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Paper No. 9
Entered: May 29, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

QUALCOMM INCORPORATED,
Patent Owner.

Case IPR2019-00129
Patent 9,154,356 B2

Before DANIEL N. FISHMAN, MICHELLE N. WORMMEESTER, and AARON W. MOORE, *Administrative Patent Judges*.

WORMMEESTER, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Intel Corporation[1] ("Petitioner") filed a Petition (Paper 3, "Pet.") requesting *inter partes* review of claims 2–6 and 10 of U.S. Patent No. 9,154,356 B2 (Ex. 1401, "the '356 patent"). Qualcomm Incorporated ("Patent Owner") filed a Preliminary Response (Paper 7, "Prelim. Resp."). We have jurisdiction under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." For the reasons that follow, we institute an *inter partes* review as to all the challenged claims of the '356 patent and all the grounds presented.

II. BACKGROUND

A. Related Proceedings

The parties identify a district court case in the Southern District of California 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.

The parties also identify an International Trade Commission ("ITC") investigation in which Patent Owner has asserted the '356 patent against Apple. Pet. 1; Paper 4, 1. According to Petitioner, the parties have moved to terminate the investigation. Paper 8, 1.

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

In addition, the parties identify four other petitions for *inter partes* review involving the '356 patent that Petitioner has filed. Pet. 1; Paper 4, 1.

B. The '356 Patent

The '356 patent describes low noise amplifiers. Ex. 1401, 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.

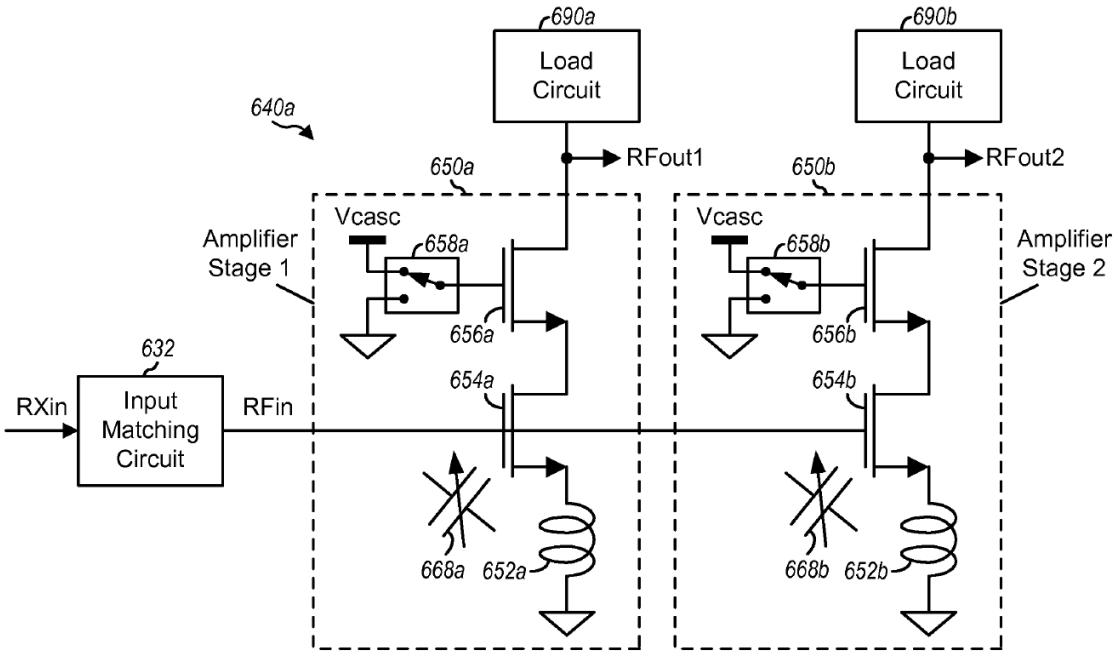

FIG. 6A

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, with 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.

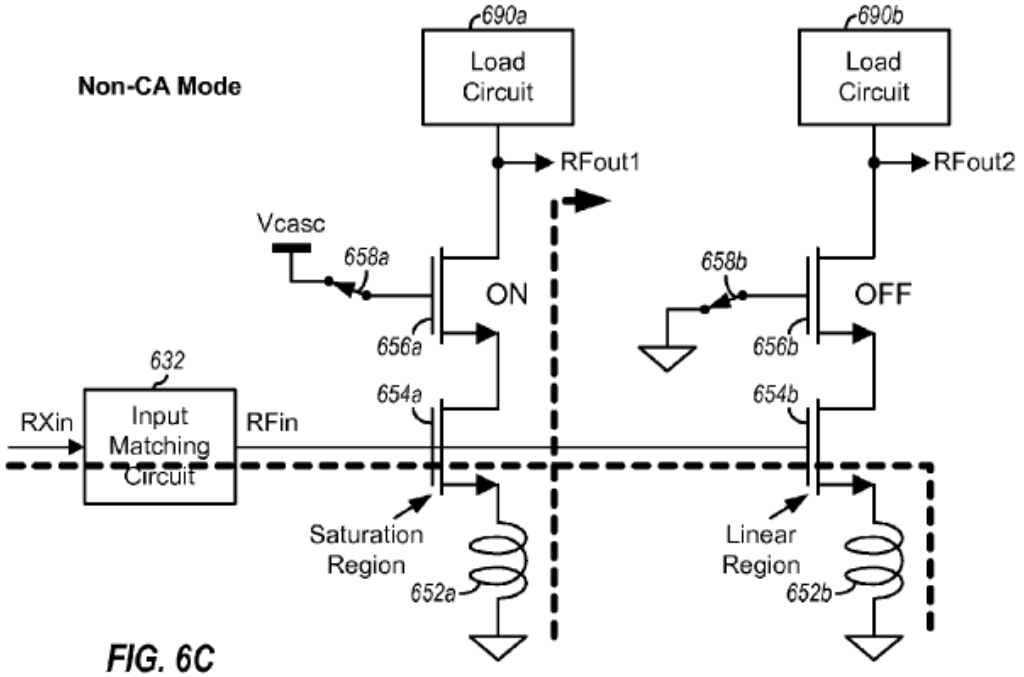

FIG. 6C

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.

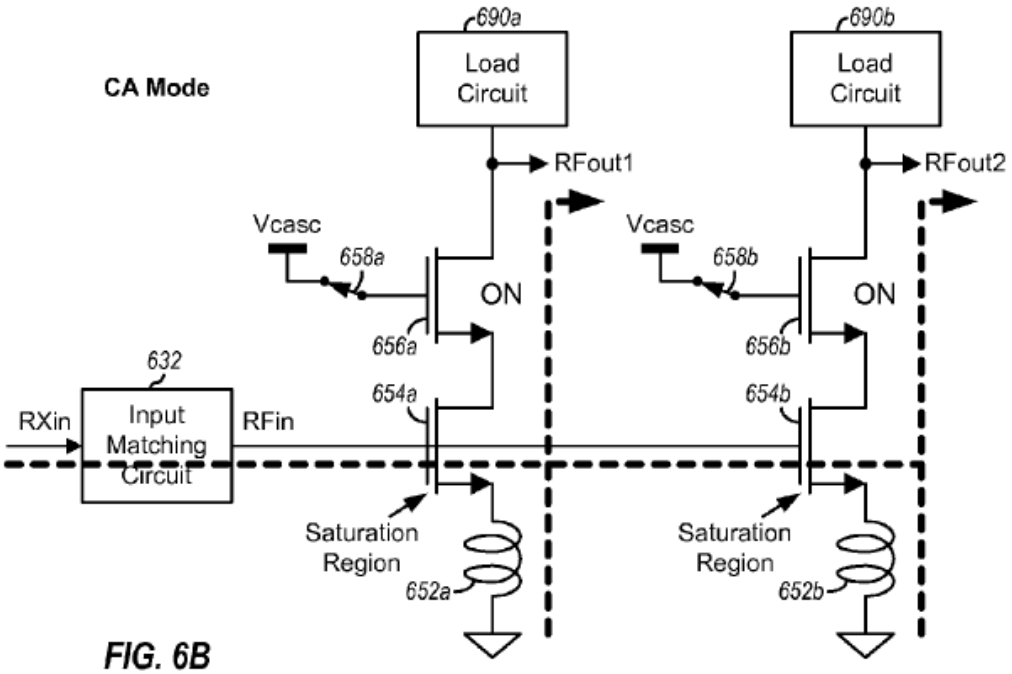

FIG. 6B

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 Claims

Petitioner challenges claims 2–6 and 10 of the '356 patent. These claims depend, directly or indirectly, from independent claim 1, which is not challenged in the Petition. Claims 2 and 10 are illustrative of the claims under challenge, and are reproduced below along with claim 1.

1. An apparatus comprising:

a first amplifier stage configured to be independently enabled or disabled, the first amplifier stage further configured to receive and amplify an input radio frequency (RF) signal and provide a first output RF signal to a first load circuit when the first amplifier stage is enabled, the input RF signal employing carrier aggregation comprising transmissions sent on multiple carriers at different frequencies to a wireless device, the first output RF signal including at least a first carrier of the multiple carriers; and

a second amplifier stage configured to be independently enabled or disabled, the second amplifier stage further configured to receive and amplify the input RF signal

> and provide a second output RF signal to a second load circuit when the second amplifier stage is enabled, the second output RF signal including at least a second carrier of the multiple carriers different than the first carrier.
>
> 2. The apparatus of claim 1, the first amplifier stage comprising a first gain transistor coupled to a first cascode transistor, the second amplifier stage comprising a second gain transistor coupled to a second cascode transistor, and the input RF signal being provided to both the first and second gain transistors.
>
> 10. The apparatus of claim 1, further comprising:
>
> an attenuation circuit coupled to the first and second amplifier stages and configured to receive the input RF signal.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 2–6 and 10 of the '356 patent on the following grounds. Pet. 42–80.

Reference(s)	Basis	Claim(s) Challenged
Lee[2]	§ 102	2–6
Lee and Youssef[3]	§ 103	10
Lee and the Feasibility Study[4]	§ 103	2–6
Lee, the Feasibility Study, and Youssef	§ 103	10

[2] U.S. Publ'n No. 2012/0056681 A1 (published Mar. 8, 2012) (Ex. 1435).
[3] Ahmed Youssef et al., *Digitally-Controlled RF Passive Attenuator in 65 nm CMOS for Mobile TV Tuner ICs*, 2010 IEEE INT'L SYMP. ON CIRCUITS & SYS. 1999 (Ex. 1409).
[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. 1404).

In support of its arguments, Petitioner relies on a Declaration of Patrick Fay, Ph.D. (Exhibit 1402). *See id.*

III. DISCUSSION

A. Discretion Under § 314(a): Multiple Petitions

Patent Owner requests that we exercise our discretion under 35 U.S.C. § 314(a) to deny institution of an *inter partes* review in light of Petitioner's multiple filings. Prelim. Resp. 15–17; *see Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."); *Harmonic Inc. v. Avid Tech, Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) ("[T]he PTO is permitted, but never compelled, to institute an IPR proceeding."). For the reasons explained below, we do not exercise our discretion to deny institution.

Patent Owner contends that "Petitioner challenges overlapping claims with redundant references and arguments across two petitions," namely the instant Petition and the petition in Case IPR2019-00049. Prelim. Resp. 15. As support, Patent Owner asserts that "Petitioner challenges dependent claims 2–6 in two separate petitions and four different invalidity grounds," relying primarily on Lee in the instant Petition, and on a combination of Jeon[5] and Xiong[6] in a second petition. *Id.* at 15–16. According to Patent Owner, "Petitioner thus challenges nearly overlapping sets of claims with

[5] Sanggeun Jeon et al., *A Scalable 6-to-18 GHz Concurrent Dual-Band Quad-Beam Phased-Array Receiver in CMOS*, 43 IEEE JOURNAL OF SOLID-STATE CIRCUITS 2660 (Dec. 2008).
[6] U.S. Publ'n No. 2010/0237947 A1 (published Sept. 23, 2010).

grounds that are substantially the same as each other and applied in the same manner." *Id.* at 16. Patent Owner further asserts that "the petitions all rely on the Feasibility Study as a back-up to the primary references," and that the combinations of the Feasibility Study and the primary references "are cumulative to one another." *Id.* at 17. In addition, Patent Owner characterizes any remaining ground across the petitions as "involv[ing] insignificant secondary references that are relied on for the same duplicative arguments already made." *Id.* (citing *TomTom, Inc. v. Blackbird Tech, LLC*, Case IPR2017-02025, slip op. at 7 (PTAB Mar. 12, 2018) (Paper 7)).

We disagree with Patent Owner. The limited evidence available on this record does not show that the prior art disclosures support substantially the same arguments. With respect to the primary references across the two petitions, Patent Owner merely asserts that Petitioner "challenges nearly overlapping sets of claims with grounds that are substantially the same as each other and applied in the same manner." Prelim. Resp. 16. Patent Owner additionally asserts that combinations based on the Feasibility Study are "cumulative to one another," and that any remaining secondary reference is "insignificant" and relied on for "duplicative arguments." *Id.* at 17.

Notwithstanding, Patent Owner acknowledges that Petitioner relies on Lee as an anticipatory reference for claims 2–6 of the '356 patent in the instant Petition, while relying on a combination of Jeon and Xiong for claims 2–8 and 11 in the second petition. *See id.* at 15–16. That Petitioner relies solely on Lee for one set of claims in this Petition but on a combination of Jeon and Xiong for a different set of claims in the other petition implies that the disclosures in the three asserted references are different and do not necessarily support substantially the same arguments.

This is not like the situation presented in *TomTom*, a prior Board decision that Patent Owner cites, where the petitioner relied on different prior art disclosures across two petitions for the same set of claims. *See TomTom*, slip op. at 14–15.

Moreover, we note that this Petition challenges claim 10 based on Youssef as a secondary reference; but the other petition does not challenge claim 10 at all, nor does it present any ground based on Youssef. As such, we are not persuaded that Youssef is relied on for "duplicative arguments." *See* Prelim. Resp. 17.

Accordingly, on this record, we find no persuasive reason to deny institution based on Petitioner's multiple filings.

B. Discretion Under § 314(a): Parallel Proceedings

Patent Owner further requests that we deny institution under 35 U.S.C. § 314(a) in light of the related ITC investigation and district court case. Prelim. Resp. 17–21. Because the related district court case has been dismissed (*see* Paper 8, 1), we address only Patent Owner's arguments with respect to the related ITC investigation. For the reasons explained below, we do not exercise our discretion to deny institution.

Patent Owner represents that Petitioner "relies on the same primary reference on which it relies in the ITC investigation," namely, Lee. Prelim. Resp. 19. Patent Owner further represents that, "before even filing the Petition, Petitioner already received the benefit of full expert briefing, and a full ITC hearing, on the underlying issues raised in this Petition," and that, "[b]y filing so late, Petitioner and Apple seek to re-litigate an issue that has already been fully litigated in a different forum and will be decided in the

ITC . . . well before the Board can reach a final written decision." *Id.* at 19–20. Additionally, Patent Owner represents that "the ITC investigation will have had the opportunity to be appealed, fully briefed, and the argument heard all by the time the Board's final written decision is due." *Id.* at 20. According to Patent Owner, "[w]hen another forum will decide the same issues earlier than the Board, this fact weighs in favor of denying institution." *Id.* (citing *NHK Spring Co. v. Intri-Plex Tech., Inc.*, Case IPR2018-00752 (PTAB Sept. 12, 2018) (Paper 8)).

Conversely, Petitioner contends that we should decline to exercise our discretion to deny institution because the ITC investigation "does not involve the same remedy, so even a finding of no violation in the ITC [investigation] would not provide the same relief that Petitioner seeks in this proceeding." Pet. 5.

In light of the particular circumstances surrounding this proceeding, we find that the ITC investigation does not weigh in favor of exercising our discretion to deny institution. Petitioner has indicated that the administrative law judge in the ITC investigation has issued an initial determination, finding, among other things, that Lee anticipates claims 1 and 17 of the '356 patent. Paper 8, 1. That finding is consistent with our finding in this Decision that Petitioner has met its burden of demonstrating a reasonable likelihood of success on the merits based on the ground that Lee anticipates claims 2–6, which depend, directly or indirectly, from claim 1. *See infra* Section III.E; *see also* Office Patent Trial Practice Guide, August 2018 Update, 83 Fed. Reg. 39,989 (August 13, 2018), available at https://go.usa.gov/xU7GP, at 10 (stating that "the merits" should be considered as part of a balanced assessment in whether to deny institution

under § 314(a)). Further, as discussed above, Petitioner also has indicated that the parties have moved to terminate the ITC investigation. Paper 8, 1. It is therefore possible that the ITC investigation will be terminated, leaving no ITC challenge to the '356 patent, as the petitioner in this proceeding, Intel, is not a party to the ITC investigation. *See* Pet. 1 (identifying Apple as the respondent in the ITC investigation). Taking into consideration these facts, we conclude that the ITC investigation should not preclude *inter partes* review.

> Moreover, the relief available in each forum is different. For instance,
>
> > [w]hen the ITC determines that a defendant has engaged in unfair practices in import trade, it may direct that the articles at issue be excluded from entry into the United States, 19 U.S.C. § 1337(d), issue a cease and desist order, 19 U.S.C. § 1337(f), and/or issue an order providing that the articles in violation be seized and forfeited to the United States, 19 U.S.C. § 1337(i).

Bio-Tech. Gen. Corp. v. Genentech, Inc., 80 F.3d 1553, 1564 (Fed. Cir. 1996). The ITC is not "empowered under existing law to set aside a patent as being invalid or to render it unenforceable." *Id.* (internal quotation marks omitted). An *inter partes* review proceeding, however, may result in "a certificate canceling any claim of the patent finally determined to be unpatentable, confirming any claim of the patent determined to be patentable, and incorporating in the patent by operation of the certificate any new or amended claim determined to be patentable." 35 U.S.C. § 318(b).

Additionally, the burdens of proof and claim construction standards applied in each forum are different. Invalidity in the ITC (for purposes of determining whether a violation has occurred) must be proven by clear and convincing evidence. *Linear Tech. Corp. v. Int'l Trade Comm'n*, 566 F.3d 1049, 1066 (Fed. Cir. 2009). Here, in an *inter partes* review proceeding, a

petitioner must establish unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e). In addition, unlike in an ITC proceeding, for petitions filed before November 13, 2018 (as was this Petition), the broadest reasonable claim construction standard applies.

For these reasons, and in the particular circumstances of this proceeding, we choose not to exercise our discretion to deny institution based on the parallel ITC investigation. The situation here is not like the one presented in *NHK Spring*, which Patent Owner cites, where the panel considered a parallel district court proceeding. *NHK Spring*, slip op. at 19–20. First, the relief available through a district court proceeding and an *inter partes* review proceeding may be the same. *See* S. Rep. No. 110-259, at 20 (2008) (explaining that post-grant review proceedings are meant to provide "a quick, inexpensive, and reliable alternative to district court litigation"). Second, the panel in *NHK Spring* chose to deny institution based on factors independent from its consideration of the parallel district court proceeding. *NHK Spring*, slip op. at 18 ("[W]e deny institution under § 325(d). Although a weighing of the § 325(d) factors alone is sufficient to support an exercise of our discretion to deny institution, we also consider Patent Owner's additional arguments under § 314(a)."), 20 ("[W]e find that the advanced state of the district court proceeding is an additional factor that weighs in favor of denying the Petition.").

C. Discretion Under § 325(d): Prior Art Previously Considered

Patent Owner further requests that we exercise our discretion under 35 U.S.C. § 325(d) to deny institution because (1) all four grounds presented in the Petition rely on a reference considered during prosecution, namely,

Lee; and (2) the other asserted references, the Feasibility Study and Youssef, are cumulative to disclosures considered during prosecution. Prelim. Resp. 8–15; *see Cuozzo*, 136 S. Ct. at 2140; *Harmonic*, 815 F.3d at 1367. For the reasons explained below, we do not exercise our discretion to deny institution.

Under 35 U.S.C. § 325(d), we have discretion to deny a petition when the same or substantially the same prior art or arguments were presented previously in another proceeding before the Office. Although a petitioner may have sound reasons for raising art or arguments similar to those previously considered by the Office, the Board weighs petitioners' desires to be heard against the interests of patent owners who seek to avoid harassment. *See* H.R. Rep. No. 112–98, pt. 1, at 48 (2011) (explaining that post-grant review proceedings "are not to be used as tools for harassment or a means to prevent market entry through repeated litigation and administrative attacks on the validity of a patent," and that "[d]oing so would frustrate the purpose of the section as providing quick and cost effective alternatives to litigation").

In the instant proceeding, Petitioner relies on Lee for teaching all the recited elements of independent claim 1 from which challenged claims 2–6 and 10 depend. Pet. 42–59. Under an alternative theory, Petitioner additionally relies on the Feasibility Study for its teaching of an input radio frequency signal employing carrier aggregation. Pet. 76–80.

Patent Owner contends that the prosecution history for the '356 patent indicates that the Examiner considered Lee. Prelim. Resp. 9–10. As support, Patent Owner points out that Lee is listed on the face of the '356 patent. *Id.* at 10; *see* Ex. 1401, at [56]. Patent Owner also directs us to

an information disclosure statement that lists Lee as a reference and includes the Examiner's signature. Prelim. Resp. 9 (citing Ex. 2004); *see also* Ex. 2004, 3 (listing of Lee), 5 (Examiner's signature). The bottom of each page of the signed information disclosure statement reads, "ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /KCT/." *See* Ex. 2004. Lee is not lined through. *See id.* at 3. According to Patent Owner, "[t]hat is enough to show that the Office previously considered Lee for purposes of Section 325(d)." Prelim. Resp. 9 (citing *R.J. Reynolds Vapor Co. v. Fontem Holdings 1 B.V.*, Case IPR2018-00626, slip op. at 21 (PTAB Sept. 27, 2018) (Paper 7);[7] *Clim-A-Tech Ind., Inc. v. William A. Ebert*, IPR2017-01863, slip op. at 18–19 (PTAB Feb. 12, 2018) (Paper 13)).

In addition, Patent Owner directs us to where the signed information disclosure statement further lists an international search report and written opinion for a related international application, and contends that these listed papers "provide[] a detailed description of how Lee allegedly reads on the claims." *Id.* at 10 (citing Ex. 2004; Ex. 2005); *see also* Ex. 2004, 5 (listing of the search report and written opinion); Ex. 2005, 7 (written opinion providing "[r]easoned statement with regard to novelty"); *compare* Ex. 2004, 1 (identifying docket number for '356 patent application), *with* Ex. 2005, 1 (identifying same docket number for international application). The search report designates Lee as an "X" reference, meaning that Lee is

[7] Patent Owner cites *R.J. Reynolds Vapor Co. v. Fontem Holdings 1 B.V.*, Case IPR2017-00626, slip op. at 12 (PTAB Sept. 27, 2018) (Paper 7), but the language relied on appears at *R.J. Reynolds Vapor Co. v. Fontem Holdings 1 B.V.*, Case IPR2018-00626, slip op. at 21 (PTAB Sept. 27, 2018) (Paper 7).

"of particular relevance" and "the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone." Ex. 2005, 3.

Based on the record before us, we are not persuaded that it is appropriate to exercise our discretion to deny institution. As Patent Owner acknowledges, the Examiner did not rely on Lee to reject claims in the application for the '356 patent. Prelim. Resp. 12 ("[T]he Office did not issue a rejection over Lee."). The fact that Lee was not the basis of rejection weighs strongly against exercising our discretion to deny institution under 35 U.S.C. § 325(d). *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, Case IPR2017-01586, slip op. at 17 (PTAB Dec. 15, 2017) (Paper 8) (informative) (considering six nonexclusive factors in evaluating whether to exercise discretion under 35 U.S.C. § 325(d), including "the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection"); *Kayak Software Corp. v. Int'l Bus. Machs. Corp.*, Case CBM2016-00075, slip op. at 11 (PTAB Dec. 15, 2016) (Paper 16) (informative) ("There could be situations where, for example, the prosecution is not as exhaustive, where there are clear errors in the original prosecution, *or where the prior art at issue was only cursorily considered* that can weigh against exercising the discretion." (emphasis added)).

Although the international search report and written opinion identify Lee as an "X" reference and provide a "[r]easoned statement with regard to novelty," the papers by themselves do not demonstrate the extent to which the Examiner considered the reference. Nor do the papers demonstrate that the Examiner considered the various combinations of Lee, the Feasibility Study, and Youssef, as relied on in the Petition.

Moreover, we note that the Examiner singled out the claim limitations "a first amplifier stage configured to be independently enabled or disabled" and "a second amplifier stage configured to be independently enabled or disabled" as "reasons for allowance" for the '356 patent. Ex. 1422, 4–5. The "[r]easoned statement with regard to novelty" in the written opinion for the related international application does not address these limitations. *See* Ex. 2005, 7.

Lastly, neither of the prior Board decisions cited by Patent Owner (*see* Prelim. Resp. 9) presents a situation where the panel denied institution based solely on the fact that the asserted prior art was listed in an information disclosure statement. For instance, the panel in *R.J. Reynolds* additionally denied institution because it was not persuaded that the petitioner had shown a reasonable likelihood of prevailing on the sole ground presented in the petition. *See R.J. Reynolds*, slip op. at 18, 21 ("After due consideration of the record before [us] and for the foregoing reasons, we deny the Petition."). Similarly, the panel in *Clim-A-Tech* additionally denied institution because it was not persuaded that the petitioner had shown a reasonable likelihood of prevailing on the grounds presented in the petition. *Clim-A-Tech*, slip op. at 18, 19 ("[T]he Board exercises its discretion under 35 U.S.C. § 325(d) as an additional basis to decline to institute."), 22, 25–26, 30–31. By contrast, for the reasons explained below, we are persuaded that Petitioner in this proceeding has demonstrated a reasonable likelihood that it will prevail on the asserted grounds presented in the Petition. *See infra* Sections III.E–G.

In view of the foregoing, we decline to exercise our discretion under 35 U.S.C. § 325(d) to deny institution. Because Lee is relied on for all four grounds presented in the Petition, we need not address whether the

Feasibility Study and Youssef are cumulative to prior art disclosures previously considered by the Office.

D. Claim Interpretation

The claim construction standard applicable to this *inter partes* review proceeding is the broadest reasonable interpretation in light of the patent specification. *See* 37 C.F.R. § 42.100(b) (2018);[8] *Cuozzo*, 136 S. Ct. at 2144–46 (upholding the use of the broadest reasonable interpretation standard). 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 provides a proposed interpretation of the claim term "carrier aggregation." Pet. 28–32. Patent Owner responds that "no terms must be construed at this stage of the proceeding" and that "the Board should deny institution under any claim construction it adopts." Prelim. Resp. 8. For purposes of this Decision, we conclude that no claim term requires express interpretation at this time to resolve any controversy in this proceeding.

[8] 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) (to be codified at 37 C.F.R. pt. 42).

E. Anticipation by Lee

Petitioner asserts that Lee anticipates claims 2–6 of the '356 patent. Pet. 42–71. For the reasons explained below, we are persuaded that Petitioner has demonstrated a reasonable likelihood of prevailing on this asserted ground.

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. 1435 ¶¶ 1–3. Figure 2, which is reproduced below, illustrates an example of a signal amplification circuit according to Lee. *Id.* ¶¶ 9, 26.

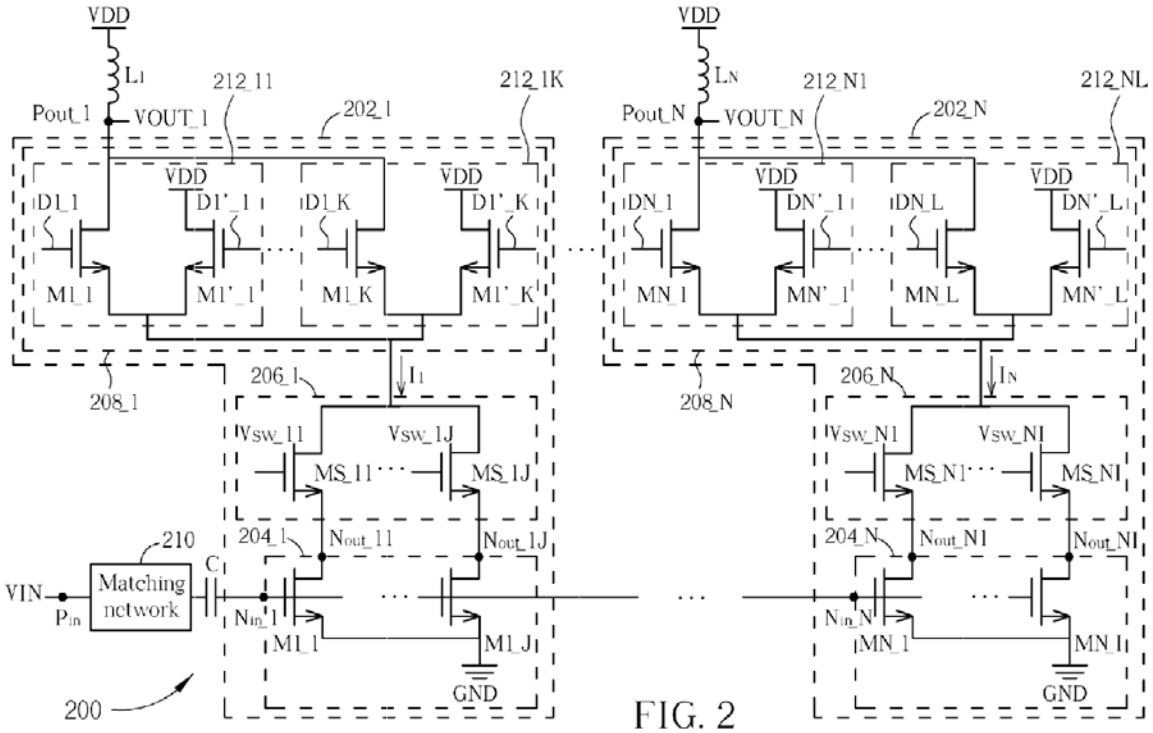

FIG. 2

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

Challenged claims 2–6 depend, directly or indirectly, from independent claim 1. Although Petitioner does not challenge claim 1 in this proceeding, Petitioner analyzes the claim as part of its analysis for claims 2–6. We also address claim 1 as part of our analysis for claims 2–6.

a. Independent Claim 1

Independent claim 1 recites "a first amplifier stage configured to be independently enabled or disabled" and "configured to receive and amplify an input radio frequency (RF) signal and provide a first output RF signal to a first load circuit when the first amplifier stage is enabled." For this limitation, Petitioner identifies Lee's amplifier block 202_1 as a "first amplifier stage," Lee's input signal VIN as an "input radio frequency (RF) signal," Lee's processed signal VOUT_1 as a "first output RF signal," and Lee's inductor L1 as a "first load circuit." Pet. 42–43, 45. To illustrate, Petitioner provides an annotated version of Figure 2 of Lee, which is reproduced below. *Id.* at 43.

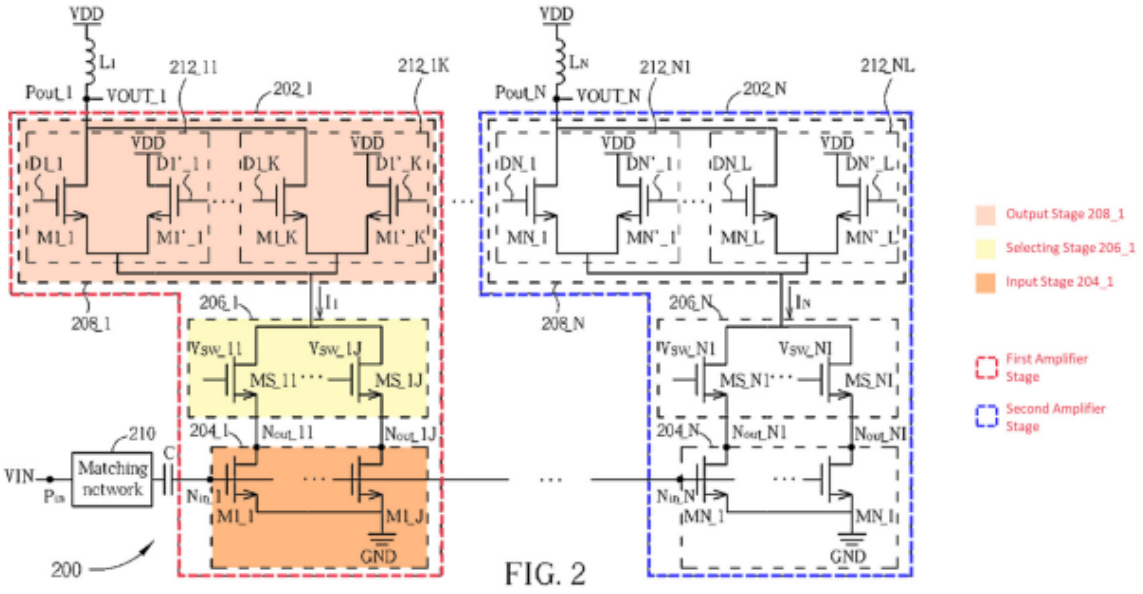

FIG. 2

Figure 2 is a diagram of Lee's signal amplification circuit 200. Ex. 1435 ¶ 9. Lee's signal amplification circuit 200 includes amplifier block 202_1 (outlined in red), which has input stage 204_1 (highlighted in dark orange), selecting stage 206_1 (highlighted in yellow), and output stage 208_1 (highlighted in light orange). Pet. 43 (citing Ex. 1435 ¶ 26).

Petitioner directs us to where Lee teaches transmitting input signal VIN to input stage 204_1 (highlighted in dark orange). *Id.* at 45–46 (citing Ex. 1435 ¶ 26). Petitioner also directs us to where Lee teaches that its selecting stage 206_1 (highlighted in yellow) selectively couples input stage 204_1 to output stage 208_1 (highlighted in light orange), which generates corresponding processed signal VOUT_1. *Id.* at 46 (citing Ex. 1435 ¶¶ 27–28). Lee's output stage 208_1 provides processed signal VOUT_1 to output port Pout_1, which is coupled to load L1. *Id.* (citing Ex. 1435 ¶ 28). Petitioner contends that Lee's input signal VIN and processed signal VOUT_1 are RF signals. *Id.* As support, Petitioner points us to where Lee teaches that "input signal VIN may include a plurality of

radio-frequency signals" such as a Bluetooth signal and a WiFi signal, and that "a plurality of received signals corresponding to the radio-frequency signals are generated as outputs of the signal amplification circuit." *Id.* at 46–47 (quoting Ex. 1435 ¶ 17).

Petitioner notes Lee's teaching that output stage 208_1 (highlighted in light orange) performs these functions only when enabled. *Id.* at 47 (citing Ex. 1435 ¶ 28). Petitioner directs us to where Lee teaches enabling output stage 208_1 when amplifier block 202_1 needs to process a signal such as a WiFi signal and disabling output stage 208_1 when amplifier block 202_1 need not generate processed signal VOUT_1. *Id.* at 43–44 (citing Ex. 1435 ¶ 33); *see also id.* at 47.

Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that Lee discloses the recited "first amplifier stage."

Claim 1 further recites that "the input RF signal employ[s] carrier aggregation comprising transmissions sent on multiple carriers at different frequencies to a wireless device." For this limitation, Petitioner directs us to where Lee teaches that its signal amplifier circuit may be used in a mobile device. Pet. 48 (citing Ex. 1435 ¶ 2). As discussed above, Lee's signal amplifier circuit 200 receives input signal VIN, which Petitioner identifies as the "input RF signal." Pet. 45; Ex. 1435, Fig. 2. Petitioner also 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. 48 (citing Ex. 1435 ¶ 17). Relying on the declaration testimony of Dr. Fay, Petitioner contends that Bluetooth and WiFi signals are transmitted over different carriers to avoid interference. *Id.* n.15 (citing Ex. 1402 ¶ 83 n.17).

Petitioner additionally contends that "transmitting or receiving data on multiple carriers increases bandwidth to the sum of the carriers' frequency ranges," and that "[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 49, 51–52 (citing Ex. 1402 ¶¶ 85, 87). Lastly, Petitioner points us to where Lee teaches operating signal amplification circuit 200 in a combo mode, where both output stages 208_1 and 208_N are enabled at the same time in order to process the Bluetooth and WiFi signals. *Id.* at 49 (citing Ex. 1435 ¶ 33). Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that Lee discloses the recited "input RF signal."

Claim 1 further recites that "the first output RF signal includ[es] at least a first carrier of the multiple carriers." For this limitation, Petitioner directs us to where Lee teaches that "the input signal VIN may include a plurality of [] radio-frequency signals (e.g., a Bluetooth signal and WiFi signal) received by a single antenna," and that "a plurality of received signals corresponding to the radio-frequency signals are generated as outputs of the signal amplification circuit." Pet. 52 (citing Ex. 1435 ¶ 17). As discussed above, Petitioner identifies Lee's processed signal VOUT_1 as the "first output RF signal." *Id.* at 45. Petitioner contends that processed signal VOUT_1 is one of the "generated outputs" of the amplification circuit. *Id.* at 52 (citing Ex. 1435 ¶ 28). Petitioner further contends that processed signal VOUT_1 may include a WiFi carrier. *Id.* at 52–53 (citing Ex. 1435 ¶¶ 29, 33); *see also* Ex. 1435 ¶ 33 ("For example, the output port Pout_1 is coupled to a first radio signal processing system (e.g., a WiFi receiver/transmitter)."). Based on the record before us, we are persuaded

that Petitioner has sufficiently shown for purposes of this Decision that Lee discloses the recited "first output RF signal."

Claim 1 further recites "a second amplifier stage configured to be independently enabled or disabled" and "configured to receive and amplify the input RF signal and provide a second output RF signal to a second load circuit when the second amplifier stage is enabled." As discussed above, Petitioner identifies Lee's input signal VIN as the "input RF signal." Pet. 45. Petitioner further identifies Lee's amplifier block 202_N as a "second amplifier stage," Lee's processed signal VOUT_N as a "second output RF signal," and Lee's inductor LN as a "second load circuit." *Id.* at 53, 55. To illustrate, Petitioner provides another annotated version of Figure 2 of Lee, which is reproduced below. *Id.* at 53.

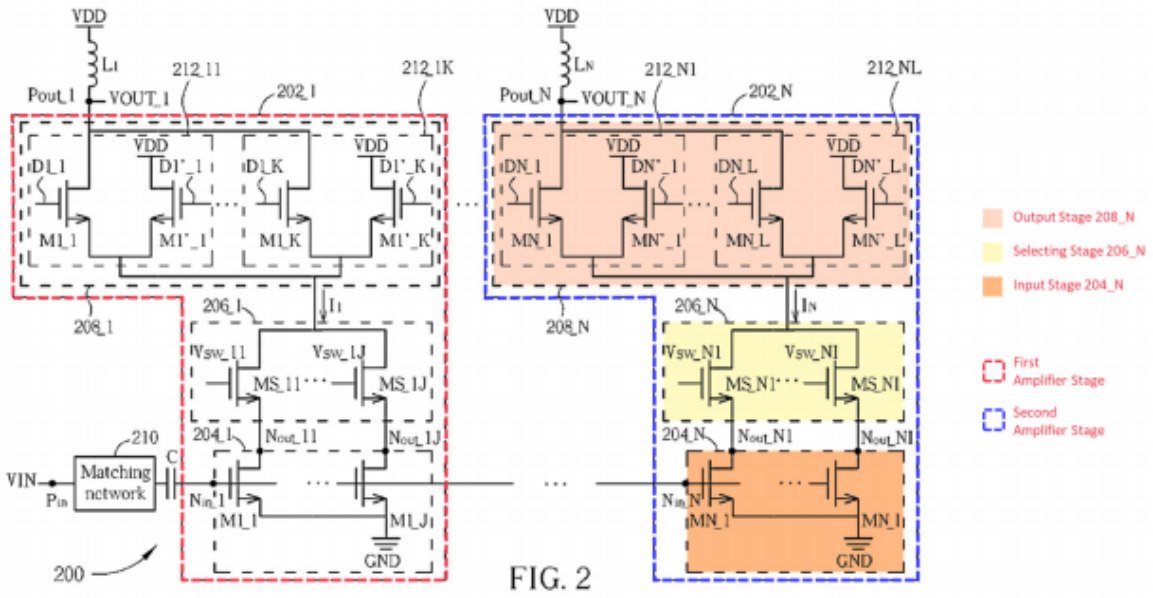

FIG. 2

Figure 2 is a diagram of Lee's signal amplification circuit 200. Ex. 1435 ¶ 9. Lee's signal amplification circuit 200 includes amplifier block 202_N (outlined in blue), which has input stage 204_N (highlighted in dark orange),

selecting stage 206_N (highlighted in yellow), and output stage 208_N (highlighted in light orange). Pet. 53 (citing Ex. 1435 ¶ 26).

Petitioner directs us to where Lee teaches transmitting input signal VIN to input stage 204_N (highlighted in dark orange). *Id.* at 55–56 (citing Ex. 1435 ¶ 26). Petitioner also directs us to where Lee teaches that its selecting stage 206_N (highlighted in yellow) couples input stage 204_N to output stage 208_N (highlighted in light orange), which generates corresponding processed signal VOUT_N. *Id.* at 56 (citing Ex. 1435 ¶ 28); *see also* Ex. 1435, Fig. 2. Lee's output stage 208_N provides processed signal VOUT_N to output port Pout_N, which is coupled to load LN. Pet. 56 (citing Ex. 1435 ¶ 28). We note that Lee's processed signal VOUT_N is an RF signal. As discussed above, Lee teaches that "input signal VIN may include a plurality of radio-frequency signals," and that "a plurality of received signals corresponding to the radio-frequency signals are generated as outputs of the signal amplification circuit." Ex. 1435 ¶ 17.

Petitioner additionally points us to Lee's teaching that output stage 208_N (highlighted in light orange) performs these functions only when enabled. *Id.* at 57 (citing Ex. 1435 ¶ 28). Petitioner directs us to where Lee teaches enabling output stage 208_N when amplifier block 202_N needs to process a signal such as a Bluetooth signal and disabling output stage 208_N when amplifier block 202_N need not generate processed signal VOUT_N. *Id.* at 54 (citing Ex. 1435 ¶ 33); *see also id.* at 57–58.

Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that Lee discloses the recited "second amplifier stage."

Lastly, claim 1 recites that "the second output RF signal includ[es] at least a second carrier of the multiple carriers different than the first carrier." For this limitation, Petitioner directs us to where Lee teaches that "the input signal VIN may include a plurality of [] radio-frequency signals (e.g., a Bluetooth signal and WiFi signal) received by a single antenna," and that "a plurality of received signals corresponding to the radio-frequency signals are generated as outputs of the signal amplification circuit." Pet. 58 (citing Ex. 1435 ¶ 17). As discussed above, Petitioner identifies Lee's processed signal VOUT_N as the "second output RF signal." *Id.* at 55. Petitioner contends that processed signal VOUT_N is one of the "generated outputs" of the amplification circuit. *Id.* at 58 (citing Ex. 1435 ¶ 28). Petitioner further contends that processed signal VOUT_N may include a Bluetooth carrier. *Id.* (citing Ex. 1435 ¶¶ 29, 33); *see also* Ex. 1435 ¶ 33 ("For example, . . . the output port Pout_N is coupled to a second radio signal processing system (e.g., a Bluetooth receiver/transmitter)."). Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that Lee discloses the recited "second output RF signal."

Patent Owner does not respond to Petitioner's arguments regarding claim 1, which, as discussed above, is not challenged in this proceeding. *See generally* Prelim. Resp.

b. Dependent Claims 2–6

Claim 2 depends from claim 1 and recites that the first amplifier stage comprises "a first gain transistor coupled to a first cascode transistor." For this limitation, Petitioner identifies Lee's transistor M1_1 of input stage 204_1 as a "first gain transistor" and Lee's transistor M1_1 of output stage

208_1 as a "first cascode transistor." Pet. 59. Relying on the declaration testimony of Dr. Fay, Petitioner explains that a gain transistor "is a transistor that receives an input signal and provides output with a gain," and that a cascode transistor "is a transistor that couples the current from the gain transistor to the amplifier output." *Id.* at 59 (citing Ex. 1402 ¶ 96[9]).

Petitioner directs us to where Lee teaches that input stage 204_1 includes transistor elements M1_1–M1_J that "are used to control the transconductance of the input stage," where "the transconductance of the input stage would be increased when more transistor elements included in the input stage are turned on." *Id.* (citing Ex. 1435 ¶ 26). Petitioner contends that "[t]he transistors in the input stage 204_1 are therefore gain (transconductance) transistors." *Id.* at 60. Petitioner relies on the declaration testimony of Dr. Fay. *Id.* (citing Ex. 1402 ¶ 96).

Petitioner further directs us to where Lee teaches that input stage 204_1 is selectively coupled to output stage 208_1 through selecting stage 206_1. *Id.* (citing Ex. 1435 ¶ 27). The output stage includes a plurality of transistor element pairs 212_11–212_1K and generates processed signal VOUT_1, which is provided to corresponding output port Pout_1 according to a gain and a signal derived from an intermediate signal of the input stage. *Id.* (citing Ex. 1435 ¶ 28). Petitioner contends that "transistors M1_1 and M1_K in the output stage 208_1 are cascode transistors because they couple the output of the input stage gain transistors M1_1 and M1_J to the amplifier output VOUT_1." Petitioner relies on the declaration testimony of Dr. Fay. *Id.* (citing Ex. 1402 ¶ 97).

[9] Petitioner cites paragraph XX of Dr. Fay's declaration, but the relevant testimony appears at paragraph 96.

Based on the record before us, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Lee discloses the recited "first amplifier stage."

Claim 2 further recites that the second amplifier stage comprises "a second gain transistor coupled to a second cascode transistor." For this limitation, Petitioner identifies Lee's transistor MN_1 of input stage 204_N as a "second gain transistor" and Lee's transistor MN_1 of output stage 208_N as a "second cascode transistor." Pet. 60–61. Petitioner directs us to where Lee teaches that input stage 202_N includes transistor elements MN_1–MN_I that can be "used to control the transconductance of the input stage," and that output stage 208_N includes transistor element pairs 212_N1–212_NL and generates processed signal VOUT_N, which is provided to corresponding output port Pout_N according to a gain and a signal derived from an intermediate signal of the input stage. *Id.* at 61 (citing Ex. 1435 ¶¶ 26, 28). Petitioner contends that "[t]he input stage 204_N transistors are gain transistors because they receive and amplify an input RF signal according to a gain, and the output stage 208_N transistors MN_1 and MN_L are cascode transistors because they couple the output of the gain transistors MN_1 and MN_I of the input stage 204_N to the amplifier output signal VOUT_N." *Id.* Petitioner relies on the declaration testimony of Dr. Fay. *Id.* (citing Ex. 1402 ¶ 99). Based on the record before us, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Lee discloses the recited "second amplifier stage."

Lastly, claim 2 recites that "the input RF signal [is] provided to both the first and second gain transistors." For this limitation, Petitioner directs us to where Lee teaches that "[t]he input signal VIN is transmitted to the

input nodes Nin_1–Nin_N of the input stages 204_1–204_N," and that "[e]ach of the input stages 204_1–204_N includes a plurality of transistor elements M1_1–M1_J, . . . , or MN_1–MN_I each having a control terminal coupled to the input node of the input stage." *Id.* at 62 (citing Ex. 1435 ¶ 26). Based on the record before us, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Lee discloses the recited "input RF signal."

Patent Owner does not respond to Petitioner's arguments regarding claim 2. *See generally* Prelim. Resp. In view of the foregoing, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that Lee anticipates claim 2. Patent Owner does not respond to Petitioner's arguments regarding claims 3–6. *See generally* Prelim. Resp. Having reviewed Petitioner's arguments asserting that Lee anticipates claims 3–6 (*see* Pet. 62–71), we also determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion as to these claims.

F. Obviousness over Lee and Youssef

Petitioner asserts that claim 10 of the '356 patent would have been obvious over Lee and Youssef. Pet. 71–76. For the reasons explained below, we are persuaded that Petitioner has demonstrated a reasonable likelihood of prevailing on this asserted ground.

We discussed Lee above.

1. Youssef

Youssef describes an attenuator suitable for mobile TV applications. Ex. 1409, 1999. Figure 1(b), which is reproduced below, illustrates an example of an attenuator according to Youssef.

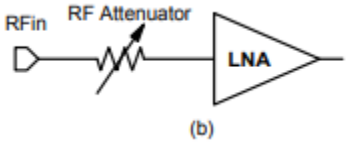

Figure 1(b) shows a programmable passive attenuator that is used to control the RF gain. *Id.* The attenuator is "capable of preventing a receiver from clipping at large input signal levels." *Id.*

2. Analysis

Claim 10 depends from claim 1 and recites "an attenuation circuit coupled to the first and second amplifier stages and configured to receive the input RF signal." For this limitation, Petitioner relies on Youssef. In particular, Petitioner directs us to the RF attenuator in Figure 1(b) of Youssef, which is reproduced above. Pet. 71 (citing Ex. 1409, Fig. 1(b)). As Figure 1(b) shows, the RF attenuator receives signal RFin and is coupled to an LNA. Petitioner identifies Youssef's signal RFin as an "input RF signal" and Youssef's LNA as an "amplifier stage." *Id.*

Petitioner contends that an ordinarily skilled artisan "would have been motivated to couple the first and second amplifier stages of the LNA of Lee to the attenuation circuit of Youssef to prevent signal clipping and suppress interfering signals." *Id.* at 73 (citing Ex. 1409, 1999). Relying on the declaration testimony of Dr. Fay, Petitioner also contends that an ordinarily skilled artisan "would have been motivated to couple the attenuation circuit

of Youssef to the first and second amplifier stages of Lee to improve dynamic range and linearity." *Id.* (citing Ex. 1402 ¶ 126). Petitioner further explains that using a common attenuation circuit "would have provided the benefits of reducing the circuit cost and complexity relative to adding separate attenuation circuits to each amplifier stage." *Id.* at 75 (citing Ex. 1402 ¶ 127).

Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that Youssef teaches an "attenuation circuit." We also are persuaded that Petitioner's proffered reasoning for modifying Lee's signal amplification circuit to include Youssef's RF attenuator, namely, to prevent clipping at large input signal levels as well as to improve dynamic range and linearity, is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.").

Patent Owner does not respond to Petitioner's arguments regarding claim 10. *See generally* Prelim. Resp. In view of the foregoing, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claim 10 would have been obvious over Lee and Youssef.

G. Grounds Based on the Feasibility Study

Petitioner asserts that claims 2–6 of the '356 patent would have been obvious over Lee and the Feasibility Study. Pet. 76–79. Petitioner also asserts that claim 10 would have been obvious over Lee, the Feasibility

Study, and Youssef. *Id.* at 79–80. For the reasons explained below, we are persuaded that Petitioner has demonstrated a reasonable likelihood of prevailing on these asserted grounds.

We discussed Lee and Youssef above.

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. 1404, 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 every limitation recited in claim 1 (from which challenged claims 2–6 and 10 depend), including an "input RF signal employing carrier aggregation." Under an alternative theory, Petitioner relies additionally on the Feasibility Study.

In particular, Petitioner contends that, "[t]o the extent Patent Owner argues that Lee fails to teach an input RF signal employing carrier aggregation, . . . the Feasibility Study also discloses this element." Pet. 76; *accord id.* at 79. 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. 1404, 22). Petitioner also directs us to where the Feasibility Study teaches that "[i]t is possible to configure a [mobile device] to aggregate a different number of component carriers originating from the same [base station] and of possibly different bandwidths in the [uplink] and the [downlink]." *Id.* at 76–77 (citing Ex. 1404, 9). Petitioner contends that an ordinarily skilled artisan "would have been motivated to use the carrier aggregated input RF signal of the Feasibility Study with the amplification blocks of Lee," and that combining these references would have "require[d] nothing more than substitution of the 'plurality of radio frequency signals' of Lee for the 'Carrier Aggregation' signals described in the Feasibility Study." *Id.* at 77–78; *see also id.* at 80 ("[T]he amplifier arrangement of Lee can remain the same when combined with the Feasibility Study. Thus, it would have been obvious to a POSITA to have coupled the first and second amplifier stages of the LNA of Lee in view of the Feasibility Study to the attenuation circuit of Youssef for the same reasons that a POSITA would have done so to Lee alone."). Petitioner relies on the declaration testimony of Dr. Fay. *Id.* at 77–78 (citing Ex. 1402 ¶ 132).

Based on the record before us, we are persuaded that Petitioner has sufficiently shown for purposes of this Decision that the Feasibility Study teaches an "input RF signal employing carrier aggregation." We also are persuaded that Petitioner's proffered reasoning for modifying Lee's signal amplification circuit to process the carrier aggregation signals described in the Feasibility Study, namely, to achieve wider transmission bandwidths and spectrum aggregation, is sufficient to support the legal conclusion of obviousness. *See Kahn*, 441 F.3d at 988.

Patent Owner does not respond to Petitioner's arguments in this regard. *See generally* Prelim. Resp. For the remaining limitations recited in claim 1 (which is not challenged in this proceeding) as well as the limitations recited in challenged claims 2–6, Petitioner relies on its arguments with respect to anticipation by Lee. Pet. 79. For the remaining limitations recited in claim 10, Petitioner relies on its arguments with respect to obviousness over Lee and Youssef. *Id.* at 79–80. As discussed above, we are persuaded by Petitioner's arguments. *See supra* Sections III.E and III.F. Accordingly, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that challenged claims 2–6 would have been obvious over Lee and the Feasibility Study as well as its assertion that claim 10 would have been obvious over Lee, the Feasibility Study, and Youssef.

IV. CONCLUSION

For the foregoing reasons, we are persuaded that Petitioner has demonstrated a reasonable likelihood that it will prevail in showing that claims 2–6 and 10 of the '356 patent are unpatentable. We have not made a final determination, however, with respect to the patentability of these claims.

V. ORDER

For the reasons given, it is

ORDERED that *inter partes* review is instituted as to all challenged claims of the '356 patent, namely, claims 2–6 and 10 based on all the grounds presented in the Petition:

A. Anticipation under 35 U.S.C. §102 of claims 2–6 by Lee;

B. Obviousness under 35 U.S.C. §103 of claim 10 over Lee and Youssef;

C. Obviousness under 35 U.S.C. §103 of claims 2–6 over Lee and the Feasibility Study; and

D. Obviousness under 35 U.S.C. § 103 of claim 10 over Lee, the Feasibility Study, and Youssef;

FURTHER ORDERED that no other grounds of unpatentability are authorized for an *inter partes* review as to any claim of the '356 patent; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this Decision.

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