IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.
NOKIA OF AMERICA CORPORATION
Petitioners,

v.

ACTIVE WIRELESS TECHNOLOGIES LLC
Patent Owner.

U.S. PATENT NO. 11,019,557
Title: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

Inter Partes Review No.: IPR2024-00886

DECLARATION OF DR. MARK P. MAHON UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,019,557

By: Mark P. Mahon
Mark, P. Mahon

TABLE OF CONTENTS

Page

I. INTRODUCTION 4

II. BACKGROUND AND QUALIFICATIONS 4

III. MATERIALS REVIEWED 11

IV. LEGAL STANDARDS 12

V. LEVEL OF ORDINARY SKILL IN THE ART 17

VI. TECHNICAL BACKGROUND AND STATE OF THE ART 20

A. Mobile Wireless Communication Systems 20

B. TS 38.331 v.15.1.0 (Exhibit 1008) 21

C. Use of timers/counters 26

VII. OVERVIEW OF THE CHALLENGED PATENT 30

A. Priority Date 30

B. Overview of the Content of the Challenged Patent 30

C. Prosecution History 35

VIII. OVERVIEW OF THE PRIOR ART 43

A. Overview of Ingale (EX-1004) 43

B. Overview of Jung (EX-1005) 45

IX. THE CHALLENGED CLAIMS OF THE '557 PATENT ARE OBVIOUS FROM INGALE IN VIEW OF JUNG 49

A. Reasons to combine Ingale and Jung 49

B. Detailed Application of Ingale and Jung to the Challenged Claims 56

1. Claim 9 56

X. SECONDARY CONSIDERATIONS DO NO REBUT THE PRIMA FACIE CASE OF OBVIOUSNESS 102

XI. CONCLUSION 102

I, Dr. Mark P. Mahon, declare as follows:

I. INTRODUCTION

1. I have been retained by Duane Morris on behalf of Petitioners as an independent, technical expert consultant in this proceeding before the United States Patent and Trademark Office (USPTO).[1] I have been ask to consider whether certain references disclose or suggest the limitations found in U.S. Patent No. 11,019,557 ("'557 Patent") which I may reference as the "challenged patent" in this Declaration as discussed in detail below. My opinions are set forth below.

2. I am being compensated at my rate of $550 per hour for my services. No part of my compensation depends on my opinions or the outcome of this proceeding. I have no financial interest in any of the parties to this proceeding.

3. In my analysis below, I generally refer to the '557 Patent for citations unless otherwise noted.

4. Unless otherwise indicated, the emphasis in quotations has been added.

II. BACKGROUND AND QUALIFICATIONS

5. My complete qualifications and professional experience are described in my

[1] Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the challenged patent.

Curriculum Vitae, a copy of which can be found in Appendix B to this Declaration.

6. The following is a brief summary of my relevant qualifications and professional experience

7. I am a Teaching Professor in the School of Electrical Engineering and Computer Science at Pennsylvania State University, University Park, PA ("Penn State" or "PSU"). I have worked on telecommunications and wireless networks, including Z-Wave, Bluetooth, Zigbee, Wi-Fi, NFC, AMPS, IS-95, CDMA2000, GSM, EDGE, UMTS/WCDMA, LTE, and 5G cellular systems since 1988.

8. I received my B.S. in Electronics Engineering from the University of Scranton in 1987. I received my M.S. in Electrical Engineering and Ph.D. in Acoustics from Penn State in 1991 and 2001, respectively.

9. In 1988, after I received my bachelor's degree, I joined the Central Intelligence Agency (CIA) while pursuing my M.S. degree at Penn State part-time. My first job at the CIA involved designing and testing systems to automatically capture and characterize telecommunication signals and emissions from various wireless and computer networking devices.

10. I returned to Penn State in early 1990 to pursue graduate research full-time and complete my M.S. degree. My graduate research work focused on

wideband beamforming and adaptive signal processing. After completing my M.S. degree in EE in 1991, I accepted a full-time faculty research position at the Applied Research Lab at PSU, primarily working on classified programs, and began working on diverse radio frequency and acoustic sensor systems including wireless communications and small wireless networks for acoustic tracking, source localization, and feature extraction.

11. I began pursuing my Ph.D. part-time in 1993 while continuing my faculty research position. In 1997, as part of my faculty research position, I began working on classified programs focused on mathematical analytical modeling of cellular communication networks and the development of hardware and software systems to test against cellular networks. My role was to develop the algorithms and write the code running on a specially developed embedded system. For this work, I received a letter of recognition as the "genius behind the VELA software algorithms" from the Director of National Reconnaissance Office (NRO) Systems Engineering and Technology Office. As part of this same work, I was extensively involved in protocol and signaling analysis as well as researching model-specific performance and unique functional characteristics associated with individual mobile devices. The work involved testing dozens of handsets from many manufacturers in controlled and real-world environments against network simulators and live

operational networks for each research project.

12. In 2000, my research extended into utilizing non-orthogonal wavelets for improving detection and localization of cellular handsets from high altitude sensor systems. In 2001, I completed my Ph.D. and my research focused on the utilization of advanced communication signals for wideband characterization and remote sensing of propagation channels.

13. Beginning in 1997, my cellular communications research work focused on CDMA, GSM, EDGE, UMTS, LTE, and 5G cellular systems primarily under grants sponsored principally by the Department of Defense. This classified research work required 3GPP protocol analysis and development of real-time embedded hardware and software systems capable of interacting with cellular networks and cellular handsets. A large portion of my work was directed at architectures, protocols, software, and signaling.

14. I have been working on classified projects since 1988. Before 1998, because the work was not deemed highly classified, I was able to publish eight journal and conference papers prior to 2000. Between 1999 and 2015, however, I was allowed to publish only one article in an unclassified symposium and published and presented about a dozen articles in classified settings. This is because during this period, the vast majority of my research was highly classified. As a result, nearly all of my research results were summarized in

classified reports and not available to the general public. Further, because the U.S. government owns any intellectual property resulting from the sponsored research work, I did not pursue or file patent applications.

15. In 2015, I transferred to the School of Electrical Engineering and Computer Science at Penn State as a teaching faculty member. In that role, I have continued teaching graduate and undergraduate courses, guiding Ph.D. and M.S. students in communication and mobile networking (including LTE and 5G cellular networks), and pursuing research in this and related areas. Since 2015, I have been an author on seven refereed papers as listed in my curriculum vitae (CV) (attached as Appendix B).

16. Because of my decades of research and my continuing work at Penn State, I have intimate knowledge of telecommunication networks, including the technology involved in the patents in this case. I have been highly recognized as an expert in such systems within the research community. I was recognized twice by the National Reconnaissance Office with commendation letters for work dealing with detecting cellular signals in low signal to noise ratio environments. The U.S. government awarded me over $12M in grants between 2003 and 2015 for projects focused on mobile communication devices and networks, in which I served as a Principal Investigator (PI), Co-PI, and/or technical lead.

17. Additionally, during my research career, I interacted extensively with computer scientists and engineers responsible for the design, development, and testing of telephony and data networking systems and testbeds. As a research faculty member, I oversaw engineers and computer scientists that executed many joint projects with development organizations. These interactions exposed me to a wide range of computer scientists and engineers working on telecommunication network technologies. Since 2011, I have been teaching undergraduate and graduate classes in communication and mobile networking and am familiar with the curricula being taught to electrical engineers and computer scientists. The interactions with a wide range of computer scientists and engineers working on telecommunication network technologies and the familiarity with the classes taught to electrical engineers and computer scientists have allowed me to have a good understanding of the level of skills possessed by a person of ordinary skill in the field of cellular technology.

18. I have extensive experience with mobile networks in general and LTE and 5G specifically. While most of my research efforts between 1998 and 2015 were highly classified, I can state that they included detailed investigation of network architectures, signaling, and functional behavior. A typical research effort would involve studying 3GPP, 3GPP2, IEEE, and other protocol

standards to fully comprehend all aspects of L1, L2, and L3 requirements including timing, bit-level construction of the control and user plane messages, and timing characteristics for a given standard as well as functional behavior of network components and user equipment.

19. From 2006 through 2015, my research focused specifically on LTE. My research continues to this day, although I am no longer operating in a classified environment. During this time, I investigated the performance and functional differences of many varied network and handset devices to see how differing signaling and hardware configurations (inlcuding MIMO) and environmental factors influenced the behavior of user equipment in a given network environment. This included how diversity techniques (transmit and receive), synchronization, timing, and signal to interference plus noise ratio (SINR) for a given device would affect specific functional aspects including elements of the receiver structure, decoding and demodulation performance, calculation of parameters used by the device for making decisions and deriving parameters reported to the network.

20. As part of my research work, I built several custom CDMA, GSM, UMTS, and LTE platforms that implemented specific network-side and user equipment-side functionality including custom signal generation and processing structures, particularly the signal processing chains on both the

transmit and receive sides. This equipment was developed using network simulation hardware in a laboratory environment and was later tested with corresponding networks in both controlled and fully operational environments. Implementing the transmit and receive chains for custom built protocol-enabled equipment required me to gain an intimate understanding of the relevant 3GPP protocol specifications and the underlying structures. Since 2015, I have been primarily focused on guiding graduate students pursuing research including using code domain non-orthognal multiple access (NOMA) combined with MIMO sparse coding multiple access to minimize latency and maximize user density in grant free Internet of Things (IoT) enviornments. Additionally, I am guiding my graduate students in pursuing research in optimized distributed processing algorithms, implementation of block chain coding techniques to improve handover security, and edge computing resource allocation in 4G (LTE)/5G (NR) networks.

21. Much of the classified research work I performed also led to similar approaches for other wireless protocols including IEEE 802.11 and 802.15 (e.g., Zigbee, Bluetooth, and UWB), HART, and other short-range standards as well as HF radio and Wi-MAX.

III. MATERIALS REVIEWED

22. The opinions contained in this Declaration are based on the documents I

reviewed, my professional judgment, as well as my education, experience, and knowledge regarding cellular networking systems.

23. I have reviewed all of the documents referenced in this Declaration. I have reviewed the challenged patent and its prosecution history. I have listed the reviewed materials in in Appendix A to this Declaration.

IV. LEGAL STANDARDS

24. I am not an attorney and offer no legal opinions. My analysis and opinions are based on my expertise in this technical field and on the instructions that counsel has given me for the legal standards relating to patentability as outlined in the rest of this section. I have applied these principles in reaching the opinions set forth herein do not provide any legal opinions in this Declaration. I have been informed and understand that certain legal standards are to be applied by technical experts in forming opinions regarding the meaning and validity of patent claims.

25. I understand and the standard that I have used throughout my Declaration is that, in this proceeding, a patent claim may be deemed unpatentable as "anticipated" if it is shown by a preponderance of the evidence that each-and-every feature of the claim is found in a single prior art reference or rendered "obvious" if, in view of a prior art reference or a combination of prior art references, it would have been obvious to a person of ordinary skill in the art

("POSITA") at the time of the invention, taking into account the following four issues: (1) the scope and intent of the prior art, (2) the differences between the prior art and the claim under consideration, (3) the level of ordinary skill in the art, and (4) any secondary evidence bearing on obviousness.

26. Counsel has informed me that legal principles regarding unpatentability of a claim due to obviousness have been addressed by the U.S. Supreme Court and that, while not absolute, the principles relating to a "motivation," "suggestion," or "teaching" in the prior art to combine references are useful in analyzing whether an invention is obvious. Counsel has also informed me that the suggestion or motivation may be either explicit or implicit and may come from knowledge generally available to a POSITA, from the nature of the problem to be solved, or from a combination of these factors. The test for an implicit motivation, suggestion, or teaching is what the combined teachings, knowledge of a POSITA, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. The analysis is not focused on the specific problem solved by the invention, but the general problem that confronted the inventor prior to the invention.

27. Counsel has further informed me that the U.S. Supreme Court has clarified that additional principles may also be applied in such an analysis. Some of

those principles are set forth below.

28. I have been informed by counsel that it is no longer always required to present evidence of an explicit teaching, suggestion, or motivation to combine prior art references for purposes of determining whether an invention is obvious. Prior art can be combined based on several factors including: an express teaching, suggestion, or motivation from the prior art itself, or from a reasoned explanation of an expert or other witness.

29. I have been informed that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. In evaluating whether such a claim would have been obvious, I may consider whether there is a reason that would have prompted a person of ordinary skill in the field to combine the elements or concepts from the prior art in the same way as in the claimed invention.

30. To determine whether there was an apparent reason to combine the known elements in the way a patent claims, it will often be necessary to look to interrelated teachings of multiple pieces of prior art, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a POSITA. Also, in determining obviousness, one must be aware of the distortion caused by hindsight bias and be cautious of arguments relying upon hindsight reasoning. An obviousness

argument cannot be sustained by mere conclusory statements. Instead, it must be some articulated reasoning with some rational underpinnings to support the legal conclusion of obviousness.

31. In an obviousness analysis, it is my understanding that there are "secondary considerations" that should be analyzed if they apply. I am told that these considerations include (a) whether the prior art teaches away from the claimed invention, (b) whether there was a long felt but unresolved need for the claimed invention, (c) whether others tried but failed to make the claimed invention, (d) skepticism of experts, (e) whether the claimed invention was commercially successful, (f) whether the claimed invention was praised by others, and (g) whether the claimed invention was copied by others.

32. I have also been informed that in order for evidence of secondary considerations to be significant, there must be a sufficient relationship between the claimed invention and the evidence of secondary considerations. I understand that this relationship serves to provide a link between the merits of the claimed invention and the evidence of secondary considerations provided.

33. I have been informed by counsel that the Board construes claims according to the so-called "Phillips" standard. Under the Phillips standard, terms in a claim are given their ordinary and customary meaning, consistent with the patent's

specification, as understood by a POSITA. I have been informed by counsel that what is to be considered includes the claims, the patent specifications and drawings, and the prosecution history, including any art listed by the examiner or the Applicant. I have been informed by counsel that information external to the patent, including expert and inventor testimony and unlisted prior art, are to be considered if ambiguities remain. However, expert testimony may be useful in helping to explain the technology.

34. I have been informed and understand that a patent claim is not patentable as obvious if the differences between the patent claim and the prior art are such that the claimed subject matter as a whole would have been obvious at the time the claimed invention was made to a person having ordinary skill in the relevant art.

35. In analyzing the relevance of the differences between the claimed invention and the prior art, I have been informed that I must consider the impact of such differences on the obviousness or non-obviousness of the invention as a whole, not merely some portion of it. The person of ordinary skill faced with a problem is able to apply their experience and ability to solve the problem and also look to any available prior art to help solve the problem.

36. I have been informed and understand that there are recognized, exemplary rationales for combining or modifying references to show the obviousness of

claimed subject matter. Some of the rationales include the following: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to yield predictable results; use of a known technique to improve a similar device (method or product) in the same way; applying a known technique to a known device (method or product) ready for improvement to yield predictable results; 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 are predictable to one of 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 teachings to arrive at the claimed invention.

V. LEVEL OF ORDINARY SKILL IN THE ART

37. It is my understanding that a person of ordinary skill in the art ("POSITA") is a hypothetical person who is used to analyze the prior art without the benefit of hindsight. I have been instructed that the level of ordinary skill may be reflected by the prior art of record, and that a person of ordinary skill in the art to which the claimed subject matter pertains would have the capability of

understanding the scientific and engineering principles applicable to the pertinent art. I have been instructed that there are multiple factors that may be considered in determining the level of ordinary skill in the art may include: (1) type of problems encountered in the prior art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. I also understand that a POSITA is also a person of ordinary creativity, not an automaton. They would be able to fit the teachings of multiple patents together like a puzzle and have the capability of understanding the scientific and engineering principles applicable to the pertinent art.

38. I have been asked to provide a definition for the level of ordinary skill in the art in the field of the challenged at the time the priority application was filed. As stated in the challenged '557 Patent, "The technology relates to wireless communications, and particularly to methods, apparatus, and techniques for requesting, transmitt, updating, and using system information (SI) in wireless communications." EX-1001, 1:18-21.

39. In my opinion, a POSITA as of the claimed priority date of the challenged patent would have had (1) the equivalent of an undergraduate degree in Electrical Engineering or a related field; and (2) at least two years of

experience in design, development, and/or testing of wireless telecommunication systems. In a similar vein, a POSITA would also have familiarity with the wireless standards and protocols related to data transmission and network management. It is also my opinion that more education could supplement practical experience or vice versa. For example, such knowledge could be aquired by a mixture of training and work experience such as a Master's degree in Electrical Engineering with less work experience.

40. When forming my opinions herein, I analyzed and applied the prior art and claim constructions from a POSITA's perspective at the invention's time.

41. I understand that a POSITA is presumed to have knowledge of all references that are sufficiently related to one another and to the pertinent art and to have knowledge of all arts reasonably pertinent to the particular problem that the claimed invention addresses.

42. All of my opinions in this Declaration are from the perspective of a POSITA, as I have defined it above and during the relevant time frame, *i.e.*, on or around date of the priority application. During this time frame, I possessed at least the qualifications of a person of ordinary skill in the art, as defined above, and I am capable of addressing the issues from the perspective of such a person. My opinions in this declaration reflect how a POSITA would have understood

the claims and the specification of the challenged patent, the prior art to the patent, and the state of the art on or around the priority date.

VI. TECHNICAL BACKGROUND AND STATE OF THE ART

43. The following section describes the relevant state of the art as of the priority date. The prior art references, and the discussions of what was known to a POSITA, provide the factual support for the general description of the state of the art, assist in understanding how a POSITA would have understood the prior art, and provide the motivation to modify or combine the teachings of references.

A. Mobile Wireless Communication Systems

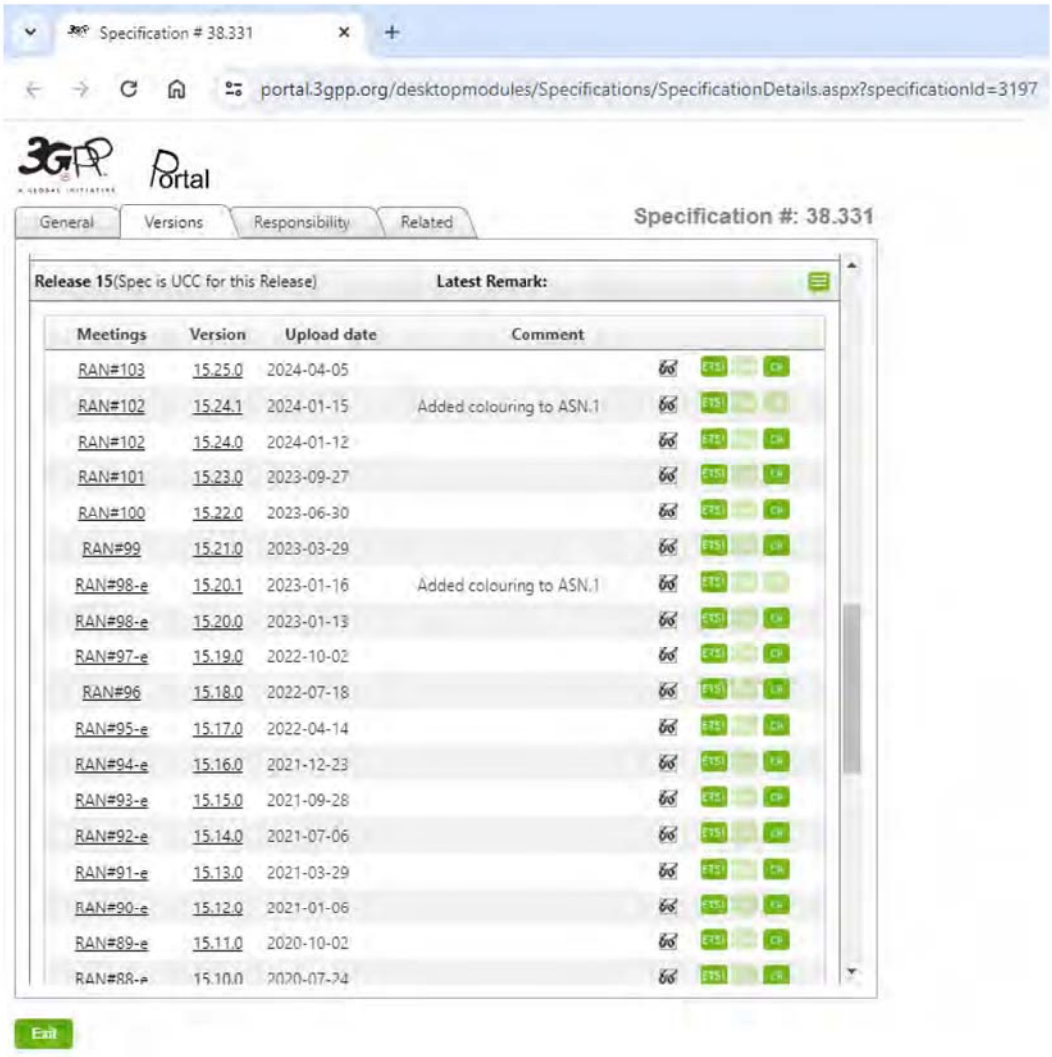
44. As the '557 Patent acknowledges, a group known as the 3rd Generation Partnership Project ("3GPP") defines global technical specifications and reports for present and future wireless communication systems. EX-1001, 1:30-34. These standards are used by equipment manufacturers – both for network equipment, such as base stations ("BS"), and end-user devices, referred to as user equipment ("UE") – to ensure that the devices may communicate with one another.

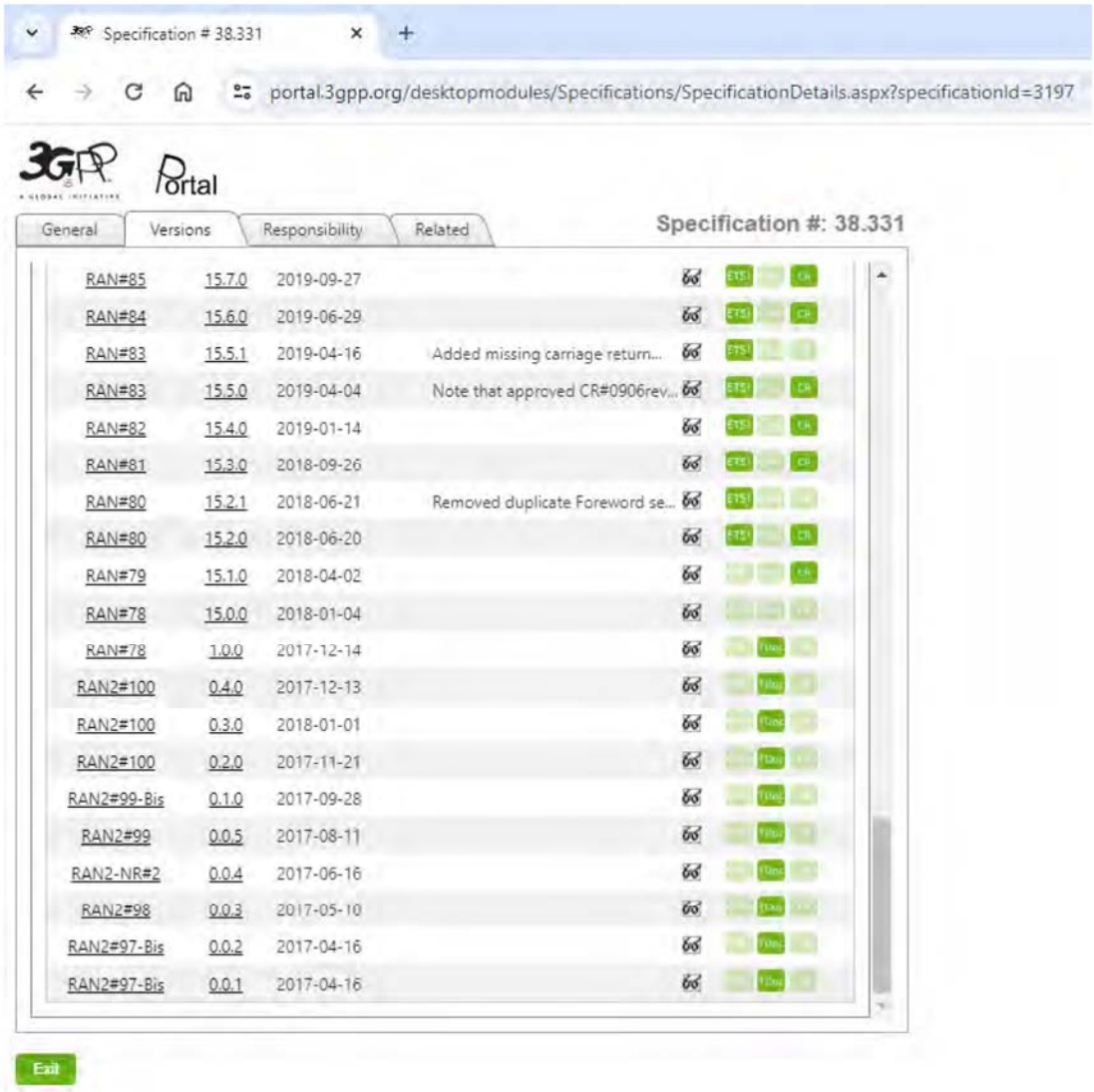
45. In a typical cellular communication system, a BS broadcasts on radio channels certain information that is required for UEs to access the network. EX-1001, 1:39-42. In Long-Term Evolution ("LTE") and LTE Advanced ("LTE-A"),

this information is called "system information" ("SI"). In the 5G New Radio ("NR") System, the system information is broadcast in a Master Information Block ("MIB") and several System Information Blocks ("SIBs"). EX-1001, 1:42-49. To conserve energy and reduce emissions, a BS may broadcast only certain types of SI and make other SI available to UEs in an on demand manner. EX-1001, 1:65-2:3; EX-1006, 1:28-30; EX-1007, Abstract.

B. TS 38.331 v.15.1.0 (Exhibit 1008)

46. Technical Specification ("TS") 38.331 v.15.1.0 ("TS38.331"; Exhibit 8) set forth the 3GPP standard as of March 2018 (2018-03) with respect to Radio Resource Control protocol for the radio interface between a UE and an NG-RAN. EX-1008, 1, 11. It appears that much of the disclosure from the '557 Patent was pulled directly or otherwise derived from TS38.331, which was publicly accessible uploaded to the 3GPP website, www.3gpp.org, on April 2, 2018, prior to the earliest claimed priority date of the '557 Patent, as shown in the below screenshots from the 3GPP website. The first screenshot is provided to show the column headers (e.g., Meetings, Version, Upload date), which are not visible in the second screenshot that shows version 15.1.0 from RAN#79 was uploaded on April 2, 2018.


Specification # 38.331
portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3197
Portal
General
Versions
Responsibility
Related
Specification #: 38.331
Release 15(Spec is UCC for this Release)
Latest Remark:
Meetings
Version
Upload date
Comment
RAN#103 15.25.0 2024-04-05
RAN#102 15.24.1 2024-01-15 Added colouring to ASN.1
RAN#102 15.24.0 2024-01-12
RAN#101 15.23.0 2023-09-27
RAN#100 15.22.0 2023-06-30
RAN#99 15.21.0 2023-03-29
RAN#98-e 15.20.1 2023-01-16 Added colouring to ASN.1
RAN#98-e 15.20.0 2023-01-13
RAN#97-e 15.19.0 2022-10-02
RAN#96 15.18.0 2022-07-18
RAN#95-e 15.17.0 2022-04-14
RAN#94-e 15.16.0 2021-12-23
RAN#93-e 15.15.0 2021-09-28
RAN#92-e 15.14.0 2021-07-06
RAN#91-e 15.13.0 2021-03-29
RAN#90-e 15.12.0 2021-01-06
RAN#89-e 15.11.0 2020-10-02
Exit



(https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3197)

47. Per TS38.331, SI "is divided into the *MasterInformationBlock* (MIB) and a number of *SystemInformationBlocks*" in which MIB is to be transmitted with a periodicity of 80 ms and includes parameters needed to acquire *SystemInformationBlockType1* ("SIB1"). EX-1008, 19. SIB1 also was to be transmitted on a periodic broadcast basis and include information regarding

the availability and scheduling of other SIBs, including whether they would be broadcast or provided on an on-demand basis. EX-1008, 19. If other SIBs were to be provided on-demand, then it was determined that SIB1 would include information for the UE to perform an SI request to obtain the needed information. EX-1008, 19. This other information included the periodically occurring time domain windows ("SI-windows") in which the SI messages are transmitted. EX-1008, 19.

48. After performing cell selection, i.e., known as camping on a cell, a UE performs an SI acquisition procedure to acquire access stratum ("AS") and non-access stratum ("NAS") information. EX-1008, 19; *see also* EX-1013 (Recommendation GSM 05.08), 10-17 (describing camping/cell (re)selection); EX-1014 (ETSI TS 136 304 v10.3.0), 8-9 (defining "camped on a cell" as "UE has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information" and "serving cell" as "The cell on which the UE is camped."); EX-1015 (TSGR2#4393), 3 ("The UE looks for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as 'camping on the cell.'").

49. In the RRC_IDLE and RRC_INACTIVE states, the UE ensures it has a valid

version of at least the MIB, SIB1, and *SystemInformationBlockTypeX* through *SystemInformationBlockTypeY*. EX-1008, 19. In the RRC_CONNECTED state, the UE ensures it has a valid version of at least the MIB, SIB1, and *SystemInformationBlockTypeX*. EX-1008, 19.

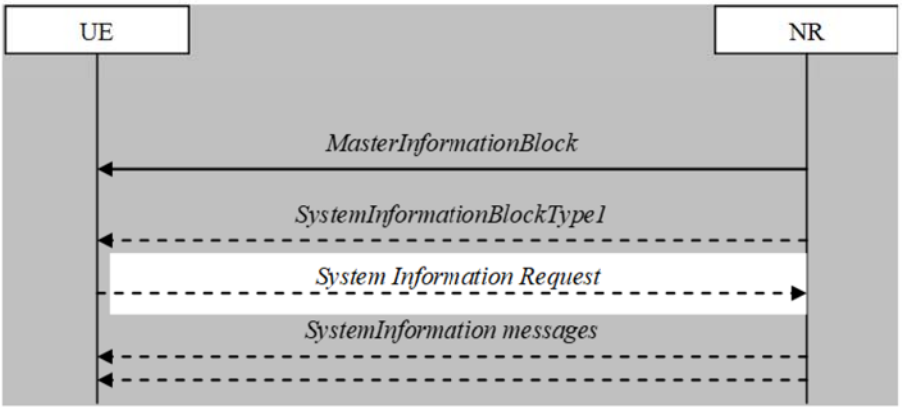


Figure 5.2.2.1-1: System information acquisition

EX-1008, 19.

50. The UE stores the SI acquired from the serving cell on which the UE is camped currently, which is valid for only a certain time. EX-1008, 19 ("The UE shall store relevant SI acquired from the currently camped/serving cell."). As long as the stored version of the SI is valid, the UE may use the stored version of the SI after cell re-selection, upon return from out of coverage, or after an indication of an SI change. EX-1008, 19. If the stored version of the SI is invalid due to the expiration of the validity time, then the UE would re-acquire the SI using the SI acquisition process. EX-1008, 20 (Section 5.2.2.2 "SI validity an need to (re)-acquire SI").

51. With respect to broadcast SI other than MIB and SIB1, then a UE would receive the downlink shared channel ("DL-SCH") using the system information radio network temporary identifier ("SI-RNTI) from the start of the SI window and continues until the end of the SI window or until the SI message is received. EX-1008, 21. If the SI message is not received by the end of the SI-window, then the UE repeats reception at the next SI window for the concerned SI message. EX-1008, 21.

C. Use of timers/counters

52. Timers and counters have been used in connection wireless communication for decades. For example, with respect to LTE and 5G technologies, timers have been used by UEs to identify if system information is valid or needs to be re-acquired from a base station:

> In accordance with an aspect of the present disclosure, a method for a terminal to management system information in a mobile communication system is provided. The method includes: receiving system information from a base station; checking whether information related to the management of a valid time regarding system information is included in the system information, and determining a valid time regarding the system information according to the checking result; and starting a timer by employing the determined valid time (validity timer) and managing the system information.

EX-1011 (U.S. Pat. App. Pub. No. 2017/0048920 – Kim) ¶8.

> The UE determines whether its storing value differs from values of the IEs [information elements] in operation 660. When the UE ascertains that its storing value does not differ from values of the IEs in operation 660, it does not need to update system information. On the other hand, when the UE ascertains that its storing value differs from values of the IEs in operation 660, it receives system information that an eNB is currently broadcasting in operation 665.

EX-1011 (U.S. Pat. App. Pub. No. 2017/0048920 – Kim) ¶75.

53. Timers also were known to be used to identify when a period for receiving system information expired, which would then trigger one or more subsequent operations:

> For example, the second receiving unit 220 may receive the needed system information block (SIB) in any one of the following manners:
>
> …
>
> (3) ***Start a receive timer*** according to pre-configured information. Receive the data packets on a corresponding downlink channel in the operation period of the timer according to the time indicated in the scheduling information.
>
> Multiple scheduling times may appear in the operation period of the timer. If the UE does not receive the requested SIB (or SI message) at the first scheduling time, the UE may continue the receiving at the second scheduling time. The process continues until the SIB (or SI

message) is correctly received. ***If the timer times out and the SIB is not yet correctly received, the UE can judge that the current link is abnormal; at this time, cell reselection or other mechanisms may need to be started***.

EX-1006 (Canadian Pat. App. Pub. No. CA 3 030 329 – Zhang), 6:13-21.

For example, SI may be acquired wen a UE is unattached to a network (e.g., as part of an initial acquisition of SI). ***SI also may be acquired*** after a UE attaches to a network and while the UE is stationary (e.g., ***because a timer or SI has expired***, or because the network has indicated (e.g., in an instance of a synch signal or in a paging message) that SI has changed).

EX-1007 (U.S. Pat. App. Pub. No. 2016/0234736 – Kubota) ¶105.

The service-specific SIBs 375, 390 may include a service-specific configuration such as SI parameters specifically configured to improve the service or meet service requirements. For example, ***service-specific configurations may include validity timers*** or SI reading requirements ***that require an IOE device to reacquire SI*** after the IOE device awakens from a power saving mode (PSM) or deep sleep.

EX-1007 (U.S. Pat. App. Pub. No. 2016/0234736 – Kubota) ¶124.

54. The same is true with respect to a counter, which could be configured to count to a predetermined value or down from a predetermined value. For example, a counter may be used to identify when system information is to be changed:

In some embodiments, the instance of the sync signal or paging

message may include a general indicator that SI has changed (e.g., a modification flag). The general indicator or modification flag may include, for example, ***a counter value that is incremented when SI has changed***, or a Boolean variable (e.g., a binary value) that is set to TRUE (e.g., a logic "1") when SI included in an MSIB has changed (or when the network expects a UE to re-acquire the MSIB) or FALSE (e.g., a logic "0") when SI included in an SMIB has not changed (or when the network does not expect a UE to re-acquire the MSIB.

EX-1007 (U.S. Pat. App. Pub. No. 2016/0234736 – Kubota) ¶144.

55. It also was known for a counter or other value to indicate a number of times system information would be (re)broadcast by a BS:

> Here, the repeatedly transmitted subframes may be identified with a window length, ***a repetition cycle*** and a transmission start timing for transmission of the second system information. In other words, the scheduling information may include the window length, the repetition cycle and the transmission starting timing for transmitting the second system information.

EX-1012 (U.S. Pat. App. Pub. No. 2018/0132165 – Takahashi) ¶37.

> There can also be a timer or a counter (specified in terms of seconds or radio frame) associated with the broadcast indicator/FLAG when the FLAG is set to TRUE to indicate how long the network will broadcast the other system information with reference to the beginning of system modification interval.

EX-1004 (WO 2018/016922 – Ingale) ¶136.

VII. OVERVIEW OF THE CHALLENGED PATENT

A. Priority Date

56. I have been instructed, for this purpose of this IPR Petition, to assume the priority date for the challenged patent is May 10, 2018 (i.e., the filing date of U.S. Provisional Patent Application No. 62/669,851 to which the challenged patent claims priority). To the extent the Challenged Claims (i.e., claims 9-16) are only entitled to the May 10, 2019 filing date of International Patent Application No. PCT/US2019/031674, my analysis herein would not change.

B. Overview of the Content of the Challenged Patent

57. The Challenged Claims are directed to techniques for improving communicating and/or updating system information blocks ("SIBs") between an access node or base station ("BS") and a wireless terminal or user equipment ("UE"). Specifically, the BS comprises transmitter circuitry and processor circuitry. The transmitter circuitry is configured to transmit a first type system information block ("SIB"), which may be minimum system information ("MSI"). MSI may include a master information block ("MIB") and a limited number of SIBs, including SIB1. The first type SIB includes scheduling information of a system information ("SI") message and an indication of broadcast status for the SI message, with the indication

indicating broadcasting. The SI message may include at least one second type SIB, which may include Other SI, e.g., SI other than MSI. EX-1001, 2:42-59; 5:49-64; 9:31-35.

58. The Challenged Claims also require the MSI to include a parameter that is associated with a condition for determining failure of an SI message acquisition process. The parameter may be a maximum number of SI message reception opportunities (e.g., SI windows) or a timer configuration that UE should use as a termination condition for the SI reception procedure. If the UE is not able to acquire the SI message within the maximum number of SI windows identified in SIB1 and/or the timer expires, then the SI message acquisition process has failed and the UE should re-initiate a re-acquisition process to re-acquire SIB1 from the BS. A master information block ("MIB") may need to be acquired prior to acquiring SIB1. According to the '557 Patent, the provisioning of the parameter enables a determination of a SI message acquisition process failure and provides for the initiation of remedial processes. EX-1001, 1:57-2:3, 14:55-65, 16:47-61.

59. FIG. 13A, which is reproduced below in annotated form, shows one example of SIB1 that includes an information element "si-MaxAcqAttempts" having a parameter that indicates the maximum number of SI message reception opportunities (e.g., SI windows) allowed before the end of an SI reception

procedure.

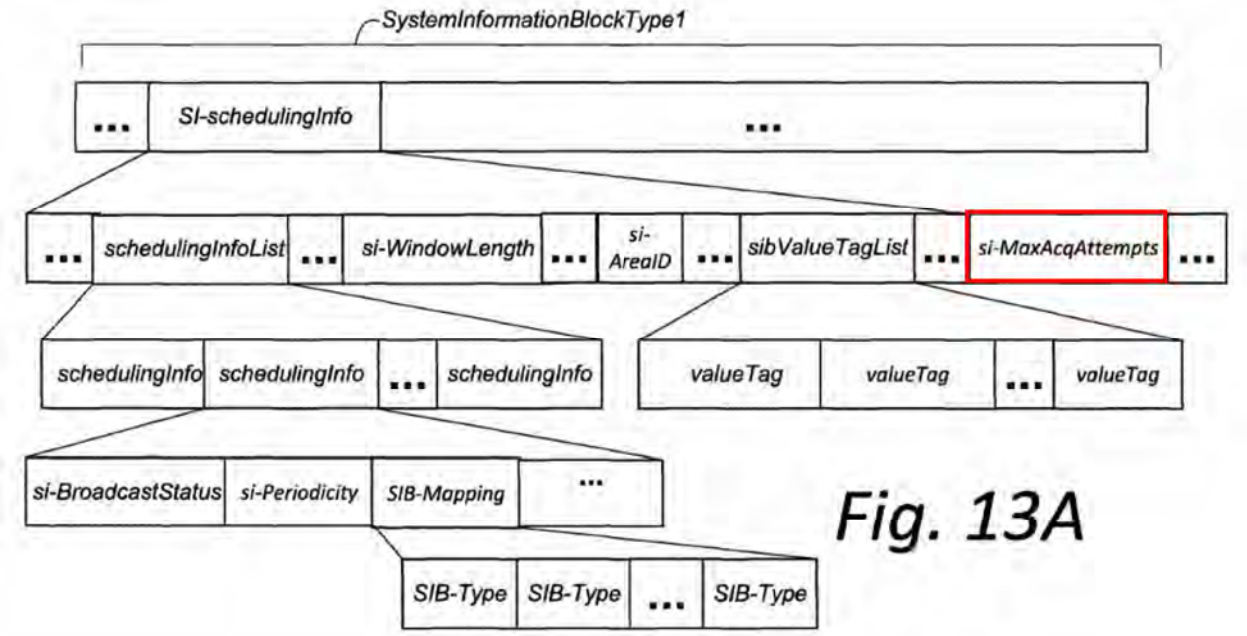


Fig. 13A

EX-1001, FIG. 13A.[2]

60. FIG. 13B, which also is reproduced below in annotated form, illustrates another example of SIB1 having an information element "Ue-TimersAndConstants." The Ue-TimersAndConstants information element includes one or more timer configurations (T#x) that are to be used as a termination condition for an SI reception procedure. EX-1001, 14:61-65.

[2] Unless otherwise noted, all emphases and annotations herein have been added.

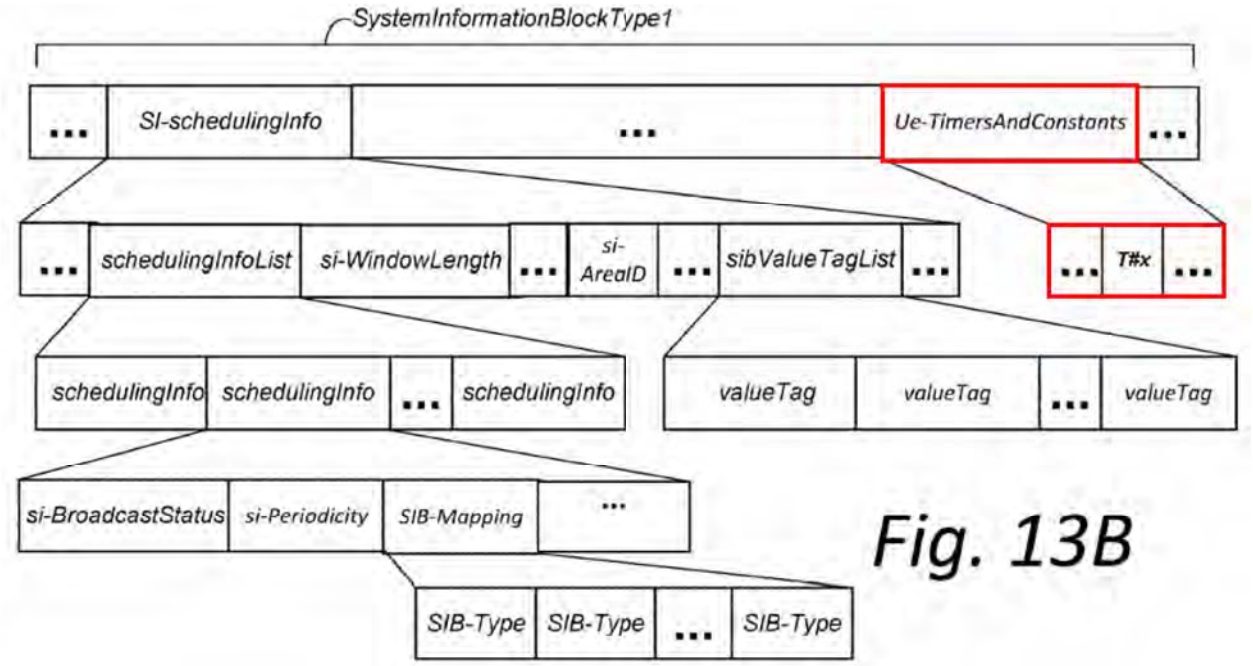


Fig. 13B

EX-1001, FIG. 13B.

61. The parameter associated with a condition for determining failure of an SI message acquisition process is used as follows (described with reference to FIG. 20). A UE obtains SIB1 as Minimum SI, e.g., first type system information, from a periodic broadcast by a BS at 20-1. SIB1 includes the scheduleInfoList that identifies that an SI message is available by broadcast. An SI reception procedure is performed at 20-3 by monitoring signals from the BS to obtain the SI message, SI#k, in the designated SI windows identified by the scheduleInfoList in the SIB1. Three successive attempts to receive the requested SI message, SI#k, but ultimately fail after the third attempt at 20-3c. Failure of the SI reception procedure is determined by a system acquisition failure detector 80, which makes the failure determination based

on a termination condition. EX-1001, 20:20-67.

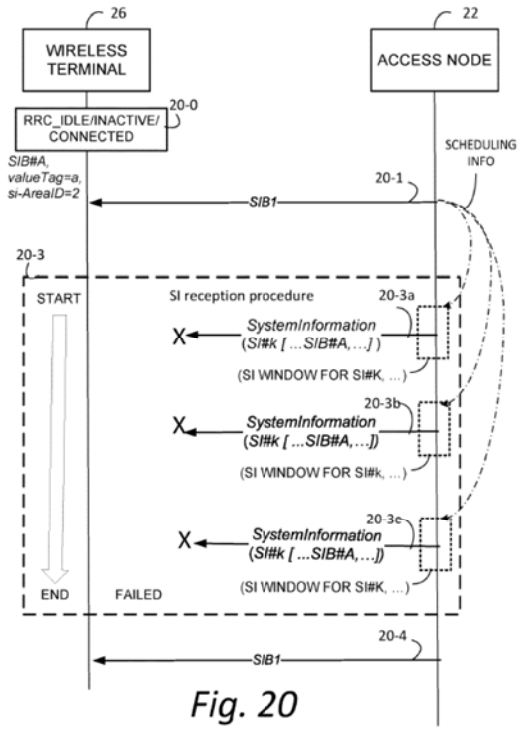


Fig. 20

EX-1001, FIG. 20.

62. Upon detection of the failure of the SI acquisition process, the UE initiates a re-acquisition of the first type system information, i.e., the MINIMAL SI or SIB1, at 20-4. The re-acquisition procedure may include re-acquiring MIB prior to acquiring SIB1 if the UE does not have a valid version of a stored SIB. EX-1001, 21:1-15.

63. The Challenged Claims recite a known principle – communicating information to facilitate system block acquisition and re-acquisition by a UE. Ingalc dcscribcs a BS broadcasting prccisely thc information claimcd – a parameter for use by a UE in determining a failure of an SI acquisition

process, which was the only basis of patentability identified during prosecution.

C. Prosecution History

64. The '557 Patent issued from U.S. Patent Application No. 16/408,922 ("'922 Application"), which was filed on May 10, 2019 as a continuation of International Patent Application No. PCT/US2019/031674, filed on May 10, 2019 claiming priority to U.S. Provisional Patent Application No. 62/669,851, filed May 10, 2018 ("'851 Provisional").

65. The '922 Application was filed with eight (8) claims, of which claims 1, 3, 5, and 7 were in independent form. EX-1002, 44-46. Independent claims 1 and 3 were directed to a user equipment and method for a user equipement, respectively, and independent claims 5 and 7 were directed to a base station apparatus and a method for a base station apparatus respectively. EX-1002, 44-46. Independent claim 5 would ultimately issue as claim 9, and independent claim 13 would ultimately issue as claim 13. Claims 5 and 7, as originally presented, recited:

5. A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB;

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

EX-1002, 45.

7. A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

EX-1002, 45-46.

66. The Examiner rejected the originally pending claims as being obvious from U.S. Patent Application Publication No. 2018/0124685 ("Jha") in view of R2-1805017, "Remaining issues on on-demand System Information," submitted by Intel Corporation ("R2-1805017"). EX-1002, 264-274.

67. In response, Applicant amended the claims. EX-1002, 285-296. The amendments to independent claims 5 and 7 are set forth below.

> 5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:
>
> ~~transmitter~~ transmitting circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:
>
> scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and
>
> an indication of broadcast status for the SI message, the indication indicating broadcasting;
>
> processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein
>
> the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message~~, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid~~.

EX-1002, 293.

> 7. (Currently Amended) A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:
>
> transmitting first type system information block (SIB), the first type SIB comprising:
>
> scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and
>
> an indication of broadcast status for the second type SI message, the indication indicating broadcasting;
>
> broadcasting the SI message; wherein
>
> the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message~~, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid~~.

EX-1002, 294.

68. Applicant also argued that the cited prior art references did not teach or suggest, "'a failure of the SI message acquisition process' occurs upon failure to receive the SI message that is broadcasted." EX-1002, 288-289.

69. A Final Office Action then issued rejecting the pending claims over U.S. patent Application Publication No. 2018/0049107 ("Johnson") in view of U.S. Patent Application Publication No. 2011/0275375 ("Yamagishi"). EX-1002, 319-331. In the Final Action, the Examiner cited the Yamagishi reference for disclosing that the first type SIB acquisition is initiated upon a failure of the SI message acquisition process. EX-1002, 322-323.

70. Applicant then filed a Request for Continued Examination and further amended the claims; this time to require the scheduling information to configure SI windows, which are periodically occurring time windows in which the SI message is transmitted. EX-1002, 340-349. The amendments to claims 5 and 7 are set forth below.

5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitting circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

EX-1002, 344.

7. (Currently Amended) A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

EX-1002, 345.

71. Applicant also argued that Yamagishi's "re-establishment process" cited in

the Final Action involved re-establishing connection with another cell and not the claimed re-acquisition process. EX-1002, 346-347. Specifically, Applicant argued:

> Paragraph [0058] of US 20110275375 to Yamagishi, relied on by the final office action, reads at least in part as follows:
>
> > "when the control unit 12 determines that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell3) other than the cell 2." Yamagishi ¶[0058], emphasis added.
>
> US 20110275375 to Yamagishi does not explain his "re-establishment process" in detail. However, the Yamagishi process appears to involve re-establishing connection with another cell, e.g., cell 3 rather than cell 2, particularly since 2 is now barred. See also Yamagishi ¶[0025] - ¶[0025] and ¶[0029] - ¶[0033], ¶[0047], ¶[0050], and ¶[0060] - ¶[0061]. Since the system information differs from one cell to the next, it cannot be concluded from US 20110275375 to Yamagishi that the "re-establishment process" is for reacquisition of the first type SIB corresponding to that which was previously received. Therefore, the combination of Johansson and US 20110275375 to Yamagishi fails to realize all the limitations of the independent claims.

EX-1002, 347.

72. Another office action then issued, this time rejecting all pending claims over U.S. Patent Application Publication No. 2017/0251500 ("Agiwal") in view of U.S. Patent Application No. 2018/0332521 ("Subramanian"). EX-1002, 356-367. The Examiner cited the Subramanian reference as disclosing the claimed re-acquisition process. EX-1002, 359-360.

73. In response (EX-1002, 389-401), Applicant amended the independent claim

5, which issued as claim 9, to require "a parameter associated with a condition for determination of a failure of an SI message acquisition process" and "the base station apparatus is a current serving access node of the user equipment," and similar amendments were made to claim 7, as shown below.

5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitting circuitry configured to transmit a first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the SI message, the indication indicating broadcasting; and

processor circuitry configured ~~to use~~to cause the ~~transmitter~~ transmitting circuitry to broadcast the SI message; wherein:

the first type SIB is re-acquired by the user equipment upon the user equipment failing on [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message,

the base station apparatus is a current serving access node of the user equipment.

EX-1002, 391-392.

7. **(Currently Amended)** A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the method comprising:

transmitting a first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the ~~second type~~ SI message, the indication indicating broadcasting; and

broadcasting the SI message; wherein;

the first type SIB is re-acquired by the user equipment upon the user equipment failing on [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message,

the base station apparatus is a current serving access node of the user equipment.

EX-1002, 392-393.

74. Paragraphs 105, 108, and 109 were identified as support for the amendments. EX-1002, 395. Applicant argued that Subramanian discloses SI acquisition failure during an attempted cell selection and does not disclose re-acquiring the SIB1 or the minimum SI when the SI acquisition failure occurs. EX-1002, 396-399. Applicant further argued that neither Agiwal nor Subramanian discloses the claimed "parameter associated with a condition for determination of a failure of an SI message acquisition process. EX-1002, 398-399.

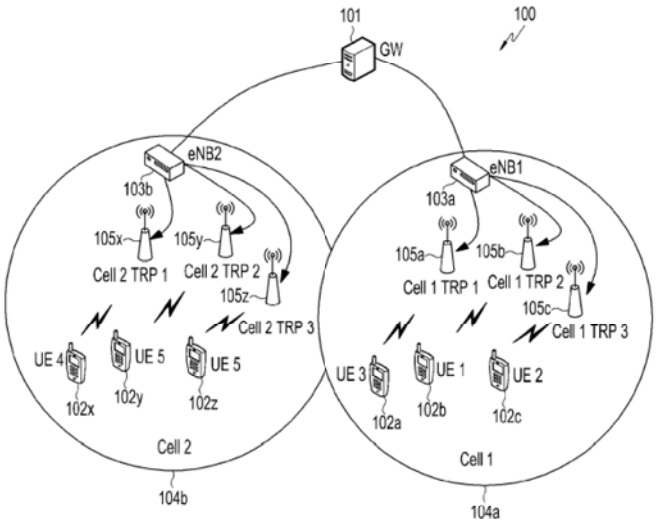
75. A Notice of Allowance then issued, but did not set forth any reasons for allowance. EX-1002, 404-427.

VIII. OVERVIEW OF THE PRIOR ART

A. Overview of Ingale (EX-1004)

76. Ingale discloses methods and systems for information acquisition in a wireless communication system such that a UE may be provisioned with system information ("SI") with greater efficiency by reducing excessive signaling overhead. FIG. 1 illustrates a next generation wireless system 100 having a gateway 101; a set of UEs 102, a set of base stations, also referred to as eNBs, 103; cells 104; and set of transmission reception points ("TRPs") 105. EX-1004 (Ingale), Abstract, ¶¶ 10, 107-108.

[Fig. 1]



EX-1004 (Ingale), FIG. 1.

77. The eNBs 103 are configured to transmit a broadcast channel to at least one of the UEs 102. The periodic broadcast includes Minimum System Information ("MSI"), which includes at least a first master information block

("MIB") and a second MIB. The second MIB (MIB#2) also is referred to as a SIB1. The MSI identifies whether at least one of a SI block or Other System Information ("OSI") is available in the camped cell (serving the UE) on-demand or via periodic broadcast by the BS as well as a number of other indicators. EX-1004 (Ingale) ¶¶16, 46, 87, 113. Table 1, which is produced below, identifies the various SIBs.

[Table 1]

MIB/SIB	Main purpose	MIB/SIB	Main purpose
MIB	Cell access	**SIB 10**	ETWS
SIB 1	Cell access	**SIB 11**	ETWS
SIB 2	Radio Resource Configuration	**SIB 12**	CMAS
SIB 3	Cell reselection	**SIB 13**	MBSFN
SIB 4	Cell reselection intra-frequency	**SIB 14**	EAB
SIB 5	Cell reselection inter-frequency	**SIB 15**	MBMS SAI list
SIB 6	Inter-RAT reselection UMTS	**SIB 16**	GPS/UTC time
SIB 7	Inter-RAT reselection GERAN	**SIB 17**	WLAN
SIB 8	Inter-RAT reselection CMDA2000	**SIB 18**	D2D Communication
SIB 9	Home eNB name	**SIB 19**	D2D discovery

EX-1004 (Ingale) ¶124.

78. The indicators broadcast as MSI includes: an OSI broadcast indication/FLAG indicating whether the cell is broadcasting OSI; multiple System Configuration Identifiers ("SCI") associated with configuration of each SIB provided in the OSI; System ("Area-Id/SAID"), which define the SI area

validity scope; a common valuetag, i.e., a counter indicating that at least one SIB configuration provided in OSI has changed or been updated; one or more individual valuetags, i.e., counters associated with change or update configuration of corresponding SI blocks provided in the OSI; and a validity flag indicating whether the already acquired and stored SI is still valid. A System Information Table ("SIT") invalidity flag is broadcasted in MSI, which if set TRUE, indicates that the UE that already acquired and stored SI is not valid and the UE needs to clear all stored system information and acquire updated SIT. A timer or counter (specified in terms of seconds or radio frame) associated with the broadcast indicator/FLAG when the FLAG is set to TRUE indicates how long the network will broadcast the OSI. EX-1004 (Ingale) ¶¶87-94, 136.

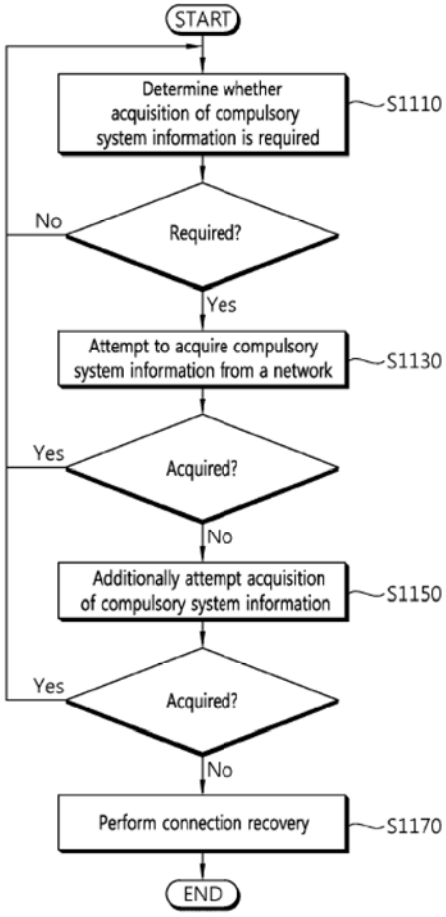
B. Overview of Jung (EX-1005)

79. Jung discloses a method for acquiring system information by a UE in a wireless communication system in which the UE generates an information acquisition failure report upon the failure of the acquisition of compulsory system information. EX-1005 (Jung), Abstract. In Jung, system information includes essential information that needs to be known by a UE (also referred to as a terminal) in order for the UE to access a BS. EX-1005 (Jung) ¶59. The system information is divided into a Master Information Block ("MIB") and

a plurality of System Information Blocks ("SIBs"). EX-1005 (Jung) ¶59. The MIB may be broadcasted and transmitted on a broadcast channel ("BCH"). EX-1005 (Jung) ¶60. SystemInformationBlockType1 ("SIB1") includes scheduling information for other SIBs. EX-1005 (Jung) ¶61.

80. FIG. 11 of Jung is a flowchart illustrating a method for acquiring system information. EX-1005 (Jung) ¶215. At S1110, the UE determines whether the acquisition of compulsory system information is required. EX-1005 (Jung) ¶215. If the UE determines that acquisition of compulsory information is required, then the terminal attempts to acquire the compulsory system information, which may be broadcast by the BS, at S1130. EX-1005 (Jung) ¶218.

FIG. 11



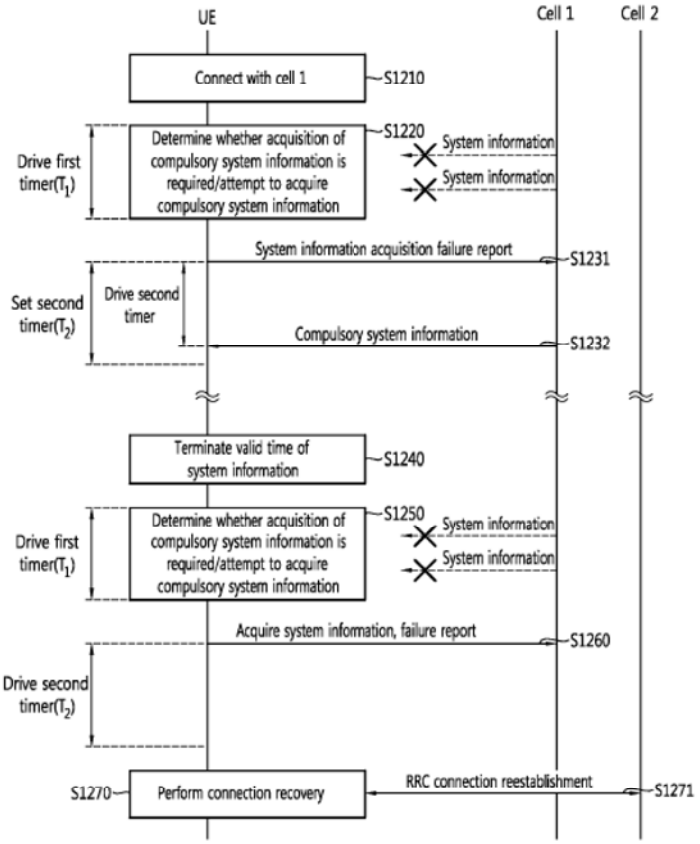
EX-1005 (Jung), FIG. 11.

81. The UE may set a first timer or a first counter with a specific value when attempting to acquire the compulsory information. EX-1005 (Jung) ¶219. The first timer may be set to a maximum time interval when the UE may attempt to acquire the compulsory system information, or the first counter may be set to a maximum number of times when the terminal may attempt to acquire broadcasted system information for acquisition of the compulsory system information. EX-1005 (Jung) ¶219.

82. If the UE does not acquire the compulsory system information at S1130, then the UE generates a system acquisition failure report message and attempts to acquire the compulsory system information again at S1150. EX-1005 (Jung) ¶221. The UE performs connection recovery at S1170 if the UE is not able to acquire the compulsory system information at S1150. EX-1005 (Jung) ¶231.

83. FIG. 12 is a diagram illustrating the method for acquiring system information, which was described above with respect to FIG. 11. EX-1005 (Jung) ¶235.

FIG. 12



EX-1005 (Jung), FIG. 12.

84. The UE connects with cell 1 at S1210 and determines whether compulsory system information is to be acquired at S1220. EX-1005 (Jung) ¶¶236-237. Upon determining that it needs to acquire the compulsory system information, then the UE sets a first timer to T1 or a first counter to N2. EX-1005 (Jung) ¶239. The UE attempts to acquire the compulsory system information until expiration of the first timer or the first counter. EX-1005 (Jung) ¶239.

85. If the acquisition of system information fails, then the UE may attempt to acquire the compulsory system information again. EX-1005 (Jung) ¶240. This second attempt may include transmitting a system information acquisition failure report message to the network at S1231 and setting a second timer to T2 or a second counter to N2. EX-1005 (Jung) ¶240. The UE may acquire the compulsory system information from the network at S1232. Otherwise, the UE may repeat the process and attempt to connect to a different cell, e.g., cell 2, if unable to acquire the compulsory system information. EX-1005 (Jung) ¶¶243-247. The disclosed methods provide for improved continuity of service and network efficiency. EX-1005 (Jung) ¶21.

IX. THE CHALLENGED CLAIMS OF THE '557 PATENT ARE OBVIOUS FROM INGALE IN VIEW OF JUNG

A. Reasons to combine Ingale and Jung

86. Both Ingale and Jung disclose methods in which a UE acquires system

information from a BS on-demand or via broadcast for the common purpose of enabling to determine and access services available in the camped cell. EX-1004 (Ingale), Abstract; EX-1005 (Jung), Abstract. In both references, the BS broadcasts MSI/compulsory SI periodically over a broadcast channel:

> Another object of the embodiments herein is to decode a broadcast channel to acquire Minimum System Information (MSI) periodically transmitted by a base station.

EX-1004 (Ingale) ¶13

> The method may further comprise attempting broadcasted system information from the serving cell. The system information failure report message may be transmitted when the terminal does not acquire the broadcasted system information from the serving cell.

EX-1005 (Jung) ¶9.

87. Both Ingale and Jung disclose that the MSI/compulsory SI includes a Master Information Block ("MIB") and SIB1:

> Similar to the default PBCH cycle, the default SBCH cycle which is frequency agnostic can be specified in the 3GPP specifications. Since the PBCH cycle (310a) is configurable per frequency the SBCH cycle can also be configured per frequency. For example if the PBCH cycle (310a, 310b, 310c so on and so forth) is 20 ms then the SBCH cycle can be specified/configured as 40 or 80 ms or some other value. The SBCH cycle can also be indicated in the PBCH (i.e. the scheduling information

of MIB#2 (SIBl) is included in the first MIB (MIB#l). The scheduling information included in the first MIB (MIB#l) indicates at least one of periodicity of the second MIB, namely, MIB#2/SIB 1 transmitted on the SBCH and an absence of the second MIB (MIB#2/SIB1) when the second MIB (MIB#2/SIB1) is not transmitted on the SBCH. The scheduling information included in the first MIB also refers to the resource information to receive the PDCCH for the PDSCH on which the second MIB is scheduled. In an example, assume the scheduling information related to MIB#2/SIB1 indicated in MIB#l as two bits which would be represented with code-points 00, 01, 10 and 11. In an example, the code-points 01, 10 and 11 indicate the SBCH cycle or MIB#2/SIB1 periodicity as 80 ms, 160ms and 320 ms respectively. The code-point 00 indicates the absence of MIB#2/SIB 1 i.e. the cell does not broadcast the MIB#2/SIB1 on the SBCH. When the scheduling information included in the first MIB (MIB#l) indicates the absence of the second MIB (MIB#2/SIB 1) then the cell 104 is considered as barred by the UE 102 because the UE 102 cannot obtain the full contents of the MSI. Apart from the scheduling information the first MIB includes a cell barred indicator, wherein if the cell barred indicator is set TRUE, then the cell 104 is considered as barred by the UE 102 regardless of the scheduling information indicating the presence of the second MIB. In case of beamforming, the PBCH and the SBCH transmissions are subject to the DL beam sweeping over the plurality of DL coverage beams in order to reach the UEs 102a-102c and 102x-102z in entire cell coverage area. A time offset between the PBCH and the SBCH can either be specified as default offset or can be indicated in the MIB#l transmitted on the PBCH when the MIB and SIB1

periodicity is same.

EX-1004 (Ingale) ¶138

> The MIB may include the limited number of compulsory parameters which are most often transmitted and requested to be obtained for other information from a cell. The terminal firstly searches the MIB after downlink synchronization. The MIB may include information to support downlink channel bandwidth, PHICH setting, and synchronization, and SFN and eNB transmission antenna setting operated as a timing reference. The MIB may be broadcasted and transmitted on a BCH.
>
> SIB1 (SystemInformationBlockType1) among the above SIBs is included in a "SystemInformationBlockType1" message to be transmitted. Other SIBs except for the SIB1 are included in the system information message to be transmitted. The SIBs may be flexibly mapped to the system information message according to a scheduling information list parameter included in the SIB1. However, each SIB is included in a single system information message. Only SIBs having only the same scheduling required value (e.g. period) may be mapped to the same system information message.

EX-1005 (Jung) ¶¶60-61.

88. Ingale discloses that the MIS can be transmitted in the MIB and SIB1 and can include a timer or counter associated with a broadcast indicator/FLAG when the FLAG is set to TRUE to indicate how long the network will broadcast the other system information. EX-1004 (Ingale) ¶136. Ingale does not expressly

state what happens if a UE is not able acquire the SI prior to the expiration of the timer or the counter.

89. However, Jung, which is in the same field of endeavor (wireless network communications) and directed to addressing a similar problem as Ingale, i.e., a UE obtaining SI from a BS, discloses a timer or counter used to identify an SI acquisition failure condition. EX-1005 (Jung) ¶¶219, 239. Jung further discloses that the UE may re-attempt to acquire the SI after the expiration of the timer or counter by first transmitting a system information acquisition failure report message to the BS and then starting a second timer or counter. EX-1005 (Jung) ¶¶221-223, 240.

90. A POSITA would have been motivated to combine the teachings of Ingale and Jung because that combination involves merely using known mechanisms (e.g., timers and counters) in a known way (e.g., to signify the lapsing of a validity period) to yield a predictable result (e.g., triggering remedial and/or subsequent action). For example, although Ingale does not expressly disclose how a UE would use the timer or counter associated with the broadcast indicator/FLAG when the FLAG is set to TRUE, a POSITA would have understood that the expiration of the timer or counter could be used to trigger a subsequent action by the UE. Indeed, as discussed above in VI.C, timers and counters were used frequently in wireless communication systems as

triggers to performing actions.

91. A POSITA would have understood that retrying to obtain compulsory SI after failing to acquire it in the first instance, as taught by Jung, would advantageously minimize a service impossible state that would separate a UE from a cell. EX-1005 (Jung) ¶248. Indeed, Jung expressly states that retrying to obtain the compulsory SI upon having failed to do so would advantageously improve continuity of service to a UE and network efficiency:

> The operating method for acquiring system information in a wireless communication system may provide compulsory system information through report/request of the terminal in a network environment in which a restricted measurement resource may be set. Accordingly, the terminal may minimize a service impossible state due to the failure of the acquisition of the system information. Since the compulsory system information may be provided through dedicated signaling according to report/request of the terminal, consumption of a radio resource due to provision of imprudent compulsory system information may be prevented. Further, although acquisition of the system information by broadcasting fails, when the system information may be acquired through dedicated signaling, a situation where the terminal is separated from a cell may be prevented. Continuity of a service provided to the terminal may maintain by operating the terminal, and a network operation may be efficiently achieved.

EX-1005 (Jung) ¶248

92. At the very least, attempting to reacquire the Other SI, i.e., SI other than MSI, upon expiration of a timer or counter was nothing more than an obvious design choice a POSITA would have made when confronted with the finite set of potential actions a UE could take to acquire the SI needed to communicate within the cell.

93. For example, one less desirable alternative would be to initiate cell reselection upon the UE failing to acquire the SI. Cell selection involves a UE searching for a suitable cell by performing various measurements to identify a cell with suitable signaling. Once a cell has been selected, the UE camps on a cell and then performs SI acquisition. *See* VI.B (describing camping). Accordingly, a POSITA would have understood it to be more efficient for a UE to re-attempt to acquire the SI upon failing to do so while remaining in the camped cell, as opposed to the more resource and time intensive process of performing cell reselection followed by cell acquisition. Therefore, a POSITA would have combined the teachings of Ingale and Jung to provide a method in which a BS transmits a parameter that may be used to set a timer or counter in a UE for determining a failure of an SI acquisition process, as detailed below.

B. Detailed Application of Ingale and Jung to the Challenged Claims

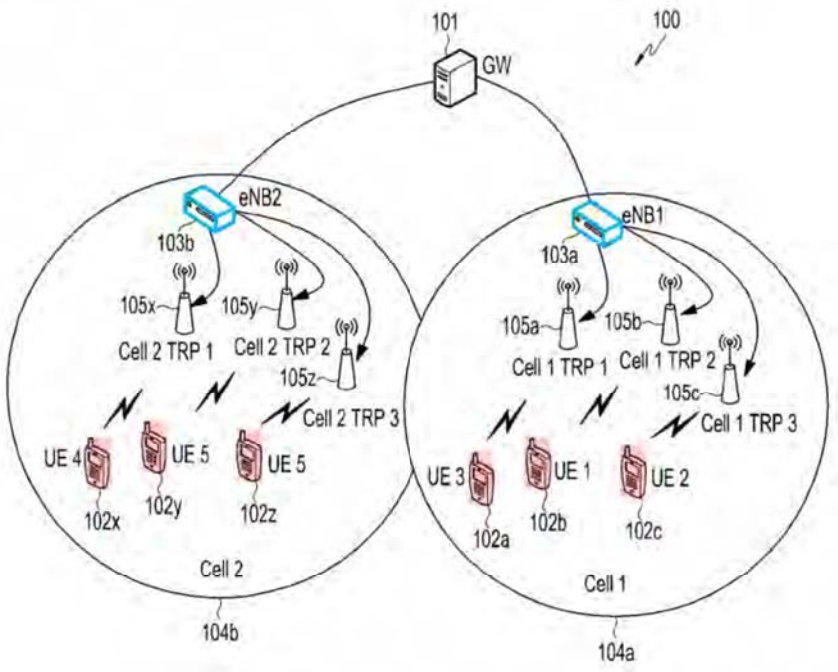
1. Claim 9

i. *[9.0] A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:*

94. To the extent the preamble is limiting, Ingale discloses[3] this claim element. Specifically, Ingale discloses a base station (*eNB 103*) (**blue**) of a RAN that communicates over a radio interface with a user equipment (*UE 102*) (**red**).

[3] Use of "discloses" in this Declaration is consistent with its use in the Petition. As such, the word "discloses" should be understood as being used to encompass what a reference would teach, suggest, or render obvious to a POSITA.

[Fig. 1]



EX-1004 (Ingale), FIG. 1.

Throughout the description, ***the terms base station, eNode-B (eNB)***, gNode-B (nNB), RAN and NW ***are used interchangeably***. Throughout the invention ***the terms UE and mobile station are used interchangeably***.

EX-1004 (Ingale) ¶80.

The 5G eNB 103 may also include or be referred to by those skilled in the art as a base station, a base transceiver station, a radio base station, an access point, a radio transceiver, a NodeB (eNB or gNB), or some other suitable terminology.

EX-1004 (Ingale) ¶111.

FIG. 1 is an example illustration of a deployment of ***Radio Access***

Network (RAN) of next generation wireless system 100, according to an embodiment as disclosed herein.

In an embodiment, the next generation wireless system 100 includes a gateway (GW) 101, a set of ***UE's 102a, 102b, 102c, 102x, 102y, and 102z*** (hereafter, the label of the UE is 102), a set of ***5G eNBs 103a, 103b*** (hereafter, the label of the 5G eNB is 103), a set of cells 104a, 104b (hereafter, the label of the cell is 104), and a set of Transmission Reception Points (TRPs) 105a, 105b, 105x, and 105y (hereafter, the label of the TRP is 105).

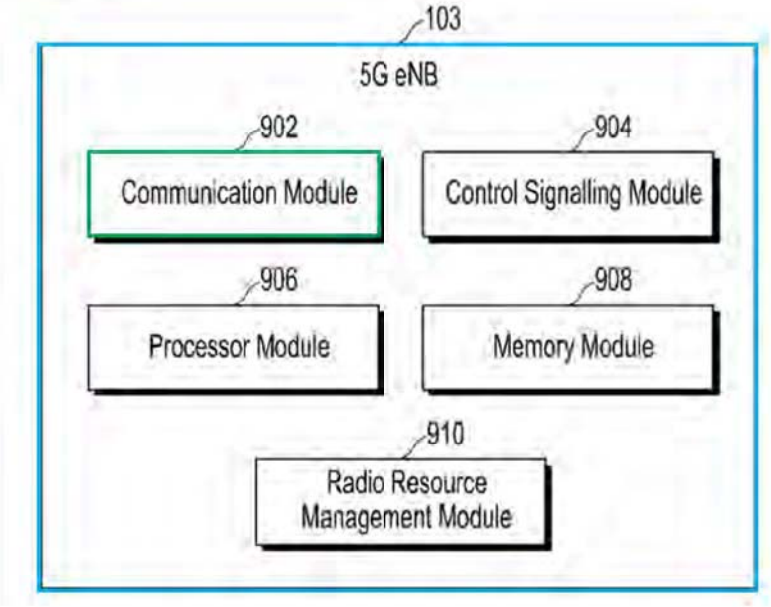
EX-1004 (Ingale) ¶¶107-108.

95. Ingale thus discloses claim element 9.0.

ii. [9.1] transmitting circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

96. Ingale discloses this claim element. As shown and described with reference to FIG. 9a, the BS (*eNB 103*) (**blue**) includes transmitting circuitry (*communication module 902*) (**green**).

[Fig. 9a]



EX-1004 (Ingale), FIG. 9a.

97. Ingale further discloses that the communication module 902 (*transmitting circuitry*) is configured to transmit first type system information block (SIB) (*Minimum System Information (MSI)*), which includes a Master Information Block and SIB1:

> Another object of the embodiments herein is to decode a broadcast channel to acquire ***Minimum System Information (MSI) periodically transmitted by a base station***.

EX-1004 (Ingale) ¶13.

> In an embodiment, ***the minimum system information (MSI) is broadcasted*** on at least one of the PBCH and the SBCH, wherein the ***MSI comprises at least one of a first Master Information Block (MIB#1) and a second MIB (MIB#2) referred as System Information***

Block Type1 (SIB1).

EX-1004 (Ingale) ¶140.

98. The foregoing disclosure from Ingale is nearly identical to the description of first type system information block in the '557 Patent:

> As used herein, "system information" ("SI") may include a ***Master Information Block (MIB)*** and several System Information Blocks (SIBs) which are provided on downlink radio resources allocated to an access node….
>
> …In an example embodiment and mode, ***a first type of the system information is Minimum System Information (Minimum SI)***, minimally containing information required for UEs initially access to the network, periodically broadcasted by each access node (e.g. eNB for LTE, gNB for 5G Radio System). In some configurations, ***Minimum System SI may consist of MIB and a limited number of SIBs***.

EX-1001, 5:49-64.

99. Accordingly, Ingale discloses claim element 9.1.

iii. [9.2] scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows comprising periodically occurring

time windows in which the SI message is transmitted;

100. Ingale discloses this claim element. A POSITA would have understood the claimed "at least one second type SIB" to have a plain and ordinary meaning consistent with the manner in which "Other SI" is discussed in the '557 Patent, i.e., SI other than MSI. Such an understanding is consistent with the disclosure of the '557 Patent. For example, the '557 Patent describes "at least one second type SIB" as follows:

> A second type of system information, e.g., "Other system information,["] "Other SI", or second type system information contains all the other types of information, i.e., all types of system information except the Minimum System Information. The Other SI may comprise several system information blocks (SIBs) that are not categorized as Minimum SI.

EX-1001, 6:4-9.

101. The MSI disclosed by Ingale (*first type of SIB*) includes scheduling information of a system information (SI message) comprising at least one second type SIB (*Other System Information (OSI)*) as claimed:

> In an embodiment, the UE monitors respective ***SI windows for the OSI indicated by the scheduling information included in the MSI to obtain one or more SI blocks of the OSI*** available in the camped cell after triggering the SI request for on-demand delivery.

EX-1004 (Ingale) ¶148.

> In an embodiment, ***the minimum system information broadcasted periodically includes*** at least one of the DL system bandwidth. System Frame Number (SFN), the list of PLMN-ID, the Tracking Area Code (TAC), the Global Cell-ID, the TRP-ID, the Cell Barred Status (i.e. parameters for Access Control Barring (ACB)), the configuration comprising the resource for requesting one or more SI blocks of OSI delivered through on-demand basis, ***the scheduling information related to the SI windows for reception of one or more SI blocks of OSI***, the ePDCCH configuration, parameters for camping (i.e. cell selection/cell re-selection), the random access parameters, the plurality of indicators and the plurality of SCI.
>
> In an embodiment, the minimum system information is transmitted in at least one system information block called the master information block (MIB).

EX-1004 (Ingale) ¶¶156-157.

102. Accordingly, Ingale discloses claim element 9.2.

iv. [9.3] a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

103. The '557 Patent describes the "parameter associated with a condition for determination of a failure of an SI message acquisition process" as being one of a maximum number of reception opportunities (e.g., SI windows) that are

allowed before the end of an SI reception procedure or one or more timer configurations that are to be used as a termination condition for an SI reception procedure. EX-1001, 11:59-65, 14:13-24, 14:55-65, 19:23-32. Ingale in combination with Jung renders obvious such a parameter.

104. Specifically, Ingale discloses a timer or counter that is associated with an indicator/FLAG that indicates how long the network will broadcast OSI:

> Before camping on the cell 104 of next generation RAT, the UE 102 blindly decodes ***the MIB (353) which contains at least the most essential or most important parameters i.e. minimum system information (MSI)***: … scheduling information related to SI windows for reception of one or more SI blocks of OSI, ePDCCH configuration, parameters for camping (i.e. cell selection/cell re-selection), random access parameters, the plurality of indicators and the plurality of system configuration indices or identifiers (SCI)….The plurality of indicators may include broadcast indicator/FLAG, a common value tag i.e., counter associated with version of each system information block and SIT invalidity FLAG which indicates whether the stored SIT is valid or not. ***There can also be a timer or a counter (specified in terms of seconds or radio frame) associated with the broadcast indicator/FLAG when the FLAG is set to true to indicate how long the network will broadcast the other system information*** with reference to the beginning of system modification interval.

EX-1004 (Ingale) ¶136.

105. A POSITA would have understood that Ingale's disclosure of a timer or counter as rendering obvious the claimed parameter in the '557 Patent in light of Jung's disclosure, as detailed below. Specfically, the above-quoted disclosure from Ingale concerning the timer or counter in combination with Jung's disclosure below is consistent with the parameters disclosed in the '557 Patent:

> The system information generator 54 of radio access node 22(12) is configured to generate first type system information. For the example embodiment and mode of FIG. 12, and in an example, non-limiting manner shown in FIG. 13, the first type system information comprises (information elements or the like which indicate): availability of second type SI messages; scheduling information of each of the SI messages; a delivery mode for each of the second type SI messages; and, ***a configuration parameter to configure at least one termination condition for determination of a failure of an SI acquisition process*** for the on-demand based second type SI messages.

EX-1001, 14:13-24.

> FIG. 13A is an exemplary format of SIB1, which is based on the format shown in FIG. 7 with an additional information element si-MaxAcqAttempts. The information element si-MaxAcqAttempts provides ***a termination condition for the SI reception procedure, indicating the maximum number of SI message reception opportunities (e.g. SI windows) allowed before the end of the SI***

> ***reception procedure***. FIG. 13B is an alternative format of SIB1, wherein the information element ue-TimersAndConstants includes ***a timer configuration (T#x) to be used as a termination condition for the SI reception procedure***.

EX-1001, 14:55-65.

> FIG. 19 shows that wireless terminal 26(17) also comprises system information acquisition failure detector 80...The system information failure detector 80 is configured to make a determination of a failure of the SI message acquisition process. ***The system information acquisition failure detector 80 may make such failure determination based on a termination condition***, as herein explained.

EX-1001, 19:23-32.

106. A POSITA would have understood the timer and counter disclosed by Ingale as corresponding to the claimed parameter in light of Jung's disclosure below. For example, the timer or counter disclosed by Ingale identifies how long the network (i.e., the BS (*eNB 103*)) will broadcast the SI message (*Other SI*) on the camped cell (*cell 104*):

> In an embodiment, the 5G eNB 103 is configured to transmit a broadcast channel to at least one of the UE 102. The UE 102 is configured to decode the broadcast channel to acquire the MSI periodically transmitted by the 5G eNB 103. Further, the UE 102 is configured to store the MSI and apply at least one cell selection parameter indicated in the MSI to camp on the cell 104 served by the

5G eNB103. Further, the UE 102 is configured to access the camped cell 104 based on at least one random access parameter indicated in the MSI. Further, the UE 102 is configured to determine whether at least one of a SI block of Other System Information (OSI) available in the camped cell 104 is provided based on at least one of the periodic broadcast and an on-demand basis.

EX-1004 (Ingale) ¶113.

The MSI can be transmitted in at least one block i.e. MIB (353) or if the MIB size is constrained by physical layer design then the MSI is distributed in a first MIB (353) and a second MIB i.e. MIB#2 also referred as SIB1. The plurality of indicators may include broadcast indicator/FLAG, a common value tag i.e., counter associated with version of each system information block and SIT invalidity FLAG which indicates whether the stored SIT is valid or not. ***There can also be a timer or a counter (specified in terms of seconds or radio frame) associated with the broadcast indicator/FLAG when the FLAG is set to TRUE to indicate how long the network will broadcast the other system information with reference to the beginning of system modification interval***.

EX-1004 (Ingale) ¶136.

107. If a UE is not able to obtain the SI message within the period specified by the timer or number of SI windows identified by the counter included in the first type SIB (*MSI*) broadcast by the BS disclosed by Ingale, then the UE will fail to acquire the SI message. Failing to acquire the SI message would prevent

the UE from accessing all of the available services within the camped cell and/or would prevent the UE from being allocated available resources of the camped cell. SI failure situations were known in the art, and it also was known that their occurrence would trigger a subsequent action:

> The second receiving unit 220 is configured to do the following: if the indication information indicates that the second SI message is already broadcast, receive the needed system information block (SIB) according to the scheduling information in the received first SI message. For example, the second receiving unit 220 may receive the needed system information block (SIB) in any one of the following manners:
>
> …
>
> (3) ***Start a receive timer according to pre-configured information***. Receive data packets on a corresponding downlink channel in the operation period of the timer according to the time indicated in the scheduling information.
>
> Multiple scheduling times may appear in the operation period of the timer. If the UE does not receive the requested SIB (or SI message) at the first scheduling time, the UE may continue the receiving at the second scheduling time. The process continues until the SIB (or SI message) is correctly received. ***If the timer times out and the SIB is not yet correctly received, the UE can judge that the current link is abnormal; at this time, cell reselection or other mechanisms may need***

to be started.

EX-1006 (Canadian Pat. App. Pub. No. CA 3 030 329 – Zhang), 6:1-21.

108. Accordingly, when combined with the teachings of Jung, a POSITA would have understood Ingale's timer and/or counter transmitted by the BS of the camped cell and used by Jung's UE to be a parameter associated with a condition for determining a failure of an SI message acquisition process. Indeed, Jung expressly discloses a parameter associated with a condition for determining a failure of an SI acquisition process, i.e., a timer or a counter that is used by a UE for determining a failure of an SI acquisition process:

> ***When attempting the compulsory system information, the terminal may drive a first timer or a first counter which is set with a specific value***. The first timer may drive may be driven for a maximum time interval when the terminal may attempt to acquire the compulsory system information. The first counter may be set to a maximum number of times when the terminal may attempt to acquire broadcasted system information for acquisition of the compulsory system information. ***If the first timer is terminated or the first counter is terminated, the terminal may stop to acquire the compulsory system information***.

EX-1005 (Jung) ¶219.

> ***If the terminal does not acquire the compulsory system information although expecting reception of the compulsory system information as described above after determining that acquisition of the***

compulsory system information is required, the terminal additionally attempts acquisition of the compulsory system information (S1150). To this end, the terminal transmits a system information acquisition failure report message indicating that acquisition of the system information and/or compulsory system information of the serving cell fails to the network. The system information acquisition failure report message may include information indicating a specific type of system information (e.g. MIB and/or specific SIB) in which the terminal fails to acquire.

The terminal may transmit the system information acquisition failure report message to the network, and may wait acquisition of the compulsory system information at a specific time interval.

EX-1005 (Jung) ¶¶221-222.

When the terminal determines that acquisition of the compulsory system information is required, the terminal may wait to acquire broadcasted system information from the cell 1 at a specific time interval. ***When the terminal determines that the acquisition of the compulsory system information is required, the terminal may drive a first timer set to T_1 or may drive the first counter set to N_1.*** The terminal may wait to acquire the system information until the first timer is terminated or the first counter is determined.

If the acquisition of the system information fails from the cell 1 within the specific time interval, the terminal may additionally attempt to acquire the compulsory system information. Accordingly, the terminal may start the second timer or the second counter to transmit

> ***a system information acquisition failure report message to the network (S1231). The second timer may be set to T_2. The second counter may be set to N_2.*** The system information acquisition failure report message may include information indicating that acquisition of the compulsory system information is required. The system information acquisition failure report message may include information indicating a specific type of system information required by the terminal[.]

EX-1005 (Jung) ¶¶239-240; *see also* EX-1005 (Jung) ¶¶241-248.

109. As noted above, a POSITA would have been motivated to combine the teachings of Ingale and Jung to provide a method that minimizes a service impossible state and will improve continuity of service and network efficiency. *See* IX.A. As a result, a POSITA would have understood that the timer/counter transmitted from a BS to a UE, as disclosed by Ingale, could be used by a UE to determine an SI message failure, as disclosed by Jung, and thus be "a parameter associated with a condition for determination of a failure of an SI message acquisition process.

110. Importantly, the combined teachings of Ingale and Jung are distinct from those of Subramanian, which was cited by the Office during prosecution for disclosing an SI Acquisition failure.

111. First, although Subramanian discloses an SI Acquisition failure occurs after a "predefined time period," EX-1010 (Subramanian) ¶63, the reference does not

expressly disclose that the value of the "predefined time period" is included in a transmission from a base station. As demonstrated above, Ingale expressly discloses that the value of the timer/counter that is used by Jung's UE (i.e., the claimed parameter) is included in the MIB transmitted by the eNB and used by the UE. EX-1004 (Ingale) ¶136 ("There can also be a timer or a counter (specified in terms of seconds or radio frame) associated with the broadcast indicator/FLAG when the FLAG is set to TRUE to indicate how long the network will broadcast the other system information with reference to the beginning of the system modification interval.").

112. Second, the Applicant distinguished Subramanian during prosecution by arguing that the SI Acquisition failure occurred during cell selection – not when a UE is camped in a cell (i.e., the base station of a current serving access node). However, both Ingale and Jung disclose that the UE is camped in a cell served by the eNB when the acquisition of the Other SI is performed:

> At step 402a, after the UE 102 powers ON, the radio circuitry starts scanning the radio frequency to detect synchronization signals transmitted every PBCH cycle. In deployments where the radio frequency belongs to mmWave/cmWave bands the PBCH is subjected to beamforming techniques including the beam sweeping operation. After detecting the synchronization signals and the beam index sequence, the UE 102 blindly decodes the PBCH on which minimum system information is broadcasted.

At step 403a, the UE 102 camps on the cell 104 based on at least the cell access parameters, the cell selection and the PLMN selection parameters and the cell barring parameters included in the minimum system information. The minimum system information is either included in one Master information block (MIB) or distributed over two blocks i.e. MIB#l and MIB#2/SIB1.

If distributed over the MIB#l and the MIB#2/SIB1 then the MIB#l is broadcasted on the PBCH and the MIB#2/SIB1 is broadcasted on the SBCH. The SBCH cycle can also be indicated in PBCH i.e., the scheduling information of the MIB#2 (i.e., SIBl) is included in the first MIB (MIB#l). The scheduling information included in the first MIB (MIB#l) indicates at least one of periodicity of the second MIB, namely, MIB#2/SIB 1 transmitted on the SBCH and an absence of the second MIB (MIB#2/SIB1) when the second MIB (MIB#2/SIB1) is not transmitted on the SBCH. The UE stores the MSI acquired from MIB#l and MIB#2.

Since the UE 102 has powered ON in step 402a, the UE 102 does not have any stored system information so UE 102 does not know the meaning of the one or more SCIs acquired from the MSI. Before initiating the SI request for acquiring the system information parameters associated with the one or more SCI values acquired from the MSI, ***the UE 102 checks the status of Other SI broadcast indicator/ FLAG acquired from the minimum system information at step 404a***. The broadcast indicator can be for each system information block or for the set of system information blocks. A bit map can be used to indicate broadcast indicator wherein each bit in the bitmap is a broadcast

indicator for the particular system information block or the set of system information blocks. The broadcast indicator can be the common indicator for all the system information blocks.

*…**Alternately, if the indicator is termed as On-demand SI indicator/FLAG then setting the FLAG as TRUE indicates Other SI blocks are transmitted on the UE request***. The procedures or steps in the FIG. 4a and the FIG. 4b are explained and embodiments formulated considering the term as Other SI broadcast indicator/FLAG and should not be considered as the limiting case to realize the on-demand Other SI delivery concept.

EX-1004 (Ingale) ¶¶162-167.

113. While the foregoing steps are discussed with respect to provisioning the SI to the UE 102 in an on-demand basis, Ingale expressly states that the method of provisioning SI to a UE via periodic broadcast includes similar or substantially similar steps as those cited above:

FIG. 4b is a sequential flow diagram 400b illustrating step by step procedure for provisioning the SI to a UE 102 in the next generation wireless system based on periodic broadcast information, according to an embodiment as disclosed herein;

The operations and procedures of the steps 401b to 403b are similar or substantially similar to the steps 401a to 403a.

If at step 404b, as depicted in the FIG. 4b, the UE 102 detects the FLAG is set to TRUE (i.e. Other SI broadcast indicator) meaning that

the network is periodically broadcasting the Other SI then UE 102 is not required to initiate the SI request procedure to request Other SI. Further, ***the UE 102 then monitors the PDCCH during respective SI windows for the OSI indicated by the scheduling information included in the MSI to check if the other system information is addressed with SI-RNTI***.

According to steps 405b and 406b of the FIG. 4b, after acquiring the other system information, the UE 102 applies the relevant configuration parameters according to one or more SCI acquired from the MSI. If the Other system information comprises the set of system information parameters and corresponding parameter values associated with the SCI other than the SCI broadcasted by the camped cell 104 then the UE 102 stores the configuration parameters as the configuration list associated with the corresponding SCI. Further at step 406b, ***the UE stores the one or more SI blocks of the OSI available in the camped cell acquired by the UE from periodic broadcast***; wherein the stored SI blocks of the OSI are associated with at least a System Information Area Identifier (SAID) and System Information Configuration Index (SCI).

EX-1004 (Ingale) ¶¶171-174.

114. Accordingly, Ingale discloses that, by the time the UE idenifies that the indicator, i.e., the On-demand SI indicator/FLAG, identifies that the Other SI will be broadcast, then the UE has camped on the cell.

115. Similarly, Jung discloses that the after cell selection a UE camps on the cell

and begins to receive periodically broadcast information from a BS:

> The UE selects a cell that has the greatest value and that belongs to cells having measured BS and signal intensity or quality greater than a specific value (cell selection) (S420). In this case, the UE that is powered off performs cell selection, which may be called initial cell selection. A cell selection procedure is described later in detail. ***After the cell selection, the UE receives system information periodically by the BS***. The specific value refers to a value that is defined in a system in order for the quality of a physical signal in data transmission/reception to be guaranteed. Accordingly, the specific value may differ depending on applied RAT.

EX-1005 (Jung) ¶81

116. Jung further discloses an operating method for acquiring system information, which a POSITA would understand as being performed after cell selection and camping on the cell. EX-1005 (Jung) ¶235. The disclosed methods includes setting a timer/counter used for determining an SI acquisition failure:

> Referring to FIG. 12, the terminal connects with a cell 1 and is operated (S1210). ***When the terminal connects with a cell 1 to be operated, the terminal may be operated by periodically acquiring broadcasted system information***. The network may be operated by setting a restricted measurement resource in the terminal. Accordingly, when the terminal connects with a cell 1 to be operated, the terminal may be performed based on the restricted measurement resource set from the

network.

The terminal determines whether acquisition of the compulsory system information is required. When the terminal determines not to include valid system information of the cell 1, the terminal may determine that the acquisition of the compulsory system information is required and may attempt to acquire the compulsory system information (S1220). ***For example, when the terminal receives broadcasted system information from the cell 1 but does not again receive the system information until a specific time interval elapses, validity of the currently included system information may be lost***. For example, the validity of the acquire system information may maintain for three hours.

…

When the terminal determines that acquisition of the compulsory system information is required, the terminal may wait to acquire broadcasted system information from the cell 1 at a specific time interval. ***When the terminal determines that the acquisition of the compulsory system information is required, the terminal may drive a first timer set to T_1 or may drive the first counter set to N_1***. The terminal may wait to acquire the system information until the first timer is terminated or the first counter is determined.

If the acquisition of the system information fails from the cell 1 within the specific time interval, the terminal may additionally attempt to acquire the compulsory system information. Accordingly, the terminal may start the second timer or the second counter to transmit a system information acquisition failure report message to the network (S1231).

The second timer may be set to T_2. The second counter may be set to N_2.

EX-1005 (Jung) ¶¶236-240.

117. Thus, the combined teachings of Ingale and Jung render obvious a BS,w hich is a current serving access node for the UE, transmitting a parameter associated with a condition for determination of a failure of an SI message acquisition process.

118. Accordingly, Ingale, alone, or in combination with Jung renders obvious claim element 9.3.

v. [9.4] an indication of broadcast status for the SI message, the indication indicating broadcasting; and

119. Ingale discloses that the MSI (the claimed "first type system information block (SIB)," as discussed above) includes an indication of broadcast status for "Other System Information" or "OSI" (the claimed "SI message," as discussed above), with the indication indicating broadcasting.

Another object of the embodiments herein is to determine whether ***at least one of a SI block of Other System Information (OSI) available in the camped cell is provided based on at least one of the periodic broadcast*** and an on-demand basis, where the on-demand basis to deliver the SI block of the OSI available in the camped cell is ***decided based on at least one of an indication and a flag included in the MSI***.

EX-1004 ¶16.

> Before camping on the cell 104 of next generation RAT, the UE 102 blindly decodes ***the MIB (353) which contains at least the most essential or most important parameters i.e. minimum system information (MSI)***:.... The plurality of indicators may include ***broadcast indicator/FLAG***....

EX-1004 ¶136.

> If at step 404b, as depicted in the FIG. 4b, the UE 102 detects the ***FLAG is set to TRUE (i.e. Other SI broadcast indicator) meaning that the network is periodically broadcasting the Other SI*** then UE 102 is not required to initiate the SI request procedure to request Other SI.

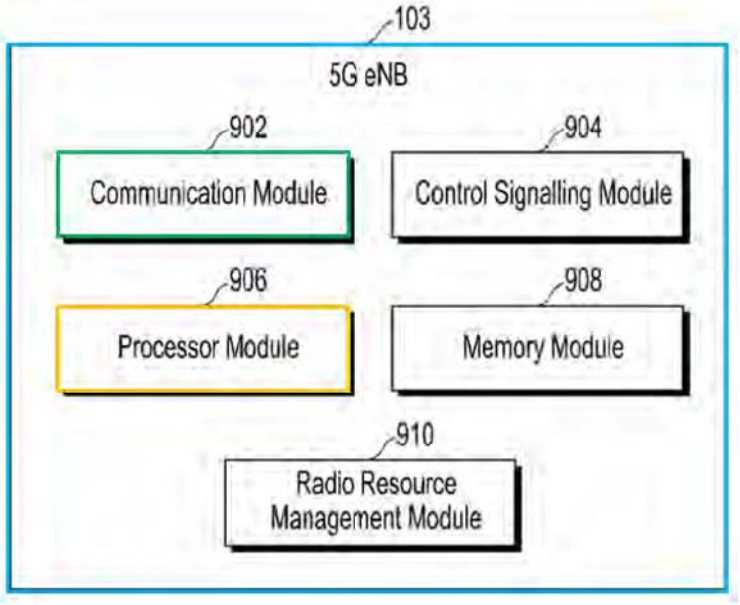
EX-1004 ¶173.

120. Accordingly, Ingale discloses claim element 9.4.

vi. [9.5] processor circuitry configured to cause the transmitting circuitry to broadcast the SI message;

121. Ingale discloses this claim element. As shown and described with reference to FIG. 9a, the BS (*eNB 103*) (**blue**) includes processor circuitry (*processor module 906*) (**orange**) in addition to having transmitting circuitry (*communication module 902*) (**green**).

[Fig. 9a]



EX-1004, FIG. 9a.

> FIG. 9a is a block diagram illustrating various modules of the 5G eNB 103, according to the embodiments as disclosed herein. In an embodiment, ***the 5G eNB 103 includes a communication module 902***, a control signaling module 904, ***a processor module 906***, a memory module 908 and a radio resource management module 910.

EX-1004 ¶274.

122. Ingale discloses that "[t]he processing module 906 synchronizes the operations and executes the instructions based on the timing signals generated by the clock chip." EX-1004 ¶276. A POSITA would have understood that the operations synchronized and executed by the processing module 906 includes operations performed by the communication module 902.

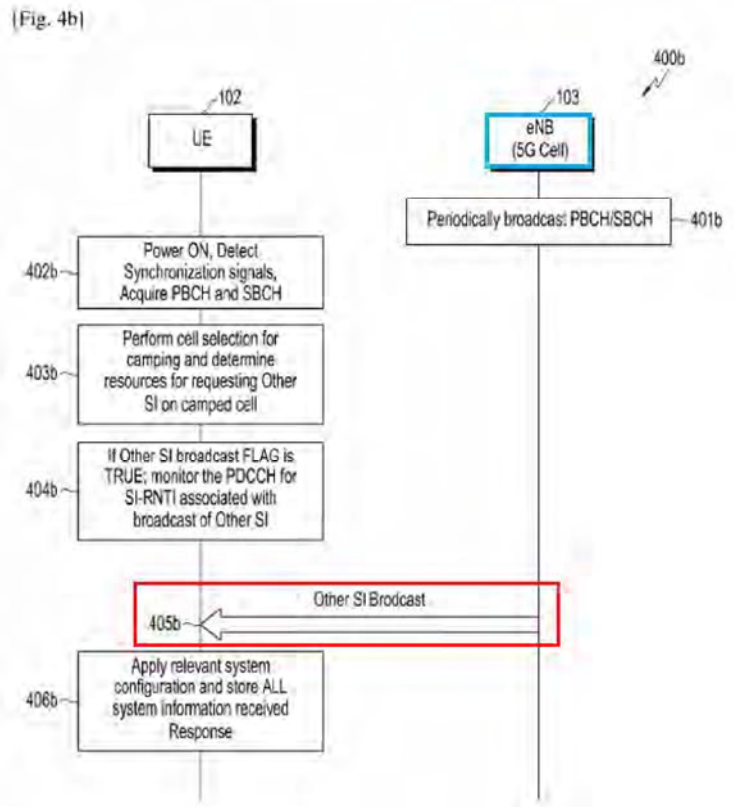
123. Ingale further discloses that the transmitting circuitry (*communication module*

902) of the BS (*eNB 103*) is configured to broadcast the SI message (*Other SI*):

> In an embodiment, ***the communication module 902 is configured to broadcast*** synchronization signal, the PBCH and the SBCH to plurality of UEs 102a-102c and 102x-102z…. In yet another embodiment, ***the communication module 902 is configured to*** transmit system information response message or ***broadcast OSI during the SI windows to plurality of UEs*** 102a-102c and 102x-102z.

EX-1004 ¶274.

124. Ingale further discloses two flow diagrams in which an SI message (*Other SI*) is broadcast by a BS (*eNB 103*). As shown below in the annotated version of FIG. 4b, the SI message is broadcast at 405b.



EX-1004, FIG. 4b.

If at step 404b, as depicted in the FIG. 4b, the UE 102 detects the FLAG is set to TRUE (i.e. Other SI broadcast indicator) meaning that the ***network is periodically broadcasting the Other SI*** then UE 102 is not required to initiate the SI request procedure to request the Other SI. Further, the UE 102 then monitors the PDCCH during respective SI windows for the OSI indicated by the scheduling information included in the MSI to check if the other system information is addressed with SI-RNTI

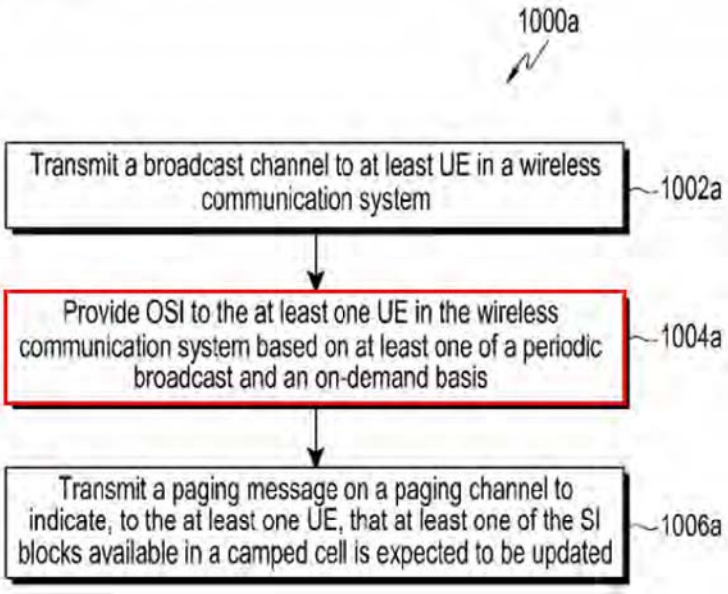
According to steps 405b and 406b of the FIG. 4b, ***after acquiring the other system information***, the UE 102 applies the relevant configuration parameters according to one or more SCI acquired from the MSI…. Further at step 406b, the UE stores the one or more SI

blocks of the OSI available in the camped cell acquired by the UE from periodic broadcast; wherein the stored SI blocks of the OSI are associated with at least a System Indication Area Identifier (SAID) and System Information Configuration Index (SCI).

EX-1004 ¶¶173-174.

125. FIG. 10a illustrates another flowchart showing the BS (*eNB 103*) broadcasting an SI message (*Other SI*) that is received by a UE.

[Fig. 10a]



EX-1004, FIG. 10a.

FIG. 10a is a flow diagram 1000a illustrating ***a method for provisioning the SI by the base station 103*** in the wireless communication system 100, according to an embodiment as disclosed herein.

* * *

At step 1004a, the method includes ***providing the OSI to the at least one UE 102 based on at least one of the periodic broadcast*** and the on-demand basis.

EX-1004 ¶¶282-284.

126. Accordingly, Ingale discloses claim element 9.5.

vii. [9.6] wherein: the first type SIB is re-acquired by the user equipment upon the user equipment failing on the SI message acquisition process in at least one of the SI windows to receive the SI message,

127. Ingale, alone, or in combination with Jung discloses this claim element. Ingale, alone, or in combination with Jung renders obvious a parameter (*timer or counter*) associated with a condition for determining a failure of an SI message acquisition process, as discussed above in IX.B.1.iv.

128. A POSITA would have understood that if the UE failed to acquire one or more of Ingale's Other SI blocks (*SI message*) prior to the expiration of the timer or before the counter is exceeded, then the UE would not have successfully received the one or more Other SI blocks. *See*, *e.g.*, EX-1006 (Canadian Pat. App. Pub. No. CA 3 030 329 – Zhang), 6:1-21 (describing failure of receiving the SIB prior to expiration of timer).

129. Jung also expressly discloses failing to acquire SI prior to the expiration of a timer or counter and that, in such a scenario, the UE would initiate another

attempt to acquire the SI.

> ***If the terminal does not acquire the compulsory system information although expecting reception of the compulsory system information as described above after determining that acquisition of the compulsory system information is required, the terminal additionally attempts acquisition of the compulsory system information (S1150)***. To this end, the terminal transmits a system information acquisition failure report message indicating that acquisition of the system information and/or compulsory system information of the serving cell fails to the network. The system information acquisition failure report message may include information indicating a specific type of system information (e.g. MIB and/or specific SIB) in which the terminal fails to acquire.

EX-1005 (Jung) ¶221.

> ***If the acquisition of the system information fails from the cell 1 within the specific time interval, the terminal may additionly attempt to acquire the compulsory system information***. Accordingly, the terminal may start the second timer or the second counter to transmit a system information acquisition failure report message to the network (S1231). The second timer may be set to T2. The second counter may be set to N2.

EX-1005 (Jung) ¶240.

130. Such teachings are consistent with Ingale, which discloses that, if a UE does not have stored a valid version of the one or more Other SI blocks, then the

UE re-acquires the one or more Other SI blocks (*SI message*) after first acquiring the MSI (*first type SIB*) broadcast on the PBCH and/or SBCH:

> Another object of the embodiments herein is to monitor respective ***SI windows indicated by scheduling information included in the MSI to acquire one or more SI blocks of the OSI*** available in the camped cell.

EX-1004 (Ingale) ¶19.

> ***The plurality of indicators broadcasted on PBCH and/or SBCH comprises at least one or more of***: … a common valutag i.e. a counter indicating at least one system information block configuration provided in other SI has changed or updated and one or more individual valuetags i.e. counter associated with change or update of configuration of corresponding SI block provided in other SI and ***a validity flag indicating whether the already acquired and stored system information is still valid***.

EX-1004 (Ingale) ¶87.

> In an embodiment, the SIT invalidity flag is broadcasted in the minimum system information on the PBCH/SBCH which if set TRUE indicates the UE 102 that already acquired and stored system information is not valid and the UE 102 ***need to clear all stored system information and acquired updated SIT***.

EX-1004 (Ingale) ¶182.

> The configurations associated with SI block applicable in different parts of the network can be provided to UE upon request or broadcasted

based on network implementation such that SI block provided in one cell can be also applicable and valid for other cells. The SCI associated with each SI block represents the configuration corresponding to the SI block used in the ***cell. The SCI need to broadcast in the minimum SI (MSI)*** so that when UE performs cell re-selection and if UE has stored configuration of SI block corresponding to SCI, UE do not need to re-acquire or request that SI block. ***UE re-acquires*** or requests for ***a SI block only when it does not have the configuration of SI block corresponding to SCI of that SI block or the stored configuration (SIT) is invalid***. It is logical that the plurality of SCI is broadcast in MIB#2 (i.e. SIB1) and MIB#1 because list of SCI associated with SI blocks available in cell needs to be signaled and MIB#1 has size restriction.

EX-1004 (Ingale) ¶204.

131. A POSITA would have understood from the foregoing teachings of Ingale and Jung that the UE would re-acquire the MSI because the MSI includes the scheduling information identifying the SI windows for acquiring one or more SI blocks of the OSI and validity flags identifying whether any stored information is valid. As such, the UE would need to confirm that it has the current scheduling information so that the UE can determine how (e.g., broadcast or on-demand) and when (e.g., SI windows) to acquire one or more Other SI blocks.

132. Here again, the teachings of Ingale and Jung are distinct from those previously

considered by the Office with respect to Agriwal and Subramanian. For example, the SI Acquisition procedure discussed in Subramanian was an SI acquisition procedure performed during cell selection, and thus Subramanian did not disclose expressly re-acquiring the first type SIB. EX-1002 ('557 File History), 396-399; EX-1010 (Subramanian) ¶¶59-63. However, as discussed above, both Ingale and Jung disclose that the UE has acquired the MSI (*first type SIB*) prior to attempting to acquire the Other SI (*second type SIB*) such that the UE has camped on the cell and the BS is the current serving access node of the UE. *See* ¶¶110-117, *supra* (citing EX-1004 (Ingale) ¶¶162-167, 171-174, FIG. 4b (steps 403b, 404b); EX-1005 (Jung) ¶¶235-240).

133. Accordingly, Ingale, alone, or in combination with Jung renders obvious claim element 9.6.

viii. [9.7] the base station apparatus is a current serving access node of the user equipment.

134. Ingale discloses that the BS (*eNB 103*) is a current serving access node of the UE (*UE 102*). For example, Ingale discloses that the UE 102 is "camped" in an area served by the eNB 103 prior to attempting to acquire the Other SI (*second type SIB*) and therefore the current serving access node of the UE:

> The on-demand basis to deliver the corresponding system information block of the second system information ***available in the camped cell*** is

decided based on at least one of an indication and a flag included in the first system information for the system information block.

EX-1004 (Ingale), Abstract.

At step 403a, the UE 102 camps on the cell 104 based on at least the cell access parameters, the cell selection and the PLMN selection parameters and the cell barring parameters included in the minimum system information. The minimum system information is either included in one Master information block (MIB) or distributed over two blocks i.e. MIB#1 and MIB#2/SIB1.

…

Further, at step 403a, the UE 102 determines the resources to access the camped cell 104 based on the configuration parameters for sending SI request acquired from the minimum system information transmitted by the camped cell 104.

EX-1004 (Ingale) ¶¶162-164.

FIG. 4b is a sequential flow diagram 400b illustrating step by step procedure for provisioning the SI to a UE 102 in the next generation wireless system based on periodic broadcast information, according to an embodiment as disclosed herein;

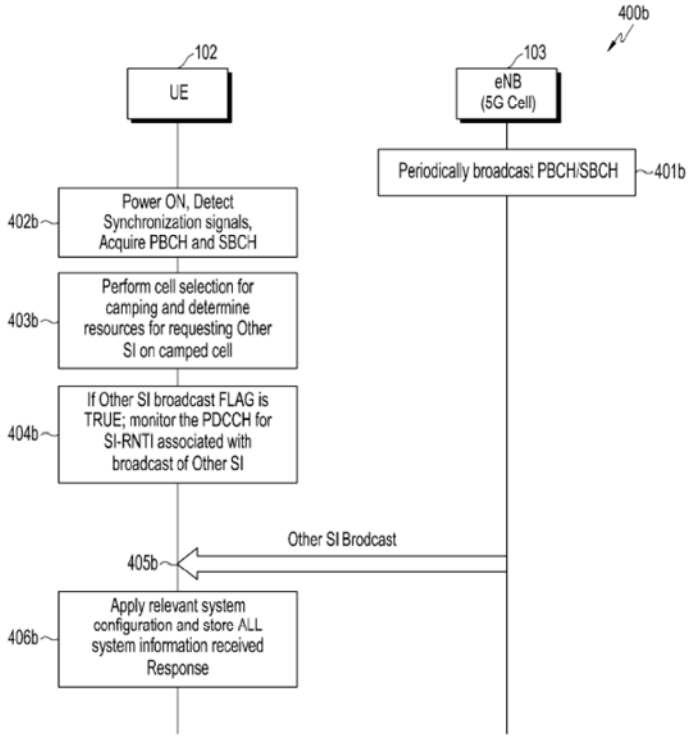
The operations and procedures of the steps 401a to 403b are similar or substantially similar to the steps 401a to 403a.

If at step 404b, as depicted in the FIG. 4b, the UE 102 detects the FLAG is set to TRUE (i.e. Other SI broadcast indicator) meaning that the

network is periodically broadcasting the Other SI then UE 102 is not required to initiate the SI request procedure to request Other SI. Further, the UE 102 then monitors the PDCCH during respective SI windows for the OSI indicated by the scheduling information included in the MSI to check if the other system information is addressed with SI-RNTI.

EX-1004 (Ingale) ¶¶171-173.

[Fig. 4b]



EX-1004 (Ingale), FIG. 4b.

135. A POSITA would have understood that when a UE 102 is camped in an area served by an eNB 103, then the eNB 103 is a current serving access node for the UE 102. EX-1004, FIGs. 1, 4b, 5b, 5c. Further, as discussed above, the UE 102 is camped in a cell upon receiving and applying the configuration

parameters in the MSI. *See* ¶48, *supra* (citing EX-1008, EX-1013, and EX-1014, all discussing "camping"). Accordingly, when the UE 102 attempts to acquire the Other SI, the eNB 103 is the current serving access node for the UE.

136. Jung also discloses that the SI acquisition procedure to acquire compulsory system information is performed when the base station apparatus (*BS*) is the current serving access node of the user equipment (*terminal*).

> Referring to FIG. 12, the terminal connects with a cell 1 and is operated (S1210). When the terminal connects with a cell 1 to be operated, the terminal may be operated by periodically acquiring broadcasted system information.

EX-1005 (Jung) ¶235.

> ***When the terminal determines that acquisition of the compulsory system information is required, the terminal may wait to acquire broadcasted system information from the cell 1 at a specific time interval***. When the terminal determines that the acquisition of the compulsory system information is required, the terminal may drive a first timer set to T_1 or may drive the first counter set to N_1. The terminal may wait to acquire the system information until the first timer is terminated or the first counter is determined.

EX-1005 (Jung) ¶239.

137. Accordingly, Ingale, alone, or in view of Jung discloses claim element 9.7.

Thus, for at least the foregoing reasons, Ingale, alone, or in view of Jung renders obvious claim 9 of the '557 Patent.

b. Claim 10

i. [10] The base station apparatus of claim 9, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

138. Ingale discloses claim 10. As discussed above in IX.B.1.vii, a POSITA would have understood that if a UE (Ingale's *UE 102*) did not have a valid configuration parameter(s) for an SI message (Ingale's *Other SI block*), then the UE would need to acquire the configuration parameter(s) for the SI message from the first type SIB (Ingale's *MSI*). This is because Ingale expressly discloses that the first type SIB (*MSI*) includes the parameter(s), such as the scheduling information, for acquiring the SI message:

> Another object of the embodiments herein is to monitor respective ***SI windows indicated by scheduling information included in the MSI to acquire one or more SI blocks of the OSI*** available in the camped cell.

EX-1004 (Ingale) ¶19.

> In an embodiment, the SIT invalidity flag is broadcasted in the minimum system information on the PBCH/SBCH which if set TRUE indicates the UE 102 that already acquired and stored system information is not valid and the UE 102 ***need to clear all stored system***

information and acquired updated SIT.

EX-1004 (Ingale) ¶182.

> The configurations associated with SI block applicable in different parts of the network can be provided to UE upon request or broadcasted based on network implementation such that SI block provided in one cell can be also applicable and valid for other cells. The SCI associated with each SI block represents the configuration corresponding to the SI block used in the ***cell. The SCI need to broadcast in the minimum SI (MSI)*** so that when UE performs cell re-selection and if UE has stored configuration of SI block corresponding to SCI, UE do not need to re-acquire or request that SI block. ***UE re-acquires*** or requests for ***a SI block only when it does not have the configuration of SI block corresponding to SCI of that SI block or the stored configuration (SIT) is invalid***. It is logical that the plurality of SCI is broadcast in MIB#2 (i.e. SIB1) and MIB#1 because list of SCI associated with SI blocks available in cell needs to be signaled and MIB#1 has size restriction.

EX-1004 (Ingale) ¶204.

139. The UE (*UE 102*) would thus use the first type SIB (*MSI*) to determine how (e.g., broadcast or on-demand) and when (e.g., SI windows) such that an SI message acquisition process may be re-initiated.

140. Accordingly, Ingale discloses claim 12 of the '557 Patent.

c. **Claim 11**

i. ***[11] The base station apparatus of claim 9, wherein a master information block (MIB) is re-acquired by the user equipment from the base station apparatus prior to the re-acquisition of the first type SIB.***

141. Ingale discloses claim 11. For example, Ingale specifically discloses that the Minimum System Information ("MSI") includes a first master information block (MIB") and may include a second MIB, which may be referred to as System Information Block #1 (SIB1).

> The MSI can be transmitted in at least one block i.e. MIB (353) or if the MIB size is constrained by physical layer design then the MSI is distributed in a first MIB (353) and a second MIB i.e. ***MIB#2 also referred as SIB1***.

EX-1004 (Ingale) ¶136.

142. Ingale also discloses that MIB#1 includes the scheduling information for receiving MIB#2 (e.g., SIB1) and the SIB1 may not be provided in all instances, such as when a cell is barred.

> In an embodiment, ***the scheduling information included in the first MIB indicates at least one of periodicity of the second MIB transmitted on the SBCH*** and an absence of the second MIB when the second MIB is not transmitted on the SBCH.
>
> In an embodiment, when the scheduling ***information included in the***

> ***first MIB indicates the absence of the second MIB*** then the cell is considered as barred because the UE cannot acquire the full contents of the MSI.

EX-1004 (Ingale) ¶¶59-60.

143. A POSITA would have understood from the foregoing disclosures that a master information block (MIB) (*MIB#1*) would be re-acquired before the first type SIB (*MIB#2/SIB1*), as receiving these MIBs in any other order would be contrary to the express teachings of Ingale. Indeed, in situations where a UE fails to acquire first type SIB (e.g., an SI acquisition failure occurs), it would have been obvious based on the teachings of Ingale and Jung to configure the UE to re-acquire the MIB (e.g., MSI) prior to attempting to re-acquire the first type SIB (e.g., SIB1). This is because MIB#1 (e.g., MIB) includes the scheduling information for receiving the first type SIB (e.g., MIB#2/SIB1):

> In an embodiment, ***the scheduling information included in the first MIB indicates at least one of periodicity of the second MIB*** transmitted on the SBCH and an absence of the second MIB when the second MIB is not transmitted on the SBCH.

EX-1004 (Ingale) ¶59.

144. Accordingly, the UE would want to ensure, upon failing to acquire the first type SIB, that it has the most up-to-date scheduling information to reduce the

likelihood that it will again fail to acquire the first type SIB and therefore would attempt to re-acquire the MIB (e.g., MIB#1) prior to attempting to re-acquire the first type SIB (e.g., MIB#2/SIB1).

145. Thus, Ingale, alone or in combination with Jung, renders obvious claim 11 of the '557 Patent.

d. <u>Claim 12</u>

i. [12] The base station apparatus of claim 9, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

146. Ingale discloses claim 12. Ingale discloses validity information in the form of a temporal value (e.g., a timer) and a geographic value (e.g., an area ID):

> The plurality of indicators broadcasted on PBCH and/or SBCH comprises at least one or more of: … ***System Information area identifier (Area-Id/SAID) which defines the SI area validity scope and points to the linking of Area-Id and SCI provided in other system information***, a common valuetag i.e. a counter indicating at least one system information block configuration provided in other SI has changed or updated and ***one or more individual valuetags i.e. counter associated with change or update of configuration of corresponding SI block provided in other SI and a validity flag indicating whether the already acquired and stored system information is still valid***.

EX-1004 (Ingale) ¶87.

> In an embodiment, a ***SIT invalidity flag is broadcasted in minimum system information*** on PBCH/SBCH which if set TRUE indicates the UE that already acquired and stored system information ***is not valid*** and UE need to clear all stored system information and acquire updated SIT.

EX-1004 (Ingale) ¶94.

147. Ingale further discloses that when a UE 102 determines that an SI block configuration is invalid, then the UE must re-acquire the configurations parameters for the SI block.

> The configurations associated with SI block applicable in different parts of the network can be provided to UE upon request or broadcasted based on network implementation such that SI block provided in one cell can be also applicable and valid for other cells. The SCI associated with each SI block represents the configuration corresponding to the SI block used in the ***cell. The SCI need to broadcast in the minimum SI (MSI)*** so that when UE performs cell re-selection and if UE has stored configuration of SI block corresponding to SCI, UE do not need to re-acquire or request that SI block. ***UE re-acquires*** or requests for ***a SI block only when it does not have the configuration of SI block corresponding to SCI of that SI block or the stored configuration (SIT) is invalid***. It is logical that the plurality of SCI is broadcast in MIB#2 (i.e. SIB1) and MIB#1 because list of SCI associated with SI blocks available in cell needs to be signaled and MIB#1 has size restriction.

EX-1004 (Ingale) ¶204.

148. Accordingly, Ingale discloses that the condition for the determination of the failure of the SI message (*SI block in Other SI*) acquisition process includes that a stored version of one of the at least one second type SIB (*stored SCI for Other SI*) is not valid.

149. Notably, the above-cited disclosures from Ingale are similar to those from the '577 Patent, which also discloses using validity tags to determine whether the stored version of at least one second type SIB is valid.

> The first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, ***in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid***.

EX-1001 ('557 Patent), 2:54-59.

> The Minimum SI may contain information about the Other SI, including the delivery method, e.g., periodic broadcast/on-demand, scheduling information, ***validity information***, etc.

EX-1001 ('557 Patent), 9:14-17.

150. The validity information disclosed by the '557 Patent may be both a temporal value (e.g., a timer) and geographic value (e.g., an area ID).

> FIG. 4 shows an example format of SIB Type 1, including…validityInfo and ***validity information of the SIB (a value***

tag [valueTag], and other parameters, such as validity timer, etc.).

EX-1001 ('557 Patent), 9:48-56.

> Furthermore, the otherSIBInfo corresponding to SIB#A indicates that the ***validity information of SIB#A is valueTag=b, si-AreaID=3***. It is assumed hereafter that whenever the wireless terminal receives SIB1, it has already received MIB beforehand.

EX-1001 ('557 Patent), 10:63-67.

151. Accordingly, a POSITA would have understood Ingale as disclosing that the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid. Therefore, claim 12 is invalid over Ingale.

e. <u>Claim 13</u>

i. [13.0] A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the method comprising:

152. To the extent the preamble is limiting, Ingale discloses a method for a base station apparatus of a RN that communications with a UE for the same reasons as those set forth above in IX.B.1.i. Specifically, although the preamble claim 13 recites a method, as opposed to a base station apparatus recited in claim 9, both Ingale and Jung disclosed that the disclosed base station apparatus performs a method.

ii. [13.1] transmitting a first type system information block (SIB), the first type SIB comprising:

153. Ingale discloses this claim element for the same reasons set forth above in IX.B.1.ii. Indeed, claim element 9.2 requires transmitting circuitry to be configured to transmit the first type of system information block (SIB), as recited in claim element 13.1.

iii. [13.2] scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows comprising periodically occurring time windows in which the SI message is transmitted;

154. Ingale discloses this claim element for the same reasons set forth in above in IX.B.1.iii, as this claim element is identical to claim element 9.2.

iv. [13.3] a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

155. Ingale, alone, or in combination with Jung renders obvious this claim element for the same reasons set forth in above in IX.B.1.iv, as this claim element is identical to claim element 9.3.

v. [13.4] an indication of broadcast status for the SI message, the indication indicating broadcasting; and

156. Ingale discloses this claim element for the same reasons set forth in above in IX.B.1.v, as this claim element is identical to claim element 9.4.

vi. [13.5] broadcasting the SI message;

157. Ingale, alone, or in combination with Jung renders obvious this claim element for the same reasons set forth in above in IX.B.1.vi. For example, claim element 9.5 requires processor circuitry of the base station apparatus to cause the transmitting circuitry to broadcast the SI message, as recited in claim element 13.5.

vii. [13.6] wherein: the first type SIB is re-acquired by the user equipment upon the user equipment failing on the SI message acquisition process in at least one of the SI windows to receive the SI message;

158. Ingale, alone, or in combination with Jung renders obvious this claim element for the same reasons set forth in above in IX.B.1.vii, as this claim element is identical to claim element 13.6.

viii. [13.7] the base station apparatus is a current serving access node of the user equipment.

159. Ingale discloses this claim element for the same reasons set forth in above in

IX.B.1.viii, as this claim element is identical to claim element 9.7.

f. Claim 14

i. [14] The method of claim 13, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

160. Ingale discloses this claim element for the same reasons set forth in above in IX.B.1.b, as claim 14 recites the same limitations as claim 10.

g. Claim 15

i. [15] The method of claim 13, wherein a master information block (MIB) is re-acquired by the user equipment from the base station apparatus prior to re-acquisition of the first type SIB.

161. Ingale discloses this claim element for the same reasons set forth in above in IX.B.1.c, as claim 15 recites the same limitations as claim 11.

h. Claim 16

i. [16] The method of claim 13, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

162. Ingale discloses this claim element for the same reasons set forth in above in IX.B.1.d, as claim 16 recites the same limitations as claim 12.

X. SECONDARY CONSIDERATIONS DO NO REBUT THE PRIMA FACIE CASE OF OBVIOUSNESS

163. In my opinion, secondary considerations do not rebut the prima facie case of obviousness for at least two reasons.

164. First, I have not seen any evidence of any secondary considerations to date. As such, I do not believe any such secondary considerations exist. To the extent Patent Owner seeks to proffer evidence of any secondary considerations in this proceeding, I reserve the right to comment on such evidence.

165. Second, I do not believe that Patent Owner will be able to establish a nexus between any secondary considerations and the Challenged Claims. I have been advised that a nexus does not exist where the alleged secondary considerations result from something other than what is both claimed and novel in the claims.

166. As I have explained above, there is nothing novel in the claims. Indeed, all claim elements are disclosed in the prior art. Thus, I do not see any basis for Patent Owner to assert that there is a nexus between any secondary considerations and the claims.

XI. CONCLUSION

167. My findings and opinions set forth in this Declaration are based on my work and examination to date. I may continue my examinations in view of

additional documents or other factual evidence over the course of this proceeding that may necessitate supplementing and/or refining my opinions. I reserve the right to add to, alter, or delete any of my opinions and my Declaration upon discovery of additional information. I reserve the right to make any changes as necessary.

168. In signing this Declaration, I understand that this Declaration will be filed as eviden contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknolwedge that I may be subject to cross-examination in this case and that cross-exmaination 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 allowed for cross-examination. I declare that all statements made herein of my knowledge, all statements made on information and belief are believed to be true, and 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.

[SIGNATURE ON COVER PAGE]

APPENDIX A

MATERIALS CONSIDERED

Exhibit #	Description
1001	U.S. Patent No. 11,019,557 (the "'557 Patent")
1002	Select portions of prosecution history of the '557 Patent ("File History")
1003	Declaration of Petitioners' Expert Mark Mahon, PhD.
1004	International Patent Application Publication No. WO 2018/016922 ("Ingale")
1005	U.S. Patent Application Publication No. 2015/0223258 ("Jung")
1006	Canadian Patent Application Publication No. CA 3 030 329 ("Zhang")
1007	U.S. Patent Application Publication No. 2016/0234736 ("Kubota")
1008	3GPP TS 38.331 v15.1.0 (2018-03) ("TS38.331")
1009	U.S. Patent Application Publication No. 2017/0251500 ("Agiwal")
1010	U.S. Patent Application Publication No. 2018/0332521 ("Subramanian")
1011	U.S. Patent Application Publication No. 2017/0048920 ("Kim")
1012	U.S. Patent Application Publication No. 2018/0132165 ("Takahashi")
1013	Recommendation GSM 05.08 (February 1992)
1014	ETSI TS 136 304 v10.3.0 (2011-11)
1015	TSGR2#4(99)393

APPENDIX B

CURRICULUM VITAE

Mark P. Mahon, Ph.D.
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W209A Westgate Bldg.
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University Park, PA

Highlights

Teaching faculty experienced in research and systems development in cellular and mobile wireless networks, wireless local area networks, wireless network security, mobility management, mobile data systems including networks, protocols, and applications, wideband signal processing, modulation theory, algorithms, mathematical/analytical modeling, communication, detection and estimation, and control systems. Pursues funding for and conducts advanced research in computer and mobile networks, theoretical and experimental analysis of communication systems, cellular, wireless, and mobile systems, wideband signal processing, sensors, tracking, localization, and data fusion. Experienced in hardware/software development, data acquisition, integration, and testing, field test planning, preparation, and execution. Extensive programming experience including UI, analysis tools, real-time object-oriented programming, and embedded systems code development in C, C++, python, java, Verilog, RTL, VHDL, HDL, and assembly.

Education

PhD. Acoustics, The Pennsylvania State University, University Park, PA 16802, 2001
M.S. Electrical Engineering, The Pennsylvania State University, University Park, PA, 16802, 1991
B. S. Electronics Engineering, The University of Scranton, Scranton, PA, 18510, 1987

Employment

July 2021 – Present: *Teaching Professor, School of Electrical Engineering and Computer Science, The Pennsylvania State University, University Park, PA 16801*
June 2018 – June 2021: *Associate Teaching Professor*
Aug. 2015 – June 2018: *Assistant Teaching Professor*
Teach graduate and undergraduate courses in computer science and electrical engineering such as communication networks, mobile networks, neural networks, programming, mathematics, and wireless security. Advise and direct graduate students' MS and PhD research in the areas of wireless and computer networks, network optimization techniques, localization and mapping techniques, and cybersecruity. Guide Schreyer Honors College students' honors theses. HackPSU and BlockChain@PSU faculty adviser, member of graduate advising committees, member of Computer Science Undergraduate Curriculum Committee, member of School of EECS Management Committee, advise undergraduate electrical engineering, computer science, computer engineering, and data science students.

2003 – Aug. 2015: *Associate Research Professor, Applied Research Laboratory, Communications, Information, and Navigation Office, The Applied Research Laboratory, The Pennsylvania State University, State College, PA* Principal Investigator, Co-Principal Investigator, Technical lead conducting research on cellular and mobile networks, computer network security, mobile communication systems, data fusion, and wideband signals and image processing with total funding over $12M.

2002 – 2003: *Sr. Systems Engineer, Klein & Stump, Inc., 2120 Washington Blvd. #400, Arlington, VA 22204* Researcher and technical consultant working on wireless communications projects for US Special Operations Command (SOCOM) and Naval Information Warfare Activity (NIWA). Awarded $150k SBIR for SOCOM advanced signal simulator.

1991 – 2002: *Assistant Research Professor, Applied Research Laboratory, Communication Sciences and Technology Division, The Applied Research Laboratory, The Pennsylvania State University, State College, PA 16804* Principal Investigator and researcher conducting research on cellular and mobile networks, wideband signals, tracking and localization, adaptive signal processing, acoustic propagation, sensor systems, remote sensing, and active noise control. Awarded $750k for development of novel wavelet based wideband signal detection for high altitude sensors.

1988 – 1989: *Program Engineer, Central Intelligence Agency, Langley, VA 22101*
Assisted in the development of algorithms and signal processing systems for novel applications in the areas of RF communications and signal modulation techniques.

Detailed Research Experience:

Current ongoing research:
Resource allocation and scheduling improvements in NG networks and edge computing; Multiple Input Multiple Output antenna techniques for increased capacity in NG systems; Fast handover techniques using blockchains to reduce mobility interruption times in 5G networks; AI/NN techniques applied to network scheduling and optimization, and mobile robotics for localization and mapping; Automated object detection and 3D mapping using sonar array data. Security vulnerabilities in UWB ranging.

2015 – Present
Lead graduate and undergraduate student research in wireless communication networks, distributed video processing in cellular systems, UWB ranging, communication systems and security, software defined network security, application of game theory to cyber resiliency, wireless, machine learning, big data analytics, and artificial intelligence for mobile and computer network security and automated detection in acoustic and sonar systems.

2014 – 2015
Leading internal research and development effort on deep packet inspection for zero day and predictive detection for data networks. Technical performer developing novel deformable wavelet-based contour matching technique for automated object detection in satellite images. Acoustic tracking and identification of drones for area defense system.

2014
Developed real-time scanner for 802.15.4 (LR-WPAN) protocol deployed on software defined radio platform.

2013-2014
Technical lead on developing novel mathematical model for analyzing torpedo acoustic threat surrogate systems for US Navy. Experimental lead on disposable, adaptive, high bandwidth fiber-optic undersea communication system for US Navy.

2013
Implemented a novel matched filter receiver for a unique OFDM signal of interest to facilitate signal detection in a high co-channel interference environment of a wide field of view high altitude receiver and wideband signal set design in highly complex propagation environments for Department of Defense (DoD).

2012-2013
Technical lead for design and implementation of a real-time transmitter/receiver on a software defined radio platform for maritime communication systems (Automatic Information System/Maritime Security).

2012
Communications/signal processing technical consultant on Maritime Domain Operations and Unmanned Surface Ship Interdiction study effort for US Navy.

2011-2012
Principal Investigator, technical and experimental lead on fiber optic undersea communication system for Advanced Submarine System Development effort for US Navy.

2011
Technical lead on mathematical analysis, algorithm development, and implementation of pattern of life signal to noise ratio analysis in high co-channel interference environment for DoD.

Trusted agent for Army Research Lab to review and critically analyze work associated with wideband signaling and passive emissions collection from cell phones. Reviewed contractor data analysis and technical briefings for scientific accuracy and rigor. Advised the sponsor on contractor testing methodologies, procedures, and analysis techniques. Technical lead implementing unique wideband acoustic communication system and specialized signal processing hardware for an acoustic system being utilized in a complex maritime environment for the DoD.

2009 – 2010
Tiger team lead for large unmanned undersea vehicle (UUV) assigned to identify platform induced electromagnetic interference with electronic payload system in the HF and acoustic regimes for the US Navy.

Developed and implemented a novel algorithm to calculate the effective force charge based on muzzle sensor data utilizing MEMS transducers and PIC controller on a portable howitzer for the US Army.

Conducted study and authored Intelligence, Surveillance, and Reconnaissance (ISR) for Unmanned/Minimally Manned Undersea Vehicle (UMUV) report presented to Defense Advanced Research Projects Agency (DARPA).

2006 – 2009
Principal Investigator for a multi-year research and FPGA-based engineering prototype development effort in the area of 3G/4G (UMTS/LTE) cellular and wireless (IEEE 802.16 and 802.11) communication systems; Effort consisted of three phases: theoretical and analytical study, proof-of-concept development, and testing, and prototype development for DoD.

2005-2006
Technical lead on Information Fusion engine integration into a sandbox enclave at Joint Interagency Task Force South (JIATF-S) to support multi-int data fusion.

2003 – 2006
Principal Investigator for multi-year Office of Secretary of Defense sponsored research program in the area of multi-intelligence data fusion as part of the overall initiative of Force Transformation; worked extensively with NGA, DIA, DISA, OSD, all military services, and some coalition components.

2002 – 2003
Pursued funding for research interests in the areas of wireless/wideband communications, wideband systems, source detection/localization, intelligent system of systems design, and data fusion; Awarded Phase I, Small Business Innovative Research contract for Portable Signal Training System by SOCOM (02-013); Technical consultant for Naval Information Warfare Center on Common for High Performance Computing Software Support Initiative's (CHSSI) Electronic Battlefield Environment (EBE) portfolio (Electromagnetic Environmental Effects Toolkit), SBIR, MERIT/TENCAP, TST programs

1998 – 2002
Researcher and principal investigator performed research in large time-bandwidth product (wavelets) source detection and localization – theoretical, analytical, and field testing; CDMA IS-95A/3G cellular communications; Developed mathematical analytical models and included code development of the CDMA air interface physical layer implementing major aspects of the CDMA protocol for test and analysis purposes; Built real-time hardware platform for deploying developed CDMA physical layer code.

1997 – 1998
Principal Investigator in charge of signal processing algorithm and code development, image acquisition and compression, telephony, and user interface design for an experimental remote, autonomous, acoustic rockslide detection for Conrail. Work included algorithm and code development utilizing embedded digital signal processing (DSP) board and development of unique algorithms for real-time monitoring of transducers to create an event detection system.

1991 – 1997
Performed fundamental research in the areas of signal processing algorithm development, acoustic atmospheric propagation, detection, source localization, beamforming, system identification, and active control; Main responsibilities include real-time code development (C, Visual C++, assembly) for signal processing systems, adaptive beamforming, and embedded processing for eight major projects during this time. Multiple DSP platform development; Active Noise Control, feature extraction, data logging and fusion, passive acoustic tracking, beamforming, and analysis for these projects

1988-1989
Assisted in the development of algorithms and signal processing systems for novel applications in the areas of RF communications and signal modulation techniques.

Case History:

October 2023 – April 2024, Erise IP; Finnegan, DLA Piper, Husch Blackwell
BNR v. ASUSTek/Media Tek/Laird/NXP Inc. Inv. No. 337-TA-1367 (USITC). Consulting for defendant ASUS on ASUS (Qualcomm-based products) non-infringement and JDG (ASUS/Media Tek/ Laird/ NXP) on Tech DI non-infringement on WiFi wireless devices and semiconductor chips with wireless capabilities related to wireless transmission technologies. Wrote rebuttal report. BNR settled with ASUS and Media Tek; BNR withdrew complaint for NXP.

September 2023 – April 2024, McKool Smith
Daingean Technologies Ltd. v. AT&T, et al, Case No. IPR2024-00309. Consulting for petitioner AT&T. Technology related to 5G wireless transmissions. Wrote declarations. Case settled.

August 2023 – December 2023, Greenberg Traurig
Atlas Global Technologies, LLC v. Acer Incorporated, No. 2:22-cv-00259 WDTX. Consulting for defendant Acer. Technology related to wireless transmissions in WiFi networks. No reports. Settled.

August 2023 – Present, McKool Smith
Ericsson v. Lenovo/Motorola, In the Matter of Certain Mobile Phones, Components Thereof, and Products Containing Same, Inv. No. 337-TA-1375 (USITC)
Consulting for Complainant Ericsson on technology related to 5G cellular signaling technology.

August 2023 – Present, Caldwell, Cassady and Curry
Neo Wireless, LLC v. Ford, et al., Case No. 2:22-MD-03034. Consulting for plaintiff on technology related to 4G cellular radio access. Wrote infringement reports.

June 2023 – November 2023, Duane Morris
Ericsson, Inc., and Cellco Partnership D/B/A Verizon Wireless v. Woodbury Wireless LLC., IPR 2023-01364. Consulted for petitioner Verizon. IPR. The technology related to MIMO and minimization of interference. Declaration filed 10/10/23. Case settled.

January 2023 – April 2023, McKool Smith
Ericsson v. Koninklijke KPN N.V., Case No. IPR2023-00582. Consulting for Petitioner Ericsson. IPR. Technology related to neighbor cell lists in wireless systems. Declaration filed 2/17/23.

November 2022 – April 2023, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP
Qualcomm, Inc. vs. FedEx, Inc., IPR 2022-00585
Consulting for patent owner FedEx. Wrote IPR declaration. Deposed 4/19/23.
Technology related to sensor information collected by tracking devices.

October 2022 – November 2023, BC Law Group, P.C.
Lionra Technologies Limited v. Apple, Inc. Case No. 6:22-cv-00351-ADA, WDTX
Consulting for patent owner Lionra. Case dismissed 11/18/23.

September 2022 – June 2023, Quinn Emanuel, LLP
Google LLC v. Sonos, Inc., Inv. No. 337-TA-1330 (USITC)
Consulting for patent owner Google. Wrote infringement and validity rebuttal reports.
Technology related to voice assistants and smart devices. Deposed 4/14/23. Testified at trial 6/20/23 and 6/23/23.

September 2022 – August 2023, BC Law Group, P.C.
Apple, Inc. vs. Speir Technologies Limited, IPR2022-01512 and -00151
Consulted for patent owner Speir on UWB localization technology. Wrote IPR declarations. Deposed 10/25/23. Case dismissed 11/18/23.

August 2022 – Present, Venable, LLP
VoIP-Pal.com, Inc. v. Verizon Communications Inc. Case No. 6:21-cv-00672, WDTX
Consulting for defendant Verizon. Wrote non-infringement report. Deposed 5/17/23.
Technology relates to VoIP in cellular networks.

July 2022 – November 2023, Quinn Emanuel Urquhart & Sullivan, LLP
Evolved Wireless LLC v. Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc., Case No. 2-21-cv-00033, EDTX. Technology related to handovers in 4G networks.
Consulting for defendant Samsung. Wrote non-infringement and validity rebuttal report. Deposed 7/5/23; Testified at trial 11/14/23.

March 2022 – Dec. 2022, Knobbe, Martens, Olson & Bear, LLP
Jawbone Innovations, LLC v. Amazon.com, Inc., et al.
Consulting for petitioner Amazon re: IPR. Case stayed. No reports.
Technology related to tracking using acoustic arrays.

May 2022 – Dec. 2022, McKool Smith; Alston Bird
Ericsson Inc. and Telefonaktiebolaget LM Ericsson vs. Apple Inc., Case No. 2:21-cv-376, EDTX
Consulted for plaintiff and counter-defendant Ericsson.
Report on Essentiality and Rebuttal report (FRAND). Deposed 10/4/2022. Testified 12/7/2022. Case settled during trial.
Broad spectrum of technology related to cellular networks (core network and mobile device)

March 2022 – Dec. 2022, McKool Smith
Ericsson Inc. and Telefonaktiebolaget LM Ericsson vs. Apple Inc., Inv. No. 337-TA-1299, ITC
Consulted for Ericsson. Opening and Rebuttal report. Deposed 10/7/2022. Case settled.
Technology related to security in cellular systems.

January 2022 – March 2023, Duane Morris
Telecom Network Solutions v. AT&T Inc., et al, Case No. 2:21-cv-415 and Verizon Communications Inc., et al, Case No 2:21-cv-416, EDTX
Consulted for defendants AT&T and Verizon on Invalidity. Case settled; no reports filed.
Technology related to QoS in cellular networks.

September 2021 – December 2021, Duane Morris, LLP
KAIFI LLC v. Verizon Wireless, Case No. 2:20-cv-280-JRG, EDTX
Consulted for defendant Verizon. Wrote Non-Infringing Alternatives and Non-Infringement reports. Deposed 12/15/21. Case settled. Technology related to cellular and WiFi enablement with cellular systems.
September 2021 – December 2021, Quinn Emanuel, LLP
L2 Mobile Technologies, LLC v. Google, Case No. 6:21-cv-358, WDTX
Consulted for defendant Google. Wrote reply Claim Construction brief. Case settled.
Technology related to control signaling in cellular systems.

August 2021 – May 2022, McKool Smith
Godo Kaisha IP Bridge 1 v. Ericsson, Case No. 2:21-cv-00213-JRG, EDTX
Consulted for defendant Ericsson. IPR and Claim Construction declarations.
Technology related to signaling in OFDM systems.

July 2021 – August 2021, Quinn Emanuel, LLP
Finesse Wireless, LLC v. Nokia, et al., Case No. 2:21-CV-00063-JRG, EDTX
Consulted for defendant Nokia on claim construction. Wrote declaration and deposed on 8/17/21.
Technology related to coding techniques in wireless systems.

June 2021 – Dec 2021, Knobbe, Martens, Olson & Bear, LLP
Vocalife LLC v. Amazon.com, Inc., et al., Case No. 2:20-cv-00401-JRG-RSP, EDTX
Consulted for defendant Amazon on claim construction. Stayed pending sister case outcome.
Technology related to echo cancelation and signal enhancement in acoustic systems.

March 2021 – Sept 2021, Wilson Sonsini
Lenovo Holding Co, Inc., et al. v. InterDigital Technology Corp.
IPR. Consulted for InterDigital. Wrote three declarations. Deposed 7/27/21.
Technology related to control signaling in cellular systems.

January 2021 – May 2021, Winston & Strawn, LLP
Ericsson, Inc. v. Samsung Electronics, Ltd., ITC
Consulted for plaintiff. Settled May 2021. No deposition. No declaration filed.
Patents dealt with antenna arrays for 5G/4G base stations, access point signaling, bearer handling.

November 2020 – June 2021, Sheppard Mullin
Hong Kong uCloudlink v. SIMO Holdings, Inc. and Skyroam, Inc., Case No. 18-cv-05031-EMC, NDCA. Consulted for plaintiff uCloudlink on infringement and validity. Deposed (3/26/21). Case settled. Virtual SIM technology.

August 2019 – August 2020; June 2021 – Sept 2021 McKool Smith/Irell & Manella
Optis Wireless Technology, LLC et al. v. Apple, Inc., EDTX, Civ No. 2:19-cv-66
Consulted for plaintiff Optis. Infringement and validity analysis/reports, IPR. Deposed 06/01/20 and testified at trial 8/3/20 – 8/9/20. Re-trial for damages 8/10/21 – 8/16/21.

March 2019 – May 2020 Gibson, Dunn, & Crutcher, LLP
Sol IP v. AT&T, Ericsson, Nokia, Verizon, and Sprint, EDTX, Case No. 2:18-cv-526
Consulted for defendants on patents involving LTE downlink cell search and synchronization signaling. Invalidity, non-infringement analysis/reports, claim construction. No deposition, case settled.

2016 – March 2019 Sidley Austin, LLP
Huawei v. Samsung, NDCA
Case No. 3:16-cv-02787-WHO
Consulted for plaintiff Huawei on original complaint and for defendant Huawei on counterclaims on patents involving control channel signaling, network access, and security. Assisted claim construction, IPR petition and preliminary response, wrote validity and non-infringement reports. Deposed 6/20/18, 7/19/18. Case settled.

2016 Russ, August & Kabat
Core Wireless v. Apple, Court of Northern California, Case No. 6:14-cv-752-JDL
Consulted for plaintiff on patents associated with core network signaling. Wrote infringement and validity reports and rebuttals. Performed source code review and conformance testing. Deposed (8/12/2016). Patent was dropped during down select before trial.

2015 - 2016 Hueston & Hennigan
Core Wireless v. LG Electronics, Court of Eastern Texas, Case No. 2:14-cv-911-JRG-RSP (lead case), Case No. 2:14-cv-912-JRG-RSP (consolidated)
Consulted for plaintiff on patents on cellular user interface. Present at jury trial (3/2016) and participated in mock jury trial (2/10/2016). Wrote rebuttal expert report on validity and deposed (12/11/2015). Wrote infringement report regarding cellular protocols. Performed source code review and conformance testing. Core Wireless prevailed.

2015 Bunsow De Mory Smith & Allison
Core Wireless v. LG Electronics, Court of Eastern Texas, Case No. 2:14-cv-911-JRG-RSP (lead case), Case No. 2:14-cv-912-JRG-RSP (consolidated) and Core Wireless v. Apple, Case No. 6:14-cv-752-JDL
Consulted for plaintiff on patents associated with core network signaling. Wrote declarations on claim construction. Prepared tutorial to be presented to court. Case handed off to Hueston & Hennigan.

Case Testimony History:

October 2023 – Present, Erise IP; Finnegan, DLA Piper, Husch Blackwell
BNR v. ASUSTek/Media Tek/Laird/NXP Inc. Inv. No. 337-TA-1367 (USITC). Consulting for defendant ASUS on ASUS (Qualcomm-based products) non-infringement and JDG (ASUS/Media Tek/ Laird/ NXP) on Tech DI non-infringement. Wrote on WiFi wireless devices and semiconductor chips with wireless capabilities related to wireless transmission technologies. Wrote rebuttal report. Deposed 2/8/24. BNR settled with ASUS and Media Tek; BNR withdrew complaint before hearing.

November 2022 – April 2023, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP
Qualcomm, Inc. vs. FedEx, Inc., IPR 2022-00585
Consulting for patent owner FedEx. Wrote IPR declaration. Deposed 4/19/23.
Technology related to sensor information collected by tracking devices.

September 2023 – June 2023, Quinn Emanuel, LLP
Google LLC v. Sonos, Inc., Inv. No. 337-TA-1330 (USITC)
Consulting for patent owner Google. Wrote infringement and validity rebuttal reports.
Technology related to voice assistants and smart devices. Deposed 4/14/23. Testified 6/20-23/23.

September 2022 – November 2023, BC Law Group, P.C.
Apple, Inc., vs. Speir Technologies Limited, IPR2022-01512 and -00151
Consulted for patent owner Speir on UWB localization technology. Wrote IPR declarations. Deposed 10/25/23. Case dismissed 11/18/23.

August 2022 – Present, Venable, LLP
VoIP-Pal.com, Inc. v. Verizon Communications Inc. Case No. 6:21-cv-00672, WDTX
Consulting for defendant Verizon. Wrote non-infringement report. Deposed 5/17/23.
Technology relates to VoIP in cellular networks.

July 2022 – November 2023, Quinn Emanuel Urquhart & Sullivan, LLP
Evolved Wireless LLC v. Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc., Case No. 2-21-cv-00033, EDTX. Technology related to handovers in 4G networks.
Consulting for defendant Samsung. Wrote non-infringement and validity rebuttal report. Deposed 7/5/23; Testified at trial 11/14/23. Jury found for defendant on all counts.

March 2022 – December 2022, McKool Smith
Ericsson Inc. and Telefonaktiebolaget LM Ericsson vs. Apple Inc., Inv. No. 337-TA-1299, ITC
Consulting for Ericsson. Opening and Rebuttal report. Deposed 10/7/2022. Testified 12/7/2022. Case settled during trial.

May 2022 – December 2022, McKool Smith; Alston Bird
Ericsson Inc. and Telefonaktiebolaget LM Ericsson vs. Apple Inc., Case No. 2:21-cv-376, EDTX
Consulting for plaintiff and counter-defendant Ericsson.
Report on Essentiality and Rebuttal report. Deposed 10/4/2022. Case settled.

September 2021 – December 2021, Duane Morris, LLP
KAIFI LLC v. Verizon Wireless, Case No. 2:20-cv-280-JRG, EDTX
Consulted for defendant Verizon. Wrote Non-Infringing Alternatives and Non-Infringement reports. Deposed 12/15/21. Case settled.

July 2021 – August 2021, Quinn Emanuel, LLP
Finesse Wireless, LLC v. Nokia, et al., Case No. 2:21-CV-00063-JRG, EDTX
Consulted for defendant Nokia on claim construction. Technology related to noise in the front-end of receiver. Deposed on 8/17/21.

March 2021 – Sept 2021, Wilson Sonsini
Lenovo Holding Co, Inc., et al. v. InterDigital Technology Corp.
IPR. Consulted for InterDigital. Technology related to control signaling in cellular systems. Wrote three declarations. Deposed 7/27/21.

November 2020 – June 2021, Sheppard Mullin
Hong Kong uCloudlink v. SIMO Holdings, Inc. and Skyroam, Inc., Case No. 18-cv-05031-EMC, NDCA. Consulted for plaintiff uCloudlink on infringement and validity. Technology related to virtual SIM. Deposed 3/26/21.

August 2019 – August 2020; June 2021 – Sept 2021 McKool Smith/Irell & Manella
Optis Wireless Technology, LLC et al. v. Apple, Inc., EDTX, Civ No. 2:19-cv-66
SEPs – Consulted for plaintiff Optis on control channel MIMO switching, control channel information fields. Infringement and validity analysis/reports, IPR. Deposed 06/01/20 and testified at trial 8/3/20 – 8/9/20. Testified at re-trial for damages 8/10/21 – 8/16/21.

2016 – March 2019 Sidley Austin, LLP
Huawei v. Samsung, NDCA
Case No. 3:16-cv-02787-WHO
Consulted for plaintiff Huawei on original complaint and for defendant Huawei. Assisted claim construction, IPR petition and preliminary response, wrote validity and non-infringement reports. Deposed 6/20/18, and 7/19/18.

2016 Russ, August & Kabat
Core Wireless v. Apple, Court of Northern California, Case No. 6:14-cv-752-JDL
Consulted for plaintiff on patents associated with core network signaling. Wrote infringement and validity reports and rebuttals. Performed source code review and conformance testing. Deposed (8/12/2016). Patent was dropped during down select before trial.

2015 - 2016 Hueston & Hennigan
Core Wireless v. LG Electronics, Court of Eastern Texas, Case No. 2:14-cv-911-JRG-RSP (lead case), Case No. 2:14-cv-912-JRG-RSP (consolidated)
Consulted for plaintiff on patents on cellular user interface. Present at jury trial (3/2016) and participated in mock jury trial (2/10/2016). Wrote rebuttal expert report on validity and deposed (12/11/2015). Wrote infringement report regarding cellular protocols. Performed source code review and conformance testing. Core Wireless prevailed.

Teaching:

Courses:

- CSE 516 (Mobile Networks): Redesigned the course to integrate latest developments in mobile network architecture design. The course now includes signaling, control, and protocol issues unique to 4G/5G architectures addressing eMBB, mMTC, and URLLC use cases critical to IoT and future wireless network development and future NG networks.
- CSE 514 (Communication Networks)
- CSE 590 (Colloquium)
- CMPEN 462 (Wireless Communication Systems and Security): Created and designed this course to address a gap in the wireless communications area focusing on security. This course is included in the cybersecurity computational foundations minor.
- EE 456 (Introduction to Neural Networks): This course is intended to address the need for EE and CMPEN students to be exposed to the principles associated with artificial intelligence with a focus on the integration of physics-based approaches.
- CMPEN/EE 362 (Communication Networks)
- CMPSC 263 (Blockchains and Modern Web Development): This course is 'module' driven and designed to provide students with a broad range of academic backgrounds an opportunity to learn about blockchains and cryptography. Under supervision, students in the Distributed Ledger Society teach the modules including theory and practice in the areas of programming, math, and cryptography.
- ACS 505 (Experimental Techniques in Acoustics)

- MATH 141 (Calculus with Analytical Geometry II)
- CMPSC 101 (Programming in C++)

Publications:

Rublein, Mehmeti, Mahon, and LaPorta, "Impact of Client Choice on Distributed Resource Allocation in Edge Computing", *The 33rd International Conference on Computer Communications and Networks (ICCCN 2024),* IEEE and IEEE Communication Society, July 29 – 31, 2024, Big Island, Hawaii, USA.

Rublein, Mehmeti, Mahon, and LaPorta, "Improved Methods of Task Assignment and Resource Allocation with Preemption in Edge Computing Systems", *IEEE Transactions on Parallel and Distributed Computing.* Submitted July 2023.

Sorensen, Mahon, Mehmeti, and LaPorta, QoE-Analysis of 5G Network Resource Allocation Schemes for Competitive Multi-User Video Streaming Applications, *IEEE Conference on Vehicular Technology,* Florence, Italy, June 2023.

Sorensen, Mehmeti, Mahon, LaPorta, and Cao, "EQMS: An Improved Energy-Aware and QOE-aware Video Streaming Policy across Multiple Competitive Mobile Devices", Wireless Networks: The Journal of Mobile Communication, Computation and Information, Dec. 2022.

Sorensen, Mehmeti, Mahon, Qui, Chan, Qui, and LaPorta, "Optimal Resource Allocation for Crowdsourced Image Processing", *IEEE Transactions on Mobile Computing.* June 2022.

Sorensen, Mehmeti, Mahon, La Porta, Cao, "Mutli-User Competitive Energy-Aware and QoE-Aware Video Streaming on Mobile Devices", *ACM Proceedings of the QoS and Security for Wireless and Mobile Networks (Q2SWinet) Symposium collocated with Modeling, Analysis, and Simulation of Wireless and Mobile Systems* (MSWIM 2020), Alicante, Spain, Nov. 2020.

Sorensen, Mehmeti, Mahon, Qui, Chan, and LaPorta, "Optimal Resource Allocation for Crowdsourced Image Processing", *IEEE International Conference on Sensing and Networking* (IEEE SECON 2020), Como, Italy, June 2020.

Swanson, Mahon, Norris, and Mast, "Atmospheric Multipath Resolution Using Spread Spectrum Acoustic Signals", *Proceedings of Meetings on Acoustics,* September 2017.

Aquaviva, Mahon, Einfalt, and LaPorta, "Optimal Cyber-Defense Strategies for Advanced Persistent Threats: A Game Theoretic Approach," *2017 International Symposium on Reliable and Distributed Systems,* Hong Kong, China, September 27 – 29, 2017.

Young, Mahon, and Wyckoff, "Automated Information Management," Chap. 12, *Mathematical Techniques in Multisensor Data Fusion,* Hall, David L., Artech House Inc., Mar 2004

Mahon, Sonsteby, and Wenchel, "Application of Non-Orthogonal Waveletes for Geolocation," *Radiolocation and Direction Finding Symposium,* Southwest Research Institute, San Antonio, Texas, 2-4 Nov. 1999.

Myers, Lovette, Kilgus, Giannini, Swanson, Reichard, Mahon, Mast, "A Java-based Information System for Wayside Sensing and Control," *Proc. of the 1998 ASME/IEEE Joint Railroad Conference,* 1998, pp. 135-147.

Mast, Swanson, Mahon, Norris, "Resolution of multipath outdoor sound propagation using spread spectrum signals," *J.Acoustic. Soc. Am., Volume 101, Issue 5,* 1997

Swanson, Mast, Mahon, "Atmospheric Multipath Resolution Using Spread Spectrum Acoustic Signals," *Proceedings of the 133rd Meeting of the ASA*, June 15-20, 1997.

Mahon, Swanson, "Acoustic Holography as an Active Control Measurement Tool," *Proceedings of Active 95, The 1995 International Symposium on Active Control of Sound and Vibration,* Newport Beach, CA, July 1995, pp. 673-684.

Mahon, Sibul, Valenzuela, "A Sliding Window Update for the Basis Matrix of the QR Decomposition," IEEE Transactions on Signal Processing, May 1993, pp. 1951-1953.

Mahon, Sibul, Valenzuela, "An Alternative Updating Scheme for the QR Algorithm as Applied to Adaptive Beamforming," *Proc. 25th Annual Conf. on Info. Sciences and Systems,* Johns Hopkins University, Baltimore, MD, March 1991, pp. 193-199.

Awards/Honors:

Senior Member IEEE

2001 Formal citation letter from National Reconnaissance Office (NRO) for experimental work with mobile wireless systems

2001 Formal citation letter for excellence in software development from the NRO for work associated with mobile wireless systems.

2000 Formal citation letter from NRO for development of wavelet course presented at NRO Technology Symposium

1997 Invited session chair of "Signal Processing in Acoustics: General Signal Processing," Noise-Con '97, 133rd meeting of the ASA.

1996 Simowitz Citation Acoustics Department PSU for outstanding publication by a graduate student

1995 Invited co-chair of "Transducers for Active Control of Sound and Vibration," Active 95, Active Noise Control Conference

1993 Simowitz Award Acoustics Department PSU for outstanding publication by a graduate student

1987 Dr. A. J. Cawley Award for Excellence in Electronics Engineering by Physics/EE Department University of Scranton