

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., AND SAMSUNG ELECTRONICS
AMERICA, INC.,
Petitioner

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner

Case IPR2023-00599
Patent No. 10,912,081

PETITIONER'S REPLY

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I. Introduction

Apex's Patent Owner's Response (Paper 12, "POR") repeats many of its Preliminary Patent Owner Response arguments, which were rejected by the Board at Institution, except it now tries to advance these arguments with unsupported and meritless claim constructions. Not only are Apex's claim constructions erroneous, they are irrelevant to the outcome.

Apex also improperly attacks *Chen* and *Lee* in Ground 2 individually, rather than addressing the proposed combination.

Finally, the testimony of Apex's expert, Mr. Gomez, should be given no weight because he does not qualify as a POSITA.

For the reasons below, the Board should reject Apex's claim constructions and arguments, and find all challenged claims unpatentable.

II. Apex's Constructions are Incorrect and Irrelevant to the Outcome

The Board should reject Apex's constructions because they lack support and merit.¹ But, even if the Board were to accept Apex's constructions, they would not affect the outcome because *Lee* (Ground 1) still discloses and *Chen* in view of *Lee*

¹ Despite Samsung's Petition being filed long before the related district court proceeding's claim construction phase, Apex never raised either construction in district court. *See* Ex. 1023.

(Ground 2) still renders obvious the claims under Apex's constructions, as discussed below.

A. Apex's "Radio Signal" Construction Lacks Support and Merit

Apex proposes construing "radio signal" as a "signal that transmits particular radio information," allegedly because "Petitioner improperly construed both 'the first radio signal' and 'the second radio signal' to be capable of each comprising two separate radio signals with different content and transmitted at different times." POR 13-17. But this is incorrect, and Apex's construction is flawed for several reasons.

1. Apex fails to provide a legitimate basis for construing "radio signal"

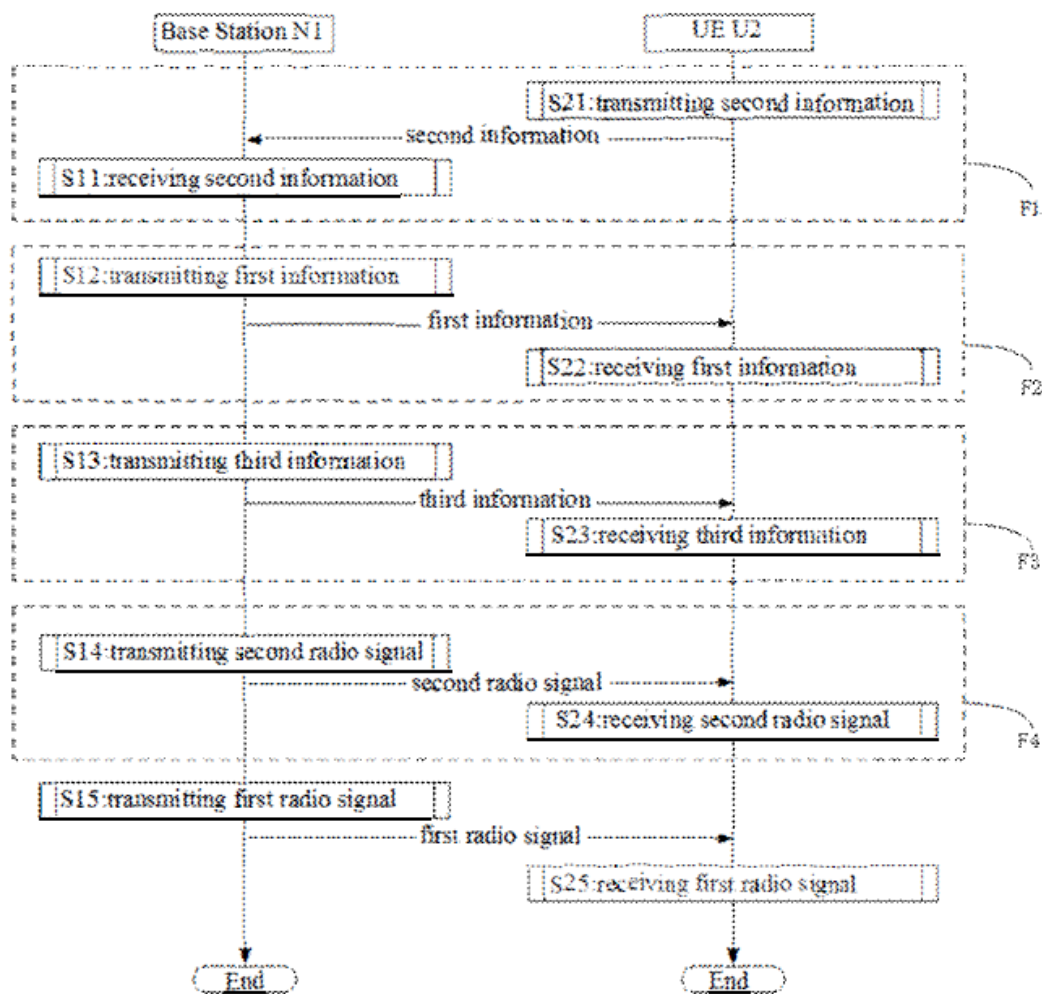
Contrary to Apex's assertion, the Petition never offered a construction for "radio signal." Petition 10-11. Instead, the Petition simply points to non-limiting examples from the specification that are within the scope of the term "radio signal" to show that the '081 patent does not preclude the "second radio signal" or "first radio signal" from having multiple portions. *Id.*, 15-19 (citing '081 patent, 2:19-23, 3:59-4:2, 9:35-37, 17:58-60, 18:3-4, 18:10-22, 21:11-12, FIG. 7; Kakaes, ¶¶82-87). Apex's alleged basis for construing this limitation therefore misses the mark.

2. Apex's construction contradicts the '081 patent

There is no support for construing a “radio signal” to mean a signal that transmits “particular radio information.” The only valid reasons for deviating from the plain meaning of a term are lexicography or clear disavowal or disclaimer.

Thorner v. Sony Comput. Ent. Am. LLC, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citations omitted). Apex has failed to show either is present here.

Instead, Apex generally cites to non-limiting examples in the specification and other extrinsic evidence that allegedly support its construction, but it ignores other parts of the '081 patent that contradict its construction. For example, Apex cites to FIG. 5 of the '081 patent and alleges that it “discloses five *different* signals.” POR 14-15 (emphasis in original). But this is contrary to the '081 patent. As illustrated below, FIG. 5 only depicts two “signals”: a “first radio signal” and a “second radio signal.”



'081 patent, FIG. 5.

Although Apex's expert admitted during cross that FIG. 5 only shows "two radio signals," Ex. 1024, 16:15-17, at Apex's counsel's suggestion, he said during redirect that the first, second, and third information were "information signal[s]," Ex. 1024, 31:12-32:6, despite that term never appearing in the '081 patent. But nothing in the '081 patent supports interpreting the figure in this way.

To the contrary, the '081 patent discloses an embodiment where “the third information is carried in the second radio signal.” '081 patent, 6:41-42. Likewise, the '081 patent discloses embodiments where the “second radio signal” and the “third information” are both “DCI” and transmitted on the “PDCCH.” *Id.*, 3:59, 4:1-2, 6:38-40, 18:19-22. Because the '081 patent allows for the third information and the second radio signal to be sent together, they are not necessarily “different signals,” as Apex argues. Similarly, nothing in the '081 patent precludes, for example, the “first information” from being sent with the third information and/or the second radio signal. Apex’s interpretation of FIG. 5 therefore cannot be reconciled with the rest of the '081 patent.

Apex relies on its flawed interpretation of FIG. 5 to argue that “[a] person of ordinary skill would understand that each of the five signals correspond to different pieces of particular information and that the '081 Patent describes the information or content is particular to each signal.” POR 15-17. But, as discussed above, the '081 patent allows for multiple pieces of information to be transmitted in a single radio signal. '081 patent, 2:66-67, 3:59, 4:1-2, 6:38-42, 18:19-22. Apex’s expert himself admitted that “particular radio information” can include multiple pieces of information. Ex. 1024, 12:23-25, 15:23-16:1 (admitting that DCI, which includes “resource information and modulation information,” can be particular radio information), 17:2-5 (admitting that FIG. 7 of the '081 patent shows the “first

radio signal” with multiple consecutive symbols in the time domain). Therefore, a POSITA would not have understood a radio signal to be limited to a particular piece of information.

Apex also relies on Petitioner’s expert Dr. Kakaes’ testimony that two PDSCH signals sent *five hours* apart may be different signals (POR 17), but this testimony does not lend any support to Apex’s construction. It has nothing to do with the back-to-back fraction-of-a-second timing in the ’081 patent and the prior art, much less whether a radio signal is limited to a particular piece of information.

Apex also cites to a purported dictionary definition of “control signal” (which is not evidence in this case because it has not been filed as an exhibit as required by Rule 42.63), but that definition defines “control signal” to be “a signal that transmits control information.” POR 17. This purported definition highlights a significant flaw in Apex’s construction. At most, the definition supports defining a “radio signal” to be “a signal that transmits radio information.” It does not, however, support adding the word “particular,” nor does Apex have any support for adding this word to the claims.

3. Apex’s construction is vague

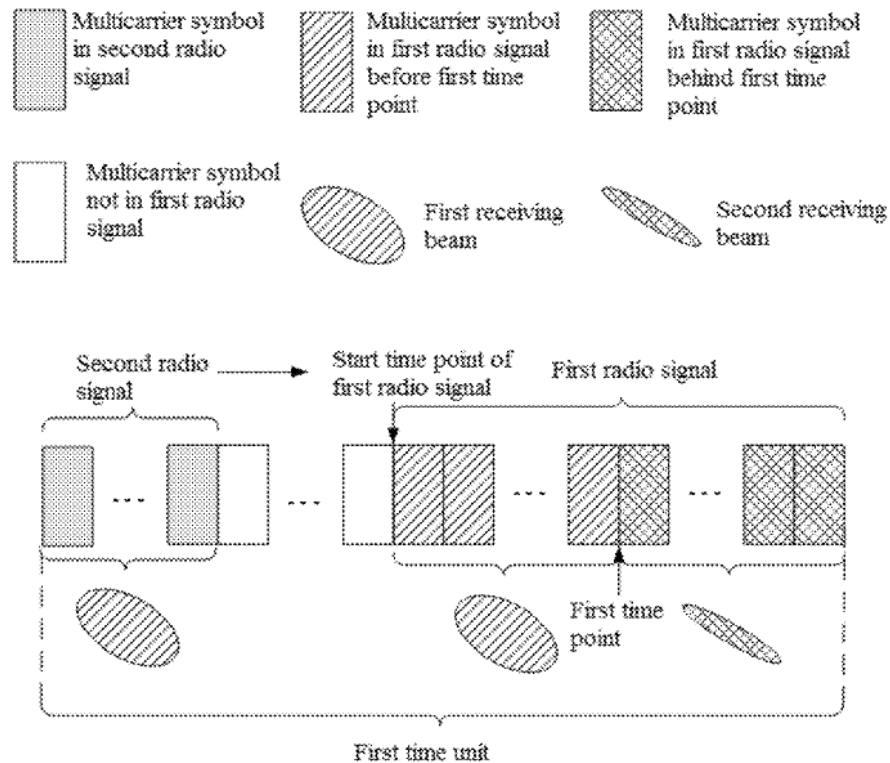
Apex’s construction should also be rejected because neither Apex nor its expert are capable of articulating what it means in a coherent way that can be squared with the disclosure of the ’081 patent. “The purpose of claim construction

is to ‘determine the meaning and scope of the patent claims asserted to be infringed.’” *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co., Ltd.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008) (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc)).

The term “particular” only appears twice in the ’081 patent, but never in the context of radio information. ’081 patent, 1:19, 1:28. Apex and its expert seem to use this term arbitrarily to bend the claims like a nose of wax. *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1351 (Fed. Cir. 2001) (citation omitted) (“A patent may not, like a ‘nose of wax,’ be twisted one way to avoid anticipation and another to find infringement.”). For example, when discussing the prior art, Apex argues that “having different particular information corresponds to different signals.” POR 25, 28. Yet, Apex’s expert concedes that a radio signal can include multiple pieces of information in some situations. Ex. 1024, 12:23-25, 15:23-16:1 (admitting that DCI, which includes “resource information and modulation information,” can be particular radio information), 17:2-5 (admitting that FIG. 7 of the ’081 patent shows the “first radio signal” with multiple consecutive symbols in the time domain).

Also, when discussing the prior art, Apex’s expert reads out embodiments in the ’081 patent. For example, he states that *Lee*’s TB 1201 and TB 1202 contain different particular information because they occupy “different places on the time

frequency resources” and are “using different beams.” Ex. 2004, ¶42. He confirmed this position at his deposition. Ex. 1024, 8:6-17 (testifying that two TBs with “different places on the time frequency resources and using different beams” would “certainly” make them different radio signals). But this interpretation directly contradicts the embodiment in FIG. 7 of the ’081 patent, where the symbols of the “first radio signal” before and behind the first time point occupy different places on the time frequency resources and use different beams, but are still part of the same radio signal.



’081 patent, FIG. 7.

Apex's expert's inconsistent use of the term "particular radio information" illustrates why Apex's construction is vague. When asked at his deposition what he meant by "particular radio information," Apex's expert could not explain it himself.

Q. What do you mean by "particular radio information"?

A. Well, it depends on the content. If the content is changing, the information itself is changing. Then it's a different radio signal.

Q. You'd agree that "particular radio information" can include multiple pieces of radio information, right?

A. Well, then you're redefining the word "information." The -- radio information is a consistent and a one type of one transmission. So it's a signal that transmits a particular radio information. So it would be the content of that radio information.

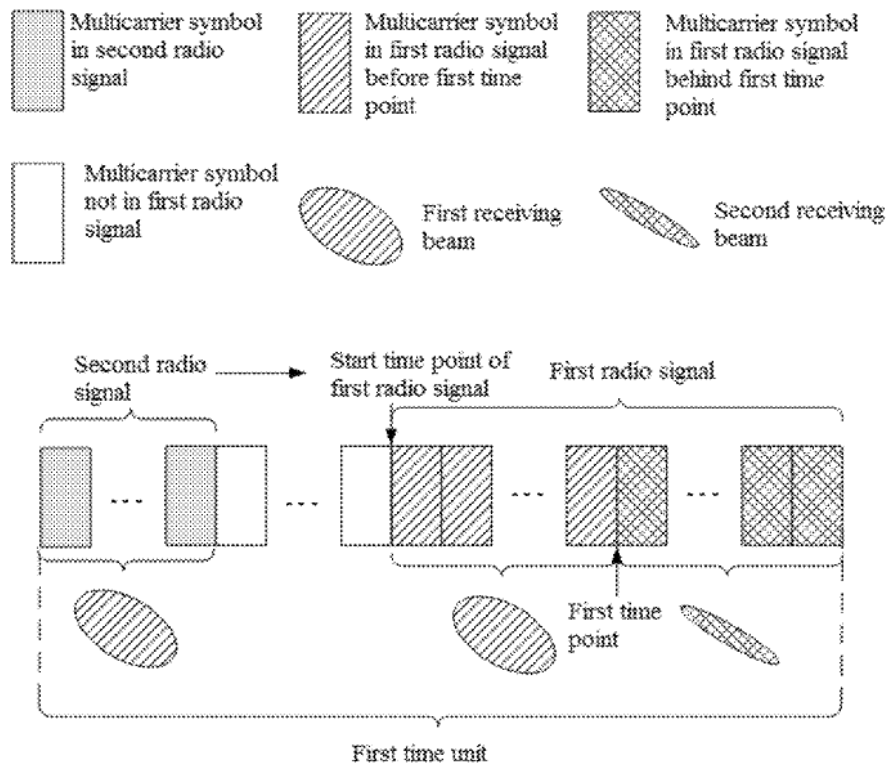
Ex. 1024, 12:7-22.

Apex's construction is clearly meant to create ambiguity and allow Apex to point to something as a radio signal when they want to and dismiss something else as a radio signal when they do not. The Board should reject this improper use of claim construction.

4. The Board should interpret “radio signal” broadly in view of the ’081 patent

As the Board recognized at Institution, the ’081 patent uses the term “signal” broadly, and the claimed second and first signals being “radio” signals connotes the physical layer. Paper 9, 17 (citing ’081 patent, 12:1-4, 12:49-50, FIG. 3). Apex does not address this discussion from the Board in its Patent Owner’s Response.

Further, the Petition cites to examples from the ’081 patent that show the “second radio signal” and the “first radio signal” can have multiple portions. Petition 15-19. For example, FIG. 7 below shows both the “second radio signal” and the “first radio signal” having multiple symbols.



’081 patent, FIG. 7.

The specification also includes broad statements that the “second radio signal” can be “a PDCCH [Physical Downlink Control Channel]” or “a DCI [Downlink Control Information] carrying downlink assignment,” and the “first radio signal” can be “a PDSCH [Physical Downlink Shared Channel],” “consecutive data transmission block in time domain,” or “G consecutive multicarrier symbols in time domain.” ’081 patent, 2:19-23, 3:59-4:2, 18:19-22; *see also* ’081 patent, 9:35-37, 17:58-60, 18:3-4, 18:10-18. These examples further support that a single radio signal can be made up of multiple portions (e.g., consecutive transmission blocks or symbols). And nothing in those examples or the ’081 patent limits the “radio signal” in terms of “particular radio information.” For these reasons, the Board should reject Apex’s proposed construction of “radio signal.”

B. Apex’s “Symbols” Construction Lacks Support and Merit

Apex proposes construing “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols” as “the second radio signal is used for determining a time-domain resource occupied by *each of* the G multicarrier symbols.” POR 18-20 (emphasis in original).

As Apex’s added emphasis illustrates, this construction is an improper attempt to inject words into the claim. *See Source Vagabond Sys. Ltd. v. Hydrapak, Inc.*, 753 F.3d 1291, 1299 (Fed. Cir. 2014) (citation omitted) (“Instead of looking

to the words themselves, [appellant] added language without support from the specification or prosecution history, altering otherwise unambiguous claim language, a practice this court has repeatedly rejected.”). The addition of “each of” before “the G multicarrier symbols” would change the scope of the claims in a manner that is inconsistent with the ’081 patent.

Apex cannot point to any intrinsic or extrinsic evidence that supports this narrowing construction. Apex simply parrots other language in the claims and argues its proposed construction is necessary to understand those other limitations. Specifically, Apex alleges that “each one of the G multicarrier symbols must be determined by the second radio signal,” otherwise “it would not be possible to determine, in the subsequent limitations, whether the time domain resource occupied by each one of the multicarrier symbols is before or behind the first time point.” POR 19. But Apex’s assumption (and therefore, basis for its construction) is incorrect.

As Apex’s expert acknowledged during his deposition, symbols have a specific length of time. Ex. 1024, 18:12-15. And, once you know the start time of the first symbol in a block of consecutive symbols, you know the start time of the second symbol that follows the first symbol, and so on. *Id.*, 21:3-20. Thus, contrary to Apex’s assumption, it is possible to determine the time domain resource of the other symbols within a block of consecutive symbols (and thus whether each of

them is before or behind a first time point) once the time domain resource of the first symbol is known.

Similarly, it is also possible to determine the time domain resource of all symbols within a block of consecutive symbols if you know when the block is sent. For example, if you know that an entire block of consecutive symbols is sent before a time point (e.g., beam switching point), you know that each symbol is sent before the beam switching point. Likewise, if you know that the entire block of consecutive symbols is sent behind the beam switching point, you know that each symbol is sent behind the beam switching point. Thus, by knowing that all symbols of the block are sent before or behind the beam switching point, it is possible to determine the time domain resource of each symbol in the block (and thus whether it is before or behind the first time point).

Regardless, the '081 patent itself does not contemplate a symbol level analysis. For example, in one embodiment, the '081 patent merely states that “the second radio signal indicates the start time point of the first radio signal in the first time unit, and the start time point is used for determining the time domain resource occupied by the first radio signal in the first time unit.” '081 patent, 18:6-10.

Moreover, none of the claim language Apex points to requires an analysis be performed separately as to “*each one* of the G multicarrier symbols.” POR 19. Instead, other limitations simply recite what happens for “*any one given*

multicarrier symbol of the G multicarrier symbols” without regard to whether the same thing happens for one or more other multicarrier symbols. ’081 patent, claim 1 (emphasis added). The Board should thus reject Apex’s attempt to rewrite the claims under the guise of claim construction.

III. Apex’s Arguments Against the *Lee* Ground Fail

A. *Lee* Discloses the “Radio Signal” Limitations, Regardless of Whether Apex’s Construction is Applied

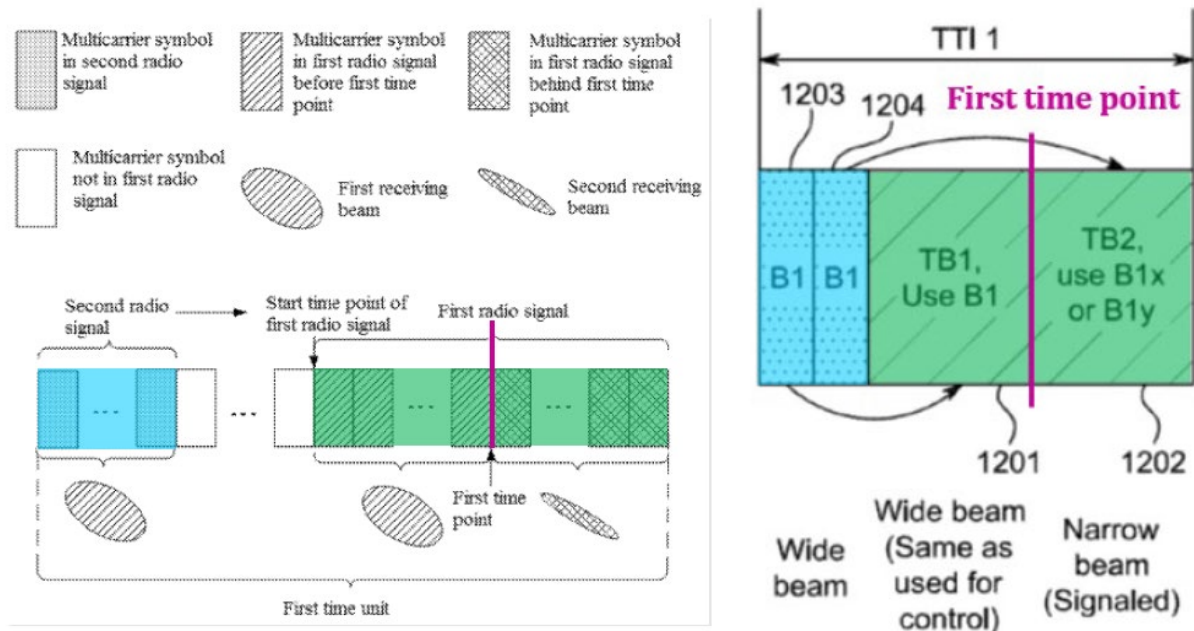
Apex argues that *Lee* fails to disclose receiving the claimed “second radio signal” and “first radio signal,” allegedly because “Petitioner does not identify a single radio signal with particular information as the one incoming ‘[second/first] radio signal.’” POR 22, 25. While the Board should reject Apex’s construction of “radio signal” for at least the reasons above, *Lee* discloses these limitations, regardless of whether the Board were to accept Apex’s construction.

1. “second radio signal”

Apex argues that *Lee*’s control data blocks “B1 1203 and B1 1204 are two separate control signals (i.e., each contain different particular information),” allegedly because they contain “different code words.” POR 23-25. But just because two control data blocks may contain different information or codewords does not mean that they are separate radio signals.

As discussed above, Apex’s expert admits that a radio signal can include multiple pieces of information (i.e., different information). Ex. 1024, 12:23-25, 15:23-16:1, 17:2-5. Further, the use of different codewords simply indicates how the data in a signal is formatted and has no bearing on whether *Lee*’s control data blocks 1203 and 1204 constitute one or two radio signals. *Lee*, [0168]-[0170], [0221]-[0228], FIG. 13.

The Petition explains how *Lee*’s “control data B1” tracks the ’081 patent’s “second radio signal.” Petition 15-16. For example, FIG. 7 of the ’081 patent and FIG. 12 of *Lee* shown below illustrate both including multiple portions of the same radio signal.



’081 patent, FIG. 7 (annotated, left); *Lee*, FIG. 12 (annotated, right)

And like the '081 patent's "second radio signal," *Lee*'s control data blocks 1203 and 1204 can be "a PDCCH [Physical Downlink Control Channel]" and include "DCI [Downlink Control Information]." '081 patent, 3:59-4:2, 18:19-22; *Lee*, [0167]-[0168], [0078], [0086]. Also, consistent with the '081 patent's description of "radio signal," *Lee*'s control data blocks 1203 and 1204 can be "consecutive data transmission block in time domain," or "G consecutive multicarrier symbols in time domain." '081 patent, 2:20-23, FIG. 7; *Lee*, [0167]-[0168], [0078], [0086], FIG. 12. The examples in the '081 patent thus support *Lee*'s control data blocks 1203 and 1204 together constituting the claimed "second radio signal."

Moreover, even if the Board were to accept Apex's construction of "radio signal," *Lee* still discloses this limitation. Specifically, *Lee*'s consecutive transmission blocks 1203 and 1204 together comprise a "signal that transmits particular radio information." *Lee*, [0167]-[0168], [0078], [0086], FIG. 12.

To the extent Apex argues that a radio signal must be sent in a single transmission block or that a radio signal can only include a single piece of information, its proposed construction does not reflect that interpretation. Nothing in Apex's construction prevents particular radio information from having two or more pieces of radio information. And thus, even under Apex's construction, the

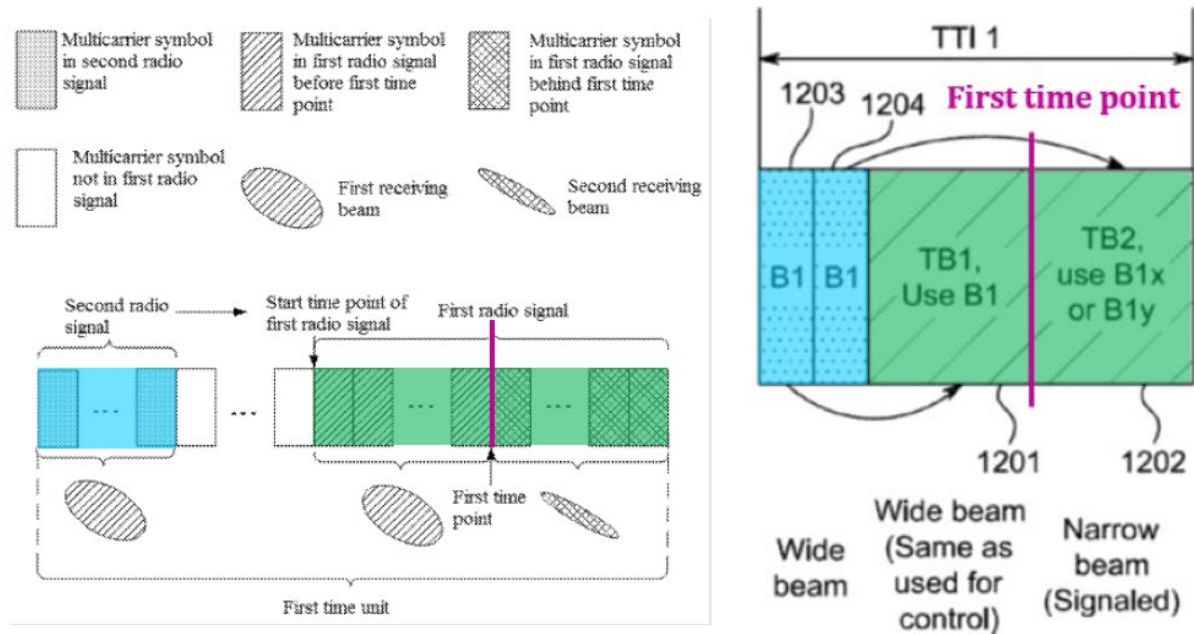
“second radio signal” reads on two consecutive transmission blocks, which are collectively “particular radio information.”

2. “first radio signal”

Apex argues that *Lee*’s transport blocks “TB1 and TB2 are separate signals (i.e., each contain different particular information),” allegedly because they have “different particular information carried, and different modulation and coding schemes.” POR 26-28. But just because two transport blocks may contain different information or use different modulation or coding schemes does not mean that they are separate radio signals.

As discussed above for the “second radio signal,” Apex’s expert admits that a radio signal can include multiple pieces of information (i.e., different information). Ex. 1024, 12:23-25, 15:23-16:1, 17:2-5. Further, the use of different modulation or coding schemes simply indicates how the data in a signal is formatted and has no bearing on whether *Lee*’s transport blocks TB1 and TB2 constitute one or two radio signals. *Lee*, [0168]-[0170], [0221]-[0228], FIG. 13.

The Petition explains how *Lee*’s transport blocks TB1 and TB2 track the ’081 patent’s “first radio signal.” Petition 16-19. For example, FIG. 7 of the ’081 patent and FIG. 12 of *Lee* shown below illustrate both including multiple portions of the same radio signal.



'081 patent, FIG. 7 (annotated, left); *Lee*, FIG. 12 (annotated, right).

And like the '081 patent's "first radio signal," *Lee*'s transport blocks TB1 and TB2 can be "a PDSCH [Physical Downlink Shared Channel]" and carry "data." '081 patent, 2:19-23; *Lee*, [0167]-[0168], [0079], [0086]. Also like the '081 patent's "first radio signal," *Lee*'s transport blocks TB1 and TB2 can be "consecutive data transmission block in time domain" or "G consecutive multicarrier symbols in time domain." '081 patent, 2:19-23, FIG. 7; *Lee*, [0167]-[0168], [0079], [0086], FIG. 12. Further, as shown above, *Lee*'s transport blocks TB1 and TB2 include two consecutive transmission blocks received using two different receiving beams like the '081 patent's "first radio signal." '081 patent, FIG. 7, 18:13-18; *Lee*, [0167]-[0168], FIG. 12. The examples in the '081 patent

thus support *Lee*'s transport blocks TB1 and TB2 together constituting the claimed "first radio signal."

Moreover, even if the Board were to accept Apex's construction of "radio signal," *Lee* still discloses this limitation. Specifically, *Lee*'s transport blocks TB1 and TB2 together comprise a "signal that transmits particular radio information." *Lee*, [0167]-[0168], [0079], [0086], FIG. 12.

To the extent Apex argues that a radio signal must be sent in a single transmission block or that a radio signal can only include a single piece of information, its proposed construction does not reflect that interpretation. Nothing in Apex's construction prevents particular radio information from having two or more pieces of radio information. And thus, even under Apex's construction, the "first radio signal" reads on two consecutive transmission blocks, which are collectively "particular radio information."²

² Apex's arguments in Sections VII.A.3 and VII.A.4 depend on its arguments for "second radio signal" and "first radio signal" (POR 28-29), and thus, they fail for the same reasons above.

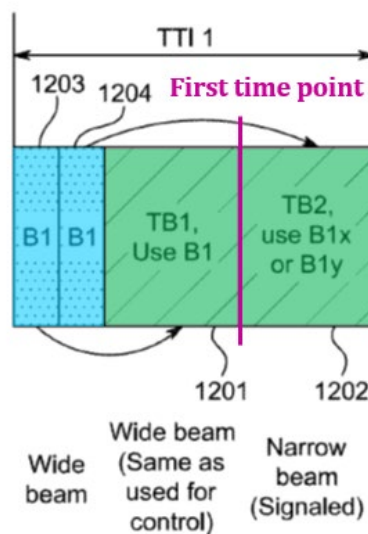
B. *Lee* Discloses the “Symbols” Limitations, Regardless of Whether Apex’s Construction is Applied

Apex argues that “nowhere does *Lee* (or Petitioner) describe how a determination of occupied time domain resources is made for each of G multicarrier symbols, but only on a transport block basis.” POR 30-31. But the claims do not require a determination of occupied time domain resources be made separately for *each* multicarrier symbol. And, while the Board should reject Apex’s construction for at least the reasons above, *Lee* discloses the “symbols” limitations, regardless of whether the Board were to accept Apex’s construction.

As the Petition shows, *Lee* discloses scheduling information and time/frequency information included in its control channel (control data B1), which a POSITA would have understood to include the time-domain resource allocation for the multicarrier symbols in the data channel (transport blocks TB1 and TB2). Petition 24-26 (citing *Lee*, [0109], [0110], [0148], [0169]; Kakaes, ¶¶98-100).

Apex does not dispute that *Lee*’s control data B1 is used for determining a time-domain resource of its transport blocks TB1 and TB2. POR 30-31. Rather, Apex’s argument focuses on its flawed construction that a determination must be made separately for each and every symbol in the “first radio signal.” *Id.* But as discussed above, there is no support for such an interpretation of the claims.

Moreover, even if the Board were to accept Apex's construction, *Lee* still discloses the "symbols" limitations. Apex's construction requires only that "the second radio signal is ***used for determining*** a time-domain resource occupied by each of the G multicarrier symbols." POR 18 (emphasis added). As discussed above, Apex does not dispute that *Lee*'s control data B1 indicates the time domain resource occupied by transport blocks TB1 and TB2. *Id.*, 30-31. Apex also does not dispute that *Lee*'s transport blocks TB1 and TB2 include multicarrier symbols, which have a specific length of time. *Id.*; Ex. 1024, 18:12-15. Based on the time-domain resource information in control data B1, *Lee* discloses that the entire transport block TB1 (and thus all of its symbols) is sent before a first time point, while the entire transport block TB2 (and thus all of its symbols) is sent behind the first time point, as shown in annotated FIG. 12 below.



Lee, FIG. 12 (annotated).

Accordingly, *Lee*'s control data B1 ("second radio signal") is "used for determining" the time domain resource occupied by "each of the G multicarrier symbols" in transport blocks TB1 and TB2 ("first radio signal"), under Apex's proposed construction.

Apex's arguments for the other "symbols" limitations in Section VII.A.6 depend on its arguments above (POR 31-34), and thus, they fail for the same reasons. For example, Apex argues that *Lee* does not disclose (1) "a determination, on a multicarrier symbol basis," (2) "determining an occupied time domain resource for a specific multicarrier symbol and its relation to a first time point," and (3) determining the occupied time domain resource "on a multi-carrier symbol basis." *Id.*, 33-34. As discussed above, the claims do not require a determination of occupied time domain resources be separately made for *each* multicarrier symbol. Regardless of Apex's construction, the Petition shows that *Lee* discloses each of these "symbols" limitations. Petition 26-32 (citing Kakaes, ¶¶101-108).

IV. Apex's Arguments Against the *Chen* Ground Fail

A. *Chen* in View of *Lee* Renders Obvious the "First Bit Block" Limitation

Apex argues that *Chen* and *Lee* do not render obvious a "first bit block is used for generating the first radio signal," allegedly because "Lee's MAC PDU does not generate a first radio signal," and "Lee's alleged first bit block (MAC

PDU) generates two different signals (*i.e.*, TB1 and TB2) associated with two different code words (CW), instead of generating one radio signal.” POR 35-36.

However, Apex’s argument ignores the combination of *Chen* and *Lee* proposed in the Petition and instead attacks the references individually, which is improper, as the Board acknowledged at Institution. Paper 9, 34 (citing *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019) (Obviousness cannot be overcome “by attacking references individually where the [ground] is based upon the teachings of a combination of references.”)).

As the Petition shows, it was well known that a data message, such as the one taught in *Chen*, can be generated using a bit block. Petition 55 (citing Kakaes, ¶¶195-196). Apex does not dispute this. The Petition further cites to *Lee* as one example of a bit block (e.g., a MAC PDU) that can be used to generate a data message. *Id.*, 56. Apex also does not dispute that a MAC PDU is a bit block.

Contrary to Apex’s suggestion, the proposed combination of *Chen* and *Lee* does not propose bodily incorporating any of *Lee*’s embodiments into *Chen*. Rather, the Petition simply proposes to implement *Lee*’s use of a bit block (e.g., MAC PDU) to generate *Chen*’s data message, as was well known in the art. Petition 55-58; Kakaes, ¶¶195-209. Apex’s isolated attacks on alleged deficiencies of specific embodiments in *Lee* thus fail to rebut the combination of *Chen* and *Lee*.

B. *Chen* in View of *Lee* Renders Obvious the “Symbols” Limitations, Regardless of Whether Apex’s Construction is Applied

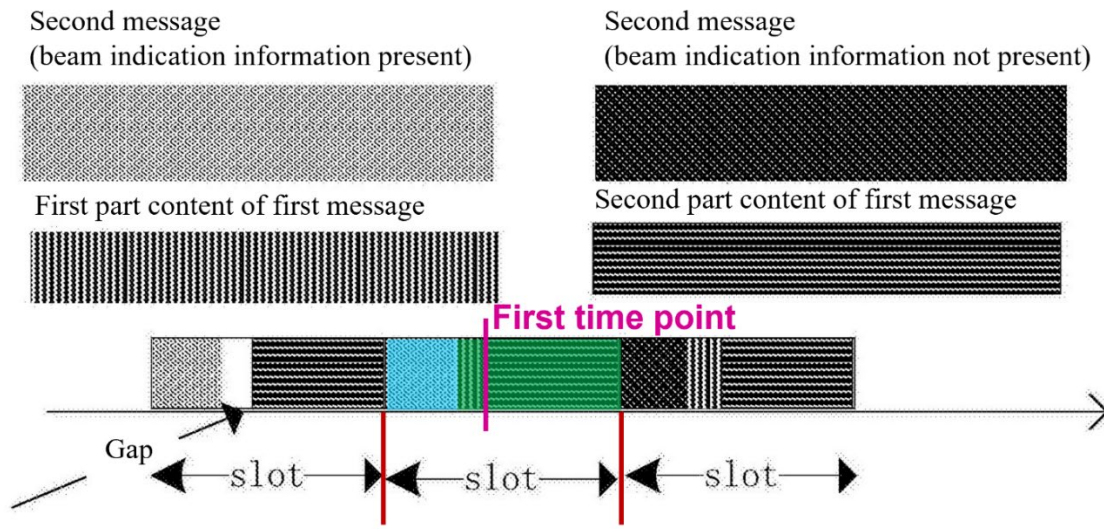
As with the *Lee* Ground above, Apex argues that “Chen only discusses indicating time-domain resource occupation for the full data message, not on an individual multicarrier symbol basis, as the claim requires.” POR 36-37. But as discussed above, the claims do not require a determination of occupied time domain resources be separately made for *each* multicarrier symbol. And, while the Board should reject Apex’s construction for at least the reasons above, *Chen* and *Lee* render obvious the “symbols” limitations, regardless of whether the Board were to accept Apex’s construction.

As the Petition shows, *Chen*’s control message and/or scheduling message (“second message”) includes information indicating a time-domain resource occupied by *Chen*’s data message (“first message”). Petition 59-60 (citing Kakaes, ¶¶211-215). Apex does not dispute this. POR 36-37. Rather, Apex’s argument focuses on its flawed construction that a determination must be made separately for each and every symbol in the “first radio signal.” *Id.* But as discussed above, there is no support for such an interpretation of the claims.³

³ Apex also incorrectly alleges that “the specification of Chen does not even mention multicarrier symbols.” POR 36. As noted in the Petition, *Chen* discloses

Moreover, even if the Board were to accept Apex's construction, *Chen* and *Lee* still render obvious the "symbols" limitations. Apex's construction requires only that "the second radio signal is *used for determining* a time-domain resource occupied by each of the G multicarrier symbols." POR 18 (emphasis added). As discussed above, Apex does not dispute that *Chen*'s second message indicates the time-domain resource information of its first message. *Id.*, 36-37. Apex also does not challenge the incorporation of *Lee*'s multicarrier symbols, which have a specific length, into *Chen*'s messages. *Id.*; Ex. 1024, 18:12-15. Based on the time-domain resource information in the second message, *Chen/Lee* discloses that the entire first part of the first message (and thus all of its symbols) is sent before a first time point, while the entire second part of the first message (and thus all of its symbols) is sent behind the first time point, as shown in annotated FIG. 4 below.

"symbol-level processing" of its first message ("first radio signal"), and "LTE, eNB, and 5G NR/NB" base stations," which a POSITA would have understood "use multicarrier symbols, e.g., OFDM symbols, to support communications for different carriers." Petition 55-56 (citing Kakaes, ¶¶201-202).



Chen, FIG. 4 (annotated); *Chen Priority*, FIG. 4.

Accordingly, *Chen/Lee*'s second message ("second radio signal") is "used for determining" the time domain resource occupied by "each of the G multicarrier symbols" in the first message ("first radio signal"), under Apex's proposed construction.

Apex's arguments for the other "symbols" limitations in Section VII.B.3 depend on its arguments above (POR 37-40), and thus, they fail for the same reasons. For example, Apex argues that *Chen* does not disclose (1) "the relational nature of receiving any given multicarrier symbol to the relative position of the time-domain resource occupied by that multicarrier symbol with respect to Petitioner's alleged first time point," and (2) "any determination of the time domain resource occupied by each multicarrier symbol in order to further

determine whether each time domain resource is before or behind a first time point.” *Id.*, 38-39. As discussed above, the claims do not require a determination of occupied time domain resources be separately made for *each* multicarrier symbol. Regardless of Apex’s construction, the Petition shows that *Chen* and *Lee* render obvious each of these “symbols” limitations. Petition 60-66; Kakaes, ¶¶216-223.

V. Apex’s Arguments Against the Other Claims Similarly Fail

Apex argues claims 2-12 are not unpatentable for the same reasons discussed above. POR 34-35, 40-41. Thus, Apex’s arguments for these claims fail for at least the reasons in Sections II-IV. As explained in the Petition, *Lee* anticipates (Ground 1) and/or *Chen* in view of *Lee* renders obvious (Ground 2) claims 2-12.

VI. The Board Should Give Mr. Gomez’s Declaration No Weight

The Board should give no weight to the testimony of Mr. Gomez because he does not qualify as a POSITA. In the Petition, Samsung proposed that a POSITA “would have had at least a master’s degree in electrical engineering or a similar field and at least two years of experience working with telecommunications systems, including multiple-input multiple-output (MIMO) technology.” Petition 13. Apex’s expert does not meet this definition because he only has a bachelor’s degree in electrical engineering, and no work experience with MIMO technology. Indeed, Mr. Gomez’s CV is silent with respect to any work experience with MIMO technology. When asked about his work experience with MIMO technology in the

related district court proceeding, he could not point to any specific work experience. Ex. 1025, 51:10-52:3. Mr. Gomez also admitted “I haven't actually specifically built a product related to those technologies.” *Id.*, 52:2-3.

Implicitly acknowledging that Apex's expert does not meet Samsung's definition of a POSITA, Apex proposed a different definition that leaves out the requirement for experience with MIMO technology and provides an alternative with only a bachelor's degree and more work experience. POR 12 (“[A] POSITA would have had either (i) at least a master's degree in electrical engineering or a similar field and at least two years of experience working with telecommunications systems; or (ii) at least a bachelor's degree in electrical engineering or a similar field and at least five years of experience working with telecommunications systems.”). This definition is wrong because, as Apex's expert admits, the '081 patent purports to address a MIMO problem in 5G. '081 patent, 1:22-45; Ex. 1024, 30:13-15 (“Typically, ‘new radio’ refers to 5G.”). Indeed, Apex asserts that the patent is related to 5G technologies. Ex. 1015, 5 (asserting patented technology is implemented in 5G products); *see also* '081 patent, 10:30-34 (disclosing 5G embodiment). Thus, telecommunications experience alone (without MIMO experience) is not enough. Samsung's definition is thus more in line with the claimed invention and specification of the '081 patent.

Regardless, it is questionable whether Apex's expert meets his own definition of a POSITA. Because Mr. Gomez does not have a master's degree, he must have had at least five years of experience working with telecommunications systems to meet Apex's proposed definition. But Mr. Gomez did not identify whether and when he had such experience. And, in any case, Mr. Gomez has admitted that any such experience is not in the 5G technology of the '081 patent, let alone 4G or even 3G. According to Mr. Gomez's testimony in the related district court proceeding, only two of his engineering experiences involved wireless networking: his work for Philips (February 1997-December 1999) and ActSolar (August 2006-March 2009). Ex. 1025, 47:14-48:11; Ex. 2004, Exhibit A, 3, 5. His testimony about this work experience makes clear that it only tangentially involved wireless networking, at best. *See* Ex. 1025, 33:4-35:23, 38:17-39:25.

In addition, Mr. Gomez admitted that none of his engineering experiences involved 5G, much less 4G or even 3G. *Id.*, 50:2-51:9. His work for Phillips involved 2G cellular network communications and "local-area-network-type technologies," and the work for ActSolar involved "transmission of data from the rooftops down to" nearby receivers "using a protocol called Zigbee." *Id.*, 47:25-48:22. Thus, Mr. Gomez's lack of practical experience related to 4G/LTE and 5G (or even 3G) highlights his lack of credentials. His only practical experience

involving cellular wireless communications (Philips) ended nearly two decades before the claimed priority date of the '081 patent.

Mr. Gomez's deposition testimony also shows his lack of understanding of the relevant technology. For example, he could not even answer basic questions about what is included in downlink control information (DCI). Ex. 1024, 13:24-14:6, 14:23-16:1 (indicating he had to "go back and look" at whether different types of information would be included in a DCI). Unlike Mr. Gomez, Samsung's expert, Dr. Kakaes, meets the definition of a POSITA under either Samsung or Apex's definition of a POSITA. *See* Kakaes, Appendix A. Dr. Kakaes' testimony is thus more credible and should be given more weight than Mr. Gomez's testimony.

VII. Conclusion

For these reasons and those in the petition, the challenged claims should be canceled.

Dated: April 5, 2024

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CERTIFICATION OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, Petitioner certifies that the word count of Petitioner's Reply (exclusive of any table of contents, table of authorities, mandatory notices under §42.8, certificates of service and word count, and list of exhibits or claim listing) as measured by Microsoft Word is 5,595.

Dated: April 5, 2024

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CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the foregoing **Petitioner's Reply** was served electronically via email on April 5, 2024, in its entirety on the following:

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