

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2025-00901
Patent 11,374,721 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 1–20 of U.S. Patent No. 11,374,721 B2 (Ex. 1001, “the ’721 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 ’721 patent.

A. *Real Parties-In-Interest*

The parties identify themselves as the real parties-in-interest. Pet. 90; Paper 4, 2.

B. *Related Matters*

The parties collectively identify *Apex Beam Technologies LLC v. Apple Inc.*, 6:24-cv-00223 (W.D. Tex.) and *Apex Beam Technologies LLC v. Samsung Electronics Co.*, No. 2:24-cv-00203 (E.D. Tex.) as matters that

may affect, or be affected by, a decision in this proceeding. Pet. 90;
Paper 4, 2.

C. The '721 Patent

The '721 patent “relates to a transmission scheme in a wireless communication system, and in particular to . . . uplink transmission.” Ex. 1001, 1:17–20. More specifically, the '721 patent relates to “[g]rant-free uplink transmission” where data “collision[s] may occur due to [a] lack of centralized dynamic scheduling and resource coordination.” *Id.* at 2:6–9. The '721 patent “provides a solution” to reduce collisions “by distinguishing uplink synchronization time for the wireless resources of the uplink transmission.” *Id.* at 2:28–34. For example, the '721 patent discloses an embodiment where for a user equipment (“UE”), a first wireless resource to use is determined based on a first time interval such that other uplink transmissions in different time ranges may use different wireless resources, reducing the possibility of collision. *Id.* at 2:59–67.

Figure 1, shown below, is such an embodiment.

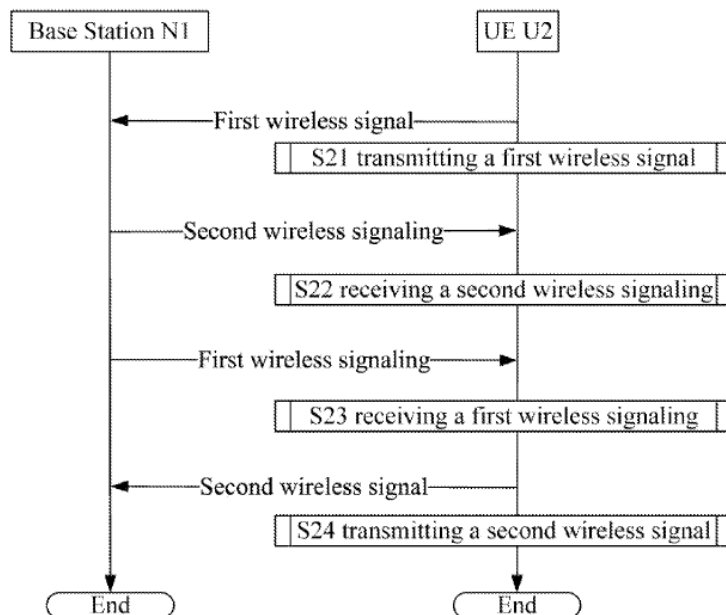


Figure 1 “shows a wireless signal transmission flow diagram” in accordance with the disclosure of the ’721 patent. *Id.* at 11:37–38. As illustrated, UE U2 transmits a first wireless signal to base station N1. *Id.* at Fig. 1, 12:26–27. “[T]he first wireless signal is used to determine a first time interval,” where “the first time interval is . . . between a first time instant and a second time instant.” *Id.* at 12:31–32. The first time instant is when UE U2 starts to transmit the first wireless signal, and the second time instant is when UE U2 starts to transmit a second wireless signal. *Id.* at 12:34–38.

The ’721 patent discloses that “[t]he second wireless signal occupies a first wireless resource,” which “is one of J candidate wireless resources.” *Id.* at 12:39–42. “[T]he first time interval is used to determine the first wireless resource out of the J candidate wireless resources [used] by the base station N1 and UE U2.” *Id.* at 12:42–45. The ’721 patent discloses that “the J candidate wireless resources correspond to P time interval ranges,” and “any two time interval ranges of the P time interval ranges do not overlap.” *Id.* at 12:49–51. Moreover, the ’721 patent teaches that “the transmission channel corresponding to the first wireless signal [can be] a Random Access Channel (RACH),” and that “a physical channel corresponding to the second wireless signal is a Physical Uplink Shared Channel (PUSCH).” *Id.* at 14:1–3, 14:14–16.

D. Illustrative Claim

Of the challenged claims, claims 1, 6, 11, and 16 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A method for wireless communication in a user equipment (UE), comprising:
 - transmitting a first wireless signal; and
 - transmitting a second wireless signal;

wherein the first wireless signal is generated by a first sequence; the first wireless signal is used to determine a first time interval; the first time interval is a time interval between a first time instant and a second time instant; the first time instant is a starting time instant at which a transmitter of the first wireless signal transmits the first wireless signal; the second time instant is a starting time instant at which a transmitter of the second wireless signal transmits the second wireless signal; the first time instant is earlier than the second time instant; the second wireless signal occupies a first wireless resource; the first wireless resource is one of J candidate wireless resources; the J is a positive integer; the first time interval is used to determine the first wireless resource out of the J candidate wireless resources; the first sequence is a Zadoff-Chu (ZC) sequence, a transport channel corresponding to the first wireless signal is a Random Access Channel (RACH), a physical channel corresponding to the second wireless signal is a Physical Uplink Shared Channel (PUSCH); the first wireless signal is used to determine whether the second wireless signal is transmitted or not.

Ex. 1001, 27:7–33.

E. Asserted Ground of Unpatentability

Petitioner asserts that the challenged claims of the '721 patent are unpatentable based on the following ground:

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)
1–20	103	Lee, ² Freda, ³ Ly, ⁴

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 '721 patent is after March 16, 2013, we apply the AIA version of this basis for unpatentability.

² US 2017/0019930 A1, published Jan. 19, 2017 (Ex. 1005, “Lee”).

³ US 2019/0320467 A1, published Oct. 17, 2019, provisional application filed Sept. 28, 2016 (Ex. 1006, “Freda”).

⁴ US 2018/0097590 A1, published Apr. 5, 2018, provisional application filed Sept. 30, 2016 (Ex. 1007, “Ly”).

Pet. 17–89. 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 the ’721 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 long-term evolution LTE/4G and 5G new radio (NR) cellular technology.” Pet. 4 (citing Ex. 1003 ¶ 32). 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.* at 4–5.

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 ’721 patent or identify any shortcoming in Petitioner’s formulation. *See* Prelim. Resp. 2.

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. 4–5. We view the definition for the level of ordinary skill as consistent with the ’721 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. 4. Patent Owner argues that at this stage, “claim construction is not required to resolve any issues.” Prelim. Resp. 2.

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 *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 LEE, FREDA, AND LY

Petitioner argues that the combination of Lee, Freda, and Ly renders claims 1–20 obvious. Pet. 17–89. For the reasons that follow, we determine that Petitioner demonstrates a reasonable likelihood that it would prevail in showing that the combination renders obvious at least one of these claims.

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

A. Summary of Lee

Lee “relates to a wireless communication system and, more particularly, to a method for allocating a temporary radio network temporary identifier [(T-RNTI)] to a terminal performing a random access procedure.” Ex. 1005 ¶ 1. In particular, Lee provides a method that includes transmitting, by a UE, a random access preamble to a base station, transmitting, by the UE, a radio resource control (RRC) request message to the base station through a contention-based PUSCH resource block in which uplink data can be transmitted without uplink resource allocation scheduling, and receiving, by the UE, an RRC connection setup message identified by a T-RNTI allocated to the UE in response to the RRC request message, wherein the T-RNTI is allocated on the basis of the contention-based PUSCH resource block in which the RRC request message has been transmitted. *Id.* at code (57).

B. Summary of Freda

Freda relates to random access in wireless systems, such as fifth generation (5G) and legacy fourth generation (4G) systems. Ex. 1006 ¶¶ 2–5. More specifically, Freda teaches that a wireless transmit/receive unit (“WTRU”) may initiate a random access by first determining whether to select a first RACH procedure or a second RACH procedure, where the first is a legacy RACH procedure, and the second is an enhanced RACH procedure. *Id.* at code (57). Freda teaches that this determination may be based at least on a type of uplink data to be transmitted. *Id.* Freda teaches that when the second RACH procedure is selected, the WTRU may determine at least one physical random access channel (“PRACH”) resource and a preamble sequence associated with the second RACH procedure. *Id.*

Freda adds that the WTRU may determine a data resource for the uplink data, and send a RACH transmission that includes the preamble sequence and the uplink data. *Id.*

C. Summary of Ly

Ly relates to wireless communication systems, and more particularly to uplink random access in 5G new radio networks to enable and provide improved communication techniques allowing communication devices to reduce random access latency for initial network access and uplink-based mobility procedures. Ex. 1007 ¶ 2.

D. Challenged Claim 1

Patent Owner disputes that the combination of Lee, Freda, and Ly teaches two limitations of independent claim 1. Prelim. Resp. 5–10. We first address the limitations disputed by Patent Owner and then turn to the undisputed limitations.

1. Disputed Limitations

a. First Time Interval

Patent Owner argues that the combination of Lee and Freda fails to teach that “the first time interval is used to determine the first wireless resource out of the J candidate wireless resources,” as recited in claim 1. Prelim. Resp. 5–8. At this stage, we agree with Petitioner and find that the combination of Lee and Freda teaches this limitation. Pet. 45–47.

First, we agree with Petitioner and find that Lee teaches “allocating resources for a UE’s PUSCH data depending on the UE’s selection/assignment of [a] RACH preamble” (i.e., a first wireless signal). Pet. 18; Ex. 1005 ¶¶ 281–290, Figs. 19(a)–(b). More specifically, as Petitioner argues, Lee teaches a UE that transmits a RRC message (i.e., the

second wireless signal) using a contention-based PUSCH resource block (“CPRB”)—which is a first wireless resource—that is selected from a set of CPRBs (i.e., J candidate wireless resources) in a contention-based PUSCH group (“CP group”),⁶ depending on the selected RACH preamble. Pet. 40–46; Ex. 1005 ¶¶ 213, 223, 282–287, Figs. 19(a), 19(b).

Lee’s Figure 19, as annotated and abridged by Petitioner, is shown below (Pet. 40).

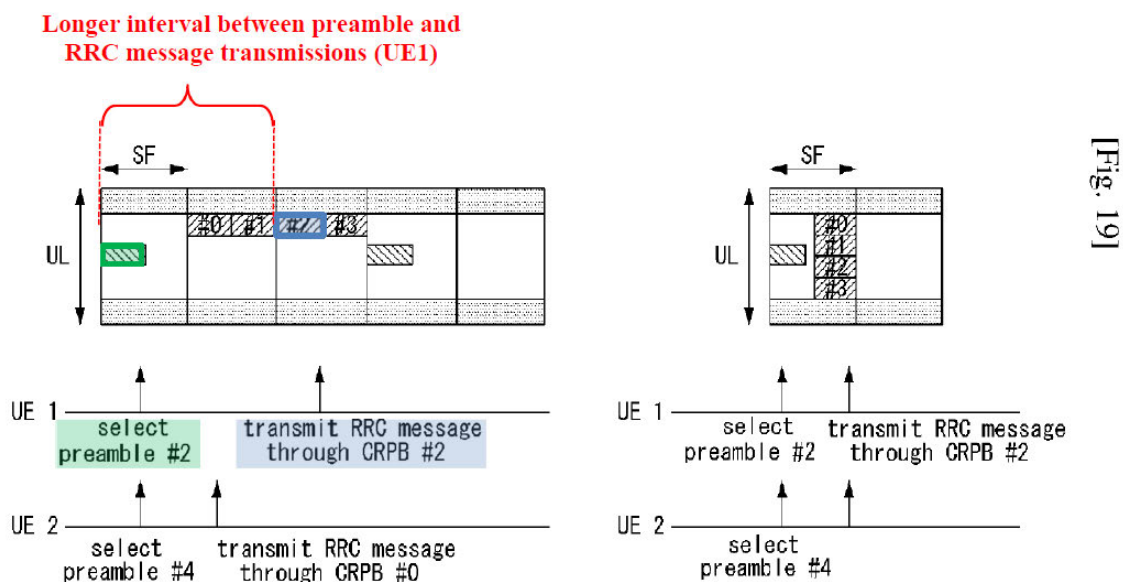


Figure 19 “is a view illustrating a method for preventing CPRB collision according to” Lee’s teachings. Ex. 1005 ¶ 43. Petitioner (i) colors in green UE 1’s “select preamble #2” label and its corresponding PRACH block, (ii) colors in blue UE 1’s “transmit RRC message through C[PR]B #2” label

⁶ CP zone(s) are “resource regions in which a contention-based UL data transmission allocated *within a subframe* is available.” Ex. 1005 ¶ 204 (emphasis added). More broadly, a CP group “may be comprised of one or more CP zone(s),” and “signifies a resource region in which the UEs that occupy the CPRB resources may contend in an arbitrary time, that is, a set of candidate CPRB(s) that an arbitrary UE may occupy.” *Id.* ¶ 209.

and its corresponding CPRB block, and (iii) labels the time interval between UE 1's preamble and RRC message transmissions. Pet. 40. Lee explains that the time interval is due to "implicitly selecting a CPRB on the basis of a randomly selected preamble." Ex. 1005 ¶¶ 282–288; Pet. 13.

Second, we agree with Petitioner and find that Freda teaches a random access procedure that uses "time and/or frequency offsets between the RACH preamble and PUSCH data, where the offsets depend on the selection of the RACH preamble." Pet. 18; Ex. 1006 ¶¶ 209, 211. More specifically, we agree that Freda teaches that "resources used for a preamble and the resources used for data may have some association, such as an implicit association" and that these association rules can be a "time and/or frequency offset" between preamble resources and data resources. Pet. 46; Ex. 1006 ¶¶ 147, 209. For example, Freda teaches "[a] relationship between preamble and data may be in a time domain," and that "a start time of a transmission of a preamble and a start time of a transmission of a data portion may be offset from each other by a specific amount of time." Ex. 1006 ¶ 209. In addition, Freda teaches that "[a] relationship between preamble and data may be in a frequency domain," and "[f]or example, a first [physical resource block ("PRB")] of a transmission of a preamble and a first PRB of a transmission of a data portion may be offset from each other by a specific amount of PRBs." *Id.* ¶ 210; Pet. 46–47.

Accordingly, as this stage, for the reasons above, we agree with Petitioner and find that Lee and Freda in combination teach "us[ing] Freda's time-domain offset (*first time interval*) to determine a 'PRB region' for transmitting the PUSCH data (Lee's RRC message), and further us[ing] Freda's frequency-domain offset to determine a specific PRB (*the first*

wireless resource) within the PRB region for transmitting the PUSCH data” (i.e., the J candidate wireless resources). Pet. 47.

At this stage, we find unavailing Patent Owner’s argument that “[b]ecause Freda’s ‘frequency-domain offset’ is not the ‘time-domain offset’ that the selection of time resources must be determined by, the Petition is deficient on its face.” Prelim. Resp. 6. Rather, as we discuss above, Freda’s time-domain offset (i.e., the first time interval) is used to determine the first wireless resource, along with Freda’s frequency-domain offset. Notably, the claim language does not recite that *only* the time interval is used to determine the wireless resource. Ex. 1001, 27:24–26; *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (stating “the name of the game is the claim”). To the extent that Patent Owner believes that this limitation should be construed to require that *only* the time interval is used, Patent Owner should provide detailed factual and legal support for such during trial, in accordance with our Rules.

We also find unavailing Patent Owner’s argument that “Freda’s frequency-domain offset only indicates the ‘specific amount of PRBs’ or the amount of resources between the transmission of a preamble and transmission of a data portion.” Prelim. Resp. 6 (citing Ex. 1006 ¶ 210). At this stage, we view this as teaching an indication of a specific PRB in the frequency domain, and as such, indicates a first wireless resource in conjunction with the time-domain offset. Ex. 1006 ¶ 210.

In addition, Petitioner argues that for the Lee and Freda combination “that these association rules can be a ‘time *and/or* frequency offset’ between preamble resources and data resources.” Pet. 46 (citing Ex. 1006 ¶¶ 147, 209) (emphasis added). And as Lee’s Figure 19(a) above illustrates, certain

CPRB regions may be allocated in a time division manner only, not implicating a frequency offset. Ex. 1005 ¶ 287, Fig. 19(a).

In sum, at this stage, we find that the combination of Lee and Freda teaches this limitation.

b. Whether the Second Wireless Signal is Transmitted

Patent Owner argues that Lee fails to teach that “the first wireless signal is used to determine whether the second wireless signal is transmitted or not,” as recited in claim 1. Prelim. Resp. 8–10. At this stage, we agree with Petitioner and find that Lee teaches this limitation. Pet. 49–51.

In particular, we agree with Petitioner and find that Lee teaches embodiments for “which CPRBs are allocated to each of several UEs ‘in order of preamble [(RACH preamble (first wireless signal))] sequences’ (e.g., ‘according to descending order or ascending order of the transmitted RACH preamble sequence number’).” Pet. 49–50; Ex. 1005 ¶ 306. But, as Petitioner argues, if for a UE with a lower order position “there is no available CPRB, a CPRB is not allocated thereto.” Pet. 50; Ex. 1005 ¶ 309. Lee thus teaches that the UE “abandons RRC message [(second wireless signal)] transmission to the [base station] at the corresponding point in time (subframe).” Pet. 50; Ex. 1005 ¶ 310.

At this stage, we view this as sufficient for teaching that the first wireless signal (RACH preamble) is used to determine that the second wireless signal (RRC) is not transmitted. We agree, however, with Patent Owner that Lee teaches that RRC messages that are abandoned (not transmitted) for a subframe or more, may later be transmitted if a CPRB is available after a back-off time. Prelim. Resp. 8–9; Ex. 1005 ¶¶ 310–311. But at this stage, we do not view this limitation, in the context of the overall

claim and '721 patent, as requiring that the RRC message never is sent. Rather, that the first signal was used at least once to determine that the second wireless signal is not transmitted is sufficient. To the extent that Patent Owner believes that this limitation should be construed as Patent Owner suggests, Patent Owner should provide detailed factual and legal support for such during trial, in accordance with our Rules.

Next, we agree with Petitioner that Lee's teachings at least suggest that RRC messages that are not abandoned are transmitted. *See* Pet. 49–50; Ex. 1005 ¶¶ 304–311; Ex. 1003 ¶ 147. For example, as Petitioner argues, Lee teaches “a scenario in which three UEs compete for allocation of two CPRBs based on their transmitted preamble sequences,” which at least suggests two UEs' RRC messages are transmitted based on their higher preamble sequence order. Pet. 50–51 (citing Ex. 1005 ¶¶ 304–311).

We also find unavailing Patent Owner's argument that “Petitioner actually admits that Lee's disclosure of this claim limitation is merely an ‘implication.’” Prelim. Resp. 9 (citing Pet. 50). Rather, this argument from Petitioner relates to RRC messages that are not abandoned, and the implication is that they are transmitted because they are not abandoned. Pet. 50. Such an implication is supported by, *inter alia*, other arguments from Petitioner we discuss above.

In sum, at this stage, we find that Lee teaches this limitation.

2. *Undisputed Limitations*

Petitioner asserts that the combination of Lee, Freda, and Ly teaches the preamble and the remaining limitations of claim 1. Pet. 30–45, 47–49. Petitioner identifies where the combination 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 Lee, Freda, and Ly 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 Lee, Freda, and Ly renders obvious claim 1.

E. Challenged Claims 2–20

At this stage, Patent Owner does not address separately Petitioner's arguments and evidence as to how the combination of Lee, Freda, and Ly teaches the limitations of claims 2–20. *See* Prelim. Resp. 10–11.

We leave for trial, however, whether Petitioner establishes that this combination renders obvious claims 2–20. *See* 37 C.F.R. § 42.108(a).

VI. 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 '721 patent. We thus institute an *inter partes* review of all of the challenged claims of the '721 patent on the ground 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.

VII. 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 '721 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.

IPR2025-00901
Patent 11,374,721 B2

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