

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., AND SAMSUNG ELECTRONICS
AMERICA, INC.,
Petitioner

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner

Case IPR2023-00602

Patent No. 10,568,113

“LIU” DECLARATION OF DR. HARRY V. BIMS IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW

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I, Harry V. Bims, Ph.D., have been retained as an independent expert by Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc.

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b. ~~[5b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially~~	

QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.”	40
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c. — <i>[6b]: “receiving a first radio signal on a first channel;”</i>	41
d. — <i>[6c]: “receiving a second radio signal on a second channel; and”</i>	42
e. — <i>[6d]: “transmitting a third radio signal in a first time window;”</i>	42
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g. — <i>[6f]: “a time resource occupied by the first radio signal is used for determining the start time of the first time window;”</i>	43
h. — <i>[6g]: “a time domain resource occupied by the first radio signal is used for determining a second time window;”</i>	43
i. — <i>[6h]: “a time domain resource occupied by the second radio signal is within the second time window, and the second time</i>	

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~~first time window;”~~ 43

j. ~~— [6i]: “a time domain resource occupied by the second radio
 signal is used for determining a third time window, and the
 end time of the third time window is the end time of the first
 time window;~~
~~and”~~—44

k. ~~— [6j]: “the second time window and the third time window
 have overlapped time domain~~
~~resource(s).”~~ 44

7. ~~Claim 7~~ 44

a. ~~— [7a]: “The method according to claim 6, wherein at least one
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 second radio signal} is used for determining a multi-antenna-
 related~~
~~transmitting of the third radio signal; or,”~~ 44

b. ~~— [7b]: “the first radio signal and the second radio signal
 together are used for determining the multi-antenna related
 transmitting of the third radio~~
~~signal.”~~ 44

8. ~~Claim 8~~ 45

a. ~~— “The method according to claim 6, wherein the first
 channel is a first type of physical layer channel, the second
 channel is a second type of physical layer channel, and the
 first type of physical layer channel and the second type of
 physical layer channel are two different types of~~
~~physical layer channels.”~~ 45

9. ~~Claim 9~~ 45

a. ~~— “The method according to claim 6, wherein the~~
~~first channel is a physical layer control channel.”~~ 45

10. ~~Claim 10~~ 46

a. ~~— [10a]: “The method according to claim 6, wherein the first~~

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~~radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi-Co-~~

Located (‘QCL’); or,” 46

~~b. — [10b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time~~

interval.” 46

11. — Independent Claim 11 47

~~a. — [11pre]: “A UE for wireless communication, comprising:” 47~~

~~b. — [11a]: “a first receiver module, to receive a target~~

~~radio signal;” 50~~

~~c. — [11b]: “a second transmitter module, to transmit a~~

~~first radio signal on a first channel;” 51~~

~~d. — [11c]: “a third transmitter module, to transmit a~~

~~second radio signal on a second channel; and” 52~~

~~e. — [11d]: “a fourth receiver module, to monitor a third~~

~~radio signal in a first time window;” 53~~

~~f. — [11e]: “wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the~~

second radio signal;” 54

g. ~~— [11f]: “a time resource occupied by the first radio signal is used for determining the start time of the~~

first time window;” 54

h. ~~— [11g]: “a time domain resource occupied by the first radio signal is used for determining a second~~

time window;” 54

i. ~~— [11h]: “a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the~~

first time window;” 54

j. ~~— [11i]: “a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window;~~

and” 54

k. ~~— [11j]: “the second time window and the third time window have overlapped time domain resource(s).”..... 54~~

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a. ~~— [12a]: “The UE according to claim 11, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used~~

for determining a multi-antenna related

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b. ~~— [12b]: “the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio~~

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a. ~~— “The UE according to claim 11, wherein the first channel is a first type of physical layer channel, the second channel is a~~

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a. — ~~[15a]: “The UE according to claim 11, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-~~

~~Located (‘QCL’); or,”~~ 57

b. — ~~15[b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially~~

~~QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time~~

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17. Claim 17	63

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- a. ~~[17a]: “The base station device according to claim 16, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna~~
related transmitting of the third radio signal; or,” 63
- b. ~~[17b]: “the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio~~
signal.” 63
18. Claim 18 63
- a. ~~“The base station device according to claim 16, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of~~
physical layer channels.” 63
19. Claim 19 64
- a. ~~“The base station device according to claim 16, wherein the first channel is a physical layer control~~
channel.” 64
20. Claim 20 64
- a. ~~[20a]: “The base station device according to claim 16, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to~~
being QCL; or,” 64
- b. ~~[20b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third~~

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~~antenna port group is spatially QCL with an antenna port
group used for transmitting the third radio signal in the third-
time~~

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PETITIONER’S EXHIBIT LIST

1. (“Petitioner” or “Samsung”) in connection with an *inter partes* review (IPR) of U.S. Patent No. 10,568,113 (“the ’113 patent”) (Ex. 1001). I have prepared this declaration in connection with Samsung’s Petition for *Inter Partes* Review.
2. Specifically, this document contains my opinions about the technology in claims 1-20 of the ’113 patent and the grounds against these claims that have been asserted by Samsung. I was not asked to provide any opinions about the ’113 patent that are not expressed herein.

II. SUMMARY OF OPINIONS

3. This declaration considered claims 1-20 of the ’113 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.
4. 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 August 11, 2017), it is my opinion that claims 1-20 of the ’113 patent would have been obvious based on the asserted grounds.

5. I am being compensated for my time at the rate of \$700 per hour. This 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

6. 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.
7. Based on my education, research, and work experience, I am knowledgeable about the subject matter of the '113 patent and the related prior art.
8. For more than 30 years, since approximately 1981, I have studied, designed, and worked in the field of telecommunications, including wireless communications. During this period, I have designed and implemented various products involving cellular communication technology.
9. I received a B.S. in Computer and Systems Engineering from Rensselaer Polytechnic Institute in 1985. I received an M.S. in Electrical Engineering in 1988 and a Ph.D. in Electrical Engineering in 1993, both from Stanford University. As a graduate student, I studied the principle of Digital Communications theory, including data modulation and demodulation, signal constellations and lattices, channel estimation, equalization, filtering, precoding, synchronization, and trellis coding. My Ph.D. thesis addressed

the application of trellis coding and precoding to a digital modulation system, and was titled “Trellis Coding for Multi-Level, Partial Response Continuous Phase Modulation with Precoding.”

10. After receiving my Ph.D. in 1993, I worked for Glenayre Technologies – Wireless Access Group, where I worked on applications for wireless communication, including inventing, designing, and building a patented two-way pager test system and co-developing a wireless application protocol.
11. In January of 1999, I launched a technology consulting company, Protocomm Systems Inc., which focuses on the development of advanced wireless communications protocols and related software implementations for wireless product companies.
12. From 1999 to 2001, I was also the Director of Software Architecture for Symmetry Communications System. In this position, I was responsible for the software architecture for core SGSN (Serving GPRS Support Node) and GGSN (Gateway GPRS Support Node) products for the GPRS (Generic Packet Radio Services) market. I also held management responsibility for the Firmware, Hardware, Performance, and Systems Engineering Groups.
13. In 2001, I developed a business plan for building network infrastructure for Institute of Electrical and Electronics Engineers (“IEEE”) 802.11 standard (“Wi-Fi”) enterprise networks, and then later that year founded AirFlow

Networks, Inc. where I invented and received eleven patents on a distributed antenna system design for wireless networks, based on the 802.11 wireless local area network specification.

14. I am currently the President of Protocomm Systems, LLC and Bims Laboratories, LLC, both of which I founded. As the President of Bims Laboratories, I perform technical research in wireless technology standards, such as UMTS, LTE/4G, 5G, Wi-Fi, Bluetooth, and other network communication protocols. I am named as an inventor of twenty-three telecommunications related patents.
15. In addition, I am a named Technical Expert and former Vice-Chair and Secretary of the IEEE 802.16 Working Group, which develops technical standards for the wireless protocol commonly known as WiMax. I am also a voting member of the IEEE 802.11 Working Group (which develops technical standards for WiFi), and the IEEE 802.15 Working Group (which develops standards for a variety of specialty wireless networks). Within the IEEE 802.15 Working Group, I am the technical editor for IEEE 802.16t, an amendment to the WiMAX standard that supports long-range wireless networks for the railroad industry. Within the IEEE 802.11 Working Group, I routinely participate and vote on discussions relating to the design of

wireless communications, including packet prioritization, transmission,
acknowledgment, and retransmission.

IV. MATERIALS CONSIDERED

16. 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. 10,568,113 to Zhang (“the ’113 patent”)
~~Ex. 1002~~	~~“Liu” Declaration of Dr. Harry Bims, Ph.D. (“Bims”)~~
Ex. 1003	Prosecution History of the ’113 patent (downloaded from the USPTO’s Patent Center Website)
Ex. 1004	U.S. Patent Application Publication No. 2019/0053294 to Xia et al., published February 14, 2019 (“ <i>Xia</i> ”)
Ex. 1005	U.S. Patent Application Publication No. 2015/0141026 to Jover, published May 21, 2015 (“ <i>Jover</i> ”)
Ex. 1006	3GPP TSG RAN WG1 NR Ad-Hoc#2, Qingdao, P.R. China 27th – 30th June 2017, published in 3GPP website (https:// ~~www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1-706~~ <u>www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1706</u> /Docs) on June 16, 2017 (“ <i>R1-1710596</i> ”)
Ex. 1007	U.S. Patent Publication No. 2018/0367374 to Liu et al., published December 20, 2018 (“ <i>Liu</i> ”)
~~Ex. 1008~~	~~Reserved~~
Ex. 1009	Raghav Pandey, Ashwani Awasthi, and Vikas Srivastava, “Comparison between Bit Error Rate And Signal To Noise Ratio in OFDM Using LSE Algorithm,” in Proceedings of the Conference on Advances in Communication and Control Systems (CAC2S 2013), pp. 463-466, Atlantis Press 2013.

~~Ex. 1010~~	~~Screen shot of 3GPP Portal showing the upload time of R1-1710596 on the 3GPP website.~~
Ex. 1011	International Patent Publication No. WO 2017/024516 A1 to Lu et al., published February 16, 2017 (“ <i>Lu</i> ”)

<u>Exhibit</u>	<u>Description</u>
Ex. 1012	U.S. Provisional Application No. 62/543,765 to Xia et al. (“ <i>Xia Provisional</i> ”)
Ex. 1013	U.S. Patent No. 6,185,432 to Vembu, published February 6, 2001 (“ <i>Vembu</i> ”)
Ex. 1014	U.S. Provisional Application No. 62/521,170 to Liu et al. (“ <i>Liu Provisional</i> ”)
Ex. ~~1015~~ <u>1021</u>	~~Printout of https://www.atlantis-press.com/proceedings/cac2s-43/63573GPP TSG RAN WG1 NR Ad-Hoc#2, R1-1710078, Qingdao, P.R. China 27th – 30th June 2017, published in 3GPP website (https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1706/Docs) on June 16, 2017 (“R1-1710078”).~~
Ex. ~~1016~~ <u>1022</u>	~~3GPP Declaration of Friedhelm Rodermund3GPP TSG RAN WG1 #87ah-NR, R1-1700771, Spokane, WA, USA, 16th – 20th January, 2017, published in 3GPP website (https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1701/Docs/) on January 10, 2017 (“R1-1700771”).~~
~~Apex Beam Technologies LLC v. Samsung Electronics Co. Ltd. et al., No. 2:22-cv-00188-JRG, Dkt. No. 1, Complaint for Patent Infringement (E.D. Tex. June 1, 2022)~~	

17. 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.
18. 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 '113 patent at the time of the earliest claimed priority date.

19. 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

20. 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.

21. 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.

22. 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.

23. I have been asked to provide my opinions as to whether the cited prior art teaches or renders obvious claims 1-20 of the '113 patent from the perspective of a person of ordinary skill in the art at the '113 patent's earliest claimed priority date in 2017, as described in more detail below.

24. 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.”

25. 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

26. 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.

27. 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

28. 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

29. 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

30. 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.

31. 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).

32. 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 August 11, 2017. My opinions would not change if I assumed a later date of invention.

33. 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.
34. 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.

35. 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.

36. 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.

37. 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.

38. 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.

39. 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 ’113 patent.

40. 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

Exhibit	Description
~~Ex. 1018~~	~~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. 1019~~	~~<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. 1020~~	~~<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. 1021~~	~~3GPP TSG RAN WG1 NR Ad-Hoc#2, R1-1710078, Qingdao, P.R. China 27th — 30th June 2017, published in 3GPP website (https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1706/Docs) on June 16, 2017 (“R1-1710078”).~~
~~Ex. 1022~~	~~3GPP TSG RAN WG1 #87ah-NR, R1-1700771, Spokane, WA, USA, 16th — 20th January, 2017, published in 3GPP website (https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_AH/NR_AH_1701/Docs/) on January 10, 2017 (“R1-1700771”).~~

I. PRELIMINARY STATEMENT

~~Petitioner Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. (collectively “Samsung”)~~ requests *inter partes* review of U.S. Patent No. 10,568,113 (~~Ex. 1001~~), assigned to Patent Owner Apex Beam Technologies LLC, and cancellation of claims 1-20.

The challenged claims are directed to methods and devices for wireless communication, and relate to a particular procedure of sending two beam recovery requests from a user equipment (UE) to a base station through two different channels. This same procedure, however, was proposed to a standards organization (3GPP) and published at least two months before the earliest claimed priority date of the '113 patent. In addition, multiple patent applications were also filed on this same procedure before the earliest claimed priority date of the '113 patent, including prior art U.S. Patent Application Publication No. 2018/0367374 to Liu et al. (“*Liu*”) (~~Ex. 1007~~).

As set forth below, claims 1-20 would have been obvious based on *Liu* in combination with U.S. Patent Application Publication No. 2015/0141026 to Jover (“*Jover*”) (~~Ex. 1005~~). The Examiner did not consider this prior art during examination. The Board should thus institute review and cancel all challenged claims.

H. PRIOR ART BACKGROUND

A. General Overview of Multiple-Input and Multiple-Output (MIMO) and Antenna Beam Failure Recovery

3.41. One of the aims of wireless communications research is to improve the speed, reliability, and coverage area of wireless signals transmitted over the air. ~~Bims, ¶41.~~ One technique that is being used to achieve these objectives is multiple- input and multiple-output (MIMO) radio communications. ~~Id.~~ MIMO is a physical layer technique that has been well known for many years, where user equipment (UE) and a base station each transmit and receive wireless signals using multiple antennas. ~~Id.~~

4.42. The multiple antennas are controlled in such a way that they collectively generate one or more antenna patterns created by the multiple antennas, called beams. ~~Id., ¶42.~~ These beams direct the energy of wireless radio signals in particular directions and even allow for multiple radio signals to be transmitted and received simultaneously. ~~Id.~~ Due to time-varying fluctuations in the radio frequency channel conditions, the quality of each beam (and thus, the quality of communication between the UE and the base station) may vary over time based on a number of factors. ~~Id.~~

5.43. When the quality of the beam is insufficient, a beam failure may be detected.

~~Id.~~, ¶43. To resolve the beam failure, the UE and the base station may communicate to change or adjust their beam patterns and thereby improve the quality of communication between the UE and the base station. ~~Id.~~ This process is known as beam failure recovery. ~~Id.~~

6.44. Beam failure recovery was well known in the art before the earliest claimed priority date of the '113 patent, August 11, 2017. ~~Id.~~, ¶44. For example, International Patent Publication No. WO 2017/024516, filed on August 11, 2015 (“*Lu*”) (~~Ex. 1011~~), discloses the recovery from beam failure in a wireless access network, where a beamforming technique is used in communication between network elements. *Lu*, Abstract; ~~Bims~~, ¶44. Specifically, *Lu* discloses sending a notification of a beam failure from the UE to an access node (i.e., base station), and in response, sending information about a new serving beam from the access node to the UE. *Lu*, [058]-[067], FIG. 3; ~~Bims~~, ¶44.

B. 3GPP Proposed Standard

7.45. The 3rd Generation Partnership Project (3GPP) is a well-known standards development organization that ~~helps to create standards for~~ develops wireless telecommunications ~~technologies~~. ~~Bims~~, ¶¶45-46. standards. Generally, the 3GPP holds ~~working~~ technical standards group meetings

several times a year to propose and discuss new

standards and/or changes to existing standards.

¹ ~~Petitioner reserves the right to challenge the priority date here and/or in other proceedings.~~

~~Id.~~ The 3GPP materials are generally made available to the public on the 3GPP website. ~~Id.~~

46. 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.

8.47. During one particular ~~working group meeting~~ (3GPP TSG RAN WG1 NR) meeting held in Qingdao, China, between June 27-30, 2017, the working group discussed the following proposal:

Proposal 7: A UE can transmit additional beam failure recovery request through PUCCH after it first transmits using PRACH and before it receives the corresponding Message 2.

Ex. 1006, ~~p. page 4; Rodermund, ¶¶46-50; Bims, ¶47.~~

9.48. In other words, “Proposal 7” describes a technique where a UE can send a second beam failure recovery request through a second channel, the Physical Uplink Control Channel (PUCCH), before receiving a response (the corresponding Message 2) to a first beam failure recovery request through a

first channel, the Physical Random Access Channel (PRACH). ~~Bims, ¶48.~~

~~The~~ Shortly after this meeting ~~document (RI-1710596)~~ was ~~made publicly~~
~~available on the 3GPP website on June 16, 2017. See Ex. 1010 at 23;~~

~~Rodermund, ¶¶46-50. Two months later~~ held, the alleged priority

application of the '113 patent was filed on August 11, 2017, describing

“Proposal 7” from the *RI-1710596* document and some other ~~already~~ well-

known ~~concepts~~. ~~Bims, details.~~

¶48.

A. — Patent Literature Implementing Proposed Standard

VII. Between June 16, 2017, and August 11, 2017, several patent applications were filed on “Proposal 7.” For example, Xia² discloses
SUMMARY OF THE PRIOR ART

A. Xia

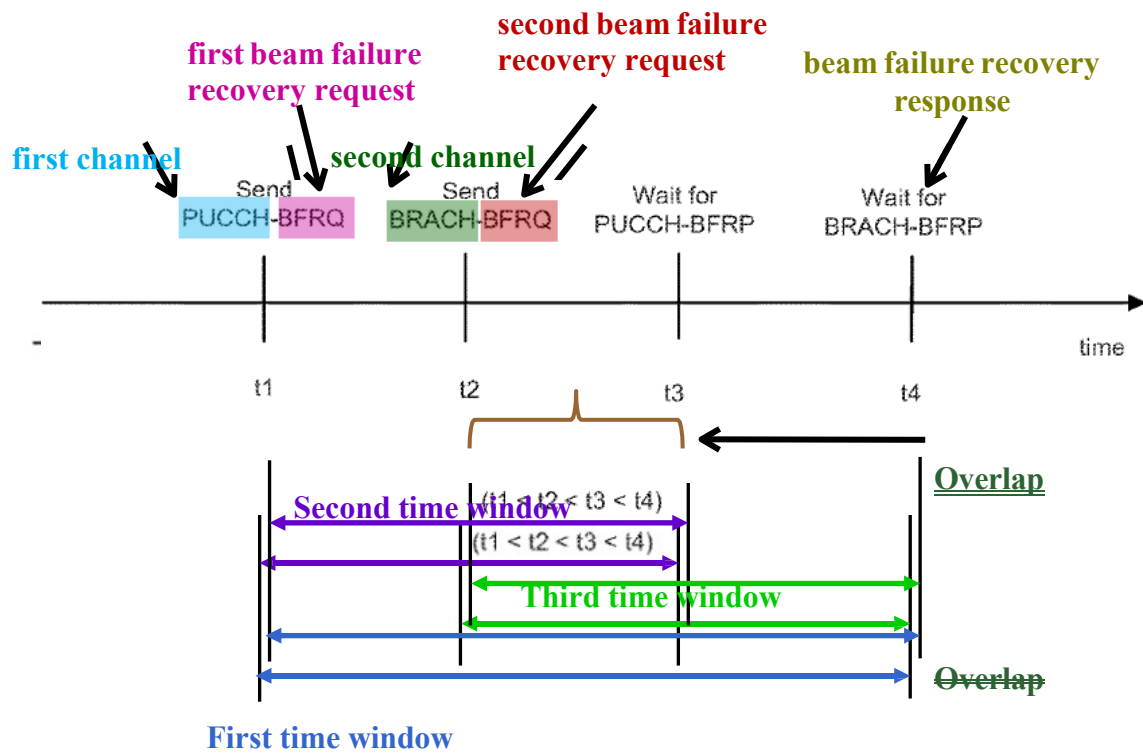
49. The disclosure in *Xia* (Ex. 1004) “generally relates to wireless communication networks, and in particular, to recovering from a beam failure between user equipment and a base station.” *Xia*, [0002]; *Xia Provisional*, [0001]. As background for its invention, *Xia* describes a problem where demand for higher capacity broadband communications causes wireless communication systems to increase their capability, in particular, by requiring beamforming antennas at the base station and user equipment. *Xia*, [0003]; *Xia Provisional*, [0002]. However, if a misalignment between the base station and user equipment beams occurs, a beam failure may result. *Xia*, [0004]; *Xia Provisional*, [0003].

10.50. *Xia* discloses a proposed solution to this problem is a method in a UE where multiple beam failure recovery requests are transmitted to a base station. *Xia*, [0091]; *Xia Provisional*, [0084]. In particular, the UE first monitors a reference signal (beam failure detection RS) to assess whether a beam failure

trigger condition has been met. *Xia*, [0076]; *Xia Provisional*, [0062]. If the condition is met, the UE transmits a **first beam failure recovery request** to the base station using a **first channel** (e.g., **PUCCH**), and subsequently, transmits a **second beam failure recovery request** to the base station using a **second channel** (e.g., **PRACH**). *Xia*, [0091]-[0093], [0097]-[0103], [0105]-[0106], ~~FIGS~~FIG. 6B, FIG. 7A-7B; *Xia Provisional*, [0084]-[0085], FIG. 6.

~~11.51. *Xia Provisional*, [0084]-[0085], FIG. 6.~~ *Xia* also discloses that the UE waits for a **beam failure recovery response** to the two beam failure recovery requests, at t3 or t4. *Xia*, [0102]; *Xia Provisional*, [0084]-[0085], FIG. 6.

² ~~*Xia* is prior art to the '113 patent based on its provisional filing date of August 10, 2017. 35 U.S.C. §§ 102(a)(2). Claim 1 of *Xia* is supported by at least claims 1 and 2, paragraphs [0001], [0004] [0009], [0062], [0065], [0067], [0073] [0078], [0083] [0085], and FIG. 5B and 6 of the *Xia Provisional* (Ex. 1012); and parallel citations to the *Xia Provisional* are provided herein for *Xia* citations. Bims, ¶¶54-55.~~



Xia, FIG. 6B (annotated); Xia Provisional, FIG. 6.

Thus

12.52. As a result, as shown in annotated FIG. 6B above, the UE waits for the response to the beam failure recovery requests within a time window starting from t1 and ending at t4, i.e., a **first time window**. *Xia*, [0102], [0084]; *Xia Provisional*, [0084]-[0085], FIG. 6. As shown, a response time window associated with the first beam failure recovery request (i.e., a **second time window**) and a response time window associated with the second beam failure recovery request (i.e., a **third time window**) have overlapped time domain resource(s). ~~Bims, ¶¶50-52.~~

53. As another example, *Liu* similarly *Xia* is analogous art to the '113 patent because *Xia*, like the '113 patent, is directed to “wireless communication networks” that include methods for “recovering from a beam failure between user equipment and a base station.” *Xia*, [0002]; *Xia Provisional*, [0001]; '113 patent, 1:16-59.

54. I understand that *Xia* is prior art based on its provisional filing date of August 10, 2017. 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.

55. In my opinion, at least claim 1 of *Xia* is supported by its provisional

application, as shown in the chart below. In addition, I believe each citation

that I rely on from *Xia* is supported by its provisional application, as shown in the sections below.

<u>Claim 1 of <i>Xia</i></u>	<u>Support in <i>Xia</i> <i>Provisional</i> (Ex. 1012)</u>
<u>1. A method for beam failure recovery in user equipment, comprising:</u>	<u>“A method for beam failure recovery in user equipment, comprising:” <i>Xia Provisional</i>, Claim 1; see also [0004]-[0009].</u>
<u>detecting a beam failure event between the user equipment and a base station;</u>	<u>“detecting a beam failure event between the user equipment and a base station;” <i>Xia Provisional</i>, Claim 1; see also [0062].</u>
<u>sending a first beam failure recovery request (BFRQ) to the base station upon detection of the beam failure event; and</u>	<u>“sending a first beam failure recovery request (BFRQ) to the base station upon detection of the beam failure,” <i>Xia Provisional</i>, Claim 1; see also [0062], [0065], [0073]-[0077], [0084], FIG. 5B, FIG. 6.</u>
<u>searching for a beam failure recovery response (BFRP) within a first response time window.</u>	<u>“The method of claim 1, further comprising searching for a PUCCH-beam failure recovery response (BFRP) within a response time.” <i>Xia Provisional</i>, Claim 2; see also [0062], [0065], [0067], [0078], [0083], [0084], [0085], FIG. 5B, FIG. 6.</u>

B. *Liu*

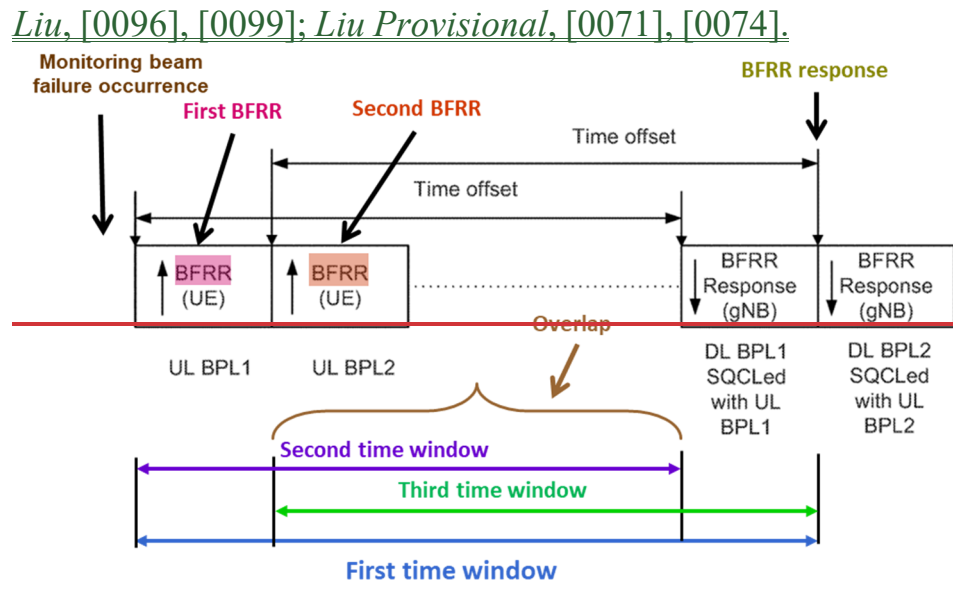
56. The disclosure in *Liu* (Ex. 1007), similar to *Xia*, also relates generally to recovering from a beam failure between user equipment and a base station, in response to demand for higher capacity broadband communications and problems with beam failure communications. *Liu*, [0002], [0003]; *Liu Provisional*, [0001], [0002].

~~13-57.~~ *Liu* discloses a method for beam failure recovery in user equipment. *Liu*, [0005]; *Liu Provisional*, [0004]. In particular, the UE first monitors a-

reference signal and determines whether a beam failure has

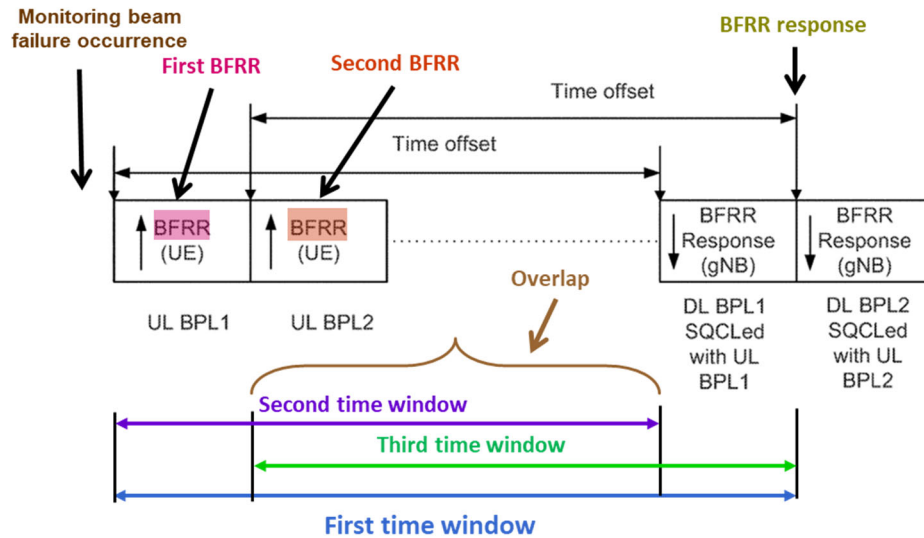
~~occurred~~ reference signal and determines whether a beam failure has occurred. If a beam failure has occurred, the UE transmits a **first beam failure recovery request (BFRR)** to the base station using a first channel (e.g., PUCCH), and subsequently, transmits a **second BFRR** to the base station using a second channel (e.g., PRACH). *Liu*, [0084], [0098]-[0101], FIG. 5B; ~~*Liu*, [0096], [0099]; *Liu Provisional*, [0062], [0073]-[0076], FIG. 5B. *Liu* also discloses that the UE monitors for a BFRR response to the two beam failure recovery requests. *Liu*, [0096], [0099]; *Liu Provisional*, [0071], [0074].~~

Provisional, [0062], [0073]-[0076], FIG. 5B. *Liu* also discloses that, the UE monitors for a **BFRR response** to the two beam failure recovery requests.



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

Thus



Liu, FIG. 5B (annotated).

14.58. As a result, as shown in annotated FIG. 5B above, the UE monitors the response to the BFRRs within a time window from the starting of the ~~depicted~~ time offset for the first BFRR (a monitoring window for the first BFRR) until the end point of the ~~depicted~~ time offset for the second BFRR (a monitoring window for the second BFRR), i.e., a first time window. Liu, [0084], [0096]-[0099], FIG. 5B; Liu, the second BFRR), i.e., a first time window. Liu, [0084], [0096]-[0099],

FIG. 5B; Liu Provisional, [0062], [0071]-[0074]. In addition, a time window associated with the response time to the first BFRR (i.e., a **second time window**) and a time window associated with the response time to the second BFRR (i.e., a **third time window**) have overlapped time domain resource(s). *Liu*, [0084], [0096]-[0099], FIG. 5B; *Liu Provisional*, [0062], [0071]-[0074]; ~~Bims, ¶¶56-58.].~~

~~15-59.~~ *Liu* is analogous art to the '113 patent because *Liu*, like the '113 patent, is directed to “wireless communication networks” that include methods for “recovering from a beam failure between user equipment and a base station.” *Liu*, [0002]; *Liu Provisional*, [0001]; '113 patent, 1:16-59; ~~Bims, ¶59.~~

60. I understand that *Liu* is prior art based on its provisional filing date of June 16, 2017. 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.

61. In my opinion, at least claim 1 of *Liu* is supported by its provisional application, as shown in the chart below. In addition, I believe each citation that I rely on from *Xia* is supported by its provisional application, as shown

in the sections below.

<u>Claim 1 of <i>Liu</i></u>	<u>Support in <i>Liu Provisional</i> (Ex. 1014)</u>
<u>1. A method for beam failure recovery in user equipment, comprising:</u>	<u>“A method for beam failure recovery in user equipment, comprising:” <i>Liu Provisional</i>, claim 1; see also [0001], [0004].</u>
<u>sending a beam failure recovery request (BFRR) to a base station upon detection of a beam failure between the base station and the user equipment; and</u>	<u>“sending a beam failure recovery request (BFRR) to the base station upon detection of a beam failure between the base station and the user equipment;” <i>Liu Provisional</i>, claim 1; see also [0074], [0078]-[0079], FIGS. 5B, 6A.</u>
<u>monitoring one or more candidate beams in which to receive a BFRR response from the base station, based on an association between a beam failure recovery request (BFRR) response and the BFRR.</u>	<u>“monitoring one or more available candidate beams in which to receive the BFRR response from the base station, where the BFRR response is associated with the BFRR.” <i>Liu Provisional</i>, claim 1; see also [0074], [0080], FIGS. 5B, 6A.</u>

A.C. *Jover*

62. U.S. Patent Application Publication No. 2015/0141026 to Jover (“*Jover*”)

(Ex. 1005), published May 21, 2015. I understand that *Jover* is prior art to the ’113 patent based on its publication date.

63. *Jover* discloses detecting a communication impairment (e.g., a connection failure) between an endpoint device (e.g., a UE) and a base station. *Jover*, [0040]. *Jover* explains that “a communication impairment may comprise a decreased signal-to-noise ratio (SNR), decreased signal-to-interference-and-noise (SINR) ratio, decreased received signal strength indication (RSSI) and/or an increased bit-error rate (BER) detected at the endpoint device

300.” *Jover*, [0039]. In one example, *Jover* discloses that the communication impairment is detected by “a threshold drop in the SNR or SINR (e.g., a 20 percent drop as compared to a preceding time period)[,] an increase in the BER (e.g., when the BER increases beyond one percent), and so forth.” *Jover*, [0040].

64. *Jover* is analogous art to the ’113 patent because *Jover*, like the ’113 patent, is directed to wireless communication networks that include methods for “detecting a communication impairment” between an endpoint device (UE) and a base station. *Jover*, [0001]-[0003], [0039]-[0040]; ’113 patent, 1:16-59.

IVIII. THE ’113 PATENT

A. Alleged Invention of the ’113 Patent ~~in View of Prior Art~~

65. ~~Viewed against this backdrop of the prior art, the ’113 patent simply describes~~ The Technical Field section of the ’113 patent states that it “relates to transmission schemes of radio signals in wireless communication systems, and in particular, to a method and a device for a User Equipment (UE) to autonomously determine transmission of information.” Ex. 1001, 1:17-21. Further, the ’113 patent describes, as part of the related art, a proposal that was made in discussions at the 3GPP where a beam recovery request should be transmitted to a base station to change the service beam when the quality

of the service beam is degraded. Ex. 1001, 1:31-39.

16.66. More specifically, the '113 patent relates to methods and devices for

wireless communications between a UE and a base station that use known

procedures. ~~Just like Xia and Liu, the '113 patent addresses a beam failure between a UE and~~

~~a base station in a wireless communication system. '113 patent, 1:43-52. And just like Xia, the,~~

where beams are used to transmit and receive radio signals using antenna

patterns that are formed by antenna port groups. The '113 patent

contemplates a transmission scheme in a UE, in which the UE receives a

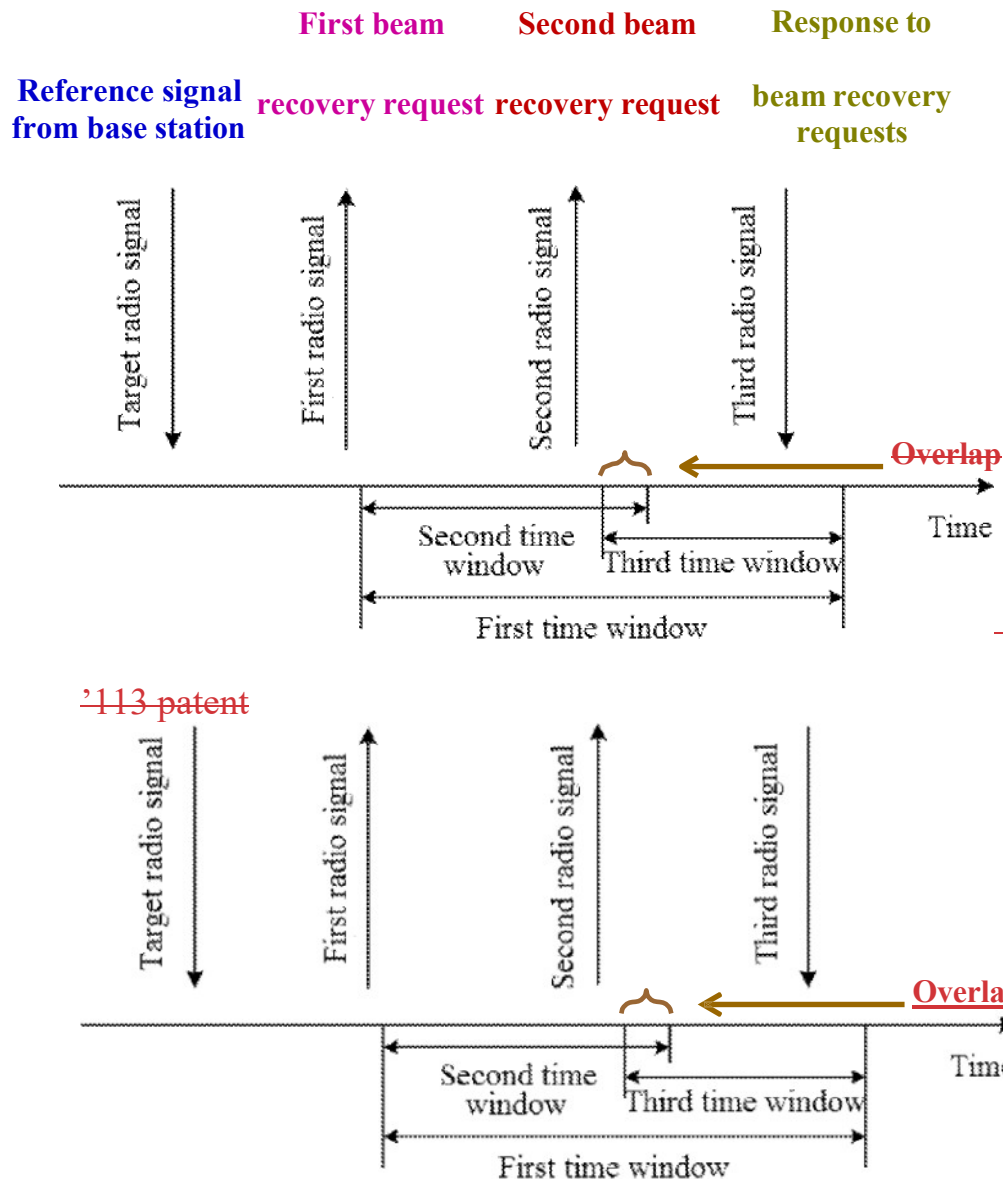
target radio signal (e.g., a **reference signal**) from the base station and

determines whether a triggering condition is met. ~~'113 patent~~ Ex. 1001, 5:9-

~~18: 23:48- 54: 2:23-24; Bims, ¶¶65-.~~

~~66.~~

~~17.67.~~Also, ~~like~~ as disclosed in *Xia* and *Liu*, if the triggering condition is met, the UE transmits a first radio signal (**first beam recovery request**) to the base station using a first channel (e.g., PUCCH), and subsequently transmits a second radio signal (**second beam recovery request**) using a second channel (e.g., PRACH). Ex. '113-patent1001, 2:1-3; 8:57-65; ~~Bims, ¶67~~. The base station receives both requests and then sends a **beam recovery response**, as shown in annotated FIG. 6 below. Ex. '113-patent1001, 10:47-49, ~~10:63-64; Bims, ¶67~~.



Ex. 1001, FIG. 6 (annotated).

18-68. And just like as disclosed in Xia and Liu, as and shown in annotated FIG. 6

above, the UE waits for the response to the beam failure recovery requests within a time window from the sending of the first beam failure recovery request to the receipt of the response to the beam failure recovery requests (i.e., a first time window). '113 patent, 2:3-7; Bims, ¶68. Further, as shown, a

response time window associated with the first beam failure recovery request (i.e., a second time window) and a response time window associated with the second beam failure recovery request (i.e., a third time window) have overlapped time domain resource(s). '113 patent, 12:7-9, 22:51-56, 9:55-56; Bims, ¶68. As explained in more detail below, all of the elements claimed in the '113 patent already existed in the prior art; 55-56.

B. The Prosecution History

~~19.69.~~ The application that ~~issued as~~led to the '113 patent was filed on August 9, 2018, ~~and claimed~~claiming priority to a foreign application CN 201710686330.4 filed on August 11, 2017. Ex. 1003, 3, 68.

~~20.70.~~ During prosecution of the '113 patent, the ~~Examiner~~examiner rejected the claims, finding that the prior art disclosed the methods and systems recited in original independent claims 1, 6, 11, and 16. Ex. 1003, 122-142. In response, the Applicant amended claims 1, 6, 11, and 16 by adding various time window limitations shown in FIG. 6 (discussed above) and argued that the prior art does not disclose that “the second time window and the third time window have overlapped time domain resource(s).” Ex. ~~1003, 153-154, 156-159. The Examiner subsequently allowed the claims, but again without the benefit of Liu, the prior art applied in this Petition, or any other reference mentioned above. Ex. 1003, 123-142, 172-182. As explained~~1003, 153-161.

The examiner subsequently allowed the claims. Ex.

above and below, at least *Liu* discloses the exact limitations the Applicant argued were not in the prior art.

71. 1003, 172-182. But *Xia* and *Liu* were not considered by the Examiner during prosecution. See Ex. 1001, 1-2.

C. Claim Construction

The Board construes claims per *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). 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.³

III. STATEMENT OF PRECISE RELIEF REQUESTED

A. Prior Art

72. I have been instructed that the “intrinsic record” includes the patent itself, including the claims, description, and figures (Ex. 1001), 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). 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.

73. 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.
74. 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 '113 patent.
75. 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 '113 patent as it would have

been understood by a person of ordinary skill in the art at the earliest
claimed priority date of August 11, 2017.

~~Ex. 1007, U.S. Patent Application Publication No. 2018/0367374 to Liu et al., published December 20, 2018, and filed on November 16, 2017 (“*Liu*”), is prior art to the ’113 patent under 35 U.S.C. § 102(a)(2). *Liu* is entitled to its provisional filing date of June 16, 2017. Support for at least one claim of *Liu* is shown in the claim chart below. Bims, ¶¶ 60–61. In addition, support for each citation relied upon from *Liu* is set forth in the sections below.~~

³~~Petitioner reserves the right to argue in an appropriate forum that certain limitations in the challenged claims are indefinite.~~

Claim 1 of <i>Liu</i>		Support in <i>Liu Provisional</i> (Ex. 1014)
~~1. A method for beam failure recovery in user equipment, comprising:~~		~~“A method for beam failure recovery in user equipment, comprising:” <i>Liu Provisional</i>, claim 1; see also [0001], [0004].~~
~~sending a beam failure recovery request (BFRR) to a base station upon detection of a beam failure between the base station and the user equipment; and~~		~~“sending a beam failure recovery request (BFRR) to the base station upon detection of a beam failure between the base station and the user equipment;” <i>Liu Provisional</i>, claim 1; see also [0074], [0078]–[0079], FIGS. 5B, 6A.~~
~~monitoring one or more candidate beams in which to receive a BFRR response from the base station, based on an association between a beam failure recovery request (BFRR) response and the BFRR.~~	~~“monitoring one or more available candidate beams in which to receive the BFRR response from the base station, where the BFRR response is associated with the BFRR.” <i>Liu Provisional</i>, claim 1; see also [0074], [0080], FIGS. 5B, 6A.~~	

~~Ex. 1005, U.S. Patent Application Publication No. 2015/0141026 to Jover, published May 21, 2015 (“*Jover*”), is prior art to the ’113 patent under 35 U.S.C. §§ 102(a)(1) and (a)(2). *Jover* is analogous art to the ’113 patent because *Jover*, like the ’113 patent, is directed to wireless communication networks that include methods for “detecting a communication impairment” between an endpoint device~~

(UE) and a base station. *Jover*, [0001] [0003], [0039] [0040]; '113 patent, 1:16-59; Bims, ¶64.

B. — Challenges

Ground	Challenged Claims	Basis	Prior Art
1	1-20	§ 103	<i>Liu and Jover</i>

H.IX. LEVEL OF ORDINARY SKILL IN THE ART

76. AIn rendering the opinions set forth in this declaration, I have been asked to consider the '113 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.

21.77. 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 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*. ~~Bims, Section IX.~~

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

X. ANALYSIS OF GROUNDS OF UNPATENTABILITY

78. In my opinion, the challenged claims are unpatentable for the reasons explained below.

A. Claims 1-20 Are Obvious over *Liu* in View of *Jover***1. Independent Claim 1**

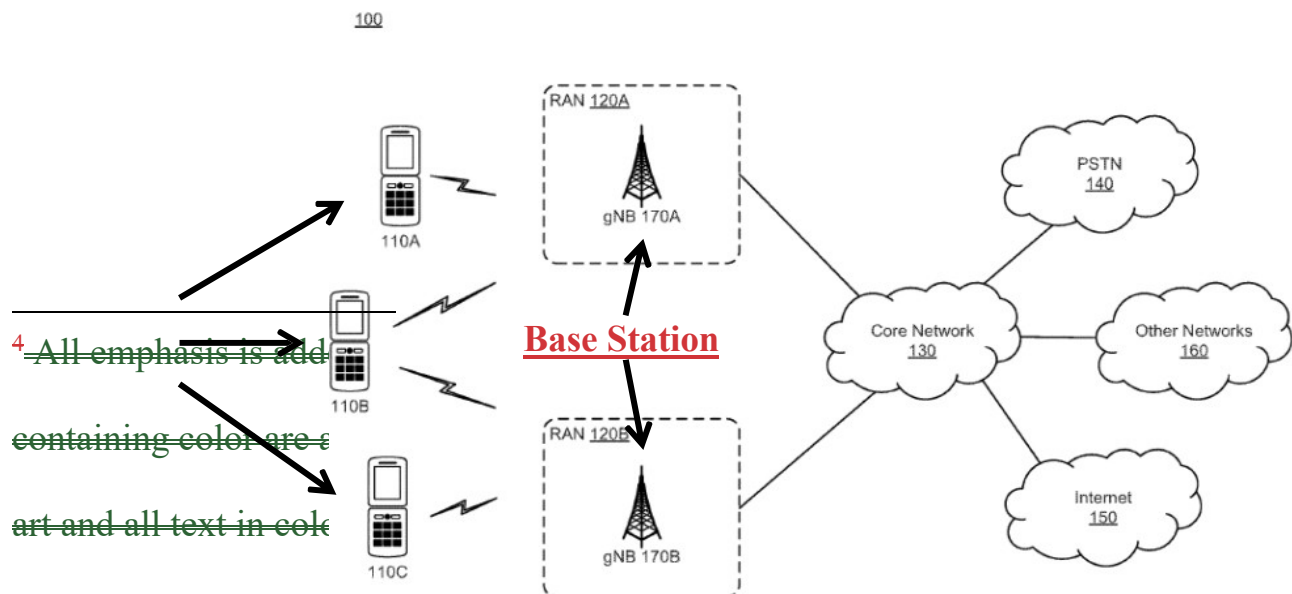
- a. [1pre]: “A method in a User Equipment (UE) for wireless communication, comprising:”

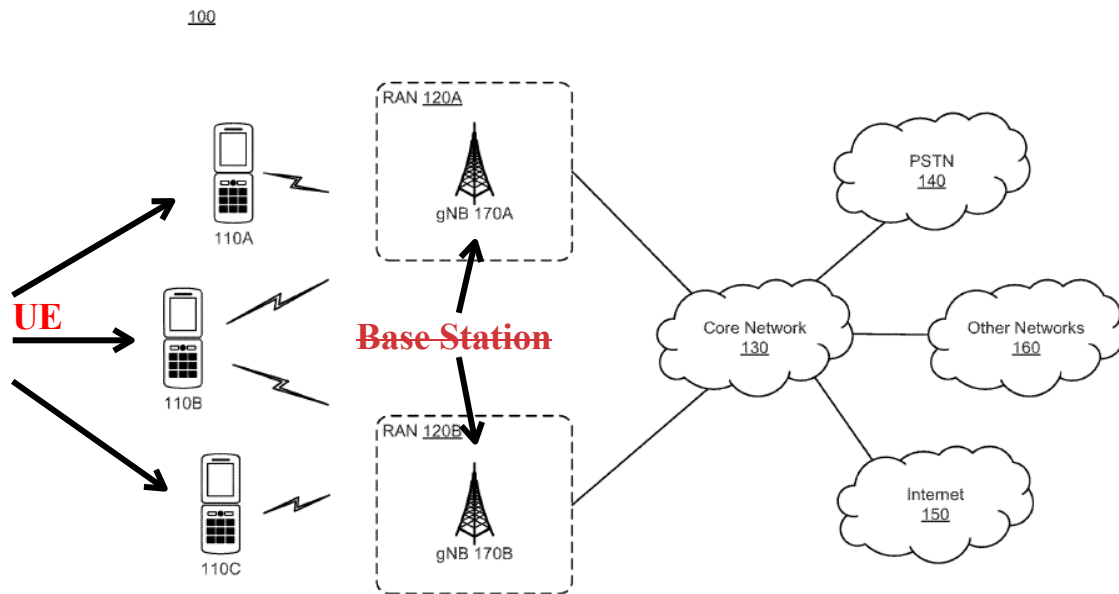
79. ~~To the extent the preamble is limiting,~~ *Liu* discloses a method in a user equipment (UE) for wireless communication. ~~Bims, ¶¶79-80.~~ For example, *Liu* explains that the technical field of its disclosure “generally relates to wireless communication networks.” *Liu* [0002]; *Liu Provisional*, [0001]. As shown in annotated FIG. 1 below, *Liu* discloses a wireless communication system 100 including “**user equipment 110A-110C**, radio access networks (RANs) 120A-120B, a core network 130, a public switched telephone network (PSTN) 140, the Internet 150, and other networks 160.” *Liu*, [0056]¹; *Liu Provisional*, [0034]. *Liu* explains that the “user equipment (UE) 110A-110C are configured to operate and/or communicate in the system 100. For example, the user equipment 110A-

¹ 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.

110C are configured to transmit and/or receive wireless signals or wired signals.” *Liu*, [0059]; *Liu Provisional*, [0037]. *Liu* further explains that “the RANs 120A-120B include one or more base stations 170A, 170B (collectively, **base stations 170**), respectively. Each of the base stations 170 is configured to wirelessly interface with one or more of the **UEs 110A, 110B, 110C** to enable access to the core network 130, the PSTN 140, the Internet 150, and/or the other networks 160.” *Liu*, [0060]; *Liu Provisional*, [0038]; *Bims*, ¶79.].





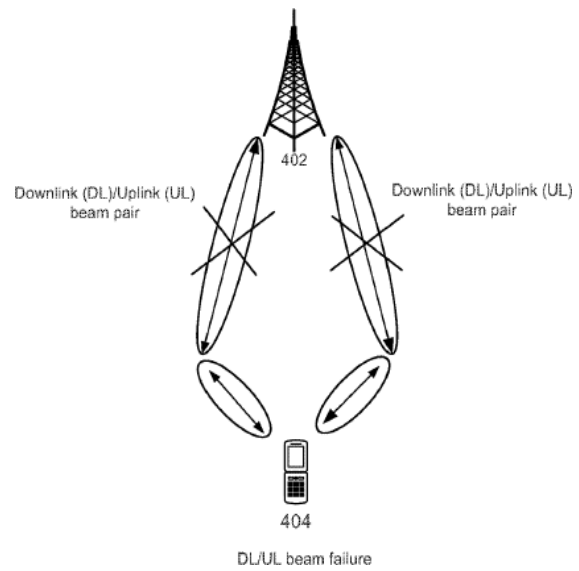
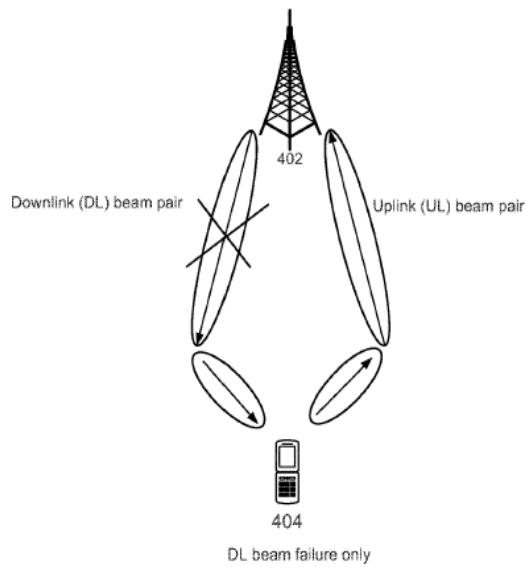
Liu, FIG. 1 (annotated); *Liu Provisional*, FIG. 1.

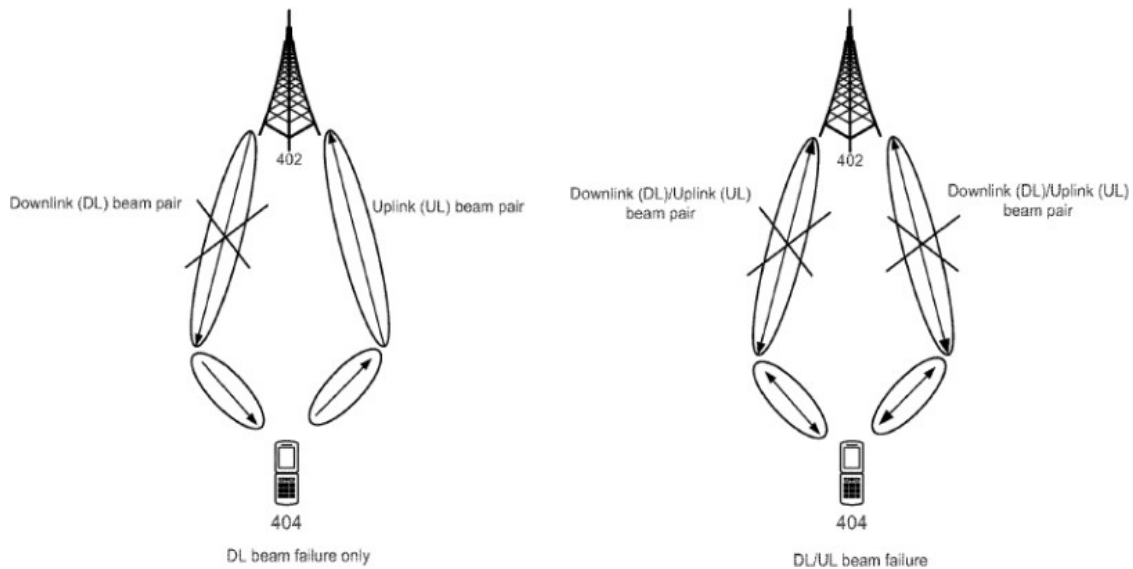
80. One wireless communication method described in *Liu* is “a method for beam failure recovery in user equipment.” *Liu*, [0005], [0002] (describing the technical field as “generally relat[ing] to wireless communication networks, and in particular, to recovering from a beam failure between user equipment

and a base station”); *Liu Provisional*, [0004], [0001]. *Liu*’s method includes, among other things, “sending a beam failure recovery request (BFRR) to the base station upon detection of a beam failure between the base station and the user equipment; and monitoring one or more candidate beams in which to receive a BFRR response from the base station, based on an association between a beam failure recovery request (BFRR) response and the BFRR.” *Liu*, [0005]; *see also Liu*, [0032], [0033], [0103]; *Liu Provisional*, [0004], [0032]; *see also*, [0017], [0077]; ~~*Bims*, ¶¶80-81.~~ This method in a UE for wireless communication is described in more detail below.

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

22-81. *Liu* discloses that the UE receives a target radio signal, which it calls a “reference signal” from the base station. *Liu*, [0069]-[0070]; *Liu Provisional*, [0047]-[0048]; ~~*Bims*, ¶¶81-83.~~ As shown in FIGS. 4A and 4B below, *Liu* discloses that “the base station 402 and user equipment 404 communicate via DL [downlink] beam pairs and UL [uplink] beam pairs.” *Liu*, [0075]; *Liu Provisional*, [0053]. FIG. 4A illustrates a case in which “the DL beam pair fails,” and FIG. 4B illustrates a case in which “the DL/UL beam pair fails.” *Liu*, [0075]; *see also Liu*, [0067], [0068], FIG. 2; *Liu Provisional*, [0053]; *see also Liu Provisional*, [0045], *see also Liu Provisional*, [0045], [0046], FIG. 2.





Liu, FIGS. 4A (left) and 4B (right); *Liu Provisional*, FIGS. 4A, 4B.

[23-82](#). According to *Liu*, “a beam failure is detected by the user equipment 110A-110C.” *Liu*, [0103]; *Liu Provisional*, [0078]. *Liu* discloses that “[i]f the user equipment 110A-110C does not support Rx beamforming, the user equipment 110A-110C measures the channel quality of a **reference signal (RS)** in each transmission beam and reports the measurements to the base station 202.” *Liu*, [0069]; *Liu Provisional*, [0047]. *Liu* further discloses “[i]f the user equipment 110A-110C is configured to support Rx beamforming, the user equipment 110A-110C measures the channel qualities of multiple Tx beams received from the base station 202 for each reception beam pattern and reports a total or some high-ranked measurements of all Tx-Rx beam pairs to the base station 202.” *Liu*, [0069]; *Liu Provisional*, [0047]. *Liu*’s reference signal can be a “channel state information-reference signal (**CSI-**

RS).” *Liu*, [0087], [0091]; *Liu Provisional*, [0068]. *Liu* also discloses that the UE receives a “**synchronization signal** from base station 402.” *Liu*, [0076]-[0077]; *Liu Provisional*, [0054]-[0055]. A POSITA would understand that *Xia* receives the beam failure detection RS because the UE detects the beam failure and reports detection of the beam failure. ~~Bims, ¶82;~~ *Liu*, [0103], [0069]; *Liu Provisional*, [0078], [0047].

24.83. The ’113 patent’s specification states that the claimed “target radio signal” can be “a **reference signal**” such as “a **Channel State Information Reference Signal (CSI-RS)** used for conducting a channel quality measurement of a physical layer control channel,” or “a **Synchronization Signal (SS)** used for conducting a channel quality measurement of a physical layer control channel.” ’113 patent, 2:23-36. Thus, *Liu*’s reference signal, such as the CSI-RS or the synchronization signal, constitutes the claimed “target reference signal.” ~~Bims, ¶83.~~

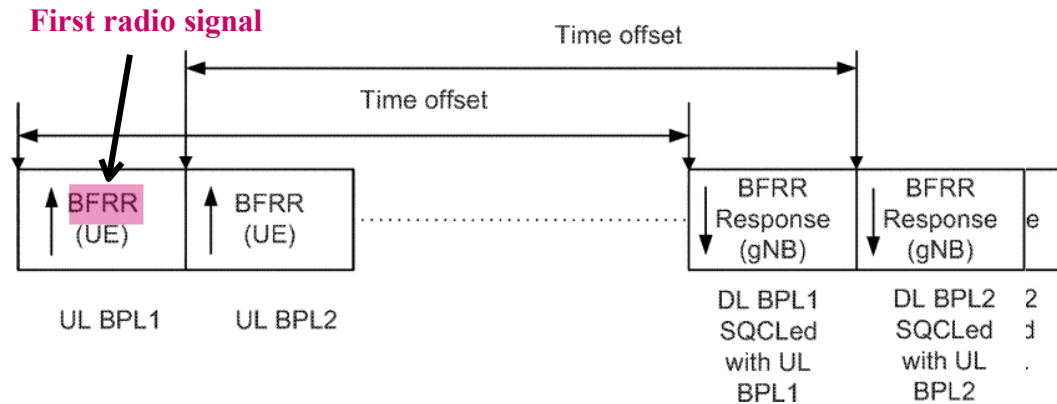
c. [1b]: “transmitting a first radio signal on a first channel;”

25.84. *Liu* discloses that “[i]n order for the system to recover from such a beam failure, the user equipment 404 sends a beam failure recovery request (BFRR) to the base station 402.” *Liu*, [0084]; *Liu Provisional*, [0062]. According to *Liu*, in some cases, “the user equipment 404 may transmit ~~multiple BFRRs in UL beam pairs (e.g., [UL BPL1, UL BPL2]).~~” *Liu*, [0099]; ~~see~~

~~also Liu, [0098], [0100]~~

multiple BFRRs in UL beam pairs (e.g., [UL BPL1, UL BPL2]).”~~{Liu,~~

[0099]; *see also* Liu, [0098], [0100]-[0102], [0105], [0114]; Liu Provisional, [0074]; *see also* Liu Provisional, [0073], [0075]-[0076], [0082], [0090]. As shown, the UE transmits a first BFRR (“**first radio signal**”) to the base station on a first channel.



Liu, FIG. 5B (annotated); Liu Provisional, FIG. 5B.

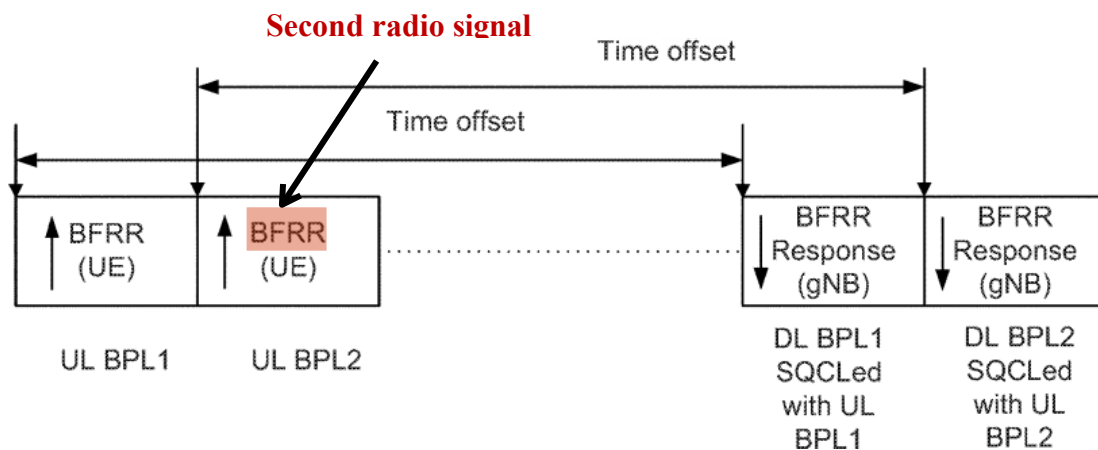
26-85. Specifically, Liu discloses that “the user equipment 404 may use the active PUCCH (originally allocated for UCI) to report the beam failure and request recovery from the base station 402.” Liu, [0084]; *see also* Liu, [0004]; Liu Provisional, [0062]; *see also* Liu Provisional, [0003].

27-86. The ’113 patent’s specification states that the claimed “first radio signal” can be a “beam recovery request.” ’113 patent, 3:41-42, *see also* ’113 patent, 13:66-67. The ’113 patent also states that “the first channel” can be “a PUCCH.” ’113 patent, 8:57. Accordingly, Liu’s first BFRR constitutes the claimed “first radio signal,” and Liu’s PUCCH constitutes the claimed “first-channel.” Bims, ¶¶84-86.

channel.”

d. [1c]: “transmitting a second radio signal on a second channel; and”

[28.87](#). After the first BFRR is sent, *Liu* discloses that the UE transmits a second BFRR (“**second radio signal**”) to the base station on a second channel, as shown in annotated FIG. 5B below. ~~Bims, ¶87.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

[29.88](#). As discussed above, *Liu* discloses that “the user equipment 404 may transmit multiple BFRRs in UL beam pairs (e.g., [UL BPL1, UL BPL2]).” *Liu*, [0099], FIG. 5B; *Liu Provisional*, [0074], FIG. 5B. The first BFRR may be sent through the “PUCCH,” as discussed for claim [1b]. In addition, *Liu* explains that the UE may also use a “Physical Random Access Channel (PRACH)” or “PRACH-like” channel for BFRR. *Liu*, [0004], [0084], [0092]; *Liu Provisional*, [0003], [0062], [\[0069\]](#).

~~[0069].~~

[30.89](#). The ’113 patent’s specification states that the claimed “second radio signal”

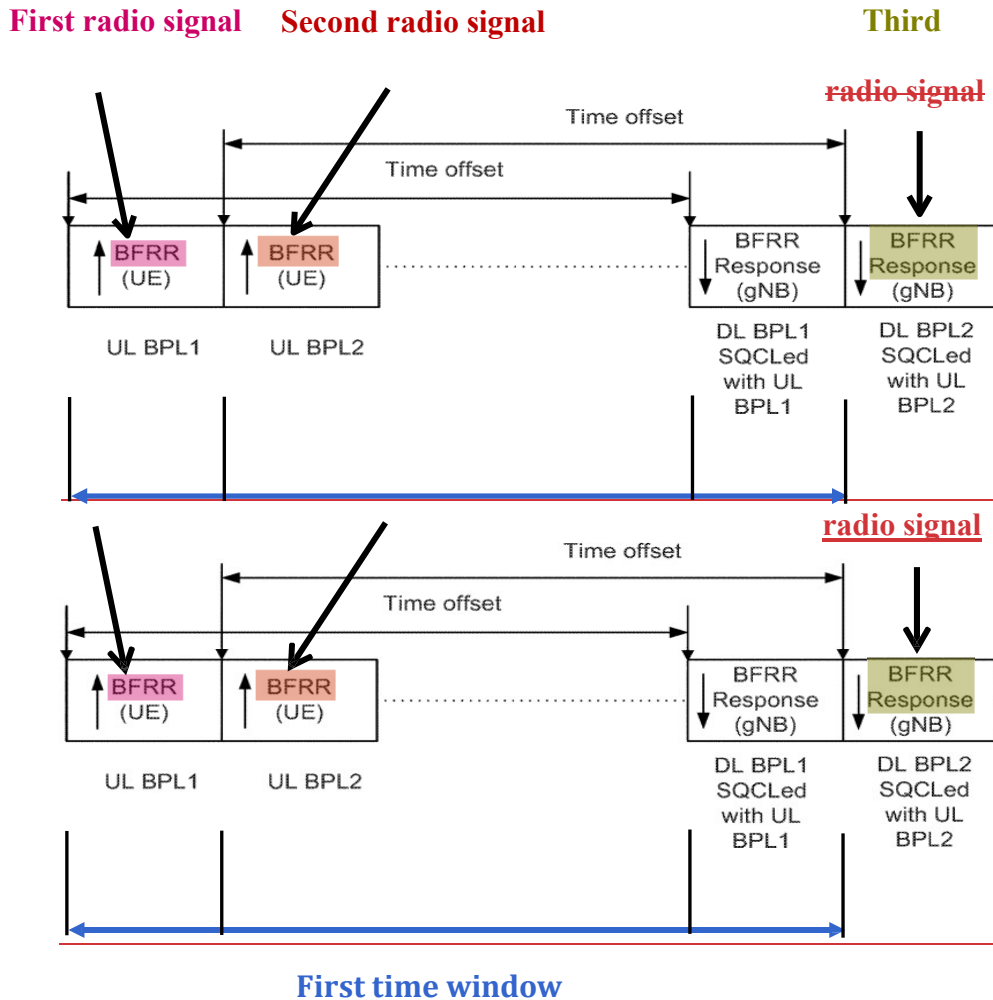
can be a “beam recovery request[.]” ’113 patent, 13:66-67. The ’113 patent

also states that “the second channel” can be “a physical layer random access channel.” ’113 patent, 8:64-65. Therefore, *Liu*’s second BFRR constitutes the claimed “second radio signal,” and *Liu*’s PRACH constitutes the claimed “second channel.” ~~Bims, ¶¶88-90.~~

~~31.90.~~ To the extent Patent Owner argues *Liu* does not expressly disclose that the first BFRR is sent through the PUUCH and the second BFRR is sent through the PRACH, it would have been obvious, as explained below for claim [3].
See infra claim [3].

e. [1d]: “**monitoring a third radio signal in a first time window;**”

~~32.91.~~ After sending the first and second BFRRs, *Liu*’s UE monitors for a BFRR response (“**third radio signal**”) from the base station in a time window (“**first time window**”) from the starting point of the depicted time offset for the first BFRR response to the end point of the depicted time offset for the second BFRR response, as shown in annotated FIG. 5B below. *Liu*, [0099]; *Liu Provisional*, [0074]; ~~Bims, ¶91.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

33-92. *Liu*'s UE may monitor for the BFRR response in a number of ways,

including: "(1) monitoring the SQCL'ed DL beam pairs for the BFRR

response simultaneously (if the user equipment 404 Rx capability permits),-

~~(2) monitoring~~

(2) monitoring the 'best' SQCL'ed DL beam pair (e.g., the candidate beam having the best channel quality) for the BFRR response, [or] (3) indicating a preferred DL beam pair in the BFRR to the base station 402, in which the

user equipment 404 monitors the indicated DL beam pair according to the time offset (in this case, the user equipment 404 may only monitor one DL beam, so a recommendation is made as to the best performing beam).” *Liu*, [0099]; *Liu Provisional*, [0074].

[34.93](#). *Liu* further discloses that “each BFRR is associated with a BFRR response,” or “all BFRRs are associated with one BFRR response.” *Liu*, [0119]; *Liu*

Provisional, [0095]. Thus, *Liu* acknowledges that there may be a single BFRR response for both the first and second BFRR, or alternatively, there may be a BFRR response for each of the first and second BFRRs. ~~Bims,~~ ¶93; ~~see~~ See also, *Liu*, FIG. 5B; *Liu Provisional*, FIG. 5B.

35-94. The '113 patent's specification states that the "third radio signal" can be "a response to the second radio signal," or "a response to the first radio signal and the second radio signal." '113 patent, 10:47-49, 10:63-64. Thus, either the second BFRR response or both the first and second BFRR responses in *Liu* constitute the claimed "third radio signal."

36-95. Moreover, as shown in annotated FIG. 5B above, *Liu* monitors the BFRR response in a "first time window" between the starting point of the depicted time offset for the first BFRR response and the end point of the depicted time offset for the second BFRR response. ~~Bims,~~ ¶95. For example, *Liu* explains that "a transmission occasion association between the BFRR (sent by the user equipment 404) and the BFRR response (sent by the base station 2402) is used to monitor the DL beams." *Liu*, [0096]; *Liu Provisional*, [0071]. *Liu* also discloses that "the transmission occasion association is indicated by a time offset such that UE should monitor the DL beams for the BFRR response from the base station 402, which is SQCL'ed with the BFRR from the user equipment 404, in a time slot with a time offset relative

to the

BFRR.” *Liu*, [0096]; *Liu Provisional*, [0071]. *Liu* further explains that the time slot is a time window for UE monitoring BFRR response and the time offset indicates the starting position of the response monitoring window relative to the BFRR. *Liu*, [0096], [0029], [0054], FIG. 5B; *Liu Provisional*, [0071], [0013], [0032], FIG. 5B. *Liu*’s UE thus monitors for one or more BFRR responses in the “first time window,” as claimed. ~~Bims, ¶¶91-97; see also Ex.~~

96. Moreover, the concept of “monitoring” for a BFRR response was previously discussed in 3GPP working group meetings, and thus, was well known to a POSITA before the priority date of the ’113 patent. For example, *RI-1710596* discloses that “an important feature of 5G NR is beam management.... To manage and maintain effective beam link pairs, recovery from beam failures is needed. A UE may initiate the beam recovery process by sending beam failure recovery request to gNB”. *Ex. 1006*, 1. Further, it was discussed that “[a]fter sending the beam recovery request, either through PRACH or PUCCH, the UE waits for response from the gNB,” and that “a UE should monitor PDCCH from gNB continuously in the time window.” *Ex. 1006*, 4.
97. Also, the configuration and size/location of the “first time window” were discussion topics for the 3GPP working group meetings long before the

priority date of the '113 patent. For example, *R1-1710078* discloses that

“[d]etection of a gNB’s response for beam failure recovery request during a time window is supported,” that “the time window is configured or pre-determined,” and that “[i]f not detected after a certain number of transmission(s), UE notifies higher layer entities.” Ex. 1006, 1-4; 1021, 1; see also Ex. 1006, 2.

~~Ex. 1021, 1; Rodermund, ¶¶ 51-55.~~

- f. [1e]: “wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal;”

~~37.98.~~ *Liu* in combination with *Jover* renders obvious this limitation. ~~Bims, ¶98.~~

~~38.99.~~ *Liu* discloses that a detection of a beam failure triggers transmission of the first and second BFRRs (“first radio signal” and “second radio signal”) to the base station. *Liu*, [0005], [0078], [0084], [0114]; *Liu Provisional*,

~~station. Liu, [0005], [0078], [0084], [0114]; Liu Provisional, [0004], [0056], [0062], [0090].~~ Liu also discloses that the UE measures “the channel quality” of the reference signal, such as a CSI-RS or a synchronization signal (“target radio signal”). Liu, [0069], [0076]-[0077], [0087], [0091]; Liu Provisional, [0047], ~~[0054]-[0055], [0091].~~

~~[0054]-[0055], [0091].~~

39.100. A POSITA would have found it obvious to modify Liu’s method to determine the beam failure based on a triggering condition with a predetermined threshold, as taught by Jover. ~~Bims, ¶¶99-100.~~ For example, Jover discloses detecting a communication impairment (e.g., a connection failure) between

an endpoint device (e.g., a UE) and a base station. *Jover*, [0040]. *Jover* explains that “a communication impairment may comprise a decreased signal-to-noise ratio (SNR), decreased signal-to-interference-and-noise (SINR) ratio, decreased received signal strength indication (RSSI) and/or an increased bit-error rate (BER) detected at the endpoint device 300.” *Jover*, [0039]. In one example, *Jover* discloses that the communication impairment is detected by “a **threshold** drop in the SNR or SINR (e.g., a 20 percent drop as compared to a preceding time period)[,] an **increase in the BER** (e.g., when the **BER increases beyond one percent**), and so forth.” *Jover*, [0040]. *Jover* further discloses that when “one or more of such threshold conditions are met, the wireless channel sensing engine 320 may signal to the beam- forming engine 310 to begin the beam sweeping procedure.” *Jover*, [0040].

~~procedure.” *Jover*, [0040].~~ Thus, *Jover* specifically discloses using a target measurement value (BER) that is higher than a target threshold (1%) as a triggering condition, as claimed. ~~*Bims*, ¶100.~~

~~40.101.~~ It would have been obvious to implement *Jover*’s teachings in *Liu*’s method to use a beam failure triggering condition with BER as the target measurement value, as taught by *Jover*. *Jover*, [0039]-[0040]; ~~*Bims*, ¶101.~~ Both *Liu* and *Jover* involve wireless communications between a UE and a base station. *Liu*, FIG. 1; *Liu Provisional*, FIG. 1; *Jover*, FIG. 1. Both references are also

specifically directed to detecting a communication failure between the UE and the base station. *Liu*, [0005], [0069], [0076]-[0078], [0084], [0087], ~~[0091], [0114], FIG. 1; *Liu* [0091], [0114], FIG. 1; *Liu* Provisional~~, [0004], [0047], [0054]-[0056], [0062], [0090], FIG. 1; *Jover*, [0039] ~~[-[0040], FIG. 3; *Bims*, ¶101.~~ And *Jover* provides further detail about how the communication failure is determined, explaining that it may be determined by using a target measurement value (BER) that is higher than a target threshold (1%) as a triggering condition. *Jover*, [0039] ~~[- [0040]; *Bims*, ¶101.].~~

41.102. A POSITA would have been motivated to adopt *Jover*'s triggering condition in *Liu*'s method to determine when to send the first and second BFRRs. *Liu* already discloses that the transmission of the first and second BFRRs to the base station are triggered by the detection of a communication failure. ~~*Bims*, ¶102.~~ And *Jover* simply provides further details about how and when to implement *Liu*'s teachings regarding the detection of the communication failure, and a POSITA would have been motivated and found it obvious to look to *Jover* to understand and implement its additional teachings. ~~*Id.*~~ A POSITA also would have been motivated to implement *Jover*'s triggering condition in *Liu*'s method to improve the accuracy and

reliability of the beam failure determination. ~~Id.~~ For example, a triggering condition based on BER would have provided threshold measurements to ensure a beam failure detection is

appropriate. ~~Id. (citing~~ Ex. 1013 (*Vembu*), 7:25-32 (“[i]f the BER rises above threshold by more than a predetermined amount, the system is no longer operating nominally.”), 7:37-47 (“receiver 112 is described as determining whether or not the system is at, above, or below threshold and whether the system is operating nominally,” and “send[ing] a command to transmitter 108 (108 b, 108 a) instructing transmitter 108 change modes when appropriate.”).

Further, a POSITA would have been motivated to implement *Jover*’s triggering condition because of the known benefits of evaluating BER.

~~Bims, ¶102 (citing~~ Ex. 1009 (*Pandey*), 463 (disclosing that “[t]he most meaningful criterion for evaluation of performance of communication systems is the bit error rate (BER)”)”); ~~Ex. 1015;)”);~~ Ex. 1013 (*Vembu*), 7:25-32, 7:37-47. Thus, a POSITA would have been motivated to implement *Jover*’s triggering condition in *Liu*’s method because of the advantages provided by *Jover*’s triggering condition. ~~Bims, ¶102. See KSR,~~

~~550~~

~~U.S. at 417 (“[I]f a technique has been used to improve one device, and a~~

~~[POSITA] 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.~~

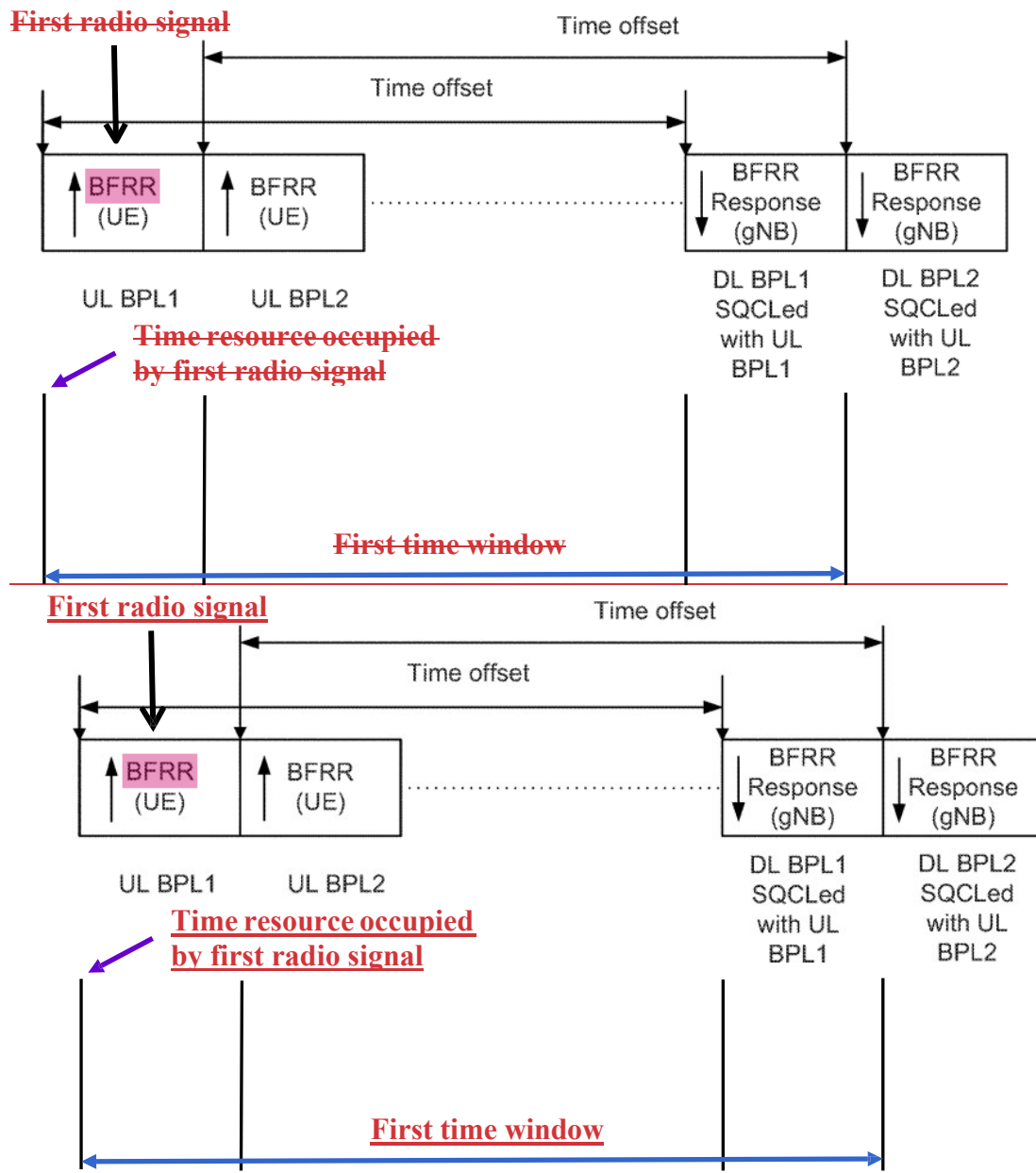
103. A POSITA would have had a reasonable expectation of success as it would have been straightforward for a POSITA to implement *Jover*’s triggering condition in *Liu*’s method. ~~Bims, ¶103.~~ As mentioned above, both *Liu* and *Jover* include similar components that perform similar functions, and both *Liu* and *Jover* detect communication failures between the UE and the base station. Also, evaluating BER was well known and widely used long before August 11, 2017. *See, e.g.*, Ex. 1009 (*Pandey*), 463-466; Ex. 1013 (*Vembu*), 7:25-32,

7:37-47. Thus, it would have been straightforward to add *Jover*'s triggering condition (BER) to *Liu*'s existing method. ~~Bims, ¶103.~~ For example, a POSITA could have easily updated the existing software in *Liu*'s UE to enable the UE to calculate BER and compare it to a threshold value for determining whether to trigger the beam failure recovery. Further, implementing *Jover*'s teachings in *Liu* would have yielded predictable results—namely, accurately and reliably determining beam failures. ~~*Id.*; See KSR, 550 U.S. at 421; Uber, 957 F.3d at 1338-41.~~

42.104. Thus, *Liu* in combination *Jover* renders obvious limitation [1e]. ~~Bims, ¶104.~~

- g. [1f]: “a time resource occupied by the first radio signal is used for determining the start time of the first time window;”

43.105. As shown in annotated FIG. 5B below, *Liu* discloses that a time resource occupied by the first radio signal (first BFRR) is used for determining the start time of the first time window. ~~Bims, ¶105.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

44.106. A POSITA would have understood “a time resource occupied by the first radio signal” to include a start time of the first radio signal. ~~Bims, ¶106.~~ This is consistent with the ’113 patent, which explains that time domain resources of the first and second signals can be start times of the time

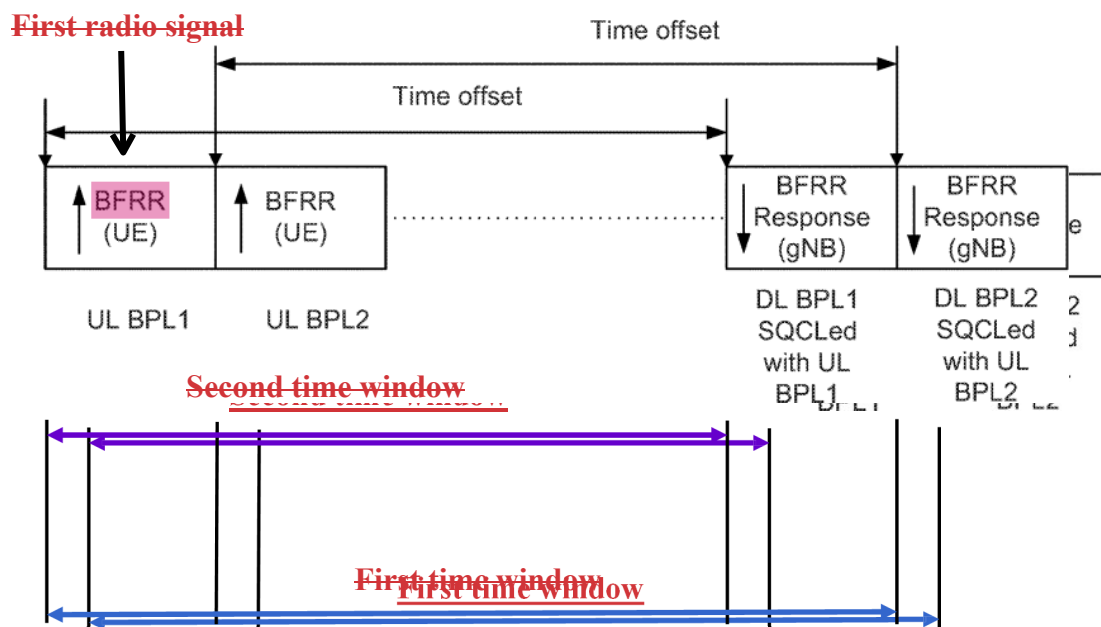
windows. '113 patent, 23:13-22 (“a time domain resource occupied by the first radio signal is the start time of the second time window,” and “a time domain resource occupied by the second radio signal is the start time of the third time window”). ~~Bims, ¶106.~~

~~45-107.~~ Further, as discussed above for claim [1d], *Liu* discloses monitoring for a BFRR response in the “first time window,” and that monitoring begins in response to the first BFRR. See Section X.A.1.e. Thus, as shown above in ~~FIG. 5B, a time resource occupied by~~

FIG. 5B, a time resource occupied by the first BFRR, for example, the start time of the first BFRR, is used for determining the start time of the first time window. ~~Bims, ¶107.~~

- h. [1g]: “a time domain resource occupied by the first radio signal is used for determining a second time window,”

46-108. As shown in annotated FIG. 5B below, *Liu* discloses that a time domain resource occupied by the first radio signal (e.g., beginning at the starting point of the first BFRR) is used for determining a second time window (the depicted time offset for the first BFRR). ~~Bims, ¶108.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

47-109. As discussed above for claim [1d], *Liu* discloses that “the transmission occasion association is indicated by a time offset such

that UE should ~~monitor the DL beams for the BFRR response from the base station~~

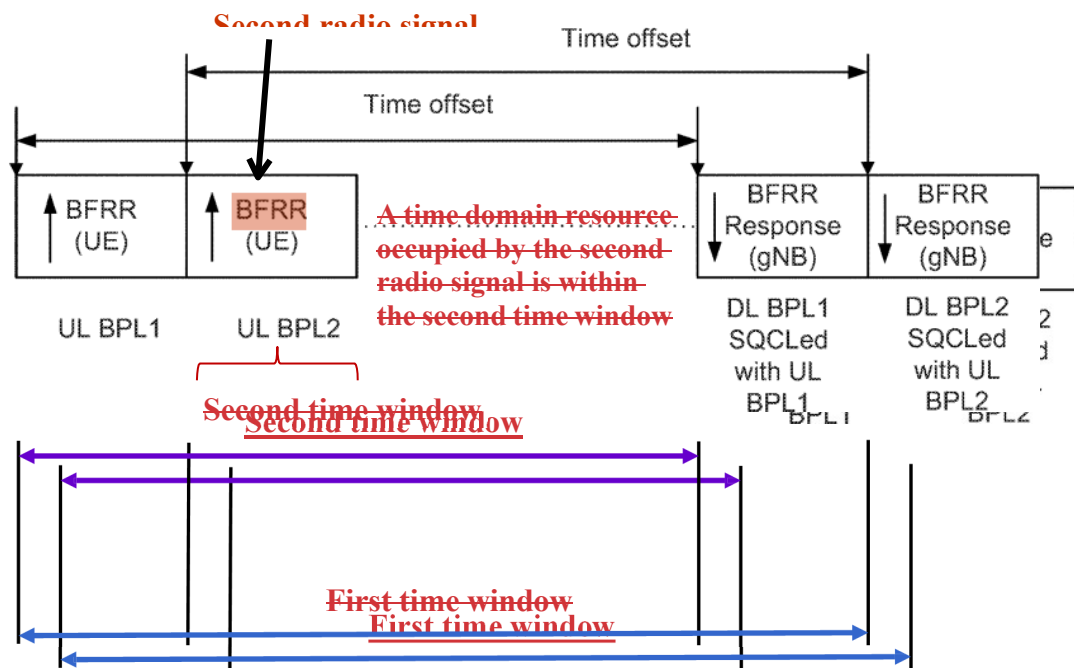
~~402, which is SQCL'ed~~

monitor the DL beams for the BFRR response from the base station 402,
which is SQCL'ed with the BFRR from the user equipment 404, in a time slot with a time offset relative to the BFRR.” See Section X.A.1.e; Liu, [0096]; *Liu Provisional*, [0071]. Thus, the depicted time offset for the first BFRR represents a “second time window” that begins in response to the first BFRR. ~~Bims, ¶109.~~

48-110. The '113 patent's specification states that “the start time of the second time window and the start time of the first time window are the same.” '113 patent, 9:23-25. Just like the '113 patent, in *Liu*, the start time of the second time window and the start time of the first time window are the same. ~~Bims, ¶110.~~

- i. [1h]: “a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window;”

49-111. As shown in annotated FIG. 5B below, *Liu* discloses that a time domain resource occupied by the second radio signal (e.g., beginning at the starting point of the second BFRR) is within the second time window. ~~Bims, ¶111.~~ Further, as shown in the figure, the second time window (the depicted time offset for the first BFRR) is within the first time window (from the starting point of the depicted time offset for the first BFRR response to the end point of the depicted time offset for the second BFRR response).

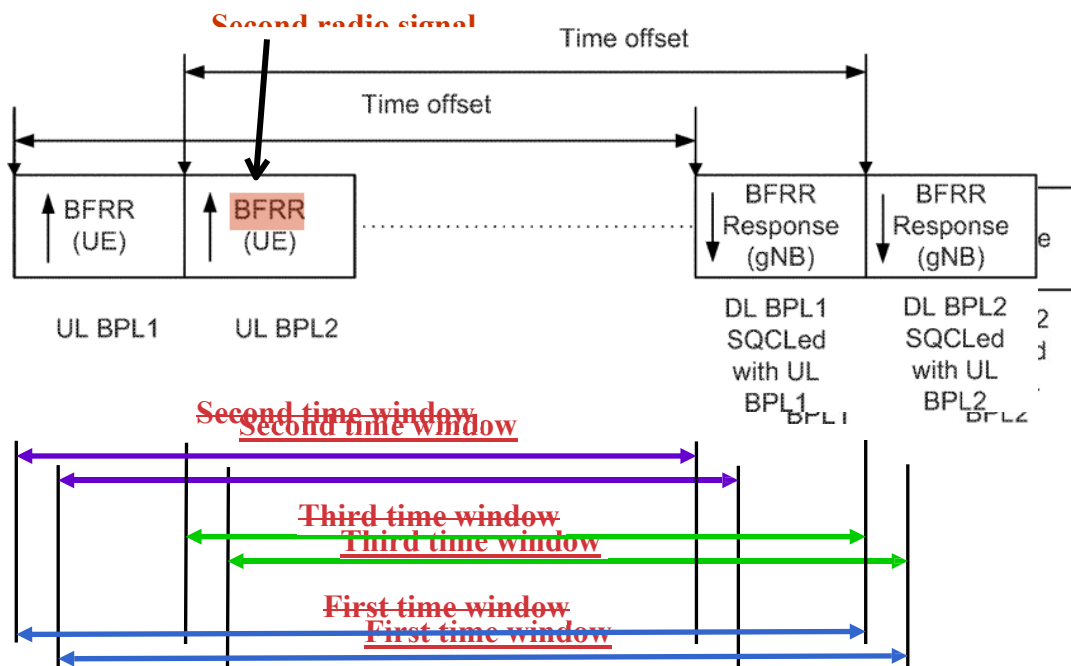


Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

- j. [1i]: “a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and”

50.112. As shown in annotated FIG. 5B below, *Liu* discloses that a time

domain resource occupied by the second radio signal (e.g., beginning at the starting point of the second BFRR) is used for determining a third time window (the depicted time offset for the second BFRR). ~~Bims, ¶112.~~ Also, as shown in the figure below, the end time of the third time window is the end time of the first time window. ~~Id.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

51.113. As discussed above for claim [1d], *Liu* discloses that “the transmission occasion association is indicated by a time offset such that UE should monitor the DL beams for the BFRR response from the base station 402, which is SQCL’ed with the BFRR from the user equipment 404, in a time slot with a time offset relative to the BFRR.” See Section X.A.1.e; *Liu*, [0096]; *Liu Provisional*, [0071]. Thus, the depicted time offset for the second BFRR represents a “third time window” that begins in response to the second BFRR. Bims, ¶113.

52.114. As also discussed above for claim [1d], *Liu* acknowledges that there may be a single BFRR response for both the first and second BFRR, or

alternatively, there may be a BFRR response for each of the first and second

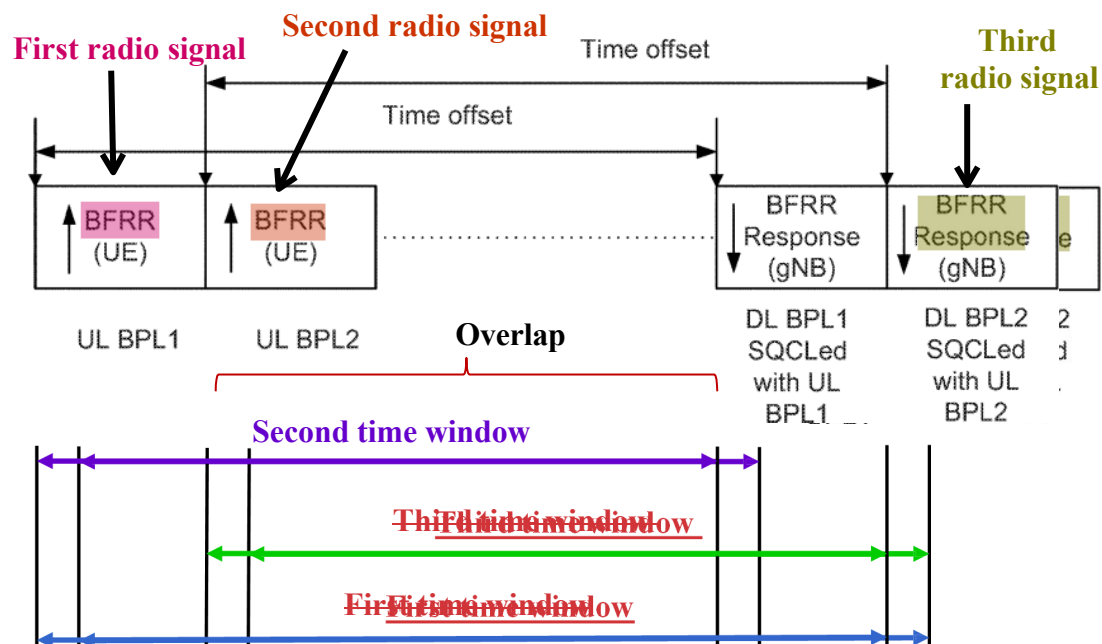
BFRRs. *Litt*, [0119], FIG. See

Section X.A.1.e; Liu, [0119], FIG. 5B; Liu Provisional, [0095], FIG. 5B.

Further, as discussed above for claims [1f], [1g], and [1i], the “first time window” and the “third time window” are time windows for monitoring for a BFRR response. See Sections X.A.1.g, X.A.1.h, and X.A.1.j. Thus, as illustrated in FIG. 5B, both the “first time window” and the “third time window” end when the BFRR response is received. ~~Bims, ¶114.~~

- k. [1j]: “the second time window and the third time window have overlapped time domain resource(s).”

53-115. As shown in annotated FIG. 5B below, *Liu* discloses that the second time window (the depicted time offset for the first BFRR) and the third time window (the depicted time offset for the second BFRR) have overlapped time domain resource(s). ~~Bims, ¶115.~~



Liu, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

~~54.116.~~ Therefore, *Liu* in combination with *Jover* renders obvious claim 1. ~~Bims,~~

~~¶116.~~

2. Claim 2

- a. [2a]: “The method according to claim 1, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or,”

~~55.117.~~ For the reasons discussed above, *Liu* in combination with *Jover*

renders obvious claim 1. *Liu* further discloses a multiple-input multiple-

output (MIMO) system with multiple antenna arrangements in the base

station and the user equipment. *Liu*, [0061], [0088], [0093], FIG. 4C; *Liu*

Provisional, [0039], [0063]-[0066]. As discussed above in 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.

~~[0066]; Bims, ¶117.~~

~~56.118.~~ As discussed for claim [1d], *Liu*’s base station transmits ~~one or more~~

BFRR ~~responses~~response (“third radio signal”) in response to the two BFRRs.

See Section X.A.1.e. *Liu* also discloses that each BFRR sent from the UE

may indicate a preferred DL beam pair in the BFRR to the base station. *Liu*, [0099]; *Liu Provisional*, [0074]. *Liu* further explains that the UE monitors and identifies a “candidate ~~beam~~” ~~that may be used by the base station. *Liu Provisional*, [0084] [0089]; *Liu Provisional*, [0007], [0063]~~

f

beam” that may be used by the base station. *Liu Provisional*, [0084]-[0089];
Liu Provisional, [0007], [0063]-[0065].

Liu further discloses that the base station’s downlink (DL) BFRR response
beam is quasi co-located with the UE’s uplink (UL) BFRR beam. ~~Bims, ¶¶118-~~

57.119. ~~119.~~ Specifically, *Liu* discloses that “in the event of a beam failure, the user equipment 404 sends a BFRR in the UL beam pair (UL BPL) to the base station 402,” and [i]n return, the base station 402 responds with a BFRR response in the DL beam pair (DL BPL) **that is SQCL’ed with the** UL beam pair used for BFRR transmission by the user equipment 404.” *Liu*, [0096]; *Liu Provisional*, [0071]. As a result, the “UE should monitor the DL beams for the BFRR response from the base station 402, **which is SQCL’ed with** the BFRR from the user equipment 404, in a time slot with a time offset relative to the BFRR.” *Liu*, [0096]; *Liu Provisional*, [0071].

Thus, in *Liu*, the multi-antenna related transmitting of the BFRR response from the base station is determined based on the UL BFRR from the UEs. ~~Bims,~~

58.120. ~~¶120.~~ And, because there are two BFRRs, determining the multi-antenna related transmitting of the BFRR response can be based on one of three scenarios:

(1) based on the first BFRR; (2) based on the second BFRR; or (3) based on both the first and second BFRRs. ~~Bims, ¶120.~~ See e.g., *Liu*, [0119] (“each BFRR is associated with a BFRR response,” or “all BFRRs are associated with one

BFRR response”); *Liu Provisional*, [0095]. In other words, in *Liu*, at least one signal of the following set of signals {first BFRR, second BFRR} is used for determining a multi-antenna related transmitting of the BFRR response. ~~Bims, ¶¶120-122; see also Ex. 1006, 1; Ex. 1021, 1, FIG. 4; Ex. 1016, 4-5.~~

121. Moreover, the concept of determining “multi-antenna related transmitting” of a beam failure recovery response was previously discussed in 3GPP working group meetings, and thus, was well known to a POSITA before the priority date of the ’113 patent. For example, *R1-1710596* discloses that UE beam failure recovery mechanism includes “[n]ew candidate beam identification,” and beam failure recovery request transmission includes “[e]xplicit/implicit information about identifying UE and whether or not new candidate beam exists.” *R1-1710596* also discloses that “[t]o receive gNB response for beam failure recovery request, a UE monitors NR PDCCH with the assumption that the corresponding PDCCH DM-RS is spatial QCL’ed with RS of the UE-identified candidate beam(s).” Ex. 1006, 1; see also Ex. 1021, 1. That is, the candidate beam information included in the beam failure recovery request (the “first radio signal” and/or the “second radio signal”) is used for determining a multi-antenna related transmitting of the gNB response for beam failure recovery request (the “third radio signal”).

122. R1-1710078 further provides the details as to how both the first radio signal and the second radio signal are used for determining a multi-antenna related transmitting of the third radio signal. For example, as shown in FIG. 4 below, R1-1710078 discloses that “a UE may monitor the NR-PDCCH on multiple beams. This may be accomplished by configuring beam-specific CORESETs as shown in Figure 4(a). The CORESETs may also be mapped on different OFDM symbols in case of analog beams. The CORESET configuration contains a QCL parameter associating the DMRS antenna ports with a beam management RS. Alternatively, multiple beams may be used for search space candidates associated with a single CORESET. In this case multiple QCL parameters are needed to associate different subsets of NR-PDCCH candidates with different beam management RS configurations. An illustration is shown in Figure 4(b).” Ex. 1016, 4-5.

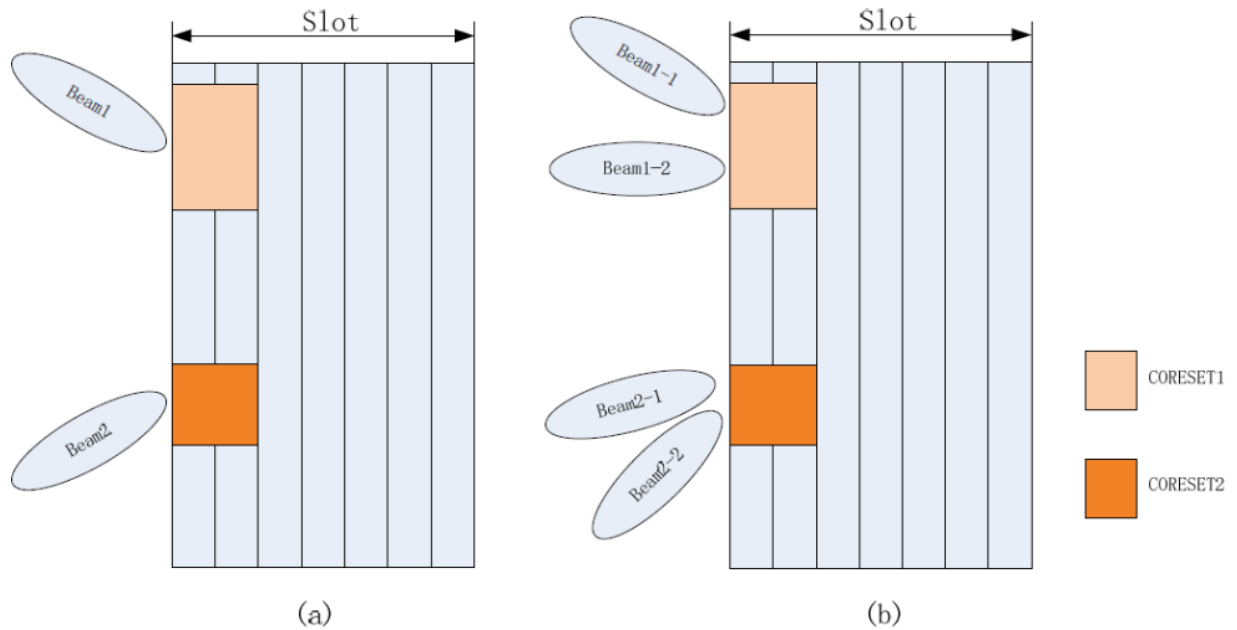


Figure4: Beam operation for UE-specific NR-PDCCH

Ex. 1021, FIG. 4

- b. [2b]: “the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.”

59-123. 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).~~

60-124. Nonetheless, *Liu* discloses this limitation in scenario (3) discussed above, where the multi-antenna related transmitting of the BFRR response is based on both the first and second BFRRs. ~~*Bims*, ¶¶123-124; see~~ *See also Liu*, [0119] (“all BFRRs are associated with one BFRR response.”); *Liu Provisional*, [0095].

3. Claim 3

- a. “The method according to claim 1, wherein the first channel is a first type of physical layer channel, ~~thesecond channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.~~”

second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.”

61.125. As discussed above, *Liu* in combination with *Jover* renders obvious claim 1.

As discussed for claim [1b] and claim [1c], *Liu*’s PUCCH (Physical Uplink Control Channel) constitutes the claimed “first channel,” and *Liu*’s PRACH (Physical Random Access Channel) constitutes the claimed “second channel.” The See Sections X.A.1.c and X.A.1.d. The term “Physical” in the names “Physical Uplink Control Channel” and “Physical Random Access Channel” denotes that it is a physical layer channel. Thus, the PUCCH and the PRACH are both physical layer channels, and the PUCCH is a different type of physical layer channel than the PRACH, as claimed. ~~Bims, ¶125.~~

62.126. To the extent Patent Owner argues that *Liu* does not expressly disclose that the first BFRR is sent through a PUCCH and the second BFRR is sent through a PRACH, it would have been obvious. ~~Bims, ¶126.~~ Indeed, *Liu* discloses sending multiple BFRRs and the ability to use both PUCCH and PRACH channels for a given BFRR. *Liu*, [0004], [0084], [0092], [0099]; *Liu Provisional*, [0003], [0062], *Provisional*, [0003], [0062], [0069], [0074]; Bims, ¶126.] Thus, it would have been a matter of simple design choice between two known alternatives

(using a PUCCH channel or a PRACH channel), which was well within the skill of a ~~POSITA. Bims, ¶126; see KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 416-417, 421 (2007); Uber Techs., Inc. v. X One, Inc., 957 F.3d 1334, 1338-41 (Fed. Cir. 2020).~~

POSITA.

A POSITA would have been motivated to use different channels for the first and second BFRRs to ensure greater reliability of the base station's response.

63.127. ~~Bims, ¶127.~~ For example, if the PUCCH is being used to send the first BFRR and await a subsequent response, the second BFRR can be sent through the PRACH. ~~Id.~~ Further, different channels may be used so that both BFRRs can be sent simultaneously. ~~Id.~~ Sending a request through multiple, different channels increases the chances that the base station will receive the request and respond accordingly. It also may decrease the response time from the base station because one channel may be processed faster than another at a given time.

64.128. A POSITA would have had a reasonable expectation of success as it would have been straightforward for a POSITA to modify *Liu*'s method so that the first BFRR is sent through a PUCCH and the second BFRR is sent through a PRACH. ~~Bims, ¶128.~~ As mentioned above, *Liu* already discloses sending multiple BFRRs and the ability to use both PUCCH and PRACH channels for a given BFRR. *Liu*, [0004], [0084], [0092], [0099]; *Liu Provisional*, [0003], [0062], ~~[0069], [0074];~~ ~~Bims, ¶128.~~ [0069], [0074]. Thus, it would have been straightforward for a POSITA to use one channel for the first BFRR and another channel for the second BFRR. ~~Id.~~

4. Claim 4

- a. “The method according to claim 1, wherein the first channel is a physical layer control channel.”**

65-129. As discussed above, *Liu* in combination with *Jover* renders obvious claim 1.

As discussed for claims [1b] and [3], *Liu*’s PUCCH (Physical Uplink Control Channel) constitutes the claimed “first channel.” ~~The PUCCH is a physical layer control channel, as claimed. Bims, ¶129. See~~
Sections

X.A.1.c and X.A.3. The term “Control” in the name “Physical Uplink Control Channel” denotes that it is a control channel. Further, as discussed above, PUUCH is also a physical layer channel. Thus, the PUCCH is a physical layer control channel, as claimed.

5. Claim 5

- a. [5a]: “The method according to claim 1, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located (‘QCL’); or,”**

66-130. As discussed above, *Liu* in combination with *Jover* renders obvious claim 1.

As discussed for claim 2, *Liu* further discloses that the base station’s BFRR response beam is quasi co-located with the UE’s BFRR beam. ~~For example, Liu~~

discloses that “the base station 402 responds with a BFRR response in the

~~DL~~See Section

X.A.2. For example, *Liu* discloses that “the base station 402 responds with a

BFRR response in the DL beam pair (DL BPL) **that is SQCL’ed with the**

UL beam pair used for BFRR transmission by the user equipment 404.” *Liu*, [0096]; *Liu Provisional*, [0071].

A POSITA would have understood that, because the base station’s BFRR response beam is quasi co-located with the UE’s BFRR beam, the antenna port(s) for the BFRR response ~~isare~~ SQCL’ed with the antenna port(s) for the BFRRs.

~~Bims,~~

~~67.131. ¶¶130-131 (citing Ex. 1022, 1 (defining~~ For example, R1-1700771 defines

“QCL” as follows: “[t]wo antenna ports are said to be quasi co-located if properties of the channel over which a symbol on one antenna port is conveyed can be inferred from the channel over which a symbol on the other antenna port is conveyed.” Ex. 1022, 1; see also, Liu, [0088] (“[t]wo antenna ports may be said to be SQCL’ed if large-scale properties of a radio channel over which a symbol on one antenna port is conveyed can be inferred from a radio channel over which a symbol on the other antenna port is conveyed.”).

~~68.132.~~ As discussed above for claim 2, in *Liu*, determining the multi-antenna related transmitting of the BFRR response can be based on one of three scenarios: (1) based on the first BFRR; (2) based on the second BFRR; or
(1) based on the first BFRR; (2) based on the second BFRR; or (3) based on

both the first and second BFRRs. ~~Bims, ¶132~~See Section X.A.2. In scenarios (1) and (3), the first BFRR (“first radio signal”) is used for determining the antenna port group used for transmitting the BFRR response (“third radio signal”), as claimed. ~~Id.~~ And thus, in scenarios (1) and (3), the ~~antenna port group for the first radio signal is quasi co-located with the antenna port group used for transmitting the third radio signal. Id.~~

antenna port group for the first radio signal is quasi co-located with the antenna port group used for transmitting the third radio signal.

- b. [5b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.”

69.133. Claim 5 includes an “or” between claim [5a] and [5b], so I

understand only one of the two limitations must be taught to satisfy claim

5, and thus, the above-discussed teachings of claim [5a] are sufficient to satisfy claim 5. ~~*Brown*, 265 F.3d at 1351.~~

6. Independent Claim 6

- a. [6pre]: “A method in a base station device for wireless communication, comprising:”

134. As discussed for claim [1pre], *Liu* discloses a wireless communication

system in which a UE communicates with a base station. See Section

X.A.1.a; *Liu*, [0056]-[0060]; *Liu Provisional*, [0034]-[0038]. In particular,

Liu discloses a “base station that may implement the methods and teachings

according to this disclosure.” *Liu*, [0111]; *Liu Provisional*, [0087]. And,

although this wireless communication method is primarily described from the perspective of the UE, *Liu* also discloses the corresponding method performed by the base station because the method involves the UE wirelessly interfacing with the base station. ~~Bims, ¶134.~~ For example, a radio signal that is transmitted from the UE is also received by the base station for wireless communication. ~~Id.~~ Likewise, a radio signal that is received by the UE is also transmitted by the base station for wireless communication. ~~Id.~~

b. [6a]: “transmitting a target radio signal;”

~~70.135.~~ As discussed for claim [1a], *Liu*’s UE receives a reference signal (“target radio signal”) from a base station. See Section X.A.1.b; *Liu*, [0069]-[0070], [0087], [0091], [0076]-[0077]; *Liu Provisional*, [0047]-[0048], [0054]-[0055]. Thus, *Liu* also discloses the base station “transmitting a target radio signal.” Bims, ¶135. ~~Id.~~

[0055]. Thus, *Liu* also discloses the base station “transmitting a target radio signal.”

c. [6b]: “receiving a first radio signal on a first channel;”

~~71.136.~~ As discussed for claim [1b], *Liu*’s UE transmits a first BFRR (“first radio signal”) to the base station via a PUCCH (“first channel”). ~~*Liu*, [0084], [0098]-[0104], [0105], [0114]; *Liu Provisional*, [0062], [0073]-[0076], [0078]-~~

[0079], See Section

X.A.1.c; Liu, [0084], [0098]-[0104], [0105], [0114]; Liu Provisional, [0062],

[0073]-[0076], [0078]-[0079], [0082], [0090]. *Liu* further discloses that, in

response to the BFRR, the base station transmits a BFRR response. *Liu*,

[0084], [0086], [0096], [0098], [0099], [0106], [0119], FIG. 5B; Liu

~~[0119], FIG. 5B; Liu~~ *Provisional*, [0062]-[0064], [0070]-[0074], [0079]-[0081], [0095], FIG. 5B.

A POSITA would have understood that, because the base station sends a response, it must have received the request. ~~Bims, ¶136.~~ Thus, *Liu* also discloses the base station “receiving a first radio signal on a first channel.”

~~*Id.*~~

d. [6c]: “receiving a second radio signal on a second channel; and”

~~72.137.~~ As discussed for claim [1c], *Liu* discloses, or in the alternative,

renders obvious that the UE transmits a second BFRR (“second radio signal”) to the base station via a PRACH (“second channel”). *See Section*

X.A.1.d; Liu, [0084], [0098]-[0104], [0105], [0114]; *Liu Provisional*,

[0062], [0073]~~[-[0076], [0078] [0079], [0082], [0090]-*Liu*]-~~

~~[0076], [0078]-[0079], [0082], [0090].~~ *Liu* further discloses that, in response

to the BFRR, the base station transmits a BFRR response. *Liu*, [0084],

[0086], [0096], [0098], [0099], [0106], [0119], FIG. 5B; *Liu Provisional*,

~~*Provisional*~~, [0062]-[0064], [0070]-[0074], [0079]-[0081], [0095], FIG. 5B. A POSITA

would have understood that, because the base station sends a response, it

must have received the request. Thus, *Liu* also discloses, or in the

alternative, renders obvious the base station “receiving a second radio signal

on a second channel.” ~~*Bims, ¶137.*~~

- e. **[6d]: “transmitting a third radio signal in a first time window;”**

73.138. As discussed for claim [1d], *Liu*’s UE monitors a BFRR response (“third radio signal”) from the base station in a time window from the starting point of the depicted time offset for the first BFRR in FIG. 5B and the end point of the depicted time offset for the second BFRR in FIG. 5B (“first time window”). See Section X.A.1.e; *Liu*, [0096], [0099], FIG. 5B; *Liu Provisional*, [0071], [0074], FIG. 5B. *Liu* further discloses that the base station transmits a BFRR response in the first time window. *Liu*, [0084], [0086], [0096], [0098], [0099], [0106], [0119], FIG. 5B; *Liu Provisional*, [0062]-[0064], [0070]-[0074], [0079]-[0081], [0095], FIG. 5B. Thus, *Liu* ~~also~~ also discloses the base station “transmitting a third radio signal in a first time window.” ~~*Bims*, ¶138.~~

- f. **[6e]: “wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal;”**

74.139. As discussed for claim [1e], *Liu* in combination with *Jover* renders this limitation obvious. ~~*Bims*, ¶139~~ See Section X.A.1.f.

- g. [6f]: “a time resource occupied by the first radio signal is used for determining the start time of the first time window;”

75.140. As discussed for claim [1f], *Liu* discloses this limitation. ~~Bims,~~

~~¶140~~ See Section X.A.1.g.

- h. [6g]: “a time domain resource occupied by the first radio signal is used for determining a second time window,”

76.141. As discussed for claim [1g], *Liu* discloses this limitation. ~~Bims,~~

~~¶141~~ See Section X.A.1.h.

- i. [6h]: “a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window;”

77.142. As discussed for claim [1h], *Liu* discloses this limitation. ~~Bims,~~

~~¶142~~ See Section X.A.1.i.

- j. [6i]: “a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and”

78.143. As discussed for claim [1i], *Liu* discloses this limitation. ~~Bims,~~

~~¶143~~ See Section X.A.1.j.

- k. [6j]: “the second time window and the third time window have overlapped time domain resource(s).”

144. As discussed for claim [1j], *Liu* discloses this limitation. ~~Bims, ¶144.~~

See Section X.A.1.k.

79.145. Therefore, *Liu* in combination with *Jover* renders obvious claim 6. ~~Bims,~~

7. Claim 7

~~¶145.~~

~~1. Claim 7~~

- a. [7a]: “The method according to claim 6, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or,”

~~80.146.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 6. As discussed for claim [2a], *Liu* discloses this additional limitation of claim [7a]. ~~Bims, ¶146~~ See Section X.A.2.a.

- b. [7b]: “the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.”

~~81.147.~~ As discussed for claim [2b], *Liu* discloses this additional limitation of claim [7b]. ~~Bims, ¶147~~ See Section X.A.2.b.

8. Claim 8

- a. “The method according to claim 6, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.”

~~82.148.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 6. As discussed for claim 3, *Liu* discloses, or in the alternative, renders obvious this additional limitation of claim 8. ~~Bims,~~

7. Claim 7
¶148 See Section X.A.3.

9. Claim 9

- a. “The method according to claim 6, wherein the first channel is a physical layer control channel.”**

83-149. For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 6. As discussed for claim 4, *Liu* discloses this additional limitation of claim 9. ~~Bims, ¶149~~ See Section X.A.4.

10. Claim 10

- a. [10a]: “The method according to claim 6, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located (‘QCL’); or,”**

84-150. For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 6. As discussed for claim [5a], *Liu* discloses this additional limitation of claim [10a]. ~~Bims, ¶150~~ See Section X.A.5.a.

- b. [10b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for ~~transmitting the third radio signal in the third time~~”**

~~interval.”~~

transmitting the third radio signal in the third time interval.”

~~85.151.~~ Claim 10 includes an “or” between claim [10a] and [10b], so ~~nothing beyond~~ I understand only one of the two limitations must be taught to satisfy claim 10, and thus, the above-discussed teachings ~~is required~~ of claim [10a] are sufficient to satisfy claim 10. ~~Brown, 265 F.3d at 1351.~~

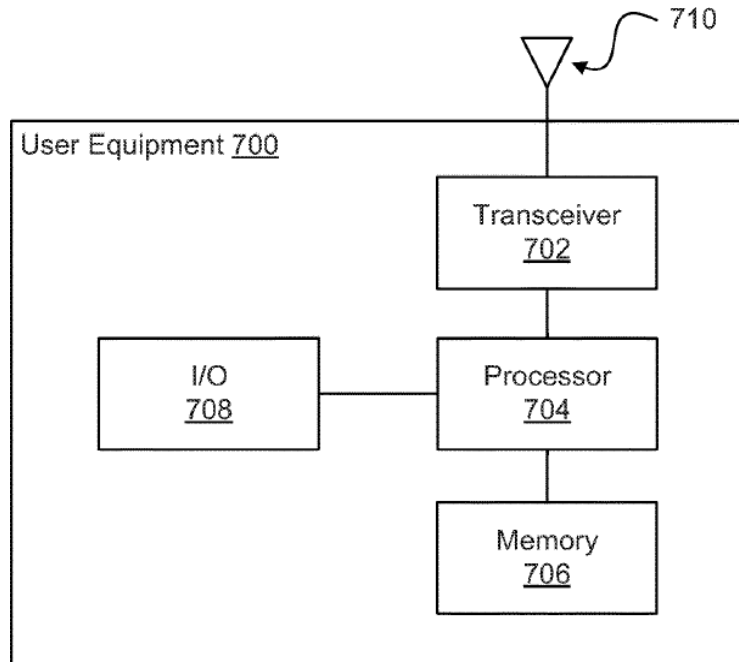
11. Independent Claim 11

a. [11pre]: “A UE for wireless communication, comprising:”

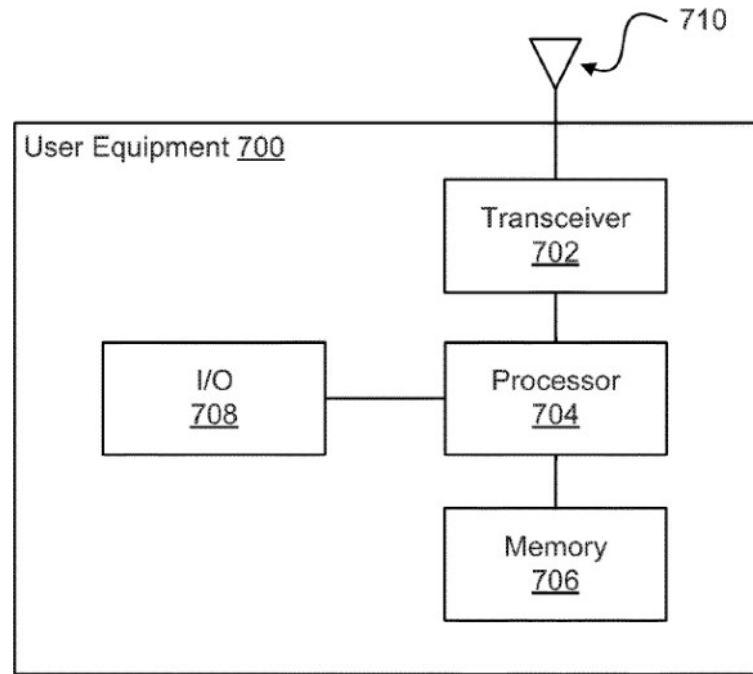
152. As discussed for claim [1pre], *Liu* discloses a wireless communication system in which a UE communicates with a base station. See Section X.A.1. a; *Liu*, [0056]-[0060]; *Liu Provisional*, [0034]-[0038]. *Liu* also discloses “a method for beam failure recovery in user equipment.” *Liu*, [0005]; *Liu Provisional*, [0004]; ~~Bims, ¶152.~~

86.153. *Liu* further discloses the structure of the UE and how it is used for

wireless communication. ~~Bims, ¶153.~~ As shown in FIG. 7A below, the UE 700 includes at least one processor 704, at least one transceiver 702, one or more input/output devices 708, at least one antenna 710, and at least one memory 706. *See Liu*, [0107]-[0110]; *Liu Provisional*, [0083]-[0086], FIG.



7A.



Liu, FIG. 7A; *Liu Provisional*, FIG. 7A.

Liu discloses that “one or multiple transceivers 702 could be used in the UE 700,” and that “a transceiver 702 may also be implemented using at least one transmitter and at least one separate receiver.” *Liu*, [0108]; *Liu Provisional*, [0084].

Thus, *Liu*’s UE has one or more transmitters and one or more receivers. ~~Bims~~, 87.154. ~~¶154.~~ *Liu* further discloses that “[e]ach transceiver 702 may include any suitable structure for generating signals for wireless transmission and/or processing signals received wirelessly.” *Liu*, [0108]; *Liu Provisional*, [0084].

88.155. In addition, each transceiver 702 (or separate transmitter/receiver) is “configured to demodulate data or other content received by the at least one antenna 710,” and “[e]ach antenna 710 includes any suitable structure for

transmitting and/or receiving wireless signals.” *Liu*, [0108]; *Liu Provisional*, [0084]. Thus, a POSITA would have understood that each antenna in *Liu*’s UE may be associated with a transmitter and a receiver. ~~Bims, ¶155.~~

~~89.156.~~ 156. Moreover, as discussed for claim [2a], *Liu* discloses a MIMO system, including multiple antenna arrangements in the user equipment. ~~*Liu*, [0061], [0088], [0093], FIG. 4C; *Liu Provisional*, [0039], [0063], [0066]. Thus, a POSITA~~
X.A.2. a; *Liu*, [0061], [0088], [0093], FIG. 4C; *Liu Provisional*, [0039], [0063]-[0066]. Thus, a POSITA would have understood that, with a multiple antenna arrangement, *Liu*’s UE would have multiple transmitters and multiple receivers for transmitting and receiving wireless signals. ~~Bims, ¶156. Furthermore, a POSITA would have understood that,~~
Furthermore, a POSITA would have understood that, in MIMO systems, each antenna arrangement (and therefore each transmitter and receiver associated with that antenna) is capable of transmitting and receiving any given wireless signal that goes into or out of the UE. ~~*Id.*~~

~~90.157.~~ 157. As shown in FIG. 8 below, *Liu* also discloses a network device 800 that may be used to facilitate communications between the UE and the base station. *Liu*, [0113]; *Liu Provisional*, [0089]; ~~Bims, ¶157.~~ A POSITA would have understood that this network device 800 can be part of the UE. ~~Bims,~~

¶157. The network device 800 includes a memory 820 that includes a

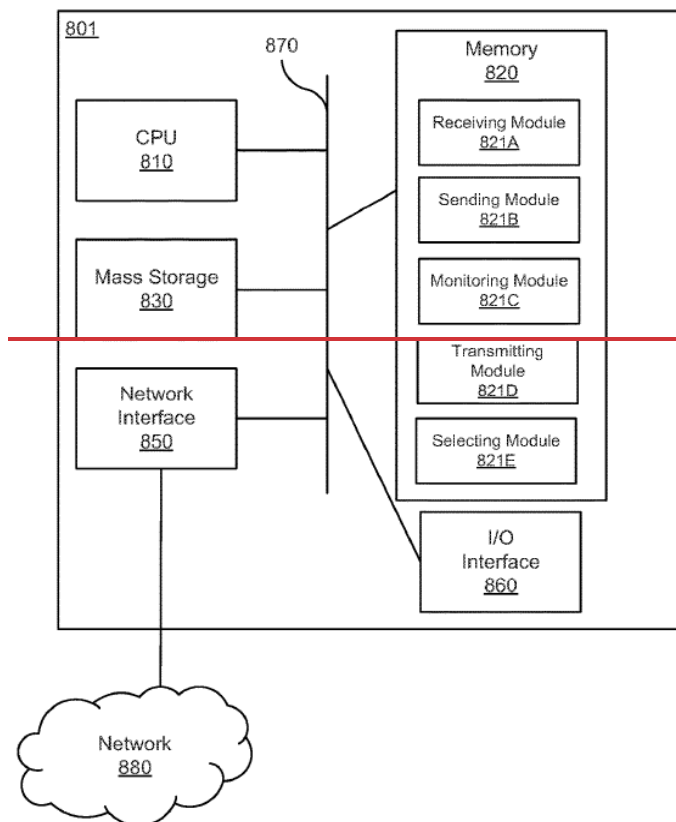
“receiving module 821A receiving spatial quasi co-located information

between a downlink beam pair and an uplink beam pair from a base station

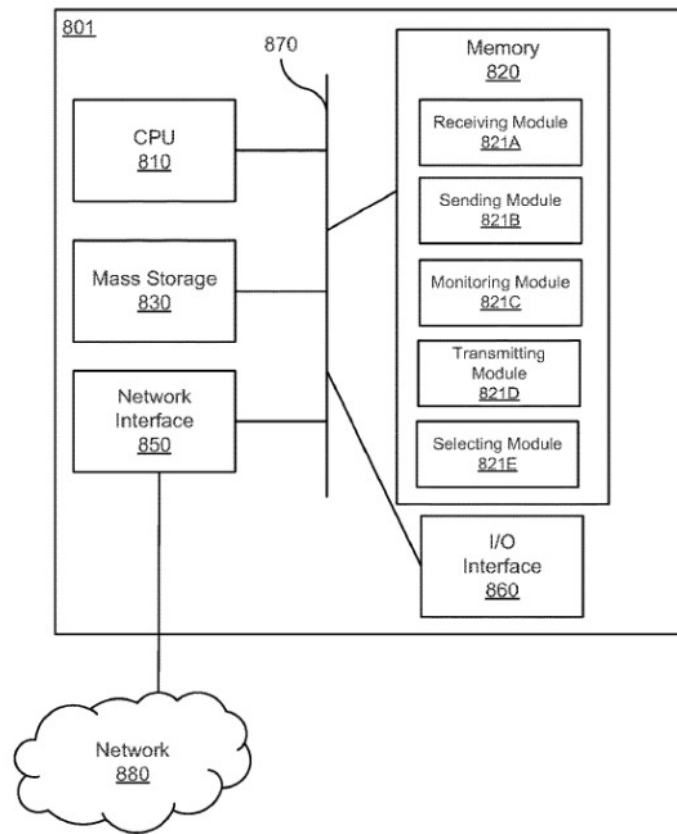
and receiving an association indication

between the downlink beam pair for a beam failure recovery request (BFRR) response and the uplink beam pair for the BFRR,” “a transmitting module 821D transmitting multiple BFRRs in two or more uplink beam pairs simultaneously and transmitting multiple BFRRs in the uplink beam pairs in time division duplex (TDD),” “a sending module 821B sending a BFRR to the base station upon detection of a beam failure between the base station and the user equipment,” and “a monitoring module 821C monitoring one or more available candidate beams in which to receive the BFRR response from the base station, where the BFRR response is associated with the BFRR.” *Liu*, [0114]; *Liu Provisional*, [0090], FIG. 8.

800



800



Liu, FIG. 8; *Liu Provisional*, FIG. 8.

b. [11a]: “a first receiver module, to receive a target radio signal;”

[94.158.](#) As discussed for claim [1a], *Liu*’s UE receives a target radio signal.

[See Section X.A.1.b.](#) *Liu* discloses the claimed “first receiver module” in at least two ways. ~~Bims, ¶158.~~

[92.159.](#) First, as discussed for claim [11pre], *Liu*’s UE can have multiple receivers for receiving wireless signals. [See Section X.A.11.a.](#) Thus, a POSITA would ~~understand that a first one of~~

understand that a first one of the receivers in *Liu*’s UE constitutes “a first receiver module, to receive a target radio signal.” ~~Bims, ¶159.~~

93.160. Second, as also discussed for claim [11pre], *Liu*’s UE can also include a receiving module 821A for receiving beam information from the base station. See Section X.A.11.a. Thus, a POSITA would understand that *Liu*’s receiving module 821A constitutes “a first receiver module, to receive a target radio signal.” ~~Bims, ¶160.~~

c. [11b]: “a second transmitter module, to transmit a first radio signal on a first channel;”

94.161. As discussed for claim [1b], *Liu*’s UE transmits a first radio signal on a first channel. See Section X.A.1.c. *Liu* discloses the claimed “second transmitter module” in at least two ways. ~~Bims, ¶161.~~

95.162. First, as discussed for claim [11pre], *Liu*’s UE can have multiple transmitters for transmitting wireless signals. See Section X.A.11.a. Thus, a POSITA would understand that a first one of the transmitters in *Liu*’s UE constitutes “a second transmitter module, to transmit a first radio signal on a first channel.” ~~Bims, ¶162.~~

96.163. Second, as also discussed for claim [11pre], *Liu*’s UE can also include a sending module 821B for sending a BFRR to the base station. ~~Thus, a POSITA would understand that *Liu*’s sending module 821B constitutes “a second transmitter module, to transmit a first radio signal on a first channel.” Bims, ¶163.~~

X.A.11.a. Thus, a POSITA would understand that *Liu*’s sending module

821B constitutes “a second transmitter module, to transmit a first radio signal on a first channel.”

d. [11c]: “a third transmitter module, to transmit a second radio signal on a second channel; and”

97.164. As discussed for claim [1c], *Liu* discloses, or in the alternative, renders obvious that the UE transmits a second radio signal on a second channel. See Section X.A.1.d. *Liu* discloses, or in the alternative, renders obvious the claimed “third transmitter module” in at least two ways. ~~Bims, ¶164.~~

165. First, as discussed for claim [11pre], *Liu*’s UE can have multiple transmitters for transmitting wireless signals, and in MIMO systems, multiple antenna arrangements (and therefore multiple transmitters associated with those arrangements) transmit wireless signals that go out of the UE. ~~Bims, ¶165.~~ See Section X.A.11.a. Thus, a POSITA would understand that a second one of the transmitters in *Liu*’s UE discloses, or in the alternative, renders obvious “a third transmitter module, to transmit a second radio signal on a second channel.” ~~Id.~~

166. Second, as also discussed for claim [11pre], *Liu*’s UE can also include a transmitting module 821D for transmitting multiple BFRRs. See Section X.A.11.a. Thus, a POSITA would understand that *Liu*’s transmitting module 821D discloses, or in the alternative, renders obvious “a third

~~transmitter module, to transmit a second radio signal on a second channel.”~~

~~Bims, ¶166.~~

module, to transmit a second radio signal on a second channel.”

e. [11d]: “a fourth receiver module, to monitor a third radio signal in a first time window;”

~~98.167.~~ As discussed for claim [1d], *Liu*’s UE monitors a third radio signal in a first time window. See Section X.A.1.e. *Liu* discloses the claimed “fourth receiver module” in at least two ways. ~~Bims, ¶167.~~

~~99.168.~~ First, as discussed for claim [11pre], *Liu*’s UE can have multiple receivers for receiving wireless signals, and in MIMO systems, multiple antenna arrangements (and therefore multiple receivers) receive wireless signals that go into the UE. ~~Bims, ¶168.~~ See Section X.A.11.a. Thus, a POSITA would understand that a second one of the receivers in *Liu*’s UE constitutes “a fourth receiver module, to monitor a third radio signal in a first time window.” ~~Id.~~

~~100.169.~~ Second, as also discussed for claim [11pre], *Liu*’s UE can also include a monitoring module 821C for monitoring the BFRR response from the base station. See Section X.A.11.a. Thus, a POSITA would understand that *Liu*’s monitoring module 821C constitutes “a fourth receiver module, to monitor a third radio signal in a first time window.” ~~Bims, ¶169.~~

f. [11e]: “wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal;”

~~101.170.~~ As discussed for claim [1e], *Liu* in combination with *Jover*

renders this limitation obvious. ~~Bims, ¶170~~ See Section X.A.1.f.

- g. [11f]: “a time resource occupied by the first radio signal is used for determining the start time of the first time window;”

[102.171.](#) As discussed for claim [1f], *Liu* discloses this limitation. ~~Bims,~~

~~¶171~~ [See Section X.A.1.g.](#)

- h. [11g]: “a time domain resource occupied by the first radio signal is used for determining a second time window,”

[103.172.](#) As discussed for claim [1g], *Liu* discloses this limitation. ~~Bims,~~

~~¶172~~ [See Section X.A.1.h.](#)

- i. [11h]: “a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window;”

[104.173.](#) As discussed for claim [1h], *Liu* discloses this limitation. ~~Bims,~~

~~¶173~~ [See Section X.A.1.i.](#)

- j. [11i]: “a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and”

[105.174.](#) As discussed for claim [1i], *Liu* discloses this limitation. ~~Bims,~~

~~¶174~~ [See Section X.A.1.j.](#)

- k. [11j]: “the second time window and the third time window have overlapped time domain resource(s).”

[106.175.](#) As discussed for claim [1j], *Liu* discloses this limitation. ~~Bims,~~

~~¶175~~ [See Section X.A.1.k.](#)

~~107.176.~~ Therefore, *Liu* in combination with *Jover* renders obvious claim 11. ~~Bims, ¶176.~~

12. Claim 12

- a. [12a]: “The UE according to claim 11, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or,”

~~108.177.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 11. As discussed for claim [2a], *Liu* discloses this additional limitation of claim [12a]. ~~Bims, ¶177.~~ See Section X.A.2.a.

- b. [12b]: “the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.”

~~109.178.~~ As discussed for claim [2b], *Liu* discloses this additional limitation of claim [12b]. ~~Bims, ¶178.~~ See Section X.A.2.b.

13. Claim 13

- a. “The UE according to claim 11, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.”

~~110.179.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 11. As discussed for claim 3, *Liu* discloses, or in the alternative, renders obvious this additional limitation of claim 13.

~~Bims, ¶179.~~ See

Section X.A.3.

14. Claim 14

- a. “The UE according to claim 11, wherein the first channel is a physical layer control channel.”**

~~111.180.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 11. As discussed for claim 4, *Liu* discloses this additional limitation of claim 14. ~~Bims, ¶180~~ See Section X.A.4.

15. Claim 15

- a. [15a]: “The UE according to claim 11, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located (‘QCL’); or,”**

~~112.181.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 11. As discussed for claim [5a], *Liu* discloses this additional limitation of claim [15a]. ~~Bims, ¶181~~ See Section X.A.5.a.

- b. ~~15b~~[15b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for**

transmitting the third radio signal in the third time interval.”

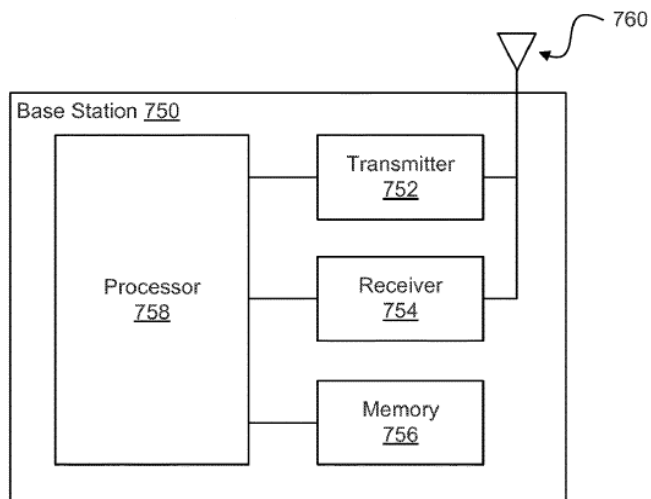
~~113.~~182. Claim 15 includes an “or” between claim [15a] and [15b], so ~~nothing beyond~~I understand only one of the two limitations must be taught to satisfy claim 15, and thus, the above-discussed teachings ~~is required of claim [15a]~~are sufficient to satisfy claim 15. ~~Brown, 265 F.3d at 1351.~~

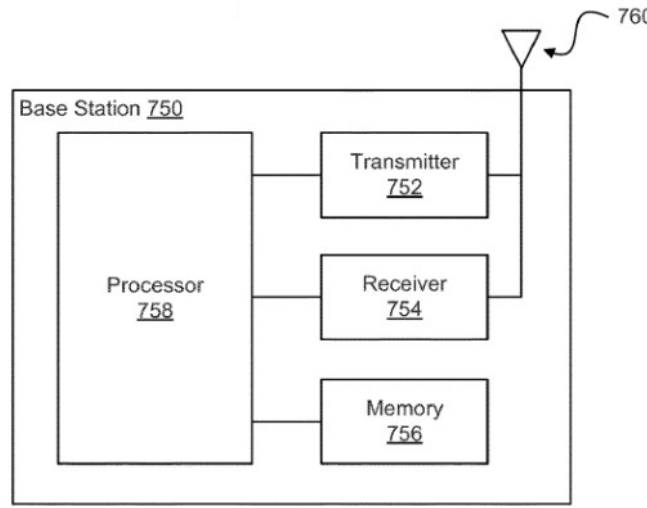
16. Independent Claim 16

a. [16pre]: “A base station device for wireless communication, comprising:”

183. As discussed for claim [6pre], *Liu* discloses a wireless communication system in which a UE communicates with a base station. See Section X.A.6.a; *Liu*, [0056]-[0060]; *Liu Provisional*, [0034]-[0038]. *Liu* also discloses a “base station that may implement the methods and teachings according to this disclosure.” *Liu*, [0111]; *Liu Provisional*, [0087]; ~~Bims,~~
~~¶183.].~~

~~114.~~184. *Liu* further discloses the structure of the base station and how it is used for wireless communication. As shown in FIG. 7B below, the base station 750 includes at least one processor 758, at least one transmitter 752, at least one receiver 754, one or more antennas 760, and at least one memory 756. *See Liu*, [0111]-[0112]; *Liu Provisional*, [0087]-[0088], FIG. 7B.





Liu, FIG. 7B; *Liu Provisional*, FIG. 7B.

~~115.185.~~ *Liu* discloses that “[e]ach transmitter 752 includes any suitable structure for generating signals for wireless transmission to one or more UEs or other devices,” while “[e]ach receiver 754 includes any suitable structure for processing signals received wirelessly from one or more UEs or other devices.” *Liu*, [0112]; *Liu Provisional*, [0088]. *Liu* further discloses that “[e]ach antenna 760 includes any suitable structure for transmitting and/or receiving wireless signals,” and that “one or more antennas 760 could be coupled to the transmitter(s) 752, and one or more separate antennas 760 could be coupled to the receiver(s) 754.” *Liu*, [0112]; *Liu Provisional*, [0088]. Thus, a POSITA would have understood that each antenna in *Liu*’s base station may be associated with a transmitter and a receiver. ~~Bims, ¶185.~~

~~116.186.~~ Moreover, as discussed for claim [2a], *Liu* discloses a MIMO system,

including multiple antenna arrangements in the base station. *Liu*, [0061],

[0088], [0093], FIG. 4C; *Liu Provisional*, [0039], [0063]-[0066]. Thus, a POSITA would have understood that, with a multiple antenna arrangement, *Liu*’s base station would have multiple transmitters and multiple receivers for transmitting and receiving wireless signals. ~~Bims, ¶186.~~ Furthermore, a POSITA would have understood that, in MIMO systems, each antenna arrangement (and therefore each transmitter and receiver associated with that antenna) is capable of transmitting and receiving any given wireless signal that goes into or out of the base station. ~~Id.~~

b. [16a]: “a first transmitter module, to transmit a target radio signal;”

~~117.~~187. As discussed for claim [6a], *Liu*’s base station transmits a target radio signal.

See Section X.A.6.b. Further, as discussed for claim [16pre], *Liu*’s base station can have multiple transmitters for transmitting wireless signals. See Section X.A.16.a. Thus, a POSITA would understand that a first one of the transmitters in *Liu*’s base station constitutes “a first transmitter module, to transmit a target radio signal.” ~~Bims, ¶187.~~

c. [16b]: “a second receiver module, to receive a first radio signal on a first channel;”

188. As discussed for claim [6b], *Liu*’s base station receives a first radio signal on a first channel. See Section X.A.6.c. Further, as discussed for claim [16pre], *Liu*’s base station can have multiple receivers for receiving wireless signals.

See Section X.A.16.a. Thus, a POSITA would understand that a first one of the receivers in *Liu*’s base station constitutes “a second receiver module, to receive a first radio signal on a first channel.” ~~Bims,~~

~~¶188.~~

d. [16c]: “a third receiver module, to receive a second radio signal on a second channel; and”

189. As discussed for claim [6c], *Liu* discloses, or in the alternative, renders obvious the base station receives a second radio signal on a second channel.

See Section X.A.6.d. Further, as discussed for claim [16pre], *Liu*’s base station can have multiple receivers for receiving wireless signals, and in MIMO systems, multiple antenna arrangements (and therefore multiple receivers) receive wireless signals that go into the base station. ~~Bims, ¶189~~ See Section

X.A.16.a. Thus, a POSITA would understand that a second one of the receivers in *Liu*’s base station discloses, or in the alternative, renders obvious “a third receiver module, to receive a second radio signal on a second channel.” ~~Id.~~

e. [16d]: “a fourth transmitter module, to transmit a third radio signal in a first time window;”

118-190. As discussed for claim [6d], *Liu*’s base station transmits a third radio signal in a first time window. See Section X.A.6.e. Further, as discussed for

claim [16pre], *Liu*’s base station can have multiple transmitters for

transmitting wireless signals, and in MIMO systems, multiple antenna

arrangements (and

therefore multiple transmitters) transmit wireless signals that go out of the base station. ~~Bims, ¶190~~ See Section X.A.16.a. Thus, a POSITA would understand that a second one of the transmitters in *Liu*’s UE constitutes “a fourth transmitter module, to transmit a third radio signal in a first time window.” ~~Id.~~

- f. [16e]: “wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal;”

119.191. As discussed for claim [6e], *Liu* in combination with *Jover* renders this limitation obvious. ~~Bims, ¶191~~ See Section X.A.6.f.

- g. [16f]: “a time resource occupied by the first radio signal is used for determining the start time of the first time window;”

120.192. As discussed for claim [6f], *Liu* discloses this limitation. ~~Bims, ¶192~~ See Section X.A.6.g.

- h. [16g]: “a time domain resource occupied by the first radio signal is used for determining a second time window,”

121.193. As discussed for claim [6g], *Liu* discloses this limitation. ~~Bims, ¶193~~ See Section X.A.6.h.

- i. [16h]: “a time domain resource occupied by the second radio signal is within the second time window, ~~and the second time window is within the first time window;~~”

and the second time window is within the first time window;”

~~122.~~194. As discussed for claim [6h], *Liu* discloses this limitation. ~~Bims,~~

~~¶194.~~See Section X.A.6.i.

- j. [16i]: “a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and”

~~123.~~195. As discussed for claim [6i], *Liu* discloses this limitation. ~~Bims,~~

~~¶195.~~See Section X.A.6.j.

- k. [16j]: “the second time window and the third time window have overlapped time domain resource(s).”

196. As discussed for claim [6j], *Liu* discloses this limitation. ~~Bims, ¶196.~~

See Section X.A.6.k.

~~124.~~197. Therefore, *Liu* in combination with *Jover* renders obvious claim 16. ~~Bims, ¶197.~~

17. Claim 17

- a. [17a]: “The base station device according to claim 16, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or,”

[125.198.](#) For the reasons discussed above, *Liu* in combination with *Jover*

renders obvious claim 16. As discussed for claim [2a], *Liu* discloses this

additional limitation of claim [17a]. ~~Bims, ¶198.~~ See Section X.A.2.a.

- b. [17b]: “the first radio signal and the second radio signal together are used for determining the multi-
~~antenna-related transmitting of the third radio~~
~~signal.”~~

antenna related transmitting of the third radio signal.”

~~126.199.~~ As discussed for claim [2b], *Liu* discloses this additional limitation of claim [17b]. ~~Bims, ¶199~~ See Section X.A.2.b.

18. Claim 18

- a. **“The base station device according to claim 16, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.”**

~~127.200.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 16. As discussed for claim 3, *Liu* discloses, or in the alternative, renders obvious this additional limitation of claim 18.

~~Bims, ¶200~~ See Section X.A.3.

19. Claim 19

- a. **“The base station device according to claim 16, wherein the first channel is a physical layer control channel.”**

~~128.201.~~ For the reasons discussed above, *Liu* in combination with *Jover* renders obvious claim 16. As discussed for claim 4, *Liu* discloses this additional limitation of claim 19. ~~Bims, ¶201~~ See Section X.A.4.

20. Claim 20

- a. **[20a]: “The base station device according to claim 16, wherein the first radio signal is used for determining**

a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being QCL; or,”

~~129.202.~~ For the reasons discussed above, *Liu* in combination with *Jover*

renders obvious claim 16. As discussed for claim 5[a], *Liu* discloses this

additional limitation of claim 20[a]. ~~Bims, ¶202~~ See Section X.A.5.a.

- b. [20b]: “the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.”

Claim 20 includes an “or” between claim [20a] and [20b], so ~~nothing~~
~~beyond~~ I understand only one of the two limitations must be taught to satisfy claim
20, and thus, the above-discussed teachings ~~is required to satisfy claim 20. Brown,~~
~~265 F.3d at 1351.~~

~~V. 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
only last month. Ex. 1020. Fact discovery opened only this month, and will not~~

~~close until February 2024, with expert discovery closing March 2024. Ex. 1019, 3. The parties will not begin of 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 6-10 and 16-20, which are not involved in the litigation. Moreover, Petitioner has not served invalidity contentions, so no overlap currently exists. Petitioner reserves the right[20a] are sufficient 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. 1017. 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. 1019, 1; Ex. 1018, 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 (instituting IPR without stipulation and co-pending 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 § 325(d)**~~

~~No other proceedings involving the ’113 patent are currently pending or have been brought before the Patent Office. Additionally, neither of the asserted prior art references (*Liu* or *Jover*) were before the Examiner during prosecution. 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).~~

~~**VI. — 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**~~

~~This petition is related to IPR2023-00601.~~

~~Apex asserted the ’113 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 ’113 patent is 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.~~

~~VII. GROUNDS FOR STANDING~~

~~130-203. Petitioner certifies that the '113 patent is available for IPR and that Petitioner is not
barred or estopped from requesting IPR challenging the patent claims on the grounds identified
hereinsatisfy claim 20.~~

~~III.~~XI. CONCLUSION

~~For the reasons set forth above, Petitioner has established a reasonable
likelihood that the challenged claims are unpatentable. Petitioner requests~~

~~institution of *inter partes* review 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~~

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
~~12,960~~.

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, and Exhibits 1001-1007, 1009-1022 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. 10,568,113:

Jialin Zhong
Zhong Law, LLC
51 JFK Parkway
1st Floor West
Short Hills, NJ 07078

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/>):

Jialin Zhong
Zhong Law, LLC
100 Connell Drive
Suite 2300
Berkeley Heights, NJ 07922

204. 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.

205. 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.

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

Date: February 28, 2023

By: 
~~William Esper~~
~~Case Manager and PTAB Coordinator~~
~~FINNEGAN, HENDERSON, FARABOW,~~

~~GARRETT & DUNNER, LLP~~

Harry V. Bims