

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2025-00900
Patent 11,063,727 B2

Before JEFFREY S. SMITH, JUSTIN T. ARBES, and
KEVIN W. CHERRY, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

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

I. INTRODUCTION

Petitioner filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–20 of U.S. Patent No. 11,063,727 B2 (Ex. 1001, “the ’727 patent”) pursuant to 35 U.S.C. § 311(a). Patent Owner filed a Preliminary Response (Paper 8, “Prelim. Resp.”) pursuant to 35 U.S.C. § 313. Patent Owner’s request for discretionary denial was denied and the Petition was forwarded to the Board. Paper 10.

Institution of an *inter partes* review may not be authorized by statute “unless . . . the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Upon consideration of the record before us, we determine Petitioner has demonstrated a reasonable likelihood that it would prevail in establishing the unpatentability of at least one of claims 1–20 of the ’727 patent. Accordingly, we institute the requested *inter partes* review.

A. Real Parties-in-Interest

Petitioner identifies itself as the real party-in-interest. Pet. 77. Patent Owner identifies itself as the real party-in-interest. Paper 4, 2.

B. Related Matters

The parties state that the ’727 patent is currently asserted in *Apex Beam Technologies LLC v. Apple Inc.*, No. 6:24-cv-00223-ADA (W.D. Tex.). Pet. 77; Paper 4, 2.

C. The '727 Patent¹

The '727 patent relates “to a transmission scheme and device for a wireless communication system with a great many antennas deployed at a base station side.” Ex. 1001, 1:20–22. User Equipment (UE) receives a first signaling, a second signaling, a first reference signal and a second reference signal, and transmits first channel information. *Id.* at code (57). The first and second reference signals respectively comprise Q1 RS (reference signal) ports and Q2 RS ports, and are transmitted by respective Q1 and Q2 antenna ports. *Id.* The first signaling and the second signaling are respectively used to determine L1 antenna ports and Q1 antenna ports. *Id.*

D. Illustrative Claim

Challenged claim 1 of the '727 patent is reproduced below along with Petitioner's labels for the limitations (Pet. iv).

1. [1pre] A method in a User Equipment (UE) for multi-antenna transmission, comprising:
 - [1.1] receiving a first signaling, a second signaling, a first reference signal and a second reference signal; and
 - [1.2] transmitting first channel information;
 - [1.3] wherein the first reference signal comprises Q1 reference signal port(s), the Q1 reference signal port(s) is(are) transmitted by Q1 antenna port(s) respectively;
 - [1.4] the second reference signal comprises Q2 reference signal port(s), the Q2 reference signal port(s) is(are) transmitted by Q2 antenna port(s) respectively;
 - [1.5] the first signaling is used to determine L1 antenna port(s), the Q1 antenna port(s) is(are) a subset of the L1 antenna port(s);

¹ The '727 patent was filed on April 29, 2019, is a continuation of application PCT/CN2017/108482 filed on October 31, 2017, and claims priority to a Chinese application filed on November 1, 2016. Ex. 1001, codes (22), (30), (63).

- [1.6] the second signaling is used to determine the Q2 antenna port(s);
- [1.7] wherein the Q1 and the Q2 are positive integers respectively, the L1 is a positive integer greater than or equal to the Q1;
- [1.8] the first channel information corresponds to Q antenna ports; the Q antenna ports consist of the Q1 antenna port(s) and the Q2 antenna port(s), the Q is equal to a sum of the Q1 and the Q2;
- [1.9] the first reference signal is transmitted in a first time resources pool, and the second reference signal is transmitted in a second time resources pool, the first reference signal occurs multiple times in the first time resources pool, and time intervals between any two adjacent occurrences of the first reference signal in the first time resources pool are equal, the second reference signal occurs once in the second time resources pool.

E. Asserted Grounds

Petitioner asserts that claims 1–20 of the '727 patent are unpatentable on the following grounds:

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1, 2, 5–7, 10–12, 15–17, 20	102	Park ²
1	1, 2, 5–7, 10–12, 15–17, 20	103	Park
2	3, 8, 13, 18	103	Park, Rahman ³
3	4, 9, 14, 19	103	Park, Yu ⁴
1A	1, 2, 5–7, 10–12, 15–17, 20	103	Park, Shin ⁵
2A	3, 8, 13, 18	103	Park, Shin, Rahman

² US Patent No. 10,720,972 B2 published Mar. 30, 2017 (Ex. 1005).

³ US Patent No. 10,659,118 B2 filed Apr. 18, 2017 (Ex. 1007).

⁴ US Patent Publ. No. 2014/0177561 A1 filed Dec. 23, 2013 (Ex. 1008).

⁵ US Patent Publ. No. 2016/0142189 A1 filed Nov. 6, 2015 (Ex. 1006).

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
3A	4, 9, 14, 19	103	Park, Shin, Yu

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner contends that:

A person of ordinary skill in the art (“POSITA”) relating to the subject matter of the ’727 Patent as of [November 1, 2016] would have 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. APPLE-1003, Section V. Additional education might substitute for some of the experience, and additional substantial experience might substitute for some of the educational background. *Id.*

Pet. 3–4. Patent Owner at this stage utilizes Petitioner’s proposed level of skill in the art. Prelim. Resp. 5. As Petitioner’s definition of a person of ordinary skill appears commensurate with the subject matter before us, we apply Petitioner’s definition for purposes of this Decision.

B. Analysis of Ground 1

Petitioner contends that claims 1, 2, 5–7, 10–12, 15–17, and 20 are anticipated or rendered obvious by Park. Pet. 12–55. In doing so, Petitioner explains how Park satisfies each claim limitation and provides supporting testimony from its declarant, Robert Akl, D.Sc. *See id.* In response, Patent Owner contends that Park neither discloses nor teaches limitations 1.1, 1.6, and 1.9 of independent claim 1. Prelim. Resp. 8–12.

Limitations 1.1, 1.5, and 1.6 recite in relevant part “receiving a first signaling [and] a second signaling” where “the first signaling is used to determine L1 antenna port(s)” and “the second signaling is used to

determine the Q2 antenna port(s).” Petitioner maps receiving the first signaling to receiving configuration information for a single CSI (control state information) process, where the configuration information includes a first configuration and a second configuration for providing a hybrid CSI report type. Pet. 21 (citing Ex. 1005, 42:60–67). Petitioner maps receiving the second signaling to receiving a DCI (downlink control information) format signal that triggers the UE to perform aperiodic CSI reporting “in a situation in which hybrid CSI has been configured.” *Id.* at 30–31 (citing Ex. 1005, 38:20–36; Ex. 1003 ¶¶ 137–139⁶). Petitioner, relying on the testimony of Dr. Akl, contends that a person of ordinary skill would have understood that Park’s DCI format signal, which triggers the UE to perform aperiodic CSI reporting, requires the UE “to determine the Q2 antenna port(s)” for the UE as claimed. *Id.* at 31–33 (citing Ex. 1003 ¶¶ 140–142).

Patent Owner contends that Park only discloses a single hybrid signaling for two reference signal configurations, but does not describe “a first and second signaling that contemplates two separate transmissions.” Prelim. Resp. 8–9 (citing Ex. 1001, Fig. 1). Patent Owner contends that having two separate signalings as claimed provides the advantage of not transmitting the aperiodic reference signal if the two signals overlap. *Id.* at 9–10 (citing Ex. 1001, 9:14–26). Patent Owner contends that the hybrid

⁶ Although the Petition cites to paragraphs 147–152 of the Declaration as the supporting testimony for limitation 1.6, paragraphs 137–142, not paragraphs 147–152, of the Declaration actually address limitation 1.6. The mistake of citing to the Declaration ten paragraphs beyond the actual supporting testimony for a given claim limitation seems consistent throughout most of the Petition. In this Decision, we cite to the actual supporting testimony in the Declaration for a given limitation when addressing the limitation.

signaling of Park requires both reference signals to be transmitted in the hybrid signal, and therefore does not possess the advantage of eliminating overhead as described in the '727 patent. *Id.* at 10.

On this record, we agree with Petitioner. Patent Owner, in contending that Park's hybrid CSI signal does not describe two signalings, does not address Petitioner's mapping of the claimed "first signaling" and the claimed "second signaling." Petitioner persuasively maps the claimed "first signaling" to Park's hybrid CSI signal (Pet. 21), and persuasively maps the claimed "second signaling" to Park's DCI format signal (Pet. 30). Patent Owner does not explain why Park's DCI format signal does not describe the claimed "second signaling." On this record, we are sufficiently persuaded by Petitioner and Dr. Akl that Park's DCI format signal, which triggers the UE to perform aperiodic CSI reporting, describes a "second signaling . . . used to determine the Q2 antenna port(s)" as recited in limitation 1.6. *See* Ex. 1003 ¶¶ 137–142; Ex. 1005, 38:20–36.

Limitation 1.9 recites in relevant part that "the second reference signal occurs once in the second time resources pool." Petitioner contends that Park discloses, for the periodic (Alt 1) CSI-RS (which Petitioner maps to the claimed "first reference signal"), the eNB (evolved node B (that is, the base station)) periodically transmits K CSI-RSs during a transmission cycle that can last 50 ms or 100 ms. Pet. 38 (citing Ex. 1005, 30:57–64). Petitioner contends that Park discloses, for the aperiodic (Alt 4) CSI-RS (which Petitioner maps to the claimed "second reference signal"), the eNB transmits the aperiodic CSI-RS in a single measurement subframe of the transmission cycle. *Id.* at 38–39 (citing Ex. 1005, 31:3–7; Ex. 1003 ¶ 159). Therefore, according to Petitioner, a person of ordinary skill in the art would have

understood that “over the same number of CSI transmission periods . . . as the periodic CSI-RS, the aperiodic CSI-RS occurs *once* during that time, e.g., in a ‘*single* measurement subframe.’” *Id.* at 39.

Patent Owner contends that although Park discloses that an aperiodic reference signal may be transmitted in a single subframe, Park does not disclose how many times the aperiodic reference signal is transmitted within the single subframe. Prelim. Resp. 11. Patent Owner further contends that paragraph 169 of the Declaration cited in the Petition is entirely inapposite. *Id.* at 11–12.

Park discloses that, for the periodic signal, the eNB periodically transmits K CSI-RSs, where $K > 1$. Ex. 1005, 30:61–63. Park discloses that, for the aperiodic signal, the CSI-RS is transmitted in “a single measurement subframe,” where $K = 1$. *Id.* at 31:3–7. We are sufficiently persuaded that Park’s disclosure of transmitting the aperiodic CSI-RS in a single measurement subframe where $K = 1$ describes, with reasonable likelihood, that the aperiodic CSI-RS is transmitted once during that subframe. Pet. 39. We are also sufficiently persuaded by the testimony of Dr. Akl that Park’s disclosure of transmitting an aperiodic reference signal in a single subframe describes transmitting the aperiodic signal once in the single subframe. Ex. 1003 ¶ 159. Regarding Patent Owner’s contention that paragraph 169 of Dr. Akl’s Declaration is inapposite, we highlight that paragraphs 157–160 of Dr. Akl’s Declaration address limitation 1.9. Although the Petition cites to paragraph 169 rather than to paragraph 159, we are sufficiently persuaded that this is harmless error, given that the Declaration itself identifies paragraphs 156–160 as addressing limitation 1.9.

We find that Petitioner has shown a reasonable likelihood that Park anticipates claim 1. Therefore, we do not address whether claim 1 would have been obvious in view of Park alone at this stage. For independent claims 6, 11, and 16, Patent Owner relies on arguments provided for claim 1 which we find unpersuasive on this record. Prelim. Resp. 12–13. Patent Owner does not dispute Petitioner’s showing that Park describes the limitations of dependent claims 2, 5, 7, 10, 12, 15, 17, and 20. *Id.* at 13.

C. Analysis of Ground 1A

For limitations 1.1–1.5 and 1.7–1.9 of claim 1, Petitioner relies on the disclosure of Park as explained in ground 1 of the Petition. Pet. 59. Limitation 1.6 recites “the second signaling is used to determine the Q2 antenna port(s).” Petitioner contends that, to the extent Park does not disclose using the DCI format signal to determine Q2 antenna ports, a person of ordinary skill in the art would have included a CSI request field as taught by Shin to indicate Q2 antenna ports used for transmitting the beamformed aperiodic CSI-RS. Pet. 60 (citing Ex. 1006 ¶ 114 (“The base station may request the terminal to report CSI on some of [the] antenna ports using the CSI request field.”), claim 8 (“including information indicating the first CSI-RS antenna port group in a CSI request field”); Ex. 1003 ¶ 216).

Petitioner contends that modifying Park’s DCI format signal to include Shin’s CSI request field provides the benefit of allowing the network to directly configure the CSI report behavior of a UE, such that the base station can obtain channel state information regarding specific channels used by the UE and the base station in order to exchange data as taught by Shin. Pet. 59 (citing Ex. 1003 ¶ 71). Petitioner also contends that adding Shin’s CSI request field to the DCI format signal of Park is the combination of

familiar elements according to known methods that yields a predictable result, and that the combination uses Shin's known technique of including a CSI request field in a DCI format signal to improve Park's DCI format signal in the same way. *Id.* at 58 (citing Ex. 1003 ¶ 69; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415–421 (2007)).

Patent Owner contends that Shin does not remedy the Petition's deficiency with respect to the claimed second signaling. Prelim. Resp. 10. According to Patent Owner, incorporating Shin's teaching of including a CSI request field in the DCI format signal of Park would result in requesting the UE to report on some of the antenna ports, but the Petition ignores whether there are two signalings, each corresponding to control information for a reference signal. *Id.*

However, Patent Owner's contention that the Petition "ignores whether there are two signalings" does not address Petitioner's showing that Park's hybrid CSI-RS describes the first signaling and Park's DCI format signal describes the second signaling as discussed in our analysis of ground 1. On this record, we are sufficiently persuaded that the combination of Park and Shin teaches limitation 1.6, and that Petitioner has provided a sufficient reason to combine the references. We find that Petitioner has shown a reasonable likelihood that claim 1 would have been obvious in view of Park and Shin. For independent claims 6, 11, and 16, Patent Owner relies on arguments provided for claim 1 which we find unpersuasive on this record. Prelim. Resp. 12–13. Patent Owner does not dispute Petitioner's showing that Park describes the limitations of dependent claims 2, 5, 7, 10, 12, 15, 17, and 20. *Id.* at 13.

D. Remaining Grounds

For grounds 2 and 3, Petitioner contends that claims 3, 4, 8, 9, 13, 14, 18, and 19 would have been obvious over several combinations of prior art, where each combination includes Park. Pet. 61–77. In addressing grounds 2 and 3, Patent Owner relies on arguments presented for claim 1 (Prelim. Resp. 13), which we find unpersuasive as discussed in our analysis of ground 1. For grounds 2A and 3A, Petitioner contends that claims 3, 4, 8, 9, 13, 14, 18, and 19 would have been obvious over several combinations of prior art, where each combination includes Park and Shin. Pet. 61–77. In addressing grounds 2A and 3A, Patent Owner relies on arguments presented for claim 1 (Prelim. Resp. 13), which we find unpersuasive as discussed in our analysis of ground 1A. In reviewing the preliminary record, we find that Petitioner demonstrates a reasonable likelihood of showing that claims 3, 4, 8, 9, 13, 14, 18, and 19 are unpatentable over the prior art based on the asserted grounds.

III. CONCLUSION

Based on the arguments presented in the Petition, we conclude that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the '727 patent challenged in the Petition. Accordingly, we institute a trial on all claims and all grounds asserted in the Petition. The Board has not made a final determination under 35 U.S.C. § 318(a) with respect to the patentability of the challenged claims.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the '727 patent is instituted with respect to 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(b), *inter partes* review of the '727 patent shall commence on the entry date of this Decision, and notice is hereby given of the institution of a trial.

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FOR PETITIONER:

W. Karl Renner
Rishi Gupta
Jennifer Huang
FISH & RICHARDSON P.C.
axf-ptab@fr.com
rgupta@fr.com
jhuang@fr.com

FOR PATENT OWNER:

Vincent Rubino
Peter Lambrianakos
Enrique Iturralde
Julian Pymonto
Jacob Ostling
FABRICANT LLP
vrubino@fabricantllp.com
plambrianakos@fabricantllp.com
eiturralde@fabricantllp.com
jpymonto@fabricantllp.com
jostling@fabricantllp.com