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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

DECLARATION OF PATRICK FAY, PH.D. IN SUPPORT OF PETITIONER'S REPLY

INTEL 1339
Intel v. Qualcomm
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I, Patrick Fay, declare as follows:

I. INTRODUCTION

1. I have been retained by Intel Corporation ("Intel" or "Petitioner") as an independent expert consultant in this proceeding before the United States Patent and Trademark Office. I previously prepared and submitted a Declaration in support of the Petition in this proceeding, dated November 9, 2018 (Ex. 1302).

2. Since preparing my Declaration, I have reviewed Qualcomm's Patent Owner's Preliminary Response ("POPR"), the Board's Decision on Institution ("DOI"), Patent Owner's Response ("POR"), Dr. Foty's declaration submitted in support of the POR (Ex. 2024), and the transcript of Dr. Foty's deposition on November 8, 2019 (Ex. 1340). I have been asked to review and respond to Dr. Foty's opinions, including those reflected in the POR, as well as the Board's Decision on Institution.

3. I am being compensated for my work on this matter, but my opinions are based on my own views of the patented technology and the prior art. My compensation in no way depends on the outcome of this proceeding or the content of my testimony.

4. In preparing this Declaration, I reviewed and considered the specification, claims, and file history of U.S. Patent No. 9,154,356 ("'356 patent") (Ex. 1301). I have been informed the '356 patent has a priority date of August 21,

2012. I have also reviewed and considered the documents cited by Dr. Foty in his declaration (Ex. 2024). Additionally, I have reviewed the related Reply, which I understand Intel will file at the United States Patent and Trademark Office (USPTO) at the same time as this Declaration is filed at the USPTO.

5. I have also reviewed all of the documents I cite in this declaration.

II. QUALIFICATIONS

6. I describe my qualifications in my first Declaration. Ex. 1302, ¶¶2-9.

III. RELEVANT LAW

7. In my first Declaration, I set forth the applicable principles of patent law that were provided to me by counsel. Ex. 1302, ¶¶15-30. As appropriate, I have continued to apply those principles in providing my opinions in this Declaration. In addition, I understand that the following legal principles apply, as explained to me by Intel's legal counsel.

8. I am not an attorney. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to my opinions. My understanding of the law is as follows.

9. I have been informed and understand that the Petitioner in an *inter partes* review Petition may request cancellation of claims as unpatentable only on grounds that such claims are anticipated or would have been obvious to a person of ordinary skill in the art at the time of the purported invention, and only on the basis

of prior art consisting of patents or printed publications. A petitioner need only establish unpatentability of challenged claims by a preponderance of the evidence—i.e., that the claims are more likely than not unpatentable. My opinions in this matter address the invalidity of the challenged claims as anticipated and obvious.

10. I have been informed and understand that an applicant for a patent can disclaim or disavow claim scope via statements made during prosecution without an express amendment, but only if such statements of disavowal or disclaimer are clear, unmistakable, unambiguous, and unequivocal.

11. I have been informed and understand that a prior art reference is considered analogous art to the challenged patent for purposes of determining obviousness if it is from the same field of endeavor, regardless of the problem addressed, or if the reference is reasonably pertinent to the particular problem with which the inventor of the challenged patent was involved.

IV. LEVEL OF ORDINARY SKILL IN THE ART

12. As stated in my original declaration (Ex. 1302), a person of ordinary skill in the art ("POSITA") at the time of the alleged invention would have had at least an M.S. degree in electrical engineering (or equivalent experience) and would have had at least two years of experience with the structure and operation of RF transceivers and related structures (or the equivalent).

13. Patent Owner's expert, Dr. Foty, does not dispute this statement of the level of ordinary skill of a POSITA. Ex. 2024, ¶78.

V. REBUTTAL TO PATENT OWNER'S RESPONSE AND DR. FOTY'S OPINIONS

A. Patent Owner's Proposed Claim Construction is Incorrect and Overly Narrow

1. "Carrier Aggregation" Construed in Accordance With its Broadest Reasonable Interpretation

14. The broadest reasonable interpretation of "carrier aggregation" is "simultaneous operation on multiple carriers." This construction comes directly from the specification, which defines the term. See Ex. 1301, 1:32-33 ("A wireless device may support carrier aggregation, which is simultaneous operation on multiple carriers."); *id.*, 2:53-54 ("Wireless device 110 may support carrier aggregation, which is operation on multiple carriers."); *id.*, 2:54-55 ("Carrier aggregation may also be referred to as multi-carrier operation."). Given the clear guidance in the specification, "carrier aggregation" should be construed as "simultaneous operation on multiple carriers" under the broadest reasonable interpretation ("BRI") claim construction standard. This meaning is consistent with the understanding of the term by a POSITA.

15. For this IPR proceeding, it is my understanding that the BRI claim construction standard applies. Paper 9, Decision on Institution ("DOI"), 12.

2. Patent Owner's Proposed Construction of "Carrier Aggregation" is Narrower than the Broadest Reasonable Interpretation of that Term in Light of the Specification

16. Despite the '356 patent expressly defining "carrier aggregation" as "simultaneous operation on multiple carriers" and discussing "Bluetooth," WiFi (*e.g.*, "802.11"), and "LTE" devices (among others) that support carrier aggregation, Patent Owner's proposed construction appears to be based on one subset of those technologies, LTE. Patent Owner's proposed construction of carrier aggregation is narrower than any disclosure in the '356 specification.

17. Patent Owner proposes a tripartite construction for carrier aggregation as "[1] simultaneous operation on multiple carriers [2] that are combined as a single virtual channel [3] to provide higher bandwidth." The second and third parts of this proposed construction lack support in the '356 patent specification.

3. The Intrinsic Evidence Does Not Support Patent Owner's Construction

18. Patent Owner's citation of the '356 patent specification in the Petition does not support the narrowness of its proposed construction. For example, Patent Owner cites column 2, lines 63-67 of the '356 patent in support of "combined higher bandwidth channel for communications," and the addition of LTE-Advanced carrier aggregation "[t]o relieve this [data] rate-limiting step." POR, 12-14. However, the '356 patent includes no discussion of these concepts; the quoted section merely recites the maximum carrier bandwidth in LTE, and indicates the

number of bands defined in LTE and how they can be configured. No mention of combined bandwidth or data rate is provided. Ex. 1301. In fact, parts [2] and [3] of Patent Owner's proposed construction lack any written description support in the '356 patent. The LTE carrier aggregation described at column 2, lines 63-67 is just one example of carrier aggregation in the patent.

19. The applicant of the '356 patent chose very broad language to describe the types of transmissions and communications equipment encompassed by the invention. For example, the written description broadly states that a "carrier" "may refer to a range of frequencies used for communication…A carrier may also be referred to as a component carrier (CC), frequency channel, a cell, etc.," expressly broadening the meaning of "carrier" beyond the "component carrier" example given in the written description. This "component carrier" example from among the list of examples in the '356 specification is now the only example upon which the Patent Owner appears to rely. Ex. 1301, 1:33-38. Ex. 1340, 50:14-51:9. A "frequency channel" or "cell" are far broader than the definition of "carrier" that the Patent Owner currently seeks to embed within its definition of "carrier aggregation," which is effectively a "component carrier" as that term is used in the context of LTE. *Id.* Likewise, the '356 patent states that "[w]ireless device 110 may be a cellular phone, a smartphone, a tablet, a wireless modem, a personal digital assistant (PDA), a handheld device, a laptop computer, a

smartbook, a netbook, a cordless phone, a wireless local loop (WLL) station, a Bluetooth device, etc. Wireless device 110 may be capable of communicating with wireless system 120. Wireless device 110 may also be capable of receiving signals from broadcast stations (e.g., a broadcast station 134), signals from satellites (e.g., a satellite 150) in one or more global navigation satellite systems (GNSS)." Ex. 1301, 2:40-50. Thus, the applicant signaled that the invention would cover devices other than those that implement LTE. The patent further states that "[w]ireless device 110 may support one or more radio technologies for wireless communication such as LTE, cdma2000, WCDMA, GSM, 802.11, etc." *Id.*, 2:50-53. By broadly encompassing all of these devices, device types, and wireless technologies, the '356 patent's written description expressly broadens the scope of the alleged invention to encompass virtually any wireless device or radio technology. Patent Owner's current proposed narrow construction is inconsistent with the broadening approach taken by the applicant in the written description.

20. Patent Owner's expert, Dr. Foty, stated that parts two and three of Patent Owner's proposed tripartite claim construction do not find support in the '356 patent's written description. His deposition testimony includes explanations that, while "simultaneous operation on multiple carriers" came from the '356 patent written description, Ex. 1340, 69:12-19, the [2] "that are combined as a single virtual channel" and [3] "to provide higher bandwidth" portions of the

proposed claim construction come only from prior art that was cited in the prosecution history. *Id.*, 70:12-71:18; 72:14-74:7. Dr. Foty alleges that WO 2012/008705 (Ex. 2016), GB2472978 (Ex. 2017), and U.S. Pat. No. 8,442,473 (Ex. 1325) are intrinsic evidence that support this portion of the construction. *Id*.

21. However, based upon my review and search, the phrases "combined as a single virtual channel" or "provide higher bandwidth" do not appear in any of the three references relied upon by Dr. Foty. A POSITA would not consider Patent Owner's arguments about these references to limit the BRI of the term "carrier aggregation" given the clear definition of that term in the '356 written description. Indeed, while the three references may mention concepts similar to those proposed for parts [2] and [3] of the Patent Owner's proposed construction, the references' various descriptions of instances of carrier aggregation are all encompassed by the BRI of that term: simultaneous operation on multiple carriers. Further, based on my review of the '356 patent's file history, none of the evidence on which Patent Owner now relies for parts 2 and 3 of its proposed claim construction was discussed during prosecution of the '356 patent. Kaukovuori (Ex. 1325) was cited during prosecution on December 26, 2014, but the prosecution file wrapper does not include the quote reproduced at page 15 of the POR; the Examiner referenced a different passage in the office action. Ex. 1318, 7. Furthermore, my review of the prosecution history indicates that by rejecting the claims based on the Kaukovuori

reference disclosing one specific type of carrier aggregation, a POSITA would not have understood the Examiner to be limiting the Examiner's interpretation of carrier aggregation based on the Kaukovuori reference. For the other two references which Dr. Foty identifies as intrinsic, I note that these are two references selected from among approximately 350 references cited either by the Examiner or in information disclosure statements, and that Dr. Foty reproduces in his declaration (Ex. 2024) quotes from these references that were not part of the prosecution file wrapper. Ex. 2024, ¶¶89-92.

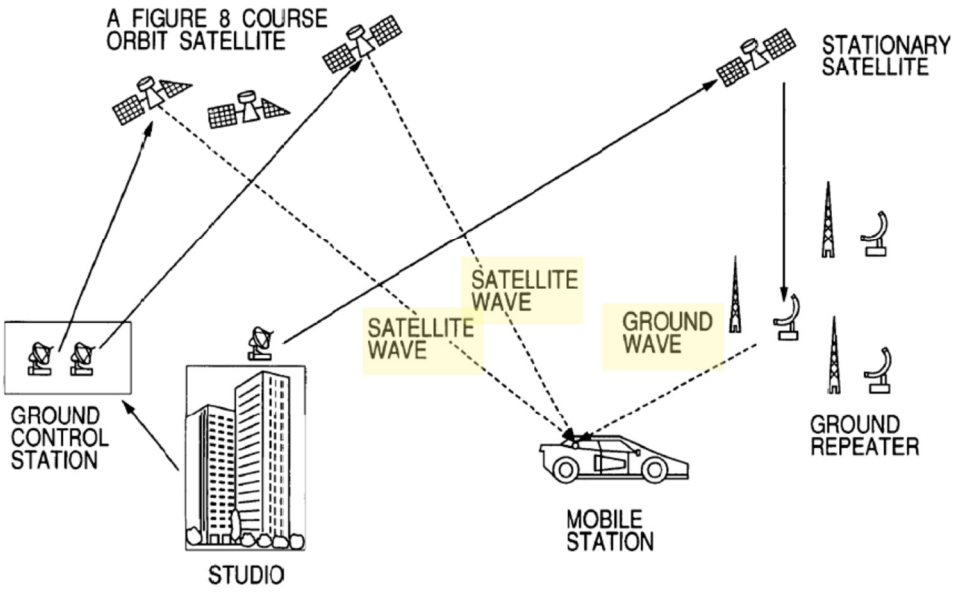
4. Prosecution Disclaimer Does Not Limit the Broadest Reasonable Interpretation Here

22. In its POR, Patent Owner also seeks to invoke the doctrine of prosecution history disclaimer. POR, 24-27. However, Patent Owner's expert, Dr. Foty, stated with respect to carrier aggregation: "I don't think there's a disavowal of that or a disclaimer." Ex. 1340, 32:2-15. Reviewing the prosecution history of the '356 patent, I agree that there was no disavowal or disclaimer of claim scope with respect to "carrier aggregation."

23. During prosecution of the '356 patent, the Examiner rejected the claims based on anticipation by U.S. Patent No. 7,317,894 ("Hirose") (Ex. 1324). Ex. 1314, 2-4. Hirose taught a receiver used for frequency, space, and time diversity having two amplifiers that receive a common input and provide separate outputs to process "the same signals [sent] over different paths." Ex. 1315, 7. In

Hirose, three different carriers (e.g., both "satellite wave" carriers and the "ground wave" carrier illustrated in Hirose Figure 1, annotated below) containing the same data are received simultaneously and synthesized to obtain a single stream of data, as shown in annotated Figure 1 of Hirose, below. *Id.*

FIG. 1



24. Patent Owner responded to the Examiner's rejection by amending its claims to require an input RF signal "employing carrier aggregation." *Id.*, 2-6. Patent Owner argued that Hirose does not disclose carrier aggregation because it describes receiving "redundant data" over multiple carriers, which Patent Owner contended does not result in an "increased aggregated data rate." *Id.*, 7-8. Thus, when Patent Owner added "the input RF signal employing carrier aggregation" to distinguish the Hirose reference, Patent Owner's point of distinction was that

Hirose did not employ "carrier aggregation" because it disclosed redundant data transmissions. *Id.* Patent Owner did not argue that "carrier aggregation" required anything more than non-redundant data transmissions. *See id.*

25. Patent Owner disputes Petitioner's statement that "Patent Owner did not argue during prosecution that carrier aggregation required anything more than non-redundant transmissions." POR, 15 (quoting Pet., 30). As support for its position, Patent Owner points to the same file history quote provided in the Petition, with an emphasis on Patent Owner's argument that "'carrier aggregation' requires an 'increased aggregated data rate.'" *Id.* A POSITA would understand those words to not amount to a clear and unmistakable disclaimer as I understand to be required for prosecution history disclaimer. The "increased aggregated" here refers to "data rate." Hirose's transmission of the "same signals over different paths" does not increase aggregated data rate because it "results in ***redundant*** data at a ***common*** data rate." Ex. 1315, 7 (bold, italics in original). If Hirose's simultaneous signals contained non-redundant (*i.e.*, different) data, Patent Owner could not have made the argument that it did, and therefore a POSITA reviewing the prosecution history would understand that the applicant was distinguishing Hirose on the basis of its redundant transmissions. My initial declaration explains this. Ex. 1302, ¶83 ("Patent Owner distinguished the prior art reference Hirose (EX1324-Hirose) on the grounds that it described sending redundant data over

three different carriers and therefore did not lead to an "increased aggregated data rate."). At a minimum, a POSITA would understand that the competing interpretations of the prosecution history set forth in the Petition and in the POR demonstrate that any disclaimer was not "clear and unmistakable."

5. A POSITA Would Not Find Patent Owner's Citation to Extrinsic Evidence Helpful in Understanding How the '356 Patent Defines "Carrier Aggregation"

26. In a case such as this one where the intrinsic evidence so clearly supports the definition that Patent Owner included in its specification, a POSITA would assign this extrinsic evidence little or no relevance. Furthermore, 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 also not prior art to the '356 patent. *See* Exs. 2018 (earliest filing 2013); 2019 (Sep. 2013); 2022 (2014). A POSITA would not accord these extrinsic sources significant weight and, in any event, these extrinsic sources are not inconsistent with Petitioner's proposed construction of "carrier aggregation," which is broad enough to encompass each of the differing examples of carrier aggregation provided in Patent Owner's extrinsic evidence sources.

6. Petitioner's Proposed BRI Construction Does Not Read Out "Aggregation"

27. Patent Owner argues that Petitioner's BRI construction reads out the word "aggregation." POR, 28. I disagree. When the claimed "input RF signal"

employs "simultaneous operation on multiple carriers," those carriers will be aggregated along the input RF signal. Pet., 46-48; Ex. 1402, ¶80 ("receiving and processing data on multiple carriers at the same time in a single input RF signal"). Thus, "carrier aggregation" in the context of the challenged claims accounts for aggregation (*i.e.*, collected together, assembled, as defined in the POR, at 29), because the multiple carriers would be present simultaneously in the input RF signal.

28. Specifically, because the '356 patent describes "carrier aggregation" as encompassing wireless devices that support "one or more radio technologies for wireless communication such as LTE, cdma2000, WCDMA, GSM, 802.11, etc.," when two or more carriers in a carrier aggregated signal are received according to "one or more" of these technologies, those carriers are all aggregated in the input RF signal (e.g. "RFin" in FIG. 6A) that enters the amplifier.

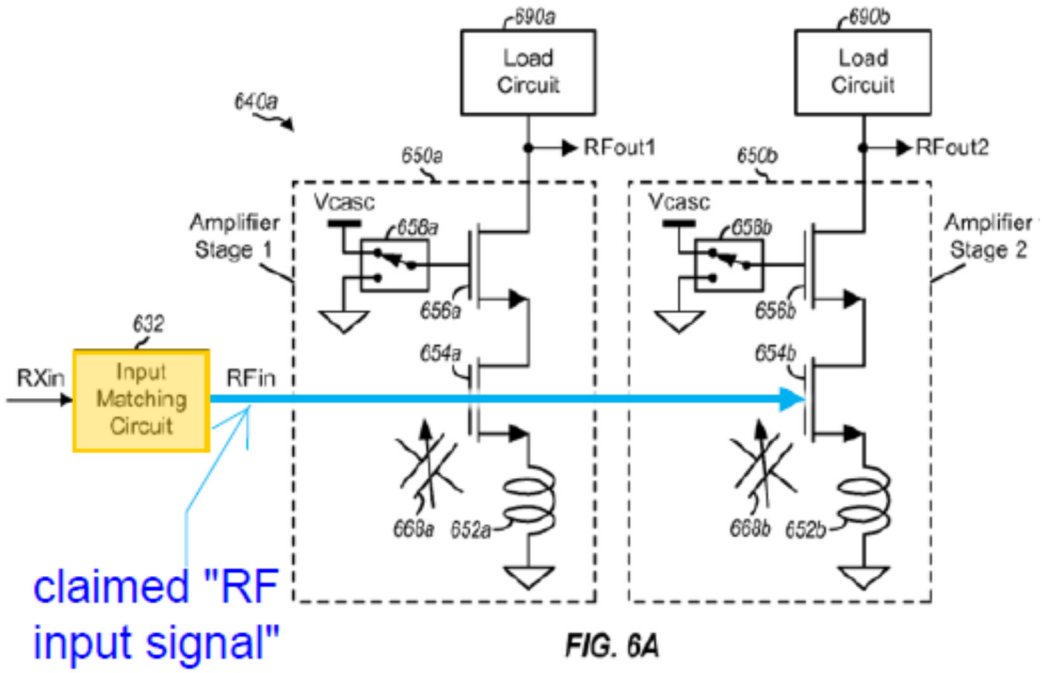


FIG. 6A

'356 patent

29. This RFin is one wire, one input, and whether two carriers received are two LTE carriers, or two WiFi carriers, or one Bluetooth and one WiFi carrier, the input RF signal RFin will be a signal that includes all of these carriers. The only difference would be the numerical values of the frequencies of these carriers that are present simultaneously on the input. Thus, any two or more carriers received simultaneously are aggregated at RFin, which is the claimed "input RF signal." The '356 patent challenged claims relate to "***receiv[ing]*** an input radio frequency (RF) signal" or "***amplifying*** a first input radio frequency (RF) signal." Ex. 1301, Claims 1, 17. To the extent Patent Owner's arguments about "aggregation" suggest a singular transmission node or a single logical transmission

channel, these narrow interpretations are inconsistent with the '356 patent, and are not supported by any presented evidence.

B. Ground I: Anticipation by Lee

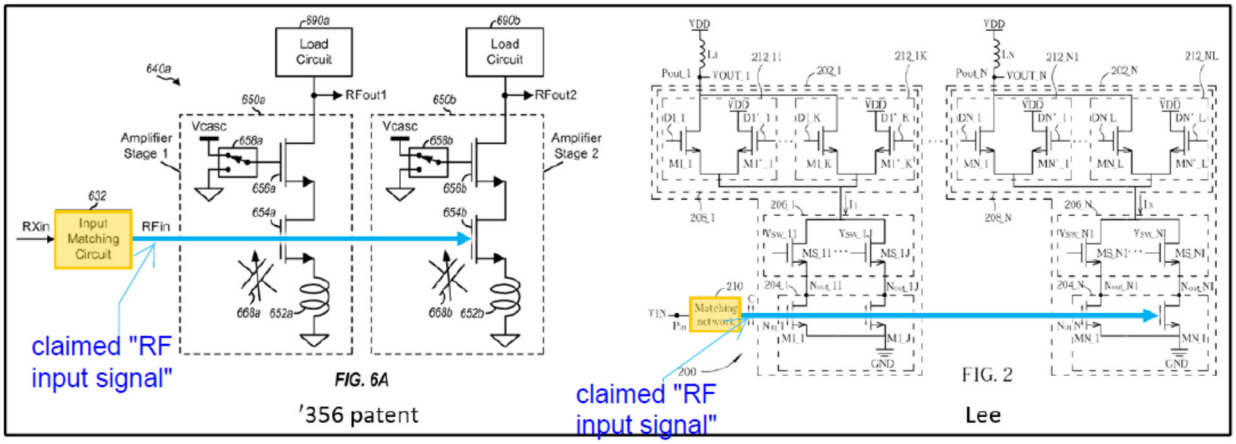
1. Applying the Correct Claim Construction, Lee Anticipates Claims 1, 7, 8, 11, 17, and 18

30. With respect to anticipation grounds for the Lee reference (Ex. 1335), Patent Owner's only argument in favor of patentability for claims 1, 11, 17, and 18 appears to be that Lee does not disclose the "input RF signal employing carrier aggregation" under Patent Owner's proposed construction. POR, 32-34. I do not agree with Patent Owner.

31. Lee discloses that its input RF signal (VIN) employs carrier aggregation (*e.g.*, simultaneous operation on multiple carriers (*e.g.*, WiFi and Bluetooth)). Patent Owner's expert agreed that the Bluetooth and WiFi signals in Lee are separate signals that can be received simultaneously. Ex. 1337, 2205:12-22; Ex. 1340, 7:17-18:5.

32. Lee also teaches that the two carriers, *e.g.* Bluetooth and WiFi, are aggregated at VIN just as the carriers in the '356 patent are aggregated at the input radio (RF) signal RFin. Pet., 47-48. As also explained above, when a Bluetooth carrier is received simultaneously with a WiFi carrier in Lee, those carriers are aggregated at VIN – 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, *i.e.*, collected together, assembled at VIN. *See* POR, 29 ("Aggregate means 'to collect together, assemble.'").



33. While Patent Owner's expert refers to them as "separate signals," Bluetooth and WiFi carriers would be present simultaneously at VIN in the same manner as two LTE carriers would be present simultaneously at VIN, the only difference being the numerical values of their carrier frequencies. This is true regardless of whether or not the two carriers originate from a common source, or whether or not they are logically related to one another in (*e.g.*, at the baseband level). The two carriers do not somehow travel down separate sides of the wire or avoid one another along VIN. Calling 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.

34. The Patent Owner's Response does not identify any arguments in favor of patentability for claims 1, 7, 8, 11, 17, or 18 under Petitioner's proposed construction. POR, 32-34. For the reasons identified in the Petition and in my original declaration, claims 1, 7, 8, 11, 17, or 18 are thus anticipated by Lee.

35. If the Board were to construe carrier aggregation to require "non-redundant data" or its logically equivalent synonym "increased aggregated data rate" (though neither party proposes this construction), Lee also teaches this. Ex. 1302, ¶¶83-84. Lee uses multiple carriers to send different data, not redundant data. *Id*. Patent Owner's expert admits that typically, the two "radio streams" in Lee are not redundant. Ex. 1337, 2213:22-2214:1; Ex. 1340, 7:17-18:5. The Patent Owner's Response does not identify any additional arguments for patentability of claims 11, 17, or 18. Thus, Patent Owner has failed to rebut Petitioner's showing that Lee teaches "input RF signal employing carrier aggregation."

2. Patent Owner's Additional Argument with Respect to Claim 7

36. Claims 7 and 8 are anticipated by Lee. Ex. 1302, ¶¶91-104. In addition to advancing the same argument about the "input RF signal employing carrier aggregation" made for claims 1, 11, 17, and 18, which is incorrect for the reasons set forth above, Patent Owner's Response makes additional arguments distinguishing claim 7 on the anticipation grounds. POR, 35-38. However, these

arguments are incorrect, and fail to rebut Petitioner's showing of anticipation based on Lee.

37. Patent Owner's additional arguments distinguishing claim 7 from the Lee anticipation ground argue that Lee "does not disclose circuit 400 operating in both ['shared' and 'combo'] modes in a single embodiment." POR, 35. Patent Owner further relies on language in Lee paragraph [0036] about a capability to enable output stages 304_1-304_N in a "time-division manner" in shared mode. POR, 35-36. However, Lee does disclose circuit 400 operating in both a combo mode and a shared mode; hence, the disclosure of Lee with respect to Figure 4 fully supports Petitioner's grounds for anticipation of claims 7 and 8, and the Patent Owner's Response fails to rebut these anticipation grounds for several reasons. Ex. 1302, ¶¶91-104.

38. A POSITA would understand that the circuit 400 of Lee operates in combo mode, in addition to shared mode. Ex. 1335, ¶41 ("In an alternative design, the signal amplification circuit 400 shown in FIG. 4 may operate under a combo mode"), ¶38 (describing exemplary operation "under the shared mode"), ¶¶42, 33; Ex. 1302, ¶92. A POSITA would understand that operation in the shared mode described in paragraph [0038] and elsewhere in Lee would apply in "the alternative design" of Lee paragraph [0041], and that the Petition does not "mix[] different embodiments" for its anticipation grounds; the shared and combo modes are

supported by the same Fig. 4 embodiment. Nothing in paragraphs [0036] or [0037] of Lee (which from context is directed to circuits 100, 300, and Fig. 3) is inconsistent with Petitioner's anticipation grounds for claims 7 and 8, and thus the POR does not rebut Petitioner's showing of anticipation.

C. Ground II: Obviousness of Claims 7 and 8 Based on Lee

39. Patent Owner first argues against the obviousness of claims 7 and 8 based on "the input RF signal employing carrier aggregation." POR, 38. This is incorrect for the reasons set forth above. Patent Owner's only other argument against the obviousness of claims 7 and 8 is the allegation that Petitioner "fails to sufficiently articulate" / "fails to sufficiently explain" and has "conclusory assertions [that] lack sufficient support" for its stated reasons to combine the teachings of Lee FIG. 2 with Lee FIG. 4. POR, 38-39. I note that the Board disagreed for purposes of its Decision on Institution: "[w]e also are persuaded that Petitioner's proffered reasoning for modifying the signal amplification circuit of Figure 2 of Lee to include the feedback elements of Figure 4 of Lee, namely, to improve input matching performance, is sufficient to support the legal conclusion of obviousness." DOI, 29.

40. The Patent Owner's Response does not state anywhere that Petitioner's reasons to combine for the obviousness of claims 7 or 8 are incorrect, or that Patent Owner disagrees with them. *See* POR, 38-39. Claims 7 and 8 are

obvious over Lee for the reasons set forth in the Petition and my prior declaration. Pet., 68-72; Ex. 1302, ¶¶123-131.

D. Ground III: Claims 1, 7, 8, 11, 17, and 18 are Obvious over Lee in View of Feasibility Study

41. Patent Owner's Response does not identify any claim elements missing from the combination of Lee and Feasibility Study for claims 1, 7, 8, 11, 17, and 18, but appears to attack Petitioner's reasons to combine the references. POR, 40-47. The Patent Owner's expert did not dispute that the Feasibility Study discloses carrier aggregation, even under the Patent Owner's proposed construction. *See* Ex. 1340, 75:20-76:6; Ex. 1340, 7:17-18:5. Patent Owner argues that the Feasibility Study does not disclose an amplifier circuit, but the Feasibility Study is not relied upon for such a teaching in the obviousness combination, and in any case the Feasibility Study does disclose amplifiers. POR, 40; Pet., 72-75.

1. The Feasibility Study is Analogous Art

42. Patent Owner argues that Petitioner has not shown that the Feasibility Study is analogous art. POR, 41. I disagree.

43. A POSITA would recognize that Lee and the Feasibility Study are highly analogous art to the '356 patent. In addition to all of the content within the Lee reference itself that demonstrates that it falls within the same field of endeavor of the '356 patent, I note that Lee was considered so materially related to the '356

patent disclosure by an independent, international search authority that the search authority designated "Lee as an 'X' reference, meaning that Lee is '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.'" DOI, 15 (quoting Ex. 2005, 3). In addition to all of the content within the Feasibility Study reference itself that demonstrates that it falls within the same field of endeavor of the '356 patent (including its broad "Keywords" of "LTE, Radio," Ex. 1304, 2, 7, *see also*, Ex. 1340, 77:9-12), the Feasibility Study was considered so materially related to the '356 patent disclosure that Patent Owner itself relies upon it as extrinsic evidence in support of its proposed "carrier aggregation" construction in the same Patent Owner Response where it attempts to argue that the Feasibility Study is non-analogous art. POR, 19, 41.

2. The Petition Establishes the Reasons to Combine Lee and the Feasibility Study

44. As set forth in the Petition, Pet. 73-75, and in my prior declaration, Ex. 1302, ¶¶133-138, a POSITA 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 and would have been motivated to combine those references. The Feasibility Study recognizes that wireless mobile devices can be configured to operate with input RF signals employing carrier aggregation. *See* Ex. 1304, 9 ("It is possible to configure a UE [user equipment] to aggregate a

different number of component carriers originating from the same eNB [base station] and of possibly different bandwidths in the UL [uplink] and the DL [downlink].”). The Feasibility Study further suggests that an ideal receiver for noncontiguous intra-band and inter-band carrier aggregation[1] would have multiple RF front-ends. *See id*., 26 (describing “Option B” with “multiple” Rx architecture for non-contiguous carrier aggregation). The Feasibility Study characterizes an “RF front end” as having its own gain control (amplifier), mixer, and analog-to-digital conversion. *See id.* (“RF front end (i.e., mixer, AGC [Automatic Gain Control], ADC [Analog to Digital Conversion)”). Lee teaches multiple amplifier blocks providing output to different receivers. *See* Ex. 1335, ¶29. Lee thus teaches the exact type of receiver that the Feasibility Study recognizes would work with signals employing carrier aggregation. The motivation to combine Lee with the teachings of the Feasibility Study arises from the references themselves and requires nothing more than substitution of the “plurality of radio frequency signals” of Lee for the “Carrier Aggregation” signals described in the Feasibility Study. Ex. 1302, ¶134.

45. A POSITA would have been motivated to use the carrier aggregated input RF signal of the Feasibility Study with the amplification blocks of Lee. The

[1] *See* Ex. 1302, ¶41.

Feasibility Study teaches that carrier aggregation (as described in that reference) may provide benefits, such as wider transmission bandwidths and spectrum aggregation. *See* Ex. 1304, 8. The Feasibility Study further teaches that carrier aggregation is supported by LTE-Advanced. *Id*. A POSITA 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. Ex. 1302, ¶135.

46. A POSITA 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. The Feasibility Study teaches that a receiver front-end with multiple processing paths can successfully support carrier aggregation. Ex. 1304, 26. The circuitry of Lee is capable of receiving and processing the types of signals described in 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. Ex. 1302, ¶136.

47. On page 42 of its Patent Owner Response, Patent Owner identifies reasons to not combine Lee and Feasibility Study. POR, 42. However, a POSITA would not have considered these arguments problematic for combining the two references. Patent Owner's arguments include "different kinds of radio

connections" vs. "same type of radio connections," as well as "Bluetooth and Wifi" vs. "LTE cellular communications." *Id.* Even applying Patent Owner's proposed construction of "carrier aggregation," however, there is no language in the '356 patent's claims upon which a POSITA would recognize these distinctions – the challenged claims encompass both different kinds of radio connections as well as the same type of radio connections. The POR also argues that the Feasibility Study would not be combined with Lee because Feasibility Study does not "disclose an amplifier circuit." POR, 42. However, the reasons to combine Feasibility Study with Lee identified in my prior declaration do not rely upon the presence of an amplifier circuit in Feasibility Study, but rather simply apply the input RF *signal* of Feasibility Study to the amplifier stages of Lee. *See* Ex. 1302, ¶¶133-138. Furthermore, Feasibility Study does disclose an amplifier circuit in the form of automatic gain control. *See* Ex. 1304, 26 ("RF front end (i.e., mixer, AGC [***Automatic Gain Control***], ADC [Analog to Digital Conversion)").

48. Patent Owner further argues that portions of Feasibility Study quoted by Petitioner state a problem rather than provide a motivation. POR, 42-43. This is not correct; these statements in Feasibility Study describe the various types of RF front ends that work with the LTE carrier aggregated signal disclosed in Feasibility Study – the "separate RF front end[s] are necessary" quote is given with

respect to "non adjacent Inter band" support, and other RF front ends accommodating carrier aggregation are described. Ex. 1304, 26.

49. Patent Owner further argues that Petitioner's "unlock the features of LTE-Advanced" reason to combine "bears no relation to any specific combination of prior art elements." POR, 43. This is also incorrect – the only prior art element from Feasibility Study in the proposed combination is the input RF signal disclosed in Feasibility Study, which is an LTE carrier aggregated signal. Ex. 1302, ¶¶133-138. Receiving the LTE carrier aggregated signal of Feasibility Study with the simultaneous multi-carrier RF amplifier stages of Lee would in fact unlock the features of LTE-Advanced. *Id.* 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. *Id.*, ¶136. This is all explained in the Petition and my prior declaration. Pet., 72-72; Ex. 1302, ¶¶133-138.

3. Patent Owner's Additional Arguments

50. Patent Owner further argues that Lee and Feasibility Study are "too far afield from the technology addressed by the '356 Patent," and thus would not have been "selected … from the sea of prior art." POR, 44. However, as explained, above, this is incorrect. Lee placed at the top of an international

searcher's list based on its strong similarity and relevance to the technology of the '356 patent. DOI, 15. And, as acknowledged by Patent Owner's expert, Feasibility Study includes "Keywords" of "LTE, Radio" which was "done for purposes of providing terms to make the document findable under searches." Ex. 1340, 77:10-11. Finally, Patent Owner's arguments about Feasibility Study are inconsistent with its use of Feasibility Study as extrinsic evidence for the meaning of carrier aggregation. POR, 19.

VI. AVAILABILITY FOR CROSS-EXAMINATION

51. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

VII. RIGHT TO SUPPLEMENT

52. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

VIII. JURAT

53. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: November 27, 2019

Patrick Fay