

# **Petitioner T-Mobile's Trial Hearing Demonstratives**

**T-Mobile USA, Inc.,**  
Petitioner,

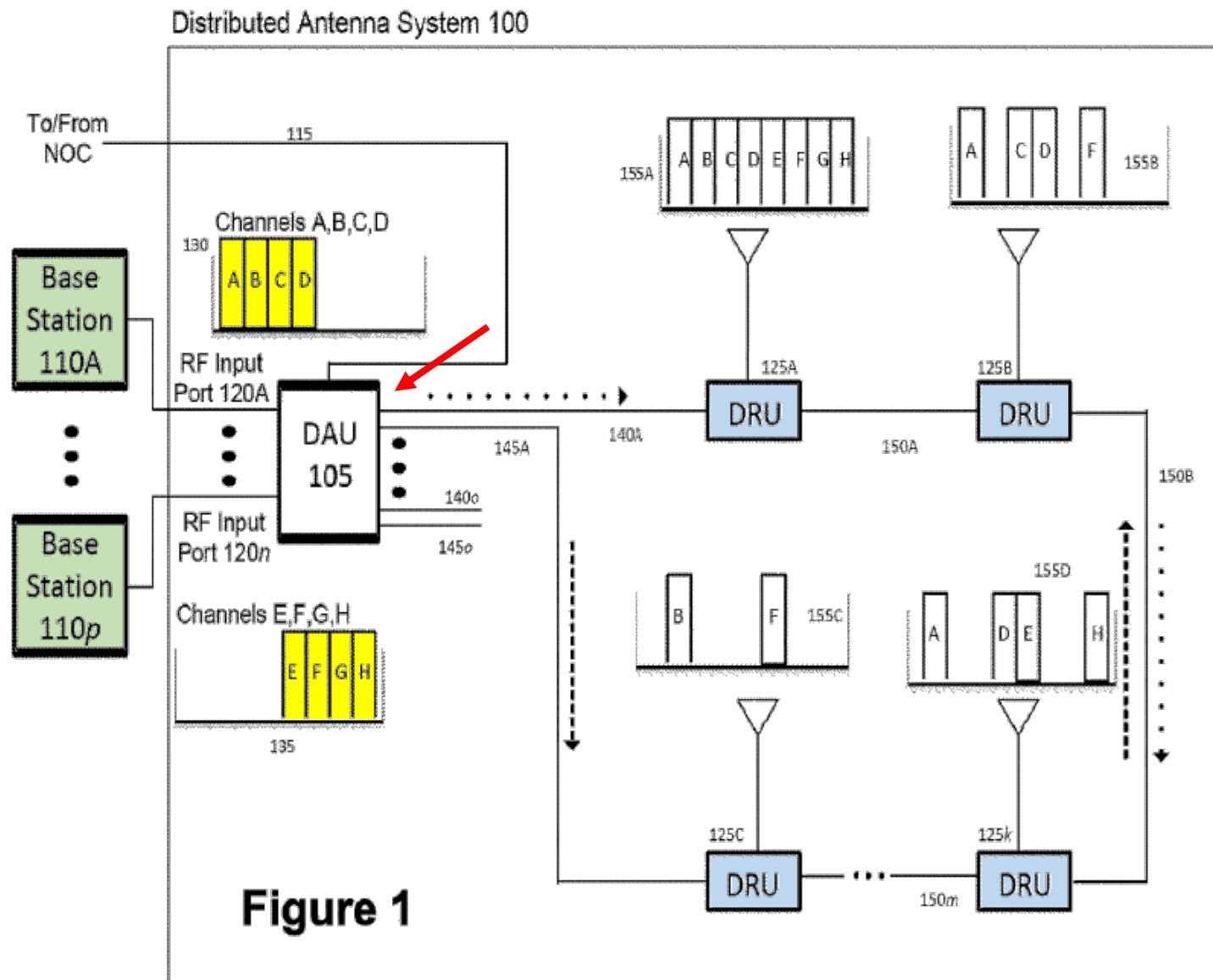
**v.**

**Dali Wireless, Inc.,**  
Patent Owner

IPR2022-01293  
U.S. Patent No. 10,334,499

December 8, 2023

# Overview of challenged '499 patent



## Specification:

The RF input signals are separately down-converted, digitized, and converted to baseband (using a Digital Down-Converter) by the DAU. Data streams are then I/Q mapped and framed and specific parallel data streams are then independently serialized and translated to optical signals using pluggable SFP modules, again by the DAU 105. The independently serialized, parallel data streams are then delivered to different DRU's 125A-125k, typically over optical fiber cable arranged, in at least some embodiments, in a ring configuration indicated at connection pairs 140A-145A, or, in other embodiments, a daisy chain configuration.

EX-1001 at 4:66-5:9

# Wu prior art

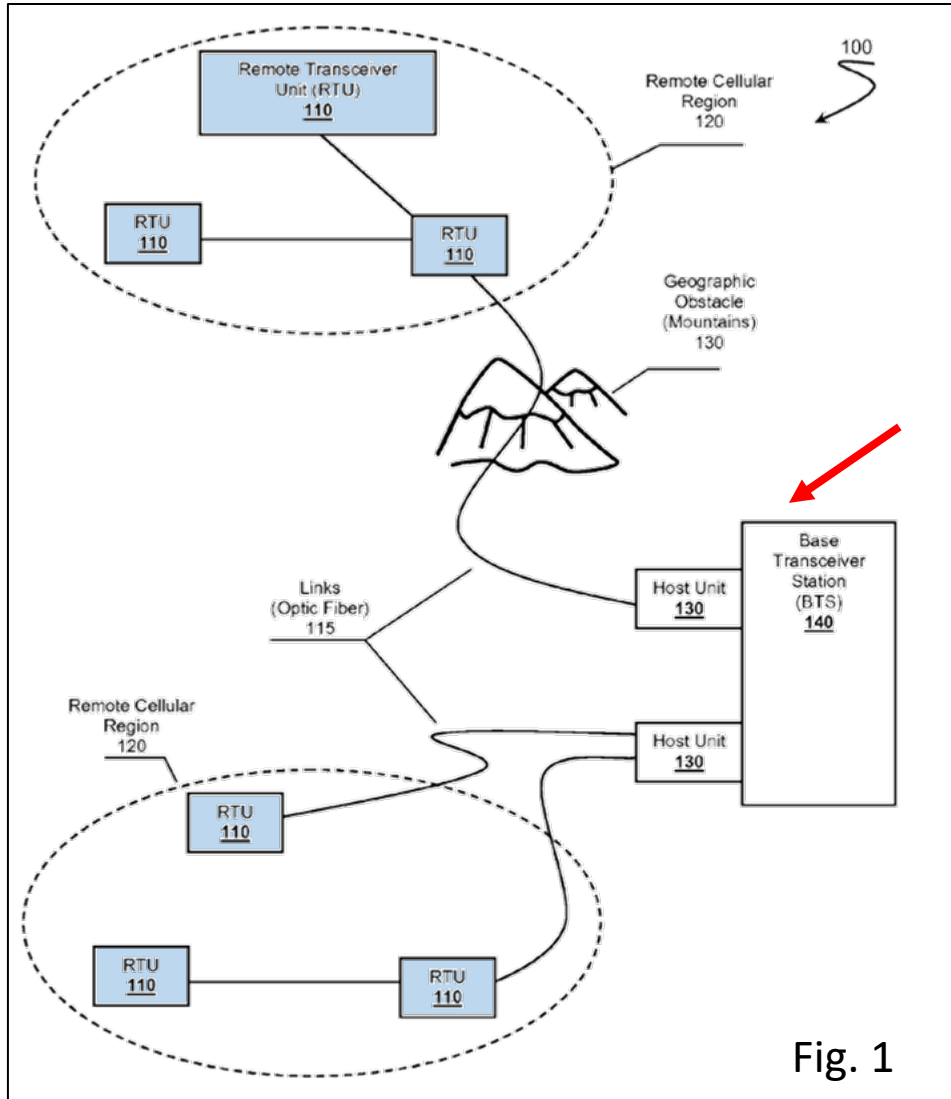


Fig. 1

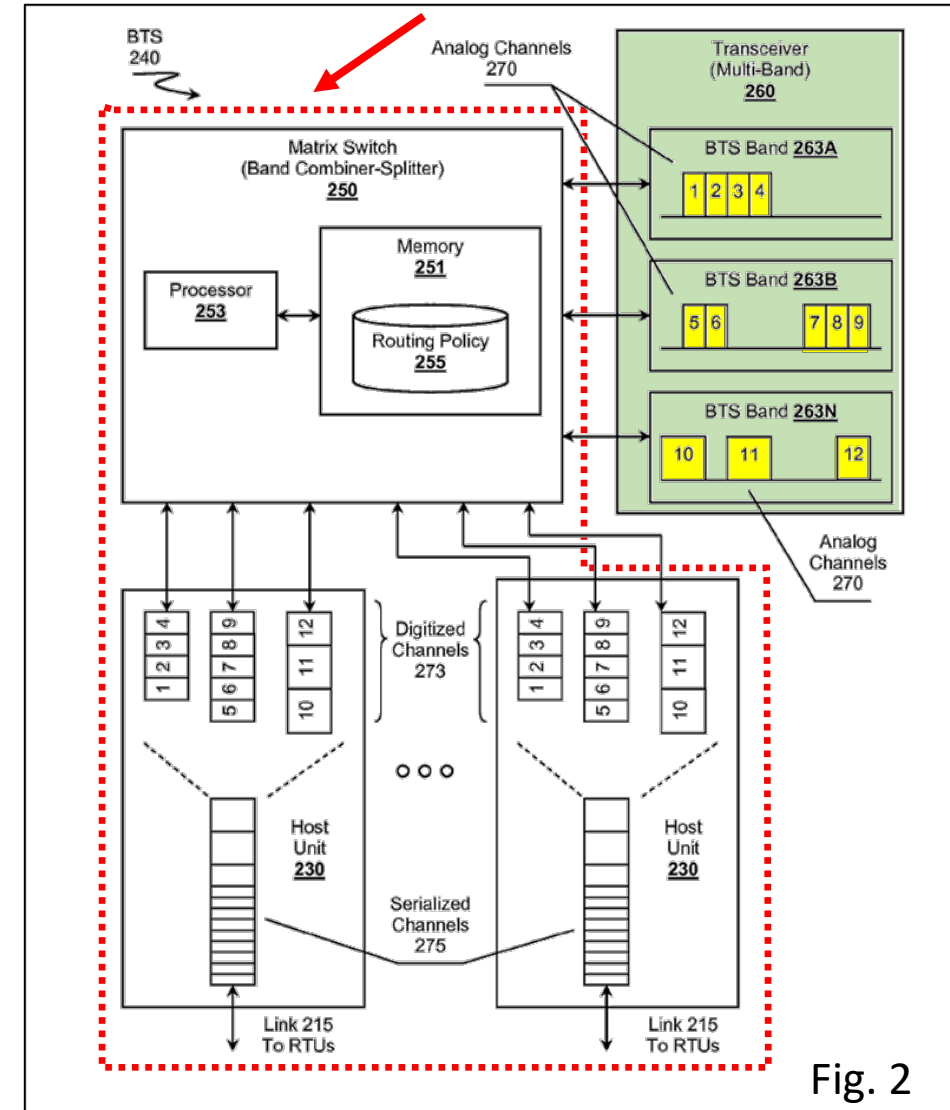
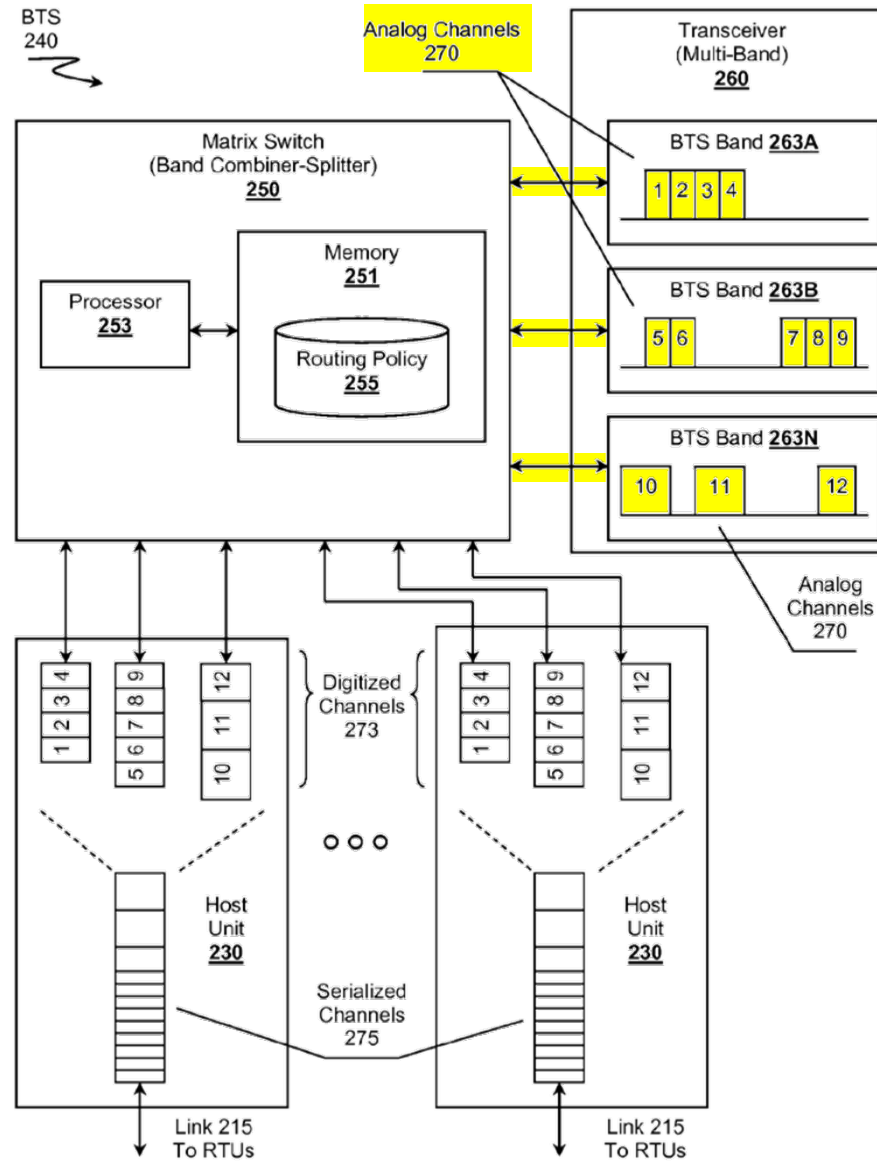


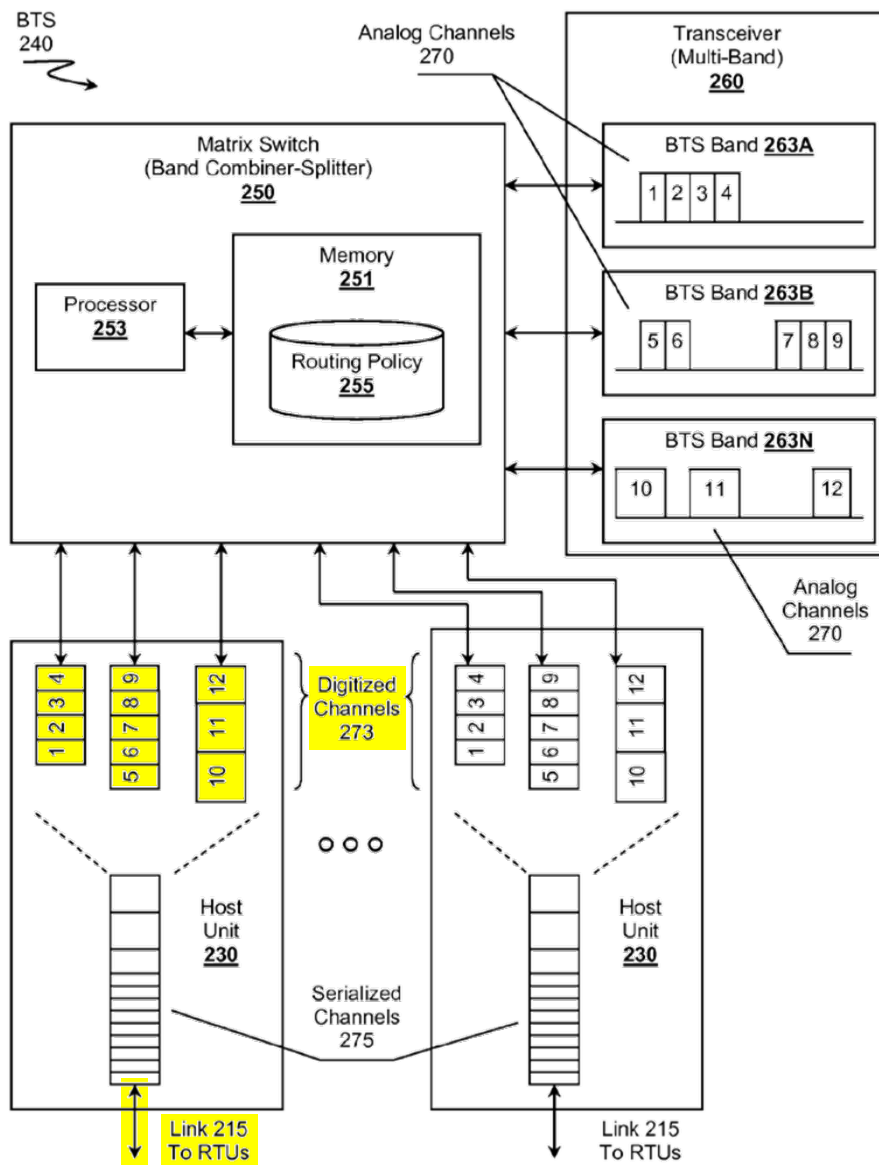
Fig. 2

**“a digital representation of ... a set of radio resources”**

# Wu's "radio resources"



# Wu's "digital representation"

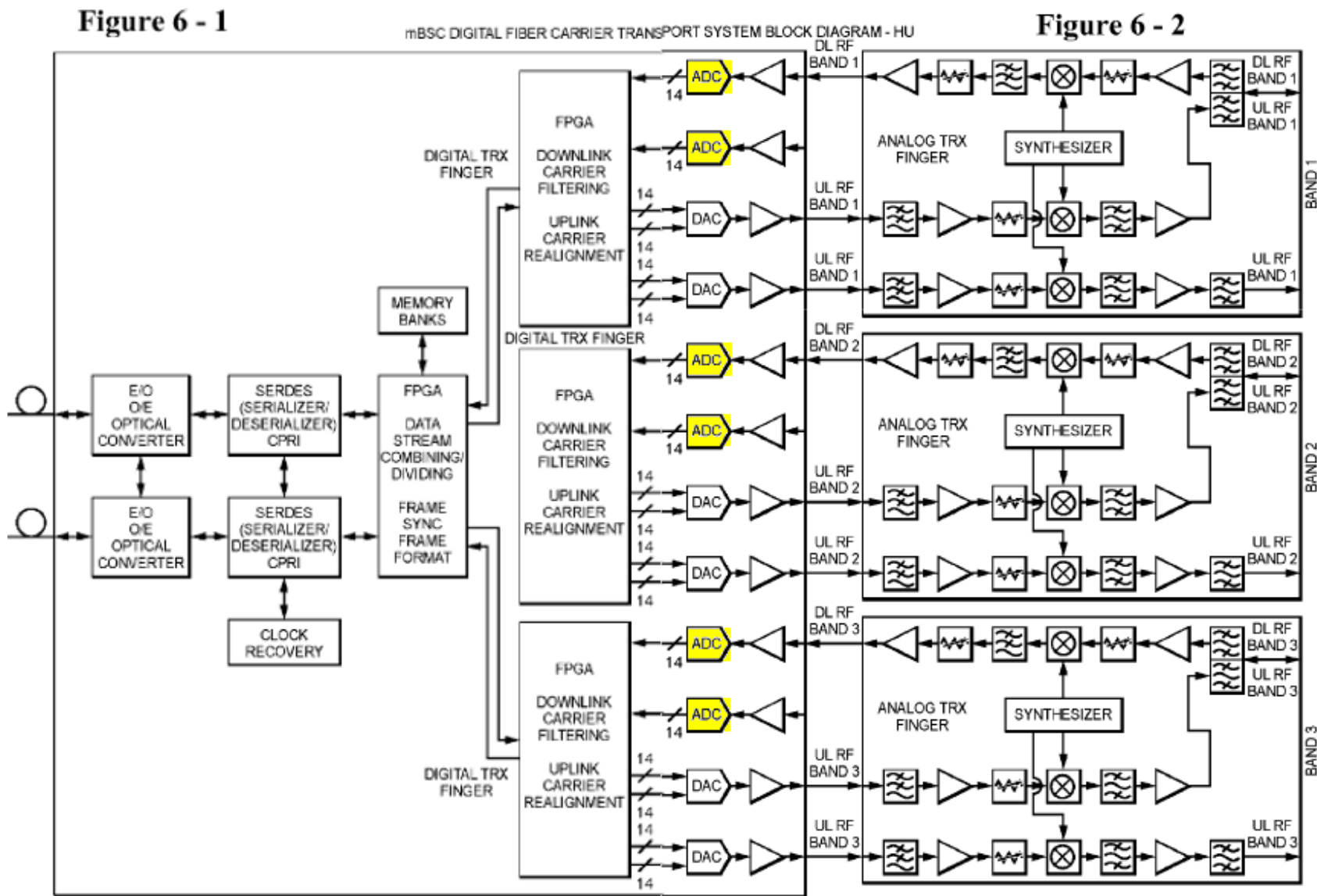


## Wu's teaching:

channels as opposed to a complete band. For example with respect to illustrated band 263B, a host unit can digitize, using an Analog to Digital Convert (ADC), a portion of band 263B that is less than the full width of the band represented by the

EX-1005 ¶0049.

# Wu's "digital representation"



# Admissions by Patent Owner

1

Q So my question is: "Analog Channels 270," numbered 1 through 12, are examples of radio resources, correct?

THE WITNESS: [...] To answer your question, **yes**; my understanding of Wu's "Analog Channels 270" are that they are RF carriers. And as RF carriers, **they are examples of radio resources**, as defined by the patent and the PTAB's guidance for the plain construction of radio resource.

2

Q What does an analog-to-digital converter do?

THE WITNESS: An analog-to-digital converter takes an analog signal as its input and it produces digital values as its output, wherein those **digital values** are meant to be somehow **representative** of the analog input.



# Admissions by Patent Owner

3

Q If you digitize an analog carrier channel, that process of digitizing preserves the underlying modulation in the analog carrier channel, correct?

THE WITNESS: Your question, as asked, I will take it as a hypothetical. But, yes, if you take an analog carrier channel and let's say that normally it's fed to an antenna, and you unplug the wire from the antenna and rather you feed it into an A-to-D, and the A-to-D was a high enough sampling rate, then the **digital values that came out of the A-to-D would represent the signal that went into it.**

4

Q What do the digitized channels in Wu represent?

A They can **represent** converted analog channels.

**“an antenna ... the antenna”**

# Wu's teachings

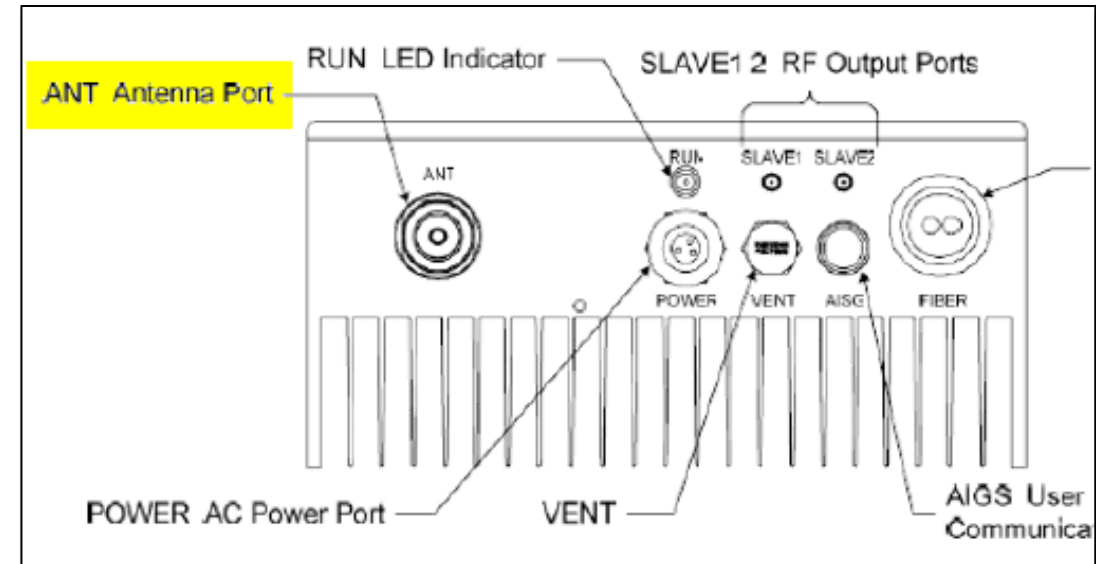
1

[0030] In FIG. 1, carrier channel distribution system 100 is deployed in an environment where cellular regions 120 require wireless coverage. A base transceiver station (BTS)

2

log Converters (DAC). Channels 370 can then be distributed to one or more boosters for re-transmission as represented by MCPA booster 383 or mBSC booster 385. Suitable boosters include those produced by Bravo Tech Inc, of Cypress Calif. For example, the Bravo Tech Multi-Channel Power Amplifier (MCPA) series of products or Bravo Tech Multi-Band, multi-Standard & multi-Carrier (mBSC) systems can be deployed in the contemplated environments, including indoor or outdoor environments. The channels 370 can be allocated to the

3



# Admissions by Patent Owner

Q What is the name of the component that is used to wirelessly transmit signals, such that a transceiver can provide wireless coverage?

A That would generally be termed an antenna.

# PO's counterargument of "single" antenna

## Federal Circuit law:

"That 'a' or 'an' can mean 'one or more' is best described as a rule, rather than merely as a presumption or even a convention. The exceptions to this rule are extremely limited: a patentee must 'evinced[] a clear intent' to limit 'a' or 'an' to 'one.' Id. The subsequent use of definite articles 'the' or 'said' in a claim to refer back to the same claim term does not change the general plural rule, but simply reinvokes that non-singular meaning.

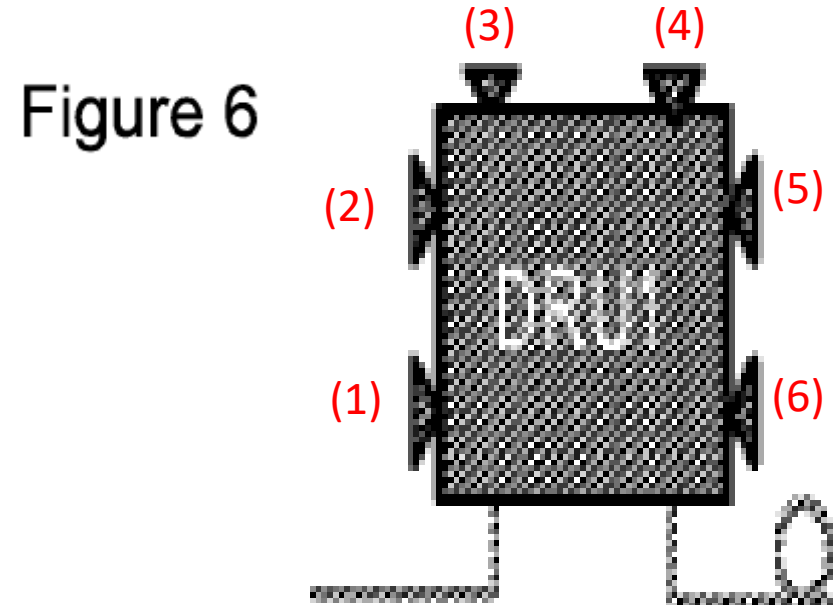
*Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008)

## PO's expert conceded:

Q The claim is not limited to remote units that only have a single antenna, correct?

THE WITNESS: I agree. That's a restatement of what I said.

# PO's counterargument of "single" antenna

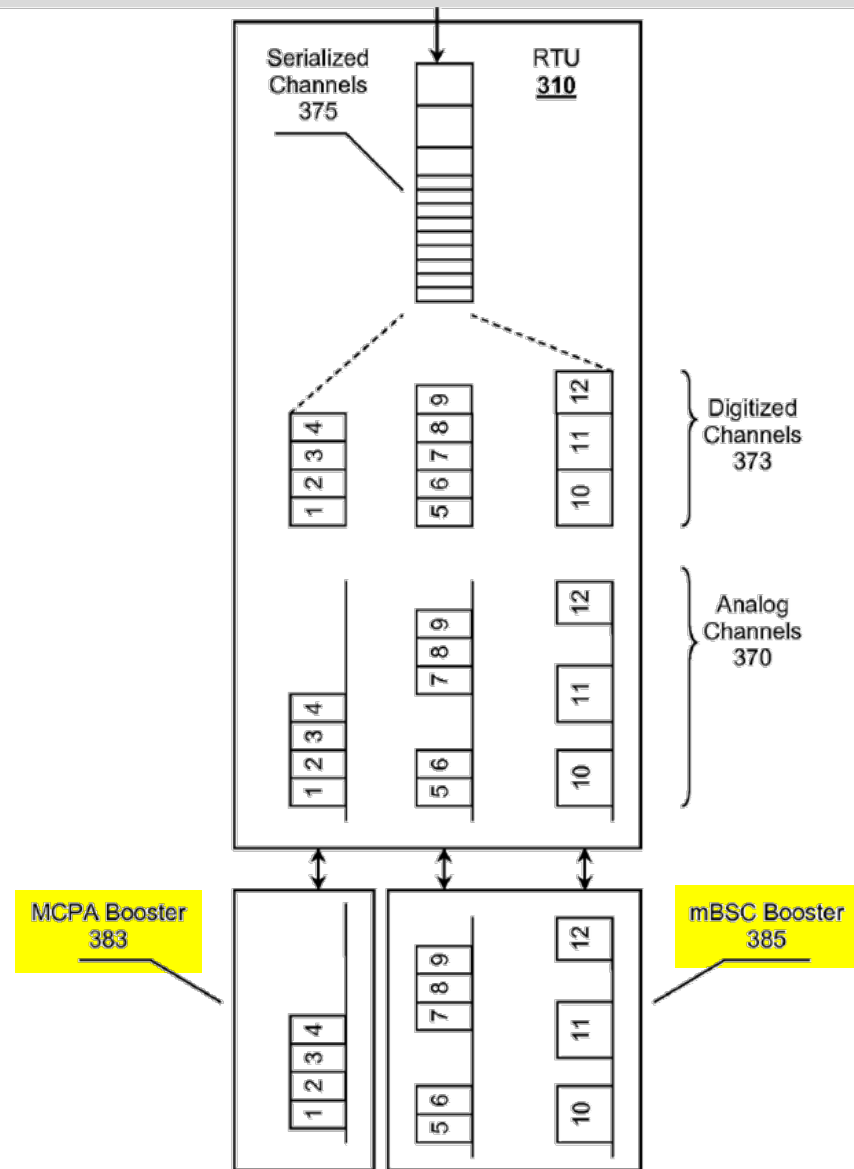


## PO's expert conceded:

Q How many antennas does that DRU have?

A Under the assumption that those are antennas -- I think they may be, but let me read the description of Figure 6. There would be six of them. But let me read the description of Figure 6. Yeah, I think it's reasonable to assume that those are representative of six antennas. According to the description, each one is for a different service. It says, six services.

# PO's counterargument about "different boosters"



**Wu's teaching:**

log Converters (DAC). Channels 370 can then be distributed to one or more boosters for re-transmission as represented by MCPA booster 383 or mBSC booster 385. Suitable boosters

EX-1007 ¶0050

# Admissions by Patent Owner

1

Q And that means Wu is covering the example where the remote has one booster and the example where the remote has more than one booster?

A Wu describes that.

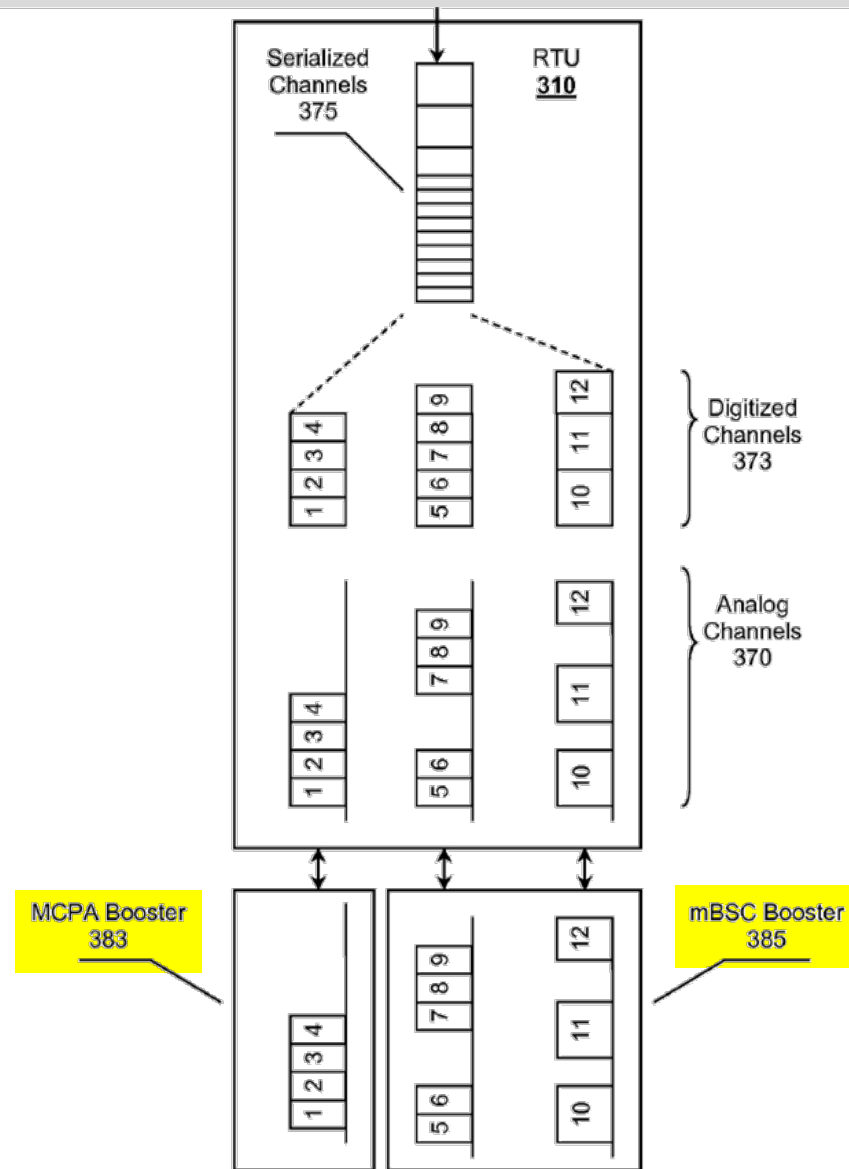
2

Q Okay. You did not offer an opinion to distinguish Wu in the case where there's only one booster, correct?

A I do not discuss the single-booster case in isolation, if that's what your question is referring to.



# PO's counterargument about "different boosters"



## Wu's teaching:

door environments. The channels 370 can be allocated to the boosters as desired: one band per booster, two bands per booster, etc.

EX-1007 (Wu) ¶10050

# Admissions by Patent Owner

Q And do you see that there's an "et cetera" at the end of the sentence?

A I see that.

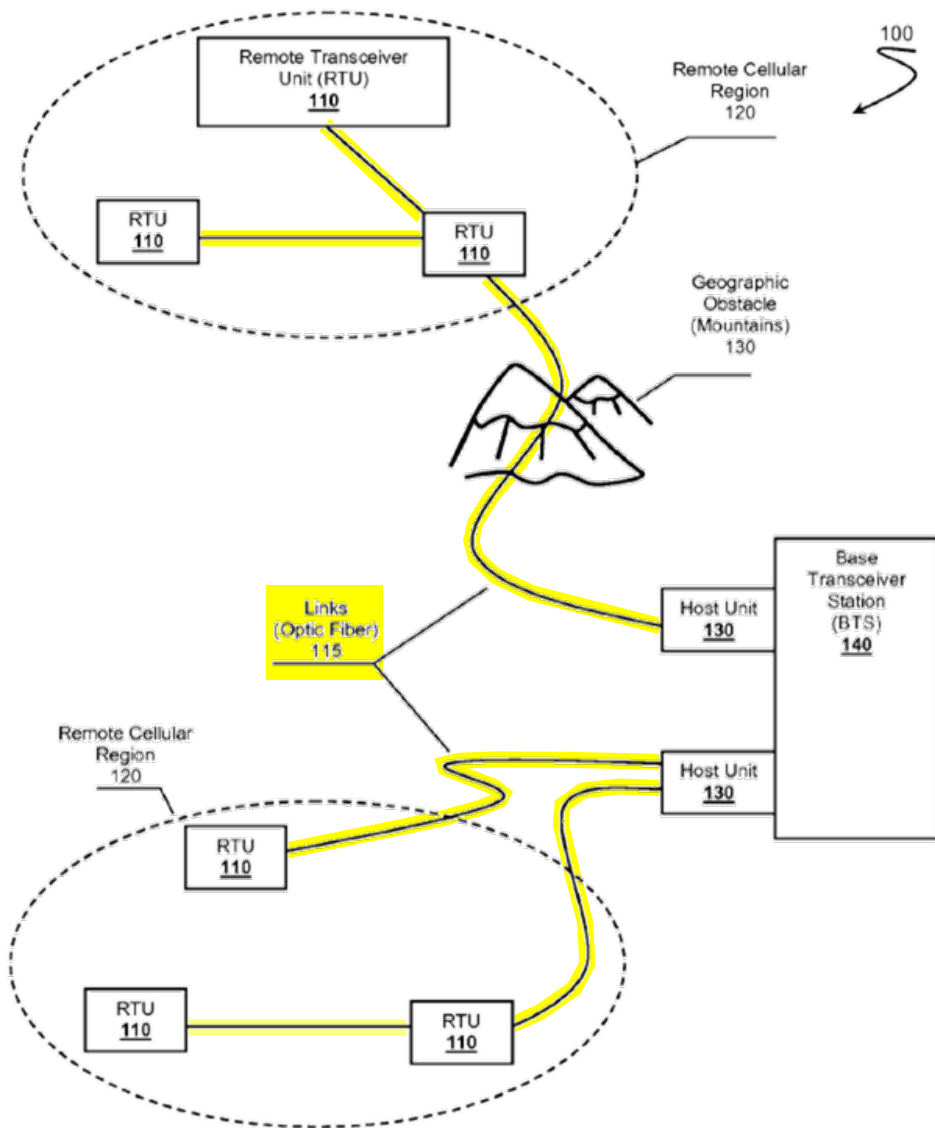
Q So where Wu teaches here that the channels 370 can be allocated to the boosters as desired, it covers not just the example of one band per booster or two bands per booster, but et cetera examples, such as three bands per booster?

A I agree that a person of skill would interpret "et cetera" as encompassing three bands per booster.

# **“packetize” & “destination information”**

(dependent claims 2-3, 9-10, 15, 19)

# Wu's teaching



**[0031]** In a preferred embodiment, the communication links **115** between BTS **140** and remote units **110** employ one or more standards to exchange digitized signals. Suitable standards include those based on the Common Public Radio Interface (**CPRI**; <http://www.cpri.info>), the Open Base Station Architecture Initiative (**OBSAI**; <http://www.obsai.org>), or other known standards or those yet to be defined.

EX1005 0031

# OBSAI's teachings

1

## Protocol Stack

The RP3 bus interface is a high-capacity, point-to-point serial interface bus for uplink and downlink telecom (user) data transfer and related control. The physical implementation of the bus is based on differential signalling technology. The protocol stack is based on a packet concept using a layered protocol with fixed length messages.

2



Figure 11: Message format of RP3 protocol stack.

# OBSAI's teachings

3

A fixed message format is used for **all data** that is transferred over the RP3 or RP3-01 (see Section 6) bus. Figure 11 shows the message structure including partitioning of the message into bytes. Each byte of

4

## 4.3.2 Message Format – Address Field

The **address controls the routing of each message**. In downlink direction, i.e. from baseband to RF, all message transfers are point-to-point, and the **address identifies the target node**. Both multicasting (point-to-multipoint) and point-to-point message transfers are applied in uplink direction, i.e. from RF to baseband. Uplink antenna sample data as well as some measurement results may require multicasting; all other message transmissions in uplink direction are typically point-to-point.

# Admissions by Patent Owner

1

Q So, here, OBSAI is teaching to include an address with the payload, correct?

A In this message, there is an address field along with some payload field that's used for internode communication. That is what this picture depicts.

2

Q So is an address used for routing a message to a target node an example of destination information?

A In this context, I would say for a target node that is a design block or a module within a design block, yeah, that could be considered a destination block or a design block.

3

Q Okay. So you've never given an opinion that in the case where Wu does use OBSAI, it wouldn't use the address field of the fixed message format that's used for all data that's transferred in OBSAI, correct?

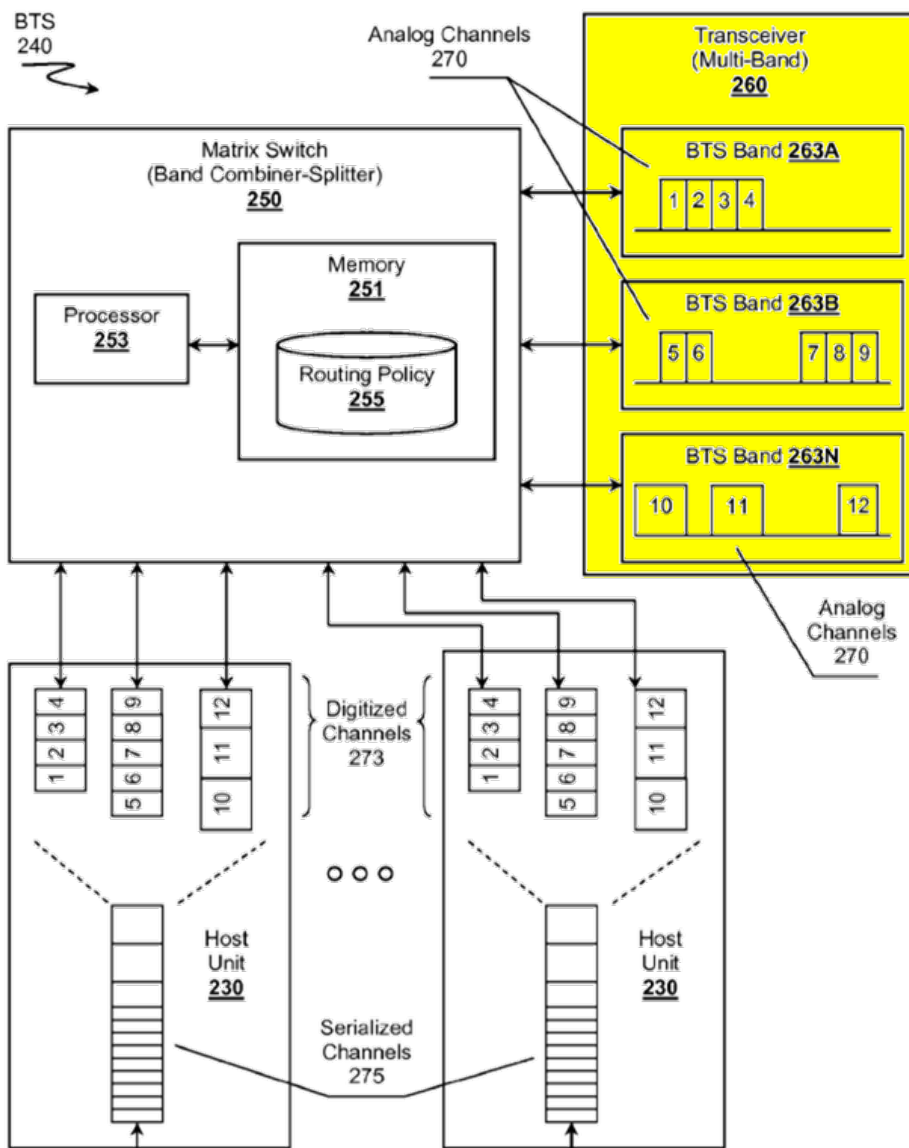
THE WITNESS: My declarations do not touch on that particular address field as I read them, specifically.

**“some radio resources from...  
first signal source and ... second signal source”**

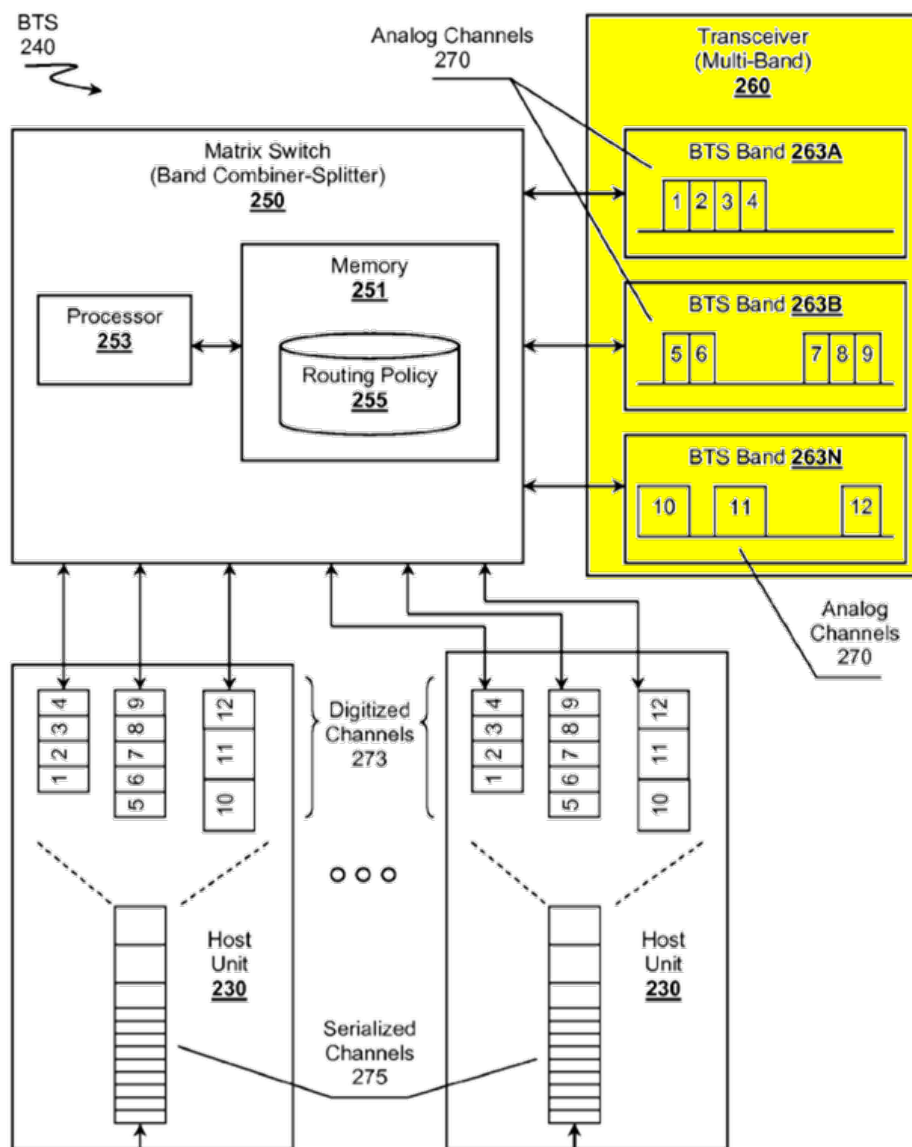
(dependent claims 4, 11, 16 and 13, 18)



# Wu's teachings



# Wu's teachings



1

frequency bands. It is contemplated that a BTS 240 can be coupled to more than one of multi-band transceiver 260, or a single multi-band transceiver 260 can be coupled to more than one BTS 240. For discussion purposes only BTS 240 can be

2

desired. One aspect of the inventive subject matter includes a system comprising one or more multi-band transceivers configured to receive one or more frequency bands. Preferred

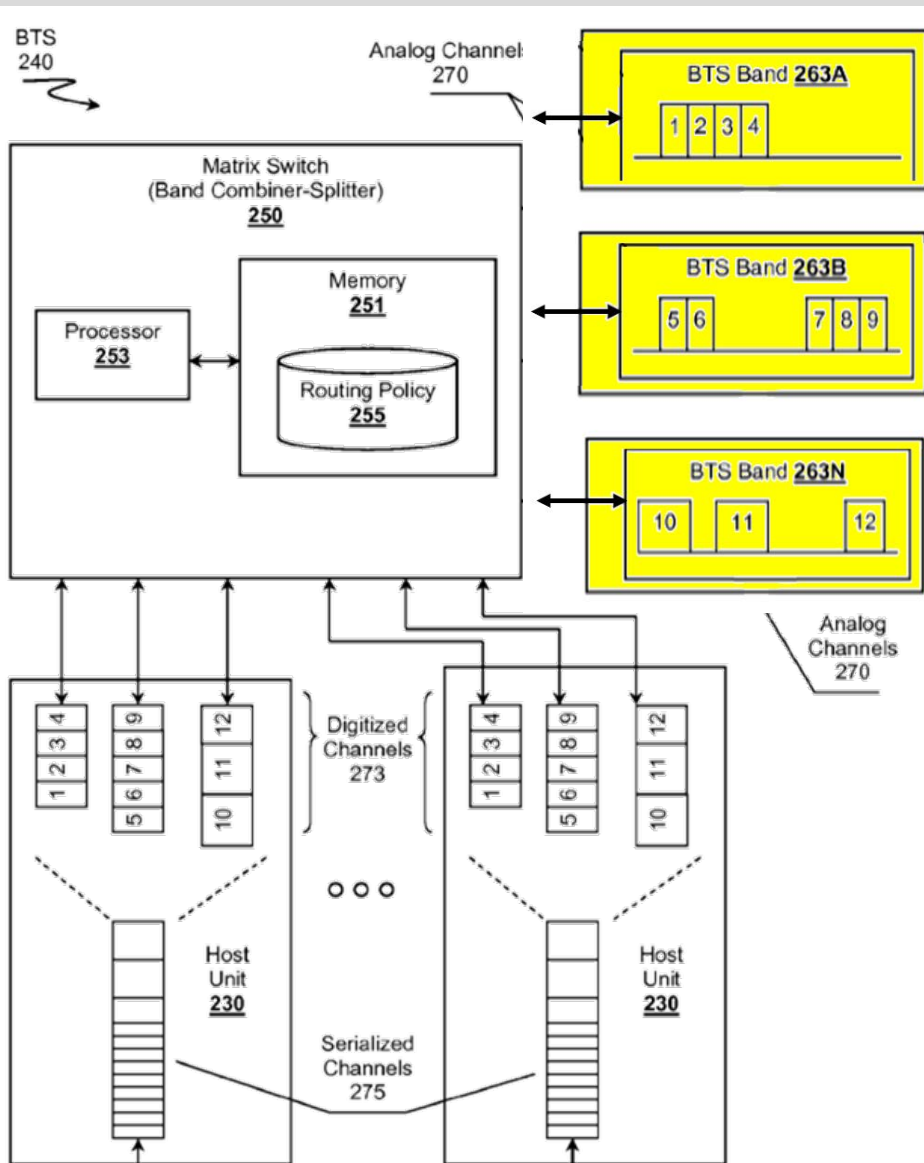
3

channels 275. One should appreciate, as discussed previously, channels 270 can be routed or allocated according to policy 255 individually, collectively as shown, or in arbitrary groups. Serialized channel 275 can then be sent to the RTUs

4

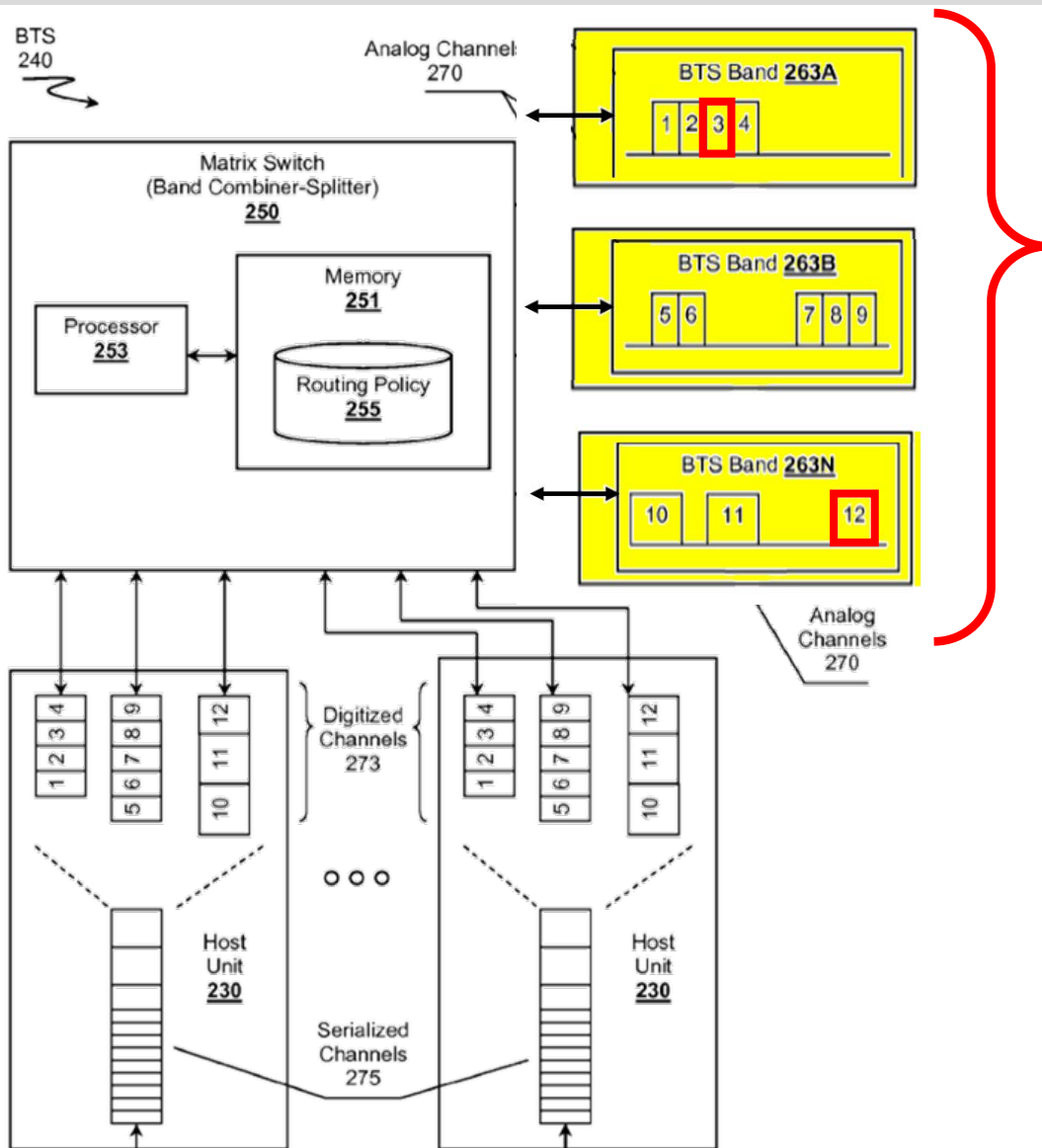
and routed together to an RTU, or could be split. Furthermore, individual channels from different bands could be split from their bands, and combined together. For example, channel 3 from band 263A could be combined with channel 12 from band 263N, which can then be routed together to an RTU as a group.

# Wu's teachings



“more than one” transceiver  
each with “one” band

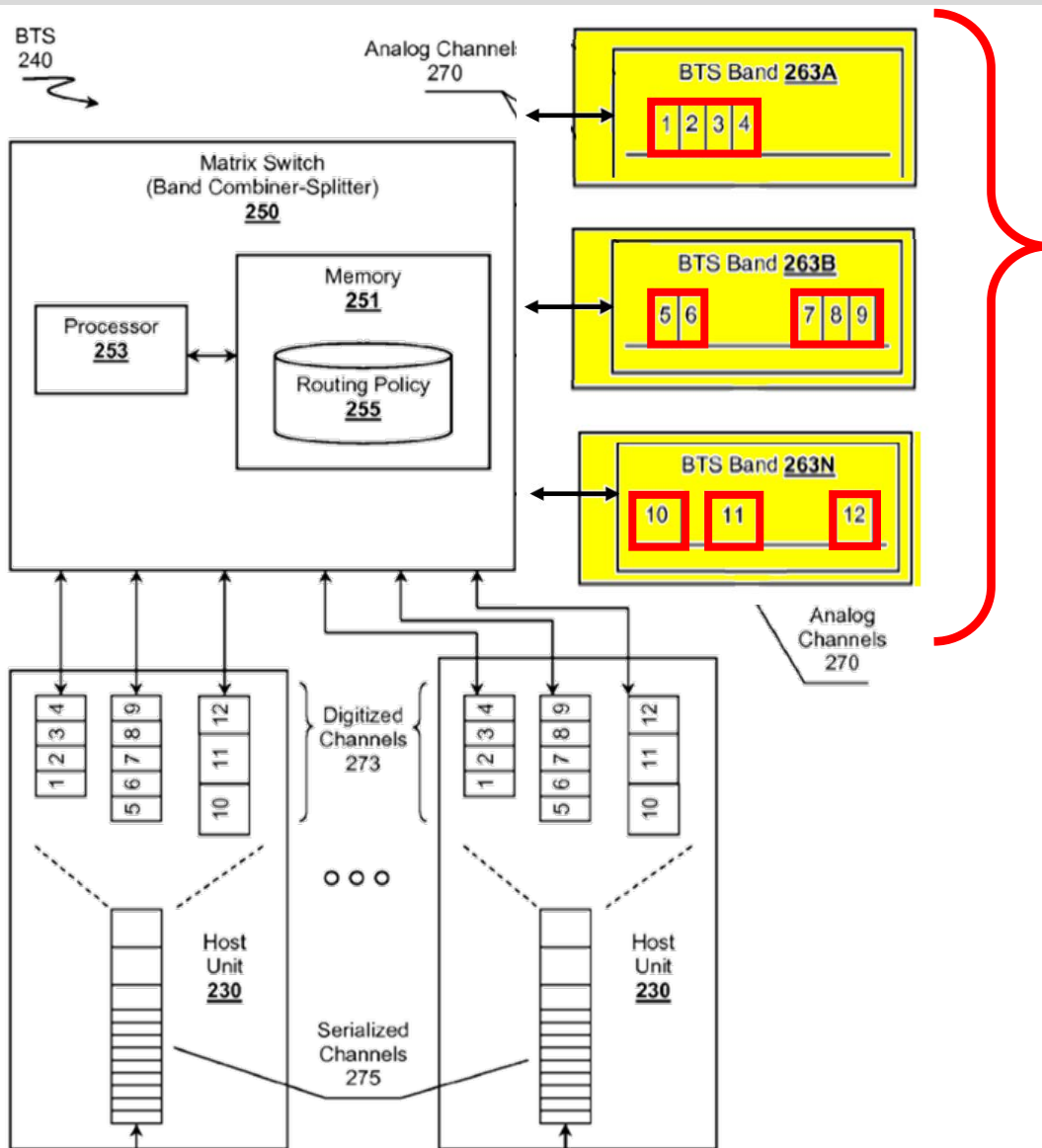
# Wu's teachings



“more than one” transceiver  
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# Wu's teachings



“more than one” transceiver  
each with “one” band

[0047] Policy 255 can be configured to route, distribute, or allocate channels 270 collectively, as groups, individually, or in other desirable configurations. Matrix switch 250, based on

# Admissions by Patent Owner

1

Q Paragraph 34 expressly teaches that BTS 240 can be coupled to more than one multiband transceiver 260, correct?

A Yes.

2

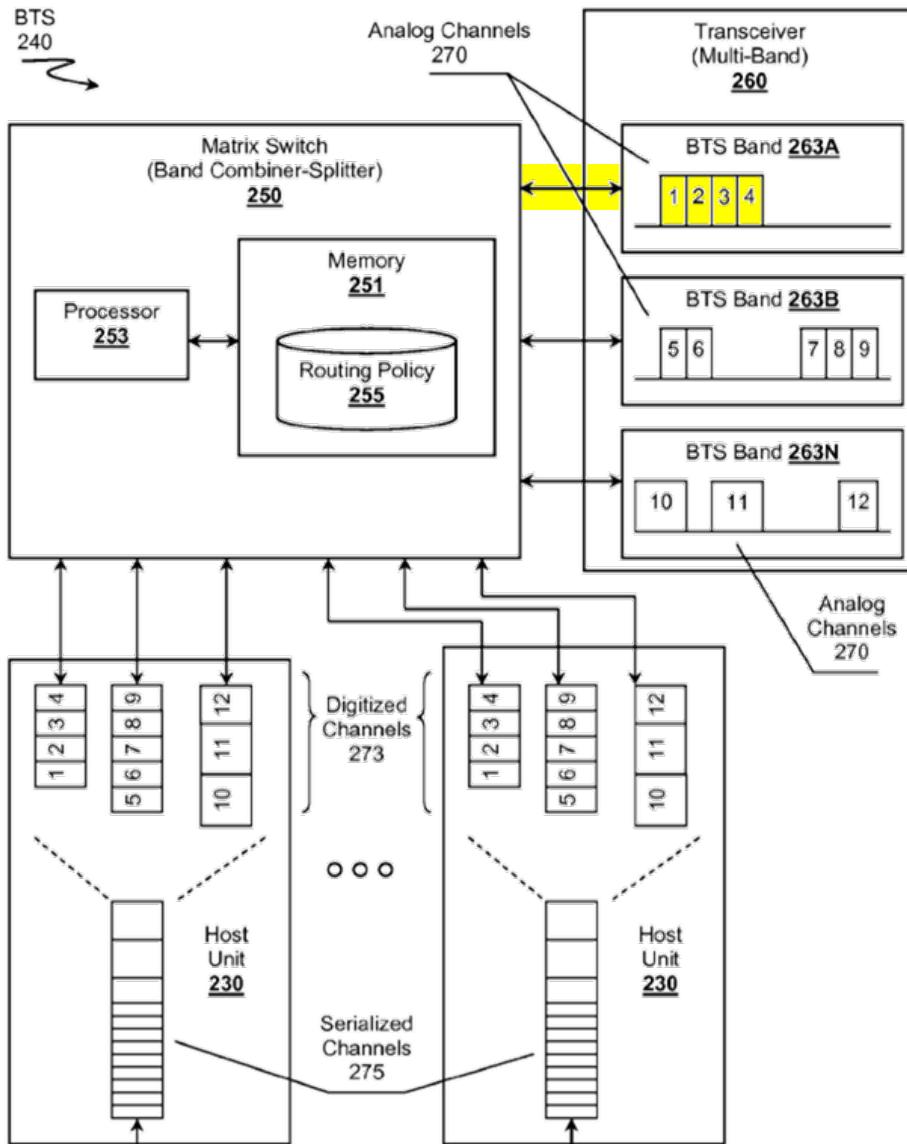
Q Within the scope of Wu's description, Wu's matrix switch could couple to three transceivers, where each of those three transceivers has one of the three bands shown in Figure 2, and in addition, each of the transceivers has some further bands.

THE WITNESS: I think the more accurate statement is: Within the scope of Wu's summary. Wu's summary describes a situation whereby you could have such a configuration.

**“composite signal”**

(dependent claims 13, 18)

# Wu's teaching



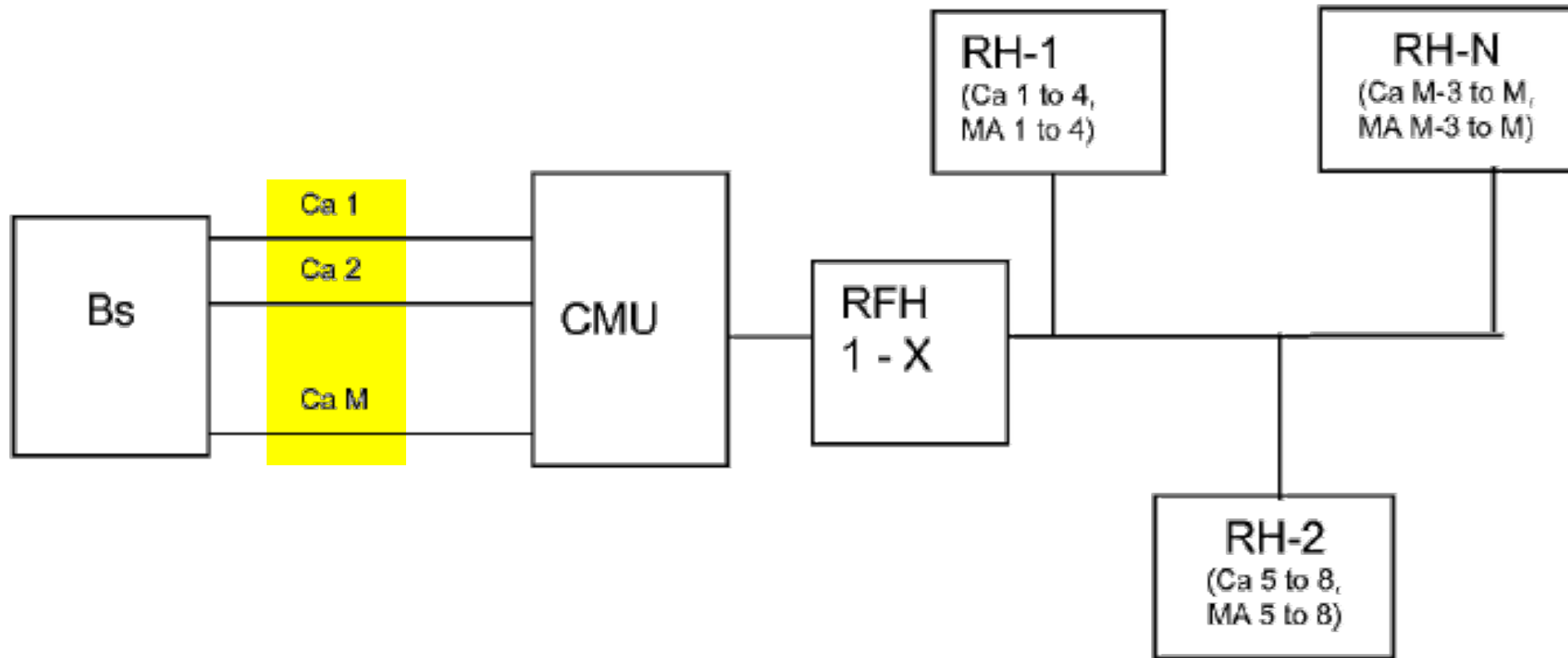


# Hettstedt Grounds

**“a digital representation of ... a set of radio resources”**

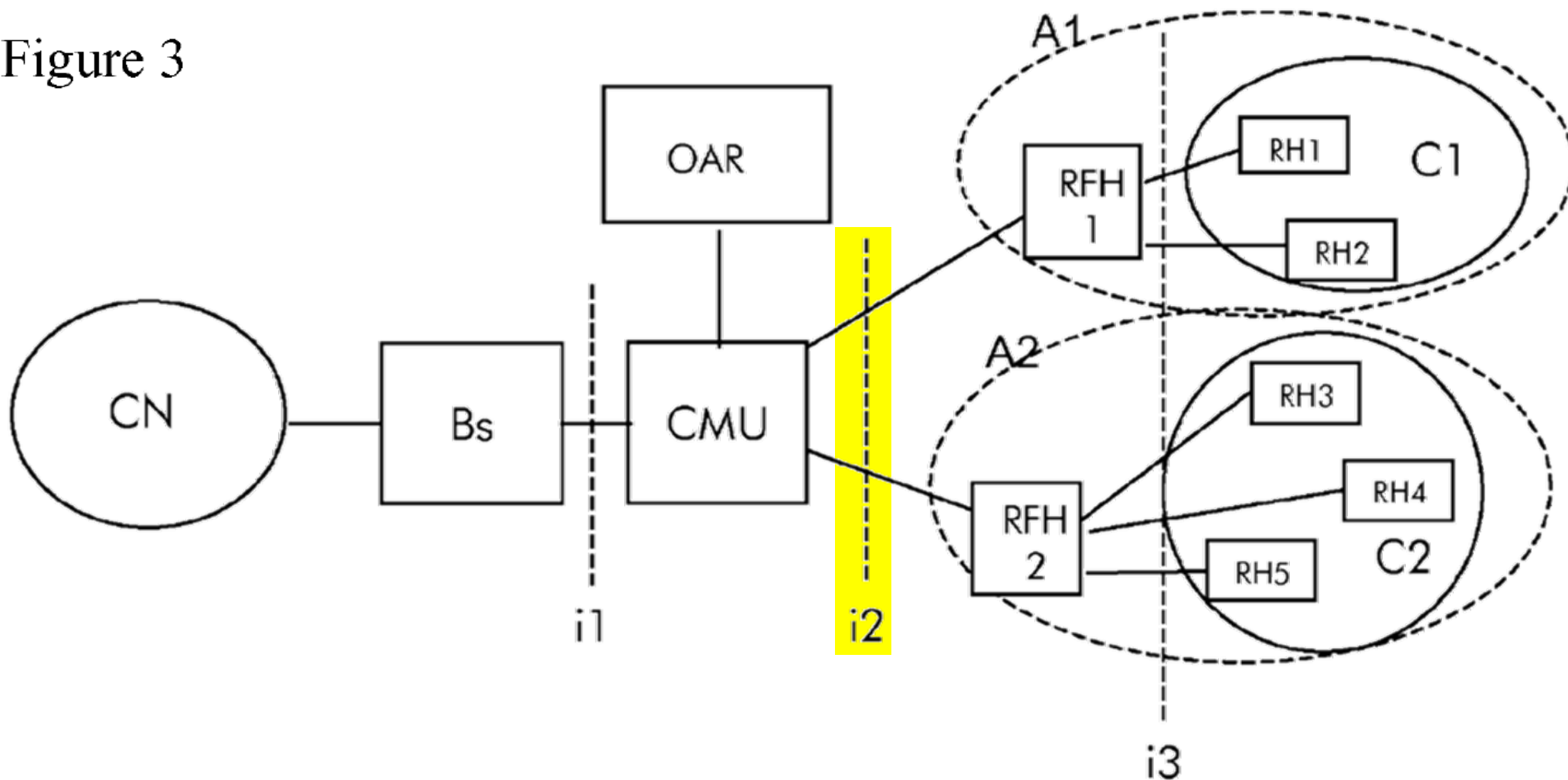
# Hettstedt's "radio resources"

Figure 5



# Hettstedt's "digital representation"

Figure 3



# Admissions by Patent Owner

Q Okay. So whatever Hettstedt is calling a carrier that comes into its CMU, the CMU does send, in digital form in digital packets over a digital connection to the remote radio heads?

A That is what appear -- that -- that is what Hettstedt appears to do with digital packets addressed to particular carriers.

# Admissions by Patent Owner

Petitioner  
expert:

104. A *baseband* signal is sometimes used to refer to a signal with its frequency centered at or near zero. For example, it can be used to refer to a signal

• • •

OBSAI and CPRI are examples of digital baseband signals. The baseband signals represent and preserve the amplitude and phase modulation characteristics of the RF signals to be used according to the chosen air-interface scheme to communicate over the air.

Patent Owner  
expert admits:

No, I did not submit an opinion in my declarations disagreeing with Dr. Acampora's technical analysis in paragraph 104.

**“an antenna ... the antenna”**

# Admissions by Patent Owner

1

Q So the use of RF here and the RF air interface and the RF bandwidth tells a POSITA that the radio heads do, in fact, have antennas to transmit the carriers, correct?

A I would agree given the statement the remote radio heads RH1 to RH5 are RF air interfaces, that at least in some way, shape, or form, RH1 through RH5 encompass some number of antennas in some configuration.

2

Q So you acknowledge that the carriers that are sent to Hettstedt's radio heads are for transmission over antennas after they're processed and transformed appropriately?

A What Hettstedt calls a carrier are for transmission over antennas after they are processed and transformed appropriately. I believe that's clear in Hettstedt.



**END**