UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,

Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,

Patent Owner.

Patent No. 11,626,904
Filing Date: December 31, 2020
Issue Date: April 11, 2023

Inventor: Xiaobo Zhang
Title: METHOD AND DEVICE FOR MULTI-ANTENNA TRANSMISSION IN USER EQUIPMENT (UE) AND BASE STATION

PATENT OWNER'S PRELIMINARY RESPONSE

Case No. IPR2025-00904

TABLE OF CONTENTS

Page(s)

TABLE OF AUTHORITIES

Page(s)

Cases

Statutes

LIST OF EXHIBITS

Exhibit No.	Description of Document
2001	Scheduling Order, Dkt. 40, *Apex Beam Techs. LLC v. Apple Inc.*, Case No. 6:24-cv-00223-ADA (W.D. Tex. June 18, 2025)
2002	Apex Beam Technologies LLC's Infringement Contentions and P.R. 3-1 and 3-2 Disclosures in *Apex Beam Techs. LLC v. Apple Inc.*, Case No. 6:24-cv-00223-ADA (W.D. Tex.), dated May 27, 2025
2003	Complaint, Dkt. 1, *Apex Beam Techs. LLC v. Apple Inc.*, Case No. 6:24-cv-00223-ADA (W.D. Tex. April 29, 2024)

I. INTRODUCTION

On May 2, 2025, Apple Inc. ("Petitioner") submitted a petition (Paper 2, "Petition" or "Pet.") to institute *inter partes* review ("IPR") of U.S. Patent No. 11,626,904 (APPLE-1001, the "'904 Patent"), challenging Claims 1-20 (the "Challenged Claims"). The Petition asserts that the Challenged Claims are rendered obvious by U.S. Patent Application Publication No. 2015/0036612 to Kim (APPLE-1004 or "Kim") in view of Certified English translation of International Publication WO 2015/131494 to Chen (APPLE-1006 or "Chen"). Pet. at 1.

The Board should deny the Petition for at least the following reasons. First, the Petition fails to describe how Kim discloses the claimed "proportional sequence." Kim only teaches reporting indexes of antenna port groups with RSRP measurements values higher than a certain threshold but those are not a sequence of ratios. Additionally, Kim's "RSRP estimation result of the corresponding CSI-RS" is a single RSRP value (evidenced by the singular CSI-RS rather than CSI-RSs) that corresponds to the "maximum of [the] M CSI-RSs" and not [a] ratio(s) of different channel qualities.

Second, the Petition and Petitioner's expert declaration provide no evidence for its assertion that, because Kim discloses "a demodulation reference signal (DM-RS) for channel estimation for coherent demodulation of information transmitted via a PUSCH and a PUCCH," a POSITA would also have transmitted CSI-RS measurements over a PUSCH or PUCCH.

The Petition is deficient with respect to the ’904 Patent’s dependent claims and analogues to Claim 1 for the same reasons.

Accordingly, the Board should deny institution of the Petition.

II. THE ’904 PATENT

The ’904 Patent discloses and claims “a scheme for multi-antenna transmission in a wireless communication system.” ’904 Patent, at 1:20-21.

The ’904 Patent describes why such a scheme is necessary in view of the “urgent problem” of “how to use the information reported by the UE to form the best beam to serve the UE service” where there are a limited number of beams for beam scanning and number of beams reported, as in the prior art:

> [T]he base station can perform beam scanning over a period of time resources. The UE selects and reports the beam. 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. 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. How to use the information reported by the UE to form the best beam to serve the UE service is an urgent problem to be solved.

Id. at 1:42-52.

The ’904 Patent claims address the aforementioned problem and provide the following advantage:

> [T]he advantage of the foregoing method is that the base station may obtain a proportional relationship among reception qualities corresponding to multiple beams, and may generate a more accurate serving beam for the UE according to the proportional relationship, thereby improving transmission quality.

Id. at 2:19-24.

As one example of the advantageous claims, the ’904 Patent describes that a first signaling originating from a base station can, in one embodiment of the subject patent specification, comprise quasi-co-located (QCL) information. The UE uses this information to determine K antenna port groups that transmit a wireless signal:

> In one embodiment, the first signaling is used to determine the co-located or QCL information.
>
> In one embodiment, the first signaling explicitly indicates the co-located or QCL information.
>
> In one embodiment, the first signaling implicitly indicates the co-located or QCL information.

Id., 6:48-53.

Another aspect of the claimed invention is “a first proportional sequence [that] corresponds to a ratio(ratios) among the K1 channel quality values” and one example of a channel quality value is a Reference Signal Received Power (RSRP). *Id.*, Claim 1. The ’904 Patent utilizes channel quality values of RSRP that 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:

> In one embodiment, the first proportional sequence includes K1-1 positive real number(s). The K1-1 positive real numbers is(are) a ratio(s) between the channel quality values other than the best channel quality value of the K1 channel quality values and the best channel quality value.
>
> In one embodiment, the first proportional sequence is composed of quantized values corresponding to the K1-1 positive real number(s).

Id., 4:31-38.

In another embodiment, the '904 Patent describes that the claimed sequence consists of the proportions of one RSRP to all the other RSRPs in the K1 subset of antenna port groups. For example, where K1 is equal to 2, the proportional sequence would consist of two values: {1 (the ratio of the first channel quality with itself), the ratio of the second channel quality and the first channel quality}:

> ***The UE receives the first signaling to determine that K1 is equal to 2.*** The first antenna port group and the second antenna port group are two antenna port groups of the K antenna port groups. The first antenna port group corresponds to the first channel quality. The second antenna port group is corresponding to the second channel quality. The first channel quality is a best channel quality value of the K channel quality values. The second channel quality is a second best channel quality value of the K channel quality values. The UE reports {the first antenna port group, the second antenna port group, and the first proportional sequence} to the base station. ***The first proportional sequence is composed of 1, ratio of the second channel quality and the first channel quality.***

Id. at 24:26-39.[1]

In another embodiment, the ’904 Patent also describes a first signaling is used to determine a target threshold, so as to compare a ratio between the second channel quality and first channel quality to the target threshold. *Id.*, Claim 1.

III. THE ALLEGED PRIOR ART

A. Kim

Kim “relates to a wireless communication system, and more particularly to a method and apparatus for performing measurement report.” Ex. 1004, [0001].

Kim’s Equation 4, reproduced below, describes creating a ratio comparing one RSRP with the maximum RSRP to compare with a specified threshold of channel quality:

RSRP_n/max(RSRP_i)>Threshold [Equation 4]

Id., [0149].

Kim discusses that channel qualities are reported for “a maximum of M CSI_RSs” instead of the total “N CSI-RSs contained in the CoMP management set.”

[1] Emphasis added unless otherwise noted.

> [T]he UE may report not only indexes of a maximum of M CSI-RSs (the RSRP ratio (RSRP_n/max(RSRP_i)) of which is higher than a predetermined threshold value) from among N CSI-RSs contained in the CoMP management set, but also the RSRP estimation result of the corresponding CSI-RS. That is, indexes of a maximum of M CSI_RSs configured to satisfy Equation 4 may be reported.

Id.

Kim describes that "[i]f two or more antenna ports are configured as a CSI-RS configuration, ***RSRP of a first antenna port and RSRP of a second antenna port are respectively measured*** so that the sum of RSRP values of two antenna ports can be reported." *Id.*, [0138].

IV. CLAIM CONSTRUCTION

For the purposes of this Preliminary Response only, Patent Owner believes that claim construction is not required to resolve any issues. Pet. at 4-6.

V. LEVEL OF ORDINARY SKILL IN THE ART

For the purposes of this Preliminary Response only, Patent Owner utilizes Petitioner's proposed level of skill in the art: "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. at 4 (citations omitted).

VI. PETITIONER HAS NOT DEMONSTRATED A REASONABLE LIKELIHOOD OF SUCCESS FOR THE GROUNDS ADVANCED IN THE PETITION, AND THE PETITION SHOULD BE DENIED

Anticipation under 35 U.S.C. § 102 is a high bar to meet. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989).

The question of obviousness is resolved on the basis of 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 skill in the art, and (4) so-called secondary considerations where in evidence. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983).

The Board has held that a failure to identify the differences between the claimed subject matter and the prior art is fatal to an obviousness challenge. *See,* *Apple, Inc. v. Contentguard Holdings, Inc.*, IPR2015-00355, Decision Denying Institution of *Inter Partes* Review, Paper 9 at 9-10 (P.T.A.B. June 26, 2015) (denying institution for failure to identify the differences between the claimed subject matter and the prior art).

In arriving at an obviousness determination, the Board must sufficiently explain and support the conclusions that the prior art references disclose all the elements recited in the Challenged Claims and a relevant, skilled artisan not only could have made, but would have been motivated to combine all the prior art references in the way the patent claims and reasonably expected success. *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017). That is, even if all the claim elements are found across a number of references, an obviousness determination must consider whether a person of ordinary skill in the art would have the motivation to combine those references. *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1368 (Fed. Cir. 2016); *Los Angeles Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v. Eli Lilly & Co.*, 849 F.3d 1049, 1067 (Fed. Cir. 2017) (vacating and remanding an obviousness determination, in part, because the Board did not make factual finding as to whether there was an apparent reason to combine all three prior art references to achieve the claimed invention and whether a person of skill in the art would have had a reasonable expectation of success from such a combination). This combinability determination, as supported by an articulated motivation to combine, requires a plausible rationale as to why those prior art references would have worked together. *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1335 (Fed. Cir. 2013). Absent some articulated rationale, a "common sense" finding is no different than the conclusory statement "would have been obvious." *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017). Of additional importance, "knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references . . . ." *Innogenetics, N.V. v. Abbott Lab'ys*, 512 F.3d 1363, 1373 (Fed. Cir. 2008).

A. The Petition Fails to Render Obvious Claim 1 in View of Kim and Chen

1. Kim in View of Chen Does Not Render Obvious "*a first proportional sequence corresponds to a ratio (ratios) among the K1 channel quality values*," as Required by Claim 1.d5

Claim [1.d5] of the '904 Patent recites "a first proportional sequence corresponds to a ratio (ratios) among the K1 channel quality values." Petitioner only relies on Kim to disclose this claim limitation. Pet. at 32-35.

Even if Kim described creating ratios comparing one RSRP with the maximum RSRP for an antenna port, as Petitioner alleges, the Petition fails to show how Kim disclosed the claimed "proportional sequence." First, Petitioner argues that Kim's "indexes of a maximum of M CSI-RSs" are the claimed "proportional sequence." *Id.* at 32-33. But, in fact, Petitioner admits that Kim only teaches "reporting the indexes of those antenna port groups (e.g., a maximum of M) that correspond to CSI-RSs with RSRP measurement values 'higher than a predetermined threshold value.'" *Id*. at 33 (citing EX1004, [0149]). Put simply, indexes of antenna port groups with RSRP measurements values higher than a certain threshold are not a sequence of ratios. The system of Kim completely forgoes creating any sequence of ratios (e.g., RSRP proportions) and just provides an identification, via indexes, of antenna port groups with RSRPs above a certain threshold.

Alternatively, Petitioner claims that Kim's "RSRP estimation result of the corresponding CSI-RS" is the claimed "proportional sequence." Pet. at 32-33. However, this is also incorrect because Kim explains that the "RSRP estimation result" is a single RSRP value (evidenced by the singular CSI-RS rather than CSI-RSs) that corresponds to the "maximum of [the] M CSI-RSs configured to satisfy Equation 5":

> Alternatively, not only indexes of a maximum of M CSI-RSs from among a plurality of CSI-RSs (i.e., multiple CSI-RS configurations) from the serving cell, but also the RSRP estimation result of the corresponding CSI-RS may be reported. According to each of the MCSI-RSs, the RSRP ratio (RSRP n/RSRP 0) with regard to CSI-RS RSRP (RSRP 0) corresponding to a first configuration/specific location configuration among the plurality of CSI-RSs is higher than a predetermined threshold value. That is, a maximum of MCSI-RSs configured to satisfy Equation 5 may be reported.

$$\text{RSRP\_}n/\text{RSRP\_0}>\text{Threshold} \qquad \text{[Equation 5]}$$

APPLE-1004, [0151]. The singular RSRP value is not a ratio (ratios) among the K1 channel quality values (e.g., a ratio between different RSRPs) and therefore is not the claimed "proportional sequence."

Therefore, the Petition is deficient because it fails to show that Claim [1.d5] is rendered obvious by the combination of Kim in view of Chen.

2. Kim in View of Chen Does Not Render Obvious "*the first information is used to determine the K1 antenna port groups and the first proportional sequence*," as Required by Claim [1.d6]

Claim [1.d6] of the '904 Patent recites "the first information is used to determine the K1 antenna port groups and the first proportional sequence."

As noted above, Kim in combination with Chen, does not disclose the claimed "first proportional sequence," and therefore cannot disclose, teach, or suggest "the first information is used to determine the . . . first proportional sequence." Specifically, as noted above, Petitioner confirms that the UE of Kim only reports a "maximum of M" ratios that have already met a threshold and not a sequence of all K1 channel quality ratios.

Therefore, the Petition is deficient because it fails to show that Claim [1.d6] is rendered obvious by the combination of Kim in view of Chen.

3. Kim in View of Chen Does Not Render Obvious "*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 Required by Claim [1.d10]

Claim [1.d10] of the '904 Patent recites "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)." Petitioner only relies on Kim to disclose this claim limitation. Pet. at 39-40.

The Petition merely glosses over the required limitation that "the first information is carried by a PUSCH (Physical Uplink Shared Channel) or a PUCCH (Physical Uplink Control Channel)." Petitioner merely mentions two disparate parts of Kim: (i) "a demodulation reference signal (DM-RS) for channel estimation for coherent demodulation of information transmitted via a PUSCH and a PUCCH" (APPLE-1004, [0055]); and (ii) Kim's purported "CSI-RS measurement report." *See* Pet. at 40. But 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. Realizing this discrepancy, Petitioner, without any support other than its own expert declaration, argues that a

POSITA would simply be motivated to use PUSCH or PUCCH for that information:

> It 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 provided by *supra* [1.c]/[1.d6], so that the base station is apprised of the results of the measurements by the UE. EX1003, ¶¶122-123. A POSITA would have been motivated to inform the base station of the measurement results when the PUSCH and PUCCH channels present ready-to-use uplink channels for feedbacking the first information to the base station. Doing so would have a reasonable expectation of success because using one of the PUSCH and PUCCH channels to carry the CSI-RS measurement report merely involves "the predictable use of prior art elements according to their established functions" to "yield predictable results" while retaining the fundamental operations of Kim's MIMO system. *KSR,* 550 U.S. 398, 416-417; EX1003, ¶¶123-124.

Pet. at 40. Petitioner's expert declaration fares no better because it is duplicative of the Petition and it also cites to nothing for its conclusions:

> In my opinion, it 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 provided by *supra* [1.c]/[1.d6], so that the base station is apprised of the results of the measurements by the UE. Here, a POSITA would have been motivated to inform the base station of the measurement results when the PUSCH and PUCCH channels present ready-to-use uplink channels for feedbacking the first information to the base station. Moreover, a POSITA would have a reasonable expectation of success at doing so because using one of the PUSCH and PUCCH channels to carry the CSI-RS measurement report merely involves "the predictable use of prior art elements according to their established functions" to "yield predictable results" while retaining the fundamental operations of Kim's MIMO system.

APPLE-1003, ¶ 123. The ipse dixit of Petitioner's expert should be afforded no weight. As such, the Petition fails to show that the first information is carried by a

PUSCH (Physical Uplink Shared Channel) or a PUCCH (Physical Uplink Control Channel)."

Therefore, the Petition is deficient because it fails to show that Claim [1.d10] is rendered obvious by the combination of Kim in view of Chen.

B. Claims 2-20 Are Not Rendered Obvious by Kim in View of Chen

1. Independent Claims 6, 11, and 16 Are Not Rendered Obvious by Grounds 1, 2, 3A, and 3B

Claim 6 recites "[a] method for multi-antenna transmission in a base station" that mirrors the claim limitations of Claim 1, which recites "[a] method for multi-antenna transmission in a user equipment (UE)." In other words, Claim 6 discloses a method from the perspective of the base station that is in communication with the UE in Claim 1. For at least the same reasons as Claim 1, the Petition fails to show that Kim in view of Chen renders obvious Claim 6.

Claim 11 recites "[a] user equipment (UE) for multi-antenna transmission," which is the apparatus claim of Claim 1. For at least the same reasons as Claim 1, the Petition fails to show that Kim in view of Chen renders obvious Claim 11.

Independent Claim 16 recites "[a] base station device for multi-antenna transmission" that mirrors the claim limitations of Claim 11, which recites "[a] user equipment (UE) for multi-antenna transmission." In other words, Claim 16 discloses the base station device that is in communication with the UE in Claim 11. For at least the same reasons as Claim 11, the Petition fails to show that Kim in view of Chen renders obvious Claim 16.

2. Dependent Claims 2-5, 7-10, 12-15, and 17-20 Are Not Rendered Obvious by Kim in View of Chen

Claims 2-5 are dependent on Claim 1, Claims 7-10 are dependent on Claim 6, Claims 12-15 are dependent on Claim 11, and Claims 17-20 are dependent on Claim 16. Therefore, the Petition fails to render obvious Claims 2-5, 7-10, 12-15, and 17-20 for at least the same reasons as Claims 1, 6, 11, and 16, respectively.

VII. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board deny institution of the Petition in its entirety.

Respectfully submitted,

Dated: September 4, 2025

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CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned PATENT OWNER'S PRELIMINARY RESPONSE has 3,122 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft Word for Office 365.

Respectfully submitted,

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