

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NETGEAR, INC.,
Petitioner,

v.

WSOU INVESTMENTS, LLC d/b/a BRAZOS LICENSING AND
DEVELOPMENT,
Patent Owner.

IPR2022-00516
Patent 7,512,096 B2

Before THU A. DANG, BRIAN J. McNAMARA, and
JOHN A. HUDALLA, *Administrative Patent Judges*.

DANG, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background*

In response to a Petition (Paper 2, “Pet.”) filed by Netgear, Inc. (“Petitioner”), we instituted *inter partes* review of claims 1–3 and 10 (“the challenged claims”) of U.S. Patent No. 7,512,096 B2 (Ex. 1001, “the ’096 patent”). See Paper 7 (“Dec. Inst.”). During trial, WSOU Investments, LLC d/b/a Brazos Licensing and Development (“Patent Owner”) filed a Response (Paper 17, “PO Resp.”), to which Petitioner filed a Reply (Paper 18, “Pet. Reply”). In turn, Patent Owner filed a Sur-reply. Paper 22 (“PO Sur-reply”). An oral hearing was held with the parties on June 22, 2023. A transcript of the hearing has been entered into the record. Paper 24.

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the claims on which we instituted trial. Based on the record before us, Petitioner has shown by a preponderance of the evidence that claims 1–3 and 10 of the ’096 patent are unpatentable.

B. *Related Proceeding*

The parties identify the ’096 patent as the subject of *WSOU Investments, LLC d/b/a Brazos Licensing and Development v. Netgear, Inc.*, Civil Action No. 1:21-cv-1117 (D. Del. July 30, 2021). Pet. 2; Paper 3, 2.

C. *The ’096 Patent*

The ’096 patent, titled “Communicating Data Between an Access Point and Multiple Wireless Devices Over a Link,” issued on March 31, 2009, from Application No. 10/996,617, filed on November 24, 2004.

Ex. 1001, codes (54), (45), (21), (22). The '096 patent relates to communication of data over a network between an access point (AP) having first and second antennas, and first and second mobile stations. *Id.* at code (57).

The '096 patent recognizes that telecommunication service providers exchange fee-based wireless and wireline traffic between mobile users and APs over a network to provide a variety of services. *Id.* at 1:16–19. According to the '096 patent, one well-known standard, the Institute of Electrical and Electronics Engineers (IEEE) 802.11 specification, describes the operation of mobile stations and APs in a wireless local area network (WLAN). *Id.* at 1:31–34. Space division multiple access (SDMA) has been studied as a tool that uses spatial dimension to simultaneously transmit to, or receive from, multiple radios at the same carrier frequency. *Id.* at 1:57–60. Sophisticated schemes, such as dynamic beam-forming, have been implemented to apply SDMA to wireless mobile communications, especially to cellular systems. *Id.* at 2:4–13.

The method of the '096 patent comprises weighting first data at the access point to transmit the first data using the first and second antennas so that the first mobile station only receives the first data. *Id.* at code (57). Similarly, the method comprises weighting second data at the access point to transmit the second data using the first and second antennas so that the second mobile station only receives the second data. *Id.* Figure 5 of the '096 patent, depicting transmission to first and second mobile stations using first and second antennas at an access point, is reproduced below.

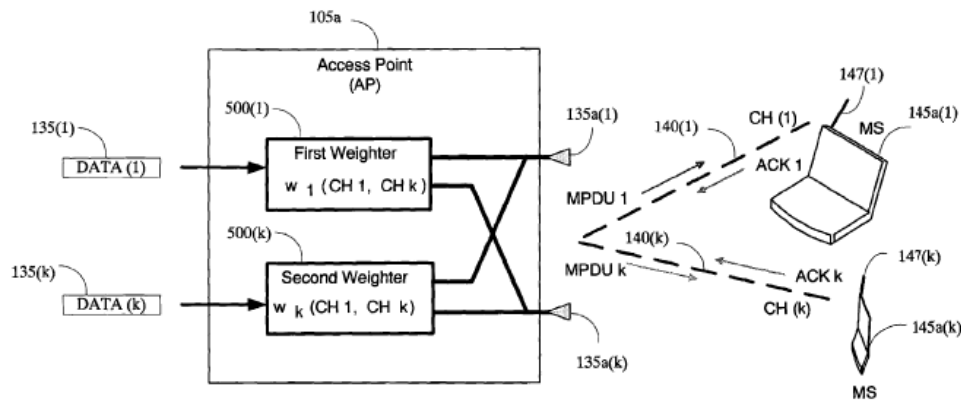


FIGURE 5

Figure 5 shows SDMA transmission to first and second mobile stations 145a(1,k) with first and second antennas at access point 105a based on the IEEE 802.11 standard. *Id.* at 8:30–35. As shown in Figure 5, access point 105a comprises first weighter 500(1) to weight first data 135(1) based on channel estimates of first and second radio channels 140(1,k) (“ $w_1(CH_1, CH_k)$ ”), and second weighter 500(k) to weight second data 135(k) based on channel estimates of first and second radio channels 140(1,k) (“ $w_k(CH_1, CH_k)$ ”). *Id.* at 8:35–42. In operation, weighted first and second data 135a(1,k) may be transmitted by both antennas at access point 105a over associated first and second radio channels 140(1,k) to first and second mobile stations 145a(1,k) for selective reception. *Id.* at 8:43–47.

To couple access point 105a to first and second mobile stations 145(1,k) through WLAN 115, at least one of access point 105a, first and second mobile stations 145(1,k), and the SDMA downlink may be defined at least in part by the IEEE 802.11 standard to establish the network. *Id.* at 7:36–53. An SDMA module may estimate first radio channel 140(1) from access point 105a to first mobile station 145(1) over a pilot interval, and may estimate second radio channel 140(k) from access point 105a to second

mobile station 145(k) over the pilot interval. *Id.* at 7:41–46. A pilot interval is a predetermined time period for transmission of a signal, either at a single frequency or several independent frequencies, for supervisory purposes including control, equalization, continuity, synchronization, or reference. *Id.* at 7:46–50.

D. The Challenged Claims

Of the challenged claims, claim 1 is the only independent claim. Claims 2, 3, and 10 depend from claim 1. Claim 1 is reproduced below:

1. A method for communicating data over a network between an access point having a first and a second antenna and a first and a second mobile station, the method comprising:

weighting a first data at said access point to transmit said first data using said first and second antennas so that said first mobile station only receives said first data; and

weighting a second data at said access point to transmit said second data using said first and second antennas so that said second mobile station only receives said second data;

increasing a first data rate of transmission of said first data and a second data rate of transmission of said second data using a single carrier frequency in a radio frequency communication based on a transmission protocol;

discriminating transmissions of said first and said second data on a downlink in said radio frequency communication based on a spatial dimension;

applying a space division multiple access based on said transmission protocol to said transmissions to transmit said first and said second data substantially concurrently from said access point to said first and second mobile stations, respectively;

defining at least one of said access point, said first and second mobile stations, and said downlink at least in part by Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard to establish said network including a wireless local area network;

coupling said access point to said first and second mobile stations through said wireless local area network;

estimating a first radio channel from said access point to said first mobile station over a pilot interval; and

estimating a second radio channel from said access point to said second mobile station over said pilot interval.

Ex. 1001, 13:24–57.

E. Asserted Grounds of Unpatentability

We instituted *inter partes* review of all claims and all challenges in the Petition. Petitioner asserts that claims 1–3 and 10 of the '096 patent are unpatentable based on the following grounds (Pet. 16–17):

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1	102	Perahia ²
1–3	102	Li ³

¹ The Leahy-Smith America Invents Act (AIA), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102, 103, effective March 16, 2013. Because the application from which the '096 patent issued was filed before this date, the pre-AIA versions of §§ 102, 103 apply.

² U.S. Patent No. 7,352,718 B1, issued April 1, 2008, filed July 22, 2003 (Ex. 1004, “Perahia”).

³ U.S. Patent No. 8,199,723 B2, issued June 12, 2012, filed December 23, 2003 (Ex. 1005, “Li”).

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
10	103	Li, Perahia
1–3	102	Wax ⁴
10	103	Wax, Perahia

Petitioner relies on the Declaration of Robert Akl, D.Sc.
(Ex. 1003) in support of its unpatentability contentions.

II. ANALYSIS

A. *Level of Ordinary Skill in the Art*

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In our analysis, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation marks omitted). Furthermore, the prior art itself can reflect the appropriate level of ordinary skill in the art. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Relying on the declaration of Dr. Akl, Petitioner contends that a person of ordinary skill in the art (POSITA) at the time of the invention of the '096 patent would have had “a Bachelor’s degree in electrical engineering (or a similar degree) and 2–3 years working in the design or

⁴ U.S. Patent No. 8,014,366 B2, issued September 6, 2011, filed August 13, 2004 (Ex. 1006, “Wax”).

development of wireless communication systems, or the equivalent,” wherein “[a]dditional education could substitute for professional experience, and vice versa, significant experience in the field could substitute for formal education.” Pet. 12 (citing Ex. 1003 ¶ 19). Patent Owner does not offer a definition for a POSITA. *See* PO Resp. 2.

We adopt and apply Petitioner’s proposed definition of a POSITA at the time of the claimed invention because, based on the record, this proposal is consistent with the ’096 patent, the asserted prior art, and the testimony of Dr. Akl. We note that the applied prior art comports with this level of skill. *See Okajima*, 261 F.3d at 1355.

B. Claim Construction

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a POSITA at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

Patent Owner contends that, for the claim term “over said pilot interval,” “the plain and ordinary meaning of the word ‘over’ in the recited context” presumptively qualifies the two “estimating” steps in claim 1 “as having at least some overlap time.” PO Resp. 4. In particular, Patent Owner contends that the presumption is that “the word ‘over’ connotes a meaning different from ‘during’ in the recited context.” *Id.* Thus, according to Patent Owner, using “over” instead of “during” “connotes overlapping performances of the two ‘estimating’ steps.” *Id.* at 5.

Petitioner responds that “when two events occur ‘over’ a particular time period, it does not mean that they are ‘co-extensive’ or ‘overlapping’ in time.” Pet. Reply 4. According to Petitioner, the claims “elsewhere recite (for other limitations) ‘substantially concurrently’—i.e., co-extensive in time—and did recite ‘time offset’—i.e., overlapping in time.” *Id.* Thus, Petitioner points out that “Patent Owner would have used that language for the ‘pilot interval’ limitation if it sought to require that the channel estimations be co-extensive or overlap in time.” *Id.*

In light of the parties’ arguments and evidence, we find that it is necessary to construe “over said pilot interval,” but only to the extent necessary to resolve the disputed issues before us.

“over said pilot interval”

Claim 1 recites “applying a space division multiple access” to “transmit said first and said second data substantially concurrently from said access point to said first and second mobile stations,” and then “estimating” a first radio channel and a second radio channel from the access point to, respectively, the first and second mobile stations “over a pilot interval.” Ex. 1001, 13:42–57. As Petitioner points out (Pet. 23), the Specification of the ’096 patent defines the “pilot interval” as “a predetermined time period for transmission of a signal, either at a single frequency or several independent frequencies, for supervisory purposes including control, equalization, continuity, synchronization, or reference.” *See* Ex. 1001, 7:46–50.

In the Decision to Institute, in view of the definition provided in the Specification of the ’096 patent, we preliminarily construed a “pilot interval” as a “predetermined time period . . . for supervisory purposes.” Dec. Inst. 8–

9 (citing Ex. 1001, 7:41–53). Further, we surmised that the pilot interval could be a “predetermined period of time encompassing (1) the beginning and ending of estimating the first radio channel, then (2) some other activity such as ‘control, equalization, continuity, synchronization, or reference,’ and then (3) the beginning and ending of estimating the second radio channel—so long as all of these . . . activities are for supervisory purposes.” *Id.* As we explained, this comports with the Specification of the ’096 patent, which merely mentions “pilot interval” as “the period of time over which the SMDA module estimates the first and second radio channels from the access point to the respective first and second mobile stations.” *Id.*

However, Patent Owner contends that the Specification of the ’096 patent and the language of claim 1 “provides additional context that supports the presumption” that the word “over” connotes “*throughout* the time period.” PO Resp. 5. In particular, Patent Owner contends that, in the Specification, “the statement ‘Space Division Multiple Access (SDMA) has been studied extensively *over* the past few decades’ plainly refers to the full breadth of the identified timeframe.” *Id.* (citing Ex. 1001, 1:57–58). Patent Owner also contends that claim 1 further recites the step of “applying a space division multiple access based on said transmission protocol to said transmissions to transmit said first and said second data *substantially concurrently* from said access point to said first and second mobile stations.” *Id.* (citing Ex. 1001, 13:42–46). According to Patent Owner, this additional step refers to Figure 7 of the ’096 patent which “teaches that *simultaneous* space division multiple access (SDMA) transmission to two mobile stations may result in those stations responding with ACK [acknowledgement] bursts

that substantially overlap in time.” *Id.* at 5–6 (citing Ex. 1001, 9:33–53, Fig. 7).

Pointing to the prosecution history of the ’096 patent, Patent Owner contends that the patentees elected not to pursue claims directed to transmission times that are offset by a predetermined time as set forth in Figure 8, but instead pursued claims directed to simultaneous transmission as set forth in Figure 7. PO Resp. 7–8. In particular, Patent Owner contends that “[d]uring prosecution, the examiner considered and rejected certain pending claims that had been amended to recite (among other limitations) that ‘the relative transmission times of the protocol data units to said first and second mobile stations is offset by a predetermined time,’” and “those claims were cancelled during prosecution.” *Id.* at 7 (citing Ex. 1002, 136, 142, 144, 145). According to Patent Owner, “[t]he patentee[s]’ election to pursue an independent claim that requires substantially concurrent SDMA transmissions supports interpreting ‘estimating a first radio channel *over* a first pilot interval’ and ‘estimating a second radio channel *over* said pilot interval’ to likewise have overlapping occurrences.” *Id.*

Accordingly, Patent Owner contends that the Office’s allowance of claim 1 while maintaining a final rejection of alternative claims reflecting Figure 8 “confirms the Office did not construe claim 1 to encompass SDMA transmission having *offset* timing configured to trigger responsive channel estimations that have corresponding *offset* timing.” PO Sur-reply 9.

Based on the full trial record, we decline to adopt Patent Owner’s proposed claim construction. In particular, we find that the ’096 patent prosecution history with respect to the claims is too ambiguous to support

Patent Owner’s argument (i.e., that prosecution history disclaims “offset” timing for channel estimations).

Phillips requires us to consider the prosecution history of a patent in construing the claims. *Phillips*, 415 F.2d at 1317. But *Phillips* also cautions that the prosecution history often is “less useful” than the specification:

[L]ike the specification, the prosecution history was created by the patentee in attempting to explain and obtain the patent. Yet because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes.

Id. Any ambiguity in the prosecution history makes it less relevant to claim construction. *See Inverness Med. Switz. GmbH v. Warner Lambert Co.*, 309 F.3d 1373, 1380–82 (Fed. Cir. 2002) (“It is inappropriate to limit a broad definition of a claim term based on prosecution history that is itself ambiguous.”); *Northern Telecom Ltd. v. Samsung Elec. Co., Ltd.*, 215 F.3d 1281, 1295 (Fed. Cir. 2000) (“[C]onfusing statements in the prosecution history simply fail to overcome the ordinary meaning of the [disputed] limitation.”). Furthermore, the Federal Circuit has made it clear that disavowal of claim scope by a patentee requires “expressions of manifest exclusion or restriction.” *Epistar Corp. v. ITC*, 566 F.3d 1321, 1335 (Fed. Cir. 2009). More specifically, “[t]o operate as a disclaimer, the statement in the prosecution history must be clear and unambiguous, and constitute a clear disavowal of scope.” *Continental Circuits LLC v. Intel Corp.*, 915 F.3d 788, 798 (Fed. Cir 2019).

We do not see in the '096 patent prosecution history any clear and unambiguous waiver of “offset” timings for the claimed channel estimations “over said pilot interval.” *See* Ex. 1002, 126–128, 157, 174. This is evident from the office actions themselves and their context in the prosecution history, which we review below.

a. Prosecution History

The Examiner initially rejected prosecution claims 1–6 and 17–26 of the application for the '096 patent over the combination of Malik (U.S. Patent Application Publication No. 2006/0164969) and Alastalo (U.S. Patent No. 7,006,529). Ex. 1002, 126–28. The Examiner found that “Malik teaches simultaneously sending data to two separate receivers,” and “Alastalo specifically teaches weighting data at the access point.” *Id.* at 126. As to prosecution claims 7–16 and 27–29, reciting “estimating a first radio channel . . . over a pilot interval” and “estimating a second radio channel . . . over said pilot interval,” the Examiner indicates that the claims “would be allowable if rewritten in independent form.” *Id.* at 128.

Applicants responded to the rejection of prosecution claims 1–6 and 17–26 by amending independent prosecution claim 1 to add other limitations, including “wherein the relative transmission times of the protocol data units to said first and second mobile stations is offset by a predetermined time.” Ex. 1002, 136. In their Remarks accompanying the amendment, Applicants argued that Malik’s access point “is configured to provide services simultaneously to a plurality of users on channels of the same frequency,” that Alastalo’s access point “is configured so that simultaneous time slots can be allocated to multiple terminal,” and thus, the prior art references fail to describe or suggest “transmitting packet data units

to different mobile stations using a predetermined offset in the transmission times,” as recited in claim 1 as amended. *Id.* at 148. Applicants also amended prosecution claim 7 to be in independent form including all the limitations of the base claim and any intervening claims, and submitted that prosecution claim 7 and prosecution claims 8–16 and 27–29 depending therefrom “are in condition for allowance.” *Id.* at 147.

In a Final Rejection, the Examiner responded by allowing prosecution claims 7–16 and 27–29 (directed to “estimating . . . over a pilot interval”), providing no reasons for allowance, and stating that the claims are allowed “based on Applicant’s amendment to claim 7 incorporating the allowable subject matter noted in the previous office action and the intervening claims.” Ex. 1002, 157. However, the Examiner maintained the rejection of prosecution claims 1–6 and 17–26 over Malik and Alastalo, explaining that Alastalo discloses “first and second data is weighted at said access point based on a channel estimate.” *Id.* at 155.

In response to the Final Rejection, Applicants canceled prosecution claims 1–6 and 17–26. Ex. 1002, 162, 165. In their Remarks accompanying the cancelation, Applicants submitted that “all claims pending in the present application are in condition for allowance.” *Id.* at 167. Thereafter, the Examiner entered a Notice of Allowability, allowing prosecution claims 7–16 and 27–29. *Id.* at 174. Prosecution claims 7–16 and 27–29 were renumbered and issued as claims 1–13 of the ’096 patent. *Compare id.* at 162–66, *with* Ex. 1001, 14:28–16:9.

b. Discussion

Patent Owner’s argument for its proposed “over said pilot interval” construction relies specifically on the Examiner’s rejection of claims

directed to Figure 8 during prosecution. PO Resp. 5–8; PO Sur-reply 1–9. According to Patent Owner, the Examiner instead “identified specific claim language reflecting FIG. 7 as being allowable if rewritten in independent form,” including “limitations which require SDMA transmissions to different mobile stations to occur ‘substantially concurrently’ and which further require two ‘estimating’ steps to both occur ‘over [the same] pilot interval.’” PO Sur-reply 2 (citing Ex. 1002, 128, 138–139).

However, we disagree such reference to the ’096 patent’s prosecution history supports Patent Owner’s contention. In particular, we are unpersuaded that the Office’s allowance of claim 1 directed to Figure 7, while maintaining a final rejection of alternative claims reflecting Figure 8, “confirms the Office did not construe claim 1 to encompass SDMA transmission having offset timing configured to trigger responsive channel estimations that have corresponding offset timing.” PO Sur-reply 9. We find that, at most, the Examiner’s rejection of prosecution claims 1–6 and 17–26 indicates that claims directed to *SDMA transmissions* having offset timing are unpatentable. Ex. 1002, 128, 157, 174.

Here, claim 1 further recites “estimating” first and second radio channels “over a pilot interval,” as a separate step from “applying” SDMA to “transmit said first and said second data substantially concurrently.” *See* Ex. 1001, 13:42–57. While the rejection is directed to offset in SDMA transmission, it is silent as to any offset timing for the recited channel estimation, wherein channel estimation is for supervisory purposes, as defined by the Specification. *See id.* at 7:46–50.

We find that the prosecution history cited by Patent Owner is at best ambiguous as to offset timing, and in any case there was no disavowal of

offset timing that would support Patent Owner's proposed construction calling for the timing for the channel estimation to be overlapping. The Examiner's rejection in the prosecution history is directed to SDMA transmission, and not for "channel estimation" recited in the allowed claims. As set forth in the prosecution history, Applicants never argued to the Examiner in the '096 patent's prosecution that the offset timing was for the channel estimation. *See* Ex. 1002, 126–28, 157, 174. Thus, to the extent there was any disclaimer, it extends only to offset timing in SDMA transmission. As set forth in claim 1, SDMA transmission is a separate step from channel estimation over a "pilot interval." *See* Ex. 1001, 13:42–57.

There is no indication in the claim language, the Specification, or the prosecution history of any intent not to claim an embodiment in which, during a pilot interval, the timing of a channel estimation can be at an offset. "To disavow claim scope, the specification must contain 'expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.'" *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1306 (Fed. Cir. 2011) (quoting *Epistar*, 566 F.3d at 1335); *SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001).

In sum, for the reasons given, we do not agree with Patent Owner's proposed construction for "over said pilot interval." PO Resp. 4. We determine the term "said pilot interval" in the phrase "estimating [first/second] radio channel . . . over said pilot interval" recited in claim 1 does not require the time for estimating the first and second radio channels to have at least some overlap in timing. *Id.* Instead, we conclude the "pilot interval" could be a longer predetermined supervisory period that

encompasses non-simultaneous estimating of the first and second radio channels.

We do not provide any further constructions for “pilot interval” or any other claim terms. *See, e.g., Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need to be construed that are in controversy, and only to the extent necessary to resolve the controversy”)))); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

B. Principles of Law

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). There is no requirement that the prior art must use the same words to describe a claim element in order to teach or disclose that claim element. Identity of terminology is not required for a claim element to be anticipated by the prior art without resort to obviousness. *See In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990).

It is proper to take into account not only the literal and “specific teachings of the reference, but also the inferences which one skilled in the art would reasonably be expected to draw therefrom.” *In re Preda*, 401 F.2d 825, 826 (CCPA 1968). For anticipation, the dispositive question is whether one skilled in the art would reasonably understand or infer from a prior art

reference that every claim element is disclosed in that reference. *Eli Lilly & Co. v. Los Angeles Biomedical Research Inst. at Harbor-UCLA Med. Ctr.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017).

A patent claim is unpatentable as obvious under 35 U.S.C. § 103(a) if “the differences between the claimed subject matter . . . and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

C. Anticipation of Claim 1–3 by Li (Ground 2) and Obviousness of Claim 10 over Li and Perahia (Ground 3)

Petitioner contends that claims 1–3 of the ’096 patent are anticipated by Li, and that claim 10 would have been obvious over Li in view of Perahia. Pet. 27–40. In response, Patent Owner contends that Li does not disclose the limitations of claim 1. PO Resp. 24–31; PO Sur-reply 18–20. We summarize the asserted prior art below.

1. Li

Li, titled “Parallel Wireless Communication Apparatus, Method, and System,” relates to an access point in an IEEE 802.11 compatible wireless network that communicates with multiple mobile stations simultaneously using SDMA. Ex. 1005, codes (54), (57). An illustration of one embodiment of Li’s wireless network is depicted in Figure 1, reproduced below:

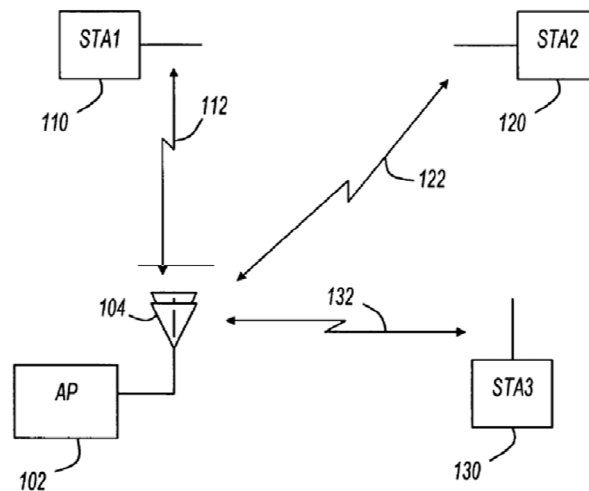


FIG. 1

Figure 1 is a diagram of wireless network 100 that includes access point 102 and mobile stations 110, 120, and 130, wherein one or more of mobile stations 110, 120, 130, or access point 102 may operate in compliance with any IEEE 801.11 standard. *Id.* at 1:51–61. As shown in Figure 1, access point 102 includes multiple antennas 104 capable of communicating using SDMA. *Id.* at 2:17–20.

Access point 102 uses zero-forcing beamformers for both downlink and uplink of signals to achieve SDMA. *Id.* at 2:48–50. According to Li, zero-forcing beamforming is a known technique for SDMA interference cancelation using channel state information, wherein channel state information is gathered by access point 102 during a prior uplink packet reception, referred to as “estimating spatial channels.” *Id.* at 2:50–56.

To obtain channel state information of all mobile stations before SDMA transmission and reception, access point 102 sends IEEE 802.11 Null-data frames to the mobile stations and estimates the stations’ channels from the received ACK frames. *Id.* at 2:57–3:3. Frames other than Null-data frames and ACK frames are utilized to estimate spatial channels,

wherein a network-allocation-vector (NAV) is set at the end of the last utilized frame to prevent an unintended station from acquiring the medium during the SDMA training process. *Id.* at 3:12–22.

For parallel communication, access point 102 sets the NAV of all mobile stations in the vicinity to prevent unintended mobile stations from interfering with the beamformed signals. *Id.* at 4:52–61.

2. Perahia

Perahia, titled “Spatial Division Multiple Access for Wireless Networks,” is directed to multiple input multiple output (MIMO) and SDMA technology in conjunction with the IEEE 802.11 standard that enables simultaneous communication of data packets to or from multiple users. Ex. 1004, codes (54), (57). Perahia discloses a method of operating an access point, wherein the method includes: sending a first packet to a first subscriber unit via a first spatial subchannel, and sending a second packet to a second subscriber unit via a second subchannel, wherein sending the first packet and sending the second packet begin and end substantially simultaneously. *Id.* at 2:28–37.

The IEEE 802.11a standard employs orthogonal frequency division multiplexing (OFDM), where the available bandwidth is effectively divided into a plurality of subchannels that are orthogonal in the frequency domain, with each such subchannel being occupied by a subcarrier or tone. *Id.* at 4:28–33. In 802.11a, some of the values are always zero and others carry pilot tones used for phase synchronization, wherein the resulting series of time domain samples is augmented with a cyclic prefix prior to transmission. *Id.* at 4:37–41. An illustration of Perahia’s wireless communication system employing SDMA techniques is depicted in Figure 1, reproduced below:

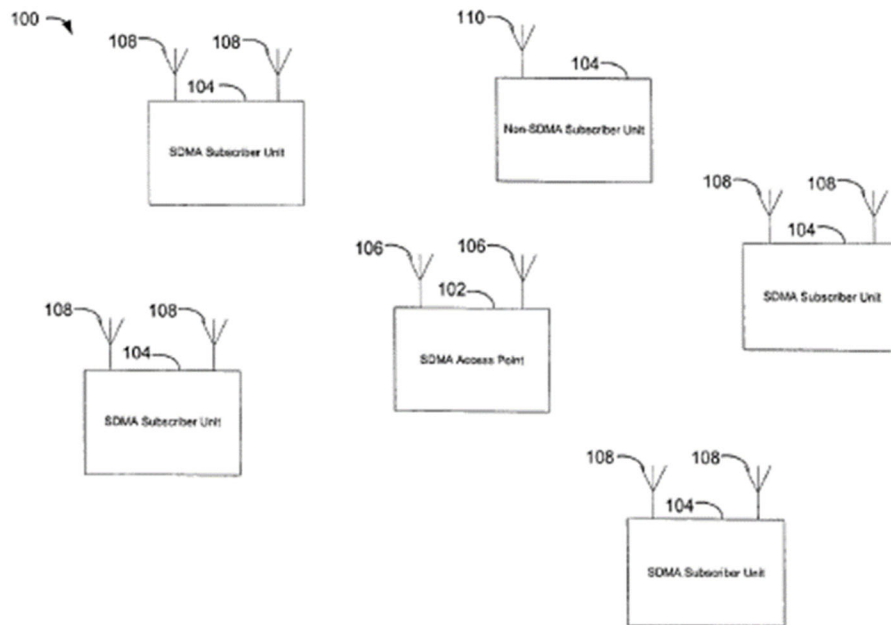


Fig. 1

Figure 1 shows wireless network 100 including access point 102 and numerous subscriber units 104. *Id.* at 4:47–50. Access point 102 is equipped with two antennas 106 to support SDMA operations. *Id.* at 4:53–54. Access point 102 may either transmit simultaneously to two or more subscriber units 104 or simultaneously receive upstream transmission from two or more subscriber units 104, as an extension of the IEEE 802.11a standard. *Id.* at 4:66–5:4.

An illustration of one embodiment of Perahia’s receiver used in an access point or a subscriber unit is depicted in Figure 2, reproduced below:

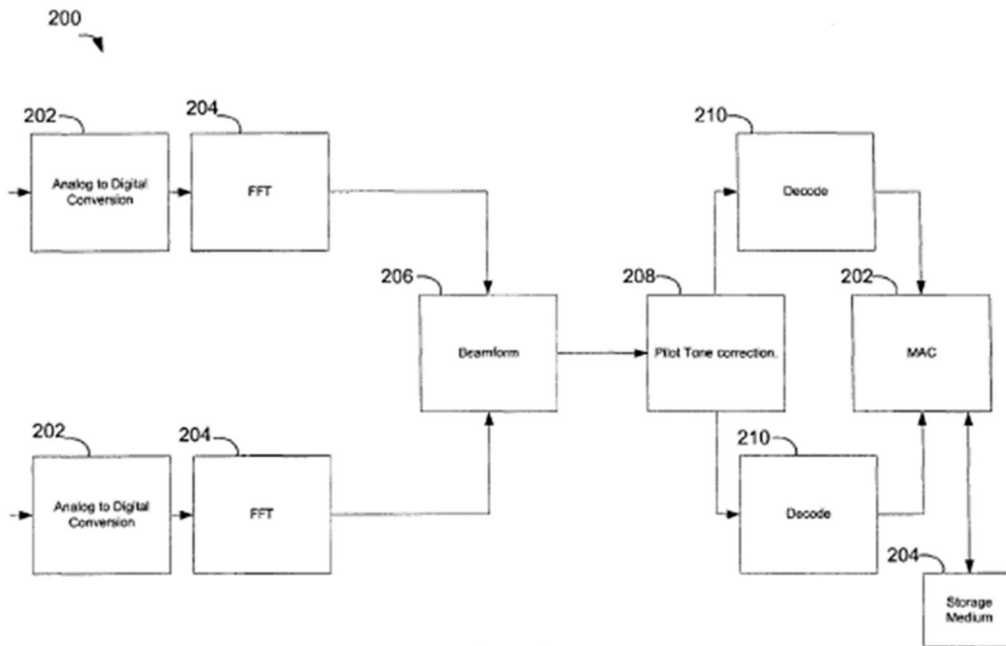


Fig. 2

Figure 2 shows receiver 200 used in access point 102 or subscriber units 104. *Id.* at 5:11–13. In receiver 200, subcarrier values corresponding to each antenna or polarization are input to beamformer 206, which in turn recovers the transmitted spatial subchannel data streams by applying a weighting matrix to the beamformer input. *Id.* at 5:24–27. The weighting matrix is based on a matrix channel estimate and on signal to interference plus noise ratio (SINR). *Id.* at 5:28–30. Pilot tone correction block 208 corrects the phase offset among subcarriers in accordance with the 802.11a standard. *Id.* at 5:32–35. The outputs of decode block 210 are combined into MAC layer packets by MAC layer processor 202, which is then shared with a transmitter. *Id.* at 5:38–43.

The preambles for first and second subscriber units may be simultaneously transmitted by two simultaneous transmitting subscriber units or by a single access point. *Id.* at 8:61–64. In a preamble, the long

symbols are specified by the 802.11a standard and are used for channel estimation. *Id.* at 9:4–5, 9:29–30. Perahia references U.S. Patent Application No. 10/355,500 titled “High Data Rate Wireless Bridging” for describing the manner in which long symbols are used for channel estimation. *Id.* at 9:14–18.

To operate a subscriber unit in a MIMO communication system, an OFDM signal is transmitted via a first spatial subchannel, wherein first channel training information on the OFDM signal is transmitted in a first channel period, and during a second channel training period, the OFDM signal is quieted to allow transmission of second channel training information by another subscriber unit. *Id.* at 3:4–12.

3. Analysis

Petitioner contends that the ’096 patent relates to simultaneous data transfer between an access point and multiple mobile units in a wireless network. Pet. 3 (citing Ex. 1001, 1:9–10, 2:67–3:8). In particular, Petitioner contends that the ’096 patent seeks to facilitate simultaneous communications on the downlink to multiple mobile units. *Id.* According to Petitioner, the ’096 patent utilizes two industry protocols: (1) the 802.11 IEEE standard; and (ii) SDMA. *Id.* at 4.

Petitioner then provides evidence that, like the ’096 patent, Li observes that an access point may communicate with many different stations. Pet. 14 (citing Ex. 1005, 1:11–14). According to Petitioner, Li’s access point is like that of the ’096 patent because it “‘is capable of maintaining simultaneous 802.11 compliant communications with multiple mobile stations’ and ‘may be any type of access point having multiple antennas capable of communicating using [SDMA].’” *Id.* (quoting

Ex. 1005, 1:62–2:32). Further, according to Petitioner, Li discloses “‘zero-forcing beamformers,’ i.e., signal weighting, and ‘estimating spatial channels,’ i.e., radio channels.” *Id.* (quoting Ex. 1005, 2:48–56).

Having reviewed Petitioner’s and Patent Owner’s contentions and supporting evidence in the complete record, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–3 are anticipated by Li, and that claim 10 would have been obvious over Li in view of Perahia. We now address in detail Petitioner’s contentions and Patent Owner’s arguments with respect to the limitations of independent claim 1.

a. Claim 1

- i. *Preamble - “A method for communicating data over a network between an access point having a first and second antenna and a first and second mobile station”*

Petitioner provides evidence that Li discloses a method for communicating data over a network between an access point having multiple antennas and a first and second mobile station. Pet. 27–28. For example, according to Petitioner, “Li teaches ‘[a]n access point in a wireless network [that] communicates with multiple mobile stations simultaneously,’” wherein the access point “may be any type of access point having multiple antennas.” *Id.* at 27 (citing Ex. 1005, Abstract). Referencing Figure 1 of Li, Petitioner contends that the figure depicts “access point 102 with two antennas 104 communicating with three mobile stations 110, 120, 130.” *Id.* (citing Ex. 1005, 2:17–20, Fig. 1).

Although Patent Owner does not present arguments addressing the specific merits of Petitioner’s contentions with respect to the preamble (*see generally* PO Resp.; PO Sur-reply), the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Here, Petitioner refers to Figure 1 of Li to support its contention. Pet. 27–28. Figure 1 is reproduced below:

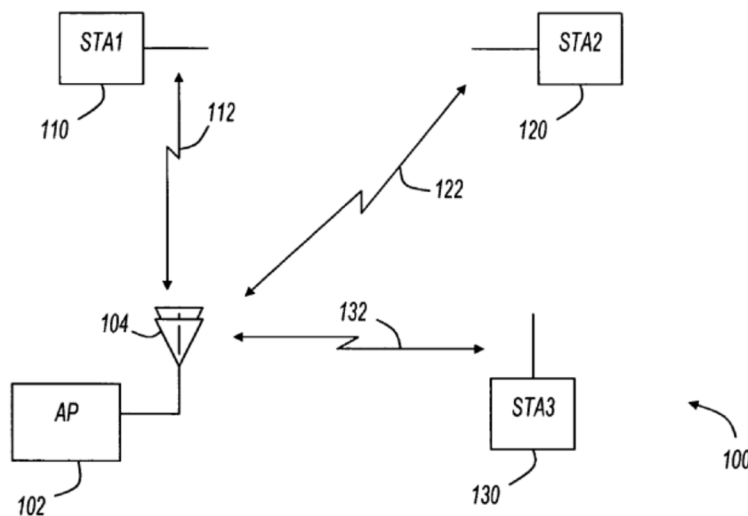


FIG. 1

Figure 1 illustrates a diagram of a wireless network including an access point communicating with a plurality of mobile stations. *See* Ex. 1005, 1:51–61, Fig. 1. As Petitioner points out, Figure 1 of Li shows access point 102 with two antennas 104 communicating with three mobile stations 110, 120, 130.

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses a “method for communicating data

over a network between an access point having a first and second antenna and a first and second mobile station,” as recited in claim 1.⁵

- ii. *“weighting a first data at said access point to transmit said first data using said first and second antenna so that said first mobile station only receives said first data,”
“weighting a second data at said access point to transmit said second data using said first and second antenna so that said second mobile station only receives said second data”*

Petitioner provides evidence that “Li weights a first and second data at the access point so that the first and second mobile stations receive only their respective data.” Pet. 28–29. In particular, Petitioner contends that, to achieve SDMA, Li weights first and second data at the access point so that the first and second mobile stations receive only their respective data. *Id.* at 28. Relying on Dr. Akl’s testimony, Petitioner contends that “[g]enerating weights . . . is a routine function in SDMA.” *Id.* (citing Ex. 1003 ¶ 48). That is, according to Dr. Akl, channel estimation over a pilot channel “is a routine process in an IEEE 802.11 WLAN.” *See* Ex. 1003 ¶ 50.

According to Petitioner, Li discloses a “zero-forcing beamformer for both downlink and uplink of first signals to achieve SDMA,” and explains that “[b]eamforming is a type of data weighting.” Pet. 28 (citing Ex. 1003

⁵ The issue of whether the preamble is limiting need not be resolved because, regardless of whether the preamble is limiting, Petitioner has persuasively shown that Li teaches a “method for communicating data over a network between an access point having a first and second antenna and a first and second mobile station.” *See Realtime Data*, 912 F.3d at 1375.

¶¶ 48, 91). Referring to Dr. Akl’s testimony for support, Petitioner contends that, to ensure that the first and second mobile stations receive only their respective data, Li’s access point defines a “network-allocation-vector” for all mobile stations to prevent unintended mobile stations from interfering with the beamformed signals. *Id.* at 28–29 (citing Ex. 1005, 4:54–56; Ex. 1003 ¶ 91).

Patent Owner contends that claim 1 requires “using the same ‘first and second antennas’ for each one of multiple [recited] weighted data transmission,” and cannot be reasonably interpreted “to broadly encompass using multiple antennas (in virtually any manner or arrangement) to form multiple spatial channels for the transmission of data.” PO Resp. 24–25; *see also* PO Sur-reply 19. Furthermore, Patent Owner contends that claim 1 also recites the “first mobile station only receives said first data,” and “the second mobile station only receives said second data,” wherein “the claimed ‘weighting’ cannot be shown, for example, by a different form of weighting that allows the first mobile station to also receive the second data, or vice versa.” PO Resp. 25.

As to Petitioner’s reliance on Li’s use of NAV “to ‘prevent unintended STAs [mobile stations] from interfering with beamformed signals,’” Patent Owner contends that, in Li, “[t]he NAV can be set by transmission of RTS [request-to-send] and CTS [clear-to-send] frames using nominally omni-directional radiation antennas,” but “an ‘omni-directional’ transmission sent to, and received by, multiple mobile stations at once is plainly distinguishable from the claim language in question.” PO Resp. 26 (citing Pet. 28–29; Ex. 1005, 3:9–11, 3:33–35, 4:54–58).

We find unavailing Patent Owner’s arguments. In particular, we do not agree with Patent Owner’s unsupported contention that Li does not disclose “using the same ‘first and second antennas’ for each one of multiple recited weighted data transmission.” PO Resp. 24–25. As Petitioner points out, Li’s access point 102, as shown in Figure 1, uses antennas 104 (i.e., first and second antennas) for communicating using SDMA operations. Pet. 27, 33–34 (citing Ex. 1005, 2:17–20); *see also* Ex. 1005, Fig. 1.

Li explains that SDMA is a technology that allows multiple simultaneous independent transmission from one wireless device that has multiple antennas. *See* Ex. 1005, 2:17–20. Li further explains that SDMA increases both user density and network throughput by utilizing spatial channels in the environment, wherein multiple spatial channels are formed by a combination of the signal paths and the antenna patterns between an access point and multiple mobile stations. *Id.* at 2:42–47. That is, in Li, the plurality of antennas (i.e., both antennas 104 as shown in Figure 1) are used for forming the multiple spatial channels for each one of multiple transmissions of data. *Id.*

We credit Dr. Akl’s unrebutted testimony that SDMA, which “uses spatial dimension to simultaneously transmit to, or receive from, multiple radios at the same carrier frequency was not a new technique,” wherein, using the plurality of antennas, “SDMA allows a single transmitter to provide multiple communication channels by dividing the radio coverage into *focused* radio beams that reuse the same frequency.” Ex. 1003 ¶ 44 (emphasis added). Thus, we are persuaded by Petitioner’s contention that, in weighting/beamforming to achieve SDMA, data is sent to each of the mobile stations by all antennas of the access point. Pet. Reply 7. As Petitioner

explains, “SDMA entails the use of multiple antennas on an access point to transmit data to each mobile station,” which is similar to the ’096 patent, which “uses a standard access point ‘having a first antenna 110(1) and a second antenna 110(m) for simultaneous wireless communication of data over a network.” *Id.* at 8 (citing Ex. 1001, 5:46–52).

We also do not agree with Patent Owner’s contention that, although Petitioner relies on Li’s use of NAV to prevent unintended STAs from interfering with beamformed signals, “[a]n ‘omni-directional’ transmission sent to, and received by, multiple mobile stations at once is plainly distinguishable from the claim language in question.” PO Resp. 26. As Petitioner explains, in Li, “the NAV is not itself the beamformed data going to only the target mobile station.” Pet. Reply 18. Rather, Petitioner references Li’s NAV to “confirm[]” that “Li takes steps to prevent interference among mobile stations.” *Id.* at 18–19.

Here, Petitioner provides evidence that, in Li, the mobile stations are set (using NAV) so that unintended mobile stations will not interfere with the beamforming signals. *See* Pet. 28–28; Ex. 1005, 3:12–22, 4:54–56. We credit Dr. Akl’s un rebutted testimony that, in Li, “[e]ach mobile station receives only its data as ‘[t]he AP sets the network-allocation-vector (NAV) of all STAs in the vicinity to prevent unintended STAs from interfering with the beamformed signals.’” *See* Ex. 1003 ¶ 91 (citing Ex. 1005, 4:54–56).

We are persuaded by Petitioner’s explanation that, in SDMA, “the weighted/beamformed signals are sent only to their intended target.” Pet. Reply 14. As Petitioner explains, “[t]he primary goal of SDMA—‘space division multiple access’—is to spatially separate signals so that an access point can communicate with multiple mobile stations at the same time.” *Id.*

We agree that the '096 patent employs weighting for this same purpose. *Id.* at 16; *see also* Ex. 1001, 6:13–28, 8:30–42, Fig. 5.

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses “weighting a first data at said access point to transmit said first data using said first and second antenna,” and “weighting a second data at said access point to transmit said second data using said first and second antenna,” as recited in claim 1.

iii. “increasing a first data rate of transmission of said first data and a second data rate of transmission of said second data using a single carrier frequency in a radio frequency communication based on a transmission protocol”

Petitioner provides evidence that Li increases the data rate of transmission for the first and second data using a single carrier frequency. Pet. 29. In particular, relying on the testimony of Dr. Akl, Petitioner contends that “increasing the data rates[] is met by merely using SDMA.” *Id.* (citing Ex. 1003 ¶¶ 71, 92). Petitioner likens Li to the '096 patent because Li's SDMA “increases both user density and network throughput of wireless systems by utilizing spatial channels in the environment,” wherein “SDMA allows the access point to ‘communicate in parallel with multiple 802.11 compliant mobile stations,’ which increases the data rate of transmission.” *Id.* (citing Ex. 1005, 2:42–47, 5:6–8; Ex. 1003 ¶ 93).

Petitioner then contends that “Li uses a single carrier frequency based on the IEEE 802.11 standard.” *Id.* (citing Ex. 1005, 1:55–61, 5:6–8, 5:38–44; Ex. 1003 ¶ 73).

Although Patent Owner does not present arguments addressing the specific merits of Petitioner's contentions with respect to this limitation (*see generally* PO Resp.; PO Sur-reply), the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. Here, we are persuaded by Petitioner's contentions, supported by the unrebutted testimony of Dr. Akl, that "SDMA allows the access point to 'communicate in parallel with multiple 802.11 compliant mobile stations,' which increases the data rate of transmission." Pet. 29 (citing Ex. 1005, 2:42–47, 5:6–8; Ex. 1003 ¶ 93). As Dr. Akl observed, like the '096 patent, Li discloses using SDMA, which increases both user density and network throughput of wireless systems by utilizing spatial channels in the environment. *See* Ex. 1003 ¶¶ 71, 92.

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses "increasing a first data rate of transmission of said first data and a second data rate of transmission of said second data using a single carrier frequency in a radio frequency communication based on a transmission protocol," as recited in claim 1.

- iv. *"discriminating transmissions of said first and said second data on a downlink in said radio frequency communication based on a spatial dimension," "applying a space division multiple access based on said transmissions protocol to said transmission to transmit said first and said second data substantially concurrently from said access point to said first and second mobile stations, respectively"*

Petitioner contends that, as the '096 patent explains, "SDMA entails 'the use of spatial dimension to allow discrimination among multiple radio.'"

Pet. 30 (citing Ex. 1001, 1:57–2:3). Relying on the testimony of Dr. Akl, Petitioner provides evidence that “[b]y employing SDMA, Li discriminates between data transmission on the downlink based on a spatial dimension,” wherein “SDMA allows Li to ‘transmit to two or more [] mobile stations simultaneously.’” *Id.* (citing Ex. 1003 ¶ 96; Ex. 1005, 2:24–26). That is, according to Petitioner, “[b]y utilizing SDMA, the AP [access point] is able to transmit information in different spatial channels to parallel STAs [mobile stations] simultaneously.” *Id.* (citing Ex. 1005, 4:4–6; Ex. 1005 ¶ 94).

Patent Owner contends that Petitioner “fails to differentiate between the ‘discriminating’ and ‘applying’ steps of claim 1.” PO Resp. 30; *see also* PO Sur-reply 20. In particular, Patent Owner contends that “Petitioner incorrectly asserts, without explanation, that the same alleged act in Li purportedly satisfies what the claim language expressly distinguishes as separate and distinct steps.” PO Resp. 30. According to Patent Owner, Petitioner argues that the “discriminating” limitations are met “merely ‘by using SDMA’ to transmit,” but then argues the “applying” limitations “are likewise met ‘by utilizing SDMA’ to transmit.” *Id.* (citing Pet. 30; Ex. 1003 ¶ 93).

We find unavailing Patent Owner’s arguments that, because Petitioner relies on “using SDMA” for the “discriminating” step as well the “applying” step (Pet. 30), Petitioner “fails to differentiate” between the steps. PO. Resp. 30. Instead, as Petitioner explains, “applying” SDMA “results in ‘discriminating transmissions . . . based on a spatial dimension’—that is the nature of SDMA.” Pet. Reply 24 (emphasis omitted). As Petitioner points out, the ’096 patent itself states that:

Space Division Multiple Access (SDMA) has been studied extensively over the past few decades as a tool that *uses spatial*

dimension to simultaneously transmit to, or receive from, multiple radios at the same carrier frequency. For more detailed discussion on the use of spatial dimension to allow discrimination among multiple radio, one may refer to [cited articles].

Pet. Reply 25 (citing Ex. 1001, 1:58–2:3).

We credit Dr. Akl’s un rebutted testimony that, like the ’096 patent, Li discloses the “discriminating” transmissions based on a spatial dimension step because “Li uses SDMA.” Ex. 1003 ¶ 93. In particular, Dr. Akl testified that Li’s access point 102 “utilizes SDMA on the downlink to transmit to two or more of mobile stations 110, 120, or 130 simultaneously.” *Id.* (citing Ex. 1005, 2:24–26). As the ’096 patent explains, SDMA “has been studied extensively over the past few decades as a tool that uses spatial dimension to simultaneously transmit to, or receive from, multiple radios at the same carrier frequency.” *See* Ex. 1001, 1:57–60. Accordingly, we also credit Dr. Akl’s testimony that, like the ’096 patent, Li also discloses “applying SDMA” to transmit first and second data “substantially concurrently” from the access point to the mobile stations, respectively. Ex. 1003 ¶ 94.

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses “discriminating transmissions of said first and said second data on a downlink in said radio frequency communication based on a spatial dimension,” and “applying a space division multiple access based on said transmissions protocol to said transmission to transmit said first and said second data substantially concurrently from said access point to said first and second mobile stations, respectively,” as recited in claim 1.

- v. *“defining at least one of said access point, said first and second mobile stations, and said downlink at least in part by . . . (IEEE) 802.11 standard to establish said network including a wireless local area network,” “coupling said access point to said first and second mobile stations through said wireless local area network”*

Petitioner provides evidence that Li establishes a WLAN “by defining its access point and mobile stations according to the IEEE 802.11 standard.” Pet. 30–31. According to Petitioner, in Li’s WLAN, the “mobile stations or access point may operate in compliance with a wireless network standard such as ANSI/IEEE std. 802.11.” *Id.* (citing Ex. 1005, 1:51–61; Ex. 1003 ¶ 95).

Petitioner then points out that Li’s access point and mobile stations are coupled through the WLAN “in the same way as described in the ’096 Patent.” Pet. 31. According to Petitioner, these devices “are in direct communication across the WLAN.” *Id.* (citing Ex. 1005, 1:51–54, 1:62–66, 2:12–16, Fig. 1; Ex. 1003 ¶ 96).

Although Patent Owner does not present arguments addressing the specific merits of Petitioner’s contentions with respect to this limitation (*see generally* PO Resp.; PO Sur-reply), the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. Here, we are persuaded by Petitioner’s contention, supported by Dr. Akl’s testimony, that Li discloses mobile stations or an access point that operate in compliance with the 802.11 standard. Pet. 30–31 (citing Ex. 1005, 1:51–61; Ex. 1003 ¶ 95). We are persuaded that Li’s access point and mobile stations are coupled through the WLAN “in the same way as described in the ’096

Patent.” *Id.* (citing Ex. 1005, 1:51–54, 1:62–66, 2:12–16, Fig. 1; Ex. 1003 ¶ 96).

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses “defining at least one of said access point, said first and second mobile stations, and said downlink at least in part by . . . (IEEE) 802.11 standard to establish said network including a wireless local area network,” and “coupling said access point to said first and second mobile stations through said wireless local area network,” as recited in claim 1.

- vi. *“estimating a first radio channel from said access point to said first mobile station over a pilot interval,” “estimating a second radio channel from said access point to said second mobile station over said pilot interval”*

Petitioner contends that “[c]hannel estimation over a pilot channel is a routine process in the IEEE 802.11 WLAN,” relying on Dr. Akl’s testimony. Pet. 31 (citing Ex. 1003 ¶ 50). Petitioner then provides evidence that Li, which discloses SDMA transmission based on the IEEE 802.11 standard, estimates the radio channels from the access point to the first and second mobile stations over a pilot interval. *Id.*

In particular, Petitioner points to Li’s Figures 2 and 3 for showing frame sequences to estimate channel state information of communication channels, wherein the channel state information is obtained before SDMA transmission and reception. Pet. 31–32 (citing Ex. 1005, 2:57–3:27). That is, in Li, “gathering state information [is] referred to as ‘estimating spatial channels,’” wherein the “channel state information of all [mobile stations] in a parallel group may be obtained before SDMA transmission and reception.”

See Ex. 1005, 2:54–61. Relying on the testimony of Dr. Akl, Petitioner contends that “this pre-transmission period is a pilot interval.” Pet. 32 (citing Ex. 1003 ¶ 97).

Patent Owner responds that “the plain and ordinary meaning of the word ‘over’ in the recited context presumptively qualifies the two ‘estimating’ steps as both having respective performances that necessarily overlap in time.” PO Resp. 27. Patent Owner contends “the Petition failed to specifically identify any ‘pilot interval’ in Li *over* which the two claimed ‘estimating’ steps . . . are both concurrently performed for respective first and second radio channels.” *Id.* at 28. Rather, Patent Owner contends that Figures 2 and 3 of Li show “nonoverlapping and temporally-separated ACK frames.” *Id.* In particular, Patent Owner contends that the Petition lacks evidence to show “how ACK-1 frame 212 should be considered the ‘pilot interval’ over which a radio channel is estimated for STA2,” or “how the subsequent and nonoverlapping ACK-2 frame should be considered the ‘pilot interval’ over which a radio channel is estimated for STA1.” *Id.* at 29.

We do not agree with Patent Owner’s contention that Petitioner fails to identify in Li any “‘pilot interval’ . . . over which the two claimed ‘estimating’ steps . . . are both concurrently performed for respective first and second radio channels.” PO Resp. 28 (emphasis omitted). In particular, we find unavailing Patent Owner’s contention that, because Li’s ACK-1 and ACK-2 frames are nonoverlapping and temporally separated, Li fails to show that the estimating of first and second radio channels takes place over the same pilot interval. *Id.*

Patent Owner’s contention relies on its proposed construction of “over said pilot interval,” which we decline to adopt, as discussed above in § II.B.

In particular, “over said pilot interval” recited in claim 1 does not require the time for estimating the first and second radio channels to be overlapping.

Figure 2 of Li, to which Patent Owner refers for allegedly showing “nonoverlapping and temporally-separated ACK frames” (PO Resp. 28), is reproduced below:

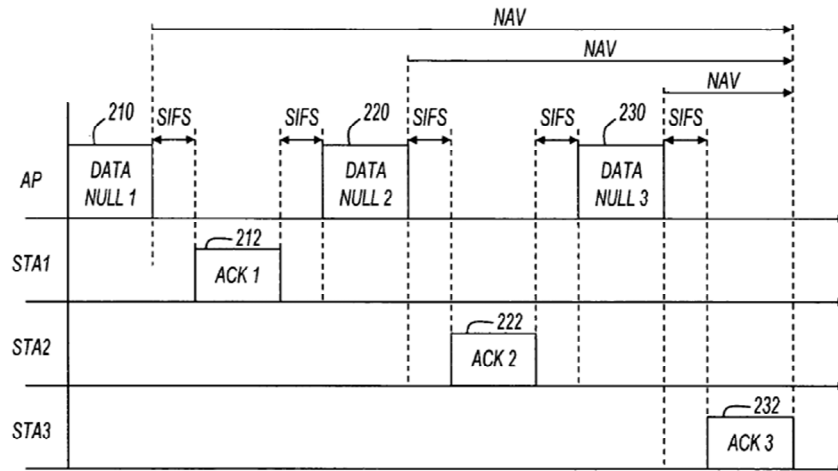


FIG. 2

Figure 2 of Li shows frame sequences to estimate channel state information of communication channels. Ex. 1005, 1:19–20. As Petitioner points out, Li discloses that “channel state information of all STAs in a parallel group may be obtained before SDMA transmission and reception.” Pet. Reply 23; *see also* Ex. 1005, 2:58–60. We are persuaded by Petitioner’s contention that period to “estimate channel state information,” as shown in Figure 2, refers to “Li’s period ‘before SDMA transmission and reception’ when channel state information is obtained.” Pet. Reply 23.

Thus, we find unavailing Patent Owner’s contention that the Petition lacks evidence to show “how ACK-1 frame 212 should be considered the ‘pilot interval’ over which a radio channel is estimated for STA2” or ACK-2 frame for STA1. PO Resp. 29. Here, Petitioner relies on the “pre-

transmission period” as shown in Figure 2 for the “pilot interval,” and not just “ACK-1 frame” or “ACK-2 frame” as Patent Owner contends. *See* Pet. 31–32; Pet. Reply 24.

Petitioner’s analysis is supported by Dr. Akl’s testimony that Li estimates channel state information of the plurality of communication channels in a pre-transmission period, i.e., a “pilot interval.” *See* Pet. 31–32 (citing Ex. 1005, 2:57–3:27; Ex. 1003 ¶ 97). We credit Dr. Akl’s unrebutted testimony that Li discloses channel estimation like the ’096 patent, wherein, as the ’096 patent defines and as a POSITA would have understood, estimating spatial channels occurs over a pilot interval, i.e., the time period where a signal is transmitted “for supervisory purposes.” Ex. 1003 ¶ 97 (citing Ex. 1001, 7:46–50).

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses “estimating a first radio channel from said access point to said first mobile station over a pilot interval,” and “estimating a second radio channel from said access point to said second mobile station over said pilot interval,” as recited in claim 1.

b. Dependent claims 2 and 3

Claim 2 depends from claim 1 and recites the step of “initializing said transmission protocol before starting said transmissions of said first and second data over said downlink.” Ex. 1001, 13:58–61. Petitioner contends that the claimed step “is closely related to the ‘channel estimation’ limitation” of claim 1 and, relying on the testimony of Dr. Akl, further contends that “[i]nitialization of a transmission protocol is a routine process in wireless communication.” Pet. 32 (citing Ex. 1001, 9:5–25; Ex. 1003 ¶ 99). Accordingly, Petitioner cites Li’s disclosure of the IEEE 802.11

initialization process including “the exchange of MPDUs [Medium Access Control Protocol Data Units] and ACK bursts between the access point and mobile stations to establish a connection.” *Id.* at 32–33 (citing Ex. 1005, 2:57–3:11; Ex. 1003 ¶ 100).

Claim 3 depends from claim 2 and recites that “initializing said transmission protocol further compris[es]: exchanging one or more protocol data units and one or more acknowledgement frames between said access point and said first mobile station and said second mobile station.”

Ex. 1001, 13:62–67. With respect to claim 3, Petitioner relies on the same analysis from claim 2 and asserts that “[t]he MPDU and ACK frames are part of the IEEE 802.11 standard.” Pet. 33 (citing Ex. 1005, 2:57–3:11; Ex. 1003 ¶¶ 51, 100, 102).

Although Patent Owner does not present arguments addressing the specific merits of Petitioner’s contentions with respect to claims 2 and 3 (*see generally* PO Resp.; PO Sur-reply), the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Here, we are persuaded that Li discloses the limitation recited in claim 2 via its description of the IEEE 802.11 initialization process. Pet. 32 (citing Ex. 1005, 2:57–3:11; Ex. 1003 ¶¶ 99–100). Similarly, for claim 3, we are persuaded that Li discloses the exchange of MPDUs and ACK frames as part of its description of the IEEE 802.11 initialization process. *Id.* at 33 (citing Ex. 1005, 2:57–3:11; Ex. 1003 ¶¶ 51, 100, 102).

Based on the complete record presented, we determine that Petitioner has persuasively shown that Li discloses the limitations in dependent claims 2 and 3.

c. Dependent claim 10

Claim 10 depends from claim 3 and further recites using time division multiple access (TDMA) to partition a channel between SDMA and non-SDMA modes. Pet. 36. Citing to Dr. Akl's testimony for support, Petitioner contends that "TDMA was well-known prior to the '096 Patent priority date." *Id.* at 37 (citing Ex. 1003 ¶ 105).

Petitioner relies on Perahia for disclosing this limitation. Pet. 37 (citing Ex. 1003 ¶¶ 108–109). In particular, citing to Perahia's Figure 9, Petitioner contends that Perahia discloses dual modes—an SDMA period reserved for serving "SDMA clients" and a non-SDMA period serving "standard clients." *Id.* (citing Ex. 1004, 3:13–30, 8:11–22, Fig. 9). Petitioner contends that it would have been obvious to a POSITA to combine the teachings of Li and Perahia that "address the same issue: enhancing throughput in a wireless network through the use of SDMA." *Id.* at 38 (citing Ex. 1004, 2:11–14; Ex. 1005, 2:42–44; Ex. 1003 ¶¶ 110, 113). According to Petitioner, a POSITA would have implemented "the SDMA/non-SDMA partition of Perahia in Li's network because some mobile stations do not operate in SMDA mode" and it would be desirable for Li's system "to continue supporting non-SDMA compatible mobile stations." *Id.* at 39–40 (citing Ex. 1004, Fig. 1; Ex. 1003 ¶ 111).

Although Patent Owner does not present arguments addressing the specific merits of Petitioner's contentions with respect to claim 10 (*see generally* PO Resp.; PO Sur-reply), the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. Here, we are persuaded by Petitioner's contention, supported by Dr. Akl's testimony, that Perahia discloses an SDMA period reserved for serving

SDMA clients and a non-SDMA period serving standard clients, wherein a POSITA would have implemented “the SDMA/non-SDMA partition of Perahia in Li’s network” to support non-SDMA compatible mobile stations. Pet. 37–38. Based on the complete record presented, we determine that Petitioner has persuasively shown that the combination of Li and Perahia teaches the subject matter of dependent claim 10.

d. Conclusion - Li and Li–Perahia Grounds

Based on the complete record presented, we are persuaded that Petitioner has demonstrated that Li discloses each limitation of claims 1–3, combined in the same way as in claims 1–3. Thus, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–3 are anticipated by Li.

We also are persuaded that the combination of Li and Perahia teaches all of the limitations of claim 10 and that an ordinarily skilled artisan would have had reasons to combine Li and Perahia. Thus, we determine that Petitioner has shown, by a preponderance of the evidence, that the subject matter of claim 10 would have been obvious over the combination of Li and Perahia.

D. *Anticipation of Claim 1 over Perahia (Ground 1)*

Petitioner argues that claim 1 is anticipated by Perahia. Pet. 18–27. Because the Li anticipation ground (Ground 2) is dispositive as to challenged claim 1 (*see supra* § II.C), we do not reach Petitioner’s challenge of claim 1 based on anticipation over Perahia. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-

precedential) (recognizing that “[t]he Board has the discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

E. Anticipation by Wax and Obviousness over Wax and Perahia

Petitioner contends that claims 1–3 of the ’096 patent are anticipated by Wax, and that claim 10 would have been obvious over Wax in view of Perahia. Pet. 40–52. Because the Li anticipation ground (Ground 2) is dispositive as to claims 1–3 and the Li-Perahia obviousness ground (Ground 3) is dispositive as to claim 10 (*see supra* § II.C), we do not reach Petitioner’s challenges based on anticipation by Wax and obviousness over Wax and Perahia. *See SAS*, 138 S. Ct. at 1359.

III. CONCLUSION⁶

For the foregoing reasons, we determine on the record at hand that Petitioner has demonstrated by a preponderance of the evidence that the challenged claims of the ’096 patent are unpatentable.

⁶ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1	102	Perahia ⁷		
1–3	102	Li	1–3	
10	103	Li, Perahia	10	
1–3	102	Wax ⁸		
10	103	Wax, Perahia ⁹		
Overall Outcome			1–3, 10	

IV. ORDER

For the reasons given, it is

ORDERED that, based on the preponderance of the evidence, claims 1–3 and 10 of the '096 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

⁷ We do not reach this ground because we have determined the challenged claim to be unpatentable under another ground. *See supra* § II.C.

⁸ We do not reach this ground because we have determined the challenged claims to be unpatentable under another ground. *See supra* § II.C.

⁹ We do not reach this ground because we have determined the challenged claim to be unpatentable under another ground. *See supra* § II.C.

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