

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

NEO WIRELESS LLC,
Patent Owner.

IPR2022-01537
Patent 10,075,941 B2

Before HYUN J. JUNG, CHARLES J. BOUDREAU, and
MATTHEW S. MEYERS, *Administrative Patent Judges*.

MEYERS, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Volkswagen Group of America, Inc. (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–14 (the “challenged claims”) of U.S. Patent 10,075,941 B2 (Ex. 1001, the “’941 patent”). Paper 1 (“Petition” or “Pet.”). Neo Wireless LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Preliminary Response” or “Prelim. Resp.”).

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review. 35 U.S.C. § 314; 37 C.F.R. § 42.4(a) (2020). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted 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 [one] of the claims challenged in the petition.”

After considering the Petition, the Preliminary Response, and the evidence of record, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one of claims 1–14. Accordingly, we institute an *inter partes* review of all challenged claims on all asserted grounds pursuant to 35 U.S.C. § 314. 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.”); *see also SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018).

B. Real Parties-in-Interest

The parties identify themselves as the real parties-in-interest. Pet. 3; Paper 6, 1. Petitioner further states that Volkswagen Group of America, Inc. is a subsidiary of Volkswagen AG. Pet. 3.

C. Related Proceedings

The parties identify, as matters involving or related to the '941 patent, *In re: Neo Wireless, LLC Patent Litigation*, 2-22-md-03034 (E.D. Mich.) (“the NEO Wireless litigation”) and *Neo Wireless LLC v. Volkswagen Group of America, Inc. et al.*, 2-22-cv-11404 (E.D. Mich.). Pet. 3–4; Paper 6, 1–2. The parties also identify other district court proceedings involving the '941 patent, both current and former, including *Neo Wireless, LLC v. Volkswagen Group of America, Inc. et al.*, 1-22-cv-00076 (E.D. Tenn.) (terminated June 14, 2022). Pet. 3–4; Paper 6, 1–3.

The parties further state that Petitioner has filed petitions in IPR2022-01538 (U.S. Patent 10,771,302) and IPR2022-01539 (U.S. Patent 10,965,512). Pet. 4; Paper 6, 3–4. In addition, Patent Owner identifies IPR2022-01567 (U.S. Patent 10,447,450) as a related matter. Paper 6, 4. Petitioner also identifies IPR2021-01468 (“the -01468 proceeding”), a petition filed by Dell Inc. that was denied *inter partes* review, as a related matter. Pet. 4.

We additionally note that Ford Motor Company and American Honda Motor Co., Inc. (“Honda”) also have filed petitions for review of the '941 patent. IPR2023-00766, Paper 1; IPR2023-00791, Paper 3. Honda’s petition is substantially identical to the instant Petition and was accompanied by a motion for joinder as a petitioner in this proceeding. IPR2023-00791, Paper 2.

D. The '941 Patent

The '941 patent is titled “Methods and Apparatus for Multi-Carrier Communication Systems with Adaptive Transmission and Feedback.” Ex. 1001, code (54). The '941 patent describes various methods to improve the performance of a wireless system, such as adaptive modulation and coding (“AMC”), channel estimation, transmission power control (“TPC”), and the adjustment of a subchannel configuration in accordance with the state of a communication channel. *Id.* at 1:34–48. The '941 patent, however, states that “[t]he subchannel configuration is normally defined and fixed in an operation, and it is usually not considered an adjustable function of the system to be adapted to the user profile and/or operational environment.” *Id.* at 2:4–7.

The '941 patent describes a method for adaptive transmission of wireless communication signals in which modulation and coding scheme (“MCS”), coding rates, training pilot patterns, TPC levels, and subchannel configurations “are jointly adjusted to adapt to the channel conditions.” Ex. 1001, 2:33–38. Figure 4 of the '941 patent is reproduced below.

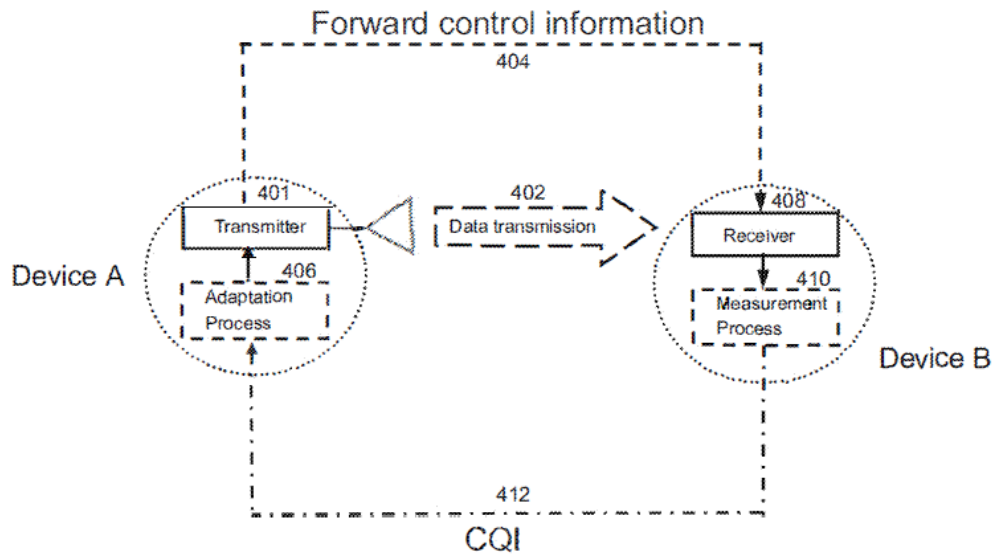


FIG. 4

Figure 4 shows an example of a control process between Device A and Device B. Ex. 1001, 2:17–18. Device A and Device B may be a base station and a mobile station that use adaptive transmission. *Id.* at 4:14–17. Specifically, based on output from adaptation process 406, Device A’s transmitter 401 transmits data 402 and control information 404 to Device B. *Id.* at 4:17–19. Device B’s receiver 408 receives data 402 and control information 404, whereas measurement process 410 measures channel conditions and feeds channel quality information (“CQI”) 412 back to Device A. *Id.* at 4:20–24.

According to the ’941 patent, “[t]he underlying principles of adaptive transmission and feedback are both to increase the degree of freedom of a transmission process and to supply information for the adaptation process of a communication system.” Ex. 1001, 3:63–66. The ’941 patent explains that when adaptive modulation, coding, training, and power control (“AMCTP”) is used, a transmitter relies on CQI to select an appropriate AMCTP scheme for transmitting the next packet or retransmitting a

previously failed packet. *Id.* at 4:46–49. The ’941 patent states that “[t]he adaptation process adjusts the allocated modulation schemes, coding rates, pilot patterns, power levels, spatial processing schemes, subchannel configurations, etc. in accordance with the transmission channel state and condition, for improving system performance and/or capacity.” *Id.* at 3:66–4:4.

E. Illustrative Claim

Petitioner challenges claims 1–14 of the ’941 patent. Pet. 1. Claims 1, 6, 8, and 13 are the independent challenged claims. Claim 1, reproduced below with Petitioner’s bracketing and labels, is representative.

1. [1A] A link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

[1B] transmitting a control message to a mobile station over a control channel, wherein:

[1C] the control message contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and

[1D] the mobile station-specific transmission parameters indicate an antenna transmission scheme and

[1E] a corresponding subchannel configuration,

[1F] the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and

[1G] the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

[1H] transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

Ex. 1001, 9:5–31; Pet. 117–118.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–14 of the '941 patent are unpatentable on the following grounds (Pet. 7):

Claims Challenged	35 U.S.C. §	References
1–14	103(a) ¹	802.16a-2001, ² 802.16a-2003, ³ Heath ⁴
1, 3–8, 10–14	103(a)	Walton040, ⁵ Li017 ⁶
2, 9	103(a)	Walton040, Li017, Tufvesson ⁷

Petitioner also relies on the Declaration of Sarah Kate Wilson, PhD. (Ex. 1003, “the Wilson Declaration”) in support of its arguments. Patent

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102 and 103 that became effective on March 16, 2013. Because the '941 patent claims priority as a continuation to an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability. *See* Ex. 1001, code (63).

² IEEE Std 802.16-2001, “802.16-2001 - IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems” (Ex. 1005, “802.16a-2001”).

³ IEEE Std 802.16-2003, “802.16a-2003 - Standard for Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz” (Ex. 1006, “802.16a-2003”).

⁴ US 6,937,592 B1, issued Aug. 30, 2005 (Ex. 1007, “Heath”).

⁵ US 2003/0125040 A1, published July 3, 2003 (Ex. 1008, “Walton040”).

⁶ US 2002/0147017 A1, published Oct. 10, 2002 (Ex. 1009, “Li017”).

⁷ F. Tufvesson et al., “Pilot Assisted Channel Estimation for OFDM in Mobile Cellular Systems,” 1997 IEEE 47th Vehicular Technology Conf. Tech. in Motion, May 4–7, 1997 (Ex. 1010, “Tufvesson”).

Owner relies on the Declaration of William P. Alberth Jr. (Ex. 2001, “the Alberth Declaration”) in support of its arguments.

II. DISCRETIONARY DENIAL

Patent Owner argues that we should exercise our discretion to deny institution of *inter partes* review in this case under 35 U.S.C. § 314(a) in view of the decision in the -01468 proceeding. Prelim. Resp. 54–66. For the following reasons, we decline to exercise our discretion under § 314(a) to deny institution of *inter partes* review.

A. Denial Due to Serial Petitions

In exercising discretion to institute review, the Board may consider the following non-exhaustive list of factors set forth in *General Plastic Industrial Co. v. Canon Kabushiki Kaisha*:

1. whether the same petitioner previously filed a petition directed to the same claims of the same patent;
2. whether at the time of filing of the first petition the petitioner knew of the prior art asserted in the second petition or should have known of it;
3. whether at the time of filing of the second petition the petitioner already received the patent owner’s preliminary response to the first petition or received the Board’s decision on whether to institute review in the first petition;
4. the length of time that elapsed between the time the petitioner learned of the prior art asserted in the second petition and the filing of the second petition;
5. whether the petitioner provides adequate explanation for the time elapsed between the filings of multiple petitions directed to the same claims of the same patent;
6. the finite resources of the Board; and

7. the requirement under 35 U.S.C. § 316(a)(11) to issue a final determination not later than 1 year after the date on which the Director notices institution of review.

IPR2016-01357, Paper 19 at 16 (PTAB Sept. 6, 2017) (precedential as to section II.B.4.i).

General Plastic's first enumerated factor has been expanded to include, as a reason weighing in favor of exercising discretion to deny institution, where a previous petition was filed by another petitioner against the same claims of the same patent, and there exists a "significant relationship" between the different petitioners. *See Valve Corp. v. Elec. Scripting Prods., Inc.*, IPR2019-00062, Paper 11 at 9–10 (PTAB April 2, 2019) (precedential). In *Valve*, a significant relationship was found between different petitioners (*HTC* and *Valve*) because they were co-defendants in litigation and accused of infringing the same patent based on "HTC's . . . devices that incorporate technology licensed from Valve." *Valve*, Paper 11 at 9–10.

Patent Owner argues that the '941 patent was previously challenged in the -01468 proceeding, which was denied on the merits, and "[s]ix months later, Petitioner filed its petition, also alleging obviousness, based on different references 'with similar inventors to' the references in [the -01468 proceeding]." Prelim. Resp. 55 (citing Pet. 7 n.1). Patent Owner contends that Petitioner discusses the previous challenge, "argues that its references and arguments are 'different' from those in that case," and replaced the references asserted in the -01468 proceeding "with 'different' references, including a 'different' Walton and a 'different' Li, in a frank attempt to address the flaws the panel pointed out and relied upon to reject [the -01468 proceeding]." *Id.* at 55–56. Patent Owner asserts this is "road-mapping"

under *General Plastic and Code200, UAB v. Bright Data, Ltd.*, IPR2022-00861, Paper 18 (PTAB Aug. 23, 2022) (precedential). *Id.* at 56–57. In addition, Patent Owner contends that although Petitioner and the petitioner in the -01468 proceeding are not the same, there is a significant relationship between the different petitioners because Petitioner has used the work product of the -01468 proceeding as a road map to form the arguments for this proceeding. *Id.* at 57–59 (citing *Ericsson Inc. v. Uniloc 2017, LLC*, IPR2019-01550, Paper 8, 12 (Mar. 17, 2020)).

In summary, Patent Owner alleges that Petitioner has used the -01468 proceeding as a road map and that this creates a significant relationship between the different petitioners. As Patent Owner’s arguments acknowledge, the petitioner in the -01468 proceeding and Petitioner are not the same. *Id.* at 57–59. Although *Ericsson* found an implicit relationship was created through the manner in which the second petitioner fashioned its petition (see *Ericsson*, Paper 8 at 12), it is not a precedential decision, and, therefore, not binding on our decision.

Our precedential decision, *Valve*, found a significant relationship existed between the petitioner, Valve Corporation (“Valve”), and HTC Corporation and HTC America, Inc. (collectively, “HTC”). Specifically, both Valve and HTC were accused of patent infringement based on the same product, “namely HTC’s VIVE devices that incorporate technology licensed from Valve,” and Valve employees provided HTC with technical assistance during the development of the accused devices. *Valve*, Paper 11 at 9–10. Here, Patent Owner does not allege that Petitioner and the petitioner in the -01468 proceeding have a relationship of this type.

Because the evidence does not show a significant relationship between Petitioner and the petitioner of the -01468 proceeding, *General Plastic* factors 1, 2, 4, and 5 weigh against discretionary denial. As explained above, this is Petitioner's first petition challenging the '941 patent and there is no indication of a significant relationship under *Valve* and factor 1 between Petitioner and the petitioner of the -01468 proceeding. Accordingly, Petitioner did not file a second petition following-on to a first petition under factors 2, 4, and 5. In other words, this is not a case where we need to address concerns that Petitioner is "strategically stag[ing] [its] prior art and arguments in multiple petitions" in order to refine its positions based on lessons learned from Petitioner's filing of an earlier petition. *General Plastic*, Paper 19 at 17; *Code200*, Paper 18 at 5.

With regard to *General Plastic* factor 3, it is undisputed that Petitioner had received both Patent Owner's preliminary response and the Board's decision denying institution in IPR2021-01468 at the time of filing the Petition. *See* Pet. 13–14 (summarizing the proceedings in IPR2021-01468). Nonetheless, as noted above, the present Petition is the first petition filed by Petitioner with respect to the '941 patent, and we find the impact of this factor to be mitigated to some extent by Patent Owner's staggered assertions of the '941 patent in district court proceedings over more than a year. *See id.* at 3–4 (listing related matters and filing dates thereof); Paper 6 (listing related matters). At the time Patent Owner first asserted the '941 patent against Petitioner in the Eastern District of Tennessee in March 2022 (*id.* at 3), more than a year after asserting the '450 patent against Dell in the Western District of Texas in January 2021 (*id.*), Patent Owner had already filed its preliminary response in IPR2021-01468, and the Board's decision

denying institution in IPR2021-01468 issued only about two weeks later. Accordingly, we weigh this factor at most slightly in favor of exercising our discretion to deny.

Lastly, under *General Plastic* factors 6 and 7, we do not discern that the institution of this proceeding would tax unduly the resources of the Board or that we could not meet the requirement of 35 U.S.C. § 316(a)(11) to issue a final determination within one year after institution. Therefore, factors 6 and 7 do not favor discretionary denial.

For the reasons stated above, we determine that only *General Plastic* factor 3 weighs to any extent in favor of exercising our discretion under 35 U.S.C. § 314(a) to deny institution. On balance, particularly in view of the lack of evidence of any relationship between Petitioner and the petitioner of the -01468 proceeding, we decline Patent Owner's request to deny the Petition under 35 U.S.C. § 314(a) for reason of serial petitions.

B. Denial Due to Analysis of Merits in the -01468 Proceeding

Patent Owner argues that denial of *inter partes* review in the -01468 proceeding is entitled to weight and deference.⁸ Prelim. Resp. 59–61. However, the majority of the caselaw Patent Owner cites to support its position concerns prior invalidity determinations by a district court. *Id.* The -01468 proceeding is neither a proceeding in a district court nor a determination of invalidity.

⁸ We note that Patent Owner does not argue that we should discretionarily deny the petition under 35 U.S.C. § 325(d) because the same or substantially the same prior art or arguments were previously presented to the Office in the -01468 proceeding. Nor does Patent Owner argue estoppel under 35 U.S.C. § 315(e)(1), which would not apply because the -01468 proceeding did not result in a final written decision and involved a different petitioner.

The remaining cases and authority Patent Owner cites regard res judicata or the preclusive effect of an earlier decision. *Id.* To the extent Patent Owner contends that res judicata, or claim preclusion, should apply, we note that “[c]laim preclusion applies when ‘(1) the parties are identical or in privity; (2) the first suit proceeded to a final judgment on the merits; and (3) the second claim is based on the same set of transactional facts as the first.’” *Phillips/May Corp. v. U.S.*, 524 F.3d 1264, 1268 (Fed. Cir. 2008) (quoting *Ammex, Inc. v. U.S.*, 334 F.3d 1052, 1055 (Fed. Cir. 2003)). As discussed above with regard to our serial petition analysis under *General Plastic*, the petitioners for this proceeding and the -01468 proceeding are not identical. Nor does Patent Owner allege that the petitioners are in privity. Therefore, res judicata, or claim preclusion, does not apply in view of the -01468 proceeding.

To the extent Patent Owner argues that collateral estoppel (also known as issue preclusion) should apply, we do not agree with that position. Issue preclusion is appropriate only if: (1) the issue is identical to one decided in the first action; (2) the issue was actually litigated in the first action; (3) resolution of the issue was essential to a final judgment in the first action; and (4) the party against whom issue preclusion is asserted had a full and fair opportunity to litigate the issue in the first action. *In re Freeman*, 30 F.3d 1459, 1466 (Fed. Cir. 1994). We do not agree that Petitioner’s grounds present issues that are identical to those decided in the -01468 proceeding. Specifically, the -01468 proceeding resulted in a denial on the merits. Conversely, for the reasons discussed below, and based on the current record, we find that Petitioner’s second ground demonstrates a

reasonable likelihood of prevailing on the merits and that at least one of the challenged claims is unpatentable.

Patent Owner also argues that the failure of the petition in the -01468 proceeding is evidence of nonobviousness. Prelim. Resp. 62–66. However, Patent Owner cites caselaw that concerns invalidity in district court cases (*Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1359 (Fed. Cir. 2001); *Mast, Foos & Co. v. Stover Mfg. Co.*, 177 U.S. 485, 488-489 (1900)), caselaw that is not controlling (*Beloit Corp. v. Valmet Corp.*, 1997 U.S. Dist. LEXIS 21329, at *11-12 (W.D. Wis. July 15, 1997)) or precedential (*Synaptics, Inc. v. Amkor Tech, Inc.*, IPR2017-00085, Paper 12, 10 (Apr. 18, 2017)), caselaw concerning the issue of serial petitions under § 314(a) that we discuss above (*General Plastic* and *Code200*), or caselaw regarding impermissible hindsight in an obviousness determination (cases cited at Prelim. Resp. 63–66). As a result, Patent Owner does not sufficiently support its position that a prior denial of a petition for *inter partes* review serves as evidence of nonobviousness.

Therefore, we decline to discretionarily deny the petition under § 314(a) in view of the analysis of the merits in the -01468 proceeding.

C. Conclusion

For these reasons, we decline to exercise our discretion to deny the Petition under § 314(a).

III. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed.

Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to the patent owner. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a)). The question of obviousness is resolved on the basis of underlying factual determinations, including “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; and “the level of ordinary skill in the pertinent art.”⁹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. An obviousness determination requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled

⁹ Additionally, secondary considerations, such as “commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.” *Graham*, 383 U.S. at 17–18. Neither party, however, has presented any such evidence for us to consider.

artisan would have had a reasonable expectation of success in doing so.”

Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd., 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see KSR*, 550 U.S. at 418 (for an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does”).

“Although the *KSR* test is flexible, the Board ‘must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to *how* or *why* the references would be combined to produce the claimed invention.’” *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (citation omitted). Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *accord In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “‘conclusory statements’” amount to an “insufficient articulation[] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (citation omitted)); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining 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) (internal quotation marks and citation omitted).

Petitioner asserts that at the time of the invention a person of ordinary skill in the art (“POSITA”) would have had “a bachelor’s degree in electrical engineering, computer engineering, computer science, or an equivalent field, or an advanced degree in those fields, as well as least 3–5 years of academic or industry experience in mobile wireless communications, or comparable industry experience.” Pet. 14 (citing Ex. 1003 ¶¶ 53–54).

Patent Owner does not provide its own assessment regarding the level of skill in the art, or otherwise dispute Petitioner’s assertion. *See generally* Prelim. Resp.; *see also* Ex. 2001 ¶ 23 (Patent Owner’s expert “accept[s] Dr. Wilson’s proposed qualifications of a POSITA.”).

Based on our review of the record at this stage, we find that Petitioner’s proposal is consistent with the level of skill reflected in the prior art references of record. *See Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007) (listing the type of problems encountered in the art, prior art solutions to those problems, and the sophistication of the technology as factors that may be considered in determining the level of ordinary skill in the art). The prior art itself may be sufficient to demonstrate the level of skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that

specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown”) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)).

Accordingly, for purposes of this decision, we adopt Petitioner’s definition of the person of ordinary skill in the art.

C. Claim Construction

In an *inter partes* review proceeding for a petition filed on or after November 13, 2018, a patent claim shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b).¹⁰ This rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*), and its progeny.

Under that standard, the words of a claim are generally given their “ordinary and customary meaning,” which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See 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).

We address the following claim terms.

¹⁰ The Petition in this case was accorded a filing date of September 15, 2022. *See Paper 3*, 1.

- 1. 1C, 6C: “transmission parameters allocated to the mobile station”
8C, 13C: “transmission parameters specific to the mobile station”
1D, 1H, 6D, 6H, 8D, 8H, 13D, 13H: “mobile station-specific transmission parameters”*

Claim 1 recites the transmission of a control message to a mobile station over a control channel, “wherein: the control message contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot.” Ex. 1001, 9:11–19 (limitation 1C).¹¹ Claim 6 includes a similar limitation for a base station. *Id.* at 9:50–55 (limitation 6C)

Claim 8 recites the transmission of a control message to a mobile station over a control channel, “wherein: the control message contains transmission parameters specific to the mobile station for a subsequent transmission by the serving base station over a frequency subchannel to the mobile station in a time slot.” Ex. 1001, 10:12–17 (limitation 8C). Claim 13 includes a similar limitation for a base station. *Id.* at 10:51–55 (limitation 13C).

Claims 1, 6, 8, and 13 each further refer to “the mobile station-specific transmission parameters.” Ex. 1001, 9:20, 9:30–31, 9:56, 9:66–67, 10:18, 10:28–29, 10:56, 10:66–67 (limitations 1D, 1H, 6D, 6H, 8D, 8H, 13D, and 13H).

Both Petitioner and Patent Owner treat the limitations of claims 1, 6, 8, and 13 in substantially the same manner. Pet. 61–66; Prelim. Resp. 6 n.1. Further, Patent Owner treats the limitation “the control message contains transmission parameters allocated to the mobile station” of claims 1 and 6 in

¹¹ Our notations for the limitations, such as “limitation 1C,” refer to the annotations Petitioner provides to the challenged claims. Pet. 117–122.

the same manner as the limitation “the control message contains transmission parameters specific to the mobile station” of claims 8 and 13. Prelim. Resp. 5–6. Therefore, we address “the control message contains transmission parameters allocated to the mobile station” of limitations 1C and 6C and “the control message contains transmission parameters specific to the mobile station” of limitations 8C and 13C in the same manner.

We note that claims 1 and 6 do not recite “mobile station-specific transmission parameters” prior to limitations 1D and 6D. However, Patent Owner’s arguments indicate that Patent Owner treats “the control message contains transmission parameters allocated to the mobile station” of limitations 1C and 6C, “the control message contains transmission parameters specific to the mobile station” of limitations 8C and 13C, and “the mobile station-specific transmission parameters” of limitations 1D, 1H, 6D, 6H, 8D, 8H, 13D, and 13H as having substantially the same meaning.

Specifically, Patent Owner asserts that Petitioner’s first ground of unpatentability does not demonstrate a control message containing transmission parameters allocated to the mobile station by the base station or mobile station-specific transmission parameters because the asserted references assign transmission parameters to bursts rather than to an individual mobile station. Prelim. Resp. 5–15. According to Patent Owner, “*each* alleged ‘mobile station’ reads *all* the bursts” with such a configuration. *Id.* at 8, 13–14 (citing Ex. 2001 ¶ 47). Patent Owner also contends that Petitioner’s first and second grounds of unpatentability do not demonstrate mobile station-specific transmission parameters because the asserted references transmit in bursts to all mobile stations. *Id.* at 15–26, 36–47. Therefore, we treat “the mobile station-specific transmission

parameters” of limitations 1D, 1H, 6D, 6H, 8D, 8H, 13D, and 13H in the same manner as the “transmission parameters allocated to the mobile station” in limitations 1C and 6C and “the control message contains transmission parameters specific to the mobile station” of limitations 8C and 13C.

We now consider the meaning of “transmission parameters allocated to the mobile station,” “transmission parameters specific to the mobile station,” and “the mobile station-specific transmission parameters.” “When construing claim terms, we first look to, and primarily rely on, the intrinsic evidence, including the claims themselves, the specification, and the prosecution history of the patent, which is usually dispositive.” *Sunovion Pharm., Inc. v. Teva Pharm. USA, Inc.*, 731 F.3d 1271, 1276 (Fed. Cir. 2013).

First, we analyze the language of claims 1, 6, 8, and 13 themselves to determine if these claims require that the transmissions are limited to transmissions to individual mobile stations with transmission parameters specific to that mobile station, as Patent Owner argues. As noted above, limitations 1C and 6C each recite that “the control message contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot.” This language does not explicitly require that the control message’s transmission parameters are limited to an individual mobile station. Nor does this language exclude a control message that includes transmission parameters allocated to multiple mobile stations. Similarly, “transmission parameters specific to the mobile station” of limitations 8C and 13C and “the mobile station-specific transmission

parameters” do not exclude a control message that includes transmission parameters allocated to multiple mobile stations or otherwise require that a control message’s transmission parameters are limited to those for a single mobile station.

We next consider the ’941 patent’s Specification. Patent Owner argues that “[t]he specification of the ’941 patent describes various schemes for adapting transmission parameters, including antenna techniques and subchannel configuration, to take into account, for example, channel conditions.” Prelim. Resp. 15–16. Patent Owner contends that:

According to certain embodiments, “[t]he *adaptation process adjusts* the allocated modulation schemes, coding rates, pilot patterns, power levels, spatial processing schemes, *subchannel configurations*, etc. *in accordance with the transmission channel state and condition*, for improving system performance and/or capacity.” Ex. 1001 [’941 Patent] 3:66–4:4. “Other factors that can be used in the *adaptation process* include modulation constellation arrangements, *transmitter antenna techniques*, and *subchannel configuration in a multi-carrier system*.” *Id.* 6:50–53. “Given the fact that different configurations of subchannel compositions are suitable for different scenarios or user profiles, *subchannel configuration is included in the transmission adaptation process*.” *Id.*, 7:10–13. “In one embodiment the transmitter or receiver uses any of several known predictive algorithms to *predict current or future channel conditions* based on previous channel measurements.... The output of the predictive algorithm is then used by the *adaption process to select the best possible scheme for the current transmission*.” *Id.*, 7:50–58.

Id. at 16. Patent Owner further argues that the ’941 patent contrasts this adaptation method with prior systems that used fixed parameters that could not be adapted. *Id.* at 16–17 (citing Ex. 1001, 2:4–7). According to Patent Owner, “[t]hese adaption features of the invention are reflected in the claim

language, including the recited ‘mobile station-specific transmission parameters,’” and one of ordinary skill in the art would have understood “the claimed ‘mobile station-specific transmission parameters’ to relate to operating conditions specific to each individual mobile station.” *Id.* at 17–18 (citing Ex. 2001 ¶ 48).

We do not agree with Patent Owner’s position regarding the adaptation embodiments because claims 1, 6, 8, and 13 do not require the adaptation or adjustment of the transmission parameters, such as the transmission parameters for the antenna transmission scheme or the subchannel configuration. Claims 1, 6, 8, and 13 merely recite the transmission of a control message containing such transmission parameters without reciting adjustment or adaptation of the transmission parameters. Therefore, although the ’941 patent may describe embodiments in which transmission parameters are adapted, Patent Owner’s position would require us to import such embodiments into claims 1, 6, 8, and 13. We decline to do so. *Superguide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (“Though understanding the claim language may be aided by explanations contained in the written description, it is important not to import into a claim limitations that are not part of the claim. For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment.”).

Conversely, the ’941 patent’s Specification contemplates broadcasting control messages to multiple users. More particularly, the Specification states that “[i]n one embodiment, the subchannel configuration information is broadcast on the common forward control channel to all users such that each user is informed of its subchannel configuration.” Ex. 1001, 7:13–16.

This passage of the '941 patent's Specification corresponds to paragraph 46 of the specification of the application for the '941 patent. Ex. 1002, 17. Paragraph 46 was cited for support when the original claims were replaced with new claims via a preliminary amendment dated November 11, 2016. *Id.* at 54–60. All four independent claims of the preliminary amendment (claims 26, 33, 35, and 42) recited “the control message contains transmission parameters specific to the mobile station” and “mobile station-specific transmission parameters.” *Id.* at 56–59. On April 12, 2018, the applicant amended the first two independent claims (claims 26 and 33) to recite that the control message contains transmission parameters “allocated” to the mobile station. *Id.* at 93–94. The applicant again cited paragraph 46 of the specification to support this amendment, among other passages. *Id.* at 98. Therefore, the prosecution history also supports a construction that claims 1, 6, 8, and 13 are not limited to control messages that include transmission parameters specific to only one mobile station.

As discussed below with regard to limitations 1F, 6F, 8F, 13F and 1G, 6G, 8G, 13G, Patent Owner argues that the parties in the NEO Wireless litigation, which include Petitioner, have taken positions regarding certain claim limitations. Prelim. Resp. 3–5 (citing Exs. 2004, 2005). However, Exhibits 2004 and 2005 do not show that the parties to the NEO Wireless litigation have taken a position regarding the terms “transmission parameters allocated to the mobile station” of limitations 1C and 6C, “transmission parameters specific to the mobile station” of limitations 8C and 13C, or “mobile station-specific transmission parameters” of limitations 1D, 1H, 6D, 6H, 8D, 8H, 13D, and 13H.

For these reasons, we disagree with Patent Owner’s position that the terms “transmission parameters allocated to the mobile station” of limitations 1C and 6C, “transmission parameters specific to the mobile station” of limitations 8C and 13C, or “mobile station-specific transmission parameters” of limitations 1D, 1H, 6D, 6H, 8D, 8H, 13D, and 13H should be construed to be limited to control messages containing transmission parameters for only a single mobile station. On this record at this preliminary stage, we determine that these limitations encompass control messages containing transmission parameters for multiple mobile stations.

2. *1F, 6F, 8F, 13F: “the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and” and 1G, 6G, 8G, 13G: “the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and”*

Claim 1 recites-in-part (including Petitioner’s annotations):

[1D] the mobile station-specific transmission parameters indicate an antenna transmission scheme and

[1E] a corresponding subchannel configuration,

[1F] the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and

[1G] the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

Ex. 1001, 9:20–28. Claims 6, 8, and 13 include limitations identical to limitations 1F and 1G. *Id.* at 9:58–64, 10:20–25, 10:58–64.

Petitioner submits “that none of the claim terms require explicit constructions” and that “[a]ccordingly, all claim terms have been given their plain and ordinary meaning, in the context of the ’941 patent specification, under the *Phillips* standard.” Pet. 15. However, Petitioner further states that

we determined in the -01468 proceeding that the limitation “the mobile station-specific transmission parameters indicate . . . a corresponding subchannel configuration . . . the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain” “requires, at a minimum, that the mobile station-specific transmission parameters are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.” *Id.* (citing Ex. 1023, 19).

Patent Owner states that the NEO Wireless litigation involves nine defendants, including Petitioner, that submitted terms for construction. Prelim. Resp. 2 (citing Ex. 2003, 1, 5–6). According to Patent Owner, “[w]hen the parties submitted the constructions to the Court, Petitioner included footnotes suggesting that it ‘do[es] not take a position on the constructions’” but then “Petitioner stipulated in the District Court that it waives its rights to challenge those constructions, in that Court or in this proceeding, including on appeal.” *Id.* at 2–3 (citing Ex. 2004 1 n.1; Ex. 2005, 1 n.1; Ex. 2006, 1–2).

Patent Owner asserts that the parties to the NEO Wireless litigation dispute the construction for the language “the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme” and language that includes “the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain.” Prelim. Resp. 3–5 (citing Ex. 2005, 4–5).

In the Decision for the -01468 proceeding we stated:

we determine that the plain and ordinary meaning of claim 1’s limitation “the corresponding subchannel configuration

characterized by distributed subcarriers or localized subcarriers in the frequency domain” requires that mobile station-specific transmission parameters are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations. Independent claims 6, 8, and 13 include similar limitations, which we construe in the same way.

IPR2021-01468, Paper 12 (citing Ex. 1001, 9:61–63, 10:23–25, 10:61–63). In other words, limitations 1G, 6G, 8G, and 13G were construed to require, “at a minimum, that the mobile station-specific transmission parameters that are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.” *Id.* On this record at this preliminary stage, we maintain that construction of limitations 1G, 6G, 8G, and 13G for this proceeding.

We next consider limitations 1F, 6F, 8F, and 13F. Limitations 1F, 6F, 8F, and 13F recite “the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme.” Limitations 1F, 6F, 8F, and 13F do not explicitly require that the antenna transmission scheme indicated by the mobile station-specific transmission parameters are capable of indicating, as alternatives, both a transmission diversity scheme or a multiple-input multiple output (MIMO) scheme. However, limitations 1F, 6F, 8F, and 13F also do not explicitly exclude such a capability.

Turning to the Specification, the ’941 patent states:

Some multiple antenna techniques, such as transmission diversity, are used to improve the transmission robustness against fading channel effects, whereas other multiple antenna techniques such as multiple-input multiple-output (MIMO) schemes are used to improve transmission throughput in favorable channel conditions. In one embodiment of the adaptive

transmissions the antenna technique used for a transmission is determined by the adaptation process.

Ex. 1001, 6:60–67. Thus, the '941 patent describes using one multiple antenna technique for one condition (i.e., transmission diversity for fading channel effects) and another multiple antenna technique for another condition (i.e., a MIMO scheme for favorable channel conditions). The '941 patent further describes transmitting the antenna scheme. *Id.* at 7:34–36 (stating that the “antenna diversity scheme can be embedded in the data transmission”). This supports a construction that limitations 1F, 6F, 8F, and 13F require, at a minimum, that antenna transmission scheme indicated by the mobile station-specific transmission parameters is capable of indicating, as alternatives, both a transmission diversity scheme and a MIMO scheme.

The prosecution history supports this understanding because the applicant cited these passages for support when the independent claims were amended on November 11, 2016 to recite that “the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration.” Ex. 1002, 56–60. These passages were also cited for support when the applicant amended the independent claims on April 12, 2018 to recite that “the mobile station-specific transmission parameters indicate an antenna transmission scheme . . . the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme.” *Id.* at 93, 95–98.

The positions taken by the plaintiff and defendants (including Petitioner) in the NEO Wireless litigation also support this understanding. When discussing limitations 8F and 13F among the disputed terms for their Joint Claim Construction Statement, both the plaintiff and the defendants

stated “[t]o avoid any doubt, this requires supporting both MIMO and non-MIMO transmission diversity systems.” Ex. 2003; Ex. 2005, 5. Therefore, our understanding of limitations 1G, 6G, 8G, and 13G in view of the language of claims 1, 6, 8, and 13; the Specification; and the prosecution history is not inconsistent with the positions taken by the parties to the NEO Wireless litigation.

On this record, at this preliminary stage, we determine that the correct construction of limitations 1G, 6G, 8G, and 13G requires, at a minimum, that the antenna transmission scheme indicated by the mobile station-specific transmission parameters is capable of supporting, as alternatives, a transmission diversity scheme and a MIMO scheme.

Considering each of claims 1, 6, 8, and 13 as a whole tends to support our constructions of limitations 1F, 6F, 8F, 13F, 1G, 6G, 8G, and 13G. As discussed below for Petitioner’s Ground 1 over 802.16a-2001 and 802.16a-2003, with or without further combination with Heath, Patent Owner argues that Petitioner has not shown that the prior art’s transmission diversity scheme is capable of indicating both distributed subcarriers and localized subcarriers. Prelim. Resp. 32–36. In other words, Patent Owner effectively argues that each of the antenna transmission schemes of limitations 1F, 6F, 8F, and 13F must be capable of supporting both types of subchannel configurations recited in limitations 1G, 6G, 8G, and 13G.

“While certain terms may be at the center of the claim construction debate, the context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those terms.” *Brookhill-Wilk I, LLC. v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1299 (Fed. Cir. 2003). As noted above, we consider limitations 1F, 6F, 8F,

and 13F to require that the antenna transmission scheme indicated by the mobile station-specific transmission parameters is capable of supporting, as alternatives, a transmission diversity scheme and a MIMO scheme. We also consider limitations 1G, 6G, 8G, and 13G to require that the mobile station-specific transmission parameters are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations, as analyzed above.

On this record, at this preliminary stage, and given these requirements, we agree that the each of the recited antenna transmission schemes (i.e., a transmission diversity scheme and a MIMO scheme) must be capable of supporting, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.

3. *Remaining Claim Terms*

Petitioner states that limitations [8E]/[8G] and [13E]/[13G] are disputed in *Neo Wireless LLC v. Dell Technologies Inc.*, 1-22-cv-00060 (W.D. Tex.). Pet. 15 (citing Ex. 1042, 7). Patent Owner does not present arguments for how these limitations should be construed, other than to argue that the parties to the NEO Wireless litigation “agreed that the preamble of independent claims 8 and 13 are limiting and should be given their plain and ordinary meaning.” Prelim. Resp. 3–4.

We determine that no other terms require explicit construction to reach a decision on institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed “only to the extent necessary to resolve the controversy” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Alleged Obviousness over 802.16a-2001, 802.16a-2003, and Heath

Petitioner asserts that claims 1–14 are unpatentable as obvious over 802.16a-2001 and 802.16a-2003, with or without further combination with Heath. Pet. 29–75. Petitioner also relies on the testimony of Dr. Wilson to support its arguments. *Id.* Patent Owner responds to Petitioner’s assertions. Prelim. Resp. 5–36.

1. Overview of 802.16a-2001 (Ex. 1005)

802.16a-2001 is a standard that “specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of fixed point-to-multipoint broadband wireless access (BWA) systems providing multiple services.” Ex. 1005, 1.¹² 802.16a-2001 states that it “includes a particular physical layer specification applicable to systems operating between 10 and 66 GHz.” *Id.* at iv. 802.16a-2001 explains that “[a] network that utilizes a shared medium requires a mechanism to efficiently share it” and “[a] two-way point-to-multipoint wireless network is a good example of a shared medium.” *Id.* at 24. 802.16a-2001 further explains:

The downlink, from the base station (BS) to the user, operates on a point-to-multipoint basis. The IEEE Std 802.16-2001 wireless link operates with a central BS and a sectorized antenna which is capable of handling multiple independent sectors simultaneously. Within a given frequency channel and antenna sector, all stations receive the same transmission, or parts thereof. The base station is the only transmitter operating in this direction, so it transmits without having to coordinate with other stations, except for the overall time division duplexing that may divide time into uplink and downlink transmission periods. It broadcasts to all stations in the sector (and frequency); stations

¹² Petitioner cites pages of 802.16a-2001 instead of pages of the exhibit. *See* Pet. 16, 18. We adopt that practice for our citations to 802.16a-2001 herein.

check the address in the received messages and retain only those addressed to them.

Id. 802.16a-2001 states that each subscriber station (“SS”) “receives and decodes the control information of the downlink and looks for MAC headers indicating data for that SS in the remainder of the downlink subframe.” *Id.* at 8, 220.

802.16a-2001 describes the downlink map (DL-MAP) message, which “defines the access to the downlink information.” Ex. 1005, 46. 802.16a-2001 states that a base station generates DL-MAP messages in a format that contains certain parameters, such as the base station’s identification and the number of information elements that follows. *Id.* 802.16a-2001 explains that “[t]he information in the DL-MAP pertains to the current frame (i.e., the frame in which it was received).” *Id.* at 97. 802.16a-2001 depicts this timing in Figure 40 for a time division duplex (“TDD”) operation variant, which is reproduced below. *Id.* at 8, 97.

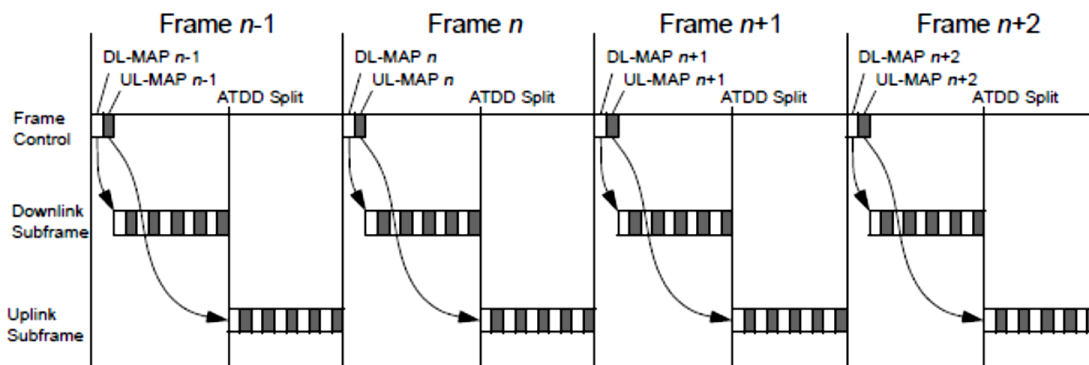


Figure 40—Minimum time relevance of PHY and MAC control information (TDD)

2. Overview of 802.16a-2003 (Ex. 1006)

802.16a-2003 states that it is an amendment to 802.16a-2001 that extends “the WirelessMAN_{air} interface to address operational frequencies from 2–11 GHz” and “provides new physical-layer specifications and also

includes appropriate enhancements to the base standard's point-to-multipoint medium access control layer (MAC).” Ex. 1006, iii.¹³ 802.16a-2003 further states that it includes editing instructions that “define how to merge the material contained herein into the existing base standard (IEEE Std™ 802.16 - 2001) to form the comprehensive standard.” *Id.* at 1.

802.16a-2003 describes the use of orthogonal frequency division multiple access (“OFDMA”). Ex. 1006, 5, 179. 802.16a-2003 explains:

In the OFDMA mode, the active carriers are divided into subsets of carriers, each subset is termed a subchannel. In the DL, a subchannel may be intended for different (groups of) receivers; in the UL, a transmitter may be assigned one or more subchannels, several transmitters may transmit in parallel. The carriers forming one subchannel may, but need not be adjacent.

Id. at 180. This concept is depicted in Figure 128as, which is reproduced below.

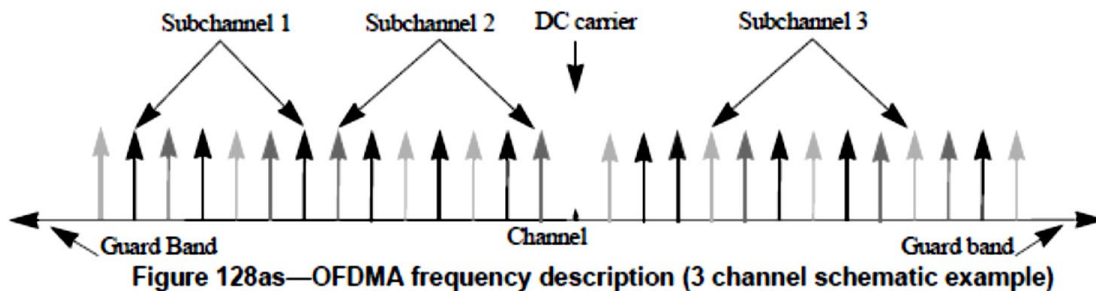


Figure 128ax, which is reproduced below, shows another example of OFDMA downlink and uplink map locations. *Id.* at 185.

¹³ Petitioner cites pages of 802.16a-2003 instead of pages of the exhibit. *See* Pet. 16, 18. We adopt that practice for our citations to 802.16a-2003 herein.

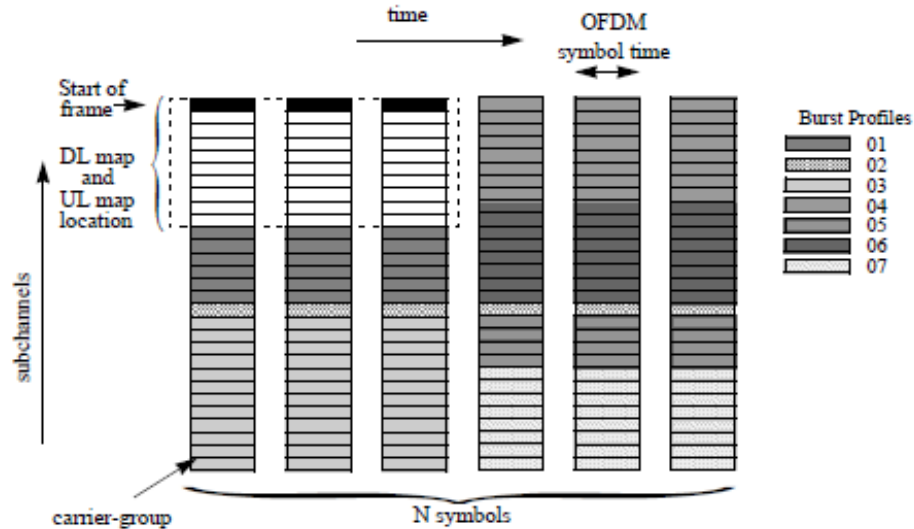


Figure 128ax—Example of OFDMA DL and UL map location

802.16a-2003 states that “[t]he framing structure used for the DL includes the transmission of a [frame control header] FCH, which is transmitted in the most robust burst profile of the system followed by the transmission using burst profiles as defined in the FCH.” Ex. 1006, 5, 183. 802.16a-2003 explains that “[t]he FCH is transmitted at the beginning of each frame” and “is a data structure that contains the DL-MAP message and may additionally include the UL-MAP, DCD or UCD messages.” *Id.* at 184. Figure 128av depicts a time plan for one TDD time frame. *Id.* at 183. Figure 128av is reproduced below.

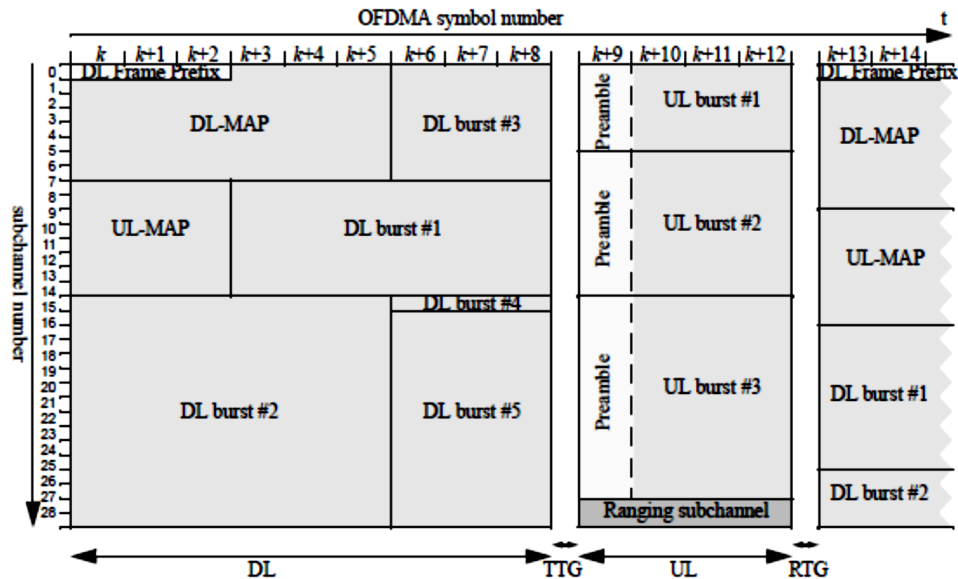


Figure 128av—Time plan - one TDD time frame

802.16a-2003 describes Space-Time Coding (“STC”) as an optional type of transmission diversity on the downlink. Ex. 1006, 203. 802.16a-2003 states that two transmission antennas are used on the base station’s side and one reception antenna on the subscriber station side under STC. *Id.* 802.16a-2003 also describes a base station using an adaptive antenna system (“AAS”). *Id.* at 4, 200.

3. Overview of Heath (Ex. 1007)

Heath is titled “Wireless Communications System that Supports Multiple Modes of Operation.” Ex. 1007, code (54). Heath “relates generally to wireless communications systems that use multiple access protocols.” *Id.* at 1:7–8. Heath states that “[n]ew wireless communications systems have been developed that utilize multiple spatially separated antennas at the base transceiver stations and the subscriber units to multiplex transmissions in order to increase the bit rates between the base transceiver stations and the subscriber units.” *Id.* at 1:46–51. Heath discloses that this technique is known as spatial multiplexing and “works well to increase the

bit rate between base transceiver stations and subscriber units that support spatial multiplexing.” *Id.* at 1:55–59. However, Heath states that “not all base transceiver stations and subscriber units [in wireless communications systems] support spatial multiplexing” and “that spatial multiplexing may not always be the most effective transmission technique.” *Id.* at 1:57–2:5. In view of this, Heath expresses a need for “a wireless communications system and method that adapts its mode of operation between spatial multiplexing and non-spatial multiplexing in response to various transmission-specific variables.” *Id.* at 2:5–8.

Heath describes an embodiment in which “the base transceiver stations and subscriber units communicate information related to the operation mode over a control channel.” Ex. 1007, 8:48–50. Heath further describes mode determination logic that considers transmission-specific inputs “to determine the appropriate mode of operation for subsequent datastream transmissions.” *Id.* at 9:15–18. The transmission characteristics that may be considered “relate to a characteristic of a received signal and include delay spread, post-processing signal-to-noise ratio, cyclical redundancy check (CRC) failures, residual inter-symbol interference (ISI), mean square error, coherence time, and path loss.” *Id.* at 9:23–30.

4. *Analysis of Claim 1*

Petitioner asserts claim 1 would have been obvious over 802.16a-2001 and 802.16a-2003, with or without further combination with Heath. Pet. 38–61. We use Petitioner’s notations to identify the claim elements, and focus on the dispositive claim limitations.

a) *1F “the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and” and 1G “the corresponding subchannel configuration characterized by*

*distributed subcarriers or localized subcarriers in the frequency domain;
and*

(1) Petitioner's Contentions

For limitation 1F, Petitioner asserts that 802.16a-2003's STC mode functions as a transmission diversity scheme and that 802.16a-2003's AAS mode functions as a MIMO scheme. Pet. 53–54 (citing Ex. 1006, 66, 203; Ex. 1003 ¶¶ 235–248). According to Petitioner, one of ordinary skill in the art “would have understood [802.16a-2003]’s AAS to be a multi-user MIMO mode” because “AAS uses multiple transmit antennas to steer different beams to multiple users simultaneously.” *Id.* at 54 (citing Ex. 1008 ¶¶ 61, 65; Ex. 1003 ¶¶ 238–240).

Petitioner further asserts that, to the extent Patent Owner may argue that the claimed “‘multiple-input multiple-output (MIMO) scheme’ requires something different from multi-user MIMO (it does not), this is taught by Heath.” Pet. 54. According to Petitioner, “Heath describes using ‘multiple spatially separated antennas at the base transceiver stations and the subscriber units to multiplex transmissions in order to increase the bit rates between the base transceiver stations and the subscriber units’” and one of ordinary skill in the art “would have thus understood that Heath utilizes a specific type of MIMO—single-user MIMO.” *Id.* at 54–55 (citing Ex. 1008 ¶ 64; Ex. 1003 ¶¶ 242–244).

With regard to limitation 1G, Petitioner contends that 802.16a-2003's distributed-carrier permutation functions as distributed subcarriers and 802.16a-2003's adjacent-carrier permutation functions as localized subcarriers. Pet. 55–56 (citing Ex. 1003 ¶¶ 249–263). Specifically, Petitioner argues that 802.16a-2003 teaches that its “carriers forming one subchannel may, but need not be adjacent” and that “symbol data within a

subchannel is assigned to adjacent carriers” for 802.16a-2003’s adjacent carrier permutation. *Id.* at 56–57 (citing Ex. 1006, 180, 196–197, 199–201, Fig. 128as; Ex. 1003 ¶¶ 251–258; Ex. 1001, 7:1–5). Petitioner further argues that 802.16a-2003’s base station “may change from the ‘distributed carrier permutation’ to the ‘adjacent carrier permutation,’ and indicate the switch to the SS in AAS_DL_IE() in DL-MAP.” *Id.* at 58–59 (citing Ex. 1006, 188–189, 200–201; Ex. 1003 ¶¶ 259–262).

With regard to combining 802.16a-2001 and 802.16a-2003, Petitioner asserts that 802.16a-2003 “explains that it ‘amends IEEE Std 802-16a-2001’” and “802.16a-2003 also contains editing instruction that ‘define how to merge the material contained herein into the existing base standard (IEEE Std 802.16™-2001) to form the comprehensive standard.’” Pet. 29 (citing Ex. 1006, i, iii, 1). According to Petitioner, “[t]hese explicit statements would have motivated [one of ordinary skill in the art] to combine 802.16a-2003 with 802.16-2001 to form a single document/standard.” *Id.* (citing Ex. 1003 ¶¶ 170–172).¹⁴

Petitioner also argues that it would have been obvious to further modify the 802.16a standards in view of Heath “so as to incorporate Heath’s spatial multiplexing, single-user MIMO, scheme at least for the ability to increase the bit rate between a base transceiver station and a single SS.” Pet. 36 (citing Ex. 1007, 1:55–65). According to Petitioner, “[s]uch a modification would have also incorporated Heath’s teaching of informing the SS of the switch to single-user MIMO via the existing FCH using DL-

¹⁴ Petitioner cites “EX100X, ¶¶ 170-172.” Pet. 29. However, it is readily apparent that Petitioner was citing these paragraphs in the Wilson Declaration.

Map so that the SS may properly receive and decode the data.” *Id.* (citing Ex. 1007, 2:58–61, 3:60–62; Ex. 1003 ¶ 193).

(2) Patent Owner Contentions

Patent Owner asserts that Petitioner fails to show both limitation 1F and limitation 1G. Prelim. Resp. 26–36. Specifically, Patent Owner cites Petitioner’s arguments that 802.16a-2003’s STC mode functions as a transmission diversity scheme and that 802.16a-2003’s AAS mode functions as a MIMO scheme. *Id.* at 27 (citing Pet. 47–48). Patent Owner contends that “the Petition asserts that AAS_DL_IE() is the transmission parameter that indicates the alleged ‘subchannel configuration’” but “AAS_DL_IE() is not transmitted when STC, the alleged ‘transmission diversity scheme,’ is selected.” *Id.* (citing Pet. 58).

Patent Owner argues that AAS_DL_IE() is used to indicate that AAS is selected for subsequent bursts. Prelim. Resp. 32–34 (citing Ex. 1006, 189; Pet. 49; Ex. 2001 ¶ 57). Patent Owner asserts that “STC, [802.16a-2003]’s alleged ‘antenna transmission diversity scheme,’ cannot be selected when AAS_DL_IE() provides an indication of ‘a corresponding subchannel configuration’” and “there is no element with STC_IE() that allows for choosing a subcarrier configuration.” *Id.* at 34–35 (citing Ex. 1006, 189). Therefore, according to Patent Owner, “Petitioner has failed to show that, when the alleged ‘transmission diversity scheme’ (STC) is selected, DL-MAP is capable of choosing between the ‘distributed-carrier permutation’ and the ‘adjacent-carrier permutation.’” *Id.* at 35.

b) Discussion

Having considered the conflicting positions of the parties, we agree with Patent Owner that Petitioner has not demonstrated a reasonable

likelihood that it would prevail in showing that the asserted references teach or suggest limitations 1F and 1G, and we conclude that Petitioner has not shown a reasonable likelihood that it would prevail in challenging the patentability of independent claim 1 over the combination of 802.16a-2001, 802.16a-2003, and Heath.

Petitioner's analysis for limitation 1F is based upon Petitioner's position that 802.16a-2003's STC mode functions as a transmission diversity scheme and that 802.16a-2003's AAS mode functions as a MIMO scheme. Pet. 53–54 (citing Ex. 1006, 66, 203; Ex. 1003 ¶¶ 235–248). Dr. Wilson's testimony mirror's this position. Ex. 1003 ¶¶ 235–248. Petitioner's arguments and Dr. Wilson's testimony for limitation 1F describe the recited antenna transmission schemes but do not address whether 802.16a-2003's STC mode and AAS mode are each capable of supporting, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations, according to our construction of limitations 1F and 1G.

Petitioner also argues that, to the extent 802.16a-2003's STC mode is not the recited MIMO scheme, such a MIMO scheme is taught by Heath. Pet. 54. However, Petitioner's arguments and citations to Heath describe the use of multiple antennas by both a base station and subscriber units, but do not discuss whether it would have been obvious to use the recited subchannel configurations (limitation 1G) for both of 802.16a-2003's STC mode and AAS mode. *Id.* at 54–55. Dr. Wilson's testimony uses a similar approach. Ex. 1003 ¶¶ 242–248.

For limitation 1G, Petitioner argues that 802.16a-2003 teaches that “carriers forming one subchannel may, but need not be adjacent,” further

describes a distributed carrier permutation, and describes an adjacent carrier permutation. Pet. 56–57 (citing Ex. 1006, 180, 196–197, 199–200, Fig. 128as; Ex. 1003 ¶¶ 251–258; Ex. 1001, 7:1–9). However, Petitioner states that “[802.16a-2003]’s BS may change from the ‘distributed carrier permutation’ to the ‘adjacent carrier permutation,’ and indicate the switch to the SS in AAS_DL_IE() in DL-MAP” and that “[a]fter this change, the BS shall only transmit/receive AAS-enabled traffic using the adjacent carrier permutation until the end of the frame.” *Id.* at 58–59 (citing Ex. 1006, 188–189, 200–201; Ex. 1003 ¶¶ 259–262) (emphasis omitted). Dr. Wilson’s testimony regarding limitation 1G mirrors Petitioner’s arguments. Ex. 1003 ¶¶ 249–262. For instance, Dr. Wilson testifies that “[802.16a-2003]’s BS may change from the ‘distributed carrier permutation’ to the ‘adjacent carrier permutation’ and indicate the switch to the mobile station in the AAS_DL_IE() in DL-MAP.” *Id.* ¶ 259 (citing Ex. 1006, 188–189, 200–201).

Petitioner’s arguments indicate that 802.16a-2003’s AAS mode supports, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations. However, Petitioner’s arguments, as further supported by Dr. Wilson’s testimony, do not address whether 802.16a-2003’s STC mode has this capability. Nor do Petitioner and Dr. Wilson state that it would have been obvious to modify 802.16a-2003’s STC mode to be capable of supporting, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations. Therefore, on this record, Petitioner has not adequately established a reasonable likelihood that it would prevail in showing that 802.16a-2001 and 802.16a-2003, with or

without further combination with Heath, teach or suggest both limitations 1F and 1G according to our construction.

c) Conclusion on Claim 1

Having considered the parties' arguments and evidence, we determine that Petitioner has not shown a reasonable likelihood of demonstrating that independent claim 1 would have been obvious over 802.16a-2001 and 802.16a-2003, alone or in combination with Heath.

5. Claims 2–14

Petitioner generally relies on its arguments for claim 1 when asserting that independent claims 6, 8, and 13 (particularly limitations 6F, 6G, 8F, 8G, 13F, and 13G) would have been obvious over 802.16a-2001 and 802.16a-2003, with or without further combination with Heath. Pet. 61–66. Claims 2–5, 7, 9–12, and 14 depend from claims 1, 6, 8, and 13. Ex. 1001, 9:32–42, 10:1–3, 10:30–42, 11:1–3.

We have considered Petitioner's arguments and evidence for independent claims 6, 8, and 13 and for dependent claims 2–5, 7, 9–12, and 14. Petitioner does not provide contentions for these claims that remedy the deficiency discussed with respect to claim 1. Accordingly, for the reasons discussed with respect to claim 1, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claims 2–14 are unpatentable under 35 U.S.C. § 103(a) as obvious over 802.16a-2001 and 802.16a-2003, or 802.16a-2001, 802.16a-2003, and Heath.

E. Alleged Obviousness over Walton040 and Li017

Petitioner asserts that claims 1, 3–8, and 10–14 are unpatentable as obvious over Walton040 and Li017. Pet. 75–107. Petitioner also relies on

the testimony of Dr. Wilson to support its arguments. *Id.* Patent Owner responds to Petitioner’s assertions. Prelim. Resp. 36–54.

1. Overview of Walton040 (Ex. 1008)

Walton040 is titled “Multiple-Access Multiple-Input Multiple-Output (MIMO) Communication System.” Ex. 1008, code (54). Walton040’s Figure 1, which is reproduced below, depicts multiple-access communication system 100. *Id.* ¶ 43.

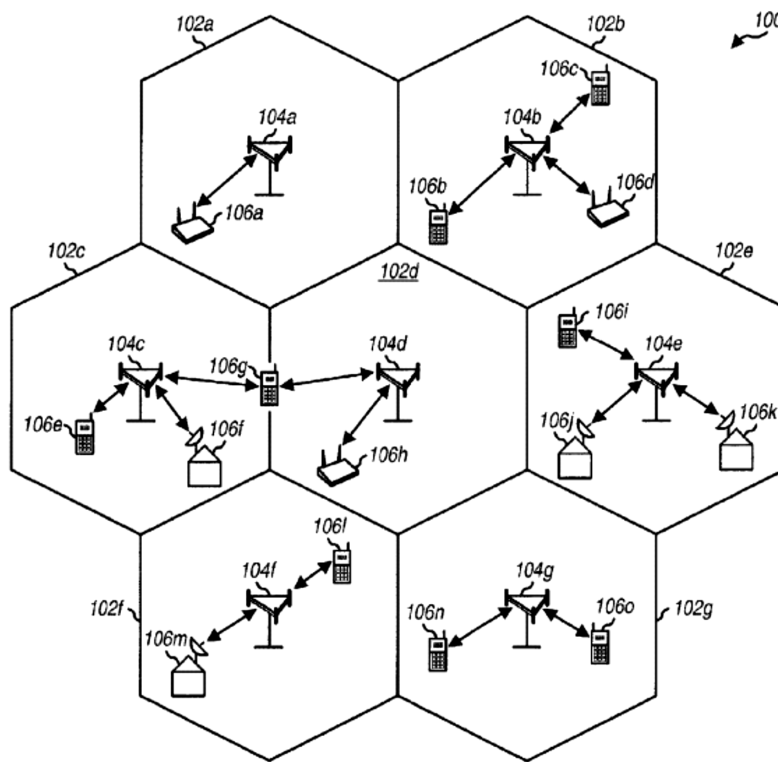


FIG. 1

System 100 supports a number of users by providing “communication for a number of coverage areas 102a through 102g, each of which is serviced by a corresponding base station 104.” *Id.* Walton040 states that “various terminals 106 are dispersed through the system, and each terminal may be fixed (i.e., stationary) or mobile.” *Id.* ¶ 44.

According to Walton040, its “techniques may be advantageously employed in a MIMO system, a multiple-access system (e.g., a CDMA, TDMA, or FDMA system), an OFDM system, or a communication system that employs any combination of the above (e.g., a multiple-access MIMO system, a MIMO system that employs OFDM, and so on).” Ex. 1008 ¶ 10. For instance, Walton040 describes “[t]he use of multiple antennas at both the transmitter unit and receiver unit” and that “[s]ystem 100 may be designed to support a number of operating modes[, such as MIMO].” *Id.* ¶¶ 55–56.

Walton040 describes the base station as controlling access to the system by allocating resources to users. Ex. 1008 ¶ 74. More particularly, Walton040 explains that:

When users are allocated resources, information may be provided to the users via a control channel to indicate the particular operating mode to use. Moreover, the system may adjust various operating parameters (e.g., the operating mode, channel, data rate, antenna(s) to transmit from, transmit power, and so on) in an adaptive manner based on system loading and/or some combination of performance metrics, as described below.

Id. ¶ 74. For instance, “[t]he schedule, antenna assignments, coding and modulation schemes, other information, or any combination thereof, may be conveyed to the scheduled terminals (e.g., via a control channel).” *Id.* ¶ 482.

2. Overview of Li017 (Ex. 1009)

Li017 is titled “Multi-Carrier Communications with Adaptive Cluster Configuration and Switching.” Ex. 1009, code (54). Li017 “relates to the field of wireless communications; more particularly, the invention relates to multi-cell, multi-subscriber wireless systems using orthogonal frequency division multiplexing (OFDM).” *Id.* ¶ 2.

Li017 describes subscribers measuring the signal to noise ratio (“SINR”) of each subcarrier cluster and reporting the measurement to the subscriber’s base station. Ex. 1009 ¶ 45. The base station receives the feedback from the subscriber, selects one or more clusters for the subscriber, and “notifies the subscriber about the cluster allocation through a downlink common control channel or through a dedicated downlink traffic channel.” *Id.* ¶¶ 46, 48.

Li017 further explains that “there are two categories of clusters: coherence clusters, containing multiple subcarriers close to each other and diversity clusters, containing multiple subcarriers with at least some of the subcarriers spread far apart over the spectrum.” Ex. 1009 ¶ 111. Li017 describes an embodiment in which a selection is made “between diversity clusters and coherence clusters depending on subscribers mobility.” *Id.* ¶ 120. Specifically, the process “tests whether the results of the channel/interference variation detection indicate that the user is mobile or in a fixed position close to the edge of the cell.” *Id.* ¶ 121. According to Li017, “[i]f the user is not mobile or is not in a fixed position close to the edge of the cell,” the process selects coherence clusters. *Id.* Otherwise, the process selects diversity clusters. *Id.*

3. *Analysis of Claim 1*

Petitioner asserts claim 1 would have been obvious over Walton040 and Li017. Pet. 84–99. We use Petitioner’s notations to identify the claim elements.

- a) *1A: A link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a*

transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

Petitioner asserts that “Walton040’s system 100 supports multiple mobile stations,” “utilizes OFDM, which partitions the ‘frequency band into a number of (N_F) frequency subchannels,’” and uses time slots. Pet. 84–86 (citing Ex. 1008 ¶¶ 5, 43–44, 47–48, 52, 55, 71, 74, 76, 91, 129–135, 140, 170–171, 283, 293, 323, 325, 332–333, 462, Fig. 1; Ex. 1003 ¶¶ 377–383).

Patent Owner does not specifically contest Petitioner’s contentions for limitation 1A at this time. On this record, we determine that Petitioner’s contentions for limitation 1A are sufficient for purposes of institution. In particular, Walton040 describes a system 100 that supports a number of users by providing “communication for a number of coverage areas 102a through 102g, each of which is serviced by a corresponding base station 104.” Ex. 1008 ¶ 43. Walton040 further discloses that system 100 may use OFDM, that OFDM effectively partitions the operating frequency band into frequency subchannels, and the use of time slots. *Id.* ¶ 47.

b) 1B: transmitting a control message to a mobile station over a control channel, wherein:

Petitioner contends that Walton040 describes providing “information via a control channel to indicate the particular operating mode to use.” Pet. 86 (citing Ex. 1008 ¶ 74). Petitioner also argues that “Li017 also discloses ‘transmitting a control message to a mobile station over a control channel.’” *Id.* at 88 (citing Ex. 1009 ¶¶ 39, 48, 89; Ex. 1003 ¶ 388).

Patent Owner does not specifically contest Petitioner’s contentions for limitation 1B at this time. On this record, we agree with Petitioner that Walton040 satisfies this limitation with its disclosure of using a control channel to provide information. Ex. 1008 ¶ 74.

- c) 1C: the control message contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and*

Petitioner argues that “Walton040 provides information to ‘users via a control channel to indicate the particular operating mode to use’” and that information is provided to the mobile station for a subsequent transmission of data because Walton040 describes that “coding and modulation for each frequency subchannel data stream . . . may be adjusted based on the coding and modulation control signals.” Pet. 88–90 (citing Ex. 1008 ¶¶ 74, 82, 93, 100, 130–131, 328, 367, 462, 482, Fig. 3E; Ex. 1003 ¶¶ 389–400).

Patent Owner does not specifically contest Petitioner’s contentions for limitation 1C at this time. On this record, we agree with Petitioner that Walton040 satisfies this limitation with its disclosures of the base station providing information to users via a control channel and adjusting the coding and modulation for frequency subchannel data streams based upon coding and modulation and control signals. Ex. 1008 ¶¶ 74, 130.

- d) 1D: the mobile station-specific transmission parameters indicate an antenna transmission scheme and*

Petitioner contends that Walton040 teaches a base station using channel state information (“CSI”) to schedule a downlink transmission to terminals and to determine channel and antenna assignments and the operating mode. Pet. 90 (citing Ex. 1008 ¶¶ 82, 93; Ex. 1003 ¶¶ 401–405). The operating mode include various antenna transmission schemes, such as MIMO and Multiple-Input, Single-Output (“MISO”). Pet. 90–91 (citing Ex. 1008 ¶¶ 57–68, 74, 82, 93, 148, 482; Ex. 1003 ¶¶ 402–406).

Patent Owner does not specifically contest Petitioner’s contentions for limitation 1D at this time. On this record, we agree with Petitioner that

Walton040 satisfies this limitation with its teachings that a base station determines antenna assignments and that various operating modes may be used. Ex. 1008 ¶¶ 57–65, 93.

e) 1E: a corresponding subchannel configuration,

Petitioner asserts that “Walton040’s BS transmits the control message containing transmission parameters to the mobile station and transmits data to the mobile station over ‘subcarriers’ but does not explicitly disclose that the control information includes an indication of a corresponding subchannel configuration for these ‘subcarriers.’” Pet. 91. Petitioner argues that Li017 teaches limitation 1E. *Id.* (citing Ex. 1003 ¶¶ 407–409).

Specifically, Petitioner contends that Li017 describes “‘coherence clusters’ contain ‘multiple subcarriers close to each other’ and ‘diversity clusters’ contain ‘multiple subcarriers with at least some of the subcarriers spread far apart over the spectrum.’” Pet. 92 (citing Ex. 1009 ¶ 111). Petitioner argues that the coherence clusters correspond to the claimed localized subcarriers and the diversity clusters correspond to the claimed distributed subcarriers. *Id.* at 92–93 (citing Ex. 1009 ¶¶ 111–112, Fig. 9; Ex. 1001, 7:1–9; Ex. 1003 ¶¶ 410–413). Petitioner further asserts that Li017 teaches the selection of “‘diversity or coherence clusters depending on subscribers’ mobility.’” *Id.* at 93–94 (citing Ex. 1009 ¶¶ 118–121, Fig. 11; Ex. 1003 ¶¶ 414–420; Ex. 1001, 7:1–9). According to Petitioner, Li017 further describes notifying a subscriber of the cluster allocation via a control channel. *Id.* at 95 (citing Ex. 1009 ¶ 48; Ex. 1003 ¶ 421).

Patent Owner argues the Petition fails to show that Walton040 and Li017 “have ‘mobile station-specific transmission parameters’ that ‘indicate . . . the corresponding subchannel configuration.’” Prelim. Resp.

36. Relying on its argument for ground 1 (Prelim. Resp. 15–18), Patent Owner argues that “the claimed ‘mobile station-specific transmission parameters’ must be customized to each particular mobile station’s operating conditions,” but that “Li017’s clusters of subchannels are base station-specific, not ‘mobile station-specific’ as required by the claims.” *Id.* at 36–37 (citing Ex. 2001 ¶ 48). Patent Owner further explains its position by discussing Li017’s teachings of coherence clusters and diversity clusters, arguing Li017 does not tailor its clusters so they are specific to particular subscribers, and asserting that Li017 teaches away from “mobile station-specific transmission parameters” because “any change to a base station’s clusters in Li017 would have the potential to deleteriously increase interference in Li017’s adjacent cells.” *Id.* at 37–44 (citing Ex. 1009 ¶¶ 40, 111, 113, 126, Figs. 9, 10, 12; Ex. 2001 ¶¶ 59, 61–64; Pet. 91–95).

On this record, we determine that Petitioner’s contentions for limitation 1A are sufficient for purposes of institution. Li017 teaches the use of coherence clusters and the use of diversity clusters. Ex. 1009 ¶¶ 111–112. Patent Owner does not dispute Petitioner’s position that the coherence clusters function as localized subcarriers and the diversity clusters function as distributed subcarriers. Further, we do not agree with Patent Owner’s position (as supported by Mr. Alberth’s testimony) that the mobile station-specific transmission parameters, including the “corresponding subchannel configuration” of limitation 1E, must be station-specific so that transmissions from a base station include transmission parameters for only one specific mobile station. For the reasons discussed above in section III.C.1, we decline to construe claim 1 in this manner.

With regard to Li017's coherence clusters and diversity clusters teachings, Patent Owner also contends that "[n]one of these disclosures in Li017 so much as hint that the choice between coherence clusters and diversity clusters is based on the operating conditions of individual subscribers." Prelim. Resp. 40 (citing Ex. 2001 ¶ 60). Patent Owner contends that Li017 does not adapt or tailor its subchannel configuration to be "mobile station-specific." Prelim. Resp. 44–47 (citing Ex. 1009 ¶¶ 41, 44–47, 110, 114, 118–121, 125; Ex. 2001 ¶¶ 65–66). Patent Owner's position (as supported by Mr. Alberth's testimony) regarding the '941 patent's embodiments is that they tailor, i.e., adapt, base station transmissions to the conditions of mobile stations. However, for the reasons discussed above in section III.C.1, we also decline to construe claim 1 in this manner.

In addition, Patent Owner disputes Petitioner's argument "that Walton040 does not describe how to assign its subchannels" because, according to Patent Owner, "Walton040 has a detailed and comprehensive method for configuring subchannels." Prelim. Resp. 47–48 (citing Pet. 77, 91–95, 98; Ex. 1003 ¶ 352). Specifically, Patent Owner argues that "Walton040 contains over 150 paragraphs on 'Scheduling,' divided into four sections including 25 paragraphs on 'Channel Assignments,'" and "these teachings in Walton040 explicitly describe how to assign or group subcarriers for use in the MIMO system using OFDM." *Id.* at 48–49 (citing Ex. 1008 ¶¶ 48, 384–539; Pet. 77, 91).

Patent Owner contends that Walton040 describes in detail various factors to consider when assigning channels and that "Walton040 proceeds to extensive, specific teachings of how download channel assignments can

be made when the system makes use of the MIMO antenna transmission scheme.” Prelim. Resp. 49–50 (citing Ex. 1008 ¶¶ 391–424, 435–507; Pet. 77, 91). Patent Owner argues, however, that Walton040 does not suggest or describe its subcarriers as “distributed” or “localized.” *Id.* at 50–51 (citing Pet. 77).

In addition, Patent Owner asserts “[t]here is no evidence suggesting that Li017’s grouping of subcarriers into clusters is superior to, or even compatible with, Walton040’s existing system for how to assign or group subcarriers” and “there is every reason to believe that [one of ordinary skill in the art] would find Walton040’s method of subchannel configuration superior to Li017’s cluster method for Walton040’s particular system and application.” *Id.* at 51–52 (citing Ex. 2001 ¶ 67).

In view of these arguments, Patent Owner asserts that “Petitioner offers no explanation why [one of ordinary skill in the art] would have [had] any reason to remove, root and stem, Walton040’s detailed subcarrier configuration method and replace it with the one described in Li017,” and “[a]s a result, no motivation is shown to combine the Petition’s two primary references” for this ground. Prelim. Resp. 50. Patent Owner further argues that Petitioner has engaged in impermissible hindsight by using the claims as a roadmap to assert the combination of Walton040 and Li017. *Id.* at 53.

We do not agree with Patent Owner’s position. Petitioner provides a sufficient rationale to modify Walton040 in view of Li017. Specifically, Petitioner asserts that Li017’s coherence clusters provide different advantages because diversity clusters provide interference diversity gain, extra robustness, and alleviation of overhead for subscribers having large “channel time variance,” whereas coherence clusters achieve good

performance for subscribers with fixed wireless access. Pet. 78–79 (citing Ex. 1009 ¶¶ 113–114, 118; Ex. 1003 ¶¶ 356–359).

According to Petitioner, one of ordinary skill in the art “would have been motivated to modify Walton040 so as to incorporate Li017’s ‘process for intelligent selection between diversity clusters and coherence clusters depending on subscribers mobility’ and informing the subscriber of the selected subchannel configuration via the existing control channel.” Pet. 81 (citing Ex. 1009 ¶ 120). Petitioner argues that one of ordinary skill in the art

would have understood that Li017’s diversity cluster (“distributed subcarriers”) would “provide interference diversity gain” for a mobile station close to a cell boundary or moving quickly through a cell (red/blue), and the coherence cluster (“localized subcarriers”) would “achieve[] good performance” for a stationary mobile station located away from a cell boundary (purple).

Id. at 81–82 (citing Ex. 1009 ¶¶ 113–114, 118–119).

We find that Petitioner’s rationale is supported by Li017’s teachings. More particularly, Li017 describes the use of coherence clusters and diversity clusters. Ex. 1009 ¶¶ 111–112. Li017 teaches that diversity clusters “provide interference diversity gain,” “are more robust to cluster mis-selection,” and “alleviate the overhead of frequent cluster reallocation.” *Id.* ¶¶ 113, 114, 118. Li017 teaches that coherence clusters provide good performance for static subscribers with fixed wireless access. *Id.* ¶ 118. Li017 also teaches that the different coherence clusters are used in view of a subscriber’s mobility. *Id.* ¶ 120. Petitioner’s citations to Dr. Wilson’s testimony also support the asserted reasons to combine Walton040 and Li017. Ex. 1003 ¶¶ 356–359.

For these reasons, even if Petitioner’s statement that, although “Walton040 describes transmitting OFDM symbols on any number of

subcarriers N_F to different terminals, Walton040 does not explicitly describe how to assign or group subcarriers for use in the MIMO system utilizing OFDM,” is incorrect, Petitioner has provided sufficient reasons why one of ordinary skill in the art would have modified Walton040 in view of Li017. Pet. 77. As explained above, Petitioner cites Li017’s teachings regarding its coherence clusters, how both types of coherence clusters are advantageous, and how the coherence clusters may be selected on the basis of a subscriber’s mobility.

To the extent Patent Owner’s position, as supported by Mr. Alberth’s testimony, is that such a modification would not have been obvious, we do not agree with such a position. For instance, Patent Owner quotes paragraph 67 of Mr. Alberth’s testimony when arguing that one of ordinary skill in the art “would find Walton040’s method of subchannel configuration superior to Li017’s cluster method for Walton040’s particular system and application.” Prelim. Resp. 51–52. Mr. Alberth testifies to differences between Walton040’s and Li017’s methods and how Li017’s method may reduce the amount of overhead required to report CSI and for scheduling. Ex. 2001 ¶ 67. However, although Mr. Alberth and Patent Owner outline differences between Walton040 and Li017, as well as advantages for Li017’s method, we do not agree that the asserted references teach away from claim 1. To the extent Walton040’s process could be considered inferior to Li017’s process, “just because better alternatives exist in the prior art does not mean that an inferior combination is inapt for obviousness purposes.” *In re Mouttet*, 686 F.3d 1322, 1334 (Fed. Cir. 2012) (citing *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)). Further, the mere fact that there are differences between references is insufficient to establish that such

references “teach away” from any combination thereof. *In re Beattie*, 974 F.2d 1309, 1312–13 (Fed. Cir. 1992). After considering the parties’ arguments and cited evidence on this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that the combination of Walton040 and Li017 satisfies limitation 1E.

f) 1F: the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and

Petitioner argues that Walton040’s “system 100 ‘support[s] a number of operating modes’” and Walton040 teaches its base station and terminals “may be equipped with both multiple transmit and receive antennas.” Pet. 95–96 (citing Ex. 1008 ¶¶ 56, 68; Ex. 1003 ¶¶ 424–427). Specifically, Petitioner contends that Walton040’s MISO scheme functions as a transmission diversity scheme and Walton040 also discloses a MIMO scheme. *Id.* at 96–97 (citing Ex. 1008 ¶¶ 60–61, 63–65, 462; Ex. 1003 ¶¶ 428–430). Petitioner also argues that Walton040’s base station provides information regarding allocated resources to a mobile station via a control channel to indicate the operating mode. *Id.* at 97 (citing Ex. 1008 ¶¶ 74, 82, 93, 482, claims 1–5, 8–9).

Patent Owner does not specifically contest Petitioner’s contentions for limitation 1F at this time. On this record, we agree with Petitioner that Walton040 satisfies this limitation by teaching the use of multiple transmit and receive antennas for a base station and for each terminal, the use of MISO and MIMO modes, and that a mobile station is notified of the operating mode via a control channel. *See* Ex. 1008 ¶¶ 56, 60–61, 74.

g) 1G: the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

Petitioner asserts that the combination of Walton040 and Li017 teaches limitation 1G, citing its arguments for limitation 1E.¹⁵ Pet. 98 (citing Ex. 1003 ¶¶ 435–436).

For the reasons discussed above with regard to limitation 1E, we agree on this record that the combination of Walton040 and Li017 satisfies this limitation. Patent Owner does not provide separate arguments for this limitation other than those discussed above with regard to limitation 1E. *See generally* Prelim. Resp.

We also determine on this record that the combination of Walton040 and Li017 would be capable of supporting each of the recited antenna transmission schemes (i.e., a transmission diversity scheme and a MIMO scheme) and each of those antenna transmission schemes would be capable of supporting, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.

Specifically, as discussed above with regard to limitation 1F, Walton040 describes the use of a MISO scheme (that Petitioner asserts is a transmission diversity scheme) and a MIMO scheme. Ex. 1008 ¶¶ 60–61. Li017 describes the use of coherence clusters (that Petitioner argues are localized subcarriers) and the use of diversity clusters (that Petitioner contends are distributed subcarriers). Ex. 1009 ¶¶ 111–112. In addition, as

¹⁵ Petitioner cites section “VIII.B.2(g),” which is the same section (limitation 1G). Pet. 98. Based upon the cited combination of Walton040 and Li017 and subchannel recitations common to both limitations 1E and 1G, we understand that Petitioner refers to their arguments for limitation 1E.

discussed above with regard to limitation 1E, Petitioner provides a sufficient rationale on this record to modify Walton040 to use Li017's subchannel configurations, including conditions when to use the subchannel configurations (i.e., based on a subscriber's mobility). As a result, we determine on this record that the combination of Walton040 and Li017 would result in a system capable of using either MISO or MIMO and that each of these antenna transmission schemes would be capable of using Li017's coherence cluster configurations.

h) 1H: transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

Petitioner contends that Walton040 describes packet error rates and discloses a transmitter unit that codes and modulates for each frequency subchannel data stream and adjusts based on coding and modulation control signals. Pet. 98–99 (citing Ex. 1008 ¶¶ 100, 130, Fig. 3E; Ex. 1003 ¶¶ 437–443).

Patent Owner does not specifically contest Petitioner's contentions for limitation 1H at this time. On this record, we agree with Petitioner that Walton040 satisfies this limitation by teaching the transmitter unit embodiment depicted in Figure 3E, as well as its use. *See* Ex. 1008 ¶ 130, Fig. 3E.

i) Conclusion on Claim 1

Having considered Petitioner's position, we conclude that, at this stage of the proceeding, Petitioner has shown a reasonable likelihood that it would prevail in challenging the patentability of independent claim 1 over Walton040 and Li017.

4. *Claims 6, 8, and 13*

Independent claim 6 is substantially similar to claim 1 except that claim 8 is directed to a base station instead of a link adaption method.

Compare Ex. 1001, 9:5–31, *with id.* at 9:43–67. Petitioner cites its arguments for claim 1 when asserting that claim 6 would have been unpatentable over Walton040 and Li017. Pet. 99–100 (citing Ex. 1003 ¶¶ 444–452).

Independent claim 8 recites a link adaption method and includes limitations similar to those of claim 1. *Compare* Ex. 1001, 10:4–26, *with id.* at 9:5–31. Petitioner cites the arguments for claim 1, with additional arguments addressing differences with claim 8’s limitations. Pet. 101–103 (citing Ex. 1008, code (57), ¶¶ 44, 93; Ex. 1003 ¶¶ 453–463).

Independent claim 13 recites a mobile station and includes limitations similar to those of claim 8. *Compare* Ex. 1001, 10:43–67, *with id.* at 10:4–26. Petitioner asserts that claim 13 is unpatentable over Walton040 and Li017 by citing its arguments for claims 1 and 8. Pet. 103–104 (citing Ex. 1003 ¶¶ 464–472).

Patent Owner does not argue claims 6, 8, and 13 separately from claim 1. Prelim. Resp. 36–54. For the reasons discussed above with regard to claim 1, Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to claims 6, 8, and 13.

5. *Claims 3 and 10*

Claim 3 depends from claim 1 and claim 10 depends from claim 8. Ex. 1001, 9:35–37, 10:34–36. Claims 3 and 10 each recite “wherein the mobile station-specific transmission parameters further indicate power control information.” *Id.* Petitioner asserts Walton040 teaches that its

system may determine a minimum transmit power to support a data rate and operating mode, as well as communicating transmit power via the downlink. Pet. 104 (citing Ex. 1008 ¶¶ 74, 93, 427, 512, claim 26; Ex. 1001, 1:44–48, 1:64–2:3; Ex. 1003 ¶¶ 473–477, 491–492).

Petitioner has made a sufficient showing that the combination of Walton040 and Li017 teaches the limitations of these dependent claims by providing an analysis of each limitation and a comparison of the limitations to Walton040's disclosure. Pet. 104. We have reviewed Petitioner's cited evidence and explanation and find it sufficient at this stage. As set forth above, Walton040 teaches determining a minimum transmit power to support a given data rate and operating mode and teaches that transmit power may be communicated to terminals. Ex. 1008 ¶¶ 93, 427. On this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that Walton040 and Li017 render claims 3 and 10 unpatentable.

6. Claims 4 and 11

Claim 4 depends from claim 1 and claim 11 depends from claim 8. Ex. 1001, 9:38–39, 10:37–39. Claim 4 recites “wherein the antenna transmission scheme is based on a channel condition” and claim 11 recites “wherein the MIMO scheme is for improving transmission throughput based on a channel condition.” *Id.*

Petitioner argues that Walton040 teaches that a base station may use channel state information to determine channel and antenna assignments and the assignment of transmit antennas allows a scheduler “to optimize performance by exploiting multi-user diversity environment.” Pet. 105 (citing Ex. 1008 ¶¶ 82, 469–470, 482, claims 1, 14; Ex. 1003 ¶¶ 479–481).

Petitioner has made a sufficient showing that the combination of Walton040 and Li017 teaches the limitations of these dependent claims by providing an analysis of each limitation and a comparison of the limitations to Walton040's disclosure. Pet. 105. We have reviewed Petitioner's cited evidence and explanation and find it sufficient at this stage. As set forth above, Walton040 teaches the use of channel state information to determine antenna assignments and that "[t]he flexibility in both selecting the best set of terminals for data transmission and assigning the transmit antennas to the selected terminals allows the scheduler to optimize performance by exploiting multi-user diversity environment." Ex. 1008 ¶¶ 93, 469. On this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that Walton040 and Li017 render claims 4 and 11 unpatentable.

7. Claims 5 and 12

Claim 5 depends from claim 1 and claim 12 depends from claim 8. Ex. 1001, 9:40–42, 10:40–42. Claims 5 and 12 each recite "wherein the corresponding subchannel configuration is selected based on a channel condition." *Id.* Petitioner asserts that it would have been obvious for one of ordinary skill in the art "to modify Walton040 to select the corresponding subchannel configuration based on a channel condition in view of Li017" because Li017 teaches that each subscriber "measures the channel and interference information for all the subcarriers' and feeds that information back to the base station." Pet. 105–106 (quoting Ex. 1009 ¶¶ 26–27, 121; citing Ex. 1003 ¶¶ 484–488).

Petitioner has made a sufficient showing that the combination of Walton040 and Li017 teaches the limitations of these dependent claims by

providing an analysis of each limitation and a comparison of the limitations to Walton040's disclosure. Pet. 105–106. We have reviewed Petitioner's cited evidence and explanation and find it sufficient at this stage. As set forth above, Li017 teaches that, “[f]or downlink channels, each subscriber first measures the channel and interference information for all the subcarriers and then selects multiple subcarriers with good performance (e.g., a high signal-to-interference plus noise ratio (SINR)) and feeds back the information on these candidate subcarriers to the base station.” Ex. 1009 ¶ 26. On this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that Walton040 and Li017 render claims 5 and 12 unpatentable.

8. Claims 7 and 14

Claim 7 depends from claim 6 and claim 14 depends from claim 13. Ex. 1001, 10:1–3, 11:1–3. Claim 7 recites “further comprising a receiver configured to receive channel state information from the mobile station” and claim 14 recites “further comprising a transmitter configured to transmit channel state information to the serving base station.” *Id.* Petitioner asserts that “Walton040 and Li017 both disclose the BS receiving CSI from the mobile station” and “Walton040 and Li017 both disclose the mobile station having a transmitter configured to transmit CSI to the BS.” Pet. 107 (citing Ex. 1008 ¶¶ 11, 80–82; Ex. 1009 ¶¶ 44–47; Ex. 1003 ¶¶ 489–490, 497–498).

Petitioner has made a sufficient showing that the combination of Walton040 and Li017 teaches the limitations of these dependent claims by providing an analysis of each limitation and a comparison of the limitations to Walton040's disclosure. Pet. 107. We have reviewed Petitioner's cited evidence and explanation and find it sufficient at this stage. As set forth

above, Walton040 describes a terminal determining CSI, including estimating the condition of the downlink, and reporting the CSI to a base station. Ex. 1008 ¶¶ 11, 80. Li017 teaches that each subscriber monitors the reception of pilot symbols to measure SINR and/or other parameters and reports SINR measurements to their base station. Ex. 1009 ¶¶ 44–45. On this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that Walton040 and Li017 render claims 7 and 14 unpatentable.

F. Alleged Obviousness over Walton040, Li017, and Tufvesson

Petitioner challenges claims 2 and 9 by adding Tufvesson to the teachings of Walton040 and Li017. Pet. 107–110. Patent Owner does not present arguments separate from those for Petitioner’s ground over Walton040 and Li017. Prelim. Resp. 36–54. Claim 2 depends from claim 1 and claim 9 depends from claim 8. Ex. 1001, 9:32–34, 10:30–32. As noted above, we determine that Petitioner has adequately established that the combination of Walton040 and Li017 teaches or suggests the limitations of claims 1 and 8.

1. Overview of Tufvesson (Ex. 1010)

Tufvesson relates to the use of pilot symbols for channel estimation. Ex. 1010, 1639.¹⁶ Tufvesson explains that a pilot pattern is transferred to a mobile when the mobile logs into a new cell and that the pilot pattern is used by an estimation system. *Id.* at 1641.

¹⁶ Petitioner cites Tufvesson’s page numbers instead of the exhibit’s page numbers. Pet. 27–28, 108. We adopt that practice for our citations to Tufvesson.

2. *Analysis of Ground 3*

Each of claims 2 and 9 recites, “wherein the mobile station-specific transmission parameters further indicate a training pilot pattern.” Ex. 1001, 9:32–34, 10:30–32.

Petitioner asserts that Walton040 describes the use of pilot data with processed information bits and Li017 describes broadcasting pilot OFDM symbols to every subscriber in a cell. Pet. 107–108 (citing Ex. 1008 ¶¶ 97, 177, 316; Ex. 1009 ¶¶ 43–44; Ex. 1003 ¶¶ 499–503). However, Petitioner states that, although “Walton040 and Li017 both explain that the pattern of the pilots to be used for CSI/channel estimation must be known to the mobile station/subscriber,” they “do not explicitly state that the mobile station-specific transmission parameters indicate a training pilot pattern.” *Id.* at 108 (citing Ex. 1008 ¶ 97; Ex. 1009 ¶ 43; Ex. 1003 ¶ 504).

Petitioner contends that one of ordinary skill in the art “would have thus looked to the prior art, e.g. Tufvesson, for how to communicate the pilot pattern such that it is known to the mobile station” and that “Tufvesson, like Walton040 and Li017, is directed to pilot assisted channel estimation for OFDM in mobile cellular systems.” *Id.* (citing Ex. 1010, 1639). Petitioner argues that “Tufvesson also explained that the pilot pattern must be known to the mobile stations and is among the information transferred to a mobile station when it logs into a new cell, and once known is used for channel estimation.” *Id.* (citing Ex. 1010, 1639, 1641; Ex. 1003 ¶¶ 505–507).

Petitioner asserts that one of ordinary skill in the art “would have been motivated to modify Walton040 to include the training pilot pattern as part of the information communicated via the control channel to also indicate the forthcoming pilot pattern such that the mobile station may properly

determine the SNR” and thus have known the location of the pilots and been able to properly measure CSI. *Id.* at 109 (citing Ex. 1010 ¶ 97; Ex. 1008 ¶¶ 74, 93, 462, 482; Ex. 1003 ¶ 508). Petitioner further argues that Walton040 and Tufvesson “are in the same general field of mobile communications, and address the same problem—improving the performance of wireless communication systems,” “are both directed to cellular communications systems using OFDM,” and one of ordinary skill in the art would have combined Walton040 and Tufvesson because it would have combined known methods to provide a predictable combination. *Id.* (citing Ex. 1003 ¶¶ 509–510).

We have reviewed Petitioner’s cited evidence and explanation regarding why Tufvesson discloses the limitations of claims 2 and 9 and find it sufficient at this stage. In particular, Tufvesson discloses the use of pilot data for channel estimation, such as when a mobile device logs into a new cell. Ex. 1010, 1639, 1641. We also have reviewed Petitioner’s reasons to combine Walton040, Li017, and Tufvesson and find them sufficient at this stage.

Based on a review of the current record, at this stage of the proceeding, Petitioner has made a sufficient showing that the combination of Walton040, Li017, and Tufvesson teaches or suggests the subject matter of dependent claims 2 and 9. On this record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in establishing that the combination of Walton040, Li017, and Tufvesson renders obvious claims 2 and 9.

IV. CONCLUSION

After considering the evidence and arguments presented in the Petition and the cited evidence, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing in proving that at least one of claims 1–14 of the '941 patent is unpatentable, and thus, we institute an *inter partes* review of all challenged claims on all presented challenges. 37 C.F.R. § 42.108(a).

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claim or any underlying factual and legal issues.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of claims 1–14 of the '941 patent is instituted on the 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 will commence on the entry date of this decision.

FOR PETITIONER:

Michael Specht
Ryan Richardson
Daniel Yonan
Timothy L. Tang
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
mspecht-ptab@sternekessler.com
rrichardson-ptab@sternekessler.com
dyonan-ptab@sternekessler.com
ttang-ptab@sternekessler.com

FOR PATENT OWNER:

Kenneth J. Weatherwax
Edward Hsieh
Parham Hendifar
LOWENSTEIN & WEATHERWAX LLP
weatherwax@lowensteinweatherwax.com
hsieh@lowensteinweatherwax.com
hendifar@lowensteinweatherwax.com

Hamad M. Hamad
CALDWELL, CASSADY, & CURRY P.C.
hhamad@caldwellcc.com