearby, adjacent band receivers. We therefore find that it is appropriate to limit the power levels to base stations as described above, regardless of their location; and thus decline to exempt rural stations from our power limit requirement.²⁶⁵

103. Finally, in addition to limiting the power of base stations, we must also consider imposing an antenna height limit for such stations. A base station’s antenna height, in combination with its EIRP, quantifies the signal level produced by the station at a specific location. In other

²⁶¹ *Id.*

²⁶² It should also be noted that this proposal would be in conflict with our Spectrum Policy Task Force recommendation to “investigate rule changes that enable the lowering of permitted power in urban areas . . .” *Spectrum Policy Task Force Report* at 64.

²⁶³ Motorola Comments at 14-15.

²⁶⁴ *Id.* at 15.

²⁶⁵ We note, however, that in our recently-adopted *Rural Services NPRM*, we seek comment on whether to increase the rural power limits for PCS and other licensed services. *Rural Services NPRM* at ¶¶ 47-58. Given that AWS network operations and configurations are likely to be similar to PCS, if a finding is made that rural power limits for PCS should be increased, we could, in the future, explore the possibility of similar power increases for AWS.

wireless services, which were initially licensed on a site-by-site basis,²⁶⁶ it was important to place a limit on the coverage area of base stations to limit co-channel interference. However, in a service such as AWS, which will be licensed from the outset on a geographic area basis, we do not believe that, with the requirement to limit signal strength at a licensee's geographic border, it is necessary to place a limit on the coverage area produced by individual base stations. We therefore do not impose antenna height limits on base or fixed stations operating in the 2110-2155 MHz band.

4. Spectrum Location of Base and Mobile Transmissions

104. *Background:* In the *AWS Service Rules NPRM*, we sought comment on whether base and mobile transmitters should be allowed to operate in both the lower (1710-1755 MHz) and upper (2110-2155 MHz) AWS bands or whether, alternatively, we should restrict base station transmissions to one band and mobile transmissions to the other band.²⁶⁷ We noted that NTIA, in reaching its conclusion that 3G systems were not likely to cause interference to Government operations, had assumed that non-Government base stations would not operate in the lower AWS band.²⁶⁸ We also observed that in other land mobile systems we have generally provided for mobile channels in one band paired with base channels in a different band.²⁶⁹

105. *Discussion:* Commenters generally oppose allowing base and mobile transmissions in the same band and specifically favor the mandatory placement of base stations in the 2110-2155 MHz band and mobile stations in the 1710-1755 MHz band. These parties believe that permitting base and mobile transmissions in the same band will result in interference among AWS users. For example, NTIA states that if base stations were allowed in the 1710-1755 MHz band, then the conclusions reached in the *NTIA AWS Assessment* regarding the sharing of the band by Government and non-Government entities would no longer be valid, and that a new assessment of this issue would be necessary.²⁷⁰ Lucent asserts that permitting "operator choice" in locating base and mobile transmissions in the AWS bands could result in the potential for interference that "would likely demand the use of more stringent out of band energy requirements, the use of lower power transmitters, and the designation of guard bands."²⁷¹ Verizon Wireless observes that though the Commission did not clearly define the PCS base and mobile transmit bands, PCS carriers agreed among themselves to locate mobile stations in one band and base stations in the other band. Verizon Wireless contends that the Commission cannot necessarily "rely on private incentives to ensure the type of interference protection that results from establishing clearly in advance that one set of frequencies will be used for mobile transmit and the other for base transmit."²⁷² Motorola indicates that the Commission "should clearly" designate the lower band for mobile transmissions and the upper band for base transmissions, claiming that "harmful interference to adjacent channel users" would result if this base and mobile transmissions were permitted in the same bands.²⁷³

²⁶⁶ See, e.g., 47 C.F.R. Part 90, Subpart S (the 800 and 900 MHz bands).

²⁶⁷ *AWS Service Rules NPRM*, 17 FCC Rcd at 24161 ¶ 66.

²⁶⁸ *NTIA AWS Assessment* at 6.

²⁶⁹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24161 ¶ 66.

²⁷⁰ NTIA Comments at 3-4.

²⁷¹ Lucent Comments at 3.

²⁷² Verizon Wireless Comments at 5.

²⁷³ Motorola Comments at 3. CTIA, Nokia, and AT&T agree with this assertion, citing the findings of ITU-R Working Party 8F Report ITU-R M.1036 (draft recommendation on "Frequency Arrangements for (continued....)

106. In favoring the mandatory placement of mobile transmissions in the 1710-1755 MHz band and base transmissions in the 2110-2155 MHz band, various parties also observe that this action would be consistent with international use of this spectrum and would enable U.S. consumers to realize the benefits of economies of scale and international roaming, which would result from such global harmonization. Nokia, for example, points out that, consistent with the recommendations of ITU-R M.1036, several countries are now using the 2110-2170 MHz band for downlink transmissions in IMT-2000 networks, and Motorola observes that the 1710-1785 MHz band is currently used for mobile transmissions in DCS-1800 spectrum in Europe.²⁷⁴

107. The TDD Coalition, however, argues that limiting the lower band to mobile transmissions and the upper band to base transmissions would prevent TDD-based services from being implemented in either band, and that such an action would go “against the FCC’s policy of flexible allocations to promote advanced wireless communications service.”²⁷⁵ The TDD Coalition points out further that, while ITU-R Working Party 8F indicated that the co-existence of TDD and FDD systems on adjacent bands in the same geographic area would cause interference to the stations of both systems, a “follow-up” ITU report is being developed which, according to the TDD Coalition, will show that the “interference between TDD and FDD systems can ‘easily’ be mitigated through the use of various techniques.”²⁷⁶

108. We are concerned about the possibility that certain interference conditions could occur if base and mobile stations were permitted to operate in the same AWS bands. One such condition is the “base-to-base” interference scenario, which occurs when transmissions from one base station cause interference to another base station attempting to receive on an adjacent channel. When base transmit and base receive frequencies (*i.e.*, mobile transmit frequencies) are far enough apart from one another, as they are in most land mobile radio services, this type of interference does not take place.²⁷⁷ However, if base transmit and receive frequencies are spectrally close to one another, then base-to-base interference can occur. Similarly, if mobile transmit and mobile receive frequencies are close by, then “mobile-to-mobile” interference can take place (*i.e.*, where a transmitting mobile causes interference to another mobile receiving on an adjacent channel).

109. Clearly, these types of interference scenarios are of concern to both Government and non-Government users. From the Government users’ standpoint, the placement of AWS base stations in the 1710-1755 MHz band could result in base-to-base interference to their systems that currently operate below, within, and above that band.²⁷⁸ Because the Government’s assessment of how

(Continued from previous page) _____

Implementation of International Mobile Telecommunications-2000 (IMT-2000) in the Bands 806-960 MHz, 1710-2025 MHz, 2110-2200 MHz and 2500-2690 MHz,” Doc. 8F/TEMP/330r2). The ITU-R Report recommends that the 1.7 GHz band should be used only for mobile transmissions and that the 2.1 GHz band should be used only for base transmissions. CTIA Comments at 14; Nokia Comments at 1-2 (unpaginated); and AT&T Comments at 8.

²⁷⁴ Nokia Comments at 3 (unpaginated); Motorola Comments at n.19 and 20; *see also* Ericsson Comments at 9; Lucent Comments at 3 (unpaginated); AT&T Wireless Comments at 9.

²⁷⁵ TDD Coalition Reply Comments at 11. PetroCom also opposes restricting one type of transmission in one band and the other type of transmission in the other band. PetroCom Comments at 8.

²⁷⁶ TDD Coalition Reply Comments at 24.

²⁷⁷ When there is sufficient frequency separation, our traditional out-of-band emission limit, *i.e.*, the $43 + 10\log P$ limit, and our limits on base station power are sufficient to prevent such interference from occurring.

²⁷⁸ Even after the relocation of Government spectrum from the 1710-1755 MHz band is completed, there will continue to be Government operations in the spectrum above 1755 MHz and below 1710 MHz.

Government and non-Government entities will share this spectrum is based on the assumption that only mobile stations would operate in the 1710-1755 MHz band, the Government might have to re-evaluate this assessment if we allow base stations in that band. Non-Government users are concerned that mixing base and mobile transmissions in the 1710-1755 and 2110-2155 MHz bands would either directly result in interference or could require the implementation of costly measures to *prevent* interference. For example, if we permitted base stations transmissions in the 1710-1755 MHz band, we would likely have to impose tighter out-of-band emission (OOBE) limits and lower power levels, and possibly even require guard bands and interference zones. Stricter OOBE limits would require licensees to employ more expensive transmitting equipment; implementing interference zones would result in a loss of coverage within a licensee's authorized area of operation; and guard bands would result in a waste of usable spectrum. The additional costs associated with equipment that provides stricter emission limits is certainly not a requirement we would want to impose on future licensees operating in the AWS bands. And we do not believe that the potential loss of spectrum and coverage area that would result from the use of guard bands and interference zones are conditions we should necessarily accept in our efforts to manage the spectrum and provide wireless service to the public.

110. We therefore conclude that base station transmissions will not be allowed in the 1710-1755 MHz band and will only be permitted in the 2110-2155 MHz band.²⁷⁹ This decision eliminates any concern about excessive potential interference between AWS and Government users and enables the transfer of Government spectrum to occur without any unnecessary impediments. The decision also allows future AWS licensees to operate on AWS spectrum without having to satisfy unnecessary technical or operational restrictions, which could limit their ability to make efficient use of the spectrum. And finally, this decision, as various commenters note, enables the United States to remain consistent with global use of the 1710-1755 MHz and 2110-2155 MHz bands; this will facilitate international roaming and will enable base and mobile equipment to be manufactured at lower cost.

111. While we determine that it is best not to permit base and mobile stations to operate in the same AWS bands -- which effectively prevents TDD systems from operating in those bands -- we continue to believe that one of our primary goals in managing the spectrum is to facilitate the development of new and different technologies, including TDD.²⁸⁰ Therefore, as discussed in paragraph 46 above, if proponents of TDD can conclusively demonstrate that such technologies could be used in these bands or some segments of these bands without causing interference to other spectrum users, we would be prepared to revisit this issue. We will also make every effort to provide spectrum

²⁷⁹ The 1710-1755 and 2110-2155 MHz bands are allocated for the Mobile and Fixed Services. The Mobile Service consists of base stations communicating with mobile stations. The Fixed Service consists of fixed stations communicating with other fixed stations. In developing our rules for AWS, we must determine how and where these various stations shall be permitted to operate within the AWS bands. Mobile stations will be allowed in the 1710-1755 MHz band and base stations will be permitted in the 2110-2155 MHz band. The question is where fixed stations shall and shall not be allowed to operate. A fixed station with a relatively high transmitting antenna is, with regard to the out-of-band emissions it can place into an adjacent band receiver, indistinguishable from a base station operating at the same antenna height -- and as we have indicated, the *NTIA AWS Assessment* was based on not permitting base stations in the 1710-1755 MHz band because of concerns about interference to Government systems operating within, above, and below that band. So in order to prevent interference to adjacent band Government operations, we shall place a special limit on the fixed stations that will be permitted to operate in the 1710-1755 MHz band. Specifically, we shall limit the antenna of any fixed station operating in the 1710-1755 MHz band to a height of no more than 10 meters above ground. As indicated in paragraph 103 above, the height of antennas of fixed stations operating in the 2110-2155 MHz band, however, shall be unrestricted.

²⁸⁰ Significantly, one of the access technologies indicated by the ITU in its IMT-2000 standard provides for TDD/CDMA transmissions.

opportunities for TDD systems in allocation and spectrum decisions affecting other bands, such as in the *AWS Allocation* proceeding.²⁸¹

5. Protecting Incumbent Systems from Interference

(a) The 2110-2155 MHz Band

112. As we indicated in the *AWS Service Rules NPRM*, some fixed point-to-point microwave systems authorized under Part 101 of our rules will continue to operate in the 2110-2155 MHz band after AWS licensing begins.²⁸² We therefore asked how such systems should be protected from interference from co-channel and adjacent channel AWS operations. In particular, we asked whether the TIA Telecommunications Service Bulletin (TSB) 10-F should be used to provide guidelines for the protection of incumbent systems. Also, Multipoint Distribution Service (MDS) systems under Part 21 are licensed in the 2110-2155 MHz band.²⁸³ While we are currently exploring the possibility of relocating MDS operations to other spectrum, until such time as those operations are relocated, they must be protected from interference from AWS systems.²⁸⁴

(i) Protection of Part 101 Systems

113. Motorola indicates that the TIA TSB 10-F procedures have been effective in determining potential interference to incumbent fixed microwave receivers operating in the 1850-1990 MHz band, and should similarly be used to protect microwave systems in the 2110-2155 MHz band.²⁸⁵ API agrees that TSB 10-F “sets forth appropriate criteria to determine what constitutes an intolerable level of interference” to an incumbent user,²⁸⁶ but also suggests that the coordination procedures developed by the National Spectrum Managers Association (WG20.94.045) be allowed to be used to evaluate the interference potential to incumbent systems.²⁸⁷ In addition, API asks us to confirm that the obligation to relocate an incumbent licensee “should be triggered by a demonstration of a potential interference under the applicable technical standard, rather than a showing that any actual interference has occurred.”²⁸⁸

114. We conclude that AWS licensees should be required to coordinate, prior to initiating operations from any base or fixed station, their frequency usage with co-channel and adjacent channel

²⁸¹ See Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003).

²⁸² *AWS Service Rules NPRM*, 17 FCC Rcd at 24158 ¶ 61. In the *Emerging Technologies* relocation procedures, we indicated that incumbent fixed point-to-point links would be moved on an as-needed basis.

²⁸³ MDS operations are confined to the 2150-2155 MHz portion of the 2110-2155 MHz band.

²⁸⁴ See Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223 (2003).

²⁸⁵ Motorola Comments at 11. See also Ericsson Comments at 8.

²⁸⁶ API Comments at 7.

²⁸⁷ *Id.* API points out that these procedures have been used in the context of the introduction of PCS operations into the 1.9 GHz band.

²⁸⁸ *Id.* at 7-8.

incumbent Part 101 fixed-point-to-point microwave licensees operating in the 2110-2155 MHz band. We therefore apply to the AWS bands the provisions of Section 24.237 of our rules, which details the coordination requirements for the protection of incumbent fixed microwave systems in the PCS bands.²⁸⁹ The procedures described in this rule rely on the use of predictive methods for determining interference. Thus, in response to API's inquiry regarding the triggering mechanism for relocation of fixed microwave systems, we find that relocation of such systems may be based on a prediction of potential interference and need not be triggered by an occurrence of actual interference. Finally, in paragraph (g) of the current rule 24.237, we indicate that we would accept the procedures developed by any "recognized authority" in determining appropriate interference criteria.²⁹⁰ The procedures developed by the National Spectrum Managers Association would appear to fall into this category and could therefore, as API suggests, be used for this purpose.

(ii) Protection of Part 21 Systems

115. As noted above, MDS operations in the 2110-2155 MHz band may eventually be relocated to other spectrum.²⁹¹ However, until that occurs, we must protect MDS systems from interference from AWS operations. We shall therefore require AWS licensees, prior to initiating operations from any base or fixed station, to coordinate their frequency usage with co-channel and adjacent channel incumbent Part 21 MDS licensees.²⁹²

(iii) Goldstone, California Facility

116. The 2110-2120 MHz band is allocated on a primary basis for earth-to-space (deep space) communications in the Space Research service used by the National Aeronautics and Space Administration (NASA).²⁹³ Operations in this service in the United States are limited to deep space communications at the NASA Goldstone Deep Space Network (DSN) facility in Goldstone, California. AWS licensees will be permitted to operate in the area around Goldstone without having to provide protection to the facility. However, operation of AWS systems will be affected by transmissions from Goldstone. In the *AWS Allocation Order*, we concluded that because of the nature of operations at Goldstone, a significant amount of interference should not occur to AWS systems operating in the 2110-2120 MHz band in the vicinity of Goldstone.²⁹⁴ However, AWS licensees using the 2110-2120 MHz band should be aware that this facility may operate at any time at a nominal EIRP of 105.5 dBW,²⁹⁵ along any azimuth, and at elevations as low as 10 degrees above the horizon. During these transmissions, AWS systems operating in the vicinity of Goldstone may become unavailable. AWS licensees cannot claim protection from interference due to these transmissions. We thus note that

²⁸⁹ 47 C.F.R. § 24.237. Included in the rule shall be the requirement that, unless AWS and fixed microwave licensees agree on an alternative method, TIA TSB 10-F must be used as the guideline for determining the co-channel and adjacent channel fixed microwave facilities to be coordinated.

²⁹⁰ 47 C.F.R. § 24.237(g).

²⁹¹ See *supra* ¶ 112.

²⁹² In the event that AWS and MDS licensees cannot reach agreement in coordinating their facilities, they may seek the assistance of the Commission, and the Commission may then, at its discretion, impose requirements on either or both parties.

²⁹³ See February 15, 1961 letter from FCC Secretary Waple to Director of Telecommunications Executive Office of the President.

²⁹⁴ *AWS Allocation Order*, 17 FCC Rcd at 23208 ¶ 33.

²⁹⁵ The DSN, under emergency conditions, transmits with EIRP up to 119.5 dBW.

future AWS licensees operating in spectrum in the 2110-2120 MHz band in the area surrounding Goldstone, California should consider this potential for interference in developing their systems.

(b) The 1710-1755 MHz Band

117. This spectrum is used extensively by the Federal Government for both military (Army, Air Force, and Navy) and non-military (Department of Agriculture (USDA), Department of Energy (DOE), Department of Justice (DOJ), Federal Aviation Agency (FAA), Department of Interior (DOI), Tennessee Valley Authority (TVA), U.S. Coast Guard (USCG), Federal Power Administration (FPA), and Department of the Treasury) operations.²⁹⁶ The following is a description of Department of Defense (DOD) and non-DOD operations in the band and a discussion of the types of protection that shall be provided to such operations by AWS licensees.

(i) Department of Defense Operations

118. There are 16 military facilities in the country that are classified as “protected facilities,” and there are various types of systems operating at these locations. These include: airborne telemetry and video systems; ground operations, including tactical radio relay and fixed microwave systems; precision guided munitions (PGM) systems; and others.²⁹⁷ According to the *NTIA AWS Assessment* and subject to the availability of reimbursement funds, DOD is expected to relocate all airborne operations at these facilities by December, 2008, but until that time, these systems must be protected from non-Government operations in the 1710-1755 MHz band.²⁹⁸ Ground-based systems at the 16 sites shall be converted from exclusive Government use to mixed use as of January 1, 2004. Ground-based operations will continue on a secondary basis with respect to non-Government systems at 14 of those 16 sites. At the remaining two locations -- in Yuma, Arizona and in Cherry Point, North Carolina -- ground-based systems shall continue to operate on a primary basis indefinitely and such systems must therefore be protected indefinitely from non-Government operations. PGM systems, which operate in the 1710-1720 MHz band, shall continue on a primary basis at all 16 sites until inventory is exhausted, or until the expected clearance date of December 31, 2008, whichever is earlier; such systems must therefore be protected from non-Government operations during this period of time.²⁹⁹ The “other” military systems³⁰⁰ will relocate to spectrum in other bands when such spectrum becomes available.

119. *Protection of the 16 DOD Facilities:* AWS must protect systems operating at the 16 DOD facilities from interference until such systems are relocated to other spectrum.³⁰¹ In order to protect these facilities, AWS licensees will be required to restrict the operations of their stations in the 1710-1755 MHz band. The February 1995 Spectrum Reallocation Final Report (*1995 Reallocation Final Report*), Appendix F, Figure F-3 provides a table indicating the “radius of operation” for each of

²⁹⁶ According to the Government Master File (GMF) of January, 2001, there are 1,825 Federal frequency assignments in the 1710-1755 MHz band.

²⁹⁷ These include unmanned ground robotic systems, range timing distribution systems, and target scoring devices.

²⁹⁸ See *supra* ¶ 7.

²⁹⁹ See *NTIA AWS Assessment* at 12.

³⁰⁰ See *supra* n. 297.

³⁰¹ TRR operations will continue indefinitely and on a primary basis at the Cherry Point and Yuma facilities.

the 16 facilities.³⁰² AWS licensees shall therefore be prohibited from situating their base and fixed stations at any locations that could potentially permit mobile, fixed, and portable stations transmitting in the 1710-1755 MHz band to cause interference to government systems operating within the radii of operation of the 16 facilities. Thus, AWS licensees shall be required to coordinate any operations that could permit mobile, fixed, and portable stations as specified in Section 27.1134(a) of the adopted rules.³⁰³ Except for Yuma, Arizona and Cherry Point, North Carolina, these various restrictions shall apply until such time as the relocation of the Federal systems has been completed.³⁰⁴ Furthermore, AWS licensees will be required to accept any interference received from operations at the 16 facilities. Such interference could occur at large distances outside the operating radii due to airborne operations within those radii.

120. Motorola, in its comments, expresses concern that aeronautical systems operating at the DOD sites will have a significant impact on AWS operations.³⁰⁵ Specifically, Motorola notes that because aircraft can operate at altitudes of up to 50,000 feet, interference could be caused to AWS operations more than 400 kilometers away. We are sympathetic to Motorola's concerns. However, there is little that can be done to prevent such interference from occurring on occasion. Aeronautical operations at these facilities are expected to cease by 2008.³⁰⁶ Until that time, we encourage Government users at the 16 installations and AWS licensees operating in nearby areas to work together to try to minimize interference to AWS operations, to the extent possible.

121. *The Yuma, Arizona and Cherry Point, North Carolina Facilities:* As noted above, protection of ground systems at the Cherry Point and Yuma installations shall continue on a primary basis indefinitely. Motorola therefore suggests that the Commission develop mandatory coordination procedures between AWS licensees and DOD operations at the Cherry Point and Yuma locations.³⁰⁷ We disagree with this proposal. Because of the critical nature of the operations being conducted at these facilities, formal interference criteria are needed to protect these sites. Coordination procedures will not ensure necessary protection to the military systems operating at these locations. Thus, in order to provide appropriate protection to DOD operations at these installations, AWS licensees must satisfy defined interference-protection criteria. We therefore decline to adopt a coordination approach, and shall require AWS licensees to provide permanent protection to the Yuma and Cherry Point facilities in accordance with the protection measures described in paragraph 119, above.

122. *Precision Guided Munitions Systems:* As noted above, PGM systems will continue to use the 1710-1720 MHz band on a primary basis until all PGM inventory is exhausted, or the expected clearance date of December 31, 2008, whichever is earlier. Motorola asks that PGM operations be

³⁰² The information from the table has been included in rule section 27.1134.

³⁰³ See Appendix C final rule section 47 C.F.R. § 27.1134(a). This coordination will be accomplished between the AWS licensee and the Commander of the affected DoD facility. Notwithstanding this local coordination, all parties must recognize that the FCC and NTIA maintain the authority to enforce the coordination requirement and correct interference (*i.e.*, in the event of an interference complaint from DoD, the Commission working with NTIA and the AWS licensee will rectify the situation).

³⁰⁴ See *supra* ¶ 7 (describing the circumstances and conditions for the relocation of Federal systems).

³⁰⁵ Motorola Comments at 12.

³⁰⁶ As discussed above, this date may change. See *supra* ¶ 7.

³⁰⁷ Motorola Comments at 11.

protected through coordination procedures developed between DOD and AWS licensees.³⁰⁸ We disagree with this suggestion as well. The only reliable way to protect these important military systems is to require AWS licensees to comply with specified interference protection criteria, and we therefore decline to adopt the proposal set forth by Motorola. Rather, AWS licensees will be required to protect PGM operations at each of the 16 facilities in accordance with the protection measures described in paragraph 119 above until PGM inventory at each facility is exhausted, or the expected clearance date of December 31, 2008, whichever is earlier.

123. *Unmanned Ground Robotic Systems, Range Timing Distribution Systems, and Target Scoring Devices*: These systems are located at military test ranges at the 16 protected DOD sites. Until such time as these systems are relocated to other spectrum, they shall be protected in accordance with the protection measures described in paragraph 119 above. No timeline has been established for the relocation of these systems.

(ii) Non-Department of Defense Operations

124. These are the fixed systems of the remaining Federal agencies (*i.e.*, DOI, USDA, DOJ, DOE, FAA, FPA, and Department of the Treasury), which are to be relocated, subject to the availability of relocation funds. According to the *NTIA AWS Assessment*, all systems subject to relocation are anticipated to vacate the 1710-1755 MHz band within 2 years of such funds becoming available.³⁰⁹ However, because relocation may not occur until well after the auction of AWS spectrum, Government and AWS systems could operate simultaneously in the 1710-1755 MHz band for some time. We must therefore provide protection to Government stations from interference from co-channel and adjacent channel AWS systems during this time period. Therefore, until such time as AWS licensees have reimbursed affected Government licensees and the Government licensees have relocated to other spectrum, AWS operators shall be required to protect Government fixed systems in accordance with the provisions set forth in TIA TSB 10-F, "Interference Criteria for Microwave Systems," or its successor.³¹⁰

(c) Below 1710 MHz

125. The 1675-1710 MHz spectrum is used by both the Federal Government and non-Federal Government in the Meteorological-Satellite Service (space-to-earth communications) and from 1675 to 1700 MHz by the Federal Government alone in the Meteorological Aids Service (radiosonde). It is anticipated that AWS stations operating in the 1710-1755 MHz band should not cause interference to meteorological operations. We therefore impose no general restriction on AWS systems to protect such operations. However, there is a potential scenario that could result in interference to meteorological systems. This would be the condition where a meteorological receiver is pointed at a low angle toward the horizon and an AWS fixed station (at a height of up to 10 meters above ground) is operating nearby and pointing in the direction of the radiosonde ground station or the meteorological-satellite earth station.³¹¹ If interference to a meteorological receiver were to occur under this scenario and the affected licensee were to notify the AWS operator that interference was

³⁰⁸ Motorola Comments at 12. Motorola also suggests that PGM operations be limited to lower altitudes and/or night-time use and that AWS licensees be given some advance notification of such operations. *Id.*

³⁰⁹ See *supra* ¶ 7.

³¹⁰ TIA TSB 10-F provides standards for protecting fixed, microwave stations from co-channel and adjacent channel operations.

³¹¹ Satellite receivers may not be registered in FCC or NTIA databases.

occurring, the operator would be required to modify its station location and/or technical parameters as necessary to eliminate the interference.

(d) Above 1755 MHz

126. There is considerable Government usage of the spectrum between 1755 and 1842 MHz, and Government operations in this spectrum shall continue after AWS systems are licensed. Government systems must therefore be protected from interference from AWS stations operating in the 1710-1755 MHz band. The Government has identified the following types of operations in the spectrum above 1755 MHz: non-DOD systems operating in the 1755-1761 MHz band; DOD operations in the 1755-1761 MHz band, which include tactical radio relay and airborne telemetry systems located at the 16 protected DOD sites; and Space-Ground Link Subsystem (SGLS) and Aircrew Combat Training Systems (ACTS) systems operating in the 1761-1842 MHz band at the 16 sites. In protecting the 16 DOD facilities from co-channel interference in accordance with the distance separations indicated in the *1995 Reallocation Final Report*, Appendix F, Figure F-3,³¹² AWS licensees operating in the 1710-1755 MHz band will effectively provide necessary protection to the DOD systems operating at those facilities on adjacent spectrum. Thus, no further protection of these operations is required by AWS licensees. However, AWS licensees will be required to protect non-DOD operations above 1755 MHz; and shall provide such protection by satisfying the appropriate provisions prescribed in TIA TSB 10-F.

(e) Below 2110 MHz

127. The 2025-2110 MHz band is used by Government and non-Government entities for Earth-to-space transmissions in the Space Operation, Space Research, and Earth-Exploration Satellite services. Recently, the ITU performed a study of potential interference to satellite services from co-channel 3G systems.³¹³ In February, we released our 2 GHz MSS/ATC Order,³¹⁴ in which we considered the ITU study in assessing the likelihood for adjacent channel interference from 1990-2025 MHz ATC operations to space receivers operating in the 2025-2110 MHz band. In our analysis, we concluded that neither base nor mobile ATC stations operating under our Part 24 out-of-band emission standards would cause interference to adjacent band satellite receivers.³¹⁵ Given that the potential for interference from AWS operations above 2110 MHz to 2025-2110 MHz space systems should be no different than interference to such systems from ATC operations below 2025 MHz, we find that no special requirements are needed to protect space systems operating in the 2025-2110 MHz band from AWS systems operating in the 2110-2155 MHz band.

128. The Earth-Exploration Satellite Service (EESS) stations operating in the 2025-2110 MHz band are uplink terminals. As such, they could potentially cause interference to AWS mobile or fixed receivers operating in the adjacent 2110-2155 MHz band. US footnote 347 in the Table of Frequency Allocations grants the non-Government Earth-to-space allocation to the EESS in the 2025-2110 MHz

³¹² See *supra* ¶ 119.

³¹³ See ITU-R Study Group 7 Recommendation SA.1154, "Provisions To Protect The Space Research (SR), Space Operations (SO) And Earth-Exploration Satellite Services (EES) And To Facilitate Sharing With The Mobile Service In The 2025-2110 MHz And 2200-2290 MHz Bands."

³¹⁴ Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 01-185, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 1962 (2003) (*ATC Report and Order*).

³¹⁵ *Id.* at 2131-32 (App. C1).

band with the condition that EESS uplink stations do not cause interference to stations operating in accordance with the Table of Frequency Allocations. Currently, there are four non-Government licensees operating in this band. Due to their limited number, and the fact that AWS stations are not yet in operation, we find that the four incumbent Earth-to-space EESS stations operating in the 2025-2110 MHz band will not be required to protect AWS stations. However, any non-Government EESS stations authorized after the adoption date of this Order shall be required to protect future AWS operations. The criteria for protecting AWS operations from future EESS uplink stations will be established in a future proceeding.

129. The 2025-2110 MHz band is also used by the Broadcast Auxiliary Service (BAS) under Part 74 of our rules, and by the Cable Television Relay Service (CARS) under Part 78 of our rules.³¹⁶ Both fixed and mobile TV BAS stations and mobile CARS stations are authorized in this band, and they are used for Electronic News Gathering (ENG) operations, transmitting TV programming material to TV studios from wherever news events may be happening.³¹⁷ We are concerned that base or fixed stations operating in the 2110-2155 MHz band, if situated too close to BAS/CARS receive stations, could cause interference to such stations. This interference could be due to out-of-band emissions falling in the 2025-2110 MHz BAS band or due to overload of the receivers operating in that band. We do not believe, however, that tightening the out-of-band emission standard for AWS base stations would be the most appropriate way to address this potential problem. As an initial matter, one of our goals in this proceeding is to, to the extent possible, try to provide the same technical criteria for AWS equipment as currently exist for PCS. Maintaining our $43 + 10 \log_{10}(P)$ OOB standard for AWS serves this purpose. Secondly, because of the nature of the potential interference scenario at issue, *i.e.*, one where a fixed station may cause interference to another fixed station, the particular stations can be situated far enough from one another to prevent interference from occurring. In addition, the technical parameters of the stations (*e.g.*, the orientation of directional antennas, the filters in transmitters and receivers) can be adjusted so as to minimize interference.

130. We therefore conclude that the best way to deal with the possibility of AWS base stations causing interference to BAS and CARS stations is to require AWS and BAS/CARS licensees to coordinate the location and technical parameters of their stations. This approach toward mitigating interference to BAS and CARS operations was similarly adopted in the ATC proceeding, where we decided that: "ATC operators will be required to protect all existing licensees in the adjacent bands."³¹⁸ We shall therefore require AWS licensees to coordinate the location of any base or fixed stations operating in the 2110-2155 MHz band with BAS/CARS licensees operating in their area. Before constructing and operating a base or fixed station, AWS licensees shall be required to determine the location and licensee of any BAS or CARS station authorized in their area of operation, and coordinate their planned stations with that licensee.³¹⁹ We shall expect BAS/CARS and AWS licensees to work together to develop ways to mitigate interference, whether it be through locating their stations as far as possible from one another or by implementing one or more technical solutions. In the event that mutually satisfactory coordination agreements cannot be reached, licensees may seek the assistance of the Commission, and we may, at our discretion, impose requirements on one or both

³¹⁶ 47 C.F.R. Part 74 and Part 78.

³¹⁷ ENG mobile units, for example, capture programming material in the field and transmit the material to fixed ENG receive stations, often located on building rooftops. ENG stations may relay programming either directly to a TV studio or to the TV studio via additional fixed ENG links.

³¹⁸ See *ATC Report and Order*, 18 FCC Rcd at 2061-62 ¶ 203 (2003).

³¹⁹ Information regarding BAS and CARS stations can be obtained by consulting local SBE coordination committees.

parties. While we conclude that interference can be avoided through coordination, AWS operators will be required to protect previously licensed BAS and CARS operations in the adjacent 2025-2110 MHz band.

(f) Above 2155 MHz

131. The 2155-2160 MHz band is allocated for use by the Multipoint Distribution Service (MDS) under Part 21 and by the Fixed Microwave Service under Part 101.³²⁰ In a future proceeding, we will decide whether MDS operations in this band should be relocated to other spectrum.³²¹ Until that decision is made, however, we must continue to protect MDS systems operating in the 2155-2160 MHz band. In the *AWS Service Rules NPRM*, we sought comment on how MDS operations should be protected from interference.³²² Although WCAI expressed concern about potential interference to MDS operations, it proposed no specific protection criteria, nor did it formally seek special protection measures for MDS.³²³ We thus have no basis upon which to make a decision as to how MDS should be protected. We therefore do not adopt any such special measures to protect MDS operations at this time, and will simply require AWS licensees operating in the 2110-2155 MHz band to satisfy the same protection criteria to protect MDS licensees that they must employ to protect adjacent band AWS licensees (*i.e.*, our $43 + 10 \log_{10}(P)$ OOB standard).

6. RF Safety

132. *Background:* In the *AWS Service Rules NPRM*, we stated that our rules implementing the National Environmental Policy Act of 1969 are intended to prevent human exposure to potentially unsafe levels of radiofrequency (RF) radiation.³²⁴ To that end, we noted that section 1.1307(b) of our rules requires preparation of Environmental Assessments when licensees propose to construct fixed transmission facilities that exceed specified parameters.³²⁵ We indicated that exposure guidelines for the 2.3 GHz Wireless Communications Services (WCS) band are the same as those for spectrum at

³²⁰ 47 C.F.R. Parts 21, 101. There are no Part 101 systems currently licensed in this spectrum.

³²¹ See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2233 (2003).

³²² *AWS Service Rules NPRM*, 17 FCC Rcd at 24159-60 ¶ 63.

³²³ WCAI Comments at 5. WCAI in its comments indicates that it will "review with great interest the comments from the AWS community" with regard to technical measures that community would provide to protect MDS operations. *Id.* at 6. WCAI states, however, that "as a preliminary observation it appears that the Commission likely will have to impose far more rigorous limitations on AWS out-of-band emissions into any relocated MDS channels in the 2155-2180 MHz band than the Commission imposes on AWS out-of-band emissions within the AWS band." *Id.*

³²⁴ *AWS Service Rules NPRM*, 17 FCC Rcd at 24161 ¶ 68; see also 47 C.F.R. §§ 1.1310, 2.1093.

³²⁵ 47 C.F.R. § 1.1307(b). Similarly, sections 2.1091 and 2.1093 require environmental evaluation of certain mobile and portable transmitters prior to equipment authorization or use. See 47 C.F.R. §§ 2.1091, 2.1093. The Commission provides guidance on acceptable methods of evaluating compliance with exposure limits in OET Bulletin No. 65. OET Bulletin No. 65 (Edition 97-01) was issued on August 25, 1997, and is available for downloading at the FCC Web Site: <<http://www.fcc.gov/oet/rfsafety>>. Copies of OET Bulletin No. 65 also may be obtained by calling the FCC RF Safety Line at (202) 418-2464. Other circumstances may also trigger an Environmental Assessment. See generally 47 C.F.R. § 1.1307(a).

1710-1755 MHz and 2110-2155 MHz.³²⁶ For WCS, we stated that the threshold for environmental review is an effective radiated power (ERP) greater than 1,000 watts.³²⁷

133. *Discussion:* With regard to RF safety requirements, the Commission adopted the 1,000 watts ERP threshold for 2.3 GHz to recognize the flexibility with respect to use, power, location, and other factors that was accorded licensees operating in that band, and determined that this power limit was appropriate to ensure compliance with the Commission's RF exposure standards for most situations.³²⁸ Moreover, the Commission found the 1,000 watts ERP threshold consistent with its existing rules for transmitters and devices of comparable use and similar operating frequencies. For the same reasons, we adopt the 1,000 watts ERP safety threshold for fixed operations in the 1710-1755 and 2110-2155 MHz bands. We therefore will modify sections 1.1307(b), 2.1091, and 2.1093 of our rules³²⁹ to include services and devices applicable to the 1710-1755 and 2110-2155 MHz bands. We note, however, that the standard we adopt today is subject to change.³³⁰

7. Canadian and Mexican Coordination

134. *Background:* In the *AWS Service Rules NPRM*, we noted that section 2.301 of our rules requires stations using radio frequencies to identify their transmissions with a view to eliminate harmful interference and generally enforce applicable radio treaties, conventions, regulations, arrangements, and agreements.³³¹ With respect to Canada, we noted that coordination of frequency assignments in the 1710-1755 MHz band is presently subject to the provisions of Arrangement D of the *Agreement between the United States of America and Canada concerning Coordination and Use of Radio Frequencies Above 30 Megacycles per Second*, October 24, 1962, as amended. Additionally, we indicated that coordination of assignments in the 2110-2155 MHz band is subject to Arrangement A of this Agreement, and assignments in the 2150-2155 MHz band are also subject to the *Interim Arrangement Concerning the Use of the Frequency Bands 2150-2162 MHz and 2500-2690 MHz by MCS and MDS Stations Near the Canada/United States of America Border*, June 25, 2002.

135. *Discussion:* At this time, changes to international agreements between and among the United States, Mexico and Canada concerning the reallocation of this spectrum are not complete. Until such time as agreements between the United States, Mexico and Canada become effective, we will require the same technical restrictions at the border that we adopt for operation between geographic service areas, to the extent they are not in violation of current bilateral agreements and arrangements. Operations in the 1710-1755 and 2110-2155 MHz bands must not cause harmful interference across the border. When agreements between the United States, Mexico and Canada are final and become effective, licensees in the 1710-1755 and 2110-2155 MHz bands will be expected to

³²⁶ See 47 C.F.R. § 1.1310.

³²⁷ 47 C.F.R. §§ 1.1307(b), 27.52; see also 47 C.F.R. § 24.52 (PCS).

³²⁸ *Part 27 Report and Order*, 12 FCC Rcd at 10862 ¶ 154 n.345, noting that in a pending petition for reconsideration of the RF Guidelines Report and Order, the Commission was considering whether to revise the threshold for requiring routine evaluation of mobile devices above 1.5 GHz from 1.5 watts to 3 watts. This change was made in Procedures for Reviewing Requests for Relief from State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act of 1934, WT Docket No. 97-192, *Second Memorandum Opinion and Order and Notice of Proposed Rulemaking*, 12 FCC Rcd 13494, 13541 ¶ 51 (1997).

³²⁹ 47 C.F.R. §§ 1.1307(b), 2.1091, 2.1093.

³³⁰ See Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields, ET Docket No. 03-137, *Notice of Proposed Rulemaking*, 18 FCC Rcd 13187 (2003).

³³¹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24162 ¶ 71; see also 47 C.F.R. § 2.301.

comply with these agreements. In addition, if these agreements are modified in the future, licensees in the 1710-1755 and 2110-2155 MHz bands will be expected to comply with these modifications.

F. Competitive Bidding

136. As discussed above, section 3002 of the Balanced Budget Act of 1997 requires the Commission to assign licenses for the majority of the AWS bands through competitive bidding pursuant to section 309(j) of the Communications Act.³³² In the *AWS Service Rules NPRM*, we tentatively concluded that it serves the public interest to license all portions of the AWS bands, including the 2150-2155 MHz portion of the 2110-2155 MHz band, by the same mechanism.³³³ Because we have adopted a geographic licensing scheme for all portions of the AWS bands that permits the filing of mutually exclusive applications, consistent with both statutory obligations, we must resolve such applications for licenses in these bands through competitive bidding.³³⁴

1. Incorporation by Reference of the Part 1 Standardized Auction Rules

137. *Background:* In the *AWS Service Rules NPRM*, we requested comment on a number of issues relating to the competitive bidding procedures for the 1710-1755 MHz and 2110-2155 MHz bands.³³⁵ We proposed to conduct the auction of initial licenses in these bands in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules and substantially consistent with the bidding procedures that have been employed in previous auctions.³³⁶ Specifically, we proposed to employ the Part 1 rules governing competitive bidding design, designated entities, application and payment procedures, reporting requirements, collusion issues, and unjust enrichment.³³⁷ Under this proposal, such rules would be subject to any modifications that the Commission may adopt in our Part 1 proceeding.³³⁸ We also sought comment on whether any of our Part 1 rules or other auction procedures would be inappropriate or should be modified for an auction of licenses in these bands.

³³² See *supra* ¶ 24. The Balanced Budget Act of 1997 identified the 1710-1755 MHz band for competitive bidding in section 3002(c) and the 2110-2150 MHz band in section 3002(b). Pub. L. No. 105-33, 111 Stat. 251 (1997). The timing requirements applicable to both these bands were rescinded. Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715 (2002).

³³³ *AWS Service Rules NPRM*, 17 FCC Rcd at 24163 ¶ 72.

³³⁴ See *supra* ¶ 30-34.

³³⁵ *AWS Service Rules NPRM*, 17 FCC Rcd at 24163-24165 ¶¶ 72-80.

³³⁶ See, e.g., Amendment of Part 1 of the Commission's Rules—Competitive Bidding Procedures, WT Docket No. 97-82, *Order, Memorandum Opinion and Order and Notice of Proposed Rule Making*, 12 FCC Rcd 5686 (1997); *Third Report and Order and Second Further Notice of Proposed Rule Making*, 13 FCC Rcd 374 (1997) (*Part 1 Third Report and Order*); *Order on Reconsideration of the Third Report and Order, Fifth Report and Order, and Fourth Further Notice of Proposed Rule Making*, 15 FCC Rcd 15293 (2000) (*Part 1 Recon Order/ Fifth Report and Order and Fourth Further Notice of Proposed Rule Making*); *Seventh Report and Order*, 16 FCC Rcd 17546 (2001); *Eighth Report and Order*, 17 FCC Rcd 2962 (2002); *Second Order on Reconsideration of the Third Report and Order and Order on Reconsideration of the Fifth Report and Order*, 18 FCC Rcd 10180 (2003), recons. pending.

³³⁷ *AWS Service Rules NPRM*, 17 FCC Rcd at 24163 ¶ 73; 47 C.F.R. § 1.2101 *et seq.*

³³⁸ See *Fourth Further Notice of Proposed Rule Making*, 15 FCC Rcd 15293 (2000); see also *Part 1 Recon Order/Fifth Report and Order*, 15 FCC Rcd 15293 (recon. pending).

138. *Discussion:* As explained below, we conclude that our Part 1 rules and other auction procedures are appropriate for an auction of licenses in these bands. While commenters did not specifically address whether we should use the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules, commenters raised a variety of arguments regarding bidding design and other aspects of our auction procedures. For example, CTIA suggests that the Commission study whether a package or combinatorial bidding design would be appropriate for some of the larger spectrum blocks.³³⁹ U.S. Cellular, however, advocates the use of simultaneous multiple round auction methodologies for all EA or MSA/RSA licenses without package bidding features.³⁴⁰ As we have indicated previously, combinatorial (or "package") bidding is an auction methodology that may take many forms.³⁴¹ We note that the Wireless Telecommunications Bureau ("WTB"), consistent with statutory obligations,³⁴² will seek comment on auction-related procedural issues, including auction design, prior to the start of the AWS auction pursuant to WTB's existing delegated authority.³⁴³ This will provide WTB with an opportunity to weigh the benefits and disadvantages of any particular bidding design, among other auction-specific issues (e.g. minimum opening bids), prior to the start of the auction. CTIA, U.S. Cellular, all potential auction applicants and other interested parties are encouraged to participate in this process and submit comments on such auction-related procedural issues.

139. One Commenter, RCA, urges the Commission to modify its competitive bidding procedures and to allow initial licensees the option of returning portions of the license, effectively disaggregating or partitioning the license back to the Commission, in exchange for a monetary credit toward future auction purchases.³⁴⁴ In support of its proposal, RCA argues that where spectrum is licensed in larger areas, only large companies are able to purchase the licenses because rural licensees lack the necessary capital.³⁴⁵ RCA also asserts that such large companies do not consistently make full use of the licenses in rural areas resulting in the existence of "unused spectrum."³⁴⁶ In those instances, RCA also believes that rural licensees are impeded in their ability to obtain spectrum through partitioning and disaggregation because large companies may dictate the terms for partitioning and

³³⁹ See CTIA Comments at 15.

³⁴⁰ See U.S. Cellular Corporation Comments at 12-13.

³⁴¹ Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Notice of Proposed Rule Making*, 16 FCC Rcd 7278, 7302-03 ¶ 50, n.120.

³⁴² See 47 U.S.C. § 309(j)(3)(E)(i) (obligation to permit notice and comment on proposed auction procedures before issuance of bidding rules).

³⁴³ See 47 C.F.R. §§ 0.131(c) (functions of WTB); 0.331 (authority delegated to WTB); 0.332 (actions taken under WTB's delegated authority); 1.2103 (competitive bidding design options, including simultaneous multi-round and combinatorial bidding auctions, among others); 1.2104 (competitive bidding mechanisms). See also Amendment of Part 1 of the Commission's rules—Competitive Bidding Procedures, *Order, Memorandum Opinion and Order, and Notice of Proposed Rule Making*, 12 FCC Rcd 5686, 5697-98 ¶ 16 (1997). See, e.g., Auction of Regional Narrowband PCS Licenses Scheduled for September 24, 2003, Comment Sought on Package Bidding Procedures, Reserve Prices or Minimum Opening Bids, and Other Auction Procedures, 18 FCC Rcd 6366 (2003).

³⁴⁴ See RCA Comments at 6-7. In a footnote, RCA also appears to suggest that such a credit should be transferable. *Id.* at n. 7. AT&T Wireless Reply Comments at 3.

³⁴⁵ See RCA Comments at 6 (urging the Commission to license available spectrum "according to MSAs and RSAs rather than by other county groupings such as EAs or MEAs.").

³⁴⁶ See *id.*

disaggregation and may also decline to deal with rural licensees.³⁴⁷ RCA contends that its proposal would help to achieve the dual goals of avoiding spectrum warehousing and promoting the use of spectrum in rural areas because large companies would have a financial incentive to return “unused spectrum” from individual licenses, presumably in rural areas, to the Commission for reassignment.³⁴⁸

140. As a preliminary matter, we decline to adopt RCA’s proposal because it would increase the likelihood that the winning bidder in an auction is not the party with the highest valued use, thus undermining the integrity of the auction system. Under RCA’s proposal, a party whose plans are more speculative might be encouraged to enter into the auction because the Commission would, in effect, partially insure auction participants against the risk of future loss through the existence of the credit option.³⁴⁹ Obviously, the Commission does not wish to encourage such behavior. Furthermore, as discussed elsewhere in this order, other market driven flexible policies are in place that should address many of the concerns raised by RCA.³⁵⁰

141. Under RCA’s proposal, a licensee would be able to retain a portion of the spectrum or a geographic area of a license for a given market and return the remainder to the Commission.³⁵¹ We believe that permitting the return of a portion of a license in exchange for an auction credit as suggested by RCA may result in the licensee partitioning spectrum or disaggregating a geographic area that is not an optimal geographic area or size.³⁵² This, in turn, would decrease the likelihood that the new licensee would be able to develop innovative services that will allow it to compete in the marketplace.³⁵³ In contrast, if a licensee and a third party can identify applications for which disaggregation, partitioning, or spectrum leasing is practical, our rules allow and we would encourage such a transaction because it would promote the rapid development of the full license. This is particularly true in light of the new flexibility provided to wireless licensees by our recent *Secondary*

³⁴⁷ See RCA Comments at 6-7; AT&T Wireless Reply Comments at 3 (supports RCA’s proposal).

³⁴⁸ See RCA Comments at 6-7.

³⁴⁹ The Commission has consistently indicated that it would not insure winning bidders against the risk of loss. Requests for Refunds of Down Payments Made in Auction No. 35, *Order*, 17 FCC Rcd 6283 (explaining that changes in the market value of licenses after the close of an auction do not affect a winning bidder’s obligations), *reversed on other grounds*; Disposition of Down Payment and Pending Applications By Certain Winning Bidders in Auction No. 35, *Order and Order on Reconsideration*, 17 FCC Rcd 23354 (2002).

³⁵⁰ See *supra* ¶ 83.

³⁵¹ RCA Comments at 7.

³⁵² Previously, the Commission has found that “cherry-picking” of spectrum in this manner is contrary to the public interest. See Amendment of the Commission’s Rules Regarding Installment Payment Financing For Personal Communications Services (PCS) Licensees, WT Docket No. 97-82, *Second Report and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 16436, 16455, 16463, 16469 ¶¶ 38 (“These provisions prevent licensees from selectively surrendering spectrum for which they may believe they paid too much, or otherwise discarding spectrum in markets that may be more difficult to serve (commonly referred to as ‘cherry-picking’ of licenses or spectrum)”), 57, 67.

³⁵³ See, e.g., Amendment of Part 95 of the Commission’s Rules to Provide Regulatory Flexibility in the 218-219 MHz Service, WT Docket No. 98-169, *Second Order on Reconsideration of the Report and Order and Memorandum Opinion and Order*, 15 FCC Rcd 25020, ¶ 19 (rejecting a licensee’s request to provide disaggregation as part of a financial restructuring plan).

Markets Report and Order.³⁵⁴ We note, however, that in certain limited circumstances, the public interest might be served by the Commission recovering previously licensed spectrum, *e.g.* when spectrum must be cleared in order to be reallocated for new uses.

142. Further, we note that a fundamental assumption of RCA's proposal is that the AWS band plan will favor larger licensees. However, as we explained above, the AWS band plan adopted here includes licenses with a variety of geographic sizes that will provide licensees with flexibility to implement their business plans and ensure that licenses are disseminated to a wide variety of applicants. Accordingly, the balance struck in our selection of geographic license areas, coupled with our existing partitioning and disaggregation procedures and the new flexibility provided by the *Secondary Markets Report and Order*, obviates the need to devise a new mechanism as proposed by RCA and AT&T Wireless, which, we believe, is inappropriate under the band plan that we have adopted. Thus, at this time, we decline to adopt the return credit option suggested by RCA in the absence of a record demonstrating that the public interest is best served by the adoption of such a proposal. We further note, however, that we are continuing to examine ways of amending our regulations and policies governing the electromagnetic spectrum and facilities-based commercial and private wireless services that rely on spectrum, in order to promote digital migration and rapid and efficient deployment of these services in rural and underserved areas.³⁵⁵

143. Consistent with our proposals, we will use the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules to conduct the auction of initial licenses in the 1710-1755 MHz and 2110-2155 MHz bands.³⁵⁶ Our decision to apply the Part 1 rules is consistent with our ongoing effort to streamline our general competitive bidding rules for all radio services that are subject to competitive bidding.³⁵⁷ As we stated in the *AWS Service Rules NPRM*, application of the general competitive bidding rules will be subject to any modifications that the Commission may subsequently adopt.³⁵⁸

2. Provisions for Designated Entities

144. *Background:* In the *Competitive Bidding Second Memorandum Opinion and Order*, the Commission stated that it would define eligibility requirements for small businesses on a service-specific basis, taking into account the capital requirements and other characteristics of each particular

³⁵⁴ The Commission has recently adopted a *Report and Order* in the secondary markets proceeding that is designed to facilitate the ability of Wireless Radio Service licensees to lease spectrum usage rights to third parties seeking access to spectrum. *Secondary Markets Report and Order*, *supra* n.59.

³⁵⁵ *Rural Services NPRM* ¶ 1.

³⁵⁶ See 47 C.F.R. § 1.2101 *et. seq.* (Part 1, Subpart Q -- Competitive Bidding Proceedings).

³⁵⁷ In the Part 1 proceeding, the Commission has engaged in an ongoing effort to clarify and amend its general competitive bidding rules for all auctionable services. See Amendment of Part 1 of the Commission's Rules — Competitive Bidding Procedures, *Part 1 Recon Order/ Fifth Report and Order* and *Fourth Further Notice of Proposed Rule Making*, 15 FCC Rcd 15293 (2000) *recons. pending*; *Part 1 Third Report and Order*, 13 FCC Rcd 374, 376 ¶ 1. The Commission has previously observed that continual changes and improvements "advance our auction program by reducing the burden on the Commission and the public of conducting service-by-service auction rule makings." *Id.*

³⁵⁸ *AWS Service Rules NPRM*, 17 FCC Rcd at 24163 ¶ 73.

service in establishing the appropriate threshold.³⁵⁹ In the *AWS Service Rules NPRM*, we proposed to adopt the same small business size standards that the Commission adopted for broadband PCS³⁶⁰ because comments received suggested that similar services might be provided in AWS.³⁶¹ We also noted that certain commenters, in response to the *AWS Allocation NPRM*, the *AWS Allocation Further NPRM*, and the *NTIA AWS Assessment*, had suggested a variety of advanced wireless services, including, but not limited to, voice, video, internet, and high speed data services for the 1710-1755 MHz and 2110-2155 MHz bands.³⁶² We acknowledged that we did not know precisely the type of services that a licensee may seek to provide in these bands. Nonetheless, we anticipated that the services that will be deployed in these bands may have capital requirements comparable to those in the broadband PCS service. We also believed that the licensees in these bands will be presented with issues and costs similar to those presented to broadband PCS licensees, including those involved in relocating incumbents, and developing markets, technologies, and services. We also noted that at the time the broadband PCS service was established, it was similarly anticipated that it would facilitate the introduction of a new generation of services.³⁶³

145. In light of the similarities we identified, we proposed to define a “small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million.³⁶⁴ We also proposed to provide “small businesses” with a bidding credit of 15 percent and “very small businesses” with a bidding credit of 25 percent. The bidding credits we proposed were those set forth in the standardized schedule in Part 1 of our Rules.³⁶⁵ Accordingly, we sought comment on the use of these standards and associated bidding credits for applicants to be licensed in the 1710-1755 MHz and 2110-2155 MHz bands, with particular focus on the appropriate

³⁵⁹ Implementation of Section 309(j) of the Communications Act—Competitive Bidding, PP Docket No. 93-253, *Second Memorandum Opinion and Order*, 9 FCC Rcd 7245, 7269 ¶ 145 (1994) (*Competitive Bidding Second Memorandum Opinion and Order*); 47 C.F.R. § 1.2110(c)(1).

³⁶⁰ Implementation of Section 309(j) of the Communications Act—Competitive Bidding, PP Docket No. 93-253, *Order on Reconsideration*, 15 FCC Rcd 17384, 17394 ¶ 21 (2000) (summarizing the bidding credits offered in broadband PCS C and F Block auctions); 47 C.F.R. § 24.720 (1994). The Commission also adopted the PCS standards for WCS in the 2.3 GHz band. *Part 27 Report and Order*, 12 FCC Rcd at 10879 ¶ 194 (employing the small business size standards used in broadband PCS because “the advantages of ready availability and familiarity to many small businesses that might be interested in this spectrum”).

³⁶¹ *AWS Service Rules NPRM*, 17 FCC Rcd at 24164-65 ¶ 77.

³⁶² Qualcomm Comments at 3, filed on Feb. 22, 2001 in response to the *AWS Allocation NPRM*; Lucent Comments at 1, filed on Aug. 28, 2000 in response to the Office of Engineering and Technology’s (OET) request for comment on the petition filed by the Cellular Telecommunications Industry Association (CTIA); and Nokia Comments at 2 filed on Aug. 28, 2000, in response to the Commission’s *Public Notice*, DA 00-1673 (rel. July 28, 2000) and the petition filed by CTIA.

³⁶³ Implementation of Section 309(j) of the Communications Act—Competitive Bidding, *Fifth Report and Order*, 9 FCC Rcd 5532, 5534 ¶ 3 (1994) (*Competitive Bidding Fifth Report and Order*).

³⁶⁴ *AWS Service Rules NPRM*, 17 FCC Rcd at 24164-65 ¶ 77. We are coordinating these proposed small business size standards with the U.S. Small Business Administration.

³⁶⁵ In the *Part 1 Third Report and Order*, we adopted a standard schedule of bidding credits, the levels of which were developed based on our auction experience. *Part 1 Third Report and Order*, 13 FCC Rcd at 403-04 ¶ 47; see also 47 C.F.R. § 1.2110(f)(2).

definitions of small and very small businesses as they relate to the size of the geographic area to be covered and the spectrum allocated to each license.³⁶⁶

146. We also noted that although AWS services may have significant advantages in terms of economies of scale compared to other services, the development of AWS services may require an unprecedented investment of capital by prospective licensees. Accordingly, we invited comment on whether there may be any distinctive characteristics to the AWS service or these bands that suggest that the adoption of small business size definitions and the use of bidding credits would be inappropriate in this instance. We also sought comment on whether the small business provisions we proposed were sufficient to promote participation by businesses owned by minorities and women, as well as rural telephone companies.³⁶⁷

147. *Discussion:* As explained below, we adopt the small business size standards and accompanying bidding credits proposed in the *AWS NPRM*. Commenters generally supported our proposal to adopt the same small business size standards that the Commission adopted for broadband PCS.³⁶⁸ Two commenters, Mizelle and RCA, however, suggest that the Commission's attempts to assist designated entities through bidding credits have not been effective to level the playing field for small businesses that are without ties to larger companies.³⁶⁹ Further, to the extent we adopt bidding credits or eligibility limitations in this service, RCA asserts that the Commission should not provide any special benefits to designated entities such as rural telephone companies that would not also be available to all small businesses.³⁷⁰

148. Although a lack of adequate capital is a critical barrier to entering business and successful auction participation by bidders, based upon the Commission's experience, the auction process provides the best opportunity to date for designated entities to acquire licenses. The Commission has long recognized that bidding preferences for qualifying bidders provides such bidders with an opportunity to compete successfully against large, well-financed entities.³⁷¹ In the 34 auctions conducted to date that utilize small business bidding credits, 76 percent of the winning bidders were small or very small businesses, 7 percent of the winning bidders were minority-owned business, 6

³⁶⁶ *AWS Service Rules NPRM*, 17 FCC Rcd at 24164-65 ¶ 77.

³⁶⁷ We also noted that to the extent that commenters proposed additional provisions to ensure participation by minority-owned or women-owned businesses, they should address how such provisions should be crafted to meet the relevant standards of judicial review. *Adarand Constructors v. Peña*, 515 U.S. 200 (1995) (requiring a strict scrutiny standard of review for Congressionally mandated race-conscious measures); *United States v. Virginia*, 518 U.S. 515 (1996) (applying an intermediate standard of review to a state program based on gender classification).

³⁶⁸ See e.g., CTIA Comments at 15.

³⁶⁹ See RCA Comments at n.3, 8-9. Mizelle argues that bidding credits only increase the price of a license and ultimately that larger companies will always win the license. Mizelle Comments at 2.

³⁷⁰ See RCA Comments at n.3, 8-9. In support of its position, RCA notes that rural wireless carriers compete with rural telephone companies to offer local access services in rural areas. *Id.* Thus, RCA concludes that it would provide rural telephone companies with an unfair competitive advantage if they were provided special benefits.

³⁷¹ See, e.g., Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems; Implementation of Section 309(j) of the Communications Act -- Competitive Bidding, WT Docket No. 96-18, PR Docket No. 93-253, *Memorandum Opinion and Order on Reconsideration and Third Report and Order*, 14 FCC Rcd 10030, 10091 ¶ 112 (1999).

percent of the winning bidders were women-owned businesses,³⁷² and 14 percent of the winning bidders were rural telephone companies.³⁷³ (Some of these entities may fall into more than one category *i.e.*, a women-owned business may also be a small or very small business). In addition, an analysis of the Upper 700 MHz Guard Band auctions (Auction Nos. 33 and 38), which employed identical small business size standards with those we adopt today, indicates that small and very small businesses successfully bid for 28 of the 104 licenses, or 27 percent of the licenses sold.³⁷⁴ Accordingly, contrary to the suggestions raised by Mizelle and Goldstein, the record amply demonstrates that bidding credits the Commission has offered to small businesses have allowed small businesses to effectively compete against large, well-financed entities.

149. Accordingly, we adopt the same small business size standards for licenses in the 1710-1755/2110-2155 MHz band that the Commission adopted for broadband PCS. Specifically, we define a “small business” in this band as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million. Correspondingly, we will provide “small businesses” with a bidding credit of 15 percent and “very small businesses” with a bidding credit of 25 percent.³⁷⁵ The small business size standards and corresponding bidding credits that we adopt here will provide a variety of businesses, including rural wireless carriers who are “small businesses” or “very small businesses,” with opportunities to participate in the auction of licenses for the AWS bands. These standards will also afford licensees substantial flexibility for the provision of services with varying capital costs.³⁷⁶ The Commission has also found that the use of tiered or graduated small business definitions is useful in furthering our mandate under Section 309(j) to promote opportunities for and disseminate licenses to a wide variety of applicants.³⁷⁷ Consequently, the use of small entity definitions for the AWS bands may result in the dissemination of licenses among a wide range of entities, consistent with our obligations under Section 309(j)(3)(B) of the Act.³⁷⁸

³⁷² We note that this information may be underreported because the Commission does not require women or minority-owned entities to indicate their status.

³⁷³ Auction results and related data may be found on the Commission’s Web site at: <http://www.fcc.gov/wtb/auctions>.

³⁷⁴ See “39 GHz Band Auction Closes,” *Public Notice*, Report No. AUC-3D-E (Auction No. 30), DA 00-1035 (rel. May 10, 2000). See also <http://www.fcc.gov/wtb/auctions>.

³⁷⁵ AWS Service Rules NPRM, 17 FCC Rcd at 24164-65 ¶ 77. On October 23, 2003, the U.S. Small Business Administration (“SBA”) approved the Commission’s request to adopt the proposed small business size standards for the auction of licenses in the 1710-1755 MHz and 2110-2155 MHz band. The SBA confirmed that these small business size standards will provide a beneficial and equitable way to assure small business competition for licenses in these bands. See Letter from Hector V. Barretto, Administrator, Office of Size Standards, U.S. Small Business Administration to Margaret W. Wiener, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, dated Oct. 23, 2003.

³⁷⁶ *Id.*

³⁷⁷ 47 U.S.C. § 309(j)(3)(B), (4)(C)-(D).

³⁷⁸ Section 309(j)(3)(B) of the Act provides that in establishing eligibility criteria and bidding methodologies the Commission shall promote “economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women.” See 47 U.S.C. § 309(j)(3)(B).

IV. PROCEDURAL MATTERS

A. Regulatory Flexibility Analysis

150. A Final Regulatory Flexibility Analysis has been prepared for this Report and Order and is included in Appendix B.

B. Paperwork Reduction Analysis

151. This Report and Order contains either new or modified information collections. As part of our continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget (OMB) to take this opportunity to comment on the information collections contained in the Report and Order, as required by the Paperwork Reduction Act of 1995.³⁷⁹ Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

152. Written comments by the public and agencies on the proposed and/or modified information collections are due 60 days after the date of publication in the Federal Register. Written comments by the OMB on the proposed and/or modified information collections are due on or before 120 days after the date of publication in the Federal Register. In addition to filing comments with the Secretary, a copy of any comments on the information collections contained herein should be submitted to Judith Boley Herman, Federal Communications Commission, 445 12th Street, S.W., Room 1-C804, Washington, D.C. 20554, or via the Internet to <Judith-B.Herman@fcc.gov>, and to Kim A. Johnson, Policy Analyst, Office of Information and Regulatory Affairs (OIRA), Office of Management and Budget (OMB), Docket Library, Room 10236, New Executive Office Building (NEOB), 725 17th Street, N.W., Washington, D.C. 20503 or via the Internet at <Kim_A._Johnson@omb.eop.gov>.

153. The public may view the documents filed in this proceeding during regular business hours in the FCC Reference Information Center, Federal Communications Commission, 445 12th Street, S.W., Room CY-A257, Washington, D. C. 20554, and on the Commission's Internet Home Page: <<http://www.fcc.gov>>. Copies of comments and reply comments are also available through the Commission's duplicating contractor: Qualex International, Portals II, 445 12th Street, S.W., CY-B4202, Washington, D.C. 20554 (telephone 202-863-2893). Accessible formats (computer diskettes, large print, audio recording and Braille) are available to persons with disabilities by contacting Brian Millin, of the Consumer & Governmental Affairs Bureau, at (202) 418-7426, TTY (202) 418-7365, or at <Brian.Millin@fcc.gov>.

C. Further Information

154. For further information concerning this rulemaking proceeding, contact Eli Johnson or John Spencer, at (202) 418-1310, Policy Division, Wireless Telecommunications Bureau, Federal Communications Commission, 445 12th Street, S.W., Room 3-C124, Washington, D.C. 20554; or via the Internet to Eli.Johnson@fcc.gov or <John.Spencer@fcc.gov>.

³⁷⁹ Pub. L. No. 104-13.

V. ORDERING CLAUSES

155. ACCORDINGLY, IT IS ORDERED, pursuant to sections 1, 2, 4(i), 7, 10, 201, 214, 301, 302, 303, 307, 308, 309, 310, 319, 324, 332, and 333 of the Communications Act of 1934, 47 U.S.C. §§ 151, 152, 154(i), 157, 160, 201, 214, 301, 302, 303, 307, 308, 309, 310, 319, 324, 332, 333, that this Report and Order is hereby ADOPTED.

156. IT IS FURTHER ORDERED that Part 27 of the Commission's Rules ARE AMENDED as specified in Appendix C, effective 60 days after the date of publication in the Federal Register. Information collections contained in these rules will be effective upon OMB approval.

157. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: LIST OF COMMENTERS**Commenters:**

American Petroleum Institute [API]
ArrayComm, Inc.
AT&T Wireless Services, Inc. [AT&T Wireless]
Cellular Telecommunications & Internet Association [CTIA]
Ericsson Inc
Fred R. Goldstein, Ionary Consulting
Lucent Technologies Inc.
John Mizelle
Motorola, Inc.
National Radio Astronomy Observatory [NRAO]
National Telecommunications and Information Administration [NTIA]
Nokia Inc.
PCIA, the Wireless Infrastructure Association
PetroCom License Corporation [PetroCom]
Rural Cellular Association [RCA]
United States Cellular Corporation [U.S. Cellular]
Verizon Wireless
Wireless Communications Association International, Inc. [WCAI]

Reply Commenters:

American Petroleum Institute
ArrayComm, Inc.
AT&T Wireless Services, Inc.
Cingular Wireless LLC
Motorola, Inc.
TDD Coalition
United States Cellular Corporation
Wireless Communications Association International, Inc.

APPENDIX B: FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands Notice of Proposed Rulemaking (*Notice*).² The Commission sought written public comment on the proposal in the Notice, including comment on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the Adopted Rules

In this Report and Order, we adopt service rules for Advanced Wireless Services (AWS) in the 1710-1755 MHz and 2110-2155 MHz bands, including provisions for application, licensing, operating and technical rules, and for competitive bidding. Licensees in these bands will have the flexibility to provide any fixed or mobile service that is consistent with the allocations for this spectrum.⁴ We will license this spectrum under our market-oriented Part 27 rules and, in order to accommodate differing needs, our band plan includes both localized and regional geographic service areas and symmetrically paired spectrum blocks with the pairings being composed of different bandwidths. Our licensing plan will allow the marketplace rather than the Commission to ultimately determine what services are offered in this spectrum and what technologies are utilized to provide these services. The licensing framework that we adopt today for these bands will ensure that this spectrum is efficiently utilized and will foster the development of new and innovative technologies and services, as well as encourage the growth and development of broadband services.

Our actions today bring us closer to our goals of achieving the universal availability of broadband access and increasing competition in the provision of such broadband services both in terms of the types of services offered and in the technologies utilized to provide those services. The widespread deployment of broadband will bring new services to consumers, stimulate economic activity, improve national productivity, and advance many other objectives – such as improving education, and advancing economic opportunity for more Americans. By encouraging the growth and development of broadband, our actions today also foster the development of facilities-based competition. We achieve these objectives by taking a market-oriented approach to licensing this spectrum that provides greater certainty, minimal regulatory intervention, and leads to greater benefits to consumers.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

We received no comments directly in response to the IRFA in this proceeding. We did, however, consider the potential impact of our rules on smaller entities. For example, we have adopted a building block approach to the licensing of this spectrum, including some smaller geographic licensing areas and some smaller spectrum block sizes. We have also provided for partitioning and disaggregation of licenses and we have adopted spectrum leasing policies. Finally, we have adopted 15 percent and 25 percent

¹ See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §§ 601-612., has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² See Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands Notice of Proposed Rulemaking, WT Docket No. 02-35, *Notice of Proposed Rulemaking*, 17 FCC Rcd 24135, xxxx (2002) (*Notice*).

³ See 5 U.S.C. § 604.

⁴ The service rules that we adopt today for this spectrum build on the policy objectives set forth in the Spectrum Policy Task Force Report. Spectrum Policy Task Force, ET Docket No. 02-135, *Report* (rel. Nov. 15, 2002) (*Spectrum Policy Task Force Report*).

“bidding credits” for small and very small businesses, respectively. These policies should provide increased opportunities for small entities to acquire the appropriate amount of spectrum for their particular needs.

C. Description and Estimate of the Number of Small Entities To Which the Adopted Rules Will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁵ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small government jurisdiction.”⁶ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁷ A small business is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁸ Nationwide, there are approximately 22.4 million small businesses, total, according to the SBA data.⁹

A small organization is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹⁰ Nationwide, as of 1992, there were approximately 275,801 small organizations.¹¹ Last, the definition of “small governmental jurisdiction” is one with populations of fewer than 50,000.¹² The term “small governmental jurisdiction” is defined as “governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹³ As of 1997, there were about 87,453 governmental jurisdictions in the United States.¹⁴ This number includes 39,044 county governments, municipalities, and townships, of which 37,546 (approximately 96.2%) have populations of fewer than 50,000, and of which 1,498 have populations of 50,000 or more. Thus we estimate the number of small governmental jurisdictions overall to be 84,098 or fewer.

⁵ 5 U.S.C. § 603(b)(3).

⁶ 5 U.S.C. § 601(6).

⁷ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small business concern” in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.” 5 U.S.C. § 601(3).

⁸ Small Business Act, 15 U.S.C. § 632 (1996).

⁹ See SBA, *Programs and Services*, SBA Pamphlet no. CO-0028, at page 40 (July 2002).

¹⁰ 5 U.S.C. § 601(4).

¹¹ U.S. Department of Commerce, Bureau of the Census, 1992 Economic Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration) (1992 Economic Census).

¹² 5 U.S.C. § 601(5).

¹³ 5 U.S.C. 601(5).

¹⁴ U.S. Census Bureau, Statistical Abstract of the United States: 2000, Section 9, pages 299-300, Tables 490 and 492.

The rules adopted in the Order affect applicants who wish to provide service in the 1710-1755 MHz and 2110-2155 MHz bands. As discussed in the Order, we do not know precisely the type of service that a licensee in these bands might seek to provide.¹⁵ Nonetheless, we anticipate that the services that will be deployed in these bands may have capital requirements comparable to those in the broadband Personal Communications Service (PCS), and that the licensees in these bands will be presented with issues and costs similar to those presented to broadband PCS licensees. Further, at the time the broadband PCS service was established, it was similarly anticipated that it would facilitate the introduction of a new generation of service. Therefore, the Order adopts the same small business size standards here that the Commission adopted for the broadband PCS service. In particular, the Order defines a “small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million. The Order also provides small businesses with a bidding credit of 15 percent and very small businesses with a bidding credit of 25 percent.

We do not yet know how many applicants or licensees in these bands will be small entities. Thus, the Commission assumes, for purposes of this FRFA, that all prospective licensees are small entities as that term is defined by the SBA or by our two special small business size standards for these bands. Although we do not know for certain which entities are likely to apply for these frequencies, we note that the 1710-1755 MHz and 2110-2155 MHz bands are comparable to those used for cellular service and personal communications service.

Wireless Telephony Including Cellular, Personal Communications Service (PCS) and SMR Telephony Carriers. The SBA has developed a small business size standard for wireless small businesses within the two separate categories of **Paging**¹⁶ and **Cellular and Other Wireless Telecommunications**.¹⁷ Under both SBA categories, a wireless business is small if it has 1,500 or fewer employees. According to the Commission’s most recent data,¹⁸ 1,387 companies reported that they were engaged in the provision of wireless service. Of these 1,387 companies, an estimated 945 have 1,500 or fewer employees and 442 have more than 1,500 employees.¹⁹ Consequently, the Commission estimates that most wireless service providers are small entities that may be affected by the rules and policies adopted herein.

D. Description of Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

Applicants for AWS licenses in the 1710-1755 MHz and the 2110-2155 MHz bands will be required to submit short-form auction applications using FCC Form 175.²⁰ In addition, winning bidders

¹⁵ See Report and Order, at ¶ 144.

¹⁶ 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 513321 (changed to 517211 in October 2002).

¹⁷ 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 513322 (changed to 517212 in October 2002).

¹⁸ FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, “Trends in Telephone Service”, Table 5.3, page 5-5 (Aug. 2003). This source uses data that are current as of December 31, 2001.

¹⁹ *Id.*

²⁰ See generally, 47 C.F.R. § 1.2105.

must submit long-form license applications through the Universal Licensing System using Form 601,²¹ FCC Ownership Disclosure Information for the Wireless Telecommunications Services using FCC Form 602, and other appropriate forms.²²

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its adopted approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.²³

We have taken significant steps to reduce burdens on small entities wherever possible. To provide opportunities for small entities to participate in any auction that is held, we provide bidding credits for small businesses and very small businesses as defined in Section C of this FRFA. The bidding credits adopted are 15 percent for small businesses and 25 percent for very small businesses. We have found that the use of tiered or graduated small business size standards is useful in furthering our mandate under Section 309(j) of the Communications Act to promote opportunities for, and disseminate licenses to, a wide variety of applicants.

Regarding our decision to apply our Part 27 rules to this spectrum, *see* paragraphs 16-21, we do not anticipate any adverse impact on small entities. The flexibility afforded by Part 27 or our rules should benefit large and small entities alike, because licensees will be in a stronger position to meet changes in demand for services. Under this approach, all licensees will have the freedom to determine the services to be offered and the technologies to be used in providing these services. An alternative to this decision would have been to determine specific allowable service in each frequency band and apply the applicable rule part to the licensing of such services. This approach, however, would be unsatisfactory because it is too restrictive, and in any event, it is unclear that this approach would benefit small entities more than the flexible licensing approach we have decided upon today.

Regarding our decision to license this spectrum by geographic area, *see* paragraphs 27-46, we anticipate that on balance small entities will benefit from this licensing approach. Geographic licensing in these bands supports the Commission's overall spectrum management goals in that it allows licensees to quickly respond to market demand. Small entities that acquire spectrum that is licensed on a geographic area basis will benefit from such flexibility. Moreover, we have attempted to strike a balance here by using varying sizes of geographic areas. For example, small entities may be more interested in spectrum licensed by smaller geographic areas rather than in spectrum licensed on a nationwide or large regional basis. Consequently, we have decided to include licensing areas based on MSAs and RSAs. As RCA observes, MSAs and RSAs permit entities who are only interested in serving rural areas to acquire spectrum licenses for these areas alone and avoid acquiring spectrum licenses with high population densities that make purchase of license rights too expensive for these types of entities.²⁴ These types of service providers could acquire an RSA and create a new service area or they could expand an existing

²¹ 47 C.F.R. § 1.913(a)(1).

²² 47 C.F.R. § 1.2107.

²³ *See* 5 U.S.C. § 603(c)(1)-(4).

²⁴ RCA Comments at 2-3; *see also* U.S. Cellular Comments at 5-7.

service territory or supplement the spectrum they are licensed to operate in by adding an RSA. They could also combine a few MSAs and RSAs to create a larger but localized service territory. MSAs and RSAs allow entities to mix and match rural and urban areas according to their business plans. By being smaller, these types of geographic service areas provide entry opportunities for smaller carriers, new entrants, and rural telephone companies. Their inclusion in our band plan will foster service to rural areas and tribal lands and thereby bring the benefits of advanced services to these areas.²⁵ An alternative to our decision to use geographic areas for licensing would have been to employ a site-by-site licensing approach. Site-by-site licensing, however, would be an inefficient licensing method due to a greater strain on Commission resources and less flexibility afforded to licensees.

We have also made the decision to license the spectrum in different bandwidths. We do not believe this will disadvantage small entities. In fact, we have decided that the RSA/MSA license areas will be licensed as paired spectrum at 1735-1740 and 2135-2140 for a total of 734 licenses, thus providing the opportunity for entities to obtain a license encompassing as little as 10 megahertz of spectrum. Other spectrum will be licensed in pairs of 10 and 15 MHz blocks, providing flexibility to licensees in constructing their systems. Our approach provides maximum flexibility for both small and large entities to offer a wide range of communications services.

We have also decided to permit the disaggregation and partitioning of these spectrum blocks, *see* paragraphs 80-83. Licensees will thus be able to increase or decrease the size of their service areas to better meet market demands. Allowing licensees to partition and/or disaggregate their licensed spectrum should improve opportunities for small entities to acquire spectrum for their particular needs. An alternative to this approach would have been to prohibit partitioning and disaggregation; we believe that such an approach could foreclose options for small entities.

In addition, we have decided that this spectrum will also be subject to the rules recently adopted in the *Secondary Markets Report and Order*,²⁶ *see* paragraph 26. In that *Order*, we took action to remove unnecessary regulatory barriers to the development of secondary markets. The *Order* established new policies and procedures that enable most wireless licensees, including Part 27 licensees, to lease some or all of their spectrum usage rights to third-party spectrum lessees.²⁷ Application of the new secondary market rules to this spectrum should help ensure that small businesses and rural carriers can acquire spectrum to meet their business needs by allowing more entities access to the AWS spectrum and permit the marketplace, rather than the Commission, to decide what use is made of this spectrum.

We believe our objectives of ensuring both efficient use of spectrum and diversity of licensees can best be achieved by adopting a variety of license areas and spectrum block sizes, and ensuring the ability of licensees to partition and disaggregate their licenses and fully participate in the secondary markets. By adopting some smaller geographic licensing areas and some smaller spectrum block sizes, we believe we will encourage participation by smaller and rural entities, without the necessity of adopting set-asides and eligibility restrictions, because such licenses will be less expensive and should more

²⁵ While we did not receive any comments from Tribal governments, we remain interested in ensuring that the communication needs of these communities are met. *See AWS Service Rules NPRM*, 17 FCC Rcd at 24146-47 ¶ 25; *see also* Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes, *Policy Statement*, 16 FCC Rcd 4078 (2000).

²⁶ *See* Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 00-230, FCC 03-113, (rel.Oct. 6, 2003) (*Secondary Markets Report and Order*).

²⁷ *See id.* at ¶ 84.

closely mirror such bidders' needs. We believe that these same factors support our decision to decline to adopt other suggested alternatives, such as spectrum aggregation limits, in this band.

Finally, regarding our decision to require a showing of "substantial service" at license renewal time, *see* paragraphs 73-79, we do not anticipate any adverse impact on small entities. An alternative would have been to adopt a "minimal coverage" requirement. We believe, however, that the substantial service standard is better because it will provide both small and large entities the flexibility to determine how best to implement their business plans based on actual service to end users.

F. Report to Congress

The Commission will send a copy of the Order, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.²⁸ In addition, the Commission will send a copy of the Order, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of the Order and FRFA (or summaries thereof) will also be published in the Federal Register.²⁹

²⁸ *See* 5 U.S.C. § 801(a)(1)(A).

²⁹ *See* 5 U.S.C. § 604(b).

APPENDIX C: FINAL RULES**PART 27 – MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES**

1. The authority citation for Part 27 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

2. The table of contents for Part 27 is amended by adding subpart L as follows:

* * * * *

Subpart L – 1710-1755 MHz and 2110-2155 MHz Bands**LICENSING AND COMPETITIVE BIDDING PROVISIONS**

- 27.1101 1710-1755 MHz and 2110-2155 MHz bands subject to competitive bidding.
27.1102 Designated Entities.

RELOCATION OF INCUMBENTS

- 27.1111 Relocation of fixed microwave service licensees in the 2110-2150 MHz band.

PROTECTION OF INCUMBENT OPERATIONS

- 27.1131 Protection of Part 101 operations.
27.1132 Protection of Part 21 operations.
27.1133 Protection of Part 74 and Part 78 operations.
27.1134 Protection of Federal Government operations.

3. Section 27.1 is amended by adding a subparagraph (8) to paragraph (b) to read as follows:

§ 27.1 Basis and purpose.

* * * * *

(b) * * *

* * * * *

(8) 1710-1755 MHz and 2110-2155 MHz.

* * * * *

4. Section 27.3 is amended by redesignating paragraphs (m) through (p) as paragraphs (n) through (q), and by adding new paragraph (m) to read as follows:

§ 27.3 Other applicable rule parts.

* * * * *

(m) *Part 64, subpart V*. This part sets forth the requirements and conditions applicable to telecommunications carriers under the Communications Assistance for Law Enforcement Act.

* * * * *

5. Section 27.4 is amended by adding a new definition to read as follows:

§ 27.4 Terms and definitions.

Advanced wireless service (AWS). A radiocommunication service licensed pursuant to this part for the frequency bands specified in § 27.5(h).

* * * * *

6. Section 27.5 is amended by adding a new paragraph (h) to read as follows:

§ 27.5 Frequencies.

* * * * *

(h) *1710-1755 MHz and 2110-2155 MHz bands*. The following frequencies are available for licensing pursuant to this part in the 1710-1755 MHz and 2110-2155 MHz bands:

(1) Two paired channel blocks of 10 megahertz each are available for assignment as follows:

Block A: 1710-1720 MHz and 2110-2120 MHz; and
Block B: 1720-1730 MHz and 2120-2130 MHz.

(2) Two paired channel blocks of 5 megahertz each are available for assignment as follows:

Block C: 1730-1735 MHz and 2130-2135 MHz; and
Block D: 1735-1740 MHz and 2135-2140 MHz.

(3) One paired channel block of 15 megahertz each is available for assignment as follows:

Block E: 1740-1755 MHz and 2140-2155 MHz.

7. Section 27.6 is amended by adding a new paragraph (h) to read as follows:

§ 27.6 Service areas.

* * * * *

(h) *1710-1755 and 2110-2155 MHz bands*. AWS service areas for the 1710-1755 MHz and 2110-2155 MHz bands are as follows:

(1) Service areas for Block A (1710-1720 MHz and 2110-2120 MHz) are based on Economic Areas (EAs) as defined in paragraph (a) of this section.

(2) Service areas for Blocks B (1720-1730 MHz and 2120-2130 MHz), C (1730-1735 MHz and 2130-2135 MHz), and E (1740-1755 MHz and 2140-2155 MHz) are based on Regional Economic Area Groupings (REAGs) as defined by paragraph (a) of this section.

(3) Service areas for Block D (1735-1740 MHz and 2135-2140 MHz) are based on cellular markets comprising Metropolitan Statistical Areas (MSAs) and Rural Service Areas (RSAs) as defined by Public Notice Report No. CL-92-40 "Common Carrier Public Mobile Services Information, Cellular MSA/RSA Markets and Counties," dated January 24, 1992, DA 92-109, 7 FCC Rcd 742 (1992), with the following modifications:

(i) The service areas of cellular markets that border the U.S. coastline of the Gulf of Mexico extend 12 nautical miles from the U.S. Gulf coastline.

(ii) The service area of cellular market 306 that comprises the water area of the Gulf of Mexico extends from 12 nautical miles off the U.S. Gulf coast outward into the Gulf.

8. Section 27.11 is amended by adding a new paragraph (i) to read as follows:

§ 27.11 Initial authorization.

* * * * *

(i) *1710-1755 MHz and 2110-2155 MHz bands.* Initial authorizations for the 1710-1755 MHz and 2110-2155 MHz bands shall be for 5, 10 or 15 megahertz of spectrum in each band in accordance with § 27.5(h) of this part.

(1) Authorizations for Block A, consisting of two paired channels of 10 megahertz each, will be based on those geographic areas specified in § 27.6(h)(1).

(2) Authorizations for Block B, consisting of two paired channels of 10 megahertz each, will be based on those geographic areas specified in § 27.6(h)(2).

(3) Authorizations for Block C, consisting of two paired channels of 5 megahertz each, will be based on those geographic areas specified in § 27.6(h)(2).

(4) Authorizations for Block D, consisting of two paired channels of 5 megahertz each, will be based on those geographic areas specified in § 27.6(h)(3).

(5) Authorizations for Block E, consisting of two paired channels of 15 megahertz each, will be based on those geographic areas specified in § 27.6(h)(2).

9. Section 27.13 is amended by adding a new paragraph (g) to read as follows:

§ 27.13 License period.

* * * * *

(g) *1710-1755 MHz and 2110-2155 MHz bands.* Authorizations for the 1710-1755 MHz and 2110-2155 MHz bands will have a term not to exceed ten years from the date of initial issuance or renewal, except that authorizations issued on or before December 31, 2009, shall have a term of fifteen years.

10. Section 27.14 is amended by revising paragraph (a) as follows:

§ 27.14 Construction requirements; Criteria for comparative renewal proceedings.

(a) AWS and WCS licensees must make a showing of "substantial service" in their license area within the prescribed license term set forth in § 27.13. * * *

* * * * *

11. Section 27.15 is amended by revising subparagraph (2) of paragraph (a) as follows:

§ 27.15 Geographic partitioning and spectrum disaggregation.

* * * * *

(2) AWS and WCS licensees may apply to partition their licensed geographic service area or disaggregate their licensed spectrum at any time following the grant of their licenses.

* * * * *

12. Section 27.50 is amended by re-designating paragraph (d) as paragraph (e), and adding a new paragraph (d) to read as follows:

§ 27.50 Power and antenna height limits.

* * * * *

(d) The following power and antenna height requirements apply to stations transmitting in the 1710-1755 MHz and 2110-2155 MHz bands:

(1) Fixed and base stations transmitting in the 2110-2155 MHz band are limited to a peak effective isotropic radiated power (EIRP) of 1640 watts and a peak output power of 100 watts.

(2) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to a peak EIRP of 1 watt. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground, and mobile and portable stations must employ a means for limiting power to the minimum necessary for successful communications.

* * * * *

13. Section 27.53 is amended by re-designating paragraphs (g), (h), (i), (j), and (k) as paragraphs (h), (i), (j), (k), and (l), respectively, and adding a new paragraph (g) to read as follows:

§ 27.53 Emission limits.

* * * * *

(g) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(3) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

* * * * *

14. Section 27.55 is amended to read as follows:

§ 27.55 Signal strength limits.

(a) *Field strength limits.* For the following bands, the predicted or measured median field strength at any location on the geographical border of a licensee's service area shall not exceed the value specified unless the adjacent affected service area licensee(s) agree(s) to a different field strength. This value applies to both the initially offered service areas and to partitioned service areas.

(i) 2110-2155, 2305-2320 and 2345-2360 MHz bands: 47 dB μ V/m.

(ii) 698-764 and 776-794 MHz bands: 40 dB μ V/m.

(iii) The paired 1392-1395 MHz and 1432-1435 MHz bands and the unpaired 1390-1392 MHz band (1.4 GHz band): 47 dB μ V/m.

(b) *Power flux density limit.* For base and fixed stations operating in the 698-746 MHz band, with an effective radiated power (ERP) greater than 1 kW, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

15. Section 27.57 is amended by adding a new paragraph (c) to read as follows:

§ 27.57 International coordination.

* * * * *

(c) Operation in the 1710-1755 MHz and 2110-2155 MHz bands is subject to international agreements with Mexico and Canada.

16. Section 27.63 is amended to read as follows:

§ 27.63 Disturbance of AM broadcast station antenna patterns.

AWS and WCS licensees that construct or modify towers in the immediate vicinity of AM broadcast stations are responsible for measures necessary to correct disturbance of the AM station antenna pattern which causes operation outside of the radiation parameters specified by the FCC for the AM station, if the disturbance occurred as a result of such construction or modification.

(a) *Non-directional AM stations.* If tower construction or modification is planned within 1 kilometer (0.6 mile) of a non-directional AM broadcast station tower, the AWS or WCS licensee must notify the licensee of the AM broadcast station in advance of the planned construction or modification. Measurements must be made to determine whether the construction or modification would affect the AM

station antenna pattern. The AWS or WCS licensee is responsible for the installation and continued maintenance of any detuning apparatus necessary to restore proper non-directional performance of the AM station tower.

(b) *Directional AM stations.* If tower construction or modification is planned within 3 kilometers (1.9 miles) of a directional AM broadcast station array, the AWS or WCS licensee must notify the licensee of the AM broadcast station in advance of the planned construction or modification. Measurements must be made to determine whether the construction or modification would affect the AM station antenna pattern. The AWS or WCS licensee is responsible for the installation and continued maintenance of any detuning apparatus necessary to restore proper performance of the AM station array.

17. A new subpart L is added to read as follows:

Subpart L – 1710-1755 MHz and 2110-2155 MHz Bands

LICENSING AND COMPETITIVE BIDDING PROVISIONS

§ 27.1101 1710-1755 MHz and 2110-2155 MHz bands subject to competitive bidding.

Mutually exclusive initial applications for 1710-1755 MHz and 2110-2155 MHz band licenses are subject to competitive bidding. The general competitive bidding procedures set forth in 47 C.F.R. Part 1, Subpart Q will apply unless otherwise provided in this subpart.

§ 27.1102 Designated Entities.

(a) Eligibility for small business provisions.

(1) A small business is an entity that, together with its affiliates, its controlling interests and the affiliates of its controlling interests, has average gross revenues that are not more than \$40 million for the preceding three years.

(2) A very small business is an entity that, together with its affiliates, its controlling interests and the affiliates of its controlling interests, has average gross revenues that are not more than \$15 million for the preceding three years.

(b) Bidding credits.

(1) A winning bidder that qualifies as a small business, as defined in this section, or a consortium of small businesses may use a bidding credit of 15 percent, as specified in § 1.2110(f)(2)(iii), to lower the cost of its winning bid on any of the licenses in this part.

(2) A winning bidder that qualifies as a very small business, as defined in this section, or a consortium of very small businesses may use a bidding credit of 25 percent, as specified in § 1.2110(f)(2)(ii), to lower the cost of its winning bid on any of the licenses in this part.

RELOCATION OF INCUMBENTS

§ 27.1111 Relocation of fixed microwave service licensees in the 2110-2150 MHz band.

Part 101, subpart B of the Commission's rules contains provisions governing the relocation of incumbent fixed microwave service licensees in the 2110-2150 MHz band.

PROTECTION OF INCUMBENT OPERATIONS

§ 27.1131 Protection of Part 101 operations.

All AWS licensees, prior to initiating operations from any base or fixed station, must coordinate their frequency usage with co-channel and adjacent channel incumbent, Part 101 fixed-point-to-point microwave licensees operating in the 2110-2155 MHz band. Coordination shall be conducted in accordance with the provisions of section 24.237 of this title.

§ 27.1132 Protection of Part 21 operations.

All AWS licensees, prior to initiating operations from any base or fixed station, must coordinate their frequency usage with co-channel and adjacent channel incumbent Part 21 MDS licensees operating in the 2150-2155 MHz band. In the event that AWS and MDS licensees cannot reach agreement in coordinating their facilities, either licensee may seek the assistance of the Commission, and the Commission may then, at its discretion, impose requirements on either or both parties.

§ 27.1133 Protection of Part 74 and Part 78 operations.

AWS operators must protect previously licensed Broadcast Auxiliary Service (BAS) or Cable Television Radio Service (CARS) operations in the adjacent 2025-2110 MHz band. In satisfying this requirement AWS licensees must, before constructing and operating any base or fixed station, determine the location and licensee of all BAS or CARS stations authorized in their area of operation, and coordinate their planned stations with those licensees. In the event that mutually satisfactory coordination agreements cannot be reached, licensees may seek the assistance of the Commission, and the Commission may, at its discretion, impose requirements on one or both parties.

§ 27.1134 Protection of Federal Government operations.

(a) *Protection of Department of Defense operations in the 1710-1755 MHz band.* The Department of Defense (DoD) operates communications systems in the 1710-1755 MHz band at 16 protected facilities, nationwide. AWS licensees must accept any interference received from these facilities and must protect the facilities from interference. AWS licensees shall protect the facilities from interference by restricting the operation of their base and fixed stations from any locations that could potentially permit AWS mobile, fixed, and portable stations transmitting in the 1710-1755 MHz band to cause interference to government operations within the radii of operation of the 16 facilities (the radii of operation of each facility is indicated in the third column of Table 1 immediately following paragraph (a)(3) of this section). In addition, AWS licensees shall be required to coordinate any operations that could permit mobile, fixed, and portable stations to operate in the specified areas of the 16 facilities, as defined in paragraph (a)(3) of this section. Protection of these facilities in this manner shall take place under the following conditions:

(1) At the Yuma, Arizona and Cherry Point, North Carolina facilities, all operations shall be protected indefinitely.

(2) At the remaining 14 facilities, airborne and military test range operations shall be protected until such time as these systems are relocated to other spectrum, and precision guided munitions (PGM)

operations shall be protected until such time as these systems are relocated to other spectrum or until PGM inventory at each facility is exhausted, whichever occurs first.

(3) AWS licensees whose transmit operations in the 1710-1755 MHz band consist of fixed or mobile operations with nominal transmit EIRP values of 100 mW or less and antenna heights of 1.6 meters above ground or less shall coordinate their services around the 16 sites at the distance specified in row a) of Table 2, below. AWS licensees whose transmit operations in the 1710-1755 MHz band consist of fixed or mobile operations with nominal transmit EIRP values of 1 W or less and antenna heights of 10 meters above ground or less shall coordinate their services around the 16 sites at the distance specified in row b) of Table 2, below. These coordination distances shall be measured from the edge of the operational distances indicated in the third column of Table 1, and coordination with each affected DoD facility shall be accomplished through the Commander of the facility.

TABLE 1: PROTECTED DEPARTMENT OF DEFENSE FACILITIES.

Location	Coordinates	Radius of Operation (km)
Cherry Point, NC.....	34° 58' N 076° 56' W	100
Yuma, AZ.....	32° 32' N 113° 58' W	120
China Lake, CA.....	35° 41' N 117° 41' W	120
Eglin AFB, FL.....	30° 29' N 086° 31' W	120
Pacific Missile Test Range/Point Mugu, CA	34° 07' N 119° 30' W	80
Nellis AFB, NV.....	36° 14' N 115° 02' W	160
Hill AFB, UT.....	41° 07' N 111° 58' W	160
Patuxent River, MD.....	38° 17' N 076° 25' W	80
White Sands Missile Range, NM.....	33° 00' N 106° 30' W	80
Fort Irwin, CA.....	35° 16' N 116° 41' W	50
Fort Rucker, AL.....	31° 13' N 085° 49' W	50
Fort Bragg, NC.....	35° 09' N 079° 01' W	50
Fort Campbell, KY.....	36° 41' N 087° 28' W	50
Fort Lewis, WA.....	47° 05' N 122° 36' W	50
Fort Benning, GA.....	32° 22' N 084° 56' W	50
Fort Stewart, GA.....	31° 52' N 081° 37' W	50

TABLE 2: COORDINATION DISTANCES FOR THE PROTECTED DEPARTMENT OF DEFENSE FACILITIES.

1710-1755 MHz Transmit Operations	Coordination Distance (km)
a) EIRP ≤ 100 mW, antenna height ≤ 1.6 m AG	35
b) EIRP ≤ 1 W, antenna height ≤ 10 m AG	55

(b) *Protection of non-DoD operations in the 1710-1755 MHz and 1755-1761 MHz bands.* Until such time as non-DoD systems operating in the 1710-1755 MHz and 1755-1761 MHz bands are relocated to other spectrum, AWS licensees shall protect such systems by satisfying the appropriate provisions of TIA Telecommunications Systems Bulletin 10-F, "Interference Criteria for Microwave Systems," May, 1994 (TSB 10-F).

(c) *Protection of Federal Government operations below 1710 MHz.* AWS licensees operating fixed stations in the 1710-1755 MHz band, if notified that such stations are causing interference to radiosonde receivers operating in the Meteorological Aids Service in the 1675-1700 MHz band or a meteorological-satellite earth receiver operating in the Meteorological-Satellite Service in the 1675-1710 MHz band, shall be required to modify the stations' location and/or technical parameters as necessary to eliminate the interference.

(d) *Recognition of NASA Goldstone facility operations in the 2110-2120 MHz band.* The National Aeronautics and Space Administration (NASA) operates the Deep Space Network (DSN) in the 2110-2120 MHz band at Goldstone, California (see Table 3). NASA will continue its operations of high power transmitters (nominal EIRP of 105.5 dBW with EIRP up to 119.5 dBW used under emergency conditions) in this band at this location. AWS licensees must accept any interference received from the Goldstone DSN facility in this band.

TABLE 3: LOCATION OF THE NASA GOLDSTONE DEEP SPACE FACILITY.

Location	Coordinates	Maximum Transmitter Output Power
Goldstone, California	35° 18' N 116° 54' W	500 kW

§ 27.1135 Protection of non-Federal Government Meteorological-Satellite operations.

AWS licensees operating fixed stations in the 1710-1755 MHz band, if notified that such stations are causing interference to meteorological-satellite earth receivers operating in the Meteorological-Satellite Service in the 1675-1710 MHz band, shall be required to modify the stations' location and/or technical parameters as necessary to eliminate the interference.

APPENDIX D: PROPAGATION FORMULAS

Basic Formula for Calculating Field Strength at a Distance

$$FS = 107.2 + Pt + 20 \log f - PL$$

where: FS is the field strength at the receiving antenna location, in dB μ V/m

Pt is the equivalent isotropically radiated power of the transmitting station, in dBw

(i.e., $Pt = 10 \log \text{EIRP}$, where EIRP is the equivalent isotropically radiated power, in watts)

f is the transmitter carrier frequency, in MHz

PL is the path loss between isotropic antennas, in dB

Note: The value of PL is a function of the distance between the transmitting and receiving antennas and the particular propagation model utilized, which may incorporate factors such as the transmitting and receiving antenna heights, the frequency of the transmitted wave, environmental (building heights, clutter) and/or topographical (terrain) features.

Formulas for Calculating Path Loss Between Isotropic Antennas for Certain Propagation Models

Extended COST231-Hata Model

The Extended COST231-Hata model is appropriate for calculating path loss of the forward link for base stations using antennas above the rooftop levels of adjacent buildings, and transmitting in the 1500 to 2000 MHz frequency range.

$$PL = 46.3 + 33.9 \log f - 13.82 \log Ht - a + (44.9 - 6.55 \log Ht) \log d + C$$

where: PL is the median path loss between isotropic antennas, in dB

f is the transmitter carrier frequency, in MHz

Ht is the effective height of the transmitting antenna, in meters

Note: $30 \text{ m} \leq Ht \leq 200 \text{ m}$

d is the distance to the receiving antenna, in kilometers

Note: $1 \text{ km} \leq d \leq 20 \text{ km}$

a is attenuation, in dB, as a function of the receiving antenna height, Hr , in meters:

For a small or medium-sized city:

$$a = (1.1 \log f - 0.7) Hr - (1.56 \log f - 0.8)$$

For a large city:

$$a = 3.2 (\log 11.75 Hr)^2 - 4.97$$

Note: $1 \text{ m} \leq Hr \leq 10 \text{ m}$

C is a correction factor to account for building and tree density:

$C = 0 \text{ dB}$ for medium-sized cities and suburban areas

$C = 3 \text{ dB}$ for metropolitan centers

Plane Earth Model

The plane earth (or two-ray) model is a simple model that is appropriate for calculating path loss between two antennas separated by a few tens of kilometers over flat terrain where ground reflection can be assumed. With this model, the path loss is independent of the transmitting frequency.

$$PL = 119.4 + 40 \log d - 20 \log Ht - 20 \log Hr$$

where: PL is the path loss between isotropic antennas, in dB
 H_t is the effective height of the transmitting antenna, in meters
 H_r is the effective height of the receiving antenna, in meters
 d is the distance to the receiving antenna, in kilometers

Note: $d \gg H_t, H_r$

Free Space Model

The free space (or geometric spreading) model is a simple model that is appropriate for calculating path loss between two antennas that have an unobstructed line-of-sight and are high enough such that ground reflection is not a significant factor. It is also useful for worst-case analysis.

$$PL = 32.44 + 20 \log d + 20 \log f$$

where: PL is the path loss between isotropic antennas, in dB
 d is the distance to the receiving antenna, in kilometers
 f is the transmitter carrier frequency, in MHz

**SEPARATE STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: Report and Order in the Matter of Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands

The 90 MHz of additional licensed spectrum made available today is a key building block for the broadband Internet future of licensed wireless service. Across the country, wireless providers -- from Verizon Wireless in Washington DC to Monet Mobile Networks in the Dakotas -- are increasingly utilizing their licensed spectrum holdings to build infrastructure to support Internet applications. Another ninety megahertz of spectrum will add momentum to that important trend. Wireless broadband internet deployment will bring valuable new services to consumers, stimulate economic activity, improve national productivity, increase investment, create jobs and advance many other worthy objectives -- such as improving education and enhancing rural communications.

Our service rules also reflect several key principles for efficient use of spectrum as noted by the Commission's Spectrum Policy Task Force, including:

- maximizing the flexibility of licensees to choose the types and characteristics of the services that they will offer in their licensed spectrum;
- grouping like spectrum uses together so that technically compatible operations remain close to one another; and
- defining spectrum users' rights and responsibilities in the clearest manner possible.

The migration to a more market-oriented approach will not always prove easy. Today's Order, with its emphasis on flexibility, compatibility and clear definitions of rights, demonstrates how better rules can create better, more reliable, more affordable services for American consumers.

Our decision also designates spectrum for smaller license areas that may be particularly useful in rural America. Over the past few months, I have outlined a vision for competition and innovation in rural telecommunications. Central to that vision is increasing the spectrum resources available in rural America -- we also advance that goal today.

Finally, I would like to thank the National Telecommunications and Information Administration (NTIA) for their extraordinary leadership and partnership in bringing this proceeding to closure. Without our common commitment and goals, these spectrum resources would never have been made available for commercial use.

**SEPARATE STATEMENT OF
COMMISSIONER MICHAEL J. COPPS**
Approving in Part, Concurring in Part

Re: Report and Order in the Matter of Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands

Advanced Wireless Services, such as 3G and IMT-2000, obviously hold tremendous potential for consumers. I join my colleagues and the Bureau in hopes that these service rules and the auction process will bring about a robust and efficient use of this spectrum, which is exactly what we are supposed to be encouraging. I also hope that as we design the specifics of the auction, we will work hard to learn from those countries where the 3G rollout is moving ahead successfully and from countries where 3G auctions may have contributed to problems.

While I approve of the majority of this Order, I have serious concern with the Commission's decision to move ahead without consolidation protections in the form of a spectrum aggregation limit. Under the rules we adopt today, one company could apparently end up controlling the entire AWS band in a city or a geographic region, leaving no AWS spectrum for competitors. That's a result I do not like. But we have arrived at this point because the Commission eliminated the overall spectrum cap more than a year ago, in a decision from which I dissented. So the Commission has already crossed the Rubicon. Establishing a limit for one band alone will not fix the larger mistake that we have already made. Consumers benefit from the competition that we enjoy in wireless services today, and we should protect it. So I continue to believe that we would be better served by protection against one company dominating too much spectrum in a particular city or region, and my concurrence instead of approval is intended to make this point.

Thank you.

**SEPARATE STATEMENT OF
COMMISSIONER KEVIN J. MARTIN**

Re: Report and Order in the Matter of Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands

I am pleased to support this item, which adopts service rules for advanced wireless services in the 1.7 GHz and 2.1 GHz bands. The flexible rules we adopt allow the two 45 MHz blocks of contiguous spectrum at issue to be used for a range of advanced wireless services. The wireless industry is already on the forefront in offering innovative new services, and it continues to make advances that will bring exciting new applications to consumers. For example, since we issued the notice of proposed rulemaking in this proceeding, camera phones, which send digital pictures to other phones or computers at the touch of a button, have become widely available. There are also phones that play MP3s, run video games, and connect to the Internet with ease. Better and faster services are becoming available every day.

A crucial ingredient to these services, however, is sufficient spectrum. This Order provides some of that spectrum, allowing a significant amount of spectrum to be used for services such as expanded voice, data, and broadband applications provided over high-speed fixed and mobile networks – applications often called “third generation” or “3G.” This item should thus lead to substantial consumer benefits, as new and better quality services develop in the 1.7 GHz and 2.1 GHz bands.

I would like to once again commend all of the different parts of government for working together to make this happen. In particular, the National Telecommunications and Information Administration deserves praise for spearheading this effort. NTIA, working with the Department of Defense, the State Department, the Office of Management and Budget, and the FCC’s staff, developed the blueprint for making this spectrum available. They accomplished a major step in ensuring that new and innovative wireless services will be available to American consumers.

**SEPARATE STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

Re: Report and Order in the Matter of Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands

Today is a banner day for wireless service in the United States. By adopting service and technical rules for Advanced Wireless Services in the 1.7 and 2.1 GHz bands, we are moving a step closer to seeing a new generation of wireless services in this country, including the so-called third generation or 3G mobile systems. I think our item represents just the right framework for further innovation in the wireless arena by promoting continued industry development while employing a light regulatory touch.

Determining a band plan is an inexact science, at best. I believe that the Commission should continue to improve the availability of spectrum to those providers who want to serve smaller areas. Though, we have been making great strides in this area recently through such work as our rural wireless NPRM and our secondary markets proceeding.

I have been concerned that large license areas raise auction prices so high that many companies that want to serve smaller areas cannot even afford to make a first bid. Large service areas also can have the effect of creating swaths of fallow spectrum in areas outside of our nation's populated service areas. Licensees, no matter how large their service areas are, understandably focus their resources on serving the more-populated metropolitan areas.

I certainly recognize that there is value in offering larger service areas for economies of scale and to facilitate larger scale deployments. Indeed, one of the noteworthy developments of the wireless industry over the past several years is the development of the so-called "nationwide" carriers. However, I believe we should find a balance in developing a band plan, and I am pleased to note that a diverse group of commenters in this proceeding supported different sizes of license areas for different blocks of the spectrum.

I believe we got the balance right here. I am especially pleased that the band plan we adopt today not only provides for several licenses to be available on a Regional Economic Area Grouping basis, but also provides for a 2x5 MHz block of spectrum on a RSA/MSA basis and a 2x10 MHz block of spectrum on an Economic Area basis.

In providing a balance of smaller and larger areas, we hopefully offer something for everyone.

Finally, I also am pleased to support the technical and service rules that are in this item. In combining the flexibility of Part 27, with the proven technical rules of Part 24, I believe that we have put in place just the right regulatory framework. I said back in April that our PCS service rules should prove a model for our future regulatory efforts for licensed mobile services, and am pleased to support this aspect of our item today.

Exhibit 1028

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
Service Rules for the 698-746, 747-762	)	WT Docket No. 06-150
and 777-792 MHz Bands	)	
	)	
Revision of the Commission's Rules to Ensure	)	CC Docket No. 94-102
Compatibility with Enhanced 911 Emergency	)	
Calling Systems	)	
	)	
Section 68.4(a) of the Commission's Rules	)	WT Docket No. 01-309
Governing Hearing Aid-Compatible Telephones	)	
	)	
Biennial Regulatory Review – Amendment of	)	WT Docket No. 03-264
Parts 1, 22, 24, 27, and 90 to Streamline and	)	
Harmonize Various Rules Affecting Wireless	)	
Radio Services	)	
	)	
Former Nextel Communications, Inc.	)	WT Docket No. 06-169
Upper 700 MHz Guard Band Licenses	)	
and Revisions to Part 27 of the	)	
Commission's Rules	)	
	)	
Implementing a Nationwide, Broadband,	)	PS Docket No. 06-229
Interoperable Public Safety Network in	)	
the 700 MHz Band	)	
	)	
Development of Operational, Technical and	)	WT Docket No. 96-86
Spectrum Requirements for Meeting Federal,	)	
State and Local Public Safety Communications	)	
Requirements Through the Year 2010	)	

REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING

Adopted: April 25, 2007

Released: April 27, 2007

By the Commission: Chairman Martin and Commissioners Copps, Adelstein, Tate and McDowell issuing separate statements.

Comment Date: [21 days after publication in the Federal Register]

Reply Comment Date: [28 days after publication in the Federal Register]

TABLE OF CONTENTS

Heading	Paragraph #
I. INTRODUCTION	1
II. BACKGROUND	13

A. DTV Transition and Reclamation of the 700 MHz Band	14
B. 700 MHz Commercial Services Proceeding	18
C. 700 MHz Guard Bands Proceeding	23
D. 700 MHz Public Safety Proceeding	25
E. Frontline Proposal	30
III. REPORT AND ORDER	31
A. 700 MHz Commercial Services	32
1. Background	34
2. Discussion	37
a. Facilitating Access to Spectrum and Provision of Service to Consumers	37
(i) Mix of Geographic Service Area Sizes	38
(ii) Secondary Markets	50
b. Auctions-Related Issues	56
(i) Aggregating Licenses	56
(ii) Bidding Preferences	59
(iii) Competitive Bidding and Aggregating New Licenses	67
(iv) Modifications to the Tribal Land Bidding Credit	70
c. Additional Rules for Licensees	73
(i) Criteria for Renewal	73
(ii) License Terms	78
(iii) Power Limits for Lower 700 MHz Band and Upper 700 MHz Commercial Services Band Base Stations	88
(iv) Power Limit Issues in WT Docket No. 03-264	103
(v) Other Technical Issues	107
(vi) 911/E911 Requirements	120
(vii) Hearing Aid-Compatible Wireless Handsets	137
B. 700 MHz Guard Bands	151
1. Background	152
2. Discussion	156
a. Adoption of Secondary Markets Spectrum Leasing Rules	157
b. Use and Operational Flexibility	163
IV. FURTHER NOTICE OF PROPOSED RULEMAKING	169
A. Introduction	169
B. Discussion	171
1. 700 MHz Band Commercial Services	176
a. Lower 700 MHz Band	177
b. Upper 700 MHz Commercial Services Band	182
(i) Proposals Based on Elimination of the Guard Band B Block	184
(ii) Proposals Based on Modified 700 MHz Guard Bands	194
c. Performance Requirements	207
d. Incumbent Eligibility	221
2. 700 MHz Guard Bands	222
a. Band Plan Proposals	222
b. Other Guard Band Issues	243
3. Competitive Bidding Procedures	246
4. 700 MHz Public Safety Spectrum	250
a. Broadband	251
b. Band Plan Issues	254
c. Power Limits for Public Safety Broadband	266
5. Frontline's Proposal	268
V. PROCEDURAL MATTERS	291
A. Final Regulatory Flexibility Analysis	291

B. Final Paperwork Reduction Act of 1995 Analysis.....	292
C. Initial Regulatory Flexibility Analysis.....	293
D. Initial Paperwork Reduction Act Analysis of 1995 Analysis	294
E. Other Procedural Matters.....	295
1. Ex Parte Presentations.....	295
2. Comment Filing Procedures	296
3. Accessible Formats.....	299
VI. ORDERING CLAUSES.....	300
APPENDICES:	
Appendix A – List of Comments and Reply Comments	
Appendix B – Rule Changes	
Appendix C – Final Regulatory Flexibility Analysis	
Appendix D – Initial Regulatory Flexibility Analysis	

I. INTRODUCTION

1. In this Report and Order and Further Notice of Proposed Rulemaking (“Further Notice”), we address rules governing wireless licenses in the 698-806 MHz Band (herein, the “700 MHz Band”). This spectrum currently is occupied by television broadcasters in TV Channels 52-69 and is being made available for wireless services, including public safety and commercial services, as a result of the digital television (“DTV”) transition.

2. We are revisiting these rules due to the significant changes that have occurred over the past several years in the statutory framework governing this spectrum, the continuing advances in a rapidly developing market for wireless communications, and the needs of the public safety community. Perhaps most importantly, the Digital Television Transition and Public Safety Act of 2005 (“DTV Act”)¹ set a firm deadline for the end of the DTV transition of February 17, 2009, at which time this spectrum will be fully available for public safety as well as commercial wireless services. It is incumbent on the Commission to take all the steps necessary to make this spectrum effectively available to both public safety as well as commercial licensees as of the end of the DTV transition. In addition, the DTV Act established two specific statutory deadlines for the auction of the 60 megahertz of “recovered analog” spectrum in the 700 MHz Band: (1) the auction must begin no later than January 28, 2008, and (2) the auction proceeds must be deposited in the Digital Television Transition and Public Safety Fund by June 30, 2008.

3. The past several years also have seen substantial changes in the wireless communications market. Many innovative wireless services and technologies have emerged, while at the same time prices have fallen, to the benefit of consumers. For example, in the past five years, there have been 100 million new subscribers to mobile telephony services.² There also has been unprecedented growth in the demand for and the provision of wireless broadband services. This may be seen in the number of Americans using mobile devices capable of accessing the Internet at broadband speeds, which has grown from fewer than 100,000 in June 2000 to over 11 million in June 2006.³ Among the providers serving these consumers,

¹ See Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) (“DRA”). Title III of the DRA is the DTV Act.

² During the past five years, the number of new mobile telephone subscribers rose by more than 100 million, from 118.4 million in June 2001 to 219.4 million in June 2006. This represents an 85 percent increase in the total number of subscribers. See “Annualized Wireless Industry Survey Results – June 1985 to June 2006,” CTIA’s Semi-Annual Wireless Industry Survey, CTIA – The Wireless Association, *available at* http://files.ctia.org/pdf/CTIA_Survey_Year_End_2006_Graphics.pdf

³ *High-Speed Services for Internet Access: Status as of June 30, 2006*, Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission (Jan. 2007) at Table 1.

those offering mobile wireless broadband services now operate in counties containing 63 percent of the population of the country.⁴

4. Similarly, the needs of those who use public safety spectrum also have evolved in recent years. As described below, we are particularly cognizant of the benefits to the public safety community of wireless broadband services. We expect that modern public safety services will increasingly depend on the advanced communications provided by wireless broadband technology to enable public safety entities to perform their vital safety-of-life and other critical roles.

5. The Commission has been considering rules related to the use of this spectrum in three ongoing proceedings: (1) the 700 MHz Commercial Services proceeding,⁵ (2) the 700 MHz Guard Bands proceeding,⁶ and (3) the 700 MHz Public Safety proceeding.⁷ Because decisions on certain issues in the three proceedings are potentially interrelated, we address them jointly in this Report and Order and Further Notice. In so doing, we seek to promote access to 700 MHz Band spectrum and the provision of service to consumers across the country, including in rural areas, as well as opportunities for broadband service for public safety users. We are seeking expedited comment on the issues in the Further Notice, with the intent of finalizing the key decisions quickly given our auction-related statutory deadlines.

6. In the Report and Order, we make a wide variety of decisions on key issues presented in the 700 MHz Commercial Services and the 700 MHz Guard Bands proceedings.⁸ With regard to the 700 MHz Commercial Services proceeding, we decide to adopt a mix of geographic license area sizes for the commercial services, including Cellular Market Areas (CMAs), Economic Areas (EAs), and Regional Economic Areas (REAGs). With regard to auctions-related issues, we find that our existing competitive bidding rules do not require modification for purposes of an auction of commercial 700 MHz Band licenses. To minimize uncertainty for licensees in this band, we eliminate the rules that permit comparative hearings for license renewal and clarify the requirements and procedures of the renewal process for 700 MHz Band licensees. In addition, we shift the termination date for initial license terms from January 15, 2015, to February 17, 2019, thus giving licensees an initial term not to exceed ten years after the end of the DTV transition. With regard to radiated power limits, we generally adopt a power spectral density (PSD) model, with certain limitations, to provide greater operational flexibility to

⁴ The FCC estimates that as of mid-2006, the mobile broadband network technologies CDMA EV-DO and WCDMA/HSDPA had been deployed in counties containing 63 percent and 20 percent of the U.S. population, respectively. See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, WT Docket No. 06-17, *Eleventh Report*, 21 FCC Rcd 10947, 10995 ¶ 117 (2006) (*Eleventh CMRS Competition Report*).

⁵ See Service Rules for the 698-749, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems and Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, CC Docket No. 94-102, WT Docket No. 01-309, *Notice of Proposed Rule Making, Fourth Further Notice of Proposed Rule Making, and Second Further Notice of Proposed Rule Making*, 21 FCC Rcd 9345 (2006) (*700 MHz Commercial Services Notice*).

⁶ See Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket Nos. 06-169 and 96-86, *Notice of Proposed Rule Making*, 21 FCC Rcd 10413 (2006) (*700 MHz Guard Bands Notice*).

⁷ See Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, PS Docket No. 06-229, WT Docket No. 96-86, *Ninth Notice of Proposed Rulemaking*, 21 FCC Rcd 14837 (2006) (*700 MHz Public Safety Ninth Notice*); Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, *Eighth Notice of Proposed Rulemaking*, 21 FCC Rcd 3668 (2006) (*700 MHz Public Safety Eighth Notice*).

⁸ See *infra* Section III.

licensees operating at wider bandwidths, and we provide for higher radiated power levels for these 700 MHz Band licensees operating in rural areas. We continue to allow a 50 kW ERP level for base station operations for already auctioned licenses and for unpaired spectrum in the “Lower 700 MHz Band” (TV Channels 52-59) but conclude that we should modify such power limits for paired spectrum in that Band to match the limits adopted for the “Upper 700 MHz Band” (TV Channels 60-69) in order to better enable mobile service on that paired spectrum. In addition, in order to accommodate emerging technologies, we permit these 700 MHz licensees to meet radiated power limits on an average, rather than peak, basis.⁹

7. In the 700 MHz Commercial Services proceeding, we also modify our 911/E911 rules to remove the service- and band-specific limitations on the applicability of those requirements. As amended, these rules will apply to all commercial mobile radio services (CMRS), no matter what spectrum is employed, to the extent that a service meets the scope requirements in our current rules.¹⁰ Similarly, we find generally that all digital CMRS providers, including providers in the 700 MHz, Advanced Wireless Services (AWS), and the Broadband Radio Service/Educational Broadband Service (BRS/EBS) bands, along with manufacturers of handsets capable of providing such services, should be subject to our hearing aid compatibility requirements to the extent that a service satisfies the scope provision in our current rules, and we amend our rules to incorporate this finding. By statute, however, we cannot impose hearing aid compatibility requirements for a band or service until applicable technical standards have been established. In recognition of the pressing need to develop applicable technical standards in certain frequency bands for which service rules have been or will soon be established, and given that the process of developing such standards has already commenced, we establish a 24-month timetable for the development of standards in these bands by all interested stakeholders.¹¹

8. With regard to the 700 MHz Guard Bands proceeding, we adopt certain measures to encourage the most effective and efficient use of the spectrum designated as guard bands in the 700 MHz Band (“Guard Bands spectrum”). Specifically, we replace the current “band manager” leasing regime with the spectrum leasing policies and rules adopted in the Secondary Markets proceeding to provide Guard Band licensees and spectrum users additional flexibility to enter into spectrum leasing agreements. We also eliminate restrictions that prevented Guard Band licensees from using their spectrum as a wireless service provider and restricted their ability to lease to affiliates.¹²

9. In the Further Notice, we make proposals that are intended to enable the Commission to offer at auction a wide variety of licenses and best enable the provision of service to consumers across the country. We propose not to alter the spectrum blocks as currently aligned in the Lower 700 MHz Band, and to license the A Block on an EA basis, the B Block on a CMA basis, and the E Block on an REAG basis. As regards the commercial spectrum in the Upper 700 MHz Band, we seek comment on several band plans, and on the appropriate sizes of the license blocks and geographic service areas for these licenses. We also propose new performance requirements for the unauctioned commercial licenses in the 700 MHz Band based on the use of specific geographic coverage benchmarks.

10. We tentatively conclude not to adopt certain proposals in connection with the 700 MHz Guard Bands spectrum, advanced by parties seeking a restructuring of the existing band plan for the Upper 700 MHz Band that would include a reallocation of the Guard Band spectrum, including the

⁹ See *infra* Section III.A.

¹⁰ In conformity with the Commission’s decision in the *E911 Scope Order*, however, we will continue to exclude Mobile Satellite Service (MSS) from the specific requirements of 47 C.F.R. § 20.18. See Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket 94-102, IB Docket No. 99-67, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 25340, 25347-57 ¶¶ 20-39 (2003) (*E911 Scope Order*).

¹¹ See *infra* Section III.A.2.c.

¹² See *infra* Section III.B.

“Broadband Optimization Plan” (hereinafter the “BOP”).¹³ While we are seeking to establish rules and policies that provide licensees greater flexibility where possible, we tentatively conclude that, at least before the end of the DTV transition, we do not have the legal authority to adopt such band reallocation proposals and that such proposals would not serve the public interest. We do, however, seek comment on other measures to promote the most efficient and effective use of the Guard Bands spectrum. Specifically, we seek comment on what additional rule changes we should make to the 700 MHz Guard Bands in the event that we decide not to adopt our proposed commercial services band plan or other proposals under consideration.

11. With regard to the 700 MHz Band spectrum allocated to public safety (“Public Safety spectrum”), we tentatively conclude to redesignate the wideband spectrum to broadband use consistent with a nationwide interoperability standard, and to prohibit wideband operations on a going forward basis.¹⁴ Should we end up adopting this broadband approach, we tentatively conclude to consolidate the 700 MHz Public Safety spectrum, with the narrowband spectrum being consolidated to the top of the public safety allocation, and the broadband spectrum located at the bottom of the public safety allocation.¹⁵ These tentative conclusions, in conjunction with our proposal in the *700 MHz Public Safety Ninth Further Notice* to establish a national public safety licensee, further our efforts to establish nationwide interoperable wireless broadband for public safety.

12. Finally, we seek comment on a proposal, the “Public Safety Broadband Deployment Plan,” recently filed by Frontline Wireless, LLC (“Frontline”).¹⁶ While we have an extensive record on many of the issues raised by Frontline, such as the appropriate size of spectrum blocks, we do not have a record on some of the significant service rule changes Frontline proposes that we adopt for a commercial spectrum block that would be located just adjacent to the current 700 MHz Guard Band B Block. We seek comment on aspects and implications of the Frontline proposal to establish such a record.¹⁷

II. BACKGROUND

13. In this background section, we briefly discuss the DTV transition, which will reclaim the 700 MHz Band for new uses, including commercial and public safety services. We then describe the portions of the 700 MHz Band that will be associated with new commercial and public safety services, as well as guard bands to protect public safety. Finally, we describe a new proposal, very recently submitted by Frontline, that would modify the service rules associated with part of the commercial spectrum.

A. DTV Transition and Reclamation of the 700 MHz Band

14. The frequencies considered in this order are part of 108 megahertz of spectrum in the 700 MHz Band (Television Channels 52-69 in the 698-806 MHz band) that will be made available as part of the digital television (DTV) transition.¹⁸ By the end of this transition, all analog television transmissions in this band will have terminated, and all digital television transmissions will be in the spectrum occupied

¹³ See *infra* Section IV.B.2.

¹⁴ See *infra* Section IV.B.4.

¹⁵ See *id.*

¹⁶ See *infra* Section IV.B.5.

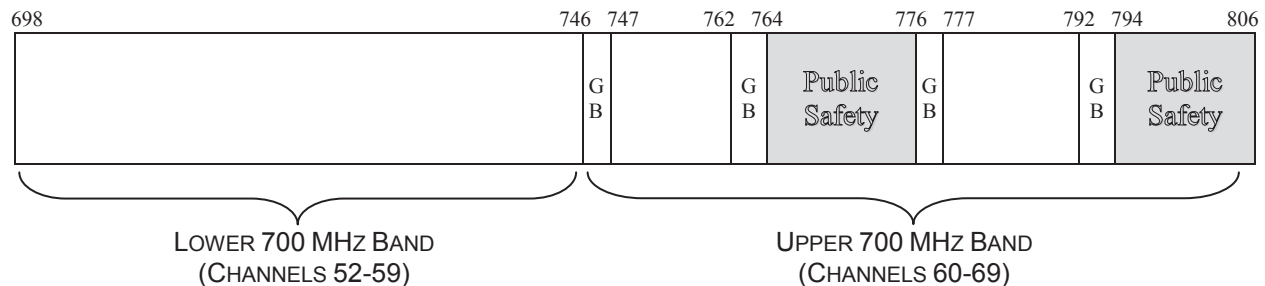
¹⁷ See *id.*

¹⁸ See generally *700 MHz Commercial Services Notice*; *700 MHz Guard Bands Notice*; *700 MHz Public Safety Eighth Notice*.

currently by TV Channels 2-51 (the “core” TV broadcast spectrum). At that time, the 700 MHz Band will be available for new uses, including public safety, commercial, and other new radio services.¹⁹

15. Prior to the DTV Act, the Commission had addressed in separate proceedings the reallocation of the 48 megahertz covering TV Channels 52-59 (“Lower 700 MHz Band”)²⁰ and the 60 megahertz covering TV Channels 60-69 (“Upper 700 MHz Band”). The proceedings addressing the Upper 700 MHz Band divided this 60 megahertz into the 36 megahertz dedicated to commercial use,²¹ including the 6 megahertz comprising the Guard Bands spectrum,²² and the 24 megahertz designated for public safety use.²³ Figure 1 shows the location of Commercial Services, Guard Band, and Public Safety spectrum within the 700 MHz Band.

FIGURE 1 – 700 MHz BAND



16. The Balanced Budget Act of 1997 (“Balanced Budget Act”) required the Commission to reallocate the Upper 700 MHz Band no later than January 1, 1998.²⁴ Specifically, the Balanced Budget Act mandated that the Commission allocate 24 megahertz of spectrum for public safety services in the Upper 700 MHz Band, while allocating the remaining 36 megahertz of spectrum for commercial use, to be assigned by competitive bidding.²⁵ In the Balanced Budget Act, Congress also directed the Commission to “reclaim and organize” additional spectrum beyond the Upper 700 MHz Band, and to do

¹⁹ This recovery of spectrum from existing, analog broadcast use is an important objective of the DTV transition. See Advanced Television Systems and Their Impact upon the Existing Television Broadcast Service, MM Docket No. 87-268, *Sixth Further Notice of Proposed Rule Making*, 11 FCC Rcd 10968, 10977 ¶ 18 (1996).

²⁰ See Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), GN Docket No. 01-74, *Report and Order*, 17 FCC Rcd 1022 (2002) (*Lower 700 MHz Report and Order*); Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), GN Docket No. 01-74, *Memorandum Opinion and Order*, 17 FCC Rcd 11613 (2002) (*Lower 700 MHz MO&O*).

²¹ See Reallocation of Television Channels 60-69, the 746-806 MHz Band, ET Docket No. 97-157, *Report and Order*, 12 FCC Rcd 22953 (1998), *recon.* 13 FCC Rcd 21578 (1998) (*Upper 700 MHz Reallocation Order*); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules, WT Docket No. 99-168, *First Report and Order*, 15 FCC Rcd 476 (2000) (*Upper 700 MHz First Report and Order*).

²² See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10414 ¶ 1 n.1.

²³ See *700 MHz Public Safety Ninth Notice*, 21 FCC Rcd at 14838-39 ¶¶ 5-6; see generally *700 MHz Public Safety Eighth Notice*.

²⁴ See Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 § 3004 (1997) (adding new § 337 of the Communications Act); *Upper 700 MHz Reallocation Order*, 12 FCC Rcd at 22955 ¶ 5.

²⁵ See 47 U.S.C. § 337(a) (enacted by the Balanced Budget Act of 1997 § 3004, which added new Section 337(a) and established an initial timetable for conducting auctions).

so “in a manner consistent with the objectives” of Section 309(j)(3) of the Act.²⁶ While Congress did not specify the amount of spectrum to be reclaimed beyond the Upper 700 MHz Band, the Commission determined that all broadcasters using digital transmission systems could be accommodated in the core TV Channels 2-51. As a result, the 48 megahertz of spectrum in the Lower 700 MHz Band (698-746 MHz) would become available for new services through competitive bidding.²⁷

17. In passing the DTV Act, Congress accelerated the DTV transition by establishing February 17, 2009, as a new firm deadline for the end of the transition.²⁸ Congress also required the Commission to commence the auction of recovered analog broadcast spectrum no later than January 28, 2008, and deposit the proceeds of the auction in the Digital Television Transition and Public Safety Fund no later than June 30, 2008.²⁹ These statutory changes will effectively clear the spectrum in both the Upper and Lower 700 MHz Bands as of February 17, 2009, and consequently eliminate any uncertainty regarding when this spectrum will be available for public safety, commercial, and other wireless services.

B. 700 MHz Commercial Services Proceeding

18. In the 700 MHz Commercial Services proceeding, we sought comment on the 78 megahertz of commercial spectrum in the 698-746, 747-762, and 777-792 MHz bands (“700 MHz Commercial Services Band”).³⁰ The 700 MHz Band also currently includes six megahertz of commercial spectrum in the 746-747/776-777 MHz and 762-764/792-794 MHz bands, the 700 MHz Guard Bands spectrum, designed to protect users in the adjacent 700 MHz Public Safety spectrum. That public safety allocation comprises the remaining 24 megahertz in the 700 MHz Band, and consists of 12 megahertz of narrowband channels (voice and low speed data) and 12 megahertz of wideband (image/high speed data and slow scan video) communications channels. Figure 2 shows the current band plan for the Upper 700 MHz Band. Guard Band licenses (A and B Blocks) were assigned over the 52 Major Economic Areas (MEAs) and the remaining licenses (C and D Blocks) were assigned over the six Economic Areas Groupings (EAGs).³¹ The A and B Blocks (Guard Bands) have been auctioned, while the C and D Blocks have not yet been auctioned.

²⁶ 47 U.S.C. § 309(j)(14)(C)(i)(II) (2005). Among the objectives of Section 309(j) of the Act are “the development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas;” “promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women;” and the “efficient and intensive use of the electromagnetic spectrum.” 47 U.S.C. § 309(j)(3).

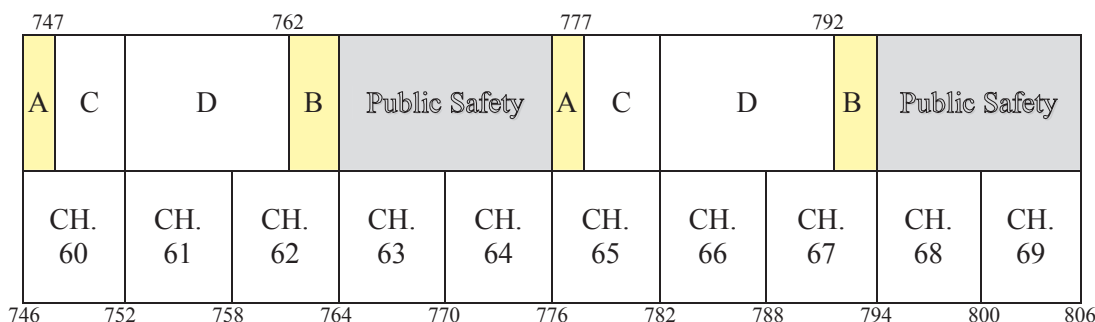
²⁷ See *Advanced Television Systems and Their Impact upon the Existing Television Broadcast Service*, MM Docket No. 87-268, *Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order*, 13 FCC Rcd 7418, 7435-36 ¶ 42 (1998) (*DTV MO&O of the Sixth Report and Order*). The Commission stated that expanding the DTV core spectrum would permit recovery of 108 megahertz of spectrum at the end of the DTV transition period. *Id.* at 7436 ¶ 45.

²⁸ DTV Act § 3002. Prior to the DTV Act, analog broadcasters were required to cease operations in this band by December 31, 2006, but the Commission was required to extend the end of this transition in certain circumstances. Specifically, extensions were to be granted at the request of broadcast licensees on a market-by-market basis if one or more of the four largest network stations or affiliates were not broadcasting in digital, if digital-to-analog converter technology was not generally available, or if 15 percent or more of television households were not receiving a digital signal. See 47 U.S.C. § 309(j)(14)(A)-(B) (2005).

²⁹ DTV Act §§ 3003-3004.

³⁰ See generally *700 MHz Commercial Services Notice*.

³¹ With regard to the size of geographic service areas for the commercial spectrum in the Upper 700 MHz Band, the Commission determined that, based on the positions of commenters, the likely uses of this spectrum, and other (continued....)

FIGURE 2 – UPPER 700 MHz BAND

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
A	746-747, 776-777	2 MHz	2 x 1 MHz	MEA	52*
B	762-764, 792-794	4 MHz	2 x 2 MHz	MEA	52*
C	747-752, 777-782	10 MHz	2 x 5 MHz	700 MHz EAG	6
D	752-762, 782-792	20 MHz	2 x 10 MHz	700 MHz EAG	6

*Blocks have been auctioned.

19. *700 MHz Commercial Services Notice.* In determining the size of geographic service areas for the C and D Blocks in the Upper 700 MHz Band, the Commission in 2000 decided to use large areas based on EAGs.³² The Commission based this decision on a number of factors, including the likely uses of this spectrum as reflected in the record, a previous statutory obligation to conduct the auction and deposit the proceeds by a specific date,³³ and the Commission's desire to help bidders avoid costs associated with initial license area sizes that are either too small or too large.³⁴ The Commission observed that large license areas such as EAGs could allow licensees to take advantage of economies of scale to develop new technologies and services, and could be aggregated to form nationwide licenses.³⁵

20. In a separate proceeding in 2001, the Commission divided the 48 megahertz of spectrum in the Lower 700 MHz Band into blocks of paired and unpaired spectrum to accommodate a range of new fixed, mobile, and broadcast services and technologies.³⁶ Figure 3 shows the current band plan for the Lower 700 MHz Band. The C Block was assigned across CMAs (*i.e.*, Metropolitan Statistical Areas (MSAs) and Rural Service Areas (RSAs)), while the remaining blocks were assigned across Economic Area Groupings (EAGs). While Congress specifically directed the Commission to delay the auction of

(Continued from previous page) _____
 considerations, the most appropriate policy would be to base the band plan on large EAGs. *See Upper 700 MHz First Report and Order*, 15 FCC Rcd at 500 ¶¶ 56-57.

³² *See Upper 700 MHz First Report and Order*, 15 FCC Rcd at 500 ¶ 56.

³³ *See Consolidated Appropriations Act, 2000*, Pub. L. No. 106-113, 113 stat. 2502, Appendix E, Sec. 213(a)(3), *reprinted in* 47 U.S.C.A. § 337 Note at Sec. 213(a)(3). With regard to previous statutory requirements to complete the auction by a certain date, in the *Upper 700 MHz First Report and Order*, the Commission stated that its experience "has shown that simultaneous multiple-round auctions for a larger number of licenses are more complex and take longer to complete than similar auctions involving fewer licenses." *Upper 700 MHz First Report & Order*, 15 FCC Rcd at 500 ¶ 57.

³⁴ *See Upper 700 MHz First Report and Order*, 15 FCC Rcd at 500 ¶ 57.

³⁵ *Id.* at 501 ¶ 59.

³⁶ *See Lower 700 MHz Report and Order*, 17 FCC Rcd at 1029, 1054-55 ¶¶ 13, 76.

licenses in the Lower 700 MHz Band, it made an exception for C Block and D Block licenses, which it directed the Commission to auction immediately.³⁷ The remaining A, B, and E Blocks have not been auctioned.

FIGURE 3 – LOWER 700 MHz BAND

A	B	C	D	E	A	B	C
CH. 52	CH. 53	CH. 54	CH. 55	CH. 56	CH. 57	CH. 58	CH. 59
698	704	710	716	722	728	734	740

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	700 MHz EAG	6
B	704-710, 734-740	12 MHz	2 x 6 MHz	700 MHz EAG	6
C	710-716, 740-746	12 MHz	2 x 6 MHz	CMA	734*
D	716-722	6 MHz	unpaired	700 MHz EAG	6*
E	722-728	6 MHz	unpaired	700 MHz EAG	6

*Blocks have been auctioned.

21. The Commission decided to make available a mix of both large and small geographic service areas in the Lower 700 MHz Band. The Commission noted that, in contrast to its experience in establishing service area sizes for the C and D Blocks in the Upper 700 MHz Band, many commenters in the Lower 700 MHz Band proceeding, including small and rural providers, favored small geographic areas, including CMAs.³⁸ In light of this interest in small areas, the Commission decided to assign the 12-megahertz C Block over CMAs.³⁹ The Commission observed that this was a “significant” amount of spectrum to assign across small geographic areas, noting that it amounted to 25 percent of the 48 megahertz in the Lower 700 MHz Band. The Commission concluded that such a policy would afford meaningful opportunities to small and rural wireless providers.⁴⁰ While the Commission declined to adopt nationwide licenses,⁴¹ it assigned the two remaining 12-megahertz paired blocks, as well as the two 6-megahertz unpaired blocks, over EAGs, for many of the same reasons cited in its proceeding for the Upper 700 MHz Band.⁴²

³⁷ Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715 (codified as 47 U.S.C. § 309(j)(15)).

³⁸ CMAs were found to correspond to the needs of many customers, including customers of small regional and rural providers. *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1061 ¶¶ 95-96.

³⁹ See *id.* at 1059 ¶ 90.

⁴⁰ See *Lower 700 MHz MO&O*, 17 FCC Rcd at 11619 ¶ 14 n. 32 (noting that one 12-megahertz block of spectrum “is significant” in that it equals 25 percent of the 48 megahertz of spectrum in the Lower 700 MHz Band).

⁴¹ *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1059 ¶ 90, 1060-61 ¶ 94.

⁴² *Id.* at 1059-60 ¶¶ 91, 93. The Commission used the definition of EAGs as defined in the Upper 700 MHz Band proceeding, which included a particular definition concerning the division of the Gulf of Mexico between two EAGs. See *id.* at 1059 ¶ 90 & n.257.

22. In the *700 MHz Commercial Services Notice* adopted in August 2006, we sought comment on possible revisions to the band plan and service rules concerning commercial licenses in the 698-746, 747-762, and 777-792 MHz bands.⁴³ Among others things, we requested comment on ways the Commission could promote access to spectrum and the provision of service by assigning unauctioned spectrum over smaller geographic areas, whether we should modify the band plan with regard to the size and location of the spectrum blocks, whether we should revise the applicable performance standards pertaining to certain of these licenses, and whether to modify any of the technical rules in these bands. In addition, we also sought comment on several auctions-related issues and license renewal procedures. Also, we tentatively concluded that the Commission's 911/E911 rules and its hearing aid compatibility rules should be extended to apply to commercial services in the 700 MHz Band, as well as to CMRS services in other bands to the extent they meet certain criteria.

C. 700 MHz Guard Bands Proceeding

23. When the Commission originally established the Guard Bands in the Upper 700 MHz Band in 2000, its goal was to ensure that operations in the 36 megahertz of commercial spectrum would not cause harmful interference to 700 MHz public safety operations.⁴⁴ While recognizing the Guard Bands' primary role as protecting public safety operations, the Commission permitted operations within the Guard Bands to "allow for effective and valued use of the spectrum, consistent with sound spectrum management, rather than the creation of guard band spectrum of little use."⁴⁵ To minimize the potential for harmful interference to public safety operations, the Commission precluded Guard Bands operations from employing cellular system architectures,⁴⁶ and required entities operating in the Guard Bands to comply with stringent out-of-band emissions criteria⁴⁷ and frequency coordination procedures.⁴⁸ The Commission created the Guard Band Manager classification, a new class of commercial licensee engaged specifically in leasing spectrum to third parties on a for-profit basis,⁴⁹ and required that Guard Band Managers control the use of the spectrum consistent with the strict interference and frequency coordination rules designed to protect public safety.⁵⁰

24. *700 MHz Guard Bands Notice.* In the *700 MHz Guard Bands Notice* adopted in September 2006, we sought comment on possible changes to the Part 27 service rules applicable to existing and prospective Upper 700 MHz Band licensees in the A Block and the B Block.⁵¹ Two developments prompted the Commission to seek comment on possible rule changes that could promote more efficient and effective use of the Guard Bands. First, in 2004 as part of the 800 MHz public safety interference remediation proceeding in WT Docket No. 02-55, the Commission reclaimed all of Nextel

⁴³ See generally *700 MHz Commercial Services Notice*, 12 FCC Rcd at 9346-48 ¶¶ 1-2.

⁴⁴ See *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 490-91 ¶ 33.

⁴⁵ *Id.* at 491 ¶ 34. The Commission also allocated each of the Upper 700 MHz spectrum blocks so that they would align with as few incumbent television broadcast channels as possible, in order to expedite deployment, reduce the number of potential negotiated agreements with broadcasters, and avoid a problem of "free riding" third parties benefiting from others' negotiations. *Id.* at 492 ¶ 37.

⁴⁶ Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, *Second Report and Order*, 15 FCC Rcd 5299, 5308-09 ¶ 19 (2000) ("*Upper 700 MHz Second Report and Order*").

⁴⁷ *Id.* at 5307-08 ¶ 17.

⁴⁸ *Id.* at 5308 ¶ 18.

⁴⁹ *Id.* at 5312-13 ¶ 27.

⁵⁰ *Id.* at 5313 ¶ 30.

⁵¹ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10414 ¶ 2.

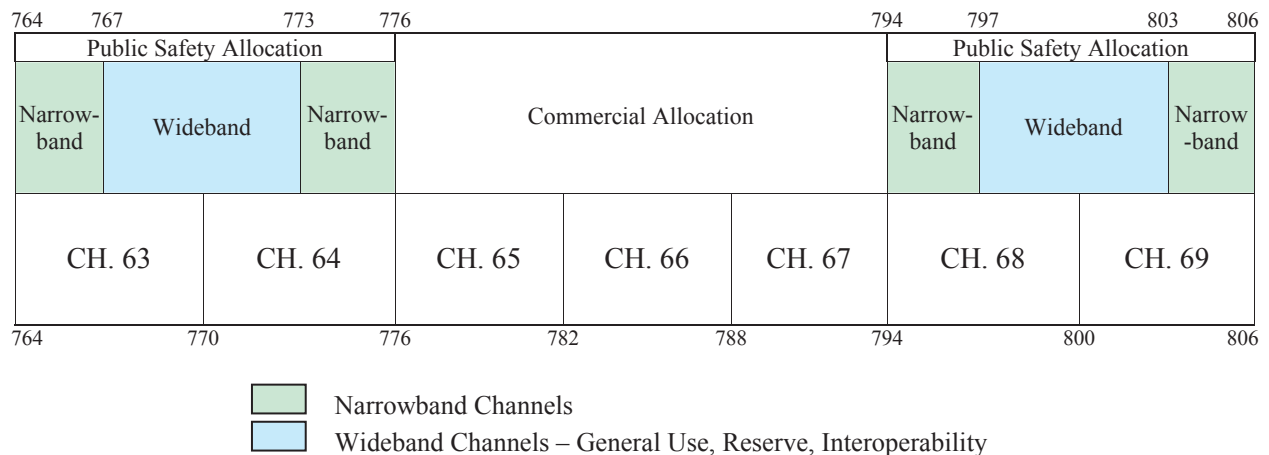
Communications, Inc.'s (Nextel) Guard Bands licenses, constituting 42 of the 52 B Block markets.⁵² Second, Congress recently created greater certainty regarding the availability of unencumbered 700 MHz Band spectrum for wireless commercial and public safety licensees—including the Guard Bands—by establishing a “hard date” of February 17, 2009, by which time incumbent analog broadcasters must vacate the spectrum. The *700 MHz Guard Bands Notice* sought comment on possible changes to the existing service rules for the Guard Bands that could result in more intensive use of the spectrum through greater operational, technical, and regulatory flexibility for licensees. Among other issues, we sought comment on whether to retain the existing Guard Band Manager rules or apply a different set of policies and rules to enable third parties to gain access to spectrum usage rights, such as those adopted in the Secondary Markets proceeding.⁵³ The *700 MHz Guard Bands Notice* also asked whether we should apply the existing Guard Band Manager rules to the returned Nextel spectrum or whether another regulatory structure is appropriate.⁵⁴

D. 700 MHz Public Safety Proceeding

25. In a December 2005 Report to Congress submitted pursuant to the Intelligence Reform Act,⁵⁵ the Commission recognized that broadband communications applications offer the public safety community a number of benefits, including video surveillance, real-time text messaging and e-mail, high resolution digital images and the ability to obtain location and status information of personnel and equipment in the field.⁵⁶ The Report to Congress found that emergency response providers would benefit from development of an integrated, interoperable network capable of delivering broadband services nationwide.⁵⁷

26. As illustrated below, however, the current allocation for the public safety portion of the 700 MHz Band does not allow for broadband applications:

FIGURE 4 – 700 MHz PUBLIC SAFETY BAND



⁵² See *id.* at 10418-19 ¶ 12.

⁵³ *Id.* at 10421-24 ¶¶ 18-24.

⁵⁴ *Id.* at 10423 ¶ 22.

⁵⁵ See Intelligence Reform Act, Pub. L. No. 108-458, 118 Stat. 3638 § 7502(d)(1) (2004).

⁵⁶ See Report to Congress on the Study to Assess the Short-Term and Long-Term Needs for Allocations of Additional Portions of the Electromagnetic Spectrum for Federal, State, and Local Emergency Response Providers, WT Docket No. 05-157 at 13 ¶ 26 (Dec. 16, 2005) (*Intel Reform Act Report*).

⁵⁷ *Id.*

27. In March 2006, the Commission adopted the *700 MHz Public Safety Eighth Notice*, seeking comment on the use of the 700 MHz Public Safety Band to accommodate the broadband needs of public safety.⁵⁸ In particular, the Commission sought comment on revisions to the above band plan proposed by the National Public Safety Telecommunications Council (NPSTC), Motorola, and Lucent.⁵⁹ All of the proposals contemplated aggregating the wideband general use channels, wideband interoperability channels, and wideband reserve spectrum to form a broadband segment. The Commission solicited alternative proposals, tentatively concluded not to alter the location of the narrowband voice and data channels, and sought comment on ways in which public safety entities could use the 700 MHz Public Safety Band for broadband applications and on measures that should be taken to promote broadband interoperability.⁶⁰

28. The subsequent *700 MHz Guard Bands Notice* sought comment on possible modifications to the rules governing the 700 MHz Guard Band licensees, including the BOP advanced by Access Spectrum and Pegasus Communications.⁶¹ The *700 MHz Guard Bands Notice* relates to the 700 MHz Public Safety proceeding, *inter alia*, because the Commission tentatively concluded that any Guard Bands proposal involving relocation of the narrowband channels in the 700 MHz Public Safety Band must address the source of funds to reprogram existing public safety 700 MHz radios and the coordination of the proposal with Canada and Mexico.

29. Most recently, in December 2006 we adopted a *700 MHz Public Safety Ninth Notice* in which we proposed, in light of the nation's current and anticipated public safety and homeland security needs, "a centralized and national approach to maximize public safety access to interoperable, broadband spectrum in the 700 MHz Band, and, at the same time, foster and promote the development and deployment of advanced broadband applications, related radio technologies, and a modern, IP-based system architecture."⁶²

E. Frontline Proposal

30. In recent weeks, Frontline has submitted several filings with the Commission regarding its proposed "Public Safety Broadband Deployment Plan" for a portion of the spectrum in the 700 MHz Band.⁶³ Frontline proposes that the Commission alter the upper portion of the band plan and service rules

⁵⁸ See *700 MHz Public Safety Eighth Notice*, 21 FCC Rcd at 3669 ¶ 2.

⁵⁹ *Id.* at 3676-79 ¶¶ 14-22.

⁶⁰ See *id.* at 3675-76 ¶ 13, 3683-84 ¶ 33.

⁶¹ See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10431-35 ¶¶ 42-48.

⁶² *700 MHz Public Safety Ninth Notice*, 21 FCC Rcd at 14838 ¶ 3.

⁶³ See, *i.e.*, Comments of Frontline Wireless, LLC, PS Docket No. 06-229 and WT Docket No. 96-86 (filed Feb. 26, 2007) ("Frontline Comments in PS Docket No. 06-229"); Reply Comments of Frontline Wireless, LLC, PS Docket No. 06-229 and WT Docket No. 96-86 (filed Mar. 12, 2007) ("Frontline Reply Comments in PS Docket No. 06-229"); Comments of Frontline Wireless, LLC, WT Docket No. 06-150 (filed Mar. 6, 2007) ("Frontline Mar. 6 Comments in WT Docket No. 06-150"); Letter from John Blevins, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 (filed Mar. 27, 2007) ("Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229"). See also Letter from Matthew S. DelNero, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229 (filed Mar. 7, 2007) ("Frontline March 7 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229"); Letter from Matthew S. DelNero, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229 (filed Mar. 12, 2007) ("Frontline March 12 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229"); Letter from Matthew S. DelNero, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229 (filed Mar. 16, 2007) ("Frontline March 16 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229"); Letter from Matthew S. DelNero, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, (continued....)

in the 700 MHz Commercial Services proceeding in order to auction a single nationwide 10-megahertz license (a new “E-block”) near the 700 MHz Public Safety spectrum that would be subject to specific conditions.⁶⁴ In particular, the Commission would require the licensee to construct a nationwide, interoperable broadband network for sharing with a national public safety licensee that would provide broadband service in the lower portion of the 700 MHz Public Safety spectrum.⁶⁵ Frontline has made these filings in the three current Commission proceedings described above: the 700 MHz Commercial Services proceeding, the 700 MHz Public Safety proceeding, and the 700 MHz Guard Bands proceeding.

III. REPORT AND ORDER

31. Based on the record before us, we make a number of decisions in this Report and Order regarding the rules that will apply with regard to issues raised in the 700 MHz Commercial Services proceeding and the 700 MHz Guard Bands proceeding. First, we discuss the 700 MHz Commercial Services, including actions we are taking to facilitate access to spectrum and the provision of service to consumers, particularly with respect to the spectrum to be auctioned as directed by the DTV Act. Second, we address rules and policies for the 700 MHz Guard Bands in order to provide licensees enhanced flexibility while at the same time guarding against interference with the adjacent 700 MHz Public Safety spectrum.

A. 700 MHz Commercial Services

32. In this Report and Order, we take a number of steps to facilitate access to spectrum and the provision of service to consumers, especially those in rural areas, and to simplify and clarify our rules related to the commercial 700 MHz Band spectrum. We adopt a mix of geographic service areas to provide for CMAs, EAs, and REAGs for licenses in the commercial services. In addition, we decline to alter our rules relating to secondary market transactions. For issues relating to auctions of the commercial spectrum, we conclude that no new rules are needed to facilitate nationwide aggregation of existing and new 700 MHz Commercial Services licenses, reject requests for set aside of licenses for designated entities and to establish an additional small business category for bidding credits, and address issues concerning competitive bidding, aggregation of new licenses, and tribal lands bidding credits. Finally, with respect to the commercial services, we address issues concerning license renewal, extend the license terms to provide that initial authorizations for the 700 MHz Commercial Services Band will have a term not to exceed 10 years from February 17, 2009, address power limits and other technical issues, and establish requirements concerning 911/E911 and hearing aid-compatible handsets.

33. We do not accept arguments made by several commenting parties in this proceeding that making revisions to the rules for this 700 MHz spectrum may cause undue administrative and judicial delay,⁶⁶ or arguments that any changes to these rules run the risk of reducing the amount of monies collected in the auction to the extent that they could jeopardize funding for all elements of the plan

(Continued from previous page) _____

Ex Parte in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229 (filed Mar. 19, 2007) (“Frontline Mar. 19 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229”); Letter from Matthew S. DelNero, counsel to Frontline Wireless, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229 (filed Mar. 22, 2007) (“Frontline Mar. 22 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229”).

⁶⁴ The “E-block” would consist of the paired 757-762 MHz and 787-792 MHz frequencies.

⁶⁵ See generally Frontline Comments in PS Docket No. 06-229; Frontline Mar. 6 Comments in WT Docket No. 06-150; Frontline Reply Comments in PS Docket No. 06-229; Frontline March 12 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229.

⁶⁶ See Cingular Reply Comments in WT Docket No. 06-150 at 7.

relating to the DTV transition.⁶⁷ Similarly, we reject the argument that any revisions to the rules for this spectrum may cause a delay in the provision of services by these licensees.⁶⁸ Accordingly, we find that our actions in this Report and Order will not jeopardize our ability to meet our statutory obligations with respect to the DTV transition.

1. Background

34. In the *700 MHz Commercial Services Notice*, we sought comment on a number of service rule issues concerning the 700 MHz Commercial Services Band.⁶⁹ With regard to the Commission's policies to promote access to spectrum and the provision of service, we sought comment on whether to assign additional unauctioned spectrum over geographic service area sizes other than the six EAGs specified under the current rules, and in particular, whether there is a need for additional small area licenses in this band, such as the 734 Cellular Market Areas (CMAs).⁷⁰ We also sought comment on whether we should modify the size of spectrum blocks in the Upper 700 MHz Commercial Services Band or the Lower 700 MHz Band, or both.⁷¹ While stating that we thought the current band plan for the Lower 700 MHz Band should be retained, we nonetheless sought comment on possible changes to that band, and also specifically asked for comment on whether the Upper 700 MHz Commercial Services Band should be reconfigured by dividing its 20 megahertz D Block into two or more blocks.⁷² We also sought comment on whether we should revise our current "substantial service" performance requirements for the 700 MHz Commercial Services Band, or whether the Commission should adopt alternative build-out rules, including population-based construction benchmarks, geography-based construction benchmarks, or a "keep-what-you-use" standard similar to that adopted for cellular service in the 1980s.⁷³ In addition, we sought comment on whether the Commission should attempt to promote access to spectrum and the provision of service through revisions to its secondary markets rules and procedures, such as by requiring licensees to make "good faith" efforts to negotiate with potential lessees and/or providing a point of contact for lessees.⁷⁴

35. With respect to the Commission's policies on auctions-related issues, we sought comment on whether it would be necessary or desirable to facilitate the aggregation of new and existing 700 MHz Commercial Services Band licenses through the use of a "two-sided auction" that would offer for sale unassigned as well as previously assigned licenses for the spectrum in this band.⁷⁵ Similarly, we generally sought comment on whether any changes to the Commission's competitive bidding rules are necessary or desirable in order to facilitate efficient aggregation of new licenses, in light of the existing spectrum blocks for the 700 MHz Commercial Services Band licenses as well as any revisions the Commission may make to these spectrum blocks.⁷⁶ The *700 MHz Commercial Services Notice* also

⁶⁷ See Verizon Wireless Comments in WT Docket No. 06-150 at 2 (discussing funding for digital-to-analog converter box program and the interoperable communications systems for public safety).

⁶⁸ See Qualcomm Comments in WT Docket No. 06-150 at 15-16 (rule changes could cause delay in delivery of services).

⁶⁹ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9346-48 ¶¶ 1-2.

⁷⁰ *700 MHz Commercial Services Notice*, 21 FCC Rcd. at 9362-69 ¶¶ 28-48.

⁷¹ *Id.* at 9369-73 ¶¶ 49-59.

⁷² *Id.* at 9369 ¶ 49.

⁷³ *Id.* at 9373-76 ¶¶ 61-69. In the Further Notice, we seek comment on specific geography-based construction benchmarks to be applied to the unauctioned commercial 700 MHz Band licenses. See *infra* Section IV.B.1.c.

⁷⁴ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9376-78 ¶¶ 70-72.

⁷⁵ *Id.* at 9372-73 ¶¶ 58-59.

⁷⁶ *Id.* at 9372 ¶¶ 56-57.

generally sought comment on whether the Commission should take additional action to help facilitate access to 700 MHz spectrum and the provision of service to all consumers, including those in rural areas, as well as whether the Commission should make any adjustments to its Tribal Lands Bidding Credit rules as they apply to the 700 MHz Band licenses to be auctioned.⁷⁷

36. In addition, the *700 MHz Commercial Services Notice* also addressed a number of other policies and rules for 700 MHz Commercial Services Band licensees. For example, we sought comment on whether the Commission should amend its rules to state more explicitly the criteria for renewal of 700 MHz Commercial Services Band licenses, whether it should integrate the substantial service or any end-of-term requirements into the renewal process for 700 MHz Commercial Services Band licenses, and whether it should replace procedures for filing competing applications at renewal time with criteria to measure level of service provided by these licenses.⁷⁸ The *700 MHz Commercial Services Notice* sought comment on whether license terms of unauctioned as well as previously auctioned 700 MHz Commercial Services Band licenses should be extended beyond 2015, and whether the Commission should establish a uniform license term for all licensees in the band.⁷⁹ We also sought comment on whether licensees in the Upper 700 MHz Commercial Services Band should be permitted to operate at higher power levels, while noting that such changes could not result in additional interference to public safety services operating in the band.⁸⁰ Regarding the Lower 700 MHz Band, we sought comment on whether the Commission should continue to permit licensees in this portion of the band to operate at the 50 kW level, or whether this capability should be reduced for existing and/or future Lower 700 MHz Band licensees.⁸¹ Finally, in the *700 MHz Commercial Services Notice* we sought comment on our tentative conclusion that the Commission's 911/E911 and hearing aid compatibility rules should be extended to apply to 700 MHz services, as well as to CMRS services in other bands, to the extent these services meet certain criteria.⁸²

2. Discussion

a. Facilitating Access to Spectrum and Provision of Service to Consumers

37. We take several steps to facilitate access to spectrum and the provision of service to consumers, especially those in rural areas, in the 700 MHz Commercial Services Band. We determine to provide for a mix of geographic service area sizes for the licenses that will be auctioned.⁸³ We also determine not to revise the Commission's existing spectrum leasing rules as they apply to 700 MHz Commercial Services Band licensees.

(i) Mix of Geographic Service Area Sizes

38. Background. In the *Upper 700 MHz First Report and Order*, the Commission determined that Blocks C and D of the Upper 700 MHz Band would be assigned over six EAGs.⁸⁴ In the

⁷⁷ *Id.* at 9378-80 ¶¶ 73-79.

⁷⁸ *Id.* at 9380-9383 ¶¶ 80-83.

⁷⁹ *Id.* at 9383-85 ¶¶ 84-89.

⁸⁰ *Id.* at 9385-86 ¶¶ 91-94.

⁸¹ *Id.* at 9388 ¶¶ 95-98.

⁸² *Id.* at 9388-90 ¶¶ 99-106.

⁸³ In the Further Notice, we seek additional comment on band plan proposals for these licenses, including the location and sizes of these different geographic area licenses as well as the size of the spectrum blocks to be auctioned.

⁸⁴ *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 500 ¶ 56; see also 47 C.F.R. § 27.6(b)(2). The C Block is a 10-megahertz paired block consisting of two 5-megahertz segments; the D Block is a 20-megahertz paired block consisting of two 10-megahertz segments. See *supra* Figure 2. The six megahertz of spectrum that comprise the (continued....)

Lower 700 MHz Report and Order, the Commission determined that Blocks A, B, and E would also be assigned over EAGs.⁸⁵ As described above, licenses already have been assigned for two blocks in the Lower 700 MHz Band: the C Block, a 12-megahertz paired block assigned over CMAs, and the D Block, a 6-megahertz unpaired block assigned over EAGs.⁸⁶

39. In the *700 MHz Commercial Services Notice*, we sought comment on whether there is a need to assign additional un auctioned spectrum over service area sizes other than the EAGs specified under current rules,⁸⁷ and, if so, what size of service areas, or combinations of sizes, should be adopted for the 700 MHz Band.⁸⁸ In particular, comment was requested on whether there is a need for additional small geographic service area licenses in the band, including 176 EAs, 734 CMAs, or any other small and/or rural areas.⁸⁹ We also sought comment on which particular spectrum block or blocks would be most appropriate for licensing in revised service area sizes.⁹⁰

40. Many commenters, including small and regional service providers, entities representing rural interests, and a coalition including cable television providers and Sprint-Nextel, support revisiting the existing band plan and suggest that the Commission adopt a mix of the proposed license areas.⁹¹ Some of these same commenters favor making one or more license block available based on small geographic areas,⁹² and support the use of smaller service areas in general and CMAs in particular.⁹³ A
(Continued from previous page)

Guard Band in the Upper 700 MHz Band's Blocks A and B has already been licensed over 52 MEAs. *See* 47 C.F.R. § 27.6(b)(1); 700 MHz Guard Bands Auction Closes, *Public Notice*, 15 FCC Rcd 18026 (2000) (announcing winning bidders in Auction 33); 700 MHz Guard Bands Auction Closes, *Public Notice*, 16 FCC Rcd 4590 (2001) (announcing winning bidders in Auction 38).

⁸⁵ *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1059 ¶ 90; *see also* 47 C.F.R. § 27.6(c)(1). Blocks A and B are each 12-megahertz paired blocks consisting of two 6-megahertz segments; the E Block is a 6-megahertz unpaired block. *See supra* Figure 3.

⁸⁶ *See supra* Figure 3; Lower 700 MHz Band Auction Closes, *Public Notice*, 17 FCC Rcd 17272 (2002) (“*Auction 44 Public Notice*”) (announcing winning bidders in Auction 44); Lower 700 MHz Band Auction Closes, *Public Notice*, 18 FCC Rcd 11873 (“*Auction 49 Public Notice*”) (2003) (announcing winning bidders in Auction 49); Auction of Lower 700 MHz Band Licenses Closes, *Public Notice*, 20 FCC Rcd 13424 (2005) (“*Auction 60 Public Notice*”) (announcing winning bidders in Auction 60).

⁸⁷ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9362 ¶ 27.

⁸⁸ *Id.* at 9363-67 ¶¶ 33-41.

⁸⁹ *Id.* at 9362 ¶ 27, 9363-67 ¶ 33-41.

⁹⁰ *Id.* at 9362 ¶ 27, 9367-69 ¶ 42-48.

⁹¹ *See* Aloha Comments in WT Docket No. 06-150 at ii, 3-6; Aloha Reply Comments in WT Docket No. 06-150 at 1-3; Corr Comments in WT Docket No. 06-150 at 3; Leap Comments in WT Docket No. 06-150 at 4-6; MetroPCS Reply Comments in WT Docket No. 06-150 at 2-8; U.S. Cellular Comments in WT Docket No. 06-150 at 4; Letter from Alltel *et al.* to Marlene H. Dortch, Secretary, FCC, WT Docket No. 06-150 (filed Oct. 20, 2006) (“Balanced Consensus Plan”) (signatories to the Balanced Consensus Plan are Alltel, Aloha, Blooston, C&W, ConnectME Authority, Corr, Dobson, Leap, Maine Office of Chief Information Officer, MetroPCS, NTCA, Nebraska PSC, North Dakota PSC, RCA, RTG, Union, U.S. Cellular, Vermont *et al.*, Vermont Telephone Company). *See also* CTIA Comments in WT Docket No. 06-150 at 6 (mix of service areas for AWS-1 spectrum served the wireless marketplace well); Letter from Michelle C. Farquhar, counsel for SpectrumCo LLC, to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 06-150 (filed Jan. 9, 2007) (“SpectrumCo Jan. 9 *Ex Parte* in WT Docket No. 06-150”) at 2-11.

⁹² *See* Aloha Comments in WT Docket No. 06-150 at ii, 3-6; Balanced Consensus Plan in WT Docket No. 06-150; Blooston Comments in WT Docket No. 06-150 at 2; C&W Comments in WT Docket No. 06-150 at 2-3; Corr Comments in WT Docket No. 06-150 at 2-4; Dobson Comments in WT Docket No. 06-150 at 2-4; Howard/Javed Comments in WT Docket No. 06-150 at 9; Leap Comments in WT Docket No. 06-150 at 4-6; MilkyWay Comments in WT Docket No. 06-150 at 1-6; NextWave Comments in WT Docket No. 06-150 at 2-6; NTCA Comments in WT Docket No. 06-150 at 6; OPASTCO Comments in WT Docket No. 06-150 at 2-3; RCA Comments in WT Docket (continued....)

coalition of cable television providers and Sprint-Nextel recommend a mix of geographic service areas that has most licenses based on EAs. Another coalition of 14 commenters, consisting of small, regional and rural carriers, as well as some state regulators, also submitted a proposal with a mix of service areas based on REAGs, EAs and CMAs.⁹⁴ Other commenters, including small and larger carriers as well as rural interests and a tribal representative, also support service areas smaller than EAGs.⁹⁵ For example, Frontier suggests that licenses be made available over areas as small as counties.⁹⁶ In addition, some commenters offer support for smaller service areas and also advocate unlicensed use of the spectrum.⁹⁷ Access Spectrum *et al.* support the use of MEAs, which are the service areas for the Guard Bands licenses, in connection with its specific proposal to reconfigure the Upper 700 MHz Band.⁹⁸

(Continued from previous page)

No. 06-150 at 4-8; RTG Comments in WT Docket No. 06-150 at 2; U.S. Cellular Comments in WT Docket No. 06-150 at 4-7.

⁹³ See Aloha Comments in WT Docket No. 06-150 at 3; Aloha Reply Comments in WT Docket No. 06-150 at 2-3; Blooston Comments in WT Docket No. 06-150 at 1, 2; C&W Comments in WT Docket No. 06-150 at 2; Consumer Federation of America *et al.* Comments in WT Docket No. 06-150 at 4-5; Corr Comments in WT Docket No. 06-150 at 2-4; Dobson Comments in WT Docket No. 06-150 at 2-4; Howard/Javed Comments in WT Docket No. 06-150 at i, 10-11, 21; Leap Comments in WT Docket No. 06-150 at 5; MetroPCS Comments in WT Docket No. 06-150 at 13; MetroPCS Reply Comments in WT Docket No. 06-150 at 2-3; MilkyWay Comments in WT Docket No. 06-150 at 3, 4-5; NTCA Comments in WT Docket No. 06-150 at 6 (supporting a 20-megahertz allocation over CMAs); NextWave Reply Comments in WT Docket No. 06-150 at 12-13; OPASTCO Comments in WT Docket No. 06-150 at 2-3; RCA Comments in WT Docket No. 06-150 at 4-8; RCA Reply Comments in WT Docket No. 06-150 at 3; RTG Comments at 3; RTG Reply Comments at 3; U.S. Cellular Comments in WT Docket No. 06-150 at 5-7; U.S. Cellular Reply Comments in WT Docket No. 06-150 at 5.

⁹⁴ Alltel *et al.* in WT Docket No. 06-150 (filing the “Balanced Consensus Plan”). The Balanced Consensus Plan recommends a mix of six different licenses, two each over CMAs (22 megahertz total), EAs (20 megahertz total), and REAGs (12 megahertz paired; 6 megahertz unpaired). This plan also includes a proposed reconfiguration of current D Block in the Upper 700 MHz Band by splitting that block into two 10-megahertz blocks.

⁹⁵ See MilkyWay Comments in WT Docket No. 06-150 at 4-5 (supporting a mix of different license sizes, including CMAs); Polar Comments in WT Docket No. 06-150 at 1 (urging CMA licenses over 20 megahertz); Frontier Comments in WT Docket No. 06-150 at 1, 5-7 (supports reducing size of all unauctioned spectrum to areas no larger than RSAs and MSAs; also supports county-sized licenses for certain portions of the spectrum); T-Mobile Reply Comments in WT Docket No. 06-150 at 3 (geographic areas smaller than EAGs are more likely to fall within business plans of parties with limited resources); OPASTCO Comments in WT Docket No. 06-150 at 2; NextWave Reply Comments in WT Docket No. 06-150 at 12-13; Howard/Javed Comments in WT Docket No. 06-150 at i, 9; Navajo Nation Comments in WT Docket No. 06-150 at 1 (supporting EA licensing).

⁹⁶ Frontier Comments in WT Docket No. 06-150 at 5-6. There are 3,141 U.S. counties. See Applications of Midwest Wireless Holdings, L.L.C. and AllTel Communications, Inc., WT Docket No. 05-339, *Memorandum Opinion and Order*, FCC 06-146, 2006 WL 2818315, n. 137 (Oct. 2, 2006).

⁹⁷ See NextWave Reply Comments in WT Docket No. 06-150 at 9-13. See also Howard/Javed Comments at i, 9, 31 (supporting the provision of easements allowing unlicensed use of 700 MHz spectrum).

⁹⁸ Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 23-24. See *infra* Section IV.B.1.a (discussing Access Spectrum *et al.*’s proposal for the Upper 700 MHz Band).

41. On the other hand, a number of commenters support retaining EAGs exclusively.⁹⁹ Cingular and Verizon Wireless oppose adopting additional small-area licenses in the 700 MHz Band.¹⁰⁰ CTIA states that, in considering revisions and determining the appropriate license area size(s), the Commission should consider all of the 700 MHz Commercial Services spectrum (both auctioned and unauctioned), the licensing framework for the AWS-1 band in the AWS proceeding,¹⁰¹ and the various secondary market opportunities available today.¹⁰² DIRECTV/EchoStar comment that a nationwide license should be included in a mix of license sizes.¹⁰³

42. Discussion. We find that providing for a mix of geographic licensing areas in the 700 MHz Band will balance the demand for differently sized licenses demonstrated in the record and enhance access to this spectrum by a variety of potential licensees. In particular, we determine to replace the unassigned EAG-sized license areas, as established in the current band plan, with a mix of geographic licensing areas consisting of CMAs, EAs, and REAGs. These revisions are consistent with the goal of providing greater access to spectrum for small providers and parties in rural areas, and improving the opportunity for a wider range of potential licensees to obtain access to this valuable spectrum. Having decided to adopt these three geographic license sizes for this commercial spectrum, in the Further Notice below we seek comment on a proposal regarding the band plan for commercial 700 MHz spectrum, both with regard to the size of the spectrum blocks to be auctioned and the location of the new CMAs, EAs, and REAGs with respect to those blocks.¹⁰⁴

43. In determining the size of service areas, the Commission has stated as a general principle that it will consider “licensing the spectrum over a range of various sized geographic areas, including smaller service areas such as MSAs/RSAs [CMAs], where consistent with the record in that proceeding and with other factors that may be relevant to the spectrum.”¹⁰⁵ Many commenters, including small and

⁹⁹ See AT&T Comments in WT Docket No. 06-150 at 3; AT&T Reply Comments in WT Docket No. 06-150 at 2; Cingular Comments in WT Docket No. 06-150 at 5; Cingular Reply Comments in WT Docket No. 06-150 at 3; Motorola Comments in WT Docket No. 06-150 at i; Motorola Reply Comments in WT Docket No. 06-150 at 2; Verizon Wireless Comments in WT Docket No. 06-150 at 3. See also CTIA Comments in WT Docket No. 06-150 at 1-2 (stating that, in large part, the existing licensing and service rules should be left unchanged); Qualcomm Comments in WT Docket No. 06-150 at 17 (stating that any change would be for unauctioned spectrum only). Cingular and AT&T argue that if any change is to be made to the size of service areas, then such changes should be limited. Cingular Reply Comments in WT Docket No. 06-150 at 9 (arguing that any changes to band plan should be limited to the Upper 700 MHz Band); AT&T Reply Comments in WT Docket No. 06-150 at 15 (noting that if any change is made, it should be to one block only, and that the Lower 700 MHz Band should not be changed).

¹⁰⁰ See Cingular Comments in WT Docket No. 06-150 at 7-9; Cingular Reply Comments in WT Docket No. 06-150 at 7-9; Verizon Wireless Comments in WT Docket No. 06-150 at 4-5; Verizon Wireless Reply Comments in WT Docket No. 06-150 at 3-6 (discussing downside of small area licensing and lack of evidence to support smaller geographic areas).

¹⁰¹ See Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands, WT Docket No. 02-353, *Order on Reconsideration*, 20 FCC Rcd 14058 (2005) (*AWS-1 Order on Reconsideration*) (adopting a mix of license sizes). “AWS-1” refers to the 90 megahertz of the spectrum in the 1710-1755 MHz and 2110-2155 MHz bands. Licenses involving this spectrum recently were auctioned in Auction No. 66.

¹⁰² CTIA Comments in WT Docket No. 06-150 at 6; see also Verizon Wireless Reply Comments in WT Docket No. 06-150 at 4-5.

¹⁰³ DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 3.

¹⁰⁴ See *infra* Section IV.B. In this Further Notice, we also consider a recently filed proposal by Frontline. See *infra* Section IV.B.5. Were the Commission to determine to create a nationwide licensee for one block of commercial spectrum, consistent with the Frontline proposal, this would not affect our decision in this Report and Order to create a mix of CMA, EA, and REAG licenses for the other blocks of commercial 700 MHz Band spectrum.

¹⁰⁵ Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services, WT Docket No. 02-381, 2000 Biennial Regulatory (continued....)

regional service providers and entities that represent rural interests, favor an approach that would provide for a variety of license sizes beyond those in the current band plan.¹⁰⁶ We agree with those commenters who observe that a revised mix of smaller license sizes would provide a more balanced set of initial licensing opportunities at this time and make available more licenses to match the needs of different potential users.¹⁰⁷ The opportunities afforded by providing licenses with a mix of geographic areas were seen in the results of Auction No. 66 involving AWS-1 licenses, where many different bidders won smaller and mid-sized licenses, such as CMAs and EAs.¹⁰⁸ The same policy of providing a mix of licenses that balances competing interests is appropriate here. These revisions will advance the Commission's statutorily directed goals to promote service to rural areas,¹⁰⁹ promote investment in and the rapid deployment of new technologies and services,¹¹⁰ avoid the excessive concentration of licenses, and provide for the dissemination of licenses among a wide variety of applicants.¹¹¹

44. We conclude that providing a mix of CMA, EA, and REAG licenses in the 700 MHz Commercial Services spectrum will be an effective means of providing increased access to spectrum, especially in rural areas, while simultaneously meeting other Commission goals. We disagree with commenters who argue that any changes to smaller area licenses should be limited to the Upper 700 MHz Commercial Services Band, and not be implemented in the Lower 700 MHz Band.¹¹² In this regard, Cingular and AT&T argue that the Lower 700 MHz Band, because of its higher maximum power limits, is well suited for new mobile applications that requires large license areas and therefore that any change in the size of service areas (e.g., the use of smaller areas) should be limited to the Upper 700 MHz

(Continued from previous page)

Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, Increasing Flexibility to Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and to Facilitate Capital Formation, WT Docket No. 03-202, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 19078, 19096 ¶ 31 (2004) (*Rural Report and Order and Further Notice*, respectively). See *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1050 ¶ 65, 1061-62 ¶ 96 (Commission sought to define an initial "scope of licenses" that can be "obtained and used by a wide range of entities and services."); Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands, WT Docket No. 02-353, *Order on Reconsideration*, 20 FCC Rcd 14058, 14066 ¶ 14 (2005) (*AWS-1 Order on Reconsideration*) ("RSAs and MSAs allow entities to mix and match rural and urban areas according to their business plans and that, by being smaller, these types of geographic service areas provide entry opportunities for smaller carriers, new entrants, and rural telephone companies"); Service Rules for Advanced Wireless Services in the 1.7 and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162, 25175-77 ¶¶ 35-39 (2003) (*AWS-1 Report and Order*) (Commission determined that using a varied selection of areas will foster service to rural areas and promote the policy goal of disseminating licenses among a wide variety of applicants).

¹⁰⁶ See, e.g., Balanced Consensus Plan; Aloha Comments in WT Docket No. 06-150 at 3; Corr Comments in WT Docket No. 06-150 at 3; U.S. Cellular Comments in WT Docket No. 06-150 at 2; T-Mobile Reply Comments in WT Docket No. 06-150 at 2-4; MilkyWay Comments in WT Docket No. 06-150 at 2-6; Leap Comments in WT Docket No. 06-150 at 5-6; RCA Comments in WT Docket No. 06-150 at 7; RTG Comments in WT Docket No. 06-150 at 2-8; MetroPCS Reply Comments in WT Docket No. 06-150 at 3.

¹⁰⁷ See Balanced Consensus Plan; U.S. Cellular Comments in WT Docket No. 06-150 at 3; Corr Comments in WT Docket No. 06-150 at 3; NTCA Comments in WT Docket No. 06-150 at 5-6.

¹⁰⁸ Of 104 winning bidders, 70 (67%) won CMA licenses only, and 21 (20%) won only EA and/or CMA licenses. See <http://wireless.fcc.gov/auctions/66/charts/66cls2.pdf> (providing auction results); see, generally, <http://wireless.fcc.gov/auctions/66/> (providing additional information on the AWS auction).

¹⁰⁹ See 47 U.S.C. § 309(j)(3)(A).

¹¹⁰ See 47 U.S.C. § 309(j)(3)(A), (4)(C)(iii).

¹¹¹ See 47 U.S.C. § 309(j)(3)(B), (4)(C).

¹¹² See *infra* Section IV.B.1.a (proposing smaller license areas in the Lower 700 MHz Band).

Commercial Services Band.¹¹³ However, the Commission previously found that the maximum power limit in the Lower 700 MHz Band, with the associated non-interference requirement, would maximize both flexibility and freedom from harmful interference “for the widest number of potential services” in the Lower 700 MHz Band.¹¹⁴ Smaller and rural operators also should have access to the benefits afforded by the higher power limits in the Lower 700 MHz Band. We note that the maximum power limit has enabled a licensee in the C Block of the Lower 700 MHz Band, C&W, to reach its entire service area from a single tower site. In this regard, C&W states that if the power limits for its Lower 700 MHz license were lowered, it would be forced to add towers at a great expense to continue to reach the outlying portions of its service area.¹¹⁵ Another C Block licensee, Corr, states that potential services under active development include mobile TV and one-way data transfers, and with 50 kW of power, a licensee could provide such a broadcast service to a small or medium-sized metropolitan area.¹¹⁶

45. Consistent with our earlier findings with respect to license sizes in the Upper and Lower 700 MHz Bands,¹¹⁷ we decline at this time to adopt nationwide licensing for any of the 700 MHz Commercial Services Band spectrum blocks, as requested by DIRECTV/EchoStar.¹¹⁸ Given the ability of licensees to combine REAGs in the upcoming auction to create regional or nationwide service territories through standard bids, adopting nationwide licensing for a spectrum block is unnecessary.¹¹⁹ Licensees will be able to seek to acquire and combine licenses based on REAGs, as well as licenses based on other area sizes, in order to achieve larger footprints, including nationwide coverage, if that is their goal. We note that bidders in Auction No. 66 were able to acquire multiple licenses so as to build larger footprints with geographic areas smaller than EAGs, including EA licenses.¹²⁰ Although we do not adopt

¹¹³ See Cingular Reply Comments in WT Docket No. 06-150 at 9-10; AT&T Reply Comments in WT Docket No. 06-150 at 15-17.

¹¹⁴ *Lower 700 MHz MO&O*, 17 FCC Rcd at 11621 ¶ 19; see also *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1064 ¶ 103 (noting that providers of non-broadcast services may also operate at power levels up to 50 kW ERP, provided they comply with the same technical requirements associated with such operations, creating a consistent set of technical rules for all services in the Lower 700 MHz Band). See also *infra* Section III.A.2.c(iii) (retaining 50 kW power levels for incumbent Lower 700 MHz Band licensees).

¹¹⁵ C&W Comments in WT Docket No. 06-150 at 5. C&W further states that such an action would force it to discontinue service on this spectrum due to the expense of continuing operations under these conditions. *Id.*

¹¹⁶ Corr, an original licensee of C Block licensees which has assigned those licenses to its parent, states that it believed at the time it bid on the licenses, and still believes, that there may be a viable use for these licenses in providing digital broadcast services. Corr Comments in WT Docket No. 06-150 at 8-9. Corr states that potential services under active development include mobile TV and one-way data transfers, and with 50 kW of power, a licensee could provide such a broadcast service to a small or medium-sized metropolitan area. *Id.*

¹¹⁷ See *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1060-61 ¶ 94 (finding the use of EAGs to be preferable to the assignment of nationwide service areas despite efficiencies associated with nationwide service); *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 502 ¶ 61 (adopting EAGs with ability of licensees to partition and aggregate to provide maximum flexibility to parties to adjust their operating area most efficiently given marketplace and technological needs).

¹¹⁸ DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 3.

¹¹⁹ See *AWS-1 Report and Order*, 18 FCC Rcd at 25176 ¶ 38.

¹²⁰ See <http://wireless.fcc.gov/auctions/66/charts/66market.xls> or http://wireless.fcc.gov/auctions/66/charts/66press_5.pdf (providing auction results, including Spectrum Co.’s acquisition of 136 EA licenses). See also MetroPCS Reply Comments in WT Docket No. 06-150 at 7; RTG Comments in WT Docket No. 06-150 at 5; Aloha Comments in WT Docket No. 06-150 at 6 (addressing SpectrumCo.’s acquisition of licenses in Auction No. 66).

nationwide licensing in this Report and Order, in the Further Notice we seek comment on proposals that would provide for combinatorial bidding for certain blocks to promote new entry in this band.¹²¹

46. Likewise, we decline to adopt service areas smaller than CMAs, such as county-sized areas.¹²² The Commission has not licensed spectrum across areas smaller than CMAs,¹²³ and we find that the 734 CMA licenses are small enough to help ensure widespread deployment of advanced services, including in rural areas, and allow participation for small and rural bidders. Also, given the excellent propagation characteristics in the 700 MHz Commercial Services Band, and the relatively small size of many counties, licensing 700 MHz Band spectrum on a county basis may result in spectral inefficiency.

47. We also decline to adopt as a part of the band plan for the 700 MHz Commercial Services Band geographic areas of other sizes, including MEAs.¹²⁴ Our decision in this Report and Order to adopt three different license sizes offers a sufficiently wide variety of service areas that may be acquired by both small and rural providers as well as large regional and nationwide providers, while minimizing complexity for bidders at auction and in our licensing process.

48. Further, we reject Milgrom/Wrege's recommendation that the boundaries of CMAs be adjusted so that each CMA is contained entirely within a single EA (or that the EAs be adjusted so that each EA comprises a set of CMAs), in the event the Commission decides to offer additional CMA license areas in the 700 MHz Commercial Services Band.¹²⁵ Adjusting the CMA licenses in such a manner would create license areas that do not match precisely the license areas for the Lower 700 MHz Band C Block spectrum, which have already been auctioned on a CMA basis.¹²⁶ We also note that such revisions could have an impact on operators that intend to match the 700 MHz Band spectrum with other spectrum which has been licensed over CMAs.

49. Because the band plan for the 700 MHz Commercial Services Band no longer contains EAGs, for the EAs, REAGs, and CMAs we will separately license the Gulf of Mexico with each of the following license divisions: EA licensing area 176; REAG licensing area 12; and MSA licensing area 306. We adopt: (i) the same definition of EAs set forth in Section 27.6(h) of the rules, currently applicable for AWS-1 spectrum, for EA licenses in the 700 MHz Commercial Services Band; (ii) the same definition of REAGs set forth in Section 27.6(h) of the rules, currently applicable for AWS-1 spectrum, for REAG licenses; and (iii) the same definition of MSA/RSAs set forth in Section 27.6(c), currently applicable to the C Block of the Lower 700 MHz Band, for CMAs. As we have done in licensing other Part 27 services, the Gulf of Mexico service area is comprised of the water area of the Gulf of Mexico starting 12 nautical miles from the U.S. Gulf coast and extending outward.

(ii) Secondary Markets

50. Background. The Commission has sought to provide access to spectrum by promoting the development of robust secondary markets in spectrum usage rights, removing unnecessary regulatory barriers and allowing entities seeking access to spectrum to enter into spectrum leasing arrangements with existing licensees. Specifically, in the 2003 *Secondary Markets Report and Order*, the Commission adopted rules to facilitate access to spectrum by permitting licensees and entities seeking spectrum access

¹²¹ See *infra* Section IV.B.1.

¹²² See Frontier Comments in WT Docket No. 06-150 at 5-6.

¹²³ See *Rural Report and Order*, 19 FCC Rcd at 19090 n.60.

¹²⁴ See Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 23; MetroPCS Comments in WT Docket No. 06-150 at 11, 14 (proposing MEAs in connection with suggested division of D Block of Upper 700 MHz Band).

¹²⁵ Milgrom/Wrege Comments in WT Docket No. 06-150 at 2-3.

¹²⁶ In the Further Notice, we propose to license the Lower 700 MHz Band B Block on a CMA basis.

to enter into different types of spectrum leasing arrangements.¹²⁷ In the *Secondary Markets Second Report and Order*, adopted in 2004, the Commission extended its application of these rules to additional services and provided for immediate (*i.e.*, overnight) processing of certain classes of spectrum lease arrangements and applications for license transfers and assignments.¹²⁸

51. In the *700 MHz Commercial Services Notice*, we sought comment on whether the Commission could further promote access to 700 MHz Commercial Services Band spectrum through revisions to its secondary markets policies and rules pertaining to partitioning, disaggregation, and spectrum leasing.¹²⁹ For instance, we sought comment on whether the Commission should revise its secondary markets rules to require licensees to make “good faith” efforts to negotiate with potential spectrum lessees. The *700 MHz Commercial Services Notice* observed that such a policy could take one of several forms, ranging from a requirement that licensees establish a point of contact for potential spectrum lessees, to a requirement for “good faith” negotiation that might stipulate that licensees have a minimum number of meetings with potential spectrum lessees and/or must provide their terms for an acceptable spectrum leasing arrangement.¹³⁰

52. The majority of commenters addressing whether the Commission should adopt additional rules to promote secondary markets transactions oppose revisions to the current secondary markets rules. These parties include all of the CMRS providers that commented on this issue, as well as a technology provider, Qualcomm.¹³¹ One small CMRS provider commenting on this issue, Corr, argues that the proposed new rules would be unnecessary and, to the extent leasing is not occurring regularly, the problem largely would be solved by the use of smaller geographic areas.¹³² Only two commenters, including a group of state agencies, take a different view and recommend that the Commission consider a licensee’s participation in secondary market transactions during the license renewal process.¹³³

53. Discussion. We decline to adopt rules that would require 700 MHz Commercial Services Band licensees to make “good faith” efforts to negotiate with potential spectrum lessees, either as part of their performance requirements or as part of the criteria associated with license renewal. We believe that such changes are unnecessary given the other measures we are adopting to promote access to spectrum in the 700 MHz Commercial Services Band. As discussed above, these measures involve revising the 700 MHz Commercial Services band plan to include a mix of smaller geographic licensing areas.

54. Most commenters support a decision not to impose a “good faith” negotiation obligation

¹²⁷ Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 20604, 20649-77 ¶¶ 93-181 (2003) (*Secondary Markets Report and Order*). The spectrum leasing policies adopted in the *Secondary Markets Report and Order* applied generally to services licensed under Parts 22, 24, 27, 90, and 101 of the Commission’s rules, including all Commercial Mobile Radio Services (CMRS) and various other services in which the licensee holds an “exclusive use” right. *Id.* at 20643 ¶ 84, fn. 181.

¹²⁸ Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Second Report and Order, Order on Reconsideration, and Second Further Notice of Proposed Rulemaking*, 19 FCC Rcd 17503, 17509-545 ¶¶ 10-84 (2004) (“*Secondary Markets Second Report and Order*”).

¹²⁹ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9376-77 ¶ 70.

¹³⁰ *Id.* at 9377 ¶ 71.

¹³¹ See, e.g., AT&T Comments in WT Docket No. 06-150 at 10-11; Aloha Partners Comments in WT Docket No. 06-150 at 12-13; CTIA Comments in WT Docket No. 06-150 at 16-17; Corr Wireless Comments in WT Docket No. 06-150 at 5-6; Qualcomm Comments in WT Docket No. 06-150 at 19-20; Verizon Wireless Comments in WT Docket No. 06-150 at 6.

¹³² Corr Wireless Comments in WT Docket No. 06-150 at 7.

¹³³ See Howard/Javed Comments in WT Docket No. 06-150 at 28-30; Vermont Public Service Commission *et al.* Comments in WT Docket No. 06-150 at 12.

on the 700 MHz Commercial Services Band licensees. Some of these commenters argue that such a requirement would be unnecessarily burdensome and could lead to uneconomic decisions.¹³⁴ Aloha is concerned that requiring licensees to make “good faith” efforts to negotiate with potential lessees would be “a very complex can of worms” with little or no corresponding benefit.¹³⁵ AT&T observes that a “good faith” requirement could encourage efforts to obtain access to this spectrum at below-market prices.¹³⁶ CTIA argues that the proposed modifications would increase transaction costs and would be contrary to the Commission’s objectives in promoting secondary markets.¹³⁷

55. Commenters supporting the adoption of a “good faith” requirement argue that the Commission should consider a licensee’s secondary markets participation as part of its license renewal process.¹³⁸ We note, however, that the Commission’s current spectrum leasing rules already provide a licensee with significant incentives to enter into spectrum leasing arrangements because licensees may rely on the activities of its spectrum lessee(s) for purposes of complying with the licensee’s construction requirements.¹³⁹ We conclude that our decision to adopt a mix of geographic license area sizes, combined with our existing secondary markets rules, are sufficient to promote access to spectrum. Accordingly, we decline to adopt further secondary markets requirements at this time.

b. Auctions-Related Issues

(i) Aggregating Licenses

56. Background. In the *700 MHz Commercial Services Notice*, we sought comment on whether Commission action is necessary or desirable to facilitate the aggregation of existing 700 MHz Band licenses with new licenses the Commission may grant. In the *700 MHz Commercial Services Notice*, we observed that such aggregation could be facilitated by a single auction in which licenses for spectrum previously assigned as well licenses for unassigned spectrum in the 700 MHz Band could be offered for sale, a mechanism sometimes referred to as a “two-sided” auction.¹⁴⁰ For example, spectrum assigned pursuant to existing licenses could be included in an auction by issuing vouchers to the existing licensees in exchange for their licenses. The amount of the vouchers could be determined by winning bids for licenses covering the returned spectrum. The vouchers could be used to offset winning bids in the auction, and possibly other Commission auctions as well.

57. As part of a wider-reaching proposal to revise the Upper 700 MHz band plan, Access Spectrum *et al.* support returning their 700 MHz Guard Band licenses in exchange for a bidding credit.¹⁴¹ DIRECTV/EchoStar see a benefit in making previously licensed spectrum available in an auction of new

¹³⁴ See, e.g., AT&T Comments in WT Docket No. 06-150 at 10-11; Corr Wireless Comments in WT Docket No. 06-150 at 6; Qualcomm Comments in WT Docket No. 06-150 at 19-20.

¹³⁵ See Aloha Partners Comments in WT Docket No. 06-150 at 12.

¹³⁶ See AT&T Comments in WT Docket No. 06-150 at 10-11.

¹³⁷ See CTIA Comments in WT Docket No. 06-150 at 17.

¹³⁸ See, e.g., Howard/Javed Comments in WT Docket No. 06-150 at 28; Vermont Department of Public Service *et al.* Comments in WT Docket No. 06-150 at 12.

¹³⁹ See *Secondary Markets Report and Order*, 18 FCC Rcd at 20655 ¶¶ 114-115 (for spectrum manager leases), 20667 ¶146 (for *de facto* transfer leases). See also 47 C.F.R. 1.9020(d)(5), 1.9030(d)(5).

¹⁴⁰ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9372-73 ¶¶ 57-59.

¹⁴¹ Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 29-31.

licenses.¹⁴² Others, including Blooston and Corr, voice support for a “two-sided” auction provided that the return of existing licenses is voluntary.¹⁴³

58. Discussion. Based on the record and the circumstances present here, we conclude that the public interest would be better served by relying on the existing secondary market to aggregate existing and new licenses rather than attempting to develop new rules and policies for incorporating existing 700 MHz Commercial Services licenses into an auction of new licenses. Parties bidding on new licenses should be able to accurately value those licenses, even absent an opportunity to simultaneously aggregate new with existing licenses. New licenses in the 700 MHz Commercial Services spectrum can be used independently of existing licenses. Applicants will be able to seek any of multiple new licenses, of varying geographic size, to serve any given location. Thus, the value of the new licenses is unlikely to depend significantly upon a party’s ability to aggregate existing and new licenses. Moreover, the interests of aggregators are likely to be met in large part by the existing secondary market. Accordingly, we conclude that no new rules or policies are needed to facilitate aggregation of existing and new 700 MHz Commercial Services licenses in order to increase the likelihood that these licenses will be assigned to the parties most likely to put them to their most effective use.

(ii) Bidding Preferences

59. Background. Certain commenters advocate that the Commission set aside 700 MHz Commercial Services licenses for designated entities or, if not, that the Commission adopt a third small business definition under which eligible applicants would receive a 35% bidding credit. In particular, certain commenters representing rural providers, small entities, and others argue that the Commission should set aside spectrum blocks for designated entities, as it did in 1994 for auctions of PCS Broadband spectrum licenses.¹⁴⁴ In reply comments, other parties argue that set-asides are not necessary and were rejected in the AWS proceeding.¹⁴⁵

60. In the event the Commission does not adopt the set-aside it proposes, Council Tree argues that the Commission must adopt an additional 35% bidding credit for the applicants with average attributable net revenues not exceeding \$3 million.¹⁴⁶ Council Tree notes that the Commission offered such a credit with respect to licenses for the Lower 700 MHz C Block. No other party addresses this proposal.

61. In addition, as part of a larger band plan proposal, Access Spectrum *et al.* propose bidding credits for commercial licensees that commit to providing access to spectrum for 700 MHz public safety services.¹⁴⁷ Cingular and MetroPCS oppose this proposal in reply comments.¹⁴⁸

¹⁴² DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 10.

¹⁴³ Blooston Comments in WT Docket No. 06-150 at 5, Corr Comments in WT Docket No. 06-150 at 10-12. *See also* Qualcomm Comments in WT Docket No. 06-150 at 19 (“does not oppose this proposal since it . . . would be entirely voluntary”).

¹⁴⁴ *See, e.g.*, NTCA Comments in WT Docket No. 06-150 at 8-11; OPASTCO Comments in WT Docket No. 06-150 at 3-4; RTG Comments in WT Docket No. 06-150 at 8; Council Tree Communications, Inc. (Council Tree) Comments in WT Docket No. 06-150 at 11-13.

¹⁴⁵ *See, e.g.*, AT&T Reply Comments in WT Docket No. 06-150 at 14-15; Cingular Reply Comments in WT Docket No. 06-150 at 10-11; USCC Reply Comments in WT Docket No. 06-150 at 16-17.

¹⁴⁶ Council Tree Comments in WT Docket No. 06-150 at 13-15. For these bands, the Commission previously adopted bidding credits of 25% and 15% for applicants with average attributable gross revenues not exceeding \$15 million and \$40 million, respectively. *See* 47 C.F.R. §§ 1.2110(f)(2), 27.502, 27.702.

¹⁴⁷ *See* Access Spectrum *et al.* Comments in WT Docket No. 06-150. In contrast to Access Spectrum *et al.*’s proposal for bidding credits in exchange for Public Safety service commitments, existing rules and practice generally provide bidding preferences for certain types of applicants rather than for applicants committing to provide (continued....)

62. Discussion. We reject the suggestions of certain commenters that the Commission set aside licenses in the 700 MHz Commercial Services Band auction solely for designated entities and Council Tree's argument that we adopt a third small business definition to provide for a 35% bidding credit. Consistent with our tentative conclusion not to adopt Access Spectrum *et al.*'s band plan proposal and in light of various difficulties in implementing such a bidding credit, we also do not adopt a bidding credit based on providing access to spectrum for 700 MHz public safety services.

63. Although the Communications Act requires that the Commission ensure that "designated entities"¹⁴⁹ are given the opportunity to participate in the provision of spectrum-based services and, for such purposes, consider the use of bidding preferences,¹⁵⁰ these preferences can take many forms. In an early attempt to meet these mandates, the Commission set aside blocks of spectrum in the Broadband PCS band to be held by designated entities. The Commission's experience in Broadband PCS auctions and subsequent auctions has demonstrated, however, that bidding credits for designated entities afford such entities substantial opportunity to compete with larger businesses for spectrum licenses and provide spectrum-based services. For example, Auction No. 66 demonstrated very recently that designated entities can succeed in auctions for licenses for valuable spectrum without any set-asides. In Auction No. 66, more than half the winning bidders were designated entities that received discounts on their gross winning bids and designated entities won over twenty percent of the licenses sold.¹⁵¹ Moreover, setting aside licenses risks denying the licenses to other applicants that may be more likely to use them effectively or efficiently for the benefit of consumers. Potentially excluding such applicants could compromise the Commission's pursuit of various statutory objectives including promoting the development and deployment of new technologies, products, and services for the benefit of the public and promoting efficient and intensive use of the spectrum.¹⁵²

64. We reject the arguments of certain commenters that setting aside 700 MHz Commercial Services licenses is essential to ensuring service in particular areas, especially rural areas. We are adopting other, very significant measures that directly serve this goal. For example, our decision to use smaller geographic areas reduces the cost of some licenses, creating opportunities for more potential licensees, including those focusing on serving rural areas in particular CMAs. The more stringent performance requirements we adopt here will also promote service to rural and underserved areas. There can be no assurance that the designated entities will provide any particular service, such as service in rural

(Continued from previous page) —————
certain services. The Commission has noted in prior proceedings "that there is no support in either the Communications Act or prior Commission decisions for creating a bidding credit for providing Public Safety services." Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, WT Docket No. 02-8, *Report and Order*, 17 FCC Rcd 9980, 10023 ¶109 (2002) (*Government Transfer Bands R&O*). Nonetheless, the Commission has created bidding credits to encourage service to underserved tribal lands, without regard to whether the provider is a designated entity. *See generally* 47 C.F.R. §1.2110(f)(3). *See also Government Transfer Bands R&O*, 17 FCC Rcd at 10024 ¶109 n.365 (noting that the tribal lands bidding credit is outside of the designated entity context).

¹⁴⁸ Cingular Reply Comments in WT Docket No. 06-150 at 16; MetroPCS Reply Comments in WT Docket No. 06-150 at 18-19.

¹⁴⁹ One of the statutory objectives the Commission must seek to promote when using its competitive bidding authority is the dissemination of licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women, sometimes collectively referred to as "designated entities." 47 U.S.C. §309(j)(3)(B).

¹⁵⁰ 47 U.S.C. §309(j)(4)(D).

¹⁵¹ *See* <http://wireless.fcc.gov/auctions/66/charts/66cls2.pdf> (providing auction results); *see, generally*, <http://wireless.fcc.gov/auctions/66/> (providing additional information on the AWS auction).

¹⁵² *See* 47 U.S.C. § 309(j)(3).

areas, that would not be provided by others. Finally, our statutory mandate with respect to bidding preferences is to provide an opportunity for designated entities to engage in the provision of spectrum-based services. As noted above, we conclude that bidding credits, in conjunction with the other policies adopted here, afford sufficient opportunity.

65. We also reject Council Tree's request that, in the absence of a set-aside, the Commission should adopt a third small business definition to provide a third level of bidding credit. Our current rules for 700 MHz Commercial Services Band licenses provide for two bidding credits, 25% for applicants with attributable gross revenues not exceeding \$15 million and 15% for applicants with attributable gross revenues not exceeding \$40 million.¹⁵³ We find distinguishable in a number of respects the Commission's previous adoption of a third bidding credit tier when it adopted CMA licenses for the Lower 700 MHz C Block. An explicit consideration in the adoption of that additional bidding credit was the fact that, pursuant to the then-current band plan, all other blocks of spectrum in these bands would be licensed by EAGs.¹⁵⁴ In light of the strong interest expressed by smaller bidders in that then-single block of non-EAG licenses, we concluded that an additional bidding credit tier would increase opportunities for bidders with little other access to 700 MHz spectrum. However, today we revise the sizes of the geographic area licenses to include CMA licenses and EA licenses. In light of these revisions and the prior opportunities afforded with CMA licenses in the Lower 700 MHz Band C Block, an additional small business definition to provide a third level of bidding credit with respect to the new CMA licenses is not necessary to assure designated entities sufficient opportunity in this band. This conclusion is consistent with recent decisions with respect to licenses for AWS. In AWS, the Commission rejected a similar Council Tree proposal for a third bidding credit tier.¹⁵⁵ The Commission distinguished the prior use of a third tier in the Lower 700 MHz C Block in part on the grounds that "all of the other licenses in that [700 MHz] service were based on large, regional geographic areas."¹⁵⁶ Furthermore, we are not persuaded by Council Tree's claims with respect to the performance of designated entities in recent auctions. The performance of designated entities in Auction No. 66 demonstrates the strength of the Commission's size-based bidding credits in creating opportunities for small businesses rather than a need for additional credits.

66. With respect to the Access Spectrum *et al.* proposal to create a bidding credit for entities providing specified assistance to 700 MHz public safety service providers, such a credit would be difficult to define and enforce. In particular, the Commission would have to determine what constitutes an adequate commitment; how to avoid a bidding credit over- or under-compensating applicants for the commitment; how to evaluate compliance; and how to enforce provision of service to public safety entities. In light of the attendant difficulties, as well as the Commission's ability and commitment to promote the public interest in the provision of wireless public safety services by other means, we decline to adopt Access Spectrum *et al.*'s proposal.

(iii) Competitive Bidding and Aggregating New Licenses

67. Background. In the 700 MHz Commercial Services Notice, we sought comment on whether any changes to the Commission's competitive bidding rules are necessary or desirable in order to facilitate efficient aggregation of new licenses, in light of the existing spectrum blocks for 700 MHz Commercial Services licenses and any spectrum blocks that may be proposed.¹⁵⁷ The 700 MHz

¹⁵³ See 47 C.F.R. §§ 1.2110(f)(2), 27.502, 27.702.

¹⁵⁴ See *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1088 ¶ 173.

¹⁵⁵ *AWS-1 Order on Reconsideration*, 20 FCC Rcd at 14075-77 ¶¶ 32-36.

¹⁵⁶ *Id.* at n.113.

¹⁵⁷ 700 MHz Commercial Services Notice, 21 FCC Rcd at 9372 ¶ 56.

Commercial Services Notice did not seek comment specifically on whether to utilize a combinatorial or package bidding auction format.

68. Commenters interested in large aggregations, including DIRECTV/EchoStar and Motorola, advocate for package bidding.¹⁵⁸ Milgrom/Wrege, as well as Access Spectrum *et al.*, note that the Commission's current package bidding system, which permits bidders to create any possible combination of licenses, limits each bidder to at most one winning bid and may be considered impracticable for auctions with more than a thousand licenses, due in part to the variety of bids each bidder may wish to place given that only one bid can become a winning bid.¹⁵⁹ Milgrom/Wrege suggest modifications to the Commission's system and also suggest that the Commission conduct a Public Forum in advance of the pre-auction Public Notices to consider the modifications. MetroPCS argues that the results of Auction No. 66 demonstrate that package bidding is not necessary for parties to aggregate large numbers of licenses.¹⁶⁰ Finally, U.S. Cellular opposes package bidding, arguing that its complexities and uncertainties may deter participation.¹⁶¹

69. Discussion. The Commission's current competitive bidding rules authorize the use of package bidding and the Commission already has utilized a form of package bidding.¹⁶² Consequently, the question before us now is whether we need to make changes to our competitive bidding rules in order to enable a new form of package bidding for the 700 MHz Commercial Services auction. We conclude that modifications to our current bidding systems, including those suggested by commenters, can be made without modifying the Commission's competitive bidding rules.

(iv) Modifications to the Tribal Land Bidding Credit

70. Background. In the *700 MHz Commercial Services Notice*, we sought comment on whether the Commission should make any adjustments to its tribal land bidding credit rules as they apply to the 700 MHz Commercial Services licenses to be auctioned. We also specifically asked commenters to address use of the tribal land bidding credit given statutory requirements that the Commission deposit the proceeds from an auction in the Digital Television Transition and Public Safety Fund no later than June 30, 2008. Depending on auction timing, it may be difficult for the Commission to grant license applications seeking tribal land bidding credits prior to the statutory deadline. To foreclose potential issues that tribal land bidding credits might create with respect to the statutory deadline, the Commission asked whether promoting deployment of wireless services to tribal lands would be better served with respect to the 700 MHz Band by exploring other means to promote access to spectrum and the provision of service in tribal lands.¹⁶³

71. Commenters did not address the relationship between post-auction credits and the deadline for depositing payments. CTIA states its support for tribal land bidding credits with respect to promoting service on tribal lands without any further discussion.¹⁶⁴

¹⁵⁸ DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 7-8; Motorola Comments in WT Docket No. 06-150 at 8.

¹⁵⁹ Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 26-27; Milgrom/Wrege Comments in WT Docket No. 06-150 at 4-9.

¹⁶⁰ MetroPCS Comments in WT Docket No. 06-150 at 5.

¹⁶¹ USCC Comments in WT Docket No. 06-150 at 11-12.

¹⁶² See Auction of Regional Narrowband PCS Licenses Scheduled for September 24, 2003; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, Package Bidding and Other Auction Procedures, 18 FCC Rcd 11974 (2003).

¹⁶³ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9378-79 ¶ 75.

¹⁶⁴ CTIA Comments in WT Docket No. 06-150 at 17-18.

72. Discussion. No parties provided suggestions for possible modifications to our tribal land bidding credit rules to promote the deployment of wireless services to tribal lands or addressed the relationship between post-auction credits and the deadline for depositing payments. In light of the record, we conclude that we need not modify the tribal land bidding credit at this time.

c. Additional Rules for Licensees

(i) Criteria for Renewal

73. Background. In the *700 MHz Commercial Services Notice*, we sought comment on whether to amend our rules to clarify or modify the requirements and procedures of the renewal process for licenses in the 700 MHz Commercial Services Band, including licenses that have already been auctioned and those that have yet to be auctioned. Specifically, we sought comment on the possibility of amending our rules to state more explicitly the criteria for renewal that apply to these 700 MHz authorizations under Part 27, regardless of whether licensees are involved in a comparative hearing.¹⁶⁵ In addition, to the extent the Commission's renewal requirements and at least some of its performance requirements apply at the end of a license term, we requested comment on the advantages and disadvantages of combining any performance requirements applicable to 700 MHz licensees with the review process that the Commission conducts during a license renewal application.¹⁶⁶ Finally, we sought comment on whether to adopt a new renewal process to replace the procedures for the filing of competing applications at renewal time.¹⁶⁷

74. The renewal of 700 MHz Commercial Services licenses is governed by Parts 1 and 27 of the Commission's rules. Section 1.949 of the Commission's rules sets forth the general procedures for filing applications for renewal of licenses in the wireless radio services, including services in the 700 MHz Commercial Services Band.¹⁶⁸ Although the rule states that "[a]dditional renewal requirements applicable to specific services are set forth in the subparts governing those services,"¹⁶⁹ Part 27 contains no provisions on the specific renewal process to the extent a competing application is not received. In addition, Section 27.14(b)-(d) of the Commission's rules, which indicates that a comparative process is used to choose among renewal and competing applicants,¹⁷⁰ does not describe the type of comparative hearing to be employed. If a 700 MHz Commercial Services licensee's renewal application is not contested and no competing applications are received, then the licensee has no affirmative renewal filing obligation codified in the rules, other than the contemporaneous filing obligation of demonstrating that it has met the "substantial service" performance requirement in Section 27.14(a).¹⁷¹ In the event that a competing application is filed under Section 27.14(b)-(d) of the rules,¹⁷² however, a 700 MHz licensee

¹⁶⁵ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9380-81 ¶¶ 80-81.

¹⁶⁶ *Id.* at 9381-82 ¶ 82.

¹⁶⁷ *Id.* at 9382-83 ¶ 83. For instance, the licenses could be returned to the Commission for re-auction should a license not be renewed. We also asked commenters to address whether any amendments of its rules on the renewal process should be limited to the unauctioned 700 MHz licenses, or whether any such amendments also should apply to those 700 MHz licenses which already have been auctioned in order to have a unitary regime for these licenses.

¹⁶⁸ 47 C.F.R. § 1.949. Specifically, it states that a renewal application must be filed no later than the expiration date of the authorization and no sooner than 90 days prior to expiration. *Id.* § 1.949(a).

¹⁶⁹ 47 C.F.R. § 1.949(a).

¹⁷⁰ *See* 47 C.F.R. § 27.14(b)-(d).

¹⁷¹ That standard has not been defined in Commission rules, and commenters strongly objected to the suggestion in the *700 MHz Commercial Services Notice* that the Commission adopt specific criteria. *See infra* Section IV.B.1.c.

¹⁷² To date, the Commission has never received a competing application to a 700 MHz license renewal, nor, for that matter, to the renewal of any wireless radio service license under Part 27.

has the burden of making a detailed showing explaining why it should receive a renewal expectancy against any competing application.

75. Discussion. In this section, we clarify that all licensees in the 700 MHz Commercial Services Band seeking renewal of their authorizations at the end of their license term must file a renewal application in accordance with the provisions of Section 1.949 of the Commission's rules. Consistent with existing rules, as part of this renewal requirement licensees must demonstrate in their applications that they have provided substantial service during their past license term, which is defined as service that is sound, favorable, and substantially above a level of mediocre service that just might minimally warrant renewal. This requirement is distinct from performance requirements. Substantial service in the renewal context, as opposed to the coverage benchmarks established for the performance requirement context, encompasses Commission consideration of a variety of factors including the level and quality of service, whether service was ever interrupted or discontinued, whether service has been provided to rural areas,¹⁷³ and any other factors associated with a licensee's level of service to the public.¹⁷⁴ Accordingly, a licensee that meets the applicable performance requirements might nevertheless fail to meet the substantial service standard at renewal. Licensees must demonstrate at renewal that they have substantially complied with all applicable Commission rules, policies, and the Communications Act of 1934, as amended, including any applicable performance requirements.

76. Under the revised Section 27.14 of the Commission's rules, we also are eliminating the filing of competing applications to requests for renewal of these 700 MHz licenses. We are mindful of the potential costs and the burdens they impose on both the Commission and licensees. We agree with MetroPCS that such administrative processes "harken[] back to an old era . . . where competitors were known to file 'strike' applications against a renewal in the hope of getting a payoff."¹⁷⁵ Under the revised Section 27.14 of the Commission's rules, we are therefore adopting a process by which 700 MHz Commercial Services Band licenses comes back to the Commission for re-auction if a license is not renewed. The existing petition to deny process,¹⁷⁶ coupled with the ability of a petitioner to participate in any subsequent auction to re-license spectrum that is returned to the Commission for lack of renewal, creates sufficient incentives to challenge inferior service or poor qualifications of licensees at renewal. This approach protects the public interest without creating incentives for speculators to file "strike" applications.

77. By eliminating the filing of competing applications at renewal, we find that the concerns raised by the majority of commenters in this proceeding about renewal expectancies are moot. We recognize that the majority of commenters that addressed renewal issues did not support any changes to the Part 27 renewal rules applicable to 700 MHz Commercial Services Band licensees. Moreover, some of these commenters, such as AT&T and CTIA expressed concern that any revision to the rules governing

¹⁷³ We note, for example, that the Commission stated in the *Upper 700 MHz Report and Order* that a licensee "that limits buildout to urban areas and areas with high density population, will not necessarily be ensured of license renewal, even if otherwise compliant with the construction benchmarks," and added its belief that substantial service "requires the licensee to buildout in rural areas as well." *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 505 ¶ 71.

¹⁷⁴ As we have had the authority to do in the past on a case-by-case basis, we could nevertheless condition the renewal of any 700 MHz license on a specific level of compliance with one or more of these or any other relevant factors. In addition, once specific 700 MHz service offerings have had a chance to develop on a basis comparable to that of, e.g., PCS, we plan to revisit these factors to the extent we determine that a particular problem or issue requires regulatory relief through the renewal review process.

¹⁷⁵ See MetroPCS Comments in WT Docket No. 06-150 at 17.

¹⁷⁶ Existing provisions in Part 1 provide procedures for petitions to deny, application dismissals, and rules for subsequent re-licensing through competitive bidding. See generally 47 C.F.R. § 1.901 *et seq.*; see also *id.* § 27.501 *et seq.*; § 27.701 *et seq.*

renewal proceedings would eliminate the concept of “renewal expectancy” that applied in comparative hearings.¹⁷⁷ Because smaller carriers and rural interests in particular seemed concerned that certain rule changes would place a new burden on carriers ill equipped to meet it, we have decided to maintain 700 MHz Commercial Services Band licensees’ expectations of renewal by eliminating provisions for competing applications. This action provides additional certainty for all 700 MHz Commercial Services Band licensees, and requests by certain commenters to do otherwise could result in additional administrative burdens on licensees that we find not to be in the public interest.

(ii) License Terms

78. Background. Section 27.13(b) of the Commission’s rules provides that initial license authorizations for spectrum in the 700 MHz Commercial Services Band will extend until January 1, 2015, except that a Part 27 licensee commencing broadcast services will be required to seek renewal of its license for such services at the termination of the eight-year term following commencement of such operations.¹⁷⁸

79. In the *700 MHz Commercial Services Notice*, we sought comment on whether and how the license terms of unauctioned and previously auctioned licenses in the 700 MHz Commercial Services Band should be revised, including whether the term for these 700 MHz licenses should be extended beyond January 1, 2015.¹⁷⁹ We also asked for comment on whether to establish a uniform license term for all services in the 700 MHz Commercial Services Band, regardless of their regulatory status.

80. Nearly all commenters who addressed this issue support revising the current rule to provide either a ten- or fifteen-year initial license term. Ten of these commenters support a 15-year term,¹⁸⁰ and eight commenters support a 10-year term.¹⁸¹ Only two commenters objected to extending the license terms of these 700 MHz licensees.¹⁸²

81. In addition, nine commenters argue that any revised license terms should apply to both unauctioned and auctioned 700 MHz Commercial Services Band licenses.¹⁸³ As part of their proposal,

¹⁷⁷ See AT&T Comments in WT Docket No. 06-150 at 15; CTIA Comments in WT Docket No. 06-150 at 18.

¹⁷⁸ 47 C.F.R. § 27.13(b).

¹⁷⁹ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9383-85 ¶¶ 84-89.

¹⁸⁰ Alltel Reply Comments in WT Docket No. 06-150 at 5; Aloha Comments in WT Docket No. 06-150 at 10-11; AT&T Reply Comments in WT Docket No. 06-150 at 3, 25-26; C&W Comments in WT Docket No. 06-150 at 4; Cingular Reply Comments in WT Docket No. 06-150 at 2; CTIA Comments in WT Docket No. 06-150 at 19-20; Frontier Comments in WT Docket No. 06-150 at 8; MetroPCS Reply Comments in WT Docket No. 06-150 at 13-14 (supports a 15 year term, or a ten year term at a minimum); Navajo Nation Comments in WT Docket No. 06-150 at 3; NextWave Reply Comments in WT Docket No. 06-150 at 15.

¹⁸¹ Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 35; Blooston Comments in WT Docket No. 06-150 at 7-8 (supports at least 10 years after DTV transition), Corr Comments in WT Docket No. 06-150 at 4; Dobson Comments in WT Docket No. 06-150 at 11; Motorola Reply Comments in WT Docket No. 06-150 at 5-6 (commenting that it would support an even longer term); Union Comments in WT Docket No. 06-150 at 6; Verizon Wireless Comments in WT Docket No. 06-150 at 10; Vermont Department of Public Service *et al.* in WT Docket No. 06-150 Comments at 11. See also RCA Reply Comments in WT Docket No. 06-150 at 4 (appearing to assume a 10-year term in discussing performance requirements); RCA Comments in WT Docket No. 06-150 at 8-9.

¹⁸² DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 10-11; Howard/Javed Comments in WT Docket No. 06-150 at 25.

¹⁸³ See Aloha Comments in WT Docket No. 06-150 at 11; Blooston Comments in WT Docket No. 06-150 at 7-8; Corr Comments in WT Docket No. 06-150 at 4; Dobson Comments in WT Docket No. 06-150 at 11; Frontier Comments in WT Docket No. 06-150 at 8; MetroPCS Reply Comments in WT Docket No. 06-150 at 13; Motorola Reply Comments in WT Docket No. 06-150 at 5-6; Navajo Nation Comments in WT Docket No. 06-150 at 3. See also NextWave Reply Comments in WT Docket No. 06-150 at 15 (extend term “for 700 MHz providers”).

Access Spectrum *et al.* urge that license terms for the Guard Band A Block in the Upper 700 MHz Band should be harmonized with the Upper 700 MHz Commercial Services Band licenses.¹⁸⁴ Two commenters discuss revising license terms only for unauctioned licenses.¹⁸⁵ One commenter specifically opposes changing the initial license terms for previously unauctioned spectrum, and its position depends on the whether the Commission increases the performance requirements for the unauctioned 700 MHz Commercial Services spectrum.¹⁸⁶

82. Discussion. We will revise our rules to provide that initial authorizations for the 700 MHz Commercial Services Band will have a term not to exceed 10 years from February 17, 2009, which is the firm deadline for the DTV transition. Subsequent renewals will be for terms not to exceed 10 years. This revised license term will apply to all licenses in the 700 MHz Commercial Services Band. However, because Section 307(c)(1) of the Communications Act provides that a license for operating a broadcast station shall not be granted for a term that exceeds 8 years, we retain the current provision that a Part 27 licensee commencing broadcast services will be required to seek renewal of its license for such services at the termination of the eight-year term following commencement of such operations.¹⁸⁷ We do not revise the license term for Guard Band licensees because such revisions fall beyond the scope of the 700 MHz Commercial Services proceeding.¹⁸⁸

83. We are extending the revised license term to both the already auctioned and unauctioned licenses in the 700 MHz Commercial Services Band. We find that uniformly extending the license term in this manner provides a level of parity for services within the same band. In addition, this treatment recognizes that band clearing and the resulting unencumbered use of the spectrum in the pre-DTV Act period was tied to a transition scheme that has now been replaced with a firm statutory transition date of February 17, 2009.¹⁸⁹ Specifically, the underlying reason behind the current rule changed with passage of the DTV Act. The Commission previously determined that a definite termination date, *e.g.*, January 1, 2015, was preferable to a discrete term of years following the end of the DTV transition, which at that time was subject to extension on a market-by market basis.¹⁹⁰ The same license terms that were adopted in the *Upper 700 MHz First Report and Order* were applied to licenses in the Lower 700 MHz Band.¹⁹¹ However, the DTV Act's uniform deadline for the DTV transition has effectively removed the issue of market-by-market broadcast incumbency. Under these circumstances, we provide a level of uniformity

¹⁸⁴ Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 35.

¹⁸⁵ See Union Comments in WT Docket No. 06-150 at 6; Verizon Wireless Comments in WT Docket No. 06-150 at 10.

¹⁸⁶ Vermont Department of Public Service *et al.* Comments in WT Docket No. 06-150 at 11.

¹⁸⁷ 47 U.S.C. § 307(c)(1); see also 47 C.F.R. § 73.1020(a).

¹⁸⁸ We also note that we did not seek comment on possible revisions to the license term for Guard Band licenses in the 700 MHz Guard Bands proceeding. See generally *700 MHz Guard Bands Notice*, 21 FCC Rcd 10413.

¹⁸⁹ Prior to the DTV Act, the Commission was required to grant extensions at the request of individual broadcast licensees on a market-by-market basis if one or more of the four largest network stations or affiliates were not broadcasting in digital, digital-to-analog converter technology was not generally available, or 15 percent or more of television households were not receiving a digital signal. 47 U.S.C. § 309(j)(14)(B)(i)-(iii) (2005). See also *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9350 ¶ 7, 9350-51 ¶ 9, 9356-57 ¶ 18 (discussing extension of DTV transition prior to DTV Act, the transition under the DTV Act, and the current license term for 700 MHz licensees).

¹⁹⁰ See *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 504 ¶ 67, n.161, *on recon.* Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 20845, 20862-63 45 (2000); see also 47 U.S.C. 309(j)(14)(B)(i)-(iii) (2005).

¹⁹¹ See *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1077 ¶ 145.

by extending the revised license terms to all licensees in the 700 MHz Commercial Services Band, except for those engaging in broadcast services.

84. We find that a term not to exceed 10 years from February 17, 2009, should be used for initial authorizations in the 700 MHz Commercial Services Band, and that subsequent renewal terms will be 10 years. A ten-year license term is consistent with most other Part 27 services, with the exception of recently auctioned AWS-1 licenses, which we address below,¹⁹² as well as with the license terms for other similar spectrum, such as that used for cellular service and PCS.¹⁹³ In addition, this period will offer licensees regulatory certainty and help promote investment in the band. Under the current rules, all licensees would have terms that extend until January 1, 2015, which is only approximately six years from the end of the DTV transition. Thus, licensees that acquire their authorizations in a future auction would have had an initial license term less than ten years, and more likely for a shorter period, *i.e.*, six or seven years, depending on the date of the auction and issuance of the authorizations. In similar fashion, current licensees in the 700 MHz Commercial Services Band would only have approximately six years of access to their spectrum free from broadcasters. We find that a longer period should be made available to all licensees in order to provide sufficient time for the recovery of costs related to the development and deployment of new services, especially those based on technologies that are more advanced, more expensive, and which may take longer to develop. The 700 MHz Commercial Services Band is a likely band for the use of these more advanced technologies and we are concerned that a license term that expires only six years from the DTV transition provides too short a time period.

85. We decline to increase the length of initial or renewal terms to fifteen years. We disagree with those commenters such as Aloha, CTIA, and Frontier who argue that parity with AWS-1 services mandates a fifteen-year term for 700 MHz services.¹⁹⁴ The “relocation and band clearance issues” that provided the rationale for the fifteen-year initial licenses for AWS-1 services do not apply here.¹⁹⁵ The date certain of February 17, 2009, for the end of the DTV transition means that spectrum in the 700 MHz Band will be clear for use by 700 MHz Band licensees as of that date.¹⁹⁶

86. We also disagree with DIRECTV/EchoStar, which believes that the current license term should be retained in order to promote prompt use of the spectrum,¹⁹⁷ and with Howard/Javed, who argue that the current rule should be kept to spur the development of a secondary market.¹⁹⁸ The combination of our decisions in this Report and Order and our secondary markets policies make it unlikely that this highly valued spectrum will sit unused. The Commission’s secondary market spectrum leasing policies

¹⁹² See 47 C.F.R. 27.13, describing initial license terms for licensees in the 2305-2320 MHz and 2345-2360 MHz Bands (ten years), 1390-1392 MHz Band (ten years), 1392-1395 MHz and 1432-1435 MHz Bands (ten years), 1670-1675 MHz Band (ten years).

¹⁹³ See 47 C.F.R. §§ 22.513(e), 24.15.

¹⁹⁴ See Aloha Comments in WT Docket No. 06-150 at 10-11; CTIA Comments in WT Docket No. 06-150 at 19-20; Frontier Comments in WT Docket No. 06-150 at 8-9.

¹⁹⁵ See *AWS-1 Report and Order*, 18 FCC Rcd at 25190 ¶ 70.

¹⁹⁶ See DTV Act § 3002; see also H.R. Conf. Rep. No. 109-362 (2005), *reprinted in* 2006 U.S.C.C.A.N. 3 (conference report for DTV Act)

¹⁹⁷ See DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 11 (DIRECTV and EchoStar are concerned that “any such extension would reduce the amount of spectrum in play and therefore make new entry more difficult.... The public interest demands that whomever the Commission licenses to use this spectrum do so in a timely manner.”).

¹⁹⁸ See Howard/Javed Comments in WT Docket No. 06-150 at 28 (commenting that the current license terms should remain as an incentive to promoting a vigorous secondary market in spectrum leases, and argue that a shorter initial license period is one way to keep licensees from being able to “costlessly hold spectrum” for anticompetitive reasons, *i.e.*, spectrum warehousing).

focus on promoting spectrum leasing arrangements, and we have taken steps in this Report and Order to improve use of the spectrum, including the provision of a mix of geographic license areas consisting of CMAs, EAs, and REAGs.¹⁹⁹

87. Finally, because of the specifically applicable statutory limitation, we will retain the current requirement that 700 MHz Commercial Services Band licensees commencing broadcast services will be required to seek renewal of their licenses for such services prior to the termination of the eight-year term following commencement of such operations.²⁰⁰ As stated above, Section 307(c)(1) of the Communications Act provides that licenses granted for operating broadcast stations “shall be for a term not to exceed 8 years.”²⁰¹

(iii) Power Limits for Lower 700 MHz Band and Upper 700 MHz Commercial Services Band Base Stations

88. Background. The power limit for base stations operating in both the Lower 700 MHz Band and the Upper 700 MHz Commercial Services Band is 1 kW ERP.²⁰² In the Lower 700 MHz Band, however, base stations are permitted to operate at power levels up to 50 kW ERP if they do not produce signals exceeding a power flux density (PFD) of 3 mW/m² on the ground within 1 kilometer of the station.²⁰³

89. In the *700 MHz Commercial Services Notice*, we sought comment on whether we should revise the power levels that commercial licensees in either the Lower 700 MHz Band and the Upper 700 MHz Commercial Services Band are permitted to employ.²⁰⁴ In response, several commenters seek an increase in the power limit for 700 MHz Commercial Services Band base stations from 1 kW ERP to 2 kW ERP.²⁰⁵ Some of these commenters specifically recommend raising the power limit for such 700 MHz licensees operating in rural areas,²⁰⁶ and one such commenter suggests that any power increase could be accompanied by the Lower 700 MHz Band PFD requirement.²⁰⁷ In addition, a number of

¹⁹⁹ See *supra* Section III.A.2.a.

²⁰⁰ See 47 C.F.R. § 27.13(b).

²⁰¹ 47 U.S.C. § 307(c)(1); see also 47 C.F.R. § 73.1020(a).

²⁰² See 47 C.F.R. §§ 27.50(b), (c). We note that under our rules, fixed stations may operate in the 700 MHz bands. Thus, the existing 1 kW ERP base station power limit and any other power limits referred to in this Order shall apply to fixed stations as well as base stations. We further note that 1 kW ERP is equivalent to 1640 W EIRP – the power limit permitted in the PCS and AWS bands.

²⁰³ See 47 C.F.R. §§ 27.50(c), 27.55(b). Through the use of an appropriate PFD limit, a transmission from a 50 kW ERP base station can appear, to an adjacent band receiver operating in the vicinity of the base station, like a transmission from a 1 kW ERP base station operating without a PFD constraint.

²⁰⁴ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9386-88.

²⁰⁵ See, e.g., DIRECTV Comments in WT Docket No. 06-150 at 13 (favoring a power increase in the Upper 700 MHz Band and asserting that in the 2008/2009 timeframe, “new or emerging technologies” will be available, which will allow 700 MHz licensees to employ power levels significantly greater than 1 kW ERP “without causing any interference to other spectrum users.”). See also Aloha Partners Reply Comments in WT Docket No. 06-150 at 5.

²⁰⁶ See Vermont Department of Public Service *et al* Comments in WT Docket No. 06-150 at 11 (favoring an increase in the Upper 700 MHz Band power limit in rural areas from 1 kW ERP to 2 kW ERP due to the “challenges” faced by rural providers in covering large geographic areas); see also AT&T Comments in WT Docket No. 06-150 at 12 (recommending a power limit increase in rural areas “similar to the higher power limits. . . now permitted in the cellular, PCS, and AWS services.”).

²⁰⁷ See Leap Wireless Comments in WT Docket No. 06-150 at 6-8 (proposing an increase in the power limit to 2 kW ERP for Upper 700 MHz Band base stations to “facilitate the deployment of robust CMRS services,” and indicating that it would “not object” to a 3 mW/m² PFD requirement along with an increased power limit). Motorola suggests (continued....)

commenters contend that the Commission should employ a power spectral density (PSD) model for defining power limits in the 700 MHz Commercial Services Band.²⁰⁸

90. We also sought comment on whether we should continue to allow Lower 700 MHz Band licensees to operate base stations at power levels up to 50 kW ERP or whether this capability should be reduced for existing and/or future Lower 700 MHz Band licensees.²⁰⁹ Most commenters addressing this issue oppose reducing the current 50 kW ERP capability in the Lower 700 MHz Band.²¹⁰ Some commenters particularly oppose any revision to this rule that might be applied to the already-auctioned portions of the Lower 700 MHz Band.²¹¹ Cingular suggests that the Commission “consider” increasing the power capability in the Lower 700 MHz Band in rural areas to 100 kW ERP “to further promote and expedite service to those areas.”²¹² In contrast, MSTV recommends lowering the power limit out of concern over potential interference to broadcast operations,²¹³ and Sprint believes that high-site, 50 kW ERP transmissions in the Lower 700 MHz Band could cause interference to adjacent band, low-site, lower power operations.²¹⁴ Finally, Motorola requests that Lower 700 MHz Band licensees’ capability to operate at 50 kW ERP be defined in terms of power spectral density.²¹⁵

91. Discussion. We modify our power limit rules for the Lower 700 MHz Band and the Upper 700 MHz Commercial Services Band in a number of ways. First, we implement a PSD model for

(Continued from previous page)

that if we permit a higher power limit for Upper 700 MHz Band commercial stations, there could be the potential for interference to Public Safety operations, and therefore recommends that if an increased power limit is adopted the “aggregate total power from non-desired signals into [a Public Safety portable] receiver front-end should not exceed approximately -25 dBm.” See Motorola Comments in WT Docket No. 06-150 at 11.

²⁰⁸ See Motorola Comments in WT Docket No. 06-150 at 11 (requesting that the Commission limit the power of 700 MHz Band base stations to 1 kW/MHz ERP). See also Aloha Partners Comments in WT Docket No. 06-150 at 11, MilkyWay Comments in WT Docket No. 06-150 at 9, CTIA Reply Comments in WT Docket No. 06-150 at 8, and Cingular Reply Comments in WT Docket No. 06-150 at 15. The issue of employing a PSD model for defining power limits was also raised in the *Streamlining and Harmonization Further Notice*. A number of parties commenting in that proceeding favored the adoption of the PSD model. See, e.g., Comments of CTIA in WT Docket No. 03-264 at 4-6.

²⁰⁹ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9385-88 ¶ 90-98.

²¹⁰ See AT&T Reply Comments in WT Docket No. 06-150 at 11; Motorola Comments in WT Docket No. 06-150 at 12.

²¹¹ See C&W Enterprises Comments in WT Docket No. 06-150 at 5 and Corr Wireless Comments in WT Docket No. 06-150 at 8-10. See also Qualcomm Comments in WT Docket No. 06-150 at 22-24 (indicating that any decrease in power limits for existing Lower Band licensees is “unwarranted” and would require Qualcomm to construct many additional base stations to implement its MediaFlo system).

²¹² See Cingular Reply Comments in WT Docket No. 06-150 at 15 (stating that such a power increase would not “substantially increas[e] the potential for interference”).

²¹³ See MSTV Reply Comments in WT Docket No. 06-150 at 5-7 (arguing that we should reduce the power capability for Lower Band licensees to some unspecified level during the transition – during which time “knowledge developed . . . will teach [us] steps that are necessary to prevent harmful interference” to broadcast operations – and then after the transition, retain that reduced power level capability for Channel 52 stations only”). In addition, MSTV requests that we reaffirm our decision announced in the Public Notice released prior to the 2002 Lower 700 MHz Band auction that 700 MHz licensees must afford interference protection to adjacent channel broadcast services, and that such services “have priority over any adjoining 700 MHz services that might interfere.” *Id.* at 4.

²¹⁴ Sprint Comments in WT Docket No. 06-150 at 11-12. Sprint, however, does not propose a particular, reduced power level for the Lower Band to prevent such interference.

²¹⁵ See Motorola Comments in WT Docket No. 06-150 at 12 (proposing that Lower Band licensees be limited to a power level of 50 kW/6 MHz ERP).

defining power limits for base stations operating in the entire 700 MHz Commercial Services Band.²¹⁶ The current power limit rules do not specify a bandwidth over which a licensee's power is to be limited, and could be construed to mean that the power limit applies on a "per emission" basis. Because some licensees may only transmit one emission within their given bandwidth, while others using technologies with narrower emissions might employ multiple emissions over that bandwidth, construing the power limit to apply on a "per emission" basis could allow licensees employing multiple emissions to transmit more total energy in their authorized spectrum blocks than licensees with only one emission in their spectrum blocks. To better accommodate all technologies, we are clarifying that the maximum allowable power levels in the 700 MHz Commercial Services Band are to be defined on a "per megahertz of spectrum bandwidth" basis, rather than on a "per emission" basis. This clarification will enable higher power signals from wider band technologies, but will not result in a decrease in the total power currently allowed in the band from narrower band technologies. Given this clarification, we are also adopting additional measures to protect against any possible increased risk of interference, especially to 700 MHz public safety users.

92. More specifically, we will allow 700 MHz Commercial Services Band licensees employing bandwidths greater than 1 MHz to meet a base station power limit of 1 kW/MHz ERP (*i.e.*, no more than 1 kW ERP in any 1 MHz band segment). Licensees operating with bandwidths of less than one megahertz will, however, continue to be permitted to operate at power levels up to 1 kW ERP over their bandwidth. Thus, for example, a licensee transmitting a signal with a bandwidth of 5 MHz could employ a power level of 5 kW ERP over the 5 MHz bandwidth, with each 1 MHz band segment within the 5 MHz bandwidth being limited to 1 kW ERP; and a licensee transmitting a signal with a bandwidth of 200 kHz could employ a power level of 1 kW ERP over the 200 kHz bandwidth. This approach to defining power limits, as suggested by Motorola, and others in the context of the *Streamlining and Harmonization Further Notice*, will achieve a degree of technological neutrality by ensuring that all licensees regardless of technology choice have enough power to operate a viable service. This neutrality would not exist if all licensees, regardless of their operating bandwidth, were required to limit their base station power levels to 1 kW ERP per emission.²¹⁷

93. In response to proposals by parties seeking greater power limits for rural area operations, we will permit power levels of up to 2 kW/MHz ERP in rural areas, and consistent with our decision above, we will allow rural licensees operating with bandwidths less than one megahertz to operate at power levels up to 2 kW ERP over their bandwidth. In implementing this decision, we define rural areas, consistent with the *Rural Report and Order*, as those counties in the U.S. having a population of fewer than 100 people per square mile, based on the most recently available population statistics from the Bureau of the Census.²¹⁸ As suggested by Vermont Department of Public Service *et al.*, increasing the permissible power in rural areas will enable 700 MHz Commercial Services Band licensees operating in such areas to more easily implement their systems; and as AT&T notes, increasing power levels in rural areas would be consistent with the recent Commission decision to permit rural carriers in the Cellular, AWS, and Broadband PCS services to operate at higher power levels.²¹⁹ We note that in the *Rural Report and Order*, where the same power increase was adopted, the Commission decided, as a "cautionary measure," to require carriers operating at higher power levels to coordinate with licensees operating within 75 miles of their base stations.²²⁰ Consistent with this decision, we shall require any 700 MHz

²¹⁶ We are not, however, adopting the PSD model for defining power limits for control, mobile, or portable stations operating in the bands.

²¹⁷ See Motorola Comments in WT Docket No. 06-150 at 10-11.

²¹⁸ See *Rural Report and Order*, 19 FCC Rcd at 19128 ¶ 89; 47 C.F.R. § 27.50(d)(1).

²¹⁹ See *Rural Report and Order*, 19 FCC Rcd at 19127 ¶ 87, 19131 ¶ 95, 19133 ¶ 100.

²²⁰ See, *e.g.*, *id.* at 19134 ¶ 101.

Commercial Services Band licensee seeking to operate a base station under our rules permitting power levels greater than 1 kW ERP in rural areas to coordinate in advance with all non-public safety 700 MHz licensees authorized to operate within 75 miles of the station and with all 700 MHz Regional Planning Committees that have jurisdiction within 75 miles of the station.

94. As noted above, licensees in the Lower 700 MHz Band are allowed to use up to 50 kW ERP if they do not produce signals exceeding a power flux density (PFD) of 3 mW/m^2 on the ground within 1 kilometer of the station. A number of commenters expressed views on the appropriateness of the current, maximum 50 kW ERP capability for Lower 700 MHz Band operations. Sprint, for example, contends that 50 kW ERP transmissions in the Lower 700 MHz Band could cause interference to adjacent band operations, and Verizon indicates that “high-powered operations could be potentially harmful to mobile systems” in the Lower 700 MHz Band.²²¹ Conversely, Qualcomm states that “there is no evidence to support the reduction in the existing 50 kW ERP power level for the Lower Band,”²²² and various incumbent Lower 700 MHz Band licensees express concern over the possibility that their 50 kW ERP power capabilities could be reduced.²²³

95. Considering these comments, we make certain modifications to the power limit rules in the Lower 700 MHz Band. Specifically, we will retain the ability of incumbent C and D Block licensees to employ power levels up to 50 kW ERP. In addition, because we believe that unpaired blocks are conducive to the provision of broadcast-type operations, we shall permit licensees operating in any unpaired block(s) in the Lower 700 MHz Band to operate at a power level of 50 kW ERP as well.²²⁴ However, because we believe that paired blocks are generally more conducive to the provision of mobile services, we shall not extend to new licensees operating in any Lower 700 MHz Band paired blocks the ability to operate at 50 kW ERP. This action helps preserve the flexibility the Commission originally envisioned for the Lower 700 MHz Band, *i.e.*, the use of both broadcast and mobile services in the band, by providing an environment conducive to mobile systems in the paired blocks and an environment conducive to broadcast-type systems in the unpaired blocks. Current and future licensees nevertheless will have the flexibility to implement broadcast-type or mobile systems in any particular block. For example, a licensee may implement a broadcast-type system in a paired block, but rather than a high-power, high-site system, it would have to design a distributed broadcast system.

96. In reaching this decision, we conclude that it would not be appropriate to reduce the power limits of incumbent Lower 700 MHz Band licensees, who acquired their spectrum with the expectation that they would be able to employ 50 kW ERP transmissions in the band. Although we recognize concerns expressed by certain parties regarding the potential for adjacent band interference into the current unauctioned paired blocks (*i.e.*, the current A and B Blocks) from high power emissions in adjacent incumbent and unauctioned unpaired blocks, we continue to believe that our out-of-band emission limits coupled with the 3 mW/m^2 PFD requirement will be effective in protecting unauctioned paired blocks from adjacent channel interference. We note, however, that the 50 kW ERP limit in the

²²¹ See Verizon *Ex Parte* letter of April 4, 2007 at 3.

²²² See Qualcomm Reply Comments in WT Docket No. 06-150 at 3.

²²³ For example, C&W, a company that operates a system employing a single, high-powered, transmitter, indicates that if the power limit were reduced, it would have to add many more stations to cover the same area, at “great expense,” and therefore “would have to discontinue the service it is providing. See C&W Comments in WT Docket No. 06-150 at 5. Similarly, Corr Wireless, which believes that with the 50 kW ERP power limit a licensee could provide “mobile TV and one-way data [services]” to small or medium-sized markets, considers the idea of reducing the power limit for existing Lower 700 MHz licensees a “gross breach of faith for licensees who relied on the specified power limits when applying for, bidding on, and paying for these licenses . . .” Corr Wireless Comments in WT Docket No. 06-150 at 8-9.

²²⁴ See *infra* Section IV.B.1.a (proposing retention of the band plan for the existing Lower 700 MHz Band, which includes an unpaired E Block).

Lower 700 MHz Band was based on a traditional broadcast emission, which consists of a single emission within the licensed bandwidth. The Commission never intended that emissions within a single block in the Lower 700 MHz Band exceed 50 kW ERP. Accordingly, we clarify that the 50 kW ERP limit for the current C and D Blocks, and any additional unpaired block(s) in the Lower 700 MHz Band, is a cap on the average total power of all emissions within the full authorized spectrum of the blocks. For example, a single incumbent C or D Block base station with an emission bandwidth of 1 megahertz could transmit with the full 50 kW ERP, but no other emissions would be permitted in the remaining 5 megahertz of the block. This limit would also apply to the cumulative emissions of both licensees if a 6 megahertz incumbent or unauctioned unpaired block is disaggregated.

97. In implementing this PSD approach to the power limits in both the Lower 700 MHz Band and the Upper 700 MHz Commercial Services Band, we continue to remain concerned that transmissions at higher power levels could potentially cause interference to adjacent channel operations. To mitigate the potential for harmful interference to adjacent channel operations, we require the following. For Lower 700 MHz Band licensees, if operating with a bandwidth of 1 megahertz or less and a transmitting power greater than 1 kW ERP non-rural or 2 kW ERP rural, or if operating with a bandwidth of more than 1 megahertz and a PSD greater than 1 kW/MHz ERP non-rural or 2 kW/MHz ERP rural, then that licensee must comply with the 3 mW/m² PFD limit.²²⁵ Thus, for example, a non-rural licensee transmitting an 8 kW ERP signal in a 5-megahertz bandwidth or a rural licensee transmitting a 4 kW ERP signal in a 1.25 MHz bandwidth would have to satisfy the 3 mW/m² PFD limit. However, a licensee transmitting an 800 watt ERP signal in a 200-kHz bandwidth or a 4 kW ERP signal in a 5-megahertz bandwidth, or a rural licensee transmitting an 8 kW ERP signal in a 5-megahertz bandwidth, would not have to meet the PFD limit. Because we wish to remain especially vigilant regarding the potential for interference to public safety operations, we impose the following additional requirement on Commercial Services licensees operating in the Upper 700 MHz Band. Specifically, all Upper 700 MHz Commercial Services Band licensees, both rural and non-rural, transmitting signals at a power levels greater than 1 kW ERP, irrespective of bandwidth, must satisfy the 3 mW/m² PFD limit.²²⁶ Thus, for example, an Upper 700 MHz Commercial Services Band licensee transmitting a 4 kW ERP signal in a 5-megahertz bandwidth would have to meet the PFD limit.

98. Leap asks that we adopt a power limit of 2 kW ERP for Upper 700 MHz Commercial Services Band base stations and indicates that it would not object to applying a 3 mW/m² PFD limit to such a power limit. To the extent that we are permitting Upper 700 MHz Commercial Services Band licensees to employ 2 kW ERP,²²⁷ and requiring the application of our 3 mW/m² PFD in such instances, we are granting Leap's request. DIRECTV/EchoStar requests that we significantly increase the power limit in the Upper 700 MHz Commercial Services Band. However, DIRECTV/EchoStar proposes no specific, higher power limit for the band, and provides no information about the "new and emerging technologies" it believes would permit such higher power levels without causing interference to other users.²²⁸ Thus, without specific information regarding DIRECTV/EchoStar's request for an increased power limit for the Upper 700 MHz Commercial Services Band, we must deny DIRECTV/EchoStar's request.

²²⁵ We will also require such licensees to meet the same type of notification requirements that currently apply to Lower 700 MHz Band licensees who are required to meet our PFD limit. *See* Sections 27.50(c), as amended.

²²⁶ We will require such licensees to meet the same type of notification requirement that we are now requiring of Lower 700 MHz Band licensees. *See* Section 27.50(b), as amended.

²²⁷ We permit Upper 700 MHz Band licensees to transmit at 2 kW ERP when operating over bandwidths of 2 megahertz or more.

²²⁸ *See* DIRECTV/EchoStar comments in WT Docket No. 06-150 at 13 (indicating that as such technologies develop, it will supplement the record with specific power limit recommendations).

99. Motorola is concerned that possible increases in Upper 700 MHz Commercial Services Band power levels could result in interference to 700 MHz public safety operations. Motorola thus suggests that, if we permit higher power levels in the band, we require that the “aggregate” power from non-desired signals received by portable public safety devices situated within 1 km of a high-powered commercial base station be limited to -25 dBm.²²⁹ We decline to adopt Motorola’s proposal for two reasons. First, Motorola does not provide the technical basis for its proposed -25 dBm limitation (*i.e.*, how it would serve to protect public safety devices).²³⁰ Second, any rule that would require new 700 MHz Commercial Services Band licensees to meet some measured signal level in all present and future public safety devices operating in the vicinity of their base stations could be burdensome and create uncertainty for such licensees as they develop and implement their networks. Our requirement that licensees meet a PFD limit at specified locations near their base stations when operating at higher power levels is less burdensome and will create more certainty for new licensees as they implement their systems.

100. We reject Cingular’s request to permit a power capability of 100 kW ERP for Lower 700 MHz Band base stations operating in rural areas because we are concerned that such a power level could result in interference to adjacent channel, Lower 700 MHz Band operations. When the Commission adopted rules for the Lower 700 MHz Band to permit a 50 kW ERP power level, it analyzed the potential for interference to adjacent channel operations if power levels significantly greater than 1 kW ERP were permitted.²³¹ In that analysis, the Commission concluded that interference to adjacent channel base station receivers from transmitting Lower 700 MHz Band base stations would not be expected to occur when such stations are operating at power levels up to 50 kW ERP.²³² This analysis indicates, however, that if Lower 700 MHz Band base stations operated at power levels as high as 100 kW ERP, then the possibility of interference to adjacent band operations would increase.²³³ In addition, Cingular does not explain why a 50 kW ERP power level would be inadequate, or why a power level of 100 kW ERP power level would be necessary to provide service to rural areas. We therefore reject Cingular’s request for a power capability of 100 kW ERP for Lower 700 MHz Band operations in rural areas.

101. With regard to the concerns raised by MSTV about the use of 50 kW ERP power levels in the Lower 700 MHz Band, we reaffirm the Commission’s long-standing position that broadcasters must be afforded adequate interference protection from 700 MHz licensees. When the Commission established its rules for these licensees, it ensured that appropriate protections would be provided to broadcast operations.²³⁴ Thus, all 700 MHz Band licensees are required to comply with these rules during the DTV transition, and all licensees operating on Channel 52 will be required to continue to meet these requirements after the transition as well.

102. We will not, however, reduce the power capabilities of all Lower 700 MHz Band licensees either during or after the DTV transition as MSTV requests. Under Section 27.60 of our rules, 700 MHz licensees must limit their stations’ transmissions to specified field strength levels at co-channel and adjacent channel broadcasters’ Grade B contours, and under Section 27.53 of our rules, 700 MHz

²²⁹ See Motorola Comments in WT Docket No. 06-150 at 11.

²³⁰ We received no comments from the Public Safety community regarding the Motorola proposal.

²³¹ See *Lower 700 MHz Band Report and Order*, 17 FCC Rcd 1121, Appendix D.

²³² The Commission indicated that desired-to-undesired (D/U) ratios of -42 dB or better would likely ensure non-interference to 700 MHz base station receivers. As shown in Table 1 of Appendix D, which indicates D/U ratios for various conditions, for base stations transmitting at 50 kW ERP, there are no conditions where D/U ratios exceed -42 dB and only a few where D/U ratios approach -42 dB. *Id.*

²³³ As indicated in Table 1 of Appendix D, for base stations transmitting at power levels as high as 100 kW ERP, there are a number of conditions where D/U ratios would approach -42 dB. *Id.*

²³⁴ See, e.g., 47 C.F.R. § 27.60 (“TV/DTV interference protection criteria”); 47 C.F.R. § 27.53 (“Emission limits”).

licensees must meet prescribed out-of-band emission limits with respect to adjacent band operations. MSTV has not provided any reasoning as to why these requirements will not be met if and when base stations operate at high power levels. Rather, MSTV bases its request for a power reduction on a general, but speculative, concern that higher power levels could cause interference to television operations in the band. Given the absence of any existing circumstances of interference to broadcast operations or any technical rationale for why such interference would occur, we find that it is not necessary to prevent all Lower 700 MHz Band licensees from operating at 50 kW ERP power levels, either during or after the transition. We note, however, that, while we are not granting MSTV's request to reduce the power capabilities of all Lower 700 MHz Band licensees prior to the end of the transition, we do, through our decision above to limit power levels in the A Block to 1 kW/MHz ERP, grant MSTV's request to reduce the power level of licensees operating on Channel 52.

(iv) Power Limit Issues in WT Docket No. 03-264

103. Background. In the *Streamlining and Harmonization Further Notice*, the Commission sought comment on a request by CTIA to redefine how power limits are measured in the PCS and AWS bands.²³⁵ CTIA asked that the Commission modify its power limit rules so that: (1) the power limit for the bands would be increased from 1640 watts EIRP to 3280 watts EIRP; (2) the power in the PCS and AWS bands would be measured using PSD (*i.e.*, the power limit in those bands, using PSD, would be 3280 watts EIRP/MHz); and 3) power would be defined by the measurement of "average," rather than "peak" power. In the *Streamlining and Harmonization Further Notice*, the Commission sought comment on the CTIA proposals in the context of other bands, including the 700 MHz Band. We therefore will address CTIA's proposals, as they would apply to the 700 MHz Band.

104. Discussion. As discussed above, we will employ PSD for defining power limits in the 700 MHz Band. We have thus granted the second of CTIA's requests as it applies to the 700 MHz Commercial Services Bands. However, we shall not apply to the 700 MHz Band CTIA's proposal to double power limits in the PCS and AWS-1 bands – *i.e.*, a power increase that would apply in both rural and non-rural areas and would not be accompanied by a PFD limit. CTIA provides no justification for permitting an unrestricted doubling of power levels for the 700 MHz Commercial Services Bands, and we find no basis for adopting such limits for the band. Instead, as discussed above, we are adopting rules for 700 MHz Band licensees that will allow for a power limit of 1 kW/MHz ERP in non-rural areas and 2 kW/MHz ERP in rural areas.

105. We do, however, find merit in extending to the 700 MHz Commercial Services Band CTIA's proposal to use "average," rather than "peak" power in measuring power levels. Although the use of "average" power will effectively result in an increase in 700 MHz Band power levels for non-constant envelope technologies, such as CDMA and WCDMA, the "average" measurement approach is a more accurate measure of the interference potential for these technologies. We find that any effective increase in power that would result through the use of an "average" measurement approach will be modest, and in any event will be outweighed by the benefit of measuring today's technologies using a more realistic and appropriate technique.

106. For purposes of clarifying the use of the "average power" measurement technique, we make the following determinations. First, we conclude that the technique shall be made during a period of continuous transmission and be based on a measurement using a 1 MHz resolution bandwidth.²³⁶ Second, we shall restrict the peak-to-average ("PAR") ratio of the radiated signal to 13 dB. Limiting the

²³⁵ Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket No. 03-264, *Report and Order and Further Notice of Proposed Rulemaking*, 20 FCC Rcd 13900 (2005) (*Streamlining and Harmonization Further Notice*).

²³⁶ See Letter from Paul W. Garnett, CTIA, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 03-264 (filed Feb. 6, 2007) at 2.

PAR to 13 dB strikes a balance between enabling licensees to use modulation schemes with high PARs (such as OFDM) and protecting other licensees from high PAR transmissions. Parties seeking to employ the “average power” measurement technique should consult with the FCC Laboratory for guidance on the appropriate averaging method for the particular technology they plan to use.

(v) Other Technical Issues

107. In response to the technical issues discussed in the *700 MHz Commercial Services Notice*, commenters raise two additional matters: (1) the appropriateness of the current out-of-band emission (“OOBE”) limits for Upper 700 MHz Commercial Services Band base stations; and (2) the potential for interference to 700 MHz public safety operations due to intermodulation (“IM”) products.

108. **Background.** Sprint raises concerns about the potential for IM and OOBE interference to 700 MHz public safety operations and believes that we must prevent these types of interference from taking place.²³⁷ With regard to IM interference, Sprint observes that signals from C and D block transmitters could potentially combine and form interference-causing IM products within the public safety base and mobile receive bands.²³⁸ With regard to OOBE interference, Sprint argues that the existing $76 + 10\log P$ OOBE limit²³⁹ for Upper 700 MHz Commercial Services Band base stations is insufficient to protect public safety operations.²⁴⁰ In response, Leap states that if the Commission were to tighten the existing OOBE limit, the Upper 700 MHz Commercial Services Band “could be rendered effectively unusable.”²⁴¹ Leap suggests, alternatively, that we *decrease* the OOBE limit, to $53 + 10\log P$. In making this recommendation, Leap contends that the existing OOBE limit “will impose added cost to 700 MHz base station equipment.”²⁴²

109. Access Spectrum *et al.* suggests that our current OOBE limit, which was designed to protect 700 MHz public safety narrowband channels, would not be needed to protect possible 700 MHz public safety broadband operations. It therefore asks that we consider adoption of the more modest OOBE limit that we currently employ to protect 700 MHz Commercial Services Band broadband systems,²⁴³ to protect potential 700 MHz public safety broadband operations.²⁴⁴ Finally, Motorola contends that regardless of what changes we make to our rules for the Upper 700 MHz Commercial

²³⁷ See Sprint Comments in WT Docket No. 06-150 at iii. On the other hand, CTIA argues that we should not reduce our 700 MHz Band base station power limits, stating that the “technical merits of [700 MHz Band] power limits were vetted in earlier proceedings and adopted consistent with the Commission’s objective in the broadband PCS and AWS-1 bands of providing service flexibility while protecting adjacent channel licensees from interferences.” CTIA Comments in WT Docket No. 06-150 at 20.

²³⁸ See Sprint Comments in WT Docket No. 06-150 at n.8.

²³⁹ See 47 C.R.F. § 27.53(c)(3).

²⁴⁰ See Sprint Comments in WT Docket No. 06-150 at n.10. Sprint does not propose a particular OOBE limit to address its concern.

²⁴¹ Leap believes that those parties advocating the need for more stringent interference protection for public safety users “must be required to provide evidence of a problem” and asserts that “to date the record contains only speculative conclusions.” Leap further believes that the technical limits proposed by Sprint to address its interference concerns “would severely limit the range of services offered” in the Upper Band. Leap Reply Comments in WT Docket No. 06-150 at 3-4.

²⁴² See Leap Comments in WT Docket No. 06-150 at 9.

²⁴³ See 47 C.F.R. §§ 27.53(c)(1)-(2).

²⁴⁴ See Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 33-34 and Appendix B at 13-14. Public safety broadband operations would be permitted under various, proposed revisions to the 700 MHz Public Safety Band presented in the 700 MHz Public Safety and 700 MHz Guard Bands proceedings.

Services Band, the current out-of-band emission requirements designed to protect 700 MHz public safety users “must be maintained.”²⁴⁵

110. Discussion. We will retain the existing OOB limits for commercial base stations operating in the Upper 700 MHz Commercial Services Band because we find these restrictions provide sufficient and appropriate protection to 700 MHz public safety operations. We also decline to impose any technical restrictions on Upper 700 MHz Commercial Services Band licensees to address potential IM interference to 700 MHz public safety operations. We will, however, require Upper 700 MHz Commercial Services Band licensees and 700 MHz public safety entities, upon request from the other, to exchange information about their stations and systems. We are adopting this requirement in order to limit the potential for IM interference to 700 MHz public safety mobile and portable devices from the transmissions of Upper 700 MHz Commercial Service Band base stations.

111. With regard to Sprint’s argument for the need for increased OOB limits, Sprint’s conclusion that our $76 + 10 \log P$ OOB limit will result in interference to 700 MHz public safety operations is based on the assumption of a 65 dB site isolation figure in analyzing potential interference between commercial base stations and public safety mobile/portable receivers.²⁴⁶ However, the Commission rejected this same premise in deciding not to adopt stricter OOB limits in the *Upper 700 MHz Band Third MO&O*. In that proceeding NPSTC sought an increase in the OOB limit based on the assertion by TIA²⁴⁷ that the appropriate site isolation figure in the CMRS system environment was 65 dB.²⁴⁸ In response the Commission stated that “short of a decision to protect all public safety systems with measures directed at worst-case conditions (e.g., interference that might occur only at certain close-in distances from an antenna), it is “unnecessary . . . to revisit the current $76 + 10 \log P$ standard.”²⁴⁹

112. In the *800 MHz Report and Order*, the Commission decided for similar reasons to not adopt stricter OOB limits to protect 800 MHz public safety operations.²⁵⁰ The Commission stated, as its rationale for not increasing the existing OOB limit for the 800 MHz band, that the additional filtering needed to achieve proposed OOB standards “would add cost and complexity – but no benefit – to those cells in a system in which, because of their location, or otherwise, unacceptable OOB interference would not occur” and the Commission was therefore unwilling to “impose stronger OOB limits on every cell of every system in the country; particularly if only a handful of cells in a system might require them.”²⁵¹

113. We continue to believe that any change to the OOB limit required for commercial Upper 700 MHz Commercial Services Band base stations is unsupported. We also note that no public safety entities expressed concern in this proceeding about the adequacy of commercial Upper Band

²⁴⁵ See Motorola Comments in WT Docket No. 06-150 at 10.

²⁴⁶ The OOB limit describes the degree to which out-of-band energy is initially reduced at a transmitter. Site isolation, in this instance, is a measure of the degree to which a signal is attenuated as it travels away from a transmitter towards an out-of-band receiver. Thus, an OOB limit, along with an appropriate site isolation figure, determine how much out-of-band energy, and thus how much interference, is absorbed by a receiver.

²⁴⁷ TIA provided the technical analysis in support of NPSTC’s proposal.

²⁴⁸ See In the Matter of Petitions for Reconsideration of the Second Memorandum Opinion and Order, Service Rules for the 746-764 and 776-794 MHz Spectrum bands and Revisions to Part 27 of the Commission’s Rules, *Third Memorandum Opinion and Order*, 17 FCC Rcd 13985, 13992 ¶ 21 (*Third 700 MHz MO&O*).

²⁴⁹ *Id.* at 13993 ¶ 22. The Commission also noted that TIA’s proposed increased OOB limit for Upper 700 MHz Band base stations “would dramatically compromise the usefulness of the upper 700 MHz commercial spectrum blocks” and therefore concluded that TIA’s presentation did not “justify the establishment of a stronger, uniform OOB standard for commercial transmitters.” *Id.* at 13993-94 ¶ 23.

²⁵⁰ See *800 MHz Report and Order*, 19 FCC Rcd at 15028-29 ¶ 104.

²⁵¹ *Id.* at 14969, 15028 ¶ 104.

OBE limits in protecting public safety mobile receivers from interference. Further, under the provisions of Section 27.53(m) of the Commission's rules, when harmful interference due to out-of-band emissions occurs in any Part 27 service, "the Commission may, at its discretion," require greater out-of-band emission limits than specified for that service. Thus, if harmful OBE interference occurred in the 700 MHz Public Safety Band from an Upper 700 MHz Commercial Services base station transmission, there would be a mechanism in place to address the problem. For these reasons, and consistent with our previous analyses and decisions with regard to OBE limits in the 700 and 800 MHz bands, we decline to adopt any increase to our existing OBE limit for Upper 700 MHz Commercial Services Band base stations.

114. We also disagree with Leap's argument that the Commission should reduce the current OBE limit to $53 + 10\log P$. Leap asserts that the existing OBE limit of $76 + 10\log P$ will impose added costs to 700 MHz base station equipment, but Leap does not indicate that such additional costs would place any significant financial burden to Upper 700 MHz Commercial Services Band licensees. Leap also states that the use of the lower OBE limit would provide fair and reasonable protection to public safety users, but provides no technical analysis in support of this assertion.²⁵² We therefore decline to adopt Leap's proposal for a reduced OBE limit for Upper 700 MHz Commercial Services Band operations.

115. In addition, we do not address Access Spectrum *et al.*'s proposal that we revise the OBE limits to make them consistent with the way licensees operating in 700 MHz Commercial Services Band broadband blocks protect one another. Because key premises of this proposal – whether to redesignate the wideband Public Safety spectrum to broadband use and whether to consolidate that broadband spectrum at the bottom of the Public Safety allocation – are subjects of the Further Notice, its consideration in this Report and Order is premature. We are seeking further comment on the issue in the Further Notice.

116. With regard to Sprint's concern about IM interference, Sprint correctly notes that signals from the C Block and D Block base stations could combine to form unwanted IM products within the 12-megahertz public safety mobile receive band in the 700 MHz Band, and that such products potentially could cause interference to public safety mobile and portable receivers. The issue of IM interference in the Upper 700 MHz Commercial Services Band was initially raised in the *Third 700 MHz Memorandum Opinion and Order*. In that proceeding, TIA suggested that, to address IM interference, the Commission adopt a requirement, which would have effectively limited the transmissions of commercial base stations to 5 watts ERP.²⁵³ The Commission concluded that requiring base stations to operate at such a low power level "could dramatically compromise the usefulness of the Upper 700 MHz band commercial blocks" and thus declined to adopt any technical limitations to address IM interference.²⁵⁴ The Commission addressed the issue of IM interference in the *800 MHz Report and Order* as well, where it acknowledged IM as a potential source of interference to public safety operations in the 800 MHz band.²⁵⁵ In that proceeding, the Commission once again declined to adopt specific technical measures to address IM

²⁵² See Leap Comments in WT Docket No. 06-150 at 7-9.

²⁵³ Specifically, TIA suggested that the Commission adopt a requirement to limit power levels produced by commercial base stations to no greater than -45 dBm on the ground within 400 meters of the station. The Commission determined that to meet this limitation, a commercial base station would not likely be able to transmit at a power level greater than 5 watts ERP. See *Third 700 MHz MO&O*, 17 FCC Rcd at 13995 ¶ 28.

²⁵⁴ *Id.* Sprint asserts that a similarly low power level would be needed to ensure the absence of IM interference in the Upper 700 MHz Band, but acknowledges that imposing such a limit on base stations "would not allow any cost-effective deployment of infrastructure, particularly if the operator sought to provide in-building service." Sprint Comments at n. 20.

²⁵⁵ *800 MHz Report and Order*, 19 FCC Rcd at 15023 ¶ 91.

interference.²⁵⁶ Rather, it adopted a series of requirements, which mandated that commercial licensees work with one another, as well as with public safety entities, to eliminate any IM interference that might occur to public safety operations.²⁵⁷

117. Although we continue to believe that it is not necessary to impose strict technical measures on Upper 700 MHz Commercial Services Band licensees to protect public safety operations from IM interference, we recognize that due to the spectral relationship between the Blocks C and D in the Upper 700 MHz Commercial Services Band and the 700 MHz Public Safety Band, IM interference to public safety mobile and portable devices could potentially occur if relatively low base station power levels are not employed.²⁵⁸ We therefore take additional steps to address potential IM interference to public safety operations in the 700 MHz Band.

118. Specifically, as we did with respect to 800 MHz ESMR and Cellular licensees,²⁵⁹ we will require Upper 700 MHz Commercial Services Band licensees, upon request from a 700 MHz public safety entity, to provide to that entity information about the location and parameters of any stations they plan to activate in the public safety entity's area of operation.²⁶⁰ We will also require, as we did in Section 90.675, public safety licensees to provide, upon request of an Upper 700 MHz Commercial Services Band licensee, the operating parameters of their radio systems.²⁶¹ As indicated in the *800 MHz*

²⁵⁶ The Commission stated that "rather than impose stringent, across-the-board emission limits at this time, [it is] adopting rules that require ESMR and cellular telephone licensees to act only when and where it is evident that unacceptable interference is or will be caused to non-cellular 800 MHz systems, thereby affording such licensees a high degree of technical flexibility and minimizing the cost of interference avoidance." *800 MHz Report and Order*, 19 FCC Rcd at 15040 ¶ 131.

²⁵⁷ See *id.* at 15041 ¶ 129 (the Commission decided that "in lieu of adopting what could be draconian rules, [it is] affording ESMR and cellular telephone licensees the discretion to make any necessary changes to their own systems—or changes to non-cellular systems affected by unacceptable interference—as may be necessary to eliminate unacceptable interference"). In implementing this decision the Commission adopted Section 90.672 ("Unacceptable interference to non-cellular 800 MHz licensees from ESMR or Part 22 Cellular Radiotelephone systems"), Section 90.673 ("Obligations to abate unacceptable interference"), Section 90.674 ("Interference resolution procedures before, during, and after band reconfiguration"), and Section 90.675 ("Information Exchange").

²⁵⁸ For example, a D Block transmission at 760 MHz, when combined with a C Block transmission at 750 MHz, will, in accordance with the $2F_1 - F_2$ formula for the calculation of 3rd order intermodulation, create an IM product at 770 MHz, which is within the 764-776 MHz Public Safety Band.

²⁵⁹ See, e.g., Section 90.675.

²⁶⁰ As per Section 90.675, this would include information about the 700 MHz station's location, effective radiated power, antenna height, and channels available for use. Also, as per Section 90.675, Public Safety licensees will not be afforded the right to accept or reject the activation of a proposed 700 MHz station or to unilaterally require changes to the station's operating parameters. We note as well that 700 MHz licensees may regard their operating parameters as proprietary and if so, we encourage such licensees to use non-disclosure agreement whereby third parties will not be given access to such information. Failing that, the affected parties could seek a protective order from the Commission. See *Digital Output Protection Technology and Recording Method Certifications, Order*, MM Docket 04-68, DA 04-716 (rel. March 17, 2004). See also 47 C.F.R. §§ 0.457, 0.459. We also encourage, but do not require, that such matters be submitted to arbitration, mediation, or other alternative dispute resolution mechanisms.

²⁶¹ Public safety licensees will also be required to provide information about any technical changes they plan to make to their systems.

Report and Order, these actions can both help prevent potential interference from occurring and help identify possible sources of interference more rapidly, if interference were to occur.²⁶²

119. Finally, if interference to public safety systems does take place, we will expect 700 MHz Commercial Services Band licensees to take whatever actions are necessary to mitigate the interference (e.g., reducing out-of-band emissions, reducing power levels, changing operating frequencies, *etc.*). As operations begin in the Upper 700 MHz Commercial Services Band, we will be keenly interested in any circumstances of interference to public safety operations that are not appropriately addressed by commercial entities, and if we believe that further actions are necessary to ensure that such circumstances do not take place, we shall take such actions.

(vi) 911/E911 Requirements

120. **Background.** In the *700 MHz Commercial Services Notice*, we sought comment on whether § 20.18 of the Commission's rules, which imposes 911 and Enhanced 911 (E911) obligations on certain enumerated wireless services, should be extended to services provided in the 700 MHz Commercial Services Band, to any Part 27 service, or to all similar wireless services, to the extent that they meet certain criteria established in the *E911 Scope Order*.²⁶³ The "basic 911" requirement of § 20.18 requires providers of specified wireless voice services to transmit all wireless 911 calls made by their subscribers without respect to their call validation process to the appropriate Public Safety Answering Point (PSAP) or designated emergency authority.²⁶⁴ Under the E911 requirement, providers are ultimately required (*i.e.*, during "Phase II") to automatically provide the PSAP or designated authority with the location of the 911 caller by longitude and latitude (Automatic Location Identification or ALI) within a specified level of accuracy.²⁶⁵ Licensees can provide ALI information by deploying technology in their networks for locating subscribers (a network-based solution),²⁶⁶ or by including Global Positioning System (GPS) or other location technology in subscribers' handsets (a handset-based solution).²⁶⁷

121. Currently, the 911/E911 obligations established in § 20.18 apply to the following services: Broadband PCS under Part 24, Cellular Radio Telephone Service under Part 22, Geographic Area and Incumbent Wide Area Specialized Mobile Radio (SMR) Service in the 800 MHz and 900 MHz Bands under Part 90, and those entities that offer these voice services by purchasing airtime or capacity wholesale from facilities-based providers.²⁶⁸ These obligations are further restricted to apply only insofar as the covered service providers offer "real-time, two way switched voice service that is interconnected

²⁶² See *800 MHz Report and Order*, 19 FCC Rcd at 15038 ¶ 125 ("if the characteristics of a proposed new cell are known in advance, it is possible to analyze the cell's potential for interference and make any necessary revisions to cell parameters before the cell is activated"), 15039 ¶ 127.

²⁶³ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9390 ¶¶ 104-06.

²⁶⁴ 47 C.F.R. § 20.18(b).

²⁶⁵ 47 C.F.R. § 20.18(e)-(h).

²⁶⁶ Network-based location solutions employ equipment and/or software added to wireless carrier networks to calculate and report the location of handsets dialing 911. These solutions do not require changes or special hardware or software in wireless handsets. See 47 C.F.R. § 20.3 ("*Network-based Location Technology*").

²⁶⁷ Handset-based location solutions employ special location-determining hardware and/or software in wireless handsets, often in addition to network upgrades, to identify and report the location of handsets calling 911. See 47 C.F.R. § 20.3 ("*Location-capable Handsets*").

²⁶⁸ 47 C.F.R. § 20.18(a).

with the public switched network and utilizes an in-network switching facility which enables the provider to reuse frequencies and accomplish seamless hand-off of subscriber calls.”²⁶⁹

122. The Commission made the majority of these application decisions in the 1996 *E911 Report and Order*.²⁷⁰ The Commission determined in that *Order* that 911/E911 should be applicable to real-time, two-way, interconnected voice services provided by Cellular Radio Telephone Service carriers and broadband PCS carriers because customers of those public telephone services “clearly expect access to 911 and E911,” given that they often cited “safety and security” as their main reason for purchasing a mobile phone.²⁷¹ Geographic area and incumbent wide area SMR providers licensed in the 800 MHz and 900 MHz bands were made subject to the rule because these carriers showed “significant potential to offer near-term direct competition to cellular and broadband PCS carriers.”²⁷²

123. The Commission declined, however, to extend 911/E911 obligations to a number of other services. For example, the Commission decided that local SMR voice service, even if interconnected, would not be governed by 911/E911 requirements as local SMR providers “offer[ed] mainly dispatch services to specialized customers in a more localized, non-cellular system configuration . . .”²⁷³ The Commission also determined that, while it expected that CMRS voice Mobile Satellite Service (MSS) carriers would eventually be required to provide access to emergency services, the Commission would not impose such requirements at that time because it might “impede the development of the service in ways that might reduce its ability to meet public safety needs.”²⁷⁴ Notwithstanding these determinations, the Commission affirmed that “the public interest will ordinarily require that all CMRS real time two-way voice communications services provide reasonable and effective access to emergency services.”²⁷⁵

124. In the *E911 Scope Order* released in 2003, the Commission derived four factors from its earlier application decisions to inform its analysis of whether other services not necessarily within the scope of § 20.18(a) should be subject to the E911 rules.²⁷⁶ Specifically, the Commission determined that it would consider whether (1) the service offers real-time, two-way voice service that is interconnected to the public switched network on either a stand-alone basis or packaged with other telecommunications services; (2) the customers using the service or device have a reasonable expectation of access to 911 and E911 services; (3) the service competes with traditional CMRS or wireline local exchange service; and (4) it is technically and operationally feasible for the service or device to support E911.²⁷⁷ The Commission also clarified, however, that while the four criteria would be “extremely useful in ensuring technological and competitive neutrality,” these criteria were not the exclusive considerations. Instead, the Commission might also “consider other factors to inform [its] decision,” including other factors that might mitigate the need to impose a requirement on a particular service.²⁷⁸ Applying this analysis, the

²⁶⁹ See Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 18676, 18716 ¶ 81 (1996) (*E911 Report and Order*); 47 C.F.R. § 20.18(a).

²⁷⁰ See *E911 Report and Order*.

²⁷¹ See *E911 Report and Order*, 11 FCC Rcd at 18716 ¶¶ 80-81; 47 C.F.R. § 20.18(a).

²⁷² *E911 Report and Order*, 11 FCC Rcd at 18716 ¶ 81; 47 C.F.R. § 20.18(a).

²⁷³ *E911 Report and Order*, 11 FCC Rcd at 18716-17 ¶ 81.

²⁷⁴ *Id.* at 18718 ¶ 83.

²⁷⁵ *Id.*

²⁷⁶ See Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket 94-102, IB Docket No. 99-67, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 25340, 25347 ¶ 18 (2003) (*E911 Scope Order*).

²⁷⁷ *Id.*

²⁷⁸ *Id.* at 25341 ¶ 2, 25347 ¶ 19.

Commission determined, among other things, that (1) MSS should now provide a modified form of basic 911 service, but would not, at that time, be required to provide E911 service; and (2) that wireless resellers and pre-paid calling service providers would be required to comply with 911/E911 requirements under § 20.18 to the extent that the underlying facilities-based provider offers access to 911 service.²⁷⁹

125. *700 MHz Commercial Services Notice.* In the *700 MHz Commercial Services Notice*, we sought comment on whether § 20.18 should be amended to apply the 911/E911 requirements to services in the 700 MHz Commercial Services Band that meet the *E911 Scope Order* criteria, to all services using bands subject to Part 27 that meet that criteria, or to all similar wireless services meeting that criteria.²⁸⁰ We tentatively concluded that services provided using both auctioned and previously unauctioned spectrum in the 700 MHz Commercial Services Band and that meet the criteria established in the *E911 Scope Order* should be subject to the 911/E911 requirements.²⁸¹ We also tentatively concluded that services using spectrum subject to Part 27, such as the AWS-1 bands,²⁸² which meet the same criteria noted above should likewise be subject to the 911/E911 requirements.²⁸³ We sought comment but made no tentative conclusion with regard to whether § 20.18 should be amended to apply to all similar wireless services that meet the *E911 Scope Order* criteria.²⁸⁴

126. Almost all of the commenters addressing the issue support application of the 911/E911 requirements to services in the 700 MHz Commercial Services Band to the extent that those services are similar to the services already subject to the requirements, with support coming from a range of interests including large, medium-sized, and rural carriers, manufacturers, and public interest groups.²⁸⁵ CTIA also supports application of 911/E911 requirements to Part 27 services more broadly,²⁸⁶ while NENA supports the extension of the 911/E911 requirements to wireless services that meet the *E911 Scope Order* criteria generally.²⁸⁷ Many commenters note the critical public safety benefits of E911,²⁸⁸ and also argue that similar services should be subject to the same requirements.²⁸⁹ Several commenters also state, however, that E911 should not apply to 700 MHz Commercial Services Band services to a greater extent than it

²⁷⁹ *Id.*

²⁸⁰ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9390 ¶¶ 104-05.

²⁸¹ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9389 ¶ 100, 9390 ¶ 104.

²⁸² As noted above, AWS-1 refers to the 1710-1755 MHz and 2110-2155 MHz bands, which the Commission determined would be licensed under its Part 27 rules.

²⁸³ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9390 ¶ 105.

²⁸⁴ *Id.* at 9390 ¶ 106.

²⁸⁵ See Aloha Comments in WT Docket No. 06-150 at 12; AT&T Comments in WT Docket No. 06-150 at 16; Blooston Comments in WT Docket No. 06-150 at 8; Cingular Comments in WT Docket No. 06-150 at 15; Dobson Comments in WT Docket No. 06-150 at 11; Leap Comments in WT Docket No. 06-150 at 11; NENA Comments in WT Docket No. 06-150 at 1-2; Qualcomm Comments in WT Docket No. 06-150 at 24 (supporting application of E911 to both auctioned and previously unauctioned spectrum); U.S. Cellular Comments at 18 (same); TIA Comments in WT Docket No. 94-102 at 9-10; T-Mobile Reply at 6.

²⁸⁶ See CTIA Comments in WT Docket No. 06-150 at 21.

²⁸⁷ See NENA Comments in WT Docket No. 06-150 at 2.

²⁸⁸ See, e.g., CTIA Comments in WT Docket No. 06-150 at 21; Dobson Comments in WT Docket No. 06-150 at 11; TIA Comments in WT Docket No. 06-150 at 9; U.S. Cellular Comments in WT Docket No. 06-150 at 19.

²⁸⁹ See Aloha Comments in WT Docket No. 06-150 at 12; CTIA Comments in WT Docket No. 06-150 at 21; Leap Comments in WT Docket No. 06-150 at 11; U.S. Cellular Comments in WT Docket No. 06-150 at 19; T-Mobile Reply Comments in WT Docket No. 06-150 at 6.

does to services currently subject to the requirements.²⁹⁰ TIA cautions against application of E911 to all services in the 700 MHz Commercial Services Band because some services might not meet the four *E911 Scope Order* criteria.²⁹¹

127. The Rural Telecommunications Group (RTG) opposes any extension of 911/E911 requirements to the 700 MHz Commercial Services Band at this time.²⁹² RTG argues that imposition of 911/E911 in this band is “premature” because “[i]t is not yet clear what services will be provided or what technology will be used to provide them.”²⁹³ RTG argues that “[t]he technologies chosen to deploy 700 MHz may or may not be able to comply” with the 911/E911 requirements, and in particular, imposing 911/E911 requirements might “completely stifle rural deployments.”²⁹⁴ RTG asserts, for example, that many GSM rural carriers already subject to the E911 requirements could not meet the requisite accuracy standards “because no GPS handsets are available for GSM and cell sites tend to be deployed in a ‘string of pearls’ along highways.”²⁹⁵ RTG therefore recommends that the Commission should “wait to see how services develop and to revisit the issue in the future.”²⁹⁶

128. Two commenters also raise issues regarding E911 and voice over internet protocol (VoIP) services. First, TIA argues that, where a wireless carrier provides broadband network access to a subscriber who then obtains interconnected voice services from a third party VoIP provider, the 911 obligation should be imposed on the VoIP provider, not the network access provider, pursuant to the Commission’s E911 requirements for VoIP.²⁹⁷ CTIA, addressing the situation where the wireless access provider and VoIP provider are the same, suggests that the Commission take this opportunity to address a petition filed by T-Mobile seeking clarification of the Commission’s *VoIP E911 Order*.²⁹⁸ T-Mobile’s petition asks the Commission to clarify that, under the *VoIP E911 Order*, providers of mobile interconnected VoIP service may deliver location information for VoIP 911 calls to the PSAP using latitude and longitude coordinates in the same fashion as is done for wireless 911 calls.²⁹⁹ In its comments, CTIA supports the requested clarification, and requests that, in this proceeding, the Commission establish more generally that mobile wireless providers offering interconnected VoIP services may meet their E911 obligations as VoIP providers through compliance with the 911/E911 requirements of § 20.18.³⁰⁰

²⁹⁰ See Aloha Comments in WT Docket No. 06-150 at 12 (700 MHz licensees should be subject to the same E911 requirements, “no more or less,” as other licensees providing services where E911 obligations exist); Cingular Comments in WT Docket No. 06-150 at 15 (supporting application where services met the *E911 Scope Order* criteria); Qualcomm Comments in WT Docket No. 06-150 at 24.

²⁹¹ See TIA Comments in WT Docket No. 06-150 at 9-10.

²⁹² See RTG Comments in WT Docket No. 06-150 at 9.

²⁹³ *Id.*

²⁹⁴ RTG Comments in WT Docket No. 06-150 at 9-10.

²⁹⁵ *Id.* at 10.

²⁹⁶ *Id.*

²⁹⁷ See TIA Comments in WT Docket No. 06-150 at 10.

²⁹⁸ See CTIA Comments in WT Docket No. 06-150 at 22; IP-Enabled Services, E911 Requirements For IP-Enabled Service Providers, WC Docket No. 04-36, *First Report and Order and Notice of Proposed Rulemaking*, 20 FCC Rcd 10245 (2005) (*VoIP E911 Order*), *petition for review denied*, Nuvio Corp. v. FCC, 2006 WL 3688755 (D.C. Cir. 2006).

²⁹⁹ See Petition of T-Mobile USA, Inc. For Clarification, WC Docket No. 04-36, filed July 29, 2006.

³⁰⁰ See CTIA Comments in WT Docket No. 06-150 at 22.

129. Discussion. We conclude that § 20.18(a) should be amended to apply 911/E911 requirements to all commercial mobile radio services (CMRS), including services licensed in the 700 MHz Commercial Services Band and the AWS-1 bands, to the same extent as they apply to wireless services currently listed in the scope provision of § 20.18.³⁰¹ Thus, CMRS providers must comply with the 911/E911 requirements solely to the extent that they “[offer] real-time, two way switched voice service that is interconnected with the public switched network and utilize an in-network-switching facility which enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls” (hereinafter, the “§ 20.18(a) criteria”).³⁰² We will continue, however, to exclude MSS from § 20.18 in conformity with the Commission’s decision in the *E911 Scope Order*.³⁰³

130. The public interest generally requires wireless services meeting the § 20.18(a) criteria to provide 911/E911 service, even if not expressly enumerated.³⁰⁴ The Commission has observed previously that “911 service is critical to our Nation’s ability to respond to a host of crises,”³⁰⁵ and that E911 in particular “saves lives and property by helping emergency services personnel do their jobs more quickly and efficiently.”³⁰⁶ We also take note of Congress’s finding in the “Ensuring Needed Help Arrives Near Callers Employing 911 Act of 2004” that “for the sake of our Nation’s homeland security and public safety, a universal emergency telephone number (911) that is enhanced with the most modern and state-of-the-art telecommunications capabilities possible should be available to all citizens in all regions of the Nation” and that “enhanced 911 is a high national priority.”³⁰⁷ Accordingly, it is critical that mobile telephone services meeting the § 20.18(a) criteria continue to offer 911 and E911 as they make use of new frequencies.

131. We further find that commercial mobile radio services meeting the 20.18(a) criteria will also meet the four criteria set forth in the *E911 Scope Order*. In particular, we find that these services are likely to compete with services provided pursuant to cellular, broadband PCS, or 800/900 MHz SMR licenses, and that subscribers will have similar expectations of emergency access from services meeting the § 20.18(a) criteria regardless of what frequencies carriers are using to provide them.³⁰⁸ Indeed, we have found that for many Americans, “the ability to call for help in an emergency is the principal reason they own a wireless phone.”³⁰⁹ This should be no less true for a consumer calling from a phone utilizing

³⁰¹ See 47 C.F.R. § 20.18.

³⁰² 47 C.F.R. § 20.18(a).

³⁰³ The Commission initially excluded MSS from § 20.18 in the *E911 Report and Order*. See *E911 Report and Order*, 11 FCC Rcd at 18718 ¶ 83. In the *E911 Scope Order*, upon revisiting the issue, the Commission recognized that MSS operators continued to face unique difficulties in implementing 911 and E911 obligations, and therefore declined to apply the obligations of § 20.18 and instead imposed a separate, limited 911 requirement specifically for MSS, including a requirement to establish emergency call centers. See *E911 Scope Order*, 18 FCC Rcd at 25347-57 ¶¶ 20-39.

³⁰⁴ *E911 Report and Order*, 11 FCC Rcd at 18718 ¶ 83.

³⁰⁵ See *E911 Scope Order*, 18 FCC Rcd at 25341 ¶ 1.

³⁰⁶ *E911 Report and Order*, 11 FCC Rcd at 18678 ¶ 3, 18679 ¶ 5.

³⁰⁷ 47 U.S.C. § 942 note.

³⁰⁸ See Cingular Comments in WT Docket No. 06-150 at 16 (“[c]onsumers’ expectations and the public interest clearly would be served by extending these rules to 700 MHz licensees”); Leap at 11 (“It is logical, equitable, and indeed, vitally important to consumers that all CMRS services – whether operating in spectrum allocated for PCS, AWS, 700 MHz or some other services, be made subject to the same emergency access and compatibility requirements.”).

³⁰⁹ Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Phase II Compliance Deadlines for Non-Nationwide CMRS Carriers, CC Docket No. 94-102, *Order to Stay*, 17 FCC Rcd 14841, 14842 ¶ 4 (2002).

700 MHz, AWS, or any other spectrum. Further, we find no support in the record, and consider it unlikely, that additional, terrestrial-based commercial mobile radio services meeting all of the criteria of § 20.18(a) will present any special technical obstacles, as compared to currently deployed services, that would warrant modifications of the 911/E911 requirements.³¹⁰ To the extent that such obstacles become apparent as new services are established, appropriate modifications can be considered at that time. We therefore agree with the commenters that the extension of the 911/E911 requirements under § 20.18 to all commercial mobile radio services meeting the § 20.18(a) criteria is justified by the interest in competitive neutrality as well as by the critical public safety benefits of 911/E911.³¹¹

132. We find that RTG's concerns regarding the possible difficulty of implementing 911/E911 in rural areas do not support delaying the extension of the 911/E911 provisioning requirements to other bands and services. RTG bases its argument on conjecture only – that technology being developed for 700 MHz may not support provision of E911 service. Given the critical importance of E911 to consumers and the public safety community, we cannot accept this unsupported assertion as a basis for delaying imposition of E911 requirements and putting at risk the safety of life and property. In this regard, we agree with NENA that deployment of E911 service is most effectively accomplished by establishing E911 requirements at the outset of establishing service in new bands.³¹² We also note that, notwithstanding RTG's reference to existing GSM deployments, to the extent that carriers pursue a handset-based solution, all subscribers that obtain service on the new bands should have compliant handsets from the beginning.³¹³

133. Blooston, while supporting the extension of 911/E911 to the 700 MHz Commercial Services Band, caution that the development of 700 MHz equipment is not as far along as it is for broadband PCS and argue that the timetables for E911 compliance should not “put licensees in a compliance quandary when they have little or no control over the equipment manufacturing process.”³¹⁴ We note, however, that while manufacturers of handset and voice network technology have no regulatory obligation under § 20.18 to produce E911-compliant products, they do have strong financial incentives to do so if they wish to sell their products to the carriers subject to § 20.18.³¹⁵ For example, because CMRS providers that adopt a handset-based solution may activate only location-capable handsets, manufacturers that do not provide location-capable handsets for the new bands may significantly diminish their access to the handset market. Conversely, as noted above, requiring carriers to incorporate E911 technology in

³¹⁰ The Commission has stated, in connection with AWS, that an “important goal in the AWS proceeding is to try, to the extent possible, to provide the same technical criteria for AWS equipment as currently exist for broadband PCS.” *AWS-1 Order on Reconsideration*, 20 FCC Rcd at ¶ 42. See also Aloha Comments in WT Docket No. 06-150 at 10 (“[t]here is nothing peculiar about 700 MHz spectrum that warrants unique treatment with regard to E911 matters”).

³¹¹ See, e.g., CTIA Comments in WT Docket No. 06-150 at 21 (applying E911 to 700 MHz is dictated by both public safety determinations and principles of regulatory parity); T-Mobile Reply Comments in WT Docket No. 06-150 at 6 (“Not only would the public interest be served . . . , the regulatory certainty created through application of uniform rules to all similarly-situated providers would benefit the licensees themselves.”).

³¹² See NENA Comments in WT Docket No. 06-150 at 2 (“Instead of trying to retrofit E9-1-1 to services long after their introduction, as occurred with conventional cellular telephony, it would be better to forewarn entrepreneurs of emergency calling access obligations that will apply to 700 MHz services meeting the chosen regulatory criteria.”)

³¹³ See 47 C.F.R. § 20.18(g)(1)(iv) (requiring that, for carriers implementing a handset-based solution, 100 percent of all new digital handsets activated be location-capable).

³¹⁴ Blooston Comments in WT Docket No. 06-150 at 9.

³¹⁵ Cf. *E911 Scope Order*, 18 FCC Rcd at 25381 ¶ 101 (“[CMRS providers] typically decide which handsets to offer for use with their service. These are the entities that provide consumers wireless voice service. Therefore, by placing the obligation on these entities, we ensure that the handsets they offer are capable of meeting the enhanced 911 requirements contained in our rules. We, therefore, do not need to impose a separate obligation on disposable phone manufacturers.”).

their initial systems also benefits the carriers, because it permits them to adopt 911/E911 without having to modify or replace non-compliant technology.

134. Further, because we have established 911/E911 obligations well before the auctioning of licenses in the 700 MHz Commercial Services Band and not long after the completion of the auction of the AWS-1 bands, we are satisfied that manufacturers will have adequate opportunity to produce compliant solutions for these new services by the time service providers are ready to begin incorporating them. This view is further supported by the fact that the manufacturing interests that commented on the 911/E911 issue, Qualcomm and TIA,³¹⁶ both fully supported extension of 911/E911 to the 700 MHz Band.³¹⁷ Their support for the 911/E911 extension gives us confidence that manufacturers of communications technology will provide E911-compliant products in a timely fashion, and that new services will not, therefore, be significantly delayed by the need to comply with the 911/E911 mandate. Accordingly, we conclude that § 20.18(a) should be amended to apply 911/E911 requirements to all CMRS providers, other than MSS providers, regardless of the frequencies over which the service is provided. We will continue to exclude MSS, however, and we further emphasize that, by this extension, we do not mean to override any prior Commission decision specifically excluding a particular service, like local SMR, from the obligation to provide 911/E911.

135. While we extend the scope of 911/E911 by deleting references to specific services and spectrum bands, we do not modify the current service criteria set forth in § 20.18(a) to incorporate the four criteria enumerated in the *E911 Scope Order*. As noted above, the four criteria for analyzing whether a service should be subject to 911/E911 include whether (1) the service offers real-time, two-way voice service that is interconnected to the public switched network on either a stand-alone basis or packaged with other telecommunications services; (2) the customers using the service or device have a reasonable expectation of access to 911 and E911 services; (3) the service competes with traditional CMRS or wireline local exchange service; and (4) it is technically and operationally feasible for the service or device to support E911. While the Commission found the criteria useful analytically to “ensur[e] technological and competitive neutrality,” and to determine whether particular services should be subject to 911 requirements when a question arises, they were never intended to be definitive and exclusive. Rather, the Commission stated in the *E911 Scope Order* that it would “also consider other factors to inform [its] decision” of whether a service would be subject to 911/E911.³¹⁸ We therefore retain the current § 20.18(a) criteria to define the scope of the 911/E911 obligation under § 20.18. We will continue, however, to consider the factors identified in the *E911 Scope Order* when analyzing whether 911/E911 obligations should be applied to a particular new CMRS service, if a significant question arises as to whether the § 20.18(a) criteria apply.

136. We reject CTIA’s request to resolve the T-Mobile Petition for Clarification regarding whether compliance with § 20.18 will also satisfy any obligations under the *VoIP E911 Order*. We will resolve that petition at a later time in the proceeding in which it has been filed. We emphasize, however, that providers of a commercial mobile service meeting the criteria specified in § 20.18(a) are required to comply with the E911 requirements of that section, regardless of what spectrum and technology is being used to provide the service. Conversely, only wireless services that satisfy the § 20.18(a) criteria are subject to the requirements of that section. Thus, if a provider offers a non-voice service, this will not trigger the § 20.18 requirements for that provider.³¹⁹

³¹⁶ TIA states that it is “the leading trade association for the information and communications technology [] industry, with 600 member companies that manufacture or supply the products and services used in global communications across all technology platforms.” TIA Comments in WT Docket No. 06-150 at 2.

³¹⁷ Qualcomm Comments in WT Docket No. 06-150 at 24; TIA Comments in WT Docket No. 06-150 at 9.

³¹⁸ *E911 Scope Order*, 18 FCC Rcd at 25347 ¶ 19.

³¹⁹ See also *E911 Report and Order*, 11 FCC Rcd at 18717-18 ¶ 82 (declining to extend E911 to two-way non-voice services). We note that service providers offering interconnected VoIP are independently subject to E911 (continued....)

(vii) Hearing Aid-Compatible Wireless Handsets

137. Background. In addition to proposing the extension of 911/E911 requirements to services provided in new spectrum bands, the Commission also sought comment on whether it should similarly extend the hearing aid compatibility requirements under § 20.19.³²⁰ The requirements of § 20.19 were established by the Commission pursuant to the Hearing Aid Compatibility Act of 1988 and a determination by the Commission in 2003 to lift the blanket exemption under that law for digital wireless telephones.³²¹ Section 20.19 of the Commission's rules requires the providers of certain enumerated wireless services and the manufacturers of handsets used in those services to offer hearing aid-compatible handset models to their customers.³²² As with the 911/E911 obligations under § 20.18, the hearing aid compatibility requirements under § 20.19 currently apply only to providers of broadband PCS, Cellular Radio Telephone Service, and certain SMR providers in the 800/900 MHz bands, and only to the extent that these providers "offer real-time, two-way switched voice or data service that is interconnected with the public switched network and utilizes an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls."³²³ The entities subject to § 20.19 must begin offering a specific number of hearing aid-compatible digital wireless handset models by specific dates unless they fall under *de minimis* exceptions.³²⁴ In addition, both carriers and manufacturers are subject to certain labeling requirements in connection with the hearing aid-compatible handsets that they offer.³²⁵

138. Pursuant to the statutory requirement that there be "established technical standards,"³²⁶ a handset must be certified as meeting a certain level of compatibility under the American National Standards Institute (ANSI) C63.19 standard.³²⁷ More specifically, section 20.19(b) of the Commission's rules provides that a wireless handset is deemed hearing aid-compatible if, at minimum, it receives a U3 rating for radio frequency interference and a U3T rating for inductive coupling "as set forth in the standard document ANSI C63.19-2001[,]' American National Standard for Methods of Measurement of

(Continued from previous page) _____

obligations under 47 C.F.R. § 9.5, including such providers using Part 15 unlicensed radio frequency devices to provide such services. *See VoIP E911 Order*, 20 FCC Rcd at 10257-58 ¶ 24 (defining the scope of VoIP E911 obligations), 10259 ¶ 25 (E911 rule applies to "providers of all interconnected VoIP services"); *see also* CTIA Comments in WT Docket No. 06-150 at 22 (noting that wireless providers are offering "IP-enabled services to their subscribers, with VoIP services integrated with mobile devices."); *see also* Petition of T-Mobile USA, Inc. For Clarification, WC Docket No. 04-36, filed July 29, 2006, at ii ("There are promising technologies using unlicensed spectrum in development that may enable the offering of VoIP services in conjunction with CMRS.").

³²⁰ 700 MHz Commercial Services Notice, 21 FCC Rcd at 9390 ¶¶ 104-06.

³²¹ *See* Hearing Aid Compatibility Act of 1988, Pub. L. No. 100-394, 102 Stat. 976 (1988), codified at 47 U.S.C. § 610; Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, *Report and Order*, WT Docket No. 01-309, 18 FCC Rcd 16753 (2003); *Erratum*, 18 FCC Rcd 18047 (2003) (*Hearing Aid Compatibility Order*).

³²² 47 C.F.R. § 20.19.

³²³ 47 C.F.R. § 20.19(a).

³²⁴ *See* 47 C.F.R. § 20.19(c), (d). *See also* Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, *Report and Order*, WT Docket No. 01-309, 18 FCC Rcd 16753 (2003); *Erratum*, 18 FCC Rcd 18047 (2003) (*Hearing Aid Compatibility Order*); *Order on Reconsideration and Further Notice of Proposed Rulemaking*, 20 FCC Rcd 11221 (2005).

³²⁵ *See* 47 C.F.R. § 20.19(f).

³²⁶ 47 U.S.C. § 610(b)(1).

³²⁷ 47 C.F.R. § 20.19(b)(1), (2).

Compatibility between Wireless Communications Devices and Hearing Aids.”³²⁸ On April 25, 2005, the Commission’s Office of Engineering and Technology (OET) announced that it would also certify handsets as hearing aid-compatible based on the revised draft version of the standard, ANSI C63.19-2005,³²⁹ and on June 6, 2006, OET and the Wireless Telecommunications Bureau permitted certification under version 3.12 of that standard (ANSI C63.19-2006), which reflected further revisions adopted and released in 2006.³³⁰ All of these versions focus on existing services that are in common use. Thus, the 2001 version provides tests for established services in the 800-950 MHz and 1.6-2.0 GHz bands, while the latest version of the ANSI C63.19 standard expands this to include established services in the 1.6-2.5 GHz band.³³¹ As a result, while applicants for certification may rely on the 2001, 2005, or 2006 version of the ANSI C63.19 standard, none of these versions of the ANSI standard currently provide tests for services in the 700 MHz Band, the AWS-1 band (which lacks established services), the BRS/EBS band, or for newer technologies such as WiMAX.³³²

139. In the *700 MHz Commercial Services Notice*, we tentatively concluded that we should amend our Part 20 rules to specify that Part 27 services, including 700 MHz Commercial Services Band services, that meet the *E911 Scope Order* criteria with appropriate modifications for hearing aid compatibility should be subject to the hearing aid compatibility requirements.³³³ We also sought

³²⁸ *Id.* We note that, since its 2005 draft version, the ANSI C63.19 technical standard has used a new nomenclature for hearing aid compatibility compliance in place of the original “U” and “UT” ratings, in order to make the ratings easier for consumers to understand. See Letter from Thomas Goode, counsel for The Alliance for Telecommunications Industry Solutions, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 01-309 (filed May 6, 2005) (ATIS Letter); “OET Clarifies Use of Revised Wireless Phone Hearing Aid Compatibility Standard Measurement Procedures and Rating Nomenclature,” *Public Notice*, 20 FCC Rcd 8188 (OET 2005). Specifically, the standard now uses an “M” nomenclature for the handset’s radio frequency interference rating (rather than “U”) and a “T” nomenclature for the handset’s inductive coupling rating (rather than “UT”). See ATIS Letter. The Commission has approved the use of the “M” and “T” nomenclature and considers the M/T and U/UT nomenclatures as synonymous. See Section 68.4(a) of the Commission’s Rules Governing Hearing-Aid Compatible Telephones, *Order on Reconsideration and Further Notice of Proposed Rulemaking*, WT Docket No. 01-309, 20 FCC Rcd 11221, 11238 ¶ 33 (*Hearing Aid Compatibility Reconsideration Order*).

³²⁹ See “OET Clarifies Use of Revised Wireless Phone Hearing Aid Compatibility Standard Measurement Procedures and Rating Nomenclature,” *Public Notice*, 20 FCC Rcd 8188 (OET 2005).

³³⁰ See “Wireless Telecommunications Bureau and Office of Engineering and Technology Clarify Use of Revised Wireless Phone Hearing Aid Compatibility Standard,” *Public Notice*, 21 FCC Rcd 6384 (WTB/OET 2006).

³³¹ Section 1.1, “Scope,” of the ANSI C63.19-2006 standard provides:

[The standard] sets forth uniform methods of measurement and parametric requirements for the electromagnetic and operational compatibility and accessibility of hearing aids used with [wireless devices], including cordless, cellular, personal communications service (PCS) phones, and voice over internet protocol (VoIP) devices, operating in the range of 800 MHz to 3 GHz. However, this version is focused on existing services, which are in common use. Accordingly, in this version tests are provided for services in the 800 MHz to 950 MHz and 1.6 GHz to 2.5 GHz frequency bands. Future versions may add tests for other frequency bands, as they come into more common use.

“American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids,” ANSI C63.19-2006, Accredited Standards Committee on Electromagnetic Compatibility, C63, approved Apr. 6, 2006 (ANSI C63.19-2006 Standard), at 1.

³³² See ANSI C63.19-2006 Standard at Table 4.2 (listing target values for validation procedures using dipoles at a limited number of frequencies, and excluding AWS-1 frequencies), Table 7.1 (giving Articulation Weighting Factors for CDMA, TDMA (50 Hz), GSM, UMTS (WCDMA) and TDMA (22 Hz and 11 Hz)). See also Comments from American National Standards Institute Accredited Standards Committee C63 (EMC) ANSI ASC C63, WT Docket Nos. 01-309, 06-203, filed Jan. 3, 2007, at 3.

³³³ See *700 MHz Commercial Services Notice*, 21 FCC at 9390 ¶¶ 104-05.

comment, without reaching any tentative conclusion, on whether we should amend § 20.19(a) to ensure that all similar wireless services that meet the criteria discussed above would be subject to the hearing aid compatibility requirements.³³⁴ In addition, we noted that the current technical standard for hearing aid compatibility only applies to phones operating on certain frequencies, which do not include operations in the 700 MHz spectrum.³³⁵ We thus sought comment on what changes to the industry standard governing digital wireless handsets' compatibility with hearing aids, ANSI C63.19-2006, would be necessary in order to establish measurement methods and parametric requirements for services provided in the 700 MHz Commercial Services Band.³³⁶ Finally, we sought comment on the time necessary to complete such changes to the standard.³³⁷

140. Comments on extending hearing aid compatibility requirements express positions similar to those taken on 911/E911. Commenters again widely support the Commission's proposal to require 700 MHz manufacturers and service providers to provide hearing aid-compatible phones.³³⁸ There is again little discussion regarding extending the requirements to other bands.³³⁹ Further, Blooston expresses the same concern as they did in connection with 911/E911 implementation that the development of 700 MHz equipment is not yet as far along as other equipment and that timetables for compliance "should not put licensees into a compliance quandary."³⁴⁰ RTG considers the imposition of hearing aid compatibility obligations at this time to be "premature."³⁴¹

141. Regarding changes to the hearing aid compatibility standard, the Hearing Aid Industries Association (HIA) argues that the current ANSI C63.19-2006 standard should be "easily adaptable to include the 700 MHz band" and that "[h]andset behavior in the new 700 MHz band is not likely to be significantly different from behavior in the well-established 800 MHz cellular band."³⁴² It further states that, "[t]o the extent that modification of the ANSI standard becomes necessary during the design and manufacturing processes for 700 MHz handsets, HIA and its members will continue to participate in activities addressing any needed additions or refinements."³⁴³

142. Discussion. For reasons similar to those discussed in the E911 section above, we determine that all digital CMRS providers, including providers of such services in the 700 MHz Commercial Services Band and the AWS-1 and BRS/EBS bands, should be subject to hearing aid compatibility requirements under § 20.19 to the extent they offer real-time, two-way switched voice or data service that is interconnected with the public switched network and utilizes an in-network switching

³³⁴ *Id.* at 9390 ¶ 106.

³³⁵ *Id.* at 9358 n.82.

³³⁶ *See id.* at 9390 ¶ 21.

³³⁷ *Id.*

³³⁸ *See* AT&T Comments in WT Docket No. 06-150 at 16; Blooston Comments in WT Docket No. 06-150 at 8; Cingular Comments in WT Docket No. 06-150 at 15; CTIA Comments in WT Docket No. 06-150 at 21; Dobson Comments in WT Docket No. 06-150 at 11; HIA Comments in WT Docket No. 06-150 at 2-3; HLAA Comments in WT Docket No. 06-150 at 4; Leap Comments in WT Docket No. 06-150 at 11; Qualcomm Comments in WT Docket No. 06-150 at 24; TIA Comments in WT Docket No. 06-150 at 10; U.S. Cellular Comments in WT Docket No. 06-150 at 18-19; T-Mobile Reply Comments in WT Docket No. 06-150 at 6.

³³⁹ *See* Leap Comments in WT Docket No. 06-150 at 11 (advocating that "all CMRS services – whether operating in spectrum allocated for PCS, AWS, 700 MHz or some other service – be made subject to the same emergency access and compatibility requirements.").

³⁴⁰ *See* Blooston Comments in WT Docket No. 06-150 at 8-9.

³⁴¹ *See* RTG Comments in WT Docket No. 06-150 at 9.

³⁴² HIA Comments in WT Docket No. 06-150 at 4 & n.7.

³⁴³ *Id.* at 4.

facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. In addition, manufacturers of wireless handsets that are capable of providing such service also should be made subject to the applicable requirements of § 20.19. As discussed below, however, the existence of an established, applicable technical standard is a statutory requirement for imposing hearing aid compatibility requirements. Because no such standard currently exists for any services beyond the broadband PCS, Cellular, and certain SMR bands, we cannot presently impose hearing aid compatibility requirements on additional services. We do commit to bringing all digital CMRS within the scope of the § 20.19 requirements as appropriate technical standards are developed, and we take steps to promote the development of these technical standards, as discussed below. In particular, we establish a specific timetable for the development of the necessary technical standards for those new services that have governing service rules in place. We amend the rule to reflect these determinations, including our decision that hearing aid compatibility requirements will apply to any CMRS to the extent that it meets the criteria discussed above and there is an established technical standard for hearing aid compatibility applicable to the relevant handsets.

143. Extending hearing aid compatibility requirements to services beyond those currently covered will ensure that comparable service providers and manufacturers will be required to comply with similar hearing aid-compatible handset requirements regardless of the frequency bands on which they operate.³⁴⁴ Further, end users will be able to expect the full range of functionality found today in mobile phones without having to know the technical details, such as the frequencies on which their phones operate.³⁴⁵ Moreover, by clarifying the applicability of the hearing aid compatibility rules to these manufacturers and service providers now, we enable them to begin planning to incorporate hearing aid compatibility compliance into their operations at the earliest possible stage, which should also promote a more efficient implementation.³⁴⁶ We also ensure that the necessary parties become involved in ongoing discussions among the Commission, service providers, standards bodies, and industry representatives to develop additional standards for hearing aid compatibility measurement methods and parametric requirements.³⁴⁷

144. This extension is consistent with the views of most commenters, which are generally supportive of the idea of extending the hearing aid compatibility requirements to services in new spectrum, and particularly the 700 MHz Commercial Services Band, to the extent that those services are similar to the services already subject to hearing aid compatibility requirements. As with the supporters of E911 extension, commenters supporting application of the hearing aid compatibility requirements to 700 MHz service providers include a broad range of interests, including large and mid-sized wireless carriers,³⁴⁸ manufacturing interests,³⁴⁹ and groups representing hearing aid users and manufacturers.³⁵⁰

³⁴⁴ See Aloha Partners Comments in WT Docket No. 06-150 at 12; CTIA Comments in WT Docket No. 06-150 at 22; USCC Comments in WT Docket No. 06-150 at 18-19. See also Implementation of Sections 3(n) and 332 of the Communications Act, *Third Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 7988 at ¶ 23 (1994) (noting that a “symmetrical regulatory framework for commercial mobile radio services” will “foster economic growth and expanded service to consumers through competition”).

³⁴⁵ See Cingular Comments in WT Docket No. 06-150 at 16 (stating that “[c]onsumers’ expectations” will be served by extension of hearing aid compatibility requirements to the 700 MHz band).

³⁴⁶ See HIA Comments in WT Docket No. 06-150 at 3; HIA Reply Comments in WT Docket No. 06-150 at 2

³⁴⁷ For the reasons discussed above, we decline to incorporate the criteria enumerated in the *E911 Scope Order* into § 20.19(a). See *supra* Section III.A.2.c(vi).

³⁴⁸ See Cingular Comments in WT Docket No. 06-150 at 15-16; Dobson Communications Comments in WT Docket No. 06-150 at 11; U.S. Cellular Comments in WT Docket No. 06-150 at 18-19.

³⁴⁹ Qualcomm Comments in WT Docket No. 06-150 at 24; TIA Comments in WT Docket No. 06-150 at 9-10.

³⁵⁰ See HIA Comments in WT Docket No. 06-150 at 2-3; HLAA Comments in WT Docket No. 06-150 at 2.

Accordingly, we conclude that any CMRS digital service that meets the § 20.19(a) criteria for inclusion should be subject to hearing aid compatibility requirements.

145. We decline, however, to impose hearing aid compatibility obligations on other services and bands at this time. When the Commission imposed the existing hearing aid compatibility obligations on handset manufacturers and service providers in 2003, it simultaneously approved ANSI C63.19 as an established technical standard applicable to the services covered by the rule.³⁵¹ Indeed, the Commission noted that the existence of an established technical standard was a statutory requirement for imposing hearing aid compatibility, and further found that this statutory requirement was “[f]undamental” to the determination of whether to impose hearing aid compatibility on wireless devices.³⁵² We therefore find that an applicable technical standard should be in place when hearing aid compatibility obligations are imposed in the 700 MHz Commercial Services Band and other bands.

146. As noted above, none of the available versions of the current hearing aid compatibility standard cover services in the 700 MHz Commercial Services Band or the AWS-1 or BRS/EBS bands. Nor do they provide tests for some of the technologies anticipated in these bands, such as WiMAX. HIA argues that the ANSI C63.19-2006 standard for the 800 MHz band provides an appropriate framework to measure performance in the 700 MHz Band for purposes of determining hearing aid compatibility, but the record does not establish that the existing standard can be extended to that band without modifications or amendments. Indeed, HIA concedes that modifications to the standard may be necessary,³⁵³ and the Hearing Loss Association of America (HLAA) also supports this conclusion, noting that changes to the standard will be necessary to accommodate emerging technologies.³⁵⁴ Accordingly, we conclude that we cannot extend specific hearing aid compatibility obligations to emerging bands and services until specific standards that establish the hearing aid compatibility measurement methods and parametric requirements for these additional services’ and bands’ devices are developed.

147. We note that ANSI has stated that it has authorized a “study project” to examine, among other topics related to the C63.19 standard, the possibility of extending the relevant frequency band for wireless devices’ compatibility with hearing aids to the range from 700 MHz to 8 GHz.³⁵⁵ The same study project will consider the addition of tests and parametric requirements for other frequency bands including AWS-1 at 1710/2110 MHz and the BRS/EBS at 2.5 GHz, as well as new broadband technologies.³⁵⁶ Because we find that a standard for compliance should be established before hearing aid compatibility is imposed on a service, and because such standards are currently in development for the new bands and technologies, we decline to extend hearing aid compatibility requirements at this time.

148. Establishment of hearing aid compatibility requirements for comparable services must not be delayed – particularly for the 700 MHz Commercial Services Band and the other bands currently

³⁵¹ See *Hearing Aid Compatibility Order*, 18 FCC Rcd at 16771 ¶ 43.

³⁵² See *id.*, 18 FCC Rcd at 16769 ¶¶ 39 (citing 47 U.S.C. § 610(b)(1)(B) (requiring that the specified telephones “provide internal means for effective use with hearing aids that are designed to be compatible with telephones *which meet established technical standards for hearing aid compatibility*.” (emphasis added))), 44, 49. See also Section 68.4(a) of the Commission’s Rules Governing Hearing Aid-Compatible Telephones, WT Docket No. 01-309, *Notice of Proposed Rulemaking*, 16 FCC Rcd 20558, 20564 ¶ 16 (2001) (finding that the statute “requires the establishment of *technical standards* governing wireless-hearing aid compatibility” (emphasis in original)).

³⁵³ See HIA Comments in WT Docket No. 06-150 at 4.

³⁵⁴ See HLAA Comments in WT Docket No. 06-150 at 4.

³⁵⁵ Comments from American National Standards Institute Accredited Standards Committee C63 (EMC) ANSI ASC C63, WT Docket Nos. 01-309 and 06-203, filed Jan. 3, 2007, at 2-3.

³⁵⁶ *Id.* at 3.

listed in § 27.1(b), which include the AWS-1, BRS/EBS, 1.4 GHz, 1.6 GHz, and 2.3 GHz bands,³⁵⁷ all of which now have or soon will have service rules established, and which either have been or will soon be licensed.³⁵⁸ Because we seek to promote the development of additional standards, we establish a schedule for future Commission actions. Accordingly, if the appropriate technical standards for the bands listed in § 27.1(b) are established within 24 months of the Federal Register publication of this Order, we will proceed based on the adopted standards and we commit to initiating a further proceeding at that time to establish a specific timetable for deployment of hearing aid-compatible handsets for services in the relevant bands that meet the criteria discussed above. Given that ANSI is already considering extensions of the C63.19 standard to the 700 MHz Commercial Services Band and the AWS-1 and BRS/EBS bands, we find that a 24 month period to complete standards for these services is reasonable.³⁵⁹ We strongly encourage ANSI and the various stakeholders in this process to work together towards adoption of technical standards in a timely manner so that hearing aid users will have the same accessibility to interconnected services in the new bands as they do in the bands already addressed in section 20.19(a) of the Commission's rules.³⁶⁰

149. We will continue to monitor progress to make sure that the adoption of such standards proceeds in a timely manner. If no standards have been adopted within 24 months, we will consider alternative means to implement compatibility requirements, including whether to develop new metrics for compliance entirely and/or whether to extend the C63.19-2006 standard for the 800 MHz Band into the 700 MHz Commercial Services Band, as HIA suggests.³⁶¹ We will not at this time establish a schedule for future action regarding bands other than the current 27.1(b) bands because it does not appear to be possible to develop compatibility standards in the absence of service rules. We also note that there is little or no discussion in the record of extending hearing aid compatibility beyond the 700 MHz Commercial Services Band. We will, however, pursue appropriate action as the nature of services in new bands becomes more defined or we find that an applicable standard has been or can be developed.

150. Although we do not impose specific hearing aid compatibility obligations on these services at this time, we again reject RTG's assertion that a timetable for such obligations must

³⁵⁷ The 1.4 GHz Band, as licensed under Part 27, includes an unpaired block of spectrum at 1390-1392 MHz and a paired block at 1392-1395 MHz and 1432-1435 MHz. The 1.6 GHz Band consists of 1670-1675 MHz. The 2.3 GHz Band includes 2305-2320 MHz and 2345-2360 MHz. See 47 C.F.R. § 27.1(b)(4)-(6).

³⁵⁸ See 47 C.F.R. § 27.1(b) (listing bands licensed under Part 27 rules, including 2.3 GHz, 700 MHz, AWS-1, 1.4 GHz, 1.6 GHz, and BRS/EBS bands); see also, e.g., Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, WT Docket No. 02-8, *Report and Order*, 17 FCC Rcd 9980 (2002) (establishing service rules for certain frequencies in the 1.4 and 1.6 GHz bands); Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162 (2003), *Order on Reconsideration*, FCC 05-149 (rel. Aug. 15, 2005) (establishing AWS-1 service rules); Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 03-66, 19 FCC Rcd 14165 (2004) (BRS/EBS R&O and FNPRM), *Order on Reconsideration and Fifth Memorandum Opinion and Order and Third Memorandum Opinion and Order and Second Report and Order*, 21 FCC Rcd 5606 (2006) (establishing BRS/EBS service rules).

³⁵⁹ See *supra* ¶ 171. We also note that ANSI has extended the C63.19 standard to the 1.6-2.5 GHz band for established services in those bands. We therefore believe that much of the work necessary to develop technical standards for the 1.4 GHz, 1.6 GHz, and 2.3 GHz Bands has already been done.

³⁶⁰ In particular, we would encourage the appropriate standards-setting body to consider HIA's proposal to make use of the existing C63.19-2006 standard in the 700 MHz Band.

³⁶¹ The Commission has authority to establish the technical standards required for hearing aid compatibility. See 47 U.S.C. 610(c).

necessarily wait until the nature of the services to be offered, the technologies to be used in the band, and the impact on rural carriers are clearer. We emphasize that the services subject to hearing aid compatibility obligations in the 700 MHz Commercial Services Band and elsewhere will be the same types of services that are subject to such obligations in other bands under the existing § 20.19(a) of the Commission's rules.³⁶² Therefore, once an appropriate technical standard is available, we do not find it necessary to delay implementation any further in order to see how the services in the band develop or through what technologies they are provided. Rather, we will expect similar services to be subject to similar hearing aid compatibility obligations, regardless of the technologies over which they are provided. Although the development of an appropriate standard will be technology-specific, the technologies that need to be addressed are few in number, and, as noted above, a study project has already been authorized by the ANSI ASC C63 Committee to develop the appropriate hearing aid compatibility measurement methods and parametric requirements for these technologies. Finally, because we are imposing no new rules at this time, any analysis of the impact of these obligations on small rural carriers in particular can be deferred until the standards are in place to allow the further rulemaking activity.

B. 700 MHz Guard Bands

151. As we indicated in the *700 MHz Guard Bands Notice*, we seek to establish rules and policies that provide Guard Band licensees greater flexibility while continuing to ensure non-interference with the adjacent 700 MHz Public Safety spectrum. As part of this endeavor we sought comment on a number of band restructuring proposals. As discussed below in the Further Notice, we tentatively conclude that we do not have the legal authority, and it is not in the public interest, to adopt at this time certain of the band restructuring proposals raised in this docket.³⁶³ We do, however, take several measures in this Report and Order, as broadly endorsed by commenters, to promote more efficient and effective use of the 700 MHz Guard Bands spectrum. Specifically, we replace the current band manager leasing regime with the spectrum leasing policies and rules adopted in the Secondary Markets proceeding. In applying the Secondary Markets leasing rules to the 700 MHz Guard Bands, we are eliminating the special restrictions imposed under the Guard Bands licensing regime that prevented licensees from using their spectrum as a wireless service provider and restricted their ability to lease to affiliates, and permitting more operational flexibility for 700 MHz Guard Bands licensees.

1. Background

152. As discussed in the *700 MHz Guard Bands Notice*, in adopting the licensing, technical and operational rules for the 700 MHz Guard Bands, the Commission created a new class of commercial licensee that makes spectrum available to system operators or directly to end users through private, written contracts known as "spectrum user agreements."³⁶⁴ The Commission afforded these Guard Band Manager licensees flexibility to tailor their spectrum to the unique requirements of potential system

³⁶² See HIA Reply Comments in WT Docket No. 06-150 at 2 ("[Hearing aid compatibility] relates to voice communication, so there is no need to wait and see what other services may develop before imposing the requirements on voice handsets."). Although the text of the scope provision does encompass data services as well, see 47 C.F.R. § 20.19(a), we note that such services must still satisfy the other requirements of § 20.19(a). Thus, they must be real-time, two-way, and interconnected with the public switched network, such that they directly give subscribers "the capability to communicate to or receive communications from all other users" on networks that use the North American Numbering Plan in connection with the provision of their service. See 47 C.F.R. § 20.3 (definition of "Interconnected Service," "Public Switched Network"). Further, as an implicit matter, services must at least potentially involve auditory output. In light of these restrictions, voice communications will remain the primary, if not exclusive, subject of hearing aid compatibility.

³⁶³ See *infra* Section IV.B.2.a.

³⁶⁴ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10417 ¶ 9, citing *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5312 ¶ 27. See generally 47 C.F.R. Part 27, Subpart G ("Guard Band Managers").

operators or end users.³⁶⁵ The Commission stated that the primary responsibility of the Guard Band Manager is to ensure non-interference with the adjacent 700 MHz Public Safety Band,³⁶⁶ and that the Guard Band Manager retains ultimate control of spectrum use within the scope of its license, including subdivision of spectrum blocks and geographic areas, frequency coordination, channel selection, resolution of interference conflicts, and compliance with the Commission's rules.³⁶⁷ Guard Band Managers also are subject to stringent coordination requirements,³⁶⁸ cannot use their spectrum as a wireless service provider, and cannot lease more than 49.9 percent of their spectrum in a geographic area to affiliates.³⁶⁹

153. The *700 MHz Guard Bands Notice* also noted that, subsequent to the adoption of the Guard Band Manager licensing regime, the Commission in 2003 established a broad set of new spectrum leasing policies and rules in its Secondary Markets proceeding and applied these spectrum leasing policies and rules to most Wireless Radio Service licensees holding "exclusive use" licenses.³⁷⁰ These spectrum leasing policies and rules, adopted in the *Secondary Markets First Report and Order* and extended to additional Wireless Radio Services in the *2004 Secondary Markets Second Report and Order*,³⁷¹ generally permit two types of leasing options: *de facto* transfer leasing, and spectrum manager leasing. A *de facto* transfer lease arrangement places primary responsibility upon the spectrum lessee to interact with the Commission and ensure compliance with the Commission's rules; however the licensee retains ultimate responsibility for its lessees' ongoing violations or other egregious behavior about which the licensee has knowledge or should have knowledge.³⁷² Under this option, subject to Commission approval, "licensees and spectrum lessees may enter into spectrum leasing arrangements – for any amount of spectrum, in any geographic area, and for any period of time within the scope and term of the license – in which *de facto* control of the leased spectrum is transferred to the spectrum lessee(s) for the duration of the lease."³⁷³ Under the second option, spectrum manager leasing, "licensees and spectrum lessees may enter into spectrum leasing arrangements – for any amount of spectrum, in any geographic area, and for any period

³⁶⁵ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10417 ¶ 9, citing *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5313 ¶ 29. For example, we noted, entities could secure spectrum from a Guard Band Manager in varying degrees of quantity, duration and geographic area to best suit their needs. *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10417 ¶ 9, citing *Second Report and Order*, 15 FCC Rcd at 5313-14 ¶ 31.

³⁶⁶ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10418 ¶ 10, citing *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5314-15 ¶ 33.

³⁶⁷ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10417 ¶ 9, citing *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5314 ¶ 32.

³⁶⁸ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10418 ¶ 10, citing *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5315 ¶ 34. Guard Band Managers must notify Commission-recognized public safety frequency coordinators in the 700 MHz Public Safety Band, as well as adjacent-area Guard Band Managers, of the technical parameters of any new station or station modification. The Commission requires each notification to specify, within a limited timeframe, the frequency, antenna height, antenna location, emission type, effective radiated power, service area description, date of coordination, and user name or description of operation. *Id.*

³⁶⁹ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5325 ¶ 59. The Commission created these restrictions to promote the core band manager feature of leasing spectrum to third parties, theoretically ensuring a "useful test of the Band Manager concept." *Id.*

³⁷⁰ See Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 20604, 20644-45 ¶ 85 n.189 (2003) ("*Secondary Markets First Report and Order*"). See generally 47 C.F.R. Part 1, Subpart X ("*Spectrum Leasing*").

³⁷¹ *Secondary Markets Second Report and Order*, 19 FCC Rcd at 17534-35 ¶ 64.

³⁷² *Secondary Markets First Report and Order*, 18 FCC Rcd at 20612-13 ¶ 13.

³⁷³ *Id.* In this type of spectrum leasing arrangement, the licensee retains *de jure* control. *Id.*

of time within the scope and term of the license – without the need for prior Commission approval, provided the licensees retain *de facto* control...over the leased spectrum.”³⁷⁴ Application filings through the Universal Licensing System (ULS) are required for both types of spectrum leasing arrangements, and spectrum leasing parties must submit detailed information on the amount, frequency and geographic location of the leased spectrum, as well as the length of the spectrum leasing arrangement.³⁷⁵

154. At the time, the Commission did not apply spectrum leasing policies adopted in the Secondary Markets proceeding to the 700 MHz Guard Bands.³⁷⁶ The Commission also did not extend the Secondary Markets spectrum leasing policies to the 700 MHz Guard Bands in the 2004 *Secondary Markets Second Report and Order*, noting that the 700 MHz Guard Bands service “already has its own distinct set of policies and rules regarding leasing arrangements, and no commenters proposed replacing those policies” with the model adopted in the Secondary Markets proceeding.³⁷⁷

155. In the *700 MHz Guard Bands Notice*, we sought comment on whether we should retain our existing Guard Band Manager rules or whether we should apply a different set of policies and rules for enabling third parties to gain access to spectrum usage rights, such as those adopted in the Secondary Markets proceeding.³⁷⁸ We also asked whether we should apply the existing Guard Band Manager rules to the returned Nextel spectrum or whether another regulatory structure is appropriate, even if existing rules are retained for incumbent licensees.³⁷⁹ We also asked whether we should permit existing or new licensees to choose among several regulatory options for managing the 700 MHz Guard Bands, and if so, how we may best implement such an approach, including how to accommodate different regulatory schemes within the same band.³⁸⁰ We also sought comment on any alternative approach involving relaxation of certain band manager restrictions, while retaining the overall band manager concept.³⁸¹ Finally, we asked any proponent of a revised Guard Band Manager regime to comment on how its proposal will fulfill the primary responsibility of any Guard Band licensee to ensure non-interference with the adjacent 700 MHz Public Safety Band.³⁸²

2. Discussion

156. For the reasons described below, we replace the Guard Band Manager regime in favor of the spectrum leasing policies and rules adopted in the Secondary Markets proceeding, and remove certain use and eligibility restrictions regarding licensee operations and leasing to affiliates to encourage the most effective and efficient use of the Guard Bands spectrum. While we seek to provide licensees and spectrum lessees with greater latitude and remove regulatory barriers where possible, we retain the existing Guard Band Manager coordination requirements.

³⁷⁴ *Id.* at 20610-12 ¶ 12. In this type of lease arrangement, the licensee retains both *de jure* and *de facto* control. *Id.*

³⁷⁵ See 47 C.F.R. §§ 1.9010, 1.9020, 1.9030, 1.9035.

³⁷⁶ *Secondary Markets First Report and Order*, 18 FCC Rcd at 20644-45 ¶ 85.

³⁷⁷ See Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Second Report and Order, Order on Reconsideration and Second Further Notice of Proposed Rulemaking*, 19 FCC Rcd 17503, 17534-35 ¶ 64 (2004) (“*Secondary Markets Second Report and Order*”).

³⁷⁸ *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10421-24 ¶¶ 18-24.

³⁷⁹ *Id.* at 10423 ¶ 22.

³⁸⁰ *Id.*

³⁸¹ *Id.*

³⁸² *Id.* at 10424 ¶ 24.

a. Adoption of Secondary Markets Spectrum Leasing Rules

157. Among our key public interest objectives is to ensure that spectrum is put to its most efficient and effective use, and the Commission has increasingly granted technical and operational flexibility to its licensees to enable them to achieve that goal when it is consistent with preventing unacceptable interference. In adopting the Secondary Markets spectrum leasing policies and rules, the Commission accommodated the demand for significantly broader access to licensed spectrum by enabling a wide array of facilities-based providers to enter into spectrum leasing arrangements with spectrum users. These rules provided licensees with greater ability and incentive to make unused spectrum available to third parties, and thus promoted the provision of new and diverse services and applications. Third parties that could benefit from such spectrum leasing arrangements may include current spectrum operators requiring additional spectrum to meet customer needs over either the short- or long-term, new entrants seeking to provide a niche service and serve a limited area or narrowly targeted end-user market, small businesses trying to deliver services in rural communities, or entities unable or unwilling to participate in spectrum auctions or that otherwise do not have a license through which they can access spectrum to meet consumer or internal operational needs. By adopting the Secondary Markets spectrum leasing model, the Commission sought to establish spectrum leasing policies that allow licensees and spectrum lessees significant flexibility to enter into leasing arrangements that best meet their respective business needs and enable more efficient use of spectrum.

158. Commenters in this proceeding advocate replacing the existing Guard Band Manager rules with the Secondary Markets spectrum leasing policies and rules.³⁸³ Commenters argue that the spectrum leasing options under the Secondary Markets rules offer a more flexible approach to the leasing of spectrum, and will aid 700 MHz Guard Bands licensees in maximizing the use of their spectrum, enabling more parties to gain access to spectrum through leasing agreements.³⁸⁴ We agree with commenters that the Secondary Markets spectrum leasing model may be more effective than the existing band manager rules in accomplishing the Commission's goals of permitting the efficient and intensive use of spectrum while protecting public safety operations from harmful interference. Although the Commission sought to provide appropriate incentives to encourage greater participation in band manager leasing arrangements, the Guard Band Managers appear to have had limited success in negotiating spectrum user agreements with third parties.³⁸⁵ In contrast, the steadily increasing number of spectrum leasing arrangements in the other Wireless Radio Services reflects the growing use and acceptance of Secondary Markets spectrum leasing policies by wireless providers and spectrum lessees as an effective method to make spectrum more readily available to additional spectrum users. Since the Secondary Markets spectrum leasing procedures went into effect in February 2004, licensees and spectrum lessees have entered into approximately 1,200 spectrum leasing arrangements.

159. Accordingly, we determine that providing Guard Bands licensees the additional flexibility offered by the Secondary Markets spectrum leasing regime would enhance spectrum usage in the 700 MHz Guard Bands. Specifically, in order to provide maximum flexibility, Guard Band licensees now will have the option of entering into both spectrum manager leasing and *de facto* transfer leasing arrangements. By permitting Guard Band licensees and spectrum lessees to choose between the two different options, we will afford licensees and spectrum lessees significant flexibility to craft the type of leasing arrangement that best matches their particular needs and the demands of the marketplace. This

³⁸³ Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 2; Ericsson Comments in WT Docket No. 06-169 at 18; Radiofone Comments in WT Docket Nos. 06-169 at 8; Arcadian Reply Comments in WT Docket No. 06-169 at 4. NPSTC does not object to the application of Secondary Markets leasing rules, provided that whatever mechanism is established fully protects public safety operations from interference. NPSTC Comments in WT Docket No. 06-169 at 10.

³⁸⁴ *See id.*

³⁸⁵ *See supra* Section III.B.1.

flexibility could, in turn, help achieve fuller utilization of the spectrum. For example, adopting rules that permit Guard Band licensees to participate in *de facto* transfer leasing – in which primary responsibility for compliance with statutory and regulatory policies and rules is transferred from licensees to spectrum lessees – could encourage a licensee to enter into a leasing agreement that might otherwise be unattractive due to the level of operational oversight necessary to ensure compliance with the Commission’s rules in a specific case.

160. We emphasize, however, that by affording 700 MHz Guard Band licensees greater flexibility, particularly in the *de facto* transfer leasing context, we are not minimizing in any way the requirement that these licensees must ensure that adjacent public safety operations are protected from harmful interference. Protection of 700 MHz public safety operations from interference remains the primary goal of the Commission’s policies relating to the 700 MHz Guard Bands. We agree with comments that the Secondary Markets spectrum leasing rules provide sufficient mechanisms to ensure non-interference with spectrum users in the adjacent 700 MHz Public Safety Band. As noted by the BOP proponents, the Secondary Markets spectrum leasing rules provide protection equivalent to the band manager rules.

161. Although we recognize that the additional flexibility afforded by the *de facto* transfer spectrum leasing option transfers the primary responsibility for ensuring interference protection to the spectrum lessee, we conclude that public safety users will still be protected from interference under the Secondary Markets spectrum leasing rules. Under this option, 700 MHz Guard Band licensees continue to retain some responsibility for operations encompassed under their license authorizations,³⁸⁶ and may be held responsible in cases of ongoing violation or other egregious lessee behavior for which licensees have, or should have, knowledge.³⁸⁷ More importantly, although we expect Guard Band licensees to continue to exercise some oversight of its lessees, the Commission retains direct authority to pursue remedies against lessees under Section 503(b) of the Act.³⁸⁸ Spectrum lessees, whether under a spectrum manager leasing arrangement or a *de facto* transfer leasing arrangement, must strictly comply with the technical restrictions of the band, and must expressly agree to comply with all applicable Commission rules as a condition of the spectrum leasing arrangement.³⁸⁹ Regardless of whether the licensee or spectrum lessee holds primary responsibility for compliance with Commission rules, the Commission maintains the ability to take direct and swift action to enforce compliance with its rules.

162. We conclude that we should apply our Secondary Markets spectrum leasing rules to the 700 MHz Guard Bands service. By doing so, we will facilitate more efficient use of the spectrum by licensees and spectrum lessees, and will produce a more market-driven system that should better meet the needs of the public without compromising the Commission’s other core public interest goals – specifically, ensuring that public safety operations are protected from harmful interference.³⁹⁰ Although we sought comment on whether we should permit licensees to choose between the existing Guard Band

³⁸⁶ See *Secondary Markets First Report and Order*, 18 FCC Rcd at 20664 ¶ 136.

³⁸⁷ *Id.*

³⁸⁸ *Id.* at 20664 ¶¶ 137-138.

³⁸⁹ See 47 C.F.R. §§ 1.9020(d)(1), 1.9030(d)(1), 1.9035 and 1.9040(a).

³⁹⁰ We note that because we will now apply secondary markets leasing rules to the 700 MHz Guard Bands, our designated entity rules – specifically the rules regarding material relationships – will apply to these Guard Bands as well. See Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission’s Competitive Bidding Rules and Procedures, WT Docket No. 05-211, *Second Report and Order and Second Further Notice of Proposed Rulemaking*, 21 FCC Rcd 4753 (2006) (revising the Commission’s Part 1 rules to include certain “material relationships” as factors in determining designated entity eligibility); Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission’s Competitive Bidding Rules and Procedures, WT Docket No. 05-211, *Order on Reconsideration of the Second Report*, 21 FCC Rcd 6703, 6716 ¶ 30 (2006) (exempting services not subject to secondary markets leasing from the revised “material relationships” rules).

Managers regime or the Secondary Markets spectrum leasing rules,³⁹¹ we conclude that it is unnecessary to also allow licensees the ability to choose between the two leasing models, and thus replace the Guard Band Manager leasing regime with the Secondary Markets spectrum leasing policies and rules. Application of the Secondary Markets rules to all 700 MHz Guard Bands licensees will provide significant additional flexibility and ensure that these licensees are treated similarly to other Wireless Radio Services holding exclusive use licenses and leasing spectrum usage rights.

b. Use and Operational Flexibility

163. In addition to providing licensees and other spectrum users additional flexibility provided under our general Secondary Markets spectrum leasing rules, we conclude that other changes to the 700 MHz Guard Bands rules should be made to promote more efficient and effective use of this spectrum. Commenters argue that certain 700 MHz Guard Bands rules deter licensees and potential spectrum users from entering into spectrum user agreements. The BOP proponents argue that the band manager model imposes a number of requirements—the specification that a Guard Band licensee acts only as a spectrum broker and not a service provider, the requirement that the predominant amount of a licensee’s spectrum must be leased to non-affiliates, and restrictions on the conditions that a licensee may impose on lessees and end users—that significantly restrict the use of Guard Bands spectrum.³⁹² Similarly, Arcadian Networks (Arcadian) – an existing Guard Band lessee – argues that the restrictions against Guard Band Managers using their spectrum as system operators, and leasing their spectrum to affiliates, should be eliminated because the restrictions have stifled the market for 700 MHz Guard Bands spectrum.³⁹³ According to Arcadian, the Secondary Markets spectrum leasing rules have proven more successful without such restrictions.³⁹⁴

164. *Band Manager Status.* In creating the 700 MHz Guard Bands service, the Commission designated Guard Band Managers as a new class of commercial licensee engaged solely in leasing spectrum to third parties.³⁹⁵ We agree with commenters that we should re-evaluate our decision to limit the ability of licensees to act as service providers. The band manager rules and policies that specify that a Guard Band licensee may only act as a spectrum manager unduly restrict the ability of parties to use the spectrum, and may preclude the deployment of services that might otherwise be offered. Depending upon the circumstances, it may be that the Guard Band licensee itself is best positioned to make maximum use of the Guard Bands spectrum. Precluding a licensee from operating as a service provider may prevent access by parties that could make actual use of the band, and hinders, rather than facilitates, the efficient use of the spectrum. We believe that, as long as a 700 MHz Guard Band licensee can fulfill its primary function of effectively managing its licensed spectrum and ensuring that 700 MHz public safety operations are protected from interference, there is little reason to preclude that licensee from also providing service. Accordingly, we will revise our rules to permit licensees to operate as wireless service providers. To the extent that a licensee chooses to provide service, we require that the licensee update their license information if they plan to switch their regulatory status,³⁹⁶ and we note that licensees will be responsible for meeting all other obligations relating to their change in status.³⁹⁷

³⁹¹ NPSTC opposes the ability for the Guard Band licensee to choose between regulatory models, stating that this can dilute responsibility. NPSTC Comments in WT Docket No. 06-169 at 11.

³⁹² Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 2.

³⁹³ Arcadian Networks Reply Comments in WT Docket No. 06-169 at 4.

³⁹⁴ *Id.*

³⁹⁵ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5312-5313 ¶¶ 26-27.

³⁹⁶ Licensees will be required to update their status pursuant to Section 27.10(d) of the Commission’s rules.

³⁹⁷ For example, such obligations could include interconnection, numbering and universal service.

165. *Restrictions on Leasing to Affiliates.* Similarly, we conclude that it is in the public interest to remove the current restriction precluding any licensee from leasing more than 49.9 percent of its licensed spectrum to affiliates. As in the case of the policy precluding licensees from providing service, we believe that our rule requiring that licensees lease the predominant amount of their spectrum to non-affiliates prevents entities from maximizing use of the spectrum, and hinders the provision of service to end users. This restriction also may prevent licensees and lessees from taking advantage of new technologies. The BOP proponents argue that since a band manager must lease the majority of its spectrum to unaffiliated parties, any band manager affiliate would not be able to deploy even a single broadband channel because it would require the majority of the spectrum.³⁹⁸ To the extent that we determine that broadband deployment is permissible in one or both of the 700 MHz Guard Bands, the Commission's restrictions that prevent Guard Band Managers from providing service or from leasing any more than 49.9 percent of its license to affiliates would hinder the ability of Guard Band licensees or their affiliates to deploy such service. Restrictions regarding use by the licensee or its affiliates may prevent entities from optimizing the use of the spectrum or entering into Secondary Markets spectrum leasing agreements with adjacent licensees that are not similarly restricted. Accordingly, we eliminate this restriction.

166. *Other Lease Restrictions.* Under existing policies, 700 MHz Guard Band licensees are prohibited from imposing unduly restrictive requirements in the spectrum user agreements regarding access to, and use of, spectrum.³⁹⁹ In adopting these band manager rules, the Commission noted that Guard Band Managers would be afforded a considerable amount of latitude in determining the most efficient way to manage their spectrum.⁴⁰⁰ The Commission concluded, however, that it was necessary to ensure that band managers did not impose unreasonable terms and conditions on lessees or end users.⁴⁰¹ Although these restrictions were aimed at ensuring that band managers do not engage in unreasonable practices, as the BOP proponents point out, the existing rules may adversely affect the ability of Guard Band licensees to negotiate with spectrum users regarding otherwise standard lease provisions, such as mandating the use of a particular technology, that other wireless licensees are permitted to negotiate.⁴⁰² We note that our Secondary Markets spectrum leasing rules do not have similar restrictions and our rules generally permit parties to determine the precise terms and provisions of their spectrum lease agreements.⁴⁰³ As noted above, we are adopting for the Guard Bands the same spectrum leasing policies set forth in the Secondary Markets proceeding. We believe that these policies provide sufficient incentives for licensees to lease spectrum usage rights, while also providing licensees with the ability to establish appropriate operational guidelines with spectrum lessees that protect public safety licensees from interference.⁴⁰⁴ As such, we eliminate this requirement.

167. *Coordination Requirement.* The Commission requires Guard Band Managers to notify public safety frequency coordinators in the 700 MHz Public Safety Band, as well as adjacent-area Guard Band Managers, of the technical parameters of any site constructed in the Guard Band Manager's license area. Guard Band Managers must provide such identifying information as the frequencies coordinated, antenna height and location, and effective radiated power.⁴⁰⁵ The BOP proponents argue that the current

³⁹⁸ Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 2.

³⁹⁹ 47 C.F.R. §§ 27.602(g), 27.603(b).

⁴⁰⁰ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5327-5328 ¶¶ 64-65.

⁴⁰¹ *Id.* at 5328 ¶¶ 64-65.

⁴⁰² Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 2.

⁴⁰³ *Secondary Markets First Report and Order*, 18 FCC Rcd at 20637 ¶ 70.

⁴⁰⁴ We note that we may still consider complaints filed against a Guard Band Manager for unreasonably denying access to its spectrum pursuant to our authority under Sections 308(b) and 309(d) of the Communications Act.

⁴⁰⁵ 47 C.F.R. § 27.601(d)(1).

rules that apply to the existing Guard Bands A and B Blocks should be replaced with the less burdensome coordination requirements that exist for the C and D Blocks.⁴⁰⁶ They argue that under the BOP, there will be no commercial operations directly adjacent to public safety narrowband channels, and thus heightened coordination requirements are unnecessary.⁴⁰⁷

168. We do not change the coordination requirements for Guard Band licensees currently contained in section 27.601(d)(1) of our rules. We note that the Commission imposed coordination requirements to minimize the potential for interference, and we reiterate that the primary purpose of the Guard Bands is to prevent interference to adjacent public safety operations. Absent information indicating that our coordination requirements do not serve to prevent interference, we conclude that we should retain the coordination requirements set forth in the rule. Given that we are adopting the Secondary Markets spectrum leasing rules for the Guard Band service, we clarify how these coordination requirements will work in the context of spectrum leasing arrangements. To the extent a licensee enters into a spectrum manager lease arrangement, it retains *de facto* control of the spectrum and primary responsibility for ensuring compliance with the rules.⁴⁰⁸ Accordingly, for this type of spectrum leasing arrangement, the licensee is required to carry out these coordination responsibilities.⁴⁰⁹ If, however, a licensee enters into a *de facto* transfer leasing arrangement, the coordination and notification tasks set forth in section 27.601 of our rules (as well as other responsibilities associated with *de facto* control) are, upon Commission approval, transferred from the licensee to the spectrum lessee. In this latter type of arrangement, we note that although the spectrum lessee becomes primarily responsible for complying with the required frequency coordination responsibilities under the license authorization, we will continue to hold licensees responsible for the failure of a spectrum lessee to comply with the Commission's frequency coordination requirements.⁴¹⁰

IV. FURTHER NOTICE OF PROPOSED RULEMAKING

A. Introduction

169. In the Report and Order, above, we provide increased flexibility to 700 MHz Commercial Services Band licensees to facilitate the development of new and innovative services in this spectrum, while also advancing the Commission's goals of promoting spectrum access and the provision of service in rural areas. In addition, we provide additional flexibility to 700 MHz Guard Band licensees to enable them to make better use of the Guard Bands spectrum.

170. In this Further Notice, we reach tentative conclusions and make proposals with respect to a limited number of key issues affecting the 700 MHz Band that affect all three of these proceedings. In addition, we seek comment on the "Public Safety Broadband Deployment Plan" proposal submitted very

⁴⁰⁶ Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 6. The existing coordination requirements for Guard Band Managers include notification to public safety frequency coordinators and adjacent area Guard Band Managers of several specified technical details within one business day after either the coordination of a station or the filing of an application with the Commission. See 47 C.F.R. § 27.601(d). Additionally, operation is restricted until at least 10 business days after the required notification, and in the event of harmful interference, the Commission may impose restrictions on the operations by involved parties. *Id.* In contrast, the coordination requirement that applies to the Upper 700 MHz C and D Blocks consists of providing a description of the proposed facility, prior to commencing operation, to a public safety coordinator when the proposed facility is within 500 meters of existing or planned public safety base station receivers. See 47 C.F.R. § 27.303.

⁴⁰⁷ Access Spectrum/Pegasus Comments in WT Docket No. 06-169, App. at 6.

⁴⁰⁸ See 47 C.F.R. § 1.9020(a)-(b).

⁴⁰⁹ See 47 C.F.R. § 1.9010 (if licensee retains *de facto* control of the spectrum, it is responsible for resolving all interference-related matters, including conflicts between its spectrum lessee and any other licensee).

⁴¹⁰ See 47 C.F.R. § 1.9030(a)-(b).

recently by Frontline, which if adopted in some form potentially could affect decisions in all three proceedings. In seeking additional comment in this Further Notice, we stress that we intend to rely on the extensive record that has already been developed in these proceedings to inform our ultimate decisions.

B. Discussion

171. This Further Notice encompasses issues pertinent to all three of our 700 MHz proceedings, as well as to Frontline's proposal. First, based on the record developed in connection with these proceedings, we seek comment on various band plan proposals for licensing the unauktioned commercial spectrum in the 700 MHz Band on a CMA, EA, and REAG basis, and for reconfiguring the size and location of some of the spectrum blocks associated with these commercial licenses.

172. Second, we propose to adopt performance requirements for the unauktioned 700 MHz Commercial Services licenses based on geographic benchmarks. These proposed requirements are intended be more stringent than the current "substantial service" requirements.

173. Third, we tentatively conclude that we can adopt neither the BOP, nor the proposals to reallocate the returned B Block licenses to critical infrastructure industries (CII) or public safety entities, because we do not have the statutory authority to adopt key components of the proposals. Irrespective of the lack of statutory authority, we also tentatively conclude that the BOP and CII proposals would not be in the public interest, because of the manner in which they propose to assign commercial licenses outside of a competitive bidding context, and because they could introduce an increased possibility of interference in the proposed assignment of licenses. However, we also seek comment on an alternative proposal for modification of the Guard Bands in the Upper 700 MHz Band recently submitted by parties that have supported the BOP.

174. Fourth, we tentatively conclude to redesignate the public safety wideband spectrum for broadband use consistent with a nationwide interoperability standard, and to prohibit wideband operations on a going forward basis. We also tentatively conclude that should we adopt this broadband approach, we should revise the band plan for the 700 MHz Public Safety Band by consolidating the existing narrowband channels to the upper half of the Public Safety block, and designating the lower half of the Public Safety block for nationwide interoperable broadband communications. Given these tentative conclusions, we further seek comment on a limited set of issues that would need to be resolved in order to effectuate the reconfiguration.

175. Finally, we seek comment on the Frontline proposal. We ask for comment on how this proposal interrelates with our proposals, tentative conclusions, and other issues.

1. 700 MHz Band Commercial Services

176. In the Report and Order, we decided to adopt a mix of geographic licensing areas for the 700 MHz Band in order to enhance access to spectrum by a variety of potential licensees. In particular, we revised the geographic areas to consist of CMAs, EAs, and REAGs, which will replace the unauktioned EAG-sized license areas in the 700 MHz Band. We concluded that by providing a mix of CMA, EA, and REAG licenses in the 700 MHz Commercial Services spectrum, we provide a more balanced set of initial licensing opportunities that provide an effective means of access to spectrum especially in rural areas, while effectively meeting other Commission goals. In this Further Notice, we seek comment on different band plan proposals for the use of CMAs, EAs and REAGs in the Lower 700 MHz Band and the Upper 700 MHz Commercial Services Band.

a. Lower 700 MHz Band

177. Background. In the existing band plan for the Lower 700 MHz Band, the 48 megahertz of spectrum is divided into five blocks: three 12-megahertz paired blocks, each consisting of two 6-

megahertz segments (Blocks A, B, and C); and two 6-megahertz unpaired blocks (Blocks D and E).⁴¹¹ In the *700 MHz Commercial Services Notice*, we suggested that the current band plan for the Lower 700 MHz Band should be retained, but we nevertheless sought comment on potential changes to the size of the spectrum blocks in the Lower 700 MHz Band.⁴¹²

178. Discussion. With regard to the Lower 700 MHz Band, we propose not to alter the spectrum blocks as currently sized and aligned.⁴¹³ The spectrum comprising Lower 700 MHz Band Blocks C and D, consisting of 18 of the 48 megahertz in that band, has already been auctioned, and the remainder of the Lower 700 MHz Band is subject to a statutorily imposed auction schedule.⁴¹⁴ We also note that a number of parties who submitted comments in response to the *700 MHz Commercial Services Notice* supported retaining the current size of spectrum blocks in the Lower 700 MHz Band, including Blocks C and D of that Band.⁴¹⁵ We therefore propose not to change the bandwidth of this licensed spectrum, but seek further comment on this proposal.

FIGURE 5 – PROPOSED RECONFIGURATION OF LOWER 700 MHz BAND

	A	B	C	D	E	A	B	C	
	CH. 52	CH. 53	CH. 54	CH. 55	CH. 56	CH. 57	CH. 58	CH. 59	
698	704	710	716	722	728	734	740	746	
<u>Block</u>	<u>Frequencies</u>		<u>Bandwidth</u>	<u>Pairing</u>	<u>Area Type</u>	<u>Licenses</u>			
A	698-704, 728-734		12 MHz	2 x 6 MHz	EA	176			
B	704-710, 734-740		12 MHz	2 x 6 MHz	CMA	734			
C	710-716, 740-746		12 MHz	2 x 6 MHz	CMA	734*			
D	716-722		6 MHz	unpaired	EAG	6*			
E	722-728		6 MHz	unpaired	REAG	12			

*Blocks have been auctioned.

179. We propose that the unpaired spectrum in the E Block of the Lower 700 MHz Band continue to be licensed in large regional areas, namely, on an REAG basis. As the Commission has found before with respect to the 700 MHz band and to the AWS-1 band, and as supported by several commenters in this record, licenses based on large geographic areas offer certain benefits, such as allowing licensees to more easily take advantage of economies of scale to develop new technologies and services. We seek comment on whether this proposal would serve the public interest.

⁴¹¹ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9354 ¶ 14; *Lower 700 MHz Band Report and Order*, 17 FCC Rcd at 1055 ¶ 80.

⁴¹² *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9369 ¶ 49.

⁴¹³ In the *700 MHz Commercial Services Notice*, we stated that we believed that the current band plan should be retained for the Lower 700 MHz Band. *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9369 ¶ 49.

⁴¹⁴ See *Auction 44 Public Notice*; *Auction 49 Public Notice*; *Auction 60 Public Notice*; *Section II.A., supra*.

⁴¹⁵ See Balanced Consensus Plan. The signatories to the Balanced Consensus Plan include some of the original and/or current licensees in the C Block of the Lower 700 MHz Band, e.g., Aloha, Blooston, C&W, Corr, Union, and Vermont Telephone Co.

180. We propose to adopt EAs as the geographic area for licenses in the A Block in the Lower 700 MHz Band. We make this proposal because, as explained above, there is significant support in the record for a mix of licenses, including EA licenses. Given the potential public interest benefits of licensing an additional spectrum block over a smaller geographic service area, we seek comment on whether it would serve the public interest to license the A Block on an EA basis.

181. Likewise, we propose that CMAs be adopted as the geographic service area for licenses in the B Block of the Lower 700 MHz Band, which results in the availability of 734 CMA licenses in this block as opposed to 6 EAG licenses. In seeking comment on this proposal, we note that certain commenters specifically favor the B Block for reassignment on the basis of CMAs.⁴¹⁶ We also note that, if we assign CMAs in the Lower 700 MHz Band B Block, licensees will be afforded the opportunity to combine the B Block licenses with licenses in the adjacent C Block, which already have been licensed over CMAs (MSAs/RSAs).⁴¹⁷ Accordingly, we seek comment on whether converting the B Block to CMA licensing could create opportunities for existing licensees in the C Block of the Lower 700 MHz Band, many of which include small or rural service providers, to create a larger block by acquiring another similarly sized spectrum block in the auction.

b. Upper 700 MHz Commercial Services Band

182. Background. Under the existing band plan for the Upper 700 MHz Commercial Services Band, 30 megahertz of spectrum is divided into two blocks: (1) a 10-megahertz paired block consisting of two 5-megahertz segments (C Block); and (2) a 20-megahertz paired block consisting of two 10-megahertz segments (D Block).⁴¹⁸ In the *700 MHz Commercial Services Notice*, we sought comment on the band plan and whether we should reconfigure the size of these spectrum blocks.⁴¹⁹ We specifically sought comment on whether the D Block, currently established as a 20-megahertz block, should be divided into two or more blocks.⁴²⁰

⁴¹⁶ See MilkyWay Comments in WT Docket No. 06-150 at 1; RCA Comments in WT Docket No. 06-150 at 1; RCA Reply Comments in WT Docket No. 06-150 at 1; RTG Comments in WT Docket No. 06-150 at 7 (supports B Block and one other block over CMAs); RTG Reply Comments in WT Docket No. 06-150 at 3 (discussing support for Balanced Consensus Plan and stressing support for B Block of the Lower 700 MHz Band to be licensed over CMAs); MetroPCS Comments in WT Docket No. 06-150 at 13; Leap Comments in WT Docket No. 06-150 at 5; Blooston Comments in WT Docket No. 06-150 at 3; Corr Reply Comments in WT Docket No. 06-150 at 4; Aloha Comments in WT Docket No. 06-150 at 7 (Aloha has no strong preference for which 700 MHz Band (Upper or Lower) should include CMA allocations of at least 10-12 MHz, but believes that it would be more efficient and less disruptive simply to revise licensing boundaries for the existing B Block in the Lower 700 MHz Band). See also Comments of Rural Telecommunications Group, Inc. in Support of Modification of License Area Sizes for 700 MHz Spectrum, Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), GN Docket No. 01-74, Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168, Rural Telecommunications Group, Inc. (filed Sept. 27, 2005) (requesting that MSA/RSA licenses be provided for the Lower 700 MHz Band B Block and Upper 700 MHz Band C Block, totaling 22 megahertz of spectrum).

⁴¹⁷ See Corr Reply Comments in WT Docket No. 06-150 at 4; Aloha Comments in WT Docket No. 06-150 at 7; Blooston Comments in WT Docket No. 06-150 at 3.

⁴¹⁸ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9352 ¶ 11; *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 491 ¶ 35.

⁴¹⁹ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9369-73 ¶¶ 49-59. We note that this portion of the notice addressed whether changes to the Commission's competitive bidding rules should be made in connection with the aggregation of spectrum, and also asked for comment concerning a "two-sided auction." *Id.* at 9372-73 ¶¶ 56-59. The competitive bidding rules, and the two-sided auction mechanism, are addressed in the Report and Order in Section III.A.2.b, above.

⁴²⁰ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9369 ¶ 49, 9370-71 ¶ 53.

183. Discussion. The following proposals would make several changes to the size and location of the spectrum blocks in the band plan currently associated with the Upper 700 MHz Commercial Services Band and the 700 MHz Guard Bands, as well as the geographic area basis on which the various blocks should be licensed. We consider these changes in large part because we are tentatively concluding to consolidate the proposed broadband portion of the 700 MHz Public Safety Band at the lower portion of the Public Safety spectrum, as discussed below, while consolidating narrowband operations to the upper portion of the Public Safety spectrum. If the Commission adopts such a proposal, the adjacency of Public Safety broadband spectrum to commercial broadband spectrum in the Upper 700 MHz Band may make it possible to make adjustments to the Guard Bands spectrum, rendering additional spectrum available for commercial use. Under one scenario, the existing Guard Band B block would be eliminated entirely, and the spectrum subsumed within the commercial spectrum in the Upper 700 MHz Band, resulting in a total of 34 megahertz available for auction. Under another scenario, the Guard Band B Block would be reduced from four to two megahertz, and the location of both the Guard Band A and B blocks would be shifted within the Upper 700 MHz Band. We discuss the proposals below on this basis.

(i) Proposals Based on Elimination of the Guard Band B Block

184. *Elimination of the Guard Band B Block.* As noted, adoption of our proposal to consolidate the broadband Public Safety spectrum in the lower portion of the 700 MHz Public Safety Band may mean that the four megahertz of spectrum in the existing Guard Band B Block is no longer needed for use as a guard band for the adjacent 700 MHz public safety users, and may be consolidated with the rest of the commercial spectrum for more efficient and effective use. The following proposals would reconfigure the band plan associated with the 30 megahertz of commercial spectrum in the Upper 700 MHz Commercial Services Band and the four megahertz of commercial spectrum in the 700 MHz Guard Band B Block, providing 34 megahertz of commercial spectrum in the Upper 700 MHz Band available for auction throughout most of the nation. These proposals also contemplate the creation of a 12 megahertz paired block of commercial spectrum (758-764 MHz/788-794 MHz) adjacent to the 700 MHz Public Safety Band (hereinafter the “adjacent block”).

185. In addition to providing additional spectrum for wireless broadband services, the new adjacent block could help facilitate the transition to wireless broadband for public safety in its 700 MHz spectrum. Under these proposals, the adjacent block auction winner(s) would have to pay the costs of consolidating the 700 MHz Public Safety spectrum with the narrowband allocation at the upper end and the broadband allocation at the lower end. We seek comment on whether the adjacent block auction winner(s) should, as a license condition, be required to post a letter of credit or place certain funds in escrow to ensure the availability of funds to fulfill this obligation. We also seek comment on how to establish the amount and mechanism for implementing such an obligation. For example, how should we assess the responsibility for relocating public safety operations if there are multiple adjacent block auction winners?

186. As mentioned above, the Commission currently holds 42 of the 52 Guard Band B Block licenses. These proposals would grandfather the remaining B Block licenses by allowing them to continue to operate in this spectrum under current rules. We seek comment on whether we should permit existing Guard Band B Block licensees to operate pursuant to the current technical specifications for the Guard Band B Block, which contemplate that Guard Band B Block licensees operate high-site, high-power communications.⁴²¹ We seek comment on whether there would be potential for harmful

⁴²¹ We note, for example, that Radiofone objects to any modification to its existing Guard Band B Block license in the Gulf of Mexico. Radiofone Comments in WT Docket No. 06-169 at 2. Radiofone does not assert that it is currently engaged in operations. Additionally, we note that the Commission requires all Guard Band Managers to file annual reports by March 1 of each year in their license term through January 1, 2015. See *700 MHz Guard Bands Second Report and Order*, 15 FCC Rcd at 5332-33 ¶¶ 75-80. Radiofone’s March 2007 Band Manager Report does not cite any Spectrum Use Agreement with Radiofone. We also note that within the context of the BOP (continued....)

interference to new, co-channel adjacent block licensees, or to public safety broadband operations, if we adopt our proposals for the 700 MHz Public Safety spectrum. Similarly, if we eliminate the existing Guard Band B block, resulting in a 12-megahertz 700 MHz commercial block immediately adjacent to the 700 MHz Public Safety block, we seek comment on whether any technical or operational restrictions or limitations would need to be adopted to protect against interference to the proposed broadband public safety operations.

187. In addition, we seek comment on whether the Commission could facilitate clearing of the existing Guard Band B Block licensees by allowing the incumbents to include their licenses in the auction inventory in a “two-sided” auction,⁴²² which would make available licenses currently held by incumbent Guard Band B Block licensees. Commenters should address details of how the existing licenses could be incorporated into the auction, and how the incumbent licensees could be compensated for “selling” a license. Are there other ways we should consider transitioning the existing Guard Band B Block licensees to the proposed band plan?

188. We note that a reconfiguration of the band plan for the 700 MHz Public Safety Band, as discussed below, may result in the relocated narrowband channels being blocked by existing Canadian TV broadcasters in certain border areas.⁴²³ Although the Canadian government has agreed to clear broadcasters from TV channels 63 and 68, there is as yet no such agreement for TV channels 64 and 69, where the narrowband channels would rest in their entirety after the proposed band plan reconfiguration.⁴²⁴ As a temporary solution to this problem, we are also seeking comment below in this Further Notice on whether to allow, in border areas, narrowband voice communications within the 1 megahertz internal guard band that is designed (under a band reconfiguration) to protect the narrowband channels from the proposed broadband channels.⁴²⁵ The result of this option would be a corresponding loss of available spectrum for broadband communications, since a 1 megahertz internal guard band would still be necessary to protect the shifted narrowband channels from public safety broadband operations.

189. As a result, under these proposals, we would impose a license condition upon the adjacent block licensee, creating a temporary easement into the adjacent block to facilitate the full 5 megahertz bandwidth of the proposed public safety broadband allocation under a band reconfiguration. This easement would terminate upon transition of the border broadcast operations and the subsequent transition of any relevant public safety users operating on the easement. We also seek comment on whether this easement should be triggered in all adjacent block licenses that share a border with Canada or Mexico, within each licensee’s entire service area or within the portion that is within range of the conflicting broadcaster’s service contour. In such a circumstance, should the adjacent block licensee be allowed to operate on a secondary basis within the easement spectrum, or not at all? Finally, we seek comment on whether we have the authority to impose this license condition on new adjacent block licensees.

190. Proposal 1. In the first proposal, we would establish a new 22-megahertz C Block (comprised of two 11-megahertz blocks of paired spectrum), and a new 12-megahertz D Block (comprised of two 6-megahertz blocks of paired spectrum). Both the C and D Blocks in the Upper 700 MHz Band would be licensed on a REAG basis. A chart illustrating this proposal is set forth below.

(Continued from previous page) _____
proposal, the BOP proponents asserted that they would agree to work around the Radiofone service area in implementing the BOP. Access Spectrum/Pegasus Reply Comments in WT Docket No. 06-169 at 21, 22.

⁴²² See, e.g., *supra* Section III.A.2.b.(i) (describing one potential type of “two-sided” auction),

⁴²³ See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10432 ¶ 45.

⁴²⁴ See Access Spectrum/Pegasus Comments in WT Docket No. 06-169 at 17.

⁴²⁵ See *infra* Section IV.B.3.b.

FIGURE 6 – FIRST PROPOSAL FOR RECONFIGURATION OF UPPER 700 MHz BAND

747		777							
A	C	D	Public Safety		A	C	D	Public Safety	
CH. 60	CH. 61	CH. 62	CH. 63	CH. 64	CH. 65	CH. 66	CH. 67	CH. 68	CH. 69
746	752	758	764	770	776	782	788	794	800
								806	

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
A	746-747, 776-777	2 MHz	2 x 1 MHz	MEA	52*
B	762-764, 792-794	4 MHz	2 x 2 MHz	MEA	52*‡
C	747-758, 777-788	22 MHz	2 x 11 MHz	REAG	12
D	758-764, 788-794	12 MHz	2 x 6 MHz	REAG	12

*Blocks have been auctioned

‡42 of 52 licenses nationwide held by the Commission, *remaining licenses potentially grandfathered*

191. Creating a paired, 22-megahertz block of spectrum in a newly configured C Block would be responsive to the desires of some potential new entrants, as well as many other commenters who favored a large 20 megahertz block of spectrum in the Upper 700 MHz Band.⁴²⁶ For example, the Coalition for 4G in America has specifically advocated that we adopt a paired, 22-megahertz license in the Upper 700 MHz Band to support new entry.⁴²⁷ Under this proposal, licensees could purchase licenses in these contiguous blocks to create 34-megahertz licenses, which could provide unique opportunities to offer broadband services. Further, with regard to the larger 22-megahertz C Block REAG licenses, we propose, consistent with the desires expressed by the Coalition for 4G America,⁴²⁸ to auction this block on a combinatorial basis, which would further facilitate the aggregation of licenses at auction to create a nationwide footprint. We seek comment on this proposal.

192. Proposal 2. This proposed band plan contemplates licensing 34 megahertz of commercial spectrum in the Upper 700 MHz Band using a mix of REAG, EA and CMA geographic licensing areas. In conjunction with the proposed mix of geographic licensing areas in the Lower 700 MHz Band,⁴²⁹ this proposal seeks to approximate the balanced mix of geographic licensing sizes adopted by the Commission in the recent AWS-1 auction. It is intended to provide opportunities for small providers in rural areas, as well as new entrants seeking to establish a nationwide wireless footprint, and to afford

⁴²⁶ See, e.g., DIRECTV/EchoStar Reply Comments in WT Docket No. 06-150 at 7-8 (dividing the 20-megahertz D Block would artificially limit the types of services available in the 700 MHz Band); Motorola Comments in WT Docket No. 06-150 at 5 (generally recommending that commercial spectrum be licensed in wider spectrum blocks); Qualcomm Comments at 18 (the D Block should remain intact because certain technologies require 20-megahertz bandwidth for fastest possible data transmission); Verizon Reply Comments in WT Docket No. 06-150 at 6-7 (asserts that a 20-megahertz paired license should be retained); CTIA Comments in WT Docket No. 06-150 at 6-7 (supports maintaining at least 20 megahertz of paired spectrum in the Upper 700 MHz Band D Block).

⁴²⁷ See Letter from Ruth Milkman, counsel for Access Spectrum L.L.C., and on behalf of the Coalition for 4G in America, to Marlene Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169 (filed Apr. 4, 2007) (“Coalition for 4G in America *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169”).

⁴²⁸ See Coalition for 4G in America *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169 at 2.

⁴²⁹ See *supra* Section IV.B.1.a.

bidders flexibility to aggregate smaller markets to create either a nationwide market, or large regional or other customized markets.

FIGURE 7 – SECOND PROPOSAL FOR RECONFIGURATION OF UPPER 700 MHz BAND

747	752.5				777	782.5				
A	C	D	E	Public Safety	A	C	D	E	Public Safety	
CH. 60	CH. 61	CH. 62	CH. 63	CH. 64	CH. 65	CH. 66	CH. 67	CH. 68	CH. 69	
746	752	758	764	770	776	782	788	794	800	806

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
A	762-763, 792-793	2 MHz	2 x 1 MHz	MEA	52*
B	762-764, 792-794	4 MHz	2 x 2 MHz	MEA	52*†
C	747-752.5, 777-782.5	11 MHz	2 x 5.5 MHz	CMA or EA	734 or 176
D	752.5-758, 782.5-788	11 MHz	2 x 5.5 MHz	EA	176
E	758-764, 788-794	12 MHz	2 x 6 MHz	REAG	12

*Blocks have been auctioned.

†42 of 52 licenses nationwide held by FCC, *remaining licenses potentially grandfathered.*

193. Specifically, this proposal would create two 11-megahertz licenses (each composed of two 5.5-megahertz paired blocks) – the C and D blocks – and a 12-megahertz E block (composed of two 6-megahertz paired blocks) similar to the block that is the subject of the Frontline proposal discussed below. Under this proposal, we would license the C and D Blocks both on an EA basis, or the C Block on a CMA basis and the D Block on an EA basis. We would license the E Block on a REAG basis. This band plan is not tied to adoption of either the Broadband Optimization Plan or the recently filed alternative plan. We seek specific comment on whether this proposal provides interested bidders with the flexibility to aggregate smaller markets to create either a nationwide market, large regional or other customized markets, as advocated by a broad array of parties.⁴³⁰ Also, we seek comment as to whether this band plan would offer some potential new entrants an opportunity to provide broadband services.⁴³¹ Finally, we seek comment on whether to consider licensing these spectrum blocks set forth in this proposal on a different geographic basis.

(ii) Proposals Based on Modified 700 MHz Guard Bands

194. *Modification of the 700 MHz Guard Bands.* The following three proposals are premised on: 1) a shift of the Guard Band A Block from 746-747/776-777 MHz to 762-763/792-793 MHz; 2) a reduction of the Guard Band B Block from 4 megahertz to 2 megahertz; and 3) a shift of the Guard Band B Block from 762-764/792-794 MHz to 775-776 MHz/805-806 MHz. These actions would make 32 megahertz of spectrum in the Upper 700 MHz Band (746-762 MHz/776-792 MHz) available for

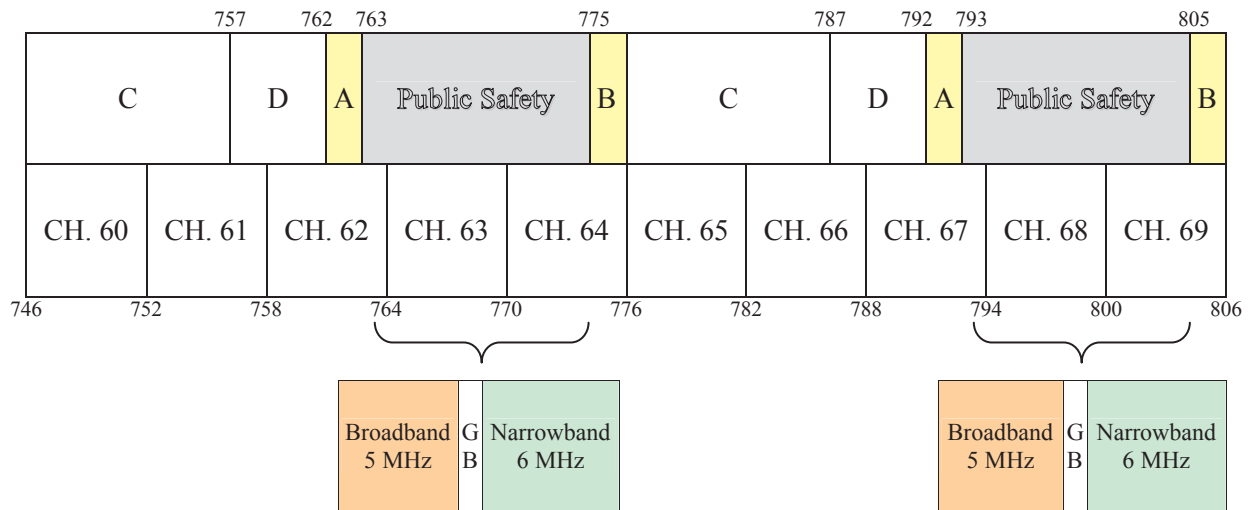
⁴³⁰ See Balanced Consensus Plan Comments in WT Docket No. 06-150 at Attachment; T-Mobile Reply Comments in WT Docket No. 06-150 at 4; Vermont Department of Public Service *et al.* Reply Comments in WT Docket No. 06-150 at 7; U.S. Cellular Comments in WT Docket No. 06-150 at 6-7; Leap Reply Comments in WT Docket No. 06-150 at 2; RTG Comments in WT Docket No. 06-150 at 5.

⁴³¹ Coalition for 4G in America *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169.

commercial licensing.

195. Proposal 3. Access Spectrum/Pegasus have submitted an alternative proposal to the Commission for modification of the Guard Bands in the Upper 700 MHz Band, which could also impact the configuration of the Upper 700 MHz Band.⁴³² According to Access Spectrum/Pegasus, its alternative plan would permit the auction of 32 megahertz of commercial broadband spectrum but leave the size of the public safety narrowband spectrum unchanged. They also argue that it would accommodate the consolidation of the public safety narrowband spectrum by addressing the Canadian interference issues and public safety relocation costs, discussed above. Finally, by proposing an 11 megahertz block immediately adjacent to the Lower 700 MHz C Block, Access Spectrum/Pegasus assert that the alternative proposal addresses interference concerns on the record by moving the Guard Band A Block.

FIGURE 8 – ACCESS SPECTRUM/PEGASUS ALTERNATIVE PROPOSAL



196. Access Spectrum/Pegasus propose to “shift” down the 700 MHz Public Safety Band by 1 megahertz to remedy potential narrowband interference issues with Canada and Mexico, if the Commission determines that a consolidation of the narrowband channels to the top of the public safety allocation is in the public interest. In implementing the “shift,” the current A Block at 746-747 MHz and 776-777 MHz would be displaced and relocated, and the Upper 700 MHz C Block would become a 22-megahertz block (comprised of two 11-megahertz paired blocks) through redistribution of a total of 2 megahertz of current B Block spectrum. According to Access Spectrum/Pegasus, a 22-megahertz C Block would address potential interference concerns and would be responsive to record support for an 11-megahertz paired block. The alternative plan proposes that the D Block would be a 10-megahertz block, (comprised of two 5-megahertz paired blocks) and that the newly configured B Block would be reduced from a total of 4 megahertz to 2 megahertz. In addition, with the displacement of the A Block, Access Spectrum/Pegasus propose that the Commission modify the licenses of the incumbent A Block licensees, essentially “repacking” the newly configured A Block with all current A and B Block licensees.

197. Access Spectrum/Pegasus propose to work with the Commission to ensure that all current A Block and B Block licensees can be accommodated in the newly configured A Block.⁴³³ Subject to

⁴³² See Letter from Ruth Milkman, counsel to Access Spectrum, LLC and Kathleen Wallman, adviser to Pegasus Communications Corporation, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169, 06-150 and 96-86 (filed Apr. 18, 2007) (Access Spectrum/Pegasus Apr. 18, 2007 *Ex Parte*).

⁴³³ The Access Spectrum/Pegasus Alternative proposal does not address how the Commission should license the new B Block Guard Band that it proposes should now be located at 775-776 MHz, paired with 805-806 MHz.

certain conditions, Access Spectrum/Pegasus would also agree to pay for the transition of public safety narrowband operations in the band. Their proposed conditions include: (a) the newly configured A Block sharing the same service rules as the Upper 700 MHz C and D Blocks, including application of our Secondary Markets rules; and (b) the Commission removing the cellular architecture restrictions on the newly configured A Block.⁴³⁴

198. We seek comment on Access Spectrum/Pegasus' alternative proposal and its likely effects on both the commercial and public safety users in the 700 MHz Band. We also seek comment on whether, and to what extent, the Commission should: (a) adopt certain, but not all, elements of the Access Spectrum/Pegasus alternative proposal; (b) modify any elements of the proposal, adopt any additional requirements, or adopt any alternative requirements to achieve the same or similar public interest goals; and (c) consider alternative approaches to encourage public-private partnerships for sharing spectrum between public safety users and commercial licensees in the 700 MHz Band.

199. The Access Spectrum/Pegasus proposal to shift down the public safety block by 1 megahertz would result in the overlap of public safety spectrum onto 1 megahertz of each pair of the current Guard Bands B Block licenses, including licenses that are currently encumbered in certain areas of the country. As a proposed solution to this problem, Access Spectrum/Pegasus offers to work with the Commission and the current Guard Bands B Block licensees to repack all of the current Guard Bands licensees into the newly configured A Block. We note that, in addition to Access Spectrum/Pegasus, two other current Guard Bands B Block license holders, PTPMS II and Harbor Guard Band, LLC, have indicated that they will work with the Commission to develop a plan that treats each party fairly.⁴³⁵ We seek comment on the extent to which the Commission may rely on these private negotiations to resolve the spectrum overlap problem. We are concerned that, if all incumbent Guard Bands licensees do not come to an agreement consistent with Access Spectrum/Pegasus' alternative proposal, public safety and commercial operations in areas with incumbent B Block licensees would be significantly curtailed. We tentatively conclude that the Commission should reject Access Spectrum/Pegasus' alternative proposal if the incumbent licensees are unable to come to an agreement.

200. Proposal 4. If we determine that we are able to modify the Upper 700 MHz Guard Bands in the manner proposed by Access Spectrum/Pegasus in connection with their alternative band plan proposal, we seek comment on other options the Commission may take. For example, we seek specific comment on the proposals illustrated below.

⁴³⁴ The alternative proposal would handle the interface between the public safety and new A Block in the same way as under the BOP, as described in the Report of the Second Technical Working Group. Access Spectrum/Pegasus Apr. 18, 2007 *Ex Parte* at 2, citing Second Report of the Technical Working Group, WT Docket Nos. 06-169 and 96-86 (Jan. 26, 2007).

⁴³⁵ See Letter from Michael Gottdenker, Access Spectrum, LLC, Marshall Pagon, Pegasus Communications Corporation, Alfred Angelo, PTPMS II, and John Mason, Harbor Guard Band, LLC, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169, 06-150 and 96-86 (filed April 23, 2007).

FIGURE 9 – FIRST ADDITIONAL PROPOSAL BASED ON MODIFIED GUARD BANDS

746	751.5	757	762	763	775	781.5	787	792	793	805	806
C	D	E	A	Public Safety	B	C	D	E	A	Public Safety	B
CH. 60	CH. 61	CH. 62	CH. 63	CH. 64	CH. 65	CH. 66	CH. 67	CH. 68	CH. 69		

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
C	746-751.5, 776-781.5	11 MHz	2 x 5.5 MHz	REAG	12
D	751.5-757, 781.5-787	11 MHz	2 x 5.5 MHz	REAG	12 [‡]
E	757-762, 787-792	10 MHz	2 x 5 MHz	EA	176 [‡]
A	762-763, 792-793	2 MHz	2 x 1 MHz	MEA	52*
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52*

*Blocks have been auctioned, at different locations in band plan.

[‡]If Frontline proposal were adopted, D Block would be licensed on EA basis with 176 licenses, and E Block would be a single, nationwide license.

201. This proposed band plan is composed of a mix of REAG and EA geographic licensing areas for the Upper 700 MHz Band. In conjunction with the tentative conclusion regarding the mix of geographic licensing areas in the Lower 700 MHz Band, this band plan closely approximates the balanced mix of geographic licensing sizes adopted by the Commission in the recent AWS auction. This band plan will provide opportunities for small providers in rural areas, as well as new entrants seeking to establish a nationwide wireless footprint.

202. Specifically, this band plan proposes to license the C and D Blocks as two separate 11-megahertz licenses (each composed of two 5.5-megahertz paired blocks) on a REAG basis, with an E Block similar to the block that is the subject of the Frontline proposal discussed below licensed as a 10-megahertz license (composed of paired 5-megahertz blocks) on an EA basis. We seek specific comment on whether this proposal regarding the C and D Blocks will provide interested bidders with an opportunity to combine the two blocks into a single 22-megahertz license, which some potential new entrants have suggested would provide unique opportunities to provide broadband services.⁴³⁶ We also seek specific comment on whether one or both of the C and D Blocks should be auctioned on a combinatorial basis in order to further facilitate the aggregation of a nationwide footprint, and if so, how this should be accomplished.

203. In addition, we propose that if the Commission were to adopt the Frontline proposal discussed below (effectively treating the E block as a single national geographic license), we would license the D Block on an EA basis (and maintain the C Block on a REAG basis) in order to maintain a balanced mix of geographic license sizes. We seek comment on this proposal.

204. Proposal 5. Finally, we seek comment on an additional alternative proposal that assumes that we modify the guard bands. As set out below, under this band plan we would license the C and D blocks as two 11-megahertz licenses (each composed of two 5.5-megahertz paired blocks), with a 10-megahertz E Block (composed of paired 5-megahertz block). The C Block would be licensed on a REAG

⁴³⁶ Coalition for 4G in America *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169.

basis, and the D and E Blocks would be licensed on an EA basis.

FIGURE 10 – SECOND ADDITIONAL PROPOSAL BASED ON MODIFIED GUARD BANDS

751.5		757		762		763		775		781.5		787		792		793		805					
C		D		E		A		Public Safety		B		C		D		E		A		Public Safety		B	
CH. 60		CH. 61		CH. 62		CH. 63		CH. 64		CH. 65		CH. 66		CH. 67		CH. 68		CH. 69					
746		752		758		764		770		776		782		788		794		800		806			

Block	Frequencies	Bandwidth	Pairing	Area Type	Licenses
C	746-751.5, 776-781.5	11 MHz	2 x 5.5 MHz	REAG	12
D	751.5-757, 781.5-787	11 MHz	2 x 5.5 MHz	EA	176
E	757-762, 787-792	10 MHz	2 x 5 MHz	EA	176 [‡]
A	762-763, 792-793	2 MHz	2 x 1 MHz	MEA	52*
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52*

*Blocks have been auctioned, at different locations in band plan.

‡If Frontline proposal were adopted, E Block would be a single, nationwide license.

205. A number of parties have argued that a more flexible Upper 700 MHz band plan that includes a mix of licenses could better support a variety of business plans and ensures that the spectrum is made available to the bidders that value it most. There is a concern that a band plan with only REAGs in the Upper 700 MHz Band may artificially favor only the largest wireless incumbents or particular business models. These principles have been supported by a large number of commenters including large wireless providers,⁴³⁷ tribal governments,⁴³⁸ state regulators,⁴³⁹ and a large coalition of wireless providers.⁴⁴⁰ These principles reflect the Commission's statutory obligation to ensure "an equitable distribution of licenses and services among geographic areas" and to "avoid [] excessive concentration of licenses . . . by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women."⁴⁴¹

206. The above band plan takes into account these several positions by providing for a mix of REAGs and EAs in the upper band plan based in part on the 700 MHz guard band and public safety spectrum restructuring advocated by Access Spectrum and Pegasus. By splitting the larger 22-megahertz block into two 11-megahertz blocks, we increase the opportunity for all providers to actively participate in the auction. We also would allow for combinatorial bidding on the C Block to facilitate the ability of entities to secure a national license. We seek comment on the merits of this proposal and on the specific areas selected for the blocks: two EAs and one REAG. Parties are also encouraged to comment on possible changes to this band plan in the event the Commission adopts a proposal similar to the one advanced by Frontline. Finally, we seek comment on the impact of this band plan on potential new

⁴³⁷ T-Mobile Reply Comments in WT Docket No. 06-150 at 2-4.

⁴³⁸ Navajo Nation Comments in WT Docket No. 06-150 at 1-2.

⁴³⁹ Vermont Department of Public Service *et al.* Comments in WT docket No. 06-150 at 3-4.

⁴⁴⁰ Balanced Consensus Plan Comments in WT Docket No. 06-150 at Attachment.

⁴⁴¹ 47 U.S.C. § 309(j)(3).

entrants, some of which have argued that a larger 22-megahertz block is critical for their market entry business plans.⁴⁴²

c. Performance Requirements

207. Background. In the *Upper 700 MHz First Report and Order*, the Commission adopted the performance requirements in Section 27.14(a) of its rules for licenses in the 746-764 and 776-794 MHz Bands.⁴⁴³ The rules outlined in Section 27.14(a) require licensees to provide “substantial service” within ten years of license issuance.⁴⁴⁴ The *Upper 700 MHz First Report and Order* also established safe harbors for meeting the substantial service requirement. Specifically, the Commission decided that it would consider a licensee to be providing “substantial service” when the licensee constructs four permanent links per one million people in the licensed service area (when fixed, point-to-point service is offered) or if the licensee demonstrates coverage of 20 percent of the population of the licensed service area (when the licensee offers either mobile services or fixed, point-to-point service).⁴⁴⁵ In the *Lower 700 MHz Report and Order*, the Commission adopted the same substantial service standard and safe harbors for licenses in the 698-746 MHz Band.⁴⁴⁶ As with all Wireless Radio Service licenses, failure to meet the specified performance requirements under the particular license authorization within the required period results in automatic license termination.⁴⁴⁷

208. In addition, the Commission established a safe harbor related to the provision of mobile service in rural areas in the *Rural Report and Order*. In that Order, the Commission stated that a licensee providing mobile service in various bands, including the 700 MHz Band, “will be deemed to have met the substantial service requirement if it provides coverage to at least 75 percent of the geographic areas of at least 20 percent of the ‘rural areas’ within its licensed area.”⁴⁴⁸ This “rural safe harbor” is in addition to the safe harbors specifically established for fixed and mobile services in the 700 MHz Band.

209. In the *700 MHz Commercial Services Notice*, we sought comment on whether the Commission should revise these existing performance requirements, or adopt alternative build-out rules, for unauctioned licenses in the 700 MHz Band in order to promote access to spectrum and the provision of service to consumers.⁴⁴⁹ In particular, the *700 MHz Commercial Services Notice* sought comment on the effectiveness of the existing substantial service standard and safe harbors and whether changes or revisions, such as additional safe harbors, should be adopted to better promote service, especially in rural areas.⁴⁵⁰ The *700 MHz Commercial Services Notice* also sought comment on whether the Commission should adopt alternative performance requirements, such as population-based or geography-based benchmarks, instead of the substantial service standard.⁴⁵¹ Finally, we sought comment on whether it

⁴⁴² Coalition for 4G in America *Ex Parte* in WT Docket Nos. 96-86, 06-150 and 06-169.

⁴⁴³ *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 505-506 ¶¶ 70-72.

⁴⁴⁴ 47 C.F.R. § 27.14(a). This section defines “substantial service” as “service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal.” *Id.*

⁴⁴⁵ See *Upper 700 MHz First Report and Order*, 15 FCC Rcd at 505 ¶ 70.

⁴⁴⁶ See *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1079 ¶¶ 149-151.

⁴⁴⁷ 47 C.F.R. § 1.946(c).

⁴⁴⁸ *Rural Report and Order*, 19 FCC Rcd at 19123 ¶ 79.

⁴⁴⁹ *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9373-76 ¶¶ 60-69.

⁴⁵⁰ *Id.* at ¶ 62-63.

⁴⁵¹ *Id.* at ¶ 64-66.

should adopt a “keep-what-you-use” performance requirement similar to the policy applied to cellular service in the 1980s, or a slightly modified version called “triggered keep-what-you-use.”⁴⁵²

210. Commenters have presented various positions on the issue of performance requirements, with most discussion centering on a debate between retaining the existing substantial service standard and adopting some type of a “keep-what-you-use” approach. Many of those parties that commented on this issue – representing a mix of large, medium, and small CMRS providers, as well as two providers of broadband technology – recommend that the Commission maintain its existing substantial service standard.⁴⁵³ In contrast, a number of other commenters support a “keep-what-you-use” approach, including rural CMRS providers, a tribal government, and a coalition of state government agencies.⁴⁵⁴ Blooston does not support a “keep-what-you-use” approach for licenses that are based on RSAs but believe the Commission should consider applying this standard to licenses based on larger geographic service areas.⁴⁵⁵

211. Some commenters argue in favor of population- or geography-based construction benchmarks, and some of these parties recommend a combination of both benchmarks and a “keep-what-you-use” approach.⁴⁵⁶ In particular, RCA supports a combination of geographic benchmarks and a “keep what you use” rule. Under the RCA proposal, licensees would be required to employ a signal level sufficient to provide service to at least 25 percent of the geographic area of their license area within three years, 50 percent of the geographic area of their license area within five years, and 75 percent of the geographic area of their license area within eight years. In addition, at the end of the license term, a “keep what you use” rule would be applied, in which the unserved portions of the license areas would return to the Commission for reassignment.⁴⁵⁷ Vermont Department of Public Service *et al.* also offer a combination of benchmarks and a “keep what you use” rule. Under the proposal by Vermont Department of Public Service *et al.*, the licensee would face either a population-based benchmark that required coverage of 50 percent of the population of the license area within five years and 90 percent of the population within eight years, or a geographic-based benchmark that would require coverage of 40 percent of the license area within five years and 75 percent of the license area within eight years. In

⁴⁵² *Id.* at ¶ 67-69.

⁴⁵³ See, e.g., AT&T Comments in WT Docket No. 06-150 at 12-16; AT&T Reply Comments in WT Docket No. 06-150 at 21-24; CTIA Comments in WT Docket No. 06-150 at 7-16; Cingular Comments in WT Docket No. 06-150 at 9-13; Corr Comments in WT Docket No. 06-150 at 5-8; Dobson Comments in WT Docket No. 06-150 at 5-10; Leap Comments in WT Docket No. 06-150 at 9-10; Leap Reply Comments in WT Docket No. 06-150 at 5-6; MetroPCS Comments in WT Docket No. 06-150 at 15-16; MetroPCS Reply Comments in WT Docket No. 06-150 at 10-12; MilkyWay Comments in WT Docket No. 06-150 at 7-9; NextWave Reply Comments in WT Docket No. 06-150 at 14; Qualcomm Comments in WT Docket No. 06-150 at 19; Union Telephone Comments in WT Docket No. 06-150 at 5-6; U.S. Cellular Comments in WT Docket No. 06-150 at 12-16; U.S. Cellular Reply Comments in WT Docket No. 06-150 at 11-16; Verizon Wireless Comments in WT Docket No. 06-150 at 6-9.

⁴⁵⁴ See, e.g., Howard/Javed Comments in WT Docket No. 06-150 at 24-26; Navajo Nation Comments in WT Docket No. 06-150 at 2-3; OPASTCO Comments in WT Docket No. 06-150 at 5-6; RCA Comments in WT Docket No. 06-150 at 8-10; RCA Reply Comments in WT Docket No. 06-150 at 4-7; RTG Comments in WT Docket No. 06-150 at 8-9; Vermont Department of Public Service *et al.* Comments in WT Docket No. 06-150 at 5-10; Vermont Department of Public Service *et al.* Reply Comments in WT Docket No. 06-150 at 4-7.

⁴⁵⁵ Blooston Comments in WT Docket No. 06-150 at 7.

⁴⁵⁶ See, e.g., DIRECTV/EchoStar Comments in WT Docket No. 06-150 at 9; Navajo Nation Comments in WT Docket No. 06-150 at 2-3; RCA Comments in WT Docket No. 06-150 at 8-10; RCA Reply Comments in WT Docket No. 06-150 at 4-7; Vermont Department of Public Service, *et al.* Comments in WT Docket No. 06-150 at 5-8. The Navajo Nation, RCA, and the Vermont Department of Public Service, *et al.* favorably discuss both benchmarks and a “keep-what-you-use” approach.

⁴⁵⁷ See RCA Comments in WT Docket No. 06-150 at 8-10; RCA Reply Comments in WT Docket No. 06-150 at 4-7.

addition, as with the RCA proposal, the proposal by the Vermont Department of Public Service *et al.* would apply a “keep what you use” standard to reclaim unused spectrum at the end of the license term.⁴⁵⁸

212. Discussion. Given the numerous and competing arguments offered by commenters, and considering the importance of rules that promote access to spectrum and the provision of service, we seek further comment on the performance requirements for the 700 MHz Commercial Services licensees. As the basis for our consideration, we propose to use a modified version of RCA’s recommendation, which combines performance requirements based on geographic benchmarks and a “keep what you use” rule. Specifically, we propose that each licensee provide coverage of 25 percent of the geographic area of the license within three years of the grant of the initial license, 50 percent of this area within five years, and 75 percent of the area within eight years. We seek comment on this proposal, including its advantages and disadvantages. To the extent commenters believe these proposed benchmarks should be higher or lower, we request that they provide information that would corroborate the benefits of their proposed benchmarks and the costs and benefits of alternative approaches. Comments should address whether these specific geographic benchmarks would promote access to spectrum and the provision of service.

213. We also propose to consider the relevant service area to exclude all government land. Under this approach, a licensee with a geographic service area that includes land owned or leased by government would be able to meet the build-out benchmarks by employing a signal level that is sufficient to provide service to the relevant percentages of land in the service area that is not owned or leased by government.⁴⁵⁹ If a licensee employs a signal level that provides coverage to land that is owned or leased by government, we seek comment on whether the licensee could count this land area and coverage as part of its service area for purposes of measuring compliance with the performance benchmark. Similarly, we seek comment on whether we should adopt a “keep what you use” standard that also excludes those portions of the licensed areas that encompass land owned or leased by government. In particular, we ask how a “keep what you use” rule that excluded government land would be applied in areas, such as Alaska, in which vast portions of the state or region include such land.

214. We also seek comment on the potential consequences for licensees that fail to meet the interim requirements to cover a minimum percentage of the geographic area of their license area. For example, licensees that fail to meet these benchmarks could have the length of their license term reduced. Alternatively, licensees that fail to meet the benchmarks could have their license area reduced under a proportionate “keep what you use” approach, as proposed by RCA.⁴⁶⁰ Under this alternative, the reduction of the license area would be sufficient to create a resulting license area in which the area currently covered meets the relevant interim benchmark. For example, if a licensee employs a signal level sufficient to provide service to only 20 percent of the geographic area by the three-year benchmark, the licensee would be required to return a portion of the licensee’s unserved area to the Commission, so that the covered area equals at least 25 percent of the remaining portion of the license area. A similar process would be used if a licensee fails to meet the five- and eight-year benchmarks.

215. We also seek comment on how we might apply a “keep what you use” rule to this proposal. In particular, we ask whether the Commission should apply such a standard to all of the licensees for the unauctioned 700 MHz Band Commercial Services or only to those licensees that fail to meet their geographic benchmarks. For example, the Commission could apply the “keep what you use” rule at the end of the license term, regardless of the level of construction by the licensee. Alternatively,

⁴⁵⁸ See Vermont Department of Public Service, *et al.* Comments in WT Docket No. 06-150 at 5-8.

⁴⁵⁹ See Letter from David L. Nace, counsel for Cellular South Licenses, Inc., to Chairman Kevin Martin and Commissioners Michael Copps, Jonathan Adelstein, Deborah Taylor Tate, and Robert McDowell, FCC, *Ex Parte* in WT Docket No. 06-150 (filed Apr. 23, 2007) at Attachment.

⁴⁶⁰ See, e.g., RCA Comments in WT Docket No. 06-150 at 8-10; RCA Reply Comments in WT Docket No. 06-150 at 4-7.

licensees that fail to meet the 75 percent geographic area coverage requirement could be subject to a “keep what you use” rule applied either at the 8-year benchmark or at the end of the license term, while licensees that meet the 8-year benchmark could be exempt from a “keep what you use” rule.

216. In addition, we ask commenters to address the process by which the Commission should reclaim unused spectrum under a “keep what you use” rule, and specifically, how such spectrum should be made available to new users. For example, we seek comment on whether parties that hold licenses for other spectrum in the same geographic area should be eligible to acquire the unused spectrum of another licensee after the Commission reclaims this spectrum and makes it available via competitive bidding. Similarly, we seek comment on whether the initial licensee should be eligible to bid on spectrum that it previously held as part of its original license. For both these alternatives, we ask that commenters address how a particular policy would help promote service to the unserved area and whether there would be a risk of negative effects, such as a loss of potential competition.

217. We also propose to apply our performance requirements on an EA and CMA basis only. Under such an approach, licensees with REAGs would be required to employ a signal level sufficient to provide adequate service to at least 25 percent of the geographic area of each EA in its license area within three years, 50 percent of the geographic area of each of these EAs within five years, and 75 percent of the geographic area of each of these EAs within eight years. REAG licensees that fail to meet the interim requirement in any EA within their license areas would lose a portion of the geographic area of that EA, such that the coverage of the remaining portion of the EA would be sufficient to meet the relevant benchmark.

218. We propose that licensees demonstrate their compliance with benchmarks by filing maps and other supporting documents with the Commission.⁴⁶¹ Would such information be sufficient to provide the Commission with easily identified areas, which could be reclaimed and reassigned via competitive bidding under a “keep what you use” approach? We also ask for comment on whether the Commission should reclaim the spectrum in unused areas in pre-defined units, such as counties. Those commenters that recommend a county-based “keep what you use” standard also should provide recommendations on how the Commission should apply this standard in the event a licensee serves only a small portion of a county, such as a highway or an area that is adjacent to a county that has more coverage by the licensee. We seek comment on these alternatives.

219. In addition, assuming licensees with REAGs are required to meet the performance requirements on an EA basis, we propose that these licensees would have to demonstrate coverage for each EA within their license area. Licenses based on EAs or CMAs would have to demonstrate coverage for their respective geographic license areas.

220. Finally, we seek comment on any other proposal that would similarly apply build-out requirements to these licensees more stringent than the substantial service standard applied under our current rules, and on how such proposals could be implemented. For example, should we use population rather than geographic benchmarks?

d. Incumbent Eligibility

221. We also seek comment on the proposal presented by Media Access Project and the Ad Hoc Public Interest Spectrum Coalition (PISC) to encourage the entry of new competitors by excluding incumbent local exchange carriers (ILECs), incumbent cable operators, and large wireless carriers from

⁴⁶¹ When the Commission adopted a benchmark approach for Personal Communications Service (PCS), it stated: “Licensees must file maps and other supporting documents showing compliance with the respective construction requirements within the appropriate five- and ten-year benchmarks of the date of their initial licenses.” See C.F.R. § 24.203(c).

eligibility for licenses in the 700 MHz Band.⁴⁶² In the alternative, PISC suggests that these incumbents only be eligible for licenses in the 700 MHz band through structurally separate affiliates, which it contends would make it possible to detect whether the incumbent receives more favorable treatment than unaffiliated providers.⁴⁶³ We also seek comment on whether we should encourage the entry of new broadband competitors through lesser restrictions on eligibility for obtaining new licenses, both at auction and in the secondary market. More particularly, we seek comment on whether only parties not affiliated with existing wireline broadband service providers, including both DSL and cable providers, should be eligible to hold one or more blocks of the Upper 700 MHz C Block spectrum. Alternatively, should we restrict eligibility for such licenses to parties not affiliated with in-region wireline broadband service providers? Finally, as an alternative to limiting the parties eligible for new licenses in the 700 MHz Band, we seek comment on whether parties unaffiliated with incumbent wireline broadband service providers should receive a bidding credit on licenses in one or more block of the Upper 700 MHz spectrum. We also seek comment on how such new entrant bidding credits should be coordinated with existing bidding credits for small businesses, *i.e.*, should new entrant credits be cumulative or exclusive of small business bidding credits.

2. 700 MHz Guard Bands

a. Band Plan Proposals

222. Background. Although the Guard Bands occupy a relatively small portion of the 700 MHz Band, changes to the Guard Bands—in terms of location or allocation of the spectrum—potentially implicate the entire Upper 700 MHz band plan. A shift in location or other change to the Guard Bands could impact the neighboring 24 megahertz public safety allocation and the forthcoming auction of the “recovered analog spectrum” that is subject to the statutory deadline established by Congress. In addition, because the Guard Bands are strategically located as interference buffers between commercial operations and public safety narrowband channels, modifications to the Guard Bands could potentially have an effect on the interference environment within the Upper 700 MHz Band.

223. In the *700 MHz Guard Bands Notice*, the Commission sought comment regarding the BOP, a proposal filed by a consortium including most of the existing Guard Band Managers.⁴⁶⁴ According to the BOP, the existing A Block would be eliminated and the existing A Block licensees

⁴⁶² See *Ex Parte* Comments of the *Ad Hoc* Public Interest Spectrum Coalition, PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86, at 9, 18-19 (filed Apr. 3, 2007) (“PISC Apr. 3 *Ex Parte* Comments in PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86”). PISC suggests a prohibition on such incumbents gaining access to the 700 MHz band either by auction or through secondary market transactions. In the alternative, PISC proposes that such restrictions apply to the E Block proposed by Frontline. See *id.* PISC is made up of the Consumer Federal of America, Consumers Union, Free Press, Media Access Project, New America Foundation, and Public Knowledge.

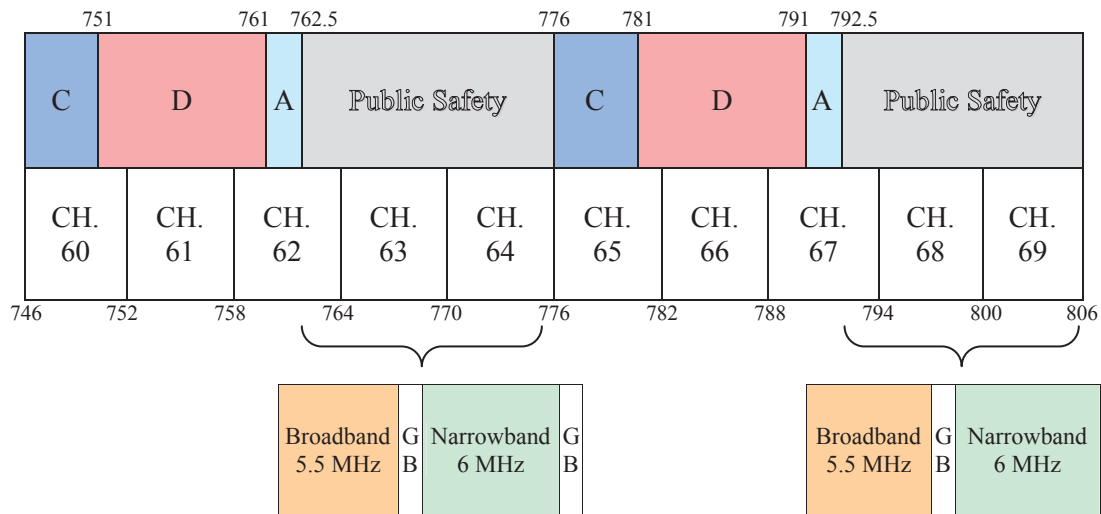
⁴⁶³ See *id.* at 9-10.

⁴⁶⁴ See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10430-35 ¶¶ 40-48. We note that the BOP was first filed in the *700 MHz Public Safety Eighth Notice*. Comments of Access Spectrum, L.L.C., Columbia Capital III, LLC, Intel Corporation and Pegasus Communications Corporation Comments in WT Docket No. 96-86 (filed June 6, 2006). For the purposes of this *Report and Order* and *Further Notice of Proposed Rule Making*, the Guard Band Managers associated with the BOP will be referred to as the “BOP proponents.” We note that the BOP proponents expanded upon their public safety and Guard Bands proposal by arguing in the *700 MHz Commercial Services* proceeding that the remaining, unauctioned spectrum in the Upper 700 MHz Band consisting of the C and D Blocks should be reconfigured from their current 5- and 10-megahertz allocations, respectively, into two spectrum blocks of 5.5 megahertz and one of 4 megahertz that would be adjacent to their proposed new 1.5-megahertz A Block. We also note that additional proposals have been filed – such as the proposal by the Coalition for 4G in America – that incorporate aspects of the BOP that would reconfigure the Guard Bands, while at the same time proposing reconfiguration of the C and D Blocks. See Letter from Ruth Milkman, counsel to Access Spectrum, LLC to Marlene H. Dortch, Secretary, FCC in *Ex Parte* in WT Docket No. 06-169 (filed Mar. 6, 2007).

would be relocated to a modified B Block that the BOP proponents have renamed the new A Block. Of the current 2 megahertz paired of B Block spectrum, 0.5 megahertz paired would be added to the adjacent public safety allocation. The remaining 1.5 megahertz paired would be designated the new A Block, and the 1 megahertz paired of current A Block spectrum would be added to the public safety allocation. These changes would increase the total allocation of public safety spectrum in the 700 MHz Band from 24 to 27 megahertz and increase the total amount of spectrum held by the current A Block licensees from 2 megahertz to 3 megahertz.

224. To permit broadband deployment in the new A Block without causing interference to public safety narrowband operations, the BOP proposes that the public safety narrowband voice channels be consolidated to the upper portion of the 700 MHz Public Safety block, and public safety broadband channels be located next to the new A Block.⁴⁶⁵ The BOP assumes that the new A Block licensees are likely to deploy compatible broadband operations in their adjacent allocations, minimizing the potential for interference between commercial and public safety operations.⁴⁶⁶

FIGURE 11 – BROADBAND OPTIMIZATION PLAN



225. Further, the BOP proposes that licenses for the new A Block would be assigned through a private negotiation among existing Guard Band licensees who would determine how the markets would be distributed, based on total MHz-pops of Guard Bands spectrum currently held by a particular licensee, rather than through competitive bidding of the new A Block.⁴⁶⁷ This negotiation would include an

⁴⁶⁵ See, e.g., Letter from Ruth Milkman, counsel to Access Spectrum, LLC to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket No. 06-169 (filed Mar. 6, 2007) (“Access Spectrum/Pegasus Mar. 6, 2007 *Ex Parte*”).

⁴⁶⁶ Further, consolidating the public safety narrowband channels, according to the BOP, reduces the amount of spectrum separating—and thus protecting—the public safety broadband and narrowband channels from each other, and thus frees up additional spectrum for public safety use. As a provision of the BOP, public safety entities would be responsible for ensuring interference protection within their own public safety allocation, and the internal guard band within the public safety block separating public safety broadband and public safety narrowband operations would be scalable depending upon the level of protection that applicable public safety entities deem necessary. Another internal guard band that would exist under the BOP at the top of the paired public safety block and which could be used by the public safety community has raised interference concerns among some commenters with regard to the adjacent C Block.

⁴⁶⁷ Access Spectrum/Pegasus Comments in WT Docket No. 06-169 at 19.

assignment through private negotiation of any of the B Block licenses returned from Nextel and currently within the Commission's auction inventory.⁴⁶⁸ Any licenses unclaimed through the private negotiation would be available for auction.

226. Other parties also submitted band plan proposals to the Commission. The *700 MHz Guard Bands Notice* sought comment on a proposal submitted by Motorola, Inc. (Motorola) and the United Telecommunications Council (UTC),⁴⁶⁹ which requested that the Commission reallocate part of the returned B Block spectrum to critical infrastructure industries communications (CII) in support of interoperability with public safety entities.⁴⁷⁰ Motorola subsequently proposed that within the framework of the BOP, 1 megahertz of spectrum could be allocated to CII.⁴⁷¹ Another commenter, Ericsson Inc., supports the BOP's reconfiguration of the 700 MHz Public Safety Band to the extent that it proposes to consolidate public safety narrowband channels at the upper half of the block allocated to public safety, and designate five megahertz of spectrum next to the B Block for broadband use.⁴⁷² Unlike the BOP, however, Ericsson's proposal recommends that the Commission reallocate the entire B Block for exclusive public safety use.⁴⁷³ Another commenter, Alcatel-Lucent, originally endorsed a 6 + 6 reconfiguration of the public safety allocation, but subsequently revised its proposal to also provide for a reallocation of the B Block Guard Band spectrum to public safety.⁴⁷⁴

⁴⁶⁸ *Id.*

⁴⁶⁹ Motorola, Inc. and United Telecom Council, *Spectrum Toward Next Generation Critical Infrastructure* (filed April 27, 2006) ("CII Proposal"). In an initial filing, Motorola proposed that the B Block be reallocated for both Federal government and critical infrastructure interoperability. Subsequently, Motorola revised its proposal to include only a reallocation for critical infrastructure industries, and not the Federal government. See Letter from Steve B. Sharkey, Motorola, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket Nos. 96-86 and 06-169 at 4-5 (filed Dec. 9, 2005).

⁴⁷⁰ *Id.* Subsequently, CII proponents have clarified that this allocation would remain commercial spectrum but assert that they would not be subject to competitive bidding due to the exemption in Section 309(j) of the Communications Act for "public safety radio services" of CII entities to the extent that they provide essential public services and maintain infrastructures that can prevent or respond to disasters or crises. See, e.g., Comments of the Critical Infrastructure Communications Coalition Comments in WT Docket Nos. 06-169 and 96-86 at 8-10 (filed Oct. 23, 2006) ("CICC Comments"), citing Implementation of Sections 309(j) and 337 of the Communications Act of 1934, As Amended, WT Docket No. 99-87, *Report and Order*, 15 FCC Rcd 22709, 22747 ¶ 77 (2000).

⁴⁷¹ Specifically, Motorola proposes that the upper internal guard band in the paired public safety block be reallocated to CII. Motorola Comments in WT Docket No. 06-169 at 16-17. CII advocates maintain support for the original CII proposal, but also support, as an alternative, Motorola's subsequent recommendation to allocate for CII use the BOP's upper internal guard band in the public safety block. See CICC Comments in WT Docket No. 06-169 at 10.

⁴⁷² See Ericsson Inc. Comments in WT Docket 06-169 at 5 (filed Oct. 23, 2006) ("Ericsson Comments"); Ericsson Inc. Reply Comments in WT Docket 06-196 at 1-2 (filed Nov. 13, 2006) ("Ericsson Reply Comments"); Letter from Elisabeth H. Ross, Counsel to Ericsson, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169 (filed Mar. 21, 2007) ("Ericsson Mar. 21, 2007 *Ex Parte*").

⁴⁷³ Ericsson Comments in WT Docket No. 06-169 at 13. Ericsson also recommends placing a 2-megahertz internal guard band between public safety broadband and narrowband channels, and a 1-megahertz internal guard band at the top of the public safety band to ensure that public safety operations are protected from interference from adjacent users. Ericsson Comments in WT Docket No. 06-169 at 10-11; Ericsson Mar. 21, 2007 *Ex Parte* in WT Docket No. 06-169 at 5.

⁴⁷⁴ Lucent Reply Comments in WT Docket 06-169 (filed November 6, 2006) at 1-3 ("Lucent Reply Comments"). The original Alcatel-Lucent "6 + 6" proposal divides the public safety spectrum into six megahertz each of broadband and narrowband, with a 1-megahertz broadband channel as an internal guard band). In an April 6, 2007 filing, Alcatel-Lucent proposed another band plan that consolidates the public safety narrowband channels at the top of the public safety band, and repurposes the wideband channels for "multimedia" use. The proposal also reallocates 1 megahertz paired of the B Block Guard Band as an internal public safety guard band, and the remaining 1 megahertz paired of the B Block Guard Band as a guard band between D Block and the public safety (continued....)

227. Discussion. We tentatively conclude that we should not adopt the BOP, or other proposals to the extent that they propose a reallocation of commercial spectrum for public safety use, or the reassignment of spectrum outside of the competitive bidding process. We believe that Congress's express instructions regarding our allocation of commercial and public safety spectrum in the 700 MHz Band statutorily prohibit the Commission from reallocating the spectrum at this time, and we therefore cannot reallocate commercial spectrum for public safety use as proposed by the BOP and Ericsson plans. Similarly, we believe we are required to use a competitive bidding process to assign the spectrum that has been allocated for commercial use pursuant to these statutory instructions, and therefore must also deny the BOP and the CII proposals on this basis. Even if we possessed legal authority to adopt the BOP and CII proposals, we believe these proposals are not in the public interest because they would assign additional spectrum to current licensees without competitive bidding. We are also concerned that the BOP could result in interference between 700 MHz Band public safety and commercial operations.

228. Legal authority. In Section 337(a) of the Act, Congress mandated that the Commission allocate "spectrum between 746 MHz and 806 MHz, inclusive" (*i.e.*, the Upper 700 MHz Band) by designating 24 megahertz of the spectrum "for public safety services" and 36 megahertz of the spectrum "for commercial use to be assigned by competitive bidding pursuant to section 309(j)."⁴⁷⁵ As directed by Congress, the Commission allocated 24 megahertz of this spectrum for public safety use at 764-776 MHz and 794-806 MHz and 36 megahertz of this spectrum for commercial use at 746-764 MHz and 776-794 MHz.⁴⁷⁶ The 36 megahertz of Upper 700 MHz Band spectrum allocated for commercial use included the Guard Bands.⁴⁷⁷ Notably, in deciding whether or not to allow commercial operations inside the Guard Bands, which primarily were designed to protect public safety operations, the Commission concluded that it was constrained by Congress' clear mandate to allocate, and thus auction, a full 36 megahertz of commercial spectrum in the Upper 700 MHz Band.⁴⁷⁸ If the Commission had decided to prohibit commercial operations inside the Guard Bands, it would have fallen 6 megahertz short of fulfilling the explicit allocation requirement in Section 337(a).⁴⁷⁹

(Continued from previous page) _____

"multimedia" block. See Letter from Michael McMenamin, Alcatel-Lucent, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169 (filed Apr. 6, 2007) ("Alcatel-Lucent Apr. 6, 2007 *Ex Parte*").

⁴⁷⁵ 47 U.S.C. § 337(a), as enacted by the Balanced Budget Act of 1997, Pub. L. No. 105-33, Title III, 111 Stat. 251 (1997). Section 337(a) provides in pertinent part:

(a) . . . the Commission shall allocate the electromagnetic spectrum between 746 megahertz and 806 megahertz, inclusive, as follows:

- (1) 24 megahertz of that spectrum for public safety services according to the terms and conditions established by the Commission, in consultation with the Secretary of Commerce and the Attorney General; and
- (2) 36 megahertz of that spectrum for commercial use to be assigned by competitive bidding pursuant to Section 309(j).

Congress also established a deadline of January 1, 1998 for this allocation, as well as a deadline of September 30, 1998 for assignment of the public safety licenses. See 47 U.S.C. § 337(b). On December 31, 1997, the Commission released an Order fulfilling Congress' allocation directive. See *Reallocation of Television Channels 60-69, the 746-806 MHz Band*, ET Docket No. 97-157, *Report and Order*, 12 FCC Rcd 22953, 22962 ¶ 17 (1998).

⁴⁷⁶ *Reallocation of Television Channels 60-69, the 746-806 MHz Band*, ET Docket No. 97-157, *Report and Order*, 12 FCC Rcd 22953 (1997).

⁴⁷⁷ The commercial portion at 746-764 MHz and 776-794 MHz includes the two blocks of paired Guard Bands spectrum at 746-747 MHz and 776-777 MHz, and 762-764 MHz and 792-794 MHz.

⁴⁷⁸ See *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5316-18 ¶¶ 36-40.

⁴⁷⁹ See *id.*

229. According to the BOP proponents, once spectrum allocated to commercial use pursuant to Section 337(a) has been auctioned once, the Commission has satisfied its allocation obligations under Section 337, and thus can reallocate the spectrum for public safety use pursuant to its broad spectrum management authority.⁴⁸⁰ As support for this interpretation of Section 337(a), the BOP proponents note that the Commission has similarly re-designated commercial spectrum to public safety use in the 800 MHz Band.⁴⁸¹ The BOP proponents assert that “[s]imilar public policy considerations and the exercise of the same statutory authority support allocation of the Upper 700 MHz [Band] B Block to public safety use consistent with the [BOP].”⁴⁸² Ericsson does not offer a legal argument in support of its proposed reallocation of the B Block from commercial to public safety use.

230. We recognize the unique communications needs of public safety entities and the instrumental role that spectrum in the 700 MHz Band can play in meeting those communications needs. To that end, we remain committed to ensuring effective and efficient communications between first responders as evidenced by the other actions and tentative conclusions we make today in this *Further Notice*. It appears, however, that the reallocation of commercial spectrum to public safety contemplated by the various Guard Bands proposals – in particular, the BOP, the Ericsson plan, and the revised Alcatel-Lucent plan – would be inconsistent with Section 337. If the proponents of reallocation are correct, and Section 337(a) does not establish a permanent legislative bar on reallocating the Upper 700 MHz Band, we nevertheless believe that it would be contrary to Congress’ intent in enacting Section 337 to consider modifying the commercial and public safety allocations in the band at this time, before the licensees have had a meaningful opportunity to use unencumbered spectrum as initially envisioned (an opportunity that is unlikely to be fully available before the end of the DTV transition in 2009).⁴⁸³ Absent further legislation, and given that we have not yet reached several fundamental milestones envisioned by Congress in the DTV transition, reallocation of spectrum in the Upper 700 MHz Band at this time would appear to be inconsistent with Section 337.⁴⁸⁴

⁴⁸⁰ Letter from Ruth Milkman, counsel to Access Spectrum, LLC and Kathleen Wallman, adviser to Pegasus Communications Corporation, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169 and 96-86 at 2-4, citing 47 U.S.C. §§ 154(i) and 303(r) (filed Dec. 12, 2006) (“Access Spectrum/Pegasus Legal Authority *Ex Parte*”); Access Spectrum, LLC and Pegasus Communications Corporation Reply Comments in WT Docket No. 06-169 at 20-21.

⁴⁸¹ *Id.* at 5, citing Improving Public Safety Communications in the 800 MHz Band, Consolidating the 800 and 900 MHz Industrial/Land Transportation and Business Pool Channels, Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, Petition for Rule Making of the Wireless Information Networks Forum Concerning the Unlicensed Personal Communications Service, Petition for Rule Making of UT Starcom, Inc., Concerning the Unlicensed Personal Communications Service, Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum at 2 GHz for use by the Mobile Satellite Service, WT Docket 02-55, ET Docket Nos. 00-258 and 95-18, RM-9498, RM-10024, *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, 19 FCC Rcd 14969, 15080 ¶ 209 (2004) (“800 MHz *Report and Order*”).

⁴⁸² Access Spectrum/Pegasus Legal Authority *Ex Parte* in WT Docket No. 06-169 at 5.

⁴⁸³ If, in contrast, these proponents’ reading of Section 337 is incorrect, and the statutory language in fact requires the Commission to maintain the specified 24/36 megahertz allocations in perpetuity (barring future legislative action), the result would be the same: the statute would prohibit us from altering these allocations at this time.

⁴⁸⁴ *C.f.* Reallocation of 30 MHz of 700 MHz Spectrum (747-762/777-792 MHz) from Commercial Use, Assignment of 30 MHz of 700 MHz Spectrum (747-762/777-792 MHz) to the Public Safety Broadband Trust for Deployment of a Shared Public Safety/ Commercial Next Generation Wireless Network, RM No. 11348, *Order*, DA 06-2278 (rel. Nov. 3, 2006) (finding Cyren Call petition inconsistent with auction requirement of Sections 337(a) and 309(j)(15)(C)(v) and that the Commission lacks authority to take further action).

231. We also believe that we cannot reassign licenses in the manner proposed by the BOP and the CII proponents. In accordance with Section 337's mandate that commercial spectrum in the 700 MHz Band be assigned by competitive bidding, the Commission established in the *Upper 700 MHz Second Report and Order* a licensing framework providing that mutually exclusive applications in this band would be subject to competitive bidding pursuant to Section 309(j) of the Act.⁴⁸⁵ This licensing scheme resulted in two auctions of the Guard Band licenses.⁴⁸⁶

232. The BOP proponents seek a reassignment of a total of 1 megahertz from the B Block to the current A Block licensees without competitive bidding.⁴⁸⁷ They argue that they should be given this spectrum because it would "create conditions conducive to public safety/commercial broadband partnerships."⁴⁸⁸ They also contend that granting them this additional spectrum would result in more efficient and effective use of the spectrum because it would allow the A Block licensees to provide broadband services, which are not possible in the paired 1 megahertz spectrum blocks that they currently hold.⁴⁸⁹ The CII proponents also seek to be awarded the B Block licenses without being subjected to competitive bidding. While offering that this spectrum would remain allocated as commercial spectrum, they maintain that the exemption to competitive bidding set out in Section 309(j) of the Commission's rules for "public safety radio services" would apply to the extent that CII provide essential public services and maintain infrastructures that can prevent or respond to disasters or crises.⁴⁹⁰

233. Even assuming agreement with the BOP proponents' reasoning for assigning additional spectrum to the current A Block licensees, it appears that we lack legal authority to assign them additional commercial spectrum in the Upper 700 MHz Band absent competitive bidding, because any such action would be inconsistent with the auction requirements in Sections 337(a). We also believe that awarding the commercial bands to CII outside of the competitive bidding process would be inconsistent with Section 337(a).⁴⁹¹ As noted above, Section 337(a)(2) prescribes competitive bidding as the method of assigning commercial spectrum in the Upper 700 MHz Band.⁴⁹² For the same reasons that we cannot reallocate the band at this time, we cannot alter the method of assignment at this time.

234. In addition, if we do not have the statutory authority at this time to assign additional Upper 700 MHz Band spectrum to public safety, the "public safety radio services" exception to Section

⁴⁸⁵ *Upper 700 MHz Second Report and Order*, 15 FCC Rcd at 5311 ¶ 27 n.60. The Balanced Budget Act of 1997 required that the Commission use competitive bidding to assign licenses in the 36 megahertz of spectrum within the 746-806 MHz band. See 47 U.S.C. § 337(a)(2), as added by § 3004 of the Balanced Budget Act of 1997. Therefore, the Commission determined to assign Guard Band Manager licenses using competitive bidding, as required by Section 337(a)(2).

⁴⁸⁶ See 700 MHz Guard Bands Auction Closes: Winning Bidders Announced, Report No. AUC-33-H (Auction No. 33), *Public Notice*, 15 FCC Rcd 18026 (WTB 2000); 700 MHz Guard Bands Auction Closes: Winning Bidders Announced, Report No. AUC-38-F (Auction No. 38), *Public Notice*, 16 FCC Rcd 4590 (WTB 2001).

⁴⁸⁷ Access Spectrum/ Pegasus Comments in WT Docket No. 06-169 filed October 10 (originally June 6) at 4-5.

⁴⁸⁸ *Id.* at 10.

⁴⁸⁹ Access Spectrum/ Pegasus Comments in WT Docket No. 06-169 filed October 23 at 7.

⁴⁹⁰ See, e.g., CICC Comments in WT Docket No. 06-169 at 8-10.

⁴⁹¹ We acknowledge that under certain circumstances spectrum allocated to CII is not required to be assigned by competitive bidding, due the exception in Section 309(j)(2)(A) for commercial spectrum used for certain "public safety radio services." However, in this case Section 337 of the Act specifically mandates that the 36 megahertz of spectrum in the Upper 700 MHz Band must be assigned by competitive bidding, and thus we cannot adopt the CII proposals to the extent that they request allocations not subject to competitive bidding. We note, however, that CII entities will be eligible to participate in future auctions for spectrum in the 700 MHz Band.

⁴⁹² 47 U.S.C. § 337(a)(2).

309(j) of the Communications Act would be inapplicable.⁴⁹³ Finally, with respect to the BOP proponents' comparisons of their proposal to the re-banding of the 800 MHz Band, we observe that our initiatives in that band did not implicate the Section 337 requirements under discussion here. Thus, the BOP proponents' reliance on the fact that the 800 MHz re-banding initiatives "withstood judicial scrutiny" is irrelevant.⁴⁹⁴

235. *Public Policy Considerations.* Even assuming we have the legal authority to assign additional spectrum to the current A Block licensees without competitive bidding, we believe that the BOP proposal for assigning licenses outside the competitive bidding process would not serve the public interest. As noted above, the BOP proponents argue that giving them additional spectrum will allow them to provide broadband services and create opportunities for public safety/commercial broadband partnerships and that such action is consistent with the Commission's reasoning in the 800 MHz proceeding. Although the A Block licensees' desire to provide broadband services is laudable, that desire appears insufficient to justify giving those licensees spectrum that otherwise would be assigned by auction. Congress and the Commission have determined that using competitive bidding mechanisms for assigning spectrum licenses offers significant public interest benefits.⁴⁹⁵ For example, the competitive bidding process ensures that spectrum licenses are assigned to those who place the highest value on the resource and will be suited to put the licenses to their most efficient use.⁴⁹⁶ Moreover, the Commission has recognized that the public interest is generally served by an auctions process that is open to a variety of applicants.⁴⁹⁷ In addition, we believe it is likely that there will be substantial interest in the returned B Block spectrum by potential applicants other than the A Block licensees.

236. The BOP proponents' reliance on our actions in the 800 MHz Band appears misplaced. Although the Commission found that certain license modifications at issue in that proceeding were in the public interest, the 800 MHz rebanding involved ongoing public safety and commercial operations experiencing "intractable" interference problems that were impairing public safety operations.⁴⁹⁸ These problems were the result of a "fundamentally incompatible mix" of communications systems operating in a heavily interleaved band pursuant to technical rules that had been developed over several decades.⁴⁹⁹ By contrast, the BOP proponents are not seeking to remedy an ongoing interference problem between validly licensed and operational public safety and commercial entities that developed over time.

⁴⁹³ *Id.* § 309(j)(2) ("The competitive bidding authority granted by this subsection shall not apply to licenses or construction permits issued by the Commission – (A) for public safety radio services, including private internal radio services used by State and local governments and non-government entities and including emergency road services provided by not-for-profit organizations, that – (i) are used to protect the safety of life, health, or property; and (ii) are not made commercially available to the public[.]").

⁴⁹⁴ Access Spectrum/Pegasus Legal Authority *Ex Parte* in WT Docket No. 06-169 at 5, citing *Mobile Relay Assocs. v. FCC*, 457 F.3d 1 (D.C. Cir. 2006). We note that in *Mobile Relay*, the reallocation of commercial spectrum to public safety spectrum was not discussed and was not at issue.

⁴⁹⁵ See Budget Reconciliation Act, P.O. 103-66, Legislative History, House Report No. 103-111 (1993) ("competitive bidding system...will encourage innovative ideas, and give proper incentive to spur a new wave of products and services that will keep the United States in a competitive position"). See generally Implementation of Section 309(j) of the Communications Act – Competitive Bidding, PP Docket No. 93-253, *Second Report and Order*, 9 FCC Rcd 2348 (1994) ("*Competitive Bidding Report and Order*").

⁴⁹⁶ See *Competitive Bidding Report and Order*, 9 FCC Rcd at 2360-2361 ¶¶ 70-71.

⁴⁹⁷ *Implementation of Section 309(j) of the Communications Act, Competitive Bidding*, 9 FCC Rcd 2941, 2943 ¶ 8.

⁴⁹⁸ *800 MHz Order*, 19 FCC Rcd at 15012 ¶ 68.

⁴⁹⁹ *Id.* at 14972 ¶ 2, 14990-93 ¶¶ 36-39.

237. Further, in the *Air-Ground Order*,⁵⁰⁰ we rejected an incumbent licensee's assertion that it should be afforded exclusive rights to use its existing spectrum on a more flexible basis that would allow it to provide broadband. In that order, we removed a limitation requiring voice and slow speed data service in the 800 MHz air-ground band and provided new licensees the flexibility to offer broadband services to aircraft of any type, and to serve any or all aviation markets. We reasoned that affording an incumbent licensee exclusive use with such increased flexibility would provide it with a substantial windfall, and concluded that permitting competing applications for licenses in that band would better serve the public interest. We believe our action in the *Air-Ground Order* supports a conclusion that adoption of the BOP would not be in the public interest, as the BOP proposes that incumbent licensees be afforded, without the prospect of competing applications, additional bandwidth beyond its existing spectrum assignment in addition to enhanced technical flexibility to provide broadband service.

238. We seek comment on these public policy concerns and any similar policy concerns, including our assessment that license assignment by auction is preferable to license assignment by private negotiation or other non-auction methods.

239. In addition to the above public policy concerns, we note that adoption of the BOP could also raise potential interference issues. The Commission created service rules for the Guard Bands that correspond to the specific environment of the existing Upper 700 MHz Band. As noted above, the primary purpose of the Guard Bands was to create a buffer between commercial and public safety operations, which would serve to reduce potential interference. Further, the Commission provided for licensees to offer new services in the Guard Bands, subject to strict technical and operational rules to prevent harmful interference to public safety operations in the adjacent bands.

240. Verizon Wireless argues in an *ex parte* that several aspects of the BOP are too indeterminate to assess the risk for interference between public safety and commercial operations. Verizon notes that under the BOP, the 1-megahertz internal public safety guard band located at 775-776 MHz would be adjacent to the C Block and the internal public safety guard band at 805-806 MHz would be adjacent to the 806-809 MHz public safety narrowband channels, and that these guard bands would be within the control of, and allocated to, public safety.⁵⁰¹ The BOP proposes that the same technical rules that apply to the existing A Block would apply to operations inside this internal guard band.⁵⁰² Verizon is concerned that public safety operations deployed in the internal guard band at 775-776 MHz would receive interference from operations in the adjacent C Block. According to Verizon, the C Block licensee would be compelled to correct this interference by dedicating part of its own spectrum as an internal guard band, and limiting usefulness of this spectrum for commercial operations.⁵⁰³ NPSTC confirms that public safety could deploy operations in the internal guard bands. NPSTC acknowledges that the “guard band status” of this paired 1-megahertz buffer “tempers the full capacity/value [that the] channel otherwise has but [it] still has operational capabilities.”⁵⁰⁴

241. We seek comment on the potential interference concerns Verizon raises, including the possibility that operations in the proposed internal public safety guard band could be undertaken by public

⁵⁰⁰ Amendment of Part 22 of the Commission's Rules to Benefit the Consumers of Air-Ground Telecommunications Services, *Report and Order and Notice of Proposed Rulemaking*, 20 FCC Rcd 4403, 4438 ¶ 74 (2005) (*Air-Ground Order*).

⁵⁰¹ Letter from Donald C. Brittingham, Verizon Wireless, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket No. 06-169 (filed Feb. 15, 2007) (“Verizon Feb. 15, 2007 *Ex Parte*”).

⁵⁰² Access Spectrum/Pegasus Reply Comments in WT Docket No. 06-169 at 7-9.

⁵⁰³ Verizon *Ex Parte* in WT Docket No. 06-169 at 13.

⁵⁰⁴ Letter from Vincent R. Stile, Chair, National Public Safety Telecommunications Council, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket No. 06-169, 96-86 at 2 (filed Feb. 23, 2007) (“NPSTC Feb. 23, 2007 *Ex Parte*”). NPSTC adds that it “is also confident that public safety can manage the guard band effectively.” *Id.*

safety licensees. We also seek comment on the possibility that a C Block licensee might have to limit emissions at the lower portion of its authorized spectrum block in some manner, which could limit its ability to fully utilize its block and thereby limit service offerings.

242. *Access Spectrum/Pegasus Alternative Proposal.* Acknowledging potential legal concerns with the BOP, especially with respect to the proposed reallocation of spectrum from commercial use to public safety services, Access Spectrum/Pegasus have submitted an alternative proposal to the Commission for modification of the Guard Bands in the Upper 700 MHz Band, which is discussed in detail above.⁵⁰⁵ In addition to our discussion of this proposal above, we note our tentative conclusion above that Section 337 and the public interest weigh against awarding 700 MHz spectrum outside of the competitive bidding process at this time. We also note, however, that Access Spectrum/Pegasus do not seek any additional spectrum in their alternative proposal, but instead seek to have the Commission modify their 1 megahertz paired A Block license to specify operations in a new 1 megahertz paired A Block license at different frequencies. We seek comment on whether the alternative proposal sufficiently addresses Section 337 and public interest concerns regarding the assignment of spectrum outside of the competitive bidding process. We also seek comment on whether the licensed geographic areas in the new A Block should be the same as in the current A Block.

b. Other Guard Band Issues

243. We seek further, limited comment here on what the Commission should do if it decides to leave the existing Guard Bands substantially intact. For example, assuming we modify the public safety allocation, the B Block's role as a critical juncture between adjacent commercial and public safety broadband spectrum would potentially be enhanced. After a reconfiguration of the public safety allocation, the B Block would rest between large commercial and public safety spectrum blocks, both of which are well-suited for broadband communications. In that context, we could provide incumbent B Block licensees, as well as future licensees via auction, greater technical and operational flexibility than currently exists by revising our rules regarding restrictions on cellular architectures, and mandating low-site, low-power system architectures. Such initiatives could afford B Block licensees the previously unavailable potential to offer compatible broadband services within their paired 2 megahertz of spectrum, thereby creating additional opportunities for efficient and effective use of the spectrum. These opportunities could include entering into public/private partnerships with the adjacent public safety broadband operator(s), partnering with other commercial licensees to deploy commercial broadband systems, and attracting a broader pool of potential leasing partners interested in deploying broadband.

244. Because the Commission is committed to resolving the issues raised in this *Further Notice* on an expedited basis, we note that if we were to retain the existing band plan, we could simultaneously require B Block licensees to deploy low-site, low-power system architectures, and permit them to deploy cellular systems.⁵⁰⁶ At the same time, we would likely request detailed comment on these and any additional prospects for enhancing the utility of the B Block in order to augment the record developed in response to the *Guard Bands Notice*. We seek comment on these ideas, specifically whether the low-site, low-power system architecture requirement, together with removal of the restriction on cellular architectures, is a positive step toward enhancing the B Block should we ultimately decide not to adopt any proposal to eliminate or substantially modify the Guard Band B Block.

245. We also seek comment on whether the Commission should make changes to the A Block Guard Bands spectrum under the current band plan. For example, we seek comment on whether the

⁵⁰⁵ See Letter from Ruth Milkman, counsel to Access Spectrum, LLC and Kathleen Wallman, adviser to Pegasus Communications Corporation, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-169, 06-150 and 96-86 (filed Apr. 18, 2007) (Access Spectrum/Pegasus Apr. 18, 2007 *Ex Parte*).

⁵⁰⁶ We sought comment on these issues in the *700 MHz Guard Bands Notice*. See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10424-29 ¶¶ 25-35.

technical flexibility we might allow for the B Block would also be possible in the A Block. Are low-site, low-power system architectures technically feasible for the upper Guard Bands A Block immediately adjacent to the Public Safety spectrum allocation? If not, would it nevertheless be useful to provide such flexibility for the lower Guard Bands A Block? With the lower A Block's proximity to both the Lower 700 MHz C Block and the Upper 700 MHz C Block, certain technical modifications might improve compatibilities in the band. We also seek comment on whether, similar to our discussion above for the Guard Bands B Block, there would be a public interest benefit to allowing the current A Block licensees to include their spectrum in the auction inventory in a "two-sided" auction.⁵⁰⁷

3. Competitive Bidding Procedures

246. We seek comment on whether we should use limited information (or "anonymous bidding") procedures in the upcoming auction of new 700 MHz licenses, in order to deter anticompetitive behavior that may be facilitated by the release of information on bidder interests and identities. Current competitive bidding rules permit withholding information on bidder interests and identities prior to the close of bidding. Accordingly, the Commission can make a final decision regarding the procedures for the auction as part of the regular pre-auction process. We seek comment here in light of the potential importance of this band with respect to competition in broadband services and in order to assess whether the use of anonymous bidding should be a factor in determining the final band plan for new 700 MHz licenses.

247. In prior auctions, the Commission has adopted procedures, contingent on pre-auction assessments of likely competition in the auction, for withholding public release until the close of the auction of: (1) bidders' license selections on their short form applications and the amount of their upfront payments; and (2) the identities of bidders placing bids.⁵⁰⁸ In the context of those prior auctions, the Commission noted that there may be potential harms as well as benefits from publicly revealing all information during the auction process.⁵⁰⁹ In this proceeding, the Ad Hoc Public Interest Spectrum Coalition asserts that anonymous bidding for new 700 MHz licenses is critical to promoting competitive entry in wireless broadband.⁵¹⁰ In contrast, United States Cellular Corporation contends that smaller auction participants need information about larger entities' bids during the auction and that smaller auction participants may encounter difficulties with financing, if the Commission withholds the information during the auction.⁵¹¹

248. We seek comment on the balance of potential harms and potential benefits from releasing information on bidder identities and interests during the auction of new 700 MHz licenses. In recent

⁵⁰⁷ See *supra* Section IV.B.1.a.

⁵⁰⁸ See, e.g., Auction of 1.4 GHz Band Licenses, Scheduled for February 7, 2007, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 69, *Public Notice*, 21 FCC Rcd 12393, ¶¶ 4-6 (2006); Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006, Notice and Filing Requirement, Minimum Opening Bids, Upfront Payment and Other Procedures for Auction No. 66, *Public Notice*, 21 FCC Rcd 4562, ¶¶ 140-157 (2006) ("*Auction No. 66 Procedures Public Notice*").

⁵⁰⁹ See *Auction No. 66 Procedures Public Notice* at ¶¶ 140-157.

⁵¹⁰ PISC Apr. 3 *Ex Parte* Comments in PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86 at 13; Letter from Harold Feld, counsel to Media Access Project, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket No. 06-150 (filed Apr. 19, 2007) (contending that accompanying Affidavit of Dr. Gregory Rose demonstrates that the open auction structure of Auction No. 66 permitted incumbents to engage in retaliatory bidding).

⁵¹¹ Letter from George Y. Wheeler, counsel to United States Cellular Corp., to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 06-150, 06-169, 96-86, 05-265, and 00-139, and PS Docket No. 06-229 (filed Mar. 27, 2007) ("U.S. Cellular Mar. 27 *Ex Parte* in WT Docket Nos. 06-150, 06-169, 96-86, 05-265, and 00-139, and PS Docket No. 06-229") at 7.

auctions where the Commission has considered withholding information about bidder identities and interests during the auction, the Commission has assessed likely competition in the auction and determined that, given the anticipated level of competition, the benefits of releasing the information outweighed the potential harms. However, if the potential harms of releasing the information are substantial enough, or the potential benefits of releasing the information so slight, it may be appropriate to withhold the information regardless of the likely level of competition. For this auction, we seek comment on whether the potential to use new 700 MHz licenses to create alternatives to existing broadband networks increases the benefits from anonymous bidding by making it harder for existing providers to identify and impede the efforts of potential new entrants to win. Does the lack of readily available technologies for use in the band, relative to existing broadband networks in other bands, reduce the potential benefit of using bidders' identities to guess what technologies will be deployed? Given the potential harms and benefits from releasing information on bidder identities and interests during the auction of new 700 MHz licenses, should the Commission make its decision regarding the release of the information contingent on an assessment of likely competition? If so, should the Commission change how it makes its pre-auction assessment of likely competition?

249. We also seek comment on whether the potential use of anonymous bidding should be a factor in determining the final band plan. Would a band plan with a greater number of small licenses be more or less appropriate if bidders are able to bid anonymously for those licenses? Commenters should make clear what factors support their position on anonymous bidding, how these factors apply to this auction, and the extent to which these factors may depend upon the final band plan adopted. Commenters should address whether their views are dependent on whether the Commission conditions the implementation of such limits on a measure of the anticipated competitiveness of the auction, such as the eligibility ratio or a modified version of the eligibility ratio.

4. 700 MHz Public Safety Spectrum

250. We tentatively conclude to redesignate the public safety wideband spectrum for broadband use consistent with a nationwide interoperability standard, and to prohibit wideband operations on a going forward basis.⁵¹² Further, should we adopt this broadband approach, we tentatively conclude that we should consolidate the existing narrowband allocations to the upper half of the 700 MHz Public Safety Band, and locate broadband communications in the lower half of this band. In addition, we tentatively conclude that we should establish an internal guard band between the narrowband and broadband allocations. We also seek comment on a limited number of issues relating to use of the 700 MHz public safety spectrum, should we reallocate the wideband spectrum to broadband use.

a. Broadband

251. The current distribution of channels in the 700 MHz Public Safety Band includes a mix of narrowband, wideband general use, wideband interoperability and wideband reserve channels.⁵¹³ In

⁵¹² Within the context of the 700 MHz public safety band plan, "wideband" refers to 50 kHz systems that may utilize a bandwidth no more than 150 kHz. See 47 C.F.R. § 90.531(c) and (d)(2). To the extent a public safety entity has constructed, deployed, and is currently operating, as of the release date of this Report and Order, a wideband system pursuant to a grant of Special Temporary Authority (STA), and has reason to continue such operations beyond the current term of the STA, we will work with such entity to extend such authority.

⁵¹³ See 47 C.F.R. § 90.531. Wideband general use refers to 50 kHz channels managed by Regional Planning Committees (RPCs) to meet regional and local needs. The Commission has issued no licenses for regular authorizations for wideband general use channels. Our licensing records reflect, however, that there are two grants of special temporary authority (STA) licensed on the wideband general use channels. Wideband interoperability channels also are channelized at 50 kHz. Wideband reserve spectrum is not channelized and refers to 700 MHz spectrum that the Commission had set aside for future public safety use. The wideband interoperability and reserve channels have not been available for licensing. We refer to the wideband general use, wideband interoperability, and wideband reserve channels collectively as "wideband."

the *700 MHz Public Safety Eighth Notice*, the Commission sought comment on revisions proposed by the National Public Safety Telecommunications Council (NPSTC), Motorola, and Lucent to the band plan.⁵¹⁴ All of the proposals contemplated aggregating the wideband general use channels, wideband interoperability channels, and wideband reserve spectrum to form a broadband segment. The Commission also sought comment on ways in which public safety entities could use the 700 MHz public safety spectrum for broadband applications, and on measures that should be taken to promote broadband interoperability.⁵¹⁵

252. In response to the *700 MHz Public Safety Eighth Notice*, the overwhelming majority of public safety entities support some form of a broadband allocation in the existing 700 MHz Public Safety block.⁵¹⁶ NPSTC and APCO recognize that “broadband would enable real-time, full motion video from any location to any other location; live video from an emergency scene to a command center; downloading building diagrams and blueprints to firefighters in the field; uploading and downloading of mug shots and AMBER Alert photos for police officers in the field; mapping/location-based services; digital image transfers; large file transfers; and bioterrorism detection and response information.”⁵¹⁷ NPSTC notes that public safety communications needs, once limited to voice communications, are now expanding rapidly to encompass new broadband applications.⁵¹⁸ In addition, while not discounting the continued need for narrowband voice and data, NPSTC contends there is an imperative need for a 700 MHz nationwide, interoperable public safety broadband network and that the 700 MHz public safety spectrum is especially suitable for that purpose.⁵¹⁹

⁵¹⁴ See *700 MHz Public Safety Eighth Notice*, 21 FCC Red at 3676-79 ¶¶ 14-22.

⁵¹⁵ *Id.* at 3675-76 ¶ 13, 3683-84 ¶ 33.

⁵¹⁶ See, e.g., NPSTC Comments in WT Docket No. 96-86 at 1; APCO Comments in WT Docket No. 96-86 at 2; State of California Comments in WT Docket No. 96-86 at 1; California Highway Patrol Comments in WT Docket No. 96-86 at 1; City and County of Denver Comments in WT Docket No. 96-86 at 1; State of Hawaii Comments in WT Docket No. 96-86 at 1; International Association of Fire Chiefs Comments in WT Docket No. 96-86 at 1; International Association of Chiefs of Police, Major Cities Chiefs Association, National Sheriffs Association, Major Cities Sheriffs Association Joint Reply Comments in WT Docket No. 96-86 at 1; National Association of Regional Planning Committees Comments in WT Docket No. 96-86 at 1; Region 12 Reply Comments in WT Docket No. 96-86 at 1; Region 24 Comments in WT Docket No. 96-86 at 1; Region 26 Comments in WT Docket No. 96-86 at 1; Region 39 Comments in WT Docket No. 96-86 at 1; Region 40 Comments in WT Docket No. 96-86 at 1; Region 45 Comments in WT Docket No. 96-86 at 1; Region 49 Comments in WT Docket No. 96-86 at 1.

⁵¹⁷ See NPSTC and APCO Joint Comments in WT Docket No. 05-157 at 6.

⁵¹⁸ See NPSTC Comments in RM-11348 at 4 (Nov. 29, 2006). See also *The Present and Future of Public Safety Communications: Hearing Before the Senate Comm. on Commerce, Science & Transportation*, 109th Cong. 2-3, (2007) (statement of Mr. Harlin R. McEwen, Chairman, Communications and Technology Committee, International Association of Chiefs of Police) (McEwen Testimony) (the benefits from a nationwide broadband network include broadband data services (such as text messaging, photos, diagrams, and streaming video) not currently available in existing public safety land mobile systems). Although these comments and testimony are related to a proposal by Cyren Call, which the Public Safety and Homeland Security Bureau found the Commission lacked statutory authority to implement, see *Reallocation of 30 MHz of 700 MHz Spectrum (747-762/777-792 MHz) from Commercial Use*, RM No. 11348, *Order*, DA 06-2278 (PSHSB 2006), the comments submitted in that proceeding and related testimony before Congress are relevant to our decision to implement a broadband allocation here because they reflect the public safety community’s support for deployment of a nationwide interoperable broadband network in the 700 MHz Band.

⁵¹⁹ See NPSTC Comments in RM-11348 at 4, 10. See also McEwen Testimony at 2 (“The implementation of a nationwide public safety broadband network can also be the beginning of the end to the problem of public safety interoperability”); Region 24 Reply Comments in WT Docket No. 96-86 at 5 (broadband is the most effective means to ensuring interoperable public safety communications); NPSTC Comments in WT Docket No. 96-86 at 14-15; Lucent Comments in WT Docket No. 96-86 at 7-8.

253. Based on this significant support in the record, we tentatively conclude that providing broadband spectrum for advanced public safety communications would best serve our goal of enabling first responders to protect safety of life, health and property. While some commenters argue that the Commission should continue to allow public safety entities the flexibility to deploy either wideband or broadband applications,⁵²⁰ we tentatively conclude that providing such flexibility could hinder efforts to deploy a nationwide, interoperable broadband network by perpetuating a balkanization of public safety spectrum licenses, networks, and technology deployment. Further, only through use of broadband networks could public safety leverage advanced commercial technologies and infrastructure to reduce costs and speed deployment, and enable the potential for priority access to commercial networks during emergencies. Accordingly, we believe that only broadband applications consistent with a nationwide interoperability standard should be deployed in the current wideband allocation of the 700 MHz Band. We thus tentatively conclude to reallocate spectrum previously designated for wideband use for broadband use only, and prohibit wideband operations on a going forward basis. We seek comment on these tentative conclusions.⁵²¹

b. Band Plan Issues

254. As noted above, in the *700 MHz Public Safety Eighth Notice*, the Commission sought comment on proposals to aggregate the public safety wideband channels to form a broadband segment. The Commission solicited alternative proposals, but tentatively concluded overall not to alter the locations of the narrowband channels.

255. In the *700 MHz Guard Bands Notice*, we sought comment on the BOP which, aside from its Guard Bands components, proposes a reconfiguration of the band plan for the 700 MHz Public Safety spectrum where the narrowband channels are consolidated to the upper half of the block, and the lower half of the block is dedicated to broadband operations. In the *700 MHz Guard Bands Notice*, we tentatively concluded that any proposal such as the BOP involving a relocation of the narrowband voice channels must address (1) the source of funds to reprogram already-deployed 700 MHz Band public safety radios, and (2) coordination of the proposal with co-channel TV broadcasters in Canada and Mexico at border areas.⁵²²

256. In response to the *700 MHz Public Safety Eighth Notice* and the *700 MHz Guard Bands Notice*, commenters generally support a reconfiguration of the 700 MHz Public Safety Band.⁵²³ The BOP proponents assert that such reconfiguration reduces the amount of spectrum consumed for separating—and thus protecting—the public safety broadband and narrowband channels from each other, and thus frees up additional spectrum for public safety use resulting in a potential contiguous 5-megahertz block of broadband spectrum.⁵²⁴ The WiMAX Forum adds that a 5-megahertz channel size enables a fuller range of applications, and facilitates partnerships between public safety broadband operations and 4G commercial broadband technologies, which also are based on 5 megahertz spectrum blocks.⁵²⁵ Alcatel-

⁵²⁰ See, e.g., NPSTC Comments in WT Docket No. 96-86 at 1-2; APCO Comments in WT Docket No. 96-86 at 2.

⁵²¹ Because we make these tentative conclusions, we defer consideration of the questions raised in the *700 MHz Public Safety Eighth Notice* regarding adoption of a wideband interoperability standard. The *700 MHz Public Safety Eighth Notice* sought to refresh the record on whether to retain the wideband segment and adopt SAM as a wideband data interoperability standard, as recommended by the National Coordination Committee (NCC). See *700 MHz Public Safety Eighth Notice*, 21 FCC Rcd at 3683-3684 ¶ 33.

⁵²² See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10433-34 ¶ 46.

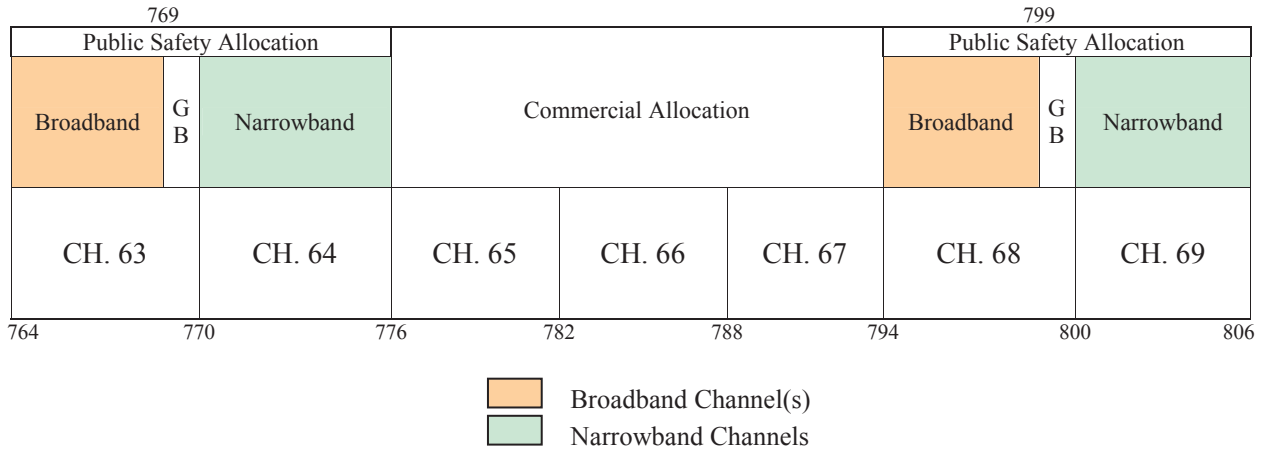
⁵²³ See, e.g., Region 24 Comments in WT Docket No. 96-86 at 2; Region 26 Comments in WT Docket No. 96-86 at 1; Region 39 Comments in WT Docket No. 96-86 at 1.

⁵²⁴ See Access Spectrum/Pegasus Comments in WT Docket No. 96-86 at 3-5.

⁵²⁵ WiMAX Forum Reply Comments in WT Docket No. 96-86 at 1-2.

Lucent states that consolidation of the narrowband channels would lower the risk of intermodulation distortion in narrowband receivers.⁵²⁶

FIGURE 12 – PROPOSED RECONFIGURATION OF 700 MHz PUBLIC SAFETY BAND



257. Having tentatively concluded that only broadband applications consistent with a nationwide interoperability standard may be deployed in the current wideband allocation for public safety in the 700 MHz Band, we seek to take further steps to optimize the band plan for this spectrum, essentially building upon the public safety-related proposals in the BOP and the record developed pursuant to the *700 MHz Guard Bands Notice* and *700 MHz Public Safety Eighth Notice*. Specifically, we tentatively conclude that, assuming we decide to adopt this broadband approach, we will consolidate the existing narrowband allocations to the upper half of the 700 MHz Public Safety block, and will designate the lower half of the block for broadband operations. Additionally, we tentatively conclude that we will adopt a 1 megahertz internal guard band at the top of the resulting broadband allocation to buffer it from the narrowband allocation and thus prevent interference.

258. In addition, we seek comment on whether we should revise the OOB limit required for Upper 700 MHz Commercial Services Band base stations to protect public safety operations in the band if we adopt the tentative conclusions discussed above. In particular, we seek comment on the proposal by Access Spectrum *et al.* that, in these circumstances, we should replace the existing limit of $76 + 10\log P$ applicable to emissions into the 700 MHz Public Safety spectrum with the $43 + 10\log P$ OOB standard that protects commercial services in the 700 MHz Band.⁵²⁷

259. We also seek comment on a limited number of related questions regarding: (1) whether to allow limited use of the internal guard band in areas along the Canadian border to the extent that Canadian broadcasters cause interference to the relocated narrowband channels; (2) whether to adopt a transition plan, and what that plan should be; and (3) whether and how such transition should be funded.

260. *Temporary Use of Internal Guard Band in International Border Areas.* The *700 MHz Guard Bands Notice* observed that a reconfiguration of the band plan for the 700 MHz Public Safety spectrum may result in the relocated narrowband channels being blocked by existing Canadian TV

⁵²⁶ See Alcatel-Lucent Mar. 21 *Ex Parte* in WT Docket No. 06-169 at 6; see also Lucent Reply Comments in WT Docket No. 06-169 at 2-3.

⁵²⁷ See Access Spectrum *et al.* Comments in WT Docket No. 06-150 at 33-34 and Appendix B at 13-14.

broadcasters in border areas.⁵²⁸ Although the Canadian government has agreed to clear broadcasters from TV channels 63 and 68, there is no such agreement for TV channels 64 and 69.⁵²⁹ Because we have tentatively concluded here that we will consolidate the public safety narrowband channels onto TV channels 64 and 69, they are subject to interference from Canadian broadcast operations throughout the duration of Canada's transition to DTV. We note that one virtue of the BOP is its differing approach to a reconfiguration of the band plan for 700 MHz Public Safety spectrum, where its shift in the spectral location of the block dedicated to public safety results in an overlap of 1 megahertz of the 6-megahertz paired narrowband channels with TV channels 63 and 68, which Canada has already agreed to clear.⁵³⁰ The BOP did not provide any corresponding detail with respect to areas along the Mexican border.

261. Because we tentatively conclude that we cannot adopt the BOP as discussed earlier, and thus its overlap feature would not be available to mitigate channel conflicts in the Canadian and Mexican border areas, we seek comment on whether to temporarily allow, in border areas, narrowband voice communications within the public safety internal guard band that we have tentatively concluded will be required to protect the narrowband channels from the broadband channels.⁵³¹

262. *Transition Issues.* Given our tentative conclusion to permit only broadband applications consistent with a nationwide interoperability standard in the channels presently allocated for wideband, and to reconfigure the 700 MHz Public Safety band plan, we also must address how best to migrate existing narrowband operations on channels 63 and 68 to channels 64 and 69. Our licensing database shows that there are 38 narrowband licenses on channels 63 and 68 that would be subject to relocation. In addition, all 50 states, Puerto Rico, the U.S. Virgin Islands and the District of Columbia were granted State Licenses, which authorize use of certain narrowband channels on TV channels 63, 64, 68 and 69.⁵³² No licenses appear to have been issued for wideband General Use channels.⁵³³ The wideband interoperability channels and the reserve spectrum have not been available for licensing. Some RPCs voice concerns that consolidating the narrowband channels will disrupt planning.⁵³⁴ On the other hand, the record suggests that the costs and inconveniences of consolidating the narrowband channels are minor compared to the relative potential for accommodating future technologies.⁵³⁵

263. We seek comment on how to implement reconfiguration of the 700 MHz public safety narrowband channels with minimum disruption to incumbent operations. Given the relatively small

⁵²⁸ See *700 MHz Guard Bands Notice*, 21 FCC Rcd at 10433 ¶ 45.

⁵²⁹ See Letter from Ruth Milkman, Counsel for Access Spectrum, LLC and Kathleen Wallman, Adviser to Pegasus Communications Corp., to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket No. 06-169 (filed Oct. 23, 2006) ("700 MHz Technical Working Group Report") at 9-10.

⁵³⁰ *Id.*

⁵³¹ We note that the result of this option would be a corresponding loss of 1 megahertz of available spectrum for broadband communications, since a 1-megahertz internal guard band would still be necessary to protect the shifted narrowband channels from public safety broadband operations. However, we are seeking comment on whether to allow the public safety broadband operator(s) to utilize their full 5-megahertz broadband allocation by gaining a temporary easement into the adjacent D Block spectrum proposed above. See *supra* Section IV.B.1.a.

⁵³² The Commission designated 2.4 megahertz of spectrum, all narrowband channels, for statewide, geographic-area licenses, and 2.4 megahertz for nationwide use.

⁵³³ Our licensing records reflect that there are two grants of special temporary authority (STA) licensed on the wideband base and mobile channels.

⁵³⁴ See Region 12 Reply Comments in WT Docket No. 96-86 at 1-2 (stating that the costs and disruption of agency activity, as well as the amount of time and effort required to put the plan into effect, would make reallocating the narrowband frequencies prohibitively expensive).

⁵³⁵ See Region 24 Comments in WT Docket No. 96-86 at 15; Region 39 Comments in WT Docket No. 96-86 at 1 (now is the best time to consider new ideas as very little has been put into effect).

number of incumbents that would be affected, we seek comment on whether relocation procedures adopted in other contexts may apply here.⁵³⁶ We also seek comment on the appropriate timing of relocating narrowband operations. How quickly should the narrowband channel consolidation be completed, in view of the February 17, 2009 date by which incumbent broadcasters are to be cleared from the 700 MHz Band? Further, how does the existence of broadcast incumbents prior to the DTV transition impact timing? Commenters also should address any special situations in border areas adjacent to Canada and Mexico, as more fully addressed below.

264. *Funding Issues.* Primary to the issue of how a relocation of public safety narrowband would occur is the determination of the costs of the relocation and how (or from whom) the costs will be covered. In order to estimate the true costs associated with relocation as accurately as possible, we seek up-to-date information regarding how many narrowband radios are currently deployed and how many are actively being used.⁵³⁷ Based on those estimates, we ask commenters to quantify the costs that would be involved with consolidating the narrowband channels and relocating existing deployments. We also seek comment on how these costs should be funded, if we should not adopt the tentative conclusion above to impose the funding requirement on the D Block licensees.⁵³⁸ Given the significant benefits of reconfiguration, and that the number of entities impacted and expected cost of reconfiguration should be relatively minor (especially in comparison to, e.g., the 800 MHz Band reconfiguration),⁵³⁹ it is also appropriate to consider, among other options, whether public safety should pay for its own relocation costs. The Commission has on occasion required incumbents to fund their own relocations.⁵⁴⁰

265. We recognize that the public safety community's ability to fund the reconfiguration may be limited.⁵⁴¹ In this regard, however, some commenters have suggested that a portion of the \$1 billion Public Safety Interoperable Communications Grant Program may be used to defray the expense of relocating public safety.⁵⁴² We seek comment on the potential availability of monies from this fund for paying the costs of narrowband consolidation. We also seek comment on whether there are other potential funding sources from existing grant programs. Finally, we seek comment on whether we should require the nationwide licensee of the commercial Upper 700 MHz spectrum block proposed by Frontline

⁵³⁶ See *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, ET Docket No. 92-9, *First Report and Order and Third Notice of Proposed Rulemaking*, 7 FCC Rcd 6886, 6888 ¶ 14 (1992) (relocation of fixed microwave incumbents for Emerging Technology services); *Improving Public Safety Communications in the 800 MHz Band*, et al., *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, WT Docket No. 02-55, 19 FCC Rcd 14969 (2004) (relocation of public safety licensees operating to comparable facilities to facilitate 800 MHz band reconfiguration).

⁵³⁷ In a recent *Ex Parte* presentation, Motorola estimates that 750,000-800,000 dual 700/800 MHz radios have been deployed, but Motorola does not provide an estimate on the number of such radios that have already been programmed to operate at 700 MHz. See Motorola Mar. 6, 2007 *Ex Parte* at 8.

⁵³⁸ We note that although Access Spectrum and Pegasus proposed to assume the entire cost of reconfiguration, conditioned on adoption of the BOP, we have tentatively concluded that we cannot adopt the BOP.

⁵³⁹ *800 MHz Report and Order*, 19 FCC Rcd at 15064 para. 179 (the Consensus Parties estimated the cost for reconfiguring the 800 MHz Band at \$850 million).

⁵⁴⁰ See *Amendment of the Commission's Rules Relative to the Licensing of Microwave Radio Stations Used to Relay Television Signals to Community Antenna Television Systems*, *First Report and Order and Further Notice of Proposed Rulemaking*, Docket No. 15586, 1 FCC 2d 897, 911 (1965).

⁵⁴¹ See, e.g., NPSTC Comments in WT Docket 96-86 at 7-8 ; APCO Comments in WT Docket 96-86 at 3-4; Region 24 Comments in WT Docket 96-86 at 17.

⁵⁴² See, e.g., Northrop Reply Comments in WT Docket 96-86 at 3. Section 3006 of the DTV Act created the Public Safety Interoperable Communications Grant Program to assist public safety entities in the acquisition of, deployment of, and training for the use of interoperable communications that utilize or enable interoperability with 700 MHz public safety communications systems. See Pub. L. No. 109-171, 120 Stat. 4 (2006), § 3006(a).

to fund the reconfiguration. Similarly, if we auction Guard Bands B Block licenses, including those returned from Nextel, should we require the auction winners to fund the reconfiguration costs, given the implicit benefits to the B Block of the reconfiguration?⁵⁴³ To the extent that the Commission determines that it is in the public interest to license a nationwide public safety broadband licensee pursuant to the *Public Safety Ninth Notice*, should the nationwide licensee be assigned responsibility for funding the reconfiguration?

c. Power Limits for Public Safety Broadband

266. In the Report and Order, above, we modify our power limit rules for the Upper and Lower 700 MHz Commercial Services Band by implementing a PSD model for defining power limits, permitting increased power in rural areas, and permitting radiated power levels to be measured on an average, rather than peak, basis. As discussed above, this action will permit higher power and increased flexibility for 700 MHz Commercial Services Band licensees implementing wider band technologies, with certain measures in place to protect against any possible increased interference, especially to 700 MHz public safety users.

267. We also tentatively conclude to permit only broadband applications in the 700 MHz Public Safety Band consistent with a nationwide interoperability standard in the channels presently allocated for wideband. We seek comment on whether it is appropriate to provide the same flexibility to 700 MHz Public Safety broadband operations as that afforded 700 MHz Commercial Services Band licensees by implementing a PSD model for defining power limits, permitting increased power in rural areas, and permitting measurement of power levels on an average, versus peak, basis. We also seek comment on whether the technical restrictions adopted today for the 700 MHz Commercial Services Band with respect to interference protection, if applied to public safety broadband spectrum, will protect adjacent band operations.

5. Frontline's Proposal

268. In this section we seek comment on Frontline's proposal that the Commission alter the upper portion of the Upper 700 MHz Commercial Services Band to designate a 10 megahertz "E Block" for a commercial licensee and to impose specific conditions on that licensee requiring it to construct and operate a nationwide, interoperable broadband network for sharing with a national public safety licensee providing broadband service in the lower portion of the 700 MHz Public Safety spectrum.⁵⁴⁴ Comment also is sought on service rules proposed by Frontline.

269. Background. Frontline has submitted filings with the Commission regarding its proposed "Public Safety Broadband Deployment Plan" for 700 MHz spectrum.⁵⁴⁵ These filings, which propose

⁵⁴³ These benefits would include the potential of public/private partnerships due to compatible system architectures between the B Block and the reconfigured Public Safety block, and the potential for the Commission to ease the existing interference protection rules (including the cellular architecture restriction) that apply to the B Block that initially were created to protect the formerly adjacent Public Safety narrowband channels.

⁵⁴⁴ See generally Frontline Comments in PS Docket No. 06-229; Frontline Mar. 6 Comments in WT Docket No. 06-150; Frontline Reply Comments in PS Docket No. 06-229; Frontline March 12 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229; Section II.E., *supra*.

⁵⁴⁵ Frontline Comments in PS Docket No. 06-229; Frontline Reply Comments in PS Docket No. 06-229; Frontline Mar. 6 Comments in WT Docket No. 06-150; Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229. See also Frontline March 7 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline March 12 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline March 16 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline Mar. 19 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229; Frontline Mar. 22 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229.

various conditions on 10 megahertz of the commercial 700 MHz spectrum that we are required to auction, also are related to issues in the 700 MHz Guard Bands proceeding and the 700 MHz Public Safety proceeding.⁵⁴⁶

270. In the *700 MHz Commercial Services Notice*, we requested comment on possible changes to the existing service rules and band plan for non-guard-band commercial spectrum that is being reclaimed by the Commission in connection with the DTV transition.⁵⁴⁷ Among other matters, Frontline seeks a revision of the band plan that would divide the existing 20-megahertz D Block of the Upper 700 MHz Band to create a new paired 5 megahertz “E Block” (10 megahertz total).

271. In the *700 MHz Guard Bands Notice*, we sought comment on possible changes to the existing service rules and band plan for the six megahertz of Guard Bands spectrum licensed to protect the operations in the adjacent 700 MHz Public Safety spectrum.⁵⁴⁸ Specifically relevant to Frontline, which supports the BOP,⁵⁴⁹ is our tentative conclusion in this Further Notice that we cannot adopt the BOP due to a lack of statutory authority and because, in any event, adoption of the BOP would not be in the public interest.⁵⁵⁰

272. *Frontline’s Proposal.* Frontline proposes that the Commission alter the upper portion of the band plan and service rules in the *700 MHz Commercial Services Notice* in order to auction a single nationwide 10-megahertz license (a new “E Block”) near the 700 MHz Public Safety spectrum that would be subject to specific conditions. The “E Block” would consist of the paired 757-762 MHz and 787-792 MHz frequencies, which currently comprises the upper half of the 20-megahertz D Block of the Upper 700 MHz Band.⁵⁵¹ As discussed in more detail below, the new paired “E Block” licensee would construct and operate a common infrastructure to support a broadband public safety network as well as its own commercial broadband network.⁵⁵²

273. Frontline’s proposal is premised on the Commission adopting a number of measures the Commission has proposed, including: (a) designating 12 megahertz of the 700 MHz Public Safety spectrum from wideband to broadband use; (b) positioning that 12 megahertz of broadband public safety at the bottom of the public safety allocation in the 700 MHz Band; and (c) assigning this spectrum nationwide to a single national public safety broadband licensee.⁵⁵³

⁵⁴⁶ See *700 MHz Guard Bands Notice*; *700 MHz Public Safety Ninth Notice*; *700 MHz Public Safety Eighth Notice*.

⁵⁴⁷ See *700 MHz Commercial Services Notice*, 21 FCC Rcd at 9346-48 ¶¶ 1-2. This *Notice* sought comment on 78 megahertz of non-guard-band commercial wireless licenses (in the 698-746, 747-762, and 777-792 MHz bands), including the 60 megahertz that the Commission is required to auction pursuant to the DTV Act. Comment was sought on rules which include those concerning the size of service areas and spectrum blocks, performance requirements, access to spectrum in the secondary market, renewal, length of license term, power limits and related requirements, and 911/E911 and hearing aid-compatible handsets. *Id.* at 9362-90 ¶¶ 28-106.

⁵⁴⁸ The 700 MHz Guard Bands consist of the A Block, comprised of paired 1-megahertz blocks (746-747, 776-777 MHz), and Guard Band B Block, comprised of paired 2-megahertz blocks (762-764, 792-794 MHz).

⁵⁴⁹ Frontline Comments in PS Docket No. 06-229 at 20-21.

⁵⁵⁰ See *supra* Section IV.B.2.

⁵⁵¹ See Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposing revisions to rules to designate frequencies).

⁵⁵² See Frontline Comments in PS Docket No. 06-229 at 5-6, 17, 19-20, 24; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 7, 8, 10-12; Frontline Reply Comments in PS Docket No. 06-229 at 3-4; see also Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposed rules relating to Frontline proposal, including the Network Sharing Agreement).

⁵⁵³ Frontline’s proposal also would be premised on the adoption of additional matters being addressed in the *700 MHz Public Service Eighth Notice* and *700 MHz Public Safety Ninth Notice*. These include permitting the public (continued....)

274. With respect to the newly created “E Block,” Frontline proposes imposing the following obligations, among others, on this nationwide licensee:

- The “E Block” licensee would be required to construct a common, interoperable network infrastructure that can be used by both the public safety broadband network and the “E Block” licensee’s commercial network.⁵⁵⁴ The details of the network would be specified in a Network Sharing Agreement negotiated by the “E Block” licensee and the National Public Safety Licensee.⁵⁵⁵
- The “E Block” licensee would be required to meet the following build-out benchmarks: provide coverage to 75 percent of the United States population within four years of the 700 MHz “auction clearing date”; provide coverage to 95 percent of the United States population within seven years; and provide coverage to 98 percent of the United States population within 10 years. As regards Alaska, the licensee would be required to provide coverage to all Alaskan cities of 10,000 or more within four years of the 700 MHz auction clearing date.⁵⁵⁶
- The “E Block” licensee would be responsible for managing and operating the public safety broadband network, and would be permitted to collect a reasonable network management fee. This fee, and the terms and conditions governing the “E Block” licensee’s management of the network, would be specified in the Network Sharing Agreement.⁵⁵⁷
- The “E Block” licensee would be required to provide priority access to public safety broadband operations during times of emergency. These requirements would be specified in the Network Sharing Agreement.⁵⁵⁸

275. Frontline also sets forth several additional elements as part of its proposal. The term of the “E Block” license would be for 15 years, and would be subject to a renewal expectancy upon the

(Continued from previous page) _____

safety licensee to provide unconditionally preemptible access to its assigned spectrum to commercial service providers on a secondary basis, and facilitating the shared use of commercial mobile radio service (CMRS) infrastructure for the efficient provision of public safety broadband service. *See 700 MHz Public Safety Ninth Notice*, 21 FCC Rcd at 14838 ¶ 4.

⁵⁵⁴ *See* Frontline Comments in PS Docket No. 06-229 at 5-6, 17, 19-20, 24; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 7, 8, 10-12; Frontline Reply Comments in PS Docket No. 06-229 at 3-4; *see also* Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposed rules relating to Frontline proposal, including the Network Sharing Agreement).

⁵⁵⁵ *See* Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 at 3-7 & Attachment (proposed 47 C.F.R. § 27.4). Frontline’s proposed rules would require that the “E Block” licensee “enter into good faith negotiations with the national public safety broadband licensee” regarding the Network Sharing Agreement, and, as part of that obligation, would require that the “E Block” Licensee “consult with the Public Safety Licensee on the design, construction, and operation of the shared network...” Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment at 5.

⁵⁵⁶ *Id.* Attachment at 3-4 (proposed 47 C.F.R. § 27.14). Under Frontline’s original proposal, the build-out benchmarks were: 25 percent geographic coverage of the continental United States within four years of license grant; 50 percent geographic coverage of the continental United States within seven years of license grant; and 75 percent geographic coverage of the continental United States within ten years of license grant. *See* Frontline Comments in PS Docket No. 06-229 at 24-25. Frontline’s current proposal provides that “auction clearing date” for purposes of the construction requirements “refers to the Analog Spectrum Recovery Firm Deadline provided for in Section 3002 of the Deficit Reduction Act of 2005.” *See* Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment at 3-4 (proposed 47 C.F.R. § 27.14).

⁵⁵⁷ Frontline Comments in PS Docket No. 06-229 at 27-28.

⁵⁵⁸ *Id.* at 28-29; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 14-15; Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 at 4.

completion of “substantial service.”⁵⁵⁹ It also states that participation by public safety would be purely voluntary, and that public safety would remain free to build its own network in the 700 MHz spectrum.⁵⁶⁰ In addition, Frontline proposes that the “E Block” licensee should be required to operate as a wholesale provider with respect to commercial use of the “E Block” spectrum. Similarly, referencing a Petition recently filed by Skype Communications, Frontline proposes that the “E Block” licensee be required to provide open access to its network, allowing the attachment of any device to the network and permitting users to access services and content provided by unaffiliated parties. As proposed, this requirement would apply not only to the “E Block” license, but to all other licenses owned or controlled by the “E Block” licensee.⁵⁶¹ Similarly, Frontline recommends that the “E Block” licensee be required to offer roaming to any provider with customers utilizing devices compatible with the “E Block” network, and that such obligation be extended to all spectrum holdings of the “E Block” licensee.⁵⁶² Frontline supports the BOP, which would, among other things, eliminate the current Guard Band B Block and allocate additional spectrum to public safety, but also indicates that its proposal for the commercial 700 MHz Band is not dependent on any Commission action regarding the Guard Band B Block.⁵⁶³

276. Several parties have filed in response to the Frontline proposal.⁵⁶⁴ For example, Media Access Project supports Frontline’s proposal as being in the public interest, argues that it would ensure that public safety has access to needed spectrum in an efficient manner, and claims that a national license would provide affordable spectrum access.⁵⁶⁵ CTIA requests that Frontline’s proposal be dismissed, arguing, among other matters, that it is prohibited by Section 337 of the Communications Act.⁵⁶⁶ MetroPCS opposes Frontline’s proposal on several grounds, including that it is disruptive to the current

⁵⁵⁹ Frontline Mar. 6 Comments in WT Docket No. 06-150 at 19-20; Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposed 47 C.F.R. § 27.13).

⁵⁶⁰ Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 at 5.

⁵⁶¹ See Frontline Comments in PS Docket No. 06-229 at 29-30 (referring to a petition by Skype Communications requesting that the Commission apply Carterphone principles to wireless networks. See Skype Communications, S.A.R.L. Petition to Confirm a Consumer’s Right to Use Internet Communications Software and Attach Devices to Wireless Networks (filed Feb. 20, 2007)); Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposed rules).

⁵⁶² See Frontline Comments in PS Docket No. 06-229 at 18, 23; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 21.

⁵⁶³ See Frontline Comments in PS Docket No. 06-229 at 20-21; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 11, n.13; Frontline March 16 *Ex Parte* in WT Docket Nos. 96-86 and 06-150 and PS Docket No. 06-229, Attachment at 3-4. See also Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (proposed 47 C.F.R. § 27.5, which maintains existing frequencies for Guard Band blocks).

⁵⁶⁴ See Reply Comments of MetroPCS Communications, Inc., PS Docket No. 06-229, WT Docket No. 96-86 (filed Mar. 12, 2007) (“MetroPCS Reply Comments in PS Docket No. 06-229 and WT Docket No. 96-86”); Reply Comments of the National Public Safety Telecommunications Council (“NPSTC”), Docket No. 06-229, WT Docket No. 96-86 (filed Mar. 12, 2007) (“NPSTC Reply Comments in PS Docket No. 06-229 and WT Docket No. 96-86”); Letter from Harold Feld, Senior Vice President, Media Access Project, to Marlene H. Dortch, Secretary, FCC, *Ex Parte* in WT Docket Nos. 05-211 and 06-150 and PS Docket No. 06-229 (filed Mar. 22, 2007) (“Media Access Project Mar. 22 *Ex Parte* in WT Docket Nos. 05-211 and 06-150 and PS Docket No. 06-229”); Response of MetroPCS Communications, Inc. to Untimely “Comments” of Frontline Wireless, LLC, WT Docket No. 06-150, CC Docket No. 94-102, WT Docket No. 01-309 (filed Mar. 26, 2007) (“MetroPCS Response in WT Docket No. 06-150, CC Docket No. 94-102, and WT Docket No. 01-309”); U.S. Cellular Mar. 27 *Ex Parte* in WT Docket Nos. 06-150, 06-169, 96-86, 05-265, and 00-139, and PS Docket No. 06-229.

⁵⁶⁵ See Media Access Project Mar. 22 *Ex Parte* in WT Docket Nos. 05-211 and 06-150 and PS Docket No. 06-229 at 1.

⁵⁶⁶ See Letter from Steve Largent, President and CEO, CTIA, to Chairman Kevin Martin, FCC, *Ex Parte* in WT Docket No. 06-150 (filed Apr. 5, 2007) (“CTIA Apr. 5 *Ex Parte* in WT Docket No. 06-150”) at 2-3.

process for adopting rules for the 700 MHz Band, contains proposed “poison pill” rules that will make the spectrum unattractive to potential bidders, has wholesale operating restrictions that require unwarranted change to the current DE rules, potentially subjects public safety users to a provider that could exact unregulated user fees, and subjects public safety users to a potentially uncertain public/private partnership arrangement.⁵⁶⁷ NPSTC states that Frontline’s proposal should receive close examination, and expresses concern with leaving to the competitive bidding process the choice of an operator of a nationwide public service broadband network.⁵⁶⁸ United States Cellular opposes adoption of Frontline’s proposal, arguing, among other matters, that the proposal would “all but eliminate” competitive bidding for the spectrum and would restrict spectrum use.⁵⁶⁹ The *Ad Hoc* Public Interest Spectrum Coalition supports Frontline’s proposal to make the “E Block” available on an open access basis and requests that the Commission go further, making at least three of the 700 MHz commercial licenses (or 30 megahertz of spectrum) available on such a basis.⁵⁷⁰

277. Discussion. We seek comment on Frontline’s proposed “Public Safety Broadband Deployment Plan,” its likely effects on both the commercial and public safety users in the 700 MHz Band, and whether it would be in the public interest for the Commission to adopt such a proposal, or alternatives to achieve the same or similar public interest goals. We also seek comment on whether, and to what extent, the Commission should: (a) adopt certain, but not all, elements of the Frontline proposal; (b) modify any elements of the proposal, adopt any additional requirements, or adopt any alternative requirements to achieve the same or similar public interest goals; and (c) consider alternative approaches to encourage public-private partnerships for sharing spectrum between public safety users and commercial licensees in the 700 MHz Band.

278. We also seek comment on the extent to which adoption of the Frontline, or similar, proposal should have an impact on our decisions regarding the Guard Bands. Under Frontline’s proposal, Guard Band B Block would be located between the new “E Block” and the public safety spectrum. We seek comment on whether the Guard Band B Block should be integrated with a new block of spectrum to be made available in the Upper 700 MHz Band for purposes of implementing the Frontline Plan or similar proposal.

279. Similarly, we seek comment here on the extent to which adoption of the Frontline, or similar, proposal should affect our decisions regarding the remainder of the commercial spectrum blocks in the Upper 700 MHz Band that we are required to auction. We ask that comments address Frontline’s proposal in the context of our proposals expressed in this Further Notice regarding the size of spectrum blocks and geographic service areas, including a comparison of Frontline’s proposal that the 757-762 MHz and 787-792 MHz spectrum be designated for the new “E Block.” If the Commission adopted the Frontline proposal, the amount of spectrum to be auctioned for commercial services pursuant to flexible service and technical rules in the Upper and Lower 700 MHz Band would decrease by ten megahertz, from 60 to 50 megahertz.

⁵⁶⁷ See MetroPCS Response in WT Docket No. 06-150, CC Docket No. 94-102, and WT Docket No. 01-309 at 1.

⁵⁶⁸ See NPSTC Reply Comments in PS Docket No. 06-229 and WT Docket No. 96-86 at 7.

⁵⁶⁹ See U.S. Cellular Mar. 27 *Ex Parte* in WT Docket Nos. 06-150, 06-169, 96-86, 05-265, and 00-139, and PS Docket No. 06-229 at 2.

⁵⁷⁰ See *Ex Parte* Comments of the *Ad Hoc* Public Interest Spectrum Coalition, filed by Larry Blosser, counsel to Consumers Union and Free Press, PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86 (filed Apr. 5, 2007) (“PISC Apr. 5 Blosser *Ex Parte* in PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86”). See also PISC Apr. 3 *Ex Parte* Comments in PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86; *Ex Parte* Comments of the *Ad Hoc* Public Interest Spectrum Coalition, filed by Gigi Sohn, counsel for Public Knowledge, PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86 (filed Apr. 5, 2007) (“PISC Apr. 5 Sohn *Ex Parte* in PS Docket No. 06-229 and WT Docket Nos. 06-150, 05-211, 96-86”).

280. We seek comment as well on Frontline's view that there is no need to impose any CALEA, E911, or similar obligations on the "E Block" licensee because it believes that retail service providers using the "E Block" spectrum will already be subject to those requirements.⁵⁷¹ Should we adopt any specific requirements applicable to retail service providers or equipment manufacturers in regard to the "E Block?" For example, should some or all public safety equipment operating on an "E Block" built network be capable of accessing satellite communications (including handsets and other mobile or fixed receivers)? Should we require the "E Block" licensee to incorporate satellite-based technology into its network infrastructure?

281. *Network Sharing Agreement.* We note Frontline's view that the proposed "E Block" licensee and a potential national public safety licensee would have strong incentives to reach agreement on suitable terms for a lease and that the Commission should not attempt to adopt detailed rules to implement its proposal but should rely on a requirement that the "E Block" licensee negotiate in good faith.⁵⁷² Frontline proposes that the Commission should leave to the "Network Sharing Agreement" negotiations the definition of "emergency" for purposes of the requirement that the "E Block" licensee provide priority access to affected public safety broadband operations during emergencies.⁵⁷³

282. We tentatively conclude that, if we adopt Frontline's proposal or some similar proposal, we will need to impose conditions on the "E Block" license as well as the national public safety license to deal with the circumstance where the bidder winning the new "E Block" at auction and the national public safety licensee are unable to reach agreement on a Network Sharing Agreement. Successful negotiation of that agreement is a critical first step to achieving the benefits to public safety under the Frontline proposal. We are concerned that under certain circumstances the parties may not be able to reach agreement, which could result in a significant delay in implementation. To avoid this result, we tentatively conclude that the Commission would not grant a license to the bidder winning the "E Block" at auction until the winning bidder files a Network Sharing Agreement with the Commission for approval. We would also condition the national public safety license on the licensee submitting to binding arbitration in the event it cannot reach agreement with the "E Block" winner. If the winning bidder and the national public safety licensee are unable to reach agreement, they would be required to enter into binding arbitration to resolve outstanding issues.

283. We seek comment on this tentative conclusion, and whether imposing such conditions would be an incentive for the parties to reach a suitable and speedy resolution in order to avoid arbitration. If the parties are unable to reach an agreement and thus have to submit to binding arbitration, would this condition then facilitate the ability of the parties to reach such an agreement? We seek comment on whether any particular requirements should be adopted in connection with such conditions, including a requirement that the parties report to the Commission on the status of the negotiations. We also ask commenters to consider whether there are other conditions that should be placed on an "E Block" licensee to ensure that an agreement is reached quickly and in a manner that is satisfactory to public safety, or if there is additional oversight that the Commission should exercise. Should we require that an agreement to be reached by a certain date? Should the Commission require status reports or other periodic reporting from the "E Block" licensee? If we do not adopt a binding arbitration proposal, what should be the consequence for failing to reach agreement in a timely manner, or for otherwise failing to comply with the Network Sharing Agreement requirement? Should the Commission have authority to appoint board members to the governance of the "E Block" licensee?

284. *Bidding Preferences.* We also have serious concerns, based on Frontline's proposed requirements, about whether we should offer any bidding preferences, such as bidding credits, to

⁵⁷¹ See Frontline Mar. 26 Ex Parte in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 at 8.

⁵⁷² *Id.* at 4-5.

⁵⁷³ *Id.* at 6.

applicants for the “E Block” license, based on their status as a small business, or designated entity. In authorizing the Commission to use competitive bidding, Congress mandated that the Commission “ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women [sometimes referred to as “designated entities”] are given the opportunity to participate in the provision of spectrum-based services.”⁵⁷⁴ In addition, Section 309(j)(3)(B) of the Act provides that in establishing eligibility criteria and bidding methodologies, the Commission shall promote “economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women.”⁵⁷⁵ One of the means by which the Commission fulfills this mandate is through the award of bidding credits to small businesses. The Commission stated that it would define eligibility requirements for small businesses on a service-specific basis, taking into account the capital requirements and other characteristics of each particular service in establishing the appropriate threshold.⁵⁷⁶ The Commission has also stated that, while it standardizes many auction rules, the Commission will continue a service-by-service approach when it comes to defining small businesses.⁵⁷⁷

285. The capital requirements for effective use of the proposed nationwide “E Block” license likely will be very high. In the past, the Commission has declined to adopt designated entity provisions for certain services, such as the direct broadcast satellite service and the digital audio radio service, which have extremely high implementation costs.⁵⁷⁸ The Commission reached this conclusion in large part because it was unclear whether small businesses could attract the capital necessary to implement and provide a nationwide service.⁵⁷⁹

286. Our concerns regarding the capital needed to implement a nationwide service are especially acute in this instance because the “E Block” licensee would be responsible for constructing a robust network to meet the needs of critical public safety service providers – and the public – in times of emergency. The public interest would not appear to favor giving applicants a preference when bidding for the “E Block” license based on their limited financial resources, as we do when we offer bidding credits to small businesses, in these circumstances.

287. The proposed restriction on such a licensee’s ability to provide spectrum-based services directly to the public is also of concern when considering whether to offer such benefits. The

⁵⁷⁴ 47 U.S.C. § 309(j)(4)(D).

⁵⁷⁵ 47 U.S.C. § 309(j)(3)(B).

⁵⁷⁶ Implementation of Section 309(j) of the Communications Act—Competitive Bidding, PP Docket No. 93-253, *Second Memorandum Opinion and Order*, 9 FCC Rcd 7245, 7269 ¶ 145 (1994) (*Competitive Bidding Second Memorandum Opinion and Order*); 47 C.F.R. § 1.2110(c)(1).

⁵⁷⁷ Amendment of Part 1 of the Commission’s Rules – Competitive Bidding Procedures, WT Docket No. 97-82, *Third Report and Order and Second Further Notice of Proposed Rule Making*, 13 FCC Rcd 374, 388 ¶ 18 (1997) (“Part 1 Third Report and Order”); 47 C.F.R. § 1.2110 (c)(1).

⁵⁷⁸ Revision of Rules and Policies for the Direct Broadcast Satellite Service, IB Docket No. 95-168, PP Docket No. 93-253, *Report and Order*, 11 FCC Rcd 9712 (1995) (*DBS Auction Order*); Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Band, IB Docket No. 95-91, *Report and Order, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 5754 (1997) (*DARS Auction Order*).

⁵⁷⁹ See *DBS Auction Order*, 11 FCC Rcd at 9799 ¶ 217; *DARS Auction Order*, 12 FCC Rcd at 5824-26 ¶¶ 174-176. We also note that the legislative history of the designated entity provisions of section 309(j) demonstrates that Congress did not necessarily intend the Commission to adopt special measures for designated entities in nationwide services. The House Report to the Omnibus Budget Reconciliation Act of 1993 states that “[t]he characteristics of some services are inherently national in scope, and are therefore ill-suited for small businesses.” H.R. Rep. No. 103-111, 103rd Cong., 1st Sess., at 254.

Commission prohibits licensees from both receiving designated entity benefits and having wholesale agreements for more than fifty percent (50%) of the spectrum capacity of any license that they hold, which are defined as impermissible material relationships.⁵⁸⁰ Frontline proposes that the “E Block” licensee should be required to operate only as a wholesale provider with respect to commercial use of the “E Block” license, *i.e.*, that it must have wholesale agreements for one hundred percent (100%) of its spectrum capacity. In the event that we offered bidding preferences with respect to such an “E Block” license, the existing rule plainly would preclude any licensee that is required to operate only as a wholesale provider from receiving designated entity benefits.

288. When it adopted the current impermissible material relationship rule, the Commission stated that it did so “to ensure that, in accordance with the intent of Congress, every recipient of our designated entity benefits is an entity that uses its licenses to directly provide facilities-based telecommunications services for the benefit of the public.”⁵⁸¹ A party holding the “E Block” license, as proposed by Frontline’s proposal, would not be directly providing facilities-based telecommunications services for the benefit of the public. For all these reasons, we have serious concerns about providing designated entity benefits for the “E Block” license proposed by Frontline, and we seek comment on this issue.

289. *Other Issues.* We seek comment on whether any service specific rules are needed to address what actions the Commission may or must take in the event that the “E Block” licensee encounters financial or other problems that prevent compliance with any of its obligations, regarding build-out or other duties. Frontline contends that the Commission’s general rules regarding reclaiming and re-auctioning the spectrum are sufficient to address this possibility.⁵⁸² We seek comment on whether the particular obligations proposed for the “E Block” would make additional provisions in the public interest. For example, should there be some special process for public safety entities or others to challenge the “E Block” licensee’s compliance with its public safety or wholesale obligations? Should the “E Block” license cancel automatically based on failure to comply with specified obligations? Should the Commission establish an unjust enrichment requirement to be paid in the event the Commission is unable to reclaim the license for any reason upon failure of the “E Block” licensee to comply with its obligations? If so, how should the amount of such a payment be calculated?⁵⁸³ If the Commission were to reclaim the license, could it also hold any network infrastructure built by the licensee in trust for public safety to avoid interruption of service to first responders? Alternatively, should the Commission provide for a rebate of a portion of the net bid amount paid by the “E Block” licensee at auction upon satisfaction of the conditions of the license and, if so, what should be the amount of such rebate? What other enforcement mechanisms might be appropriate?

290. We also seek comment on Frontline’s proposal that the “E Block” licensee be required to operate a wholesale network.⁵⁸⁴ Frontline claims that this requirement would encompass freedom of

⁵⁸⁰ 47 C.F.R. 1.2110(b)(3)(iv)(A).

⁵⁸¹ Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission’s Competitive Bidding Rules and Procedures, *Second Report and Order and Second Further Notice of Proposed Rule Making*, 21 FCC Rcd 4753, 4760 ¶15 (2006).

⁵⁸² Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229 at 8.

⁵⁸³ In this regard, we note that the Commission has collected unjust enrichment obligations, under its existing unjust enrichment rules in section 1.2111, from bankrupt licensees, even where the protections afforded by section 525 of the United States Bankruptcy Code prevented the automatic cancellation of the license for failure to render timely payment pursuant to the Commission’s installment payment rules of section 1.2110(g)(iv). See 47 C.F.R. § 1.2111; 11 U.S.C. § 525; 47 C.F.R. § 1.2110(g)(iv).

⁵⁸⁴ See Frontline Comments in PS Docket No. 06-229 at 29-31; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 16-19. See also Frontline Mar. 26 *Ex Parte* in WT Docket Nos. 06-150 and 06-169 and PS Docket No. 06-229, Attachment (Frontline’s proposed 47 C.F.R. § § 27.16, 27.51).

equipment choice concerning the attachment of devices or multiple devices to the network.⁵⁸⁵ It also states that this proposal would provide non-discriminatory access, and that the “E Block” licensee could not discriminate against any retail service provider,⁵⁸⁶ and would operate “as an open network available on a wholesale basis to a host of innovative service providers.”⁵⁸⁷ We seek comment on these issues. We also seek comment on proposals filed by Media Access Project and the Ad Hoc Public Interest Spectrum Coalition, which support a condition on licenses for at least 30 megahertz of 700 MHz Commercial Services spectrum that would require a licensee to provide “open access,” including the right of a consumer to use any equipment, content, application or service on a non-discriminatory basis.⁵⁸⁸

V. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Analysis

291. Pursuant to the Regulatory Flexibility Act of 1980, as amended (RFA),⁵⁸⁹ the Final Regulatory Flexibility Analysis (FRFA) for the Report and Order is set forth in Appendix C. Although Section 213 of the Consolidated Appropriations Act 2000 provides that the RFA shall not apply to the rules and competitive bidding procedures for frequencies in the 746-806 MHz Band,⁵⁹⁰ we nevertheless believe that it would serve the public interest to analyze the possible significant economic impact of the proposed policy and rule changes in this band on small entities. Accordingly, the FRFA in Appendix C of this Report and Order includes an analysis of this impact in connection with all spectrum that falls within the scope of the Report and Order, including spectrum in the 746-806 MHz Band.

B. Final Paperwork Reduction Act of 1995 Analysis

292. The Report and Order contains modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies are invited to comment on the new information collection requirements contained in this proceeding. Public and agency comments are due sixty days from publication of a summary of the Report and Order in the Federal Register. Comments should address the following: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission’s burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on respondents, including the use of automated collection techniques or other forms of information technology. In addition, the Commission notes that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might “further reduce the information collection burden for small business concerns with fewer than 25 employees.” In this present document, we have assessed the potential effects of the various policy

⁵⁸⁵ *See* Frontline Comments in PS Docket No. 06-229 at 30; Frontline Mar. 6 Comments in WT Docket No. 06-150 at 16-17.

⁵⁸⁶ Frontline Mar. 6 Comments in WT Docket No. 06-150 at 17.

⁵⁸⁷ *Id.* at 18.

⁵⁸⁸ *See* Media Access Project Mar. 22 *Ex Parte* in WT Docket Nos. 05-211 and 06-150 and PS Docket No. 06-229; *Ad Hoc* Public Interest Spectrum Coalition Apr. 5 *Ex Parte* in PS Docket No. 06-229, WT Docket Nos. 06-150, 05-211, 96-86, at 8.

⁵⁸⁹ *See* 5 U.S.C. § 604.

⁵⁹⁰ In particular, this exemption extends to the requirements imposed by Chapter 6 of Title 5, United States Code, Section 3 of the Small Business Act (15 U.S.C. 632) and Sections 3507 and 3512 of Title 44, United States Code. Consolidated Appropriations Act 2000, Pub. L. No. 106-113, 113 Stat. 2502, Appendix E, Sec. 213(a)(4)(A)-(B); *see* 145 Cong. Rec. H12493-94 (Nov. 17, 1999); 47 U.S.C.A. 337 note at Sec. 213(a)(4)(A)-(B).

changes with regard to information collection burdens on small business concerns, and find that there are no results specific to businesses with fewer than 25 employees. We note, however, that Section 213 of the Consolidated Appropriations Act 2000 provides that rules governing frequencies in the 746-806 MHz Band become effective immediately upon publication in the Federal Register without regard to certain sections of the Paperwork Reduction Act.⁵⁹¹ We are therefore not inviting comment on any information collections that concern frequencies in the 746-806 MHz Band.

C. Initial Regulatory Flexibility Analysis

293. As required by the Regulatory Flexibility Act (RFA), *see* 5 U.S.C. 603, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the policies and rules addressed in the Further Notice. The IRFA is set forth in Appendix D. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to the Further Notice, and must have a separate and distinct heading designating them as responses to the IRFA. Although Section 213 of the Consolidated Appropriations Act 2000 provides that the RFA shall not apply to the rules and competitive bidding procedures for frequencies in the 746-806 MHz Band,⁵⁹² we nevertheless believe that it would serve the public interest to analyze the possible significant economic impact of the proposed policy and rule changes in this band on small entities. Accordingly, the IRFA in Appendix C of the Further Notice includes an analysis of (and seeks comment on) this impact in connection with all spectrum that falls within the scope of the Further Notice, including spectrum in the 746-806 MHz Band.

D. Initial Paperwork Reduction Act Analysis of 1995 Analysis

294. This document contains proposed new or modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. Public and agency comments are due 30 days after date of publication in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we seek specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees." In this present document, we have assessed the potential effects of the various proposals with regard to information collection burdens on small business concerns, and find that there are no results specific to businesses with fewer than 25 employees. We note, however, that Section 213 of the Consolidated Appropriations Act 2000 provides that rules governing frequencies in the 746-806 MHz Band become effective immediately upon publication in the Federal Register without regard to certain sections of the Paperwork Reduction Act.⁵⁹³ We are therefore not inviting comment on any information collections that concern frequencies in the 746-806 MHz Band.

⁵⁹¹ *Id.*

⁵⁹² *Id.*

⁵⁹³ *Id.*

E. Other Procedural Matters

1. Ex Parte Presentations

295. The rulemaking shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.⁵⁹⁴ Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and arguments presented generally is required.⁵⁹⁵ Other requirements pertaining to oral and written presentations are set forth in Section 1.1206(b) of the Commission’s rules.⁵⁹⁶

2. Comment Filing Procedures

296. Pursuant to Sections 1.415 and 1.419 of the Commission’s rules,⁵⁹⁷ interested parties may file comments on or before 21 days after publication of the Further Notice in the Federal Register and reply comments regarding the Further Notice may be filed on or before 28 days after publication of the Further Notice in the Federal Register. All filings related to this Further Notice should refer to WT Docket No. 06-150, WT Docket No. 06-169, PS Docket No. 06-229, and WT Docket No. 96-86. Comments may be filed using: (1) the Commission’s Electronic Comment Filing System (ECFS), (2) the Federal Government’s eRulemaking Portal, or (3) by filing paper copies.⁵⁹⁸

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://www.fcc.gov/cgb/ecfs/> or the Federal eRulemaking Portal: <http://www.regulations.gov>. Filers should follow the instructions provided on the website for submitting comments.
 - ECFS filers must transmit one electronic copy of the comments for WT Docket No. 06-150, WT Docket No. 06-169, PS Docket No. 06-229, and WT Docket No. 96-86. In completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and WT Docket No. 06-150, WT Docket No. 06-169, PS Docket No. 06-229, and WT Docket No. 96-86. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions, filers should send an e-mail to ecfs@fcc.gov and include the following words in the body of the message, “get form.” A sample form and directions will be sent in response.
- Paper Filers: Parties who choose to file by paper must file an original and four copies of each filing. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). All filings must be addressed to the Commission’s Secretary, Marlene H. Dortch, Office of the Secretary, Federal Communications Commission, 445 12th Street, S.W., Washington, DC, 20554.
 - The Commission’s contractor will receive hand-delivered or messenger-delivered paper filings for the Commission’s Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, DC 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All

⁵⁹⁴ 47 C.F.R. §§ 1.200 *et. seq.*

⁵⁹⁵ See 47 C.F.R. § 1.1206(b)(2).

⁵⁹⁶ 47 C.F.R. § 1.1206(b).

⁵⁹⁷ 47 C.F.R. §§ 1.415, 1.419.

⁵⁹⁸ See Electronic Filing of Documents in Rulemaking Proceedings, 63 FR 24121 (1998).

hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.

- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail should be addressed to 445 12th Street, S.W., Washington DC 20554.

297. Parties should send a copy of their filings to: Paul D'Ari, Wireless Telecommunications Bureau, 445 12th Street, S.W., Washington, D.C. 20554, or by e-mail to paul.dari@fcc.gov; Linda Chang, Wireless Telecommunications Bureau, 445 12th Street, S.W., Washington, D.C. 20554, or by e-mail to linda.chang@fcc.gov; and Jeff Cohen, Public Safety and Homeland Security Bureau, 445 12th Street, S.W., Washington, D.C. 20554, or by e-mail to jeff.cohen@fcc.gov. Parties shall also serve one copy with the Commission's copy contractor, Best Copy and Printing, Inc. (BCPI), Portals II, Room CY-B402, 445 12th Street, S.W., Washington, D.C. 20554, (202) 488-5300, or via e-mail to fcc@bcpiweb.com.

298. Documents in WT Docket No. 06-150, WT Docket No. 06-169, PS Docket No. 06-229, and WT Docket No. 96-86 will be available for public inspection and copying during business hours at the FCC Reference Information Center, Portals II, Room CY-A257, 445 12th Street, S.W., Washington, D.C. 20554. The documents may also be purchased from BCPI, telephone (202) 488-5300, facsimile (202) 488-5563, TTY (202) 488-5562, e-mail fcc@bcpiweb.com.

3. Accessible Formats

299. To request materials in accessible formats for people with disabilities (Braille, large print, electronic files, audio format), send an e-mail to FCC504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY). Contact the FCC to request reasonable accommodations for filing comments (accessible format documents, sign language interpreters, CARTS, *etc.*) by e-mail: FCC504@fcc.gov; phone: 202-418-0530 (voice), 202-418-0432 (TTY).

VI. ORDERING CLAUSES

300. Accordingly, IT IS ORDERED that pursuant to sections Sections 1, 4(i), 7, 10, 201, 202, 208, 214, 215, 222(d)(4)(A)-(C), 222(f), 222(g), 222(h)(1)(A), 222(h)(4)-(5), 251(e)(3), 301, 303, 307, 308, 309, 310, 311, 315, 316, 317, 324, 331, 332, 336, 337 and 710, of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 157, 160, 201, 202, 208, 214, 215, 222(d)(4)(A)-(C), 222(f), 222(g), 222(h)(1)(A), 222(h)(4)-(5), 251(e)(3), 301, 303, 307, 308, 309, 310, 311, 315, 317, 324, 331, 332, 336, 337, and 610, this REPORT AND ORDER in WT Docket No. 06-150, CC Docket No. 94-102, WT Docket No. 01-309, WT Docket No. 03-264, WT Docket No. 06-169, WT Docket No. 96-86 and PS Docket No. 06-229 IS ADOPTED, and that Part 1, Part 20, Part 27 and Part 90 of the Commission's rules, 47 C.F.R. Part 1, 47 C.F.R. Part 20, 47 C.F.R. Part 27 and 47 C.F.R. Part 90, ARE AMENDED as set forth in Appendix B. The REPORT AND ORDER shall become effective upon publication in the Federal Register subject to OMB approval for new information collection requirements.

301. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this REPORT AND ORDER, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

302. IT IS FURTHER ORDERED that the Commission SHALL SEND a copy of this REPORT AND ORDER in a report to be sent to Congress and the General Accounting Office pursuant to the Congressional Review Act, 5 U.S.C. § 801(a)(1)(A).

303. IT IS FURTHER ORDERED pursuant to sections 1, 2, 4(i), 5(c), 7, 10, 201, 202, 208, 214, 301, 302, 303, 307, 308, 309, 310, 311, 314, 316, 319, 324, 332, 333, 336, 337, 614, 615, and 710 of

the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 155(c), 157, 160, 201, 202, 208, 214, 301, 302, 303, 307, 308, 309, 310, 311, 314, 316, 319, 324, 332, 333, 336, and 337, that this FURTHER NOTICE OF PROPOSED RULEMAKING in WT Docket No. 06-150, CC Docket No. 94-102, WT Docket No. 01-309, WT Docket No. 03-264, WT Docket No. 06-169, WT Docket No. 96-86 and PS Docket No. 06-229 IS ADOPTED. The FURTHER NOTICE OF PROPOSED RULEMAKING shall become effective upon publication in the Federal Register.

304. IT IS FURTHER ORDERED that pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on the FURTHER NOTICE OF PROPOSED RULEMAKING on or before 21 days after publication in the Federal Register and reply comments on or before 28 days after publication in the Federal Register.

305. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this FURTHER NOTICE OF PROPOSED RULEMAKING, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

306. IT IS FURTHER ORDERED that the Commission SHALL SEND a copy of this FURTHER NOTICE OF PROPOSED RULEMAKING in a report to be sent to Congress and the General Accounting Office pursuant to the Congressional Review Act, 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Comments and Reply Comments

**List of Comments and Reply Comments
in the 700 MHz Commercial Services Proceeding
(WT Docket No. 06-150, CC Docket No. 94-102, WT Docket No. 01-39)**

Comments

Access Spectrum LLC, Columbia Capital III, LLC, Pegasus Communications Corporation, and Telcom Ventures, LLC (“Access Spectrum/Pegasus”)
Aloha Partners, L.P. (“Aloha”)
Alltel, Aloha, Blooston, C&W, ConnectME Authority, Corr, Dobson, Leap, Maine Office of Chief Information Officer, MetroPCS, NTCA, Nebraska PSC, North Dakota PSC, RCA, RTG, Union, U.S. Cellular, Vermont et al., Vermont Telephone Company (“Alltel *et al.*”) (filing the “Balanced Consensus Plan”)
AT&T Inc. (“AT&T”)
Blooston Rural Carriers (“Blooston”)
C&W Enterprises (“C&W”)
Cingular Wireless LLC (“Cingular”)
Consumer Federation of America, Consumers Union, and Free Press (“Consumer Federation of America, et al.”)
Corr Wireless Communications, LLC (“Corr”)
Council Tree Communications, Inc. (“Council Tree”)
CTIA – The Wireless Association (“CTIA”)
DIRECTV, Inc. and EchoStar Satellite L.L.C. (“DIRECTV/EchoStar”)
Dobson Communications Corporation (“Dobson”)
Doug Howard and Farooq Javed (“Howard/Javed”)
Frontier Communications (“Frontier”)
Hearing Industries Association (“Hearing Industries Association”)
Hearing Loss Association of America (“Hearing Loss Association”)
Leap Wireless International, Inc. (“Leap”)
MetroPCS Communications, Inc. (“MetroPCS”)
MilkyWay Broadband, LLC (“MilkyWay”)
Motorola, Inc. (“Motorola”)
National Telecommunications Cooperative Association (“NTCA”)
Navajo Nation Telecommunications Regulatory Commission (“Navajo Nation”)
Navini Networks, Inc. (“Navini”)
National Emergency Number Association (“NENA”)
NextWave Broadband Inc. (“NextWave”)
Organization for the Promotion and Advancement of Small Telecommunications Companies (“OPASTCO”)
Paul Milgrom and Karen Wrege (“Milgrom/Wrege”)
Polar Communications (“Polar”)
Qualcomm Incorporated (“Qualcomm”).
Region 24 700 MHz Regional Planning Committee (“Region 24”)
Rural Cellular Association (“RCA”)
Rural Telecommunications Group, Inc. (“RTG”)
Sprint NexTel Corporation (“Sprint NexTel”)
Telecommunications Industry Association (“TIA”)
Tropos Networks (“Tropos”)

Union Telephone Company (“Union”)
 United States Cellular Corporation (“U.S. Cellular”)
 Verizon Wireless (“Verizon Wireless”)
 Vermont Department of Public Service, Vermont Public Service Board, Vermont Office of the Chief Information Officer, North Dakota Public Service Commission, Nebraska Public Service Commission, ConnectME Authority, Maine Office of the Chief Information Officer (“Vermont Department of Public Service, et al.”)

Reply Comments

Alcatel North America (“Alcatel”)
 AllTel Corporation (“AllTel”)
 Aloha Partners, L.P. (“Aloha”)
 Association for Maximum Service Television, Inc. and National Association of Broadcasters (“MSTV/NAB”)
 Association of Public-Safety Communications Officials-International, Inc., International Association of Fire Chiefs, Major Cities Chiefs Association, Major County Sheriffs Association, and National Sheriffs Association (“Public Safety Organizations”)
 AT&T Inc. (“AT&T”)
 Blooston Rural Carriers (“Blooston”)
 Cingular Wireless LLC (“Cingular”)
 Corr Wireless Communications, LLC (“Corr”)
 Council Tree Communications, Inc. (“Council Tree”)
 CTIA – The Wireless Association (“CTIA”)
 Cyren Call Communications Corporation (“Cyren Call”)
 DIRECTV, Inc. and EchoStar Satellite L.L.C. (“DIRECTV/EchoStar”)
 Doug Howard and Farooq Javed (“Howard/Javed”)
 Hearing Industries Association (“Hearing Industries Association”)
 Leap Wireless International, Inc. (“Leap”)
 MetroPCS Communications, Inc. (“MetroPCS”)
 Motorola, Inc. (“Motorola”)
 National Telecommunications Cooperative Association (“NTCA”)
 NextWave Broadband Inc. (“NextWave”)
 Multiple Parties (filing Balanced Consensus Plan) (“Balanced Consensus Plan”)
 Paul Milgrom and Karen Wrege (“Milgrom/Wrege”)
 Qualcomm Incorporated (“Qualcomm”)
 Region 24 700 MHz Regional Planning Committee (“700 MHz Regional Planning Committee”)
 Rural Cellular Association (“RCA”)
 Rural Telecommunications Group, Inc. (“RTG”)
 T-Mobile USA, Inc. (“T-Mobile”)
 Tropos Networks (“Tropos”)
 United States Cellular Corporation (“U.S. Cellular”)
 Verizon Wireless (“Verizon Wireless”)
 Vermont Department of Public Service, Vermont Public Service Board, Vermont Office of the Chief Information Officer, North Dakota Public Service Commission, Nebraska Public Service Commission, ConnectME Authority, Maine Office of the Chief Information Officer (“Vermont Department of Public Service, et al.”)
 Vermont Telephone Company, Inc. (“Vermont Telephone”)
 WiMAX Forum (“WiMAX Forum”)

**List of Comments and Reply Comments in 700 MHz Guard Bands Proceeding
(WT Docket No. 06-169)**

Comments

Access Spectrum, LLC and Pegasus Communications (“Access Spectrum/Pegasus”)
Access Spectrum, LLC and Pegasus Communications/700 MHz Technical Working Group (“700 MHz TWG”)
Association of Public Safety Communications Officials-International (APCO)
Commonwealth of Virginia (“CoVa”)
Critical Infrastructure Communications Coalition (“CICC”)
CTIA – The Wireless Association (“CICC”)
Enterprise Wireless Alliance (“EWA”)
Ericsson Inc. (“Ericsson”)
G. Edward Ryan, II
Gary P. McKelvey
Gregory J. Urban – State of Maryland (“State of Maryland”)
Motorola, Inc. (“Motorola”)
National Public Safety Telecommunications Council (“NPSTC”)
Prince George’s County, Maryland (“Prince George’s County”)
Radiofone Nationwide PCS, L.L.C. (“Radiofone”)
Region 24 700 MHz Regional Planning Committee (“Region 24”)
Verizon Wireless (“Verizon Wireless”)

Reply Comments

Access Spectrum, LLC and Pegasus Communications (“Access Spectrum/Pegasus”)
Access Spectrum, LLC and Pegasus Communications/700 MHz Technical Working Group (“700 MHz TWG”)
Arcadian Networks (“Arcadian”)
Cyren Call Communications Corporation (“Cyren Call”)
Ericsson Inc. (“Ericsson”)
Lucent Technologies, Inc. (“Lucent”)
National Public Safety Telecommunications Council (“NPSTC”)
Northrop Grumman Information Technology (“Northrop Grumman”)
Prince George’s County, Maryland (“Prince George’s County”)
Region 20 RPC, Region 42 RPC, State of Maryland, Commonwealth of Virginia
Region 24 700 MHz Regional Planning Committee (“Region 24”)
Regional Planning Committee 42 (“Region 42”)
Stafford County, VA Sheriff’s Department (“Stafford County”)
United Telecom Council (“UTC”)

**List of Comments and Reply Comments in the 700 MHz Public Safety Proceeding
(WT Docket No. 96-86)**

3G Americas, LLC (“3G Americas”)
Access Spectrum, LLC (“Access Spectrum”)
Alan Bull (“Alan Bull”)
Association of Public Safety Communications Officials-International, Inc. (“APCO”)
California Highway Patrol (“CHP”)
City and County of Denver Colorado (“Denver”)
Columbia Capital III, LLC (“Columbia Capital”)

Cyren Call Communications Corporation (“Cyren Call”)
DataRadio (“DataRadio”)
EADS Public Safety, Inc. (“EADS”)
Enterprise Wireless Alliance (“EWA”)
Ericsson, Inc. (“Ericsson”)
Intel Corporation (“Intel”)
Intelligent Transportation Society of America (“ITS”)
International Association of Chiefs of Police (“IACP”)
International Association of Fire Chiefs (“IAFC”)
Joe Kuran (“Joe Kuran”)
Lockheed Martin Corporation (“Lockheed Martin”)
Lucent Technologies, Inc. (“Lucent”)
M/A-COM, Inc. (“M/A-COM”)
Major Cities Chiefs Association (“MCCA”)
Motorola, Inc. (“Motorola”)
National Association of Regional Planning Committees (“NARPC”)
National Emergency Number Association (“NENA”)
National Public Safety Telecommunications Council (“NPSTC”)
National Sheriffs Association, Major Cities Sheriffs Association (“NSA/MCSA”)
North Carolina State Highway Patrol (“NCSHP”)
Northrop Grumman Information Technology, Inc. (“Northrop Grumman”)
Ohio State-Wide Interoperability Executive Committee (“Ohio SIEC”)
Pegasus Communications Corporation (“Pegasus”)
Pinellas County Emergency Communications (“Pinellas County”)
Qualcomm, Inc. (“Qualcomm”)
Radiofone Nationwide PCS, LLC (“Radiofone”)
Region 12 700 MHz Regional Planning Committee (“Region 12”)
Region 24 700 MHz Regional Planning Committee (“Region 24”)
Region 26 700 MHz Regional Planning Committee (“Region 26”)
Region 39 700 MHz Regional Planning Committee (“Region 39”)
Region 40 700 MHz Regional Planning Committee (“Region 40”)
Region 45 700 MHz Regional Planning Committee (“Region 45”)
Region 49 700 MHz Regional Planning Committee (“Region 49”)
Spectrum Coalition for Public Safety (“Spectrum Coalition”)
Sprint Nextel Corporation (“Sprint Nextel”)
State of California: Department of General Services-Telecommunications Division (“State of California”)
State of Hawaii: Department of Accounting and General Services (“State of Hawaii”)
WiMax Forum (“WiMax Forum”)

APPENDIX B**Rule Changes****Part 1 of Title 47 of the Code of Federal Regulations is amended as follows:**

1. The authority citation for Part 1 continues to read as follows:

AUTHORITY: 47 U.S.C. 151, 154(i), 154(j), 155, 225, 303(r), 309 and 325(e).

2. Section 1.955 is amended by revising paragraph (a)(1) to read as follows:

§ 1.955 Termination of Authorizations

(a) *****

(1) *Expiration.* Authorizations automatically terminate, without specific Commission action, on the expiration date specified therein, unless a timely application for renewal is filed. *See* § 1.949 of this part. No authorization granted under the provisions of this part shall be for a term longer than ten years, except to the extent a longer term is authorized under § 27.13 of Part 27 of this chapter.

3. Section 1.9005 is amended by revising paragraphs (gg) and (hh) and adding paragraph (ii) to read as follows:

§ 1.9005 Included services.

* * * * *

(gg) The Common Carrier Fixed Point-to-Point Microwave Service (part 101 of this chapter);

(hh) The Multipoint Video Distribution and Data Service (part 101 of this chapter); and,

(ii) The 700 MHz Guard Bands Service (part 27 of this chapter).

Part 20 of Title 47 of the Code of Federal Regulations is amended as follows:

4. The authority citation for Part 20 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 160, 201, 251-254, 303, and 332 unless otherwise noted.

5. Section 20.18 is amended by revising paragraph (a) to read as follows:

§ 20.18 911 Service.

(a) *Scope of Section.* The following requirements are only applicable to CMRS providers, excluding mobile satellite service (MSS) operators, to the extent that they (1) offer real-time, two way switched voice service that is interconnected with the public switched network and (2) utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. These requirements are applicable to entities that offer voice service to consumers by purchasing airtime or capacity at wholesale rates from CMRS licensees.

* * * * *

6. Section 20.19 is amended by revising paragraphs (a) and (b) as follows:

§ 20.19 Hearing aid-compatible mobile handsets.

(a) *Scope of Section.* Providers of digital CMRS are subject to hearing aid-compatibility requirements to the extent that they (1) offer real-time, two way switched voice or data service that is interconnected with the public switched network and (2) utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. Such providers are subject to the requirements set forth in this section to the extent that the established technical standard or standards specified in paragraph (b) are applicable to the service provided. This section also applies to the manufacturers of the wireless phones used in delivery of the services specified in this paragraph.

(b) *Technical standard for hearing aid compatibility.* The technical standard set forth in the standard document ANSI C63.19-2001 “American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids, ANSI C63.19-2001” (published October 8, 2001—available for purchase from the American National Standards Institute) is applicable to providers of Broadband Personal Communications Services (part 24, subpart E of this chapter), Cellular Radio Telephone Service (part 22, subpart H of this chapter), and Specialized Mobile Radio Services in the 800 MHz and 900 MHz bands (including in part 980, subpart S of this chapter). A wireless phone used for these services is hearing aid compatible for the purposes of this section if it meets, at a minimum:

* * * * *

Part 27 of Title 47 of the Code of Federal Regulations is amended as follows:

7. The authority citation for Part 27 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

8. The table of contents for Part 27 is amended by revising Subpart F and Subpart G as follows:

* * *

Subpart F – Competitive Bidding Procedures for the 698-806 MHz Band

* * *

Subpart G – Guard Band Service (746-747/776-777 MHz and 762-764/792-794 MHz Bands)

* * * * *

9. Section 27.4 is amended by deleting the definition of Guard Band Manager.

.

10. Section 27.10 is amended by revising the introductory paragraph to read as follows:

§ 27.10 Regulatory status.

The following rules apply concerning the regulatory status in the frequency bands specified

in § 27.5.

11. Section 27.13 is amended by revising paragraph (b) to read as follows:

§ 27.13 License Period.

* * * * *

(b) *698-764 MHz and 776-794 MHz bands.* Initial authorizations for the 698-764 MHz, 747-762 MHz, and 777-792 MHz bands, will extend for a term not to exceed ten years from February 17, 2009, except that initial authorizations for a Part 27 licensee that provides broadcast services, whether exclusively or in combination with other services, will not exceed eight years. Initial authorizations for the 746-747 MHz, 776-777 MHz, 762-764 MHz, and 792-794 MHz bands shall not exceed January 1, 2015. Subsequent license terms shall be for a term not to exceed ten years. Licensees that initiate the provision of a broadcast service, whether exclusively or in combination with other services, may not provide this service for more than eight years or beyond the end of the license term if no broadcast service had been provided, whichever period is shorter in length.

12. Section 27.14 is amended redesignating paragraph (e) as paragraph (f), and by adding new paragraphs (e), (g), (h), (i), and (j) to read as follows:

§ 27.14 Construction requirements; Criteria for renewal.

* * * * *

(e) Comparative renewal proceedings do not apply to WCS licensees holding authorizations for the 698-746 MHz, 747-762 MHz, and 777-792 MHz bands. These licensees must file a renewal application in accordance with the provisions set forth in § 1.949.

13. Section 27.50 is amended by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(9) and (b)(10), respectively, and redesignating paragraphs (c)(2) and (c)(3) as paragraphs (c)(9) and (c)(10), respectively, deleting paragraphs (b)(1), (b)(4), (c)(1), (c)(4), and (c)(5), adding new paragraphs (b)(1) through (b)(8), (b)(11), (b)(12), (c)(1) through (c)(8), and (c)(11) to read as follows:

§ 27.50 Power and antenna height limits.

* * * * *

(b) * * *

(1) Fixed and base stations transmitting a signal in the 746-747 and 762-764 MHz bands must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(2) Fixed and base stations transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(3) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.

(4) Fixed and base stations transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

(5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

(6) Licensees of fixed or base stations transmitting a signal in the 747-762 or 777-792 MHz bands at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b)(8) and §27.55(c).

(7) Licensees seeking to operate a fixed or base station located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz or 777-792 MHz bands at an ERP greater than 1000 watts must:

(i) coordinate in advance with all licensees authorized to operate in the 698-764 MHz and 776-794 MHz bands within 120 kilometers (75 miles) of the base or fixed station;

(ii) coordinate in advance with all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.

(8) Licensees authorized to transmit in the 747-762 or 777-792 MHz bands and intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (b)(6) of this section must provide advanced notice of such operation to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized to operate in the 764-776 MHz and 794-806 MHz bands under Part 90 of this chapter within 75 km of the base or fixed station and all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation

* * * * *

(11) For transmissions in the 746-747 MHz, 762-764 MHz, 776-777 MHz, and 792-794 MHz bands, maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel.

(12) For transmissions in the 747-762 MHz and 777-792 MHz bands, licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of 27.51.

(c) * * *

(1) Fixed and base stations transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.

(3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section.

(4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

(5) Licensees seeking to operate a fixed or base station located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal at an ERP greater than 1000 watts must:

(i) coordinate in advance with all licensees authorized to operate in the 698-764 MHz and 776-794 MHz bands within 120 kilometers (75 miles) of the base or fixed station;

(ii) coordinate in advance with all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.

(6) Licensees of fixed or base stations transmitting a signal at an ERP greater than 1000 watts and greater than 1000 watts/MHz must comply with the provisions of paragraph (c)(8) and §27.55(b), except that licensees of fixed or base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, must comply with the provisions of paragraph (c)(8) and §27.55(b) only if transmitting a signal at an ERP greater than 2000 watts and greater than 2000 watts/MHz.

(7) A licensee authorized to operate in the 710-716, 716-722, or 740-746 MHz bands, or in any unpaired spectrum blocks within the 698-746 MHz band, may operate a fixed or base station at an ERP up to a total of 50 kW within its authorized, 6 MHz spectrum block if the licensee complies with the provisions of §27.55(b). The antenna height for such stations is limited only to the extent required to satisfy the requirements of §27.55(b).

(8) Licensees intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (c)(6) must provide advanced notice of such operation to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized under this part to operate on an adjacent spectrum block within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation.

* * * * *

(11) Licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of 27.51.

Table 1 - Permissible Power and Antenna Heights for Base and Fixed Stations in the 746-747 MHz and 762-764 MHz Bands and for Base and Fixed Stations in the 698-746 MHz, 747-762 MHz, and 777-792 MHz Bands Transmitting a Signal with an Emission Bandwidth of 1 MHz or Less	
Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200

Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

Table 2 – Permissible Power and Antenna Heights for Base and Fixed Stations in the 698-746 MHz, 747-762 MHz, and 777-792 MHz Bands Transmitting a Signal with an Emission Bandwidth of 1 MHz or Less

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150
Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

Table 3 – Permissible Power and Antenna Heights for Base and Fixed Stations in the 698-746 MHz, 747-762 MHz and 777-792 MHz Bands Transmitting a Signal with an Emission Bandwidth Greater than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140

Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

Table 4 – Permissible Power and Antenna Heights for Base and Fixed Stations in the 698-746 MHz, 747-762 MHz and 777-792 MHz Bands Transmitting a Signal with an Emission Bandwidth Greater than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150
Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

14. Section 27.55 is amended by revising paragraph (b) and adding new paragraph (c) to read as follows:

§ 27.55 Power strength limits.

* * * * *

(b) *Power flux density limit for stations operating in the 698-746 MHz bands.* For base and fixed stations operating in the 698-746 MHz band in accordance with the provisions of §27.50(c)(6) of this chapter, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

(c) *Power flux density limit for stations operating in the 747-762 and 777-792 MHz bands.* For base and fixed stations operating in the 747-762 and 777-792 MHz bands in accordance with the provisions of

§27.50(b)(6) of this chapter, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

15. Section 27.70 is added to read as follows:

§ 27.70 Information exchange.

(a) *Prior notification.* Public safety licensees authorized to operate in the 764-776 MHz and 794-806 MHz bands may notify any licensee authorized to operate in the 747-762 or 777-792 MHz bands that they wish to receive prior notification of the activation or modification of the licensee's base or fixed stations in their area. Thereafter, the 747-762 or 777-792 MHz band licensee must provide the following information to the public safety licensee at least 10 business days before a new base or fixed station is activated or an existing base or fixed station is modified:

- (1) Location;
- (2) Effective radiated power;
- (3) Antenna height; and,
- (4) Channels available for use.

(b) *Purpose of prior notification.* The prior coordination of base or fixed stations is for informational purposes only. Public safety licensees are not afforded the right to accept or reject the activation of a proposed base or fixed station or to unilaterally require changes in its operating parameters. The principal purposes of notification are to:

- (1) Allow a public safety licensee to advise the 747-762 or 777-792 MHz band licensee whether it believes a proposed base or fixed station will generate unacceptable interference;
- (2) Permit 747-762 and 777-792 MHz band licensees to make voluntary changes in base or fixed station parameters when a public safety licensee alerts them to possible interference; and,
- (3) Rapidly identify the source if interference is encountered when the base or fixed station is activated.

16. Section 27.601 is amended by deleting paragraph (c), redesignating paragraphs (d) and (e) as paragraphs (c) and (d), respectively, and revising the title, paragraphs (a) and (b), and redesignated paragraph (d) to read as follows:

§ 27.601 Authority and coordination requirements.

(a) Subject to the provisions of §27.2(b), a Guard Band licensee may allow a spectrum lessee, pursuant to a spectrum lease arrangement under part 1, subpart X of this chapter, to construct and operate stations at any available site within the licensed area and on any channel for which the Guard Band licensee is licensed, provided such stations comply with Commission Rules and coordination requirements.

(b) Subject to the provisions of §27.2(b), a Guard Band licensee may allow a spectrum lessee, pursuant to a spectrum lease arrangement under part 1, subpart X of this chapter, to delete, move or change the operating parameters of any of the user's stations that are covered under the Guard Band licensee's authorization without prior Commission approval, provided such stations comply with Commission Rules

and coordination requirements.

(c) *Frequency Coordination.*

(1) A Guard Band licensee, or a spectrum lessee operating pursuant to a spectrum lease arrangement under §§ 1.9030 and 1.9035 of this chapter, must notify Commission-recognized public safety frequency coordinators for the 700 MHz Public Safety band and adjacent-area Guard Band licensees within one business day after the licensee or the spectrum lessee has:

- (i) Coordinated a new station or modification of an existing station; or
- (ii) Filed an application for an individual station license with the Commission.

(2) The notification required in paragraph (c)(1) of this section must include, at a minimum—

- (i) The frequency or frequencies coordinated;
- (ii) Antenna location and height;
- (iii) Type of emission;
- (iv) Effective radiated power;
- (v) A description of the service area, date of coordination, and user name or, in the alternative, a description of the type of operation.

(3) In the event a licensee partitions its service area or disaggregates its spectrum, it is required to submit the notification required in paragraph (c)(1) of this section to other Guard Band licensees in the same geographic area.

(4) Entities coordinated by a Guard Band licensee, or a spectrum lessee operating pursuant to a spectrum lease arrangement under §§ 1.9030 and 1.9035 of this chapter, must wait at least 10 business days after the notification required in paragraph (c)(1) of this section before operating under the license.

(d) Where a deletion, move or change authorized under paragraph (b) of this section constitutes a discontinuance, reduction, or impairment of service under §27.66 or where discontinuance, reduction or impairment of service results from an involuntary act subject to §27.66(a), the licensee must comply with the notification and authorization requirements set forth in that section.

17. Section 27.602 is amended by deleting paragraphs (a), (d), (e), (f), (g) and (h), redesignating paragraphs (b) and (c) as paragraphs (a) and (b), and revising the title, the introductory language, and redesignated paragraphs (a) and (b) to read as follows:

§ 27.602 Lease agreements.

Guard Band licensees may enter into spectrum leasing arrangements under part 1, subpart X of this chapter regarding the use of their licensed spectrum by spectrum lessees, subject to the following conditions:

(a) The spectrum lease agreement between the licensee and the spectrum lessee must specify in detail the operating parameters of the spectrum lessee's system, including power, maximum antenna heights,

frequencies of operation, base station location(s), area(s) of operation, and other parameters specified in Commission rules for the use of spectrum identified in §27.5(b)(1) and (b)(2).

(b) The spectrum lease agreement must require the spectrum lessee to use Commission-approved equipment where appropriate and to complete post-construction proofs of system performance prior to system activation.

18. Section 27.603 is deleted.

19. Section 27.605 is deleted.

20. Section 27.606 is deleted.

21. Section 27.607 is amended by deleting paragraphs (c)(2), redesignating paragraph (c)(1) as paragraph (c)(2), adding a new paragraph (c)(1), and revising the title, the introductory text in paragraph (c), paragraphs (b), (c)(3), (c)(4) and (c)(5), and redesignated paragraph (c)(2) to read as follows:

§ 27.607 Performance requirements and annual reporting requirement.

* * * * *

(b) Guard Band licensee are required to file an annual report providing the Commission with information about the manner in which their spectrum is being utilized. * * *

(c) Guard Band licensees must, at a minimum, include the following information in their annual reports:

- (1) The total number of spectrum lessees;
- (2) The amount of the licensee's spectrum being used pursuant to spectrum lease agreements;
- (3) The nature of the spectrum use of the licensee's customers; and,
- (4) The length of term of each spectrum lease agreement, and whether the agreement is a spectrum manager lease agreement, or a *de facto* transfer lease agreement.

(d) The specific information that licensees will provide and the procedures that they will follow in submitting their annual reports will be announced in a Public Notice issued by the Wireless Telecommunications Bureau.

Part 90 of Title 47 of the Code of Federal Regulations is amended as follows:

22. The authority citation for Part 27 continues to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), and 332(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7).

23. Part 90 is amended by adding new Section 90.555 to read as follows:

§ 90.555 Information exchange.

a) *Prior notification.* Public safety licensees authorized to operate in the 764-776 MHz and 794-806 MHz bands may notify any licensee authorized to operate in the 747-762 or 777-792 MHz bands that they

wish to receive prior notification of the activation or modification of the licensee's base or fixed stations in their area. Thereafter, the 747-762 or 777-792 MHz band licensee must provide the following information to the public safety licensee at least 10 business days before a new base or fixed station is activated or an existing base or fixed station is modified:

- (1) Location;
- (2) Effective radiated power;
- (3) Antenna height; and,
- (4) Channels available for use.

(b) *Purpose of prior notification.* The prior coordination of base or fixed stations is for informational purposes only. Public safety licensees are not afforded the right to accept or reject the activation of a proposed base or fixed station or to unilaterally require changes in its operating parameters. The principal purposes of notification are to:

- (1) Allow a public safety licensee to advise the 747-762 or 777-792 MHz band licensee whether it believes a proposed base or fixed station will generate unacceptable interference;
- (2) Permit 747-762 and 777-792 MHz band licensees to make voluntary changes in base or fixed station parameters when a public safety licensee alerts them to possible interference; and
- (3) Rapidly identify the source if interference is encountered when the base or fixed station is activated.

(c) *Public Safety Information Exchange.*

- (1) Upon request by a 747-762 or 777-792 MHz band licensee, public safety licensees authorized to operate radio systems in the 764-776 and 794-806 MHz bands shall provide the operating parameters of their radio system to the 747-762 or 777-792 MHz band licensee.
- (2) Public safety licensees who perform the information exchange described in this section must notify the appropriate 747-762 or 777-792 MHz band licensees prior to any technical changes to their radio system.

APPENDIX C

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ separate Initial Regulatory Flexibility Analyses (IRFA) were incorporated in the *700 MHz Commercial Services Notice* in WT Docket No. 06-150, CC Docket No. 94-102, and WT Docket No. 01-309; the *700 MHz Guard Band Notice*, WT Docket Nos. 06-169 and 96-86; and the *700 MHz Public Safety Notice*, PS Docket No. 06-229 and WT Docket No. 96-86.² The Commission sought written public comment on the proposals in these dockets, including comment on the IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

2. Although Section 213 of the Consolidated Appropriations Act of 2000 provides that the RFA shall not apply to the rules and competitive bidding procedures for frequencies in the 746-806 MHz Band,⁴ the Commission believes that it would serve the public interest to analyze the possible significant economic impact of the proposed policy and rule changes in this band on small entities. Accordingly, this FRFA contains an analysis of this impact in connection with all spectrum that falls within the scope of this *Report and Order*, including spectrum in the 746-806 MHz Band.

A. Need for, and Objectives of, the Rules

3. In the *Report and Order*, with regard to commercial services, the Commission takes a number of steps to facilitate access to spectrum and the provision of service to consumers, especially those in rural areas, and to simplify and clarify our rules related to the commercial 700 MHz spectrum. The Commission decides that it will auction the Commercial Services licenses across a mix of geographic service area definitions. The Commission also extends the date for initial license terms from January 15, 2015, to the end of the DTV transition on February 17, 2019. With regard to radiated power limits, the Commission generally adopts a power spectral density model, with certain limitations, to provide greater operational flexibility to licensees operating at wider bandwidths, and provides for higher radiated power levels for those 700 MHz licensees operating in rural areas under the current 1 kW per MHz power limit.

¹ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² See Service Rules for the 698-749, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, and Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, WT Docket No. 01-309, *Notice of Proposed Rule Making, Fourth Further Notice of Proposed Rule Making, and Second Further Notice of Proposed Rule Making*, 21 FCC Rcd 9345, 9394 (2006) ("*700 MHz Commercial Services Notice*"); Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket Nos. 06-169 and 96-86, *Notice of Proposed Rule Making*, 21 FCC Rcd 10413, 10440 (2006) ("*700 MHz Guard Bands Notice*"); Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket 06-229, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, *Ninth Notice of Proposed Rule Making*, 21 FCC Rcd 14837, 14853 (2006) ("*700 MHz Public Safety Ninth Notice*").

³ See 5 U.S.C. § 604.

⁴ In particular, this exemption extends to the requirements imposed by Chapter 6 of Title 5, United States Code, Section 3 of the Small Business Act (15 U.S.C. 632) and Sections 3507 and 3512 of Title 44, United States Code. Consolidated Appropriations Act 2000, Pub. L. No. 106-113, 113 Stat. 2502, Appendix E, Sec. 213(a)(4)(A)-(B); see 145 Cong. Rec. H12493-94 (Nov. 17, 1999); 47 U.S.C.A. 337 note at Sec. 213(a)(4)(A)-(B).

The Commission also modifies the 911/E911 rules to remove the service- and band-specific limitations on the applicability of those requirements. Further, the Commission finds that all digital CMRS providers, including providers in the 700 MHz, Advanced Wireless Services, and the Broadband Radio Service/Educational Broadband Service bands, along with manufacturers of handsets capable of providing such services, should be subject to the Commission's hearing aid compatibility requirements to the extent that a service satisfies the scope provision the current rules.

4. The Commission also adopts rules to enhance spectrum usage in the 700 MHz Guard Bands by replacing the Guard Band Manager spectrum leasing regime with the Secondary Markets spectrum leasing policies and rules. Guard bands licensees will have the option of entering into spectrum manager and *de facto* transfer leasing arrangements. By permitting Guard Band licensees and spectrum lessees to choose between the two different options, the Commission affords licensees and spectrum lessees significant flexibility to craft the type of leasing arrangement that best matches their particular needs and the demands of the marketplace.

B. Legal Basis

5. The authority for the actions taken in this *Report and Order* is contained in Sections 1, 4(i), 7, 10, 201, 202, 208, 214, 215, 222(d)(4)(A)-(C), 222(f), 222(g), 222(h)(1)(A), 222(h)(4)-(5), 251(e)(3), 301, 303, 307, 308, 309, 310, 311, 315, 316, 317, 324, 331, 332, 336, 337 and 710, of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 157, 160, 201, 202, 208, 214, 215, 222(d)(4)(A)-(C), 222(f), 222(g), 222(h)(1)(A), 222(h)(4)-(5), 251(e)(3), 301, 303, 307, 308, 309, 310, 311, 315, 317, 324, 331, 332, 336, 337, and 610.

C. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

6. No comments specifically addressed the IRFAs from any of the respective proceedings. We have nonetheless addressed small entity issues found in comments in this FRFA.

D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply

7. The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by the proposed rules, if adopted.⁵ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁶ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁷ A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁸

8. *Governmental Entities.* The term "small governmental jurisdiction" is defined as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."⁹ As of 2002, there were approximately 87,525 governmental jurisdictions in

⁵ 5 U.S.C. § 604(a)(3).

⁶ 5 U.S.C. § 601(6).

⁷ 5 U.S.C. § 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

⁸ 15 U.S.C. § 632.

⁹ 5 U.S.C. § 601(5).

the United States.¹⁰ This number includes 38,967 county governments, municipalities, and townships, of which 37,373 (approximately 95.9%) have populations of fewer than 50,000, and of which 1,594 have populations of 50,000 or more. Thus, the Commission estimates the number of small governmental jurisdictions overall to be 85,931 or fewer.

9. In the following paragraphs, the Commission further describes and estimates the number of small entity licensees that may be affected by the rules the Commission adopts in this *Report and Order*. The rule changes affect Upper 700 MHz and Lower 700 MHz Band licensees in the 698-746, 747-762, and 777-792 MHz spectrum bands, as well as all commercial mobile radio services (CMRS) with respect to 911/E911 requirements adopted in this *Report and Order*.

10. Since this *Report and Order* applies to multiple services, this FRFA analyzes the number of small entities affected on a service-by-service basis. When identifying small entities that could be affected by the Commission's new rules, this FRFA provides information that describes auctions results, including the number of small entities that were winning bidders. However, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily reflect the total number of small entities currently in a particular service. The Commission does not generally require that licensees later provide business size information, except in the context of an assignment or a transfer of control application that involves unjust enrichment issues.

Part 27 Miscellaneous Wireless Communications Services (MWCS)

11. *Wireless Communications Services*. This service can be used for fixed, mobile, radiolocation, and digital audio broadcasting satellite uses in the 2305-2320 MHz and 2345-2360 MHz bands. The Commission defined "small business" for the wireless communications services (WCS) auction as an entity with average gross revenues of \$40 million for each of the three preceding years, and a "very small business" as an entity with average gross revenues of \$15 million for each of the three preceding years.¹¹ The SBA has approved these definitions.¹² The Commission auctioned geographic area licenses in the WCS service. In the auction, which commenced on April 15, 1997 and closed on April 25, 1997, there were seven bidders that won 31 licenses that qualified as very small business entities, and one bidder that won one license that qualified as a small business entity.

12. *700 MHz Guard Band Licenses*. In the *700 MHz Guard Band Order*, the Commission adopted size standards for "small businesses" and "very small businesses" for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.¹³ A small business in this service is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.¹⁴ Additionally, a "very small business" is an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.¹⁵ SBA approval of these

¹⁰ U.S. Census Bureau, Statistical Abstract of the United States: 2006, Section 8, pages 272-273, Tables 415 and 417.

¹¹ Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service (WCS), *Report and Order*, 12 FCC Rcd 10785, 10879 ¶ 194 (1997).

¹² See Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.

¹³ See Service Rules for the 746-764 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Second Report and Order*, 15 FCC Rcd 5299 (2000).

¹⁴ *Id.* at 5343 ¶ 108.

¹⁵ *Id.*

definitions is not required.¹⁶ An auction of 52 Major Economic Area (MEA) licenses commenced on September 6, 2000, and closed on September 21, 2000.¹⁷ Of the 104 licenses auctioned, 96 licenses were sold to nine bidders. Five of these bidders were small businesses that won a total of 26 licenses. A second auction of 700 MHz Guard Band licenses commenced on February 13, 2001, and closed on February 21, 2001. All eight of the licenses auctioned were sold to three bidders. One of these bidders was a small business that won a total of two licenses.¹⁸

13. Upper 700 MHz Band Licenses. The Commission released a *Report and Order* authorizing service in the Upper 700 MHz band.¹⁹ An auction for these licenses, previously scheduled for January 13, 2003, was postponed.²⁰

14. Lower 700 MHz Band Licenses. The Commission adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits.²¹ The Commission has defined a small business as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.²² A very small business is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.²³ Additionally, the Lower 700 MHz Band has a third category of small business status that may be claimed for Metropolitan/Rural Service Area (MSA/RSA) licenses. The third category is entrepreneur, which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$3 million for the preceding three years.²⁴ The SBA has approved these small size standards.²⁵ An auction of 740 licenses (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)) commenced on August 27, 2002, and closed on September 18, 2002. Of the 740 licenses available for auction, 484 licenses were sold to 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business or entrepreneur status and won a total of 329 licenses.²⁶ A second auction commenced on May 28, 2003, and closed on June 13, 2003, and included 256 licenses: 5 EAG licenses

¹⁶ *Id.* At 5343 ¶ 108 n.246 (for the 746-764 MHz and 776-794 MHz bands, the Commission is exempt from 15 U.S.C. § 632, which requires Federal agencies to obtain Small Business Administration approval before adopting small business size standards).

¹⁷ See “700 MHz Guard Bands Auction Closes: Winning Bidders Announced,” *Public Notice*, 15 FCC Rcd 18026 (2000).

¹⁸ See “700 MHz Guard Bands Auctions Closes: Winning Bidders Announced,” *Public Notice*, 16 FCC Rcd 4590 (WTB 2001).

¹⁹ Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules, *Second Memorandum Opinion and Order*, 16 FCC Rcd 1239 (2001).

²⁰ See “Auction of Licenses for 747-762 and 777-792 MHz Bands (Auction No. 31) Is Rescheduled,” *Public Notice*, 16 FCC Rcd 13079 (WTB 2003).

²¹ See Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Report and Order*, 17 FCC Rcd 1022 (2002).

²² *Id.* at 1087-88 ¶ 172.

²³ *Id.*

²⁴ *Id.* at 1088 ¶ 173.

²⁵ See Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated August 10, 1999.

²⁶ See “Lower 700 MHz Band Auction Closes,” *Public Notice*, 17 FCC Rcd 17272 (WTB 2002).

and 476 CMA licenses.²⁷ Seventeen winning bidders claimed small or very small business status and won sixty licenses, and nine winning bidders claimed entrepreneur status and won 154 licenses.²⁸

15. Government Transfer Bands. The Commission adopted small business size standards for the unpaired 1390-1392 MHz, 1670-1675 MHz, and the paired 1392-1395 MHz and 1432-1435 MHz bands.²⁹ Specifically, with respect to these bands, the Commission defined an entity with average annual gross revenues for the three preceding years not exceeding \$40 million as a “small business,” and an entity with average annual gross revenues for the three preceding years not exceeding \$15 million as a “very small business.”³⁰ Correspondingly, the Commission adopted a bidding credit of 15 percent for “small businesses” and a bidding credit of 25 percent for “very small businesses.”³¹ An auction for one license in the 1670-1674 MHz band commenced on April 30, 2003 and closed the same day. One license was awarded. The winning bidder was not a small entity.

16. Advanced Wireless Services. In the *AWS-1 Report and Order*, the Commission adopted rules that affect applicants who wish to provide service in the 1710-1755 MHz and 2110-2155 MHz bands.³² The *AWS-1 Report and Order* defines a “small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million. The *AWS-1 Report and Order* also provides small businesses with a bidding credit of 15 percent and very small businesses with a bidding credit of 25 percent.

17. Broadband Radio Service (formerly Multipoint Distribution Service) and Educational Broadband Service (formerly Instructional Television Fixed Service). Multichannel Multipoint Distribution Service (MMDS) systems, often referred to as “wireless cable,” transmit video programming to subscribers using the microwave frequencies of the Multipoint Distribution Service (MDS) and

²⁷ See “Lower 700 MHz Band Auction Closes,” *Public Notice*, 18 FCC Rcd 11873 (WTB 2003).

²⁸ *Id.*

²⁹ See Amendments to Parts 1, 2, 27 and 90 of the Commission’s Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, AND 2385-2390 MHz Government Transfer Bands, 17 FCC Rcd 9980 (2002) (*Government Transfer Bands Service Rules Report and Order*).

³⁰ See *Service Rules Notice*, 17 FCC Rcd at 2550-51 ¶¶ 144-146. To be consistent with the size standard of “very small business” proposed for the 1427-1432 MHz band for those entities with average gross revenues for the three preceding years not exceeding \$3 million, the *Service Rules Notice* proposed to use the terms “entrepreneur” and “small business” to define entities with average gross revenues for the three preceding years not exceeding \$40 million and \$15 million, respectively. Because the Commission has not adopted a \$3 million size standard for the 1427-1432 MHz band, it instead uses the terms “small business” and “very small business” to define entities with average gross revenues for the three preceding years not exceeding \$40 million and \$15 million, respectively.

³¹ See Reallocation of the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, *Notice of Proposed Rulemaking*, 17 FCC Rcd 2500, 2550-51 ¶¶ 144-146 (*Government Transfer Bands Service Rules Notice*). To be consistent with the size standard of “very small business” proposed for the 1427-1432 MHz band for those entities with average gross revenues for the three preceding years not exceeding \$3 million, the *Government Transfer Bands Service Rules Notice* proposed to use the terms “entrepreneur” and “small business” to define entities with average gross revenues for the three preceding years not exceeding \$40 million and \$15 million, respectively. Because the Commission is not adopting small business size standards for the 1427-1432 MHz band, it instead uses the terms “small business” and “very small business” to define entities with average gross revenues for the three preceding years not exceeding \$40 million and \$15 million, respectively.

³² Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162 (2003) (*AWS-1 Report and Order*).

Instructional Television Fixed Service (ITFS).³³ In its recently issued *BRS/EBS Report and Order* in WT Docket No. 03-66, the Commission comprehensively reviewed its policies and rules relating to the ITFS and MDS services, and replaced the MDS with the Broadband Radio Service and ITFS with the Educational Broadband Service in a new band plan at 2495-2690 MHz.³⁴ In connection with the 1996 MDS auction, the Commission defined “small business” as an entity that, together with its affiliates, has average gross annual revenues that are not more than \$40 million for the preceding three calendar years.³⁵ The SBA has approved of this standard.³⁶ The MDS auction resulted in 67 successful bidders obtaining licensing opportunities for 493 Basic Trading Areas (BTAs).³⁷ Of the 67 auction winners, 61 claimed status as a small business. At this time, the Commission estimates that of the 61 small business MDS auction winners, 48 remain small business licensees. In addition to the 48 small businesses that hold BTA authorizations, there are approximately 392 incumbent MDS licensees that have gross revenues that are not more than \$40 million and are thus considered small entities.³⁸

Additional Wireless Radio Services (WRS)

18. Cellular Licensees. The SBA has developed a small business size standard for small businesses in the category “Cellular and Other Wireless Telecommunications.”³⁹ Under that SBA category, a business is small if it has 1,500 or fewer employees.⁴⁰ For the census category of “Cellular and Other Wireless Telecommunications,” Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.⁴¹ Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.⁴² Thus, under this category and size standard, the majority of firms can be considered small.

19. 220 MHz Radio Service – Phase I Licensees. The 220 MHz service has both Phase I and

³³ Amendment of Parts 21 and 74 of the Commission’s Rules with Regard to Filing Procedures in the Multipoint Distribution Service and in the Instructional Television Fixed Service and Implementation of Section 309(j) of the Communications Act – Competitive Bidding, MM Docket No. 94-131 and PP Docket No. 93-253, *Report and Order*, 10 FCC Rcd 9589, 9593 ¶ 7 (1995) (*MDS Auction R&O*).

³⁴ See Amendment of Parts 1, 21, 73, 74 and 101 of the Commission’s Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 14165 (2004) (*BRS/EBS Report and Order* and *BRS/EBS Further Notice*, respectively).

³⁵ 47 C.F.R. § 21.961(b)(1).

³⁶ See Letter to Margaret Wiener, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Bureau, from Gary Jackson, Assistant Administrator for Size Standards, Small Business Administration, dated Mar. 20, 2003 (noting approval of \$40 million size standard for MDS auction).

³⁷ Basic Trading Areas (BTAs) were designed by Rand McNally and are the geographic areas by which MDS was auctioned and authorized. See *MDS Auction R&O*, 10 FCC Rcd at 9608 ¶ 34.

³⁸ 47 U.S.C. § 309(j). Hundreds of stations were licensed to incumbent MDS licensees prior to implementation of Section 309(j) of the Communications Act of 1934, 47 U.S.C. § 309(j). For these pre-auction licenses, the applicable standard is SBA’s small business size standard for “other telecommunications” (annual receipts of \$12.5 million or less). See 13 C.F.R. § 121.201, NAICS code 517910.

³⁹ 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 517212.

⁴⁰ *Id.*

⁴¹ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Establishment and Firm Size (Including Legal Form of Organization,” Table 5, NAICS code 517212 (issued Nov. 2005).

⁴² *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with “1000 employees or more.”

Phase II licenses. Phase I licensing was conducted by lotteries in 1992 and 1993. There are approximately 1,515 such non-nationwide licensees and four nationwide licensees currently authorized to operate in the 220 MHz Band. The Commission has not developed a definition of small entities specifically applicable to such incumbent 220 MHz Phase I licensees. To estimate the number of such licensees that are small businesses, the Commission applies the small business size standard under the SBA rules applicable to “Cellular and Other Wireless Telecommunications” companies. This category provides that a small business is a wireless company employing no more than 1,500 persons.⁴³ For the census category of “Cellular and Other Wireless Telecommunications,” Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.⁴⁴ Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.⁴⁵ Thus, under this category and size standard, the majority of firms can be considered small.

20. 220 MHz Radio Service – Phase II Licensees. The 220 MHz service has both Phase I and Phase II licenses. The Phase II 220 MHz service is subject to spectrum auctions. In the *220 MHz Third Report and Order*, the Commission adopted a small business size standard for defining “small” and “very small” businesses for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.⁴⁶ This small business standard indicates that a “small business” is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$15 million for the preceding three years.⁴⁷ A “very small business” is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that do not exceed \$3 million for the preceding three years.⁴⁸ The SBA has approved these small size standards.⁴⁹ Auctions of Phase II licenses commenced on September 15, 1998, and closed on October 22, 1998.⁵⁰ In the first auction, 908 licenses were auctioned in three different-sized geographic areas: three nationwide licenses, 30 Regional Economic Area Group (EAG) Licenses, and 875 Economic Area (EA) Licenses. Of the 908 licenses auctioned, 693 were sold.⁵¹ Thirty-nine small businesses won 373 licenses in the first 220 MHz auction. A second auction included 225 licenses: 216 EA licenses and 9 EAG licenses. Fourteen companies claiming small business status won 158 licenses.⁵² A third auction included four licenses: 2 BEA licenses and 2 EAG licenses in the 220 MHz Service. No small or very small business won any of these licenses.⁵³

21. Paging. In the *Paging Second Report and Order*, the Commission adopted a size

⁴³ 13 C.F.R. § 121.201, NAICS code 517212.

⁴⁴ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Establishment and Firm Size (Including Legal Form of Organization,” Table 5, NAICS code 517212 (issued Nov. 2005).

⁴⁵ *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with “1000 employees or more.”

⁴⁶ Amendment of Part 90 of the Commission’s Rules to Provide For the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service, *Third Report and Order*, 12 FCC Rcd 10943, 11068-70 ¶¶ 291-295 (1997).

⁴⁷ *Id.* at 11068 ¶ 291.

⁴⁸ *Id.*

⁴⁹ See Letter to Daniel Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated January 6, 1998.

⁵⁰ See generally “220 MHz Service Auction Closes,” *Public Notice*, 14 FCC Rcd 605 (WTB 1998).

⁵¹ See “FCC Announces It is Prepared to Grant 654 Phase II 220 MHz Licenses After Final Payment is Made,” *Public Notice*, 14 FCC Rcd 1085 (WTB 1999).

⁵² See “Phase II 220 MHz Service Spectrum Auction Closes,” *Public Notice*, 14 FCC Rcd 11218 (WTB 1999).

⁵³ See “Multi-Radio Service Auction Closes,” *Public Notice*, 17 FCC Rcd 1446 (WTB 2002).

standard for “small businesses” for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.⁵⁴ A small business is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$15 million for the preceding three years.⁵⁵ The SBA has approved this definition.⁵⁶ An auction of Metropolitan Economic Area (MEA) licenses commenced on February 24, 2000, and closed on March 2, 2000. Of the 2,499 licenses auctioned, 985 were sold.⁵⁷ Fifty-seven companies claiming small business status won 440 licenses.⁵⁸ An auction of MEA and Economic Area (EA) licenses commenced on October 30, 2001, and closed on December 5, 2001. Of the 15,514 licenses auctioned, 5,323 were sold.⁵⁹ 132 companies claiming small business status purchased 3,724 licenses. A third auction, consisting of 8,874 licenses in each of 175 EAs and 1,328 licenses in all but three of the 51 MEAs commenced on May 13, 2003, and closed on May 28, 2003. Seventy-seven bidders claiming small or very small business status won 2,093 licenses.⁶⁰ Currently, there are approximately 24,000 Private Paging site-specific licenses and 74,000 Common Carrier Paging licenses. According to the Commission’s *Trends in Telephone Service*, 375 such carriers reported that they were engaged in the provision of either paging or “messaging service.”⁶¹ Of these, the Commission estimates that 370 are small, under the SBA-approved small business size standard.⁶² The Commission estimates that the majority of private and common carrier paging providers would qualify as small entities under the SBA definition.

22. *Broadband Personal Communications Service.* The broadband Personal Communications Service (PCS) spectrum is divided into six frequency blocks designated A through F, and the Commission has held auctions for each block. The Commission has created a small business size standard for Blocks C and F as an entity that has average gross revenues of less than \$40 million in the three previous calendar years.⁶³ For Block F, an additional small business size standard for “very small business” was added and is defined as an entity that, together with its affiliates, has average gross revenues of not more than \$15 million for the preceding three calendar years.⁶⁴ These small business size

⁵⁴ Revision of Part 22 and Part 90 of the Commission’s Rules to Facilitate Future Development of Paging Systems, *Second Report and Order*, 12 FCC Rcd 2732, 2811-2812 ¶¶ 178-181 (*Paging Second Report and Order*); see also Revision of Part 22 and Part 90 of the Commission’s Rules to Facilitate Future Development of Paging Systems, *Memorandum Opinion and Order on Reconsideration*, 14 FCC Rcd 10030, 10085-10088 ¶¶ 98-107 (1999).

⁵⁵ *Paging Second Report and Order*, 12 FCC Rcd at 2811 ¶ 179.

⁵⁶ See Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.

⁵⁷ See “929 and 931 MHz Paging Auction Closes,” *Public Notice*, 15 FCC Rcd 4858 (WTB 2000).

⁵⁸ See *id.*

⁵⁹ See “Lower and Upper Paging Band Auction Closes,” *Public Notice*, 16 FCC Rcd 21821 (WTB 2002).

⁶⁰ See “Lower and Upper Paging Bands Auction Closes,” *Public Notice*, 18 FCC Rcd 11154 (WTB 2003).

⁶¹ See *Trends in Telephone Service*, Industry Analysis Division, Wireline Competition Bureau, Table 5.3 (Number of Telecommunications Service Providers by Size of Business) (June 2005).

⁶² 13 C.F.R. § 121.201, NAICS code 517211.

⁶³ See Amendment of Parts 20 and 24 of the Commission’s Rules – Broadband PCS Competitive Bidding and the Commercial Mobile Radio Service Spectrum Cap, *Report and Order*, 11 FCC Rcd 7824, 7850-7852 ¶¶ 57-60 (1996); see also 47 C.F.R. § 24.720(b).

⁶⁴ See Amendment of Parts 20 and 24 of the Commission’s Rules – Broadband PCS Competitive Bidding and the Commercial Mobile Radio Service Spectrum Cap, *Report and Order*, 11 FCC Rcd 7824, 7852 ¶ 60.

standards, in the context of broadband PCS auctions, have been approved by the SBA.⁶⁵ No small businesses within the SBA-approved small business size standards bid successfully for licenses in Blocks A and B. There were 90 winning bidders that qualified as small entities in the C Block auctions. A total of 93 “small” and “very small” business bidders won approximately 40 percent of the 1,479 licenses for Blocks D, E, and F.⁶⁶ On March 23, 1999, the Commission reaucted 155 C, D, E, and F Block licenses; there were 113 small business winning bidders.⁶⁷ On January 26, 2001, the Commission completed the auction of 422 C and F PCS licenses in Auction 35.⁶⁸ Of the 35 winning bidders in this auction, 29 qualified as “small” or “very small” businesses. Subsequent events concerning Auction 35, including judicial and agency determinations, resulted in a total of 163 C and F Block licenses being available for grant.

23. *Narrowband Personal Communications Service.* The Commission held an auction for Narrowband Personal Communications Service (PCS) licenses that commenced on July 25, 1994, and closed on July 29, 1994. A second commenced on October 26, 1994 and closed on November 8, 1994. For purposes of the first two Narrowband PCS auctions, “small businesses” were entities with average gross revenues for the prior three calendar years of \$40 million or less.⁶⁹ Through these auctions, the Commission awarded a total of forty-one licenses, 11 of which were obtained by four small businesses.⁷⁰ To ensure meaningful participation by small business entities in future auctions, the Commission adopted a two-tiered small business size standard in the *Narrowband PCS Second Report and Order*.⁷¹ A “small business” is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than \$40 million.⁷² A “very small business” is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than \$15 million.⁷³ The SBA has approved these small business size standards.⁷⁴ A third auction commenced on October 3, 2001 and closed on October 16, 2001. Here, five bidders won 317 (MTA and nationwide) licenses.⁷⁵ Three of these claimed status as a small or very small entity and won

⁶⁵ See Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.

⁶⁶ FCC News, “Broadband PCS, D, E and F Block Auction Closes,” No. 71744 (rel. January 14, 1997).

⁶⁷ See “C, D, E, and F Block Broadband PCS Auction Closes,” *Public Notice*, 14 FCC Rcd 6688 (WTB 1999).

⁶⁸ See “C and F Block Broadband PCS Auction Closes; Winning Bidders Announced,” *Public Notice*, 16 FCC Rcd 2339 (2001).

⁶⁹ Implementation of Section 309(j) of the Communications Act – Competitive Bidding Narrowband PCS, *Third Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 10 FCC Rcd 175, 196 ¶ 46 (1994).

⁷⁰ See “Announcing the High Bidders in the Auction of ten Nationwide Narrowband PCS Licenses, Winning Bids Total \$617,006,674,” *Public Notice*, PNWL 94-004 (rel. Aug. 2, 1994); “Announcing the High Bidders in the Auction of 30 Regional Narrowband PCS Licenses; Winning Bids Total \$490,901,787,” *Public Notice*, PNWL 94-27 (rel. Nov. 9, 1994).

⁷¹ Amendment of the Commission’s Rules to Establish New Personal Communications Services, Narrowband PCS, *Second Report and Order and Second Further Notice of Proposed Rule Making*, 15 FCC Rcd 10456, 10476 ¶ 40 (2000).

⁷² *Id.*

⁷³ *Id.*

⁷⁴ See Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.

⁷⁵ See “Narrowband PCS Auction Closes,” *Public Notice*, 16 FCC Rcd 18663 (WTB 2001).

311 licenses.

24. *Specialized Mobile Radio.* The Commission awards “small entity” bidding credits in auctions for Specialized Mobile Radio (SMR) geographic area licenses in the 800 MHz and 900 MHz bands to firms that had revenues of no more than \$15 million in each of the three previous calendar years.⁷⁶ The Commission awards “very small entity” bidding credits to firms that had revenues of no more than \$3 million in each of the three previous calendar years.⁷⁷ The SBA has approved these small business size standards for the 900 MHz Service.⁷⁸ The Commission has held auctions for geographic area licenses in the 800 MHz and 900 MHz bands. The 900 MHz SMR auction began on December 5, 1995, and closed on April 15, 1996. Sixty bidders claiming that they qualified as small businesses under the \$15 million size standard won 263 geographic area licenses in the 900 MHz SMR band. The 800 MHz SMR auction for the upper 200 channels began on October 28, 1997, and was completed on December 8, 1997. Ten bidders claiming that they qualified as small businesses under the \$15 million size standard won 38 geographic area licenses for the upper 200 channels in the 800 MHz SMR band.⁷⁹ A second auction for the 800 MHz band was held on January 10, 2002 and closed on January 17, 2002 and included 23 BEA licenses. One bidder claiming small business status won five licenses.⁸⁰

25. The auction of the 1,050 800 MHz SMR geographic area licenses for the General Category channels began on August 16, 2000, and was completed on September 1, 2000. Eleven bidders won 108 geographic area licenses for the General Category channels in the 800 MHz SMR band qualified as small businesses under the \$15 million size standard. In an auction completed on December 5, 2000, a total of 2,800 Economic Area licenses in the lower 80 channels of the 800 MHz SMR service were sold. Of the 22 winning bidders, 19 claimed “small business” status and won 129 licenses. Thus, combining all three auctions, 40 winning bidders for geographic licenses in the 800 MHz SMR band claimed status as small business.

26. In addition, there are numerous incumbent site-by-site SMR licensees and licensees with extended implementation authorizations in the 800 and 900 MHz bands. The Commission does not know how many firms provide 800 MHz or 900 MHz geographic area SMR pursuant to extended implementation authorizations, nor how many of these providers have annual revenues of no more than \$3 million or \$15 million (the special small business size standards), or have no more than 1,500 employees (the generic SBA standard for wireless entities, discussed, *supra*). One firm has over \$15 million in revenues. The Commission assumes, for purposes of this analysis, that all of the remaining existing extended implementation authorizations are held by small entities.

27. *Private Land Mobile Radio.* Private Land Mobile Radio (PLMR) systems serve an essential role in a range of industrial, business, land transportation, and public safety activities. These radios are used by companies of all sizes operating in all U.S. business categories, and are often used in support of the licensee’s primary (non-telecommunications) business operations. The SBA has developed a small business size standard for the economic census category, “Cellular and Other Wireless

⁷⁶ 47 C.F.R. § 90.814(b)(1).

⁷⁷ *Id.*

⁷⁸ See Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated August 10, 1999. The Commission notes that, although a request was also sent to the SBA requesting approval for the small business size standard for 800 MHz, approval is still pending.

⁷⁹ See “Correction to Public Notice DA 96-586 ‘FCC Announces Winning Bidders in the Auction of 1020 Licenses to Provide 900 MHz SMR in Major Trading Areas,’” *Public Notice*, 18 FCC Rcd 18367 (WTB 1996).

⁸⁰ See “Multi-Radio Service Auction Closes,” *Public Notice*, 17 FCC Rcd 1446 (WTB 2002).

Telecommunications," which is any such entity employing no more than 1,500 persons.⁸¹ The Commission does not require PLMR licensees to disclose information about number of employees, so the Commission does not have information that could be used to determine how many PLMR licensees constitute small entities under this definition.

28. Fixed Microwave Services. Fixed microwave services include common carrier,⁸² private-operational fixed,⁸³ and broadcast auxiliary radio services.⁸⁴ Currently, there are approximately 22,015 common carrier fixed licensees and 61,670 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services. The Commission has not yet defined a small business with respect to microwave services. As noted, the SBA has developed a small business size for the broad census category, "Cellular and Other Wireless Telecommunications" companies—that is, an entity with no more than 1,500 persons.⁸⁵ The Commission does not have data specifying the number of these licensees that have more than 1,500 employees, and thus is unable at this time to estimate with greater precision the number of fixed microwave service licensees that would qualify as small business concerns under the SBA's small business size standard. Consequently, the Commission estimates that there are 22,015 or fewer small common carrier fixed licensees and 61,670 or fewer small private operational-fixed licensees and small broadcast auxiliary radio licensees in the microwave services that may be affected by the rules and policies adopted herein. The Commission notes, however, that the common carrier microwave fixed licensee category includes some large entities.

29. 39 GHz Service. The Commission defines "small entity" for 39 GHz licenses as an entity that has average gross revenues of less than \$40 million in the three previous calendar years.⁸⁶ "Very small business" is defined as an entity that, together with its affiliates, has average gross revenues of not more than \$15 million for the preceding three calendar years.⁸⁷ The SBA has approved these definitions.⁸⁸ The auction of the 2,173 39 GHz licenses began on April 12, 2000, and closed on May 8, 2000. The 18 bidders who claimed small business status won 849 licenses.

30. Local Multipoint Distribution Service. An auction of the 986 Local Multipoint Distribution Service (LMDS) licenses began on February 18, 1998, and closed on March 25, 1998. The Commission defined "small entity" for LMDS licenses as an entity that has average gross revenues of less

⁸¹ See 13 C.F.R. § 121.201, NAICS code 517212.

⁸² 47 C.F.R. §§ 101 *et seq.* (formerly, part 21 of the Commission's Rules).

⁸³ Persons eligible under parts 80 and 90 of the Commission's rules can use Private Operational-Fixed Microwave services. See generally 47 C.F.R. parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

⁸⁴ Auxiliary Microwave Service is governed by part 74 of Title 47 of the Commission's Rules. See 47 C.F.R. Part 74. Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

⁸⁵ 13 C.F.R. § 121.201, NAICS code 517212.

⁸⁶ See Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Band, *Report and Order*, 12 FCC Rcd 18600 (1997).

⁸⁷ *Id.*

⁸⁸ See Letter to Margaret Wiener, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, from Hector Barreto, Administrator, Small Business Administration, dated January 18, 2002.

than \$40 million in the three previous calendar years.⁸⁹ An additional classification for “very small business” was added and is defined as an entity that, together with its affiliates, has average gross revenues of not more than \$15 million for the preceding three calendar years.⁹⁰ These regulations defining “small entity” in the context of LMDS auctions have been approved by the SBA.⁹¹ There were 93 winning bidders that qualified as small entities in the LMDS auctions. A total of 93 small and very small business bidders won approximately 277 A Block licenses and 387 B Block licenses. On March 27, 1999, the Commission re-auctioned 161 licenses; there were 32 small and very small business winning bidders that won 119 licenses.

31. 218-219 MHz Service. The first auction of 218-219 MHz (previously referred to as the Interactive and Video Data Service or IVDS) spectrum resulted in 178 entities winning licenses for 594 Metropolitan Statistical Areas (MSAs).⁹² Of the 594 licenses, 567 were won by 167 entities qualifying as a small business. For that auction, the Commission defined a small business as an entity that, together with its affiliates, has no more than a \$6 million net worth and, after federal income taxes (excluding any carry over losses), has no more than \$2 million in annual profits each year for the previous two years.⁹³ For future auctions in the *218-219 MHz Report and Order and Memorandum Opinion and Order*, the Commission defined a small business as an entity that, together with its affiliates and persons or entities that hold interests in such an entity and their affiliates, has average annual gross revenues not exceeding \$15 million for the preceding three years.⁹⁴ A very small business is defined as an entity that, together with its affiliates and persons or entities that holds interests in such an entity and its affiliates, has average annual gross revenues not exceeding \$3 million for the preceding three years.⁹⁵ The SBA has approved of these definitions.⁹⁶ At this time, no additional auction is scheduled.

32. Location and Monitoring Service. Multilateration Location and Monitoring Service (LMS) systems use non-voice radio techniques to determine the location and status of mobile radio units. For purposes of auctioning LMS licenses, the Commission has defined “small business” as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years not exceeding \$15 million.⁹⁷ A “very small business” is defined as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the preceding three years

⁸⁹ See Rulemaking to Amend Parts 1, 2, 21, 25, of the Commission’s Rules to Redesignate the 27.5-29.5 GHz Frequency Band, Reallocate the 29.5-30.5 Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rule Making*, 12 FCC Rcd 12545, 12689-90 ¶ 348 (1997).

⁹⁰ *Id.*

⁹¹ See Letter to Daniel Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated January 6, 1998.

⁹² See “Interactive Video and Data Service (IVDS) Applications Accepted for Filing,” *Public Notice*, 9 FCC Rcd 6227 (1994).

⁹³ Implementation of Section 309(j) of the Communications Act – Competitive Bidding, *Fourth Report and Order*, 9 FCC Rcd 2330 (1994).

⁹⁴ Amendment of Part 95 of the Commission’s Rules to Provide Regulatory Flexibility in the 218-219 MHz Service, *Report and Order and Memorandum Opinion and Order*, 15 FCC Rcd 1497 (1999).

⁹⁵ *Id.*

⁹⁶ See Letter to Daniel Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated January 6, 1998.

⁹⁷ Amendment of Part 90 of the Commission’s Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Second Report and Order*, 13 FCC Rcd 15182, 15192 ¶ 20 (1998); see also 47 C.F.R. § 90.1103

not exceeding \$3 million.⁹⁸ These definitions have been approved by the SBA.⁹⁹ An auction for multilateration LMS licenses commenced on February 23, 1999, and closed on March 5, 1999. Of the 528 licenses auctioned, 289 licenses were sold to four small businesses. In addition, there are numerous site-by-site non-multilateration licensees, and the Commission does not know how many of these providers have annual revenues of no more than \$3 million or \$15 million (the special small business size standards), or have no more than 1,500 employees (the generic SBA standard for wireless entities, discussed *supra*). The Commission assumes, for purposes of this analysis, that all of these licenses are held by small entities.

33. Rural Radiotelephone Service. The Commission uses the SBA small business size standard applicable to cellular and other wireless telecommunication companies, *i.e.*, an entity employing no more than 1,500 persons.¹⁰⁰ There are approximately 1,000 licensees in the Rural Radiotelephone Service, and the Commission estimates that there are 1,000 or fewer small entity licensees in the Rural Radiotelephone Service that may be affected by the rules and policies adopted herein.

34. Air-Ground Radiotelephone Service. The Commission uses the SBA small business size standard applicable to cellular and other wireless telecommunication companies, *i.e.*, an entity employing no more than 1,500 persons.¹⁰¹ There are approximately 100 licensees in the Air-Ground Radiotelephone Service, and the Commission estimates that almost all of them qualify as small entities under the SBA standard.

35. Offshore Radiotelephone Service. This service operates on several ultra high frequency (UHF) TV broadcast channels that are not used for TV broadcasting in the coastal area of the states bordering the Gulf of Mexico. At present, there are approximately 55 licensees in this service. The Commission uses the SBA small business size standard applicable to cellular and other wireless telecommunication companies, *i.e.*, an entity employing no more than 1,500 persons.¹⁰² The Commission is unable at this time to estimate the number of licensees that would qualify as small entities under the SBA standard. The Commission assumes, for purposes of this analysis, that all of the 55 licensees are small entities, as that term is defined under the SBA standard.

36. Multiple Address Systems. Entities using Multiple Address Systems (MAS) spectrum, in general, fall into two categories: (1) those using the spectrum for profit-based uses, and (2) those using the spectrum for private internal uses. With respect to the first category, the Commission defines “small entity” for MAS licenses as an entity that has average gross revenues of less than \$15 million in the three previous calendar years.¹⁰³ “Very small business” is defined as an entity that, together with its affiliates, has average gross revenues of not more than \$3 million for the preceding three calendar years.¹⁰⁴ The SBA has approved of these special small business size standards.¹⁰⁵ The majority of these entities will

⁹⁸ Amendment of Part 90 of the Commission’s Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Second Report and Order*, 13 FCC Rcd at 15192 ¶ 20; *see also* 47 C.F.R. § 90.1103.

⁹⁹ *See* Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated Feb. 22, 1999.

¹⁰⁰ 13 C.F.R. § 121.201, NAICS code 517212.

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *See* Amendment of the Commission’s Rules Regarding Multiple Address Systems, *Report and Order*, 15 FCC Rcd 11956, 12008 ¶ 123 (2000).

¹⁰⁴ *Id.*

¹⁰⁵ *See* Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated June 4, 1999.

most likely be licensed in bands where the Commission has implemented a geographic area licensing approach that would require the use of competitive bidding procedures to resolve mutually exclusive applications. The Commission's licensing database indicates that, as of January 20, 1999, there were a total of 8,670 MAS station authorizations. Of these, 260 authorizations were associated with common carrier service. In addition, an auction for 5,104 MAS licenses in 176 EAs began November 14, 2001, and closed on November 27, 2001.¹⁰⁶ Seven winning bidders claimed status as small or very small businesses and won 611 licenses.

37. With respect to the second category, which consists of entities that use, or seek to use, MAS spectrum to accommodate their own internal communications needs, MAS serves an essential role in a range of industrial, safety, business, and land transportation activities. MAS radios are used by companies of all sizes, operating in virtually all U.S. business categories, and by all types of public safety entities. As noted, the SBA has developed a small business size standard for the broad economic census category, "Cellular and Other Wireless Telecommunications," which is any such entity employing no more than 1,500 persons.¹⁰⁷ The Commission's licensing database indicates that, as of January 20, 1999, of the 8,670 total MAS station authorizations, 8,410 authorizations were for private radio service, and of these, 1,433 were for private land mobile radio service.

38. Incumbent 24 GHz Licensees. The rules at issue could affect incumbent licensees who were relocated to the 24 GHz band from the 18 GHz band, and applicants who wish to provide services in the 24 GHz band. As noted, the SBA has developed a small business size standard for the broad economic census category, "Cellular and Other Wireless Telecommunications," which is any such entity employing no more than 1,500 persons.¹⁰⁸ The Commission believes that there are only two licensees in the 24 GHz band that were relocated from the 18 GHz band, Teligent¹⁰⁹ and TRW, Inc. The Commission understands that Teligent and its related companies have less than 1,500 employees, though this may change in the future. TRW is not a small entity. Thus, only one incumbent licensee in the 24 GHz band is a small business entity.

39. Future 24 GHz Licensees. With respect to new applicants in the 24 GHz band, the Commission has defined "small business" as an entity that, together with controlling interests and affiliates, has average annual gross revenues for the three preceding years not exceeding \$15 million.¹¹⁰ "Very small business" in the 24 GHz band is defined as an entity that, together with controlling interests and affiliates, has average gross revenues not exceeding \$3 million for the preceding three years.¹¹¹ The SBA has approved these size standards. At this time, no additional auction is scheduled.

40. Cable and Other Program Distribution. The SBA has developed a small business size standard for Cable and Other Program Distribution, which is: all such firms having \$13.5 million or less in annual receipts.¹¹² According to Census Bureau data for 2002, there were a total of 1,191 firms in this

¹⁰⁶ See "Multiple Address Systems Spectrum Auction Closes," *Public Notice*, 16 FCC Rcd 21011 (2001).

¹⁰⁷ See 13 C.F.R. § 121.201, NAICS code 517212.

¹⁰⁸ See *id.*

¹⁰⁹ Teligent acquired the Digital Electronic Message Service (DEMS) licenses of FirstMark, the only licensee other than TRW in the 24 GHz band whose license has been modified to require relocation to the 24 GHz band.

¹¹⁰ Amendments to Parts 1, 2, 87 and 101 of the Commission's Rules To License Fixed Services at 24 GHz, *Report and Order*, 15 FCC Rcd 16934, 16967 ¶ 77 (2000) (24 GHz Report and Order); see also 47 C.F.R. § 101.538(a)(2).

¹¹¹ 24 GHz Report and Order, 15 FCC Rcd at 16967 ¶ 77; see also 47 C.F.R. § 101.538(a)(1).

¹¹² 13 C.F.R. § 121.201, NAICS code 517510.

category that operated for the entire year.¹¹³ Of this total, 1,087 firms had annual receipts of under \$10 million, and 43 firms had receipts of \$10 million or more but less than \$25 million.¹¹⁴ Thus, under this size standard, the majority of firms can be considered small.

41. Cable Television Relay Service. This service includes transmitters generally used to relay cable programming within cable television system distribution systems. The Census Bureau has defined a category of Cable and Other Program Distribution as follows: “This industry comprises establishments primarily engaged as third-party distribution systems for broadcast programming. The establishments of this industry deliver visual, aural, or textual programming received from cable networks, local television stations, or radio networks to consumers via cable or direct-to-home satellite systems on a subscription or fee basis. These establishments do not generally originate programming material.”¹¹⁵ The SBA has developed a small business size standard for Cable and Other Program Distribution, which is: all such firms having \$13.5 million or less in annual receipts.¹¹⁶ According to Census Bureau data for 2002, there were a total of 1,191 firms in this category that operated for the entire year.¹¹⁷ Of this total, 1,087 firms had annual receipts of under \$10 million, and 43 firms had receipts of \$10 million or more but less than \$25 million.¹¹⁸ Thus, under this size standard, the majority of firms can be considered small.

42. Cable Companies and Systems. The Commission has also developed its own small business size standards, for the purpose of cable rate regulation. Under the Commission’s rules, a “small cable company” is one serving 400,000 or fewer subscribers, nationwide.¹¹⁹ Industry data indicate that, of 1,076 cable operators nationwide, all but eleven are small under this size standard.¹²⁰ In addition, under the Commission’s rules, a “small system” is a cable system serving 15,000 or fewer subscribers.¹²¹ Industry data indicate that, of 7,208 systems nationwide, 6,139 systems have under 10,000 subscribers, and an additional 379 systems have 10,000-19,999 subscribers.¹²² Thus, under this second size standard, most cable systems are small.

43. Cable System Operators. The Communications Act of 1934, as amended, also contains a size standard for small cable system operators, which is “a cable operator that, directly or through an affiliate, serves in the aggregate fewer than 1 percent of all subscribers in the United States and is not

¹¹³ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, Table 4, Receipts Size of Firms for the United States: 2002, NAICS code 517510 (issued November 2005).

¹¹⁴ *Id.* An additional 61 firms had annual receipts of \$25 million or more.

¹¹⁵ U.S. Census Bureau, 2002 NAICS Definitions, “517510 Cable and Other Program Distribution”; <http://www.census.gov/epcd/naics02/def/NDEF517.HTM>.

¹¹⁶ 13 C.F.R. § 121.201, NAICS code 517510.

¹¹⁷ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, Table 4, Receipts Size of Firms for the United States: 2002, NAICS code 517510 (issued November 2005).

¹¹⁸ *Id.* An additional 61 firms had annual receipts of \$25 million or more.

¹¹⁹ 47 C.F.R. § 76.901(e). The Commission determined that this size standard equates approximately to a size standard of \$100 million or less in annual revenues. *Implementation of Sections of the 1992 Cable Act: Rate Regulation*, Sixth Report and Order and Eleventh Order on Reconsideration, 10 FCC Rcd 7393, 7408 (1995).

¹²⁰ These data are derived from: R.R. Bowker, *Broadcasting & Cable Yearbook 2006*, “Top 25 Cable/Satellite Operators,” pages A-8 & C-2 (data current as of June 30, 2005); Warren Communications News, *Television & Cable Factbook 2006*, “Ownership of Cable Systems in the United States,” pages D-1805 to D-1857.

¹²¹ 47 C.F.R. § 76.901(c).

¹²² Warren Communications News, *Television & Cable Factbook 2006*, “U.S. Cable Systems by Subscriber Size,” page F-2 (data current as of Oct. 2005). The data do not include 718 systems for which classifying data were not available.

affiliated with any entity or entities whose gross annual revenues in the aggregate exceed \$250,000,000.”¹²³ The Commission has determined that an operator serving fewer than 677,000 subscribers shall be deemed a small operator, if its annual revenues, when combined with the total annual revenues of all its affiliates, do not exceed \$250 million in the aggregate.¹²⁴ Industry data indicate that, of 1,076 cable operators nationwide, all but ten are small under this size standard.¹²⁵ The Commission neither requests nor collects information on whether cable system operators are affiliated with entities whose gross annual revenues exceed \$250 million,¹²⁶ and therefore it is unable to estimate more accurately the number of cable system operators that would qualify as small under this size standard.

44. Multichannel Video Distribution and Data Service. Multichannel Video Distribution and Data Service (MVDDS) is a terrestrial fixed microwave service operating in the 12.2-12.7 GHz band. Licenses in this service were auctioned in January 2004, with 10 winning bidders for 192 licenses. Eight of these 10 winning bidders claimed small businesses status for 144 of these licenses.¹²⁷

45. Amateur Radio Service. These licensees are believed to be individuals, and therefore are not small entities.

46. Aviation and Marine Services. Small businesses in the aviation and marine radio services use a very high frequency (VHF) marine or aircraft radio and, as appropriate, an emergency position-indicating radio beacon (and/or radar) or an emergency locator transmitter. The Commission has not developed a small business size standard specifically applicable to these small businesses. As noted, the SBA has developed a small business size standard for the broad economic census category, “Cellular and Other Wireless Telecommunications,” which is any such entity employing no more than 1,500 persons.¹²⁸ Most applicants for recreational licenses are individuals. Approximately 581,000 ship station licensees and 131,000 aircraft station licensees operate domestically and are not subject to the radio carriage requirements of any statute or treaty. For purposes of the Commission’s evaluations in this analysis, the Commission estimates that there are up to approximately 712,000 licensees that are small businesses (or individuals) under the SBA standard. In addition, between December 3, 1998 and December 14, 1998, the Commission held an auction of 42 VHF Public Coast licenses in the 157.1875-157.4500 MHz (ship transmit) and 161.775-162.0125 MHz (coast transmit) bands. For purposes of the auction, the Commission defined a “small” business as an entity that, together with controlling interests and affiliates, has average gross revenues for the preceding three years not to exceed \$15 million dollars. In addition, a “very small” business is one that, together with controlling interests and affiliates, has average gross revenues for the preceding three years not to exceed \$3 million dollars.¹²⁹ There are approximately 10,672 licensees in the Marine Coast Service, and the Commission estimates that almost all of them qualify as “small” businesses under the above special small business size standards.

¹²³ 47 U.S.C. § 543(m)(2); see 47 C.F.R. § 76.901(f) and nn. 1-3.

¹²⁴ 47 C.F.R. § 76.901(f); see Public Notice, *FCC Announces New Subscriber Count for the Definition of Small Cable Operator*, DA 01-158 (Cable Services Bureau, Jan. 24, 2001).

¹²⁵ These data are derived from: R.R. Bowker, *Broadcasting & Cable Yearbook 2006*, “Top 25 Cable/Satellite Operators,” pages A-8 & C-2 (data current as of June 30, 2005); Warren Communications News, *Television & Cable Factbook 2006*, “Ownership of Cable Systems in the United States,” pages D-1805 to D-1857.

¹²⁶ The Commission does receive such information on a case-by-case basis if a cable operator appeals a local franchise authority’s finding that the operator does not qualify as a small cable operator pursuant to § 76.901(f) of the Commission’s rules. See 47 C.F.R. § 76.909(b).

¹²⁷ “Multichannel Video Distribution and Data Service Auction Closes,” *Public Notice*, DA 04-215 (Feb. 2, 2004).

¹²⁸ 13 C.F.R. § 121.201, NAICS code 517212.

¹²⁹ Amendment of the Commission’s Rules Concerning Maritime Communications, *Third Report and Order and Memorandum Opinion and Order*, 13 FCC Rcd 19853 (1998).

47. *Personal Radio Services.* Personal radio services provide short-range, low power radio for personal communications, radio signaling, and business communications not provided for in other services. The Personal Radio Services include spectrum licensed under Part 95 of the rules.¹³⁰ These services include Citizen Band Radio Service (CB), General Mobile Radio Service (GMRS), Radio Control Radio Service (R/C), Family Radio Service (FRS), Wireless Medical Telemetry Service (WMTS), Medical Implant Communications Service (MICS), Low Power Radio Service (LPRS), and Multi-Use Radio Service (MURS).¹³¹ There are a variety of methods used to license the spectrum in these rule parts, from licensing by rule, to conditioning operation on successful completion of a required test, to site-based licensing, to geographic area licensing. Under the RFA, the Commission is required to make a determination of which small entities are directly affected by the rules being adopted. Since all such entities are wireless, the Commission applies the small business size standard “Cellular and Other Wireless Telecommunications,” pursuant to which a small entity is defined as employing 1,500 or fewer persons.¹³² Many of the licensees in these services are individuals, and thus are not small entities. In addition, due to the mostly unlicensed and shared nature of the spectrum utilized in many of these services, the Commission lacks direct information upon which to base an estimation of the number of small entities under an SBA definition that might be directly affected by the proposed rules.

48. Despite the paucity, or in some instances, total absence, of information about their status as licensees or regulatees or the number of operators in each such service, users of spectrum in these services are listed here as a matter of Commission discretion in order to fulfill the mandate imposed on the Commission by the RFA to regulate small business entities with an understanding towards preventing the possible differential and adverse impact of the Commission’s rules on smaller entities. Further, the listing of such entities, despite their indeterminate status, should provide them with fair and adequate notice of the possible impact of the instant proposals.

49. *Public Safety Radio Licensees.* As a general matter, public safety radio licensees include police, fire, local government, forestry conservation, highway maintenance, and emergency medical services.¹³³ The SBA rules contain a small business size standard for “Cellular and Other Wireless Telecommunications,” which encompass business entities engaged in wireless communications

¹³⁰ 47 C.F.R. Part 90.

¹³¹ The Citizens Band Radio Service, General Mobile Radio Service, Radio Control Radio Service, Family Radio Service, Wireless Medical Telemetry Service, Medical Implant Communications Service, Low Power Radio Service, and Multi-Use Radio Service are governed by Subpart D, Subpart A, Subpart C, Subpart B, Subpart H, Subpart I, Subpart G, and Subpart J, respectively, of Part 95 of the Commission’s rules. *See generally* 47 C.F.R. Part 95.

¹³² 13 C.F.R. § 121.201, NAICS Code 517212.

¹³³ *See* subparts A and B of Part 90 of the Commission's Rules, 47 C.F.R. §§ 90.1-90.22. Police licensees include 26,608 licensees that serve state, county, and municipal enforcement through telephony (voice), telegraphy (code), and teletype and facsimile (printed material). Fire licensees include 22,677 licensees comprised of private volunteer or professional fire companies, as well as units under governmental control. Public Safety Radio Pool licensees also include 40,512 licensees that are state, county, or municipal entities that use radio for official purposes. There are also 7,325 forestry service licensees comprised of licensees from state departments of conservation and private forest organizations that set up communications networks among fire lookout towers and ground crews. The 9,480 state and local governments are highway maintenance licensees that provide emergency and routine communications to aid other public safety services to keep main roads safe for vehicular traffic. Emergency medical licensees (1,460) use these channels for emergency medical service communications related to the delivery of emergency medical treatment. Another 19,478 licensees include medical services, rescue organizations, veterinarians, persons with disabilities, disaster relief organizations, school buses, beach patrols, establishments in isolated areas, communications standby facilities, and emergency repair of public communications facilities.

employing no more than 1,500 persons.¹³⁴ According to Census Bureau data for 2002, in this category there was a total of 8,863 firms that operated for the entire year.¹³⁵ Of this total, 401 firms had 100 or more employees, and the remainder had fewer than 100 employees.¹³⁶ With respect to local governments, in particular, since many governmental entities as well as private businesses comprise the licensees for these services, the Commission includes under public safety services the number of government entities affected.

50. Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”¹³⁷ The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is: all such firms having 750 or fewer employees.¹³⁸ According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.¹³⁹ Of this total, 1,010 had employment of under 500, and an additional 13 had employment of 500 to 999.¹⁴⁰ Thus, under this size standard, the majority of firms can be considered small.

E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

51. The projected reporting, recordkeeping, and other compliance requirements resulting from the Report and Order will apply to all entities in the same manner. The Commission believes that applying the same rules equally to all entities promotes fairness. The Commission does not believe that the costs and/or administrative burdens associated with the rules will unduly burden small entities. The revisions the Commission adopts should benefit small entities by giving them more information, more flexibility, and more options for gaining access to valuable wireless spectrum.

52. Renewal Procedures. In this *Report and Order*, the Commission revises Section 27.14 of the rules to eliminate the filing of competing applications at the time of the renewal of 700 MHz licenses. This rule change will relieve all licensees, including small businesses that hold or will hold licenses in the

¹³⁴ See 13 C.F.R. § 121.201 (NAICS code 517212); U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Employment Size of Establishments for the United States: 2002,” Table 2, NAICS code 517212.

¹³⁵ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Employment Size of Establishments for the United States: 2002,” Table 2, NAICS code 517212.

¹³⁶ *Id.*

¹³⁷ U.S. Census Bureau, 2002 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

¹³⁸ 13 C.F.R. § 121.201, NAICS code 334220.

¹³⁹ U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); <http://factfinder.census.gov>. The number of “establishments” is a less helpful indicator of small business prevalence in this context than would be the number of “firms” or “companies,” because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

¹⁴⁰ *Id.* An additional 18 establishments had employment of 1,000 or more.

700 MHz Band the burden of possibly facing a comparative hearing. The *Report and Order* also clarifies that within the renewal context, all licensees must make a substantial service showing and demonstrate that they have substantially complied with the Commission's rules, policies, and the Communications Act of 1934, as amended.¹⁴¹ This requirement is distinct from the performance requirements that the Commission seeks comment on in the *Further Notice*.

53. 911/E911. There is no general reporting or recordkeeping requirements for 911/E911 compliance. The 911/E911 obligations established in Section 20.18 of our rules, however, are extended to cover all commercial mobile radio services (CMRS), including services licensed in the 700 MHz Commercial Services Band and the AWS-1 bands, to the same extent as they apply to wireless services currently listed in the scope provision of Section 20.18. The Commission will continue, however, to exclude MSS from Section 20.18 in conformity with the Commission's decision in the *E911 Scope Order*.¹⁴² All other CMRS providers must comply with the 911/E911 requirements to the extent that they offer real-time, two way switched voice service that is interconnected with the public switched network and utilize an in-network-switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls.¹⁴³ The Commission finds that this extension of 911/E911 requirements, while substantial for small carriers, is justified by the interest in competitive neutrality as well as by the critical public safety benefits of 911/E911. To the extent that special circumstances arise in particular situations where compliance may not be technically or economically feasible, waiver relief is available on a case-by-case basis. In addition, to the extent that carriers pursue a handset-based compliance solution, implementation should be easier than in previous 911/E911 compliance instances involving other services. Given that the 911/E911 requirements in Part 27 will be imposed prior to the commencement of services in the 700 MHz band, all of the subscribers to the new services will have compliant handsets from the commencement of service. Small carriers will therefore not have the complication of replacing phones that lack 911/E911 capability.

54. Public Safety Notification. In this *Report and Order*, the Commission takes steps to address potential intermodulation ("IM") to public safety operations in the 700 MHz Band. Specifically, as the Commission did with respect to 800 MHz ESMR and Cellular licensees,¹⁴⁴ the Commission will require 700 MHz Commercial Services Band licensees, upon request from a 700 MHz public safety entity, to provide to that entity information about the location and parameters of any stations they plan to activate in the public safety entity's area of operation.¹⁴⁵ The Commission will also require, as it did in

¹⁴¹ See 47 C.F.R. § 27.14 (2006).

¹⁴² The Commission initially excluded MSS from § 20.18 in the *E911 Report and Order*. See Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 18676, 18718 ¶ 83 (1996) (*E911 Report and Order*). In the *E911 Scope Order*, upon revisiting the issue, the Commission recognized that MSS operators continued to face unique difficulties in implementing 911 and E911 obligations, and therefore declined to apply the obligations of § 20.18 and instead imposed a separate, limited 911 requirement specifically for MSS, including a requirement to establish emergency call centers. See Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket 94-102, IB Docket No. 99-67, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 25340, 25347-57 ¶¶ 20-39 (2003) ("*E911 Scope Order*").

¹⁴³ 47 C.F.R. § 20.18(a).

¹⁴⁴ See 47 C.F.R. § 90.675.

¹⁴⁵ As per Section 90.675, this would include information about the 700 MHz station's location, effective radiated power, antenna height, and channels available for use. 47 C.F.R. § 90.675. Also, as per Section 90.675, Public Safety licensees will not be afforded the right to accept or reject the activation of a proposed 700 MHz station or to unilaterally require changes to the station's operating parameters. We note as well that 700 MHz licensees may regard their operating parameters as proprietary and if so, we encourage such licensees to use non-disclosure agreement whereby third parties will not be given access to such information. Failing that, the affected parties could (continued....)

Section 90.675, public safety licensees to provide, upon request of a 700 MHz Commercial Services Band licensee, the operating parameters of their radio systems.¹⁴⁶ As indicated in the *800 MHz Report and Order*, these actions can both help prevent potential interference from occurring and help identify possible sources of interference more rapidly, if interference were to occur.¹⁴⁷ It is not anticipated that it will be onerous for small businesses to come into compliance with this requirement, which is triggered only upon a request from a public safety entity. The information to be reported is of a type that the licensee will likely have readily available.

55. Application of Secondary Markets Spectrum Leasing Policies and Rules to the Guard Bands. Although the *Report and Order* replaces the Guard Band Manager spectrum leasing regime with the Secondary Markets spectrum leasing policies and rules, it sustains the requirements that applied to the Guard Band Manager regime with respect to the necessity to file annual reports with the Commission on spectrum use, as well as mandatory coordination with public safety entities for all uses of spectrum including that procured through leasing arrangements. The *Report and Order* also eliminates restrictions that had prevented Guard Band licensees from using their spectrum as system operators, and from leasing any more than 49.9 percent of their spectrum to affiliates.

F. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

56. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include (among others) the following four alternatives: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.¹⁴⁸

57. In the *700 MHz Commercial Services Notice*, the Commission invited comment on extending the license terms of 700 MHz Band licenses to an expiration date beyond 2015 in order to afford licensees a sufficient period of time for deployment of new 700 MHz Band services once the DTV transition is complete. In addition, the *Notice* sought comment on whether the power limits in the existing rules for the 700 MHz Band spectrum should be revised. Finally, the Commission sought comment on its tentative conclusion that services provided in the 700 MHz Band, and in other bands

(Continued from previous page) _____

seek a protective order from the Commission. See Digital Output Protection Technology and Recording Method Certifications, *Order*, 19 FCC Rcd 4735 (2004). See also 47 C.F.R. §§ 0.457, 0.459. We also encourage, but do not require, that such matters be submitted to arbitration, mediation, or other alternative dispute resolution mechanisms.

¹⁴⁶ Public Safety licensees will also be required to provide information about any technical changes they plan to make to their systems.

¹⁴⁷ See Improving Public Safety Communications in the 800 MHz Band, Consolidating the 800 and 900 MHz Industrial/Land Transportation and Business Pool Channels, Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, Petition for Rule Making of the Wireless Information Networks Forum Concerning the Unlicensed Personal Communications Service, Petition for Rule Making of UT Starcom, Inc., Concerning the Unlicensed Personal Communications Service, Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for use by the Mobile Satellite Service, WT Docket 02-55, ET Docket Nos. 00-258 and 95-18, RM-9498, RM-10024, *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, 19 FCC Rcd 14969, 15038-39 ¶ 125 (2004) ("*800 MHz Report and Order*") ("if the characteristics of a proposed new cell are known in advance, it is possible to analyze the cell's potential for interference and make any necessary revisions to cell parameters before the cell is activated"), 15039 ¶ 127.

¹⁴⁸ 5 U.S.C. § 603(c).

subject to Part 27 of the rules such as AWS-1, should be subject to E911 and hearing aid-compatibility requirements to the same extent that such services would be covered if provided in other bands, and on whether such requirements should be extended to all similar wireless services.

58. Small Geographic Service Areas. A number of small and rural service providers, as well as a several different coalitions of small, regional, and rural carriers proposed a mix of service areas that would include 12 REAGs, 176 EAs, and 734 CMAs, instead of just six EAGs. Several national carriers filed comments in support of leaving the EAG pattern in place. Separate comments were also received seeking a nationwide license and license areas smaller than CMAs.

59. The Commission concluded that providing a mix of CMAs, EAs, and REAGs licenses in the 700 MHz Commercial Services spectrum will be an effective means of providing increased access to spectrum, especially in rural areas, while simultaneously meeting other Commission goals. The Commission agrees with those commenters who observe that a revised mix of smaller license sizes would provide a more balanced set of initial licensing opportunities at this time and make available more licenses to match the needs of different potential users.¹⁴⁹ The most common recommendation made to the Commission by small and rural providers was that additional licenses be made available based on small geographic service areas.¹⁵⁰ Some of these commenters asserted in particular that the use of small geographic license areas provides an incentive for licensees to serve more rural communities, whereas licensing by large geographic license areas may allow licensees to meet their performance requirements only by serving the largest urban markets.¹⁵¹

60. Power Limits and Public Safety Notification. In this *Report and Order*, the Commission takes steps to address potential intermodulation ("IM") to public safety operations in the 700 MHz band in a manner that minimizes the impact on commercial licensees in the Upper 700 MHz Band, including small businesses with commercial operations in this band. The Commission declines to impose any technical restrictions on Upper 700 MHz Commercial Services Band licensees to address potential IM interference to 700 MHz public safety operations. The Commission will, however, require Upper 700 MHz Commercial Services Band licensees and 700 MHz public safety entities, upon request from the other, to exchange information about their operating stations and systems. A reporting requirement triggered only by a request of a public safety entity operating on the 700 MHz Band will minimize economic impact on small businesses operating in the commercial 700 MHz Band relative to the alternative of imposing potentially burdensome technical restrictions on Upper 700 MHz Commercial Services Band licensees to address potential IM interference to 700 MHz public safety operations.

61. 911/E911. Almost all of the commenters addressing the 911/E911 issue support application of the 911/E911 requirements to services in the 700 MHz Commercial Services Band to the

¹⁴⁹ See Letter from Multiple Commenters to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 06-150 (filed October 20, 2006) ("Balanced Consensus Plan") (signatories to the Balanced Consensus Plan are Alltel, Aloha, Blooston, C&W, ConnectME Authority, Corr, Dobson, Leap, Maine Office of Chief Information Officer, MetroPCS, NTCA, Nebraska PSC, North Dakota PSC, RCA, RTG, Union, US Cellular, Vermont et al., Vermont Telephone Company); U.S. Cellular Comments in WT Docket 06-150 at 3; Corr Comments in WT Docket 06-150 at 3; NTCA Comments in WT Docket 06-150 at 5-6.

¹⁵⁰ See Aloha Comments in WT Docket 06-150 at 3-6; Balanced Consensus Plan at attachment; Blooston Comments in WT Docket 06-150 at 2; C&W Reply Comments in WT Docket 06-150 at 2-3; Corr Comments in WT Docket 06-150 at 2-4; Dobson Comments in WT Docket 06-150 at 2-4; Howard/Javed Comments in WT Docket 06-150 at 9; Leap Comments in WT Docket 06-150 at 4, 5-6; MilkyWay Comments in WT Docket 06-150 at 1-6; NextWave Comments in WT Docket 06-150 at 2-6; NTCA Comments in WT Docket 06-150 at 6; OPASTCO Comments in WT Docket 06-150 at 2-3; RCA Comments at 4-8; RTG Comments in WT Docket 06-150 at 2; U.S. Cellular Comments in WT Docket 06-150 at 4.

¹⁵¹ See Corr Comments in WT Docket 06-150 at 4; RCA Comments in WT Docket 06-150 at 9-10.

extent that those services are similar to the services already subject to the requirements.¹⁵² Several commenters also state, however, that E911 should not apply to 700 MHz Commercial Services Band services to a greater extent than it does to services currently subject to the requirements.¹⁵³

62. The Commission concludes that Section 20.18(a) of its rules should be amended to apply 911/E911 requirements to all commercial mobile radio services (CMRS), including services licensed in the 700 MHz Commercial Services Band and the AWS-1 bands, to the same extent as they apply to wireless services currently listed in the scope provision of Section 20.18.¹⁵⁴ For those small carriers who can demonstrate in a particular circumstance that implementation is not technically or economically feasible, the option of waiver relief is available. The *Report and Order* concludes, however, that such case-by-case circumstances, if any, should not delay the implementation of 911/E911 for service providers generally. In this regard, the Commission has observed previously that “911 service is critical to our Nation’s ability to respond to a host of crises,”¹⁵⁵ and that E911 in particular “saves lives and property by helping emergency services personnel do their jobs more quickly and efficiently.”¹⁵⁶ The Commission also takes note of Congress’s finding in the “Ensuring Needed Help Arrives Near Callers Employing 911 Act of 2004” that “for the sake of our Nation’s homeland security and public safety, a universal emergency telephone number (911) that is enhanced with the most modern and state-of-the-art telecommunications capabilities possible should be available to all citizens in all regions of the Nation” and that “enhanced 911 is a high national priority.”¹⁵⁷

63. Application of Secondary Markets Spectrum Leasing Policies and Rules to the Guard Bands. The *Report and Order* maintains the existing requirement for Guard Band licensees to file annual reports regarding their spectrum usage, and thus does not increase the existing recordkeeping and reporting burden. Additionally, the *Report and Order* maintains the existing coordination requirements where all uses of Guard Bands spectrum must be coordinated with public safety operations in the 700 MHz Band. Under the *de jure* transfer leasing option within the Secondary Markets spectrum leasing policies and rules, the Guard Band licensee continues to be responsible for coordinating with the public safety operations. Under the *de facto* transfer leasing option, the lessee becomes primarily responsible for such coordination. As a result, to the extent that a Guard Band licensee is a small entity, the availability of the *de facto* transfer leasing option under the *Report and Order* reduces the overall potential burden on the Guard Band licensee, compared to its previous responsibility as a Guard Band Manager to coordinate all uses of its spectrum.

G. Report to Congress

64. The Commission will send a copy of the *Report and Order*, including this FRFA, in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional

¹⁵² See Aloha Comments in WT Docket 06-150 at 12; AT&T Comments in WT Docket 06-150 at 16; Blooston Comments in WT Docket 06-150 at 8; Cingular Comments in WT Docket 06-150 at 15; Dobson Comments in WT Docket 06-150 at 11; Leap Comments in WT Docket 06-150 at 11; NENA Comments in WT Docket 06-150 at 1-2; Qualcomm Comments in WT Docket 06-150 at 24 (supporting application of E911 to both auctioned and previously unauctioned spectrum); U.S. Cellular Comments in WT Docket 06-150 at 18 (same); TIA Comments in WT Docket 06-150 at 9-10; T-Mobile Reply at 6.

¹⁵³ See Aloha Comments in WT Docket 06-150 at 12 (700 MHz licensees should be subject to the same E911 requirements, “no more or less,” as other licensees providing services where E911 obligations exist); Cingular Comments in WT Docket 06-150 at 15 (supporting application where services met the *E911 Scope Order* criteria); Qualcomm Comments at 24.

¹⁵⁴ See 47 C.F.R. § 20.18.

¹⁵⁵ See *E911 Scope Order*, 18 FCC Rcd at 25341 ¶ 1.

¹⁵⁶ *E911 Report and Order*, 11 FCC Rcd at 18678 ¶ 3, 18679 ¶ 5.

¹⁵⁷ 47 U.S.C. § 942, notes (1), (4).

Review Act.¹⁵⁸ In addition, the Commission will send a copy of the *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.¹⁵⁹

¹⁵⁸ See 5 U.S.C. § 801(a)(1)(A).

¹⁵⁹ See 5 U.S.C. § 604(b).

APPENDIX D

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (the “RFA”),¹ the Commission has prepared this Initial Regulatory Flexibility Analysis (“IRFA”) of the possible significant economic impact of the policies and rules proposed in the *Further Notice of Proposed Rulemaking* (“*Further Notice*”) on a substantial number of small entities.² Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *Further Notice* provided in paragraph 297 of the item. The Commission will send a copy of the *Further Notice*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (“SBA”).³ In addition, the *Further Notice* and IRFA (or summaries thereof) will be published in the Federal Register.⁴

2. Although Section 213 of the Consolidated Appropriations Act of 2000 provides that the RFA shall not apply to the rules and competitive bidding procedures for frequencies in the 746-806 MHz Band,⁵ the Commission believes that it would serve the public interest to analyze the possible significant economic impact of the proposed policy and rule changes in this band on small entities. Accordingly, this IRFA contains an analysis of this impact in connection with all spectrum that falls within the scope of this *Further Notice*, including spectrum in the 746-806 MHz Band.

A. Need for, and Objectives of, the Proposed Rules

3. The *Further Notice* encompasses issues pertinent to all three of our 700 MHz proceedings, as well as to Frontline’s proposal. First, based on the record developed in connection with the *700 MHz Commercial Services Notice*, the *Further Notice* proposes several band plans that include a mix of small, medium and large geographic area licenses.

4. Second, the *Further Notice* also proposes to replace the current substantial service requirement with a geographic-based performance requirement, and seeks comment on this suggestion.

5. Third, the *Further Notice* tentatively concludes that the Commission can adopt neither the Broadband Optimization Plan (BOP), nor the proposals to reallocate and reassign commercial spectrum to critical infrastructure industries (CII) or public safety entities, because we do not have the statutory authority to adopt key components of the proposals. Irrespective of the lack of statutory authority, the *Further Notice* also tentatively concludes that the BOP and CII proposals would not be in the public interest, because of the manner in which they propose to assign commercial licenses outside of a competitive bidding context, and because they could introduce an increased possibility of interference.

¹ The RFA, *see* 5 U.S.C. §§ 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (“SBREFA”), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *See* 5 U.S.C. § 603. Although we are conducting an IRFA at this stage in the process, it is foreseeable that ultimately we will certify this action pursuant to the RFA, because we anticipate at this time that any rules adopted pursuant to this *Notice* will have no significant economic impact on a substantial number of small entities. *See* 5 U.S.C. § 605(b).

³ *See* 5 U.S.C. § 603(a).

⁴ *See* 5 U.S.C. § 603(a).

⁵ In particular, this exemption extends to the requirements imposed by Chapter 6 of Title 5, United States Code, Section 3 of the Small Business Act (15 U.S.C. 632) and Sections 3507 and 3512 of Title 44, United States Code. Consolidated Appropriations Act 2000, Pub. L. No. 106-113, 113 Stat. 2502, Appendix E, Sec. 213(a)(4)(A)-(B); *see* 145 Cong. Rec. H12493-94 (Nov. 17, 1999); 47 U.S.C.A. 337 note at Sec. 213(a)(4)(A)-(B).

6. Fourth, the *Further Notice* asks certain questions specifically related to the current Upper 700 MHz Guard Bands, in the event that the Commission maintains the current sizes and locations of either block of the Guard Bands licenses. The *Further Notice* also seeks comment on the alternative Guard Bands proposal recently submitted by Access Spectrum and Pegasus, as well as variations on that proposal.

7. Fifth, the *Further Notice* seeks to achieve broadband communications capabilities consistent with a nationwide interoperability standard for public safety. The Commission expects that modern public safety services will increasingly depend on the advanced communications capabilities afforded by wireless broadband technologies, which should enable first responders to perform their vital safety-of-life and other critical roles. The *Further Notice* tentatively concludes to redesignate the wideband spectrum to broadband use that would be consistent with a nationwide interoperability standard, and to prohibit wideband operations on a going forward basis. The *Further Notice* then seeks comment on a tentative conclusion to consolidate the narrowband spectrum to the top of the Public Safety Band, locate the broadband spectrum at the bottom of the Public Safety Band, and divide these segments with an internal guard band. Given this tentative conclusion, the *Further Notice* also seeks comment on a limited set of issues that would need to be resolved in order to effectuate the reconfiguration. This proposed reconfiguration would reduce the amount of spectrum necessary to separate and protect the public safety broadband and narrowband allocations, and could facilitate partnerships between public safety broadband operations and adjacent commercial broadband technologies, thereby optimizing the 700 MHz public safety band plan.

8. Finally, the *Further Notice* seeks comment on the “Public Safety Broadband Deployment Plan” proposal submitted very recently by Frontline Wireless, which if adopted in some form potentially would affect decisions in all three proceedings.

B. Legal Basis

9. The legal authority for the actions proposed in this rulemaking are contained in sections 1, 2, 4(i), 5(c), 7, 10, 201, 202, 208, 214, 301, 302, 303, 307, 308, 309, 310, 311, 314, 316, 319, 324, 332, 333, 336, 337, 614, 615, and 710 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 155(c), 157, 160, 201, 202, 208, 214, 301, 302, 303, 307, 308, 309, 310, 311, 314, 316, 319, 324, 332, 333, 336, and 337.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

10. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁶ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁷ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁸ A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration

⁶ 5 U.S.C. § 603(b)(3).

⁷ 5 U.S.C. § 601(6).

⁸ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

("SBA").⁹

11. Small Businesses. Nationwide, there are a total of approximately 22.4 million small businesses, according to SBA data.¹⁰

12. Small Organizations. Nationwide, there are approximately 1.6 million small organizations.¹¹

13. Governmental Entities. The term "small governmental jurisdiction" is defined as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."¹² As of 2002, there were approximately 87,525 governmental jurisdictions in the United States.¹³ This number includes 38,967 county governments, municipalities, and townships, of which 37,373 (approximately 95.9%) have populations of fewer than 50,000, and of which 1,594 have populations of 50,000 or more. Thus, we estimate the number of small governmental jurisdictions overall to be 85,931 or fewer.

14. Wireless Service Providers. The SBA has developed a small business size standard for wireless firms within the two broad economic census categories of "Paging"¹⁴ and "Cellular and Other Wireless Telecommunications."¹⁵ Under both categories, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. For the census category of Paging, Census Bureau data for 2002 show that there were 807 firms in this category that operated for the entire year.¹⁶ Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.¹⁷ Thus, under this category and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.¹⁸ Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.¹⁹ Thus, under this second category and size standard, the majority of firms can, again, be considered small.

15. Under this *Further Notice*, any of the changes to the Commission's rules which may occur as a result of the *Further Notice* would be limited to the 698-806 MHz spectrum band. Since this rulemaking proceeding applies to services in that band, this IRFA analyzes the number of small entities

⁹ 15 U.S.C. § 632.

¹⁰ See SBA, Programs and Services, SBA Pamphlet No. CO-0028, at page 40 (July 2002).

¹¹ Independent Sector, The New Nonprofit Almanac & Desk Reference (2002).

¹² 5 U.S.C. § 601(5).

¹³ U.S. Census Bureau, Statistical Abstract of the United States: 2006, Section 8, pages 272-273, Tables 415 and 417.

¹⁴ 13 C.F.R. § 121.201, NAICS code 517211.

¹⁵ 13 C.F.R. § 121.201, NAICS code 517212.

¹⁶ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 517211 (issued Nov. 2005).

¹⁷ *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

¹⁸ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 517212 (issued Nov. 2005).

¹⁹ *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

affected on a service-by-service basis. When identifying small entities that could be affected by the Commission's new rules, this IRFA provides information describing auctions results, including the number of small entities that were winning bidders. However, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily reflect the total number of small entities currently in a particular service. The Commission does not generally require that licensees later provide business size information, except in the context of an assignment or transfer of control application where unjust enrichment issues are implicated. Consequently, to assist the Commission in analyzing the total number of potentially affected small entities, the Commission requests commenters to estimate the number of small entities that may be affected by any rule changes that might result from this *Further Notice*.

16. 700 MHz Guard Band Licenses. In the *700 MHz Guard Band Order*, the Commission adopted size standards for "small businesses" and "very small businesses" for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.²⁰ A small business in this service is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.²¹ Additionally, a "very small business" is an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.²² SBA approval of these definitions is not required.²³ An auction of 52 Major Economic Area (MEA) licenses commenced on September 6, 2000, and closed on September 21, 2000.²⁴ Of the 104 licenses auctioned, 96 licenses were sold to nine bidders. Five of these bidders were small businesses that won a total of 26 licenses. A second auction of 700 MHz Guard Band licenses commenced on February 13, 2001, and closed on February 21, 2001. All eight of the licenses auctioned were sold to three bidders. One of these bidders was a small business that won a total of two licenses.²⁵

17. Upper 700 MHz Band Licenses. The Commission released a *Report and Order* authorizing service in the Upper 700 MHz band.²⁶ An auction for these licenses, previously scheduled for January 13, 2003, was postponed.²⁷

18. Lower 700 MHz Band Licenses. The Commission adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits.²⁸ The Commission has defined a small business as an entity that, together with its

²⁰ See Service Rules for the 746-764 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Second Report and Order*, 15 FCC Rcd 5299 (2000).

²¹ *Id.* at 5343 ¶ 108.

²² *Id.*

²³ *Id.* At 5343 ¶ 108 n.246 (for the 746-764 MHz and 776-704 MHz bands, the Commission is exempt from 15 U.S.C. § 632, which requires Federal agencies to obtain Small Business Administration approval before adopting small business size standards).

²⁴ See "700 MHz Guard Bands Auction Closes: Winning Bidders Announced," *Public Notice*, 15 FCC Rcd 18026 (2000).

²⁵ See "700 MHz Guard Bands Auctions Closes: Winning Bidders Announced," *Public Notice*, 16 FCC Rcd 4590 (WTB 2001).

²⁶ Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Second Memorandum Opinion and Order*, 16 FCC Rcd 1239 (2001).

²⁷ See "Auction of Licenses for 747-762 and 777-792 MHz Bands (Auction No. 31) Is Rescheduled," *Public Notice*, 16 FCC Rcd 13079 (WTB 2003).

²⁸ See Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Report and Order*, 17 FCC Rcd 1022 (2002).

affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.²⁹ A very small business is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.³⁰ Additionally, the Lower 700 MHz Band has a third category of small business status that may be claimed for Metropolitan/Rural Service Area (MSA/RSA) licenses. The third category is entrepreneur, which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$3 million for the preceding three years.³¹ The SBA has approved these small size standards.³² An auction of 740 licenses (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)) commenced on August 27, 2002, and closed on September 18, 2002. Of the 740 licenses available for auction, 484 licenses were sold to 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business or entrepreneur status and won a total of 329 licenses.³³ A second auction commenced on May 28, 2003, and closed on June 13, 2003, and included 256 licenses: 5 EAG licenses and 476 CMA licenses.³⁴ Seventeen winning bidders claimed small or very small business status and won sixty licenses, and nine winning bidders claimed entrepreneur status and won 154 licenses.³⁵

19. Public Safety Radio Licensees. As a general matter, public safety radio licensees include police, fire, local government, forestry conservation, highway maintenance, and emergency medical services.³⁶ The SBA rules contain a small business size standard for cellular and other wireless telecommunications companies, which encompasses business entities engaged in wireless communications employing no more than 1,500 persons.³⁷ According to Census Bureau data for 2002, in this category there were 8,863 firms that operated for the entire year.³⁸ Of this total, 401 firms had 100 or

²⁹ *Id.* at 1087-88 ¶ 172.

³⁰ *Id.*

³¹ *Id.* at 1088 ¶ 173.

³² See Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated August 10, 1999.

³³ See “Lower 700 MHz Band Auction Closes,” *Public Notice*, 17 FCC Rcd 17272 (WTB 2002).

³⁴ See “Lower 700 MHz Band Auction Closes,” *Public Notice*, 18 FCC Rcd 11873 (WTB 2003).

³⁵ *Id.*

³⁶ See subparts A and B of Part 90 of the Commission’s Rules, 47 C.F.R. §§ 90.1-90.22. Police licensees include 26,608 licensees that serve state, county, and municipal enforcement through telephony (voice), telegraphy (code), and teletype and facsimile (printed material). Fire licensees include 22,677 licensees comprised of private volunteer or professional fire companies, as well as units under governmental control. Public Safety Radio Pool licensees also include 40,512 licensees that are state, county, or municipal entities that use radio for official purposes. There are also 7,325 forestry service licensees comprised of licensees from state departments of conservation and private forest organizations that set up communications networks among fire lookout towers and ground crews. The 9,480 state and local governments are highway maintenance licensees that provide emergency and routine communications to aid other public safety services to keep main roads safe for vehicular traffic. Emergency medical licensees (1,460) use these channels for emergency medical service communications related to the delivery of emergency medical treatment. Another 19,478 licensees include medical services, rescue organizations, veterinarians, persons with disabilities, disaster relief organizations, school buses, beach patrols, establishments in isolated areas, communications standby facilities, and emergency repair of public communications facilities.

³⁷ See 13 C.F.R. § 121.201 (NAICS code 517212); U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Employment Size of Establishments for the United States: 2002,” Table 2, NAICS code 517212.

³⁸ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Employment Size of Establishments for the United States: 2002,” Table 2, NAICS code 517212.

more employees, and the remainder had fewer than 100 employees.³⁹ With respect to local governments, in particular, since many governmental entities as well as private businesses comprise the licensees for these services, we include under public safety services the number of government entities affected.

20. Wireless Communications Equipment Manufacturers; Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”⁴⁰ The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is: all such firms having 750 or fewer employees.⁴¹ According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.⁴² Of this total, 1,010 had employment of under 500, and an additional 13 had employment of 500 to 999.⁴³ Thus, under this size standard, the majority of firms can be considered small.

D. Description of Projected Reporting, Recordkeeping and Other Compliance Requirements

21. Performance Requirements. The *Further Notice* proposes to replace the current substantial service requirement with a geographic-based performance requirement, and seeks comment on this suggestion.

22. Incumbent Eligibility. The *Further Notice* seeks comment on a proposal to encourage the entry of new competitors by excluding incumbent local exchange carriers (ILECs), incumbent cable operators, and large wireless carriers from eligibility for licenses in the 700 MHz Band. The *Further Notice* also seeks comment on whether incumbents should only be eligible for licenses in the 700 MHz band through structurally separate affiliates, which would make it possible to detect whether the incumbent receives more favorable treatment than unaffiliated providers. The *Further Notice* seeks comment on whether the Commission should encourage the entry of new broadband competitors through lesser restrictions on eligibility for obtaining new licenses, both at auction and in the secondary market. Finally, as an alternative to limiting the parties eligible for new licenses in the 700 MHz Band, the *Further Notice* seeks comment on whether parties unaffiliated with incumbent wireline broadband service providers should receive a bidding credit on licenses in the Upper 700 MHz C Block, and how such new entrant bidding credits should be coordinated with existing bidding credits for small businesses (*i.e.*, whether new entrant credits should be cumulative or exclusive of small business bidding credits).

³⁹ *Id.*

⁴⁰ U.S. Census Bureau, 2002 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

⁴¹ 13 C.F.R. § 121.201, NAICS code 334220.

⁴² U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); <http://factfinder.census.gov>. The number of “establishments” is a less helpful indicator of small business prevalence in this context than would be the number of “firms” or “companies,” because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

⁴³ *Id.* An additional 18 establishments had employment of 1,000 or more.

23. Anonymous Bidding. The *Further Notice* seeks comment on whether the Commission should use limited information (or “anonymous bidding”) procedures in the upcoming auction of new 700 MHz licenses, in order to deter anticompetitive behavior that may be facilitated by the release of information on bidder interests and identities.

24. Public Safety Broadband. The *Further Notice* tentatively concludes to redesignate the wideband spectrum to broadband use that would be consistent with a nationwide interoperability standard, and to prohibit wideband operations on a going forward basis. The Commission has issued no licenses for wideband channels. Furthermore, although two special temporary authorizations (STAs) have been issued for wideband operations, to the extent a public safety entity has constructed, deployed and is currently operating, as of the release date of the accompanying *Report and Order*, a wideband system pursuant to a grant of STA, and has reason to continue such operations beyond the current term of the STA, the *Further Notice* states that the Commission will work with such entity to extend such authority. The *Further Notice* also seeks comment on a tentative conclusion to consolidate the narrowband channels to the top of the public safety band, locate the broadband spectrum at the bottom of the public safety band, and divide these segments with an internal guard band. These tentative conclusions may entail additional reporting, recordkeeping or other compliance efforts by existing public safety entities. The *Further Notice* does not otherwise propose any additional reporting, recordkeeping or other compliance requirements.

25. Frontline Proposal. The *Further Notice* seeks comment on Frontline’s proposed “Public Safety Broadband Deployment Plan.” This plan would alter the upper portion of the band plan and service rules in order to auction a single nationwide 10-megahertz license (a new “E Block”). The “E Block” licensee would be required to meet certain build-out benchmarks, and would be required to provide priority access for public safety broadband operations during times of emergency as specified in a Network Sharing Agreement. Under the proposal, the “E Block” licensee would be required to operate as a wholesale provider with respect to commercial use of the “E Block” spectrum. It also would be required to provide open access to its network, allowing the attachment of any device to the network and permitting users to access services and content provided by unaffiliated parties. In addition, Frontline’s proposal would require the “E Block” licensee to offer roaming to any provider with customers utilizing devices compatible with the “E Block” network, with such obligation extended to all spectrum holdings of the “E Block” licensee. Frontline’s proposal also would require the “E Block” licensee to operate only as a wholesale provider with respect to commercial use of the “E Block” license, *i.e.*, it must have wholesale agreements for 100 percent of its spectrum capacity.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered

26. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.”⁴⁴

27. Performance Requirements. Commenters who are small carriers could be found among commenters who supported both a substantial service requirement and a “keep what you use” framework. Some small CMRS providers recommended a combination of both population- and geography-based construction benchmark in the context of a “keep-what-you-use” approach.⁴⁵ The *Further Notice*

⁴⁴ 5 U.S.C. §§ 603(c)(1)-(4).

⁴⁵ See, e.g., DirecTV/EchoStar Comments in WT Docket 06-150 at 9; Navajo Nation Comments in WT Docket 06-150 at 2-3; RCA Comments in WT Docket 06-150 at 8-10; Vermont Department of Public Service, *et al.* Comments (continued....)

proposes to replace the current substantial service requirement with a geographic-based performance requirement, and seeks comment on this suggestion.

28. By establishing clear benchmarks, the Commission would provide small licensees with regulatory certainty regarding the requirements that they must meet or, if they do not, permit other providers to gain access to the spectrum to provide services to consumers. The adoption of more stringent benchmarks also would complement the Commission's determination to auction additional licenses based on smaller geographic areas to promote access to spectrum and the provision of service, especially in rural areas.

29. The Commission recognizes that the existing substantial service standard could allow providers, including small carriers, additional flexibility with regard to their development and deployment of certain services.⁴⁶ The Commission determines, however, that given the excellent propagation characteristics of this spectrum, the benefits of service being offered before the end of the license term, and the public interest that would be served by ensuring additional service in the more rural and remote areas of this country, more rigorous requirements may be appropriate for these 700 MHz Commercial Services licenses.⁴⁷

30. Incumbent Eligibility. The proposals to prevent incumbents from being eligible to participate in the 700 MHz auctions can benefit small entities to the extent that they find less competition at auction from large entities such as established incumbent licensees, including wireline providers. Additionally, the proposal to provide bidding credits with regard to the Upper 700 MHz C Block for parties unaffiliated with incumbent wireline broadband service providers could encourage new entry by small entities.

31. Anonymous Bidding. Smaller auction participants can benefit from having access to information about larger entities' bids during the auction, and smaller auction participants may encounter difficulties with financing if the Commission withholds the information during the auction. However, the potential to use new 700 MHz licenses to create alternatives to existing broadband networks increases the benefits from anonymous bidding by making it harder for existing providers to identify and impede the efforts of potential new entrants to win. Accordingly, in seeking comment on whether to require anonymous bidding for 700 MHz auctions, the Commission balances the difficulties it may cause to smaller auction participants, against the opportunities for new entrants—including small entities—that may result from anonymous bidding.

32. 700 MHz Band Plan Proposals. The *Further Notice* includes several proposals to reconfigure the 700 MHz Band plan. Under any revised band plan, the Commission seeks comment on whether the spectrum block adjacent to the Public Safety Band's lower half would, pursuant to another tentative conclusion, be responsible for funding the reconfiguration of the public safety spectrum with the narrowband channels at the upper end and a broadband allocation at the lower end. This proposal would, if adopted, impose additional economic burdens on any small business that procured the spectrum block adjacent to the Public Safety Band's proposed broadband allocation.

33. The *Further Notice* also proposes to license the 700 MHz Band using a mix of small, medium and large geographic areas. These proposed service area definitions should benefit small businesses, because they would enhance the mix of licenses to be made available in the 700 MHz Band,

(Continued from previous page) _____

in WT Docket 06-150 at 5-8. The Navajo Nation, RCA, and the Vermont Department of Public Service, *et al.* favorably discuss both benchmarks and a "keep-what-you-use" approach

⁴⁶ See AT&T Comments in WT Docket 06-150 at 12-13; CTIA Comments in WT Docket 06-150 at 10; Dobson Comments in WT Docket 06-150 at 5; Leap Comments in WT Docket 06-150 at 10.

⁴⁷ See, e.g., Aloha Comments in WT Docket 06-150 at 2; Blooston Comments in WT Docket 06-150 at 3; Dobson Comments in WT Docket 06-150 at 3; Frontier Comments in WT Docket 06-150 at 4; NTCA Comments in WT Docket 06-150 at 3-5; RCA Comments in WT Docket 06-150 at 3-4; RTG Comments in WT Docket 06-150 at 4-5.

and are consistent with the goals of providing greater access to spectrum for small providers and parties in rural areas, and improving the opportunity for a wider range of potential licensees to access this spectrum.

34. Public Safety Broadband. The *Further Notice* tentatively concludes to reallocate the wideband spectrum to broadband use that would be consistent with a nationwide interoperability standard, and prohibit wideband operations on a going forward basis. The public safety community expressed broad support for a broadband allocation to enable advanced communications capabilities. The availability of a contiguous block of broadband spectrum, subject to a nationwide interoperability standard, would enable partnerships with commercial licensees in adjacent broadband spectrum. As a result, the proposed band plan would ultimately enable public safety entities to utilize the 700 MHz spectrum in a more cost-effective and spectrally efficient manner to address their homeland security and emergency response roles. Because the Commission does not anticipate that the proposal will impose additional economic burdens on public safety, and is in fact designed to reduce economic burdens on public safety, the Commission has taken steps to minimize any adverse impact of the rule changes.

35. The *Further Notice* also seeks comment on its tentative conclusion to consolidate the narrowband spectrum to the top of the public safety band and locate the broadband spectrum at the bottom of the public safety band, in light of the potentially significant benefits such reconfiguration would afford the public safety community. The alternative would be to retain the existing band plan. The *Further Notice* seeks comment on how to implement reconfiguration of the narrowband channels with minimum disruption to incumbent operations. The *Further Notice* invites comment on an appropriate transition mechanism, including how to accommodate public safety operations in the border areas with Canada and Mexico, and the costs of relocation and how such costs will be covered. The Commission expects that the number of entities impacted and expected cost of reconfiguration should be relatively minor. To assist the Commission in its analysis, however, commenters are requested to provide information regarding the number of narrowband radios that are deployed, as well as the number of radios that are in active use, and thus would be affected by the proposed changes to the 700 MHz public safety band plan as described in the *Further Notice*. The *Further Notice* recognizes that the public safety community's ability to fund the reconfiguration may be limited. Thus, in addition to considering whether public safety should pay for its own relocation costs, the *Further Notice* seeks comment on several alternatives, including whether to impose funding requirements on 700 MHz commercial licensees, and whether Federal or other grant monies could be used. In the event the Commission determines to license the broadband allocation to a nationwide public safety broadband licensee, the *Further Notice* also invites comment on whether that licensee should be assigned responsibility for funding the reconfiguration.

36. Although the economic burden on public safety to effectuate reconfiguration is expected to be relatively small, the *Further Notice* will develop a record on the true costs that would be implicated. The Commission remains open to considering alternatives, however, should an alternative be stated in comments that would reach our objectives and minimize the impact on public safety entities.

37. Frontline Proposal. In the *Further Notice*, the Commission seeks comment on Frontline's proposed "Public Safety Broadband Deployment Plan." Although Frontline proposes that the Commission offer bidding credits to applicants based on their status as a small business, the Commission tentatively concludes in the *Further Notice* that it should not offer any bidding preferences, such as bidding credits, to applicants for the "E Block" license. The *Further Notice* states, however, that the public interest would not appear to favor giving applicants a preference when bidding for the "E Block" license based on their limited financial resources, as the Commission does when it offers bidding credits to small businesses in these circumstances. The Commission stated that its concerns regarding the capital needed to implement a nationwide service are especially acute in this instance, because the "E Block" licensee would be responsible for constructing a network to meet the needs of critical public safety providers. The Commission seeks comment on this tentative conclusion.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules

38. None.

**STATEMENT OF
CHAIRMAN KEVIN J. MARTIN**

Re: *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands (WT Docket No. 06-150); Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems (CC Docket No. 94-102); Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones (WT Docket No. 01-309); Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services (WT Docket No. 03-264); Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules (WT Docket No. 06-169); Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band (PS Docket No. 06-229); Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010 (WT Docket No. 96-86); Report and Order and Further Notice of Proposed Rule Making.*

Since I became chairman, promoting broadband deployment and increasing penetration has been one of my highest priorities. I am pleased that since then, we have made significant progress. For instance, an independent study by Pew Internet and American Life Project recently confirmed our own findings about the growth of broadband. Pew found that from March 2005 to March 2006, overall broadband adoption increased by 40%—twice the growth rate of the year before. Critically, this significant increase in broadband adoption was widespread and cut across all demographics. Equally important, Pew found that the average price consumers pay for broadband has also dropped in the past two years.

However, there is no question that much work still needs to be done.

One important factor spurring both increased broadband availability and reduced prices is competition among broadband platforms.

In much of the country, however, consumers have a choice of only two broadband services: cable or DSL. And in some parts of the country, consumers don't even have that choice. The most important step we can take to provide affordable broadband to all Americans is to facilitate the deployment of a third "pipe" into the home. We need a real third broadband competitor. And we need a technology that is cost-effective to deploy not just in the big cities, but in the rural areas, as well. All Americans should enjoy the benefits of broadband competition – availability, high speeds, and low prices.

The upcoming auction presents the single most important opportunity for us to achieve this goal. Depending on how we structure the upcoming auction, we will either enable the emergence of a third broadband pipe – one that would be available to rural as well as urban American – or we will miss our biggest opportunity. Such a status quo outcome certainly would not sit well with consumer groups that have been strongly urging us to adopt rules that facilitate the ability of a "third pipe" to develop.

The leading technology companies – Google, Intel, Skype, Yahoo, along with DirecTV, and EchoStar are the only parties that have promised to try to provide a national, wireless broadband alternative. They have explained that, for a national wireless broadband service to emerge, the auction must do three things: (1) make available at least one 11 MHz paired block; (2) offer at least some large geographic areas; and (3) enable package bidding so that rights to a national service could be acquired. These technology companies have formed a coalition urging the Commission to follow these key principles that they believe are essential to the deployment of an additional broadband competitor.

I put forth a proposal that would meet these three requirements. I am surprised that some of my colleagues do not support this approach. Indeed, some of them have been the most critical of the current state of broadband deployment and competition and the most vocal about us needing a national strategy. It is puzzling that they would not endorse taking the minimum steps necessary to enable a wireless broadband alternative to develop for all Americans.

Importantly, the proposal I put forth would provide for a variety of geographic license areas spectrum block sizes. The mix of geographic license sizes coupled with a proposal for specific geographic build-out requirements – the strictest build-out the Commission has ever proposed – would help ensure that the rural and underserved areas of the country will benefit from the provision new services that this spectrum will facilitate. We also would permit higher power limits in rural areas, which will reduce the number of towers necessary to serve consumers and lower the cost of build-out. This proposal would provide significant opportunities for small and rural carriers as well as new entrants to the broadband market to obtain spectrum at auction.

Like broadband, meeting the needs of public safety has been a major focus of mine since becoming Chairman. We all know the tragedies that can occur when public safety officials cannot adequately communicate. The public safety community needs more spectrum, and they need to be able to build a truly national, interoperable broadband network. This item takes an important step to achieving those goals.

We tentatively conclude that public safety wideband spectrum allocation should be consolidated and revised to provide broadband only on a going-forward basis. In addition, many national and local public safety organizations have expressed support for a public-private partnership approach for a single, national licensee to achieve an interoperable public safety broadband network in the context of other public safety proposals. In the *Further Notice*, we seek comment on the proposal by Frontline Wireless, which would establish a new commercial licensee that would have specific obligations to build out a common broadband infrastructure for public safety and commercial use, working in concert with a national public safety licensee. We also ask if there are other opportunities for public-private partnerships that will help bring our first responders the benefits of broadband.

Although we are seeking further comment on issues, I remain highly aware of the need to move swiftly to provide sufficient time for all parties to prepare for the auction. It is paramount that this auction not be delayed. I look forward to a focused public dialogue on these issues in the coming weeks, and look forward working with my fellow commissioners to come quickly to resolution on these issues.

STATEMENT OF
COMMISSIONER MICHAEL J. COPPS

Re: Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband Interoperable Public Safety Network in the 700 MHz Band; Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, Report and Order and FNPRM

The upcoming 700 MHz auction is perhaps the most important this Commission will ever conduct. When it comes to spectrum, to paraphrase Mark Twain, "they aren't making any more." And the soon-to-be freed-up 700 MHz variety is among the most valuable spectrum of all because of its uniquely favorable propagation characteristics.

So the stakes here are high—very high. If we do our jobs correctly, this auction will deliver countless benefits to the American people as well as billions of dollars to the U.S. Treasury. It will enhance our readiness for the next disaster and inject some much-needed competition into the market for broadband services across the nation (especially in rural areas). But if the Commission fails at its task, then we will have wasted one of the best opportunities in recent memory to improve the way our nation communicates, develops and protects itself. We will never have another chance like this one.

Let's begin with the question of public safety which is, as you have often heard me say, the first obligation of the public servant. In a more perfect world, our nation's first responders would already have access to a cutting-edge, custom-built, interoperable and fully-funded broadband network that makes use of dedicated public safety spectrum. After all, it has been over half a decade since 9/11 and we are coming up on the two-year anniversary of Hurricane Katrina. Both tragedies were greatly—and unnecessarily—compounded by flaws in our public safety communications system. And yet we are not appreciably closer to a solution today than we were back then. This is a failure—a truly monumental national failure—that I believe will come to haunt us in the years ahead.

It is against this background of missed opportunities and an unacceptable status quo that we must consider a recent, late-filed proposal to create a nationwide, interoperable, public-private broadband network in the 700 MHz band. The basic idea is a network that will be used by both commercial *and* public safety users, with commercial users generating enough revenue to build and operate the network and with public safety users able to preempt commercial users (either in whole or in part) during an emergency. It's a tantalizing prospect—but *only* if it works as promised. And there's the challenge.

So let me be crystal clear right up-front: I am not at all sure that a dual-use network along the lines proposed here will actually deliver public safety users the network they so desperately need and deserve. While I certainly support putting this proposal out for comment, even at this late date, I am going to approach it with a skeptical eye. Put simply, I will need strong assurances—much stronger than any we have been provided thus far—that the plan will *actually work* before I can support it. And by work, I mean *work for public safety*. I'm talking about an interoperable network—*built and configured to public safety standards*—that police officers, firefighters, EMS technicians and other first responders all across the nation can actually afford to use. And I mean a system that is managed and maintained with a clear public safety priority, with the hard preemption and other calls made by those entrusted with ensuring the public safety. Let's focus on these issues in some detail.

To begin with, a public safety network is a fundamentally different beast than a commercial network. It requires greater reliability and interoperability, as well as a substantially different architecture, than traditional cellular networks. We've all felt the frustration and annoyance that comes when our cell phone drops a call. But for a first responder or a person in distress, a dropped communication can quite literally be the difference between life and death. Ninety-five or ninety-six

percent reliability just isn't going to cut it here, nor are weather- or disaster-related outages. We should be demanding the wireline system's famous "five nines"—99.999%—or better. To take a second example, we also all know how complicated it can be to organize a conference call with a handful of colleagues. But first responders need instantaneous communication with extensive talk groups at the scene of a major disaster—groups that can contain several hundred officers from dozens of different jurisdictions and services. I am unaware of any commercial network that is designed to provide such a feature. And public safety users need to be able to communicate directly from handset to handset, even if a central cell tower has been knocked down. Again, this is not a feature that commercial operators typically provide.

A public safety network also needs to be ubiquitous, or as close to ubiquitous as is practically feasible. First responders don't lose the need to communicate just because they are on a distant farm, an underground urban parking garage, or some other remote location; if anything, the need is even greater. Commercial build-out schedules are simply not appropriate here. So in any plan that is adopted I will be looking for strong assurances for an accelerated build-out schedule.

Here is another imperative that we might as well face up to right here. No plan is going to work without the close, ongoing oversight and enforcement authority of this Commission. The commitments made here are commitments that have to be met. This isn't about voluntary best efforts that may or may not culminate in real-world results at some future date—this is about getting an essential job done right and done on time. Achieving just the right balance in the management and oversight of this dual-use system and making sure it is flexible enough to jump from one purpose to another instantaneously will require unprecedented and historical coordination and cooperation. Just hoping that effective decision-making will fall into place between commercial and public safety partners who have different strengths, different histories and different levels of influence does not provide the kind of guarantees needed here.

And then, of course, there is the issue of money. The proposal we are considering here would give public safety users a binding legal right to access spectrum on a preemptible basis—but for a price. This brings to mind Anatole France's bitter observation about how the law in its majesty forbids both rich and poor from sleeping under bridges. The fundamental question here is whether public safety users will be able to *afford* to exercise their right to access the network. The network we're talking about cannot be just a luxury item available to a few first responders whose budgets allow them to use costly services—it needs to be something that public safety users, all across the nation, can afford to use on a regular basis and to rely upon as one of their basic forms of communication. Cash registers and toll booths don't belong at the heart of our nation's public safety planning. I approach these questions with special skepticism because I've seen too many companies, many with genuinely good intentions, promise to abide by a slew of special public interest conditions when they are seeking a license. But then, a few years down the road—and after a change in management or sometimes just a change in attitude—they suddenly develop an overpowering interest in reducing costs and increasing profits beyond the level that their original commitments would allow. When this seemingly inevitable shift occurs, the commercial operator will face strong pressure to cut back on the costly features that public safety demands and to start charging higher prices that commercial users but not public safety users can swallow. For this reason, I think that the FCC must—at a minimum—maintain strong and ongoing oversight of any for-profit corporation that is charged with maintaining a public safety network.

I also have concerns about whether preempting commercial users in favor of public safety users during times of emergency could have unintended and possibly dangerous consequences. For example, consider the tragic possibility of someone trapped under a building who cannot call for help because his or her cell phone relies on spectrum that has been preempted for exclusive use by first responders. Or consider how preemption might impact the ability of commercial end users to contact colleagues and loved ones in the aftermath of a crisis. I recognize, of course, that communications bandwidth will inevitably become a scarce and precious resource during an emergency and that first responders have a

unique claim to priority in such situations. But at the same time, we need to think about whether it may be feasible to give some degree of priority to certain commercial communications—such as calls to 911—as well as about the wisdom of adopting a plan that could give commercial end-users a false sense of security about technologies that will become unavailable at exactly the times they are most needed.

I am pleased that today's FNPRM seeks comment on some of the issues I have just discussed, as well as others such as the potential inclusion of satellite technologies in any viable public safety proposal; how best to manage cross-border interference issues; and whether the Commission should adopt anonymous bidding procedures. I also am pleased that we ask general questions about how the "open-access" proposals made by some might encourage the development of a sorely-needed wireless "third pipe" in the broadband market. And though today's item does not seek specific comment on every conceivable aspect of the proposal, I would welcome and encourage interested parties to offer their thoughts on whatever other considerations they deem relevant, including the possible unintended consequences of allowing public safety users to preempt commercial users; on what lessons the Commission should draw from the experiences of other countries (like the United Kingdom) that have considered or adopted public-private spectrum sharing initiatives; and on what level of detail and specificity the Network Sharing Agreement should go into about network design and cost/revenue sharing between the commercial licensee and public safety users.

It took a while and it took some doing, but I think this notice now proceeds in a good and measured way regarding band plans. We make no conclusions here, final or tentative, but instead tee up a number of options. I wish we had a Commission-wide consensus plan right now, but we don't. The options presented in the item provide, however, reasonable parameters for final Commission decision-making. I have put forward ideas to achieve a fair and balanced approach. As I have noted several times, I think that the Commission should offer a wide variety of geographic license sizes—just as we did in last year's AWS auction. This is the appropriate way to balance the competitive goals of the auction. Small and medium license sizes play a critical role in encouraging participation among smaller and rural wireless companies. At the same time, larger license sizes can permit new entrants—such as high tech entrepreneurs and satellite providers—to offer broadband on a nationwide basis. One size doesn't fit all, and I am convinced that we can put together a final plan making room for a multiplicity of interests.

Certain it is that we desperately need a third broadband pipe to challenge the current telco-cable duopoly in our metropolitan areas, as well a *first* broadband pipe in many rural areas. It is this duopoly and lack of rural availability that have caused the United States to continue its slide in the world when it comes to broadband—witness the OECD ranking that came out just the other day taking the United States from 12th to 15th among the nations. And as I have noted before, I don't think any of us should be relying on wireless companies owned by wireline broadband providers to provide this much-needed competition. So coming up with a good, progressive auction strategy is a good step forward—maybe one that can actually produce a new entrant into the broadband market—but don't mistake what we are talking about today for anything like the sort of comprehensive broadband strategy that our country so desperately needs. I guess that will await another day.

Finally, I am pleased with our proposal that the 700 MHz licenses be subject to strong performance requirements for network build-out. A license to use the people's airwaves is a public trust—and we must not countenance spectrum warehousing or any other unreasonable delay in putting this spectrum to work. However, even as we seek to provide licensees with a firm incentive to make use of spectrum, we also need to make sure that we do not unfairly punish licensees—especially in rural areas—who cannot engage in aggressive build-out for perfectly good economic reasons. I look forward to reading comments from the parties on this important issue.

I want to thank all my colleagues for their hard work on this item; various stakeholders who have already contributed input into our deliberations; and the Bureau for working late into the night on several

occasions to start us down the road on one of the greatest challenges we've ever confronted. I also thank the Bureau in advance for what I know will be its hard work to develop final service rules for this granddaddy of all auctions, hopefully by June of this year.

**STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

*Re: Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; WT Docket No. 06-150 et al;
Report and Order and Further Notice of Proposed Rulemaking*

Today, we take another step towards one of the most significant FCC actions in this decade. Our 700 MHz auction will be a critical opportunity for new and existing providers to bring the latest technologies and services to the American people. There rightly is a great deal of pressure on the Commission to construct a band plan and service rules that will meet a wide-range of interests. We hear from an ever-increasing chorus of voices expressing concern about the lack of competition in the broadband marketplace and the need to promote advanced services in rural and other underserved areas. So our decisions today and in the near future will have a profound impact on the future role of wireless broadband services and on the ability of wireless providers to provide important competition to existing providers of these critical services.

The item before us is much improved, and because of these changes I can enthusiastically support it. I appreciate the willingness of my colleagues to accept several of my edits to create a more balanced discussion of a proposed band plan and to ask more meaningful questions about ways in which the band plan should or not be changed. I also support the meaningful performance requirements proposed in the item and am pleased with Chairman Martin's suggestion to propose to apply these requirements on a geographic basis. Finally, I support our inquiry into whether or not we should condition a "Block E" license on the licensee constructing a public safety broadband network and providing wholesale commercial services. I am pleased that we were able to add a number of important questions about the oversight of such a potential licensee.

The item is also greatly improved with the addition of a number of the questions raised by the *Ad Hoc* Public Interest Spectrum Coalition about alternative open access proposals in the 700 MHz band and on possible steps the Commission could take to encourage the entry of new wireless competitors. We need to maximize the possibility that new competition emerges from this spectrum opportunity. Some talk about a "third pipe" into the home to challenge the cozy duopoly between the cable and telephone companies that now dominate the broadband marketplace. I like to think we need to encourage the creation of a "third channel" into the home, since wireless technologies are most likely to provide the competitive alternative. The questions we ask today about open access networks are critical to informing this debate.

Band Plan

The Commission has a unique role in establishing the market for spectrum. Auctions are a free-market mechanism, but it is the government's role to establish the ground rules through a band plan. We have a special responsibility to establish band plans that allow for a diversity of license sizes. We want to maximize the level of utilization by giving more options so that the market can perform most efficiently. We also want to preclude companies from being forced to bid on licenses that are larger than the areas they intend to serve. Large carriers can always aggregate smaller licenses, but companies of all sizes cannot make license areas any smaller during the auction process than what the Commission allows.

As we begin to finalize our rules for the 700 MHz auction, it is critical we build on the lessons learned from our previous auctions to provide a diverse group of licenses so that all bidders have an opportunity to obtain licenses that best match their business plan. While I have supported rules to facilitate the secondary market for spectrum rights and licenses, I think we are best served by providing a wide variety of license sizes at the initial auction when appropriate.

Turning to the specific item before us, I would have been concerned if the Commission had proposed a band plan that ignored the overwhelming record that advocated for a more balanced set of license areas – a band plan that would accommodate large and small interests, tribal governments, rural providers, and possible new entrants. We simply would not have been well served by a band plan that positions all but one of the remaining blocks to be auctioned on a large, regional basis. So I am very pleased with our proposal to auction off the paired A block in the lower 700 MHz band on EA basis.

While I am troubled by the item's treatment of the Broadband Optimization Plan, I am pleased that we have added a request for comment on the latest proposal by Access Spectrum and Pegasus to reconfigure the guard band and public safety 700 MHz spectrum allocations. Access Spectrum and Pegasus are to be commended for their ongoing efforts in pushing proposals that will facilitate more efficient use of the upper 700 MHz band while at the same time addressing critical communications needs of public safety. Their recent proposal deserves serious consideration as it (1) clearly addresses the Canadian border issue for public safety; (2) eliminates the need for undefined temporary easements in the commercial band adjacent to public safety; and (3) ensures funding from Access Spectrum and Pegasus for the conversion of existing 700 MHz narrowband public safety systems and the necessary changes to the Computer Assisted Pre-Coordination Resource and Database System. These are important public interest objectives, and are particularly critical to the consolidation of public safety's narrowband spectrum.

Finally, I am pleased that we are seeking comment on a variety of proposals to modify the structure of the upper 700 MHz band. We have heard from a number of diverse parties on this matter, and I believe it is important that we continue to keep critical band plan issues on the table given that we are putting other proposals out for comment. This discussion will well inform and advance our consideration of these challenging issues.

Some have argued that a more flexible upper 700 MHz band plan that includes a mix of licenses could better support a variety of business plans and ensures that the spectrum is made available to the bidders that value it most. There is a concern that a band plan with only REAGs in the upper 700 MHz band may artificially favor only the largest wireless incumbents or particular business models. On the other hand, a paired 22 MHz block available on a REAG basis could address the needs of potential new entrants, some of whom argue that they need the ability to create a large swath of spectrum to compete with a wireless broadband product on a national basis. And other groups have noted that this 700 MHz spectrum is a unique opportunity to create a new competitor to our highly-concentrated broadband market, and have argued that a band plan that allows for larger blocks will facilitate entry by new providers.

So I am pleased that we have band plans in the item representing all of these different views. I did not believe it was necessary to potentially foreclose the band plan debate today by tipping our hand in one direction or the other, at the same time we are seeking further comment on so many issues related to the 700 MHz auction.

Performance requirements

I have long talked about my interests in promoting spectrum use. Our job at the FCC is to do whatever we can to promote spectrum-based opportunities like the significant prospects for advanced wireless communications services in the 700 MHz band. To get there, I am continually evaluating the FCC's service and construction rules to ensure that our policies do not undercut the ability of wireless innovators to get access to new or unused spectrum. I have advocated a carrot and stick approach. We want to promote flexibility and innovation, but since the spectrum is a finite public resource, we want to see results as well.

In this regard, I am pleased to support the Chairman's proposal to base performance requirements in the 700 MHz band on a geographic basis. This is a meaningful requirement that shows the Commission's resolve in ensuring that this valuable public resource is put to use for the benefit of all Americans, no matter where they live. By proposing a geographic coverage requirement, we are looking to ensure that 700 MHz will not become an untapped well for the thirsty and instead will be deployed to all corners of the country. Given the favorable propagation characteristics of this spectrum, a rigorous performance requirement well serves the public interest.

E Block Public-Private Public Safety Network

This country has a dilemma. Policymakers all agree that our first responders need the best technology and communications networks possible. Yet, we continue to have a situation in which many of our nation's public safety agencies struggle to keep pace with today's rapidly evolving communications landscape. And interoperability remains an elusive goal for too many first responders. Our nation needs a national interoperable public safety broadband network.

So I very much appreciate the leadership of Frontline in developing a creative proposal that may allow this country to move forward with a national public safety communications network. And I would be remiss in not recognizing the early work of Cyren Call in planting the seeds of a commercially-supported public safety broadband network.

The Frontline proposal offers many intriguing positions. First and foremost, the Commission would require the E Block licensee to construct and operate a nationwide, interoperable broadband network for sharing with a national public safety licensee. This public-private network would use commercial spectrum in the upper 700 MHz band as well as 12 megahertz of the public safety spectrum block. Second, the E Block licensee would be required to operate as a facilities-based wholesale provider with respect to commercial use of the spectrum. And finally, the E Block licensee would be required to provide open access to its network, allow the attachment of any device to its network, and permit users to access the content and services of their choice. Frontline's proposal rightly addresses many of the concerns that have been recently raised with our existing wireless communications marketplace.

So I applaud Frontline for their initiative; but a number of questions still remain if we decide to go forward with such a unique proposal. Primarily, how does the Commission ensure that the E Block licensee truly meets the needs of public safety in deploying and operating the national broadband network? What can the Commission legally impose on the E Block licensee to make sure that it meets not just its own commercial objectives, but the Government's objectives as well? If we go forward with a facilities-based wholesale network, what rules can we adopt to ensure that the E Block licensee does not simply turn around and wholesale services back to itself or its commonly controlled affiliates? I am pleased that we were able to add a number of additional questions to the item about the oversight of the E Block licensee should the Frontline proposal be adopted in one form and another.

Conclusion

Finally, as we consider a schedule for the upcoming 700 MHz auction, we must remember that our rules have not yet been finalized. We must be mindful that some companies may not currently be in a position to move forward with plans to participate in the auction until the Commission makes a final decision about the band plan and specific performance requirements. They need sufficient time to establish business plans and line up financing. Consequently, we must make sure that our auction schedule allows for sufficient spacing between the adoption of final 700 MHz band rules and the filing of auction applications. This will ensure that the auction truly is available to a diverse group of interested parties, and that full participation will lead to a more successful and robust auction. I am confident that we can provide the necessary time for preparation and still comply with our statutory obligations related

to the auction.

I would like to thank the Wireless Telecommunications Bureau staff for their continued hard work in guiding us to the 700 MHz auction. With the digital transition on the horizon, our work comes at a crucial time, and we are making decisions that will impact the 700 MHz band and indeed the future of wireless services to come. Additional dialogue on these matters can only serve American consumers well. I look forward to working with my colleagues and the Bureau in tackling these important issues in the very near future.

**STATEMENT OF
COMMISSIONER DEBORAH TAYLOR TATE**

Re: Service Rules for the 698-746, 747-762 and 777-792 MHz Bands (WT Docket No. 06-150); Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems (CC Docket No. 94-102); Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones (WT Docket No. 01-309); Biennial Regulatory Review - Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services (WT Docket No. 03-264); Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules (WT Docket No. 06-169); Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band (PS Docket No. 06-229); Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010 (WT Docket No. 96-86).

Broadband deployment is vital to our nation. The availability of ubiquitous, reliable, high-speed broadband access already is changing the way Americans work and live, but we must act to ensure that the unprecedented business, educational, and healthcare opportunities that broadband makes possible are available to all Americans, regardless of where they chose to live. I'm not alone in this opinion. Every member of this Commission has voiced the need for ubiquitous, affordable broadband, and Members of Congress have clearly indicated their belief that the FCC must do more to get broadband services deployed to all Americans.

The adoption of today's item is a critical step towards achieving this shared goal. The inherent propagation characteristics of the 700 MHz band could make it less expensive to construct new networks covering larger geographic areas, making it ideal for expanding the availability of broadband in rural areas. At the same time, the band potentially provides better in-building coverage than higher frequencies, which not only would facilitate the provision of advanced services in urban areas but also could help improve 911 access and location system performance. The rules we adopt today, along with the detailed questions set forth in the Further Notice, bring us one step closer to putting this critical spectrum into the hands of those who can best put it to work.

In conducting the upcoming 700 MHz auction, we must be particularly mindful of the following Congressional directives: (1) encouraging small businesses, rural telephone companies, and businesses owned by members of minority groups and women to participate in the auction; and (2) commencing the auction no later than January 28, 2008, with the proceeds of the auction to be deposited into the Digital Television Transition and Public Safety Fund no later than June 30, 2008. These directives are not mutually exclusive.

In the highly successful AWS auction, the Commission increased the amount of spectrum licensed in smaller geographic areas – 20 megahertz to be exact – to afford greater opportunities for smaller, rural or regional providers to obtain access to that spectrum at auction. Forty eight rural telephone companies were winning bidders in the AWS auction – a clear indicator of success. I am very interested in hearing comments on how the proposed band plan would help to ensure a repeat of that success.

The sooner the auction begins, the closer we will be to reaping the benefits of services provided via this prime spectrum. I look forward to working with my colleagues to move this forward expeditiously.

**STATEMENT OF
COMMISSIONER ROBERT M. McDOWELL**

RE: Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, WT Docket No. 01-309, Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27 and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket No. 03-264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, WT Docket No. 06-169, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 07-72

Opening up the Lower and Upper 700 MHz Band for auction is America's best opportunity for spurring more competition in the broadband market. More than likely, we will not have another chance like this for years. That's why it is so important that we get it right. But we also need to act quickly. That's not just a good idea, it's the law. Congress has mandated that we start the auction no later than January 28, 2008, and deposit the auction proceeds by June 30, 2008. So, we appear to have some tension between getting it done right and meeting our statutory deadlines. That said, I am optimistic that we can produce high-quality service and auction rules on time. However, I am not without some anxiety.

It is important to note that the Commission is not reaching any tentative conclusions with respect to the band plan today. We are inviting additional comment and debate on several ideas. And, I thank the Chairman for his patience and flexibility in this regard. I'd also like to make clear that I have not reached conclusions on certain of the proposals discussed in today's *Further Notice*. That's why I'm delighted we'll be building a more complete record upon which to make an informed decision.

In my view, to "get it right," the Commission must ensure that businesses of all sizes have a fair opportunity to bid on varied market sizes in both the Upper *and* Lower bands of the 700 MHz slice. The Lower and Upper portions offer their own attributes that are attractive to different entities for different reasons. Accordingly, both the Upper and Lower portions should be accessible at auction to all bona fide bidders regardless of size. Ideally, our rules should also provide bidders the flexibility to aggregate markets together to create either a nationwide market, or large, regional or other customized markets much like that occurred in the AWS auction, but even better. Providing such equal opportunities will help increase the chances of competition in the broadband market for the benefit of *all* Americans. The more players we have competing both between and within platforms, the better. Such competition will also spur untold economic growth.

Some may be concerned that allowing for smaller market sizes in the Upper portion of the band may preclude the ability of some entities to secure a nationwide license to provide a new, competitive broadband platform, or a "third pipe." I'd like to hear more about those concerns. In the AWS auction, we witnessed a successful effort that fashioned together EA markets to form a virtual nationwide license. I welcome a discussion regarding that may or may not work in the 700 MHz band. However, we must be careful to ensure that we do not overly-tailor our auction rules to fit a particular business plan because there are never any guarantees as to who will participate at auction, or for how long.

Should we be limited to three pipes? Why not four, five or more? Are only national companies capable of providing such alternative platforms? What about regional players or local providers? Small town entrepreneurs? I hope commenters will help provide answers to these important questions.

In a perfect world, we would be completing our work in the 700 MHz commercial services proceeding today, and interested parties and potential auction participants would have both the certainty and time necessary to give consideration to the significant matters surrounding participation in a spectrum auction. But we live in an imperfect world where issues to be resolved by rulemakings are complex. In this spirit, I support the Commission's effort to seek additional comment on the unresolved matters relating to our upcoming auction of spectrum in the 700 MHz band.

Once we reach the end of this process, I hope that I find that my concerns were misplaced. It goes without saying that I will do all I can to ensure that the Commission completes this proceeding in record time.

Finally, in addition to my thanks to the Chairman and my colleagues, I want to acknowledge the hard working and talented staff of the Wireless Telecommunications Bureau. We have a number of milestones ahead of us, and I thank you for your diligence despite the demanding schedule associated with this proceeding.

Exhibit 1029



PUBLIC NOTICE

Federal Communications Commission
445 12th St., S.W.
Washington, D.C. 20554

News Media Information 202 / 418-0500
Internet: <http://www.fcc.gov>
TTY: 1-888-835-5322

DA 07-3415
August 17, 2007

AUCTION OF 700 MHz BAND LICENSES SCHEDULED FOR JANUARY 16, 2008

COMMENT SOUGHT ON COMPETITIVE BIDDING PROCEDURES FOR AUCTION 73

AU Docket No. 07-157

Comments Due: August 31, 2007

Reply Comments Due: September 7, 2007

Report No. AUC-07-73-A (Auction 73)

TABLE OF CONTENTS

Heading	Paragraph #
I. INTRODUCTION AND SUMMARY	1
II. BACKGROUND	4
III. LICENSES TO BE OFFERED IN AUCTION 73	9
IV. BUREAU SEEKS COMMENT ON AUCTION PROCEDURES.....	13
A. Auction Design	14
1. Anonymous Bidding.....	14
2. SMR Auction with Package Bidding on C Block Licenses	17
a. Previous Commission Package Bidding Designs	19
b. SMR-HPB Auction Format.....	21
B. Auction Structure	25
1. Round Structure.....	25
2. Stopping Rule	28
3. Information Relating to Auction Delay, Suspension, or Cancellation	31
C. Bidding Procedures.....	32
1. Upfront Payments and Bidding Eligibility	32
2. Activity Rule	35
3. Activity Rule Waivers and Reducing Eligibility	42
4. Reserve Prices or Minimum Opening Bids	47
a. Reserve Prices	47
b. Minimum Opening Bids.....	56
5. Bid Amounts.....	60
6. Provisionally Winning Bids	70
7. Bid Removal.....	76
8. Bid Withdrawal and Dropped Bids	77

D. Considerations Relating to Certain Post-Auction Payment Rules	85
1. Apportioning Package Bids	85
2. Interim Withdrawal Payment Percentage	87
3. Additional Default Payment Percentage	90
V. CONTINGENT SUBSEQUENT AUCTION	94
VI. DEADLINES AND FILING PROCEDURES	104
VII. CONTACTS	110

ATTACHMENT A: Licenses to Be Auctioned

ATTACHMENT B: Activity-Based Formula to Determine Minimum Acceptable Bids

ATTACHMENT C: Determining Provisionally Winning Bids and Current Price Estimates

ATTACHMENT D: Subsequent C Block Licenses to Be Auctioned

I. INTRODUCTION AND SUMMARY

1. By this Public Notice, the Wireless Telecommunications Bureau (“Bureau”) announces an auction of 1,099 licenses in the 698-806 MHz band (herein, the “700 MHz Band”).¹ A complete list of licenses available is included as Attachment A of this Public Notice. This auction, which is designated as Auction 73, is scheduled to commence on January 16, 2008.

2. Pursuant to governing statutes and Commission rules, the Commission will announce final procedures for Auction 73 after considering comment provided in response to this Public Notice.² In Auction 73, the Commission will make available 176 licenses over Economic Areas (EAs) in the A Block, 734 licenses over Cellular Market Areas (CMAs)³ in the B Block, 176 licenses over EAs in the E Block, 12 licenses over Regional Economic Area Groupings (REAGs) in the C Block, and one

¹ This spectrum is part of the 698-806 MHz band, which currently is occupied by television broadcasters and is being made available for new commercial and public safety services as a result of the digital television (DTV) transition. In prior proceedings, the Commission considered the 700 MHz Band in two parts, 698-746 MHz (the “Lower 700 MHz Band”) and 746-806 MHz (the “Upper 700 MHz Band”). The Lower 700 MHz Band was divided into blocks A through E, and the Upper 700 MHz Band was divided into blocks A through D. The Commission previously assigned licenses for blocks C and D in the Lower 700 MHz Band and for blocks A and B in the Upper 700 MHz Band. Consequently, the remaining blocks to be licensed are the Lower 700 MHz Band A, B, and E Blocks, and the Upper 700 MHz Band C and D Blocks. As the letters identifying the blocks remaining to be licensed in the Lower and Upper 700 MHz Bands do not overlap, we will refer to these blocks to be licensed as the A, B, E, C and D Blocks, without repeating the Lower 700 MHz Band and Upper 700 MHz Band designation.

² Based on statutory mandates that subsequently were repealed, the Commission previously announced several auctions for licenses associated with spectrum covered by licenses now offered in Auction 73. *See* Auction Reform Act of 2002, *Report to Congress*, FCC 03-138, 18 FCC Rcd 12556, 12561 (2003). The Commission cancelled or postponed those previously announced auctions. *Id.* at 12561-62. The Commission’s prior public notices regarding those cancelled or postponed auctions have no continuing effect with respect to Auction 73. *See, e.g.*, “Auction of Licenses in the 747-762 and 777-792 MHz Bands Scheduled for June 19, 2002, Further Modification of Package Bidding Procedures and Other Procedures for Auction No. 31,” *Public Notice*, DA 02-659, 17 FCC Rcd 5140 (2002) (procedures for an auction of Upper 700 MHz licenses); *see also* “Auction of Licenses for 747-762 and 777-792 MHz Bands (Auction No. 31) is Rescheduled,” *Public Notice*, DA 02-1829, 17 FCC Rcd 14546 (2002) (postponing Auction 31, which already had been rescheduled for January 14, 2003, pending further notice).

³ The CMA licenses consist of both Metropolitan Statistical Area (MSA) and Rural Service Area (RSA) licenses. For the Lower 700 MHz Band, the Commission adopted MSAs and RSAs as defined by Public Notice Report No. CL-92-40 “Common Carrier Public Mobile Services Information, Cellular MSA/RSA Markets and Counties,” dated January 24, 1992, DA 92-109, 7 FCC Rcd 742 (1992), with the following modifications: (i) the service areas of cellular markets that border the U.S. coastline of the Gulf of Mexico extend 12 nautical miles from the U.S. Gulf coastline; and (ii) the service area of cellular market 306 that comprises the water area of the Gulf of Mexico extends from 12 nautical miles off the U.S. Gulf coast outward into the Gulf. 47 C.F.R. § 27.6(c)(2).

nationwide license, to be used as part of the 700 MHz Public/Private Partnership, in the D Block. In this Public Notice, we propose and seek comment on detailed procedures for Auction 73, including, among other things, procedures for

- anonymous bidding, to enhance competition by safeguarding against potential anti-competitive auction strategies;
- applicants trying to combine multiple C Block licenses to place bids on packages of those licenses;
- block-specific aggregate reserve prices, to help assure that the public recovers a portion of the licenses' value; and
- offering licenses for the relevant block(s) in a prompt subsequent auction in the event auction results do not satisfy applicable reserve prices.

3. The Commission is offering the licenses in Auction 73 consistent with the requirements of the Digital Television Transition and Public Safety Act of 2005 ("DTV Act").⁴ Pursuant to the DTV Act the Commission must conduct the auction of licenses for recovered analog spectrum by commencing the bidding not later than January 28, 2008.⁵

II. BACKGROUND

4. The Commission recently released the *700 MHz Second Report and Order*, in which it revised rules governing licenses in the 700 MHz Band and, as discussed below, made certain determinations regarding the auction of 700 MHz Band licenses.⁶ Parties responding to this Public Notice

⁴ See Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) ("DRA"). Title III of the DRA is the DTV Act. The DTV Act is codified in various portions of Title 47 of the United States Code.

⁵ 47 U.S.C. § 309(j)(15)(v).

⁶ Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, WT Docket No. 01-309, Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket 03-264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, WT Docket No. 06-169, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, Second Report and Order, FCC 07-132, (2007) ("*700 MHz Second Report and Order*"). The *700 MHz Second Report and Order* is part of the 700 MHz band proceeding. See also, e.g., Service Rules for the 698-749, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems and Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, CC Docket No. 94-102, WT Docket No. 01-309, *Notice of Proposed Rule Making, Fourth Further Notice of Proposed Rule Making, and Second Further Notice of Proposed Rule Making*, 21 FCC Rcd 9345 (2006) ("*700 MHz Commercial Services Notice*"); Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, WT Docket No. 01-309, Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket 03-264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules, WT Docket No. 06-169, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, *Report and Order and Further Notice of Proposed Rulemaking*, 22 FCC Rcd 8064 (2007) ("*700 MHz Report and Order*" and "*700 MHz Further Notice*," respectively).

should be familiar with the details of the *700 MHz Second Report and Order*. We now propose and seek comment on detailed procedures to implement the Commission's determinations and generally enable the conduct of Auction 73.

5. *Anonymous Bidding*. In the *700 MHz Second Report and Order*, the Commission found that the public interest would be served if the auction for new 700 MHz Band licenses is conducted using anonymous (or "limited information") bidding procedures, regardless of any pre-auction measurement of likely auction competition. Such information procedures are intended to reduce the potential for anti-competitive bidding behavior, including bidding activity that aims to prevent the entry of new competitors. Having made this determination, the Commission directed the Bureau to propose and seek comment on more detailed procedures for employing anonymous bidding for the upcoming auction. Accordingly, in this Public Notice, we seek comment on anonymous bidding procedures for Auction 73.

6. *Package Bidding for C Block Licenses But Not for A, B, D, and E Block Licenses*. The Commission also determined in the *700 MHz Second Report and Order* that providing for package bidding for C Block licenses in Auction 73 would serve the public interest. The Commission found that package bidding for these licenses should facilitate the entry of entities seeking to create a nationwide footprint and whose business plans require the economies of scale that only can be obtained with nationwide operation. The Commission directed the Bureau to propose and seek comment on detailed procedures for implementing package bidding for the C Block licenses and not for licenses in the other blocks to be auctioned.⁷

7. *Block-Specific Aggregate Reserve Prices for Auction 73*. The Commission also decided to provide for aggregate reserve prices for licenses authorizing the use of each block of the 700 MHz Band. The Commission concluded that, consistent with its statutory mandate, disclosed reserve prices would promote the recovery of a portion of the value of the public spectrum resource. The Commission directed the Bureau to adopt aggregate reserve prices reflecting the potential market value of this spectrum based on a variety of factors including, but not limited to, the characteristics of this band and the auction prices of other recently auctioned licenses, such as licenses for Advanced Wireless Services in the 1710-1755 MHz and 2110-2155 MHz bands ("AWS-1").⁸ Accordingly, we propose to adopt the following block-specific aggregate reserve prices: Block A, \$1.807380 billion; Block B, \$1.374426 billion; Block C, \$4.637854 billion; Block D, \$1.330000 billion; Block E, \$0.903690 billion. Further, we propose that if the sum of the provisionally winning gross bids for the licenses in a block does not satisfy the relevant aggregate reserve price, none of the relevant licenses for the particular block will be assigned based on the auction results.

8. *Prompt Subsequent Auction, If Necessary, of Alternative Licenses*. The Commission, moreover, decided that if licenses initially offered for the A, B, C, or E Blocks are not assigned because the auction results do not satisfy the applicable aggregate reserve price(s) for those licenses, the Commission promptly will offer alternative licenses for those blocks. More specifically, the Commission will offer licenses for the A, B, and E Blocks subject to alternative performance requirements. With respect to the C Block, the Commission will offer alternative licenses without the open platform conditions and based on different geographic areas and spectrum bandwidth. If the D Block license is not assigned because the auction results do not satisfy the D Block reserve price, the Commission may re-offer that license subject to the same rules or reconsider the applicable rules. Consistent with the Commission's direction, we will permit only qualified bidders in the initial auction to participate in the

⁷ In the event that unforeseen difficulties make it impracticable to implement package bidding for the C Block consistent with the goals the Commission articulated in the *700 MHz Second Report and Order*, the Commission provided that the Bureau could conduct the auction without package bidding for the C Block.

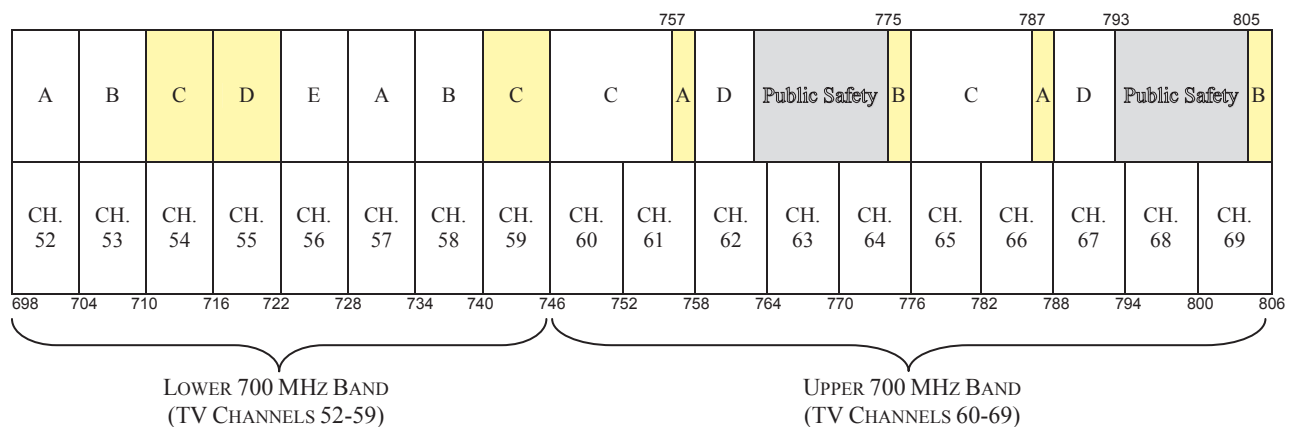
⁸ The Commission's website provides extensive information regarding the recent auction of AWS-1 licenses ("AWS-1 auction" or "Auction 66"). See <http://wireless.fcc.gov/auctions/66/>.

subsequent auction and propose to use the same auction design, including an aggregate reserve price for each block that matches the applicable initial reserve price, insofar as possible.

III. LICENSES TO BE OFFERED IN AUCTION 73

9. Auction 73 includes a total of 1,099 licenses: 176 in the A Block, 734 in the B Block, 176 in the E Block, 12 in the C Block, and 1 in the D Block. Figure 1 shows the 700 MHz band plan adopted in the recent *700 MHz Second Report and Order*:

Figure 1: 700 MHz Band



The blocks highlighted above (Lower 700 MHz Band C and D Blocks and Upper 700 MHz Band A and B Blocks) have previously been auctioned.

Block	Frequencies (MHz)	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	EA	176
B	704-710, 734-740	12 MHz	2 x 6 MHz	CMA	734
E	722-728	6 MHz	unpaired	EA	176
C	746-757, 776-787	22 MHz	2 x 11 MHz	REAG	12
D	758-763, 788-793	10 MHz	2 x 5 MHz	Nationwide	1*

* Subject to conditions respecting a public/private partnership license.

10. *Predefined Packages of C Block Licenses.* As directed by the Commission's recent decision in the *700 MHz Second Report and Order*, the Bureau proposes below detailed procedures that will enable bidders to place bids on all individual licenses and on certain predefined packages of C Block licenses. More specifically, the Bureau proposes to enable bidders to place individual bids on the 12 REAG licenses and package bids on the following combinations of C Block REAG licenses: REAGs 1-8, comprising the 50 United States; REAGs 9 and 11, comprising the United States Pacific territories; and REAGs 10 and 12, comprising Puerto Rico, the U.S. Virgin Islands and the Gulf of Mexico.

11. *Incumbents.* A number of incumbent broadcasters are licensed and operating on these frequencies (TV Channels 52-53, 56-58, 60-62, and 65-67) and adjacent channels. In accordance with the Commission's rules, 700 MHz Band licensees must protect analog TV incumbents from harmful interference through February 17, 2009, the end of the DTV transition period.⁹ These limitations may restrict the ability of such geographic area licensees to use certain portions of the electromagnetic spectrum or provide service to some parts of their geographic license areas.

⁹ See 47 C.F.R. § 27.60 (co-channel and adjacent channel interference protection requirements for analog TV and DTV facilities).

12. In the *700 MHz Second Report and Order*, the Commission grandfathered an incumbent Guard Band B Block licensee in Major Economic Areas (MEAs) 21 and 39 at 761-763 MHz and 791-793 MHz of the D Block. The new D Block licensee will be authorized on a secondary basis in these markets, and it may not cause interference to the primary operations of the grandfathered licensee. If the grandfathered licensee, or a successor or assignee, cancels either of the grandfathered licenses, or if either license cancels automatically, is terminated by the Commission, or expires, then the licensed geographic area will revert to the D Block licensee automatically.

IV. BUREAU SEEKS COMMENT ON AUCTION PROCEDURES

13. Section 309(j)(3) of the Communications Act of 1934, as amended, requires the Commission to “ensure that, in the scheduling of any competitive bidding under this subsection, an adequate period is allowed . . . before issuance of bidding rules, to permit notice and comment on proposed auction procedures”¹⁰ Consistent with the provisions of Section 309(j)(3) and to ensure that potential bidders have adequate time to familiarize themselves with the specific rules that will govern the day-to-day conduct of an auction, the Commission directed the Bureau, under its existing delegated authority, to seek comment on a variety of auction-specific procedures prior to the start of each auction.¹¹ The Bureau therefore seeks comment on the following issues relating to Auction 73.

A. Auction Design

1. Anonymous Bidding

14. In the *700 MHz Second Report and Order*, the Commission concluded that anonymous bidding procedures, which withhold from public release until after the auction closes any information that may indicate specific applicants’ interests in the auction, including information such as their license selections and bidding activity, should be implemented in the upcoming auction of new 700 MHz Band licenses regardless of whether the auction meets a pre-auction assessment of likely competition. The Commission concluded that such procedures will serve the public interest by reducing the potential for anti-competitive bidding behavior, including bidding activity that aims to prevent the entry of new competitors.

15. In light of these conclusions, for Auction 73 the Bureau proposes to withhold, until after the close of bidding, public release of: (1) bidders’ license selections on their short-form applications (FCC Form 175), (2) the amounts of bidders’ upfront payments and bidding eligibility, and (3) information that may reveal the identities of bidders placing bids and taking other bidding-related actions. For example, we propose to withhold the identities of bidders placing specific bids or withdrawals and the net bid amounts, although we will disclose after the close of each round the amount of every bid placed and whether a bid amount was withdrawn. We propose to provide individual bidders with additional information about their own bids. In contrast to procedures implemented for anonymous bidding in past

¹⁰ 47 U.S.C. § 309(j)(3)(E)(i).

¹¹ See Amendment of Part 1 of the Commission’s Rules — Competitive Bidding Procedures, Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, 4660-4685 MHz, *Third Report and Order and Second Further Notice of Proposed Rule Making*, FCC 97-413, 13 FCC Rcd 374, 448 ¶¶ 124-25 (1997) (“*Part 1 Third Report and Order*”) (directing the Bureau to seek comment on specific mechanisms related to day-to-day auction conduct including, for example, the structure of bidding rounds and stages, establishment of minimum opening bids or reserve prices, minimum acceptable bids, initial maximum eligibility for each bidder, activity requirements for each stage of the auction, activity rule waivers, criteria for determining reductions in eligibility, information regarding bid withdrawal and bid removal, stopping rules, and information relating to auction delay, suspension or cancellation). See also 47 C.F.R. § 0.131; Amendment of Part 1 of the Commission’s Rules — Competitive Bidding Proceeding, *Order, Memorandum Opinion and Order, and Notice of Proposed Rule Making*, FCC 97-60, 12 FCC Rcd 5686, 5697-98 ¶ 16 (1997) (“*Part 1 Order*”).

auctions,¹² and consistent with the *700 MHz Second Report and Order*, we will withhold this information irrespective of any pre-auction measurement of likely auction competition. Accordingly, we propose to withhold the amount of bidders' upfront payments and bidding eligibility until after the close of bidding. Bidders will be able to view their own level of eligibility, before and during the auction, through the Commission's Integrated Spectrum Auction System ("ISAS" or "FCC Auction System"). Moreover, bidders will be made aware of other bidders with whom they will not be permitted to discuss bidding strategies for the purpose of complying with the Commission's anti-collusion rules.¹³ Specifically, the Bureau will notify separately each applicant with short-form applications for participation in a pending auction, including but not limited to Auction 73, whether applicants in Auction 73 have applied for licenses in any of the same geographic areas as that applicant.

16. In the event that licenses initially offered for any of the 700 MHz Band spectrum blocks are not assigned because the auction results do not satisfy the applicable reserve price and the Commission conducts a prompt subsequent auction of licenses for the relevant block(s), the Commission proposes generally to withhold the information described above on bidder license selection and eligibility and information that may reveal the identities of bidders placing bids for both auctions until after the close of bidding in the second auction. Thus, if the initial auction results satisfy aggregate reserve prices with respect to licenses in some but not all blocks, the Commission proposes, except for the D Block, to withhold information on the winning bidders for licenses in the relevant block(s) as well as information on bidder license selections and eligibility and information that may reveal the identities of bidders placing bids and taking other bidding-related actions on licenses in all blocks until after the close of bidding in both auctions. Because bidding on the 700 MHz Band licenses is interrelated, the purpose for which we impose anonymous bidding procedures in the first place – to make signaling and other anti-competitive bidding behavior less likely to be successful – will continue to be served by not making such information public until after the close of bidding on all of the licenses.¹⁴ For the D Block, however, we propose, instead of withholding all information, to make public before the close of bidding in a second auction only such information as may be necessary to proceed with promptly facilitating the D Block winner's obligations to negotiate a Network Sharing Agreement with the national Public Safety Broadband Licensee in the adjacent spectrum block,¹⁵ in the event there is a winning bidder for the D Block license in the initial auction. We seek comment on these details regarding our proposal for implementation of anonymous bidding in Auction 73, and on alternative proposals for the specific procedures to implement anonymous bidding.

2. SMR Auction with Package Bidding on C Block Licenses

17. In the *700 MHz Second Report and Order*, the Commission directed the Bureau to propose detailed auction procedures that would permit the license-by-license bidding of the FCC's standard

¹² See, e.g., "Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 66," *Public Notice*, 21 FCC Rcd 4562, 4600-05 ¶¶ 140-157 (2006) ("*Auction 66 Procedures Public Notice*"); "Auction of Broadband PCS Spectrum Scheduled for May 16, 2007; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 71," *Public Notice*, DA 07-30, 22 FCC Rcd 433, 463-464 ¶¶ 109-113 (WTB 2007) ("*Auction 71 Procedures Public Notice*"); "Auction of Phase II 220 MHz Service Spectrum Scheduled for June 20, 2007; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 72," *Public Notice*, DA 07-514, 22 FCC Rcd 3404, 3433-34 ¶¶ 112-116 (WTB 2007) ("*Auction 72 Procedures Public Notice*").

¹³ See 47 C.F.R. § 1.2105(c).

¹⁴ Consistent with this determination, if there is a subsequent auction of alternative licenses, the anti-collusion rule, which goes into effect prior to the first auction, will remain in effect until the down-payment deadline following the second auction. See Section V. "Contingent Subsequent Auction," below.

¹⁵ See *700 MHz Second Report & Order* at ¶¶ 444-454.

simultaneous multiple round (SMR) auction format for the A, B, D, and E Block licenses, while enabling package bidding for C Block licenses.¹⁶ Accordingly, the Bureau proposes to conduct Auction 73 using an SMR auction design with hierarchical package bidding (“HPB”) for the C Block licenses.¹⁷ The Bureau has developed software for an auction format (“SMR-HPB”) that permits license-by-license bidding as well as limited package bidding using HPB on predetermined packages of specified licenses. Under this proposal, HPB will be available for 12 licenses in the C Block, and license-by-license bidding without package bids will be available for the 1,087 licenses in the other available blocks. In this SMR-HPB auction format, as detailed below, we propose for the C Block licenses certain procedures that differ from standard SMR procedures, while retaining the standard SMR procedures for all of the other licenses to be offered. We seek comment on the details of the proposed SMR-HPB format described below, keeping in mind the Commission’s goal of facilitating the entry of a new nationwide competitor with sufficient bandwidth to offer a range of advanced wireless services, without causing undue difficulty for bidders that are not interested in a nationwide license.¹⁸

18. In the *700 MHz Second Report and Order*, the Commission also provided that the Bureau may conduct an auction without package bidding for the C Block licenses “in the event that currently unforeseen difficulties make it impracticable to implement package bidding.”¹⁹ In the event that package bidding cannot be implemented for Auction 73, the Bureau proposes to conduct the auction using standard SMR procedures for all of the licenses, including the C Block licenses as well as the A, B, D, and E Block licenses.

a. Previous Commission Package Bidding Designs

19. The Bureau’s proposed SMR-HPB auction design further develops and modifies prior package bidding designs for the Commission’s spectrum license auctions. Unlike previous designs that allowed bidders to create their own packages of any or all of the licenses in the auction, SMR-HPB allows a form of package bidding only on predetermined packages of specified licenses, while using SMR procedures for licenses not subject to package bidding. The Commission first proposed a simple form of package bidding in 2000, in connection with procedures for a planned auction of licenses in the Upper 700 MHz Band (Auction 31). These package bidding procedures were modified in 2002 when Auction 31 was scheduled to begin on June 19, 2002. After Auction 31 was postponed consistent with the Auction Reform Act of 2002,²⁰ the Commission further modified its package bidding design. This package bidding design was used for an auction of narrowband Personal Communication Services licenses (Auction 51) in September 2003.²¹ Following Auction 51, the Commission continued to consider alternative package bidding auction formats and developed a particular SMR auction format with package bidding (“SMR-PB”). In 2006, the Commission sought comment on whether to use SMR-PB and/or SMR for Auction 66, and decided to use its SMR auction format without package bidding for all of the

¹⁶ *Id.* at ¶¶ 290-292.

¹⁷ In the economic experiments previously conducted by the Bureau, this type of package bidding was referred to as “tiered” package bidding. *See Report on Results of Economic Experiments comparing Performance Properties of Certain Simultaneous Multiple round Spectrum License Auctions With Package Bidding*, May 25, 2007, and *Report on Results of Economic Experiments Examining Performance Properties of Simultaneous Multiple Round Spectrum License Auctions With and Without Combinatorial Bidding*, July 15, 2006, both at <http://wireless.fcc.gov/auctions/data/papersAndStudies.html>.

¹⁸ *Id.* at ¶ 292.

¹⁹ *Id.*

²⁰ Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715 (codified as 47 U.S.C. § 309(j)(15)(C)(iii)).

²¹ “Auction of Regional Narrowband PCS Licenses Scheduled for September 24, 2003, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, Package Bidding and Other Auction Procedures,” *Public Notice*, DA 03-1994, 18 FCC Rcd 11974, 12008-10 (2003).

licenses in that auction.²² In 2005 and 2006 the Commission conducted experimental economic testing of the SMR-PB format.

20. The Commission has received considerable feedback on auction design from potential bidders and other members of the public, including comments submitted in the 700 MHz proceeding.²³ Also, in 2007 the Commission did further experimental economic testing on alternative package bidding designs.²⁴ Furthermore, there has been a significant amount of recent academic research and economic experiments on auction designs that incorporate package bidding in various ways.²⁵ Taking into

²² *Auction 66 Procedures Public Notice*, 21 FCC Rcd at 4612-15 ¶¶ 188-200.

²³ See, for example, United States Cellular Corporation 700 MHz Commercial Services Comments; Paul Milgrom and Karen Wrege 700 MHz Commercial Services Comments and 700 MHz Commercial Services Reply Comments; Letter from Ruth Milkman, Counsel to Access Spectrum, LLC, and Kathleen Wallman, Advisor to Pegasus Communication Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission, *Ex Parte* in WT Docket No. 06-150 (filed February 5, 2007); Letter from George Y. Wheeler, Counsel to United States Cellular Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission, *Ex Parte* in WT Docket No. 06-150 (filed March 7, 2007); AT&T Inc. 700 MHz Further Notice Comments; Coalition for 4G in America 700 MHz Further Notice Comments; Frontline Wireless, LLC 700 MHz Further Notice Comments; United States Cellular Corporation 700 MHz Further Notice Reply Comments; Verizon Wireless 700 MHz Further Notice Comments; Letter from Glenn S. Rabin, Vice President and Federal Regulatory Counsel, Alltel Corporation, to Marlene H. Dortch, Federal Communications Commission, *Ex Parte* in WT Docket No. 06-150 (filed July 9, 2007). On May 2, 2005, the Bureau sought comment on a proposed design for economic experiments to examine the performance properties of designs for conducting simultaneous multiple round auctions of spectrum licenses both with and without combinatorial bidding. “Comment Sought on Experimental Design for Examining Performance Properties of Simultaneous Multiple Round Spectrum License Auctions With and Without Combinatorial Bidding,” *Public Notice*, DA 05-1267, 20 FCC Rcd 8685 (“*Combinatorial Bidding Comment Public Notice*”). In response to the *Combinatorial Bidding Comment Public Notice*, the Bureau received the following filings: Comments of Lawrence M. Ausebel, Peter Cramton, and Paul Milgrom (dated June 1, 2005); Comments of Leap Wireless International, Inc. (dated June 1, 2005); Comments of PA Consulting Group (dated June 1, 2005); Comments of Telephone and Data Systems, Inc. and United States Cellular Corporation (dated June 1, 2005); Comments of Verizon Wireless (dated June 1, 2005); *Ex Parte* Letter from Robert J. Weber, on behalf of Telephone and Data Systems, Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission (filed May 12, 2005). Filings made in response to the *Combinatorial Bidding Public Notice* are available at <http://wireless.fcc.gov/auctions/data/papersAndStudies.html>.

²⁴ See *Report on Results of Economic Experiments comparing Performance Properties of Certain Simultaneous Multiple Round Spectrum License Auctions With Package Bidding*, May 25, 2007, and *Report on Results of Economic Experiments Examining Performance Properties of Simultaneous Multiple Round Spectrum License Auctions With and Without Combinatorial Bidding*, July 15, 2006, both at <http://wireless.fcc.gov/auctions/data/papersAndStudies.html>.

²⁵ Such work includes, but is not limited to, the following: Goeree, J. K. and C. A. Holt, “A Simple Combinatorial Auction,” Working Paper, May 2007 (addressing pricing in a hierarchically-tiered package bidding format); Rothkopf, M. H., A. Pekeč, and R. M. Harstad, “Computationally Manageable Combinatorial Auctions,” *Management Sciences*, 44(8), August 1998, 1131-1147 (addressing a hierarchically-tiered package bidding format); Ausubel, L. M., P. Cramton, and P. Milgrom, “The Clock-Proxy Auction: A Practical Combinatorial Auction Design,” in *Combinatorial Auctions*, eds. P. Cramton, Y. Shoham, and R. Steinberg, MIT Press, 2006, p. 115-138; Ausubel, L. M. and P. Milgrom, “Ascending Auctions with Package Bidding,” *Frontiers of Theoretical Economics*, 1(1), 2002; Brunner, C., J. K. Goeree, C. A. Holt, and J. O. Ledyard, “Combinatorial Auctioneering,” Working Paper, July 26, 2006; Cantillon, E. and M. Pesendorfer, “Combination Bidding in Multi-Unit Auctions,” Working Paper, November, 2006; Klemperer, P., *Auctions: Theory and Practice*, Princeton University Press, 2004; Kwasnica, A. M., J. O. Ledyard, D. Porter, and C. DeMartini, “A New and Improved Design for Multi-Object Iterative Auctions,” *Management Science*, 51(3), March 2005, 419-434; Milgrom, P., *Putting Auction Theory to Work*, Cambridge University Press, 2004; Porter, D., S. Rassenti, A. Roopnarine, and V. Smith, “Combinatorial Auction Design,” *Proceedings of the National Academy of Sciences*, 100(19), September 2003, 11153-11157.

consideration Commission experience and input from the public, the Commission now seeks comment on using the following SMR-HPB format for Auction 73.

b. SMR-HPB Auction Format

21. As in the Commission’s non-package bidding SMR auctions, the proposed SMR-HPB auction format offers all licenses for sale simultaneously, with bid amounts generally ascending over a series of bidding rounds. SMR-HPB allows bids on all individual licenses and on certain predefined packages of specified licenses. In Auction 73, not all licenses will be included in packages: the Commission will offer package bidding only on the C Block licenses. Bidding on licenses in other blocks will be on a license-by-license basis only, as in SMR. A bidder may bid on, and potentially win, any number of licenses and/or packages. Typically, bidding remains open on all licenses until bidding stops on every license, based on the applicable stopping rule.

22. With respect to licenses offered subject to HPB, bidders may not create their own packages. The predefined packages are determined by the Commission according to a hierarchical structure. The initial level consists of individual licenses, and the next level consists of non-overlapping packages of those licenses, such that a given license is included only once in each level. The winning set of bids may consist of bids from various levels, as long as each license is included in only one winning bid.

23. For Auction 73, the Bureau proposes to accept individual bids on C Block licenses for REAGs 1-12 (Level 1) and package bids on certain combinations of C Block REAG licenses (Level 2). Thus, the initial level will be the twelve individual REAG licenses, and the second level will consist of packages of REAGs 1-8 (the 50 United States), REAGs 10 and 12 (Puerto Rico, the U.S. Virgin Islands and the Gulf of Mexico, or “Atlantic”), and REAGs 9 and 11 (the U.S. Pacific territories, or “Pacific”). We propose a package of REAGs covering the 50 states consistent with the Commission’s determination that we should implement a package bidding auction design to facilitate the entry of a new nationwide competitor in the C Block.²⁶ We seek comment on this proposal, including comments suggesting alternative levels or alternative ways of packaging licenses within levels.

Figure 2: Proposed Package Structure of C Block Licenses

Level 2: Packages	50 States								Atlantic		Pacific	
Level 1: REAG licenses	1	2	3	4	5	6	7	8	10	12	9	11

24. After each round, the FCC determines the combination of package and/or single license bids that yields the highest gross amount, and those bids become provisionally winning.²⁷ For licenses that are not subject to package bidding, the FCC Auction System will consider the bids placed in the round and the provisionally winning bids from the previous round; the highest bid on each license will become that round’s provisionally winning bid.²⁸ For licenses subject to package bidding, when determining provisionally winning bids, the FCC Auction System will consider each bidder’s highest bid on each license or package placed up to that point in the auction, regardless of whether the bids were provisionally winning after the rounds in which they were placed. Considering these bids from previous rounds makes it possible for new bids on individual licenses to combine with other bids in order to compete with bids on

²⁶ See 700 MHz Second Report and Order at ¶292.

²⁷ Tied bids, or ties among sets of bids, will be broken randomly. See below, Section IV.C.6.

²⁸ The Bureau proposes to provide bidders with limited ability to withdraw provisionally winning bids for licenses not subject to package bidding (non-C Block licenses). See below, Section IV.C.8.

packages.²⁹ The provisionally winning bids are determined by comparing aggregate gross bid amounts, at each level, for various combinations of package and individual license bids.³⁰

B. Auction Structure

1. Round Structure

25. Auction 73 will consist of sequential bidding rounds. The initial bidding schedule will be announced in a public notice to be released at least one week before the start of the auction.

26. The Commission will conduct Auction 73 over the Internet, and telephonic bidding will be available as well. The toll-free telephone number for the Auction Bidder Line will be provided to qualified bidders.

27. The Bureau proposes to retain the discretion to change the bidding schedule in order to foster an auction pace that reasonably balances speed with the bidders' need to study round results and adjust their bidding strategies. Under this proposal, the Bureau may change the amount of time for bidding rounds, the amount of time between rounds, or the number of rounds per day, depending upon bidding activity and other factors. The Bureau seeks comment on this proposal. Commenters may wish to address the role of the bidding schedule in managing the pace of the auction and the tradeoffs in managing auction pace by bidding schedule changes, by changing the activity requirements or bid amount parameters, or by using other means.

2. Stopping Rule

28. The Bureau has discretion "to establish stopping rules before or during multiple round auctions in order to terminate the auction within a reasonable time."³¹ For Auction 73, the Bureau proposes to employ a simultaneous stopping rule approach. A simultaneous stopping rule means that all licenses remain available for bidding until bidding closes simultaneously on all licenses. More specifically, bidding will close simultaneously on all licenses and packages after the first round in which no bidder submits any new bids, applies a proactive waiver, or withdraws any provisionally winning bids.³² Thus, unless the Bureau announces alternative stopping procedures, bidding will remain open on all licenses until bidding stops on every license, regardless of whether bids are placed on individual licenses or packages of licenses. Consequently, it is not possible to determine in advance how long the auction will last.

²⁹ This set of considered bids for licenses and packages in the C Block will likely include many bids with very little likelihood of ever becoming provisionally winning. Bidders will be able to assess the chances that a considered bid from a previous round will become provisionally winning in a later round by comparing it to the considered bids and to prevailing price levels. As discussed in more detail below, for licenses subject to package bidding, we propose to give bidders some limited ability to "drop" non-provisionally winning bids in order to prevent a bid they no longer want from becoming provisionally winning in a later round. See Section IV.C.8.

³⁰ Packages do not overlap within a level. That is, a license cannot be included in more than one package in a given level. Consequently, comparing aggregate gross bid amounts at each level does not require combinatorial optimization. See Attachment C for a more detailed discussion. See also Rothkopf, M. H., A. Pekeč, and R. M. Harstad, "Computationally Manageable Combinatorial Auctions," *Management Sciences*, 44(8), August 1998, 1131-1147. A more complex combinatorial optimization process to determine provisionally winning bids is required in some other package bidding designs, including SMR-PB, the design of which the FCC sought comment on for Auction 66.

³¹ 47 C.F.R. § 1.2104(e).

³² Proactive waivers are described in Section IV.C.3. "Activity Rule Waivers and Reducing Eligibility," provisionally winning bids are defined in Section IV.C.6. "Provisionally Winning Bids," and bid withdrawals are described in Section IV.C.8. "Bid Withdrawal and Dropped Bids," below. Dropped bids, described in Section IV.C.8., do not keep the auction open.

29. Further, the Bureau proposes to retain the discretion to exercise any of the following options during Auction 73:

- a) Use a modified version of the simultaneous stopping rule. The modified stopping rule would close the auction for all licenses after the first round in which no bidder applies a waiver, withdraws a provisionally winning bid, or places any new bids on any license or package for which it is not the provisionally winning bidder. Thus, absent any other bidding activity, a bidder placing a new bid on a license or a package of licenses for which it is the provisionally winning bidder would not keep the auction open under this modified stopping rule. When commenting on this proposal, commenters should address whether this modified stopping rule should apply across licenses and packages of those licenses. For example, should the auction close if the only bid placed is a new bid on a license that is part of a package upon which that same bidder holds the provisionally winning bid? Commenters should also address whether this modified stopping rule should apply only after applicable reserve prices have been met.
- b) Declare that the auction will end after a specified number of additional rounds (“special stopping rule”). If the Bureau invokes this special stopping rule, it will accept bids in the specified final round(s) after which the auction will close.
- c) Keep the auction open even if no bidder places any new bids, applies a waiver, or withdraws any provisionally winning bids. In this event, the effect will be the same as if a bidder had applied a waiver. The activity rule, therefore, will apply as usual, and a bidder with insufficient activity will either lose bidding eligibility or use a waiver.

30. The Bureau proposes to exercise these options only in certain circumstances, for example, where the auction is proceeding unusually slowly or quickly, there is minimal overall bidding activity, or it appears likely that the auction will not close within a reasonable period of time or will close prematurely, e.g., before bidders have had an adequate opportunity to satisfy any applicable reserve prices. Before exercising certain of these options, the Bureau is likely to attempt to change the pace of the auction by, for example, changing the number of bidding rounds per day and/or changing minimum acceptable bids. The Bureau proposes to retain the discretion to exercise any of these options with or without prior announcement during the auction. The Bureau seeks comment on these proposals.

3. Information Relating to Auction Delay, Suspension, or Cancellation

31. For Auction 73, the Bureau proposes that, by public notice or by announcement during the auction, the Bureau may delay, suspend, or cancel the auction in the event of natural disaster, technical obstacle, administrative or weather necessity, evidence of an auction security breach or unlawful bidding activity, or for any other reason that affects the fair and efficient conduct of competitive bidding.³³ In such cases, the Bureau, in its sole discretion, may elect to resume the auction starting from the beginning of the current round, resume the auction starting from some previous round, or cancel the auction in its entirety. Network interruption may cause the Bureau to delay or suspend the auction. The Bureau emphasizes that exercise of this authority is solely within the discretion of the Bureau, and its use is not intended to be a substitute for situations in which bidders may wish to apply their activity rule waivers. The Bureau seeks comment on this proposal.

³³ 47 C.F.R. § 1.2104(i).

C. Bidding Procedures

1. Upfront Payments and Bidding Eligibility

32. The Bureau has delegated authority and discretion to determine an appropriate upfront payment for each license being auctioned.³⁴ A bidder's upfront payment is a refundable deposit to establish eligibility to bid on licenses. Upfront payments related to the licenses for specific spectrum subject to auction protect against frivolous or insincere bidding and provide the Commission with a source of funds from which to collect payments owed at the close of the auction.³⁵ With these guidelines in mind, the Bureau proposes to calculate upfront payments on a license-by-license basis using a method that considers the likely relative demand for the licenses, taking into account, among other factors, the population within the license area, the bandwidth covered by the license, whether the license includes rural areas, and whether a license for the exact same area was unsold in Auction 66.³⁶ Specifically, the Bureau proposes to calculate upfront payments as follows:³⁷

- For licenses covering CMAs in the 50 states in which the licenses offered in Auction 66 were sold, \$0.05 per MHz per population (MHz-pop) for Metropolitan Statistical Area (MSA) licenses and \$0.03/MHz-pop for Rural Service Area (RSA) licenses
- For licenses covering EAs in the 50 states in which the corresponding licenses in both EA blocks offered in Auction 66 were sold, the sum of \$0.05/MHz-pop for counties contained within an MSA and \$0.03/MHz-pop for counties contained within an RSA
- For licenses covering REAGs in the 50 states in which the corresponding licenses in all three REAG blocks offered in Auction 66 were sold, the sum of \$0.05/MHz-pop for counties contained within an MSA and \$0.03/MHz-pop for counties contained within an RSA
- For licenses covering geographic areas for which an Auction 66 license was unsold, \$0.01/MHz-pop
- For licenses covering the Gulf of Mexico, \$1,000 per MHz
- For all remaining licenses, \$0.01/MHz-pop

For all licenses, the results of the above calculations are subject to a minimum of \$500 per license and are rounded using our standard rounding procedure.³⁸ The proposed number of bidding units for each license

³⁴ See *Part 1 Order*, 12 FCC Rcd at 5697-98 ¶ 16. See also *Part 1 Third Report and Order*, 13 FCC Rcd at 425 ¶ 86; Implementation of Section 309(j) of the Communications Act—Competitive Bidding, *Second Report and Order*, FCC 94-61, 9 FCC Rcd 2348, 2378-79 ¶¶ 171-75 (1994) (“*Competitive Bidding Second Report and Order*”).

³⁵ See *Competitive Bidding Second Report and Order*, 9 FCC Rcd at 2378-79 ¶¶ 171-76.

³⁶ For a CMA license in Auction 73, the proposed upfront payment considers whether the Auction 66 A Block license for the same CMA was sold; for an EA license, whether either of the two Auction 66 licenses (B and C Blocks) for the same EA were unsold; and for an REAG license, whether any of the three Auction 66 licenses (D, E and F Blocks) for the same REAG were unsold. This approach does not consider Auction 66 results for other licenses that overlap or encompass a particular geographic area. That is, the Auction 66 results for EA and REAG licenses are not considered for Auction 73 CMA licenses, the Auction 66 results for CMA and REAG licenses are not considered for Auction 73 EA licenses, and the Auction 66 results for CMA and EA licenses are not considered for Auction 73 REAG licenses.

³⁷ All population figures are from the 2000 U.S. Census, U.S. Department of Commerce, Bureau of the Census. See Census 2000 Summary File 1 (SF1) and July 3, 2001, news releases covering the U.S. Virgin Islands, Guam, the Northern Mariana Islands, and American Samoa.

³⁸ Results above \$10,000 are rounded to the nearest \$1,000; results below \$10,000 but above \$1,000 are rounded to the nearest \$100; and results below \$1,000 are rounded to the nearest \$10.

and associated upfront payment amounts are listed in Attachment A.³⁹ The Bureau seeks comment on this proposal.

33. The Bureau further proposes that the amount of the upfront payment submitted by a bidder will determine the bidder's initial bidding eligibility in bidding units. The Bureau proposes that each license be assigned a specific number of bidding units equal to the upfront payment listed in Attachment A, on a bidding unit per dollar basis.⁴⁰ For a package, we propose to calculate the bidding units by adding together the bidding units of the individual licenses that make up the package. The number of bidding units for a given license is fixed and does not change during the auction as prices change. A bidder's upfront payment is not attributed to specific licenses or packages. Rather, a bidder may place bids on any of the licenses it selected on its application to participate in the auction as long as the total number of bidding units associated with those licenses does not exceed its current eligibility. Eligibility cannot be increased during the auction; it can only remain the same or decrease.

34. In the proposed SMR-HPB auction format, a bidder may place bids on any combination of licenses and packages of licenses as long as the total number of bidding units associated with the licenses does not exceed the bidder's current eligibility. Therefore, applicants interested in bidding only on individual licenses should determine the total number of bidding units associated with licenses they wish to bid on or have included in provisionally winning bids⁴¹ in any single round, and submit an upfront payment amount covering that total number of bidding units. Applicants interested in bidding on packages should determine their upfront payment by calculating the sum of bidding units associated with each discrete license they wish to include in new bids (package or individual bids) or have included in provisionally winning bids in any single round. The bidding units associated with a given license, even if the license is included in more than one bid, will be counted only once per bidder per round. Hence, if a bidder has enough eligibility to bid on certain licenses, it can place bids on the licenses individually *and* on packages containing the licenses without needing additional eligibility. For example, if licenses A, B, and C each have 10,000 bidding units, and a bidder wishes in a single round to be able to bid on licenses A, B, and C individually and on packages AB and ABC, the bidder needs 30,000 bidding units of eligibility.

2. Activity Rule

35. In order to ensure that the auction closes within a reasonable period of time, an activity rule requires bidders to bid actively throughout the auction, rather than wait until late in the auction before participating.

36. In the proposed SMR-HPB format, as well as in an SMR format, bidders are required to be active on a specific percentage of their current bidding eligibility during each round of the auction. Failure to maintain the requisite activity level will result in the use of an activity rule waiver, if any remain, or a reduction in the bidder's eligibility, possibly curtailing or eliminating the bidder's ability to place additional bids in the auction.⁴²

³⁹ The upfront payment for any of the pre-defined packages of C Block licenses will be the sum of the upfront payments of the licenses included in the specific package.

⁴⁰ "Former defaulters" — *i.e.*, applicants, including any of their affiliates, any of their controlling interests, or any of the affiliates of their controlling interests, that in the past have defaulted on any Commission licenses or been delinquent on any non-tax debt owed to any Federal agency, but that have since remedied all such defaults and cured all of their outstanding non-tax delinquencies — are required to pay upfront payments that are fifty percent more than the normal upfront payment amounts. 47 C.F.R. § 1.2106(a).

⁴¹ See Section IV.C.6. "Provisionally Winning Bids," below.

⁴² See Section IV.C.3. "Activity Rule Waivers and Reducing Eligibility," below.

37. The Bureau proposes to divide the auction into at least two stages, each characterized by a different activity requirement. The auction will start in Stage One. The Bureau proposes to advance the auction to the next stage by announcement during the auction. In exercising this discretion, the Bureau will consider a variety of measures of auction activity, including but not limited to the percentage of licenses (as measured in bidding units) on which there are new bids,⁴³ the number of new bids, and the increase in revenue. The Bureau seeks comment on these proposals.

38. Commenters that believe these activity rules should be modified should explain their reasoning and comment on the desirability of an alternative approach. Commenters are advised to support their claims with analyses and suggested alternative activity rules. Additionally, commenters may wish to address the role of activity rules in managing the pace of the auction and the tradeoffs in managing auction pace by bidding schedule changes, by changing the activity requirements or bid amount parameters, or by using other means.

39. In SMR and SMR-HPB, a bidder's activity in a round will be the sum of the bidding units associated with any licenses covered by new and provisionally winning bids.⁴⁴ In SMR-HPB, the bidding units associated with a given license will be counted only once in a bidder's activity calculation for the round, even if the bidder places multiple bids including the license. For example, consider two licenses, A and B, each having 10,000 bidding units. Assuming a bidder bids on license A as well as the package AB in a given round, the bidder's activity would be 20,000 bidding units, calculated as the sum of the bidding units of licenses A and B. Note that the bidding units for license A are not counted twice.

40. The Bureau proposes the following activity requirements, while noting again that the Bureau retains the discretion to change stages unilaterally by announcement during the auction:

Stage One: In each round of the first stage of the auction, a bidder desiring to maintain its current bidding eligibility is required to be active on licenses representing at least 80 percent of its current bidding eligibility. Failure to maintain the required activity level will result in the use of an activity rule waiver or a reduction in the bidder's bidding eligibility for the next round of bidding. During Stage One, a bidder's reduced eligibility for the next round will be calculated by multiplying the bidder's current round activity by five-fourths (5/4).

Stage Two: In each round of the second stage, a bidder desiring to maintain its current bidding eligibility is required to be active on 95 percent of its current bidding eligibility. Failure to maintain the required activity level will result in the use of an activity rule waiver or a reduction in the bidder's bidding eligibility for the next round of bidding. During Stage Two, a bidder's reduced eligibility for the next round will be calculated by multiplying the bidder's current round activity by twenty-nineteenths (20/19).

41. The Bureau retains the discretion to change the activity requirements during the auction. For example, the Bureau could decide to add an additional stage with a higher activity requirement, not to transition to Stage Two if it believes the auction is progressing satisfactorily under the Stage One activity requirement, or to transition to Stage Two with an activity requirement that is higher or lower than the 95

⁴³ For example, when monitoring activity for determining when to change stages, the Bureau may consider the percentage of bidding units of the licenses receiving new provisionally winning bids, excluding any FCC-held licenses. In past auctions, the Bureau has generally changed stages when this measure was approximately twenty percent or below for three consecutive rounds of bidding.

⁴⁴ In a standard SMR auction without package bidding, the activity calculation is described as the sum of the bidding units for licenses on which the bidder places new bids or holds provisionally winning bids. For bidders placing bids only on individual licenses, the calculation as stated above is equivalent to the standard SMR calculation.

percent proposed herein.⁴⁵ If the Bureau exercises this discretion, it will alert bidders by announcement in the FCC Auction System.

3. Activity Rule Waivers and Reducing Eligibility

42. Use of an activity rule waiver preserves the bidder's eligibility despite the bidder's activity in the current round being below the required minimum level. An activity rule waiver applies to an entire round of bidding, not to particular licenses. Activity rule waivers can be either proactive or automatic and are principally a mechanism for bidders to avoid the loss of bidding eligibility in the event that exigent circumstances prevent them from bidding in a particular round.

43. The FCC Auction System assumes that a bidder not meeting the activity requirement would prefer to apply an activity rule waiver (if available) rather than lose bidding eligibility. Therefore, the system will automatically apply a waiver at the end of any bidding round in which a bidder's activity level is below the minimum required unless (1) the bidder has no activity rule waivers remaining; or (2) the bidder overrides the automatic application of a waiver by reducing eligibility, thereby meeting the activity requirement. If a bidder has no waivers remaining and does not satisfy the required activity level, its eligibility will be permanently reduced, possibly curtailing or eliminating the bidder's ability to place additional bids in the auction.

44. A bidder with insufficient activity may wish to reduce its bidding eligibility rather than use an activity rule waiver. If so, the bidder must affirmatively override the automatic waiver mechanism during the bidding round by using the "reduce eligibility" function in the FCC Auction System. In this case, the bidder's eligibility is permanently reduced to bring the bidder into compliance with the activity rule as described above. Reducing eligibility is an irreversible action. Once eligibility has been reduced, a bidder will not be permitted to regain its lost bidding eligibility, even if the round has not yet closed.

45. Under the proposed simultaneous stopping rule, a bidder may apply an activity rule waiver proactively as a means to keep the auction open without placing a bid. If a bidder proactively applies an activity rule waiver (using the "apply waiver" function in the FCC Auction System) during a bidding round in which no bids are placed or withdrawn, the auction will remain open and the bidder's eligibility will be preserved. An automatic waiver applied by the FCC Auction System in a round in which there are no new bids, withdrawals, or proactive waivers will not keep the auction open. A bidder cannot apply a proactive waiver after bidding in a round, and applying a proactive waiver will preclude a bidder from placing any bids in that round.⁴⁶ Applying a waiver is irreversible; once a proactive waiver is submitted, that waiver cannot be unsubmitted, even if the round has not yet closed.

46. Consistent with recent auctions of commercial wireless spectrum, the Bureau proposes that each bidder in Auction 73 be provided with three activity rule waivers that may be used as set forth above at the bidder's discretion during the course of the auction. The Bureau seeks comment on this proposal.

4. Reserve Prices or Minimum Opening Bids

a. Reserve Prices

47. In the *700 MHz Second Report and Order*, the Commission concluded that establishing separate aggregate reserve prices for all the licenses in each block of the 700 MHz Band spectrum to be offered in Auction 73 will serve the public interest. More specifically, the Commission directed the

⁴⁵ If the Bureau implements stages with activity requirements other than the ones listed above, a bidder's reduced eligibility for the next round will be calculated by multiplying the bidder's current round activity by the reciprocal of the activity requirement. For example, with a 98 percent activity requirement, the bidder's current round activity would be multiplied by 50/49; with a 100 percent activity requirement, the bidder's current round activity would become its bidding eligibility (current round activity would be multiplied by 1/1).

⁴⁶ In general, once a bidder places a proactive waiver during a round, the FCC Auction System does not allow the bidder to take any other bidding-related action, including placing, withdrawing, or dropping bids later in that round.

Bureau to adopt and publicly disclose block-specific aggregate reserve prices, pursuant to its existing delegated authority and the regular pre-auction process and consistent with the Commission's conclusions in the *700 MHz Second Report and Order*. We propose that the sum of the provisionally winning gross bids for all licenses in each block must equal or exceed the disclosed aggregate reserve price for the block before the Commission will assign licenses in that block.⁴⁷ For reasons discussed below, we propose to adopt the following block-specific aggregate reserve prices to be used pursuant to this proposal: Block A, \$1.807380 billion; Block B, \$1.374426 billion; Block C, \$4.637854 billion; Block D, \$1.330000 billion; Block E, \$0.903690 billion. We seek comment on all aspects of this proposal, as well as comment on other proposals for implementing the Commission's direction in the *700 MHz Second Report and Order*.

48. *Background.* Section 309(j) calls upon the Commission to prescribe methods for establishing a reasonable reserve price or a minimum opening bid amount when FCC licenses are subject to auction, unless the Commission determines that a reserve price or minimum opening bid amount is not in the public interest.⁴⁸ Consistent with this mandate, the Commission has directed the Bureau to seek comment on the use of a minimum opening bid amount and/or reserve price prior to the start of each auction.⁴⁹ If a reserve price is adopted, it may be disclosed or undisclosed.⁵⁰

49. The Commission is statutorily obliged to consider and balance a variety of public interests and objectives when establishing service rules and licensing procedures with respect to the public spectrum resource. These objectives include promoting recovery for the public a portion of the value of that resource.⁵¹ In the *700 MHz Second Report and Order*, the Commission adopted innovative provisions with respect to licenses in each separate block of the 700 MHz Band, including provisions establishing a public/private partnership with respect to the D Block license, open platform requirements for licenses in the C Block, and geographic performance requirements with respect to licenses in the A, B, and E Blocks. To address the possibility that various factors, including but not limited to the innovative service rules adopted for 700 MHz Band licenses, might impact the recovery of a portion of the value of the public spectrum resource, the Commission concluded that the public interest requires that the auction of the licenses be subject to certain reserve prices.

50. The Commission further recognized that, given the array of different conditions imposed on the licenses for different blocks, bidders may place sufficient value on licenses in a particular block to satisfy a reserve applicable to that block even though interest in licenses in another block may be too low to satisfy the latter block's aggregate reserve. The Commission therefore concluded that block-specific aggregate reserve prices should be used and directed the Bureau to adopt auction procedures that will enable licensing of specific blocks provided that the auction results satisfy the block-specific reserve prices. In this regard, the Commission expressly noted that under procedures typical of Commission auctions, a bidder would be able to raise its own provisionally winning bid(s) to attempt to satisfy the reserve price for licenses in any spectrum block.⁵²

⁴⁷ If the auction results satisfy a block-specific aggregate reserve, licenses in that block will be assigned based on the auction results, subject to completion of the licensing process, including review of applicants' qualifications. If not, the Commission has provided for a prompt auction of alternative, less restrictive licenses for the A, B, C, and E Blocks, and the possibility of a prompt re-auction of the license for the D Block, subject to the same applicable block-specific reserves. We propose and seek comment on procedures for any such subsequent auction in Section V, below.

⁴⁸ 47 U.S.C. § 309(j)(4)(F). See also 47 C.F.R. § 1.2104(c) and (d).

⁴⁹ *Part 1 Third Report and Order*, 13 FCC Rcd at 455-56 ¶ 141.

⁵⁰ See 47 C.F.R. § 1.2104(c). See also *Part 1 Third Report and Order*, 13 FCC Rcd at 455 ¶ 140.

⁵¹ 47 U.S.C. § 309(j)(3)(C).

⁵² See Section IV.B.2. "Stopping Rule," above.

51. The Commission concluded that, in order to recover an appropriate portion of the value of the public spectrum resource, the block-specific aggregate prices should reflect current assessments of the potential market value of licenses for the 700 MHz Band. The Commission directed that this assessment be based on various factors including, but not limited to, the characteristics of this band and the value of other recently auctioned licenses, such as licenses for Advanced Wireless Services. The Commission reasoned that using AWS-1 auction results might be an appropriate guide for setting block-specific reserve prices reflecting a conservative estimate of final market value. For instance, spectrum in the 700 MHz Band possesses superior propagation characteristics to AWS-1 spectrum. In addition, as of February 18, 2009, the 700 MHz Band spectrum will be unencumbered, while full access to AWS-1 spectrum requires the relocation of both Government and commercial incumbent users. Thus, other factors aside, 700 MHz Band licenses with comparable geographic service areas and bandwidth should have a higher market value than AWS-1 licenses.

52. The Commission expressly noted that the detailed rules regarding the D Block license, the D Block licensee's required construction of a network to be shared by public safety service users, and the resulting limitations on the flexibility of the D Block licensee, should be given weight in assessing the D Block's potential market value. Based solely on geographic area and spectrum block size, AWS-1 auction results might suggest a D Block reserve price of \$1.7 billion. However, in light of the D Block license conditions essential to the public safety purpose of the public/private partnership, it might be appropriate to expect bidders to bid only about 75 percent to 80 percent of such an amount, or about \$1.33 billion. In addition, when determining relative valuation of other blocks, the Bureau should consider the relative valuation of differing blocks in the recent auction of AWS-1 licenses.

53. *Discussion.* The Commission directed the Bureau to establish block-specific reserve prices by taking into account a conservative estimate of market value based on auction results for AWS-1 spectrum licenses, as noted above and in the *700 MHz Second Report and Order*, as well as various factors including, but not limited to, the characteristics of this band. Using AWS-1 auction results as a guide, the sum of block-specific reserves would amount to about \$10.4 billion. The Commission also provided specific guidance in setting the reserve applicable to the D Block license, suggesting that an amount of approximately \$1.33 billion would be appropriate. Consistent with the guidance of the Commission, we propose the following block-specific aggregate reserve prices for Auction 73: Block A, \$1.807380 billion; Block B, \$1.374426 billion; Block C, \$4.637854 billion; Block D, \$1.330000 billion; Block E, \$0.903690 billion. Together, these block-specific aggregate reserves sum to \$10.053350 billion.⁵³

54. As the Commission has already noted and as discussed above, the D Block reserve price of \$1.33 billion is discounted from an amount based more closely on AWS-1 bids because of the unique service rules and related obligations imposed upon the D Block licensee. For the A, B, C, and E Blocks, we base the reserve prices on the respective market value estimates using AWS-1 bids, adding one percent, and rounding to the nearest thousand dollars. Because of the value-enhancing propagation characteristics and relatively unencumbered nature of the 700 MHz Band spectrum, we believe these are

⁵³ The Commission's suggested \$10.4 billion aggregate market value estimate for the 700 MHz licenses was derived as the sum of block-specific estimates of the market value of 700 MHz licenses, based on AWS-1 winning bids. Each block-specific estimate was based on bid amounts for comparable AWS-1 spectrum blocks, taking geographic area type and bandwidth into account, and further adjusting for the specific bandwidth in the 700 MHz blocks. See *700 MHz Second Report and Order*, at n.700. The block-specific reserves we propose here accept the amounts suggested by the Commission in the *700 MHz Second Report and Order* as a base, with the \$10.4 billion aggregate market value estimate adjusted for the specific amount of \$1.33 billion for the D Block.

conservative estimates.⁵⁴ We seek comment on these proposed reserve prices and specifically on whether any or all of them should be higher or lower than proposed here.

55. We propose to consider gross bid amounts rather than net bid amounts in determining whether the block-specific reserve prices have been met. Anonymous bidding procedures, which we propose to apply in Auction 73 at Commission direction, preclude disclosing net bid amounts until after the close of bidding. Therefore, were the block-specific reserve prices to be set in net rather than gross terms, during the auction bidders and the public would be less able to monitor whether provisionally winning bids had met the applicable reserve prices.

b. Minimum Opening Bids

56. In contrast to a reserve price, a minimum opening bid is the minimum bid price set at the beginning of the auction below which no bids will be accepted. It is generally used to accelerate the competitive bidding process. Also, the auctioneer often has the discretion to lower the minimum opening bid amount later in the auction. It is also possible for the minimum opening bid and the reserve price to be the same amount.

⁵⁴ The estimated market values based on Auction 66 (AWS-1) bids and the calculation of the reserve prices we propose are described in the tables below.

Estimated 700 MHz Band Market Value Based on AWS-1 Bids

700 MHz Block	700 MHz Bandwidth (MHz)	Geographic Area Type	Comparable AWS-1 Block	AWS-1 Bandwidth (MHz)	Bandwidth Ratio 700/AWS-1	AWS-1 Bids	Estimated Market Value Based on AWS-1 Bids
A	12	EA	C	10	1.2	\$1,491,238,000	\$1,789,485,600
B	12	CMA	A	20	0.6	\$2,268,029,200	\$1,360,817,520
E	6	EA	C	10	0.6	\$1,491,238,000	\$894,742,800
C	22	REAG	F	20	1.1	\$4,174,486,000	\$4,591,934,600
D	10	Nationwide*	D and E	10	1.0	\$1,749,031,000	\$1,749,031,000
Total	62						\$10,386,011,520

* Since AWS-1 did not have any nationwide licenses, “Estimated Market Value Based on AWS-1 Bids” is based on Auction 66 bids for 10 MHz REAG licenses.

The “Estimated Market Value Based on AWS-1 Bids” is calculated as the “Bandwidth Ratio 700/AWS-1” multiplied by “AWS-1 Bids.”

Proposed 700 MHz Band Reserve Prices

700 MHz Block	Estimated Market Value Based on AWS-1 Bids	Commission Guidance on D Block Reserve Price	Proposed 700 MHz Band Reserve Prices
A	\$1,789,485,600		\$1,807,380,000
B	\$1,360,817,520		\$1,374,426,000
E	\$894,742,800		\$903,690,000
C	\$4,591,934,600		\$4,637,854,000
D	\$1,749,031,000	\$1,330,000,000	\$1,330,000,000
Total	\$10,386,011,520		\$10,053,350,000

The “Estimated Market Value Based on AWS-1 Bids” entries were calculated in the previous table.

“Commission Guidance on D Block Reserve Price” reflects explicit Commission advice on the D Block reserve price.

Auction 66 results are available at <http://wireless.fcc.gov/auctions/66/>.

57. In light of Section 309(j)'s requirement to prescribe methods for establishing reasonable minimum opening bid amounts for licenses subject to auction unless such bid amounts are not in the public interest, the Bureau proposes to establish minimum opening bid amounts for Auction 73. The Bureau believes a minimum opening bid amount, which has been used in other auctions, is an effective bidding tool for accelerating the competitive bidding process.⁵⁵

58. Specifically, for Auction 73, the Bureau proposes to calculate minimum opening bid amounts on a license-by-license basis using a method that takes into consideration, among other factors, the winning bids for AWS-1 licenses in Auction 66. This approach for Auction 73 minimum opening bid amounts draws on the Auction 66 prices that were bid on licenses for the exact same geographic areas.⁵⁶ This approach makes it possible to establish somewhat higher minimum opening bids for licenses that may likely sell for relatively higher prices, thereby potentially reducing the number of bidding rounds necessary for licenses to reach their final auction prices. Specifically, the Bureau proposes to calculate minimum opening bid amounts as follows:⁵⁷

- For licenses covering geographic areas in the 50 states for which all of the corresponding licenses offered in Auction 66 for the exact same geographic area were sold, 25 percent of the dollars per MHz per population (MHz-pop) of the net amounts of the Auction 66 winning bids for licenses covering the same geographic license area, subject to a minimum of \$0.03/MHz-pop
- For licenses covering geographic areas for which a corresponding Auction 66 license was unsold, \$0.01/MHz-pop
- For licenses covering the Gulf of Mexico, \$1,000 per MHz
- For all remaining licenses, \$0.01/MHz-pop

For all licenses, the results of the above calculations are subject to a minimum of \$500 per license and are rounded using our standard rounding procedure.⁵⁸ The Bureau proposes to calculate the minimum opening bid for any package as the sum of the minimum opening bids for the licenses in the package. The proposed minimum opening bid amount for each license available in Auction 73 is set forth in Attachment A of this Public Notice. The Bureau seeks comment on this proposal.

59. If commenters believe that these minimum opening bid amounts will result in unsold licenses or are not reasonable amounts, they should explain why this is so, and comment on the desirability of an

⁵⁵ See, e.g., Auction of 800 MHz SMR Upper 10 MHz Band, Minimum Opening Bids or Reserve Prices, *Order*, DA 97-2147, 12 FCC Rcd 16354 (1997); "Auction of the Phase II 220 MHz Service Licenses, Auction Notice and Filing Requirements for 908 Licenses Consisting of Economic Area (EA), Economic Area Grouping (EAG), and Nationwide Licenses, Scheduled for September 15, 1998, Minimum Opening Bids and Other Procedural Issues," *Public Notice*, DA 98-1010, 13 FCC Rcd 16445 (1998).

⁵⁶ For a CMA license in Auction 73, the proposed minimum opening bid considers the net amount of the winning bid for the Auction 66 A Block license for the same CMA; for an EA license, the net amounts of the winning bids for the two Auction 66 licenses (B and C Blocks) for the same EA; and for an REAG license, the net amounts of the winning bids for the three Auction 66 licenses (D, E and F Blocks) for the same REAG. This approach does not consider Auction 66 results for other licenses that overlap or encompass a particular geographic area. That is, the Auction 66 results for EA and REAG licenses are not considered for the minimum opening bid amounts for Auction 73 CMA licenses the Auction 66 results for CMA and REAG licenses are not considered for Auction 73 EA licenses and the Auction 66 results for CMA and EA licenses are not considered for Auction 73 REAG licenses.

⁵⁷ All population figures are from the 2000 U.S. Census, U.S. Department of Commerce, Bureau of the Census. See Census 2000 Summary File 1 (SF1) and July 3, 2001, news releases covering the U.S. Virgin Islands, Guam, the Northern Mariana Islands, and American Samoa.

⁵⁸ Results above \$10,000 are rounded to the nearest \$1,000; results below \$10,000 but above \$1,000 are rounded to the nearest \$100; and results below \$1,000 are rounded to the nearest \$10.

alternative approach. Commenters are advised to support their claims with valuation analyses and suggested amounts or formulas. In establishing minimum opening bid amounts, the Bureau particularly seeks comment on such factors as the amount of spectrum being auctioned, the availability of technology to provide service, the size of the service areas, issues of interference with other spectrum bands and any other relevant factors that could reasonably have an impact on valuation of the licenses being auctioned. The Bureau also seeks comment on whether, consistent with Section 309(j), the public interest would be served by having no minimum opening bid amounts or higher minimum opening bid amounts. Furthermore, commenters may wish to comment on whether, given the proposed block-specific aggregate reserve prices, it would be desirable to have different minimum opening bid formulas for different blocks. For example, higher minimum opening bids could reduce the number of rounds it takes for block-specific aggregate reserve prices to be met. Commenters may also wish to address the general role of minimum opening bids in managing the pace of the auction. Would it be preferable for auction pace to be controlled by minimum opening bids – for example, by setting higher minimum opening bids to reduce the number of rounds it takes licenses to reach their final prices – or through other means such as changes to bidding schedules or activity requirements?

5. Bid Amounts

60. The Bureau proposes that, in each round, eligible bidders be able to place a bid on a given license or package using one or more pre-defined bid amounts.⁵⁹ Under this proposal, the FCC Auction System interface will list the acceptable bid amounts for each license or package.

61. *Minimum Acceptable Bids.* The first of the acceptable bid amounts is called the minimum acceptable bid amount. The minimum acceptable bid amount for a license will be equal to its minimum opening bid amount until there is a provisionally winning bid on the license or on a package that includes the license. The minimum acceptable bid amount for a package will be the sum of the minimum acceptable bid amounts for the licenses in the package. Minimum acceptable bids are calculated based on current price estimates and an activity-based formula.

62. *Current Price Estimates.* After there is a provisionally winning bid covering a license, the FCC Auction System will determine a “current price estimate” (“CPE”) for each license in each round as a basis for calculating minimum acceptable bids.⁶⁰ For non-C Block licenses the CPE is the provisionally winning bid amount, so that minimum acceptable bids are based on provisionally winning bid amounts, as in a standard SMR auction without package bidding. For licenses in the C Block subject to HPB, if a bid on an individual license is provisionally winning, the CPE for that license is the provisionally winning bid amount. If a package bid is provisionally winning, CPEs for individual licenses in the package are constructed by scaling up the bids on individual licenses so that the sum of the license CPEs equals the provisionally winning package bid.⁶¹ Bids are scaled up by adding “shares” to the highest bid received so far in the auction for each license in the package.⁶² These shares are proportional to the bidding units associated with each license relative to the total number of bidding units in the package. If, contrary to our proposal here, there are multiple levels of packages, license bids may need to have additional shares added in order to scale up to the package bids at higher levels of aggregation. The mechanism for determining CPEs in an SMR-HPB auction format is described in more detail in Attachment C.

⁵⁹ Bidders must have sufficient eligibility to place a bid on the particular license and/or package. *See* Section IV.C.1. “Upfront Payments and Bidding Eligibility,” above.

⁶⁰ For the licenses subject to package bidding in SMR-HPB, there may not be individual provisionally winning bids for some licenses, if the provisionally winning bid covering the licenses is a package bid. Therefore, CPEs serve as a proxy for individual license provisionally winning bid amounts. The procedure for computing CPEs is described briefly above in Section IV.A.2.b. and in greater detail in Attachment C.

⁶¹ Goeree, J. K. and C. A. Holt, “A Simple Combinatorial Auction,” Working Paper, May, 2007.

⁶² If no bids have been placed on an individual license, the share will be added to the minimum opening bid amount.

63. *Activity-Based Formula.* Once CPEs are calculated, minimum acceptable bids are then determined for each license as the amount of the CPE plus a percentage of the CPE. The percentage is calculated using the activity-based formula described below. In general, the percentage will be higher when many bidders are bidding on a license, or on a package containing a license, than when few bidders are bidding on a license.

64. The percentage of the provisionally winning bid used to establish the minimum acceptable bid amount is calculated based on an activity index at the end of each round. The activity index is a weighted average of (a) the number of distinct bidders placing a bid on the license, including package bids, in that round, and (b) the activity index from the prior round. Specifically, the activity index is equal to a weighting factor times the number of bidders placing a bid covering the license in the most recent bidding round plus one minus the weighting factor times the activity index from the prior round.⁶³ The additional percentage is determined as one plus the activity index times a minimum percentage amount, with the result not to exceed a given maximum. The additional percentage is then multiplied by the CPE amount to obtain the minimum acceptable bid for the next round.⁶⁴ The Bureau proposes initially to set the weighting factor at 0.5, the minimum percentage at 0.1 (10%), and the maximum percentage at 0.2 (20%). Hence, at these initial settings, the minimum acceptable bid for a license will be between ten percent and twenty percent higher than the CPE (which, for non-C Block licenses not subject to HPB, will equal the provisionally winning bid), depending upon the bidding activity covering the license. Equations and examples are shown in Attachment B.

65. *Additional Bid Amounts.* Any additional bid amounts are calculated using the minimum acceptable bid amount and a bid increment percentage – more specifically, by multiplying the minimum acceptable bid by one plus successively higher multiples of the bid increment percentage. If, for example, the bid increment percentage is ten percent, the calculation of the first additional acceptable bid amount is (minimum acceptable bid amount) * (1 + 0.1), or (minimum acceptable bid amount) * 1.1; the second additional acceptable bid amount equals the minimum acceptable bid amount times one plus two times the bid increment percentage, or (minimum acceptable bid amount) * 1.2, etc. The Bureau will round the results of these calculations and the minimum acceptable bid calculations using the Bureau's standard rounding procedures.⁶⁵ The Bureau proposes initially to set the bid increment percentage at 0.1.

66. In the case of a license for which the provisionally winning bid has been withdrawn, the minimum acceptable bid amount will equal the second highest bid received for the license.⁶⁶

67. For Auction 73, for non-C Block licenses, the Bureau proposes to begin the auction with one acceptable bid amount per license (the minimum acceptable bid amount). For C Block licenses subject to HPB, the Bureau proposes to begin the auction with three acceptable bid amounts per license (the minimum acceptable bid amount and two additional bid amounts) and one acceptable bid amount per package (the minimum acceptable bid amount and no additional bid amounts).⁶⁷ While the Commission typically has provided for up to a total of nine acceptable bid amounts, we depart from past procedure because our experience indicates that other methods for controlling the pace of the auction (for example,

⁶³ For Round 1 calculations, because there is no prior round (i.e., no round 0), the activity index from the prior round is set at 0.

⁶⁴ The Bureau will round the result using our standard rounding procedures: results above \$10,000 are rounded to the nearest \$1,000; results below \$10,000 but above \$1,000 are rounded to the nearest \$100; and results below \$1,000 are rounded to the nearest \$10.

⁶⁵ *Id.*

⁶⁶ See Section IV.C.8. "Bid Withdrawal and Dropped Bids," below.

⁶⁷ Additional acceptable bidding amounts are proposed for licenses subject to package bidding to ensure that bidders on individual licenses or on smaller packages can compete with larger package bids, even when there may not be active competition on all the separate components of the large package.

changing the minimum and maximum percentages in the activity-based minimum acceptable bid formula described above, or increasing the number of bidding rounds per day) are more effective in that regard.

68. The Bureau retains the discretion to change the minimum acceptable bid amounts, the additional bid amounts, the number of acceptable bid amounts, and the parameters of the formulas used to calculate minimum acceptable bid amounts and additional bid amounts if it determines that circumstances so dictate. Further, the Bureau retains the discretion to do so on a license-by-license and package-by-package basis. The Bureau also retains the discretion to limit: (a) the amount by which a minimum acceptable bid for a license may increase compared with the corresponding provisionally winning bid, and (b) the amount by which an additional bid amount may increase compared with the immediately preceding acceptable bid amount. For example, the Bureau could set a \$10 million limit on increases in minimum acceptable bid amounts over provisionally winning bids. Thus, if the activity-based formula calculates a minimum acceptable bid amount that is \$20 million higher than the provisionally winning bid on a license, the minimum acceptable bid amount would instead be capped at \$10 million above the provisionally winning bid. We seek comment on the circumstances under which the Bureau should employ such a limit, factors we should consider when determining the dollar amount of the limit, and the tradeoffs in setting such a limit or changing parameters of the activity-based formula, such as changing the minimum percentage. If the Bureau exercises this discretion, it will alert bidders by announcement in the FCC Auction System.

69. The Bureau seeks comment on the above proposals. If commenters disagree with the Bureau's proposal to begin the auction with one acceptable bid amount per most licenses and per package, they should suggest an alternative number of acceptable bid amounts to use at the beginning of the auction, an alternative number to use later in the auction, and whether the same number of bid amounts should be used for both licenses and packages. Commenters may wish to address the role of the minimum acceptable bids and the number of acceptable bid amounts in managing the pace of the auction and the tradeoffs in managing auction pace by bidding schedule changes, by changing the activity requirements or bid amount parameters, or by using other means. Given the proposed block-specific aggregate reserve prices, commenters may wish to address the desirability of setting bid amount parameters such that the reserve prices may be met more quickly, or whether it would be preferable to constrain bid amounts such that prices rise more slowly.

6. Provisionally Winning Bids

70. After each round of bidding, the FCC Auction System determines which combination of bids together provides the greatest aggregate gross amount and is therefore provisionally winning. If the auction were to close at the end of that round, the provisionally winning bids would become final winning bids, provided that applicable reserve prices had been met. For the 1,087 licenses not subject to package bidding, the FCC Auction System determines a provisionally winning bid for each license based on the highest bid amount received for the license, taking into account the bids placed in the round and the provisionally winning bids from the previous round.⁶⁸ For licenses in the C Block subject to HPB, the FCC Auction System will determine which combination of individual and package bids yields the highest aggregate gross bid amount, taking into consideration each bidder's highest bid on each license or package submitted up to that point in the auction.⁶⁹ These bids become the provisionally winning bids for the round.

71. In order to determine which combination of bids on licenses and/or packages yields the highest aggregate bid amount in a HPB auction, the FCC Auction System compares aggregate bid

⁶⁸ Bidders may have limited ability to withdraw provisionally winning bids on non-C Block licenses. See Section IV.C.8. Bid Withdrawal and Dropped Bids, below.

⁶⁹ For C Block licenses and packages, bidders may be able to drop non-provisionally winning bids from consideration, in some circumstances and with certain restrictions on subsequent bidding. See Section IV.C.8. Bid Withdrawal and Dropped Bids, below.

amounts across the various levels in a recursive process. It first compares, for each package in the second level, the sum of the highest individual license bids from the first level with the highest bids on packages in the second level containing those licenses. If we decide to include more than two levels, for each package in any subsequent level, the FCC Auction System would compare the highest bid on the package with the highest combination of bids from previous levels corresponding to licenses in that package. Those bids that generate the maximum total bid amounts become provisionally winning. Attachment C provides additional detail on this procedure.

72. For licenses subject to package bidding in SMR-HPB, the FCC Auction System considers each bidder's highest bid on each license or package when determining the provisionally winning bids.⁷⁰ Consequently, for licenses in the C Block, an individual license or package bid that does not become a provisionally winning bid at the conclusion of the round in which it was placed may become a provisionally winning bid at the conclusion of a subsequent round. This may occur even if the bidder does not have the bidding eligibility to cover the newly-provisionally winning bid.⁷¹ This contrasts with the SMR procedure used for licenses not subject to package bidding, in which only provisionally winning bids from the previous round and bids placed during the round are considered when determining provisionally winning bids.

73. Below we propose procedures to permit bidders on C Block licenses or packages to drop from consideration a limited number of non-provisionally winning bids on such licenses and/or packages.⁷² However, provisionally winning bids for licenses subject to package bidding cannot be withdrawn, as discussed below.⁷³

74. If more than one set of bids generates the same highest aggregate gross bid amount (i.e., the sets of bids are tied), the FCC Auction System will break ties randomly. Specifically, the FCC Auction System will assign a random number to each license in each bid upon submission. In the event of ties among bids that generate the highest aggregate gross bid amount, the set of bids with the highest sum of random numbers becomes provisionally winning. Bidders, regardless of whether they hold a provisionally winning bid, can submit higher bids in subsequent rounds. However, if the auction were to end with no other bids being placed, the winning bidders would be those that placed the provisionally winning bids.

75. The set of provisionally winning bids is determined after every round in which new bids are submitted or provisionally winning bids are withdrawn, if applicable. As stated above, the provisionally winning bids at the end of the auction become winning bids provided that applicable reserve prices have been met.

7. Bid Removal

76. Before the close of a bidding round, a bidder has the option of removing any bid placed in that round. By removing bids a bidder may effectively "unsubmit" any bid placed within that round. Once a round closes, a bidder may no longer remove a bid. In contrast to the bid withdrawal provisions described below, a bidder removing a bid placed in the same round is not subject to a withdrawal payment. The Bureau seeks comment on these bid removal procedures.

⁷⁰ The solver considers the highest bid placed by each bidder on a given license or package, regardless of the rounds in which the bids were placed.

⁷¹ In such cases, the bidder's bidding eligibility will not be restored or increased.

⁷² If dropped bids are permitted, their use will be limited and bidders will face constraints on subsequent bidding activity. See Section IV.C.8.

⁷³ See Section IV.C.8. Bid Withdrawal and Dropped Bids, below.

8. Bid Withdrawal and Dropped Bids

77. *Bid Withdrawals.* The Commission has previously found that, in certain circumstances, allowing bid withdrawals facilitates efficient aggregation of licenses and the pursuit of backup strategies as information becomes available during the course of an auction.⁷⁴ The Commission noted, however, that in some instances bidders may seek to withdraw bids for improper reasons and should, therefore, be subject to bid withdrawal payment provisions.⁷⁵ Moreover, the Commission gave the Bureau discretion in managing the auction to limit the number of withdrawals to prevent any bidding abuses. The Commission stated that the Bureau should exercise its discretion, consider limiting the number of rounds in which bidders may withdraw bids, and prevent bidders from bidding on a particular market if the Bureau finds that a bidder is abusing the Commission's bid withdrawal procedures.⁷⁶

78. Applying this reasoning to Auction 73, the Bureau proposes to allow a limited number of bid withdrawals under certain circumstances. Specifically, bidders will be allowed to withdraw their provisionally winning bids on licenses not subject to package bidding (i.e., all licenses except C Block), but in no more than two rounds of the auction. The two rounds in which a bidder may withdraw provisionally winning bids will be at the bidder's discretion. Otherwise, withdrawals must be in accordance with the Commission's rules.⁷⁷ Under this proposal, there is no limit on the number of provisionally winning bids that a bidder may withdraw in either of the rounds in which it withdraws bids. After a provisionally winning bid for a license is withdrawn, the minimum acceptable bid for the license will be set to the next highest bid on the license, and the license will revert to the FCC (i.e., there will not be a provisionally winning bidder on the license).

79. With respect to licenses subject to package bidding (i.e., the C Block) bidders have the option of placing bids on certain predetermined packages of licenses, thereby reducing their risk of winning some, but not all, of the licenses in those packages. While the predetermined packages may not coincide with the "all or nothing" aggregation needs of all bidders, the hierarchical packages should significantly reduce the overall "exposure risk" in the auction that bidders will win only some of the licenses in a desired set. Therefore, to the extent that package bids allow bidders to avoid such risk, withdrawals are less useful to bidders.

80. At the same time, withdrawals by one bidder on licenses subject to package bidding can be more disruptive to the bidding strategies of others than withdrawals on licenses not subject to package bidding. Whether a bid on a license not subject to package bidding becomes provisionally winning depends only upon whether it is the highest bid submitted for the license and, in the case of ties, on its random number assignment. In contrast, whether a bid becomes provisionally winning on a license subject to package bidding depends in part upon the particular configuration of bids submitted by other bidders that cover the same license. Consequently, a withdrawn bid on a license subject to package bidding has the potential to alter the composition of the provisionally winning bids, and may adversely affect other bidders.

81. Therefore, because the potential benefits to bidders from being able to withdraw bids are likely to be lower, and because the potential harms to other bidders from withdrawn bids are potentially much greater, we propose to permit withdrawals only on licenses not subject to package bidding.

⁷⁴ *Part 1 Third Report and Order*, 13 FCC Rcd at 459-60 ¶ 150. Additionally, the "exposure risk" that is addressed by withdrawals and package bidding involves not only the risk that a bidder will win some, but not all, of a desired set of licenses, but also the risk that the bidder will have to pay more for the subset than those licenses alone are worth to the bidder.

⁷⁵ 47 C.F.R. §§ 1.2104(g) and 1.2109.

⁷⁶ *Part 1 Third Report and Order*, 13 FCC Rcd at 459-60 ¶ 150.

⁷⁷ See 47 C.F.R. §§ 1.2104(g) and 1.2109.

82. *Dropped Bids.* With respect to the C Block licenses, since HPB considers bids made in previous rounds when determining provisionally winning bids, it is possible that a bid for a package or a license subject to package bidding can become provisionally winning many rounds after it was placed. These non-provisionally winning bids are useful to the auction since they enhance the ability of bidders interested in single licenses or smaller packages to combine their bids with the bids of others to compete with a large package bid, and they provide stability to the process for determining current price estimates.⁷⁸ It may be the case, however, that a bidder wishes to focus on alternative licenses instead, and no longer wishes to win one of its previous bids. In order to allow bidders to opt out of non-provisionally winning considered bids that they no longer wish to win, we propose that under HPB, for licenses subject to package bidding, bidders be allowed a limited number of opportunities to “drop” non-provisionally winning bids from further consideration in the auction.

83. Eliminating non-provisionally winning bids from consideration may affect the current price estimates of other licenses, thereby affecting other bidders. This ability to affect the bids of other bidders may lead to undesirable strategic use of dropped bids. Therefore, we propose to permit bidders to drop non-provisionally winning bids on packages and on licenses subject to package bidding in no more than one round of the auction. To discourage bidders from dropping bids in order to disadvantage their competitors we also propose the following restrictions on the circumstances under which bids may be dropped and on the bidder’s subsequent bidding activity:

(1) A bidder that is a provisionally winning bidder on a package will not be permitted to drop bids on licenses or sub-packages that are included in the package.

(2) A bidder that drops its bids on a license or package will not be permitted to submit further bids on that particular license or package during the auction.

(3) A bidder that drops its bids on a license or package will not be permitted to submit any bids on packages containing that license or package for the duration of the auction.

84. No payments are associated with dropped bids. The round in which a bidder may drop non-provisionally winning bids from consideration will be at the bidder’s discretion. We seek comment on these proposals. We also seek comment on the possibilities of not allowing dropped bids, of allowing dropped bids not subject to all the restrictions proposed above, and of imposing other restrictions than proposed above.

D. Considerations Relating to Certain Post-Auction Payment Rules

1. Apportioning Package Bids

85. Given that the Commission has determined that package bidding will be used for the C Block licenses in Auction 73, we seek comment on the appropriate mechanism for apportioning package bids among the individual licenses comprising the package. In package bidding, when a bidder places an all-or-nothing bid on a package of licenses, there will be no identifiable bid amounts on the individual licenses that comprise the package. However, the Commission’s competitive bidding rules and procedures assume that the amount of each bid on an individual license always is known. For example, rules for calculating the amount of small business, new entrant, or tribal land bidding credits presume that the winning bid on the license is known.⁷⁹ Similarly, in determining the amount of a default or withdrawal payment, which involves a comparison between the withdrawing or defaulting bidder’s bid and a subsequent bid, the rules assume that there are bid amounts for individual licenses.⁸⁰ Accordingly,

⁷⁸ See Section IV.C.5. “Bid Amounts” and Attachment C.

⁷⁹ 47 C.F.R. § 1.2110(f). Knowing the size of a small business bidding credit on an individual license may be necessary in order to calculate a small business bidding credit unjust enrichment obligation on a license won as part of a package.

⁸⁰ 47 C.F.R. § 1.2104(g).

the Commission recently adopted a new rule providing that, in advance of each auction with package bidding, the Commission shall establish a methodology for determining how to estimate the price or bid on an individual license included in a package of licenses.⁸¹

86. The Bureau proposes to apportion package bids when regulatory calculations require individual license bid amounts by dividing the package bid amount among the licenses comprising the package in proportion to the number of bidding units for each license. Alternatively, the Bureau proposes to use the final round CPEs for each license to apportion package bids.⁸² We seek comment on these proposals.

2. Interim Withdrawal Payment Percentage

87. The Bureau seeks comment on the appropriate percentage of a withdrawn bid that should be assessed as an interim withdrawal payment, in the event that a final withdrawal payment cannot be determined at the close of the auction.⁸³ In general, the Commission's rules provide that a bidder that withdraws a bid during an auction is subject to a withdrawal payment equal to the difference between the amount of the withdrawn bid and the amount of the winning bid in the same or a subsequent auction.⁸⁴ However, if a license for which a bid has been withdrawn does not receive a subsequent higher bid or winning bid in the same auction, the final withdrawal payment cannot be calculated until a corresponding license receives a higher bid or winning bid in a subsequent auction. When that final payment cannot yet be calculated, the bidder responsible for the withdrawn bid is assessed an interim bid withdrawal payment, which will be applied toward any final bid withdrawal payment that is ultimately assessed.⁸⁵

88. The Commission recently amended its rules to provide that in advance of the auction, the Commission shall establish a percentage between three percent and twenty percent of the withdrawn bid to be assessed as an interim bid withdrawal payment.⁸⁶ When it adopted the new rule, the Commission indicated that it would consider the nature of the service and the inventory of the licenses being offered when determining the level of the interim withdrawal payment in a particular auction.⁸⁷

89. Auction 73 will offer licenses under several different geographic licensing schemes and bandwidth sizes, and bidders may have a legitimate interest in using withdrawals to facilitate their efforts to aggregate licenses across potentially substitutable blocks of licenses not subject to package bidding. We also believe that the likely significant bid amounts for licenses in this auction (and resulting absolute value of withdrawal payments) will in themselves serve as a deterrent to unnecessary withdrawals. Therefore, we do not propose to set the interim bid withdrawal payment at the maximum rate of twenty percent. At the same time, we believe that a rate above the minimum three percent will help deter undesirable strategic use of withdrawals. Specifically, the Bureau proposes to establish an interim bid withdrawal payment of ten percent of the withdrawn bid in Auction 73. This proposal, moreover, is

⁸¹ See 47 C.F.R. § 1.2104(g)(2), as amended by the *CSEA/Part 1 Report and Order*. *CSEA/Part 1 Report and Order*, 21 FCC Rcd at 906 ¶ 39.

⁸² Current price estimates are discussed in Section IV.C.5., above.

⁸³ In Auction 73, withdrawals are permitted only on non-C Block licenses, which are not subject to package bidding.

⁸⁴ 47 C.F.R. § 1.2104(g)(1). The withdrawal payment amount is deducted from any upfront payments or down payments that the withdrawing bidder has deposited with the Commission. No withdrawal payment is assessed for a withdrawn bid if either the subsequent winning bid or any of the intervening subsequent withdrawn bids equals or exceeds that withdrawn bid. *Id.*

⁸⁵ *Id.*

⁸⁶ See *CSEA/Part 1 Report and Order*, 21 FCC Rcd at 903 ¶ 30.

⁸⁷ *Id.* at 903-04 ¶ 31.

consistent with bid withdrawal payment percentages adopted in recent auctions for wireless licenses.⁸⁸ The Bureau seeks comment on this proposal.

3. Additional Default Payment Percentage

90. Any winning bidder that defaults or is disqualified after the close of an auction (i.e., fails to remit the required down payment within the prescribed period of time, fails to submit a timely long-form application, fails to make full payment, or is otherwise disqualified) is liable for a default payment under Section 1.2104(g)(2) of the Commission's rules.⁸⁹ This payment consists of a deficiency payment, equal to the difference between the amount of the bidder's bid and the amount of the winning bid the next time a license covering the same spectrum is won in an auction, plus an additional payment equal to a percentage of the defaulter's bid or of the subsequent winning bid, whichever is less. Until recently this additional payment for non-combinatorial auctions has been set at three percent of the defaulter's bid or of the subsequent winning bid, whichever is less.

91. The percentage of the bid that a defaulting bidder must pay in addition to the deficiency will depend on the auction format ultimately chosen for a particular auction. In non-package auctions, the amount can range from three percent up to a maximum of twenty percent, established in advance of the auction and based on the nature of the service and the inventory of the licenses being offered.⁹⁰ In auctions with package bidding, the additional payment is set, pursuant to Section 1.2104(g)(2)(ii), at 25 percent of the applicable bid. This higher level reflects the fact that a defaulted winning bid in an auction with package bidding may have affected which other bids were winning.⁹¹

92. The Bureau proposes to establish an additional default payment of fifteen percent with respect to bids on licenses in Blocks A, B, D, and E, which are not subject to package bidding. As previously noted by the Commission, defaults weaken the integrity of the auction process and impede the deployment of service to the public, and an additional default payment of more than three percent will be more effective in deterring defaults. Moreover, we believe an additional default payment greater than ten percent, which the Commission has established in several recent auctions, is appropriate for Auction 73.⁹² Because no licenses in Blocks A, B, or E will be sold unless the aggregate reserve price for that block is met, bidders may have an additional incentive to bid on a license and later default (after determination that the reserve price has been met), in order to help ensure that the reserve price is met and other initial licenses in the block are assigned. We believe a higher additional default payment will help deter such behavior. With respect to the D Block, for which there is a single nationwide license which will not be assigned unless the D Block reserve price is met, a default by the winning bidder will delay the especially time-sensitive process of establishing a public-private partnership for the provision of public safety services. Given the unusually large public interest benefits of timely licensing the D Block, we propose to deter defaults by imposing a higher additional default payment in that block as well. Accordingly, we

⁸⁸ See *Auction 66 Procedures Public Notice*, 21 FCC Rcd at 4623 ¶ 239; see also "Auction of 1.4 GHz Band Licenses Scheduled for February 7, 2007; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments and Other Procedures for Auction No. 69," *Public Notice*, DA 06-2014, 21 FCC Rcd 12393, 12437 ¶ 179 (WTB 2006) ("*Auction 69 Procedures Public Notice*"); *Auction 72 Procedures Public Notice*, 22 FCC Rcd at 344 ¶ 172. Note that in the recent broadband PCS auction (Auction 71), which offered only 38 licenses, most that were not adjacent frequencies or geographic areas, the Bureau adopted a 15 percent interim withdrawal payment. *Auction 71 Procedures Public Notice* 22 FCC Rcd at 475 ¶ 169.

⁸⁹ 47 C.F.R. § 1.2104(g)(2).

⁹⁰ See *CSEA/Part 1 Report and Order*, 21 FCC Rcd at 903 ¶ 30.

⁹¹ 47 C.F.R. § 1.2104(g)(2)(ii).

⁹² See *Auction 66 Procedures Public Notice*, 21 FCC Rcd at 4627-28 ¶ 258; see also *Auction 69 Procedures Public Notice*, 21 FCC Rcd at 12440 ¶ 193; *Auction 71 Procedures Public Notice*, 22 FCC Rcd at 477 ¶ 183; *Auction 72 Procedures Public Notice*, 22 FCC Rcd at 3447 ¶ 186.

propose an additional default payment of fifteen percent on licenses in the A, B, D, and E Blocks. The Bureau seeks comment on this proposal.

93. For licenses in the C Block, because they are subject to package bidding, the additional default payment will be the twenty-five percent as set forth in Section 1.2104(g)(2)(ii). This additional default payment will apply to all bids for packages and for licenses that are subject to package bidding.

V. CONTINGENT SUBSEQUENT AUCTION

94. In the *700 MHz Second Report and Order*, the Commission concluded that if licenses for the A, B, C or E Blocks are not assigned because the auction results for the licenses as initially offered do not satisfy the applicable aggregate reserve price(s), the public interest will be served by offering alternative licenses for the relevant blocks as soon as possible after the initial auction. Similarly, if the license for the D Block is not assigned because the auction results do not satisfy the reserve price applicable to that license, the license for the D Block may be offered again in a prompt subsequent auction. As detailed in the *700 MHz Second Report and Order*, any alternative A, B and E Block licenses will be subject to alternative performance requirements. With respect to the C Block, any alternative licenses will be based on different geographic areas and spectrum bandwidth, as detailed below. In addition, the alternative C Block licenses will not be subject to the open platform conditions applicable to the licenses initially offered for the C Block.

95. The Commission directed the Bureau to permit only qualified bidders in the initial auction to participate in any contingent subsequent auction and to use the same auction design, including the applicable aggregate reserve price(s), insofar as possible. Pursuant to these directions, we propose and seek comment on the following procedures for a contingent subsequent auction. Except as detailed below, we propose to apply all of the procedures discussed above for Auction 73 to such a subsequent auction.

96. *Licenses To Be Offered.* Licenses in the A, B, D and E Block offered in any contingent subsequent auction will cover the same geographic areas and frequencies as such licenses offered in the initial auction. However, as indicated in Figure 3, the alternative C Block will include C1 Block licenses offered in each of the 176 EAs and C2 Block licenses offered in each of the 12 REAGs. A complete list of alternative C Block licenses that would be offered in such an auction is included as Attachment D of this Public Notice.

Figure 3: Alternative C Block Plan

757		763		775		787		793		805			
C1	C2	A	D	Public Safety		B	C1	C2	A	D	Public Safety		B
CH. 60	CH. 61	CH. 62		CH. 63	CH. 64	CH. 65	CH. 66	CH. 67	CH. 68	CH. 69			
746	752	758	764	770	776	782	788	794	800	806			

<u>Block</u>	<u>Frequencies (MHz)</u>	<u>Bandwidth</u>	<u>Pairing</u>	<u>Area Type</u>	<u>Licenses</u>
C1	746-752, 776-782	12 MHz	2 x 6 MHz	EA	176
C2	752-757, 782-787	10 MHz	2 x 5 MHz	REAG	12

97. *Auction Design.* If the subsequent auction offers only licenses not subject to package bidding in Auction 73, *i.e.*, licenses for Blocks A, B, D, and/or E, we propose to conduct the subsequent auction using the Commission's standard SMR auction design without package bidding. The procedures applicable to the auction will be the same as those discussed above with respect to licenses for Blocks A, B, D and E in Auction 73, subject to the differences discussed below.

98. We are not certain that package bidding will be appropriate with respect to C1 and C2 Block licenses that may be available in a subsequent auction. We seek comment on whether we should implement HPB for such alternative C Block licenses in a subsequent auction. If so, we seek comments suggesting levels and ways of packaging licenses within levels using HPB or SMR-HPB auction formats, depending on whether the subsequent auction also includes licenses for Blocks A, B, D, and/or E.

99. *Aggregate Reserve Prices.* As required by the Commission, the licenses in a subsequent auction will be subject to the same aggregate reserve price(s) applicable in the initial auction. In the *700 MHz Second Report and Order*, the Commission noted that the Bureau has delegated authority to determine how to allocate the C Block reserve price upon auction of alternative licenses. Accordingly, the Bureau proposes to apply the C Block aggregate reserve price of \$4.637854 billion to all of the alternative C Block licenses. That is, the sum of the gross bid amounts on the C1 and C2 Block licenses must equal or exceed \$4.637854 billion in order to meet the reserve price. We seek comment on this proposal and on alternatives to this proposal. Commenters may wish to address whether, in the alternative, the C Block reserve price should be split between the C1 and C2 Blocks based on their respective bandwidths (e.g., \$2.529739 billion and \$2.108115 billion for the C1 and C2 Blocks, respectively) or by other measures.

100. *Pre-Auction Application Process.* As noted above, the Commission has directed that only applicants found qualified to bid in Auction 73 may be eligible to bid in any contingent subsequent auction. We propose that the subsequent public notice announcing the close of Auction 73 also will announce the auction number of the contingent subsequent auction and the deadline for pre-auction submissions in connection with any contingent subsequent auction. That public notice will specify the licenses that will be offered in the subsequent auction, the deadline by which qualified bidders must select licenses to be offered in order to be eligible to bid on those licenses, and the deadline by which such bidders must submit upfront payments to purchase bidding eligibility in the subsequent auction. We propose that the public notice will provide that the deadline for selecting alternative licenses will be 10 business days from the date of the public notice and the deadline for submitting upfront payments will be 10 business days from the date of the selection deadline. This will enable bidding on the alternative licenses to begin less than two months after the public notice announcing the close of Auction 73. We seek comment on this proposal.

101. *Effective Period for Anti-Collusion Rule.* In the *700 MHz Second Report and Order*, the Commission directed the Bureau to adopt any procedures that may enhance the effectiveness of an auction of licenses in Auction 73 or any subsequent contingent auction. In part, the Commission found that the Commission's anti-collusion rule should treat Auction 73 and any such subsequent auction as a single auction, given the related nature of the auctions. Accordingly, the applicable "down payment deadline" marking the end of the anti-collusion period for Auction 73 and any subsequent auction shall be the down payment deadline established following the close of the subsequent auction.⁹³

102. *Minimum Opening Bids.* For a contingent subsequent auction, the Bureau proposes to calculate minimum opening bid amounts on a license-by-license basis using the same approach described above that draws on the Auction 66 prices that were bid on licenses for the exact same geographic areas.⁹⁴ The proposed minimum opening bid amounts for the C1 and C2 Block licenses that would be available in a contingent subsequent auction are set forth in Attachment D of this Public Notice. For any licenses in other blocks offered in the same subsequent auction, we propose the same minimum opening bid amounts set forth in Attachment A of this Public Notice. We seek comment on these proposals and other possible amounts for minimum opening bids. If commenters believe that these minimum opening bid amounts will result in unsold licenses or are not reasonable amounts, they should explain why this is so, and comment on the desirability of an alternative approach. Commenters are advised to support their claims

⁹³ See 47 C.F.R. § 1.2105(c)(1).

⁹⁴ See Section IV.C.4.b. "Minimum Opening Bids," above.

with valuation analyses and suggested amounts or formulas. The change of conditions with respect to any licenses for the A, B, C and E Blocks to be offered in a subsequent auction should increase the value of the licenses and may support higher minimum opening bids. In addition, the bidding in the initial auction may provide further information regarding the appropriate level of minimum opening bids. If we modify the minimum opening bids, we will announce the new minimum opening bids in the same public notice announcing pre-auction procedures.

103. *Additional Procedures.* The Commission also directed the Bureau to consider what procedures may be appropriate to deter bidders from actions that might thwart the assignment of licenses in either auction. We propose that otherwise eligible bidders will be denied bidding eligibility in a subsequent auction in the event that they default on any winning bids in the initial auction. We seek comment on this proposal, as well as comment on any other proposals that may enhance the effectiveness of the auction of licenses in Auction 73 or any contingent subsequent auction.

VI. DEADLINES AND FILING PROCEDURES

104. Comments are due on or before August 31, 2007, and reply comments are due on or before September 7, 2007. All filings related to the auction of 700 MHz spectrum licenses should refer to AU Docket No. 07-157. Comments may be submitted using the Commission's Electronic Comment Filing System ("ECFS") or by filing paper copies.⁹⁵ The Bureau strongly encourages interested parties to file comments electronically, and requests submission of a copy via the Auction 73 e-mail box (auction73@fcc.gov).

105. *Electronic Filers:* Comments may be filed electronically using the Internet by accessing the ECFS at <http://www.fcc.gov/cgb/ecfs/>. Filers should follow the instructions provided on the website for submitting comments. In completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions, filers should send an e-mail to ecfs@fcc.gov, and include the following words in the body of the message, "get form." A sample form and directions will be sent in response.

106. *Paper Filers:* Parties who choose to file by paper must file an original and four copies of each filing. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although the Bureau continues to experience delays in receiving U.S. Postal Service mail). All filings must be addressed to the Commission's Secretary Attn: WTB/ASAD, Office of the Secretary, Federal Communications Commission.

- The Commission's contractor will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, NE, Suite 110, Washington, DC 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. Eastern Time (ET). All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail should be addressed to 445 12th Street, SW, Washington DC 20554.

107. *Auction 73 E-mail Box:* The Bureau also requests that a copy of all comments and reply comments be submitted electronically to the following address: auction73@fcc.gov.

⁹⁵ See Electronic Filing of Documents in Rulemaking Proceedings, *Report and Order*, FCC 98-56, 13 FCC Rcd 11322 (1998).

108. Copies of comments and reply comments will be available for public inspection between 8:00 a.m. and 4:30 p.m. ET Monday through Thursday or 8:00 a.m. to 11:30 a.m. ET on Fridays in the FCC Reference Information Center, Room CY-A257, 445 12th Street, SW, Washington, DC 20554, and will also be accessible through the search function on the ECFS web page at <http://www.fcc.gov/cgb/ecfs/>.

109. This proceeding has been designated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.⁹⁶ Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and arguments presented is generally required. Other rules pertaining to oral and written *ex parte* presentations in permit-but-disclose proceedings are set forth in Section 1.1206(b) of the Commission’s rules.

VII. CONTACTS

110. For further information concerning this proceeding, contact the Wireless Telecommunications Bureau, as listed below:

Mobility Division, Wireless Telecommunications Bureau

For service rules questions: Erin McGrath (legal) or Keith Harper (technical) at (202) 418-0620

Auctions and Spectrum Access Division, Wireless Telecommunications Bureau

For general auction questions: Jeff Crooks at (202) 418-0660 or Lisa Stover at (717) 338-2868

For auctions legal questions: Erik Salovaara or Scott Mackoul at (202) 418-0660

- FCC -

⁹⁶ 47 C.F.R. §§ 1.1200(a), 1.1206.

Exhibit 1030

3GPP TSG-RAN Meeting #47
Kansas City, USA, 5-9th May 2008

R4-081247

Comment [H1]: Document numbers are allocated by the Working Group Secretary.

Comment [H2]: Enter the specification number in this box. For example, 04.08 or 31.102. Do not prefix the number with anything . i.e. do not use "TS", "GSM" or "3GPP" etc.

Comment [H3]: Enter the CR number here. This number is allocated by the 3GPP support team. It consists of at least three digits, padded with leading zeros if necessary.

Comment [H4]: Enter the revision number of the CR here. If it is the first version, use a "-".

Comment [H5]: Enter the version of the specification here. This number is the version of the specification to which the CR was written and (normally) to which it will be applied if it is approved. Make sure that the latest version of the specification (of the relevant release) is used when creating the CR. If unsure what the latest version is, go to <http://www.3gpp.org/specs/specs.htm>.

Comment [H6]: For help on how to fill out a field, place the mouse pointer over the special symbol closest to the field in question.

Comment [H7]: Mark one or more of the boxes with an X.

Comment [H8]: SIM / USIM / ISIM applications.

Comment [H9]: Enter a concise description of the subject matter of the CR. It should be no longer than one line. Do not use redundant information such as "Change Request number xxx to 3GPP TS xx.xxx".

Comment [H10]: One or more organizations (3GPP Individual Members) which drafted the CR and are presenting it to the Working Group.

Comment [H11]: For CRs agreed at Working Group level, the identity of the WG. Use the format "x WGn" where
x = "CT" for TSG CT, "RAN" for TSG RAN, "SA" for TSG SA, "GERAN" for TSG GERAN;
n = digit identifying the Working Group; fo ... [1]

Comment [H12]: Enter the acronym for the work item which is applicable to the change. ... [2]

Comment [H13]: Enter the date on which the CR was last revised. Format to be interpreted ... [3]

Comment [H14]: Enter a single letter corresponding to the most appropriate category ... [4]

Comment [H15]: Enter a single release code from the list below.

Comment [H16]: Enter text which explains why the change is necessary.

Comment [H17]: Enter text which describes the most important components of the change. i.e. ... [5]

Comment [H18]: Enter here the consequences if this CR were to be rejected. It is mandatory ... [6]

Comment [H19]: Enter the number of each clause which contains changes.

Comment [H20]: Tick "yes" box if any other specifications are affected by this change. Elt ... [7]

Comment [H21]: List here the specifications which are affected or the CRs which are linked.

Comment [H22]: Enter any other information which may be needed by the group being requested ... [8]

CHANGE REQUEST

CR-Form-v9.1

TS36.101 CR 4 rev 1 Current version: 8.1.0

For **HELP** on using this form look at the pop-up text over the symbols. Comprehensive instructions on how to use this form can be found at <http://www.3gpp.org/specs/CR.htm>.

Proposed change affects: UICC apps ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	TS36.101 - Combined updates of E-UTRA UE requirements	
Source to WG:	Motorola	
Source to TSG:	RAN4	
Work item code:	LTE-RF	Date: 10/05/2008
Category:	B	Release: Rel-8
Use one of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900.		
Use one of the following releases: R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) Rel-4 (Release 4) Rel-5 (Release 5) Rel-6 (Release 6) Rel-7 (Release 7) Rel-8 (Release 8)		

Reason for change: Update of TS36.101 to include changes arising from RAN4#46bis and RAN4#47

Summary of change:

- 1) Section 5: R4-081181 (Frequency arrangement)
- 2) Section 6: R4-081239 (Tx Characteristics)
- 3) Section 7: R4-081227 (Rx Characteristic)
- 4) Section 8: R4-081229 (Performance requirements)
- 5) Section 9: R4-081229 (Reporting of CQI)
- 6) Annex X: R4-081001 (Transmit modulation)

Consequences if not approved: Changes are needed to progress specification work

Clauses affected:

Other specs affected:	☐	☐	Other core specifications Test specifications O&M Specifications
	☒	☐	
	☐	☐	

Other comments:

5 Frequency bands and channel arrangement

5.1 General

The channel arrangements presented in this clause are based on the frequency bands and channel bandwidths defined in the present release of specifications.

NOTE: Other frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit	Downlink (DL) eNode B transmit UE receive	UL-DL Band separation	Duplex Mode
	F _{UL_low} – F _{UL_high}	F _{DL_low} – F _{DL_high}	F _{DL_low} – F _{UL_high}	
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	~~130 MHz~~	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	~~20 MHz~~	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	~~20 MHz~~	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	~~355 MHz~~	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	~~20 MHz~~	FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz	~~35 MHz~~	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	~~50 MHz~~	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	~~10 MHz~~	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	~~60 MHz~~	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	~~340 MHz~~	FDD
11	1427.9 MHz – 1452.9 MHz	1475.9 MHz – 1500.9 MHz	~~23 MHz~~	FDD
12	[TBD] – [TBD]	[TBD] – [TBD]	~~[TBD]~~	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	~~21~~	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	~~20~~	FDD
...				
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	N/A	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	N/A	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	N/A	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	N/A	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	N/A	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	N/A	TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	N/A	TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	N/A	TDD

5.3 TX–RX frequency separation

5.4 Channel arrangement

5.4.1 Channel spacing

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between two adjacent E-UTRA carriers is defined as following:

$$\text{Nominal Channel spacing} = (\text{BW}_{\text{Channel}(1)} + \text{BW}_{\text{Channel}(2)})/2$$

where $BW_{\text{Channel}(1)}$ and $BW_{\text{Channel}(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. The channel spacing can be adjusted to optimize performance in a particular deployment scenario.

5.4.2 Channel bandwidth

Requirements in present document are specified for the channel bandwidths listed in Table 5.4.2-1.

Table 5.4.2-1 Transmission bandwidth configuration N_{RB} in E-UTRA channel bandwidths

Channel bandwidth BW_{Channel} [MHz]	1.4	3	5	10	15	20
Transmission bandwidth configuration N_{RB}	6	15	25	50	75	100

Figure 5.4.2-1 shows the relation between the Channel bandwidth (BW_{Channel}) and the Transmission bandwidth configuration (N_{RB}). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at $F_C \pm BW_{\text{Channel}}/2$.

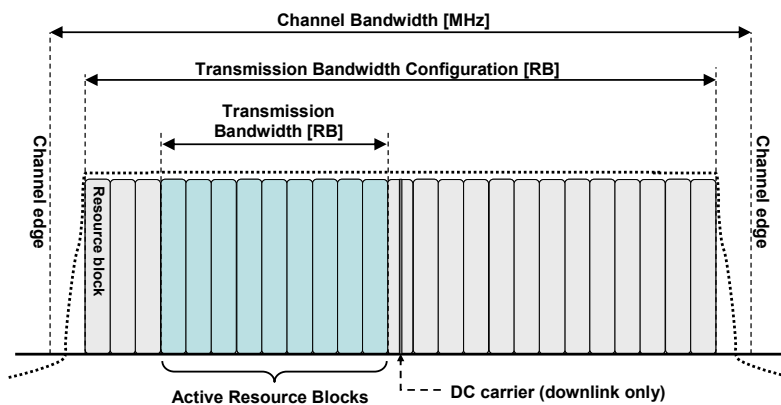


Figure 5.4.2-1 Definition of Channel Bandwidth and Transmission Bandwidth Configuration [for one E-UTRA carrier](#).

5.4.2.1 Nominal channel bandwidth

[Table 5.4.2.1-1 specifies the channel bandwidth that shall be supported per E-UTRA operating band for which all general and additional minimum performance requirements shall be met. The corresponding transmission bandwidth configuration in Table 5.4.2.1-1 shall be supported for each supported channel bandwidth.](#)

[Table 5.4.2.1-1 specifies the channel bandwidth and corresponding maximum number of transmitted resources blocks that are required to be supported to meet the reference receive sensitivity \(clause 7.3.1\) whilst meeting the maximum output power requirement—](#)

Formatted: Not Highlight

Table 5.4.2.1-1: E-UTRA channel bandwidth

<u>E-UTRA band / channel bandwidth</u>						
<u>E-UTRA Band</u>	<u>1.4 MHz</u>	<u>3 MHz</u>	<u>5 MHz</u>	<u>10 MHz</u>	<u>15 MHz</u>	<u>20 MHz</u>
<u>1</u>			✓	✓	✓	✓
<u>2</u>	✓	✓	✓	✓		
<u>3</u>	✓	✓	✓	✓		
<u>4</u>	✓	✓	✓	✓	✓	✓
<u>5</u>	✓	✓	✓			
<u>6</u>			✓			
<u>7</u>			✓	✓	✓	
<u>8</u>	✓	✓	✓			
<u>9</u>			✓	✓		
<u>10</u>			✓	✓	✓	✓
<u>11</u>			✓			
<u>12</u>						
<u>13</u>	✓	✓				
<u>14</u>	✓	✓				
...						
<u>33</u>			✓	✓	✓	✓
<u>34</u>			✓	✓	✓	
<u>35</u>	✓	✓	✓	✓	✓	✓
<u>36</u>	✓	✓	✓	✓	✓	✓
<u>37</u>			✓	✓	✓	✓
<u>38</u>			✓	✓		
<u>39</u>			✓	✓	✓	✓
<u>40</u>				✓	✓	✓

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

<u>E-UTRA Band / Channel bandwidth / N_{RB} / Duplex mode</u>							
<u>E-UTRA Band</u>	<u>1.4 MHz</u>	<u>3 MHz</u>	<u>5 MHz</u>	<u>10 MHz</u>	<u>15 MHz</u>	<u>20 MHz</u>	<u>Duplex Mode</u>
1	-	-	25	50	75	100	FDD
2	6	15	25	50	{50 ⁺ }	{50 ⁺ }	FDD
3	6	15	25	50	{50 ⁺ }	{50 ⁺ }	FDD
4	6	15	25	50	75	100	FDD
5	6	15	25	{25 ⁺ }	-	-	FDD
6	-	-	25	{25 ⁺ }	-	-	FDD
7	-	-	25	50	{50 ⁺ }	{50 ⁺ }	FDD
8	6	15	25	{25 ⁺ }	-	-	FDD
9	-	-	25	50	{50 ⁺ }	{50 ⁺ }	FDD
10	-	-	25	50	75	100	FDD
11	-	-	25	{25 ⁺ }	{25 ⁺ }	{25 ⁺ }	FDD
12							
13							
14							

...							
33	-	-	25	50	75	100	TDD
34	-	-	25	50	75	-	TDD
35	6	15	25	50	75	100	TDD
36	6	15	25	50	75	100	TDD
37	-	-	25	50	75	100	TDD
38	-	-	25	50	-	-	TDD
39			25	50	75	100	TDD
40				50	75	100	TDD
Note 1. Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

Formatted: Indent: Left: 0.22", Hanging: 0.2", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 1.88" + Tab after: 2.13" + Indent at: 2.13", Tab stops: Not at 2.13"

5.4.2.2 Additional channel bandwidth

Table 5.4.2.2-1 specifies the additional channel bandwidths that shall be supported per E-UTRA operating band for which certain relaxations of the UE performance are allowed or UE functionality is limited. The transmission bandwidth configuration in Table 5.4.2.2-1 shall be supported for each supported channel bandwidth.

Formatted: Not Highlight

Table 5.4.2.2-1: Additional E-UTRA channel bandwidth

E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1				[N]	[N]	[N]
2					[N]	[N]
3					[N]	[N]
4						
5				[N]		
6				[N]		
7						[N]
8				[N]		
9					[N]	[N]
10						
11				[N]	[N]	[N]
12						
13			[N]	[N]		
14			[N]	[N]		
...						
33						
34						
35						
36						
37						
38						
39						
40						

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

5.4.3 Channel raster

The channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz.

5.4.4 Carrier frequency and EARFCN Channel number

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN). The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where F_{DL_low} and $N_{Offs-DL}$ are given in table 5.4.4-1 and N_{DL} is the downlink EARFCN.

$$F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs-DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where F_{UL_low} and $N_{Offs-UL}$ are given in table 5.4.4-1 and N_{UL} is the uplink EARFCN.

$$F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs-UL})$$

Table 5.4.4-1 E-UTRA channel numbers

Band	Downlink			Uplink		
	F_{DL_low} (MHz)	$N_{Offs-DL}$	Range of N_{DL}	F_{UL_low} (MHz)	$N_{Offs-UL}$	Range of N_{UL}
1	2110	0	0 – 599	1920	13000	13000 – 13599
2	1930	600	600 – 1199	1850	13600	13600 – 14199
3	1805	1200	1200 – 1949	1710	14200	14200 – 14949
4	2110	1950	1950 – 2399	1710	14950	14950 – 15399
5	869	2400	2400 – 2649	824	15400	15400 – 15649
6	875	2650	2650 – 2749	830	15650	15650 – 15749
7	2620	2750	2750 – 3449	2500	15750	15750 – 16449
8	925	3450	3450 – 3799	880	16450	16450 – 16799
9	1844.9	3800	3800 – 4149	1749.9	16800	16800 – 17149
10	2110	4150	4150 – 4749	1710	17150	17150 – 17749
11	1475.9	4750	4750 – 4999	1427.9	17750	17750 – 17999
12						
13	746	5180	5180 – 5279	777	18180	18180 – 18279
14	758	5280	5280 – 5379	788	18280	18280 – 18379
...						
33	1900	26000	26000 – 26199	1900	26000	26000 – 26199
34	2010	26200	26200 – 26349	2010	26200	26200 – 26349
35	1850	26350	26350 – 26949	1850	26350	26350 – 26949
36	1930	26950	26950 – 27549	1930	26950	26950 – 27549
37	1910	27550	27550 – 27749	1910	27550	27550 – 27749
38	2570	27750	27750 – 28249	2570	27750	27750 – 28249
39	1880	28250	28250-28649	1880	28250	28250-28649
40	2300	28650	28650-29649	2300	28650	28650-29649

5.4.5 Void EARFCN

6 Transmitter characteristics

6.1 General

Unless otherwise stated, the transmitter characteristics are specified at the antenna connector of the UE with a single transmit antenna. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

6.2 Transmit power

6.2.1 Void

6.2.2 UE Maximum Output Power

The following UE Power Classes define the nominal maximum output power. The nominal power is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth (clause 5.2) of the radio access mode. The period of measurement shall be at least one [timeslot/ frame/TTI].

Table 6.2.2-1: UE Power Class

E-UTRA Band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	±2		
2					23	±2		
3					23	±2		
4					23	±2		
5					23	±2		
6					23	±2		
7					23	±2		
8					23	±2		
9					23	±2		
10					23	±2		
11					23	±2		
12					23	±2		
13					23	±2		
14					23	±2		
...								
33					23	±2		
34					23	±2		
35					23	±2		
36					23	±2		
37					23	±2		
38					23	±2		
39					23	±2		
40					23	±2		
Note 1. The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS								

Formatted: Indent: Left: 0", Hanging: 0.41",
 Numbered + Level: 1 + Numbering Style: 1, 2,
 3, ... + Start at: 1 + Alignment: Left + Aligned
 at: 1.88" + Tab after: 2.13" + Indent at:
 2.13", Tab stops: Not at 2.13"

6.2.3 UE Maximum Output power for modulation / channel bandwidth

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the P_{max} maximum output power in Table 6.2.2-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for **Power Class 3**

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5 TBD	> 4 TBD	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5 TBD	≤ 4 TBD	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5 TBD	> 4 TBD	> 8	> 12	> 16	> 18	≤ 2

Formatted Table

6.2.4 UE Maximum Output Power with additional requirements

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall meet also additional requirements in a specific deployment scenario. To meet these additional requirements the concept of Additional Maximum Power Reduction A-MPR is introduced for the output power in Table 6.2.2-1

For UE Power Class 3 the specific requirements and identified sub-clauses are specified in table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4-1 are in addition to the allowed MPR requirements specified in clause 6.2.3.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_01	-	-	-	-	-
NS_02	6.6.2.4.1	1, 6, 9, 10, 11	10	> [30]42	≤ 21
			15	> 44	≤ 1
			20	> 48	≤ 1
NS_03	6.6.2.2.1	2, 4, 10, 35, 36	3	> 5 > [5]	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	5	> 6 > [5]	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	10	> 6 > [7]	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	15	> 8 TBD	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	20	> 10 TBD	≤ 1
NS_04	6.6.2.2.2	TBD	TBD	TBD	-
NS_05	6.6.3.3.1	1 ²	10, 15, 20	> [50] for QPSK	≤ 1
NS_06	6.6.2.2-3	13, 14	1.4, 3, 5, 10	n/a	n/a
..	-	-	-	-	-
NS_32	-	-	-	-	-
Note: 0 ≤ A-MPR ≤ 3					
Note2: Applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to 1920MHz + the Channel BW assigned. Operations below this point are for further study.					

6.3 Output power dynamics

6.3.1 Power control

6.3.2 Minimum output power

The minimum controlled output power of the UE is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the power is set to a minimum value.

6.3.2.1 Minimum requirement

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall be less than -40 dBm.

6.3.3 Transmit ON/OFF power

6.3.3.1 Transmit OFF power

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

6.3.3.1.1 Minimum requirement

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The requirement for the transmit OFF power shall be less than -1 dBm

Formatted: Normal

6.4 Control and monitoring functions

6.4.1 Out-of-synchronization handling of output power

6.5 Transmit signal quality

6.5.1 Frequency error

The UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of one sub-frame (1ms) compared to the carrier frequency received from the E-UTRA Node B

6.5.2 Transmit modulation

Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. This transmit modulation limit is specified in terms of; an Error Vector Magnitude (EVM) for the allocated resources blocks (RB), an I/Q component and an in-band emissions for the non-allocated RB.

6.5.2.1 Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the IQ origin offset shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one [timeslot] except when the mean power between slots is expected to change whereupon the measurement interval is reduced by [] μ s at each end of the slot.

6.5.2.1.1 Minimum requirement

The RMS average of the basic EVM measurements for [10 consecutive sub-frames] for the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.1-1 for the parameters defined in Table 6.5.2.1.1-2.

Table 6.5.2.1.1-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Level
QPSK	%	17.5
16QAM	%	12.5
64QAM	%	[tbd]

Table 6.5.2.1.1-2: Parameters for Error Vector Magnitude

Parameter	Unit	Level
UE Output Power	dBm	$\geq$ [-40]
Operating conditions		Normal conditions
Power control step size	dB	[tbd]
Basic measurement period (Note 1,2)	[slot]	[] ms
Note 1: Less any [] μ s transient periods		
Note 2: []ms for FDD and [] ms for TDD		

6.5.2.2 IQ-component

The IQ origin offset is the phase and amplitude of an additive sinusoid waveform that has the same frequency as the reference waveform carrier frequency.

6.5.2.2.1 Minimum requirements

The relative carrier leakage power (IQ origin offset power) shall not exceed the values specified in Table 6.5.2.2.1-1.

Table 6.5.2.2.1-1: Minimum requirements for Relative Carrier Leakage Power

LO Leakage	Parameters	Relative Limit (dBc)
	Output power >0 dBm	-25
	-30 dBm $\leq$ Output power $\leq$ 0 dBm	-20
	[-40] dBm $\leq$ Output power < -30 dBm	[-10]

6.5.2.3 In-band emissions

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the [relative UE output power] of any non -allocated RB(s) and the [total UE output power] of all the allocated RB(s)

6.5.2.3.1 Minimum requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2.3.1-1.

Table 6.5.2.3.1-1: Minimum requirements for in-band emissions

In band emission	Relative emissions (dB)
	$\max[-25, (20 \cdot \log_{10} EVM) - 3 - 10 \cdot (\Delta_{RB} - 1) / N_{RB}]$

6.5.2.4 Spectrum flatness

The spectrum flatness is defined as a relative power variation across the subcarrier of all RB of the allocated UL block. The spectrum flatness is measured as a dB value comparing the output power of a subcarrier and the average power per subcarrier.

6.5.2.4.1 Minimum requirements

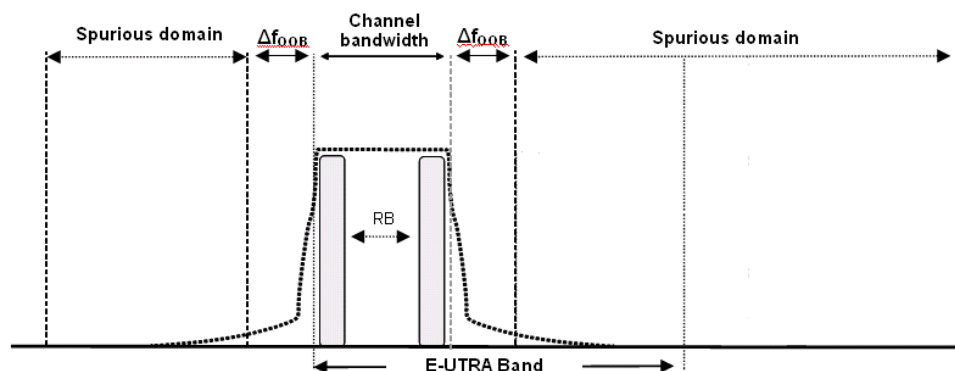
The spectrum flatness shall not exceed the values specified in Table 6.5.2.4.1-1.

Table 6.5.2.4.1-1: Minimum requirements for spectrum flatness

Spectrum Flatness	Relative Limit (dB)
	Tbd.

6.6 Output RF spectrum emissions

The output UE transmitter spectrum consists of the three components; the emission within the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.

**Figure 6.6-1: Transmitter RF spectrum**

6.6.1 Occupied bandwidth

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.6.1-1

Table 6.6.1-1: Occupied channel bandwidth

	Occupied channel bandwidth / channel bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Channel bandwidth [MHz]	1.4	3	5	10	15	20

6.6.2 Out of band emission

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an Adjacent Channel Leakage power Ratio.

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies (Δf_{OoB}) starting from the $\pm$ edge of the assigned E-UTRA channel bandwidth. For frequencies greater than (Δf_{OoB}) as specified in Table 6.6.2.1.1-1 the spurious requirements in clause 6.6.3 are applicable.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.1-1 for the specified channel bandwidth.

Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask

Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[-10]	[-10]	-10	-10	-10	-10	1 MHz
$\pm 2.5-5$	[-25]	[-10]	-10	-10	-10	-10	1 MHz
$\pm 5-6$		[-25]	-13	-13	-13	-13	1 MHz
$\pm 6-10$			-25	-13	-13	-13	1 MHz
$\pm 10-15$				-25	-13	-13	1 MHz
$\pm 15-20$					-25	-13	1 MHz
$\pm 20-25$						-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2 Additional Spectrum Emission Mask

This requirement is specified in terms of an "additional spectrum emission" requirement.

6.6.2.2.1 Minimum requirement (network signalled value "NS_03")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.1-1.

Table 6.6.2.2.1-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 5-6$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 6-10$	[TBD]	[TBD]	-25	-13	-13	-13	1 MHz
$\pm 10-15$	[TBD]	[TBD]		-25	-13	-13	1 MHz
$\pm 15-20$	[TBD]	[TBD]			-25	-13	1 MHz
$\pm 10-25$	[TBD]	[TBD]				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.2 Minimum requirement (network signalled value "NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.2-1.

Table 6.6.2.2.2-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 5-6$	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
$\pm 6-10$	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
$\pm 10-15$	[TBD]	[TBD]		-25	-25	-25	1 MHz
$\pm 15-20$	[TBD]	[TBD]			-25	-25	1 MHz
$\pm 10-25$	[TBD]	[TBD]				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.3 Minimum requirement (network signalled value "NS_06")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_06" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3-1.

Table 6.6.2.3-1: Additional requirements

Δf_{OoB} (MHz)	Spectrum emission limit (dBm)/ Channel bandwidth					Measurement bandwidth
	1.4 MHz	3.0 MHz	5 MHz	10 MHz		
$\pm 0-0.1$	[TBD]	[TBD]	-15	-18		30 kHz
$\pm 0.1-1$	-13	-13	-13	-13		100 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13		1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13		1 MHz
$\pm 5-6$		[TBD]	-25	-25		1 MHz
$\pm 6-10$			-25	-25		1 MHz
$\pm 10-15$				-25		1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Formatted: Normal

6.6.2.3 Adjacent Channel Leakage Ratio

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirements are specified for two scenarios for an adjacent E-UTRA and/or UTRA channel as shown in Figure 6.6.2.3-1.

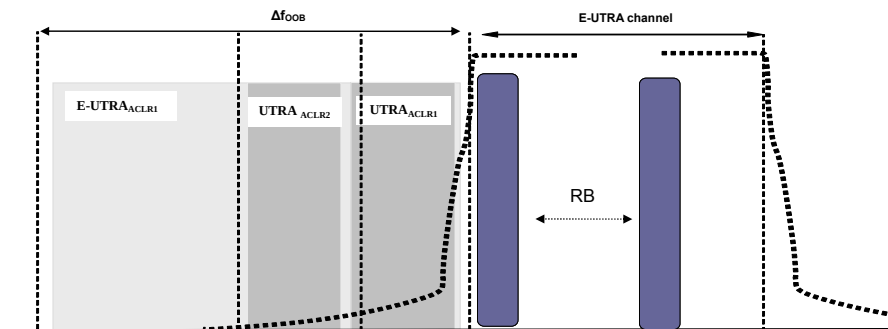


Figure 6.6.2.3-1: Adjacent Channel Leakage requirements

6.6.2.3.1 Minimum requirement E-UTRA

E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The E-UTRA on channel and adjacent channel power is measured with a rectangular measurement bandwidth filter.

Table 6.6.2.3.1-1: General requirements for E-UTRA_{ACLR}

	Channel bandwidth / E-UTRA _{ACLR1} / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
E-UTRA _{ACLR1}	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
E-UTRA channel Measurement bandwidth			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.6.2.3.2 Minimum requirements UTRA

UTRA Adjacent Channel Leakage power Ratio (UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA 5 MHz adjacent channel (UTRA_{ACLR1}) and the 2nd UTRA 5MHz adjacent channel (UTRA_{ACLR2}). The UTRA channel is measured with a 3.84 MHz RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The E-UTRA channel is measured with a rectangular measurement bandwidth filter

Table 6.6.2.3.2-1: Additional requirements

	Channel bandwidth / UTRA _{ACLR1/2} / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR1}	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
UTRA _{ACLR2}	-	-	36 dB	36 dB	36 dB	36 dB
E-UTRA channel Measurement bandwidth		-	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz

6.6.2.4 Additional ACLR requirements

This requirement is specified in terms of an additional UTRA_{ACLR2} requirement.

6.6.2.4.1 Minimum requirements (network signalled value "NS_02")

"NS_02" is signalled by the network to indicate that the UE shall meet this additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

The Additional ACLR requirements is specified for the 2nd UTRA 5MHz adjacent channel (UTRA_{ACLR2}). The UTRA channel is measured with a 3.84 MHz RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The E-UTRA channel is measured with a rectangular measurement bandwidth filter.

Table 6.6.2.4.1-1: Additional requirements (UTRA_{ACLR2})

	Channel bandwidth / UTRA _{ACLR2} / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR2bis}	-	-	43 dB	43 dB	-	-
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	-	-
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	-	-

6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions. The spurious emission limits are specified in terms of general requirements inline with SM.329 [2] and E-UTRA operating band requirement to address UE co-existence.

6.6.3.1 Minimum requirements

The spurious emission limits apply for the frequency ranges that are more than Δf_{OoB} (MHz) from the edge of the channel bandwidth.

Table 6.6.3.1-1: Boundary between E-UTRA Δf_{OoB} and spurious emission domain

Channel bandwidth	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Δf_{OoB} (MHz)	[tbd]	[tbd]	10	15	20	25

The spurious emission limits in Table 6.6.3.1-2 apply for all transmitter band configurations (RB) and channel bandwidths.

Table 6.6.3.1-2: Spurious emissions limits

Frequency Range	Maximum Level	Measurement Bandwidth
9 kHz $\leq f < 150$ kHz	-36 dBm	1 kHz
150 kHz $\leq f < 30$ MHz	-36 dBm	10 kHz
30 MHz $\leq f < 1000$ MHz	-36 dBm	100 kHz
1 GHz $\leq f < 12.75$ GHz	-30 dBm	1 MHz

6.6.3.2 Spurious emission band UE co-existence

This clause specifies the requirements for the specified E-UTRA band

Table 6.6.3.2-1: Requirements

E-UTRA Band	Spurious emission limits						
	Protection Band	FDL_low – FDL_high			Level	Bandwidth	Comment
		(MHz)		(dBm)	(MHz)		
1	1	2110	:	2170	[-50]	1	
	3	1805	:	1880	[-50]	1	
	6 ¹	860	–	895	[-50]	1	
	7	2620	:	2690	[-50]	1	
	8	925	:	960	[-50]	1	
	9	1844.9	:	1879.9	[-50]	1	
	11	1475.9	:	1500.9	[-55]	1	
	33 ⁴	1900	:	1920	[-50]	1	
	34	2010	–	2025	[-50]	1	

	<u>38</u>	<u>2570</u>	-	<u>2620</u>	<u>[-50]</u>	<u>1</u>	
	<u>39⁴</u>	<u>1880</u>		<u>1920</u>	<u>[-50]</u>	<u>1</u>	
	<u>Regulatory³</u>	<u>1884.5</u>	-	<u>1919.6</u>	<u>-41</u>	<u>0.3</u>	
<u>2</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>	
	<u>4</u>	<u>2110</u>	-	<u>2155</u>	<u>[-50]</u>	<u>1</u>	
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>	
	<u>10</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>	
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>	
<u>3</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>3</u>	<u>1805</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>	
	<u>7</u>	<u>2620</u>	-	<u>2690</u>	<u>[-50]</u>	<u>1</u>	
	<u>8</u>	<u>925</u>	-	<u>960</u>	<u>[-50]</u>	<u>1</u>	
	<u>33</u>	<u>1900</u>		<u>1920</u>	<u>[-50]</u>	<u>1</u>	
	<u>34</u>	<u>2010</u>		<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>38</u>	<u>2570</u>	-	<u>2620</u>	<u>[-50]</u>	<u>1</u>	
<u>4</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>	
	<u>4</u>	<u>2110</u>	-	<u>2155</u>	<u>[-50]</u>	<u>1</u>	
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>	
	<u>10</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>	
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>	
<u>5</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>	
	<u>4</u>	<u>2110</u>	-	<u>2155</u>	<u>[-50]</u>	<u>1</u>	
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>	
	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>	
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>	
<u>6</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>6¹</u>	<u>860</u>	-	<u>875</u>	<u>-37</u>	<u>1</u>	
	<u>6¹</u>	<u>875</u>	-	<u>895</u>	<u>[-50]</u>	<u>1</u>	
	<u>9</u>	<u>1844.9</u>	-	<u>1879.9</u>	<u>[-50]</u>	<u>1</u>	
	<u>11</u>	<u>1475.9</u>	-	<u>1500.9</u>	<u>[-55]</u>	<u>1</u>	
	<u>Regulatory³</u>	<u>1884.5</u>	-	<u>1919.6</u>	<u>-41</u>	<u>0.3</u>	

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

3GPP

<u>7</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		
	<u>3</u>	<u>1805</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>		
	<u>7</u>	<u>2620</u>	-	<u>2690</u>	<u>[-50]</u>	<u>1</u>		
	<u>8</u>	<u>925</u>	-	<u>960</u>	<u>[-50]</u>	<u>1</u>		
	<u>33</u>	<u>1900</u>		<u>1920</u>	<u>[-50]</u>	<u>1</u>		
	<u>34</u>	<u>2010</u>		<u>2025</u>	<u>[-50]</u>	<u>1</u>		
	<u>38^{1,4}</u>	<u>2570</u>	-	<u>2620</u>	<u>[-50]</u>	<u>1</u>		Formatted: Not Highlight
<u>8</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		
	<u>3¹</u>	<u>1805</u>	-	<u>1830</u>	<u>[-50]</u>	<u>1</u>		
	<u>3^{1,2}</u>	<u>1805</u>	-	<u>1830</u>	<u>-36</u>	<u>0.1</u>		
	<u>3¹</u>	<u>1830</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>		Formatted: Not Highlight
	<u>7¹</u>	<u>2640</u>	-	<u>2690</u>	<u>[-50]</u>	<u>1</u>		
	<u>7^{1,2}</u>	<u>2640</u>	-	<u>2690</u>	<u>-36</u>	<u>0.1</u>		
	<u>8</u>	<u>925</u>	-	<u>960</u>	<u>[-50]</u>	<u>1</u>		
<u>9</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		
	<u>6¹</u>	<u>860</u>	-	<u>895</u>	<u>[-50]</u>	<u>1</u>		
	<u>9</u>	<u>1844.9</u>	-	<u>1879.9</u>	<u>[-50]</u>	<u>1</u>		
	<u>11</u>	<u>1475.9</u>	-	<u>1500.9</u>	<u>[-55]</u>	<u>1</u>		Formatted: Not Highlight
	<u>Regulatory³</u>	<u>1884.5</u>	-	<u>1919.6</u>	<u>-41</u>	<u>0.3</u>		
<u>10</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>		
	<u>4</u>	<u>2110</u>	-	<u>2155</u>	<u>[-50]</u>	<u>1</u>		
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>		
	<u>10</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		
	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>		
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>		
<u>11</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		
	<u>6¹</u>	<u>860</u>	-	<u>895</u>	<u>[-55]</u>	<u>1</u>		Formatted: Not Highlight
	<u>9</u>	<u>1844.9</u>	-	<u>1879.9</u>	<u>[-55]</u>	<u>1</u>		Formatted: Not Highlight
	<u>11</u>	<u>1475.9</u>	-	<u>1500.9</u>	<u>[-55]</u>	<u>1</u>		Formatted: Not Highlight
	<u>Regulatory³</u>	<u>1884.5</u>	-	<u>1919.6</u>	<u>-41</u>	<u>0.3</u>		Formatted: Not Highlight
<u>13</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>		
	<u>4</u>	<u>2110</u>	-	<u>2155</u>	<u>[-50]</u>	<u>1</u>		
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>		Formatted: Not Highlight
	<u>10</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>		

3GPP

	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>	
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>	
	<u>Regulatory³</u>	<u>763</u>	-	<u>775</u>	<u>-35</u>	<u>0.00625</u>	
<u>14</u>	<u>2</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>	
	<u>5</u>	<u>869</u>	-	<u>894</u>	<u>[-50]</u>	<u>1</u>	
	<u>10</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>13</u>	<u>746</u>	-	<u>756</u>	<u>[-50]</u>	<u>1</u>	
	<u>14</u>	<u>758</u>	-	<u>768</u>	<u>[-50]</u>	<u>1</u>	
	<u>Regulatory³</u>	<u>763</u>	-	<u>775</u>	<u>-35</u>	<u>0.00625</u>	
<u>33</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>3</u>	<u>1805</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>	
	<u>7</u>	<u>2620</u>	-	<u>2690</u>	<u>[-50]</u>	<u>1</u>	
	<u>8</u>	<u>925</u>	-	<u>960</u>	<u>[-50]</u>	<u>1</u>	
	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>38</u>	<u>2570</u>	-	<u>2620</u>	<u>[-50]</u>	<u>1</u>	
	<u>40</u>	<u>2300</u>	-	<u>2400</u>	<u>[-50]</u>	<u>1</u>	
<u>34</u>	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>3</u>	<u>1805</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>	
	<u>7</u>	<u>2620</u>	-	<u>2690</u>	<u>[-50]</u>	<u>1</u>	
	<u>8</u>	<u>925</u>	-	<u>960</u>	<u>[-50]</u>	<u>1</u>	
	<u>33</u>	<u>1900</u>	-	<u>1920</u>	<u>[-50]</u>	<u>1</u>	
	<u>38</u>	<u>2570</u>	-	<u>2620</u>	<u>[-50]</u>	<u>1</u>	
	<u>39</u>	<u>1880</u>	-	<u>1920</u>	<u>[-50]</u>	<u>1</u>	
	<u>40</u>	<u>2300</u>	-	<u>2400</u>	<u>[-50]</u>	<u>1</u>	
<u>35</u>	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>36</u>	<u>1930</u>	-	<u>1990</u>	<u>[-50]</u>	<u>1</u>	
<u>36</u>	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>35</u>	<u>1850</u>	-	<u>1910</u>	<u>[-50]</u>	<u>1</u>	
<u>37</u>	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>1</u>	<u>2110</u>	-	<u>2170</u>	<u>[-50]</u>	<u>1</u>	
	<u>3</u>	<u>1805</u>	-	<u>1880</u>	<u>[-50]</u>	<u>1</u>	
	<u>33</u>	<u>1900</u>	-	<u>1920</u>	<u>[-50]</u>	<u>1</u>	
<u>38</u>	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

39	<u>3</u> ¹	<u>1805</u>	-	<u>1850</u>	<u>[-50]</u>	<u>1</u>	
	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>40</u>	<u>2300</u>	-	<u>2400</u>	<u>[-50]</u>	<u>1</u>	
	<u>1</u>	<u>2110</u>		<u>2170</u>	<u>[-50]</u>	<u>1</u>	
40	<u>3</u>	<u>1805</u>		<u>1880</u>	<u>[-50]</u>	<u>1</u>	
	<u>33</u>	<u>1900</u>	-	<u>1920</u>	<u>[-50]</u>	<u>1</u>	
	<u>34</u>	<u>2010</u>	-	<u>2025</u>	<u>[-50]</u>	<u>1</u>	
	<u>39</u>	<u>1880</u>	-	<u>1920</u>	<u>[-50]</u>	<u>1</u>	

Note

¹ Indicates split band protection requirements are applicable

² A number of exceptions are permitted and is FFS. For these exceptions the requirements of Table 6.6.3.1-2 are applicable

³ For band which are identified as "Regulatory", regional requirement are applicable.

⁴ To meet these requirements some restriction will be needed for either the operating band or protection band

Formatted: Not Highlight

Formatted: Bullets and Numbering

Formatted: Not Highlight

Formatted: Space After: 0 pt, Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.65" + Indent at: 0.65", Allow hanging punctuation, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Font Alignment: Auto

Formatted: Space After: 0 pt, Allow hanging punctuation, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Font Alignment: Auto

E-UTRA-Band	Frequency-Range	Maximum-Level	Measurement Bandwidth	Channel-bandwidth
1	-			
2	-			
3	-			
4	-			
5	-			
6	-			
7	-			
8	-			
9	-			
10	-			
11	-			
12	-			
13	-			
14	-			
...				
33	-			
34	-			
35	-			
36	-			
37	-			
38	-			

6.6.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement.

6.6.3.3.1 Minimum requirement (network signalled value "NS_05")

Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.1-1.

Table 6.6.3.3.1-1: Additional requirements (PHS)

Δf_{OOB} (MHz)	Channel bandwidth / Spectrum emission limit (dBm)						Measurement bandwidth
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
F _{UL_low} F _{UL_high}	-41	-41	-41	-41	-41 ¹	-41 ¹	300 KHz
Note 1. Applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to 1920MHz + the Channel BW assigned. Operations below this point are for further study.							

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective sections below.

All the parameters in clause 7 are defined using the DL reference measurement channel specified in Annex A.3.2C and using the set-up specified in Annex C.3.1 ~~fixed power allocation for the RB(s).~~

~~The ACS, blocking, spurious emissions and intermodulation requirements in sections 7.5, 7.6, 7.7 and 7.8 are defined for full band width signals i.e. for signals where all resource blocks are allocated for a specific user.~~

7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. Requirements for 4 ports are FFS. With the exception of clause 7.9 all requirements shall be verified by using both (all) antenna ports simultaneously.

Formatted: Not Highlight

7.3 Reference sensitivity power level

The reference sensitivity power level REFSENS is the minimum mean power applied to both the UE antenna ports at which the ~~mean~~ throughput R_{av} shall meet or exceed the requirements for the specified reference measurement channel.

7.3.1 Minimum requirements (QPSK)

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channel as specified in Annex A.3.2 with parameters specified in Table 7.3.1-1 and table 7.3.1-2

~~The throughput R_{av} shall meet or exceed the minimum requirements specified in table 7.3.1-1 for the specified REFSENS.~~

Table 7.3.1-1: Reference sensitivity QPSK P_{REFSENS}

E-UTRA Band	Channel bandwidth						Duplex Mode
	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	
1			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>FDD</u>
2		-	<u>[-98]</u>	<u>[-95]</u>	<u>[-93.2]</u>	<u>[-92]</u>	<u>FDD</u>
3	-	-	<u>[-97]</u>	<u>[-94]</u>	<u>[-92.2]</u>	<u>[-91]</u>	<u>FDD</u>
4			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>FDD</u>
5			<u>[-98]</u>	<u>[-95]</u>			<u>FDD</u>
6			<u>[-100]</u>	<u>[-97]</u>			<u>FDD</u>
7			<u>[-98]</u>	<u>[-95]</u>	<u>[-93.2]</u>	<u>[-92]</u>	<u>FDD</u>
8			<u>[-97]</u>	<u>[-94]</u>			<u>FDD</u>
9			<u>[-99]</u>	<u>[-96]</u>	<u>[-94]</u>	<u>[-93]</u>	<u>FDD</u>
10			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>FDD</u>
11			<u>[-98]</u>	<u>[-95]</u>	<u>[-93.2]</u>	<u>[-92]</u>	<u>FDD</u>
12							<u>FDD</u>
13			<u>[-97]</u>	<u>[-94]</u>			<u>FDD</u>
14							<u>FDD</u>
33			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
34			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
35			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
36			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
37			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
38			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
39			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>
40			<u>[-100]</u>	<u>[-97]</u>	<u>[-95.2]</u>	<u>[-94]</u>	<u>TDD</u>

Note 1: The transmitter shall be set to maximum output power level (Table 7.3.1-2)
 Note 2: Reference measurement channel is [A.3.2]
 Note 3: The signal power is specified per port
 Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level of Band 3 + 0.5 dB is applicable for band 9

Formatted Table

Note 1: The relation to the received PSD is $\langle \text{REF } \hat{I}_{\text{or}} \rangle = P_{\text{REFSENS}} (N_{\text{sc}}^{\text{RB}} N_{\text{RB}} \Delta f)^{-1}$ with N_{RB} is the maximum transmission configuration according to Table 5.4.2-1.

Formatted: Indent: Left: 0.2", Hanging: 0.49"

Table 7.3.1-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement must be met. For larger transmission configurations a certain relaxation of the UE performance is allowed. Table 7.3.1-3 specifies the maximum output power level for which the reference receive sensitivity requirement must be met when UL resource blocks is the total resource blocks (Table 5.4.2-1) supported by the channel bandwidth.

Table 7.3.1-2: Maximum uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N_{RB} / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
1	-	-	25	50	75	100	FDD
2	6	15	25	50	[50 ¹]	[50 ¹]	FDD
3	6	15	25	50	[50 ¹]	[50 ¹]	FDD
4	6	15	25	50	75	100	FDD

Formatted Table

<u>5</u>	<u>6</u>	<u>15</u>	<u>25</u>	<u>[25¹]</u>	<u>=</u>	<u>=</u>	<u>FDD</u>
<u>6</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>[25¹]</u>	<u>=</u>	<u>=</u>	<u>FDD</u>
<u>7</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>[75¹]</u>	<u>[75¹]</u>	<u>FDD</u>
<u>8</u>	<u>6</u>	<u>15</u>	<u>25</u>	<u>[25¹]</u>	<u>=</u>	<u>=</u>	<u>FDD</u>
<u>9</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>[50¹]</u>	<u>[50¹]</u>	<u>FDD</u>
<u>10</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>FDD</u>
<u>11</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>[25¹]</u>	<u>[25¹]</u>	<u>[25¹]</u>	<u>FDD</u>
<u>12</u>							<u>FDD</u>
<u>13</u>	<u>6</u>	<u>15</u>	<u>[15-25]</u>	<u>[15-25]</u>			<u>FDD</u>
<u>14</u>							<u>FDD</u>
<u>...</u>							
<u>33</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
<u>34</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>=</u>	<u>TDD</u>
<u>35</u>	<u>6</u>	<u>15</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
<u>36</u>	<u>6</u>	<u>15</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
<u>37</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
<u>38</u>	<u>=</u>	<u>=</u>	<u>25</u>	<u>50</u>	<u>=</u>	<u>=</u>	<u>TDD</u>
<u>39</u>			<u>25</u>	<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
<u>40</u>				<u>50</u>	<u>75</u>	<u>100</u>	<u>TDD</u>
Note 2. Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Indent: Left: 0.22", Hanging: 0.2", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 1.88" + Tab after: 2.13" + Indent at: 2.13", Tab stops: Not at 2.13"

Formatted: Bullets and Numbering

Table 7.3.1-3: Maximum transmission power for reference sensitivity

<u>E-UTRA</u> <u>Band</u>	<u>Channel bandwidth</u>						<u>Duplex</u> <u>Mode</u>
	<u>1.4 MHz</u> <u>(dBm)</u>	<u>3 MHz</u> <u>(dBm)</u>	<u>5 MHz</u> <u>(dBm)</u>	<u>10 MHz</u> <u>(dBm)</u>	<u>15 MHz</u> <u>(dBm)</u>	<u>20 MHz</u> <u>(dBm)</u>	
<u>1</u>				-			<u>FDD</u>
<u>2</u>		-					<u>FDD</u>
<u>3</u>	-	-					<u>FDD</u>
<u>4</u>							<u>FDD</u>
<u>5</u>							<u>FDD</u>
<u>6</u>							<u>FDD</u>
<u>7</u>							<u>FDD</u>
<u>8</u>							<u>FDD</u>
<u>9</u>							<u>FDD</u>
<u>10</u>							<u>FDD</u>
<u>11</u>							<u>FDD</u>
<u>12</u>							<u>FDD</u>
<u>13</u>							<u>FDD</u>
<u>14</u>							<u>FDD</u>
<u>Note 1: UE output power is less than the maximum output power</u>							

E-UTRA BAND	Channel bandwidth-MHz											
	1.4 MHz		3.0 MHz		5 MHz		10 MHz		15 MHz		20 MHz	
	REFSENS R_{av}		REFS ENS	R_{av}	REFS ENS	R_{av}	REFS ENS	R_{av}	REFS ENS	R_{av}	REFS ENS	R_{av}
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
...												
33												
34												
35												
36												
37												
38												
Note: 1.The transmitter shall be set to maximum output power level. 2.Reference measurement channel is [Annex C QPSK R=1/3]												

Formatted: Bullets and Numbering

7.3.2 (Void) Maximum Sensitivity Reduction (MSR)

Formatted: Font: (Default) Arial

For some operating bands, it is anticipated that the transmitter noise falling in the receive band will be dependant on the channel bandwidth and will degrade the reference sensitivity depending on the operating bandwidth, TX power and FDD or TDD operation configured by the scheduler. This section is for FFS.

7.4 Maximum input level

This is defined as the maximum mean power received at the UE antenna port, at which the specified [relative](#) throughput R_{av} shall meet or exceed the minimum requirements for the specified reference measurement channel.

7.4.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4.1.

The throughput R_{av} shall meet or exceed the minimum requirements specified in table 7.4.1-1 for the specified wanted signal mean power.

Table 7.4.1-1: Maximum input level

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	-25					
R_{av}	kbps						
Note:							
1. The transmitter shall be set to 4dB below the supported maximum output power.							
2. Reference measurement channel is [Annex C 64QAM R=3/4]							

Formatted: Indent: Left: 0", Hanging: 0.25", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0" + Tab after: 0.25" + Indent at: 0.25"

7.5 Adjacent Channel Selectivity (ACS)

7.5.1 Minimum requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5.1-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.1-2 and Table 7.5.1-3 where the throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2. R_{av} shall meet or exceed the values specified in Table 7.5.1-1.

Table 7.5.1-1: Adjacent channel selectivity

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
ACS	dB	33.0	33.0	33.0	33.0	30	[27]

Table 7.5.1-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + 14 dB					
$P_{\text{interferer}}$	dBm	REFSENS +[45]dB	REFSENS +[45]dB	REFSENS +[45]dB*	REFSENS +[45]dB	REFSENS +[42]dB	REFSENS +[39]dB
$BW_{\text{interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{interferer (offset)}}$	MHz	1.4	3	5	7.5	10	12.5
Note: 1. The transmitter shall be set to 4dB below the supported maximum output power. 2. The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1 Reference measurement channel is [Annex C-QPSK R=1/3]							

Formatted: Indent: Left: -0.03", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5" + 0.99"

Table 7.5.1-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	[-56.0]	[-56.0]	[-56.0]	[-56.0]	[-53.0]	[-50.0]
$P_{\text{interferer}}$	dBm	-25					
$BW_{\text{interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{interferer (offset)}}$	MHz	1.4	3	5	7.5	10	12.5
Note: 1. The transmitter shall be set to 24dB below the supported maximum output power. 2. The interferer consists of the Reference measurement channel specified in Annex 3.2 with set-up according to Annex C.3.1 2.Reference measurement channel is [Annex C-QPSK R=1/3]							

Formatted: Indent: Left: -0.03", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5" + 1.18"

Formatted: Bullets and Numbering

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 In-band blocking

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band at which the specified-relative throughput R_{av} shall meet or exceed the minimum requirement for the specified measurement channels.

7.6.1.1 Minimum requirements

The requirements are specified in terms of a minimum information bit throughput R_{av} for the parameters specified in Table 7.6.1.1-1. Using this configuration the throughput shall meet or exceed the minimum requirements specified in Table 7.6.1.1-2 The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1.1-1 and 7.6.1.1-2.

Table 7.6.1.1-1: In band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		63	63	63	63	74	96
BW _{Interferer}	MHz	1.4	3	5	5	5	5
$F_{\text{offset, case 1}}$ $F_{\text{interferer, Case 1}}$ (Offset)	MHz	2.1	4.5	7.5	7.5	7.5	7.5
$F_{\text{offset, case 2}}$ $F_{\text{interferer, Case 2}}$ (Offset)	MHz	3.5	7.5	12.5	12.5	12.5	12.5
R_{av}	kbps						
Note: 1. The transmitter shall be set to 4dB below the supported maximum output power. 2. <u>The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1</u> 2.Reference measurement channel is {Annex C QPSK R=1/3}							

Formatted: Indent: Left: 0", Hanging: 0.25", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0" + Tab after: 0.25" + Indent at: 0.25"

Formatted: Bullets and Numbering

Table 7.6.1.1-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2
	$P_{\text{Interferer}}$	dBm	-56	-44
	$F_{\text{Interferer}}$ (Offset)	MHz	$\pm BW/2 - F_{\text{offset, case 1}}$ & $\pm BW/2 + F_{\text{offset, case 1}}$	$\leq -BW/2 - F_{\text{offset, case 2}}$ & $\geq +BW/2 + F_{\text{offset, case 2}}$
1, 2, 3, 4, 5 7, 8, 9, 10, 11, 13 33, 34, 35, 36, 37, 38, 39, 40	$F_{\text{Interferer}}$	MHz	$F_{\text{DL\_low}} - 7.5$ to $F_{\text{DL\_high}} + 7.5$ (Note 3)	$F_{\text{DL\_low}} - 15$ to $F_{\text{DL\_high}} + 15$
6	$F_{\text{Interferer}}$	MHz	$F_{\text{DL\_low}} - 7.5$ to $F_{\text{DL\_high}} + 7.5$ (Note 2 & 3)	$F_{\text{DL\_low}} - 15$ to $F_{\text{DL\_high}} + 15$ (Note 3)
Note: 2.1. <u>The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidths ≥ 5 MHz]</u> 3.2. <u>For each carrier frequency the requirement is valid for two frequencies, the carrier frequencies $-BW/2 - F_{\text{offset, case 1}}$ & $+BW/2 + F_{\text{offset, case 1}}$.</u> 4.3. <u>For Band 6, the unwanted modulated interfering signal does not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band</u>				

Formatted: Indent: Left: 0", Hanging: 0.22", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5"

7.6.2 Out of-band blocking

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band. For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

7.6.2.1 Minimum requirements

The requirements are specified in terms of a minimum information bit throughput R_{av} for the parameters specified in Table 7.6.2.1-1. Using this configuration the throughput shall meet or exceed the minimum requirements specified in Table 7.6.2.1-2. The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2.1-1 and 7.6.2.1-2.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious response are applicable.

Table 7.6.2.1-1: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
R_{av}	kbps	63	63	63	63	74	96
Note: 81. The transmitter shall be set to 4dB below the supported maximum output power. 2. Reference measurement channel is [A.3.2] 2. Reference measurement channel is [Annex C QPSK R=1/3]							

Formatted: Indent: Left: 0", Hanging: 0.22", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5" + 1.18"

Formatted: Bullets and Numbering

Table 7.6.2.1-2: Out of band blocking

E-UTRA band	Parameter	Units	Frequency			
			range 1	range 2	range 3	range 4
	$P_{interferer}$	dBm	[-44]	[-30]	[-15]	[-15]
1, 2, 3, 4, 5 6, 7, 8, 9, 10, 11, 13 33, 34, 35, 36, 37 38, 39, 40	$F_{interferer}$ (CW)	MHz	$F_{DL\_low} -15$ to $F_{DL\_low} -60$	$F_{DL\_low} -60$ to $F_{DL\_low} -85$	$F_{DL\_low} -85$ to 1 MHz	-
			$F_{DL\_high} +15$ to $F_{DL\_high} +60$	$F_{DL\_high} +60$ to $F_{DL\_high} +85$	$F_{DL\_high} +85$ to +12750 MHz	-
2, 5	$F_{interferer}$	MHz	-	-	-	$F_{UL\_low} - F_{UL\_high}$
Note:						

7.6.3 Narrow band blocking

This requirement is measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

7.6.3.1 Minimum requirements

The requirements are specified in terms of a minimum information bit throughput R_{av} for the parameters specified in Table 7.6.3.1-1. The relative throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3.1-1

Formatted: Normal

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
$P_{\text{interferer (CW)}}$	dBm	[10]	[16]	[13]	[10]	[11]	[13]
$F_{\text{interferer (Offset)}}$	MHz	[-55.5]	[-55.5]	[-55.3]	[-55.3]	[-55.5]	[-55.2]
R_{av}	Kbps						
Note: The transmitter shall be set to 4dB below the supported maximum output power. Reference measurement channel is [Annex C QPSK R=1/3] d= frequency off set. Value of d is TBD.							

Table 7.6.3.1-1: Narrow-band blocking

Parameter	Unit	Channel Bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
P_w	dBm	$P_{\text{REFSENS}} + \text{channel bandwidth specific value below}$					
		22	18	16	13	14	16
$P_{\text{UW (CW)}}$	dBm	-55	-55	-55	-55	-55	-55
$F_{\text{UW (offset for } \Delta f = 15 \text{ kHz)}}$	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075
$F_{\text{UW (offset for } \Delta f = 7.5 \text{ kHz)}}$	MHz						
Note 1: The transmitter shall be set a 4 dB below the supported maximum power. Note 2: Reference measurement channel is [A.3.2].							

Formatted: Indent: Left: -0.03", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5"

Formatted: Bullets and Numbering

Formatted: English (U.K.)

Formatted: TH

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 is not met.

7.7.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7.1-1 and 7.7.1-2.

The requirements are specified in terms of a minimum information bit throughput R_{av} for the parameters specified in Table 7.7.1-1. Using this configuration the throughput shall meet or exceed the minimum requirements specified in table 7.7.1-2.

Table 7.7.1-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		36	36	36	36	47	67
R_{av}	kbps						
Note: 1. The transmitter shall be set to 4dB below the supported maximum output power. 2. Reference measurement channel is [A.3.2] 3. Reference measurement channel is [Annex C QPSK R=1/3]							

Formatted: Indent: Left: 0", First line: 0", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5"

Formatted: Bullets and Numbering

Table 7.7.1-2: Spurious Response

Parameter	Unit	Level
$P_{\text{Interferer}}$ (CW)	dBm	-44
$F_{\text{Interferer}}$	MHz	Spurious response frequencies

7.8 Intermodulation characteristics

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Wide band intermodulation

The wide band intermodulation requirement is defined following the same principles using modulated E-UTRA carrier and CW signal as interferer.

7.8.1.1 Minimum requirements

The throughput R_{av} shall meet or exceed the minimum requirements specified in table 7.8.1-1 for the specified wanted signal mean power in the presence of two interfering signals. The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1.1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8.1.1-1: Wide band intermodulation

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		[12][9]	[8][5]	63	63	74	96

P Interferer 1 (CW)	dBm	-46				
P Interferer 2 (Modulated)	dBm	-46				
BW Interferer 2		1.4	3	5		
F Interferer 1 (Offset)	MHz	-BW/2 –2.1 / +BW/2+ 2.1	-BW/2 –4.5 / +BW/2 + 4.5	-BW/2 – 7.5 / +BW/2 + 7.5		
F Interferer 2 (Offset)	MHz	2*F Interferer 1				
R _{av}	kbps					
Note:						
a-1. The transmitter shall be set to 4dB below the supported maximum output power. b-2. Reference measurement channel is [Annex C QPSK R=1/3] 3. <u>The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1</u><u>The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz</u> ~~3. The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth- ≥5MHz~~						

Formatted: Indent: Left: -0.03", Numbered + Level: 1 + Numbering Style: 1, 2, 3, ... + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Tab after: 0.5" + Indent at: 0.5", Tab stops: 0.22", List tab + Not at 0.5"

Formatted: Bullets and Numbering

7.8.2 Narrow band intermodulation

7.8.2.1 Minimum requirements

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1-1

Table 7.9.1-1: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
$30\text{MHz} \leq f < 1\text{GHz}$	100 kHz	<u>-57 dBm</u>	
$1\text{GHz} \leq f \leq 12.75\text{GHz}$	1 MHz	<u>-47 dBm</u>	

8 Performance requirement

This clause contains performance requirements for the physical channels specified in [TS 36.211]. The performance requirements for the UE in this clause are specified for the measurement channels specified in Annex A.3, the propagation conditions in Annex B and the downlink channels in Annex C.3.2.

8.1 General

8.1.1 Dual-antenna receiver capability

The performance requirements are based on UE(s) that utilize a dual-antenna receiver.

8.1.1.1 Simultaneous unicast and MBMS operations

8.1.1.2 Dual-antenna receiver capability in idle mode

8.2 Demodulation of PDSCH (Cell-Specific Reference Symbols)

8.2.1 FDD (Fixed Reference Channel)

8.2.1.1 Single-antenna port performance

The receiver single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.2 is achieved.

8.2.1.1.1 Minimum Requirement QPSK

The requirements are specified in Table 8.2.1.1.1-2, with the addition of the parameters in Table 8.2.1.1.1-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.1.1.1-1: Test Parameters for Testing QPSK

<u>Parameter</u>	<u>Unit</u>	<u>Test 10.1-10.3 [More columns if needed for other test setups]</u>
<u>Reference signal power</u> E_{RS} / I_{or}	<u>dB</u>	<u>0</u>
<u>N_{oc} at antenna port</u>	<u>dBm/15kHz</u>	<u>TBD [-74]</u>
<u>Inter-TTI Distance</u>		<u>1</u>
<u>Number of HARQ processes</u>	<u>Processes</u>	<u>8</u>
<u>Maximum number of HARQ transmission</u>		<u>4</u>
<u>Redundancy version coding sequence</u>		<u>{0,1,2,3}</u>
<u>Note: TBD</u>		

Formatted: Bullets and Numbering

Table 8.2.1.1.1-2: Minimum performance QPSK (FRC)

Bandwidth	Test Number	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR $\hat{I}_{or} / N_{oc}$ (dB)
10 MHz	10.1	[F14]	EVA5	Low	70	
	10.2	[F14]	ETU70	Low	70	
	10.3	[F14]	ETU300	Low	70	
	10.4	[F44]				
	[1 PRB]					

8.2.1.1.2 Minimum Requirement 16QAM

The requirements are specified in Table 8.2.1.1.2-1, with the addition of the parameters in Table 8.2.1.1.2-2 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.1.1.2-1: Test Parameters for Testing 16QAM

Parameter	Unit	Test 10.1-10.2
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Inter-TTI Distance		1
Number of HARQ processes	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3}
Note: TBD		

Table 8.2.1.1.2-2: Minimum performance 16QAM (FRC)

Bandwidth	Test Number	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR $\hat{I}_{or} / N_{oc}$ (dB)
10 MHz	10.1	[F24]	ETU70	Low	30	
					70	
	10.2	[F24]	ETU300	High	70	

8.2.1.1.3 Minimum Requirement 64QAM

The requirements are specified in Table 8.2.1.1.3-2, with the addition of the parameters in Table 8.2.1.1.3-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Formatted: Bullets and Numbering

Formatted: TH

Table 8.2.1.1.3-1: Test Parameters for Testing 64QAM

Parameter	Unit	Test 10.1-10.4
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Inter-TTI Distance		1
Number of HARQ processes	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,0,1,2}
Note: TBD		

Table 8.2.1.1.3-2: Minimum performance 64QAM (FRC)

Bandwidth	Test Number	Reference Channel	Propagation Condition	Correlation Matrix	Reference value	
					Fraction of Maximum Throughput (%)	SNR $\hat{I}_{or} / N_{oc}$ (dB)
10 MHz	10.1	[F34]	EVA5	Low	70	
	10.2	[F34]	ETU70	Low	70	
	10.3	[F34]	EVA5	Medium	70	
	10.4	[F34]	EVA5	High	70	

8.2.1.2 Transmit diversity performance**8.2.1.3** Open-loop spatial multiplexing performance**8.2.1.4** Closed-loop spatial multiplexing performance**8.2.1.5** MU-MIMO**8.2.1.6** [Control channel performance: D-BCH and PCH]**8.2.2** DL-SCH TDD (Fixed Reference Channel)**8.2.1.1** Single-antenna port performance**8.2.1.2** Transmit diversity performance**8.2.1.3** Open-loop spatial multiplexing performance**8.2.1.4** Closed-loop spatial multiplexing performance**8.2.1.5** MU-MIMO**8.2.1.6** [Control channel performance: D-BCH and PCH]

Formatted: Bullets and Numbering

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

Requirements for user-specific requirements are TBD. 8.4 Demodulation of PDCCH/PCFICH

8.4.1 FDD

8.4.1.1 Single-antenna port performance

8.4.1.2 Transmit diversity performance

8.4.2 TDD

8.4.2.1 Single-antenna port performance

8.4.2.2 Transmit diversity performance

8.5 Demodulation of PHICH

8.6 Demodulation of PBCH

9 Reporting of [CQI/PMI]

<Text omitted>

Formatted: Normal

Annex A (normative): Measurement channels

A.1 General

A.2 UL reference measurement channels

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.

2. [Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24) / N_{ch}|_a$$

subject to

a) A is a valid TB size assuming an allocation of N_{RB} resource blocks]

3. If there is more than one A that minimises the equation above, then the larger value is chosen per default.

A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) [with the exception of sub-clause 7.4 (Maximum input level)].

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.2-1 Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit	Value						
Nominal Avg. Inf. Bit Rate	kbps							
Number of HARQ Processes	Processes	1	1	1	1	1	1	1
Maximum number of HARQ transmission		1	1	1	1	1	1	1
Information Bit Payload per Sub-Frame	Bits							
Number of Code Blocks								
Binary Channel Bits Per Sub-Frame	Bits							
Coding Rate								
Bandwidth	MHz	1.4	3	5	10	15	20	
Number of OFDM symbols per Sub-Frame								
					11.5			
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Note 1: 2 symbols allocated to PDCCH								
Note 2: The RLC should be configured to Unacknowledged Mode								

Table A.3.2-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value						
Nominal Avg. Inf. Bit Rate	kbps							
Number of HARQ Processes	Processes	1	1	1	1	1	1	1
Maximum number of HARQ transmission		1	1	1	1	1	1	1
Information Bit Payload per Sub-Frame	Bits							
Number of Code Blocks								
Binary Channel Bits Per Sub-Frame	Bits							
Coding Rate								
Bandwidth	MHz	1.4	3	5	10	15	20	
Number of OFDM symbols per Sub-Frame								
					11.5			
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Note 1: 2 symbols allocated to PDCCH								
Note 2: The RLC should be configured to Unacknowledged Mode								

A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna port (Fixed Reference Channel)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>					
<u>Reference Channel</u>		<u>[F11]</u>	<u>[F12]</u>	<u>[F13]</u>	<u>[F14]</u>	<u>[FA15]</u>	<u>[FA16]</u>
<u>Nominal Avg. Inf. Bit Rate</u>	<u>kbps</u>						
<u>Information Bit Payload per Sub-Frame</u>	<u>Bits</u>						
<u>Number of Code Blocks</u>							
<u>Binary Channel Bits Per Sub-Frame</u>	<u>Bits</u>						
<u>Coding Rate</u>							
<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>					
<u>Reference Channel</u>		<u>[F21]</u>	<u>[F22]</u>	<u>[F23]</u>	<u>[F24]</u>	<u>[F25]</u>	<u>[F26]</u>
<u>Nominal Avg. Inf. Bit Rate</u>	<u>kbps</u>						
<u>Information Bit Payload per Sub-Frame</u>	<u>Bits</u>						
<u>Number of Code Blocks</u>							
<u>Binary Channel Bits Per Sub-Frame</u>	<u>Bits</u>						
<u>Coding Rate</u>							
<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>16QAM</u>	<u>16QAM</u>	<u>16QAM</u>	<u>16QAM</u>	<u>16QAM</u>	<u>16QAM</u>

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>					
<u>Reference Channel</u>		<u>[F31]</u>	<u>[F32]</u>	<u>[F33]</u>	<u>[F34]</u>	<u>[F35]</u>	<u>[F36]</u>
<u>Nominal Avg. Inf. Bit Rate</u>	<u>kbps</u>						
<u>Information Bit Payload per Sub-Frame</u>	<u>Bits</u>						
<u>Number of Code Blocks</u>							
<u>Binary Channel Bits Per Sub-Frame</u>	<u>Bits</u>						
<u>Coding Rate</u>							
<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>64QAM</u>	<u>64QAM</u>	<u>64QAM</u>	<u>64QAM</u>	<u>64QAM</u>	<u>64QAM</u>

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>					
<u>Reference Channel</u>		<u>[F41]</u>	<u>[F42]</u>	<u>[F43]</u>	<u>[F44]</u>	<u>[F45]</u>	<u>[F46]</u>
<u>Nominal Avg. Inf. Bit Rate</u>	<u>kbps</u>						
<u>Information Bit Payload per Sub-Frame</u>	<u>Bits</u>						
<u>Number of Code Blocks</u>							
<u>Binary Channel Bits Per Sub-Frame</u>	<u>Bits</u>						
<u>Coding Rate</u>							
<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>

A.3.3.2 Transmit diversity (Fixed Reference Channel)

A.3.3.3 Spatial Multiplexing (Fixed Reference Channel)

A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna port (Fixed Reference Channel)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>					
<u>Reference Channel</u>		<u>[T11]</u>	<u>[T12]</u>	<u>[T13]</u>	<u>[T14]</u>	<u>[T15]</u>	<u>[T16]</u>
<u>Nominal Avg. Inf. Bit Rate</u>	<u>kbps</u>						
<u>Information Bit Payload per Sub-Frame</u>	<u>Bits</u>						
<u>Number of Code Blocks</u>							
<u>Binary Channel Bits Per Sub-Frame</u>	<u>Bits</u>						
<u>Coding Rate</u>							
<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

<u>Parameter</u>	<u>Unit</u>	<u>Value</u>

Reference Channel		[T21]	[T22]	[T23]	[T24]	[T25]	[T26]
Nominal Avg. Inf. Bit Rate	kbps						
Information Bit Payload per Sub-Frame	Bits						
Number of Code Blocks							
Binary Channel Bits Per Sub-Frame	Bits						
Coding Rate							
Bandwidth	MHz	1.4	3	5	10	15	20
Number of OFDM symbols per Sub-Frame							
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference Channel		[T31]	[T32]	[T33]	[T34]	[T35]	[T36]
Nominal Avg. Inf. Bit Rate	kbps						
Information Bit Payload per Sub-Frame	Bits						
Number of Code Blocks							
Binary Channel Bits Per Sub-Frame	Bits						
Coding Rate							
Bandwidth	MHz	1.4	3	5	10	15	20
Number of OFDM symbols per Sub-Frame							
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM

Table A.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit	Value					
Reference Channel		[T41]	[T42]	[T43]	[T44]	[T45]	[T46]
Nominal Avg. Inf. Bit Rate	kbps						
Information Bit Payload per Sub-Frame	Bits						
Number of Code Blocks							
Binary Channel Bits Per Sub-Frame	Bits						
Coding Rate							

<u>Bandwidth</u>	<u>MHz</u>	<u>1.4</u>	<u>3</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Number of OFDM symbols per Sub-Frame</u>							
<u>Modulation</u>		<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>	<u>QPSK</u>

A.3.4.2 Transmit diversity (Fixed Reference Channel)

A.3.4.3 Spatial multiplexing (Fixed Reference Channel)

Annex B (normative): Propagation conditions

B.1 Static propagation condition

B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.
- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1 Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

Table B.2.1-2 Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3 Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4 Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies

Table B.2.2-1 Channel model parameters

Model	Maximum Doppler frequency
EPA 5Hz	5 Hz
EVA 5Hz	5 Hz
EVA 70Hz	70 Hz
ETU 70Hz	70 Hz
ETU 300Hz	300 Hz

B.2.3 Multi-Antenna channel models

Table B.2.3-1 defines the correlation matrix for the eNodeB

Table B.2.3-1 eNodeB correlation matrix

	One antenna	Two antenna
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix}$

Table B.2.3-2 defines the correlation matrix for the UE:

Table B.2.3-2 UE correlation matrix

UE Correlation	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & 1 \end{pmatrix}$

Table B.2.3-3 define the channel spatial correlation matrix R_{spat} . The parameters, α and β in Table B.2.3-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2. 3-3: R_{spat} correlation matrices

1x2 case	2x2 case
$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$

The α and β for different correlation types are given in Table B.2.3-4.

Table B.2.3-4

Low correlation		Medium Correlation		High Correlation	
α	β	α	β	α	β
0	0	0.3	0.9	0.9	0.9

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3 Correlation Matrix Definitions

The correlation matrices for high, medium and low correlation are defined in Table B.23-1-1, B.2.3.1-2 and B.2.3.1-3, below

Table B.2.3.1: correlation matrices for high correlation

1x2 case	2x2 case
$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$	$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$

Table B.2.3-2: correlation matrices for medium correlation

1x2 case	2x2 case

N/A	$R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$

Table B.2.3-3: correlation matrices for low correlation

1x2 case	2x2 case
$R_{low} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	$R_{low} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$

B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos \theta(t)$$

where $f_s(t)$ is the Doppler shift and f_d is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos \theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{min}^2 + (D_s/2 - vt)^2}}, \quad 0 \leq t \leq D_s/v$$

where $D_s/2$ is the initial distance of the train from eNodeB, and D_{min} is eNodeB Railway track distance, both in meters; v is the velocity of the train in m/s, t is time in seconds. The parameters in the equation are shown in Table B.3-1 assuming a carrier frequency $f_c = 2690$ MHz. The resulting Doppler shift is shown in Figure.B.3-1.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
D_{min}	2 m
v	300 km/h
f_d	750 Hz

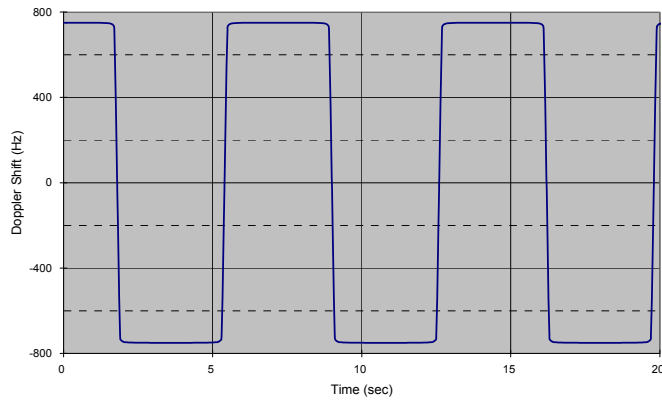


Figure B.3-1: Doppler shift trajectory

Annex C (normative): Downlink Physical Channels

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required for connection set-up

<u>Physical Channel</u>
<u>PBCH</u>
<u>SSS</u>
<u>PSS</u>
<u>PCFICH</u>
<u>PDCCH</u>
<u>PHICH</u>
<u>PDSCH</u>

C.3 Connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

<u>Physical Channel</u>	<u>EPRE Ratio</u>	
<u>PBCH</u>	<u>PBCH RA = 0 dB</u>	
	<u>PBCH RB = 0 dB</u>	
<u>PSS</u>	<u>PSS RB = 0 dB</u>	
	<u>SSS RB = 0 dB</u>	
<u>PCFICH</u>	<u>PCFICH RA = 0 dB</u>	
<u>PDCCH</u>	<u>PDCCH RA = 0 dB</u>	
	<u>PDCCH RB = 0 dB</u>	
<u>PDSCH</u>	<u>PDSCH RA = 0 dB</u>	
	<u>PDSCH RB = 0 dB</u>	

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		0 dB	

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH $RA = \rho_A$	
	PBCH $RB = \rho_B$	
PSS	PSS $RB = \rho_B$	
SSS	SSS $RB = \rho_B$	
PCFICH	PCFICH $RA = \rho_A$	
PDCCH	PDCCH $RA = \rho_A$	
	PDCCH $RB = \rho_B$	
PDSCH	PDSCH $RA = \rho_A$	
	PDSCH $RB = \rho_B$	

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		Test specific	1. Applies for antenna port p

Annex D (normative): Characteristics of the interfering signal

D.1 General

When the channel band width is wider or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel band widths below 5MHz, the band width of modulated interferer should be equal to band width of the received signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth					
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
RB	6	15	25	50	75	100
BW _{interferer}	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz

Annex E (normative): Environmental conditions

E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

E.2 Environmental

The requirements in this clause apply to all types of UE(s).

E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

+15°C to +35°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°C	for extreme conditions (see IEC publications 68-2-1 and 68-2-2)

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table E.2.2-1

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries:			
Leclanché	0,85 * nominal	Nominal	Nominal
Lithium	0,95 * nominal	1,1 * Nominal	1,1 * Nominal
Mercury/nickel & cadmium	0,90 * nominal		Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table E.2.3-1

Frequency	ASD (Acceleration Spectral Density) random vibration
5 Hz to 20 Hz	0,96 m ² /s ³
20 Hz to 500 Hz	0,96 m ² /s ³ at 20 Hz, thereafter -3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 for extreme operation.

Annex X (normative): Transmit modulation

X.1 Measurement Point

The unwanted emission falling into non-allocated RB(s) is calculated directly after the FFT as described below. In contrast to this, the EVM for the allocated RB(s) is calculated after the IDFT.

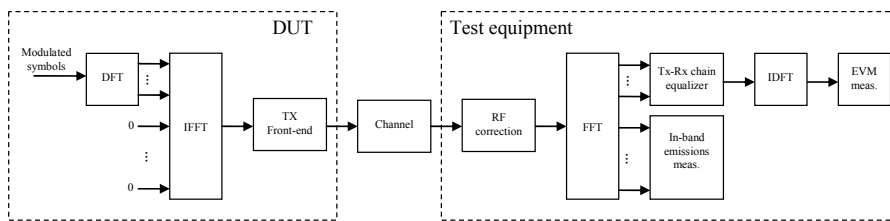


Figure 6.8.1-1: EVM measurement points

X.2 Basic Error Vector Magnitude measurement

The EVM is the difference between the ideal waveform and the measured waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{v \in T_m} |z'(v) - i(v)|^2}{|T_m| \cdot P_0}}$$

where

T_m is a set of $|T_m|$ modulation symbols with the considered modulation scheme being active within the measurement period.

$z'(v)$ are the samples of the signal evaluated for the EVM.

$i(v)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

The basic EVM measurement interval is defined over one subframe in the time domain.

X.3 Basic in-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

For the non-allocated RBs below the allocated frequency block the in-band emissions would be measured as follows

$$Emissions_{absolute}(\Delta_{RB}) = \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{\substack{\min(f_{max}, c-12 \cdot \Delta_{RB} + 1) \\ \max(f_{min}, c-12 \cdot \Delta_{RB})}}^{\min(f_{max}, c-12 \cdot \Delta_{RB} + 1)} |Y(t, f)|^2$$

where

T_s is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period.

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB).

f_{min} (resp. f_{max}) is the lower (resp. upper) edge of the UL system BW.

c is the lower edge of the allocated BW, and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii).

The relative in-band emissions are given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s|} \cdot N_{RB} \sum_{t \in T_s} \sum_c^{c+12 \cdot N_{RB} - 1} |Y(t, f)|^2}$$

where

N_{RB} is the number of allocated RBs

The basic in-band emissions measurement interval is defined over one subframe in the time.

Formatted: Font:

X.4 Modified signal under test

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

$\Delta \tilde{t}$ is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

$\Delta \tilde{f}$ is the RF frequency offset.

$\tilde{\varphi}(t, f)$ is the phase response of the TX chain.

$\tilde{a}(t, f)$ is the amplitude response of the TX chain.

In the following $\Delta \tilde{c}$ represents the middle sample of the EVM window of length W (defined in the next subsections) or the last sample of the first window half if W is even.

The EVM analyser shall

- detect the start of each subframe and estimate $\Delta \tilde{t}$ and $\Delta \tilde{f}$.

Formatted: Bullets and Numbering

- determine $\Delta\tilde{C}$ so that the EVM window of length W is centred on the measured cyclic prefix of the considered OFDM symbol.

To determine the other parameters a sample timing offset equal to $\Delta\tilde{C}$ is corrected from the signal under test. The EVM analyser shall then

- correct the RF frequency offset $\Delta\tilde{f}$ for each subframe, and
- apply an FFT of appropriate size.

The IQ origin offset shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative IQ origin offset power (relative carrier leakage power) also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. The signal on the non-allocated RB(s), $Y(t, f)$, is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s). The UL EVM analyzer shall then estimate the TX chain equalizer coefficients $\tilde{a}(t, f)$ and $\tilde{\varphi}(t, f)$ used by the ZF equalizer for all subcarriers by

1. time averaging at each reference signal subcarrier of the amplitude and phase of the reference symbols, the time-averaging length is [1] subframe. This process creates an average amplitude and phase for each reference signal subcarrier.

At this stage estimates of $\Delta\tilde{f}$, $\tilde{a}(t, f)$, $\tilde{\varphi}(t, f)$ and $\Delta\tilde{C}$ are available. $\Delta\tilde{t}$ is one of the extremities of the window

W , i.e. $\Delta\tilde{t}$ can be $\Delta\tilde{C} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$ or $\Delta\tilde{C} + \left\lfloor \frac{W}{2} \right\rfloor$, where $\alpha = 0$ if W is odd and $\alpha = 1$ if W is even. The EVM analyser shall then

- calculate EVM_i with $\Delta\tilde{t}$ set to $\Delta\tilde{C} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$,
- calculate EVM_o with $\Delta\tilde{t}$ set to $\Delta\tilde{C} + \left\lfloor \frac{W}{2} \right\rfloor$.

X.5 Window length

a. Timing offset

As a result of using a cyclic prefix, there is a range of $\Delta\tilde{t}$, which, at least in the case of perfect Tx signal quality, would give close to minimum error vector magnitude. As a first order approximation, that range should be equal to the length of the cyclic prefix. Any time domain windowing or FIR pulse shaping applied by the transmitter reduces the $\Delta\tilde{t}$ range within which the error vector is close to its minimum.

b. Window length

The window length W affects the measured EVM, and is expressed as a function of the configured cyclic prefix length. In the case where equalization is present, as with frequency domain EVM computation, the effect of FIR is reduced. This is because the equalization can correct most of the linear distortion introduced by the FIR. However, the time domain windowing effect can't be removed.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

c. Window length for normal CP

Formatted: Bullets and Numbering

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for normal CP. The nominal window length for 3 MHz is rounded down one sample to allow the window to be centered on the symbol.

Table X.5-1 EVM window length for normal CP

<u>Channel Bandwidth</u> <u>MHz</u>	<u>Cyclic prefix length N_{cp} for</u> <u>symbol 0</u>	<u>Cyclic prefix length N_{cp} for</u> <u>symbols 1 to 6</u>	<u>Nominal</u> <u>FFT size</u>	<u>Cyclic prefix</u> <u>for symbols 1</u> <u>to 6 in FFT</u> <u>samples</u>	<u>EVM</u> <u>window</u> <u>length W</u>	<u>Ratio of W</u> <u>to CP for</u> <u>symbols 1</u> <u>to 6*</u>
<u>1.4</u>	<u>160</u>	<u>144</u>	<u>128</u>	<u>9</u>	<u>[7]</u>	<u>[77.8]</u>
<u>3</u>			<u>256</u>	<u>18</u>	<u>[14]</u>	<u>[77.8]</u>
<u>5</u>			<u>512</u>	<u>36</u>	<u>[32]</u>	<u>[88.9]</u>
<u>10</u>			<u>1024</u>	<u>72</u>	<u>[66]</u>	<u>[91.7]</u>
<u>15</u>			<u>1536</u>	<u>108</u>	<u>[102]</u>	<u>[94.4]</u>
<u>20</u>			<u>2048</u>	<u>144</u>	<u>[136]</u>	<u>[94.4]</u>
<u>* Note: These percentages are informative and apply to symbols 1 through 6. Symbol 0 has a longer CP and therefore a lower percentage.</u>						

d. Window length for Extended CP

Formatted: Bullets and Numbering

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for extended CP. The nominal window lengths for 3 MHz and 15 MHz are rounded down one sample to allow the window to be centered on the symbol.

Table X.5-2 EVM window length for extended CP

<u>Channel Bandwidth</u> MHz	<u>Cyclic prefix</u> length N_{cp}	<u>Nominal</u> <u>FFT size</u>	<u>Cyclic</u> <u>prefix in</u> <u>FFT</u> <u>samples</u>	<u>EVM</u> <u>window</u> <u>length</u> W	<u>Ratio of W</u> <u>to CP*</u>
<u>1.4</u>	<u>512</u>	<u>128</u>	<u>32</u>	<u>[30]</u>	<u>[93.8]</u>
<u>3</u>		<u>256</u>	<u>64</u>	<u>[60]</u>	<u>[93.8]</u>
<u>5</u>		<u>512</u>	<u>128</u>	<u>[124]</u>	<u>[96.9]</u>
<u>10</u>		<u>1024</u>	<u>256</u>	<u>[250]</u>	<u>[97.4]</u>
<u>15</u>		<u>1536</u>	<u>384</u>	<u>[374]</u>	<u>[97.4]</u>
<u>20</u>		<u>2048</u>	<u>512</u>	<u>[504]</u>	<u>[98.4]</u>
* Note: These percentages are informative					

X.6 Averaged EVM

EVM is averaged over all basic EVM measurements for 10 consecutive subframes.

$$\overline{EVM} = \sqrt{\frac{1}{10} \sum_{i=1}^{10} EVM_i^2}$$

The EVM requirements should be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{EVM}_l$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_l$ in the expressions above and $\overline{EVM}_h$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_h$.

Thus we get:

$$EVM = \max(\overline{EVM}_l, \overline{EVM}_h)$$

X.7 Spectrum Flatness

The data for the subcarrier output power shall be taken from the equaliser estimation step.

Annex F (informative): Change history

Table F.1: Change History

[illegible]

Page 1: [1] Comment [H11]	Explanation of field	May 9, 2008 7:24:00 PM
For CRs agreed at Working Group level, the identity of the WG. Use the format "x WGr" where x = "CT" for TSG CT, "RAN" for TSG RAN, "SA" for TSG SA, "GERAN" for TSG GERAN; n = digit identifying the Working Group; for CRs drafted during the TSG meeting itself, use "TSG x". Examples: "CT WG4", "RAN WG5", "GERAN WG3", "TSG SA".		
Page 1: [2] Comment [H12]	Explanation of field	May 9, 2008 7:24:00 PM
Enter the acronym for the work item which is applicable to the change. This field is mandatory for category F, B & C CRs for release 4 and later. A list of work item acronyms can be found in the 3GPP work plan. See http://www.3gpp.org/ftp/information/work_plan/.		
Page 1: [3] Comment [H13]	Explanation of field	May 9, 2008 7:24:00 PM
Enter the date on which the CR was last revised. Format to be interpretable by English version of MS Windows ® applications, e.g. 19/02/2002.		
Page 1: [4] Comment [H14]	Explanation of field	May 9, 2008 7:24:00 PM
Enter a single letter corresponding to the most appropriate category listed below. For more detailed help on interpreting these categories, see the Technical Report 21.900 "TSG working methods".		
Page 1: [5] Comment [H17]	Explanation of field	May 9, 2008 7:24:00 PM
Enter text which describes the most important components of the change. i.e. How the change is made.		
Page 1: [6] Comment [H18]	Explanation of field	May 9, 2008 7:24:00 PM
Enter here the consequences if this CR were to be rejected. It is mandatory necessary to complete this section only if the CR is of category "F" (i.e. correction), though it may well be useful for other categories.		
Page 1: [7] Comment [H20]	Explanation of field	May 9, 2008 7:24:00 PM
Tick "yes" box if any other specifications are affected by this change. Else tick "no". You MUST fill in one or the other.		
Page 1: [8] Comment [H22]	Explanation of field	May 9, 2008 7:24:00 PM
Enter any other information which may be needed by the group being requested to approve the CR. This could include special conditions for its approval which are not listed anywhere else above.		

Exhibit 1031

CHANGE REQUEST

⌘ **36.101 CR 48** ⌘ rev **3** ⌘ Current version: **8.2.0** ⌘

For **HELP** on using this form look at the pop-up text over the ⌘ symbols. Comprehensive instructions on how to use this form can be found at <http://www.3gpp.org/specs/CR.htm>.

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘ Addition of Band 17		
Source to WG:	⌘ AT&T		
Source to TSG:	⌘ R4		
Work item code:	⌘ LTE-RF	Date:	⌘ 18/08/2008
Category:	⌘ B	Release:	⌘ Rel-8
Use <u>one</u> of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Use <u>one</u> of the following releases: R99 (Release 1999) Rel-4 (Release 4) Rel-5 (Release 5) Rel-6 (Release 6) Rel-7 (Release 7) Rel-8 (Release 8) Rel-9 (Release 9)	

Reason for change:	⌘ Due to the disparity of wireless services that are deployed and envisioned for the Lower 700 MHz band in the US there will be additional requirements on the UE and the eNode-B to ensure acceptable performance for two-way voice and data services in the band. As proposed in previous RAN4 meetings some of these issues can be addressed through the introduction of an additional band in the specifications (Band 17) that includes only the B and C Blocks. The expected signal levels due to high-powered systems in neighboring blocks may be mitigated to some degree by front-end filtering and this alleviate some of the blocking and intermodulation problems in the UE receiver.
Summary of change:	⌘ Added Band 17 (704-716/734-746 MHz) to table 5.2-1
Consequences if not approved:	⌘ There is a potential for more stringent requirements to be imposed on the UE

Clauses affected:	⌘ 5.2										
Other specs affected:	<table border="1"> <tr> <td>Y</td> <td>N</td> </tr> <tr> <td>☐</td> <td>☐</td> </tr> <tr> <td>Y</td> <td>☐</td> </tr> <tr> <td>☐</td> <td>☐</td> </tr> </table>	Y	N	☐	☐	Y	☐	☐	☐	Other core specifications	⌘
	Y	N									
	☐	☐									
Y	☐										
☐	☐										
		Test specifications									
		O&M Specifications									
Other comments:	⌘										

5.1 General

The channel arrangements presented in this clause are based on the frequency bands and channel bandwidths defined in the present release of specifications.

NOTE: Other frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit	Downlink (DL) eNode B transmit UE receive		Duplex Mode
	$F_{UL\ low} - F_{UL\ high}$	$F_{DL\ low} - F_{DL\ high}$		
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz		FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz		FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz		FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz		FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz		FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz		FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz		FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz		FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz		FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz		FDD
11	1427.9 MHz – 1452.9 MHz	1475.9 MHz – 1500.9 MHz		FDD
12	[TBD] – [TBD]	[TBD] – [TBD]		FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz		FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz		FDD
...				
17	704 MHz – 716 MHz	734 MHz – 746 MHz		FDD
...				
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz		TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz		TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz		TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz		TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz		TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz		TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz		TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz		TDD

5.3 TX–RX frequency separation

Exhibit 1032

CHANGE REQUEST		CR-Form-v9.4
TS 36.101 CR 52	rev -	Current version: 8.2.0

For **HELP** on using this form look at the pop-up text over the symbols. Comprehensive instructions on how to use this form can be found at <http://www.3gpp.org/specs/CR.htm>.

Proposed change affects: UICC apps ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	Frequency range for Band 12		
Source to WG:	Ericsson		
Source to TSG:	R4		
Work item code:	LTE-RF	Date:	22/08/2008
Category:	F	Release:	Rel-8
Use one of the following categories:		Use one of the following releases:	
F (correction)		R99 (Release 1999)	
A (corresponds to a correction in an earlier release)		Rel-4 (Release 4)	
B (addition of feature),		Rel-5 (Release 5)	
C (functional modification of feature)		Rel-6 (Release 6)	
D (editorial modification)		Rel-7 (Release 7)	
Detailed explanations of the above categories can be found in 3GPP TR 21.900.		Rel-8 (Release 8)	
		Rel-9 (Release 9)	

Reason for change:	The frequency range for Band 12 is missing							
Summary of change:	The frequency ranges of Band 12 are added to Table 5.2-1 (comprises the paired Blocks A, B and C).							
Consequences if not approved:	Band 12 is not defined.							
Clauses affected:	Clause 5.2							
Other specs affected:	<table><tr><td>Y</td><td>N</td></tr><tr><td>Y</td><td>N</td></tr><tr><td>Y</td><td>N</td></tr></table> Other core specifications Test specifications O&M Specifications	Y	N	Y	N	Y	N	TS 36.521-1
Y	N							
Y	N							
Y	N							
Other comments:								

Comment [H1]: Document numbers are allocated by the Working Group Secretary. Use the format of document number specified by the 3GPP Working Procedures.

Comment [H2]: Enter the specification number in this box. For example, 04.08 or 31.102. Do not prefix the number with anything, i.e. do not use "TS", "GSM" or "3GPP" etc.

Comment [H3]: Enter the CR number here. This number is allocated by the 3GPP support team. It consists of at least four digits, padded with leading zeros if necessary.

Comment [H4]: Enter the revision number of the CR here. If it is the first version, use a "-".

Comment [H5]: Enter the version of the specification here. This number is the version of the specification to which the CR was written and (normally) to which it will be applied if it is approved. Make sure that the latest version of the specification (of the relevant release) is used when creating the CR. If unsure what the latest version is, go to <http://www.3gpp.org/specs/specs.htm>.

Comment [H6]: For help on how to fill out a field, place the mouse pointer over the special symbol closest to the field in question.

Comment [H7]: Mark one or more of the boxes with an X.

Comment [H8]: SIM / USIM / ISIM applications.

Comment [H9]: Enter a concise description of the subject matter of the CR. It should be no longer than one line, but if this is not possible, do not enter hard new-line characters. Do not use redundant information such as "Change Request number xxx to 3GPP TS xx.xxx".

Comment [H10]: One or more organizations (3GPP Individual Members) which drafted the CR and are presenting it to the Working Group.

Comment [H11]: For CRs agreed at Working Group level, the identity of the WG. Use the format "xn" where ... [1]

Comment [H12]: Enter the acronym for the work item which is applicable to the change. ... [2]

Comment [H13]: Enter the date on which the CR was last revised. Format to be interpreted ... [3]

Comment [H14]: Enter a single letter corresponding to the most appropriate category ... [4]

Comment [H15]: Enter a single release code from the list below.

Comment [H16]: Enter text which explains why the change is necessary.

Comment [H17]: Enter text which describes the most important components of the change. i.e. ... [5]

Comment [H18]: Enter here the consequences if this CR were to be rejected. It is mandatory to ... [6]

Comment [H19]: Enter the number of each clause which contains changes. Be as specific ... [7]

Comment [H20]: Tick "yes" box if any other specifications are affected by this change. Else ... [8]

Comment [H21]: List here the specifications which are affected or the CRs which are linked.

Comment [H22]: Enter any other information which may be needed by the group being requested ... [9]

< Start of Change >

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit		Downlink (DL) eNode B transmit UE receive		Duplex Mode
	F _{UL, low}	F _{UL, high}	F _{DL, low}	F _{DL, high}	
1	1920 MHz	– 1980 MHz	2110 MHz	– 2170 MHz	FDD
2	1850 MHz	– 1910 MHz	1930 MHz	– 1990 MHz	FDD
3	1710 MHz	– 1785 MHz	1805 MHz	– 1880 MHz	FDD
4	1710 MHz	– 1755 MHz	2110 MHz	– 2155 MHz	FDD
5	824 MHz	– 849 MHz	869 MHz	– 894 MHz	FDD
6	830 MHz	– 840 MHz	875 MHz	– 885 MHz	FDD
7	2500 MHz	– 2570 MHz	2620 MHz	– 2690 MHz	FDD
8	880 MHz	– 915 MHz	925 MHz	– 960 MHz	FDD
9	1749.9 MHz	– 1784.9 MHz	1844.9 MHz	– 1879.9 MHz	FDD
10	1710 MHz	– 1770 MHz	2110 MHz	– 2170 MHz	FDD
11	1427.9 MHz	– 1452.9 MHz	1475.9 MHz	– 1500.9 MHz	FDD
12	698 MHz{FDD}	– 716 MHz{FDD}	728 MHz{FDD}	– 746 MHz{FDD}	FDD
13	777 MHz	– 787 MHz	746 MHz	– 756 MHz	FDD
14	788 MHz	– 798 MHz	758 MHz	– 768 MHz	FDD
...					
33	1900 MHz	– 1920 MHz	1900 MHz	– 1920 MHz	TDD
34	2010 MHz	– 2025 MHz	2010 MHz	– 2025 MHz	TDD
35	1850 MHz	– 1910 MHz	1850 MHz	– 1910 MHz	TDD
36	1930 MHz	– 1990 MHz	1930 MHz	– 1990 MHz	TDD
37	1910 MHz	– 1930 MHz	1910 MHz	– 1930 MHz	TDD
38	2570 MHz	– 2620 MHz	2570 MHz	– 2620 MHz	TDD
39	1880 MHz	– 1920 MHz	1880 MHz	– 1920 MHz	TDD
40	2300 MHz	– 2400 MHz	2300 MHz	– 2400 MHz	TDD

5.3 TX–RX frequency separation

< End of Change >

Page 1: [1] Comment [H11]	Explanation of field	December 7, 2006 4:04:00 PM
For CRs agreed at Working Group level, the identity of the WG. Use the format "xn" where x = "C" for TSG CT, "R" for TSG RAN, "S" for TSG SA, "G" for TSG GERAN; n = digit identifying the Working Group; for CRs drafted during the TSG meeting itself, use "P". Examples: "C4", "R5", "G3new", "SP".		
Page 1: [2] Comment [H12]	Explanation of field	December 7, 2006 4:07:00 PM
Enter the acronym for the work item which is applicable to the change. This field is mandatory for category F, A, B & C CRs for Release 4 and later. A list of work item acronyms can be found in the 3GPP work plan. See http://www.3gpp.org/ftp/Specs/html-info/WI-List.htm.		
Page 1: [3] Comment [H13]	Explanation of field	December 7, 2006 4:08:00 PM
Enter the date on which the CR was last revised. Format to be interpretable by English version of MS Windows ® applications, e.g. 19/02/2006.		
Page 1: [4] Comment [H14]	Explanation of field	December 7, 2006 4:08:00 PM
Enter a single letter corresponding to the most appropriate category listed. For more detailed help on interpreting these categories, see Technical Report 21.900 "TSG working methods".		
Page 1: [5] Comment [H17]	Explanation of field	
Enter text which describes the most important components of the change. i.e. How the change is made.		
Page 1: [6] Comment [H18]	Explanation of field	December 7, 2006 4:09:00 PM
Enter here the consequences if this CR were to be rejected. It is mandatory to complete this section only if the CR is of category "F" (i.e. correction), though it may well be useful for other categories.		
Page 1: [7] Comment [H19]	Explanation of field	December 7, 2006 4:10:00 PM
Enter the number of each clause which contains changes. Be as specific as possible (ie list each subclause, not just the umbrella clause).		
Page 1: [8] Comment [H20]	Explanation of field	
Tick "yes" box if any other specifications are affected by this change. Else tick "no". You MUST fill in one or the other.		
Page 1: [9] Comment [H22]	Explanation of field	
Enter any other information which may be needed by the group being requested to approve the CR. This could include special conditions for it's approval which are not listed anywhere else above.		

Exhibit 1033

3GPP TS 36.101 V8.11.0 (2010-10)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 8)



The present document has been developed within the 3rd Generation Partnership Project (3GPPTM) and may be further elaborated for the purposes of 3GPP.

The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented. This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification. Specifications and reports for implementation of the 3GPPTM system should be obtained via the 3GPP Organizational Partners' Publications Offices.

Keywords

radio

3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

<http://www.3gpp.org>

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© 2010, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TTA, TTC).
All rights reserved.

UMTS™ is a Trade Mark of ETSI registered for the benefit of its members
3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners
LTE™ is a Trade Mark of ETSI currently being registered for the benefit of its Members and of the 3GPP Organizational Partners
GSM® and the GSM logo are registered and owned by the GSM Association

Contents

Foreword	9
1 Scope	10
2 References	10
3 Definitions, symbols and abbreviations	10
3.1 Definitions	10
3.2 Symbols	11
3.3 Abbreviations	12
4 General	13
4.1 Relationship between minimum requirements and test requirements	13
4.2 Applicability of minimum requirements	13
4.3 Uplink 64-QAM modulation format	13
4.4 RF requirements in later releases	13
5 Operating bands and channel arrangement	14
5.1 General	14
5.2 Void	14
5.3 Void	14
5.4 Void	14
5.5 Operating bands	14
5.6 Channel bandwidth	14
5.6.1 Channel bandwidths per operating band	15
5.7 Channel arrangement	16
5.7.1 Channel spacing	16
5.7.2 Channel raster	16
5.7.3 Carrier frequency and EARFCN	17
5.7.4 TX–RX frequency separation	17
6 Transmitter characteristics	19
6.1 General	19
6.2 Transmit power	19
6.2.1 Void	19
6.2.2 UE Maximum Output Power	19
6.2.3 UE Maximum Output power for modulation / channel bandwidth	20
6.2.4 UE Maximum Output Power with additional requirements	20
6.2.5 Configured transmitted Power	21
6.3 Output power dynamics	22
6.3.1 (Void)	22
6.3.2 Minimum output power	22
6.3.2.1 Minimum requirement	22
6.3.3 Transmit OFF power	22
6.3.3.1 Minimum requirement	22
6.3.4 ON/OFF time mask	23
6.3.4.1 General ON/OFF time mask	23
6.3.4.2 PRACH and SRS time mask	23
6.3.4.2.1 PRACH time mask	23
6.3.4.2.2 SRS time mask	24
6.3.4.3 Slot / Sub frame boundary time mask	25
6.3.4.4 PUCCH / PUSCH / SRS time mask	25
6.3.5 Power Control	26
6.3.5.1 Absolute Power Tolerance	26
6.3.5.1.1 Minimum requirements	27
6.3.5.2 Relative Power tolerance	27
6.3.5.3 Aggregate power control tolerance	28
6.3.5.3.1 Minimum requirement	28
6.4 Void	29

6.5	Transmit signal quality	29
6.5.1	Frequency error	29
6.5.2	Transmit modulation quality	29
6.5.2.1	Error Vector Magnitude	29
6.5.2.1.1	Minimum requirement	30
6.5.2.2	Carrier leakage	30
6.5.2.2.1	Minimum requirements	30
6.5.2.3	In-band emissions	30
6.5.2.3.1	Minimum requirements	30
6.5.2.4	EVM equalizer spectrum flatness	31
6.5.2.4.1	Minimum requirements	31
6.6	Output RF spectrum emissions	32
6.6.1	Occupied bandwidth	33
6.6.2	Out of band emission	33
6.6.2.1	Spectrum emission mask	33
6.6.2.1.1	Minimum requirement	33
6.6.2.2	Additional Spectrum Emission Mask	34
6.6.2.2.1	Minimum requirement (network signalled value "NS_03")	34
6.6.2.2.2	Minimum requirement (network signalled value "NS_04")	35
6.6.2.2.3	Minimum requirement (network signalled value "NS_06" or "NS_07")	35
6.6.2.3	Adjacent Channel Leakage Ratio	36
6.6.2.3.1	Minimum requirement E-UTRA	36
6.6.2.3.2	Minimum requirements UTRA	36
6.6.2.4	Additional ACLR requirements	37
6.6.2.4.1	Void	37
6.6.3	Spurious emissions	37
6.6.3.1	Minimum requirements	38
6.6.3.2	Spurious emission band UE co-existence	38
6.6.3.3	Additional spurious emissions	40
6.6.3.3.1	Minimum requirement (network signalled value "NS_05")	40
6.6.3.3.2	Minimum requirement (network signalled value "NS_07")	41
6.7	Transmit intermodulation	41
6.7.1	Minimum requirement	41
7	Receiver characteristics	42
7.1	General	42
7.2	Diversity characteristics	42
7.3	Reference sensitivity power level	42
7.3.1	Minimum requirements (QPSK)	42
7.3.2	Requirement for large transmission configurations	45
7.4	Maximum input level	45
7.4.1	Minimum requirements	45
7.5	Adjacent Channel Selectivity (ACS)	46
7.5.1	Minimum requirements	46
7.6	Blocking characteristics	47
7.6.1	In-band blocking	47
7.6.1.1	Minimum requirements	47
7.6.2	Out-of-band blocking	48
7.6.2.1	Minimum requirements	48
7.6.3	Narrow band blocking	49
7.6.3.1	Minimum requirements	49
7.7	Spurious response	50
7.7.1	Minimum requirements	50
7.8	Intermodulation characteristics	50
7.8.1	Wide band intermodulation	50
7.8.1.1	Minimum requirements	50
7.8.2	Void	51
7.9	Spurious emissions	51
7.9.1	Minimum requirements	51
8.1	General	52
8.1.1	Dual-antenna receiver capability	52
8.1.1.1	Simultaneous unicast and MBMS operations	52

8.1.1.2	Dual-antenna receiver capability in idle mode	52
8.2	Demodulation of PDSCH (Cell-Specific Reference Symbols)	52
8.2.1	FDD (Fixed Reference Channel)	52
8.2.1.1	Single-antenna port performance	52
8.2.1.1.1	Minimum Requirement	53
8.2.1.1.2	Void	53
8.2.1.1.3	Void	53
8.2.1.1.4	Minimum Requirement 1 PRB allocation in presence of MBSFN	53
8.2.1.2	Transmit diversity performance	54
8.2.1.2.1	Minimum Requirement 2 Tx Antenna Port	54
8.2.1.2.2	Minimum Requirement 4 Tx Antenna Port	55
8.2.1.3	Open-loop spatial multiplexing performance	55
8.2.1.3.1	Minimum Requirement 2 Tx Antenna Port	55
8.2.1.3.2	Minimum Requirement 4 Tx Antenna Port	55
8.2.1.4	Closed-loop spatial multiplexing performance	56
8.2.1.4.1	Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port	56
8.2.1.4.1A	Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port	56
8.2.1.4.2	Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port	57
8.2.1.4.3	Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port	58
8.2.1.5	MU-MIMO	58
8.2.1.6	[Control channel performance: D-BCH and PCH]	58
8.2.2	TDD (Fixed Reference Channel)	58
8.2.2.1	Single-antenna port performance	59
8.2.2.1.1	Minimum Requirement	59
8.2.2.1.2	Void	60
8.2.2.1.3	Void	60
8.2.2.1.4	Minimum Requirement 1 PRB allocation in presence of MBSFN	60
8.2.2.2	Transmit diversity performance	61
8.2.2.2.1	Minimum Requirement 2 Tx Antenna Port	61
8.2.2.2.2	Minimum Requirement 4 Tx Antenna Port	61
8.2.2.3	Open-loop spatial multiplexing performance	62
8.2.2.3.1	Minimum Requirement 2 Tx Antenna Port	62
8.2.2.3.2	Minimum Requirement 4 Tx Antenna Port	62
8.2.2.4	Closed-loop spatial multiplexing performance	63
8.2.2.4.1	Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port	63
8.2.2.4.1A	Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port	63
8.2.2.4.2	Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port	64
8.2.2.4.3	Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port	65
8.2.2.5	MU-MIMO	65
8.2.2.6	[Control channel performance: D-BCH and PCH]	65
8.3	Demodulation of PDSCH (User-Specific Reference Symbols)	65
8.3.1	FDD	65
8.3.2	TDD	66
8.4	Demodulation of PDCCH/PCFICH	67
8.4.1	FDD	67
8.4.1.1	Single-antenna port performance	67
8.4.1.2	Transmit diversity performance	68
8.4.1.2.1	Minimum Requirement 2 Tx Antenna Port	68
8.4.1.2.2	Minimum Requirement 4 Tx Antenna Port	68
8.4.2	TDD	68
8.4.2.1	Single-antenna port performance	69
8.4.2.2	Transmit diversity performance	69
8.4.2.2.1	Minimum Requirement 2 Tx Antenna Port	69
8.4.2.2.2	Minimum Requirement 4 Tx Antenna Port	69
8.5	Demodulation of PHICH	69
8.5.1	FDD	70
8.5.1.1	Single-antenna port performance	70
8.5.1.2	Transmit diversity performance	70
8.5.1.2.1	Minimum Requirement 2 Tx Antenna Port	70
8.5.1.2.2	Minimum Requirement 4 Tx Antenna Port	71
8.5.2	TDD	71
8.5.2.1	Single-antenna port performance	71

8.5.2.2	Transmit diversity performance.....	72
8.5.2.2.1	Minimum Requirement 2 Tx Antenna Port.....	72
8.5.2.2.2	Minimum Requirement 4 Tx Antenna Port.....	72
8.6	Demodulation of PBCH.....	72
8.6.1	FDD.....	72
8.6.1.1	Single-antenna port performance.....	72
8.6.1.2	Transmit diversity performance.....	73
8.6.1.2.1	Minimum Requirement 2 Tx Antenna Port.....	73
8.6.1.2.2	Minimum Requirement 4 Tx Antenna Port.....	73
8.6.2	TDD.....	73
8.6.2.1	Single-antenna port performance.....	74
8.6.2.2	Transmit diversity performance.....	74
8.6.2.2.1	Minimum Requirement 2 Tx Antenna Port.....	74
8.6.2.2.2	Minimum Requirement 4 Tx Antenna Port.....	74
9	Reporting of Channel State Information	74
9.1	General.....	74
9.2	CQI reporting definition under AWGN conditions	74
9.2.1	Minimum requirement PUCCH 1-0	75
9.2.1.1	FDD	75
9.2.1.2	TDD.....	75
9.2.2	Minimum requirement PUCCH 1-1	76
9.2.2.1	FDD	76
9.2.2.2	TDD.....	77
9.3	CQI reporting under fading conditions	78
9.3.1	Frequency-selective scheduling mode.....	78
9.3.1.1	Minimum requirement PUSCH 3-0.....	78
9.3.1.1.1	FDD	78
9.3.1.1.2	TDD	79
9.3.2	Frequency non-selective scheduling mode.....	81
9.3.2.1	Minimum requirement PUCCH 1-0	81
9.3.2.1.1	FDD	81
9.3.2.1.2	TDD	82
9.3.3	Frequency-selective interference.....	83
9.3.3.1	Minimum requirement PUSCH 3-0.....	84
9.3.3.1.1	FDD	84
9.3.3.1.2	TDD	85
9.4	Reporting of Precoding Matrix Indicator (PMI)	86
9.4.1	Single PMI	86
9.4.1.1	Minimum requirement PUSCH 3-1	86
9.4.1.1.1	FDD	86
9.4.1.1.2	TDD	87
9.4.2	Multiple PMI.....	87
9.4.2.1	Minimum requirement PUSCH 1-2	87
9.4.2.1.1	FDD	87
9.4.2.1.2	TDD	88
9.5	Reporting of Rank Indicator (RI).....	89
9.5.1	Minimum requirement	89
9.5.1.1	FDD	89
9.5.1.2	TDD	91

Annex A (normative): Measurement channels.....92

A.1	General	92
A.2	UL reference measurement channels	92
A.2.1	General.....	92
A.2.1.1	Applicability and common parameters.....	92
A.2.1.2	Determination of payload size.....	92
A.2.2	Reference measurement channels for FDD	93
A.2.2.1	Full RB allocation	93
A.2.2.1.1	QPSK.....	93
A.2.2.1.2	16-QAM	94

A.2.2.1.3	64-QAM	94
A.2.2.2	Partial RB allocation	94
A.2.2.2.1	QPSK.....	94
A.2.2.2.2	16-QAM	96
A.2.2.2.3	64-QAM	98
A.2.3	Reference measurement channels for TDD	98
A.2.3.1	Full RB allocation	99
A.2.3.1.1	QPSK.....	99
A.2.3.1.2	16-QAM	99
A.2.3.1.3	64-QAM	99
A.2.3.2	Partial RB allocation	100
A.2.3.2.1	QPSK.....	100
A.2.3.2.2	16-QAM	103
A.2.3.2.3	64-QAM	105
A.3	DL reference measurement channels	105
A.3.1	General.....	105
A.3.2	Reference measurement channel for receiver characteristics.....	106
A.3.3	Reference measurement channels for PDSCH performance requirements (FDD)	114
A.3.3.1	Single-antenna transmission (Common Reference Symbols)	114
A.3.3.2	Multi-antenna transmission (Common Reference Symbols).....	118
A.3.3.2.1	Two antenna ports	118
A.3.3.2.2	Four antenna ports	119
A.3.3.3	[RMC for UE-Specific Reference Symbols].....	120
A.3.4	Reference measurement channels for PDSCH performance requirements (TDD).....	120
A.3.4.1	Single-antenna transmission (Common Reference Symbols)	120
A.3.4.2	Multi-antenna transmission (Common Reference Signals).....	125
A.3.4.2.1	Two antenna ports	125
A.3.4.2.2	Four antenna ports	126
A.3.4.3	[RMC for UE-Specific Reference Symbols].....	127
A.3.5	Reference measurement channels for PDCCH/PCFICH performance requirements	128
A.3.5.1	FDD.....	128
A.3.5.2	TDD	128
A.3.6	Reference measurement channels for PHICH performance requirements.....	128
A.3.7	Reference measurement channels for PBCH performance requirements	129
A.4	CSI reference measurement channels.....	129
A.5	OFDMA Channel Noise Generator (OCNG).....	132
A.5.1	OCNG Patterns for FDD.....	132
A.5.1.1	OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern	132
A.5.1.2	OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern.....	133
A.5.1.3	OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz	133
A.5.2	OCNG Patterns for TDD	134
A.5.2.1	OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern	134
A.5.2.2	OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern	135
A.5.2.3	OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz	136
Annex B (normative):	Propagation conditions.....	137
B.1	Static propagation condition.....	137
B.2	Multi-path fading propagation conditions	137
B.2.1	Delay profiles.....	137
B.2.2	Combinations of channel model parameters	138
B.2.3	MIMO Channel Correlation Matrices.....	139
B.2.3.1	Definition of MIMO Correlation Matrices.....	139
B.2.3.2	MIMO Correlation Matrices at High, Medium and Low Level	140
B.2.4	Propagation conditions for CQI tests	142
B.3	High speed train scenario	143
B.4	Beamforming Model	144
B.4.1	Single-layer beamforming (Antenna port 5).....	144

Annex C (normative):	Downlink Physical Channels	145
C.1	General	145
C.2	Set-up	145
C.3	Connection	145
C.3.1	Measurement of Receiver Characteristics.....	145
C.3.2	Measurement of Performance requirements	146
Annex D (normative):	Characteristics of the interfering signal	147
D.1	General	147
D.2	Interference signals	147
Annex E (normative):	Environmental conditions	148
E.1	General	148
E.2	Environmental	148
E.2.1	Temperature	148
E.2.2	Voltage.....	148
E.2.3	Vibration	149
Annex F (normative):	Transmit modulation.....	150
F.1	Measurement Point.....	150
F.2	Basic Error Vector Magnitude measurement	150
F.3	Basic in-band emissions measurement.....	151
F.4	Modified signal under test.....	151
F.5	Window length	153
F.5.1	Timing offset	153
F.5.2	Window length.....	153
F.5.3	Window length for normal CP	153
F.5.4	Window length for Extended CP	154
F.5.4	Window length for PRACH.....	154
F.6	Averaged EVM	155
F.7	Spectrum Flatness	156
Annex G (informative):	Change history	157

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

Where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

. The present document establishes the minimum RF characteristics and minimum performance requirements for E-UTRA User Equipment (UE).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain"
- [3] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [4] 3GPP TS 36.211: "Physical Channels and Modulation".
- [5] 3GPP TS 36.212: "Multiplexing and channel coding".
- [6] 3GPP TS 36.213: "Physical layer procedures".
- [7] 3GPP TS 36.331: " Requirements for support of radio resource management ".
- [8] 3GPP TS 36.307: " Requirements on User Equipments (UEs) supporting a release-independent frequency band ".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Channel edge: The lowest and highest frequency of the carrier, separated by the channel bandwidth.

Channel bandwidth: The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

Maximum Output Power: The mean power level per carrier of UE measured at the antenna connector in a specified reference condition.

Mean power: When applied to E-UTRA transmission this is the power measured in the operating system bandwidth of the carrier. The period of measurement shall be at least one subframe (1ms) unless otherwise stated.

Occupied bandwidth: The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given emission.

Output power: The mean power of one carrier of the UE, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Reference bandwidth: The bandwidth in which an emission level is specified.

Transmission bandwidth: Bandwidth of an instantaneous transmission from a UE or BS, measured in Resource Block units.

Transmission bandwidth configuration: The highest transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in Resource Block units.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

BW_{Channel}	Channel bandwidth
E_{RS}	Transmitted energy per RE for reference symbols during the useful part of the symbol, i.e. excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B transmit antenna connector
$\hat{E}_s$	The received energy per RE of the wanted signal during the useful part of the symbol, i.e. excluding the cyclic prefix, averaged across the allocated RB(s) (average power within the allocated RB(s), divided by the number of RE within this allocation, and normalized to the subcarrier spacing) at the UE antenna connector
F	Frequency
$F_{\text{Interferer}} \text{ (offset)}$	Frequency offset of the interferer
$F_{\text{Interferer}}$	Frequency of the interferer
F_C	Frequency of the carrier centre frequency
$F_{\text{DL\_low}}$	The lowest frequency of the downlink operating band
$F_{\text{DL\_high}}$	The highest frequency of the downlink operating band
$F_{\text{UL\_low}}$	The lowest frequency of the uplink operating band
$F_{\text{UL\_high}}$	The highest frequency of the uplink operating band
I_o	The power spectral density of the total input signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal
I_{or}	The total transmitted power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector
$\hat{I}_{or}$	The total received power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
N_{cp}	Cyclic prefix length
N_{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector $N_{\text{Offs-DL}}$ Offset used for calculating downlink EARFCN

$N_{\text{Offs-UL}}$	Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B transmit antenna connector
N_{RB}	Transmission bandwidth configuration, expressed in units of resource blocks
N_{UL}	Uplink EARFCN
R_{av}	Minimum average throughput per RB
P_{CMAX}	The configured maximum UE output power.
P_{EMAX}	Maximum allowed UE output power signalled by higher layers. Same as IE <i>P-Max</i> , defined in [7].
$P_{\text{Interferer}}$	Modulated mean power of the interfere
$P_{\text{PowerClass}}$	$P_{\text{PowerClass}}$ is the nominal UE power (i.e., no tolerance)r
P_{UMAX}	The measured configured maximum UE output power.
ΔF_{OOB}	Δ Frequency of Out Of Band emission

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
A-MPR	Additional Maximum Power Reduction
AWGN	Additive White Gaussian Noise
BS	Base Station
CW	Continuous Wave
DL	Downlink
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
EPRE	Energy Per Resource Element
E-UTRA	Evolved UMTS Terrestrial Radio Access
EUTRAN	Evolved UMTS Terrestrial Radio Access Network
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FRC	Fixed Reference Channel
HD-FDD	Half- Duplex FDD
MCS	Modulation and Coding Scheme
MOP	Maximum Output Power
MPR	Maximum Power Reduction
MSD	Maximum Sensitivity Degradation
OCNG	OFDMA Channel Noise Generator
OFDMA	Orthogonal Frequency Division Multiple Access
OOB	Out-of-band
PA	Power Amplifier
PSS	Primary Synchronization Signal
PSS_RA	PSS-to-RS EPRE ratio for the channel PSS
RE	Resource Element
REFSENS	Reference Sensitivity power level
r.m.s	Root Mean Square
SNR	Signal-to-Noise Ratio
SSS	Secondary Synchronization Signal
SSS_RA	SSS-to-RS EPRE ratio for the channel SSS
TDD	Time Division Duplex
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network
xCH_RA	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS
xCH_RB	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS

4 General

4.1 Relationship between minimum requirements and test requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 36.xxx section y defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ITU-R M.1545 [3].

4.2 Applicability of minimum requirements

In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios

For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.

The reference sensitivity power levels defined in subclause 7.3 are valid for the specified reference measurement channels.

Note: Receiver sensitivity degradation may occur when:

- 1) the UE simultaneously transmits and receives with bandwidth allocations less than the transmission bandwidth configuration (see Figure 5.6-1), and
- 2) any part of the downlink transmission bandwidth is within an uplink transmission bandwidth from the downlink center subcarrier.

4.3 Uplink 64-QAM modulation format

Transmit signal quality requirements and maximum transmit power requirements for uplink 64-QAM modulation are not defined in this release of the specification

4.4 RF requirements in later releases

The standardisation of new frequency bands may be independent of a release. However, in order to implement a UE that conforms to a particular release but supports a band of operation that is specified in a later release, it is necessary to specify some extra requirements. TS 36.307 [9] specifies requirements on UEs supporting a frequency band that is independent of release.

NOTE: For terminals conforming to the 3GPP release of the present document, some RF requirements in later releases may be mandatory independent of whether the UE supports the bands specified in later releases or not. The set of requirements from later releases that is also mandatory for UEs conforming to the 3GPP release of the present document is determined by regional regulation.

5 Operating bands and channel arrangement

5.1 General

The channel arrangements presented in this clause are based on the operating bands and channel bandwidths defined in the present release of specifications.

NOTE: Other operating bands and channel bandwidths may be considered in future releases.

5.2 Void

5.3 Void

5.4 Void

5.5 Operating bands

E-UTRA is designed to operate in the operating bands defined in Table 5.5-1.

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	$F_{UL\_low} - F_{UL\_high}$	$F_{DL\_low} - F_{DL\_high}$	
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD
12	698 MHz – 716 MHz	728 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
...			
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD

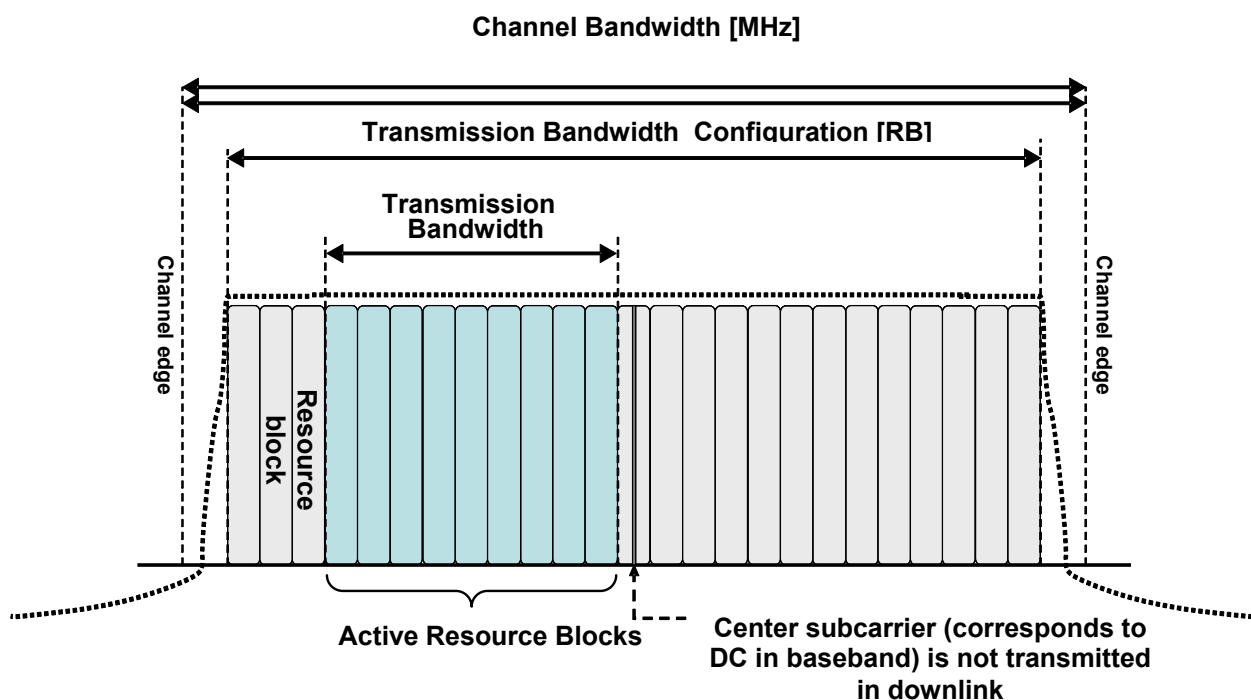
5.6 Channel bandwidth

Requirements in present document are specified for the channel bandwidths listed in Table 5.6-1.

Table 5.6-1 Transmission bandwidth configuration N_{RB} in E-UTRA channel bandwidths

Channel bandwidth $BW_{Channel}$ [MHz]	1.4	3	5	10	15	20
Transmission bandwidth configuration N_{RB}	6	15	25	50	75	100

Figure 5.6-1 shows the relation between the Channel bandwidth ($BW_{Channel}$) and the Transmission bandwidth configuration (N_{RB}). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at $F_C \pm BW_{Channel}/2$.

**Figure 5.6-1 Definition of Channel Bandwidth and Transmission Bandwidth Configuration for one E-UTRA carrier**

5.6.1 Channel bandwidths per operating band

- The requirements in this specification apply to the combination of channel bandwidths and operating bands shown in Table 5.6.1-1. The transmission bandwidth configuration in Table 5.6.1-1 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

Table 5.6.1-1: E-UTRA channel bandwidth

E-UTRA band / channel bandwidth						
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1			Yes	Yes	Yes	Yes
2	Yes	Yes	Yes	Yes	Yes ^[1]	Yes ^[1]
3	Yes	Yes	Yes	Yes	Yes ^[1]	Yes ^[1]
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes ^[1]		
6			Yes	Yes ^[1]		
7			Yes	Yes	Yes	Yes ^[1]
8	Yes	Yes	Yes	Yes ^[1]		
9			Yes	Yes	Yes ^[1]	Yes ^[1]
10			Yes	Yes	Yes	Yes
11			Yes	Yes ^[1]		
12	Yes	Yes	Yes ^[1]	Yes ^[1]		
13			Yes ^[1]	Yes ^[1]		
14			Yes ^[1]	Yes ^[1]		
...						
17			Yes ^[1]	Yes ^[1]		
...						
33			Yes	Yes	Yes	Yes
34			Yes	Yes	Yes	
35	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	Yes	Yes	Yes	Yes	Yes
37			Yes	Yes	Yes	Yes
38			Yes	Yes	Yes	Yes
39			Yes	Yes	Yes	Yes
40			Yes	Yes	Yes	Yes
NOTE 1: bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Clause 7.3) is allowed.						

- b) The use of different (asymmetrical)) channel bandwidth for the TX and RX is not precluded and is intended to form part of a later release.

5.7 Channel arrangement

5.7.1 Channel spacing

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between two adjacent E-UTRA carriers is defined as following:

$$\text{Nominal Channel spacing} = (\text{BW}_{\text{Channel}(1)} + \text{BW}_{\text{Channel}(2)})/2$$

where $\text{BW}_{\text{Channel}(1)}$ and $\text{BW}_{\text{Channel}(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. The channel spacing can be adjusted to optimize performance in a particular deployment scenario.

5.7.2 Channel raster

The channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz.

5.7.3 Carrier frequency and EARFCN

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0 - 65535. The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where F_{DL_low} and $N_{Offs-DL}$ are given in table 5.7.3-1 and N_{DL} is the downlink EARFCN.

$$F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs-DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where F_{UL_low} and $N_{Offs-UL}$ are given in table 5.7.3-1 and N_{UL} is the uplink EARFCN.

$$F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs-UL})$$

Table 5.7.3-1 E-UTRA channel numbers

E-UTRA Operating Band	Downlink			Uplink		
	F_{DL_low} (MHz)	$N_{Offs-DL}$	Range of N_{DL}	F_{UL_low} (MHz)	$N_{Offs-UL}$	Range of N_{UL}
1	2110	0	0 – 599	1920	18000	18000 – 18599
2	1930	600	600 – 1199	1850	18600	18600 – 19199
3	1805	1200	1200 – 1949	1710	19200	19200 – 19949
4	2110	1950	1950 – 2399	1710	19950	19950 – 20399
5	869	2400	2400 – 2649	824	20400	20400 – 20649
6	875	2650	2650 – 2749	830	20650	20650 – 20749
7	2620	2750	2750 – 3449	2500	20750	20750 – 21449
8	925	3450	3450 – 3799	880	21450	21450 – 21799
9	1844.9	3800	3800 – 4149	1749.9	21800	21800 – 22149
10	2110	4150	4150 – 4749	1710	22150	22150 – 22749
11	1475.9	4750	4750 – 4949	1427.9	22750	22750 – 22949
12	728	5000	5000 – 5179	698	23000	23000 – 23179
13	746	5180	5180 – 5279	777	23180	23180 – 23279
14	758	5280	5280 – 5379	788	23280	23280 – 23379
...						
17	734	5730	5730 – 5849	704	23730	23730 – 23849
...						
33	1900	36000	36000 – 36199	1900	36000	36000 – 36199
34	2010	36200	36200 – 36349	2010	36200	36200 – 36349
35	1850	36350	36350 – 36949	1850	36350	36350 – 36949
36	1930	36950	36950 – 37549	1930	36950	36950 – 37549
37	1910	37550	37550 – 37749	1910	37550	37550 – 37749
38	2570	37750	37750 – 38249	2570	37750	37750 – 38249
39	1880	38250	38250-38649	1880	38250	38250-38649
40	2300	38650	38650-39649	2300	38650	38650-39649
NOTE: The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively.						

5.7.4 TX–RX frequency separation

- a) The default E-UTRA TX channel (carrier centre frequency) to RX channel (carrier centre frequency) separation is specified in Table 5.7.4-1 for the TX and RX channel bandwidths defined in Table 5.6.1-1

Table 5.7.4-1: Default UE TX-RX frequency separation

Frequency Band	TX - RX carrier centre frequency separation
1	190 MHz
2	80 MHz
3	95 MHz
4	400 MHz
5	45 MHz
6	45 MHz
7	120 MHz
8	45 MHz
9	95 MHz
10	400 MHz
11	48 MHz
12	30 MHz
13	-31 MHz
14	-30 MHz
17	30 MHz

- b) The use of other TX channel to RX channel carrier centre frequency separation is not precluded and is intended to form part of a later release.

6 Transmitter characteristics

6.1 General

Unless otherwise stated, the transmitter characteristics are specified at the antenna connector of the UE with a single transmit antenna. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

6.2 Transmit power

6.2.1 Void

6.2.2 UE Maximum Output Power

The following UE Power Classes define the maximum output power for any transmission bandwidth within the channel bandwidth. The period of measurement shall be at least one sub frame (1ms).

Table 6.2.2-1: UE Power Class

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	± 2		
2					23	$\pm 2^2$		
3					23	$\pm 2^2$		
4					23	± 2		
5					23	± 2		
6					23	± 2		
7					23	$\pm 2^2$		
8					23	$\pm 2^2$		
9					23	± 2		
10					23	± 2		
11					23	± 2		
12					23	$\pm 2^2$		
13					23	± 2		
14					23	± 2		
17					23	± 2		
...								
33					23	± 2		
34					23	± 2		
35					23	± 2		
36					23	± 2		
37					23	± 2		
38					23	± 2		
39					23	± 2		
40					23	± 2		
Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS Note 2: For transmission bandwidths (Figure 5.6-1) confined within F_{UL_low} and $F_{UL\_low} + 4$ MHz or $F_{UL\_high} - 4$ MHz and F_{UL_high}, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance								

6.2.3 UE Maximum Output power for modulation / channel bandwidth

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

6.2.4 UE Maximum Output Power with additional requirements

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

For UE Power Class 3 the specific requirements and identified sub-clauses are specified in Table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4-1 and 6.2.4-2 are in addition to the allowed MPR requirements specified in clause 6.2.3.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_01	NA	NA	NA	NA	NA
NS_03	6.6.2.2.1	2, 4, 10, 35, 36	3	>5	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	5	>6	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	10	>6	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	15	>8	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	20	>10	≤ 1
NS_04	6.6.2.2.2	TBD	TBD	TBD	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	n/a	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
..					
NS_32	-	-	-	-	-

Table 6.2.4-2: A-MPR for “NS0_7”

	Region A		Region B		Region C
RB_start ¹	0 - 12		13 – 18	19 – 42	43 – 49
L_CRB ² [RBs]	6-8	1 to 5 and 9-50	≥8	≥18	≤2
A-MPR [dB]	≤ 8	≤ 12	≤ 12	≤ 6	≤ 3
Note 1 RB_start indicates the lowest RB index of transmitted resource blocks 2 L_CRB is the length of a contiguous resource block allocation 3 For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis. 4 For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.					

For the UE maximum output power modified by A-MPR, the power limits specified in subclause 6.2.5 apply.

6.2.5 Configured transmitted Power

The UE is allowed to set its configured maximum output power P_{CMAX} . The configured maximum output power P_{CMAX} is set within the following bounds:

$$P_{\text{CMAX\_L}} \leq P_{\text{CMAX}} \leq P_{\text{CMAX\_H}}$$

Where

- $P_{\text{CMAX\_L}} = \text{MIN} \{ P_{\text{EMAX}} - \Delta T_{\text{C}}, P_{\text{PowerClass}} - \text{MPR} - \text{A-MPR} - \Delta T_{\text{C}} \}$
- $P_{\text{CMAX\_H}} = \text{MIN} \{ P_{\text{EMAX}}, P_{\text{PowerClass}} \}$
- P_{EMAX} is the value given to IE *P-Max*, defined in [7]
- $P_{\text{PowerClass}}$ is the maximum UE power specified in Table 6.2.2-1 without taking into account the tolerance specified in the Table 6.2.2-1
- MRP and A-MPR are specified in Section 6.2.3 and Section 6.2.4, respectively
- $\Delta T_{\text{C}} = 1.5$ dB when Note 2 in Table 6.2.2-1 applies
- $\Delta T_{\text{C}} = 0$ dB when Note 2 in Table 6.2.2-1 does not apply

The measured maximum output power P_{UMAX} shall be within the following bounds:

$$P_{\text{CMAX\_L}} - T(P_{\text{CMAX\_L}}) \leq P_{\text{UMAX}} \leq P_{\text{CMAX\_H}} + T(P_{\text{CMAX\_H}})$$

Where $T(P_{\text{CMAX}})$ is defined by the tolerance table below and applies to $P_{\text{CMAX\_L}}$ and $P_{\text{CMAX\_H}}$ separately.

Table 6.2.5-1: P_{CMAX} tolerance

P_{CMAX} (dBm)	Tolerance $T(P_{\text{CMAX}})$ (dB)
$21 \leq P_{\text{CMAX}} \leq 23$	2.0
$20 \leq P_{\text{CMAX}} < 21$	2.5
$19 \leq P_{\text{CMAX}} < 20$	3.5
$18 \leq P_{\text{CMAX}} < 19$	4.0
$13 \leq P_{\text{CMAX}} < 18$	5.0
$8 \leq P_{\text{CMAX}} < 13$	6.0
$-40 \leq P_{\text{CMAX}} < 8$	7.0

6.3 Output power dynamics

6.3.1 (Void)

6.3.2 Minimum output power

The minimum controlled output power of the UE is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the power is set to a minimum value.

6.3.2.1 Minimum requirement

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2.1-1.

Table 6.3.2.1-1: Minimum output power

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	-40 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.3 Transmit OFF power

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

6.3.3.1. Minimum requirement

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.3.1-1.

Table 6.3.3.1-1: Transmit OFF power

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power	-50 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.4 ON/OFF time mask

6.3.4.1 General ON/OFF time mask

The General ON/OFF time mask defines the observation period between Transmit OFF and ON power and between Transmit ON and OFF power. ON/OFF scenarios include; the beginning or end of DTX, measurement gap, contiguous, and non contiguous transmission

The OFF power measurement period is defined in a duration of at least one sub-frame excluding any transient periods. The ON power measurement period is defined as the mean power over one sub-frame excluding any transient period.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

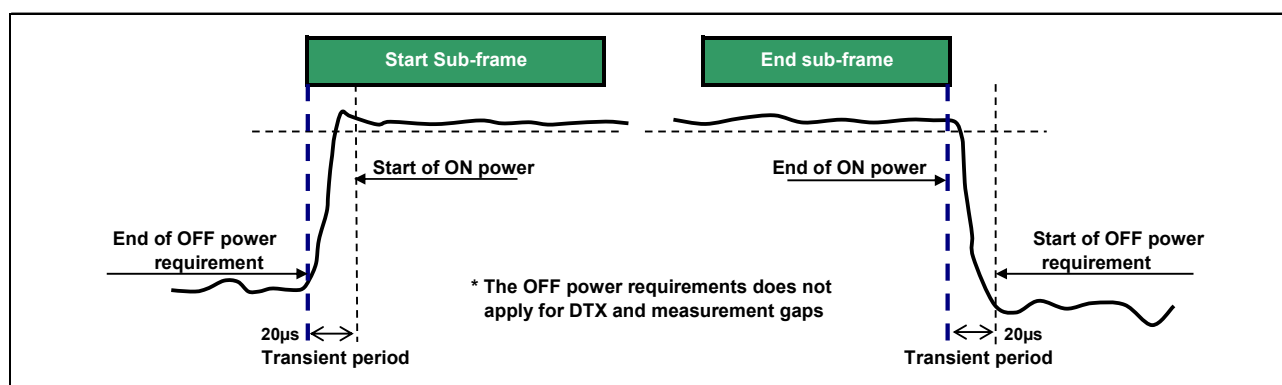


Figure 6.3.4.1-1: General ON/OFF time mask

6.3.4.2 PRACH and SRS time mask

6.3.4.2.1 PRACH time mask

The PRACH ON power is specified as the mean power over the PRACH measurement period excluding any transient periods as shown in Figure 6.3.4.2-1. The measurement period for different PRACH preamble format is specified in Table 6.3.4.2-1.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

Table 6.3.4.2-1: PRACH ON power measurement period

PRACH preamble format	Measurement period (ms)
0	0.9031
1	1.4844
2	1.8031
3	2.2844
4	0.1479

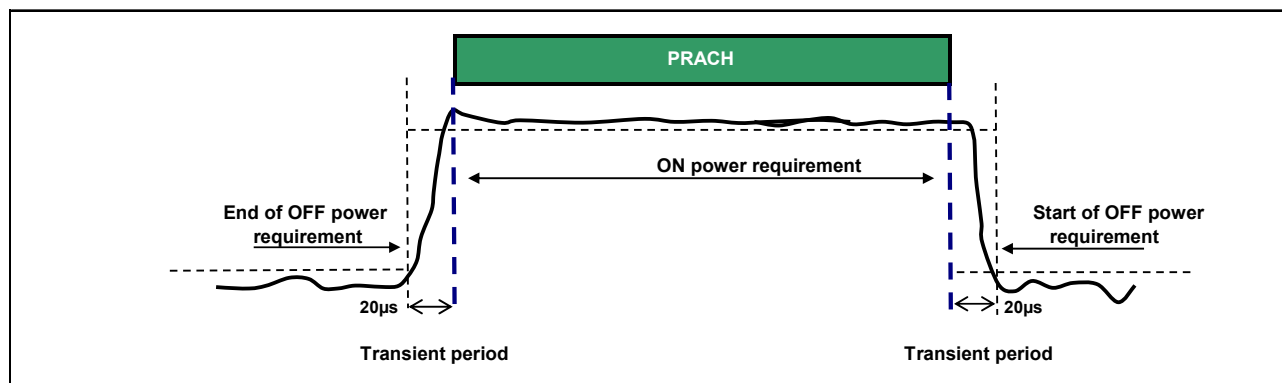


Figure 6.3.4.2-1: PRACH ON/OFF time mask

6.3.4.2.2 SRS time mask

In the case a single SRS transmission, the ON measurement period is defined as the mean power over the symbol duration excluding any transient period. Figure 6.3.4.2.2-1

In the case a dual SRS transmission, the ON measurement period is defined as the mean power for each symbol duration excluding any transient period. Figure 6.3.4.2.2-2

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

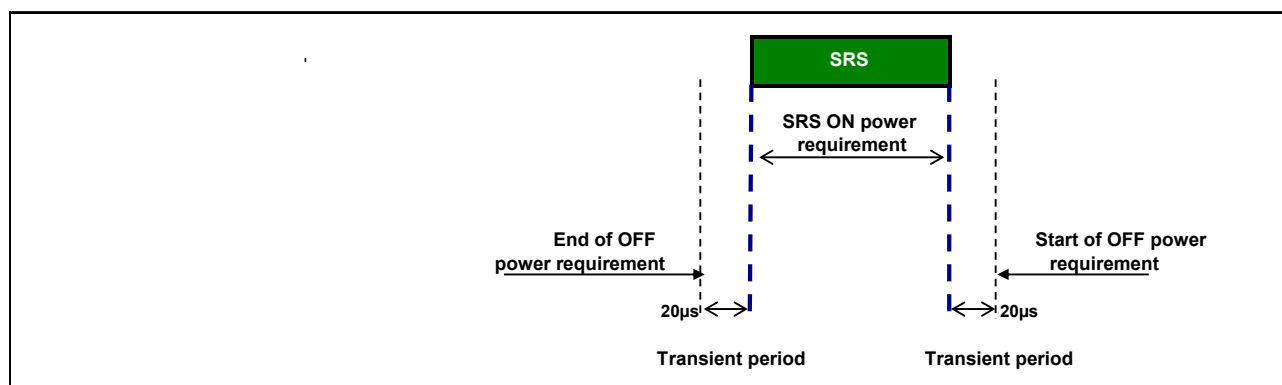


Figure 6.3.4.2.2-1: Single SRS time mask

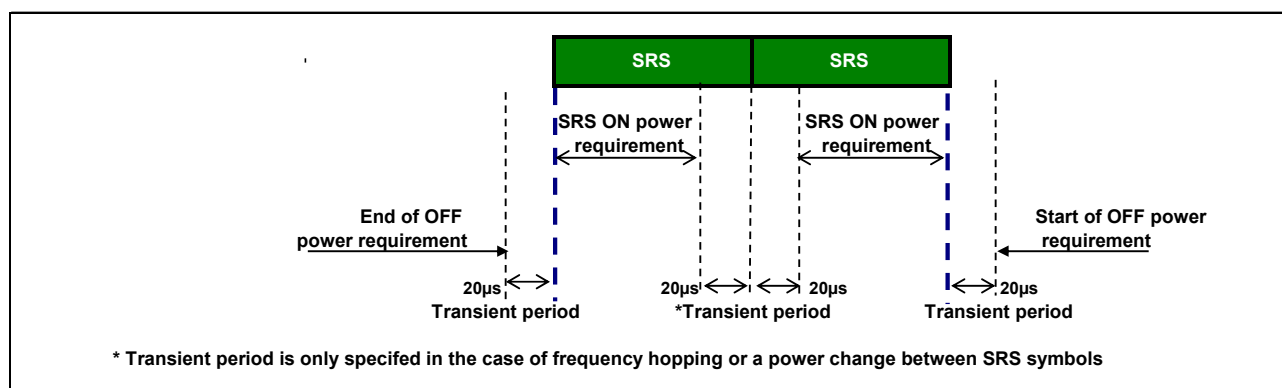


Figure 6.3.4.3-1: Dual SRS time mask for the case of UpPTS transmissions

6.3.4.3 Slot / Sub frame boundary time mask

The sub frame boundary time mask defines the observation period between the previous/subsequent sub-frame and the (reference) sub-frame. A transient period at a slot boundary within a sub-frame is only allowed in the case of Intra-sub frame frequency hopping. For the cases when the subframe contains SRS the time masks in subclause 6.3.4.4 apply.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

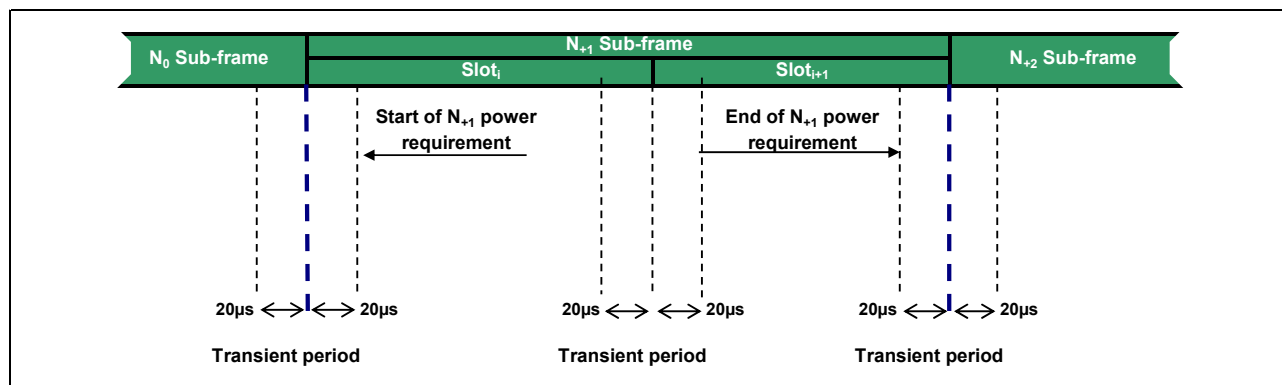


Figure 6.3.4.3-1: Transmission power template

6.3.4.4 PUCCH / PUSCH / SRS time mask

The PUCCH/PUSCH/SRS time mask defines the observation period between sounding reference symbol (SRS) and an adjacent PUSCH/PUCCH symbol and subsequent sub-frame.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

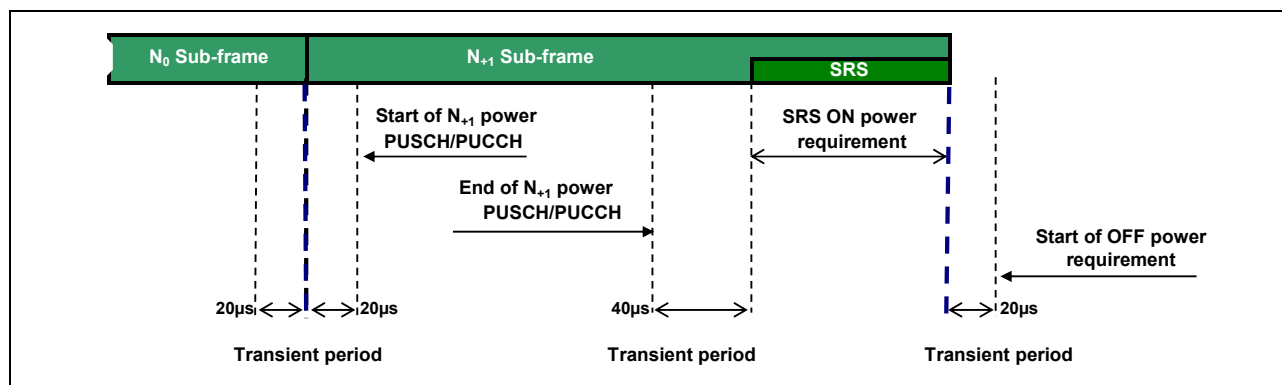


Figure 6.3.4.4-1: PUCCH/PUSCH/SRS time mask when there is a transmission before SRS but not after

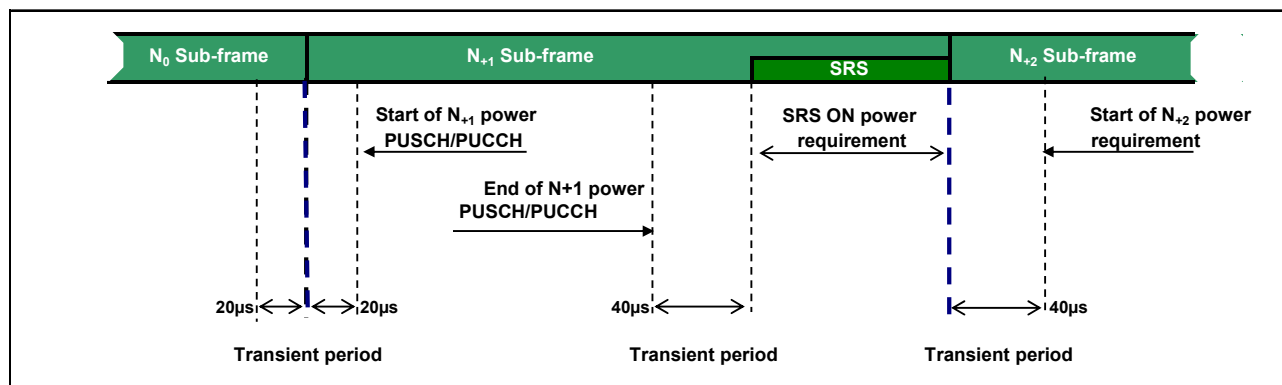


Figure 6.3.4.4-2: PUCCH/PUSCH/SRS time mask when there is transmission before and after SRS

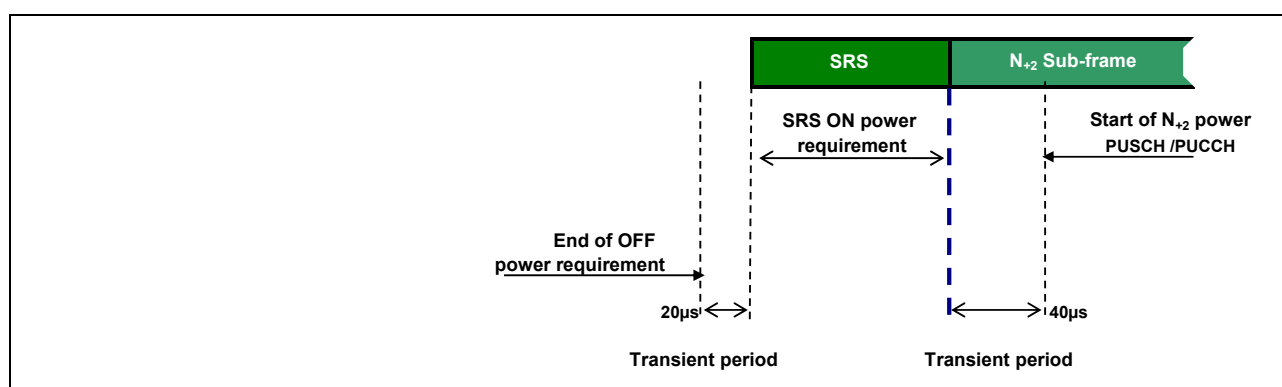


Figure 6.3.4.4-3: PUSCH/PUCCH/SRS time mask when there is a transmission after SRS but not before

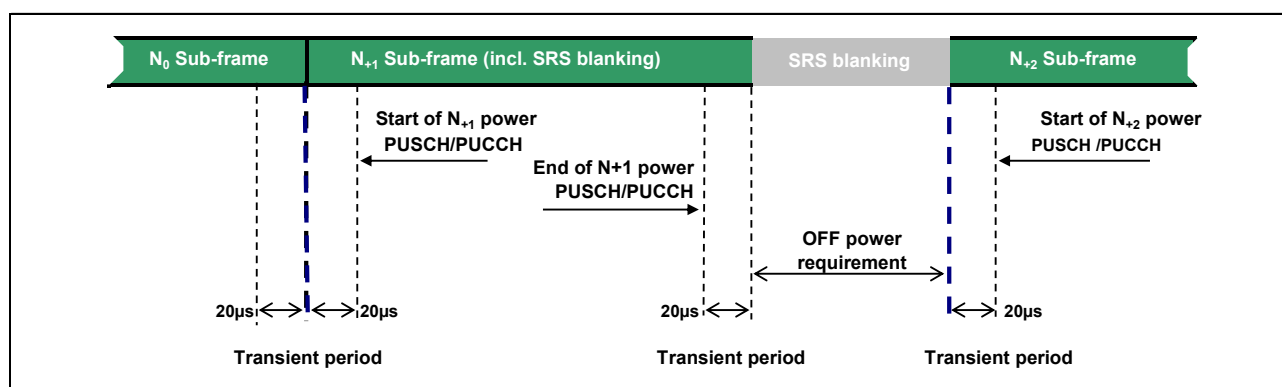


Figure 6.3.4.4-4: SRS time mask when there is FDD SRS blanking

6.3.5 Power Control

6.3.5.1 Absolute Power Tolerance

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than

20ms. This tolerance includes the channel estimation error (the absolute RSRP accuracy requirement specified in clause 9.1 of TS 36.133)

In the case of a PRACH transmission, the absolute tolerance is specified for the first preamble. The absolute power tolerance includes the channel estimation error (the absolute RSRP accuracy requirement specified in clause 9.1 of TS 36.133).

6.3.5.1.1 Minimum requirements

The minimum requirement for absolute power tolerance is given in Table 6.3.5.1.1-1 over the power range bounded by the Maximum output power as defined in sub-clause 6.2.2 and the Minimum output power as defined in sub-clause 6.3.2.

For operating bands under Note 2 in Table 6.2.2-1, the absolute power tolerance as specified in Table 6.3.5.1.1-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within F_{UL_low} and $F_{UL\_low} + 4$ MHz or $F_{UL\_high} - 4$ MHz and F_{UL_high} .

Table 6.3.5.1.1-1: Absolute power tolerance

Conditions	Tolerance
Normal	± 9.0 dB
Extreme	± 12.0 dB

6.3.5.2 Relative Power tolerance

The relative power tolerance is the ability of the UE transmitter to set its output power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is ≤ 20 ms.

For PRACH transmission, the relative tolerance is the ability of the UE transmitter to set its output power relatively to the power of the most recently transmitted preamble. The measurement period for the PRACH preamble is specified in Table 6.3.4.2-1.

6.3.5.2.1 Minimum requirements

The requirements specified in Table 6.3.5.2.1-1 apply when the power of the target and reference sub-frames are within the power range bounded by the Minimum output power as defined in subclause 6.3.2 and the measured P_{UMAX} as defined in subclause 6.2.5 (i.e, the actual power as would be measured assuming no measurement error). This power shall be within the power limits specified in subclause 6.2.5.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of two test patterns. The test patterns are a monotonically increasing power sweep and a monotonically decreasing power sweep over a range bounded by the requirements of minimum power and maximum power specified in clauses 6.3.2 and 6.2.2. For these exceptions the power tolerance limit is a maximum of ± 6.0 dB in Table 6.3.5.2.1-1

Table 6.3.5.2.1-1 Relative Power Tolerance for Transmission (normal conditions)

Power step ΔP (Up or down) [dB]	All combinations of PUSCH and PUCCH transitions [dB]	All combinations of PUSCH/PUCCH and SRS transitions between sub- frames [dB]	PRACH [dB]
$\Delta P < 2$	± 2.5 (Note 3)	± 3.0	± 2.5
$2 \leq \Delta P < 3$	± 3.0	± 4.0	± 3.0
$3 \leq \Delta P < 4$	± 3.5	± 5.0	± 3.5
$4 \leq \Delta P \leq 10$	± 4.0	± 6.0	± 4.0
$10 \leq \Delta P < 15$	± 5.0	± 8.0	± 5.0
$15 \leq \Delta P$	± 6.0	± 9.0	± 6.0
Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed Note 2: For operating bands under Note 2 in Table 6.2.2-1, the relative power tolerance is relaxed by reducing the lower limit by 1.5 dB if the transmission bandwidth of either the reference or target sub-frames is confined within F_{UL_low} and $F_{UL\_low} + 4$ MHz or $F_{UL\_high} - 4$ MHz and F_{UL_high}. Note 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step $\Delta P \leq 1$ dB, the relative power tolerance for transmission is ± 1.0 dB.			

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames with the power setting according to Clause 5.1 of [TS 36.213]. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5.2-1.

For sub-frames not containing an SRS symbol, the power change is defined as the relative power difference between the mean power of the original reference sub-frame and the mean power of the target subframe not including transient durations. The mean power of successive sub-frames shall be calculated according to Figure 6.3.4.3-1 and Figure 6.3.4.1-1 if there is a transmission gap between the reference and target sub-frames.

If at least one of the sub-frames contains an SRS symbol, the power change is defined as the relative power difference between the mean power of the last transmission within the reference sub-frame and the mean power of the first transmission within the target sub-frame not including transient durations. A transmission is defined as PUSCH, PUCCH or an SRS symbol. The mean power of the reference and target sub-frames shall be calculated according to Figures 6.3.4.1-1, 6.3.4.2-1, 6.3.4.4-1, 6.3.4.4-2 and 6.3.4.4-3 for these cases.

6.3.5.3 Aggregate power control tolerance

Aggregate power control tolerance is the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

6.3.5.3.1 Minimum requirement

The UE shall meet the requirements specified in Table 6.3.5.3.1-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2 and the maximum output power as defined in subclause 6.2.2.

Table 6.3.5.3.1-1: Aggregate Power Control Tolerance

TPC command	UL channel	Aggregate power tolerance within 21 ms
0 dB	PUCCH	± 2.5 dB
0 dB	PUSCH	± 3.5 dB
Note: 1. The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission.		

6.4 Void

6.5 Transmit signal quality

6.5.1 Frequency error

The UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the E-UTRA Node B

6.5.2 Transmit modulation quality

Transmit modulation quality defines the modulation quality for expected in-channel RF transmissions from the UE. The transmit modulation quality is specified in terms of:

- Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)
- EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process
- Carrier leakage (caused by IQ offset)
- In-band emissions for the non-allocated RB

All the parameters defined in clause 6.5.2 are defined using the measurement methodology specified in Annex F.

6.5.2.1 Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the IQ origin offset shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

The basic EVM measurement interval in the time domain is one preamble sequence for the PRACH and is one slot for the PUCCH and PUSCH in the time domain.. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the EVM measurement interval is reduced by one symbol, accordingly. The PUSCH or PUCCH EVM measurement interval is also reduced when the mean power, modulation or allocation between slots is expected to change. In the case of PUSCH transmission, the measurement interval is reduced by a time interval equal to the sum of 5 μ s and the applicable exclusion period defined in subclause 6.3.4, adjacent to the boundary where the power change is expected to occur. The PUSCH exclusion period is applied to the signal obtained after the front-end IDFT. In the case of PUCCH transmission with power change, the PUCCH EVM measurement interval is reduced by one symbol adjacent to the boundary where the power change is expected to occur.

6.5.2.1.1 Minimum requirement

The RMS average of the basic EVM measurements for 10 sub-frames excluding any transient period for the average EVM case, and 60 sub-frames excluding any transient period for the reference signal EVM case, for the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.1-1 for the parameters defined in Table 6.5.2.1.1-2. For EVM evaluation purposes, [all PRACH preamble formats 0-4 and] all PUCCH formats 1, 1a, 1b, 2, 2a and 2b are considered to have the same EVM requirement as QPSK modulated.

Table 6.5.2.1.1-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Average EVM Level	Reference Signal EVM Level
QPSK or BPSK	%	17.5	[17.5]
16QAM	%	12.5	[12.5]

Table 6.5.2.1.1-2: Parameters for Error Vector Magnitude

Parameter	Unit	Level
UE Output Power	dBm	≥ -40
Operating conditions		Normal conditions

6.5.2.2 Carrier leakage

Carrier leakage (The IQ origin offset) is an additive sinusoid waveform that has the same frequency as the modulated waveform carrier frequency. The measurement interval is one slot in the time domain.

6.5.2.2.1 Minimum requirements

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2.2.1-1.

Table 6.5.2.2.1-1: Minimum requirements for Relative Carrier Leakage Power

	Parameters	Relative Limit (dBc)
	Output power > 0 dBm	-25
	-30 dBm $\leq$ Output power ≤ 0 dBm	-20
	-40 dBm $\leq$ Output power < -30 dBm	-10

6.5.2.3 In-band emissions

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non-allocated RB to the UE output power in an allocated RB.

The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

6.5.2.3.1 Minimum requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2.3.1-1.

Table 6.5.2.3.1-1: Minimum requirements for in-band emissions

Parameter Description	Unit	Limit (Note 1)		Applicable Frequencies
General	dB	$\max \left\{ \begin{array}{l} -25 - 10 \cdot \log_{10} (N_{RB} / L_{CRBs}), \\ 20 \cdot \log_{10} EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRBs}, \\ -57 \text{ dBm} / 180 \text{ kHz} - P_{RB} \end{array} \right\}$		Any non-allocated (Note 2)
IQ Image	dB	-25		Image frequencies (Notes 2, 3)
Carrier leakage	dBc	-25	Output power > 0 dBm	Carrier frequency (Notes 4, 5)
		-20	-30 dBm ≤ Output power ≤ 0 dBm	
		-10	-40 dBm ≤ Output power < -30 dBm	
Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB} - 30$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. P_{RB} is defined in Note 10.				
Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.				
Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.				
Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.				
Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if N_{RB} is odd, or in the two RBs immediately adjacent to the DC frequency if N_{RB} is even, but excluding any allocated RB.				
Note 6: L_{CRBs} is the Transmission Bandwidth (see Figure 5.6-1).				
Note 7: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.6-1).				
Note 8: EVM is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.				
Note 9: Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).				
Note 10: P_{RB} is the transmitted power per 180 kHz in allocated RBs, measured in dBm.				

6.5.2.4 EVM equalizer spectrum flatness

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex F) must meet a spectral flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block. The basic measurement interval is the same as for EVM.

6.5.2.4.1 Minimum requirements

The peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the uplink allocation shall not exceed the maximum ripple specified in Table 6.5.2.4.1-1 for normal conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 5 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 7 dB (see Figure 6.5.2.4.1-1).

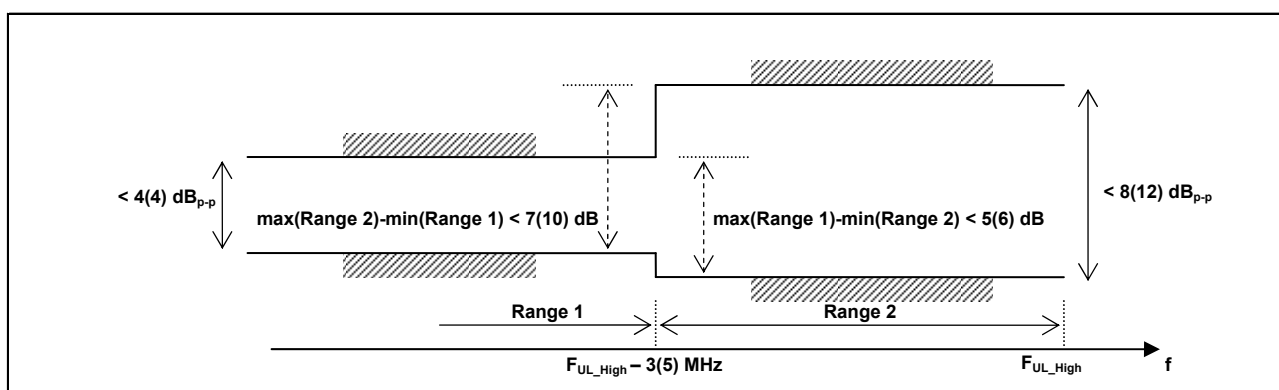
The EVM equalizer spectral flatness shall not exceed the values specified in Table 6.5.2.4.1-2 for extreme conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 10 dB (see Figure 6.5.2.4.1-1).

Table 6.5.2.4.1-1: Minimum requirements for EVM equalizer spectrum flatness (normal conditions)

Frequency Range	Maximum Ripple [dB]
$F_{UL\_Meas} - F_{UL\_Low} \geq 3 \text{ MHz}$ and $F_{UL\_High} - F_{UL\_Meas} \geq 3 \text{ MHz}$ (Range 1)	4 (p-p)
$F_{UL\_Meas} - F_{UL\_Low} < 3 \text{ MHz}$ or $F_{UL\_High} - F_{UL\_Meas} < 3 \text{ MHz}$ (Range 2)	8 (p-p)
Note 1: F_{UL_Meas} refers to the sub-carrier frequency for which the equalizer coefficient is evaluated	
Note 2: F_{UL_Low} and F_{UL_High} refer to each E-UTRA frequency band specified in Table 5.5-1	

Table 6.5.2.4.1-2: Minimum requirements for EVM equalizer spectrum flatness (extreme conditions)

Frequency Range	Maximum Ripple [dB]
$F_{UL\_Meas} - F_{UL\_Low} \geq 5 \text{ MHz}$ and $F_{UL\_High} - F_{UL\_Meas} \geq 5 \text{ MHz}$ (Range 1)	4 (p-p)
$F_{UL\_Meas} - F_{UL\_Low} < 5 \text{ MHz}$ or $F_{UL\_High} - F_{UL\_Meas} < 5 \text{ MHz}$ (Range 2)	12 (p-p)
Note 1: F_{UL_Meas} refers to the sub-carrier frequency for which the equalizer coefficient is evaluated	
Note 2: F_{UL_Low} and F_{UL_High} refer to each E-UTRA frequency band specified in Table 5.5-1	

**Figure 6.5.2.4.1-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets).**

6.6 Output RF spectrum emissions

The output UE transmitter spectrum consists of the three components; the emission within the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.

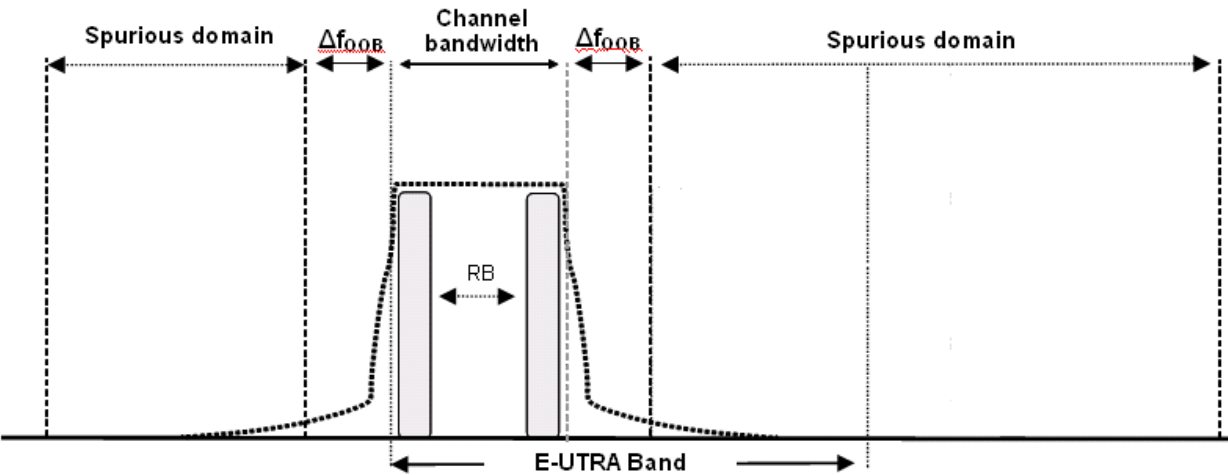


Figure 6.6-1: Transmitter RF spectrum

6.6.1 Occupied bandwidth

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.6.1-1

Table 6.6.1-1: Occupied channel bandwidth

	Occupied channel bandwidth / channel bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Channel bandwidth (MHz)	1.4	3	5	10	15	20

6.6.2 Out of band emission

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an Adjacent Channel Leakage power Ratio.

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the $\pm$ edge of the assigned E-UTRA channel bandwidth. For frequencies greater than (Δf_{OOB}) as specified in Table 6.6.2.1.1-1 the spurious requirements in clause 6.6.3 are applicable.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.1-1 for the specified channel bandwidth.

Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask

Spectrum emission limit (dBm)/ Channel bandwidth							
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	-10	-13	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	-10	-10	-10	-10	-10	-10	1 MHz
$\pm 2.5-2.8$	-25	-10	-10	-10	-10	-10	1 MHz
$\pm 2.8-5$		-10	-10	-10	-10	-10	1 MHz
$\pm 5-6$		-25	-13	-13	-13	-13	1 MHz
$\pm 6-10$			-25	-13	-13	-13	1 MHz
$\pm 10-15$				-25	-13	-13	1 MHz
$\pm 15-20$					-25	-13	1 MHz
$\pm 20-25$						-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2 Additional Spectrum Emission Mask

This requirement is specified in terms of an "additional spectrum emission" requirement.

6.6.2.2.1 Minimum requirement (network signalled value "NS_03")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.1-1.

Table 6.6.2.2.1-1: Additional requirements

Spectrum emission limit (dBm)/ Channel bandwidth							
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	-10	-13	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	-13	-13	-13	-13	-13	-13	1 MHz
$\pm 2.5-2.8$	-25	-13	-13	-13	-13	-13	1 MHz
$\pm 2.8-5$		-13	-13	-13	-13	-13	1 MHz
$\pm 5-6$		-25	-13	-13	-13	-13	1 MHz
$\pm 6-10$			-25	-13	-13	-13	1 MHz
$\pm 10-15$				-25	-13	-13	1 MHz
$\pm 15-20$					-25	-13	1 MHz
$\pm 20-25$						-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.2 Minimum requirement (network signalled value "NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.2-1.

Table 6.6.2.2-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	-10	-13	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	-13	-13	-13	-13	-13	-13	1 MHz
$\pm 2.5-2.8$	-25	-13	-13	-13	-13	-13	1 MHz
$\pm 2.8-5$		-13	-13	-13	-13	-13	1 MHz
$\pm 5-6$		-25	-25	-25	-25	-25	1 MHz
$\pm 6-10$			-25	-25	-25	-25	1 MHz
$\pm 10-15$				-25	-25	-25	1 MHz
$\pm 15-20$					-25	-25	1 MHz
$\pm 20-25$						-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.3 Minimum requirement (network signalled value "NS_06" or "NS_07")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_06" or "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3-1.

Table 6.6.2.2.3-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth				
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	Measurement bandwidth
$\pm 0-0.1$	-13	-13	-15	-18	30 kHz
$\pm 0.1-1$	-13	-13	-13	-13	100 kHz
$\pm 1-2.5$	-13	-13	-13	-13	1 MHz
$\pm 2.5-2.8$	-25	-13	-13	-13	1 MHz
$\pm 2.8-5$		-13	-13	-13	1 MHz
$\pm 5-6$		-25	-13	-13	1 MHz
$\pm 6-10$			-25	-13	1 MHz
$\pm 10-15$				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.3 Adjacent Channel Leakage Ratio

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirements are specified for two scenarios for an adjacent E-UTRA and /or UTRA channel as shown in Figure 6.6.2.3-1.

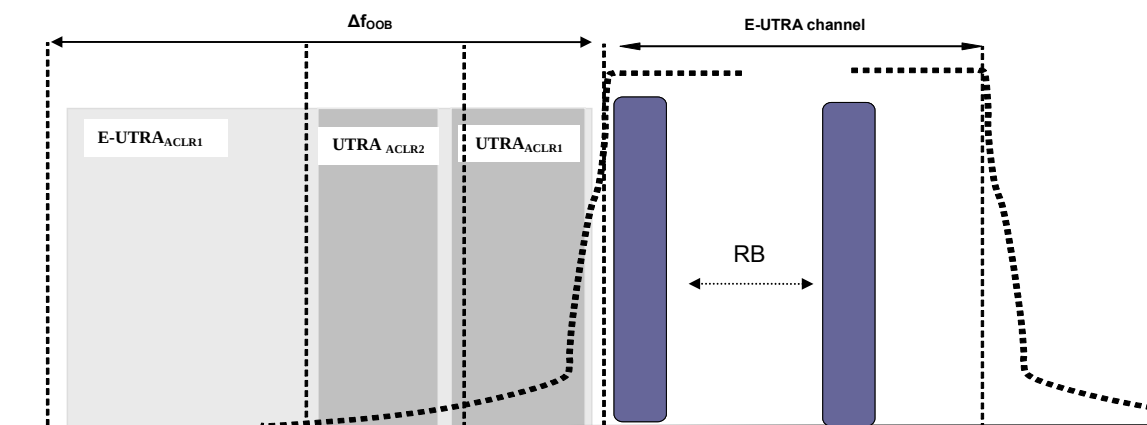


Figure 6.6.2.3-1: Adjacent Channel Leakage requirements

6.6.2.3.1 Minimum requirement E-UTRA

E-UTRA Adjacent Channel Leakage power Ratio ($E-UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3.1-1. If the measured adjacent channel power is greater than -50dBm then the $E-UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.1-1.

Table 6.6.2.3.1-1: General requirements for $E-UTRA_{ACLR}$

	Channel bandwidth / $E-UTRA_{ACLR1}$ / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E-UTRA_{ACLR1}$	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
Adjacent channel centre frequency offset (in MHz)	+1.4 / -1.4	+3.0 / -3.0	+5 / -5	+10 / -10	+15 / -15	+20 / -20

6.6.2.3.2 Minimum requirements UTRA

UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel ($UTRA_{ACLR1}$) and the 2nd UTRA adjacent channel ($UTRA_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2-1. If the measured UTRA channel power is greater than -50dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.2-1.

Table 6.6.2.3.2-1: Requirements for $UTRA_{ACLR1/2}$

	Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$UTRA_{ACLR1}$	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
Adjacent channel centre frequency offset (in MHz)	$0.7+BW_{UTRA}/2$ / $-0.7-BW_{UTRA}/2$	$1.5+BW_{UTRA}/2$ / $-1.5-BW_{UTRA}/2$	$+2.5+BW_{UTRA}/2$ / $-2.5-BW_{UTRA}/2$	$+5+BW_{UTRA}/2$ / $-5-BW_{UTRA}/2$	$+7.5+BW_{UTRA}/2$ / $-7.5-BW_{UTRA}/2$	$+10+BW_{UTRA}/2$ / $-10-BW_{UTRA}/2$
$UTRA_{ACLR2}$	-	-	36 dB	36 dB	36 dB	36 dB
Adjacent channel centre frequency offset (in MHz)	-	-	$+2.5+3*BW_{UTRA}/2$ / $-2.5-3*BW_{UTRA}/2$	$+5+3*BW_{UTRA}/2$ / $-5-3*BW_{UTRA}/2$	$+7.5+3*BW_{UTRA}/2$ / $-7.5-3*BW_{UTRA}/2$	$+10+3*BW_{UTRA}/2$ / $-10-3*BW_{UTRA}/2$
E-UTRA channel Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA 5MHz channel Measurement bandwidth*	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz
UTRA 1.6MHz channel measurement bandwidth**	1.28 MHz	1.28 MHz	1.28 MHz	1.28MHz	1.28MHz	1.28MHz
* Note: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.						
** Note: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.						

6.6.2.4 Additional ACLR requirements

This requirement is specified in terms of an additional $UTRA_{ACLR2}$ requirement.

6.6.2.4.1 Void

6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions. The spurious emission limits are specified in terms of general requirements inline with SM.329 [2] and E-UTRA operating band requirement to address UE co-existence.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than Δf_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.3.1 Minimum requirements

Table 6.6.3.1-1: Boundary between E-UTRA Δf_{OoB} and spurious emission domain

Channel bandwidth	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Δf_{OoB} (MHz)	2.8	6	10	15	20	25

The spurious emission limits in Table 6.6.3.1-2 apply for all transmitter band configurations (RB) and channel bandwidths.

NOTE: In order that the measurement of spurious emissions falls within the frequency ranges that are more than Δf_{OoB} (MHz) from the edge of the channel bandwidth, the minimum offset of the measurement frequency from each edge of the channel should be $\Delta f_{\text{OoB}} + \text{MBW}/2$. MBW denotes the measurement bandwidth defined in Table 6.6.3.1-2.

Table 6.6.3.1-2: Spurious emissions limits

Frequency Range	Maximum Level	Measurement Bandwidth
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	-36 dBm	1 kHz
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	-36 dBm	10 kHz
$30 \text{ MHz} \leq f < 1000 \text{ MHz}$	-36 dBm	100 kHz
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	-30 dBm	1 MHz

6.6.3.2 Spurious emission band UE co-existence

This clause specifies the requirements for the specified E-UTRA band, for coexistence with protected bands

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.6.3.2-1: Requirements

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Comment
1	E-UTRA Band 1, 3, 7, 8, 9, 11, 34, 38, 40	FDL_low	-	FDL_high	-50	1	
	E-UTRA band 33	FDL_low	-	FDL_high	-50	1	Note ³
	E-UTRA band 39	FDL_low	-	FDL_high	-50	1	Note ³
	Frequency range	860	-	895	-50	1	
	Frequency range	1475.9	-	1510.9	-50	1	
		1884.5	-	1919.6	-41	0.3	Note ⁶ , Note ⁷
Frequency range	1884.5	-	1915.7	Note ⁶ , Note ⁸			
2	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	

3	E-UTRA Band 1, 3, 7, 8, 33, 34, 38	FDL_low	-	FDL_high	-50	1	
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
6	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	Note ⁷
		1884.5	-	1915.7			Note ⁸
7	E-UTRA Band 1, 3, 7, 8, 33, 34	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 38	FDL_low	-	FDL_high	-50	1	Note ³
8	E-UTRA Band 1, 8, 33, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	
	E-UTRA band 3	FDL_low	-	FDL_high	-50	1	Note ²
	E-UTRA band 7	FDL_low	-	FDL_high	-50	1	Note ²
9	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
	Frequency range	1475.9	-	1510.9	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	Note ⁷
		1884.5	-	1915.7			Note ⁸
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
11	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	1457.9	-	1510.9	-50	1	
	Frequency range	860	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	Note ⁷
		1884.5	-	1915.7			Note ⁸
12	E-UTRA Band 2, 5, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 4, 10	FDL_low	-	FDL_high	-50	1	Note ²
13	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	769	-	775	-35	0.00625	
	Frequency range	799	-	805	-35	0.00625	Note ¹¹
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	769	-	775	-35	0.00625	
	Frequency range	799	-	805	-35	0.00625	Note ¹¹
17	E-UTRA Band 2, 5, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 4, 10	FDL_low	-	FDL_high	-50	1	Note ²
...							
33	E-UTRA Band 1, 3, 7, 8, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note ⁵
34	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note ⁵

	Frequency range	860	-	895	-50	1	
	Frequency range	1475.9	-	1510.9	-50	1	
		1884.5	-	1919.6			Note ⁷
	Frequency range	1884.5	-	1915.7	-41	0.3	Note ⁸
35							
36							
37			-				
38	E-UTRA Band 1, 3, 8, 33, 34	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 7	FDL_low	-	FDL_high	-50	1	Note ³
39	E-UTRA Band 34, 40	FDL_low	-	FDL_high	-50	1	
40	E-UTRA Band 1, 3, 33, 34, 39	FDL_low	-	FDL_high	-50	1	

Note

- ¹ FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.5-1
- ² As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.6-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth (MBW).
- ³ To meet these requirements some restriction will be needed for either the operating band or protected band
- ⁴ N/A
- ⁵ For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
- ⁶ Applicable when NS_05 in section 6.6.3.3.1 is signalled by the network.
- ⁷ Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.
- ⁸ Applicable when co-existence with PHS system operating in 1884.5-1915.7MHz.
- ⁹ N/A
- ¹⁰ N/A
- ¹¹ Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

6.6.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

6.6.3.3.1 Minimum requirement (network signalled value "NS_05")

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.1-1. This requirement also applies for the frequency ranges that are less than Δf_{OoB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.1-1: Additional requirements (PHS)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)				Measurement bandwidth
	5 MHz	10 MHz	15 MHz	20 MHz	
$1884.5 \leq f \leq 1919.6^{*1}$	-41	-41	-41	-41	300 KHz
$1884.5 \leq f \leq 1915.7^{*2}$	-41	-41	-41	-41	300 KHz
Note 1. Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1919.6 MHz) + 4 MHz + the Channel BW assigned, where Channel BW is as defined in Subclause 5.6. Operations below this point are for further study. 2. Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the Channel BW assigned, where Channel BW is as defined in Subclause 5.6. Operations below this point are for further study.					

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth (300 kHz).

6.6.3.3.2 Minimum requirement (network signalled value “NS_07”)

When “NS_07” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.2-1.

Table 6.6.3.3.2-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	10 MHz	
$769 \leq f \leq 775$	-57	6.25 kHz

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth (6.25 kHz).

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by

the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through E-UTRA rectangular filter with measurement bandwidth shown in Table 6.7.1-1.

The requirement of transmitting intermodulation is prescribed in Table 6.7.1-1.

Table 6.7.1-1: Transmit Intermodulation

BW Channel (UL)	5MHz		10MHz		15MHz		20MHz	
Interference Signal Frequency Offset	5MHz	10MHz	10MHz	20MHz	15MHz	30MHz	20MHz	40MHz
Interference CW Signal Level	-40dBc							
Intermodulation Product	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc
Measurement bandwidth	4.5MHz	4.5MHz	9.0MHz	9.0MHz	13.5MHz	13.5MHz	18MHz	18MHz

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective sections below.

With the exception of Clause 7.3, the requirements shall be verified with the network signalling value NS_01 configured (Table 6.2.4-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and using the set-up specified in Annex C.3.1.

7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. These requirements apply to all UE categories unless stated otherwise. Requirements for 4 ports are FFS. With the exception of clause 7.9 all requirements shall be verified by using both (all) antenna ports simultaneously.

7.3 Reference sensitivity power level

The reference sensitivity power level REFSENS is the minimum mean power applied to both the UE antenna ports at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3.1 Minimum requirements (QPSK)

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1 and table 7.3.1-2

Table 7.3.1-1: Reference sensitivity QPSK P_{REFSENS}

E-UTRA Band	Channel bandwidth						Duplex Mode
	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	
1	-	-	-100	-97	-95.2	-94	FDD
2	-102.7	-99.7	-98	-95	-93.2	-92	FDD
3	-101.7	-98.7	-97	-94	-92.2	-91	FDD
4	-104.7	-101.7	-100	-97	-95.2	-94	FDD
5	-103.2	-100.2	-98	-95			FDD
6			-100	-97			FDD
7			-98	-95	-93.2	-92	FDD
8	-102.2	-99.2	-97	-94			FDD
9			-99	-96	-94.2	-93	FDD
10			-100	-97	-95.2	-94	FDD
11			-100	-97			FDD
12	-101.7	-98.7	-97	-94			FDD
13			-97	-94			FDD
14		-99.2	-97	-94			FDD
...							
17			-97	-94			FDD
...							
33			-100	-97	-95.2	-94	TDD
34	-	-	-100	-97	-95.2	-94	TDD
35	-106.2	-102.2	-100	-97	-95.2	-94	TDD
36	-106.2	-102.2	-100	-97	-95.2	-94	TDD
37			-100	-97	-95.2	-94	TDD
38			-100	-97	-95.2	-94	TDD
39			-100	-97	-95.2	-94	TDD
40			-100	-97	-95.2	-94	TDD
Note 1:	The transmitter shall be set to P_{UMAX} as defined in clause 6.2.5						
Note 2:	Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1						
Note 3:	The signal power is specified per port						
Note 4:	For the UE which supports both Band 3 and Band 9 the reference sensitivity level of Band 3 + 0.5 dB is applicable for band 9						

Table 7.3.1-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement must be met.

Table 7.3.1-2: Minimum uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
1			25	50	75	100	FDD
2	6	15	25	50	50 ¹	50 ¹	FDD
3	6	15	25	50	50 ¹	50 ¹	FDD
4	6	15	25	50	75	100	FDD
5	6	15	25	25 ¹	-	-	FDD
6			25	25 ¹	-	-	FDD
7			25	50	75 ¹	75 ¹	FDD
8	6	15	25	25 ¹	-	-	FDD
9			25	50	50 ¹	50 ¹	FDD
10			25	50	75	100	FDD
11			25	25 ¹			FDD
12	6	15	20 ¹	20 ¹			FDD
13			20 ¹	20 ¹			FDD
14		15	15 ¹	15 ¹			FDD
...							
17			20 ¹	20 ¹			FDD
...							
33			25	50	75	100	TDD
34			25	50	75	-	TDD
35	6	15	25	50	75	100	TDD
36	6	15	25	50	75	100	TDD
37			25	50	75	100	TDD
38			25	50	75	100	TDD
39			25	50	75	100	TDD
40			25	50	75	100	TDD
Note 1: The number of UL resource blocks allocated is less than the total resources blocks supported by the channel bandwidth. The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).							

Unless given by Table 7.3.1-3, the minimum requirements specified in Tables 7.3.1-1 and 7.3.1-2 shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

Table 7.3.1-3: Network Signalling Value for reference sensitivity

E-UTRA Band	Network Signalling value
2	NS_03
4	NS_03
10	NS_03
12	NS_06
13	NS_06
14	NS_06
17	NS_06
35	NS_03
36	NS_03

7.3.2 Requirement for large transmission configurations

For some combinations of bandwidths and operating bands, a certain relaxation of the UE performance is allowed when the transmission configuration is larger than that in Table 7.3.1-2. Table 7.3.2-1 specifies the allowed maximum sensitivity degradation (MSD) when the UL resource block allocation is the maximum supported transmission bandwidth configuration N_{RB} (Table 5.6-1). Unless given by Table 7.3.1-3, the MSD shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

Table 7.3.2-1: Maximum Sensitivity Degradation

E-UTRA Band	Channel bandwidth						Duplex Mode
	1.4 MHz (dB)	3 MHz (dB)	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	
1			n/a	n/a	n/a	n/a	FDD
2	n/a	n/a	n/a	n/a	TBD	TBD	FDD
3	n/a	n/a	n/a	n/a	TBD	TBD	FDD
4	n/a	n/a	n/a	n/a	n/a	n/a	FDD
5	n/a	n/a	n/a	TBD			FDD
6			n/a	TBD			FDD
7			n/a	n/a	TBD	TBD	FDD
8	n/a	n/a	n/a	TBD			FDD
9			n/a	n/a	TBD	TBD	FDD
10			n/a	n/a	n/a	n/a	FDD
11			n/a	TBD			FDD
12			TBD	TBD			FDD
13			TBD	TBD			FDD
14							FDD
17			TBD	TBD			FDD
Note: 1. The transmitter shall be set to P_{UMAX} as defined in clause 6.2.5 with MPR applied and with the maximum transmission configuration (Table 5.5-1) allocated							

7.4 Maximum input level

This is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

7.4.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.1.

Table 7.4.1-1: Maximum input level

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	-25					
Note:							
1. The transmitter shall be set to 4dB below P _{CMAX_L} at the minimum uplink configuration specified in Table 7.3.1-2 with P _{CMAX_L} as defined in clause 6.2.5.							
2. Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.							

7.5 Adjacent Channel Selectivity (ACS)

7.5.1 Minimum requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5.1-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.1-2 and Table 7.5.1-3 where the throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.5.1-1: Adjacent channel selectivity

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
ACS	dB	33.0	33.0	33.0	33.0	30	27

Table 7.5.1-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + 14 dB					
$P_{\text{Interferer}}$	dBm	REFSENS +45.5dB	REFSENS +45.5dB	REFSENS +45.5dB*	REFSENS +45.5dB	REFSENS +42.5dB	REFSENS +39.5dB
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	1.4+0.0025 / -1.4-0.0025	3+0.0075 / -3-0.0075	5+0.0025 / -5-0.0025	7.5+0.0075 / -7.5-0.0075	10+0.0125 / -10-0.0125	12.5+0.0025 / -12.5-0.0025
Note: 1. The transmitter shall be set to 4dB below $P_{\text{CMAX\_L}}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{\text{CMAX\_L}}$ as defined in clause 6.2.5. 2. The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1							

Table 7.5.1-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	-56.5	-56.5	-56.5	-56.5	-53.5	-50.5
$P_{\text{Interferer}}$	dBm	-25					
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	$1.4+0.0025$ / $-1.4-0.0025$	$3+0.0075$ / $-3-0.0075$	$5+0.0025$ / $-5-0.0025$	$7.5+0.0075$ / $-7.5-0.0075$	$10+0.0125$ / $-10-0.0125$	$12.5+0.0025$ / $-12.5-0.0025$
Note: 1. The transmitter shall be set to 24dB $P_{\text{CMAX\_L}}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{\text{CMAX\_L}}$ as defined in clause 6.2.5. 2. The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1							

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 In-band blocking

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band at which the relative throughput shall meet or exceed the minimum requirement for the specified measurement channels..

7.6.1.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1.1-1 and 7.6.1.1-2.

Table 7.6.1.1-1: In band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{offset, case 1}}$	MHz	$2.1+0.0125$	$4.5+0.0075$	$7.5+0.0125$	$7.5+0.0025$	$7.5+0.0075$	$7.5+0.0125$
$F_{\text{offset, case 2}}$	MHz	$3.5+0.0075$	$7.5+0.0075$	$12.5+0.0075$	$12.5+0.0125$ 5	$12.5+0.0025$ 5	$12.5+0.0075$ 5

- Note 1: The transmitter shall be set to 4dB $P_{\text{CMAX\_L}}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{\text{CMAX\_L}}$ as defined in clause 6.2.5.
- Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Table 7.6.1.1-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2	Case 3
	$P_{\text{Interferer}}$	dBm	-56	-44	-30
	$F_{\text{Interferer}}$ (Offset)	MHz	$= -BW/2 - F_{\text{offset, case 1}}$ & $= +BW/2 + F_{\text{offset, case 1}}$	$\leq -BW/2 - F_{\text{offset, case 2}}$ & $\geq +BW/2 + F_{\text{offset, case 2}}$	$-BW/2 - 9 \text{ MHz}$ & $-BW/2 - 15 \text{ MHz}$
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 33, 34, 35, 36, 37, 38, 39, 40	$F_{\text{Interferer}}$	MHz	(Note 2)	$F_{\text{DL\_low}} -15$ to $F_{\text{DL\_high}} +15$	
17	$F_{\text{Interferer}}$	MHz	(Note 2)	$F_{\text{DL\_low}} -9.0$ to $F_{\text{DL\_high}} +15$	$F_{\text{DL\_low}} -15$ and $F_{\text{DL\_low}} -9.0$ (Note 3)
Note 1 For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band. Note 2 For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency $-BW/2 - F_{\text{offset, case 1}}$ and b. the carrier frequency $+BW/2 + F_{\text{offset, case 1}}$. Note 3 $F_{\text{Interferer}}$ range values for unwanted modulated interfering signal are interferer center frequencies. Note 4 Case 3 only applies to assigned UE channel bandwidth of 5 MHz.					

7.6.2 Out-of-band blocking

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band. For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

7.6.2.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.1-1 and 7.6.2.1-2.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{\text{RB}} / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of clause 7.7 Spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to $\max(8, \lceil (N_{\text{RB}} + 2 \cdot L_{\text{CRBs}}) / 8 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.4.2-1) and L_{CRBs} is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7 spurious response are applicable.

Table 7.6.2.1-1: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
Note 1:	The transmitter shall be set to 4dB below P _{CMAX_L} at the minimum uplink configuration specified in Table 7.3.1-2 with P _{CMAX_L} as defined in clause 6.2.5.						
Note 2:	Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.						

Table 7.6.2.1-2: Out of band blocking

E-UTRA band	Parameter	Units	Frequency			
			range 1	range 2	range 3	range 4
	$P_{\text{Interferer}}$	dBm	-44	-30	-15	-15
1, 2, 3, 4, 5 6, 7, 8, 9, 10,11,12, 13, 17, 33,34, 35, 36, 37, 38, 39, 40	$F_{\text{Interferer}}$ (CW)	MHz	$F_{\text{DL\_low}} -15$ to $F_{\text{DL\_low}} -60$	$F_{\text{DL\_low}} -60$ to $F_{\text{DL\_low}} -85$	$F_{\text{DL\_low}} -85$ to 1 MHz	-
			$F_{\text{DL\_high}} +15$ to $F_{\text{DL\_high}} + 60$	$F_{\text{DL\_high}} +60$ to $F_{\text{DL\_high}} +85$	$F_{\text{DL\_high}} +85$ to +12750 MHz	-
2, 5, 12, 17	$F_{\text{Interferer}}$	MHz	-	-	-	$F_{\text{UL\_low}} - F_{\text{UL\_high}}$
Note:						

7.6.3 Narrow band blocking

This requirement is measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

7.6.3.1 Minimum requirements

. The relative throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.1-1

Table 7.6.3.1-1: Narrow-band blocking

Parameter	Unit	Channel Bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
P_w	dBm	P_{REFSENS} + channel-bandwidth specific value below					
		22	18	16	13	14	16
P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55
F_{uw} (offset for $\Delta f = 15$ kHz)	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075
F_{uw} (offset for $\Delta f = 7.5$ kHz)	MHz						
Note 1: The transmitter shall be set to 4 dB below $P_{\text{CMAX\_L}}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{\text{CMAX\_L}}$ as defined in clause 6.2.5.							
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.							

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 is not met.

7.7.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.1-1 and 7.7.1-2.

Table 7.7.1-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
Note:							
1.	The transmitter shall be set to 4dB below P _{CMAX_L} at the minimum uplink configuration specified in Table 7.3.1-2 with P _{CMAX_L} as defined in clause 6.2.5.						
2.	Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.						

Table 7.7.1-2: Spurious Response

Parameter	Unit	Level
$P_{\text{Interferer (CW)}}$	dBm	-44
$F_{\text{Interferer}}$	MHz	Spurious response frequencies

7.8 Intermodulation characteristics

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Wide band intermodulation

The wide band intermodulation requirement is defined following the same principles using modulated E-UTRA carrier and CW signal as interferer.

7.8.1.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1.1 for the specified wanted signal mean power in the presence of two interfering signals

Table 7.8.1.1-1: Wide band intermodulation

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		12	8	6	6	7	9
P _{Interferer 1} (CW)	dBm	-46					
P _{Interferer 2} (Modulated)	dBm	-46					
BW _{Interferer 2}		1.4	3	5			
F _{Interferer 1} (Offset)	MHz	-BW/2 – 2.1 / +BW/2+ 2.1	-BW/2 – 4.5 / +BW/2 + 4.5	-BW/2 – 7.5 / +BW/2 + 7.5			
F _{Interferer 2} (Offset)	MHz	2*F _{Interferer 1}					
Note:							
1 The transmitter shall be set to 4dB below P _{CMAX_L} at the minimum uplink configuration specified in Table 7.3.1-2 with P _{CMAX_L} as defined in clause 6.2.5.							
2 Reference measurement channel is specified in Annex Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.							
3 The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz							

7.8.2 Void

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1-1

Table 7.9.1-1: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
$30\text{MHz} \leq f < 1\text{GHz}$	100 kHz	-57 dBm	
$1\text{GHz} \leq f \leq 12.75\text{GHz}$	1 MHz	-47 dBm	

8 Performance requirement

This clause contains performance requirements for the physical channels specified in TS 36.211 [4]. The performance requirements for the UE in this clause are specified for the measurement channels specified in Annex A.3, the propagation conditions in Annex B and the downlink channels in Annex C.3.2.

8.1 General

8.1.1 Dual-antenna receiver capability

The performance requirements are based on UE(s) that utilize a dual-antenna receiver.

For all test cases, the SNR is defined as

$$SNR = \frac{\hat{E}_s^{(1)} + \hat{E}_s^{(2)}}{N_{oc}^{(1)} + N_{oc}^{(2)}}$$

where the superscript indicates the receiver antenna connector. The SNR requirement applies for the UE categories given for each test.

8.1.1.1 Simultaneous unicast and MBMS operations

8.1.1.2 Dual-antenna receiver capability in idle mode

8.2 Demodulation of PDSCH (Cell-Specific Reference Symbols)

8.2.1 FDD (Fixed Reference Channel)

The parameters specified in Table 8.2.1-1 are valid for all FDD tests unless otherwise stated.

Table 8.2.1-1: Common Test Parameters (FDD)

Parameter	Unit	Value
Inter-TTI Distance		1
Number of HARQ processes	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH	OFDM symbols	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths
Cyclic Prefix		Normal
Cell_ID		0
Note:		

8.2.1.1 Single-antenna port performance

The single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.3 is achieved. The

purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.6.1-1.

8.2.1.1.1 Minimum Requirement

The requirements are specified in Table 8.2.1.1.1-2, with the addition of the parameters in Table 8.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.1.1.1-1: Test Parameters

Parameter		Unit	Test 1- 5	Test 6- 8	Test 9- 15	Test 16- 18
Downlink power allocation	ρ_A	dB	0	0	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	98
Symbols for unused PRBs			OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)
Modulation			QPSK	16QAM	64QAM	16QAM
Note 1: $P_B = 0$						
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.						

Table 8.2.1.1.1-2: Minimum performance (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0	1-5
2	10 MHz	R.2 FDD	OP.1 FDD	ETU70	1x2 Low	70	-0.4	1-5
3	10 MHz	R.2 FDD	OP.1 FDD	ETU300	1x2 Low	70	0.0	1-5
4	10 MHz	R.2 FDD	OP.1 FDD	HST	1x2 Low	70	-2.4	1-5
5	1.4 MHz	R.4 FDD	OP.1 FDD	EVA5	1x2 Low	70	0.0	1-5
6	10 MHz	R.3 FDD	OP.1 FDD	EVA5	1x2 Low	70	6.7	2-5
7	10 MHz	R.3 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.4	2-5
8	10 MHz	R.3 FDD	OP.1 FDD	ETU300	1x2 High	70	9.4	2-5
9	3 MHz	R.5 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.6	1-5
10	5 MHz	R.6 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.4	2-5
11	10 MHz	R.7 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.7	2-5
12	10 MHz	R.7 FDD	OP.1 FDD	ETU70	1x2 Low	70	19.0	2-5
13	10 MHz	R.7 FDD	OP.1 FDD	EVA5	1x2 High	70	19.1	2-5
14	15 MHz	R.8 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.7	2-5
15	20 MHz	R.9 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.6	3-5
16	3 MHz	R.0 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	1-5
17	10 MHz	R.1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	1-5
18	20 MHz	R.1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	1-5

8.2.1.1.2 Void

8.2.1.1.3 Void

8.2.1.1.4 Minimum Requirement 1 PRB allocation in presence of MBSFN

The requirements are specified in Table 8.2.1.1.4-2, with the addition of the parameters in Table 8.2.1.1.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge in presence of MBSFN.

Table 8.2.1.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Symbols for MBSFN portion of MBSFN subframes (Note 2)			OCNG (Note 3)
Note 1: $P_B = 0$ Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot. Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead.			

Table 8.2.1.1.4-2: Minimum performance 1PRB (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.29 FDD	OP.3 FDD	ETU70	1x2 Low	30	2.0	1-5

8.2.1.2 Transmit diversity performance

8.2.1.2.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.2.1-2, with the addition of the parameters in Table 8.2.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.2.1.2.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.2.1-2: Minimum performance Transmit Diversity (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11 FDD	OP.1 FDD	EVA5	2x2 Medium	70	6.8	2-5
2	10 MHz	R.10 FDD	OP.1 FDD	HST	2x2 Low	70	-2.3	1-5

8.2.1.2.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.2.2-2, with the addition of the parameters in Table 8.2.1.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC-FSTD) with 4 transmitter antennas.

Table 8.2.1.2.2-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.2.2-2: Minimum performance Transmit Diversity (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	1.4 MHz	R.12 FDD	OP.1 FDD	EPA5	4x2 Medium	70	0.6	1-5

8.2.1.3 Open-loop spatial multiplexing performance

8.2.1.3.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.3.1-2, with the addition of the parameters in Table 8.2.1.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

Table 8.2.1.3.1-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.3.1-2: Minimum performance Large Delay CDD (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Low	70	13.0	2-5

8.2.1.3.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.3.2-2, with the addition of the parameters in Table 8.2.1.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 4 transmitter antennas.

Table 8.2.1.3.2-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.3.2-2: Minimum performance Large Delay CDD (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.14 FDD	OP.1 FDD	EVA70	4x2 Low	70	14.3	2-5

8.2.1.4 Closed-loop spatial multiplexing performance

8.2.1.4.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.1-2, with the addition of the parameters in Table 8.2.1.4.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.1.4.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 2
Downlink power allocation	ρ_A	dB	-3	-3
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98
Precoding granularity		PRB	6	50
PMI delay (Note 2)		ms	8	8
Reporting interval		ms	1	1
Reporting mode			PUSCH 1-2	PUSCH 3-1
Note 1: $P_B = 1$				
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)				

Table 8.2.1.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.10 FDD	OP.1 FDD	EVA5	2x2 Low	70	-2.5	1-5
2	10 MHz	R.10 FDD	OP.1 FDD	EPA5	2x2 High	70	-2.3	1-5

8.2.1.4.1A Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.1A-2, with the addition of the parameters in Table 8.2.1.4.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.1.4.1A-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	8
Reporting interval		ms	1
Reporting mode			PUSCH 1-2
Note 1: $P_B = 1$			
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 8.2.1.4.1A-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.13 FDD	OP.1 FDD	EVA5	4x2 Low	70	-3.2	1-5

8.2.1.4.2 Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.4. 2-2, with the addition of the parameters in Table 8.2.1.4. 2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.1.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 2
Downlink power allocation	ρ_A	dB	-3	-3
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98
Precoding granularity		PRB	50	50
PMI delay (Note 2)		ms	8	8
Reporting interval		ms	1	1
Reporting mode			PUSCH 3-1	PUSCH 3-1
Note 1: $P_B = 1$				
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)				

Table 8.2.1.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11 FDD	OP.1 FDD	EVA5	2x2 Low	70	12.9	2-5
2	10 MHz	R.11 FDD	OP.1 FDD	ETU70	2x2 Low	70	14.3	2-5

8.2.1.4.3 Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.3-2, with the addition of the parameters in Table 8.2.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.1.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	8
Reporting interval		ms	1
Reporting mode			PUSCH 1-2
Note 1: $P_B = 1$			
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 8.2.1.4.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Band-width	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.14 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.5	2-5

8.2.1.5 MU-MIMO

8.2.1.6 [Control channel performance: D-BCH and PCH]

8.2.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.2.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.2.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value
Uplink downlink configuration (Note 1)		1
Special subframe configuration (Note 2)		4
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Number of HARQ processes	Processes	7
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH	OFDM symbols	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]		
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]		

8.2.2.1 Single-antenna port performance

The single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.4 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.6.1-1.

8.2.2.1.1 Minimum Requirement

The requirements are specified in Table 8.2.2.1.1-2, with the addition of the parameters in Table 8.2.2.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.2.1.1-1: Test Parameters

Parameter		Unit	Test 1- 5	Test 6- 8	Test 9- 15	Test 16- 18
Downlink power allocation	ρ_A	dB	0	0	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	-98
Symbols for unused PRBs			OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)
Modulation			QPSK	16QAM	64QAM	16QAM
ACK/NACK feedback mode			Multiplexing	Multiplexing	Multiplexing	Multiplexing
Note 1: $P_B = 0$						
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.						

Table 8.2.2.1.1-2: Minimum performance (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.2	1-5
2	10 MHz	R.2 TDD	OP.1 TDD	ETU70	1x2 Low	70	-0.6	1-5
3	10 MHz	R.2 TDD	OP.1 TDD	ETU300	1x2 Low	70	-0.2	1-5
4	10 MHz	R.2 TDD	OP.1 TDD	HST	1x2 Low	70	-2.6	1-5
5	1.4 MHz	R.4 TDD	OP.1 TDD	EVA5	1x2 Low	70	0.0	1-5
6	10 MHz	R.3 TDD	OP.1 TDD	EVA5	1x2 Low	70	6.7	2-5
7	10 MHz	R.3 TDD	OP.1 TDD	ETU70	1x2 Low	30	1.4	2-5
8	10 MHz	R.3 TDD	OP.1 TDD	ETU300	1x2 High	70	9.3	2-5
9	3 MHz	R.5 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	1-5
10	5 MHz	R.6 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	2-5
11	10 MHz	R.7 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	2-5
12	10 MHz	R.7 TDD	OP.1 TDD	ETU70	1x2 Low	70	19.1	2-5
13	10 MHz	R.7 TDD	OP.1 TDD	EVA5	1x2 High	70	19.1	2-5
14	15 MHz	R.8 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.8	2-5
15	20 MHz	R.9 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.7	3-5
16	3 MHz	R.0 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.1	1-5
17	10 MHz	R.1 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.0	1-5
18	20 MHz	R.1 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.1	1-5

8.2.2.1.2 Void

8.2.2.1.3 Void

8.2.2.1.4 Minimum Requirement 1 PRB allocation in presence of MBSFN

The requirements are specified in Table 8.2.2.1.4-2, with the addition of the parameters in Table 8.2.2.1.1.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge in presence of MBSFN.

Table 8.2.2.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Symbols for MBSFN portion of MBSFN subframes (Note 2)			OCNG (Note 3)
ACK/NACK feedback mode			Multiplexing
Note 1: $P_B = 0$ Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot. Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead.			

Table 8.2.2.1.4-2: Minimum performance 1PRB (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.29 TDD	OP.3 TDD	ETU70	1x2 Low	30	2.0	1-5

8.2.2.2 Transmit diversity performance

8.2.2.2.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.2.1-2, with the addition of the parameters in Table 8.2.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.2.2.2.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
ACK/NACK feedback mode			Multiplexing
Note 1: $P_B = 1$			

Table 8.2.2.2.1-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11 TDD	OP.1 TDD	EVA5	2x2 Medium	70	6.8	2-5
2	10 MHz	R.10 TDD	OP.1 TDD	HST	2x2 Low	70	-2.3	1-5

8.2.2.2.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.2.2-2, with the addition of the parameters in Table 8.2.2.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC-FSTD) with 4 transmitter antennas.

Table 8.2.2.2.2-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
ACK/NACK feedback mode			Multiplexing
Note 1: $P_B = 1$			

Table 8.2.2.2-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	1.4 MHz	R.12 TDD	OP.1 TDD	EPA5	4x2 Medium	70	0.2	1-5

8.2.2.3 Open-loop spatial multiplexing performance

8.2.2.3.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.3.1-2, with the addition of the parameters in Table 8.2.2.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

Table 8.2.2.3.1-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
ACK/NACK feedback mode			Bundling
Note 1: $P_B = 1$			

Table 8.2.2.3.1-2: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.1	2-5

8.2.2.3.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.3.2-2, with the addition of the parameters in Table 8.2.2.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 4 transmitter antennas.

Table 8.2.2.3.2-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
ACK/NACK feedback mode			Bundling
Note 1: $P_B = 1$			

Table 8.2.2.3.2-2: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.14 TDD	OP.1 TDD	EVA70	4x2 Low	70	14.2	2-5

8.2.2.4 Closed-loop spatial multiplexing performance

8.2.2.4.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.1-2, with the addition of the parameters in Table 8.2.2.4.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.2.4.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 2
Downlink power allocation	ρ_A	dB	-3	-3
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98
Precoding granularity		PRB	6	50
PMI delay (Note 2)		ms	10 or 11	10 or 11
Reporting interval		ms	1 or 4 (Note 3)	1 or 4 (Note 3)
Reporting mode			PUSCH 1-2	PUSCH 3-1
ACK/NACK feedback mode			Multiplexing	Multiplexing
Note 1: $P_B = 1$				
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)				
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms				

Table 8.2.2.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.10 TDD	OP.1 TDD	EVA5	2x2 Low	70	-3.1	1-5
2	10 MHz	R.10 TDD	OP.1 TDD	EPA5	2x2 High	70	-2.8	1-5

8.2.2.4.1A Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.1A-2, with the addition of the parameters in Table 8.2.2.4.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.2.4.1A-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	10 or 11
Reporting interval		ms	1 or 4 (Note 3)
Reporting mode			PUSCH 1-2
ACK/NACK feedback mode			Multiplexing
Note 1: $P_B = 1$			
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms			

Table 8.2.2.4.1A-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.13 TDD	OP.1 TDD	EVA5	4x2 Low	70	-3.5	1-5

8.2.2.4.2 Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.2-2, with the addition of the parameters in Table 8.2.2.4.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.2.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 2
Downlink power allocation	ρ_A	dB	-3	-3
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98
Precoding granularity		PRB	50	50
PMI delay (Note 2)		ms	10 or 11	10 or 11
Reporting interval		ms	1 or 4 (Note 3)	1 or 4 (Note 3)
Reporting mode			PUSCH 3-1	PUSCH 3-1
ACK/NACK feedback mode			Bundling	Bundling
Note 1: $P_B = 1$				
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)				
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms				

Table 8.2.2.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA5	2x2 Low	70	12.8	2-5
2	10 MHz	R.11-1 TDD	OP.1 TDD	ETU70	2x2 Low	70	13.9	2-5

8.2.2.4.3 Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.3-2, with the addition of the parameters in Table 8.2.2.4.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.2.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	10 or 11
Reporting interval		ms	1 or 4 (Note 3)
Reporting mode			PUSCH 1-2
ACK/NACK feedback mode			Bundling
Note 1: $P_B = 1$			
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms			

Table 8.2.2.4.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.14 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.7	2-5

8.2.2.5 MU-MIMO

8.2.2.6 [Control channel performance: D-BCH and PCH]

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

8.3.1 FDD

[TBD]

8.3.2 TDD

The parameters specified in Table 8.3.2-1 are valid for TDD unless otherwise stated.

Table 8.3.2-1: Common Test Parameters for DRS

Parameter	Unit	Value
Uplink downlink configuration (Note 1)		1
Special subframe configuration (Note 2)		4
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Number of HARQ processes	Processes	7
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH	OFDM symbols	2
Beamforming Model		As specified in Section B.4
Precoder update granularity		Frequency domain: 1 PRB Time domain: 1 ms
ACK/NACK feedback mode		Multiplexing
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]		
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]		

The requirements are specified in Table 8.3.2-3, with the addition of the parameters in Table 8.3.2-2 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the demodulation performance using user-specific reference signals with full RB or single RB allocation.

Table 8.3.2-2: Test Parameters for Testing DRS

parameter		Unit	Test 1	Test 2	Test 3	Test 4
Downlink power allocation	ρ_A	dB	0	0	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
Cell-specific reference signals			Antenna port 0			
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	-98
Symbols for unused PRBs			OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)
Number of allocated resource blocks		PRB	50	50	50	1 (Note 2)
Note 1: $P_B = 0$						
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.						

Table 8.3.2-3: Minimum performance DRS (FRC)

Test number	Bandwidth and MCS	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz QPSK 1/3	R.25 TDD	OP.1 TDD	EPA5	2x2 Low	70	-0.8	1-5
2	10 MHz 16QAM 1/2	R.26 TDD	OP.1 TDD	EPA5	2x2 Low	70	7.0	2-5
3	10 MHz 64QAM 3/4	R.27 TDD	OP.1 TDD	EPA5	2x2 Low	70	17.0	2-5
4	10 MHz 16QAM 1/2	R.28 TDD	OP.1 TDD	EPA5	2x2 Low	30	1.7	1-5

8.4 Demodulation of PDCCH/PCFICH

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

8.4.1 FDD

Table 8.4.1-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Single antenna port	Transmit diversity
Number of PDCCH symbols		symbols	2	2
Number of PHICH groups (N_g)			1	1
PHICH duration			Normal	Normal
Cell ID			0	0
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	0	-3
	PCFICH_RB PDCCH_RB PHICH_RB	dB	0	-3
N_{oc} at antenna port		dBm/15kHz	-98	-98
Cyclic prefix			Normal	Normal

8.4.1.1 Single-antenna port performance

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	10 MHz	8 CCE	R.15 FDD	ETU70	1x2 Low	1	-1.7

8.4.1.2 Transmit diversity performance

8.4.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.2.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	1.4 MHz	2 CCE	R.16 FDD	EPA5	2 x 2 Low	1	4.3

8.4.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.2.2-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	10 MHz	4 CCE	R.17 FDD	EVA5	4 x 2 Medium	1	0.9

8.4.2 TDD

Table 8.4.2-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Single antenna port	Transmit diversity	
Uplink downlink configuration (Note 1)			0	0	
Special subframe configuration (Note 2)			4	4	
Number of PDCCH symbols		symbols	2	2	
Number of PHICH groups (N_g)			1	1	
PHICH duration			Normal	Normal	
Cell ID			0	0	
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	0	-3	
	PDFICH_RB PDCCH_RB PDCCH_RB	dB	0	-3	
	N_{oc} at antenna port	dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
ACK/NACK feedback mode			Multiplexing	Multiplexing	
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]					
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]					

8.4.2.1 Single-antenna port performance

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	10 MHz	8 CCE	R.15 TDD	ETU70	1x2 Low	1	-1.6

8.4.2.2 Transmit diversity performance

8.4.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.2.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	1.4 MHz	2 CCE	R.16 TDD	EPA5	2 x 2 Low	1	4.2

8.4.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.2.2-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
1	10 MHz	4 CCE	R.17 TDD	EVA5	4 x 2 Medium	1	1.2

8.5 Demodulation of PHICH

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

8.5.1 FDD

Table 8.5.1-1: Test Parameters for PHICH

Parameter		Unit	Single antenna port	Transmit diversity	
Downlink power allocation	PHICH_RA	dB	0	-3	
	PHICH_RB	dB			
	PCFICH_RA	dB			
	PCFICH_RB	dB	0	-3	
	PDCCH_RA	dB			
	PDCCH_RB	dB			
PHICH duration			Normal	Normal	
Number of PHICH groups (Note 1)			$N_g = 1$	$N_g = 1$	
Cell ID			0	0	
PDCCH content			UL grant should be included with the proper information aligned with A.3.6, other PDCCH resource shall be occupied by non-zero data		
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
Note 1: according to Clause 6.9 in TS 36.211 [4]					

8.5.1.1 Single-antenna port performance

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (P_{m-an}) shall be below the specified value in Table 8.5.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.1-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					P_{m-an} (%)	SNR (dB)
1	10 MHz	R.18	ETU70	1 x 2 Low	0.1	5.5
2	10 MHz	R.24	ETU70	1 x 2 Low	0.1	0.6

8.5.1.2 Transmit diversity performance

8.5.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (P_{m-an}) shall be below the specified value in Table 8.5.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.2.1-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					P_{m-an} (%)	SNR (dB)
1	1.4 MHz	R.19	EPA5	2 x 2 Low	0.1	5.6

8.5.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (P_{m-an}) shall be below the specified value in Table 8.5.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.2.2-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
1	10 MHz	R.20	EVA5	4 x 2 Medium	0.1	6.0

8.5.2 TDD

Table 8.5.2-1: Test Parameters for PHICH

Parameter		Unit	Single antenna port	Transmit diversity	
Uplink downlink configuration (Note 1)			1	1	
Special subframe configuration (Note 2)			4	4	
Downlink power allocation	PHICH_RA	dB	0	-3	
	PHICH_RB	dB			
	PCFICH_RA	dB			
	PCFICH_RB	dB	0	-3	
	PDCCH_RA	dB			
	PDCCH_RB	dB			
PHICH duration			Normal	Normal	
Number of PHICH groups (Note 3)			$N_g = 1$	$N_g = 1$	
Cell ID			0	0	
PDCCH content			UL grant should be included with the proper information aligned with A.3.6, other PDCCH resource shall be occupied by non-zero data		
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
ACK/NACK feedback mode			Multiplexing	Multiplexing	
Note 1: as specified in Table 4.2-2 in TS 36.211 [4] Note 2: as specified in Table 4.2-1 in TS 36.211 [4] Note 3: according to Clause 6.9 in TS 36.211 [4]					

8.5.2.1 Single-antenna port performance

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (P_{m-an}) shall be below the specified value in Table 8.5.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.1-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
1	10 MHz	R.18	ETU70	1 x 2 Low	0.1	5.8
2	10 MHz	R.24	ETU70	1 x 2 Low	0.1	1.3

8.5.2.2 Transmit diversity performance

8.5.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.2.1-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
1	1.4 MHz	R.19	EPA5	2 x 2 Low	0.1	5.3

8.5.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.2.2-1: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
1	10 MHz	R.20	EVA5	4 x 2 Medium	0.1	6.1

8.6 Demodulation of PBCH

The receiver characteristics of the PBCH are determined by the probability of miss-detection of the PBCH (Pm-bch).

8.6.1 FDD

Table 8.6.1-1: Test Parameters for PBCH

Parameter		Unit	Single antenna port	Transmit diversity	
Downlink power allocation	PBCH_RA	dB	0	-3	
	PBCH_RB	dB	0	-3	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
Cell ID			0	0	
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]					
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]					

8.6.1.1 Single-antenna port performance

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detecting PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.1-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.1

8.6.1.2 Transmit diversity performance

8.6.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.2.1-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.22	EPA5	2 x 2 Low	1	-4.8

8.6.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.2.2-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.23	EVA5	4 x 2 Medium	1	-3.5

8.6.2 TDD

Table 8.6.2-1: Test Parameters for PBCH

Parameter		Unit	Single antenna port	Transmit diversity	
Uplink downlink configuration (Note 1)			1	1	
Special subframe configuration (Note 2)			4	4	
Downlink power allocation	PBCH_RA	dB	0	-3	
	PBCH_RB	dB	0	-3	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
Cell ID			0	0	
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]					
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]					

8.6.2.1 Single-antenna port performance

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.1-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.4

8.6.2.2 Transmit diversity performance

8.6.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.2.1-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.22	EPA5	2 x 2 Low	1	-4.8

8.6.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.2.2-1: Minimum performance PBCH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.23	EVA5	4 x 2 Medium	1	-4.1

9 Reporting of Channel State Information

9.1 General

This section includes requirements for the reporting of channel state information (CSI). For all test cases in this section, the definition of SNR is in accordance with the one given in clause 8.1.1.

9.2 CQI reporting definition under AWGN conditions

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 36.211 [4].

To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.2.1 Minimum requirement PUCCH 1-0

9.2.1.1 FDD

The following requirements apply to UE Category 2-5. For the parameters specified in Table 9.2.1.1-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-1 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.1-1: PUCCH 1-0 static test (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			1			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
Propagation condition and antenna configuration			AWGN (1 x 2)			
SNR (Note 2)		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI reporting			PUCCH Format 2			
PUCCH Report Type			4			
Reporting periodicity		ms	$N_P = 5$			
<i>cqi-pmi-ConfigurationIndex</i>			6			
Note 1: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.						
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

9.2.1.2 TDD

The following requirements apply to UE Category 2-5. For the parameters specified in Table 9.2.1.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-2 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.2-1: PUCCH 1-0 static test (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz			10	
PDSCH transmission mode					1	
Uplink downlink configuration					2	
Special subframe configuration					4	
Downlink power allocation	ρ_A	dB			0	
	ρ_B	dB			0	
Propagation condition and antenna configuration			AWGN (1 x 2)			
SNR (Note 2)		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI reporting			PUSCH (Note 3)			
PUCCH Report Type			4			
Reporting periodicity		ms	$N_P = 5$			
<i>cqi-pmi-ConfigurationIndex</i>			3			
ACK/NACK feedback mode			Multiplexing			
Note 1: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.						
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.						

9.2.2 Minimum requirement PUCCH 1-1

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

9.2.2.1 FDD

The following requirements apply to UE Category 2-5. For the parameters specified in table 9.2.2.1-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband CQI}_1 = \text{wideband CQI}_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set $\{\text{median CQI}_1 - 1, \text{median CQI}_1 + 1\}$ for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $\text{CQI}_0 - 1$ and median $\text{CQI}_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $\text{CQI}_0 + 1$ and median $\text{CQI}_1 + 1$ shall be greater than or equal to 0.1.

Table 9.2.2.1-1: PUCCH 1-1 static test (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			4			
Downlink power allocation	ρ_A	dB	-3			
	ρ_B	dB	-3			
Propagation condition and antenna configuration			Clause B.1 (2 x 2)			
CodeBookSubsetRestriction bitmap			010000			
SNR (Note 2)		dB	10	11	16	17
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-87	-82	-81
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI/PMI reporting			PUCCH Format 2			
PUCCH Report Type for CQI/PMI			2			
PUCCH Report Type for RI			3			
Reporting periodicity		ms	$N_P = 5$			
<i>cqi-pmi-ConfigurationIndex</i>			6			
<i>ri-ConfigIndex</i>			1 (Note 3)			
Note 1:	Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.					
Note 2:	For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.					
Note 3:	It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.					

9.2.2.2 TDD

The following requirements apply to UE Category 2-5. For the parameters specified in table 9.2.2.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband CQI}_1 = \text{wideband CQI}_0 - \text{Codeword 1 offset level}$$

The wideband CQI₁ shall be within the set {median CQI₁ -1, median CQI₁ +1} for more than 90% of the time, where the resulting wideband values CQI₁ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI₀ - 1 and median CQI₁ - 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI₀ + 1 and median CQI₁ + 1 shall be greater than or equal to 0.1.

Table 9.2.2.2-1: PUCCH 1-1 static test (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz			10	
PDSCH transmission mode					4	
Uplink downlink configuration					2	
Special subframe configuration					4	
Downlink power allocation	ρ_A	dB			-3	
	ρ_B	dB			-3	
Propagation condition and antenna configuration			Clause B.1 (2 x 2)			
CodeBookSubsetRestriction bitmap			010000			
SNR (Note 2)		dB	10	11	16	17
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-87	-82	-81
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI/PMI reporting			PUSCH (Note 3)			
PUCCH Report Type			2			
Reporting periodicity		ms	$N_P = 5$			
<i>cqi-pmi-ConfigurationIndex</i>			3			
RI report			OFF			
ACK/NACK feedback mode			Multiplexing			
Note 1: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.						
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.						

9.3 CQI reporting under fading conditions

9.3.1 Frequency-selective scheduling mode

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective fading conditions is determined by a double-sided percentile of the reported differential CQI offset level 0 per sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set S of TS 36.213 [6]. The purpose is to verify that preferred sub-bands can be used for frequently-selective scheduling. To account for sensitivity of the input SNR the sub-band CQI reporting under frequency selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.1.1 Minimum requirement PUSCH 3-0

9.3.1.1.1 FDD

For the parameters specified in Table 9.3.1.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.1-2 and by the following

- sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;

- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the sub-band size.

Table 9.3.1.1.1-1 Sub-band test for single antenna transmission (FDD)

Parameter	Unit	Test 1		Test 2	
Bandwidth	MHz	10 MHz			
Transmission mode		1 (port 0)			
SNR (Note 3)	dB	9	10	14	15
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-89	-88	-84	-83
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98		-98	
Propagation channel		Clause B.2.4 with $\tau_d = 0.45 \mu s$, $a = 1$, $f_D = 5$ Hz			
Correlation		Full			
Reporting interval	ms	5			
CQI delay	ms	8			
Reporting mode		PUSCH 3-0			
Max number of HARQ transmissions		1			
Note 1:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)				
Note 2:	Reference measurement channel according to Table A.4-4 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.				
Note 3:	For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.				

Table 9.3.1.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2	
α [%]	2	2	
β [%]	55	55	
γ	1.1	1.1	
UE Category	1-5	1-5	

9.3.1.1.2 TDD

For the parameters specified in Table 9.3.1.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.2-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;

- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the sub-band size.

Table 9.3.1.1.2-1 Sub-band test for single antenna transmission (TDD)

Parameter	Unit	Test 1		Test 2	
Bandwidth	MHz	10 MHz			
Transmission mode		1 (port 0)			
Uplink downlink configuration		2			
Special subframe configuration		4			
SNR (Note 3)	dB	9	10	14	15
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-89	-88	-84	-83
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98		-98	
Propagation channel		Clause B.2.4 with $\tau_d = 0.45 \mu s$, $a = 1$, $f_D = 5$ Hz			
Correlation		Full			
Reporting interval	ms	5			
CQI delay	ms	10 or 11			
Reporting mode		PUSCH 3-0			
Max number of HARQ transmissions		1			
ACK/NACK feedback mode		Multiplexing			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)					
Note 2: Reference measurement channel according to Table A.4-5 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.					
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.					

Table 9.3.1.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2	
α [%]	2	2	
β [%]	55	55	
γ	1.1	1.1	
UE Category	1-5	1-5	

9.3.2 Frequency non-selective scheduling mode

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective fading conditions is determined by a double-sided percentile of the reported CQI, and the relative increase of the throughput obtained when the transport format transmitted is that indicated by the reported CQI compared to the case for which a fixed transport format configured according to the reported median CQI is transmitted. In addition, the reporting accuracy is determined by a minimum BLER using the transport formats indicated by the reported CQI. The purpose is to verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling. To account for sensitivity of the input SNR the CQI reporting under frequency non-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.2.1 Minimum requirement PUCCH 1-0

9.3.2.1.1 FDD

For the parameters specified in Table 9.3.2.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.1-2 and by the following

- a) a CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α % of the time;
- b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the maximum transmission configuration (Table 5.6-1).

Table 9.3.2.1.1-1 Fading test for single antenna (FDD)

Parameter	Unit	Test 1		Test 2	
Bandwidth	MHz	10 MHz			
Transmission mode		1 (port 0)			
SNR (Note 3)	dB	6	7	12	13
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-92	-91	-86	-85
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98		-98	
Propagation channel		EPA5			
Correlation		High			
Reporting mode		PUCCH 1-0			
Reporting periodicity	ms	$N_p = 2$			
CQI delay	ms	8			
Physical channel for CQI reporting		PUSCH (Note 4)			
PUCCH Report Type		4			
<i>cqi-pmi-ConfigurationIndex</i>		1			
Max number of HARQ transmissions		1			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)					
Note 2: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.					
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.					
Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.					

Table 9.3.2.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2	
α [%]	20	20	
γ	1.05	1.05	
UE Category	2-5	2-5	

9.3.2.1.2 TDD

For the parameters specified in Table 9.3.2.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.2-2 and by the following

- a CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α % of the time;
- the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the maximum transmission configuration (Table 5.6-1).

Table 9.3.2.1.2-1 Fading test for single antenna (TDD)

Parameter	Unit	Test 1		Test 2	
Bandwidth	MHz	10 MHz			
Transmission mode		1 (port 0)			
Uplink downlink configuration		2			
Special subframe configuration		4			
SNR (Note 3)	dB	6	7	12	13
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-92	-91	-86	-85
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98		-98	
Propagation channel		EPA5			
Correlation		High			
Reporting mode		PUCCH 1-0			
Reporting periodicity	ms	$N_p = 5$			
CQI delay	ms	10 or 11			
Physical channel for CQI reporting		PUSCH (Note 4)			
PUCCH Report Type		4			
<i>cqi-pmi-ConfigurationIndex</i>		3			
Max number of HARQ transmissions		1			
ACK/NACK feedback mode		Multiplexing			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)					
Note 2: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.					
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.					
Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.					

Table 9.3.2.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2	
α [%]	20	20	
γ	1.05	1.05	
UE Category	2-5	2-5	

9.3.3 Frequency-selective interference

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective interference conditions is determined by a double-sided percentile of the reported differential CQI offset level +2 for a preferred sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is

transmitted on any sub-band in set S of TS 36.213 [6]. The purpose is to verify that preferred sub-bands are used for frequently-selective scheduling under frequency-selective interference conditions.

9.3.3.1 Minimum requirement PUSCH 3-0

9.3.3.1.1 FDD

For the parameters specified in Table 9.3.3.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.1-2 and by the following

- a sub-band differential CQI offset level of +2 shall be reported at least α % for at least one of the sub-bands of full size at the channel edges;
- the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the sub-band size.

Table 9.3.3.1.1-1 Sub-band test for single antenna transmission (FDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	10 MHz
Transmission mode		1 (port 0)	1 (port 0)
$I_{ot}^{(j)}$ for RB 0...5	dB[mW/15kHz]	-102	-93
$I_{ot}^{(j)}$ for RB 6...41	dB[mW/15kHz]	-93	-93
$I_{ot}^{(j)}$ for RB 42...49	dB[mW/15kHz]	-93	-102
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-94	-94
Max number of HARQ transmissions		1	
Propagation channel		Clause B.2.4 with $\tau_d = 0.45 \mu s$, $a = 1$, $f_D = 5$ Hz	
Correlation		Full	
Reporting interval	ms	5	
CQI delay	ms	8	
Reporting mode		PUSCH 3-0	
Sub-band size	RB	6 (full size)	
Note 1:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).		
Note 2:	Reference measurement channel according to Table A.4-4 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.		

Table 9.3.3.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α [%]	60	60
γ	1.6	1.6
UE Category	1-5	1-5

9.3.3.1.2 TDD

For the parameters specified in Table 9.3.3.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.2-2 and by the following

- a) a sub-band differential CQI offset level of +2 shall be reported at least α % for at least one of the sub-bands of full size at the channel edges;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the sub-band size.

Table 9.3.3.1.2-1 Sub-band test for single antenna transmission (TDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	10 MHz
Transmission mode		1 (port 0)	1 (port 0)
Uplink downlink configuration		2	
Special subframe configuration		4	
$I_{ot}^{(j)}$ for RB 0...5	dB[mW/15kHz]	-102	-93
$I_{ot}^{(j)}$ for RB 6...41	dB[mW/15kHz]	-93	-93
$I_{ot}^{(j)}$ for RB 42...49	dB[mW/15kHz]	-93	-102
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-94	-94
Max number of HARQ transmissions		1	
Propagation channel		Clause B.2.4 with $\tau_d = 0.45 \mu s$, $a = 1$, $f_D = 5 \text{ Hz}$	
Correlation		Full	
Reporting interval	ms	5	
CQI delay	ms	10 or 11	
Reporting mode		PUSCH 3-0	
Sub-band size	RB	6 (full size)	
ACK/NACK feedback mode		Multiplexing	
Note 1:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)		
Note 2:	Reference measurement channel according to table A.4-5 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.		

Table 9.3.3.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α [%]	60	60
γ	1.6	1.6
UE Category	1-5	1-5

9.4 Reporting of Precoding Matrix Indicator (PMI)

The minimum performance requirements of PMI reporting are defined based on the precoding gain, expressed as the relative increase in throughput when the transmitter is configured according to the UE reports compared to the case when the transmitter is using random precoding, respectively. Transmission mode 6 is used with a fixed transport format (FRC) configured. The requirements are specified in terms of the ratio

$$\gamma = \frac{t_{ue}}{t_{rnd}}$$

where t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding, and t_{ue} the throughput measured at SNR_{rnd} with precoders configured according to the UE reports.

9.4.1 Single PMI

9.4.1.1 Minimum requirement PUSCH 3-1

9.4.1.1.1 FDD

For the parameters specified in Table 9.4.1.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.1.1.1-2.

Table 9.4.1.1.1-1 PMI test for single-layer (FDD)

Parameter	Unit	Test 1
Bandwidth	MHz	10
Transmission mode		6
Propagation channel		EVA5
Precoding granularity	PRB	50
Correlation and antenna configuration		Low 2 x 2
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98
Reporting mode		PUSCH 3-1
Reporting interval	ms	1
PMI delay (Note 2)	ms	8
Measurement channel		R.10 FDD
OCNG Pattern		OP.1 FDD
Max number of HARQ transmissions		4
Redundancy version coding sequence		{0,1,2,3}
Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)		
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).		

Table 9.4.1.1.1-2 Minimum requirement (FDD)

Parameter	Test 1
γ	1.1
UE Category	1-5

9.4.1.1.2 TDD

For the parameters specified in Table 9.4.1.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.1.1.2-2.

Table 9.4.1.1.2-1 PMI test for single-layer (TDD)

Parameter	Unit	Test 1
Bandwidth	MHz	10
Transmission mode		6
Uplink downlink configuration		1
Special subframe configuration		4
Propagation channel		EVA5
Precoding granularity	PRB	50
Correlation and antenna configuration		Low 2 x 2
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98
Reporting mode		PUSCH 3-1
Reporting interval	ms	1
PMI delay (Note 2)	ms	10 or 11
Measurement channel		R.10 TDD
OCNG Pattern		OP.1 TDD
Max number of HARQ transmissions		4
Redundancy version coding sequence		{0,1,2,3}
ACK/NACK feedback mode		Multiplexing
Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)		

Table 9.4.1.1.2-2 Minimum requirement (TDD)

Parameter	Test 1
γ	1.1
UE Category	1-5

9.4.2 Multiple PMI

9.4.2.1 Minimum requirement PUSCH 1-2

9.4.2.1.1 FDD

For the parameters specified in Table 9.4.2.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.2.1.1-2.

Table 9.4.2.1.1-1 PMI test for single-layer (FDD)

Parameter	Unit	Test 1
Bandwidth	MHz	20
Transmission mode		6
Propagation channel		EPA5
Precoding granularity	PRB	8
Correlation and antenna configuration		Low 2 x 2
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98
Reporting mode		PUSCH 1-2
Reporting interval	ms	1
PMI delay	ms	8
Measurement channel		R.30 FDD
OCNG Pattern		OP.1 FDD
Max number of HARQ transmissions		4
Redundancy version coding sequence		{0,1,2,3}
Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity) Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)		

Table 9.4.2.1.1-2 Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	2-5

9.4.2.1.2 TDD

For the parameters specified in Table 9.4.2.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.2.1.2-2.

Table 9.4.2.1.2-1 PMI test for single-layer (TDD)

Parameter	Unit	Test 1
Bandwidth	MHz	20
Transmission mode		6
Uplink downlink configuration		1
Special subframe configuration		4
Propagation channel		EPA5
Precoding granularity	PRB	8
Correlation and antenna configuration		Low 2 x 2
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98
Reporting mode		PUSCH 1-2
Reporting interval	ms	1
PMI delay	ms	10 or 11
Measurement channel		R.30 TDD
OCNG Pattern		OP.1 TDD
Max number of HARQ transmissions		4
Redundancy version coding sequence		{0,1,2,3}
ACK/NACK feedback mode		Multiplexing
Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)		

Table 9.4.2.1.2-2 Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	2-5

9.5 Reporting of Rank Indicator (RI)

The purpose of this test is to verify that the reported rank indicator accurately represents the channel rank. The accuracy of RI (CQI) reporting is determined by the relative increase of the throughput obtained when transmitting based on the reported rank compared to the case for which a fixed rank is used for transmission. Transmission mode 4 is used with the specified CodebookSubSetRestriction.

For fixed rank 1 transmission, the RI and PMI reporting is restricted to two single-layer precoders, For fixed rank 2 transmission, the RI and PMI reporting is restricted to one two-layer precoder, For follow RI transmission, the RI and PMI reporting is restricted to select the union of these precoders. Channels with low and high correlation are used to ensure that RI reporting reflects the channel condition.

9.5.1 Minimum requirement

9.5.1.1 FDD

The minimum performance requirement in Table 9.5.1.1-2 is defined as

- The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS is that resulting from the code rate which is closest to that indicated by M = wideband CQI and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the transmission bandwidth configuration (Table 5.6-1).

For the parameters specified in Table 9.5.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.1-2.

Table 9.5.1.1-1 RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Propagation condition and antenna configuration			2 x 2 EPA5		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUCCH 1-1		
Physical channel for CQI/PMI reporting			PUCCH Format 2		
PUCCH Report Type for CQI/PMI			2		
Physical channel for RI reporting			PUSCH (Note 3)		
PUCCH Report Type for RI			3		
Reporting periodicity		ms	$N_P = 5$		
PMI and CQI delay		ms	8		
<i>cqi-pmi-ConfigurationIndex</i>			6		
<i>ri-ConfigurationInd</i>			1		
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).					
Note 2: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.					
Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.					

Table 9.5.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2	Test 3
γ_1	N/A	1.05	N/A
γ_2	1	N/A	1.1
UE Category	2-5	2-5	2-5

9.5.1.2 TDD

The minimum performance requirement in Table 9.5.1.2-2 is defined as

- The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS is that resulting from the code rate which is closest to that indicated by $M = \text{wideband CQI}$ and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the transmission bandwidth configuration (Table 5.6-1).

For the parameters specified in Table 9.5.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.2-2.

Table 9.5.1.2-1 RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
Uplink downlink configuration			2		
Special subframe configuration			4		
Propagation condition and antenna configuration			2 x 2 EPA5		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUSCH 3-1 (Note 3)		
Reporting interval		ms	5		
PMI and CQI delay		ms	10 or 11		
ACK/NACK feedback mode			Bundling		
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).					
Note 2: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.					
Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.					

Table 9.5.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2	Test 3
γ_1	N/A	[1.05]	N/A
γ_2	[1]	N/A	[1.1]
UE Category	2-5	2-5	2-5

Annex A (normative): Measurement channels

A.1 General

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per datastream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all datastreams (codewords).

A.2 UL reference measurement channels

A.2.1 General

A.2.1.1 Applicability and common parameters

The following sections define the UL signal applicable to the Transmitter Characteristics (clause 6) and for the Receiver Characteristics (clause 7) where the UL signal is relevant.

The Reference channels in this section assume transmission of PUSCH and Demodulation Reference signal only. The following conditions apply:

- 1 HARQ transmission
- Cyclic Prefix normal
- PUSCH hopping off
- Link adaptation off
- Demodulation Reference signal as per TS 36.211 [4] subclause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [5] subclause 5.2.2.6.

- ACK/NACK 1 bit
- ACK/NACK mapping adjacent to Demodulation Reference symbol
- ACK/NACK resources punctured into data
- Max number of resources for ACK/NACK: 4 SC-FDMA symbols per subframe
- No CQI transmitted, no RI transmitted

A.2.1.2 Determination of payload size

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.
2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24) / N_{ch}|,$$

subject to

- a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of N_{RB} resource blocks.
- b) Segmentation is not included in this formula, but should be considered in the TBS calculation.
- c) For RMC-s, which at the nominal target coding rate do not cover all the possible UE categories for the given modulation, reduce the target coding rate gradually (within the same modulation), until the maximal possible number of UE categories is covered.

3. If there is more than one A that minimises the equation above, then the larger value is chosen per default.

A.2.2 Reference measurement channels for FDD

A.2.2.1 Full RB allocation

A.2.2.1.1 QPSK

Table A.2.2.1.1-1 Reference Channels for QPSK with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		1-5	1-5	1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.2.2.1.2 16-QAM

Table A.2.2.1.2-1 Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3
Payload size	Bits	2600	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	4	4	4
Total number of bits per Sub-Frame	Bits	3456	8640	14400	28800	43200	57600
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		1-5	1-5	1-5	2-5	2-5	2-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.2.2.1.3 64-QAM

[FFS]

A.2.2.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.2.2.1 QPSK

Table A.2.2.2.1-1 Reference Channels for 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size	Bits	72	424
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	288	1440
Total symbols per Sub-Frame		144	720
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.1-2 Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size	Bits	72	392
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	288	1152
Total symbols per Sub-Frame		144	576
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.1-3 Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	5	5	5
Allocated resource blocks		1	8	20
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size	Bits	72	808	1736
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1
Total number of bits per Sub-Frame	Bits	288	2304	5760
Total symbols per Sub-Frame		144	1152	2880
UE Category		1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				

Table A.2.2.2.1-4 Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		1	12	20	25
DFT-OFDM Symbols per Sub-Frame		12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3
Payload size	Bits	72	1224	1736	2216
Transport block CRC	Bits	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1
Total number of bits per Sub-Frame	Bits	288	3456	5760	7200
Total symbols per Sub-Frame		144	1728	2880	3600
UE Category		1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)					

Table A.2.2.2.1-5 Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	15	15	15
Allocated resource blocks		1	16	50
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size	Bits	72	1384	5160
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1
Total number of bits per Sub-Frame	Bits	288	4608	14400
Total symbols per Sub-Frame		144	2304	7200
UE Category		1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				

Table A.2.2.2.1-6 Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20	20
Allocated resource blocks		1	18	25	50	75
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5
Payload size	Bits	72	1864	2216	5160	4392
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	5184	7200	14400	21600
Total symbols per Sub-Frame		144	2592	3600	7200	10800
UE Category		1-5	1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						

A.2.2.2.2 16-QAM

Table A.2.2.2.2-1 Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	2880
Total symbols per Sub-Frame		144	720
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-2 Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	1736
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	2304
Total symbols per Sub-Frame		144	576
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-3 Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	5	5
Allocated resource blocks		1	8
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	4608
Total symbols per Sub-Frame		144	1152
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-4 Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	10	10
Allocated resource blocks		1	12
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	6912
Total symbols per Sub-Frame		144	1728
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-5 Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	15	15
Allocated resource blocks		1	16
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size	Bits	408	4584
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	9216
Total symbols per Sub-Frame		144	2304
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-6 Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	20	20
Allocated resource blocks		1	18
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	10368
Total symbols per Sub-Frame		144	2592
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

A.2.2.2.3 64-QAM

[FFS]

A.2.3 Reference measurement channels for TDD

For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL:2UL.

A.2.3.1 Full RB allocation

A.2.3.1.1 QPSK

Table A.2.3.1.1-1 Reference Channels for QPSK with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size							
For Sub-Frame 2,3,7,8	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)							
For Sub-Frame 2,3,7,8		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400
UE Category		1-5	1-5	1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							
Note 2: As per Table 4.2-2 in TS 36.211 [4]							

A.2.3.1.2 16-QAM

Table A.2.3.1.2-1 Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	2600	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)							
For Sub-Frame 2,3,7,8		1	1	1	4	4	4
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	3456	8640	14400	28800	43200	57600
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400
UE Category		1-5	1-5	1-5	2-5	2-5	2-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							
Note 2: As per Table 4.2-2 in TS 36.211 [4]							

A.2.3.1.3 64-QAM

[FFS]

A.2.3.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.3.2.1 QPSK

Table A.2.3.2.1-1 Reference Channels for 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size			
For Sub-Frame 2,3,7,8	Bits	72	424
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	288	1440
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	720
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.1-2 Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size			
For Sub-Frame 2,3,7,8	Bits	72	392
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	288	1152
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	576
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.1-3 Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	5	5	5
Allocated resource blocks		1	8	20
Uplink-Downlink Configuration		1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size				
For Sub-Frame 2,3,7,8	Bits	72	808	1736
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)				
For Sub-Frame 2,3,7,8		1	1	1
Total number of bits per Sub-Frame	Bits			
For Sub-Frame 2,3,7,8		288	2304	5760
Total symbols per Sub-Frame				
For Sub-Frame 2,3,7,8		144	1152	2880
UE Category		1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				
Note 2: As per Table 4.2-2 in TS 36.211 [4]				

Table A.2.3.2.1-4 Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		1	12	20	25
Uplink-Downlink Configuration (Note 2)		1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3
Payload size					
For Sub-Frame 2,3,7,8	Bits	72	1224	1736	2216
Transport block CRC	Bits	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)					
For Sub-Frame 2,3,7,8		1	1	1	1
Total number of bits per Sub-Frame					
For Sub-Frame 2,3,7,8	Bits	288	3456	5760	7200
Total symbols per Sub-Frame					
For Sub-Frame 2,3,7,8		144	1728	2880	3600
UE Category		1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)					
Note 2: As per Table 4.2-2 in TS 36.211 [4]					

Table A.2.3.2.1-5 Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	15	15	15
Allocated resource blocks		1	16	50
Uplink-Downlink Configuration (Note 2)		1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size				
For Sub-Frame 2,3,7,8	Bits	72	1384	5160
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)				
For Sub-Frame 2,3,7,8		1	1	1
Total number of bits per Sub-Frame				
For Sub-Frame 2,3,7,8	Bits	288	4608	14400
Total symbols per Sub-Frame				
For Sub-Frame 2,3,7,8		144	2304	7200
UE Category		1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				
Note 2: As per Table 4.2-2 in TS 36.211 [4]				

Table A.2.3.2.1-6 Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20	20
Allocated resource blocks		1	18	25	50	75
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5
Payload size						
For Sub-Frame 2,3,7,8	Bits	72	1864	2216	5160	4392
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)						
For Sub-Frame 2,3,7,8		1	1	1	1	1
Total number of bits per Sub-Frame						
For Sub-Frame 2,3,7,8	Bits	288	5184	7200	14400	21600
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		144	2592	3600	7200	10800
UE Category		1-5	1-5	1-5	1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						
Note 2: As per Table 4.2-2 in TS 36.211 [4]						

A.2.3.2.2 16-QAM

Table A.2.3.2.2-1 Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	2880
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	720
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.2-2 Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	1736
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	2304
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	576
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.2-3 Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	5	5
Allocated resource blocks		1	8
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	4608
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	1152
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.2-4 Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	10	10
Allocated resource blocks		1	12
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	6912
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	1728
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.2-5 Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	15	15
Allocated resource blocks		1	16
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	4584
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	9216
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	2304
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

Table A.2.3.2.2-6 Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	20	20
Allocated resource blocks		1	18
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)			
For Sub-Frame 2,3,7,8		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	10368
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	2592
UE Category		1-5	1-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			
Note 2: As per Table 4.2-2 in TS 36.211 [4]			

A.2.3.2.3 64-QAM

[FFS]

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

No user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.
2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24) / N_{ch}|,$$

subject to

- a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of N_{RB} resource blocks.
- b) Segmentation is not included in this formula, but should be considered in the TBS calculation.
3. If there is more than one A that minimizes the equation above, then the larger value is chosen per default.
4. For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL+DwPTS (12 OFDM symbol): 2UL

A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of sub-clause 7.4 (Maximum input level).

Tables A.3.2-3 and A.3.2-4 are applicable for sub-clause 7.4 (Maximum input level).

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.2-1 Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1320	2216	4392	6712	8760
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	152	872	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	1	1	1	2	2
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	3780	6300	13800	20700	27600
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	528	2940	5460	12960	19860	26760
Max. Throughput averaged over 1 frame	kbps	341.6	1143.2	1952.8	3952.8	6040.8	7884
UE Category		1-5	1-5	1-5	1-5	1-5	1-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value					
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 6)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		4	4+2	4+2	4+2	4+2	4+2
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmission		1	1	1	1	1	1
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 4, 9		408	1320	2216	4392	6712	8760
For Sub-Frame 1, 6		n/a	968	1544	3240	4968	6712
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		208	1064	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frame 4, 9		1	1	1	1	2	2
For Sub-Frame 1, 6		n/a	1	1	1	1	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 4, 9		1368	3780	6300	13800	20700	27600
For Sub-Frame 1, 6		n/a	3276	5556	11256	16956	22656
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		672	3084	5604	13104	20004	26904
Max. Throughput averaged over 1 frame	kbps	102.4	564	932	1965.6	3007.2	3970.4
UE Category		1-5	1-5	1-5	1-5	1-5	1-5
Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). Note 5: As per Table 4.2-2 in TS 36.211 [4]							

Table A.3.2-3 Fixed Reference Channel for Maximum input level for UE Categories 3-5 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	61664
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	12576	28336	45352	61664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	11
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	55498
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-3a Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	2	2	2	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	2	2	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	11088	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	9079.6	9266.4	9266.4	9266.4
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-3b Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	83
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	12576	28336	45352	48936
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	9
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	8
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	68724
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	16380	38880	59580	66204
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	45713
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-4 Fixed Reference Channel for Maximum input level for UE Categories 3-5 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 6)		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	61664
For Sub-Frames 1,6	Bits	n/a	6968	11448	23688	35160	46888
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	12576	30576	45352	61664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	2	3	5	8	11
For Sub-Frames 1,6		n/a	2	3	5	7	9
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	11
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frames 1,6		n/a	9828	16668	33768	50868	67968
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	16812	39312	60012	80712
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	27877
Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). Note 5: As per Table 4.2-2 in TS 36.211 [4]							

Table A.3.2-4a Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frames 1,6	Bits	n/a	6968	8248	7480	7480	7480
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	2	2	2	2	2
For Sub-Frames 1,6		n/a	2	2	2	2	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	2	2	2	2
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frames 1,6		n/a	9828	11880	11628	11628	11628
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	11520	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	4533.6	4584.8	4584.8	4584.8
Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 5: As per Table 4.2-2 in TS 36.211 [4]							

Table A.3.2-4b Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	83
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frames 1,6	Bits	n/a	6968	11448	23688	35160	39232
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	12576	30576	45352	51024
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	2	3	5	8	9
For Sub-Frames 1,6		n/a	2	3	5	7	7
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	8
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	68724
For Sub-Frames 1,6		n/a	9828	16668	33768	50868	56340
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	16380	39312	60012	66636
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	23154
Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 5: As per Table 4.2-2 in TS 36.211 [4]							

A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		R.4 FDD			R.2 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Allocated subframes per Radio Frame		10			10		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408			4392		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	152			4392		
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1			1		
For Sub-Frame 5		n/a			n/a		
For Sub-Frame 0		1			1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368			13800		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	528			12960		
Max. Throughput averaged over 1 frame	Mbps	0.342			3.953		
UE Category		1-5			1-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					R.3 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Allocated subframes per Radio Frame					10		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				14112		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9					3		
For Sub-Frame 5					n/a		
For Sub-Frame 0					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				27600		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				25920		
Max. Throughput averaged over 1 frame	Mbps				12.586		
UE Category					2-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.5 FDD	R.6 FDD	R.7 FDD	R.8 FDD	R.9 FDD
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		8504	14112	30576	46888	61664
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9			2	3	5	8	11
For Sub-Frame 5			n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		11340	18900	41400	62100	82800
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		7.449	12.547	27.294	42.046	55.498
UE Category			1-5	2-5	2-5	2-5	3-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

Parameter	Unit	Value					
Reference channel			R.0 FDD		R.1 FDD		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Allocated subframes per Radio Frame			10		10		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		224		256		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9			1		1		
For Sub-Frame 5			n/a		n/a		
For Sub-Frame 0			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		504		552		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.202		0.230		
UE Category			1-5		1-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		R.29 FDD (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		TBD
Allocated subframes per Radio Frame		4
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	256
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
For Sub-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Number of Code Blocks per Sub-Frame (Note 3)		
For Sub-Frames 4,9		1
For Sub-Frame 5		n/a
For Sub-Frame 0		1
For Sub-Frame 1,2,3,6,7,8		0 (MBSFN)
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	552
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	552
For Sub-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Max. Throughput averaged over 1 frame	kbps	76.8
UE Category		1-5
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)		

A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value					
Reference channel			R.10 FDD	R.11 FDD			R.30 FDD
Channel bandwidth	MHz		10	10			20
Allocated resource blocks			50	50			100
Allocated subframes per Radio Frame			10	10			10
Modulation			QPSK	16QAM			16QAM
Target Coding Rate			1/3	1/2			1/2
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		4392	12960			25456
For Sub-Frame 5	Bits		n/a	n/a			n/a
For Sub-Frame 0	Bits		4392	12960			25456
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		1	3			5
For Sub-Frame 5	Bits		n/a	n/a			n/a
For Sub-Frame 0	Bits		1	3			5
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		13200	26400			52800
For Sub-Frame 5	Bits		n/a	n/a			n/a
For Sub-Frame 0	Bits		12384	24768			51168
Max. Throughput averaged over 1 frame	Mbps		3.953	11.664			22.910
UE Category			1-5	2-5			2-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.3.3.2.2 Four antenna ports

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value					
Reference channel		R.12 FDD	R.13 FDD	R.14 FDD			
Channel bandwidth	MHz	1.4	10	10			
Allocated resource blocks		6	50	50			
Allocated subframes per Radio Frame		10	10	10			
Modulation		QPSK	QPSK	16QAM			
Target Coding Rate		1/3	1/3	1/2			
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	4392	12960			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	152	3624	11448			
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3			
For Sub-Frame 5		n/a	n/a	n/a			
For Sub-Frame 0		1	1	2			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1248	12800	25600			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	480	12032	24064			
Max. Throughput averaged over 1 frame	Mbps	0.342	3.876	11.513			
UE Category		1-5	1-5	2-5			
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.3.3.3 [RMC for UE-Specific Reference Symbols]

A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		R.4 TDD			R.2 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Uplink-Downlink Configuration (Note 4)		1			1		
Allocated subframes per Radio Frame (D+S)		4+2			4+2		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 4,9	Bits	408			4392		
For Sub-Frames 1,6	Bits	n/a			3240		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	208			4392		
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1			1		
For Sub-Frames 1,6		n/a			1		
For Sub-Frame 5		n/a			n/a		
For Sub-Frame 0		1			1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	1368			13800		
For Sub-Frames 1,6	Bits	n/a			11256		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	672			13104		
Max. Throughput averaged over 1 frame	Mbps	0.102			1.966		
UE Category		1-5			1-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point. Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: As per Table 4.2-2 in TS 36.211 [4] Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					R.3 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Uplink-Downlink Configuration (Note 3)					1		
Allocated subframes per Radio Frame (D+S)					4+2		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits				14112		
For Sub-Frames 1,6	Bits				11448		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9					3		
For Sub-Frames 1,6					2		
For Sub-Frame 5					n/a		
For Sub-Frame 0					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits				27600		
For Sub-Frames 1,6	Bits				22512		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				26208		
Max. Throughput averaged over 1 frame	Mbps				6.408		
UE Category					2-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: As per Table 4.2-2 in TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
			R.5 TDD	R.6 TDD	R.7 TDD	R.8 TDD	R.9 TDD
Reference channel							
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Uplink-Downlink Configuration (Note 3)			1	1	1	1	1
Allocated subframes per Radio Frame (D+S)			4+2	4+2	4+2	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 4,9	Bits		8504	14112	30576	46888	61664
For Sub-Frames 1,6	Bits		6968	11448	23688	35160	46888
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		6968	12576	30576	45352	61664
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9			2	3	5	8	11
For Sub-Frames 1,6			2	2	4	6	8
For Sub-Frame 5			n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		11340	18900	41400	62100	82800
For Sub-Frames 1,6	Bits		9828	16668	33768	50868	67968
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		9252	16812	39312	60012	80712
Max. Throughput averaged over 1 frame	Mbps		3.791	6.370	13.910	20.945	27.877
UE Category			1-5	2-5	2-5	2-5	3-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: As per Table 4.2-2 TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit	Value					
Reference channel			R.0 TDD		R.1 TDD		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Uplink-Downlink Configuration (Note 3)			1		1		
Allocated subframes per Radio Frame (D+S)			4+2		4+2		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits		224		256		
For Sub-Frames 1,6	Bits		208		208		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9			1		1		
For Sub-Frames 1,6			1		1		
For Sub-Frame 5			n/a		n/a		
For Sub-Frame 0			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		504		552		
For Sub-Frames 1,6	Bits		456		456		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.109		0.118		
UE Category			1-5		1-5		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: As per Table 4.2-2 in TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		R.29 TDD (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		[TBD]
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		2+2
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	208
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
Number of Code Blocks per Sub-Frame (Note 4)		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	1
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	1
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	456
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	552
Max. Throughput averaged over 1 frame	kbps	67.2
UE Category		1-5
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: as per Table 4.2-2 in TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)		

A.3.4.2 Multi-antenna transmission (Common Reference Signals)

A.3.4.2.1 Two antenna ports

Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value					
Reference channel			R.10 TDD	R.11 TDD	[R.11-1 TDD]		R.30 TDD
Channel bandwidth	MHz		10	10	10		20
Allocated resource blocks			50	50	50		100
Uplink-Downlink Configuration (Note 3)			1	1	1		1
Allocated subframes per Radio Frame (D+S)			4+2	4+2	4+2		4+2
Modulation			QPSK	16QAM	16QAM		16QAM
Target Coding Rate			1/3	1/2	1/2		1/2
Information Bit Payload							
For Sub-Frames 4,9	Bits		4392	12960	12960		25456
For Sub-Frames 1,6			3240	9528	9528		22920
For Sub-Frame 5	Bits		n/a	n/a	n/a		n/a
For Sub-Frame 0	Bits		4392	12960	n/a		25456
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9			1	3	3		5
For Sub-Frames 1,6			1	2	2		4
For Sub-Frame 5			n/a	n/a	n/a		n/a
For Sub-Frame 0			1	3	n/a		5
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		13200	26400	26400		52800
For Sub-Frames 1,6			10656	21312	21312		42912
For Sub-Frame 5	Bits		n/a	n/a	n/a		n/a
For Sub-Frame 0	Bits		12528	25056	n/a		51456
Max. Throughput averaged over 1 frame	Mbps		1.966	5.794	4.498		12.221
UE Category			1-5	2-5	2-5		2-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: As per Table 4.2-2 in TS 36.211 [4] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.3.4.2.2 Four antenna ports

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value					
Reference channel		R.12 TDD	R.13 TDD	R.14 TDD			
Channel bandwidth	MHz	1.4	10	10			
Allocated resource blocks		6	50	50			
Uplink-Downlink Configuration (Note 4)		1	1	1			
Allocated subframes per Radio Frame (D+S)		4+2	4+2	4+2			
Modulation		QPSK	QPSK	16QAM			
Target Coding Rate		1/3	1/3	1/2			
Information Bit Payload							
For Sub-Frames 4,9	Bits	408	4392	12960			
For Sub-Frames 1,6	Bits	n/a	3240	9528			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	208	4392	n/a			
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	1	3			
For Sub-Frames 1,6		n/a	1	2			
For Sub-Frame 5		n/a	n/a	n/a			
For Sub-Frame 0		1	1	n/a			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	1248	12800	25600			
For Sub-Frames 1,6		n/a	10256	20512			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	624	12176	n/a			
Max. Throughput averaged over 1 frame	Mbps	0.102	1.966	4.498			
UE Category		1-5	1-5	2-5			
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point. Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 4: As per Table 4.2-2 in TS 36.211 [4] Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.3.4.3 [RMC for UE-Specific Reference Symbols]

Table A.3.4.3-1: Fixed Reference Channel for UE-specific reference symbols

Parameter	Unit	Value			
		R.25 TDD	R.26 TDD	R.27 TDD	R.28 TDD
Reference channel					
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		50 ⁴	50 ⁴	50 ⁴	1
Uplink-Downlink Configuration (Note 3)		1	1	1	1
Allocated subframes per Radio Frame (D+S)		4+2	4+2	4+2	4+2
Modulation		QPSK	16QAM	64QAM	16QAM
Target Coding Rate		1/3	1/2	3/4	1/2
Information Bit Payload					
For Sub-Frames 4,9	Bits	4392	12960	28336	224
For Sub-Frames 1,6	Bits	3240	9528	22920	176
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	9528	22152	224
Number of Code Blocks per Sub-Frame (Note 5)					
For Sub-Frames 4,9		1	3	5	1
For Sub-Frames 1,6		1	2	4	1
For Sub-Frame 5		n/a	n/a	n/a	n/a
For Sub-Frame 0		1	2	4	1
Binary Channel Bits Per Sub-Frame					
For Sub-Frames 4,9	Bits	12600	25200	37800	504
For Sub-Frames 1,6	Bits	10356	20712	31068	420
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	10332	20664	30996	504
Max. Throughput averaged over 1 frame	Mbps	1.825	5.450	12.466	0.102
UE Category		1-5	2-5	2-5	1-5
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: as per Table 4.2-2 in TS 36.211 [4] Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1–9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)					

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

Parameter	Unit	Value		
		R.15 FDD	R.16 FDD	R.17 FDD
Reference channel		1	2	4
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 2	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	31	31	46

A.3.5.2 TDD

Table A.3.5.2-1: Reference Channel TDD

Parameter	Unit	Value		
		R.15 TDD	R.16 TDD	R.17 TDD
Reference channel		1	2	4
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 2	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	34	34	49

A.3.6 Reference measurement channels for PHICH performance requirements

Table A.3.6-1: Reference Channel FDD/TDD

Parameter	Unit	Value			
		R.18	R.19	R.20	R.24
Reference channel		1	2	4	1
Number of transmitter antennas		1	2	4	1
Channel bandwidth	MHz	10	1.4	10	10
User roles (Note 1)		[W I1 I2]	[W I1 I2]	[W I1 I2]	[W I1]
Resource allocation (Note 2)		[(0,0) (0,1) (0,4)]	[(0,0) (0,1) (0,4)]	[(0,0) (0,1) (0,4)]	[(0,0) (0,1)]
Power offsets (Note 3)	dB	[-4 0 -3]	[-4 0 -3]	[-4 0 -3]	[0 -3]
Payload (Note 4)		[A R R]	[A R R]	[A R R]	[A R]
Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2. Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH). The remaining PHICH groups (other than group zero) shall contain zeros. Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user. Note 4: A=fix ACK, R=random ACK/NACK.					

A.3.7 Reference measurement channels for PBCH performance requirements

Table A.3.7-1: Reference Channel FDD/TDD

Parameter	Unit	Value		
Reference channel		R.21	R.22	R.23
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	1.4	1.4	1.4
Modulation		QPSK	QPSK	QPSK
Target coding rate		40/1920	40/1920	40/1920
Payload (without CRC)	Bits	24	24	24

A.4 CSI reference measurement channels

This section defines the DL signal applicable to the reporting of channel quality information (Clause 9.2, 9.3 and 9.5).

The reference channel in Table A.4-1 complies with the CQI definition specified in Sec. 7.2.3 of [6]. Table A.4-3 specifies the transport format corresponding to each CQI for single antenna transmission. Table A.4-3a specifies the transport format corresponding to each CQI for dual antenna transmission.

Table A.4-1: Reference channel for CQI requirements (FDD) full PRB allocation

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10	15	20	
Allocated resource blocks		6	15	25	50	75	100	
Subcarriers per resource block		12	12	12	12	12	12	
Allocated subframes per Radio Frame		8	8	8	8	8	8	
Modulation					Table A.4-3	Table A.4-3a		
Target coding rate					Table A.4-3	Table A.4-3a		
Number of HARQ Processes	Processes	8	8	8	8	8	8	
Maximum number of HARQ transmissions		1	1	1	1	1	1	
Note 1: 3 symbols allocated to PDCCH								
Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-2: Reference channel for CQI requirements (TDD) full PRB allocation

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10	15	20	
Allocated resource blocks		6	15	25	50	75	100	
Subcarriers per resource block		12	12	12	12	12	12	
Allocated subframes per Radio Frame		4	4	4	4	4	4	
Modulation					Table A.4-3	Table A.4-3a		
Target coding rate					Table A.4-3	Table A.4-3a		
Number of HARQ Processes	Processes	10	10	10	10	10	10	
Maximum number of HARQ transmissions		1	1	1	1	1	1	
Note 1: 3 symbols allocated to PDCCH								
Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-3: Transport format corresponding to each CQI index for 50 PRB allocation single antenna transmission

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	1384	12600	0.1117
2	QPSK	0.1172	0	1384	12600	0.1117
3	QPSK	0.1885	2	2216	12600	0.1778
4	QPSK	0.3008	4	3624	12600	0.2895
5	QPSK	0.4385	6	5160	12600	0.4114
6	QPSK	0.5879	8	6968	12600	0.5549
7	16QAM	0.3691	11	8760	25200	0.3486
8	16QAM	0.4785	13	11448	25200	0.4552
9	16QAM	0.6016	16	15264	25200	0.6067
10	64QAM	0.4551	18	16416	37800	0.4349
11	64QAM	0.5537	21	21384	37800	0.5663
12	64QAM	0.6504	23	25456	37800	0.6741
13	64QAM	0.7539	25	28336	37800	0.7503
14	64QAM	0.8525	27	31704	37800	0.8394
15	64QAM	0.9258	27	31704	37800	0.8394

Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.

Table A.4-3a: Transport format corresponding to each CQI index for 50 PRB allocation dual antenna transmission

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	1384	12000	0.1173
2	QPSK	0.1172	0	1384	12000	0.1173
3	QPSK	0.1885	2	2216	12000	0.1867
4	QPSK	0.3008	4	3624	12000	0.3040
5	QPSK	0.4385	6	5160	12000	0.4320
6	QPSK	0.5879	8	6968	12000	0.5827
7	16QAM	0.3691	11	8760	24000	0.3660
8	16QAM	0.4785	13	11448	24000	0.4780
9	16QAM	0.6016	15	14112	24000	0.5890
10	64QAM	0.4551	18	16416	36000	0.4567
11	64QAM	0.5537	20	19848	36000	0.5520
12	64QAM	0.6504	22	22920	36000	0.6373
13	64QAM	0.7539	24	27376	36000	0.7611
14	64QAM	0.8525	26	30576	36000	0.8500
15	64QAM	0.9258	27	31704	36000	0.8813

Note1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.

Table A.4-4: Reference channel for CQI requirements (FDD) 6 PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	8	8	8	8	8
Modulation					Table A.4-6		
Target coding rate					Table A.4-6		
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH							
Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead							

Table A.4-5: Reference channel for CQI requirements (TDD) 6 PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		4	4	4	4	4	4
Modulation					Table A.4-6		
Target coding rate					Table A.4-6		
Number of HARQ Processes	Processes	10	10	10	10	10	10
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH							
Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead							

Table A.4-6: Transport format corresponding to each CQI index for 6 PRB allocation

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	152	1512	0.1005
2	QPSK	0.1172	0	152	1512	0.1005
3	QPSK	0.1885	2	256	1512	0.1693
4	QPSK	0.3008	4	408	1512	0.2698
5	QPSK	0.4385	6	600	1512	0.3968
6	QPSK	0.5879	8	808	1512	0.5344
7	16QAM	0.3691	11	1032	3024	0.3413
8	16QAM	0.4785	13	1352	3024	0.4471
9	16QAM	0.6016	16	1800	3024	0.5952
10	64QAM	0.4551	19	2152	4536	0.4744
11	64QAM	0.5537	21	2600	4536	0.5732
12	64QAM	0.6504	23	2984	4536	0.6578
13	64QAM	0.7539	25	3496	4536	0.7707
14	64QAM	0.8525	27	3752	4536	0.8272
15	64QAM	0.9258	27	3752	4536	0.8272
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.						

A.5 OFDMA Channel Noise Generator (OCNG)

A.5.1 OCNG Patterns for FDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i\_RA / OCNG\_RA = PDSCH_i\_RB / OCNG\_RB,$$

where γ_i denotes the relative power level of the i :th virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

A.5.1.1 OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	
0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.			
Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.			

A.5.1.2 OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB} - 1$.

Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	
0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.			
Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.			

A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

Allocation n_{PRB}	Relative power level γ_{PRB} [dB]				PDSCH Data	PMCH Data
	Subframe					
	0	5	4, 9	1 – 3, 6 – 8		

1 – 49	0	0 (Allocation: all empty PRB-s)	0	N/A	Note 1	N/A
0 – 49	N/A	N/A	N/A	0	N/A	Note 2
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter γ_{PRB} is used to scale the power of PMCH. Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. N/A: Not Applicable						

A.5.2 OCNG Patterns for TDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i\_RA / OCNG\_RA = PDSCH_i\_RB / OCNG\_RB,$$

where γ_i denotes the relative power level of the i :th virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

A.5.2.1 OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern

Relative power level γ_{PRB} [dB]				PDSCH Data
Subframe (only if available for DL)				
0	5	3, 4, 7, 8, 9 and 6 (as normal subframe) ^{Note 2}	1 and 6 (as special subframe) ^{Note 2}	
Allocation				
First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	
0	0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.				
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211				
Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.				

A.5.2.2 OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB} - 1$.

Table A.5.2.2-1: OP.2 TDD: Two sided dynamic OCNG TDD Pattern

Relative power level γ_{PRB} [dB]				PDSCH Data
Subframe (only if available for DL)				
0	5	3, 4, 6, 7, 8, 9 (6 as normal subframe) ^{Note 2}	1,6 (6 as special subframe) ^{Note 2}	
Allocation				
0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB} - 1$)	
[0]	[0]	[0]	[0]	
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.				
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211				
Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.				

A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.2. 3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity

Allocation n_{PRB}	Relative power level γ_{PRB} [dB]				PDSCH Data	PMCH Data
	Subframe					
	0	5	4, 9 ^{Note 2}	1, 6		
1 – 49	0	0 (Allocation: all empty PRB-s)	N/A	0	Note 1	N/A
0 – 49	N/A	N/A	0	N/A	N/A	Note 3

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.

Note 3: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals

Note 4: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

Annex B (normative): Propagation conditions

B.1 Static propagation condition

For 2 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}.$$

B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.
- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.
- Additional multi-path models used for CQI (Channel Quality Indication) tests

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1 Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

Table B.2.1-2 Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3 Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4 Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies

Table B.2.2-1 Channel model parameters

Model	Maximum Doppler frequency
EPA 5Hz	5 Hz
EVA 5Hz	5 Hz
EVA 70Hz	70 Hz
ETU 70Hz	70 Hz
ETU 300Hz	300 Hz

B.2.3 MIMO Channel Correlation Matrices

B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1 eNodeB correlation matrix

	One antenna	Two antennas	Four antennas
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & \mathbf{1} \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{pmatrix}$

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2 UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & \mathbf{1} \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{pmatrix}$

Table B.2.3.1-3 defines the channel spatial correlation matrix R_{spat} . The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3: R_{spat} correlation matrices

1x2 case	$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
2x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$
4x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
4x4 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{bmatrix}$

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The α and β for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1

Low correlation		Medium Correlation		High Correlation	
α	β	α	β	α	β
0	0	0.3	0.9	0.9	0.9

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.1-2, B.2.3.2-3 and B.2.3.2-4, as below.

The values in Table B.2.3.2-2 have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + a\mathbf{I}_n]/(1+a)$$

Where the value “a” is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$
2x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$
4x4 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.8999 & 0.8894 & 0.8587 & 0.8099 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.8894 & 0.8999 & 0.8894 & 0.8587 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.8587 & 0.8894 & 0.8999 & 0.8894 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8099 & 0.8587 & 0.8894 & 0.8999 \\ 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 \\ 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 \\ 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 \\ 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 \\ 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 \\ 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 \\ 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 \\ 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 \\ 0.8999 & 0.8894 & 0.8587 & 0.8099 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.8894 & 0.8999 & 0.8894 & 0.8587 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.8587 & 0.8894 & 0.8999 & 0.8894 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.8099 & 0.8587 & 0.8894 & 0.8999 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{bmatrix}$

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

2x2 case	N/A
2x2 case	$R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$

2x2 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 & 0.3000 & 0.2700 \\ 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 & 0.2700 & 0.3000 \\ 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 \\ 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 \\ 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 \\ 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 \\ 0.3000 & 0.2700 & 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 \\ 0.2700 & 0.3000 & 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 \end{pmatrix}$
4x4 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.3000 & 0.2965 & 0.2862 & 0.2700 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.2965 & 0.3000 & 0.2965 & 0.2862 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.2862 & 0.2965 & 0.3000 & 0.2965 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.2700 & 0.2862 & 0.2965 & 0.3000 \\ 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 \\ 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 \\ 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 \\ 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 \\ 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 \\ 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 \\ 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 \\ 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 \\ 0.3000 & 0.2965 & 0.2862 & 0.2700 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.2965 & 0.3000 & 0.2965 & 0.2862 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.2862 & 0.2965 & 0.3000 & 0.2965 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.2700 & 0.2862 & 0.2965 & 0.3000 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{pmatrix}$

Table B.2.3.2-4: MIMO correlation matrices for low correlation

1x2 case	$R_{low} = \mathbf{I}_2$
2x2 case	$R_{low} = \mathbf{I}_4$
4x2 case	$R_{low} = \mathbf{I}_8$
4x4 case	$R_{low} = \mathbf{I}_{16}$

In Table B.2.3.2-4, $\mathbf{I}_d$ is the $d \times d$ identity matrix.

B.2.4 Propagation conditions for CQI tests

[For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:

$$h(t, \tau) = \delta(\tau) + a \exp(-i2\pi f_D t) \delta(\tau - \tau_d),$$

in continuous time (t, τ) representation, with τ_d the delay, a a constant and f_D the Doppler frequency.]

B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos \theta(t) \quad (\text{B.3.1})$$

where $f_s(t)$ is the Doppler shift and f_d is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos \theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}^2 + (D_s/2 - vt)^2}}, \quad 0 \leq t \leq D_s/v \quad (\text{B.3.2})$$

$$\cos \theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}^2 + (-1.5D_s + vt)^2}}, \quad D_s/v < t \leq 2D_s/v \quad (\text{B.3.3})$$

$$\cos \theta(t) = \cos \theta(t \bmod (2D_s/v)), \quad t > 2D_s/v \quad (\text{B.3.4})$$

where $D_s/2$ is the initial distance of the train from eNodeB, and $D_{\min}$ is eNodeB Railway track distance, both in meters; v is the velocity of the train in m/s, t is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1 and B.3.2-B.3.4 respectively, where the required input parameters listed in table B.3-1 and the resulting Doppler shift shown in Figure B.3-1 are applied for all frequency bands.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
$D_{\min}$	2 m
v	300 km/h
f_d	750 Hz

NOTE 1: Parameters for HST conditions in table B.3-1 including f_d and Doppler shift trajectories presented on figure B.3-1 were derived for Band 7.

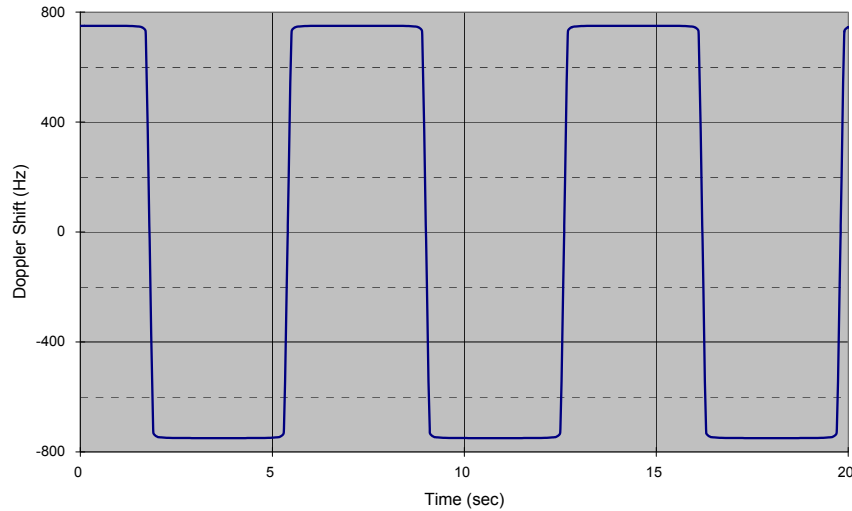


Figure B.3-1: Doppler shift trajectory

B.4 Beamforming Model

B.4.1 Single-layer beamforming (Antenna port 5)

Transmission on antenna port 5 is defined by using a precoder vector $W(i)$ of size 2×1 randomly selected from Table 6.3.4.2.3-1 in [4] as the beamforming weight. This precoder takes as an input the signal $y^{(p)}(i)$, $i = 0, 1, \dots, M_{\text{symp}}^{\text{ap}} - 1$, for antenna port $p = 5$, with $M_{\text{symp}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DRS), and generates a block of signals $y_{bf}(i) = [y_{bf}(i) \quad \tilde{y}_{bf}(i)]^T$ the elements of which is to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i)y^{(5)}(i)$$

Precoder update granularity is according to Table 8.3.2-1.

Annex C (normative): Downlink Physical Channels

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

**Table C.2-1: Downlink Physical Channels required
for connection set-up**

Physical Channel
PBCH
SSS
PSS
PCFICH
PDCCH
PHICH
PDSCH

C.3 Connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PCFICH	PCFICH_RB = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
OCNG	OCNG_RA = 0 dB	
	OCNG_RB = 0 dB	

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		0 dB	

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH_RA = ρ_A	
	PBCH_RB = ρ_B	
PSS	PSS_RA = ρ_A	
SSS	SSS_RA = ρ_A	
PCFICH	PCFICH_RB = ρ_B	
PDCCH	PDCCH_RA = ρ_A	
	PDCCH_RB = ρ_B	
PDSCH	PDSCH_RA = ρ_A	
	PDSCH_RB = ρ_B	
OCNG	OCNG_RA = ρ_A	
	OCNG_RB = ρ_B	

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		Test specific	1. Applies for antenna port p

Annex D (normative): Characteristics of the interfering signal

D.1 General

When the channel band width is wider or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel band widths below 5MHz, the band width of modulated interferer should be equal to band width of the received signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth					
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
BW _{interferer}	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz
RB	6	15	25	25	25	25

Annex E (normative): Environmental conditions

E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

E.2 Environmental

The requirements in this clause apply to all types of UE(s).

E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

+15°C to +35°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°C	for extreme conditions (see IEC publications 68-2-1 and 68-2-2)

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table E.2.2-1

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries:			
Leclanché	0,85 * nominal	Nominal	Nominal
Lithium	0,95 * nominal	1,1 * Nominal	1,1 * Nominal
Mercury/nickel & cadmium	0,90 * nominal		Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table E.2.3-1

Frequency	ASD (Acceleration Spectral Density) random vibration
5 Hz to 20 Hz	0,96 m ² /s ³
20 Hz to 500 Hz	0,96 m ² /s ³ at 20 Hz, thereafter –3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 for extreme operation.

Annex F (normative): Transmit modulation

F.1 Measurement Point

Figure F.1-1 shows the measurement point for the unwanted emission falling into non-allocated RB(s) and the EVM for the allocated RB(s).

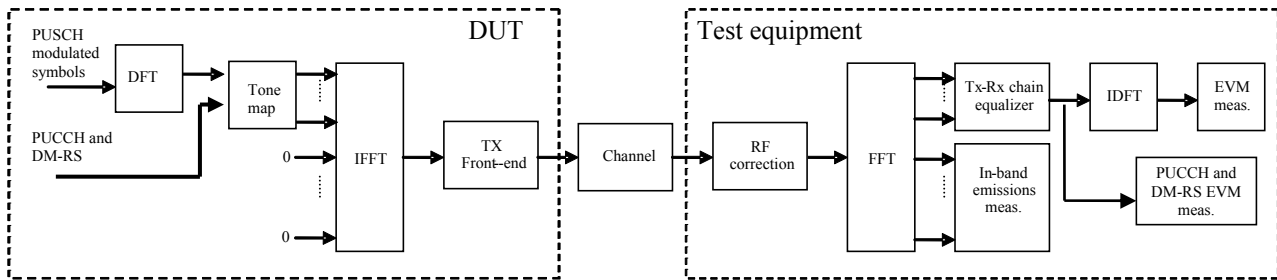


Figure F.1-1: EVM measurement points

F.2 Basic Error Vector Magnitude measurement

The EVM is the difference between the ideal waveform and the measured waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{v \in T_m} |z'(v) - i(v)|^2}{|T_m| \cdot P_0}},$$

where

T_m is a set of $|T_m|$ modulation symbols with the considered modulation scheme being active within the measurement period,

$z'(v)$ are the samples of the signal evaluated for the EVM,

$i(v)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

The basic EVM measurement interval is defined over one slot in the time domain for PUCCH and PUSCH and over one preamble sequence for the PRACH.

F.3 Basic in-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks. The in-band emission requirement is evaluated for PUCCH and PUSCH transmissions. The in-band emission requirement is not evaluated for PRACH transmissions.

The in-band emissions are measured as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{f_l + (12 \cdot \Delta_{RB} + 11) \Delta f}^{\max(f_{\min}, f_l + 12 \cdot \Delta_{RB} \Delta f)} |Y(t, f)|^2, \Delta_{RB} < 0 \\ \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{f_h + (12 \cdot \Delta_{RB} - 11) \Delta f}^{\min(f_{\max}, f_h + 12 \cdot \Delta_{RB} \Delta f)} |Y(t, f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

T_s is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB),

$f_{\min}$ (resp. $f_{\max}$) is the lower (resp. upper) edge of the UL system BW,

f_l and f_h are the lower and upper edge of the allocated BW, and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii)

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot N_{RB}} \sum_{t \in T_s} \sum_{f_l}^{f_l + (12 \cdot N_{RB} - 1) \Delta f} |Y(t, f)|^2}$$

where

N_{RB} is the number of allocated RBs

The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

In the evaluation of in-band emissions, the timing is set according to $\Delta \tilde{t} = \Delta \tilde{c}$, where sample time offsets $\Delta \tilde{t}$ and $\Delta \tilde{c}$ are defined in subclause F.4.

F.4 Modified signal under test

Implicit in the definition of EVM is an assumption that the receiver is able to compensate a number of transmitter impairments.

The PUSCH data or PRACH signal under test is modified and, in the case of PUSCH data signal, decoded according to::

$$Z'(t, f) = IDFT \left\{ \frac{FFT \left\{ z(v - \Delta \tilde{t}) \cdot e^{-j2\pi \Delta \tilde{f} v} \right\} e^{j2\pi f \Delta \tilde{t}}}{\tilde{a}(t, f) \cdot e^{j\tilde{\varphi}(t, f)}} \right\}$$

where

$z(v)$ is the time domain samples of the signal under test.

The PUCCH or PUSCH demodulation reference signal or PUCCH data signal under test is equalised and, in the case of PUCCH data signal decoded according to:

$$Z'(t, f) = \frac{FFT \left\{ z(v - \Delta \tilde{t}) \cdot e^{-j2\pi \Delta \tilde{f} v} \right\} e^{j2\pi f \Delta \tilde{t}}}{\tilde{a}(t, f) \cdot e^{j\tilde{\varphi}(t, f)}}$$

where

$z(v)$ is the time domain samples of the signal under test.

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

$\Delta \tilde{t}$ is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

$\Delta \tilde{f}$ is the RF frequency offset.

$\tilde{\varphi}(t, f)$ is the phase response of the TX chain.

$\tilde{a}(t, f)$ is the amplitude response of the TX chain.

In the following $\Delta \tilde{c}$ represents the middle sample of the EVM window of length W (defined in the next subsections) or the last sample of the first window half if W is even.

The EVM analyser shall

- detect the start of each slot and estimate $\Delta \tilde{t}$ and $\Delta \tilde{f}$,
- determine $\Delta \tilde{c}$ so that the EVM window of length W is centred
 - on the time interval determined by the measured cyclic prefix minus 16 samples of the considered OFDM symbol for symbol 0 for normal CP, i.e. the first 16 samples of the CP should not be taken into account for this step. In the determination of the number of excluded samples, a sampling rate of 30.72MHz was assumed. If a different sampling rate is used, the number of excluded samples is scaled linearly.
 - on the measured cyclic prefix of the considered OFDM symbol for symbol 1 to 6 for normal CP and for symbol 0 to 5 for extended CP.
 - on the measured preamble cyclic prefix for the PRACH

To determine the other parameters a sample timing offset equal to $\Delta \tilde{c}$ is corrected from the signal under test. The EVM analyser shall then

- correct the RF frequency offset $\Delta \tilde{f}$ for each time slot, and
- apply an FFT of appropriate size. The chosen FFT size shall ensure that in the case of an ideal signal under test, there is no measured inter-subcarrier interference.

The IQ origin offset shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative IQ origin offset power (relative carrier leakage power) also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. In the case of PUCCH and PUSCH EVM, the signal on the non-allocated RB(s), $Y(t, f)$, is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s).

- In the case of PUCCH and PUSCH, the UL EVM analyzer shall estimate the TX chain equalizer coefficients $\tilde{a}(t, f)$ and $\tilde{\varphi}(t, f)$ used by the ZF equalizer for all subcarriers by time averaging at each signal subcarrier of the amplitude and phase of the reference and data symbols. The time-averaging length is 1 slot. This process creates an average amplitude and phase for each signal subcarrier used by the ZF equalizer. The knowledge of data modulation symbols may be required in this step because the determination of symbols by demodulation is not reliable before signal equalization.
- In the case of PRACH, the UL EVM analyzer shall estimate the TX chain coefficients $\tilde{a}(t)$ and $\tilde{\varphi}(t)$ used for phase and amplitude correction and are selected so as to minimize the resulting EVM. The TX chain coefficients are not dependent on frequency, i.e. $\tilde{a}(t, f) = \tilde{a}(t)$ and $\tilde{\varphi}(t, f) = \tilde{\varphi}(t)$. The TX chain coefficient are chosen independently for each preamble transmission and for each $\Delta\tilde{t}$.

At this stage estimates of $\Delta\tilde{f}$, $\tilde{a}(t, f)$, $\tilde{\varphi}(t, f)$ and $\Delta\tilde{c}$ are available. $\Delta\tilde{t}$ is one of the extremities of the window W , i.e. $\Delta\tilde{t}$ can be $\Delta\tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$ or $\Delta\tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$, where $\alpha = 0$ if W is odd and $\alpha = 1$ if W is even. The EVM analyser shall then

- calculate EVM_l with $\Delta\tilde{t}$ set to $\Delta\tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$,
- calculate EVM_h with $\Delta\tilde{t}$ set to $\Delta\tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$.

F.5 Window length

F.5.1 Timing offset

As a result of using a cyclic prefix, there is a range of $\Delta\tilde{t}$, which, at least in the case of perfect Tx signal quality, would give close to minimum error vector magnitude. As a first order approximation, that range should be equal to the length of the cyclic prefix. Any time domain windowing or FIR pulse shaping applied by the transmitter reduces the $\Delta\tilde{t}$ range within which the error vector is close to its minimum.

F.5.2 Window length

The window length W affects the measured EVM, and is expressed as a function of the configured cyclic prefix length. In the case where equalization is present, as with frequency domain EVM computation, the effect of FIR is reduced. This is because the equalization can correct most of the linear distortion introduced by the FIR. However, the time domain windowing effect can't be removed.

F.5.3 Window length for normal CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for normal CP. The nominal window length for 3 MHz is rounded down one sample to allow the window to be centered on the symbol.

Table F.5.3-1 EVM window length for normal CP

Channel Bandwidth MHz	Cyclic prefix length ¹ N_{cp} for symbol 0	Cyclic prefix length ¹ N_{cp} for symbols 1 to 6	Nominal FFT size	Cyclic prefix for symbols 1 to 6 in FFT samples	EVM window length W in FFT samples	Ratio of W to CP for symbols 1 to 6 ²
1.4	160	144	128	9	[5]	[55.6]
3			256	18	[12]	[66.7]
5			512	36	[32]	[88.9]
10			1024	72	[66]	[91.7]
15			1536	108	[102]	[94.4]
20			2048	144	[136]	[94.4]
Note 1:	The unit is number of samples, sampling rate of 30.72MHz is assumed.					
Note 2:	These percentages are informative and apply to symbols 1 through 6. Symbol 0 has a longer CP and therefore a lower percentage.					

F.5.4 Window length for Extended CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for extended CP. The nominal window lengths for 3 MHz and 15 MHz are rounded down one sample to allow the window to be centered on the symbol.

Table F.5.4-1 EVM window length for extended CP

Channel Bandwidth MHz	Cyclic prefix length ¹ N_{cp}	Nominal FFT size	Cyclic prefix in FFT samples	EVM window length W in FFT samples	Ratio of W to CP ²
1.4	512	128	32	[28]	[87.5]
3		256	64	[58]	[90.6]
5		512	128	[124]	[96.9]
10		1024	256	[250]	[97.4]
15		1536	384	[374]	[97.4]
20		2048	512	[504]	[98.4]
Note 1:	The unit is number of samples, sampling rate of 30.72MHz is assumed.				
Note 2:	These percentages are informative				

F.5.4 Window length for PRACH

The table below specifies the EVM window length for PRACH preamble formats 0-4.

Table F.5.5-1 EVM window length for PRACH

Preamble format	Cyclic prefix length ¹ N_{cp}	Nominal FFT size ²	EVM window length W in FFT samples	Ratio of W to CP*
0	3168	24576	[TBD]	[TBD]
1	21024	24576	[TBD]	[TBD]
2	6240	49152	[TBD]	[TBD]
3	21024	49152	[TBD]	[TBD]
4	448	4096	[TBD]	[TBD]
Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed				
Note 2: The use of other FFT sizes is possible as long as appropriate scaling of the window length is applied				
Note 3: These percentages are informative				

F.6 Averaged EVM

The general EVM is averaged over basic EVM measurements for 20 slots in the time domain.

$$\overline{EVM} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_i^2}$$

The EVM requirements shall be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{EVM}_l$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_l$ in the expressions above and $\overline{EVM}_h$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_h$.

Thus we get:

$$EVM = \max(\overline{EVM}_l, \overline{EVM}_h)$$

The calculation of the EVM for the demodulation reference signal, EVM_{DMRS} , follows the same procedure as calculating the general EVM, with the exception that the modulation symbol set T_m defined in clause F.2 is restricted to symbols containing uplink demodulation reference signals.

The basic EVM_{DMRS} measurements are first averaged over 20 slots in the time domain to obtain an intermediate average $\overline{EVM}_{DMRS}$.

$$\overline{EVM}_{DMRS} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_{DMRS,i}^2}$$

In the determination of each $EVM_{DMRS,i}$, the timing is set to $\Delta\tilde{t} = \Delta\tilde{t}_l$ if $\overline{EVM}_l > \overline{EVM}_h$, and it is set to

$\Delta\tilde{t} = \Delta\tilde{t}_h$ otherwise, where $\overline{EVM}_l$ and $\overline{EVM}_h$ are the general average EVM values calculated in the same 20 slots over which the intermediate average $\overline{EVM}_{DMRS}$ is calculated. Note that in some cases, the general average EVM may be calculated only for the purpose of timing selection for the demodulation reference signal EVM.

Then the results are further averaged to get the EVM for the demodulation reference signal, EVM_{DMRS} ,

$$EVM_{DMRS} = \sqrt{\frac{1}{6} \sum_{j=1}^6 \overline{EVM}_{DMRS,j}^2}$$

The PRACH EVM, EVM_{PRACH} , is averaged over two preamble sequence measurements for preamble formats 0, 1, 2, 3, and it is averaged over 10 preamble sequence measurements for preamble format 4.

The EVM requirements shall be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{EVM}_{PRACH,l}$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_l$ and $\overline{EVM}_{PRACH,h}$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_h$.

Thus we get:

$$EVM_{PRACH} = \max(\overline{EVM}_{PRACH,l}, \overline{EVM}_{PRACH,h})$$

F.7 Spectrum Flatness

The data shall be taken from FFT coded data symbols and the demodulation reference symbols of the allocated resource block.

Annex G (informative): Change history

Table G.1: Change History

Date	TSG#	TSG Doc.	CR	Subject	Old	New
11-2007	R4#45	R4-72206		TS36.101V0.1.0 approved by RAN4	-	
12-2007	RP#38	RP-070979		Approved version at TSG RAN #38	1.0.0	8.0.0
03-2008	RP#39	RP-080123	3	TS36.101 - Combined updates of E-UTRA UE requirements	8.0.0	8.1.0
05-2008	RP#40	RP-080325	4	TS36.101 - Combined updates of E-UTRA UE requirements	8.1.0	8.2.0
09-2008	RP#41	RP-080638	5r1	Addition of Ref Sens figures for 1.4MHz and 3MHz Channel bandwidths	8.2.0	8.3.0
09-2008	RP#41	RP-080638	7r1	Transmitter intermodulation requirements	8.2.0	8.3.0
09-2008	RP#41	RP-080638	10	CR for clarification of additional spurious emission requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	15	Correction of In-band Blocking Requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	18r1	TS36.101: CR for section 6: NS_06	8.2.0	8.3.0
09-2008	RP#41	RP-080638	19r1	TS36.101: CR for section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080638	20r1	TS36.101: CR for UE minimum power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	21r1	TS36.101: CR for UE OFF power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	24r1	TS36.101: CR for section 7: Band 13 Rx sensitivity	8.2.0	8.3.0
09-2008	RP#41	RP-080638	26	UE EVM Windowing	8.2.0	8.3.0
09-2008	RP#41	RP-080638	29	Absolute ACLR limit	8.2.0	8.3.0
09-2008	RP#41	RP-080731	23r2	TS36.101: CR for section 6: UE to UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	30	Removal of [] for UE Ref Sens figures	8.2.0	8.3.0
09-2008	RP#41	RP-080731	31	Correction of PA, PB definition to align with RAN1 specification	8.2.0	8.3.0
09-2008	RP#41	RP-080731	37r2	UE Spurious emission band UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	44	Definition of specified bandwidths	8.2.0	8.3.0
09-2008	RP#41	RP-080731	48r3	Addition of Band 17	8.2.0	8.3.0
09-2008	RP#41	RP-080731	50	Alignment of the UE ACS requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080731	52r1	Frequency range for Band 12	8.2.0	8.3.0
09-2008	RP#41	RP-080731	54r1	Absolute power tolerance for LTE UE power control	8.2.0	8.3.0
09-2008	RP#41	RP-080731	55	TS36.101 section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080732	6r2	DL FRC definition for UE Receiver tests	8.2.0	8.3.0
09-2008	RP#41	RP-080732	46	Additional UE demodulation test cases	8.2.0	8.3.0
09-2008	RP#41	RP-080732	47	Updated descriptions of FRC	8.2.0	8.3.0
09-2008	RP#41	RP-080732	49	Definition of UE transmission gap	8.2.0	8.3.0
09-2008	RP#41	RP-080732	51	Clarification on High Speed train model in 36.101	8.2.0	8.3.0
09-2008	RP#41	RP-080732	53	Update of symbol and definitions	8.2.0	8.3.0
09-2008	RP#41	RP-080743	56	Addition of MIMO (4x2) and (4x4) Correlation Matrices	8.2.0	8.3.0
12-2008	RP#42	RP-080908	94r2	CR TX RX channel frequency separation	8.3.0	8.4.0
12-2008	RP#42	RP-080909	105r1	UE Maximum output power for Band 13	8.3.0	8.4.0
12-2008	RP#42	RP-080909	60	UL EVM equalizer definition	8.3.0	8.4.0
12-2008	RP#42	RP-080909	63	Correction of UE spurious emissions	8.3.0	8.4.0
12-2008	RP#42	RP-080909	66	Clarification for UE additional spurious emissions	8.3.0	8.4.0
12-2008	RP#42	RP-080909	72	Introducing ACLR requirement for coexistence with UTRA 1.6MHZ channel from 36.803	8.3.0	8.4.0
12-2008	RP#42	RP-080909	75	Removal of [] from Section 6 transmitter characteristics	8.3.0	8.4.0
12-2008	RP#42	RP-080909	81	Clarification for PHS band protection	8.3.0	8.4.0
12-2008	RP#42	RP-080909	101	Alignment for the measurement interval for transmit signal quality	8.3.0	8.4.0
12-2008	RP#42	RP-080909	98r1	Maximum power	8.3.0	8.4.0
12-2008	RP#42	RP-080909	57r1	CR UE spectrum flatness	8.3.0	8.4.0
12-2008	RP#42	RP-080909	71r1	UE in-band emission	8.3.0	8.4.0
12-2008	RP#42	RP-080909	58r1	CR Number of TX exceptions	8.3.0	8.4.0
12-2008	RP#42	RP-080951	99r2	CR UE output power dynamic	8.3.0	8.4.0
12-2008	RP#42	RP-080951	79r1	LTE UE transmitter intermodulation	8.3.0	8.4.0
12-2008	RP#42	RP-080910	91	Update of Clause 8	8.3.0	8.4.0
12-2008	RP#42	RP-080950	106r1	Structure of Clause 9 including CSI requirements for PUCCH mode 1-0	8.3.0	8.4.0
12-2008	RP#42	RP-080911	59	CR UE ACS test frequency offset	8.3.0	8.4.0
12-2008	RP#42	RP-080911	65	Correction of spurious response parameters	8.3.0	8.4.0
12-2008	RP#42	RP-080911	80	Removal of LTE UE narrowband intermodulation	8.3.0	8.4.0
12-2008	RP#42	RP-080911	90r1	Introduction of Maximum Sensitivity Degradation	8.3.0	8.4.0

12-2008	RP#42	RP-080911	103	Removal of [] from Section 7 Receiver characteristic	8.3.0	8.4.0
12-2008	RP#42	RP-080912	62	Alignment of TB size n Ref Meas channel for RX characteristics	8.3.0	8.4.0
12-2008	RP#42	RP-080912	78	TDD Reference Measurement channel for RX characteristics	8.3.0	8.4.0
12-2008	RP#42	RP-080912	73r1	Addition of 64QAM DL reference measurement channel	8.3.0	8.4.0
12-2008	RP#42	RP-080912	74r1	Addition of UL Reference Measurement Channels	8.3.0	8.4.0
12-2008	RP#42	RP-080912	104	Reference measurement channels for PDSCH performance requirements (TDD)	8.3.0	8.4.0
12-2008	RP#42	RP-080913	68	MIMO Correlation Matrix Corrections	8.3.0	8.4.0
12-2008	RP#42	RP-080915	67	Correction to the figure with the Transmission Bandwidth configuration	8.3.0	8.4.0
12-2008	RP#42	RP-080916	77	Modification to EARFCN	8.3.0	8.4.0
12-2008	RP#42	RP-080917	85r1	New Clause 5 outline	8.3.0	8.4.0
12-2008	RP#42	RP-080919	102	Introduction of Bands 12 and 17 in 36.101	8.3.0	8.4.0
12-2008	RP#42	RP-080927	84r1	Clarification of HST propagation conditions	8.3.0	8.4.0
03-2009	RP#43	RP-090170	156r2	A-MPR table for NS_07	8.4.0	8.5.0
03-2009	RP#43	RP-090170	170	Corrections of references (References to tables and figures)	8.4.0	8.5.0
03-2009	RP#43	RP-090170	108	Removal of [] from Transmitter Intermodulation	8.4.0	8.5.0
03-2009	RP#43	RP-090170	155	E-UTRA ACLR for below 5 MHz bandwidths	8.4.0	8.5.0
03-2009	RP#43	RP-090170	116	Clarification of PHS band including the future plan	8.4.0	8.5.0
03-2009	RP#43	RP-090170	119	Spectrum emission mask for 1.4 MHz and 3 MHz bandwidths	8.4.0	8.5.0
03-2009	RP#43	RP-090170	120	Removal of "Out-of-synchronization handling of output power" heading	8.4.0	8.5.0
03-2009	RP#43	RP-090170	126	UE uplink power control	8.4.0	8.5.0
03-2009	RP#43	RP-090170	128	Transmission BW Configuration	8.4.0	8.5.0
03-2009	RP#43	RP-090170	130	Spectrum flatness	8.4.0	8.5.0
03-2009	RP#43	RP-090170	132r2	PUCCH EVM	8.4.0	8.5.0
03-2009	RP#43	RP-090170	134	UL DM-RS EVM	8.4.0	8.5.0
03-2009	RP#43	RP-090170	140	Removal of ACLR2bis requirements	8.4.0	8.5.0
03-2009	RP#43	RP-090171	113	In-band blocking	8.4.0	8.5.0
03-2009	RP#43	RP-090171	127	In-band blocking and sensitivity requirement for band 17	8.4.0	8.5.0
03-2009	RP#43	RP-090171	137r1	Wide band intermodulation	8.4.0	8.5.0
03-2009	RP#43	RP-090171	141	Correction of reference sensitivity power level of Band 9	8.4.0	8.5.0
03-2009	RP#43	RP-090172	109	AWGN level for UE DL demodulation performance tests	8.4.0	8.5.0
03-2009	RP#43	RP-090172	124	Update of Clause 8: additional test cases	8.4.0	8.5.0
03-2009	RP#43	RP-090172	139r1	Performance requirement structure for TDD PDSCH	8.4.0	8.5.0
03-2009	RP#43	RP-090172	142r1	Performance requirements and reference measurement channels for TDD PDSCH demodulation with UE-specific reference symbols	8.4.0	8.5.0
03-2009	RP#43	RP-090172	145	Number of information bits in DwPTS	8.4.0	8.5.0
03-2009	RP#43	RP-090172	160r1	MBSFN-Unicast demodulation test case	8.4.0	8.5.0
03-2009	RP#43	RP-090172	163r1	MBSFN-Unicast demodulation test case for TDD	8.4.0	8.5.0
03-2009	RP#43	RP-090173	162	Clarification of EARFCN for 36.101	8.4.0	8.5.0
03-2009	RP#43	RP-090369	110	Correction to UL Reference Measurement Channel	8.4.0	8.5.0
03-2009	RP#43	RP-090369	114	Addition of MIMO (4x4, medium) Correlation Matrix	8.4.0	8.5.0
03-2009	RP#43	RP-090369	121	Correction of 36.101 DL RMC table notes	8.4.0	8.5.0
03-2009	RP#43	RP-090369	125	Update of Clause 9	8.4.0	8.5.0
03-2009	RP#43	RP-090369	138r1	Clarification on OCNG	8.4.0	8.5.0
03-2009	RP#43	RP-090369	161	CQI reference measurement channels	8.4.0	8.5.0
03-2009	RP#43	RP-090369	164	PUCCH 1-1 Static Test Case	8.4.0	8.5.0
03-2009	RP#43	RP-090369	111	Reference Measurement Channel for TDD	8.4.0	8.5.0
03-2009	RP#44			Editorial correction in Table 6.2.4-1	8.5.0	8.5.1
05-2009	RP#44	RP-090540	167	Boundary between E-UTRA FOOB and spurious emission domain for 1.4 MHz and 3 MHz bandwidths. (Technically Endorsed CR in R4-50bis - R4-091205)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	168	EARFCN correction for TDD DL bands. (Technically Endorsed CR in R4-50bis - R4-091206)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	169	Editorial correction to in-band blocking table. (Technically Endorsed CR in R4-50bis - R4-091238)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	171	CR PRACH EVM. (Technically Endorsed CR in R4-50bis - R4-	8.5.1	8.6.0

				091308)		
05-2009	RP#44	RP-090540	172	CR EVM correction. (Technically Endorsed CR in R4-50bis - R4-091309)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	177	CR power control accuracy. (Technically Endorsed CR in R4-50bis - R4-091418)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	179	Correction of SRS requirements. (Technically Endorsed CR in R4-50bis - R4-091426)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	186	Clarification for EVM. (Technically Endorsed CR in R4-50bis - R4-091512)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	187	Removal of [] from band 17 Refsens values and ACS offset frequencies	8.5.1	8.6.0
05-2009	RP#44	RP-090540	191	Completion of band17 requirements	8.5.1	8.6.0
05-2009	RP#44	RP-090540	192	Removal of 1.4 MHz and 3 MHz bandwidths from bands 13, 14 and 17.	8.5.1	8.6.0
05-2009	RP#44	RP-090540	223	CR: 64 QAM EVM	8.5.1	8.6.0
05-2009	RP#44	RP-090540	201	CR In-band emissions	8.5.1	8.6.0
05-2009	RP#44	RP-090540	203	CR EVM exclusion period	8.5.1	8.6.0
05-2009	RP#44	RP-090540	204	CR In-band emissions timing	8.5.1	8.6.0
05-2009	RP#44	RP-090540	206	CR Minimum Rx exceptions	8.5.1	8.6.0
05-2009	RP#44	RP-090540	207	CR UL DM-RS EVM	8.5.1	8.6.0
05-2009	RP#44	RP-090540	218r1	A-MPR table for NS_07	8.5.1	8.6.0
05-2009	RP#44	RP-090540	205r1	CR In-band emissions in shortened subframes	8.5.1	8.6.0
05-2009	RP#44	RP-090540	200r1	CR PUCCH EVM	8.5.1	8.6.0
05-2009	RP#44	RP-090540	178r2	No additional emission mask indication. (Technically Endorsed CR in R4-50bis - R4-091421)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	220r1	Spectrum emission requirements for band 13	8.5.1	8.6.0
05-2009	RP#44	RP-090540	197r2	CR on aggregate power tolerance	8.5.1	8.6.0
05-2009	RP#44	RP-090540	196r2	CR: Rx IP2 performance	8.5.1	8.6.0
05-2009	RP#44	RP-090541	198r1	Maximum output power relaxation	8.5.1	8.6.0
05-2009	RP#44	RP-090542	166	Update of performance requirement for TDD PDSCH with MBSFN configuration. (Technically Endorsed CR in R4-50bis - R4-091180)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	175	Adding AWGN levels for some TDD DL performance requirements. (Technically Endorsed CR in R4-50bis - R4-091406)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	182	OCNG Patterns for Single Resource Block FRC Requirements. (Technically Endorsed CR in R4-50bis - R4-091504)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	170r1	Update of Clause 8: PHICH and PMI delay. (Technically Endorsed CR in R4-50bis - R4-091275)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	183	Requirements for frequency-selective fading test. (Technically Endorsed CR in R4-50bis - R4-091505)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	199	CQI requirements under AWGN conditions	8.5.1	8.6.0
05-2009	RP#44	RP-090543	188r1	Adaptation of UL-RMC-s for supporting more UE categories	8.5.1	8.6.0
05-2009	RP#44	RP-090543	193r1	Correction of the LTE UE downlink reference measurement channels	8.5.1	8.6.0
05-2009	RP#44	RP-090543	184r1	Requirements for frequency non-selective fading tests. (Technically Endorsed CR in R4-50bis - R4-091506)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	185r1	Requirements for PMI reporting. (Technically Endorsed CR in R4-50bis - R4-091510)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	221r1	Correction to DL RMC-s for Maximum input level for supporting more UE-Categories	8.5.1	8.6.0
05-2009	RP#44	RP-090543	216	Addition of 15 MHz and 20 MHz bandwidths into band 38	8.5.1	8.6.0
09-2009	RP#45	RP-090822	224	LTE UTRA ACLR1 centre frequency definition for 1.4 and 3 MHz BW	8.6.0	8.7.0
09-2009	RP#45	RP-090822	226	Harmonization of text for LTE Carrier leakage	8.6.0	8.7.0
09-2009	RP#45	RP-090822	228	Sensitivity requirements for Band 38 15 MHz and 20 MHz bandwidths	8.6.0	8.7.0
09-2009	RP#45	RP-090822	237	Addition of 5MHz channel bandwidth for Band 40	8.6.0	8.7.0
09-2009	RP#45	RP-090822	244	Removal of unnecessary requirements for 1.4 and 3 MHz bandwidths on bands 13 and 17	8.6.0	8.7.0
09-2009	RP#45	RP-090877	260	Correction of LTE UE ACS test parameter	8.6.0	8.7.0
09-2009	RP#45	RP-090877	262	Correction of LTE UE ACLR test parameter	8.6.0	8.7.0
09-2009	RP#45	RP-090877	285	Uplink power and RB allocation for receiver tests	8.6.0	8.7.0
09-2009	RP#45	RP-090877	301	CR 64QAM MPR	8.6.0	8.7.0
09-2009	RP#45	RP-090877	319	CR Sensitivity relaxation for small BW	8.6.0	8.7.0
09-2009	RP#45	RP-090877	323	Correction of Band 3 spurious emission band UE co-existence	8.6.0	8.7.0
09-2009	RP#45	RP-090877	248R1	CR Pcmx definition (working assumption)	8.6.0	8.7.0
09-2009	RP#45	RP-090877	329	Spectrum flatness clarification	8.6.0	8.7.0
09-2009	RP#45	RP-090877	331	Additional SRS relative power requirement and update of measurement definition	8.6.0	8.7.0
09-2009	RP#45	RP-090877	281R1	Additional SRS relative power requirement and update of measurement definition	8.6.0	8.7.0
09-2009	RP#45	RP-090877	283R1	Power range applicable for relative tolerance	8.6.0	8.7.0

09-2009	RP#45	RP-090878	232	TDD UL/DL configurations for CQI reporting	8.6.0	8.7.0
09-2009	RP#45	RP-090878	234	Further clarification on CQI test configurations	8.6.0	8.7.0
09-2009	RP#45	RP-090878	242	Corrections to UL- and DL-RMC-s	8.6.0	8.7.0
09-2009	RP#45	RP-090878	246	Reference measurement channel for multiple PMI requirements	8.6.0	8.7.0
09-2009	RP#45	RP-090878	289	CQI reporting test for a scenario with frequency-selective interference	8.6.0	8.7.0
09-2009	RP#45	RP-090878	264R2	CQI reference measurement channels	8.6.0	8.7.0
09-2009	RP#45	RP-090878	304R2	CR RI Test	8.6.0	8.7.0
09-2009	RP#45	RP-090875	230	Correction of parameters for demodulation performance requirement	8.6.0	8.7.0
09-2009	RP#45	RP-090875	240R1	UE categories for performance tests and correction to RMC references	8.6.0	8.7.0
09-2009	RP#45	RP-090875	277	Clarification of $\hat{E}_s$ definition in the demodulation requirement	8.6.0	8.7.0
09-2009	RP#45	RP-090875	325	Editorial corrections and updates to PHICH PBCH test cases	8.6.0	8.7.0
09-2009	RP#45	RP-090875	258R2	Test case numbering in section 8 Performance tests	8.6.0	8.7.0
12-2009	RP#46	RP-091264	334	Test case numbering in TDD PDSCH performance test (Technically endorsed at RAN 4 52bis in R4-093522)	8.7.0	8.8.0
12-2009	RP#46	RP-091261	336	Adding beamforming model for user-specific reference signal (Technically endorsed at RAN 4 52bis in R4-093524)	8.7.0	8.8.0
12-2009	RP#46	RP-091263	338R1	Adding redundancy sequences to PMI test (Technically endorsed at RAN 4 52bis in R4-093580)	8.7.0	8.8.0
12-2009	RP#46	RP-091264	340	Throughput value correction at FRC for Maximum input level (Technically endorsed at RAN 4 52bis in R4-093659)	8.7.0	8.8.0
12-2009	RP#46	RP-091261	342	Correction to the modulated E-UTRA interferer (Technically endorsed at RAN 4 52bis in R4-093661)	8.7.0	8.8.0
12-2009	RP#46	RP-091264	344R1	OCNG: Patterns and present use in tests (Technically endorsed at RAN 4 52bis in R4-093663)	8.7.0	8.8.0
12-2009	RP#46	RP-091264	346	OCNG: Use in receiver and performance tests (Technically endorsed at RAN 4 52bis in R4-093665)	8.7.0	8.8.0
12-2009	RP#46	RP-091263	348	Miscellaneous corrections on CSI requirements (Technically endorsed at RAN 4 52bis in R4-093676)	8.7.0	8.8.0
12-2009	RP#46	RP-091261	350	Removal of RLC modes (Technically endorsed at RAN 4 52bis in R4-093677)	8.7.0	8.8.0
12-2009	RP#46	RP-091261	352	CR Rx diversity requirement (Technically endorsed at RAN 4 52bis in R4-093703)	8.7.0	8.8.0
12-2009	RP#46	RP-091261	354	A-MPR notation in NS_07 (Technically endorsed at RAN 4 52bis in R4-093706)	8.7.0	8.8.0
12-2009	RP#46	RP-091263	358	Single- and multi-PMI requirements (Technically endorsed at RAN 4 52bis in R4-093846)	8.7.0	8.8.0
12-2009	RP#46	RP-091263	362	CQI reference measurement channel (Technically endorsed at RAN 4 52bis in R4-093970)	8.7.0	8.8.0
12-2009	RP#46	RP-091264	366	Numbering of PDSCH (User-Specific Reference Symbols) Demodulation Tests	8.7.0	8.8.0
12-2009	RP#46	RP-091264	368	Numbering of PDCCH/PCFICH, PHICH, PBCH Demod Tests	8.7.0	8.8.0
12-2009	RP#46	RP-091261	370	Remove [] from Reference Measurement Channels in Annex A	8.7.0	8.8.0
12-2009	RP#46	RP-091264	372R1	Corrections to RMC-s for Maximum input level test for low UE categories	8.7.0	8.8.0
12-2009	RP#46	RP-091261	376	Correction of UE-category for R.30	8.7.0	8.8.0
12-2009	RP#46	RP-091262	383	CR: Removal of 1.4 MHz and 3 MHz channel bandwidths from additional spurious emissions requirements for Band 1 PHS protection	8.7.0	8.8.0
12-2009	RP#46	RP-091262	385R3	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain	8.7.0	8.8.0
12-2009	RP#46	RP-091262	389	Spurious emission table correction for TDD bands 33 and 38.	8.7.0	8.8.0
12-2009	RP#46	RP-091262	391R2	36.101 Symbols and abbreviations for P _{cm}	8.7.0	8.8.0
12-2009	RP#46	RP-091262	393	UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed	8.7.0	8.8.0
12-2009	RP#46	RP-091263	395	Introduction of the ACK/NACK feedback modes for TDD requirements	8.7.0	8.8.0
12-2009	RP#46	RP-091262	403R2	CR Power control exception R8	8.7.0	8.8.0
12-2009	RP#46	RP-091262	415R1	Relative power tolerance: special case for receiver tests	8.7.0	8.8.0
12-2009	RP#46	RP-091263	419R1	CSI reporting: test configuration for CQI fading requirements	8.7.0	8.8.0
12-2009	RP#46	RP-091264	424	Editorial corrections and updates to Clause 8.2.1 FDD demodulation test cases	8.7.0	8.8.0
12-2009	RP#46	RP-091262	426	CR: time mask	8.7.0	8.8.0
12-2009	RP#46	RP-091264	429	Correction of the payload size for PDCCH/PCFICH performance requirements	8.7.0	8.8.0
12-2009	RP#46	RP-091263	431	Transport format and test point updates to RI reporting test cases	8.7.0	8.8.0
12-2009	RP#46	RP-091263	433	Transport format and test setup updates to frequency-selective interference CQI tests	8.7.0	8.8.0
12-2009	RP#46	RP-091263	435	CR RI reporting configuration in PUCCH 1-1 test	8.7.0	8.8.0
12-2009	RP#46	RP-091261	437	Addition of R.11-1 TDD references	8.7.0	8.8.0
12-2009	RP#46	RP-091287	440	Correction of Band 11 requirements for TS36.101 Rel-8	8.7.0	8.8.0
12-2009	RP#46	RP-091262	441	In Band Emissions Requirements Correction CR	8.7.0	8.8.0

12-2009	RP#46	RP-091262	443R1	PCMAX definition	8.7.0	8.8.0
03-2010	RP#47	RP-100246	461r1	UTRA ACLR measurement bandwidths for 1.4 and 3 MHz	8.8.0	8.9.0
03-2010	RP#47	RP-100246	492	Band 8 Coexistence Requirement Table Correction	8.8.0	8.9.0
03-2010	RP#47	RP-100246	488r1	Rel 8 CR for Band 14	8.8.0	8.9.0
03-2010	RP#47	RP-100246	484r1	CR Band 1- PHS coexistence	8.8.0	8.9.0
03-2010	RP#47	RP-100247	500	Fading CQI requirements for FDD mode	8.8.0	8.9.0
03-2010	RP#47	RP-100247	498	CR correction to RI test	8.8.0	8.9.0
03-2010	RP#47	RP-100249	450	Reporting mode, Reporting Interval and Editorial corrections for demodulation	8.8.0	8.9.0
03-2010	RP#47	RP-100249	463r1	Corrections to 1PRB PDSCH performance test in presence of MBSFN.	8.8.0	8.9.0
03-2010	RP#47	RP-100249	457r1	OCNG corrections	8.8.0	8.9.0
03-2010	RP#47	RP-100249	466	Addition of OCNG configuration in DRS performance test	8.8.0	8.9.0
03-2010	RP#47	RP-100250	459r1	Use of OCNG in CSI tests	8.8.0	8.9.0
03-2010	RP#47	RP-100250	490r1	Corrections to CQI test configurations	8.8.0	8.9.0
03-2010	RP#47	RP-100250	468r1	Corrections of some CSI test parameters	8.8.0	8.9.0
03-2010	RP#47	RP-100251	455r1	TBS correction for RMC UL TDD 16QAM full allocation BW 1.4 MHz	8.8.0	8.9.0
03-2010	RP#47	RP-100264	447	RF requirements for UE in later releases	8.8.0	8.9.0
03-2010	RP#47	RP-100238	477r4	Modification of the spectral flatness requirement and some editorial corrections	8.8.0	8.9.0
06-2010	RP-48	RP-100619	527r1	Corrections on the definition of PCMAX	8.9.0	8.10.0
06-2010	RP-48	RP-100619	556r2	CR on UE coexistence requirement	8.9.0	8.10.0
06-2010	RP-48	RP-100619	537	Correction of transient time definition for EVM requirements	8.9.0	8.10.0
06-2010	RP-48	RP-100619	535	CR: Corrections on MIMO demodulation performance requirements	8.9.0	8.10.0
06-2010	RP-48	RP-100619	546r1	Correction of antenna configuration and beam-forming model for DRS	8.9.0	8.10.0
06-2010	RP-48	RP-100619	558r1	Corrections of tables for Additional Spectrum Emission Mask	8.9.0	8.10.0
06-2010	RP-48	RP-100619	567	Relaxation of the PDSCH demodulation requirements due to control channel errors	8.9.0	8.10.0
06-2010	RP-48	RP-100619	565	Correction of the UE output power definition for RX tests	8.9.0	8.10.0
06-2010	RP-48	RP-100620	520	Correction to FRC for CQI index 0	8.9.0	8.10.0
06-2010	RP-48	RP-100620	504r1	Fading CQI requirements for TDD mode	8.9.0	8.10.0
06-2010	RP-48	RP-100620	515r1	Correction to CQI test configuration	8.9.0	8.10.0
06-2010	RP-48	RP-100620	525r1	UE Categories for CSI reporting test	8.9.0	8.10.0
06-2010	RP-48	RP-100620	531	Correction of CQI and PMI delay configuration description for TDD	8.9.0	8.10.0
06-2010	RP-48	RP-100620	570	Minimum requirements for Rank indicator reporting	8.9.0	8.10.0
06-2010	RP-48	RP-100620	573	Correction to FDD and TDD CSI test configurations	8.9.0	8.10.0
09-2010	RP-49	RP-100914	604	Reference sensitivity requirements for the 1.4 and 3 MHz bandwidths	8.10.0	8.11.0
09-2010	RP-49	RP-100914	612	Band 13 and Band 14 spurious emission corrections	8.10.0	8.11.0
09-2010	RP-49	RP-100914	587	Missing note in Additional spurious emission test with NS_07	8.10.0	8.11.0
09-2010	RP-49	RP-100914	589r1	Downlink power for receiver tests	8.10.0	8.11.0
09-2010	RP-49	RP-100916	598	Correction of PDCCH content for PHICH test	8.10.0	8.11.0
09-2010	RP-49	RP-100916	580r1	Test configuration corrections to CQI reporting in AWGN	8.10.0	8.11.0
09-2010	RP-49	RP-100916	592	Throughput for multi-datastreams transmissions	8.10.0	8.11.0
09-2010	RP-49	RP-100916	594	Corrections to RF OCNG Pattern OP.1 and 2	8.10.0	8.11.0

Exhibit 1034

**3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
User Equipment (UE) radio transmission and reception
(Release 8)**



The present document has been developed within the 3rd Generation Partnership Project (3GPPTM) and may be further elaborated for the purposes of 3GPP.

The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented. This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification. Specifications and reports for implementation of the 3GPPTM system should be obtained via the 3GPP Organizational Partners' Publications Offices.

Keywords

UMTS, BSS, radio

3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

<http://www.3gpp.org>

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© 2008, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TTA, TTC).
All rights reserved.

Contents

Foreword	7
1 Scope	8
2 References	8
3 Definitions, symbols and abbreviations	8
3.1 Definitions	8
3.2 Symbols	9
3.3 Abbreviations	10
4 General	11
4.1 Relationship between minimum requirements and test requirements	11
4.2 Applicability of minimum requirements	11
5 Frequency bands and channel arrangement	11
5.1 General	11
5.2 Frequency bands	11
5.3 TX–RX frequency separation	12
5.4 Channel arrangement	12
5.4.1 Channel spacing	12
5.4.2 Channel bandwidth	12
5.4.2.1 Channel bandwidths per operating band	13
5.4.2.2 Void	14
5.4.3 Channel raster	14
5.4.4 Carrier frequency and EARFCN	14
5.4.5 Void	15
6 Transmitter characteristics	16
6.1 General	16
6.2 Transmit power	16
6.2.1 Void	16
6.2.2 UE Maximum Output Power	16
6.2.3 UE Maximum Output power for modulation / channel bandwidth	16
6.3 Output power dynamics	18
6.3.1 Power control	18
6.3.1.1.1 Minimum requirement	18
6.3.2 Minimum output power	18
6.3.2.1 Minimum requirement	18
6.3.3 Transmit ON/OFF power	19
6.3.3.1 Transmit OFF power	19
6.3.3.1.1 Minimum requirement	19
6.4 Control and monitoring functions	19
6.4.1 Out-of-synchronization handling of output power	19
6.5 Transmit signal quality	19
6.5.1 Frequency error	19
6.5.2 Transmit modulation	19
6.5.2.1 Error Vector Magnitude	19
6.5.2.1.1 Minimum requirement	20
6.5.2.2 IQ-component	20
6.5.2.2.1 Minimum requirements	20
6.5.2.3 In-band emissions	20
6.5.2.3.1 Minimum requirements	20
6.6 Output RF spectrum emissions	21
6.6.1 Occupied bandwidth	22
6.6.2 Out of band emission	22
6.6.2.1 Spectrum emission mask	22
6.6.2.1.1 Minimum requirement	22
6.6.2.2 Additional Spectrum Emission Mask	23

6.6.2.2.1	Minimum requirement (network signalled value "NS_03")	23
6.6.2.2.2	Minimum requirement (network signalled value "NS_04")	23
6.6.2.2.3	Minimum requirement (network signalled value "NS_06")	24
6.6.2.3	Adjacent Channel Leakage Ratio	24
6.6.2.3.1	Minimum requirement E-UTRA	25
6.6.2.3.2	Minimum requirements UTRA	25
6.6.2.4	Additional ACLR requirements	26
6.6.2.4.1	Minimum requirements (network signalled value "NS_02")	26
6.6.3	Spurious emissions	26
6.6.3.1	Minimum requirements	26
6.6.3.2	Spurious emission band UE co-existence	27
6.6.3.3	Additional spurious emissions	28
6.6.3.3.1	Minimum requirement (network signalled value "NS_02" or "NS_05")	28
6.7	Transmit intermodulation	29
6.7.1	Minimum requirement	29
7	Receiver characteristics	30
7.1	General	30
7.2	Diversity characteristics	30
7.3	Reference sensitivity power level	30
7.3.1	Minimum requirements (QPSK)	30
7.4	Maximum input level	33
7.4.1	Minimum requirements	33
7.5	Adjacent Channel Selectivity (ACS)	34
7.5.1	Minimum requirements	34
7.6	Blocking characteristics	35
7.6.1	In-band blocking	35
7.6.1.1	Minimum requirements	35
7.6.2	Out of-band blocking	36
7.6.2.1	Minimum requirements	36
7.6.3	Narrow band blocking	37
7.6.3.1	Minimum requirements	37
7.7	Spurious response	38
7.7.1	Minimum requirements	38
7.8	Intermodulation characteristics	38
7.8.1	Wide band intermodulation	38
7.8.1.1	Minimum requirements	38
7.8.2	Narrow band intermodulation	39
7.8.2.1	Minimum requirements	39
7.9	Spurious emissions	39
7.9.1	Minimum requirements	39
8.1	General	40
8.1.1	Dual-antenna receiver capability	40
8.1.1.1	Simultaneous unicast and MBMS operations	40
8.1.1.2	Dual-antenna receiver capability in idle mode	40
8.2	Demodulation of PDSCH (Cell-Specific Reference Symbols)	40
8.2.1	FDD (Fixed Reference Channel)	40
8.2.1.1	Single-antenna port performance	40
8.2.1.1.1	Minimum Requirement QPSK	41
8.2.1.1.2	Minimum Requirement 16QAM	41
8.2.1.1.3	Minimum Requirement 64QAM	41
8.2.1.1.4	Minimum Requirement 1 PRB allocation	42
8.2.1.2	Transmit diversity performance	43
8.2.1.3	Open-loop spatial multiplexing performance	43
8.2.1.4	Closed-loop spatial multiplexing performance	43
8.2.1.4.1	Minimum Requirement Single-Layer Spatial Multiplexing	43
8.2.1.4.2	Minimum Requirement Multi-Layer Spatial Multiplexing	44
8.2.1.5	MU-MIMO	45
8.2.1.6	[Control channel performance: D-BCH and PCH]	45
8.2.2	TDD (Fixed Reference Channel)	45
8.2.2.1	Single-antenna port performance	46
8.2.2.1.1	Minimum Requirement QPSK	46

8.2.2.1.2	Minimum Requirement 16QAM.....	46
8.2.2.1.3	Minimum Requirement 64QAM.....	47
8.2.2.1.4	Minimum Requirement 1 PRB allocation.....	47
8.2.2.2	Transmit diversity performance.....	48
8.2.2.3	Open-loop spatial multiplexing performance.....	48
8.2.2.4	Closed-loop spatial multiplexing performance.....	48
8.2.2.5	MU-MIMO.....	48
8.2.2.6	[Control channel performance: D-BCH and PCH].....	48
8.3	Demodulation of PDSCH (User-Specific Reference Symbols).....	48
8.4	Demodulation of PDCCH/PCFICH.....	48
8.4.1	FDD.....	49
8.4.1.1	Single-antenna port performance.....	49
8.4.1.2	Transmit diversity performance.....	49
8.4.2	TDD.....	49
8.4.2.1	Single-antenna port performance.....	49
8.4.2.2	Transmit diversity performance.....	49
8.5	Demodulation of PHICH.....	49
8.6	Demodulation of PBCH.....	49
9	Reporting of [CQI/PMI].....	50
Annex A (normative): Measurement channels.....		51
A.1	General.....	51
A.2	UL reference measurement channels.....	51
A.3	DL reference measurement channels.....	51
A.3.1	General.....	51
A.3.2	Reference measurement channel for receiver characteristics.....	51
A.3.3	Reference measurement channels for PDSCH performance requirements (FDD).....	53
A.3.3.1	Single-antenna transmission (Common Reference Symbols).....	53
A.3.3.2	Multi-antenna transmission (Common Reference Symbols).....	55
A.3.3.2.1	Two antenna ports.....	55
A.3.3.2.2	Four antenna ports.....	55
A.3.3.3	[RMC for UE-Specific Reference Symbols].....	56
A.3.4	Reference measurement channels for PDSCH performance requirements (TDD).....	56
A.3.4.1	Single-antenna transmission (Common Reference Symbols).....	56
A.3.4.2	Multi-antenna transmission (Common Reference Signals).....	58
A.3.4.3	[RMC for UE-Specific Reference Symbols].....	58
A.3.5	Reference measurement channels for PDCCH/PCFICH performance requirements.....	58
A.3.5.1	FDD.....	58
A.3.5.2	TDD.....	58
Annex B (normative): Propagation conditions.....		59
B.1	Static propagation condition.....	59
B.2	Multi-path fading propagation conditions.....	59
B.2.1	Delay profiles.....	59
B.2.2	Combinations of channel model parameters.....	60
B.2.3.1	Definition of MIMO Correlation Matrices.....	60
B.3	High speed train scenario.....	63
Annex C (normative): Downlink Physical Channels.....		65
C.1	General.....	65
C.2	Set-up.....	65
C.3	Connection.....	65
C.3.1	Measurement of Receiver Characteristics.....	65
C.3.2	Measurement of Performance requirements.....	66

Annex D (normative):	Characteristics of the interfering signal	67
D.1	General	67
D.2	Interference signals	67
Annex E (normative):	Environmental conditions	68
E.1	General	68
E.2	Environmental	68
E.2.1	Temperature	68
E.2.2	Voltage	68
E.2.3	Vibration	69
Annex F (normative):	Transmit modulation.....	70
F.1	Measurement Point.....	70
F.2	Basic Error Vector Magnitude measurement	70
F.3	Basic in-band emissions measurement.....	70
F.4	Modified signal under test.....	71
F.5	Window length	73
F.5.1	Timing offset	73
F.5.2	Window length.....	73
F.5.3	Window length for normal CP	73
F.5.4	Window length for Extended CP	73
F.6	Averaged EVM	74
F.7	Spectrum Flatness	74
Annex G (informative):	Change history	75

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

Where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

. The present document establishes the minimum RF characteristics and minimum performance requirements for E-UTRA User Equipment (UE).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain"
- [3] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [4] 3GPP TS 36.211: "Physical Channels and Modulation".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Channel edge: The lowest and highest frequency of the carrier, separated by the channel bandwidth.

Channel bandwidth: The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

Maximum Output Power: The mean power level per carrier of UE measured at the antenna connector in a specified reference condition.

Mean power: When applied to E-UTRA transmission this is the power measured in the operating system bandwidth of the carrier. The period of measurement shall be at least one subframe (1ms) unless otherwise stated.

Occupied bandwidth: The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given emission.

Output power: The mean power of one carrier of the UE, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Reference bandwidth: The bandwidth in which an emission level is specified.

Transmission bandwidth: Bandwidth of an instantaneous transmission from a UE or BS, measured in Resource Block units.

Transmission bandwidth configuration: The highest transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in Resource Block units.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

BW_{Channel}	Channel bandwidth
E_{RS}	Transmitted energy per RE for reference symbols during the useful part of the symbol, i.e. excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B transmit antenna connector
$\hat{E}_s$	The received energy per RE during the useful part of the symbol, i.e. excluding the cyclic prefix, averaged across the allocated RB(s) (average power within the allocated RB(s), divided by the number of RE within this allocation, and normalized to the subcarrier spacing) at the UE antenna connector
F	Frequency
$F_{\text{Interferer}} \text{ (offset)}$	Frequency offset of the interferer
$F_{\text{Interferer}}$	Frequency of the interferer
F_{C}	Frequency of the carrier centre frequency
$F_{\text{DL\_low}}$	The lowest frequency of the downlink operating band
$F_{\text{DL\_high}}$	The highest frequency of the downlink operating band
$F_{\text{UL\_low}}$	The lowest frequency of the uplink operating band
$F_{\text{UL\_high}}$	The highest frequency of the uplink operating band

Editor's note : one of the two following definitions for I_o will be used (TBD)

I_o	The power spectral density of the total input signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal
I_o	The power spectral density of the total input signal at the UE antenna connector (power averaged over the useful part of the symbols within a given bandwidth and normalised to the said bandwidth), including the own-cell downlink signal
I_{or}	The total transmitted power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector
$\hat{I}_{or}$	The total received power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
N_{cp}	Cyclic prefix length
N_{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector
$N_{\text{Offs-UL}}$	Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B transmit antenna connector
N_{RB}	Transmission bandwidth configuration, expressed in units of resource blocks

N_{UL}	Uplink EARFCN
R_{av}	Minimum average throughput per RB
$P_{Interferer}$	Modulated mean power of the interferer
ΔF_{OOB}	Δ Frequency of Out Of Band emission

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
A-MPR	Additional Maximum Power Reduction
AWGN	Additive White Gaussian Noise
BS	Base Station
CW	Continuous Wave
DL	Downlink
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
EPRE	Energy Per Resource Element
E-UTRA	Evolved UMTS Terrestrial Radio Access
EUTRAN	Evolved UMTS Terrestrial Radio Access Network
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FRC	Fixed Reference Channel
HD-FDD	Half- Duplex FDD
MCS	Modulation and Coding Scheme
MOP	Maximum Output Power
MPR	Maximum Power Reduction
MSR	Maximum Sensitivity Reduction
OOB	Out-of-band
PA	Power Amplifier
PSS	Primary Synchronization Signal
PSS_RA	PSS-to-RS EPRE ratio for the channel PSS
RE	Resource Element
REFSENS	Reference Sensitivity power level
r.m.s	Root Mean Square
SNR	Signal-to-Noise Ratio
SSS	Secondary Synchronization Signal
SSS_RA	SSS-to-RS EPRE ratio for the channel SSS
TDD	Time Division Duplex
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network
xCH_RA	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS
xCH_RB	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS

4 General

4.1 Relationship between minimum requirements and test requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 36.xxx section y defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ITU-R M.1545 [3].

4.2 Applicability of minimum requirements

In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios

For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.

5 Frequency bands and channel arrangement

5.1 General

The channel arrangements presented in this clause are based on the frequency bands and channel bandwidths defined in the present release of specifications.

NOTE: Other frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit	Downlink (DL) eNode B transmit UE receive		Duplex Mode
	$F_{UL, low} - F_{UL, high}$	$F_{DL, low} - F_{DL, high}$		
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz		FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz		FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz		FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz		FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz		FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz		FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz		FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz		FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz		FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz		FDD
11	1427.9 MHz – 1452.9 MHz	1475.9 MHz – 1500.9 MHz		FDD
12	698 MHz – 716 MHz	728 MHz – 746 MHz		FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz		FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz		FDD
...				
17	704 MHz – 716 MHz	734 MHz – 746 MHz		FDD
...				
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz		TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz		TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz		TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz		TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz		TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz		TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz		TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz		TDD

5.3 TX–RX frequency separation

5.4 Channel arrangement

5.4.1 Channel spacing

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between two adjacent E-UTRA carriers is defined as following:

$$\text{Nominal Channel spacing} = (BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)})/2$$

where $BW_{\text{Channel}(1)}$ and $BW_{\text{Channel}(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. The channel spacing can be adjusted to optimize performance in a particular deployment scenario.

5.4.2 Channel bandwidth

Requirements in present document are specified for the channel bandwidths listed in Table 5.4.2-1.

Table 5.4.2-1 Transmission bandwidth configuration N_{RB} in E-UTRA channel bandwidths

Channel bandwidth BW_{Channel} [MHz]	1.4	3	5	10	15	20
Transmission bandwidth configuration N_{RB}	6	15	25	50	75	100

Figure 5.4.2-1 shows the relation between the Channel bandwidth (BW_{Channel}) and the Transmission bandwidth configuration (N_{RB}). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at $F_C \pm BW_{\text{Channel}}/2$.

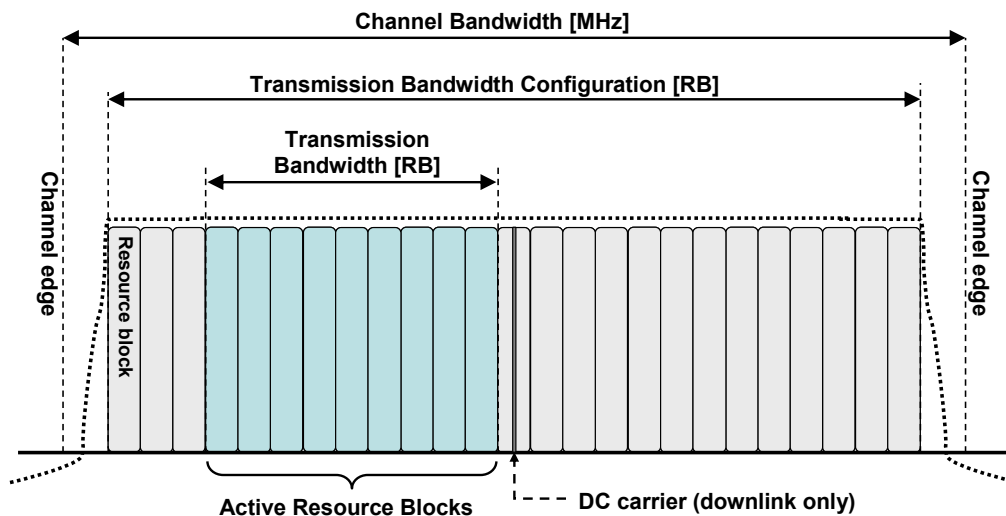


Figure 5.4.2-1 Definition of Channel Bandwidth and Transmission Bandwidth Configuration for one E-UTRA carrier.

5.4.2.1 Channel bandwidths per operating band

The requirements in this specification apply to the combination of channel bandwidths and operating bands shown in Table 5.4.2.1-1. The transmission bandwidth configuration in Table 5.4.2.1-1 shall be supported for each of the specified channel bandwidths.

Table 5.4.2.1-1: E-UTRA channel bandwidth

E-UTRA band / channel bandwidth						
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1			Yes	Yes	Yes	Yes
2	Yes	Yes	Yes	Yes	Yes ^[1]	Yes ^[1]
3	Yes	Yes	Yes	Yes	Yes ^[1]	Yes ^[1]
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes ^[1]		
6			Yes	Yes ^[1]		
7			Yes	Yes	Yes	Yes ^[1]
8	Yes	Yes	Yes	Yes ^[1]		
9			Yes	Yes	Yes ^[1]	Yes ^[1]
10			Yes	Yes	Yes	Yes
11			Yes	Yes ^[1]	Yes ^[1]	Yes ^[1]
12						
13	Yes	Yes	Yes ^[1]	Yes ^[1]		
14	Yes	Yes	Yes ^[1]	Yes ^[1]		
...						
33			Yes	Yes	Yes	Yes
34			Yes	Yes	Yes	
35	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	Yes	Yes	Yes	Yes	Yes
37			Yes	Yes	Yes	Yes
38			Yes	Yes		
39			Yes	Yes	Yes	Yes
40				Yes	Yes	Yes
NOTE 1: bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Clause 7.3) is allowed.						

5.4.2.2 Void

5.4.3 Channel raster

The channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz.

5.4.4 Carrier frequency and EARFCN

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN). The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where F_{DL_low} and $N_{Offs-DL}$ are given in table 5.4.4-1 and N_{DL} is the downlink EARFCN.

$$F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs-DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where F_{UL_low} and $N_{Offs-UL}$ are given in table 5.4.4-1 and N_{UL} is the uplink EARFCN.

$$F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs-UL})$$

Table 5.4.4-1 E-UTRA channel numbers

Band	F_{DL_low} (MHz)	Downlink		F_{UL_low} (MHz)	Uplink	
		$N_{Offs-DL}$	Range of N_{DL}		$N_{Offs-UL}$	Range of N_{UL}
1	2110	0	0 – 599	1920	13000	13000 – 13599
2	1930	600	600 – 1199	1850	13600	13600 – 14199
3	1805	1200	1200 – 1949	1710	14200	14200 – 14949
4	2110	1950	1950 – 2399	1710	14950	14950 – 15399
5	869	2400	2400 – 2649	824	15400	15400 – 15649
6	875	2650	2650 – 2749	830	15650	15650 – 15749
7	2620	2750	2750 – 3449	2500	15750	15750 – 16449
8	925	3450	3450 – 3799	880	16450	16450 – 16799
9	1844.9	3800	3800 – 4149	1749.9	16800	16800 – 17149
10	2110	4150	4150 – 4749	1710	17150	17150 – 17749
11	1475.9	4750	4750 – 4999	1427.9	17750	17750 – 17999
12						
13	746	5180	5180 – 5279	777	18180	18180 – 18279
14	758	5280	5280 – 5379	788	18280	18280 – 18379
...						
33	1900	26000	26000 – 26199	1900	26000	26000 – 26199
34	2010	26200	26200 – 26349	2010	26200	26200 – 26349
35	1850	26350	26350 – 26949	1850	26350	26350 – 26949
36	1930	26950	26950 – 27549	1930	26950	26950 – 27549
37	1910	27550	27550 – 27749	1910	27550	27550 – 27749
38	2570	27750	27750 – 28249	2570	27750	27750 – 28249
39	1880	28250	28250-28649	1880	28250	28250-28649
40	2300	28650	28650-29649	2300	28650	28650-29649

5.4.5 Void

6 Transmitter characteristics

6.1 General

Unless otherwise stated, the transmitter characteristics are specified at the antenna connector of the UE with a single transmit antenna. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

6.2 Transmit power

6.2.1 Void

6.2.2 UE Maximum Output Power

The following UE Power Classes define the nominal maximum output power. The nominal power is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth (clause 5.2) of the radio access mode. The period of measurement shall be at least one [timeslot/ frame/TTI].

Table 6.2.2-1: UE Power Class

E-UTRA Band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	±2		
2					23	±2		
3					23	±2		
4					23	±2		
5					23	±2		
6					23	±2		
7					23	±2		
8					23	±2		
9					23	±2		
10					23	±2		
11					23	±2		
12					23	±2		
13					23	±2		
14					23	±2		
...								
33					23	±2		
34					23	±2		
35					23	±2		
36					23	±2		
37					23	±2		
38					23	±2		
39					23	±2		
40					23	±2		

Note

- The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS

6.2.3 UE Maximum Output power for modulation / channel bandwidth

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

6.2.4 UE Maximum Output Power with additional requirements

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall meet also additional requirements in a specific deployment scenario. To meet these additional requirements the concept of Additional Maximum Power Reduction A-MPR is introduced for the output power in Table 6.2.2-1

For UE Power Class 3 the specific requirements and identified sub-clauses are specified in table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4-1 are in addition to the allowed MPR requirements specified in clause 6.2.3.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_01	-	-	-		
NS_02	6.6.2.4.1 6.6.3.3.1	1, 6, 9, 11	10	> 42	≤ 1
			15	> 44	≤ 1
			20	> 48	≤ 1
NS_03	6.6.2.2.1	2, 4, 10, 35, 36	3	>5	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	5	>6	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	10	>6	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	15	>8	≤ 1
	6.6.2.2.1	2, 4, 10, 35, 36	20	>10	≤ 1
NS_04	6.6.2.2.2	TBD	TBD	TBD	
NS_05	6.6.3.3.1	1 ²	10, 15, 20	≥ 50 for QPSK	≤ 1
NS_06	6.6.2.2.3	13, 14	1.4, 3, 5, 10	n/a	n/a
..					
NS_32	-	-	-	-	-

Note: $0 \leq \text{A-MPR} \leq 3$

Note2: Applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to 1920MHz + the Channel BW assigned. Operations below this point are for further study.

6.3 Output power dynamics

6.3.1 Power control

Power control is used to limit the interference level and compensate the channel fading. The UE power is defined as the mean power in a subframe or ON power duration, whichever is available.

The UE transmission can be in two contiguity modes, i.e. contiguous transmission and non-contiguous transmission. The former has a transmission gap of 0 and the latter has a transmission gap larger than 0. The transmission gap is the time interval between the end of the last UE transmission subframe and the beginning of the next UE transmission subframe or the UpPTS (for TDD).

6.3.1.1 Absolute power tolerance

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than [x] ms. It includes the channel estimation error (the absolute RSRP accuracy requirement specified in clause 9.1 of TS 36.133) and UE power setting error.

6.3.1.1.1 Minimum requirement

The minimum requirement on absolute power tolerance is given in Table 6.3.1.1.1.

Table 6.3.1.1.1: Absolute power tolerance

Conditions	Tolerance
Normal conditions	± 10.5 dB
Extreme conditions	± 13.5 dB

6.3.2 Minimum output power

The minimum controlled output power of the UE is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the power is set to a minimum value.

6.3.2.1 Minimum requirement

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2.1-1.

Table 6.3.2.1-1: Minimum output power

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	-40 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.3 Transmit ON/OFF power

6.3.3.1 Transmit OFF power

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

6.3.3.1.1 Minimum requirement

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.3.1-1.

Table 6.3.3.1-1: Transmit OFF power

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power	-50 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.4 Control and monitoring functions

6.4.1 Out-of-synchronization handling of output power

6.5 Transmit signal quality

6.5.1 Frequency error

The UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of one sub-frame (1ms) compared to the carrier frequency received from the E-UTRA Node B

6.5.2 Transmit modulation

Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. This transmit modulation limit is specified in terms of; an Error Vector Magnitude (EVM) for the allocated resources blocks (RB), an I/Q component and an in-band emissions for the non-allocated RB.

All the parameters defined in clause 6.5.2 are defined using the measurement methodology specified in Annex F.

6.5.2.1 Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the IQ origin offset shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The basic EVM measurement interval is one sub-frame in the time domain.

6.5.2.1.1 Minimum requirement

The RMS average of the basic EVM measurements for 10 consecutive sub-frames for the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.1-1 for the parameters defined in Table 6.5.2.1.1-2.

Table 6.5.2.1.1-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Level
QPSK	%	17.5
16QAM	%	12.5
64QAM	%	[tbd]

Table 6.5.2.1.1-2: Parameters for Error Vector Magnitude

Parameter	Unit	Level
UE Output Power	dBm	≥ -40
Operating conditions		Normal conditions
Basic measurement period		slot

6.5.2.2 IQ-component

The IQ origin offset is the phase and amplitude of an additive sinusoid waveform that has the same frequency as the reference waveform carrier frequency.

6.5.2.2.1 Minimum requirements

The relative carrier leakage power (IQ origin offset power) shall not exceed the values specified in Table 6.5.2.2.1-1.

Table 6.5.2.2.1-1: Minimum requirements for Relative Carrier Leakage Power

LO Leakage	Parameters	Relative Limit (dBc)
	Output power >0 dBm	-25
	-30 dBm ≤ Output power ≤ 0 dBm	-20
	-40 dBm ≤ Output power < -30 dBm	-10

6.5.2.3 In-band emissions

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the [relative UE output power] of any non –allocated RB(s) and the [total UE output power] of all the allocated RB(s). The basic in-band emissions measurement interval is defined over one slot in the time domain.

6.5.2.3.1 Minimum requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2.3.1-1.

Table 6.5.2.3.1-1: Minimum requirements for in-band emissions

In band emission	Relative emissions (dB)
	$\max[-25, (20 \cdot \log_{10} EVM) - 3 - 10 \cdot (\Delta_{RB} - 1) / N_{RB}]$

6.5.2.4 Spectrum flatness

The spectrum flatness is defined as a relative power variation across the subcarriers of all RB of the allocated UL block. The spectrum flatness is measured as a dB value comparing the output power of a subcarrier and the average power per subcarrier.

6.5.2.4.1 Minimum requirements

The spectrum flatness shall not exceed the values specified in Table 6.5.2.4.1-1 for normal conditions and Table 6.5.2.4.1-2 for extreme conditions.

Table 6.5.2.4.1-1: Minimum requirements for spectrum flatness (normal conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq [3\text{MHz}]$ and If $F_{UL\_high} - F_{UL\_measurement} \geq [3\text{ MHz}]$	[+2/-2]
If $F_{UL\_measurement} - F_{UL\_low} < [3\text{ MHz}]$ and If $F_{UL\_high} - F_{UL\_measurement} < [3\text{ MHz}]$	[+3/-5]
Note F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 $F_{UL\_measurement}$ refers to frequency tone being evaluated	

Table 6.5.2.4.1-2: Minimum requirements for spectrum flatness (extreme conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq [3\text{MHz}]$ and If $F_{UL\_high} - F_{UL\_measurement} \geq [3\text{ MHz}]$	[+2/-2]
If $F_{UL\_measurement} - F_{UL\_low} < [3\text{ MHz}]$ and If $F_{UL\_high} - F_{UL\_measurement} < [3\text{ MHz}]$	[+4/-8]
Note F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 $F_{UL\_measurement}$ refers to frequency tone being evaluated	

6.6 Output RF spectrum emissions

The output UE transmitter spectrum consists of the three components; the emission within the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.

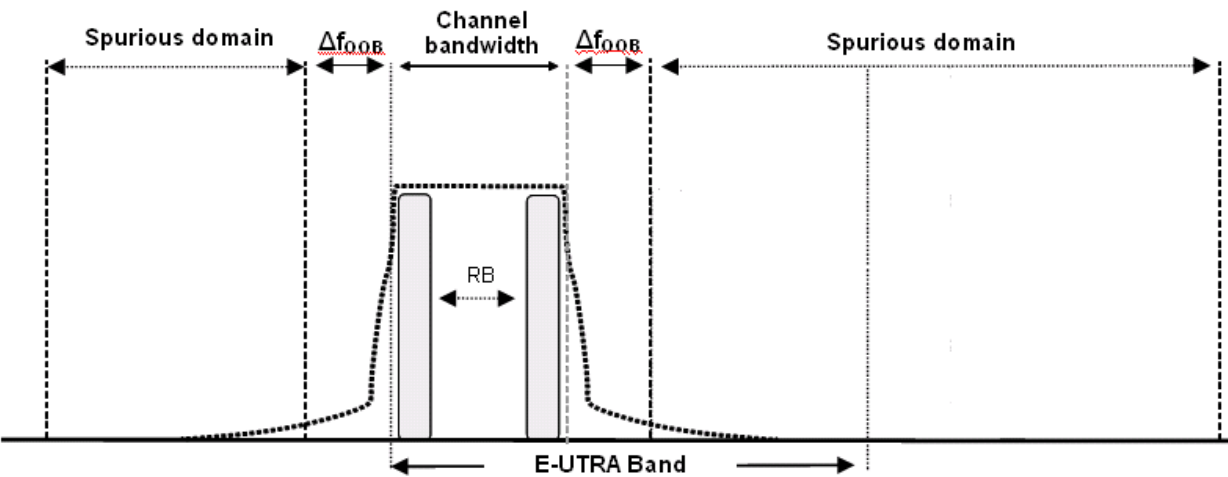


Figure 6.6-1: Transmitter RF spectrum

6.6.1 Occupied bandwidth

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.6.1-1

Table 6.6.1-1: Occupied channel bandwidth

Channel bandwidth [MHz]	Occupied channel bandwidth / channel bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
	1.4	3	5	10	15	20

6.6.2 Out of band emission

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an Adjacent Channel Leakage power Ratio.

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the $\pm$ edge of the assigned E-UTRA channel bandwidth. For frequencies greater than (Δf_{OOB}) as specified in Table 6.6.2.1.1-1 the spurious requirements in clause 6.6.3 are applicable.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.1-1 for the specified channel bandwidth.

Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask

Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[-10]	[-10]	-10	-10	-10	-10	1 MHz
$\pm 2.5-5$	[-25]	[-10]	-10	-10	-10	-10	1 MHz
$\pm 5-6$		[-25]	-13	-13	-13	-13	1 MHz
$\pm 6-10$			-25	-13	-13	-13	1 MHz
$\pm 10-15$				-25	-13	-13	1 MHz
$\pm 15-20$					-25	-13	1 MHz
$\pm 20-25$						-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2 Additional Spectrum Emission Mask

This requirement is specified in terms of an "additional spectrum emission" requirement.

6.6.2.2.1 Minimum requirement (network signalled value "NS_03")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.1-1.

Table 6.6.2.2.1-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 5-6$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 6-10$	[TBD]	[TBD]	-25	-13	-13	-13	1 MHz
$\pm 10-15$	[TBD]	[TBD]		-25	-13	-13	1 MHz
$\pm 15-20$	[TBD]	[TBD]			-25	-13	1 MHz
$\pm 10-25$	[TBD]	[TBD]				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.2 Minimum requirement (network signalled value "NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.2-1.

Table 6.6.2.2-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
$\pm 5-6$	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
$\pm 6-10$	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
$\pm 10-15$	[TBD]	[TBD]		-25	-25	-25	1 MHz
$\pm 15-20$	[TBD]	[TBD]			-25	-25	1 MHz
$\pm 10-25$	[TBD]	[TBD]				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.3 Minimum requirement (network signalled value "NS_06")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_06" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3-1.

Table 6.6.2.2.3-1: Additional requirements

	Spectrum emission limit (dBm)/ Channel bandwidth				
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	Measurement bandwidth
$\pm 0-0.1$	[TBD]	[TBD]	-15	-18	30 kHz
$\pm 0.1-1$	-13	-13	-13	-13	100 kHz
$\pm 1-2.5$	[TBD]	[TBD]	-13	-13	1 MHz
$\pm 2.5-5$	[TBD]	[TBD]	-13	-13	1 MHz
$\pm 5-6$		[TBD]	-13	-13	1 MHz
$\pm 6-10$			-25	-13	1 MHz
$\pm 10-15$				-25	1 MHz

Note: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.3 Adjacent Channel Leakage Ratio

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirements are specified for two scenarios for an adjacent E-UTRA and /or UTRA channel as shown in Figure 6.6.2.3 -1.

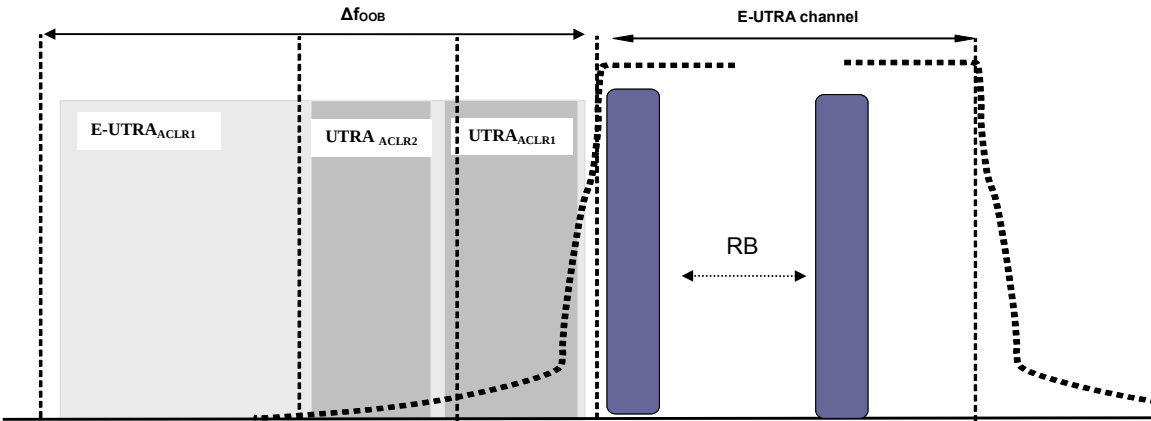


Figure 6.6.2.3-1: Adjacent Channel Leakage requirements

6.6.2.3.1 Minimum requirement E-UTRA

E-UTRA Adjacent Channel Leakage power Ratio ($E-UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3.1-1. If the measured adjacent channel power is greater than $-[50]\text{dBm}$ then the $E-UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.1-1.

Table 6.6.2.3.1-1: General requirements for $E-UTRA_{ACLR}$

	Channel bandwidth / $E-UTRA_{ACLR1}$ / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E-UTRA_{ACLR1}$	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
E-UTRA channel						
Measurement bandwidth			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.6.2.3.2 Minimum requirements UTRA

UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA 5 MHz adjacent channel ($UTRA_{ACLR1}$) and the 2nd UTRA 5MHz adjacent channel ($UTRA_{ACLR2}$). The UTRA channel power is measured with a 3.84 MHz RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2-1. If the measured UTRA channel power is greater than $-[50]\text{dBm}$ then the $UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.2-1.

Table 6.6.2.3.2-1: Additional requirements

	Channel bandwidth / UTRA _{ACLR1/2} / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR1}	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
UTRA _{ACLR2}	-	-	36 dB	36 dB	36 dB	36 dB
E-UTRA channel Measurement bandwidth		-	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz

6.6.2.4 Additional ACLR requirements

This requirement is specified in terms of an additional UTRA_{ACLR2} requirement.

6.6.2.4.1 Minimum requirements (network signalled value "NS_02")

"NS_02" is signalled by the network to indicate that the UE shall meet this additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

The Additional ACLR requirement is specified for the 2nd UTRA 5MHz adjacent channel (UTRA_{ACLR2}). The UTRA channel power is measured with a 3.84 MHz RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2-1. If the UTRA 2nd adjacent channel power is greater than $-[50]$ dBm then the UTRA_{ACLR2} shall be higher than the value specified in Table 6.6.2.4.1-1.

Table 6.6.2.4.1-1: Additional requirements (UTRA_{ACLR2})

	Channel bandwidth / UTRA _{ACLR2} / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR2bis}	-	-	43 dB	43 dB	-	-
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	-	-
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	-	-

6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions. The spurious emission limits are specified in terms of general requirements inline with SM.329 [2] and E-UTRA operating band requirement to address UE co-existence.

6.6.3.1 Minimum requirements

The spurious emission limits in Table 6.6.3.1-2 apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth.

Table 6.6.3.1-1: Boundary between E-UTRA Δf_{OOB} and spurious emission domain

Channel bandwidth	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Δf_{OOB} (MHz)	[tbd]	[tbd]	10	15	20	25

The spurious emission limits in Table 6.6.3.1-2 apply for all transmitter band configurations (RB) and channel bandwidths.

Table 6.6.3.1-2: Spurious emissions limits

Frequency Range	Maximum Level	Measurement Bandwidth
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	-36 dBm	1 kHz
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	-36 dBm	10 kHz
$30 \text{ MHz} \leq f < 1000 \text{ MHz}$	-36 dBm	100 kHz
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	-30 dBm	1 MHz

6.6.3.2 Spurious emission band UE co-existence

This clause specifies the requirements for the specified E-UTRA band

Table 6.6.3.2-1: Requirements

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)			Level (dBm)	Bandwidth (MHz)	Comment
1	E-UTRA Band 1, 3, 7, 8, 9, 11, 34, 38, 40	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	
	E-UTRA band 33	1900	-	1920	-50	1	Note ³
	E-UTRA band 39	1880	-	1920	-50	1	Note ³
2	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
3	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 34, 38	FDL_low	-	FDL_high	-50	1	
4	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
6	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	
7	E-UTRA Band 1, 3, 7, 8, 33, 34	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 38	2570	-	2620	-50	1	Note ³
8	E-UTRA Band 1, 8, 7, 33, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	
	E-UTRA band 3	1805	-	1830	-50	1	Note ⁴
	E-UTRA band 3	1805	-	1880	-36	0.1	Note ^{2,4}
	E-UTRA band 3	1830	-	1880	-50	1	Note ⁴
	E-UTRA band 7	2640	-	2690	-50	1	Note ⁴
	E-UTRA band 7	2640	-	2690	-36	0.1	Note ^{2,4}
9	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	

	Frequency range	860	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	
10	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
11	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	
13	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
14	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
33	E-UTRA Band 1, 3, 8, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note ⁵
34	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note ⁵
	Frequency range	860	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	
35							
36							
37			-				
38	E-UTRA Band 1, 3, 33, 34	FDL_low	-	FDL_high	-50	1	
39	E-UTRA Band 34, 40	FDL_low	-	FDL_high	-50	1	
40	E-UTRA Band 1, 3, 33, 34, 39	FDL_low	-	FDL_high	-50	1	
Note 1 FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1 2 A number of exceptions are permitted and is FFS. These exceptions include both spurious due to LO mixing and I/Q imbalance for specific values of N_{RB}. For these exceptions the requirements of Table 6.6.3.1-2 are applicable. 3 To meet these requirements some restriction will be needed for either the operating band or protected band 4 Requirements are specified in terms of E-UTRA sub-bands 5 For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band							

6.6.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement.

6.6.3.3.1 Minimum requirement (network signalled value "NS_02" or "NS_05")

Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_02" or "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.1-1.

Table 6.6.3.3.1-1: Additional requirements (PHS)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)						Measurement bandwidth
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
$1884.5 \leq f \leq 1919.6$	-41	-41	-41	-41	-41	-41	300 KHz
Note 1. The requirements are applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to 1920MHz + the Channel BW assigned. Operations below this point are for further study.							

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated.

The requirement of transmitting intermodulation is prescribed in Table 6.7.1-1.

Table 6.7.1-1: Transmit Intermodulation

BWChannel (UL)	5MHz		10MHz		15MHz		20MHz	
Interference Signal Frequency Offset	5MHz	10MHz	10MHz	20MHz	15MHz	30MHz	20MHz	40MHz
Interference CW Signal Level	[-40dBc]							
Intermodulation Product	[-31dBc]	[-41dBc]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]
Measurement bandwidth	4.5MHz	4.5MHz	9.0MHz	9.0MHz	13.5MHz	13.5MHz	18MHz	18MHz

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective sections below.

All the parameters in clause 7 are defined using the DL reference measurement channel specified in Annex A.3.2 and using the set-up specified in Annex C.3.1

7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. Requirements for 4 ports are FFS. With the exception of clause 7.9 all requirements shall be verified by using both (all) antenna ports simultaneously.

7.3 Reference sensitivity power level

The reference sensitivity power level REFSENS is the minimum mean power applied to both the UE antenna ports at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3.1 Minimum requirements (QPSK)

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channel as specified in Annex A.3.2 with parameters specified in Table 7.3.1-1 and table 7.3.1-2

Table 7.3.1-1: Reference sensitivity QPSK P_{REFSENS}

Channel bandwidth							
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1	-	-	-100	-97	-95.2	-94	FDD
2	-104.2	-100.2	-98	-95	-93.2	-92	FDD
3	-103.2	-99.2	-97	-94	-92.2	-91	FDD
4	-106.2	-102.2	-100	-97	-95.2	-94	FDD
5	-104.2	-100.2	-98	-95			FDD
6	-	-	-100	-97			FDD
7	-	-	-98	-95	-93.2	-92	FDD
8	-103.2	-99.2	-97	-94			FDD
9	-	-	-99	-96	-94	-93	FDD
10	-	-	-100	-97	-95.2	-94	FDD
11	-	-	-98	-95	-93.2	-92	FDD
12							FDD
13	-103.2	-99.2	-97	-94			FDD
14							FDD
33	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
34	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
35	[-106.2]	[-102.2]	[-100]	[-97]	[-95.2]	[-94]	TDD
36	[-106.2]	[-102.2]	[-100]	[-97]	[-95.2]	[-94]	TDD
37	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
38	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
39	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
40	-	-	[-100]	[-97]	[-95.2]	[-94]	TDD
Note 1: The transmitter shall be set to maximum output power level (Table 7.3.1-2)							
Note 2: Reference measurement channel is A.3.2							
Note 3: The signal power is specified per port							
Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level of Band 3 + 0.5 dB is applicable for band 9							

Note 1: The relation to the received PSD is $\langle \text{REF } \hat{I}_{\text{or}} \rangle = P_{\text{REFSENS}} (N_{\text{sc}}^{\text{RB}} N_{\text{RB}} \Delta f)^{-1}$ with N_{RB} is the maximum transmission configuration according to Table 5.4.2-1.

Table 7.3.1-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement must be met. For larger transmission configurations a certain relaxation of the UE performance is allowed. Table 7.3.1-3 specifies the maximum output power level for which the reference receive sensitivity requirement must be met when UL resource blocks is the total resource blocks (Table 5.4.2-1) supported by the channel bandwidth.

Table 7.3.1-2: Maximum uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N_{RB} / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
1	-	-	25	50	75	100	FDD
2	6	15	25	50	[50 ¹]	[50 ¹]	FDD
3	6	15	25	50	[50 ¹]	[50 ¹]	FDD
4	6	15	25	50	75	100	FDD

5	6	15	25	[25 ¹]	-	-	FDD
6	-	-	25	[25 ¹]	-	-	FDD
7	-	-	25	50	[75 ¹]	[75 ¹]	FDD
8	6	15	25	[25 ¹]	-	-	FDD
9	-	-	25	50	[50 ¹]	[50 ¹]	FDD
10	-	-	25	50	75	100	FDD
11	-	-	25	[25 ¹]	[25 ¹]	[25 ¹]	FDD
12							FDD
13	6	15	20 ¹	20 ¹			FDD
14							FDD
...							
33	-	-	25	50	75	100	TDD
34	-	-	25	50	75	-	TDD
35	6	15	25	50	75	100	TDD
36	6	15	25	50	75	100	TDD
37	-	-	25	50	75	100	TDD
38	-	-	25	50	-	-	TDD
39			25	50	75	100	TDD
40				50	75	100	TDD
Note 1. Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

Table 7.3.1-3: Maximum transmission power for reference sensitivity

E-UTRA Band	Channel bandwidth						Duplex Mode
	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	
1							FDD
2							FDD
3							FDD
4							FDD
5							FDD
6							FDD
7							FDD
8							FDD
9							FDD
10							FDD
11							FDD
12							FDD
13							FDD
14							FDD
Note 1: UE output power is less than the maximum output power							

7.3.2 (Void)

7.4 Maximum input level

This is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

7.4.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4.1.

Table 7.4.1-1: Maximum input level

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	-25					

Note:

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. Reference measurement channel is [Annex C 64QAM R=3/4]

7.5 Adjacent Channel Selectivity (ACS)

7.5.1 Minimum requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5.1-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.1-2 and Table 7.5.1-3 where the throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2.

Table 7.5.1-1: Adjacent channel selectivity

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
ACS	dB	33.0	33.0	33.0	33.0	30	[27]

Table 7.5.1-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + 14 dB					
$P_{\text{Interferer}}$	dBm	REFSENS + [45.5]dB	REFSENS + [45.5]dB	REFSENS + [45.5]dB*	REFSENS + [45.5]dB	REFSENS + [42.5]dB	REFSENS + [39.5]dB
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	1.4	3	5	7.5	10	12.5

Note:

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1

Table 7.5.1-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	[-56.5]	[-56.5]	[-56.5]	[-56.5]	[-53.5]	[-50.5]
$P_{\text{Interferer}}$	dBm				-25		
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	1.4	3	5	7.5	10	12.5

Note:

1. The transmitter shall be set to 24dB below the supported maximum output power.
2. The interferer consists of the Reference measurement channel specified in Annex 3.2 with set-up according to Annex C.3.1

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 In-band blocking

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band at which the relative throughput shall meet or exceed the minimum requirement for the specified measurement channels..

7.6.1.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1.1-1 and 7.6.1.1-2.

Table 7.6.1.1-1: In band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
$BW_{\text{Interferer}}$	MHz	1.4	3	5	5	5	5
$F_{\text{offset, case 1}}$	MHz	2.1	4.5	7.5	7.5	7.5	7.5
$F_{\text{offset, case 2}}$	MHz	3.5	7.5	12.5	12.5	12.5	12.5

Note:

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1

Table 7.6.1.1-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2
	$P_{\text{Interferer}}$	dBm	-56	-44
	$F_{\text{Interferer}}$ (Offset)	MHz	$= -BW/2 - F_{\text{offset, case 1}}$ & $= +BW/2 + F_{\text{offset, case 1}}$	$\leq -BW/2 - F_{\text{offset, case 2}}$ & $\geq +BW/2 + F_{\text{offset, case 2}}$
1, 2, 3, 4, 5 7, 8, 9, 10, 11, 33,34,35,36,37,38 ,39,40	$F_{\text{Interferer}}$	MHz	$F_{\text{DL\_low}} - 7.5$ to $F_{\text{DL\_high}} + 7.5$ (Note 1)	$F_{\text{DL\_low}} - 15$ to $F_{\text{DL\_high}} + 15$
6, 13	$F_{\text{Interferer}}$	MHz	$F_{\text{DL\_low}} - 7.5$ to $F_{\text{DL\_high}} + 7.5$ (Note 1 & 2)	$F_{\text{DL\_low}} - 15$ to $F_{\text{DL\_high}} + 15$ (Note 2)
Note 1. For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency $-BW/2 - F_{\text{offset, case 1}}$ and b. the carrier frequency $+BW/2 + F_{\text{offset, case 1}}$. 2. For Band 6 and 13 the unwanted modulated interfering signal does not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band				

7.6.2 Out of-band blocking

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band. For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

7.6.2.1 Minimum requirements

. The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2.1-1 and 7.6.2.1-2.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious response are applicable.

Table 7.6.2.1-1: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
Note:		6	6	6	6	7	9

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. Reference measurement channel is [A.3.2]

Table 7.6.2.1-2: Out of band blocking

E-UTRA band	Parameter	Units	Frequency			
			range 1	range 2	range 3	range 4
1, 2, 3, 4, 5 6,7, 8, 9, 10,11,13 33,34,35,36,37 ,38,39,40 2, 5	$P_{\text{Interferer}}$	dBm	[-44]	[-30]	[-15]	[-15]
	$F_{\text{Interferer}}$ (CW)	MHz	$F_{\text{DL\_low}} -15$ to $F_{\text{DL\_low}} -60$	$F_{\text{DL\_low}} -60$ to $F_{\text{DL\_low}} -85$	$F_{\text{DL\_low}} -85$ to 1 MHz	-
			$F_{\text{DL\_high}} +15$ to $F_{\text{DL\_high}} +60$	$F_{\text{DL\_high}} +60$ to $F_{\text{DL\_high}} +85$	$F_{\text{DL\_high}} +85$ to +12750 MHz	-
	$F_{\text{Interferer}}$	MHz	-	-	-	$F_{\text{UL\_low}} - F_{\text{UL\_high}}$

Note:

7.6.3 Narrow band blocking

This requirement is measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

7.6.3.1 Minimum requirements

. The relative throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3.1-1

Table 7.6.3.1-1: Narrow-band blocking

Parameter	Unit	Channel Bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
P_w	dBm	P_{REFSENS} + channel-bandwidth specific value below					
		22	18	16	13	14	16
P_{UW} (CW)	dBm	-55	-55	-55	-55	-55	-55
F_{UW} (offset for $\Delta f = 15$ kHz)	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075
F_{UW} (offset for $\Delta f = 7.5$ kHz)	MHz						
Note 1: The transmitter shall be set a 4 dB below the supported maximum power.							
Note 2: Reference measurement channel is [A.3.2].							

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 is not met.

7.7.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7.1-1 and 7.7.1-2.

Table 7.7.1-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	7

Note:

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. Reference measurement channel is [A.3.2]

Table 7.7.1-2: Spurious Response

Parameter	Unit	Level
$P_{\text{Interferer (CW)}}$	dBm	-44
$F_{\text{Interferer}}$	MHz	Spurious response frequencies

7.8 Intermodulation characteristics

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Wide band intermodulation

The wide band intermodulation requirement is defined following the same principles using modulated E-UTRA carrier and CW signal as interferer.

7.8.1.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1.1 for the specified wanted signal mean power in the presence of two interfering signals

Table 7.8.1.1-1: Wide band intermodulation

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		[12]	[8]	6	6	7	9

$P_{\text{Interferer 1}}$ (CW)	dBm				-46
$P_{\text{Interferer 2}}$ (Modulated)	dBm				-46
$BW_{\text{Interferer 2}}$		1.4	3	5	
$F_{\text{Interferer 1}}$ (Offset)	MHz	$-BW/2 - 2.1$ / $+BW/2 + 2.1$	$-BW/2 - 4.5$ / $+BW/2 + 4.5$	$-BW/2 - 7.5$ / $+BW/2 + 7.5$	
$F_{\text{Interferer 2}}$ (Offset)	MHz				$2 \cdot F_{\text{Interferer 1}}$
R_{av}	kbps				
Note:					

1. The transmitter shall be set to 4dB below the supported maximum output power.
2. Reference measurement channel is [Annex C QPSK R=1/3]
3. The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1 The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth $\geq 5\text{MHz}$

7.8.2 Narrow band intermodulation

7.8.2.1 Minimum requirements

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1-1

Table 7.9.1-1: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
$30\text{MHz} \leq f < 1\text{GHz}$	100 kHz	-57 dBm	
$1\text{GHz} \leq f \leq 12.75\text{GHz}$	1 MHz	-47 dBm	

8 Performance requirement

This clause contains performance requirements for the physical channels specified in [TS 36.211]. The performance requirements for the UE in this clause are specified for the measurement channels specified in Annex A.3, the propagation conditions in Annex B and the downlink channels in Annex C.3.2.

8.1 General

8.1.1 Dual-antenna receiver capability

The performance requirements are based on UE(s) that utilize a dual-antenna receiver.

8.1.1.1 Simultaneous unicast and MBMS operations

8.1.1.2 Dual-antenna receiver capability in idle mode

8.2 Demodulation of PDSCH (Cell-Specific Reference Symbols)

8.2.1 FDD (Fixed Reference Channel)

The parameters specified in Table 8.2.1-1 are valid for all FDD tests unless otherwise stated.

Table 8.2.1-1: Common Test Parameters (FDD)

Parameter	Unit	Value
Inter-TTI Distance		1
Number of HARQ processes	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH	OFDM symbols	2 [for bandwidths ≥ 10 MHz]
Cyclic Prefix		Normal
Note:		

For all test cases, the SNR is defined as

$$SNR = \frac{\hat{E}_s^{(1)} + \hat{E}_s^{(2)}}{N_{oc}^{(1)} + N_{oc}^{(2)}},$$

where the superscript indicates the receiver antenna connector. The SNR requirement applies for the UE categories given for each test.

8.2.1.1 Single-antenna port performance

The receiver single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.2 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.4.2.1-1.

8.2.1.1.1 Minimum Requirement QPSK

The requirements are specified in Table 8.2.1.1.1-2, with the addition of the parameters in Table 8.2.1.1.1-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.1.1.1-1: Test Parameters for Testing QPSK

Parameter	Unit	Test [1.1-1.4,2.1]
Reference signal power E_{RS}/I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD [-74]
Note: TBD		

Table 8.2.1.1.1-2: Minimum performance QPSK (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[1.1]	10 MHz	[R.2 FDD]	EVA5	Low	70	-1.0	
[1.2]	10 MHz	[R.2 FDD]	ETU70	Low	70	-0.4	
[1.3]	10 MHz	[R.2 FDD]	ETU300	Low	70	0.0	
[1.4]	10 MHz	[R.2 FDD]	HST	Low	70	TBD	
[2.1]	1.4 MHz	[R.4 FDD]	EVA5	Low	70	TBD	

8.2.1.1.2 Minimum Requirement 16QAM

The requirements are specified in Table 8.2.1.1.2-1, with the addition of the parameters in Table 8.2.1.1.2-2 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.1.1.2-1: Test Parameters for Testing 16QAM

Parameter	Unit	Test [1.5-1.7]
Reference signal power E_{RS}/I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Note: TBD		

Table 8.2.1.1.2-2: Minimum performance 16QAM (FRC)

Test number	Bandwidth h	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[1.5]	10 MHz	[R.3 FDD]	EVA5	Low	70	6.7	
[1.6]	10 MHz	[R.3 FDD]	ETU70	Low	30	1.4	
[1.7]	10 MHz	[R.3 FDD]	ETU300	High	70	9.4	

8.2.1.1.3 Minimum Requirement 64QAM

The requirements are specified in Table 8.2.1.1.3-2, with the addition of the parameters in Table 8.2.1.1.3-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.1.1.3-1: Test Parameters for Testing 64QAM

Parameter	Unit	Test [1.8-1.10, 2.2-2.5]
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Note: TBD		

Table 8.2.1.1.3-2: Minimum performance 64QAM (FRC)

Test number	Bandwidth h	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[2.2]	3 MHz	[R.5 FDD]	EVA5	Low	70	TBD	
[2.3]	5 MHz	[R.6 FDD]	EVA5	Low	70	TBD	
[1.8]	10 MHz	[R.7 FDD]	EVA5	Low	70	17.7	
[1.9]	10 MHz	[R.7 FDD]	ETU70	Low	70	19.0	
[1.10]	10 MHz	[R.7 FDD]	EVA5	High	70	19.1	
[2.4]	15 MHz	[R.8 FDD]	EVA5	Low	70	17.7	
[2.5]	20 MHz	[R.9 FDD]	EVA5	Low	70	17.6	

8.2.1.1.4 Minimum Requirement 1 PRB allocation

The requirements are specified in Table 8.2.1.1.4-2, with the addition of the parameters in Table 8.2.1.1.4-1 and the downlink physical channel setup according to table [in Annex C.3.2]. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge.

Table 8.2.1.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter	Unit	Test [3.1-3.3]
Reference signal power E_{RS} / I_{or}	dB	
N_{oc} at antenna port	dBm/15kHz	TBD
PRB allocation		[Lower channel edge]
Note: TBD		

Table 8.2.1.1.4-2: Minimum performance 1PRB (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[3.1]	1.4 MHz 16QAM 1/2	[R.0 FDD]	ETU70	Low	30	TBD	
[3.2]	10 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD	
[3.3]	20 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD	

8.2.1.2 Transmit diversity performance

The requirements are specified in Table 8.2.1.2-2, with the addition of the parameters in Table 8.2.1.2-1 and the downlink physical channel setup according to table [in Annex C.3.2]. The purpose is to verify the performance of transmit diversity (SFBC) with 2 and 4 transmitter antennas.

Table 8.2.1.2-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter	Unit	Test [7.1]		
Reference signal power $(E_{RS} / I_{or})^{(p)}$	dB	3		
N_{oc} at antenna port	dBm/15kHz			

Table 8.2.1.2-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[7.1]	10 MHz 16QAM 1/2	[R.11 FDD]	EVA5	2x2 Medium	70	6.8	
[7.2]	10 MHz QPSK 1/3	[R.10 FDD]	HST	2x2 Low	70	TBD	
[7.3]	1.4 MHz QPSK 1/3	[R.12 FDD]	EPA5	4x2 Medium	70	TBD	

8.2.1.3 Open-loop spatial multiplexing performance

8.2.1.4 Closed-loop spatial multiplexing performance

8.2.1.4.1 Minimum Requirement Single-Layer Spatial Multiplexing

The requirements are specified in Table 8.2.1.4.1-2, with the addition of the parameters in Table 8.2.1.4.1-1 and the downlink physical channel setup according to table [in Annex C.3.2]. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.1.4.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter	Unit	Test [4.1]	Test [4.2]	
Reference signal power $(E_{RS} / I_{or})^{(p)}$	dB	3		
N_{oc} at antenna port	dBm/15kHz			
Precoding granularity	PRB	6	50	

Table 8.2.1.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[4.1]	10 MHz QPSK 1/3	[R.10]	EVA5	2x2 Low	70	-2.5	
[4.2]	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-2.8	
[4.3]	10 MHz QPSK 1/3	[R.13]	EVA5	4x2 Low	70	TBD	

8.2.1.4.2 Minimum Requirement Multi-Layer Spatial Multiplexing

The requirements are specified in Table 8.2.1.4.2-2, with the addition of the parameters in Table 8.2.1.4.2-1 and the downlink physical channel setup according to table [in Annex C.3.2]. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.1.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter	Unit	Test [5.1,5.2]	Test [5.3]	
Reference signal power $(E_{RS} / I_{or})^{(p)}$	dB	3		
N_{oc} at antenna port	dBm/15kHz			
Precoding granularity	PRB	50	6	
PMI delay		6	6	

Table 8.2.1.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[5.1]	10 MHz 16QAM 1/2	[R.11 FDD]	EVA5	2x2 Low	70	12.9	
[5.2]	10 MHz 16QAM 1/2	[R.11 FDD]	ETU70	2x2 Low	70	14.3	
[5.3]	10 MHz 16QAM 1/2	[R.14 FDD]	EVA5	4x2 Low	70	TBD	

8.2.1.5 MU-MIMO

8.2.1.6 [Control channel performance: D-BCH and PCH]

8.2.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.2.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.2.2-1: Common Test Parameters (TDD)

Parameter		Value
Uplink downlink configuration (Note 1)		1
Special subframe configuration (Note 2)		4
Cyclic prefix		Normal
Inter-TTI Distance		1
Number of HARQ processes	Processes	7
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH	OFDM symbols	
Cyclic Prefix		Normal
Note 1: as specified in Table 4.2-2 in [TS 36.211]		
Note 2: as specified in Table 4.2-1 in [TS 36.211]		

8.2.2.1 Single-antenna port performance

The receiver single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.2 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.4.2.1-1.

8.2.2.1.1 Minimum Requirement QPSK

The requirements are specified in Table 8.2.2.1.1-2, with the addition of the parameters in Table 8.2.2.1.1-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.2.1.1-1: Test Parameters for Testing QPSK

Parameter	Unit	Test [1.1-1.4,2.1]
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD [-74]
Note: TBD		

Table 8.2.2.1.1-2: Minimum performance QPSK (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[1.1]	10 MHz	[R.2 TDD]	EVA5	Low	70	TBD	
[1.2]	10 MHz	[R.2 TDD]	ETU70	Low	70	TBD	
[1.3]	10 MHz	[R.2 TDD]	ETU300	Low	70	TBD	
[1.4]	10 MHz	[R.2 TDD]	HST	Low	70	TBD	
[2.1]	1.4 MHz	[R.4 TDD]	EVA5	Low	70	TBD	

8.2.2.1.2 Minimum Requirement 16QAM

The requirements are specified in Table 8.2.2.1.2-1, with the addition of the parameters in Table 8.2.2.1.2-2 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.2.1.2-1: Test Parameters for Testing 16QAM

Parameter	Unit	Test [1.5-1.7]
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Note: TBD		

Table 8.2.2.1.2-2: Minimum performance 16QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[1.5]	10 MHz	[R.3 TDD]	EVA5	Low	70	TBD	
[1.6]	10 MHz	[R.3 TDD]	ETU70	Low	30	TBD	
[1.7]	10 MHz	[R.3 TDD]	ETU300	High	70	TBD	

8.2.2.1.3 Minimum Requirement 64QAM

The requirements are specified in Table 8.2.2.1.3-2, with the addition of the parameters in Table 8.2.2.1.3-1 and the downlink physical channel setup according to table [in Annex C.3.2].

Table 8.2.2.1.3-1: Test Parameters for Testing 64QAM

Parameter	Unit	Test [1.8-1.10, 2.2-2.5]
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
Note:	TBD	

Table 8.2.2.1.3-2: Minimum performance 64QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
[2.2]	3 MHz	[R.5 TDD]	EVA5	Low	70	TBD	
[2.3]	5 MHz	[R.6 TDD]	EVA5	Low	70	TBD	
[1.8]	10 MHz	[R.7 TDD]	EVA5	Low	70	TBD	
[1.9]	10 MHz	[R.7 TDD]	ETU70	Low	70	TBD	
[1.10]	10 MHz	[R.7 TDD]	EVA5	High	70	TBD	
[2.4]	15 MHz	[R.8 TDD]	EVA5	Low	70	TBD	
[2.5]	20 MHz	[R.9 TDD]	EVA5	Low	70	TBD	

8.2.2.1.4 Minimum Requirement 1 PRB allocation

The requirements are specified in Table 8.2.2.1.4-2, with the addition of the parameters in Table 8.2.2.1.4-1 and the downlink physical channel setup according to table [in Annex C.3.2]. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge.

Table 8.2.2.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter	Unit	Test [3.1-3.3]
Reference signal power E_{RS} / I_{or}	dB	
N_{oc} at antenna port	dBm/15kHz	TBD
PRB allocation		[Lower channel edge]
Note: TBD		

Table 8.2.2.1.4-2: Minimum performance 1PRB (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value Fraction of Maximum Throughput (%)	Reference value SNR (dB)	UE Category
[3.1]	1.4 MHz 16QAM 1/2	[R.0 TDD]	ETU70	Low	30	TBD	
[3.2]	10 MHz 16QAM 1/2	[R.1 TDD]	ETU70	Low	30	TBD	
[3.3]	20 MHz 16QAM 1/2	[R.1 TDD]	ETU70	Low	30	TBD	

8.2.2.2 Transmit diversity performance

8.2.2.3 Open-loop spatial multiplexing performance

8.2.2.4 Closed-loop spatial multiplexing performance

8.2.2.5 MU-MIMO

8.2.2.6 [Control channel performance: D-BCH and PCH]

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

Requirements for user-specific requirements are TBD. 8.4 Demodulation of PDCCH/PCFICH

8.4 Demodulation of PDCCH/PCFICH

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

8.4.1 FDD

Table 8.4.1-1: Test Parameters for PDCCH/PCFICH

Parameter	Unit	Test [8.1]		
Number of PDCCH symbols	symbols	2		
PHICH mapping		1 PHICH group, normal PHICH duration		
Cell ID		0		
Reference signal power $(E_{RS} / I_{or})^{(p)}$	dB	0		
Power difference between PCFICH and PDCCH	dB	0		
N_{oc} at antenna port	dBm/15kHz			
Cyclic prefix		Normal		

8.4.1.1 Single-antenna port performance

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1-1 [The downlink physical setup is in accordance with Annex C.3.2.]

Table 8.4.1.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	10 MHz	8 CCE	[R.15 FDD]	ETU70	Low	1	-1.7

8.4.1.2 Transmit diversity performance

8.4.2 TDD

8.4.2.1 Single-antenna port performance

8.4.2.2 Transmit diversity performance

8.5 Demodulation of PHICH

8.6 Demodulation of PBCH

9 Reporting of [CQI/PMI]

<Text omitted>

Annex A (normative): Measurement channels

A.1 General

A.2 UL reference measurement channels

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.
2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24) / N_{ch}|,$$

subject to

- a) A is a valid TB size (according to section 7.1.7 of 36.213) assuming an allocation of N_{RB} resource blocks.

3. If there is more than one A that minimises the equation above, then the larger value is chosen per default.

A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) [with the exception of sub-clause 7.4 (Maximum input level)].

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.2-1 Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1320	2216	4392	6712	8760
For Sub-Frame 5	Bits	320	1064	1800	4392	6712	8760
For Sub-Frame 0	Bits	152	872	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per subframe		1	1	1	1	2	2
Code block CRC size	Bits	0	0	0	0	24	24
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	3780	6300	13800	20700	27600
For Sub-Frame 5	Bits	1080	3492	6012	13512	20412	27312
For Sub-Frame 0	Bits	528	2940	5460	12960	19860	26760
Max. Throughput averaged over 1 frame	kbps	373.6	1249.6	2132.8	4392	6712	8760
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: The RLC should be configured to Unacknowledged Mode							

Table A.3.2-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value					
Nominal Avg. Inf. Bit Rate	kbps						
Number of HARQ Processes	Processes	1	1	1	1	1	1
Maximum number of HARQ transmission		1	1	1	1	1	1
Information Bit Payload per Sub-Frame	Bits						
Number of Code Blocks							
Binary Channel Bits Per Sub-Frame	Bits						
Coding Rate							
Bandwidth	MHz	1.4	3	5	10	15	20
Number of OFDM symbols per Sub-Frame							
					11.5		
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Note 1: 2 symbols allocated to PDCCH							
Note 2: The RLC should be configured to Unacknowledged Mode							

A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		[R.4 FDD]			[R.2 FDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Allocated subframes per Radio Frame		10			10		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408			4392		
For Sub-Frame 5	Bits	328			4392		
For Sub-Frame 0	Bits	152			4392		
Number of Code Blocks per subframe		1			1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368			13800		
For Sub-Frame 5	Bits	1080			13512		
For Sub-Frame 0	Bits	528			12960		
Max. Throughput averaged over 1 frame	Mbps	0.374			4.39		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					[R.3 FDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Allocated subframes per Radio Frame					10		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				14112		
For Sub-Frame 5	Bits				12960		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per subframe					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				27600		
For Sub-Frame 5	Bits				27024		
For Sub-Frame 0	Bits				25920		
Max. Throughput averaged over 1 frame	Mbps				13.9		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			[R.5 FDD]	[R.6 FDD]	[R.7 FDD]	[R.8 FDD]	[R.9 FDD]
Channel bandwidth	MHz	1.4	3	5	10	15	20

Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		8504	14112	30576	46888	61664
For Sub-Frame 5	Bits		7992	13536	30576	45352	61664
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per subframe			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		11340	18900	41400	62100	82800
For Sub-Frame 5	Bits		10476	18036	40536	61236	81936
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		8.25	13.9	30.4	46.6	61.7
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

Parameter	Unit	Value					
Reference channel			[R.0 FDD]		[R.1 FDD]		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Allocated subframes per Radio Frame			10		10		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		224		256		
For Sub-Frame 5	Bits		224		256		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per subframe			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		504		552		
For Sub-Frame 5	Bits		504		552		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.224		0.256		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value					
Reference channel			[R.10 FDD]	[R.11 FDD]			
Channel bandwidth	MHz		10	10			
Allocated resource blocks			50	50			
Allocated subframes per Radio Frame			10	10			
Modulation			QPSK	16QAM			
Target Coding Rate			1/3	1/2			
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		4392	12960			
For Sub-Frame 5	Bits		4392	12960			
For Sub-Frame 0	Bits		4392	12960			
Number of Code Blocks per subframe			1	3			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		13200	26400			
For Sub-Frame 5	Bits		12912	25824			
For Sub-Frame 0	Bits		12384	24768			
Max. Throughput averaged over 1 frame	Mbps		4.39	13.0			
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

A.3.3.2.2 Four antenna ports

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value					
Reference channel		[R.12 FDD]	[R.13 FDD]	[R.14 FDD]			
Channel bandwidth	MHz	1.4	10	10			
Allocated resource blocks		6	50	50			
Allocated subframes per Radio Frame		10	10	10			
Modulation		QPSK	QPSK	16QAM			
Target Coding Rate		1/3	1/3	1/2			
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	4392	12960			
For Sub-Frame 5	Bits	328	4392	12960			
For Sub-Frame 0	Bits	152	3624	11448			
Number of Code Blocks per subframe							
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3			
For Sub-Frame 5		1	1	3			
For Sub-Frame 0		1	1	2			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1248	12800	25600			
For Sub-Frame 5	Bits	960	12512	25024			
	Bits	480	12032	24064			
Max. Throughput averaged over 1 frame	Mbps	0.374	4.32	12.8			
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							

A.3.3.3 [RMC for UE-Specific Reference Symbols]

A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		[R.4 TDD]			[R.2 TDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Uplink-Downlink Configuration (Note 3)		1			1		
Allocated subframes per Radio Frame (D+S)		4+2			4+2		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 4,9	Bits	TBD			4392		
For Sub-Frames 1,6	Bits	TBD			3624		
For Sub-Frame 5	Bits	TBD			4392		
For Sub-Frame 0	Bits	TBD			4392		
Number of Code Blocks per subframe					1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	TBD			13800		
For Sub-Frames 1,6	Bits	TBD			11256		
For Sub-Frame 5	Bits	TBD			13656		
For Sub-Frame 0	Bits	TBD			13104		
Max. Throughput averaged over 1 frame	Mbps				2.48		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: as per Table 4.2-2 in TS 36.211 [4]							

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					[R.3 TDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Uplink-Downlink Configuration (Note 3)					1		
Allocated subframes per Radio Frame (D+S)					4+2		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits				14112		
For Sub-Frames 1,6	Bits				11448		
For Sub-Frame 5	Bits				14112		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per subframe							
For Sub-Frames 4,9					3		
For Sub-Frames 1,6					2		
For Sub-Frame 5					3		
For Sub-Frame 0					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits				27600		

For Sub-Frames 1,6	Bits				22512		
For Sub-Frame 5	Bits				27312		
For Sub-Frame 0	Bits				26208		
Max. Throughput averaged over 1 frame	Mbps				7.82		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: as per Table 4.2-2 in TS 36.211 [4]							

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			[R.5 TDD]	[R.6 TDD]	[R.7 TDD]	[R.8 TDD]	[R.9 TDD]
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Uplink-Downlink Configuration (Note 3)			1	1	1	1	1
Allocated subframes per Radio Frame (D+S)			4+2	4+2	4+2	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 4,9	Bits		TBD	TBD	30576	46888	61664
For Sub-Frames 1,6	Bits		TBD	TBD	25456	37888	51024
For Sub-Frame 5	Bits		TBD	TBD	30576	46888	61664
For Sub-Frame 0	Bits		TBD	TBD	30576	45352	61664
Number of Code Blocks per subframe							
For Sub-Frames 4,9			TBD	TBD	41400	62100	82800
For Sub-Frames 1,6			TBD	TBD	33768	50868	67968
For Sub-Frame 5			TBD	TBD	40968	61668	82368
For Sub-Frame 0			TBD	TBD	39312	60012	80712
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		TBD	TBD	5	8	11
For Sub-Frames 1,6	Bits		TBD	TBD	5	7	9
For Sub-Frame 5	Bits		TBD	TBD	5	8	11
For Sub-Frame 0	Bits		TBD	TBD	5	8	11
Max. Throughput averaged over 1 frame	Mbps				17.3	26.2	34.9
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: as per Table 4.2-2 TS 36.211 [4]							

Table A.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit	Value					
Reference channel			[R.0 TDD]		[R.1 TDD]		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Uplink-Downlink Configuration (Note 3)			1		1		
Allocated subframes per Radio Frame (D+S)			4+2		4+2		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits		TBD		256		
For Sub-Frames 1,6	Bits		TBD		208		
For Sub-Frame 5	Bits		TBD		256		
For Sub-Frame 0	Bits		TBD		256		
Number of Code Blocks per subframe			TBD		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		TBD		552		
For Sub-Frames 1,6	Bits		TBD		456		

For Sub-Frame 5	Bits		TBD		552		
For Sub-Frame 0	Bits		TBD		552		
Max. Throughput averaged over 1 frame	Mbps				0.144		
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]							
Note 3: as per Table 4.2-2 in TS 36.211 [4]							

A.3.4.2 Multi-antenna transmission (Common Reference Signals))

A.3.4.3 [RMC for UE-Specific Reference Symbols]

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

Parameter	Unit	Value		
Reference channel		[R.15 FDD]	[R.16 FDD]	[R.17 FDD]
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 1	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	31	32+1	46

A.3.5.2 TDD

Table A.3.5.1-1: Reference Channel TDD

Parameter	Unit	Value		
Reference channel		[R.15 TDD]	[R.16 TDD]	[R.17 TDD]
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 1	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	34	35	49

Annex B (normative): Propagation conditions

B.1 Static propagation condition

B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.
- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1 Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

Table B.2.1-2 Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3 Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4 Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies

Table B.2.2-1 Channel model parameters

Model	Maximum Doppler frequency
EPA 5Hz	5 Hz
EVA 5Hz	5 Hz
EVA 70Hz	70 Hz
ETU 70Hz	70 Hz
ETU 300Hz	300 Hz

B.2.3 MIMO Channel Correlation Matrices

B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1 eNodeB correlation matrix

One antenna	Two antennas	Four antennas

eNode B Correlation

$$R_{eNB} = 1 \quad R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix} \quad R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{pmatrix}$$

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2 UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & 1 \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{pmatrix}$

Table B.2.3.1-3 defines the channel spatial correlation matrix R_{spat} . The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3: R_{spat} correlation matrices

1x2 case

$$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$$

2x2 case

$$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$$

4x2 case

$$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$$

4x4 case

$$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{bmatrix}$$

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The α and β for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1

Low correlation		Medium Correlation		High Correlation	
α	β	α	β	α	β
0	0	0.3	0.9	0.9	0.9

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.1-2, B.2.3.2-3 and B.2.3.2-4, as below.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case

$$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$$

2x2 case

$$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$$

4x2 case

$$R_{high} = \begin{pmatrix} 1.0000 & 0.9000 & 0.9884 & 0.8895 & 0.9543 & 0.8588 & 0.9000 & 0.8100 \\ 0.9000 & 1.0000 & 0.8895 & 0.9884 & 0.8588 & 0.9543 & 0.8100 & 0.9000 \\ 0.9884 & 0.8895 & 1.0000 & 0.9000 & 0.9884 & 0.8895 & 0.9543 & 0.8588 \\ 0.8895 & 0.9884 & 0.9000 & 1.0000 & 0.8895 & 0.9884 & 0.8588 & 0.9543 \\ 0.9543 & 0.8588 & 0.9884 & 0.8895 & 1.0000 & 0.9000 & 0.9884 & 0.8895 \\ 0.8588 & 0.9543 & 0.8895 & 0.9884 & 0.9000 & 1.0000 & 0.8895 & 0.9884 \\ 0.9000 & 0.8100 & 0.9543 & 0.8588 & 0.9884 & 0.8895 & 1.0000 & 0.9000 \\ 0.8100 & 0.9000 & 0.8588 & 0.9543 & 0.8895 & 0.9884 & 0.9000 & 1.0000 \end{pmatrix}$$

4x4 case

$$R_{high} = \begin{pmatrix} 1.0000 & 0.9884 & 0.9543 & 0.9000 & 0.9884 & 0.9769 & 0.9431 & 0.8895 & 0.9543 & 0.9431 & 0.9106 & 0.8588 & 0.9000 & 0.8895 & 0.9000 \\ 0.9884 & 1.0000 & 0.9884 & 0.9543 & 0.9769 & 0.9884 & 0.9769 & 0.9431 & 0.9431 & 0.9543 & 0.9431 & 0.9106 & 0.8895 & 0.9000 & 0.8895 \\ 0.9543 & 0.9884 & 1.0000 & 0.9884 & 0.9431 & 0.9769 & 0.9884 & 0.9769 & 0.9106 & 0.9431 & 0.9543 & 0.9431 & 0.8588 & 0.8895 & 0.9000 \\ 0.9000 & 0.9543 & 0.9884 & 1.0000 & 0.8895 & 0.9431 & 0.9769 & 0.9884 & 0.8588 & 0.9106 & 0.9431 & 0.9543 & 0.8100 & 0.8588 & 0.9000 \\ 0.9884 & 0.9769 & 0.9431 & 0.8895 & 1.0000 & 0.9884 & 0.9543 & 0.9000 & 0.9884 & 0.9769 & 0.9431 & 0.8895 & 0.9543 & 0.9431 & 0.9000 \\ 0.9769 & 0.9884 & 0.9769 & 0.9431 & 0.9884 & 1.0000 & 0.9884 & 0.9543 & 0.9769 & 0.9884 & 0.9769 & 0.9431 & 0.9431 & 0.9543 & 0.9000 \\ 0.9431 & 0.9769 & 0.9884 & 0.9769 & 0.9543 & 0.9884 & 1.0000 & 0.9884 & 0.9431 & 0.9769 & 0.9884 & 0.9769 & 0.9106 & 0.9431 & 0.9000 \\ 0.8895 & 0.9431 & 0.9769 & 0.9884 & 0.9000 & 0.9543 & 0.9884 & 1.0000 & 0.8895 & 0.9431 & 0.9769 & 0.9884 & 0.8588 & 0.9106 & 0.9000 \\ 0.9543 & 0.9431 & 0.9106 & 0.8588 & 0.9884 & 0.9769 & 0.9431 & 0.8895 & 1.0000 & 0.9884 & 0.9543 & 0.9000 & 0.9884 & 0.9769 & 0.9000 \\ 0.9431 & 0.9543 & 0.9431 & 0.9106 & 0.9769 & 0.9884 & 0.9769 & 0.9431 & 0.9884 & 1.0000 & 0.9884 & 0.9543 & 0.9769 & 0.9884 & 0.9000 \\ 0.9106 & 0.9431 & 0.9543 & 0.9431 & 0.9431 & 0.9769 & 0.9884 & 0.9769 & 0.9543 & 0.9884 & 1.0000 & 0.9884 & 0.9431 & 0.9769 & 0.9000 \\ 0.8588 & 0.9106 & 0.9431 & 0.9543 & 0.8895 & 0.9431 & 0.9769 & 0.9884 & 0.9000 & 0.9543 & 0.9884 & 1.0000 & 0.8895 & 0.9431 & 0.9000 \\ 0.9000 & 0.8895 & 0.8588 & 0.8100 & 0.9543 & 0.9431 & 0.9106 & 0.8588 & 0.9884 & 0.9769 & 0.9431 & 0.8895 & 1.0000 & 0.9884 & 0.9000 \\ 0.8895 & 0.9000 & 0.8895 & 0.8588 & 0.9431 & 0.9543 & 0.9431 & 0.9106 & 0.9769 & 0.9884 & 0.9769 & 0.9431 & 0.9884 & 1.0000 & 0.9000 \\ 0.8588 & 0.8895 & 0.9000 & 0.8895 & 0.9106 & 0.9431 & 0.9543 & 0.9431 & 0.9431 & 0.9769 & 0.9884 & 0.9769 & 0.9543 & 0.9884 & 1.0000 \\ 0.8100 & 0.8588 & 0.8895 & 0.9000 & 0.8588 & 0.9106 & 0.9431 & 0.9543 & 0.8895 & 0.9431 & 0.9769 & 0.9884 & 0.9000 & 0.9543 & 0.9000 \end{pmatrix}$$

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

1x2 case	N/A
2x2 case	$R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 & 0.3000 & 0.2700 \\ 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 & 0.2700 & 0.3000 \\ 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 \\ 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 \\ 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 \\ 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 \\ 0.3000 & 0.2700 & 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 \\ 0.2700 & 0.3000 & 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 \end{pmatrix}$
4x4 case	TBD

Table B.2.3.2-4: MIMO correlation matrices for low correlation

1x2 case	$R_{low} = \mathbf{I}_2$
2x2 case	$R_{low} = \mathbf{I}_4$
4x2 case	$R_{low} = \mathbf{I}_8$
4x4 case	$R_{low} = \mathbf{I}_{16}$

In Table B.2.3.2-4, $\mathbf{I}_d$ is the $d \times d$ identity matrix.

B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos \theta(t)$$

where $f_s(t)$ is the Doppler shift and f_d is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos \theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{min}^2 + (D_s/2 - vt)^2}}, \quad 0 \leq t \leq D_s/v$$

$$\cos \theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}^2 + (-1.5D_s + vt)^2}}, \quad D_s/v < t \leq 2D_s/v$$

$$\cos \theta(t) = \cos \theta(t \bmod (2D_s/v)), \quad t > 2D_s/v$$

where $D_s/2$ is the initial distance of the train from eNodeB, and $D_{\min}$ is eNodeB Railway track distance, both in meters; v is the velocity of the train in m/s, t is time in seconds. The parameters in the equation are shown in Table B.3-1 assuming a carrier frequency $f_c = 2690$ MHz. The resulting Doppler shift is shown in Figure.B.3-1.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
$D_{\min}$	2 m
v	300 km/h
f_d	750 Hz

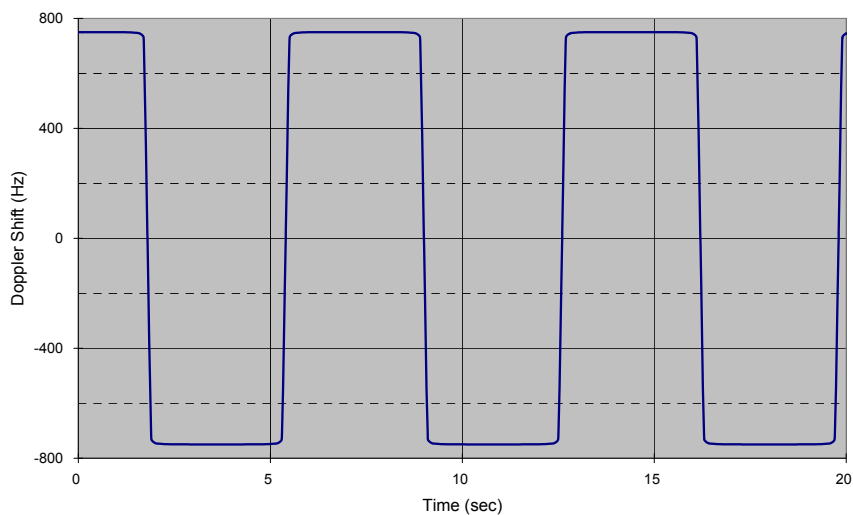


Figure B.3-1: Doppler shift trajectory

Annex C (normative): Downlink Physical Channels

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

**Table C.2-1: Downlink Physical Channels required
for connection set-up**

Physical Channel
PBCH
SSS
PSS
PCFICH
PDCCH
PHICH
PDSCH

C.3 Connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PCFICH	PCFICH_RB = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		0 dB	

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH_RA = ρ_A	
	PBCH_RB = ρ_B	
PSS	PSS_RA = ρ_A	
SSS	SSS_RA = ρ_A	
PCFICH	PCFICH_RB = ρ_B	
PDCCH	PDCCH_RA = ρ_A	
	PDCCH_RB = ρ_B	
PDSCH	PDSCH_RA = ρ_A	
	PDSCH_RB = ρ_B	

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		Test specific	1. Applies for antenna port p

Annex D (normative): Characteristics of the interfering signal

D.1 General

When the channel band width is wider or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel band widths below 5MHz, the band width of modulated interferer should be equal to band width of the received signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth					
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
RB	6	15	25	50	75	100
BW _{Interferer}	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz

Annex E (normative): Environmental conditions

E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

E.2 Environmental

The requirements in this clause apply to all types of UE(s).

E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

+15°C to +35°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°C	for extreme conditions (see IEC publications 68-2-1 and 68-2-2)

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table E.2.2-1

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries:			
Leclanché	0,85 * nominal	Nominal	Nominal
Lithium	0,95 * nominal	1,1 * Nominal	1,1 * Nominal
Mercury/nickel & cadmium	0,90 * nominal		Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table E.2.3-1

Frequency	ASD (Acceleration Spectral Density) random vibration
5 Hz to 20 Hz	0,96 m ² /s ³
20 Hz to 500 Hz	0,96 m ² /s ³ at 20 Hz, thereafter –3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 for extreme operation.

Annex F (normative): Transmit modulation

F.1 Measurement Point

Figure F.1-1 shows the measurement point for the unwanted emission falling into non-allocated RB(s) and the EVM for the allocated RB(s).

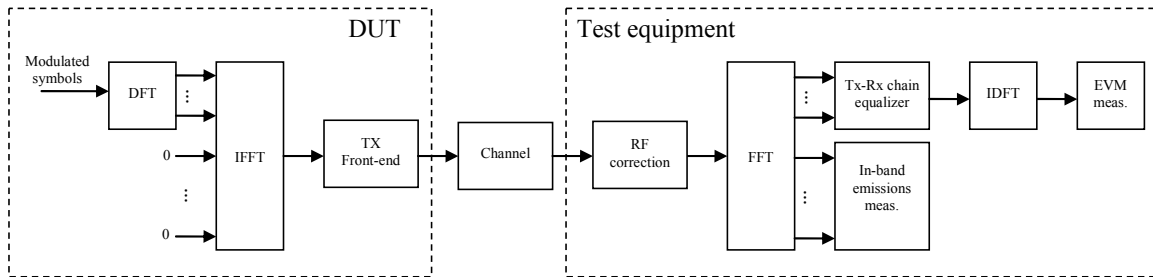


Figure F.1-1: EVM measurement points

F.2 Basic Error Vector Magnitude measurement

The EVM is the difference between the ideal waveform and the measured waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{v \in T_m} |z'(v) - i(v)|^2}{|T_m| \cdot P_0}},$$

where

T_m is a set of $|T_m|$ modulation symbols with the considered modulation scheme being active within the measurement period,

$z'(v)$ are the samples of the signal evaluated for the EVM,

$i(v)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

The basic EVM measurement interval is defined over one slot in the time domain.

F.3 Basic in-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

For the non-allocated RBs below the allocated frequency block the in-band emissions would be measured as follows

$$Emissions_{absolute}(\Delta_{RB}) = \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{\substack{\min(f_{\max}, c-12 \cdot \Delta_{RB} + 11) \\ \max(f_{\min}, c-12 \cdot \Delta_{RB})}} |Y(t, f)|^2,$$

where

T_s is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB),

$f_{\min}$ (resp. $f_{\max}$) is the lower (resp. upper) edge of the UL system BW,

c is the lower edge of the allocated BW, and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii)

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot N_{RB}} \sum_{t \in T_s} \sum_c^{c+12 \cdot N_{RB}-1} |Y(t, f)|^2}$$

where

N_{RB} is the number of allocated RBs

The basic in-band emissions measurement interval is defined over one slot in the time domain.

F.4 Modified signal under test

Implicit in the definition of EVM is an assumption that the receiver is able to compensate a number of transmitter impairments. The signal under test is equalised and decoded according to:

$$Z'(t, f) = IDFT \left\{ \frac{FFT \left\{ z(v - \Delta \tilde{t}) \cdot e^{-j2\pi \Delta \tilde{f} v} \right\} e^{j2\pi \Delta \tilde{t} f}}{\tilde{a}(t, f) \cdot e^{j\tilde{\phi}(t, f)}} \right\}$$

where

$z(v)$ is the time domain samples of the signal under test.

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

$\Delta \tilde{t}$ is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

$\Delta \tilde{f}$ is the RF frequency offset.

$\tilde{\varphi}(t, f)$ is the phase response of the TX chain.

$\tilde{a}(t, f)$ is the amplitude response of the TX chain.

In the following $\Delta\tilde{c}$ represents the middle sample of the EVM window of length W (defined in the next subsections) or the last sample of the first window half if W is even.

The EVM analyser shall

- detect the start of each slot and estimate $\Delta\tilde{t}$ and $\Delta\tilde{f}$,
- determine $\Delta\tilde{c}$ so that the EVM window of length W is centred
 - on the time interval determined by the measured cyclic prefix minus 16 samples of the considered OFDM symbol for symbol 0 for normal CP, i.e. the first 16 samples of the CP should not be taken into account for this step.
 - on the measured cyclic prefix of the considered OFDM symbol for symbol 1 to 6 for normal CP and for symbol 0 to 5 for extended CP.

To determine the other parameters a sample timing offset equal to $\Delta\tilde{c}$ is corrected from the signal under test. The EVM analyser shall then

- correct the RF frequency offset $\Delta\tilde{f}$ for each subframe, and
- apply an FFT of appropriate size.

The IQ origin offset shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative IQ origin offset power (relative carrier leakage power) also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. The signal on the non-allocated RB(s), $Y(t, f)$, is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s). The UL EVM analyzer shall then estimate the TX chain equalizer coefficients $\tilde{a}(t, f)$ and $\tilde{\varphi}(t, f)$ used by the ZF equalizer for all subcarriers by

1. [tbd]

At this stage estimates of $\Delta\tilde{f}$, $\tilde{a}(t, f)$, $\tilde{\varphi}(t, f)$ and $\Delta\tilde{c}$ are available. $\Delta\tilde{t}$ is one of the extremities of the window W , i.e. $\Delta\tilde{t}$ can be $\Delta\tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$ or $\Delta\tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$, where $\alpha = 0$ if W is odd and $\alpha = 1$ if W is even. The EVM analyser shall then

- calculate EVM_l with $\Delta\tilde{t}$ set to $\Delta\tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$,
- calculate EVM_h with $\Delta\tilde{t}$ set to $\Delta\tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$.

F.5 Window length

F.5.1 Timing offset

As a result of using a cyclic prefix, there is a range of $\Delta\tilde{t}$, which, at least in the case of perfect Tx signal quality, would give close to minimum error vector magnitude. As a first order approximation, that range should be equal to the length of the cyclic prefix. Any time domain windowing or FIR pulse shaping applied by the transmitter reduces the $\Delta\tilde{t}$ range within which the error vector is close to its minimum.

F.5.2 Window length

The window length W affects the measured EVM, and is expressed as a function of the configured cyclic prefix length. In the case where equalization is present, as with frequency domain EVM computation, the effect of FIR is reduced. This is because the equalization can correct most of the linear distortion introduced by the FIR. However, the time domain windowing effect can't be removed.

F.5.3 Window length for normal CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for normal CP. The nominal window length for 3 MHz is rounded down one sample to allow the window to be centered on the symbol.

Table F.5.3-1 EVM window length for normal CP

Channel Bandwidth MHz	Cyclic prefix length N_{cp} for symbol 0	Cyclic prefix length N_{cp} for symbols 1 to 6	Nominal FFT size	Cyclic prefix for symbols 1 to 6 in FFT samples	EVM window length W	Ratio of W to CP for symbols 1 to 6*
1.4	160	144	128	9	[5]	[55.6]
3			256	18	[12]	[66.7]
5			512	36	[32]	[88.9]
10			1024	72	[66]	[91.7]
15			1536	108	[102]	[94.4]
20			2048	144	[136]	[94.4]

* Note: These percentages are informative and apply to symbols 1 through 6. Symbol 0 has a longer CP and therefore a lower percentage.

F.5.4 Window length for Extended CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for extended CP. The nominal window lengths for 3 MHz and 15 MHz are rounded down one sample to allow the window to be centered on the symbol.

Table F.5.4-1 EVM window length for extended CP

Channel Bandwidth	Cyclic prefix length	Nominal FFT size	Cyclic prefix in FFT	EVM window	Ratio of W to CP*

MHz	N_{cp}	samples	length W		
1.4	512	128	32	[28]	[87.5]
3		256	64	[58]	[90.6]
5		512	128	[124]	[96.9]
10		1024	256	[250]	[97.4]
15		1536	384	[374]	[97.4]
20		2048	512	[504]	[98.4]

* Note: These percentages are informative

F.6 Averaged EVM

EVM is averaged over all basic EVM measurements for 20 slots in the time domain.

$$\overline{EVM} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_i^2}$$

The EVM requirements should be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{EVM}_l$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_l$ in the expressions above and $\overline{EVM}_h$ is calculated using $\Delta\tilde{t} = \Delta\tilde{t}_h$.

Thus we get:

$$EVM = \max(\overline{EVM}_l, \overline{EVM}_h)$$

F.7 Spectrum Flatness

The data for the subcarrier output power shall be taken from the equaliser estimation step.

Annex G (informative): Change history

Table G.1: Change History

Date	TSG#	TSG Doc.	CR	Subject	Old	New
9-11-2007	R4#45	R4-72206		TS36.101V0.1.0 approved by RAN4	-	
12-2007	RP#38	RP-070979		Approved version at TSG RAN #38	1.0.0	8.0.0
03-2008	RP#39	RP-080123	3	TS36.101 - Combined updates of E-UTRA UE requirements	8.0.0	8.1.0
05-2008	RP#40	RP-080325	4	TS36.101 - Combined updates of E-UTRA UE requirements	8.1.0	8.2.0
09-2008	RP#41	RP-080638	5r1	Addition of Ref Sens figures for 1.4MHz and 3MHz Channel bandwidths	8.2.0	8.3.0
09-2008	RP#41	RP-080638	7r1	Transmitter intermodulation requirements	8.2.0	8.3.0
09-2008	RP#41	RP-080638	10	CR for clarification of additional spurious emission requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	15	Correction of In-band Blocking Requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	18r1	TS36.101: CR for section 6: NS_06	8.2.0	8.3.0
09-2008	RP#41	RP-080638	19r1	TS36.101: CR for section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080638	20r1	TS36.101: CR for UE minimum power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	21r1	TS36.101: CR for UE OFF power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	24r1	TS36.101: CR for section 7: Band 13 Rx sensitivity	8.2.0	8.3.0
09-2008	RP#41	RP-080638	26	UE EVM Windowing	8.2.0	8.3.0
09-2008	RP#41	RP-080638	29	Absolute ACLR limit	8.2.0	8.3.0
09-2008	RP#41	RP-080731	23r2	TS36.101: CR for section 6: UE to UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	30	Removal of [] for UE Ref Sens figures	8.2.0	8.3.0
09-2008	RP#41	RP-080731	31	Correction of PA, PB definition to align with RAN1 specification	8.2.0	8.3.0
09-2008	RP#41	RP-080731	37r2	UE Spurious emission band UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	44	Definition of specified bandwidths	8.2.0	8.3.0
09-2008	RP#41	RP-080731	48r3	Addition of Band 17	8.2.0	8.3.0
09-2008	RP#41	RP-080731	50	Alignment of the UE ACS requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080731	52r1	Frequency range for Band 12	8.2.0	8.3.0
09-2008	RP#41	RP-080731	54r1	Absolute power tolerance for LTE UE power control	8.2.0	8.3.0
09-2008	RP#41	RP-080731	55	TS36.101 section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080732	6r2	DL FRC definition for UE Receiver tests	8.2.0	8.3.0
09-2008	RP#41	RP-080732	46	Additional UE demodulation test cases	8.2.0	8.3.0
09-2008	RP#41	RP-080732	47	Updated descriptions of FRC	8.2.0	8.3.0
09-2008	RP#41	RP-080732	49	Definition of UE transmission gap	8.2.0	8.3.0
09-2008	RP#41	RP-080732	51	Clarification on High Speed train model in 36.101	8.2.0	8.3.0
09-2008	RP#41	RP-080732	53	Update of symbol and definitions	8.2.0	8.3.0
09-2008	RP#41	RP-080743	56	Addition of MIMO (4x2) and (4x4) Correlation Matrices	8.2.0	8.3.0

Exhibit 1035

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
Promoting Interoperability in the 700 MHz	)	WT Docket No. 12-69
Commercial Spectrum	)	
	)	
Interoperability of Mobile User Equipment Across	)	RM-11592 (Terminated)
Paired Commercial Spectrum Blocks in the 700	)	
MHz Band	)	

NOTICE OF PROPOSED RULEMAKING

Adopted: March 21, 2012

Released: March 21, 2012

Comment Date: [60 days after date of publication in the Federal Register]

Reply Comment Date: [105 days after date of publication in the Federal Register]

By the Commission: Chairman Genachowski and Commissioners McDowell and Clyburn issuing separate statements.

TABLE OF CONTENTS

Heading	Paragraph #
I. INTRODUCTION	1
II. BACKGROUND	6
III. DISCUSSION	17
A. Challenges to Achieving Interoperability	17
B. Potential for Harmful Interference	30
C. Promoting Interoperability	47
IV. CONCLUSION	60
V. PROCEDURAL MATTERS	61
A. Ex Parte Rules	61
B. Filing Requirements	62
C. Initial Regulatory Flexibility Act Analysis	66
D. Paperwork Reduction Act	67
VI. ORDERING CLAUSES	68
APPENDIX - Initial Regulatory Flexibility Analysis	

I. INTRODUCTION

1. The Communications Act directs the Commission to, among other things, promote the widest possible deployment of communications services, ensure the most efficient use of spectrum, and protect and promote vibrant competition in the marketplace. On each occasion where the Commission has made available new spectrum for mobile telephony and/or broadband, it has strived to meet these important goals. This was the case when the Commission launched its proceeding to free up the 700 MHz band for commercial mobile services, as it expressly recognized the need to “balance several competing goals, including facilitating access to spectrum by both small and large providers, providing

for the efficient use of the spectrum, and better enabling the delivery of broadband services in the 700 MHz Band.”¹

2. Since the completion of the 700 MHz auction and the subsequent clearing of the spectrum, however, certain Lower 700 MHz A Block licensees have asserted that the development of two distinct band classes within the Lower 700 MHz band has hampered their ability to have meaningful access to a wide range of advanced devices.² The result, they argue, is that this spectrum is being built out less quickly than anticipated (and in some cases not at all), so that a large number of Lower 700 MHz A Block licensees are unable to provide the level of service and degree of competition envisioned at the close of the auction and as contemplated by the Communications Act. The 700 MHz band, at 70 megahertz, one of the largest commercial mobile service bands, is the only non-interoperable commercial mobile service band.

3. The record to date in response to the underlying Petition for Rulemaking reveals disagreement over the rationale for the distinct band classes, and the wisdom of maintaining both.³ At its core, the dispute is whether a unified band class would result in harmful interference to Lower 700 MHz licensees in the B and C Blocks and whether, if harmful interference exists, it reasonably can be mitigated.

4. There is express agreement, however, that a unified band class across the Lower 700 MHz band has the potential to yield significant benefits for all licensees. Indeed, as AT&T, the primary holder of Lower B and C Block licenses, affirmed in a recent letter to the Commission, “[AT&T] indeed anticipate[s] that there would be increased opportunity [if interference concerns were addressed] for commercial relationships with A Block licensees.”⁴ Unfortunately, no industry-led solution to the lack of interoperability has yet emerged.

5. Therefore, we initiate this rulemaking proceeding to promote interoperability in the

¹ Service Rules for the 698-746, 747-762 and 777-792 MHz Band, WT Docket No. 06-150, Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Section 68.4(a) of the Commission’s Rules Governing Hearing Aid-Compatible Telephone, WT Docket No. 01-309, Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket No. 03-264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission’s Rules, WT Docket No. 06-169, Implementing a Nationwide, Broadband Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State, and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, Declaratory Ruling on Reporting Requirement Under Commission’s Part 1 Anti-Collusion Rule, WT Docket No. 07-166, *Second Report and Order*, 22 FCC Rcd 15289, 15305 ¶ 44 (2007) (*700 MHz Second Report and Order*).

² See 700 MHz Block A Good Faith Purchaser Alliance Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks, filed Sept. 29, 2009 (Petition).

³ The Petition was placed on Public Notice for comment in RM-11592. See *infra* note 26. The record in WT Docket No. 11-18 also discussed the distinct band classes and interoperability concerns in the Lower 700 MHz band. See Application of AT&T Inc. and Qualcomm Incorporated For Consent To Assign Licenses and Authorizations, WT Docket No. 11-18.

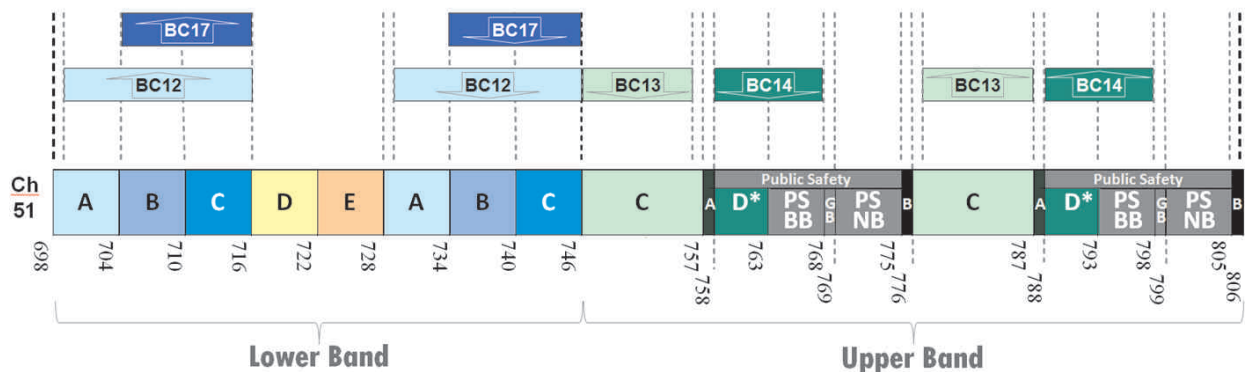
⁴ Letter from Joan Marsh, Vice President – Federal Regulatory, AT&T, to Marlene H. Dortch, FCC, WT Docket No. 11-18, filed Dec. 21, 2011 (AT&T Dec. 21, 2011 *Ex Parte* in WT Dkt. No. 11-18), at 2.

Lower 700 MHz band and to encourage the efficient use of spectrum.⁵ We will evaluate whether the customers of Lower 700 MHz B and C Block licensees would experience harmful interference – and if so, to what degree – if the Lower 700 MHz band were interoperable. We also explore the next steps should we find that interoperability would cause limited or no harmful interference to Lower 700 MHz B and C Block licensees, or that such interference can reasonably be mitigated through industry efforts and/or through modifications to the Commission’s technical rules or other regulatory measures.

II. BACKGROUND

6. *700 MHz Band.* The 700 MHz band (698-806 MHz), illustrated in the following figure, is comprised of 70 megahertz of commercial, non-guard band spectrum, 4 megahertz of guard band spectrum, 24 megahertz of public safety spectrum, and 10 megahertz of spectrum that will be reallocated for public safety use pursuant to recent Congressional mandate.⁶

700 MHz Band Plan & 3GPP Band Classes



“BCxx” indicates Band Classes proposed as part of the international 3GPP industry LTE technical standards processes.

*The D Block will be reallocated for use by public safety entities as directed by the Middle Class Tax Relief and Job Creation Act of 2012

7. As shown above, the Lower 700 MHz band spectrum (698-746 MHz) consists of 48 megahertz of commercial spectrum, with three blocks of 12 megahertz each of paired spectrum (Lower A, B, and C Blocks), and two blocks of 6 megahertz each of unpaired spectrum (Lower D and E Blocks). The Lower A Block spectrum is adjacent to Channel 51 (692-698 MHz), which has been allocated for TV broadcast operations at power levels of up to 1000 kW.⁷ The Lower A Block is also adjacent to the

⁵ The Commission has a longstanding interest in promoting the interoperability of mobile user equipment in a variety of contexts as a means to promote the widest possible deployment of mobile services, ensure the most efficient use of spectrum, and protect and promote competition. *See infra* ¶¶ 17-29.

⁶ Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 158, 205 (directing the Commission to “reallocate the 700 MHz D Block spectrum for use by public safety entities”) (to be codified at 47 U.S.C. § 1411) (“Spectrum Act”).

⁷ *See* 47 C.F.R. § 73.622(f)(8). Maximum ERP of 1000 kW is allowed if antenna HAAT is at or below 365 meters. For higher HAAT levels, lower maximum ERP is allowed according to the “Maximum Allowable ERP and Antenna Height for DTV Stations on Channels 14-59, All Zones” table.

unpaired Lower 700 MHz E Block, where licensees (along with Lower 700 MHz D Block licensees) may operate at power levels up to 50 kW.⁸ The Upper 700 MHz band (746-806 MHz) consists of the C Block, which is comprised of 22 megahertz of paired spectrum for commercial use, two guard bands, the public safety allocation, and the D Block, which consists of 10 megahertz of paired spectrum that will be reallocated for use by public safety entities, in accordance with the Spectrum Act.⁹

8. *Assignment of Licenses in the 700 MHz Band.* The Commission has assigned licenses for the 700 MHz band through several auction proceedings. The Commission auctioned licenses for the guard bands in the Upper 700 MHz band in 2000, and it initially auctioned licenses in the Lower C and D Blocks in 2002.¹⁰ In 2008, the Commission auctioned licenses in the Lower 700 MHz band A, B, and E Blocks, as well as the Upper 700 MHz band C Block.¹¹

9. *Performance Requirements.* In adopting rules for the 700 MHz band, the Commission's goals included promoting commercial access to 700 MHz band spectrum,¹² as well as providing licensees with flexibility in the services to be offered and the technologies to be deployed.¹³ For the Lower 700

⁸ See 47 C.F.R. § 27.50(c)(7). Lower 700 MHz C, D, and E Block fixed and base stations may operate at total power levels up to 50 kW ERP in their authorized 6 megahertz spectrum blocks. In the recent ATT-Qualcomm transaction, in which AT&T acquired all of the Lower 700 MHz D Block licenses and Lower 700 MHz E Block licenses covering 70 million people, the Commission conditioned the assignment of these licenses on AT&T's compliance with the requirements that: (1) it operates on the associated spectrum under the same power limits and antenna height restrictions that apply to the Lower 700 MHz A, B, and C Block licensees; (2) it does not use the acquired licenses for uplink transmission; and (3) its operations on the associated spectrum avoid undue interference to operations of other Lower 700 MHz A, B, and C Block licensees, as specified therein. Application of AT&T Inc. and Qualcomm Incorporated For Consent To Assign Licenses and Authorizations, *Order*, WT Docket No. 11-18, 26 FCC Rcd 17589, 17616-18 ¶¶ 61-68 (2011) (*AT&T/Qualcomm Order*).

⁹ See *supra* note 6.

¹⁰ See Lower 700 MHz Band Auction Closes, *Public Notice*, 17 FCC Rcd 17272 (2002); 700 MHz Guard Bands Auction Closes, *Public Notice*, 15 FCC Rcd 18026 (2000).

¹¹ See Auction of 700 MHz Band Licenses Closes, *Public Notice*, 23 FCC Rcd 4572 (2008). The Commission also conducted an auction for a single, nationwide license covering the entire Upper 700 MHz D Block, but bidding for that license did not meet the applicable reserve price of \$1.33 billion. Pursuant to the Commission's rules, there was consequently no winning bid for that license. See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, *Second Further Notice of Proposed Rulemaking*, 23 FCC Rcd 8047, 8049 ¶ 1 (2008). Recent legislation has directed the Commission to reallocate the Upper 700 MHz D Block spectrum for public safety use. See *supra* note 6.

¹² See *700 MHz Second Report and Order*, 22 FCC Rcd at 15292 ¶ 3; Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), GN Docket No. 01-74, *Report and Order*, 17 FCC Rcd 1022, 1079 ¶¶ 149-51 (2002) (*Lower 700 MHz Report and Order*).

¹³ See *700 MHz Second Report and Order*, 22 FCC Rcd at 15328 ¶ 95; Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services, WT Docket No. 02-381, 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, Increasing Flexibility to Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and to Facilitate Capital Formation, WT Docket No. 03-202, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 19078, 19079 ¶ 1 (2004) (*Rural Report and Order*); Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, *Policy Statement*, 14 FCC Rcd 19868 (1999); Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets, *Policy Statement*, 15 FCC Rcd 24178 (2000); 47 U.S.C. § 303(y).

MHz C and D Block licenses that were auctioned in 2002, the Commission required licensees to provide “substantial service” to their license service areas no later than the end of the license term.¹⁴ In 2007, the Commission adopted performance requirements for licenses in the 700 MHz band that subsequently were auctioned in 2008, including Lower 700 MHz A Block.¹⁵ Specifically, Cellular Market Area (CMA)-based and Economic Area (EA)-based licensees are required to provide service sufficient to cover 35 percent of the geographic area of their licenses within four years and 70 percent of this area within ten years (the license term), and Regional Economic Area Grouping (REAG) licensees must provide service sufficient to cover 40 percent of the population of their license areas within four years and 75 percent of the population within ten years. For licensees that fail to meet the applicable interim benchmark, the license term is reduced by two years, which would require that the end-of-term benchmark be met within eight years, and the Commission may take other enforcement action.¹⁶ At the end of the license term, licensees that fail to meet the end-of-term benchmark are subject to a “keep what you use” rule, which will make unused spectrum available to other potential users.¹⁷

10. *Development of 3GPP Technical Standards.* Industry standards for Long-Term Evolution (LTE) wireless broadband technology are developed by the 3rd Generation Partnership Project (3GPP), a consensus-driven international partnership of industry-based telecommunications standards bodies. 3GPP, established in 1998, is an industry-based group and it is not associated with any governmental agency.¹⁸ In the Lower 700 MHz band, there are two different 3GPP operating bands:¹⁹ Band Class 12, which covers operations in the Lower A, B, and C Blocks, and Band Class 17, which covers operations in the Lower B and C Blocks only. The spectrum to which Band Class 17 applies is a subset of the spectrum covered by Band Class 12. Entities involved in the creation of Band Class 17 during 3GPP proceedings assert that it was necessary to create a separate band class for Lower 700 MHz B and C Block licenses in order to avoid interference issues from DTV in Channel 51 and high power operations in the E Block.²⁰ In the Upper 700 MHz band, the Band Class 13 specification provides for

¹⁴ See 47 C.F.R. § 27.14(a); *Lower 700 MHz Report and Order*, 17 FCC Rcd at 1079 ¶¶ 149-51. Lower 700 MHz licenses have a term of ten years from June 13, 2009, except for any licensees providing broadcast services, which have a term not to exceed eight years. See 47 C.F.R. § 27.13(b).

¹⁵ See *700 MHz Second Report and Order*, 22 FCC Rcd at 15348 ¶ 153.

¹⁶ See 47 C.F.R. §§ 27.14(g)(1), (h)(1). In December, 2011, the Wireless Telecommunications Bureau announced that the deadline for 700 MHz performance reports was January 13, 2012, and reminded licensees of enforcement actions for failure to meet interim construction benchmarks. See *700 MHz Construction and Reporting Requirements, Public Notice*, DA 11-1981, 26 FCC Rcd 16442 (WTB 2011).

¹⁷ See *700 MHz Second Report and Order*, 22 FCC Rcd at 15293-94 ¶ 6.

¹⁸ Its world-wide partners come from Asia, Europe, and North America. 3GPP’s many technical specification groups meet in various countries throughout the year to carry out the organization’s mission. See 3GPP – ABOUT 3GPP, <http://www.3gpp.org/-About-3GPP> (last visited Mar. 12, 2012). For the schedules of the meetings, see 3GPP – 3GPP CALENDAR, <http://www.3gpp.org/3GPP-Calendar> (last visited Mar. 12, 2012).

¹⁹ Hereinafter, we refer to each 3GPP LTE Operating Band as a “Band Class.” For example, we refer to 3GPP LTE Operating Band 12 as “Band Class 12.”

²⁰ See, e.g., Letter from Michael Goggin, General Attorney, AT&T, to Marlene H. Dortch, FCC, filed July 29, 2011 (AT&T July 29, 2011 *Ex Parte*) at 1 (claiming that during the 3GPP standard setting process, there was concern regarding potential interference to Lower A Block mobile reception because of high power transmissions on the Lower E Block, and therefore, as a result, it adopted a Band Class 17, which covered only the Lower 700 MHz B and C Blocks, and a Band Class 12, which covers the Lower 700 MHz A, B, and C Blocks); Motorola Comments at 4-6 (discussing the development of the 3GPP band classes for the 700 MHz Band and claiming that “[t]he decision (continued....)

operations in the Upper C Block, and Band Class 14 provides for operations in the public safety spectrum (including the Upper 700 MHz D Block). 3GPP has adopted certain technical specifications for user equipment operating in different 700 MHz bands. Output power and the OOB specifications for LTE equipment are the same for all commercial paired frequencies in the Lower 700 MHz band.²¹ The 3GPP specifications differ for receiver blocking requirements. The 3GPP specified requirements for receiver blocking are the same for Band Class 13 and Band Class 14 equipment, but Band Class 12 and Band Class 17 each have different and distinct blocking requirements, due to differences in each band's relative proximity to neighboring high-powered operations in the E block.²²

11. *700 MHz Interoperability Petition for Rulemaking.* In late 2009, an alliance comprised of four Lower 700 MHz A Block licensees (Petitioners) filed a petition for rulemaking, asking the Commission to “assure that consumers will have access to all paired 700 MHz spectrum that the Commission licenses, to act so that the entire 700 MHz Band will develop in a competitive fashion, and to adopt rules that prohibit restrictive equipment arrangements that are contrary to the public interest.”²³ Petitioners request the Commission to require that all mobile units for the 700 MHz band be capable of operating over all frequencies in the band.²⁴ Petitioners further request “an immediate freeze on the authorization of mobile equipment that is not capable of operation on all paired commercial 700 MHz frequencies.”²⁵ The Wireless Telecommunications Bureau sought comment on the Petition in 2010.²⁶

12. The Commission received 18 comments and 13 reply comments in response to the Petition. Commenters are divided on the merits of the relief sought in the Petition. Commenters in support of the Petition include smaller, regional 700 MHz licensees, a coalition including Sprint Nextel

(Continued from previous page) _____

to identify [B]and [C]lass 17 separately from [B]and [C]lass 12 was based entirely on desire to avoid harmful interference that would negatively affect the operation of 700 MHz mobile broadband devices”); Letter from Alan K. Tse, Vice President and General Counsel, LG Electronics MobileComm U.S.A., to Marlene H. Dortch, FCC, filed June 11, 2010 at 4 (“[i]n the case of Bands 12 and 17, distinctions were made due to regulatory and interference limitations on the Lower 700 MHz A Block”).

²¹ See Sections 6.2.2, 6.6.2, and 6.6.2.2.3 of 3GPP TS 36.101 V9.9.0 (2011-09). The class 3 devices (UE) maximum transmit power is 23dBm for all bands with ± 2 dB tolerance, and Table 6.6.2.2.3-1 specifies the spectrum emission limits for available channel bandwidths.

²² Receiver blocking requirements address a receiver's ability to receive at least 95% of the maximum throughput at its assigned channel in the presence of an unwanted interfering signal falling into the device receive band or into the first adjacent 15 megahertz. See Table 7.6.1.1-2, Section 7.6.1 of 3GPP TS 36.104 V9.9.0 (2011-09). Unlike Band Class 17, 3GPP determined that Band Class 12 cannot achieve the typical minimum specification for blocking interference from the Lower 700 MHz E Block, so this requirement was omitted from the Band 12 technical specification.

²³ Petition at 1. The Alliance is a “joint venture” consisting of Cellular South Licenses, Inc.; Cavalier Wireless, LLC; Continuum 700, LLC; and King Street Wireless, L.P., each of which is currently the licensee of Lower 700 MHz Band A Block spectrum. *Id.*

²⁴ Petition at iii, 12.

²⁵ Petition at 1-2.

²⁶ Wireless Telecommunications Bureau Seeks Comment on Petition for Rulemaking Regarding 700 MHz Band Mobile Equipment Design and Procurement Practices, RM No. 11592, *Public Notice*, 25 FCC Rcd 1464 (2010) (700 MHz Interoperability PN). All future filings concerning RM-11592 should be made in this docket, WT Docket No. 12-69.

and T-Mobile,²⁷ trade associations representing rural and smaller providers,²⁸ a coalition of public interest groups,²⁹ and public safety associations.³⁰ These supporters assert that the mobile devices currently being developed for AT&T and Verizon Wireless preclude supporting operation on Lower A Block spectrum and that this is contrary to the public interest and anti-competitive.³¹ They argue that small providers that acquired Lower band 700 MHz Block A spectrum are left without viable and widely usable equipment options. Thus, they contend that unless Verizon Wireless and AT&T are required to support Band Class 12 in their devices, Lower A Block licensees will not be able to obtain devices with competitive economies of scale.³² They also argue that requiring full 700 MHz support will maximize roaming opportunities.³³ Specifically, Petitioners assert that a prerequisite for negotiating roaming agreements is the availability of capable devices and that there is no basis for negotiation if there are no mobile devices that work across 700 MHz frequency blocks.³⁴ While the Petition requests interoperability across the entire 700 MHz band, subsequent filings from some of the proponents of an interoperability requirement, including parties to the Petition, have asked the Commission to first focus on establishing an interoperability requirement for the Lower 700 MHz band.³⁵

²⁷ The coalition is Connect Public Safety Now (CPSN), formerly Coalition for 4G in America. Its members include Sprint Nextel, T-Mobile, MetroPCS, Cricket, Cellular South, Rural Cellular Association, Xanadoo, New America Foundation, Media Access Project, and Access Spectrum.

²⁸ The trade associations include Rural Cellular Association, National Telecommunications Cooperative Association, and Rural Telecommunications Group.

²⁹ The coalition is the Public Interest Spectrum Coalition (PISC). Its members are the Consumer Federation of America, Consumers Union, Media Access Project, New America Foundation, and Public Knowledge. *See* PISC Reply Comments at 1.

³⁰ The public safety associations are the National Fraternal Order of Police (FOP) and The Public Safety Spectrum Trust (PSST). These associations support interoperability in the 700 MHz band generally but urge the Commission to carefully evaluate the technical feasibility and economic viability of requiring devices that “cover *all* 700 MHz paired spectrum” before ruling on the Petition. PSST Comments at 9-10 (emphasis in original); *see also* FOP Comments at 10.

³¹ Petitioners Reply Comments at 2, 27-28; NTCA Comments at 3; PVT Comments at 4; PVT Reply Comments at 2-5; MetroPCS Comments at 4-6, 10; Triad 700 Comments at 10; U.S. Cellular Reply Comments at i-ii, 7; Cellular South Comments at 9; RCA Reply Comments at 8; PISC Reply Comments at 2; RTG Reply Comments at 7-8.

³² Petitioners Reply Comments at 13, 28-29; PISC Reply Comments at 2-3; Letter from Mark A. Stachiw, Executive Vice President, General Counsel, and Secretary, MetroPCS Communications, Inc., Lawrence R. Krevor, Vice President, Spectrum, Sprint Nextel Corp. *et al.*, to Marlene H. Dortch, FCC, filed May 10, 2010, Attachment, 700 MHz Band Analysis by Wireless Strategy LLC, at 6 (MetroPCS *et al.* May 10, 2010 *Ex Parte*) (additional parties to the filing are T-Mobile USA, Access Spectrum, Xanadoo Co., Rural Telecom. Group, Triad 700, U.S. Cellular, RCA, and Cellular South); Vulcan Reply Comments at 2-3; PVT Comments at 3-4; PVT Reply Comments at 2, 11; Blooston Comments at 3; U.S. Cellular Comments at 5; Cellular South Comments at 3-5; RCA Comments at 19; Cox Comments at 3; MetroPCS Comments at 6; RTG Comments at 3, 10.

³³ *See, e.g.*, Petitioners Reply Comments at 19-23; RCA Reply Comments at 7-9; PVT Reply Comments at 4-5; RTG Reply Comments at 8-9; Cellular South Comments at 4-5; NTCA Comments at 3-4; Blooston Comments at 2-5; MetroPCS Comments at 11, 13; Triad 700 Comments at 5; U.S. Cellular Comments at 8.

³⁴ Petitioners Reply Comments at 22-23.

³⁵ For example, Cellular South requests that there be a single specification – Band Class 12 – for the Lower 700 MHz Band and a single specification for the Upper 700 MHz Band. Letter from David L. Nace and Thomas Gutierrez, Lukas, Nace, Gutierrez, and Sachs, LLP, Counsels for Cellular South and King Street (respectively), to

(continued...)

13. In their initial comments, parties such as AT&T and Verizon Wireless,³⁶ device manufacturers Motorola and Qualcomm, and TIA, a manufacturer trade association, opposed the Petition. They argued that without Band Class 17 filtering, Lower 700 MHz B and C licensees will face greater levels of harmful interference.³⁷ Further, they suggested that an interoperability requirement at that time, spring 2010, would have unnecessarily delayed the deployment of 700 MHz mobile broadband devices.³⁸ They contended that the existing 3GPP band classes were crafted through an open process and are responsive to the realities of the engineering and manufacturing constraints of the Commission-defined spectrum blocks.³⁹ Further, AT&T asserted that nothing prevents 700 MHz A Block licensees from negotiating roaming deals with any provider offering services on other 700 MHz blocks.⁴⁰ AT&T also argued that even if A Block licensees will have greater difficulty or face higher costs in developing handsets for use on the A Block, those disadvantages are fully reflected in the lower prices A Block licensees paid to obtain A Block spectrum.⁴¹

(Continued from previous page)

Marlene H. Dortch, FCC, filed May 27, 2011 (Cellular South/King Street May 27, 2011 *Ex Parte*) Attachment at 12. While RCA requests that the Commission require interoperability across the entire 700 MHz Band, RCA requests that it do so “most immediately in the lower portion of the band.” Letter from Rebecca M. Thomson, General Counsel, RCA, to Marlene H. Dortch, FCC, filed Nov. 22, 2011 at 1. *See also* Letter from Rebecca Murphy Thompson, General Counsel, Rural Cellular Association, to Marlene Dortch, FCC, filed March 15, 2012 at 2-3 (arguing that “lower band interoperability is achievable in the short term and should not be slowed by the complex issue of full band interoperability”); Letter from Thomas Gutierrez, Lukas, Nace, Gutierrez and Sachs, LLP, Counsel for Cavalier Wireless, LLC, to Marlene H. Dortch, filed Dec. 8, 2011, at 2 (Cavalier Wireless Dec. 8, 2011 *Ex Parte*) (advocating a “one-band” solution that involves only the Lower 700 MHz Band); *see also* Letter from M. Chris Riley and Matthew F. Wood, Free Press, to Marlene H. Dortch, FCC, filed Dec. 20, 2011, at 1-2 (*Free Press Dec. 20, 2011 Ex Parte*) (urging the Commission to condition AT&T’s acquisition of Qualcomm’s licenses on certain conditions, including “a mandate on interoperability across the lower 700 MHz spectrum bands”). In a recent filing, Verizon Wireless also requests that the Commission limit this proceeding to the Lower 700 MHz spectrum band. Letter from Tamara Preiss, Vice President, Federal Regulatory Affairs, Verizon Wireless, to Marlene H. Dortch, FCC, filed January 25, 2012 at 2.

³⁶ AT&T holds licenses in the Lower B and Lower C Blocks, as well as all of the Lower 700 MHz D Block and a significant number of Lower E Block licenses, recently acquired from Qualcomm. *See supra* note 8. Verizon Wireless holds licenses in the Lower 700 MHz A and B Blocks, and all of the spectrum in the Upper C Block. Neither of the other two nationwide wireless providers, Sprint Nextel and T-Mobile, holds any 700 MHz licenses.

³⁷ *See, e.g.*, AT&T Comments at 5-7; AT&T Reply Comments at 10, 11; Letter from Joseph P. Marx, Assistant Vice President, Federal Regulatory, AT&T, to Marlene H. Dortch, FCC, filed June 3, 2010 (AT&T June 3, 2010 *Ex Parte*) at 1-10; Verizon Wireless Reply Comments at 2; Motorola Comments at 8-9; Qualcomm Comments at 6; TIA Reply Comments at 2. *See also* Letter from Joan Marsh, Vice President – Federal Regulatory, AT&T, to Marlene H. Dortch, FCC, WT Docket No. 11-18, filed Dec. 9, 2011 (AT&T Dec. 9, 2011 *Ex Parte* in WT Dkt. No. 11-18) at 2-4 (opposing an interoperability condition in connection with the proposed assignment of 700 MHz spectrum from Qualcomm to AT&T).

³⁸ *See, e.g.*, CEA Comments at 2; Qualcomm Comments at 1-3; Motorola Comments at 8; TIA Reply Comments at 3; Verizon Wireless Reply Comments at 2; AT&T June 4, 2010 *Ex Parte* at 2.

³⁹ *See, e.g.*, AT&T Comments at 2-7; AT&T Reply Comments at 14-15; Verizon Wireless Comments at 2-4; Verizon Wireless Reply Comments at 9; Motorola Comments at 4. A number of parties also assert that granting the Petition would contradict the Commission’s policy of technology neutrality. *See, e.g.*, Motorola Comments at 8-9; Qualcomm Comments at 6-8; AT&T Reply Comments at 6-9.

⁴⁰ AT&T Reply Comments at 17.

⁴¹ AT&T June 3, 2010 *Ex Parte* at 11.

14. *Workshop on Interoperability.* Last year, to update the record and gather additional information, the Wireless Telecommunications Bureau held a workshop on the status and availability of interoperable mobile user equipment across commercial spectrum blocks in the 700 MHz band.⁴² Panelists included a range of industry experts, including licensees holding spectrum in different portions of the 700 MHz band, as well as public interest advocates and equipment manufacturers. In addition to exploring solutions for promoting the development and availability of equipment for the 700 MHz band, the workshop discussed providers' technology choices, such as the planned deployment of LTE, and how these technology choices affect equipment availability, competition, and roaming. Panelists discussed the technical feasibility of an interoperability condition,⁴³ as well as how an interoperability requirement might affect such factors as device cost and performance,⁴⁴ and the need for additional development and testing.⁴⁵

15. *Other Developments Regarding the 700 MHz Band.* On March 15, 2011, CTIA and RCA filed a petition for rulemaking and request for licensing freezes on Channel 51, urging the Commission to facilitate the deployment of wireless broadband services in the Lower 700 MHz A Block by providing a stable interference environment that allows licensees to plan network deployments.⁴⁶ The petition noted the potential for interference between Channel 51 broadcast and Lower 700 MHz A Block licensees.⁴⁷ On March 28, 2011, the Media Bureau requested comment on the petition,⁴⁸ and in August 2011, the Media Bureau adopted a freeze on the filing of certain applications with respect to operations on Channel 51.⁴⁹ The freeze covers (1) applications for low power television, TV translator, replacement translators, and Class A television facilities on Channel 51, and displacement applications on this channel; and (2)

⁴² A video of the workshop is available for streaming on the Internet at <http://www.fcc.gov/events/700-mhz-interoperability-workshop>.

⁴³ See, e.g., Workshop comments of Edgar Fernandes, Motorola; Workshop comments of Eugene Fong, Qualcomm; Workshop comments of Paul Kolodzy, Consultant to Vulcan Wireless; Workshop comments of Eric B. Graham, Cellular South. A video of the workshop is available for streaming on the Internet at <http://www.fcc.gov/events/700-mhz-interoperability-workshop>.

⁴⁴ See, e.g., Workshop comments of William Stone, Verizon Wireless; Workshop comments of Stacey Black, AT&T. A video of the workshop is available for streaming on the Internet at <http://www.fcc.gov/events/700-mhz-interoperability-workshop>.

⁴⁵ See, e.g., Workshop comments of Michael Chard, Qualcomm. A video of the workshop is available for streaming on the Internet at <http://www.fcc.gov/events/700-mhz-interoperability-workshop>.

⁴⁶ See Petition for Rulemaking and Request for Licensing Freezes by CTIA - the Wireless Association and Rural Cellular Association, RM-11626, filed March 15, 2011 (Channel 51 Petition).

⁴⁷ *Id.* at 4-5 (referencing potential for interference from Channel 51 broadcast stations into A Block base station receivers); *id.* at 5 (referencing potential for interference from A Block licensees into Channel 51 TV receivers).

⁴⁸ Media Bureau Seeks Comment on a Petition for Rulemaking and Request for Licensing Freezes, *Public Notice*, RM 11626, 26 FCC Rcd 4916 (MB 2011).

⁴⁹ General Freeze on the Filing and Processing of Applications for Channel 51 Effective Immediately and Sixty (60) Day Amendment Window for Pending Channel 51 Low Power Television TV Translator and Class A Applications, *Public Notice*, 26 FCC Rcd 11409 (MB 2011) (Channel 51 PN). The Media Bureau also announced that it would lift the previous freeze on the filing of petitions for rulemaking by full power television stations seeking to relocate from Channel 51 pursuant to voluntary relocation agreements with Lower 700 MHz A Block licensees. *Id.* at 11411; see also Freeze on the Filing of Petitions for Digital Channel Substitutions, Effective Immediately, *Public Notice*, 26 FCC Rcd 7721 (MB 2011).

applications for minor change for low power and full power television stations on Channel 51.⁵⁰

16. *AT&T/Qualcomm Transaction*. On January 13, 2011, AT&T and Qualcomm filed an application for Commission consent to the assignment or transfer of control of all eleven of Qualcomm's D and E Block licenses in the Lower 700 MHz band to AT&T.⁵¹ The Commission sought comment on the proposed transaction.⁵² Several parties asked the Commission to impose requirements relating to device interoperability as a condition of approving the transaction.⁵³ After examination of the record, the Commission approved the assignment on December 22, 2011, but declined to adopt an interoperability condition.⁵⁴ The Commission observed that even assuming that the lack of Lower 700 MHz interoperability causes significant competitive harm, such harm already existed independent of the license transfer applications.⁵⁵ The Commission concluded that the better course would be to consider the numerous technical issues raised by the lack of interoperability through a rulemaking proceeding, which we undertake in this NPRM.⁵⁶

III. DISCUSSION

A. Challenges to Achieving Interoperability

17. The Commission historically has been interested in promoting interoperability. Beginning with the licensing of cellular spectrum, the Commission has opined that consumer equipment should be capable of operating over the entire range of cellular spectrum as a means to "insure full coverage in all markets and compatibility on a nationwide basis."⁵⁷ Although the Commission did not adopt a rule to require band-wide interoperability for PCS, it again stressed the importance of

⁵⁰ Channel 51 PN, 26 FCC Rcd at 11409. The filing of petitions for rulemaking for new digital full power television stations, including those for channel 51, is frozen as well. *See Freeze on the Filing of Certain TV and DTV Requests for Allotment or Service Area Changes, Public Notice*, 19 FCC Rcd 14810 (MB 2004). Therefore, petitions for rulemaking for new channel 51 allotments cannot be filed. In addition, the Media Bureau is not currently accepting any applications for major changes to existing analog and digital LPTV and TV translator facilities. *See Freeze on the Filing of Applications for New Digital Low Power Television and TV Translator Stations, Public Notice*, 25 FCC Rcd 15120 (MB 2010).

⁵¹ The applicants amended their application on February 9, 2011. *See* FCC File No. 0004566825.

⁵² AT&T Mobility Spectrum LLC and Qualcomm Incorporated Seek FCC Consent to the Assignment of Lower 700 MHz Band Licenses, WT Docket No. 11-18, *Public Notice*, 26 FCC Rcd 1336 (2011).

⁵³ *See, e.g.*, Cellular South Petition to Deny, WT Docket No. 11-18, at 5-6, 19; RTG Petition to Deny, WT Docket No. 11-18, at 19; RTG Reply Comments, WT Docket No. 11-18, at 7; RCA Petition to Deny, WT Docket No. 11-18, at 12; King Street Petition to Deny, WT Docket No. 11-18, at 5; Free Press Petition to Condition Grant, WT Docket No. 11-18, at 5; Letter from Michele C. Farquhar, Counsel to Vulcan Wireless LLC., to Marlene H. Dortch, FCC, WT Docket No. 11-18, filed May 27, 2011 (Vulcan May 27, 2011 *Ex Parte* in WT Dkt. No. 11-18), Attachment at 6.

⁵⁴ *See AT&T/Qualcomm Order*, 26 FCC Rcd at 17591 ¶ 5.

⁵⁵ *AT&T/Qualcomm Order*, 26 FCC Rcd at 17620 ¶ 71.

⁵⁶ *AT&T/Qualcomm Order*, 26 FCC Rcd at 17620 ¶ 71 (noting that the Commission planned to begin such a rulemaking proceeding in the first quarter of 2012).

⁵⁷ Inquiry Into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems, CC Docket No. 79-318, *Report & Order*, 86 FCC 2d 469, 482 (1981) (*Cellular Report and Order*). The Commission adopted band-wide interoperability requirements for cellular service. *Id.*

interoperability by acknowledging industry efforts to establish voluntary interoperability standards and asserted that “[t]he availability of interoperability standards will deliver important benefits to consumers and help achieve our objectives of universality, competitive delivery of PCS, that includes the ability of consumers to switch between PCS systems at low cost, and competitive markets for PCS equipment.”⁵⁸ The Commission also stated that if PCS technology did not develop in a manner to accommodate roaming and interoperability, it might consider “what actions the Commission may take to facilitate the more rapid development of appropriate standards.”⁵⁹

18. *Availability of End-User Equipment.* According to the Petitioners, a lack of interoperability in the Lower 700 MHz band has cut off meaningful access for many Lower A Block licensees to cutting-edge devices, and even those that do have access are able to acquire only a fraction of what other 700 MHz licensees are able to procure. Petitioners and proponents of a near-term interoperability requirement make essentially two arguments. Specifically, Vulcan argues that equipment vendors currently first serve the needs of “the unique band class that is dominated by AT&T” and that this slows the time to market for Lower A Block licensees because they experience a lack of access to new devices and face delays in the development of standards, chipsets, and equipment.⁶⁰ Similarly, RTG asserts that equipment manufacturers have little incentive to innovate and provide compatible devices for smaller markets, particularly when providing interoperable devices would run contrary to their largest customers’ desires.⁶¹

19. Petitioners and other proponents also claim that an interoperability requirement should enable Lower A Block licensees and other Lower 700 MHz licensees to benefit from economies of scale with respect to mobile devices, which in turn would promote greater affordability that can be passed along to consumers. RCA argues that even where Band Class 12 equipment can be made available, the costs are unnecessarily inflated by the limited scale resulting from the lack of interoperability across the 700 MHz spectrum.⁶² According to the record, Cellular South was able to find a manufacturer willing to supply it with devices that included, at a minimum, Band Class 12 frequencies, but “the cost of obtaining such devices without the economies of scale available based upon demand for similar devices by a nationwide carrier made pursuing the opportunity not economically feasible.”⁶³ Cellular South asserts

⁵⁸ Amendment of the Commission’s Rules to Establish New Personal Communications Services, RM-7140, RM-7175, RM-7618, GEN Docket No. 90-314, *Memorandum Opinion and Order*, 9 FCC Rcd 4957, 5021-22 ¶¶ 163-64 (1994) (*Broadband PCS Memorandum Opinion and Order*).

⁵⁹ *Id.* at 5022 ¶ 164.

⁶⁰ Vulcan May 27, 2011 *Ex Parte*, Attachment at 11. Vulcan notes that AT&T developed a new band class and has completed product development in the time it has taken Lower A Block licensees to get their band class approved and that Verizon Wireless “had its LTE network deployed covering 100+ million US POPs before Band Class 12 was even fully ratified in the LTE standards body.” *Id.*

⁶¹ RTG Reply Comments in WT Docket No. 11-18 at 10.

⁶² See Letter from Steven K. Berry, President and CEO, RCA, to Marlene H. Dortch, FCC, filed Mar. 29, 2011, at 1. RCA also states that equipment manufacture depends on scale economies and that AT&T and Verizon Wireless are sufficiently large to achieve these economies alone. In contrast, Lower A Block licensees have insufficient scale to develop affordable end user devices that would work on the A Block. Letter from Rebecca Murphy Thompson, General Counsel, RCA, to Marlene H. Dortch, FCC, filed Aug. 10, 2010 (RCA Aug. 10, 2010 *Ex Parte*) Attachment, “700 MHz Device Flexibility Promotes Competition” by Peter Cramton, Professor of Economics, University of Maryland (Cramton Report) at 7.

⁶³ Letter from David L. Nace, Lukas, Nace, Gutierrez, & Sachs, LLP, Counsel for 700 MHz Block A Good Faith Purchasers Alliance, to Marlene H. Dortch, FCC, filed June 8, 2010, at 2 (Information regarding Cellular South’s (continued....))

that the necessary “scale” to obtain pricing that would allow it to bring devices to market would be expected to involve more than one million devices and in any case no less than a half million devices.⁶⁴

20. Nationwide providers AT&T and Verizon Wireless respond that Lower 700 MHz A Block licensees are free to negotiate with device manufacturers.⁶⁵ Verizon Wireless claims that “those decisions have to be made by those carriers to meet their own individual business plans. Verizon Wireless has nothing to do with those decisions.”⁶⁶ Verizon Wireless also asserts that there are at least 33 companies that manufacture devices for the U.S. market and that Petitioners “provide no evidence about their efforts (or the apparent lack thereof) to obtain the devices they want, either individually or through a consortium, from any of these potential suppliers.”⁶⁷

21. We seek comment on Petitioners’ and other proponents’ argument that an interoperability requirement in the 700 MHz band is necessary to obtain affordable, advanced mobile devices to deploy service to consumers in smaller, regional, and rural service areas. To what extent have any Lower A Block licensees successfully negotiated with equipment vendors to date? What efforts have other Lower A Block licensees undertaken to negotiate with equipment vendors? Would an interoperability requirement help enable Lower A Block licensees to benefit from economies of scale with respect to mobile devices, and what would be the benefits to consumers? Do manufacturers require a provider to purchase a minimum number of devices? If so, what is that number and is it prohibitive for a smaller provider to achieve such a scale? We seek data and evidence in support of all of these claims.

22. *Effect on the Deployment of Advanced Broadband Services.* The record to date suggests that, unless mobile user equipment is capable of operating on all paired commercial Lower 700 MHz spectrum, the deployment of facilities-based mobile broadband networks could be hampered, particularly in rural and unserved areas. We note that a significant number of Lower A Block licenses are held by smaller, rural, and regional licensees.⁶⁸ Petitioners and proponents argue that requiring all Lower 700

(Continued from previous page) _____

experience was provided on behalf of Cellular South, a member of the 700 MHz Block A Good Faith Purchasers Alliance, during the course of the *ex parte* presentation.).

⁶⁴ *Id.*

⁶⁵ AT&T Comments at 13 (asserting that “A Block licensees are free to negotiate with handset manufacturers to design, manufacture, and deploy wireless handsets and other devices that operate within their spectrum holdings, including Band Class 12 or other commercial spectrum”); Verizon Wireless Comments at 9 (asserting that petitioners are free to work either collectively or individually with manufacturers to build devices that operate on the spectrum their members voluntarily acquired, and those devices could include other spectrum besides Band Class 12).

⁶⁶ Verizon Wireless Comments at 9 n.10. Verizon Wireless also asserts that the fact that 3GPP has established various band classes for the LTE standard does not compel any service provider or any device manufacturer to use any particular class, or to limit devices to operation in only one class, or to use LTE at all. *Id.* at 4. Further, other arrangements of bands could be proposed for the LTE standard as another band class, and each provider deploying LTE must determine which of the classes or combinations of classes is best suited to meet its authorized spectrum requirements and its business plans. *Id.*

⁶⁷ See *id.* at 9 n.10 (citing Letter from Christopher Guttman-McCabe, CTIA, to Marlene H. Dortch, FCC, RM 11361, filed May 12, 2009 at 2 and accompanying charts).

⁶⁸ According to the Commission’s Universal Licensing Database (ULS), the 700 MHz A Block licensees include Vulcan, U.S. Cellular (King Street Wireless), Rural Cellular Corp., PVT, NTUA Wireless, MetroPCS, Cox Wireless, Continuum 700, CenturyTel, Cellular South, Cavalier Wireless, Alltel Communications Wireless, and (continued....)

MHz licensees to use interoperable equipment would increase the likelihood that these Lower A Block licensees can obtain the necessary financing to deploy networks and devices.⁶⁹ They add that the inability of small and regional providers to obtain interoperable devices impedes their ability to compete in the provision of 4G services, makes it difficult to maintain current customers and acquire new ones, results in equipment costs that are higher than for other bands, and creates uncertainty for spectrum holders that could have adverse effects on investment in deployment of networks and devices.⁷⁰ RCA and Triad argue that Lower A Block licensees' inability to obtain affordable end user devices could cause the A Block spectrum to remain fallow for an extended period of time.⁷¹

23. AT&T responds that an interoperability requirement in the Lower 700 MHz spectrum would impose unreasonable burdens on AT&T's ability to build out its Lower 700 MHz spectrum. Specifically, AT&T claims that such a requirement would create "substantial disruption and delay to [its] current LTE deployment plans and significant additional costs."⁷² AT&T claims that if it were required to abandon plans to use Band Class 17 and deploy a network around Band Class 12, it would need to upgrade its LTE base stations and develop and obtain "new chipsets, devices and radio equipment, a process that usually takes years to complete."⁷³ It also asserts that adding Band Class 12 capabilities into its mobile devices along with Band Class 17 capabilities would make the devices substantially larger, likely shorten battery life, and potentially require the tradeoff of other uses, such as bands used for international roaming.⁷⁴ In addition, as discussed below, AT&T's objections also stem from issues associated with potential interference concerns from Channel 51 operations and high power Lower E Block broadcasts.⁷⁵

(Continued from previous page) _____

Triad 700. We also note that Verizon Wireless holds many Lower A Block licenses. *See* Verizon Wireless Comments at 11 (stating that it holds 25 such licenses); Verizon Wireless Reply Comments at 5.

⁶⁹ Petition at 5; *see also* Triad Comments at 5. According to Blooston, separate band specifications for different Lower 700 MHz Bands "will shift equipment design and development costs onto rural and regional 700 MHz licensees and their customers" and "delay[] rural network buildout and availability of service . . ." Blooston Reply Comments at 2.

⁷⁰ *See, e.g.,* RCA Comments at 11 ("If the *status quo* is not altered, small rural and regional wireless carriers will be less able to compete against the large wireless carriers, the Lower A Block spectrum will be devalued, consumers will have fewer roaming options, and small rural and regional Lower A Block licensees will face high hurdles in attempting to deploy broadband infrastructure utilizing 700 MHz spectrum in rural areas."); Letter from David Nace, Lukas, Nace, Gutierrez & Sachs, LLP, Counsel to Cellular South, to Marlene H. Dortch, FCC filed Mar. 9, 2010 at 2 (asserting an urgent need for Commission action on interoperability to realize potential for competition in the 700 MHz bands); U.S. Cellular Comments at 2-3 (stating the lack of interoperability impedes competitive roll out of 4G coverage by additional commercial providers, increases cost of Band Class 12 devices, and diminishes incentives for innovation); Blooston Reply Comments at 8 (lack of interoperability harms consumers). RCA also asserts that requiring interoperability in the 700 MHz Band will improve service, especially in rural areas, as a result of greater coverage and seamless roaming. *See* RCA Aug. 10, 2010 *Ex Parte*, Cramton Report at 1.

⁷¹ *See* RCA Aug. 10, 2010 *Ex Parte*, Cramton Report at 7 (inability to obtain devices may cause Lower A Block licenses to be "orphaned for multiple years"); Triad 700 Comments at 3 (lack of devices may cause smaller Lower A Block licensees' spectrum to "lay fallow for a long period of time").

⁷² AT&T Dec. 9, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 3.

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Id.*

24. We ask commenters to submit additional detailed metrics to evaluate the effects of an interoperability requirement on competition. Specifically, would the use of interoperable equipment promote consumer choice by facilitating the portability of mobile devices between service providers, thereby allowing consumers to switch more easily between providers?⁷⁶ At the same time, would deployment of Lower 700 MHz B and C Block service be delayed by a move towards interoperability, either by rule or industry agreement? What would be the relevant costs associated with possible Commission action? What costs would Lower 700 MHz B and C licensees who have already committed to Band Class 17, or who plan to do so, incur if we adopt an interoperability rule in the Lower 700 MHz spectrum?

25. Would a requirement that mobile user equipment be capable of operating on all paired commercial Lower 700 MHz spectrum facilitate deployment of facilities-based mobile broadband networks in rural and unserved areas? Are Lower A Block licensees just as likely to obtain funding and obtain affordable mobile equipment without Commission action? We also seek specific data and anecdotal evidence to support claims that an interoperability obligation would require complete redesign and upgrade of devices and base stations. We seek additional information on the necessary changes to chipsets and the timeframes these changes will impose.

26. U.S. Cellular recently announced the planned launch of a 4G LTE network that will cover 25 percent of U.S. Cellular's customers and will use the 700 MHz licenses of its partner, King Street Wireless.⁷⁷ C-Spire, in contrast, reportedly has delayed its previously announced launch of its 4G LTE network.⁷⁸ We ask Lower A Block licensees to provide detailed information on the effect that a lack of interoperability has had, if any, on their efforts to deploy service. Commenters should be as specific as possible and should, where possible, include data or affidavits.

27. *Roaming.* A number of commenters argue that an interoperability requirement would promote roaming among 700 MHz licensees.⁷⁹ These proponents argue that requiring the use of interoperable equipment in the Lower 700 MHz band would promote the commercial availability of mobile device equipment for all Lower 700 MHz licensees.⁸⁰ Without that equipment, Lower 700 MHz A Block licensees maintain they cannot build out their networks, which they claim is a prerequisite for the negotiation of roaming agreements.⁸¹ Petitioners also claim that they have no reason to expect such

⁷⁶ Consumers Union notes that lack of interoperability in the 700 MHz Band would prevent consumers from taking their phones with them if they choose to sign up with a new wireless provider. Letter from Parul P. Desai, Policy Counsel, Consumers Union, to Chairman Julius Genachowski, FCC, filed Feb. 10, 2011 (Consumers Union Feb. 11, 2011 *Ex Parte*) at 2.

⁷⁷ See Press Release, U.S. Cellular, U.S. Cellular Announces Launch of 4G LTE Network Next Month Along With Upcoming Devices (Feb. 1, 2012), available at <http://www.uscellular.com/about/press-room/2012/USCELLULAR-ANNOUNCES-LAUNCH-OF-4G-LTE-NETWORK-NEXT-MONTH-ALONG-WITH-UPCOMING-DEVICES.html> (last accessed Feb. 16, 2012) (U.S. Cellular Feb. 1, 2012 Press Release).

⁷⁸ See Alan F., *C-Spire misses target date for LTE service*, PHONEARENA.COM, http://www.phonearena.com/news/C-Spire-misses-target-date-for-LTE-service_id25551 (last accessed Feb. 16, 2012).

⁷⁹ See, e.g., Letter from Benjamin M. Moncrief, Director, Government Relations, C Spire Wireless, to Marlene H. Dortch, FCC, filed Dec. 22, 2011 at 2; Letter from Grant B. Spellmeyer, Esq., Executive Director, Federal Affairs & Public Policy, U.S. Cellular, to Marlene H. Dortch, FCC, filed Dec. 21, 2011 at 1; Free Press Dec. 20, 2011 *Ex Parte* at 2; Letter from Rebecca M. Thompson, General Counsel, RCA, to Marlene H. Dortch, FCC, filed Oct. 28, 2011 at 1; Petition at 4; PVT Comments at 4; FOP Comments at 2-6.

⁸⁰ Petitioners Reply Comments at 21.

⁸¹ Petitioners Reply Comments at 22.

mobile devices to be available on a widespread, affordable basis in the 700 MHz band and without such devices, there is nothing to negotiate.⁸² Petitioners contend that small rural and regional carriers are in no position to place bulk orders for mobile devices that work in the Lower 700 MHz A Block and also work in other 700 MHz frequency blocks.⁸³ They claim that AT&T and Verizon Wireless are the only ones who hold the market power with the device manufacturers and the two carriers currently are developing mobile devices that work exclusively on their bands.⁸⁴ Without interoperable devices, Petitioners state that there will be no roaming in the 700 MHz band.⁸⁵

28. NTCA states that mobile customers rely on and expect a “seamless experience” that is made possible by roaming arrangements.⁸⁶ Without roaming, NTCA explains that customers will experience “isolated islands of service.”⁸⁷ Further, Petitioners and other supporters assert that even if Band Class 12 equipment were available, from a technical perspective, Band Class 17 device users would be unable to roam on Band Class 12 networks operating on Block A.⁸⁸ They argue that a lack of interoperability leaves customers of small carriers “without an option for a nationwide service, perpetually unable to roam on the networks of the large carriers.”⁸⁹

29. AT&T and Verizon Wireless respond that the Lower A Block licensees are not prevented from negotiating roaming arrangements with providers offering services on the other 700 MHz blocks.⁹⁰ AT&T also responds that A Block licensees are free to negotiate with handset manufacturers to design, manufacture and deploy wireless handsets and other devices that operate within the spectrum bands that are needed based upon their spectrum holdings and business plans, including Band Class 12 or other commercial spectrum.⁹¹ AT&T argues that “[t]he Commission should not take action to force carriers to utilize a certain spectrum band for roaming,” but that carriers should be able “to choose their roaming partners based on factors like network compatibility, price, coverage, and call quality.”⁹² We seek comment on whether interoperability would promote reasonable roaming arrangements among 700 MHz providers and would increase the number of providers that are technologically compatible for roaming partnership.

B. Potential for Harmful Interference

30. Even if the record demonstrates that the existence of two distinct band classes in the Lower 700 MHz band is creating a device and network deployment problem, the Commission must

⁸² Petitioners Reply Comments at 22. As discussed above, U.S. Cellular, however, recently announced the upcoming launch of two 4G LTE devices for the Lower 700 MHz Blocks. See U.S. Cellular Feb. 1, 2012 Press Release, *supra* note 77.

⁸³ Petitioners Reply Comments at 22.

⁸⁴ Petitioners Reply Comments at 22-23.

⁸⁵ Petitioners Reply Comments at 22.

⁸⁶ NTCA Comments at 3-4.

⁸⁷ NTCA Comments at 3.

⁸⁸ See Petitioners Reply Comments at 20; Triad 700 Comments at 6; NTCH Comments at 3.

⁸⁹ NTCA Comments at 4; see also Petitioners Reply Comments at 21.

⁹⁰ AT&T Comments at 13; Verizon Wireless Comments at 6.

⁹¹ AT&T Comments at 13.

⁹² AT&T Comments at 13, n.20.

ultimately resolve the central question as to whether a single band class would cause widespread harmful interference to Lower 700 MHz B and C Block licensees, who would otherwise use Band Class 17 devices rather than Band Class 12.

31. Interoperability issues are particularly relevant at this time, as licensees are in the process of deploying LTE in the Lower 700 MHz band. As of December 2011, AT&T has launched LTE service using its Lower 700 MHz B and C Block licenses in 15 markets.⁹³ In addition, as noted above, U.S. Cellular recently announced the planned launch of an LTE network that will cover 25 percent of its customers and will use the 700 MHz licenses of its partner, King Street Wireless.⁹⁴ As discussed earlier, there are two Lower 700 MHz band LTE standards for the Lower 700 MHz band, with 3GPP Band Class 17 spanning the B and C Blocks,⁹⁵ and Band Class 12 spanning the A, B, and C Blocks.⁹⁶ Some commenters have argued that this, in turn, fragments the device ecosystem for LTE devices that operate in the Lower 700 MHz band and prevents interoperability.⁹⁷

32. Commenters argue that there would be two primary interference concerns for providers operating in the Lower 700 MHz B and C Blocks if these providers were to substitute Band Class 12 for Band Class 17 in newly-offered devices (as opposed to adding Band Class 12 capabilities into devices along with Band Class 17): (1) reverse intermodulation interference from adjacent DTV Channel 51 operations; and (2) blocking interference from neighboring high-powered operations in the Lower 700 MHz E Block.⁹⁸ We focus our technical analysis on these two primary issues. We note that some commenters also express concern regarding the need to deploy wider filters in order to migrate to Band Class 12.⁹⁹ We observe, however, that a transition from Band Class 17 to Band Class 12 does not necessitate a change to base station filtering. Operators deploying networks in the Lower 700 MHz B and C Blocks can continue to filter base station receivers as they would for Band Class 17, and thus interference from Channel 51 to B and C Block base stations is the same regardless of whether Band

⁹³ See AT&T Dec. 9, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 3.

⁹⁴ See *supra* note 77.

⁹⁵ 704 MHz-716 MHz and 734 MHz-746 MHz.

⁹⁶ 699 MHz-716 MHz and 729 MHz-746 MHz.

⁹⁷ See, e.g., U.S. Cellular Comments at 6-7 (in the absence of vendor support by the two largest spectrum holders in the 700 MHz band, the vendor community has been reluctant to develop chipsets, filters, amplifiers and other device components to support Band Class 12 and 14 operations); Letter from Michele C. Farquhar, Hogan Lovells, Counsel to Vulcan, to Marlene H. Dortch, FCC, filed Dec. 12, 2011, Attachment at 3 (700 MHz band is characterized by “unprecedented band class fragmentation and delays, slower ecosystem development and less consumer choice”).

⁹⁸ Letter from Trey Hanbury, Coalition for 4G in America, to Marlene H. Dortch, FCC, filed May 27, 2010 (Coalition for 4G in America May 27, 2010 *Ex Parte*) Attachment at 7-9 (now known as “Connect Public Safety Now”); Letter from Lawrence R. Krevor, *et al.*, Coalition for 4G in America, to Marlene H. Dortch, FCC, WT Docket No. 06-150, PS Docket No. 06-229, GN Docket No. 09-51, filed Sept. 20, 2010, at 2; 3GPP TSG RAN WG4 (Radio) Meeting #47, R4-081108, “TS36.101: Lower 700 MHz Band 15”; Petitioners Reply Comments at 40-44; Letter from Steve B. Sharkey, Senior Director, Reg. and Spectrum Policy, Motorola, *et al.*, to Marlene H. Dortch, FCC, filed Feb. 8, 2010 at 2; AT&T Comments at 2, 4-6. In light of the Commission’s recent approval of AT&T’s acquisition of Qualcomm’s 700 MHz D Block licenses, however, high-powered D Block transmissions will no longer pose an interference issue. See *AT&T/Qualcomm Order*, 26 FCC Rcd at 17616 ¶¶ 61-63 (requiring AT&T to operate on D and E block spectrum under same power limits and antenna height restrictions applicable to Lower 700 MHz A and B Block licensees).

⁹⁹ Qualcomm Comments at 2; Motorola Comments at 4.

Class 12 devices or Band Class 17 devices are used. Commenters also raise other potential interference concerns, including interference from Band Class 12 devices into Channel 51 television receivers,¹⁰⁰ and other interference issues that are specific to operations in the A Block. We do not address those issues herein. We focus the scope of this proceeding to interference to Lower 700 MHz B and C Block operations that may result from the adoption of Band Class 12 devices by Lower 700 MHz B and C licensees, whether voluntarily or by regulatory mandate.

33. AT&T asserts that both reverse intermodulation and blocking interference are significant issues. It expects that managing and mitigating the interference from Channel 51 and any high power Lower E Block broadcasts to its network would account for the greatest expenses, and that its customers would not, on balance, benefit from AT&T migrating to Band Class 12.¹⁰¹ AT&T argues that if it were required to use Band Class 12 devices as opposed to Band Class 17 devices, its customers would be forced to use devices that would expose them to interference risks (from Channel 51 and the E Block) they otherwise would not face.¹⁰² Notwithstanding the foregoing, AT&T affirms that it does not object to supporting interoperability in the Lower 700 MHz band, assuming supply chain availability, if interference challenges from Channel 51 and the Lower 700 MHz E Block licensees are addressed to its satisfaction.¹⁰³

34. With regard to the Channel 51 interference concerns, Motorola's view in its original 3GPP proposal to create Band Class 17 was that reverse intermodulation interference could happen when Band Class 12 devices are close to high-powered Channel 51 transmission towers, which it believes could result in in-band interference because of the limited radio frequency (RF) filtering capability of Band Class 12 filters.¹⁰⁴ According to Motorola's paper, "the key issue" in determining the possibility of such interference is "the level of the DTV Channel 51 wideband signal that would be present at the UE antenna port based on a reasonable deployment scenario," but Motorola does not provide evidence showing the circumstances that could produce conditions suitable to create reverse intermodulation interference from Channel 51.¹⁰⁵

35. Proponents of an interoperability requirement argue that no reverse intermodulation interference would occur, and that if an operator does experience any such interference, solutions exist to

¹⁰⁰ See, e.g., Letter from Joseph P. Marx, Assistant Vice President, AT&T Services, Inc., to Marlene H. Dortch, FCC, filed May 28, 2010, Attachment at 5; Letter from Steve Sharkey *et al.*, Motorola, Inc., to Marlene H. Dortch, FCC, filed Feb. 12, 2010 at 2.

¹⁰¹ AT&T Dec. 9, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 3. AT&T does not attempt to quantify the cost of mitigating potential harmful interference to its network in the event of an interoperability requirement except to state that the cost "could easily total billions of dollars." *Id.* at 4.

¹⁰² AT&T Reply Comments at 10; AT&T July 29, 2011 *Ex Parte* at 6 (stating that an interoperability requirement "would require consumers with Band 17 devices (that are free of interference risk from Channel 51 and the E Block) to obtain new devices with Band 12 radios that expose them to such interference").

¹⁰³ Letter from Joan Marsh, Vice President – Federal Regulatory, AT&T, to Marlene H. Dortch, FCC, WT Docket No. 11-18, filed Dec. 22, 2011 at 1.

¹⁰⁴ See Motorola, "TS36.101: Lower 700 MHz Band 15," 3GPP TSG-RAN WG4 meeting #47, Kansas City, MO, USA (April 2008) at 1-2, available at http://www.3gpp.org/ftp/tsg_ran/wg4_radio/TSGR4_47/Docs/R4-081108.zip. (Motorola presented its paper at Meeting #47 of the WG4 in May 2008.) The large in-band interfering signals would then combine with Band Class 12 device transmissions to generate intermodulation products in other parts of the 700MHz Band. *Id.*

¹⁰⁵ *Id.*

mitigate Channel 51 interference concerns to Band Class 12 devices operating in the B and/or C Blocks. According to Cellular South and King Street Wireless, “With [less than five megahertz] Tx bandwidth, any Channel 51-700 intermodulation products would not fall within the device receive blocks (no self-interference issue).”¹⁰⁶ They represent that this is because a strong signal from Channel 51 must mix with a full-power Lower 700 MHz B and C Block device transmission, but “LTE base stations do not allow devices to transmit at full power with [greater than five megahertz] bandwidth due to a self-desense issue.”¹⁰⁷ Essentially, Cellular South and King Street Wireless argue that power amplifier linearity in a mobile device improves considerably when it is not transmitting at full power and that if the device transmitted bandwidth is less than five megahertz, then intermodulation products resulting from the combination of Channel 51 and Lower 700 MHz band C Block transmit frequencies would not cause intermodulation interference. Finally, they point out that if intermodulation interference is experienced, the wireless operator “may deploy an LTE base station several hundred meters away from the Channel 51 station to control device transmit power and provide a stronger downlink desired signal.”¹⁰⁸

36. Vulcan performed lab and field tests to test the assertion that “reverse intermodulation distortion caused by Channel 51 using a Band Class 12 device would create an interfering signal in the B Block receiver.”¹⁰⁹ Based on the results of lab tests, Vulcan concludes that a minimum signal level of 0 dBm from Channel 51 would be necessary to create an interference signal at the noise floor of the B Block receiver, and field measurements showed that Channel 51 transmissions were no stronger than -21 dBm. The report indicates that the strongest signal strength in the field measurements of DTV Channel 51 is typically much lower than necessary to generate noticeable reverse intermodulation interference.¹¹⁰ AT&T responds that the tests referenced by Vulcan do not represent real-world situations, because the tests occurred only within a two kilometer radius of the Channel 51 tower, whereas stronger signals from Channel 51 can occur at closer distances.¹¹¹

37. With regard to interference from Lower E Block operations, Motorola asserts that receiver blocking performance may be degraded when Band Class 12 devices are close to high-powered Lower E Block transmission towers, due to limited Band Class 12 device out-of-band blocking rejection.¹¹² According to AT&T, Band Class 17, with an extra six megahertz of separation from the Lower E Block, was created to alleviate this concern, so that the device filter can provide sufficient attenuation of the E Block transmissions.¹¹³ It further asserts that Band Class 12 has sub-optimal filtering because of the lack of sufficient frequency separation between the Lower E Block and the starting frequencies of Band Class 12.¹¹⁴

¹⁰⁶ Cellular South/King Street May 27, 2011 *Ex Parte*, Attachment at 4.

¹⁰⁷ *Id.*, Attachment at 4.

¹⁰⁸ *Id.*, Attachment at 4.

¹⁰⁹ Letter from Michele C. Farquhar, Hogan Lovells, Counsel to Vulcan, to Marlene H. Dortch, FCC, filed Nov. 30, 2011 (Vulcan Nov. 30, 2011 *Ex Parte*), Attachment, “Study to Review Interference Claims that have Thwarted Interoperability in the Lower 700 MHz Band” at 12.

¹¹⁰ *Id.*, Attachment at 12.

¹¹¹ Letter from Jim Bugel, Asst. Vice President, Public Safety and Homeland Security, AT&T, to Marlene H. Dortch, FCC, filed Dec. 7, 2011 (AT&T Dec. 7, 2011 *Ex Parte*) at 1.

¹¹² *Id.* at 2.

¹¹³ AT&T July 29, 2011 *Ex Parte* at 2-4; AT&T Reply Comments at 10.

¹¹⁴ AT&T July 29, 2011 *Ex Parte* at 3-4.

38. The Coalition for 4G asserts that network operators can eliminate potential interference from Lower E Block operations by deploying the A, B, or C Block base stations near the E Block transmitters.¹¹⁵ In support of its position that interference from Lower 700 MHz E Block transmitters is manageable for Band Class 12 devices operating in Lower 700 MHz B and C blocks, Vulcan's lab and field tests assess the severity of interference issues to Band Class 12 devices from high power 50 kW transmissions in the Lower 700 MHz E Block.¹¹⁶ The tests indicate that the Atlanta field measurements of the highest signal power ratios between the 50 kW Lower E Block and B Block are typically 15 to 30 dB lower than necessary to produce Lower B Block receiver blocking. The tests conclude that real-world tests found the anticipated interference circumstances are manageable and Band Class 17 is redundant.¹¹⁷ Vulcan also asserts that the test results confirm Band Class 12 devices performance would not be worse than Band Class 17 devices, and that Band Class 17 already has greater levels of internal interference from within the Lower B and C Blocks.

39. In response, AT&T disagrees generally with the effectiveness of these potential mitigation techniques, stating that (1) increasing the number of cell sites near E Block transmitters or Channel 51 towers would increase the cost of providing 4G service, which would eventually be passed on to consumers, and (2) given the limited number of available site locations, coordination alone is insufficient to solve Band Class 12 interference issues.¹¹⁸ AT&T also asserts that adequate coverage of a 50 kW mobile broadcast service in the market in which Vulcan conducted its testing would require at least thirteen Lower 700 MHz E Block transmitters, which would lead to higher signal levels compared to the four transmitters that were active when testing was conducted by Vulcan.¹¹⁹ It is unclear, however, how much higher the signal levels may be close to a Lower E Block transmitter that is surrounded by twelve additional E Block transmitters versus one that is surrounded by only three. Whereas more base stations will improve overall signal levels and coverage, basic engineering calculations would suggest that any increase to the signal levels close to each base station, where signals may be strong enough to cause in-band receiver blocking interference to neighboring bands, would be negligible.

40. We seek comment on these and any additional technical and operational factors that should be taken into consideration in any transition to an interoperable Lower 700 MHz band. We ask interested parties to submit measurements and quantitative analyses regarding the magnitude and extent of the interference risk from adjacent Channel 51 and Lower Block E transmissions for Band Class 12 devices operating in the Lower B and C Blocks. How effective are existing mitigation measures, such as coordination between Lower 700 MHz and DTV Channel 51 licensees? Further, what innovative technical measures might be introduced in the near future, such as better performing RF duplexers and filters? What additional interoperability solutions exist or are being developed to address these interference concerns? We also seek comment on the performance of Band Class 12 devices compared to Band Class 17 devices, as well as on other factors relating to the operations in the Lower B and C Blocks. Furthermore, in the event unwanted harmful interference cannot be mitigated in some areas, we seek comment on whether the potential harm resulting from interference in those areas is outweighed by the

¹¹⁵ Coalition for 4G May 27, 2010 *Ex Parte*, Attachment at 9 (now known as "Connect Public Safety Now").

¹¹⁶ Vulcan Nov. 30, 2011 *Ex Parte*, Attachment at 1-2.

¹¹⁷ Vulcan Nov. 30, 2011 *Ex Parte*, Attachment at 15-16 (field measurements were conducted with a 3dBi gain antenna; typical 700 MHz device antenna gain is -5dBi).

¹¹⁸ Letter from Joseph P. Marx, Assistant Vice President, Federal Regulatory, AT&T, to Marlene H. Dortch, FCC, filed Nov. 2, 2010 at 4-5, 6-7.

¹¹⁹ AT&T Dec. 7, 2011 *Ex Parte* at 2.

public interest benefits that would result from interoperability in the Lower 700 MHz band, and what factors should be considered in balancing these concerns.

41. As noted above, should Band Class 12 be substituted in devices for Band Class 17, operational issues may arise to the extent that a single network must be capable of supporting more than one device band class. That is, if a licensee chooses to continue supporting its existing grandfathered Band Class 17 devices, the wireless network will need to support both Band Class 17 devices and Band Class 12 devices. We seek comment on possible ways to address this issue. Since the two Band Classes overlap in frequencies, we think it is likely that there are relatively simple, cost effective solutions that will allow a single network to accommodate devices from both band classes. For example, would the Equivalent Home Public Land Mobile Network file (EHPLMN) update in devices allow the LTE network to support both Band Class 12 and Band Class 17 devices?¹²⁰

42. We seek comment on whether there are measures the Commission should take to address Lower 700 MHz interference concerns that may be preventing the voluntary adoption of Band Class 12 by Lower B and C Block licensees. We note that AT&T asks the Commission to “modify the rules governing service in Channel 51 and in the 700 MHz Lower E Block to permit power levels, out of band emissions and antenna heights that are no greater than those currently permitted in the 700 MHz Lower A and B blocks, to allow downlink only in the Lower E Block and uplink only in Channel 51, and to relocate any incumbent high power broadcast operations out of Channel 51 and the Lower E Block.”¹²¹ In approving AT&T’s acquisition of Qualcomm’s Lower 700 MHz licenses (comprising all of the Lower 700 MHz D Block licenses and five of the Lower E Block licenses), the Commission included a condition that AT&T operate under the same power limits and height restrictions applicable to Lower 700 MHz A and B Block licensees, which will reduce the instances of high-powered operations in the Lower D and E Blocks.¹²² Specifically, the Commission stated that “AT&T must operate on the Lower D and E Block licenses consistent with the limits set forth in Section 27.50(c), excluding Subsection 27.50(c)(7).”¹²³ The Commission also conditioned the transaction on AT&T’s use of this spectrum only for downlink transmissions.¹²⁴ In addition, it conditioned the transaction on AT&T taking certain steps to mitigate possible interference caused by AT&T’s use of the Lower D and E Blocks to the uplink operations of licensees operating in the Lower 700 MHz A, B, and C Blocks, including mitigating interference within 30 days after receiving written notice from the A, B, or C Block licensee.¹²⁵

¹²⁰ Qualcomm, Inc., “Multimode System Selection (MMSS) Basic Provisioning,” 80-W3637-1 Rev B at 6-7 (Jan. 5, 2012), available at <http://www.qualcomm.com/search/?query=%2280-W3637-1+Rev+B%22>.

¹²¹ AT&T Dec. 22, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 1-2.

¹²² *AT&T/Qualcomm Order*, 26 FCC Rcd at 17616 ¶¶ 62-63.

¹²³ *AT&T/Qualcomm Order*, 26 FCC Rcd at 17616 ¶ 62.

¹²⁴ *AT&T/Qualcomm Order*, 26 FCC Rcd at 17616 ¶ 65.

¹²⁵ *AT&T/Qualcomm Order*, 26 FCC Rcd at 17617 ¶ 67. Specifically, the condition requires AT&T to “(1) coordinate with the A, B, or C Block licensee to mitigate potential interference; (2) mitigate interference to A, B, or C Block operations within 30 days after receiving written notice from the A, B, or C Block licensee; and (3) ensure that D/E Block transmissions in areas where another licensee holds the A, B, or C Block license are filtered at least to the extent that D/E Block transmissions are filtered in markets where AT&T holds the A, B, or C Block license, as applicable.” *Id.* U.S. Cellular urges the Commission to seek comment on and adopt a rule that imposes conditions on Lower E Block licensees consistent with the power limit restrictions, requirement for downlink-only transmissions, and interference mitigation requirements in the conditions adopted in the *AT&T/Qualcomm Order*. U.S. Cellular asserts that “[i]mposition of such conditions will serve the public interest by helping to accelerate the (continued....)

43. We seek comment on whether we should modify our rules for Lower 700 MHz D and E Block operations, using the technical conditions set forth in the AT&T/Qualcomm decision as a template. Modifying our rules in this manner would lead to consistency in the technical requirements for the Lower D and E Blocks and would help to address potential harmful interference from operations on the Lower E Block licenses that are not held by AT&T. Would these modifications adequately address concerns that Lower B and C Block licensees may experience harmful interference from Lower D and E Block operations if they transition to Band Class 12? As a practical matter, would modifying our rules in this manner encourage Lower B and C Block licensees to voluntarily adopt interoperable devices? We also seek comment on how such modifications would affect the operations and plans of Lower E Block licensees, other than AT&T. What other modifications to the Lower 700 MHz D and E Block technical operational rules should we consider and what are the costs and public interest benefits of these alternative rules?

44. With respect to potential interference as a result of Channel 51 operations, are there steps the Commission could take to reduce the threat of such potential interference that would balance the needs and rights of Channel 51 incumbents with Lower 700 MHz licensees? What role, if any, should the passage of the Spectrum Act, which gives the Commission authority to conduct incentive auctions, including in the television broadcast bands,¹²⁶ have in our approach to potential interference from Channel 51 to the Lower 700 MHz band licensees? Could any measures be implemented without causing an undue burden on existing licensees? What is the likelihood that Channel 51 licensees will experience interference from operations in the Lower 700 MHz band?¹²⁷ Vulcan asserts that “Band Class 12 device interference into TV receivers is a claim that has never been substantiated,” and that the potential for Channel 51 licensees to cause interference to A Block base stations “is a deployment issue to be managed by the Lower A Block licensees.”¹²⁸ Aside from regulatory measures, what steps should the Commission take to encourage voluntary industry efforts to find solutions to interference concerns?

45. *Other Issues.* Commenters are concerned that if a provider adds Band Class 12 capabilities into mobile devices along with Band Class 17 (as opposed to substituting Band Class 12 for Band Class 17 in newly offered devices), the devices will be adversely affected with respect to form factor, cost, and battery life.¹²⁹ We seek comment on these assertions. What network-specific issues would arise, and how could licensees address those issues? How difficult or costly would it be for licensees to address any network-specific issues? Are there interim as well as long-term solutions that might be employed, and what is their timing? Are there any roaming or legacy device support issues that one solution may address that another may not? Given the highly technical and complex nature of this proceeding, we seek qualitative and quantitative data and engineering analyses to support commenters’ claims.

(Continued from previous page) _____

further development of the Lower 700 MHz ecosystem.” Letter from Grant B. Spellmeyer, Executive Director, Federal Affairs and Public Policy, U.S. Cellular, to Marlene H. Dortch, FCC, filed March 15, 2012, at 1.

¹²⁶ See Spectrum Act, Pub. L. No. 112-96, 126 Stat. 158, 222-25 (2012).

¹²⁷ We note that we intend to open a separate proceeding to address potential interference issues between Channel 51 television operations and Lower 700 MHz A Block operations.

¹²⁸ Letter from Michele C. Farquhar, Hogan Lovells, Counsel to Vulcan, to Marlene H. Dortch, FCC, filed Dec. 15, 2011, Attachment at 4.

¹²⁹ AT&T Dec. 9, 2011 *Ex Parte* in WT Docket No. 11-18 at 3; Letter from Praveen Goyal, Senior Director, Corporate and Government Relations, Research In Motion Corp., to Marlene H. Dortch, FCC, filed July 27, 2011, Attachment at 10-13.

46. Finally, we seek comment on whether our efforts should be focused exclusively – as they are now – on interoperability in the Lower 700 MHz band, as opposed to the entire band. As we noted above, although the Petition initially requests an interoperability requirement that requires mobile equipment to be capable of operating on all paired commercial frequency blocks in both the Upper and Lower 700 MHz bands, subsequent filings from some of the proponents of an interoperability requirement focus on requiring the use of Band Class 12 devices in the Lower 700 MHz band.¹³⁰ We note that there are unique interference environments and different technology-related issues, including the ability of equipment to accommodate multi-band interoperability, that are specific to the Lower versus Upper 700 MHz bands, as well as additional issues pertaining to consideration of requiring equipment to accommodate multi-band interoperability.¹³¹

C. Promoting Interoperability

47. Assuming we conclude that concerns regarding harmful interference to Lower 700 MHz B and C Block licensees are not a reasonable obstacle to interoperability or can be mitigated through industry efforts and/or Commission action, we seek comment on whether there is likely to be a timely industry solution to interoperability in the Lower 700 MHz band, or whether additional regulatory measures will be necessary to promote interoperability across the Lower 700 MHz band. Commenters currently supporting Band Class 17 suggest that resolving interference concerns would encourage the use of Band Class 12. For example, Verizon asserts that it “fully supports commercial development of Band Class 12 devices,” and that “actions addressing interference issues would spur evolution of the device market toward full Lower 700 MHz interoperability.”¹³² AT&T asserts that, if interference challenges from high power broadcasts in Channel 51 and in the Lower 700 MHz E Block are addressed satisfactorily, it will not object to supporting interoperability in the Lower 700 MHz band.¹³³ Further, AT&T contends that “these challenges can and should be addressed.”¹³⁴ Absent a regulatory mandate to implement interoperability, will Lower 700 MHz licensees voluntarily ensure that all of the Lower 700 MHz spectrum used for mobile transmit is included in their mobile equipment?

48. In what timeframe would a voluntary migration to interoperable devices reasonably take

¹³⁰ See *supra* n.35. We note that certain recent ex parte filings urge the Commission to consider interoperability across the entire 700 MHz band in light of the recent passage of the Spectrum Act, either now or in a future proceeding. See, e.g., Letter from Harold Feld, Legal Director, Public Knowledge, to Marlene H. Dortch, FCC, filed March 13, 2012 at 2; Letter from Kathleen O’Brien Ham, Vice President, Federal Regulatory Affairs, T-Mobile USA, Inc., to Marlene H. Dortch, FCC, filed March 13, 2012 at 1, 4. Our focus on the Lower 700 MHz band in this NPRM does not preclude our consideration of broader interoperability issues, including interoperability across the entire 700 MHz band, in the future.

¹³¹ The recent technical study submitted by a consortium of several Lower 700 MHz A Block licensees focuses on interference issues associated with the use of Band Class 17 versus Band Class 12 in the Lower 700 MHz Band. See Letter from Mark W. Brennan, Hogan Lovells, Counsel to Vulcan, to Marlene H. Dortch, FCC, filed Nov. 25, 2011, Attachment, “Study to Review Interference Claims that have Thwarted Interoperability in the Lower 700 MHz Band.” We note that requiring interoperability in the Upper 700 MHz Band would introduce additional and unique interference scenarios, particularly technical issues related to implementing both Band Class 13 and Band Class 14 in a single device, as well as the use of such a device while also protecting GPS receivers and Public Safety Narrowband operations.

¹³² Letter from Tamara Preiss, Vice President, Regulatory Affairs, Verizon Wireless, to Marlene H. Dortch, FCC, filed Feb. 13, 2012 at 1.

¹³³ AT&T Dec. 22, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 1.

¹³⁴ AT&T Dec. 22, 2011 *Ex Parte* in WT Dkt. No. 11-18 at 1.

place? We note that while U.S. Cellular recently announced that it has impending plans to launch 4G LTE service, together with its partner King Street Wireless L.P., it nevertheless asserts that “the Commission must still act quickly to address issues related to interoperability within the lower 700 MHz bands.”¹³⁵ Similarly, proponents of an interoperability requirement argue that action must be taken by the end of 2012.¹³⁶ Aside from the widespread and exclusive adoption of Band Class 12 in devices, which would necessitate only a single duplexer solution, what other solutions exist that might address interoperability concerns without regulatory intervention and within a reasonable timeframe? What would be a reasonable timeframe for a path to interoperability, and how will this timing affect consumers and competition?

49. We think that an industry solution to the question of interoperability in the Lower 700 MHz band would be preferable because such a solution allows the market greater flexibility in responding to evolving consumer needs and dynamic and fast-paced technological developments.¹³⁷ At the same time, we recognize that if the industry fails to move timely toward interoperability once interference concerns are adequately addressed (by regulatory action or otherwise), additional regulatory steps might be appropriate to further the public interest. The Commission staff will remain vigilant in monitoring the state of interoperability in the Lower 700 MHz band to ensure that the industry is making sufficient progress. What metrics and quantifiable data can the Commission use to measure whether the industry is making adequate progress towards achieving interoperability in the Lower 700 MHz band? In the event that such steps are warranted, we seek comment on whether it would be necessary to mandate interoperability in the Lower 700 MHz band or whether there are other, flexible regulatory measures that we should consider.

50. In the event that interference concerns are reasonably addressed and the Commission is left with no other option to maximize innovation and investment in the Lower 700 MHz band besides mandating mobile device interoperability, one approach would be to require Lower 700 MHz A, B, or C Block licensees, with respect to their networks operating in this spectrum, to use only mobile user equipment that has the capability to operate across all of these blocks. For example, those licensees deploying LTE in the Lower 700 MHz band would no longer be allowed to offer mobile units operating on Band Class 17, which provides for operation on only the Lower 700 MHz B and C Blocks. Those licensees deploying LTE in the Lower 700 MHz band would substitute Band Class 17 with Band Class 12.¹³⁸ We note that this approach focuses on mobile user device interoperability and would not require modifications to Lower 700 MHz B and C Block licensees’ base stations beyond those necessary to support Band Class 12 devices operating on these licensees’ authorized Lower 700 MHz frequencies only. In other words, we are not contemplating requiring licensees to implement base station operations on frequencies they do not have the potential to use, in order to spur production of base station elements that can be used only by licensees operating on other frequencies. We seek comment on this approach and how, if adopted, it would promote key public interest objectives, including competition and consumer

¹³⁵ Letter from Grant B. Spellmeyer, Executive Director, Federal Affairs and Public Policy, U.S. Cellular, to Marlene H. Dortch, FCC, filed Feb. 8, 2012, at 1.

¹³⁶ See, e.g., Letter from Rebecca Murphy Thompson, General Counsel, RCA, to Marlene H. Dortch, FCC, filed Jan. 19, 2012, at 2 (interoperability “must be implemented before the end of 2012 if competitive carriers are to remain viable”); Letter from Michele C. Farquhar, Counsel to Vulcan Wireless LLC, to Marlene H. Dortch, FCC, filed March 14, 2012, at 1 (requesting that the Commission adopt “an order in this proceeding before the end of 2012 that mandates interoperability across the Lower 700 MHz paired spectrum band as well as an implementation timeline”).

¹³⁷ See *Broadband PCS Memorandum Opinion and Order*, 9 FCC Rcd at 5021-22 ¶¶ 163-64.

¹³⁸ See *supra* III. B (Potential for Harmful Interference).

choice among mobile broadband service providers, the widespread deployment of 4G networks, particularly in rural and unserved areas, the availability of additional innovative 4G devices, and increased roaming opportunities. In order to facilitate a smooth transition to interoperable mobile equipment use in the Lower 700 MHz band, we would propose a reasonable transition period of no longer than two years after the effective date of an interoperability requirement, thereby minimizing the possibility of stranded investments in existing equipment. Furthermore, we would propose to grandfather the use of devices already in use by consumers as of the transition deadline, so that consumers using existing Band Class 17 equipment would not be adversely affected. We seek comment on this approach – as well as on any alternative approaches, including associated costs and benefits – that might equally satisfy our public interest objectives in promoting the widespread deployment of broadband service and increased competition and consumer choice in the mobile broadband marketplace.

51. We note that, in considering whether to adopt rules to promote the development of interoperable equipment in the Lower 700 MHz band, we will consider a number of factors, including the costs or burdens that any such new obligation would impose on licensees or others, and whether the costs would be offset by benefits to consumers, including those that would result from innovation in the marketplace, increased investments in networks, or additional competition. We therefore request comment on the costs and the benefits of adopting rules that would promote interoperability. We also seek comment on the costs and benefits of an industry-based solution to interoperability in the Lower 700 MHz band. Are there cost savings to consider, or conversely, are there costs that Lower 700 MHz licensees would incur if the industry resolved the interoperability issue without a regulatory mandate?

52. Commenters should quantify the costs of implementing any proposed solutions to the interference issues discussed above. We seek comment on costs that Lower 700 MHz B and C licensees are likely to incur in order to comply with a device interoperability requirement, including quantification of the costs to develop and obtain new compatible chipsets or front ends; design and manufacture new mobile devices; and develop any hardware or software changes necessary to implement an interoperability requirement. How much will the costs and prices of devices change as a result of an interoperability requirement? We seek comment on the revenue implications an interoperability requirement would have for providers and device manufacturers. We also seek comment on quantifiable ways in which licensees may benefit from a sunset of devices capable of operating only on a subset of paired Lower 700 MHz frequencies. For example, will Lower 700 MHz licensees achieve economies of scale in devices? We seek quantification of these economies of scale. What cost savings might result from an interoperability rule? We also seek comment on the potential costs associated with interoperability if interference cannot be mitigated in some areas. In these areas, will the public interest benefits from interoperability outweigh the costs?

53. We seek data on consumer benefits that may result from interoperability, including greater affordability and availability of 4G equipment, increasing consumer choice in equipment, promoting the widespread deployment of broadband services, providing greater options in selecting a service provider, and facilitating greater roaming opportunities. How would a rule requiring interoperability affect innovation and investment, both in the near term and in the longer term? Would such a requirement foster additional competition, and how would any increase in competition be measured?

54. What are the particular benefits to consumers or others that would result from a device interoperability requirement that includes a reasonable transition period (*e.g.*, two years) and grandfathers the use of existing, non-interoperable devices after the transition deadline? We seek comment on the costs that licensees may incur in continuing to offer service for non-interoperable devices. How long will such devices need to be supported? Are there any classes of customers that will require longer-term support than others? Further, we seek comment on the extent to which the proposed transition period minimizes or alleviates any adverse economic impact to licensees and device manufacturers. Is there an

optimal transition period that would reduce costs to the extent practicable while maximizing benefits?

55. In providing responses to these questions, we ask commenters to take into account only those costs and benefits that directly result from the implementation of particular rules that could be adopted. Commenters should identify the various costs and benefits associated with a particular requirement. Further, to the extent possible, commenters should provide specific data and information, such as actual or estimated dollar figures for each specific cost or benefit addressed, including a description of how the data or information was calculated or obtained, and any supporting documentation or other evidentiary support.

56. *Legal authority.* Finally, we seek comment on our authority to mandate a device interoperability requirement should interference concerns be reasonably addressed and there be no industry solution in place. The record is divided on this issue. On the one hand, Petitioners argue that the Commission should find the current contractual arrangements between wireless providers and equipment providers unlawful under Section 201(b), which prohibits unjust or unreasonable practices in connection with communications services, and Section 202(a), which prohibits unjust or unreasonable discrimination.¹³⁹ Petitioners also claim that a device interoperability requirement would fall within the purview of Section 1 of the Communications Act, which directs the Commission to establish policies that promote the provision of communications service to all people of the United States, without discrimination.¹⁴⁰ Petitioners argue that, at a minimum, “Section 1 can be combined by the Commission with other ‘express delegations of authority’ to enable the Commission to exercise ancillary jurisdiction over issues that are reasonably related to the policies stated in Section 1.”¹⁴¹ Commenters also reference additional sections of the Communications Act as support for Commission authority, including: Section 4(i), which specifies that the Commission “may . . . make such rules and regulations . . . as may be necessary in the execution of its functions”;¹⁴² Section 254(b)(3), which sets forth universal service principles;¹⁴³ Section 303(g), to “encourage the larger and more effective use of radio in the public interest”;¹⁴⁴ Section 303(r), which directs the Commission to prescribe such restrictions and conditions as necessary to carry out the provisions of the Act;¹⁴⁵ Section 307(b), which directs the Commission to consider a “fair, efficient and equitable” distribution of radio services in applications for licenses, modifications, and renewals,¹⁴⁶ and Section 706, which encourages the reasonable and timely deployment of advanced telecommunications capability to all Americans through “measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.”¹⁴⁷

¹³⁹ Petition at 7-8 (citing 47 U.S.C. §§ 201(b), 202(a)); *see also* Triad 700 Comments at 11.

¹⁴⁰ Petition at 9 (citing 47 U.S.C. § 151).

¹⁴¹ Petitioners Reply Comments at 65 (citing *Comcast v. FCC*, 600 F.3d 642, 657 (D.C. Cir. 2010) (slip op. at 19) (“*Comcast*”)).

¹⁴² Petition at 1 (citing 47 U.S.C. § 154(i)).

¹⁴³ Petition at 8; Triad 700 Comments at 11 (citing 47 U.S.C. § 254(b)(3)).

¹⁴⁴ Vulcan Reply Comments at 8 (citing 47 U.S.C. § 303(g)).

¹⁴⁵ Petition at 1 (citing 47 U.S.C. § 303(r)).

¹⁴⁶ Petition at 9 (citing 47 U.S.C. § 307(b)). *See also* PVT Comments at 6; Blooston Comments at 6 (arguing that the larger providers’ equipment design and procurement practices are contrary to the Commission’s obligation “to ensure ‘a fair, efficient and equitable distribution of radio service’ to all states . . .”).

¹⁴⁷ Triad 700 Comments at 11 (citing 47 U.S.C. § 1302(a)).

57. On the other hand, other commenters argue that Petitioners fail to cite a valid legal basis to adopt such an interoperability requirement. Both Verizon and AT&T argue that Sections 201 and 202 prohibit providers from unreasonable practices or discrimination among consumers.¹⁴⁸ Verizon and AT&T also argue that the other provisions referenced by supporters of an interoperability requirement do not grant the Commission the authority to regulate equipment,¹⁴⁹ or else are not substantive grants of authority for Commission action.¹⁵⁰

58. We observe that, under Title III of the Communications Act, the Commission has broad and extensive authority to manage the use of spectrum.¹⁵¹ This authority includes the power and obligation to condition our licensing actions on compliance with requirements that we deem consistent with the public interest, convenience, and necessity,¹⁵² including operational requirements, if the condition or obligations will further the goals of the Communications Act without contradicting any basic parameters of the agency's authority.¹⁵³ It also includes the powers to "prescribe the nature of the service to be rendered by each class of licensed stations and each station within any class,"¹⁵⁴ to "generally encourage the larger and more effective use of radio in the public interest,"¹⁵⁵ and to modify licenses if, in

¹⁴⁸ Verizon Comments at 18; AT&T Reply Comments at 19.

¹⁴⁹ Verizon Comments at 17-19; AT&T Reply Comments at 19.

¹⁵⁰ Verizon Comments at 17-19 (stating that Sections 4(i) and 303(r) "merely grant rulemaking authority to the Commission to carry out the substantive provisions of the Act, and contain no substantive grant of authority themselves"). Verizon states that Sections 1 and 706 are "statements of Congressional policy" and, as such, are not grants of Congressional authority for any specific regulatory action. Verizon Reply Comments at 10 (citing *Comcast*, 600 F.3d at 654 (slip op. at 17)). Both AT&T and Verizon dismiss Section 254(b)(3) as inapplicable in this case. AT&T Reply Comments at 19; Verizon Reply Comments at 10. AT&T and Verizon further argue that Section 307(b) applies only to radio station licensing, not regulation of equipment. Verizon Comments at 18-19; AT&T Reply Comments at 19.

¹⁵¹ See, e.g., 47 U.S.C. § 301 (stating that "[i]t is the purpose of this Act, among other things, to maintain the control of the United States over all the channels of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license").

¹⁵² See, e.g., 47 U.S.C. §§ 301 (authorizing the Commission to issue licenses for use of radio spectrum); 304 (stating that "[n]o station license shall be granted by the Commission until the applicant therefore shall have waived any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise"); 307(a) (stating that Commission shall grant licenses "if public convenience, interest, or necessity will be served thereby, subject to the limitations of [the Communications Act]"); 309(j)(3) (requiring the Commission to design and conduct competitive bidding systems for issuance of licenses to promote the purposes of section 1 of the Act and specified statutory objectives, including "the development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas").

¹⁵³ See, e.g., 47 U.S.C. § 303(r) (stating that if "the public convenience, interest, or necessity requires [, the Commission] shall. . . prescribe such restrictions and conditions, not inconsistent with law, as may be necessary to carry out the provisions of this Act"); *Schurz Communications, Inc. v. FCC*, 982 F.2d 1043 (7th Cir. 1992) (Communications Act invests Commission with "enormous discretion" in promulgating licensee obligations that the agency determines will serve the public interest).

¹⁵⁴ 47 U.S.C. § 303(b).

¹⁵⁵ 47 U.S.C. § 303(g). See also 47 U.S.C. § 151 (creating the Commission for the purpose of regulating communications in order to make available to all people of the United States a rapid, efficient, nationwide and world-wide communication service with adequate facilities at reasonable prices).

the judgment of the Commission, such action will promote the public interest, convenience, and necessity.¹⁵⁶ Furthermore, the Communications Act provides the Commission with broad powers under such provisions as Section 302(a) to promulgate regulations designed to address radio frequency (RF) interference, including the regulation of devices that are capable of emitting RF energy,¹⁵⁷ and Section 303(e) and (f), which empower the Commission to regulate licensees and the equipment and apparatus they use.¹⁵⁸

59. We seek comment on the Commission's statutory authority to adopt a device interoperability requirement. We note that the Commission has previously required interoperability across licensed spectrum as a means to "insure full coverage in all markets and compatibility on a nationwide basis."¹⁵⁹ In addition, by promoting the availability of subscriber handsets and network buildout of Lower 700 MHz A Block licenses, an interoperability requirement of the type discussed here can facilitate the provision of roaming services, which is subject to Commission rules.¹⁶⁰ We seek comment on our analysis of these Title III statutory provisions as a basis for our authority to take the actions proposed herein.

IV. CONCLUSION

60. In this *Notice of Proposed Rulemaking*, we are focused primarily on resolving a long-running dispute over the threat of interference to Lower 700 MHz B and C Block licensees either by agreement on the part of these licensees to be interoperable with the Lower 700 MHz A Block licensees, or by a regulatory mandate for such interoperability. Should the Commission find that interference concerns are truly minimal or can be reasonably mitigated, then the Commission, along with industry, must determine the next best steps to ensure interoperability. Our aim is to explore various options through this proceeding that help achieve the ultimate goal of interoperability.

¹⁵⁶ See 47 U.S.C. § 316(a)(1) (stating that "[a]ny station license or construction permit may be modified by the Commission either for a limited time or for the duration of the term thereof, if in the judgment of the Commission such action will promote the public interest, convenience, and necessity"); see also *Committee for Effective Cellular Rules v. FCC*, 53 F.3d 1309 (D.C. Cir. 1995).

¹⁵⁷ See, e.g., 47 U.S.C. § 302a(a) (providing Commission with authority, consistent with the public interest, convenience and necessity, to make reasonable regulations "governing the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications").

¹⁵⁸ See, e.g., 47 U.S.C. §§ 303(e) (providing Commission with authority to "[r]egulate the kind of apparatus to be used with respect to its external effects and the purity and sharpness of the emissions from each station and from the apparatus therein") and 303(f) (providing Commission with authority to "[m]ake such regulations not inconsistent with law as it may deem necessary to prevent interference between stations and to carry out the provisions of this Act").

¹⁵⁹ See *Cellular Report & Order*, 86 FCC 2d at 482.

¹⁶⁰ See 47 U.S.C. § 303(r). The Commission has imposed voice roaming requirements for interconnected CMRS providers under, *inter alia*, its Title II authority, and requirements to promote the availability of data roaming arrangements under, *inter alia*, its Title III authority. See, e.g., *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services*, WT Docket No. 05-265, *Order on Reconsideration and Second Further Notice of Proposed Rulemaking*, 25 FCC Rcd 4181, 4184 ¶ 5 (2010) (based on Commission's Title II authority); *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services*, WT Docket No. 05-265, *Second Report and Order*, 26 FCC Rcd 5411, 5439-46 ¶¶ 61-68 (2011) (based on Commission's Title III authority).

V. PROCEDURAL MATTERS

A. Ex Parte Rules

61. The proceeding initiated by this Notice of Proposed Rulemaking shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.¹⁶¹ Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must: (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made; and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter’s written comments, memoranda, or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with rule 1.1206(b). In proceedings governed by rule 1.49(f) or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission’s *ex parte* rules.

B. Filing Requirements

62. Pursuant to Sections 1.415 and 1.419 of the Commission’s rules,¹⁶² interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using: (1) the Commission’s Electronic Comment Filing System (“ECFS”), (2) the Federal Government’s eRulemaking Portal, or (3) by filing paper copies.¹⁶³

- **Electronic Filers:** Comments may be filed electronically using the Internet by accessing the ECFS: <http://www.fcc.gov/cgb/ecfs/> or the Federal eRulemaking Portal: <http://www.regulations.gov>.
- **Paper Filers:** Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission’s Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission’s Secretary must be delivered to FCC Headquarters at 445 12th St., SW, Room TW-

¹⁶¹ 47 C.F.R. §§ 1.1200 *et seq.*

¹⁶² *See id.* §§ 1.415, 1.419.

¹⁶³ *See* Electronic Filing of Documents in Rulemaking Proceedings, GC Docket No. 97-113, *Report and Order*, 13 FCC Rcd 11322 (1998).

A325, Washington, DC 20554. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. The filing hours are 8:00 a.m. to 7:00 p.m.

- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

63. Comments, reply comments, and *ex parte* submissions will be available for public inspection during regular business hours in the FCC Reference Center, Federal Communications Commission, 445 12th Street, S.W., CY-A257, Washington, D.C., 20554. These documents will also be available via ECFS. Documents will be available electronically in ASCII, Microsoft Word, and/or Adobe Acrobat.

64. To request information in accessible formats (Braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the FCC's Consumer and Governmental Affairs Bureau at (202) 418-0530 (voice), (202) 418-0432 (TTY). This document can also be downloaded in Word and Portable Document Format (PDF) at: <http://www.fcc.gov>.

65. For additional information on this proceeding, contact Brenda Boykin of the Spectrum and Competition Policy Division, Wireless Telecommunications Bureau, at (202) 418-2062.

C. Initial Regulatory Flexibility Act Analysis

66. As required by the Regulatory Flexibility Act of 1980 ("RFA"),¹⁶⁴ the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) relating to this NPRM. The IRFA is attached to this NPRM as an Appendix. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to this Notice of Proposed Rulemaking as set forth on the first page of this document and have a separate and distinct heading designating them as responses to the IRFA.

D. Paperwork Reduction Act

67. This document does not contain proposed information collection(s) subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. 3506(c)(4).

VI. ORDERING CLAUSES

68. Accordingly, IT IS ORDERED, pursuant to Sections 1, 2, 4(i), 4(j), 301, 302(a), 303(b), 303(e), 303(f), 303(g), 303(r), 304, 307(a), 309(j)(3), and 316(a)(1) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 154(j), 301, 302(a), 303(b), 303(e), 303(f), 303(g), 303(r), 304, 307(a), 309(j)(3), and 316(a)(1), and Sections 1.401 *et seq.* of the Commission's Rules, 47 C.F.R. §§ 1.401 *et seq.*, that this Notice in WT Docket No. 12-69 IS ADOPTED.

69. IT IS FURTHER ORDERED that the Petition for Rulemaking of the 700 MHz Block A Good Faith Purchaser Alliance IS GRANTED to the extent described herein.

¹⁶⁴ See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et seq.*, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996). The SBREFA was enacted as Title II of the Contract With America Advancement Act of 1996 (CWAAA).

70. IT IS FURTHER ORDERED that the proceeding in RM-11592 IS HEREBY TERMINATED.

71. IT IS FURTHER ORDERED that the Commission's Consumer & Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Notice, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (the RFA),¹ the Commission has prepared this Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact of the policies and rules proposed in the Notice of Proposed Rulemaking (NPRM) on a substantial number of small entities. Written public comments are requested on the IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadline for comments on the NPRM provided in the item. The Commission will send a copy of the NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).² In addition, the NPRM and IRFA (or summaries thereof) will be published in the Federal Register.³

A. Need for, and Objectives of, the Proposed Rules

2. Certain Lower 700 MHz A Block licensees have asserted that the development of two distinct band classes within the Lower 700 MHz band has hampered their ability to have meaningful access to a wide range of advanced devices. The Commission initiates this rulemaking proceeding to promote interoperability in the Lower 700 MHz band. The Commission states that the Communications Act directs the Commission to, among other things, promote the widest possible deployment of communications services, ensure the most efficient use of spectrum, and protect and promote vibrant competition in the marketplace. In this NPRM, the Commission's objective is to evaluate whether the customers of Lower 700 MHz B and C Block licensees would experience harmful interference, and if so to what degree, if the Lower 700 MHz were interoperable. Assuming that interoperability would cause limited or no harmful interference to Lower 700 MHz B and C Block licensees or that such interference can reasonably be mitigated through industry efforts and/or through modifications to the Commission's technical rules or other regulatory measures, the Commission asks whether there is likely to be a timely industry solution to interoperability in the Lower 700 MHz band, or whether additional regulatory measures will be necessary to promote interoperability across the Lower 700 MHz band, such as requiring Lower 700 MHz A, B, or C Block licensees, with respect to their networks operating in this spectrum, to use only mobile user equipment that has the capability to operate across all of these paired commercial 700 MHz blocks.

3. The Commission considers whether a requirement that mobile user equipment be capable of operating on all paired commercial Lower 700 MHz spectrum could foster deployment of facilities-based mobile broadband networks, particularly in rural and unserved areas. The Commission also considers whether such a requirement would increase the likelihood that the Lower A Block licensees can obtain the necessary financing to deploy networks and devices, particularly in smaller and regional areas. The Commission considers the extent to which Lower A Block licensees have successfully negotiated with equipment vendors, whether an interoperability requirement will enable the A Block licensees to benefit from economies of scale with respect to mobile devices, and whether manufacturers require a provider to purchase a minimum number of devices. The Commission considers whether interoperability would promote reasonable roaming arrangements among 700 MHz providers and would increase the number of providers that are technologically compatible for roaming partnership.

¹ The RFA, *see* 5 U.S.C. §§ 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 ("SBREFA"), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *See* 5 U.S.C. § 603(a).

³ *Id.*

4. With respect to the technical issues, the Commission states that the Commission must ultimately resolve the central question as to whether a single band class would cause widespread harmful interference to Lower 700 MHz B and C Block licensees, who would otherwise use Band Class 17 devices rather than Band Class 12. The Commission's goal is to determine the extent of two primary interference concerns for providers operating in the Lower 700 MHz B and C Blocks if these providers substitute Band Class 12 for Band Class 17 in newly-offered devices: (1) reverse intermodulation interference from adjacent DTV Channel 51 operations; and (2) blocking interference from neighboring high-powered operations in the Lower 700 MHz E Block. The Commission considers and seeks comment on the extent of the interference risk from adjacent Channel 51 and Lower Block E transmissions for Band Class 12 devices operating in the Lower B and C Blocks, the effectiveness of existing mitigation measures, and the extent of any innovative technical measures in the near future, or that can be developed. The Commission also considers how licensees can continue to support its existing grandfathered Band Class 17 devices and Band Class 12 devices.

5. Through the NPRM, the Commission's objective is to develop a record to determine whether there are measures it should take to address Lower 700 MHz interference concerns that may be preventing a voluntary adoption of Band Class 12 by Lower B and C Block licensees. For instance, the Commission seeks comment on whether to modify its technical rules for Lower 700 MHz D and E Block operations. In addition, the Commission considers steps to take to reduce the threat of potential interference to balance the needs and rights of Channel 51 incumbents with Lower 700 MHz licensees.

6. The Commission thinks that an industry solution to the question of interoperability in the Lower 700 MHz band would be preferable to a regulatory approach because such a solution allows the market greater flexibility in responding to evolving consumer needs and dynamic and fast-paced technological developments. The Commission considers what would be a reasonable timeframe for a voluntary migration to interoperability and how such timing may affect consumers and competition.

7. However, the Commission recognizes that if the industry fails to move timely toward interoperability once interference concerns are adequately addressed, by regulation or otherwise, additional regulatory steps might be appropriate to further the public interest. If interference concerns are reasonably addressed and the Commission is left with no other option to maximize innovation and investment in the Lower 700 MHz band besides mandating mobile device interoperability, one approach to achieve the Commission's goals would be to require Lower 700 MHz A, B, or C Block licensees, with respect to their networks operating in this spectrum, to use only mobile user equipment that has the capability to operate across all of these blocks. For example, the Commission considers whether to prohibit those licensees deploying LTE in the Lower 700 MHz band from offering mobile units that operate on Band Class 17, which provides for operation on only the Lower 700 MHz B and C Blocks. In order to facilitate the goal of a smooth transition to interoperable mobile equipment use in the Lower 700 MHz band, the Commission would propose a transition period of no longer than two years after the effective date of an interoperability requirement. The Commission also would propose to grandfather the use of devices already in use by consumers as of the transition deadline, so that consumers using existing Band Class 17 equipment would not be adversely affected.

B. Legal Basis

8. The authority for the actions taken in this Notice is contained in Sections 1, 2, 4(i), 4(j), 301, 302(a), 303(b), 303(e), 303(f), 303(g), 303(r), 304, 307(a), 309(j)(3), and 316(a)(1) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 154(j), 301, 302(a), 303(b), 303(e), 303(f), 303(g), 303(r), 304, 307(a), 309(j)(3), and 316(a)(1), and Sections 1.401 *et seq.* of the Commission's Rules, 47 C.F.R. §§ 1.401 *et seq.*

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

9. The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by the proposed rules, if adopted. The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁴ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁵ A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁶

10. In the following paragraphs, the Commission further describes and estimates the number of small entity licensees that may be affected by an interoperability rule. Implementing a mobile user equipment interoperability requirement in the Lower 700 MHz band affects 700 MHz spectrum licensees.

11. This IRFA analyzes the number of small entities affected on a service-by-service basis. When identifying small entities that could be affected by the Commission’s new rules, this IRFA provides information that describes auction results, including the number of small entities that were winning bidders. However, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily reflect the total number of small entities currently in a particular service. The Commission does not generally require that licensees later provide business size information, except in the context of an assignment or a transfer of control application that involves unjust enrichment issues.

12. *Wireless Telecommunications Carrier (except satellite)*. The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers. The size standard for that category is that a business is small if it has 1,500 or fewer employees.⁷ Census Bureau data for 2007, which now supersede data from the 2002 Census, show that there were 3,188 firms in this category that operated for the entire year. Of this total, 3,144 had employment of 999 or fewer, and 44 firms had had employment of 1,000 employees or more. Thus under this category and the associated small business size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities that may be affected by our proposed action.⁸

13. *Upper 700 MHz Band Licensees*. In the *700 MHz Second Report and Order*, the Commission revised its rules regarding Upper 700 MHz licenses.⁹ On January 24, 2008, the Commission

⁴ 5 U.S.C. § 601(6).

⁵ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

⁶ 15 U.S.C. § 632.

⁷ 13 C.F.R. § 121.201, NAICS code 517110.

⁸ See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-skip=600&-ds_name=EC0751SSSZ5&-lang=en

⁹ Service Rules for the 698-746, 747-762 and 777-792 MHz Band, WT Docket No. 06-150, Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Section 68.4(a) of the Commission’s Rules Governing Hearing Aid-Compatible Telephone, WT Docket No. 01-309, Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, WT Docket No. 03-264, Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission’s Rules, WT Docket No. 06-169, (continued....)

commenced Auction 73 in which several licenses in the Upper 700 MHz band were available for licensing: 12 Regional Economic Area Grouping licenses in the C Block, and one nationwide license in the D Block.¹⁰ The auction concluded on March 18, 2008, with 3 winning bidders claiming very small business status (those with attributable average annual gross revenues that do not exceed \$15 million for the preceding three years) and winning five licenses.

14. *Lower 700 MHz Band Licensees.* The Commission previously adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits.¹¹ The Commission defined a “small business” as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.¹² A “very small business” is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.¹³ Additionally, the lower 700 MHz Service had a third category of small business status for Metropolitan/Rural Service Area (MSA/RSA) licenses—“entrepreneur”—which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$3 million for the preceding three years.¹⁴ The SBA approved these small size standards.¹⁵ An auction of 740 licenses (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)) was conducted in 2002. Of the 740 licenses available for auction, 484 licenses were won by 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business or entrepreneur status and won licenses.¹⁶ A second auction commenced on May 28, 2003, closed on June 13, 2003, and included 256 licenses.¹⁷ Seventeen winning bidders claimed small or very small business status, and nine winning bidders claimed entrepreneur status.¹⁸ In 2005, the Commission completed an auction of 5 licenses in the Lower 700 MHz band. All three winning bidders claimed small business status.

15. In 2007, the Commission reexamined its rules governing the 700 MHz band in the *700 MHz Second Report and Order*.¹⁹ An auction of A, B and E Block 700 MHz licenses was held in 2008.²⁰

(Continued from previous page) _____

Implementing a Nationwide, Broadband Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State, and Local Public Safety Communications Requirements Through the Year 2010, WT Docket No. 96-86, Declaratory Ruling on Reporting Requirement Under Commission’s Part 1 Anti-Collusion Rule, WT Docket No. 07-166, *Second Report and Order*, 22 FCC Rcd 15289 (2007) (*700 MHz Second Report and Order*).

¹⁰ See Auction of 700 MHz Band Licenses Closes, *Public Notice*, 23 FCC Rcd 4572 (WTB 2008).

¹¹ See Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Report and Order*, 17 FCC Rcd 1022 (2002).

¹² See *id.*, 17 FCC Rcd at 1087-88 ¶ 172.

¹³ See *id.*

¹⁴ See *id.*, 17 FCC Rcd at 1088 ¶ 173.

¹⁵ See Letter from Aida Alvarez, Administrator, SBA, to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, FCC (Aug. 10, 1999).

¹⁶ See Lower 700 MHz Band Auction Closes, *Public Notice*, 17 FCC Rcd 17272 (2002).

¹⁷ See Lower 700 MHz Band Auction Closes, *Public Notice*, 18 FCC Rcd 11873 (2003).

¹⁸ See *id.*

¹⁹ *700 MHz Second Report and Order*, 22 FCC Rcd at 15359 n.434.

Twenty winning bidders claimed small business status (those with attributable average annual gross revenues that exceed \$15 million and do not exceed \$40 million for the preceding three years). Thirty three winning bidders claimed very small business status (those with attributable average annual gross revenues that do not exceed \$15 million for the preceding three years).

16. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”²¹ The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is: all such firms having 750 or fewer employees. According to Census Bureau data for 2007, there were a total of 939 establishments in this category that operated for part or all of the entire year. According to Census bureau data for 2007, there were a total of 919 firms in this category that operated for the entire year. Of this total, 771 had less than 100 employees and 148 had more than 100 employees.²² Thus, under that size standard, the majority of firms can be considered small.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

17. This NPRM proposes no new reporting or recording keeping requirements.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered

18. The RFA requires an agency to describe any significant alternatives that it has considered in developing its approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.²³

19. As an alternative to a regulatory approach, the Commission considers the impact of a timely voluntary industry solution to interoperability in the Lower 700 MHz band. The Commission considers how this alternative approach may affect consumers and competition. The Commission seeks comment on the economic impact of this approach on licensees, including small entities. In addition, the Commission seeks comment on other alternative approaches to interoperability in the Lower 700 MHz band that would reduce or eliminate economic adversity on licensees, including small entities.

20. Whether the Commission implements an interoperability requirement, or an industry

(Continued from previous page) _____

²⁰ See Auction of 700 MHz Band Licenses Closes, *Public Notice*, 23 FCC Rcd 4572 (2008).

²¹ The NAICS Code for this service is 334220. See 13 C.F.R 121.201. See also http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-skip=300&-ds_name=EC0731SG2&-lang=en

²² See http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-fds_name=EC0700A1&-skip=4500&-ds_name=EC0731SG3&-lang=en

²³ See 5 U.S.C. § 603(c).

solution, it seeks comment on the relevant costs and benefits on small entities. The Commission considers the potential benefits to consumers, innovation, and investment. In addition, it considers the revenue implications, cost savings, or adverse economic impact of an interoperability rule or an industry-based solution for Lower 700 MHz providers and device manufacturers.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules

21. None.

**STATEMENT OF
CHAIRMAN JULIUS GENACHOWSKI**

Re: *Promoting Interoperability in the 700 MHz Commercial Spectrum, WT Docket No. 12-69;
Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the
700 MHz Band, RM-11592*

Since the completion of the 700 MHz auction in 2008, we have seen the emergence of two non-interoperable band classes for devices. This was an unanticipated development, and it is having consequences that raise real concerns.

We have heard from providers in one of the bands – the A band – that the lack of interoperability is making it difficult to obtain mobile broadband devices. That difficulty, they have said, is slowing mobile broadband roll-outs and buildouts, and making it harder for those providers to compete. And so this issue affects central FCC goals.

To help facilitate solutions to the interoperability challenges, we have over the past months increased the agency's engagement with 3GPP -- the principal mobile broadband standards setting body.

To continue this work and to help drive toward a solution, today we initiate a proceeding on interoperability. A key issue will be interference -- whether a unified band class would result in harmful interference to Lower 700 MHz B and C Block licensees, and whether, if interference exists, it reasonably can be mitigated.

I hope and expect that industry will take the lead in developing an interoperability solution to allow for additional deployment of mobile broadband networks and increase the choice of providers available to consumers. An industry-led solution would be the preferable solution, and multiple stakeholders have indicated that a unified band class can be win-win if interference concerns are addressed. Of course, we are launching this proceeding because no solution has been reached yet and we will be closely monitoring progress in addition to developing a record as part of this proceeding.

I'd like to thank Commissioner Clyburn for her strong work to bring this issue to the fore, and Commissioner McDowell for his constructive input that is reflected in the Notice.

I want to thank the FCC staff for their work on this item.

**STATEMENT OF
COMMISSIONER ROBERT M. MCDOWELL**

Re: *Promoting Interoperability in the 700 MHz Commercial Spectrum, WT Docket No. 12-69;*
Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the
700 MHz Band, RM-11592

I am voting to approve today's notice of proposed rulemaking regarding interoperable communications in the lower 700 MHz band. I thank all of the interested parties for sharing their insights and marketplace experiences on this topic. And, I am grateful to the Chairman for his willingness to accept edits to create a more dispassionate examination and thereby allow for more analytical comment.

Although I support today's action, I hope that all interested parties will come to the negotiating table and work in good faith to develop their own solution. Government mandates should be a last resort. That maxim is especially relevant here because minimal regulation in the wireless sector has created an environment that has maximized opportunities for investment, innovation, competition and job creation. Before disrupting this fruitful environment with new government mandates, all stakeholders, including industry and consumers, should work as hard as they can to produce a private sector solution. An independently created interoperability framework stands a far better chance of success than would a top-down government regulation. In other words, the private sector is better at this than we are. In fact, we might not be here today were it not for earlier mandates handed down in July of 2007 from which I dissented.

Finally, in this case, I support our decision to refrain from including draft rules at this time. Putting forth proposed rules at this delicate stage may only distort the private sector's creative process. With this in mind, many of our questions are open-ended to elicit greater insight regarding the costs and technical feasibility of potential implementation. Accordingly, I approve of this prudent approach to develop the record further before drafting proposed rules.

As always, I thank our Wireless Telecommunications Bureau team for your work in this area.

**STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN**

Re: *Promoting Interoperability in the 700 MHz Commercial Spectrum, WT Docket No. 12-69;*
Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the
700 MHz Band, RM-11592

Last month, Congress received much deserved praise for passing legislation that gives the Commission authority to conduct voluntary incentive auctions. If finding new ways to repurpose spectrum for commercial mobile broadband services is a national priority, then removing a barrier to productive use of perhaps the most valuable spectrum the Commission has ever repurposed, should be just as important. I am grateful to Chairman Genachowski for releasing this NPRM this quarter. Amy Levine, Rick Kaplan, and Tom Peters deserve special mention for leading the staff to prepare an NPRM that shows us a path towards resolving this interoperability issue. But, the industry and the Commission owe American consumers much more. They deserve resolution of the issues and an interoperable lower 700 MHz band as quickly as possible.

We have owed the American public the competition and innovation in mobile broadband services that the 700 MHz band promises, since at least 2006, when the Commission initiated the proceeding to adopt service rules for the band. That proceeding was widely and closely followed not just by communications licensees and the lawyers that frequently lobby the Commission.

It also drew rapt attention from application developers, other technology innovators, and members of the public who do not often follow our proceedings. More than 250,000 different entities filed comments. Why? Because of the excellent propagation characteristics of the 700 MHz band.

The technological potential of this spectrum band is so great that the Commission tried to anticipate the impact that the acquisition of licenses for the band could have on competition throughout the mobile wireless ecosystem. The Commission found that wireless service providers had been requiring mobile device manufacturers to block consumer access to certain services such as Wi-Fi technology. Wi-Fi can improve the consumer experience by reducing network congestion and providing faster data throughput rates. Therefore, the Commission determined that the practice of blocking access to Wi-Fi was unrelated to reasonable network management, or technological necessity, and was an improper barrier to consumer choice. Accordingly, the Commission imposed an open access condition on the Upper C Block of the 700 MHz Band to encourage additional innovation and consumer choice at a critical stage in the evolution of wireless broadband services.

Unfortunately, the Commission did not foresee another way that the 700 MHz band could be used to harm consumer access to services. It did not anticipate there would be a standard setting process, which would divide the lower 700 MHz band, and would impede the ability of devices for A Block licenses to work on B Block and C Block networks. This lack of interoperability means fewer device and service choices for consumers. Fewer competitive options result in higher prices.

The Commission's failure to anticipate the lack of interoperability was perhaps excusable, in 2007, when it adopted the service rules for the 700 MHz band. That is because, as this NPRM explains, since the early 1980's, the Commission has sent strong messages that it expects wireless service licensees to offer consumers equipment that was capable of operating over the entire range of an allocated spectrum band. As the Commission stated, such interoperability, would "insure full coverage in all markets and compatibility on a nationwide basis."

In any event, the Commission's failure to anticipate this particular anticompetitive development means the Commission needs to move as quickly as possible to achieve true interoperability, in the lower 700 MHz band. I understand the interest in giving the industry some time to arrive at a voluntary solution. I agree that, generally speaking, such an approach can offer a market greater flexibility to respond to evolving consumer needs and fast-paced technological developments. But, the industry has already had more than four years to find a solution. This industry knows how to arrive at interoperability. In fact, as I alluded to before, until the splintering of the lower 700 MHz band occurred, the entire mobile wireless industry had been operating with the understanding that this Commission expects interoperability within all spectrum bands.

Therefore, the staff should not only carefully, but expeditiously, consider and resolve the claims about interference from Channel 51 licensees and from high power operations in the lower E Block. The staff should also be vigilant, in monitoring the industry effort, to find a voluntary solution. This NPRM provides sufficient notice about the rules the Commission might adopt if the industry does not achieve true interoperability across the lower 700 MHz band. At a minimum, those are the goals the voluntary solution should achieve. We need to quickly arrive at an appropriate method to measure the progress of those efforts. If sufficient progress is not being made, we should not hesitate to adopt these proposed rules. I look forward to an industry solution, or the adoption of rules, by the end of this calendar year.