

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2023-00571
Patent 10,951,271 B2

Before JUSTIN T. ARBES, JOHN D. HAMANN, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

RAEVSKY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–20 of U.S. Patent No. 10,951,271 B2 (Ex. 1001, “the ’271 patent”). Pet. 1. Apex Beam Technologies LLC (“Patent Owner”) filed a Preliminary Response (Paper 8, “Prelim. Resp.”).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless it is determined that there is a reasonable likelihood that the petitioner would prevail with respect to at least one of the claims challenged in the petition. After considering the parties’ arguments and evidence, and for the reasons set forth below, Petitioner demonstrates a reasonable likelihood of prevailing with respect to at least one of the challenged claims of the ’271 patent. Accordingly, we institute an *inter partes* review with respect to all challenged claims and grounds asserted in the Petition. 37 C.F.R. § 42.108(a) (2022).

Our factual findings and conclusions at this stage of the proceeding are based on the evidentiary record developed thus far. This is not a final decision as to patentability of the challenged claims.

II. BACKGROUND

A. Related Matters

The parties identify the following infringement lawsuits involving the ’271 patent: *Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd. et al.*, No. 2:22-cv-00188-JRG (E.D. Tex.); *Apex Beam Technologies LLC v. ZTE Corporation*, No. 2:22-cv-00031-JRG-RSP (E.D. Tex.); *Apex Beam Technologies LLC v. OnePlus Technology (Shenzhen) Co., Ltd.*, No. 2:22-

cv-00032-JRG (E.D. Tex.); and *Apex Beam Technologies LLC v. TCT Mobile International Limited et al.*, No. 2:21-cv-00438-JRG (E.D. Tex.) (collectively, the “related District Court litigation”). Pet. 65–66; Paper 5, 3.

The following *inter partes* review has also been filed against the ’271 patent: *Samsung Electronics Co. v. Apex Beam Technologies LLC*, IPR2023-00747 (PTAB filed March 29, 2023).

B. Real Parties-in-Interest

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. identify themselves as the only real parties-in-interest (RPI). Pet. 65. Patent Owner identifies itself as the sole RPI. Paper 5, 2.

C. The ’271 patent

The ’271 patent describes a scheme for multi-antenna transmission in a wireless communication system. Ex. 1001, 1:18–19. The ’271 patent explains that massive Multi-Input Multi-Output (MIMO) is a research hotspot of next-generation mobile communications. *Id.* at 1:23–25. In massive MIMO, multiple antennas use beamforming to form a relatively narrow beam which points to a particular direction to improve the quality of communication. *Id.* at 1:25–27. Hybrid beamforming, combining analog beamforming and digital precoding, has become an important research topic for New Radio Technology (NR) systems. *Id.* at 1:33–36.

The ’271 patent further explains that in a massive MIMO system, the base station can perform beam scanning over a period of time resources. *Id.* at 1:40–42. The User Equipment (UE) selects and reports the beam. *Id.* at 1:42–43. However, due to the limitation of air interface resources, the number of beams used for beam scanning and the number of beams reported by the UE are limited. *Id.* at 1:43–45. In addition, due to the uncertainty of

the UE location, the beam used for beam scanning does not necessarily include the beam that best serves the UE. *Id.* at 1:45–48. How to use the information reported by the UE to form the best beam to serve the UE service is a problem the '271 patent attempts to solve. *Id.* at 1:48–50.

In the disclosed method, “K antenna port groups are used to transmit [a] first wireless signal,” and “first signaling is used to determine the K antenna port groups,” where “K is a positive integer greater than 1.” *Id.* at 1:64–67. “[T]he K antenna port groups respectively correspond to K channel quality values,” which “are K non–negative real numbers,” and “the channel quality value is . . . Reference Signal Received Power (RSRP).” *Id.* at 1:67–2:2, 3:63–65. Similarly, “K1 antenna port groups of the K antenna port groups” correspond to “K1 channel quality values of the K channel quality values,” where K1 “is a positive integer less than or equal to the K.” *Id.* at 2:2–5.

Further, “a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values,” and “the first information is used to determine . . . the K1 antenna port groups [and] the first proportional sequence.” *Id.* at 2:5–9. The “K1 channel quality values” include “a first channel quality [that] is a best channel quality value” and “a second channel quality [that] is a worse channel quality value,” and “a ratio between the second channel quality and the first channel quality is greater than or equal to [a] target threshold” determined from the first signaling. *Id.* at 2:9–16. When discussing antenna port groups, the '271 patent explains that an antenna port group may be “composed of one antenna port.” *Id.* at 2:45–46, 13:64–65.

D. Challenged Claims

Claim 1, below, is illustrative of the challenged claims. Additional paragraph breaks and Petitioner's claim element labels are included for ease of reference.

1. A method for multi-antenna transmission in a user equipment (UE), comprising:

[1a] receiving, by the UE, a first signaling originating from a base station;

[1b] receiving, by the UE, a first wireless signal originating from the base station; and

[1c] transmitting, by the UE, first information to the base station;

[1d]

[1d1] wherein, K antenna port groups of the base station are used to transmit the first wireless signal;

[1d2] the first signaling is used by the UE to determine the K antenna port groups transmitting the first wireless signal received by the UE; the K is a positive integer greater than 1;

[1d3] the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; the K channel quality values are Reference Signal Received Powers (RSRPs) or a Signal to Interference plus Noise Ratios (SINRs);

[1d4] K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K;

[1d5] a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values;

[1d6] the first information is used to determine the K1 antenna port groups and the first proportional sequence;

[1d7] the first signaling is used to determine a target threshold; the target threshold is a non-negative real number;

[1d8] a first channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values;

[1d9] a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold.

Ex. 1001, 27:14–47; *see* Pet. 10–35, Claims Appendix.

E. Asserted Ground of Unpatentability

Petitioner asserts the following ground of unpatentability (Pet. 9):

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1–20	103	Liu, ² Park ³

Petitioner also relies on the declaration of Dr. Apostolos K. Kakaes (Ex. 1003). Patent Owner has not submitted declaration testimony at this stage.

III. ANALYSIS

A. Discretion under 35 U.S.C. § 314(a)

Patent Owner argues that we should exercise discretion under § 314(a) to deny institution in light of the related District Court litigation. Prelim. Resp. 25–32.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. §§ 102, 103 effective March 16, 2013. The ’113 patent’s earliest claimed priority application was filed after March 16, 2013, so the AIA versions of §§ 102, 103 apply. Ex. 1001, code (30).

² WIPO Publication No. WO 2016/015307 A1 to Liu, published Feb. 4, 2016 (Ex. 1006).

³ WIPO Publication No. WO 2016/126099 A1 to Park, published Aug. 11, 2016 (Ex. 1009).

We consider the following factors when determining whether to deny institution under § 314(a) based on a parallel district court proceeding:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board's exercise of discretion, including the merits.

Apple Inc. v. Fintiv, Inc., IPR2020-00019, Paper 11 at 5–6 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). We also consider “several clarifications” made by the Director of the United States Patent and Trademark Office (“USPTO”). See USPTO Memorandum, Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation, 2 (June 21, 2022) (“Director’s Memo”).⁴

The Director’s Memo provides that “[c]onsistent with *Sotera Wireless, Inc.*,^[5] the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that

⁴ Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

⁵ *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18–19 (PTAB Dec. 1, 2020) (precedential).

could have reasonably been raised before the PTAB.” Director’s Memo 3. With our authorization, Petitioner has filed a stipulation which stipulates that “if the PTAB institutes *inter partes* review, Petitioner ‘will not pursue in [*Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd. et al.*, Case No. 2:22-cv-00188-JRG (E.D. Tex.) (consolidated with *Apex Beam Technologies LLC v. ZTE Corporation*, Case No. 2:22-cv-00031-JRG-RSP (E.D. Tex.))] the specific grounds [asserted in IPR2023-00571], or . . . any other ground . . . that was raised or could have been reasonably raised in an IPR (i.e., any ground that could be raised under §§ 102 or 103 on the basis of prior art patent or printed publications).” Ex. 1032, 1.

We determine that the language of this stipulation sufficiently comports with the language of the Director’s Memo, consistent with *Sotera Wireless, Inc.* See Director’s Memo 3. We accordingly decline to discretionarily deny institution in view of the related District Court litigation.⁶

B. Notice Ranking Petitions

Petitioner filed two concurrent petitions (IPR2023-00571 and IPR2023-00747) challenging the patentability of claims 1–20 of the ’271 patent. Consistent with the Board’s practice for handling parallel petitions provided in the Consolidated Trial Practice Guide (“CTPG” or “Trial Practice Guide”),⁷ Petitioner filed a Notice Ranking Petitions (Paper 2,

⁶ Patent Owner urges us not to accept a “late” *Sotera* stipulation. Prelim. Resp. 33–35. We disagree that Petitioner’s *Sotera* stipulation is late. It is within our discretion to permit Petitioner to file a stipulation prior to institution. See *NXP USA, Inc. v. Impinj, Inc.*, IPR2021-01566, Paper 13 (PTAB Sept. 7, 2022) (precedential).

⁷ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

“Notice”). *See* CTPG 59–60. Patent Owner did not file a response to Petitioner’s Notice or address the Notice in its Preliminary Response.

In the Notice, Petitioner states that although it “believes that both Petitions are meritorious and justified,” it ranks the Petition filed in this proceeding first and the -00747 petition second. Notice, 1. Although we have discretion to deny a parallel petition under 35 U.S.C. § 314(a) (*see* CTPG 61), in light of Petitioner ranking this Petition first, we decline to exercise that discretion here.

C. Principles of Law

A claim is unpatentable as obvious if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a)). We resolve the question of obviousness based on underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the prior art and the claims; (3) the level of skill in the art; and (4) when in evidence, objective indicia of nonobviousness. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

We apply these principles to the Petition’s challenges.

D. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 13, 17. Petitioner asserts that

A person of ordinary skill in the art (“POSITA”) would have had at least a master’s degree in electrical engineering or a similar field and at least two years of experience working with telecommunications systems, including multiple-input multiple-output (“MIMO”) technology. Additional relevant work experience can compensate for less education, and vice versa.

Pet. 9 (citing Ex. 1003 ¶ 81).

Patent Owner uses Petitioner’s proposed level of skill in the art at this stage. Prelim. Resp. 9. We are persuaded, on the present record, that Petitioner’s proposal is consistent with the problems and solutions in the ’271 patent and prior art of record. We adopt Petitioner’s definition of the level of skill for the purposes of this Decision, except that we do not include in our definition Petitioner’s last sentence regarding additional relevant work experience compensating for less education and *vice versa*, as this sentence is vague.

E. Claim Construction

In *inter partes* review, we construe a claim using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b).

The parties do not propose any claim constructions. *See* Pet. 4; Prelim. Resp. 9. As no terms are in dispute, we determine that no terms require construction at this stage. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve

the controversy.” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

However, for reasons explained below, we invite the parties to construe limitation [1d5] during trial.

F. Asserted Obviousness over Liu and Park

Petitioner contends that claims 1–20 would have been obvious over the combination of Liu and Park. Pet. 9–63.

1. Overview of Liu

Liu describes a “signal transmission method and an associated device for performing more effective antenna selection.” Ex. 1006, 1. Liu further discloses that “[d]uring antenna configuration, a second network device transmits configuration information of M antenna ports . . . and transmits signals of the M antenna ports to [a] first network device, which receives the signals of the M antenna ports transmitted by the second network device based on the configuration information.” *Id.* at 15. Liu explains that “the first network device may be user equipment (UE), and the second network device may be a base station.” *Id.*

2. Overview of Park

Park “relates to a wireless communication system” and discloses a “method for feeding back [channel state information (CSI)] from a terminal based on a reference signal.” Ex. 1009 ¶ 1. Park’s UE measures the signal strength of a serving cell and a neighbor cell, “including measuring the reference signal receive power (RSRP).” *Id.* ¶ 292. Based on these RSRP measurements, Park selects antenna ports “that are received strongly” and “limits reporting to RSRPs of ports that are within a certain difference compared to the RSRP of the selected antenna ports.” *Id.* ¶ 372.

3. *Independent Claim 1*

a. *Undisputed limitations*

Petitioner asserts that, to the extent the preamble is limiting, Liu teaches the preamble by disclosing “a first network device [UE] receives signals of M antenna ports transmitted by a second network device [base station].”⁸ Pet. 10 (citing Ex. 1006, 15; Ex. 1003 ¶¶ 96–97).

Petitioner contends that Liu discloses limitation [1a], “receiving, by the UE, a first signaling originating from a base station,” by describing that its base station “transmits configuration information of M antenna ports to a first network device [UE].” *Id.* at 10–11 (citing Ex. 1006, 15; Ex. 1003 ¶¶ 98–100).

Petitioner also contends that Liu discloses limitation [1b], “receiving, by the UE, a first wireless signal originating from the base station,” by describing the “second network device [base station] . . . transmits signals of the M antenna ports to the first network device [UE].” *Id.* at 13 (citing Ex. 1006, 15; Ex. 1003 ¶¶ 101–103).

Petitioner further contends that Liu discloses limitation [1d7], “the first signaling is used to determine a target threshold; the target threshold is a non-negative real number,” by disclosing that the UE uses a “first criterion” or threshold, such as an SNR threshold, throughput threshold, or codebook information, to determine the selected (N or K1) antenna ports, and that the threshold “may be predefined or provided through base station broadcasting.” *Id.* at 32 (citing Ex. 1006, 16–17; Ex. 1003 ¶¶ 144–148).

⁸ We omit both parties’ italicization of reference names throughout this decision.

Petitioner further contends that Liu discloses limitation [1d8], “a first channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values,” by disclosing calculating the RSRP (“channel quality value”) for each of the N (K1) antenna port groups within the M or X antenna port groups, where the RSRP values are compared and ranked from best (maximum value) to worse (less than the maximum value). *Id.* at 34 (citing Ex. 1003 ¶¶ 149–151; Ex. 1006, 17, 26).

Finally, Petitioner contends that Liu and Park disclose limitation [1d9], “a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold.” *Id.* at 35. For instance, Petitioner argues, Liu discloses that the criterion or threshold for selecting antenna port groups may rely on a power ratio calculation that is “greater than or equal to” a particular threshold, including power ratios, such as signal-to-noise (SNR) ratios. *Id.* (citing Ex. 1006, *passim*; Ex. 1003 ¶¶ 153–163). Petitioner further argues this limitation based on the combination of Liu and Park, asserting that “Liu and Park both teach determining power ratio measurements (e.g., SNR or RSRP ratio) for antenna port groups and comparing the power ratio to a threshold value.” *Id.* at 36 (citing Ex. 1009 ¶ 385; Ex. 1003 ¶ 154). Petitioner also sets forth a rationale to combine these references, with a reasonable expectation of success, for both limitations [1d5] and [1d9]. *See id.* at 27–29, 38–39.

Patent Owner does not dispute Petitioner’s arguments regarding the preamble or these limitations at this stage; nor does Patent Owner dispute Petitioner’s rationale to combine Liu and Park. We determine that on this record, Petitioner has made a sufficient showing that the combination of Liu

and Park discloses the preamble (whether or not limiting) and these limitations, and that one of ordinary skill in the art would have combined Liu and Park, with a reasonable expectation of success.

- b. [1d1] wherein, *K* antenna port groups of the base station are used to transmit the first wireless signal;
... [1d2] the *K* is a positive integer greater than 1

Patent Owner argues limitations [1d1] and a portion of limitation [1d2] together, so we also address them together. Prelim. Resp. 12–15.⁹

For limitation [1d1], Petitioner first argues that Liu’s base station “transmits signals of the *M* antenna ports” to the UE. Pet. 16 (citing Ex. 1006, 15). Noting that the ’271 patent teaches that an “antenna port group may include only one antenna port,” Petitioner contends that Liu’s “*M* individual antenna ports . . . correspond to *K* antenna port groups having one port per group.” *Id.* (citing Ex. 1001, 13:64–65, 2:45–46; Ex. 1003 ¶ 110).

On this point, Patent Owner contends that Liu’s “*M* antenna ports” do not disclose “*K* antenna **port groups**,” as “Liu makes an explicit distinction between antenna port groups and singular antenna ports.” Prelim. Resp. 12–13 (citing Ex. 1006, 32 (“**transmitting signals of *M* antenna ports**”)). We find this argument unavailing, as Patent Owner does not address the disclosure in the ’271 patent, cited by Petitioner in the Petition, that “the antenna port group [may] include[] only one antenna port.” Ex. 1001, 13:64–65; *see also id.* at 2:45–46 (“In one embodiment, the antenna port group is composed of one antenna port.”). Thus, on this record, we find

⁹ We address the remainder of limitation [1d2], “the first signaling is used by the UE to determine the *K* antenna port groups transmitting the first wireless signal received by the UE,” in the next section.

persuasive Petitioner’s argument that Liu’s “M individual antenna ports . . . correspond to K antenna port groups having one port per group.” Pet. 16.¹⁰

Petitioner sets forth an alternative argument for this limitation, which is that Liu discloses “the M antenna ports are divided into X groups,” and the “base station individually configures one codebook set for each antenna port group.” Pet. 16–17. Petitioner contends that “a POSITA would have understood [this] describes the base station transmitting the wireless signal for each of the X (K) antenna port groups.” *Id.* at 17 (citing Ex. 1006, 21; Ex. 1003 ¶ 112). This is “because the codebook information for each group corresponds to the matrix that describes the beam pattern transmitted by the base station and received by the UE for that port group.” *Id.* (citing Ex. 1006, 21; Ex. 1003 ¶ 112). For example, Petitioner argues, Liu’s UE “measures . . . 5 groups of antenna ports” and records the receive signal power (RSRP) for each cell’s wireless signal, “which confirms a POSITA’s understanding that each group of antenna ports (e.g., cell) is used to transmit a corresponding wireless signal.” *Id.* (citing Ex. 1006, 26; Ex. 1003 ¶ 112).

Patent Owner disputes Petitioner’s reliance on Liu’s “codebook sets” because “Liu’s codebook sets . . . are not the same as the claimed first wireless signal.” Prelim. Resp. 14. Rather, Patent Owner argues, Liu describes codebook information relating to “antenna configuration, but **configuration** is not a base station **transmission** of a first wireless signal.” *Id.* at 14–15 (citing Ex. 1006, 21). Further, Patent Owner contends that Liu’s UE uses the codebooks, which is “not the same as transmitting the first

¹⁰ To the extent Patent Owner disagrees that the term “antenna port groups” should be interpreted as Petitioner argues, Patent Owner should make its claim construction position explicit during trial.

wireless signal *from the base station*.” *Id.* at 15 (citing Ex. 1006, 21–22). Even if Liu’s codebook information were transmitted from the base station, Patent Owner argues, “it would be on an antenna port by antenna port basis as described above, and not collectively transmitted by multiple antenna port groups.” *Id.*

It appears, on this record, that Liu’s codebook disclosure may meet this limitation, as Liu teaches, for example, that “alternatively, first information of the N antenna ports is transmitted to the second network device [base station], which determines the N antenna ports,” and that “the M antenna ports are divided into X groups, and *the base station* individually configures one codebook set *for each antenna port group*.” Ex. 1006, 16, 21 (emphasis added). Liu further teaches that the UE calculates “mean reference signal receiving power (RSRP)” and “feeds back the index corresponding to the antenna configuration having the largest RSRP to the base station,” which appears to suggest that the base station will use this information to transmit the first wireless signal on “the antenna configuration.” *Id.* at 21–22. All these disclosures appear to support Dr. Kakaes’s testimony that “a POSITA would have understood [that Liu] describes the base station transmitting the wireless signal for each of the X (K in the ’271 patent) antenna port groups.” Ex. 1003 ¶ 112.

However, Liu’s teaching that “the base station individually configures one codebook set for each antenna port group” is somewhat unclear. *See* Ex. 1006, 21. This statement refers to the base station *configuring* antenna port groups but, standing alone, does not appear to refer to *transmitting* using multiple antenna port groups, although such appears to be implied by this statement and the surrounding disclosure discussed above. *See id.* The

parties should clarify how Liu’s codebook disclosure allegedly meets, or does not meet, limitation [1d1] during trial. Regardless, Petitioner’s first argument based on the ’271 patent’s broad disclosure that “the antenna port group [may] include[] only one antenna port,” addressed above, is sufficient to meet Petitioner’s institution burden for limitation [1d1]. *See* Pet. 16 (citing Ex. 1001, 13:64–65, 2:45–46; Ex. 1003 ¶ 110).

For the portion of limitation [1d2] highlighted above, “the K is a positive integer greater than 1,” Petitioner argues that Liu discloses “M is a positive integer” and “X is a positive integer.” Pet. 17 (citing Ex. 1006, 15, 23, 31). Petitioner also points to Liu’s Figure 2, which shows “a configuration diagram of multiple [greater than one] antennas in an exemplary active antenna array.” *Id.* at 17–18 (citing Ex. 1006, 15; Ex. 1003 ¶ 114). Petitioner also quotes Liu’s disclosure of “M antenna ports,” i.e., plural antenna ports. *Id.* at 18 (citing Ex. 1006, 16, 23, 25, 32).

Patent Owner responds that “Petitioner failed to specify where this required element of the claim is found in the prior art,” but Patent Owner does not address the disclosures of Liu relied on by Petitioner and discussed above. Prelim. Resp. 13. Based on those disclosures, we determine that Petitioner sufficiently explains for institution purposes that Liu discloses “the K is a positive integer greater than 1.” *See* Pet. 17–18.

Accordingly, at this stage, Petitioner persuades us that Liu discloses limitations [1d1] and the portion of [1d2] addressed in this section.

c. [1d2] the first signaling is used by the UE to determine the K antenna port groups transmitting the first wireless signal received by the UE

We next address the remainder of limitation [1d2], “the first signaling is used by the UE to determine the K antenna port groups transmitting the

first wireless signal received by the UE.” Petitioner contends that Liu uses the configuration information described above for limitation [1a] to determine the M antenna port groups transmitting the first wireless signal received by the UE. Pet. 18 (citing Ex. 1003 ¶ 115). Petitioner contends that a POSITA would have understood that the UE uses this configuration information and broadcasting and signal notifications (“first signaling”) to determine the M antenna port groups “because the configuration information specifies the antenna port groups and includes ‘an antenna port pattern’ and ‘[c]odebook information [that] refers to information containing multiple precoding matrices’ of the antenna port groups.” *Id.* (citing Ex. 1006, 16, 21; Ex. 1003 ¶ 115). Petitioner further contends that the “UE uses this information to determine and measure the antenna port groups,” and once it has done so, the UE “selects the best antenna configuration and sends the identifying information to the base station.” *Id.* at 18–19 (citing Ex. 1006, 16, 21; Ex. 1003 ¶ 115).

Patent Owner repeats arguments from the previous limitations, which we find unavailing on this record. Prelim. Resp. 16–17. Patent Owner additionally argues that “Liu does not disclose any of the types of information that would be indicative of disclosing the claimed first signaling.” *Id.* at 18. Pointing to the ’271 patent specification’s disclosure of quasi-co-located (QCL) information as the claimed “first signaling,” Patent Owner contends that Liu lacks a description of such QCL information. *Id.* (citing Ex. 1001, 6:44–49).

At this stage, Petitioner persuades us that Liu discloses this limitation. On this record, we find that Liu discloses the first signaling information (including configuration information) as explained above for limitation [1a],

which Patent Owner does not challenge. Further, we agree on this record that Liu’s UE uses this configuration information to determine the M antenna port groups “because the configuration information specifies the antenna port groups and includes ‘an antenna port pattern’ and ‘[c]odebook information [that] refers to information containing multiple precoding matrices’ of the antenna port groups.” Pet. 18 (citing Ex. 1006, 16, 21; Ex. 1003 ¶ 115). Patent Owner’s argument based on disclosed but not claimed QCL information is unavailing.¹¹

- d. [1d3] the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; the K channel quality values are Reference Signal Received Powers (RSRPs) or a Signal to Interference plus Noise Ratios (SINRs); . . . [1d5] a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values*

Patent Owner argues limitations [1d3] through [1d5] together.¹² Prelim. Resp. 19–22. We address limitations [1d3] and [1d5] in this section and address limitation [1d4] in the next section.

For limitation [1d3], Petitioner contends that Liu’s channel state information (“CSI”) includes “a channel quality value, such as RSRP.” Pet.

¹¹ To the extent Patent Owner is relying on an implicit claim construction of “first signaling,” Patent Owner should make this construction explicit during trial. However, we note that the QCL disclosure Patent Owner relies on is couched in “embodiment” language and, without more, does not warrant limiting the claims. See Prelim. Resp. 18 (citing Ex. 1001, 6:44–49).

¹² Limitations [1d3] through [1d5] constitute a large block of text. To the extent possible during trial, for clarity, the Board requests Patent Owner to address individual limitations separately in its briefing, preferably under separate headings. For consistency, Patent Owner should also follow Petitioner’s claim element numbering.

19–20 (citing Ex. 1006, 21 (“the [UE] employs a random beamforming approach in the codebook set . . . to calculate and report mean reference signal receiving power (RSRP)”). Petitioner adds, “a POSITA would have recognized [RSRP] is a non-negative real number, because RSRP is the received power in Watts of the wireless signal, which a POSITA would have known is always a non-negative real number.” *Id.* at 19–20 (citing Ex. 1006, 21; Ex. 1003 ¶ 117).

For limitation [1d5], Petitioner asserts obviousness based on Liu alone as well as Liu in combination with Park. *Id.* at 22. Petitioner first contends that “Liu discloses determining a reference signal receiving quality (RSRQ), which a POSITA would have recognized is a ratio of RSRP over the received signal strength indicator (RSSI).” *Id.* (citing Ex. 1003 ¶ 126; Ex. 1006, 21, 30–31, 16, 26). Petitioner further explains that Liu’s RSRQ for the N (K1) antenna port groups of the M antenna port groups (see limitation [1d4] below) “together form a proportional sequence of RSRP and RSSI ratios.” *Id.* (citing Ex. 1009 ¶ 295; Ex. 1014, 514; Ex. 1003 ¶ 126). In so stating, Petitioner and Dr. Kakaes cite Park, rather than Liu. *Id.*; Ex. 1003 ¶ 126. Because Petitioner appears to argue earlier that Liu alone discloses or suggests this limitation, but then cites to Park for the claimed “first proportional sequence,” Petitioner should clarify during trial whether it truly relies on Liu alone. For purposes of determining whether to institute trial, we assume that Petitioner relies solely on the combination of Liu and Park for limitation [1d5].

Patent Owner, addressing Petitioner’s reliance on Liu for limitation [1d3] and the “ratio(ratios)” portion of [1d5], argues that “Liu’s RSSI falls squarely outside of the claim language that describes ‘the K channel quality

values are Reference Signal Received Powers (RSRPs) or a Signal to Interference plus Noise Ratios (SINRs).” Prelim. Resp. 19. Patent Owner provides no further explanation for this assertion. For example, Patent Owner does not dispute Dr. Kakaes’s testimony that a POSITA would have recognized RSRP as a ratio of RSRP over the received signal strength indicator (RSSI). *See id.*; Ex. 1003 ¶ 126; Pet. 22. We find Petitioner’s argument for limitation [1d3] and limitation [1d5]’s “ratio(ratios) among the K1 channel quality values” to be supported by Dr. Kakaes’s testimony and persuasive at this stage.

We now turn to Petitioner’s Park-specific arguments regarding the “first proportional sequence” portion of limitation [1d5]. Petitioner contends that in Park, “[a] POSITA would have recognized that an ‘RSRP ratio’ describes the power ratio $\text{RSRP}(r,m)/\text{max}(\text{RSRP}(r,m))$.” Pet. 24 (citing Ex. 1003 ¶ 129). Petitioner explains that “Park’s FIG. 12 confirms the comparison of each measured RSRP to the $\text{max}(\text{RSRP})$, which forms a proportional sequence of RSRP ratios.” *Id.* (citing Ex. 1009 ¶¶ 376–378; Ex. 1003 ¶ 130).

Patent Owner argues that Petitioner mischaracterizes Park, which “merely describ[es] that differences in RSRP can be expressed as a ratio.” Prelim. Resp. 20 (citing Ex. 1009 ¶¶ 372–378). Regardless, Patent Owner contends, Park still does not disclose “creating a proportional *sequence*” as claimed. *Id.* at 20–21. On this point, Patent Owner points to the ’271 patent specification, arguing that the claimed “proportional sequence” has a meaning related to a “best channel quality value”:

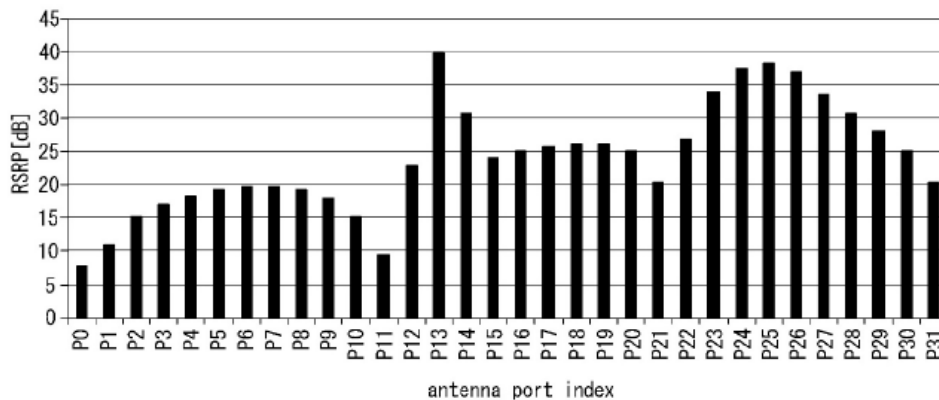
[t]he claimed language, in view of the ’271 Patent specification, is clear that the embodiment utilizing channel quality values of RSRP would create a proportion of one RSRP to all the other

RSRPs in the K1 subset of antenna port groups to create a proportional sequence (*i.e.*, a sequence comprising ratios between channel quality values ***other than the best channel quality value***).

Id. at 21 (citing Ex. 1001, 4:29–36); *see also id.* at 21–22 (similar) (citing Ex. 1001, 24:18–31).

On this record, Petitioner persuades us that the combination of Liu and Park discloses this limitation. Petitioner persuasively explains, as supported by Dr. Kakaes’s testimony, that “[a] POSITA would have recognized that an ‘RSRP ratio’ describes the power ratio $\text{RSRP}(r,m)/\max(\text{RSRP}(r,m))$ Park’s FIG. 12 confirms the comparison of each measured RSRP to the $\max(\text{RSRP})$, which forms a proportional sequence of RSRP ratios.” Pet. 24 (citing Ex. 1009 ¶¶ 376–378, Fig. 12; Ex. 1003 ¶¶ 129–130). We reproduce Figure 12 of Park below:

[FIG. 12]



Park explains that Figure 12 shows exemplary RSRPs for each antenna port of 32 antenna ports. Ex. 1009 ¶ 377. We agree at this stage that Figure 12 and the corresponding context in paragraphs 372–378 of Park appear to disclose a proportional sequence corresponding to ratios of channel quality values (e.g., RSRP values compared to a maximum RSRP value). *See*

Ex. 1003 ¶ 130. We note, however, that the parties have not addressed in detail the meaning of limitation [1d5], including the meaning of the terms “proportional” and “corresponds.” It is unclear, for example, if the word “corresponds” in “first proportional sequence corresponds to a ratio(ratios)” means that the first proportional sequence *is* merely a sequence of ratios. It is also unclear whether the word “proportional” imposes an additional, as yet unspecified, requirement for the sequence of ratios, or what quantity the sequence may be proportional to. We invite the parties to construe limitation [1d5] during trial.

Patent Owner’s argument against Petitioner’s application of Park is unavailing because Patent Owner attempts to import unclaimed embodiments from the ’271 patent specification. *See* Prelim. Resp. 21–22. The portions of the specification Patent Owner relies on are couched in “embodiment” language, which on this record, is not shown to be limiting. *See id.*; Ex. 1001, 4:29–36 (“In one embodiment”), 24:15–31 (“In Embodiment 9”).

Petitioner also sets forth an alternative argument on limitation [1d5]. Petitioner points to Patent Owner’s infringement contentions from the related District Court litigation, which allegedly argue that limitations [1d5]–[1d9] “can be satisfied by subtracting dB values.” Pet. 25. Petitioner contends that Park also teaches limitation [1d5] due to Park’s Equation 13: “ $RSRP(r,m) - \max(RSRP(r,m)) > \text{Threshold}$.” *Id.* (citing Ex. 1009 ¶¶ 372–373; Ex. 1003 ¶ 131). At this stage, Petitioner’s alternative argument may have merit, but it is unclear at this stage. We invite the parties to address this argument further at trial. But the parties should address more specifically whether Equation 13 teaches the claimed proportional sequence,

independent of any reference to Patent Owner's infringement contentions. The relevant inquiry is whether the proposed combination of Liu and Park discloses the claim limitation at issue, not whether Patent Owner made a similar comparison to any allegedly infringing device. Thus, during trial, the parties should avoid discussing the alleged infringing device(s) and instead should focus on comparing the claims with the proposed combination. *See* 35 U.S.C. § 311(b) ("A petitioner in an inter partes review may request to cancel as unpatentable 1 or more claims of a patent only on a ground that could be raised under section 102 or 103 and *only on the basis of prior art consisting of patents or printed publications.*" (emphasis added)).

As for rationale to combine, Petitioner contends, for example, that "[a] POSITA would have been motivated to use Park's proportional sequence to compare a ratio of Liu's measured RSRP values for each of the K1 antenna port groups to identify the 'strongly received' signals, as explained by Park." Pet. 27 (citing Ex. 1003 ¶¶ 134–137). Petitioner sets forth a detailed rationale to combine with reasonable expectation of success, which Patent Owner does not challenge at this stage. *Id.* at 27–29.

On this record, we agree with Petitioner that the combination of Liu and Park discloses limitations [1d3] and [1d5] and that one of ordinary skill in the art would have combined Liu and Park, with a reasonable expectation of success.¹³

¹³ As we assume above that Petitioner relies solely on the combination of Liu and Park for this limitation, and not Liu alone, we do not decide at this stage whether Liu alone discloses limitation [1d5].

- e. [1d4] K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K*

For this limitation, Petitioner contends that “Liu’s UE determines the channel quality values (RSRP) for a subset, N, of the M antenna ports transmitting the wireless signal where ‘N is an integer less than or equal to M.’” Pet. 21 (citing Ex. 1006, Abstract, 16, Fig. 1; Ex. 1003 ¶ 123). Petitioner further explains that the “UE selects N (K1) antenna port groups and sends the channel quality value information (RSRP) back to the base station as first information, for example, using a ‘feedback unit’ for ‘selecting N antenna ports from among M antenna ports.’” *Id.* (citing Ex. 1006, 7, 11; Ex. 1003 ¶ 124).

Patent Owner contends that “the description of Park discusses creating RSRP ratios for ‘a maximum of L antenna ports,’ instead of RSRP ratios for a subset of antenna port groups (e.g., K1 out of a K total antenna port groups), as the claim limitation requires.” Prelim. Resp. 22 (citing Ex. 1009 ¶ 372). At this stage, Patent Owner’s argument is inapposite because Petitioner relies on Liu, not Park, for this limitation. We agree with Petitioner at this stage that Liu discloses limitation [1d4].

- f. [1d6] the first information is used to determine the K1 antenna port groups and the first proportional sequence [and] [1c] transmitting, by the UE, first information to the base station*

Patent Owner argues limitations [1d6] and [1c] together, so we also address them together. Prelim. Resp. 22–24. For limitation [1c], Petitioner argues that “Liu’s UE transmits first information about the received wireless signal back to the base station after measuring each port signal, including

‘channel state information (CSI),’ such as RSRP, or ‘index information’ corresponding to antenna port or port groups selected by the UE.” Pet. 14 (citing Ex. 1006, 16, 17; Ex. 1003 ¶ 105). For limitation [1d6], Petitioner argues that “Park’s ‘UE reports antenna ports with an RSRP’ ratio or difference from the max(RSRP) over a desired threshold to determine the selected port groups (e.g., Liu’s N or K1 antenna port groups).” *Id.* at 30 (citing Ex. 1009 ¶ 378; Ex. 1003 ¶ 141). Further, Petitioner contends that “[a] POSITA would have found it obvious to use Liu’s RSRP values to create the proportional sequence, as described for [1d5], which would, in turn, be used to select Liu’s N (K1) antenna port groups that ‘cause the [base station] to transmit data on these N antenna ports to the [UE].” *Id.* at 31 (citing Ex. 1006, 17; Ex. 1003 ¶ 142).

Patent Owner contends that because the Liu-Park combination does not disclose the claimed “first proportional sequence” in limitation [1d5], it cannot disclose limitation [1d6]. Prelim. Resp. 23. Similarly, Patent Owner contends that “Liu does not describe determining a subdivision of antenna port groups from K into K1,” appearing to rely on its prior argument that Liu’s ports “are individual ports” and not the claimed “determin[ation] of K1 antenna port groups.” *Id.* We have addressed these arguments above and find them unavailing on this record. Finally, Patent Owner charges Petitioner with failing to set forth a motivation to combine Liu and Park for this limitation. *Id.* at 23–24. We also find this contention unavailing because Petitioner relies on its rationale to combine from the previous limitation [1d5], which we find sufficient at this stage. Pet. 31.

Thus, at this stage we agree with Petitioner that the combination of Liu and Park discloses limitations [1c] and [1d6].

g. Petitioner's Expert Declaration

Relying on our recent precedential *Xerox* decision, Patent Owner also contends that we should give “no weight” to Dr. Kakaes’s declaration because it is “almost entirely a recitation of the Petition.” Prelim. Resp. 32–33 (citing *Xerox Corp. v. Bytemar, Inc.*, IPR2022-00624, Paper 9 (PTAB Aug. 24, 2022) (precedential); 37 C.F.R. § 42.65(a)). Patent Owner asserts that “[b]ecause Dr. Kakaes provides nearly no independent analysis, aside from copying the attorney arguments in the Petition, and does not disclose the underlying facts or data upon which his opinions are based, his opinion should be entitled to no weight.” *Id.*

We do not read *Xerox* to require us to give little weight to an expert declaration solely because some or all of it is also within the Petition. Rather, the Board in *Xerox* found a declaration entitled to little weight where the declaration “merely repeat[ed], *verbatim*, the conclusory assertion for which it is offered to support.” *Xerox*, Paper 9 at 15. Patent Owner does not point to any specific statements in Dr. Kakaes’s declaration that Patent Owner believes are conclusory, and thus, Patent Owner has not persuasively explained the applicability of *Xerox* here. Moreover, we will also be able to more fully assess the weight to be given to Dr. Kakaes’s declaration in the context of a full trial record, which may include Dr. Kakaes’s cross-examination testimony. Accordingly, at this stage, we decline Patent Owner’s invitation to assign little weight to Dr. Kakaes’s declaration.

h. Summary as to Claim 1

Based on the preliminary record before us, Petitioner has shown a reasonable likelihood that claim 1 would have been obvious over the combination of Liu and Park.

4. *Independent Claims 6, 11, 16*

Petitioner sets forth similar arguments for independent claims 6, 11, and 16 as for claim 1. *See* Pet. 53–62. Patent Owner relies on the same arguments for these claims as it does for claim 1. Prelim. Resp. 24–25. For similar reasons as discussed above, Petitioner has shown a reasonable likelihood that claims 6, 11, and 16 would have been obvious over the combination of Liu and Park.

5. *Dependent Claims 2–5, 7–10, 12–15, 17–20*

Petitioner contends that dependent claim 2–5, 7–10, 12–15, and 17–20 would have been obvious over the combination of Liu and Park. Pet. 40–54, 58, 62–63. Petitioner provides a detailed analysis explaining where the combination of Liu and Park discloses or suggests the limitations in these dependent claims, which Patent Owner does not contest at this stage. Prelim. Resp. 25.

We leave for trial the issue of whether Petitioner establishes that the combination of Liu and Park would have rendered obvious claims 2–5, 7–10, 12–15, and 17–20.

IV. CONCLUSION

At this stage of the proceeding, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its challenges as to at least one challenged claim. At this preliminary stage, we have not made a final determination as to the patentability of the challenged claims or any underlying factual and legal issues.

V. ORDER

It is, therefore,

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of all challenged claims of the '271 patent is instituted with respect to all grounds of unpatentability set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial commencing on the entry date of this Decision.

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