

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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TESLA, INC.,  
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,  
Patent Owner.

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IPR2025-00220  
U.S. Patent No. 11,206,670

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**DECLARATION OF DR. ZHI DING, PH.D.,  
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR  
*INTER PARTES* REVIEW**

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I, Dr. Zhi Ding, do hereby declare as follows:

**I. INTRODUCTION**

1. I am making this declaration at the request of Tesla, Inc. in the matter of the *Inter Partes* Review of U.S. Patent No. 11,206,670 (“the ’670 patent”) to Meister, *et al.*

2. I am being compensated for my work on this matter and for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony, and I have no other interest in this case or the parties thereto.

3. I have been asked to provide my opinions regarding whether claims 1-18 (“the Challenged Claims”) of the ’670 patent are patentable, or whether they would have been obvious to a person having ordinary skill in the art (“POSITA”) at the time of the alleged invention, in light of the prior art. It is my opinion that all of the limitations of the Challenged Claims would have been obvious to a POSITA.

4. In the preparation of this declaration, I have studied:

- a. the ’670 patent, Ex.1001;
- b. the prosecution history of the ’670 patent (“**’670 File History**”),

Ex.1002;

- c. U.S. Patent Application Publication No. 2012/0327895 by A. Wallen et al. (“**Wallen**”), Ex.1005; and
- d. U.S. Provisional Application No. 61/501,547 (“**Wallen-Prov**”), Ex.1006;
- e. U.S. Patent Application Publication No. 2011/0269475 to F. Berggren et al. (“**Berggren**”), Ex.1007;
- f. WIPO Publication WO 2010/117240 to M. Noh et al. (“**Noh**”), Ex.1008;
- g. WIPO Publication WO 2012/084001 to M. Sagfors, et al. (“**Sagfors**”), Ex.1009;
- h. U.S. Patent Application Publication No. 2012/0327894 to J. Axmon et al. (“**Axmon**”), Ex.1010;
- i. U.S. Provisional Application No. 61/501,310 to J. Axmon et al. (“**Axmon-Prov**”), Ex.1011;
- j. the prosecution history of U.S. Patent No. 10,939,446, Ex.1012;
- k. IV’s Preliminary Infringement Contentions, *Intellectual Ventures II, LLC v. Tesla, Inc.*, No. 6:24-cv-188-ADA (WDTX), Ex.1013;
- l. GB 1201000, filed January 20, 2012, Ex.1018; and
- m. U.S. Patent Application Publication No. 2013/0083749 to H. Xu et al., Ex.1019.

5. In forming the opinions expressed below, I have considered:  
the documents listed above;  
the relevant legal standards, including the standard for obviousness,  
and any additional authoritative documents as cited in the body of this  
declaration; and

my own knowledge and experience based upon my work in the field  
of networking as described below, as well as the following materials.

6. Unless otherwise noted, all emphasis in any quoted material has been  
added.

## **II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE**

7. I presently hold the title of Distinguished Professor in the Department  
of Electrical and Computer Engineering at the University of California, Davis.  
Before my appointment on July 1, 2020, I held the position of professor for the  
prior 24 years and have served as a faculty member at several United States  
universities for over 34 years. I am also a private technical consultant on various  
technologies related to information systems. In total, I have more than three  
decades of research experience on a wide range of topics related to data  
communications and signal processing.

8. I earned my Bachelor of Science degree in 1982 in wireless  
engineering from the Nanjing Institute of Technology (later renamed as Southeast

University) in Nanjing, China. I earned my Master of Science degree in 1987 in electrical engineering from the University of Toronto in Toronto, Canada. I earned my Ph.D. in 1990 in electrical engineering from Cornell University in Ithaca, New York.

9. My responsibilities as a Professor at University of California, Davis, include classroom instruction on various topics of communication systems and signal analysis, as well as mentoring undergraduate students and supervising graduate students in their research and development efforts on various topics related to digital communications. I have directly supervised such research and development works ranging from signal detection to wireless networking. As the chief academic advisor, I have also directly supervised the completion of over 20 Masters' theses and over 30 Ph.D. dissertations on various topics related to digital communications. I have served full time as a faculty member at three major research universities in the United States over the past 30 years, including Auburn University from 1990 to 1998, University of Iowa from 1999 to 2000, and University of California, Davis, from 2000 to present.

10. Since 1990, I have been selected as the principal investigator of multiple highly competitive federal and local research grants, including more than twenty major research projects supported by the National Science Foundation and two research projects funded by the U.S. Army Research Office. These

competitive research projects focused on developing more efficient and effective digital communication transceivers, networks, and signal processing tools. I have also participated in several large-scale projects supported by the Defense Advanced Research Projects Agency (DARPA) with teams of researchers. I have applied for, and received support from, other federal, state, and industry sponsors.

11. I have published over 250 peer-reviewed research articles in premier international journals, in addition to over 250 refereed technical articles at top international conferences on communications and information technologies. According to Google Scholar, my published works have been cited by over 20,000 times by peers. I also authored two books on communications technologies. My most recent book, coauthored with B.P. Lathi, is entitled, “Modern Digital and Analog Communication Systems,” 5th edition, and was published by the Oxford University Press in 2018. The 4th edition of this book (published in 2009) had been widely adopted as an introductory textbook to communication systems.

12. In addition to the over 500 published technical papers that have been cited over 20,000 times according to Google Scholar, I am also co-inventor of 4 issued U.S. patents on communication technologies.

13. I am a member of the Institute of Electrical and Electronics Engineers (IEEE) and was elevated to the grade of Fellow in January 2003 for contributions made in signal processing for communication. The IEEE is the world's largest

professional society of engineers, with over 400,000 members in more than 160 countries. The IEEE has led the development of many standards for modern digital communications and networking, most notably, the IEEE 802 series of network standards. The IEEE Grade of Fellow is conferred by the Boards of Directors upon a person with an extraordinary record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year does not exceed one-tenth of one percent of the total voting Institute membership.

14. I have served the IEEE in the following capacities:

- Chief Information Officer of the IEEE Communications Society from Jan. 2018 to present.
- Chief Marketing Officer of the IEEE Communications Society from Jan. 2020 to present.
- General Chair of the 2016 IEEE International Conference on Acoustics, Speech, and Signal Processing, the flagship conference of the IEEE Signal Processing Society.
- Chair of the Steering Committee for the IEEE Transactions on Wireless Communications from 2008 to 2010.
- Distinguished Lecturer of the IEEE Communications Society from January 2008 to December 2009.
- Technical Program Chair of the 2006 IEEE Globecom, one of two

flagship annual IEEE Communication Society conferences.

- Distinguished Lecturer of the IEEE Circuits and Systems Society from 2004 to 2005.
- Associate Editor of the IEEE Transactions on Signal Processing from 1994 to 1997 and from 2001 to 2004.
- Member of the IEEE Statistical Signal and Array Processing for Communications Technical Committee from 1993 to 1998.
- Member of the IEEE Signal Processing for Communications Technical Committee from 1998 to 2004.

15. In 2012, I received the Wireless Communications Technical Committee Recognition Award from the IEEE Communications Society, an award given to a person with a high degree of visibility and contribution in the field of "Wireless and Mobile Communications Theory, Systems, and Networks." I received the 2020 Education Award from the IEEE Communications Society. According to the Society, this award "recognizes distinguished and significant contributions to education within the Society's technical scope."

16. I have also served as a technical consultant for the telecommunication industry. For example, in 1995 I consulted for Analog Devices, Inc., on the development of the first generation DOCSIS cable modem systems. I have also consulted for other companies, including Nortel Networks and NEC US

Laboratories. I worked as a visiting faculty research fellow at NASA Glenn Research Center in 1992 and at U.S. Air Force Wright Laboratory in 1993. I have served on multiple review panels of the National Science Foundation to evaluate competitive research proposals in the field of communication. I have also reviewed a large number of research proposals at the request of the National Science and Engineering Research Council (NSERC) of Canada as an expert panelist from 2010 to 2013, and also at the request of the Research Grant Council (RGC) of Hong Kong as an external reviewer.

17. I have served as an expert witness or consulting expert on a number of matters related to intellectual property, mostly in the arena of telecommunications, including cellular communications, Wi-Fi technologies, Bluetooth, and optical communications. For example, since 2007, I have been engaged to work on various litigations involving cellular, WiFi, Bluetooth, and optical communication networks. Many of my expert works related to the standard essentiality of patents with respect to the 3GPP 2G/3G/4G/5G technical specifications, the IEEE 802.11 standards, and the Bluetooth standards. I have provided testimonies at court trials or hearings in multiple jurisdictions, both in the United States and internationally. I have submitted declarations to PTAB as expert on a number of inter partes reviews of challenged patents.

18. Further experience and a complete list of my publications are

presented in my curriculum vitae. *See* Ex.1004.

### III. LEVEL OF ORDINARY SKILL IN THE ART

19. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

20. It is my understanding that the earliest possible priority date for the '670 patent is January 20, 2012. I am familiar with the wireless communications art pertinent to the '670 Patent. I am also aware of the state of the art at the time of the alleged priority date. Based on the technologies disclosed in the '670 patent, a person of ordinary skill in the art ("POSITA") in the field of the '670 patent, as of the earliest possible priority date of January 20, 2012, would have been someone knowledgeable and familiar with the wireless communications systems that are pertinent to the '670 patent. That person would have had at least a bachelor's degree from an accredited program in electrical engineering, computer engineering, computer science, or equivalent training, and at least two years of professional experience relating to wireless communication technology. Lack of professional experience can be remedied by additional education, and vice versa. I believe that I possessed and exceeded such experience and knowledge before and

at the priority date and that I am qualified to opine on the '670 Patent.

21. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the earliest alleged priority date of the '670 patent (i.e., January 20, 2012). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA as of the alleged priority date of the '670 patent.

#### **IV. RELEVANT LEGAL STANDARDS**

22. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '670 patent, I am relying on certain basic legal principles that counsel explained to me. These principles are discussed below.

23. I understand that prior art to the '670 patent includes patents and printed publications in the relevant art that predate the priority date of the alleged invention recited in the '670 patent.

24. I have been informed that a claim preamble may or may not limit the claim scope. For the purposes of this *Inter Partes* Review, I have been informed by counsel to include the preamble in the analysis for obviousness in order to follow a conservative approach.

25. I have been informed that a claimed invention is unpatentable under

35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

26. I have been informed that a threshold inquiry as to whether a reference can be considered in the obvious analysis is whether the reference is analogous art to the claimed invention. A reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

27. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device

(method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

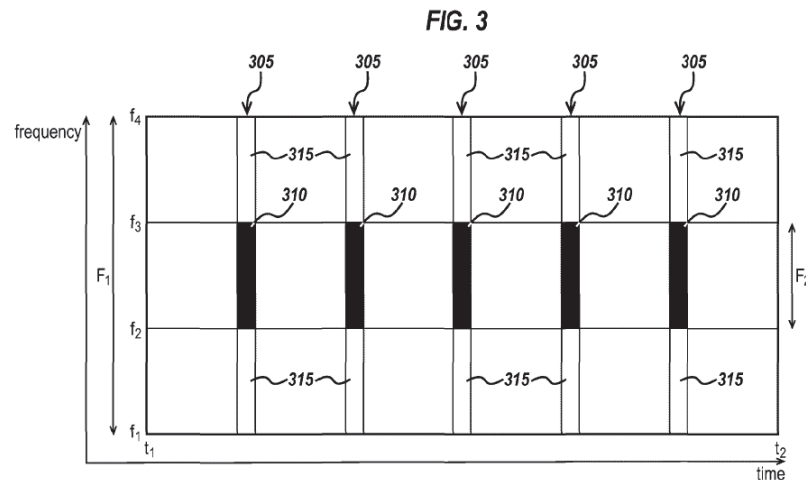
28. Also, I have been informed and understand that obviousness does not require physical combination or bodily incorporation but rather consideration of what the combined teachings of prior art references would have suggested to a POSITA at the time of the alleged invention.

## **V. OVERVIEW OF THE '670 PATENT**

29. The '670 patent explains that the advent of fourth generation (4G) cellular technology, referred to as Long Term Evolution (LTE), provides for “enhanced data rates” allowing “a user [] to enjoy high data rate applications such as mobile video streaming and mobile video conferencing that would previously only have been available via a fixed line data connection.” '670 patent, 1:29-50. At the same time, there has been a “parallel development” of “so-called machine type communication (MTC)” devices that, “rather than taking advantage of the high data rates available, instead take advantage of the robust

radio interface and increasing ubiquity of the coverage area” to communicate “small amounts of data on a relatively infrequent basis.” *Id.*, 1:54-65. Thus, the ’670 patent expresses a desire to provide enhanced data rates and sophisticated services in LTE for more complex and powerful devices, such as a smartphone, while at the same time accommodating and providing simpler services to MTC devices. *See id.*, 2:3-25.

30. The ’670 patent refers to two types of terminal devices: “[a] first class of device is configured to communicate via a host carrier, and a second class of device is configured to communicate via a subordinate carrier.” *Id.*, 7:33-36. An example of a “host carrier,” spanning frequency band  $F_1$ , and a “subordinate carrier,” spanning frequency band  $F_2$ , is shown in FIG. 3 below. *See id.*, 8:23-33. An example “first class” of device is a non-MTC device, such as an LTE device, and an example of the “second class” of device is an MTC device. ’670 patent, 2:48-56.



'670 patent, Figure 3

31. The '670 patent acknowledges that Releases 8, 9, and 10 of the LTE standards describe certain synchronization signals (PSS and SSS) and system information (included in a MIB) residing within 1.4 MHz of the overall up to 20 MHz system bandwidth:

3GPP LTE Releases 8, 9 and 10 (Rel. 8/9/10) define 6 downlink transmission bandwidth configurations from 1.4 MHz to 20 MHz representing the use of 6, 15, 25, 50, 75 or 100 resource blocks. As noted above, all Rel. 8/9/10 terminal devices are required to support the maximum single carrier bandwidth of 20 MHz for compliance with the Rel. 8/9/10 standards. **Nevertheless, for all bandwidth configurations Rel. 8/9/10 has specified that basic physical layer synchronisation signals (Primary Synchronisation Signals—PSS, and Secondary Synchronisation Signals—SSS), and the most fundamental system information (Master Information Block—MIB) is transmitted**

**using only the central 6 resource blocks which are receivable with a 1.4 MHz transceiver.**

'670 patent, 9:32-55. As shown above, a Master Information Block (or MIB) was known in LTE to carry “the most fundamental system information.” Also, system bandwidth can be expressed in terms of “resource blocks,” which represent a unit of time and frequency resources in LTE. The '670 patent explains how a resource block is defined in prior art LTE systems as follows:

Each resource element 450 has a length (duration) of one modulation symbol, and a frequency range of one subcarrier (e.g. 15 kHz). In the present case the resource block 440 has a dimension of 12 resource elements 450 in the frequency dimension and 7 resource elements 450 in the time dimension, resulting in an overall bandwidth of 12 subcarriers and a duration of 7 symbols.

'670 patent, 9:18-25.<sup>1</sup> LTE uses Orthogonal Frequency Division Multiplexing

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<sup>1</sup> Noh confirms that a resource block in LTE is defined in terms of units of time (OFDM symbols) and units of frequency (OFDM subcarriers). *See, e.g.*, Noh, [0040] (discussing “the structure of a radio frame in 3GPP LTE specifications.”); [0042] (“A Resource Block (RB) is the unit of resource allocation, and it includes a plurality of consecutive subcarriers in one slot.”); [0047] (“[O]ne resource block is illustrated to include 7x12 resource elements, including 7 OFDM symbols in the time domain and 12 subcarriers in the frequency domain.”).

(OFDM) on the downlink, '670 patent, 1:29-38, and an OFDM symbol was known to consist of a number of frequency subcarriers, which is why the '670 patent refers to "subcarriers."

32. The '670 patent addresses a problem that because MTC communication devices would be required to receive the full system bandwidth of up to 20 MHz to receive all system information if changes are not made to accommodate these devices, such terminals with reduced capability (such as MTC devices) may not work on LTE networks. '670 patent, 9:65-10:2 ("Terminal devices with a lower bandwidth capability than that specified for Rel. 8/9/10 may mean that such devices are unable to operate properly on Rel. 8/9/10 compliant networks which specify higher bandwidth capabilities."). The '670 patent proposes that the "MTC subordinate carrier indicator flag may be signalled in one (or more) of the MIB bits that are spare in LTE Release 8/9/10 (10 bits are currently spare)." Ex.1001, 13:34-37.

33. Claim 1 of the '670 patent generally recites the standard procedure in legacy LTE system of receiving the PSS, SSS, and MIB in a "*first bandwidth*" that is a "*first portion of the cell bandwidth*." In the context of this standard procedure, it recites steps to accommodate certain devices, for example MTC devices (although the type of device is not specified in the claim):

[1.4] *wherein the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information...*

[1.6] *wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1.*<sup>2</sup>

34. As shown herein, Wallen (Ex.1001) likewise relates to the same problem addressed by the '670 patent of how to accommodate MTC devices in LTE networks by providing certain PSS, SSS, and MIB information and solves the problem in the same way - by allocating spare bits of legacy MIB messages to indicate to MTC devices the locations in time and frequency where pointers to system information blocks (SIBs) can be obtained. *See, e.g., Wallen, [0065]* (“These [MIB] spare bits can be used for conveying the MTC-related information, such as time- and/or frequency-wise locations of resource blocks ... that the MTC device needs to receive and decode for further information to be able to connect to” a cell.); [0067] (“[T]he MIB 901 indicates the resource blocks allocated to a specific M-PDCCH... The M-PDCCH supplies ... downlink assignments pointing to the SIBs that are intended for this MTC device.”); Wallen-Prov, 9.<sup>3</sup>

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<sup>2</sup> Limitation numbering from Section VIII.A.4 is added.

<sup>3</sup> As shown in Sections IX and X, Wallen (Ex.1005) is entitled to the filing date of its provisional application (“Wallen-Prov,” Ex.1006) for prior art purposes.

**VI. PROSECUTION HISTORY OF THE '670 PATENT**

35. Application No. 17/184,127 (“the ’127 application”) that led to the ’670 patent was filed on February 24, 2021. The ’127 application claims the benefit of several continuation applications, Ex.1002, 178-179, and also claims priority to GB 1201000, filed on January 20, 2012. Ex.1002, p. 179. The ’127 application was filed with a Track One request. Ex.1002, p. 127.

36. A non-final rejection was issued shortly after filing on May 17, 2021. In the rejection, claims 1-21 were rejected as obvious over Xu (U.S. 2013/0083749) (Ex.1019) in view of Axmon (U.S. 2012/0327894) (Ex.1010). The Office Action relies on Axmon as disclosing “the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information,” citing Axmon, paras. [0106]-[0107]. Ex.1002, pp. 97-99. Claims 1-21 were also rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of parent application 16/190,420 (issued as U.S. 10,939,446) (Ex.1012). Ex.1002, 95-96.

37. Applicant filed a response on August 16, 2021, alleging that neither Xu nor Axmon qualify as prior art. Ex.1002, pp. 65-67. Applicant asserted without proof that the ’127 application is entitled to the benefit of GB 1201000.5, filed on January 20, 2012, whereas the non-provisional filing dates of both Xu and Axmon are after January 20, 2012. Thus, the provisional applications leading to both Xu

and Axmon must be relied upon, according to Applicant. Applicant indicated that the Examiner is required to make two showings for the provisional applications of Xu and Axmon (61/501,310): “(1) that the claims of the patent are supported by the provisional, and (2) that the portions relied upon to anticipate or render obvious the patent-at-issue were included in the priority application.” Ex.1002, pp. 65-66.

38. With regard to Axmon, Applicant argued: “[T]he Axmon provisional application [(61/501,310) (Ex.1011)] provides no information stating the MIB includes information that identifies one or more possible upcoming locations in terms of time/frequency.” Ex.1002, p. 67. Applicant also filed a terminal disclaimer with respect to parent Application No. 16/190,420 (U.S. 10,939,446). Ex.1002, p. 45.

39. Applicant thereafter conducted an Examiner Interview on August 20, 2021. During the interview, the Applicant agreed to an Examiner’s amendment. ’670 File History, p. 21. Representative claim 1 was amended for the first time during prosecution as follows (amendment indicated in underline):

1. A user equipment (UE) comprising:

a transceiver; and

a processor, operatively coupled to the transceiver; wherein

the transceiver and the processor are configured to receive a primary synchronization signal (PSS), a secondary synchronization signal (SSS), and a physical broadcast channel (PBCH) including a master information block (MIB), the PSS, SSS and PBCH are in a first

bandwidth of a cell having a cell bandwidth, wherein the first bandwidth is a first portion of the cell bandwidth, wherein the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information; and

the transceiver and the processor are configured to acquire the additional system information using the indication of the frequency resources and the time resources, wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1.

Ex.1002, p. 16. The limitation added by amendment is numbered as limitation [1.6] in the analysis below.

40. Although not stated during prosecution, note that Axmon discloses or renders obvious the added limitation of “*wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1*”:

In one aspect, the MIB 1501 (which occupies its standard location in the host cell) **includes time/frequency information (represented by the number “1” enclosed in a circle) that informs the MTC device of a location of the resource blocks** and/or modulation and coding scheme (MCS) **allocated to the first system information block (SIB1)** that is transmitted in a system standardized location (e.g., in subframe 5 in an LTE system).

Axmon, [0126].

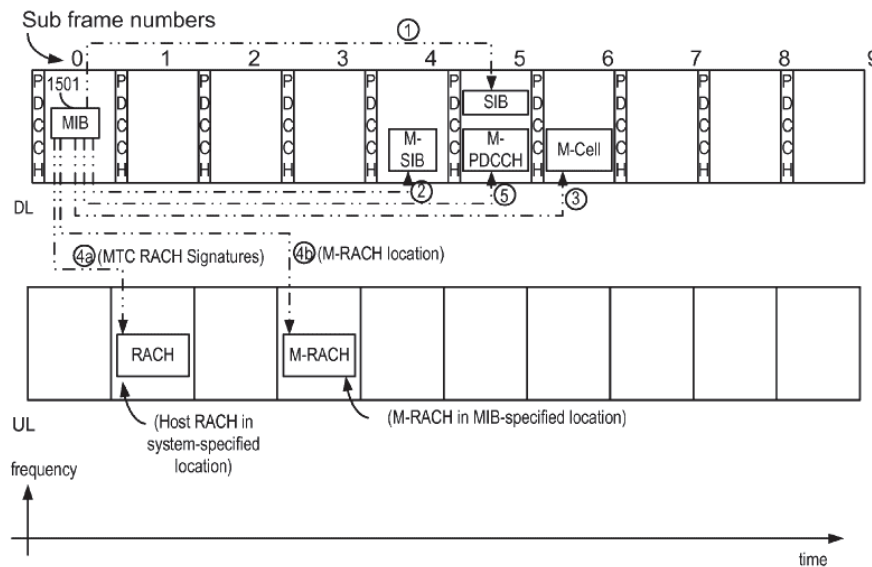


FIG. 15

Axmon, Figure 15

41. The Axmon Provisional (61/501,310, Ex.1011) does not appear to include substantially the same disclosure regarding SIB1. *See generally* Ex.1011.

42. However, as shown below, a provisional application filed by the same inventors on the same day (Wallen-Prov, Ex.1006) as the Axmon Provisional does have substantially the same disclosure as shown in FIG. 15 and the associated discussion of Axmon above. *See, e.g.*, Wallen-Prov, Figure 1.

43. A notice of allowance issued on September 22, 2021. Ex.1002, p. 9.

44. Note that Wallen was submitted in an Information Disclosure Statement on May 28, 2021 along with over 50 other references, but Wallen was not applied in any rejection during prosecution of the '670 patent.

45. With respect to the prosecution of U.S. Patent No. 10,939,446 (the

subject of the terminal disclaimer during the prosecution of the '670 patent), there was non-final rejection in which different prior art was applied than in '670 prosecution, Ex.1012, pp. 142-149, followed by a response in which Applicant argued that the priority date on one of the references was not early enough, Ex.1012, pp. 134-136. Next, a final office action issued, presenting an obviousness rejection also based on Xu (U.S. 2013/0083749) and another reference not applied in during prosecution of the '670 patent. Ex.1012, pp. 115-123. In response, Applicant amended the claims and argued over the art. Ex.1012, pp. 97-108. After a non-final office action using Xu and references different than Axmon, Ex.1012, pp. 65-73, and further amendments, Ex.1012, pp. 60-64, a notice of allowance issued, Ex.1012, pp. 27-31.

## VII. CLAIM CONSTRUCTION

46. It is my understanding that in order to properly evaluate the '670 patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term. For the purposes of my analysis below, I do not believe any claim terms require an explicit construction.

**VIII. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE**

47. I have been asked to provide my opinion as to whether the Challenged Claims of the '670 patent would have been obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references identified below teach the limitations of the Challenged Claims of the '670 patent.

48. As part of my analysis, I have considered the scope and content of the prior art and any differences between the alleged invention and the prior art. I describe in detail below the scope and content of the prior art, as well as differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claims of the '670 patent.

49. As described in detail below, the alleged invention of the Challenged Claims would have been obvious in view of the teachings of the identified prior art references as well as the knowledge of a POSITA.

**A. Ground 1: Claims 1-18 are obvious under 35 U.S.C. § 103 over Wallen combined with Berggren**

**1. Summary of Wallen**

50. Wallen refers to U.S. Patent Pub. No. 2012/0327895, which was filed on February 16, 2012. I understand that Wallen claims priority to U.S. Provisional App. No. 61/501,547 (Ex.1006, referred to herein as "Wallen-Prov"), filed on June 27, 2011. I also understand that in order to claim the benefit of Wallen-Prov, two requirements must be satisfied: (1) the subject matter relied upon in Wallen must

have been described in Wallen-Prov; and (2) at least one claim of Wallen is supported by Wallen-Prov. Accordingly, I have been asked to provide a table comparing the disclosures of Wallen that are relied on in the Petition and my declaration with the corresponding disclosures of Wallen-Prov. This table is included below in Section IX. I have also been asked to provide a table demonstrating that Wallen-Prov provides support for at least one claim of Wallen, and this table is included below in Section X.

51. Because the disclosures in Wallen that I (and Petitioner) reply on were previously described in Wallen-Prov, I understand that Wallen is entitled to claim the benefit of Wallen-Prov and therefore qualifies as prior art as of the filing date of the Wallen-Prov of June 27, 2011, which is before the earliest possible priority date of the '670 patent of January 20, 2012. For convenience, I provide dual citations to Wallen and Wallen-Prov herein.

52. Wallen recognizes the same problem as the '670 patent that MTC devices operate using a relatively low supported bandwidth but it is desirable for MTC devices to connect to pre-existing LTE networks that use a larger bandwidth. Wallen, [0016] (It is “desirable to have methods and apparatuses that enable an MTC device to retain its relatively low performance characteristics (e.g., in terms of size of bandwidth supported and/or processing power) and yet be capable of connecting to a modern-day cellular communications system, such as but not

limited to an LTE system.”); Wallen-Prov, p. 8.

53. Wallen provides a solution to this problem of connecting MTC devices to LTE networks by using “spare bits” of an MIB, which are not otherwise used, to “convey MTC-related information, such as time- and/or frequency-wise locations of resource blocks or resource elements that the MTC device needs to receive and decode for further information to be able to connect to the” network. Wallen, [0065]; Wallen-Prov, p. 9.

54. Wallen describes several types of information that can be indicated for MTC devices using the MIB, including: (1) “time/frequency information... that informs the MTC device of a location of the resource blocks ... allocated to the first system information block (SIB 1),” Wallen, [0068]; Wallen-Prov, p. 9; and (2) “resource blocks ... allocated to a specific M-PDCCH [which] ... supplies control information to the MTC device, including MTC specific SIBs or downlink assignments pointing to the SIBs that are intended for this MTC device.” Wallen, [0072]; Wallen-Prov, p. 9. Thus, Wallen discloses an MIB identifying the location of “resource blocks,” which were known units of LTE resources representing a certain number of units of time (OFDM symbols) and units of frequency (OFDM subcarriers). *See, e.g.*, Noh, [0040]-[0047] (discussing “the structure of a radio frame in the 3GPP LTE specifications,” including a “Resource Block (RB) [as] the unit of resource allocation, and it includes a plurality of consecutive subcarriers in

one slot.”). In other words, Wallen’s MIB indicates to a receiver where to find certain control messages in frequency and time.

55. Figure 9 of Wallen illustrates several examples of how an MIB can indicate (or point to) time and frequency resources where various MTC control messages are located (see arrows labeled 1, 2, 3, and 5 in annotated Figure 9).

Wallen, [0068]-[0070], [0072]; Wallen-Prov, 9.

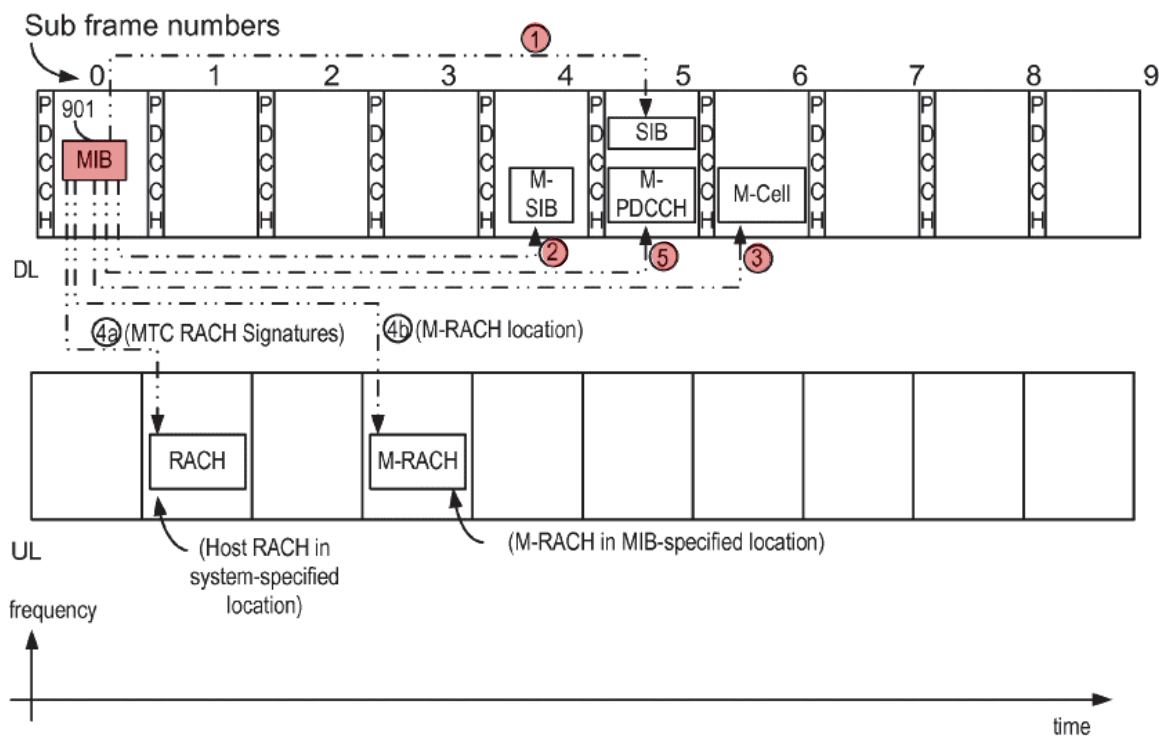


FIG. 9

Wallen, Figure 9 (annotated); Wallen-Prov, Figure 1

## 2. Summary of Berggren

56. Berggren relates to LTE systems, including how a UE detects and synchronizes to a cell by receiving synchronization signals, and then acquires

system information for operating within a cell. Berggren, [0074] (“For establishing a connection to a cell in LTE, a UE first detects and synchronizes to the cell by receiving the synchronization signals, and then acquires the system information needed for operating within a cell.”).

57. Berggren explains that the LTE standard specifies that a physical broadcast channel (PBCH) carries the MIB:

The downlink system bandwidth is included in the so called master information block (MIB) which contains only a small part of the system information and is transmitted with a periodicity of 40 ms on the BCH (Broadcast Channel). The BCH is a transport channel which in turn is mapped to the PBCH (Physical BCH) which is always located in the 6 central RBs of the component carrier.”

Berggren, [0074]. Berggren also presents the various system bandwidth configurations that are available in LTE and the number of resource blocks (RBs) associated with a particular bandwidth.

TABLE 1

| Channel bandwidth<br>[MHz] | Transmission band-<br>width configuration<br>[RBs] |
|----------------------------|----------------------------------------------------|
| 1.4                        | 6                                                  |
| 3                          | 15                                                 |
| 5                          | 25                                                 |
| 10                         | 50                                                 |
| 15                         | 75                                                 |
| 20                         | 100                                                |

Berggren, Table 1

### 3. Reasons to Combine Wallen and Berggren

58. It would have been obvious to a POSITA to combine Wallen's system with Berggren's description of how the LTE standard implements the MIB. In particular, it would have been predictable, and beneficial for Wallen's user equipment to receive the MIB in the physical broadcast channel (PBCH), as was standard in LTE.

#### *a) Analogous art*

59. Wallen and Berggren are analogous art to the '670 patent, as all three documents are directed to the field of wireless, cellular communication systems, such as LTE communications systems. '670 patent, 1:18-21 ("The present invention relates to wireless communications systems and methods..."); 2:23-25 ("[T]here is now a desire to use relatively inexpensive and less complex devices to communicate using LTE type networks."); Wallen, [0016] ("It is therefore desirable to have methods and apparatuses that enable an MTC device to retain its relatively low performance characteristics ... and yet be capable of connecting to a modern-day cellular communications system, such as but not limited to an LTE system."); Wallen-Prov, p. 8; Berggren, [0002] ("The present disclosure relates to a field of wireless communication, especially it relates to a method, apparatus and system for signaling resource partition."); [0004] ("In this document, the embodiments of the disclosure will be exemplified for the LTE-Advanced system, and thus for

Advanced E-UTRA.”).

60. Wallen and Berggren are also analogous art to the '670 patent because Wallen and Berggren are reasonably related to the same problem faced by the inventor of the '670 patent of how to accommodate MTC devices in an LTE network without requiring the MTC devices to receive information on the wide spectral bandwidth of the LTE network. *See* '670 patent, 3:25-42. Wallen addresses the same problem as the '670 patent. Wallen, [0016] (“**It is therefore desirable to have methods and apparatuses that enable an MTC device to retain its relatively low performance characteristics (e.g., in terms of size of bandwidth supported and/or processing power) and yet be capable of connecting to a modern-day cellular communications system, such as but not limited to an LTE system,** that ordinarily imposes higher performance requirements on connecting devices.”); Wallen-Prov, 8. Berggren is reasonably related to this problem because it presents numerous details about LTE systems that inform the background of a POSITA in addressing the problem of the '670 patent. Berggren, [0070]-[0077] (describing various aspects of LTE, including available system bandwidths, the concept of resource blocks, available channels and their operation (PDCCH, PDSCH, PBCH), and salient facts about system information (such as MIB, SIB1, and SIB2)).

*b) Motivation to combine Wallen with Berggren*

61. A POSITA would have found it obvious for Wallen's MIB to be implemented consistent with Berggren's implementation details because doing so would have been a matter of implementing the MIB according to 3GPP standards.

62. In particular, Wallen's MTC device is configured to receive an MIB: "The MTC device then receives and decodes the MIB which supplies the MTC device with MTC-specific information..." Wallen, [0077]. The MIB was understood as being broadcast in an LTE system. Wallen, [0006]; Wallen-Prov, p. 7. A POSITA that is implementing an LTE system would have been motivated to understand which LTE channel carries the MIB, and Berggren provides this implementation detail:

In order to give an understanding of the present disclosure it is first described how the number of primary RBs is communicated in the LTE system... **The downlink system bandwidth is included in the so called master information block (MIB) which contains only a small part of the system information and is transmitted with a periodicity of 40 ms on the BCH (Broadcast Channel). The BCH is a transport channel which in turn is mapped to the PBCH (Physical BCH) which is always located in the 6 central RBs of the component carrier.** Berggren, [0073]-[0074]. Thus, Wallen discloses that an MIB is broadcast, and Berggren confirms that the LTE's broadcast MIB is carried on a physical broadcast channel (PBCH), which spans six resource blocks (RBs). Consistent with

Berggren's teachings, Wallen confirms that the MIB spans six resource blocks, which is equivalent to 1.4 MHz. Wallen, [0060] ("1.4 MHz...or 6 RBs"); Wallen-Prov, p. 11. Thus, as would be expected, the MIB in both Wallen and Berggren spans the same bandwidth of 1.4 MHz.

63. A POSITA would have been motivated for Wallen's LTE system to utilize the LTE standard implementation details taught by Berggren. To the extent any modifications of Wallen are required, any modifications would have involved the combination of prior art elements (broadcasting an MIB, per Wallen, using a PBCH, per Berggren, where the MIB spans 1.4 MHz according to both references) according to known methods (using the pre-existing LTE channel PBCH that already transmits an MIB) to yield the predictable and beneficial result of providing the implementation detail that an MIB is carried in a 1.4 MHz PBCH in order to implement an LTE system. Moreover, a POSITA would have found it beneficial to implement all aspects of the base stations and terminals according to known standards to ensure compatibility, interoperability, and marketability of the product. For example, a POSITA would have found it beneficial and advantageous to implement such devices with standardized techniques that have already been well vetted and tested for workability. Indeed, the combination is nothing more than the predictable use of prior art elements according to their established functions. In addition, it would have been obvious to try transmitting the MIB in a

PBCH because LTE already provides PBCH (a broadcast channel) for broadcasting the MIB. Berggren, [0073]-[0074].

***c) Reasonable expectation of success***

64. A POSITA would have had a reasonable expectation of success of transmitting Wallen's MIB in Berggren's PBCH because Wallen's MIB is broadcast to all devices, Wallen, [0006]; Wallen-Prov, p. 7, a PBCH in LTE is designed to transmit broadcast information, such as an MIB, Berggren, [0073]-[0074], and both MIB and the PBCH span the same bandwidth, 1.4 MHz, Wallen, [0060]; Wallen-Prov, pp. 7, 11; Berggren, [0074]. More generally, a POSITA would expect to be successful implementing standard LTE elements into LTE systems (like Wallen's) because the very purpose of standardization is to ensure interoperability.

**4. Claim 1**

***[1.0] A user equipment (UE) comprising:  
a transceiver; and  
a processor, operatively coupled to the transceiver; wherein***

65. Wallen discloses or renders obvious limitation [1.0].

66. Wallen discloses a "an MTC device" having "user equipment (UE) circuitry/hardware" that includes "radio circuitry," which is an example of the claimed "*transceiver*," and the UE circuitry/hardware is coupled to a "processor," which is an example of the claimed "*processor*":

FIG. 13 is a block diagram of an **exemplary limited bandwidth communication device 1300**, such as the MTC device used in the examples described above. The **limited bandwidth communication device includes a controller 1303 coupled to other User Equipment (UE) circuitry/hardware components 1305** that enable the limited bandwidth communication device 1301 to ... operate as a communication device (e.g., to be able to communicate sensor data to a server, and possibly also to receive instructions). The **other UE circuitry/hardware components 1305 are generally known in the art, and may include** such elements as, for example and without limitation, **radio circuitry 1307** coupled to one or more antennas 1309...

Wallen, [0083]; Wallen-Prov, p. 12.

Depicted in the exemplary embodiment of FIG. 13, however, is programmable circuitry, comprising a **processor 1315** coupled to one or more memory devices 1317 (e.g., Random Access Memory, Magnetic Disc Drives, Optical Disk Drives, Read Only Memory, etc.).

Wallen, [0084]; Wallen-Prov, p. 12. As illustrated in Figure 13 below, Wallen's "radio circuitry 1307 [is] coupled to one or more antennas 1309," and radio circuitry 1307 is part of the "other UE circuitry/hardware components 1305 that enable the...communication device 1301...to operate as a communication device (e.g., to be able to communicate sensor data to a server, and possibly also receive instructions)." Wallen, [0083]; Wallen-Prov, p. 12. Therefore, radio circuitry 1307 enables bi-directional UE communications (e.g., to communicate "data to a server"

and also “receive” instructions), demonstrating that radio circuitry 1307 is an example “*transceiver*”. Wallen discloses that the “processor 1315 [] control[s] the other UE circuitry/hardware components 1305,” Wallen, [0084]; Wallen-Prov, p. 12, which includes “radio circuitry 1307,” thereby disclosing that the processor 1315 (*processor*) and radio circuitry 1307 (*transceiver*) are *operatively coupled*.

67. The ’670 patent confirms that a “transceiver” is circuitry that enables communication of data to and from another device. ’670 patent, 7:3-6 (“Each of the base stations 101 comprises **a transceiver unit 103 enabling communication of data to and from a plurality of mobile communication devices via a radio interface.**”). The ’670 patent also confirms that Wallen’s MTC device is an example of the claimed *UE*. Ex.1001, 18:34-36 (“**The term MTC terminal as used herein can be replaced with user equipment (UE)...**”)

68. Wallen’s MTC device (*UE*) having a *transceiver* and *processor* is illustrated in Figure 13 below.

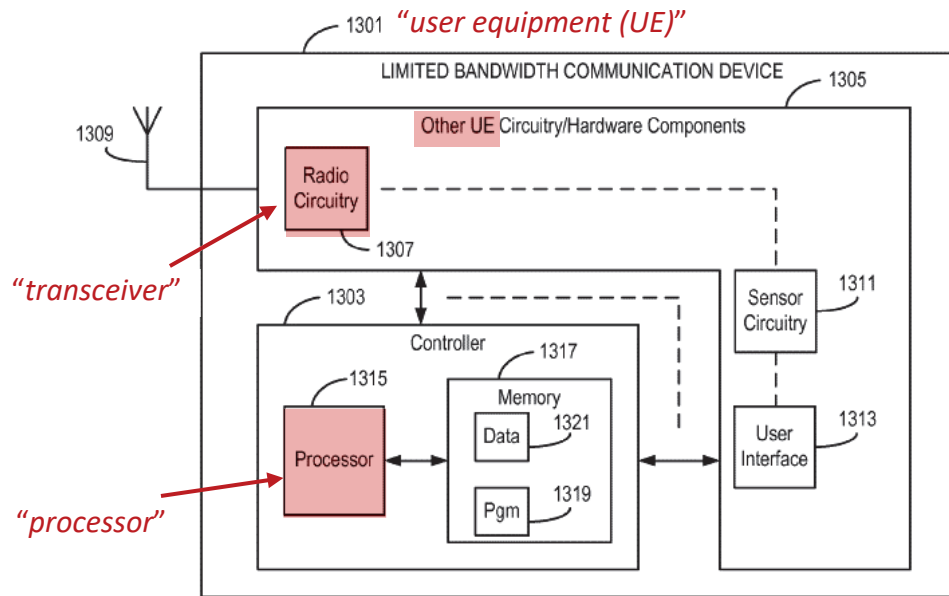


FIG. 13

Wallen, Figure 13 (annotated); Wallen-Prov, Figure 6

69. Thus, Wallen discloses or renders obvious “*A user equipment (UE)* (“MTC device” having “user equipment (UE) circuitry/hardware”) *comprising: a transceiver* (radio circuitry 1307); *and a processor* (processor 1315), *operatively coupled to the transceiver* (radio circuitry 1307).”

**[1.1] the transceiver and the processor are configured to receive a primary synchronization signal (PSS), a secondary synchronization signal (SSS), and a physical broadcast channel (PBCH) including a master information block (MIB),**

70. Wallen in view of Berggren renders obvious limitation [1.1].

71. Wallen’s MTC device (including radio circuitry 1307 (*transceiver*) and a processor 1315 (*processor*)) is configured to receive a *primary synchronization signal (PSS)*, [and] *a secondary synchronization signal (SSS)*. :

Accordingly, **the MTC device regularly performs a cell search** in order to find a suitable cell to camp on/connect to (step 1001). **This is done using synchronization signals defined by the legacy system (e.g., in an LTE system, the primary and secondary synchronization signals, “PSS” and “SSS”).** Even in a legacy system, this only requires a system bandwidth of 1.4 MHz, the signal itself occupying approximately 1 MHz, so the MTC device is fully capable of performing this procedure.

Wallen, [0076]; Wallen-Prov, p. 9.

72. Wallen’s MTC device is also configured to receive the claimed *master information block (MIB)*:

**The MTC device then receives and decodes the MIB** which supplies the MTC device with MTC-specific information, such as but not limited to time/frequency position of resource blocks and/or resource elements that include broadcast information that the MTC device needs to receive and decode in order to connect to an M-cell (step 1003).

Wallen, [0077]; Wallen-Prov, p. 10.

73. Wallen’s MTC device has a memory device storing “a set of processor instructions[] **configured to cause the processor 1315 to control the other UE circuitry/hardware components 1305 so as to carry out any of the MTC device-related aspects described above.**” Wallen, [0084]; Wallen-Prov, p. 12. The “UE circuitry/hardware components 1305” include “radio circuitry 1307.” Wallen, [0083]; Wallen-Prov, p. 12. Thus, Wallen discloses that its *transceiver* (radio circuitry 1307) and *processor* (processor 1315) are configured

to receive a primary synchronization signal (PSS), a secondary synchronization signal (SSS), (the primary and secondary synchronization signals, ‘PSS’ and ‘SSS’) and ... a master information block (MIB) (MIB), as claimed.

74. Wallen’s MIB is broadcast. Wallen, [0006] (“In both LTE and WCDMA the **broadcast information** is divided into a Master Information Block (MIB) and a System Information Block (SIB).”); Wallen-Prov, p. 7. It would have been obvious for Wallen’s MIB carrying broadcast information to be transmitted in LTE’s physical broadcast channel (PBCH), because the PBCH already transmits MIBs as was standardized in LTE, as discussed in Section VIII.A.3.b (Reasons to Combine Wallen and Berggren) above. Berggren confirms that the LTE standard specifies that a physical broadcast channel (PBCH) carries the MIB, thereby rendering obvious that Wallen’s MIB carrying broadcast information is carried in a physical broadcast channel (PBCH):

In order to give an understanding of the present disclosure it is first described how the number of primary RBs is communicated in the LTE system....The downlink system bandwidth is included in the so called **master information block (MIB)** which contains only a small part of the system information and **is transmitted** with a periodicity of 40 ms **on the BCH (Broadcast Channel)**. The **BCH is a transport channel which in turn is mapped to the PBCH (Physical BCH)** which is always located in the 6 central RBs of the component carrier.”

Berggren, [0073]-[0074]. As explained in the Section VIII.A.3.b above, a POSITA

would have been motivated to transmit Wallen's MIB using Berggren's PBCH, which already carries MIBs.

75. Thus, Wallen's MTC device having a processor 1315 (*processor*) and radio circuitry 1307 (*transceiver*), disclosed as receiving a PSS and a SSS, and an MIB that is broadcast information block, with Berggren confirming that LTE's broadcast MIB is carried on a broadcast channel, renders obvious *the transceiver* (radio circuitry 1307) *and the processor* (processor 1315) *are configured to receive a primary synchronization signal (PSS), a secondary synchronization signal (SSS),* (the primary and secondary synchronization signals, 'PSS' and 'SSS') *and a physical broadcast channel (PBCH) including a master information block (MIB)* (MIB transmitted on PBCH).

**[1.2] *the PSS, SSS and PBCH are in a first bandwidth of a cell having a cell bandwidth,***

76. Wallen in view of Berggren renders obvious limitation [1.2].

77. Wallen discloses that the PSS, SSS, and MIB are transmitted in 6 RBs (resource blocks), which equals a 1.4 MHz bandwidth ("*first bandwidth*") and which is a subset of the cell system bandwidth ("*a cell having a cell bandwidth*"):

The MTC device only needs to support **a subset of the cell system bandwidth** ... This is done using synchronization signals defined by the legacy system (e.g., in an LTE system, the primary and secondary synchronization signals, "PSS" and "SSS"). Even in a legacy system, this only requires a system bandwidth of 1.4 MHz, the signal itself

occupying approximately 1 MHz, so the MTC device is fully capable of performing this procedure.

Wallen, [0076]; Wallen-Prov, pp. 9-10.

While such MTC devices would be able to perform a cell search and **receive a Master Information Block (MIB) on just a 1.4 MHz bandwidth...**

Wallen, [0015]; Wallen, [0010] (“[C]ell bandwidth is within the range of about 1.4 ... MHz (6 ... resource blocks (RBs) in LTE terminology).”); Wallen-Prov, p. 10.

78. Consistent with Wallen’s teachings that the MIB spans 6 resource blocks (1.4 MHz), Berggren confirms that the MIB is mapped to the PBCH, which uses the “6 central RBs [resource blocks],” or 1.4 MHz, Berggren, [0074], an example of the claimed “*first bandwidth*.”

TABLE 1

| Channel bandwidth<br>[MHz] | Transmission band-<br>width configuration<br>[RBs] |
|----------------------------|----------------------------------------------------|
| 1.4                        | 6                                                  |
| 3                          | 15                                                 |
| 5                          | 25                                                 |
| 10                         | 50                                                 |
| 15                         | 75                                                 |
| 20                         | 100                                                |

Berggren, Table 1 (annotated)

79. Wallen’s wireless cellular system bandwidth (“*cell bandwidth*”) may be up to 20 MHz. Wallen, [0012] (“**Examples of cellular system parameters ...**

**are the system bandwidth...** Using LTE as defined according to current standardization releases requires that a device support a system bandwidth that is up to 20 MHz.”); Wallen-Prov, p. 8. The cellular bandwidth is used by one or more cells (*a cell*) in the system. Wallen, [0080] (“[T]he MTC device regularly performs **a cell search in order to find a suitable cell** to camp on/connect to (step 1101). This is done using synchronization signals defined by the legacy system (e.g., in an LTE system, the primary and secondary synchronization signals, ‘PSS’ and ‘SSS’).”); Wallen-Prov, p. 11.

80. Thus, Wallen discloses that the *PSS* and *SSS* (PSS and SSS) and MIB are transmitted in *a first bandwidth of a cell having a cell bandwidth* (a subset of the system bandwidth used by one or more cells), and Berggren confirms that the MIB is transmitted in a “*PBCH*” (PBCH) spanning the same bandwidth as the *PSS* and *SSS* (PSS and SSS), thereby rendering obvious that “*the PSS, SSS and PBCH are in a first bandwidth of a cell having a cell bandwidth.*”

**[1.3] wherein the first bandwidth is a first portion of the cell bandwidth,**

81. Wallen discloses limitation [1.3].

82. As discussed in the analysis of limitation [1.2], Wallen discloses that the PSS, SSS, and MIB are transmitted in a 1.4 MHz bandwidth (“*first bandwidth*”), which is a “subset of the cell system bandwidth” (*of the cell bandwidth*”) that spans up to 20 MHz (“*a first portion of the cell bandwidth*”),

Wallen, [0076], [0012]; Wallen-Prov, 9-10, thereby disclosing or rendering obvious limitation [1.3].

**[1.4] wherein the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information; and**

83. Wallen discloses or renders obvious limitation [1.4].

84. Wallen discloses that *the MIB* (the MIB) *includes an indication of frequency resources and time resources* (indicates the resource blocks) *for use in acquiring additional system information* (where an MTC device can find control information that in turn points to SIBs):

In another aspect (represented by the number ‘5’ enclosed in a circle), the **MIB 901 indicates the resource blocks**, reference signal sequence, or search space **allocated to a specific M-PDCCH**, which should occupy regions of the host system's radiofrequency spectrum that are different from the host system's own (legacy) PDCCH locations. **The M-PDCCH supplies control information to the MTC device, including MTC specific SIBs or downlink assignments pointing to the SIBs that are intended for this MTC device.**

Wallen, [0072]; Wallen-Prov, p. 9. Thus, the MIB “indicates the...resource blocks allocated to a specific M-PDCCH.” Wallen, [0072]; Wallen-Prov, p. 9. A “resource block” is a term of art in the context of LTE standards that refers to a unit of time and frequency resources in the available time-frequency grid. Prior art documents as well as the ’670 patent itself confirm this understanding. *See, e.g.*, Ex.1008, [0042] (“A Resource Block (RB) is the unit of resource allocation, and it

includes a plurality of consecutive subcarriers in one slot.”), [0047] (“[O]ne resource block is illustrated to include 7x12 resource elements, including 7 OFDM symbols in the time domain and 12 subcarriers in the frequency domain.”); ’670 patent, 9:16-25 (“Each resource block 440 comprises a two-dimensional array of resource elements 450 distributed in both the time direction and the frequency direction...the resource block 440 has a dimension of 12 resource elements 450 in the frequency dimension and 7 resource elements 450 in the time dimension”). Consistent with this understanding, Wallen describes the MIB generally as “conveying the MTC-related information, **such as time- and/or frequency-wise locations of resource blocks**...that the MTC device needs to receive and decode...” Wallen, [0065]; Wallen-Prov, p. 9; *see also* Wallen, [0077] (“the MIB which supplies the MTC device with MTC-specific information, such as but not limited to **time/frequency position of resource blocks**”); Wallen-Prov, p. 10 (“From the MIB, the device extracts the MTC specific information, the bit sequence point out a **time/frequency position for RBs**.”). Wallen’s indication of resource blocks, conveyed as time and frequency locations, allocated to an M-PDCCH is therefore *an indication of frequency resources and time resources*, as further illustrated in Figure 9 (which illustrates time on the x-axis and frequency on the y-axis, with an MIB pointing to specific regions of time and frequency).

MIB points out time/frequency location  
of M-PDCCH is located, which in turn points to SIBs

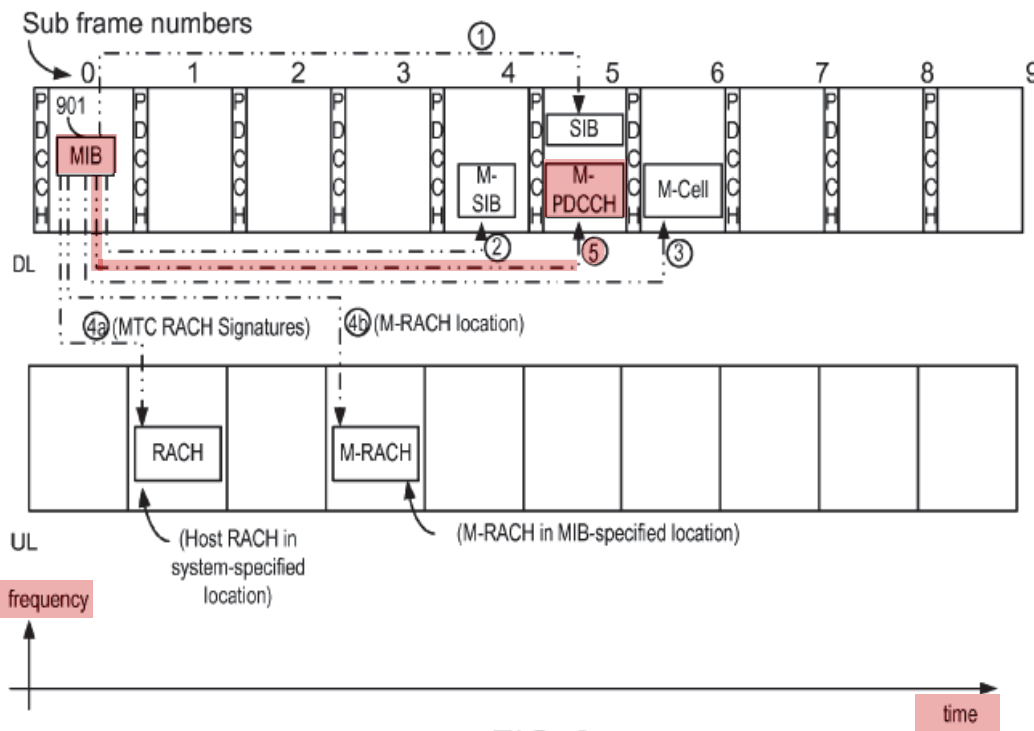


FIG. 9

Wallen, Figure 9 (annotated); Wallen-Prov, Figure 1

85. These resource blocks of the M-PDCCH include “control information” that indicates “downlink assignments pointing to the SIBs.” Wallen, [0072]; Wallen-Prov, p. 9. Therefore, the indicated resource blocks (*an indication of frequency resources and time resources*) are used for acquiring additional system information in the form of SIBs (*for use in acquiring additional system information*).

86. In summary, Wallen discloses that *the MIB* (the MIB) *includes an indication of frequency resources and time resources* (indicates resource blocks)

*for use in acquiring additional system information* (for use in acquiring system information blocks/SIBs), as recited in limitation [1.4].<sup>4</sup>

**[1.5] *the transceiver and the processor are configured to acquire the additional system information using the indication of the frequency resources and the time resources,***

87. Wallen discloses or renders obvious limitation [1.5].

88. Wallen discloses that its *UE* (MTC device) includes a *processor* (processor 1315) and *transceiver* (radio circuitry 1307) that provide the functionality described in the previous claim elements. For example, as shown in Figure 13, Wallen's *UE* (MTC device) has a memory device storing "a set of processor instructions[] **configured to cause the processor 1315 to control the other *UE* circuitry/hardware components 1305 so as to carry out any of the**

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<sup>4</sup> According to Patent Owner's apparent understanding of limitation [1.4] in the district court litigation, the MIB points directly to system information, such as an SIB1. Ex.1013, 25. Note that Wallen presents an embodiment that discloses or renders obvious limitation [1.4] under Patent Owner's apparent understanding that an MIB that points directly to SIB1 satisfies limitation [1.4]. Wallen, [0068] ("the MIB 901...informs the MTC device of a location of the resource blocks ... allocated to the first system information block (SIB 1)"), Figure 9; Wallen-Prov, 9, Figure 1.

**MTC device-related aspects described above.”** Wallen, [0084]; Wallen-Prov, p. 12 (and Wallen-Prov, Figure 6).

89. As further discussed in the analysis of limitation [1.4], Wallen’s *transceiver* and *processor* (MTC device, having radio circuitry 1307 and a processor 1315, Wallen, [0083]-[0084]; Wallen-Prov, p. 12), *are configured to acquire the additional system information* (are configured to cause the processor 1315 to control radio circuitry 1307 to receive SIBs) *using the indication of the frequency resources and the time resources* (using the indicated resource blocks having control information that includes “downlink assignments pointing to the SIBs,” Wallen, [0072]; Wallen-Prov, p. 9), thereby disclosing or rendering obvious limitation [1.5].

**[1.6] wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1.**

90. Wallen discloses or renders obvious limitation [1.6].

91. As explained in the analysis of limitation [1.4], Wallen’s MIB indicates the frequency and time locations of “resource blocks” (*the indicated frequency resources and the time resources*) “allocated to a specific M-PDCCH” which, in turn, includes “control information” (*control information*) such as “downlink assignments pointing to the SIBs that are intended for this MTC device [UE].” Wallen’s “control information” is thus “for use by the UE [MTC device] to acquire a system information block [SIBs].”

In another aspect (represented by the number ‘5’ enclosed in a circle), the **MIB 901 indicates the resource blocks**, reference signal sequence, or search space **allocated to a specific M-PDCCH**, which should occupy regions of the host system's radiofrequency spectrum that are different from the host system's own (legacy) PDCCH locations. **The M-PDCCH supplies control information to the MTC device, including MTC specific SIBs or downlink assignments pointing to the SIBs that are intended for this MTC device.**

Wallen, [0072]; Wallen-Prov, p. 9. Wallen's MIB that provides the location in frequency and time of the M-PDCCH is illustrated in Figure 9.

MIB indicates the time/frequency location of M-PDCCH, which in turn has “control information” such as downlink assignments pointing to SIBs (not shown)

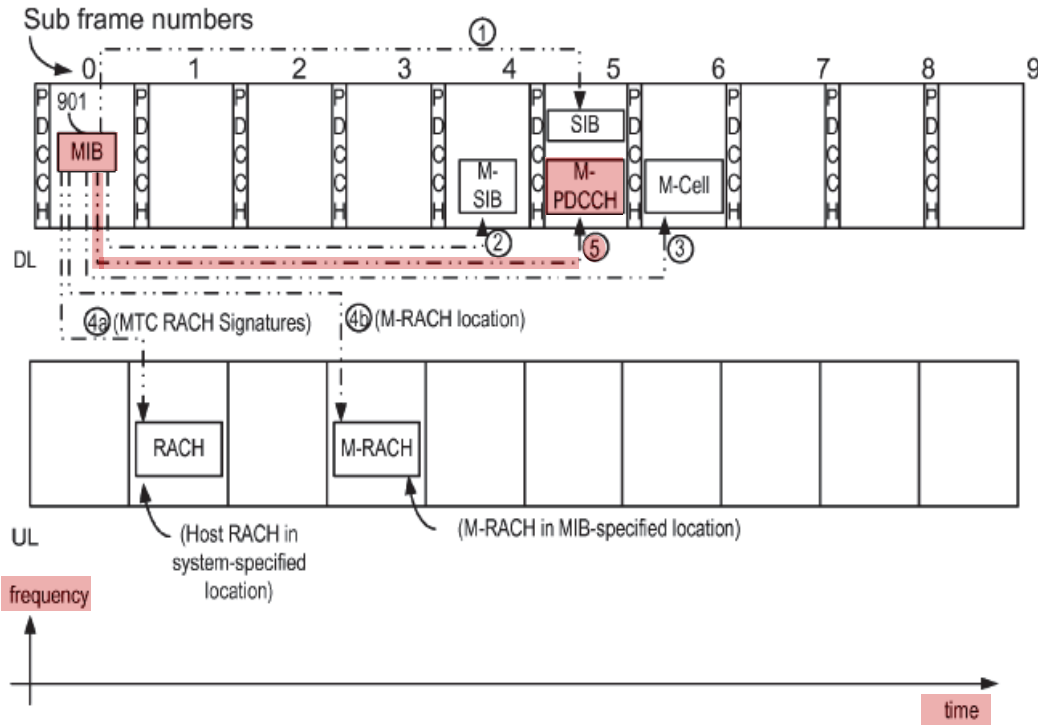


FIG. 9

Wallen, Figure 9 (annotated); Wallen-Prov, Figure 1

An example of one of the “SIBs” that may be received is SIB1, as disclosed in Wallen. Wallen, [0068] ([T]he MIB 901 ... includes time/frequency information ... that informs the MTC device of a location of the resource blocks ... allocated to the first system information block (SIB 1)”); Wallen-Prov, 9. In fact, SIB1 is the only specific LTE SIB disclosed in Wallen. Moreover, it would have been obvious that one of the “SIBs” that are received includes the disclosed system information block 1 (SIB1) because SIB1 was known in LTE to carry

information “essential” to connecting to a cell. Ex.1009, p. 2, line 34-p. 3, line 2 (LTE defines thirteen SIBs, including SIB1); p. 3, lines 19-21 (“SIB1 ...must be present in every cell... A user equipment considers the cell as ‘barred’ in case it cannot find this essential system information.”). Therefore, the indication of SIB1 represents simply specifying an implementation detail of which of the known “SIBs” to indicate by Wallen’s M-PDCCH, and it was obvious, predictable, and beneficial that one of the “SIBs” to be indicated is a known and essential SIB in LTE, namely, SIB1, the only specific SIB disclosed in Wallen.

92. In summary, the MIB indicates the time/frequency location of resource blocks allocated to M-PDCCH, which in turn provides time/frequency locations of SIBs, and it would have been obvious that the “SIBs” include Wallen’s SIB1 because SIB1 is a known LTE SIB that carries essential system information, thereby rendering obvious *the indicated frequency resources and the time resources* (indicated frequency and time locations of resource blocks for the M-PDCCH) *include control information* (include control information of downlink assignments pointing to SIBs, such as SIB1) *for use by the UE to acquire a system information block 1* (the first system information block, SIB1).<sup>5</sup>

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<sup>5</sup> According to Patent Owner’s apparent understanding of limitation [1.6] in the district court litigation, the MIB points directly to system information, such as an

## 5. Claim 2

### *The UE of claim 1*

**[2.1] wherein the indication of the frequency resources and the time resources is within a first portion of the cell bandwidth.**

93. Wallen discloses or renders obvious limitation [2.1].

94. Wallen's MTC device is an example of *the UE* as claimed. Moreover, by definition, MTC devices receive signals in only a "subset," or portion, of the cell system bandwidth by design. Wallen, [0076] ("The MTC device only needs to support a subset of the cell system bandwidth."); Wallen-Prov, p. 10; *see also* Wallen, [0042] ("[A]n MTC device[] is capable of receiving a signal no larger than a second bandwidth, wherein the second bandwidth is smaller than the first bandwidth," which is "a full bandwidth of the cellular communication system."); Wallen-Prov, p. 9. Thus, all transmissions to the MTC device, including the examples presented in the analysis of limitation [1.4] of the "*indication*," exist in a

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SIB1. Ex.1013, 25. Note that Wallen presents an embodiment that discloses or renders obvious limitation [1.6] under Patent Owner's apparent understanding that an MIB that points directly to SIB1 satisfies limitation [1.6]. Wallen, [0068] ("the MIB 901...informs the MTC device of a location of the resource blocks ... allocated to the first system information block (SIB 1)"), Figure 9; Wallen-Prov, 9, Figure 1.

bandwidth that is smaller than the cell system bandwidth, which is an example of “a first portion of the cell bandwidth.”

## 6. Claim 3

### *The UE of claim 1*

**[3.1] wherein the transceiver and the processor are configured to receive control information and physical downlink shared channel (PDSCH) transmissions with the first portion of the cell bandwidth and not in other portions of the cell bandwidth.**

95. Wallen discloses or renders obvious limitation [3.1].

96. **First**, Wallen discloses that its MTC device (*UE*) is configured to receive *transmissions with the first portion of the cell bandwidth and not in other portions of the cell bandwidth*. Wallen discloses an MTC device that “only needs to support a subset of the cell system bandwidth.” Wallen, [0076]; Wallen-Prov, p. 8. MTC devices are “**capable of receiving a signal no larger than a second bandwidth,**” which is “**smaller than**” “**a full bandwidth of the cellular communication system,**” Wallen, [0042], Wallen-Prov, pp. 8-9. Thus, information is received by an MTC device only on this smaller, or reduced, bandwidth (receiving *transmissions with the first portion of the cell bandwidth and not in other portions of the cell bandwidth* (MTC device is not capable of receiving a signal outside of the subset or second bandwidth of the full cellular system bandwidth)).

97. **Second**, Wallen discloses that its transmissions include *control*

*information and physical downlink shared channel (PDSCH) transmissions.*

Wallen acknowledges that legacy LTE devices communicate using physical downlink control channel (PDCCH) and PDSCH channels. Wallen, [0015] (discussing legacy LTE devices being able to “decode PDCCH and PDSCH.”); Wallen-Prov, p. 8. The PDSCH was known to transmit data. Wallen, [0013] (“In LTE systems, the PDCCH points out data in the PDSCH that is included in the same subframe as the PDCCH.”); Wallen-Prov, p. 8.

98. More generally, the PDCCH and PDSCH channels were known to be a typical part of communication in LTE for carrying downlink control information and data, respectively. *See, e.g.*, Noh, [0049] (Describing an LTE “downlink sub-frame” with a “data region to which Physical Downlink Shared Channels (PDSCHs) are allocated” and a “control region” including “[d]ownlink control channels” including “a Physical Downlink Control Channel (PDCCH).”) In addition, Wallen presents an example in which the MIB indicates the “RBs” (resource blocks) allocated to an “M-PDCCH” (PDCCH for an MTC device), where the “M-PDCCH supplies **control information** to the MTC device.” Wallen, [0072]; Wallen-Prov, p. 9. Thus, part of the transmissions received on “*the first portion of the cell bandwidth*” include “*control information*” on the M-PDCCH.

99. In addition, Wallen presents an example in which the MIB indicates the “resource blocks” allocated to an “M-PDCCH” (PDCCH for an MTC device),

where the “M-PDCCH supplies **control information** to the MTC device.” Wallen, [0072]; Wallen-Prov, p. 9. Thus, M-PDCCH transmissions received on *the first portion of the cell bandwidth* (subset of cell system bandwidth) include *control information* (control information). Wallen additionally discloses that the “M-PDCCH may comply with the legacy PDCCH format for the MTC device's lower bandwidth.” Wallen, [0072]; Wallen-Prov, p. 9. Because the legacy PDCCH format “points out data in the PDSCH that is included in the same subframe as the PDCCH,” it would have been understood or obvious that the M-PDCCH, having a “legacy PDCCH format,” also points to a PDSCH for data for MTC devices.

100. **Third**, Wallen discloses that its *UE* (MTC device) includes a *processor* (processor 1315) and *transceiver* (radio circuitry 1307) that provide the functionality described limitation [3.1]. Wallen, [0084] (“The memory device(s) store program means 1319 (e.g., a set of processor instructions) configured to **cause the processor 1315 to control the other UE circuitry/hardware components 1305 [including radio circuitry 1307] so as to carry out any of the MTC device-related aspects described above.**”), Figure 13; Wallen-Prov, p. 12, Figure 6.

101. In summary, Wallen discloses a *UE* (MTC device) whose *transceiver* (radio circuitry 1307) and *processor* (processor 1315) *are configured to receive control information* (control information in M-PDCCH) *and PDSCH transmissions*

(M-PDCCH having a legacy PDCCH format, which was known to point to PDSCH transmissions) *with the first portion of the cell bandwidth and not in other portions of the cell bandwidth* (MTC devices are “capable of receiving a signal no larger than a second bandwidth,” which is “smaller than” “a full bandwidth of the cellular communication system” so all transmissions are in the second bandwidth).

## 7. Claim 4

### *The UE of claim 2*

**[4.1] wherein the transceiver and the processor are configured to receive control information indicating a plurality of bandwidth portions of the cell bandwidth, wherein the plurality of bandwidth portions includes the first portion.**

102. Wallen discloses or renders obvious limitation [4.1].

103. Wallen’s M-PDCCH that includes downlink assignments for multiple SIBs renders obvious “*control information indicating a plurality of bandwidth portions of the cell bandwidth*” for the following reasons.

104. As explained in the analysis of limitation [1.6], Wallen discloses an MIB that “indicates the resource blocks” (time and frequency locations) “allocated to a specific M-PDCCH” which, in turn, is where an MTC can detect “control information” (*control information* of limitation [1.6] as claimed) that includes “downlink assignments pointing to the SIBs,” which are time and frequency resources that, in turn, point to SIBs. For example, Wallen states:

FIG. 9 [] is a timing/frequency diagram of a MIB 901 and its relationship to various other MTC elements within the host cell spectral resources.

Wallen, [0067]; Wallen-Prov, p. 9 and Figure 1.

In another aspect (represented by the number ‘5’ enclosed in a circle), **the MIB 901 indicates the resource blocks ... allocated to a specific M-PDCCH**, which should occupy regions of the host system's radiofrequency spectrum that are different from the host system's own (legacy) PDCCH locations. **The M-PDCCH supplies control information to the MTC device, including MTC specific SIBs or downlink assignments pointing to the SIBs that are intended for this MTC device.**

Wallen, [0072]; Wallen-Prov, p. 9. In other words, an MIB points to where the MTC device is able to read a M-PDCCH, which in turn points to multiple “SIBs that are intended for this device.” It would have been obvious or understood from Wallen’s disclosure, as well as fundamental knowledge of how LTE works, that Wallen “control information” “point[s] to” where SIBs are located by using an indication of resource blocks, which are “regions of the host system’s radiofrequency spectrum.” Each resource block, or collection of resource blocks used together, represents a “*bandwidth portion*” of the available frequency spectrum (as well as a position in time). For example, Wallen references six resource blocks, which is equal to 1.4 MHz of bandwidth. Wallen, [0010] (1.4 MHz is six “resource blocks (RBs) in LTE terminology”); Wallen-Prov, p. 10.

105. Wallen’s disclosure of an MIB that “indicates the resource blocks...allocated to a specific M-PDCCH,” that, in turn, “supplies control information ... including... downlink assignments pointing to the SIBs that are intended for this MTC device,” Wallen, [0072]; Wallen-Prov, p. 9, renders obvious “*control information indicating a plurality of bandwidth portions of the cell bandwidth.*” Indicating the resource blocks corresponding to multiple “SIBs,” is an example of “*a plurality of bandwidth portions of the cell bandwidth.*” A downlink assignment in “control information” corresponding to a single SIB is an indication of the resource blocks (which are units of time and frequency) allocated to the SIB such that the UE knows where in time and frequency to receive the SIB. It would have been obvious to a POSITA that multiple of these assignments can correspond to multiple “*bandwidth portions.*” The resource blocks are within the “*cell bandwidth*” because that is the bandwidth being used for all communication in a cell.

106. Sagfors explains a POSITA’s understanding of LTE that there are numerous SIBs (at least 13) defined in the LTE standard: “Parameters for system information distribution are grouped into System Information Blocks (SIBs). Currently, there are **fourteen such blocks defined in LTE RRC**; a Master Information Block (MIB) and **thirteen other SIBs.**” Sagfors, 2:34-36. Among the known SIBs are “SIB1,” “SIB2, and “SIB8”. Sagfors, 3:2-18; *see also* Berggren,

[0075] (“**There are a number of different SIBs**, e.g., SIB1 contains information if the UE is allowed to camp on the cell and scheduling information of the other system information, whereas SIB2 contains information needed for the UE to access the cell.”). The description of the LTE standard in the ’670 patent confirms that prior art LTE systems include at least SIB1, SIB2, and others up to SIB13. ’670 patent, 3:10-24 (“The LTE Rel. 8/9/10 specifications define a means (**in the standard LTE SystemInformationBlockType2-SIB2**) by which certain subframes can be excluded from normal allocation to the Physical Downlink Shared Channel (PDSCH)... Furthermore, the [LTE Rel. 8/9/10] specifications define signalling within the standard system information which allows some or all of these excluded subframes to be used for other defined purposes, such as MBMS (**in SystemInformationBlockType13-SIB 13**)...”); ’670 patent, 17:22-26 (“Generally, the Master Information Block 830 provides sufficient information to gain access to the first of **the System Information Blocks (SIB1)**, which in turn provides sufficient information to gain access to **SIB2 et seq.**”).

107. Noh provides details on the frame structure, time slots, and resource blocks in LTE. *See* Noh, [0040]-[0047]. A resource block is a block of time and frequency resources in LTC, and it is “the unit of resource allocation.” Noh, [0042]. In LTE, “one sub-frame is called a Transmission Time Interval (TTI),” and “[t]he TTI can be called a scheduling unit for data transmission.” Noh, [0041].

There are a number of resource blocks in a subframe, which spans a TTI. For example, in a slot (which is half of a subframe), “the number of resource blocks  $N_{RB}$  may be one of 60 to 110.” Noh, [0045]. Noh’s teachings regarding LTE are consistent with the ’670 patent’s description of LTE. ’670 patent, 8:65-9:25 (“Referring now to FIG. 4, a radio frame and resource grid structure for an LTE type network is schematically illustrated.... Each resource block 440 comprises a two-dimensional array of resource elements 450 distributed in both the time direction and the frequency direction.”).

108. The MIB illustrated in Wallen’s Figure 9 points to different frequency segments (*bandwidth portions*) for various illustrated examples, so the communication system has the flexibility to use different bandwidth portions for different transmissions to an MTC device.

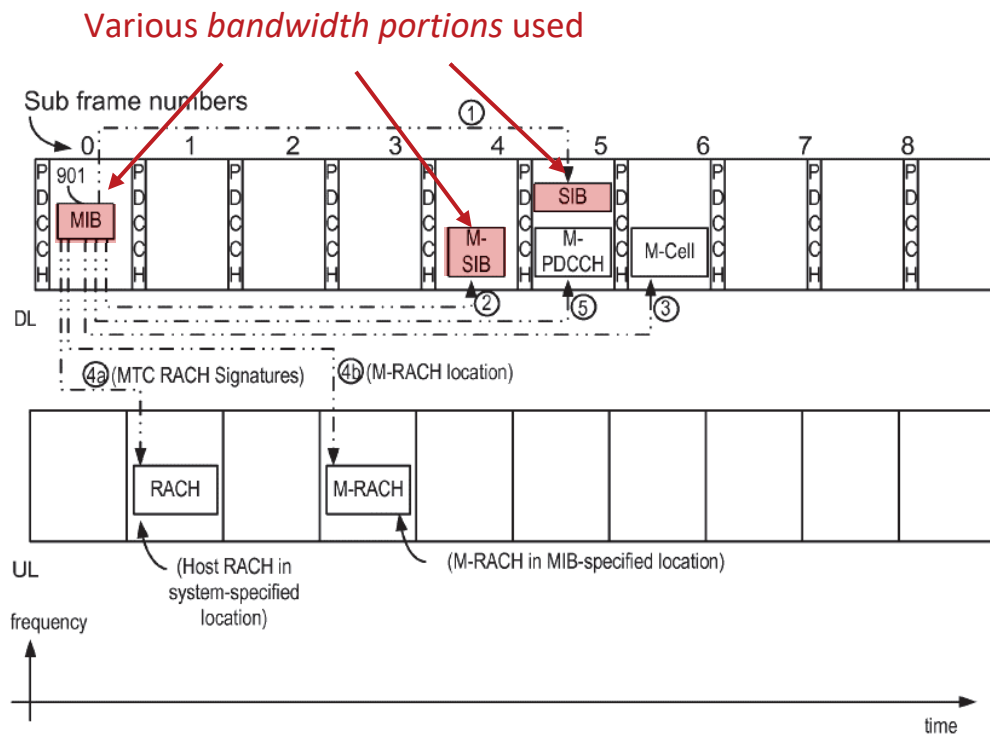


FIG. 9

Wallen, Figure 9 (annotated); Wallen-Prov, Figure 1

109. As discussed in the analysis of limitation [1.3], Wallen discloses that the PSS, SSS, and MIB are transmitted in a 1.4 MHz bandwidth (“*first bandwidth*”), which is a “subset [*a first portion*] of the cell system bandwidth [*of the cell bandwidth*]” that spans up to 20 MHz. Wallen, [0076], [0012]; Wallen-Prov, pp. 9-10. As discussed in the analysis of limitation [1.2], a 1.4 MHz bandwidth spans six resource blocks in the frequency axis. Wallen, [0010] (“[C]ell bandwidth is within the range of about 1.4 ... MHz (6 ... resource blocks (RBs) in LTE terminology).”); Wallen-Prov, p. 10. It would have been obvious that 1.4 MHz, corresponding to six resource blocks, of the available bandwidth (the *first*

*portion*) may be included in the downlink assignment in Wallen's M-PDCCH. Six resource blocks are used by the MIB at a certain time, but then these resource blocks are available for other types of transmissions, such as the disclosed M-PDCCH in Wallen, as well as SIB1, SIB2, etc. at other times.

110. Finally, regarding the *transceiver* and *processor* aspects of limitation [4.1], as discussed in the analysis of limitations [1.1] and [3.1], Wallen's processor 1315 (*processor*) is configured to control the other UE circuitry and hardware, such as radio circuitry 1307 (*transceiver*), to carry out any of the MTC device (*UE*) functionality.

111. Thus, Wallen discloses a *UE* (MTC device) having a *transceiver* (radio circuitry 1307) and *processor* (processor 1315) *configured to receive control information* (control information in an M-PDCCH) *indicating a plurality of bandwidth portions* (downlink assignments pointing to SIBs) *of the cell bandwidth* (cellular system bandwidth up to 20 MHz), *wherein the plurality of bandwidth portions includes the first portion* (wherein the downlink assignments can use any of the six resource blocks, or 1.4 MHz, at a given time, just as six resource blocks were used for the MIB at a particular time), thereby disclosing or rendering obvious limitation [4.1].

## 8. Claim 5

### *The UE of claim 4*

**[5.1] *wherein the transceiver and the processor are configured to switch between the plurality of bandwidth portions at different times.***

112. Wallen discloses or renders obvious limitation [5.1].

113. As explained in the analysis of limitation [4.1], Wallen describes a scenario in which an M-PDCCH indicates “downlink assignments pointing to the SIBs.” Wallen, [0072]; Wallen-Prov, p. 9. It would have been obvious or understood that “downlink assignments” for “SIBs” refers to frequency resources (*bandwidth portions*) (and time resources) where different SIBs are located. For example, Wallen’s Figure 10 illustrates the MIB pointing out the frequency/time (“Freq/Time”) resources for receiving SIB information (denoted in Figure 10 as “Freq/Time Position for SIB” 1003). Wallen, Figure 10; Wallen-Prov, Figure 3. Figure 10 is a flowchart that illustrates “any of the embodiments depicted in Figure 9.” Wallen, [0075]; Wallen-Prov, 10.

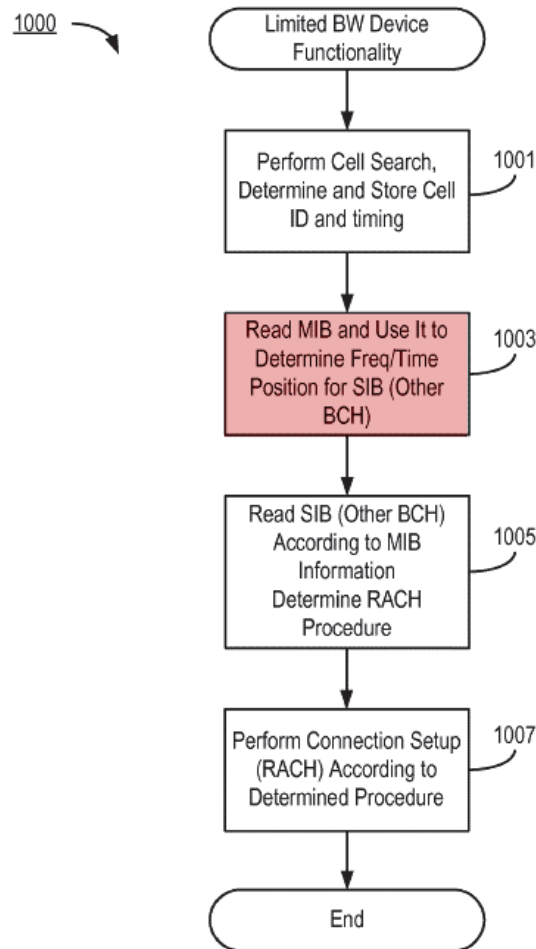


FIG. 10

Wallen, Figure 10 (annotated); Wallen-Prov, Figure 3

114. In addition, as discussed in the analysis of limitation [4.1], it would have been understood or obvious that Wallen’s teaching “downlink assignments pointing to SIBs,” referring to frequency (and time) locations, are in the form of an assignment of resource blocks where SIBs are located. It would have been obvious that one option (among many) is for SIB1 to be indicated as appearing in one or more resource blocks at one time and SIB2 to be indicated as appearing in one or

more different RBs at a different time (that may also be at different frequencies), thereby rendering obvious that a UE switches between different bandwidth portions (e.g., resource blocks allocated to respective SIBs) at different times (“switch between the plurality of bandwidth portions at different times.”).

115. The MIB illustrated in Wallen’s Figure 9 points to different frequency resources (*bandwidth portions*) being used at *different times* for various illustrated examples, further demonstrating that the MTC device (*UE*) *switch[es] between the plurality of bandwidth portions at different times*.

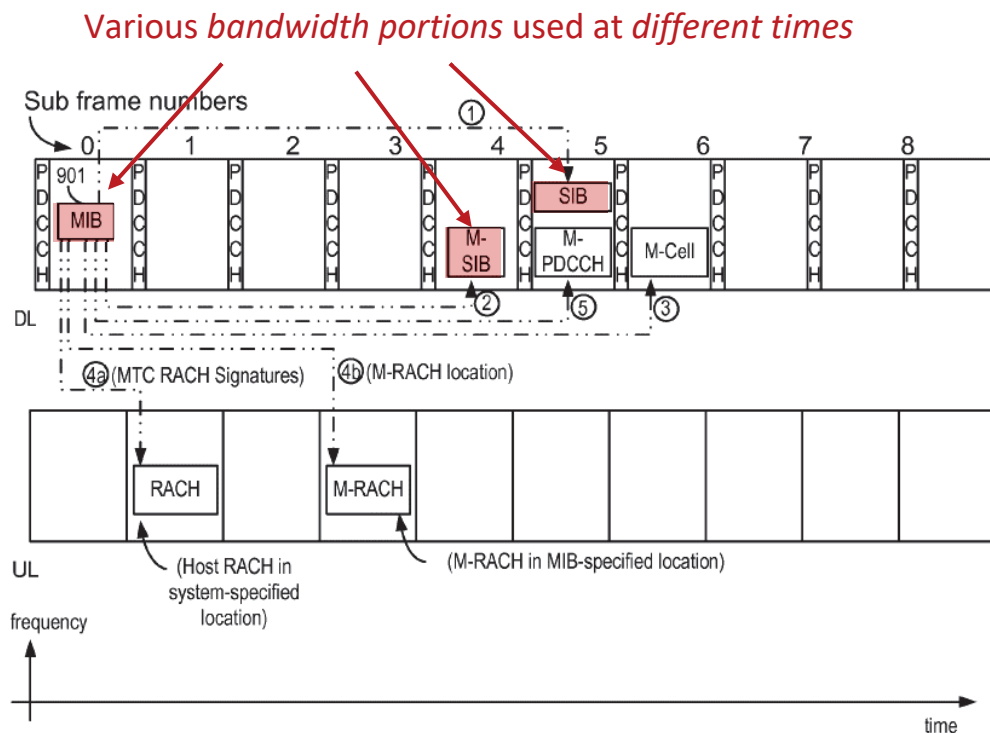


FIG. 9

Wallen, Figure 9 (annotated); Wallen-Prov, Figure 1

116. Finally, regarding the *transceiver* and *processor* aspects of limitation

[5.1], as discussed in the analysis of limitations [1.1] and [3.1], Wallen's processor 1315 (*processor*) is configured to control the other UE circuitry and hardware, such as radio circuitry 1307 (*transceiver*), to carry out any of the MTC device (*UE*) functionality.

117. Thus, Wallen discloses *the UE* (MTC device) *wherein the transceiver* (radio circuitry 1307) and *the processor* (processor 1315) *are configured to switch between the plurality of bandwidth portions at different times* .

## 9. Claim 6

118. Wallen discloses or renders obvious limitation [6.1].

119. Wallen discloses or at least renders obvious that its MIB (*MIB* of claim 1) includes "time/frequency information" (*the indicated frequency resources and the time resources*) that indicate "positions of an M-MIB" (*include a second MIB*):

**[T]he MIB 901 includes time/frequency information ... that informs the MTC device of a location of the resource blocks and/or MCS allocated to a specific M-cell. Armed with this information, the MTC device is then able to determine (e.g., via standardization) positions of an M-MIB and/or M-SIB(s) associated with the M-cell.**

Wallen, [0070]; Wallen-Prov, 9. The "resource blocks ... allocated to an M-cell" include the M-MIB because the "M-MIB [is] ... associated with the M-cell."

Wallen, [0070]; Wallen-Prov, 9.<sup>6</sup> Thus, Wallen discloses or at least renders obvious that *the indicated frequency resources and the time resources* (“time/frequency information” in the MIB) *includes a second MIB* (“of resource blocks ...allocated to a specific M-cell” that includes an “M-MIB ...associated with the M-cell”).

## 10. Claim 7

**[7.0] *A method performed by a user equipment (UE), the method comprising:***

120. As explained in the analysis of limitation [1.0], Wallen discloses a “communication device” having “user equipment (UE) circuitry/hardware” that includes “radio circuitry,” which is an example of *user equipment (UE)*. Various actions/steps are discussed below as being performed by Wallen’s communication device, therefore disclosing a “*method*” performed by a UE. Thus, Wallen discloses limitation [7.0].

**[7.1] *receiving a primary synchronization signal (PSS), a secondary synchronization signal (SSS), and a physical broadcast channel (PBCH) including a master information block (MIB),***

121. Limitation [7.1] is an action performed by “*the transceiver and the processor*” of Wallen’s device, as discussed in the analysis of limitation [1.1].

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<sup>6</sup> The “M” prefix for “M-cell” and “M-MIB” signifies a cell and an MIB, respectively, specifically for MTC devices. Wallen, [0043]; Wallen-Prov, 9.

Other than specifying that the “*receive*” function is performed by “*the transceiver and the processor*” in limitation [1.1], the remainder of limitation [1.1] is identical to limitation [7.1]. Thus, Wallen combined with Berggren renders obvious limitation [7.1] for the same reasons as [1.1].

**[7.2] *the PSS, SSS and PBCH are in a first bandwidth of a cell having a cell bandwidth,***

122. Limitation [7.2] is identical to limitation [1.2]. Therefore, Wallen combined with Berggren renders obvious limitation [7.2] for the same reasons given in the analysis of [1.2].

**[7.3] *wherein the first bandwidth is a first portion of the cell bandwidth,***

123. Limitation [7.3] is identical to limitation [1.3]. Therefore, Wallen discloses or renders obvious limitation [7.3] for the same reasons given in the analysis of [1.3].

**[7.4] *wherein the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information; and***

124. Limitation [7.4] is identical to limitation [1.4]. Therefore, Wallen discloses or renders obvious limitation [7.4] for the same reasons given in the analysis of [1.4].

**[7.5] *acquiring the additional system information using the indication of the frequency resources and the time resources,***

125. Other than specifying that the “*acquire*” function is performed by “*the transceiver and the processor*” in limitation [1.5], the remainder of limitation [1.5]

is identical to limitation [7.5]. Thus, Wallen discloses or renders obvious limitation [7.5] for the same reasons as [1.5].

***[7.6] wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1.***

126. Limitation [7.6] is identical to limitation [1.6]. Therefore, Wallen discloses or renders obvious limitation [7.6] for the same reasons given in the analysis of [1.6].

## **11. Claim 8**

***8. The method of claim 7***

***[8.1] wherein the indication of the frequency resources and the time resources is within a first portion of the cell bandwidth.***

127. Limitation [8.1] is identical to limitation [2.1]. Therefore, Wallen discloses or renders obvious limitation [8.1] for the same reasons given in the analysis of [2.1].

## **12. Claim 9**

***9. The method of claim 7, further comprising:***

***[9.1] receiving control information and physical downlink shared channel (PDSCH) transmissions with the first portion of the cell bandwidth and not in other portions of the cell bandwidth.***

128. Other than specifying that the “receive” function is performed by “*the transceiver and the processor*” in limitation [3.1], the remainder of limitation [3.1] is identical to limitation [9.1]. Thus, Wallen discloses or render obvious limitation [9.1] for the same reasons as [3.1].

### 13. Claim 10

**10. The method of claim 8, further comprising:**

**[10.1] receiving control information indicating a plurality of bandwidth portions of the cell bandwidth, wherein the plurality of bandwidth portions includes the first portion.**

129. Other than specifying that the “receive” function is performed by “the transceiver and the processor” in limitation [4.1], the remainder of limitation [10.1] is identical to limitation [4.1]. Thus, Wallen discloses or renders obvious limitation [10.1] for the same reasons as presented in [4.1].

### 14. Claim 11

**11. The method of claim 10, further comprising:**

**[11.1] switching between the plurality of bandwidth portions at different times.**

130. Other than specifying that the “switch” function is performed by “the transceiver and the processor” in limitation [5.1], the remainder of limitation [11.1] is identical to limitation [5.1]. Thus, Wallen discloses or renders obvious limitation [11.1] for the same reasons as presented in [5.1].

### 15. Claim 12

**The method of claim 7**

**[12.1] wherein the indicated frequency resources and the time resources include a second MIB.**

131. Claim element [12.1] is identical to claim element [6.1]. Therefore, Wallen discloses or renders obvious claim element [12.1] for the same reasons given in the analysis of [6.1].

## 16. Claim 13

**[13.0] *At least one non-transient computer readable medium containing program instructions to perform a method of:***

132. Wallen discloses limitation [13.0]. Wallen discloses a memory that stores “a set of processor instructions[] configured to cause the processor 1315 to control the other UE circuitry/hardware components 1305 so as to carry out any of the MTC device-related aspects described above,” Wallen, [0084], Wallen-Prov, p. 12, which discloses or renders obvious limitation [13.0].

**[13.1] *receiving a primary synchronization signal (PSS), a secondary synchronization signal (SSS), and a physical broadcast channel (PBCH) including a master information block (MIB),***

133. Limitation [13.1] is identical to limitation [7.1]. Therefore, Wallen combined with Berggren renders obvious limitation [13.1] for the same reasons given in the analysis of [7.1].

**[13.2] *the PSS, SSS and PBCH are in a first bandwidth of a cell having a cell bandwidth,***

134. Limitation [13.2] is identical to limitation [7.2]. Therefore, Wallen combined with Berggren renders obvious limitation [13.2] for the same reasons given in the analysis of [7.2].

**[13.3] *wherein the first bandwidth is a first portion of the cell bandwidth,***

135. Limitation [13.3] is identical to limitation [7.3]. Therefore, Wallen discloses or renders obvious limitation [13.3] for the same reasons given in the

analysis of [7.3].

**[13.4] wherein the MIB includes an indication of frequency resources and time resources for use in acquiring additional system information; and**

136. Limitation [13.4] is identical to limitation [7.4]. Therefore, Wallen discloses or renders obvious limitation [13.4] for the same reasons given in the analysis of [7.4].

**[13.5] acquiring the additional system information using the indication of the frequency resources and the time resources,**

137. Limitation [13.5] is identical to limitation [7.5]. Therefore, Wallen discloses or renders obvious limitation [13.5] for the same reasons given in the analysis of [7.5].

**[13.6] wherein the indicated frequency resources and the time resources include control information for use by the UE to acquire a system information block 1.**

138. Limitation [13.6] is identical to [7.6]. Therefore, Wallen discloses or renders obvious limitation [13.6] for the same reasons given in the analysis of [7.6].

## **17. Claim 14**

**The at least one non-transient computer readable medium of claim 13 wherein [14.1] the indication of the frequency resources and the time resources is within a first portion of the cell bandwidth.**

139. Limitation [14.1] is identical to limitation [8.1]. Therefore, Wallen discloses or renders obvious limitation [14.1] for the same reasons given in the analysis of [8.1].

**18. Claim 15**

***15. The at least one non-transient computer readable medium of claim 13, further comprising:***

***[15.1] receiving control information and physical downlink shared channel (PDSCH) transmissions with the first portion of the cell bandwidth and not in other portions of the cell bandwidth.***

140. Limitation [15.1] is identical to limitation [9.1]. Therefore, Wallen discloses or renders obvious limitation [15.1] for the same reasons given in the analysis of [9.1].

**19. Claim 16**

***16. The at least one non-transient computer readable medium of claim 14, further comprising:***

***[16.1] receiving control information indicating a plurality of bandwidth portions of the cell bandwidth, wherein the plurality of bandwidth portions includes the first portion.***

141. Limitation [16.1] is identical to limitation [10.1]. Therefore, Wallen discloses or renders obvious limitation [16.1] for the same reasons given in the analysis of [10.1].

**20. Claim 17**

***17. The at least one non-transient computer readable medium of claim 16, further comprising:***

***[17.1] switching between the plurality of bandwidth portions at different times.***

142. Limitation [17.1] is identical to limitation [11.1]. Therefore, Wallen discloses or renders obvious limitation [17.1] for the same reasons given in the analysis of [11.1].

**21. Claim 18**

143. Claim element [18.1] is identical to claim element [6.1]. Therefore, Wallen discloses or renders obvious claim element [18.1] for the same reasons given in the analysis of [6.1].

**IX. COMPARISON CHART OF WALLEN VERSUS WALLEN-PROV**

144. Below I provide a comparison chart. The chart compares the disclosures relied upon in the Petition and in my declaration from Wallen (Ex.1005) in the right column and the corresponding disclosures of U.S. Provisional App. No. 61/501,547 (“Wallen-Prov,” Ex.1006) in the left column. In general, I have included figures only once, so as to avoid unnecessary repetition. I have also added color to facilitate comparison of disclosure between documents, but absence of color matching between wording across the documents should not be taken as an indication that the wording is materially different. As the chart shows, there are no substantive differences between Wallen and the corresponding disclosures of Wallen-Prov. To the extent there are differences I have not referenced as a note in the chart below, their absence from the chart should not be taken as indicative of any material difference between the references.

| <b>U.S. Provisional App. No. 61/501,547<br/> (“Wallen-Prov”)</b>                                                                                                                                                                               | <b>U.S. Patent Pub. No. 2012/0327895<br/> (“Wallen”)</b>                                                                                                                                                                                  |
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| “In both LTE and WCDMA the broadcast information is divided into Master Information Block (MIB) and System Information Block (SIB). In the MIB, the most important system information like frame timing is transmitted.”<br>Wallen-Prov, p. 7. | “In both LTE and WCDMA the broadcast information is divided into a Master Information Block (MIB) and a System Information Block (SIB). The MIB includes the most important system information, such as frame timing.”<br>Wallen, [0006]. |
| “The position used for the SIB redundancy versions are determined by                                                                                                                                                                           | “[T]he Physical Downlink Control Channel (PDCCH), [] points out which                                                                                                                                                                     |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                           | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| decoding the PDCCH, which points out the RBs used on the PDSCH."<br>Wallen-Prov, p. 7.                                                                                                                                                                                                                                                                                                                                                                            | RBs of the Physical Downlink Shared Channel (PDSCH) are used for SIB transmission(s)."<br>Wallen, [0007].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| "Examples of cellular system parameters that typically drive cost and power consumption are the system bandwidth as well as response time."<br>Wallen-Prov, p. 8.                                                                                                                                                                                                                                                                                                 | "Examples of cellular system parameters that typically drive cost and power consumption are the system bandwidth as well as response time."<br>Wallen, [0012].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| "(PDCCH pointing out data in the PDSCH is included in the same sub frame)."<br>Wallen-Prov, p. 8.                                                                                                                                                                                                                                                                                                                                                                 | "(In LTE systems, the PDCCH points out data in the PDSCH that is included in the same subframe as the PDCCH)."<br>Wallen, [0013].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>"However. reception of further broadcast information (SIBs) in order to be able to e.g. do a random access via the RACH requires that full bandwidth is supported as well as the possibility to decode PDCCH and PDSCH without any additional delay restrictions compared to the current standard.</p> <p>Hence. there is a need for the introduction of a new signaling method in LTE taking the above shortcomings into account."<br/>Wallen-Prov, p. 8.</p> | <p>"[B]eing able to receive the further broadcast information (e.g., a System Information Block—"SIB") that is required for the MTC device to be able to, for example, perform a random access via the Random Access Channel (RACH) requires that the MTC device be capable of supporting the full LTE bandwidth and also that the MTC device be able to decode the PDCCH and the PDSCH without any additional delay restrictions compared to the current standard.</p> <p>It is therefore desirable to have methods and apparatuses that enable an MTC device to retain its relatively low performance characteristics (e.g., in terms of size of bandwidth supported and/or processing power) and yet be capable of connecting to a modern-day cellular communications system, such as but not limited to an LTE system, that ordinarily imposes higher</p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | performance requirements on connecting devices."<br>Wallen, [0015]-[0016].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p data-bbox="204 443 820 779">"Using LTE as defined according to current standardization releases requires support of up to 20 MHz system bandwidth. Such large BW support increases the cost for LTE MTC devices. Furthermore, MTC devices supporting low data rates only need a small system bandwidth (up to some few MHz)....</p> <p data-bbox="204 827 820 1331">According to the arguments above, it is beneficial to restrict MTC devices to operate at lower system bandwidths than 20 MHz. At the same time, it may be too restrictive to require that all cellular networks supporting power and cost efficient MTC devices need to use only small bandwidths. Instead it may be beneficial to make MTC Devices supporting only low bandwidth being able to operate in an LTE network with larger system bandwidth....</p> <p data-bbox="204 1379 797 1587">Hence. there is a need for the introduction of a new signaling method in LTE taking the above shortcomings into account."<br/>Wallen-Prov., p. 8.</p> | <p data-bbox="846 443 1451 1031">"Using LTE as defined according to current standardization releases requires that a device support a system bandwidth that is up to 20 MHz. Supporting such a large bandwidth would increase the cost for LTE MTC devices, and such support would essentially be unnecessary from the MTC device's point of view because only a small system bandwidth (e.g., up to some few MHz) is required to support the MTC device's relatively low data rate."<br/>Wallen, [0012].</p> <p data-bbox="846 1079 1451 1457">"The points raised above show why it is beneficial to restrict MTC devices to operate at system bandwidths that are lower than 20 MHz. But it would be too restrictive to require that all cellular networks limit themselves to using only small bandwidths if they are support power and cost efficient MTC devices."<br/>Wallen, [0011].</p> <p data-bbox="846 1505 1435 1883">"It is therefore desirable to have methods and apparatuses that enable an MTC device to retain its relatively low performance characteristics (e.g., in terms of size of bandwidth supported and/or processing power) and yet be capable of connecting to a modern-day cellular communications system, such as but not limited to an LTE system,</p> |

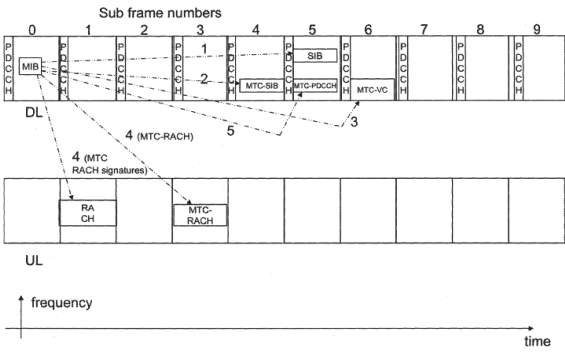
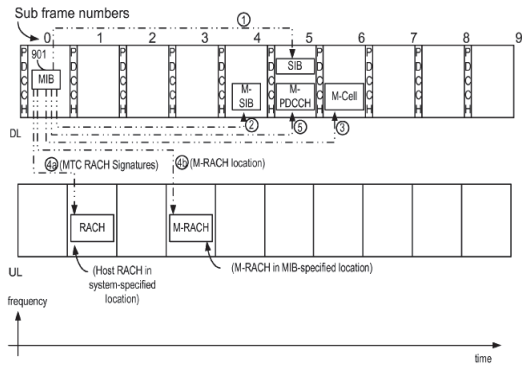
| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>that ordinarily imposes higher performance requirements on connecting devices.”<br/>Wallen [0016].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>“This disclosure proposes an <b>extended Master Information Block including a bit sequence pointing out a subset of Resource Elements (RE) and/or Resource Blocks (RB) in the time and frequency grid.</b> This can easily be made by utilizing a subset of the 10 spare bits in the LTE MIB currently not used to carry information. <b>This subset of REs and/or RBs pointed out by the bit sequence could include information suitable for MTC devices operating on a smaller (a subset) of the (LTE) system bandwidth than the cell system bandwidth, to still be able connect to the cell.</b>”</p> <p>Wallen-Prov, p. 9.</p> <p>“<b>MTC devices supporting low data rates only need a small system bandwidth (up to some few MHz.).</b>”<br/>Wallen-Prov, p. 8.</p> <p>“<b>[I]t is beneficial to restrict MTC devices to operate at lower system bandwidths than 20 MHz.</b>”<br/>Wallen-Prov, p. 8.</p> | <p>“Even including the additional information, however, the frequency-wise size of the MIB does not exceed the MTC device's receive capability.”<br/>Wallen, [0064].</p> <p>“As illustrated in FIG. 8, the node inserts a first part of MIB information (e.g., MIB information as defined by the legacy system, such as MIB information for mobile broadband devices as defined by Rel-10 of the LTE standard) into a data structure buffer <b>representing the MIB prior to transmission (step 803).</b> <b>Extended MIB information bits (a second part of the MIB information),</b> representing the additional MIB-related information that supplies at least some of the information needed by an MTC device to establish a connection with the node is also inserted into the data structure buffer (step 805). For example, <b>the LTE standard defines a MIB such that it includes spare bits. These spare bits can be used for conveying the MTC-related information, such as time- and/or frequency-wise locations of resource blocks or resource elements that the MTC device needs to receive and</b></p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov") | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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|                                                         | <p>decode for further information to be able to connect to the M-cell.”<br/>Wallen, [0065].</p> <p>“[T]he collection of aspects/entities of a host cell that supports MTC devices is herein referred to as an ‘M-cell.’”<br/><br/>Wallen, [0043].</p> <p>“... a full bandwidth of the cellular communication system (“first bandwidth”). ... The network node also supports a second type of communication device (e.g., an MTC device) that is capable of receiving a signal no larger than a second bandwidth, wherein the second bandwidth is smaller than the first bandwidth.”<br/><br/>Wallen, [0042].</p> <p>“The MTC device only needs to support a subset of the cell system bandwidth...”<br/>Wallen, [0076].</p> |
| <p>“Examples of such information in the MIB are:</p>    | <p>“These aspects will now be described in further detail with reference to FIG. 9, which is a timing/frequency diagram of a MIB 901 and its relationship to various other MTC elements within the host cell spectral resources.”<br/>Wallen, [0067].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                              | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <p>1. The RBs and/or MCS allocated to the first system information block (SIB 1) that is transmitted in subframe 5</p> <p>2. The RBs (or subset REs in certain RBs) and/or MCS allocated to a specific MTC-SIB that is transmitted in a certain subframe</p> <p>3. The RBs and/or MCS allocated to a specific MTC-MIB or SIB that is valid for a virtual cell included in the current cell, handling MTC devices</p> | <p>[1.]<sup>7</sup> "In one aspect, the MIB 901 (which occupies its standard location in the host cell) includes time/frequency information (represented by the number '1' enclosed in a circle) that informs the MTC device of a location of the resource blocks and/or modulation and coding scheme (MCS) allocated to the first system information block (SIB 1) that is transmitted in a system standardized location (e.g., in subframe 5 in an LTE system)." Wallen, [0068].</p> <p>[2.] "In another aspect, the MIB 901 includes time/frequency information (represented by the number '2' enclosed in a circle) that informs the MTC device of a location of the resource blocks (or subset resource elements within certain resource blocks) and/or MCS allocated to a specific M-SIB that is transmitted in a certain subframe." Wallen, [0069].</p> <p>[3] "In still another aspect, the MIB 901 includes time/frequency information (represented by the number '3' enclosed in a circle) that informs the MTC device of a location of the resource blocks and/or MCS allocated to a specific M-cell. Armed with this information, the MTC device is then able to determine</p> |

<sup>7</sup> Brackets are inserted to show the correspondence with the corresponding numbers in Wallen-Prov.

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <p>4. A set of MTC-specific RACH sequences and/or RACH regions in the time/frequency grid to be used by the MTC device for connection setup.</p> <p>5. The RBs, reference signal sequence or search space allocated to a specific MTC-PDCCH, which should be different than the legacy PDCCH locations, where an MTC can receive and detect control information, including the MTC specific SIBs or downlink assignments pointing to the SIBs.</p> <p>6. A direct or indirect reference to a set of different RB and/or MCS allocations among which the device can perform blind decoding in order to find system information mentioned above.</p> | <p>(e.g., via standardization) positions of an M-MIB and/or M-SIB(s) associated with the M-cell.”<br/>Wallen, [0070].</p> <p>[4] “In still another aspect, the MIB 901 includes a set of MTC-specific RACH sequences and/or RACH regions in the time/frequency grid to be used by the MTC device for connection setup.”<br/>Wallen, [0071].</p> <p>[5] “In another aspect (represented by the number ‘5’ enclosed in a circle), the MIB 901 indicates the resource blocks, reference signal sequence, or search space allocated to a specific M-PDCCH, which should occupy regions of the host system's radiofrequency spectrum that are different from the host system's own (legacy) PDCCH locations. The M-PDCCH supplies control information to the MTC device, including MTC specific SIBs or downlink assignments pointing to the SIBs that are intended for this MTC device.”<br/>Wallen, [0072].</p> <p>[6] “In still another aspect (not shown in the figure in order to avoid an undue amount of clutter), the MIB 901 includes a direct or indirect reference to a set of different resource blocks and/or MCS allocations among which the</p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <p>Figure 1 depicts examples of how the extended MIB refers to the time/frequency positions where the MTC can obtain further system information. The numbers at the arrows refer to the numbers in the list above."</p> <p>Wallen-Prov, p. 9.</p>  <p>Figure 1 shows a time/frequency grid with sub frame numbers 0 to 9. The grid is divided into DL (Downlink) and UL (Uplink) sections. Arrows point from the MIB (Master Information Block) in sub frame 0 to various MTC elements: MTC-SIB, MTC-PDCCH, and MTC-VC. The UL section shows RA-CH and MTC-RACH. The caption states: "Figure 1: Time/frequency grid and sketch over how MIB can point out relevant information for MTC devices according to the invention."</p> | <p>device can perform blind decoding in order to find system information mentioned above."</p> <p>Wallen, [0073].</p> <p>"These aspects will now be described in further detail with reference to FIG. 9, which is a timing/frequency diagram of a MIB 901 and its relationship to various other MTC elements within the host cell spectral resources."</p> <p>Wallen, [0067].</p> <p>"FIG. 9 is a timing/frequency diagram of a MIB and its relationship to various other MTC elements within the host cell spectral resources."</p> <p>Wallen, [0035].</p>  <p>FIG. 9 shows a timing/frequency diagram with sub frame numbers 0 to 9. The diagram illustrates the relationship between the MIB 901 and various MTC elements: MTC-SIB, MTC-PDCCH, and MTC-VC. The UL section shows RA-CH and MTC-RACH. The caption states: "FIG. 9 is a timing/frequency diagram of a MIB and its relationship to various other MTC elements within the host cell spectral resources."</p> |
| <p>"MTC devices supporting low data rates only need a small system bandwidth (up to some few MHz.)."</p> <p>Wallen-Prov, p. 8.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>"The MTC device only needs to support a subset of the cell system bandwidth... Accordingly, the MTC device regularly performs a cell search in order to find a suitable cell to camp on/connect to (step 1001). This is done using</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

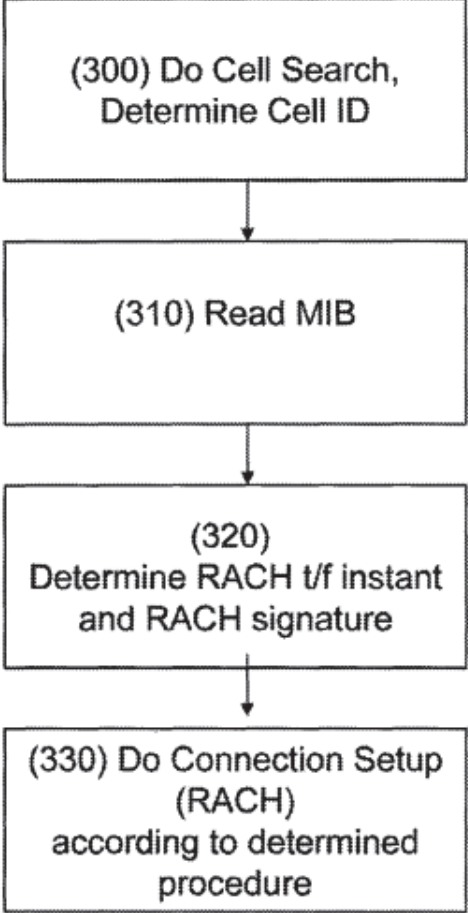
| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <p>"[I]t is beneficial to restrict MTC devices to operate at lower system bandwidths than 20 MHz."<br/>Wallen-Prov, p. 8.</p> <p>"First the MTC device does on regular basis perform cell search in order to a find a suitable cell to camp on/connect to (200). This is done using synchronization signals defined by LTE (PSS/SSS), and only requiring a system bandwidth of 6 RBs (corresponding to a system bandwidth of 1.4 MHz, the signal itself occupying approximately 1 MHz). ... Then the MTC device receives and decodes the MIB (210) (also only occupying a bandwidth of 6 RBs, i.e., 1.4 MHz). From the MIB, the device extracts the MTC specific information, the bit sequence point out a time/frequency position for RBs or REs including more broadcast information needed to be decoded by the device in order to connect to the cell (210), using the specific capabilities covered by the MTC. Then the MTC device reads this extended MTC broadcast information, which could be of different forms as discussed in Section 1.3 above (220)."<br/>Wallen-Prov, p. 10.</p> | <p>synchronization signals defined by the legacy system (e.g., in an LTE system, the primary and secondary synchronization signals, "PSS" and "SSS"). Even in a legacy system, this only requires a system bandwidth of 1.4 MHz, the signal itself occupying approximately 1 MHz, so the MTC device is fully capable of performing this procedure."<br/>Wallen, [0076].</p> <p>"For instance, in LTE the MIB is transmitted in the central 6 resource blocks (RBs)..."<br/>Wallen, [0007].</p> <p>"In release 8/9 versions of LTE, the supported cell bandwidth is within the range of about 1.4 ... MHz (6 ... resource blocks (RBs) in LTE terminology)."<br/>Wallen, [0010].</p> <p>"The MTC device then receives and decodes the MIB which supplies the MTC device with MTC-specific information, such as but not limited to time/frequency position of resource blocks and/or resource elements that include broadcast information that the MTC device needs to receive and decode in order to connect to an M-cell (step 1003)."</p> <p>Then, the MTC device reads the extended MTC broadcast information to</p> |

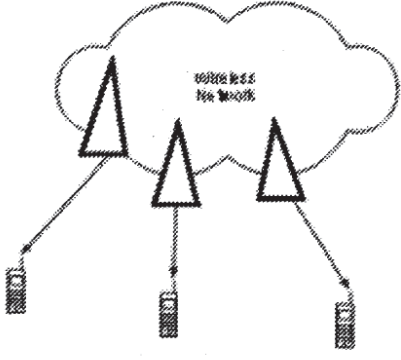
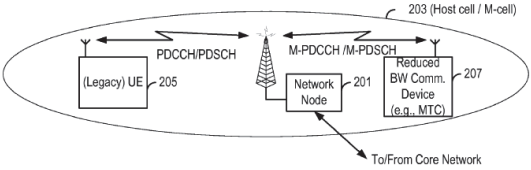
| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov") | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                              |
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|                                                         | <p>which it has been directly or indirectly led by the second part of the MIB information bits (step 1005). The extended MTC broadcast information can be in any of a number of different forms such as those discussed above with respect to FIG. 9.”<br/>Wallen, [0077]-[0078].</p> <p>“While such MTC devices would be able to perform a cell search and receive a Master Information Block (MIB) on just a 1.4 MHz bandwidth...”<br/>Wallen, [0015].</p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                          | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> graph TD     A["(200) Do Cell Search,<br/>Determine Cell ID"] --&gt; B["(210) Read MIB<br/>Determine f/t position for<br/>SIB (other BCH)"]     B --&gt; C["(220) Read SIB (other BCH)<br/>according to<br/>MIB information<br/>Determine RACH procedure"]     C --&gt; D["(230) Do Connection Setup<br/>(RACH)<br/>according to determined<br/>procedure"]           </pre> <p><b>Figure 3:</b><br/>Flow Chart first<br/>MTC embodiment</p>               | <pre> graph TD     1000 --&gt; 1001["Perform Cell Search,<br/>Determine and Store Cell<br/>ID and timing"]     1001 --&gt; 1003["Read MIB and Use It to<br/>Determine Freq/Time<br/>Position for SIB (Other<br/>BCH)"]     1003 --&gt; 1005["Read SIB (Other BCH)<br/>According to MIB<br/>Information<br/>Determine RACH<br/>Procedure"]     1005 --&gt; 1007["Perform Connection Setup<br/>(RACH) According to<br/>Determined Procedure"]     1007 --&gt; End([End])           </pre> <p><b>FIG. 10</b></p> |
| <p>“The MTC device only supports a subset of the cell system bandwidth, and might also have different requirements on response time compared to mobile broadband devices. First the MTC device on regular basis performs cell search in order to find a suitable cell to camp on/connect to (300). This is done using synchronization signals defined by LTE (PSS/SSS), and only requiring a system bandwidth of 6 RBs, i.e. 1.4 MHz. The algorithm for this</p> | <p>“The MTC device only needs to support a subset of the cell system bandwidth, and might also have different requirements with respect to response time compared to legacy system (e.g., LTE) mobile broadband devices. Accordingly, the MTC device regularly performs a cell search in order to find a suitable cell to camp on/connect to (step 1101). This is done using synchronization signals defined by the legacy system (e.g., in an LTE system,</p>                                                |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>synchronization is not limited by the disclosure. Once a cell is detected, the cell ID and timing (which is determined by the synchronization signals} are stored in the MTC device. Then the MTC device receives and decodes the MIB (310) (also only spanning 6 RBs, 1.4 MHz).”<br/>Wallen-Prov, p. 11.</p> <p>“Cell search and MIB could be received assuming only 1.4 MHz bandwidth.”<br/>Wallen-Prov, p. 8.</p> <p>“Then the MTC device receives and decodes the MIB (310) (also only spanning 6 RBs, 1.4 MHz).”<br/>Wallen-Prov, p. 11.</p> <p>“In both LTE and WCDMA the broadcast information is divided into Master Information Block (MIB) and System Information Block (SIB).”<br/>Wallen-Prov, p. 7.</p> | <p>the primary and secondary synchronization signals, “PSS” and “SSS”). Even in a legacy system, this only requires a system bandwidth of 1.4 MHz, the signal itself occupying approximately 1 MHz, so the MTC device is fully capable of performing this procedure. Accordingly, any of the cell search algorithms that are known in the art and suitable for performing cell search in the legacy system can be used.</p> <p>Once a cell is detected, the cell ID and timing (which is determined from the synchronization signals) are stored in the MTC device. The MTC device then receives and decodes the MIB (step 1103) which supplies the MTC device with MTC-specific information.”<br/>Wallen, [0080]-[0081].</p> <p>“MTC devices would be able to perform a cell search and receive a Master Information Block (MIB) on just a 1.4 MHz bandwidth.”<br/>Wallen, [0015].</p> <p>“The Physical Broadcast Channel (PBCH) (carrying the MIB) and synchronization signals are transmitted at prior known OFDM symbol positions over the central 72 subcarriers,” which is “1.4 MHz (72 subcarriers or 6 RBs).”<br/>Wallen, [0060].</p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov") | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | <pre>graph TD; A([Limited BW Device Functionality (alt)]) --&gt; B[Perform Cell Search, Determine and Store Cell ID and timing 1101]; B --&gt; C[Read MIB 1103]; C --&gt; D[Determine RACH Freq/ Time Position and RACH Signature 1105]; D --&gt; E[Perform Connection Setup (RACH) According to Determined Procedure 1107]; E --&gt; F([End]);</pre> <p data-bbox="1003 1623 1170 1675"><b>FIG. 11</b></p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                  | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <pre> graph TD     A["(300) Do Cell Search,<br/>Determine Cell ID"] --&gt; B["(310) Read MIB"]     B --&gt; C["(320)<br/>Determine RACH t/f instant<br/>and RACH signature"]     C --&gt; D["(330) Do Connection Setup<br/>(RACH)<br/>according to determined<br/>procedure"] </pre> <p><b>Figure 4:</b><br/>Flow Chart second<br/>MTC embodiment</p> |                                                                                                                                                                                          |
| <p>“[P]articular embodiments of the described solutions may be implemented in an LTE network, such as that illustrated in Figure 5.”<br/>Wallen-Prov, p. 12.</p>                                                                                                                                                                                                                                                                         | <p>“In some but not necessarily all of these embodiments, the cellular communication system operates in accordance with a Long Term Evolution (LTE) standard...”<br/>Wallen, [0024].</p> |

| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>Figure 5:</b> Example Communication System</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  <p><b>FIG. 2</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>"As shown in Figure 5, the example network may include one or more instances of user equipment (UEs) and one or more base stations capable of communicating with these UEs, along with any additional elements suitable to support communication between UEs or between a UE and another communication device (such as a landline telephone). Although the illustrated UEs may represent communication devices that include any suitable combination of hardware and/or software, <b>these UEs</b> may, in particular embodiments, represent devices such as the <b>example UE</b> illustrated in greater detail by Figure 6...</p> <p>As shown in Figure 6, the example <b>UE</b> includes <b>a processor</b>, <b>a memory</b>, <b>a transceiver</b>, and <b>an antenna</b>. In particular embodiments, <b>some or all of the functionality described above as being provided by mobile communication devices or other forms of UE may be provided by the UE processor executing</b></p> | <p>"FIG. 13 is a block diagram of an exemplary <b>limited bandwidth communication device 1300</b>, such as the <b>MTC device used in the examples described above</b>. The limited bandwidth communication device includes a controller 1303 coupled to other <b>User Equipment (UE)</b> circuitry/hardware components 1305 that enable the limited bandwidth communication device 1301 to perform its application-specific functionality (e.g., operating as a sensor of some sort) and also to operate as a communication device (e.g., to be able to communicate sensor data to a server, and possibly also to receive instructions). The other UE circuitry/hardware components 1305 are generally known in the art, and may include such elements as, for example and without limitation, <b>radio circuitry 1307 coupled to one or more antennas 1309</b>, and (optionally) sensor circuitry 1311 (e.g., temperature sensor, acoustical sensor, magnetic field sensor, etc.)."</p> |

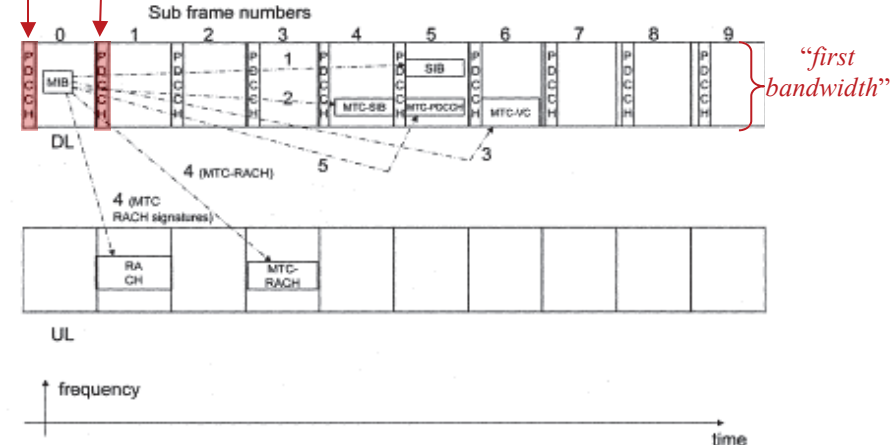
| U.S. Provisional App. No. 61/501,547<br>("Wallen-Prov")                                                                                                                                                                                                                                                                                                              | U.S. Patent Pub. No. 2012/0327895<br>("Wallen")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <p>instructions stored on a computer-readable medium, such as the memory shown in Figure 6.”<br/>Wallen-Prov, p. 12.</p> <div data-bbox="454 1211 639 1629" data-label="Diagram"> <pre> graph TD     Transceiver[Transceiver] --- UEProcessor[UE Processor]     UEProcessor --- Memory[(Memory)]   </pre> </div> <p><b>Figure 6: Example User Equipment (UE)</b></p> | <p>Wallen, [0083].</p> <p>“The controller 1303 includes circuitry configured to carry out any one or any combination of the MTC-related aspects described above with respect to MTC device actions. ... Depicted in the exemplary embodiment of FIG. 13, however, is programmable circuitry, comprising a processor 1315 coupled to one or more memory devices 1317 (e.g., Random Access Memory, Magnetic Disc Drives, Optical Disk Drives, Read Only Memory, etc.). The memory device(s) store program means 1319 (e.g., a set of processor instructions) configured to cause the processor 1315 to control the other UE circuitry/hardware components 1305 so as to carry out any of the MTC device-related aspects described above.”<br/>Wallen, [0084].</p> <div data-bbox="860 1350 1390 1696" data-label="Diagram"> <pre> graph TD     1309[1309] --- 1301[1301 LIMITED BANDWIDTH COMMUNICATION DEVICE]     1301 --- 1307[1307 Radio Circuitry]     1307 --- 1303[1303 Controller]     1303 --- 1315[1315 Processor]     1303 --- 1317[1317 Memory]     1317 --- 1321[1321 Data]     1317 --- 1319[1319 Pgm]     1303 --- 1311[1311 Sensor Circuitry]     1303 --- 1313[1313 User Interface]     1305[1305 Other UE Circuitry/Hardware Components] --- 1307   </pre> </div> <p><b>FIG. 13</b></p> |

## X. SUPPORT IN WALLEN-PROV FOR CLAIM 1 IN WALLEN

145. The table below indicates support in Wallen-Prov for at least one claim of Wallen.

| Claim                                                                                                                                | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <b>Claim 1</b>                                                                                                                       | All cites are to Wallen-Prov (Ex.1006)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| [1.0] <i>A method of operating a network node that serves a host cell in a cellular communication system, the method comprising:</i> | <p>Wallen-Prov's context is cellular communication systems. For example, in the "Technical Overview" section, Wallen-Prov recites:</p> <p style="padding-left: 40px;"><b>Cellular systems</b> like WCDMA and LTE transmit broadcast information on a regular basis.</p> <p>p. 7.</p> <p>Background on the techniques presented in Wallen-Prov relate to system information designed to provide "cell specific" information:</p> <p style="padding-left: 40px;">SIB then includes more <b>cell specific information</b>, for instance information needed for the mobile terminal to be able to do random access, via the RACH.</p> <p>p. 7.</p> <p>Wallen-Prov describes mobile terminals (or UEs) communicating with base stations" in a network:</p> <p style="padding-left: 40px;">As shown in Figure 5, the <b>example network may include</b> one or more instances of user equipment (UEs) and <b>one or more base stations</b> capable of communicating with these UEs, along with any additional elements suitable to support communication between UEs or between a UE and another communication device (such as a landline telephone).</p> <p>p. 12.</p> <p>Wallen-Prov describes the transmission of an "extended MIB [Master Information Block]" for an MTC [machine-type communication] device to connect to the cell:</p> |

| Claim                                                                        | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|                                                                              | <p>Figure 4 shows a second embodiment of how an MTC utilizes the extended MIB for connection to the cell.</p> <p>p. 11</p> <p>A base station, acting as the claimed “<i>network node that serves a host cell in a cellular communication system</i>,” transmits the various messages of Figure 4 on the “DL” or downlink.</p> <p>Furthermore, Wallen-Prov describes an “eNB” generating an “MIB” that provides “information for being able to connect to the cell/eNB”:</p> <p>Figure 2 shows a flow chart over an eNB embodiment according to particular embodiments of the disclosure. <b>The eNB generates the MIB.</b> First MIB information according to {Rel-10} standard (Mobile broadband devices) of the LTE is generated (100). Then MIB information related to MTC devices (110) is generated (the order could be changed between {110} and (100)). <b>A subset of the spare bits in the MIB is used for this message. The MTC information points out some RBs or REs in the time frequency grid an MTC device needs to receive and decode <u>for further information to be able to connect to the cell/eNB.</u></b></p> <p>p. 10</p> <p>The term “eNB” is well-known in LTE as referring to an LTE base station node. Wallen-Prov describes a method of transmitted an MIB from a base station so that an MTC device can connect to the base station and cell served by the base station, thereby supporting “<i>a method of operating a network node that serves a host cell in a cellular communication system</i>”.</p> |
| [1.1] <i>at one or more first time intervals, transmitting first control</i> | <p>Wallen-Prov describes the use of a physical downlink control channel (PDCCH) carrying information, e.g., SIB position and modulation and coding used for SIB, (“<i>first control channel information on a control channel</i>”), and the PDCCH (“<i>control</i>”).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Claim                                                                                                                    | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <p><i>channel information on a control channel that extends over a first bandwidth of a radiofrequency resource,</i></p> | <p><i>channel</i>”) occupies the “whole system bandwidth” (“<i>extends over a first bandwidth of a radiofrequency resource</i>”):</p> <p>The position used for the SIB redundancy versions are determined by decoding the PDCCH, which points out the RBs used on the PDSCH. The modulation and coding scheme (MCS) used for the SIBs are also signalled on the PDCCH. The PDCCH itself occupies the whole system bandwidth...</p> <p>p. 7.</p> <p>As illustrated in Figure 1, the PDCCH is transmitted in a time interval at the beginning of each subframe (“<i>at one or more first time intervals</i>”), and the PDCCH occupies the system bandwidth (“<i>a control channel that extends over a first bandwidth of a radiofrequency resource</i>”).</p> <p><i>“at one or more first time intervals, transmitting first control channel information on a control channel”</i></p>  <p>Figure 1: Time/frequency grid and sketch over how MIB can point out relevant information for MTC devices according to the invention.</p> <p>Wallen-Prov, Figure 1</p> <p>Thus, Wallen-Prov supports limitation [1.1].</p> |
| <p>[1.2] <i>wherein the first</i></p>                                                                                    | <p>Wallen-Prov’s PDCCH communicates information that is necessary for current LTE mobile terminals/UEs (“<i>first type of</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

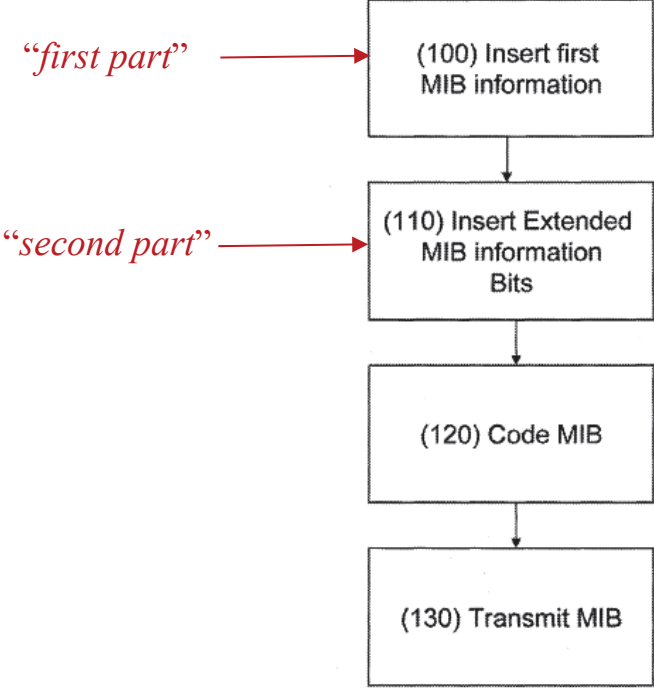
| Claim                                                                                                                                                                 | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p><i>control channel communicates information that is necessary to enable a first type of communication device to establish a connection with the host cell,</i></p> | <p><i>communication device”)</i> to be able to receive permission to camp on a cell as well as receive connection setup parameters, which discloses limitation [1.2]. For example, the PDCCH provides information for receiving SIBs, which in turn provides “<b>cell specific information</b>, for instance information needed for the mobile terminal to be able to do random access,” thereby describing [1.2].</p> <p>Cellular systems like WCDMA and LTE transmit broadcast information on a regular basis. <b>Such broadcast information is needed in order for the <u>mobile terminal</u> to be able to determine permission to camp on a cell as well as connection setup parameters. In both LTE and WCDMA the broadcast information is divided into Master Information Block (MIB) and System Information Block (SIB). ... SIB then includes more cell specific information, for instance information needed for the mobile terminal to be able to do random access, via the RACH. ...</b></p> <p>... The position used for the SIB redundancy versions are determined by decoding the PDCCH, which points out the RBs used on the PDSCH. <b>The modulation and coding scheme (MCS) used for the SIBs are also signalled on the PDCCH.</b> The PDCCH itself occupies the whole system bandwidth, which forces <b><u>current LTE terminals</u></b> to adapt its receiver bandwidth to the system bandwidth in order to be able to receive the SIB.</p> <p>p. 7.</p> <p>Thus, an LTE terminal receives control information on the PDCCH to be able to receive SIBs, which carries permission for the LTE device to camp on a cell and other connection setup parameters, among other information, thereby supporting <i>the first control channel communicates information that is necessary to enable a first type of communication device to establish a connection with the host cell</i>, in limitation [1.2].</p> |

| Claim                                                                                                                                                                         | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p>[1.3] <i>the first type of communication device being capable of receiving a signal having the first bandwidth of the radiofrequency resource; and</i></p>                 | <p>As described in the analysis of limitation [1.2], Wallen-Prov describes LTE mobile terminals (“<i>first type of communication device</i>”) receiving a PDCCH (“<i>receiving a signal</i>”) by adapting receiver bandwidth to the system bandwidth (“<i>first bandwidth of the radiofrequency resource</i>”), thereby supporting limitation [1.3]. As shown in Figure 1, the PDCCH is repeatedly transmitted, each of which is an example of “<i>a signal</i>.”</p> <p>The position used for the SIB redundancy versions are <b>determined by decoding the PDCCH</b>, which points out the RBs used on the PDSCH. The modulation and coding scheme (MCS) used for the SIBs are also signalled on the PDCCH. <b>The PDCCH itself occupies the whole system bandwidth, which forces current LTE terminals to adapt its receiver bandwidth to the system bandwidth</b> in order to be able to receive the SIB.</p> <p>Wallen-Prov, p. 7.</p> |
| <p>[1.4] <i>at one or more second time intervals, transmitting a master information block that occupies a part of the first bandwidth of the radiofrequency resource,</i></p> | <p>Wallen-Prov’s full system bandwidth may be up to 20 MHz (“<i>first bandwidth</i>”):</p> <p>Using LTE as defined according to current standardization releases requires support of up <b>to 20 MHz system bandwidth</b>.</p> <p>p. 8.</p> <p>However, the MIB (“master information block”) may occupy only 1.4 MHz (“<i>a part of the first bandwidth of the radiofrequency resource</i>”):</p> <p>Cell search and MIB could be received assuming only 1.4 MHz bandwidth.</p> <p>p. 8.</p> <p>Then the MTC device receives and decodes the MIB (210) (also only occupying a bandwidth of 6 RBs, i.e., 1.4 MHz).</p> <p>p. 10.</p>                                                                                                                                                                                                                                                                                                         |



| Claim                                                                                                                                                                                                                   | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <p><i>is smaller than the first bandwidth and is receivable by a second type of communication device having reduced receive bandwidth capabilities compared to those of the first type of communication device,</i></p> | <p><i>reduced receive bandwidth capabilities compared to those of the first type of communication device”).</i></p> <p>Legacy LTE devices need to support up to 20 MHz system bandwidth:</p> <p>Using LTE as defined according to current standardization releases requires support of up to 20 MHz system bandwidth.</p> <p>p. 8.</p> <p>MTC devices operate at lower bandwidths:</p> <p>Machine type communication (MTC) devices utilizing a cellular system for communication has become increasingly popular. MTC typically requires only low data rate for signaling of small amount of data. One example of an MTC device is sensors. ... <b>Furthermore, MTC devices supporting low data rates only need a small system bandwidth (up to some few MHz)....</b></p> <p>According to the arguments above, <b>it is beneficial to restrict MTC devices to operate at lower system bandwidths than 20 MHz.</b></p> <p>p. 8.</p> <p><b>The MTC device only needs to support a subset of the cell system bandwidth, and might also have different requirements on response time compared to legacy LTE mobile broadband devices.</b></p> <p>p. 10.</p> <p>In summary, MTC devices (“<i>second type of communication device</i>”) are contrasted with legacy LTE devices (“<i>first type of communication device</i>”) as needing to support only a subset of the cell system bandwidth (“<i>reduced bandwidth capabilities compared to those of the first type of communication device,</i>” thereby supporting limitation [1.5].</p> |
| <p>[1.6] <i>wherein the master</i></p>                                                                                                                                                                                  | <p>Wallen-Prov discloses an “extended” MIB that uses a subset of the 10 spare bits in the LTE MIB (“<i>second part</i>”) that are not</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Claim                                                                     | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>information block comprises a first part and a second part,</i></p> | <p>currently used to carry information (“<i>first part</i>”). In other words, the extended MIB includes a first part that has bits already used to carry information and a second part that includes spare bits not currently used to carry information:</p> <p style="padding-left: 40px;">This disclosure proposes an extended Master Information Block including a bit sequence pointing out a subset of Resource Elements (RE) and/or Resource Blocks (RB) in the time and frequency grid. This can easily be made by <b>utilizing a subset of the 10 spare bits in the LTE MIB currently not used to carry information.</b></p> <p>p. 9.</p> <p>Figure 2 illustrates the first part and second part of the MIB, , noting “first MIB information” (<i>first part</i>) and “Extended MIB information bits” (<i>second part</i>):</p> |

| Claim                                          | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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|                                                |  <p><b>Figure 2:</b><br/>Flow Chart eNB embodiment</p> <p>Wallen-Prov, Figure 2 (annotated)</p> <p>The description of Figure 2 highlights different parts of the MIB:</p> <p>The eNB generates the MIB. First MIB information according to (Rel-10) standard (Mobile broadband devices) of the LTE is generated (100). Then MIB information related to MTC devices (110) is generated (the order could be changed between (110) and (100)). A subset of the spare bits in the MIB is used for this message.</p> <p>Ex.1006,10. The “First MIB information” (100) is an example of the claimed “<i>first part</i>” and the “MIB information related to MTC devices (110)” is an example of the claimed “<i>second part</i>.”</p> |
| [1.7.1] wherein the first part comprises first | The information currently used to carry system information in the MIB is for legacy LTE terminals to connect to the host base station/cell:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Claim                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <p><i>part information that is necessary to enable the first type of communication device to establish the connection with the host cell, and [1.7.2] wherein the second part comprises second part information that directly or indirectly enables the second type of communication device to obtain parameters that enable the second type of communication device to establish a connection with the host cell.</i></p> | <p>Cellular systems like WCDMA and LTE transmit broadcast information on a regular basis. <b>Such broadcast information is needed in order for the mobile terminal to be able to determine permission to camp on a cell as well as connection setup parameters.</b> In both LTE and WCDMA the broadcast information is divided into Master Information Block (MIB) and System Information Block (SIB). <b>In the MIB, the most important system information like frame timing is transmitted.</b></p> <p>p. 7.</p> <p>Figure 2 shows a flow chart over an eNB embodiment according to particular embodiments of the disclosure. The eNB generates the MIB. <b>First MIB information according to (Rel-10) standard (Mobile broadband devices) of the LTE is generated (100).</b> Then MIB information related to MTC devices (110) is generated (the order could be changed between (110) and (100)). A subset of the spare bits in the MIB is used for this message.</p> <p>p. 10.</p> <p>Thus, “<u>the most important system information like frame timing,</u>” which is necessary for an LTE device (“<i>the first type of communication device</i>”) to connect to the host serving cell, is inserted in part of the MIB (“<i>first part</i>”), thereby supporting limitation [1.7.1].</p> <p>The “spare bits” (<i>second part</i>) in the extended MIB are used to provide information (<i>second part information</i>) for an MTC device (<i>second type of communication device</i>) to “be able to connect to the cell” (<i>to establish a connection with the host cell</i>), and examples of such information are provided:</p> <p>This disclosure proposes an extended Master Information Block including a bit sequence pointing out a subset of Resource Elements (RE) and/or</p> |

| Claim | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|       | <p>Resource Blocks (RB) in the time and frequency grid. This can easily be made by utilizing a subset of the 10 spare bits in the LTE MIB currently not used to carry information. <b>This subset of REs and/or RBs pointed out by the bit sequence could include information suitable for MTC devices</b> operating on a smaller (a subset) of the (LTE) system bandwidth than the cell system bandwidth, <u>to still be able connect to the cell.</u> <b>Examples of such information in the MIB are:</b></p> <p>1. The RBs and/or MCS allocated to the <b>first system information block (SIB 1)</b> that is transmitted in subframe 5</p> <p>...</p> <p>4. A set of MTC-specific RACH sequences and/or RACH regions in the time/frequency grid <b>to be used by the MTC device for connection setup.</b></p> <p>5. The RBs, reference signal sequence or search space allocated to a specific MTC-PDCCH, which should be different than the legacy PDCCH locations, where an MTC can receive and detect control information, <b>including the MTC specific SIBs or downlink assignments pointing to the SIBs.</b></p> <p>p. 9.</p> <p>Figure 2 of Wallen-Prov and the associated description further describe information inserted in a second part of an MIB:</p> <p>Figure 2 shows a flow chart over an eNB embodiment according to particular embodiments of the disclosure. The eNB generates the MIB. First MIB information according to (Rel-10) standard (Mobile broadband devices) of the LTE is generated (100). <b>Then MIB information related to MTC devices (110) is generated</b> (the order could be changed between (110) and (100)). A subset of the spare bits in the MIB is used for this message.</p> |

| Claim | Reference Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|       | <p>Wallen-Prov, p. 10.</p> <p>The spare bits of an MIB (second part) carrying an indication of RBs in the time/frequency grid that include information “suitable for MTC devices...to still be able [to] connect to the cell,” such as SIBs or other information “for connection setup,” supports “<i>second part information that directly or indirectly enables the second type of communication device [MTC device] to obtain parameters that enable the second type of communication device to establish a connection with the host cell.</i>”</p> |

**XI. CONCLUSION**

146. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: November 24, 2024

 Digitally signed by  
Zhi Ding  
Date: 2024.11.24  
17:15:48 -08'00'

Zhi Ding