

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., and
SAMSUNG ELECTRONICS AMERICA, INC.,

Petitioners,

v.

APEX BEAM TECHNOLOGIES, LLC,

Patent Owner.

Patent No. 10,944,527
Filing Date: June 3, 2019
Issue Date: March 9, 2021

Inventor: Leeobo Zhang
Title: METHOD AND DEVICE USED FOR WIRELESS COMMUNICATION
IN UE AND BASE STATION

PATENT OWNER'S PRELIMINARY RESPONSE

Case No. IPR2023-00603

TABLE OF CONTENTS

	<u>Page(s)</u>
I. INTRODUCTION	1
II. THE '527 PATENT	2
III. THE ALLEGED PRIOR ART	5
A. Kim	5
B. Zhang	8
C. Kang	9
D. Park	11
IV. CLAIM CONSTRUCTION	12
V. LEVEL OF ORDINARY SKILL IN THE ART	12
VI. PETITIONER HAS NOT DEMONSTRATED A REASONABLE LIKELIHOOD OF SUCCESS FOR THE GROUNDS ADVANCED IN THE PETITION, AND THE PETITION SHOULD BE DENIED	12
A. Claims 1-20 are Not Obvious Over Kim in Any Combination with Zhang, Kang, or Park	15
1. Independent Claim 1	15
a. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the first signaling is used to determine a first time resource pool,” as Required by Claim 1	15
b. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group,” as Required by Claim 1	18

c.	Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool,” as Required by Claim 1	23
d.	Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool,” as Required by Claim 1	24
2.	Independent Claims 6, 11, and 16.....	26
3.	Dependent Claims 2-5, 7-10, 12-15, and 17-20.....	26
VII.	THE PETITION SHOULD BE DENIED IN THE DISCRETION OF THE DIRECTOR UNDER 35 U.S.C. § 314(A)	27
A.	The Parallel District Court Litigation and the Petition Involve the Same Parties	28
B.	The District Court Litigation Involves Substantially the Same Claims, Grounds, Arguments, and Evidence	29
C.	Proximity of the District Court’s Trial Date	29
D.	Significant Investment and Petitioner’s Delay in Filing the Petition.....	31
E.	No Stay of the Parallel District Court Litigation	32
F.	Other Factors Favor Discretionary Denial	33
VIII.	PETITIONER’S COPYCAT EXPERT DECLARATION IS ENTITLED TO NO WEIGHT	34
IX.	CONCLUSION.....	34

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>Apex Beam Techs. LLC v. Samsung Elecs. Co., Ltd., et al.</i> , Case No. 2:22-cv-00188-JRG (E.D. Tex. Feb. 6, 2023)	30, 32
<i>Apple Inc. v. Fintiv, Inc.</i> , IPR2020-00019, Paper 11 (P.T.A.B. Mar. 20, 2020)	27, 29
<i>Apple, Inc. v. Contentguard Holdings, Inc.</i> , IPR2015-00355, Decision Denying Institution of <i>Inter Partes</i> Review, Paper 9 at 9-10 (P.T.A.B. June 26, 2015)	13
<i>Broadcom Corp. v. Emulex Corp.</i> , 732 F.3d 1325 (Fed. Cir. 2013)	14
<i>Cisco Sys., Inc. v. Ramot at Tel Aviv Univ. Ltd.</i> , IPR2020-00122, Paper 15 (P.T.A.B. May 15, 2020)	29, 31
<i>Edward LifeSciences Corp. v. Evalve, Inc.</i> , IPR2019-01479, Paper 7 (P.T.A.B. Feb. 26, 2020)	30
<i>Gen. Plastic Indus. Co. v. Canon Kabushiki Kaisha</i> , IPR2016-01357, Paper 19, at 16-17 (P.T.A.B. Sept. 6, 2017) (precedential)	28
<i>Graham v. John Deere Co. of Kansas City</i> , 383 U.S. 1 (1966)	12
<i>Innogenetics, N.V. v. Abbott Lab 'ys.</i> , 512 F.3d 1363 (Fed. Cir. 2008)	14
<i>Intell. Ventures II v. FedEx Corp.</i> , No. 2:16-cv-00980-JRG, Dkt. 141 (E.D. Tex. Oct. 24, 2017)	32, 33
<i>Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.</i> , 821 F.3d 1359 (Fed. Cir. 2016)	13

<i>KSR Int’l Co. v. Teleflex Inc.</i> , 550 U.S. 398 (2007).....	13
<i>Lennon Image Techs., LLC v. Macy’s Retail Holdings, Inc.</i> , 2:13-CV-00235-JRG, 2014 WL 4652117 (E.D. Tex. Sept. 18, 2014)	32
<i>Los Angeles Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v.</i> <i>Eli Lilly & Co.</i> , 849 F.3d 1049 (Fed. Cir. 2017)	14
<i>Next Caller Inc. v. TrustID, Inc.</i> , IPR2019-00961, -00962, Paper 10, at 8-16 (P.T.A.B. Oct. 16, 2019)	30
<i>NHK Spring Co. v. Intri-Plex Techs., Inc.</i> , IPR2018-00752, Paper 8 (P.T.A.B. Sept. 12, 2018).....	28
<i>Pers. Web Techs., LLC v. Apple, Inc.</i> , 848 F.3d 987 (Fed. Cir. 2017)	13
<i>Samsung Elecs. Am., Inc. v. Uniloc 2017 LLC</i> , IPR2019-01218, Paper 7 (P.T.A.B. Jan. 7, 2020)	30
<i>Samsung Elecs. Co., Ltd. et al., v. Apex Beam Techs. LLC</i> , IPR2023-00599, Paper 5 (P.T.A.B. March 21, 2023)	29
<i>Stratoflex, Inc. v. Aeroquip Corp.</i> , 713 F.2d 1530 (Fed. Cir. 1983)	13
<i>Supercell Oy v. Gree, Inc.</i> , IPR2020-00513, Paper 11 (P.T.A.B. June 24, 2020)	30
<i>In re Van Os</i> , 844 F.3d 1359 (Fed. Cir. 2017)	14
<i>Xerox Corp. v. Bytemark, Inc.</i> , IPR2022-00624, Paper No. 9 (P.T.A.B. Aug. 24, 2022) (designated precedential Feb. 10, 2023, Paper 12)	34

Statutes

U.S.C. § 314(b)(1).....	30
35 U.S.C. § 314(a)	<i>passim</i>
35 U.S.C. § 316(a)(11).....	30

Other Authorities

37 C.F.R. § 42.65(a).....	34
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LIST OF EXHIBITS

Exhibit No.	Description of Document
2001	Defendants' Patent L.R. 3-3 Invalidity Contentions and Subject Matter Ineligibility Contentions, <i>Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd. et al.</i> , Case No. 2:22-cv-00188-JRG, served March 2, 2023
2002	Order Denying Motion to Stay Pending <i>Inter Partes</i> Review, Dkt. 55, <i>Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:22-cv-00188-JRG (E.D. Tex. June 14, 2023)
2003	Redline Comparison of the Declaration of Apostolos Kakaes, Ph.D. (Ex. 1003) to the Petition

I. INTRODUCTION

On February 28, 2023, Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) submitted a petition (Paper 1, “Petition” or “Pet.”) to institute *inter partes* review (“IPR”) of U.S. Patent No. 10,944,527 (Ex. 1001, “the ’527 Patent”), challenging claims 1-12 (the “Challenged Claims”). The Petition asserts that the Challenged Claims are rendered obvious by (i) U.S. Patent Application Publication No. 2013/0182594 to Kim et al., published July 18, 2013 (“Kim”) in view of International Publication No. WO 2015/199414 to Zhang et al., published December 30, 2015 (“Zhang”); (ii) Kim in view of Zhang and U.S. Patent Application Publication No. 2015/0195025 to Kang et al., published July 9, 2015 (“Kang”); (iii) Kim in view of Zhang and U.S. Patent Application Publication No. 2019/0387501 to Park et al., published December 19, 2019 (“Park”); and (iv) Kim in view of Zhang, Kang, and Park. Pet. at 9. However, the Board should deny the Petition for at least two reasons: (1) the Petitioner fails to identify how several elements of the Challenged Claims are rendered obvious by any combination of Kim, Zhang, Kang, and Park; and (2) the Board should exercise its discretion to deny the Petition under 35 U.S.C. § 314(a).

Moreover, the Board should not credit the expert testimony of Dr. Kakaes because his expert Declaration merely repeats the language of the Petition. *See generally* Ex. 2003.

II. THE '527 PATENT

The '527 Patent discloses and claims “a multiple antenna transmission method in a wireless communication system.” Ex. 1001, at 1:19-20.

The '527 Patent describes why such a method is necessary in view of the “the urgent problem” of “signaling overhead of wireless resource dynamic scheduling,” as in the prior art:

[A]n increase in the number of cell users will lead to a large amount of signaling overhead for dynamic scheduling of wireless time-frequency resources. The signaling overhead of wireless resource dynamic scheduling is an urgent problem to be solved in massive MIMO system.

Id. at 1:37-44.

The exemplary embodiments of the '527 Patent to address the aforementioned problem have several technical advantages including that the UE can quickly determine the location of the first time resource pool and quickly determine the antenna virtualization vectors for receiving a radio signal by associating the first time resource pool with the first antenna port group:

In one embodiment, 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.

In one embodiment, 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.

Ex. 1001, 2:3-14.

As noted in the '527 Patent's advantages, the first time resource pool is directly associated with the claimed "first antenna port group":

In Embodiment 9, the first antenna port group is one of the K antenna port groups respectively correspond to K different beam groups. 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, 17:1-7.

At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. *The first antenna virtualization vector is an available antenna virtualization vector of the base station in the first time resource pool. The second antenna virtualization vector is an available antenna virtualization vector of the UE in the first time resource pool.*

Ex. 1001, 17:27-34.

In the context of time resources in units of subframes, the '527 Patent describes that the first time resource pool requires *multiple subframes*:

In Embodiment 6 , subframes #1- #8 are candidate subframes for transmitting a second radio signal , and the ***first signaling***, by the form of bitmap, uses 10101010 to ***indicate that the first time resource pool is consisted of subframes #1, #3, #5 and #7***, the second signaling, by the form of bitmap, uses 0101 to indicate that the subframe #3 and #7 in the first time resource pool {#1, #3, #5, #7} consisted of the first time sub-pool, which means the UE receives the second radio signal on the subframes #3 and #7.

Ex. 1001, 16:3-12.

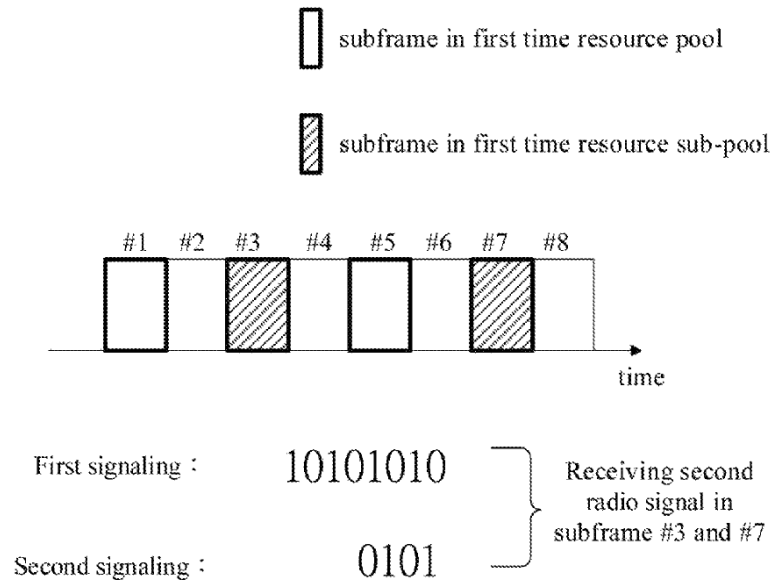


Fig. 6

Ex. 1001, Fig. 6.

The '527 Patent describes two antenna virtualization vectors that are available in the first time resource pool, where the first vector is for transmitting the first signaling from the base station and the second vector is for receiving the first

signaling at the UE.

At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. *The first antenna virtualization vector is an available antenna virtualization vector of the base station in the first time resource pool. The second antenna virtualization vector is an available antenna virtualization vector of the UE in the first time resource pool.*

Ex. 1001, 17:27-34; *see also id.* at 18:44-51.

At least one first antenna virtualization vector, and the second antenna virtualization vector is associated with the first antenna port group. *The first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to a target receiver of the first signaling in the first time resource pool.*

Id. at 19:56-64.

III. THE ALLEGED PRIOR ART

A. Kim

Kim “relates to a wireless mobile communication system. More particularly, the present invention relates to a method for effectively transmitting and receiving a Channel State Information-Reference Signal (CSI-RS) and measuring interference.”

Ex. 1004, [0003].

Kim discloses the problem it tries to solve as follows:

The resources of time, frequency, and transmission power are limited in a mobile communication system. Therefore, an increase in the quantity of resources allocated to a reference signal may decrease the quantity of resources that can be allocated to transmission of traffic channels and thus may reduce the absolute quantity of transmitted data. In this case, although the performances of channel measurement and estimation may be improved, the reduced absolute quantity of transmitted data may rather decrease the performance of the entire system throughput. Therefore, in order to obtain an optimum performance in view of the entire system throughput, a proper distribution between resources for the reference signal and resources for transmission of traffic channels is necessary.

Id. at [0008].

An exemplary embodiment of Kim is:

[A] method of transmitting a reference signal for generation of channel state information by an evolved Node B(eNB) in a wireless communication system is provided. The method includes transmitting a first reference signal to a plurality of User Equipments (UES), receiving channel state information generated based on the first reference signal from the plurality of UEs, selecting candidate UEs to which wireless resources are to be allocated and transmitting second reference signals to the selected candidate UEs, receiving channel state information generated based on the second reference signals from the candidate UEs, and selecting final UEs, to which wireless resources are to be allocated, from the candidate UEs based on the channel state information generated based on the second reference signals, and transmitting control information for data reception to the selected final UEs.

Id. at [0018].

One aspect of the way in which Kim seeks to solve the technical problem described above of resource allocation is through an “antenna group [that] transmits a CSI-RS in *each* transmission interval by using *one* CSI-RS resource.” In other words, a CSI-RS is transmitted over a single subframe (*i.e.*, as opposed to multiple subframes or a resource pool).

Referring to FIG.5, the CSI-RSs for massive MIMO are transmitted at different time intervals according to the respective antenna groups in FIG. 4. In FIG. 5, *one time interval corresponds to one subframe* in an LTE/LTE-A system. The subframe is a time unit used for resource allocation in an LTE/LTE-A system and corresponds to 1 msec. For example, antenna groups 1 through 5 in FIG. 4 are allocated transmission time intervals and *transmit CSI-RSs in the allocated transmission time intervals*. In FIG. 4, since each antenna group includes 8 transmission antennas, *each antenna group transmits a CSI-RS in each transmission interval by using one CSI-RS resource* (as indicated by reference numeral 500 of FIG. 5)...

Id. at [0060].

FIG. 7 illustrates a grouping of a plurality of beams into five beam groups, wherein *each beam group is transmitted in an individual time interval*, according to an exemplary embodiment of the present invention.

Referring to FIG. 7, five beam groups 710 are illustrated, each antenna group includes 8 transmission antennas, and each antenna group *transmits CSI-RSs by using one CSI-RS resource* 700 for 8 ports in each transmission interval. Although *CSI-RSs for massive MIMO are transmitted using a particular CSI-RS resource within a subframe* as indicated by reference numeral 720, CSI-RSs for a large

number of beams may be transmitted by performing transmission for different beam groups according to subframes.

Id. at [0082]-[0083].

B. Zhang

Zhang “relates to a field of mobile communication systems, and more particularly to a method and apparatus for reference signal transmitting and receiving in active antenna systems.” Ex. 1005 at [1].

Zhang seeks to solve “the coverage problem of CRS signal and physical broadcast channel (PBCH)/physical downlink control channel (PDCCH)/physical downlink shared channel (PDSCH) demodulated based on CRS and the problem of measurement for radio resource management (RRM) in the active antenna systems.” *Id.* at [24].

Zhang’s exemplary embodiments “provide reference signal transmitting and receiving devices in the active antenna system. With these devices, the coverage problem of CRS signal and physical broadcast channel (PBCH)/physical downlink control channel (PDCCH)/physical downlink shared channel (PDSCH) demodulated based on CRS and the problem of measurement for radio resource management (RRM) in the active antenna systems may be avoided.” *Id.* at [25]. For example, “[a] reference signal transmitting method in an active antenna system includes: setting number of Cell-specific Reference Signal (CRS) ports and transmitting a notification

of number of the CRS ports, wherein the number of the CRS ports is larger than 1; precoding a reference signal with a different precoding vector for each of the CRS ports, wherein number of elements in the precoding vector is equal to number of transmit antennas, which correspond to the CRS ports; and transmitting the precoded reference signal for the each of the CRS ports over a corresponding frequency-time resource. *Id.* at [26]-[30].

C. Kang

Kang “relates to a wireless communication system and, more specifically, to a method and apparatus for virtualizing an antenna.” Ex. 1006 at [0001].

Kang seeks to solve the technical problem of performance deterioration due to channel aging as beamforming resolution increases:

In enhanced wireless communication systems, Support for more accurate beam forming is considered. As beamforming resolution increases, performance deterioration due to channel aging may be aggravated. Furthermore, as a moving speed of a UE increases, a channel that the UE suffers remarkably changes and thus performance deterioration due to channel aging may become serious.

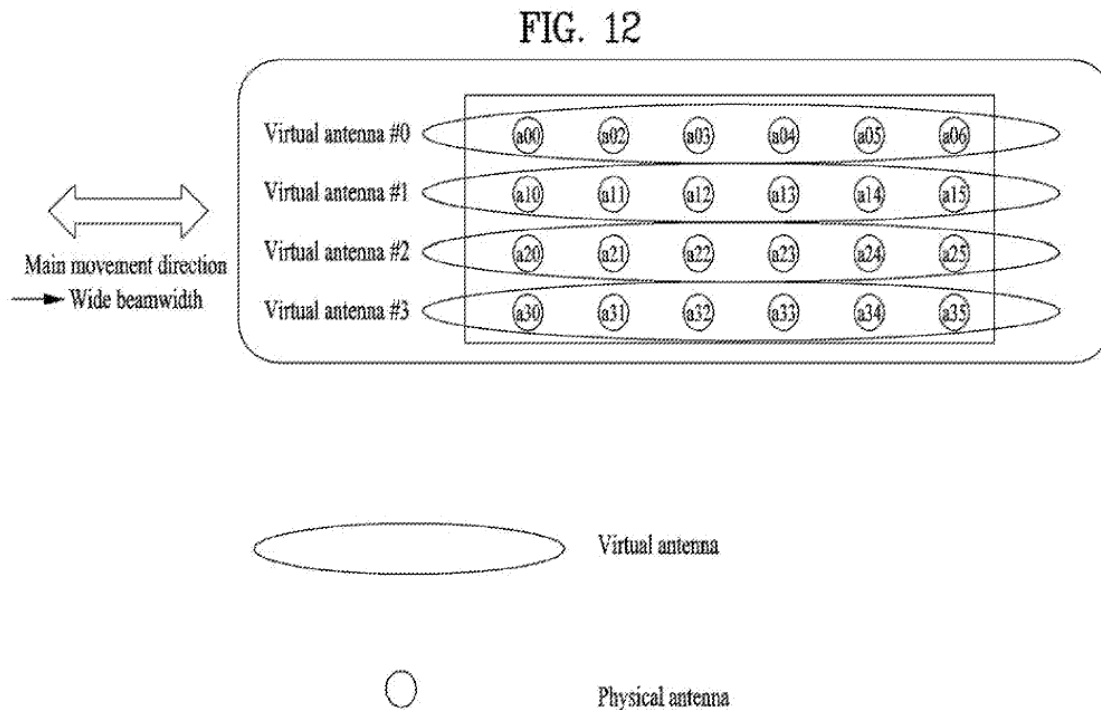
An object of the present invention devised to solve the problem lies in a method and apparatus for virtualizing an antenna to minimize performance deterioration due to channel aging even when channel aging occurs.

Id. at [0004]-[0005].

One aspect of the way in which Kang seeks to solve the technical problem

above is through “communicating with a base station using the one or more virtual antennas, wherein one or more physical antennas mapped to one virtual antenna are determined on the basis of a direction of movement of the terminal.” *Id.* at [0007].

Such virtual antennas do not overlap and each virtual antenna corresponds to only one antenna port group for the UE’s antenna configuration, as shown in Fig. 12 and related disclosure of Kang.



Id., at Fig. 12.

FIG. 12 illustrates an antenna virtualization method with respect to a two-dimensional antenna configuration according to the present invention.

In the example of FIG. 12, it is assumed that a UE has a two-dimensional antenna configuration in which 24

physical antennas are arranged in four columns and 6 rows. The UE may be a vehicle and the physical antennas may be arranged outside the vehicle.

Id. at [0139]-[0140].

D. Park

Park “relates to a wireless communication system and, more particularly, to a method for transmitting and receiving Downlink control Information (DCI) in a wireless communication system and an apparatus for implementing the method.”

Ex. 1007 at [0002].

Park seeks to solve the technical problem of “enabl[ing] a base station to adjust payload sizes to be identical when transmitting different DCI formats, thereby minimizing the number of times for a user equipment (UE) to perform blind detection.” *Id.* at [0005].

Park’s exemplary embodiment includes “a method for transmitting Downlink Control Information (DCI) by a base station in a wireless communication system, the method including: allocating a resource for data transmission; transmitting in a first DCI format, DCI including scheduling information about the allocated resource; and transmitting data according to the scheduling information, wherein the first DCI format is transmitted in a payload size, which is adjusted to be identical to a payload size of a pre-configured second DCI format, through a Common Search Space (CSS) when the DCI includes scheduling information about multicast/broadcast data, and

wherein the first DCI format is transmitted in a payload size, which is not adjusted, through a UE-specific Search Space (USS) when the DCI includes scheduling information about unicast data.” *Id.* at [0008].

IV. CLAIM CONSTRUCTION

For the purposes of this Preliminary Response only, Patent Owner believes that claim construction is not required to resolve any issues. Pet. at 8.

V. LEVEL OF ORDINARY SKILL IN THE ART

For the purposes of this Preliminary Response only, Patent Owner utilizes Petitioner’s proposed level of skill in the art: “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. More work experience can compensate for less education, and *vice versa*.” Pet. at 9-10 (citations omitted).

VI. PETITIONER HAS NOT DEMONSTRATED A REASONABLE LIKELIHOOD OF SUCCESS FOR THE GROUNDS ADVANCED IN THE PETITION, AND THE PETITION SHOULD BE DENIED

The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) so-called secondary considerations where in evidence. *Graham v.*

John Deere Co. of Kansas City, 383 U.S. 1, 17-18 (1966); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983).

The Board has held that a failure to identify the differences between the claimed subject matter and the prior art is fatal to an obviousness challenge. *See, Apple, Inc. v. Contentguard Holdings, Inc.*, IPR2015-00355, Decision Denying Institution of *Inter Partes* Review, Paper 9 at 9-10 (P.T.A.B. June 26, 2015) (denying institution for failure to identify the differences between the claimed subject matter and the prior art).

In arriving at an obviousness determination, the Board must sufficiently explain and support the conclusions that the prior-art references disclose all the elements recited in the Challenged Claims and a relevant, skilled artisan not only could have made, but would have been motivated to combine all the prior art references in the way the patent claims and reasonably expected success. *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017). That is, even if all the claim elements are found across a number of references, an obviousness determination must consider whether a person of ordinary skill in the art would have the motivation to combine those references. *Intelligent Bio-Sys., Inc. v. Illumina*

Cambridge Ltd., 821 F.3d 1359, 1368 (Fed. Cir. 2016); *Los Angeles Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v. Eli Lilly & Co.*, 849 F.3d 1049, 1067 (Fed. Cir. 2017) (vacating and remanding an obviousness determination, in part, because the Board did not make factual finding as to whether there was an apparent reason to combine all three prior art references to achieve the claimed invention and whether a person of skill in the art would have had a reasonable expectation of success from such a combination). This combinability determination, as supported by an articulated motivation to combine, requires a plausible rationale as to why those prior art references would have worked together. *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1335 (Fed. Cir. 2013). Absent some articulated rationale, a “common sense” finding is no different than the conclusory statement “would have been obvious.” *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017). Of additional importance, “knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references. . . .” *Innogenetics, N.V. v. Abbott Lab’ys.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008).

A. Claims 1-20 are Not Obvious Over Kim in Any Combination with Zhang, Kang, or Park

1. Independent Claim 1

a. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the first signaling is used to determine a first time resource pool,” as Required by Claim 1

Claim 1 of the '527 Patent recites “the first signaling is used to determine a first time resource pool.” Kim in combination with Zhang and Kang neither discloses nor renders this claim limitation obvious, as Petitioner asserts. Pet. at 20-22.¹

Petitioner only relies on Kim to disclose this claim limitation. Pet. at 20-22. Specifically, Petitioner argues that this claim limitation is disclosed by Kim’s “CSI-RSs for each antenna port group [that] are transmitted over separate time resources (subframes).” Pet. at 21. However, Petitioner’s characterization of Kim, and the portions of Kim that Petitioner cites, is misleading. For example, Petitioner cites to Kim, [0060], [0082]-[0083] reproduced below, which actually indicate that an “antenna group transmits a CSI-RS in *each* transmission interval by using *one* CSI-RS resource.” In other words, a CSI-RS is transmitted over only one subframe.

Referring to FIG.5, the CSI-RSs for massive MIMO are transmitted at different time intervals according to the respective antenna groups in FIG. 4. In FIG. 5, *one time*

¹ The Petition cites the expert Declaration of Dr. Kakaes (Ex. 1002, ¶¶ 105-107) for its assertion that Kim in combination with Zhang and Kang renders obvious these limitations, but this portion of the Kakaes Declaration merely repeats the Petition and should, therefore, be given no weight. *See infra* Sec. VIII; Ex. 2003, ¶¶ 105-107.

interval corresponds to one subframe in an LTE/LTE-A system. The subframe is a time unit used for resource allocation in an LTE/LTE-A system and corresponds to 1 msec. For example, antenna groups 1 through 5 in FIG. 4 are allocated transmission time intervals and *transmit CSI-RSs in the allocated transmission time intervals*. In FIG. 4, since each antenna group includes 8 transmission antennas, *each antenna group transmits a CSI-RS in each transmission interval by using one CSI-RS resource* (as indicated by reference numeral 500 of FIG. 5)...

Ex. 1004, [0060].

FIG. 7 illustrates a grouping of a plurality of beams into five beam groups, wherein *each beam group is transmitted in an individual time interval*, according to an exemplary embodiment of the present invention.

Referring to FIG. 7, five beam groups 710 are illustrated, each antenna group includes 8 transmission antennas, and each antenna group *transmits CSI-RSs by using one CSI-RS resource* 700 for 8 ports in each transmission interval. Although *CSI-RSs for massive MIMO are transmitted using a particular CSI-RS resource within a subframe* as indicated by reference numeral 720, CSI-RSs for a large number of beams may be transmitted by performing transmission for different beam groups according to subframes.

Id., at [0082]-[0083].

Petitioner also improperly interprets the claimed “time resource pool,” and opts to ignore the term “pool” entirely. For example, Petitioner’s expert notes that “the first time resource pool” is “the time resource corresponding to the first antenna port group.” Ex. 1002, ¶130. This omission obfuscates the fact that Kim cannot

disclose the claimed “time resource *pool*” because it only discloses one subframe in which to transmit a CSI-RS. In the context of time resources in units of subframes, the '527 Patent describes that a time resource pool requires *multiple subframes*:

In Embodiment 6 , subframes #1- #8 are candidate subframes for transmitting a second radio signal , and the *first signaling*, by the form of bitmap, uses 10101010 to *indicate that the first time resource pool is consisted of subframes #1, #3, #5 and #7*, the second signaling, by the form of bitmap, uses 0101 to indicate that the subframe #3 and #7 in the first time resource pool {#1, #3, #5, #7} consisted of the first time sub-pool, which means the UE receives the second radio signal on the subframes #3 and #7.

Ex. 1001, 16:3-12.

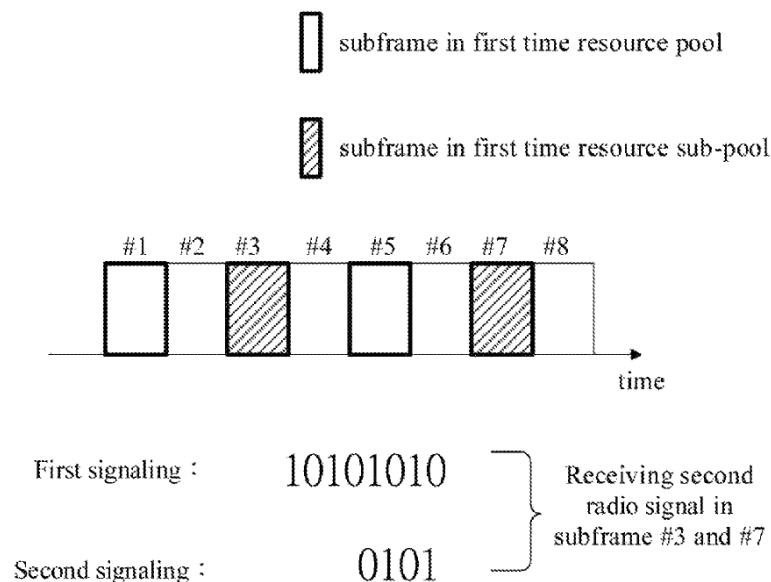


Fig. 6

Ex. 1001, Fig. 6. Precluding the time resource pool from having multiple subframes,

as in Kim, would completely eliminate the embodiment described above in Fig. 6 and other embodiments in the '527 Patent which describe sub-pools (i.e., a subset of subframes from the first resource pool) that receive the second radio signal.

Therefore, Kim in combination with Zhang and Kang does not render obvious this claim limitation.

b. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group,” as Required by Claim 1

Claim 1 of the '527 Patent recites “at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group.” Kim in combination with Zhang and Kang neither discloses nor renders this claim limitation obvious, as Petitioner asserts. Pet. at 23-34.²

Petitioner provides no basis for Kim, Zhang, or Kang disclosing, teaching, or suggesting an association between antenna virtualization vectors and antenna port groups, let alone the first antenna port group.

As a preliminary matter, Petitioner argues that “[i]f the Board determines that

² The Petition cites the expert Declaration of Dr. Kakaes (Ex. 1002, ¶¶ 108-128) for its assertion that Kim in combination with Zhang and Kang renders obvious these limitations, but this portion of the Kakaes Declaration merely repeats the Petition and should, therefore, be given no weight. *See infra* Sec. VIII; Ex. 2003, ¶¶ 108-128.

[1g] requires **both** a first antenna virtualization vector and a second antenna virtualization vector, *Kim* in view of *Zhang* and *Kang* renders this limitation obvious” because it tacitly admits that *Kim* in view of *Zhang* (without *Kang*) cannot obviate the claim limitation with two antenna virtualization vectors. Pet. at 23.

Petitioner argues that Patent Owner’s infringement contentions do not require both the first antenna virtualization or second antenna virtualization vector. Pet. at 23. This is not true. The claim language and specification of the ’527 Patent is clear that these two antenna virtualization vectors are complementary. The first vector is for transmitting the first signaling from the base station and the second vector is for receiving the first signaling at the UE. The two are complementary although at least one has to be associated with the first antenna port group.

At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. ***The first*** antenna virtualization vector is an available antenna virtualization vector of the ***base station in the first time resource pool. The second*** antenna virtualization vector is an available antenna virtualization vector of the ***UE in the first time resource pool.***

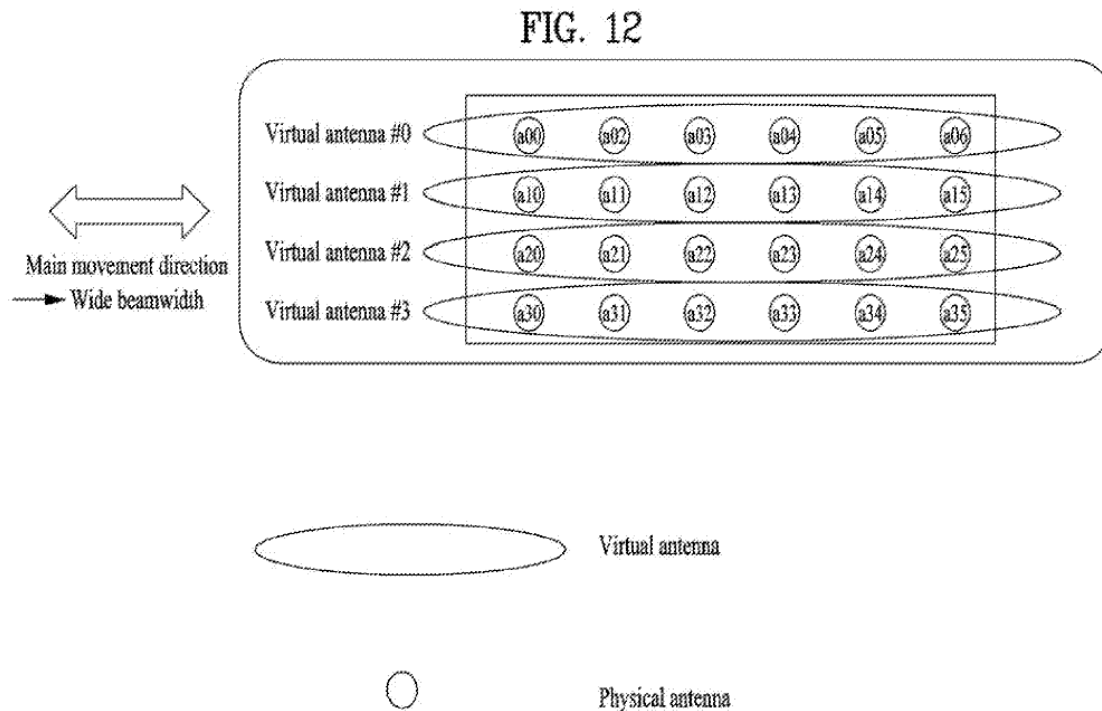
Ex. 1001, 17:27-34; *see also id.* at 18:44-51.

At least one first antenna virtualization vector, and the second antenna virtualization vector is associated with the first antenna port group. ***The first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling*** in the first time resource pool; the ***second antenna virtualization vector is an***

antenna virtualization vector available to a target receiver of the first signaling in the first time resource pool.

Id. at 19:56-64.

But Petitioner’s argument about Patent Owner’s infringement theory obfuscates Petitioner’s lack of support for “associat[ion] with the first antenna port group” in either Kim, Zhang, or Kang. In fact, Petitioner resorts to conclusory statements such as, “*Kang*’s antenna virtualization vector would be associated with the first antenna port group because *Kang*’s antenna virtualization vector would be used to receive signals transmitted over the first antenna port group,” which merely points to the same conclusory statement in Petitioner’s expert declaration. Pet. at 31 (citing Ex. 1002, ¶124). But Kang, like Kim, does not disclose both first and second antenna virtualizations that could be associated with the first antenna port group. Instead, Kang’s Fig. 12 and the accompanying portion of Kang’s specification discloses that none of the alleged antenna virtualization vectors (“virtual antennas”) overlap to disclose “*at least* one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group,” which implies a possibility of both the first and second antenna virtualization vectors being associated with the first antenna port group. The disclosure in Kang does not contain this possibility.



Ex. 1006, Fig. 12.

FIG. 12 illustrates an antenna virtualization method with respect to a two-dimensional antenna configuration according to the present invention.

In the example of FIG. 12, it is assumed that a UE has a two-dimensional antenna configuration in which 24 physical antennas are arranged in four columns and 6 rows. The UE may be a vehicle and the physical antennas may be arranged outside the vehicle.

Id. at [0139]-[0140].

As noted above, the '527 Patent describes that the first antenna virtualization vector is a “vector of the base station in the first time resource pool.” Fig. 12 and its accompanying disclosure in Kang only show vectors for the UE.

At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. ***The first*** antenna virtualization vector is an available antenna virtualization vector of the ***base station in the first time resource pool***. ***The second*** antenna virtualization vector is an available antenna virtualization vector of the ***UE in the first time resource pool***.

Ex. 1001, 17:27-34; *see also id.* at 18:44-51.

Moreover, Petitioner fails to overcome the hurdle raised in Section VI.A.1.a, namely, that neither of Petitioner's references disclose a first time resource pool, which is directly tied to the claimed "first antenna port group":

In Embodiment 9, the first antenna port group is one of the K antenna port groups respectively correspond to K different beam groups. 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, 17:1-7.

At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. ***The first*** antenna virtualization vector is an available antenna virtualization vector of the ***base station in the first time resource pool***. ***The second*** antenna virtualization vector ***is an available antenna virtualization vector of the UE in the first time resource pool***.

Ex. 1001, 17:27-34.

Because neither Kim, Zhang, nor Kang discloses the claimed “first resource pool,” they cannot now obviate this claim limitation requiring “associat[ion] with the first antenna port group,” which implicates both first and second antenna virtualization vectors with the first time resource pool.

Therefore, Kim in combination with Zhang and Kang does not render obvious this claim limitation.

c. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool,” as Required by Claim 1

Claim 1 of the ’527 Patent recites “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool.” Kim in combination with Zhang and Kang neither discloses nor renders this claim limitation obvious, as Petitioner asserts. Pet. at 34.³

As noted above in Section VI.A.1.a, Kim does not disclose the claimed “first resource pool,” and therefore cannot disclose, teach, or suggest “the first antenna virtualization vector is an antenna virtualization vector available to the base station

³ The Petition cites the expert Declaration of Dr. Kakaes (Ex. 1002, ¶¶ 129-130) for its assertion that Kim in combination with Zhang and Kang renders obvious these limitations, but this portion of the Kakaes Declaration merely repeats the Petition and should, therefore, be given no weight. *See infra* Sec. VIII; Ex. 2003, ¶¶ 129-130.

in the first time resource pool.” Petitioner does not even attempt to relate its allegedly disclosed “first antenna virtualization vector” to a first time resource pool. Petitioner merely makes the conclusory statement that “because the combination of *Kim* and *Zhang* renders obvious that the precoding scheme applied by the base station includes a precoding vector (first antenna virtualization vector), the combination thus also renders obvious that the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool,” which is a direct copy of the equally conclusory statement made in Petitioner’s expert declaration. Pet. at 34; *see also* Ex. 1002, ¶130. Aside from Petitioner’s conclusory statement, *Kim* and *Zhang* are both silent on any “antenna virtualization vector available to the user equipment in the first time resource pool,” as required by this claim limitation.

Therefore, *Kim* in combination with *Zhang* and *Kang* does not render obvious this claim limitation.

d. Kim in Any Combination with Zhang, Kang, or Park Does Not Disclose “the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool,” as Required by Claim 1

Claim 1 of the ’527 Patent recites “the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time

resource pool.” Kim in combination with Zhang, Kang, or Park neither discloses nor renders this claim limitation obvious, as Petitioner asserts. Pet. at 35-36.⁴

As with Section VI.A.1.c, Petitioner does not attempt to relate its allegedly disclosed “second antenna virtualization vector” to a first time resource pool. Petitioner merely makes the conclusory statement that “*Kang*’s second antenna virtualization vector used to form a reception beam would be available to the user equipment in the first time resource pool (the time resource corresponding to the first antenna port group) because that second antenna virtualization vector would be used to receive the reference signal transmitted by the first antenna virtualization vector in the first time resource pool,” which is a direct copy of the equally conclusory statement made in Petitioner’s expert declaration. Pet. at 35; *see also* Ex. 1002, ¶132. Aside from Petitioner’s conclusory statement, the specifications of Kim and Kang are both silent on any “antenna virtualization vector available to the user equipment in the first time resource pool,” as required by this claim limitation.

Therefore, Kim in combination with Zhang and Kang does not render obvious this claim limitation.

⁴ The Petition cites the expert Declaration of Dr. Kakaes (Ex. 1002, ¶¶ 131-132) for its assertion that that Kim in combination with Zhang and Kang renders obvious these limitations, but this portion of the Kakaes Declaration merely repeats the Petition and should, therefore, be given no weight. *See infra* Sec. VIII; Ex. 2003, ¶¶ 131-132.

2. Independent Claims 6, 11, and 16

Claim 6 recites “[a] method for multi-antenna transmitting in a base station” that mirrors the claim limitations of Claim 1, which recites “[a] method for multi-antenna transmission in a user equipment.” In other words, Claim 6 discloses a method from the perspective of the base station that is in communication with the UE in Claim 1. For at least the same reasons as Claim 1, any combination of Kim, Zhang, Kang, or Park fails to render obvious Claim 6.

Claim 11 recites “[a] user equipment (UE) for multi-antenna transmission,” which is the apparatus claim of Claim 1. For at least the same reasons as Claim 1, any combination of Kim, Zhang, Kang, or Park fails to render obvious Claim 11.

Independent Claim 16 recites “[a] base station equipment for multi-antenna transmission” that mirrors the claim limitations of Claim 11, which recites “[a] user equipment (UE) for multi-antenna transmission.” In other words, Claim 16 discloses the base station equipment that is in communication with the UE in Claim 11. For at least the same reasons as Claim 11, any combination of Kim, Zhang, Kang, or Park fails to render obvious Claim 16.

3. Dependent Claims 2-5, 7-10, 12-15, and 17-20

Claims 2-4 are dependent on Claim 1, Claims 6-8 are dependent on Claim 5, Claim 10 is dependent on Claim 9, and Claim 12 is dependent on Claim 11. Therefore, Claims 2-5, 7-10, 12-15, and 17-20 are not rendered obvious by any

combination of Kim, Zhang, Kang, or Park for at least the same reasons as Claims 1, 6, 11, and 16 respectively.

VII. THE PETITION SHOULD BE DENIED IN THE DISCRETION OF THE DIRECTOR UNDER 35 U.S.C. § 314(A)

Based on Petitioner's reasons regarding § 314(a), the Board should exercise its discretion to deny this Petition.

The circumstances of the parallel District Court Litigation necessitate denial of the Petition under the Board's precedent, as every factor considered in relation to efficiency, fairness, and the merits supports denial. *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11, at 6 (P.T.A.B. Mar. 20, 2020) (precedential) (considering (a) "whether the petitioner and the defendant in the parallel proceeding are the same party"; (b) "overlap between issues raised in the petition and in the parallel proceeding" (c) "proximity of the court's trial date to the Board's projected statutory deadline for a final written decision"; (d) "investment in the parallel proceeding by the court and the parties"; (e) "whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted"; and (f) "other circumstances that impact the Board's exercise of discretion, including the merits.")).

As set forth below, these factors collectively demonstrate that efficiency and integrity of the AIA are best served by denying review. First, the Petitioner is the Defendant in the parallel proceeding. *See infra* Section VII.A. Second, the

Challenged Claims are all at issue in the District Court Litigation, and Petitioner has raised identical arguments for invalidity there. *See infra* Section VII.B. Third, trial in the District Court Litigation is set for June 24, 2024, four months earlier than the projected statutory deadline for a Final Written Decision of this Petition in October 9, 2024. *See infra* Section VII.C. Fourth, the parties (and Patent Owner in particular) have invested significant resources on developing legal and factual issues of validity and infringement in the District Court Litigation and will have invested substantially more resources before any decision on this Petition. *See infra* Section VII.D. Fifth, the Court has already denied a stay pending this Petition. *See infra* Section VII.E. Finally, no other factors favor institution. *See infra* Section VII.F.

Accordingly, the Board should exercise its discretion under § 314(a) and deny the Petition because institution of this proceeding would not be consistent with the objective of the AIA to “provide an effective and efficient alternative to District Court litigation.” *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8, at 20 (P.T.A.B. Sept. 12, 2018) (quoting *Gen. Plastic Indus. Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19, at 16–17 (P.T.A.B. Sept. 6, 2017) (precedential)).

**A. The Parallel District Court Litigation and the Petition
Involve the Same Parties**

As noted in Patent Owner’s Mandatory Notice, there exists a parallel District

Court Litigation between the same parties regarding the same subject patent (the '527 Patent). *Samsung Elecs. Co., Ltd. et al., v. Apex Beam Techs. LLC*, IPR2023-00599, Paper 5 at 3 (P.T.A.B. March 21, 2023); Pet. at 81-82. Accordingly, this factor weighs in favor of discretionary denial.

B. The District Court Litigation Involves Substantially the Same Claims, Grounds, Arguments, and Evidence

This Petition is co-extensive with invalidity arguments that Petitioner has already raised in the District Court Litigation. Ex. 2001, at 60-62. “In at least these ways, the parallel proceedings would duplicate effort. This is an inefficient use of Board, party, and judicial resources and raises the possibility of conflicting decisions.” *Cisco Sys., Inc. v. Ramot at Tel Aviv Univ. Ltd.*, IPR2020-00122, Paper 15 at 10 (P.T.A.B. May 15, 2020). Accordingly, this fact weighs strongly in favor of discretionary denial.

For this reason, denial of institution under § 314(a) is appropriate because the Petition “includes the same or substantially the same claims, grounds, arguments, and evidence as presented in the parallel [District Court] proceeding.” *Fintiv*, IPR2020-00019, Paper 11, at 12.

C. Proximity of the District Court’s Trial Date

The proximity of the District Court Litigation’s trial date to the Board’s projected statutory deadline for a Final Written Decision strongly weighs in favor of

discretionary denial.

The parties' trial is scheduled for June 24, 2024. Exhibit 1017 (Docket Control Order, Dkt. 37, *Apex Beam Techs. LLC v. Samsung Elecs. Co., Ltd., et al.*, Case No. 2:22-cv-00188-JRG (E.D. Tex. Feb. 6, 2023)). Pursuant to 35 U.S.C. §§ 314(b)(1) and 316(a)(11), the projected statutory deadline for a Final Written Decision of this Petition is October 24, 2024.⁵ As the District Court's trial will be four months before the projected statutory deadline, this factor weighs strongly in favor of denying institution. *See Supercell Oy v. Gree, Inc.*, IPR2020-00513, Paper 11 at 10-12 (P.T.A.B. June 24, 2020) (denying institution where the jury trial was scheduled to conclude approximately ten months before the statutory deadline); *Edward LifeSciences Corp. v. Evalve, Inc.*, IPR2019-01479, Paper 7, at 6-13 (P.T.A.B. Feb. 26, 2020) (denying institution where jury trial would conclude more than nine months before a final decision would be due); *Samsung Elecs. Am., Inc. v. Uniloc 2017 LLC*, IPR2019-01218, Paper 7, at 7-10 (P.T.A.B. Jan. 7, 2020) (denying institution where jury selection was scheduled for approximately six months before trial in the Board proceeding would conclude); *Next Caller Inc. v. TrustID, Inc.*,

⁵ Petitioner incorrectly states that "[a] FWD is anticipated in August 2024, about one month after trial ends." Pet. at 80. Pursuant to U.S.C. § 314(b)(1), an Institution Decision is due, three months after this Preliminary Response, on October 24, 2023. Pursuant to 35 U.S.C. § 316(a)(11), a Final Written Decision is due one year after an Institution Decision, on October 24, 2024.

IPR2019-00961, -00962, Paper 10, at 8-16 (P.T.A.B. Oct. 16, 2019) (denying institution where trial was scheduled to conclude “several months,” before a final decision would be due); *Cisco Sys., Inc.*, IPR2020-00122, Paper 15 at 8 (“Because the trial date is substantially earlier than the projected statutory deadline for the Board’s final decision, this factor weighs in favor of discretionary denial.”).

Petitioner does not contest that the proximity of the trial favors denial of institution. Thus, this factor also weighs in favor of discretionary denial.

D. Significant Investment and Petitioner’s Delay in Filing the Petition

The parties’ investment in the parallel proceeding weighs in favor of discretionary denial.

In the District Court Litigation, the Court has already filed a Docket Control Order (Dkt. 37), Discovery Order (Dkt. 38), and Protective Order (Dkt. 44). Discovery is also well under way. The parties have already exchanged initial disclosures, infringement contentions pursuant to P.R. 3-1 and invalidity contentions pursuant to P.R. 3-3, and a trial date is set for June 24, 2024, which is less than a year away. Ex. 1025.

As noted above, the two references used in the Petition (Lee and Chen) and Petitioner’s corresponding arguments significantly overlap with the claims, references, arguments, and evidence in the District Court Litigation. Petitioner

further fails to offer any explanation why the Board should review the same claims on the same grounds which will already have been adjudicated by the District Court based on the parties' investment. Thus, the parties' and the Court's substantial investment in this proceeding weighs in favor of denial of institution under this factor.

E. No Stay of the Parallel District Court Litigation

There is no stay of the parallel District Court Litigation, and Petitioner's previous motion to stay the case pending *inter partes* reviews, including this *inter partes* review, was denied. Ex. 2002, Order Denying Motion to Stay Pending Inter Partes Review, Dkt. 55, *Apex Beam Techs. LLC v. Samsung Elecs. Co., Ltd., et al.*, Case No. 2:22-cv-00188-JRG (E.D. Tex. June 14, 2023). Even if the Petition was instituted and Petitioner filed a motion to stay the District Court Litigation again, prejudice, tactical disadvantage to Patent Owner, the stage of the litigation and the lack of potential simplification would weigh strongly against such a motion. *See Lennon Image Techs., LLC v. Macy's Retail Holdings, Inc.*, 2:13-CV-00235-JRG, 2014 WL 4652117, at *1 (E.D. Tex. Sept. 18, 2014); *see Intell. Ventures II v. FedEx Corp.*, No. 2:16-cv-00980-JRG, Dkt. 141 at 4-5 (E.D. Tex. Oct. 24, 2017) ("The Court agrees that the Parties have already invested substantial effort and resources during discovery and in preparing claim construction briefing. . . . These circumstances weigh against staying this case").

Moreover, a stay would not decrease the burden on the Court and the parties since the instituted IPRs cover only 4 out of at least 18 references that Petitioner raised in the District Court Litigation for obviousness, and challenges under § 112 and § 101. Ex. 2001, at 48-49, 60-62, 70-74. *Intell. Ventures II*, No. 2:16-cv-00980-JRG, Dkt. 141 at 3-4 (“[T]he instituted IPRs only cover a narrow slice of the invalidity arguments Defendants have raised in this case. For example, Defendants have argued that the ’715 Patent is invalid under § 102 with respect to at least eight references . . . under § 103 with respect to at least twenty-six combinations . . . under § 112 [], and under § 101.”).

Accordingly, it would be unlikely for the Court to hold that a stay would streamline the litigation and this factor supports denial of institution.

F. Other Factors Favor Discretionary Denial

Petitioner does not present a strong case on the merits, further supporting denial of institution. *See supra* Section VI. Petitioner also does not identify any other factors which weigh against discretionary denial. Pet. at 79-81.

Thus, when viewing the factors together, the Petition should be denied in the Director’s discretion under 35 U.S.C. § 314(a).

VIII. PETITIONER’S COPYCAT EXPERT DECLARATION IS ENTITLED TO NO WEIGHT

“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.” 37 C.F.R. § 42.65(a). Here, the Declaration of Dr. Kakaes is almost entirely a recitation of the Petition, except for the Introduction, Qualifications Background, Materials Considered, and Legal Standards sections. *See generally* Ex. 2003. Because Dr. Kakaes provides nearly no independent analysis aside from copying the attorney arguments in the Petition and does not disclose the underlying facts or data upon which his opinions are based, his opinion should be entitled to no weight. *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper No. 9 (P.T.A.B. Aug. 24, 2022) (designated precedential Feb. 10, 2023, Paper 12) (denying institution and rejecting a conclusory and unsupported expert declaration that repeated portions of the Petition verbatim.).

IX. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board deny institution of the Petition in its entirety.

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned PATENT OWNER'S PRELIMINARY RESPONSE specified in 37 C.F.R. § 42.24 has 7,054 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft Word for Office 365.

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