

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ericsson Inc.

Petitioner

v.

Electronics and Telecommunications Research Institute

Patent Owner

Patent No. 9,155,066
Filing Date: April 24, 2007
Issue Date: June 24, 2014

Title: METHOD FOR PAGING INFORMATION IN CELLULAR SYSTEM

Inter Partes Review No. IPR2019-00252

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *ET SEQ.***

**DECLARATION OF DR. WAYNE STARK
UNDER 37 C.F.R. § 1.68**

TABLE OF CONTENTS

	Page
I. BACKGROUND AND QUALIFICATIONS	4
II. LEGAL UNDERSTANDING.....	6
III. MATERIALS CONSIDERED.....	10
IV. TECHNOLOGICAL BACKGROUND.....	12
A. 3GPP Standardized Cellular System and Architecture	12
B. The '066 Patent	15
C. Challenged Claims	19
D. Prosecution History of the '066 Patent	20
E. Priority Date of the '814 Patent	29
V. LEVEL OF ORDINARY SKILL IN THE ART	29
VI. CLAIM CONSTRUCTION	30
VII. SUMMARY OF PRIOR ART	32
A. R2-060429	32
B. R1-060572	35
C. R1-060576	36
D. R1-060187	38
E. R2-060988	40
F. TR 25.814	45
VIII. MOTIVATION TO COMBINE PRIOR ART.....	46
IX. THE CHALLENGED CLAIMS ARE UNPATENABLE.....	47

A.	Ground 1: Claims 10 and 16 are Obvious Under 35 U.S.C. § 103(a) Over R2-060429 in View of R1-060572 (to the extent necessary) and R1-060576	47
B.	Ground 2: Claim 11 is Obvious Under 35 U.S.C. § 103(a) Over R2-060429 in View of R1-060572 (to the extent necessary), R1-060576, and R1-060187	64
C.	Ground 3: Claims 10 and 11 are Obvious Under 35 U.S.C. § 103(a) Over R2-060988 in View of R1-060572 and TR 25.814.....	68
D.	Ground 4: Claim 16 is Obvious Under 35 U.S.C. § 103(a) Over R2-060988 in View of R1-060572, TR 25.814, and R2-060429 (to the extent necessary)	82
X.	CONCLUSION	85

DECLARATION OF DR. WAYNE STARK, PH.D.

I, Dr. Wayne Stark, hereby declare as follows:

1. I make this declaration based on my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

2. I have been asked to provide technical assistance in the review of U.S. Patent No. 9,155,066 (“the ’066 Patent”).

3. This declaration is a statement of my opinions on issues related to the unpatentability of claims 10, 11, and 16 of the ’066 Patent.

I. BACKGROUND AND QUALIFICATIONS

4. In forming my opinions, I have relied upon my knowledge, training, and experience in the relevant art. While my qualifications are stated more fully in my curriculum vitae (Ex. 1004), I provide a summary of my qualifications here.

5. I received a Ph.D. in electrical engineering from the University of Illinois in 1982. I also received Bachelor and Master’s Degrees in electrical engineering from the University of Illinois in 1978 and 1979, respectively. My Curriculum Vitae is attached as Ex. 1004.

6. I have over 35 years of experience as a researcher and a practitioner in electrical engineering, particularly in the field of wireless communications, and more specifically in the technical areas of frequency hopping and error correction coding.

7. I am currently a Professor of Electrical Engineering and Computer Science at the University of Michigan, Ann Arbor campus, and have held that position since September 1996. Prior to becoming a full Professor, I had been employed continuously either as an Associate Professor or an Assistant Professor (with the exception of sabbaticals working for various corporations, as noted in my attached CV), at the University of Michigan, Ann Arbor campus, since September 1982.

8. I am a named inventor on several U.S. Patents. I have also authored over two hundred (200) technical articles and conference publications and have contributed to several books. Most of those articles, publications, and contributions relate to wireless communications in general, and frequency hopping and error correction coding in particular.

9. I have received several honors for the research I have done. I am an IEEE Fellow (for contributions to the theory and practice of coding and modulation in spread spectrum systems). I received the National Science Foundation Presidential Young Investigator Award in 1985. I received the IEEE Milcom Board 2002 Technical Achievement Award. I received the Journal of Communications and Networks Best Paper Award in 2010.

10. In preparation of this declaration, I have reviewed the patents and printed publications listed in the “Materials Considered” section below, together with any other publications cited in this declaration.

11. I have also reviewed the '066 Patent and its prosecution history.

12. I am being compensated at an hourly rate \$500 for my work in preparing this declaration. My compensation is not based on the resolution of this matter. My findings, as I explain below, are based on my education, experience, and background in the fields I discuss above.

II. LEGAL UNDERSTANDING

13. I am not an attorney and render no opinion on the law itself. My opinions are informed by my understanding of the relevant law, as it has been provided to me by counsel. I understand that the patentability analysis is conducted on a claim-by-claim and element-by-element basis, and that there are several possible reasons that a patent claim may be found to be unpatentable.

14. In preparing this declaration, I have considered the noted prior art and formed my opinions described herein, based on my understanding of the legal terms of anticipation and obviousness.

15. I understand that a prior art reference “anticipates” an asserted claim, and thus renders the claim invalid, if all elements of the claim are disclosed in that prior art reference, either explicitly or inherently (i.e., necessarily present or

implied). I understand that a prior art reference inherently anticipates a claim element even though that claim element is not expressly disclosed if a person of ordinary skill in the art (“POSITA”) would understand that the missing descriptive matter is necessarily present in the thing described in the reference. I have been instructed by counsel on the law regarding obviousness and understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the pertinent art.

16. I understand that a POSITA provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious.

17. I understand that an obviousness determination includes the consideration of various factors, such as: (1) the scope and content of the prior art; (2) the differences between the prior art and the asserted claims; (3) the level of ordinary skill in the pertinent art; and (4) the existence of secondary considerations, such as commercial success, long-felt but unresolved needs, failure of others, etc.

18. I understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine.

Other times, the nexus linking two or more prior art references is simple common sense or ordinary knowledge available to a POSITA. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine and/or modify subject matter of references may be supplied by the direction of the marketplace.

19. I also understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I understand that obviousness analysis takes into account the inferences and creative steps that a POSITA would employ under the circumstances.

20. I understand that a particular combination may be proven obvious merely by showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

21. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces

can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, it is likely not patentable.

22. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a POSITA, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed. I understand that a person of ordinary skill would find motivation to combine two pieces of prior art or substitute one prior art element for another if the substitution can be made with predictable results, even if the swapped-in element is different from the swapped out element. In other words, the prior art need not be like two puzzle pieces that must fit together perfectly. The relevant question is whether prior art techniques are interoperable with respect to one another, such that a person of ordinary skill would view them as a design choice, or whether a person of ordinary skill could apply prior art techniques into a new combined system.

23. In sum, my understanding is that prior art teachings are properly combined where a POSITA having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the

field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

24. I have been informed and understand that the obviousness analysis requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

III. MATERIALS CONSIDERED

25. In the preparation of this declaration, I have studied the following materials (for consistency with the Petition, the exhibit numbers have been provided to me by counsel):

1001	U.S. Patent No. 9,155,066 (“the ’066 patent”)
1002	Prosecution History of U.S. Ser. No. 14/276,511 (application leading to the ’066 patent)
1005	<i>Sol IP, LLC v. AT&T</i> , et al. Mobility Preliminary Constructions on December 4, 2019 (“Court’s Preliminary Constructions”)
1006	Bishop Declaration
1007	“PCH mapping and Paging control” submitted to 3GPP at the March 27-31, 2006 joint meeting of the 3GPP RAN1/RAN2 in Athens, Greece by China Academy of Telecommunications Technology (“CATT”) (“R2-060988”)
1008	“LTE physical-layer models” submitted to 3GPP at the TSG-RAN WG1 #44 in Denver, Colorado on February 13-17, 2006 by Ericsson (“R1-060572”)
1009	“Physical Layer Aspects for Evolved UTRA (Release 7),” Technical Report of 3GPP published in April 2006 (“3 GPP TR 25.814 v1.2.2 (2006-03)”)

1010	“Evolved Paging for LTE” submitted to 3GPP at the 3GPP TSG-RAN WG2 Meeting #51 in Denver, Colorado on February 13-17, 2006 by Philips (“R2-060429”)
1011	“Paging for E-UTRA” submitted to 3GPP at the TSG-RAN WG1 #44 in Denver, Colorado on February 13-17, 2006 by Ericsson (“R1-060576”).
1012	“OFDMA Downlink Physical channel mapping – text proposal” submitted to 3GPP at the 3GPP TSG RAN WG1 LTE Ad Hoc Meeting in Helsinki, Finland on January 23-25, 2006 by Nokia (“R1-060187”)
1013	“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Physical channels and mapping of transport channels onto physical channels (FDD) (Release 6)” (“3GPP TS 25.211 v6.7.0 (2005-12)”)
1014	3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Radio interface protocol aspects (Release 7)” (“3GPP TR 25.813 v0.8.0 (2006-04)”)
1015	First Amended Complaint for Patent Infringement, Sol IP, LLC v. AT&T Mobility LLC, Case No. 2:18-cv-00526 (E.D. Tex.), filed on March 22, 2019 (Dkt. No. 100) (“Complaint”)

26. In forming the opinions I express below, I have considered the materials listed above and my knowledge and experience based on my work in this area, as I described above.

27. I understand the above prior art references are prior art to the '066 Patent because they were published or known to the public before April 26, 2006, the presumed priority date of the '066 Patent. *See* § 7 below.

IV. TECHNOLOGICAL BACKGROUND

A. 3GPP Standardized Cellular System and Architecture

28. A cellular communication system is a system where a base station serves as a central control station and mobile terminals, or user equipment (“UE”), serve as remote stations. The UEs need to share the available bandwidth (spectrum) and time in transmitting information bearing signals to the base station. For uplink transmission of user data (UE-to-base station), the UEs need to inform the base station of the need for transmission so that the base station can allocate the spectrum to UEs with data to transmit. For downlink transmission (base station-to-UEs), the base station needs to inform a UE of the spectrum and time used for data that is intended for the UE.

29. Terminology of the 3rd generation cellular system standardized by the 3rd Generation Partnership Project (“3GPP”) standards organization includes the mobile user equipment, the base station, called Node B, and the subsystem that controls access to the network, including handover and the like, called the radio network controller (“RNC”). The combination of the Node B and multiple RNCs is called the UMTS (Universal Mobile Telecommunications System) Terrestrial Radio Access Network (UTRAN). The multiple-access technique used in the 3GPP standardized cellular system is known as wideband code-division multiple-access

(“WCDMA”). Sometimes the 3GPP standardized cellular system is referred to as WCDMA.

30. In the 3rd generation cellular system standardized by 3GPP, there are physical layer channels (layer 1), transport layer channels, and logical channels. “Transport channels are services offered by Layer 1 to the higher layers.” Ex. 1013 at 8. One *transport* channel is a Paging Channel (PCH). “The transmission of the PCH is associated with the transmission of physical-layer generated Paging Indicators, to support efficient sleep-mode procedures.” *Id.* In the 3rd generation cellular system, “[p]hysical channels are defined by a specific carrier frequency, scrambling code, channelization code (optional), time start & stop (giving a duration) and, on the uplink, relative phase (0 or $\pi/2$).” *Id.* at 9. One of the *physical* layer channels in the 3rd generation cellular system is the paging indicator channel (PICH). The PICH “is a fixed rate (SF=256) physical channel used to carry the paging indicators. The PICH is always associated with an S-CCPCH to which a PCH transport channel is mapped.” *Id.* at 35. The S-CCPCH is a Secondary Common Control Physical Channel. The paging procedure in the 3rd generation cellular system was as follows. When there is paging information, the paging indicator would be used with the physical channel PICH, and then the paging information in the transport channel PCH would be transmitted on the S-CCPCH.

When there is no need for paging, the PICH would not be transmitted and the associated the S-CCPCH, a dedicated radio resource, would go unused.

31. In developing the LTE system, the name for the base station became eNodeB. The connection between a base station and external networks is through a system called a gateway (GW) or access gateway (aGW).

32. Communications between the base station and the UEs happen at different levels and with different types of messages. There are control messages, which direct the UE to perform some action (e.g., transmit at a certain time in a certain frequency). There is also user traffic, which is the desired information that the UE wants to send to some other person/device or information that is intended for the UE.

33. The protocols for sending and receiving communications is organized into various layers, e.g., Layer 1 (physical layer), Layer 2 (data link layer), and Layer 3 (network layer). In the 3GPP cellular system, the communication at the lowest level, sometimes called L1, is through a physical channel. A physical channel is specified by a time duration, frequency range, and modulation and coding technique used.

34. There are many physical downlink channels in the 3rd generation 3GPP cellular system. These include, among others, the Paging Indicator Channel (PICH), the High Speed Physical Downlink Shared Channel (HS-PDSCH), the Primary

Common Control Physical Channel (P-CCPCH), and the Secondary Common Control Physical Channel (S-CCPCH). Ex. 1013 at 30-31, 35-37.

35. Physical layer channels are used by transport channels to send data from a base station to a UE or from a UE to a base station. There are two types of transport channels: dedicated transport channels where a UE is identified by the physical channel and common transport channels that indicate the UE identity so that a UE can know if the message being transported is intended for it. Downlink transport channels in the 3rd generation system standardized by the 3GPP standards body include, among others, the Paging Channel (PCH), the Broadcast Channel (BCH), and the High Speed Downlink Shared Channel (HS-DSCH). Ex. 1013 at 8-9. Cellular networks have transport channels mapped to physical channels for providing the means for information in a transport channel to be communicated between a base station and a UE. Allocation of these scarce radio resources in an efficient manner is a major goal in designing a cellular communication system.

B. The '066 Patent

36. The '066 Patent relates to the wireless communication between cellular devices and base stations, and in particular, a concept called paging. Patent Owner Electronics and Telecommunications Research Institute, by and through its licensing agent Sol IP, LLC (collectively "Patent Owner"), allege that claims 10, 11, and 16 of the '066 Patent are essential to LTE Release 8. The '066 Patent describes a

“method [of] transmitting paging information which can improve applicability of a limited radio resource by variably and flexibly setting up and mapping a transport channel and a physical channel in order to transmit information notifying start of downlink information from a base station to a terminal in a cellular system for packet transmission.” Ex. 1001 at Abstract. The methods for transmitting paging information are for a packet-based cellular system, such as LTE. Ex. 1001 at 1:21-25; 2:13-16.

37. Paging is a mechanism used in cellular communications that allows a transmitting device, e.g., a base station, to inform a receiving device, e.g., a smartphone (also known as a terminal, or UE) that there is information available. The goal of the paging procedure is to inform UEs of the physical radio resources that will be used to transmit information to a UE in an efficient manner. In a typical paging process, a terminal may use a “discontinuous reception process” (also called DRX) to cycle between a low-power idle state and an active state to listen for paging information. In DRX, if paging information is received, the terminal will remain in an active state and initiate a process to obtain the available information. The general concept of paging far predates the '066 Patent.

38. The '066 Patent provides a background of the paging process used in the prior art WCDMA (i.e., the third generation cellular 3GPP standardized system) with respect to the concepts of transport channels and physical channels. Ex. 1001

at 1:29-40. Typically, cellular communications refer to the concept of “channels” as a way to distinguish and group specific types of information and the way that information is processed. The concept of “transport channels” is used to define *how* data is transmitted over the air, e.g., the encoding and interleaving options used to transmit data. The concept of “physical channels” is used to define *where* data is located (e.g., time, frequency) when transmitted over the air, e.g., the first N symbols of a transmission.

39. The WCDMA paging process involved transmitting a paging message and use of a paging indicator channel to notify the terminal that the paging message was transmitted. The paging message was included in a transport channel called a paging channel (PCH). The PCH was mapped into a physical channel called a secondary common control physical channel (S-CCPCH). Ex. 1001 at 1:31-37. A physical channel called a paging indicator channel (PICH) was used to notify UEs that a paging message was sent. Ex. 1001 at 1:43-60. In WCDMA, terminals “monitor the paging indication channel every monitoring cycle . . . [and] when it is sensed that indication information corresponding to the group including the terminal exists in the paging indication channel, the terminals search PCH information transmitted to the S-CCPCH channel” and decode the paging information. Ex. 1001 at 1:58-2:3.

40. The '066 Patent characterizes WCDMA as having “a problem that limited radio resource is wasted.” Ex. 1001 at 2:8-12. In WCDMA, the S-CCPCH was “statically operated” and existed regardless of whether a paging message was being sent. Ex. 1001 at 2:8-12, 1:49-52. Because of this static operation, limited radio resources, such as OVSF code index and power, are always allocated regardless of whether a paging message was actually present. *Id.*

41. The '066 Patent alleges that its invention “improve[s] applicability of a limited radio resource by variably and flexibly setting up and mapping a transport channel and physical channel in a method for transmitting information notifying start of downlink information from a base station to a terminal in a cellular system for packet transmission.” Ex. 1001 at 2:66-3:4.

42. The '066 Patent describes the process as follows:

That is, the terminals may recognize whether the paging message on the terminal group exists by searching a control channel and checking existence of the group ID reserved and allocated for transmission of the paging information in the scheduling information of the control channel transmitted from the base station. Therefore, when there is no group ID for the paging message indicating own group in the control channel, the terminals determine that the paging message does not exist, and continuously performs a discontinuous reception operation. When the group ID exists, the terminals stop the discontinuous

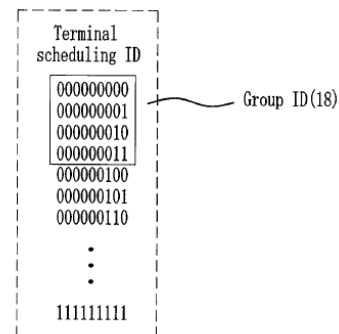
reception operation and receive the paging message that the base station transmits on the radio resource addressed by the group ID.

Ex. 1001 at 6:57-7:3.

43. The '066 Patent further describes a process where a part of the information included in the terminal scheduling identifiers are used as a group ID:

As shown in FIG. 5, the present invention is operated by reserving and allocating a part of the information included in the terminal scheduling ID as a group ID for paging information. The group ID is an ID used by reserving and allocating a part of a scheduling ID (i.e., a cell radio network temporary identifier (C-RNTI)) for uniquely identifying a terminal. A base station may operate by reserving at least one scheduling ID.

FIG. 5



Ex. 1001 at 6:3-10. A “C-RNTI” is a concept used in WCDMA and LTE to refer to a “Cell Radio Network Temporary Identifier.” In WCDMA and LTE, C-RNTI’s were IDs used to identify a terminal participating in a cell area.

C. Challenged Claims

44. Petitioner’s Petition challenges claims 10, 11, and 16 of the '066 Patent.

Claims 10, 11, and 16 are reproduced below:

10. A method for transmitting paging information, performed in a base station, the method comprising:

when a paging information is generated, allocating the paging information to a downlink shared channel;

allocating an identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel; and

transmitting the control channel and the downlink shared channel to a terminal,

wherein when the paging information is not generated, the identifier is not allocated to the control channel, and

wherein the identifier is used by reserving and allocating a part of scheduling identifiers.

11. The method of claim 10, wherein the control channel and the downlink shared channel are physical channels.

16. The method of claim 10, wherein the terminal is in Radio Resource Control (RRC) Connected state.

D. Prosecution History of the '066 Patent

45. I have reviewed the prosecution history of the '066 Patent. The '066 Patent application was filed on May 13, 2014. During prosecution, the United States Patent and Trademark Office issued a non-final office action on August 1, 2014 and a final office action on March 3, 2015. A Notice of Allowance was issued on June 5, 2015.

46. In the August 1, 2014 office action, the Examiner rejected pending claim 1 on the ground of double patenting over claim 1 of U.S. Patent No. 8,761,814 (the "'814 patent") and rejected pending claim 1 as anticipated by 3GPP RAN1/RAN2 joint meeting on LTE, R2-060988 ("R2-060988"). Ex. 1002 at 58.

47. In response, the Applicant amended pending claim 1 as follows:

1. (Currently amended) A method for decoding paging information, ~~at performed in a terminal, in a wireless communication system,~~ the method comprising:

receiving a control channel and a downlink shared channel;

detecting an identifier indicating existence of a paging information in the downlink shared channel, the identifier is transmitted on the control channel;

when the identifier is detected, detecting a radio resource allocation information indicating a radio resource to which the paging channel (PCH) in information is allocated, the radio resource allocation information is transmitted on the control channel; and

decoding the paging information, ~~based on indicated by the radio resource allocation information, in a the downlink shared channel,~~

~~wherein the identifier is used by reserving and allocating a part of scheduling identifiers when the paging information does not exist in the downlink shared channel, the identifier is not detected.~~

Ex. 1002 at 92. The Applicant also added an additional 19 new claims, including pending claims 11, 12, and 18 (which issued as presently challenged claims 10, 11, and 16, respectively). *Id.* at 92-94.

48. Pending claim 11 recited:

11. (New) A method for transmitting paging information, performed in a base station, the method comprising:

when a paging information is generated, allocating the paging information to a downlink shared channel;

allocating a identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel; and

transmitting the control channel and the downlink shared channel to a terminal,

when the paging information is not generated, the identifier is not allocated to the control channel.

Ex. 1002 at 93.

49. Pending claim 12 recited:

12. (New) The method of claim 11, wherein the control channel and the downlink shared channel are physical channels.

Id.

50. Pending claim 18 recited:

18. (New) The method of claim 11, wherein the terminal is in Radio Resource Control (RRC)_Connected state.

Id. at 4.

51. Regarding the double patenting rejection, the Applicant argued that the added limitations to pending amended claim 1 made it patentably distinct from and nonobvious over claim 1 of the '814 patent. Ex. 1002 at 95. For the rejected pending claim 1, the Applicant argued that R2-060988 did not anticipate pending amended claim 1. The Applicant argued that R2-060988 “neither discloses nor suggests the limitations of amended claim 1, for example, detecting an identifier indicating

existence of a paging information and when the paging information does not exist in the downlink shared channel, the identifier is not detected.” *Id.* at 96. According to the Applicant, R2-060988 disclosed that the paging indicator is always allocated to radio resources, i.e., “the paging indicator is allocated to the radio resources if there is the paging information as well as if there is no the paging information.” *Id.* at 97. In contrast, the Applicant argued that in the present invention, the identifier is flexibly allocated to the radio resources such that “the identifier is allocated to the radio resources if there is the paging information. However, the identifier is not allocated to the radio resources if there is no the paging information.” *Id.* Thus, the Applicant argued that the paging indicator of R2-060988 taught away from the identifier of the claimed invention. *Id.*

52. Further, the Applicant argued that the PI-ID of R2-060988 also taught away from the identifier of the claimed invention. The Applicant argued that “the PI-ID indicates existence of the paging information. For example, the PI-ID is identical to the UE-ID if there is the paging information. The PI-ID is not identical to the UE-ID if there is no the paging information. In other words, the PI-ID is always allocated to the radio resources.” Ex. 1002 at 98. According to the Applicant, this disclosure of the PI-ID was in contrast to the present invention that the identifier is flexibly allocated to the radio resources, where the identifier is

allocated to the radio resources if there is paging information, but it is not allocated to the radio resources if there is no paging information. *Id.*

53. Finally, the Applicant argued that in the present invention, the UE received the paging information through two steps, whereas R2-060988 disclosed a UE receiving the paging information in a three step procedure. Ex. 1002 at 98. The Applicant described the alleged three steps of receiving paging information disclosed in R2-060988 as “[i]n first step, UE decodes the PI-ID to identify existence of the paging information. In second step, UE decodes the paging indicator if there is the paging information. In third step, UE receives the paging information based on resource allocation information.” *Id.* In contrast, for the present invention, the Applicant argued that “UE detects the identifier in the first step, and UE receives the paging information based on the resource allocation information if the identifier is detected in the second step.” *Id.* Thus, the Applicant argued that R2-060988 allegedly taught away from the claimed invention. *Id.*

54. In the March 3, 2015 office action, the Examiner issued a final rejection and found the Applicant’s arguments to be moot because of a new ground of rejection based on the same R2-060988 reference as before. However, the Examiner offered some clarifying remarks regarding the Applicant’s arguments. The Examiner found that the scope and content of amended claim 1 only indicated that “the paging identifier is detected when there is paging information and the paging

indicator is not detected when there is no paging information.” Ex. 1002 at 107. The Applicant’s focus on the paging identifier being flexibly allocated and the radio resource is allocated for the paging indicator based on the existence of paging information were not found in the current scope of the claim. *Id.* Further, R2-060988’s disclosure that “UE listening to paging indicator in DRX mode and monitor if the paging indicator match with the ID of the mobile device which indicate that there is existence of paging information for the mobile device, and proceed further by reading resource allocation of paging channel PCH and read PCH data” addressed the current scope of claim 1. *Id.*

55. Regarding the Applicant’s argument about the claimed invention’s two-step procedure, the Examiner found that to be inaccurate and that there was actually a three step procedure to detect the paging information. Ex. 1002 at 107. Accordingly, “the current claimed procedure is similar to the teaching presented in Fig. 2 of 3GPP teaching.” *Id.* at 107-108.

56. In addition, the Examiner again rejected the pending claims 1-20 on the ground of double patenting over claims of ’814 patent. Ex. 1002 at 109-117. The Examiner also rejected pending claims 11 and 12 (which issued as presently challenged claims 10 and 11, respectively) as anticipated by R2-060988. *Id.* at 121-122. For pending claim 18 (which issued as presently challenged claim 16), the Examiner rejected the claim as obvious over R2-060988 in view of US 20050192021

A1 to Lee et al. (“Lee”). The Examiner found that “Lee discloses wherein the terminal is in Radio Resource Control (RRC)_Connected state or RRC_idle state (0022 discloses mobile terminal is in RRC idle or connected mode).” *Id.* at 125.

57. In response, the Applicant amended pending claim 11 by incorporating the limitation of pending claim 13 (and canceling claim 13). Ex. 1002 at 158. Pending claims 12 and 18 were not amended.

58. Regarding the double patenting rejection, the Applicant filed a terminal disclaimer to obviate the rejection based on non-statutory double patenting. Ex. 1002 at 160. For the rejected pending claim 11, which pending claims 12 and 18 are dependent from, the Applicant argued that R2-060988 did not anticipate pending amended claim 11 (which issued as presently challenged claim 10).

59. The Applicant argued that R2-060988 failed to disclose the limitation “‘wherein when the paging information does not exist in the downlink shared channel, the identifier is not detected, *and the identifier is not allocated to the control channel,*’ (emphasis added) as recited in independent claim 1 and similarly recited in independent claim 11.” Ex. 1002 at 162. The Applicant argued that because R2-060988 disclosed “the paging indicating channel to which the paging indicator is allocated indicates whether having PCH,” that showed that “the paging indicator is always allocated to radio resources,” and thus, “the paging indicator is allocated to the radio resources if there is the paging information as well as if there is no the

paging information.” *Id.* (emphasis in original). The Applicant argued that this taught away from the identifier of the claimed invention. *Id.* at 163.

60. Further, the Applicant argued that the PI-ID of R2-060988 likewise taught away from the identifier of the claimed invention. The Applicant argued that because R2-060988 disclosed “the PI-ID is identical to the UE-ID if there is the paging information” and the “PI-ID is not identical to the UE-ID if there is no the paging information,” that showed that “the PI-ID is always allocated to radio resources.” Ex. 1002 at 164. In contrast, the claimed invention required that “the identifier is not allocated to the radio resources if there is no the paging information.” *Id.* (emphasis in original).

61. Furthermore, the Applicant argued that R2-060988 did not disclose amended claim 11’s limitation “‘wherein the identifier is used by reserving and allocating a part of scheduling identifiers,’ (emphasis added).” Ex. 1002 at 164. The Applicant argued that the Office Action alleged that the PI-ID is the scheduling identifier which is reserved temporarily to UE. But because R2-060988 disclosed that “the PI-ID equals to C-RNTI in size and is used in place of C-RNTI,” the Applicant argued that “the PI-ID is not used by reserving and allocating a part of scheduling identifiers, but rather replaces C-RNTI.” *Id.* According to the Applicant, this is in contrast to the operation of the claimed invention, as shown in Fig. 5.

[T]he present invention is operated by reserving and allocating a part of the information included in the terminal scheduling ID as a group ID for paging information. The group ID is an ID used by reserving and allocating a part of a scheduling ID (i.e., a cell radio network temporary identifier (C-RNTI)) for uniquely identifying a terminal. A base station may operate by reserving at least one scheduling ID.

Id. Thus, R2-060988 failed to disclose all the features recited in claim 11. Pending claims 12 and 18 were argued to be allowable based on their dependencies from allowable claim 11.

62. The Examiner issued a Notice of Allowance (“NOA”) on June 5, 2015.

In the NOA, the Examiner characterized R2-060988 as follows:

3GPP RAN1/RAN2 joint meeting on LTE R2-060988, “PCH mapping and paging control” (“3GPP_1” hereinafter) discloses details about using PI-CH indicator for indicating an existing of a paging indicator. When PI-CH exists, mobile device read the paging indicator to determine if paging information exists for the mobile device **(section 2-3)**. Therefore, the reference is silent on details about **(1)** using identifier transmitted through the control channel for indicating existence of paging information wherein the identifier is used by reserving and allocating a part of scheduling identifier.

Ex. 1002 at 186 (emphasis in original).

E. Priority Date of the '814 Patent

63. The application leading to the issuance of the '066 Patent was filed on May 13, 2014. It is a continuation of Application No. 12/298,227 filed on April 24, 2007, now U.S. Patent No. 8,761,814, and claims priority to two foreign Korean applications filed on April 26, 2006 and April 20, 2007, respectively. I have assumed a priority date of April 26, 2006 for the purpose of my analysis in this declaration.

V. LEVEL OF ORDINARY SKILL IN THE ART

64. Based on the technologies disclosed in the '066 Patent and my experience in the field, it is my opinion that a POSITA would have a minimum of (i) an undergraduate degree in Electrical Engineering, Computer Science, or Computer Engineering, or a related field, and around two years of experience in the theory, design, and/or development of cellular technology, or (ii) a Master's degree in one of the foregoing fields with a focus on cellular technology. Someone with less or different technical education but more relevant practical experience, or more relevant education but less practical experience, could also be considered a POSITA.

65. My opinions with respect to the '066 Patent and the prior art referenced here are based on what a POSITA would have perceived at the time of the alleged invention of the '066 Patent. Unless otherwise stated, when I provide my

understanding and analysis below, it is consistent with the level of a POSITA in these techniques at and around the priority date of the '066 Patent.

VI. CLAIM CONSTRUCTION

66. I understand that the '066 Patent is subject to pending lawsuits entitled *Sol, IP, LLC v. AT&T Mobility LLC*, Case No. 2:18-cv-526-RWS-RSP (E.D. Tex.); *Sol, IP, LLC v. Sprint Corporation, Sprint Communications Co. L.P., Sprint Solutions, Inc., Sprint Spectrum, L.P.*, Case No. 2:18-cv-527-RWS-RSP (E.D. Tex.); and *Sol, IP, LLC v. Cellco Partnership d/b/a Verizon Wireless*, Case No. 2:18-cv-528-RWS-RSP (E.D. Tex.) (the "Related Litigations") in which Petitioner Ericsson Inc. has intervened.

67. I understand that in the Related Litigations, the parties disagree on the construction of four terms with respect to claims 10, 11, and 16 of the '066 Patent.

68. I also understand that while a claim construction order has not issued at the time of filing of Petitioner's present IPR Petition, the Court in the Related Litigations issued Preliminary Constructions for these terms on December 4, 2019. Ex. 1005 at 1. My understanding of the parties' positions are set forth below. The Board does not need to construe the disputed terms because the prior art encompasses both sides' proposed constructions for these terms, as well as the Court's Preliminary Constructions, as explained herein.

Claim Term	Sol IP's Construction	Defendants' Construction	Court's Preliminary Construction
“downlink shared channel”	Plain and ordinary meaning. Alternatively, “shared channel used for downlink.”	“DL-SCH, a downlink transport channel for user data transmission”	“shared channel used for downlink”
“scheduling identifiers”	Plain and ordinary meaning. Alternatively, “scheduling identifier” means “identifier of a specific terminal or terminal group.” “Scheduling identifiers” is the plural.	“cell radio network temporary identifiers (C-RNTIs)”	“identifiers that identify specific terminals or terminal groups and that are used for scheduling”
“the identifier is used by reserving and allocating a part of scheduling identifiers”	Plain and ordinary meaning. Alternatively, “the identifier is a reserved and allocated part of the scheduling identifiers.”	“the identifier is used by reserving and allocating a part of the information included in the terminal [scheduling identifier] as a group identifier for paging information”	Plain meaning apart from the Court's construction of “scheduling identifiers”

“wherein ... the downlink shared channel are physical channels”	Plain and ordinary meaning, with “downlink shared channel” construed as proposed above.	Indefinite	Plain meaning apart from the Court’s construction of “downlink shared channel”
---	---	------------	--

VII. SUMMARY OF PRIOR ART

69. As evidenced by the prior art I rely on in my analysis, the claimed paging methods were well known before the claimed priority date of the ’066 Patent. In addition to the extensive background knowledge that a POSITA would have brought to bear on the subject matter discussed in the ’066 Patent, the following prior art references demonstrate that the challenged claims would have been obvious.

A. R2-060429

70. The reference entitled “Evolved Paging for LTE” is a written contribution submitted to 3GPP at the 3GPP TSG-RAN WG2 Meeting #51 in Denver, Colorado on February 13-17, 2006 by Philips (“R2-060429”). I understand that R2-060429 is a submission to the 3GPP standards body for consideration in developing the LTE cellular system. Ex. 1006, ¶¶ 70-77. R2-060429 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible and available via 3GPP’s publicly available website on February 9, 2006 before the ’066 Patent’s priority date of April 26, 2006. *Id.* R2-060429 was not considered during prosecution of the ’066 Patent application.

71. R2-060429 discloses an evolved paging procedure for LTE for how to use the paging channel (PCH) as a transport channel. R2-060429 discloses the paging channel already described in TR 25.813, Evolved Universal Terrestrial Radio Access (UTRA) and Universal Terrestrial Radio Access Network (UTRAN); Radio interface protocol aspects (Release 7), V0.3.0, 2006-01, as shown below.

3. Paging Channel (PCH) characterised by:

- support of UE power saving (DRX cycle is indicated by the network to the UE);
- requirement to be broadcast in the entire coverage area of the cell;
- mapped to physical resources which can be used dynamically also for traffic/other control channels.

Ex. 1010 at 1. R2-060429 further discloses a “Text Proposal” for TR 25.813 with redlines to the paging section 5.2.2’s description of a paging channel PCH. Ex. 1010 at 4.

72. R2-060429 discloses that the 3GPP group “decided that the [paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels such as the DL-SCH.” Ex. 1010 at 1. In light of that decision, R2-060429 proposes that “the [paging channel] PCH carries broadcast data of Paging Information.” *Id.* at 2. R2-060429 also discloses that “[t]he PCH is configured to carry Paging Information that is monitored in either continuous mode or in DRX mode depending on the LTE RRC and/or LTE-MAC state of the

UE.” *Id.* at 2 (Proposal 1). R2-060429 discloses “a series of proposals for the Paging Channel in the E-UTRAN.” Ex. 1010 at 3.

Proposal 1 is described as follows:

This proposal 1 is the basis on which we propose to extend the functionality of the PCH in order to provide scheduling and data allocation on the DL-SCH: we propose that no separate Scheduling Control Channel be needed for monitoring by the UE, and that the PCH be used as a minimal scheduling indicator for data scheduled on the DL-SCH.

This aims to give the network the flexibility to assign the physical resources for the service that a UE may be paged to receive, through a range of configurable settings included in the Paging Information, dependent for instance on the type of connection, application-specific Quality of Service parameters suitable for the specific service that the UE is to receive, or radio channel conditions.

This minimal scheduling information may be seen as a service-scheduling indicator indicating the scheduling and availability on the DL-SCH of the service that a UE is being paged to receive.

Ex. 1010 at 2.

73. With Proposal 1, as well as Proposals 2 and 3, R2-060429 discloses “a series of proposals for the Paging Channel in the E-UTRAN, with the aim to provide

flexible configurations and faster initial cell access.” Ex. 1010 at 3. The functionality of the paging channel (PCH) is extended “by using it as a means of scheduling physical resource allocation for data transmitted on the DL-SCH and of enabling faster Radio Bearer configuration.” *Id.* at 3.

B. R1-060572

74. The reference entitled “LTE physical-layer models” is a written contribution submitted to 3GPP at the TSG-RAN WG1 #44 in Denver, Colorado on February 13-17, 2006 by Ericsson (“R1-060572”). The document is a submission to the 3GPP standards body for consideration in developing the LTE cellular system. Ex. 1006, ¶¶ 54-61. R1-060572 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible and available via 3GPP’s publicly available website on February 9, 2006 before the ’066 Patent’s priority date of April 26, 2006. *Id.* R1-060572 was not considered during prosecution of the ’066 Patent application.

75. R1-060572 discloses “some aspects of the services provided by the LTE physical layer to higher layers, primarily Layer 2.” Ex. 1008 at 1. Specifically, R1-060572 outlines proposals for physical-layer models of E-UTRA DL-SCH and UL-SCH, i.e., how the layer two transport shared channels (DL-SCH and UL-SCH) access physical layer radio resources and select resource and transport blocks for transmission. Ex. 1008 at 1, 3, 4. As it relates to paging procedures for LTE, R1-

060572 discloses that “[f]rom a Layer 1 point-of-view, paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted using the DL-SCH or, more exactly, the physical-layer characteristics of transfer of paging messages and system information can be assumed to be a sub-set of the possible physical-layer characteristics of DL-SCH transmission.” Ex. 1008 at 2. Thus, R1-060572 discloses that rather than defining a specific transport-channel type PCH (paging channel) for transmission of paging messages, paging messages should be transmitted using the DL-SCH. Ex. 1008 at 2. Such a design without “defin[ing] specific BCH and PCH transport-channel types would obviously lead to a simplified transport-channel structure.” R1-060752.

C. R1-060576

76. The reference entitled “Paging for E-UTRA” is a written contribution submitted to 3GPP at the TSG-RAN WG1 #44 in Denver, Colorado on February 13-17, 2006 by Ericsson (“R1-060576”). I understand that R1-060576 is a submission to the 3GPP standards body for consideration in developing the LTE cellular system. Ex. 1006, ¶¶ 62-69. R1-060576 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible and available via 3GPP’s publicly available website on February 9, 2006 before the ’066 Patent’s priority date of April 26, 2006. *Id.* R1-060576 was not considered during prosecution of the ’066 Patent application.

77. R1-060576 discloses a more efficient paging procedure for E-UTRA. “An efficient paging procedure should allow the UE to sleep with no receiver processing most of the time and to briefly wake up at predefined time intervals to monitor paging information from the network.” Ex. 1011 at 1. R1-060576 describes that while a separate, specific paging indicator channel was used in WCDMA to signal to a UE to receive paging information, for LTE, “paging can rely on the shared control channel, monitored at predefined time instants (DRX cycle, configured by higher layers).” *Id.* The shared control channel is “the part of the subframe carrying control information for operation of downlink scheduling, similar to the HS-SCCH in HSDPA.” *Id.* at fn. 1. By relying on the shared control channel to serve the purpose of a paging indicator, a paging indicator channel is no longer needed, providing potential power savings. *Id.* at 1. Also, “[r]elying on the shared control channel for paging avoids having to introduce specific L1 structures. Instead, paging relies on already existing L1 structures and can be seen as scheduling implementation.” *Id.*

78. R1-060576’s paging procedure is described as follows: “[i]f the UE detects scheduling control information, through the presence of its own identity or a common paging group identity, the data part of the downlink transmission is received and further processed by higher layers. Otherwise, the UE reverts to sleeping until the next paging occasion.” 1011 at 1. This paging procedure is

reflected in Figure 1, shown below. Control signaling may be used to indicate that paging information is present. Further, as disclosed in R1-060576, the control signaling may contain a single UE's own identity or a common paging group identity. 1011 at 1, Figure 1.

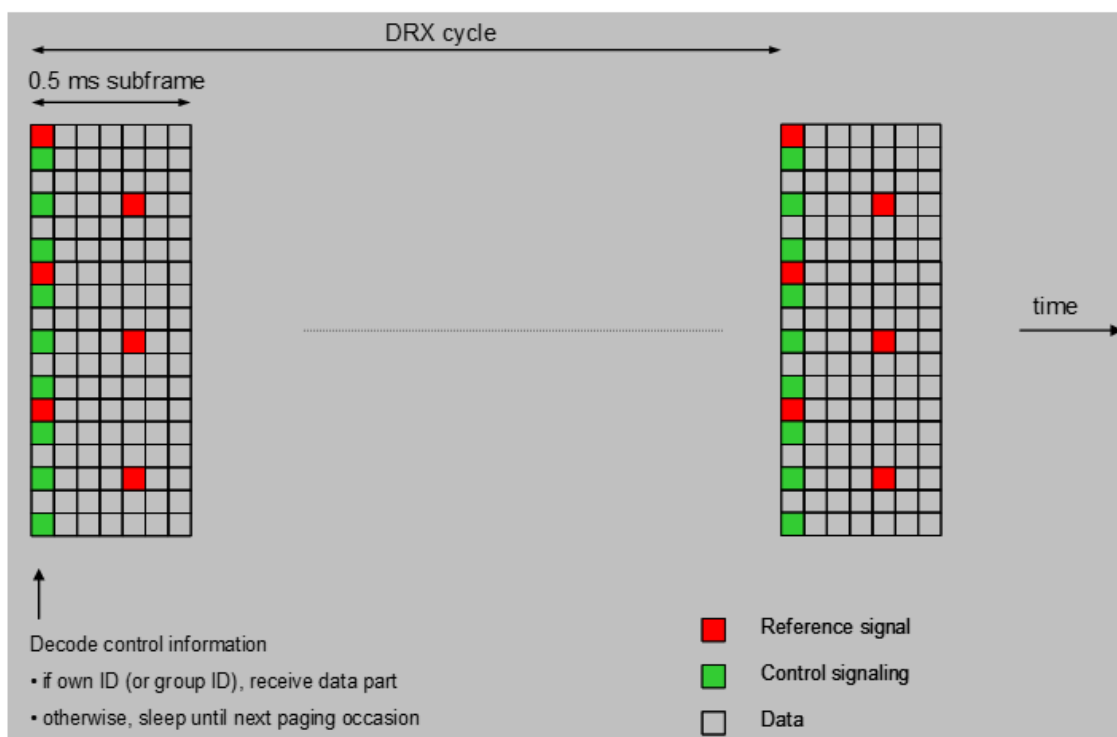


Figure 1: Schematic illustration of the paging mechanism (the amount of reference signals, location of control information, etc is not to scale).

1011 at Figure 1.

D. R1-060187

79. The reference entitled “OFDMA Downlink Physical channel mapping – text proposal” is a written contribution submitted to 3GPP at the 3GPP TSG RAN WG1 LTE Ad Hoc Meeting in Helsinki, Finland on January 23-25, 2006 by Nokia (“R1-060187”). I understand that R1-060187 is a submission to the 3GPP standards

body for consideration in developing the LTE cellular system. Ex. 1006, ¶¶ 46-53. R1-060187 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible and available via 3GPP's publicly available website on January 19, 2006 before the '066 Patent's priority date of April 26, 2006. *Id.* R1-060187 was not considered during prosecution of the '066 Patent application.

80. R1-060187 "is a text proposal for mapping from [downlink] DL Transport Channels to Physical Channel for E-UTRA similar to the figure found for WCDMA in TS 25.211." Ex. 1012 at 1. As disclosed in R1-060187, a channel called the "Paging Indicator Channel (PICH) is carried with other L1/L2 control information on PDSCCH." *Id.* A POSITA would have understood the Paging Indicator Channel to be referring to the PICH, e.g., as used in WCDMA, not the paging channel (PCH), which is shown in R1-060187 as mapped to the Physical Downlink Shared Channel (PDSCH) and not the Physical Downlink Shared Control Channel (PDSSCH). The Paging Indicator Channel (PICH) (not shown in Figure XY) is mapped to the Physical Downlink Shared Control Channel (PDSSCH). The proposed mapping of transport channels onto physical channels is summarized in Figure xy of R1-060187, shown below.

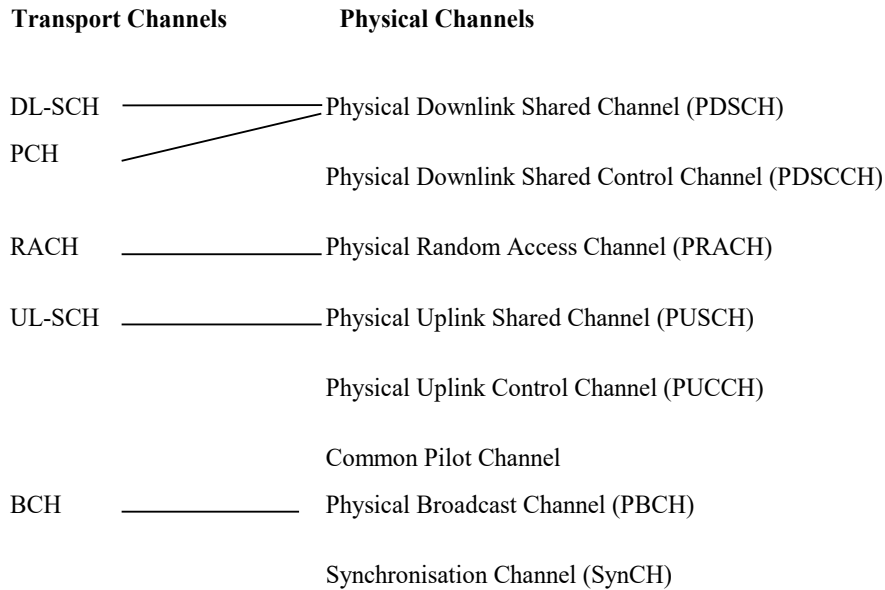


Figure xy: Transport-channel to physical-channel mapping

Ex. 1012 at Figure xy. As shown in Figure xy, the DL-SCH and PCH transport channels are shown to be mapped to the same Physical Downlink Shared Channel (PDSCH). There is also a Physical Downlink Shared Control Channel (PDSCCH).

E. R2-060988

81. The reference entitled “PCH mapping and Paging control” is a written contribution submitted to the 3GPP” standards organization at the March 27-31, 2006, joint meeting of the 3GPP RAN1/RAN2 in Athens, Greece by China Academy of Telecommunications Technology (“CATT”) (“R2-060988”). I understand that R2-060988 is a submission to the 3GPP standards body for consideration in developing the LTE cellular system. Ex. 1006, ¶¶ 78-85. R2-060988 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible

and available via 3GPP's publicly available website on March 24, 2006 before the '814 Patent's priority date of April 26, 2006. *Id.* I understand that R2-060988 was cited during prosecution of the '066 Patent, and the Applicant made no effort to swear behind it.

82. R2-060988 is entitled "PCH mapping and Paging control procedures for LTE." Ex. 1007 at Title. The reference discloses mapping a paging channel "PCH . . . on the downlink physical shared channel" and combining a "paging indicator channel . . . with [the] downlink shared control channel." Ex. 1007 at 1. The paging channel PCH is a "transport channel" (*Id.* at 1), and the downlink physical shared channel (also referred to as a DPSCCH) and the paging indicator combined with the downlink shared control channel (also referred to as a DSCCH) are physical channels (*Id.* at 1-2). When there is "no paging" information present, "the DPSCCH doesn't carry any content of PCH to save the radio resource." *Id.* at 1.

83. Figure 1 of R2-060988, shown below, generally illustrates the paging process.

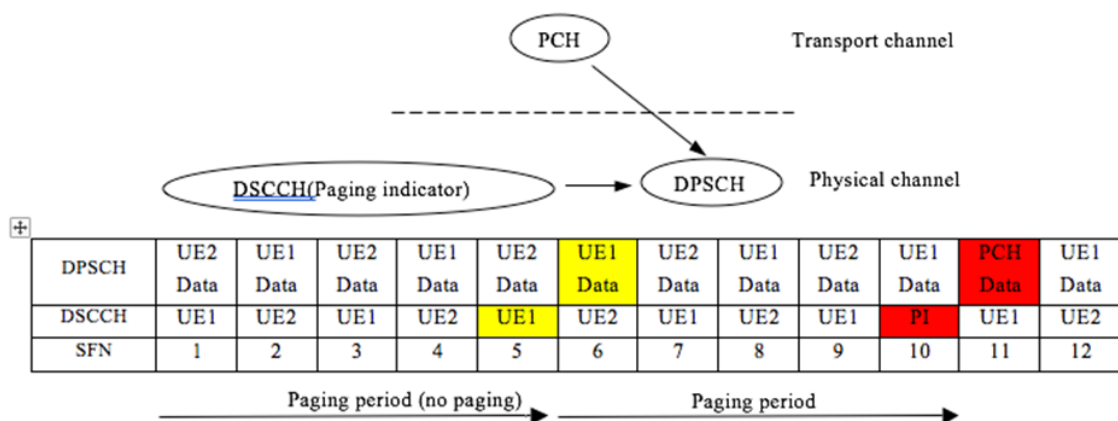


Figure 1: PCH mapping

Ex. 1007 at Figure 1 (annotated in original). Two physical channels are shown in Figure 1, DSCCH and DPSCH. The DPSCH is a downlink physical shared channel shared between users (“which can be used dynamically”), and the DSCCH is a downlink shared control channel. Ex. 1007 at 1. There is also a PCH transport channel. Ex. 1007 at Figure 1. The process is depicted with respect to system frame numbers (SFNs) dividing up the paging period.

84. As shown in Figure 1 above, the information on the DSCCH for each SFN is either (i) scheduling information for a specific terminal (labeled in Fig. 1 as “UE1” or “UE2”) or (ii) a paging indicator (labeled in Fig. 1 as “PI”). Ex. 1007 at Figure 1. If in a period of “no paging,” the DSCCH will carry a C-RNTI that is specific to a terminal, and data for that terminal will be included in the DPSCH during the next SFN. For example, looking at Figure 1, it depicts that SFN#5 has a DSCCH that includes the C-RNTI for UE1 while SFN#6 has a DPSCH that includes

the data for UE1. If in a period of “paging,” the DSCCH will carry a paging indicator, and the paging channel including the paging message will be included in the DPSCH during the next SFN. For example, looking at Figure 1, it depicts that SFN#10 has a DSCCH that includes the paging indicator PI while SFN#11 has a DPSCH that includes the paging channel PCH.

85. Two proposed “solutions . . . for distinguishing the paging indicator and scheduling information on DSCCH” are described in R2-060988. Ex. 1007 at 2. In the first solution, the DSCCH will either include a C-RNTI (when no paging information is present) or a PI-ID (when paging information is present on the DPSCH). Ex. 1007 at 2-3. R2-060988 discloses that the “PI-ID equals to C-RNTI in size.” Ex. 1007 at 2. In the second solution, the DSCCH will include a “paging tag.” Ex. 1007 at 2. A POSITA would understand that the paging tag could be very short, e.g., a single bit. A paging tag value of “1” indicates that paging information is present on the DPSCH, and a paging tag value of “0” indicates that paging information is not present.

86. R2-060988’s Figure 2 (copied below) is a flow chart of the PI-ID solution.

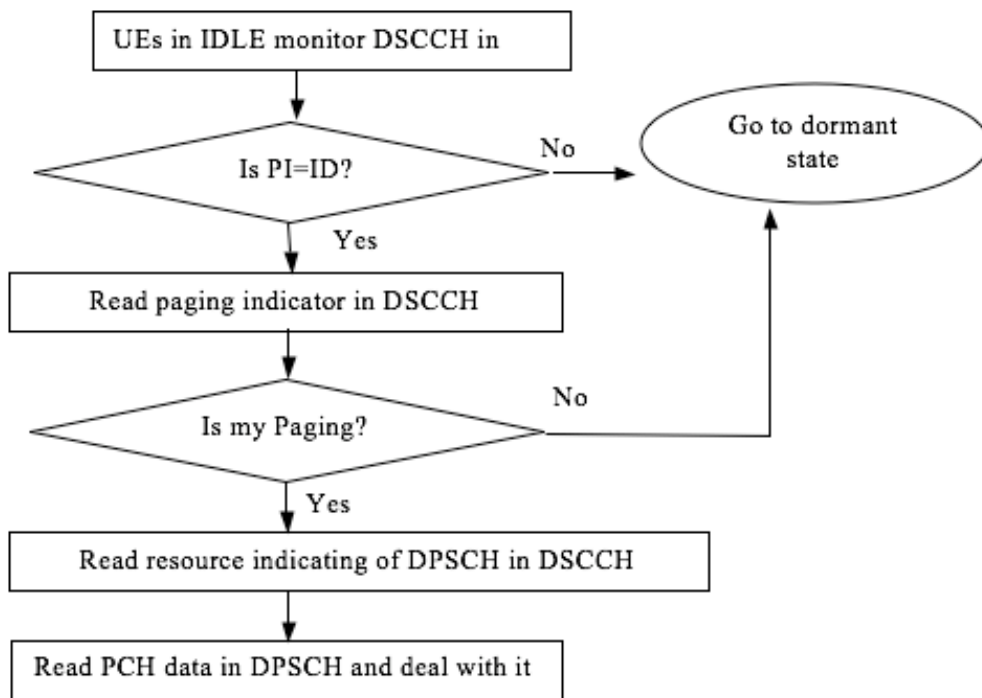


Figure 2: The control procedure of Idle UE

Ex. 1007 at Figure 2. As shown in the flow chart, an idle UE will periodically wake to monitor the DSCCH. If the UE detects a PI-ID in the DSCCH, “the content carried on DSCCH is a paging indicator” (Ex. 1007 at 2), and the UE will “[r]ead paging indicator in DSCCH” (Figure 2). After the UE detects a PI-ID, it will decide if the paging information is for the UE. *See* Ex. 1007 at Figure 2 (“Is my Paging?”). If so, the UE will read the DSCCH information indicating where the PCH is in the DPSCH (labeled in Figure 2 as “[r]ead resource indicating of DPSCH in DSCCH) and then read “PCH data in DPSCH and deal with it.” Ex. 1007 at Figure 2. R2-

060988 includes a similar flowchart for the “paging tag” solution. *See* Ex. 1007 at Figure 3.

F. TR 25.814

87. The reference 3GPP TR 25.814 V1.2.2 (2006-03), titled “Physical Layer Aspects for Evolved UTRA (Release 7),” is a Technical Report of 3GPP published in April 2006 (“TR 25.814”). I understand that TR 25.814 is a draft technical specification endorsed by 3GPP. Ex. 1006, ¶¶ 38-45. TR 25.814 describes its goal “to help TSG RAN WG1 to define and describe the potential physical layer evolution under consideration and compare the benefits of each evolution techniques, along with the complexity evaluation of each technique.” Ex. 1009 at 8. The “evolution under consideration” resulted in the LTE cellular system. *Id.* TR 25.814 is a printed publication prior art reference under at least 35 U.S.C. 102(a) as it was accessible and available via 3GPP’s publicly available website on April 4, 2006 before the ’066 Patent’s priority date of April 26, 2006. *Id.* TR 25.814 was not considered during prosecution of the ’066 Patent application.

88. TR 25.814 at § 7 focuses on downlink concepts for paging information. The document describes that a “PICH: Paging Indicator Channel if S-CCPCH carrying the PCH is transmitted over a single carrier.” Ex. 1009 at 45. The different downlink scheduling information required by a UE for downlink transmission is shown in Table 7.1.1.2.3.1-1 of TR 25.814. *Id.* at 26 (§ 7.1.1.2.3.1). As shown in

Table 7.1.1.2.3.1-1, the ID Field in the scheduling information for category 1 type of information includes a specific UE identity or the identity of a group of UEs. *Id.* at Table 7.1.2.3.1-1.

Table 7.1.1.2.3.1-1 Downlink scheduling information required by a UE

	<u>Field</u>		<u>Size</u>	<u>Comment</u>
<u>Cat. 1</u> (Resource indication)	<u>ID (UE or group specific)</u>		<u>8-9</u>	<u>Indicates the UE (or group of UEs) for which the data transmission is intended</u>
	<u>Resource assignment</u>		<u>FFS</u>	<u>Indicates which (virtual) resource units (and layers in case of multi-layer transmission) the UE(s) shall demodulate.</u>
	<u>Duration of assignment</u>		<u>2-3</u>	<u>The duration for which the assignment is valid, could also be used to control the TTI or persistent scheduling.</u>
<u>Cat. 2</u> (transport format)	<u>Multi-antenna related information</u>		<u>FFS</u>	<u>Content depends on the MIMO/beamforming schemes selected.</u>
	<u>Modulation scheme</u>		<u>2</u>	<u>QPSK, 16QAM, 64QAM. In case of multi-layer transmission, multiple instances may be required.</u>
	<u>Payload size</u>		<u>6</u>	<u>Interpretation could depend on e.g. modulation scheme and the number of assigned resource units (c.f. HSDPA). In case of multi-layer transmission, multiple instances may be required.</u>
<u>Cat. 3</u> (HARQ)	<u>If asynchronous hybrid ARQ is adopted</u>	<u>Hybrid ARQ process number</u>	<u>3</u>	<u>Indicates the hybrid ARQ process the current transmission is addressing.</u>
		<u>Redundancy version</u>	<u>2</u>	<u>To support incremental redundancy.</u>
		<u>New data indicator</u>	<u>1</u>	<u>To handle soft buffer clearing.</u>
	<u>If synchronous hybrid ARQ is adopted</u>	<u>Retransmission sequence number</u>	<u>2</u>	<u>Used to derive redundancy version (to support incremental redundancy) and 'new data indicator' (to handle soft buffer clearing).</u>

Ex. 1009 at Table 7.1.1.2.3.1-1 (annotated).

VIII. MOTIVATION TO COMBINE PRIOR ART

89. A POSITA would have had numerous reasons to combine the prior art discussed in the previous section. First, all the above cited prior art are related to paging in a cellular communication system. More specifically, all the above cited

prior art are related to the standardization of the fourth-generation cellular communication system as standardized by the 3GPP organization. Further, all the above cited prior art are related in part to a method to efficiently use physical layer channels for scheduling data transmission from the base station to the user equipment. A POSITA would be motivated to consider using any subset or all of the above cited art in a paging protocol for cellular communication systems because the goals of the references (e.g., efficient use of radio resources for paging) are the same. Moreover, because all the techniques described in the above cited references are complementary, there is no “teaching away” such that a POSITA would have reason to think that any two of these prior art references could not be combined. Besides the foregoing reasons to combine any of the above references, I discuss specific combinations of references with respect to the grounds below.

IX. THE CHALLENGED CLAIMS ARE UNPATENABLE

A. Ground 1: Claims 10 and 16 are Obvious Under 35 U.S.C. § 103(a) Over R2-060429 in View of R1-060572 (to the extent necessary) and R1-060576

90. I first address how the cited prior art references render the challenged claims 10 and 16 obvious. I then identify exemplary reasons why a POSITA would have combined the cited prior art references.

1. Claim 10

a. Claim 10: [10.pre] “A method for transmitting paging information, performed in a base station, the method comprising:”

91. To the extent the preamble is limiting, R2-060429 discloses a “method for transmitting paging information, performed in a base station.” R2-060429 discloses “a series of proposals for the Paging Channel in the E-UTRAN, with the aim to provide flexible configurations and faster initial cell access.” Ex. 1010 at 3. The paging channel (“PCH”) “carries broadcast data of Paging Information, and [] the UE listens to the PCH in either continuous or DRX mode depending on their state for power-saving purposes.” Ex. 1010 at 2. R2-060429 further discloses multiple ways that a UE listens to paging information. “[A] UE would listen to the Paging Information in the follow way: - In LTE RRC Active mode, a UE may monitor the PCH in continuous mode or in DRX mode (in LTE-MAC level) - In LTE Idle mode, a UE may monitor the PCH in DRX mode.” Ex. 1010 at 2. In light of the above, a POSITA would have understood that R2-060429 discloses a base station broadcasting, i.e., transmitting, paging information to UEs in a cellular system.

b. [10.2] “when a paging information is generated, allocating the paging information to a downlink shared channel;”

92. R2-060429 discloses “when a paging information is generated, allocating the paging information to a downlink shared channel.” The proposals

disclosed in R2-060429 “relat[e] to the Paging Channel in [1] in order to extend the model for the Paging Channel in the E-UTRAN.” Ex. 1010 at 1. The “Paging Channel (PCH) [is] characterised by: . . . requirement to be broadcast in the entire coverage area of the cell.” Ex. 1010 at 1. R2-060429 discloses that “the PCH carries broadcast data of Paging Information, and that the UE listens to the PCH in either continuous or DRX mode depending on their state for power-saving purposes.” Ex. 1010 at 1. A POSITA would have understood that broadcasting the PCH carrying paging information data requires paging information to be generated first.

93. Moreover, R2-060429 discloses that “[i]n our original proposals [3, 4] we advocated the merging of the PCH together with the DL-SCH as transport channels for a simplification of the number of transport channels.” Ex. 1010 at 1. Thus, a POSITA would have understood that the paging information could be allocated to a downlink shared channel under either side’s proposed construction for “downlink shared channel.”

94. To the extent R2-060429 is found not to does not disclose “allocating the paging information to a downlink shared channel,” R2-060429 in view of R1-060572 would have rendered this limitation obvious under either side’s proposed construction for “downlink shared channel.” R1-060572 discloses that “paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted using the DL-SCH or, more exactly, the

physical-layer characteristics of transfer of paging messages and system information can be assumed to be a sub-set of the possible physical-layer characteristics of DL-SCH transmission.” Ex. 1008 at 2.

- c. **[10.3] “allocating an identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel; and”**

95. R2-060429 in view of R1-060576 discloses “allocating an identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel.” R1-060576 discloses the use of a shared control channel, which is “the part of the subframe carrying control information for operation of downlink scheduling, similar to the HS-SCCH in HSDPA.” 1011 at fn. 1. R1-060576 further discloses that the shared control channel shown in Figure 1 below “serves the purpose of a paging indicator. If the UE detects scheduling control information, through the presence of its own identity or a common paging group identity, the data part of the downlink transmission is received and further processed by higher layers. Otherwise, the UE reverts to sleeping until the next paging occasion.” 1011 at 1. A POSITA would have understood that only when there is existence of paging information is the scheduling control information, i.e., the identifier, allocated to a control channel. A POSITA would have understood that if

the UE reverts to sleeping, then an identifier has not been allocated to indicate the existence of the paging information.

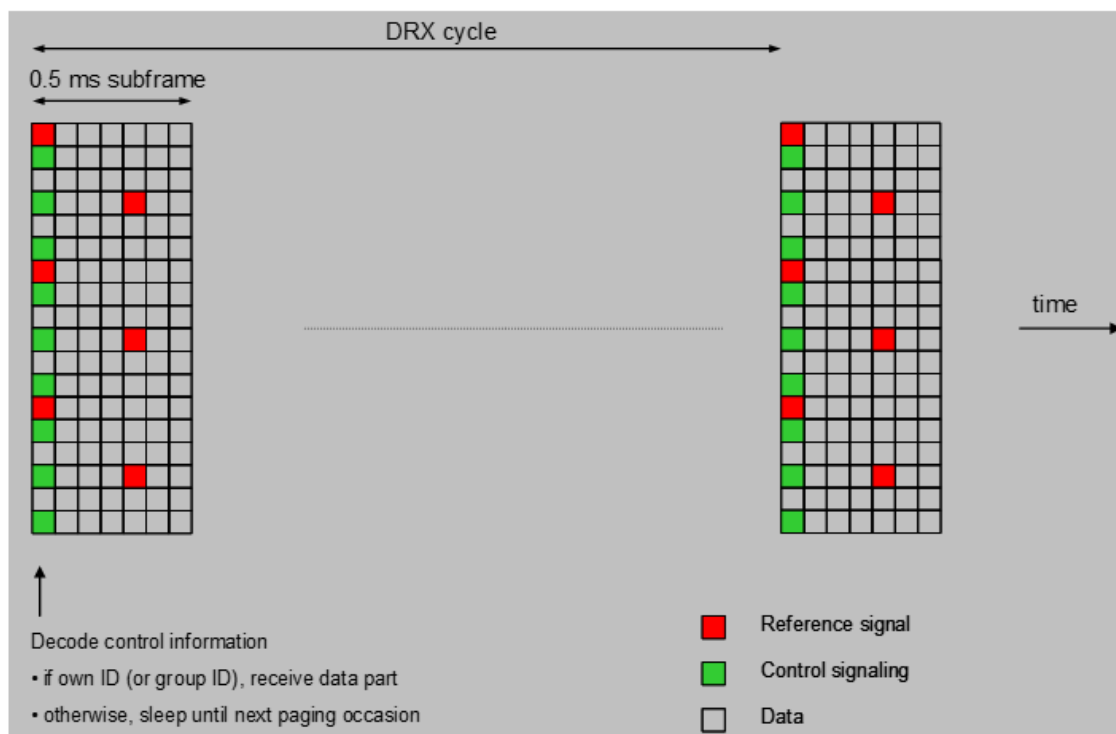


Figure 1: Schematic illustration of the paging mechanism (the amount of reference signals, location of control information, etc is not to scale).

1011 at Figure 1.

96. Furthermore, as disclosed in R1-060576, the control channel includes radio resource allocation information indicating the radio resource to which the paging information is allocated, since “[i]f the UE detects scheduling control information . . . the data part of the downlink transmission is received and further processed by higher layers.” 1011 at 1.

d. [10.4] “transmitting the control channel and the downlink shared channel to a terminal,”

97. R2-060429 in view of R1-060576 discloses “transmitting the control channel and the downlink shared channel to a terminal.” As discussed above, R2-060429 discloses that the “Paging Channel (PCH) [is] characterised by: . . . requirement to be broadcast in the entire coverage area of the cell.” Ex. 1010 at 1. R2-060429 further discloses that “the PCH carries broadcast data of Paging Information, and that the UE listens to the PCH in either continuous or DRX mode depending on their state for power-saving purposes.” Ex. 1010 at 1. Moreover, R2-060429 discloses that “[i]n our original proposals [3, 4] we advocated the merging of the PCH together with the DL-SCH as transport channels for a simplification of the number of transport channels.” Ex. 1010 at 1. Thus, a POSITA would have understood that the paging information could be allocated to a downlink shared channel and is broadcast, i.e., transmitted to UEs.

98. In addition, R1-060576 discloses that the shared control channel shown in Figure 1 below “serves the purpose of a paging indicator. If the UE detects scheduling control information, through the presence of its own identity or a common paging group identity, the data part of the downlink transmission is received and further processed by higher layers. Otherwise, the UE reverts to sleeping until the next paging occasion.” 1011 at 1. A POSITA would have

understood that the UE can detect scheduling control information because the control channel is transmitted to the UE.

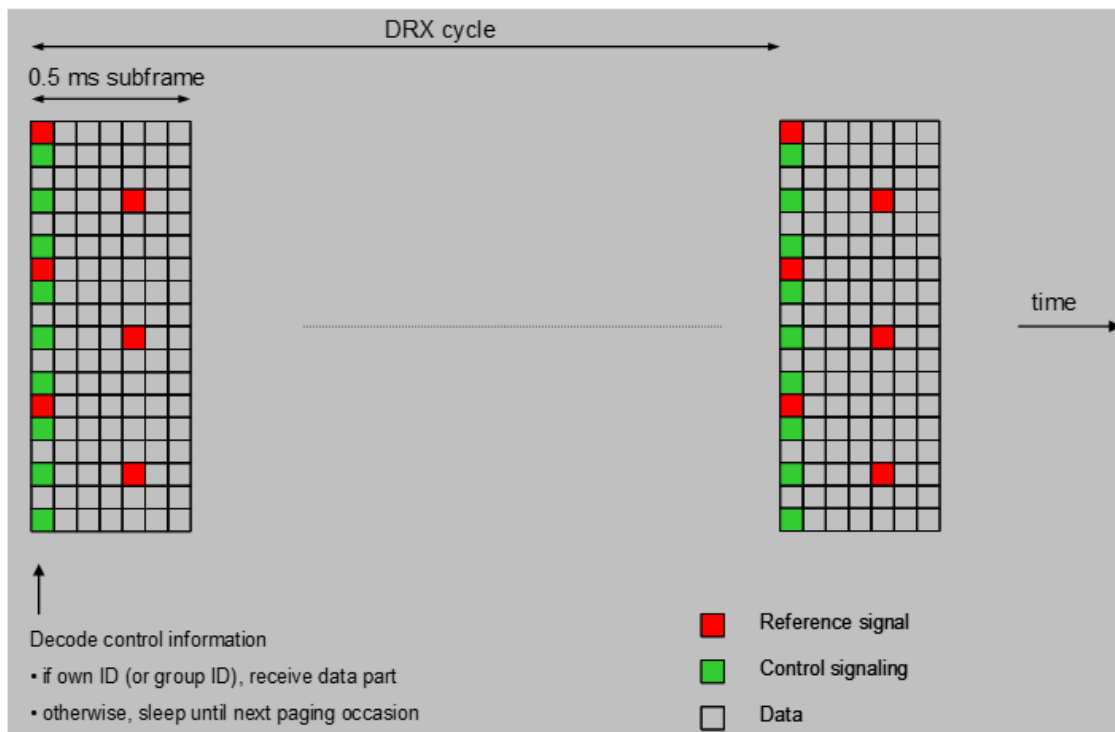


Figure 1: Schematic illustration of the paging mechanism (the amount of reference signals, location of control information, etc is not to scale).

1011 at Figure 1.

99. To the extent R2-060429 is found not to does not disclose “the downlink shared channel,” R2-060429 in view of R1-060572 would have rendered this limitation obvious under either side’s proposed construction for this term. R1-060572 discloses that “paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted using the DL-SCH or, more exactly, the physical-layer characteristics of transfer of paging

messages and system information can be assumed to be a sub-set of the possible physical-layer characteristics of DL-SCH transmission.” Ex. 1008 at 2.

e. [10.5] “wherein when the paging information is not generated, the identifier is not allocated to the control channel, and”

100. R2-060429 in view of R1-060576 discloses that “wherein when the paging information is not generated, the identifier is not allocated to the control channel.” As disclosed in R2-060576, “[i]f the UE detects scheduling control information, through the presence of its own identity or a common paging group identity, the data part of the downlink transmission is received and further processed by higher layers.” R2-060576 at 1. However, if no scheduling control information, i.e., identifier, is received, “the UE reverts to sleeping until the next paging occasion.” R2-060576 at 1. Similarly, in WCDMA, “[i]f the UE receives a paging indicator, it performs further processing of paging information transmitted on a separate channel.” R2-060576. A POSITA would have understood that only when there is paging information generated does the scheduling control information or paging indicator, i.e., the identifier, get allocated to the control channel.

f. [10.6] “wherein the identifier is used by reserving and allocating a part of scheduling identifiers.”

101. R2-060429 in view of R1-060576 discloses “wherein the identifier is used by reserving and allocating a part of scheduling identifiers.”

102. With respect to the term “scheduling identifiers,” R1-060576 discloses use of the shared control channel shown in annotated Figure 1 below to “serve[] the purpose of a paging indicator. If the UE detects *scheduling control information, through the presence of its own identity or a common paging group identity*, the data part of the downlink transmission is received and further processed by higher layers.” 1011 at 1 (emphasis added). A POSITA would have understood that this disclosure meets the proposed construction of “scheduling identifiers” by Patent Owner¹ and the preliminary construction by the Court.² This is particularly true given that Patent Owner has taken a position in the Related Litigations that LTE implementations infringe the claim element where LTE allows for use of common paging group identifier (the paging radio network temporary identifier “P-RNTI”).

¹ See § VI *supra* (proposed construction: “Plain and ordinary meaning. Alternatively, “scheduling identifier” means “identifier of a specific terminal or terminal group.” “Scheduling identifiers” is the plural”).

² Ex. 1005 at 1 (preliminary construction: “identifiers that identify specific terminals or terminal groups and that are used for scheduling”).

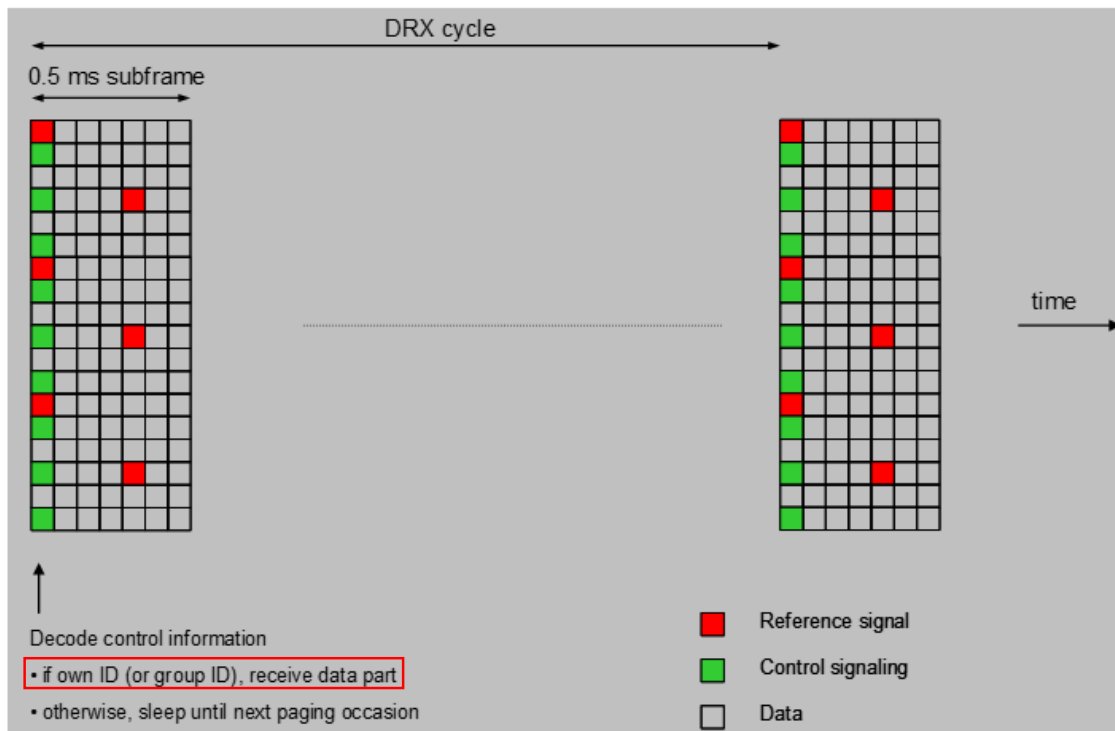


Figure 1: Schematic illustration of the paging mechanism (the amount of reference signals, location of control information, etc is not to scale).

1011 at Figure 1 (annotated).

103. Moreover, R1-060576's disclosure of "*scheduling control information, through the presence of its own identity or a common paging group* identity in combination with the knowledge of a POSITA meets Defendants' proposed construction of "scheduling identifiers."³ It was well understood that an efficient way to indicate a UE's "own identity" for LTE scheduling is through the

³ See § VI *supra* (proposed construction: "cell radio network temporary identifiers (C-RNTIs)")

use of a “cell radio network temporary identifier” or “C-RNTI,” a concept used in LTE to refer to an identifier of a specific terminal. *See, e.g.*, 3GPP TR 25.813 v0.8.1 (2005-04) at 20 (“The C-RNTI provides a unique UE identification at the cell level;

- It is assumed that this identity is used for scheduling unless the cost would turn out to be too high and the introduction of a separate MAC-Id would be required.”). To the extent not disclosed by R1-060576, a POSITA would have been motivated to combine its understanding of C-RNTI’s with R1-060576 in order to use known resources for identifying a UE.

104. R2-060576 also discloses the longer phrase “the identifier is used by reserving and allocating a part of scheduling identifiers.” R1-060576 discloses that the identifier to specify where to transmit data can be either a UE’s own identity or a common paging group identity. 1011 at 1. This disclosure meets the proposed construction of “the identifier is used by reserving and allocating a part of [scheduling identifiers]” by Patent Owner⁴ and the preliminary construction by the

⁴ *See* § VI *supra* (proposed construction: “Plain and ordinary meaning.

Alternatively, “the identifier is a reserved and allocated part of the scheduling identifiers”).

Court under Patent Owner’s interpretation of the element.⁵ In particular, the Patent Owner has taken a position in the Related Litigations that LTE implementations infringe the claim element where LTE allows for use of common paging group identifier (the paging radio network temporary identifier “P-RNTI”) in addition to other identifiers (for example, cell network temporary identifiers “C-RNTIs”). Similarly, R2-060576 discloses a system that can reserve and allocate at least two types of identifiers (a UE’s own identity or a common paging group identity) and a POSITA would understand that LTE was being developed with multiple identifiers. *See, e.g.*, 3GPP TR 25.813 v0.8.1 (2005-04) at 20 (“The C-RNTI provides a unique UE identification at the cell level.”).

105. R2-060576 in combination with the knowledge of a POSITA also renders the phrase “the identifier is used by reserving and allocating a part of scheduling identifiers” obvious under Defendants’ proposed construction.⁶ As

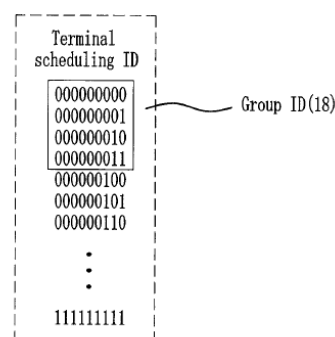
⁵ Ex. 1005 at 1 (preliminary construction: “Plain meaning apart from the Court’s construction of ‘scheduling identifiers’”).

⁶ *See* § VI *supra* (proposed construction: “the identifier is used by reserving and allocating a part of the information included in the terminal [scheduling identifier] as a group identifier for paging information”).

stated above, R2-060576 discloses identifiers such as UE-specific identifiers and a common paging group identity. Similarly, the '066 Patent discloses a process that reserves a part of UE/terminal-specific IDs to allocate as a group ID for paging:

As shown in FIG. 5, the present invention is operated by reserving and allocating a part of the information included in the terminal scheduling ID as a group ID for paging information. The group ID is an ID used by reserving and allocating a part of a scheduling ID (i.e., a cell radio network temporary identifier (C-RNTI)) for uniquely identifying a terminal. A base station may operate by reserving at least one scheduling ID.

FIG. 5



Ex. 1001 at 6:3-10 (emphasis added). Additionally, reserving and allocating specific data as a group ID was a well known process solidly within the skill set of a POSITA, and is a design choice that would be obvious to try. And to the extent not already disclosed by R2-060576, a POSITA would have been motivated to combine its knowledge of reserving and allocating part of specific values as a group ID with R2-060576's disclosure in order to develop a more efficient system and utilize existing resources (e.g., UE-specific IDs) to add additional functionality (e.g., use as a group paging ID).

2. Claim 16

- a. Claim 16: “The method of claim 10, wherein the terminal is in Radio Resource Control (RRC) Connected state.”**

106. R2-060429 discloses “wherein the terminal is in Radio Resource Control (RRC) Connected state.” R2-060429 discloses that “[i]n LTE RRC Active mode, a UE may monitor the PCH in continuous mode or in DRX mode (in LTE-MAC level).” Ex. 1010 at 2.

3. A POSITA would have been motivated to combine R2-060429 with R1-060572 and R1-060576

- a. Motivation to Combine R2-060429 with R1-060572**

107. A POSITA would have been motivated to combine the teachings of R2-060429 with R1-060572. Each of these references relates to paging in a cellular communication system. *See, e.g.*, Ex. 1010 at 2 (“[B]oth the PCH and the DL-SCH may share physical resources.”); R1-060572 (“Thus one may question if there really is a need to define specific transport-channel types (PCH and BCH) for transmission of paging messages and system information or if these should be transmitted using the DL-SCH.”). More specifically, each of these references were paging contributions proposed for 3GPP’s standardization of the fourth-generation cellular communication system known as LTE. *See, e.g.*, Ex. 1010 at 1 (“We provide in this part an analysis of some of the points relating to the Paging Channel in [1] in order to extend the model for the Paging Channel in the E-UTRAN.”); R1-060572 (“the

BCCH and PCCH could be mapped to the DL-SCH, leading to a more simple E-UTRA transport-channel structure.”). Each reference is also related to a common goal of efficiently using radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1010 at 1 (“[T]he [paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels such as the DL-SCH.”); Ex. 1008 at 2 (“paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted using the DL-SCH.”). Thus, a POSITA would have been motivated to combine the proposed solutions in these references.

108. A POSITA would also have been motivated to combine R1-060572’s teaching of mapping a paging message to the transport downlink shared channel (DL-SCH), rather than a separate transport paging channel (PCH) as disclosed in R2-060429, because both references contemplate how to best map transport channels to physical channels to achieve the common goal of efficiently using radio resources efficiently. Indeed, R2-060429 already contemplates combining the paging channel (PCH) with the downlink shared channel (DL-SCH). *See* Ex. 1010 at 2 (“[W]e advocated the merging of the PCH together with the DL-SCH as transport channels for a simplification of the number of transport channels.”).

b. Motivation to Combine R2-060429 with R1-060576

109. A POSITA would also have been motivated to combine the teachings of R2-060429 with R1-060576. Each of these references relates to paging in a cellular communication system. *See, e.g.*, Ex. 1010 at 2 (“[T]he [paging channel] PCH carries broadcast data of Paging Information, and that the UE listens to the PCH in either continuous or DRX mode depending on their state for power-saving purposes.”); R1-060576 (“An efficient paging procedure should allow the UE to sleep with no receiver processing most of the time and to briefly wake up at predefined time intervals to monitor paging information from the network.”). More specifically, each of these references were paging contributions proposed for 3GPP’s standardization of the fourth-generation cellular communication system known as LTE. *See, e.g.*, Ex. 1010 at 1 (“We provide in this part an analysis of some of the points relating to the Paging Channel in [1] in order to extend the model for the Paging Channel in the E-UTRAN.”); R1-060576 (“For LTE, paging can rely on the shared control channel, monitored at predefined time instants (DRX cycle, configured by higher layers).”). Each reference is also related to a common goal of efficiently using radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1010 at 1 (“[T]he [paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels

such as the DL-SCH.”); R1-060576 (“No paging indicator channel is necessary as the potential power savings are very small thanks to the short subframe duration. Instead, the shared control channel serves the purpose of a paging indicator.”). Thus, a POSITA would have been motivated to combine the proposed solutions in these references.

110. A POSITA would also have been motivated to combine R1-060576’s teaching of using the physical layer shared control channel frame disclosed in Figure 1 of R1-060576 as the “physical resources that can be shared with other traffic or control channels” disclosed in R2-060429, because each of these references is discussing a physical channel for shared control resources in the same cellular communications system, and “frames” were a well-understood time unit of data for cellular communications. Ex. 1010 at 1; 1011 at 1. Furthermore, a POSITA would have been motivated to combine the R1-060576’s teaching of detecting “scheduling control information, through the presence of its own identity or a common paging group identity” with Ex. 1010 at least because use of identifiers was well known in LTE and the Scheduling Control Channel disclosed in R2-060429 is also disclosed as minimal scheduling indicator to indicate the presence of paging information on the paging channel (PCH). Ex. 1011 at 1; Ex. 1010 at 2. Additionally, the motivation is further supported because LTE envisioned transmitting control information (in a control channel) at the start of the downlink frame—therefore

including an identifier for paging in the control channel allows a UE reduce the amount of time and resources it needs to spend monitoring whether an identifier is present through use of R21-060576's disclosed solution.

B. Ground 2: Claim 11 is Obvious Under 35 U.S.C. § 103(a) Over R2-060429 in View of R1-060572 (to the extent necessary), R1-060576, and R1-060187

111. I first address how the cited prior art references render the challenged claim 11 obvious. I then identify exemplary reasons why a POSITA would have combined the cited prior art references.

1. Claim 11

a. Claim 11: “The method of claim 10, wherein the control channel and the downlink shared channel are physical channels.”

112. Claim 10 is invalid for the reasons discussed above in Ground 3. R2-060429 in view of R1-060187 discloses “wherein the control channel and the downlink shared channel are physical channels.” Figure xy of R1-060187, shown below, discloses both the Physical Downlink Shared Channel (PDSCH) and Physical Downlink Shared Control Channel (PDSCCH) as physical channels. A POSITA would have understood that a PDSCH is a “downlink shared channel” because, as Sol IP has proposed to construe the term and under the Court’s preliminary construction, it is a shared channel used for downlink. A PDSCCH is a physical control channel.

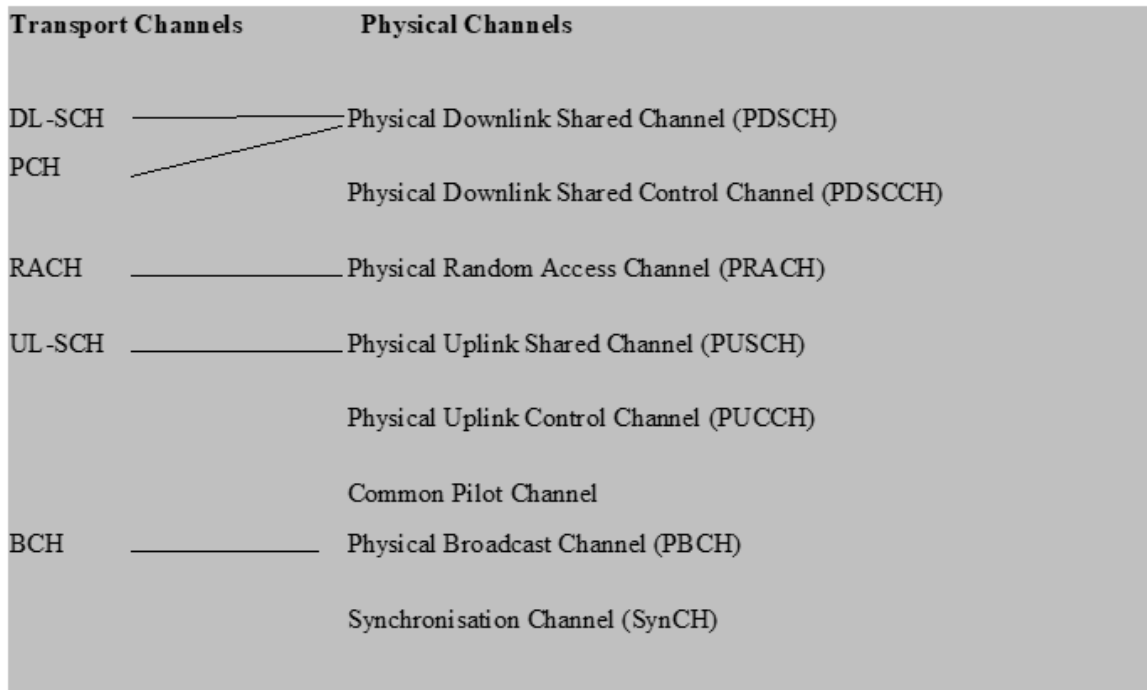


Figure xy: Transport-channel to physical-channel mapping

Ex. 1012 at Figure xy.

2. A POSITA would have been motivated to combine R2-060429 with R1-060572, R1-060576, and R1-060187

a. Motivation to Combine R2-060429 with R1-060572 and R1-060576

113. As explained above in § IX.A.3 for Ground 1, a POSITA would have been motivated to combine R2-060429 with R1-060572 and R1-060576.

b. Motivation to Combine R2-060429 with R1-060187

114. A POSITA would also have been motivated to combine the teachings of R2-060429 with R1-060187. Each of these references relates to paging in a cellular communication system. *See, e.g.*, Ex. 1010 at 2 (“[T]he [paging channel] PCH carries broadcast data of Paging Information, and that the UE listens to the

PCH in either continuous or DRX mode depending on their state for power-saving purposes.”); R1-060187 (“Note that the Paging Indicator Channel (PCH) is carried with other L1/L2 control information on PDSCCH.”). More specifically, each of these references were paging contributions proposed for 3GPP’s standardization of the fourth-generation cellular communication system known as LTE. *See, e.g.*, Ex. 1010 at 1 (“We provide in this part an analysis of some of the points relating to the Paging Channel in [1] in order to extend the model for the Paging Channel in the E-UTRAN.”); R1-060187 (“Included in this contribution is a text proposal for mapping from DL Transport Channels to Physical Channel for E-UTRA.”). Each reference is also related to a common goal of efficiently using radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1010 at 1 (“[T]he [paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels such as the DL-SCH.”); R1-060187 (“Note that the Paging Indicator Channel (PCH) is carried with other L1/L2 control information on PDSCCH.”). Thus, a POSITA would have been motivated to combine the proposed solutions in these references.

115. A POSITA would also have been motivated to combine R1-060187’s teaching of the Physical Downlink Shared Channel (PDSCH) and Physical Downlink Shared Control Channel (PDSCCH) as physical channels that can be used

in R2-060429. R2-060429 discloses that “[paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels such as the DL-SCH.” Ex. 1010 at 1. The same paging channel (PCH) and downlink shared channel (DL-SCH) are both shown in Figure xy of R1-060187 mapped to the Physical Downlink Shared Channel (PDSCH), highlighted below.

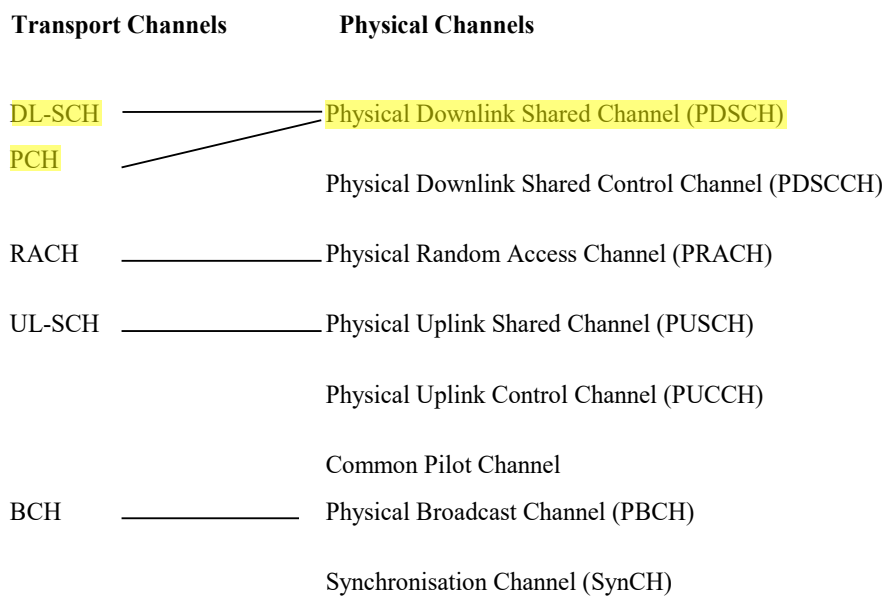


Figure xy: Transport-channel to physical-channel mapping

Ex. 1012 at Figure xy. Thus, it would have been obvious to a POSITA that the “physical resources that can be shared with other traffic or control channels” disclosed in R2-060429 can be the physical downlink shared channel (PDSCH) that the downlink shared channel (DL-SCH) transmits on and the Physical Downlink Shared Control Channel (PDSCCH) that control signals transmit on.

C. Ground 3: Claims 10 and 11 are Obvious Under 35 U.S.C. § 103(a) Over R2-060988 in View of R1-060572 and TR 25.814

116. I first address how the cited prior art references render the challenged claims 10 and 11 obvious. I then identify exemplary reasons why a POSITA would have combined the cited prior art references.

1. Claim 10

a. Claim 10: [10.1] “A method for transmitting paging information, performed in a base station, the method comprising:”

117. To the extent the preamble is limiting, R2-060988 discloses a “method for transmitting paging information, performed in a base station.” R2-060988 “discusses the paging mapping and paging control procedure.” Ex. 1007 at 4. It is a paging control procedure for the eNodeB, which is a base station, to communicate paging information to a user equipment. “If there is [a] paging message coming from aGW [access gateway], the eNodeB sends paging indicator and resources indicating of DPSCCH on DSCCH when the paging occasion comes . . . UEs in LTE-IDLE monitor the DSCCHs that may carry paging indicators with DRX period.” Ex. 1007 at 2.

b. [10.2] “when a paging information is generated, allocating the paging information to a downlink shared channel;”

118. R2-060988 discloses “when a paging information is generated, allocating the paging information to a downlink shared channel.” R2-060988

discloses that “[i]f there is paging message coming from aGW, the eNodeB sends paging indicator and resources indicating of DPSCCH on DSCCH when the paging occasion comes, and set the PI-ID in the DSCCH frame instead of C-RNTI at the same time.” Ex. 1007 at 2. R2-060988 further discloses the contrasting situation where paging information is not generated as it describes that “[i]f the UE-ID is not the PI-ID, it means there is no paging information.” *Id.*

119. When paging information is generated, R2-060988 discloses that “[i]t is proposed that the PCH is mapped on the *downlink physical shared channel*, and the paging indicating channel is combined with downlink shared control channel.” Ex. 1007 at 1 (emphasis added). Specifically, R2-060988 discloses that “PCH can be mapped on the downlink physical shared channel (named as DPSCCH for short).” A POSITA would have understood that the DPSCCH is a downlink shared channel under Patent Owner’s proposed construction and the Court’s Preliminary Construction.

120. To the extent R2-060988 is found not to does not disclose “allocating the paging information to a downlink shared channel,” R2-060988 in view of R1-060572 would have rendered this limitation obvious under both side’s proposed construction for “downlink shared channel.” As disclosed in R1-060572, “paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted using the DL-SCH or, more exactly, the

physical-layer characteristics of transfer of paging messages and system information can be assumed to be a sub-set of the possible physical-layer characteristics of DL-SCH transmission.” Ex. 1008 at 2.

- c. **[10.3] “allocating an identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel; and”**

121. R2-060988 discloses “allocating an identifier indicating existence of the paging information and a radio resource allocation information indicating radio resource to which the paging information is allocated to a control channel.” R2-060988 discloses that “[i]f the paging indicator is presented on DSCCH, the corresponding resource of DPSCCH will be utilized to transfer the data of PCH.” Ex. 1007 at 2. This discloses that a paging indicator is transmitted through the control channel as an identifier for notifying the existence of the paging channel (PCH), which contains the data of PCH. A POSITA would have understood that the data of PCH is paging information. “In the SFN #10, paging indicator is presented on DSCCH, and the PCH information appears in SFN #11.” Ex. 1007 at 2.

122. Furthermore, R2-060988 discloses that the control channel includes radio resource allocation information indicating the radio resource to which the paging information is allocated. “If there is paging message coming from aGW, the eNodeB sends paging indicator *and resources indicating of DPSCCH* on DSCCH

when the paging occasion comes, and set[s] the PI-ID in the DSCCH frame instead of C-RNTI at the same time.” Ex. 1007 at 2 (emphasis added). As disclosed in R2-060988, the paging data is carried on the DPSCCH. “When the UE-ID is PI-ID, UEs will read the paging indicator belonging to themselves. . . . the UE reads scheduling information; and receives the paging data carried on DPSCCH, and then deals with paging message.” Ex. 1007 at 2.

d. [10.4] “transmitting the control channel and the downlink shared channel to a terminal,”

123. R2-060988 discloses “transmitting the control channel and the downlink shared channel to a terminal.” R2-060988 discloses that “the PCH is mapped on the downlink physical shared channel, and the paging indicating channel is combined with downlink shared control channel.” Ex. 1007 at 1. Further, “[a]s PCH is mapped on DPSCCH and the scheduling information of DPSCCH is carried on the downlink shared control channel (named as DSCCH for short), we can combined [*sic*] the paging indicating channel into DSCCH.” Ex. 1007 at 1. A POSITA would have understood that the DSCCH is a control channel, and the DPSCCH is the physical downlink shared channel that the PCH is mapped to, which is a “downlink shared channel” under Sol IP’s proposed construction and the Court’s Preliminary Construction.

124. Moreover, Figure 1 of R2-060988 is shown below.

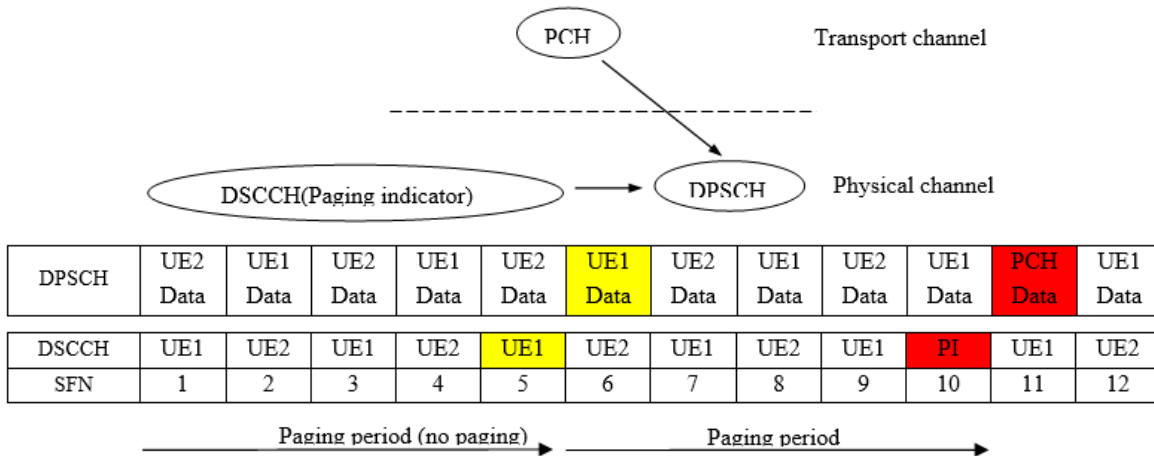


Figure 1: PCH mapping

Ex. 1007 at Figure 1 (annotated in original). R2-060988 discloses that “[i]f there is no paging, the eNodeB transfers scheduling information on the DSCCHs with a C-RNTI allocated to a UE, then transfers data on the related DPSCH. If there is [a] paging message coming from aGW, the eNodeB *sends* paging indicator and resources indicating of DPSCH on DSCCH when the paging occasion comes, and set[s] the PI-ID in the DSCCH frame instead of C-RNTI at the same time.” Ex. 1007 at 2 (emphasis added). Thus, R2-060988 discloses that the DSCCH and DPSCH are both transmitted from the eNodeB to a UE.

125. To the extent R2-060988 is found not to does not disclose “the downlink shared channel,” R2-060988 in view of R1-060572 would have rendered this limitation obvious under both side’s proposed construction for this term. As discussed above, R1-060572 discloses that “paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as data being transmitted

using the DL-SCH or, more exactly, the physical-layer characteristics of transfer of paging messages and system information can be assumed to be a sub-set of the possible physical-layer characteristics of DL-SCH transmission.” Ex. 1008 at 2. In other words, a downlink shared channel, DL-SCH can be used in place of the PCH in R2-060988. “Thus one may question if there really is a need to define specific transport-channel types (PCH and BCH) for transmission of paging messages and system information or if these should be transmitted using the DL-SCH.” Ex. 1008 at 2.

e. **[10.5] “wherein when the paging information is not generated, the identifier is not allocated to the control channel, and”**

126. R2-060988 discloses “wherein when the paging information is not generated, the identifier is not allocated to the control channel.” R2-060988 discloses that whether a PI-ID or a C-RNTI is sent on the DSCCH depends on whether there is a paging message coming from aGW. “If there is no paging, the eNodeB transfers scheduling information on the DSCCHs with a C-RNTI allocated to a UE, then transfers data on the related DPSCCH. If there is paging message coming from aGW, the eNodeB sends paging indicator and resources indicating of DPSCCH on DSCCH when the paging occasion comes, and set the PI-ID in the DSCCH frame instead of C-RNTI at the same time.” Ex. 1007 at 2. Thus, when

there is no paging information generated, a PI-ID is not allocated on the control channel DSCCH; a C-RNTI is allocated on the control channel DSCCH instead.

f. [10.6] “wherein the identifier is used by reserving and allocating a part of scheduling identifiers.”

127. R2-060988 alone, or in view of TR 25.814, discloses “wherein the identifier is used by reserving and allocating a part of scheduling identifiers.”

128. With respect to the term “scheduling identifiers,” R2-060988 discloses use of a “C-RNTI.” Ex. 1007 at 2. A POSITA would understand “C-RNTI” to refer to a “cell radio network temporary identifier,” which is a concept used in LTE to refer to an identifier of a specific terminal. Thus, the disclosure of C-RNTI encompasses both party’s proposed construction of “scheduling identifiers” and the Court’s preliminary construction.⁷

⁷ See § VI *supra* (Patent Owner’s proposed construction: “Plain and ordinary meaning. Alternatively, “scheduling identifier” means “identifier of a specific terminal or terminal group.” “Scheduling identifiers” is the plural”; Defendants’ proposed construction: “proposed construction: “cell radio network temporary identifiers (C-RNTIs)”); Ex. 1005 at 1 (Court’s preliminary construction: “identifiers that identify specific terminals or terminal groups and that are used for scheduling”).

129. R2-060988 also discloses the longer phrase “the identifier is used by reserving and allocating a part of [scheduling identifiers]” under Sol IP’s proposed construction and the Court’s preliminary construction under Patent Owner’s interpretation of the element.” My understanding is that in the Related Litigations, Sol IP is asserting that LTE meets this proposed construction because the protocol uses a paging radio network temporary identifier (P-RNTI) in addition to cell radio network temporary identifiers (C-RNTIs). R2-060988 similarly discloses a system with a paging identifier that is a reserved and allocated part of the cell radio network temporary identifiers (C-RNTIs). *See* Ex. 1007 at 2 (“Introducing a PI-ID. This PI-ID equals to C-RNTI in size, and isn’t assigned to any UE for ever. When the special PI-ID has been detected, the content carried on DSCCH is a paging indicator.”).

130. In addition, R2-060988 in view of TR 25.814 would have rendered obvious “wherein the identifier is used by reserving and allocating a part of scheduling identifiers” under Defendants’ proposed construction of “the identifier is used by reserving and allocating a part of the information included in the terminal [scheduling identifier] as a group identifier for paging information,” as well as the Court’s Preliminary Construction for this term.

131. As shown in Table 7.1.1.2.3.1-1 of TR 25.814 below, part of the downlink scheduling information required by a UE is an ID that can be either UE or group specific to specify where to transmit data.

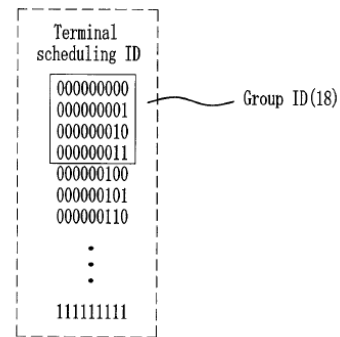
Table 7.1.1.2.3.1-1 Downlink scheduling information required by a UE

	Field		Size	Comment
Cat. 1 (Resource indication)	<u>ID (UE or group specific)</u>		<u>8-9</u>	<u>Indicates the UE (or group of UEs) for which the data transmission is intended</u>
	<u>Resource assignment</u>		<u>FFS</u>	<u>Indicates which (virtual) resource units (and layers in case of multi-layer transmission) the UE(s) shall demodulate.</u>
	<u>Duration of assignment</u>		<u>2-3</u>	<u>The duration for which the assignment is valid, could also be used to control the TTI or persistent scheduling.</u>
Cat. 2 (transport format)	<u>Multi-antenna related information</u>		<u>FFS</u>	<u>Content depends on the MIMO/beamforming schemes selected.</u>
	<u>Modulation scheme</u>		<u>2</u>	<u>QPSK, 16QAM, 64QAM. In case of multi-layer transmission, multiple instances may be required.</u>
	<u>Payload size</u>		<u>6</u>	<u>Interpretation could depend on e.g. modulation scheme and the number of assigned resource units (c.f. HSDPA). In case of multi-layer transmission, multiple instances may be required.</u>
Cat. 3 (HARQ)	<u>If asynchronous hybrid ARQ is adopted</u>	<u>Hybrid ARQ process number</u>	<u>3</u>	<u>Indicates the hybrid ARQ process the current transmission is addressing.</u>
		<u>Redundancy version</u>	<u>2</u>	<u>To support incremental redundancy.</u>
		<u>New data indicator</u>	<u>1</u>	<u>To handle soft buffer clearing.</u>
	<u>If synchronous hybrid ARQ is adopted</u>	<u>Retransmission sequence number</u>	<u>2</u>	<u>Used to derive redundancy version (to support incremental redundancy) and 'new data indicator' (to handle soft buffer clearing).</u>

Ex. 1009 at Table 7.1.1.2.3.1-1 (annotated). Similarly, the '066 patent discloses a process that reserves a part of UE/terminal-specific IDs to allocate as a group ID for paging:

As shown in FIG. 5, the present invention is operated by reserving and allocating a part of the information included in the terminal scheduling ID as a group ID for paging information. The group ID is an ID used by reserving and allocating a part of a scheduling ID (i.e., a cell radio network temporary identifier (C-RNTI)) for uniquely identifying a terminal. A base station may operate by reserving at least one scheduling ID.

FIG. 5



Ex. 1001 at 6:3-10 (emphasis added). Additionally, reserving and allocating specific data as a group ID was a well known process solidly within the skill set of a POSITA, and is a design choice that would be obvious to try. And to the extent not already disclosed by R2-060988, a POSITA would have been motivated to combine its knowledge of reserving and allocating part of specific values as a group ID with R2-060988's disclosure of "the UE-ID is PI-ID" (Ex. 1007 at 2) in order to develop a more efficient system and utilize existing resources (e.g., UE-specific IDs) to add additional functionality (e.g., use as a group paging ID).

2. Claim 11

- a. **Claim 11: "The method of claim 10, wherein the control channel and the downlink shared channel are physical channels."**

132. R2-060988 discloses "wherein the control channel and the downlink shared channel are physical channels." R2-060988 discloses that "the PCH is mapped on the downlink physical shared channel, and the paging indicating channel is combined with downlink shared control channel." Ex. 1007 at 1. Further, "[a]s

PCH is mapped on DPSCH and the scheduling information of DPSCH is carried on the downlink shared control channel (named as DSCCH for short), we can combined [sic] the paging indicating channel into DSCCH.” A POSITA would have understood that the DSCCH is a control channel, and the DPSCH is the physical downlink shared channel that the PCH is mapped to.

133. Figure 1 of R2-060988 is shown below.

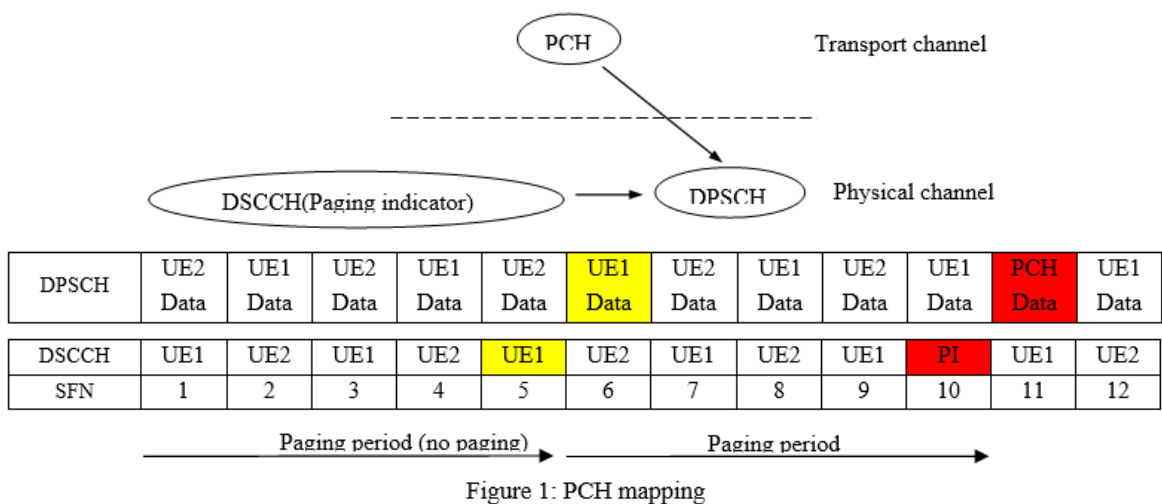


Figure 1: PCH mapping

Ex. 1007 at Figure 1 (annotated in original). As disclosed in Figure 1 of R2-060988, both the DSCCH and DPSCH are physical channels.

- 3. A POSITA would have been motivated to combine R2-060988 with R1-060572 and TR 25.814
 - a. Motivation to Combine R2-060988 with R1-060572

134. A POSITA would have been motivated to combine the teachings of R2-060988 with R1-060572, as each of these references relates to transport channels for paging and system information in a cellular communication system. See, e.g., Ex.

1007 at 2 (“As [paging channel] PCH is mapped on [downlink physical shared channel] DPSCCH and the scheduling information of DPSCCH is carried on the downlink shared control channel (named as DSCCH for short), we can combined [*sic*] the paging indicating channel into DSCCH.”), Figure 1; R1-060572 (“Thus one may question if there really is a need to define specific transport-channel types (PCH and BCH) for transmission of paging messages and system information or if these should be transmitted using the DL-SCH.”). Specifically, each of these references were paging contributions proposed for 3GPP’s standardization of the fourth-generation cellular communication system known as LTE. *See, e.g.*, Ex. 1007 at 1 (“It is proposed that the PCH is mapped on the downlink physical shared channel, and the paging indicating channel is combined with downlink shared control channel.”); R1-060572 (“the BCCH and PCCH could be mapped to the DL-SCH, leading to a more simple E-UTRA transport-channel structure.”). R2-060988 and R1-060572 are related to a common goal of efficiently using radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1007 at 4 (“The PCH is mapped on the DPSCCH, and the paging indicating channel is combined with DSCCH. The radio resource is saved if the schemes were adopted and the scheduling of radio resource [*sic*] is very flexible.”); Ex. 1008 at 2 (“paging messages (‘PCCH’) and system information (‘BCCH’) can be transmitted in the same way as

data being transmitted using the DL-SCH.”). Thus, a POSITA, would have been motivated to combine proposed solutions in these references.

135. A POSITA would also have been motivated to combine R1-060572’s teaching of mapping a paging message to the transport downlink shared channel (DL-SCH), rather than a separate transport paging channel (PCH) as disclosed in R2-060988, because both references contemplate how to best map transport channels to physical channels to achieve the common goal of efficiently using radio resources efficiently.

b. Motivation to Combine R2-060988 with TR 25.814

136. A POSITA would have been motivated to combine the teachings of R2-060988 with TR 25.814. R2-060988 discusses the underlying motivation for developing a paging procedure for the next generation cellular standard, which is the efficient use of radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1007 at 1 (“While no paging, the DPSCCH doesn’t carry any content of PCH to save the radio resource.”). TR 25.814 has a similar purpose. TR 25.814 is to help “define and describe the potential physical layer evolution under consideration and compare the benefits of each evolution techniques” for the next generation cellular system, i.e., Evolved UTRA or LTE. Ex. 1009 at 8. Further, TR 25.814 is described as a “living document” and is updated and presented at TSG-RAN meetings. *Id.* As discussed above, R2-060988 is a written contribution

submission at the 3GPP RAN1/RAN2 joint meeting on LTE in Athens, Greece held on March 27-31, 2006. Thus, it is the exact type of document that contributes to updating the “living document” TR 25.814. Indeed, R2-060988 lists “[2] TR25.814 ‘Physical Layer Aspects for Evolved UTRA’” under “References.” Ex. 1007 at 5.

137. A POSITA would also have been motivated to combine TR 25.814’s teaching of using an ID that indicates a specific UE or a group of UEs as the paging indicator in R2-060988. § 7.1.1.2.3.1 of TR 25.814 discusses “[d]ownlink scheduling information [] used to inform the UE how to process the downlink data transmission.” Ex. 1009 at 26 (§ 7.1.1.2.3.1). Paging information is a type of downlink data transmission, and R2-060988 provides for “[t]wo solutions . . . for distinguishing the paging indicator and scheduling information on [physical downlink shared control channel] DSCCH.” Ex. 1007 at 2. Thus, it would have been obvious to a POSITA to consider techniques disclosed in TR 25.814, such as what kind of “ID (UE or group specific)” (Ex. 1009 at Table 7.1.1.2.3.1-1) to use as a scheduling identifier, and combine them with techniques disclosed in R2-060988, e.g., “the eNodeB sends paging indicator and resources indicating of DPSCCH on DSCCH when the paging occasion comes” (Ex. 1007 at 2), in developing a paging procedure for the next generation cellular standard. In addition, a POSITA would be motivated to include a group ID because paging sometimes requires sending cell-

wide information, such as for the group of UEs in an area, and not information that is specific for any particular UE. Including a group ID for these group messages saves radio resources that would otherwise be required in allocating paging identifiers that are specific to each UE in a cell.

D. Ground 4: Claim 16 is Obvious Under 35 U.S.C. § 103(a) Over R2-060988 in View of R1-060572, TR 25.814, and R2-060429 (to the extent necessary)

138. I first address how the cited prior art references render the challenged claim 16 obvious. I then identify exemplary reasons why a POSITA would have combined the cited prior art references.

1. Claim 16

a. Claim 16: “The method of claim 10, wherein the terminal is in Radio Resource Control (RRC) Connected state.”

139. Claim 10 is invalid for the reasons discussed above in Ground 1. Furthermore, R2-060988 alone or in view of R2-060429 discloses “wherein the terminal is in Radio Resource Control (RRC) Connected state.” R2-060988 discloses that “UEs in LTE_ACTIVE state decide next execution based on the UE-ID taken on DSCCH like current system.” Ex. 1007 at 2; *see also id.* at 4 (“figure 3. The control procedure of Active UE using paging tag.”). A POSITA would have understood that LTE_ACTIVE state is when a UE is in a RRC Connected state. Thus, R2-060988 discloses that the paging control procedure also executes the same

as the current system when the UE is in the RRC Connected state, i.e., LTE_ACTIVE state.

140. To the extent R2-060988 is found not to does not disclose “wherein the terminal is in Radio Resource Control (RRC) Connected state,” R2-060988 in view of R1-060429 would have rendered this limitation obvious. R2-060988 discloses a paging method where “UEs in LTE-IDLE monitor the DSCCHs that may carry paging indicators with DRX period.” Ex. 1007 at 2. R2-060429 discloses that a paging method in DRX mode could also be used wherein the terminal is in a RRC connected state, i.e., in an RRC Active mode. “In LTE RRC Active mode, a UE may monitor the PCH in continuous mode or in DRX mode (in LTE-MAC level).” Ex. 1010 at 2.

2. A POSITA would have been motivated to combine R2-060988 with R1-060572, TR 25.814, and R2-060429

a. Motivation to Combine R2-060988 with R1-060572 and TR 25.814

141. As explained above in § IX.C.3 for Ground 3, a POSITA would have been motivated to combine R2-060988 with R1-060572 and TR 25.814.

b. Motivation to Combine R2-060988 with R2-060429

142. A POSITA would also have been motivated to combine the teachings of R2-060988 with R2-060429. Each of these references relates to paging in a cellular communication system. *See, e.g.*, Ex. 1007 at 1 (“This document discusses the PCH mapping and paging control in the physical layer.”); Ex. 1010 at 2 (“[T]he

[paging channel] PCH carries broadcast data of Paging Information, and that the UE listens to the PCH in either continuous or DRX mode depending on their state for power-saving purposes.”). More specifically, each of these references were paging contributions proposed for 3GPP’s standardization of the fourth-generation cellular communication system known as LTE. *See, e.g.*, Ex. 1007 at 1 (“It is proposed that the PCH is mapped on the downlink physical shared channel, and the paging indicating channel is combined with downlink shared control channel.”); Ex. 1010 at 1 (“We provide in this part an analysis of some of the points relating to the Paging Channel in [1] in order to extend the model for the Paging Channel in the E-UTRAN.”). Each of these references is related to a common goal of efficiently using radio resources for paging transmission from the base station to the UE. *See, e.g.*, Ex. 1007 at 1 (“While no paging, the DP-SCH doesn’t carry any content of PCH to save the radio resource.”); Ex. 1010 at 1 (“[T]he [paging channel] PCH will be a separate transport channel from the Downlink Shared Channel (DL-SCH), while being mapped to physical resources that can be shared with other traffic or control channels such as the DL-SCH.”). Thus, a POSITA, would have been motivated to combine proposed solutions in these references.

143. A POSITA would also have been motivated to combine R2-060429’s teaching of paging procedures that can be used in both “LTE Idle mode” and “LTE RRC Active mode.” Ex. 1010 at 2. R2-060429 discloses that “[i]n LTE RRC Active

mode, a UE may monitor the PCH in continuous mode or in DRX mode (in LTE-MAC level).” *Id.* R2-060988 discloses a paging procedure for “UEs in LTE-IDLE [to] monitor the DSCCHs that may carry paging indicators with DRX period.” Ex. 1007 at 2. It would have been obvious to a POSITA to use R2-060988’s paging procedure in LTE RRC Active mode, because a UE may still monitor the physical downlink shared control channel (DSCCH) with DRX period in LTE RRC Active mode, as disclosed in R2-060429.

X. CONCLUSION

144. This declaration represents my opinions that I have formed up to date and are based on the materials currently available to me. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information that becomes available to me and on my continuing analysis of the materials already provided.

145. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code. I hereby declare that the foregoing is true and correct to the best of my knowledge subject to the laws of perjury of the United States.

Wayne E. Stark

Dr. Wayne Stark

Date: _December 10, 2019_