

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T SERVICES INC., T-MOBILE USA, INC., CELLCO PARTNERSHIP
D/B/A VERIZON WIRELESS, ERICSSON INC., AND NOKIA OF AMERICA
CORPORATION,
Petitioners

v.

ASUS TECHNOLOGY LICENSING INC. AND CELERITY IP, LLC.
Patent Owner.

Case IPR2024-01142
U.S. Patent No. 10,887,868

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,887,868**

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LIST OF EXHIBITS

Ex. Number	Title
1001	U.S. Patent No. 10,887,868 to Guo et al. (“the ’868 patent”)
1002	File History of U.S. Patent No. 10,887,868
1003	Declaration of Alexander Haimovich, Ph.D.
1004	<i>Curriculum Vitae</i> of Alexander Haimovich, Ph.D.
1005	U.S. Patent No. 11,539,419 (“Jung”)
1006	U.S. Provisional Application No. 62/350,453 (“Jung Provisional”)
1007	U.S. Patent No. 11,096,195 to Xiong et al. (“Xiong”)
1008	U.S. Provisional Application No. 62/294,095 (“Xiong Provisional”)
1009	June 21, 2022 Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings With Parallel District Court Litigation
1010	Docket Control Order
1011	Consolidation Order
1012	U.S. Patent Pub. No. 2019/0058518A1 (“Koskela”)
1013	EP2017/182556 - April 10, 2019 Annex to Communication from the Examining Division
1014	EP2017/182556 - June 24, 2020 Annex to Communication from the Examining Division
1015	U.S. Patent Pub. No. 2013/0286960A1 (“Li”)
1016	U.S. Patent Pub. No. 2018/0160421A1 (“Suzuki”)
1017	U.S. Patent Pub. No. 2019/0104549A1 (“Deng”)
1018	ASUS Technology Licensing Inc. and Celerity IP, LLC’s First Amended Complaint

Petitioners AT&T Services Inc., T-Mobile USA, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson Inc., and Nokia of America Corporation (collectively, “Petitioners”) request *Inter Partes* Review (“IPR”) of claims 5, 6, 8, 13, 14, 16 and 18 (“the Challenged Claims”) of the ’868 patent, asserted to be owned by ASUS Technology Licensing Inc. and Celerity IP, LLC (collectively, “Patent Owner”). Petitioners respectfully request that the Challenged Claims be found unpatentable.

I. INTRODUCTION

The claims of the ’868 patent combine two cellular concepts: beam correspondence between a base station and a mobile device (i.e., using the same downlink transmission beam from the base station and receive beam from the UE as the uplink transmission beam from the UE and receive beam for the base station) and using higher layer signaling (i.e., MAC and RRC signaling) in the beam management process. Both concepts were known before the ’868 patent. Indeed, the European Patent Office has repeatedly rejected Patent Owner’s attempts to gain patent protection for these ideas:

2.2.1	The distinguishing technical features of claims 2, 6, 7, 9, 12 and 13 relating to transmitting first and second signal through higher layer signaling, namely MAC and RRC, are considered as normal design measures and form part of the common general knowledge of the skilled person.
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Ex-1013 (EP2017/182556 - April 10, 2019 Annex to Communication from the Examining Division) at 3.

On the other hand, using the indicated beam for performing transmission of CSI or any other information is simply the application of the method of D1 for UL transmission which a skilled person would consider, based upon the circumstances, without involving any inventive skill.

Ex-1014 (EP2017/182556 - June 24, 2020 Annex to Communication from the Examining Division) at 2. Ultimately, during prosecution of the '868 patent, applicant conceded that the prior art of record disclosed the second concept (MAC signaling): “Koskela seems to provide for candidate beams being signaled by a MAC CE for the UE to monitor, the UE being be [sic] configured based upon a measurement performed by measuring beam specific reference signals on the candidate beams, and filtering fast changes in beam quality.” Ex-1002 at 243.

The first concept, beam correspondence, is not novel either. Not only is it disclosed in the art, but it is routine and conventional — the entire point of determining the appropriate transmission and reception beams is to use those beams to transmit and receive data. The Challenged Claims disclose nothing more than transmitting routine types of data using the derived corresponding beams.

This Petition focuses on two references that were not before the Patent Office during prosecution: Jung and Xiong. As reflected in these references, the concepts claimed by the '868 patent were well known in the art at the time of the '868 patent's

priority date. The patent should not have issued. Therefore, Petitioners request *inter partes* review of the '868 patent based on the grounds below, and cancelation of the Challenged Claims as unpatentable.

II. MANDATORY NOTICES

A. Real Party-in-Interest Under 37 C.F.R. § 42.8(b)(1)

The real parties in interest are AT&T Enterprises, LLC,¹ AT&T Mobility LLC, AT&T Mobility II LLC, AT&T Services Inc., Cellco Partnership d/b/a Verizon Wireless, Verizon Corporate Resources Group LLC, T-Mobile USA, Inc., Ericsson Inc., Telefonaktiebolaget LM Ericsson, and Nokia of America Corporation.²

¹ AT&T Corp. is a named defendant in the below identified related cases. AT&T Corp. has undergone a corporate transaction and is now merged and converted into AT&T Enterprises, LLC. Out of an abundance of caution, Petitioners are identifying AT&T Enterprises, LLC as a real party in interest in this IPR.

² Out of an abundance of caution, Petitioners identify all current defendants in the below identified cases as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR. Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The following are a list of related matters: *ASUS Technology Licensing Inc. et al. v. AT&T Inc. et al.*, Case No. 2-23-cv-00486-JRG-RSP (E.D. Tex. 2023) (Lead Case); *ASUS Technology Licensing Inc. et al. v. T-Mobile USA, Inc.*, Case No. 2-23-cv-00487-JRG-RSP (E.D. Tex. 2023); *ASUS Technology Licensing Inc. et al. v. Verizon Communications Inc.*, Case No. 2-23-cv-00488-JRG-RSP (E.D. Tex. 2023); *Innovative Sonic Limited et al. v. AT&T Inc., et al.*, Case No. 2-23-cv-00489-JRG-RSP (E.D. Tex. 2023); *Innovative Sonic Limited et al. v. T-Mobile USA, Inc.*, Case No. 2-23-cv-00490-JRG-RSP (E.D. Tex. 2023); *Innovative Sonic Limited et al. v. Verizon Communications, Inc. et al.*, Case No. 2-23-cv-00491-JRG-RSP (E.D. Tex. 2023).

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioners provide the following designation of counsel.

also acknowledge that each Petitioner has a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. § 315(e).

Lead Counsel	Backup Counsel
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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

A copy of this entire Petition, including all Exhibits and a Power of Attorney, is being served via FEDERAL EXPRESS, costs prepaid, to the address of the attorney or agent of record at the USPTO:

Cooper Legal Group LLC
1388 Ridge Road, Unit 1
Hinckley, OH 44233

Petitioners are also serving Patent Owner's litigation counsel of record, as reflected below on the Certificate of Service.

Petitioners consent to electronic service at the addresses provided above for lead and back-up counsel and at the following email address:

Celerity_IPRs@mckoolsmith.com. A Power of Attorney is filed concurrently herewith under 37 C.F.R. § 42.10(b).

III. FEES

The Office is authorized to charge a fee under 37 C.F.R. 42.15(a) to Deposit Account No. DA-505723 and any additional fees that are due.

IV. CERTIFICATION OF STANDING

Petitioners certify pursuant to 37 C.F.R. §42.104(a) that the '868 patent is available for IPR and that Petitioners are not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein.

V. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

A. Prior Art

This challenge is based on the following references: U.S. Patent No. 11,539,419 (Jung) (Ex-1005 and Ex-1006)³ and U.S. Patent No. 11,096,195 (Xiong) (Ex-1007).

³ Ex-1006 is a provisional application (U.S. Provisional App. No. 62/350,453) to which Jung claims priority and which is incorporated by reference into Jung. Ex-1005 at 1:9-26.

B. Relief Requested

Petitioners request institution of IPR and cancellation of the Challenged Claims based on the following Grounds, supported by the Declaration of Alexander Haimovich, Ph.D. (Ex-1003).

Ground	Basis	Challenged Claims	References
1	35 U.S.C. § 103 (Obviousness)	5, 6, 8, 13, 14, 16 and 18	Jung
2	35 U.S.C. § 103 (Obviousness)	5, 6, 8, 13, 14, 16 and 18	Jung in view of Xiong

VI. THE '868 PATENT

A. Overview of the '868 patent

The '868 patent (Ex-1001) is directed to a method and apparatus for beamforming in a wireless communication system. In particular, the patent claims systems and methods for a UE to derive a “UE beam,” based on a beam reference signal of a “network beam.” *See, e.g.*, Ex-1001 at claims 5 and 13. The UE receives “a first information” associated with the “network beam” via a “first signal” that is “a Medium Access Control (MAC) signaling[.]” *Id.* at 20:15-20.

The “UE beam” is used to transmit two specific pieces of information: (1) a periodic Channel State Information (CSI), and (2) a scheduling request. *Id.* Both

pieces of information are then received “using the network beam, mapped to the UE beam[.]” *Id.* at 20:22-24.

The dependent claims add additional steps of: (1) transmitting a second signal indicating radio resources for: (i) the beam reference signal of the network beam and (ii) the periodic CSI; (2) wherein the second signal is a Radio Resource Control (RRC) message; and (3) transmitting to the UE an indication of candidates of network beams for communication with the network node. *Id.* at claims 6, 8, 14, 16, and 18.

The challenged independent claims are set forth below.

5. A method of a network node for transmission or reception using beamforming, the method comprising:

selecting a network beam;

transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling; and

using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

13. A network node for transmission or reception using beamforming comprising:

a control circuit;

a processor installed in the control circuit; and

a memory installed in the control circuit and operatively coupled to the processor;

wherein the processor is configured to execute a program code stored in the memory to:

select a network beam;

transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling; and

use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

B. Overview of the Prosecution History

The application for the '868 patent claims priority to U.S. Provisional Patent Application Serial No. 62/365,540 filed on July 22, 2016. For the purposes of this

Petition, July 22, 2016, is presumed as the priority date for the Challenged Claims. The '868 patent application was filed on July 21, 2017. Ex-1002.

During prosecution, the examiner repeatedly rejected the claims as anticipated or obvious over the prior art. All told, the examiner rejected the claims five times based on four prior art references before ultimately allowing the claims to issue.

On July 21, 2017, applicant submitted the application that ultimately issued as the '868 patent with 20 claims. Originally filed claim 8, which corresponds to Challenged Claim 5 in the '868 patent, read as follows:

8. A method of a network node for transmission or reception using beamforming, the method comprising:

- selecting at least one specific network beam;

- transmitting a second signal to a UE to indicate a first information for the UE to derive at least one specific UE beam used to receive or transmit at least one transmission; and

- using the at least one specific network beam to transmit or receive the at least one transmission, wherein the at least one transmission is periodic channel state indication, scheduling request, and/or scheduling information for downlink assignment or uplink resource.

Ex-1002 at 875-76.

Ultimately over the course of the '868 Patent's prosecution, applicant amended the claim as follows:

§ 5. A method of a network node for transmission or reception using beamforming, the method comprising:

~~selecting at least one specific~~ a network beam;

~~transmitting a second~~ first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, ~~at least one specific~~ a UE beam used to receive or transmit at least one transmission; and

~~using the at least one specific network beam to transmit or receive the at least one transmission, wherein the at least one transmission is a periodic Channel State Information (CSI) channel state indication,~~ and to transmit a scheduling request, and/or scheduling information for downlink assignment or uplink resource wherein the first signal is a Medium Access Control (MAC) signaling; and

using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

Compare Ex-1001, Claim 5 *with* Ex-1002 at 875-876. Applicant used these amendments to argue that the Challenged Claims overcame prior art rejections based on the four prior art references identified by the examiner.

The table below identifies the grounds for the rejection in each office action, and following that is a description of the specific disclosures relied upon by the examiner and applicant's arguments in response.

	Office Action	Grounds / Reference(s)	Applicant Arguments / Remarks Made In Amendment
1	December 4, 2018 - Non-Final Rejection (Ex-1002 at 721-727)	35 USC 102 - Li (2013/0286960)	Ex-1002 at 710-712
2	April 12, 2019 - Final Rejection (Ex-1002 at 693-699)	35 USC 102 - Koskela (2019/0058518) 35 USC 103 - Koskela + Deng (2019/0104549)	Ex-1002 at 684-685
3	August 8, 2019 - Non-Final Rejection (Ex-1002 at 278-284)	35 USC 112 35 USC 103 - Koskela + Suzuki (2018/0160421) 35 USC 103 - Koskela + Suzuki + Deng	Ex-1002 at 269-272

4	January 8, 2020 - Final Rejection (Ex-1002 at 254-260)	35 USC 103 - Koskela 35 USC 103 - Koskela + Suzuki (2018/0160421) 35 USC 103 - Koskela + Suzuki + Deng	Ex-1002 at 241-246
5	April 29, 2020 - Non-Final Rejection (Ex-1002 at 215-220)	35 USC 103 - Li + Suzuki 35 USC 103 - Li + Suzuki + Deng	Ex-1002 at 42-45

1) Li et al., US 2013/0286960 (“Li”)

The examiner relied on Li as a basis for rejecting the pending claims in both the first and fifth office actions. In the first office action, on December 4, 2018, the examiner rejected all pending claims as anticipated by Li, finding it disclosed each of the originally filed claims’ requirements, including original filed claim 8’s requirements, which corresponds to Challenged Claim 5, based on Li’s disclosures of: (1) “BS [base station] 102 sends UE 116 the information 1420, which includes its TX beams to be used. The information 1420 also can include how the BS TX beams are transmitted, e.g., by steering, or the beams being concurrently transmitted. Alternatively, BS 1102 can inform UE 116, via the information 1420, which MS RX beams to use”; (2) “BS 102 uses 1430 the selected TX beam(s) to transmit the information to UE 116”; and (3) “[t]he information includes the resource allocation

for UE 116.” Ex-1002 at 725 (quoting Ex-1015 (Li), ¶¶ 140-145 and citing Figure 14).

In response, the applicant amended the claims to: (1) add a requirement that “the first signal is a Medium Access Control (MAC) signalling”; and (2) introducing dependent claims involving “transmitting a second signal indicating radio resources for the at least one transmission.” Ex-1002 at 706.

With these changes, the applicant distinguished Li on two grounds, alleging Li fails to disclose: (1) how to decide a specific beam to periodically transmit/receive the at least one transmission containing “periodic channel state indication, and/or a periodic downlink signal for beam maintenance” and (2) “receiving [or receive] a first signal indicating a first information, wherein the first signal is a Medium Access Control (MAC) signaling; deriving [or derive] at least one specific UE beam based on the first information.” *Id.* at 710–711.

In the fifth office action, on April 29, 2020, the examiner again relied on Li to reject all pending claims, this time under 35 U.S.C. § 103 in view of Suzuki (2018/0160421) and in further view of Deng (U.S. Pub. #2019/0104549). Ex-1002 at 216-220. The examiner found that Li disclosed receiving a first signal indicating a first information associated with a network beam, wherein the first signal is a Medium Access Control (MAC) signaling based on paragraphs 0141 and 0186-0188; deriving a UE beam by measuring a beam reference signal of the network

beam based on the first information based on paragraphs 0141-0142; and using the UE beam to transmit a Channel State Information (CSI) and to transmit a scheduling request, based on paragraphs 0139, 0140, and 0145. Ex-1002 at 217-218. The examiner also found that Li discloses receiving a second signal indicating radio resources for the beam reference signal and the periodic CSI, based on paragraphs 0144 and 0156, which corresponds to Challenged Claims 6 and 14. Ex-1002 at 218. The examiner further found that Li discloses receiving an indication of candidates of network beams for communication with a network node based on paragraphs 0139-0149, which corresponds to Challenged Claims 16 and 18. Ex-1002 at 218.

The examiner found that the CSI disclosed by Li was not periodic (but that Suzuki disclosed periodic CSI) and that while Li disclosed the claimed “second signal,” it did not disclose wherein the second signal is an RRC message (but that Deng contained this disclosure). Ex-1002 at 218-219.

In response, applicant argued that “Li seems to provide for a UE providing a measurement report to a BS, the BS using the measurement report to select control beams for the UE and sending the UE information comprising a transmission beam of the BS and/or a reception beam of the UE, and the UE using the reception beam of the UE to receive the transmission beam of the BS. Li seems to be silent as to deriving a UE beam by measuring a beam reference signal of a network beam based on first information indicated in a MAC signal, and the UE using the derived UE

beam to transmit a periodic CSI and a scheduling request.” Ex-1002 at 43 (emphasis omitted). Applicant did not identify any other claim elements as not disclosed by Li.

2) Koskela et al, U.S. Pub. # 2019/0058518 (Koskela)

The examiner thrice rejected applicant’s claims based on Koskela, finding that Koskela both anticipated the then-pending claims, and rendered them obvious in view of Suzuki and Deng. In short, the examiner repeatedly found that Koskela disclosed each of the claim elements except those relating to the “second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI” and “wherein the second signal is a Radio Resource Control (RRC) message.” *See, e.g.*, Ex-1002 at 256-257. In particular, the examiner relied on Koskela’s disclosures in paragraphs [0156] and [0181] to find that Koskela anticipated applicant’s claims:

[0156] One area which is addressed by some embodiments is beam management, for example determining the best possible communication beam or set of candidate (communication) beams. This may be particularly challenging for when there is no active communication. During active communication the AP may typically receive CSI (channel state information) feedback from UE (which may be beam specific) and thus it may determine the best or a set of best beams which can be used to communicate with UE. When there

is no active communication UE does not typically transmit any CSI feedback. During inactivity periods, due to the mobility of a UE, the UE and/or network may see one or more better communication beams or the current 'selected' beam may become unsuitable for communication so the selected beam or set of candidate beams may vary over time. The selected beam may be a beam that access point utilizes for communication or requests CSI feedback on)

...

[0181] The control apparatus may signal the set of one or more candidate beams (for example providing beam indices explicitly in a MAC CE, MAC Control Element) for the UE to monitor when in an inactive (for example DRX) or in active mode. The control apparatus, which configures the candidate set related trigger measurements (measurement configuration), may set the measurement type to be, for example, on one or more of received reference signal power levels (RSRP, reference signal received power); received reference signal quality levels (RSRQ, reference signal received quality); and RSSI (reference signal strength indicator). These may be measured from the beam specific reference signals transmitted either periodically during downlink sweep or during scheduled reference signal transmissions.

Ex-1012 (Koskela).

In response, the applicant did not dispute that Koskela disclosed using the MAC layer to perform beam management: “Koskela seems to provide for candidate beams being signaled by a MAC CE for the UE to monitor, the UE being be [sic] configured based upon a measurement performed by measuring beam specific reference signals on the candidate beams, and filtering fast changes in beam quality.” Ex-1002 at 243. Instead, applicant focused its point of distinction solely on the information to be sent back from the UE to base station using the UE and network beams: “Notably, Koskela seems to be silent as to requesting that the UE use a selected beam to transmit the CSI feedback” and “Koskela seems to be silent as to the UE using the measurement to derive a UE beam for transmitting a periodic CSI and a scheduling request.” *Id.* at 242-243 (emphasis altered).

Applicant further conceded that “Koskela seems to be directed to a MAC CE from an AP indicating candidate beam(s) for a UE to measure CSI on the candidate beam(s) that the UE can provide CSI feedback for the AP to determine best beam(s) for communication with the UE.” *Id.* at 243. Applicant argued that this failed to disclose the pending claims because “Koskela seems to be silent as to a connection between the beam candidate(s) signaled by the MAC CE and the beam used by the UE to transmit CSI feedback” and “Koskela also seems to be silent as to using a derived UE beam to transmit a scheduling request.” *Id.*

3) Suzuki et al, U.S. Pub. #2018/0160421 (Suzuki)

In the August 8, 2019, Non-Final Rejection, the examiner rejected then-pending claims 1, 3, 5, 6, 8, 10, 12, 14, 16, 18, 19, 21, and 22 under 35 U.S.C. 103 as unpatentable over Koskela in view of Suzuki. According to the examiner, while Koskela “fail[s] to disclose transmitting a periodic channel state information by the specific UE,” Suzuki does disclose that requirement (Ex-1002 at 282) via paragraph 0104 and claims 13, 16. *See, e.g.*, Ex-1016 (Suzuki) at [0104].

In response, on October 28, 2019, applicant argued “Suzuki fails to teach the UE transmits periodic channel state information **by using the specific UE Beam indicated by the network.** Suzuki also fails to disclose **which UE beam is used** to transmit periodic channel state information.” Ex-1002 at 271 (emphasis in original).⁴

⁴ Applicant also argued “the claims recite using a specific UE beam to transmit periodic CSI, and also **using the same UE beam** to receive a periodic downlink reference signal for beam maintenance, which is **not** disclosed in Koskela and/oror [sic] Suzuki.” Ex-1002 at 272 (emphasis in original). The Challenged Claims do not require “receiv[ing] a periodic downlink reference signal for beam maintenance.

4) Deng et al, U.S. Pub. #2019/0104549 (Deng)

In the April 12, 2019 office action, the examiner rejected then-pending claims 4, 7, 11, 13, 17, 20, and 23 based on Koskela in view of Deng. Ex-1002 at 696-97. Then-pending claims 4, 11, 17, and 23 required a second signal indicating radio resources for the at least one transmission, and then-pending claims 7, 13, 20, and 23 required that the second signal is a Radio Resource Control (RRC) message. Similar requirements also appear in Challenged Claims 6, 8, and 14. The examiner found them disclosed by Deng paragraph 206 (Ex-1002 at 697), which discloses:

. . . The mWTRU may receive time and frequency
resource allocation of the present reference signals in SIB
or RRC signaling.

Ex-1017 (Deng) at [0206]. Applicant did not dispute this disclosure. Ex-1002 at 684–685. Instead, Applicant argued that the primary reference relied upon by the examiner failed to disclose each element of the independent claims and so the invalidity ground involving Deng could not render the dependent claims invalid. *Id.*

C. Level of Ordinary Skill in the Art

As of the earliest claimed priority date, a person of ordinary skill in the art at the time of the alleged invention of the '868 patent (“POSITA”) would have had a B.S. in Electrical Engineering or a related field with at least three years of experience designing, developing, and/or testing telecommunication systems. Ex-1003, ¶48. A POSITA would also have familiarity with the wireless standards and well-known

protocols for accessing wireless networks. *Id.* More education may supplement practical experience or *vice versa*. *Id.*

VII. CLAIM CONSTRUCTION

Petitioners submit that the Board does not need to expressly construe any terms to resolve the arguments presented herein. Petitioners submit that no terms need to be construed because the prior art in this Petition discloses all limitations under any plausible construction. Ex-1003, ¶49.

VIII. OVERVIEW OF PRIOR ART

As evidenced by the cited prior art and explained by Dr. Haimovich in the attached expert declaration (Ex-1003), the claimed beamforming implementation was well known before the '868 patent's priority date. In addition to the extensive background knowledge that a POSITA would have brought to bear on the subject matter discussed in the '868 patent, the following prior art demonstrates that the challenged claims would have been obvious.

A. Jung (Ex-1005)

Jung describes a technique for beam management that exchanges beam state information between a UE and an eNB, tracks a change of a beam rapidly, and applies the beam to the transmission of information. Ex-1005 at 8:31-34. "The present disclosure relates to a beam feedback procedure that informs a beam using entity (eNB) of beam information observed and measured by a beam measuring

entity UE in an environment and a wireless communication system where a UE and an eNB using MIMO antennas coexist, or a system employs a beamforming, particularly, a beamforming using MIMO antennas” Ex-1005 at 1:37-43.

Jung explains that in order to achieve high data rates, 5G is developed to be implemented also at high frequencies, such as mm wave: “when a center frequency of 30 or more GHz is used, the coverage area of an evolved NodeB (eNB) is reduced due to signal attenuation, and this causes the need to use a number of beams.” Ex-1005 at 6:10-13. Forming a beam “obtains an antenna gain with directivity in a physically specified direction.” Ex-1005 at 6:42-43. The use of beams with directivity compensates for the signal attenuation. “Using a number of antennas increases the intensity of directivity to be higher and thus makes it possible to transmit signals to a further distance, under the same power condition,…” Ex-1005 at 6:53-55. According to Jung, prior art has not addressed the issue of uplink communication failure due to rapid changes in channel conditions associated with a beam in use. Ex-1005 at 8:19-26. “In this case, a UE may have a chance to maintain the connectivity” by changing the serving beam. Ex-1005 at 8:53-54.

Jung teaches that “a UE performs the following three processes, (1) beam information measurement, (2) providing beam information, and (3) changing beams in use.” Ex-1005 at 9:64-66. “Beam measurement is performed to measure channels of beam pairs created by a combination of beams between a UE and a neighboring

eNB.” Ex-1005 at 10:13-15. Beam measurement is based on a beam reference signal: “[t]he UE receives beam reference signal (BRS) transmitted from an eNB, measures received different beams by turns with respect to the BRS, and obtains a beam quality measurement value for the UE reception beam pairs and each eNB transmission beam.” Ex-1005 at 16:35-40. “Beam feedback is an operation that a UE informs an eNB of its measuring beam information.” Ex-1005 at 10:29-30. “Beam information feedback may be periodically or aperiodically performed.” Ex-1005 at 10:34-35. The feedback may include channel state information. Ex-1005 at 9:17-21; Ex-1005 at 36:50-54. An eNB may use the feedback to determine whether a beam pair needs to be changed or not: “when the eNB ascertains that a beam applied to the UE needs to be changed in operation 3325, it transmits a beam change request message to the UE in operation 3330.” Ex-1005 at 43:39-42.

Jung discloses that to react quickly to a change in channel conditions, a determination whether a beam needs to be changed or not has to be performed rapidly. Ex-1005 at 31:27-31. In view of this, Jung teaches signaling that is done at the Medium Access Control (MAC) level. For example, signaling of a threshold level (Ex-1005 at 16:65-17:3), signaling of a time interval for feedback (Ex-1005 at 27:60-28:3, Ex-1005 at 28:1-15) or in case of a beam change, signaling of a new beam ID (Ex-1005 at 42:29-34, Ex-1005 at Fig. 31A, Ex-1006 at 105).

Jung teaches a UE is capable of selecting a best UE beam based on the beam measurement results (Ex-1005 at 21:27-32. Ex-1005 at Fig. 11, Ex-1006 figure at 72). Jung further teaches a UE is capable of selecting a best UE beam for reception (Ex-1005 at 16:41-44) or for transmission (Ex-1006 at 101). Jung further discloses channel reciprocity (Ex-1005 at 36:46-49, Ex-1006 at 24, Ex-1006 at 28). A POSITA understands that channel reciprocity implies the same UE beam may be used for both reception and transmission. Ex-1003, ¶55.

Jung discloses the use of a scheduling request for the allocation of resources in the uplink (Ex-1005 at 7:31-34, Ex-1005 at 25:65-26:1, Ex-1005 at 27:37-42). The scheduling request is transmitted on the best beam selected by the UE (Ex-1005 at 27:49-67).

B. Xiong (Ex-1007)

Xiong relates to methods of sending scheduling requests using beamforming. Like Jung, the methods taught by Xiong are motivated by the expected use of higher frequency bands (mm wave) in 5G (Ex-1007 at 1:35-37). “However, higher frequency bands can have significant losses in the atmosphere due, in part, to absorption by oxygen and water vapor in the atmosphere.” Ex-1007 at 1:37-40. Similar to Jung, Xiong teaches that beamforming can overcome losses at higher frequencies: “Beam forming can be a critical technology for the implementation of high frequency band system due to the fact that the beam forming gain can

compensate for the severe path loss caused by atmospheric attenuation.” Ex-1007 at 3:44-48.

Xiong teaches a beam selected at the UE is used to transmit a scheduling request and other information: “The UE can select, at the UE, a selected eNodeB transmission (Tx) beam and a selected UE reception (Rx) beam based on a highest power beamforming reference signal (BRS) received power (BRS-RP). The UE can signal a transceiver of the UE to transmit to the eNodeB a scheduling request (SR), using the selected Rx beam...” Ex-1007 at Abstract. Embodiments include a beam reference signal (BRS) to be transmitted from an eNodeB. The BRS is used by the UE to select a UE receive beam. Ex-1007 at 5:54-62. Ex-1007 at Fig. 4.

Like Jung, Xiong also discloses channel reciprocity. Ex-1007 at 4:28-29. Ex-1007 at 6:58-63. A POSITA understands that in light of channel reciprocity, a UE beam that is used for reception may be also used for transmission. Ex-1003, ¶60. Similarly, a eNB selected for transmission may be used for reception. Therefore, Xiong teaches selecting the UE beam used for transmission and the eNB beam used for reception of scheduling requests and other information. Ex-1007 at Fig. 4.

IX. SPECIFIC GROUNDS FOR PETITION

A. Ground 1: The Challenged Claims are Obvious in View of Jung

Jung discloses the Challenged Claims for the reasons below.

1) Jung is Prior Art

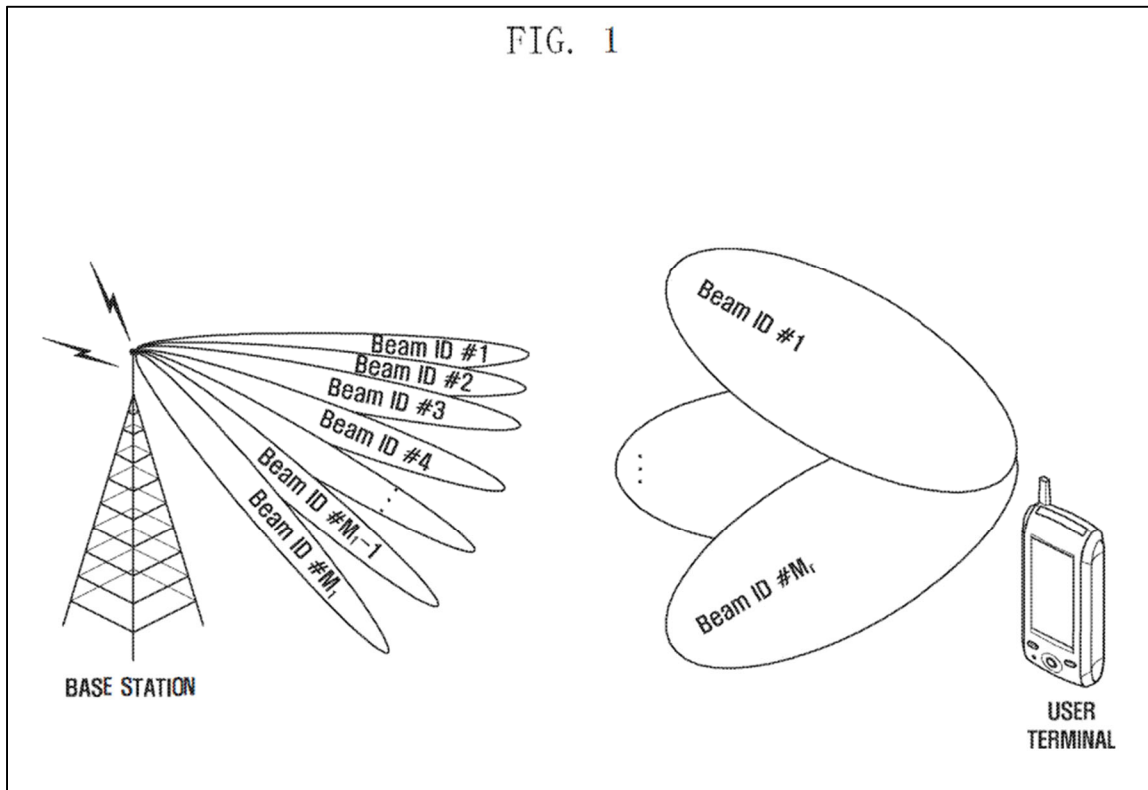
Jung qualifies as AIA § 102(a) prior art. It was filed on May 18, 2020, and claims priority to five provisional applications, each of which was filed before the '868 patent's earliest potential priority date (July 22, 2016). Ex-1005 at Cover (showing the latest provisional application was filed on June 15, 2016). The latest-filed provisional, U.S. Provisional App. No. 62/350,453, provides support for the subject matter in Jung relied on by this Petition, as shown below. *Penumbra, Inc. v. Rapidpulse, Inc.*, No. IPR2021-01466, 2023 WL 2605070 (P.T.A.B. Mar. 10, 2023) at 28-29 (“[U]nder AIA §§ 102(a)(2) and 102(d), there is no need to evaluate whether any claim of a reference patent document is actually entitled to priority when applying such a reference patent as prior art.”).

Jung also incorporates by reference each of the provisionals. Ex-1005 at 1:9-26. Thus, citations to Ex-1006, which is the latest-filed Jung provisional, should be understood to be citations to Jung itself.

2) Claim 5

a) [Element 5Pre]: A method of a network node for transmission or reception using beamforming, the method comprising:

To the extent the preamble is considered limiting, Jung teaches “a method of a network node for transmission or reception using beamforming”:



Ex-1005 at Figure 1; *id.* at 3:41-42 (“FIG. 1 is a diagram showing a multiple beam system according to an embodiment of the present disclosure”); Ex-1006 at 23.

According to the Abstract:

A mobility application method of a user equipment (UE) residing in a system of wireless communication systems, which supports **transmission/reception** of data, using a **beamforming**, via multiple input multiple output (MIMO) antennas is provided. The method includes measuring beam measurement reference signals that a **network** transmitted using different transmission **nodes** and evolved **NodeB (eNBs)** and transmitting the measured

information to the **network** in a system using a number of beams.

Ex-1005 at Abstract (emphasis added); Ex-1006 at 23; Ex-1003, ¶61.

The '868 patent explains that “the network node may be a TRP, base station, or a 5G node.”⁵ Ex-1001 at 16:44-45. Jung “relates to a beam feedback procedure that informs a beam using entity (eNB) of beam information observed and measured by a beam measuring entity UE in an environment and a wireless communication system where a UE and an eNB using MIMO antennas coexist, or a system employs a beamforming, particularly, a beamforming using MIMO antennas, and a method of continuously tracking beams using the beam feedback procedure.” Ex-1005 at 1:37-45.

A POSITA would thus have understood Jung to disclose a method of a network node for transmission or reception using beamforming. Ex-1003, ¶63.

⁵ A “TRP” refers to a “Transmission/Reception Point.” Ex-1001 at 6:10-11. The '868 patent describes that “an evolved Node B may have multiple Transmission /Reception Points (TRPs) that are either centralized or distributed. Each TRP can form multiple beams.” *Id.* at 6:9-12.

b) [Element 5(a)]: selecting a network beam;

Jung teaches selecting a network beam. *See* Ex-1005 at 12:15-17; Ex-1006 at 32, 35; Ex-1003, ¶64.

The '868 patent specification does not explicitly describe “selecting a network beam.” Rather, it provides a single example of the network “choos[ing] . . . a special network beam,” explaining that in a preferred embodiment:

the network chooses at least one special network beam for the UE to determine at least one special UE beam for the transmission. The network could provide an indication to indicate at least one network beam to the UE. The indicated network beam(s) in the indication may be called special network beam(s). The UE may determine the special UE beam(s) by measuring signal of the special network beam(s). For example, the UE beam(s) with received power larger than a threshold or UE beam with largest received power may be determined to be the special UE beam(s) by measuring the signal of the special network beam(s). By this way, the mapping between the UE beam(s) and the network beam(s) is known to the UE.

Ex-1001 at 12:3-15.⁶

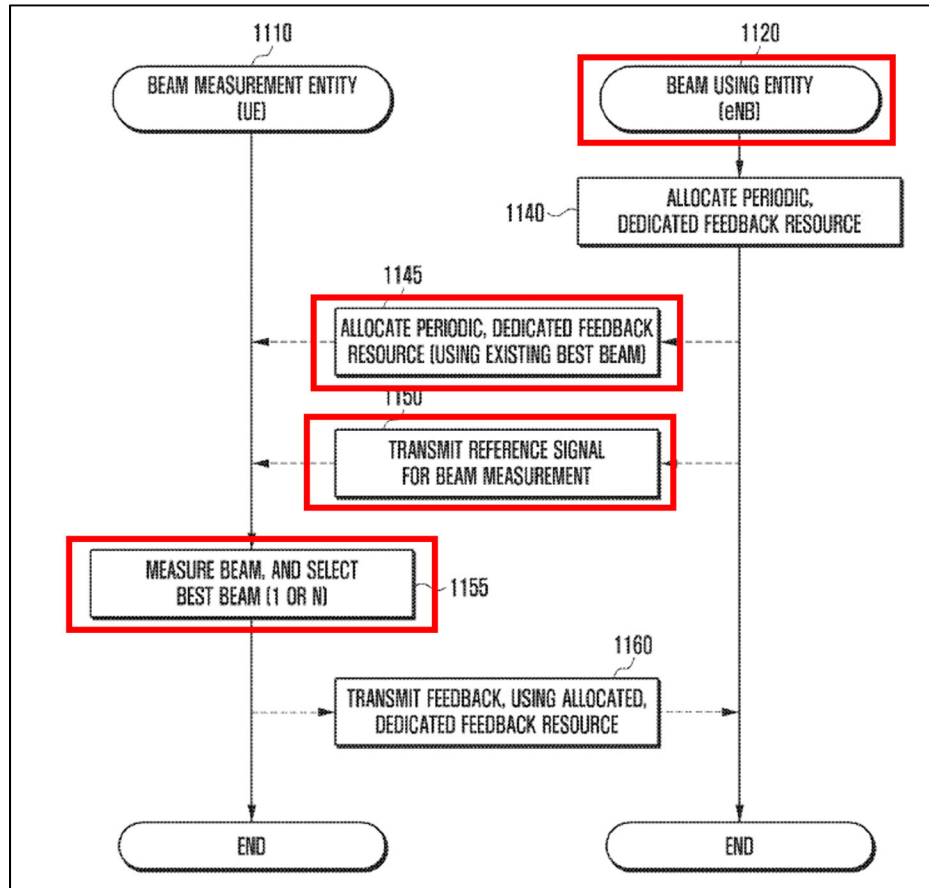
Jung similarly “selects a network beam.” *See, e.g.*, Ex-1005 at 8:11-15 (“For example, in a system using a number of analogue beams for transmission/reception, a UE and an eNB select a specified beam which can be estimated to have high performance and perform the transmission/reception of information via the selected beam.”); Ex-1006 at 32, 35. Jung does so through at least two embodiments: one in which the *current* eNB beam corresponds to the selected “network beam” of the ’868 patent, and another in which a *changed* or *new* eNB beam corresponds to the selected “network beam.”⁷

For instance, Jung selects an “existing best beam” on which to allocate periodic, dedicated feedback resource(s), after which it transmits a reference signal

⁶ Applicant’s initially filed claim 8, which corresponds to Challenged Claim 5, referred to “selecting at least one specific network beam.” Ex-1002 at 875.

⁷ One example of an eNB beam is a “serving beam.” *See, e.g.* Ex-1005 at 17:9-11 (“The number of current serving beam may be one. Alternatively, the number of current serving beam may be one or more that an eNB can transmit to the current UE.”); Ex-1003, ¶¶65, 67.

for beam measurement, which the UE uses to measure a beam and to select a best beam:



Ex-1005 at Figure 11 (annotated); Ex-1006 at 72. Under this embodiment, the selected “network beam” is the existing eNB beam of the “best beam.” Ex-1003, ¶65; Ex-1005 at 16:41-44. Jung further describes how a “best beam” may be selected:

In the following embodiments of the present disclosure, when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among

the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called ‘best beam (or best beams).’ Alternatively, the ‘best beam (or best beams)’ may also be referred to as two individual beams of the beam pair (or beam pairs). In an embodiment of the present disclosure, the **‘best beam’ is referred to as a beam with the best performance that a beam using entity (eNB) uses to communicate with a beam measurement entity (UE)**, from among a pair of best beams measured according to reference signals transmitted by the beam using entity (eNB), however, it should be understood that the present disclosure is not limited to the best beam as defined above.

Ex-1005 at 12:15-32 (emphasis added); Ex-1006 at 32.

Jung also selects a “network beam” that is a changed beam from an existing beam: “eNB changes a scheduling beam of a UE in such a way to transmit, to UE, an MAC-CE including a beam change indication containing information regarding a desired beam to which an existing beam is changed[.]” Ex-1006 at 104. In addition, a POSITA understands that when an embodiment in which an eNB beam needs to be changed to a “new beam,” the selected “network beam” is the “new beam”:

1. 2. Method for an eNB to Change a Beam

The eNB/UE is capable of using a new beam contained in a beam change request signal from a corresponding beam change time.

Ex-1005 at 45:3-6; Ex-1003, ¶70. And Jung discloses that “[a]n eNB or a UE is capable of determining a beam pair to be used later, based on received beam feedback information.” Ex-1005 at 10:52-54; Ex-1006 at 25, 35. A POSITA would thus have understood that when a beam is changed, the selected network beam can be the beam “to be used later.” Ex-1003, ¶71.

Based on these disclosures in Jung, a POSITA would have understood Jung to teach Element [5(a)]. Ex-1003, ¶¶72-73.

- c) **[Element 5(b)]: transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling**

Jung teaches transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic

Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

- i. Element 5(b)(1) - Transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam . . . wherein the first signal is a Medium Access Control (MAC) signaling*

Jung discloses transmitting a “Medium Access Control (MAC) signaling” to a UE to indicate a first information associated with the network beam. Ex-1003, ¶75.

The ’868 patent specification provides examples of the claimed “first information” as either an explicit or implicit beam identification:

The first information indicates which network beam(s) is the specific network beam(s) explicitly. Alternatively the first information implicitly indicates which network beam(s) is the specific network beam(s). For example, the specific network beam(s) is the network beam(s) where the first information is transmitted.

Ex-1001 at 15:35-39.

Alternatively, according to the ’868 patent, the “first information” can provide the UE with an association between beams:

The first information can indicate which network beam or beams are associated with the specific UE beam or beams. In some methods, the first information indicates a

configuration related to a signal of the specific network beam or beams to be measured (such as BRS). The first information may be applicable to more than one transmission. The first information may be applicable before it is updated or becomes invalid.

Ex-1001 at 15:39-47.

Jung discloses at least three types of “first information associated with the network beam” sent from an eNB to a UE via a MAC signal, including a “beam identification,” as discussed in the ’868 patent.

First, Jung discloses transmitting a MAC signal with a “first information” that corresponds to a “beam ID”: “eNB changes a scheduling beam of a UE in such a way to transmit, to UE, an MAC-CE including a beam change indication containing information regarding a desired beam to which an existing beam is changed[.]” Ex-1006 at 104; *see also* Ex-1005 at 20:39-44 (“Resource allocation information may be provided via part of a transmission signal such as . . . MAC CE”) and 20:66-21:02 (“eNB may include beam information, which will be received via a corresponding resource, in the scheduling information, as a form of “eNB beam ID,” and may transmit the information to the UE.”).

Similarly, corresponding to the ’868 patent’s disclosure of a first information that “can indicate which network beam or beams are associated with the specific UE beam,” Jung teaches transmitting ID information on a specific eNB beam, the

specific associated UE beam, or the specific pair comprising an eNB beam and a UE beam:

In order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an **eNB beam ID**, a UE beam ID, a beam pair ID, and the like.

See Ex-1005 at 42:20-25 (emphasis added); Ex-1006 at 85-86, 104-105. The “beam ID” may be included in a MAC CE. Ex-1005 at 42:29-34, Fig. 31A; Ex-1003, ¶¶77, 82.

Second, similar to the '868 patent's disclosure of a “first information [that] indicates a configuration related to a signal of the specific network beam or beams to be measured” (Ex-1001 at 15:42-45), Jung discloses transmitting a MAC signal with a “first information” that corresponds to a “threshold” used for beam change or beam feedback. *See* Ex-1005 at 16:61-65. This threshold is “an absolute channel estimation or measurement value (e.g., RSRP, RSRQ, RSSI, CQI, SNR, etc.) with which an eNB and UE compare the channel quality of a corresponding beam.” Ex-1006 at 88; Ex-1005 at 16:65-17:3. The threshold is transmitted using MAC signaling. *Id.* (“The eNB may notify the UE of the threshold (a notification method:

a specified message in an RRC message, **MAC data, a specified parameter in an MAC-CE**, a specified parameter in a DCI, etc.).”); Ex-1005 at 20:20-23. And the “threshold” is associated with the “network beam.” For instance, beam change may be trigger if “[t]he channel quality or performance of another beam is greater than or equal to a specified threshold/offset, compared to a serving beam.” Ex-1005 at 42-44. In other words, the change is triggered if “[n]ew beam measurement value > current beam measurement value + threshold.” *Id.* at 17:45-46. A POSITA understands Jung’s “threshold” to be a “first information associated with a network beam.” Ex-1003, ¶¶85-89.

Third, Jung discloses transmitting a MAC signal containing “first information” that is a time interval referred to as a “beam feedback duration”:

The eNB is capable of notifying individual UEs of the set cycle or the set time interval. The notification method may be one of the following message transmissions:

...

Notify a Downlink MAC-CE message (via PDSCH) that contains an element specifying a beam feedback duration.

Ex-1005 at 27:60-28:03. A POSITA understands a “beam feedback duration” is a “first information associated with the network beam.” Ex-1003, ¶¶91-92. It is information on the duration the “network beam” transmits a beam reference signal

and the time duration the network beam receives feedback from the UE. Ex-1005 at 28:1-15 (emphasis added); Ex-1006 at 82.

Based on these disclosures, a POSITA would have understood Jung to disclose transmitting a “Medium Access Control (MAC) signaling” to a UE to indicate a first information associated with the network beam. Ex-1003, ¶93.

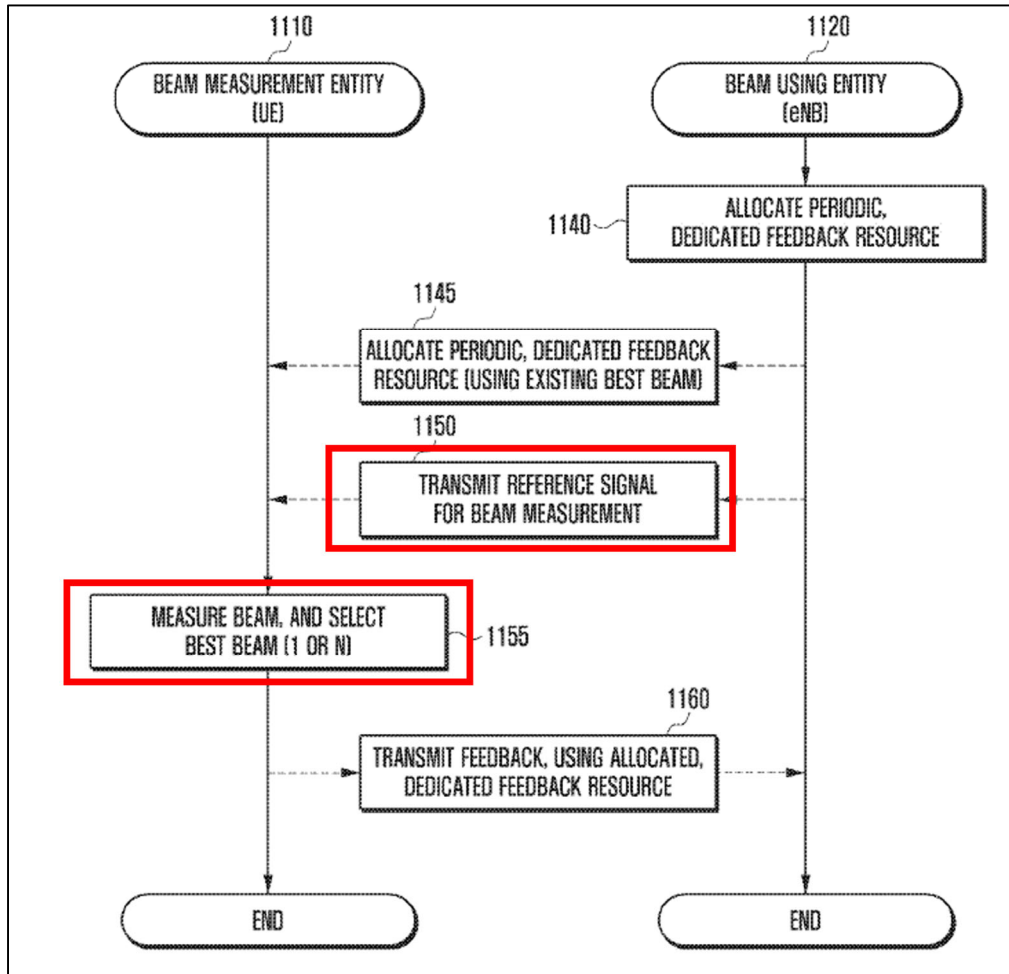
*ii. Element 5(b)(2) - Transmitting a first signal . . .
for the UE to derive, based on a beam reference
signal of the network beam, a UE beam*

The MAC signals associated with these examples of “first information” are for the UE to derive, based on a beam reference signal of the network beam, a UE beam. Ex-1003, ¶94.

Jung describes the mapping between a transmission beam from a base station (a “beam using entity”) and a UE (a “beam measurement entity”):

[W]hen one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called ‘best beam (or best beams).’ Alternatively, the ‘best beam (or best beams)’ may also be referred to as two individual beams of the beam pair (or beam pairs).

Ex-1005 at 12:15-25; Ex-1006 at 32. And Figure 11 of Jung provides an example of how a UE determines its UE reception beam:



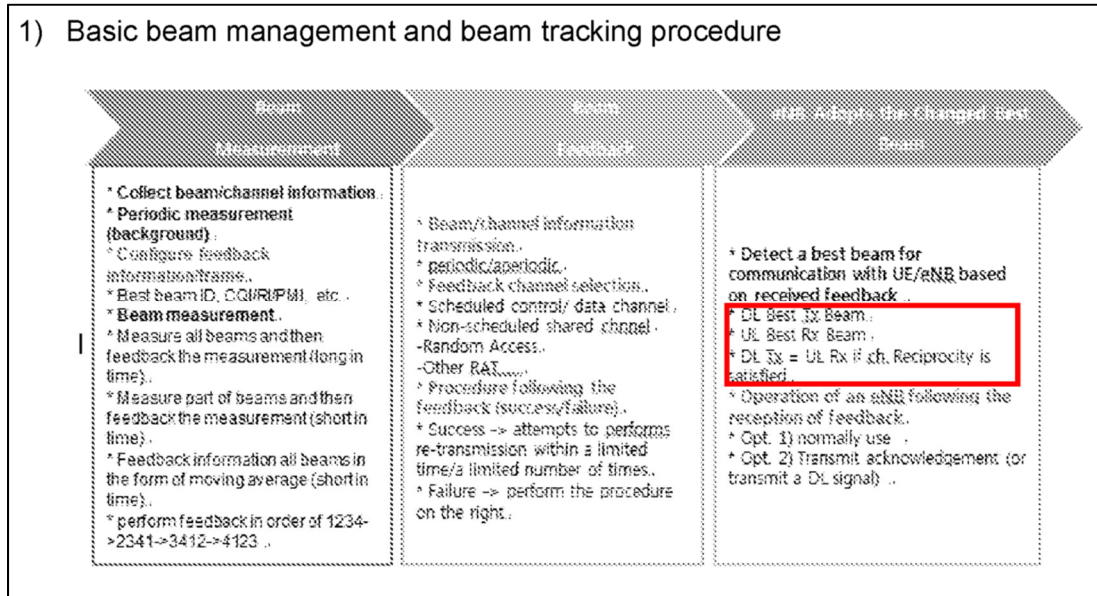
Ex-1005 at Figure 11 (annotated); Ex-1006 at 72. Similarly, with respect to Figure 9, Jung explains that “the UE measures a beam in operation 910. The UE receives beam reference signal (BRS) transmitted from an eNB, measures received different beams by turns with respect to the BRS, and obtains a beam quality measurement value for the UE reception beam pairs and each eNB transmission beam.” *Id.* at

16:35-40. Jung explains that the UE uses the “beam reference signal (BRS)” to determine the best UE reception beam:

The UE selects a preferable beam in operation 920. The selected beam may be a best beam. The UE compares beam quality measurement values with each other, and selects the best UE reception beam for each eNB transmission beam. In addition, the UE identifies beams (or beam groups) which are better for an eNB to perform transmission, in order of quality from best to lowest, and selects the identified beam as a preferable beam (or preferable beam group).

Id. at 16:41-48.

Jung also discloses channel reciprocity: “[w]hen **channel reciprocity** is assumed, **a best beam suitable for a UE to perform transmission is identical to a best beam that an eNB may use to perform transmission.**” Ex-1005 at 36:46-49 (emphasis added). A POSITA understands a corollary of the **channel reciprocity** assumption is that a best beam for reception is also a best beam for transmission. Ex-1003, ¶99. Indeed, Jung teaches as much via the Jung Provisional, which is incorporated by reference into Jung:



Ex-1006 at 24 (disclosing that when reciprocity is satisfied, “DL Tx = UL Rx.”). In other words, Jung teaches using the same beam for transmission and reception. Ex-1003, ¶¶100-101.

Jung provides numerous additional examples of a UE measuring a beam reference signal of a network beam and deriving a UE beam. *See* Ex-1003, ¶¶102-106; Ex-1005 at 21:27-32, 26:43-46, and Figure 11; Ex-1006 at 33, 72, 101, 104.

The “UE beam” in Jung is derived using the MAC signals identified in connection with Element 5(b)(1). *See* Ex-1003, ¶¶106-108; Ex-1005 at 11:3-6, 17:4, 16:41-44, Figs. 9 and 11 (“Threshold” MAC signal); Ex-1005 at 28:1-5 (“beam duration” MAC signal); Ex-1005 at 12:17-23, 42:20-25 (“beam ID” MAC signal); Ex-1006 at 17, 34 (“Threshold” MAC signal); Ex-1006 at 82 (“beam duration” MAC signal); Ex-1006 at 32, 105 (“beam ID” MAC signal).

Based on these disclosures, a POSITA would have understood Jung to teach Element [5(b)(2)]. Ex-1003, ¶110.

To the extent that Jung does not disclose Element [5(b)(2)], it would have been obvious to a POSITA to modify Jung to meet that limitation. Ex-1003, ¶111. For example, to the extent that Jung's disclosure of a MAC signal indicating a beam change with an eNB beam ID, as discussed above, does not constitute a first information for the UE to derive a UE beam “based on a beam reference signal,” it would have been obvious and to modify Jung to meet that limitation and a POSITA would have been motivated to do so. *Id.* For instance, to the extent it is not directly disclosed, it would have been obvious to modify Jung so that it expressly teaches the first information (eNB beam ID) is for deriving the UE beam based on a beam reference signal.

Jung teaches determining a best beam comprising two entities that form one beam pair: an network beam and a UE beam. Ex-1005 at 12:16-23; Ex-1006 at 32. The best beam pair is determined from measurements of beam reference signals. Ex-1005 at 16:35-40, Figure 11.

As discussed earlier, Jung discloses a MAC CE beam change instruction that includes an “eNB beam ID”:

In order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame

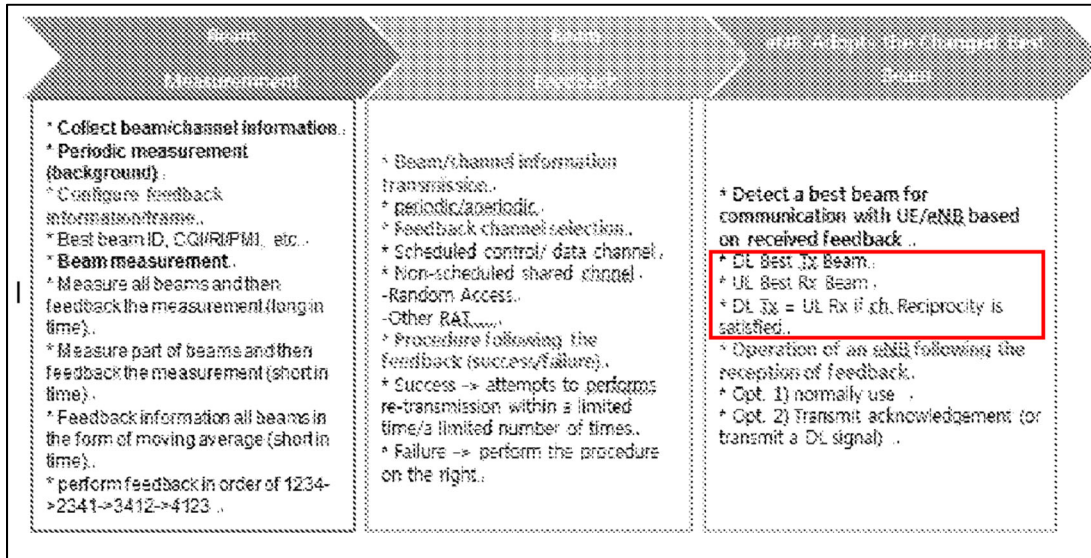
transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an **eNB beam ID**, a UE beam ID, a beam pair ID, and the like.

Ex-1005 at 42:20-25 (emphasis added), Ex-1006 at 104-105.

A POSITA understands that since beam pairs are derived at the UE based on beam reference signals, given an eNB beam ID, a UE can derive a UE beam implicitly based on the beam reference signals. Ex-1003, ¶114. It would have been obvious for a POSITA to modify Jung so that, to the extent it does not already do so, it teaches that given an eNB beam ID, it explicitly checks results from prior beam measurements based on beam reference signals to derive the best UE beam corresponding to the eNB beam. *Id.*

iii. Element 5(b)(3) - a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request

Jung teaches that the derived UE beam is used to transmit a periodic CSI and to transmit a scheduling request. Ex-1003, ¶115. As an initial matter, Jung discloses that the same beams used for transmission can be used for reception and vice versa:



Ex-1006 at 24 (annotated); *see* Section IX(A)(2)(c)(ii) regarding Element [5(b)(2)] above.

And Jung teaches feeding back beam information periodically over a selected UE beam:

Another aspect of the present disclosure is to provide a method that feeds back beam information and changes beams in such a way that a UE periodically measures beam information and reports the information to an eNB, and the eNB and the UE select a restricted number of beams and transmit/receive information to/from each other via the selected beams, thereby increasing the resource use efficiency.

Ex-1005 at 2:50-57; Ex-1006 at 25; *see also* Ex-1005 at 9:17-21, 9:31-33, 9:64-65, 10:34-36, 16:49-60, and Figs. 9 and 11; Ex-1003, ¶¶ 116-118.

Jung further teaches that the beam information fed back may be channel state information (CSI):

Alternatively, a UE transmits an uplink transmission request (or a request for allocating a resource for uplink transmission) to an eNB, is allocated a resource, and transmits channel state information.

Ex-1005 at 9:17-21, 36:50-54 (“The beam measurement information may be transmitted along with channel information in operation 2478. The channel measurement information may contain channel state information (CSI)[.]”); *see also* Ex-1005 at 16:49-59 and Ex-1006 at 45.

Jung also teaches transmitting a scheduling request. Specifically, Jung discloses that “[r]elated technology used in a wireless communication technology following the 3GPP standard has characteristics as follows . . .”:

A UE which needs to perform uplink transmission transmits a request for a resource that an eNB has allocated, i.e., **scheduling request (SR)**, and is allocated the resource for uplink transmission.

Ex-1005 at 7:24-34 (emphasis added); Ex-1006 at 19. And Jung teaches that this scheduling request is sent over the determined best beam pair:

The beam using entity 1220 is capable of allocating a periodic dedicated feedback resource to a **best beam** that it has recognized in operation 1275. Information

regarding the best beam that the beam using entity 1220 has recognized may be information regarding a best beam included in feedback received from the beam measurement entity.

When a periodic feedback transmission resource is not allocated, a measurement entity (UE) performs transmission of feedback in such a way as to periodically request the allocation of a resource (**scheduling request**), or transmit uplink information using a random access protocol, and the like.

Ex-1005 at 22:49-60 (emphasis added); Ex-1005 at 27:33-42; Ex-1006 at 86. Jung further teaches that this scheduling request is typically made via the existing determined best beam pair, by providing an additional solution for when this existing beam pair has degraded. Ex-1005 at 27:43-53 (“However, an instance may occur that the UE has not been allocated the resource or cannot use the resource (e.g., **an instance that the quality of a serving beam is abruptly degraded**, an instance that the UE uplink is asynchronous, and the like).”) (emphasis added).

Based on these disclosures, a POSITA would have understood Jung to teach Element [5(b)(3)]. Ex-1003, ¶124.

To the extent Jung does not explicitly teach a specific “UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request,” a POSITA would have been motivated to modify Jung to teach that

element. Indeed, Jung has numerous references to a “serving beam” or “current serving beam”. *See, e.g.*, Ex-1005 at 16:49-60, 16:65, 17:9. As discussed previously, Jung discloses beams operate in pairs (Ex-1005 at 12:16-32, 16:35-40, Ex-1006 at 83). In view of channel reciprocity, a POSITA understands a UE beam may be used for both transmission and reception. Ex-1003, ¶126; Ex-1005 at 36:46-49, Ex-1006 at 24, 28).

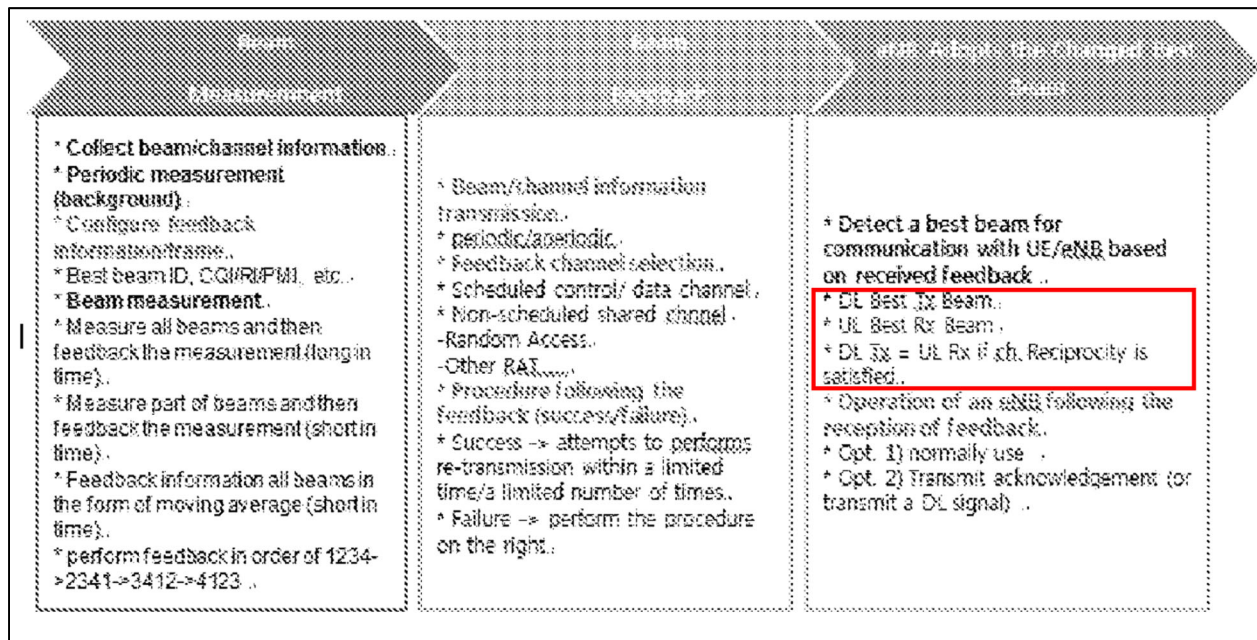
Jung teaches that in some cases the “current serving beam” does not need to be changed, and the UE “is capable of feeding back its pervious [sic] beam information” (Ex-1005 at 16:49-60). In such a case, it would have been obvious to a POSITA that the CSI report/scheduling request is transmitted by the UE on the current serving beam. Ex-1003, ¶127.

* * *

Thus, a POSITA would have understood Jung to teach transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling. Ex-1003, ¶¶ 74-128.

d) [Element 5(c)]: using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

Jung discloses using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request. Ex-1003, ¶129. As described above, Jung discloses that the same beams used for downlink transmission are used for uplink reception:



Ex-1006 at 24, 28 (“Downlink beam measurement is only performed due channel reciprocity.”). A POSITA would thus understand Jung to disclose using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request. Ex-1003, ¶133; *see also* Section IX(A)(2)(c)(ii) and (iii), above.

To the extent Jung does not explicitly teach a specific “using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request,” a POSITA would have been motivated to modify Jung to teach that element for the same reasons as set forth above with respect to Element [5(b)(3)]. *See* Section IX(A)(2)(c)(iii); *see also* Ex-1003, ¶¶134-136.

3) Claim 6

a) [Element 6Pre]: The method of claim 5, further comprising

Jung renders obvious claim 5 for the reasons above. *See* Section IX(A)(2).

b) [Element 6(a)]: transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

Jung discloses transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI:

A resource allocable entity (eNB) allocates resources at every time period and a measurement entity (UE) transmits feedback using a corresponding resource.

al. A resource allocable entity allocates resources, such as, a periodic frequency/time/resource block/sub-frame/symbol, and the like, to a specified UE, and provides the UE with information, such as a corresponding allocated resource location, a UE feedback transmission cycle, and the like.

Ex-1005 at 20:31-38; Ex-1006 at 34, 83-84. A POSITA understands that resources such as frequency/time/resource and block/sub-frame/symbol are radio resources. Ex-1003, ¶140.

Jung discloses an eNB allocating radio resources for beam feedback: “Uplink beam feedback used in such a way that an eNB allocates a specified resource operated based on scheduling, such as beam/time/frequency, and the like, to a specified UE[.]” Ex-1005 at 11:27-33; *id.* at 27:54-56 (“[T]he periodic beam feedback method and the aperiodic beam feedback method need resources allocated by an eNB so that the UE performs uplink feedback transmission.”), 27:60-67; Ex-1006 at 34, 83-84.

Jung further discloses allocating resources for a reference signal and for feedback: “Another aspect of the present disclosure is to provide ... a method of allocating a reference signal for a transmission/reception node ..., a method of signaling and allocating resources for receiving feedback of the measured information[.]” Ex-1005 at 2:34-43; Ex-1006 at 52.

A POSITA would thus understand Jung to disclose transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI. Ex-1003, ¶144.

To the extent Jung does not explicitly teach a specific “transmitting a second signal indicating radio resources for the beam reference signal of the network beam,”

a POSITA would have been motivated to modify Jung to teach that element. Ex-1003, ¶145.

Indeed, it would have been obvious to a POSITA that the UE must be notified of the configuration of beam reference signals in order to find, process and measure them. *Id.*, ¶146.

4) Claim 8

a) [Element 8Pre]: The method of claim 6, further comprising

Jung renders obvious claim 6 for the reasons above. *See* Section IX(A)(3).

b) [Element 8a]: the second signal is a Radio Resource Control (RRC) message.

Jung discloses that the second signal is a Radio Resource Control (RRC) message. *See* claim 6 above (Section IX(A)(3)). In particular, Jung provides that “Resource allocation information may be provided via part of a transmission signal, such as Preamble, **RRC signal**” Ex-1005 at 20:39-44 (emphasis added), 2:34-43, 27:60-67; Ex-1006 at 50, 83; Ex-1003, ¶148.

5) Claim 13

- a) [Element 13Pre(1)]: A network node for transmission or reception using beamforming comprising:**

To the extent Element [13Pre(1)] is considered limiting, Jung discloses or suggests claim Element [13Pre(1)] for the reasons described above with respect to Element [5Pre]. *See* Section IX(A)(2)(a).

- b) [Element 13Pre(2)]: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to:**

To the extent Element [13Pre(2)] is considered limiting, Jung discloses or suggests claim Element [13Pre(2)] for the reasons described above with respect to the Element [5Pre]. *See* Section IX(A)(2)(a).

- c) [Element 13(a)]: select a network beam;**

Jung discloses or suggests Element [13(a)] for the reasons above with respect to corresponding Element [5(a)]. *See* Section IX(A)(2)(b).

- d) **[Element 13(b)]: transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling;**

Jung renders obvious Element [13(b)] for the reasons above with respect to corresponding Element [5(b)]. *See* Section IX(A)(2)(c).

- e) **[Element 13(c)]: and use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.**

Jung renders obvious Element [13(c)] for the reasons above with respect to corresponding Element [5(c)]. *See* Section IX(A)(2)(d).

6) Claim 14

- a) **[Element 14Pre]: The network node of claim 13, wherein the processor is further configured to:**

Jung renders obvious Element [14Pre] for the reasons above with respect to claim 13. *See* Section IX(A)(5).

- b) [Element 14(a)]: transmit a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI**

Jung renders obvious Element [14(a)] for the reasons above with respect to claim 6. *See* Section IX(A)(3).

- c) [Element 14(b)]: wherein the second signal is a Radio Resource Control (RRC) message.**

Jung renders obvious Element [14(b)] for the reasons above with respect to claim 8. *See* Section IX(A)(4).

7) Claim 16

- a) [Element 16Pre]: The method of claim 5, further comprising:**

Jung renders obvious Element [16Pre] for the reasons above with respect to claim 5. *See* Section IX(A)(2).

- b) [Element 16(a)]: transmitting, to the UE, an indication of candidates of network beams for communication with the network node.**

Jung discloses transmitting, to the UE, an indication of candidates of network beams for communication with the network node: “Resources allocated to each UE are allocated to all (or part) of eNB’s reception beams[.]” Ex-1006 at 30, 44 (“eNB periodically allocates a dedicated feedback resource using a UE’s best beam that it has currently known about . . . information regarding an allocated resource through

which UE will transmit the following feedback via uplink: uplink beam, frequency, time, etc.”). In addition, Jung discloses an embodiment in which the candidate network beams are the eNB sweep beams received by a UE:

An uplink resource for the beam feedback may be a resource through which corresponding UE that an eNB has known about can perform transmission/reception using a currently serving beam, a resource through which a UE can perform transmission/reception using a beam that an eNB determined as a receivable beam, **or a resource through which a UE receives (sweep) a number of beams, which can be used by an eNB**, by turns, within an interval.

Ex-1005 at 20:54-61 (emphasis added); *id.* at 23:3-11, 28:10-12; Ex-1006 at 18, 34-35, 82-83.

Thus, a POSITA would understand Jung to disclose transmitting, to the UE, an indication of candidates of network beams for communication with the network node. Ex-1003, ¶162.

8) Claim 18

[Element 18Pre]: The network node of claim 13, wherein the processor is further configured to:

Jung renders obvious Element [18Pre] for the reasons above with respect to claim 13. *See* Section IX(A)(5).

[Element 18(a)]: transmit, to the UE, an indication of candidates of network beams for communication with the network node.

Jung renders obvious Element [18(a)] for the reasons above with respect to Element [16(a)]. *See* Section IX(A)(7)(b).

B. Ground 2: Jung Renders Obvious the Challenged Claims in view of Xiong

1) Xiong is Prior Art.

Xiong qualifies as Section 102 prior art. It was filed on August 3, 2016, and claims priority to a provisional applications filed before the '868 patent's earliest potential priority date (July 22, 2016). Ex-1007 at Cover (showing the provisional application was filed on February 11, 2016). provisional, U.S. Provisional App. No. 62/294,095, provides support for the subject matter in Xiong relied on by this Petition, as shown below. *See Penumbra* at 28-29.

2) Motivation to Combine Jung and Xiong.

A POSITA would have been motivated to combine the teachings of Jung and Xiong. Ex-1003, ¶¶165-179.

a) Jung and Xiong Are From the Same Field of Endeavor and Are Directly Related

As an initial matter, one of ordinary skill in the art when considering the teachings of Jung would have also considered the teachings of Xiong, as they are

analogous prior art pertaining to the same field of endeavor, namely, beamforming in a 5G network. Ex-1003, ¶165; Ex-1005 at Abstract, 1:30-32; Ex-1007 at Abstract, 3:3-10. In addition, both references focus on transmission and reception beam management in high frequency systems, such as mm wave. Ex-1005 at 1:57-67; Ex-1007 at 1:35-42; Ex-1003, ¶167.

b) A POSITA Would Have Readily Observed that Jung and Xiong Address Beam Reference Signals and Beam Measurements

A POSITA would have been further motivated to combine the teachings of Jung and Xiong because both references address utilization aspects of beam reference signals for beam measurements. Ex-1003, ¶¶168-169; Ex-1005 at Abstract, Fig. 11; Ex-1007 at 6:2-5, Figs. 3 and 4.

c) A POSITA Would Have Readily Observed that Jung and Xiong Both Address Methods Related to Beam Selection

A POSITA would also have been motivated to combine the teachings of Jung and Xiong because both references address design aspects of beam selection methods. Ex-1003, ¶¶170-171. For example, “[a]nother aspect of the present disclosure is to provide a method of measuring a reference signal for **selecting** a transmission/reception node and **a beam** of a UE[.]” Ex-1005 at 2:34-36 (emphasis added); *id.* at 2:50-57, Fig. 9. Similarly, Xiong discloses that “[t]he UE can **select**,

at the UE, a selected eNodeB transmission (Tx) beam and a **selected UE reception (Rx) beam** based on a highest power beamforming reference signal (BRS) received power (BRS-RP).” Ex-1007 at Abstract (emphasis added); *id.* at 5:53-58, Fig. 4.

d) A POSITA Would Have Readily Observed that Jung and Xiong Both Address Methods Related to Channel Reciprocity

A POSITA would have been motivated to combine the teachings of Jung and Xiong because both references address beamforming methods related to channel reciprocity. Ex-1003, ¶¶172-174. For example, Jung teaches and explains channel reciprocity: “[w]hen channel reciprocity is assumed, a best beam suitable for a UE to perform transmission is identical to a best beam that an eNB may use to perform transmission.” Ex-1005 at 36:46-49 (emphasis added). As discussed earlier, a POSITA understands that channel reciprocity implies that a best beam for reception is also a best beam for transmission. *See* Sections IX(A)(2)(c)(iii) and IX(A)(2)(d); Ex-1003, ¶172. This concept is expressly taught also by Jung via the Jung Provisional’s disclosure that “**DL Tx = UL Rx**,” Ex-1006 at 24.

Similarly, Xiong addresses methods related to channel reciprocity. For example, “[i]n one aspect, based on channel reciprocity, an eNodeB Tx beam can be the UE Rx beam.” Ex. 1007 at 4:28-29; Ex-1008 at 12, 16. “In one embodiment, the selected eNodeB Tx beam, which can be reciprocal with the UE Rx beam, can have

a BRS-RP with a BRS-RP that has a highest amplitude or a highest received power BRS-RP as compared to the BRS-RP for other eNodeB Tx beams.” Ex-1007 at 6:58-63; Ex-1008 at 12, 13, 16.

Thus a POSITA would have been motivated to combine the teachings of Jung and Xiong as both disclosures address methods related to channel reciprocity. Ex-1003, ¶174.

**e) A POSITA Would Have Desired to Apply the
Solutions in Xiong to Jung to Perform Scheduling
Requests**

As discussed previously, Jung relates to a 5G network. In particular, it is concerned with beamforming designed to overcome the increased propagation loss at the high frequencies expected to be used in 5G. *See* Section VIII(A); Ex-1003, ¶175. Beamforming introduces a spatial dimension in resource management, alongside time and frequency. Ex-1003, ¶175. Jung teaches the transmission of a beam reference signal over a selected network beam, and the selection of a best UE beam via measurements of the beam reference signals. The beams taught by Jung are reciprocal, meaning they can be used for both transmission and reception. *Id.*

Similarly, Xiong also relates to beamforming methods designed to allow 5G systems to operate at mm wave frequencies. *See* Section VIII(B); Ex-1003, ¶176. These methods include the transmission of beam reference signals, and the

measurement of the beam reference signals to select beams. As in Jung, beams are reciprocal, and, for example, a UE beam selected for reception can also be used for transmission. Ex-1003, ¶176; Ex-1008, 12, 13, 16.

Jung teaches the allocation of a resource for transmitting a scheduling request for allocating a resource to perform beam measurement information feedback. For example, “[a] measurement entity (UE) determines to transmit feedback, based on a timing and a criterion, and then requests resource allocation (**scheduling request**)[.]” Ex-1005 at 25:65-26:1 (emphasis added); Ex-1006 at 19.

Xiong discloses transmitting a scheduling request expressly using “the selected UE Rx beam acquired from the BRS-RP measurement.” Ex-1007 at Fig. 4; Ex-1008 at 13.

In light of the fact that Jung already teaches at least the transmission of a “scheduling request,” a POSITA would have desired to apply the Xiong teaching of using the selected UE beam and selected eNB beam for the transmission and reception of the scheduling request. Ex-1003, ¶179.

3) **Claim 5**

- a) **[Element 5Pre]: A method of a network node for transmission or reception using beamforming, the method comprising:**

To the extent the preamble is considered limiting, Jung discloses “a method of a network node for transmission or reception using beamforming” for the same reasons discussed above in Ground 1. *See* Section IX(A)(2)(a).

- b) **[Element 5a]: selecting a network beam;**

Jung discloses selecting a network beam for the same reasons discussed above in Ground 1. *See* Section IX(A)(2)(b).

- c) **[Element 5(b)]: transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling**

Jung in view of Xiong discloses or suggests transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a

scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

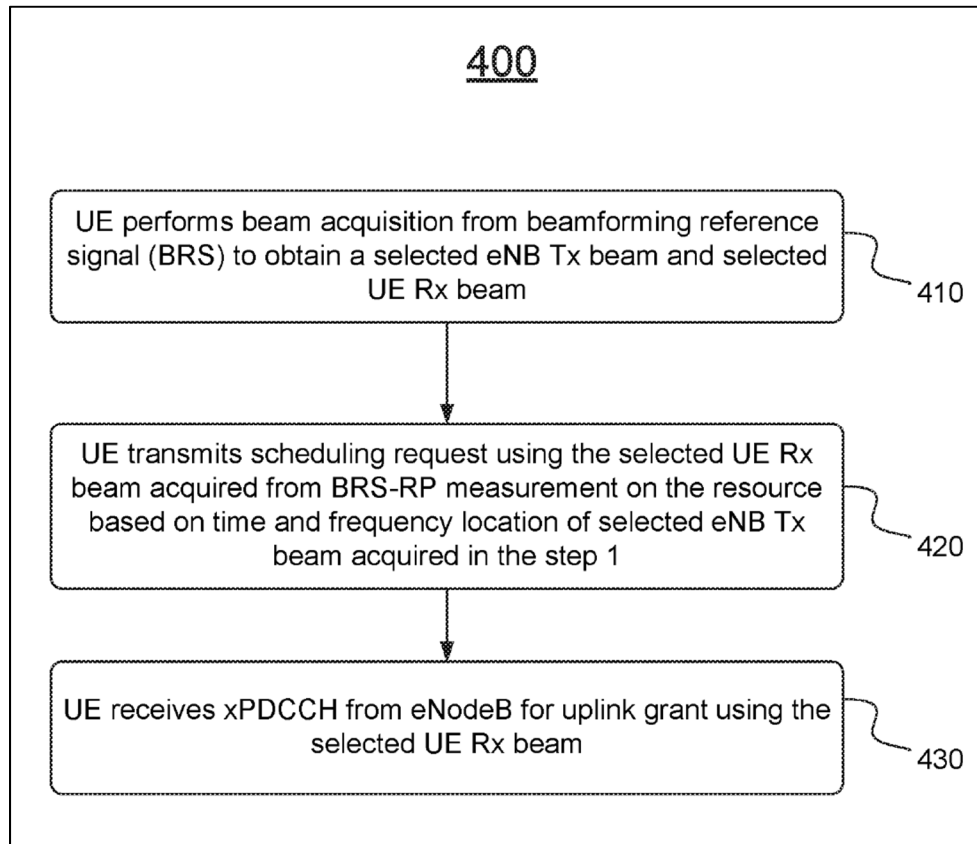
- i. Element 5(b)(1) - Transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam . . . wherein the first signal is a Medium Access Control (MAC) signaling*

As discussed in Ground 1, Jung discloses transmitting a “Medium Access Control (MAC) signaling” to a UE to indicate a first information associated with the network beam. *See* Section IX(A)(2)(c)(i).

- ii. Element 5(b)(2) - Transmitting a first signal . . . for the UE to derive, based on a beam reference signal of the network beam, a UE beam*

As discussed in Ground 1, Jung discloses that the MAC signals associated with Jung’s “first information” are for the UE to derive, based on a beam reference signal of the network beam, a UE beam. *See* Section IX(A)(2)(c)(ii).

To the extent that Jung does not disclose transmitting a first signal for a UE to derive, based on a beam reference signal of the network beam, a UE beam, Xiong describes the UE deriving a UE beam based on a beam reference signal: between a transmission beam from a base station (a “beam using entity”) and a UE (a “beam measurement entity”):



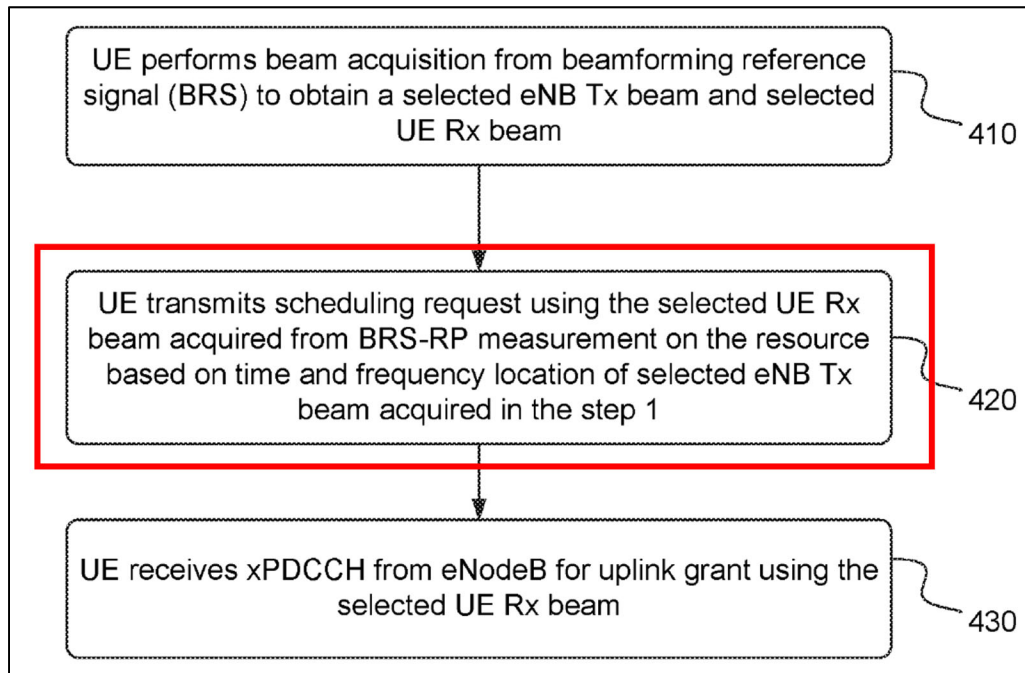
Ex-1007 at Figure 4; *see also, e.g.*, Ex-1007 at 5:48-63; Ex-1008 at 13. Thus, a POSITA would understand that the combination of Jung and Xiong discloses this claim element. Ex-1003, ¶186.

iii. Element 5(b)(3) - a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request

Jung in view of Xiong discloses that the derived UE beam is used to transmit a periodic CSI and to transmit a scheduling request. Jung discloses this element as set forth in Section IX(A)(2)(c)(iii). To the extent Jung alone does not disclose Element [5(b)(3)], Jung in view of Xiong disclose this element based on Xiong's

teaching of a “transceiver of the UE to transmit to the eNodeB a scheduling request (SR) using the selected Rx beam[.]” Ex-1007 at 4:31-32; Ex-1008 at 13; Ex-1003,

¶187. Xiong expands on this disclosure in Figure 4 and the associated discussion:



Ex-1007 at Fig 4, 5:64-6:21; Ex-1008 at 13.

As discussed earlier, both Jung and Xiong teach “channel reciprocity.” Ex-1005 at 36:46-49; Ex-1007 at 4:28-29. Thus, a POSITA understands the “selected UE Rx beam” is also the selected UE beam used for transmission. Ex-1003, ¶188; *see also* Ex-1007 at 6:8-20; Ex-1008 at 12, 13, 16.

Based on these disclosures, a POSITA would understand that Jung in view of Xiong discloses that the derived UE beam is used to transmit a periodic CSI and to transmit a scheduling request. Ex-1003, ¶189.

* * *

Thus, a POSITA would have understood Jung in view of Xiong to teach transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling. Ex-1003, ¶¶ 182-190.

d) [Element 5(c)]: using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

Jung in view of Xiong discloses or suggests using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request. As described above, Jung discloses this element. *See* Section IX(A)(2)(d). To the extent Jung does not disclose it, Xiong does: “the UE can transmit a scheduling request (SR) using a selected UE Rx beam acquired from BRS-RP measurement on the resource based on time and frequency location of a selected eNB Tx beam.” Ex-1007 at 6:2-5; Ex-1008 at 12, 13, 16. Xiong similarly discloses the base station receiving beam feedback (CSI) using the network beam. Ex-1007 at 5:54-63; Ex-1008 at 12, 16.

A POSITA would thus understand Jung in view of Xiong to disclose using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request. Ex-1003, ¶193; *see also* Section IX(A)(2)(c), above.

4) Claim 6

a) [Element 6pre]: The method of claim 5, further comprising

Jung in view of Xiong renders obvious claim 5 for the reasons above. *See* Section IX(B)(3).

b) [Element 6a]: transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

Jung discloses transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI for the same reasons as discussed above in Ground 1. *See* Section IX(A)(3).

5) Claim 8

a) [Element 8pre]: The method of claim 6, further comprising

Jung in view of Xiong renders obvious claim 6 for the reasons above. *See* Section IX(B)(4).

- b) [Element 8a]: the second signal is a Radio Resource Control (RRC) message.**

Jung in view of Xiong discloses that the second signal is a Radio Resource Control (RRC) message. *See* Section IX(B)(4).

6) Claim 13

- a) [Element 13Pre(1)]: A network node for transmission or reception using beamforming comprising:**

To the extent Element [13Pre(1)] is considered limiting, Jung in view of Xiong renders obvious claim Element [13Pre(1)] for the reasons described above with respect to the preamble of claim 5. *See* Section IX(B)(3)(a).

- b) [Element 13pre(2)]: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to:**

To the extent Element [13Pre(2)] is considered limiting, Jung in view of Xiong renders obvious claim Element [13Pre(2)] for the reasons described above with respect to the preamble of claim 5. *See* Section IX(B)(3)(a).

- c) [Element 13(a)]: select a network beam;**

Jung in view of Xiong renders obvious Element [13(a)] for the reasons above with respect to corresponding Element [5(a)]. *See* Section IX(B)(3)(b).

- d) **[Element 13(b)]: transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling;**

Jung in view of Xiong renders obvious Element [13(b)] for the reasons above with respect to corresponding Element [5(b)]. *See* Section IX(B)(3)(c).

- e) **[Element 13(c)]: and use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.**

Jung in view of Xiong renders obvious Element [13(c)] for the reasons above with respect to corresponding Element [5(c)]. *See* Section IX(B)(3)(d).

7) **Claim 14**

- a) **[Element 14Pre]: The network node of claim 13, wherein the processor is further configured to:**

Jung in view of Xiong renders obvious Element [14Pre] for the reasons above with respect to claim 13. *See* Section IX(B)(6).

- b) [Element 14(a)]: transmit a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI**

Jung in view of Xiong renders obvious Element [14(a)] for the reasons above with respect to claim 6. *See* Section IX(B)(4).

- c) [Element 14(b)]: wherein the second signal is a Radio Resource Control (RRC) message.**

Jung in view of Xiong renders obvious Element [14(b)] for the reasons above with respect to claim 8. *See* Section IX(B)(5).

8) Claim 16

- a) [Element 16Pre]: The method of claim 5, further comprising:**

Jung in view of Xiong renders obvious Element [16Pre] for the reasons above with respect to claim 5. *See* Section IX(B)(3).

- b) [Element 16(a)]: transmitting, to the UE, an indication of candidates of network beams for communication with the network node.**

Jung discloses transmitting, to the UE, an indication of candidates of network beams for communication with the network node for the same reasons as discussed above in Ground 1. *See* Section IX(A)(7).

9) Claim 18

- a) [Element 18Pre]: The network node of claim 13,
wherein the processor is further configured to:**

Jung in view of Xiong renders obvious Element [18Pre] for the reasons above with respect to claim 13. *See* Section IX(B)(6).

- b) [Element 18(a)]: transmit, to the UE, an indication of
candidates of network beams for communication with
the network node.**

Jung in view of Xiong renders obvious Element [18(a)] for the reasons above with respect to claim 16. *See* Section IX(B)(8).

X. SECONDARY CONSIDERATIONS

Petitioners are unaware of any evidence of secondary considerations that would support a finding of non-obviousness. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311-12 (Fed. Cir. 2006). The asserted prior art cited herein demonstrates there is no evidence of failure by others and that the features recited in the Challenged Claims were readily available in the prior art. Ex-1003, ¶¶61–209. Even if secondary considerations did exist, they could not overcome the strong prima facie case of obviousness shown in this Petition. *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010). Should Patent Owner attempt to meet its burden to show secondary considerations, Petitioners reserve the right to respond.

XI. INSTITUTION IS PROPER UNDER SECTIONS 314 AND 325

Petitioners have shown that there is a reasonable likelihood of prevailing with respect to at least one Challenged Claim. Petitioners have not filed a civil action challenging the validity of the '868 patent that could bar review under Section 325. This is also the first and only petition challenging any of the '868 patent's claims, which weighs in favor of institution under *General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (P.T.A.B. Sept. 6, 2017). And the prior art relied upon here—Moon and R1-1609515—were not before the Patent Office during prosecution, which further weighs in favor of institution. *Advanced Bioinc, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469 (Paper No. 6) (P.T.A.B. Feb. 13, 2020) (precedential) (looking to “whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office”).

The factors set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 6 (P.T.A.B. Mar. 20, 2020) (“*Fintiv*”) (precedential) also favor institution.

The **first factor** (stay) is neutral, because Petitioners have not yet moved for a stay. *See Hulu LLC v. SITO Mobile R&D IP, LLC et al.*, IPR2021-00298, Paper 11 at 10-11 (P.T.A.B. May 19, 2021).

The **second factor** (proximity) is neutral. As the Director's Interim Guidance explains, “[t]he PTAB will weigh this factor against exercising discretion to deny

institution under *Fintiv* if the median time-to trial is around the same time or after the projected statutory deadline for the PTAB’s final written decision.” Ex-1009, 9. The Interim Guidance further explains that “[w]here the parties rely on time-to-trial statistics, the PTAB will also consider additional supporting factors such as the number of cases before the judge in the parallel litigation” *Id.*

Jury selection is scheduled to begin on July 21, 2025. Ex-1010, 1. With this Petition filed in July 2024, a final written decision may be expected by January 2026, not long after the trial date (and likely before any appealable post-trial decision). The Board has granted institution in cases where the final written decision issued a few months after the scheduled trial date when other factors favor institution. *See Hulu*, IPR2021-00298, Paper 11 at 11-18; *see also NetNut Ltd. v. Bright Data Ltd.*, IPR2021-01492, Paper 12 at 9-16 (P.T.A.B. Mar. 21, 2022) (instituting review with trial date six months before final written decision). Those same factors are present here. In the litigation, moreover, there are multiple defendants, and there will be separate trials. The cases are only consolidated for pretrial. Ex-1011. It is reasonable to expect that all trials will not be complete or through post-trial orders before the final written decision. In these circumstances, the Board treats this factor as neutral. *See CrowdStrike, Inc. v. Open Text Inc.*, IPR2023-00556, Paper 9 at 8 (P.T.A.B. Sept. 12, 2023).

The **third factor** (investment) weighs against denial. The district court litigation is in its early stages. Fact discovery is in its infancy, and the parties have not engaged in expert discovery. Ex-1010, 3-5. The parties have not identified terms for claim construction. *Id.* Nor have there been any substantive orders in the case. The district court's investment is, therefore, minimal. *See PEAG LLC v. Varta Microbattery GmbH*, IPR2020-01214, Paper 8 at 17 (P.T.A.B. Jan. 6, 2021).

Petitioners diligently filed this Petition after they received Patent Owner's infringement contentions that confirmed Petitioners' technology is at the center of the district court litigation. The Board has recognized that "it is often reasonable for a petitioner to wait to file its petition until it learns which claims are being asserted against it in the parallel proceeding." *Fintiv*, IPR2020-00019, Paper 11 at 11. The Board has further found a petitioner acted diligently when filing its petition approximately four months after receiving the infringement contentions, which is close to the six-month timeframe here (Ex-1010, 6). *See Corning Optical Communications LLC v. Dali Wireless, Inc.*, IPR2021-00762, Paper 8 at 9-10 (P.T.A.B. Oct. 31, 2021); *see also Hulu*, IPR2021-00298, Paper 11 at 13-14; *Ericsson Inc. v. Koninklijke KPN N.V.*, IPR2022-00079, Paper 9, 10-11 (P.T.A.B. May 25, 2022) (finding petitioner "very diligent" in filing two months after receiving infringement contentions); *Ericsson Inc. v. Koninklijke KPN N.V.*, IPR2022-00069, Paper 9, 11-12 (P.T.A.B. May 25, 2022) (same).

In addition, Petitioners demonstrated further diligence because the '868 patent was only first asserted in the district court litigation on the day plaintiffs served their infringement contentions. *See, e.g.*, Ex-1018 (First Amended Complaint in the AT&T case, filed January 4, 2024). Plaintiffs delayed asserting the '868 patent until the deadline for infringement contentions. *See* Ex-1010, 6.

Petitioners' diligence in filing and the district court's minimal investment tips this factor in favor of institution. *PEAG*, IPR2020-01214, Paper 8 at 17-18.

The **fourth factor** (overlap) also weighs against denial. Petitioners hereby stipulate that, if trial is instituted, Petitioners will not pursue this IPR's Grounds in the district court litigation. This stipulation eliminates any risk of overlapping effort and results. The Board has confirmed that such a stipulation "mitigates any concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions." *See VMWare, Inc. v. Intellectual Ventures I LLC*, IPR2020-00470, Paper 13 at 20 (P.T.A.B. Aug. 18, 2020) ("Thus, we find that this factor weighs in favor of not exercising discretion to deny institution under 35 U.S.C. § 314(a)."). "Instituting trial here serves overall system efficiency and integrity goals by not duplicating efforts and by resolving materially different patentability issues." *Apple, Inc. v. SEVEN Networks, LLC*, IPR2020-00156, Paper 10 at 19 (P.T.A.B. June 15, 2020); *see also Sand Revolution II, LLC v. Continental*

Intermodal Group-Trucking LLC, IPR2019-01393, Paper 24 at 12 (P.T.A.B. June 16, 2020). This factor, therefore, weighs against discretionary denial.

The **fifth factor** (parties) favors institution. Petitioners are either parties to the district court litigations or have sought to intervene. And if Petitioners Ericsson and Nokia’s motions to intervene are granted, a “holistic view” of the factors likewise favors institution. *See Verizon Business Network Services, Inc. v. Huawei Techs. Co.*, IPR2020-01141, Paper 12, 17 (P.T.A.B Jan. 14, 2021); *Samsung Elecs. Co Ltd., v Dynamics Inc.*, IPR2020-00505, Paper 11, 15 (P.T.A.B. Aug. 12, 2020).

Even if the Board determines that the aforementioned factors favor denial, the Board should not discretionarily deny institution, because this Petition presents compelling merits (the **sixth factor**). *See CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 4-5 (P.T.A.B. Feb. 27, 2023) (precedential). During prosecution Patent Owner pointed to only two points of novelty for the Challenged Claims over Koskela - that the derived UE beam was not used to transmit periodic CSI and a scheduling request, and that this information was not received using the network beam. Ex-1002, 242-243. Jung, both alone and in combination with Xiong—neither of which was before Patent Office—teaches these limitations. This Petition thus presents compelling merits that plainly lead to the conclusion that at least one claim is unpatentable, and the Board should grant institution. *See*

CommScope Techs. LLC v. Dali Wireless, Inc., IPR2022-01242, Paper 24, 75 (P.T.A.B. Mar. 17, 2023).

Due to Petitioners' diligence, it would be premature at the time of this Petition to argue regarding the timing of respective milestones in the proceeding versus the litigation. Thus, if Patent Owner raises § 314(a) arguments in a Preliminary Response, Petitioners respectfully request the opportunity to reply before institution, to address, e.g., the expected schedules of the co-pending cases.

XII. CONCLUSION

Petitioners request institution of IPR and cancellation of the Challenged Claims.

Date: July 26, 2024

Respectfully submitted,

/ Scott W. Hejny /

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CERTIFICATION OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned **PETITION FOR INTER PARTES REVIEW** specified in 37 C.F.R. § 42.24 have **13,996** words, in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24(b)(1). This word count was prepared using Microsoft Word 2010.

Respectfully submitted,

Date: July 26, 2024

/Scott W. Hejny /

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CERTIFICATION OF SERVICE

The undersigned hereby certifies that the above-captioned **PETITION FOR INTER PARTES REVIEW** is being served on counsel for patent owner via FEDERAL EXPRESS, costs prepaid, to the address of the attorney or agent of record at the USPTO: on the next business day, July 29, 2024, in its entirety on the following counsel of record for Patent Owner:

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