

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED,
Petitioner,

v.

BANDSPEED, INC.,
Patent Owner.

Case IPR2016-00620¹
Patent 8,873,500 B2

Before THOMAS L. GIANNETTI, JAMES B. ARPIN, and
MATTHEW R. CLEMENTS, *Administrative Patent Judges*.

ARPIN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

¹ Case IPR2016-00623 has been consolidated with the instant proceeding.

I. BACKGROUND

In Case IPR2016-00620, Qualcomm Incorporated (“Petitioner”) filed a Petition pursuant to 35 U.S.C. §§ 311–19 to institute an *inter partes* review of claims 1–31 of U.S. Patent No. 8,873,500 B2 (Ex. 1001, “the ’500 patent”).² IPR2016-00620, Paper 2 (“620 Pet.”).³ In Case IPR2016-00623, Petitioner filed a Petition pursuant to 35 U.S.C. §§ 311–19 also to institute an *inter partes* review of claims 1–31 of the ’500 patent. IPR2016-00623, Paper 1 (“623 Pet.”). Bandspeed, Inc. (“Patent Owner”) did not file a Preliminary Response in either case.⁴

On August 24, 2016, we issued decisions in Case IPR2016-00620 and Case IPR2016-00623 (1) granting institution of *inter partes* review of claims 1–5, 8–20, and 23–31 of the ’500 patent and (2) denying institution of *inter partes* review of claims 6, 7, 21 and 22 of the ’500 patent. IPR2016-00620, Paper 6 (“620 Dec. on Inst.”), 34; IPR2016-00623, Paper 6 (“623 Dec. on Inst.”), 34. Further, we consolidated the *inter partes* reviews of Case IPR2016-00620 and Case IPR2016-00623. *E.g.*, IPR2016-00620, Paper 7, 2–3.

After consolidation, the parties only made filings for the consolidated cases in Case IPR2016-00620. In the consolidation order, we ordered that

² Because the ’500 patent was filed as Exhibit 1001 in each case, we refer to this exhibit number without identifying the case in which it was filed.

³ Petitioner identifies Qualcomm Incorporated, Qualcomm Atheros, Inc., and Qualcomm Innovation Center, Inc., as real parties-in-interest. *See, e.g.*, 620 Pet. 2.

⁴ Patent Owner identifies only Bandspeed, Inc., as a real party-in interest. IPR2016-00620, Paper 5 (“620 Paper 5”), 2.

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“each Party shall file any exhibits previously filed only in IPR2016-00623 in IPR2016-00620 within ten (10) business days of the entry of this Order.”

IPR2016-00620, Paper 7, 3; *see* 37 C.F.R. § 42.63(a). Petitioner did not comply with our order. In addition, we ordered that “each Party shall file an exhibit list in IPR2016-00620 identifying (1) the exhibits previously filed in IPR2016- 00620 and (2) the exhibits previously filed only in IPR2016-00623, but newly filed IPR2016-00620, within ten (10) business days of the entry of this Order.” IPR2016-00620, Paper 7, 3; *see* 37 C.F.R. § 42.63(e). Petitioner again did not comply with our order. We also ordered that “the case caption in IPR2016-00620 shall be changed to reflect the consolidation of IPR2016-00623 with IPR2016-00620, in accordance with the attached example.” IPR2016-00620, Paper 7, 3. Petitioner yet again did not comply with our order. *See* Paper 11; *cf.* Paper 10. The purpose of these orders was to facilitate the creation of a clear record in the consolidated proceedings and the efficient presentation of the parties’ arguments and evidence and our efficient review of such arguments and evidence in preparation of this Final Written Decision. Petitioner’s failure to comply with our orders in this proceeding placed unnecessary burdens on Patent Owner and on us. *See* PO Resp. vi–v; *infra* Section I.D. Consequently, we now cite to papers filed after consolidation only by their paper numbers and exhibit numbers and identify the particular case for papers and exhibits filed before consolidation. We strongly caution Petitioner that it disregards our orders at its peril. *See* 37 C.F.R. § 42.12(a) (“The Board may impose a sanction against a party for misconduct, including: (1) Failure to comply with an applicable rule or order in the proceeding”).

After institution and consolidation, Patent Owner filed a Patent Owner Response to the Petition (Paper 10, “PO Resp.”), and Petitioner replied (Paper 11, “Reply”). Neither party requested a hearing in the consolidated case; consequently, no hearing was held.

We have jurisdiction under 35 U.S.C. § 6, and this Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, addresses issues and arguments raised during the review. For the reasons discussed below, we determine that Petitioner has met its burden to prove, by a preponderance of the evidence, that claims 1–5, 8–12, 14–20, 23–27, and 29–31 of the ’500 patent are unpatentable on the grounds upon which we instituted *inter partes* review.

A. The ’500 Patent (Ex. 1001)

The ’500 patent is entitled “Approach for Managing the Use of Communications Channels Based on Performance.” Ex. 1001, [54]; *see id.* at 1:1–3, 60–62. Figure 2 of the ’500 patent is reproduced below.

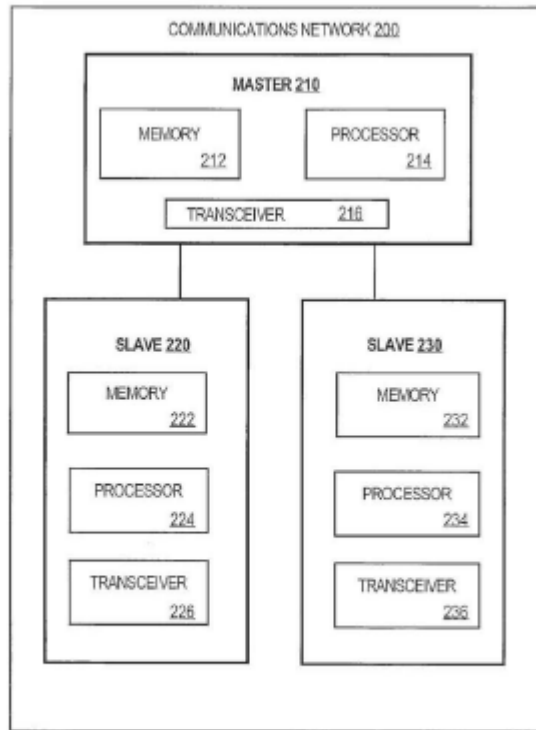


FIG. 2

Figure 2 depicts a communications network having communications devices or mechanisms labeled master 210, slave 220, and slave 230. *Id.* at 9:51–10:9; *see id.* at 2:5–18 (describing “participants” as “a device or mechanism that communicates with other devices or mechanisms,” including “a master participant” or “master” and “slave participants” or “slaves”). Each communication device or mechanism includes a memory, a processor that may execute instructions stored in memory, and a transceiver configured to transmit and receive communications with other devices of the communications network. *Id.* at 10:3–9.

To manage the communications channels, the methods and devices of the ’500 patent communicate between communication devices over a plurality of communication channels, test the plurality of communication

channels, and select a first set of communications channels based on the results of the testing, e.g., “based on the performance of the communications channels and channel selection criteria.” *See id.* at 4:26–28. “For example, the selection criteria may be to select the good channels but not the bad channels.” *Id.* at 7:3–5; *see id.* at 4:4–12 (describing a “bad” channel as one that suffers from interference). The methods and devices may revert to the plurality of channels and thereafter may select a second set of communication channels. *See id.* at 4:28–31.

The ’500 patent describes various techniques for measuring performance of communications channels. *See id.* at 10:33–15:7. For example, the methods and devices of the ’500 patent may measure performance by means of special test packets (*id.* at 10:49–12:53), received signal strength indicators (“RSSI”) (*id.* at 12:57–13:17), cyclic redundancy checks (“CRC”) (*id.* at 14:1–21), and forward error correction (“FEC”) (*id.* at 14:39–56). The methods and devices of the ’500 patent may classify a communication channel based on channel performance and one or more classification criteria. *Id.* at 15:14–42. “For example, a channel may be classified as ‘good’ or ‘bad’ based on the results of the channel performance testing by applying one or more performance measurements to specified performance criteria.” *Id.* at 15:16–19.

The methods and devices of the ’500 patent use a frequency hopping (“FH”) protocol, such as defined by Bluetooth standards.⁵ *Id.* at 8:19–23.

A frequency hopping (FH) protocol is an approach for wireless communications in a communications network that

⁵ The “Bluetooth” word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. *E.g.*, 620 Dec. on Inst. 5 n.3.

uses a frequency hopping signal transmission technique in which information or data is transmitted over a set of frequencies in a communications frequency band. . . . The order in which the communications network hops among the set of frequencies is known as the *hopping sequence*.

Id. at 2:19–27 (emphasis added). For example, a method or a device using a FH protocol “transmits data on one channel, hops to the next channel in the hopping sequence to transmit more data, and continues by transmitting data on subsequent channels in the hopping sequence.” *Id.* at 2:34–38. “When the FH communications system hops over part of the frequency band *occupied* by an [non-frequency hopping (“NFH”)] communications system, there may be interference between the systems.” *Id.* at 3:33–36 (emphasis added). “Interference results in data transmission errors, such as an increase in the bit error rate (BER) or the loss of data packets, resulting in reduced transmission quality and performance and the need to retransmit the data.” *Id.* at 3:58–61. Thus, the use of an FH protocol may reduce problems with interference from other communications systems and other interference sources. *Id.* at 2:39–41.

Figure 5B of the ’500 patent also is reproduced below.

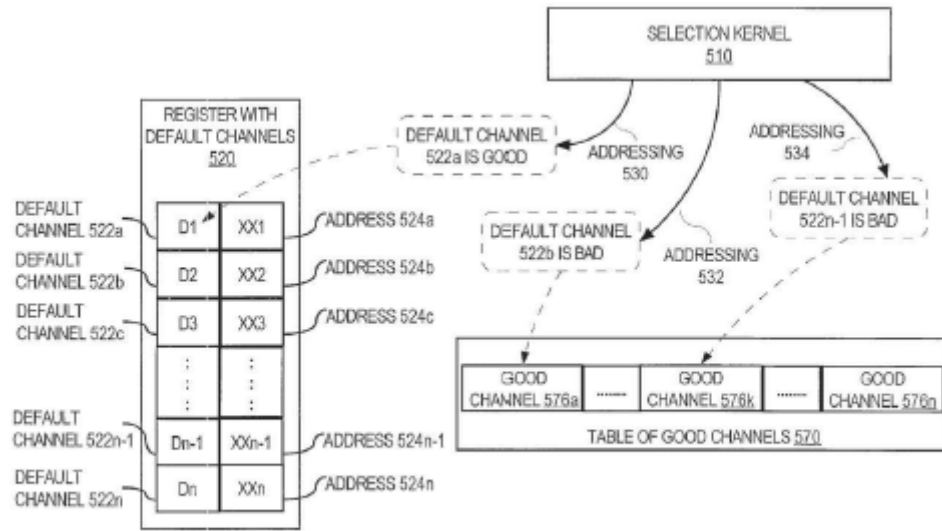


FIG. 5B

Figure 5B depicts forming a modified hopping sequence through replacement of a bad channel, i.e., default channel 522b, in a default set of channels, e.g., in a default FH sequence, with a good channel, i.e., good channel 576a, from table of good channels 570. *Id.* at 5:51–53; *see id.* at 20:13–16. For example, “whenever [the] selection kernel **510** addresses a bad default channel in [the] register with default channels **520**, the bad channel is replaced with good channels that are randomly selected from [the] table of good channels **570**.” *Id.* at 20:64–21:1. As a result, “only good channels are selected to form the hopping sequence.” *Id.* at 20:61–62.

The ’500 patent also discloses switching from using the modified hopping sequence back to using the default channels. *Id.* at 24:15–16. The decision to switch back to default channels may be based on elapsed time or changed performance. *See id.* at 24:18–28.

B. Illustrative Claims

Claims 1, 14, 16, and 29 are independent claims. Claims 1 and 14 are method claims, and claims 16 and 29 are directed to devices which implement methods substantially similar to those recited in claims 1 and 14, respectively. In particular, claim 16 recites a device including “at least one processor” and a memory storing instructions “which, when executed by the at least one processor” cause the device to perform substantially the same steps of the method recited in claim 1. Ex. 1001, 28:53–29:4 (claim 16); *cf. id.* at 27:11–27 (claim 1);⁶ *see* 620 Dec. on Inst. 21 n.8. Claims 2–13 depend directly or indirectly from claim 1; claim 15 depends from claim 14; claims 17–28 depend directly or indirectly from claim 16; and claims 30 and 31 depend directly from claim 29.

Although we instituted review of claims 1–5, 8–20, and 23–31, Patent Owner has elected only to argue the patentability of claims 4, 10, 11, 13, 19, 25, 26, and 28 of the ’500 patent. PO Resp. 1–2. “Patent Owner does not make *any arguments* herein related to the patentability of claims 1-3, 5, 8-9, 12, 14-18, 20, 23-24, 27 and 29-31 of the ’500 Patent.” *Id.* at 2 n.2 (emphasis added).

Claim 1 is illustrative of the independent claims 1 and 16 at issue and is reproduced below:

⁶ Although claim 16 recites “[a] frequency hopping wireless communication device” and “another frequency hopping wireless communication device,” instead of “a master device” and “a slave device,” as recited in claims 1 and 14, we understand that the communication devices of claim 16 encompass master and slave devices. *See* Ex. 1001, 2:5–18.

1. A method performed by a master device in a frequency hopping wireless communication system, the method comprising:
 - communicating with a slave device over a plurality of communication channels according to a default hopping sequence;
 - testing the plurality of communication channels;
 - selecting a subset of the plurality of communication channels based on results of the testing;
 - communicating with the slave device over the subset of communication channels according to an adapted hopping sequence;
 - monitoring the subset of communications channels;
 - based on results of the monitoring or after a specified period of time, reverting back to communicating with the slave device over the plurality of communication channels according to the default hopping sequence.

Id. at 27:11–27. As noted previously, claims 17–28 recite limitations that parallel those of claims 2–13, and the limitations of claim 15 parallel those of claim 30. *E.g.*, 620 Dec. on Inst. 7. In particular, we note the following correspondence of the recited limitations between the dependent claims argued by Patent Owner.

Dependent from Claim 1	Dependent from Claim 16
4	19
10	25
11	26
13	28

Thus, we again determine, for purposes of our analysis, that the device claims, although differing in format, do not require a separate analysis, and

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claims 4, 10, 11, and 13 are representative of the claims remaining in dispute in this proceeding. *E.g., id.* at 7–8; *see* Ex. 1001, 27:45–50 (claim 4), 28:16–23 (claims 10 and 11), 28:27–30 (claim 13).

C. Related Proceedings

Petitioner and Patent Owner identify pending related litigation in the Western District of Texas involving the '500 patent: *Bandspeed, Inc. v. Qualcomm Incorporated et al.*, Case No. 1:14-cv-436 (W.D. Tex.); *Bandspeed, Inc. v. Texas Instruments Incorporated*, Case No. 1:14-cv-438 (W.D. Tex.). 620 Pet. 2; 620 Paper 5, 2–3. Patent Owner, however, identifies additional related litigations in the Western District of Texas involving the '500 patent, which are no longer pending: *Bandspeed, Inc. v. Broadcom Corp.*, Case No. 1:14-cv-433 (W.D. Tex.); *Bandspeed, Inc. v. Marvell Semiconductor, Inc.*, Case No. 1:14-cv-434 (W.D. Tex.); *Bandspeed, Inc. v. MediaTek USA, Inc.*, Case No. 1:14-cv-435 (W.D. Tex.); and *Bandspeed, Inc. v. STMicroelectronics N.V. et al.*, Case No. 1:14-cv-437 (W.D. Tex.). 620 Paper 5, 2–3. In addition to now consolidated Case IPR2016-00623, the parties identify the following administrative proceedings before the Office: *In re Treister et al.*, Inter Partes Reexamination Control Nos. 95/000,647 & 95/002,111; *In re Gan et al.*, Inter Partes Reexamination Control Nos. 95/000,648 & 95/002,108; *MediaTek USA, Inc. v. Bandspeed, Inc.*, IPR2015-00237; *Qualcomm Inc. v. Bandspeed, Inc.*, IPR2015-00314 (joined with IPR2015-01577), IPR2015-00315 (joined with IPR2015-01580), IPR2015-00316 (joined with IPR2015-01581), and IPR2015-00531 (joined with IPR2015-01582). 620 Pet. 2; 620 Paper 5, 2.

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D. Applied References and Declaration

Petitioner relies on the following references and declarations in support of its asserted grounds of unpatentability:

Case	Exhibit	References and Declaration
IPR2016-00620	1002	Declaration of Dr. Zhi Ding (“620 Ex. 1002”)
IPR2016-00620	1009	U.S. Patent No. 7,684,465 B1 to Dabak <i>et al.</i> , filed Feb. 18, 2000 (“Dabak”)
IPR2016-00620	1010	U.S. Patent No. 6,909,737 B1 to Kockmann, publ’d Dec. 23, 1999 (“Kockmann”)
IPR2016-00623	1002	Declaration of Dr. Zhi Ding (“623 Ex. 1002”)
IPR2016-00623	1009	U.S. Patent No. 6,760,319 B1 to Gerten <i>et al.</i> , filed July 5, 2000 (“Gerten”)
IPR2016-00623	1011	U.S. Patent No. 7,280,580 B1 to Haartsen, filed Oct. 15, 1999 (“Haartsen”)
IPR2016-00623	1012	Kockmann

620 Pet. i.; 623 Pet. i.

The ’500 patent issued from U.S. Patent Application No. 14/034,206, filed September 23, 2013. Ex. 1001, [21], [22]. The ’500 patent, however, claims priority to a string of patent applications as a division or a continuation; the earliest of these claims a filing date of September 6, 2001. *Id.* at [60]; *see* 620 Pet. 4–5. Nevertheless, Petitioner notes that the ’500 patent claims priority to U.S. Provisional Patent Application No. 60/264,594, filed January 25, 2001. Ex. 1001, [60]; *see, e.g.*, 620 Pet. 5. Petitioner asserts that the filing date of the provisional application is the “earliest effective filing date” to which the ’500 patent could claim priority, but argues that each of Dabak, Gerten, Haartsen, and Kockmann is prior art to the ’500 patent as of that date or the September 6, 2001, filing date of the earliest utility application from which the ’500 patent claims priority. 620 Pet. 5; 623 Pet. 5. Patent Owner does not propose an

alternative date, but asserts that “[a] POSITA would also have had access to relevant technical publications, text books and online references at the time of the invention just prior to January 25, 2001 which is the date of U.S. Provisional Application No. 60/264,594 to which the ‘500 Patent claims priority.” PO Resp. 6. For purposes of this Final Written Decision, we treat January 25, 2001, as the earliest effective filing date.

E. Grounds of Unpatentability

We instituted review on the following grounds of unpatentability:

Reference(s)	Basis	Challenged Claims
Dabak and Kockmann	§ 103(a)	1–5, 8–20, and 23–31
Gerten	§ 103(a)	1–5, 10, 11, 13–20, 25, 26, and 28
Gerten and Kockmann	§ 103(a)	1–5, 8–11, 13–20, 23–26, and 28–31
Gerten and Haarsten, alone or in combination with Kockmann	§ 103(a)	12 and 27

IPR2016-00620, Paper 6, 34; IPR2016-00623, Paper 6, 34. Nevertheless, in view of Patent Owner’s decision to waive all arguments and the presentation of evidence with respect to challenged claims, other than claims 4, 10, 11, 13, 19, 25, 26, and 28 (PO Resp. 2 n.2; Paper 8, 3 (“The patent owner is cautioned that any arguments for patentability not raised in the response will be deemed waived.”)), the challenges to independent claims 1 and 16 and the following grounds are addressed in greater detail below:

Reference(s)	Basis	Challenged Claims
Dabak and Kockmann	§ 103(a)	4, 10, 11, 13, 19, 25, 26, and 28
Gerten	§ 103(a)	4, 10, 11, 13, 19, 25, 26, and 28
Gerten and Kockmann	§ 103(a)	4, 10, 11, 13, 19, 25, 26, and 28

F. Assessment of Person of Ordinary Skill in the Art

Petitioner argues that a person of ordinary skill in the relevant art “would have a B.S. degree in Electrical and/or Computer Engineering, or an equivalent field, as well as at least 3-5 years of academic or industry experience in the wireless communications field.” *E.g.*, 620 Pet. 11 (citing 620 Ex. 1002 ¶¶ 10–13); *see* 620 Ex. 1002 ¶ 14. Patent Owner and Patent Owner’s declarant, Dr. Melendez,⁷ adopt this assessment for purposes of this proceeding. PO Resp. 5–6; Ex. 2001 ¶ 29. We note that both Petitioner’s declarant and Patent Owner’s declarant exceed this assessment (Ex. 1002 ¶¶ 3–8; Ex. 2001 ¶¶ 10–16) and are competent to testify regarding the lower assessment of a person of ordinary skill in the art, and, for purposes of this Final Written Decision and to the extent necessary, we adopt this assessment of a person of ordinary skill in the relevant art.

II. DISCUSSION

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are construed according to their broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b). Under that standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

⁷ Although each party relies on declarant testimony to support its arguments, neither party elected to cross-examine the other party’s declarant.

Petitioner proposed constructions for four claim terms in its Petitions: “hopping sequence,” “clear” and “occupied” channel, and “default hopping sequence.” *E.g.*, 620 Pet. 11–13. We construed each of these terms in our institution decisions for Case IPR2016-00620 and Case IPR2016-00623. 620 Dec. on Inst. 10–15; 623 Dec. on Inst. 5–7.

1. “*hopping sequence*” (*Claims 1, 14, 16, and 29 and others*)

In the institution decisions, we determined that, in light of the Specification of the ’500 patent, the broadest reasonable interpretation of the phrase “hopping sequence” is “*the order in which the communications network hops among the set of frequencies.*” *E.g.*, 620 Dec. on Inst. 10–11 (citing 620 Pet. 11–12). Patent Owner does not contest this construction. PO Resp. 6–7. For the reasons set forth in the Decision on Institution in Case IPR2016-00620, we remain persuaded that Petitioner’s proposed construction is the broadest reasonable interpretation of the phrase “hopping sequence.”

2. “*clear*” and “*occupied*” channel (*Claims 4, 7, 19, and 22*)

In our institution decisions, we determined that the broadest reasonable interpretation of a “clear” channel is “a channel that is not already in use by a non-frequency hopping (NFH) communication system” and that the broadest reasonable interpretation of an “occupied” channel is “a channel that already is in use by a NFH communication system.” *E.g.*, 620 Dec. on Inst. 11–13. Patent Owner does not contest that construction (PO Resp. 6–7), but Petitioner raises new arguments regarding the

construction of these terms (Reply 2–6).⁸ For the reasons set forth below, we maintain our previous constructions.

First, Petitioner argues that “[t]he specification of the ’500 Patent does not teach **classifying** a channel as ‘clear’ or ‘occupied.’ The ’500 Patent does, however, disclose **examples** of multiple types of interference, e.g., both isolated interference and fixed NFH systems. [Ex. 1001,] 3:27-44; 15:32-43.” Reply 2. Nevertheless, Petitioner fails to show where any of the examples of isolated interference refers to “occupied” channels. Instead, as we noted in the institution decisions, the Specification of the ’500 patent states that “[w]hen the FH communications system hops over part of the frequency band *occupied by an NFH communications system*, there may be interference between the systems.” Ex. 1001, 3:33–36 (emphasis added); *see, e.g.*, 620 Dec. on Inst. 12. Moreover, the claims are part of the Specification, and claim 4, as well as claim 19, states that “the channel classifications for the plurality of communication channels comprise *one of two values for each channel* of the plurality of communication channels, *one of the two values* indicating the channel is *occupied* and the other of the two

⁸ Petitioner acknowledges that:

Patent Owner does not raise any argument regarding Claims 4 and 19 under Petitioner’s proposed constructions. Instead, Patent Owner argues that these claims are not obvious because the [Institution Decision] adopted a narrower construction of “clear” and “occupied” channel than proposed by Petitioner.

Reply 2. Because Patent Owner does not challenge the construction of these terms, Petitioner’s new arguments in its Reply may exceed the scope of the Patent Owner Response. 37 C.F.R. § 42.23(b). Nevertheless, Patent Owner does not object to the presentation of these arguments, and we consider them here.

values indicating the channel is *clear*.” Ex. 1001, 27:45–50 (emphases added). Thus, we read the Specification as describing “occupied” in relation to frequency bands, e.g., channels, in use by a NFH communications system, and “clear” as the alternative, i.e., the *other* of *two* classification values, to “occupied.”

Second, according to Petitioner, “[t]hat ‘clear’ and ‘occupied’ are not limited to NFH systems is further confirmed by the disclosed channel classification methods, which assign performance characteristics by applying ***one or more*** performance measurement tests.” Reply 3 (citing Ex. 1001, 15:60–16:13 (Table 1), 17:15–30 (Table 2)). Specifically, Petitioner argues that the ’500 patent discloses that

Determining an interference situation results from an NFH system, among other things, requires at least two performance measurements - a first identifying and a second confirming a continued presence of interference. Indeed, the specification recognizes that use of “multiple tests” is needed to distinguish ***“an isolated instance of interference [that] may cause a poor channel performance measurement”*** [Ex. 1001,] 15:32-37.

Id. Thus, Petitioner argues that, because multiple tests must be applied to determine the continued presence of interference regardless of the source, limiting “occupied” to NFH communications systems is overly narrow. Nevertheless, the words chosen by the patentee to describe its invention have significance. *In re Morris*, 127 F.3d 1048, 1056 (Fed. Cir. 1997) (“It is the applicants’ burden to precisely define the invention, not the PTO’s.”). As noted above, “occupied” is *only* used in the Specification with respect to NFH communications systems, and neither claims 4 and 19 nor their base claims nor the intervening claims specify a single or multiple tests.

Therefore, we find Petitioner’s arguments, which attempt to incorporate the teachings of “bad” and “good” channels from elsewhere in the Specification into the interpretation of these claim limitations, unpersuasive. *See Intervet America, Inc. v. Kee-Vet Laboratories, Inc.*, 887 F.2d 1050, 1053 (Fed. Cir. 1989) (“[I]nterpreting what is *meant* by a word *in* a claim ‘is not to be confused with adding an extraneous limitation appearing in the specification, which is improper.’”); *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Third, Petitioner argues that principles of claim differentiation suggest that our construction of “occupied” and “clear” are overly narrow. Reply 3. In particular, Petitioner argues that “Claims 4 and 19 depend from claims[, i.e., independent claims 1 and 16, respectively,] requiring a single test of communication channels prior to classification of channels as ‘occupied’ or ‘clear.’” *Id.* at 3–4. Thus, Petitioner argues that, because the determination that a channel is “occupied” by a NFH communications system requires multiple tests, our construction of claims 4 and 19 renders claims 10 and 25 superfluous. *Id.* at 4. We disagree.

Petitioner’s argument is based on the incorrect premise that claims 1 and 16 are limited to the use of a *single* test for classification. Petitioner fails to point to any language of claim 1 or 16 that recites the use of only a single test. In fact, each of claims 1 and 16 only refers generally to “testing” and to the results of “testing.” *See, e.g.*, Ex. 1001, 27:17–19. Because we interpret claims 1 and 16 to recite that “testing” may include one or more tests, claims 4, 10, 19, and 25 *may* recite methods or systems employing multiple tests. Moreover, we find that claims 10 and 25 depend directly

from claims 1 and 16, respectively, and recite different limitations from those recited in claims 4 and 19. *Compare* Ex. 1001, 27:45–50 (claim 4) *with id.* at 28:16–18 (claim 10). Thus, we are not persuaded that any limitations of other claims are contradicted or that any limitations of these claims are rendered superfluous by our constructions.

Fourth, Petitioner argues that, because we find that “‘clear’ should be construed ‘in the context’ of the term ‘occupied,’” we should look to other uses of the term “clear” in the Specification. Reply 4 (citing 620 Dec. on Inst. 12–13). In particular, Petitioner argues that we should look to “good channel usage timeout” to interpret “clear channel usage timeout.” *Id.* at 5 (citing Ex. 1001, 21:30–41). In its Petitions, Petitioner asserts that

[t]he specification of the ’500 Patent does not use the terms “clear” or “occupied” to refer to channels. Instead, the ’500 Patent uses the terms “good” and “bad” channels. Ex. [1001] 4:10, 6:58-63. A “good” channel is one that experiences a low interference level, whereas a “bad” channel experiences a high interference level. *Id.* A [person of ordinary skill in the art] reading the specification would equate a “good” channel to a “clear” channel and a “bad” channel to an “occupied” channel. [620] Ex. 1002 ¶ 32.

620 Pet. 12 (emphasis added). As we stated in the institution decisions, we find that the terms “occupied” and “clear,” however, are narrower terms than “bad” and “good,” respectively, and their meanings cannot properly be equated under the broadest reasonable interpretation standard. 620 Dec. on Inst. 12; *see* IPR2016-00620, Ex. 1011, 10 (“[T]he existence of NFH systems will give high RSSI in channels they *occupy*.”), 12 (“A channel which gives constant packet loss or high [number of error bits (“NEB”)] will be identified as occupied by NFH system, and classified as Occupied. Other

channels will be classified as Clear, even though they occasionally give packet loss or high NEB, as this could be a clash by another FH system or local fading.”). We maintain that distinction here.

Finally, Petitioner argues that, because claims 4 and 19 refer to “channel classifications” and because throughout the Specification channel classifications are referred to “good” or “bad,” rather than “clear” and “occupied,” we should modify our constructions because they cover “new matter” absent from the Specification. Reply 5. As the Specification explains, “[i]n contrast to FH systems, a non-frequency hopping (NFH) system is simply a communications system whose carrier does not hop over a set of frequencies. A typical NFH system may *occupy* a portion of the *communications frequency band* corresponding to several frequencies used by an FH system.” Ex. 1001, 2:28–32 (emphasis added); *see* 620 Dec. on Inst. 13. A relevant dictionary defines a “channel” as “[a] band of radio frequencies channel allotted to a particular purpose.” MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 328 (4th ed. 1989) (Ex. 3003). Thus, we are persuaded that the Specification of the ’500 patent teaches classifying a channel as “occupied,” rather than only as “bad,” and, in the context of claims 4 and 19, we understand that the term “clear” should be construed as an alternative to “occupied.”⁹ No “new matter” is covered by this construction. *See* Reply 5.

⁹ Petitioner also faults Patent Owner for failing to provide *extrinsic* evidence supporting our constructions of the terms “occupied” and “clear.” Reply 5. Because Patent Owner elected not to contest our constructions, it was not required to attempt to strengthen them with additional evidence. Given that we found that the language of the claims and the Specification was sufficient

Consequently, we maintain that the broadest reasonable interpretation of a “clear” channel is “a channel that is not already in use by a non-frequency hopping communications system” and that the broadest reasonable interpretation of an “occupied” channel is “a channel that already is in use by a non-frequency hopping communications system.”

3. “*default hopping sequence*” (*Claims 1, 14, 16, and 29*)

In the institution decisions, we determined that the broadest reasonable interpretation of “default hopping sequence” is “‘a preset hopping sequence that does not change based on channel performance, including, but not limited to, an original hopping sequence.’” *E.g.*, 620 Dec. on Inst. 14–15. Neither Patent Owner nor Petitioner contests this construction. PO Resp. 6–7; Reply 2–6. For the reasons set forth in the Decision on Institution in Case IPR2016-00620, we remain persuaded that our previous construction is the broadest reasonable interpretation of the phrase “default hopping sequence.”

4. *Other Claim Terms*

For purposes of this Decision, we discern no other claim terms that require express interpretation. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (explaining that “claim terms need only be construed ‘to the extent necessary to resolve the controversy’” (quoting

to allow us to construe the terms “occupied” and “clear,” we relied less on Dr. Ding’s testimony regarding how a person of ordinary skill in the art would understand these terms. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc) (“[T]he specification ‘is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.’”).

Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999)); *see* PO Resp. 7.

B. Asserted Grounds

As noted above, we granted institution of *inter partes* review of claims 1–5, 8–20, and 23–31 of the '500 patent. 620 Dec. on Inst., 34; 623 Dec. on Inst. 34. Patent Owner elected to challenge Petitioner's asserted grounds with respect to only a limited number of claims, namely, claims 4, 10, 11, 13, 19, 25, 26, and 28 of the '500 patent. PO Resp. 1–2; *see id.* at 2 ("STATEMENT OF RELIEF REQUESTED"),¹⁰ 2 n.2 (Patent Owner does not present "any arguments" regarding the other challenged claims.), 8–9 (summarizing Patent Owner's contentions).

In our Scheduling Order, we expressly cautioned Patent Owner that "*any arguments* for patentability not raised in the response will be deemed waived." Paper 8, 3. Consequently, we treat as waived any arguments for patentability that Patent Owner might have raised with respect to claims 1–3, 5, 8, 9, 12, 14–18, 20, 23, 24, 27, and 29–31. In particular, we treat as waived any arguments that Patent Owner might have raised regarding the claims from which claims 4, 10, 11, 13, 19, 25, 26, and 28 depend, i.e., independent claims 1 and 16, as well as any intervening claims, for those

¹⁰ Specifically, Patent Owner requests that we find claims 4, 10, 11, 13, 19, 25, 26, and 28 "valid." PO Resp. 2. Nevertheless, because the presumption of validity does not apply to claims before the Board in an *inter partes* review, we instead assess *patentability*, i.e., should the Office have found the claims under review unpatentable under 35 U.S.C. §§ 102 and 103 in view of the arguments and evidence presented by Petitioner. 35 U.S.C. § 311; *see In re Etter*, 756 F.2d 852, 855–859 (Fed. Cir. 1985) (en banc), cert. denied, 474 U.S. 828 (1985).

eight (8) claims, for which Patent Owner has chosen to present arguments and evidence for patentability. *See Nike, Inc. v. Adidas AG*, 812 F.3d. 1326, 1335 (Fed. Cir. 2016) (“In its Final Written Decision, the Board acknowledged that because Nike declined to file a response to the petition, the Board would ‘accept as unchallenged that Nishida teaches or suggests all of the limitations of [the] original claims.’ This left only the added limitation in proposed substitute claims 47-50, namely, the recitation of ‘flat knit edges free of surrounding textile structure.’”); *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1380–1381 (Fed. Cir. 2016) (“NuVasive abandoned its challenge to the public accessibility determination even though the PTAB had warned NuVasive [in the Scheduling Order] that this would result in waiver.”).

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 between the claimed subject matter and the prior art; (3) the level of skill in the art;¹¹ and (4) objective evidence of nonobviousness,

¹¹ *See supra* Section I.F.

i.e., secondary considerations.¹² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Despite Patent Owner’s waiver of any arguments for patentability with respect to claims 1–3, 5, 8, 9, 12, 14–18, 20, 23, 24, 27, and 29–31, the burden of proving the unpatentability of the challenged claims rests with Petitioner. We also acknowledge that “the decision to institute and the final written decisions are ‘two very different analyses,’ and each applies a ‘qualitatively different,’” but potentially overlapping, standard. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016) (citing *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016)). Although we weigh the arguments and evidence anew in the context of this Final Written Decision, arguments and evidence sufficient to support a determination that there is *at least* a reasonable likelihood of prevailing in showing the unpatentability of challenged claims also may be sufficient, especially if acquiesced to and/or unchallenged by Patent Owner, to support a determination of unpatentability by a preponderance of the evidence. Here, they are. Petitioner presents detailed mappings of the challenged claims onto the teachings of the applied references and reasons why a person of ordinary skill in the art would combine the teachings of the applied references, supported by Dr. Ding’s testimony. *See* 620 Pet. 38–55 (Obviousness over Dabak and Kockmann); 623 Pet. 17–40 (Obviousness over Gerten), 40–57 (Obviousness over Gerten and Kockmann), 57–60

¹² Patent Owner does not argue or present evidence of secondary considerations supporting a determination of non-obviousness in its Patent Owner Response.

(Obviousness over Gerten and Haartsen, with or without Kockmann); 620 Ex. 1002 ¶¶ 107–209; 623 Ex. 1002 ¶¶ 41–228.

As noted above, Patent Owner elected to not present any arguments or evidence for the grounds asserted in the Petitions against claims 1–3, 5, 8, 9, 12, 14–18, 20, 23, 24, 27, and 29–31 in the preliminary proceeding **and** during trial. Thus, not only does Patent Owner fail to present any arguments or evidence in response to Petitioner’s arguments and evidence that the applied art teaches or suggests all of the limitations of these claims, but also to Petitioner’s arguments and evidence that a person of ordinary skill in the relevant art would have had sufficient reason to combine the teachings of the applied art to achieve the recited methods and systems. We expressly adopt as our own findings Petitioner’s persuasive evidence and rationale for applying Gerten or combining the teachings of the applied references regarding claims 1–3, 5, 8, 9, 12, 14–18, 20, 23, 24, 27, and 29–31 here. Thus, we are persuaded that Petitioner demonstrates by a preponderance of the evidence that claims 1–3, 5, 8, 9, 12, 14–18, 20, 23, 24, 27, and 29–31 of the ’500 patent are unpatentable on the asserted grounds. We now turn to Petitioner’s challenges to claims 4, 10, 11, 13, 19, 25, 26, and 28, as well as to their base claims, and Patent Owner’s response to those challenges.

1. Obviousness over Combined Teachings of Dabak and Kockmann

a. Overview

Petitioner argues that claims 4, 10, 11, 13, 19, 25, 26, and 28 are unpatentable under 35 U.S.C. § 103(a) as obvious over Dabak and Kockmann. *See supra* Section I.E. To support its arguments, Petitioner provides a detailed mapping of limitations of challenged claims to Dabak

and Kockmann. 620 Pet. 16–55. Petitioner also cites Dr. Ding’s Declaration for support. *See* 620 Ex. 1002 ¶¶ 107–209. We begin our analysis of these challenges with an overview of the teachings of Dabak and of Kockmann.

b. Dabak

Dabak seeks to improve data throughput and to reduce packet error rates in FH systems. Dabak, 4:33–49; *see* 620 Ex. 1002 ¶ 35. Dabak teaches systems and methods for improvement of Bluetooth protocol frequency hopping. Dabak, 2:26–30. The Bluetooth protocol allows master and slave devices to frequency hop among 79 1-MHz channels in the 2.4 GHz industrial, scientific, and medical (“ISM”) band up to 1,600 times per second. *Id.* at 1:38–40, 64–66. “Although the Bluetooth protocol employs frequency hopping to provide for frequency diversity and as a means for providing robustness against noise/interference, the frequency hopping of Bluetooth does not exploit the full frequency diversity of the wide Bluetooth transmission bandwidth, particularly for voice applications.” *Id.* at 2:13–18. To further address these issues, Dabak teaches the “use of solely good frequencies” to “significantly improve Bluetooth performance.” *Id.* at 5:65–67. In particular,

[b]ased upon the Slave to Master transmission, *the Master keeps a record of the best frequencies*, i.e. those frequencies exhibiting good signal correlation characteristics, low numbers of retransmissions, low BER and the like. Signals generated at these frequencies will have the least path loss or least interference from other sources, like microwave ovens, etc. *Then, at some point in time, the Master communicates to the Slave that after N packets, the Master and Slave should use the frequency f_i , in their communication for a time T_i (instead of the*

normal Bluetooth hopping frequencies over time T_i). . . . After time T_i , the Master and Slave would return to the normal Bluetooth hopping frequencies. The foregoing procedure would then be continually repeated as long as the Master and Slave continue to communicate with one another.

Id. at 2:38–62 (emphasis added). In Dabak, the “normal Bluetooth hopping frequencies” correspond to a default FH sequence.

Figures 3A and 3B of Dabak are reproduced below.

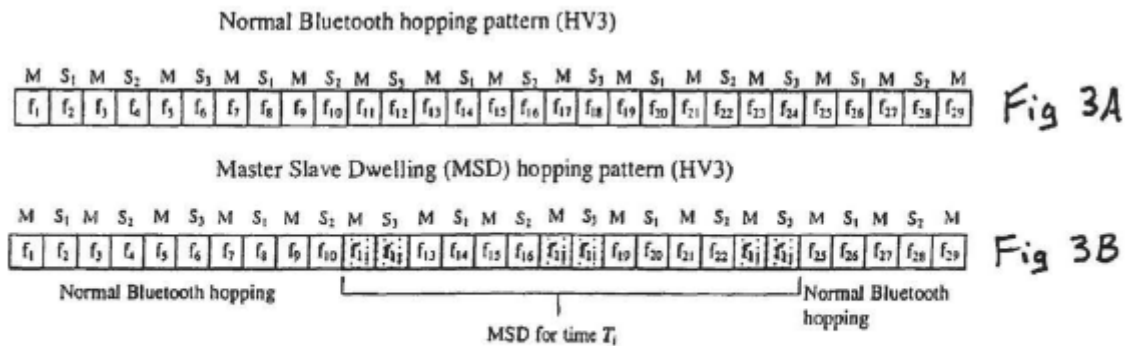


Figure 3: The Master-Slave Dwelling (MSD) hopping pattern is shown for slave 3, HV3 voice. Slaves 1, 2 use normal Bluetooth hopping frequencies.

Figure 3A depicts Dabak’s use of a Master-Slave Dwelling (MSD) technique, in which a normal Bluetooth FH pattern is employed. *Id.* at 8:42–49. Figure 3B depicts the switch to the MSD technique for time T_i .

Specifically, Master (M) communicates with Slaves (S_1 , S_2 , and S_3) over 29 different channel frequencies (f_1 , f_2 , . . . f_{29}). *Id.* During this normal Bluetooth FH,

the Master performs measurements on all frequencies regarding path loss characteristics between the Master and the Slave to determine the channels with least interference from other sources, e.g. other Bluetooth links, microwave ovens and the like. The path loss characteristics are evaluated to determine if Master-Slave Dwelling should be implemented

Id. at 7:17–23. Based upon these measurements, the Master “keeps a record of the best frequencies, i.e., frequencies with [the] least path loss or least interference from other sources.” *Id.* at 7:29–31. If the Master “determine[s] that one or more frequencies are not effectively providing error-free transmissions to the Slave(s),” the MSD technique is implemented. *Id.* at 7:24–28.

Referring to Figure 3B, during time T_i , communications between the Master and Slaves S_1 and S_2 continue to *frequency hop*, but communications between the Master and Slave S_3 *dwell* on a single frequency, frequency f_{11} . *Id.* at 8:49–57. Although communications with Slave S_3 dwell at frequency f_{11} , communications with Slaves S_1 and S_2 continue according to the normal Bluetooth FH protocol.

Normal Bluetooth hopping is again implemented at frequency f_{25} which is the first hopping frequency used by the Master following the MSD. *During the time T_i , it can be seen that all communications between the Master and Slaves 1 and 2 will continue using the normal Bluetooth hopping pattern, even though MSD is being used between the Master and Slave 3.*

Id. at 8:57–63 (emphasis added). At the end of period T_i , or if communications are adversely affected by a new source of interference, the Master and Slave S_3 resume normal Bluetooth FH. *Id.* at 7:44–51, 57–64.

c. Kockmann

As with Dabak, Kockmann teaches apparatus and methods for improvement of FH protocol performance. *See Kockmann*, 2:49–53. In particular, Kockmann notes that:

Problems occur when the plurality of usable carrier frequencies is not temporally constant. This, for example, is the

case when a carrier frequency recognized as *disturbed* is blocked during a certain time span and, thus, is not enabled for employment and, for example, is enabled for re-employment after a certain time span.

Id. at 2:24–32 (emphasis added). “A disturbed carrier frequency is thus a carrier frequency onto which a signal is modulated that exceeds a specific threshold.” *Id.* at 6:47–49. A disturbance may be “either a disturbance in the actual sense *or an occupancy by some other transmitter is present.*” *Id.* at 6:42–43 (emphasis added).

Kockmann teaches that a base station sends a message to mobile stations providing the list of disturbed frequencies. *Id.* at 4:33–40. The base station and mobile stations eliminate disturbed frequencies from their table of frequencies used for FH communication. *Id.* at 4:27–31, 40–44. Kockmann’s apparatus then forms a “modified sequence” replacing disturbed frequencies and comprising only undisturbed frequencies. *Id.* at 7:44–55. Once Kockmann’s apparatus detects that “the previously disturbed carrier frequency is now no longer disturbed,” or “when [the frequency] was inhibited for longer than a previously defined time,” that frequency no longer needs to be replaced in the table of frequencies used for communication. *Id.* at 7:53–63, 8:39–49, 11:24–33.

d. Analysis

i. Claims 1 and 16

Initially, we consider Petitioner’s challenges to independent claims 1 and 16. Petitioner provides a mapping onto Dabak of most of the limitations of each of claims 1 and 16. Petitioner also argues that Kockmann teaches the limitation of independent claims 1 and 16 that is missing from Dabak,

namely, “communicating with the slave device over the subset of communication channels according to an adapted hopping sequence,” and that a person of ordinary skill in the art would have had reason to combine the teachings of Dabak and Kockmann to achieve the methods and devices recited in those independent claims. 620 Pet. 39–40 (claim 1), 49 (claim 16). For the reasons set forth below, we agree.

Petitioner argues that Kockmann teaches

frequency hopping, monitoring interference and disturbances on each channel, eliminating disturbed channels from the hopping sequence, hopping over an adapted frequency hopping sequence, and reintroducing the previously disturbed channels in the hopping sequence once disturbance has abated, i.e., reverting back to a default hopping sequence.

620 Pet. 16 (citing 620 Ex. 1002 ¶ 39). In particular, Petitioner argues that Kockmann teaches that, if a particular frequency in a hopping sequence is determined to be “disturbed,” that frequency is removed from the hopping sequence. *Id.* at 39 (citing Kockmann, 7:25–44). Petitioner further argues that

the removal of the disturbed frequency from the hopping sequence creates a “modified sequence” that “comprises only undisturbed carrier frequencies.” [Kockmann] 7:44-47. Kockmann’s disclosure of “only undisturbed carrier frequencies” is a subset of communications channels; the “modified sequence” using only undisturbed frequencies is the adapted hopping sequence. [620] Ex. 1002 ¶ 112. As such, Kockmann teaches communicating with a slave device over the subset of communications channels according to an adapted hopping sequence. *Id.*

620 Pet. 39. We find this argument persuasive, and, thus, we are persuaded that Kockmann teaches the limitation of independent claims 1 and 16 that is

missing from Dabak. Further, as noted above, we are persuaded that Dabak teaches the remaining limitations of independent claims 1 and 16. *See id.* at 17–20 (the remaining limitations of claim 1 taught by Dabak; citing Dabak, 1:60–66, 2:36–42, 6:31–34, 7:17–22, 24–26, 28–37, 8:20–22, Figs. 1, 2A; 620 Ex. 1002 ¶¶ 41–44), 33–35 (the remaining limitations of claim 16 taught by Dabak; citing Dabak, 11:12–14, 22–24, 28–31, 15:6–7, Figs. 4, 5, 8, and 9; 620 Ex. 1002 ¶¶ 80–88).

Petitioner also provides a persuasive rationale for combining the teachings of Dabak and Kockmann. *Id.* at 39–40. Petitioner asserts that they are both references directed to the same problem, namely, “to communication performance improvements through adapted frequency hopping to avoid channels disturbed by interference.” *Id.* at 40 (citing Dabak, Abstract; Kockmann, 2:49–3:20; 620 Ex. 1002 ¶ 113). In addition, according to Petitioner, a person of ordinary skill in the art would have had reason to modify the teachings of Dabak regarding the MSD technique in view of the teachings of Kockmann “to utilize multiple channels to communicate with the slave device over the subset of communication channels according to an adapted hopping sequence” in order to accomplish the shared goals of these references. *Id.* at 40 (citing 620 Ex. 1002 ¶ 113); *see In re Ethicon, Inc.*, 844 F.3d 1344, 1351 (Fed. Cir. 2017) (“The normal desire of artisans to improve upon what is already generally known can provide the motivation to optimize variables such as the percentage of a known polymer for use in a known device.”). According to Petitioner, the combination of these teachings “is a simple use of known teachings to yield predictable results.” *Id.* (citing *KSR*, 550 U.S. at 416 (“The combination of

familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”)).

Based on our review of Petitioner’s arguments and evidence, we find that Petitioner demonstrates that combined teachings of Dabak and Kockmann teach or suggest all of the limitations of independent claims 1 and 16 and find that a person of ordinary skill in the art would have had reason to combine the teachings of Dabak and Kockmann to achieve the methods of claim 1 and the devices of claim 16. *See* 620 Pet. 17–20, 33–35, 38–40, 48–49. We conclude that Petitioner has shown by a preponderance of the evidence that independent claim 1 would have been obvious over the combined teachings of Dabak and Kockmann. Moreover, because Petitioner’s arguments for the obviousness of independent claim 16 over Dabak and Kockmann rely on the arguments and evidence presented with respect to independent claim 1, we also conclude that Petitioner has shown by a preponderance of the evidence that independent claim 16 would have been obvious over the combined teachings of Dabak and Kockmann, as well as on its related challenges to dependent claims 2, 3, 5, 8, 9, 12, 14, 15, 17, 18, 20, 23, 24, 27, and 29–31. *See* 620 Pet. 25–26, 40 (claim 2; citing Dabak, 7:57–60, 8:1–2, Fig. 1; 620 Ex. 1002 ¶ 51, 52), 26–27, 40 (claim 3; citing Dabak, 2:39–40, 3:1–5, 3:50–54, 3:60–62; 620 Ex. 1002 ¶¶ 54, 55), 27–28, 42 (claim 5; citing Dabak, 7:57–67; 620 Ex. 1002 ¶ 57), 28, 44 (claim 8; citing Dabak, 2:58–59; 620 Ex. 1002 ¶ 59), 44–47 (claim 9; citing Kockmann, 7:44–47, 8:39–48; 620 Ex. 1002 ¶¶ 136, 137), 31, 47 (claim 12; citing Dabak, Fig. 3B; 620 Ex. 1002 ¶ 65), 31–32, 47 (claim 14; citing 620 Ex. 1002 ¶¶ 69–75, 152), 32–33, 48 (claim 15; citing Dabak, 3:1–5, 7:57–

60; 620 Ex. 1002 ¶¶ 77, 78), 35, 49 (claim 17; citing 620 Ex. 1002 ¶¶ 90, 91), 35–36, 49 (claim 18; citing 620 Ex. 1002 ¶¶ 93, 94), 36, 50 (claim 20; citing 620 Ex. 1002 ¶ 96), 36, 51 (claim 23; citing 620 Ex. 1002 ¶ 98), 51–52 (claim 24; citing 620 Ex. 1002 ¶ 186), 37, 52 (claim 27; citing 620 Ex. 1002 ¶ 104), 52–53 (claim 29; citing 620 Ex. 1002 ¶¶ 196–198, 200–204), 54 (claim 30; citing 620 Ex. 1002 ¶¶ 206, 207), 54–55 (claim 31; citing Dabak, 11:2–6; 620 Ex. 1002 ¶ 209).

ii. *Claims 4 and 19*

Claim 4 depends from claim 3 and recites that “the channel classifications for the plurality of communication channels comprise one of two values for each channel of the plurality of communication channels, one of the two values indicating the channel is occupied and the other of the two values indicating the channel is clear.” Ex. 1001, 27:45–50. Similarly, claim 19 depends from claim 18 and recites identical limitations to those of claim 4. *Id.* at 29:24–29. Petitioner argues that Kockmann teaches that a channel frequency may be described as falling into one of two classifications: as *disturbed* frequency or as a *non-disturbed* frequency. 620 Pet. 41; see Kockmann, 6:43–49. Further, Petitioner notes that “[d]isturbance thereby means that either a disturbance in the actual sense or ***an occupancy by some other transmitter is present.***” 620 Pet. 41 (quoting Kockmann, 6:41–43). Thus, a *disturbed* frequency may be an *occupied* frequency. Similarly, both Dabak and Kockmann teach that a bad and disturbed frequency, respectively, may be determined by the level of interference measured on the frequency. See Dabak, 2:42–44; Kockmann,

6:47–49. Thus, we are persuaded that Kockmann teaches the additional limitations of claims 4 and 19.

Patent Owner does not contest Petitioner’s assertion that Dabak teaches the “classifications” of claim 3, from which claim 4 depends. 620 Pet. 26–27; *see also id.* at 35–36 (claim 18). Petitioner argues that a person of ordinary skill in the art “would recognize that Kockmann’s classification of carrier frequencies being disturbed discloses the value indicating an occupied channel, and Kockmann’s classification of carrier frequencies being non-disturbed discloses the value indicating a clear channel” (*id.* at 41 (citing 620 Ex. 1002 ¶ 124)). Thus, as recited in challenged claim 4, Kockmann teaches two values for channel classifications: one value indicating the channel is *occupied* and the other indicating the channel is *clear*. *Id.* at 42 (citing 620 Ex. 1002 ¶ 123). The simple substitution of a known classification variation within the same field would have been obvious to a person of ordinary skill in the art. 620 Ex. 1002 ¶ 124; *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.”).

Patent Owner contends, however, that the combined teachings of Dabak and Kockmann fail to teach or suggest all of the limitations of claim 4. In particular, Patent Owner contends that, “[a]s described in Kockmann, ‘disturbed’ does not in fact mean ‘occupied,’ but rather it only means that ‘[a] disturbed carrier frequency is thus a carrier frequency onto which a signal is modulated that exceeds a specific threshold.’” PO Resp. 14 (citing

Kockmann, 6:43–49). Patent Owner contends that determining whether a channel is “occupied” “requires analysis beyond the measurements called for by Kockmann (i.e.,] determining more than just the mere presence of a modulated signal ‘that exceeds a specific threshold,’ but rather whether its source was FH or NFH).” *Id.* at 15; *see* 620 Ex. 2001 ¶¶ 33–37.

Initially, Petitioner again states that Kockmann discloses that “[d]isturbance thereby means that either a disturbance in the actual sense *or an occupancy by some other transmitter is present.*” Kockmann, 6:41–43 (emphasis added). Patent Owner contends, however, “that a channel ‘occupied’ by an NFH system and a channel ‘disturbed’ by another transmitter are somehow different because an occupancy determination requires additional ‘analysis.’” Reply 10. Nevertheless, we agree with Petitioner that Patent Owner does not show where the claims recite one type of analysis or prohibit another. *Id.* Thus, we find that the combined teachings of Dabak and Kockmann teach or suggest all of the limitations of claim 4.

Petitioner’s arguments with respect to claim 4 apply equally to claim 19. Based on our review of the arguments and evidence, we conclude that Petitioner has established by a preponderance of the evidence that claims 4 and 19 would have been obvious over the combined teachings of Dabak and Kockmann.

iii. Claims 10 and 25

Claim 10 depends from claim 1 and recites that the step of “testing the plurality of communication channels comprises testing *each* channel of the plurality of communication channels multiple times.” Ex. 1001, 28:15–17

(emphasis added). Similarly, claim 25 depends from claim 16 and recites the identical limitations of claim 10. *Id.* at 30:8–10. As discussed above, Petitioner argues that the combined teachings of Dabak and Kockmann teach or suggest all of the limitations of claims 1 (620 Pet. 38–40) and 16 (*id.* at 48–49). Patent Owner does not contest this. PO Resp. 2 n.2. Petitioner argues that Dabak teaches or suggests the additional limitations of claims 10 and 25. 620 Pet. 47 (claim 10), 52 (claim 25). In particular, Petitioner argues that Dabak teaches a measurement loop in which all channels are measured (i.e., tested) on each iteration of the loop. 620 Pet. 28. According to Dabak, if a set of channel measurements does not indicate the need for MSD, channel measurements are repeated. *See* Dabak, 7:11–31.

Patent Owner contends, however, that the additional limitations of claims 10 and 25 must be read in the context of the limitations of their base claims. In particular, “[t]he method of claims 10 and 25 also incorporate ‘selecting a subset of channels based on results of the testing’ as recited in independent claims 1 and 16 from which claims 10 and 25 depend, respectively.” PO Resp. 16. Thus, Patent Owner contends that, “[i]n combination, these limitations require selection of a subset of channels based upon the results of testing that includes testing each channel multiple times *prior to* selecting the subset of channels.” *Id.* at 16–17 (emphasis added); *see* Ex. 1001, 16:1–13 (Table 1). Patent Owner contends that Dabak merely teaches that *each* measurement loop 116 results in a determination regarding whether to switch to MSD, rather than taking *multiple* measurements into account. PO Resp. 18.

Petitioner argues, however, that, referring to its Figure 1, Kockmann teaches the step of employing normal Bluetooth hopping frequencies and performing “channel measurements on all frequencies” (Kockmann, Fig. 1 (step 102)), then deciding whether to use MSD (*id.*, Fig. 1 (step 104)), and if the answer is “No,” repeating the channel measurements (*id.*, Fig. 1 (step 116)). Reply 13. In particular, Petitioner argues that:

Dabak explains that the Master “performs measurements on all frequencies regarding path loss characteristics between the Master and the Slave to determine the channels with least interference from other sources, e.g., other Bluetooth links, microwave ovens and the like.” [Dabak], 7:18-21. The Master then determines whether techniques should be implemented in order to avoid one or more channels. *Id.* 7:21-24. In doing so, the Master “determine[s] that one or more frequencies are not effectively providing error-free transmissions to the Slave(s), i.e., the transmissions must be repeated numerous times to ensure accurate transmissions.” *Id.* 7:25-28; *see also id.* 13:8-10 (“comparing whether a request to retransmit data occurs more than a **predetermined number of times**”) (emphases added). By determining whether transmissions must be repeated numerous times, Dabak makes determinations based on the results from multiple tests. *Id.* 7:25-31 (“the Master keeps a record of the best frequencies, i.e., frequencies with the least path loss or least interference from other sources”).

Reply 14–15. Petitioner argues that “Patent Owner’s arguments against Dabak are premised on its attempt to require the combining of the results of multiple tests in order to determine which channels to utilize,” but Petitioner argues that claim 10 does not recite such a limitation. *Id.* at 14. We agree.

Petitioner’s arguments with respect to claim 10 apply equally to claim 25. Based on our review of the arguments and evidence, we conclude that Petitioner has established by a preponderance of the evidence that claims 10

and 25 would have been obvious over the combined teachings of Dabak and Kockmann.

iv. *Claims 11 and 26*

Claim 11 depends from claim 1 and recites that the step of “transmitting a packet identifying the subset of communication channels to the slave device prior to communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.” Ex. 1001, 28:19–22. Similarly, claim 26 depends from claim 16 and recites identical limitations of claim 11. *Id.* at 30:11–16. Petitioner argues that the combined teachings of Dabak and Kockmann teach or suggest all of the limitations of claims 1 (620 Pet. 38–40) and 16 (*id.* at 48–49). Patent Owner does not contest this. PO Resp. 2 n.2. Petitioner again argues that Dabak teaches or suggests the additional limitations of claims 11 and 26. 620 Pet. 47 (claim 10), 52 (claim 25). In particular, Petitioner argues that:

Dabak discloses that the Master “[c]onvey[s] to Slave, use frequency fi for time Ti after J packets.” [Dabak,] Fig. 1; *see also* [*id.*] 2:45-47, 2:56-58; [620] Ex. 1002 [] ¶ 63. In the combination of Dabak and Kockmann, the Master sends a packet to the Slave identifying the subset of channels to use. This teaching, when read in context with the rejection of the independent claims as a whole, is sufficient to render obvious “transmitting a packet identifying the subset of communication channels to the slave device prior to communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.”

Reply 19. Thus, Petitioner argues that “Kockmann, not Dabak, discloses ‘a subset of communication channels’ and ‘an adapted hopping sequence’ in [this ground].” *Id.* at 18–19 (citing 620 Pet. 39).

Patent Owner contends, however, that Petitioner’s reliance on Dabak’s conveyance of MSD information does not teach or suggest “the subset of communication channels *according to the adapted hopping sequence*,” as recited in claim 11. PO Resp. 20. As we noted in the Decision on Institution for Case IPR2016-00620,

Petitioner argues that “Dabak teaches the concept of device M switching from a default hopping sequence to an adapted hopping sequence in order to avoid interference, then reverting back to the default hopping sequence.” [620] Pet. 15 (citing [620] Ex. 1002 ¶ 38). Although a single frequency may be a subset of a *plurality*, i.e., two or more, communication channels, as recited in claim 1, we are not persuaded that dwelling on a single frequency teaches an “adapted *hopping sequence*,” as we construed “hopping sequence” above. . . . [See 620] Pet. 11–12.

620 Dec. on Inst. 22. In its Petition, Petitioner relies solely on Dabak to teach this limitation (see 620 Pet. 47, 52) and, in particular, on Dabak’s teachings with respect to the MSD information as “the subset of communication channels” (Reply 19). Although we agree that “*an adapted hopping sequence*” is taught by Kockmann in the combination of references applied to the base claims (620 Pet. 39–40; see 620 Dec. on Inst. 22, 24–26), Petitioner does not rely on Kockmann to teach the additional and narrower limitations of claim 11. See also 620 Pet. 20–23 (relying on Dabak alone to teach “an adapted hopping sequence”). Thus, we agree with Patent Owner that, even if MSD information “identif[ies] the subset of communication channels to the slave device,” those communications over that *MSD* subset are not “according to the adapted hopping sequence,” as recited in claim 11. PO Resp. 20–21.

Petitioner's arguments with respect to claim 11 apply equally to claim 26. Based on our review of the arguments and evidence, we conclude that Petitioner fails to establish by a preponderance of the evidence that claims 11 and 26 would have been obvious over the combined teachings of Dabak and Kockmann.

v. *Claims 13 and 28*

Claim 13 depends from claim 1 and recites that the step of “monitoring the subset of communications channels is performed *while* communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.” Ex. 1001, 28:27–30 (emphasis added). Similarly, claim 28 depends from claim 16 and recites the identical limitations of claim 13. *Id.* at 30:21–24. Petitioner argues that the combined teachings of Dabak and Kockmann teach or suggest all of the limitations of claims 1 (620 Pet. 38–40) and 16 (*id.* at 48–49). Patent Owner does not contest this. PO Resp. 2 n.2. Petitioner yet again argues that Dabak teaches or suggests the additional limitations of claims 13 and 28. 620 Pet. 47 (claim 10), 52 (claim 25). In particular, Petitioner argues that:

Dabak explains that “[*d*]uring *all communications* between the Master and Slave however, the Master is continuously in a loop to perform channel measurements on all frequencies,” including the subset of communication channels. [Dabak,] 7:51-54 (emphasis added). Dabak teaches that the continuous measurements occur during the dwell time period, i.e., while using the adapted hopping sequence: “the channel measurements may indicate that communications between the Master and Slave *during any particular dwell time period* may have somehow been adversely affected because of a new source of unforeseen interference.” *Id.* 7:57-60; *see also* [620] Ex. 1002 [] ¶ 47.

Reply 22–23. Thus, Petitioner argues that *Dabak* discloses monitoring channels *while* the Master communicates with the Slave. *Id.* at 23.

As with claims 11 and 26, Patent Owner contends that Petitioner’s reliance on *Dabak*’s conveyance of MSD information does not teach or suggest “the subset of communication channels according to *the adapted hopping sequence*,” as recited in claim 13. PO Resp. 22. Here again, Petitioner relies solely on *Dabak* to meet this limitation (620 Pet. 47, 52), and, in particular, Petitioner states that “*Dabak discloses the limitation* that ‘monitoring the subset of communication channels is performed while communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.’” Reply 22 (emphasis added). Although, as noted above, we agree that “an adapted hopping sequence” is taught by Kockmann in the combination of references applied to the base claims (620 Pet. 39–40; *see* 620 Dec. on Inst. 22, 24–26), Petitioner does not rely on Kockmann to teach the additional and narrower limitations of claims 13 and 28. *See also* 620 Pet. 20–23 (cited above). Thus, we agree with Patent Owner that, even if MSD information is “the subset of communication channels,” communications over that subset are not “according to the adapted hopping sequence,” as recited in claim 13. PO Resp. 22–23.

Petitioner’s arguments with respect to claim 13 apply equally to claim 28. Based on our review of the arguments and evidence, we conclude that Petitioner fails to establish by a preponderance of the evidence that claims 13 and 28 would have been obvious over the combined teachings of *Dabak* and Kockmann.

e. Summary

We conclude that Petitioner has established by a preponderance of the evidence that claims 4, 10, 19, and 25 would have been obvious over the combined teachings of Dabak and Kockmann, but that Petitioner fails to establish by a preponderance of the evidence that claims 11, 13, 26, and 28 would have been obvious over the combined teachings of Dabak and Kockmann.

2. Obviousness over Teachings of Gerten

a. Overview

Petitioner argues that claims 1–5, 10, 11, 13–20, 25, 26, and 28 are unpatentable under 35 U.S.C. § 103(a) as obvious over Gerten. *See supra* Section I.E. To support its arguments, Petitioner provides a detailed mapping of limitations of challenged claims to Gerten. 623 Pet. 17–60. Petitioner also cites Dr. Ding’s Declaration for support. *See* 623 Ex. 1002 ¶¶ 40–209. We begin our analysis of these challenges with an overview of the teachings of Gerten.

b. Gerten

Gerten teaches methods “for removing channels in a frequency hopping scheme having strong interference or interferers in a wireless communication system.” Gerten, 2:34–37. Gerten’s Figure 1 is reproduced below.

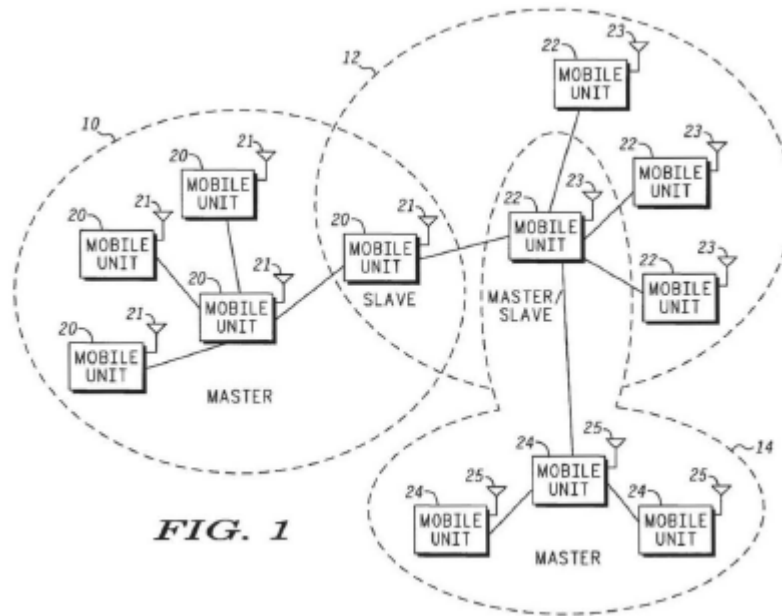


Figure 1 depicts piconet 10 having a plurality of mobile units 20 that may function as “master” or “slave” mobile units. *Id.* at 3:27–31. Gerten’s master mobile unit 20 is a device “whose clock and hopping sequence are employed to synchronize other devices in the piconet—devices in a piconet that are not the master are typically slaves.” *Id.* at 3:22–26. Further, mobile unit 20 includes transceiver 32, frequency synthesizer 60 having memory 62, and central control system 30 that can include a processor that is programmed to control and operate various components within master mobile unit 20 to carry out various functions. *Id.* at 3:44–48, 53–65, Fig. 2. In particular, “frequency synthesizer component **60** cooperates with the central control system **30** and a device clock **64** to provide frequency hopping for the mobile communication unit **20**.” *Id.* at 3:65–4:1.

Master mobile unit 20 in piconet 10 determines “which channels have [the] strongest interference.” *Id.* at 4:50–51. For example, Master mobile unit 20 may employ “signal strength measurements on N number of

channels (N being an integer) of the frequency hopping scheme to determine M number of channels (M being an integer less than or equal to N) to avoid.” *Id.* at 2:37–41. Thus, the difference between values N and M may determine a subset of “good” channels which the master and slave units may use to communicate. Master mobile unit 20 “periodically updates the channels to be avoided” (*id.* at 4:58–59), causes each slave unit to modify its respective hopping sequence (*id.* at 4:62–65).

Gerten’s Figure 3 is reproduced below.

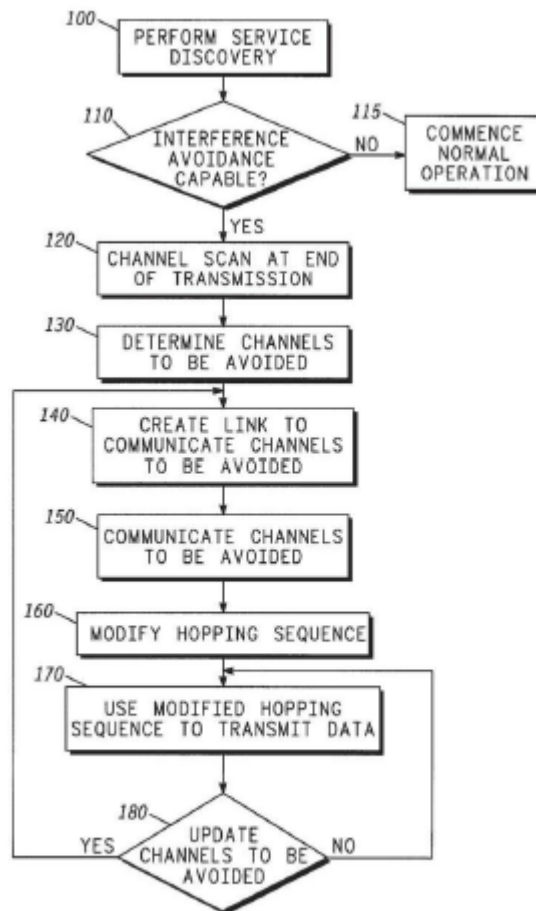


FIG. 3

Figure 3 depicts the steps of Gerten’s method for determining which channels should be avoided and communicating those channels to a slave

unit. *Id.* at 2:4–6. In steps 120 and 130, the master unit performs a channel scan to determine which channels have the strongest interference. *Id.* at 4:47–51. The master unit then sends the list of channels to be avoided via a communication link at step 150 (*id.* at 4:51–54), and, in step 160, the master and slave units modify their hopping sequence (*id.* at 4:54–56). In step 180, the master unit determines whether the channels to be avoided needs to be updated. *Id.* at 4:58–59. If updating is necessary, the master unit repeats steps 140–170 and sends the updated list of channels to be avoided to the slave unit. *Id.* at 4:62–65. “If a normal hop sequence is desired for some reason, the master can send an interference avoidance data packet with zero channels to indicate that none of the channels are to be avoided.” *Id.* at 10:2–5.

c. Analysis

Petitioner argues that Gerten teaches or suggests all of the limitations of claims 4, 10, 11, 13, 19, 25, 26, and 28 of the ’500 patent. 623 Pet. 17–40. In particular, Petitioner argues that Gerten teaches or suggests all of the limitations of each of independent claims 1 and 16. 623 Pet. 18–23 (claim 1), 34–36 (claim 16).

i. Claims 1 and 16

Initially, we consider Petitioner’s challenges to independent claims 1 and 16. Petitioner provides a detailed mapping of the limitations of claims 1 and 16 on the teachings of Gerten. *E.g.*, 623 Pet. 18–23 (claim 1). In particular, independent claim 1 recites the steps of “communicating with a slave device over a plurality of communication channels according to a default hopping sequence; testing the plurality of communication channels;

[and] selecting a subset of the plurality of communication channels based on results of the testing.” Ex. 1001, 27:14–19 (claim 1); *see id.* at 28:58–60 (claim 16). In view of Petitioner’s analysis, we are persuaded that Gerten teaches or suggests each of these limitations. In addition, each of the challenged independent claims recites the limitation “communicating with the slave device over the subset of communication channels according to an adapted hopping sequence.” *Id.* at 27:20–22 (claim 1); *see id.* at 28:64–66 (claim 16). After reviewing Petitioner’s arguments and evidence, including the supporting testimony of Dr. Ding, we are persuaded that Gerten also teaches or suggests this limitation. *Cf.* 620 Dec. on Inst. 21–23 (failure of Dabak reference to teach this limitation).

With regard to the use of “an adapted hopping sequence” to communicate between the master device and the slave device over a subset of the plurality of communication channels, Petitioner argues that this limitation is taught by steps 150–170 of Gerten’s Figure 3, reproduced above. 623 Pet. 21 (citing Gerten, 2:43–47). Petitioner states that “Gerten teaches that the M channels to be avoided are communicated ‘to wireless units involved in the communication system, so that the members of the wireless communication system can **frequency hop together** over the modified frequency hopping scheme,’ using namely the (N-M) channels.” *Id.* at 21 (quoting Gerten, 2:43–47). Although Gerten describes a “*modified* frequency hopping sequence,” rather than an “*adapted* hopping sequence,” Petitioner argues that a person of ordinary skill in the art would understand these sequences to address the same concept, namely, “to avoid channels where interference is present.” *Id.* (citing 623 Ex. 1002 ¶ 46). We agree.

Claims 1 and 16 further recite the step of “monitoring the subset of communications channels.” Petitioner argues that Gerten teaches that, after communications have begun using the “modified frequency hopping sequence,” the master unit of Gerten’s piconet “periodically updates the channels to be avoided.” Gerten, 4:58–59; *see also id.*, Fig. 3 (step 180 recites “Update Channels To Be Avoided”). Petitioner argues that a person of ordinary skill in the art would “recognize that the master must repeat the channel scan at step 120, including scanning the subset of (N-M) channels, to update the channels to be avoided.” 623 Pet. 22 (citing 623 Ex. 1002 ¶ 47). Gerten’s Figure 3, however, describes the “updating” decision step, step 180, as requiring the method to repeat steps 140–170, *not* step 120. *See* Gerten, Fig. 3 (reproduced above). Nevertheless, we are persuaded that step 180 of Gerten’s Figure 3 teaches or suggests monitoring the used communication channels in order to determine whether updating is or is not required. *See* 623 Pet. 22 (citing Gerten, 9:64–10:2). Therefore, we are persuaded that Gerten teaches monitoring the subset of communications channels.

Finally, Petitioner argues that Gerten teaches the step of, “based on results of the monitoring or after a specified period of time, *reverting* back to communicating with the slave device over the plurality of communication channels according to the default hopping sequence.” *E.g.*, Ex. 1001, 27:24–27 (claim 1; emphasis added). Petitioner notes that Gerten teaches that, “[i]f a normal hop sequence is desired *for some reason*, the master can send an interference avoidance data packet with zero channels to indicate that none of the channels are to be avoided.” 623 Pet. 22 (quoting Gerten, 10:2–5

(emphasis added)). Petitioner further argues that, although Gerten does not specify or even give examples of such “reasons,” because Gerten monitors and updates channels to be avoided based on interference, a person of ordinary skill in the art would recognize that “a readily apparent ‘reason’ to return to a normal hop sequence would be that the monitoring identifies no channels have significant interference, and therefore, no channels are to be avoided.” *Id.* at 22–23 (citing 623 Ex. 1002 ¶ 48); *see KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”)). Consequently, we are persuaded that Petitioner has shown that Gerten teaches or suggests this limitation.

Based on our review of Petitioner’s arguments and evidence, we find that Petitioner demonstrates that teachings of Gerten teach or suggest all of the limitations of independent claims 1 and 16 and find that a person of ordinary skill in the art would have had reason to modify the teachings of Gerten to achieve the method of claim 1 and the device of claim 16. *See* 623 Pet. 18–23 (claim 1), 34–36 (claim 16). We conclude that Petitioner has shown by a preponderance of the evidence that independent claim 1 would have been obvious over the teachings of Gerten. Moreover, because Petitioner’s arguments for the obviousness of independent claims 1 and 16 over Gerten rely on the arguments and evidence presented with respect to independent claim 1, we also conclude that Petitioner has shown by a preponderance of the evidence that independent claim 16 would have been obvious over the teachings of Gerten, as well as on its challenges to dependent claims 2, 3, 5, 14, 15, 17, 18, and 20. *See* 623 Pet. 23–25 (claim

2; citing Gerten, 2:37–52, 4:58–65, 9:64–10:5, Fig. 3; 623 Ex. 1002 ¶¶ 50–53), 26–27 (claim 3; citing Gerten, 5:25–63, 6:37–41 6:57–63; 620 Ex. 1002 ¶¶ 55, 56), 28 (claim 5; citing 623 Ex. 1002 ¶ 60), 33 (claim 14; citing 623 Ex. 1002 ¶¶ 74–80)) 33–34 (claim 15; citing Gerten, 4:49–51, 4:56–62, 6:36–59, Fig. 3; 623 Ex. 1002 ¶¶ 82, 83), 36 (claim 17; citing 623 Ex. 1002 ¶¶ 95, 96) 37 (claim 18; citing 623 Ex. 1002 ¶¶ 98, 99), 37–38 (claim 20; citing 623 Ex. 1002 ¶ 103).

ii. *Claims 4 and 19*

Claim 4 depends from claim 3 and recites that “the channel classifications for the plurality of communication channels comprise one of two values for each channel of the plurality of communication channels, one of the two values indicating the channel is occupied and the other of the two values indicating the channel is clear.” Ex. 1001, 27:45–50. Similarly, claim 19 depends from claim 18 and recites identical limitations of claim 4. *Id.* at 29:24–29. Petitioner argues that “Gerten teaches that if the interference signal strength does not exceed a particular threshold, the channel is clear and is referred to as level 1.” 623 Pet. 27 (citing Gerten, 5:32–37, 6:37–41); *see* Gerten, 1:47–62. Further, Petitioner notes that, “if the interference signal strength does not surpass the level 1 threshold, the channel is deemed clear, whereas if it does surpass the level 1 threshold again the channel is classified as level 2 because it contains a ‘fixed interferer’ (i.e. is occupied).” 623 Pet. 27–28 (citing Gerten, 6:41–55). Thus, Petitioner argues that a channel containing a “fixed interferer” may be an *occupied* channel and is classified as Level 2; and that a channel that does not surpass the Level 1 threshold is a *clear* channel.

Patent Owner contends that Gerten's classification into Levels 1 and 2 is not as straight forward as Petitioner argues. Referring to step 230 of Gerten's Figure 4, Patent Owner contends that Gerten teaches scanning a channel for interference, and, if that interference does not exceed a threshold, the channel is placed in the Level 1 list because that channel's noise is below a defined threshold usable for frequency hopping communications. PO Resp. 25 (citing Gerten, 5:35–63). Gerten also teaches that, “[i]f the signal strength of the channel is above a level one threshold (YES), the process/algorithm advances to step **240**. In step **240**, the master device waits a predetermined period and then determines signal strength of the channel a second time.” Gerten, 5:39–43, Fig. 4 (step 240); *see id.* at 6:41–44 (“the signal strength of that channel will be measured again 3.125 milliseconds later, (the longest Bluetooth packet will take 3.125 milliseconds to transmit)”). Gerten also teaches that, if interference exceeds the threshold at the time of the second test, the channel contains a “fixed interferer,” and the channel is placed on a Level 2 list. *Id.* at 6:45–55, Fig. 4 (steps 250, 255, 260, and 265). Thus, Patent Owner contends that, unlike the method of claim 4 and the system of claim 19, Gerten teaches a list of Level 2 “interferers” and a list of Level 1 “interferers” (PO Resp. 26 (citing Gerten, 6:50–54), and that, consequently, Gerten does not teach “occupied” and “clear” channel classifications. Further, Gerten teaches that if the Level 2 list is full, additional qualifying channels may remain on the Level 1 list. *Id.* at 26–27 (citing Gerten, 6:57–59). In addition, Gerten teaches that if the Level 2 list is not full, channels immediately preceding and following the listed channels may be added to the Level 2 list. *Id.* at 27 (citing Gerten,

6:60–67). Alternatively, Level 1 channels may be included on the Level 2 list. *Id.* at 27–28 (citing Gerten, 7:1–5); *see* Ex. 2001 ¶¶ 38–40.

Petitioner responds that it “did not argue that every channel on Gerten’s Level 1 list is always clear and every channel on Gerten’s Level 2 list is always occupied. Indeed, such an arrangement would not be required to meet the present claim language.” Reply 7–8. Instead, Petitioner argues that the relevant embodiment of Gerten “functions to (i) test the plurality of channels, (ii) classify the channels as being occupied or clear, and (iii) *select the channels for use based on the classifications of the plurality of channels.*” *Id.* at 8 (citing Gerten, 6:45–7:5). Put simply, Petitioner argues that it doesn’t matter whether the channel actually is “occupied” or “clear,” but only that it is *classified* as “occupied” or “clear.” *Id.* at 8–9.

As we noted above, the *only* use of the term “occupied” in the Specification of the ’500 patent refers to a situation in which the channel actually is occupied by an interfering, NFH communications system (Ex. 1001, 3:33–36), but Petitioner would have us interpret the language of claim 4 to recite that the classifications need only *indicate* that the channels are occupied or clear, not that the classified channels *actually are* occupied or clear. Petitioner’s arguments with respect to claim 4 apply equally to claim 19. We disagree, however, with this interpretation. *See supra* Section II.A.2 (construing “occupied” and “clear”).

Based on our review of the arguments and evidence, we conclude that Petitioner fails to establish by a preponderance of the evidence that claims 4 and 19 would have been obvious over the teachings of Gerten.

iii. *Claims 10 and 25*

Claim 10 depends from claim 1 and recites that the step of “testing the plurality of communication channels comprises testing *each channel* of the plurality of communication channels multiple times.” Ex. 1001, 27:15–17 (emphasis added). Similarly, claim 25 depends from claim 16 and recites identical limitations of claim 10. *Id.* at 30:8–10. The “plurality of communication channels” are those channels over which a master device communicates with a slave device. *E.g., id.* at 28:11–16 (claim 1).

Petitioner argues that Gerten teaches or suggests the additional limitations of claims 10 and 25. 623 Pet. 31 (claim 10), 39 (claim 25). In particular, Petitioner argues that Gerten teaches updating the channels to be avoided. *Id.* at 31 (citing Gerten, 4:58–65, 9:64–65, Fig. 3). Such periodic updating requires repeated testing and classification of channels, including communication channels that are experiencing high interference. *Id.* (citing 623 Ex. 1002 ¶ 68). Further, Petitioner argues that Gerten teaches that, if the interference signal strength exceeds a particular level 1 threshold, the channel is tested again 3.123 milliseconds later. *Id.* (citing Gerten, 6:41–44). Thus, in the event that the interference signal strength exceeds the level 1 threshold for the plurality of channels, *each* of the plurality of channels is tested multiple times, as recited in claims 10 and 25. Gerten, 6:41–44. As such, Petitioner argues that Gerten teaches testing *each* channel of the plurality of communication channels multiple times. 623 Ex. 1002 ¶ 68.

Patent Owner contends, however, that

the Gerten algorithm seeks to identify M channels to be avoided based on a level 2 threshold. . . . Gerten at 6:33-7:11[.] The Gerten algorithm only retests channels that exceed a level 1

threshold in a first test and also terminates prior to testing each channel even once after M channels are detected and added to the level 2 list. *Id.* Therefore, *Petitioner's argument that all channels be tested multiple times relies on a very particular and extremely unlikely outcome that Gerten neither taught nor described.*

PO Resp. 28–29 (emphasis added). Even if perhaps rare or even unlikely, Patent Owner does not contend that the scenario proposed by Petitioner could not occur or would not be understood by a person of ordinary skill in the art to be a possibility within the scope of Gerten's teachings. *Id.* at 29. Further, although Patent Owner contends that “[t]his unlikely Gerten scenario is also not what the ‘500 Patent contemplated when it discussed retesting of all channels” (*id.*), the correct question is whether the limitations of claims 10 and 25 encompass these teachings of Gerten. *See* Reply 16 (“Patent Owner’s argument concedes that Gerten is configured to function such that it tests each channel of the plurality of channels multiple times.”). Based on Petitioner’s arguments and evidence, we are persuaded that they do.

Based on our review of the arguments and evidence, we conclude that Petitioner has established by a preponderance of the evidence that claims 10 and 25 would have been obvious over the teachings of Gerten.

iv. Claims 11 and 26

Claim 11 depends from claim 1 and recites that the step of “transmitting a packet identifying the subset of communication channels to the slave device prior to communicating with the slave device over the subset of communication channels according to the adapted hopping

sequence.” Ex. 1001, 28:19–22. Similarly, claim 26 depends from claim 16 and recites identical limitations of claim 11. *Id.* at 30:11–16.

Petitioner argues that “Gerten teaches that the master transmits a packet to the slave that ‘contain[s] the modified hop sequence data’ that the slave acknowledges. [Gerten,] 9:60-67. The master and slave then begin communication according to the disclosed modified hop sequence. *Id.*” 623 Pet. 32. In particular, Petitioner argues that “Gerten describes the ‘modified hop sequence data’ that contains ‘the number of channels to be avoided, their corresponding array indices and what the channels should be replaced with.’” Reply 20 (quoting Gerten, 9:55–58). Thus, Petitioner concludes that, “[b]ecause there is a fixed set of N available channels, transmitting the M channels to be avoided **identifies** the subset of remaining N-M channels to use for adaptive frequency hopping.” *Id.* (citing Gerten, 2:37–52). Therefore, Petitioner argues that Gerten teaches the limitations of claims 11 and 26.

Patent Owner contends that:

Petitioner has inaccurately portrayed the disclosure of Gerten. Gerten states that the modified hop sequence data conveyed in the packet is “the number of channels to be avoided, their corresponding array indices and what the channels should be replaced with” while making no mention of “identifying the subset of communications channels” as claims 11 and 26 require.

PO Resp. 32 (citing Gerten, 9:51–62). Moreover, Patent Owner notes that Gerten describes the procedure by which the modified hopping sequence is determined after receipt of the M channels to be avoided of the N channels available. *Id.* at 33 (citing Gerten, 7:6–20). Thus, Patent Owner argues that, while Gerten teaches altering the inputs to the frequency selection process,

the '500 patent teaches putting out to the slave device “a set of addresses for each slot in the register.” *Id.* (citing Ex. 1001, 19:63–20:1).

Nevertheless, each of challenged claims 11 and 26 requires only that “a packet *identifying* the subset of communication channels [is transmitted] to the slave device prior to communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.” (Emphasis added.) In the embodiment of Gerten, upon which Petitioner relies, Gerten teaches replacing a set of channels to be avoided with replacement channels, so that the total number of channels in use remains the same. Reply 21 (citing Gerten, 7:44–48); *see* Gerten, 9:53–57 (“Once a Bluetooth connection has been established and the master has identified the slave's capability to engage in an interference avoidance hop sequence, a link can be initiated to convey the number of channels to be avoided, their corresponding array indices *and what the channels should be replaced with.*” (emphasis added)). Because the claim only recites “*identifying* the subset of communication channels to the slave device prior to communicating with the slave device over the subset of communication channels,” we are persuaded that Gerten teaches “identifying” such a subset by identifying the channels to be avoided *and their replacements*.

Based on our review of the arguments and evidence, we conclude that Petitioner has established by a preponderance of the evidence that claims 11 and 26 would have been obvious over the teachings of Gerten.

v. *Claims 13 and 28*

Claim 13 depends from claim 1 and recites that the step of “monitoring the subset of communications channels is performed *while*

communicating with the slave device over the subset of communication channels according to the adapted hopping sequence.” Ex. 1001, 28:27–30 (emphasis added). Similarly, claim 28 depends from claim 16 and recites identical limitations of claim 10. *Id.* at 30:21–24.

Petitioner argues that Gerten teaches monitoring communications channels while simultaneously communicating according to the adapted hopping sequence. 623 Pet. 32. Further, Gerten teaches that:

In step **170**, the master device and the remote device begin transmitting data at the modified hopping sequences. In step **180**, the master device periodically updates the channels to be avoided. If the master does not update the channels to be avoided (NO), the master device and the remote device continue transmitting data at the modified hopping sequences in step **170**.

Gerten, 4:56–62. Petitioner argues that a person of ordinary skill in the art would understand that it is necessary to “monitor” the channels in use in order to periodically update them. 623 Pet. 33 (citing 623 Ex. 1002 ¶ 72).

Patent Owner notes that the ’500 patent describes “continuous monitoring of channel performance.” PO Resp. 36–38. Patent Owner contends, however, that:

Gerten does not disclose any method capable of performing monitoring *while communicating*. Gerten only discloses monitoring channels for avoidance by determining received signal strength (an indication of use by another system), which necessarily must occur while not communicating, since the objective of the measurement is to measure the received signal strength on a channel resulting from sources outside of the network. The Gerten algorithm for determining channels to avoid depends explicitly on monitoring the signal strength at specific times when the channels are not being used for communication by the system itself.

PO Resp. 35 (emphasis added; citing Gerten, Abstract, 5:19–24). Further, we note that, with respect to Gerten’s Figure 3 (reproduced above), Gerten states that “[i]f the remote device does have interference avoidance capabilities (YES), *the master device performs a channel scan at completion of its last transmission* (step **120**) and determines which channels have strongest interference in step **130**.” Gerten, 4:47–51 (emphasis added). Thus, Gerten teaches that the scan to identify channels to be avoided occurs after the “*last transmission*.”

Petitioner responds that we should construe the term “while” in claims 13 and 28 broadly to mean “during the same time period.” Reply 24 (citing *Qualcomm Inc. v. Bandspeed, Inc.*, Case IPR2015-00314, slip op. at 11–12 (PTAB Sept. 7, 2016) (Paper 39) (“We construe ‘while,’ as recited in claims 1, 16, and 28, as requiring that communication take place with multiple devices during the same time period, such as with interleaved communications, but not requiring simultaneous communication with the multiple devices.”). Nevertheless, because Gerten teaches that the scan to identify channels to be avoided occurs *after* the *last* transmission, even under Petitioner’s proposed construction, we are not persuaded that Petitioner has shown by a preponderance of the evidence that Gerten teaches “monitoring the subset of communications channels” *during the same time period* as “communicating with the slave device over the subset of communication channels.”

Based on our review of the arguments and evidence, we conclude that Petitioner fails to establish by a preponderance of the evidence that claims 13 and 28 would have been obvious over the teachings of Gerten.

d. Summary

We conclude that Petitioner has established by a preponderance of the evidence that claims 10, 11, 25, and 26 would have been obvious over the teachings of Gerten, but that Petitioner fails to establish by a preponderance of the evidence that claims 4, 13, 19, and 28 would have been obvious over the teachings of Gerten.

3. Obviousness over Combined Teachings of Gerten and Kockmann

a. Overview

Petitioner argues that claims 4, 10, 11, 13, 19, 25, 26, and 28 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combined teachings of Gerten and Kockmann. *See supra* Section I.E. To support its arguments, Petitioner provides a detailed mapping of limitations of challenged claims to Gerten and Kockmann. 623 Pet. 40–57. Petitioner also cites Dr. Ding’s Declaration for support. *See, e.g.*, 623 Ex. 1002 ¶¶ 115–124 (claim 1), 165–175 (claim 16). Overviews of the teachings of Gerten and of Kockmann are provided above.

b. Analysis

i. Claims 1 and 16

Initially, we consider Petitioner’s challenges to independent claims 1 and 16. To the extent that Gerten may not teach or suggest the “reverting” step of claims 1 and 16 (623 Pet. 40), Petitioner argues that Kockmann teaches this step.

This inhibit can be in turn canceled by the inhibit/enable unit 21 as soon as a renewed acquisition by the acquisition means 24 indicates that the previously disturbed carrier frequency is now no longer disturbed. *In this case, the inhibit/enable unit 21*

provides an enable signal to the processors 23 that indicates that the processor 23 now no longer need replace the previously disturbed carrier frequency by a different carrier frequency.

Kockmann, 7:55–63 (emphasis added); *see* 623 Pet. 42. In particular, Kockmann teaches that, if a particular frequency in a hopping sequence is determined to be “disturbed,” that frequency is removed from the hopping sequence. Kockmann, 7:25–44; 623 Ex. 1002 ¶ 123. Petitioner further argues that:

Once Kockmann determines that the frequency is no longer disturbed, the enable signal instructs the processor to cancel the replacement of that frequency in the hopping sequence. [Ex. 1002 ¶ 123.] Thus, Kockmann discloses reverting back to communicating with the slave device over the plurality of communication channels according to the default hopping sequence *based on the results of the monitoring. Id.*

In addition, Kockmann teaches that “the inhibit/enable unit 21 can automatically output an enable signal to the processor 23 without renewed acquisition by the acquisition means 24 as soon as a predetermined time duration has expired.” Ex. 1012 7:64-67. This enable signal instructs the processor to cancel the replacement of the inhibited frequency in the hopping sequence *after expiration of a predetermined duration of time.* Ex. 1002 ¶ 124.

623 Pet. 43 (emphases added). We find this argument persuasive, and, thus, we are persuaded that Kockmann teaches the “reverting” step of independent claims 1 and 16 to the extent that limitation is missing from Gerten. Further, as noted above, we are persuaded that Gerten teaches the remaining limitations of independent claims 1 and 16. *See* 623 Pet. 17–21 (the remaining limitations of claim 1), 34–36 (the remaining limitations of claim 16).

Petitioner also provides a persuasive rationale for combining the teachings of Gerten and Kockmann. *Id.* at 40–41. Petitioner asserts that both references are directed to the same problem, namely, “to communication performance improvement through adapted frequency hopping to avoid channels having significant interference.” *Id.* at 41 (citing Gerten, Abstract; Kockmann, 2:49–3:20; 623 Ex. 1002 ¶ 115). Kockmann teaches that “an advantage of the frequency hopping spread spectrum system is that the system becomes more insensitive to disturbances due to the offering of a great plurality of carrier frequencies.” Kockmann, 2:9–15; *see* 623 Pet. 40. Further, Kockmann teaches canceling a frequency inhibit and re-introducing the inhibited frequency to the FH sequence when the master device detects that the frequency is no longer disturbed. 623 Pet. 40. Thus, according to Petitioner, a person of ordinary skill in the art would have had reason to modify the teachings of Gerten in view of the teachings of Kockmann “to improve immunity to disturbances by increasing the number of frequencies in use.” *Id.* at 41 (citing Kockmann, 2:9–15); *see Ethicon*, 844 F.3d at 1351 (cited above). According to Petitioner, the combination of these teachings is “a simple substitution of known methods that would yield predictable results.” *Id.* (citing *KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”))).

Based on our review of the arguments and evidence, we conclude that Petitioner has shown by a preponderance of the evidence that independent claim 1 would have been obvious over the combined teachings of Gerten and Kockmann. Moreover, because Petitioner’s arguments for the

obviousness of independent claims 1 and 16 over Gerten and Kockmann rely on the arguments and evidence presented with respect to independent claim 1, we also conclude that Petitioner has shown by a preponderance of the evidence that independent claim 16 would have been obvious over the combined teachings of Gerten, and Kockmann, as well as on its challenges to dependent claims 2, 3, 5, 8, 9, 14, 15, 17, 18, 20, 23, 24, and 29–31. *See* 623 Pet. 23–25, 43 (claim 2; citing Gerten, 2:37–52, 4:58–65, 9:64–10:5, Fig. 3; 623 Ex. 1002 ¶¶ 50–53), 26–27, 43 (claim 3; citing Gerten, 5:25–63, 6:37–41 6:57–63; 620 Ex. 1002 ¶¶ 55, 56), 43–44 (claim 5; citing 623 Ex. 1002 ¶ 134), 46–47 (claim 8; citing 623 Ex. 1002 ¶ 142), 47–49 (claim 9; citing Kockmann, 7:44–47, 8:39–48; 623 Ex. 1002 ¶¶ 144–146), 33, 49 (claim 14; citing 623 Ex. 1002 ¶¶ 74–80, 161)) 33–34, 49–50 (claim 15; citing Gerten, 4:49–51, 4:56–62, 6:36–59, Fig. 3; 623 Ex. 1002 ¶¶ 82, 83), 36, 52 (claim 17; citing 623 Ex. 1002 ¶¶ 95, 96), 37, 52 (claim 18; citing 623 Ex. 1002 ¶¶ 98, 99), 52 (claim 20; citing 623 Ex. 1002 ¶ 185), 53–54 (claim 23; citing 623 Ex. 1002 ¶ 192), 54 (claim 24; citing 623 Ex. 1002 ¶ 194), 54–56 (claim 29; citing 623 Ex. 1002 ¶¶ 202–210), 56 (claim 30; citing 623 Ex. 1002 ¶ 212), 57 (claim 31; citing Gerten, 3:22–26; 623 Ex. 1002 ¶ 215).

ii. Claims 4, 10, 11, 13, 19, 25, 26, and 28

With respect to claims 4, 10, 11, 13, 19, 25, 26, and 28, Patent Owner contends that:

Petitioner relies exclusively on Gerten for disclosing the limitations of claims 4, 10, 11, 13, 19, 25, 26 and 28 of the ‘500 Patent in both its Gerten-based and Gerten/Kockmann-based proposed rejections of these claims. With respect to the Gerten/Kockmann-based proposed rejections, Petitioner states, “[a]s discussed in Ground 1, Gerten discloses the limitations of

claims 2-4” and “Gerten discloses the limitations of claims 10, 11 and 13.” [623 Pet. 43, 49.] Similarly, Petitioner relies on only Gerten in its Gerten/Kockmann-based proposed rejections of claims 19, 25, 26 and 28. *Id.* at 52 and 54.

PO Resp. 38. Thus, Patent Owner contends that the challenges to claims 4, 10, 11, 13, 19, 25, 26, and 28 based on the combined teachings of Gerten and Kockmann fail for the same reasons that the challenges to claims 4, 10, 11, 13, 19, 25, 26, and 28 based on the teachings of Gerten. *Id.*

With respect to claims 4, 10, 11, 13, 19, 25, 26, and 28, we agree that Petitioner presents substantially the same arguments and evidence in response to Patent Owner’s contentions based on the combined teachings of Gerten and Kockmann that it presents with respect to the teachings of Gerten alone. *E.g.*, Reply 6.

Consequently, for the reasons set forth above, we conclude that Petitioner has established by a preponderance of the evidence that claims 10, 11, 25, and 26 would have been obvious over the combined teachings of Gerten and Kockmann, but that Petitioner fails to establish by a preponderance of the evidence that claims 4, 13, 19, and 28 would have been obvious over the combined teachings of Gerten and Kockmann. *See supra* Section II.B.2.c.ii.–v.; Section II.B.3.b.i.

4. Obviousness over Combined Teachings of Gerten and Haarsten, alone or in combination with Kockmann

a. Overview

Petitioner argues that claim 12 and 27 would have been obvious over the combined teachings of Gerten and Haarsten, alone or in combination with Kockmann. 623 Pet. 57–60. Petitioner also cites Dr. Ding’s Declaration for support. *See* 623 Ex. 1002 ¶¶ 222–228. Claim 12 depends

directly from independent claim 1, and claim 27 depends directly from independent claim 27. Ex. 1001, 28:24–26 (claim 12), 30:18–20 (claim 27). Each of claims 12 and 27 recites that “at least one channel of the plurality of communication channels is repeated in the adapted hopping sequence.” We begin our analysis of these challenges with an overview of the teachings of Haartsen; overviews of the teachings of Gerten and of Kockmann are provided above.

b. Haartsen

Haartsen teaches methods and apparatus for selecting a hop channel for use in a channel hopping communication system that includes a sequence of hop channels. Ex. 1011, 5:52–54. The sequence includes a set of forbidden hop channels and a remaining set of allowable hop channels. *Id.* at 5:54–56. Selecting a hop channel from the sequence is a function of a present phase. *Id.* at 5:56–59.

If the selected hop channel is an allowable hop channel, then the selected hop channel is used for communication during the present phase. If the selected hop channel is a forbidden hop channel, then a time-varying parameter is used to select a substitute hop channel from the set of allowable hop channels. *Id.* at 5:59–64.

Haartsen’s Figures 15(a) and 15(b) are reproduced below.

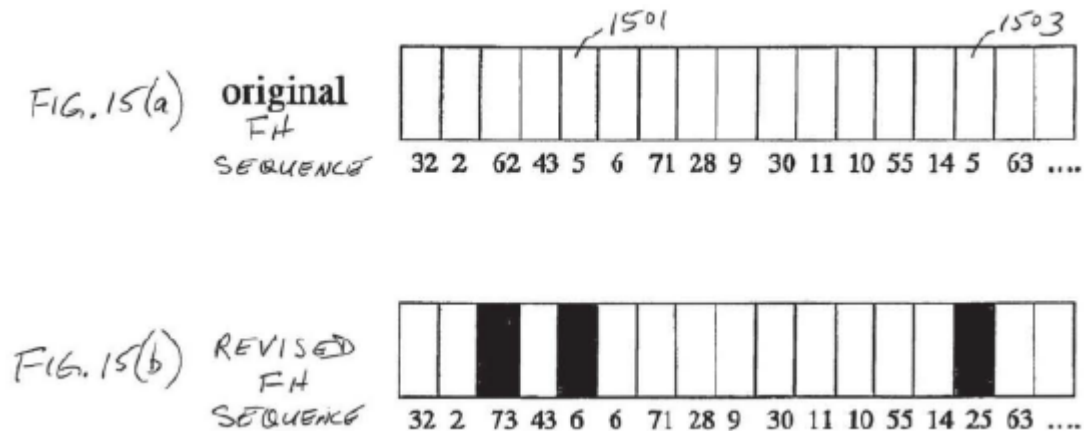


Figure 15(a) depicts a frequency hopping (“FH”) sequence in which hops 5 and 62 are forbidden. *Id.* at 18:16–17. Figure 15(b) depicts a revised FH sequence in which hop 62 is mapped to hop 73 and in which the first time that hop 5 is avoided (see hop 1501), hop 5 is mapped to hop 6. *Id.* at 18:17–19. Hop 5, however, appears twice in the FH sequence of Figure 15(a), and the second time hop 5 is avoided (see hop 1503), hop 5 is mapped to hop 25. *Id.* at 18:19–21. Thus, in the revised FH sequence of Figure 15(b), hop 6 is repeated.

c. Analysis

Initially, we note that we have found that Petitioner demonstrates by a preponderance of the evidence that independent claims 1 and 16 would have been obvious in light of the teachings of Gerten (see *supra* Section II.B.2.c.i.) or the combined teachings of Gerten and Kockmann (see *supra* Section II.B.3.b.i.). Therefore, we focus on evaluating whether Haarsten teaches or suggests the additional limitations of claims 12 and 27 and whether a person of ordinary skill in the art would have reason to combine the teachings of Haarsten with those of Gerten or of Gerten and Kockmann to achieve the methods and devices recited in claims 12 and 27, respectively.

With respect to the additional limitations of claims 12 and 27, Petitioner argues that Haartsen teaches repeating at least one communication channel in the adapted hopping sequence. Haartsen, 18:16–21, Figs. 15(a), 15(b) (reproduced above). Specifically, in the revised FH sequence of Figure 15(b), Haartsen’s hop 6 is *repeated*. Thus, as recited in the challenged claims, Haartsen teaches that “at least one channel of the plurality of communication channels is *repeated* in the adapted hopping sequence.” (Emphasis added.)

Petitioner also provides a persuasive rationale for combining the teachings of Gerten, or Gerten and Kockmann, with Haartsen. 623 Pet. 57–58. Petitioner asserts that both Gerten and Kockmann are directed to the same problem, namely, to avoid channels with high interference. *Id.* (citing Gerten, 4:17–27; Kockmann, 2:25–32; 623 Ex. 1002 ¶ 216). Haartsen is directed to solving this same problem in a similar fashion. *Id.* at 58 (citing Kockmann, 4:14–24, 5:42–48). Thus, Petitioner argues that a person of ordinary skill in the art would have had reason to look to the teachings of these references when seeking to resolve their commonly addressed problem. *See* 623 Ex. 1002 ¶¶ 216, 223. In particular, a person of ordinary skill in the art “would readily understand that adapted hopping sequences, such as those described by Gerten, Kockmann and Haartsen, provide for improved performance,” and that Haartsen teaches a beneficial hopping method including repeating the use of a particular “good” channel in such a sequence. 623 Pet. 58 (citing 623 Ex. 1002 ¶¶ 216, 223). On this record, the combination of these teachings is simply the use of known teachings to yield predictable results. *KSR*, 550 U.S. at 416 (“The

combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”)). Patent Owner does not contest Petitioner’s interpretation of Haartsen or its reasons to combine Haartsen’s teachings with those of Gerten or Gerten and Kockmann. PO Resp. 2 n.2.

Based on our review of Petitioner’s arguments and evidence, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 12 and 27 are rendered obvious by Gerten and Haartsen, alone or in combination with Kockmann.

III. SUMMARY

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that

- (1) claims 1–5, 8, 9, 10, 12, 14–20, 23–25, 27, and 29–31 are unpatentable under 35 U.S.C. § 103(a) as d obvious over Dabak and Kockmann;
- (2) claims 1–3, 5, 10, 11, 14–18, 20, 25, and 26 are unpatentable under 35 U.S.C. § 103(a) as obvious over Gerten; and
- (3) claims 1–3, 5, 8–11, 14–18, 20, 23–26, and 29–31 are unpatentable under 35 U.S.C. § 103(a) as obvious over Gerten and Kockmann; and
- (4) claims 12 and 27 are unpatentable under 35 U.S.C. § 103(a) as obvious over Gerten and Haarsten, alone or in combination with Kockmann.

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We are not persuaded, however, that Petitioner has demonstrated by a preponderance of the evidence that claims 13 and 28 are unpatentable under any asserted ground. *See supra* Section I.E.

IV. ORDER

It is, therefore,

ORDERED that, pursuant to 35 U.S.C. § 314(a), claims 1–5, 8–12, 14–20, 23–27, and 29–31 of the '500 patent are held unpatentable;

FURTHER ORDERED that Petitioner has not demonstrated by a preponderance of the evidence that claims 13 and 28 are 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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