

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LENOVO HOLDING COMPANY, INC.,
LENOVO (UNITED STATES) INC., and MOTOROLA MOBILITY LLC,
Petitioner,

v.

INTERDIGITAL TECHNOLOGY CORPORATION,
Patent Owner.

IPR2020-01494
Patent 9,456,449 B2

Before JUSTIN T. ARBES, CHRISTOPHER L. OGDEN, and
JOHN R. KENNY, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* OGDEN.

Opinion Dissenting in Part filed by *Administrative Patent Judge* KENNY.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In response to a Petition (Paper 1, “Pet.”) by petitioners Lenovo Holding Company, Inc., Lenovo (United States) Inc., and Motorola Mobility LLC (collectively, “Petitioner”),¹ the Board instituted an *inter partes* review of claims 1–18 and 21–36 of U.S. Patent No. 9,456,449 B2 (Ex. 1001, “the ’449 patent”). Paper 9 (“Inst. Dec.”). Patent Owner InterDigital Technology Corporation (“InterDigital”)² filed a Patent Owner Response (Paper 14, “PO Resp.”), Petitioner filed a Reply to the Patent Owner Response (Paper 15, “Pet. Reply”), and InterDigital filed a Sur-reply (Paper 18, “PO Sur-reply”).

We held an oral hearing on January 25, 2022, and the transcript is entered on the record. Paper 28 (“Tr.”).

This is a Final Written Decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the *inter partes* review are unpatentable. By a preponderance of the evidence on the record before us, Petitioner has shown that claims 1–8, 10–12, 21–24, and 26 are unpatentable, and has not shown that claims 9, 13–18, 25, or 27–36 are unpatentable.

¹ The named Petitioner entities are the only real parties in interest identified in the Petition. *See* Pet. 2–3.

² The Petition incorrectly identifies the Patent Owner as “IPR Licensing, Inc.” *See* Paper 5, 2 n.1. InterDigital identifies itself as the Patent Owner and the real party in interest. *Id.* at 2.

II. BACKGROUND

A. RELATED PROCEEDINGS

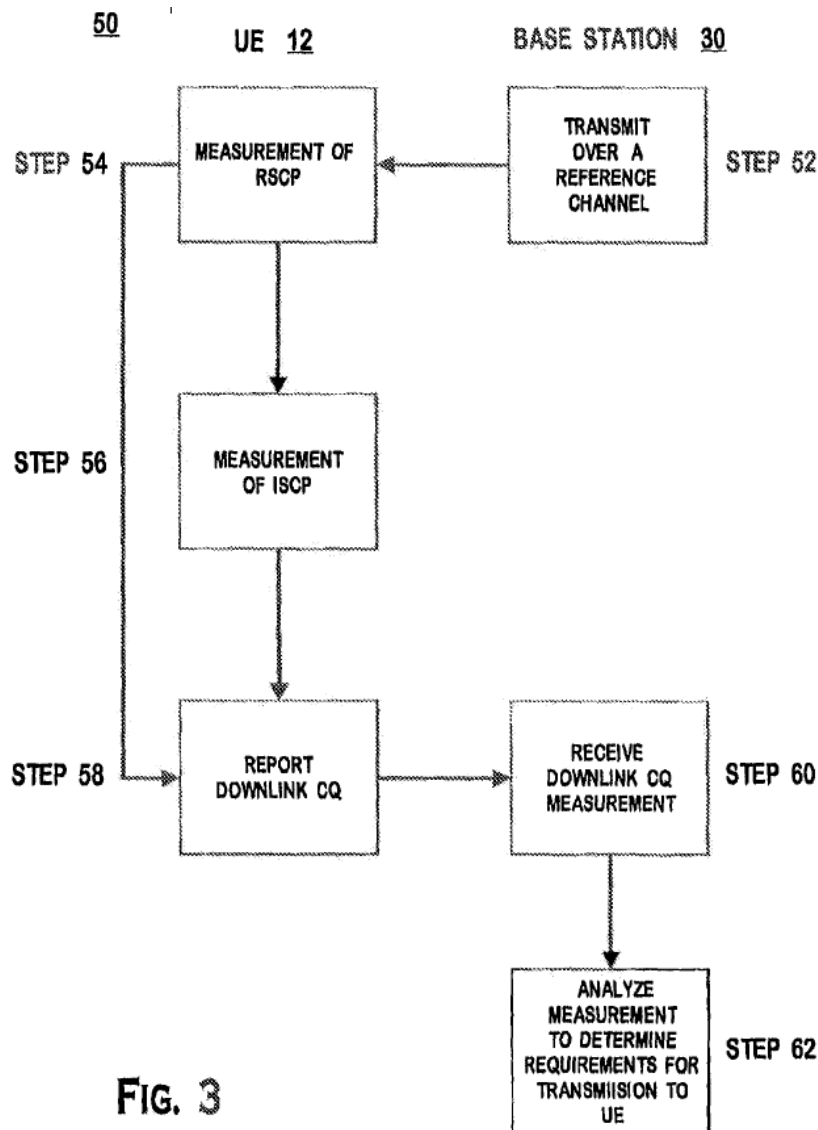
As a related matter, the parties identify *InterDigital Technology Corp. v. Lenovo Holding Co.*, No. 1:19-cv-01590 (D. Del. filed Aug. 28, 2019) (“the parallel district court litigation”). Pet. 3; Paper 5, 2.

B. THE ’449 PATENT (EX. 1001)

The ’449 patent relates to wireless communication systems that employ code-division multiple access (CDMA) technology, using measurement techniques to determine how to efficiently allocate “downlink resources”³ transmitted from a base station to a user equipment (“UE”) device. Ex. 1001, 1:17–21, code (57). In various embodiments, “[m]easurements may be performed at a high rate for all relevant timeslots or sub-channels, or may be made at a lower rate by selectively reducing the rate by which such measurements are performed.” *Id.* at 2:38–42.

Figure 3, reproduced below, is a flow diagram illustrating the preferred method by which the UE performs channel quality measurements and reports them to the base station:

³ Petitioner argues that the term “downlink resource” means “any radio signal, or portion thereof, used to transmit in the downlink direction, including a downlink pilot signal.” Pet. 9 (citing Ex. 1003 ¶ 63). InterDigital does not contest this interpretation in its Patent Owner Response, and as discussed below, we do not need to construe this term for our decision. *See infra* Part III.B.4.



Ex. 1001, 3:12–15. Figure 3, above, shows a digital communication system comprising UE 12 and base station 30, as it performs method 50. *Id.* at 4:24–27. Base station 30 transmits a fixed-level transmission (step 52), at a known power level, to UE 12. *Id.* at 4:44–51. UE 12 measures the received signal code power (“RSCP”) in step 54, and then measures the interference signal code power (“ISCP”) in step 56. *Id.* at 4:51–53. Next, UE 12 reports to base station 30 a downlink channel quality (“CQ”) based on the RSCP, ISCP, or other factors. *Id.* at 5:30–38. Base station 30 receives the CQ report and

analyzes it “to determine the activity necessary for subsequent transmissions to the UE 12.” *Id.* at 5:39–43.

The ’449 patent describes nine particular ways in which UE 12 may report channel quality to base station 30 in step 58 of Figure 3. *See* Ex. 1001, 5:61–7:2. “The nine alternatives are generally in the order from requiring the most number of bits to requiring the least number of bits to transmit the downlink CQ information from the UE 12 to the base station 30.” *Id.* at 6:17–20. The different alternatives reflect “a trade-off between the amount of data provided, and the overhead necessary to transmit the measurement data back to the base station 30.” *Id.* at 5:44–48.

The last two alternatives (8 and 9) are of particular relevance to the challenged claims. In alternative 8, “the UE 12 measures and transmits the mean of the CQs for all timeslots, which is coded using a larger number of bits, and then transmits the difference of each remaining timeslot to the mean value using coded values having a smaller number of bits.” Ex. 1001, 6:53–57. In alternative 9, “one of the timeslots or sub-channels is designated as a reference point,” and UE 12 transmits the channel quality measurement for this timeslot, “and then for the remaining timeslots it is only necessary to transmit the differential information as referred to the reference point.” *Id.* at 6:62–66.

C. CHALLENGED CLAIMS AND GROUNDS

Independent claim 1, which exemplifies the other challenged claims, is as follows:

- [1.a] 1. A user equipment comprising:
- [1.b] a receiver configured to receive downlink resource allocations from a base station,
- [1.c] wherein a received downlink resource allocation indicates to the user equipment which downlink resources of a plurality of downlink resources have been allocated to the user equipment for a downlink transmission;
- [1.d] a measurement device configured to perform a plurality of downlink measurements for the plurality of downlink resources,
- [1.e] wherein the plurality of downlink measurements are performed to determine channel quality information associated with one or more of the plurality of downlink resources;
- [1.f] a channel quality determination device configured to:
- [1.g] determine a first channel quality indication, wherein the first channel quality indication is used to indicate to the base station a modulation and coding set (MCS) that has been determined based on a channel quality of the plurality of downlink resources, and
- [1.h] determine at least a second channel quality indication, wherein the second channel quality indication is used to indicate to the base station an MCS that has been determined based on a channel quality of a particular downlink resource of the plurality of downlink resources; and
- [1.i] a transmitter configured to transmit at least one channel quality report to the base station,
- [1.j] wherein the at least one channel quality report comprises the first channel quality indication and the second channel quality indication, and the second channel quality indication is reported as a differential channel quality with respect to the first channel quality indication.

Ex. 1001, 7:33–64 (line formatting and Petitioner’s reference letters added); *see also* Pet. Attachment C (claim listing). Claims 13, 21, 27, and 33 are also independent, and the remaining challenged claims depend directly or indirectly from the independent claims. *See* Ex. 1001, cols. 7–12.

Petitioner argues seven grounds for *inter partes* review, as summarized in the following table:

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, 36	102(e) ⁴	Li ⁵
2	1–18, 21–36	103(a)	Li
3	1–18, 21–36	103(a)	Li, Tiedemann ⁶
4	1–18, 21–36	103(a)	Li, Lundby ⁷
5	7, 8, 24, 31, 32	103(a)	Li, ETSI1997 ⁸
6	7, 8, 24, 31, 32	103(a)	Li, Tiedemann, ETSI1997
7	7, 8, 24, 31, 32	103(a)	Li, Lundby, ETSI1997

Pet. 10, 13.

⁴ 35 U.S.C. §§ 102(e), 103(a) (2006), *amended by* Leahy–Smith America Invents Act, Pub. L. No. 112-29 §§ 102, 103, sec. (n)(1), 125 Stat. 284, 287, 293 (2011) (effective Mar. 16, 2013). Petitioner assumes, and InterDigital does not contest, that the effective filing date of the challenged claims is May 14, 2001, which is before the effective date of this amendment to sections 102 and 103. *See* Pet. 6.

⁵ Li et al., US 6,947,748 B2, filed Dec. 15, 2000, issued Sept. 20, 2005 (Ex. 1006).

⁶ Tiedemann, Jr. et al., US 6,307,849 B1, filed Sept. 8, 1997, issued Oct. 23, 2001 (Ex. 1005).

⁷ Lundby et al., US 6,985,453 B2, filed Feb. 15, 2001, issued Jan. 10, 2006 (Ex. 1009).

⁸ European Telecommunications Standards Institute, Universal Mobile Telecommunications System (UMTS); UMTS Terrestrial Radio Access (UTRA); Concept Evaluation, TR 101 146, V3.0.0 (Dec. 1997) (Ex. 1007).

D. DECLARATORY TESTIMONY

Petitioner relies on the declaration of Dr. Anthony Acampora. Ex. 1003; Ex. 1004 (curriculum vitae). Petitioner also relies on the declaration of Craig Bishop. Ex. 1016. InterDigital relies on the declaration of Dr. Mark Mahon. Ex. 2001; Ex. 2003 (curriculum vitae).

Neither party challenges the credentials of these witnesses.⁹ We consider their testimony. *See* Fed. R. Evid. 702(a); Ex. 1003 ¶¶ 3–14; Ex. 1004; Ex. 1016 ¶¶ 5–16, App’x A; Ex. 2001 ¶¶ 2–14; Ex. 2003.

III. GROUNDS OF THE PETITION

For the reasons below, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–8, 10–12, 21–24, and 26 of the ’449 patent are unpatentable under § 103(a) as obvious over Li in view of Tiedmann, with or without ETSI1997 (Grounds 3 and 6). We determine that Petitioner has not shown that any claims are unpatentable under Grounds 1, 2, or 5, and we do not reach alternative Grounds 4 or 7 as to the claims found unpatentable based on other grounds. We also determine that Petitioner has not shown that claims 9, 13–18, 25, or 27–36 are unpatentable under any ground.

Before analyzing the Petition’s asserted grounds in detail, we address two matters that will underlie our analysis: the level of ordinary skill in the art and the construction we will apply to the claim terms. We also address

⁹ InterDigital does, however, contend that we should give little or no weight to Dr. Acampora’s testimony. We address this below in Part III.C.

InterDigital’s general challenge to the credibility of Dr. Acampora, Petitioner’s primary expert witness.

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is relevant to how we construe the patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factual considerations relevant to obviousness, *see Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966), and it is relevant when considering whether a reference anticipates a claimed invention, *see In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Relying on Dr. Acampora’s testimony, Petitioner argues that a person of ordinary skill in the art would have had “at least a bachelor’s degree in electrical engineering, or a related field, with four years of experience in a relevant technical field, such as working with any one of a number of wireless communications systems that were known in the relevant time period,” or, alternatively, “at least a master’s degree in electrical engineering, or a related field, with two years of experience in a relevant technical field.” Pet. 6 (citing Ex. 1003 ¶ 49). Petitioner also argues that the level of ordinary skill would have included familiarity with technologies

such as “wireless, paging, cellular, and computer networking technologies and techniques” including frequency division, time division, or code division duplexing or multiplexing, as well as channel allocation and message acknowledgement techniques. *Id.* (citing Ex. 1003 ¶ 49).

In its Response, InterDigital does not contest Dr. Acampora’s articulation of the level of ordinary skill, except that “InterDigital applies Petitioners’ alleged baseline level of ordinary skill without the phrase ‘at least.’” PO Resp. 3. We agree with InterDigital that the term *at least* arguably “creates unnecessary ambiguity.” *Id.* (citing Inst. Dec. 9–10). But we find that Petitioner’s articulation, after deleting the phrase *at least*, is reasonable in light of the subject matter involved in the ’449 patent, and we adopt it for our decision.

B. CLAIM CONSTRUCTION

In an *inter partes* review, we construe a patent claim “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) (2020). This includes “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary artisan after reading the entire patent,” and “as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1313, 1321.

To make this determination, “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). We also consider “[a]ny prior claim construction determination concerning a term of the claim in a civil action . . . that is timely made of record” in this proceeding. 37 C.F.R. § 42.100(b) (2020).

We address the parties’ claim construction arguments below.

1. “*channel quality*”

InterDigital states that the court in the parallel district court litigation adopted the parties’ agreed construction of “channel quality” as meaning “a value/values quantifying how efficiently downlink resources of a channel can communicate information.” PO Resp. 3–4 (citing Ex. 2008, 1; Ex. 2009, 18). InterDigital contends that the ’449 patent suggests this construction, and that both sides’ experts agree with it. *Id.* at 4 (citing Ex. 1001, 1:36–61; Ex. 2001 ¶¶ 33–35; Ex. 2002, 21:14–22; Ex. 2007, 26:12–17).

Because the meaning of this term is uncontested, and it is consistent with the evidence of record, we adopt the parties’ agreed construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and 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))).

2. “*a channel quality of the plurality of downlink resources*”; “*a first channel quality indication for the plurality of downlink resources*”

Petitioner argues that we should construe the term *a channel quality of the plurality of downlink resources* (claims 1, 13, and 21) and the related term *a first channel quality indication for the plurality of downlink resources*

(claims 27 and 33). Pet. 11–13. According to Petitioner, these terms mean a channel quality value or an indication of channel quality, respectively, “relat[ing] to the ‘*plurality of downlink resources*’ as a whole, such as a mean or reference value related to the plurality.” Pet. 11; *accord* Pet. 12–13.¹⁰

In support of this construction, Petitioner first points to the language of claim 1, which refers to a channel quality “of the plurality of downlink resources” and separately to a channel quality of a “particular downlink resource.” Ex. 1001, 7:50–51, 7:55–56. According to Petitioner, this suggests “that the former phrase refers to a channel quality relating to the plurality as a whole.” Pet. 11 (emphasis omitted) (citing Ex. 1003 ¶ 69). Petitioner also points to alternative 8 in the ’449 patent, which “discloses reporting channel qualities to the base station as ‘*[a] mean of the CQ for all timeslots* (i.e., 4–5 bits) and the difference from the mean (i.e., 1 or 2 bits) for each timeslot.” Pet. 11–12 (alteration in original) (quoting Ex. 1001, 6:10–12). According to Petitioner, “the mean of all channel quality values of the plurality of downlink resources (in this example each resource being a timeslot) relates to the plurality as a whole because it describes a middle point of the set consisting of each such channel quality.” Pet. 12 (citing Ex. 1015, 891 (dictionary definition of “mean”); Ex. 1003 ¶ 70).

¹⁰ We construe the two versions of this term together. The only distinction between the two terms that Petitioner argues is that an “indication” of a channel quality does not necessarily need to be the channel quality itself. *See* Pet. 13. But according to InterDigital, adding the word *indication* to the phrase “has no impact on the outcome.” PO Resp. 4 n.1 (citing Ex. 2002, 36:2–36:2 (Dr. Acampora stating that the two versions of the term are “very similar if not identical”)). We agree with InterDigital. *See Nidec*, 868 F.3d at 1017.

Petitioner also argues that alternative 9 of the '449 patent embodies a channel quality of the plurality of downlink resources. *See* Pet. 27 (citing Ex. 1003 ¶ 135). In alternative 9, the user equipment designates “one of the timeslots or sub-channels . . . as a reference point” and transmits the channel quality measurement for that reference point. Ex. 1001, 6:62–64; *see also id.* at 6:12–15 (“The actual measured value of one predetermined or identified timeslot or sub-channel [is transmitted] as a reference . . .”). For example, if the reference value is the “highest” value among the plurality of downlink resources, Petitioner argues that this is analogous to reporting a mean, as in alternative 8: “Just as the mean identifies a middle point of channel quality values for the plurality, the channel quality value of the cluster having the best performance identifies the high point (*i.e.*, maximum) of channel quality values for the plurality.” Pet. 26.

After our Institution Decision and before InterDigital’s Response, the court in the parallel district court litigation agreed with Petitioner in construing *a (first) channel quality of the plurality of downlink resources* to mean “a channel quality value related to the ‘plurality of downlink resources’ as a whole, such as a mean or reference value related to the plurality.” Ex. 2009, 12.¹¹ According to the court, “[t]he embodiments

¹¹ The court also agreed with Petitioner and construed the term *first channel quality indication*, as it appears in a related patent (not the '449 patent), “to encompass a channel quality indication providing quality information for the ‘plurality of downlink resources’ as a whole and also encompass the use of a channel quality indication of one resource as a reference value related to the plurality.” Ex. 2009 11. Neither party urges us to construe this term, but we see no inconsistency between the district court’s two constructions. *See id.* at 12 (“Although arising in different claim terms in different patents, the parties’ disputes with respect to these two terms are essentially the same:

disclosed in the patent make clear that so long as the value is *related* to the plurality of resources, it suffices. InterDigital’s proposed construction would improperly read out embodiments (including Alternative 9) disclosed in the patent.” *Id.* at 12–13 (citing *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1305 (Fed. Cir. 2007)).

In its Response, InterDigital acknowledges that the court “sided with Petitioners on this construction.” PO Resp. 5 n.2 (citing Ex. 2009, 12–13). But InterDigital contends that the district court’s construction “is neither correct nor binding on the Board” because “[t]he opinion offers little explanation of its reasoning,” the court “lacked the benefit of Dr. Mahon’s testimony,” and “Petitioners presented different arguments and relied on different evidence before the district court.” PO Resp. 5 n.2 (citing *In re Vistaprint, Ltd.*, 628 F. 3d 1342, 1347 (Fed. Cir. 2010); *CVI/Beta Ventures, Inc. v. Tura LP*, 112 F. 3d 1146, 1160 n.7 (Fed. Cir. 1997)).

InterDigital does not, in this proceeding, offer an alternative construction for these terms,¹² but argues that Petitioner has not met its burden to prove that the terms encompass a “reference value related to the plurality.” *See* PO Resp. 4–12; PO Sur-reply 2–5. First, InterDigital argues that “Petitioners’ own analysis refutes [the] aspect of their constructions” that allows a channel quality value or indication, by showing that “the

whether the terms ‘may also cover the channel quality of one downlink resource used [as] a reference value for the plurality of resources.’” (citation omitted)).

¹² In the parallel district court litigation, InterDigital argued that *a (first) channel quality of the plurality of downlink resources* means “a channel quality value related to the ‘plurality of downlink resources’ as a whole, such as a *mean*.” Ex. 2009, 12 (emphasis added).

channel quality value/indication of the plurality as a whole does not encompass the [channel quality or channel quality indication] of a particular resource.” PO Resp. 5–6. According to InterDigital, Petitioner acknowledges that based on the plain claim language, “a channel quality of the plurality of downlink resources” is different from “a channel quality of a particular downlink resource.” *Id.* at 6 (citing Pet. 11). Thus, InterDigital contends that any one channel quality taken from the plurality of values cannot be both the “channel quality of the plurality” and the “channel quality of a particular downlink resource.”

We disagree that the plain claim language undermines Petitioner’s argument that “a channel quality of the plurality” could include a reference value related to the plurality such as the reference value in alternative 9 of the ’449 patent. Although *channel quality of the plurality of downlink resources* does not have the same scope as *channel quality of a particular downlink resource*, this does not mean that a particular channel quality cannot be designated as a reference value by a user equipment’s transmitter, which may differentially report the other channel qualities as per alternative 9. *See* Ex. 1001, 6:62–66 (“[O]ne of the timeslots or sub-channels is designated as a reference point . . . and then for the remaining timeslots it is only necessary to transmit the differential information as referred to the reference point.”).

Second, InterDigital addresses Petitioner’s arguments for alternative 8 of the ’449 patent, in which “[user equipment] 12 measures and transmits the mean of the [channel qualities] for all timeslots, which is coded using a larger number of bits, and then transmits the difference of each remaining timeslot to the mean value using coded values having a smaller number of

bits.” Ex. 1001, 6:53–57. InterDigital concedes that Petitioner’s discussion of alternative 8 “supports the ‘such as a mean’ portion of their construction,” but InterDigital contends that Petitioner does not argue “that the specification supports extending the construction to any ‘reference value related to the plurality’” according to alternative 9 of the ’449 patent. PO Resp. 6–7. Thus, InterDigital argues that any potential argument that Petitioner might subsequently make regarding alternative 9 would reflect a pivot to “a new theory during trial.” *Id.* at 8 & n.3.

We disagree that Petitioner’s reliance on alternative 9 in the Reply raises a new issue. As Petitioner correctly points out in its Reply, Petitioner addressed the claim construction issue in light of both alternatives 8 and 9 in the Petition. *See* Pet. 11–12, 25–27; Pet. Reply 3 n.2.

As Petitioner persuasively argues in the Petition, selecting a reference value within a set of values, such as the maximum of the values, is analogous to reporting a mean as in alternative 8. *See* Pet. 26. We agree with Petitioner that both a mean and a particular selected value from among the plurality (such as the maximum value) can be “characteristic of the group of measured clusters as a whole.” Pet. 26; *see also* Pet. 27 (“[T]he best [channel quality] value reflects a characteristic of the ‘*plurality*’ of clusters being reported on”); Pet. Reply 2; Ex. 1003 ¶¶ 133–136.

Relying on testimony by Dr. Mahon, InterDigital also argues that a person of ordinary skill in the art “would not have viewed a [channel quality] ‘of the plurality’ (or a [channel quality indication] ‘for the plurality’) as encompassing Alternative 9.” PO Resp. 9 (citing Ex. 2001 ¶¶ 36–37, 40–41). In particular, Dr. Mahon argues that a person of ordinary skill in the art would have understood that *a channel quality of the plurality of downlink*

resources is a distinct element from *a channel quality of a particular downlink resource*. Ex. 2001 ¶¶ 36–37 (stating that Dr. Acampora agrees with him on this point); *see also id.* ¶ 42 (making the same point).

But Dr. Mahon’s testimony does not effectively rebut Petitioner’s argument, based on Dr. Acampora’s supporting testimony, that the claims encompass alternative 9. The fact that the two “channel quality” phrases have different meanings and scopes does not imply that they must always refer to different values.

InterDigital also argues that Petitioner’s proposed construction is incompatible with other language in claims 13, 27, and 33. *See* PO Resp. 9–10. According to InterDigital, “[t]hose claims clarify that the report includes second [channel quality indications], reported as differential channel qualities with respect to the first [channel quality indication], for *each* of the plurality of downlink resources.” *Id.* at 10. InterDigital contends that this is consistent with alternative 8, but not alternative 9, “which includes a reference value and ‘the difference of the *remaining* timeslots from the reference timeslot.’” *Id.* (quoting Ex. 1001, 6:10–15) (citing Ex. 2001 ¶¶ 38–39, 44–47).

We disagree that Petitioner’s proposed construction is inconsistent with the language in claims 13, 27, or 33. Although claims 13, 27, and 33 would not encompass alternative 9 because the “plurality of downlink resources” would include the downlink resource corresponding to the first channel quality indication, other claims, such as independent claims 1 and 21, would still encompass alternative 9, given their different claim language.

Next, InterDigital argues that Petitioner’s proposed construction “would render the phrase ‘of the plurality of downlink resources’ (or ‘for the

plurality of downlink resources’) superfluous” because “[t]his ‘reference’ concept is already captured by the requirement that the second [channel quality indication] be reported as a differential channel quality with respect to the first [channel quality indication].” PO Resp. 10.

We disagree that Petitioner’s proposed construction renders superfluous the limitation of reporting at least one differential channel quality. The proposed construction, as adopted by the district court, is “a channel quality value related to the ‘plurality of downlink resources’ as a whole, *such as* a mean or reference value related to the plurality.” Ex. 2009, 12 (emphasis added). In other words, a “reference value” is not required under the proposed construction. It is merely an example (in addition to a mean or other possibilities) of a channel quality that can be encompassed by the proposed construction.

Finally, InterDigital argues that Petitioner fails to provide support for a construction in which a “channel quality of the plurality of downlink resources” extends beyond alternative 9 “to encompass reference values that are not even part of the plurality of downlink resources.” PO Resp. 11–12 (citing Pet. 11). We agree that Petitioner has not provided sufficient explanation to show (in arguing that the prior art teaches the relevant claim limitations) that its proposed construction would encompass such a reference value that is not part of the plurality and thus not within the scope of alternative 9, as we discuss below. *See infra* part III.D.3(b). This does not, however, require us to reject Petitioner’s proposed construction.

For the above reasons, we determine that Petitioner has persuasively shown that *a channel quality of the plurality of downlink resources* and the related term *a first channel quality indication for the plurality of downlink*

resources mean “a channel quality value related to the ‘plurality of downlink resources’ as a whole.” Pet. 11–13. We also determine that Petitioner has persuasively shown that both alternatives 8 and 9 reflect embodiments of this term, which is consistent with the district court’s construction that provides “a mean or reference value related to the plurality” as examples of a channel quality value related to the plurality of downlink resources as a whole, explicitly referencing alternative 9 in its analysis. *See* Ex. 2009, 12–13.

3. “*differential channel quality*”

Petitioner argues that we should construe the term “differential channel quality” to mean “a channel quality expressed as a difference relative to some other channel quality value.” Pet. 12 (citing Ex. 1001, 6:10–15 (“the difference from the mean”; “the difference of the remaining timeslots from the reference timeslot”); Ex. 1009, 5:7–10 (“[T]he differential indicator is an indication of relative changes in the quality of the FL pilot channel”); Ex. 1003 ¶ 71). According to Petitioner, “[t]his is consistent with the ordinary English definition of the phrase, which is of, showing, or depending on a difference.” Pet. 12 (citing Ex. 1003 ¶ 72).

InterDigital does not contest Petitioner’s proposed construction, and its arguments in response to Ground 1 assume that construction for the sake of argument. *See* PO Resp. 16.

For our decision, we adopt Petitioner’s uncontested construction. However, as we explain below, we find Petitioner’s arguments unpersuasive that Li discloses or teaches a differential channel quality, even under Petitioner’s proposed construction on which that analysis is based. *See infra* Part III.D.

4. *Other Terms*

Petitioner argues that we should construe the terms “downlink resource” and “sub-channel.” Pet. 8–11, 13. InterDigital does not contest Petitioner’s proposed constructions for these terms. Because the meaning of these terms is not material to our decision, we do not explicitly construe these terms. *See Nidec*, 868 F.3d at 1017.

C. WEIGHT OF DR. ACAMPORA’S TESTIMONY

InterDigital contends that we should give Dr. Acampora’s testimony little or no weight because “the near identity between Dr. Acampora’s declaration and the petition undercuts the independence and objectivity of his testimony.” PO Resp. 12–14 (citing Pet. 10, 31, 37, 57–58, 62, 66–68; Ex. 1003 ¶¶ 61, 152, 159, 162–163, 172, 184, 240). InterDigital contends that during his deposition, Dr. Acampora admitted that certain typographical errors present in both the Petition and his declaration were the result of a “cut-and-paste mistake.” *Id.* at 13 (citing Ex. 2001, 15:5–17:24). InterDigital also cites a non-precedential Board case for the proposition that “expert testimony that simply parrots the petition is entitled to little weight.” *Id.* at 13 (citing *Wowza Media Sys., LLC v. Adobe Sys., Inc.*, IPR2013-00054, Paper 16, 4 (PTAB July 13, 2013)).

To the extent that text was copied and pasted in either direction between the Petition and Dr. Acampora’s declaration, we disagree that this mere fact indicates that we should give Dr. Acampora’s testimony less weight. Patent Owner does not argue that Dr. Acampora was uninvolved with the preparation of his declaration, which he signed, under penalty of perjury, and presented as reflecting his own opinions. That typographical

errors may, for example, have been propagated from his declaration to the Petition is by itself of little consequence. The cited *Wowza* decision does not suggest otherwise. In that case, the Board assigned little weight to the expert declaration, not because of its similarity to the petition, but because the declaration did not disclose the underlying facts or data on which its opinion testimony was based. *See* IPR2013-00054, Paper 16 at 4–5. As Petitioner correctly argues in its Reply, InterDigital does not “identif[y] where Dr. Acampora fails to provide sufficient facts underlying his opinions.” Pet. Reply 1 n.1.

InterDigital also contends that we should give less weight to Dr. Acampora’s testimony because of “the hindsight bias that infused his analysis.” PO Resp. 14 (citing *Ruiz v. AB Chance Co.*, 357 F.3d 1270, 1275 (Fed. Cir. 2004)). According to InterDigital, “Dr. Acampora admitted under cross-examination that he had assumed the [person of ordinary skill in the art]’s knowledge of the state of the art included familiarity with the ’449 patent itself.” *Id.* (emphasis omitted) (citing Ex. 2002, 91:5–92:11).

Although Dr. Acampora’s isolated statement during cross-examination that the knowledge of a person of ordinary skill in the art includes the disclosure of the challenged patent is mistaken, on this record, the mistake is harmless. Patent Owner cites nowhere where Dr. Acampora relied on the disclosure of the challenged patent to demonstrate that a challenged claim was anticipated or rendered obvious by the asserted prior art. Further, neither his declaration nor his cited cross-examination testimony indicate any such reliance. *See generally* Ex. 1002; *see also id.* ¶ 36 (stating Dr. Acampora’s understanding “that the obviousness inquiry should not be done based on hindsight”). Thus, we find that Dr. Acampora’s mistaken assumption

expressed during cross-examination was harmless, and, as such, it does not diminish the persuasiveness or weight of his declaratory testimony.

D. GROUND 1: ANTICIPATION BY LI

1. *Overview of Li*

Li relates to a wireless system employing orthogonal frequency division multiple access (OFDMA), in which “a wide bandwidth is divided into multiple narrow-band subcarriers, which are arranged to be orthogonal with each other.” Ex. 1006, 1:16–18. Within such a system, Li describes a method and system for selecting subcarriers for use by a wireless subscriber. *Id.* at 2:8–9, code (57).

This subcarrier selection process involves “a subscriber measuring channel and interference information for subcarriers based on pilot symbols received from a base station.” *Id.* at 2:12–14. The subscriber selects a set of candidate subcarriers, provides feedback information on the set of candidate subcarriers to the base station, and receives an indication of subcarriers of the set of subcarriers selected by the base station for use by the subscriber. *Id.* at 2:14–19. The selected subcarriers are those “with good performance (e.g., a high signal-to-interference plus noise ratio (SINR)),” and the information on these subcarriers is sent to the base station. *Id.* at 3:7–12.

In one embodiment, the information sent to the base station takes the form shown in Figure 5, reproduced below:

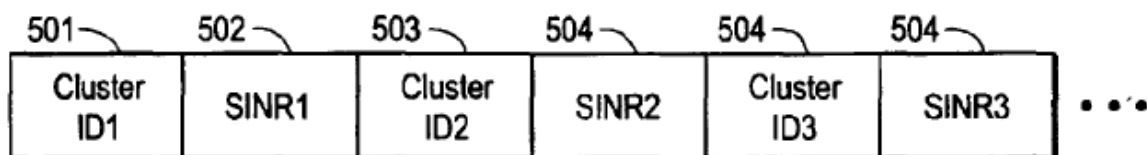


FIG. 5

Figure 5 “illustrates one embodiment of a format for arbitrary cluster feedback.” Ex. 1006, 2:36–37. Li defines a “cluster” as “a logical unit that contains at least one physical subcarrier.” *Id.* at 5:10–11. For each selected subcarrier cluster, the subscriber device “provides a cluster index (ID) to indicate the cluster and its associated SINR value.” *Id.* at 10:52–54.

In the example of Figure 5, there are at least three cluster IDs and three associated SINR values. Ex. 1006, 10:54–58. Li discloses that “the selected clusters can . . . be ordered in the feedback to indicate priority. In one embodiment, the subscriber may form a priority list of clusters and send[] back the SINR information in a descending order of priority.” *Id.* at 10:61–64.

Petitioner contends that Li anticipates claims 1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, and 36 of the ’449 patent under § 102(e). Pet. 5, 13, 16–49.

To establish anticipation, a petitioner must find each and every element in a claim, arranged as recited in the claim, in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). The limitations may be present in the reference “either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). Further, an anticipating prior art reference must be enabling and must describe the claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *See Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000); *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1994).

Based on the full trial record, we find that Petitioner has not shown by a preponderance of the evidence that Li anticipates any of the challenged claims, for the reasons below.

2. *Preamble 1.a and Limitations 1.b–1.f: “receiver”; “measurement device”; “channel quality determination device”*

The preamble of claim 1 (which Petitioner labels as 1.a) and limitations 1.b–1.f recite a user equipment device and some of its components. *See* Ex. 1001, 7:33–46. InterDigital does not contest that Li discloses these features. *See* PO Resp. 14–28.

In particular, the preamble of claim 1 recites “[a] user equipment.” Ex. 1001, 7:33. Petitioner contends that Li meets this limitation by disclosing mobile devices in a wireless network. Pet. 17 (citing Ex. 1006, 3:1–6, 8:42–47, Figs. 3, 4; Ex. 1003 ¶ 95). We find this persuasive, and thus we do not need to decide whether the preamble of claim 1 is limiting.

Limitations 1.b and 1.c recite “a receiver configured to receive downlink resource allocations from a base station, wherein a received downlink resource allocation indicates to the user equipment which downlink resources of a plurality of downlink resources have been allocated to the user equipment for a downlink transmission.” Ex. 1001, 7:34–39. Petitioner argues that Li discloses these limitations because its subscriber unit receives information from a base station about which clusters are allocated to the subscriber for downlink transmissions. Pet. 17–20 (citing Ex. 1006, code (57), 2:29–30, 2:66–3:42, 5:2–8, 5:20–45, 5:53–55, 5:65–6:27, 6:30–54, 7:30–8:41, 9:2–6, 10:48–64, Figs. 1A–B, 2A–C, 5; Ex. 1003 ¶¶ 88–93, 99–101, 104–106, 108–109); *see also* Pet. 54–55 (arguing, in an

obviousness context, that implementing limitation 1.c would have been within the level of skill in the art to implement).

Limitations 1.d and 1.e recite “a measurement device configured to perform a plurality of downlink measurements for the plurality of downlink resources, wherein the plurality of downlink measurements are performed to determine channel quality information associated with one or more of the plurality of downlink resources.” Ex. 1001, 7:40–45. Petitioner argues that Li discloses these limitations because it describes a measurement device for measuring the SINR of each subcarrier cluster, including an ability to calculate an average of SINRs for a plurality of subcarriers within each cluster. Pet. 20–22 (citing Ex. 1006, 5:20–57, 7:29–65, 8:42–47, Figs. 1B, 2, 3, 4; Ex. 1003 ¶¶ 113–115, 118).

Limitation 1.f recites “a channel quality determination device configured to” perform the determinations of limitations 1.g and 1.h (discussed below). Ex. 1001, 7:46. Petitioner argues that Li discloses this limitation because the subscriber device makes channel quality determinations. Pet. 22–23 (citing Ex. 1006, 3:7–12, 5:5–6:8, 8:42–47, 9:49–64, Figs. 3, 4; Ex. 1011 ¶ 27; Ex. 1003 ¶¶ 121–122).

We find Petitioner’s uncontested arguments, and supporting testimony from Dr. Acampora, to be persuasive in showing that Li discloses limitations 1.b–1.f.

3. *Limitation 1.g: “first channel quality indication”*

Limitation 1.g. requires that the channel quality determination device “determine a first channel quality indication, wherein the first channel quality indication is used to indicate to the base station a modulation and

coding set (MCS) that has been determined based on a channel quality of the plurality of downlink resources.” Ex. 1001, 7:47–51.

Petitioner argues that Li’s SINR (or an index identifying an SINR) is a “channel quality indication” as recited in limitation 1.g because it is a known indicator of channel quality. Pet. 23 (citing Ex. 1011 ¶ 27; Ex. 1003 ¶ 126). InterDigital does not contest this argument, and we find it persuasive.¹³

We address Petitioner’s remaining, contested arguments regarding limitation 1.g below.

(a) “used to indicate to the base station a modulation and coding set (MCS)”

According to Petitioner, Li “discloses that the SINR feedback values from the subscriber can be ‘ordered according to which clusters have the best performance, relative to each other for the subscriber.’” Pet. 23 (citing Ex. 1006, 6:4–8, 7:49–51). Alternatively, Petitioner argues that Li discloses that the subscriber device can send indexes to the SINR values, rather than the SINR values themselves, but in either case, the value or the index is “used to indicate to the base station a modulation and coding set (MCS).” Pet. 25 (emphasis omitted) (citing Ex. 1006, 5:65–6:1, 7:2–19, 7:59–63,

¹³ Alternatively, Petitioner argues that Li’s embodiment in which the subscriber device orders the cluster IDs in the feedback message based on their relative performance, is a channel quality indication because the act of ordering the cluster IDs entails “identifying the best channel quality and creating information (*i.e.*, the identity of the best cluster and relative values of others and a message encoding that identity).” Pet. 24 (citing Ex. 1006, 8:60–65; Ex. 1003 ¶¶ 127–128). Because we find that there is sufficient evidence in the full trial record that the SINR values are channel quality indications themselves, we do not need to address Petitioner’s alternative argument.

9:35–40); *see also id.* at 23 (citing Ex. 1006, 7:61–63, 10:65–67; Ex. 1003 ¶ 125).

In response, InterDigital argues that during cross-examination, Dr. Acampora abandoned the theory relying on Li’s embodiment of sending indexes rather than actual SINR values. *See* PO Resp. 17 (citing Ex. 2002, 78:18–80:3, 81:1–23); *id.* at 25.¹⁴ InterDigital contends that, absent reliance on Li’s index embodiment, the Petition “fails to show that the reported value is used to indicate to the base station an MCS that ‘has been determined’” as recited in claim 1. *Id.* at 25. According to InterDigital, “while SINR values may be part of the process of choosing a coding/modulation rate, Li states that if the mobile device wants to indicate to the base station a particular modulation/coding rate it desires to use, it provides that indication using an index.” *Id.* at 25–26 (citing Ex. 1006, 7:59–63). Relying on Dr. Mahon’s testimony, InterDigital argues that a person of ordinary skill in the art “would not have expected Li’s base station and the mobile devices communicating with that base station to have equivalent processes for selecting an MCS.” *Id.* at 26 (citing Ex. 2001 ¶¶ 63–72); *see also id.* at 26–28. InterDigital also contends that, during cross-examination, Dr. Acampora stated that he had not considered this issue. *See id.* at 27 (citing Ex. 2002, 95:16–99:10); PO Sur-reply 11 (citing same).

¹⁴ Petitioner does not dispute this characterization. *See* Pet. Reply 9–10 (arguing that Li’s SINR values *also* indicate a particular MCS, not just the indexes, but not reiterating its argument relying on the index embodiment); Tr. 58:18–59:2 (“[D]uring cross-examination . . . [Petitioner’s] expert testified that Li’s index reporting wouldn’t satisfy the claim, which they didn’t dispute in their Reply.”).

In its Reply, Petitioner argues that Li clearly discloses that either the index or the SINR value, itself, may indicate a particular MCS, and Petitioner points to an example in which the subscriber specifies the coding/modulation rates and they are based on whether the SINR is within various thresholds. Pet. Reply 9–10 (citing Ex. 1006, 3:35–42, 5:65–6:1, 9:35–40; Ex. 1003 ¶ 131). Petitioner also argues that Li’s disclosure that using “an index to the SINR level, instead of the SINR itself[,] is sufficient to indicate the appropriate coding/modulation for the cluster” implies that the SINR itself is sufficient to indicate the appropriate coding/modulation for the cluster. *Id.* at 10 (quoting Ex. 1006, 10:65–67).

In its Sur-reply, InterDigital challenges Petitioner’s reading of certain cited passages in Li, and in particular, InterDigital alleges that the passage at column 7, lines 59–65 “contrasts . . . using the SINR value to ‘choose’ the appropriate rate with using the index to ‘indicate.’” PO Sur-reply 12 (citing Ex. 1006, 7:59–65).

We disagree. The passage in column 7 states that “[t]he estimated SINR values are also used to choose the appropriate coding/modulation rate for each cluster By using an appropriate SINR indexing scheme, the SINR index may also indicate a particular coding and modulation rate that the subscriber desires to use.” Ex. 1006, 7:59–63. This passage mentions both the indexing and non-indexing embodiments, and in both cases the passage states that the SINR values or indexes are used to identify an appropriate coding and modulation rate. Thus, rather than disclosing a distinction between “choosing” and “indicating,” we find Petitioner’s argument and Dr. Acampora’s supporting testimony more persuasive that

this passage discloses using *either* SINR values or SINR indexes to indicate the desired MCS. *See* Pet. 25; Ex. 1003 ¶ 132.

InterDigital also alleges in its Sur-reply that one of Petitioner's cited passages in Li about selecting modulation based on SINR values only "describes selection by the base station." PO Sur-reply 12 (citing Ex. 1006, 3:33–43). We disagree. In the passage, Li discloses that the base station selects "the channels to allocate, based on the feedback, [which] results in the selection of coding/modulation rates." Ex. 1006, 3:32–34. But the passage then continues to explain that "[s]uch coding/modulation rates may be specified by the subscriber when specifying subcarriers that it finds favorable to use." *Id.* at 3:34–36.

In response to another passage of Li that Petitioner cites in the Reply, InterDigital argues that the "passage describes the UE requesting the desired *rates*, not using SINR values to indicate the rate." PO Sur-reply 12 (citing Ex. 1006, 9:27–40). In full context, this passage discloses that a subscriber is able to "predict[] the data rate that would be available using [the relevant] clusters," and "[t]he predicted data rate information may be obtained from a look up table with precalculated data rate values. Such a look up table may store the pairs of each SINR and its associated desired transmission rate." Ex. 1006, 9:30–35. Then, "[b]ased on this information, the subscriber selects clusters that it desires to use based on predetermined performance criteria" and "requests the desired clusters along with coding and modulation rates known to the subscriber to achieve desired data rates." *Id.* at 9:35–40. In other words, this passage discloses that the subscriber requests the desired rates by using a lookup table storing pairs of SINR values and their associated desired transmission rates. As Petitioner persuasively argues, the

way that the subscriber indicates an MCS is by sending SINR values or indexes correspond to the desired MCS. *See* Pet. 25; Pet. Reply 9; Ex. 1003 ¶¶ 131–132.

Thus, having considered the parties’ arguments and the testimony of Drs. Mahon and Acampora, we find more persuasive Petitioner’s arguments, supported by Dr. Acampora’s testimony, that a person of ordinary skill in the art would have understood that Li discloses that the subscriber can indicate an MCS by transmitting channel quality (SINR) values.

(b) “a channel quality of the plurality of downlink resources”

Petitioner makes two alternative arguments for why Li’s first SINR is “a channel quality of the plurality of downlink resources.” First, Petitioner contends that the identified best-performance cluster in Li, which Petitioner identifies as the recited first channel quality indication, is a “channel quality of the plurality of downlink resources” as recited in limitation 1.g “because that information identifies a characteristic of the group of measured clusters as a whole (*i.e.*, the best or maximum quality of the group) and reflect[s] a characteristic of the entire group, (*i.e.*, the best performance/all other members of the group are necessarily of equal or lesser performance).” Pet. 25–26. The parties call this argument Petitioner’s “first mapping” or “member theory.” *See* Pet. Reply 5; PO Sur-reply 18.

Alternatively, Petitioner argues that the best-performance cluster is not, itself, a channel quality of the plurality of downlink resources, but it still “identifies a characteristic of the measured clusters as a whole (*i.e.*, a channel quality that *is better than* any of the group) and reflects a characteristic of the entire group, (*i.e.*, the best performance of members of

the group *are less than* that of the first channel quality indication).” Pet. 26. In later papers, the parties call this argument Petitioner’s “alternative mapping” or “nonmember theory.” Pet. Reply 6; PO Sur-reply 18.

Petitioner argues that under either mapping to Li, “the channel quality value of the cluster having the best performance is analogous to the mean of all channel quality values disclosed in the 449 Patent.” Pet. 26. According to Petitioner, “[j]ust as the mean identifies a middle point of channel quality values for the plurality, the channel quality value of the cluster having the best performance identifies the high point (*i.e.*, maximum) of channel quality values for the plurality.” *Id.* Petitioner also argues that reporting the channel with the best SINR is “analogous to the reference value disclosed in [the ’449 patent] in Table 2, Alternative 9.” Pet. 27 (citing Ex. 1006, 6:10–15; Ex. 1003 ¶ 135).

InterDigital contends that, under either of Petitioner’s alternative mappings to Li, an SINR value cannot be “a channel quality of the plurality of downlink resources” as correctly construed. PO Resp. 18. InterDigital contends that the best-performance SINR in Li amounts to a “reference value,” and Petitioner has failed to show that a “channel quality of the plurality of downlink resources” encompasses a reference value such as in alternative 9 of the ’449 patent. *Id.* at 19–21. InterDigital also contends that Petitioner’s analogy to alternative 8 of the ’449 patent is flawed because, unlike a reference value, “each individual channel quality contributes to the mean, and a change to any one channel quality affects the mean.” *Id.* at 20 (citing Ex. 2001 ¶¶ 57–58).

For Petitioner’s second mapping or “nonmember theory,” InterDigital also argues that this mapping “is inconsistent with [Petitioner’s] own claim

construction analysis” because Petitioner allegedly argued that, “[t]aken literally, the phrase ‘*a channel quality of the plurality of downlink resources*’ could cover any channel quality of any member of the plurality.”

PO Resp. 23 (citing Pet. 11). According to InterDigital, “the alleged first [channel quality indication] in the *nonmember* theory comes from a resource that is explicitly *not* a member of the plurality.” *Id.* (citing Pet. 19).

In response, Petitioner argues that “[t]he Petition states that the plain language of the claims ‘could cover any channel quality of any member,’ not that the ‘*first channel quality indication*’ must be a member of the plurality.” Pet. Reply 7 (quoting Pet. 11). We agree with Petitioner that InterDigital misinterprets the statement in the Petition.

InterDigital also argues that an analogy to alternative 9 of the ’449 patent does not support Petitioner’s second mapping because in this case, the first channel quality indication is not a member of the plurality, and thus not a reference point according to alternative 9. PO Resp. 24; PO Sur-reply 9. InterDigital also contends that this mapping “defies the claim language, the specification, and common sense,” and is “akin to saying the height of the Empire State Building is the height of Staten Island’s skyline just because all buildings in Staten Island are smaller.” PO Resp. 24.

In response, Petitioner argues that the claim language only requires that the first channel quality indication “convey *a* channel quality of the plurality (e.g., a threshold height greater than the height of each building in the skyline), which Li’s non-member SINR value undoubtedly does.” Pet. Reply 7–8. According to Petitioner, InterDigital “concedes that the mean value of the plurality disclosed in Alternative 8 of the patent—which is not a

member of the plurality—is an example of the claimed invention.” *Id.* at 7 (citing PO Resp. 20; Ex. 2001 ¶ 39).

In its Sur-reply, InterDigital responds that “just because the mean—which is derived from all members of the plurality and characterizes the [channel quality] of the plurality as a whole—is a [channel quality] of the plurality, it does not follow that the [channel quality] of a cluster entirely separate from the plurality also qualifies.” PO Sur-reply 10.

Having considered the parties’ arguments and supporting expert testimony, we find that only Petitioner’s first, “member” mapping is consistent with the claims and our construction of the term *a channel quality of the plurality of downlink resources*. As we discuss above, Petitioner has persuasively shown that this term encompasses “a channel quality value related to the ‘plurality of downlink resources’ as a whole.” *See supra* Part III.B.2. We also determine that Petitioner has persuasively shown that both alternatives 8 and 9 reflect embodiments of this term. *See id.*

Under Petitioner’s first, “member” mapping, Li’s best-performance SINR value is a reference value directly analogous to alternative 9. Because it is a member of, and the *maximum* of, the channel qualities of the identified “plurality of downlink resources,” we agree with Petitioner that it is related to that plurality as a whole.

However, under Petitioner’s alternative, “nonmember” mapping, Li’s best-performance SINR value is not itself a reference value for a downlink resource chosen from among the plurality as in alternative 9. Although a channel quality value need not necessarily correspond to alternatives 8 or 9 to fall within the scope of the claim, so long as the channel quality value is “related to” the plurality as a whole, Petitioner has not met its burden to

show why Li's selected channel quality that is not, itself, a member of the plurality, is "related to" the alleged plurality of downlink resources. *See supra* Part III.B.2.

Under Petitioner's alternative, "nonmember" mapping, the best-performance SINR is not part of the "plurality of downlink resources"—only those appearing after SINR1 in Figure 5 of Li (i.e., SINR2, SINR3, etc.) are what Petitioner considers to be the "plurality." Petitioner's sole explanation as to how the best-performance SINR is "related to" the alleged plurality is that it indicates a channel quality "better than" those in the plurality (or conversely, the performance of those in the plurality is "less than" that of the best-performance SINR). *See* Pet. 26 (emphasis omitted); Pet. Reply 6–8; Ex. 1003 ¶ 134. Absent any additional explanation, we are not persuaded that this argument is sufficient to establish that the value is "related to" the plurality as a whole. Indeed, the best-performance SINR could have a value that is only slightly higher, or is orders of magnitude higher, than the next value in the sequence. The best-performance SINR says nothing about the plurality of values as a whole, other than that it indicates a performance "better than" (by an unknown amount) those of the plurality.

Moreover, although the best-performance SINR would be a "channel quality" of one of the downlink resources in Li, importantly, that downlink resource is not part of what Petitioner maps to the recited "plurality of downlink resources" (i.e., SINR2, SINR3, etc. in Figure 5). Thus, Petitioner has not explained why, under its "nonmember" theory, the best-performance SINR value would *be* a "channel quality of the plurality," any more than some other randomly-selected value that is greater than the maximum SINR of downlink resources within that plurality.

Also, we do not find persuasive Petitioner’s conclusory argument that Li’s “nonmember” reference value is analogous enough to alternative 9 of the ’449 patent that it could also be considered “related to” the plurality according to the district court’s construction. *See* Pet. 26–27. In the ’449 patent, the reference value of alternative 9 is not necessarily a maximum value, but it is explicitly a *member* of the plurality. *See* Ex. 1001, 6:13–15, 6:62–66. Petitioner’s explanation that a “nonmember” reference value is “related to” the plurality simply because it is greater than any value within the plurality has no solid basis in the intrinsic record of the ’449 patent, and Petitioner’s conclusory showing is insufficient to establish this analogy.

For the above reasons, Petitioner has shown that Li discloses limitation 1.g for claim 1 under its “member” theory, but not under its “nonmember” theory.

4. *Limitations 1.h–1.i: “second channel quality indication”; transmitter configured to transmit channel quality reports*

Limitation 1.h. requires that the channel quality determination device “determine at least a second channel quality indication, wherein the second channel quality indication is used to indicate to the base station an MCS that has been determined based on a channel quality of a particular downlink resource of the plurality of downlink resources.” Ex. 1001, 7:52–57.

Limitation 1.i recites “a transmitter configured to transmit at least one channel quality report to the base station.” Ex. 1001, 7:58–59.

Petitioner argues that Li discloses these limitations because its subscriber unit transmits channel quality indications (either an SINR or an index) for multiple clusters, which indicate base station and coding

modulation rates for subscriber units. Pet. 27–28. (citing Ex. 1006, 3:7–12, 5:53–57, 5:65–6:8, 7:2–4, 7:59–65; Ex. 1003 ¶¶ 139–140, 143).

According to Petitioner, these indications are part of “feedback information” that the user equipment transmits, among other things, to the base station. Pet. 29 (citing Ex. 1006, 2:36–37, 3:7–15, 8:60–63, 10:49–58, Figs. 3, 5; Ex. 1003 ¶¶ 145–149).

InterDigital does not contest that Li discloses these features, except to argue that Li’s channel quality values do not “indicate to the base station an MCS” as recited. *See* PO Resp. 24–28. As we discuss above, Petitioner has persuasively shown that Li’s channel quality (SINR) values indicate an MCS. *See supra* Part III.D.3(a). This determination applies to the “channel quality of a particular downlink resource” because in Li, the “channel quality of the plurality of downlink resources” is simply the best-performance SINR, and other SINRs (channel qualities for particular downlink resources) would likewise indicate an MCS for the same reasons as we discuss above. *See id.*

Thus, we find that Petitioner has shown that Li discloses limitations 1.h and 1.i.

5. *Limitation 1.j: reporting channel quality “as a differential channel quality with respect to the first channel quality indication”*

Limitation 1.j recites “wherein the at least one channel quality report comprises the first channel quality indication and the second channel quality indication, and the second channel quality indication is reported as a differential channel quality with respect to the first channel quality indication.” Ex. 1001, 7:59–64.

Petitioner argues that Li discloses this limitation by “disclos[ing] an embodiment in which the SINR feedback values for each of three or more clusters, or indexes associated with them, are ‘ordered according to which clusters *have the best performance, relative to each other* for the subscriber.’” Pet. 29–30 (quoting Ex. 1006, 6:4–8) (citing Ex. 1006, 5:65–6:1, 7:9–19, 7:59–63, 10:60–64; Ex. 1003 ¶¶ 50, 125).

In Li’s Figure 5, Petitioner identifies the “first channel quality indication” as the first-listed SINR or index (the “best” one), and the “second channel quality indication” as one of the other SINR values or indexes. Pet. 30 (citing Ex. 1006, 10:48–64, Fig. 5; Ex. 1003 ¶¶ 126, 150). According to Petitioner, a person of ordinary skill in the art would have understood that “the SINR cluster quality indications included in the Figure 5 report, other than the best one,” are each differential channel qualities “because their placement in the report indicates that the channel quality of the associated cluster is less than the best one, and therefore indicates a difference relative to the best channel quality value.” Pet. 31 (citing Ex. 1004 ¶ 152). Thus, Petitioner argues that reporting the SINR quality indications in order of relative performance constitutes reporting each of them as a “differential channel quality.” *See id.* (citing Ex. 1006, 1:65–2:7, 3:7–11, 3:26–35, 6:4–7; Ex. 1009, 5:7–10, 5:10–12; Ex. 1003 ¶ 153–155).

InterDigital counters that “Petitioners never show that the [second and subsequent SINR values] in Li’s feedback message are *expressed as a difference* at all, let alone with respect to the [best-performance SINR value].” PO Resp. 16.

Petitioner replies that, for each subsequent SINR value after the best-performance one, its “ordered position (*i.e.*, how it is expressed in the report)

indicates ‘a difference in channel quality between the cluster associated with the SINR value and the cluster associated with the first listed SINR value, *i.e.*, the difference being that the second list value is less than the first.’” Pet. Reply 8 (quoting Pet. 31) (citing Ex. 1003 ¶¶ 154, 155). According to Petitioner, “[t]he claims require only that the *second channel quality indication* show a difference, not the mathematical or numerical difference, between the *second channel quality indication* and the *first channel quality indication*.” *Id.* at 8–9.

We do not find Petitioner’s arguments persuasive. Although the ordering of the SINRs in Li’s Figure 5, for example, may indicate that there is a difference between the first channel quality indication and the second channel quality indication, Li does not actually *report* the second channel quality indication *as a difference* relative to the first channel quality indication. Thus, even if we accept Petitioner’s proposed construction of the term *differential channel quality* (*see supra* Part III.B.3) we are not persuaded that Li discloses limitation 1.j.

For the above reasons, we find that Petitioner has not shown, by a preponderance of the evidence, that Li anticipates claim 1 of the ’449 patent.

6. *Dependent Claims 2, 3, 6–13, 16–18, 21, 22, 24–27, 30–33, and 36*

Independent claims 13, 21, 27, and 33 include limitations equivalent to limitation 1.j. *See* Ex. 1001, 9:4–11, 10:25–31, 11:10–15, 12:21–26. For these claims, Petitioner relies on the same reasoning as for claim 1, including the reasoning for limitation 1.j. *See* Pet. 39–45, 47–49. Dependent claims 2, 3, 6–12, 16–18, 22, 24–26, 30–32, and 36 also inherit limitation 1.j or an equivalent limitation in independent claims 13, 21, 27, or 33. *See*

Ex. 1001, cols. 7–12. Thus, Petitioner’s showing in Ground 1 is unpersuasive as to each of these claims.

Also, as we discuss above, for limitation 1.g (and for analogous limitations in independent claims 13, 21, 27, and 33), we do not find Petitioner’s “nonmember” theory to be persuasive. *See supra* Part III.D.3(b). This theory is the only theory that Petitioner relies on for claims 9, 13, 16–18, 25, 27, 30–33, and 36. *See* Pet. 37, 40–41, 43–49; PO Resp. 21–22 & n.5. Thus, we do not find that Li anticipates claims 9, 16–18, 25, 30–33, and 36 for that additional reason.

Because Petitioner relies solely on Li’s teachings for its obviousness Ground 3 directed to these and other claims (*see* Pet. 55–63), we address Petitioner’s uncontested arguments regarding the other challenged dependent claims 2, 3, 6–8, 10–12, 22, 24, and 26 below.

Claim 2 depends from claim 1 and further recites “wherein the received downlink resource allocation indicates to the user equipment one or more downlink transmission parameters for the downlink transmission, and the one or more downlink transmission parameters comprise an MCS used for the downlink transmission.” Ex. 1001, 7:65–8:3. Petitioner contends that in one embodiment, Li discloses that the base station informs the subscriber about the appropriate modulation/coding rates, which a person of ordinary skill in the art would have understood includes downlink transmission parameters such as “modulation type, spread information, and coding rates.” Pet. 32 (citing Ex. 1006, 3:1–42, 6:21–27, 7:1–29; Ex. 1003 ¶ 189).

Claim 3 depends from claim 1 and further recites “wherein other user equipments are also allocated downlink resources within the plurality of downlink resources.” Ex. 1001, 8:4–6. Petitioner contends that Li discloses

allocating clusters to multiple subscribers as recited. Pet. 32–34 (citing Ex. 1006, 1:5–10, 1:54–2:5, 2:66–3:43, 3:1–3, 5:20–28, 5:37–45, 6:9–11, 6:21–25, 11:10–14, 11:18–23, Fig. 1B; Ex. 1003 ¶¶ 192–194).

Claim 6 depends from claim 1 and further recites “wherein the MCS that is determined based on the channel quality of the plurality of downlink resources is selected by the user equipment from a predefined set of available MCSs.” Ex. 1001, 8:15–18. Petitioner argues that Li discloses such a predefined set of available MCSs, as reflected in Li’s Table 1. Pet. 34–35 (citing Ex. 1006, 7:1–19, 7:59–63; Ex. 1003 ¶ 212).¹⁵

Claim 7 depends from claim 1 and further recites “wherein each of the plurality of downlink resources correspond to a sub-channel.” Ex. 1001, 8:19–20. Petitioner argues that Li “discloses that each cluster includes one or more subcarriers,” and that “clusters constitute a collection of one or more timeslots.” Pet. 35–36 (citing Ex. 1006, 1:26–29, 1:47–50, 2:29–30, 2:59–61, 3:7–15, 5:9–19, 5:37–45, 6:21–27, 7:30–8:47, 11:37–39, 15:9–67, Figs. 1B, 2A–C, 10; Ex. 1003 ¶¶ 220–225).

Claim 8 depends from claim 1 and further recites “wherein each downlink resource of the plurality of downlink resources corresponds to a timeslot.” Ex. 1001, 8:21–23. Petitioner relies on the same arguments as for claim 7, and further argues that “an allocated resource can be a cluster/frequency band consisting of one timeslot.” Pet. 36–37 (citing Ex. 1003 ¶¶ 217–234, 236–237).

¹⁵ In the obviousness context of Ground 2, Petitioner makes an alternative argument that relies on Li’s use of SINR indexes rather than SINR values. *See* Pet. 53–54. Because Petitioner no longer relies on this embodiment in Li, we do not need to address this argument. *See supra* Part III.D.3(a) and note 14.

Claim 10 depends from claim 1 and further recites “wherein the particular downlink resource is a subset of the plurality of downlink resources.” Ex. 1001, 8:31–33. Petitioner relies on its arguments for limitation 1.h and argues that Li’s second and subsequent reported SINR values are channel qualities of a subset of the plurality. Pet. 38 (citing Ex. 1006, 5:65–6:8; Ex. 1003 ¶¶ 243–244).

Claim 11 depends from claim 1 and further recites “wherein the measurement device is configured to perform the plurality of downlink measurements based on reference signals transmitted across the plurality of downlink resources.” Ex. 1001, 8:34–37. Petitioner relies on its arguments for 1.d and 1.e, and argues that the measurement device in Li’s subscriber unit performs its measurements based on pilot (reference) signals transmitted by the base station, which cover the entire OFDM frequency bandwidth. Pet. 38 (citing Ex. 1006, 5:26–57, 7:29–65, Fig. 2; Ex. 1003 ¶ 246).

Claim 12 depends from claim 11 and further recites “wherein the measurement device is configured to perform the plurality of downlink measurements assuming the reference signals were transmitted across the plurality of downlink resources at known or fixed power levels.” Ex. 1001, 8:38–42. Petitioner argues that Li’s pilot (reference) symbols “are transmitted at known or fixed power levels” and, “[o]therwise, the subscriber would have no way of determining the channel quality.” Pet. 39 (citing Ex. 1006, 5:26–30; Ex. 1012, 10:10–13; Ex. 1013, 5:48–52; Ex. 1003 ¶¶ 249–250).

Claims 22, 24, and 26 are analogous to claims 6, 7, and 2, respectively, and Petitioner relies on the same arguments. *See* Pet. 42.

InterDigital does not contest that Li discloses the added features introduced by dependent claims 2, 3, 6–8, 10–12, 22, 24, or 26. *See generally* PO Resp. 14–28 (addressing issues in common from all claims challenged under Ground 1). Having considered Petitioner’s argument and supporting evidence, we find that Petitioner has shown that Li discloses the added limitations of dependent claims 2, 3, 6–8, 10–12, 22, 24, and 26. Nevertheless, as we discuss above, we do not find that Li anticipates these claims because Petitioner has not shown that Li discloses limitation 1.j or equivalent limitations in the other independent claims, and Petitioner’s discussion regarding the dependent claims does not cure that defect. Likewise, we do not find that Li anticipates dependent claims 9, 16–18, 25, 30–33, and 36 because they rely solely on Petitioner’s “nonmember” theory, which we do not find persuasive in light of the construction of the term *a channel quality of the plurality of downlink resources*. *See supra* part III.D.3(b).

7. *Conclusion as to Ground 1*

Because Petitioner has not shown that Li explicitly or inherently discloses differential channel quality reporting, we find that a preponderance of the evidence does not support Petitioner’s contention that Li anticipates any of the challenged claims, and we do not find any of the claims unpatentable on that basis.

E. GROUND 2: OBVIOUSNESS OVER THE TEACHINGS OF LI

For its second ground, Petitioner contends that claims 1–18 and 21–36 of the ’449 patent are unpatentable under § 103(a) as obvious over the teachings of Li. Pet. 49–55.

A claim is unpatentable under § 103(a) for obviousness if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). A successful petition must “articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (citing *KSR*, 550 U.S. at 418); *see also* 35 U.S.C. § 322(a)(3); 37 C.F.R. §§ 42.22(a)(2), 42.104(b)(4) (2019). When a ground in a petition is based on a combination of references, we consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factual considerations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

Considering these factors,¹⁶ we do not find Petitioner’s arguments persuasive based on the full trial record, as explained below.

¹⁶ Neither party has submitted evidence of objective indicia of obviousness or non-obviousness relating to any of the grounds of the Petition, so our analysis does not consider any such indicia.

1. *Claims 1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, and 36*

For claims 1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, and 36, which were the subject of Ground 1, Petitioner bases this obviousness ground largely on its argument that Li anticipates these claims, and we discuss those arguments above. *See id.*; *supra* Part III.D. Beyond these anticipation arguments, Petitioner does not include any further argument that Li teaches limitation 1.j or the corresponding limitations in the other independent claims. *See* Pet. 49–55. Thus, Petitioner’s showing fails to persuade us that these claims would have been obvious over Li alone. *See In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) (“Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.”).

Thus, we determine that Petitioner has not shown, by a preponderance of the evidence, that any of claims 1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, or 36 are unpatentable as obvious over Li alone.

2. *Claims 4, 5, 14, 15, 23, 28, 29, 34, and 35*

Petitioner’s Ground 2 includes claims 4, 5, 14, 15, 23, 28, 29, 34, and 35, which are not included in Ground 1. Petitioner makes additional arguments regarding these claims, which we address below in the context of Ground 3. *See infra* Part III.F.4. However, those arguments are insufficient in Ground 2 because they do not address limitation 1.j or equivalent limitations in the other independent claims. Thus, we do not find persuasive Petitioner’s overall argument that claims 4, 5, 14, 15, 23, 28, 29, 34 would have been obvious over Li alone.

For the above reasons, Petitioner has not shown, by a preponderance of the evidence, that the challenged claims would have been obvious over Li alone, and we do not find any of the claims unpatentable on that basis.

F. GROUND 3: OBVIOUSNESS OVER THE TEACHINGS OF LI AND
TIEDEMANN

Petitioner contends that claims 1–18 and 21–36 are unpatentable under § 103(a) as obvious over the teachings of Li in view of Tiedemann. Pet. 5, 55–63. For this ground, Petitioner substantially relies on its argument that Li anticipates or renders obvious each limitation of these claims, and we have discussed those arguments above. *See* Pet. 16–55; *supra* Part III.D. To its previous argument, Petitioner adds arguments with respect to limitation 1.j and equivalent limitations in independent claims 13, 21, 27, and 33. *See* Pet. 55–63. Petitioner also includes arguments for dependent claims 4, 5, 14, 15, 23, 28, 29, 34, and 35. *See* Pet. 50–53, 63.

Based on the evidence of record, we determine that claims 1–8, 10–12, 21–24, and 26 of the ’449 patent are unpatentable as obvious over the combined teachings of Li and Tiedemann. We begin our analysis with a brief overview of Tiedemann, and then we address the parties’ contentions with respect to the combination of these two references.

1. *Overview of Tiedemann*

Tiedemann describes a system for adjusting forward traffic channel power allocation in a communications system. Ex. 1005, code (57). In Tiedemann’s system, a mobile device measures and reports signal qualities of pilot channels from a base station. *Id.* at 3:5–8. For example, the mobile device may report a signal-to-noise ratio such as the “ratio of the received

pilot energy per chip (E_c) to total received spectral density, noise and signals, denoted as E_c/I_o .” *Id.* at 8:50–60. In response to these channel quality reports from the mobile device, the base station adjusts the power levels of its code channels accordingly. *Id.* at 3:16–21. According to Tiedemann, this increases the efficiency and total capacity of the communication system. *Id.* at 3:27–34.

In one embodiment of Tiedemann’s system, the pilot signals are compared to a threshold signal, as shown below in Figure 5B:

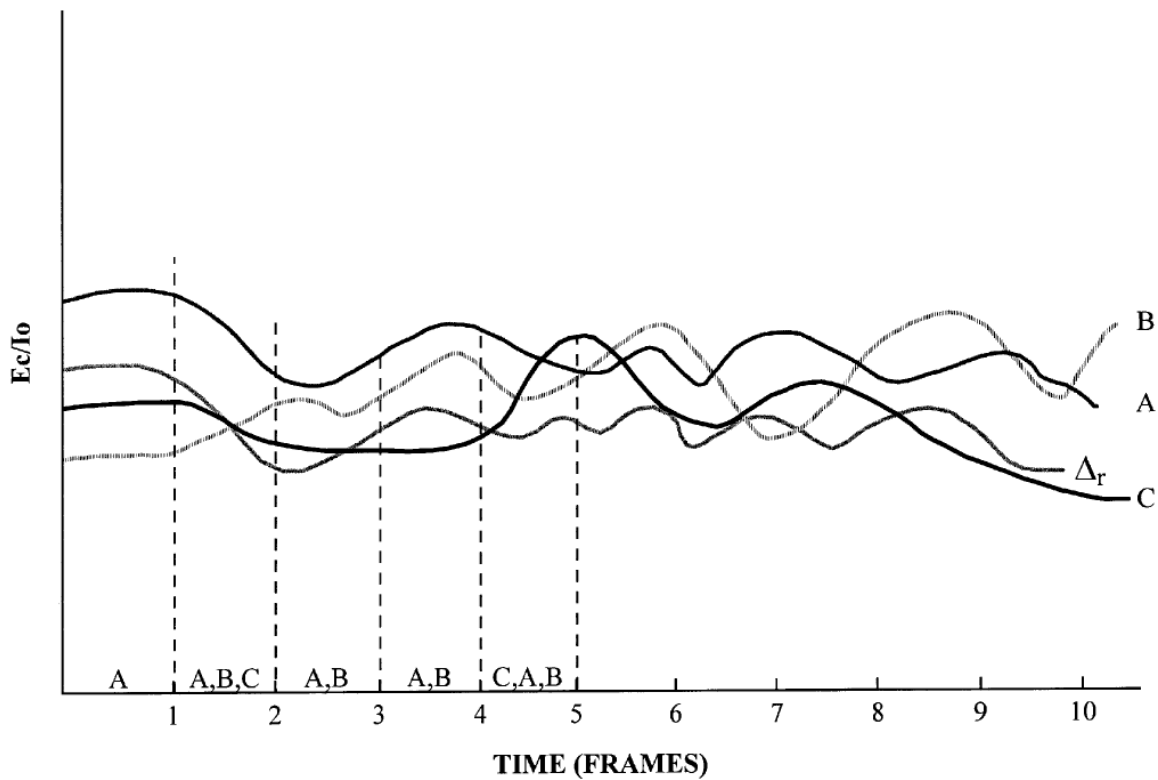


FIG. 5B

Figure 5B is a graph plotting signal-to-noise ratio E_c/I_o over time for pilots A, B, and C. Ex. 1005, 3:56–60, 10:64–18. The plot also includes threshold level Δ_r , which is a fixed, calculated distance beneath the strongest signal-to-noise ratio among pilots A, B, and C. *Id.* at 11:18–22.

Figure 6A, reproduced below, shows an example channel quality report sent from the mobile device to the base station:

I ₁	I ₂	I ₃	U ¹	U ²	U ³	U ⁴	U ⁵	U ⁶	H ^m
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FIG. 6A

Ex. 1005, 13:5–7. Figure 6A shows a 10-bit vector message that reports “which of the pilots in the mobile [device]’s active set have signal qualities at or above a given standard (e.g., the Δ_r threshold signal in FIG. 5B).” *Id.* at 13:9–12. Tiedemann teaches that this format is “desirable” because it is “a short message.” *Id.* at 13:14. In the message, I₁, I₂, and I₃ represent three bits identifying “the pilot signal having the best quality (i.e., highest signal to interference ratio) as judged by the process described in reference to FIG. 5B.” *Id.* at 13:22–25. Each of bits U¹–U⁶ indicates whether one of six corresponding pilot channels is “above the Δ_r threshold signal.” *Id.* at 13:34–37. For example, the bit is set to 1 if the pilot channel corresponding to that bit position is equal to or above the Δ_r threshold signal. *Id.* at 13:37–41.¹⁷

Tiedemann also discloses alternative embodiments for reporting channel quality. One example is to send a message that contains three bits uniquely identifying the strongest pilot channels, or all the pilot channels. *See* Ex. 1005, 15:57–67, 16:4–7, Fig. 6C. Another alternative is to add an additional bit to the threshold Δ_r “to indicate the relative strength of the pilots in finer quantization levels, rather than merely above and below the threshold Δ_r .” *Id.* at 15:67–16:4; *see also id.* at 11:22–26 (stating that

¹⁷ The H^m bit identifies a handoff direction message, and is not pertinent to our decision. *See* Ex. 1005, 13:50–65.

threshold Δ_r could comprise multiple numbers “such that gradations of Δ are used to resolve more finely the relative signal qualities of the pilots”). A final alternative is “sending the E_c/I_o of the largest pilot in the active set and then relative E_c/I_o values relative to the largest pilot.” *Id.* at 16:7–10.

2. *Combination of Li and Tiedemann*

Petitioner argues that “it would have been obvious to combine [the differential channel quality report of limitation 1.j] with Li’s subscriber unit in view [of] Tiedemann’s technique of employing differential channel qualities.” Pet. 56 (citing Ex. 1003 ¶ 156).¹⁸ According to Petitioner, Tiedemann teaches “sending the E_c/I_o of the largest pilot in the active set and then relative E_c/I_o values relative to the largest pilot.” Pet. 56 (emphasis omitted) (quoting Ex. 1005, 16:7–10). According to Petitioner, the E_c/I_o of the largest pilot, as the “first channel quality indication,” would be “a channel quality of the plurality of downlink resources” because it “identifies a channel quality characteristic of the whole, *i.e.*, the maximum or best quality of a group.” *Id.* Petitioner also argues that the subsequent *relative* E_c/I_o values would each be a “second channel quality indication,” and that a person of ordinary skill in the art would have recognized them as indicating

¹⁸ Petitioner also makes an alternative argument to this one. *See* Pet. 56. In the second argument, Petitioner replaces Li’s second and subsequent SINR values with Tiedemann’s indications U^1 – U^6 as shown in Tiedemann’s Figure 6A (reproduced in Part III.F.1), which would be the new second channel quality indications. Pet. 59–62. The parties refer to this as the “threshold values” theory. *See* Pet. 59; PO Resp. 45. Because we find Petitioner’s first argument persuasive, we need not address the alternative argument.

a numerical difference from the largest pilot channel quality value. Pet. 56–57 (citing Ex. 1008,¹⁹ 1:65–2:7, 3:7–35; Ex. 1009, 5:7–12; Ex. 1003 ¶ 158).

Petitioner argues that combining Tiedemann’s differential channel quality technique with Li “would have been only the arrangement of old elements . . . with each performing the same function it had been known to perform . . . and yielding no more than one would expect from such an arrangement.” Pet. 58. Petitioner also contends that a person of ordinary skill would have been motivated to make this combination based on the understanding that “transmitting multiple values as a single value along with relative values reduces the number of bits required to encode the transmitted information.” *Id.* (citing Ex. 1008, 1:65–2:7). Thus, according to Petitioner, the ordinarily skilled artisan would have been motivated to make the combination to improve the system’s speed, efficiency, and latency. *See* Pet. 58–59 (citing Ex. 1009, 5:18–30, 39–43, 6:11–13; Ex. 1003 ¶ 164).

Finally, Petitioner contends that a skilled artisan would have understood that differential indicators were applicable in wireless systems, such as Li’s, that use “fast link adaptation techniques that require the receiver to constantly feedback the latest channel state to the transmitter.” Pet. 59 (quoting Ex. 1009, 6:1–4) (citing Ex. 1005, 3:5–10; Ex. 1006, 3:7–15; Ex. 1003 ¶¶ 165–166).

InterDigital makes two pertinent arguments in response,²⁰ and also addresses Petitioner’s alleged motivation to combine Li with Tiedemann.

¹⁹ Tuutijarvi et al., US 5,774,809, issued June 30, 1998 (Ex. 1008).

²⁰ InterDigital also makes a third argument directed to the combination of Li’s index-reporting embodiment with Tiedemann’s relative E_c/I_o values. PO Resp. 44–45. Petitioner does not respond to this argument in its Reply. *See* Pet. Reply 14–17. Because Petitioner appears to have abandoned this

First, InterDigital argues that, although Tiedemann refers to reporting the second and subsequent channel qualities as “relative E_c/I_o values,” there is evidence that these values are only “relative” because of their ordering, similar to the SINR values in Li. *See* PO Resp. 39–41. InterDigital contends that Petitioner has not adequately explained, and never truly argued, why these values are numerical differences. *See id.*; *see also* PO Sur-reply 17–19.

In response, Petitioner argues that, as it presented its “relative values” combination in the Petition, “the channel quality report would report Li’s SINR value of the cluster with the largest SINR and Tiedemann’s relative values to the largest SINR.” Pet. Reply 14 (citing Pet. 57). Petitioner disagrees that this combination only reports relative order and not numerical differences, and points to Dr. Acampora’s testimony that a person of ordinary skill in the art would have understood Tiedemann’s disclosure of sending relative values for the second and subsequent E_c/I_o values “to mean that the relative values are comparative/differential values between the absolute E_c/I_o value of the largest pilot and the absolute E_c/I_o value of the respective resource for each one of the plurality.” *Id.* at 15 (citing Ex. 1003 ¶ 158). Petitioner also points to its evidentiary references, including Lundby and Tuutijarvi, that use the term “relative value” to refer to a numerical difference between channel quality values. *Id.* at 15–16 (citing Ex. 1008, 3:7–10; Ex. 1009, 5:8–10; Ex. 1020, 14:7–9).

Petitioner also argues that Tiedemann’s reference to “relative E_c/I_o values” suggests a numerical difference in light of Tiedemann’s overall disclosure because in the same paragraph, Tiedemann also discloses adding

argument, we do not need to address it. *See supra* Part III.D.3(a) and note 14.

“an additional bit to the message to indicate the relative strength of the pilots in finer quantization levels, rather than merely above and below the threshold Δ_r .” Pet. Reply 16 (quoting Ex. 1005, 15:67–16:4).

Based on the evidence of record, Petitioner has shown that a person of ordinary skill in the art would have understood Tiedemann’s reference to “relative E_c/I_o values relative to the largest pilot,” in light of Tiedemann’s disclosure as a whole, to refer to a numerical comparison between the values, and we credit Dr. Acampora’s supporting testimony (Ex. 1003 ¶ 158 (citing Ex. 1008, 1:65–2:7, 3:7–11, 3:26–35; Ex. 1009, 5:7–12)) over that of Dr. Mahon (Ex. 2001 ¶¶ 91–93), which does not substantially engage with Dr. Acampora’s discussion of how the term “relative” was used in Tuutijarvi (Ex. 1008) and Lundby (Ex. 1009).

Second, InterDigital argues that Petitioner fails to meet its burden of showing that Tiedemann’s relative values indicate an MCS to the base station, as required by the claims. PO Resp. 41–43; *see, e.g.*, Ex. 1001, 7:54. According to InterDigital, Petitioner’s Li–Tiedemann combination replaces Li’s SINR values with Tiedemann’s relative E_c/I_o values, and Petitioner has not explained why Tiedemann’s values would indicate an MCS. PO Resp. 41–42 (citing Ex. 2001 ¶ 94). InterDigital also argues that reporting an SINR difference “would introduce errors, inconsistency, and uncertainty” and work against Petitioner’s stated motivation for combining Li with Tiedemann to reduce the number of required bits to convey the information. *Id.* at 43 (citing Pet. 58; Ex. 2001 ¶ 95); *see also* PO Sur-reply 19–20.

We disagree that Petitioner has failed to meet its burden of showing that the relative values in the proposed Li–Tiedemann combination would indicate an MCS. This combination merely replaces Li’s second and

subsequent absolute SINR values with a relative numerical value that is simply a difference between an absolute SINR and the best-performance SINR. *See* Pet. 56–57 (the differential value in the combination is “an indication that such a value differs from that of the largest pilot by some numerical amount”). As it is a numerical difference from a known SINR, it still indicates a specific SINR value to the base station, and does not undermine Petitioner’s rationale for how, in Li, an SINR conveys an MCS to the base station, as we discuss above in Part III.D.3(a).

We also disagree with InterDigital’s argument that relative reporting would introduce errors, inconsistency, and uncertainty. InterDigital’s only support for this allegation is in the context of Petitioner’s alternative argument relying not on reporting relative values, but on “threshold values,” an argument we do not reach in this decision. *See* PO Resp. 43 (referring to pages 45–48 of its Response, which relate to the “threshold values” theory); *supra* note 18. But even if we were to assume that using relative SINR values in the Li–Tiedemann combination would potentially introduce more errors, inconsistency, or uncertainty, this would not outweigh Petitioner’s stated motivations for modifying Li’s system with Tiedemann’s relative channel quality values. *See Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) (“The fact that the motivating benefit comes at the expense of another benefit . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.”).

Finally, InterDigital questions Petitioner’s proposed motivation to combine Li with Tiedemann in general, and in particular Petitioner’s reliance on Tuutijarvi and Lundby as evidentiary references supporting a motivation

to combine. *See* PO Resp. 48–51. InterDigital acknowledges that, in our Institution Decision, we agreed with InterDigital that a passage in Tuutijarvi does not suggest that reducing the number of bits is a specific advantage of relative reporting, although we noted that Tuutijarvi teaches other advantages of relative reporting “such as increased accuracy, minimization of inconsistent signals, and maintaining a linear amplifier range.” Inst. Dec. 34 (citing Ex. 1008, 1:65–2:7). InterDigital contends that it does not have to engage with these cited benefits in Tuutijarvi because Petitioner did not raise them in the Petition. *See* PO Resp. 49. But in any event, InterDigital contends that the alleged benefit of reducing the number of bits presumes “the false assumption that a ‘relative’ value is necessarily smaller than Li’s full SINR value.” *Id.* at 50 (citing Ex. 2001 ¶ 109).

In its Reply, Petitioner provides no further evidence from Tuutijarvi itself that a person of ordinary skill in the art would have recognized a benefit specifically from using fewer bits. *See* Pet. Reply 19. But Petitioner is still persuasive on this point, in part because of its reliance on Lundby. *See id.* (citing Ex. 1009, 5:18–30). Lundby teaches that there are benefits to using a “differential indicator” that uses a smaller number of bits. Ex. 1009, 5:18–30. We credit Dr. Acampora’s testimony, based on Lundby’s teachings, that the benefit of reducing the number transmitted bits was known in the art at the time of the alleged invention. *See* Ex. 1003 ¶¶ 163–164, 208.

InterDigital also contends that Petitioner’s reliance on Lundby is “ill-founded” because Petitioner has not adequately explained why a person of ordinary skill in the art “would have expected Lundby’s approach to work in the context of Li.” PO Resp. 50. Although this is a pertinent argument for Petitioner’s Ground 4, which cites Lundby as prior art, Petitioner’s reliance

on Lundby in Ground 3 is of an evidentiary nature supporting Petitioner's asserted motivation to combine, and Petitioner does not in this ground propose modifying Li based on the teachings of Lundby. *See* Pet. 58.

Having considered the evidence of record as a whole, and the arguments on both sides, we determine that Petitioner has shown, by a preponderance of the evidence, that the combination of Li and Tiedemann teaches all the limitations of independent claims 1 and 21, and that a skilled artisan would have had a reason to modify Li's system, based on the teachings of Tiedemann, in which the user equipment reports a channel quality indication of the best-performance SINR followed by "relative" channel qualities for particular downlink resource(s). Petitioner has proven, by a preponderance of the evidence, that independent claims 1 and 21 would have been obvious over the combination of Li and Tiedemann, but has not met its burden with respect to independent claims 13, 27, and 33 because Petitioner relies on the "nonmember" theory discussed above. *See supra* Part III.D.3(b).

3. *Dependent Claims 2, 3, 6–12, 16–18, 22, 24–26, 30–32, and 36*

Petitioner challenges dependent claims 2, 3, 6–12, 16–18, 22, 24–26, 30–32, and 36 as part of Ground 3. But Petitioner relies on Li for disclosing or teaching these additional limitations, and discusses these claims in the context of Ground 1, which we address above. *See supra* Part III.D.6. For claims 2, 3, 6–8, 10–12, 22, 24, and 26, we find Petitioner's arguments persuasive. *See* Pet. 32–39, 41, 43, 45–47, 49, 53–54; *supra* Part III.D.6. InterDigital does not specifically contest Petitioner's arguments for these claims in the context of Ground 3. Dependent claims 9, 16–18, 25, 26, 30–

32, and 36 rely on Petitioner’s “nonmember” theory for the first channel quality indication, and Petitioner’s arguments in Ground 3 do not cure this deficiency. *See supra* Part III.D.3(b). Thus, we do not find Petitioner’s arguments in Ground 3 persuasive as to claims 9, 16–18, 25, 26, 30–32, and 36.

4. *Dependent Claims 4, 5, 14, 15, 23, 28, 29, 34, and 35*

Claim 4 depends from claim 1 and further recites “wherein in the at least one channel quality report the second channel quality indication is reported using fewer bits than are used for reporting the first channel quality indication.” Ex. 1001, 8:7–10. Claim 5 depends from claim 4 and further recites “wherein in the at least one channel quality report the first channel quality indication is reported using 4 bits and the second channel quality indication is reported using 2 bits.” Ex. 1001, 8:11–14. Claim 23, which depends from claim 21, is analogous to claim 5.

Petitioner relies in part on Lundby as an evidentiary reference. Pet. 50–51. Lundby discloses a method and apparatus for providing link quality feedback to a transmitter using “differential indicators,” between quality messages, which “track the quality of the link.” Ex. 1009, code (57). According to Lundby, “the differential indicator is an indication of relative changes in the quality of the [forward link] pilot channel, which is sent much more frequently” than the more detailed link quality message. *Id.* at 5:8–10. “To determine the differential indicator, a comparison is made of successive [carrier-to-interference] measurements of the [forward link] pilot signal. The result of the comparison is transmitted as a bit or bits indicating the direction of the change.” *Id.* at 5:10–14. If the differential indicators use multiple bits, they can also “identify the . . . amount of change.” *Id.* at 5:34–37.

Based on Lundby's disclosure, Petitioner argues that "[i]n the 2001 time frame, it was known that the use of differential indicators 'provides a fast, efficient, low latency feedback method' by eliminating the need to send the entire channel quality." Pet. 50 (quoting Ex. 1009, 5:18–30). Petitioner argues that, "[s]ince this differential message is much smaller than the full [carrier-to-interference] message, not only does it take less time to encode, to transmit, and to decode, but it also takes up less energy on the reverse link," which improves performance. Pet. 50–51 (alteration in original) (quoting Ex. 1009, 5:39–43) (citing Ex. 1005, 13:22–37; Ex. 1009, 6:11–13; Ex. 1003 ¶¶ 197, 200–201).

Petitioner also cites Tiedemann as suggesting a specific example in which the first channel quality indication has three bits and the second channel quality indications each have one bit. Pet. 51–52 (citing Ex. 1005, 13:22–41, 15:65–16:3, 21:46–49; Ex. 1003 ¶¶ 203–204). According to Petitioner, Lundby also discloses that "each differential indicator is *at least one bit*." Pet. 52 (quoting Ex. 1005, 13:17–18) (citing Ex. 1005, 5:27–39). Petitioner argues that this "expressly suggests that such an indicator can be any number of bits greater than one, a set that obviously begins with two," thus a person of ordinary skill in the art would have been motivated "to employ an encoding scheme having different numbers of bits, such as required by these claims." *Id.* (citing Ex. 1003 ¶ 205).

Petitioner also relies on Tiedemann to suggest a motivation for using slightly more bits to encode the reported information than Tiedemann's specific embodiment (e.g., four and two bits rather than three and one bits), because according to Tiedemann, adding more bits "would have permitted finer quantization levels, and therefore more useful reporting with only a

minimal additional use of bandwidth.” Pet. 52 (citing Ex. 1003 ¶¶ 206–207). Petitioner contends that selecting four and two bits, in particular, would have been a design choice because “[t]here was a known need to limit the number of bits used to encode channel quality information reported to the system,” and “as a practical matter, a relatively small number of bit combinations to do so.” Pet. 52–53 (citing Ex. 1009, 1:24–29; Ex. 1003 ¶ 208). And according to Petitioner, “using different numbers of bits to encode information was clearly known and produces no unpredictable results, so [it] is therefore obvious.” Pet. 53 (citing Ex. 1003 ¶¶ 203–210).

First, InterDigital argues that “Petitioners’ argument is founded on the false premise that Li discloses reporting using differential indications.” PO Resp. 30–31 (citing Ex. 2001 ¶¶ 74–76); *see also id.* at 31–32; PO Sur-reply 13–14. We agree, to the extent that Petitioner is relying solely on Li in Ground 2. *See supra* Part III.E.2. But here in Ground 3, Petitioner relies on Tiedemann, not Li, for differential reporting. *See supra* Part III.F.2.

Next, regarding the specific selection of four and two bits in claim 5, InterDigital argues that in Tiedemann, the three-bit embodiment for the first channel quality is an index that merely identifies a pilot from a set of six, and Petitioner has not explained why a person of ordinary skill in the art “would have viewed the number of bits to report an index as pertinent to the number of bits used to report Li’s SINR value.” PO Resp. 31–32 (citing Ex. 1005, 13:19–33; Ex. 2001 ¶ 80). InterDigital also argues that “Tiedeman’s use of an extra bit to provide finer quantization applies to Tiedemann’s one-bit threshold value, not Tiedemann’s three-bit index.” *Id.* at 33 (citing Ex. 1005, 15:65–16:4; Ex. 2001 ¶ 82).

In its Reply, Petitioner contends that Tiedemann's disclosure of using three bits "is not limited to transmitting the index of the pilot with the best channel quality," and that a person of ordinary skill in the art would have understood that this teaching could also apply to "adding one bit to Li's SINR value of the best cluster." Pet. Reply 13 (citing Pet. 51–52; Ex. 1003 ¶¶ 203–204).

We find Petitioner's argument persuasive. Based on the evidence, we agree that there are only a limited number of bits that can be selected, and that selecting a width of four bits for the first channel quality indication would have been within the level of ordinary skill in the art. We also agree that it would have been a matter of merely selecting a numerical precision that reflects the known and conventional tradeoff between (1) requiring enough bits to accurately encode the data (i.e., the first channel quality indication) with enough precision to be useful to the base station, and (2) minimizing, for the sake of efficiency, the amount of data that needs to be transmitted. *See* Pet. 52–53; Ex. 1003 ¶ 208.

As to the selection of two bits for the differential channel qualities, we agree with Petitioner that Tiedemann (1) discloses the use of a single bit for its differential channel quality indication and (2) suggests adding more bits to permit finer quantization levels. *See* Pet. 52 (citing Ex. 1003 ¶¶ 206–207). Thus, Tiedemann strongly suggests the use of two bits, which only adds a single additional bit to Tiedemann's single-bit threshold indicators.

Thus, we find Petitioner's arguments persuasive that claims 4, 5, and 23 would have been obvious over the combination of Li and Tiedemann. Claims 14, 15, 28, 29, 34, and 35 depend from claims 13, 27, or 33 and thus rely on Petitioner's "nonmember" theory as to the first channel quality

indication, which the above arguments do not cure. *See supra* Part III.D.3(b). Thus, we do not find Petitioner’s arguments persuasive as to claims 14, 15, 28, 29, 34, or 35.

5. *Conclusion as to Ground 3*

For the above reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–8, 10–12, 21–24, and 26 are unpatentable as obvious over Li in view of Tiedemann, but has not shown that claims 9, 13–18, 25, or 27–36 are unpatentable on this ground.

G. GROUND 4: OBVIOUSNESS OVER THE TEACHINGS OF LI AND LUNDBY

Petitioner contends that claims 1–18 and 21–36 are unpatentable under § 103(a) as obvious over Li in view of the teachings of Lundby. Pet. 5, 63–69.

Because we determine that Petitioner has shown that challenged claims 1–8, 10–12, 21–24, and 26 are unpatentable over the combination of Li and Tiedemann (Ground 3), we need not reach this ground as to these claims. *See supra* Part III.F. *See Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding that once a dispositive issue is decided, there is no need to decide other potentially dispositive issues); *Boston Scientific Scimed, Inc. v. Cook Group Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (“[T]he Board need not address issues that are not necessary to the resolution of the proceeding.”). With respect to claims 9, 13–18, 25, and 27–36, Petitioner relies on its “nonmember” theory discussed above, and thus has not shown by a preponderance of the evidence that the claims are unpatentable over Li and Lundby. *See supra* Part III.D.3(b).

H. GROUND 5–7: OBVIOUSNESS OVER THE TEACHINGS OF LI, LI
AND TIEDEMANN, OR LI AND LUNDBY IN VIEW OF ETSI1997

For dependent claims 7, 8, 24, 31, and 32, Petitioner presents alternative grounds that apply the teachings of ETSI1997 to the preceding combinations addressed in Grounds 2–4. *See* Pet. 70–74.

ETSI1997 is a technical report prepared as part of evaluation work towards defining the Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (UTRA), within the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI). Ex. 1007, 4–5.

Claim 7 depends from claim 1 and further recites “wherein each of the plurality of downlink resources correspond to a sub-channel.” Ex. 1001, 8:19–20. Claim 8 also depends from claim 1 and further recites “wherein each downlink resource of the plurality of downlink resources corresponds to a timeslot.” *Id.* at 8:21–23. Claims 24 and 31 recite similar limitations. *Id.* at 10:40–42. Claim 32 depends from claim 31 and further recites “wherein the plurality of downlink resources correspond to a first sub-channel, and the first sub-channel corresponds to a reference resource.” *Id.* at 11:33–36.

Petitioner cites ETSI1997 for its teaching “that physical channel resources are allocated in terms of frequency bands, called ‘band slots,’ and timeslots.” Pet. 70–71 (citing Ex. 1007, 198). According to Petitioner, “[t]he band slots each consist of 24 subcarriers.” *Id.* (citing Ex. 1007, 199; Ex 1003 ¶ 227). Petitioner contends that a person of ordinary skill in the art would have been motivated to use sub-channels or timeslots in Li’s system “because it provided system flexibility in allocating resources,” which

“increased the efficiency of the system by permitting the system a way to avoid over or under allocating.” Pet. 73–74 (citing Ex. 1003 ¶ 233–234).

InterDigital contends that Grounds 5–7 fail because Petitioner “do[es] not address any of the deficiencies of the previous grounds,” and “add[s] no new arguments with respect to any . . . claims” other than 7, 8, 24, 31, and 32. PO Resp. 61. Thus, InterDigital does not distinctly challenge Petitioner’s arguments regarding ETSI1997.

We agree with InterDigital that Petitioner’s arguments involving ETSI1997 do not remedy the deficiencies in Grounds 1 and 2, which rely solely on Li. But as to Ground 3, which additionally relies on the teachings of Tiedemann, we find Petitioner’s uncontested arguments persuasive that ETSI1997 teaches that each of the plurality of downlink resources may correspond to a sub-channel, and that a person of ordinary skill in the art would have been motivated to incorporate sub-channels in Li’s system to provide flexibility and efficiency, particularly in light of Li’s own similar teachings. *See* Pet. 35–36, 70–74.

Thus, we determine that Petitioner has not shown that any claims are unpatentable as obvious over Li in view of only ETSI1997 (Ground 5). We also determine that Petitioner has shown, by a preponderance of the evidence, that claims 7, 8, and 24 are unpatentable as obvious over the combined teachings of Li, Tiedemann, and ETSI1997 (Ground 6). Because claims 31 and 32 depend from claim 27 and thus rely on Petitioner’s “nonmember” theory, we determine that Petitioner has not shown these two claims to be unpatentable under Ground 6 for the reasons discussed above. *See supra* Part III.D.3(b). Because the combination of Li, Lundby, and ETSI1997 (Ground 7) is an alternative ground addressing the same claims as

Ground 6, we need not reach that combination as to claims 7, 8, and 24, but conclude that Petitioner has not shown by a preponderance of the evidence that claims 31 and 32 are unpatentable because Petitioner relies on the “nonmember” theory discussed above. *See supra* Part III.D.3(b).

IV. CONCLUSION²¹

For the reasons above, Petitioner has shown by a preponderance of the evidence that claims 1–8, 10–12, 21–24, and 26 of the ’449 patent are unpatentable under § 103(a) as obvious over Li in view of Tiedmann, with or without ETSI1997 (Grounds 3 and 6). Petitioner has not shown that claims 9, 13–18, 25, or 27–36 are unpatentable.

V. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1–8, 10–12, 21–24, and 26 of the ’449 patent are unpatentable;

FURTHER ORDERED that claims 9, 13–18, 25, and 27–36 of the ’449 patent have not been shown to be unpatentable; and

²¹ Should InterDigital wish to pursue amendment of claims in a reissue or reexamination proceeding after this decision, we draw InterDigital’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If InterDigital chooses to file a reissue application or a request for reexamination of the challenged patent, we remind InterDigital of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2) (2020).

FURTHER ORDERED that parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, 36	102(e)	Li		1–3, 6–13, 16–18, 21, 22, 24–27, 30–33, 36
1–18, 21–36	103(a)	Li		1–18, 21–36
1–18, 21–36	103(a)	Li, Tiedemann	1–8, 10–12, 21–24, 26	9, 13–18, 25, 27–36
1–18, 21–36	103(a) ²²	Li, Lundby		9, 13–18, 25, 27–36
7, 8, 24, 31, 32	103(a)	Li, ETSI1997		7, 8, 24, 31, 32
7, 8, 24, 31, 32	103(a)	Li, Tiedemann, ETSI1997	7, 8, 24	31, 32
7, 8, 24, 31, 32	103(a) ²²	Li, Lundby, ETSI1997		31, 32
Overall Outcome			1–8, 10–12, 21–24, 26	9, 13–18, 25, 27–36

²² We do not reach these grounds (Grounds 4 and 7) as to the claims found unpatentable based on other grounds. *See supra* Parts III.F–H.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LENOVO HOLDING COMPANY, INC.,
LENOVO (UNITED STATES) INC., and MOTOROLA MOBILITY LLC,
Petitioner,

v.

INTERDIGITAL TECHNOLOGY CORPORATION,
Patent Owner.

IPR2020-01494
Patent 9,456,449 B2

Before JUSTIN T. ARBES, CHRISTOPHER L. OGDEN, and
JOHN R. KENNY, *Administrative Patent Judges*.

KENNY, *Administrative Patent Judge*, dissenting in part.

I join in all portions of the majority’s decision (“Decision,” “Dec.”) except the findings in Section III.D.3.(b), Section III.D.6, Sections III.F.2–4, and Sections III.G–H regarding Petitioner’s alternate “nonmember” mapping, from which I respectfully dissent. Figure 5 of Li, reproduced below, shows an embodiment in which three or more SINRs (signal-to-interference plus noise ratios) are sent to a base station (Ex. 1006, 3:10, 10:49–58):

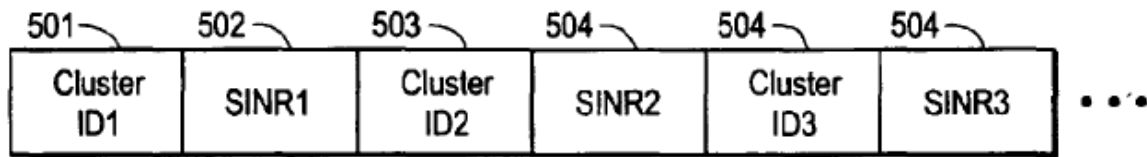


FIG. 5

Figure 5 “illustrates one embodiment of a format for arbitrary cluster feedback.” Ex. 1006, 2:36–37.

In Petitioner’s alternate mapping, Petitioner maps the “first channel quality indication,” recited by limitation 1.g¹ of claim 1 of the ’449 patent, to SINR1 (the best (largest) SINR). Pet. 26. Li discloses ordering SINR values from largest to smallest. Ex. 1006, 7:49–51 (“The estimated SINR values may be ordered from largest to smallest.”). Petitioner maps “the plurality of downlink resources,” recited in limitation 1.g, to the other reported SINRs (i.e., SINR2, SINR3, and any additional SINRs that are represented by the ellipses (collectively, “the other reported SINRs”)). Pet. 19, 26.

The Decision determines that Petitioner has not shown that the largest SINR (SINR1) is a channel quality for the plurality of downlink resources in Figure 5 (i.e., the other reported SINRs). *See* Dec. § III.D.3.(b). I disagree. The Decision construes the term “*a channel quality of the plurality of downlink resources*” in limitation 1.g to be “a channel quality value related to the ‘plurality of downlink resources’ as a whole.” *See* Dec. § III.B.2. SINR1 is a channel quality related to the other reported SINRs (the plurality of downlink resources) as a whole. In particular, as Petitioner explains,

¹ “determine a first channel quality indication, wherein the first channel quality indication is used to indicate to the base station a modulation and coding set (MCS) that has been determined based on a channel quality of the plurality of downlink resources.” Ex. 1001, 7:46–51.

SINR1 is the best channel quality for the clusters being measured and reported on. Pet. 26; Reply Br. 6–8; Ex. 1006, 5:53–57; Ex. 1003 ¶¶ 134, 154. Further, as Petitioner explains, SINR1 is compared to all of the other measured SINRs and determined to be better (larger) than all of the other measured and reported SINRs. Pet. 26; Reply Br. 6–8; Ex. 1006, 5:53–55; Ex. 1003 ¶¶ 134, 154. As such, SINR1 bounds the other reported SINRs. Pet. 26; Reply Br. 6–8; Ex. 1006, 5:53–57; Ex. 1003 ¶¶ 134, 154. To me, these facts establish that SINR1 is related to the other reported SINRs as a whole.

Although SINR1 in Petitioner’s alternate mapping is not the same as the examples provided in alternatives 8 and 9 of the ’449 patent, “*a channel quality of the plurality of downlink resources*” under the Decision’s construction is not limited to the specific examples disclosed in those alternatives. Ex. 1001, 6:10–15, 6:53–7:2; *see* Dec. § III.D.3. Thus, I would find, with Petitioner’s alternative mapping, that SINR1 is a “channel quality of the plurality of downlink resources.”

The Decision’s findings regarding Petitioner’s alternate mapping are dispositive for claims 9, 13–18, 25, and 27–36 under Ground 3 (obviousness over Li and Tiedemann) and for claims 31 and 32 under Ground 6 (obviousness over Li, Tiedemann, and ETSI1997). *See* Dec. §§ III.F.3–5, § III.H; Pet. 5. Thus, I would reach different conclusions from the Decision for those claims and grounds (i.e., I would hold claims 9, 13–18, 25, and 27–36 unpatentable under Ground 3 and claims 31 and 32 unpatentable under Ground 6).²

² With such a holding, Grounds 4 and 7 would be moot. Pet. 5; Dec. § V.

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Patent 9,456,449 B2

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