

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2025-00896
Patent 10,912,081 B2

Before JEFFREY S. SMITH, JUSTIN T. ARBES, and
JOHN D. HAMANN, *Administrative Patent Judges*.

HAMANN, Administrative Patent Judge.

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

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a petition for *inter partes* review of claims 1–12 of U.S. Patent No. 10,912,081 B2 (Ex. 1001, “the ’081 patent”). Paper 2 (“Pet.”). Apex Beam Technologies LLC (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Patent Owner’s request for discretionary denial was denied and the Petition was forwarded to the Board. Paper 10.

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 (2023) and 37 C.F.R. § 42.4(a) (2024). An *inter partes* review may be instituted if “the information presented in the petition filed under section 311 and any response filed under section 313 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 papers, we determine that the information presented in the Petition demonstrates that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one challenged claim of the ’081 patent.

A. *Real Parties-In-Interest*

The parties identify themselves as the real parties-in-interest. Pet. 88; Paper 4, 2.

B. *Related Matters*

The parties collectively identify *Apex Beam Technologies LLC v. Apple Inc.*, 6-24-cv-00223 (W.D. Tex.); *Apex Beam Technologies LLC v. Samsung Electronics Co.*, No. 2:22-cv-00188 (E.D. Tex.); *Apex Beam Technologies LLC v. ZTE Corp.*, No. 2:22-cv-00031 (E.D. Tex.); *Apex Beam*

Technologies LLC v. OnePlus Technology (Shenzhen) Co., No. 2:22-cv-00032 (E.D. Tex.); and *Apex Beam Technologies LLC v. TCT Mobile Int'l Ltd.*, No. 2:21-cv-00438 (E.D. Tex.) as matters that may affect, or be affected by, a decision in this proceeding. Pet. 88; Paper 4, 2.

C. The '081 Patent

The '081 patent “relates to transmission schemes of radio signals in wireless communication systems, and in particular to . . . multi-antenna transmission.” Ex. 1001, 1:17–20. As background, the '081 patent explains that in Massive Multi-Input Multi-Output (MIMO), “multiple antennas experience beamforming to form a relatively narrow beam which points to a particular direction to improve the quality of communication.” *Id.* at 1:26–29. According to the '081 patent, others previously proposed “to increase the robustness of transmission [by] using a relatively wide beam transmitting Physical Downlink Control Channel (PDCCH) and to increase the Signal-to-Noise Ratio (SNR) using a relatively narrow beam transmitting Physical Downlink Shared Channel (PDSCH).” *Id.* at 1:34–39. The '081 patent adds that it was also previously proposed “to use the PDCCH to cross-slot indicate the transmission beam of the PDSCH, so as to solve the problem of delay between a User Equipment (UE) acquiring the transmission beam of the PDSCH from the PDCCH and conducting PDSCH receiving using the beam information indicated by the PDCCH.” *Id.* at 1:39–45.

According to the '081 patent, however, “cross-slot beam indication would result in reduction of dynamic of beam information, increase of overhead of control signaling, reduction of dynamic of scheduling, and other problems.” *Id.* at 1:49–53. For example, “[a] UE with high processing

capacity can decode the PDCCH in a short time to obtain beam information that is used for receiving the PDSCH that is in the time slot of the PDCCH, and adjust a receiving beam to receive a multicarrier symbol in which the PDSCH is located.” *Id.* at 1:53–58. “However, the delay in PDSCH transmission caused by decoding PDCCH would result in underutilization of system resources,” according to the ’081 patent. *Id.* at 1:58–60.

In response, the ’081 patent discloses embodiments that address these problems. *Id.* at 1:61–62. The ’081 patent discloses for one such embodiment that “if the time-domain resource occupied by [a] given multicarrier symbol is before [a] first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal,” which “is advantageous in that the delay in the receiving of the first radio signal resulted from the delay in the decoding of the second radio signal is avoided.” *Id.* at 4:19–23, 4:27–31. Put differently, the ’081 patent discloses that “the PDSCH receives the multicarrier symbol of the PDSCH before the first time point using the same beam used for receiving the PDCCH, thereby avoiding the problem of the delay in PDSCH transmission resulted from the delay in PDCCH decoding.” *Id.* at 4:32–37.

Figure 7, shown below, illustrates an embodiment of the ’081 patent.

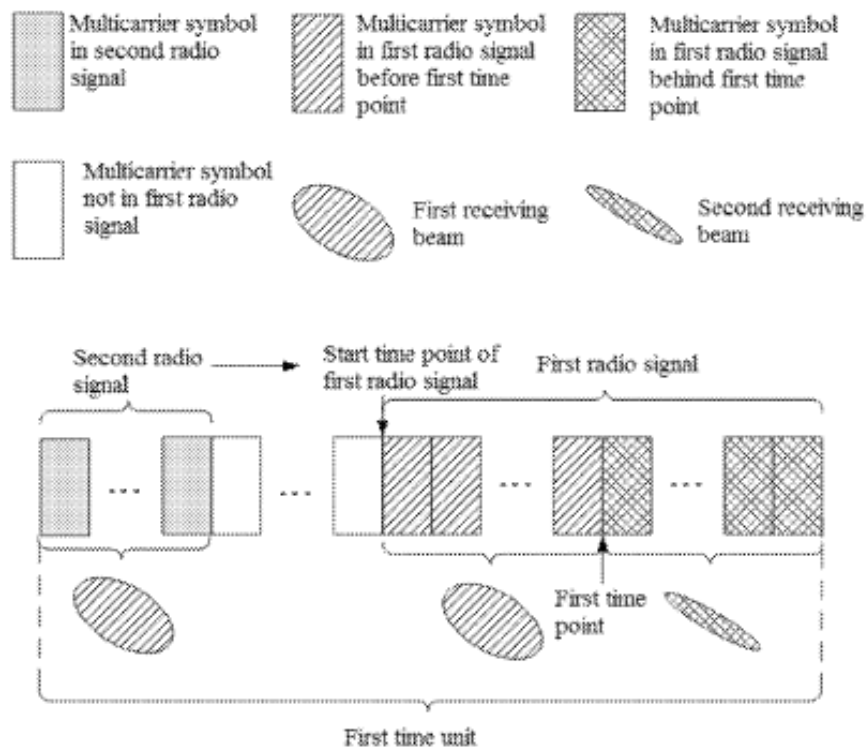


FIG. 7

Figure 7 “is a diagram illustrating a second radio signal and a first radio signal according to one embodiment of the” ’081 patent. *Id.* at 9:35–37. As illustrated, “[g]rey rectangles represent multicarrier symbols in the second radio signal, rectangles filled by oblique lines represent multicarrier symbols in the first radio signal before the first time point, rectangles filled by cross lines represent multicarrier symbols in the first radio signal behind the first time point, blank rectangles represent multicarrier symbols not in the first radio signal, a wide oval filled by oblique lines represents a first receiving beam, and a narrow oval filled by cross lines represents a second receiving beam.” *Id.* at 17:58–67.

As illustrated, “both the first radio signal and the second radio signal are transmitted within the first time unit, [and] the multicarrier symbols

occupied by the second radio signal are before the multicarrier symbols occupied by the first radio signal in [the] time domain.” *Id.* at 18:1–5. Also as illustrated, “the first receiving beam is used for receiving the second radio signal and the multicarrier symbols of the first radio signal before the first time point, and the second receiving beam is used for receiving the multicarrier symbols of the first radio signal behind the first time point.” *Id.* at 18:13–18.

The ’081 patent explains that “the second radio signal indicates the start time point of the first radio signal in the first time unit, and the start time point is used for determining the time domain resource occupied by the first radio signal in the first time unit.” *Id.* at 18:6–10. The ’081 patent explains that “[t]he first time point is one time point within the first time unit behind the multicarrier symbols occupied by the second radio signal.” *Id.* at 18:10–12.

In addition, the ’081 patent discloses that for a subembodiment, “the second radio signal is a PDCCH, and the first radio signal is a PDSCH.” *Id.* at 18:19–20. The ’081 patent also discloses that for a subembodiment “the second radio signal is a [downlink control information (DCI)] that is used for indicating downlink assignment, and the first radio signal is a PDSCH transmitted on the downlink resource indicated by the second radio signal.” *Id.* at 18:21–24.

D. Illustrative Claim

Of the challenged claims, claims 1, 5, 9, and 11 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A method in a User Equipment (UE) for wireless communication, comprising:
receiving a second radio signal;

receiving a first radio signal;

wherein the first radio signal is transmitted within a first time unit, a first bit block is used for generating the first radio signal, and the first radio signal comprises G multicarrier symbols; the second radio signal is transmitted within the first time unit, and the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols; as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain; when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal; the first time point is one time point within the first time unit; and G is a positive integer.

Ex. 1001, 21:5–31.

E. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds:

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)
1–12	103	Chen, ² 3GPP ³

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the earliest possible effective filing date of the ’081 patent is after March 16, 2013, we apply the AIA version of these bases for unpatentability.

² US 11,039,470 B2, issued June 15, 2021, foreign application filed May 4, 2017 (Ex. 1004, “Chen”).

³ 3GPP Release 14, which includes multiple Technical Specifications (Exs. 1024–1028, “3GPP”).

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)
1–12	103	Chen, Dahlman ⁴

Pet. 32–86. Petitioner submits in support of its arguments the Declaration of Dr. Robert Akl, D.Sc. (Ex. 1003).

II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious before the effective filing date of the claimed invention, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “[O]ne or more factors may predominate.” *Id.* Petitioner argues that one of ordinary skill in the art at the time of ’081 patent “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 [MIMO] technology.” Pet. 32 (citing Ex. 1003 ¶ 51). Petitioner adds that “[a]dditional education might substitute for some of the experience, and additional substantial experience might substitute for some of the educational background.” *Id.* In addition, Petitioner argues that one of ordinary skill in the art “would also have familiarity with the [Third

⁴ Erik Dahlman et al., 4G LTE-Advanced Pro and The Road to 5G (3d ed. 2016) (Ex. 1023, “Dahlman”).

Generation Partnership Project (‘3GPP’) Long Term Evolution (‘LTE’)] standards, and would have understood how to search through the available Technical Specifications for implementing [radio access network (‘RAN’)] technologies.” *Id.*

Patent Owner at this stage of the proceeding does not provide an alternative definition for a level of skill in the art that one would have had at the time of the ’081 patent or identify any shortcoming in Petitioner’s formulation. *See* Prelim. Resp. 8–9.

For purposes of this Decision on Institution, we adopt Petitioner’s definition of the level of skill for one of ordinary skill in the art. Pet. 32. We view the definition for the level of ordinary skill as consistent with the ’081 patent and the asserted prior art, and we apply it in our analysis below.

III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic*

Sofamor Danek, Inc., 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Petitioner argues “that no claim terms need be construed to resolve issues of controversy in the present Petition.” Pet. 5. Patent Owner argues that at this stage of the proceeding, “claim construction is not required to resolve any issues.” Prelim. Resp. 8.

We determine that no express constructions are needed for us to render our Decision on Institution. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”). Rather, at this stage of the proceeding, we apply the plain and ordinary meaning of the claim terms.

IV. PRINCIPLES OF LAW

A 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. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). 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 ordinary skill in the art; and (4) objective evidence of non-obviousness, if present.⁵

⁵ Patent Owner does not present arguments or evidence of such objective evidence of non-obviousness. *See generally* Prelim. Resp.

See Graham, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

V. ALLEGED OBVIOUSNESS OVER CHEN AND 3GPP

Petitioner argues that the combination of Chen and 3GPP renders claims 1–12 obvious. Pet. 32–77. For the reasons that follow, we determine that Petitioner demonstrates a reasonable likelihood that it would prevail in showing that the combination of Chen and 3GPP renders obvious at least one of these claims.

A. *Summary of Chen*

Chen relates to the field of communications technology and in particular relates to message-decoding. Ex. 1004, 1:16–18. Chen teaches that a receiving end device (i) receives a second message associated with a first message from a transmitting end device; (ii) determines, based on the second message, a target receiver parameter for decoding the first message; and (iii) decodes the first message transmitted by the transmitting end device based on the target receiver parameter. *Id.* at code (57).

B. *Summary of 3GPP*

As described by Petitioner, the 3GPP LTE standard, Release 14 includes multiple Technical Specifications, each describing standardized techniques for implementing Evolved Universal Terrestrial Radio Access (E-UTRA) technologies, including TS 36.201 (Ex. 1024), TS 36.211 (Ex. 1025), TS 36.212 (Ex. 1026), TS 36.213 (Ex. 1027), and TS 36.331 (Ex. 1028). Pet. 12–13.

C. Challenged Claim 1

Patent Owner disputes that the combination of Chen and 3GPP teaches three limitations of independent claim 1. Prelim. Resp. 11–15. We first address the limitations disputed by Patent Owner and then turn to the undisputed limitations.

1. Disputed Limitations

Patent Owner argues that Chen fails to teach claim 1’s following limitations: (i) “as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain”; (ii) “when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol”; and (iii) “when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal.” Prelim. Resp. 11–15; Ex. 1001, 21:15–29.

At this stage of the proceeding, we agree with Petitioner and find that the combination of Chen and 3GPP teaches these limitations. Pet. 47–62. We below focus on the disputed aspects of these limitations.

First, Patent Owner argues that “Chen does not mention multicarrier symbols at all in its specification.” Prelim. Resp. 13. But, as Patent Owner acknowledges, Petitioner relies on the combined teachings of Chen and 3GPP, and in particular, 3GPP’s teachings regarding multicarrier symbols

for these limitations. *See* Pet. 41–44, 50. Obviousness cannot be overcome “by attacking references individually where the [ground] is based upon the teachings of a combination of references.” *See Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019) (quoting *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986)). Accordingly, we find this argument unavailing.

Second, Patent Owner argues that “these claim limitations describe that the determination of whether a time domain resource is before or behind the first time point is on a symbol-by-symbol basis.” Prelim. Resp. 14. And according to Patent Owner, “[w]hile the Petition describes Chen’s disclosure of switching beams based on parameters at a given point in time, the Petition glosses over any disclosure in Chen of determining the time domain resource occupied by *each* multicarrier symbol.” *Id.* at 13. More specifically, Patent Owner argues that “[t]he Petition’s reliance on Chen’s disclosure that receiver parameters indicating time domain resources are associated only on a ‘part’ basis (i.e., first part and second part of the first message) is insufficient to render obvious” these claim limitations. *Id.* at 14 (citing Ex. 1004, 15:64–16:3). Patent Owner argues that “Chen decidedly taught only the broader and traditional allocation of time resources to ‘parts’ of the first message rather than the more granular time resource allocation to symbols.” *Id.* at 14–15.

We find these arguments unavailing. To begin, we agree with Petitioner and find that Chen teaches a base station that transmits messages using beams emitted from one or more antennas, and that these beams can have different configurations. Pet. 47; Ex. 1004, 1:23–41. We also agree that Chen teaches that the base station can indicate that the beam to use has

changed by adding a new beam parameter into a control portion of a transmitted message to enable UEs to make corresponding changes to maintain alignment with base station transmission. Ex. 1004, 10:30–11:9; Pet. 48.

In addition, we agree with Petitioner that Chen “describe[s] how the . . . beam switching process is achieved during one slot.” Pet. 50. Chen’s Figure 4, as annotated and abridged by Petitioner, is shown below.

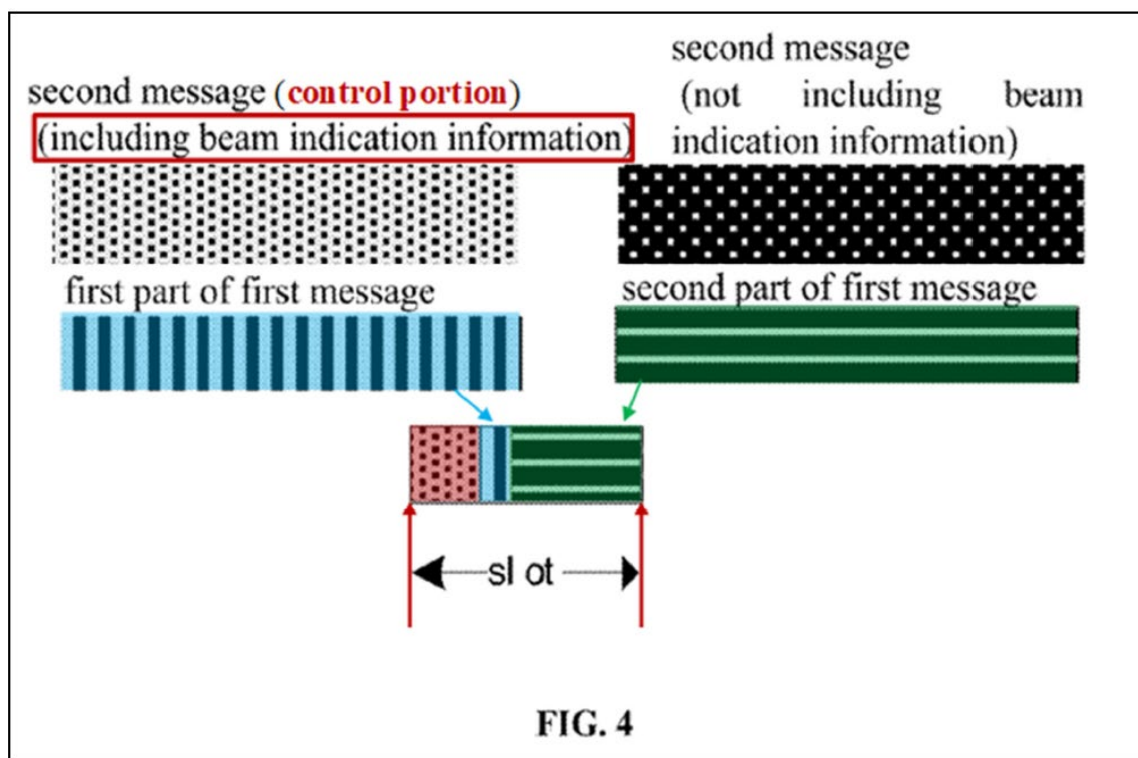


Figure 4 is a schematic view showing transmission of a message according to an embodiment of Chen. Ex. 1004, 8:62–64. Petitioner annotates the figure by (i) labeling the second message as “(control portion),” (ii) drawing a box around “(including beam indication information),” (iii) coloring the portions that correspond to the “first part of first message” in blue (and drawing a light blue arrow therebetween), (iv) coloring the portions that correspond to the “second part of first message” in green (and drawing a

green arrow therebetween), (v) providing red arrows to denote the beginning and ending of a middle slot, and (vi) coloring in red the portion of the middle slot that corresponds to the “second message (including beam indication information).” Pet. 51. In addition, Petitioner excises the depiction of the slots preceding and following the middle slot. *Id.*

As illustrated and described, Chen teaches using a default beam for decoding the second message (which includes a beam indicator) (shown in red) and decoding a first part of the first message (shown in blue). *See* Ex. 1004, Fig. 4, 15:64–16:3; Ex. 1003 ¶¶ 139, 142. Chen also teaches using the beam indicator for decoding a second part of the first message after the UE adopts the new indicated beam (shown in green). *See* Ex. 1004, Fig. 4, 15:64–16:3, 16:17–30, 16:35–40. We also agree with Petitioner and find that Chen teaches a transition point between the first message’s first part (which uses a default beam) and its second part (which uses the new beam), which is the claimed “first time point.” Pet. 53; Ex. 1004, 15:64–16:47, Fig. 4.

We also agree with Petitioner on this record and find that Chen teaches having the first message’s “first and second parts [be] consecutive in the time-domain, such that each part is composed of symbols within the same slot.” Pet. 52; Ex. 1004, 14:31–34, Fig. 4. This is illustrated in Figure 4, which labels the first and second parts of the first message as portions of a “slot.” And as Petitioner explains, a “slot” is made up of “an integer number of symbols,” where “[a] symbol is the smallest granularity for a time-domain resource in 3GPP.” Pet. 50 (citing Ex. 1025, § 6.2.1; Ex. 1003 ¶ 141). Moreover, Chen teaches that with “the first part and the second part belong[ing] to a same message, . . . the receiving end device may perform

symbol-level processing on each of the first part and the second part,” as Petitioner points out. Pet. 52; Ex. 1004, 15:35–37.

Accordingly, as we discuss above, Chen teaches that what beam is used for receiving each of the symbols is related to the relative time position occupied by the given multicarrier symbol (e.g., whether a symbol is before or behind a first time point within the slot). As we also discuss above, Chen teaches that when the time position of the symbol is behind the first time point, the second message’s beam indicator parameter is used for determining the beam for receiving the symbol; otherwise, if before, the default beam parameter is used for receiving the symbol of the first message, as well as the second message. Thus, at this stage, we find Patent Owner’s arguments to be contrary to Chen’s disclosure.

In sum, at this stage, we find that the combination of Chen and 3GPP teaches these limitations.

2. Undisputed Limitations

Petitioner asserts that the combination of Chen and 3GPP teaches the preamble and the remaining limitations of claim 1. Pet. 32–47, 63. Petitioner identifies where the combination of Chen and 3GPP 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 Chen and 3GPP teaches 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)).

3. *Summary*

In sum, for purposes of this institution decision, we determine that Petitioner shows a reasonable likelihood that the combination of Chen and 3GPP renders obvious claim 1.

D. Challenged Claims 2–12

At this stage, Patent Owner does not address separately Petitioner’s arguments and evidence as to how the combination of Chen and 3GPP teaches the limitations of claims 2–12. *See* Prelim. Resp. 16–17.

We leave for trial, however, whether Petitioner establishes that the combination of Chen and 3GPP renders obvious claims 2–12. *See* 37 C.F.R. § 42.108(a).

VI. ALLEGED OBVIOUSNESS OVER CHEN AND DAHLMAN

Petitioner argues that claims 1–12 would have been obvious over Chen and Dahlman. Pet. 77–86. Patent Owner relies on its arguments regarding Chen, which as we discuss above, we find unavailing at this stage. Prelim. Resp. 11–17; *supra* Section V.C.

We leave for trial, however, whether Petitioner establishes that the combination of Chen and Dahlman renders obvious claims 1–12. *See* 37 C.F.R. § 42.108(a).

VII. CONCLUSION

For the foregoing reasons, we determine that Petitioner shows a reasonable likelihood that it would prevail in proving the unpatentability of at least one of the challenged claims of the ’081 patent. We thus institute an

inter partes review of all of the challenged claims of the '081 patent on all grounds asserted in the Petition. *See* 37 C.F.R. § 42.108(a).

Any findings or conclusions in this Decision are made only for the purposes of institution and are not dispositive of any issue. We have not made a final determination with respect to the patentability of any challenged claim. Our final determination will be based on the record as fully developed during trial, including any evidence or argument timely presented by the parties under our Rules.

VIII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the '081 patent is instituted on all of the challenged claims and all grounds asserted 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; the trial commences on the entry date of this Decision.

IPR2025-00896
Patent 10,912,081 B2

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