

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 IPR2023-00603
Patent No. 10,944,527

PETITIONER'S REPLY

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I. Introduction

In its Patent Owner's Response (Paper 13, "POR"), Apex offers ambiguous and unsupported constructions for two terms: (1) "the first radio signal is transmitted by K antenna port groups of the base station"; and (2) "time resource pool." Apex's constructions in effect seek to rewrite the claims and inject ambiguity into the terms. If the Board decides to construe the terms, it should reject Apex's constructions.

But the Board need not construe the terms to resolve this case because the prior art discloses the relevant disputed limitations in claim 1 in substantially the same way as the '527 patent's embodiments. Even applying Apex's constructions, the claim limitations [1c] "wherein the first radio signal is transmitted by K antenna port groups of the base station" and [1f] "the first signaling is used to determine a first time resource pool" read on the prior art. Apex's arguments to the contrary fail because they are improperly premised on limitations found in neither the claim language nor Apex's claim constructions. Accordingly, the constructions are irrelevant to the outcome, and the Board need not address them.

Apex premises all its remaining arguments for claim 1 and all other claims on its arguments for limitations [1c] and [1f], so the remaining arguments fail for the same reasons that Apex's arguments fail for limitations [1c] and [1f].

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 against the prior art, and find all challenged claims unpatentable.

II. Claim Construction

Apex proposes constructions for (1) “the first radio signal is transmitted by K antenna port groups of the base station”; and (2) “time resource pool.”¹ POR, 11-16. Contrary to Apex’s assertions, Samsung construed neither of these terms in its Petition. Pet. 8. Both of Apex’s constructions should be rejected because they lack support and introduce confusion to otherwise unambiguous claim language.

A. “the first radio signal is transmitted by K antenna port groups of the base station”

Apex argues that the term “the first radio signal is transmitted by K antenna port groups of the base station” should be construed to mean “the first radio signal is collectively transmitted by K groups of antenna ports of the base station.” POR, 11-14. Apex’s construction alters the claim language in two ways: (1) it adds the

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. 1037, 57-75.

word “collectively”; and (2) it rearranges “K antenna port groups” to be “K groups of antenna ports.”

1. Apex improperly adds the word “collectively” into the term

Apex’s construction is an improper attempt to inject language 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 Board should reject the construction for this reason alone.

The Board should also reject the construction because Apex identifies nothing in the patent that would justify adding the word “collectively.” Apex only cites column 3, lines 44-49, but those lines merely articulate a non-limiting example. POR, 13. Moreover, not only do they fail to provide any definition, but they also fail to use the word “collectively,” much less define the meaning of “the first radio signal is transmitted by K antenna port groups of the base station.”

Apex’s extrinsic evidence fares no better. Its purported dictionary definition of “group” (which is not evidence in this case because it has not been filed as an exhibit as required by Rule 42.63), POR, 12, at most defines the word “group” outside the context of the ’527 patent. The definition says nothing about whether

the claimed first radio signal must be “collectively” transmitted by K antenna port groups. Nor does Apex’s cited testimony of Samsung’s expert. POR, 11-13.

Apex’s expert’s conclusory testimony is likewise devoid of anything that could justify adding the word “collectively” to the claim.

No construction is necessary here because the meaning of the claim term is readily understandable from its ordinary meaning. *See Hill–Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1374 (Fed. Cir. 2014) (“Where the meaning of a claim term is clear, as it is here, we do not rewrite the claim to preserve its validity.”). Claim construction should provide clarity, not confusion. *See O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co., Ltd.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008). But confusion is all Apex’s construction brings.

It is unclear what meaning the word “collectively” adds to the claim. During his deposition, Apex’s expert testified that “collectively” means “together.” Ex. 1036, 30:5-6. But he refused to say whether either of those words means “simultaneously” or “at the same time,” instead saying things like “collectively” is “similar to at the same time”; “collectively” means being “treated” or “sent collectively as a unit” (which is circular); and he uses the word together “in the ordinary sense of the word ‘together,’ ‘collectively.’” *Id.*, 8:11-20, 32:11-18, 30:7:18.

One thing that was clear from the deposition of Apex's expert is that he himself does *not* have an "understanding of whether the first radio signal should be transmitted by K groups of antenna ports at the same time." Ex. 1036, 32:20-33:4. When asked about such an understanding, all he could say is "I don't think the patent – the '527 patent defines 'at the same time.' I don't think it describes it at all." *Id.*

Adding the word "collectively" only injects ambiguity into claim language that is clear on its face. Apex's construction should be rejected as improper, unsupported, and unhelpful.

2. Apex improperly changes the meaning of the term when replacing "K antenna port groups" with "K groups of antenna ports"

Apex's construction makes both "groups" and "ports" plural nouns, whereas the original language "antenna port groups" is a single plural noun, and there are K of them. The Board should reject Apex's construction because it contradicts the plain language of the claim and the specification.

Apex's construction appears to require that each group have a plurality of antenna ports. POR, 11-12. But the plain claim language is not so limited, and neither is the specification. To the contrary, the specification expressly states that "[i]n one embodiment, the antenna port group includes only one antenna port." Ex. 1001, 3:18-19.

The Board should reject Apex’s construction for excluding this embodiment.

“[T]here is a strong presumption against a claim construction that excludes a disclosed embodiment.” *In re Katz Interactive Call Processing Patent Litig.*, 639 F.3d 1303, 1324 (Fed. Cir. 2011). And none of Apex’s alleged extrinsic evidence overcomes this presumption. *Profectus Tech. LLC v. Huawei Techs. Co.*, 823 F.3d 1375, 1380 (Fed. Cir. 2016) (citation omitted) (extrinsic evidence may not be used to contradict intrinsic record).

B. “time resource pool”

Apex argues that the term “time resource pool” should be construed to mean “collection of time resources for a shared use.” POR, 14-16. The Board should reject this construction as unsupported and unhelpful.

Apex cites the specification and Samsung’s expert for the unremarkable proposition that the terms “time resource,” “time resource pool,” and “time resource sub-pool” have different meanings. POR, 14-15. But Apex cites only purported dictionary definitions and its own expert as supporting its definition of “time resource pool.” *Id.*, 15-16. Neither justifies the construction. The dictionary definitions are not evidence in this case because they have not been filed as exhibits as required by Rule 42.63. And Apex’s expert relies on nothing else to support his conclusory opinion. The Board should reject Apex’s construction for this reason.

Like the first term, no construction is necessary here because the meaning of the “time resource pool” is readily understandable from its ordinary meaning. *See Hill–Rom Servs.*, 755 F.3d at 1374. Claim construction should provide clarity, not confusion. *See O2 Micro Int’l Ltd.*, 521 F.3d at 1360. But confusion is all Apex’s construction brings.

It is unclear what, if any, “shared use” the construction requires. Indeed, despite Apex saying in its arguments against *Kim* (not in its claim construction discussion) that “[t]he shared use of the time resource pool described in the ’527 Patent refers to the shared collection of time resources for transmission by *all K antenna port groups*,” Apex’s expert took a different position during his deposition that “the time resource pool can be time resources shared for use by *one antenna port group*.” *Compare* POR, 22-23 (emphasis added), *with* Ex. 1036, 23:23-24:6 (emphasis added). The Board should reject Apex’s ambiguous construction.

III. Apex’s Arguments Against the Prior Art Fail for Claim 1

A. *Kim* discloses “wherein the first radio signal is transmitted by K antenna port groups of the base station” under Apex’s construction

Apex’s arguments against *Kim*’s disclosure of this claim limitation are premised entirely on its claim construction arguments for the limitation. POR, 19-21. Accordingly, if the Board rejects Apex’s claim construction arguments,

Apex's arguments against *Kim*'s disclosure fail. But even if the Board were to accept Apex's claim construction arguments, Apex's arguments against *Kim*'s disclosure would still fail because *Kim* discloses "wherein the first radio signal is transmitted by K antenna port groups of the base station" under Apex's construction. And, to the extent Apex premises its arguments on claim 1 requiring the first radio signal be transmitted by K antenna port groups *at the same time*, Apex's arguments fail because neither the plain language of claim 1 nor its construction require this, and it would be contrary to both the intrinsic record and the deposition testimony of Apex's expert.

1. *Kim* discloses this limitation under Apex's construction

Kim discloses Apex's construction, i.e., "the first radio signal is collectively transmitted by K groups of antenna ports of the base station." The Petition explains that *Kim* discloses the base station transmitting the CSI-RS (first radio signal) collectively using multiple antenna port groups. Pet. 17-20. Figures 5 and 7² of *Kim* show the CSI-RS being transmitted collectively over multiple antenna port groups using different time resources, just like the embodiment described in Figure 9 of the '527 patent. *Compare*:

² Each of *Kim*'s antenna port groups in Figures 5 and 7 includes a plurality of antenna ports, e.g., eight antenna ports. *Kim*, ¶¶[0055]-[0057], [0080]-[0083].

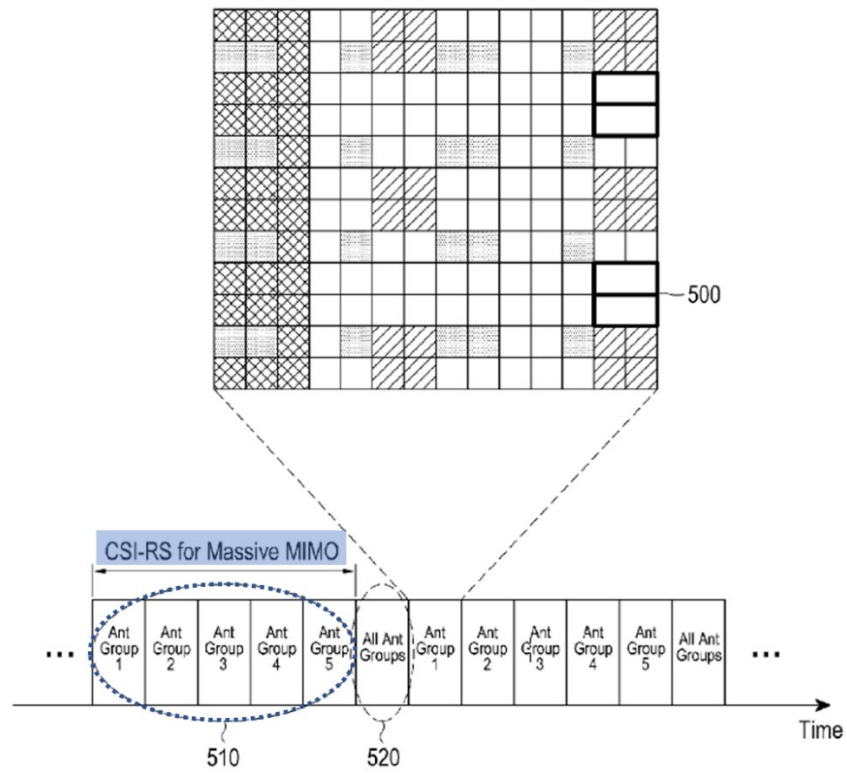


FIG.5

Kim, Fig. 5 (annotated), and

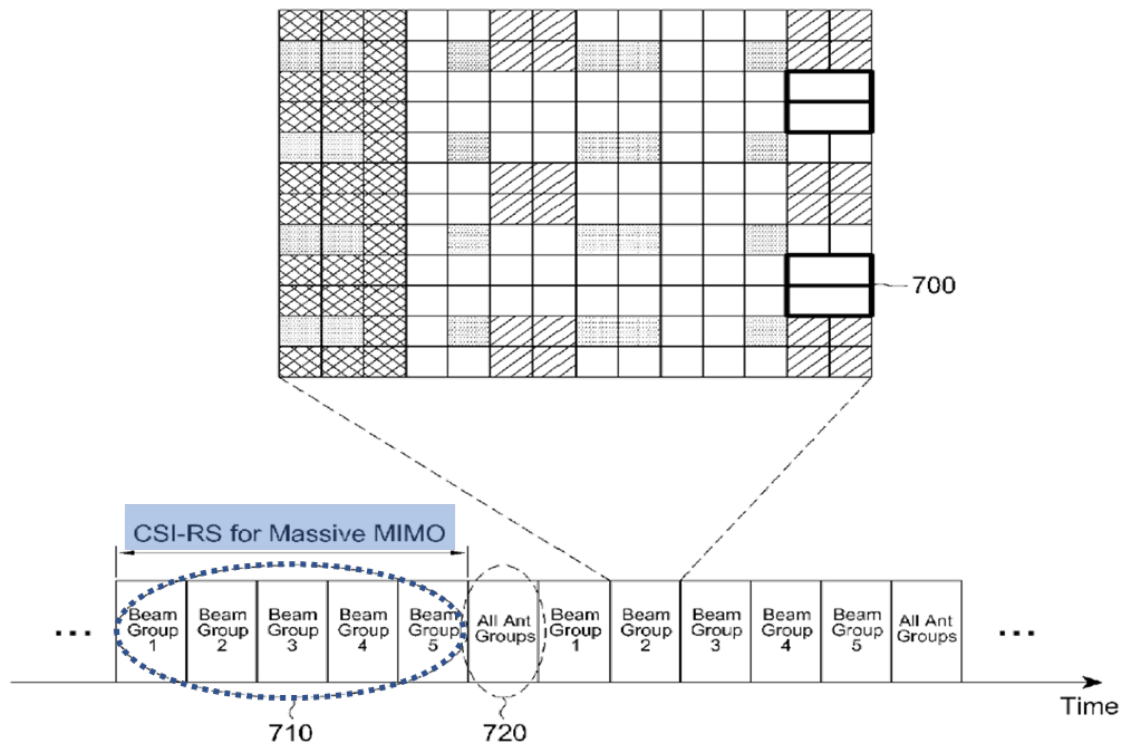


FIG. 7

Kim, Fig. 7 (annotated),

with:

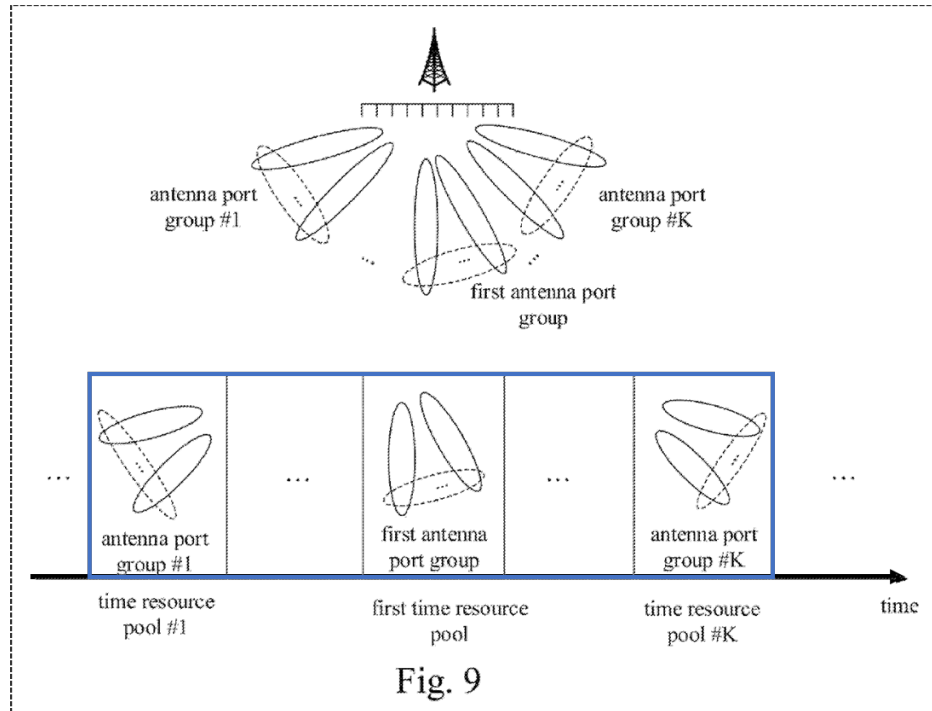


Fig. 9

Ex. 1001, Fig. 9 (annotated).

Apex wrongly argues that *Kim* describes transmitting “a different CSI-RS” from each of its antenna groups. POR, 21. *Kim* consistently describes the CSI-RS transmitted over different antenna port groups as the same signal. For example, the same reference number 510 is used to represent the “CSI-RSs 510 for massive MIMO” transmitted over different antenna port groups (e.g., antenna groups 1-5). *Kim*, Fig. 5, ¶[0060]; see also *id.*, Fig. 7 (“CSI-RS for massive MIMO” 710). *Kim* refers to the CSI-RS transmitted over multiple antenna port groups as “a reference signal,” that is, the same signal. See *Kim*, ¶[0022] (“In accordance with another aspect of the present invention, a method of transmitting **a reference signal** for generation of channel state information by an eNB in a wireless communication system is provided. The method includes grouping a plurality of transmission

antennas into a plurality of antenna groups, transmitting **the reference signal** to UEs in different time intervals or frequency intervals according to the antenna groups”), ¶[0023] (“In accordance with another aspect of the present invention, a method of transmitting **a reference signal** for generation of channel state information by an eNB in a wireless communication system is provided. The method includes grouping a plurality of beams transmitted through a plurality of transmission antennas into a plurality of beam groups, transmitting **the reference signal** to UEs in different time intervals or frequency intervals according to the beam groups.”), claims 39, 44. Thus, *Kim*’s transmission of the CSI-RS using multiple antenna port groups corresponds to the claimed “the first radio signal is collectively transmitted by K groups of antenna ports of the base station” even under Apex’s construction.

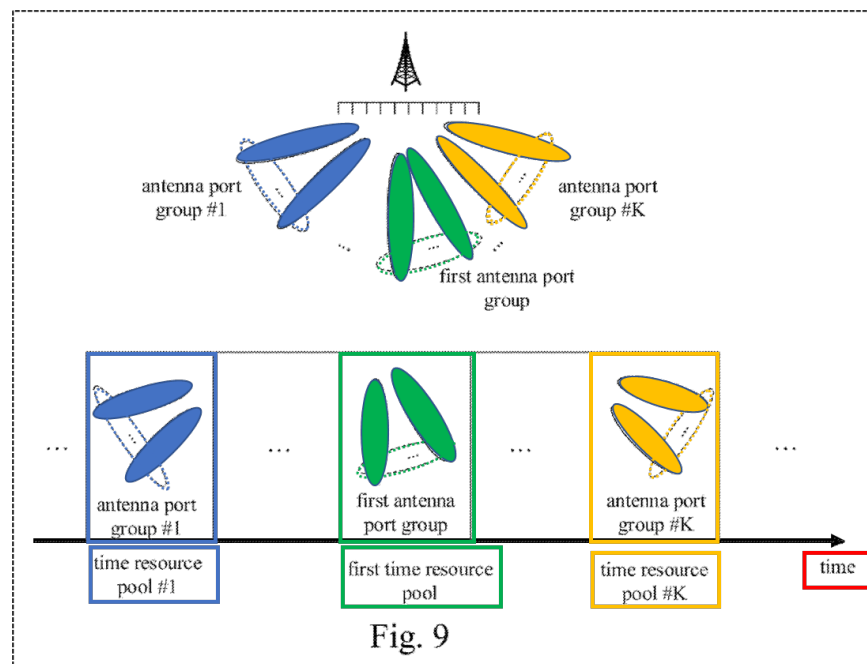
In contrast, when different signals are transmitted, *Kim* says so. For example, *Kim* distinguishes “CSI-RSs 510 for massive MIMO” from “CSI-RSs 520 for non-massive MIMO.” *Kim*, Fig. 5, ¶[0060]; *see also id.*, Fig. 7 (denoting CSI-RS for massive MIMO as 710 and CRS for all antenna groups as 720). While *Kim* refers to the signal transmitted over different antenna port groups as “a reference signal,” *Kim* refers to the signal transmitted for all antenna groups as “another reference signal,” *id.*, ¶¶[0022]-[0023], confirming that the CSI-RS transmitted using different antenna port groups is the same radio signal.

2. To the extent Apex premises its arguments on claim 1 requiring the first radio signal be transmitted by K antenna port groups *at the same time*, Apex’s arguments should be rejected

Apex argues, “Assuming that Kim’s CSI-RS may correspond to the claimed ‘first radio signal,’ however, Kim teaches away from the required collective transmission of the CSI-RS by K groups of antenna ports.” POR, 19. In support of this alleged teaching away, Apex argues “Kim teaches that one of multiple CSI-RSs each correspond to an antenna port group . . . and are each transmitted by a respective group of an allocated transmission time interval for that antenna group,” emphasizing text from *Kim* reciting “transmit CSI-RSs in the allocated transmission time intervals” and “each antenna group transmits a CSI-RS in each transmission interval.” POR, 19-20 (quoting *Kim*, ¶[0060]). If Apex is emphasizing the time intervals in an attempt to distinguish claim 1 based on some unstated requirement in claim 1 that the first radio signal be transmitted by K antenna port groups *at the same time*, the Board should reject Apex’s argument because neither the claim language nor Apex’s construction requires this. Moreover, adding this requirement to the claim would be contrary to both the intrinsic record and the deposition testimony of Apex’s expert.

Nothing in the claims or the specification requires the first radio signal be transmitted by K antenna port groups at the same time. To the contrary, the ’527 patent contemplates the first radio signal being transmitted by K antenna port

groups at different times. For example, after specifying that “the first radio signal is transmitted by K antenna port groups,” the ’527 patent says that “the time resources respectively corresponding to the K antenna port groups are orthogonal,” Ex. 1001, 1:57-58, 3:50-51, meaning that the first radio signal is transmitted by K antenna port groups over different time resources. *See also id.*, 17:3-5 (“The K antenna port groups respectively correspond to K time resource pools.”). Figure 9 shows separate time resources for K antenna port groups.



Ex. 1001, Fig. 9 (annotated).

The ’527 patent also describes an embodiment in which the first radio signal carries “K reference signal groups.” Ex. 1001, 3:44-46; *see also id.*, 14:31-32 (“the first radio signal includes the K reference signal groups”). The K reference signal groups are transmitted on resources “orthogonal in the time-frequency domain,”

meaning that the first radio signal is transmitted by K antenna port groups, each occupying different time-frequency resources. *Id.*, 3:16-17; *see also id.*, 3:25-30 (explaining that “the air interface resource(s) occupied by one reference signal is different from the air interface resource(s) occupied by another reference signal,” where the air interface resource(s) include “time domain resources”). Therefore, requiring the first radio signal be transmitted by K antenna port groups ***at the same time*** would be contrary to the ’527 patent. *See In re Katz*, 639 F.3d at 1324 (“there is a strong presumption against a claim construction that excludes a disclosed embodiment”).

Apex identifies nothing that could justify interpreting claim 1 to require the first radio signal be transmitted by K antenna port groups ***at the same time***. It cannot do so. When asked about his “understanding of whether the first radio signal should be transmitted by K groups of antenna ports at the same time,” Apex’s expert said “I don’t think the patent – the ’527 patent defines ‘at the same time.’ I don’t think it describes it at all.” Ex. 1036, 32:20-33:4.

B. Kim discloses “the first signaling is used to determine a first time resource pool” under Apex’s construction

Apex’s arguments against *Kim*’s disclosure of this claim limitation are premised entirely on its claim construction arguments for the limitation. POR, 21-23. Accordingly, if the Board rejects Apex’s claim construction arguments, Apex’s arguments against *Kim*’s disclosure fail. But even if the Board were to

accept Apex's claim construction arguments, Apex's arguments against *Kim*'s disclosure would still fail. *Kim* would still disclose "the first signaling is used to determine a first time resource pool" under Apex's construction. And, to the extent Apex premises its arguments on claim 1 requiring time resources shared by ***all K antenna port groups***, Apex's arguments fail because neither the plain language of claim 1 nor its construction require this, and it would be contrary to both the intrinsic record and the deposition testimony of Apex's expert.

1. *Kim* discloses this limitation under Apex's construction

Kim discloses Apex's construction, i.e., the first signaling is used to determine a "collection of time resources for a shared use." The Petition explains that *Kim* discloses the first signaling being used to determine a collection of time resources for a shared use by an antenna port group. Pet. 20-22. For example, *Kim* discloses that the control information includes "positions of time and frequency resources at which a CSI-RS for each antenna group is transmitted." *Kim*, ¶[0069]. Figure 5 of *Kim* shows a collection of time resources (subframes colored in **blue**) for a shared use by antenna group 1, a collection of time resources (subframes colored in **green**) for a shared use by antenna group 2, and so on.

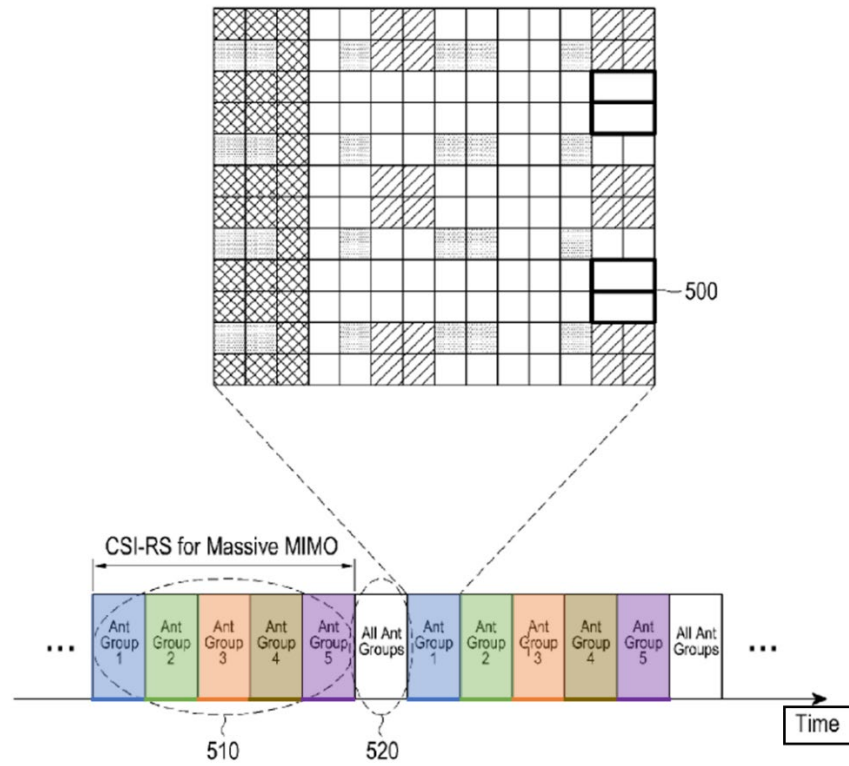


FIG.5

Kim, Fig. 5 (annotated).

Figure 7 of *Kim* shows a collection of time resources (subframes colored in **blue**) for a shared use by beam group 1, a collection of time resources (subframes colored in **green**) for a shared use by beam group 2, and so on.

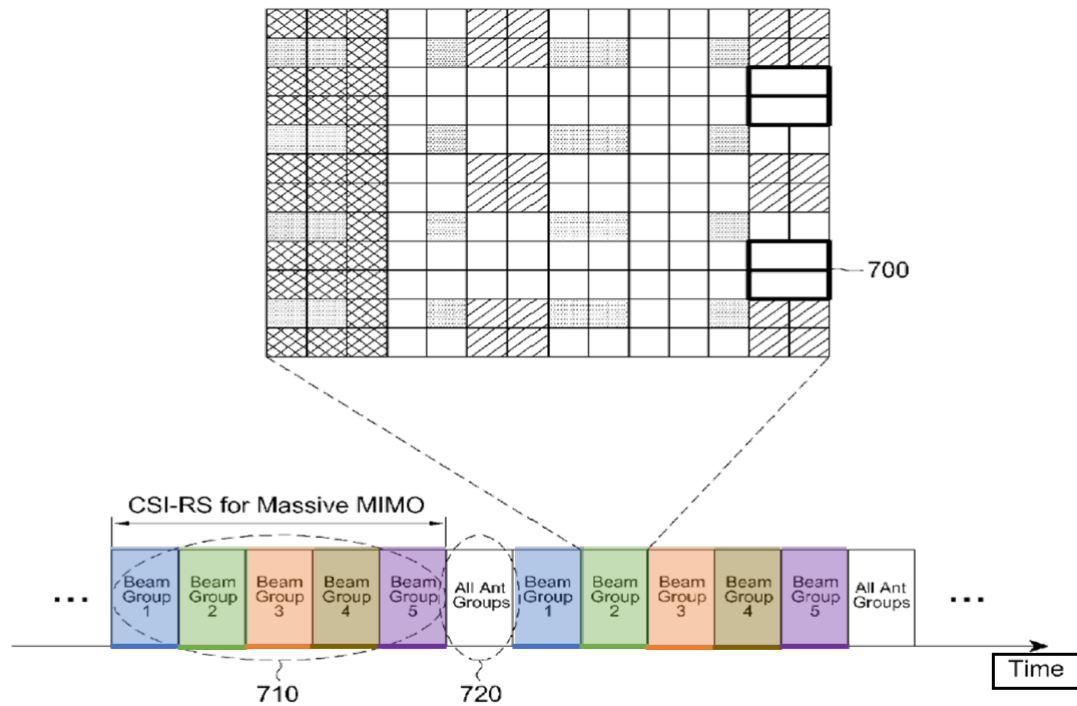


FIG. 7

Kim, Fig. 7 (annotated).

Apex argues that the separate time resources in *Kim* are not the claimed “time resource pool.” POR, 22. But there is no requirement that the “time resource pool” must be continuous time resources. The ’527 patent explicitly describes embodiments where the first time resource pool consists of time resources that are discontinuous. *See* Ex. 1001, Fig. 6 (showing first time resource pool consisting of discontinuous subframes #1, #3, #5, and #7), 16:7-10 (“the first time resource pool is consisted of subframes #1, #3, #5 and #7”). Further, such an interpretation would conflict with dependent claim 5, which recites that “the first time resource pool is discontinuous in time domain.” *See Baxalta Inc. v. Genentech, Inc.*, 972 F.3d 1341,

1345-46 (Fed Cir. 2020) (rejecting a narrow construction that would exclude dependent claims and thus be “inconsistent with the plain language of the claims”).

Thus, *Kim*’s separate time resources corresponding to each antenna port group fall squarely into the scope of the claimed “first time resource pool” even under Apex’s construction.

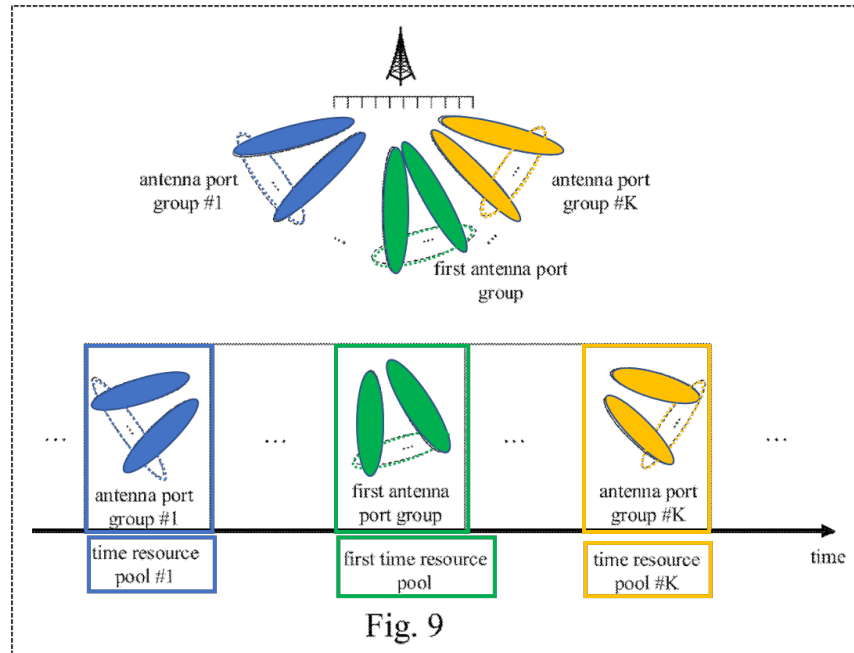
2. To the extent Apex premises its arguments on claim 1 requiring time resources shared by *all K antenna port groups*, Apex’s arguments should be rejected

Apex argues that *Kim* “contradicts” the “shared use” of the patent because allegedly the “shared use of the time resources pool described in the ’527 Patent refers to the shared collection of time resources for transmission by *all K antenna port groups*.” POR, 22-23 (emphasis added). But any argument based on this premise should be rejected because neither the plain language of the claims nor Apex’s construction requires this form of sharing. Moreover, requiring this form of sharing would be contrary to both the intrinsic record and the deposition testimony of Apex’s expert.

The claims do not define a “time resource pool” as being shared by all K antenna port groups. Instead, claim 1 recites that “at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group,” where the first antenna virtualization vector is “available to the base station in the first time resource pool,” and the second

antenna virtualization vector is “available to the user equipment in the first time resource pool.” Thus, claim 1 at most recites a potential association between the “first time resource pool” and “first antenna port group,” not all K antenna port groups. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (citation omitted) (“[T]he context of the surrounding words of the claim . . . must be considered in determining the ordinary and customary meaning of those terms.”).

The '527 patent also describes a “time resource pool” shared by an antenna port group, not all K antenna port groups. For example, the '527 patent explains that the “K antenna port groups respectively correspond to K time resource pools, and the first time resource pool is a time resource pool corresponding to the first antenna port group.” Ex. 1001, 17:3-6. Figure 9 shows that time resource pool #1 is shared by antenna port group #1, time resource pool #K is shared by antenna port group #K, and so on. *See In re Katz*, 639 F.3d at 1324 (“there is a strong presumption against a claim construction that excludes a disclosed embodiment”).



Ex. 1001, Fig. 9 (annotated).

In addition, the '527 patent touts the advantages of associating the first time resource pool with the first antenna port group. For example, after reciting a method substantially similar to claim 1, the '527 patent states “the foregoing method is advantageous in that, by associating the first time resource pool with the first antenna port group, the UE can quickly determine[] the location of the first time resource pool in the time domain by the index of the first antenna port group in the K antenna port groups.” Ex. 1001, 2:3-8. The '527 patent continues, “the foregoing method is advantageous in that, by associating the first time resource pool with the first antenna port group, the UE can quickly determine the antenna virtualization vectors which used for receiving radio signal transmitted on the first time resource pool by the location of the first time resource pool in the time

domain.” *Id.*, 2:9-14. These advantages are derived directly from the correspondence between a time resource pool and an antenna port group. The stated benefits would be eliminated if the first time resource pool is shared by all K antenna port groups, as proposed by Apex.

Apex identifies nothing that could justify interpreting claim 1 to require a shared collection of time resources for transmission by *all* K antenna port groups. It cannot do so. Apex’s expert took the position during his deposition that “the time resource pool can be time resources shared for use by *one antenna port group*.” Ex. 1036, 24:3-6 (emphasis added). The Board should reject any attempt by Apex to argue otherwise.

C. *Kim, Zhang, and Kang* render obvious “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool” and “the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool”

Apex argues the proposed combination does not disclose elements [1h] and [1i]: “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool” and “the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool” because the cited references do not disclose the claimed “first time resource pool.” POR, 23-24. Apex’s arguments fail for the same reasons explained in Section III.B—*Kim* discloses the claimed “first

time resource pool.” And Apex has waived its ability to present further arguments for elements [1h] and [1i]. Paper 11, Scheduling Order, at 9.

IV. Apex’s Arguments Against the Prior Art for the Other Claims Fail for the Same Reasons

Apex argues claims 2-20 are not obvious over any combination of the prior art for the same reasons discussed above. POR, 24-31. Thus, Apex’s arguments for these claims fail for at least the reasons discussed above, and Apex has waived its ability to present further arguments for the claims. Paper 11, Scheduling Order, at 9. As explained in the Petition, the combinations of *Kim* and *Zhang*; *Kim*, *Zhang*, and *Kang*; *Kim*, *Zhang*, and *Park*; and *Kim*, *Zhang*, *Kang*, and *Park* render obvious claims 2-20.

V. 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 multiple-input multiple-output (MIMO) technology in telecommunications systems.” Pet. 9-10. The Board agreed with Samsung’s definition but left out the language “at least.” Paper 10, Institution Decision, at 9. The Board’s modified definition is acceptable to Samsung. Apex proposed a different definition that leaves out the requirement for experience with MIMO technology and requires only general experience with

telecommunications systems. POR, 10 (“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.”). Apex’s expert does not meet either party’s definition of a POSITA.

Samsung’s definition for the level of ordinary skill should be accepted because it is consistent with the ’527 patent and the asserted prior art. The ’527 patent is concerned with solving problems in a massive MIMO system, a specialized area in telecommunications systems. Ex. 1001, 1:37-44. The term MIMO refers to the multiple-antenna technology used to improve communication quality and increase cell throughput. *Id.*, 1:24-28, 1:37-39; *Kim*, ¶[0006]; *Kang*, ¶[0002]. There is no dispute that the claimed invention is related to a MIMO system. The claimed “antenna port groups,” “first antenna virtualization vector,” and “second antenna virtualization vector” are all techniques intrinsically linked to the multi-antenna technology in the MIMO systems. *See* Ex. 1001, 2:34-38. The ’527 patent also says that the claimed “first radio signal” is transmitted by a transceiver 1101 that includes a “MIMO detector.” *Id.*, 18:33-41, 19:23-25.

The asserted prior art also concerns MIMO technology. *Kim*, ¶¶[0016]-[0017] (“an aspect of the present invention is to provide a method and an

apparatus for transmitting a reference signal ... in a Multiple Input Multiple Output (MIMO) transmission and reception.”); *Zhang*, Abstract (describing port virtualization for multiple CRS antenna ports); *Kang*, ¶¶[0001]-[0006], [0165]; *Park*, ¶¶[0004], [0109], [0281].

Samsung’s definition is further supported by the fact that the named inventor of the ’527 patent was well-versed in MIMO technology. The sole inventor Xiaobo Zhang had a master’s degree in electrical engineering and published multiple conference papers on MIMO technology before the filing date of the ’527 patent. *See* Ex. 1032; Ex. 1033; Ex. 1034.

Apex does not provide any explanation for not requiring any experience with MIMO technology in its definition of ordinary skill in the art. POR, 10. A person with general experience with telecommunications systems but lacking MIMO experience would not be able to properly appreciate the subject of the claimed invention. Apex’s definition is improper.

Apex’s expert does not meet Samsung’s definition because he has no work experience with MIMO technology and he only has a bachelor’s degree in electrical engineering. 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, Mr. Gomez could not point to any specific work experience. Ex. 1035, 51:10-52:3. Mr. Gomez also

admitted “I haven't actually specifically built a product related to those technologies.” *Id.*, 52:2-3.

Even applying Apex’s definition of a POSITA, which is wrong, Mr. Gomez is not qualified as 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, under 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 telecommunications system (also referred to as a new radio (NR) system) of the ’527 patent. *See* Ex. 1001, 1:29-33, Fig. 13 (describing an NR system). 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. 1035, 47:14-48:11; Ex. 2004, Ex. A, 3, 5. His testimony about this work experience makes clear that it only tangentially involved wireless networking, at best. *See* Ex. 1035, 33:4-35:23, 38:17-39:25. None of his engineering experiences involved 5G or 4G. *Id.*, 50:2-51:9. His work for Phillips involved 2G cellular network communications and “local-area-network-type technologies,” and his 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 5G or even 4G 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 '527 patent.

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* Ex. 1002, Appendix A; Ex. 2005, 18:16-19:14. Dr. Kakaes's testimony is thus more credible and should be given more weight than Mr. Gomez's testimony.

VI. 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 5,014.

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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