

Exhibit 1003

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCL Communication Technology Holdings Limited
TCT Mobile International Limited
TCT Mobile, Inc.
TCT Mobile US Inc.

Petitioners

v.

Mitsubishi Electronic Corporation

Patent Owner.

Case No. IPR2023-00957

U.S. Patent No. 9,635,656

**DECLARATION OF MARK R. LANNING IN SUPPORT OF PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,635,656**

***Expert Declaration of Mark R. Lanning In Support of
Petition for Inter Partes Review of U.S. Patent No. 10,499,656***

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Exhibit No.	Description
1001	U.S. Patent No. 9,635,656 (“the ’656 Patent”)
1002	Excerpts of Prosecution history of U.S. Patent No. 9,635,656 (“Prosecution History”)
1003	Declaration of Mark R. Lanning
1004	C.V. of Mark R. Lanning
1005	MELCO Complaint for Case No.: 8:22-cv-1073-CJC-DFM.
1006	Stipulation Not to Assert the Same Grounds in parallel District Court Litigation
1007	Joint Claim Construction and Prehearing Statement, Case No.: 8:22-cv-1073-CJC-DFM.
1008	Plaintiff’s Opening Claim Construction Brief, Case No.: 8:22-cv-1073-CJC-DFM.
1009	Defendants’ Opening Claim Construction Brief, Case No.: 8:22-cv-1073-CJC-DFM.
1010	Certified English Translation of Japanese Patent Application JP 2006-33778 (“Umesh”)
1011	3GPP TS 25.309 V6.6.0 (2006-03). FDD Enhanced Uplink; Overall description; Stage 2 (Release 6).
1012	R1-060583. A 3GPP Standard Contribution to TSG-RAN WG1 #44, Denver, CO, USA, February 13-17, 2006 (“R1-060583”).
1013	About the 3GPP webpages saved on 4/25/2021.
1014	3GPP Working Procedures webpages saved on 4/25/2021.
1015	3GPP Delegates Corner webpages saved on 4/25/2021.
1016	3GPP FAQs webpages saved on 4/25/2021.

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1017	3GPP TDoc List showing Ex. 1014 LISTSERV - 3GPP_TSG_RAN_WG1 Archives - LIST.ETSI.ORG.
1018	Directory Listing showing Ex. 1012 /ftp/tsg_ran/WG1_RL1/TSGR1_44/Docs.
1019	Exhibit B to Plaintiff's Preliminary Infringement Contention
1020	3GPP TS 25.214-670 (2005-09). Physical layer procedures (FDD) (Release 6) ("TS 25.214")
1021	3GPP TS 25.321-660 (2005-09). Medium Access Control (MAC) protocol specification (Release 6) ("TS 25.321").
1022	Approved Report of 3GPP TSG RAN WG1 #44 meeting (R1-061099)
1023	M. Miyake, "A Survey on Progress and Standardization Trends in Wireless Communications", <i>Journal of Communications</i> , vol. 4, no. 7, August 2009.
1024	Japanese version - Japanese Patent Application JP 2006-33778 ("UMESH")

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I, Mark R. Lanning, declare as follows:

I. INTRODUCTION

1. My name is Mark R. Lanning, and I have been retained by the Petitioners to offer technical opinions relating to U.S. Patent No. 9,635,656 (“the ’656 Patent”) and prior art references relating to its subject matter. My extensive experience with 2G, 3G and 4G LTE cellular networks and their standards provides me with an understanding of the subject matter described and claimed in the ’656 Patent.

2. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the ’656 Patent. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the ’656 Patent and the prior art discussed below.

3. I have no financial interest in the party or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

II. PROFESSIONAL BACKGROUND AND QUALIFICATIONS

4. I have extensive experience in the field of telecommunications including circuit-switched networks; multiple generations of cellular networks; and packet-switched networks.

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5. Further details on my education, work experience, and the cases in which I have previously given testimony in the past four years are contained in my curriculum vitae (CV). Ex. 1004.

6. I am currently the president of two consulting companies: Telecom Architects, Inc. and Reticle Consulting, LLC. Telecom Architects provides consulting services to fixed and wireless telecom service providers and their equipment suppliers. I have been President of Telecom Architects since 1999.

7. I have over 40 years of experience working in the telecommunications industry that began in the U.S. Army Signal Corp. My experience relevant to this case includes my work as an architect of various telecommunications systems and my work developing equipment used in telecommunications systems. This experience includes extensive design, implementation and testing work on the wireless interface functionality (between the base station and mobile phones) for multiple generations of cellular standards.

8. I received a B.S. in Computer Science from Southern Methodist University (SMU) in 1983.

9. DSC, now a part of Alcatel, hired me in 1983 where I was a software development manager on the team responsible for turning DSC's PSTN telephone switch into a Mobile Switching Center (MSC) for Motorola to sell as a part of their cellular product offering in the U.S. and many other countries.

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10. In 1991, I began working as a consultant to Motorola for its “SuperCell” base station product and as a consultant to British Telecom to upgrade its current analog cellular network and I was one of the network architects responsible for the design and rollout of its Global System for Mobile Communications (GSM) network known as Cellnet. Beginning in the early 1990s, I was responsible for implementation of the SMS service, including working with suppliers of the SMS Center (SMSC), Mobile Switching Centers (MSCs) and cellular phones to define and roll out the functionality that was to be provided.

11. I was personally involved with Nokia, Ericsson, Motorola and other equipment suppliers in this effort.

12. Since 1995, I have also provided second generation (2G) and third generation (3G) Code Division Multiple Access (“CDMA”) network architecture and equipment design and implementation consulting services to companies such as Sprint, Nextel, Nokia, and Ericsson. While consulting to Nextel, which has since become part of Sprint, as one of the network architects for its iDEN network, one of my responsibilities was to define the network and mobile phone functionality required to support MMS and advanced data communications capability.

13. In addition to my cellular experience listed above, for at least the past ten years, I have kept up to date my knowledge of the present-day 3G, 4G, and 5G cellular network and wireless standards and their associated equipment and

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protocols. I have done this through my study of each new release of these standards, technical books and trade publications as well as my expert work in legal cases, which has involved evaluating the functionality of many different types of network equipment, mobile devices, and baseband chipsets. I have also evaluated thousands of cellular technology patents and most of these were for cellular phone and/or base station functionality.

14. I have also been responsible for the procurement, configuration and implementation of multiple types of Wi-Fi networks and have served as a technical expert on multiple cases regarding Wi-Fi standards, technology, chipsets and products.

15. I am a member of the Institute of Electrical and Electronics Engineers (IEEE), including the IEEE Standards Association. I am also a member of the Association for Computing Machinery (ACM). While employed at DSC, I was a member of the ANSI T1 and T1X1 standard groups responsible for the definition and standardization of the Advanced Intelligent Network (AIN) and Signaling System 7 (SS7) protocol.

16. I was retained as a technical expert by TCL Communication Technology Holdings Limited, TCT Mobile International Limited, TCT Mobile, Inc., and TCT Mobile US Inc., (“Petitioners”)

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III. DOCUMENTS AND OTHER MATERIALS REVIEWED

17. In forming the opinions set forth in this declaration, I have reviewed the documents Identified in the Exhibit List and the prosecution history of the '656 Patent and of the patents and patent applications to which it claims priority.

18. Additionally, I have utilized my own experience and expertise, including that regarding the knowledge and capabilities of a person of ordinary skill in the relevant art in the timeframe of the claimed priority date of the '656 Patent.

IV. UNDERSTANDING OF THE LAW

A. Date of Invention

19. I have been asked to use the date of the filing of the earliest application to which priority is claimed, October 27, 2006, as the date of invention for purposes of my analysis (“priority date”).

B. Obviousness

20. I am a technical expert and do not offer any legal opinions. However, counsel has informed me that in proceedings before the USPTO, claim terms are to be given the meaning they would have to a person having ordinary skill in the art at the time of the alleged invention (“POSITA”), taking into consideration the patent, its file history, and secondarily, any applicable extrinsic evidence (e.g., dictionary definitions).

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21. I am informed by Counsel and understand that a patent claim is invalid under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person having ordinary skill in the art to which the subject matter pertains. Obviousness, as has been explained to me, is based on (i) the scope and content of the prior art, (ii) the differences between the prior art and the claim, (iii) the level of ordinary skill in the art, and (iv) any secondary indicia of non-obviousness (e.g., “secondary considerations” such as commercial success in the marketplace of the claimed invention), to the extent that they exist.

22. I further understand that obviousness may be shown by showing that it would have been obvious to combine the teachings of more than one item of prior art. In determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices (methods, or products) in the same way;

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- Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- Applying a technique or approach that would have been obvious to try (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to a person having ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

23. I further understand that an invention may be obvious if one of ordinary skill in the art, facing a wide range of needs created by developments in the field, would have seen an obvious benefit to the solutions tried by the applicant. When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, it may be obvious to a person of ordinary skill to try the known options. If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique would have been obvious.

24. I further understand that a person of ordinary skill in the art is a hypothetical person who is presumed to be aware of all the relevant art at the time

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of the invention. The person of ordinary skill is not an automaton and may be able to fit together the teachings of multiple patents and/or printed publications employing ordinary creativity and the common sense that familiar items may have uses in another context or beyond their primary purposes.

25. I also understand that when considering the obviousness of a patent claim, one should consider whether a teaching, suggestion, or motivation to combine the references exists to avoid impermissibly applying hindsight when combining or modifying the prior art. I understand this test should not be applied rigidly, but that the test can be important to avoid such hindsight.

26. I also understand that one of ordinary skill in the art must have a reasonable expectation of success in combining or modifying prior art references.

27. I also understand that all elements of a claim must be considered in an obviousness analysis.

C. Standard of Proof

28. I understand that the standard to prove unpatentability in an *inter partes* review proceeding is by a preponderance of the evidence, which means more likely than not.

V. LEVEL OF ORDINARY SKILL

29. I have considered the level of ordinary skill in the art relevant to the '656 Patent. I understand that factors such as the education level of those working

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in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art.

30. After reviewing the '656 Patent, the relevant portions of the prosecution history of the '656 Patent, and cited references, it is my opinion that the relevant art of the '656 Patent is in the general field of wireless communication systems and more specifically it is focused on some of the functionality used in Long Term Evolution (LTE) 4G cellular networks. *See* Ex. 1001, 1:17-23.¹

31. Specifically, the '656 Patent relates to techniques for “a communication method for an uplink control signal which this mobile terminal transmits to a base station.” *Id.* at 1:20-23.

32. The '656 Patent is said to relate to:

[A] data communication method with which a mobile terminal carries out a response signal transmission process of transmitting a response signal to a base station by using an uplink control channel in an uplink direction from the mobile terminal to the base station, a scheduling request signal transmission process of transmitting a scheduling request signal to the base station by using a physical channel different from the

¹ All cites to the exhibits are to the original exhibit page numbers.

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uplink control channel when transmission data to be transmitted to the base station occur, and a control process of, when a processing timing of the response signal transmission process coincides with that of the scheduling request signal transmission process, stopping the response signal transmission process during a time interval during which the mobile terminal transmits the scheduling request signal.

Ex. 1001 at 7:53 – 8:3.

33. Based upon my knowledge of this field, I conclude that a POSITA at the time of the alleged invention of the '656 Patent, and for that matter, at all subsequent times through the present, would have held at least a degree in electrical engineering, computer engineering, computer science or a similar discipline, with at least two years of relevant industry or research experience, including experience designing, planning, or implementing cellular networks. Additional work or research experience can substitute for less or different education, and vice versa. A person of ordinary skill in the art would also have had familiarity with the 3GPP technical standards. *See e.g.*, Ex. 1001, 1:40-50 and 7:4-9.

34. I am and was at the time of the alleged invention, at least a person of skill in the relevant art, of a level at least as high as or more than ordinarily skilled persons, and I can provide insight and opinions into the understandings of such persons at all relevant times by virtue of my education, training, and experience.

VI. RELEVANT TECHNOLOGY BACKGROUND

35. The '656 Patent states that its invention is for 4G LTE cellular networks and provides five “Nonpatent references” that are regarding the 3GPP 4G LTE standard (Ex. 1001 at 7:4-8). The 3GPP 4G LTE standard was/is known to require Orthogonal Frequency Division Multiplexing (OFDM) on the downlink and SC-FDMA on the uplink before the '656 Patent as it concedes by the following passages. LTE uses, as its access method, OFDM (Orthogonal Frequency Division Multiplexing) for the downlink direction and uses SC-FDMA (Single Carrier Frequency Division Multiple Access) for the uplink direction. (Ex. 1001 at 1:55-59.)

36. However, I note that Claims 1 and 2 require a base station using “an OFDM (Orthogonal Frequency Division Multiplexing) method” (Ex. 1001 at 71:10-12 and 71:37-39), which is the downlink interface used by 4G LTE as described above. However, the Challenged Claim does not require any specific type of downlink or uplink air interface. In other words, claim 3 does not require an LTE downlink or uplink air interface.

A. The 3GPP Standards Organization

37. The 3GPP is a standards-setting organization. As cellular telecommunications technology developed in the late 1980s, network operators recognized that standardization was necessary to ensure subscriber mobility and compatibility of equipment provided from multiple suppliers. Thus, the 3GPP began

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in 1998 when the European Telecommunications Standards Institute (ETSI) and other standard development organizations as well as several telecommunications companies formed a partnership to develop and standardize various aspects of 2G, 3G, and 4G mobile network operator systems. *See* Ex. 1013 at pp. 1, 4 and Ex. 1014 at p. 1.

38. The 3GPP is a group enterprise. Within the larger 3GPP umbrella are four primary plenary Technical Specification Groups (“TSGs”) (*e.g.*, the Systems and Architecture (“SA”) group), under which are several working groups (*e.g.*, Systems and Architecture Working Group 2 (“SA-2” or “S2”)). The meetings for each plenary and working group are numbered sequentially (*e.g.*, TSG RAN WG1, Meeting #40; TSG RAN WG1, Meeting #41).² In my experience, the working groups met roughly every month and were responsible for drafting and editing specific standards and change requests. All change requests had to be approved by the plenary group before the change requests were incorporated into a specific release of the standard. *See* Ex. 1013 at pp. 1-2.

39. Major changes to the 3GPP standard are defined in “**Releases**,” which comprise many Technical Specifications (TS) and in my experience certain groups of releases are informally referred to as a “**generation**.” *See also* Ex. 1013 at pp. 1-

² RAN stands for Radio Access Network.

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2. As shown by the table below, each generation of cellular network has multiple releases.

Generation	Release	End Date ³
“2G”	Release 98	2/12/1999
“3G” or “UMTS”	Release 99	12/17/1999
	Release 4	6/21/2001
	Release 5	9/12/2002
	Release 6	9/28/2005
	Release 7	3/13/2008
“4G” or “LTE”	Release 8	3/12/2009
	Release 9	3/25/2010
...	...	...

a. 3GPP Documentation

40. Standardization by the 3GPP at the time of the '656 Patent was a collaborative effort and remains so today regarding new generations and Releases. It involves hundreds of engineers from companies that are interested in developing the technology. Each 3GPP working group typically holds monthly meetings in different locations around the world. The members of the working group submit

³ All these end dates are available on the 3GPP website. *See Releases*, 3GPP: The Mobile Broadband Standard, <http://www.3gpp.org/specifications/67-releases>.

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written contributions (called “temporary documents” or “Tdocs”) and discussion documents. In my experience, the 3GPP has stored and controlled documents electronically, and these documents are retained on the public 3GPP server indefinitely. *See also* Ex. 1017, at pp. 2-3.

41. In my experience the general practice of the 3GPP, both now and at the time of the invention, is to make Tdocs and discussion documents publicly available prior to each meeting. Then at the meeting itself, the members publicly discuss those Tdocs and discussion documents. Members also vote on the Tdocs and, if approved, incorporate them into the standard. *See also* Ex. 1017 at p. 1. Sometimes Tdocs are drafted, edited, or combined during the meeting. The new and edited Tdocs are given new Tdoc numbers and uploaded to the public 3GPP file server, usually soon after the meeting. Sometimes, the new and edited Tdocs are further circulated for e-mail approval—that is, they can be distributed and voted upon via e-mail.

42. In my experience, both now and at the time of the '656 Patent, Tdocs and discussion documents are publicly circulated to group members before and after meetings in two ways. First, they can be uploaded to the public 3GPP file server prior to each meeting. *See also* Ex. 1017. If so, the file will receive a date and time stamp. In my experience, the date and time stamp can be relied upon to indicate when the upload occurred, making the document available to the public on the Internet. *See* Ex. 1015, *Delegates Corner*. Second, Tdocs and discussion documents

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can be distributed to the public using the group's public e-mail exploder. *See, e.g.*, Ex. 1016 at p. 1 "Questions about 3GPP email exploder lists."

43. I provide a specific example of how the public can find and download the 3GPP TSG-RAN WG1 document R1-060583 (Ex. 1012) without a password and how it was distributed to members and other people (guests) that desired it in Section IX.C below.

B. The 3GPP 4G LTE Network Standard

44. The 3GPP LTE (4G) cellular standard was not based on a greenfield model. Instead, the LTE standard adopted many of the proven concepts that were known and used by millions of mobile terminals (UEs) in its predecessor 3G UMTS network. UMTS networks are still in operation today in the U.S. and many mobile terminals (UEs) can switch to 3G UMTS cells when they are in areas where LTE coverage is very weak or absent.

45. The two most significant changes made to the 3G UMTS standard to create the 4G LTE standard were made to the air interface and the core network protocol. The air interface is the wireless communication method and communication protocols that are used by the base stations and the mobile terminals (UEs) to communicate with each other. As described in the paragraphs directly above, the LTE standard uses an air interface for the downlink referred to as OFDM and air interface for the uplink referred to as SC-FDMA. The details of these two

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types of air interfaces are beyond the scope of this declaration. However, these are used in LTE in order to support the ever-increasing requirement for higher network data capacities and higher connection speeds with mobile terminals. The core network in a cellular system provides connections to each of the base stations in a cellular provider's network and to other communication networks like the Public Switched Telephone Network (PSTN) and Internet in order to provide mobile terminals with voice and data connections. Prior to 4G LTE, the 3G UMTS cellular core network really consisted of two subnetworks. One of these was used to carry voice calls and is referred to as a circuit-switched network. The other subnetwork was used to carry data connections and is referred to as a packet network. The 4G LTE standard only includes a packet-switched network that is used for carrying both voice and data calls.

C. The 3G UMTS Cellular Network Standard

46. Apart from 4G LTE networks using a different air interface and a packet-only core network as described directly above, LTE adopted many of the control and signaling procedures from the 3G UMTS standard. The 3G UMTS functionality that the LTE standard adopted, which is relevant to this declaration is the “*quality notification signal*” and the “*scheduling request signal*.” These functions are an integral part of the prior art 3G UMTS standard and are used in 4G LTE for the same reasons as described below.

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a. Quality Notification Signal in 3G UMTS

47. The “*quality notification signal*” in the form of a Channel Quality Indicator (CQI)⁴ signal was defined in the 3GPP UMTS standard and used in UMTS networks long before the priority date of the ’656 Patent. For example, a 3GPP UMTS Specification published at least a year before the priority date ‘656 Patent describes how a CQI value is calculated and how it is repeatedly transmitted from the UE to the base station to report the channel condition it is receiving from the base station. I note that other specific requirements regarding the transmission of the CQI are also contained in at least sections 6A.1, 6A.1.1 and 6A.2 of this specification.

6A .1.2 UE procedure for reporting channel quality indication (CQI)

~~With the exception of the provisions of subclause 6A.3, the following shall apply:~~

Release 6	35	3GPP TS 25.214 V6.7.0 (2005-09)
1) The UE derives the CQI value as defined in 6A .2.		
2) For $k = 0$, the UE shall not transmit the CQI value. For $k > 0$, the UE shall transmit the CQI value in each subframe that starts $m \times 256$ chips after the start of the associated uplink DPCCH frame with m fulfilling		
3) The UE shall repeat the transmission of the CQI value derived in 1) over the next $(N_cqi_transmit - 1)$ consecutive HS-DPCCH sub frames in the slots respectively allocated to the CQI as defined in [1]. UE does not support the case of $k' < N_cqi_transmit$.		
4) The UE shall not transmit the CQI in other subframes than those described in 2) and 3).		

⁴ The ’656 Patent describes the CQI as the quality notification signal as described in Section VII.A.f

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Ex. 1020 at pp. 34-35, (highlighting added).

48. This same Specification's change history shown below shows that the CQI requirement was added in July of 2002, at least four years before the '656 Patent.

07/06/02	RAN_16	RP-020316	259	1	Clarification of UE transmission timing adjustment with HS-DPCCH	5.0.0	5.1.0
07/06/02	RAN_16	RP-020316	260	4	Definition of CQI reporting	5.0.0	5.1.0
07/06/02	RAN_16	RP-020316	266	-	Correction to the setting of DPCCH/HS-DPCCH power difference	5.0.0	5.1.0
07/06/02	RAN_16	RP-020316	267	-	Inclusion of CQI table	5.0.0	5.1.0

Id. at 59, (highlighting added).

b. Scheduling Request in 3G UMTS

49. Like the CQI signal described directly above, a “*Scheduling Request Signal*” was defined in the UMTS standard at least a year before the priority date of the '656 Patent. As shown by the passages below from the UMTS Specification for the Medium Access Control (MAC) communications protocol, the UE transmitting a scheduling request to the base station so it can receive permission (grant) to send its data on the uplink are not novel to the '656 Patent.

50. This section describes the responsibilities of the NodeB (base station) for receiving Scheduling Requests from each UE and transmitting scheduling grants.

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4.2.4.5 MAC-e entity – UTRAN Side

There is one MAC-e entity in the Node B for each UE and one E-DCH scheduler function in the Node-B. The MAC-e and E-DCH scheduler handle HSUPA specific functions in the Node B. In the model below, the MAC-e and E-DCH scheduler comprises the following entities:

- **E-DCH Scheduling:**
This function manages E-DCH cell resources between UEs. Based on scheduling requests, Scheduling Grants are determined and transmitted. The general principles of the E-DCH scheduling are described in subclause 11.8.2.3 below. However implementation is not specified (i.e. depends on RRM strategy).
- **E-DCH Control:**
The E-DCH control entity is responsible for reception of scheduling requests and transmission of Scheduling Grants. The general principles of the E-DCH scheduling are described in subclause 11.8.2.3 below.

Ex. 1021 at p. 23, (highlighting added).

51. The following section describes the scheduling information (scheduling request) transmitted from the UE to the NodeB (base station). This section also describes the type of information contained in this scheduling request, e.g., the UE's transmit buffer occupancy to inform the NodeB the amount of data the UE needs to send.

9.2.5.3 UL Scheduling information

This control information is used by UEs to indicate to their serving E-DCH Node-B the amount of resources they require.

9.2.5.3.2 Scheduling Information

The Scheduling Information is located at the end of the MAC-e PDU and is used to provide the serving Node B with a better view of the amount of system resources needed by the UE and the amount of resources it can actually make use of. The transmission of this information will be initiated due to the quantization of the transport block sizes that can be

Id. at p. 50, (highlighting added).

52. Therefore, the “*quality notification signal*” and the “*scheduling request signal*” included in the Challenged Claim 3 are not novel to the '656 Patent.

VII. OVERVIEW OF THE '656 PATENT

A. Summary of the Disclosure of the '656 Patent

53. The '656 Patent, titled “Data communication method, communication system and mobile terminal” issued on April 25, 2017, from an application filed on December 31, 2014. This application claims priority to a Japanese patent application JP2006/292641, filed on October 27, 2006. Ex. 1001 at (30).

54. The '656 Patent invention allegedly is for a communication system “which complies with LTE” and includes at least one base station and at least one mobile terminal where the mobile terminal: (1) sends positive or negative (Ack/Nack) signal responses to the base station regarding the data packets it receives; (2) sends a downlink *quality notification signal* (“QNS”) to the base station; (3) sends a *scheduling request (SR) signal* to the base station when it has data to send; (4) sends the data to the base station after receiving permission (grant); and (5) when the transmission time of the downlink QNS coincides with the time for sending the SR signal, it stops transmitting the quality notification signal and sends the SR signal. The Challenged Claim 3 does not include any requirement/limitation for the mobile terminal to send data or to send an Ack/Nack to the base station, so explanation of these functions is limited below.

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a. Mobile Terminal Sends Ack/Nack for Received Data Packets

55. The '656 Patent describes the Mobile Terminal sending the Ack/Nack signals as follows:

When receiving data, via a downlink, from a base station, **a mobile terminal transmits a signal indicating whether the mobile terminal has received the data perfectly**, and a signal indicating either the quality of the received data or the quality of the downlink communication path to the base station via an uplink. **The response signal indicating whether the mobile terminal could receive the data correctly from the base station is referred to as an Ack/Nack**, and the quality information indicating the quality of the received data or the quality of the downlink communication path is referred to as a CQI (Channel Quality Indicator).

Ex. 1001 at 2:25-35 (emphasis added)⁵.

b. Mobile Terminal Sends Downlink Quality Notification Signal to the Base Station

56. The '656 Patent describes the Mobile Terminal sending the downlink *Quality Notification Signal* to the base station, so it knows how well the mobile terminal is receiving its communication with:

⁵ All emphasis has been added unless otherwise noted.

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When receiving data, via a downlink, from a base station, a mobile terminal transmits a signal indicating whether the mobile terminal has received the data perfectly, **and a signal indicating either the quality of the received data or the quality of the downlink communication path to the base station via an uplink.** The response signal indicating whether the mobile terminal could receive the data correctly from the base station is referred to as an Ack/Nack, and **the quality information indicating the quality of the received data or the quality of the downlink communication path is referred to as a CQI (Channel Quality Indicator).**

Ex. 1001 at 2:25-35 (emphasis added)

A CQI is a signal with which the mobile terminal notifies the downlink channel's state (the communication path's state) which the mobile terminal has measured to the base station, and the base station uses the CQI for downlink scheduling.

Id. at 2:42-45 (emphasis added)

c. Mobile Terminal Sends a Scheduling Request to the Base Station

57. The '656 Patent describes the Mobile Terminal sending a *Scheduling Request (SR) signal* to the base station in order to get permission from the base station for it to send the data on the uplink. This is done so multiple mobile terminals

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do not transmit data to the base station at the same time. This permission is typically referred to as a scheduling grant or grant as described with:

Furthermore, when data which the mobile terminal has to transmit to the base station occur, **the mobile terminal transmits a signal with which to make a request for allocation of uplink radio resources to the base station.** Such a request signal is called a **scheduling request**, an uplink resource request, or **an uplink scheduling request signal (SR: Scheduling Request).**

Id. at 2:46-50 (emphasis added)

d. Mobile Terminal Sends Data to the Base Station After Receiving Grant

58. The '656 Patent describes the mobile terminal sending data after it has received a grant from the base station with at least:

In contrast, when uplink data occurs in the mobile terminal, **the mobile terminal transmits a scheduling request SR to the base station before transmitting the uplink data.** Allocation of the SR to physical resource is implemented by monopolistically allocating one certain time-frequency region, as previously explained.

Id. at 5:62-65 (emphasis added).

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e. SR and QNS Transmission Time Coincides

59. The '656 Patent describes the situation that, when there is a time collision (time coincides) at the mobile terminal's transmitter when sending both the SR and the QNS, the QNS is stopped, and the SR is sent with:

In accordance with the present invention, there is provided a data communication method with which a mobile terminal carries out a response signal transmission process of transmitting a response signal to a base station by using an uplink control channel in an uplink direction from the mobile terminal to the base station, a scheduling request signal transmission process of transmitting a scheduling request signal to the base station by using a physical channel different from the uplink control channel when transmission data to be transmitted to the base station occur, and a control process of, **when a processing timing of the response signal transmission process coincides with that of the scheduling request signal transmission process, stopping the response signal transmission process during a time interval during which the mobile terminal transmits the scheduling request signal.**

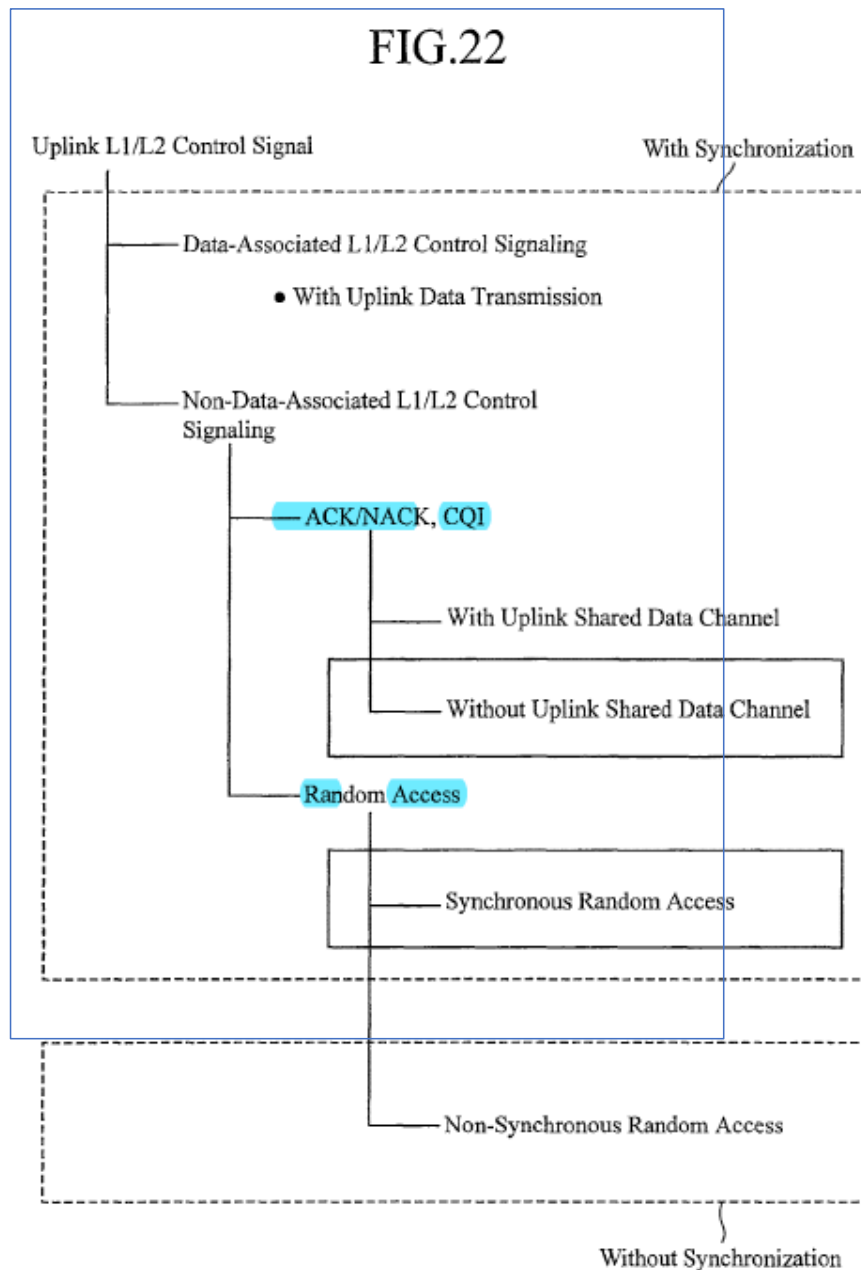
Id. at 7:55-8:3 (emphasis added).

f. L1/L2 Control Signals

60. The '656 Patent describes the “Ack/Nack, the CQI, and the SR” as “uplink L1/L2 control signals” (an L1/L2 control signaling). *Id.* at 2:52-54. The “L1/L2” control signal terminology the specification is referring to is for the first two signaling communication protocol layers that are used to format specialized data packets, fill their predefined fields with the appropriate bit values for the type of packet being sent and to send each of these specialized data packets to a peer protocol layer located in the other device. These specialized control packets are transmitted in both directions between the mobile terminal and the base station. Thus, an Ack/Nack is a packet with a predetermined format that contains either the value of an Ack or a different value for a Nack and a reference number for the received data packet, so the base station knows which packet the mobile terminal is referring to. Likewise, a CQI packet will have a predetermined format to store the measured quality value of the received communication link. This format will typically be different than the format used for an Ack/Nack or SR packets. A signaling request packet can contain information regarding the amount of data the mobile terminal needs to send or be a value as small as one or two bits in a data packet.

61. The '656 Patent describes these L1/L2 signals in relation to Fig. 22 with “FIG. 22 shown below is an explanatory drawing for explaining uplink L1/L2 control signals.”

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Id. at Fig. 22 (highlighting added)

62. As I have shown by the highlighting in Fig. 22 above, the '656 Patent discloses that the “ACK/NACK” and “CQI” signals are “non-data-associated L1/L2 control signaling” on the uplink. The SR signal is also considered to be the same

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type of L1/L2 control signaling as the “ACK/NACK” and “CQI” signals. As described below, the SR signal is transmitted on a “Random Access” channel independent of the ACK/NACK and CQI signals. The Random Access channel that is used to carry the transmission of the SR signal is also highlighted above.

As shown in FIG. 22, uplink L1/L2 control signals are roughly divided into two types of L1/L2 control signals. They are uplink-data-associated L1/L2 control signals (a data-associated L1/L2 control signaling), and **uplink-data-non-associated L1/L2 control signals** (a data-non-associated L1/L2 control signaling).

An uplink-data-associated L1/L2 control signal is information required for uplink data transmission (reception by a base station), such as a transport format, and is transmitted together with uplink data. **Uplink-data-non-associated L1/L2 control signals** include an **Ack/Nack** and **a CQI** which are relevant to a downlink, and **random access (Random Access) signals, such as a scheduling request (SR, UL SR) which is transmitted before uplink data transmission is started.**

Id. at 2:57-3:4 (emphasis added).

63. The '656 Patent also describes a situation that can occur where the transmission of the “*quality notification signal*” (CQI) can coincide with the SR signal at the mobile terminal’s transmitter.

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Not only uplink-data-associated L1/L2 control signals but also an **Ack/Nack and a CQI are transmitted in a state in which uplink time synchronization is established.** Hereafter, the fact that **there is a state** in which an Ack/Nack and/or **a CQI, and an SRA** [Synchronized Random Access Channel used to transmit a SR signal] in a case in which no uplink data transmission is carried out **are transmitted simultaneously will be mentioned, and a problem with this state and a solution of this problem will be mentioned.**

Id. at 3:19-26 (emphasis added).

64. The “problem” referred to by the passage above is the situation where a mobile terminal is required to transmit two different control signals at the same time. Based on the passage above, a possible combination for two of these control signals would be the CQI signal and SR signal, which is the specific situation required by the Challenged Claim limitation for when a CQI (downlink *quality notification signal*) and a *Scheduling Request (SR) signal* are to be transmitted simultaneously (their transmissions coincide in time). This “problem” is further described by the ’656 Patent in the passage below:

However, there may be a case in which **a mobile terminal has to simultaneously carry out a process of transmitting** an uplink Ack/Nack and **an uplink CQI** by using an Ack/Nack exclusive channel

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and a process of **transmitting an uplink scheduling request signal (SR)** by using an S-RACH or a scheduled channel, or a CQICH and an ACHCH according on its status. In this case, because those signals have no correlation among them, when transmitted simultaneously, they are not transmitted with single carrier transmission, but are transmitted with multi carrier transmission.

Id. at 7:25-36, emphasis added).

65. The '656 Patent continues to explain that negative cellular network impacts will occur if the mobile terminal is allowed to send the uplink CQI signal simultaneously with the uplink scheduling request (SR) signal. The PAPR referred to in the passage below stands for the Peak to Average Power Ratio Requirement (*Id.* at 7:19-20). The PAPR is defined as the ratio of peak power to the average power of a signal and is expressed in decibels (dB). When this value is high, the mobile terminal's transmitter uses more power and consumes its battery at a higher rate. Thus, a high PAPR is undesirable for a mobile terminal because it consumes its battery more quickly and, based on my experience, one of the key criteria used in the mobile terminal design by suppliers is maximizing the amount of battery time for each type of cellular device. Another problem that occurs when one or more mobile terminals are transmitting at a high PAPR is a significant reduction in the cell's capacity to support a maximum number of mobile terminals.

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In the case in which such signals having no correlation among them are transmitted simultaneously, **the PAPR becomes high** because the time waveforms of the transmission signals have a high peak. A problem is that **as the PAPR becomes high, the power consumption of the mobile terminal increases and therefore the cell coverage becomes narrow**. A further problem is that as the PAPR becomes high, those signals become an interference wave to other mobile terminals and the communication system.

Id. at 7:35-44, emphasis added).

66. Thus, the patent's purported solution to this problem is to not transmit both the CQI and SR signals simultaneously. Instead, when a timing collision occurs between the "*quality notification signal*" (CQI) and the "*scheduling request signal*" (SR), the transmitter is to stop transmitting the "*quality notification signal*" and transmit the "*scheduling request signal*," as required by the coinciding signals limitation in the Challenged Claim as discussed in more detail in the claim analysis section below.

i. ***The Quality Notification Signal***

67. The '656 patent describes the "*quality notification signal*" as the Channel Quality Indicator (CQI) signal that is transmitted by the mobile terminal to inform the base station the quality level that its downlink channel is being received.

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68. As discussed in the Grounds below, the “quality notification signal” (CQI) is not novel to the ’656 Patent. As discussed in Section VIII, below, in the Related Litigation Patent Owner provides no construction for this term and Petitioners construe this term as the CQI signal.

The CQI signal is discussed in the ’656 Patent as follows:

When receiving data, via a downlink, from a base station, a mobile terminal transmits a signal indicating whether the mobile terminal has received the data perfectly, and a signal indicating either the quality of the received data or **the quality of the downlink communication path to the base station via an uplink**. The response signal indicating whether the mobile terminal could receive the data correctly from the base station is referred to as an Ack/Nack, and **the quality information indicating the quality of the received data or the quality of the downlink communication path is referred to as a CQI (Channel Quality Indicator)**.

* * *

A CQI is a signal with which the mobile terminal notifies the downlink channel's state (the communication path's state) which the mobile terminal has measured to the base station, and the base station uses the CQI for downlink scheduling.

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Id. at 2:25-46 (emphasis added).

ii. ***The Scheduling Request Signal***

69. The '656 patent describes the “*scheduling request signal*” as a request for allocation of uplink radio resources as described by the passage below.

Furthermore, when data which the mobile terminal has to transmit to the base station occur, the mobile terminal **transmits a signal with which to make a request for allocation of uplink radio resources to the base station**. Such a request signal **is called a scheduling request**, an uplink resource request, or an uplink scheduling request signal (**SR: Scheduling Request**).

Id. at 2:46-53 (emphasis added).

70. A mobile terminal transmitting a SR to the base station is not novel to the '656 Patent. As described VI.B above and in the Grounds below, the “*scheduling request signal*” (SR) was known years before the '656 Patent.

B. Challenged Claim

71. I understand that the Petitioners are challenging claim 3 (the “Challenged Claim”). I note that Claim 3 is an independent claim that, unlike Claims 1 and 2, does not require, inter alia, Orthogonal Frequency Division Multiplexing (OFDM) as the downlink access method. OFDM is unique to the LTE 4G standard as taught by the '656 Patent and described above. The significance of the OFDM

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limitation not being required by Claim 3 is discussed in detail in the Claim Analysis for each of the Grounds below.

C. Prosecution History

72. Applicant filed a preliminary amendment on January 2, 2015, canceling existing claim 1 and adding new claims 2-4. Ex. 1002 at pp. 6-7. (January 2, 2015, Claims).

73. The Examiner rejected claims 2-4 under §102(e) by Ihm et al. (US 7,873,023), rejected claims 2-4 under §103(a) over Ihm in view of R2-061464, and rejected claims 2-4 under §103(a) over Ihm in view of R1-060111. *Id.* at pp. 9-26. (November 4, 2015, Non-Final Rejection). In response, the applicant argued that Ihm is silent regarding any control processor or controller that ***stops*** a quality notification process that transmits the quality notification signal when the mobile terminal transmits the scheduling request signal. *Id.* at pp. 32-33. In addition, R2-061464, like Ihm, merely suggests that a “bit indicator” may be provided as a signal from the mobile device to the base station device, and thus fails to disclose that the transmission of a “bit indicator” should cause a process that transmits a quality notification signal to be ***stopped***. *Id.* at pp. 33-34. Further, R1-060111 describes that the **scheduling request process** of the mobile station may **wait** until a concurrent transmission is completed before sending the scheduling request, but fails to teach

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or suggest ***stop*** a process that transmits a quality notification signal to a base station.
Id. at p. 35.

74. The Examiner issued a Final Rejection under §103(a) over Ihm in view of Baker et al. (US 2007/0054689 A1). *Id.* at pp. 37-48. (March 31, 2016, Final Rejection). In response, the applicant asserted that the cited references do not disclose the claimed feature of “scheduling request signal,” because Baker’s “another signal” means the signal “to enable the mobile station to make measurements on other channels in preparation for handover to another system,” but not “TPC commands” evidently. *Id.* at 49-53.

75. The Examiner disagreed with the applicant regarding Baker reference, and in an Advisory Action dated July 12, 2016, maintained the position that Baker reference was cited as teaching certain features that related to stopping a quality notification process when it coincides with another signal transmission process, not the specific term of “scheduling request signal.” *Id.* at pp. 54-56. (July 12, 2016, Advisory Action). In response, the applicant amended claim 4 to recite “a controller configured to perform a first control process that includes, when there is no radio resource available for transmitting said transmission data, enabling said transmitter to transmit said scheduling request signal to said base station, and a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping

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transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal,” and amended claims 2-3 similarly, and argued that the cited references do not disclose this feature. *Id.* at pp. 60-62. (July 28, 2016, Claims).

76. The Examiner again rejected the claims, this time adding a new reference Varma (US 2014/0177444 A1). That is, claim 2-4 are rejected under §103(a) over Ihm in view of Baker, and Varma. *Id.* at pp. 68-85. (August 31, 2016, Non-Final Rejection). In response, the applicant amended claim 4 to recite “a controller configured to perform a first control process that includes, when there is no the mobile terminal has not been allocated a radio resource available for transmitting said transmission data, enabling said transmitter to transmit transmitting said scheduling request signal to said base station, and a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal,” and amended claims 2-3 similarly. *Id.* at pp. 87-89. (November 30, 2016, Claims). On December 16, 2016, the Examiner issued a Notice of Allowance. *Id.* at pp. 96-100. (December 16, 2016 Notice of Allowance and Fees Due).

VIII. CLAIM CONSTRUCTION

A. Legal Standard

77. I understand that patent claim terms are given their ordinary and customary meaning as understood by a POSITA. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576 (Fed. Cir. 1996)). I further understand that if a claim term is to be construed, proper claim construction requires a review of the patent's intrinsic evidence and, when appropriate, extrinsic evidence. *Phillips v. AWH Corp.*, 415 F3d 1303 (Fed. Cir. 2005) (en banc). Intrinsic evidence includes the language of the claims, the specification of the patent, and the prosecution history of the patent. *Id.* at 1314.

78. It is my understanding that the '656 patent is involved in litigation in the Central District of California, captioned Mitsubishi Electric Corporation and Sisvel International S.A. v TCL. (f/k/a TCL Communication Technology Holdings Limited) et al., Case No. 8:22-cv-1073-CJC-DFM ("Related Litigation").

79. It is further my understanding that on March 23, 2023, Patent Owner and Petitioners filed their Joint Claim Construction and Prehearing Statement in the Related Litigation. (Ex. 1007). It is also my understanding that Patent Owner filed Plaintiffs Opening Claim Construction Brief in the Related Litigation (Ex. 10078 on May 4, 2023, and that Petitioners filed Defendants' Opening Claim Construction Brief in the Related Litigation (Ex. 1009) on the same date. Patent Owner and

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Petitioners disagreed on the proper construction of one term and two phrases in claim 3 of the '656 Patent as will be discussed below.

B. Terms Submitted for Construction in the Related Litigation

a. “quality notification signal”

80. Patent Owner and Petitioners dispute the construction of the term “quality notification signal.” Patent Owner’s position is that “[n]o construction is necessary” and Petitioners position is that the term should be construed as the “Channel Quality Indication (CQI) signal.” Ex. 1007 at p. 2.

81. My analysis and conclusions in this Declaration stand regardless whether the PTAB adopts the petitioners’ proposed claim construction or any other reasonable construction(s) understood by a POSITA.

b. “when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter”

82. Patent Owner and Petitioners dispute the construction of this phrase in claim 3. Patent Owner’s position is that “[n]o construction is necessary” and Petitioners position is that the phrase should be construed as the “when said [quality notification signal] is transmitted by the transmitter simultaneously with the transmission of the scheduling request signal” *Id.* at pp. 2-3.

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83. My analysis and conclusions in this Declaration stand regardless whether the PTAB adopts the petitioners' proposed claim constructions or any other reasonable construction(s) understood by a POSITA.

c. “stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal”

84. Patent Owner and Petitioners dispute the construction of this phrase in claim 3. Patent Owner's position is that “[n]o construction is necessary” and Petitioners position is that the phrase should be construed as “stopping the transmission of said [quality notification signal] during a time interval when the transmitter is also transmitting said scheduling request signal.” *Id.* at pp. 3-4.

85. My analysis and conclusions in this Declaration stand regardless whether the PTAB adopts the petitioners' proposed claim constructions or any other reasonable construction(s) understood by a POSITA.

IX. OVERVIEW OF THE PRIOR ART

86. The earliest application to which the '656 Patent purports to claim priority to is JP2006/292641, filed on Oct. 27, 2006. Ex. 1001 at 1:8-15. I understand the priority date of the '656 Patent is therefore, at the earliest, Oct. 27, 2006. Each of the references relied on in this Petition, are prior art under at least pre-AIA 35 U.S.C. §102(a).

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**A. Published Japanese Patent Application JP 2006-33778 – Umesh et al.
(Ex. 1010)**

87. Umesh et al. (“Umesh”) is a Japanese patent application that was published on February 2, 2006. It claims a priority to JP P2004-180238 filed in Japan on June 17, 2004. Ex. 1024 is an original version of this published application. Ex. 1010 is a certified English translation of this application and I understand it is prior art against the ’656 Patent under pre-AIA 35 U.S.C. §102 (a).

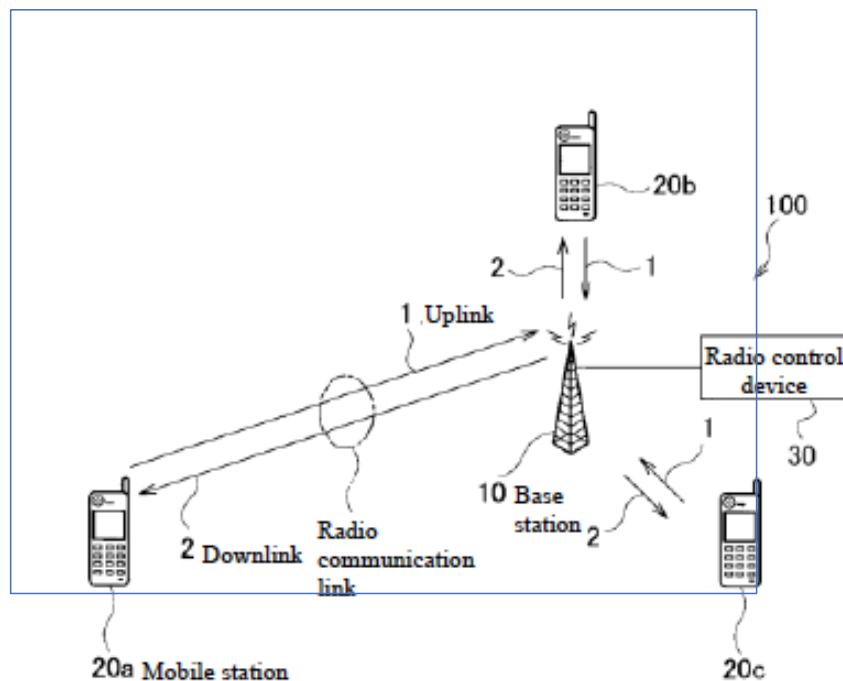
88. The title of Umesh is “Mobile Station, Base Station, Control Device, Mobile Communication System, and Mobile Communication Method.” Umesh states that “[t]he present invention relates to a mobile station, a base station, a control device, a mobile communication system, and a mobile communication method.” *Id.* [0001]. Umesh is directed to transmitting a high efficiency uplink control signal without affecting an existing physical channel or increasing a peak power vs. average power ratio (PAPR) at transmission power of a mobile station. Ex. 1010 at Abstract [Problem]. As described above in Section VII.A, one of the problems that is addressed by the purported invention of the ’656 Patent was to eliminate a high Peak to Average Power Ratio (PAPR) transmission power on the uplink, which consumes more of the mobile terminal’s battery and causes more interference and less efficiency in the cell. Thus, Umesh is also addressing the same problem.

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89. Umesh's solution to this problem is to use "time-division multiplexing" of the control signals. By using time-division multiplexing the control signals are sent at different times so the PAPR does not increase like it would if the control signals are sent at the same time. *Id.* at Abstract [Resolution Means].

a. Umesh Discloses a Mobile Terminal Communicating with a Base Station on a Downlink and Uplink in a Mobile Communications System

90. Umesh discloses a mobile station (*mobile terminal*) 20a in a mobile communication system 100 that includes a *base station* 10 and a radio control device 30, a *downlink* 2, and an *uplink* 1. *Id.* at [0032] and FIG. 1.



Id. at Fig. 1

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As shown in FIG. 1, the mobile communication system 100 includes a **base station 10, mobile stations 20a to 20c**, and a radio control device 30. The radio control device 30 controls radio communication between the base station 10 and the mobile stations 20a to 20c. **A radio link is established between the base station 10 and the mobile stations 20a-20c.** The radio link includes an **uplink 1 transmitted from the mobile stations 20a to 20c to the base station 10 and a downlink 2 transmitted from the base station 10 to the mobile stations 20a to 20c.**

Id. at [0032] (emphasis added).

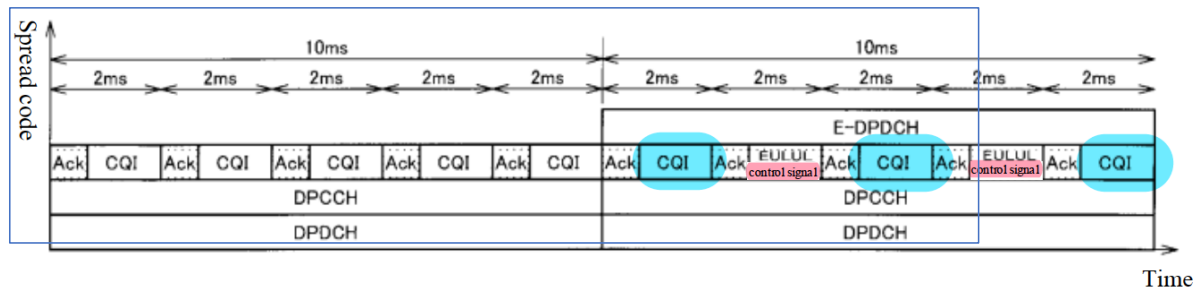
b. Umesh Discloses the Mobile Terminal Transmitting a “quality notification signal” and a “scheduling request signal.”

91. Fig. 4 from Umesh is shown below with two different colors of highlighting that I added. The CQI control signal, which is defined by the '656 Patent as the claimed “*quality notification signal*,” (see Section VIII.B.a) is being transmitted by the mobile terminal to the base station in three different time slots highlighted in Blue during the 10ms (millisecond) time called a frame. The “EULUL control signal”⁶ is being transmitted by the mobile terminal in two different time slots highlighted in Red during the same 10ms timeframe. The

⁶ The “control signal” text was included with the translated document.

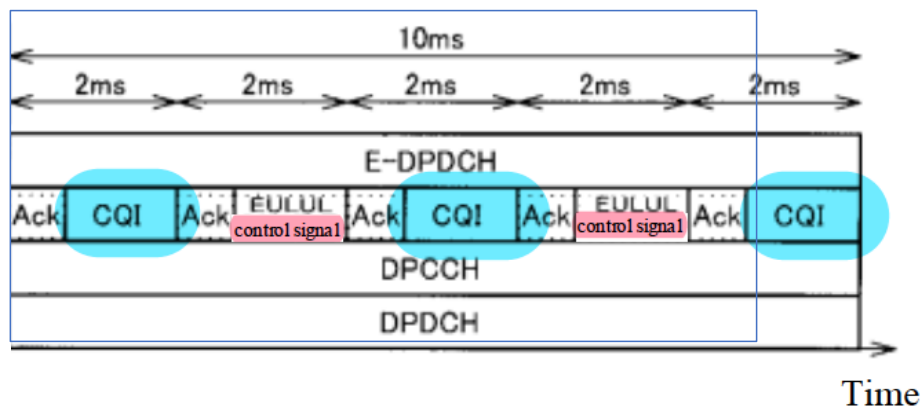
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EULUL control signal is defined by Umesh as the “enhanced uplink physical control signal (UL control signal) conforming to enhanced uplink (EUL: enhanced uplink)” *Id.* at [0003]. In other words, the EULUL is an uplink control signal that is transmitted on the enhanced uplink channel. Therefore, the two different control signals are time-division multiplexed in different time slots.



Id. at Fig. 4 (Highlighting added)

92. The diagram below is the right half of Fig. 4 shown above so the text is easier to read.



Id. Right Half of Fig. 4 (highlighting added)

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93. Umesh describes the CQI signal as radio quality information, which is essentially the same description provided for CQI by the '656 Patent (*See* Section VIII.B.a) with at least the following passage:

Radio quality information (CQI) is information relating to downlink radio quality. The radio quality information (CQI) is downlink radio quality between each mobile station 20a-20c and the base station 10, and is determined in each mobile stations 20a-20c. The radio quality information (CQI) is used to control data transmission in downlink according to the packet high-speed transmission method. Specifically, the base station 10 determines, based on the radio quality information (CQI), a transmission rate of data transmission in the mobile station or the HS-DSCH allocating the HS-DSCH.

Id. at [0044] (emphasis added).

94. Umesh discloses that one of “EULUL control signals,” shown above being transmitted by the mobile terminal to the base station, can be the claimed “*scheduling request signal*” (*see* Section VIII.B.b) with at least the following passage that describes the “Scheduling Information (SI) Signal.” The mobile terminal sends this RR/SI request to the base station when it has data to send but it does not have any uplink resources available. The base station needs the information

in the RR/SI signal so it can calculate the uplink resources it should assign to the mobile terminal:

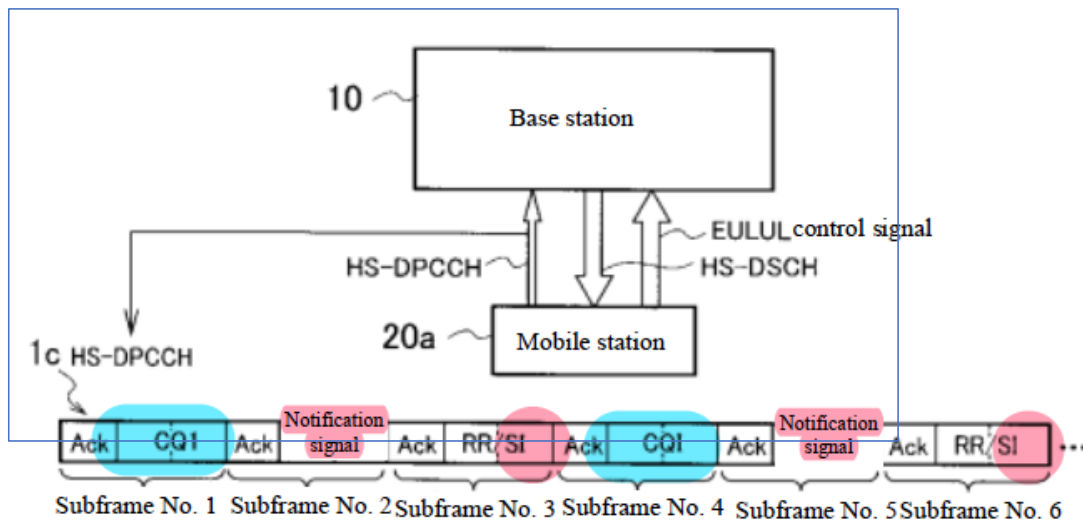
The mobile station 20a may transmit an RR (Rate Request)/SI **(Scheduling Information) as an EULUL control signal to the base station 10.** RR/SI is one of the EULUL control signals discussed in 3GPP. **RR and SI are information necessary for calculating an uplink radio resource to be assigned to the mobile station 20a by the base station 10 in a high efficiency transmission system.**

Id. at [0075] (emphasis added).

c. Umesh Discloses That a Scheduling Request Signal Can be Sent Instead of a Quality Notification Signal and Stopping Transmitting the Quality Notification Signal

95. Umesh discloses that a scheduling information signal (*scheduling request signal*) can be transmitted in place of a CQI (*quality notification signal*) when a scheduling request signal needs to be transmitted to the base station. Umesh specifically states that the mobile terminal “stops CQI transmission and transmits the EULUL control signal.” *Id.* at [0077]. As described in Section IX.A.a above, one of the EULUL control signals is a “*scheduling request signal*.”

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Id. at Fig. 11 (highlighting added).

96. Umesh also discloses that, to notify the base station that a different type of control information is coming other than a CQI signal, that a notification control signal precedes the SI (*scheduling request signal*). In Fig. 11 shown above, the blue highlighting shows the time slots used to send the actual CQI signal (*quality information signal*). The red highlighting shows the time slots where the “notification signal” is inserted one subframe before the “RR/SI” signal (*scheduling request signal*) *Id.* at [0075] is inserted. Umesh discloses that the notification signal could be an invalid CQI value, like “a CQI value 31” *Id.* at [0080]. Fig. 11 above shows two different occurrences where the RR/SI signal is being inserted in place of the CQI signal and the mobile terminal “stops CQI transmission.”

97. Umesh explains this process and Fig. 11 with at least the following passages:

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As illustrated in FIG. 11, the transmission notification unit 26 of the mobile station 20a uses the HS-DPCCH 1c to **transmit a notification signal to the base station 10 prior to transmission of the EULUL control signal.** The mobile station 20a stops CQI transmission and **transmits the EULUL control signal.** The mobile station 20a also stops CQI transmission and transmits the notification signal to the base station 10 in the CQI slot one subframe prior to transmission of the EULUL control signal. **In this manner, the mobile station 20a can transmit the EULUL control signal immediately after transmission of the notification signal according to this notification signal.** The base station 10 can receive the notification signal, ascertain transmission of the EULUL control signal, and detect the EULUL control signal.

Id. at [0077] (emphasis added).

98. In addition to the text describing Fig. 11 above, Umesh additionally explains that when a EULUL control signal needs to be transmitted, it can be sent in the same uplink time slot that is normally used for the CQI. As described above, one of the EULUL control signals is a scheduling request. In other words, a *scheduling request signal* can be sent in place of a *quality notification signal* on the uplink as described with:

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When a need arises to transmit the EULUL control signal, the mobile stations 20a to 20c normally set the EULUL control signal in the CQI slot setting the channel quality indicator (CQI) and transmit HS-DPCCH and the EULUL control signal by time-division multiplexing.

That is, when a need arises to transmit the EULUL control signal, the mobile stations 20a to 20c transmit no channel quality indicator (CQI) in HS-DPCCH and perform transmission by replacing the channel quality indicator (CQI) with the EULUL control signal.

Id. at [0048] (emphasis added).

99. Umesh also discloses that, when a EULUL control signal does not need to be transmitted by a mobile terminal, the mobile terminal can send the “radio quality information” (CQI) signal at its normal rate with:

As shown in FIG. 4 and FIG. 5, when the E- DPDCH/EULUL control signal is not transmitted, the mobile stations 20a to 20c transmit radio quality information (CQI) as usual on HS-DPCCH.

Id. at [0051] (emphasis added).

100. I note that Umesh discloses two different transmission methods and the method described above is for the “second transmission method” as described starting at paragraph [0076]. Umesh also discloses that “[t]he mobile station 20a

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and the base station 10 may choose between using a first transmission method or a second transmission method according to the application.” *Id.* at [0085].

101. Therefore, Umesh discloses a mobile terminal transmitting a *scheduling request signal* (RR/SI signal) and a *quality notification signal* (CQI) to a base station and when the timing of the transmission of *scheduling request signal* coincides with the transmission of a *quality notification signal*, the mobile terminal stops the transmission of the *quality notification signal* and sends the *scheduling request signal* in its place.

B. 3GPP TS 25.309 V6.6.0 (2006-03) FDD Enhanced Uplink; Overall description; Stage 2 (Release 6) Ex. 1011

102. The 3GPP TS 25.309 Specification (“TS 25.309”) is titled “Technical Specification Group Radio Access Network; FDD Enhanced Uplink; Overall description; Stage 2 (Release 6)” and was publicly released no later than March of 2006, as it states on the header of each page of the document. The 3GPP releases versions of each Specification to the public as described in Section VI.A above. I understand it is prior art against the ’656 Patent under pre-AIA 35 U.S.C. §102(a).

103. The TS 25.309 document provides a disclosure that the “*signaling request signal*” required by the ’656 Patent is essentially the same as the “*signaling information signal*” used by other prior art documents in this declaration, e.g., Umesh and R1-060583.

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104. Specifically, TS 25.309 states that the NodeB (base station) schedules the uplink resource for each mobile terminal (UE) based on, inter alia, the “Scheduling Request” received from the mobile terminal with:

9 Node B controlled scheduling

9.1 General Principle

The Node B controlled scheduling is based on uplink and downlink control together with a set of rules on how the UE shall behave with respect to this signaling.

In the downlink, a resource indication (Scheduling Grant) is required to indicate to the UE the maximum amount of uplink resources it may use. When issuing Scheduling Grants, the Node B may use QoS-related information provided by the SRNC (see subclause 11.1.1) and from the UE in Scheduling Requests (see subclause 9.3.1)

Ex. 1011 at p. 21.

105. TS 25.309 also states that “Scheduling Requests” are transmitted from the mobile terminal (UE) to the base station (NodeB) in the form of a “Scheduling Information” signal with at least:

9.3 Signalling

9.3.1 Uplink

Release 6

25

3GPP TS 25.309 V6.6.0 (2006-03)

For the UE to request resources from the Node B(s), Scheduling Requests will be transmitted in the uplink in the form of Scheduling Information and Happy Bit. The Scheduling information will be transmitted for the logical channels for which RRC configured that reporting needed to be made, while the Happy Bit shall always be included in the E-DPCCH, whenever the E-DPCCH is transmitted.

Id. at pp. 24-25

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106. Thus, a “*scheduling request signal*” as required by the Challenged Claim is essentially the same as the “Scheduling Information signal” disclosed in other documents.

C. R1-060583. 3GPP LTE CONTRIBUTION TO TSG-RAN WG1 (EX. 1012)

107. This document (“R1-060583”) is a contribution to the 3GPP LTE working group responsible for defining the LTE Specifications regarding the Radio Access Network (RAN). It was made public no later than February 13, 2006, in the Working Group1 (WG1) meeting located in Denver, CO. As described in Section VI above, the 3GPP meetings are public and many of the industry experts representing many, if not all, the companies involved with supplying network and/or mobile equipment, network providers, logistics and support are represented. This document was contributed by Ericsson and NTT DoCoMo, two companies that are very involved with defining the 3GPP LTE standard.

108. This document has been stored on the 3GPP document server and can be located by using the following links:

- <https://www.3gpp.org/3gpp-groups/radio-access-networks-ran/ran-wg1>
- https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/
- https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_44
- https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_44/Docs

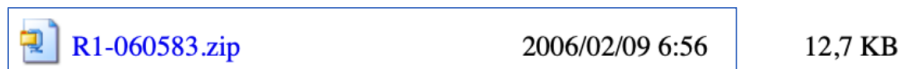
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- This is the header of the page that appeared after clicking the link directly above.



Ex. 1018 at p. 1.

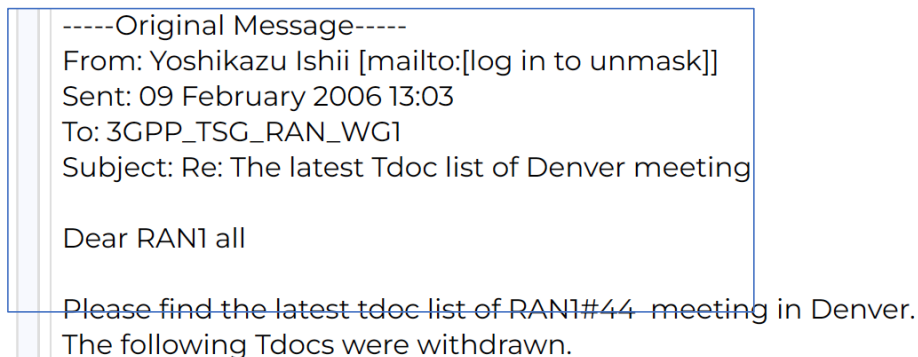
- I clicked on the link shown below (R1-060583.zip) when on the previous webpage and the file downloaded to my computer.



Ex. 1018 at p. 11.

109. The date for this file on the 3GPP server is “2006/02/09,” which is four days before the TSG-RAN WG1 #44 meeting convened in Denver CO.

110. The image taken below from a 3GPP webpage shows this document was made public to all the members of the 3GPP TSG (Technical Specification Group) RAN (Radio Access Network) WG1 (Working Group 1 for Radio Layer 1) no later than February 9, 2006.



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R1-060366, 402, 633, 634, 635

See you in Denver
Yoshi (MCC)

* * *

Dear RAN1 all,

Please find the latest tdoc list of RAN1#44 meeting in Denver.
You can also find it on the following site.

http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_44/Docs/

best regards,

Yoshi

Ex. 1017 at 1-2.

111. The Report for the TSG RAN WG1 #44 Meeting also confirms this document was publicly submitted for the WG1 #44 meeting because it states that there were 183 delegates (Attendees) at this meeting, and it includes the R1-060583 as one of the documents submitted. Ex. 1022 at pp. 43 and 86.

112. I understand it is prior art against the '656 Patent under pre-AIA 35 U.S.C. §102(a).

113. I also note that the examiner for the '656 Patent application also referenced similar 3GPP documents as prior art as shown in the file history in Section VII.C above. These documents are R2-061464 and R1-060111.

114. This document is focused on providing the overhead for the uplink signaling messages in an LTE network. Signaling messages are essentially the same

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as the “control signals” disclosed and claimed by the ’656 Patent (See Section VII above). The “overhead” is the information that is added to each signaling message (control signal) so the receiver, inter alia, can determine the type of message being received and its format. Based on my personal experience of defining signaling messages and developing signaling equipment, one of the key considerations is the overall length of each signaling message because many of these are sent on the uplink and downlink control channels and it’s very important that they do not overload them or require additional capacity, which would reduce the data throughput of the cell.

115. The relevant signaling messages/control signals analyzed by this document include “Scheduling requests” and the “CQI.”

116. This document describes “Scheduling requests” as:

control signaling transmitted by the UE [mobile terminal] to request resources for uplink data transmission. Scheduling requests are only transmitted when the UE does not have a valid scheduling grant as inband signaling can be used otherwise.”

Ex. 1012 at p. 1 (1. Introduction section).

The scheduling request is used to request uplink resources from the NodeB [base station] scheduler. **Outband scheduling requests are**

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only required when the UE does not have a valid scheduling grant

....

Id. (2. Scheduling Request section, emphasis added).

Additionally, information on **priority, buffer status**, etc. might be useful to the scheduler although it is far from obvious whether it is required. The **scheduler could, upon receiving a scheduling request, issue a grant** and once the transmission has started obtain more information about the UE status through inband signaling.

Id. (emphasis added).

117. In other words, when the mobile terminal (UE) has data that it needs to transmit to the base station (NodeB) and does not currently have any uplink resources assigned (no valid scheduling grant), it needs to send a “Scheduling request” (SR) signal to the base station. This description is essentially the same as disclosed by the ’656 Patent for the *Scheduling Request (SR) Signal* (See Sections VI.C.b and VII.A.c).

118. This document also describes the “CQI” as:

transmitted by the UE [mobile terminal] for the purpose of downlink scheduling and link adaptation. CQI transmission is independent of uplink data transmissions.”

Id. at p. 1 (1. Introduction section).

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Transmission of CQI is independent of uplink data transmissions, i.e., the user may or may not transmit data simultaneously with the CQI.

The CQI consists of several bits.

* * *

Coverage for CQI reporting can be solved in similar ways as for the data-associated control signaling. A simple approach, **present already in HSDPA, is to repeat the same CQI information in several subsequent subframes.**

Id. at pp. 2-3 (4. CQI section, emphasis added).

119. This description is describing the purpose of the mobile terminal sending a CQI signal and methods used to send it to the base station, which is essentially the same purpose disclosed by the '656 Patent for the *quality notification signal/CQI* (See Sections VI.C.a and VIII.B.a).

X. GROUND 1: CLAIM 3 OF THE '656 PATENT IS UNPATENTABLE UNDER 35 U.S.C. §103 OVER UMESH MODIFIED IN VIEW OF THE KNOWLEDGE OF A POSITA

A. Independent Claim 3

a. Limitation 3[pre]: “A mobile terminal configured to:”

120. To the extent the preamble is limiting, Umesh discloses a mobile terminal communicating with a base station on a downlink and uplink in a mobile communication system as described in more detail in Section IX.A.a above.

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Furthermore, Ex.1010 at [0055] discloses that ““the mobile station 20a is provided with an antenna 25, a radio unit 21, a baseband signal processing unit 22, a radio control unit 23, an interface 24, and a transmission notification unit 26.” Ex.1010 at [0055]. Therefore, the mobile station 20a is a mobile terminal.

121. Therefore, Umesh discloses this limitation regardless if it is limiting.

b. Limitation 3[1], “transmit a quality notification signal for notifying downlink communication quality to a base station, and”

122. Umesh discloses this limitation by disclosing a mobile terminal transmitting a *quality notification signal* on the uplink to the base station, which notifies the base station of the quality of the downlink. The *quality notification signal* is referred to specifically as a CQI (channel quality indicator) signal, which is the same as the *quality notification signal/CQI* described by the '656 Patent. See Section IX.A.b above for a more detailed description.

123. Therefore, Umesh discloses this limitation.

124. Furthermore, the '656 Patent admits that “transmit a quality notification signal for notifying downlink communication quality to a base station” is known in the prior art. Ex.1001 at 43:4-8 (“The nonpatent reference 1 discloses that in a case in which a mobile terminal is receiving downlink data without performing transmission of uplink data, an Ack/Nack or/and a CQI are transmitted by using an

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Ack/Nack exclusive channel having a broad band as shown in FIG. 23.”) (emphasis added).

- c. **Limitation 3[2], “transmit a scheduling request signal with which to make a request for allocation of radio resources to said base station before transmitting transmission data to said base station, wherein said mobile terminal includes:”**

125. Umesh discloses the mobile terminal transmitting a *scheduling request* to the base station, which is requesting an allocation of uplink radio resources so it can send the data to the base station after it has received a grant in response to this request. Umesh refers to this *scheduling request signal* as a scheduling information signal or a Rate Request/Scheduling Information (RR/SI) request signal. Umesh describes its “scheduling information signal” or “RR/SI” is the same type of request from the base station for the same reasons as the ’656 Patent describes for its *scheduling request signal*.”

126. The ’656 Patent describes its *scheduling request signal* as:

When the mobile terminal “transmits a signal with which to make a **request for allocation of uplink radio resources to the base station.**

Such a request signal is called a scheduling request, an **uplink resource request**, or an uplink scheduling request signal (SR: Scheduling Request).”

Ex. 1001 at 2:46-53 (emphasis added).

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127. Umesh describes its Rate Request/Scheduling Information (RR/SI” signal as:

The mobile station 20a may transmit an RR (Rate Request)/SI (Scheduling Information) as an EULUL control signal **to the base station 10**. RR/SI is one of the EULUL control signals discussed in 3GPP. **RR and SI are information necessary for calculating an uplink radio resource to be assigned to the mobile station 20a by the base station 10** in a high efficiency transmission system.

Ex. 1010 at [0075] (emphasis added).

128. This functionality is additionally described in Sections VII.A.f and IX.A.b, above.

129. A POSITA would have understood from his/her knowledge of the 3GPP standard and cellular networks that the Rate Request/Scheduling information taught by Umesh is the same as the scheduling request described in claim 3 of the '656 Patent. RR/SI and a scheduling request serve the same purpose of getting uplink resources allocated to send uplink data thereafter. Further, both RR/SI and scheduling request are sent to the base station by the mobile terminal.

130. Further, Umesh discloses transmitting a scheduling request before transmitting transmission data to the base station. As explained in Umesh, a rate request is “information necessary” for assigning uplink radio resources for the

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mobile terminal's access of the base station, a POSITA would thus understand that transmission of the scheduling request signal is prior to data transmission to the base station. *See e.g.*, Ex.1010 at [0075].

131. Therefore, Umesh alone or Umesh combined with the knowledge of a POSITA fully meet this limitation.

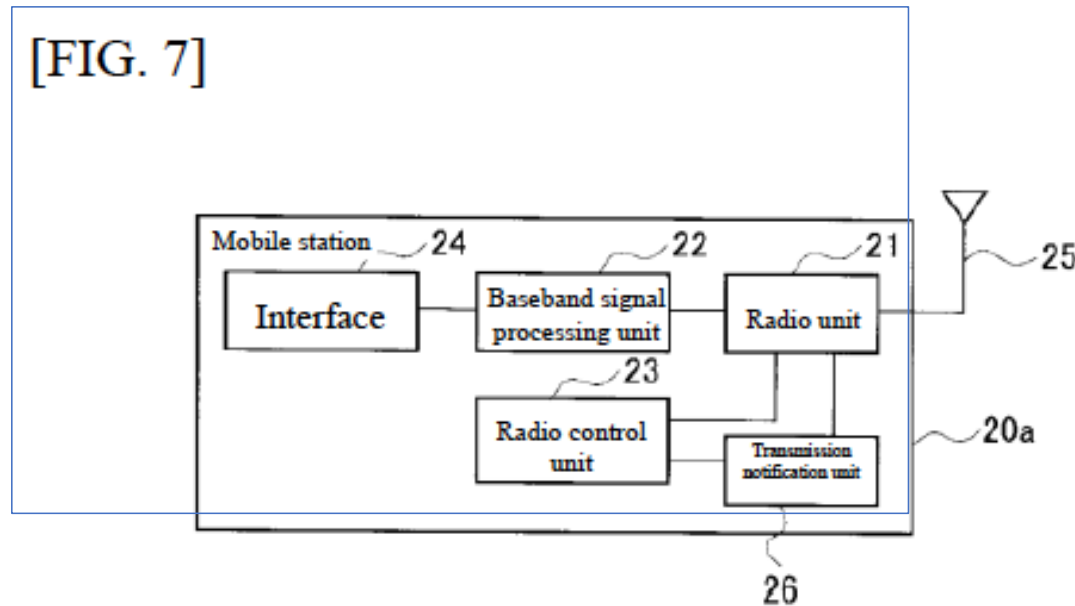
132. Further, the '656 patent admits that "transmit a scheduling request signal with which to make a request for allocation of radio resources to said base station before transmitting transmission data to base station" is known in the prior art. *See e.g.*, Ex.1001 at 4:37-50 ("A synchronous random access (Synchronous Random Access SRA) is a signal used for a scheduling request (SR) which a mobile terminal transmits before starting uplink data transmission. . .As a method of allocating an SRA to physical resources, there is provided a method of monopolistically allocating one certain time-frequency region (Nonpatent reference 3: TR25.814V7.0.0).").

d. Limitation 3[3], "a transmitter configured to transmit said quality notification signal to said base station, and to transmit said scheduling request signal to said base station; and"

133. Umesh discloses this limitation because it discloses that the transmitter for the mobile terminal is configured to transmit the *quality notification signal* (CQI) to the base station at a periodic rate unless a different control signal needs to be transmitted in the CQI's time slot. Umesh also discloses the mobile terminal is also

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configured to transmit a *scheduling request signal* to the base station when it's required. As shown in Fig. 7 and its associated text below, Umesh discloses a mobile station transmitter for transmitting the *quality notification signal* and the *scheduling request signal* to the base station.



Ex. 1010 at Fig. 7

134. Specifically, at least the three paragraphs below from Umesh describe the transmitter functionality included in Fig. 7.

[0055] Next, configurations of the mobile stations 20a to 20c, the base station 10, and the radio control device 30 **used in such transmission and reception of the physical channels are described.** As illustrated in FIG. 7, the mobile station 20a is provided with an antenna 25, a radio unit 21, a baseband signal processing unit 22, a radio control unit 23,

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an interface 24, and a transmission notification unit 26. For FIG. 7, description is omitted other than for portions having a radio communication function. Moreover, the mobile stations 20b, 20c are also provided with a configuration like that of the mobile station 20a.

[0056] **The radio unit 21 performs radio transmission and reception of physical channels with the base station 10. The radio unit 21 transmits and receives the physical channels to and from the base station 10 via the antenna 25 as controlled by the radio control unit 23.** The radio unit 21 acquires user data from the baseband signal processing unit 22 and acquires control data from the control unit 23.

[0057] The radio control unit 23 controls the radio unit 21 so an enhanced uplink physical control signal conforming to enhanced access and a high-speed uplink physical control signal on a high-speed uplink physical control channel conforming to high-speed packet access are transmitted by time-division multiplexing. **Specifically, the radio control unit 23 controls the radio unit 21 so the EULUL control signal is transmitted in the CQI slot included in HS-DPCCH.**

Ex. 1011 at [0055 – 0057] (emphasis added).

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135. Umesh teaches that the transmitter, i.e., the radio unit 21, transmits a quality notification signal to the base station. For example, Umesh teaches “the CQI slot that normally sets the channel quality indicator (CQI) and instructs the radio unit 21 to transmit. . .” *See e.g.*, Ex.1010 at [0058].

136. As described for limitation 3[2] in Section X.A.c above, Umesh further teaches that the transmitter, i.e., the radio unit 21, transmits a scheduling request signal to the base station.

137. An additional description of this functionality is in Section IX.A.b above.

138. Therefore, Umesh discloses this limitation.

- e. **Limitation 3[4] “a controller configured to perform a first control process that includes, when the mobile terminal has not been allocated a radio resource for transmitting said transmission data, transmitting said scheduling request signal to said base station, and”**

139. Umesh discloses that the controller that is configured to perform a first control process that includes transmitting a scheduling request when it has data to send to the base station and does not have any uplink resources assigned for doing so. As described for limitation 3[3] in Section X.A.d above, Umesh discloses a mobile terminal has a transmitter for transmitting multiple control signals, including a *scheduling request signal*. Specifically, the box numbered 23 and labelled “radio control unit” is the required controller for this limitation.

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140. As described for limitation 3[2] in Section X.A.c above, such control process taught by Umesh includes transmitting a scheduling request signal to the base station.

141. As described for limitation 3[2] in Section X.A.c above, Umesh further teaches that the scheduling request signal is transmitted to the base station when the mobile terminal has not been allocated a radio resource for data transmission.

142. Therefore, Umesh discloses this limitation.

- f. Limitation 3[5], “a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal.”**

143. Umesh discloses this limitation because Umesh explains that a *quality notification signal* (CQI) is transmitted periodically until a EULUL control signal needs to be transmitted. When a EULUL control signal needs to be transmitted, the “mobile station 20a stops CQI transmission and transmits the EULUL control signal.” (Ex. 1011 at [0077]). This is done *during a time interval* because it occurs during a single frame time. Umesh also discloses that the RR/SI scheduling information signal is one of the EULUL control signals so the transmission of the *quality notification signal* (CQI) would be stopped, and the *scheduling request signal* (RR/SI) would be transmitted instead of the CQI *during a time interval*

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(frame). At the next time interval, if no EULUL control signal needs to be transmitted, the CQI would be transmitted at its normal rate. This process is all described in more detail along with a highlighted Fig. 11 above in Section IX.A.c.

144. Therefore, Umesh discloses this limitation.

145. Claim 3 would have been obvious over the teachings of Umesh combined with the knowledge of a POSITA.

XI. GROUND 2: CLAIM 3 OF THE '656 PATENT IS UNPATENTABLE UNDER 35 U.S.C. §103 OVER UMESH MODIFIED IN VIEW OF R1-060583

146. R1-060583 in view of Umesh discloses or renders obvious all elements of claim 3 of the '656 Patent. R1-060583 discloses each and every element of claim 3, except for “a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal” which was disclosed by Umesh.

147. Umesh teaches every element of '656 Patent Claim 3, and R1-060583 clarifies that the Scheduling Information described in Umesh is the “Scheduling Request” as in '656 Claim 3.

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A. Motivation to Combine

148. A POSITA would be motivated to combine Umesh with R1-060583 for at least the following reasons. First, both are addressing control signals for cellular wireless networks. The title of R1-060583 is “E-UTRA Uplink Control Signaling – Overhead Assessment”. Umesh resolves the problem of “to transmit an enhanced uplink physical control signal conforming to enhanced access without affecting existing physical channels or increasing a peak-to-average ratio in transmission power of a mobile solution,” by means of “[a] high-speed uplink physical control signal on an uplink physical control channel conforming to high-speed packet access (HS-DPCCH) and an EPLUL control signal conforming to enhanced access are transmitted from a mobile station to a base station by time-division multiplexing.” Ex.1010 at Abstract.

149. Second, both are focused on providing efficient control signals (signaling messages, aka signals) for at least the mobile terminal functionality of sending downlink channel quality (CQI), scheduling requests, and data to the base station (NodeB). Both R1-060583 and Umesh teach alteration of transmitting the CQI for purpose of reducing overload. R1-060583 teaches that “depending on the CQI reporting scheme used, a single CQI report may span multiple subframes (‘progressive update’) to reduce the overhead.” Ex.1012 at page 2. Umesh discloses “CQI transmission on the HS-DPCCH 1c is stopped every three subframes and the

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EULUL control signal is transmitted in the CQI slot.” Ex.1010 at [0073]. A POSITA would thus readily be able to integrate Umesh’s teaching of stopping the transmission of the CQI signal while the scheduling request signal is transmitted into R1-060583’s alteration of CQI transmission given that both references are to reduce the overload.

150. Third, as described in Section VI above, the 4G LTE signaling methods and functionality are based on the existing and proven 3G UMTS functionality. Therefore, a POSITA looking to modify the LTE signaling (R1-060583) for downlink quality notification signals and scheduling requests would first look to how this functionality was implemented in 3G UMTS and possible variations to 3G UMTS, like what is disclosed by Umesh.

B. Independent Claim 3

a. Limitation 3[pre]: “A mobile terminal configured to:”

151. To the extent the preamble is limiting, Umesh discloses a mobile terminal communicating with a base station on a downlink and uplink in a mobile communication system as described in more detail in Section IX.A.a above.

152. To the extent that the preamble is limiting, R1-060583 discloses a mobile terminal as it describes a “UE”, i.e., user equipment in a communication system, which transmits (1) a quality notification signal, (2) a scheduling request signal. For example, R1-060583 explains that “CQI, transmitted by the UE for the

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purpose of downlink scheduling and link adaption” and “Scheduling requests, i.e., control signaling transmitted by the UE to request resources for uplink data transmission” *See e.g.*, Ex.1012 at 1.

b. Limitation 3[1], “transmit a quality notification signal for notifying downlink communication quality to a base station, and”

153. As explained in the Claim Construction section above, “a quality notification signal” should be construed as “Channel Quality Indication (CQI) signal” which is supported by intrinsic and extrinsic evidence. R1-060583 discloses the mobile terminal transmitting a CQI signal to a base station, as it states “the uplink control signaling can be grouped into the following categories. . .CQI, transmitted by the UE for the purpose of downlink scheduling and link adaption. CQI transmission is independent of uplink data transmissions.” *See e.g.*, Ex.1012 at 1.

154. Umesh discloses this limitation for the reasons discussed for Ground 1, claim 3, limitation 3[1].

c. Limitation 3[2], “transmit a scheduling request signal with which to make a request for allocation of radio resources to said base station before transmitting transmission data to said base station, wherein said mobile terminal includes:”

155. As discussed in Ground 1, claim 3, limitation 3[2], Umesh discloses this limitation. However, and alternatively, Umesh modified in view of R1-060583 meets this limitation.

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156. Umesh discloses the mobile terminal transmitting a *scheduling request* to the base station, which is requesting an allocation of uplink radio resources so it can send the data to the base station after it has received a grant in response to this request. Umesh refers to this *scheduling request signal* as a scheduling information signal or a Rate Request/Scheduling Information (RR/SI) request signal. Umesh describes its “scheduling information signal” or “RR/SI” is the same type of request from the base station for the same reasons as the ’656 Patent describes for its *scheduling request signal*.”

157. The ’656 Patent describes its *scheduling request signal* as:

When the mobile terminal “transmits a signal with which to make a
request for allocation of uplink radio resources to the base station.

Such a request signal is called a scheduling request, an **uplink resource request**, or an uplink scheduling request signal (SR: Scheduling Request).”

Ex. 1001 at 2:46-53 (emphasis added).

158. Umesh describes its Rate Request/Scheduling Information (RR/SI) signal as:

The mobile station 20a may transmit an RR (Rate Request)/SI (Scheduling Information) as an EULUL control signal **to the base station** 10. RR/SI is one of the EULUL control signals discussed in

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**3GPP. RR and SI are information necessary for calculating an
uplink radio resource to be assigned to the mobile station 20a by
the base station 10 in a high efficiency transmission system.**

Ex. 1010 at [0075] (emphasis added).

159. This functionality is additionally described in Sections VII.A.f and IX.A.b above.

160. R1-060583 discloses that the UE, i.e., the mobile terminal, transmits a scheduling request signal to base station. An “uplink control signal” is a signal transmitted from the mobile terminal to the base station, while “a scheduling request” is an “uplink control signal”. *See e.g.*, Ex.1012 at 1.

161. The R1-060583 document describes the following for its “Scheduling Requests:” (1) what they are; (2) what they are used for; (3) when they are used; and (4) they need to be transmitted and receive a grant in response before the mobile terminal can send its data as stated in the following passages.

**control signaling transmitted by the UE [mobile terminal] to request
resources for uplink data transmission. Scheduling requests are
only transmitted when the UE does not have a valid scheduling
grant as inband signaling can be used otherwise.”**

Ex. 1012 at p. 1 (1. Introduction section, emphasis added).

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The scheduling request is used to request uplink resources from the NodeB [base station] scheduler. **Outband scheduling requests are only required when the UE does not have a valid scheduling grant**

Id. (2. Scheduling Request section, emphasis added).

Additionally, information on **priority, buffer status**, etc. might be useful to the scheduler although it is far from obvious whether it is required. The **scheduler could, upon receiving a scheduling request, issue a grant** and once the transmission has started obtain more information about the UE status through inband signaling.

Id. (emphasis added).

162. Additional details regarding the disclosures of the R1-060583 document are in Section IX.C above.

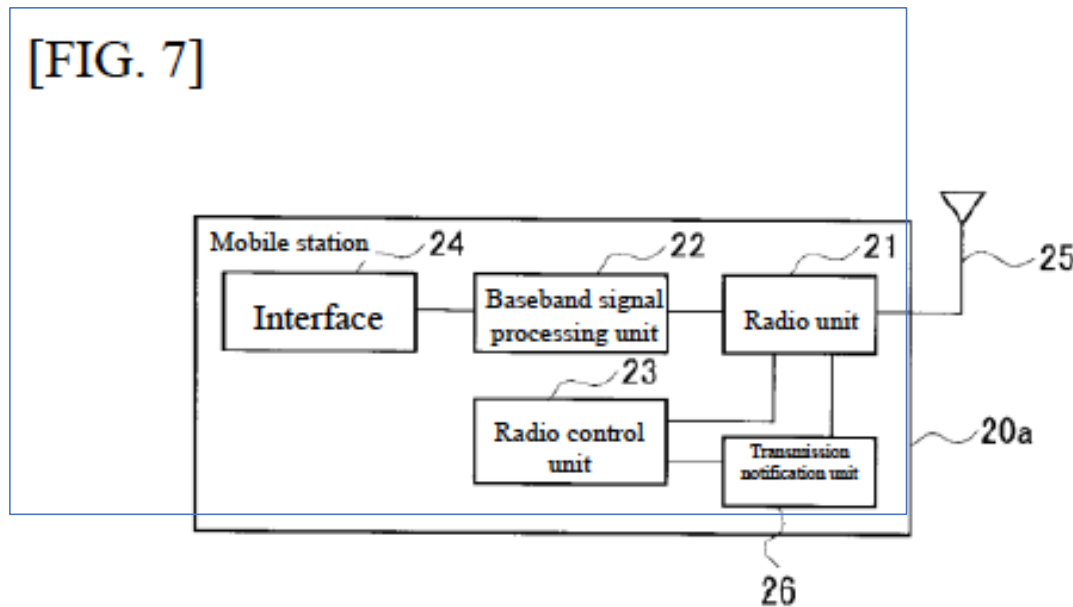
163. Therefore, Umesh combined with R1-060583 also discloses this limitation.

d. Limitation 3[3], “a transmitter configured to transmit said quality notification signal to said base station, and to transmit said scheduling request signal to said base station; and”

164. Umesh discloses this limitation because it discloses that the transmitter for the mobile terminal is configured to transmit the *quality notification signal* (CQI) to the base station at a periodic rate unless a different control signal needs to be

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transmitted in the CQI's time slot. Umesh also discloses the mobile terminal is also configured to transmit a *scheduling request signal* to the base station when it's required. As shown in Fig. 7 and its associated text below, Umesh discloses a mobile station transmitter for transmitting the *quality notification signal* and the *scheduling request signal* to the base station.



Ex. 1010 at Fig. 7

165. Specifically, at least the three paragraphs below from Umesh describe the transmitter functionality included in Fig. 7.

[0055] Next, configurations of the mobile stations 20a to 20c, the base station 10, and the radio control device 30 **used in such transmission and reception of the physical channels are described.** As illustrated in FIG. 7, the mobile station 20a is provided with an antenna 25, a radio

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unit 21, a baseband signal processing unit 22, a radio control unit 23, an interface 24, and a transmission notification unit 26. For FIG. 7, description is omitted other than for portions having a radio communication function. Moreover, the mobile stations 20b, 20c are also provided with a configuration like that of the mobile station 20a.

[0056] **The radio unit 21 performs radio transmission and reception of physical channels with the base station 10. The radio unit 21 transmits and receives the physical channels to and from the base station 10 via the antenna 25 as controlled by the radio control unit 23.** The radio unit 21 acquires user data from the baseband signal processing unit 22 and acquires control data from the control unit 23.

[0057] The radio control unit 23 controls the radio unit 21 so an enhanced uplink physical control signal conforming to enhanced access and a high-speed uplink physical control signal on a high-speed uplink physical control channel conforming to high-speed packet access are transmitted by time-division multiplexing. **Specifically, the radio control unit 23 controls the radio unit 21 so the EULUL control signal is transmitted in the CQI slot included in HS-DPCCH.**

Ex. 1010 at [0055 – 0057] (emphasis added).

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166. An additional description of this functionality is in Section IX.A.b above.

167. R1-060583 discloses that the UE, i.e., a mobile terminal, includes a transmitter configured to transmit said quality notification signal to the base station. As described by R1-060583 that “CQI, transmitted by the UE for the purpose of downlink scheduling and link adaption,” indicates that the UE, i.e., mobile terminal, comprises a transmitter which transmits the CQI. *See e.g.*, Ex.1012 at 1. The transmitter disclosed by R1-060583 also transmits scheduling request signal to the base station, “Scheduling requests, i.e., control signaling transmitted by the UE”. *See e.g.*, Ex.1012 at 1.

168. Therefore, Umesh in view of R1-060583 discloses this limitation.

- e. **Limitation 3[4] “a controller configured to perform a first control process that includes, when the mobile terminal has not been allocated a radio resource for transmitting said transmission data, transmitting said scheduling request signal to said base station, and”**

169. Umesh discloses that the controller that is configured to perform a first control process that includes transmitting a scheduling request when it has data to send to the base station and does not have any uplink resources assigned for doing so. As described for limitation 3[3] in Section X.A.d above, Umesh discloses a mobile terminal has a transmitter for transmitting multiple control signals, including

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a *scheduling request signal*. Specifically, the box numbered 23 and labelled “radio control unit” is the required controller for this limitation.

170. Therefore, Umesh discloses this limitation.

171. R1-060583 teaches a controller configured to perform a control process. For example, “this contribution addresses the required E-UTRA uplink control signaling”, and “Scheduling requests, i.e., control signaling transmitted by the UE”, both indicate a controller configured to perform a control process. *See e.g.*, Ex.1012 at 1.

172. R1-060583 further teaches that such a control process includes, when the mobile terminal has not been allocated a radio resource for transmitting said transmission data, transmitting said scheduling request signal to said base station, as it explains that “scheduling requests are only transmitted when the UE does not have a valid scheduling grant”. *See e.g.*, Ex.1012 at 1.

173. Therefore, R1-060583 discloses this limitation.

- f. **Limitation 3[5], “a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal.”**

174. Umesh discloses this limitation because Umesh explains that a *quality notification signal* (CQI) is transmitted periodically until a EULUL control signal

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needs to be transmitted. When a EULUL control signal needs to be transmitted, the “mobile station 20a stops CQI transmission and transmits the EULUL control signal.” (Ex. 1011 at [0077]). This is done *during a time interval* because it occurs during a single frame time. Umesh also discloses that the RR/SI scheduling information signal is one of the EULUL control signals so the transmission of the *quality notification signal* (CQI) would be stopped, and the *scheduling request signal* (RR/SI) would be transmitted instead of the CQI *during a time interval* (frame). At the next time interval, if no EULUL control signal needs to be transmitted, the CQI would be transmitted at its normal rate. This process is all described in more detail along with a highlighted Fig. 11 above in Section IX.A.c.

175. Therefore, Umesh discloses this limitation.

176. Claim 3 would have been obvious over the teachings of Umesh combined with R1-060583.

XII. GROUND 3: CLAIM 3 OF THE '656 PATENT IS UNPATENTABLE UNDER 35 U.S.C. §103 OVER UMESH MODIFIED IN VIEW OF TS 25.309

177. Umesh teaches every element of '656 Patent Claim 3, and 3GPP TS 25.309 V6.6.0 Release 6 (2006-03) clarifies that the Scheduling Information described in Umesh is the “Scheduling Request” as in the '656 patent claim 3.

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A. Motivation to Combine

178. A POSITA would be motivated to combine Umesh with the TS 25.309 Specification as Umesh expressly refers to 3GPP, when explaining Rate Request/Scheduling Information recited in Umesh. *See e.g.*, Ex.1010 at [0075] (“The mobile station 20a can transmit RR (Rate Request) / SI (Scheduling Information) to the base station 10 as an EUUL control signal. RR/SI is one of the EUUL control signals discussed in 3GPP.”).

179. A POSITA would be further motivated to combine the teachings for at least the following reasons.

180. First, both are addressing control signals for cellular wireless networks. The relevant sections of TS 25.309 are at least Section 9 regarding “Node B controlled scheduling” and Section 9.3 regarding “Signaling” for the “Uplink.” Second, both are focused on providing efficient control signals (signaling messages, aka signals) for at least the mobile terminal (UE) functionality of sending downlink channel quality (CQI), scheduling requests/scheduling information, and data to the base station (NodeB). Third, both are focused on the “Enhanced Uplink” functionality being added to the 3G UMTS standard. This functionality is also referred to as High-Speed Uplink Packet Access (HSUPA). Therefore, a POSITA looking to modify the UMTS signaling to support this new HSUPA functionality regarding downlink quality notification signals and scheduling requests would first

look to the existing 3GPP requirements for this functionality (TS 25.309) and possible methods for modifying it to make it more efficient, like what is disclosed by Umesh.

B. Independent Claim 3

a. Limitation 3[pre]: “A mobile terminal configured to:”

181. To the extent the preamble is limiting, Umesh discloses a mobile terminal communicating with a base station on a downlink and uplink in a mobile communication system as described in more detail in Section IX.A.a above.

182. Therefore, Umesh discloses this limitation regardless of whether it is limiting.

183. 3GPP TS 25.309 V6.6.0 Release 6 also teaches a mobile terminal. For example, section 9.2 of the document describes scheduling operations of a User Equipment, i.e., a mobile terminal. *See e.g.*, Ex.1011 at 9.2.1.

b. Limitation 3[1], “transmit a quality notification signal for notifying downlink communication quality to a base station, and”

184. Umesh discloses this limitation by disclosing a mobile terminal transmitting a *quality notification signal* on the uplink to the base station, which notifies the base station of the quality of the downlink. The *quality notification signal* is referred to specifically as a CQI (channel quality indicator) signal, which

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is the same as the *quality notification signal*/CQI described by the '656 Patent. See Section IX.A.b above for a more detailed description.

185. Therefore, Umesh discloses this limitation.

186. 3GPP TS 25.309 V6.6.0 Release 6 also teaches a quality notification signal. *See e.g.*, Ex. 1011 at Fig. 6.3.1-1 (indicating a CQI).

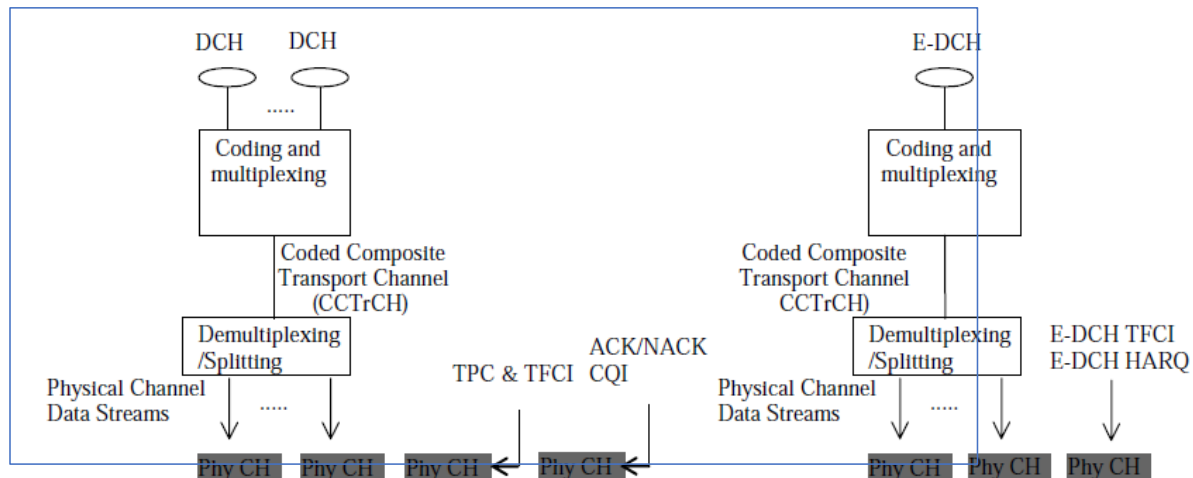


Figure 6.3.1-1: Model of the UE's Uplink physical layer

- c. **Limitation 3[2], “transmit a scheduling request signal with which to make a request for allocation of radio resources to said base station before transmitting transmission data to said base station, wherein said mobile terminal includes:”**

187. As discussed in Ground 1, claim 3, limitation 3[2], Umesh discloses this limitation. Alternatively, Umesh modified in view of TS 25.309 meets this limitation.

188. Umesh discloses the mobile terminal transmitting a *scheduling request* to the base station, which is requesting an allocation of uplink radio resources so it

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can send the data to the base station after it has received a grant in response to this request. Umesh refers to this *scheduling request signal* as a scheduling information signal or a Rate Request/Scheduling Information (RR/SI) request signal. Umesh describes its “scheduling information signal” or “RR/SI” is the same type of request from the base station for the same reasons as the ’656 Patent describes for its *scheduling request signal*.”

189. The ’656 Patent describes its *scheduling request signal* as:

When the mobile terminal “transmits a signal with which to make a
request for allocation of uplink radio resources to the base station.

Such a request signal is called a scheduling request, an **uplink resource request**, or an uplink scheduling request signal (SR: Scheduling Request).”

Ex. 1001 at 2:46-53 (emphasis added).

190. Umesh describes its Rate Request/Scheduling Information (RR/SI) signal as:

The mobile station 20a may transmit an RR (Rate Request)/SI (Scheduling Information) as an EULUL control signal **to the base station** 10. RR/SI is one of the EULUL control signals discussed in 3GPP. **RR and SI are information necessary for calculating an**

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**uplink radio resource to be assigned to the mobile station 20a by
the base station 10 in a high efficiency transmission system.**

Ex. 1010 at [0075] (emphasis added).

191. This functionality is additionally described in Sections VII.A.f and IX.A.b above.

192. Alternatively, 3GPP TS 25.309 V6.6.0 Release 6 clarifies that the rate request/scheduling information discussed in Umesh is a scheduling request. Umesh describes “RR (Rate Request) /SI (Scheduling Information) is one of the EULUL control signals being discussed by 3GPP”, wherein TS 25.309 supplements that “for the UE to request resources from the Node B(s), Scheduling Requests will be transmitted in the uplink in the form of Scheduling Information and Happy Bit.” *See e.g.*, Ex.1010 at [0075]; Ex. 1011 at Section 9.3.1.

Release 6	25	3GPP TS 25.309 V6.6.0 (2006-03)
For the UE to request resources from the Node B(s), Scheduling Requests will be transmitted in the uplink in the form of Scheduling Information and Happy Bit. The Scheduling information will be transmitted for the logical channels for which RRC configured that reporting needed to be made, while the Happy Bit shall always be included in the E-DPCCH, whenever the E-DPCCH is transmitted.		

Id.

193. Further, as discussed in connection with Ground I, Umesh discloses transmitting a scheduling request before transmitting transmission data to base station. *See Supra* at Section X.A.c.

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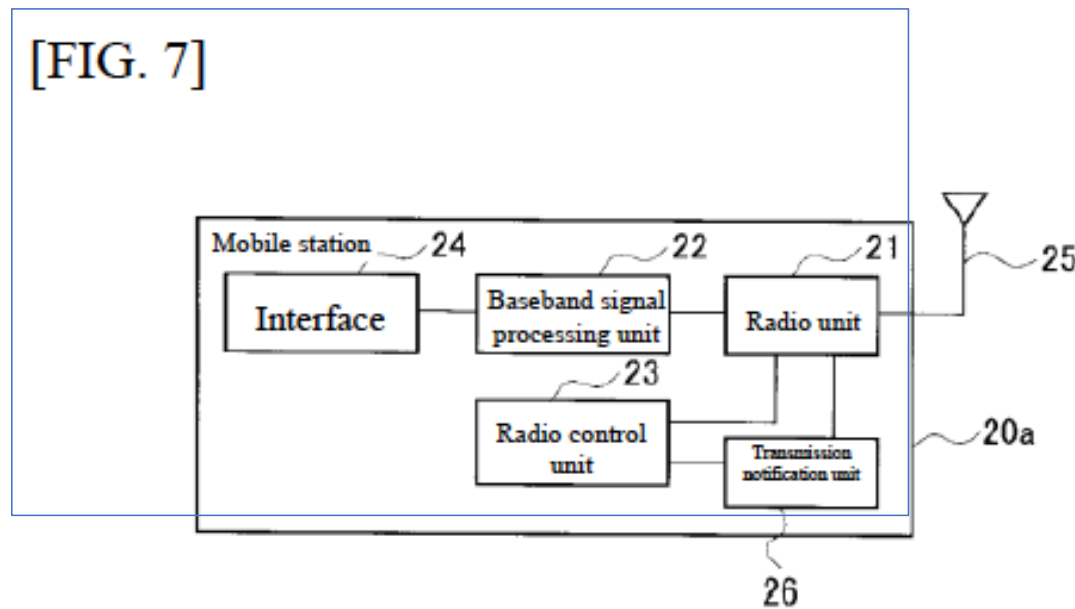
194. 3GPP TS 25.309 V6.6.0 Release 6 also discloses a scheduling request for allocation of radio resources to base station. *See e.g.*, Ex. 1011 section 7.3.6. (“Based on scheduling requests, Scheduling Grants” are determined and transmitted”). TS 25.309 explained in latter section(s) that a Scheduling Grant is a resource indication required to indicate to the UE (mobile terminal) “the maximum amount of uplink resources it may use” before initiation of uplink transmission. *See Id.* at Section 9.1.

195. Additional details regarding the disclosures of the TS 25.309 Specification are in Section IX.B above.

196. Therefore, Umesh combined with TS 25.309 discloses this limitation.

d. Limitation 3[3], “a transmitter configured to transmit said quality notification signal to said base station, and to transmit said scheduling request signal to said base station; and”

197. Umesh discloses this limitation because it discloses that the transmitter for the mobile terminal is configured to transmit the *quality notification signal* (CQI) to the base station at a periodic rate unless a different control signal needs to be transmitted in the CQI’s time slot. Umesh also discloses the mobile terminal is also configured to transmit a *scheduling request signal* to the base station when it’s required. As shown in Fig. 7 and its associated text below, Umesh discloses a mobile station transmitter for transmitting the *quality notification signal* and the *scheduling request signal* to the base station.



Ex. 1010 at Fig. 7

198. Specifically, at least the three paragraphs below from Umesh describe the transmitter functionality included in Fig. 7.

[0055] Next, configurations of the mobile stations 20a to 20c, the base station 10, and the radio control device 30 **used in such transmission and reception of the physical channels are described.** As illustrated in FIG. 7, the mobile station 20a is provided with an antenna 25, a radio unit 21, a baseband signal processing unit 22, a radio control unit 23, an interface 24, and a transmission notification unit 26. For FIG. 7, description is omitted other than for portions having a radio communication function. Moreover, the mobile stations 20b, 20c are also provided with a configuration like that of the mobile station 20a.

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[0056] The radio unit 21 performs radio transmission and reception of physical channels with the base station 10. The radio unit 21 transmits and receives the physical channels to and from the base station 10 via the antenna 25 as controlled by the radio control unit 23. The radio unit 21 acquires user data from the baseband signal processing unit 22 and acquires control data from the control unit 23.

[0057] The radio control unit 23 controls the radio unit 21 so an enhanced uplink physical control signal conforming to enhanced access and a high-speed uplink physical control signal on a high-speed uplink physical control channel conforming to high-speed packet access are transmitted by time-division multiplexing. **Specifically, the radio control unit 23 controls the radio unit 21 so the EULUL control signal is transmitted in the CQI slot included in HS-DPCCH.**

Ex. 1010 at [0055 – 0057] (emphasis added).

199. An additional description of this functionality is in Section IX.A.b above.

200. As previously discussed with respect to claim element [3.2], 3GPP TS 25.309 V6.6.0 Release 6 clarifies that the rate request/scheduling information

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discussed in Umesh is a scheduling request. *See e.g., supra* at XII.B.c. Ex. 1011 at Section 9.3.1.

201. Therefore, Umesh in view of 3GPP TS 25.309 discloses this limitation.

- e. **Limitation 3[4] “a controller configured to perform a first control process that includes, when the mobile terminal has not been allocated a radio resource for transmitting said transmission data, transmitting said scheduling request signal to said base station, and”**

202. As discussed in connection with Ground I, Umesh teaches a controller which performs a control process. *See Supra* at X.A.e. Umesh discloses that the controller that is configured to perform a first control process that includes transmitting a scheduling request when it has data to send to the base station and does not have any uplink resources assigned for doing so. As described for limitation 3[3] in Section X.A.d above, Umesh discloses a mobile terminal has a transmitter for transmitting multiple control signals, including a *scheduling request signal*. Specifically, the box numbered 23 and labelled “radio control unit” is the required controller for this limitation.

203. Further as discussed in connection with Ground I, limitation 3[4], such control process taught by Umesh includes transmitting a scheduling request signal to the base station. *See Supra* at X.A.e.

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204. As discussed above, for claim term [3.2], Ex.1011 at Section 9.3.1 clarified that the rate request/scheduling information discussed in Umesh is a scheduling request.

205. As discussed in connection with Ground I, limitation 3[4], Umesh further teaches that the scheduling request signal is transmitted to the base station when the mobile terminal has not been allocated a radio resource for data transmission. *See Supra* at X.A.e.

206. Therefore, Umesh in view of TS 25.309 discloses this limitation.

- f. Limitation 3[5], “a second control process that includes, when a transmission of said quality notification signal coincides with that of said scheduling request signal in said transmitter, stopping transmitting said quality notification signal during a time interval during which said transmitter transmits said scheduling request signal.”**

207. Umesh discloses this limitation for the reasons discussed regarding Ground 1, claim 3, imitation 3[5].

208. Therefore, Umesh discloses this limitation.

209. Claim 3 would have been obvious over the teachings of Umesh combined with TS 25.309.

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XIII. CONCLUSION

210. For at least the reasons addressed above, it is my opinion that every claim of the '656 Patent is invalid as obvious.

211. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

212. I declare that all statements made herein of my knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

213. I declare under penalty of perjury that the foregoing is true and correct.

Executed on:

JUNE 1, 2023


Mark R. Lanning