Paper No. ___
Filed: March 30, 2022

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,
Petitioners,

v.

INTERDIGITAL TECHNOLOGY CORPORATION,
Patent Owner.

Case IPR2020-01413
Patent No. 8,199,726

PATENT OWNER'S NOTICE OF APPEAL

Pursuant to 37 C.F.R. § 90.2(a) and 35 U.S.C. §§ 141(c), 142, and 319, InterDigital Technology Corporation ("Patent Owner") respectfully gives notice that it appeals to the United States Court of Appeals for the Federal Circuit from the Patent Trial and Appeal Board's Final Written Decision entered on January 26, 2022 (Paper 28), and from all other underlying orders, decisions, rulings, and opinions.

For the limited purpose of providing the Director of the United States Patent and Trademark Office with the information specified in 37 C.F.R. § 90.2(a)(3)(ii), the issues on appeal include the Board's determination that claims 1-10 and 14-18 of U.S. Patent No 8,199,726 B2 were shown to be unpatentable in view of the grounds of unpatentability on which trial was instituted (Paper 8). The issues on appeal also include any finding or determination supporting or related to these issues, as well as all other issues decided adversely to Patent Owner in any order, decision, ruling, or opinion.

Simultaneous with this filing and in accordance with 37 C.F.R. § 90.2(a)(1), this Notice of Appeal is being filed with the Director and served on Petitioners in accordance with 37 C.F.R. § 42.6(e). This Notice of Appeal, along with the required fees, is also being filed with the Clerk's Office for the United States Court of Appeals for the Federal Circuit in accordance with Fed. Cir. R. 15(a)(1).

Respectfully Submitted,

Dated: March 30, 2022

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CERTIFICATES OF FILING AND SERVICE

I hereby certify that, in addition to being filed electronically through the Patent Trial and Appeal Board's End to End system, the foregoing Notice of Appeal was filed by Express Mail on this 30th day of March, 2022, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the U.S. Patent and Trademark Office
c/o Office of the General Counsel
P.O. Box 1450
Alexandria, Virginia 22313-1450

I hereby certify that a true and correct copy of the foregoing Notice of Appeal was filed electronically by CM/ECF on this 30th day of March, 2022, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit.

Pursuant to 37 C.F.R. § 42.6(e), I certify that I caused to be served a true and correct copy of the foregoing Notice of Appeal on the Petitioners at the electronic service addresses of the Petitioners as follows:

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Paper 28
Date: January 26, 2022

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.

IPR2020-01413
Patent 8,199,726 B2

Before SALLY C. MEDLEY, MIRIAM L. QUINN, and KRISTI L. R. SAWERT, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

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

I. INTRODUCTION

Lenovo Holding Company, Inc., Lenovo (United States) Inc., and Motorola Mobility LLC (collectively "Petitioner") filed a Petition for *inter partes* review of claims 1–10 and 14–18 of U.S. Patent No. 8,199,726 B2 (Ex. 1001, "the '726 patent"). Paper 1 ("Pet."). InterDigital Technology Corporation ("Patent Owner") filed a Preliminary Response. Paper 7. Upon consideration of the Petition and Preliminary Response, we instituted *inter partes* review, pursuant to 35 U.S.C. § 314, as to claims 1–10 and 14–18 based on the challenges set forth in the Petition. Paper 8 ("Decision to Institute" or "Dec.").

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 15, "PO Resp."), Petitioner filed a Reply to Patent Owner's Response (Paper 17, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 20, "Sur-reply"). On November 3, 2021, we held an oral hearing. A transcript of the hearing is of record. Paper 27 ("Tr.").

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that claims 1–10 and 14–18 of the '726 patent are unpatentable.

A. Related Matters

The parties indicate that the '726 patent is or has been the subject of, or relates to, the following proceeding: *InterDigital Technology Corporation et al. v. Lenovo Holding Company, Inc. et al.*, No. 1:19-cv-01590 (D. Del.). Pet. 3; Paper 6, 2.

B. The '726 Patent

The Specification of the '726 patent relates to wireless digital communication systems with communication stations using code-division

multiple access (CDMA) technology utilizing measurement techniques to determine downlink resource allocation. Ex. 1001, 1:12–16. The '726 patent describes measuring channel quality (CQ) and signaling the information from user equipment (UE) to a base station. *Id.* at 2:27–31. Specifically, the '726 patent describes "several embodiments to measure and signal the CQ per timeslot, or subchannel, from the UE to the base station." *Id.* at 2:29–31. Reproduced below is Figure 2.

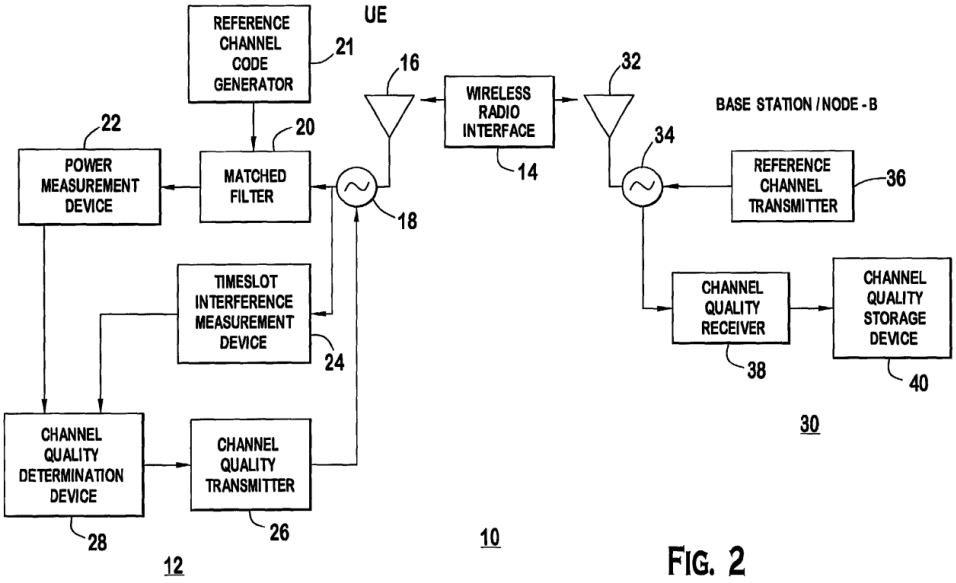

FIG. 2

Figure 2 shows a block diagram illustrating a UE and a base station for implementing channel quality measurements for downlink resource allocation.

Figure 2 shows a UE with antenna 16 coupled through isolator/switch 18 to matched filter 20, which receives a downlink signal from the base station through wireless interface 14. *Id*. at 3:21–23, 3:51–53. Power measurement device 22 analyzes the output of matched filter 20 to determine the power level of the downlink signal and outputs this power level to CQ determination device 28. *Id*. at 3:26–29. Interference measurement device 24 is connected to a second input of CQ determination device 28. *Id*. at 3:30–33. CQ determination device 28 analyzes the power level output from

power measurement device 22 and interference level from interference measurement device 24 and provides a CQ measurement to transmitter 26. *Id*. at 3:33–37.

C. Illustrative Claim

Petitioner challenges claims 1–10 and 14–18 of the '726 patent. Claims 1, 6, and 14 are independent claims. Claim 1 is reproduced below.

> 1. A user equipment (UE), comprising:
>
> a measurement device configured to take a plurality of measurements based on a downlink quality, wherein each of the plurality of measurements is taken on a respective downlink resource of a plurality of downlink resources;
>
> a channel quality determination device configured to:
>
> derive a first channel quality indication indicating a channel quality of the plurality of downlink resources; and
>
> derive a plurality of difference indications, each difference indication being between the first channel quality indication and a channel quality indication for one of the plurality of downlink resources; and
>
> a transmitting device configured to transmit at least one report including the first channel quality indication and the plurality of difference indications.

Ex. 1001, 6:58–7:7.

D. Instituted Grounds of Unpatentability

We instituted *inter partes* review based on the following grounds of unpatentability under 35 U.S.C. § 103(a)[1] as follows (Dec. 4–5, 31):

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended several provisions of 35 U.S.C., including § 103. Because the '726 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of 35 U.S.C. § 103. Petitioner asserts, and Patent Owner does not dispute, that

Claim(s) Challenged	35 U.S.C §	Reference(s)/Basis
1–10, 14–18	103(a)	Tiedemann[2]
1–3, 6–8, 14–16	103(a)	Li[3]
1–10, 14–18	103(a)	Li, Tiedemann
6–10	103(a)	Tiedemann, Padovani[4]
1–10, 14–18	103(a)	Li, Gesbert[5]
1–10, 14–18	103(a)	Tiedemann, Gesbert

II. DISCUSSION

A. Principles of Law

To prevail in its challenges to Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence[6] that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). A patent claim is unpatentable under 35 U.S.C. § 103(a) 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). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences

each relied upon reference is prior art under the pre-AIA version. Pet. 16–17, 61, 64; *see generally* PO Resp.

[2] U.S. Pat. No. 6,307,849 B1, issued Oct. 23, 2001 (Ex. 1005, "Tiedemann").

[3] U.S. Pat. No. 6,947,748 B2, issued Sept. 20, 2005 (Ex. 1006, "Li").

[4] U.S. Pat. No. 6,574,211 B2, issued June 3, 2003 (Ex. 1014, "Padovani").

[5] U.S. Pat. No. 6,760,882 B1, issued July 6, 2004 (Ex. 1012, "Gesbert").

[6] The burden of showing something by a preponderance of the evidence requires the trier of fact to believe that the existence of a fact is more probable than its nonexistence before the trier of fact may find in favor of the party who carries the burden. *Concrete Pipe & Prods. of Cal., Inc. v. Constr. Laborers Pension Tr. for S. Cal.*, 508 U.S. 602, 622 (1993).

between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.[7] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). Petitioner relies on the declaration testimony of Dr. Anthony Acampora, who testifies that a person having ordinary skill in the art "would have been someone with at least a bachelor's degree in electrical engineering, or 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." Pet. 6–7 (citing Ex. 1003 ¶ 49). Dr. Acampora further testifies that alternatively a person having ordinary skill in the art "would have been someone with at least a master's degree in electrical engineering, or related field, with two years of experience in a relevant technical field." Ex. 1003 ¶ 49.

Patent Owner responds that it "applies Petitioners' alleged baseline level of ordinary skill without the phrase 'at least.'" PO Resp. 3.

We adopt Petitioner's definition of the level of skill for purposes of this Decision, except that we delete the phrase "at least" to avoid including

[7] Patent Owner does not present any objective evidence of nonobviousness as to the challenged claims.

ambiguity in the definition of the level of skill. We further note that the prior art of record in the instant proceeding reflects the appropriate level of ordinary skill in the art. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (holding the Board may omit specific findings as to the level of ordinary skill in the art "where the prior art itself reflects an appropriate level and a need for testimony is not shown").

C. Claim Construction

In an *inter partes* review, "[claims] of a patent . . . shall be construed using the same claim construction standard that would be used to construe the [claims] in a civil action under 35 U.S.C. 282(b), including construing the [claims] in accordance with the ordinary and customary meaning of such [claims] as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *See* 37 C.F.R. § 42.100(b) (2019); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

"receiver configured to receive . . ."

Dependent claim 2 recites "[t]he UE of claim 1, further comprising: a receiver configured to receive at least one subsequent downlink transmission associated with at least one modulation and coding set in response to the transmitted first channel quality indication and the plurality of difference indications." Dependent claims 7 and 15 include a similar phrase. For purposes of this discussion, we focus on claim 2. Petitioner contends that the phrase "should be construed to require only that '*a receiver*' at the UE is configured to receive a downlink transmission '*associated with*' a modulation and coding set and that the transmission is received '*in response to*' the first channel quality indication." Pet. 14 (citing Ex. 1003 ¶ 85). Petitioner explains that the claim language does not require "that the 'at least

one modulation and coding set' be a newly changed modulation and coding set or that it be selected based on the first channel quality indication." *Id.* (citing Ex. 1003 ¶ 87). Patent Owner disagrees with Petitioner's proposed construction and argues that the claim language requires "that the MCS [modulation and coding set] must be associated with the subsequent downlink transmission in response to the first CQI [channel quality indication] and difference indications." PO Resp. 15.

We begin with the claim language. Claim 2 recites, "a receiver configured to receive at least one subsequent downlink transmission associated with at least one modulation and coding set in response to the transmitted first channel quality indication and the plurality of difference indications." Petitioner argues that "in response to" is an adverbial phrase that modifies the verb "receive." Pet. 14 (citing Ex. 1010, 1–3; Ex. 1003 ¶ 86). Patent Owner argues that "the adverbial phrase 'in response' modifies 'associated,' not 'receive,' because an adverbial phrase typically modifies the nearest reasonable referent." PO Resp. 15 (citing Ex. 2008, 152–153). Patent Owner concludes, therefore, that "the phrase 'in response to' modifies the verb 'associated' because it is between 'receive' and 'in response to.'" *Id.*

We agree with Petitioner that "associated with" is an adjective phrase where the word "associated" is itself an adjective, not a verb as Patent Owner argues. Pet. Reply 5–6 (citing Ex. 1021). Tellingly, Patent Owner's arguments and supporting evidence are premised on the mischaracterization of the disputed limitation to require "that the subsequent downlink transmission be 'associated with at least one [MCS] in response to the transmitted first [CQI] and . . . difference indications." PO Resp. 15. The claim, however, does not recite that the subsequent downlink transmission

be associated with at least one modulation and coding set. Insertion of the word "be" or "to be" changes the meaning of the disputed limitation. Accordingly, we decline to rewrite the claim as Patent Owner suggests. As such, we find that "in response to" modifies "receive," not "associated with." Thus, the plain meaning of the claim language includes a modulation and coding set associated with the subsequent downlink transmission. The plain language of the claim does not require that the modulation and coding set be selected based on the first channel quality indication and plurality of difference indications as Patent Owner asserts.

We next turn to the written description of the '726 patent. Patent Owner argues that "[a] goal of the invention is 'to determine the proper modulation and coding to use for the downlink channels,' and the specification explains that the appropriate MCS is determined based on channel quality" and that "[t]he claim language parallels this process." PO Resp. 16 (citing Ex. 1001, 5:19–21, 5:66–6:6 (describing "alternative 6"; Ex. 2001 ¶ 56). Patent Owner further argues that the claim language "was similarly interpreted during prosecution." *Id.* (citing Ex. 1002, 4[8]).

[8] Patent Owner cites to page 4 of Exhibit 1002. That page, however, is included in the "Application Data Sheet" information and appears to have nothing to do with the argument presented. Ex. 1002, 3–4. We decline to sift through over eleven hundred pages to try to find what Patent Owner intended to cite in support of the position that the "language was similarly interpreted during prosecution." PO Resp. 16. Moreover, Patent Owner fails to explain sufficiently how the language it quotes, "mapping an 'adjusted data rate and modulation scheme [that] is at least one modulation and coding set,'" supports the position that the disputed claim language was interpreted during prosecution the same as Patent Owner proposes here. No explanation is provided.

The testimony of Patent Owner's expert, Dr. Mark Mahon, is also based on a flawed reading of the claim limitation to require "that the 'subsequent downlink transmission' *be associated with* at least one MCS in response to the transmission of the 'first channel quality indication and the plurality of difference indications.'" Ex. 2001 ¶ 56. Again, the claim limitation does not recite that the subsequent downlink transmission *be associated with* at least one modulation and coding set. In that light, we do not give much weight to Dr. Mahon's testimony regarding how the written description of the '726 patent supports the way that Dr. Mahon reads the claim language.

In any event, Dr. Mahon does not explain how the embodiment describing alternative 6 is instructive of how we should interpret the disputed limitation. *Id.* Indeed, as the parties seem to assert, only certain embodiments that describe a "difference" indication are relevant to what is claimed in the independent claims from which claims 2, 7 and 15 depend. *See* Pet. 12 (explaining that Table 2 shows two examples that "employ the 'differential' channel quality encoding to which the claims are directed"); PO Resp. 13 (explaining that Table 2 example 8 and corresponding description make it clear that "difference indications allow the base station to determine the CQI for a particular downlink resource by undoing the reported difference"). In alternative 6, however, "the UE 12 selects the available modulation coding sets (MCS) from the RSCP and ISCP measurements, and transmits this selection to the base station which the base station 30 uses for transmission." Ex. 1001, 5:66–6:2. The UE "calculates which MSCs would be supportable give the current CQ." *Id.* at 6:4–6. Missing from this description is that the modulation and coding set is in response to the transmitted first channel quality indication *and* the plurality

of difference indications or that the technique is even relevant to what a *UE receiver receives*. Patent Owner has failed to show that such description supports its narrower proposed construction.

The other portion of the Specification to which we are directed states that "[t]he goal of the present invention is to return timely and accurate CQ information and to determine the proper modulation and coding to use for the downlink channels." Ex. 1001, 5:19–21. Dr. Mahon fails to explain how this description supports construing the disputed limitation the way that Patent Owner proposes. Ex. 2001 ¶ 56. Notably missing from the description is any mention about "difference indications" or that the "proper modulation and coding to use for the downlink channels" is dictated by the CQ information. We decline to read the passage to contain more than it does. It is broad and not as specific as Patent Owner proposes. For the above reasons, we adopt Petitioner's proposed construction and construe the disputed term to "require only that '*a receiver*' at the UE is configured to receive a downlink transmission '*associated with*' a modulation and coding set and that the transmission is received '*in response to*' the first channel quality indication." Pet. 14.

For purposes of this Decision, we need not expressly construe any other claim terms. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy"); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean*

Motor Co. Matal, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

D. Asserted Obviousness of Claims 1–10 and 14–18 over Tiedemann in view of Gesbert

1. Tiedemann

Tiedemann describes a system for adjusting forward traffic channel power allocation in a communications system. Ex. 1005, code (57). A mobile station (mobile) measures signal qualities (signal to interference ratios) of pilot channels from base stations. *Id.* at 3:5–8. The mobile "uses a ratio of the received pilot energy per chip (E_c) to total received spectral density, noise and signals, denoted as E_c/I_o, as a measure of the quality of the received pilot." *Id.* at 7:12, 8:50–60, Fig. 3. The signal qualities are compared to a signal quality standard and the comparison results are reported to a system controller, indicating which of the pilot channels surpass the standard. *Id.*, code (57).

2. Gesbert

Gesbert describes a method for selecting a mode for encoding data for transmission in a wireless communication channel between a transmit unit and a receive unit. Ex. 1012, 2:56–59. Data is encoded in accordance with an initial mode and transmitted to a receive unit. *Id.* at 2:59–61. Quality parameters are sampled in the data received by the receive unit. *Id.* at 2:61–62. A first-order statistical parameter and a second-order statistical parameter of the quality parameter are computed and used for selecting a subsequent mode for encoding the data. *Id.* at 2:62–65. Gesbert describes that the quality parameters can include several short-term quality parameters

and be selected among parameters such as signal-to-interference and noise ratio (SINR). *Id.* at 2:66–3:3.

3. Discussion

Petitioner contends claims 1–10 and 14–18 are unpatentable under 35 U.S.C. § 103(a) as obvious over Tiedemann in view of Gesbert. Pet. 63–67. In support of its showing, Petitioner relies upon the declaration of Dr. Anthony Acampora. *Id.* (citing Ex. 1003). Patent Owner relies upon the declaration of Dr. Mark Mahon (Ex. 2001). PO Resp.

As explained in the Decision to Institute, this challenge builds on the challenge made in the Petition based on Tiedemann alone. Dec. 28; Pet. 18–42. For example, Claim 1 recites "a first channel quality indication indicating a channel quality of the plurality of downlink resources." Independent claims 6 and 14 recite similar limitations. Petitioner argues that to the extent Tiedemann does not meet this limitation, "it would have been obvious to include that functionality in the system of Tiedemann" in view of Gesbert. Pet. 64. In particular, Petitioner argues that Gesbert discloses deriving a mean channel quality value for a plurality of downlink resources that would be "a first channel quality indication" as claimed. *Id*. at 64–65. Petitioner also argues that the "differential indicators" in Tiedemann "would be calculated relative to this mean value." *Id.* at 65. Petitioner provides reasons to combine Tiedemann with Gesbert. *Id*. at 65–67. For the remaining claim elements, we refer to Petitioner's showing based on Tiedemann alone. *Id.* at 18–42.

Patent Owner recognizes that "Ground 5 builds on the petition's challenge based on Tiedemann alone (i.e., Ground 1)" and states that "its discussion below addresses the Board's stated understanding of Ground 5."

PO Resp. 44. Patent Owner argues, however, that it "*maintains* that Ground 5 does not sufficiently identify which aspects of which references apply to each limitation." *Id.* (emphasis added). To the extent Patent Owner is attempting to "maintain" arguments from pages 28–29 of its Preliminary Response, we find that Patent Owner has not preserved those arguments. *Id.* In our Scheduling Order, we notified the parties that "Patent Owner is cautioned that any arguments not raised in the [Patent Owner Response] may be deemed waived." Paper 9, 8; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner's failure to proffer argument at trial as instructed in the scheduling order constitutes waiver). Any arguments for patentability not raised in the Patent Owner Response are deemed waived. Merely mentioning an argument made in the Preliminary Response without providing the substance of that argument does not preserve the argument at trial. Accordingly, we consider any such argument to have been waived.

With respect to independent claims 1, 6, and 14, Patent Owner argues that Petitioner fails to show that a person having ordinary skill in the art would have made the proposed modifications to Tiedemann. PO Resp. 44–46; *see also* Tr. 13:20–15:13, 47:11–48:14. Patent Owner makes additional arguments with respect to certain dependent claim and independent claim 6 limitations. PO Resp. 61–62.

For our analysis, we first focus on the terms of each of the claims. Then, we evaluate Petitioner's reasons to combine Tiedemann and Gesbert, and Patent Owner's arguments to that end. For the reasons that follow, we conclude that Petitioner has met its burden of proving by a preponderance of the evidence that each of the challenged claims 1–10 and 14–18 would have been obvious in view of the asserted prior art.

a. Claim 1: "a user equipment comprising:" (preamble)[9]

Claim 1 recites "user equipment." Petitioner contends, and we agree, that Tiedemann describes examples of a mobile unit or "mobile," which is "user equipment," because it provides for the delivery of user data to a user. Pet. 19 (citing Ex. 1005, 4:18–5:5, 7:11–9:53, 10:64–16–19, Figs. 1, 3, 11; Ex. 1003 ¶ 115). Patent Owner does not dispute Petitioner's showing with respect to the preamble. *See generally* PO Resp.

b. Claim 1: "a measurement device configured to take a plurality of measurements based on a downlink quality, wherein each of the plurality of measurements is taken on a respective downlink resource of a plurality of downlink resources"

For the above limitation, Petitioner contends, and we agree, that Tiedemann describes that the mobile measures downlink quality of a number of pilot channels, and that the pilot channels are "a plurality of downlink resources" because each channel is transmitted in the downlink direction (from base station to mobile). Pet. 20 (citing Ex. 1005, code (57), 1:67–2:4, 3:5–10, 4:47–61, 5:6–6:5, 18:6–11; Ex. 1003 ¶ 118). Petitioner further contends that the mobile includes search receiver 44 that receives the pilot channel information and "uses a ratio of the received pilot energy per chip (E_c) to total received spectral density, noise and signals, denoted as E_c/I_o, as a measure of the quality of the received pilot." *Id.* (citing Ex. 1005, 8:50–60, Fig. 3; Ex. 1003 ¶ 119). We agree with Petitioner that measurements of "received pilot energy per chip (E_c)" and of "total received spectral density, noise and signals" for each pilot meets the "measurements based on a downlink quality," because each is an indication of how efficiently a channel

[9] We need not determine whether the preamble is limiting because Petitioner shows that Tiedemann meets the preamble.

is capable of communicating information. *Id.* (citing Ex. 1007, 1:30–2:30; Ex. 1003 ¶ 120). Petitioner contends that, to the extent Tiedemann's mobile receiver 44 does not meet the claimed "measurement device," it would have been obvious to include structures and functionality required to take the claimed measurements within search receiver 44. *Id.* at 21–22 (citing Ex. 1005, 8:50–60, Fig. 3; Ex. 1003 ¶¶ 122–124).

Petitioner asserts that Tiedemann describes that search receiver 44 "provides a signal strength measurement signal to the control processor 46 indicative of the respective pilot channels and their strengths." *Id.* at 22 (quoting Ex. 1005, 8:50–60). Petitioner contends, and we agree, that a person having ordinary skill in the art would have understood "from this that search receiver 44 is taking the disclosed measurements on each 'of the respective pilot channels.'" *Id.* at 22–23 (citing Ex. 1005, 18:6–10, Fig. 7; Ex. 1003 ¶ 125). Patent Owner does not contest Petitioner's showing as to the above limitation. *See generally* PO Resp.

c. Claim 1: "a channel quality determination device configured to"

Claim 1 further recites "a channel quality determination device." Petitioner contends, and we find, that Tiedemann's mobile control processor 46 is a channel quality determination device, because it is a device that makes several different determinations related to channel quality. Pet. 23 (citing Ex. 1005, 11:18–12:38, Fig. 5B; Ex. 1003 ¶¶ 127–130). Patent Owner does not contest Petitioner's showing as to the above limitation. *See generally* PO Resp.

d. Claim 1: "derive a first channel quality indication indicating a channel quality of the plurality of downlink resources"

Petitioner argues that Gesbert discloses deriving a mean channel quality value for a plurality of downlink resources that would be "a first channel quality indication" as claimed. Pet. 64–65. In particular, Petitioner contends that Gesbert describes a mobile unit (receive unit) taking SINR measurements on each of a number of transmission frequencies and during time slots in which training tones are transmitted from the base station. *Id.* at 64 (citing Ex. 1012, 2:56–3:3, 8:13–24). Petitioner asserts, and we agree, that a person having ordinary skill in the art would have understood the training tones to be analogous to pilot beacons (downlink resources). *Id.* (citing Ex. 1017 ¶ 32). Petitioner contends, and we agree, that Gesbert describes using the measurements made during a time window to compute a mean SINR of those values, which meets "a first channel quality indication indicating a channel quality of the plurality of downlink resources." *Id.* at 64–65 (citing Ex. 1012, 8:24–41; Ex. 1003 ¶¶ 363–364). Petitioner proposes to include Gesbert's mean in place of the three bit field of Tiedemann (Petitioner's first mapping of Tiedemann). *Id.* at 65; *see id.* 23–25. Patent Owner does not contest Petitioner's showing as to the above limitation. *See generally* PO Resp.

e. Claim 1: "derive a plurality of difference indications, each difference indication being between the first channel quality indication and a channel quality indication for one of the plurality of downlink resources"

Petitioner proposes to include the mean of Gesbert in place of the three bit field of Tiedemann (Petitioner's first mapping of Tiedemann) in the bit vector message and then the differential indicators "described above"

would be calculated relative to the mean value. Pet. 65 (citing Ex. 1003 ¶ 365).

The "described above" reference is with respect to Petitioner's explanation (*id.* at 28–30) of how Tiedemann alone calculates differential indicators using the "the three bit field of Tiedemann." *Id.* There, Petitioner contends that Tiedemann discloses that the mobile receives from the communication system a quantity "Δ," which the mobile uses to calculate a threshold value "Δ_r" that represents "a fixed level Δ beneath the strongest signal-to-noise ratio of the pilots A, B, and C in the mobile's active set," for making comparisons between respective qualities of the pilot channels being measured. *Id.* at 28 (citing Ex. 1005, 11:18–67; Ex. 1003 ¶ 149). Petitioner further contends that control processor 46 derives an indicator U for each respective pilot channel in the set that indicates whether the corresponding pilot channel was received above the Δ_r threshold signal. *Id.* (citing Ex. 1005, 13:35–45, 15:41–56, Figs. 6A, 6B; Ex. 1003 ¶ 150). Petitioner argues that each quantity U is a "difference indication" as claimed because the U for each pilot channel indicates whether the quality of that pilot channel differs from the best pilot quality of the plurality (identified by I_1, I_2, I_3) by more or less than the threshold Δ. *Id.* at 28–29 (citing Ex. 1005, 11:18–22, 13:38–39, Fig. 5B; Ex. 1003 ¶¶ 151–152).

For the challenge based on Tiedemann and Gesbert, we understand that Gesbert's mean value would replace Tiedemann's "three bit field" in making the U calculations. *Id.* at 65 (citing Ex. 1003 ¶ 365). Thus, in the combination, the threshold value "Δ_r" would represent a fixed level Δ beneath the mean value of the pilots A, B, and C in the mobile's active set for making comparisons between respective qualities of the pilot channels being measured. We find that the combination of Tiedemann and Gesbert

meets the limitation of deriving difference indicators as claimed. Patent Owner does not contest Petitioner's showing as to the above limitation. *See generally* PO Resp.

f. Claim 1: "a transmitting device configured to transmit at least one report including the first channel quality indication and the plurality of difference indications"

Claim 1 further recites, "a transmitting device configured to transmit at least one report including the first channel quality indication and the plurality of difference indications." Petitioner contends that Tiedemann describes that the mobile includes Transmit Modulator 52, Transmit Power Control 38, Transmit Power Amplifier 36, a Diplexer, and Antenna 30, which collectively constitute a transmitting device. Pet. 32 (citing Ex. 1005, 8:18–32, 9:24–53, Fig. 3; Ex. 1003 ¶ 159). Petitioner asserts, and we agree, that Tiedemann describes that the transmitter is configured to transmit "bit vector messages" (at least one report). *Id.* at 32–33 (citing Ex. 1005, 12:39–18:5, Figs. 6A–6C; Ex. 1003 ¶¶ 160–162). Patent Owner does not contest Petitioner's showing as to the above limitation. *See generally* PO Resp.

g. Independent Claims 6 and 14

Independent claim 14 is a method claim, which substantively essentially corresponds to apparatus claim 1. Petitioner's showing for claim 14 is similar to its showing for claim 1, while sufficiently accounting for differences between claim 14 and claim 1. Pet. 41–42, 63–67. Patent Owner does not contest Petitioner's showing that the combination of Tiedemann and Gesbert teaches the limitations of claim 14. *See generally* PO Resp. We are persuaded by Petitioner's showing, which we adopt.

Independent claim 6 is an apparatus claim that is substantively similar to claim 1; however, the last phrase of claim 6 differs from claim 1 by

reciting "transmit at least one report including the first channel quality indication and the plurality of difference indications *to a network in a time interval including a plurality of time slots*" (emphasis added). Thus, claim 6 differs from claim 1 with the additional highlighted language.

For the additional highlighted language, Petitioner quotes Tiedemann's description that in one embodiment, "a single code channel reverse link signal is employed, as is used in an IS-95 compliant system. The bit-vector message is preferable transmitted along with the other user data within the single code channel via time multiplexing or bit puncturing the data vector into the reverse link PN code." Pet. 41 (quoting Ex. 1005, 12:66–13:4). Petitioner argues that a person having ordinary skill in the art "would understand that sending both the bit-vector message and user data using time multiplexing would require each of the bit-vector message and the user data to be transmitted within its own time slot . . . and that collectively those two time slots ('*a plurality of time slots*') constitute '*a time interval*' because they collectively occur over a period, or interval, of time." *Id.* (citing Ex. 1013, 469; Ex. 1003 ¶¶ 197–198).

Patent Owner argues the Petition fails to show that a person having ordinary skill in the art "would have understood Tiedemann's reference to time multiplexing generally suggests using 'time slots' as part of time-division multiplexing" because not all time multiplexing is time-division multiplexing. PO Resp. 34 (citing Ex. 2001 ¶¶ 84–86; Ex. 2010, 390–391). Patent Owner further argues that time-division multiplexing (TDM) is a communications system in which different time slots are allocated to different users, but "Tiedemann is a CDMA system, and CDMA does not use time slots." *Id.* (citing Ex. 1005, 2:41–46; Ex. 2001 ¶¶ 84–86; Ex. 2010, 390–391). Patent Owner contends that the Tiedemann passage the Petition

relies on would have been understood "as referring to a manner of encoding CDMA transmissions between a mobile unit and a base station, not as describing a system using TDM with multiple time slots." *Id.* (citing Ex. 2001 ¶ 85).

Petitioner contends that Patent Owner's argument—that not all time multiplexing is time-division multiplexing—ignores Tiedemann's description of time multiplexing "within the single code channel" and is premised on a narrow interpretation of time slots, which means time allocation. Pet. Reply 11 (citing Ex. 1005, 13:2–3). Petitioner argues that Dr. Mahon testified that Tiedemann's description of time multiplexing refers to transmitting the bit vector message during some of the time of transmission and the other user data taking up the remainder, which is all that the claims require. *Id.* (citing Ex. 2001 ¶ 85). We agree with Petitioner.

Claim 6 requires UE circuitry configured to "transmit at least one report including the first channel quality indication and the plurality of difference indications to a network in a time interval including a plurality of time slots." Dr. Mahon testifies that Tiedemann's description of time multiplexing refers to transmitting the bit vector message during some of the time of transmission and the other user data taking up the remainder of the time of transmission. Ex. 2001 ¶ 85. We agree with his testimony because it is consistent with Tiedemann's description. *See* Ex. 1005, 12:66–13:4 (stating that a single code channel reverse link signal is employed with the bit-vector message preferably transmitted along with the other user data within the single code channel via time multiplexing). We find that Tiedemann describes transmitting the bit vector message during one period of time (a "time slot") and transmitting the user data during another period of time (another "time slot"), and, therefore, Tiedemann meets the claimed

transmission of at least one report "in a time interval including a plurality of time slots."

Despite testifying that Tiedemann describes transmitting the bit vector message during some time of transmission and the user data taking up the remainder time, Dr. Mahon testifies that such description fails to meet the "time slot" limitation. Ex. 2001 ¶ 85. According to Dr. Mahon, time-division multiplexing is a type of communication system in which frames are "divided into intervals of equal length called 'time slots.'" *Id.* Dr. Mahon also testifies that because "Tiedemann is a CDMA system," which "divides users and channels for a single user by codes rather than time slots," Tiedemann employs "multiplexing . . . without the construct of a time slot." *Id.* We do not give substantial weight to Dr. Mahon's testimony.

First, we are not directed to sufficient evidence to conclude that the claimed "time slots" must mean time intervals of equal length. The claim language itself does not recite that the time slots must be of equal length, and Patent Owner has failed to show sufficiently that the claims should be construed so narrowly. Indeed, there is no analysis of the claim language or Specification in support of the implicit narrow construction. Second, Dr. Mahon fails to direct us to evidence in support of his assertion that CDMA systems, such as Tiedemann's, foreclose using "time slots." *See* 37 C.F.R. § 42.65(a) ("testimony that does not disclose the underlying facts or data on which the opinion is based in entitled to little or no weight."). Indeed, Dr. Mahon's testimony in that regard appears to be in direct contrast with the '726 patent, which is directed to a CDMA system that uses time slots. Ex. 1001, 1:12–16, code (57). We also have considered Dr. Mahon's testimony that "time slots are not required to time multiplex data." Ex. 2001 ¶ 85 (citing Ex. 2010, 390–91, which is described as "contrasting

synchronous time multiplexing that uses time slots to stagger users' transmissions with asynchronous time multiplexing that doesn't use time slots"). Dr. Mahon fails to explain the supporting evidence sufficiently to support the assertion that "time slots are not required to time multiplex data." In particular, we have considered pages 390 to 391 of Exhibit 2010 and do not understand that it describes "contrasting synchronous time multiplexing that uses time slots to stagger users' transmissions with asynchronous time multiplexing that doesn't use time slots." Exhibit 2010 at page 390 describes that '[s]ynchronous operation refers to the fact that each connected source is given a *channel slot* within a frame," not a "time slot." Moreover, we do not understand the discussion regarding "asynchronous time multiplexing" to foreclose using time slots as Dr. Mahon implicitly asserts. Ex. 2010, 390–391. Thus, Dr. Mahon fails to sufficiently support his statement that "time slots are not required to time multiplex data."

For the above reasons, Petitioner has sufficiently accounted for the disputed limitation. Accordingly, Petitioner has shown sufficiently that the combination of Tiedemann and Gesbert teaches the limitations of claim 6.

h. Dependent claims 2–5, 7–10, and 15–18

The analysis below, regarding claims 2–5, 7–10, and 15–18, focuses on the Petition's detailed showing regarding the additional limitations of those claims with the understanding that Tiedemann's "three bit data field index" would be replaced by Gesbert's mean value. Pet. 33–39, 63–67.

Dependent claim 2 recites "[t]he UE of claim 1, further comprising: a receiver configured to receive at least one subsequent downlink transmission associated with at least one modulation and coding set in response to the transmitted first channel quality indication and the plurality of difference

indications." Dependent claims 7 and 15 include a similar phrase. Petitioner contends that Tiedemann teaches or suggests the limitation. *Id.* at 33–35. Petitioner contends that Tiedemann describes antenna 30 coupled through diplexer 32 to analog receiver 34, which receives transmitted pilot and code channel signals from the base stations of the system. *Id.* at 33 (citing Ex. 1005, 7:12–19, Fig. 3). Petitioner asserts, and we agree, that the transmitted pilot and code channel signals are "downlink transmissions" because they consist of RF energy transmitted from the base stations to the mobile unit. *Id.* (citing Ex. 1003 ¶ 165). Petitioner further asserts, and we agree, that Tiedemann describes that the base stations transmit signals to the mobile unit *subsequent* to the mobile unit transmitting its bit-vector message containing the "first channel quality indication." *Id.* at 33–34 (citing Ex. 1005, code (57), 3:5–34, 18:6–20:32, Figs. 7, 8).

Petitioner explains that Tiedemann's system operates with at least a single modulation and coding set that is associated with the IS-95 standard for CDMA. *Id.* at 34 (citing Ex. 1005, 1:7–11, 1:22–25, 1:35; Ex. 1003 ¶ 165). Petitioner contends that "every transmission received by the mobile unit in that system would be associated with that modulation and coding set because that set would be used to carry out the transmission," and, thus, meets "a receiver configured to receive at least one subsequent downlink transmission associated with at least one modulation and coding set." *Id.* (citing Ex. 1003 ¶ 167). Petitioner further contends that Tiedemann further describes that in response to the uplink bit vector message (including the first channel quality indication), the system produces a control message sent to respective base stations in the mobile's active set controlling which of the base stations in the mobile's active set should transmit a respective code channel to the mobile. *Id.* at 34–35 (citing Ex. 1005, 3:16–21, 18:6–20:32,

Figs. 7, 8). Petitioner concludes, and we agree, that "code channel transmissions with an adjusted power from a particular base station occurring subsequent to the uplink bit-vector message from the mobile are carried out 'in response to' the signal quality information carried by that message." *Id.* at 35 (citing Ex. 1003 ¶¶ 168–169, 200, 216).

Patent Owner's arguments are directed to its proposed claim construction that "'in response to' modifies 'associated,'" which we do not adopt. PO Resp. 35–36. Accordingly, Patent Owner's arguments that Tiedemann's modulation and coding set is not in response to the transmitted first CQI and difference indications do not undermine Petitioner's showing. *Id.* ("Tiedemann's bit vector message has nothing to do with associating subsequent messages with an MCS"). Accordingly, for the above reasons, Petitioner has sufficiently shown that the combination of Tiedemann and Gesbert teaches the limitations of claims 2, 7, and 15.

Claim 3 depends from claim 1 and recites, "wherein each of the plurality of measurements is derived at least from a received power of a reference signal." Claim 8, which depends from claim 6, and claim 16, which depends from claim 14, are similar. We determine that Petitioner has shown by a preponderance of the evidence that the combination of Tiedemann and Gesbert teaches the limitations of claims 3, 8, and 16. For example, Petitioner argues that Tiedemann describes that the measurements of search receiver 44 includes the received pilot energy per chip (Ec) and a ratio of the received pilot energy per chip (Ec) to total received spectral density, noise and signals, denoted as Ec/Io. Pet. 35–36 (citing Ex. 1005, 8:54–57; Ex. 1003 ¶ 172). Petitioner contends, and we agree, that energy per chip is a measure of power across the duration of a chip and is therefore "derived at least from a received power of a reference signal." *Id.* at 36

(citing Ex. 1003 ¶ 173). Patent Owner does not separately argue claims 3, 8, and 16. *See generally* PO Resp. We are persuaded by Petitioner's showing, which we adopt.

Claim 4 depends from claim 1 and recites "wherein in the at least one report, a number of bits used for each of the plurality of difference indications is less than a number of bits used for the first channel quality indication." Claim 9, which depends from claim 6, and claim 17, which depends from claim 14, are similar. We determine that Petitioner has shown by a preponderance of the evidence that the combination of Tiedemann and Gesbert teaches the limitations of claims 4, 9, and 17. For example, Petitioner argues that Tiedemann's three bit index is greater than the single bits required for each difference indication. Pet. 36–37, 65–66 (where "the same number of bits" would be used for the mean value). Patent Owner does not separately argue claims 4, 9, and 17. *See generally* PO Resp. We are persuaded by Petitioner's showing, which we adopt.

Claim 5 depends from claim 4 and recites "wherein in the at least one report, the number of bits for each of the plurality of difference indications is two and the number of bits of the first channel quality indication is four." Claim 10, which depends from claim 9, and claim 18, which depends from claim 17, are similar. Petitioner argues, and we agree, that Tiedemann describes adding an additional bit to the message to indicate the relative strength of the pilots in finer quantization levels, which would result in two bits for each of the plurality of difference indications. Pet. 38–39 (citing Ex. 1005, 15:67–16:4; Ex. 1003 ¶ 183). Patent Owner does not dispute that Tiedemann teaches "the number of bits for each of the plurality of difference indications is two." PO Resp. 36–39.

Petitioner argues that Tiedemann does not explicitly describe "the number of bits of the first channel quality indication *is four*," but "Tiedemann does not limit his invention to any particular type of wireless system, and discloses different bit configurations for the channel quality information his mobile reports to the base station" and that different combinations of reporting techniques could be used. Pet. 39 (citing Ex. 1005, 12:1–12, 15:56–62, 16:10–19, 21:46–49; Ex. 1003 ¶ 184). Petitioner argues that a person having ordinary skill in the art would have been motivated to employ the number of bits recited "because using slightly more bits to encode the reported information . . . would have permitted finer quantization levels, and therefore more useful reporting and only a minimal additional use of bandwidth." *Id.* at 39–40 (citing Ex. 1003 ¶¶ 185, 206, 222).

Patent Owner argues that "[a]s discussed above in §§IV.D-E, the petition additionally fails to show that Tiedemann teaches . . . the bit limitations of claims 5, 10, and 18. Petitioners do not address [the bit limitations] in Ground 5, nor do they propose any modification to remedy the deficiencies described above." PO Resp. 61. Thus, we understand that for this challenge (based on the combination of Tiedemann and Gesbert), Patent Owner asserts the same arguments made regarding Tiedemann alone. *Id.* at 61–62.

Patent Owner argues that none of the Tiedemann passages Petitioner cites to address or suggest changing or modifying the number of bits used to report the first channel quality indication. *Id.* at 37 (citing Ex. 1005, 12:1–12, 15:56–62, 16:10–19, 21:46–49; Ex. 2001 ¶ 92). Patent Owner further argues that Petitioner's assertion that Tiedemann suggests that different numbers of bits in the report may be used is a vague assertion and fails to

establish why a person having ordinary skill in the art "would have been motivated to use four bits for the alleged first CQIs." *Id.* at 38 (citing Pet. 39). Lastly, Patent Owner argues that Petitioner's assertion that using four bits instead of three would provide for "finer quantization levels" fails because "Tiedemann's I-bits do not quantify channel quality at all." *Id.* (citing Ex. 2001 ¶ 94).

Patent Owner's arguments do not undermine Petitioner's showing because such arguments are directed to the "first channel quality indication" being based on Tiedemann's I-bits or index (what Petitioner refers to as three bit field). *Id.* 36–39. For Ground 5, however, Tiedemann's index (three bit field) is replaced with *Gesbert's mean*. Pet. 65; PO Resp. 2. Thus, Patent Owner's arguments and supporting evidence are not responsive to the combined teachings of Tiedemann and Gesbert. For example, Patent Owner's argument that Petitioner's reasoning for modifying the number of bits associated with the "first channel quality indication" from three to four, namely, to "permit[] finer quantization levels" and "more useful reporting" (Pet. 39), is insufficient because "Tiedemann's I-bits do not quantify channel quality at all" says nothing about using the mean value as taught by Gesbert. PO Resp. 38; Ex. 2001 ¶ 95. In other words, while Patent Owner all along argues that Tiedemann's I-bits do not quantify channel quality, Patent Owner does not make that same argument with respect to Gesbert's mean value. PO Resp. 18–22, 44–45; Tr. 13:20–15:13, 47:11–48:14.

Based on the record before us, we agree with Petitioner's unrebutted showing that a person having ordinary skill in the art would have been motivated to employ four bits instead of three bits for the "first channel quality indication" "because using slightly more bits to encode the reported information . . . would have permitted finer quantization levels, and

therefore more useful reporting and only a minimal additional use of bandwidth." Pet. 39–40 (citing Ex. 1003 ¶¶ 185, 206, 222). Tiedemann teaches the general notion that adding a bit to a message, for instance, would permit finer quantization levels. Ex. 1005, 15:67–16:4. We find that such teaching would equally apply to a "first channel quality indication" that is represented by a mean value, which Patent Owner does not dispute would quantify channel quality. *See, e.g.*, Ex. 2001 ¶¶ 67–68.

For all of the above reasons, we determine that Petitioner has shown by a preponderance of the evidence that the combination of Tiedemann and Gesbert teaches the limitations of claims 5, 10, and 18.

i. Motivation and Rationale to Combine

As explained above, Petitioner argues that to the extent that Tiedemann does not disclose "a first channel quality indication," it would have been obvious to replace Tiedemann's three bit field with Gesbert's mean value. Pet. 64–65. In particular, Petitioner argues that combining the system of Tiedemann with the mean calculation technique of Gesbert would have been the arrangement of old elements (Tiedemann's mobile unit and the technique of deriving mean channel quality information of Gesbert) with each performing the same function it had been known to perform (reporting link quality information; deriving mean channel quality) and yielding no more than one would expect from such an arrangement (the efficient delivery of mean channel quality information). *Id.* at 66 (citing Ex. 1003 ¶ 367). Petitioner further argues that when a patent claims a structure known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. *Id.* Petitioner asserts that substituting the mean channel quality value of Gesbert for the best channel quality value (*e.g.*, three bit

field) of Tiedemann would have been predictable because the mean value would have been used in the same manner as the best value. *Id.* (citing Ex. 1003 ¶ 368). As another separate reason for combining, Petitioner argues that using a mean channel quality in Tiedemann's system would permit the channel quality report to be encoded more efficiently. *Id.* at 67 (citing Ex. 1006, 12:3–17; Ex. 1003 ¶ 369).

Patent Owner argues that using a mean channel quality in Tiedemann's system would not permit the channel quality report to be encoded more efficiently because the same number of bits would result in a "one-to-one substitution" producing no bit reduction, "making the sole alleged benefit nonexistent." PO Resp. 47–49 (citing Ex. 2001 ¶¶ 118–119). Patent Owner also argues that there would have been significant technical problems that would have discouraged a person having ordinary skill in the art from making the proposed modification. *Id.* at 49–54. First, Patent Owner argues that the proposed modification would eliminate the Tiedemann system controller's ability to identify the best pilot, which is important information for Tiedemann's management of soft handoffs. *Id.* at 50–51 (citing Ex. 2001 ¶ 122). Second, Patent Owner argues that the proposed modification "significantly compromises the basis for calculating U-bits" because (1) the mean will almost always be lower than the strongest Ec/Io such that pilots with lower Ec/Io values would be identified as meeting the standard for inclusion in the active set; and (2) the modified standard would be unpredictably lower because the difference between the strongest Ec/Io and the mean would vary unpredictably and the system controller would not be able to infer the difference between the reported mean and the strongest Ec/Io from the data in the report. *Id.* at 51–54 (citing Ex. 2001 ¶¶ 123–130).

We determine that Petitioner's reasons for combining Tiedemann and Gesbert are sufficiently specific and persuasive, given the relatively high level of ordinary skill in the art. *See KSR*, 550 U.S. at 417 ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill."); *see also id.* at 416 ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.").

It is not disputed, and we find, that like the '726 patent, Tiedemann and Gesbert are directed to the transmission of downlink quality reports on the uplink to overcome the problem of non-optimal allocation of downlink resources. Ex. 1003 ¶ 366 (citing Ex. 1001, 1:12–23; Ex. 1005, 1:7–11, 2:54–57, 3:5–19; Ex. 1012 code (570), 1:21–50, 3:46–51). It also is not disputed, and we find, that Gesbert teaches deriving a mean SINR ("channel quality indication") indicating a channel quality of a plurality of training tones/pilot signals ("downlink resources"). *Id.* ¶ 363 (citing Ex. 1012, 2:56–3:3, 8:13–41; Ex. 1017 ¶ 32). We give substantial weight to Dr. Acampora's testimony that implementing a mean value in place of Tiedemann's three bit field to report link quality information was within the level of ordinary skill in the art at the time of the claimed invention and would have been predictable. *Id.* ¶¶ 367–368. In particular, we give substantial weight to Dr. Acampora's testimony that using the mean channel quality value in place of the best channel value would have resulted in the mean channel quality value being used in the same way as the best value in a predictable way to report link quality information. *See* Ex. 1003 ¶ 367.

We have considered Patent Owner's arguments that substituting Gesbert's mean for Tiedemann's index would not produce a bit reduction, and, therefore, the Petition fails to demonstrate any reason for making the modification. PO Resp. 47–49 (citing Ex. 2001 ¶¶ 118–119). As explained above, even if there were no bit reduction, we determine that Petitioner has shown sufficiently that it would have been obvious to substitute Gesbert's mean value for Tiedemann's index value. Although not necessary to this Decision, we make the following determinations regarding Patent Owner's specific bit reduction arguments.

It is not disputed that a person having ordinary skill in the art at the time of the invention would have known that there is a tradeoff of using more bits leading to additional bandwidth and overhead versus using fewer bits leading to less bandwidth and overhead. Ex. 1003 ¶¶ 180–181, 184–185; Ex. 1006, 12:3–17; Ex. 1009, 5:18–30, 5:39–43; Ex. 1001, 5:10–14.[10] We give substantial weight to Dr. Acampora's testimony that the mean channel quality could be conveyed using two bits or more bits because of these known tradeoffs. Ex. 2002, 168:10–169:9. The evidence of record supports a determination that a person having ordinary skill in the art would have been motivated to use two bits to convey Gesbert's mean value, as opposed to Tiedemann's three bit index, since doing so would have resulted in less overhead, which was desirable. Ex. 1003 ¶¶ 180–181, 184–185; Ex. 1006, 12:3–17; Ex. 1009, 5:18–30, 5:39–43; Ex. 1001, 5:10–14.

We also have considered Patent Owner's arguments that the

[10] We determine that Dr. Mahon's responses about what a person having ordinary skill in the art at the time of the invention knew about bit reduction were evasive, not helpful, and do not undermine the record evidence before us. Ex. 1020, 144:21–148:18.

combination of Tiedemann and Gesbert would eliminate the Tiedemann system controller's ability to identify the best pilot and would compromise the basis for calculating U-bits. PO Resp. 50–54. We first address Patent Owner's assertion that the combination would compromise the basis for calculating U-bits. *Id.* at 51–54.

A stated purpose of Tiedemann's invention is to provide a system where a mobile frequently sends a bit-vector message to a system controller indicating signal qualities of pilots from each base station in an active set. Ex. 1005, 3:5–16. Tiedemann describes a mobile that transmits a pilot quality bit-vector message to system controller 10. *Id.* at 13:5–7. The message is "capable of reporting to the system controller 10 which of the pilots in the mobile's active set have signal qualities at or above a given standard." *Id.* at 13:7–11. System controller 10 receives the measured power message and determines which of the signals in the active set to remove from the forward traffic channels, and which of the base stations to keep transmitting. *Id.* at 14:25–29. System controller 10 instructs "the identified base stations to stop transmitting the traffic channel directed to the corresponding mobile, which in turn reduces the transmit power of the forward link signal generated by these base stations." *Id.* at 14:32–36.

We agree with Petitioner that using the mean value to determine the U-bits would function in the same way to report which of the pilots in the mobile's active set have signal qualities at or above a given standard. Pet. 65–66; Pet. Reply 24. We do not give substantial weight to Dr. Mahon's testimony regarding why using a mean value and determining the U-bits based on the mean value "significantly undermines the [Tiedemann] system controller's ability to tell which base stations should be in the active set." Ex. 2001 ¶ 129. Dr. Mahon's testimony in that regard is based on the

premise that the mean value would be too low to be useful. Ex. 2001 ¶¶ 124–126. For example, Dr. Mahon testifies that "the mean of a set will always be below the highest member of the set unless all members of the set are equal" "having the general effect of lowering Tiedemann's quality standards" with pilots "far below the mean" that "would affect the location of the threshold." *Id.* ¶ 126 (citing Ex. 1005, Figs. 2, 5A–B). The evidence to which we are directed in support of Dr. Mahon's testimony, however, has not been explained and does not support the assertions Dr. Mahon makes. For example, we do not know, nor has Dr. Mahon sufficiently explained, why we should assume that some pilots *in the active set* would always be *far below the mean* affecting the location of the threshold. Thus, Dr. Mahon has not provided a sufficient factual basis for us to find that using the mean value of a plurality of downlink resources as taught by Gesbert would not function in the same way in Tiedemann to identify "which of the pilots in the mobile's active set have signal qualities at or above a given standard." Ex. 1005, at 13:7–11.[11] Moreover, the '726 patent does not identify anything that would lead us to conclude that using the mean value as taught by Gesbert would be unpredictable in Tiedemann's system for reporting link quality information. *See, e.g.*, Ex. 1001, 6:11–19.

We also have considered Patent Owner's arguments that the combination of Tiedemann and Gesbert eliminates Tiedemann's system controller's ability to identify the best pilot, which allows Tiedemann's

[11] Dr. Mahon seems to contradict his testimony too by asserting that Tiedemann's index bits do not serve as a metric to indicate channel quality (in contrast with a mean value). Ex. 2001 ¶¶ 60–62, 67–68, 73; *see also* PO Resp. 20 (Tiedemann's "system controller has no idea what the relevant channel quality is because the I-bits themselves are not a metric for channel quality"), 21–22.

system to identify which base station should take over as the serving base station. PO Resp. 50 (citing Ex. 2001 ¶ 122). Dr. Mahon's testimony as to why a person having ordinary skill in the art would not have combined the teachings of Tiedemann and Gesbert is based on narrowly focusing on why the combination would have been undesirable for one of Tiedemann's stated purposes. Ex. 2001 ¶ 126 ("An essential premise in Tiedemann is that pilots in a fading environment will fluctuate and generally not be equal . . . so the petition's proposal will have the general effect of lowering Tiedemann's quality standards"); ¶ 130 ("the bit vector messages would no longer report the *relevant* quality information for Tiedemann's purposes"). Here the claims broadly recite reporting channel quality of a plurality of channels. Both Tiedemann and Gesbert are directed to the transmission of downlink quality reports on the uplink to overcome the problem of non-optimal allocation of downlink resources. Ex. 1003 ¶ 367. Dr. Mahon's testimony is based on how the Tiedemann system controller *uses the report* from the mobile device to assign the best base station as the new serving base station for the mobile, which we do not find particularly helpful in our obviousness determination. *See, e.g.*, Ex. 2001 ¶ 122. The claims are not directed to a system controller using channel quality information for assigning a base station for a mobile device. Accordingly, Dr. Mahon's testimony regarding assigning the best base station does not undermine Petitioner's showing that using Gesbert's mean value in place of Tiedemann's index functions in the same way *to report link quality information* (of a plurality of downlink resources), which is also a stated goal of Tiedemann (*see, e.g.*, Ex. 1005,

3:5–15)[12] and which is directed to the claimed invention. Ex. 1003 ¶¶ 366–368.

For the above reasons, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–10 and 14–18 of the '726 patent would have been obvious over Tiedemann and Gesbert.

E. Remaining Grounds Challenging Claims 1–10 and 14–18

For the reasons discussed above, Petitioner has shown by a preponderance of the evidence that claims 1–10 and 14–18 are unpatentable as obvious over Tiedemann and Gesbert. In addressing this ground, we have addressed all of the challenged claims. *See* 35 U.S.C. § 318(a) (requiring the Board to "issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d)"); *see also SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2108) (holding that a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"). Accordingly, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 1–10 and 14–18 are unpatentable based on the remaining challenges. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming the anticipation ground); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421,

[12] Dr. Mahon acknowledges that there are two stated purposes of the Tiedemann invention, one of which is to identify pilots in the mobile's active set having signal qualities at or above a given standard. Ex. 2001 ¶ 122; *see also* Ex. 1005, 3:5–15, 13:5–11.

1423 (Fed. Cir. 1984) (holding that once a dispositive issue is decided, there is no need to decide other issues).

III. CONCLUSION[13]

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–10 and 14–18 of the '726 patent are unpatentable, as summarized in the following table:

Claims	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–10, 14–18	103(a)[14]	Tiedemann		
1–3, 6–8, 14–16	103(a)	Li		
1–10, 14–18	103(a)	Li, Tiedemann		
6–10	103(a)	Tiedemann, Padovani		
1–10, 14–18	103(a)	Li, Gesbert		

[13] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner'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. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner 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).

[14] As explained immediately above, because the ground relying on Tiedemann and Gesbert is dispositive as to challenged claims 1–10 and 14–18, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that these claims also would have been obvious based on the remaining grounds.

Claims	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–10, 14–18	103(a)	Tiedemann, Gesbert	1–10, 14–18	
Overall Outcome			1–10, 14–18	

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–10 and 14–18 of the '726 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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