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Paper 12
Date: December 2, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2025-00904
U.S. Patent No. 11,626,904 B2

Before JUSTIN T. ARBES, SCOTT A. DANIELS, and SCOTT RAEVSKY, *Administrative Patent Judges.*

DANIELS, *Administrative Patent Judge*.

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

I. INTRODUCTION

Apple Inc., ("Apple" or "Petitioner"), filed a Petition requesting *inter partes* review ("IPR") of claims 1–20 of U.S. Patent No. 11,626,904 B2 (Ex. 1001, "the '904 patent"). Paper 2 ("Pet."). Apex Beam Technologies LLC ("Apex" or "Patent Owner") filed a Request for Discretionary Denial. Paper 8 ("Request"). Petitioner filed an Opposition to Patent Owner's Request. Paper 9. Patent Owner also filed a Preliminary Response to the Petition. Paper 10 ("Prelim. Resp."). On September 19, 2025, the Acting Director of the United States Patent and Trademark Office issued a Decision denying Patent Owner's Request, resolving the discretionary denial issues. Paper 11.

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." Upon consideration of the arguments and evidence presented by Petitioner and Patent Owner, we are persuaded that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims. *See* 35 U.S.C. § 314(a). Accordingly, we institute an *inter partes* review of the challenged claims.

A. Real Parties in Interest

Petitioner states that Apple Inc. is the petitioner and the real party in interest. Pet. 79. Patent Owner states that the real party in interest is Apex Beam Technologies LLC. Paper 6, 2.

B. Related Matters

The parties indicate that the '904 patent is at issue in *Apex Beam Technologies LLC v. Apple Inc.*, Case No. 6:24-cv-00223, in the U.S. District Court for the Western District of Texas and *Apex Beam*

Technologies LLC v. Samsung Electronics Co., Ltd. et al., 2:24-cv-00203 in the U.S. District Court for the Eastern District of Texas. Pet. 79; Paper 6, 2.

We note that the Petition is similar to another recent petition filed by Apple, IPR2025-00898 ("the '898 IPR"), in which U.S. Patent No. 10,951,271 B2 ("the '271 patent") is at issue, and the Board has instituted trial. *See* IPR2025-00898, Papers 3, 14. The '904 patent, challenged here, is a continuation of the '271 patent. Ex. 1001, (63).

C. The '904 Patent (Ex. 1001)

The '904 patent, titled "Method and Device for Multi-Antenna Transmission in User Equipment (UE) and Base Station," describes a scheme for multi-antenna transmission in a wireless communication system. Ex. 1001, 1:20–21, code (54). According to the '904 patent, this scheme provides for improved data transmission quality where a base station obtains information including "a proportional relationship among reception qualities corresponding to multiple beams" and generates "a more accurate serving beam for the UE according to the proportional relationship." *Id.* at 2:19–24.

The '904 patent explains that massive Multi-Input Multi-Output (MIMO) is a research hotspot of next-generation mobile communications. *Id.* at 1:25–27. 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 1:27–29. Hybrid beamforming, combining analog beamforming and digital precoding, has become an important research topic for New Radio Technology (NR) systems. *Id.* at 1:35–38.

The '904 patent further explains that in a massive MIMO system, the base station can perform beam scanning over a period of time resources. *Id.* at 1:42–44. The User Equipment (UE) selects and reports the beam. *Id.* at

1:44–45. 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 1:45–47. 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 1:47–50. How to use the information reported by the UE to form the best beam to serve the UE service is a problem the '904 patent attempts to solve. *Id.* at 1:50–52.

The '904 patent provides a method for multi-antenna transmission in a UE, in part, by transmitting a wireless signal using K antenna port groups. *Id.* at 1:61–67. The '904 patent explains that an antenna port group may be "composed of one antenna port" or "a plurality of antenna ports." *Id.* at 2:47–50. Also, the'904 patent explains that "the K antenna port groups respectively correspond to K channel quality values," which are "Reference Signal Received Power[s] (RSRP[s])." *Id.* at 2:2–3, 3:66–67. Also, "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 "less than or equal to the K." *Id.* at 2:4–7. The '904 patent further describes "transmitting first information" and that "a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values," where "the first information is used to determine []the K1 antenna port groups, [and] the first proportional sequence[]." *Id.* at 1:65, 2:7–11.

D. Illustrative Claim

Claims 1, 6, 11, and 16 are independent. Each of claims 2–5, 7–10, 12–15, and 17–20 ultimately depend from independent claims 1, 6, 11, and 16 respectively. Claim 1 illustrates the claimed subject matter and is reproduced below. 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:

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

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

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

[1.d]

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

[1.d2] 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;

[1.d3] 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);

[1.d4] 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;

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

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

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

[1.d8] 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;

> [1.d9] a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold;
>
> [1.d10] the first signaling is a RRC (Radio Resource Control) signaling; the first information is transmitted in a CSI (Channel State Information) report; the first information is carried by a PUSCH (Physical Uplink Shared Channel) or a PUCCH (Physical Uplink Control Channel).

Ex. 1001, 27:23–57.

E. Prior Art and Asserted Ground

Petitioner asserts that claims 1–20 would have been unpatentable based on the following ground:[1]

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–20	103	Kim[2], Chen[3]

II. ANALYSIS

A. Legal Standards

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which said subject matter pertains. 35 U.S.C. § 103; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). "[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one

[1] Petitioner supports its challenge with a Declaration of Robert Akl, D.Sc. (Ex. 1003). *See infra*.
[2] U.S. Publication No. 2015/0036612 A1 to Kim, published Feb. 5, 2015 (Ex. 1004).
[3] WIPO Publication No. WO 2015/131494 A1 to Chen, published Sept. 11, 2015 (Ex. 1006). Exhibit 1006 is a certified translation of Chen (Exhibit 1005). We refer solely to Exhibit 1006 throughout this decision.

element for another known in the field, the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 416 (citing *United States v. Adams*, 383 U.S. 39, 50–51 (1966)). The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1889, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

We organize our patentability analysis into three sections. First, we address the level of ordinary skill in the art. Second, we address claim construction. Third, taking account of the asserted references and information presented by both parties, we consider and determine for the reasons explained below why the Petition satisfies the threshold requirement for instituting an *inter partes* review under 35 U.S.C. § 314(a).

B. Level of Ordinary Skill in the Art

We review the challenge of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the '904

patent. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). Petitioner asserts that

> A person of ordinary skill in the art . . . ("POSITA") would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a similar field, along with two years of experience designing or developing wireless networks, including long-term evolution LTE/4G or 5G new radio (NR) cellular technology. . . . Additional years of experience could substitute for an advanced-level degree (and vice versa).

Pet. 4 (citing Ex. 1003 ¶¶ 10, 16, 29–32). Patent Owner relies on Petitioner's proposed level of skill in the art at this stage. Prelim. Resp. 6.

We are persuaded, on the present record, that Petitioner's proposal is consistent with the problems and solutions in the '904 patent and prior art of record. We adopt Petitioner's definition of the level of skill at this stage.

C. Claim Construction

Neither party proposes any specific claim constructions at this stage. Pet. 4–6; Prelim. Resp. 6. Where there is no dispute in this case, we conclude that no express interpretation of any claim term is necessary to determine whether to institute an *inter partes* review in this proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe 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))).

D. Claim 1: Alleged Obviousness over Kim (Ex. 1004), and Chen (Ex. 1006)

We have reviewed Petitioner's cited evidence, including the prior art references and Dr. Akl's declaration, and find that Petitioner has shown a reasonable likelihood of prevailing on its challenge to claims 1, 6, 11, and 16

based on Kim and Chen. Pet. 13–40. In its Preliminary Response, Patent Owner only disputes Petitioner's arguments regarding limitations [1.d5], [1.d6], and [1.d10]. Prelim. Resp. 1–15. We, therefore, address specifically the parties' arguments with respect to these claim limitations.

1. Petitioner's Arguments as to Limitations [1.d5], [1.d6], and [1.d10]

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

For limitation [1.d5], Petitioner points to Kim's disclosure of reporting the K1 antenna ports that satisfy an RSRP ratio higher than a threshold when compared to the maximum received RSRP. Pet. 32 (citing Ex. 1004 ¶¶ 149, 136). To qualify for this reporting, Petitioner argues, an assessment is made of the following equation:

$$RSRP\_n/\max(RSRP\_i)>\text{Threshold}$$

Id. at 32–33 (citing Ex. 1004 ¶¶ 149, 136). According to Petitioner, Kim reports indexes of a maximum of M channel state information reference signals (CSI-RSs) and also the RSRP estimation result of the corresponding CSI-RS. *Id.* (citing Ex. 1004 ¶ 149). Both the indexes and the RSRP estimation results qualify as the claimed proportional sequence, Petitioner argues. *Id.* at 33.

After considering Patent Owner's arguments, which we address below, we agree with Petitioner at this stage that Kim discloses limitation [1.d5].

Patent Owner contends that Petitioner fails to show how Kim discloses the claimed "proportional sequence." Prelim. Resp. 9. First, Patent Owner contends that "indexes of antenna port groups with RSRP measurement[] values higher than a certain threshold *are not a sequence of*

ratios," but rather, just an identification of antenna port groups. *Id.* at 10 (emphasis added). We disagree on this record. A flaw in Patent Owner's reasoning is that the claim does not require the first proportional sequence to be a sequence of ratios. Rather, the claimed "first proportional sequence" merely "*corresponds* to . . . ratios." Ex. 1001, 27:40–41. Thus, Patent Owner's argument that the indexes "are not a sequence of ratios" is not commensurate with the scope of the claim. Petitioner persuades us, at this stage, that the indexes *correspond* to ratios (e.g., RSRP_*n*/max(RSRP_*i*)). *See* Pet. 32–33.

Patent Owner next disputes that Kim's "RSRP estimation result" is the claimed "proportional sequence" because Kim explains that this result is a single RSRP value. Prelim. Resp. 10 (citing Ex. 1004 ¶ 150). In Patent Owner's view, a singular RSRP value is not a ratio among the K1 channel quality values ("e.g., a ratio between different RSRPs") and therefore does not disclose the "proportional sequence." *Id.* at 11.

Petitioner has the better argument at this stage. According to Petitioner, "[t]he sequence of these RSRP estimation results is based on the RSRP ratios (e.g., 'RSRP_*n*/max(RSRP_*i*),' . . . such that the sequence would be proportional." Pet. 33 (citing Ex. 1004 ¶ 149). Petitioner further cites Kim as teaching that each measurement report value "may be defined as [a] ratio," and so "the sequence of these RSRP estimation results" also teaches the claimed "proportional sequence [that] corresponds to . . . ratios." *Id.* at 33–34 (citing Ex. 1004 ¶¶ 106, 136). At this stage, Petitioner's citations to Kim suggest that contrary to Patent Owner's argument, Kim's RSRP estimation results are ratios and that there are multiple of them, thereby forming a "proportional sequence [that] corresponds to . . . ratios" as claimed.

Thus, at this stage we agree with Petitioner that Kim discloses limitation [1.d5].

b) Limitation [1.d6] – the first information is used to determine the K1 antenna port groups and the first proportional sequence

Patent Owner's argument for this limitation depends on its argument for limitation [1.d5]. Prelim. Resp. 11. As we disagree with Patent Owner at this stage that Kim and Chen fail to disclose limitation [1.d5], we also disagree with Patent Owner that its argument for limitation [1.d6] undermines Petitioner's persuasive showing.

Based on the current record, we agree with Petitioner that Kim discloses limitation [1.d6].

c) Limitation [1.d10] – the first signaling is a RRC (Radio Resource Control) signaling; the first information is transmitted in a CSI (Channel State Information) report; the first information is carried by a PUSCH (Physical Uplink Shared Channel) or a PUCCH (Physical Uplink Control Channel).

As for limitation [1.d10], Petitioner argues that that Kim's first signaling is disclosed as RRC (Radio Resource Control) signaling, for example, where Kim teaches "the quality of M CSI-RS values . . . can be reported" and "M may be predetermined or may be previously designated by the [base station] through RRC signaling." Pet. 39 (quoting Ex. 1004 ¶ 146). Petitioner argues further that "***the first information is transmitted in a CSI report*** because Kim's 'UE may perform RSRP measurements on the CRS and CSI RS signals transmitted by the base station and report the RSRP values and RSRP-to-max(RSRP) ratios back to the base station.'" *Id.* at 39–40 (quoting Ex. 1003 ¶ 122; citing Ex. 1004 ¶¶ 113, 136, 148–149).

Additionally, Petitioner asserts that "Kim provides using an uplink reference signal to convey 'channel estimation' from the UE to the base station, e.g., 'via a PUSCH and a PUCCH.'" *Id.* at 40 (citing Ex. 1004 ¶¶ 50, 55. Considering Kim's disclosure, and relying on the testimony of Dr. Akl, Petitioner argues that "[i]t would have been obvious for the Kim-Chen combination to use one of the PUSCH and PUCCH, as already disclosed in Kim, to carry the CSI-RS measurement report, as" discussed in the Petition for limitations [1.c] and [1.d6], "so that the base station is apprised of the results of the measurements by the UE." *Id.* (citing Ex. 1003 ¶¶ 122–123).

Disputing Petitioner's position, Patent Owner contends that "a channel estimation for demodulation is not the same as a CSI-RS measurement and it does not automatically follow that, because one type of information is transmitted over PUSCH or PUCCH, another type of information would also be transmitted using the same channel." Prelim. Resp. 12. Patent Owner argues specifically that Dr. Akl's testimony and reasoning is insufficient to show that a person of ordinary skill in the art would have considered using PUSCH and PUCCH uplink channels to transmit the CSI-RS measurement report, and should be given no weight. *Id.* at 13.

Currently, Petitioner has presented evidence that PUSCH and PUCCH uplink channels were known in Kim to be used for transmitting data, e.g., control information as to channel estimation for demodulation from the UE to the base station. Pet. 40 (citing, e.g., Ex. 1004 ¶ 55). And, on the record before us, Dr. Akl's testimony is unrebutted that a person of skill in the art would have understood that for other information, such as the UE's CSI-RS measurement report, "the PUSCH and PUCCH channels present ready-to-

use uplink channels for feedbacking the first information to the base station." Ex. 1003 ¶ 123.

Given such evidence, at this early stage of the proceeding Petitioner has shown a reasonable likelihood that a person of ordinary skill in the art would have known to use the PUSCH and PUCCH channels for also transmitting the CSI-RS measurement report to the base station as required by limitation [1.d10].

d) Undisputed Limitations

Petitioner asserts that the combination of Kim and Chen discloses the preamble and the remaining limitations of claim 1. Pet. 13–40. Petitioner identifies where the combination of Kim and Chen teaches these limitations, supported with testimony from Dr. Akl, which Patent Owner does not specifically rebut at this stage. *Id.*

We determine, on this record, that the combination of Kim and Chen discloses the preamble (whether or not limiting) and the remaining undisputed limitations of claim 1. *See LG Elecs., Inc. v. Conversant Wireless Licensing S.A.R.L.*, 759 F. App'x 917, 925 (Fed. Cir. 2019) (nonprecedential) ("The Board is 'not required to address undisputed matters' or arguments about limitations with which it was never presented.") (quoting *In re NuVasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016)).

2. Independent claims 6, 11, and 16

Petitioner sets forth similar arguments for independent claims 6, 11, and 16 as for claim 1. *See* Pet. 54–68. Patent Owner relies on the same arguments for these claims as it does for claim 1. Prelim. Resp. 14–15. 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 Kim and Chen.

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

Petitioner contends that dependent claim 2–5, 7–10, 12–15, and 17–20 would have been obvious over Kim and Chen. Pet. 41–54, 61, 67–68. Petitioner provides a detailed analysis explaining where the combination of Kim and Chen discloses or suggests the limitations in these dependent claims, which Patent Owner does not specifically contest at this stage. Prelim. Resp. 15.

We leave for trial the issue of whether Petitioner establishes that Kim and Chen would have rendered obvious claims 2–5, 7–10, 12–15, and 17–20. *See* 37 C.F.R. § 42.108(a).

III. CONCLUSION

On this record, we are persuaded that Petitioner demonstrates a reasonable likelihood of prevailing on its challenge as to at least one claim of the '904 patent. We therefore institute trial on all claims and all challenges included in the Petition. This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of the '904 patent is hereby instituted as to claims 1–20 on all grounds 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 on the grounds of unpatentability authorized above; the trial commences on the entry date of this decision.

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