

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.

IPR2023-00598
Patent 10,462,767 B2

Before JOHN D. HAMANN, SEAN P. O'HANLON, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) filed a Petition for *inter partes* review of claims 1–20 (“the challenged claims”) of U.S. Patent No. 10,462,767 B2 (Ex. 1001, “the ’767 patent”). Paper 1 (“Pet.”), 1. Apex Beam Technologies LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized by statute only when “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). A decision to institute may not institute on fewer than all claims challenged in the petition. *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018). If the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition. *See* 37 C.F.R. § 42.108(a) (“When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). For the reasons set forth below, upon considering the Petition, Preliminary Response, and evidence of record, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of

the challenged claims. Thus, we institute *inter partes* review of all challenged claims based on all asserted grounds.

B. Real Parties in Interest

Petitioner identifies its individual entities as real parties in interest.
Pet. 85.

Patent Owner identifies itself as the sole real party in interest.
Paper 5, 2.

C. Related Matters

The parties indicate that the '767 patent is the subject of the following district court proceedings:

Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd., No. 2-22-cv-00188 (E.D. Tex. filed June 1, 2022) (“the Related Litigation”),

Apex Beam Technologies LLC v. ZTE Corp., No. 2-22-cv-00031 (E.D. Tex. filed February 1, 2022),

Apex Beam Technologies LLC v. OnePlus Technology (Shenzhen) Co., Ltd., No. 2-22-cv-00032 (E.D. Tex. filed February 1, 2022), and

Apex Beam Technologies LLC v. TCT Mobile International Ltd., No. 2-21-cv-00438 (E.D. Tex. filed November 30, 2021).

Pet. 85; Paper 5, 3. Petitioner notes other patents and a patent application that are related to the '767 patent. Pet. 85. Patent Owner notes other petitions for *inter partes* review filed by Petitioner and challenging patents owned by Patent Owner. Paper 5, 2–3.

D. The Challenged Patent

The '767 patent discloses wireless communication paging transmission schemes that support multiple numerologies. Ex. 1001, 1:15–18. Figure 6 illustrates a relationship between time windows and frequency subbands and is reproduced below. *Id.* at 9:25–27.

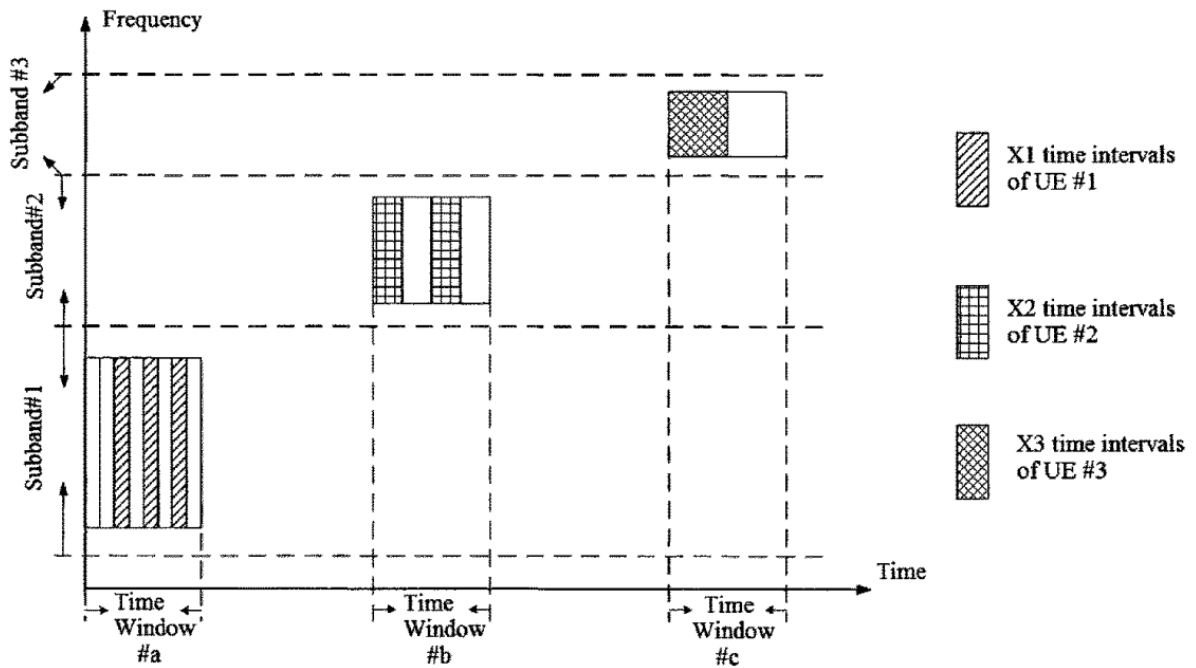


FIG. 6

Figure 6 shows a relationship between time windows and frequency subbands, with the horizontal axis representing time and the vertical axis representing frequency. *Id.* at 17:44–48. As illustrated, a first piece of user equipment (“UE”) monitors X1 time intervals in frequency subband 1 during time window a. *Id.* at 17:49–51, Fig. 6 A second UE monitors X2 time intervals in frequency subband 2 during time window b. *Id.* at 17:51–52, Fig. 6. A third UE monitors X3 time intervals in frequency subband 3 during time window c. *Id.* at 17:53–54, Fig. 6. The number of time

intervals within a time window can be determined based on the subcarrier spacing within the various subbands. *Id.* at 17:65–18:2. The time windows in the frequency subbands can be of different lengths. *Id.* at Fig. 6. A feature ID of each UE can determine during which of the time intervals are monitored for signaling. *Id.* at 18:2–4.

E. The Challenged Claims

Petitioner challenges claims 1–20 of the '767 patent. Pet. 1, 21. Claims 1, 6, 11, and 16 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below (with some paragraph formatting added for readability).

1. A method in a User Equipment (UE) for paging, comprising:
monitoring a first signaling in X time intervals; and
receiving a first radio signal;
wherein X is a positive integer;
the first signaling is used for determining scheduling information for the first radio signal;
the scheduling information comprises at least one of {occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource};
the first radio signal carries a paging message;
the frequency domain resource used for transmitting the first signaling belongs to a first subband;
the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and
at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

Ex. 1001, 23:2–20.

F. Asserted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
You	WO 2017/052199 A1, published March 30, 2017	1005
Liu	WO 2018/126401 A1, published July 12, 2018	1006
Mallick	WO 2016/136143 A1, published September 1, 2016	1007

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 4–6, 9–11, 14–16, 19, 20	103 ¹	You, Liu
2, 3, 7, 8, 12, 13, 17, 18	103	You, Liu, Mallick

Pet. 21. Petitioner submits a declaration of Harry V. Bims, Ph.D. (Ex. 1002, “Bims Declaration”) in support of its contentions. Patent Owner does not submit any witness testimony with its Preliminary Response.

II. DISCRETIONARY DENIAL

Patent Owner argues that we should exercise discretion under 35 U.S.C. § 314(a) to deny institution in light of the Related Litigation. Prelim. Resp. 14–21. For the reasons set forth below, we decline to do so.

Under 35 U.S.C. § 314(a), the Director has discretion to deny institution. In determining whether to exercise that discretion on behalf of

¹ The application resulting in the ’767 patent was filed on April 18, 2018, claiming priority to a foreign patent application filed on April 19, 2017, and is subject to the Leahy-Smith American Invents Act’s (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), revisions to 35 U.S.C. § 100 *et seq.*

the Director, we are guided by the Board’s precedential decision in *NHK Spring Co., Ltd. v. Intri-Plex Technologies, Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (designated precedential).

In *NHK*, the Board found that the “advanced state of the district court proceeding” was a “factor that weighs in favor of denying” the petition under § 314(a). *NHK*, Paper 8 at 20. The Board determined that “[i]nstitution of an *inter partes* review under these circumstances would not be consistent with ‘an objective of the AIA . . . to provide an effective and efficient alternative to district court litigation.’” *Id.* (citing *Gen. Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16–17 (designated precedential in relevant part)).

“[T]he Board’s cases addressing earlier trial dates as a basis for denial under *NHK* have sought to balance considerations such as system efficiency, fairness, and patent quality.” *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5 (PTAB Mar. 20, 2020) (designated precedential). *Fintiv* sets forth six non-exclusive factors for determining “whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Id.* at 6. In evaluating the factors, we take a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review. *Id.* We are also guided by the Director’s Memorandum, *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, issued June 21, 2022 (“Guidance Memo”),² which provides

² Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621.pdf.

several clarifications concerning the application of the *Fintiv* factors. One such clarification instructs that “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 could have reasonably been raised before the PTAB.” Guidance Memo 3; *see also id.* at 7–8. Thus, we will not exercise our discretion to deny institution if a petitioner makes a stipulation similar to that provided in *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18–19 (PTAB Dec. 1, 2020) (designated precedential in relevant part).

Petitioner stipulates that, upon institution of *inter partes* review in this proceeding, it will not pursue in the Related Litigation “the specific grounds [asserted in IPR2023-00598], or . . . any other ground . . . that was raised or could have been reasonably raised.” Ex. 1038, 1 (alterations in original).

Accordingly, pursuant to the Guidance Memo, we decline to exercise discretion under 35 U.S.C. § 314(a) to deny institution.

III. PATENTABILITY ANALYSIS

A. Principles of Law

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 to a person having ordinary skill in the art to which the subject matter pertains. *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 skill in the art, and (4) when in evidence, any objective evidence of nonobviousness.³ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (quoting *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007)). “The patent’s purpose can also be informative.” *Id.*

Petitioner contends that a person having ordinary skill in the art at the time of the invention would have had “at least a master’s degree in electrical engineering or a related field, and five years of work/research experience in the field of wireless networking.” Pet. 22. According to Petitioner, “[a]dditional education beyond a master’s degree can make up for a lack of work and/or research experience, and more than five years of relevant work

³ At this stage of the proceeding, the parties have not directed us to any such objective evidence.

and/or research experience can compensate for a lesser level of education.”
Id. (citing Ex. 1002 ¶¶ 93–95).

Patent Owner does not dispute Petitioner’s definition of ordinary skill, at this stage of the proceeding. Prelim. Resp. 7.

We find Petitioner’s definition to be consistent with the patent and prior art of record, and adopt it as our own for purposes of this Decision. *See, e.g., In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (approving the determination of the level of ordinary skill in the art by appeal to the references of record).

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims 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). “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention” and “after reading the entire patent.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the

specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner argues that we need not interpret any claim terms for purposes of this Decision. Pet. 20–21.

Patent Owner argues that “the term ‘subband’ should be construed as ‘one of a plurality of subsets of a frequency band.’” Prelim. Resp. 4. Patent Owner argues that the specification of the ’767 patent defines “subband” in this manner. *Id.* at 4–7.

We do not see an explicit definition of “subband” in the ’767 patent as asserted by Patent Owner. However, we agree on this record that the ordinary and customary meaning of “subband” as used in the ’767 patent is a subset of the available frequency band. *See, e.g.*, Ex. 1001, 2:28–29 (“The first subband includes a positive integer number of consecutive subcarriers in frequency domain.”), Fig. 6 (illustrating three subbands); *see also* Ex. 1005 ¶ 176 (describing a subband as a narrowband of frequency available in a cell); Ex. 1002 ¶ 68 (describing 5G systems as dividing “an available bandwidth . . . between four subbands ‘BW’ with 7.5, 15, 30, and 60 kHz subcarrier spacings, respectively”); Pet. 42 (mapping You’s “reduced UE downlink and uplink bandwidth” to the recited subband).

For purposes of this Decision, and based on the record before us, we determine that no further construction of any term is necessary. We note

that this determination does not preclude the parties from arguing their proposed constructions of the claims during trial. Indeed, the parties are hereby given notice that claim construction, in general, is an issue to be addressed at trial. A final determination as to claim construction will be made at the close of the proceeding, after any hearing, based on all the evidence of record. The parties are expected to assert all of their claim construction arguments and evidence during the trial, as permitted by our rules.

D. Overview of the Asserted Prior Art

1. You

You discloses “a method for transmitting or receiving downlink control information” in a wireless communication system. Ex. 1005 ¶ 1. More specifically, You describes a method for a UE to receive downlink control information (“DCI”). *Id.* ¶ 8. You describes DCI as including “resource allocation information for a UE or UE group and other control information.” *Id.* ¶ 104. “The method comprises: receiving, by the UE, a common search space configuration for a common search space; receiving, by the UE, a first physical downlink control channel (PDCCH) scheduling a random access response; and receiving, by the UE, a second PDCCH carrying the DCI for the UE.” *Id.* ¶ 8.

Figure 8 illustrates a configuration of a common search space (“CSS”) for paging and is reproduced below.



Figure 8 illustrates a CSS configuration for paging. Ex. 1005 ¶ 32. You explains that when there is no coverage enhancement (“CE”) or CE has a repetition level of one, a respective modified PDCCH (“M-PDCCH”) can be transmitted on each CSS illustrated in Figure 8. *Id.* ¶¶ 178, 186.

Alternatively, when CE having a repetition level greater than 1 is applied, each CSS illustrated in Figure 8 may be a plurality of consecutive subframes that may have repetitions of M-PDCCH. *Id.* ¶ 187. When operating in a CE scheme, the base station repeats transmission of the M-PDCCH signal in multiple subframes. *Id.* ¶ 174.

You defines a “paging occasion” as “an interval where a UE monitors a paging M-PDCCH.” Ex. 1005 ¶ 199. You further explains that “a UE can monitor a common search space (CSS)” and that “there can be multiple CSS monitoring opportunities within a paging occasion.” *Id.* ¶ 196. The UE continuously monitors the CSSs within the paging occasion. *Id.* ¶ 199. If a paging M-PDCCH is received within a corresponding interval, the UE may receive a physical downlink shared channel (“PDSCH”) carrying the corresponding paging message. *Id.*

2. Liu

Liu discloses “methods and apparatuses for downlink control information (DCI) transmission and receiving in a wireless communication system.” Ex. 1006 ¶ 1. Liu recognizes that new radio access systems may use different numerologies in the same carrier. *Id.* ¶¶ 2–3. “As a result, DCI monitoring may be performed per symbol based on the specific numerology,” and “a terminal device like user equipment (UE) needs to know when to monitor the DCI for scheduling related operations.” *Id.* ¶ 3.

Liu describes a procedure in which a DCI configuration parameter is transmitted to a UE and then the DCI is transmitted to the UE. Ex. 1006 ¶ 40. Lui purports that this two-stage process permits DCI monitoring occasion changes due to numerology and scheduling unit size. *Id.* “[T]he DCI configuration parameter comprises at least one of: a numerology to be used; a valid duration for the DCI configuration parameter; a duration for a single DCI; and DCI occurrence occasions.” *Id.* ¶ 44. The “DCI occurrence occasions can be at a slot level, at subframe level (multi-slot), or at symbol level.” *Id.* ¶ 48.

3. Mallick

Mallick discloses methods for paging one or several UEs in a cell of a radio base station, where the UE(s) require coverage extension to be paged reliably. Ex. 1007 ¶ 1. The base station uses a CE-specific paging frame and subframe, which is monitored by all UEs requiring CE, to send a paging notification. *Id.* ¶¶ 148, 150–152. The system may use varying levels of CE, in which case a CE-specific UE identity (“CE-ISMI”) is used for each CE level. *Id.* ¶ 169. The base station and the UEs use the CE-ISMI to calculate the paging location for each CE level. *Id.* ¶ 170; *see also id.* ¶ 27 (describing a formula for determining paging occasions). UEs that do not require CE will monitor UE-specific paging, and may also monitor CE-specific paging. *Id.* ¶¶ 154, 157, Fig. 5.

E. Asserted Obviousness Based on You and Liu

Petitioner argues that claims 1, 4–6, 9–11, 14–16, 19, and 20 would have been obvious in view of You and Liu. Pet. 22–66. In support of its showing, Petitioner relies upon the Bims Declaration. *Id.* (citing Ex. 1002).

We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious in view of the combination of You and Liu.

1. Independent Claim 1

Petitioner relies on You to disclose a method substantially as recited in claim 1, and relies on Liu to teach using subcarrier spacing to determine the first signaling time intervals. Pet. 28–51.

a. The Preamble

Claim 1 recites “[a] method in a User Equipment (UE) for paging.” Ex. 1001, 23:2. Petitioner argues that You discloses such a method, observing that You discloses a UE that monitors a paging M-PDCCH. Pet. 36–37 (citing Ex. 1005 ¶¶ 185–187, 199, Fig. 8; Ex. 1002 ¶ 124).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, to the extent the preamble is limiting, the cited portions of You support Petitioner’s contentions. We note that it is You’s machine type communication (“MTC”) UE that monitors M-PDCCH signaling, which is a PDCCH modified for transmission within the subband in which the MTC UE is operated. Ex. 1005 ¶ 177.

b. The Monitoring Recitation

Claim 1 recites “monitoring a first signaling in X time intervals.” Ex. 1001, 23:4. Petitioner argues that, “when coverage enhancement is

applied,” You’s UE monitors repetitions of M-PDCCH paging over multiple subframes. Pet. 37–38 (citing Ex. 1005 ¶¶ 47, 183–187, 199, Fig. 8; Ex. 1002 ¶¶ 125–127).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, the cited portions of You support Petitioner’s contentions. Of particular note, You discloses its base station repeating transmission of the M-PDCCH signal for coverage enhancement over a number of consecutive downlink subframes and the MTC UE monitoring the repeated transmissions. Ex. 1005 ¶¶ 182–183.

c. The Receiving Recitation

Claim 1 recites “receiving a first radio signal.” Ex. 1001, 23:5. Petitioner argues that, if You’s UE receives the M-PDCCH signaling within a paging occasion, “the UE may receive a PDSCH carrying the corresponding paging message.” Pet. 38 (citing Ex. 1005 ¶¶ 47, 199; Ex. 1002 ¶ 128). Petitioner argues that an ordinarily skilled artisan “would have understood that the set of time-frequency resources occupied by the PDSCH is a radio signal.” *Id.* at 38–39 (citing Ex. 1001, 19:54–62, 20:18–19; Ex. 1002 ¶ 128).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, the cited portions of You support Petitioner’s contentions. Of particular note, You discloses its base station transmitting and the MTC UE receiving a PDSCH carrying a paging message. Ex. 1005 ¶ 199.

d. The X Recitation

Claim 1 recites “wherein X is a positive integer.” Ex. 1001, 23:6. Relying on its showing made regarding the Monitoring Recitation, Petitioner argues that You discloses monitoring paging M-PDCCH in one or more time intervals. Pet. 39 (citing Ex. 1002 ¶ 129).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, You supports Petitioner’s contentions. As noted above, You discloses repeating transmission of the M-PDCCH signal for coverage enhancement over a number of consecutive downlink subframes. Ex. 1005 ¶¶ 182–183.

e. The Signaling Recitation

Claim 1 recites “wherein . . . the first signaling is used for determining scheduling information for the first radio signal.” Ex. 1001, 23:6–8. Petitioner argues that the DCI transmitted on You’s paging M-PDCCH contains scheduling information for the PDSCH carrying the paging message. Pet. 39 (citing Ex. 1005 ¶¶ 104–105, 188, 194, 196, 199, 293; Ex. 1002 ¶¶ 130–131).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, the cited portions of You support Petitioner’s contentions. Of particular note, You discloses that its PDCCH includes DCI that includes resource allocation information, such as downlink and uplink scheduling information. Ex. 1005 ¶ 104.

f. The Scheduling Information Recitation

Claim 1 recites “wherein . . . the scheduling information comprises at least one of {occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource}.” Ex. 1001, 23:8–12. Petitioner argues that You’s DCI contains information including MCS and resource block (“RB”) allocation, which Petitioner argues “contain[s] a predetermined number of consecutive symbols in the time domain and a predetermined number of consecutive subcarriers in the frequency domain.” Pet. 40 (citing Ex. 1005 ¶¶ 59, 61, 104, Fig. 2). Petitioner concludes, therefore, that You’s DCI “includes both an occupied time-frequency resource and an adopted Modulation Coding Scheme (MCS).” *Id.* at 40–41 (citing Ex. 1002 ¶ 134).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, the cited portions of You support Petitioner’s contentions.

g. The Paging Message Recitation

Claim 1 recites “wherein . . . the first radio signal carries a paging message.” Ex. 1001, 23:12–13. Relying on its showing made regarding the Receiving Recitation, Petitioner argues that You’s PDSCH carries a paging message. Pet. 42 (citing Ex. 1005 ¶¶ 193, 199; Ex. 1002 ¶ 136).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, You supports Petitioner’s contentions. Of particular note, You discloses that, if a paging M-PDCCH is received within

a corresponding paging interval, the UE may receive a PDSCH carrying the corresponding paging message. Ex. 1005 ¶ 199.

h. The Subband Recitation

Claim 1 recites “wherein . . . the frequency domain resource used for transmitting the first signaling belongs to a first subband.” Ex. 1001, 23:13–14. Petitioner argues that You’s MTC UE monitors the paging M-PDCCH at a reduced bandwidth and at a specified narrowband location. Pet. 42–43 (citing Ex. 1005 ¶¶ 175–177, 194, 235, Fig. 6; Ex. 1002 ¶ 137).

Patent Owner argues that the embodiment illustrated in You’s Figure 6(a) “does not disclose a claimed ‘subband’ because its entire system bandwidth only comprises *one* ‘MTC sub-band.’” Prelim. Resp. 13. According to Patent Owner, the challenged claims “clearly recite a ‘first’ subband as one of a plurality of subbands.” *Id.*

You discloses operating MTC UEs at one of several frequency subbands. Ex. 1005 ¶ 176, Fig. 6(b). The bandwidth of each subband may be, for example, 1.4 MHz. *Id.* ¶ 176. Thus, on this record, You supports Petitioner’s contentions.

To the extent Patent Owner argues that the recited “first subband” requires one or more additional subbands, we disagree. We see no language in claim 1 that requires the use of a second subband. Moreover, even if we were to agree with Patent Owner that claim 1 requires the presence of multiple subbands, You discloses multiple subbands on this record. You discloses communication between the base station and multiple MTC UEs, where each MTC UE uses one of several provided subbands. Ex. 1005 ¶ 176, Fig. 6(b). Additionally, both Figures 6(a) and 6(b) illustrate the MTC

UE subbands as being a subset of a “Legacy PDCCH” that covers frequencies above and below the MTC UE subbands, indicating that multiple subbands are available for use.

i. The Subcarriers Recitation

Claim 1 recites “wherein . . . the first subband comprises a positive integer number of consecutive subcarriers in frequency domain.” Ex. 1001, 23:14–16. Petitioner argues that the paging M-PDCCH subbands are “configured on several physical resource blocks (PRBs).” Pet. 43 (citing Ex. 1005 ¶ 176, Fig. 6; Ex. 1002 ¶ 138). Petitioner argues that each of You’s PRBs includes a number of consecutive subcarriers in the frequency domain. *Id.* at 43–44 (citing Ex. 1005 ¶¶ 61–62, Fig. 2; Ex. 1002 ¶ 138).

Patent Owner argues that the Petition and Dr. Bims’s testimony inconsistently map the asserted references to the challenged claims. Prelim. Resp. 8–13. Patent Owner notes that the Petition maps You’s M-PDCCH to the recited first signaling, You’s MTC subband to the recited first subband, and You’s PRBs to the recited consecutive subcarriers in the frequency domain. *Id.* at 9 (citing Pet. 42–43). Patent Owner argues that “*You* does not disclose any case in which a subband with an M-PDCCH comprises any PRB.” *Id.* Rather, Patent Owner argues, *You* discloses “two distinct embodiments” of its MTC subband: one embodiment illustrated in Figure 6(a) in which the subband may include PRBs, and a separate embodiment illustrated in Figure 6(b) in which the subband may include an M-PDCCH. *Id.* at 9–10 (citing Ex. 1005 ¶ 176, Figs. 6(a), 6(b)). Patent Owner argues the embodiment illustrated in *You*’s Figure 6(a) uses legacy PDCCH rather than M-PDCCH. *Id.* at 10–11 (citing Ex. 1005 ¶ 177).

Patent Owner concludes that “[Petitioner] has failed show that *You* discloses any embodiment comprising a subband with both a PRB (on which it relies for consecutive subcarrier symbols) and a M-PDCCH (on which it relies for a first signaling).” *Id.* at 13.

Contrary to Patent Owner’s assertions, *You* discloses that “the MTC UE cannot receive a legacy PDCCH transmitted through a full system band.” Ex. 1005 ¶ 177. Thus, as explained above, *You* discloses that its MTC UEs use a M-PDCCH, which is a PDCCH modified for transmission within the subband in which the MTC UE is operated. *Id.* The M-PDCCH is transmitted via a narrowband that may comprise six PRBs. *Id.* ¶ 176. Figure 6(a) illustrates a single MTC subband located at the center of a cell, and Figure 6(b) illustrates five MTC subbands. *Id.* Both figures also illustrate the MTC UE subband(s) as being a subset of a “Legacy PDCCH” bandwidth that covers frequencies above and below the MTC UE subbands. Thus, on this record, both Figures 6(a) and 6(b) illustrate subbands comprised of PRBs through which the M-PDCCH is transmitted. *You*, therefore, supports Petitioner’s contentions.

j. The Determining Recitation

Claim 1 recites “wherein . . . at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.” Ex. 1001, 23:16–20. Petitioner argues that Liu teaches the use of subcarrier spacing to determine the time intervals for monitoring DCI. Pet. 45–46 (citing Ex. 1006 ¶¶ 44, 48–49, 57, 95, Figs. 3A, 3B; Ex. 1002 ¶¶ 139–147). Petitioner argues that Liu discloses using the subcarrier spacing to determine

three different aspects of the time-frequency resource associated with monitoring a paging message: slot locations in the time domain (*id.* at 47–48 (citing Ex. 1006 ¶¶ 44–45, 49, 57, 95, 143, Fig. 2; Ex. 1002 ¶¶ 142–144)), the duration of each monitoring occasion (*id.* at 49 (citing Ex. 1006 ¶¶ 45, 47; Ex. 1002 ¶ 145)), and the number of monitoring occasions (*id.* at 49–50 (citing Ex. 1006 ¶¶ 45, Fig. 2; Ex. 1002 ¶ 146)). Petitioner argues that it would have been obvious to modify You’s M-PDCCH monitoring scheme from the subframe level to the slot level, as taught by Liu, to more efficiently allocate the time-frequency resources in the control region. *Id.* at 31–32 (citing Ex. 1005 ¶ 184; Ex. 1006 ¶¶ 2, 48, 62; Ex. 1002 ¶ 114); *see also id.* at 29–31, 50–51 (presenting additional rationales for modifying You in view of Liu’s teachings).

Patent Owner does not contest this aspect of the Petition at this stage of the proceeding. *See generally* Prelim. Resp.

On this preliminary record, the cited portions of You support Petitioner’s contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have combined the teachings of You and Liu. *See, e.g.,* Pet. 31–32.

k. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 1 would have been obvious in view of the combination of You and Liu.

2. Independent Claims 6, 11, and 16

As discussed above, independent claim 1 recites a method of paging in wireless communication from the perspective of user equipment. Ex. 1001, 23:2–20. Independent claim 6 recites the method of claim 1 from the perspective of the base station (*id.* at 23:53–24:4), independent claim 11 recites a user equipment having first and second receiver modules for performing the method recited in claim 1 (*id.* at 24:37–54), and independent claim 16 recites a base station having first and second transmitter modules for performing the method recited in claim 6 (*id.* at 25:18–26:2).

Petitioner sets forth similar arguments for claims 6, 11, and 16 as for claim 1, and further maps receive antennas in You’s UEs to the recited receiver modules and transmit antennas and oscillators in You’s base station to the recited transmitter modules. Pet. 57–66. Patent Owner does not present arguments for claims 6, 11, and 16 apart from its arguments discussed above regarding claim 1. Prelim. Resp. 8–14. For similar reasons as discussed above, Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 6, 11, and 16 would have been obvious in view of the combination of You and Liu.

F. Asserted Obviousness Based on You, Liu, and Mallick

Petitioner argues that claims 2, 3, 7, 8, 12, 13, 17, and 18 would have been obvious in view of You, Liu, and Mallick. Pet. 66–83. Petitioner relies on You and Liu to teach most of the recitations of these dependent claims, and relies on Mallick to teach using a UE feature id for determining the monitoring time intervals and time window. *Id.* In support of its showing, Petitioner relies upon the Bims Declaration. *Id.* (citing Ex. 1002).

Patent Owner, at this stage of the proceeding, does not contest Petitioner's showings for this challenge apart from its assertions discussed above regarding the challenge based on You and Liu. Prelim. Resp. 14.

We have reviewed Petitioner's assertions and supporting evidence. Based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious in view of the combination of You, Liu, and Mallick.

IV. CONCLUSION

For the foregoing reasons, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in showing that at least one of the challenged claims is unpatentable. At this preliminary stage, we have not made a final determination with respect to the patentability of the challenged claims or any underlying factual and legal issues. *See TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that "there is a significant difference between a petitioner's burden to establish a 'reasonable likelihood of success' at institution, and actually proving invalidity by a preponderance of the evidence at trial").

Accordingly, *inter partes* review is instituted as to all challenged claims and all proposed grounds of unpatentability. *See* 37 C.F.R. § 42.108(a).

V. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the '767 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, notice is hereby given of the institution of a trial, which commences on the entry date of this decision.

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