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Paper 27
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

IPR2024-00430
Patent 8,284,690 B2

Before JON M. JURGOVAN, FREDERICK C. LANEY, and AARON W. MOORE, *Administrative Patent Judges*.

JURGOVAN, *Administrative Patent Judge*.

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

I. INTRODUCTION 7
A. Background and Summary 7
B. Real Parties in Interest 7
C. Related Matters 7
D. The ’690 Patent 8
E. Challenged Claims 10
F. Evidence of Record 12
G. The Asserted Challenges to Patentability 14
II. ANALYSIS AND DISCUSSION 15
A. Claim Construction 16
1. “Probe” 17
2. “Physical Layer Probe” 22
B. Legal Standards for Anticipation and Obviousness 24
C. Level of Ordinary Skill in the Art 25
D. Ground A: Anticipation by IEEE-802.16 25
1. IEEE-802.16 (Ex. 1013) 26
2. Claim 1 27
a) Disputes over Limitation 1A 27
b) Preamble 1PRE 29
c) Limitation 1A 29
d) Limitation 1B 30
e) Limitation 1C 30
f) Limitation 1D 31
g) Conclusion for Claim 1 31
3. Claim 2 31
4. Claim 3 32
5. Claim 4 32
6. Claim 5 33
7. Claim 6 33
8. Claim 7 34

9. Claim 9 34
a) Preamble 9PRE 34
b) Limitation 9A 34
c) Limitation 9B 36
d) Conclusion for Claim 9 36
10. Claim 10 36
11. Claim 14 37
12. Claim 15 37
13. Conclusion for Ground A 37
E. Ground B: Obviousness over IEEE-802.16 38
1. Claim 3 38
2. Claim 4 38
3. Claim 5 38
4. Claim 11 38
5. Claim 12 40
6. Claim 13 41
7. Claim 16 41
8. Claim 17 42
a) Preamble 17PRE 42
b) Limitation 17A 42
c) Limitation 17B 44
d) Limitation 17C 45
e) Limitation 17D 45
f) Limitation 17E 45
g) Limitation 17F 46
h) Conclusion for Claim 17 46
9. Claim 18 46
10. Claim 19 47
11. Claim 20 47
12. Claim 21 47

13. Claim 22 47
14. Claim 23 48
15. Claim 24 48
16. Conclusion for Ground B 48
F. Ground C: Obviousness over IEEE-802.16 and Won 48
1. Won (Ex. 1008) 49
2. Motivation to Combine 50
3. Claims 8, 16, and 24 50
4. Conclusion for Ground C 51
G. Ground D: Anticipation by Waxman 51
1. Waxman (Ex. 1007) 51
2. Claim 1 54
3. Claims 2–8 55
4. Claim 9 55
a) Preamble 9PRE 55
b) Limitation 9A 55
c) Limitation 9B 57
d) Conclusion for Claim 9 58
5. Claim 10 58
6. Claim 11 58
7. Claims 14–16 59
8. Claim 17 59
9. Claims 18–19 and 22–24 59
10. Conclusion for Ground D 59
H. Ground E: Obviousness over Waxman 59
I. Ground F: Obviousness over Waxman and Giesberts 60
1. Giesberts (Ex. 1009) 60
2. Motivation to Combine 60
3. Claim 12 61
4. Claim 13 61

5. Claims 3–5 and 20–21 62
6. Conclusion for Ground F 62
J. Ground G: Obviousness over Waxman and Zuckerman 62
1. Zuckerman (Ex. 1016) 63
2. Motivation to Combine 63
3. Claim 10 64
4. Claim 11 64
5. Claims 5 and 18–19 65
K. Ground H: Obviousness over Waxman, Giesberts, and Zuckerman 65
L. Ground I: Obviousness over Waxman and Won 65
M. Ground J: Anticipation by DOCSIS-2.0 65
1. DOCSIS-2.0 (Ex. 1010) 66
2. Claim 9 66
a) Preamble 9PRE 66
b) Limitation 9A 67
c) Limitation 9B 68
d) Conclusion for Claim 9 69
N. Ground K: Obviousness over DOCSIS-2.0 and ISO8802-2 69
O. Ground L: Obviousness over DOCSIS-2.0 and Zuckerman 69
1. Motivation to Combine 70
1. Claim 10 70
2. Claim 11 72
3. Claim 17 73
a) Preamble 17PRE 73
b) Limitation 17A 73
c) Limitation 17B 74
d) Limitation 17C 74
e) Limitation 17D 75
f) Limitation 17E 75

g) Limitation 17F 75
h) Conclusion for Claim 17 76
4. Claim 18 76
5. Claim 19 76
6. Conclusion for Ground L 77
P. Ground M: Obviousness over DOCSIS-2.0, ISO8802-2, and Zuckerman 77
III. Conclusion 78
IV. Order 79

I. INTRODUCTION

A. Background and Summary

Comcast Cable Communications, LLC ("Petitioner") filed a Petition requesting *inter partes* review ("IPR") of claims 1–24 of U.S. Patent No. 8,284,690 B2 (Ex. 1001, "the '690 patent"). Paper 2 ("Petition" or "Pet."). Entropic Communications, LLC ("Patent Owner") filed a Preliminary Response ("Prelim. Resp.") to the Petition. Paper 7. We instituted *inter partes* review. Paper 8 ("Institution Decision" or "Inst. Dec.").

Thereafter, Patent Owner filed a Response. Paper 13 ("PO Resp."). Petitioner filed a Reply. Paper 15 ("Pet. Reply"). Patent Owner filed a Sur-Reply. Paper 19 ("PO Sur-Reply"). An oral hearing was conducted, and the transcript is in the record. Paper 26.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a). Having reviewed the complete trial record, we determine that Petitioner has shown, by a preponderance of the evidence, that challenged claims 1–3, 6–9, 10, 14–18, and 22–24 are unpatentable, but not claims 4, 5, 11–13, and 19–21.

B. Real Parties in Interest

Petitioner identifies itself, Comcast Corporation, Comcast Cable Communications, LLC, and Comcast Cable Communications Management, LLC as real parties-in-interest. Pet. vii (Petitioner's Mandatory Notices).

Patent Owner identifies itself as the real party-in-interest. Paper 3, 1 (Patent Owner's Mandatory Notices).

C. Related Matters

Petitioner and Patent Owner ("the parties") identify the following as matters related to this proceeding:

Entropic Communications, LLC v. Cox Communications, Inc., 2-23-cv-01049 (C.D. Cal.) ("the *Cox* case");

Entropic Communications, LLC v. Comcast Corporation, 2-23-cv-01050 (C.D. Cal.); and

Entropic Communications, LLC v. Charter Communications, *Inc.*, 2-22-cv-00125 (E.D. Tex.) ("the *Charter* case").

Pet. vii–viii; Paper 3, 1.

Patent Owner identifies the following as patents related to this proceeding: U.S. Patent No. 9,825,826; U.S. Patent No. 8,223,775; U.S. Patent No. 8,792,008; U.S. Patent No. 9,210,362; U.S. Patent No. 9,866,438; U.S. Patent No. 10,135,682; U.S. Patent No. 11,381,866; U.S. Patent No. 11,399,206; and U.S. Patent No. 11,785,275. Paper 4, 1–2.

Patent Owner also identifies several *inter partes* reviews sought by Petitioner against Patent Owner's patents: U.S. Patent No. 8,223,775 (IPR2024-00446); U.S. Patent No. 7,295,518 (IPR2024-00431); U.S. Patent No. 9,210,362 (IPR2024-00432, IPR2024-00433, and IPR2024-00434); U.S. Patent No. 11,381,866 (IPR2024-00435, IPR2024-00436, and IPR2024-00437); U.S. Patent No. 11,399,206 (IPR2024-00438, IPR2024-00439, and IPR2024-00440); U.S. Patent No. 8,792,008 (IPR2024-00441); U.S. Patent No. 9,825,826 (IPR2024-00442); U.S. Patent No. 10,135,682 (IPR2024-00444 and IPR2024-00445); and U.S. Patent No. 7,889,759 (IPR2024-00452). Paper 3, 2.

D. The '690 Patent

The '690 patent is titled "Receiver Determined Probe." Ex. 1001, code (54). The '690 patent generally relates to channel assessment probes used in communication networks. *Id*. at 1:12–15. Nodes on a network "are

programmed to generate a probe transmission in response to a request from nodes that will be receiving the probe." *Id.* at 1:67–2:3. The receiving node generates a probe request specifying parameters for generation and transmission of the probe. *Id.* at 2:3–9. The parameters may include the modulation profile for the probe, the payload content for the probe, the transmit power of the probe, the power scaling factor for the payload of the probe, and others. *Id.* at 2:10–19.

Figure 4 of the '690 patent is reproduced below.

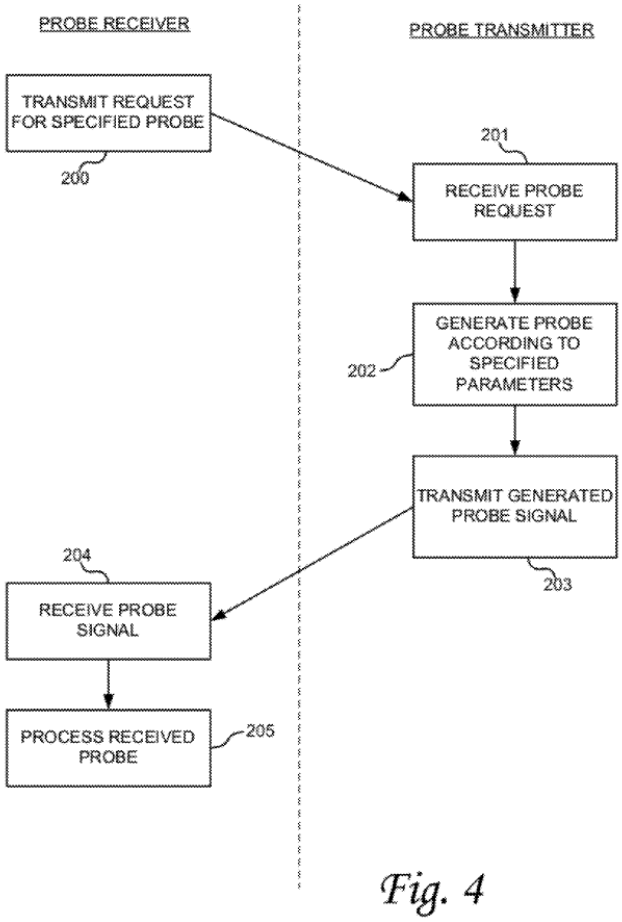

Fig. 4

Figure 4 shows "a method of operation according to an embodiment of the disclosed method and apparatus." *Id.* at 6:17–18. In block 200, a node transmits a probe request specifying probe parameters for a node that will

transmit the probe having a form dictated by the specified parameters. *Id.* at 6:18–22. In block 201, a probe transmitter node receives the probe request, and in block 202, uses the specified parameters to generate a probe with a form compliant with the specified parameters. *Id.* at 6:33–40. In block 203, the probe transmitter node transmits the generated probe to the probe requester node. *Id.* at 6:40–42. In block 204, the requesting node receives the probe generated according to its probe request, and in block 205, the received probe is processed. *Id.* at 6:57–59. The received probe may be used in channel analysis to determine a bitloading table, FEC,[1] and other communications parameters for OFDM[2] or OFDMA[3] signal for future transmission from the probe transmitter node. *Id.* at 6:60–63.

E. Challenged Claims

Claims 1, 9, and 17 are independent. Claims 1 and 9 are method claims, and claim 17 is a system claim. Claims 2–8 depend from claim 1, claims 10–16 depend from claim 9, and claims 18–24 depend from claim 17.

Claim 1 is set forth below with Petitioner's limitation identifiers indicated in brackets.

> [1PRE] A method comprising:
>
> [1A] receiving in a first node, a probe request specifying a first plurality of parameters associated with the generation and transmission of a probe, wherein the first plurality of parameters at least specify content payload of the probe and a second node;
>
> [1B] determining a second plurality of parameters associated

---

[1] Forward Error Correction. Pet. 10.

[2] Orthogonal Frequency Division Multiplexing. Ex. 1001 at 4:39–40.

[3] Orthogonal Frequency Division Multiple Access. Ex. 1001 at 2:22–24.

> with generation and transmission of the probe;
>
> [1C] generating the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters; and
>
> [1D] transmitting the probe from the first node to the second node.

Ex. 1001, 13:45–58.

Claim 9 is set forth below with Petitioner's limitation identifiers indicated in brackets.

> [9PRE] A method comprising:
>
> [9A] a first node transmitting a probe request to a second node, the probe request specifying a first plurality of probe parameters for a physical layer probe, the first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe;
>
> [9B] the first node receiving the probe from the second node, wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node.

Ex. 1001, 14:18–28.

Claim 17 is set forth below with Petitioner's limitation identifiers indicated in brackets.

> [17PRE] A system, comprising:
>
> [17A] a first node on a communications network, the first node comprising a first processor and a first computer executable program code embodied on a first a computer readable medium, the first computer executable program code configured to transmit a probe request to a second node, on the communications network, the probe request specifying a first plurality of probe parameters for a physical layer probe, wherein the first plurality of probe parameters comprising at least a payload content for the probe and a modulation profile

for the probe; and

[17B] the second node on the communications network, the second node comprising a second processor and a second computer executable program code embodied on a second computer readable medium, the second executable program code configured to:

[17C] receive the probe request;

[17D] determine a second plurality of parameters associated with generation and transmission of the probe;

[17E] generate the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters; and

[17F] transmit the probe to the first node.

Ex. 1001, 14:59–15:15.

F. Evidence of Record

Petitioner relies upon the following prior art references:[4]

[4] Petitioner alleges that all of the prior art references were filed, issued, or published before the '690 patent's earliest alleged priority date of December 15, 2008. Pet. 3–4. Petitioner contends that all of these references are prior art under 35 U.S.C. §§ 102(a), (b), and (e) (pre-Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011)). *Id.* Patent Owner does not refute these assertions.

Name	Reference	Date	Exhibit No.
IEEE-802.16 (“WiMAX”)	802.16 IEEE Standard for local and metropolitan area networks; Part 16: Air Interface for Fixed and Broadband Wireless Access Systems	Published Dec. 5, 2004	1013
Won	US 2008/0198826 A1	Filed Feb. 21, 2008; Published Aug. 21, 2008	1008
Waxman	US 2007/0223402 A1	Filed Mar. 21, 2006; Published Sep. 27, 2007	1007
Giesberts	US 2005/0124340 A1	Filed Sep. 24, 2004; Published Jun. 9, 2005	1009
Zuckerman	US 2007/0121573 A1	Issued May 31, 2007	1016
DOCSIS-2.0	Data-Over-Cable Service Interface Specifications DOCSIS 2.0 Radio Frequency Interface Specification	Published Jun. 15, 2006	1010

ISO8802-2	ANSI/IEEE 802.2, 1998 Edition, IEEE Standard for Information Technology–Telecommunications and information exchange between systems–Local and metropolitan area networks–Specific requirements Part 2: Logical Link Control ISO/IEC 8802-2:1998	Published Jun. 15, 2006	1011

Petitioner also supports its challenges with declarations from Mr. James Bertonis. Ex. 1002; Ex. 1036. Patent Owner supports its arguments with a declaration from Dr. John Holobinko. Ex. 2007. Depositions of the parties' experts are in the record. Ex. 1055; Ex. 2002. Other evidence is in the record as well.

G. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Ground	**Challenged Claims**	**35 U.S.C. §[5]**	**Reference(s)**
A	1–7, 9–10, 14–15	102	IEEE-802.16
B	3–5, 11–13, 16–24	103(a)	IEEE-802.16
C	8, 16, 24	103(a)	IEEE-802.16, Won

[5] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the application from which the '690 patent issued was effectively filed before this date, the pre-AIA versions of §§ 102 and 103 apply.

Ground	Challenged Claims	35 U.S.C. §[5]	Reference(s)
D	1–11, 14–19, 22–24	102	Waxman
E	1–11, 14–19, 22–24	103(a)	Waxman
F	3–5, 12–13, 20–21	103(a)	Waxman, Giesberts
G	5, 10–11, 18–19	103(a)	Waxman, Zuckerman
H	5	103(a)	Waxman, Giesberts, Zuckerman
I	7–8, 15–16, 23–24	103(a)	Waxman, Won
J	1–2, 6–7, 9, 14–15	102	DOCSIS-2.0
K	1–2, 6–7, 9, 14–15	103(a)	DOCSIS-2.0, ISO8802-2
L	8, 10–11, 16–19, 22–24	103(a)	DOCSIS-2.0, Zuckerman
M	8, 10–11, 16–19, 22–24	103(a)	DOCSIS-2.0, ISO8802-2, Zuckerman

Pet. 4.

II. ANALYSIS AND DISCUSSION

In this section, we discuss claim construction, legal standards for anticipation and obviousness, the level of ordinary skill in the art, Petitioner's contentions that claims 1–24 of the '690 patent are anticipated and/or rendered obvious in grounds A to M, and Patent Owner's arguments

for patentability. For the reasons that follow, we determine that Petitioner has demonstrated that claims 1–3, 6–9, 10, 14–18, and 22–24 of the '690 patent have been shown to be unpatentable as anticipated and/or obvious in grounds A–E and J–M, but not claims 4, 5, 11–13, and 19–21 in grounds A, B, D–H, L, and M. We do not reach ground I.

A. Claim Construction

We construe the challenged claims under the same standard used by a federal court in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b). This standard is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) and its progeny, and includes "construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b). "Any prior claim construction determination concerning a term of the claim in a civil action . . . that is timely made of record in the *inter partes* review proceeding will be considered." *Id.*

Petitioner contends that it has given all terms their plain and ordinary meaning, but notes that, in related proceedings, certain constructions were adopted. Pet. 6 (citing Ex. 1005, 78–89; Ex. 1002 ¶¶ 121–127). Petitioner asserts that the prior art teaches the claim limitations under any reasonable construction. *Id.*

Patent Owner argues that the *Phillips* standard applies, and states that the '690 patent's terms were construed in the *Charter* case (2:22-cv-00125). PO Resp. 9 (citing Ex. 1005, 78–89). Specifically, Patent Owner asserts that the district court in the *Charter* case construed the terms "probe" and "probe request" as follows:

Term	Construction
"probe"	"a signal transmitted to a network node that the network node can compare to a reference signal having a known form in order to determine characteristics of the channel on which the signal was transmitted"
"probe request"	"a request, sent by one network node to another network node, that specifies the form of a probe to be generated and transmitted"

Id. at 9–10 (citing Ex. 1005, 104–105). Patent Owner advises that the court also adopted the plain meaning for other terms of the '690 patent. *Id.* at 10.

1. "Probe"

Patent Owner argues that the term "probe" must be "a signal or message that is used to ***characterize (or assess) the communications channel (or path) between the two nodes***." PO Resp. 11 (citing Ex. 2007 ¶¶ 47–48, 54–55; Ex. 2002, 10:5–10; 17:24–25; 25:18–26:10). Patent Owner asserts that its construction is supported by the '690 patent. *Id.* at 11–12 (citing Ex. 1001, 1:48–52, 2:20–27; 6:59–7:11; Ex. 1005, 79–84; Ex. 2007 ¶ 49) ("In some instances, probes are sent between nodes of the network in order to allow a receiving node on the network to determine some of the characteristics of the channel between the receiving node and the transmitting node" (Ex. 1001, 1:48–52); "the probes may be used for OFDMA subchannel assessment" (Ex. 1001, 2:24–25); "the received probe may be used in channel analysis" (Ex. 1001, 6:60–61)). Patent Owner argues that the '690 patent emphasizes that its probes are "channel

assessment probes." *Id.* at 12 (citing Ex. 1001, 1:12–14, 1:41–43; 4:34–38; Ex. 2007 ¶ 49). Patent Owner asserts that extrinsic evidence supports its view that a "probe" was a signal or message used to characterize a channel. *Id.* at 12–13 (citing Ex. 2007 ¶¶ 50–53; Ex. 2003, 6:19–21; Ex. 2004, 2:46–50; Ex. 2005, abstract).

Petitioner argues that the claimed "probe" is not limited to Patent Owner's constructions or the additional limitations that Patent Owner attempts to add. Pet. Reply 2–4. Petitioner states that the '690 patent does not define "probe" but merely provides examples, of which channel assessment is one, but other examples include reaching/discovering hidden nodes, network diagnoses, network maintenance, replicating a problem, assisting with network admissions, and determining modulation schemes. *Id.* at 3 (citing Ex. 1036 ¶¶ 6–9; Ex. 1001, 1:13–14, 2:20–27, 4:25–38, 5:23–34, 8:43–47, 9:31–33, 9:44–47; Ex. 1055, 71:25–73:16). Petitioner argues that "[u]nder these circumstances . . . plain and ordinary meaning should apply." *Id.* (citing Ex. 1012, 47–48, 84–85; Ex. 1036 ¶ 7; Ex. 1040, 4; Ex. 1041, 6–7). Petitioner asserts that Patent Owner's extrinsic evidence is far outweighed by the intrinsic evidence against a limited interpretation. *Id.* at 4 (citing Ex. 1036 ¶¶ 6–12; Ex. 1042–1044). Petitioner argues that even under Patent Owner's construction, IEEE-802.16's Ranging Response, Waxman's probe response, and DOCSIS-2.0's Ranging Request and Test Response are probes. *Id.*

Patent Owner criticizes Petitioner for arguing that the plain and ordinary meaning of "probe" should apply but not offering what that meaning is. PO Sur-Reply 5 (citing *O2 Micro Int'l v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1361 (Fed. Cir. 2008)). Patent Owner asserts that

Petitioner's silence is so Petitioner can treat the word as having no meaning, and can "brush over the case-dispositive fact that both experts in this case agree on the *salient* requirements for a 'probe.'" *Id.* at 5–6. Patent Owner further contends that Petitioner's criticism of Patent Owner's previous proposed constructions is irrelevant as they are not the construction that Patent Owner currently proposes. *Id.* at 6–7.

Patent Owner further argues that Petitioner's expert, Mr. Bertonis, stated at his deposition that a "probe" is "a signal used to assess the communications path" but Petitioner's counsel "attempts to rewrite history by claiming his testimony was only 'an example' or pull his "statements out of context.'" *Id.* at 7–8.

Patent Owner asserts that while Petitioner cites other patents of Patent Owner to support its construction, those patents actually support Patent Owner's construction because they are directed to channel assessment. *Id.* at 8–9 (citing Ex. 1045, code (57); Ex. 1046, 2:40–63). In any event, Patent Owner states that the Federal Circuit has "rejected reading related patents too closely for claim construction purposes when they have different language," which applies more strictly here because the cited patents are not related to the '690 patent. *Id.* at 9 (citing *Maquet Cardiovascular LLC v. Abiomed Inc.*, 131 F.4th 1330, 1340 (Fed. Cir. 2025)).

Patent Owner asserts that Petitioner applies a "vague and incoherent definition" for "probe" that encompasses "many (although not all) signals for 'various' uses including (but not limited to) channel assessment, network diagnosis, network maintenance, and assistance with network admission." *Id.* at 9. Patent Owner asserts that Petitioner seems to argue that a signal for any of these purposes could be a probe, but might not be a probe, and does

not offer any other guideposts that would "make for a workable construction." *Id.* at 9–10. Patent Owner argues that Petitioner's vague statements cannot overcome its own expert's testimony, and asserts that the Board should adopt the meaning of "probe" agreed by both experts, and reject the challenges to the claims because the prior art fails to satisfy that meaning. *Id.* at 10.

We agree with Petitioner that the '690 patent does not limit the term "probe" to channel assessment. Pet. Reply 2–4. Reviewing the intrinsic evidence, the "Technical Field" of the '690 patent states that "*some* embodiments relate to channel assessment probes," implying others do not. Ex. 1001, 1:13–14. The '690 patent further states that "receiver determined probes may be used in a variety of applications" including to "discover hidden nodes" and "off-site network diagnosis." *Id.* at 2:20–27. In addition, the '690 patent states that probes may be used for "network maintenance procedures," to "replicate a potential problem, reach or discover a distant or previously undetected node on the network, or assist with network admissions procedures." *Id.* at 4:25–38.

Turning to the claims of the '690 patent, the evidence of record does not establish that the independent claims recite anything unique or specific to channel assessment (although their scope covers that purpose). Furthermore, dependent claim 7 of the '690 patent recites that the "probe" is used to diagnose a network problem, and dependent claim 13 recites that the "probe" is used to identify a hidden node. Restricting the independent claims to probes used solely for channel assessment would be contradictory to these dependent claims. *Littlefuse, Inc. v. Mersen USA EP Corp.*,

29 F.4th 1376, 1380 (Fed. Cir. 2022) (construction of term in independent claims should not render dependent claims superfluous or lacking scope).

Reviewing the ’690 patent’s prosecution history, we find nothing helpful toward the proper construction of the term “probe.” Neither do the parties mention the prosecution history in their proposed constructions.

As the meaning of the term “probe” is sufficiently clear from the ’690 patent, we do not resort to extrinsic evidence. *See Phillips*, 415 F.3d at 1317 (explaining that extrinsic evidence is less significant than intrinsic evidence); *Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, 8 F.4th 1285, 1287 (Federal Circuit gives primacy to intrinsic evidence and resorts to extrinsic evidence only if consistent with intrinsic evidence); *Sequoia Tech., LLC v. Dell, Inc.*, 66 F.4th 1317, 1324 (Federal Circuit stating that its “decision rests solely on the intrinsic evidence”).

Accordingly, we determine that “probe” as used in the claims of the ’690 patent is *not* limited to use in channel assessment. We need not, and do not, construe the claims further to resolve the parties dispute over the meaning of the term “probe.” *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (only claim terms in controversy need to be construed, and only to the extent necessary to resolve the controversy). As such, we do not adopt the District Court’s construction in the *Charter* case which apparently required a more specific construction.[6]

---

[6] We further determine that construing the “probe” as a signal that is transmitted and compared with a reference signal of known form to determine channel characteristics would amount to improper importation of limitations from the specification of the ’690 patent in this case.

2. "Physical Layer Probe"

Patent Owner argues that while claims 1–8 and 17–24 recite a "probe," claims 9–16 recite a "physical layer probe" and the terms are presumed to have different meanings. PO Resp. 13–14 (citing *Comark Comm'n, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998); *Tandon Corp. v. USITC*, 831 F.2d 1017, 1023 (Fed. Cir. 1987)). Patent Owner argues that Petitioner improperly treats the two terms as though they have identical meaning. *Id.* at 14 (citing Ex. 2002, 39:8–21, 40:3–40:13, 40:21–41:8, 41:10–14; Ex. 2007 ¶¶ 68, 87, 88). Patent Owner argues that the proper construction is "a probe that characterizes attributes of the physical layer of the communications channel." *Id.* at 14–15 (citing Ex. 2007 ¶¶ 56–58).

Petitioner argues that Patent Owner's "physical layer probe" construction suffers the same issues as "probe" and assumes that all probes are used for channel assessment when the proper construction should not be so limited. Pet. Reply 4. Petitioner notes the term is absent from the specification and occurs only in the claims. *Id.* Petitioner asserts that the plain and ordinary meaning of the term should apply, which would "simply involve treating the term as a probe (giving "probe" its plain meaning) relating to the physical layer, as opposed to higher layers (e.g., application layer)." *Id.* (citing Ex. 1055, 90:2–91:3). Petitioner states that the '690 patent mentions probes that relate to the physical layer. *Id.* (citing Ex. 1036 ¶ 13; Ex. 1001, 1:13–14, 2:20–27, 4:25–38, 5:23–34, 8:43–47, 9:31–33, 9:44–47). Petitioner argues that Patent Owner's support for its construction relies on its expert's declaration and he only cites to one piece of evidence—the Grinkmeyer patent, which is "dwarfed" by Petitioner's

intrinsic and extrinsic evidence. *Id.* (citing PO Resp. 14–15; Ex. 2007 ¶¶ 56–58). Petitioner asserts that, regardless, even under Patent Owner's construction, the references disclose physical layer probes. *Id.* (citing Ex. 1036 ¶ 14).

Patent Owner responds that Petitioner's expert, Mr. Bertonis, at his Reply deposition confirmed that he read the words "physical layer" out of "physical layer probe" entirely because every use of "probe" in the '690 patent means "physical layer probe," making the two one and the same, which does not accord with black letter law that different claim terms must be construed differently. PO Sur-Reply 13 (citing Ex. 2002, 38:24–39:16, 41:10–14; Ex. 2008, 174:14–20; 204:6–8; 204:12–19; *Comark*, 156 F.3d at 1187).

We agree with Petitioner that a "physical layer probe" is "a probe that relates to the physical layer." The term does not appear per se in the specification of the '960 patent, nor in the prosecution history, but only in claims 9, 17, and 19. However, the term "physical layer" is well-known and is the first layer in the Open Systems Interconnection (OSI) network model. *See, e.g.*, Ex. 1021, 35–40, 69; Ex. 1002 ¶¶ 49–50. The physical layer is used to transmit digital bits over a network, and defines the timing, mechanical, and physical network characteristics required for transmitting the data bits. Hence, a "physical layer probe" is a probe that relates to the physical layer.

We need not, and do not, construe the term further to resolve the parties' dispute. *See Realtime, Vivid Techs.*, *supra*.

Having decided proper constructions for the disputed terms, we proceed in our analysis to consider the parties' arguments concerning the

challenge grounds. In the following sections, we apply the plain meaning of the claim terms, and as necessary, specify what the plain meanings are.

B. Legal Standards for Anticipation and Obviousness

To establish anticipation under 35 U.S.C. § 102, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). "However, a reference can anticipate a claim even if it 'd[oes] not expressly spell out' all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would 'at once envisage' the claimed arrangement or combination." *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1341 (Fed. Cir. 2016) (citing *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d at 1381 (quoting *In re Petering*, 49 CCPA 993, 301 F.2d 676, 681 (1962))).

A patent claim is unpatentable as obvious under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the 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 ordinary skill in the art; and

(4) where present, objective evidence of nonobviousness.[7] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

C. Level of Ordinary Skill in the Art

Petitioner contends as follows:

> A POSITA[8] would have had a bachelor's degree in electrical engineering, computer engineering, or a similar discipline, and three to four years of experience working in signal processing and/or communication systems/networks. Additional education may substitute for experience, and significant work experience may substitute for formal education.

Pet. 6 (citing Ex. 1002 ¶¶ 115–120).

Patent Owner does not dispute Petitioner's proposed level of skill in the art. We adopt and apply Petitioner's proposed skill level because it is consistent with the problems and solutions identified in the '690 patent and the prior art references asserted by Petitioner. In addition, we find the adopted skill level consistent with the education and experience that a POSITA would have had. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)) (citing factors to consider when determining level of ordinary skill in the art).

D. Ground A: Anticipation by IEEE-802.16

Petitioner contends that claims 1–7, 9–10, and 14–15 are anticipated by IEEE-802.16. Pet. 6–47. Patent Owner disputes Petitioner's contentions. PO Resp. 15–30. In this section, we address the disclosure of IEEE-802.16

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[7] The parties do not identify any objective evidence of nonobviousness to be considered in this decision.

[8] Person of ordinary skill in the art.

and the parties' contentions, and determine that Petitioner has shown by a preponderance of the evidence that IEEE-802.16 anticipates claims 1–3, 6, 7, 9, 14, and 15, but not claims 4, 5, and 10.

1. IEEE-802.16 (Ex. 1013)

IEEE-802.16 is a standard for the air interface for fixed broadband wireless access systems. Ex. 1013, cover. IEEE-802.16 discloses a ranging procedure that is used to acquire transmission parameters (such as timing offset and transmission power level) so that a BS[9] and an SS[10] can communicate. Ex. 1013, 174, 199, 202. The ranging procedure involves an SS transmitting a Ranging Request (RNG-REQ) to the BS which transmits a Ranging Response (RNG-RSP) to the SS. *Id.* at 49–51.

The Ranging Request includes Management Message Type, Downlink Channel ID, and Type/Length/Value (TLV) encoded information. *Id.* at 49. When joining a network, the SS includes TLV information for "Requested Downlink Burst Profile" and "SS MAC Address" parameters in its Ranging Request. *Id.* The downlink burst profile has parameters including modulation type and forward error correction (FEC) code type. Ex. 1013, 7, 314–315, 547.

The Ranging Response includes TLV information with parameters such as timing adjust, power level adjust, and offset frequency adjust. *Id.* at 50, 665–66. Both the Ranging Request and the Ranging Response include

[9] Base Station. Ex. 1013, 13.

[10] Subscriber Station. Ex. 1013, 15.

CID[11], ranging code index, and SS MAC address parameters. *Id.* at 33, 35, 42–43, 49–51, 168, 204–213, 576–579, 664–666.

2. Claim 1

In our analysis for claim 1, we first address the parties' disputes, which concern limitation 1A. We then address Petitioner's mapping of the claim to IEEE-802.16, and conclude that Petitioner has shown by a preponderance of the evidence that claim 1 is anticipated by IEEE-802.16.

a) Disputes over Limitation 1A

Limitation 1A of claim 1 recites "receiving in a first node, a ***probe request*** specifying a first plurality of parameters associated with the generation and transmission of a ***probe***, wherein the first plurality of parameters ***at least specify content payload of the probe*** and a second node" (disputed claim language shown in emphasis).

Petitioner contends that IEEE-802.16 discloses a ranging procedure in which the BS ("first node") communicates with the SS ("second node"). Pet. 8 (citing Ex. 1013, 49–51, 199–213; Ex. 1002 ¶ 136). The SS generates and transmits the Ranging Request (RNG-REQ) ("probe request") to the BS, and the BS responds by generating and transmitting a Ranging Response (RNQ-RSP) ("probe response") to the SS. Pet. 8–16 (citing Ex. 1013, 7, 33, 35–43, 49–51, 71, 168, 199–213, 314–315, 329, 370, 522, 547, 576–579, 660, 663, 664–666, 723; Ex. 1002 ¶¶ 136–151).

Patent Owner argues that IEEE-802.16 does not disclose the claimed "probe" or "probe request" because its ranging procedure is "no more than a message exchange between network nodes to negotiate communication

[11] Connection Identifier. Ex. 1013, 13.

protocols and parameters between them" and does not characterize the communication channel between the BS and SS. PO Resp. 15–16 (citing Ex. 2007 ¶¶ 63–68; Ex. 2002, 131:17–132:18), 18–22 (citing Ex. 1013, 174–179, 199–213, 478–479; Ex. 2002, 70:17–25; Ex. 2007 ¶¶ 61–62, 64–66, 68; Ex. 1002 ¶ 191); PO Sur-Reply 15–16 (citing Ex. 1036 ¶ 24; Ex. 1013, 665–666; Ex. 1036 ¶ 24; Ex. 1055, 172:6–20; Ex. 2007 ¶¶ 57, 64, 68; Ex. 2008, 220:23–223:1, 224:6–25). Patent Owner's argument hinges on its construction that the claimed "probe" must be used for channel characterization. PO Resp. 18. However, we do not agree that the term "probe" as used in the '690 patent is so limited, and, as the patent states, it may be used for purposes other than channel characterization. *See* § II.A.1, *supra*.

Patent Owner further argues that the IEEE 802.16 Ranging Request does not disclose parameters that "at least specify content payload of the probe" as claimed. PO Resp. 22–28 (citing Ex. 1013, 1–8, 35–37, 43; Ex. 2007 ¶¶ 71–72). Patent Owner argues that neither the connection identifier (CID) nor ranging code index that Petitioner relies on for this limitation satisfy it. *Id.* The CID identifies a particular MAC connection (e.g. for data, video, or voice) between a BS and an SS. Ex. 1002 ¶ 102; Ex. 1013, 7.

We do not agree with Patent Owner's contention. Petitioner demonstrates that the CID is a parameter in the MAC header of the Ranging Request (RNG-REQ), and the Ranging Response (RNG-RSP) message includes the same CID in its TLV information which constitutes the message's "payload." Pet. 13–15 (citing Ex. 1013, 35, 42–43, 49–51, 204–213, 576–579, 665–666; Ex. 1002 ¶¶ 148–149); Pet. Reply 9–13 (citing

Ex. 1013, 33, 42–43, 49–50, 176, 665–666; Ex. 1036 ¶¶ 25–31; Ex. 1036 ¶¶ 32–35, 37–38; Ex. 1050, 2–7; Ex. 1052, 62:2–71:18, 78:3–79:13, 82:2–83:21; Ex. 1055, 113:5–114:13; Ex. 1002 ¶¶ 148–149).

Hence, we determine that Petitioner has shown by preponderant evidence that the Ranging Request ("probe request") message includes CID and SS MAC address and other parameters ("first plurality of parameters") which at least specify the CID ("content payload of the probe") and the SS MAC address ("second node") of the Ranging Response.[12]

We thus proceed to consider Petitioner's contentions for the remaining limitations of claim 1, which are undisputed, and determine that claim 1 is anticipated by IEEE-802.16.

b) Preamble 1PRE

Preamble 1PRE recites "A method comprising:"

Petitioner shows that IEEE-802.16's ranging procedure discloses the claimed "method." Pet. 7 (citing Ex. 1013, 121–218; Ex. 1002 ¶¶ 133–135).

We agree with Petitioner that IEEE-802.16's ranging procedure discloses the claimed "method."

c) Limitation 1A

We have already discussed the disputed parts of limitation 1A. Petitioner further shows that IEEE-802.16 discloses the remaining parts of limitation 1A, including the BS ("first node") receiving a Ranging Request ("probe request") specifying the SS MAC address and CID ("first plurality of parameters") used for "generation and transmission" of the Ranging

[12] In the Institution Decision, we were concerned that the CID in the Ranging Request's MAC header could not specify itself in the Ranging Response's TLV information. However, further study of the claim language leads us to conclude that there is no limitation to preclude this possibility.

Response ("probe"), wherein the CID in the Ranging Request specifies the CID in the TLV information of the Ranging Response ("first plurality of parameters at least specify content payload of the probe") and the SS MAC address specifies the SS ("first plurality of parameters at least specify . . . a second node"). Pet. 8–16 (citing Ex. 1013, 33, 35, 37, 42–43, 49–51, 71, 168, 199–213, 315, 329, 370, 522, 547, 576–579, 664–666, 723, Tables 5, 18–20, 143, 276, 359, 363–364, 367; Ex. 1002 ¶¶ 135–140, 145–151). We agree with Petitioner that IEEE-802.16 discloses limitation 1A.

d) Limitation 1B

Limitation 1B recites "determining a second plurality of parameters associated with generation and transmission of the probe."

Petitioner shows that the BS determines several parameters "for inclusion within and to generate and transmit the Ranging Response ("probe")." Pet. 16–18 (citing Ex. 1013, 49–50, 199–213, 665–666, Tables 20, 367; Ex. 1002 ¶¶ 152–154). Such parameters include "Timing Adjust," "Power Level Adjust," "Offset Frequency Adjust," and "Downlink Operational Burst Profile" ("second plurality of parameters associated with generation and transmission of the probe"). *Id.* at 17–18 (Ex. 1013, 665–666). We agree with Petitioner that IEEE-802.16 discloses limitation 1B.

e) Limitation 1C

Limitation 1C recites "generating the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters."

Petitioner shows that the Ranging Request's parameters (CID and SS MAC address) ("first plurality of parameters") and the Ranging Response's

parameters (e.g., "Timing Adjust," "Power Level Adjust," "Offset Frequency Adjust," and "Downlink Operational Burst Profile") ("second plurality of parameters") are used to generate the Ranging Response ("probe"). Pet. 15–16, 18–19 (citing Ex. 1013, 49–50, 199–213; Ex. 1002 ¶ 155). Petitioner demonstrates that the "the Requested Downlink Burst Profile of the Ranging Request provides a downlink burst profile (including a downlink frequency and FEC Code type that includes a modulation type) to be used by the BS to format and send the Ranging Response," and accordingly "the Requested Downlink Burst Profile parameter dictates the form of the Ranging Response ("probe")." *Id.* at 19 (citing Ex. 1013, 49–50, 199–201, 314–316, 547, 617, 660, 663; Ex. 1002 ¶¶ 156–157). We agree with Petitioner that IEEE-802.16 discloses limitation 1C.

f) Limitation 1D

Limitation 1D recites "transmitting the probe from the first node to the second node."

Petitioner shows that the BS ("first node") transmits the Ranging Response ("probe") to the SS ("second node") in response to receiving the Ranging Request. Pet. 19 (citing Ex. 1013, 199–213; Ex. 1002 ¶ 158). We agree with Petitioner that IEEE-802.16 discloses limitation 1D.

g) Conclusion for Claim 1

Petitioner has shown by a preponderance of the evidence that IEEE-802.16 discloses each limitation of claim 1. Accordingly, Petitioner has demonstrated that claim 1 is unpatentable as anticipated by IEEE-802.16 notwithstanding Patent Owner's arguments.

3. Claim 2

Claim 2 depends from claim 1 and recites "further including using

within the first node, at least one of the probe parameters to determine a modulation profile for the probe."

Petitioner shows that the BS uses the Requested Downlink Burst Profile parameter to determine the burst profile ("modulation profile") for the Ranging Response ("probe"). Pet. 19 (citing *id.* § IX.A.1.b, Ex. 1013, 7, 49–50, 199–213, 547, 663; Ex. 1002 ¶¶ 159–161). Patent Owner presents no arguments specific to claim 2.

Petitioner has demonstrated by preponderant evidence that claim 2 is unpatentable as anticipated by IEEE-802.16.

4. Claim 3

Claim 3 depends from claim 1 and specifies that "at least one of the probe parameters" indicates one of several enumerated parameters (a) to (g).[13] Parameter (a) is "a modulation profile for the probe."

Petitioner demonstrates that the Requested Downlink Burst Profile parameter indicates a burst profile ("modulation profile") for the Ranging Response ("probe"). Pet. 20 (citing *id.* §§ IX.A.1.b, IX.A.2; Ex. 1013, 664–666), Ex. 1002 ¶¶ 163–164, 210). Accordingly, Petitioner has shown by preponderant evidence that claim 3 is unpatentable as anticipated by IEEE-802.16.

5. Claim 4

Claim 4 depends from claim 3 and recites "wherein the probe identifies a hidden node."

Petitioner contends that the initial Ranging Request ("probe request")

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[13] We understand claim 3 to be satisfied when a probe parameter is one of the enumerated parameters (a) to (g) because it would not make sense for "at least one of the probe parameters" to indicate multiple other parameters in the context of the '690 patent. *See, e.g.*, Ex. 1001, 7:29–8:32, Fig. 5.

identifies a hidden node because the SS that sends it is unknown to the BS until it receives the Ranging Request with the SS MAC address. Pet. 26–27 (citing Ex. 1013, 49, 167–177, 205–206, 664; Ex. 1002 ¶¶ 165–167, 239). However, claim 4 requires that the "probe" (not "probe request") identifies a hidden node. Petitioner has not demonstrated by a preponderance of the evidence that claim 4 is unpatentable as anticipated by IEEE-802.16.

6. Claim 5

Claim 5 depends from claim 3 and recites "wherein the modulation probe for the probe emulates an orthogonal frequency division multiple access (OFDMA) transmission."

Petitioner contends that IEEE-802.16's WirelessMAN-OFDMA PHY layer emulates an OFDMA transmission. Pet. 27–28 (citing Ex. 1013, iv, 2, 50–51, 204–213, 493–501, 547, 660, 663–664; Ex. 1002 ¶¶ 168–172). The term "emulate" means "imitate."[14] Since the WirelessMAN-OFDMA PHY layer is an OFDMA transmission, and does not merely emulate one, Petitioner has not shown by a preponderance of the evidence that claim 5 is unpatentable as anticipated by IEEE-802.16.

7. Claim 6

Claim 6 depends from claim 1 and recites "wherein the probe request is generated by the second node."

Petitioner undisputedly shows that the Ranging Request ("probe request") is generated and transmitted by the SS ("second node"). Pet. 28 (citing *id.* §§ IX.A.1.b–d; Ex. 1013, 49, 199–213; Ex. 1002 ¶¶ 173–174). Petitioner has shown by a preponderance of the evidence that claim 6 is

[14] See https://www.merriam-webster.com/dictionary/emulate.

unpatentable as anticipated by IEEE-802.16.

8. Claim 7

Claim 7 depends from claim 1 and recites "wherein the probe request requests a probe that assists in diagnosing a network problem."

Petitioner undisputedly shows that the Ranging Request ("probe request") assists in diagnosing timing, power, and synchronization problems ("network problems") on the RF link between the BS and SS. Pet. 28–29 (citing *id.* § IX.A.1; Ex. 1013, 49–50, 169–174, 199–213, 477, 665–666; Ex. 1002 ¶¶ 175–177). Petitioner shows by preponderant evidence that claim 7 is unpatentable as anticipated by IEEE-802.16.

9. Claim 9

We now address Petitioner's contentions for claim 9, and Patent Owner's arguments against those contentions.

a) *Preamble 9PRE*

The preamble of claim 9 recites "A method comprising."

Petitioner undisputedly shows that IEEE-802.16's ranging procedure discloses a "method" as claimed. Pet. 34 (citing *id.* at §§ IX.A.9.b–c; Ex. 1002 ¶ 178).

b) *Limitation 9A*

Limitation 9A recites "a first node transmitting a probe request to a second node, the probe request specifying a first plurality of probe parameters for a physical layer probe, the first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe."

Petitioner contends that IEEE-802.16's SS ("first node") transmits a Ranging Request ("probe request") and specifies parameters for the Ranging

Response ("specifying a first plurality of probe parameters for a physical layer probe"), the parameters comprising a form for the Ranging Response including a burst profile for it ("modulation profile for the probe"). Pet. 34–35 (citing *id.* §§ IX.A.1.b–e, IX.A.3.b; Ex. 1002 ¶¶ 179–190). Petitioner contends that the Ranging Response is a "physical layer probe" because it is transmitted from the PHY[15] layer to maintain the RF link's quality and ensure correct timing and preferred power for transmissions over the PHY layer. *Id.* at 35 (citing Ex. 1013, 174–182, 199; Ex. 1002 ¶¶ 191–192).

Patent Owner argues that Petitioner did not explain why the Ranging Response (RNG-RSP) ("probe") would be considered to be the claimed "physical layer probe" because it is not used to characterize the physical layer. PO Resp. 22 (citing Ex. 1002 ¶ 191; Ex. 2007 ¶ 68). As explained, we do not consider the term "physical layer probe" to require channel characterization because examples in the '690 patent are used for other purposes. *See* § II.A.2, *supra*. Petitioner shows that the Ranging Response ("probe") is transmitted over the PHY layer ("physical layer") and is used to determine timing and power for transmissions, which are parameters related to the physical or PHY layer. Pet. 35; Ex. 1013, 174–182, 199.

Consequently, Patent Owner's argument does not undermine Petitioner's showing, and Petitioner demonstrates that IEEE-802.16 discloses limitation 9A.

[15] Physical layer. Ex. 1013, 15.

c) *Limitation 9B*

Claim 9's limitation 9B recites "the first node receiving the probe from the second node, wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node."

Petitioner contends that "IEEE-802.16's SS ("first node") receives the Ranging Response ("probe") from the BS ("second node"), wherein the Ranging Response is generated according to the Ranging Request's parameters and Ranging Response's parameters as determined by the BS." Pet. 35 (citing *id.* at §§ IX.A.1.b–e; Ex. 1002 ¶¶ 194–196).

Petitioner shows that IEEE-802.16 discloses limitation 9B.

d) *Conclusion for Claim 9*

Petitioner shows by a preponderance of the evidence that each limitation of claim 9 is disclosed by IEEE-802.16, and that the claim is therefore unpatentable as anticipated.

10. Claim 10

Claim 10 depends from claim 9 and recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission."

Petitioner contends that the Ranging Request is configured with the burst profile that dictates the form of the Ranging Response and the Ranging Response emulates an OFDMA transmission. Pet. 35 (citing *id.* §§ IX.A.1.b–d, IX.A.5; Ex. 1002 ¶¶ 197–201).

As explained earlier (§ II.D.6, *supra*, discussing claim 5), the Ranging Response is an actual, not emulated, OFDMA transmission. Thus, Petitioner does not show by preponderant evidence that claim 10 is anticipated by IEEE-802.16.

11. Claim 14

Claim 14 depends from claim 9 and recites "wherein the probe request is transmitted at a specific time."

Petitioner undisputedly shows that the BS allocates a ranging interval or "ranging transmission opportunities" to the SS. Pet. 40 (citing Ex. 1013, 167–171, 174–175; Ex. 1002 ¶¶ 202–204). These are specific times based on synchronization of the BS and SS during which the SS can transmit the Ranging Request to the BS. *Id.*

Petitioner has shown by preponderant evidence that claim 14 is anticipated by IEEE-802.16.

12. Claim 15

Claim 15 depends from claim 9 and recites "wherein the probe request is configured to diagnose a network problem."

Petitioner undisputedly shows that IEEE-802.16 discloses claim 15 for similar reasons as claim 7. Pet. 40–41 (citing *id.* § IX.A.7; Ex. 1013, 199–213, 665–666; Ex. 1002 ¶¶ 205–207). Specifically, Petitioner demonstrates that the Ranging Request ("probe request") is configured to diagnose problems with timing, power, and synchronization on the RF link ("network problems") between the BS and SS.

13. Conclusion for Ground A

We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–3, 6–7, 9, and 14–15 are anticipated by IEEE-802.16, but not claims 4, 5, and 10.

E. Ground B: Obviousness over IEEE-802.16

Petitioner contends that claims 3–5, 8, 11–13, and 16–24 would have been obvious over IEEE-802.16. Pet. 4. We consider the parties' contentions for these claims and provide our determinations below.

1. Claim 3

We have already determined that claim 3 is anticipated by IEEE-802.16. *See* § II.D.4, *supra*. We determine that claim 3 would have been obvious over the same teachings of IEEE-802.16 identified previously. *Id.*

2. Claim 4

Claim 4 depends from claim 3 and recites "wherein the probe request identifies a hidden node."

As we determined that Petitioner's showing for claim 4 was with respect to the "probe request" and not the "probe" as the claim requires, we determine that Petitioner has not shown that claim 4 would have been obvious over IEEE-802.16. *See* § II.D.5, *supra*.

3. Claim 5

Claim 5 depends from claim 3 and recites "wherein the modulation profile for the probe emulates an orthogonal frequency division multiple access (OFDMA) transmission."

As explained, Petitioner's showing for claim 5 does not demonstrate that the probe's modulation profile "emulates" OFDMA transmission because it is an OFDMA transmission, not an imitation of one. Accordingly, we determine that claim 5 has not been shown obvious over IEEE-802.16.

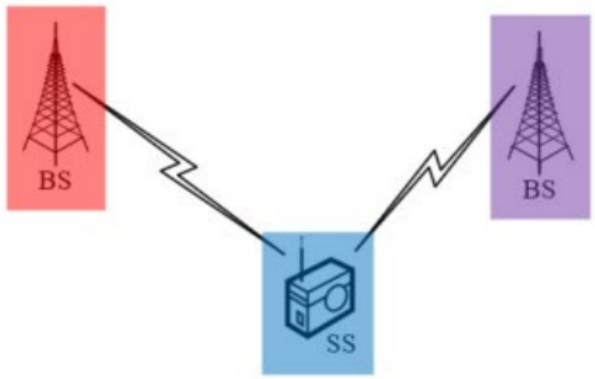
4. Claim 11

Claim 11 depends from claim 9 and recites that the method further comprises

[11A] a) the first node transmitting a second probe request to a third node;
[11B] b) and the first node receiving a second probe from the third node, wherein the second probe is generated according to the second probe request; and
[11C] wherein the first probe and second probe are transmitted simultaneously using OFDMA.

Petitioner contends that, as discussed for claims 9 and 10 in ground A, IEEE-802.16 discloses "a second instance of probing" and "using OFDMA." Pet. 35 (citing *id.* §§ IX.A.9–10). Petitioner acknowledges that IEEE-802.16 does not expressly disclose transmitting two probes simultaneously, but asserts that a POSITA would have found this obvious. *Id.* at 35–38 (citing *id.* §§ IX.A.9.b–c, IX.A.10; Ex. 1013, 49–51, 166, 177 (Note 2), 199–213, 227, 274, 494–495; Ex. 1016 ¶¶ 65–70, 131–134, Figs. 1A–1C; Ex. 1002 ¶¶ 249–259).

Petitioner provides the following annotated figure to support its contentions. Pet. 36 (citing Ex. 1013, 166, 227, 274; Ex. 1002 ¶ 250):



In the above figure, Petitioner indicates that the SS (blue) is the "first node," the BS (red) is the "second node," and the BS (purple) is the "third node." *Id.*

Patent Owner argues that Petitioner's contentions for limitation 11C rest on the premise that "there would be situations in which two BSs happen to transmit their responses simultaneously, but this would be only by pure chance." PO Resp. 28–30 (citing Ex. 1002 ¶¶ 249, 257; Ex. 2002, 84:12–16; Ex. 2007 ¶¶ 75–77; *Therasense, Inc. v. Becton, Dickinson and Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010); *Trintec Indus., Inc. v. Top-USA Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002)). We agree with Patent Owner that Petitioner has not shown that two BSs would have transmitted probes simultaneously in response to probe requests from an SS, as claim 11 requires.

Petitioner asserts that simultaneous probe transmission by multiple BSs would enable the SS to determine "an optimal connection to the network" and "efficient[] use of bandwidth." Pet. 38 (citing Ex. 1013, 166, 227, 274; Ex. 1002 ¶¶ 257–259). However, Petitioner's assertions are based on improper hindsight and are not sufficiently supported in the record. For example, Petitioner's citation to multiple service flows and maintaining link quality in IEEE-802.16 is insufficient to disclose two BSs simultaneously transmitting probes to an SS in response to its probe requests, as limitation 11C requires.

Accordingly, Petitioner does not demonstrate obviousness of claim 11 by preponderant evidence.

5. Claim 12

Claim 12 depends from claim 9 and recites

> wherein the probe parameters further comprises:
> [12A] an indication of the number of times to transmit the probe;
> [12B] a number of symbols for the payload of the probe; a preamble type for the probe;

> [12C] a cyclic-prefix length for the payload of the probe; a transmit power for the probe; and
> [12D] a transmit power scaling factor for the payload of the probe.

Referring back to its showing for claim 3, Petitioner contends that IEEE-802.16 discloses each of these features. Pet. 39 (citing *id.* §§ IX.A.3.c–h). For limitation 12A, Petitioner acknowledges that IEEE-802.16 does not expressly describe a Ranging Request message including the number of times that the BS should transmit the same Ranging Response message, but asserts it would be obvious. Pet. 20–21 (citing Ex. 1013, 49–50, 165–166, 177, 181, 202–203, 307, 637–638; Ex. 1002 ¶¶ 211–215). According to Petitioner, this modification would "improve flexibility of contention resolution" described in IEEE-802.16, and "achieve successful delivery of Ranging Response to obtain and maintain a quality RF link." *Id.* at 21.

We determine that Petitioner has not shown by preponderant evidence that IEEE-802.16 teaches or suggests limitation 12A, or that a POSITA would have considered it beneficial to modify IEEE-802.16 to provide such a feature. In our view, Petitioner's assertions are based only on impermissible hindsight.

6. Claim 13

Claim 13 depends from claim 12 and is similar to claim 4. For the reasons explained for those claims, Petitioner has not demonstrated by preponderant evidence that claim 13 would have been obvious. Pet. 39–40.

7. Claim 16

Claim 16 depends from claim 15 and recites "wherein the probe request is generated by a network operator and uploaded to the first node."

Petitioner contends that claim 16 is similar to claim 8 and relies upon the evidence submitted for claim 8 as rendering claim 16 obvious. Pet. 29–34 (claim 8), 41 (claim 16).

We understand "network operator" to refer to a human. As Petitioner's evidence for this limitation cites only non-human entities or systems, Petitioner has not shown claim 16 to be obvious.

8. Claim 17

Petitioner contends that claim 17 would have been obvious over IEEE-802.16. Pet. 41–45. Patent Owner disagrees. PO Resp. 15–28, 30. We determine that Petitioner has shown by preponderant evidence that claim 17 would have been obvious notwithstanding Patent Owner's arguments, as explained below.

a) Preamble 17PRE

The preamble of claim 17 recites "A system, comprising:"

Petitioner contends that claim 17 is similar to claims 1 and 9 but claims a system, which IEEE-802.16 discloses. Pet. 41 (citing *id.* §§ IX.A.1, IX.A.9, IX.A.17b–g; Ex. 1002 ¶¶ 270–271).

Petitioner shows that IEEE-802.16 discloses the preamble of claim 17, which Patent Owner does not dispute.

b) Limitation 17A

Limitation 17A recites

> a first node on a communications network, the first node comprising a first processor and a first computer executable program code embodied on a first a computer readable medium, the first computer executable program code configured to transmit a probe request to a second node, on the communications network, the probe request specifying a first plurality of probe parameters for a physical layer probe, wherein the first plurality of probe parameters comprising at least a

payload content for the probe and a modulation profile for the probe.

Petitioner contends that IEEE-802.16's system includes a wireless network ("communications network") including one or more SSs ("first node") communicating with a BS ("second node"). Pet. 41. Petitioner contends that the "SS comprises a processor and computer executable program code embodied on a computer readable medium because that was a well-known implementation for the protocol stack of the SS." Pet. 42–43 (citing Ex. 1013, 3, Fig.1). To support its contentions, Petitioner provides the following figure:

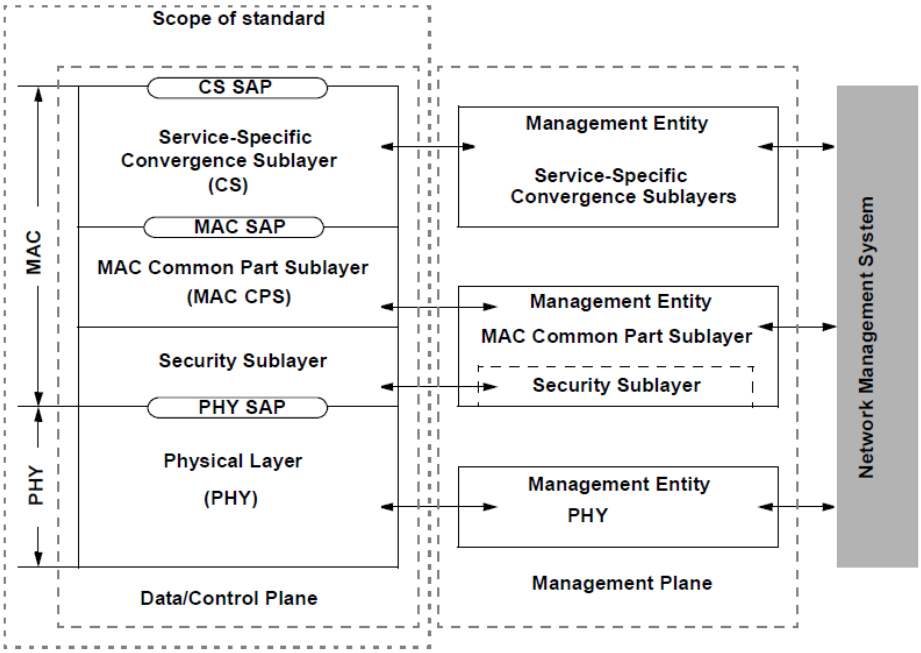


Figure 1—IEEE Std 802.16 protocol layering, showing SAPs

IEEE-802.16's Figure 1 above shows the various layers of the protocol stack specified by the standard. Petitioner asserts that the program code would have been executable to carry out the procedures (e.g., ranging) of the layers in the stack and would have performed the

"transmit" of limitation 1A. Pet. 43 (citing *id.* §§ IX.A.9.b; Ex. 1002 ¶ 274).

Petitioner asserts that the Ranging Request specifies the parameters for the Ranging Response ("the probe request specifying a first plurality of probe parameters for a physical layer probe"). *Id.* (citing *id.* §§ IX.A.1.b, IX.A.9.b). Petitioner contends that the Ranging Request's parameters (e.g., CID, SS MAC Address, Requested Downlink Burst Profile) comprise a payload content and burst profile for the Ranging Response ("a payload content for the probe and a modulation profile for the probe"). *Id.* (citing §§ IX.A.1.b, IX.A.2, IX.A.9.b; Ex. 1002 ¶¶ 275–289).

Patent Owner presents the same arguments for limitation 17A as for limitation 1A, which we found unpersuasive for reasons explained. *See* § II.D.2.a, *supra*.

Petitioner shows that IEEE-802.16 discloses limitation 17A.

c) Limitation 17B

Limitation 17B recites "the second node on the communications network, the second node comprising a second processor and a second computer executable program code embodied on a second computer readable medium, the second executable program code configured to:"

Petitioner contends that "the BS ("second node") comprises a processor and computer executable program code embodied on a computer readable medium." Pet. 43–44 (citing Ex. 1013, 3; Ex. 1002 ¶ 290). Petitioner states that the computer executable program code would have been configured to carry out the procedures (e.g., ranging)

of the stack layers, and that the BS's program code would have been configured to carry out the functions of limitations 17C–17F. Pet. 44 (citing *id.* §§ IX.A.17.d–g; Ex. 1013, 46 (programmable BS); Ex. 1002 ¶¶ 291–293).

Patent Owner does not submit any arguments against limitation 17B beyond those already mentioned.

Petitioner shows that IEEE-802.16 discloses limitation 17B.

d) Limitation 17C

Limitation 17C recites "receive the probe request."

Petitioner undisputedly contends that IEEE-802.16 discloses that the BS receives the Ranging Request. Pet. 44 (citing §§ IX.A.1.b, IX.A.9.c; Ex. 1002 ¶ 293).

Petitioner shows that IEEE-802.16 discloses limitation 17C.

e) Limitation 17D

Limitation 17D recites "determine a second plurality of parameters associated with generation and transmission of the probe."

Petitioner contends that the "BS determines parameters associated with generating and transmitting the Ranging Response." Pet. 45 (citing *id.* § IX.A.1.c; Ex. 1002 ¶ 294). Patent Owner presents no arguments for this limitation beyond those already considered.

Petitioner shows that IEEE-802.16 discloses limitation 17D.

f) Limitation 17E

Limitation 17E recites "generate the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters."

Petitioner contends that IEEE-802.16 discloses that "the BS generates the Ranging Response according to the Ranging Request's parameters and the Ranging Response's parameters, and "the Ranging Response has a form (e.g., modulation) dictated by the Ranging Request's parameters. Pet. 45 (citing *id.* § IX.A.1.d; Ex. 1002 ¶ 295). Patent Owner presents no arguments for this limitation beyond those previously discussed.

Petitioner shows that IEEE-802.16 discloses limitation 17E.

g) Limitation 17F

Limitation 17F recites "transmit the probe to the first node."

Petitioner contends that IEEE-802.16 discloses that the "BS transmits the Ranging Response to the SS." Pet. 45 (citing *id.* § IX.A.1.e; Ex. 1002 ¶ 296). Patent Owner presents no other arguments for this claim limitation.

Petitioner shows that IEEE-802.16 discloses limitation 17F.

h) Conclusion for Claim 17

Petitioner has shown by a preponderance of the evidence that each limitation of claim 17 is taught or suggested by IEEE-802.16, and that the claim would have been obvious notwithstanding Patent Owner's arguments.

9. Claim 18

Claim 18 depends from claim 17 and is similar to claim 10. Claim 18 recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission."

For the reasons explained (§ II.D.10), Petitioner does not show that IEEE-802.16 teaches or suggests that the Ranging Response "emulates an OFDMA transmission." Pet. 45. IEEE-802.16's Ranging Response is an actual OFDMA transmission, and is not a message used in a test procedure.

10. Claim 19

Claim 19 depends from claim 17 and in part recites "wherein the first probe and second probe are transmitted simultaneously using OFDMA" similar to claim 11.

For the reasons explained for claim 11 (§ II.E.4), Petitioner does not show that IEEE-802.16 teaches or suggests two BSs that transmit probes simultaneously in response to probe requests from an SS using OFDMA. Pet. 47.

11. Claim 20

Claim 20 depends from claim 17 and is similar claim 12. Claim 20 recites that the probe parameters comprise "an indication of the number of times to transmit the probe."

For the reasons explained for claim 12 (§ II.E.5), Petitioner does not show that IEEE-802.16 teaches or suggests this limitation of claim 20. Pet. 47.

12. Claim 21

Claims 21 depends from claim 20 and is similar to claims 4 and 13. Claim 21 recites "wherein the probe request is configured such that the probe identifies a hidden node."

For the reasons explained for claims 4 and 13 (§§ II.E.2, II.E.6), Petitioner does not show that IEEE-802.16 teaches or suggests claim 21. Pet. 47.

13. Claim 22

Claim 22 depends from claim 17 and recites "wherein the probe request is generated by the first node." Claim 22 is similar to claim 6 (the "first node" of claim 17 corresponds to the "second node" of claim 6).

For the reasons explained for claim 6 (§ II.D.7), Petitioner shows that claim 22 would have been obvious. Pet. 47.

14. Claim 23

Claim 23 depends from claim 17 and is similar to claim 15. Claim 23 recites "wherein the probe request is configured to diagnose a network problem."

For the reasons explained for claim 15 (§ II.D.12), Petitioner demonstrates that claim 23 would have been obvious. Pet. 47.

15. Claim 24

Claim 24 depends from claim 23 and is similar to claim 16. Claim 24 recites "wherein the probe request is generated by a network operator and uploaded to the first node."

For the reasons explained for claim 16 (§ II.E.7), Petitioner does not show that claim 24 would have been obvious.

16. Conclusion for Ground B

Petitioner has shown by a preponderance of the evidence that each limitation of claims 3, 17, 22, and 23 is taught or suggested by IEEE-802.16 and that these claims would have been obvious. Petitioner has not demonstrated obviousness for claims 4–5, 10–13, 18–21, and 24 under this ground.

F. Ground C: Obviousness over IEEE-802.16 and Won

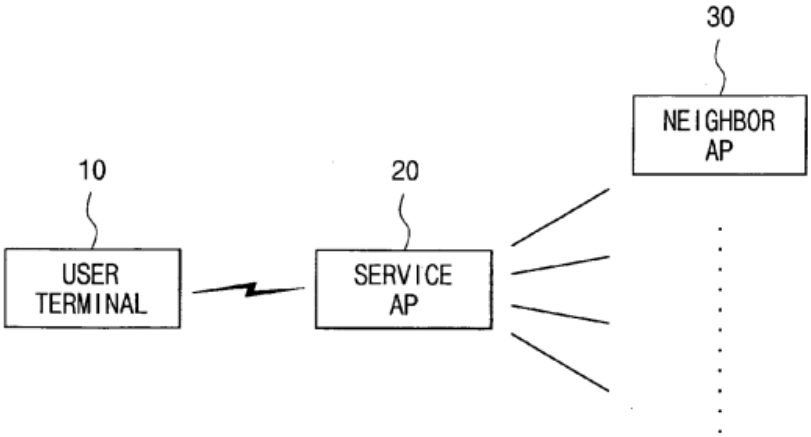
Petitioner contends that claims 8, 16, and 24 would have been obvious over the combination of IEEE-802.16 and Won. Pet. 29–34, 41, 47. We address the disclosure of Won, Petitioner's motivation to combine IEEE-802.16 and Won, and Petitioner's contentions that claims 8, 16, and 24 would have been obvious over the combination. Patent Owner relies on its

contentions for independent claims 1, 9, and 17 from which respective claims 8, 16, and 24 depend. PO Resp. 30. We conclude that Petitioner has shown by a preponderance of the evidence that claims 8, 16, and 24 would have been obvious for the reasons that follow.

1. Won (Ex. 1008)

Won is titled "Method and System of Detecting Duplicate SSID via Self-Scanning in WLAN." Ex. 1008, code (54). Won's Figure 2 is shown below:

FIG. 2



Won's Figure 2 shows a detection system that includes user terminal 10 and service access point (AP) 20 for providing data service to the user terminal 10 and neighbor APs 30 for transmitting/receiving packets to/from the service AP 20. *Id.* ¶ 26. User terminal 10 sends a scan request to AP 20 and in response service AP 20 generates and sends a probe request packet to neighbor APs 30. *Id.* AP 20 collects probe response packets from the neighbor APs 30, detects whether a service set identifier (SSID) is the same as that used by the AP 20, and informs the user terminal of the presence or absence of an AP that uses the same SSID. *Id.* ¶ 27. The presence of an AP that uses the same SSID may result in service failures. *Id.* ¶ 9.

2. Motivation to Combine

Petitioner contends that a POSITA would have been motivated to use a terminal for generating and uploading IEEE-802.16's similar Ranging Request to its SS because Won's terminal gives users/administrator more control over probe requests. Pet. 33 (citing Ex. 1002 ¶ 322). Petitioner contends this is merely combining known elements according to known methods yielding predictable results, and use of a known technique to improve similar devices in the same way. *Id.* at 33–34 (citing Ex. 1002 ¶¶ 323–324). Petitioner further asserts that given a POSITA's programming and network design skills, the POSITA would have expected success in making the combination. *Id.* at 34 (citing Ex. 1002 ¶ 325).

Patent Owner does not dispute Petitioner's stated motivation to combine or reasonable expectation of success.

Petitioner shows that a POSITA would have had reason to combine IEEE-802.16 and Won with a reasonable expectation of success.

3. Claims 8, 16, and 24

Claims 8, 16, and 24 depend from respective claims 1, 9, and 17, and recite similar limitations. For example, claim 8 recites "wherein the probe request is generated by a network operator and uploaded to the second node."

We agree with Petitioner that Won's teaching of a user terminal 10 that sends a scan request to an AP 20 which, in response, generates and sends probe requests to neighbor APs 30, at least suggests that a "network operator" would be the "user" operating user terminal 10. Pet. 32–34 (citing Ex. 1008, code (57), ¶¶ 3, 12–15, 19, 26–31, 35, Fig. 2; Ex. 1002 ¶¶ 248, 319–326).

4. Conclusion for Ground C

Petitioner shows by a preponderance of the evidence that a POSITA would have been motivated to combine IEEE-802.16 and Won with a reasonable expectation of success, and that the limitations of claims 8, 16, and 24 are taught or suggested by the combination. Accordingly, Petitioner has shown that claims 8, 16, and 24 would have been obvious.

G. Ground D: Anticipation by Waxman

We address below Waxman's disclosure, Petitioner's contention that Waxman anticipates claims 1–11, 14–19, and 22–24, and Patent Owner's disputes concerning Petitioner's contentions. Pet. 48–61; PO Resp. 30–41.

1. Waxman (Ex. 1007)

Waxman is titled "Device, System and Method of Extended-Range Wireless Communication." Ex. 1007, code (54). Waxman discloses an extended-range wireless communication method that receives a probe request indicating a requested transmission scheme, and transmits a data packet using the requested transmission scheme. *Id.*, code (57).

Waxman's Figure 1 is shown below.

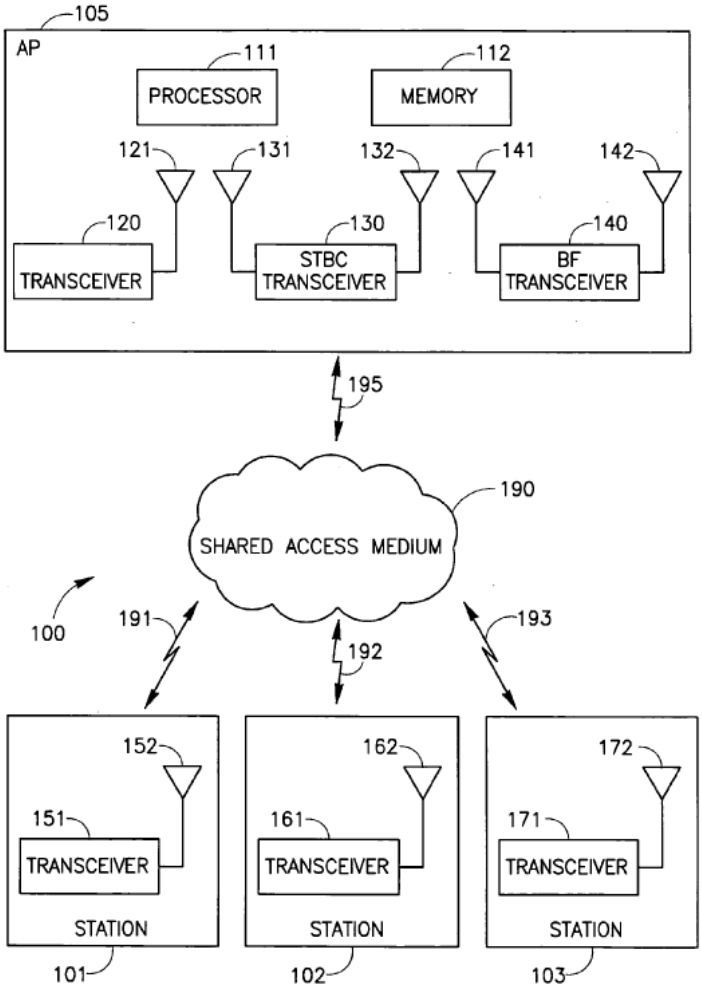


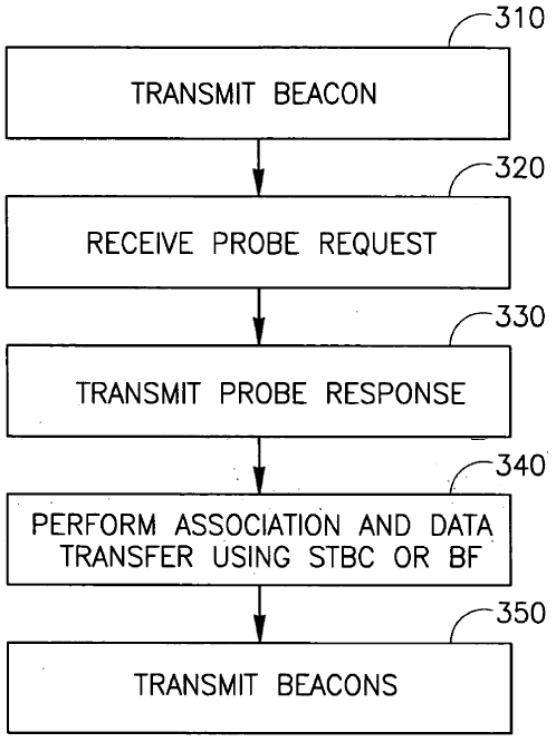
FIG.1

Figure 1 shows a wireless communication system using extended-range wireless communication. *Id.* ¶ 4. System 100 includes wireless communication stations 101, 102, and 103, and access point (AP) 105, which communicates using shared access medium 190 through wireless links 191, 192, 193, and 195. *Id.*

Stations 101, 102, and 103 may perform active scanning by transmitting a probe request. *Id.* ¶ 30. The probe request includes a Requested Transmission Scheme (RTS) field that indicates to AP 105 a

transmission scheme requested by stations 101, 102, and 103. *Id.* AP 105 may determine based on the received probe request and other information that AP 105 is required or requested to transmit data to a certain station using an extended-range transmission scheme such as Transmission Antenna Diversity Scheme (TADS) using Space-Time Block Codes (STBC) or beam forming (BF). *Id.* ¶¶ 1, 15, 30.

Waxman's Figure 3 is shown below.



Waxman's Figure 3 shows a method of extended-range wireless communication implemented by system 100 including stations 102 and 103, and AP 105. *Id.* ¶ 52. In box 310, the AP transmits a beacon. *Id.* ¶ 53. In box 320, the AP receives a probe request transmitted by a station. *Id.* ¶ 54. The probe request includes a parameter requesting the AP to communicate with the station using TADS, for example, STBC or BF communication. *Id.* In box 330, the AP transmits a probe response using the TADS scheme. *Id.*

¶ 55. In box 340, the AP performs association and data transfer between the AP and station using TADS to transmit the preamble or header portion and data portion of a packet. *Id.* ¶ 56. In box 350, the AP transmits a non-STBC beacon signal periodically or repeatedly. *Id.* ¶ 57.

2. Claim 1

Limitation 1A of claim 1 recites "receiving in a first node, a probe request specifying a first plurality of parameters associated with the generation and transmission of a probe, wherein the first plurality of parameters at least specify content payload of the probe and a second node."

Petitioner contends that the parameters in Waxman's probe request specify payload content of the probe response. Pet. 49 (citing Ex. 1007 ¶¶ 37, 49, Fig. 2; Ex. 1002 ¶¶ 343–346).

Patent Owner argues that Waxman does not disclose limitation 1A because the only three parameters ("requested transmission scheme," "requested number of transmission antennas to be used," and "other attributes of a requested transmission scheme") that Waxman discloses in the probe request relate to the transmission scheme to be used by the access point, and do not relate to the content payload of the probe response. PO Resp. 30–39 (citing Ex. 1007 ¶¶ 12, 20, 30–35, 37, 42–49, 52–56, Figs. 2–3; Ex. 2002, 87:16–88:18, 96:21–100:14; Ex. 1002 ¶ 343; Ex. 2007 ¶¶ 80, 82–83, 86–90).

We agree with Patent Owner that the Waxman's parameters relate to how messages are to be transmitted, not their content. Consequently, Petitioner has not shown that Waxman discloses limitation 1A, nor met its burden to show that Waxman anticipates claim 1.

3. Claims 2–8

Claims 2–8 depend from claim 1 and thus incorporate all of its limitations. For the reasons just explained for claim 1 in § II.G.2, Petitioner has not demonstrated that Waxman anticipates claim 1, so dependent claims 2–8 are likewise not anticipated by Waxman.

4. Claim 9

We now address Petitioner's contentions for claim 9, and Patent Owner's arguments against those contentions.

a) *Preamble 9PRE*

The preamble of claim 9 recites "A method comprising."

Petitioner undisputedly shows that Waxman's active scanning process discloses a method. Pet. 48 (citing Ex. 1007, code (57)), ¶ 6; Ex. 1002 ¶¶ 329–332), 53.

b) *Limitation 9A*

Limitation 9A recites "a first node transmitting a probe request to a second node, the probe request specifying a first plurality of probe parameters for a physical layer probe, the first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe."

Petitioner shows that Waxman's wireless AP 105 constitutes a "first node" and any one of Waxman's stations 101, 102, 103 constitutes a "second node." Pet. 48 (citing Ex. 1007 ¶¶ 12–17, 28, 45, Fig. 1; Ex. 1002 ¶¶ 333–341), 53. Petitioner further shows that Waxman's station transmits a probe request to AP 105 which receives it ("receiving in a first node, a probe request"). *Id.* at 48–49 (citing Ex. 1007 ¶¶ 30, 46–48, 52–54, Figs. 2–3; Ex. 1002 ¶¶ 335–337), 53–54. Petitioner shows that Waxman's probe

request provides numerous parameters ("first plurality of parameters") including "a requested transmission scheme, a requested number of transmission antennas to be used, and/or other attributes of a requested transmission scheme." *Id.* at 49 (citing Ex. 1007 ¶¶ 30–35; Ex. 1002 ¶¶ 342–344), 53–54.

Petitioner shows that Waxman's probe response is a "physical layer probe" because its transmission scheme determines its modulation on the physical layer of the wireless air interface between the AP 105 and station. *Id.* at 54 (citing Ex. 1007 ¶¶ 42–43, 56; Ex. 1002 ¶ 404).

Petitioner further shows that Waxman's probe request includes an RTS parameter that instructs the AP to use a particular transmission scheme (STBC or BF) ("modulation profile"). *Id.* (citing Ex. 1007 ¶¶ 22–28, 32–33; Ex. 1002 ¶¶ 405–407). The RTS parameter thus determines the form for the probe response ("comprises a form for the probe including a modulation profile"). *Id.* (citing Ex. 1002 ¶ 406).

Patent Owner contends that Waxman's probe response does not characterize a communication channel between the AP and the station. PO Resp. 32–33 (citing Ex. 2007 ¶ 89). Patent Owner's argument hinges on its construction of "probe" with which we do not agree. *See* § II.A.1, *supra*. Claim 9 does not require the "probe" to be used for channel characterization.

Patent Owner further argues that Waxman does not disclose a "physical layer probe." PO Resp. 39–41 (citing Ex. 1007 ¶¶ 37, 56; Ex. 2002, 95:4–96:4, 104:25–106:13, 107:3–24; Ex. 1002 ¶ 404; Ex. 2007 ¶¶ 87–89). However, Waxman's probe response is generated in accordance with a transmission scheme specified by the probe request, and that

transmission scheme relates to the physical layer on the air interface between the station and AP. Pet. 54 (citing Ex. 1007 ¶¶ 42–43, 56; Ex. 1002 ¶ 404).

Consequently, Patent Owner's arguments do not undermine Petitioner's showing that Waxman discloses limitation 9A.

c) *Limitation 9B*

Claim 9's limitation 9B recites "the first node receiving the probe from the second node, wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node."

Petitioner shows that Waxman's station ("first node") receives the probe transmitted by Waxman's AP ("second node") based on the station's probe request. Pet. 52–54 (citing Ex. 1007 ¶¶ 37, 49, 55, Figs. 2–3; Ex. 1002 ¶¶ 363–366). Petitioner shows that Waxman's AP determines parameters based on the probe request for use in generating the probe response ("second plurality of parameters determined by the second node"). Pet. 50–54 (citing Ex. 1007 ¶¶ 19, 23, 25, 27–28, 30–31, 43–44, 54; Ex. 1002 ¶¶ 347–356) (Waxman's determined parameters, using a matrix and weights, relate to the number of antennas, time slots for data, beam direction, cyclic delay diversity, and the preamble, header and data of packets).

Petitioner further shows that Waxman's AP generates the probe response in accordance with parameters received in the probe request and parameters that it determines itself ("wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node"). Pet. 51–52

(citing Ex. 1007 ¶¶ 37–39, 49, 55, Figs. 2–3; Ex. 1002 ¶¶ 357–362), 54 (citing Ex. 1002 ¶¶ 409–421).

Patent Owner presents no arguments specific to limitation 9B beyond the arguments made for limitation 9A.

Petitioner shows that Waxman discloses limitation 9B.

d) *Conclusion for Claim 9*

Petitioner shows by a preponderance of the evidence that each limitation of claim 9 is disclosed by Waxman, and that the claim is therefore unpatentable as anticipated.

5. Claim 10

Claim 10 depends from claim 9 and recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission."

Although Petitioner contends that Waxman uses OFDM intended for access by multiple stations, Petitioner does not show that Waxman's probe response "emulates" (i.e., imitates) an OFDMA transmission. Pet. 57 (citing Ex. 1007 ¶¶ 9, 12; Ex. 1002 ¶ 386).

6. Claim 11

Claim 11 depends from claim 9 and recites that the first node receives first and second probes "wherein the first probe and second probe are transmitted simultaneously using OFDMA."

Petitioner does not show that Waxman discloses this feature as there is no mention in Waxman of transmitting probes simultaneously using OFDMA. Pet. 57–59 (citing Ex. 1007 ¶¶ 9, 12, 31; Ex. 1002 ¶¶ 384–387, 422–425, 429–430, 460).

7. Claims 14–16

We have already decided that claims 14–16 are unpatentable for the reasons stated in grounds A and B and thus do not address them further here.

8. Claim 17

Limitation 17A of claim 17 recites in part that "the probe request specif[ies] a first plurality of probe parameters for a physical layer probe, wherein the first plurality of probe parameters compris[es] at least a payload content for the probe and a modulation profile for the probe."

For the reasons explained for claim 1 in § II.G.2, Petitioner does not show that claim 17 is anticipated by Waxman. Waxman's probe request does not specify content in its probe response's payload.

9. Claims 18, 19, and 22–24

Claims 18, 19, and 22–24 depend from claim 17 and thus include all of its limitations. For the reasons just explained for claim 17 in § II.G.8, Petitioner does not show that these dependent claims are anticipated by Waxman.

10. Conclusion for Ground D

Petitioner shows by preponderant evidence that claim 9 is anticipated by Waxman, but not claims 1–11, 17–19, and 22–24, and we do not reach claims 14–16.

H. Ground E: Obviousness over Waxman

Petitioner contends that claims 1–11, 14–19, and 22–24 would have been obvious over Waxman. Pet. 48–61. As noted for the anticipation ground D discussed in § II.G, we agree with Patent Owner that Petitioner has not shown that Waxman discloses that the probe request specifies payload content of a probe as recited in claims 1 and 17 and their dependent claims 2–8, and 18–19 and 22–24, respectively. PO Resp. 33–39. In

Gound D, we determined that claim 9 is anticipated by Waxman, and it is also obvious in light of the noted teachings of Waxman in this ground. Petitioner has not shown that claims 10 and 11 would have been obvious for similar reasons stated for these claims in ground D. *See* II.G.5–6, *supra*. We do not reach claims 14–16 as they were shown to be anticipated or obvious in grounds A and B. *See* §§ II.D.11–12, II.E.7, *supra*.

I. Ground F: Obviousness over Waxman and Giesberts

Petitioner contends that claims 3–5, 12–13, and 20–21 of the '690 patent would have been obvious over the combination of Waxman and Giesberts. Pet. 61–64. Patent Owner disagrees. PO Resp. 30–41. The disclosure of Giesberts, the motivation to combine Waxman and Giesberts, and the parties' contentions concerning these claims are addressed below.

1. Giesberts (Ex. 1009)

Giesberts is titled "Method and Apparatus for Access Point Selection Using Channel Correlation in a Wireless Communication System." Ex. 1009, code (54). Giesberts discloses an active scanning process in which a station issues a probe request to an access point specifying the data rates that the station can support. *Id.* ¶ 45. The probe request may be enhanced with the MIMO[16] modes that the station supports. *Id.* ¶ 46.

2. Motivation to Combine

Petitioner contends that a POSITA would have been motivated to include Giesberts' parameters in Waxman to efficiently leverage available communication schemes and optimize communications. Pet. 62 (citing Ex. 1009 ¶¶ 25–26, 41–47; Ex. 1002 ¶¶ 471–478).

[16] Multiple-Input Multiple-Output. Ex. 1009 ¶ 27.

Petitioner asserts that "Waxman-Giesberts involves using known techniques (Giesberts' techniques for AP selection using parameters specified in probe requests) to improve similar devices (Waxman's stations and APs similar to Giesberts' stations and APs) in the same way (setting parameters to optimize AP-station communications)." *Id.* (citing Ex. 1002 ¶ 478). Petitioner contends that a POSITA would have expected success in in combining Waxman and Giesberts because Waxman already teaches various parameters for its probes. *Id.* (citing Ex. 1007 ¶¶ 22–28, 32–33; Ex. 1009 ¶¶ 26, 44–47; Ex. 1002 ¶ 479).

Patent Owner does not dispute Petitioner's contentions.

Petitioner shows that a POSITA would have combined Waxman and Giesberts with a reasonable expectation of success.

3. Claim 12

Claim 12 depends from claim 9 and recites that the probe parameters include "an indication of the number of times to transmit the probe."

Petitioner contends that Giesberts discloses this feature. Pet. 63 (citing Ex. 1009 ¶¶ 24, 35; Ex. 1002 ¶¶ 483–486, 504, 510). The cited paragraphs of Giesberts, however, relate to tracking packet errors (Ex. 1009 ¶ 24) or determining how many independent data streams can be transmitted using MIMO channel correlation (Ex. 1009 ¶ 35), and do not disclose the claimed "indication of the number of times to transmit the probe." Consequently, Petitioner has not shown that claim 12 would have been obvious over Waxman and Giesberts.

4. Claim 13

Claim 13 depends from claim 9 and recites "wherein the probe request is configured such that the probe identifies a hidden node."

Petitioner contends that Waxman-Giesberts teaches claim 13. Pet. 64 (citing *id.* §§ IX.B.6, IX.C.2; Ex. 1002 ¶¶ 508, 516). Specifically, Petitioner asserts that Waxman teaches that when a station does not receive an AP's beacon signal, it transmits a probe request instructing the AP to use an extended-range transmission scheme, thereby revealing itself as a hidden node. Pet. 57 (citing Ex. 1007 ¶¶ 29–30; Ex. 1002 ¶¶ 380–383).

Claim 13, however, requires that the probe, not the probe request, identifies the hidden node. Accordingly, Petitioner does not show that claim 13 would have been obvious over the Waxman-Giesberts combination.

5. Claims 3–5, 20, and 21

Claims 3–5 depend from claim 1, and claim 17 is the parent of claims 20 and 21, and thus incorporate their respective limitations. Because we determined in §§ II.G–H that Petitioner did not show preponderant evidence of unpatentability for claims 1 and 17, we likewise determine that Petitioner has not shown unpatentability of dependent claims 3–5, 20, and 21.

6. Conclusion for Ground F

Petitioner does not demonstrate preponderant evidence that claims 3–5, 12–13, 20, and 21 would have been obvious over the Waxman-Giesberts combination.

J. Ground G: Obviousness over Waxman and Zuckerman

Petitioner asserts that claims 5, 10, 11, 18, and 19 would have been obvious over the combination of Waxman and Zuckerman. Pet. 65–66. Patent Owner disagrees. PO Resp. 41–43.

We consider below the disclosure of Zuckerman, the motivation to combine Waxman and Zuckerman, and the parties' contentions concerning these claims.

1. Zuckerman (Ex. 1016)

Zuckerman is titled "Hybrid System Having Multiple Downlink Channels and a Single Uplink Channel." Ex. 1016, code (54). Zuckerman discloses a centralized controller 7 that communicates with wireless clients using OFDMA or OFDM. *Id*. at ¶¶ 6–8.

2. Motivation to Combine

Petitioner contends that a POSITA would have been motivated to combine Waxman and Zuckerman because Waxman discloses OFDM, and Zuckerman teaches to use OFDM and OFDMA interchangeably. Pet. 65 (citing Ex. 1016 ¶¶ 64–66; Ex. 1002 ¶ 520). Petitioner further asserts that using Zuckerman's OFDMA modulation techniques in Waxman's extended-range communication system allows for more efficient multi-user communications. *Id.* at 65–66 (citing Ex. 1016 ¶¶ 7–8, 94, 104; Ex. 1002 ¶ 522).

According to Petitioner, Waxman-Zuckerman merely uses a known technique (Zuckerman's OFDMA) to improve similar devices (Waxman's wireless network similar to Zuckerman's wireless network) in the same way (the way OFDMA provides multiple access to Zuckerman's network). *Id.* at 66 (citing Ex. 1002 ¶¶ 522–523).

Patent Owner does not dispute Petitioner's stated motivation to combine Waxman and Zuckerman.

Petitioner shows that a POSITA would have been motivated to combine Waxman and Zuckerman.

3. Claim 10

Claim 10 depends from claim 9 and recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission."

Petitioner contends that a POSITA would have used Zuckerman's OFDMA modulation techniques in Waxman's extended-range communication system. Pet. 65 (citing Ex. 1016 ¶¶ 64–66; Ex. 1002 ¶ 520). However, Petitioner does not show that Zuckerman's OFDMA "emulates" (i.e., imitates) an OFDMA transmission as claimed. Rather, Waxman's probe request transmitted with Zuckerman's OFDMA is an actual, not test, transmission.

Consequently, Petitioner has not met its burden to show that claim 10 would have been obvious over Waxman-Zuckerman.

4. Claim 11

Claim 11 depends from claim 9 and recites in part that the first node receives first and second probes from different nodes "wherein the first probe and second probe are transmitted simultaneously using OFDMA."

Petitioner contends that Zuckerman teaches OFDMA for simultaneous transmissions on the same channel. Pet. 66–67 (citing Ex. 1016 ¶¶ 7–8, 94, 104, 176, 178, 211–212, 215–216; Ex. 1002 ¶¶ 525–535). However, Petitioner does not show that the combination of Waxman and Zuckerman discloses two different nodes transmitting probes simultaneously using OFDMA in response to probe requests from another node.

Accordingly, Petitioner has not met its burden to show by preponderant evidence that claim 11 would have been obvious over Waxman-Zuckerman.

5. Claims 5, 18, and 19

Claim 5 depends from claim 1, and claims 18–19 depend from claim 17, and thus incorporate their respective limitations. Petitioner contends these claims would have been obvious over Waxman-Zuckerman. Pet. 65–67. Patent Owner disagrees. PO Resp. 41–43.

Because we determined in §§ II.G–H that Petitioner did not show preponderant evidence establishing claims 1 and 17 are unpatentable, and Petitioner has not shown that Zuckerman cures Waxman's deficiencies by emulating OFDMA transmissions or transmitting probes simultaneously, we likewise determine that Petitioner does not show preponderant evidence that claims 5 and 18–19 would have been obvious over Waxman-Zuckerman.

K. Ground H: Obviousness over Waxman, Giesberts, and Zuckerman

This ground is subsumed by grounds G and H, and thus, for the reasons explained for those grounds (§§ II.I–J), we similarly determine that Petitioner has not shown preponderant evidence that claim 5 would have been obvious over Waxman-Giesberts-Zuckerman.

L. Ground I: Obviousness over Waxman and Won

Petitioner contends that claims 7, 8, 15, 16, 23, and 24 would have been obvious over the combination of Waxman and Won. Pet. 67–71. As we have already determined these claims unpatentable in grounds A–C, we do not discuss them further in this ground.

M. Ground J: Anticipation by DOCSIS-2.0

Petitioner contends that claims 1, 2, 6, 7, 9, 14, and 15 are anticipated by DOCSIS-2.0. Pet. 71–85. We previously determined that these claims are unpatentable under grounds A and D. Nonetheless, we address in this

section the disclosure of DOCSIS-2.0 and the parties' contentions for claim 9 because grounds L and M concern claims dependent from claim 9.

Petitioner's contentions rely on two features of DOCSIS-2.0—the ranging procedure and the testing procedure. *Id.* Because Petitioner maps the claimed "probe" to a Ranging Request (RNG-REQ), we determine that the ranging procedure does not disclose the claims. *See, e.g.*, Pet. 83–84. As Patent Owner argues, DOCSIS-2.0's Ranging Request is not a "probe" but a "request." PO Resp. 46–47. Accordingly, we restrict our analysis to the parties' contentions for DOCSIS-2.0's testing procedure. Pet. 84–85; PO Resp. 50–54. We determine that DOCSIS-2.0 anticipates claim 9, as explained below.

1. DOCSIS-2.0 (Ex. 1010)

DOCSIS-2.0 is titled "Data-Over-Cable Service Interface Specifications, DOCSIS 2.0, Radio Frequency Interface Specification." Ex. 1010, 1. DOCSIS-2.0 discloses a test procedure in which a cable modem termination system (CMTS) transmits a Test Request (TST-REQ) to a cable modem (CM). *Id.*, 184–186. Responsive to the Test Request, the CM transmits an upstream signal using the commanded modulation rate, carrier frequency, and power level. *Id.*, 185–186.

2. Claim 9

We now address Petitioner's contentions for claim 9, and Patent Owner's arguments against those contentions.

a) *Preamble 9PRE*

The preamble of claim 9 recites "A method comprising."

Petitioner undisputedly contends that DOCSIS-2.0's testing procedure constitutes a "method." Pet. 83 (citing *id.* §§ IX.F.5.b–c; Ex. 1002 ¶ 611). We agree.

b) *Limitation 9A*

Limitation 9A recites "a first node transmitting a probe request to a second node, the probe request specifying a first plurality of probe parameters for a physical layer probe, the first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe."

Petitioner contends that the CMTS transmits a Test Request ("probe request") to a CM that specifies parameters for the Test Response ("first plurality of probe parameters for a physical layer probe"). Pet. 84 (citing *id.* §§ IX.F.1.b–e; Ex. 1002 631–634). Petitioner asserts the Test Request's parameters comprise a form for the Test Response including its modulation rate and type ("form for the probe including a modulation profile for the probe"). *Id.* Petitioner argues that the Test Response is a "physical layer probe" because it is configured using physical-layer parameters (e.g., modulation rate) and is used to test timing of the communications on the physical layer. *Id.* (citing Ex. 1010, 24, 140–142, 185; Ex. 1002 ¶¶ 629–630).

Patent Owner argues that DOCSIS-2.0 does not disclose that its testing procedure is used to determine channel characteristics. PO Resp. 50–54 (citing Ex. 1010, 184–185; Ex. 2007 ¶¶ 106–108, 110). Patent Owner's argument depends on its construction of "probe" which we do not adopt. *See* § II.A.2, *supra*. Thus, Patent Owner's argument is unavailing.

Patent Owner argues that Petitioner treats "probe" as a nonce word. PO Resp. 52–53. We do not agree since DOCSIS-2.0's testing procedure generates a test transmission that is a "probe" under its plain meaning.

Patent Owner further argues that DOCSIS-2.0 does not explain what the CMTS does with the CM's continuous test transmissions. Pet. 52 (citing Ex. 1010, 185; Ex. 2007 ¶¶ 107–108). We do not read claim 9 to require any action after the "first node" receives the probe. Thus, Patent Owner's argument depends on limitations not present in the claim, which are unavailing.

Consequently, Patent Owner's argument does not undermine Petitioner's showing, and Petitioner demonstrates that DOCSIS-2.0 discloses limitation 9A.

c) *Limitation 9B*

Claim 9's limitation 9B recites "the first node receiving the probe from the second node, wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node."

Petitioner contends that DOCSIS-2.0 discloses that the CMTS receives the Test Response ("probe") generated in accordance with the Test Request's parameters and the Test Response parameters as determined by the CM. Pet. 84–85 (citing id. §§ IX.F.1.b–e; Ex. 1002 ¶¶ 635–639).

Patent Owner does not submit any additional arguments for limitation 9B beyond those already discussed for limitation 9A.

Petitioner shows that DOCSIS-2.0 discloses limitation 9B.

d) *Conclusion for Claim 9*

Petitioner shows by a preponderance of the evidence that each limitation of claim 9 is disclosed by DOCSIS-2.0 such that the claim is unpatentable as anticipated.

N. Ground K: Obviousness over DOCSIS-2.0 and ISO8802-2

Petitioner contends that claims 1–2, 6–7, 9, and 14–15 would have been obvious over the combination of DOCSIS-2.0 and ISO8802-2. Pet. 71–85. We previously determined that these claims are unpatentable in grounds A and D. Also, this ground subsumes ground J discussed above. Consequently, we determine that claim 9 would have been obvious in this ground over the combination of DOCSIS-2.0 and ISO8802-2 under Petitioner's showing for this claim in ground J because the addition of ISO8802-2 does not negate Petitioner's showing for claim 9 in this ground.

O. Ground L: Obviousness over DOCSIS-2.0 and Zuckerman

Petitioner contends that claims 8, 10–11, 16–19, and 22–24 would have been obvious over the combination of DOCSIS-2.0 and Zuckerman. Pet. 85–99. We determined that claims 8, 16–17, and 22–24 are unpatentable under grounds B and C and, except for claim 17, we do not discuss them further in this ground. We analyze the parties' contentions concerning claims 10–11 and 18–19. Pet. 89–99; PO Resp. 56–57. Because claims 18–19 depend from claim 17, we address claim 17 below. We determine that Petitioner has demonstrated that claims 10, 17, and 18 would have been obvious over the combination of DOCSIS-2.0's testing procedure and Zuckerman, but not claims 11 and 19.

1. Motivation to Combine

Petitioner contends that a POSITA would have been motivated to use Zuckerman's OFDMA in DOCSIS-2.0 because this would improve network performance (e.g., bit error rate), allow simultaneous access by multiple users, support high-rate applications (e.g., video), and address noise and network congestion problems. Pet. 89–90 (citing Ex. 1016 ¶ 8; Ex. 1002 ¶¶ 665–671).

Patent Owner's argument against Petitioner's motivation to combine depends upon its construction of "probe" which we do not accept. PO Resp. 52–54. Patent Owner also presents additional arguments touching upon the motivation to combine and reasonable expectation of success as discussed for claim 10 below.

We determine that Petitioner has shown that a POSITA would have been motivated to use Zuckerman's OFDMA in DOCSIS-2.0 for the benefits it provides with a reasonable expectation of success.

1. Claim 10

Claim 10 depends from claim 9 and recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission."

Petitioner contends that a POSITA would have used Zuckerman's OFDMA modulation techniques with DOCSIS-2.0 testing procedures. Pet. 89–90 (citing Ex. 1016 ¶¶ 6–8, 15, 41, 48–54, 58–65, 71–72, 76, 110, 134, 141; Ex. 1002 ¶¶ 665–671). Petitioner demonstrates that DOCSIS-2.0's Test Request ("probe request") includes a parameter that specifies the Test Response's transmission (when the parameter is set to mode 1, the generated Test Response is "1, -1, 1, -1, …" and when set to mode 2, the generated Test Response is "1, 1, 1, 1, …" for 30 minutes or until mode 0 is

received) ("is configured such that the probe emulates an … transmission"). Ex. 1010, 184–186. The Test Response "emulates" a transmission because it used in a testing procedure, and not actual communication. Zuckerman's OFDMA teaches "an OFDMA transmission." *See, e.g.*, Ex. 1016 ¶¶ 36, 49.

Patent Owner argues that DOCSIS-2.0 did not use OFDMA, and that OFDMA was not introduced until DOCSIS-3.1, twelve years after DOCSIS-2.0 and five years after the '690 patent's priority date. PO Resp. 55–56 (citing Pet. 89; Ex. 1002 ¶¶ 665–671, 681–687, 729, 746; Ex. 2002, 93:5–15; Ex. 2007 ¶¶ 113–115).

Petitioner replies that the advantages of OFDMA were well-known, as Zuckerman establishes, and the mere passage of time between DOCSIS-2.0 and when OFDMA was adopted twelve years later in DOCSIS-3.1 does not negate that market was moving toward OFDMA before the '690 patent. Pet. Reply 27 (citing Pet. 89–92, 97–99; Ex. 1016 ¶¶ 5, 41, 49; Ex. 1036 ¶¶ 79–83; Ex. 1002 ¶¶ 665–670; *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004)).

Patent Owner responds that Zuckerman discloses both OFDMA and OFDM and Petitioner's expert, Mr. Bertonis, does not explain which one would be more appropriate to use. PO Sur-Reply 19–20 (citing Ex. 2008, 167:7–12, 168:1–12, 168:19–23).

We are persuaded by Petitioner's argument that the benefits of using OFDMA such as Zuckerman's were well known, and that Zuckerman alludes to using its OFDMA in DOCSIS-2.0 because the frequency ranges it mentions are those used in DOCSIS-2.0. *See, e.g.*, Ex. 1010, 1, 15, 19; Ex. 1016 ¶¶ 47–49, 66, 71; Ex. 1036 ¶¶ 81–83. As to Patent Owner argument concerning appropriateness of using Zuckerman's OFDMA or

OFDM, Petitioner stated that OFDMA would allow simultaneous access by multiple users, so a POSITA would have used OFDMA in circumstances where multiple users would need to be accommodated. *See* Pet. 89–90. We agree.

Consequently, Petitioner shows by preponderant evidence that claim 10 would have been obvious over the combination of DOCSIS-2.0 and Zuckerman.

2. Claim 11

Claim 11 depends from claim 9 and further recites "a) the first node transmitting a second probe request to a third node; b) and the first node receiving a second probe from the third node, wherein the second probe is generated according to the second probe request; and wherein the first probe and second probe are transmitted simultaneously using OFDMA."

Petitioner contends that DOCSIS-2.0 discloses transmitting a second Test Request ("second probe request") to CM#2 ("third node"). Pet. 91 (citing *id.* § IX.B.5.b; Ex. 1010, 184–185; Ex. 1002 ¶¶ 675–676).

Petitioner further contends DOCSIS-2.0 discloses that the CMTS receives a second "Test Response" ("second probe") from CM#2 that is generated according to the second Test Request. *Id.* (citing § IX.F.5.c; Ex. 1002 ¶¶ 679–680).

Petitioner asserts that "Test Responses" would have been transmitted simultaneously using OFDMA "because the messages that trigger them would have been sent simultaneously or near-simultaneously so that the . . . test procedure would be performed on multiple channels simultaneously." Pet. 92 (citing *id.* § IX.G.2; Ex. 1016 ¶¶ 76, 80, 174, 176, 198, 210–212; Ex. 1002 ¶¶ 682–687).

Reviewing Petitioner's evidence, we find no mention of simultaneously transmitting Test Responses from two CMs to a CMTS. Thus, Petitioner's contentions are supported only by its expert's testimony, which is insufficient to demonstrate obviousness. 37 C.F.R. § 42.65(a).

Petitioner does not show by preponderant evidence that claim 11 would have been obvious over the combination of DOCSIS-2.0 and Zuckerman.

3. Claim 17

a) Preamble 17PRE

The preamble of claim 17 recites "A system, comprising:"

Petitioner undisputedly demonstrates that DOCSIS-2.0 discloses a system. Pet. 92–93 (citing *id.* §§ IX.F.1, IX.F.9; Ex. 1002 ¶¶ 689–690).

b) Limitation 17A

Limitation 17A recites

> a first node on a communications network, the first node comprising a first processor and a first computer executable program code embodied on a first a computer readable medium, the first computer executable program code configured to transmit a probe request to a second node, on the communications network, the probe request specifying a first plurality of probe parameters for a physical layer probe, wherein the first plurality of probe parameters comprising at least a payload content for the probe and a modulation profile for the probe.

Petitioner demonstrates that the combination of DOCSIS-2.0's testing procedure with Zuckerman discloses limitation 17A. Pet. 93–95 (citing *id.* §§ IX.F.1.b, IX.F.5.b; Ex. 1010, 27, 118, 125, 239; Ex. 1016 ¶ 10; Ex. 1002 ¶¶ 691–694, 707–714). DOCSIS-2.0 shows a communications network with nodes including CMTS and CM#1 and

CM#2 that have processors and execute program code stored in computer-readable media to perform various functions, including the DOCSIS-2.0 testing procedure. *See, e.g.*, Ex. 1010, 29, 184–186. DOCSIS-2.0's Test Request includes parameters that specify the payload content ("1, -1, 1, -1, … in mode 1, "1, 1, 1, 1, … in mode 2) and parameters like modulation rate which pertain to the physical layer such that the Test Request is a "physical layer probe" notwithstanding Patent Owner's arguments. Pet. 92–95; PO Resp. 50–54; Pet. Reply 27; PO Sur-Reply 23–24.

Petitioner shows that the combination of DOCSIS-2.0 and Zuckerman discloses limitation 17A.

c) Limitation 17B

Limitation 17B recites "the second node on the communications network, the second node comprising a second processor and a second computer executable program code embodied on a second computer readable medium, the second executable program code configured to:"

Petitioner demonstrates that the combination of DOCSIS-2.0 and Zuckerman discloses limitation 17B, which Patent Owner does not dispute. Pet. 95–96 (citing *id.* §§ IX.G.5.d–g; Ex. 1010, 27, 118, 125; Ex. 1002 ¶¶ 715–718).

d) Limitation 17C

Limitation 17C recites "receive the probe request."

Petitioner shows that DOCSIS-2.0 discloses that the CM#1 ("the second node" with processor and code stored on medium) receives the Test Request. Pet. 96 (citing §§ IX.F.1.b, IX.F.5.c;

Ex. 1002 ¶¶ 719–720). Other than its construction arguments concerning "probe," "probe request" and "physical layer probe") (*see, e.g.,* § II.A, *supra*), Patent Owner does not dispute Petitioner's contention.

e) Limitation 17D

Limitation 17D recites "determine a second plurality of parameters associated with generation and transmission of the probe."

Petitioner shows that CM#1 determines parameters associated with generating and transmitting the Test Response. Pet. 96 (citing *id.* § IX.A.1.c; Ex. 1002 ¶¶ 721–722). Other than as previously noted, Patent Owner does not dispute Petitioner's contention for this limitation.

f) Limitation 17E

Limitation 17E recites "generate the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters."

Petitioner demonstrates that DOCSIS-2.0 discloses that its CM#1 generates the Test Response according to the Test Request's and Test Response's parameters, and the Test Response has a form (e.g., modulation rate) dictated by the Test Request's parameters. Pet. 96 (citing *id.* § IX.F.1.d; Ex. 1002 ¶ 724). Other than as previously noted, Patent Owner does not dispute Petitioner's contentions.

g) Limitation 17F

Limitation 17F recites "transmit the probe to the first node."

Petitioner shows that DOCSIS-2.0 discloses that CM#1 transmits the Test Response to the CMTS. Pet. 96 (citing *id.* § IX.F.1.e; Ex. 1002 ¶¶ 725–728). Patent Owner's arguments have been addressed previously.

h) Conclusion for Claim 17

Petitioner has shown by a preponderance of the evidence that a POSITA would have been motivated to combine DOCSIS-2.0 and Zuckerman with a reasonable expectation of success, and that each limitation of claim 17 is taught or suggested by the combination of DOCSIS-2.0 and Zuckerman, such that the claim would have been obvious notwithstanding Patent Owner's arguments.

4. Claim 18

Claim 18 depends from claim 17 and recites "wherein the probe request is configured such that the probe emulates an OFDMA transmission." Claim 18 is thus similar to claim 10.

For the reasons stated for claim 10, we determine that Petitioner has shown that claim 18 would have been obvious over the combination of DOCSIS-2.0 and Zuckerman notwithstanding Patent Owner's arguments. Pet. 97 (citing *id.* § IX.G.2; Ex. 1002 ¶ 729); PO Resp. 54–57; Pet. Reply 27; PO Sur-Reply 23–24. DOCSIS-2.0's Test Request is configured such that the Test Response "emulates" (i.e., imitates) a transmission using Zuckerman's OFDMA.

5. Claim 19

Claim 19 depends from claim 17 and in part recites "wherein the first probe and the second probe are transmitted simultaneously using OFDMA." Claim 19 is thus similar to claim 11.

For the reasons stated for claim 11, we determine that Petitioner has not shown that claim 19 would have been obvious over the combination of DOCSIS-2.0 and Zuckerman. Pet. 97–99 (citing *id.* §§ IX.F.1.b, IX.F.5.b, IX.G.3.b, IX.G.3.d, IX.G.5.b–g; Ex. 1002 ¶¶ 730–746); Ex. 1002 ¶ 729);

PO Resp. 54–57; Pet. Reply 27; PO Sur-Reply 23–24. DOCSIS-2.0-Zuckerman does not disclose two different nodes simultaneously transmitting probes to another node using OFDMA.

6. Conclusion for Ground L

For the reasons explained, we determine that Petitioner has shown that claims 10, 17, and 18 would have been obvious over the combination of DOCSIS-2.0's testing procedure and Zuckerman, but has not demonstrated that claims 11 and 19 would have been obvious. We do not reach claims 8, 16, and 22–24 in this ground because we previously determined they were unpatentable under grounds B and C.

P. Ground M: Obviousness over DOCSIS-2.0, ISO8802-2, and Zuckerman

Petitioner contends that claims 8, 10–11, 16–19, and 22–24 would have been obvious over the combination of DOCSIS-2.0-ISO8802-2, and Zuckerman. Pet. 85–99.

Because this ground is subsumed by ground L, and the addition of ISO8802-2 does not change our analysis, we determine for this ground that Petitioner has demonstrated that claims 10, 17, and 18 would have been obvious over the combination of DOCSIS-2.0-ISO8802-2, and Zuckerman. Petitioner does not rely on ISO8802-2 for claims 11 and 19. Pet. 92, 99. Consequently, Petitioner has not shown that claims 11 and 19 would have been obvious over the combination. As we determined that claims 8, 16, and 22–24 were unpatentable under grounds B and C, we do not reach them again in this ground.

III. CONCLUSION

In light of the foregoing, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–3, 6, 7, 9, 14, and 15 are unpatentable as anticipated by IEEE-802.16, but not claims 4, 5, and 10 (ground A). Claims 3, 17, 22, and 23 are unpatentable as obvious over IEEE-802.16, but not claims 4, 5, 10–13, 18–21, and 24 (ground B). Claims 8, 16, and 24 are unpatentable as obvious over the combination of IEEE-802.16 and Won (ground C). Claim 9 unpatentable as anticipated by Waxman, but not claims 1–11, 17–19, and 22–24, and we do not reach claims 14–16 (ground D). Claim 9 is unpatentable as obvious over Waxman, but not claims 1–8, 17–19, and 22–24, and we do not reach claims 14–16 (ground E). None of claims 3–5, 12, 13, 20, and 21 are unpatentable as obvious over the combination of Waxman and Giesberts (ground F). Claims 5, 10, 11, 18, and 19 are not unpatentable as obvious over Waxman and Zuckerman (ground G). Claim 5 is not unpatentable as obvious over Waxman, Giesberts, and Zuckerman (ground H). We do not reach whether claims 7, 8, 15, 16, 23, and 24 are unpatentable as obvious over the combination of Waxman and Won (ground I). Claim 9 is anticipated by DOCSIS-2.0, and we do not reach claims 1, 2, 6, 7, 14, and 15 (ground J). Claim 9 is also obvious over the combination of DOCSIS-2.0 and ISO8802-2, and we do not reach claims 1, 2, 6, 7, 14, and 15 (ground K). Claims 10, 17, and 18 are unpatentable as obvious over DOCSIS-2.0 and Zuckerman, but not claims 11 and 19, and we do not reach claims 8, 16, and 22–24 (ground L). Claims 10, 17, and 18 are unpatentable as obvious over the combination of DOCSIS-2.0, ISO8802-2, and

Zuckerman, but not claims 11 and 19, and we do not reach claims 8, 16, and 22–24 (ground M).

IV. ORDER

For the foregoing reasons, it is

ORDERED that pursuant to 35 U.S.C. § 318(a), claims 1–3, 6–9, 10, 14–18, and 22–24 of the '690 patent have been shown to be unpatentable but not claims 4–5, 11–13, and 19–21; and

FURTHER ORDERED that any party seeking judicial review must comply with the notice and service requirements of 37 C.F.R. § 90.2.[17]

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

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
1–7, 9–10, 14–15	102	IEEE-802.16	1–3, 6–7, 9, 14–15	4, 5, 10
3–5, 11–13, 16–24	103(a)	IEEE-802.16	3, 17, 22–23	4–5, 10–13, 18–21, 24
8, 16, 24	103(a)	IEEE-802.16, Won	8, 16, 24	
1–11, 14–19, 22–24	102	Waxman	9	1–8, 10–11, 17–19, 22–24
1–11, 14–19, 22–24	103(a)	Waxman	9	1–8, 10–11, 17–19, 22–24
3–5, 12–13, 20–21	103(a)	Waxman, Giesberts		3–5, 12–13, 20–21
5, 10–11, 18–19	103(a)	Waxman, Zuckerman		5, 10–11, 18–19
5	103(a)	Waxman, Giesberts, Zuckerman		5
7–8, 15–16, 23–24	103(a)	Waxman, Won		
1–2, 6–7, 9, 14–15	102	DOCSIS-2.0	9	
1–2, 6–7, 9, 14–15	103(a)	DOCSIS-2.0, ISO8802-2	9	
8, 10–11, 16–19, 22–24	103(a)	DOCSIS-2.0, Zuckerman	10, 17, 18	11, 19
8, 10–11, 16–19, 22–24	103(a)	DOCSIS-2.0, ISO8802-2, Zuckerman	10, 17, 18	11, 19

Claims	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
Overall Outcome			1–3, 6–9, 10, 14–18, 22–24	4–5, 11–13, 19–21

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