

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD._{1,2} AND
SAMSUNG ELECTRONICS AMERICA, INC.,

Petitioner₂

v.

APEX BEAM TECHNOLOGIES LLC,

Patent Owner₂

Case IPR2023-00599
U.S. Patent No. 10,912,081

DECLARATION OF APOSTOLOS K. KAKAES, PH.D.

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I. INTRODUCTION

1. I have been retained by Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., (collectively “Petitioner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office.

2. I am over 21 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein.

3. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of any proceeding.

4. I understand that this proceeding involves U.S. Patent No. 10,912,081 (“the ’081 patent,” Ex. 1001). The application for the ’081 patent was filed May 6, 2018, as U.S. Patent Application No. 15/972,167 (“the ’167 application”). The ’081 patent claims priority to Chinese Patent Application 201710318202, filed on May 8, 2017. ’081 patent, cover.

5. I have been asked by Petitioner to provide my opinion whether the claims of the ’081 patent would have been obvious to a person of ordinary skill in the art at the time of the earliest claimed priority date of the ’081 patent. In performing my analysis, I have been asked to assume that the priority date is May 8, 2017. My opinions are set forth below.

6. Throughout this declaration, I refer to specific pages, figures, and/or line numbers of various exhibits. These citations are illustrative and are not intended to suggest that they are the only support for the propositions for which they are cited.

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9. — Independent Claim 9	42
a. — ~~[9pre]: “A UE for wireless communication, comprising:”~~	42
b. — ~~[9a]: “a first transceiver module, to receive a second radio signal and a first radio signal;”~~	43

c. ~~[9b] [9k]~~	44
10. Claim 10	45
a. ~~[10a]: “The UE according to claim 9, wherein the first transceiver module receives first information, the first information being used for determining~~ the first time point; or,”	45
b. ~~[10b]: “the first transceiver module transmits second information, the second information being~~ used for determining the first time point; or,”	45
c. ~~[10c]: “the first transceiver module receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”~~	46
11. Independent Claim 11	46
a. ~~[11pre]: “A base station device for wireless communication, comprising:”~~	46
b. ~~[11a]: “a second transceiver module, to transmit a~~ second radio signal and a first radio signal;”	47
c. ~~[11b] [11k]~~	48
12. Claim 12	48
a. ~~Claim [12a]: “The base station device according to claim 11, wherein the second transceiver module transmits first information, the first information~~ being used for determining the first time point; or,”	48
b. ~~Claim [12b]: “the second transceiver module receives second information, the second information being used for determining the first~~ time point; or,”	49
c. ~~Claim [12c]: “the second transceiver module transmits third information, the third information being used for determining~~	

~~a candidate scheme for the multi-antenna related receiving- corresponding~~	
to the G multicarrier symbols.”	49
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a. ~~[1pre]: “A method in a User Equipment (UE) for wireless communication, comprising:”~~	50
b. ~~[1a]: “receiving a second radio signal;”~~	51
c. ~~[1b]: “receiving a first radio signal;”~~	52
d. ~~[1e]: “wherein the first radio signal is transmitted within a first time unit,”~~	54
e. ~~[1d]-[1e]: “a first bit block is used for generating the first radio signal, and the first radio signal~~	
comprises G multicarrier symbols;”	55
f. ~~[1f]: “the second radio signal is transmitted within the first time unit, and”~~	58
g. ~~[1g]: “the second radio signal is used for determining a time-domain resource occupied by~~	
the G multicarrier symbols;”	59
h. ~~[1h]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier- symbol with respect to a first time point in time~~	
domain;”	60
i. ~~[1i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for~~	
the given multicarrier symbol; and”	63

j.	~~[1j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna-related receiving for the given multicarrier symbol is related to the multi-antenna-related receiving for the second~~	
	radio signal;”	64
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a.	~~[2a]: “The method according to claim 1, comprising: receiving first information, wherein the first information is used for determining the~~	
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b.	~~[2b]: “receiving third information, ...”~~	68
3.	Claim 3	69
a.	~~“The method according to claim 2 comprising: transmitting second information, wherein the second information is used for determining the~~	
	first time point.”	69
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	first time point.”	71
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	wireless communication, comprising:”	71
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c.	~~[5b]: “transmitting a first radio signal;”~~	72

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b.	~~[6b]: “transmitting third information, ...”~~	74
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b. ~~[10b] [10c]: “the first transceiver module transmits second information, the second information being~~	
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11. Independent Claim 11	79
a. ~~[11pre]: “A base station device for wireless communication, comprising:”~~	79
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PETITIONER'S EXHIBIT LIST

7. This declaration considers claims 1-12 of the '081 patent. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for these opinions and conclusions. I believe the statements contained in this declaration to be true and correct to the best of my knowledge.

8. Based on my experience, knowledge of the art at the time of the applicable priority date (I was told to assume a priority date of May 8, 2017), it is my opinion that claims 1-12 of the '081 patent would have been anticipated and/or obvious based on the asserted grounds discussed below.

9. I am being compensated for my time at my normal hourly rate. My compensation is in no way contingent upon the nature of my findings, the presentation of my findings in testimony, or the outcome of this proceeding.

III. QUALIFICATIONS AND BACKGROUND

10. I believe that I am well qualified to serve as a technical expert in this matter based upon my qualifications, discussed in detail below. A copy of my curriculum vitae is attached as Appendix A to this declaration.

11. I am competent to write this Declaration.

12. I have personal knowledge and expertise concerning the relevant technologies based upon my education, training, or experience. My relevant experience includes a deep understanding of the systems that we broadly refer to as “1G,” “2G,” “3G,” “4G,” “LTE,” and “5G” communications systems, as well as other wireless communication technologies, including those based on the IEEE 802.11 set of standards (often referred to as WiFi) as well as those related to IEEE 802.16 set of standards (often referred to as WiMAX).

13. I am an expert in the field of communication engineering and specifically, among others, the field of wireless communications. I have over 40 years of experience in electrical engineering and computer science and in fixed and mobile communications networks. I attended the University of Colorado from 1974 to 1980, during which I earned a Bachelor of Science (B.S.) and a Master of Science (M.S.) in applied mathematics with a minor in electrical engineering. I attended the Polytechnic Institute of New York between 1982 and 1988, during which I earned a Doctor of Philosophy (Ph.D.) in electrical engineering, with a minor in applied mathematics. My Ph.D. thesis was titled “Topological Properties and Design of Multihop Packet Radio Networks.” While pursuing my Ph.D. degree, I held a joint appointment as Special Research Fellow and Adjunct

Instructor at the Polytechnic Institute of New York between 1985 and 1986 teaching graduate-level courses in Electrical Engineering.

14. Between 1982 and 1987, I worked at AT&T Bell Laboratories in Holmdel, New Jersey. While at AT&T Bell Laboratories, I worked on modeling, analysis, design, and performance evaluation of voice and data networks. I developed algorithms for DNHR (Dynamic, Non-Hierarchical Routing) used in the telephone network. I also analyzed advanced data services and formulation of long-term plans for development of enhanced data services and network design tools to support such services.

15. I was an Assistant Professor of Electrical Engineering and Computer Science at The George Washington University (GWU) in Washington, D.C., between 1987 and 1994. During my association with GWU, I taught graduate courses in the area of communication engineering, including communication theory, coding theory, voice and data networking, and mobile communications. In the early 1990s I developed and taught the first course on Mobile Communications at GWU to Electrical Engineering graduate students. I also received several research awards/grants, including the prestigious NSF Research Initiation Award.

16. In 1988, I founded Cosmos Communications Consulting Corporation (“Cosmos”), which is a private communications engineering consulting firm specializing in mobile communications, and I have been the President of the

company since its founding. Since 1994, I have worked full-time at Cosmos. At Cosmos, among various activities, I have consulted on high level technology-related issues and trends to corporate entities, governmental agencies, and international organizations, such as the United Nations.

17. I have provided technical consultancy to engineering firms, operators, and equipment vendors on issues related to existing or evolving technologies for mobile communications, and to the investment community on issues related to both fixed and wireless communications technologies. I developed and taught hundreds of courses to thousands of engineers around the world in the area of communication engineering, mostly in the area of mobile, wireless communications.

18. Over the course of my career, I have authored and co-authored some thirty (30) publications on various aspects of fixed and mobile communications, as noted in my curriculum vitae. I am a life member of the Institute of Electrical and Electronics Engineers (IEEE) and have been actively involved in the Communications Society and the Information Theory Society of the IEEE. Between 1991 and 1992, I served as the Secretary of IEEE Communications Society National Capital Area Chapter. Between 1992 and 1993, I was the Vice-Chair of IEEE Communications Society National Capital Area Chapter. I was the Vice-Chair of the Communication Theory Technical Committee of the

Communications Society of the IEEE for the 1993–1996 term, and Treasurer of the Communication Theory Technical Committee of the Communications Society of the IEEE for the 1996–1999 term.

19. I have served as a reviewer for the IEEE, book editors, other technical publications, and various National Science Foundation (NSF) Panels. I have organized technical sessions in technical conferences, including the IEEE International Conference on Communications (ICC) and IEEE Global Communications Conference (Globecom). I served as the Technical Program Chair for the Communication Theory Mini-Conference in 1992.

20. During the past 35+ years, I have been lucky enough to be part of the community of engineers that have contributed to the astounding growth of the mobile communications industry. It started from a niche industry that was thought of as being something for the “rich and the famous” to becoming one of the most widespread household concepts, providing useful tools to all segments of the global society.

21. My involvement in this industry included providing consulting services to company executives who needed to make deployment plans, taking into consideration the strengths and weaknesses of the technology, economics, user value, etc. As such, I have developed a deep understanding of all aspects of a given technology, its features, added value, and the like. In addition, my consulting

services included developing courses for the companies that were at the forefront of this developing technology. By definition, this previously non-existent technology was not taught in university courses, as it was too new. Having developed hundreds of courses over the years and taught thousands of engineers (and non-engineers alike), I have a solid understanding and knowledge of the technical developments and how their importance fits in the larger puzzle of a fast-developing technology.

22. My consulting included providing training to engineers in the field that were deploying the various networks. For example, I developed courses and provided training and consulting to the engineers deploying some of the earliest GSM networks in Germany and France, to be followed by many countries in Europe and around the world, including the United States when it was decided that GSM would be used in the U.S. Successful deployments of the initial GSM systems were followed by deployments of GPRS and EDGE, which was then followed by deployments of 3G UMTS systems worldwide. Of course, the 3G systems were followed by the currently most widespread deployments of 4G systems, also referred to as LTE, worldwide and most recently deployments of 5G networks. Thus, as I explain above, my experience includes a deep understanding of the entirety of each system that we broadly refer to as “1G,” “2G,” “3G,” “4G,” “LTE,” and “5G.”

23. Similarly, I developed courses and provided training and consulting to engineers deploying and/or enhancing wireless local area networks using one or more of the IEEE 802.11 set of standards (often referred to as WiFi) as well as networks using the IEEE 802.16 set of standards (often referred to as WiMax).

24. As an expert consultant, I have served on both civil and criminal legal cases, including several patent infringement cases both at the ITC and in district courts, as well as in support of IPR petitions, such as the one in this case. I have also participated as a technical expert consultant in the analysis of large patent portfolios for the purposes of due diligence, sales, and merger and acquisition activities for some of the largest companies in the mobile communications space. These projects span a multidimensional spectrum of technologies in both fixed and mobile communications as they have evolved over the past more than 30 years.

IV. MATERIALS CONSIDERED

25. In forming my opinions, I have reviewed the following documents, and any other document cited in this declaration.

Exhibit	Description
Ex. 1001	U.S. Patent No. 10,912,081 ~~to Zhang~~ (“the ’081 patent”)
~~Ex. 1002~~	~~Declaration of Apostolos Kakaes, Ph.D. (“Kakaes”)~~
Ex. 1003	Prosecution History of the ’081 patent (downloaded from the USPTO’s Patent Center Website)
Ex. 1004	International Patent Publication No. WO 2017/083489 to Lee et al. (“Lee”)

<u>Exhibit</u>	<u>Description</u>
Ex. 1005	Provisional Application No. 62/253,473 to Lee et al. (“ <i>Lee Provisional</i> ”)
Ex. 1006	3GPP TR 25.892 V6.0.0 (2004-06) Technical Report (3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Feasibility Study for Orthogonal Frequency Division Multiplexing (OFDM) for UTRAN enhancement (Release 6)) (“ <i>TR-25.892</i> ”).
Ex. 1007	3GPP TS 36.213 version 12.11.0 Release 12 (2016-11) Technical Specification (Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures) (“ <i>TS-36.213</i> ”).
Ex. 1008	3GPP TS 36.321 version 12.6.0 Release 12 (2015-0) Technical Specification (Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) Protocol Specification) (“ <i>TS-36.321</i> ”).
Ex. 1009	Wu, Hao. “Accurate determination of transport block size for 5G new radio.” <i>Electronics Letters</i> 56.9 (2020): 459-462 (“ <i>Wu</i> ”).
Ex. 1010	Sandrasegaran, Kumbesan, Huda Adibah Mohd Ramli, and Riyaj Basukala. “Delay-prioritized scheduling (DPS) for real time traffic in 3GPP LTE system.” 2010 IEEE wireless communication and networking conference. IEEE, 2010 (“ <i>Sandrasegaran</i> ”).
Ex. ~~4011~~101 2	~~Reserved~~ International Patent Publication No. <u>WO 2018/201861</u> to Chen et al. (“ <i>Chen</i> ”)¹, including certified English translation and certification
Ex. ~~4012~~101 3	InternationalChinese Patent <u>Application</u> Publication No. ~~WO-2018/201861~~ <u>CN 108809488</u> to Chen et al. (“ <i>Chen</i> ”)⁴, <u>Priority</u>)², including certified English translation and certification

¹ Citations to *Chen* are made to the English translation.

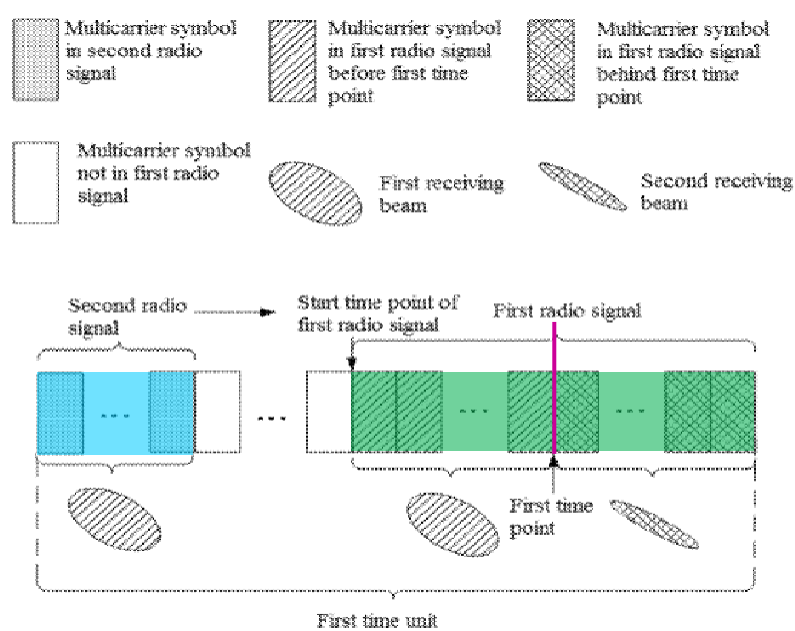
~~Exhibit~~	~~Description~~
~~Ex. 1013~~	~~Chinese Patent Application Publication No. CN 108809488 to Chen et al. ("<i>Chen Priority</i>")², including certified English translation and certification~~
~~Ex. 1014~~	~~3GPP Declaration of Friedhelm Rodermund~~
~~Ex. 1015~~	~~<i>Apex Beam Technologies LLC v. Samsung Electronics Co. Ltd. et al.</i>, No. 2:22-cv-00188-JRG, Dkt. No. 1, Complaint for Patent Infringement (E.D. Tex. June 1, 2022)~~
~~Ex. 1016~~	~~United States District Courts — National Judicial Caseload Profile, available at https://www.uscourts.gov/sites/default/files/fcms_na_distprofile0630.2022_0.pdf (retrieved February 5, 2023)~~
~~Ex. 1017~~	~~<i>Apex Beam Technologies LLC v. ZTE Corp.</i>, No. 2:22-cv-00031-JRG-RSP, Dkt. No. 37, Docket Control Order (E.D. Tex. Feb. 2, 2023) (consolidated with <i>Apex Beam Technologies LLC v. Samsung Electronics Co. Ltd. et al.</i>, No. 2:22-cv-00188-JRG)~~
~~Ex. 1018~~	~~<i>Apex Beam Technologies LLC v. Samsung Electronics Co. Ltd. et al.</i>, No. 2:22-cv-00188-JRG, Plaintiff's Infringement Contentions Cover Pleading (January 5, 2023)~~
~~Ex. 1019~~	~~3GPP TS 36.211 version 12.5.0 Release 12 (2015-03) 3rd-Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation ("<i>TS-36.211</i>").~~
~~Ex. 1020~~	~~3GPP TS 36.212 version 12.4.0 Release 12 (2015-03) 3rd-Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding ("<i>TS-36.212</i>").~~
~~Ex. 1021~~	~~3GPP TSG RAN WG1 Meeting #89, Hangzhou, China 15th — 19th May 2017, R1-1707475, CATT, "Discussion on DL beam management" ("<i>R1-1710596</i>")~~

² Citations to *Chen Priority* are made to the English translation.

~~I. PRELIMINARY STATEMENT~~

~~Petitioner Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. (collectively “Samsung”) requests *inter partes* review of U.S. Patent No. 10,912,081 (Ex. 1001), assigned to Patent Owner Apex Beam Technologies, LLC, and cancellation of claims 1–12.~~

~~The challenged claims are directed to methods and devices for wireless communication, and relate to a procedure of transmitting a second radio signal (e.g., **control information**) and a first radio signal (e.g., **user data**) from a base station to a user equipment (UE). As shown in annotated FIG. 7 below, the UE uses a first beam (e.g., a wide beam) to receive a first portion of the first radio signal before a **first time point**, and a second beam (e.g., a narrow beam) to receive a second portion of the first radio signal behind the first time point.~~



~~During prosecution, the Applicant argued that the prior art did not disclose these features. See Ex. 1003, 195-201. However, this procedure was well known in the art before the earliest claimed priority date of the '081 patent. For example, both International Patent Publication No. WO 2017/083489 to Lee et al. (Ex. 1004) (“Lee”) and~~

<u>Exhibit</u>	<u>Description</u>
<u>Ex. 1019</u>	<u>3GPP TS 36.211 version 12.5.0 Release 12 (2015-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (“TS-36.211”).</u>
<u>Ex. 1020</u>	<u>3GPP TS 36.212 version 12.4.0 Release 12 (2015-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (“TS-36.212”).</u>
<u>Ex. 1021</u>	<u>3GPP TSG RAN WG1 Meeting #89, Hangzhou, China 15th – 19th May 2017, R1-1707475, CATT, “Discussion on DL beam management” (“R1-1707475”).</u>

26. I have also relied on my education, experience, research, training, and knowledge in the relevant art, and my understanding of any applicable legal principles described in this declaration.

27. All of the opinions contained in this declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my understanding of how a person of ordinary skill in the art would have understood the claims of the '081 patent at the time of the earliest claimed priority date.

28. I reserve the right to supplement and amend any of my opinions in this declaration based on documents, testimony, and other information that

becomes available to me after the date of this declaration.

V. LEGAL STANDARDS

29. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents submitted in this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the challenged claims.

30. I have been informed that there are two ways in which prior art may render a patent claim unpatentable. First, I have been informed that the prior art can “anticipate” a claim. Second, I have been informed that the prior art can render a claim “obvious” to a person of ordinary skill in the art. I understand that a claim is patentable if it was not anticipated and would not have been obvious by the prior art at the effective filing date of the patent.

31. I have been informed that a dependent claim is a patent claim that refers back to another patent claim. I have been informed that a dependent claim includes all of the limitations of the claim to which it refers.

32. I have been asked to provide my opinions as to whether the cited prior art teaches or renders obvious claims 1-12 of the '081 patent from the perspective of a person of ordinary skill in the art at the '081 patent's earliest claimed priority date in 2017, as described in more detail below.

33. I have been informed that in *inter partes* review proceedings, such as this one, the party challenging the patent bears the burden of proving unpatentability by a preponderance of the evidence. I understand that a preponderance of the evidence means “more likely than not.”

34. For purposes of this declaration, I have been asked to provide my opinions on issues regarding unpatentability. I have been informed of the following legal standards, which I have applied in forming my opinions.

A. Level of Ordinary Skill

35. I have been informed a person of ordinary skill in the art is determined by considering several factors, including the (i) type of problems encountered in the art; (ii) prior art solutions to those problems; (iii) rapidity with which innovations are made; (iv) sophistication of the technology; and (v) educational level of active workers in the field.

36. I have been instructed to assume a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors discussed above.

B. Prior Art

37. I have been advised and understand the information used to evaluate whether an invention was new and not obvious when made is generally referred to as “prior art.” I understand that prior art includes patents and printed publications

that existed before the earliest claimed priority date or the earliest filing date of the patent (which I have been informed is also called the “effective filing date”). I have been informed and understand that a patent or published patent application is prior art if it was filed before the earliest filing date of the claimed invention and that a printed publication is prior art if it was publicly available before the earliest filing date.

C. Anticipation

38. I have been informed that under 35 U.S.C. § 102, a patent claim is unpatentable for anticipation if the claimed subject matter was patented or described in a printed publication before the effective filing date of the claimed invention. I have been informed that this is referred to as unpatentability by anticipation. I have been informed that a patent claim is anticipated under § 102 if a single prior art reference discloses all limitations of the claimed invention.

D. Obviousness

39. I have been informed that obviousness under 35 U.S.C. § 103, a patent claim is unpatentable if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the art to which said subject matter pertains at the time the invention was made. I have been informed that this is referred to as unpatentability by obviousness.

40. I have been informed that a proper obviousness analysis includes the following:

- a. Determining the scope and content of the prior art;
- b. Ascertaining the differences between the prior art and the claims at issue;
- c. Resolving the level of ordinary skill in the pertinent art; and
- d. Considering evidence of secondary indicia of non-obviousness (if available).

41. I have been informed that the relevant time for considering whether a claim would have been obvious to a person of ordinary skill in the art is the time of invention. For my obviousness analysis, counsel for Petitioner instructed me to assume that the date of invention for the Challenged Claims is May 8, 2017. My opinions would not change if I assumed a later date of invention.

42. I have been informed that a reference may be modified or combined with other references or with a person of ordinary skill in the art's own knowledge if the person would have found the modification or combination obvious. I have also been informed that a person of ordinary skill in the art is presumed to know all the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

43. I have been informed that whether a prior art reference renders a patent claim obvious is determined from the perspective of a person of ordinary skill in the art. I have also been informed that, while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, and while a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually and may consider the inferences and creative steps a person of ordinary skill in the art would employ, as filtered through the knowledge of one skilled in the art, obviousness grounds cannot be sustained by mere conclusory statements and must include some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.

44. In determining whether a prior art reference could have been combined with another prior art reference or other information known to a person having ordinary skill in the art, I have been informed that the following principles may be considered:

- a. A combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;
- b. The substitution of one known element for another is likely to be obvious if it yields predictable results;

- c. The use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;
- d. The application of a known technique to a prior art reference that is ready for improvement to yield predictable results;
- e. Any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;
- f. A person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and
- g. The proper analysis of obviousness requires a determination of whether a person of ordinary skill in the art would have a “reasonable expectation of success”—but not “absolute predictability” of success—in achieving the claimed invention by combining prior art references.

45. I have been informed that, when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. I have been informed that if a person of ordinary skill in the art could have implemented a predictable variation and would have seen the benefit of doing so, that variation is likely to have been obvious. I have been

informed that, in many fields, there may be little discussion of obvious combinations, and in these fields market demand—not scientific literature—may drive design trends. I have been informed that, when there was a design need or market pressure and there are a finite number of predictable solutions, a person of ordinary skill in the art would have had a good reason to pursue those known options.

46. I have been informed that the law permits the application of “common sense” in examining whether a claimed invention would have been obvious to a person skilled in the art. For example, I have been informed that combining familiar elements according to known methods and in a predictable way may suggest obviousness when such a combination would yield nothing more than predictable results. I understand, however, that a claim is not obvious merely because every claim element is disclosed in the prior art and that a party asserting obviousness must still provide a specific motivation to combine or modify the references as recited in the claims and explain why one skilled in the art would have reasonably expected to succeed in doing so.

47. I have been informed that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also understand that the “teaching, suggestion, or motivation” test can be a useful guide in establishing a rationale for combining

elements of the prior art. I have been informed that this test poses the question as to whether there is an express or implied teaching, suggestion, or motivation to combine prior art elements in a way that realizes the claimed invention, and that it seeks to counter impermissible hindsight analysis.

48. I am not aware of any evidence of secondary considerations that would support a determination of non-obviousness of the claimed subject matter in the '081 patent.

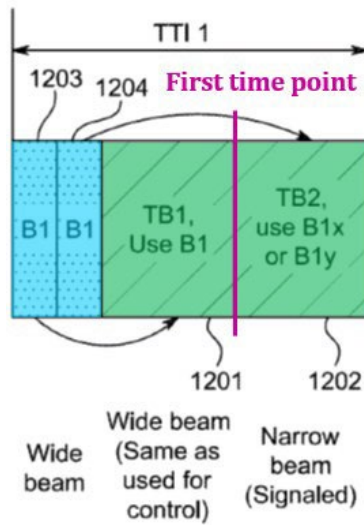
49. I have been informed that, in an obviousness analysis, prior art must be analogous prior art to the patent being considered. I have been informed that a prior art reference is considered to be analogous, or in the same field of art, if the reference is either (1) in the same field of endeavor as the challenged patent, regardless of the problems the challenged patent and the prior art address, or (2) reasonably pertinent to the particular problem being solved by the challenged patent.

VI. TECHNOLOGY OVERVIEW

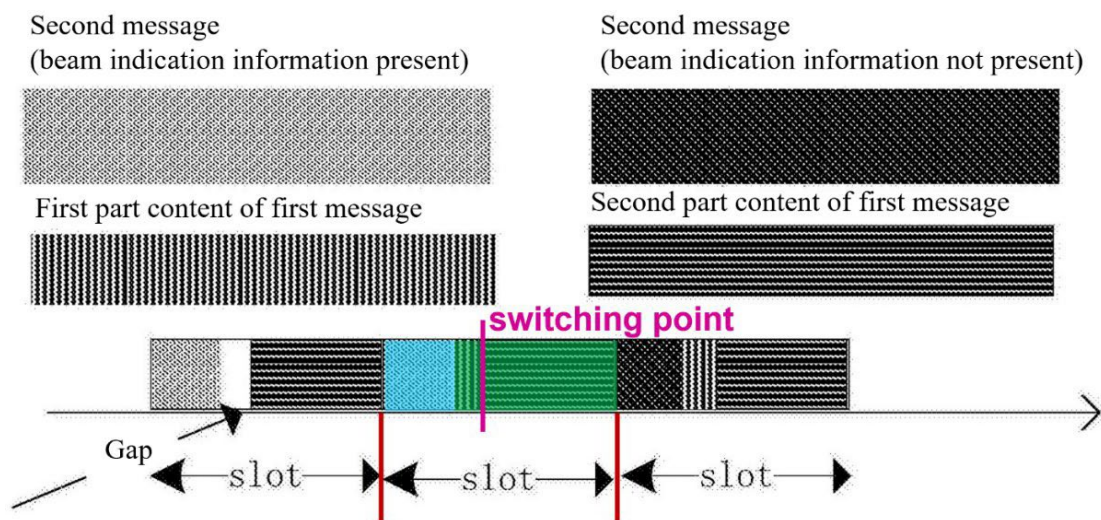
~~International Patent Publication No. WO 2018/201861 to Chen et al. (“Chen”), neither of which the Examiner was aware of during prosecution, disclose the same procedure.~~

~~Just like FIG. 7 of the '081 patent, Lee discloses that **control data B1** (“second radio signal”) and **transport blocks TB1 and TB2** (“first radio signal”) are transmitted from a base station to a UE. As shown in annotated FIG. 12 below,~~

~~Lee also discloses that the UE uses a wide beam for receiving the first transport block TB1 before a **first time point**, and a narrow beam for receiving the second transport block TB2 behind the first time point.~~



Further, also like FIG. 7 of the '081 patent, *Chen* discloses that a **second message** (“second radio signal”) and a **first message** (“first radio signal”) are transmitted from a base station to a UE. ~~As shown in annotated FIG. 4 below, the first message includes two parts, where the first part of the first message is received before a **first time point** using the same reception beam used to receive the second message, and the second part of the first message is received after the first time point using a different reception beam.~~



~~As set forth below, all claims are anticipated by *Lee* and rendered obvious by *Chen* in view of *Lee*. The Board should thus institute review and cancel all claims.~~

~~II. PRIOR ART BACKGROUND~~

A. Overview of Multiple-Input and Multiple-Output (MIMO) and Antenna Beam Switching

7.50. The concept of using multiple antennas to transmit and receive radio signals between a user equipment (UE) and a base station (i.e., multiple-input and multiple-output (MIMO) radio communications), has been well known for many years. ~~Kakaes, ¶50.~~ In these radio communications, the radio signals can be transmitted and

received by forming one or more beams using the antennas associated with the UE and the base station. ~~Id.~~ These beams can have different patterns, which may impact various characteristics of the communication between the UE and the base station. ~~Id.~~

8.51. For example, a wider beam is generally known to provide a greater area of coverage but may produce a relatively lower quality signal for a given amount of transmitted power. ~~Id., ¶51.~~ On the other hand, a narrower beam may generally produce a higher quality signal while providing less coverage. ~~Id.~~ Thus, in some cases, it may be desirable to provide two or more beams and switch from one beam to another during communication between the UE and the base station depending on the particular situation. ~~Id.~~ This process is known as beam switching. ~~Id. Such “beam switching” was well known in the art before the earliest claimed priority~~

~~date of the '081 patent, May 8, 2017.³ *Id.*; see also Kakaes, ¶¶52-54; Ex. 1021, 8-9, FIG. 6; Rodermund, ¶¶88-92.~~

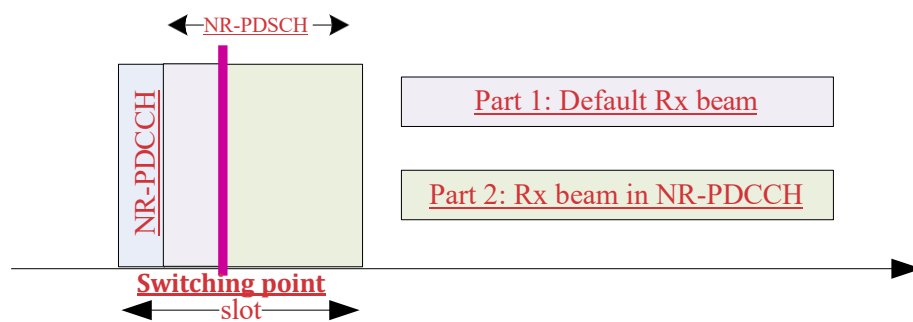
B. 3GPP Proposed Standard

52. The 3rd Generation Partnership Project (3GPP) is a well-known organization that develops specifications for wireless telecommunications, which, in turn, may be adopted as standards. Generally, the 3GPP holds specifications group meetings several times a year to propose and discuss new standards and/or changes to existing standards. The 3GPP materials are generally made available to the public on the 3GPP website.

53. 3GPP is organized into several Technical Specification Groups (TSGs) which “prepare, approve and maintain the 3GPP Technical Specifications and Technical Reports, under the chair-ship of an elected leadership.” See 3GPP

website at <https://www.3gpp.org/3gpp-groups>. Each TSG consists of several “Working Groups” (WG). For example, the Radio Access Network TSG includes the RAN WG1, “Radio Layer 1” working group, referred to as either TSG RAN WG1 or sometimes simply as RAN1.

54. During one particular 3GPP TSG RAN WG1 meeting held in Hangzhou, China between May 15-19, 2017, the working group discussed the concept of switching beams during data signal transmission within a single slot. In particular, as shown in Figure 6 below, the meeting document (R1-1707475) discloses “divid[ing] NR-PDSCH in two parts,” e.g., part 1 and part 2. Ex. 1021 (R1-1707475), 8-9. PDSCH stands for Physical Downlink Shared Channel and is a well known channel for carrying data. When the UE decodes part 1, it uses a “default Rx beam,” and when the UE decodes part 2, it uses the “Rx beam indicated in NR-PDCCH.” Ex. 1021 (R1-1707475), 8-9. PDCCH stands for Physical Downlink Control Channel and is a well known channel for carrying control information.



Ex. 1021 (R1-1707475), Figure 6 (annotated).

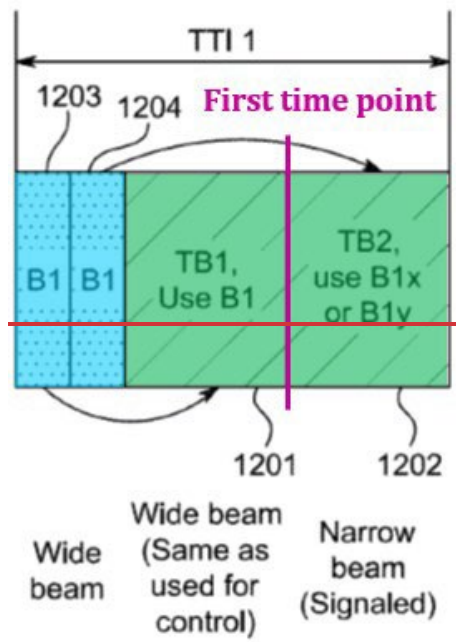
VII. SUMMARY OF THE PRIOR ART

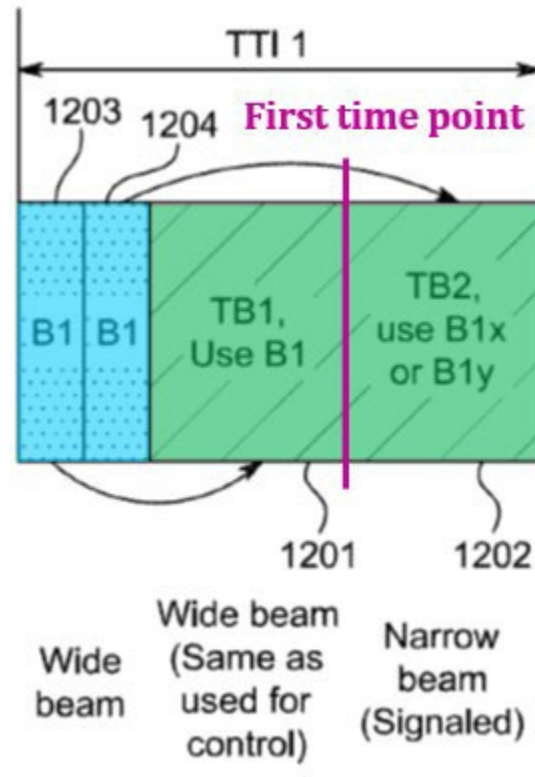
A. *Lee*

55. *Lee*, which is directed to “a system, method, and apparatus for transmitting data between a wireless transmit/receive unit (WTRU) and a base station at a high carrier frequency. *Lee*, [0005]; *Lee Provisional*, [0004]. *Lee* was filed on November 10, 2016 and claims priority to its provisional application ~~filing date of~~ filed on November 10, 2015, *Lee*, cover. *Lee* discloses a method in a UE where a beam used for receiving signals from a base station is switched from one beam to another during a transmission period. ~~Referring to~~ In particular, as shown in annotated FIG. 12 below, *Lee* discloses that control data B1 and transport blocks TB1 and TB2 are transmitted from the base station to the UE. *Lee*, [0167], [0168]; see also [0155], [0166], FIG. 10; *Lee Provisional*, [0153]-[0157], [0208]; see also, [0140], FIG. 10.

Lee further discloses that control data B1 contains “control information” and transport blocks TB1 and TB2 contain “data.” *Lee*, [0167], [0168]; *Lee Provisional*, [0153]-[0157], [0208].

~~³ Petitioner reserves the right to challenge the priority date here and/or in other proceedings.⁴ Petitioner reserves the right to argue in an appropriate forum that certain limitations in the challenged claims are indefinite.~~





Lee, FIG. 12 (annotated); *Lee Provisional*, FIG. 12.

As shown above, *Lee* discloses that the UE uses a **wide beam** for receiving the data (e.g., TB1) before a **first time point**, and switches to a **narrow beam** for receiving the data (e.g., TB2) after the first time point. *Lee*, [0167], [0258], [0150], [0168], [0006]-[0008],

9.56. FIGS FIG. 12, FIG. 19.; *Lee Provisional*, [0153], [0140], [0208], [0006]-[0007], FIG. 12.

10.57. *Lee* is analogous art to the '081 patent because *Lee*, like the '081 patent, is directed to a “system, method, and apparatus for transmitting data between a wireless transmit/receive unit (WTRU) and a base station,” and methods

for switching a receiving beam during a data transmission period. ~~Lee, [0005]-[0008],~~
~~[0167], [0258], [0150], [0168], FIGS. 12 and 19; Kakaes, ¶¶55-57. Lee, [0005]-~~

[0008], [0167], [0258], [0150], [0168], FIGS. 12 and 19; *Lee Provisional*, [0004]-[0007], [0153], [0140], FIG. 12; '081 patent, 1:16-20.

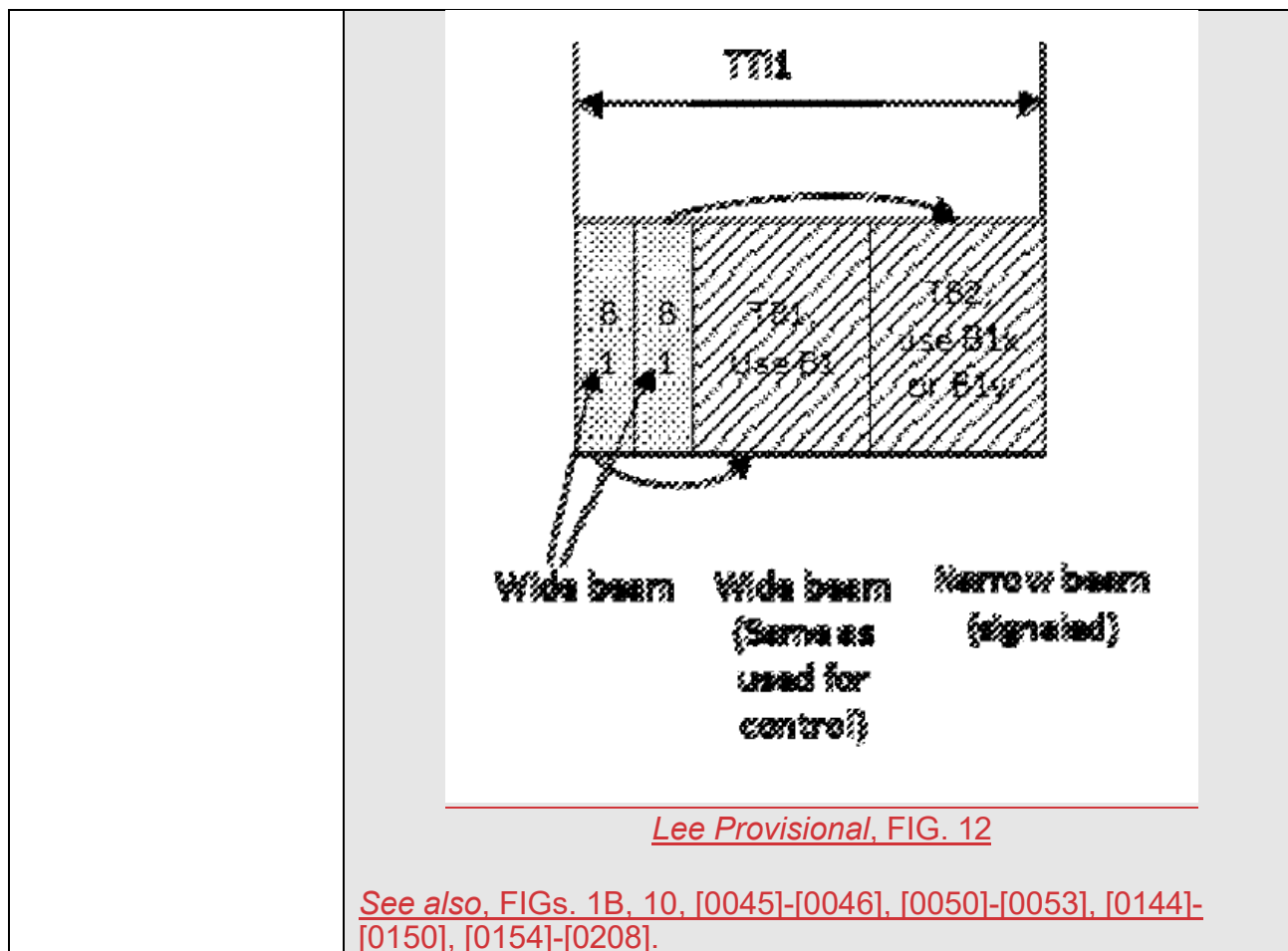
58. I understand that *Lee* is prior art based on its filing date of November 10, 2016. I also understand that *Lee* is prior art based on its provisional filing date of November 10, 2015. I understand that a prior art reference may be entitled to its provisional filing date if (1) the provisional application contains support for at least one claim of the prior art reference, and (2) each part of the prior art reference being relied upon as prior art has support in the provisional application.

59. In my opinion, at least claim 21 of *Lee* is supported by its provisional application, as shown in the chart below. In addition, I believe each citation that I rely on from *Lee* is supported by its provisional application, as shown in the sections below.

<u>Claim 21 of <i>Lee</i></u>	<u>Support in <i>Lee Provisional</i> (Ex. 1005)</u>
<u>21. A wireless transmit/receive unit (WTRU) configured to perform wireless communications in higher frequency bands using a fallback scheme, comprising:</u>	<u>"[T]he communications system 100 may include wireless transmit/receive units (WTRUs) 102a, 102b, 102c, 102d ... Each of the WTRUs 102a, 102b, 102c, 102d may be any type of device configured to operate and/or communicate in a wireless environment." <i>Lee Provisional</i>, [0034]; see also FIGS. 1A-1B, [0033]-[0053].</u> <u>"Embodiments described herein may define transmission modes (including reference signals and channel state information (CSI) feedback) and transmission schemes for operation of highly directional beamformed systems. In addition, embodiments may define how to mitigate control and/or data channel performance loss due to narrow beam misalignment, for systems operating in higher frequency bands (e.g., above-6 GHz frequencies)." <i>Lee Provisional</i>, [0029]; see also [0006], [0090].</u>

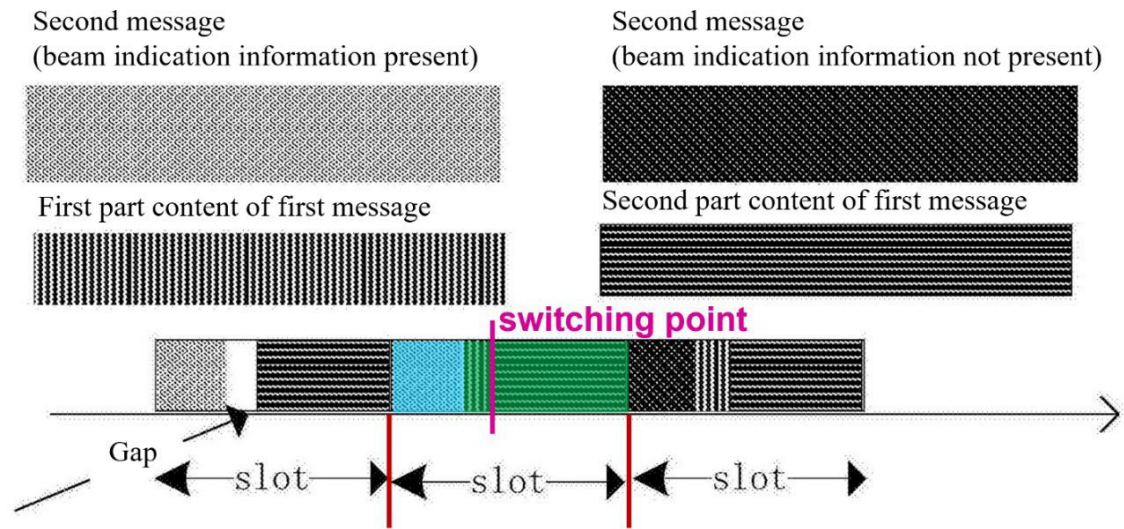
	<u>“In an embodiment, a system, method, and apparatus for transmitting data between a wireless transmit/receive unit (WTRU) and a base station at a high carrier frequency is disclosed. The embodiment may include: a normal transmission time interval (TTI), wherein ... the WTRU receives a downlink (DL) control channel via a beam-paired transmission scheme, and wherein the WTRU receives a DL control channel with a determined beam-specific reference signal (BRS); and a fallback TTI, wherein the WTRU receives the DL control channel with a fallback transmission scheme, and wherein the WTRU receives a DL control channel with multiple Tx/Rx beams with repetition.”</u> <i>Lee Provisional</i>, [0006]; <u>see also</u> [0071].
<u>a receiver configured to receive, in a time transmission interval (TTI), at least one control signal, a first transport block and a second transport block,</u>	<u>“[T]he WTRU 102 may include a processor 118, a transceiver 120, [and] a transmit/receiver element 122”</u> <i>Lee Provisional</i>, [0045]. <u>“Referring now to FIG. 12, a dual TB transmission scheme is shown. The two or more transport blocks may be transmitted with a same beam as the control channel, or may be transmitted with different beams. FIG. 12 illustrates an example of two transport blocks transmitted in a TDM fashion within a TTI. The transmission of the individual transport blocks may use the same beam as the control channel, or may use a different beam. In the latter case, the narrow beam ID may need to be signaled in the control region of the TTI.”</u> <i>Lee Provisional</i>, [0153]; <u>see also</u> [0154], [0046]-[0049], [0144]-[0150], FIGS. 1B, 12.

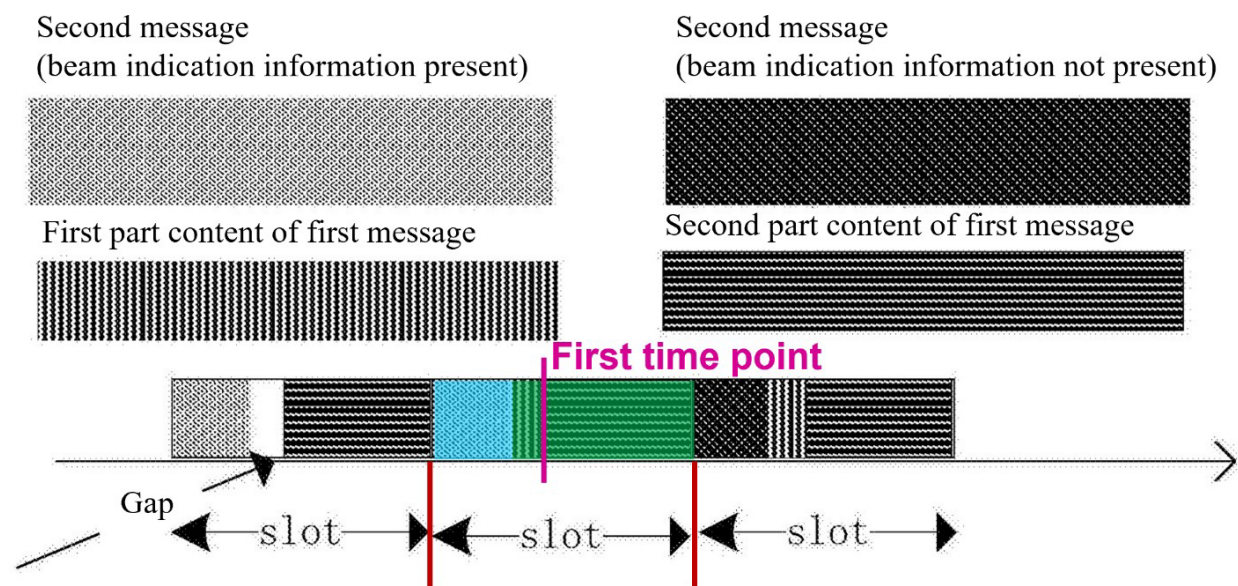
	<u>Lee Provisional, FIG. 12</u>
<u>wherein the first transport block and the second transport block are multiplexed using time division multiplexing such that the second transport block is received subsequent to the first transport block; and</u>	<u>“Referring now to FIG. 12, a dual TB transmission scheme is shown. The two or more transport blocks may be transmitted with a same beam as the control channel, or may be transmitted with different beams. FIG. 12 illustrates an example of two transport blocks transmitted in a TDM fashion within a TTI. The transmission of the individual transport blocks may use the same beam as the control channel, or may use a different beam. In the latter case, the narrow beam ID may need to be signaled in the control region of the TTI.” Lee Provisional, [0153]; see also FIG. 12, [0154].</u>
<u>a processor configured to switch a receive beam of the WTRU from the first beam to the second beam, to receive the second transport block, based on beam information associated with the second beam received in one of the at least one control signal.</u>	<u>“[T]he WTRU 102 may include a processor 118, a transceiver 120, [and] a transmit/receiver element 122” Lee Provisional, [0045].</u> <u>“Referring now to FIG. 12, a dual TB transmission scheme is shown. The two or more transport blocks may be transmitted with a same beam as the control channel, or may be transmitted with different beams. FIG. 12 illustrates an example of two transport blocks transmitted in a TDM fashion within a TTI. The transmission of the individual transport blocks may use the same beam as the control channel, or may use a different beam. In the latter case, the narrow beam ID may need to be signaled in the control region of the TTI.” Lee Provisional, [0153].</u>



B. Chen

[44:60](#). Similarly, *Chen*, which claims priority to Chinese Patent Application No. 201710307962.5 that was filed on May 4, 2017, also discloses a method in a UE where a beam used for receiving signals from a base station is switched from one beam to another during a transmission period. Referring to FIG. 4, *Chen* discloses that a **first message** and a **second message** are transmitted from a base station to a UE. *Chen*, 17, FIG. 4; *Chen Priority*, [0128], FIG. 4. *Chen* further discloses that the first message may be a “data” message and that the second message may be a “control message.” *Chen*, 12; *Chen Priority*, [0123].





Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

[12.61](#). As shown, the first message includes two parts. *Chen*, 17; *Chen Priority*, [0151]. *Chen* discloses that the first part of the first message can be received using the reception beam currently being used (i.e., the reception beam used to receive the second message), and then, the reception beam may be switched to another reception beam at a **first time point** to receive the second part of the first message. *Chen*, 13; *Chen Priority*, [0128].

[13.62](#). *Chen* is analogous art to the '081 patent because *Chen*, like the '081 patent, is directed to a wireless communication system for transmitting/receiving signals between a UE and a base station, and methods for switching a receiving beam during a data transmission period. *Chen*, 11, 13, FIG. 4; *Chen Priority*, [0118], [\[0128\]](#), [FIGS. 1 and 4](#); '081 patent, 1:16-20.

[\[0128\]](#), [FIGS. 1 and 4](#); '081 patent, 1:16-20; Kakaes, ¶¶60-62.

63. I understand that *Chen* is prior art based on its Chinese Application filing date of May 4, 2017. I understand that a prior art reference may be entitled to its foreign priority application filing date if (1) the foreign priority application contains support for at least one claim of the prior art reference, and (2) each part of the prior art reference being relied upon as prior art has support in the foreign priority application.

64. In my opinion, at least claim 1 of *Chen* is supported by its foreign priority application, as shown in the chart below. In addition, I believe each citation that I rely on from *Chen* is supported by its foreign priority application, as shown in the sections below.

<u>Claim 1 of <i>Chen</i></u>	<u>Support in <i>Chen</i> Priority (Ex. 1013)</u>
<u>1. A message decoding method includes:</u>	<u>“A message-decoding method.” <i>Chen</i> Priority, claim 1; see also FIGs. 1A-1B, [0033]-[0053]</u>
<u>receiving, by the receiving device, a second message that is sent by the sending end device and is associated with the first message;</u>	<u>“a receiving end receiving a second message associated with a first message from a transmitting end.” <i>Chen</i> Priority, claim 1; see also FIGs. 1B, 10, 12; [0045]-[0049], [0144]-[0150], [0153]-[0208]</u>
<u>determining, by the receiving end device, a target receiver parameter for decoding the first message according to the second message;</u>	<u>“said receiving end determining, based on said second message, a target receiver parameter for decoding said first message.” <i>Chen</i> Priority, claim 1; see also FIGs. 1B, 10, 12; [0045]-[0046], [0050]-[0053], [0144]-[0150], [0153]-[0208]</u>

the receiving end device decodes the first message sent by the sending end device according to the target receiver parameter.

“said receiving end decoding said first message transmitted by said transmitting end based on said target receiver parameter.” *Chen Priority*, claim 1; *see also* FIGs. 1B, 10, 12; [0045]-[0046], [0050]-[0053], [0144]-[0150], [0153]-[0208]

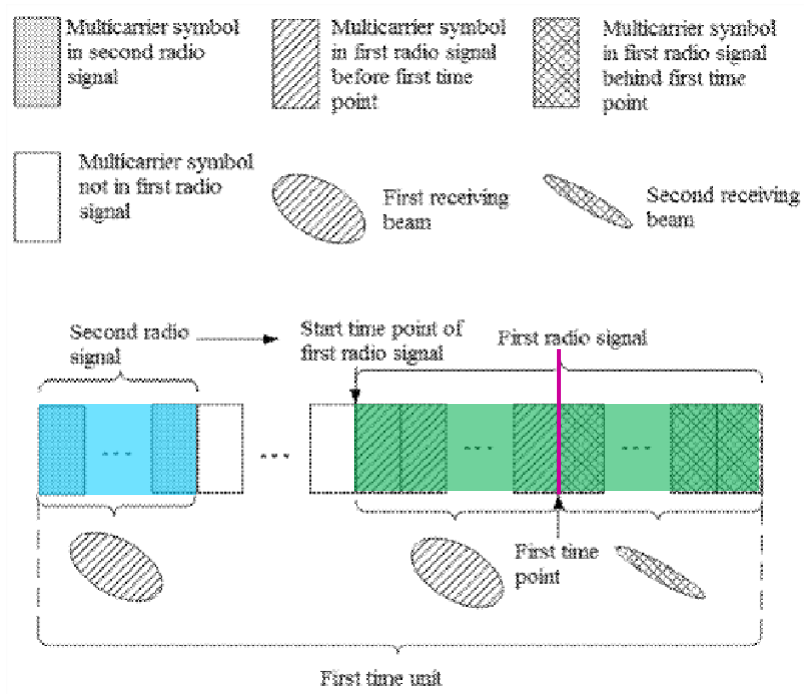
H.VIII. THE '081 PATENT

A. Alleged Invention of the '081 Patent ~~in View of Prior Art~~

~~14.65. Viewed against this backdrop of the prior art, the '081 patent simply describes methods and devices for wireless communications between a UE and a base station that use known procedures.~~

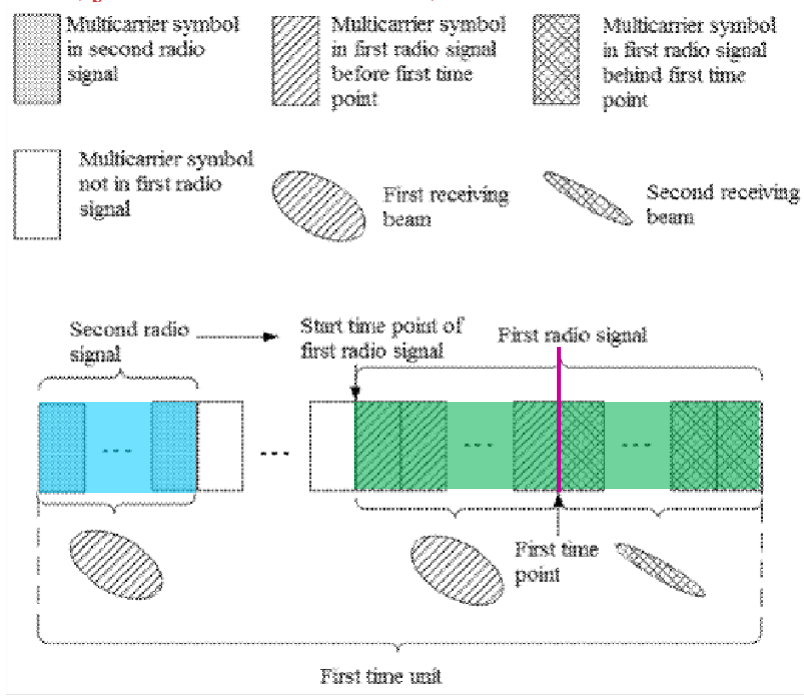
~~Kakaes, ¶65. Just like *Lee* and *Chen*, the~~ The '081 patent discloses switching a receiving beam during a transmission period between the UE and the base station. '081 patent, 17:16-18:29. And just like *Lee* and *Chen*, the '081 patent contemplates a transmission scheme in which the UE receives a second radio signal (e.g., **control information**) and a first radio signal (e.g., **user data**), as shown in annotated FIG.

7 below. ~~Id~~ '081 patent, 17:16-18:29.



~~'081 patent, FIG. 7 (annotated).~~

Also, just like *Lee and Chen*, the



'081 patent, FIG. 7 (annotated).

15-66. The '081 patent discloses that the UE uses a **wide beam** (depicted

above as a “wide oval”) for receiving a first portion of the first radio signal before a **first time point** and switches to a **narrow beam** (depicted above as a “narrow oval”) for receiving a second portion of the first radio signal after the first time point. ’081 patent, 17:16-18:29; ~~Kakaes, ¶66~~.

~~16.67.~~ As ~~explained~~ I explain in more detail below, ~~nothing~~ none of this differentiates the claims of the ’081 patent from the prior art.

B. Prosecution History

~~17.68.~~ ~~During~~ I understand that during prosecution of the ’081 patent, the ~~Examiner~~ examiner rejected all the claims, finding that the prior art (US 2018/0083680 to Guo et al.) disclosed the methods and systems recited in original independent claims 1, 6, 11,

~~and systems recited in original independent claims 1, 6, 11, and 15, respectively.~~

Ex-1003, 96-102. In response, the ~~Applicant~~applicant amended independent claim 1 by adding features of dependent claims 2 and 3 (and making similar amendments to the other independent claims). ~~Id., Ex-1003, 195-201.~~ The ~~Applicant~~applicant then argued that the prior art does not disclose either a determination is made as to when a time-domain resource occupied by the given multicarrier symbol occurs relative to the first time point or a determination is made for the use of the second radio signal, depending on whether the “time-domain resource occupied by the given multicarrier symbol” was “behind” or “before” the first time point. ~~Id., 201.~~ ~~The Examiner subsequently allowed the claims, after making only a minor Examiner’s Amendment to change the term “if” to “when.” Id., 207-215~~Ex-1003, 201.

~~The Examiner, however, was not aware of Lee or Chen, the prior art applied in this Petition, when the claims were allowed. Lee and Chen disclose the limitations the Applicant argued were not in the prior art. Lee and Chen thus anticipate and/or render obvious the claims, and they should never have been allowed.~~

69. The examiner subsequently allowed the claims, after making only a minor examiner’s amendment to change the term “if” to “when.” Ex-1003, 207-215.

C. Claim Construction

~~The Board construes claims per *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Claims must be construed only to the extent necessary to resolve a controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*,~~

~~868 F.3d 1013, 1017 (Fed. Cir. 2017). Here, no terms need construction to resolve the controversy in this forum.⁴~~

~~III.—STATEMENT OF PRECISE RELIEF REQUESTED~~

~~A.—Prior Art~~

~~*Lee*, which was filed on November 10, 2016, designated the U.S., and claimed priority to a provisional application filed on November 10, 2015, is prior art to the '081 patent under 35 U.S.C. § 102(a)(2). *Lee* is entitled to both its PCT filing date of November 10, 2016, which is sufficient to render it prior art, as well as its provisional application filing date of November 10, 2015, which further antedates the '081 patent. Kakaes, ¶¶58–59.~~

~~*Chen*, which published November 8, 2018, designated the U.S., and claimed priority to Chinese Application No. 201710307962.5 filed May 4, 2017, is prior art to the '081 patent under 35 U.S.C. §§ 102(a)(2). *Chen* is entitled to its Chinese priority application filing date of May 4, 2017. Kakaes, ¶¶63–64. Support in the Chinese priority application for at least one claim of *Chen* is shown in the claim chart below, and support for each citation relied upon from *Chen* is set forth in the~~

⁴~~Petitioner reserves the right to argue in an appropriate forum that certain limitations in the challenged claims are indefinite.~~

~~sections below, thus substantiating *Chen*'s entitlement to its Chinese priority application filing date. *Id.*~~

~~Claim 1 of <i>Chen</i> (Ex. 1012)~~	~~Support in <i>Chen</i> <i>Priority</i> (Ex. 1013)~~
~~1. A message-decoding method, comprising:~~	~~"A message-decoding method." <i>Chen Priority</i>, claim 1; see also FIGs. 1A- 1B, [0033]-[0053]~~
~~a receiving end device receiving a second message associated with a first message from a transmitting end device;~~	~~"a receiving end receiving a second message associated with a first message from a transmitting end." <i>Chen</i> <i>Priority</i>, claim 1; see also FIGs. 1B, 10, 12; [0045]- [0049], [0144]-[0150], [0153]- [0208]~~
~~said receiving end device determining, based on said second message, a target receiver parameter for decoding said first message; and~~	~~"said receiving end determining, based on said second message, a target receiver parameter for decoding said first message." <i>Chen Priority</i>, claim 1; see also FIGs. 1B, 10, 12; [0045]- [0046], [0050]-[0053], [0144]-[0150], [0153]-[0208]~~
~~said receiving end device decoding said first message transmitted by said transmitting end device based on said target receiver parameter.~~	~~"said receiving end decoding said first message transmitted by said transmitting end based on said target receiver parameter." <i>Chen Priority</i>, claim 1; see also FIGs. 1B, 10, 12; [0045]-[0046], [0050]-[0053], [0144]-[0150], [0153]-[0208]~~

~~B. Challenge~~

~~Ground~~	~~Challenged Claims~~	~~Bas is~~	~~Prior Art~~
~~1~~	~~1-12~~	~~§ 102~~	~~Lee~~
~~2~~	~~1-12~~	~~§ 103~~	~~Chen in view of Lee~~

70. I have been instructed that the “intrinsic record” includes the patent itself, including the claims, description, and figures (Ex. 1001, ’081 patent), and the patent’s prosecution history—i.e., the record of proceedings at the U.S. Patent and Trademark Office (“Patent Office”) concerning the patent (Ex. 1003, Prosecution History). I understand that, like the claims and written description, the prosecution history provides evidence to a person of ordinary skill in the art of how the inventor intended his patent to be understood, and how the Patent Office

understood the patent. I understand that the inventor is permitted to apply a special definition to the terms or to limit the scope of claim terms in his patent claims, which may differ from the term's plain and ordinary meaning. That special definition or limitation on scope may be provided in the patent's written description, the patent's prosecution history, or both.

71. I understand that claim interpretation may also be informed by "extrinsic evidence" (that is, evidence outside of the patent record itself). I have been informed that extrinsic evidence may include dictionaries, technical treatises, and other materials evidencing the meaning of a claim term and the understanding held by a POSITA in the relevant time period.

72. I have been asked for purposes of this declaration to apply the plain and ordinary meaning of the claim terms as they would have been understood by a person of ordinary skill in the art at the earliest claimed priority date of the '081 patent.

73. I understand that no claim term's construction is in dispute at this time. Based on my review of these materials and my personal knowledge and experience, I have considered each term of the '081 patent as it would have been understood by a person of ordinary skill in the art at the earliest claimed priority date of May 8, 2017.

III.IX. LEVEL OF ORDINARY SKILL IN THE ART

74. AIn rendering the opinions set forth in this declaration, I have been asked to consider the '081 patent's claims and the prior art through the eyes of a person of ordinary skill in the art (which I may also refer to as "one skilled in the art," "skilled artisan," "POSITA," or similar variation). I have considered factors such as the educational level and years of experience of those working in the pertinent art, the types of problems encountered in the art, the teachings of the prior art, patents and publications of other persons or companies, and the sophistication of the technology.

48-75. Taking the factors described in the Legal Standards – Level of Ordinary Skill section into consideration, it is my opinion that a person of ordinary skill in the art ("POSITA") would have had at least a ~~master's~~ Master's degree in electrical engineering or a similar field and at least two years of experience working with telecommunications systems, including multiple-input multiple-output (MIMO) technology. Additional relevant work experience can compensate for less education, and *vice versa*. ~~Kakaes, Section IX.~~

X. GROUND OF UNPATENTABILITY

76. Based on my review of the materials set forth above, including my application of the knowledge of a person of ordinary skill in the art, it is my

opinion that claims 1-12 of the '081 patent would have been anticipated and/or obvious to one of ordinary skill in the art.

77. In particular, it is my opinion that claims 1-12 of the '081 patent would have been anticipated and/or obvious to a person of ordinary skill in the art based on the prior art shown below:

<u>Ground</u>	<u>Claims</u>	<u>Basis</u>	<u>Prior Art</u>
<u>1</u>	<u>1-12</u>	<u>§ 102</u>	<u>Lee</u>
<u>2</u>	<u>1-12</u>	<u>§ 103</u>	<u>Chen in combination with Lee</u>

IV.XI. THE CHALLENGED CLAIMS ARE UNPATENTABLE OVER THE PRIOR ART

78. In my opinion, claims 1-12 would have been anticipated and/or obvious to one skilled in the art at the earliest priority date of the '081 patent.

A. Ground 1: Claims 1-12 Are Anticipated by Lee

1. ~~Independent~~ Claim 1

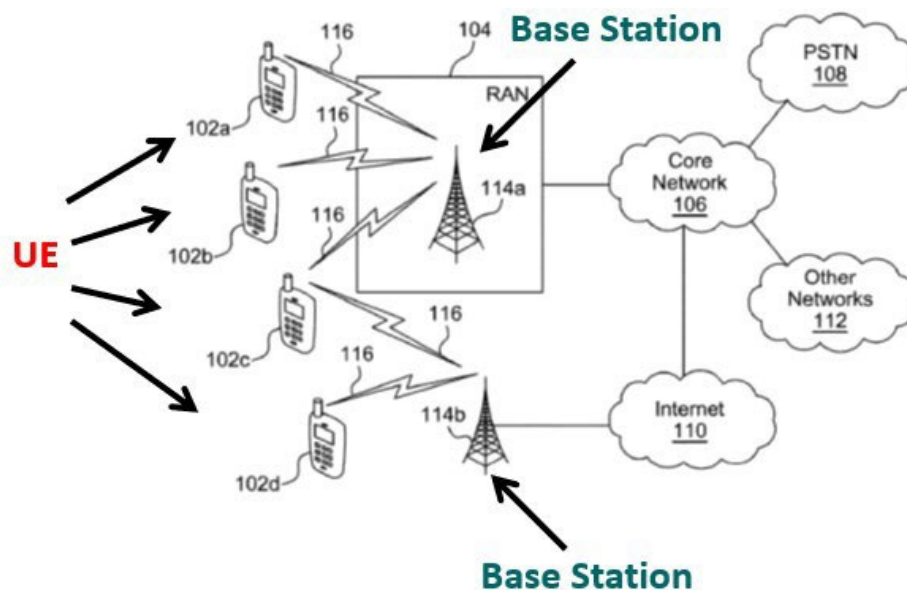
- a. [1pre]: “A method in a User Equipment (UE) for wireless communication, comprising:”

~~19.79. To the extent the preamble is limiting,~~ Lee discloses a method in a user equipment (UE) for wireless communication. ~~Kakaes, ¶¶ 79-81.~~ As shown in annotated FIG. 1A below, Lee discloses a wireless communication system 100

including “**wireless transmit/receive units (WTRUs)**~~102a, 102b, 102c, 102d.~~”

102a, 102b, 102c, 102d.” Lee, [0040].⁵]; Lee Provisional, [0034]. Lee explains that “the WTRUs “102a, 102b, 102c, 102d may be configured to transmit and/or receive wireless signals and may include **user equipment (UE)**.” *Id.*), a mobile station, a fixed or mobile subscriber unit, a pager, a cellular telephone, a personal digital assistant (PDA), a smartphone, a laptop, a netbook, a personal computer, a wireless sensor, consumer electronics, and the like.” Lee, [0040]; Lee Provisional, [0034].

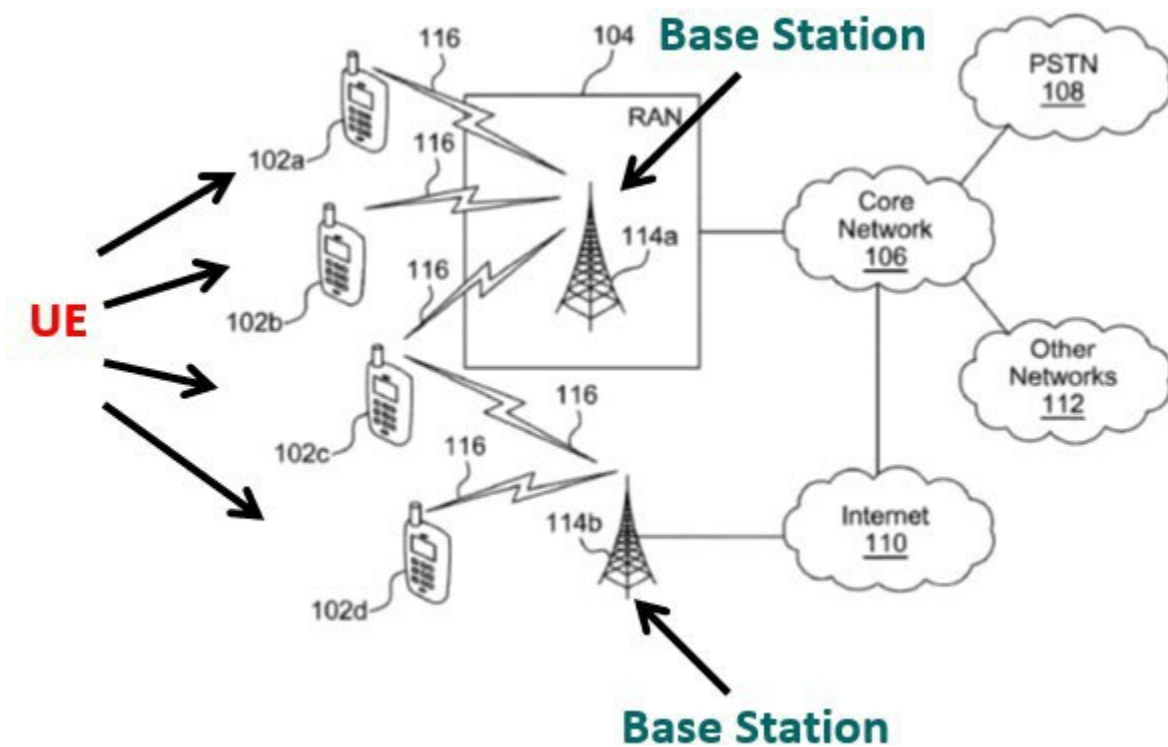
20-80. Lee further discloses that wireless communications system 100 includes “a **base station** 114a and a **base station** 114b,” and that “[e]ach of the base stations 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs.” 102a, 102b, 102c, 102d.” Lee, [0041]; Lee Provisional, [0035].



Lee, FIG. 1A (annotated).

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³ All emphasis is added unless noted otherwise. Also, all figures in this petition containing color are annotated relative to the original figures in the patent or prior art and all text in color is added.



Lee, FIG. 1A (annotated); Lee Provisional, FIG. 1A.

21.81. One wireless communication method described in *Lee* is a method implemented by the WTRU (UE) that includes “receiving, in a time transmission interval (TTI), at least one control signal, a first transport block and a second transport block.” *Lee*, [0259]; Lee Provisional, [0153]-[0157]. This method in a UE for wireless communication is described in more detail below. ~~Kakaes, ¶81.~~

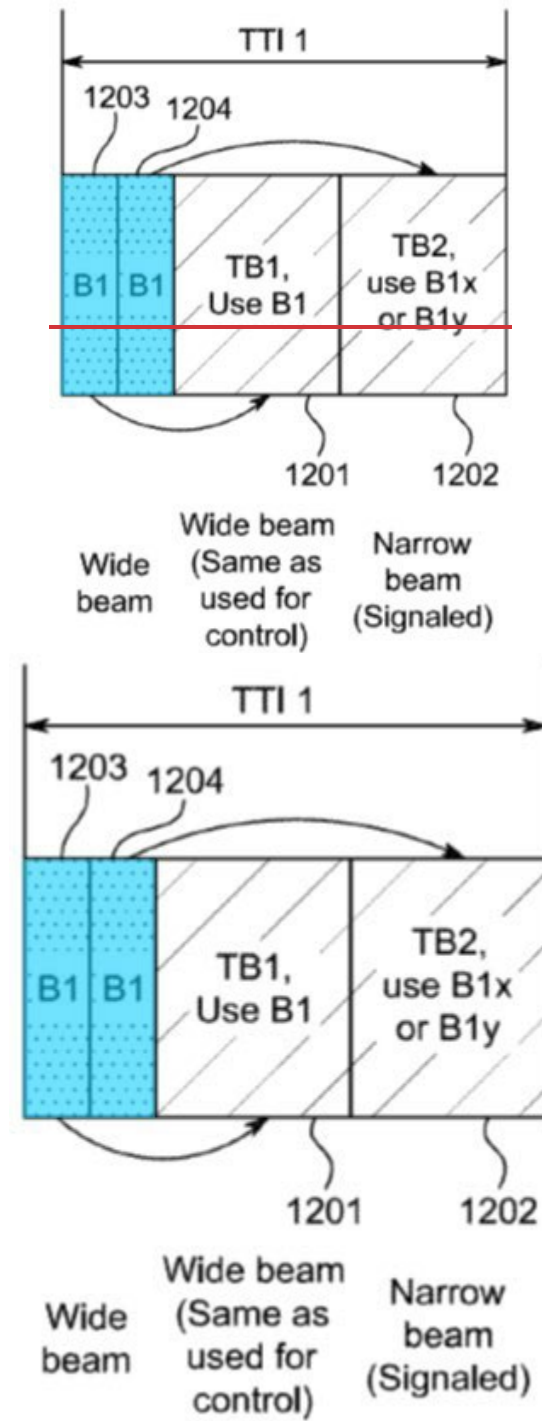
b. [1a]: “receiving a second radio signal;”

22.82. *Lee* discloses that the WTRU (UE) receives a “second radio signal” from the base station. ~~Kakaes, ¶82;~~ *Lee*, [0167], [0168]; *see also* [0009]-[0011], [0169], [0171], [0157], [0160]-[0161], [0258], [0259], [0261], [0262], FIGS. 10, and 19; *Lee*

Provisional, [0153]-[0157], [0144]-[0149], FIG. 10. For example, the '081 patent states that the “second radio signal” can be “a PDCCH [Physical Downlink Control Channel]” or “a DCI [Downlink Control Information] carrying downlink assignment.” '081 patent, 3:59-4:2, *see also* 18:19-22. Like the '081 patent, *Lee* discloses that the WTRU (UE) receives a “control channel” that includes “DCI [Downlink Control Information].” *Lee*, [0167], [0168]~~+~~; *Lee Provisional, [0153]-[0157]*. The control information is represented as “**control data B1**” in annotated FIG. 12 below:⁶~~Id.~~⁴ *Lee*, [0167], [0168]; *Lee Provisional, [0153]-[0157]*.

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⁴ *Lee* explains that the terms control, control signal, control channel, control channel beam, and PDCCH (among other terms) may be used interchangeably. *See Lee*, [0086]; *Lee Provisional, [0077]*.



Lee, FIG. 12 (annotated); *Lee Provisional*, FIG. 12.

To the extent Patent Owner argues that the two portions (i.e., 1203 and 1204) for control data B1 illustrated in FIG. 12 of *Lee* cannot together constitute

the claimed “second radio signal,” such an interpretation would be incorrect.

~~23-83.~~24-84.~~Kakaes, ¶83.~~ The ’081 patent does not preclude the “second radio signal” from having multiple portions.~~Id.~~ To the contrary, the ’081 patent indicates radio signals can have multiple portions. *See, e.g.*, ’081 patent, 9:35-37, 17:58-60, 18:3-4, 18:10-12; ~~FIG. 7; Kakaes, ¶83; see also infra Section VI.A.1.e.~~

7.

c. [1b]: “receiving a first radio signal;”

~~24-84.~~24-84.~~Lee~~ further discloses that the WTRU (UE) receives a “first radio signal” from the base station. ~~Kakaes, ¶84; Lee, [0167], [0168]; see also [0009]-[0011], [0079],~~

[0110], [0155], [0166], [0168], [0258], [0259], [0261], [0262], FIGS. 10,

and 19;

Lee Provisional, [0153]-[0157], [0208]; *see also* [0101], [0144], [0152], FIG.

10. For example, the '081 patent states that the "first radio signal" can be "a PDSCH [Physical Downlink Shared Channel]," "consecutive data transmission block in time domain," or "G consecutive multicarrier symbols in time domain."

'081 patent, 2:19-23. PDSCH is a well-known physical downlink channel for

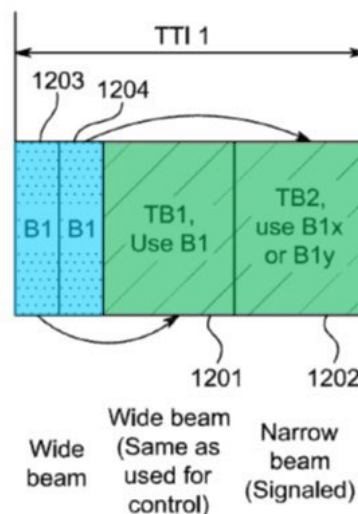
carrying user data. ~~Kakaes~~, ¶84. Like the '081 patent, *Lee* discloses that the WTRU

(UE) receives two transport blocks TB1 and TB2 that carry "data."⁷ ⁵ *Lee*, [0167],

[0168]; *see also* [0110]; *Lee Provisional*, [0153]-[0157]; *see also* [0101]. The

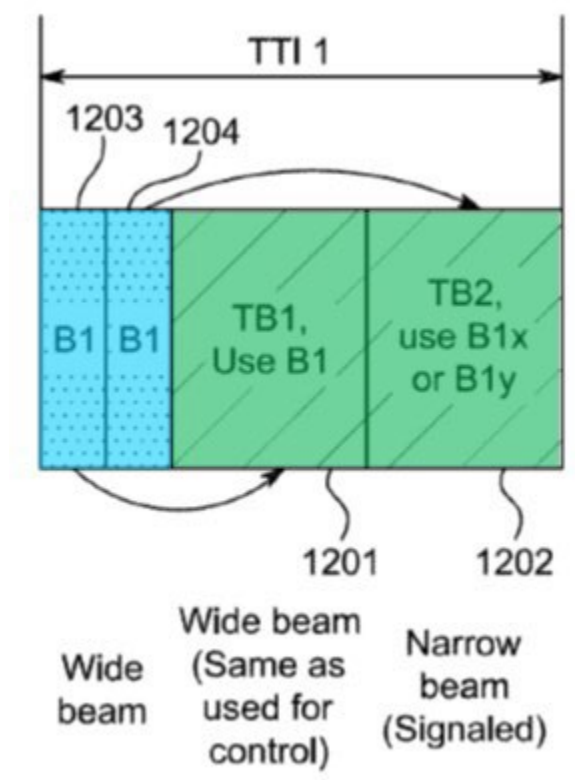
transport blocks TB1 and TB2 are shown in annotated FIG. 12 below. *Lee*,

[0167], [0168]; *Lee Provisional*, [0153]-[0157].



~~*Lee*, FIG. 12 (annotated).~~

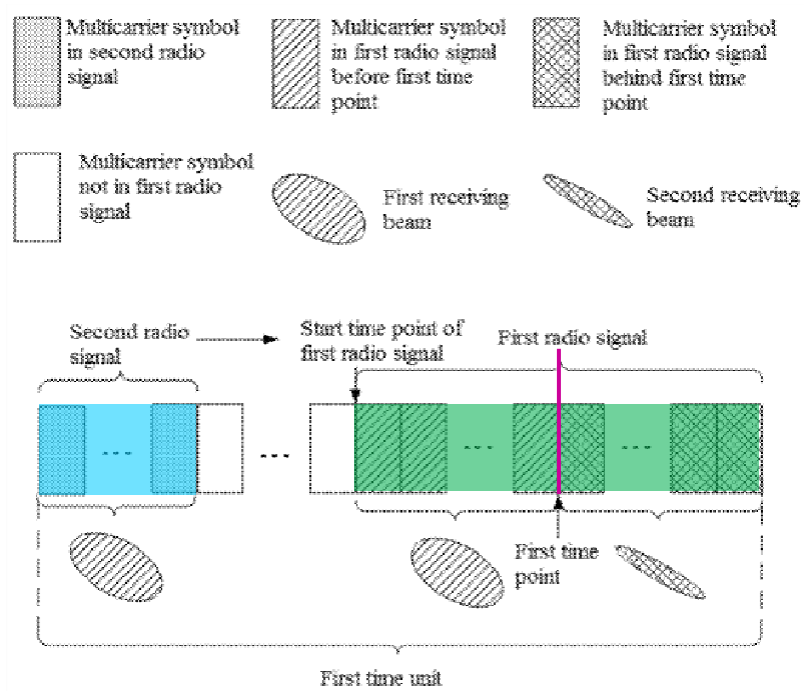
⁵ *Lee* explains that the terms data, data signal, data channel, data channel beam, and PDSCH (among other terms) may be used interchangeably. *See Lee*, [0086]; *Lee Provisional*, [0077].



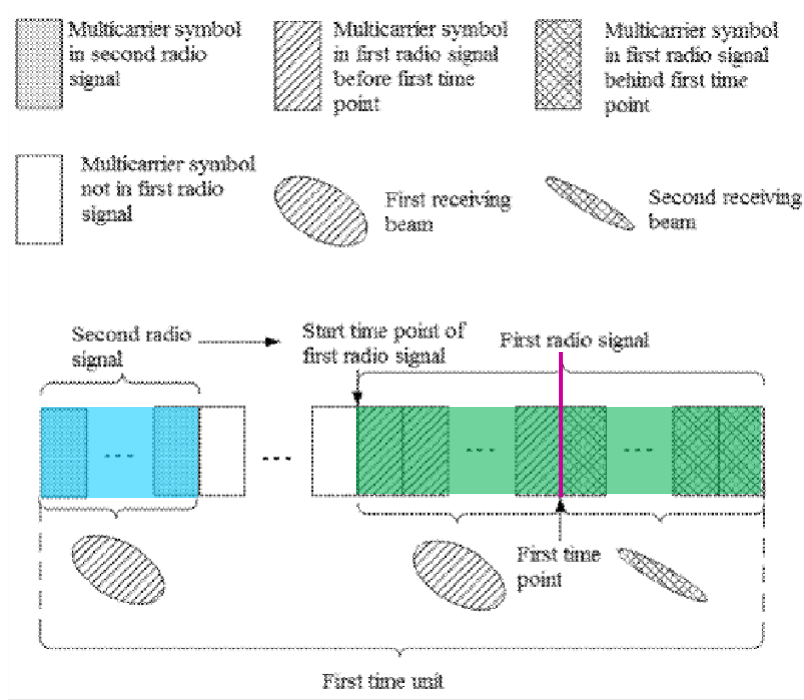
Lee, FIG. 12 (annotated); Lee Provisional, FIG. 12.

[25-85](#). To the extent Patent Owner argues that *Lee*’s two transport blocks TB1 and TB2 in FIG. 12 cannot together constitute the claimed “first radio signal,” such an interpretation would be incorrect. ~~Kakaes, ¶85.~~ The ’081 patent does not preclude the “first radio signal” from having multiple portions. ~~Id.~~ To the contrary, the claims require the first radio signal to have multiple portions. *See, e.g.,* ’081 patent, 21:11-12; ~~Kakaes, ¶85.~~ 12 (“the first radio signal comprises G multicarrier symbols”).

[26-86](#). Moreover, just like *Lee*’s FIG. 12, the ’081 patent discloses an embodiment where two different receiving beams are used for receiving the first radio signal, as shown in annotated FIG. 7 below. ’081 patent, FIG. 7, 18:13-18.



~~'081 patent, FIG. 7 (annotated).~~



'081 patent, FIG. 7 (annotated).

[27.87](#). Because two different receiving beams are used for receiving the first radio signal, a POSITA would understand that the first radio signal includes at least two portions (e.g., transmission blocks). ~~Kakaes, ¶¶86-87~~. Thus, any proposed construction of “first radio signal” that excludes *Lee*’s two transport blocks TB1 and TB2 would ~~improperly exclude embodiments disclosed in~~ be inconsistent with the ’081 patent.

~~*Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276 (Fed. Cir. 2008).~~

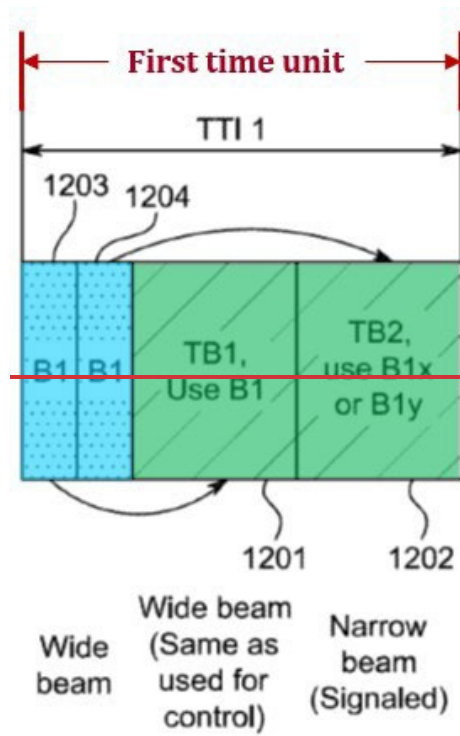
d. [1c]: “wherein the first radio signal is transmitted within a first time unit,”

[28.88](#). *Lee* discloses that transport blocks TB1 and TB2 (“first radio signal”) are transmitted within a single transmission time interval (TTI) (“first time unit”).

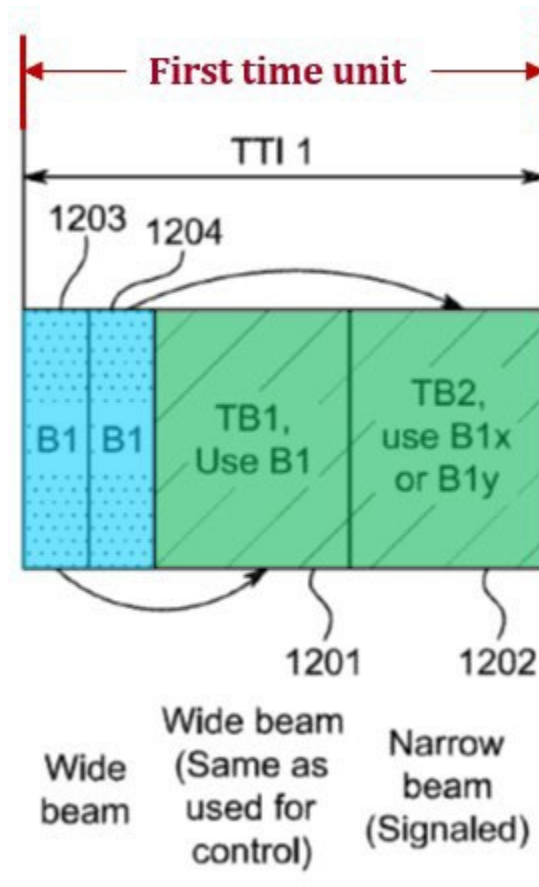
~~Kakaes, ¶88; Lee~~, [0167]; *see also* [0155], [0166], FIG. ~~10~~10; *Lee Provisional*,

[0153]; see also [0144], [0152], FIG. 10. For example, as shown in annotated FIG. 12 below, *Lee* discloses “two **transport blocks 1201 and 1202** transmitted (multiplexed) in a ~~TDM fashion within a single TTI (e.g., TTI 1).~~” *Lee*, [0167].

TDM fashion within a **single TTI** (e.g., TTI 1)."



Lee, [0167]; Lee Provisional, [0153].



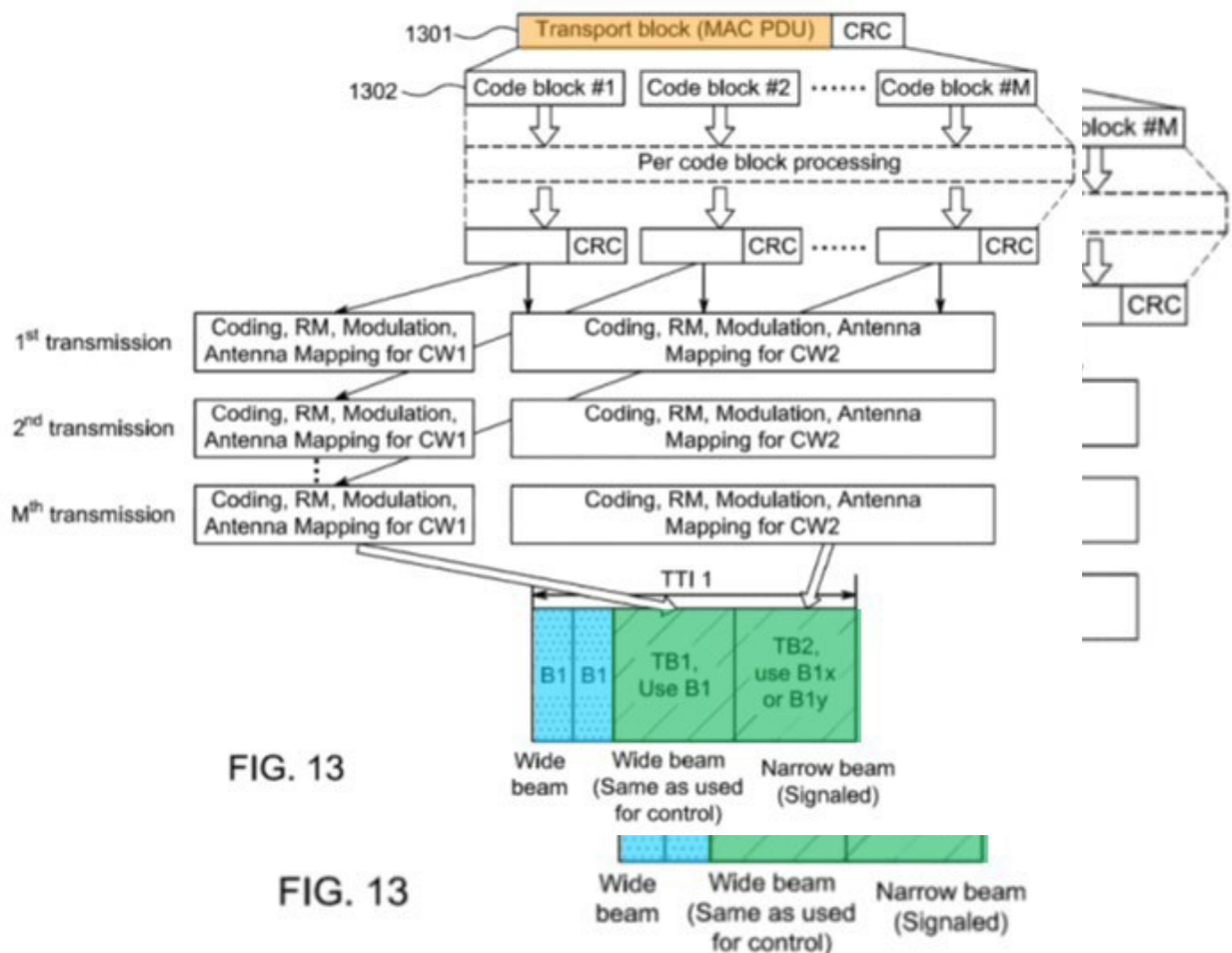
Lee, FIG. 12 (annotated); Lee Provisional, FIG. 12.

29-89. The '081 patent specification states that the “first time unit” can be “a Transmission Time Interval (TTI).” '081 patent, 2:30-31. Thus, *Lee*’s single TTI constitutes the claimed “first time unit.” ~~Kakaes, ¶89.~~

e. [1d]: “a first bit block is used for generating the first radio signal, and”

30-90. *Lee* discloses that a Medium Access Control Protocol Data Unit (MAC PDU) (“first bit block”) is used to generate transport blocks TB1 and TB2

(“first radio signal”). ~~Kakaes, ¶¶90-92~~; *Lee*, [0110], [0224]-[0230], FIGS. 13-14; *Lee Provisional*, [0101], [0209]-[0215], FIGS. 13-14. For example, as shown in annotated FIG. 13 below, *Lee* discloses that “[a] physical downlink **data channel** may carry payload information in the form of **Medium Access Control (MAC) Protocol Data Unit (PDU)** from the MAC layer,” and that “[t]he resource allocation of this channel may be carried in the scheduling information in the physical downlink **control channel**.” *Lee*, [0110]; *Lee Provisional*, [0101].



Lee, FIG. 13 (annotated~~1~~); Lee Provisional, FIG. 13.

~~31-91.~~ It was well known at the time of the earliest claimed priority date that a MAC PDU is a bit block. ~~Kakaes, ¶91 (citing Ex. 1008 (TS-36.321), 49, stating discloses~~ that “[a] MAC PDU is a bit string that is byte aligned (i.e. multiple of 8 bits) in length.” ~~Redermund, ¶¶81-87.”~~ Ex. 1008 (TS-36.321), page 49. Thus, Lee’s MAC PDU constitutes the claimed “first bit block [that] is used for generating the first radio signal.” ~~Id.~~

92. Consistent with my opinion above, Lee’s MAC PDU is also subject to similar steps as the bit block in the ’081 patent’s specification. In particular, the ’081 patent specification explains that the claimed “first bit block” is “subjected to steps of Circular [sic] Redundancy Check (CRC) addition, segmentation, channel coding, rate matching, scrambling, modulation, [and] antenna mapping to form the first radio signal.” ’081 patent, 2:39-52. Just like the ’081 patent, Lee’s MAC PDU is subjected to the same steps for generating the transport blocks TB1 and TB2. As shown in annotated FIG. 13 above, Lee discloses that “a single MAC PDU” is processed through a cyclic redundancy check (CRC) addition at 1301, code-block partitioning (segmentation) at 1302, per-code-block processing (per block CRC addition), coding, rate matching (RM), modulation, and antenna mapping for codeword to form a codeword #1 and a codeword #2 that are mapped to TB1 and TB2, respectively. See Lee, [0224]-[0230], FIGS. 13-14; see also [0168], [0169], [0222]; Lee Provisional, [0209]-[0215], FIGS. 13-14; see also [0153]-[0157],

| [0207], [0208]. *Lee* further discloses that the above process includes scrambling.

Lee, [0074] (“[t]he data channel beam may be identified or associated with a reference signal, an antenna port, a beam identity (ID), and/or a **scrambling** sequence number.”); Lee Provisional, [0066]. Thus, for these additional reasons, Lee’s MAC PDU constitutes the claimed “first bit block [that] is used for generating the first radio signal.”

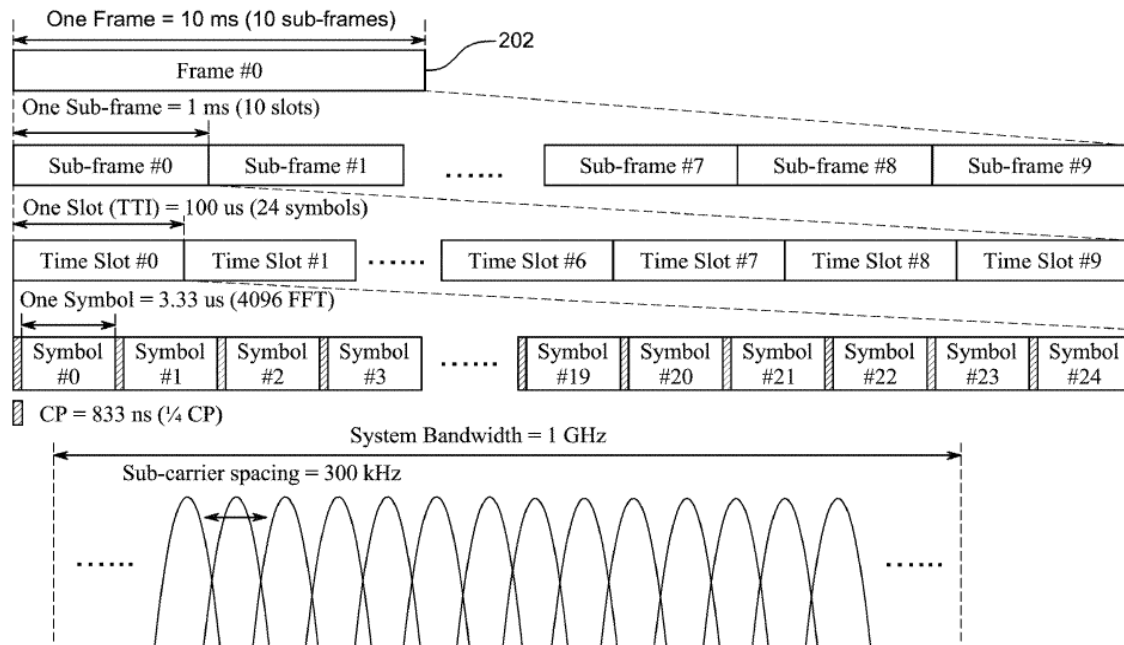
f. [1e]: “the first radio signal comprises G multicarrier symbols;”

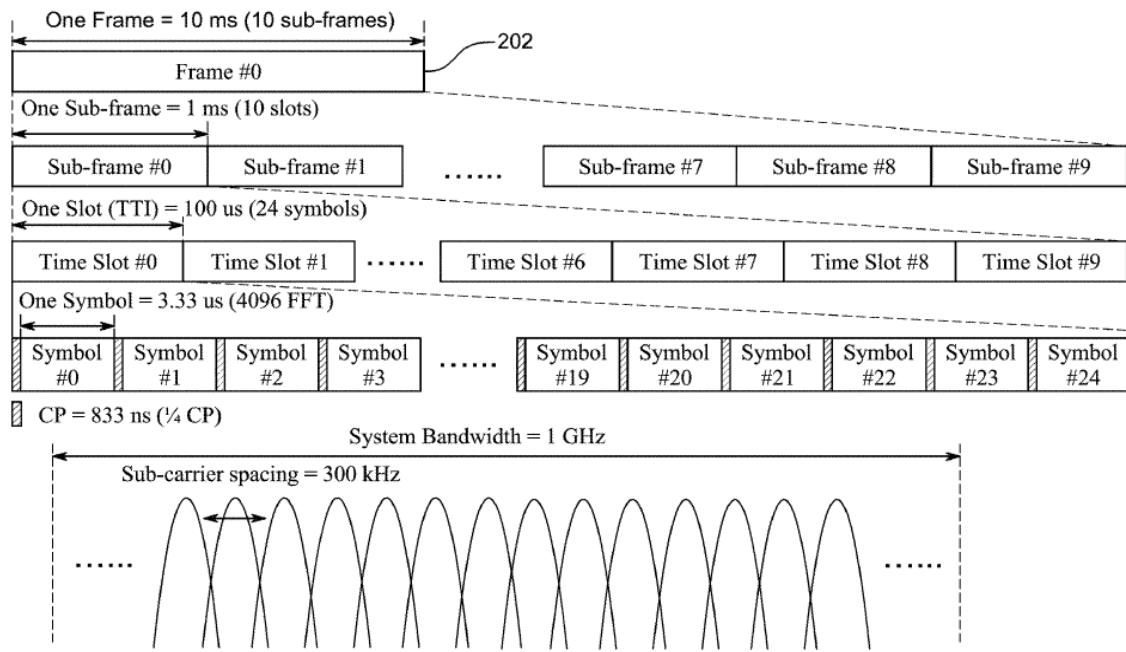
32-93. Lee’s transport blocks TB1 and TB2 (“first radio signal”) comprise a positive integer (“G”) number of orthogonal frequency-division multiplexing (OFDM) symbols (“multicarrier symbols”). ~~Kakaes, ¶¶93-96.~~

33-94. Lee discloses an OFDM frame structure that is commonly used for data transmission. ~~Kakaes, ¶¶94.~~ As shown in FIG. 2 below, in the time domain, a frame 202 “includes 10 sub-frames, each sub-frame includes 10 slots, and each slot includes 24 symbols.” Lee, [0095]; Lee Provisional, [0086]. In the frequency domain, each symbol includes multiple sub-carriers with a “sub-carrier spacing of 300 kHz.” ~~Id.~~; Lee, [0095]; Lee Provisional, [0086]; see also Lee, [0091]; Lee Provisional, [0082].

$F_s = 1228.8 \text{ MHz}$ $T_s = 0.814 \text{ ns}$

200





Lee, FIG. 2.; *Lee Provisional*, FIG. 2.

34.95. As shown in FIG. 2 above, *Lee* discloses that each TTI includes “24 symbols.” Thus, *Lee*’s TTI includes a positive integer number of OFDM symbols.

~~Kakaes, ¶¶95.~~ Indeed, it was well known in the art that OFDM symbols are designed such that a TTI includes an integer number of OFDM symbols, as evidenced by Ex. 1006 (*TR 25.892*). ~~Id.~~; Ex. 1006, (*TR 25.892*), 18 (disclosing that “the design of the parameter set leads to an **integer number of symbols per TTI (2 ms).**”); ~~Rodermund, ¶¶51-57.).~~

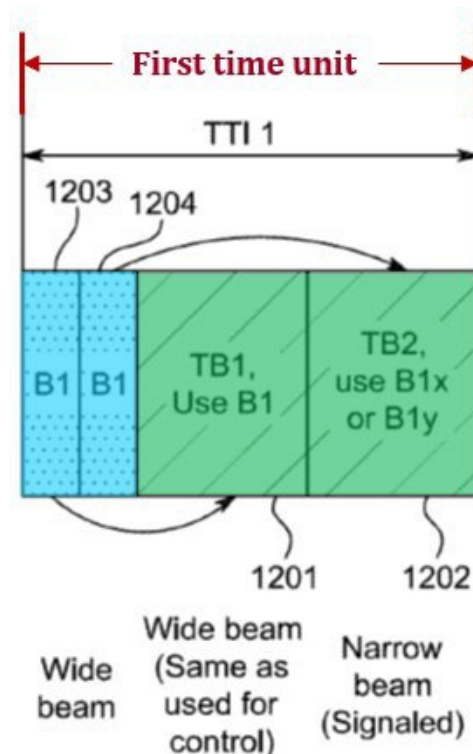
35.96. Among the positive integer number of OFDM symbols in each TTI (e.g., 24 OFDM symbols), *Lee* further discloses that a “data region” may be “part of the scheduling interval in time domain, which may be referred to in **units of OFDM symbols**, used for the transmission of all data channel beams in that

scheduling interval.” *Lee*, [0079]; *Lee Provisional*, [0070]. Thus, a POSITA would

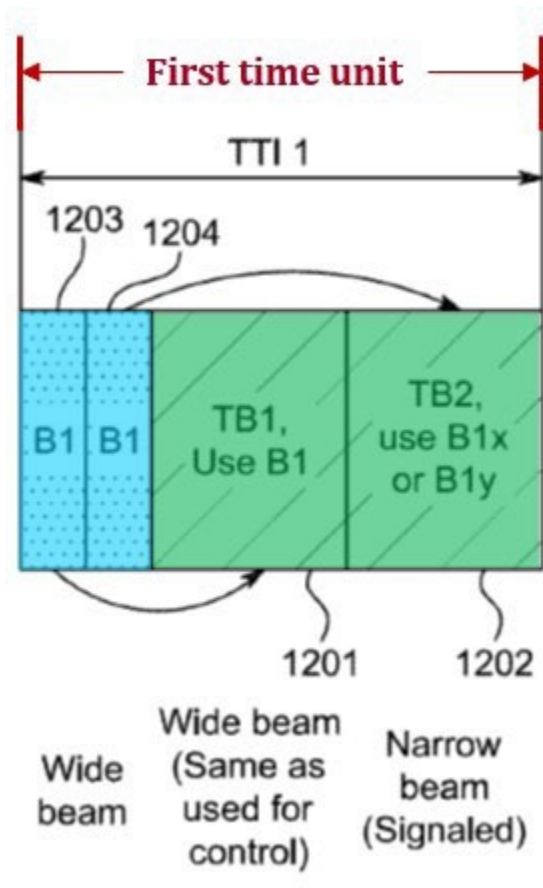
have understood that the data region (transport blocks TB1 and TB2 in FIG. 12) of *Lee* includes a positive integer number of OFDM symbols. ~~Kakaes, ¶96.~~ Indeed, a POSITA would have known that there cannot be a negative number of OFDM symbols. ~~Id.~~ Nor can there be fractions of OFDM symbols. ~~Id.~~ Thus, *Lee*'s transport blocks TB1 and TB2 ("first radio signal") comprise "G multicarrier symbols." ~~Id.~~

- g. [1f]: "the second radio signal is transmitted within the first time unit, and"

~~36-97.~~ *Lee*'s **control data B1** ("second radio signal") is transmitted within the same **single TTI** ("first time unit") as the **transport blocks TB1 and TB2**, as shown in annotated FIG. 12 below. *Lee*, [0167]; see also [0154]-[0155], FIG. 10; ~~Kakaes, ¶97.~~



Lee, Provisional, [0153]-[0157]; see also [0144]-[0149], FIG. 10.



Lee, FIG. 12 (annotated); Lee Provisional, FIG. 12.

- h. [1g]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

37.98. Lee discloses that control data B1 (“second radio signal”) is used for determining a time-domain resource occupied by transport blocks TB1 and TB2 (“first radio signal”), which includes G multicarrier symbols, as discussed for claim [1e]. ~~Kakaes, ¶¶ 98-100~~ See Section XI.A.1.f. It was well known that a control channel provides, among other things, control information associated with a data channel. ~~As the name “control” implies, the purpose of the control information is to provide instructions for receiving the data.~~ Further, it was well known that the

control information includes, among other things, scheduling information and time-domain resource information for determining time-domain resources of OFDM symbols in data transmission schemes such as *Lee's Id.*

information includes, among other things, scheduling information and time-domain resource information for determining the time-domain resource of OFDM symbols in data transmission schemes such as Lee's.

38.99. Indeed, *Lee* discloses these well-known features. For example, *Lee* discloses that “[a] physical downlink control channel may carry data related control information to identify, demodulate and decode the associated data channel properly.” *Lee*, [0109]; *Lee Provisional*, [0100]. As an example, *Lee* discloses that the control channel may carry **scheduling information** for the data channel.

~~Id.~~ *Lee*, [0110]; *Lee Provisional*, [0101]. As another example, *Lee* discloses that the control channel may indicate the “transmit beam” used for the data channel, where the transmit beam “may include one or more of following parameters: Tx or Rx beam width (e.g., beam subgroup), Tx or Rx beam direction (e.g., beam index) within the beam width, and a **time-frequency resource associated with the beam.**” *Lee*, [0148]; *Lee Provisional*, [0138]. Finally, with specific reference to FIG. 12, *Lee* discloses that “[t]he first transport block may be mapped on to a first codeword provided in the control Tx beam 1203 and the second transport block may be mapped on to a second codeword provided in control Tx beam 1204.” *Lee*, [0169]; *Lee Provisional*, [0158]-[0159]. And “[t]he codeword may be associated with: a specific beam or beam ID, a BRS, and/or a **time/frequency location.**”

~~Id.~~ *Lee*, [0169]; *Lee Provisional*, [0158]-[0159].

39-100. Further, because transport blocks are transmitted using multicarrier symbols, the scheduling information and time/frequency resource allocation information would have included the scheduling and time/frequency resource allocation of the multicarrier symbols. Thus, as was well known in the art at the time, a POSITA would have understood that *Lee*'s scheduling information and time/frequency information included in the control channel would have included the time-domain resource allocation for the multicarrier symbols in the data channel (e.g., transport blocks TB1 and TB2). ~~Kakaes, ¶100.~~ The reason for its inclusion is that *Lee*'s control data B1 would be "used for determining a time-domain resource occupied by the G multicarrier symbols" in transport blocks TB1 and TB2. ~~Id.~~

- i. [1h]: "as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;"

40-101. *Lee*'s WTRU (UE) "may employ MIMO technology." *Lee*, [0055]; *Lee Provisional*, [0048]. In particular, *Lee* discloses that "the WTRU 102 may include two or more transmit/receive elements 122 (e.g., **multiple antennas**) for transmitting and receiving wireless signals over the air interface 116." ~~Id.~~ *Lee*, [0055]; *Lee Provisional*, [0048]. One particular example of *Lee*'s multi-antenna system is shown below in FIG. 4. *Lee*, [0121]; see also [0122]-[0127], FIGS. 5-7;

Lee

~~[0122]-[0127]~~ Provisional, [0112]; see also [0113]-[0118], FIGS. 5-7; Kakaes, ¶101. As discussed above in

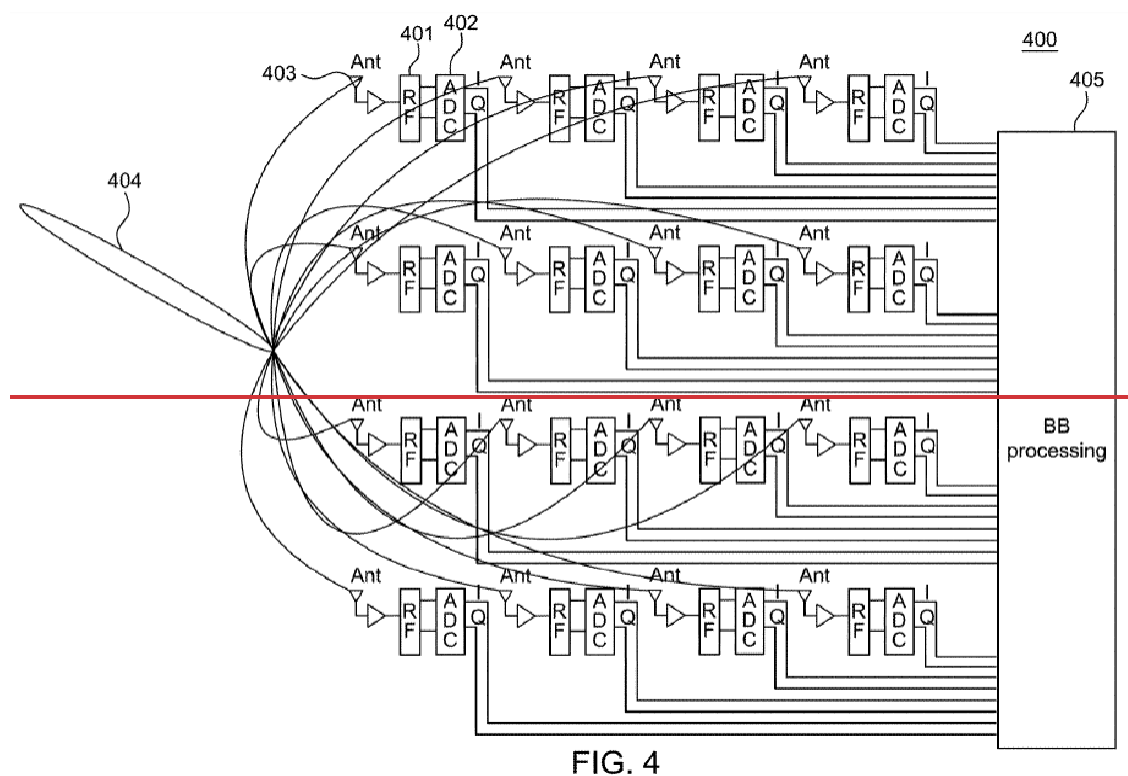
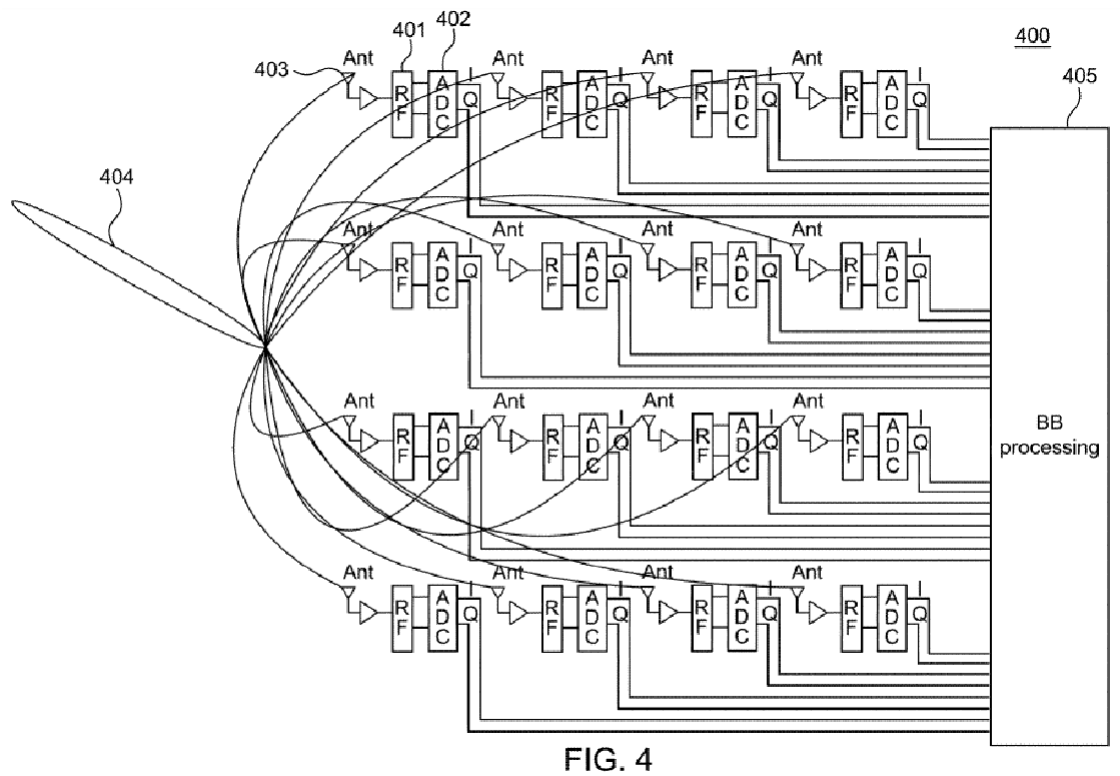


FIG. 4

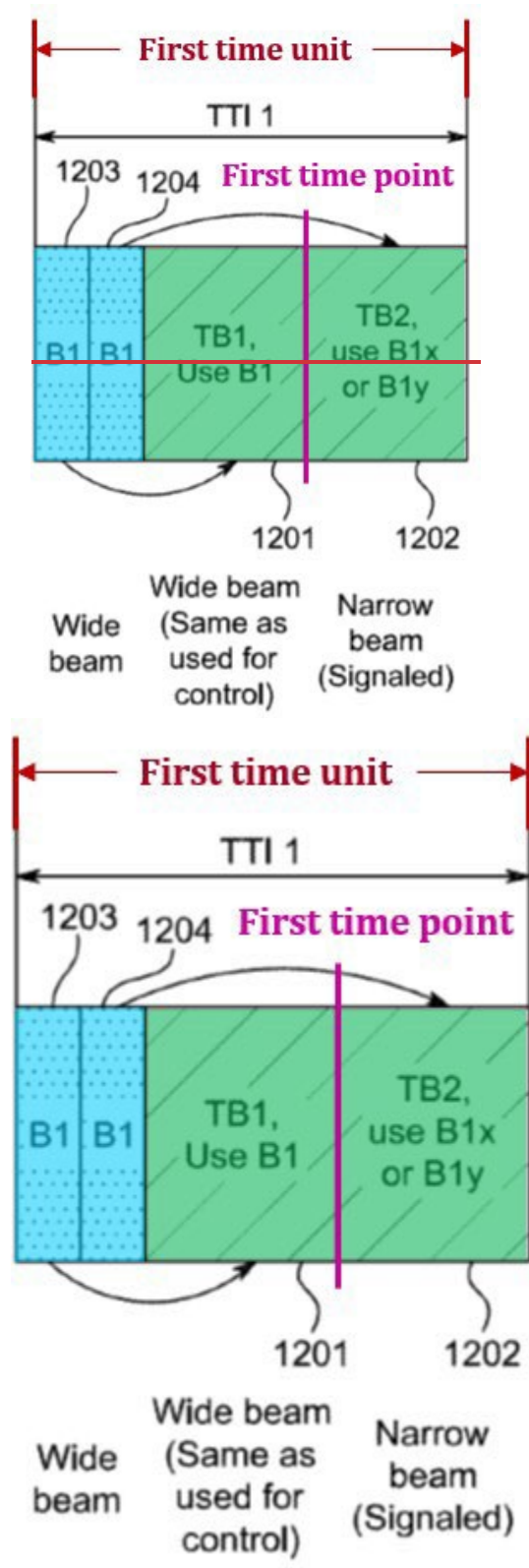
Section VI.A, MIMO technology uses multiple antennas to form one or more beams for transmitting and receiving signals between the UE and the base station. Thus, “multi-antenna related receiving” refers to the beam(s) used to receive a signal.



Lee, FIG. 4.; Lee Provisional, FIG. 4.

41.102. Lee also discloses switching a beam during a data transmission period.

As shown in annotated FIG. 12 below, Lee discloses that a beam switch occurs at a time between transport blocks TB1 and TB2 (“**first time point**”) within a time transmission interval (TTI) (“**first time unit**”). See also Lee, [0011], [0171], [0258], [0261], [0262], [0259], FIGS. 19, and 20; ~~Kakaes,~~ ¶102.Lee Provisional, [0153]-[0157].



Lee, FIG. 12 (annotated); [Lee Provisional, FIG. 12.](#)

42.103. Specifically, *Lee* discloses “two transport blocks 1201 and 1202 transmitted (multiplexed) in a TDM fashion within a single TTI (e.g., TTI1),” and that “[t]he transmission of the individual transport blocks may use the same beam as the control channel (e.g., **transport block 1201** which uses a **wide beam**), or may use a different beam (e.g., **transport block 1202** which uses a **narrow beam**).” *Lee*, [0167]; *see also* [0155], FIG. 10; *Lee Provisional*, [0153]-[0157]; *see also* [0144]-[0149], FIG. 10. That is, *Lee* discloses switching from a wide beam to a narrow beam at the first time point. ~~Kakaes, ¶103; Lee, [0259] (“switching a receive beam of the WTRU from the first beam to the second beam, to receive the second transport block.”).~~

WTRU from the first beam to the second beam, to receive the second transport block.”); *Lee Provisional* [0153]-[0157].

43-104. Moreover, as discussed for claim [1e], *Lee*’s transport blocks TB1 and TB2 include a positive number G multicarrier symbols. *See Section XI.A.1.f.* Thus, as shown in annotated FIG. 12 above, *Lee* discloses that, for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving (e.g., the receiving beam) for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to the first time point in the time domain. ~~Kakaes,~~
~~¶104.~~ This is because, in FIG. 12, when the given multicarrier symbol is before the first time point (e.g., in TB1), a wide beam is used for receiving the given multicarrier symbol, and when the given multicarrier symbol is behind the first time point (e.g., in TB2), a narrow beam is used for receiving the given multicarrier symbol. ~~Id.~~

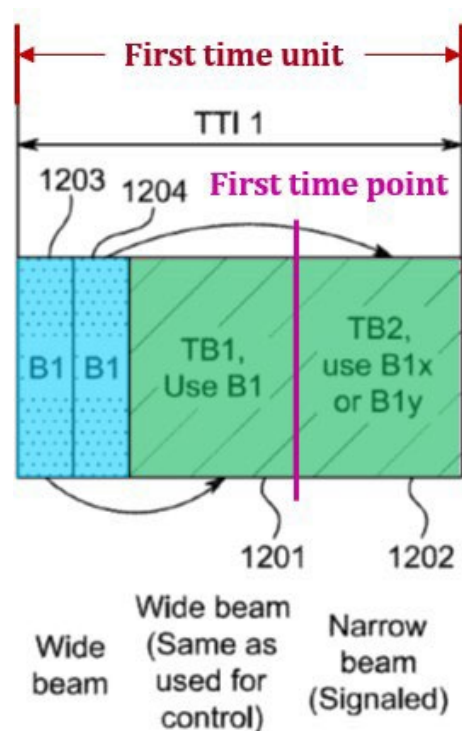
~~a. [1i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and”~~

j. [1i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and”

44.105. As discussed for claim [1h], *Lee* discloses that, when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the beam is switched to a narrow beam to receive transport block TB2, as shown in annotated FIG. 12 below. ~~*Lee* further discloses that the control data B1 (“second radio signal”) is used for determining the multi-antenna related receiving for the given multicarrier symbol in transport block TB2. Kakaes, ¶105. Specifically, *Lee*~~See Section XI.A.1.i. *Lee* further discloses that the

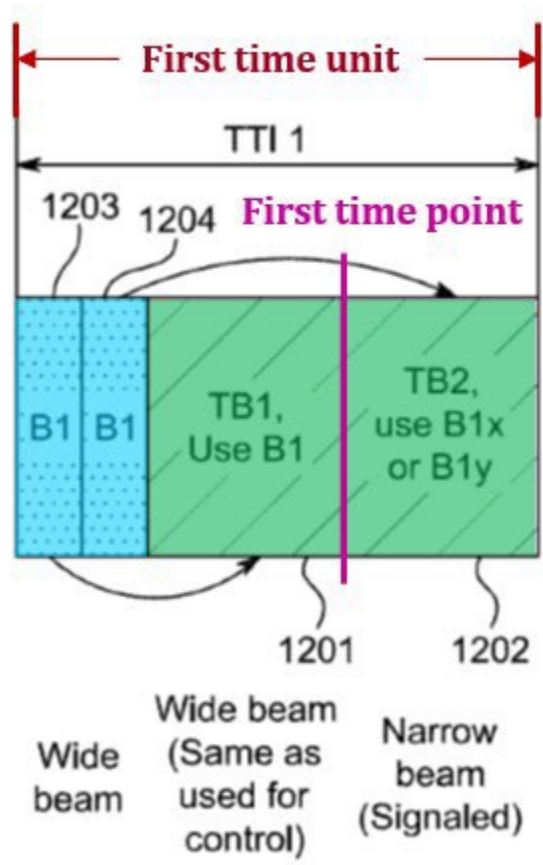
control data B1 (“second radio signal”) is used for determining the multi-antenna related receiving for the given multicarrier symbol in transport block TB2.

Specifically, Lee discloses that “the **narrow beam ID** may need to be signaled in the **control region** of the TTI.” *Lee*, [0167]; *see also* [0006]-[0008], [0150], [0156], [0168], [0172], [0258], FIGS. 10, and 19; *Lee Provisional*, [0153]-[0157];



see also [0144]-[0149], FIG. 10.

As the name implies, “narrow beam ID” identifies the particular beam (in this case, a narrow beam) to be used for receiving transport block TB2.



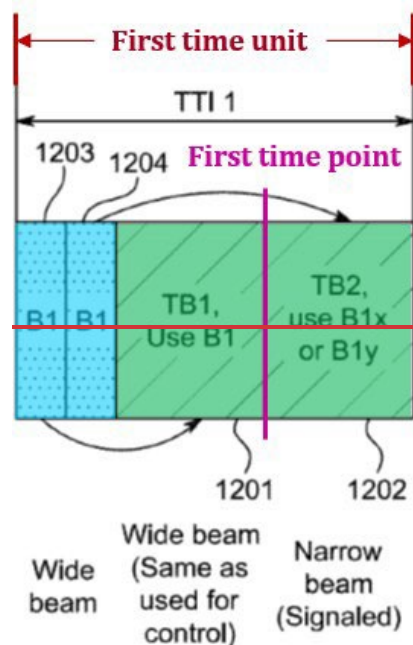
Lee, FIG. 12 (annotated); *Lee Provisional*, FIG. 12.

45.106. Thus, *Lee* discloses that, when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the control data B1 is used for determining the multi-antenna related receiving (e.g., the receiving beam) for the given multicarrier symbol. ~~Kakaes, ¶106.~~

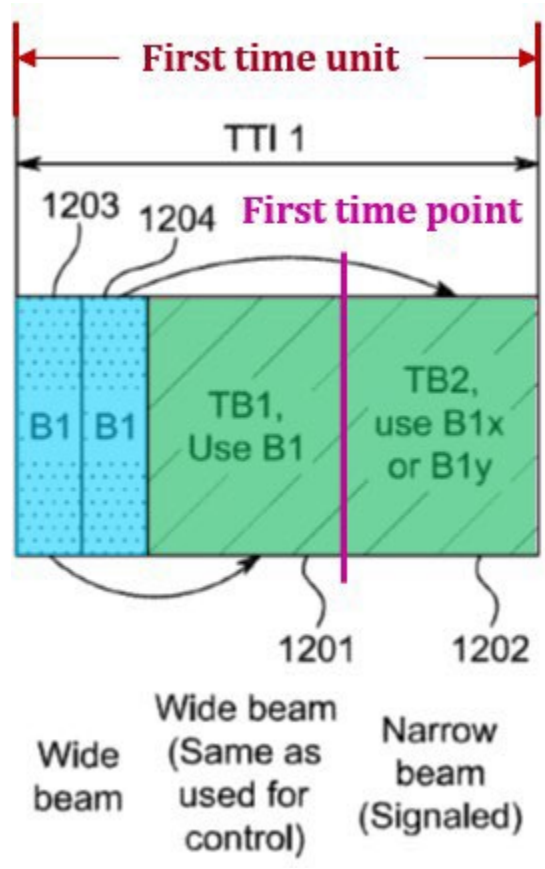
k. [1j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

~~b. [1j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna-related receiving for the given multicarrier symbol is related to the multi-antenna-related receiving for the second radio signal;”~~

46.107. As also discussed for claim [1h], Lee discloses that, when the time-domain resource occupied by the given multicarrier symbol is before the first time point (e.g., in TB1), the same wide beam that is used for receiving the control data B1 (“second radio signal”) is also used for receiving the given multicarrier symbol. ~~Kakaes, ¶107~~ See Section XI.A.1.i. In particular, as shown in annotated FIG. 12 below, Lee discloses that “a **first TB (TB1)** may use the **same wide beam** or the same beam ID as the **control channel**.” Lee, [0168]; see also [0156], [0258], FIGS. 10, and 19;



Lee, Provisional, [0153]-[0157]; *see also* [0144]-[0149], FIG. 10.

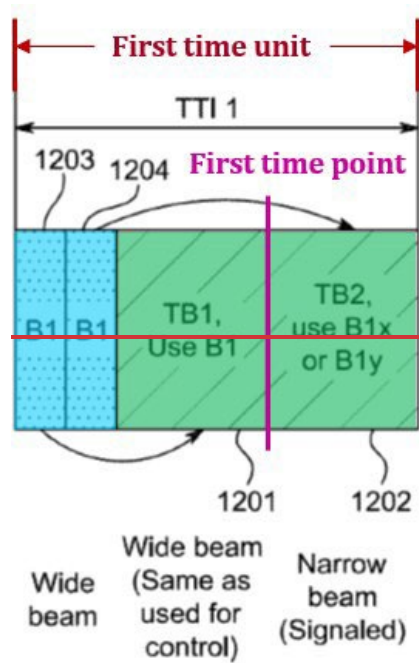


Lee, FIG. 12 (annotated); Lee Provisional, FIG. 12.

47.108. Thus, *Lee* discloses that, when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving (e.g., the receiving beam) for the given multicarrier symbol of transport block TB1 (“first radio signal”) is related to the multi-antenna related receiving for control data B1 (“the second radio signal”). ~~Kakaes, ¶108.~~

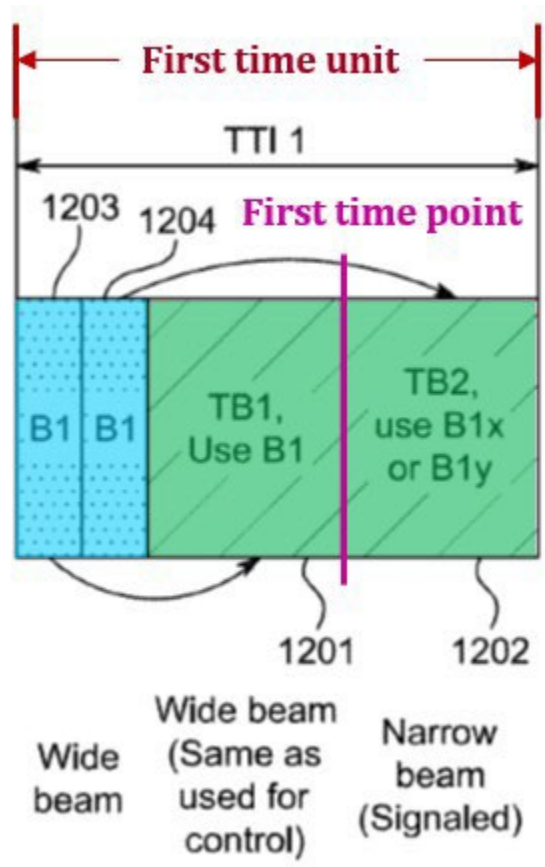
¶1. [1k]: “the first time point is one time point within the first time unit; and”

48.109. *Lee* discloses that the beam switching point (“**first time point**”) is one time point within the single TTI (“first time unit”), as shown in annotated FIG. ~~12 below. See also Lee, FIG. 10; Kakaes, ¶109.12~~



Lee, FIG. 12 (annotated).

below. See also Lee, FIG. 10; Lee Provisional, FIG. 10. Indeed, FIG. 12 depicts the time domain axis within the TTI, and the “first time point” shown below (which is the beam switching point) is one time point within the time unit.



Lee, FIG. 12 (annotated); Lee Provisional, FIG. 12.

k.m. [11]: “G is a positive integer.”

49.110. As discussed for claim [1e], Lee’s data signal transmitted within the single TTI includes a positive integer number G of multicarrier OFDM symbols. ~~Kakaes,~~ See Section XI.A.1.f.

~~¶110.~~

50.111. Therefore, Lee discloses claim 1. ~~Kakaes, ¶111.~~

2. Claim 2

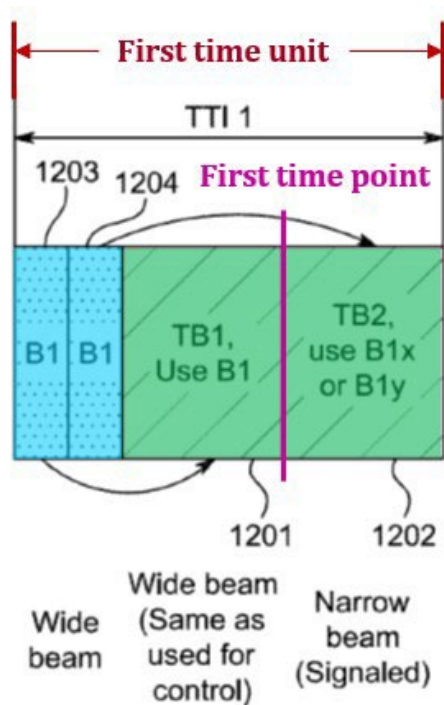
- a. [2a]: “The method according to claim 1, comprising: receiving first information, wherein the first information is used for determining the first time point; or,”

112. As discussed above, Lee discloses claim 1. Further, as As discussed above, Lee discloses claim 1. Claim 2 recites two alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 2, which I understand is consistent with legal standards. Nonetheless, Lee discloses both options as I explain below.

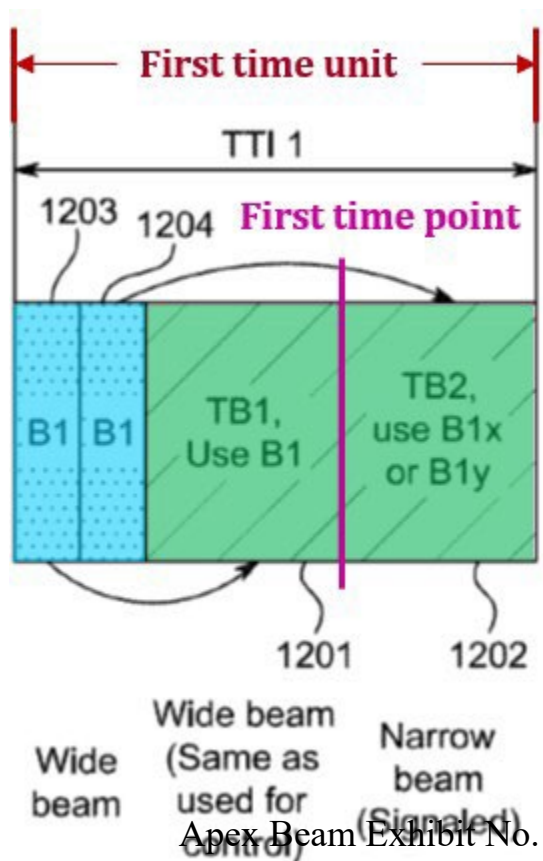
51.113. As discussed for claim [1g]-[1j], Lee’s WTRU (UE) receives control data B1 from the base station and that control data B1 may include scheduling information and time/frequency information associated with transport blocks TB1 and TB2. See Section XI.A.1.h through Section XI.A.1.k.

52.114. As shown in annotated FIG. 12 below, Lee discloses that the WTRU (UE) switches the beam for receiving transport block TB2 at a first time point based on a narrow beam ID indicated in control data B1. Specifically, Lee discloses that “a second TB (TB2) may use a narrow beam or a **beam ID** that is different from the beam ID used by the control channel.” Lee, [0168]; *see also* [0006], [0008]; Lee Provisional, [0153]-[0157]. Lee further discloses that “[t]he beam ID for TB2 may be signal[ed] in a DCI transmitted in control data B1 that is

transmitted in control data B1 that is associated with TB2.” Lee, [0168]; see also [0157], [0169], [0246]; Lee



Provisional, [0153]; see also [0144], [0158], [0159], [0232].



Lee, FIG. 12 (annotated ~~7~~); *Lee Provisional*, FIG. 12.

~~53~~.115. As discussed for claim [1g], the “transmit beam” indicated by *Lee*’s control channel may include, among other things, “a **time-frequency resource associated with the beam.**” *See Section XI.A.1.h; Lee*, [0148]; *Lee Provisional*, [0138].

~~54~~.116. A POSITA would have understood that the time-frequency resource associated with a particular beam would have included the time at which the UE switches to the particular beam (e.g., the switching point between TB1 and TB2

shown in FIG. 12 above). ~~Kakaes, ¶¶116.~~ Moreover, a POSITA would have understood that, when a base station instructs a UE to switch a beam by sending control information, including a beam ID, the beam ID would have included a beam switching point, such that the beam transmission between the base station and the UE can be synchronized. ~~Id.~~

55.117. The '081 patent states that the claimed “first information” indicates “the first time point” either “explicitly” or “implicitly.” '081 patent, 5:40-43. Thus, just like the '081 patent, a POSITA would have understood that the beam ID, scheduling information, and/or the time-frequency information associated with the beam used to receive the TB2 constitutes the claimed “first information” used for determining the “first time point.” ~~Kakaes, ¶¶112-117.~~

- b. **[2b]: “receiving third information, wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”**

~~Claim 2 includes an “or” between claim [2a] and [2b], so only one of the two limitations must be taught to satisfy claim 2. *Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001).~~

56.118. ~~Nonetheless, Lee discloses this additional limitation.~~ The '081 patent states that the claimed “candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols” can include “a first multi-antenna

receiving mode and a second multi-antenna receiving mode.” ’081 patent, 6:17-20.

Like the ’081 patent, *Lee*’s UE receives a transmission scheme (“third information”) that may use “two or more transport blocks (TBs) within a TTI,” which can be received with different beams. *Lee*, ~~[0166]-[0168]~~.

~~[0166]-[0168]; *Lee Provisional*, [0152]-[0153].~~

57.119. *Lee* further discloses that the UE receives different parameters for the transmission scheme via the control channel. For example, *Lee* discloses that “[t]he DCI in the control channel may carry one or more of following parameters for the transmission scheme using explicit beam association: HARQ process number, transport block information, **antenna configuration** (as needed), downlink assignment index (DAI), and/or power control indicator.” *Lee*, [0149]; *Lee Provisional*, [0139].

58.120. *Lee* also discloses that the transmission scheme may indicate the steering of the receive beam at the UE for beam switching. For example, *Lee* discloses that “the transmission scheme using explicit beam association may dynamically switch the Tx beam within a TTI from the wide beam used for control channel to a narrow beam used for the associated data channel,” and “[a]s the transmit node dynamically switches from a wide to a narrow beam within a TTI, the receive node may need to also **steer its receive beam** to ensure that it can receive the narrow Tx beam correctly from the transmitter (e.g., mB).” *Lee*, [0149]; *Lee Provisional*, [0139].

59.121. Thus, a POSITA would have understood that the antenna configuration and beam steering indicated in *Lee*’s transmission scheme indicates the multi-antenna related receiving corresponding to the G multicarrier symbols of transport blocks TB1 and TB2. ~~Kakaes, ¶121.~~ And therefore, *Lee*’s transmission

|

scheme received

by the WTRU (UE) constitutes the claimed “third information” used for determining “a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.” ~~Kakaes, ¶¶118-121.~~

3. Claim 3

- a. **“The method according to claim 2 comprising: transmitting second information, wherein the second information is used for determining the first time point.”**

~~60.122.~~ As discussed above, *Lee* discloses claim 2. *Lee* further discloses that the WTRU (UE) transmits receiver beamforming capability (“second information”) to the base station that is used to determine the first time point.-

~~Kakaes, ¶¶122-125.~~

~~61.123.~~ For example, *Lee* discloses that the WTRU (UE) indicates the receiver beamforming capability to the base station. *See Lee*, [0144], [0159]; *Lee Provisional*, [0135], [0146]. *Lee* also discloses that “the beamforming capability of a WTRU ... may include the number of RF chains, number of receive beams, and/or **beam switching time**.” *Lee*, [0196]; *Lee Provisional*, [0181].

~~62.124.~~ Similarly, *Lee* discloses that “[t]he relative timing between a downlink control channel and the associated data channel may be determined as a function of the WTRU beamforming capability.” *Lee*, [0144], ~~[0166] [0167]~~; *Lee Provisional*, [0135]. For example, “[t]he receiver beamforming may be indicated as a WTRU capability and a transmission scheme may be determined as a function

of the receiver beamforming capability.” *Lee*, [0144]; *Lee Provisional*, [0135].

That is, a

capability.” ~~Lee, [0144]. That is, a~~ transmission scheme, such as the transmission scheme in FIG. 12 that uses “two or more transport blocks (TBs) within a TTI,” is determined based on the receiver beamforming capability. ~~Lee, [0149]; Lee Provisional, [0139].~~ Such a transmission scheme indicates the multi-antenna related receiving corresponding to the G multicarrier symbols of transport blocks TB1 and TB2. ~~Kakaes, ¶124.~~

~~63-125.~~ The ’081 patent states that the claimed “second information” indicates “the first time point” either “explicitly” or “implicitly.” ’081 patent, 5:60-63. A POSITA would have understood that beamforming capability both explicitly indicates the “first time point” (e.g., by indicating the beam switching time) and implicitly indicates the “first time point” (e.g., by indicating the transmission scheme, which indicates the multi-antenna related receiving of the multicarrier symbols). Thus, just like the ’081 patent, a POSITA would have understood that the receiver beamforming capability transmitted from the WTRU (UE) to the base station constitutes the claimed “second information” used for determining the “first time point.” ~~Kakaes, ¶125.~~

4. Claim 4

- a. **“The method according to claim 1 comprising:
transmitting second information; wherein the second**

information is used for determining the first time point.”

64.126. Claim 4 recites the same additional limitation as claim 3, except that claim 4 depends from claim 1 instead of claim 2. Thus, for at least the same reasons as claim 3, *Lee* discloses claim 4. ~~Kakaes, ¶126.~~

5. Independent Claim 5

a. [5pre]: “A method in a base station device for wireless communication, comprising:”

65.127. As discussed for claim [1pre], *Lee* discloses a wireless communication system and methods of a WTRU (UE) in communication with a base station. See Section XI.A.1.a; Lee, [0040], [0041]; see also [0259]; Lee Provisional, [0034], [0035]; see also [0153]-[0157]. Likewise, *Lee* also discloses the corresponding system and methods performed by the base station. ~~See id; Kakaes, ¶¶127-128.~~ See Lee, [0040], [0041]; see also [0259]; Lee Provisional, [0034], [0035]; see also [0153]-[0157].

66.128. For example, *Lee* discloses that “a method implemented in a wireless communication device [“a base station”] includes transmitting, in a time transmission interval (TTI), at least one control signal, a first transport block and a second transport block.” *Lee*, [0262]; Lee Provisional, [0153]-[0157].

b. [5a]: “transmitting a second radio signal;”

67.129. As discussed for claim [1a], *Lee*’s WTRU (UE) receives

control data B1 (“second radio signal”) from the base station. *Lee*, FIG. *See Section*

XI.A.1.b; Lee, FIG. 12, [0168]; *see also* [0167], [0169], [0171], [0157], [0160] [0161], FIG. 10.

~~Thus, *Lee* also discloses~~

12, [0168]; *see also* [0167], [0169], [0171], [0157], [0160]-[0161], FIG. 10; *Lee Provisional*, FIG. 12, [0153]-[0157], FIG. 10. Thus, *Lee* also discloses the base station “transmitting a second radio signal.” ~~Kakaes, ¶129; *see also* Lee, [0261], FIG. 20; *Lee Provisional*, [0153]-[0157].~~

c. [5b]: “transmitting a first radio signal;”

~~68.130.~~ As discussed for claim [1b], *Lee*’s WTRU (UE) receives transport blocks TB1 and TB2 (“first radio signal”) from the base station. ~~*Lee*, [0167], [0168]; *See Section XI.A.1.c; Lee*, [0167], [0168], [0110], [0079]; *Lee Provisional*, [0153]-[0157].~~ Thus, *Lee* also discloses the base station “transmitting a first radio signal.” ~~Kakaes, ¶130; *see also* Lee, [0261], FIG. 20; *Lee Provisional*, [0153]-[0157].~~

e. — ~~[5e]-[5k]~~

~~Limitations [5e]-[5i] are identical to limitations [1e]-[1i] except for one instance where “for determining” instead recites “to determine.” Thus, as discussed for limitations [1e]-[1i], *Lee* discloses these limitations. Kakaes, ¶¶131-140.~~

d. [5c]: “wherein the first radio signal is transmitted within a first time unit,”

~~131. As discussed for claim [1c], *Lee* discloses this limitation. *See Section XI.A.1.d.*~~

e. [5d]: “a first bit block is used for generating the first radio signal, and”

~~132. As discussed for claim [1d], *Lee* discloses this limitation. *See Section*~~

XI.A.1.e.

f. [5e]: “the first radio signal comprises G multicarrier symbols;”

133. As discussed for claim [1e], *Lee* discloses this limitation. See Section

XI.A.1.f.

g. [5f]: “the second radio signal is transmitted within the first time unit, and”

134. As discussed for claim [1f], Lee discloses this limitation. See Section

XI.A.1.g.

h. [5g]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

135. As discussed for claim [1g], Lee discloses this limitation. See Section

XI.A.1.h.

i. [5h]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

136. As discussed for claim [1h], Lee discloses this limitation. See Section

XI.A.1.i.

j. [5i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna related receiving for the given multicarrier symbol; and”

137. As discussed for claim [1i], Lee discloses this limitation. See Section

XI.A.1.j.

k. [5j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-

antenna related receiving for the second radio signal;”

138. As discussed for claim [1j], Lee discloses this limitation. See Section XI.A.1.k.

l. [5k]: “the first time point is one time point within the first time unit; and”

139. As discussed for claim [1k], Lee discloses this limitation. See Section XI.A.1.l.

m. [5l]: “G is a positive integer.”

140. As discussed for claim [1l], Lee discloses this limitation. See Section XI.A.1.m.

69-141. Therefore, Lee discloses claim 5. ~~Kakaes, ¶141.~~

6. Claim 6

a. [6a]: “The method according to claim 5, comprising: transmitting first information, wherein the first information is used for determining the first time point; or,”

142. As discussed above, Lee discloses claim 5. As discussed above, Lee discloses claim 5. Claim 6 recites two alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 6, which I understand is consistent with legal standards. Nonetheless, Lee discloses both options as I explain below.

~~70.143.~~ As discussed for claim [2a], *Lee* discloses the WTRU (UE) receiving from the base station, first information, wherein the first information is used for determining the first time point. See Section XI.A.2.a. Thus, *Lee* also discloses the base station “transmitting first information, wherein the first information is used for determining the first time point.” ~~Kakaes, ¶¶142-143.~~

- b. **[6b]: “transmitting third information, wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”**

~~Claim 6 includes an “or” between claim [6a] and [6b], so only one of the two limitations must be taught to satisfy claim 6. *Brown v. 3M*, 265 F.3d at 1351.~~

~~71.144.~~ ~~Nonetheless, as~~ As discussed for claim ~~[2b2[b]~~, *Lee* discloses the WTRU (UE) receiving from the base station, third information, wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols. See Section XI.A.2.b. Thus, *Lee* also discloses the base station “transmitting third information, wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”-

~~Kakaes, ¶144.~~

7. Claim 7

~~a. “The method according to claim 6 comprising:
receiving second information, wherein the second
information is used for determining the first time
point.”~~

~~a. “The method according to claim 6 comprising:
receiving second information, wherein the second
information is used for determining the first time
point.”~~

~~72.145.~~ As discussed above, *Lee* discloses claim 6. As discussed for claim 3, *Lee* discloses the WTRU (UE) transmitting to the base station, second information, wherein the second information is used for determining the first time point. See

Section XI.A.3. Thus, *Lee* also discloses the base station “receiving second information, wherein the second information is used for determining the first time point.” ~~Kakaes, ¶145.~~

8. Claim 8

- a. “The method according to claim 5, comprising: receiving second information; wherein the second information is used for determining the first time point.”
- d. ~~“The method according to claim 5, comprising: receiving second information; wherein the second information is used for determining the first time point.”~~

73-146. As discussed above, *Lee* discloses claim 5. Claim 8 recites the same additional limitation as claim 7, except that claim 8 depends from claim 5 instead of claim 6. Thus, for at least the same reasons as claim 7, *Lee* discloses claim 8. ~~Kakaes, ¶146.~~

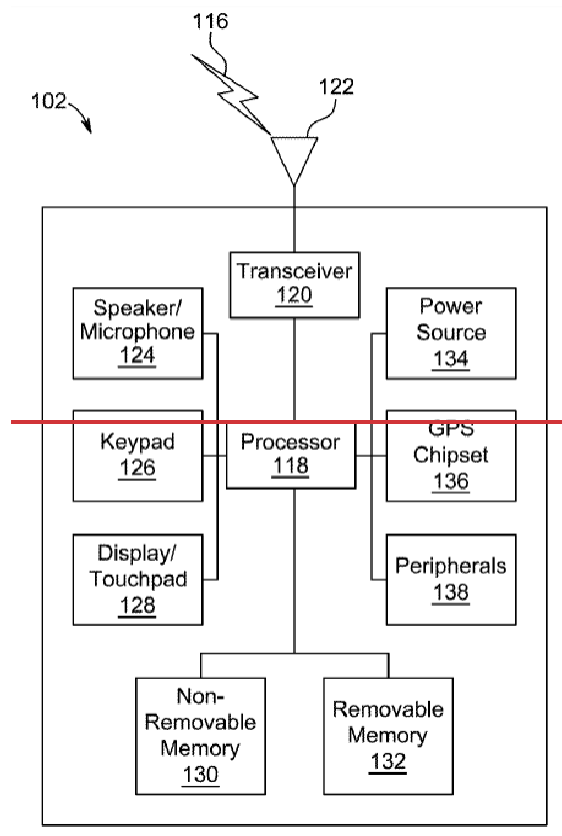
9. Independent Claim 9

- a. [9pre]: “A UE for wireless communication, comprising:”

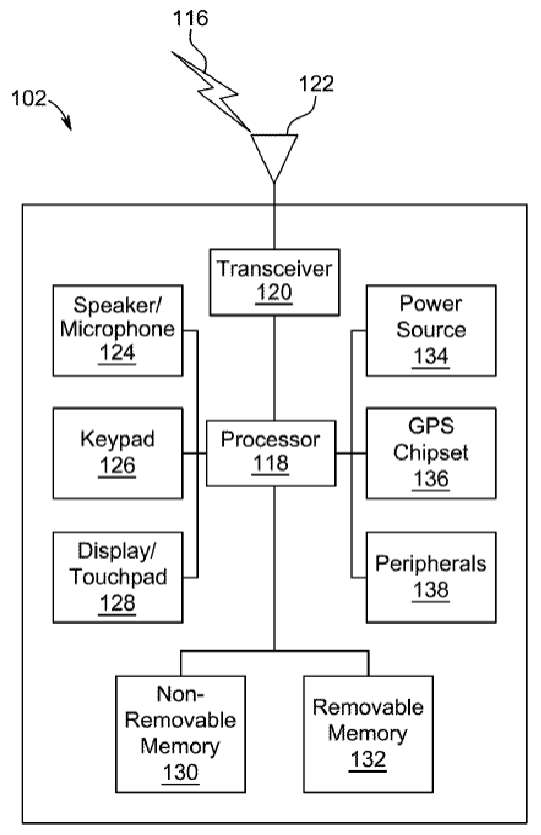
147. As discussed for claim [1pre], *Lee* discloses a wireless communication system and methods implemented by a WTRU (UE) in communication with a base station. See Section XI.A.1.a; Lee, [0040], [0041], [0259~~+~~]; Lee Provisional, [0034], [0035], [0153]-[0157].

74.148. *Lee* further discloses the structure of the WTRU (UE) and how it is used for wireless communication. ~~Kakaes, ¶148.~~ As shown in FIG. 1B below, “the WTRU 102 may include a processor 118, a transceiver 120, a transmit/receive element 122, a speaker/microphone 124, a keypad 126, a display/touchpad 128, non-~~removable~~ removable ~~memory 130, removable memory 132, a power source 134, a global positioning system (GPS) chipset 136, and other peripherals 138.~~” ~~*Lee,*~~ ~~[0051]–[0052].~~ memory 130, removable memory 132, a power source 134, a global positioning

system (GPS) chipset 136, and other peripherals 138.”



Lee, [0051]-[0052]; Lee Provisional, [0045]-[0046].



Lee, FIG. 1B.; [Lee Provisional, FIG. 1B.](#)

- b. [9a]: “a first transceiver module, to receive a second radio signal and a first radio signal;”

[75-149.](#) As discussed for claim [1a] and [1b], *Lee*’s WTRU (UE) receives control data B1 (“second radio signal”) and transport blocks TB1 and TB2 (“first radio signal”) from a base station. [See Sections XI.A.1.a and XI.A.1.b.](#) As discussed for [9pre], *Lee* further discloses that the WTRU (UE) includes a transceiver 120 and transmit/receive element 122 for transmitting and receiving wireless signals. [See Section XI.A.9.a.](#)

~~76.~~150. Specifically, *Lee* discloses that the WTRU (UE) includes “multiple **transceivers** for communicating with different wireless networks over different wireless links.” *Lee*, [0050]; *Lee Provisional*, [0044]. *Lee* also discloses that transceiver 120 is “coupled to the **transmit/receive element** 122,” (*Lee*, [0052]; *Lee Provisional*, [0046]) and “configured to align its receive beam, for receiving a downlink transmission, with a transmit beam of the eNode-B [i.e., base station].” *Lee*, [0053]; *Lee Provisional*, [0046]-[0050]. *Lee* further discloses that “[t]he processor 118 may further be configured to determine a transmit beam and/or receive beam (e.g., based on received configuration or control information) for the transceiver 120 to use, and configure the transceiver 120 accordingly for communicating with the eNode-B [i.e., base station].” *Lee*, [0053]; *Lee Provisional*, [0046]-[0050].

~~77.~~151. Thus, the transceiver 120 and/or transmit/receive element 122 in *Lee*’s WTRU (UE) receives control data B1 (“second radio signal”) and transport blocks TB1 and TB2 (“first radio signal”), from the base station. ~~Kakaes, ¶¶149-151.~~

~~e. — [9b]-[9k]~~

~~Limitations [9b]-[9k] are identical to limitations [1e]-[11] except for one instance where “for determining” instead recites “to determine.” Thus, as discussed for limitations [1e]-[11], *Lee* discloses these limitations. Kakaes, ¶¶152-161.~~

c. [9b]: “wherein the first radio signal is transmitted within a first time unit,”

152. As discussed for claim [1c], *Lee* discloses this limitation. See Section XI.A.1.d.

d. [9c]: “a first bit block is used for generating the first radio signal, and”

153. As discussed for claim [1d], Lee discloses this limitation. See Section

XI.A.1.e.

e. [9d]: “the first radio signal comprises G multicarrier symbols;”

154. As discussed for claim [1e], Lee discloses this limitation. See Section

XI.A.1.f.

f. [9e]: “the second radio signal is transmitted within the first time unit, and”

155. As discussed for claim [1f], Lee discloses this limitation. See Section

XI.A.1.g.

g. [9f]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

156. As discussed for claim [1g], Lee discloses this limitation. See Section

XI.A.1.h.

h. [9g]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

157. As discussed for claim [1h], Lee discloses this limitation. See Section

XI.A.1.i.

- i. [9h]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna related receiving for the given multicarrier symbol; and”

158. As discussed for claim [1i], Lee discloses this limitation. See Section XI.A.1.j.

- j. [9i]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

159. As discussed for claim [1j], Lee discloses this limitation. See Section XI.A.1.k.

- k. [9j]: “the first time point is one time point within the first time unit; and”

160. As discussed for claim [1k], Lee discloses this limitation. See Section XI.A.1.l.

- l. [9k]: “G is a positive integer.”

161. As discussed for claim [1l], Lee discloses this limitation. See Section XI.A.1.m.

78-162. Therefore, Lee discloses claim 9. ~~Kakaes, ¶162.~~

10. Claim 10

- a. **[10a]: “The UE according to claim 9, wherein the first transceiver module receives first information, the first ~~information being used for determining the first time~~**

| ~~point; or,”~~

information being used for determining the first time point; or,”

163. As discussed above, *Lee* discloses claim 9. Claim 10 recites three alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 10, which I understand is consistent with legal standards. Nonetheless, *Lee* discloses both options as I explain below.

79.164. As discussed for claim [2a], *Lee*’s WTRU (UE) receives first information, the first information being used for determining the first time point. See Section XI.A.2.a. Thus, the transceiver 120 and/or transmit/receive element 122 in *Lee*’s WTRU (UE) “receives first information, the first information being used for determining the first time point.” ~~Kakaes, ¶¶163-164.~~

- b. [10b]: “the first transceiver module transmits second information, the second information being used for determining the first time point; or,”

~~Claim 10 includes “or” between claim [10a], [10b], and [10c], so only one of the three limitations must be taught to satisfy claim 10. *Brown v. 3M*, 265 F.3d at 1351.~~

80.165. ~~Nonetheless, as~~ As discussed for claim 3, *Lee*’s WTRU (UE) ~~transmits second information, the second information being used for determining the first time point. Thus, the transceiver 120 and/or transmit/receive element 122 in *Lee*’s WTRU (UE) “transmits second information, the second information being used for determining the first time~~

point.” Kakaes, ¶165. See Section XI.A.3. Thus, the transceiver 120 and/or transmit/receive element 122 in Lee’s WTRU (UE) “transmits second information, the second information being used for determining the first time point.”

~~e.a. [10c]: “the first transceiver module receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G-multicarrier symbols.”~~

c. Further, as [10c]: “the first transceiver module receives third information, the third information being used for determining a candidate scheme for the multi-

antenna related receiving corresponding to the G multicarrier symbols.”

~~81-166.~~ As discussed for claim [2b], *Lee*’s WTRU (UE) receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols. See Section XI.A.2.b. Thus, the transceiver 120 and/or transmit/receive element 122 in *Lee*’s WTRU (UE) “receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.” ~~Kakaes, ¶¶166.~~

11. Independent Claim 11

a. [11pre]: “A base station device for wireless communication, comprising:”

~~82-167.~~ As discussed for claim [5pre], *Lee* discloses a wireless communication system in which a UE communicates with a base station. See Section XI.A.5.a. *Lee*, [0040], [0041]; *Lee Provisional*, [0034]-[0036]. *Lee* also discloses methods implemented by a base station in communication with the UE. *Lee*, [0262]; *Lee Provisional*, [0153]-[0157].

~~83-168.~~ *Lee* further discloses the structure of the base station and how it is used for wireless communication. ~~Kakaes, ¶¶168-169.~~ *Lee* explains that “[e]ach of the base stations ~~114a, 114b~~ 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more

~~with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more~~ communication networks, such as the core network 106, the Internet 110, and/or

the other networks 112.” *Lee*, [0041]; *Lee Provisional*, [0035]. *Lee* further discloses that “the base stations 114a, 114b may be a base transceiver station (BTS), a Node-B, an eNode B, a Home Node B, a Home eNode B, a site controller, an access point (AP), a wireless router, and the like.” ~~*Id.*~~ *Lee*, [0041]; *Lee Provisional*, [0035].

84.169. Further, *Lee* discloses that “[t]he eNode-~~Bs~~⁸Bs⁶ 140a, 140b, 140c may each include **one or more transceivers** for communicating with the WTRUs 102a, 102b, 102c over the air interface 116.” *Lee*, [0062]; *Lee Provisional*, [0055].

b. [11a]: “a second transceiver module, to transmit a second radio signal and a first radio signal;”

85.170. As discussed for claim [5a] and [5b], *Lee*’s base station transmits control data B1(“second radio signal”) and transport blocks TB1 and TB2 (“first radio signal”) to the WTRU (UE). *See Sections XI.A.5.b and XI.A.5.c.* As discussed for [11pre], *Lee* further discloses that the base station includes a transceiver (“second transceiver module”) for transmitting and receiving wireless signals. *See Section XI.A.11.a.*

⁸~~*Lee* discloses that the terms base station and eNode B (eNB) (among other terms) may be used interchangeably. *Lee*, [0082].~~

171. Specifically, *Lee* discloses that “[t]he eNode-Bs 140a, 140b, 140c may each include one or more **transceivers** for communicating with the WTRUs 102a, 102b, 102c over the air interface 116.” *Lee*, [0062~~+~~]; *Lee Provisional*, [0055].

Thus,

⁶ *Lee* discloses that the terms base station and eNode-B (eNB) (among other terms) may be used interchangeably. *Lee*, [0082]; *Lee Provisional*, [0073].

the transceiver in *Lee*'s base station transmits the control data B1 ("second radio signal") and transport blocks TB1 and TB2 ("first radio signal"), to the UE.-

~~Kakaes, ¶¶170-171.~~

~~f. — [11b]-[11k]~~

~~Limitations [11b]-[11k] are identical to limitations [1c]-[11] except for one instance where "for determining" instead recites "to determine." Thus, as discussed for limitations [1c]-[11], *Lee* discloses these limitations. Kakaes, ¶¶172-181.~~

~~c. [11b]: "wherein the first radio signal is transmitted within a first time unit,"~~

~~172. As discussed for claim [1c], *Lee* discloses this limitation. See Section XI.A.1.d.~~

~~d. [11c]: "a first bit block is used for generating the first radio signal, and"~~

~~173. As discussed for claim [1d], *Lee* discloses this limitation. See Section XI.A.1.e.~~

~~e. [11d]: "the first radio signal comprises G multicarrier symbols;"~~

~~174. As discussed for claim [1e], *Lee* discloses this limitation. See Section XI.A.1.f.~~

~~f. [11e]: "the second radio signal is transmitted within the first time unit, and"~~

~~175. As discussed for claim [1f], *Lee* discloses this limitation. See Section XI.A.1.g.~~

g. [11f]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

176. As discussed for claim [1g], *Lee* discloses this limitation. See Section

XI.A.1.h.

- h. [11g]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

177. As discussed for claim [1h], Lee discloses this limitation. See Section

XI.A.1.i.

- i. [11h]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna related receiving for the given multicarrier symbol; and”

178. As discussed for claim [1i], Lee discloses this limitation. See Section

XI.A.1.j.

- j. [11i]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

179. As discussed for claim [1j], Lee discloses this limitation. See Section

XI.A.1.k.

- k. [11j]: “the first time point is one time point within the first time unit; and”

180. As discussed for claim [1k], Lee discloses this limitation. See Section

XI.A.1.l.

l. [11k]: “G is a positive integer.”

181. As discussed for claim [11], Lee discloses this limitation. See Section XI.A.1.m.

86-182. Therefore, Lee discloses claim 11. ~~Kakaes, ¶182.~~

12. Claim 12

- a. ~~Claim~~ [12a]: “The base station device according to claim 11, wherein the second transceiver module transmits first information, the first information being used for determining the first time point; or,”

183. As discussed above, Lee discloses claim 11. Claim 12 recites three alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 12, which I understand is consistent with legal standards. Nonetheless, Lee discloses each of these three options as I explain below.

87-184. As discussed for claim ~~{6a6[a]}~~, Lee’s base station transmits first information, the first information being used for determining the first time point. See Section XI.A.6.a. Thus, the transceiver in Lee’s base station “transmits first information, the first information being used for determining the first time point.”-

~~Kakaes, ¶¶183-184.~~

- b. ~~Claim~~ [12b]: “the second transceiver module receives second information, the second information being used for determining the first time point; or,”

~~Claim 12 includes “or” between claim [12a], [12b], and [12c], so only one of the three limitations must be taught to satisfy claim 12. *Brown v. 3M*, 265 F.3d at 1351.~~

185. ~~Nonetheless, as~~ As discussed for claim 7, *Lee*’s base station receives second information, the second information being used for determining the first time point.

See Section XI.A.7. Thus, the transceiver in *Lee*'s base station "receives second information, the second information being used for determining the first time point." ~~Kakaes, ¶185.~~

- c. ~~Claim~~ [12c]: "the second transceiver module transmits third information, the third information being used for determining a candidate scheme for the multi- antenna related receiving corresponding to the G multicarrier symbols."

~~88.186.~~ Further, as AS discussed for claim ~~6b~~ [6b], *Lee*'s base station transmits third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols. See Section XI.A.6.b. Thus, the transceiver in *Lee*'s base station "transmits third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols." ~~Kakaes, ¶186.~~

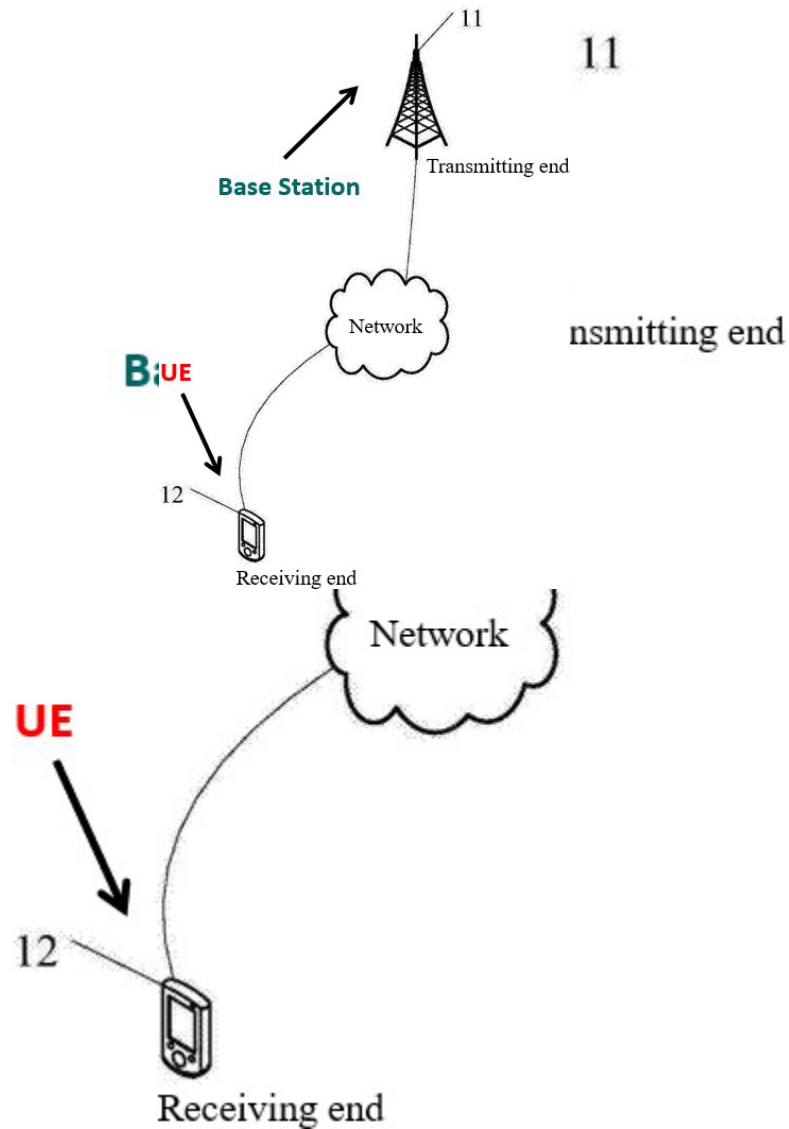
B. Claims 1-12 Are Obvious Based on *Chen* in View of *Lee*

1. Independent Claim 1

- a. [1pre]: “A method in a User Equipment (UE) for wireless communication, comprising:”**

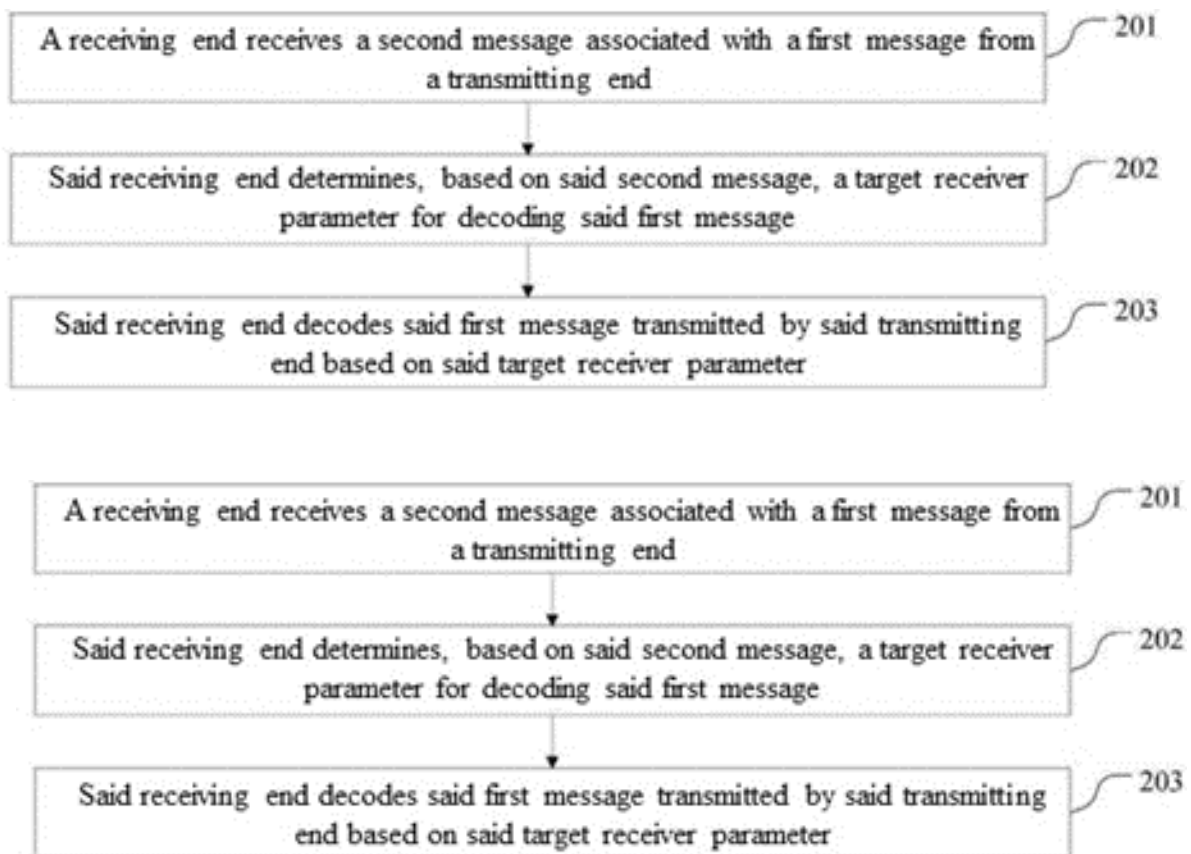
~~89-187.~~ ~~To the extent the preamble is limiting,~~ *Chen* discloses a method in a user equipment (UE) for wireless communication. ~~Kakaes, ¶¶187-188.~~ As shown in annotated FIG. 1 below, *Chen* discloses a wireless network including “[a] transmitting end device 11 [that] is a **base station**, and [a] receiving end device 12 [that] is a terminal.” *Chen*, 11; *Chen Priority*, [0118].

Chen explains that “[t]he terminal may be a user terminal (or **user equipment, UE**), e.g., a terminal-side device such as a mobile telephone, a tablet computer, a laptop computer, a personal digital assistant (PDA), a mobile Internet device (MID), or a wearable device.” *Id.* Chen, 11; *Chen Priority*, [0118].



Chen, FIG. 1 (annotated); *Chen Priority*, FIG. 1.

90.188. One wireless communication method described in *Chen* is a method implemented by the receiving end device (UE) that includes, among other things, “a receiving end device receiving a second message associated with a first message from a transmitting end device,” as shown in FIG 2 below. *Chen*, 12; *Chen Priority*, [0120]-[0122].



Chen, FIG. 2; *Chen Priority*, FIG. 2.

b. [1a]: “receiving a second radio signal;”

91.189. *Chen* discloses that the receiving end device (UE) receives a second message (“second radio signal”) from the transmitting end device (base station). ~~Kakaes~~, *Chen*, 12, FIG. 2, FIG. 4; *Chen Priority*, [0120], [0123], FIG. 2,

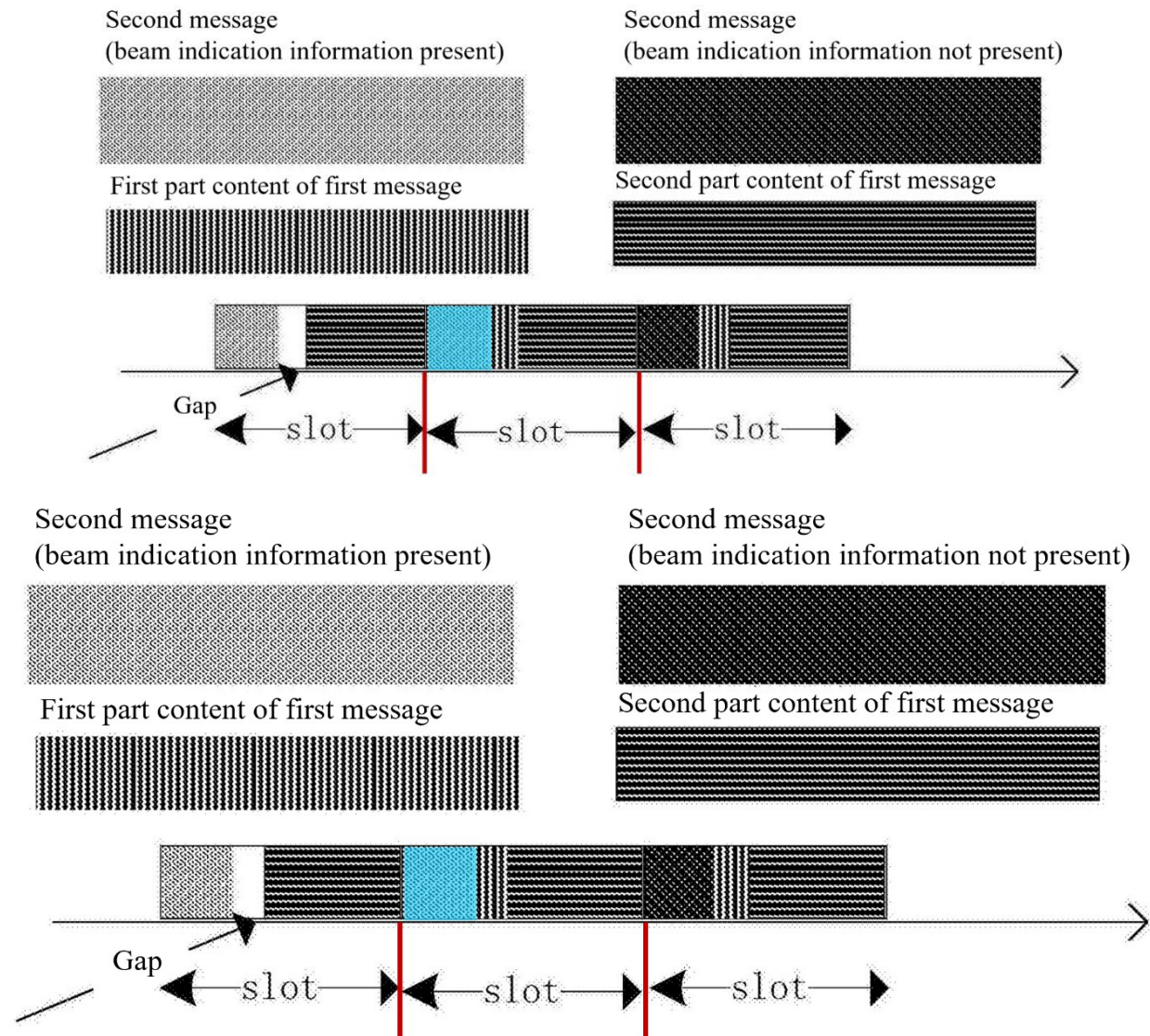
FIG. 4. For

~~¶189; *Chen*, 12, FIGS. 2, 4; *Chen Priority*, [0120], [0123], FIGS. 2, 4. For~~

example, annotated FIG. 4 of *Chen* below illustrates three examples of time slots including messages transmitted from the base station to the UE. *Chen*, 17-18, FIG. 4; *Chen Priority*, FIG. 4, [0150]-[0156]. In the middle slot shown below, *Chen's* UE receives a **second message** that may carry "beam indication information."

UE receives a **second message** that may carry “beam indication information.”

Kakaes, ¶189.



Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

[92.190.](#) *Chen* explains that the second message “may be understood as a message for notifying the receiving end device of a receiver reference, e.g., a **control message** or a scheduling message.” *Chen*, 12; *Chen Priority*, [0123].

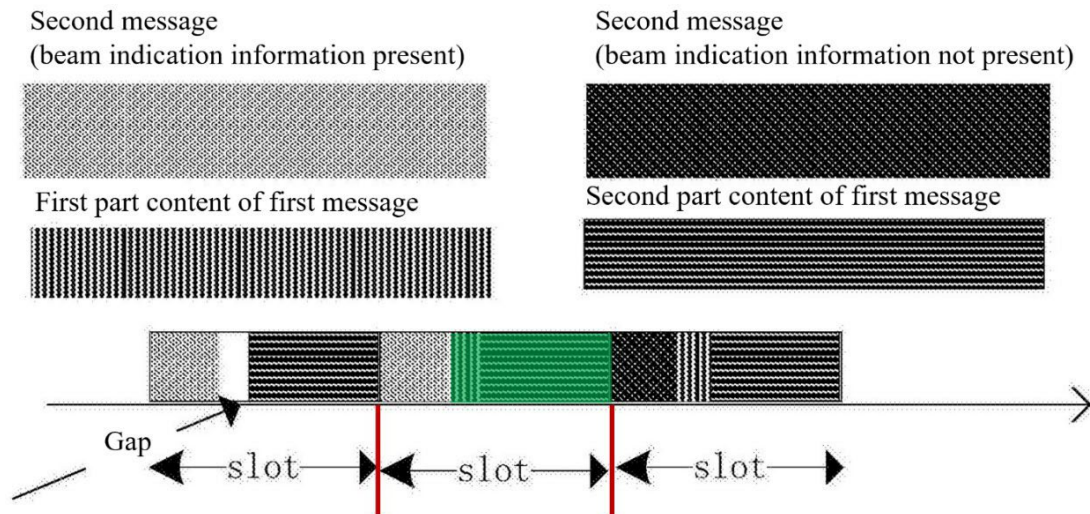
Chen’s second message, which can be a control message, constitutes the claimed

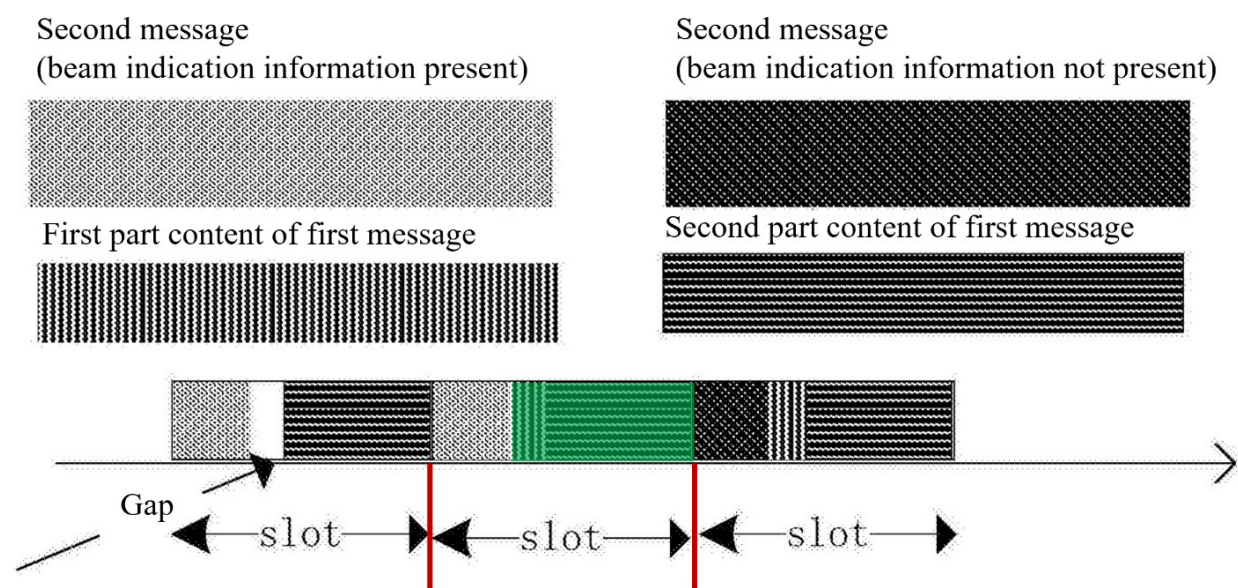
“second radio signal.” ~~Kakaes, ¶190.~~

c. [1b]: “receiving a first radio signal;”

~~93.~~191. *Chen* further discloses that the receiving end device (UE) receives a first message (“first radio signal”) from the transmitting end device (base station). ~~Kakaes, ¶¶191-192; Chen, 12, FIGS~~FIG. 2, FIG. 4; Chen Priority, [0120], [0123], FIGSFIG. 2, FIG. 4. For

4. ~~For~~ example, in the middle slot shown in annotated FIG. 4 below, *Chen's* UE receives a **first message**.





Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

[94.192.](#) *Chen* explains that “said first message may be a signal, e.g., a **data** and/or control message, that the transmitting end device needs to transmit to the receiving end device; for example, said first message may be a **downlink signal**.” *Chen*, 12; *Chen Priority*, [0123]. *Chen* discloses that the first message includes two parts, where “because the first part content and the second part content belong to the same message, the receiving end device may execute symbol-level processing separately on the first part content and the second part content.” *Chen*, 17; *Chen Priority*, [0152]. *Chen* also discloses that “[t]he first part of the first message immediately follows the second message, i.e. with no gap between them, and the second part content of the first message is adjacent to the first part content, e.g., the second slot shown in FIG. 4.” *Chen*, 17; *Chen Priority*, [0151]. ~~Thus, *Chen*’s first message, which can be a data message or downlink signal, constitutes the~~

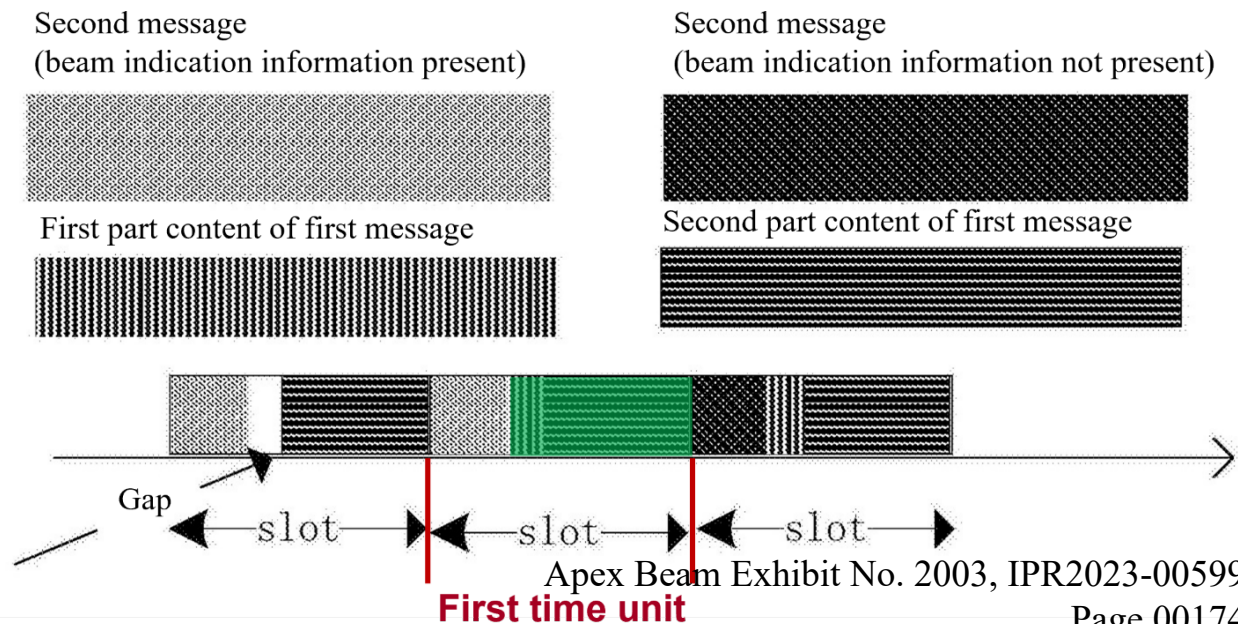
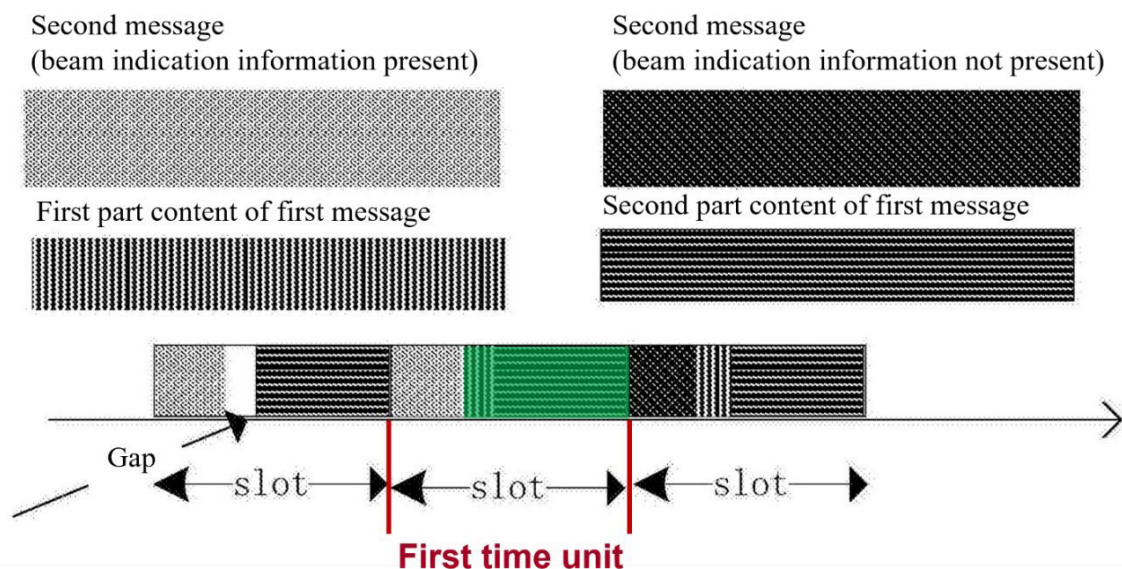
elaimed “first radio signal.” Kakaes, ¶192. Chen’s first

message, which can be a data message or downlink signal, constitutes the claimed “first radio signal.”

d. [1c]: “wherein the first radio signal is transmitted within a first time unit,”

95-193. As shown in annotated FIG. 4 below, *Chen’s* **first message** (“first radio signal”) is transmitted within a single slot (“**first time unit**”).-

~~Kakaes, ¶193.~~



Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

~~96-194.~~ The '081 patent specification states that the “first time unit” can be “a time slot.” '081 patent, 2:27. Thus, *Chen*'s slot constitutes the claimed “first time unit.” ~~Kakaes, ¶194.~~

- e. ~~[1d]-[1e]: “a first bit block is used for generating the first radio signal, and the first radio signal~~ [1d]-[1e]: “a first bit block is used for generating the first radio signal, and the first radio signal comprises G multicarrier symbols;”

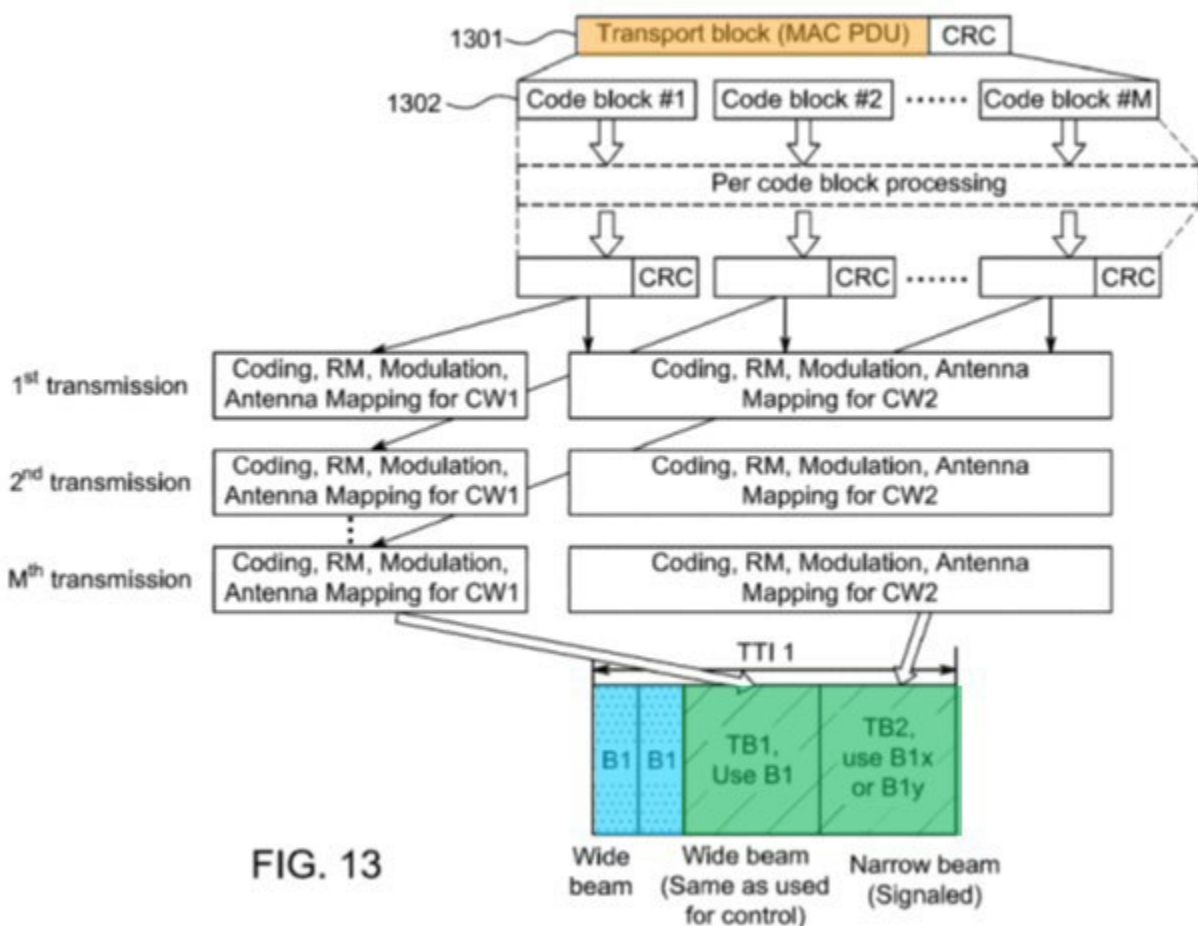
195. As discussed above for claim [1b], *Chen*’s transmitting end device (base station) transmits a first message, which can be a “data” message, to the receiving end device (UE). See Section XI.B.1.c; *Chen*, 12; *Chen Priority*, [0123]. *Chen* teaches that “the first part content and the second part content belong to the same message.” *Chen* 17; *Chen Priority* 152. A POSITA would understand that a block of bits is used to generate both the “first part content of the first message” and the “second part content of the first message”, i.e., of the claimed “first radio signal.” ~~Kakaes, ¶¶195-196. It~~

97.196. Further, it was well known to a POSITA that a data message may be generated using a bit block, which is a group of bits. Ex. 1020 (TS-36.212), 10 (describing a bit block having “B bits,” and if B is no more than “Z” (which is defined to be 6144), the “number of code blocks C is determined” to be “C = 1” (36.212, 10)). The bits of each code word are further processed and transmitted in a set of OFDM signals over a set of antenna ports. Ex. ~~Id. (citing~~ 1019 (TS-36.211), 66 (“the block of bits” transmitted on the “physical channel in one subframe, shall be scrambled prior to modulation, resulting in a block of scrambled bits”), Fig. 6.3-1. = ~~Ex. 1020 (TS-36.212); Ex. 1019 (TS-36.211); Rodermund, ¶¶58-65, 66-73; Lee, [0110], [0224] [0230], FIGS. 13-14). For~~

197. The above well-known concepts relevant to this claim limitation are also taught by *Lee*, [0110], [0224]-[0230], FIGS. 13-14; *Lee Provisional*, [0101],

[0209]-[0215], FIGS. 13-14. For example, as discussed above in Section
VIXI.A.1.e, Lee discloses that data messages may be generated by a Medium
Access Control Protocol Data Unit (MAC PDU), which is a well-known bit block.
Kakaes, ¶¶197-200; see also Lee, [0110], [0224]-[0230], FIGS. 13-14; Lee
Provisional, [0101], [0209]-[0215], FIGS. 13-14.

198. Specifically, Lee discloses that a Medium Access Control Protocol
Data Unit (MAC PDU) (“first bit block”) is used to generate transport blocks TB1
and TB2 (“first radio signal”). Lee, [0110], [0224]-[0230], FIGS. 13-14; Lee
Provisional, [0101], [0209]-[0215], FIGS. 13-14. For example, as shown in
annotated FIG. 13 below, Lee discloses that “[a] physical downlink **data channel**
may carry payload information in the form of **Medium Access Control (MAC)**
Protocol Data Unit (PDU) from the MAC layer,” and that “[t]he resource
allocation of this channel may be carried in the scheduling information in the
physical downlink **control channel**.” Lee, [0110]; Lee Provisional, [0101].



Lee, FIG. 13 (annotated); Lee Provisional, FIG. 13.

199. It was well known at the time of the earliest claimed priority date that a MAC PDU is a bit block. Ex. 1008 (TS-36.321), 49 (stating that “[a] MAC PDU is a bit string that is byte aligned (i.e., multiple of 8 bits) in length.”). Thus, Lee’s MAC PDU constitutes the claimed “first bit block.”

200. Further, as discussed above in Section XI.A.1.e, Lee’s MAC PDU is also subject to similar steps as the bit block in the ’081 patent’s specification. In particular, the ’081 patent specification explains that the claimed “first bit block” is “subjected to steps of Circular [sic] Redundancy Check (CRC) addition,

segmentation, channel coding, rate matching, scrambling, modulation, antenna mapping to form the first radio signal.” ’081 patent, 2:39-52. Just like the ’081 patent, *Lee*’s MAC PDU is subjected to the same steps for generating the transport blocks TB1 and TB2. As shown in annotated FIG. 13 above, *Lee* discloses that “a single MAC PDU” is processed through a cyclic redundancy check (CRC) addition 1301, code-block partitioning (segmentation) 1302, per-code-block processing (CRC addition), coding, rate matching (RM), modulation, and antenna mapping for codeword to form a codeword #1 and a codeword #2, that are mapped to TB1 and TB2, respectively. See *Lee*, [0224]-[0230], FIGs. 13-14; see also [0169], [0222]; *Lee Provisional*, [0209]-[0215], FIGs. 13-14; see also [0153]-[0157], [0207]. *Lee* further discloses that the above process includes scrambling. *Lee*, [0072] (“[t]he data channel beam may be identified or associated with a reference signal, an antenna port, a beam identity (ID), and/or a **scrambling** sequence number.”); *Lee Provisional*, [0066]. Thus, for these additional reasons, *Lee*’s MAC PDU constitutes the claimed “first bit block [that] is used for generating the first radio signal.”

98-201. Moreover, *Chen* discloses “symbol-level processing” of the first message (“first radio signal”). For example, *Chen* discloses that “because the first part content and the second part content belong to the same message, the receiving end device may execute **symbol-level processing separately on the first part-**

content

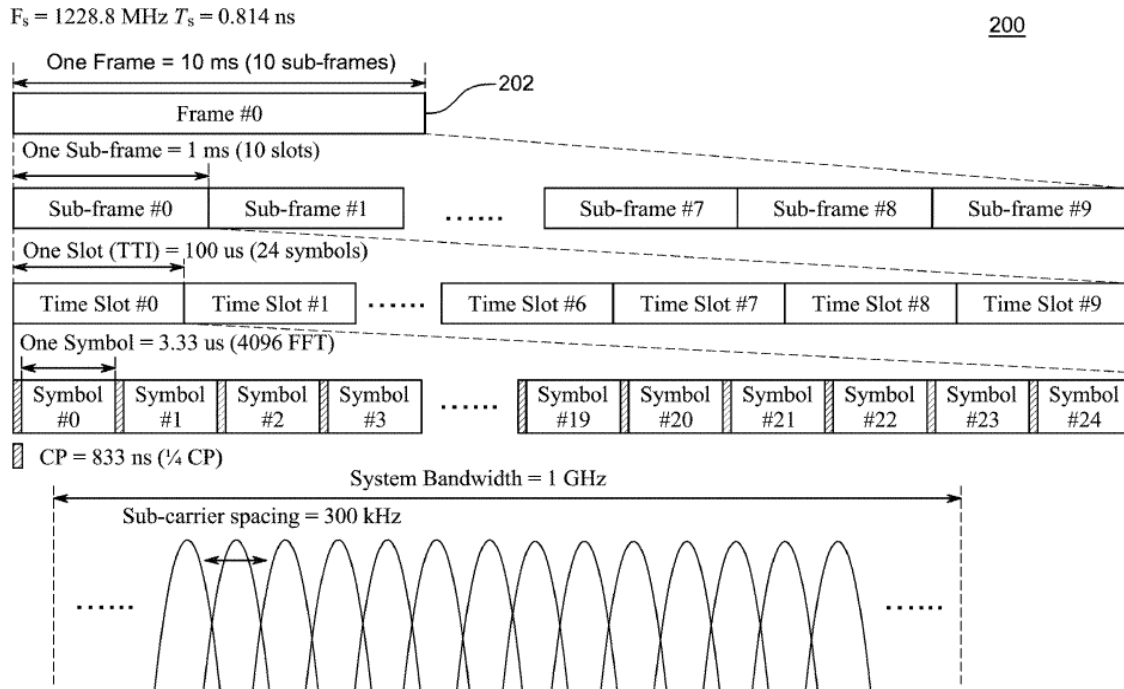
content and the second part content.” *Chen*, 17; *Chen Priority*, [0152]. Thus, a POSITA would have understood that *Chen*’s first message includes multiple symbols.

~~Kakaes, ¶201.~~ Further, a POSITA would have understood that *Chen*’s first message includes a positive integer number of symbols, as there cannot be a negative number of symbols, nor can there be fractions of symbols. ~~Id.~~

99.202. *Chen* also discloses that the transmitting end device (base station) may be “LTE, eNB, and 5G NR/NB” base stations. *Chen*, 11; *Chen Priority*, [0118]. It was well known to a POSITA that LTE and 5G base stations use multicarrier symbols, e.g., OFDM symbols, to support communications for different carriers. ~~Kakaes, ¶202. (citing Ex. 1019 (TS-36.211), 59-62; (“[t]he transmitted signal in each slot is described by one or several resource grids of ... subcarriers and ... OFDM symbols”); citing Ex. 1020 (TS-36.212), 87; (“[d]ata arrives each subframe to the coding unit in the form of an indicator for the time span, in units of OFDM symbols, of the DCI carried by PDCCH in that subframe of the corresponding DL cell”); Lee, [0079], [0091], [0095], FIG. 2; Ex. 1006 (TR-25.892), 18).~~ For example, as discussed above in Section ~~vi~~XI.A.1.f, *Lee* discloses a commonly used OFDM frame structure that includes a positive integer number of OFDM symbols in a data message. *Lee*, [0079], [0091], [0095], FIG. 2; Ex. 1006 (TR-25.892), 18.

203. Specifically, *Lee* discloses an OFDM frame structure that is commonly used for data transmission. As shown in FIG. 2 below, in the time

domain, a frame 202 “includes 10 sub-frames, each sub-frame includes 10 slots, and each slot includes 24 symbols.” *Lee*, [0095]. In the frequency domain, each symbol includes multiple sub-carriers with a “sub-carrier spacing of 300 kHz.” *Lee*, [0095]; *see also Lee*, [0091].



Lee, FIG. 2.

204. As shown in FIG. 2 above, *Lee* discloses that each TTI includes “24 symbols.” Thus, *Lee*’s TTI includes a positive integer number of OFDM symbols. Indeed, it was well known in the art that OFDM symbols are designed such that a TTI includes an integer number of OFDM symbols, as evidenced by Ex. 1006 (*TR* 25.892). *Ex. Kakaes*, ¶¶202-205; *see also* 1006 (*TR* 25.892), page 18 (disclosing that “the design of the parameter set leads to an **integer number of symbols per TTI** (2 ms).”).

205. Among the positive integer number of OFDM symbols in each TTI (e.g., 24 OFDM symbols), Lee further discloses that a “data region” may be “part of the scheduling interval in time domain, which may be referred to in **units of OFDM symbols**, used for the transmission of all data channel beams in that scheduling interval.” Lee, [0079]. Thus, a POSITA would have understood that the data region of Lee includes a positive integer number of OFDM symbols. Indeed, a POSITA would have known that there cannot be a negative number of OFDM symbols. Nor can there be fractions of OFDM symbols. Thus, Lee’s data region comprises “G multicarrier symbols.”

~~Lee, [0079], [0091], [0095], FIG. 2; Ex. 1006 (TR-25.892), 18.~~

100.206. A POSITA would have been motivated to implement Lee’s teachings of a data message generated by a bit block (e.g., MAC PDU) and using multicarrier symbols (e.g., OFDM symbols) into Chen’s method. ~~Kakaes, ¶206.~~ Both Chen and Lee disclose wireless communication systems where a base station transmits control and data messages to the UE within a single time slot. See e.g., Chen, FIG. 4; Chen Priority, FIG. 4; Lee, FIG. 12. Both Chen and Lee disclose that the data includes multiple symbols in the time domain. Chen, 17; Chen Priority, [0152]; Lee, [0079]. Lee further discloses that the data is generated using a bit block, and the multiple symbols are a positive integer number of multicarrier

symbols. *Lee*, [0079], [0091], [0095], [0110], [0224]-[0230], FIGS. 2, 13-14.

207. A POSITA would therefore have found it obvious to combine *Chen* and *Lee* by implementing *Lee*'s use of a bit block and multicarrier symbols in *Chen*'s method, because this was a well-known, conventional procedure, as taught by *Lee*. ~~Kakaes, ¶207.~~ See also Ex. 1020 (TS-36.212), 10, 63, 87; Ex. 1019 (TS-36.211), 18-19, 59-62, 66; Ex. 1008 (TS-36.321), 49; Ex. 1006 (TR 25.892), 18. A POSITA would have understood that *Lee*'s disclosure simply provides additional details and explanation about how *Chen*'s data message is generated and modulated in time and frequency domains, and, thus, would have found it obvious to look to the conventional procedure described in *Lee* to understand and implement the details not expressly described in *Chen*'s method.

~~*Id.*~~

A POSITA would have been motivated to implement *Lee*'s bit block and multicarrier symbols in *Chen*'s method because of the well-known benefits of bit block and multicarrier symbol transmission methods, for example, increased bandwidth efficiency, increased speed, and low sensitivity to channel fading.

~~101-208.~~ ~~Kakaes, ¶208.~~ Thus, a POSITA would have been motivated to implement *Lee*'s bit block and multicarrier symbols because of these well-known advantages provided by *Lee*'s method. Further, a POSITA would have been motivated to look to *Lee* to understand how to generate and modulate *Chen*'s data message.

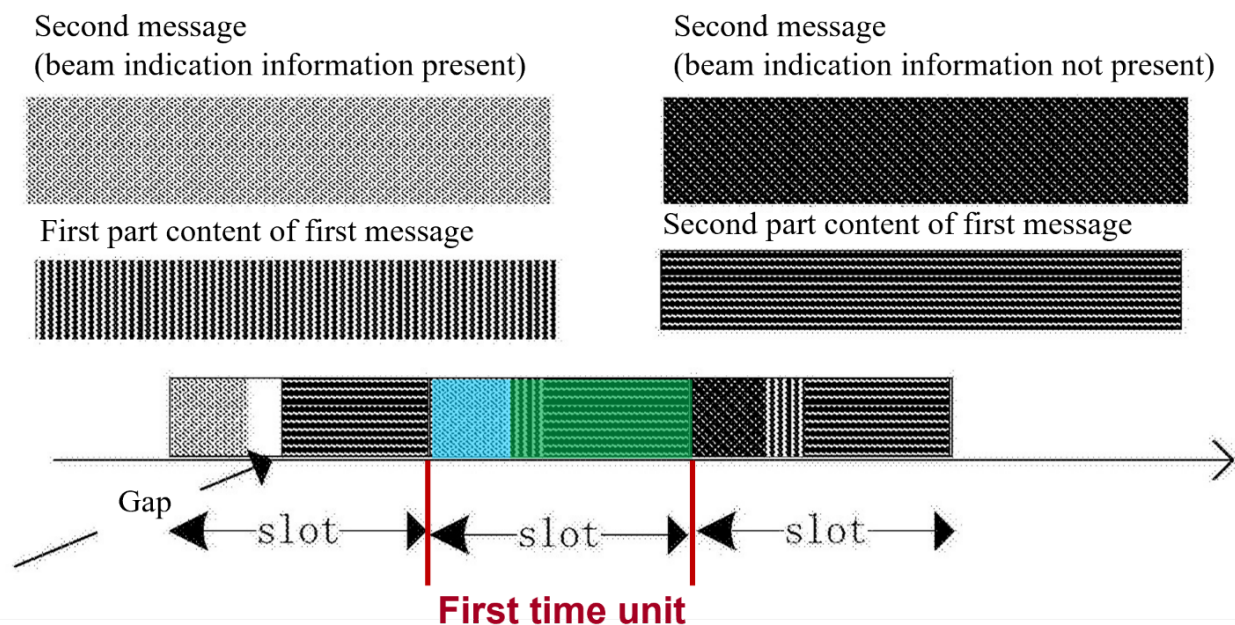
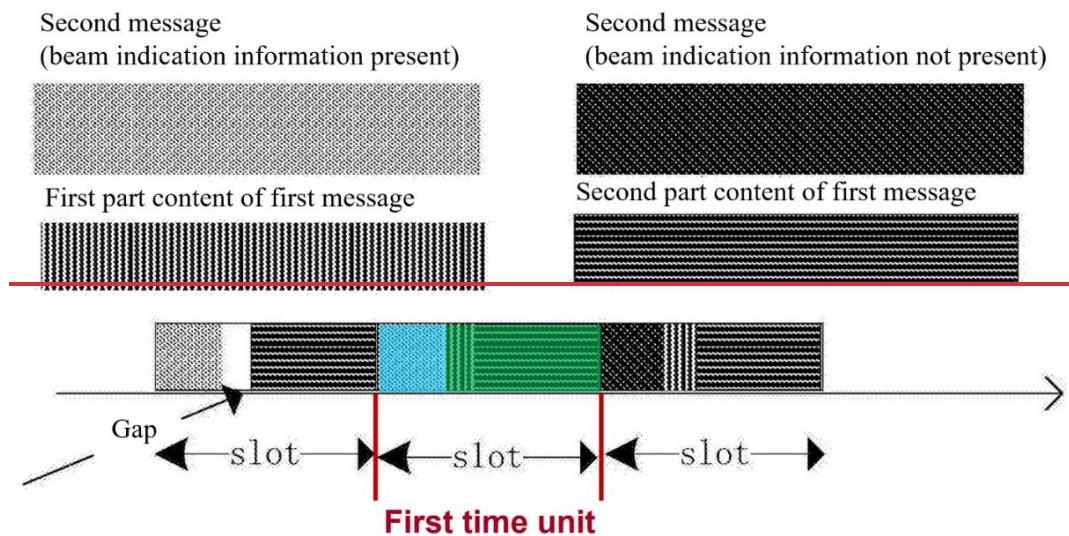
~~by *Lee*'s method. *Id.*; see *KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”), 421; *Uber*, 957 F.3d at 1338-41.~~

102.209. A POSITA would have had a reasonable expectation of success as it would have been straightforward for a POSITA to implement *Lee*'s bit block and

multicarrier symbols in *Chen*'s method. ~~Kakaes, ¶209~~. As mentioned above, *Chen* and *Lee* include similar components that perform similar functions. Further, *Lee* simply provides additional details and explanation about how *Chen*'s data message is generated and modulated in time and frequency domains. ~~Id.~~ Thus, it would have been straightforward to implement *Lee*'s bit block and multicarrier symbols in *Chen*'s existing method. ~~Id.~~ For example, a POSITA could have easily updated the existing software in *Chen*'s UE and/or base station to enable the UE and the base station to transmit and receive bit blocks (e.g., MAC-PDU) and multicarrier symbols (OFDM symbols), which were well known in the art.

f. [1f]: “the second radio signal is transmitted within the first time unit, and”

~~103-210~~. As shown in annotated FIG. 4 below, *Chen*'s **second message** (“second radio signal”) is transmitted within the same slot (“**first time unit**”) as the **first message** (“first radio signal”). *Chen*, FIG. 4; *Chen Priority*, FIG. 4; ~~Kakaes, ¶2104~~.



Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

- g. [1g]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

[104:211.](#) *Chen* discloses that the second message (“second radio signal”) is used for determining a time-domain resource occupied by the first message

(“first radio signal”). ~~Kakaes, ¶¶211-215.~~ For example, *Chen* discloses that “said **second message** may be understood as a message for notifying the receiving end device of a receiver reference, e.g., a **control message** or a **scheduling message**.” *Chen*, 12; *Chen Priority*, [0123].

~~105-212.~~ 212. It was well known that a control message provides, among other things, control information associated with a data message. ~~Kakaes, ¶212.~~ ~~Further, it was well known that~~ As the name “control” implies, the purpose of the control information ~~includes, among other things, scheduling~~ is to provide instructions for

receiving the data. Further, it was well known that the control information includes, among other things, scheduling information and time-domain resource information for determining the time-domain resource resources of symbols in data transmission schemes such as *Chen's*. ~~Id.~~ Indeed, *Chen* specifically states that the second message may be a “scheduling message” for the first message. *Chen*, 12; *Chen Priority*, [0123]. Thus, a POSITA would have understood that *Chen's* control message and/or scheduling message includes information indicating a time-domain resource occupied by *Chen's* data message (“first message”). ~~Kakaes, ¶¶212-214.~~

213. Further, as discussed above in Section XI.A.1.h, *Lee* discloses a similar “control” message. For example, *Lee* discloses that “[a] physical downlink control channel may carry data related control information to identify, demodulate and decode the associated data channel properly.” *Lee*, [0109]; *Lee Provisional*, [0100]. As an example, *Lee* discloses that the control channel may carry **scheduling information** for the data channel. *Lee*, [0110]; *Lee Provisional*, [0101]. As another example, *Lee* discloses that the control channel may indicate the “transmit beam” used for the data channel, where the transmit beam “may include one or more of following parameters: Tx or Rx beam width (e.g., beam subgroup), Tx or Rx beam direction (e.g., beam index) within the beam width, and a time-frequency resource associated with the beam.” *Lee*, [0148]; *Lee Provisional*, [0138]. Finally, with specific reference to FIG. 12, *Lee* discloses that

“[t]he first transport block may be mapped on to a first codeword provided in the control Tx beam 1203 and the second transport block may be mapped on to a second codeword provided in control Tx beam 1204.” Lee, [0169]; Lee Provisional, [0158]-[0159]. And “[t]he codeword may be associated with: a specific beam or beam ID, a BRS, and/or a **time/frequency location**.” Lee, [0169]; Lee Provisional, [0158]-[0159]. Thus, as Lee describes in more detail, it was well known that a control message includes scheduling information and time/frequency resource allocation information.

214. Further, because Chen/Lee’s data message includes multicarrier symbols, the scheduling information and time/frequency resource allocation information would have included the scheduling and time/frequency resource allocation of the symbols. Thus, as was well known in the art at the time, a POSITA would have understood that Chen’s control/scheduling message to include scheduling information and time/frequency information for the multicarrier symbols in the data message.

~~106,215.~~ Further, as discussed for claim [1e], Chen/Lee’s method includes G multicarrier symbols. See Section XI.B.1.e. Thus, the control message in Chen/Lee’s method is “used for determining a time-domain resource occupied by the G multicarrier symbols.” ~~Kakaes, ¶215.~~

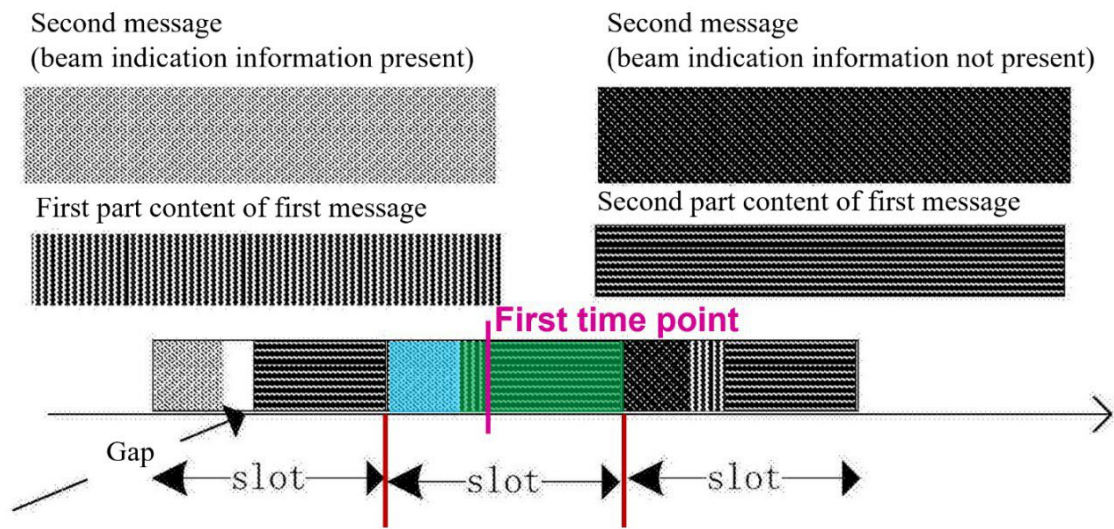
- h. [1h]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related**

receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

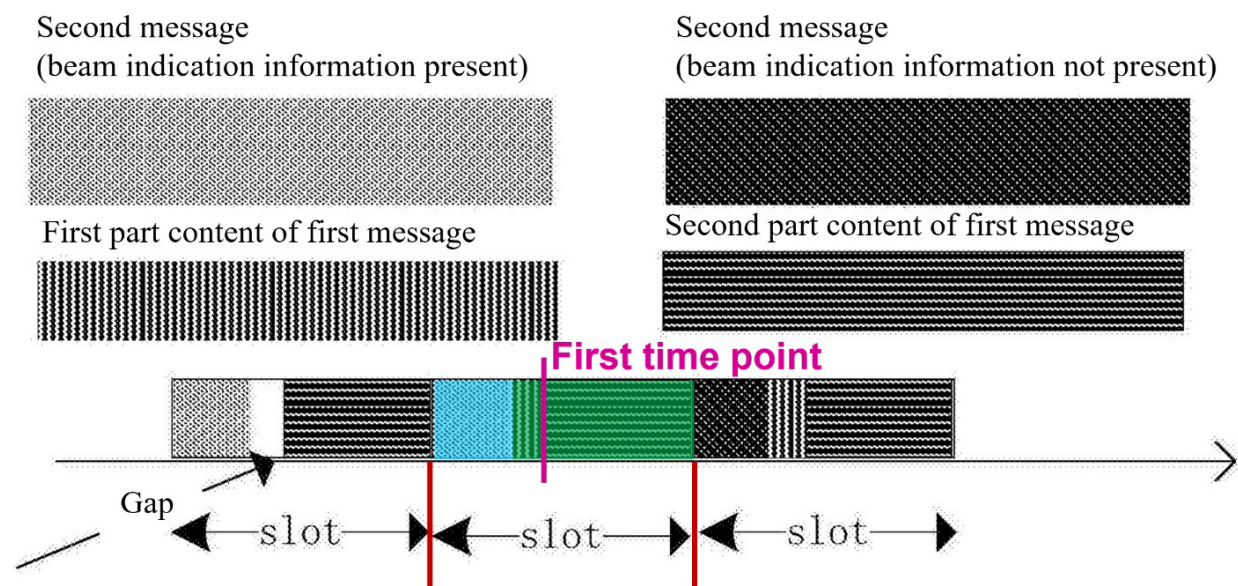
Chen’s receiving end device (UE) is a multi-antenna system. ~~Kakaes, ¶216.~~

~~107.216.~~ For example, *Chen*’s background section describes that “all communications devices now support multiple antenna systems. For example, they support as many as 128, 256, or 512 antenna units and as many as 128, 256, or 512 transceiver units, wherein each antenna unit connects to one transceiver unit.” *Chen*, 1; *Chen Priority*, [0002]. *Chen* further explains that this multi-antenna system “support[s] multiple wave beams, and the coverages of different wave beams may vary.” ~~Id.~~ *Chen*, 1; *Chen Priority*, [0002]. Moreover, the rest of the disclosure in *Chen* is directed to improving such multi-antenna systems. See generally ~~*Chen*; *Chen Priority*, *Chen*; *Chen Priority*. As discussed above in Section VI.A, communication devices using multiple antennas (e.g., MIMO) form one or more beams for transmitting and receiving signals between the UE and the base station. Thus, “multi-antenna related receiving” refers to the beam(s) used to receive a signal.~~

~~108.217.~~ *Chen* also discloses switching a receiver parameter at the receiving end device (UE). *Chen*, 13; *Chen Priority*, [0128]. For example, as shown in annotated FIG. 4 below, *Chen* discloses a time point (“**first time point**”) at which the receiver parameter is switched to a target receiver parameter.



Chen, FIG. 4 (annotated); Chen Priority, FIG. 4.



Chen, FIG. 4 (annotated); Chen Priority, FIG. 4.

109-218. Specifically, *Chen* discloses that “a **reception beam** indicated by the parameter indication information may be a receiver parameter different from the receiver parameter currently used by the receiving end device; **at this time**, the receiving end device needs to **switch the receiver parameter.**” *Chen*, 13; *Chen Priority*, [0128]. *Chen* also discloses that “the target receiver parameter may be a relevant parameter of a receiver in the receiving end device,” including, e.g., a “**reception beam.**” *Chen*, 12; *Chen Priority*, [0124]. *Chen* further explains that “[t]o take a target reception beam as an example of a target receiver parameter, determining the target reception beam for decoding said first message, as described above, may be as follows: **selecting one or more reception beams from among a plurality of reception beams (Rx beams)** of the receiving end device.” ~~*Id.*~~ *Chen*, 12;

| *Chen Priority, [0124].*

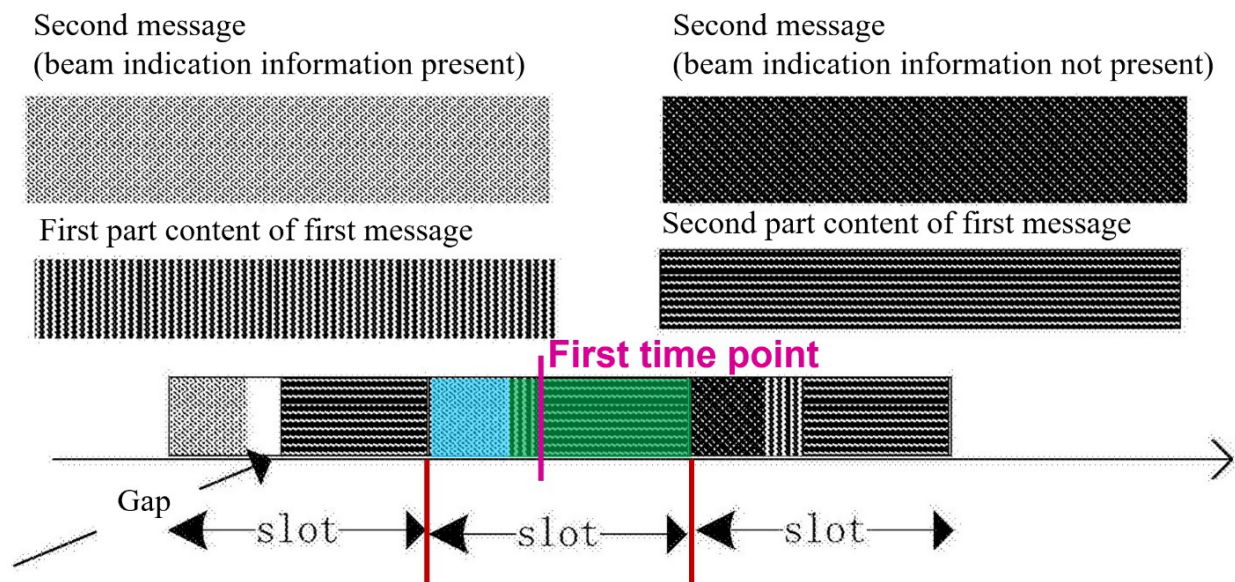
~~110.219.~~ Moreover, as discussed for claim [1e], *Chen/Lee*'s method includes G multicarrier symbols in the first message. See Section XI.B.1.e. Thus, as shown in annotated FIG. 4 above, *Chen/Lee*'s method discloses that, for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving (e.g., the reception beam) for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to the first time point in the time domain. ~~Kakaes, ¶219.~~ This is because, in FIG. 4, when the given multicarrier symbol is before the first time point (e.g., in the first part of the first message), a default beam (or the current beam used for reception of the control message) is used for receiving the given multicarrier symbol, and when the given multicarrier symbol is behind the first time point (e.g., in the second part of the first message), a target beam is used for receiving the given multicarrier symbol.

the first message), a target beam is used for receiving the given multicarrier symbol. *Id.*

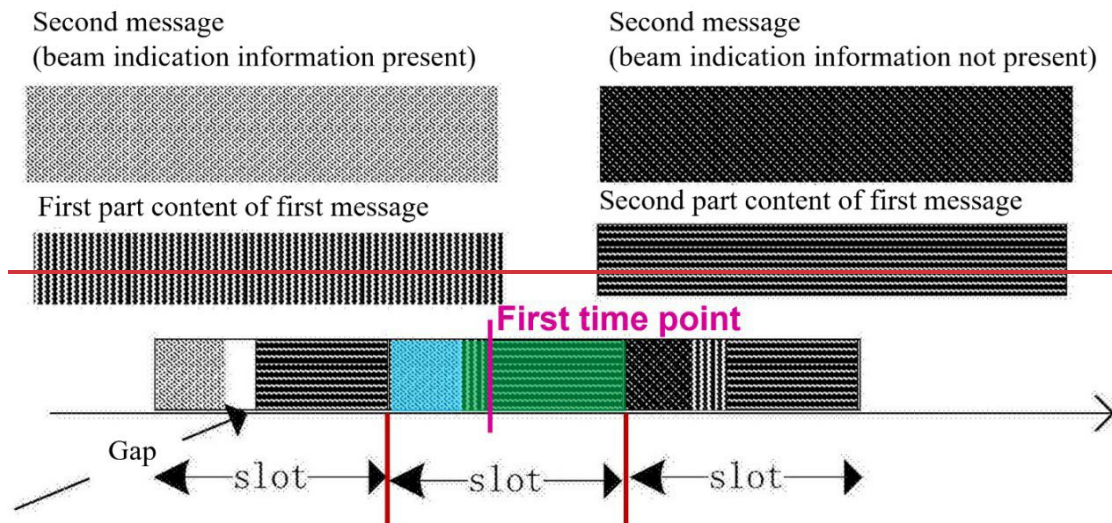
- i. [1i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and”
- ~~ii. [1i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and”~~

111.220. As discussed for claim [1h], *Chen/Lee*’s method discloses that, when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the receiver parameter (e.g., reception beam) of the receiving end device (UE) is switched based on the parameter indication information included in

the second message (“second radio signal”). ~~Kakaes, ¶220~~ See Section XI.B.1.h. In particular, as shown in annotated FIG. 4 below, *Chen* discloses that “said **second message** may include or not include the **parameter indication information**; if it does include it, then the receiver parameter indicated by the parameter indication information serves as said **target receiver parameter**.” *Chen*, 13; *Chen Priority*, [0128]. *Chen* further discloses that “a reception beam indicated by the parameter indication information may be a receiver parameter different from the receiver parameter currently used by the receiving end device; **at this time**, the receiving end device needs to **switch the receiver parameter**.” ~~Id.~~ *Chen*, 13; *Chen Priority*, [0128].



Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.



~~Chen, FIG. 4 (annotated); Chen Priority, FIG. 4.~~

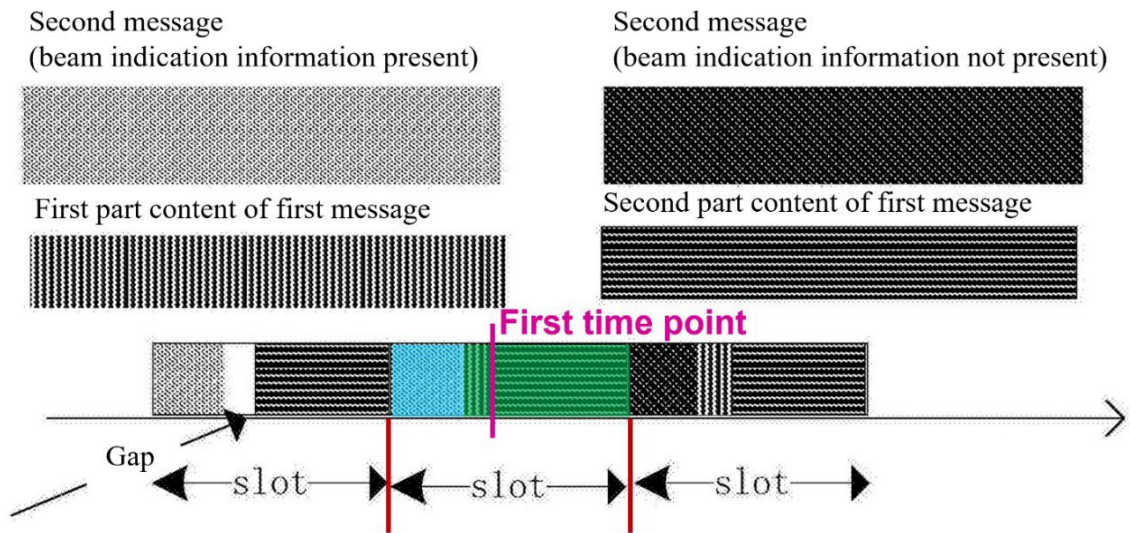
412.221. Thus, *Chen/Lee*'s method discloses that, when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second message ("second radio signal") is used for determining the multi-
~~antenna-related receiving (e.g., the reception beam) for the given multicarrier~~
~~symbol. Kakaes,~~
~~¶221.~~

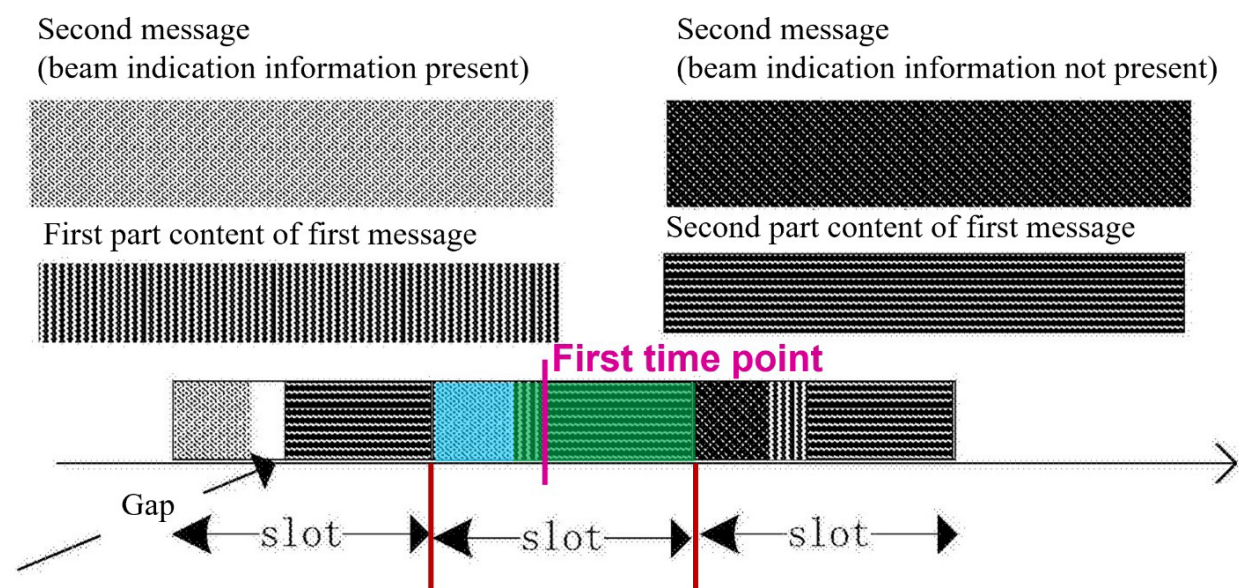
~~m.i. [1]: "when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna-related receiving for the given multicarrier symbol is related to the multi-antenna-related receiving for the second radio signal;"~~

antenna related receiving (e.g., the reception beam) for the given multicarrier symbol.

i. [1j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

413-222. As also discussed for claim [1h], *Chen/Lee*’s method discloses that, when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the default receiver parameter (e.g., reception beam) that is used for transmitting the second message (“second radio signal”) is used for the given multicarrier symbol. See Section XI.B.1.h. For example, *Chen* discloses that “the **default receiver parameter** may be the receiver parameter **currently used** by the receiving end device for rapid decoding of the message transmitted by the transmitting end device.” *Chen*, 13; *Chen Priority*, [0128]. As shown in FIG. 4 below, the reception of the second message occurs immediately before the reception of the first message. Thus, the “currently used” receiver parameter (reception beam) in *Chen* is the receiver parameter (reception beam) used for the second message. ~~Kakaes, ¶222.~~





Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

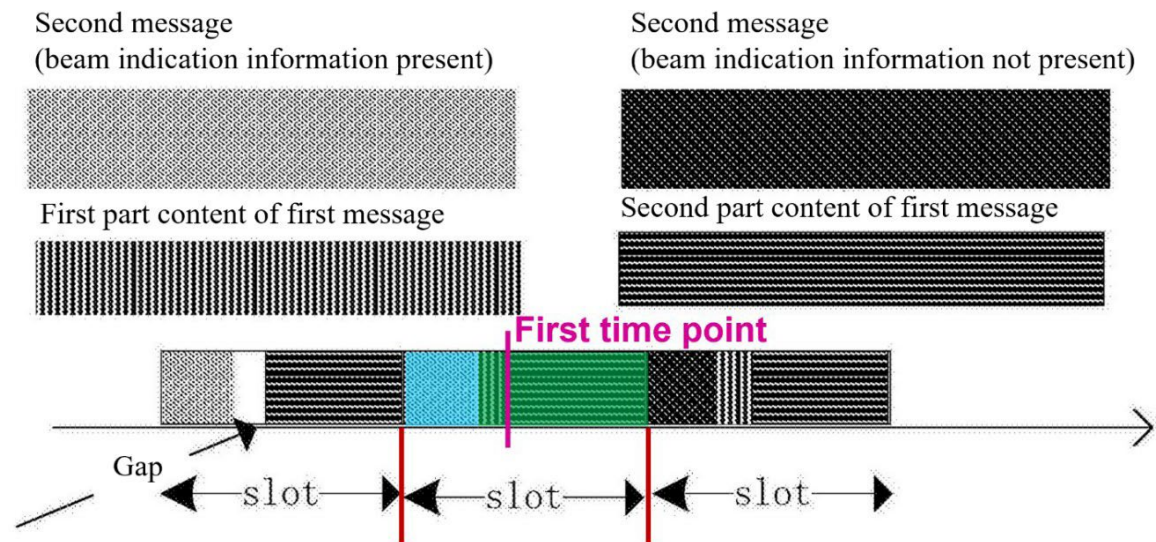
[114.223.](#) Accordingly, *Chen/Lee*'s method discloses that, when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving (e.g., the reception beam) for the given multicarrier symbol of the first message ("first radio signal") is related to the multi-antenna related receiving for the second message ("the second radio signal").

~~Kakaes, ¶223.~~

[i.k.](#) [1k]: "the first time point is one time point within the first time unit; and"

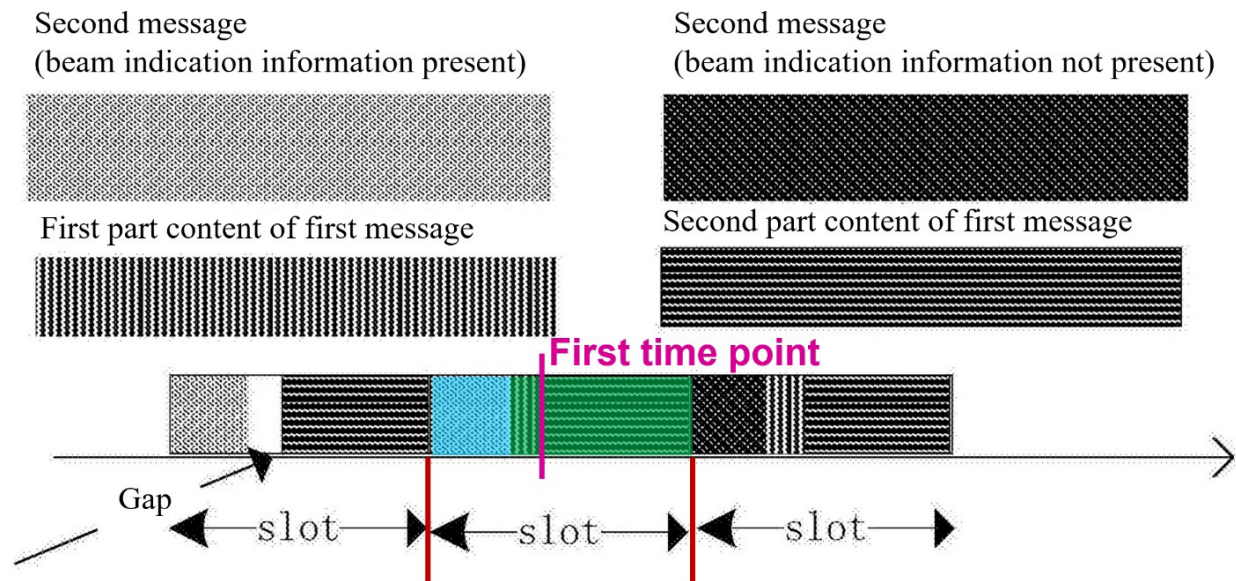
[115.224.](#) As shown in annotated FIG. 4 below, *Chen* discloses that the receiver parameter switching point ("first time point") is one time point within the single slot ("first time unit"). ~~Kakaes, ¶224; see also~~ *Chen*, 13 ("at this time, the receiving end device needs to switch the receiver parameter"); *Chen*

Priority, [0128]. Indeed, FIG. 4 depicts



~~Chen, FIG. 4 (annotated); Chen Priority, FIG. 4.~~

the time domain axis within the slot, and the “first time point” shown below (which is the beam switching point) is one time point within the time unit.



Chen, FIG. 4 (annotated); Chen Priority, FIG. 4.

¶1. [11]: “G is a positive integer.”

¶16.225. As discussed above for claim [1e], *Chen/Lee*’s method includes a positive integer number G of multicarrier OFDM symbols. ~~Kakaes,~~
~~¶225~~ See Section XI.B.1.e.

¶17.226. Thus, *Chen* and *Lee* render obvious claim 1. ~~Kakaes, ¶226.~~

2. Claim 2

- a. [2a]: “The method according to claim 1, comprising: receiving first information, wherein the first information is used for determining the first time point; or,”

227. As discussed above, *Chen* and *Lee* render obvious claim 1. ~~Further,~~
Claim 2 recites two alternative options separated by “or.” A POSITA would

have

understood that satisfying either of these options satisfies the requirements of claim

2, which I understand is consistent with legal standards. As I explain below, *Chen* discloses [2a], which is sufficient to disclose claim 2.

118-228. *Chen*'s receiving end device (UE) receives "first information" from the transmission end device (base station) that is used for determining the first time point. ~~Kakaes,~~

~~¶¶227-231.~~

119-229. For example, as discussed above for claims [1h]-[1j], *Chen* discloses that the receiving end device switches the receiver parameter (reception beam) to a target receiver parameter when the second message includes "parameter indication information." See Section XI.B.1.h through Section XI.B.1.j. Specifically, *Chen* discloses that "a **reception beam** indicated by the parameter indication information may be a receiver parameter different from the receiver parameter currently used by the receiving end device; **at this time**, the receiving end device needs to **switch the receiver parameter**." *Chen*, 13; *Chen Priority*, [0128]. One specific example of "parameter indication information" disclosed by *Chen* is "beam indication information." *Chen*, FIG. 4; *Chen Priority*, FIG. 4.

120-230. Further, as discussed for claim [1g], *Chen*'s control/scheduling message includes scheduling information and time/frequency information for the data message. See Section XI.B.1.g.

121.231. The '081 patent states that the claimed “first information” indicates “the first time point” either “explicitly” or “implicitly.” '081 patent, 5:40-43. Thus,

just like the '081 patent, a POSITA would have understood that *Chen*'s parameter indication information (e.g., beam indication information), scheduling information, and/or time/frequency information constitutes the claimed "first information" used for determining the "first time point." ~~Kakaes, ¶231.~~

- b. [2b]: "receiving third information," wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols."

~~122.232.~~ ~~Claim~~ As discussed above, because claim 2 includes an "or" between claim [2a] and [2b], ~~so~~ the above-discussed teachings of claim [2a] are sufficient to satisfy claim 2. ~~Brown v. 3M, 265 F.3d at 1351.~~

3. Claim 3

- a. "The method according to claim 2 comprising: transmitting second information, wherein the second information is used for determining the first time point."

~~123.233.~~ As discussed above, *Chen* and *Lee* render obvious claim 2. *Chen* does not explicitly disclose transmitting second information that is used for determining the first time point. But, as discussed above in Section ~~vi~~XI.A.3, *Lee* discloses that a WTRU (UE) transmits receiver beamforming capability ("second information") to the base station that is used to determine a beam switching time ("first time point"). See *Lee*, [0144], [0149], [0159], [0196].

~~124.234.~~ A POSITA would have found it obvious to combine *Chen* and *Lee* by

adopting *Lee*'s transmitting of beamforming capability in *Chen*'s method because

it was well known to consider the UE's capabilities (including, e.g., beamforming capability) in determining the beam switching point, as taught by *Lee*. ~~Kakaes,~~
¶234. Both *Chen* and *Lee* disclose wireless communication systems where a base station transmits control and data messages to the UE within a single time slot. *See e.g., Chen*, FIG. 4; *Chen Priority*, FIG. 4; *Lee*, FIG. 12. Both *Chen* and *Lee* disclose switching a reception beam for UE during the transmission of the data message. ~~Id.~~ *Chen*, FIG. 4; *Chen Priority*, FIG. 4; *Lee*, FIG. 12. *Lee* further discloses that the UE transmits beamforming capability to the base station and the UE's beamforming capability is used for determining the beam switching point.

~~beamforming capability is used for determining the beam switching point. Kakaes, ¶234.~~

~~125.235.~~ A POSITA would have been motivated to implement *Lee*'s method of transmitting UE beamforming capability in *Chen*'s method because it would improve the efficiency of the communications between the UE and the base station. ~~Kakaes, ¶235.~~ For example, as *Lee* explains, "[a] transmission mode may be determined based on the beamforming capability of a [UE] which may include the number of RF chains, number of receive beams, and/or beam switching time." *Lee*, [0196]. Further, the UE may indicate a "required guard period" or "gap" for the receiver beamforming adaptation (*Lee*, [0157], [0159]), which the base station may factor into the selection of the beam switching point. ~~Kakaes, ¶235.~~ Thus, a POSITA would have been motivated to implement *Lee*'s method because of the advantages provided by *Lee*'s method. ~~*Id.*; see KSR, 550 U.S. at 417, 421; Uber, 957 F.3d at 1338-41.~~

~~126.236.~~ A POSITA would have had a reasonable expectation of success as it would have been straightforward for a POSITA to implement *Lee*'s teachings in *Chen*'s method. ~~Kakaes, ¶236.~~ As mentioned above, *Chen* and *Lee* include similar components that perform similar functions. *Chen*'s UE is also already designed to transmit various signals to the base station. ~~Id.~~ And therefore, it would have been straightforward to implement *Lee*'s teachings to *Chen*'s existing method. ~~Id.~~ For example, a POSITA could have easily updated the existing software in *Chen*'s UE and/or base station to enable *Lee*'s UE to transmit its beamforming capability to the base station and to enable *Lee*'s base station to consider the UE beamforming capability in determining the beam switching point.

4. Claim 4

- a. **“The method according to claim 1 comprising: transmitting second information; wherein the second information is used for determining the first time point.”**

~~127.237.~~ Claim 4 recites the same additional limitation as claim 3, except that claim 4 depends from claim 1 instead of claim 2. Thus, for at least the same reasons as claim 3, *Chen* and *Lee* render obvious claim 4. ~~Kakaes, ¶237.~~

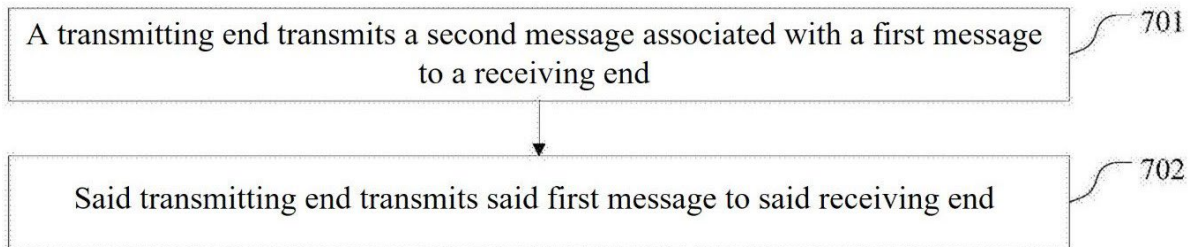
5. Independent Claim 5

- a. **[5pre]: “A method in a base station device for wireless communication, comprising:”**

~~128.238.~~ As discussed for claim [1pre], *Chen* discloses a wireless communication system and methods of a receiving end device (UE) in

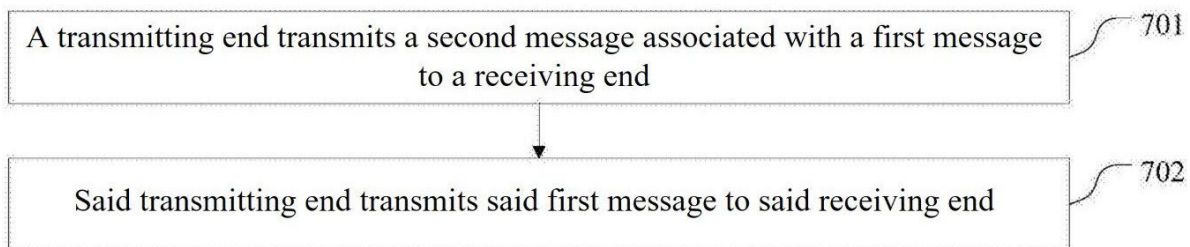
communication with a transmitting end device (base station). See Section XI.B.1.a; Chen, 11, FIG. 1; Chen Priority, [0118], FIG. 1. Likewise, *Chen* also discloses the corresponding system and methods performed by the transmitting end device (base station). See ~~id.~~; Kakaes, ¶¶238–239 *Chen, 11, FIG. 1; Chen Priority, [0118], FIG. 1.*

429.239. For example, *Chen* discloses a method implemented in a transmitting end device (base station) that includes, among other things, “a transmitting end device transmitting a second message associated with a first message to a receiving end device,” and “said transmitting end device transmitting said first message to said receiving end device,” as shown in FIG. 7 below. *Chen, 21; Chen Priority, [0177]–[0179].*



receiving end device,” as shown in FIG. 7 below.

Chen, 24FIG. 7; *Chen Priority*, [0177]–[0179].



Chen, FIG. 7; *Chen Priority*, FIG. 7.

b. [5a]: “transmitting a second radio signal;”

130:240. As discussed for claim [1a], *Chen*’s receiving end device (UE) receives a second message (“second radio signal”) from the transmitting end device (base station). See Section XI.B.1.b; *Chen*, 12, FIGS FIG. 2, FIG. 4; *Chen Priority*, [0120], [0123], FIGS FIG. 2, FIG. 4. Thus, *Chen* also discloses the base station “transmitting a second radio signal.” *Chen*, 21; *Chen Priority*, [0177]–[0179]. ~~Kakaes,~~

- c. ~~¶240; see also Chen, 21; Chen Priority, [0177]-[0179].~~[5b]:
“transmitting a first radio signal;”

241. As discussed for claim [1b], *Chen*’s UE receives a first message (“first radio signal”) from the transmitting end device (base station). See Section XI.B.1.c; Chen, 12, 17, FIG. 4; Chen Priority, FIG. 4, [0123], [0151], [0152].

Thus, *Chen* also discloses the transmitting end device (base station) “transmitting a first radio signal.” ~~Kakaes, Chen, 21; Chen Priority, [0177]-[0179]~~

- d. ¶241; see also [5c]: “wherein the first radio signal is transmitted within a first time unit,”
As Chen, 21; Chen Priority, [0177]-[0179].

~~g. [5e]-[5h]~~

~~242. Limitations [5e]-[5i] are identical to limitations [1e]-[1i] except for one instance where “for determining” instead recites “to determine.” Thus, as discussed for limitations claim [1c]-[1i], Chen discloses this limitation. See~~

Section XI.B.1.d.

~~e. [5d]: “a first bit block is used for generating the first radio signal, and”~~

~~131-243. As discussed for claim [1d], Chen and/or Chen and Lee~~
~~render obvious these limitations. Kakaes, ¶¶242-251 this limitation. See Section~~

XI.B.1.e.

~~f. [5e]: “the first radio signal comprises G multicarrier symbols;”~~

~~244. As discussed for claim [1e], Chen and/or Lee render obvious this~~
~~limitation. See Section XI.B.1.e.~~

~~g. [5f]: “the second radio signal is transmitted within the first time unit, and”~~

~~245. As discussed for claim [1f], Chen discloses this limitation. See Section~~
~~XI.B.1.f.~~

h. [5g]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

246. As discussed for claim [1g], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.g.

i. [5h]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

247. As discussed for claim [1h], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.h.

j. [5i]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna related receiving for the given multicarrier symbol; and”

248. As discussed for claim [1i], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.i.

k. [5j]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

249. As discussed for claim [1j], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.j.

l. [5k]: “the first time point is one time point within the first time unit; and”

250. As discussed for claim [1k], *Chen* discloses this limitation. See Section XI.B.1.k.

m. [5l]: “G is a positive integer.”

251. As discussed for claim [1l], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.l.

~~132-252.~~ Therefore, *Chen* and *Lee* render obvious claim 5. ~~Kakaes, ¶252.~~

6. Claim 6

a. [6a]: “The method according to claim 5, comprising: transmitting first information, wherein the first information is used for determining the first time point; or,”

253. As discussed above, *Chen* and *Lee* render obvious claim 5. Claim 6 recites two alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 6, which I understand is consistent with legal standards. As I explain below, *Chen* discloses [6a], which is sufficient to disclose claim 6.

~~133-254.~~ As discussed for claim [2a], *Chen* teaches the receiving end device (UE) receiving from the transmitting end device (base station), first information, wherein the first information is used for determining the first time point. See Section XI.B.2.a. Thus, *Chen* also teaches the transmitting end device (base station) “transmitting first information, wherein the first information is used for determining

the first time point.” Kakaes, ¶¶253–254.

station) “transmitting first information, wherein the first information is used for determining the first time point.”

- b. [6b]: “transmitting third information,——” wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”

134.255. ~~Claim~~ As discussed above, claim 6 includes an “or” between claim ~~[6a]~~ [a] and [6b], so the above-discussed teachings of claim [6a] are sufficient to satisfy claim 6. ~~Brown v. 3M, 265 F.3d at 1351.~~

7. Claim 7

- ~~a. “The method according to claim 6 comprising: receiving second information, wherein the second information is used for determining the first time point.”~~
- a. “The method according to claim 6 comprising: receiving second information, wherein the second information is used for determining the first time point.”

135.256. As discussed above, *Chen* and *Lee* render obvious claim 6. As discussed for claim 3, *Chen* and *Lee* render obvious the receiving end device (UE) transmitting to the transmitting end device (base station), second information, wherein the second information is used for determining the first time point. See Section XI.B.3. Thus, *Chen* and *Lee* also render obvious the transmitting end device (base station) “receiving second information, wherein the second

information is used for determining the first time point.” ~~Kakaes, ¶256.~~

8. Claim 8

~~a. “The method according to claim 5, comprising:
receiving second information; wherein the second
information is used for determining the first time
point.”~~

a. “The method according to claim 5, comprising:
receiving second information; wherein the second

information is used for determining the first time point.”

~~136.257.~~ As discussed above, *Chen* and *Lee* render obvious claim 5.

Claim 8 recites the same additional limitation as claim 7, except that claim 8 depends from claim 5 instead of claim 6. Thus, for at least the same reasons as claim 7, *Chen* and *Lee* render obvious claim 8.

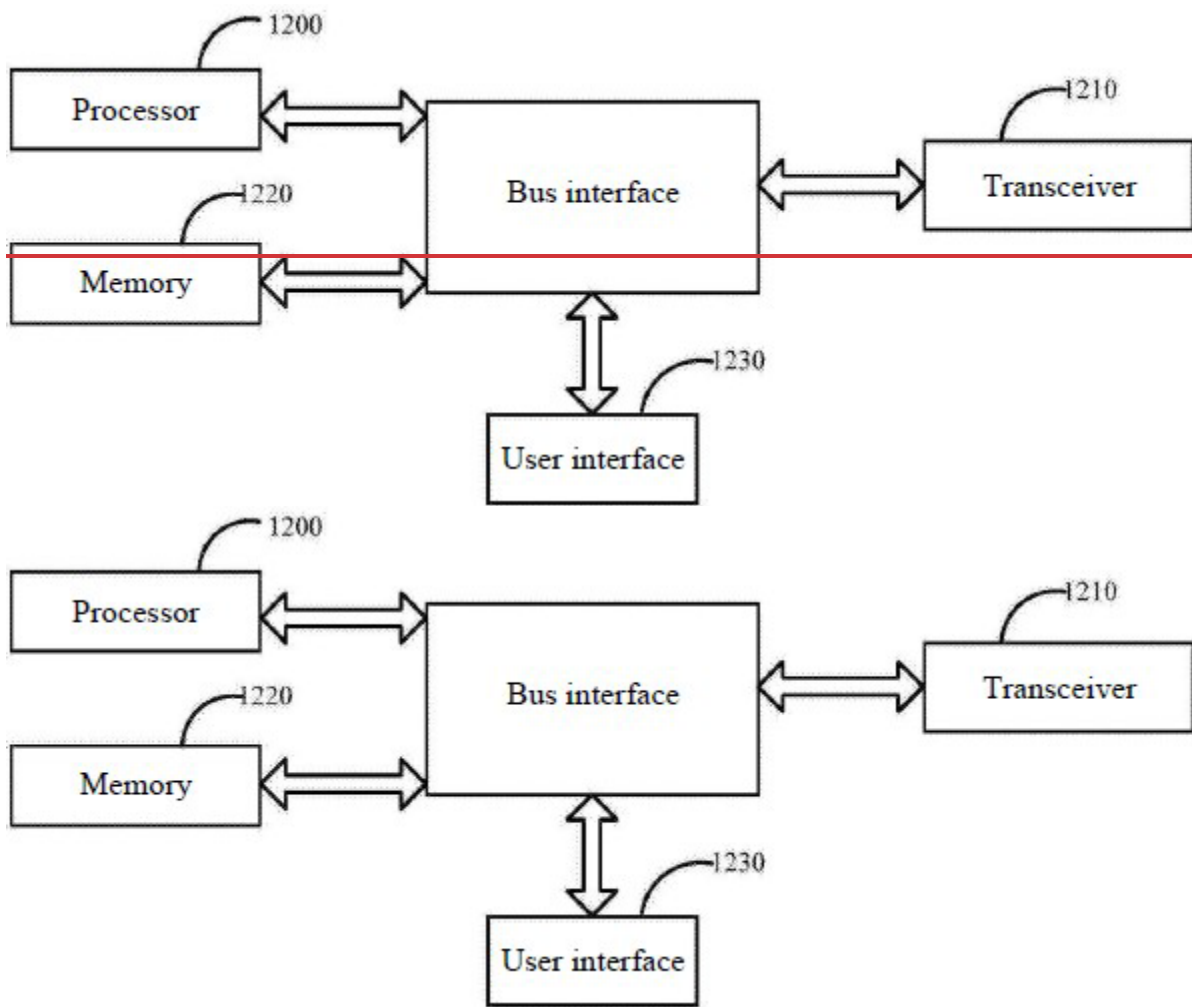
~~instead of claim 6. Thus, for at least the same reasons as claim 7, *Chen* and *Lee* render obvious claim 8. *Kakaes*, ¶257.~~

9. Independent Claim 9

a. [9pre]: “A UE for wireless communication, comprising:”

258. As discussed for claim [1pre], *Chen* discloses a wireless communication system and methods implemented by a receiving end device (UE) in communication with a transmitting end device (base station). See Section XI.B.1.a; *Chen*, 11, FIG. 1; *Chen Priority*, [0118], FIG. 1.

137.259. *Chen* further discloses the structure of the receiving end device (UE) and how it is used for wireless communication. ~~*Kakaes*, ¶¶258-259.~~ As shown in FIG. 12 below, *Chen*’s receiving end device (UE) “comprises a processor 1200, a transceiver 1210, memory 1220, a user interface 1230, and a bus interface.” *Chen*, 27-28, FIG. 12; *Chen Priority*, [0246]-[0252], FIG. 12.



Chen, FIG. 12; *Chen Priority*, FIG. 12.

- b. [9a]: “a first transceiver module, to receive a second radio signal and a first radio signal;”

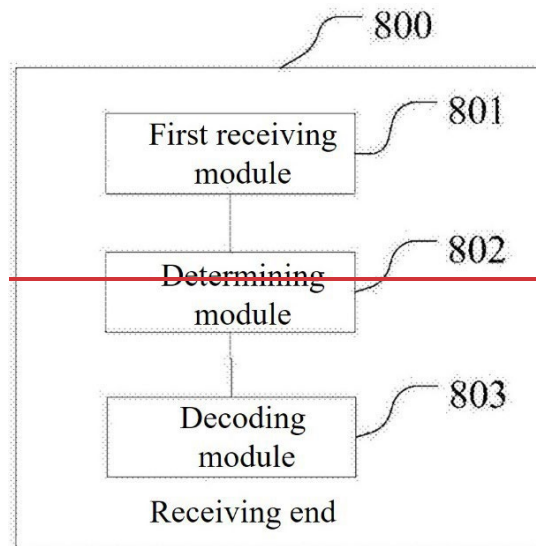
[138.260.](#) As discussed for claim [1a] and [1b], *Chen*’s receiving end device (UE) receives a second message (“second radio signal”) and a first message (“first radio signal”) from a transmitting end device (base station). [See Sections XI.B.1.b and XI.B.1.c.](#) As discussed for [9pre], *Chen* further discloses that the receiving end device (UE) includes a transceiver 1210.

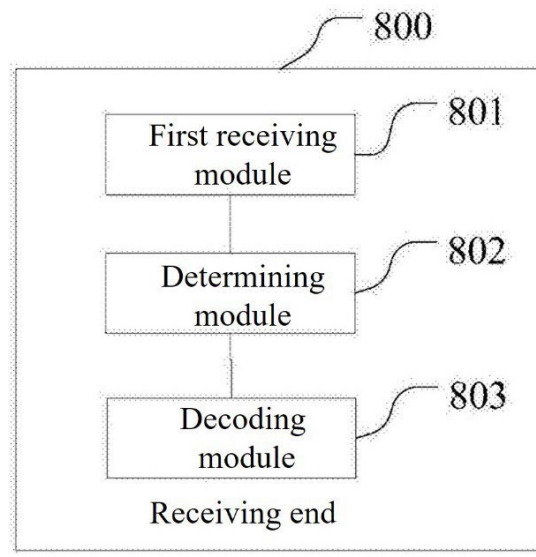
Chen discloses that the transceiver 1210 includes “multiple components, i.e., ~~139-261.~~ ... a transmitter and a receiver, and provide[s] units for communicating over a transmission medium with various other apparatuses.”

Chen, 27-28; *Chen Priority*, [0252]. *Chen* also discloses “the receiving end device receiving, via the transceiver 1210, a second message associated with a first message from a transmitting end device,” and that “the transceiver 1210 is

device,” and that “the transceiver 1210 is [configured] for receiving and transmitting data under the control of the processor 1200.” *Chen*, 27; *Chen Priority*, [0248], [251].

140-262. Further, as shown in FIG. 8 below, *Chen* discloses a receiving end device (UE) 800 that includes “a first receiving module 801, which is [configured] for receiving a second message associated with a first message from a transmitting end device .” *Chen*, 23; *Chen Priority*, [0197]-[0200].





Chen, FIG. 8; *Chen Priority*, FIG. 8.

141.263. Thus, a POSITA would have understood that the transceiver 1210 and/or first receiving module 801 in *Chen*'s receiving end device (UE) receives the second message ("second radio signal") and the first message ("first radio signal"), from the transmitting end device (base station ~~Kakaes, ¶¶260-263.~~).

~~h. [9b]-[9k]~~

~~c. Limitations [9b]-[9k] are identical to limitations [1e]-[1h] except [9b]: “wherein the first radio signal is transmitted within a first time unit;”~~

~~264. As discussed for one instance where “for determining” instead recites “to determine.” Thus, as discussed for limitations [1e]-[1h] claim [1c], Chen discloses or Chen this limitation. See~~

Section XI.B.1.d.

~~d. [9c]: “a first bit block is used for generating the first radio signal, and”~~

~~142.265. As discussed for claim [1d], Chen and/or Lee render obvious these limitations. Kakaes, ¶¶264-273 this limitation. See Section XI.B.1.e.~~

~~e. [9d]: “the first radio signal comprises G multicarrier symbols;”~~

~~266. As discussed for claim [1e], Chen and/or Lee render obvious this limitation. See Section XI.B.1.f.~~

~~f. [9e]: “the second radio signal is transmitted within the first time unit, and”~~

~~267. As discussed for claim [1f], Chen discloses this limitation. See Section XI.B.1.g.~~

~~g. [9f]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”~~

~~268. As discussed for claim [1g], Chen and/or Lee render obvious this limitation. See Section XI.B.1.h.~~

h. [9g]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource

occupied by the given multicarrier symbol with respect to a first time point in time domain;”

269. As discussed for claim [1h], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.i.

i. [9h]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna related receiving for the given multicarrier symbol; and”

270. As discussed for claim [1i], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.j.

j. [9i]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

271. As discussed for claim [1j], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.k.

k. [9j]: “the first time point is one time point within the first time unit; and”

272. As discussed for claim [1k], *Chen* discloses this limitation. See Section XI.B.1.l.

l. [9k]: “G is a positive integer.”

273. As discussed for claim [1l], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.m.

~~143.274.~~ Therefore, *Chen* and *Lee* render obvious claim 9. ~~Kakaes, ¶274.~~

10. Claim 10

- a. [10a]: “The UE according to claim 9, wherein the first transceiver module receives first information, the first information being used for determining the first time point; or,”

~~275.~~ ~~As discussed above, *Chen* and *Lee* render obvious claim 9.~~ As discussed above, *Chen* and *Lee* render obvious claim 9. Claim 10 recites three alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 10, which I understand is consistent with legal standards. As I explain below, *Chen* discloses, or *Chen* and *Lee* renders obvious [10a] or [10b], either of which is sufficient to disclose claim 10.

~~144.276.~~ As discussed for claim [2a], *Chen*’s receiving end device (UE) receives first information, the first information being used for determining the first time point. See Section XI.B.2.a. Further, as discussed for claim [9a], *Chen* discloses “the transceiver 1210 is for receiving and transmitting data under the control of the processor 1200.” See Section XI.B.9.a; *Chen*, 27; *Chen* Priority, [0251]. Thus, a POSITA would have understood that the transceiver 1210 and/or first receiving module 801 in *Chen*’s receiving end device (UE) “receives first information, the first information being used for determining the first time point.”- ~~Kakaes, ¶¶275-276.~~

- b. ~~[10b]~~~~[10e]~~: “the first transceiver module transmits second information, the second information being used for determining the first time point; or,—”

Claim 10 includes “or” between claim [10a], [10b], *Chen* and [10e], so only one of the three limitations must be taught to satisfy claim *Lee* further render obvious this alternative limitation. As ~~10. *Brown v. 3M*, 265 F.3d at 1351.~~

~~145.277.~~ Nonetheless, as discussed for claim 3, *Chen/Lee*’s receiving end device (UE) transmits second information, the second information being used for determining the first time point. See Section XI.B.3. Further, as discussed for claim [9a], *Chen* discloses “the transceiver 1210 is for receiving and transmitting data under the control of the processor 1200.” *Chen*, 27; *Chen Priority*, [0251]. Thus, a POSITA would have understood that the transceiver 1210 and/or first ~~receiving~~reception module 801 in *Chen/Lee*’s receiving end device (UE) “transmits second information, the second information being used for determining the first time point.” ~~Kakaes, ¶277.~~

- c. [10c]: “the first transceiver module receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.”

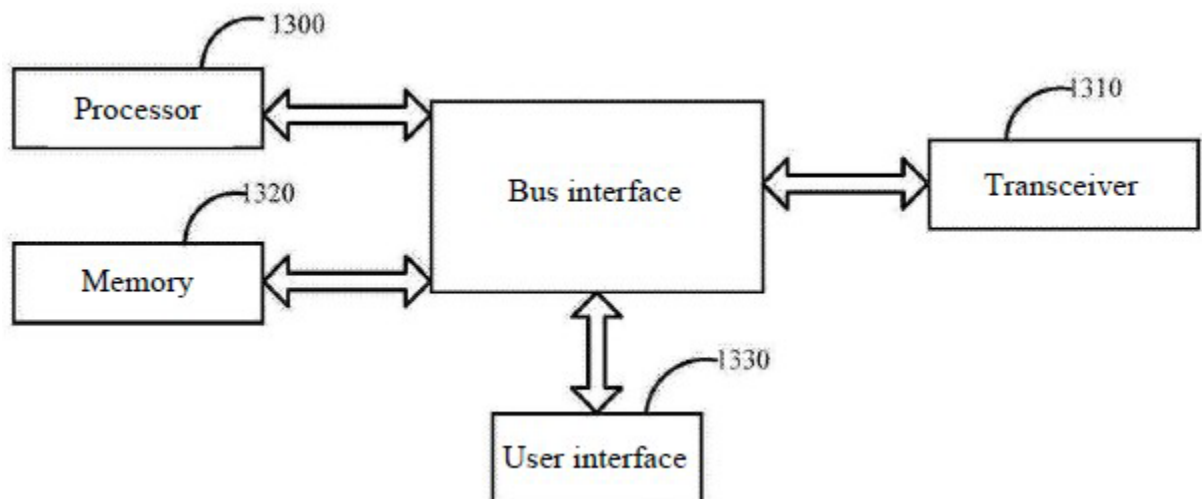
278. As discussed above, claim 10 includes “or” between claim [10a], [10b], and [10c], so the above-discussed teachings of claim [10a] or [10b] are sufficient to satisfy claim 10.

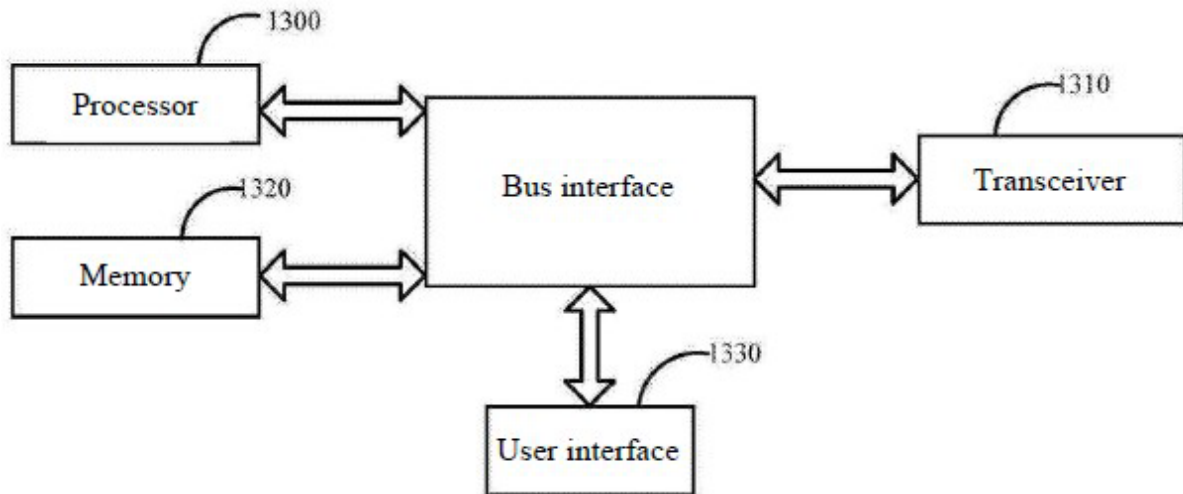
11. Independent Claim 11

a. [11pre]: “A base station device for wireless communication, comprising:”

146.279. As discussed for claim [5pre], *Chen* discloses a wireless communication system in which a receiving end device (UE) communicates with a transmitting end device (base station). See Section XI.B.5.a. *Chen*, 11, FIG. 1; *Chen Priority*, [0118], FIG. 1. *Chen* also discloses methods implemented by the transmitting end device (base station) in communication with the UE. *Chen*, 21, FIG. 7; *Chen Priority*, [0177]-[0179], FIG. 7.

147.280. *Chen* further discloses the structure of the transmitting end device (base station) and how it is used for wireless communication. ~~Kakaes, ¶¶279-280.~~ As shown in FIG. 13 below, *Chen* discloses a transmitting end device (base station) that “comprises a processor 1300, a transceiver 1310, memory 1320, a user interface 1330, and a bus interface.” *Chen*, 30; *Chen Priority*, [0279]-[0284].





Chen, FIG. 13; *Chen Priority*, FIG. 13.

b. [11a]: “a second transceiver module, to transmit a second radio signal and a first radio signal;”

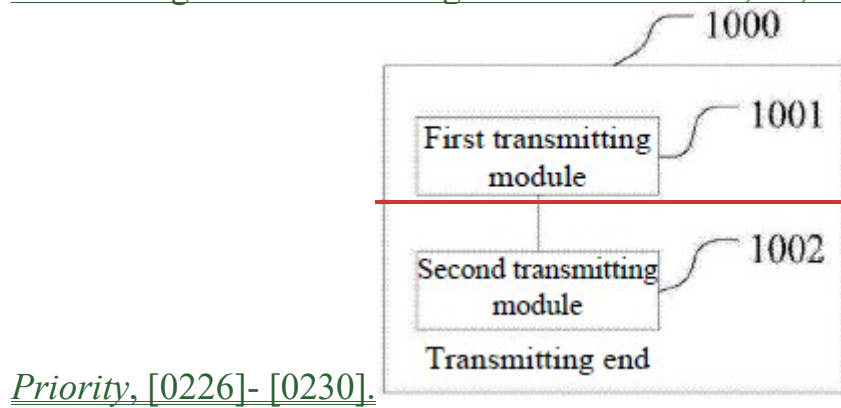
281. As discussed for claim [5a] and [5b], *Chen*’s transmitting end device (base station) transmits the second message (“second radio signal”) and the first message (“first radio signal”) to the receiving end device (UE). See Section XI.B.5.a and Section XI.B.5.b. As discussed for [11pre], *Chen* further discloses that the base station includes a transceiver (“second transceiver module”) for transmitting and receiving wireless signals. See Section XI.B.11.a.

148.282. Specifically, *Chen* discloses that “[t]he transceiver 1310 may have multiple components, i.e., may include a transmitter and a receiver, and provide units for communicating over a transmission medium,” and “~~transmit~~the transceiver 1310 is for receiving and transmitting data under the control of the processor 1300.” *Chen*, 30; *Chen Priority*, [0283]. For example, *Chen* discloses “transmitting said first message via said transceiver 1310 to said receiving end device.” *Chen*, 30-31; *Chen Priority*, [0282], [0284].

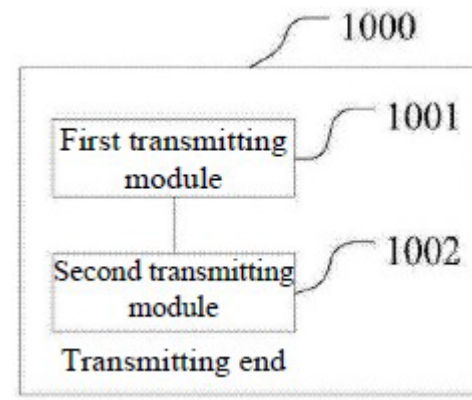
149.283. *Chen* further discloses a transmitting end device 1000 that includes “a first transmitting module 1001, which is used by the transmitting end device for transmitting a second message associated with a first message to a receiving end device,” and “a second transmitting module 1002, which is for transmitting said ~~first message to said receiving end device.~~” *Chen*, 25; *Chen Priority*, [0226]

~~[0230]~~

first message to said receiving end device.” *Chen*, 25; *Chen*



Priority, [0226]- [0230].



Chen, FIG. 10; *Chen Priority*, FIG. 10.

150:284. Thus, a POSITA would have understood that the transceiver 1310 and/or the combination of the first transmitting module 1001 and the second transmitting module 1002 in *Chen*’s transmitting end device (base station) transmits the second message (“second radio signal”) and the first message (“first radio signal”), to the receiving end device (UE). ~~Kakaes, ¶¶281-284.~~

~~i. — [11b]-[11k]~~

~~c. Limitations [11b]-[11k] are identical to limitations [1e]-[1h] except [11b]: “wherein the first radio signal is transmitted within a first time unit,”~~

285. As discussed for one instance where “for determining” instead recites “to determine.” Thus, ~~as discussed for limitations [1c] [11c]~~ claim [1c], *Chen* discloses ~~or *Chen*~~ this limitation.
See

Section XI.B.1.d.

d. [11c]: “a first bit block is used for generating the first radio signal, and”

151.286. As discussed for claim [1d], *Chen* and/or *Lee* render
obvious ~~these limitations. Kakaes, ¶¶ 285-294~~ this limitation. See Section XI.B.1.e.

e. [11d]: “the first radio signal comprises G multicarrier symbols;”

287. As discussed for claim [1e], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.f.

f. [11e]: “the second radio signal is transmitted within the first time unit, and”

288. As discussed for claim [1f], *Chen* discloses this limitation. See Section XI.B.1.g.

g. [11f]: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;”

289. As discussed for claim [1g], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.h.

h. [11g]: “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;”

290. As discussed for claim [1h], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.i.

i. [11h]: “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the

multi-antenna related receiving for the given multicarrier symbol; and”

291. As discussed for claim [1i], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.j.

j. [11i]: “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;”

292. As discussed for claim [1j], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.k.

k. [11j]: “the first time point is one time point within the first time unit; and”

293. As discussed for claim [1k], *Chen* discloses this limitation. See Section XI.B.1.l.

l. [11k]: “G is a positive integer.”

294. As discussed for claim [1l], *Chen* and/or *Lee* render obvious this limitation. See Section XI.B.1.m.

~~152.295.~~ Therefore, *Chen* and *Lee* render obvious claim 11. ~~Kakaes, ¶¶295.~~

12. Claim 12

a. ~~Claim~~ [12a]: “The base station device according to claim 11, wherein the second transceiver module transmits first

information, the first information being used for determining the first time point; or,”

296. As discussed above, *Chen* and *Lee* render obvious claim 11. Claim 12 recites three alternative options separated by “or.” A POSITA would have understood that satisfying either of these options satisfies the requirements of claim 12, which I understand is consistent with legal standards. As I explain below, *Chen* discloses, or *Chen* and *Lee* render obvious [12a] or [12b], either of which is sufficient to disclose claim 12.

153-297. As discussed for claim [6a], *Chen*’s transmitting end device (base station) transmits first information, the first information being used for determining the first time point. See Section XI.B.6.a. Further, as discussed above for claim [11a], “the transceiver 1310 is for receiving and transmitting data under the control of the processor 1300.” See Section XI.B.11.b; *Chen*, 30; *Chen Priority*, [0283]. Thus, a POSITA would have understood that the transceiver in *Chen*’s transmitting end device (base station) “transmits first information, the first information being used for determining the first time point.” ~~Kakaes, ¶¶296-297.~~

- b. ~~Claim [12b]-[12e]~~: “the second transceiver module receives second information, the second information being used for determining the first time point; or”
~~or,....”~~

~~Claim 12 includes “or” between claim [12a], [12b], and [12c], so only one of the three limitations must be taught to satisfy claim 12. *Brown v. 3M*, 265 F.3d at 1351.~~

298. Nonetheless, as *Chen* and *Lee* further render obvious this alternative limitation. As discussed for claim 7, *Chen/Lee*’s transmitting end device (base station) receives second information, the second information being used for determining the first ~~time point~~.

time point. See Section XI.B.7. Further, as discussed above for claim [11a], “the transceiver 1310 is for receiving and transmitting data under the control of the processor 1300.” See Section XI.B.11.b; *Chen*, 30; *Chen Priority*, [0283]. Thus, a POSITA would have understood that the transceiver in *Chen/Lee*’s transmitting end device (base station) “receives second information, the second information being used for determining the first time point.” ~~Kakaes, ¶299.~~

~~IV. — DISCRETIONARY DENIAL IS NOT WARRANTED~~

~~A. — *Denial of Institution Is Not Warranted Under Fintiv*~~

~~*Fintiv* and the Office’s interim guidelines dated June 21, 2022 (“Interim Procedures”) require institution. Factor 6 requires institution because Petitioner presents a compelling unpatentability challenge; Factors 3 and 4 favor institution; and Factors 1, 2, and 5 are, at worst, neutral.~~

~~Factor 3 favors institution because Petitioner acted diligently and almost no parallel investment has occurred. Patent Owner served infringement contentions~~

c. ~~only last month.~~[12c]: “the second transceiver module transmits third information, the third information being used for determining a candidate scheme for the multi- antenna related receiving corresponding to the G multicarrier symbols.”

299. As discussed above, claim 10 includes “or” between claim [12a], [12b], and [12c], so the above-discussed teachings of claim [12a] or [12b] are sufficient to satisfy claim 12.

~~Ex. 1018. Fact discovery opened only this month, and will not close until February 2024, with expert discovery closing March 2024. Ex. 1017, 3. The parties will not begin claim construction until August 2023 and the hearing will not take place until December 2023. *Id.*~~

~~Factor 4 favors institution because this petition challenges claims 5-8, 11, and 12, which are not involved in the litigation. Moreover, Petitioner has not served invalidity contentions, so no overlap currently exists. Petitioner reserves the right to submit a stipulation after serving invalidity contentions.~~

~~Regarding Factors 1, 2, and 5, Patent Owner filed its Complaint against Petitioner on June 1, 2022. Ex. 1015. No stay has been requested, trial is currently scheduled for June 24, 2024, and the median time to trial in the Eastern District of Texas is 24.5 months, so trial is projected to occur, at the earliest, in June or July 2024. Ex. 1017, 1; Ex. 1016, 35. A FWD is anticipated in August 2024, about one month after trial ends. In these circumstances, Factors 1, 2, and 5 are at worst~~

~~neutral. *Protect Animals with Satellites v. OnPoint Sys.*, IPR2021-01483, Paper 11 at 12-13, 17 (Mar. 4, 2022). Indeed, the Board has instituted with far more time between trial and FWD. See *NetNut v. Bright Data*, IPR2021-01492, Paper 12 at 9-16 (Mar. 21, 2022) (instituting IPR without stipulation and co-pending trial date six months before FWD); *Protect Animals*, IPR2021-01483, Paper 11 at 18 (same but trial date one month before FWD); Interim Procedures, 8.~~

~~Denial of institution is not warranted under *Fintiv*.~~

~~**B. — *Denial of Institution Is Not Warranted Under 35 U.S.C. § 325(d)***~~

~~No other proceedings involving the '081 patent are currently pending or have been brought before the Patent Office. Additionally, the asserted prior art references (*Lee* and *Chen*) were not before the Examiner. Thus, the same or substantially the same prior art or arguments have not been previously presented to the Patent Office and denial of institution is not warranted under § 325(d).~~

~~**V. — MANDATORY NOTICES**~~

~~**A. — *Real Party-in-Interest***~~

~~The real parties in interest are Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc.~~

~~**B. — *Related Matters***~~

~~Apex asserted the '081 patent in the following litigations: *Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd. et al.*, Case No. 2:22-cv-00188-JRG (E.D. Tex.); *Apex Beam Technologies LLC v. ZTE Corporation*, Case No. 2:22-cv-00031-JRG-RSP (E.D. Tex.); *Apex Beam Technologies LLC v. OnePlus Technology (Shenzhen) Co., Ltd.*, Case No. 2:22-cv-00032-JRG (E.D. Tex.); and *Apex Beam Technologies LLC v. TCT Mobile International Limited et al.*, Case No. 2:21-cv-00438-JRG (E.D. Tex.).~~

~~The '081 patent is related to pending U.S. Patent Application No. 17/079,539. The '081 patent is also related to CN 109391300 B and CN 112600653 A.~~

~~C. — Lead and Backup Counsel, and Service Information~~

~~Lead Counsel~~	~~Backup Counsel~~
~~Joshua L. Goldberg, Reg. No. 59,369 joshua.goldberg@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 901 New York Avenue NW Washington, DC 20001-4413 Phone: 202-408-6092 Fax: 202-408-4400~~	~~Kevin D. Rodkey, Reg. No. 65,506 kevin.rodkey@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 271 17th Street NW Suite 1400 Atlanta, GA 30363-6209 Phone: 404-653-6484 Fax: 404-653-6444~~ ~~Nicholas A. Cerulli, Reg. No. 71,900 nicholas.cerulli@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 901 New York Avenue NW Washington, DC 20001-4413 Phone: 202-408-4248 Fax: 202-408-4400~~ ~~Mingji Jin, Reg. No. 69,674 mingji.jin@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 901 New York Avenue NW Washington, DC 20001-4413 Phone: 202-408-6020 Fax: 202-408-4400~~

	~~Chen Zang, Reg. No. L1002 chen.zang@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 901 New York Avenue NW Washington, DC 20001-4413 Phone: 202-408-4416 Fax: 202-408-4400 Yi Yu, Reg. No. 69,397 yi.yu@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 1875 Explorer Street Reston, VA 20190-6023 Phone: 571-203-2479 Fax: 202-408-4400~~
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~~Please address all correspondence to counsel at the addresses above.~~

~~Petitioner consents to electronic service by email at the above email addresses.~~

~~VI. GROUNDS FOR STANDING~~

~~Petitioner certifies that the '081 patent is available for IPR and that
Petitioner is not barred or estopped from requesting IPR challenging the patent
claims on the grounds identified herein.~~

V.XII. CONCLUSION

~~For the reasons set forth above, Petitioner requests institution of IPR and cancellation of each challenged claim. The Office may charge any required fees to Deposit Account No. 06-0916.~~

~~Dated: February 28, 2023 By: /Joshua L. Goldberg/
Joshua L. Goldberg, Lead Counsel
Reg. No. 59,369~~

CLAIMS APPENDIX

1. ~~[1pre]~~ A method in a User Equipment (UE) for wireless communication, comprising:
 - ~~[1a]~~ receiving a second radio signal;
 - ~~[1b]~~ receiving a first radio signal;
 - ~~[1c]~~ wherein the first radio signal is transmitted within a first time unit,
 - ~~[1d]~~ a first bit block is used for generating the first radio signal, and
 - ~~[1e]~~ the first radio signal comprises G multicarrier symbols;
 - ~~[1f]~~ the second radio signal is transmitted within the first time unit, and
 - ~~[1g]~~ the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;
 - ~~[1h]~~ as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time-domain;
 - ~~[1i]~~ when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and

~~[1j] when the time domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna-related receiving for the given multicarrier symbol is related to the multi-antenna-related receiving for the second radio signal;~~

~~[1k] the first time point is one time point within the first time unit; and~~

~~[1l] G is a positive integer.~~

2. ~~[2a] The method according to claim 1, comprising:~~

~~receiving first information, wherein the first information is used for determining the first time point; or,~~

~~[2b] receiving third information, wherein the third information is used for determining a candidate scheme for the multi-antenna-related receiving corresponding to the G multicarrier symbols.~~

3. ~~The method according to claim 2 comprising:~~

~~transmitting second information, wherein the second information is used for determining the first time point.~~

4. ~~The method according to claim 1 comprising:~~

~~transmitting second information;~~

wherein the second information is used for determining the first time point.

5. ~~[5pre]~~ A method in a base station device for wireless communication, comprising:

~~[5a]~~ transmitting a second radio signal;

~~[5b]~~ transmitting a first radio signal;

~~[5c]~~ wherein the first radio signal is transmitted within a first time unit,

~~[5d]~~ a first bit block is used for generating the first radio signal, and

~~[5e]~~ the first radio signal comprises G multicarrier symbols;

~~[5f]~~ the second radio signal is transmitted within the first time unit, and

~~[5g]~~ the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;

300. ~~[5h]~~ as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain
In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-

examination.

301. I declare that all statements made herein of my 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 knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

302. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

~~resource occupied by the given multicarrier symbol with respect to a first time point in time domain;~~

~~[5i] when the time domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to~~

~~determine the multi-antenna related receiving for the given multicarrier symbol; and~~

~~[5j] when the time domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;~~

~~[5k] the first time point is one time point within the first time unit; and~~

~~[5l] G is a positive integer.~~

6. ~~[6a] The method according to claim 5, comprising:~~

~~transmitting first information, wherein the first information is used for determining the first time point; or,~~

~~[6b] transmitting third information, wherein the third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.~~

7. ~~The method according to claim 6 comprising:~~

~~receiving second information, wherein the second information is used for determining the first time point.~~

8. ~~The method according to claim 5, comprising:-~~

~~receiving second information;~~

~~wherein the second information is used for determining the first time point.~~

9. ~~[9pre] A UE for wireless communication, comprising:~~

~~[9a] a first transceiver module, to receive a second radio signal and a first radio signal;~~

~~[9b] wherein the first radio signal is transmitted within a first time unit,~~

~~[9c] a first bit block is used for generating the first radio signal, and~~

~~[9d] the first radio signal comprises G multicarrier symbols;~~

~~[9e] the second radio signal is transmitted within the first time unit, and~~

~~[9f] the second radio signal is used for determining a time domain resource occupied by the G multicarrier symbols;~~

~~[9g] as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;~~

~~[9h] when the time domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to~~

determine the multi-antenna related receiving for the given multicarrier symbol; and

~~[9i]~~ when the time domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;

~~[9j]~~ the first time point is one time point within the first time unit; and

~~[9k]~~ G is a positive integer.

10. ~~[10a]~~ The UE according to claim 9,

wherein the first transceiver module receives first information, the first information being used for determining the first time point; or,

~~[10b]~~ the first transceiver module transmits second information, the second information being used for determining the first time point; or,

~~[10c]~~ the first transceiver module receives third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.

11. ~~[11pre]~~ A base station device for wireless communication, comprising:

~~[11a] a second transceiver module, to transmit a second radio signal and a first radio signal;~~

~~[11b] wherein the first radio signal is transmitted within a first time unit,~~

~~[11c] a first bit block is used for generating the first radio signal, and~~

~~[11d] the first radio signal comprises G multicarrier symbols;~~

~~[11e] the second radio signal is transmitted within the first time unit, and~~

~~[11f] the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;~~

~~[11g] as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna-related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;~~

~~[11h] when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used to determine the multi-antenna-related receiving for the given multicarrier symbol; and~~

~~[11i] when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna-related~~

~~receiving for the given multicarrier symbol is related to the multi-
antenna related receiving for the second radio signal;~~

~~[11j] the first time point is one time point within the first time unit; and~~

~~[11k] G is a positive integer.~~

12. ~~[12a]~~ The base station device according to claim 11,

~~wherein the second transceiver module transmits first information, the first
information being used for determining the first time point; or,~~

~~[12b] the second transceiver module receives second information, the~~

~~second information being used for determining the first time point; or,~~

~~[12c] the second transceiver module transmits third information, the third~~

~~information being used for determining a candidate scheme for the
multi-antenna related receiving corresponding to the G multicarrier
symbols.~~

~~CERTIFICATION OF WORD COUNT~~

~~Pursuant to 37 C.F.R. § 42.24, Petitioner certifies that the word count of
Petitioner's Petition for *Inter Partes* Review (exclusive of any table of contents,
table of authorities, mandatory notices under § 42.8, certificates of service and
word count, and list of exhibits or claim listing) as measured by Microsoft Word is
13,978.~~

~~Dated: February 28, 2023~~ ~~By: /Joshua L. Goldberg/~~
~~Joshua L. Goldberg, Lead Counsel~~
~~Reg. No. 59,369~~

CERTIFICATE OF SERVICE

~~Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), the undersigned certifies that on February 28, 2023, a copy of the foregoing Petition for *Inter Partes* Review, the associated powers of attorney, Exhibits 1001-1010 and 1012-1021 were served by FedEx Priority Overnight on the correspondence address of record indicated in the Patent Office's Patent Center website for U.S. Patent No. 10,912,081:~~

~~Jialin Zhong
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1st Floor West
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~~A courtesy copy of the foregoing was also served by FedEx Priority Overnight on the address listed on the same law firm's website (<https://zhong-law.com/>):~~

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Date: February 28, 2023

By: /William Esper/
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