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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

QUALCOMM INCORPORATED,
Patent Owner.

Case IPR2019-00128
U.S. Patent No. 9,154,356

PETITIONER'S NOTICE OF APPEAL

Pursuant to 35 U.S.C. §§ 141-144 and 319, and 37 C.F.R. § 90.2-90.3, notice is hereby given that Petitioner Intel Corporation appeals to the U.S. Court of Appeals for the Federal Circuit from the Final Written Decision entered May 27, 2020 (Paper 35) in IPR2019-00128, attached as Exhibit A, and all prior and interlocutory rulings related thereto or subsumed therein.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Petitioner indicates that the issues for appeal include the holding that claims 1, 7, 8, 11, 17, and 18 of U.S. Patent 9,154,356 are not unpatentable, as well as any finding or determination supporting or related to these issues, including the findings as to reasons for combining prior art references. Additionally, Petitioner identifies claim construction as an issue for appeal, including the construction of "carrier aggregation."

Pursuant to 37 C.F.R. § 90.3, this Notice of Appeal is timely, having been duly filed within 63 days after the date of the Final Written Decision.

A copy of this Notice of Appeal is being filed simultaneously with the Patent Trial and Appeal Board, the Clerk's Office for the United States Court of Appeals for the Federal Circuit, and the Director of the U.S. Patent and Trademark Office.

Dated: July 27, 2020

Respectfully submitted,

/Benjamin S. Fernandez/

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 90.2(a)(1) and 104.2(a), I hereby certify that, in addition to being filed electronically through the Patent Trial and Appeal Board's End to End (PTAB E2E) system, a true and correct original version of the foregoing PETITIONER'S NOTICE OF APPEAL is being filed by Priority Mail Express on this 27th day of July, 2020, with the Director of the United States Patent and Trademark Office, at the following address:

Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Pursuant to 37 C.F.R. § 90.2(a)(2) and Federal Circuit Rule 15(a)(1), and Rule 52(a),(e), I hereby certify that a true and correct copy of the foregoing PETITIONER'S NOTICE OF APPEAL is being filed in the United States Court of Appeals for the Federal Circuit using the Court's CM/ECF filing system on this 27th day of July, 2020, and the filing fee is being paid electronically using pay.gov.

I hereby certify that on July 27, 2020, I caused a true and correct copy of the PETITIONER'S NOTICE OF APPEAL to be served via electronic mail, as previously agreed by the parties, on the following counsel for Patent Owner:

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EXHIBIT A

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Paper 35
Date: May 27, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

QUALCOMM INCORPORATED,
Patent Owner.

IPR2019-00128
Patent 9,154,356 B2

Before MICHELLE N. WORMMEESTER, AMANDA F. WIEKER, and AARON W. MOORE, *Administrative Patent Judges*.

WORMMEESTER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Intel Corporation[1] ("Petitioner") filed a Petition (Paper 3, "Pet.") requesting an *inter partes* review of claims 1, 7, 8, 11, 17, and 18 of U.S. Patent No. 9,154,356 B2 (Ex. 1301, "the '356 patent"). Qualcomm Incorporated ("Patent Owner") filed a Preliminary Response. Paper 7 ("Prelim. Resp."). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of challenged claims 1, 7, 8, 11, 17, and 18 based on all the grounds presented in the Petition. Paper 9 ("Inst. Dec."). Patent Owner filed a Response (Paper 13, "PO Resp."), Petitioner filed a Reply (Paper 20, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 26, "PO Sur-reply"). On February 27, 2020, we conducted an oral hearing. A copy of the transcript (Paper 34, "Tr.") is included in the record.

We have jurisdiction under 35 U.S.C. § 6(b). For the reasons that follow, we determine that Petitioner has not shown by a preponderance of the evidence that claims 1, 7, 8, 11, 17, and 18 of the '356 patent are unpatentable. This final written decision is issued pursuant to 35 U.S.C. § 318(a).

II. BACKGROUND

A. Related Proceedings

The parties identify a federal district court case in which Patent Owner asserted the '356 patent against Apple: *Qualcomm Incorporated v. Apple Incorporated*, No. 3:17-cv-02398 (S.D. Cal.). Pet. 1; Paper 4, 1. Petitioner indicates that the district court has dismissed this case. Paper 8, 1.

[1] Intel Corporation identifies itself and Apple Inc. ("Apple") as real parties in interest. Paper 3, 1.

The parties also identify an International Trade Commission ("ITC") investigation in which Patent Owner asserted the '356 patent against Apple. Pet. 1; Paper 4, 1. According to Petitioner, the ITC has terminated the investigation. Paper 14, 2.

In addition, the parties identify four other petitions for *inter partes* review involving the '356 patent that Petitioner has filed, namely, Cases IPR2019-00047, IPR2019-00048, IPR2019-00049, and IPR2019-00129. Pet. 1; Paper 4, 1.

B. The '356 Patent

The '356 patent describes low noise amplifiers. Ex. 1301, 1:15–16. Figure 6A, which is reproduced below, illustrates an example of a low noise amplifier according to the '356 patent. *Id.* at 1:54–55.

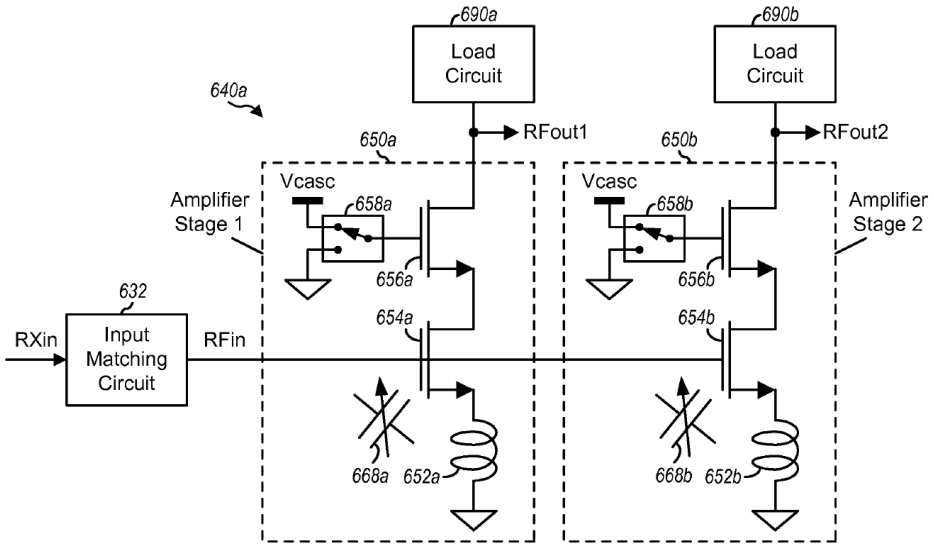

FIG. 6A

In particular, Figure 6A shows carrier aggregation low noise amplifier 640a, which has two amplifier stages 650a and 650b. *Id.* at 7:44–49. Amplifier stage 650a includes source degeneration inductor 652a, gain transistor 654a, cascode transistor 656a, and switch 658a. *Id.* at 7:58–8:4. Similarly,

amplifier stage 650b includes source degeneration inductor 652b, gain transistor 654b, cascode transistor 656b, and switch 658b. *Id.* at 8:4–9. Both amplifier stages 650a and 650b are coupled to common input matching circuit 632 and to respective load circuits 690a and 690b. *Id.* at 7:47–49.

In operation, matching circuit 632 receives receiver input signal RXin, performs input matching for low noise amplifier 640a, and provides input RF signal RFin to low noise amplifier 640a. *Id.* at 7:49–52. Input RF signal RFin may include transmissions on one set of carriers or transmissions on two sets of carriers in the same band, each set including one or more carriers. *Id.* at 7:55–57, 8:16–18, 8:30–32. An RF signal with transmissions on multiple sets of carriers is called a carrier aggregated RF signal. *Id.* at 8:16–18.

Low noise amplifier 640a operates in either a non-carrier aggregation (non-CA) mode or a carrier aggregation (CA) mode, depending on the type of input RF signal it receives. *Id.* at 8:24–32, 8:36–44. In the non-CA mode, low noise amplifier 640a receives transmissions on one set of carriers and provides one output RF signal to one load circuit. *Id.* at 8:30–32. Only one amplifier stage is enabled, while the other amplifier stage is disabled. *Id.* at 8:46–47. To illustrate, Figure 6C is reproduced below.

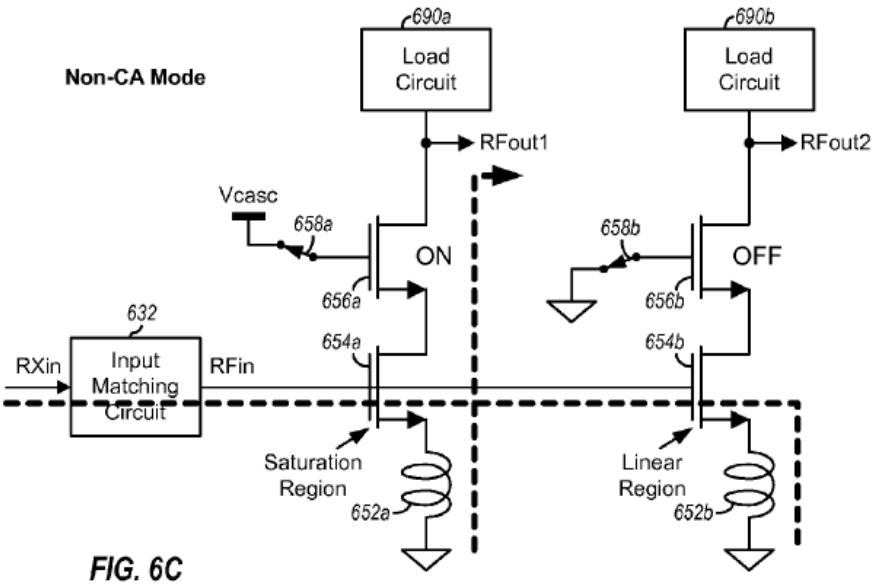

FIG. 6C

Figure 6C shows low noise amplifier 640a operating in the non-CA mode. *Id.* at 8:45–46. Amplifier stage 650a is enabled by connecting the gate of cascode transistor 656a to the Vcasc voltage via switch 658a, and amplifier stage 650b is disabled by shorting the gate of cascode transistor 656b to circuit ground via switch 658b. *Id.* at 8:47–52. Amplifier stage 650a amplifies the input RF signal and provides an output RF signal to load circuit 690a. *Id.* at 8:52–54.

In the CA mode, low noise amplifier 640a receives transmissions on two sets of carriers and provides two output RF signals to two load circuits, one output RF signal for each set of carriers. *Id.* at 8:32–35. Both amplifier stages are enabled. *Id.* at 8:37–38. To illustrate, Figure 6B is reproduced below.

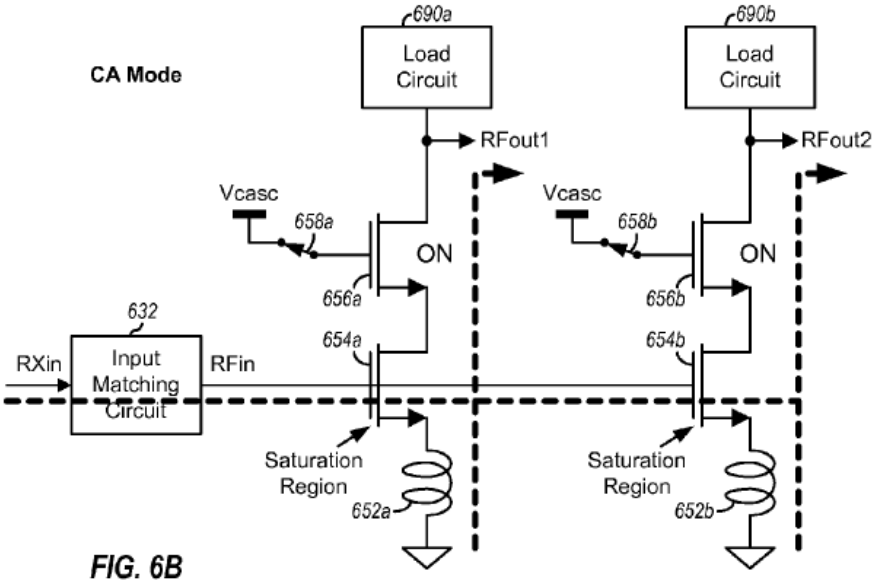

FIG. 6B

Figure 6B shows low noise amplifier 640a operating in the CA mode. *Id.* at 8:36–37. Amplifier stages 650a and 650b are enabled by connecting the gate of cascode transistor 656a to the Vcasc voltage via switch 658a and coupling the gate of cascode transistor 656b to the Vcasc voltage via switch 658b. *Id.* at 8:37–40. The carrier aggregated RF signal splits at the input of low noise amplifier 640a, and then amplifier stages 650a and 650b amplify the carrier aggregated RF signal and provide two output RF signals to two separate downconverters in load circuits 690a and 690b. *Id.* at 8:21–28. Specifically, amplifier stage 650a amplifies the input RF signal and provides the first output RF signal to load circuit 690a. *Id.* at 8:41–42. Similarly, amplifier stage 650b amplifies the input RF signal and provides the second output RF signal to load circuit 690b. *Id.* at 8:42–44.

C. Illustrative Claim

Petitioner challenges claims 1, 7, 8, 11, 17, and 18 of the '356 patent. Claims 1 and 17 are independent. Claim 1 is illustrative of the challenged claims:

> 1. A boost circuit having an input terminal and an output terminal, comprising:
>
> a first switch coupled between the input terminal and the output terminal and operated by a first phase signal;
>
> a second switch coupled between the input terminal and the output terminal and operated by a second phase signal that is opposite to the first phase signal;
>
> a first capacitor having a first terminal coupled to the output terminal and a second terminal coupled for receiving a boost signal; and
>
> a second capacitor having a first terminal coupled to the output terminal and a second terminal coupled for receiving the boost signal.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1, 7, 8, 11, 17, and 18 of the '356 patent on grounds of anticipation under 35 U.S.C. § 102 and obviousness under 35

U.S.C. § 103.[2] Pet. 39–75. We instituted *inter partes* review of all the asserted grounds. Inst. Dec. 32. The instituted grounds are as follows.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 7, 8, 11, 17, 18	102	Lee[3]
7, 8	103	Lee
1, 7, 8, 11, 17, 18	103	Lee, the Feasibility Study[4]

In support of its arguments, Petitioner relies on a declaration (Ex. 1302) as well as a reply declaration (Ex. 1339) of Patrick Fay, Ph.D. Patent Owner submits with its Response a declaration of Daniel Foty, Ph.D. (Ex. 2024). The transcripts of the depositions of Dr. Fay are entered in the record as Exhibits 2014 and 2029, and the transcript of the deposition of Dr. Foty is entered in the record as Exhibit 1340.

III. ANALYSIS

A. Claim Construction

The claim construction standard applicable to this *inter partes* review proceeding is the broadest reasonable interpretation ("BRI") in light of the patent specification and prosecution history. *Personalized Media Comm'cns, LLC v. Apple Inc.*, 952 F.3d 1336, 1340 (Fed. Cir. 2020); 37 C.F.R. § 42.100(b) (2018); *see Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable

[2] The Leahy-Smith America Invents Act ("AIA") amended 35 U.S.C. §§ 102 and 103. *See* Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011). As the application that issued as the '356 patent was filed before the effective date of the relevant amendments, the pre-AIA version of §§ 102 and 103 apply.
[3] U.S. Publ'n No. 2012/0056681 A1 (published Mar. 8, 2012) (Ex. 1335).
[4] 3d Generation P'Ship Project, *Technical Specification Group Radio Access Network; Feasibility Study for Further Advancements for E-UTRA (LTE-Advanced) (Release 9) (3GPP TR 36.912 V9.1.0)* (Dec. 2009) (Ex. 1304).

interpretation standard).[5] Under this standard, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner proposes a construction of the claim term "carrier aggregation." Pet. 28–32. Patent Owner disputes Petitioner's proposed construction. PO Resp. 10–30. In light of the parties' arguments, we address this claim term.

"carrier aggregation"

The term "carrier aggregation" appears in both independent claims 1 and 17. Petitioner argues that this term "should be construed as 'simultaneous operation on multiple carriers.'" Pet. 28. As support, Petitioner points us to three passages in the specification of the '356 patent. *Id.* The first passage states that "[a] wireless device may support carrier aggregation, which is simultaneous operation on multiple carriers." Ex. 1301, 1:32–33 (cited by Pet. 28). The second passage specifies that "[w]ireless device 110 may support carrier aggregation, which is operation on multiple carriers." *Id.* at 2:53–54 (cited by Pet. 28). Finally, the third passage notes that "[c]arrier aggregation may also be referred to as multi-

[5] The revised claim construction standard for interpreting claims in *inter partes* review proceedings as set forth in the final rule published October 11, 2018, does not apply to this proceeding because the new "rule is effective on November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date." Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (codified at 37 C.F.R. § 42.100(b) (2019)). The Petition here was filed on November 9, 2018.

carrier operation." *Id.* at 2:54–55 (cited by Pet. 28). Petitioner further asserts that the Administrative Law Judge ("ALJ") in the related ITC investigation "construed 'carrier aggregation' as Petitioner proposes here." Pet. 31 (citing Ex. 1336, 17 (ITC Claim Construction Order)). Relying on the declaration testimony of Dr. Fay, Petitioner adds that its proposed construction "is consistent with the understanding of the term by a person having ordinary skill in the art." *Id.* at 29 (citing Ex. 1302 ¶¶ 59–60).

In response, Patent Owner contends that "at the time of the invention of the '356 Patent, a person of ordinary skill in the art would have understood that 'carrier aggregation' was a term of art that meant '*simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth*.'" PO Resp. 11. Patent Owner makes several arguments in support of this proposed construction.

For instance, Patent Owner argues that "[w]hile it is true that 'simultaneous operation on multiple carriers' is an attribute of carrier aggregation, a person of ordinary skill would have further understood the term to mean that the multiple carriers are combined (aggregated) as a single virtual channel." *Id.* at 11–12 (internal citation omitted). As support, Patent Owner relies on intrinsic evidence, including the '356 patent and its prosecution history file, as well as extrinsic evidence.

Specifically, Patent Owner points to where the '356 patent specification cites a technical report (referred to as "LTE Release 11" or "3GPP TS 36.101") while discussing carrier aggregation. *Id.* at 13 (citing Ex. 1301, 2:63–67); Ex. 2026 (LTE Release 11). The technical report defines carrier aggregation as "[a]ggregation of two or more component carriers in order to support wider transmission bandwidths." Ex. 2026, 14;

see also Ex. 1301, 37–38 ("A carrier may also be referred to as a *component carrier* (CC), a frequency channel, a cell, etc.") (emphasis added) (cited by PO Resp. 12). Patent Owner asserts that "while earlier LTE [(Long-Term Evolution)] systems were limited to 20 MHz channels, LTE Release 11 (which provided support for LTE-Advanced functionality) could be configured to aggregate up to five of these 20 MHz channels as component carriers of a single virtual channel having a bandwidth capacity of up to 100 MHz." PO Resp. 13 (citing Ex. 1301, 2:63–67). To illustrate, Patent Owner further asserts:

> In earlier LTE systems, a user device connects to the wireless network over a single 20 MHz carrier frequency. As the maximum-available data rate of the single-carrier wireless connection is the rate-limiting step for the end user, requests for a large amount of data (e.g., a video) can only be received at the data rate of that single carrier. To relieve this rate-limiting step, LTE-Advanced added the ability for network equipment to practice carrier aggregation. When an end user requests a large amount of data, the network will activate carrier aggregation to deliver that data more quickly. This is done by multiplexing the incoming data stream . . . so that the incoming data stream is separated into multiple streams that are transmitted over multiple component carriers at the same time. The user device receives and de-multiplexes (aggregates) the multiple streams to recreate the original incoming data stream. The result is that the incoming data stream is received more quickly because it was transmitted in a higher bandwidth virtual channel.

Id. at 13–14 (internal citations omitted). Patent Owner relies on the declaration testimony of Dr. Foty. *Id.* at 12–14 (citing Ex. 2024 ¶¶ 84–87).

Patent Owner also points to the prosecution history of the '356 patent. During prosecution, the Examiner relied on two U.S. patents, namely,

Hirose[6] and Kaukovuori,[7] as anticipatory references. Ex. 1314, 2–4 (Office Action relying on Hirose); Ex. 1316, 2–4 (Office Action relying on Kaukovuori). In addition, the applicant filed an Information Disclosure Statement listing various references, including an international patent application[8] and a British patent application.[9] Ex. 2015, 10, 12 (Information Disclosure Statement); Ex. 2016 (international application); Ex. 2017 (British application). With respect to Hirose, Patent Owner highlights the applicant's argument that the "claimed invention recites 'carrier aggregation' which results in an ***increased aggregated*** data rate," whereas "Hirose transmits the same signals over different paths which results in ***redundant*** data at a ***common*** data rate." PO Resp. 15; Ex. 1315, 7 (cited by PO Resp. 15). Regarding Kaukovuori, Patent Owner highlights the teaching that "LTE Advanced proposes the aggregation of multiple carrier signals in order to provide a higher aggregate bandwidth than would be available if transmitting via a single carrier signal," where "Carrier Aggregation (CA) requires each utilized carrier signal to be demodulated at the receiver, whereafter the message data from each of the signals can be combined in order to reconstruct the original data." PO Resp. 15–16; Ex. 1325, 1:30–33 (cited by PO Resp. 15–16). As for the references cited in the Information Disclosure Statement, Patent Owner points to where the international application states that "LTE-A is a technology for aggregating a plurality of

[6] U.S. Patent No. 7,317,894 B2 (issued Jan. 8, 2008) (Ex. 1324).
[7] U.S. Patent No. 8,442,473 B1 (issued May 14, 2013) (Ex. 1325).
[8] Int'l Publication No. WO 2012/008705 A2 (published Jan. 19, 2012) (Ex. 2016, "the international application").
[9] UK Patent Application GB 2472978 A (published Mar. 2, 2011) (Ex. 2017, "the British application").

unit carriers . . . to be used simultaneously," as well as to where the British application describes a "carrier aggregation mode" in which "data has . . . been multiplexed across multiple carrier frequencies" and carrier aggregation refers to "bond[ing] together two parallel carriers." PO Resp. 16–17; Ex. 2016 ¶ 7 (cited by PO Resp. 16–17); Ex. 2017, code (57), 1:8–11 (cited by PO Resp. 17). According to Patent Owner, all these portions of "[t]he file history further confirm[] that a skilled artisan understood that carrier aggregation resulted in a single virtual channel to provide an increased bandwidth." PO Resp. 15. Patent Owner relies on the declaration testimony of Dr. Foty. *Id.* at 16–17 (citing Ex. 2024 ¶¶ 89–90, 92).

Patent Owner additionally points to various extrinsic evidence in support of its proposed construction, relying again on the declaration testimony of Dr. Foty. *Id.* at 17–22 (citing Ex. 1304, 10; Ex. 2013, 3:19–53; Ex. 2018, 3:27–62; Ex. 2019, 6; Ex. 2020 ¶ 3; Ex. 2021, 26–27; Ex. 2022; Ex. 2024 ¶¶ 95–100). For example, Patent Owner directs us to a U.S. patent, which states that "[o]ne technique for providing additional bandwidth capacity to wireless devices is through the use [of] carrier aggregation of multiple smaller bandwidths to form a virtual wideband channel at a wireless device." Ex. 2013, 3:19–22 (cited by PO Resp. 18); *see also* Ex. 2018, 3:27–62 (stating the same) (cited by PO Resp. 18).

Turning to Petitioner's proposed construction of "carrier aggregation," Patent Owner argues that Petitioner's reading of the term is "unreasonably broad." PO Resp. 23. To illustrate, Patent Owner asserts that "two 20 MHz carriers operating independently do not provide a single virtual channel with an increased ***aggregated*** bandwidth," as "[t]he maximum capacity of any

one channel remains 20 MHz." *Id.* Patent Owner additionally asserts, "But by aggregating two 20 MHz carriers as a single virtual channel, the user device may operate using an aggregated 40 MHz channel that has a combined bandwidth equal to the sum of the bandwidths of the component carriers." *Id.* at 23–24.

Patent Owner also argues that Petitioner's proposed construction "violates the doctrine of prosecution disclaimer" because "Hirose discloses 'simultaneous operation on multiple carriers.'" PO Resp. 23–24, 27. Patent Owner points to the Examiner's reliance on Hirose for teaching the originally recited "input RF signal comprising transmissions sent on multiple carriers at different frequencies to a wireless device," where Hirose's "input RF signal compris[es] [a] satellite wave signal and [a] ground wave signal." PO Resp. 24; Ex. 1314, 3. In response, the applicant amended the claim language to further limit the recited input RF signal to a signal "employing carrier aggregation." Ex. 1315, 2 (cited by PO Resp. 25). The applicant acknowledged that Hirose teaches receiving the satellite and ground wave signals at the same time, but argued that "such receipt of diversity signals does **not** disclose '***carrier aggregation***'" because the "waves contain[] the same contents." *Id.* at 8 (cited by PO Resp. 26). According to Patent Owner, "[i]f the term 'carrier aggregation' simply meant 'simultaneous operation on multiple carriers,' the amendment would have been ineffective in overcoming Hirose." PO Resp. 26–27; *see also* PO Sur-reply 13 ("Petitioner now proposes construing the term so broadly that the claims once again read on Hirose, which discloses 'simultaneous operation on multiple carriers.'").

Lastly, Patent Owner argues that "Petitioner's proposed construction is also incorrect because it reads out the word 'aggregation.'" PO Resp. 28. Patent Owner asserts that "[a]ggregate means 'to collect together, assemble.'" *Id.* at 29 (citing Ex. 2025, 4 (The Oxford English Dictionary)). According to Patent Owner, "it is the component carriers that are aggregated into a single virtual channel to provide higher bandwidth." *Id.* Patent Owner adds that "[s]ubstituting Petitioner's proposed construction would result in a claim that recited 'the input RF signal employing *simultaneous operation on multiple carriers* comprising transmissions sent on multiple carriers,'" thereby "add[ing] little, if any, additional meaning beyond the surrounding claim language." *Id.*

In its Reply, Petitioner reiterates that the ALJ in the related ITC investigation construed "carrier aggregation" to mean "simultaneous operation on multiple carriers," and argues that "the BRI construction[, which is the standard applied in this proceeding,] must be at least as broad as a proper *Phillips* construction," which is the standard applied in an ITC investigation. Pet. Reply 3–4; Ex. 1336, 12–14 (Claim Construction Order from related ITC investigation).

Petitioner further argues that the specification of the '356 patent does not support Patent Owner's proposed construction. In particular, Petitioner contends that the portion of Patent Owner's proposed construction requiring the multiple carriers to be "combined as a single virtual channel to provide higher bandwidth . . . lack[s] any written description support." Pet. Reply 5. Petitioner asserts that "the LTE carrier aggregation expressly described at column 2, lines 63–67 [of the '356 patent] is merely one example of carrier aggregation in the patent," and that "the applicant signaled that the invention

would cover devices other than those that implement LTE." *Id.* at 5–6 (citing Ex. 1301, 1:37–38, 2:40–53).

Petitioner also argues that the prosecution history of the '356 patent does not support Patent Owner's proposed construction. Petitioner contends that the phrases "combined as a single virtual channel" and "provide higher bandwidth" do not appear in the prior art references cited during prosecution, and that "Patent Owner's arguments about them do not limit the BRI of the term 'carrier aggregation' given the clear definition of that term in the '356 written description." *Id.* at 7–8. With respect to Kaukovuori in particular, Petitioner further contends that the Examiner did not rely on the same passage that Patent Owner relies on now to support its proposed construction. *Id.* at 8. Petitioner adds, "Patent Owner's argument that the Examiner found that Kaukovuori *discloses* one specific type of carrier aggregation signifies only that the Examiner thought that Kaukovuori's disclosure fell within the '356 patent's definition of carrier aggregation, not that the Examiner was limiting the Examiner's interpretation of carrier aggregation based on the Kaukovuori reference." *Id.*

In addition, Petitioner argues that the extrinsic evidence does not support Patent Owner's proposed construction. According to Petitioner, "in a case such as this, where the intrinsic evidence so clearly supports the definition that Patent Owner included in its specification, a [person of ordinary skill in the art] would assign extrinsic evidence little or no relevance." *Id.* at 13. Petitioner further notes that "many of the extrinsic references included with Patent Owner's Response were dated or filed *well after* the filing date of the '356 patent, and are not prior art." *Id.* (citing Ex. 2018; Ex. 2019; Ex. 2022).

With respect to Patent Owner's prosecution disclaimer argument, Petitioner responds that the applicant's argument during prosecution that "'carrier aggregation' requires an '***increased aggregated*** data rate'" does "not amount to the clear and unmistakable disclaimer that Patent Owner contends." *Id.* at 11–12 (citing PO Resp. 15). According to Petitioner, "[i]f Hirose's simultaneous signals contained non-redundant (*e.g.*, different) data, [the applicant] could not have made the argument that it did, and therefore the most natural reading of the prosecution history is that the applicant was distinguishing Hirose on the basis of its redundant transmissions." *Id.* at 12. That is, any "disclaimer was of systems that receive transmissions of redundant data over multiple channels." *Id.* at 12 n.2.

Lastly, Petitioner argues that its proposed construction does not read out "aggregation." *Id.* at 14. As support, Petitioner contends that "[w]hen there is 'simultaneous operation on multiple carriers,' those carriers will be *aggregated* in the input RF signal." *Id.*; *see id.* ("[W]hen read in view of the complete claim language, 'carrier aggregation' in the context of the challenged claims accounts for aggregation . . . because the multiple carriers would be present simultaneously in the input RF signal."). Petitioner relies on the declaration testimony of Dr. Fay. *Id.* at 14–15 (citing Ex. 1339 ¶¶ 27–29).

Patent Owner counters that "Petitioner does not propose construing the term 'carrier aggregation' according to its plain and ordinary meaning" but proposes instead that "the patentee acted as a lexicographer to assign the term a special definition different than its plain and ordinary meaning." PO Sur-reply 2. According to Patent Owner, however, "Petitioner fails to establish that the patentee expressed the necessary intent to redefine the term

to have a special meaning that differed from its plain and ordinary meaning." *Id.* at 6. As support, Patent Owner contends that "[i]n the '356 Patent, the patentee adopted a . . . distinctive format to clearly set forth a definition for a different term," namely, the format used for the term "exemplary." *Id.* at 4. Patent Owner directs us to where the '356 patent states that "[t]he term 'exemplary' is used herein to mean 'serving as an example, instance, or illustration.'" Ex. 1301, 2:9–11 (cited by PO Sur-reply 4). Patent Owner further asserts that "[n]one of the statements Petitioner relies on for the term 'carrier aggregation' resemble this format," as "[t]he patentee did not use the phrase 'is used herein to mean' for the term" or "quotation marks for the term or its purported definition." PO Sur-reply 4. Patent Owner also contends that "the three statements Petitioner relies on to support its argument lack the clear expression of intent because they do not characterize the term carrier aggregation consistently: (1) 'which is simultaneous operation on multiple carriers,' Ex. 1301, 1:32–33; (2) 'which is operation on multiple carriers,' *id.*, 2:53–54; and, (3) 'may also be referred to as multi-carrier operation,' *id.*, 2:54–55." PO Sur-reply 5.

On the record before us, we determine that Petitioner's proposed construction of "carrier aggregation" (i.e., "simultaneous operation on multiple carriers") is overly broad. As Petitioner indicates, the '356 patent specification states that "[a] wireless device may support *carrier aggregation, which is simultaneous operation on multiple carriers*." Ex. 1301, 1:32–33 (emphasis added); Pet. 28 (quoting Ex. 1301, 1:32–33). We note that prosecution history, however, "facilitates claim construction by revealing the intended meaning and scope of technical terms and may even trump the weight of specification language in some circumstances." *TDM*

Am., LLC v. U.S., 85 Fed. Cl. 774, 788 (2009) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 804 (Fed. Cir. 1999)). For example, "an applicant's amendment accompanied by explanatory remarks can define a claim term by demonstrating what the applicant meant by the amendment." *Personalized Media*, 952 F.3d at 1340. Thus, "like the specification, the prosecution history can act like a dictionary." *Hemphill v. McNeil-PPC, Inc.*, 25 F. App'x 915, 918 (Fed. Cir. 2001) (non-precedential).

Here, the claims of the '356 patent, as originally filed, recited an "input RF signal comprising transmissions sent on multiple carriers at different frequencies to a wireless device." Ex. 1311, 30 (Application). During prosecution, the Examiner rejected the claims, relying on Hirose for teaching this limitation. Ex. 1314, 3 (Office Action). Hirose discloses a "satellite radio broadcast receiver [that] receives three radio waves in total, two satellite waves and one ground wave, at the same time at its wide band RF amplifier," where the "three waves contain[] the same contents." Ex. 1324, 1:31–34, 5:1–4; *see also* Ex. 1314, 3 (finding that "Hirose discloses . . . the input RF signal comprising satellite wave signal and ground wave signal"); Ex. 1315, 8 (Response to Office Action). To overcome the Examiner's rejection, the applicant amended its claims to further limit the recited input RF signal to a signal "employing carrier aggregation" and argued that Hirose's "receipt of diversity signals does **not** disclose '***carrier aggregation***.'" Ex. 1315, 2, 8; *see also id.* at 8 ("Specifically, a disclosure in Hirose of receipt of the 'same data' over 'three [different] waves' does **not** anticipate Applicant's invention of 'the [] input RF signal employing ***carrier aggregation***' as claimed.") (alterations in original). Construing "carrier aggregation" to mean "simultaneous operation

on multiple carriers," as Petitioner proposes, would encompass Hirose's "receipt of diversity signals." As such, Petitioner's proposed construction of "carrier aggregation," though consistent with the specification language, is broader than the applicant's intended meaning and scope of the term.

We note Petitioner's contention that "the most natural reading of the prosecution history is that the applicant was distinguishing Hirose on the basis of its redundant transmissions." Pet. Reply 12. To the extent that Petitioner acquiesces to limiting its proposed construction of "carrier aggregation" to transmissions of non-redundant data, we still consider Petitioner's proposed construction to be overly broad. *See* Tr. 19:12–14 (Petitioner's counsel stating, "I think that in our proposed construction, simultaneous operation on multiple carriers means that you are not just really receiving one carrier's worth of information. It's nonredundant information."); *id.* at 27:23–25 (Petitioner's counsel stating, "[B]y including the language 'carrier aggregation,' the claims in the ['']356 Patent would not cover redundant data."). As discussed above, Petitioner relies on the '356 patent specification to support its proposed construction. Pet. 28–30. Dr. Fay similarly relies on the '356 patent specification to support Petitioner's proposed construction. Ex. 1302 ¶ 59 (cited by Pet. 29). Dr. Fay further states, without citing supporting evidence, "[t]his construction is consistent with the understanding of persons having ordinary skill in the art." *Id.* ¶ 60 (cited by Pet. 29). While discussing carrier aggregation in the background technology section of his declaration, however, Dr. Fay relies on Kaukovuori for illustrating "one example of a receiver configured to support *carrier aggregation* by sending different carriers to different receive paths." *Id.* ¶ 42 (emphasis added). Aside from

the '356 patent, Kaukovuori is the only other reference that Dr. Fay cites in this section of his declaration. *See id.* ¶¶ 31–48 (background technology section), ¶¶ 39–42 (discussion on carrier aggregation). Notably, Kaukovuori states that "Carrier Aggregation (CA) *requires* each utilized carrier signal to be demodulated at the receiver, whereafter the message data from each of the signals can be combined in order to reconstruct the original data." Ex. 1325, 1:30–33 (emphasis added). This combining feature is not present in Petitioner's proposed construction.

We turn now to Patent Owner's proposed construction (i.e., "simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth"), which can be divided into three parts: (1) "simultaneous operation on multiple carriers," (2) which "are combined as a single virtual channel," (3) "to provide higher bandwidth." We determine that the intrinsic evidence supports each part. For the first part, we rely on the '356 patent's specification, which teaches that carrier aggregation involves "simultaneous operation on multiple carriers." Ex. 1301, 1:32–33 (describing "carrier aggregation, which is simultaneous operation on multiple carriers"); *see also id.* at 2:53–54 (describing "carrier aggregation, which is operation on multiple carriers"). Petitioner does not dispute this aspect of Patent Owner's proposed construction. *See* Pet. 28 ("'Carrier aggregation' should be construed as 'simultaneous operation on multiple carriers.'").

For the other two parts of Patent Owner's proposed construction, we rely on various prior art references, including Kaukovuori, which the Examiner relied on during prosecution; the British application, which the applicant cited in an Information Disclosure Statement; and the technical

report, which the '356 patent refers to as LTE Release 11. According to our reviewing court, "prior art cited in a patent or cited in the prosecution history of the patent constitutes intrinsic evidence," and "when prior art that sheds light on the meaning of a term is cited by the patentee, it can have particular value as a guide to the proper construction of the term, because it may indicate not only the meaning of the term to persons skilled in the art, but also that the patentee intended to adopt that meaning." *V-Formation, Inc. v. Benetton Grp. SpA*, 401 F.3d 1307, 1311 (Fed. Cir. 2005) (quoting *Arthur A. Collins, Inc. v. N. Telecom Ltd.*, 216 F.3d 1042, 1045 (Fed. Cir. 2000)) (other citations omitted).

With respect to the second part of Patent Owner's proposed construction in particular, which requires combining the multiple carriers "as a single virtual channel," Kaukovuori teaches that "LTE Advanced proposes the *aggregation of multiple carrier signals in order to provide a higher aggregate bandwidth than would be available if transmitting via a single carrier signal*," and that "[t]his technique of Carrier Aggregation (CA) *requires* each utilized carrier signal to be demodulated at the receiver, whereafter *the message data from each of the signals can be combined in order to reconstruct the original data*." Ex. 1325, 1:30–33 (emphases added) (cited by PO Resp. 15–16). As discussed above, the Examiner relied on Kaukovuori as an anticipatory reference that discloses an "input RF signal employing carrier aggregation." Ex. 1316, 2–3 (Office Action). In particular, the Examiner noted that Kaukovuori "teaches a method of receiving data transmitted via a combination of at least a plurality of radio frequency signals using carrier aggregation." *Id.* at 3 (emphases omitted). We note Petitioner's contention that the passage in Kaukovuori on which

Patent Owner relies was not discussed during prosecution. Pet. Reply 8. That passage describes a feature that carrier aggregation "requires," however, and it is therefore relevant to our analysis here. *See Collins*, 216 F.3d at 1045.

Additionally, the British application cited in the applicant's Information Disclosure Statement states that "[a] known technique for increasing the capacity of a cellular telecommunications network . . . is to *bond together two parallel carriers*," where the technique "is called carrier or spectrum aggregation." Ex. 2017, 1:8–11 (emphasis added) (cited by PO Resp. 17). Regarding this reference, we note Petitioner's contention that it "amount[s] to less than 1% of the prior art references submitted during prosecution of the '356 patent" and "cannot properly be used to narrow the express definition of 'carrier aggregation' supplied by the '356 patent itself." Pet. Reply 8. As explained above, however, prior art cited in the prosecution history of a patent is intrinsic evidence, and when it sheds light on the meaning of a claim term, it can have particular value as a guide to the proper construction of the claim term. *V-Formation*, 401 F.3d at 1311; *Collins*, 216 F.3d at 1045. Petitioner does not explain why our ability to rely on this reference's teachings about carrier aggregation should depend on the number of references cited during prosecution of the application. Thus, relying on prior art cited in the applicant's Information Disclosure Statement, including the British application, is appropriate in our claim construction analysis.

Although neither Kaukovuori nor the British application uses the phrase "single virtual channel," the cited portions of these references discussed above support the notion of a single virtual channel. *See* Ex. 1325, 1:30–33 (describing "the aggregation of multiple carrier signals to

provide a higher aggregate bandwidth than would be available if transmitting via a single carrier signal," where "the message data from each of the signals can be combined in order to reconstruct the original data"); Ex. 2017, 1:8–11 (describing "increasing the capacity of a cellular telecommunications network" by "bond[ing] together two parallel carriers"). Moreover, we note that the technical report referred to as LTE Release 11 in the '356 patent also supports the notion of a single virtual channel, defining "[c]arrier aggregation" as the "*[a]ggregation* of two or more *component* carriers in order to support wider transmission bandwidths." Ex. 2026, 14 (emphases added) (cited by Ex. 1301, 2:63–65 (the '356 patent)).

We further note that the teachings in these three references are consistent with contemporaneous extrinsic evidence that uses a phrase similar to "single virtual channel," namely, the phrase "virtual wideband channel." For example, as discussed above, Patent Owner directs us to a U.S. patent that describes "carrier aggregation of multiple smaller bandwidths to form a *virtual wideband channel* at a wireless device." Ex. 2013, 3:19–22 (emphasis added). The application for this patent was filed less than one year after the application for the '356 patent was filed. Ex. 1301, code (22); Ex. 2013, code (22).

As to the third part of Patent Owner's proposed construction, which requires "provid[ing] higher bandwidth," the technical report referred to as LTE Release 11 in the '356 patent defines "[c]arrier aggregation" as the "[a]ggregation of two or more component carriers in order to *support wider transmission bandwidths*." Ex. 2026, 14 (emphasis added) (cited by Ex. 1301, 2:63–65 ('356 patent)). In addition, Kaukovuori teaches that LTE Advanced proposes using carrier aggregation "to provide a *higher aggregate*

bandwidth." Ex. 1325, 1:26–33 (emphasis added) (cited by Ex. 1316, 2–3 (Office Action)).

We note Petitioner's contention that Patent Owner's proposed construction limits "carrier aggregation" to the LTE context, where the '356 patent indicates it is not so limited. Pet. Reply 5–7 (asserting that "LTE carrier aggregation . . . is merely one example of carrier aggregation" and that "the applicant signaled that the invention would cover devices other than those that implement LTE"); *see also* Tr. 23:5–9 (Petitioner's counsel stating, "[W]e certainly don't dispute that 'carrier aggregation' has been used in the -- in the way that the Patent Owner suggests. It's just that's not the way the 356 Patent uses it. It makes very clear that it was using its broad meaning of 'carrier aggregation,' which is not limited just to the LTE example of the way that you can perform carrier aggregation."). That contention is unpersuasive. The language in Patent Owner's proposed claim construction says nothing about LTE. In addition, although the references on which Patent Owner relies to support its proposed construction may focus on carrier aggregation in the LTE context, they state that carrier aggregation applies in other contexts as well. For example, the British application cited in the applicant's Information Disclosure Statement states that carrier aggregation is "[a] known technique for increasing the capacity of a cellular telecommunications network such as HSDPA, LTE, WiFi or WiMAX." Ex. 2018, 5. Kaukovuori similarly states that "[c]arrier [a]ggregation can be used also in other radio communication protocols such as High Speed Packet Access (HSPA)." Ex. 1325, 1:33–35; *see also* Ex. 2013, 4:46–49 (contemporaneous U.S. patent stating, "While an LTE frame structure is illustrated, a frame structure for an IEEE 802.16 standard (WiMax), and

IEEE 802.11 standard (WiFi), or another type of communication standard using SC-FDMA or OFDMA may also be used."). Accordingly, Patent Owner's proposed construction does not limit "carrier aggregation" to the LTE context, consistent with the disclosure of the '356 patent as well as the references on which Patent Owner relies.

We also recognize that the ALJ in the related ITC investigation adopted the construction of "carrier aggregation" that Petitioner now proposes in this proceeding. *See* Ex. 1336, 16–17 (construing "carrier aggregation" to mean "simultaneous operation on multiple carriers"). We cannot properly evaluate the ALJ's claim construction analysis, however, because portions of the ALJ's analysis were not filed in this proceeding. *See id.*, App. A, at 20–30 (missing pages 21, 22, 26, 28, and 29). Based on the evidence of record, we disagree with the ALJ's construction, and, for the reasons discussed above, we determine that Petitioner's proposed construction is overly broad and that the intrinsic evidence supports Patent Owner's proposed construction.

In view of the foregoing, we adopt Patent Owner's proposed construction of "carrier aggregation," namely, "simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth." *See* PO Resp. 11. For the reasons given above, our construction is supported by the intrinsic evidence. *See, e.g.*, Ex. 1301, 1:32–33 (the '356 patent); Ex. 1325, 1:26–35 (Kaukovuori); Ex. 2017, 1:8–11 (British application); Ex. 2026, 14 (LTE Release 11). Our construction also is consistent with relevant extrinsic evidence. *See, e.g.*, Ex. 2013, 3:19–22. Further, our construction reflects Petitioner's proposed language,

"simultaneous operation on multiple carriers," as well as portions of the specification cited by Petitioner. *See* Pet. 28 (citing Ex. 1301, 1:32–33).

B. Anticipation by Lee

Petitioner asserts that Lee anticipates claims 1, 7, 8, 11, 17, and 18 of the '356 patent. Pet. 39–68. Patent Owner traverses this ground. PO Resp. 32–38. For the reasons explained below, we determine that Petitioner has not demonstrated by a preponderance of the evidence that Lee anticipates claims 1, 7, 8, 11, 17, and 18.

We start with an overview of Lee.

1. Lee

Lee describes signal amplification circuits that may be used in multi-radio devices (e.g., mobile devices with multiple wireless connections such as WiFi and Bluetooth connections). Ex. 1335 ¶¶ 1–3. Figure 2, which is reproduced below, illustrates an example of a signal amplification circuit according to Lee. *Id.* ¶¶ 9, 26.

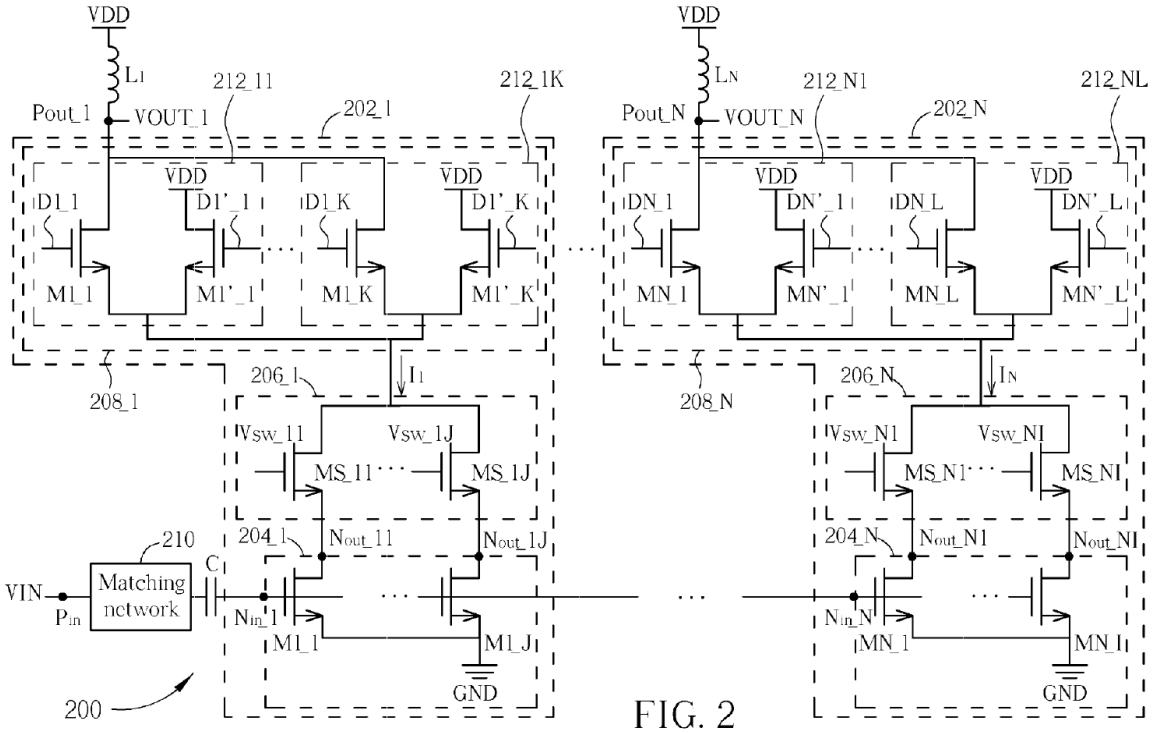

FIG. 2

In particular, Figure 2 shows signal amplification circuit 200, which includes matching network 210 as well as a plurality of amplifier blocks 202_1 through 202_N. *Id.* ¶ 26. Each amplifier block has an input stage, a selecting stage, and an output stage. *Id.* For example, amplifier block 202_1 has input stage 204_1, selecting stage 206_1, and output stage 208_1. *Id.* Input signal VIN is transmitted to input nodes Nin_1 through Nin_N of input stages 204_1 through 204_N via matching network 210. *Id.* In each amplifier block, the selecting stage comprises multiple transistors that are used to selectively couple the input stage to the output stage. *Id.* ¶ 27. The output stages 208_1 through 208_N are coupled to respective output ports Pout_1 to Pout_N, and configured to generate respective processed signals VOUT_1 to VOUT_N when enabled. *Id.* ¶ 28. An output stage is enabled when at least one transistor of a selecting stage in the same amplifier block is turned on. *Id.* ¶ 31.

Signal amplification circuit 200 operates in either a shared mode or a combo mode. *Id.* ¶ 29. The output stages may be used to control the operational mode. *Id.* ¶ 33. Assume, for example, output port Pout_1 is coupled to a first radio signal processing system such as a WiFi receiver/transmitter, and output port Pout_N is coupled to a second radio signal processing system such as a Bluetooth receiver/transmitter. *See id.* ¶ 29. If only the WiFi function of the multi-radio device needs to be active, then signal amplification circuit 200 should operate in the shared mode. *Id.* ¶ 33. Output stage 208_1 is enabled, while all other output stages are disabled. *Id.* Similarly, if only the Bluetooth function needs to be active, then signal amplification circuit 200 should operate in the shared mode. *Id.* Output stage 208_N is enabled, while all other output stages are disabled. *Id.* If both WiFi and Bluetooth functions need to be active, then signal amplification circuit 200 should operate in the combo mode, where both output stages 208_1 and 208_N are enabled and all other output stages are disabled. *Id.*

2. Analysis

Claim 1 is directed to an apparatus. Claim 17 is directed to a corresponding method and recites similar limitations as claim 1. Petitioner relies on the same discussion for both claims. Pet. 65 (referring to discussion of claim 1 for claim 17). Our analysis of claim 1 applies to claim 17.

Claim 1 recites an "input RF signal employing carrier aggregation comprising transmissions sent on multiple carriers at different frequencies to a wireless device." As discussed above, we construe "carrier aggregation"

to mean "simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth." *See supra* Part III.A.

Petitioner identifies Lee's input signal VIN as an "input radio frequency (RF) signal." Pet. 42. As support, Petitioner directs us to where Lee teaches that input signal VIN may include multiple radio frequency signals such as a Bluetooth signal and a WiFi signal. Pet. 45 (citing Ex. 1335 ¶ 17). Petitioner also directs us to where Lee teaches receiving input signal VIN at signal amplification circuit 200, which Petitioner asserts may be used in a mobile device. *Id.* at 45–46 (citing Ex. 1335 ¶¶ 2, 33); Ex. 1335 ¶ 33. Relying on the declaration testimony of Dr. Fay, Petitioner further asserts that Bluetooth and WiFi signals are transmitted over different carriers to avoid interference. Pet. 45 n.14 (citing Ex. 1302 ¶ 79 n.17).

Petitioner contends that "[c]arrier aggregation is 'simultaneous operation on multiple carriers.'" *Id.* at 46. In this regard, Petitioner directs us to where Lee teaches operating signal amplification circuit 200 in a combo mode so that its output stages 208_1 and 208_N are enabled at the same time to process the Bluetooth and WiFi signals at the same time. *Id.* (citing Ex. 1335 ¶ 33). Petitioner adds that Lee teaches more specifically "simultaneous operation on multiple carriers that increases bandwidth for a wireless device," as "carriers occupy bandwidth, and transmitting or receiving data on multiple carriers increases bandwidth to the sum of the carriers' frequency ranges." *Id.* (citing Ex. 1302 ¶ 81). To illustrate, Petitioner states that "receiving data over two 20 MHz carriers increases bandwidth to 40 MHz." *Id.* Petitioner also contends that Lee teaches an "increased aggregated data rate" because "Lee uses multiple carriers to send different data," and "[r]eceiving data on two or more carriers carrying non-

redundant data simultaneously increases the data rate to the sum of the two carriers' data rates." *Id.* at 48–49 (citing Ex. 1302 ¶ 83). Petitioner states that "if the first carrier transmits data at 50 megabits per second and the second carrier transmits data at 25 megabits per second, transmitting data over both of those carriers at the same time increases the aggregated data rate to 75 megabits per second." *Id.* at 49.

Patent Owner counters that "Lee never describes the VIN signal as 'employing carrier aggregation.'" PO Resp. 32. Patent Owner asserts that "Lee consistently refers to two separate and distinct input signals '(e.g., a Blue tooth signal and a WiFi signal) received by a single antenna,'" which "emanate from separate and distinct 'wireless connections.'" *Id.* (quoting Ex. 1335 ¶¶ 2, 17). According to Patent Owner, "the mere presence of both a Bluetooth signal and a WiFi signal cannot establish 'carrier aggregation' without evidence of anything being aggregated," and "Lee fails to disclose that the signals or connections are 'aggregated.'" *Id.* Patent Owner contends specifically that "the disclosure of two unrelated signals is not evidence of an 'aggregation' because it ignores the meaning of the word 'aggregation.'" *Id.* Patent Owner also contends that "Petitioner's expert cites no evidence or authority to support [his] opinion" that Lee teaches carrier aggregation based on the premise that "receiving data over two 20 MHz carriers increases bandwidth to 40 MHz." *Id.* Patent Owner adds, "[n]or does Petitioner's expert argue that Lee's Bluetooth and WiFi connections are combined (aggregated) as a single virtual channel." *Id.* Lastly, Patent Owner submits that sending "'different data' [using multiple carriers] does not establish that the input signal employs carrier aggregation." *Id.* at 34.

In its Reply, Petitioner responds that "Lee discloses that its input RF signal (VIN) employs carrier aggregation (*i.e.*, simultaneous operation on multiple carriers (*e.g.*, WiFi and Bluetooth))." Pet. Reply 16. Specifically, Petitioner contends that "the Bluetooth and WiFi signals in Lee are separate signals that can be received simultaneously." *Id.* Petitioner further contends that "the two carriers, e.g. Bluetooth and WiFi, are aggregated at VIN," and submits that "because VIN goes along a single wire, and is a single input that is the claimed 'input RF signal,' the Bluetooth and WiFi carriers are aggregated, *e.g.*, collected together, assembled at VIN." *Id.* at 16–17. According to Petitioner, "[c]alling the simultaneously-received Bluetooth and WiFi carriers of Lee a single signal, or labeling them as separate carriers or separate signals does not change the fact that their physical presence and behavior is the same – they are aggregated along VIN as they are received by the amplifier stages of Lee." *Id.* at 17.

We disagree with Petitioner. On this record, we find that Lee does not disclose "carrier aggregation," which we construe to mean "simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth." *See supra* Part III.A. Petitioner does not point to any teaching in Lee to combine multiple carriers as a single virtual channel. Indeed, Petitioner does not even argue that Lee teaches this feature of carrier aggregation. *See generally* Pet.; Pet. Reply. As discussed above, Lee discloses transmitting WiFi and Bluetooth signals over different carriers at the same time, and then receiving and processing both signals at the same time. Nothing in the cited record, however, indicates that Lee's carriers are combined as a single virtual channel. For instance, nothing in the cited record teaches bonding Lee's carriers together, or aggregating Lee's signals

to provide a higher aggregate bandwidth than would be available if transmitting the signals via a single carrier signal, where the message data from each signal is combined to reconstruct the original data. *See* Ex. 1325, 1:30–33 (explaining that carrier aggregation requires combining data from each signal to reconstruct the original data); Ex. 2017, 1:8–11 (explaining that carrier aggregation involves bonding together parallel carriers to increase the capacity of a cellular telecommunications network). Although Lee's signals are transmitted, received, and processed at the same time, at no point are they combined or bonded together as a single virtual channel.

In view of the foregoing, we determine that Petitioner has not demonstrated by a preponderance of the evidence that Lee anticipates independent claims 1 and 17. Claims 7, 8, 11, and 18 depend from claims 1 or 17. Accordingly, we also determine that Petitioner has not demonstrated by a preponderance of the evidence that Lee anticipates dependent claims 7, 8, 11, and 18.

C. Obviousness over Lee

Petitioner asserts that claims 7 and 8 of the '356 patent would have been obvious over Lee. Pet. 68–72. Claims 7 and 8 depend directly or indirectly from claim 1. As discussed above, we determine that Petitioner has not demonstrated by a preponderance of the evidence that Lee anticipates claim 1. In its analysis of claims 7 and 8, Petitioner does not provide any argument or evidence overcoming the deficiencies we noted above as to claim 1. *See id.* We therefore determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 7 and 8 would have been obvious over Lee.

D. Obviousness over Lee and the Feasibility Study

Petitioner asserts that claims 1, 7, 8, 11, 17, and 18 of the '356 patent would have been obvious over Lee and the Feasibility Study. Pet. 72–75. Patent Owner traverses this ground. For the reasons explained below, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 1, 7, 8, 11, 17, and 18 would have been obvious over Lee and the Feasibility Study.

We discussed Lee above. *See supra* Part. III.B.1. Accordingly, we provide an overview of the Feasibility Study before addressing the parties' arguments.

1. The Feasibility Study

The Feasibility Study is a 3GPP (Third Generation Partnership Project) technical report that considers technology components for the evolution of E-UTRA (Evolved Universal Mobile Telecommunications System Terrestrial Radio Access). Ex. 1304, 6–8. E-UTRA also refers to LTE-Advanced (Long Term Evolution). *See id.* at 8 ("E-UTRA (LTE-Advanced)").

2. Analysis

As discussed above with respect to anticipation by Lee, Petitioner relies on Lee for teaching an "input RF signal employing carrier aggregation." *See supra* Part III.B.2. Under an alternative theory, Petitioner relies instead on the Feasibility Study for teaching this limitation. Pet. 72 ("To the extent Patent Owner argues that Lee fails to teach an input RF signal employing carrier aggregation, . . . the Feasibility Study also discloses

this element."). As support, Petitioner directs us to where the Feasibility Study teaches that "LTE-Advanced extends LTE release 8 with support for *Carrier Aggregation*, where two or more *component carriers* (CC) are aggregated in order to support wider transmission bandwidths up to 100MHz and for spectrum aggregation." *Id.* (citing Ex. 1304, 22).

It is not sufficient, however, for Petitioner to demonstrate that an "input RF signal employing carrier aggregation" was known. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). Petitioner also must provide "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). In that regard, Petitioner argues that an ordinarily skilled artisan "would have found it obvious to turn to the amplification circuit of Lee in order to process the carrier aggregated input RF signal of the Feasibility Study." *Id.* at 73. Petitioner asserts that "the Feasibility Study recognizes that wireless mobile devices can be configured to operate with input RF signals employing carrier aggregation" and "suggests that an ideal receiver for noncontiguous intra-band and inter-band carrier aggregation would have multiple RF front-ends," each "having its own gain control (amplifier), mixer, and analog-to-digital conversion." *Id.* at 73–74 (citing Ex. 1304, 9, 26). Petitioner further asserts that Lee describes "multiple amplifier blocks providing output to different receivers," thereby "teach[ing] the exact type of receiver that the Feasibility Study recognizes would work with signals employing carrier aggregation." *Id.* at 74 (citing Ex. 1335 ¶ 29). In addition, Petitioner asserts that "[t]he Feasibility Study teaches that carrier aggregation may provide benefits, such as wider transmission bandwidths and spectrum aggregation." *Id.* (citing Ex. 1304, 8). Petitioner contends that

an ordinarily skilled artisan "would have been motivated to use the input RF signal employing carrier aggregation of the Feasibility Study with the amplification blocks of Lee in order to achieve these benefits and unlock the features of LTE-Advanced." *Id.* Petitioner submits that combining Lee and the Feasibility Study "requires nothing more than substitution of the 'plurality of radio frequency signals' of Lee for the 'Carrier Aggregation' signals described in the Feasibility Study," and that "[t]he circuitry of Lee is capable of receiving and processing the types of signals described in [the] Feasibility Study, and any further modifications that would have been made to Lee to accept the input RF signal of the Feasibility Study would have involved nothing more than well-known receiver tuning and filtering techniques." *Id.* at 74–75. According to Petitioner, an ordinarily skilled artisan "would have had a reasonable expectation of success in using the carrier aggregated input RF signals as described in the Feasibility Study with the amplification blocks of Lee." *Id.* Petitioner relies on the declaration testimony of Dr. Fay. *Id.* (citing Ex. 1302 ¶¶ 134–136).

In response, Patent Owner argues that "Petitioner fails to sufficiently articulate why a skilled artisan would have been motivated to combine these two distinctly different references." PO Resp. 41. Patent Owner asserts that Lee is directed to different kinds of radio connections (e.g., Bluetooth and WiFi) and does not disclose carrier aggregation, whereas the Feasibility Study is directed to the same type of radio connections (e.g., LTE) and does not disclose an amplifier circuit. *Id.* at 42; *see also id.* at 45–46. With respect to Petitioner's contention that it would have been obvious to combine Lee and the Feasibility Study to achieve the benefits of carrier aggregation and unlock the features of LTE-Advanced, Patent Owner further

asserts that such contention is "generic and bears no relation to any specific combination of prior art elements," and that "[i]t also fails to explain *why* a person of ordinary skill in the art would have combined elements from specific references in the way the claimed invention does." *Id.* at 43 (quoting *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1328 (Fed. Cir. 2012)). Patent Owner also characterizes the Feasibility Study's teaching that a receiver would have multiple RF front-ends as "nothing more than the statement of a problem," and contends that "knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references." *Id.* at 42–43 (quoting *Metalcraft of Mayville, Inc. v. Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017)). In addition, Patent Owner argues that the Feasibility Study is non-analogous art, asserting that it "fails to disclose an amplifier circuit." *Id.* at 41.

On the record before us, we find that Petitioner does not explain sufficiently *why* an ordinarily skilled artisan would have considered combining Lee and the Feasibility Study to *arrive at the claimed invention*, which includes an "input RF signal employing carrier aggregation." *See Metalcraft*, 848 F.3d at 1366 ("In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason why a person of skill in the art would have made the combination."). For instance, Petitioner contends that its proposed combination of Lee and the Feasibility Study "requires nothing more than substitution of the 'plurality of radio frequency signals' of Lee for the 'Carrier Aggregation' signals described in the Feasibility Study."

Pet. 74; *see also* Pet. Reply 24 ("Petitioner's reasons to combine [the] Feasibility Study with Lee do not rely upon the presence of an amplifier circuit in [the] Feasibility Study, but rather simply apply the input RF *signal* of [the] Feasibility Study to the amplifier stages of Lee."), 25 ("The system of Lee would operate the same whether it was receiving Bluetooth and WiFi carriers simultaneously or two LTE carriers simultaneously, and no modifications to Lee would have been involved other than, possibly, well-known receiver tuning and filtering techniques."). During oral argument, Petitioner's counsel echoed that position, asserting, "[y]ou don't have to add anything to Lee, you don't have to subtract anything from Lee in order to use it to process this LTE carrier-aggregated signal." Tr. 57:9–11. Petitioner's counsel also asserted, "[a]nd from the receiver hardware standpoint receiving an intra-band carrier-aggregated signal is no different than receiving a signal that originated from Wi-Fi and from Bluetooth. Those two things are the same." *Id.* at 59:17–19. As discussed above, we construe "carrier aggregation" to mean "simultaneous operation on multiple carriers that are combined as a single virtual channel to provide higher bandwidth." *See supra* Part III.A. In the context of the Feasibility Study, "two or more *component carriers* (CC) are aggregated," or combined as a single virtual channel. *See* Ex. 1304, 22. Lee, however, does not teach combining carriers as a single virtual channel. *See supra* Part III.B.2. We find that Petitioner does not adequately address why an ordinarily skilled artisan would have considered using the Feasibility Study's carrier aggregated signal with Lee's amplifier blocks, when Lee does not teach combining carriers as a single virtual channel.

We note Petitioner's argument that "[t]he motivation to combine Lee with the teachings of the Feasibility Study arises from the references themselves." *See* Pet. 74. In this regard, Petitioner asserts that "[t]he Feasibility Study teaches that carrier aggregation may provide benefits, such as wider transmission bandwidths and spectrum aggregation" and "is supported by LTE-Advanced," and further contends that an ordinarily skilled artisan "would have been motivated to use the input RF signal employing carrier aggregation of the Feasibility Study with the amplification blocks of Lee in order to achieve these benefits and unlock the features of LTE-Advanced." *Id.* Petitioner's argument is overly generic. The benefits that Petitioner identifies, "wider transmission bandwidths and spectrum aggregation," are simply advantages of using carrier aggregation in general, not a reason to use the specific hardware of Lee with the carrier aggregated signal of the Feasibility Study. Petitioner does not explain why or how using Lee's particular circuitry would be necessary to "achieve [the] benefits and unlock the features of LTE Advanced." For example, Petitioner does not argue that one of ordinary skill in the art seeking to employ carrier aggregation would have turned to Lee because Lee's circuitry would have allowed for power conservation by shutting off unneeded portions of the circuitry when not using all component carriers. *See* Pet. 72–75.

Petitioner also does not adequately address why or how an ordinarily skilled artisan would have considered using the Feasibility Study's carrier aggregated signal with Lee's amplifier blocks, when Lee does not teach combining carriers as a single virtual channel.

We additionally note Petitioner's argument that an ordinarily skilled artisan "would have had a reasonable expectation of success in using the

carrier aggregated input RF signals as described in the Feasibility Study with the amplification blocks of Lee." *See id.* at 74–75. Petitioner relies on the declaration testimony of Dr. Fay, who repeats this argument verbatim. *See id.* (citing Ex. 1302 ¶ 136). Again, Petitioner does not explain sufficiently why an ordinarily skilled artisan would have considered combining Lee and the Feasibility Study to arrive at the claimed invention. Petitioner's argument is therefore conclusory and nothing more than a restatement of a basic test identified by the Supreme Court for determining whether an invention would have been obvious. *See KSR*, 550 U.S. at 421 ("If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense."). General principles on what may constitute a supporting rationale cannot substitute for specific application of those principles to the facts.

Lastly, we note Petitioner's argument that "Lee and the Feasibility Study are highly analogous art to the '356 patent" because each "falls within the same field of endeavor of the '356 patent." Pet. Reply 22; *see also id.* at 26. The mere fact that Lee and the Feasibility Study are in the same field of endeavor as the '356 patent, however, falls short of an adequate rationale. The same field of endeavor analysis is merely the jumping-off point in reaching the determination of whether a claimed invention is obvious. *See K-TEC, Inc. v. Vita-Mix Corp.*, 696 F.3d 1364, 1375 (Fed. Cir. 2012) (explaining that to qualify as prior art in an obviousness analysis, references must be analogous art—either from the same field of endeavor, or reasonably pertinent to the problem with which the inventor is involved). Further, any known need or problem in the relevant field of endeavor relied on when articulating a rationale must support "a *reason* for combining the

elements *in the manner claimed*." *See KSR*, 550 U.S. at 420 (emphases added). As discussed above, Petitioner does not explain sufficiently why an ordinarily skilled artisan would have considered combining Lee and the Feasibility Study to arrive at the claimed invention.

For the reasons given, Petitioner has not provided adequately articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *See Kahn*, 441 F.3d at 988. Accordingly, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 1, 7, 8, 11, 17, and 18 would have been obvious over the proposed combination of Lee and the Feasibility Study.

IV. CONCLUSION[10]

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 7, 8, 11, 17, 18	102	Lee		1, 7, 8, 11, 17, 18
7, 8	103	Lee		7, 8
1, 7, 8, 11, 17, 18	103	Lee, the Feasibility Study		1, 7, 8, 11, 17, 18
Overall Outcome				1, 7, 8, 11, 17, 18

[10] 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).

V. ORDER

In consideration of the foregoing, it is hereby

ORDERED that claims 1, 7, 8, 11, 17, 18 of the '356 patent have not been shown to be unpatentable; and

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

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