

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 IPR2023-00598
Patent No. 10,462,767

PETITIONER'S REPLY

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I. Introduction

Nearly every argument that Apex raised in its Patent Owner's Response (Paper 13, "POR") is premised on a construction of "time intervals" that both Apex and its expert admit is contrary to the term's plain and ordinary meaning. But Apex failed to identify *any* evidence of lexicography or disavowal—the only justifications for departing from that meaning. Indeed, Apex's construction would read out multiple embodiments from the specification. Regardless, the combinations satisfy the "time intervals" limitations even under Apex's erroneous construction, rendering it irrelevant.

Apex's remaining arguments likewise fail. For example, Apex's arguments against a motivation to combine fail to confront the abundance of motivation-to-combine evidence in the petition, improperly require bodily incorporation, and erroneously argue that a POSA would lack a motivation to do anything other than what was specified in the 5G standards despite those standards not yet being complete as of the patent's effective filing date. Apex's other arguments either rely on mischaracterizations of Samsung's combinations or its erroneous "time intervals" construction.

Moreover, the testimony of Apex's witness, Mr. Gomez, should be given no weight because he falls short of the undisputed definition of a POSA.

II. Apex’s “Time Intervals” Arguments Are Incorrect and Irrelevant to the Outcome

A. Apex’s Construction of “Time Intervals” Improperly Strays from the Plain and Ordinary Meaning

1. Taken at face value, Apex’s construction of “time intervals” is wrong

Apex concedes that the plain and ordinary meaning of “time intervals” is “ranges of time” but proposes departing from this meaning because the ’767 patent purportedly “explicitly construes ‘time intervals’ as *variable* ranges of time.” POR 9-11 (emphasis added). Apex identifies nothing warranting such construction.

“[T]he words of a claim are generally given their ordinary and customary meaning.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quotations omitted). The only exceptions are lexicography or disavowal. *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Neither exception applies here.

To justify inserting the word “variable” into its construction, Apex appears to assert lexicography. Relying solely on four cited “embodiments,” Apex argues that “the relevant embodiments in the specification show that the length of each time interval is variable, and not necessarily following a pattern.” POR 11-12 (citing ’767 patent, 2:48-51, 2:58-63, 19:1-4, 19:11-15). But these embodiments prove Apex’s construction wrong.

Of Apex's four cited embodiments, three contradict Apex's construction because they disclose "time intervals" fixed in duration rather than variable. See '767 patent, 2:48-49, 2:58-63, 19:1-2, 19:11-15. As Apex recognizes, the '767 patent describes each of the following as "one embodiment":

- "any two of the X time intervals have an equal time length";
- "any one of the X time intervals is M OFDM symbols. M is a positive integer smaller than 14"; and
- "any one of the X time intervals is M OFDM symbols. M is a positive integer smaller than 7."¹

'767 patent, 2:48-49, 2:58-63, 19:1-2, 19:11-15; POR 11. It would be improper to construe "time intervals" to be "variable" ranges of time and exclude these embodiments. *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1305 (Fed. Cir. 2007) (declining to adopt construction that "would exclude several examples in the specification").

Only one of Apex's cited embodiments even arguably discloses variable ranges of time, reciting that "two of the X time times [sic] have different time

¹ The last two embodiments state *any* one of the X time intervals is M OFDM symbols, M being a positive integer. This means the X time intervals have an equal time length, i.e., M OFDM symbols.

lengths.” ’767 patent, 2:50-51, 19:3-4; POR 11. This lone “embodiment” does not justify reading out the other embodiments and *requiring* that the time intervals have variable lengths.

The specification does not even use the word “variable” when describing this embodiment, much less clearly express an intent to redefine “time intervals” from its the plain and ordinary meaning. *See Thorner*, 669 F.3d at 1365-66; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1346-47 (Fed. Cir. 2015) (“This court has repeatedly ‘cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.’”); *IGT v. Bally Gaming Int’l, Inc.*, 659 F.3d 1109, 1118 (Fed. Cir. 2011) (holding that the specification’s inclusion of examples supporting a party’s construction was “not sufficient to redefine the term . . . to have anything other than its plain and ordinary meaning”).

2. Additional, uncited embodiments further contradict Apex’s construction

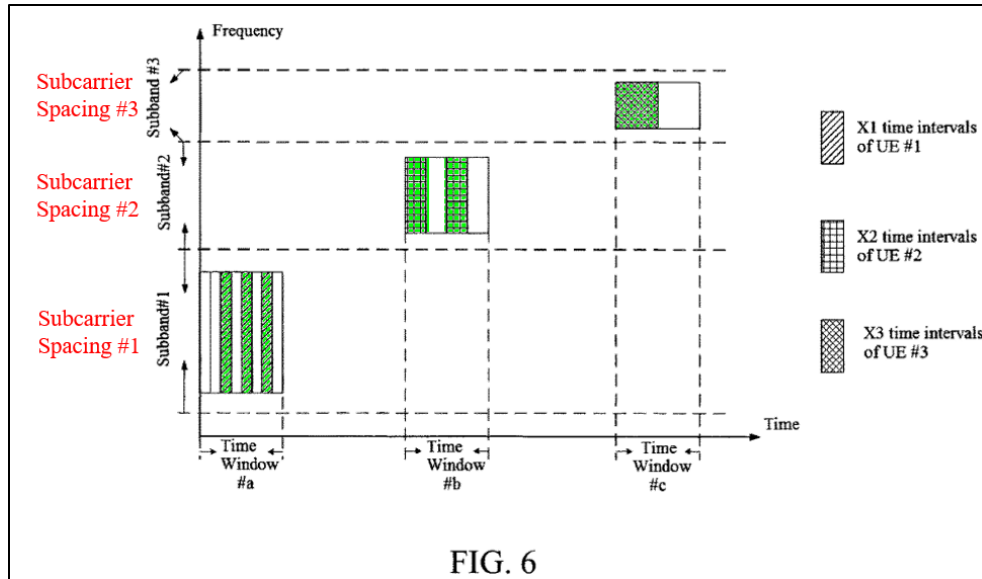
Apex based its lexicography argument on the purportedly “relevant embodiments in the specification,” POR 11, but omitted several additional embodiments that contradict its construction by disclosing fixed “time intervals.” *See* POR 11 (skipping ’767 patent, 2:52-57, 19:5-10).

In the first omitted embodiment, “any one of the X time intervals is a slot.” ’767 patent, 2:52-53, 19:5-6. But according to Apex, “slots are also fixed

ranges of time, which cannot be X time intervals.” POR 20. Taking Apex at its word, its construction reads out this embodiment.

In the second omitted embodiment, “any two of the X time intervals have an equal time length, and the time length of each one of the X time intervals is correlated to the subcarrier spacing of subcarriers included in the first subband.” ’767 patent, 2:54-57, 19:7-10. This embodiment, again, demonstrates the impropriety of reading fixed time intervals out of the claims.

Figure 6 of the ’767 patent illustrates this point. It shows three different subbands, each with a different **subcarrier spacing**, and one set of **X time interval(s)** for each subband monitored by a different UE (User Equipment). *Id.*, 17:44-18:13, 18:32-35, Fig. 6. UEs #1 and #2, the UEs that monitor multiple **time intervals**, each monitor fixed **time intervals** in Time Windows #a and #b, respectively. *Id.* UE #3 monitors only *one* time interval in Time Window #c, which also does not disclose variable ranges (plural) of time. *Id.*; see Ex. 1041, 69:19-24 (“[V]ariable means that it changes over time.”).



'767 patent, Fig. 6 (annotated). While Figure 6 depicts the **time-interval** lengths differing across subbands, even that need not occur, as the '767 patent discloses another embodiment where the subbands “have an equal subcarrier spacing.” *Id.*, 18:36-37.

It would be improper to construe “time intervals” to be “variable” ranges of time and exclude these additional embodiments. *See Verizon*, 503 F.3d at 1305.

3. The extrinsic evidence further undermines Apex’s construction

Apex identifies no extrinsic evidence supporting its claim construction. Apex cites dictionary definitions only to establish that the plain and ordinary meaning of “time intervals” is “ranges of time,” not “variable” ranges of time. POR 10. And Apex’s expert Mr. Gomez agrees that the plain meaning of “time

intervals” is “ranges of time” and is not limited to “variable” ranges of time.

Ex. 2004, ¶¶35-36.

Mr. Gomez does not strengthen Apex’s claim construction arguments by repeating them. He does not cite any additional intrinsic evidence. Ex. 2004, ¶¶33-37. And because his testimony contradicts the intrinsic evidence discussed above, it is entitled to no weight. *Phillips*, 415 F.3d at 1318 (“[A] court should discount any expert testimony that is clearly at odds with the claim construction mandated by . . . the written record of the patent.” (quotations omitted)).

Regardless, Mr. Gomez’ deposition testimony proves Apex’s construction wrong. Mr. Gomez agreed that the ’767 patent discloses one embodiment “where all of the X time intervals have an equal time length.” Ex. 1041, 44:14-46:17. He agreed that nothing in the ’767 patent “excludes” “an embodiment where all of the X time intervals comprise the same number of OFDM symbols.” Ex. 1041, 55:3-57:7. He testified that the claimed X time intervals “could be the same length.” Ex. 1041, 62:4-64:16. And “the one” dictionary definition for “interval” that he “like[s]” specifies that the intervals could be “regular,” i.e., not variable. Ex. 1041, 66:4-21; Ex. 2004, ¶35.

B. If “Variable” in Apex’s Construction Is Optional, Apex’s Construction Is Irrelevant to the Outcome

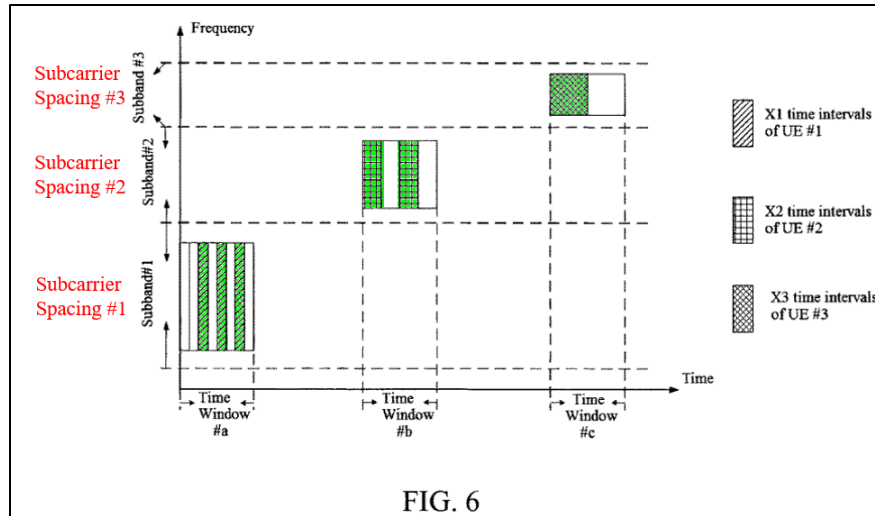
After expressly stating that “time intervals” mean “variable ranges of time,” Apex confuses the matter by stating that the “time intervals” can nevertheless be

equal and expressing its “variable” definition using permissive/optional language. POR 11 (some intervals “can be equal in time / symbol length”), 11-12 (each “interval need not be equally spaced between each other”), 19 (the interval lengths “are not necessarily equal” and the “intervals are not necessarily periodic in time”), 21 (the intervals “could be variable”). Given these admissions, Apex cannot dispute that the claimed “time intervals” read on “fixed” ranges of time, rendering its arguments against Samsung’s proposed combination baseless and its construction irrelevant to the outcome of this case. *In re Johnston*, 435 F.3d 1381, 1384 (Fed. Cir. 2006) (“optional elements do not narrow the claim because they can always be omitted”).

C. Even Under a Restrictive Version of “Variable,” the Combinations Satisfy Apex’s Construction

Apex’s construction is also irrelevant because the combinations’ “time intervals” are “variable ranges of time” at least in the same way that the ’767 patent’s “time intervals” are “variable ranges of time.”

In claim 1, the claimed “X time intervals” may vary with respect to “at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.” ’767 patent, 23:16-20. Figure 6 of the ’767 patent depicts this. *Id.*, 17:47-64, 18:32-35.



Id., Fig. 6 (annotated). But as depicted, for a given first-subband location or subcarrier spacing, the length of the X time intervals may be fixed, consistent with the multiple embodiments of the '767 patent reciting “equal” time intervals. *See* Sections II.A.1-II.A.2.

The X time intervals in the combination are variable just like those in the '767 patent. Petition 37-38, 45-51. *Liu* discloses that switching “the numerology (i.e., subcarrier spacing) will change the ‘DCI monitoring occasions,’” which “constitute the claimed ‘X time intervals’ for monitoring the DCI.” Petition 30 (citing Ex. 1006 (“*Liu*”), Abstract, [0005], [0019], [0040], [0095], Fig. 2; Ex. 1002 (“*Bims*”), ¶113), 45 (citing *Bims*, ¶140). For example, the petition explains that each of *Liu*’s DCI monitoring occasions can be “a number of symbols” and “start[] and end[] from the symbol boundary rather than a slot boundary.” *Liu*, [0047], [0062]; Petition 31, 33-34, 37-38, 45-46, 49; *Bims*, ¶¶114, 117, 140-141, 145. This mirrors embodiments of the '767 patent Apex cited as

supporting its claim construction. POR 11 (citing '767 patent, 19:1-4, 19:11-15).

“[D]ifferent subcarrier spacings mean different symbol lengths,” so changing the subcarrier spacing changes the DCI monitoring occasions. Petition 49 (citing *Liu*, [0045], [0047]; Bims, ¶145).

Liu solves the exact problem Apex argues was solved by “variable ranges of time.” *Compare* POR 20 (arguing “a fixed time length . . . restrict[s] the time periods for transmission opportunities for paging”), *with* Petition 31 (explaining “*Liu* solves this problem by expanding the transmission/monitoring opportunities from ‘subframe level (multi-slot)’ to ‘slot level’ and ‘symbol level.’”). Apex cannot distinguish Samsung’s combination when it discloses the same thing Apex argues is inventive in the '767 patent.

Apex argues that a POSA would “understand ‘determining the X time intervals’ to include determining the number of time intervals (*i.e.*, X), the duration of each of the X time intervals, and the spacing between each of the X time intervals.”² POR 27. Apex premises this entirely on the conclusory opinion of

² In contrast to the petition, which refers to “time-domain locations” of the X time intervals, Petition 46, Apex refers to “the spacing between each of the X time intervals,” but Apex does not articulate any meaningful distinction between the

Mr. Gomez, who in turn identifies nothing supporting his conclusion. Ex. 2004,

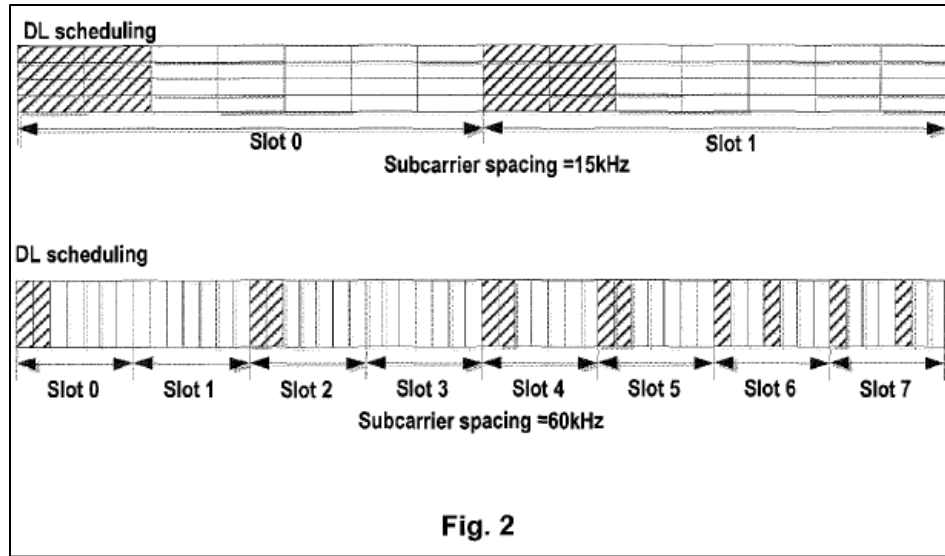
¶57. Regardless, any such understanding is irrelevant because Apex did not dispute that, in the combination, the numerology (subcarrier spacing) is used to determine the time-domain locations and duration of each X time interval and the number X.³ See POR 26-28; Petition 45-51.

As the petition explains, *Liu* discloses transmitting a DCI configuration parameter containing, *inter alia*, the numerology, the DCI occurrence occasions, and the duration for a single DCI to a UE so it “may learn the time-frequency resource for the DCI from the DCI configuration parameter and monitor the DCI” accordingly. *Liu*, [0044]-[0052], [0057], [0095]; Petition 45-51. In the combination, “a UE would use *Liu*’s ‘numerology’ and ‘DCI occurrence occasions’ to determine the time-domain locations and number of the M-PDCCH monitoring occasions, and use the ‘numerology’ and ‘duration for a single DCI’ to determine the duration of each M-PDCCH occasion.” Petition 50 (citing *Liu*, [0045], [0047]-[0049], Fig. 2; Bims, ¶147).

two or why such distinction would matter, given that both would be determined based on the subcarrier spacing.

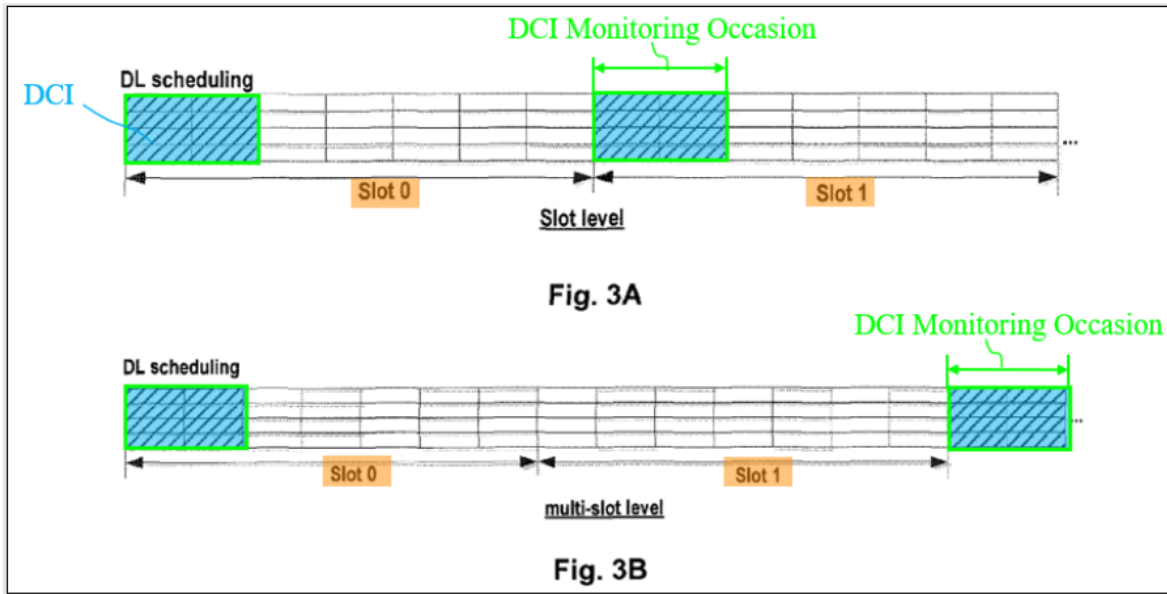
³ Apex has not articulated any evidence-based reason why any one of these would not be sufficient to render the claims obvious.

Apex is wrong that *Liu* “only discloses periodic slots with fixed length for DCI monitoring occasions.” POR 26-27; *see also id.*, 20-21 (arguing that slots are “fixed ranges of time, which cannot be X time intervals”). *Liu* discloses both “periodic” and “aperiodic” DCI occurrence occasions and “dynamically” transmitting a new DCI configuration parameter within a first DCI “for the following DCI.” *Liu*, [0049]-[0050], [0059]. Additionally, *Liu*’s Figure 2, reproduced below, depicts how the slot length and corresponding DCI monitoring occasions (the shaded portions) vary depending on the subcarrier spacing (15 or 60 kHz in these examples). *Liu*, [0022], [0045], Fig. 2; Bims, ¶104 (explaining *Liu*’s disclosures that “the symbol and slot durations depend on the subcarrier spacing”). Mr. Gomez agreed that if just the numerology changed, the length of both the slots and DCI monitoring occasions would change. Ex. 1041, 72:12-76:9. And in the case of the 60 kHz subcarrier spacing, Figure 2 shows the periodicity and duration of the DCI monitoring occasions changing over time. *Liu*, Fig. 2.



Id., Fig. 2.

Apex also mistakenly equates the slot-level DCI monitoring in the combination to searching each entire slot. POR 20-21. As depicted below, slot-level monitoring refers to specifying the slots in which DCI occurs (e.g., every slot or every other slot), and the duration for a single DCI can be less than the length of a slot (e.g., two symbols). *Liu*, [0047]-[0049], Figs. 3A-3B; Petition 45-49.



Liu, Figs. 3A and 3B.

Petition 46.

D. Whether “X” Can Be One Is Irrelevant to the Outcome

Contrary to Apex’s argument, POR 22, Samsung has not changed positions on the construction of “positive integer” in “wherein X is a positive integer.” Samsung never took a position on the construction of “positive integer” in this IPR because it is irrelevant to the outcome of the case.

Despite the claims reciting “X time intervals” (plural), Apex asserts that the claims also encompass X being one (singular). POR 22-23. The Board need not address whether the claims encompass both the singular and plural because Samsung’s combinations teach both. For the claimed “wherein X is a positive integer,” Samsung referred to limitation [1a], stating “*You alone or in view of Liu* teaches that the paging M-PDCCH is monitored in one or more (i.e., a positive

integer) time intervals.” Petition 39. Samsung thereby accounted for both X being one and more than one. Apex does not dispute these teachings, so its arguments about whether “X” can be one are irrelevant here.

E. Apex’s Other Arguments Against the Combinations’ “Time Intervals” Fail with Its Claim Construction Arguments.

Apex makes two other “time intervals” arguments against Samsung’s combinations. Apex argues the combination of *You* and *Liu* does not render obvious (1) “monitoring a first signaling in X time intervals,” POR 19-22, and (2) “at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals,” POR 26-28. Apex premises both arguments on its claim construction and does not otherwise confront the “time intervals” in Samsung’s combinations, so the Board need not address these arguments if it rejects Apex’s claim construction and/or finds that the combinations satisfy Apex’s construction.

III. Apex’s Motivation-to-Combine Argument Based on Purported Differences Between 4G and 5G Systems Fails

A. Samsung Provided Ample Evidence of a Motivation to Combine in the Petition

Samsung’s petition demonstrated a motivation to apply *Liu*’s 5G/NR solutions to upgrade *You/Mallick*’s 4G/LTE system to 5G/NR with predictable results. *E.g.*, Petition 28-36, 69-73. Despite the Board acknowledging that Samsung thus set “forth reasoning with rational underpinning as to why a person

having ordinary skill in the art would have combined the teachings of You and Liu,” Paper 10 (“DI”) 22, Apex fails to confront Samsung’s reasoning. Instead, Apex mischaracterizes Samsung’s combinations and disregards its own admissions about how the technology developed.

Apex focuses on “[t]he difference between scheduling units (subframes in 4G/LTE systems versus slots in 5G/NR systems)” and argues that the “4G/LTE and 5G/NR systems are not combinable to create another 5G/NR system” and thus a POSA would have lacked a motivation to combine. POR 14-18. But Samsung did not propose bodily incorporation of *Liu*’s 5G/NR system into *You/Mallick*’s 4G/LTE systems (or vice versa). Nor is that required to show obviousness. *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016).

Rather, Samsung’s combination “appl[ies] *Liu*’s teachings to modify *You*’s M-PDCCH monitoring scheme, so that it can support [5G/NR] communications.” Petition 29; Bims, ¶111. Dr. Bims showed this modification would succeed by explaining in detail how *Liu*’s solution enables *You*’s UE to perform monitoring under 5G/NR’s flexible scheduling unit size, i.e., flexible slot/symbol size. Bims, ¶113; Petition 30-31. Indeed, the only difference that Apex identified between 4G/LTE and 5G/NR is the very thing that Samsung’s combination modifies based on *Liu*. See POR 14-18.

Apex cannot dispute this natural progression of the technology. Not only does Apex admit “5G is a progression from 4G,” POR 14, but Apex also relies on this same progression of technology in articulating the problem the ’767 patent is trying to solve, *compare* POR 15-16 (quoting ’767 patent’s objective of “solv[ing] the [] design problem of paging when multiple numerologies are employed in the 5G NR”), *with Liu*, [0040] (“[N]one of the prior arts can support the DCI monitoring occasion change due to numerology and scheduling unit size. Thus . . . there is proposed a new DCI transmission and receiving solution.”). As the petition shows, *Liu* already solved this purported problem before the ’767 patent. A POSA would not have disregarded *You* and *Mallick* simply because they are 4G/LTE systems. POR 18. Rather, as Dr. Bims explained, newer 3GPP technical specifications “are accumulatively built upon previous versions,” and this “natural transition to 5G” would have prompted a POSA to improve *You* “to meet the requirements of the emerging 5G/NR system.” Bims, ¶112. Even Mr. Gomez acknowledged that 5G built off of concepts that existed in 4G/LTE and that 4G/LTE and 5G contain many similarities. Ex. 1041, 33:10-34:15, 35:7-19, 36:18-39:14, 41:8-15.

Apex cites Dr. Bims’ deposition testimony to support its assertion that *You* is silent about doing M-PDCCH monitoring in a portion of a subframe. POR 17. But Dr. Bims actually said this “is possible if [Y]ou were to be combined with

other art such as *Liu*.” Ex. 2005, 60:3-25.⁴ Indeed, Apex and its expert admit that *Liu* expressly discloses “[i]n current LTE system, DCI monitoring is performed per subframe or per slot” (i.e., a portion of a subframe), and teaches the need of changing “the current DCI monitoring solution in LTE . . . [to] support the DCI monitoring occasion change due to numerology and scheduling unit size.” *Liu*, [0004]-[0005]; POR 18 (citing the same portion of *Liu*); Ex. 2004, ¶45; Petition 29-30.

Applying *Liu*’s solution to *You/Mallick* during the upgrade to 5G/NR would have resulted in the same 5G/NR system as that claimed by the ’767 patent. Petition 33-34; Bims, ¶117. It would address the difference between 4G/LTE’s and 5G/NR’s scheduling units, not be prevented by it.

Apex also argues that a POSA would not make the proposed modification because it “include[s] regressing to 4G/LTE again,” such as by incorporating the 4G/LTE features of monitoring the M-PDCCH in a subband and using SIBs to

⁴ The POR and Mr. Gomez falsely insert “improperly” into Dr. Bims’ testimony to distort its meaning. *Compare* Ex. 2004, ¶43, *with* Ex. 2005, 60:13-21. When shown a similar insertion of “improperly” into one sentence from his declaration, Mr. Gomez agreed that it “mischaracterizes” his testimony. Ex. 1041, 85:19-87:18.

transmit paging configuration parameters. POR 14-15, 24-26, 28-29. But that mischaracterizes Samsung's combination. The combination simply retains 4G/LTE features that are not impacted when applying *Liu*'s 5G/NR solution to upgrade *You/Mallick*'s 4G/LTE systems. For example, the combination does not require changing *You*'s subband configuration and SIBs. Thus, they are incorporated into the resulting 5G/NR solution.

Apex fails to confront the abundant evidence showing a motivation to apply *Liu*'s teachings to *You/Mallick*, which would yield the claimed invention of the '767 patent.

B. Apex Improperly Relies on Purported Events Arising After the Effective Filing Date

Apex's arguments against a motivation to combine improperly attempt to assess obviousness at the wrong time. POR 14-15. Obviousness must be assessed "from 'the effective filing date of the claimed invention.'" *SNIPR Techs. Ltd. v. Rockefeller Univ.*, 72 F.4th 1372, 1375 (Fed. Cir. 2023). As of the effective filing date of the '767 patent, 5G was still under development. Indeed, the '767 patent describes 5G/NR as a "future wireless communication system[]." '767 patent, 1:22-34.

Apex argues a lack of motivation to combine 4G/LTE and 5G/NR systems because they have "various and substantial differences" that "were already considered by standard setting organizations, such as 3GPP, at the time of

transitioning to 5G.” POR 14-15. Apex and its expert rely on an unauthenticated 2023 blog post, which is not evidence in this case because it has not been filed as an exhibit as required by Rule 42.63, to argue that “any motivation to ‘combine’ was already acted upon.” POR 15; Ex. 2004, ¶39. Apex improperly relies on purported events after the effective filing date of the ’767 patent, namely the adoption of 5G. Even Mr. Gomez admits that many of the 5G technical specifications “were published after the priority date of the ’767 [patent].” Ex. 1041, 19:7-20:5.

It was known at the time that 5G/NR would adopt varying numerologies, *e.g.*, *Liu*, [0003], as the ’767 patent and Mr. Gomez admit, ’767 patent, 1:32-34; Ex. 1041, 31:16-32:12, and Samsung demonstrated how a POSA would have relied on *Liu* to solve the problems caused by this change, *e.g.*, Petition 28-36. That sufficiently demonstrates a motivation to combine here. Apex’s arguments about a POSA’s motivations *after* the 5G/NR standards were completed are irrelevant to the obviousness analysis.

Even if it were proper to consider the later-arising decisions of standard setting organizations when assessing obviousness, “a particular combination” need not “be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention.” *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004). That the proposed combination may differ from the

5G/NR standards ultimately adopted after the patent's effective filing date is irrelevant to the obviousness analysis.

IV. Apex's "Subband" Arguments Rely on Mischaracterizations of the Proposed Combination and a Misunderstanding of *You*

Apex's "subband" arguments fail because they incorrectly assume Samsung's proposed combination requires the "subband" to exist in more than one subframe and because they misunderstand the teachings of *You*. Contrary to Apex's argument, POR 24-26, Samsung's proposed combination does *not* require the "subband" to exist in more than one subframe, making it irrelevant whether *You* teaches any subband existing in more than one subframe.

In Samsung's combination, "the duration of [*You*'s] paging occasion is set to be equal to *Liu*'s 'valid duration for the DCI configuration parameter,' which could be a single subframe containing multiple slots," and "the paging occasion includes one or more M-PDCCH monitoring occasions that have a periodicity and offset specified by *Liu*'s 'DCI occurrence occasions.'" Petition 33; Bims, ¶117. For the "subband" limitation, the proposed modification to *You* does not require changing its frequency-domain structure, including the subband configuration. Petition 33-34 (discussing substitution of some of *Liu*'s DCI configuration parameters for *You*'s time-domain paging configuration parameters). Thus, the resulting *You/Liu* combination can use the same subband configuration as that in *You*, which discloses the claimed "subband." Bims, ¶137.

Even if Samsung's combination required the "subband" to exist in more than one subframe (which it does not), Apex's argument would still fail because *You* teaches a "subband" existing in more than one subframe. Starting with Figure 6(a), Apex agrees with the Board's finding that it "illustrate[s] the MTC UE subbands as being a subset of a 'Legacy PDCCH' that covers frequencies above and below the MTC UE subbands, indicating that multiple subbands are available for use." DI 19-20; POR 5, 24-26. Apex's new argument quotes *You*'s statement that "several subbands for MTC may be provided for one subframe to multiplex MTC UEs as shown in Fig. 6(b)," to support its notion that *You*'s subbands are limited to a singular subframe. POR 25. But this quoted statement of *You* is only applicable to Figure 6(b), not Figure 6(a).

For Figure 6(a), *You* discloses "a sub-band (narrowband) for operating the MTC UE may always be located at the center (e.g., 6 center PRBs) of a cell as shown in FIG. 6(a)." Ex. 1005 ("*You*"), [176]. The central subband configuration in Figure 6(a) remains unchanged in the time domain and is applicable to more than one subframe. Accordingly, contrary to Apex's assertion, *You*'s Figure 6(a) discloses the claimed "first subband" even if it must exist in more than one subframe. DI 19-20; Petition 42-43; Bims, ¶137. Apex forfeited its ability to argue anything more is required when it did not repeat its preliminary response arguments about Figure 6(a).

You also discloses that the subband configuration in Figure 6(b) can be extended to more than one subframe. *You* discloses a coverage enhancement (CE) scheme to repeat the transmission of a signal in multiple subframes so that a UE can effectively receive the signal. Petition 22-23; *You*, [173]-[174], [178], [182]-[183]. In this scheme, the configurations disclosed in *You*'s Figures 6(a) and 6(b) would be repeated for multiple subframes. *You*, [176], [187]. Dr. Bims confirms this is the understanding of a POSA. Bims, ¶¶97-98, 148, 157; Ex. 2005, 68:13-69:18; *see also* Petition 51-52, 56; *You*, [174], [250] (Table 13).

V. Apex's Claim 4 Arguments Fail Because They Do Not Address the Proposed Combination

Apex facially disputes the obviousness of claim 4, but these arguments fail because they do not address Samsung's combination of *You* and *Liu*. POR 28-29. Apex cannot show nonobviousness by attacking Samsung's references individually. *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). Contrary to Apex's assertion that Samsung "only relies on *You*'s SIB to disclose 'the second radio signal,'" POR 29, Samsung expressly relies on the combination of *You* and *Liu* to teach the claimed "second radio signal."

According to the petition, "*You/Liu*'s SIB message constitutes the claimed 'second radio signal.'" Petition 53. In particular, "it would have been obvious to modify *You*'s SIB message (claimed 'second radio signal') to include *Liu*'s DCI configuration parameter." *Id.*, 54. A POSA would have been motivated to do so

and had a reasonable expectation of success in doing so for several reasons, *id.*, 52-53, none of which are addressed by Apex. Given that the DCI configuration parameter includes “a numerology to be used” and a “frequency domain resource unit”; the numerology corresponds to a “subcarrier spacing[]” (claimed “subcarrier spacing”); and the frequency domain resource unit specifies “a subband” (claimed “location of the first subband”), the combination results in what is claimed.

Petition 52-54.

Apex’s remaining arguments fail with those already addressed.

VI. Apex’s Arguments Against Other Claims Similarly Fail Because They Rely on Arguments Previously Addressed Above

Although Apex argues Samsung’s combinations do not render obvious various other limitations of the claims, these other arguments are premised on those already addressed. For example, Apex argues that the combination of *You* and *Liu* does not render obvious “the first signaling is used for determining scheduling information for the first radio signal” because Samsung allegedly fails to show how the combination discloses, teaches, or suggests “monitoring a first signaling in X time intervals.” POR 23-24. But Samsung has shown how the combination renders obvious “monitoring a first signaling in X time intervals.” Petition 37-38. Apex’s argument to the contrary fails for the reasons discussed above, and Apex’s “the first signaling is used for . . . ” argument likewise fails for the same reasons.

As another example, Apex argues that the combination of *You*, *Liu*, and *Mallick* does not render obvious “wherein any one of the X time intervals belongs to a first time window in time domain” because Samsung allegedly fails to show how the combination of *You* and *Liu* discloses, teaches, or suggests “time intervals.” POR 31-32. But Samsung has shown how the combination of *You* and *Liu* renders obvious “time intervals.” Petition 37-38, 45-51. Apex’s argument to the contrary fails for the reasons discussed above, and Apex’s “wherein any one of the X time intervals belongs to a first time window in time domain” argument likewise fails for the same reasons.

Apex’s further argument that *Mallick* does not rectify a deficiency of *You* with *Liu*, POR 31-32, is irrelevant because there is no such deficiency.

All of Apex’s remaining arguments, including its arguments for claims 6-10, 11-15, and 16-20, which mirror its arguments for claims 1-5, POR 35-36, likewise fail for the same reasons as those already addressed by Samsung in Sections II-V of this paper.

VII. 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 POSA. “To offer expert testimony from the perspective of a skilled artisan in a patent case . . . a witness must at least have ordinary skill in the art.” *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm’n*, 22 F.4th 1369,

1376-77 (Fed. Cir. 2022). Otherwise, “the witness’ opinions are neither relevant nor reliable.” *Id.* at 1377. By his own testimony, Mr. Gomez fails that test. *See Unified Patents, LLC v. AK Meeting IP LLC*, IPR2022-01142, Paper 20, at 19-20 (Jan. 5, 2024) (giving “no weight to the testimony” of patent owner’s witness as to claim construction and obviousness because he was “not evidenced to have ordinary skill in the art”).

Consistent with Samsung’s definition, Petition 22, Mr. Gomez asserts that a POSA would have had “at least a master’s degree in electrical engineering or a related field, and five years of work/research experience in the field of wireless networking.” Ex. 2004, ¶27. Mr. Gomez only has a “Bachelor’s degree in Electrical Engineering,” not a master’s degree, and accordingly lacks the requisite education to testify as an expert in this proceeding. Ex. 2004, ¶2; *see id.*, Ex. A, 2.

While Mr. Gomez asserts that “[s]omeone with less or different technical education but more relevant practical experience . . . could also be considered a POS[A],” he lacks sufficient additional relevant practical experience. *Id.*, ¶27. According to Mr. Gomez, only *two* of his engineering experiences involved wireless networking: his work for Philips (February 1997-December 1999) and ActSolar (August 2006-March 2009). Ex. 1040, 47:14-48:11; Ex. 2004, Ex. A, 3, 5. This experience does not make up for him lacking the requisite education. His testimony about this work experience makes clear that it only tangentially involved

wireless networking, at best. *See* Ex. 1040, 33:4-35:23, 38:17-39:25. And the total time for this experience is only about one year more than the baseline experience of someone with a master's degree, not enough time to *get* the additional master's degree, let alone enough to make up for lacking one.

Moreover, Mr. Gomez admitted that none of his engineering experiences involved 4G or 5G. *Id.*, 50:2-51:9. The work for Philips 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." Ex. 1040, 47:25-48:22.

Considering the level of discussion of 4G/LTE and 5G/NR in the '767 patent, 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 '767 patent.

Mr. Gomez's testimony also shows his lack of understanding of the relevant technology. His declaration contains admitted errors. *Compare* Ex. 2004, ¶39 ("4G/LTE systems have a single subcarrier spacing"), *with* Ex. 1041, 23:22-24:5 (agreeing that 4G/LTE supported two subcarrier spacings). And his deposition testimony shows his lack of understanding regarding the differences between 4G/LTE and 5G, despite making that a central tenet of certain opinions in his

declaration. *Compare* Ex. 2004, ¶38 (asserting that 4G and 5G systems “have various and substantial differences which make combination not possible”), *with* Ex. 1041, 25:2-13, 25:16-26:5, 28:14-17, 29:15-22, 29:23-30:4, 34:16-24, 39:23-40:22, 41:22-44:5 (unable to answer basic questions about 4G/LTE). He could not even answer fundamental questions about how technical specifications for the standards are adopted or identify the name of the entity that develops these technical specifications. Ex. 1041, 19:19-23:7. In comparison to Dr. Bims, who has a Ph.D. in Electrical Engineering and decades of relevant work experience, *see* Bims, ¶¶8-15; Ex. 2005, 18:12-21:19, Mr. Gomez’s experience (and credibility) pales.

VIII. Conclusion

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

Dated: February 29, 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 5,576.

Dated: February 29, 2024

By: /Joshua L. Goldberg/
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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 February 29, 2024, in its entirety on the following:

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