

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC. and HP INC.,
Petitioner,

v.

XR COMMUNICATIONS LLC,
Patent Owner.

IPR2022-01155
Patent 10,715,235 B2

Before MIRIAM L. QUINN, BARBARA A. PARVIS, and
JAMES J. MAYBERRY, *Administrative Patent Judges*.

MAYBERRY, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Apple Inc. and HP Inc. (collectively, “Petitioner”), filed a Petition requesting *inter partes* review of claims 1–7, 15, and 16 (the “Challenged Claims”) of U.S. Patent No. 10,715,235 B2 (Ex. 1001, the “’235 patent”). Paper 3 (“Pet.”), 7. XR Communications LLC (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 7 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply (“Prelim. Reply,” Paper 8) and Patent Owner filed a Preliminary Sur-reply (“Prelim. Sur-Reply,” Paper 9), each addressing discretionary denial.

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2022) (permitting the Board to institute trial on behalf of the Director). To institute an *inter partes* review, we must determine that the information presented in the Petition shows “a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). For the reasons set forth below, upon considering the record, we deny the Petition and do not institute an *inter partes* review.

B. *Real Parties-in-Interest*

Petitioner identifies Apple Inc. and HP Inc. as the real parties-in-interest. Pet. 71. Patent Owner identifies itself as the real party-in-interest. Paper 5, 2.

C. *Related Matters*

The parties each identify the following litigations as matters related to the ’235 patent: *XR Communications, LLC, dba Vivato Technologies. v. Amazon.com, Inc., Amazon.com Services LLC, and Eero LLC*, No.

6:21-cv-0619-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. Apple Inc.*, No. 6:21-cv-0620-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. ASUSTek Computer Inc.*, No. 6:21-cv-0622-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. Google LLC*, No. 6:21-cv-0625-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc.*, No. 6:21-cv-0626-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. Dell Technologies Inc.*, No. 6:21-cv-0646-ADA (W.D. Tex.); *XR Communications, LLC, dba Vivato Technologies. v. HP Inc.*, No. 6:21-cv-0694-ADA (W.D. Tex.); and *XR Communications, LLC, dba Vivato Technologies. v. Microsoft Corporation*, No. 6:21-cv-0695-ADA (W.D. Tex.). Pet. 71; Paper 5, 2–3.

Petitioner has also challenged claims 8–14 of the '235 patent in IPR2022–00367, which was instituted. Pet. 60, 71; Paper 5, 2.

D. The '235 Patent

The '235 patent, titled “Directed Wireless Communication,” issued July 14, 2020, from application US 15/495,539. Ex. 1001, codes (54), (45), (21). The '235 patent ultimately claims priority to a provisional application, US 60/423,660, filed on November 4, 2002. *Id.* at code (60).

The '235 patent relates to “a multi-beam directed signal system [that] coordinates directed wireless communication with client devices.”

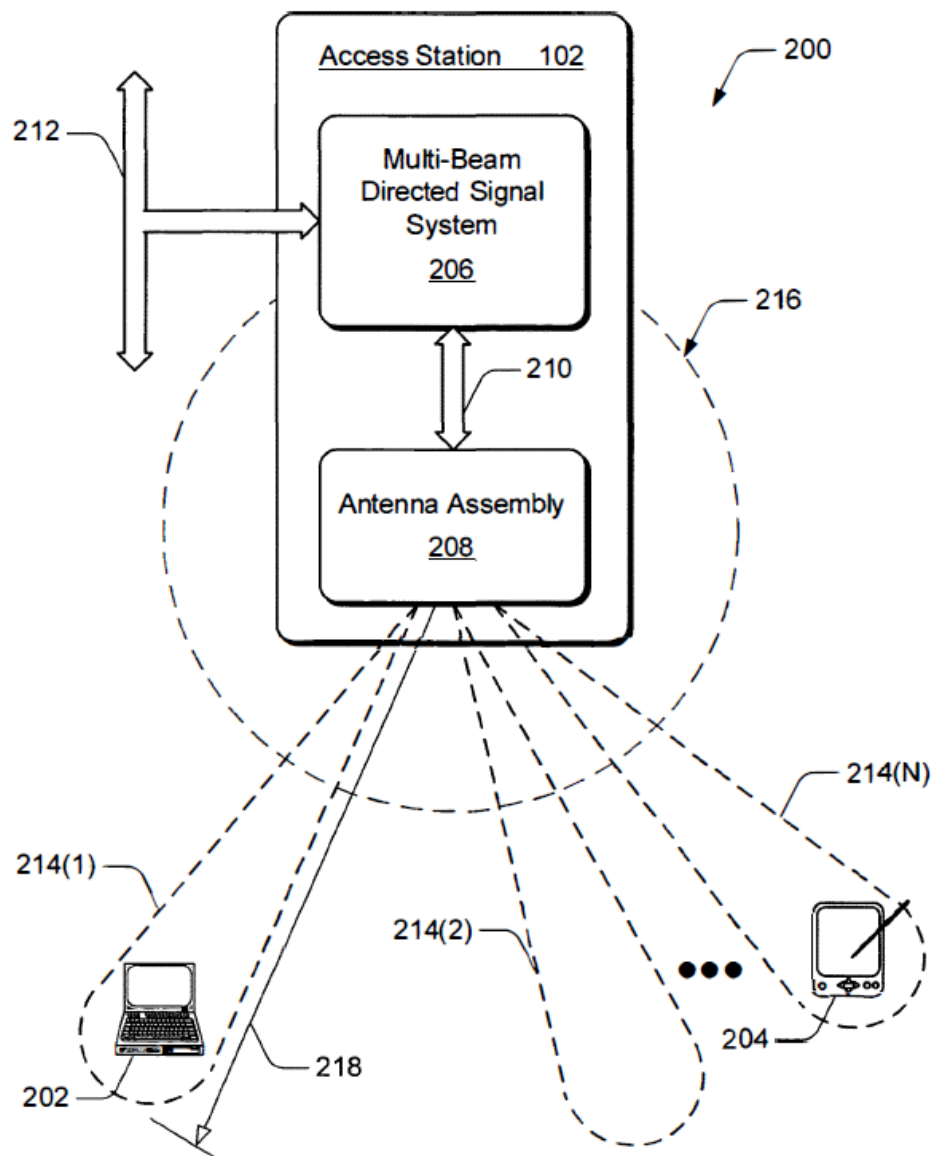
Ex. 1001, 2:8–10. “In a described implementation, a multi-beam directed signal system (e.g., also referred to as an access point or Wi-Fi switch) is a long-range packet switch . . . in accordance with an 802.11 standard.”

Id. at 3:43–47. “[S]imultaneous transmission and reception may occur at a

wireless routing device by applying multi-channel techniques.”

Id. at 3:41–43. Further, “[a]n increase in communication range is achieved by beamforming directed communication beams which simultaneously transmit directed signals and receive communication signals from different directions.” *Id.* at 3:47–51.

Figure 2, reproduced below, “illustrates an exemplary directed wireless communication system 200.” Ex. 1001, 4:44–45.



As shown, “antenna assembly 208 can be implemented as two or more antennas . . . to emanate multiple directed communication beams 214(1), 214(2), . . . , 214(N).” Ex. 1001, 4:54–57. “[C]lient device 202 can communicate via directed communication beam 214(1) with a first channel of the multi-beam directed signal system 206, and client device 204 can communicate via directed communication beam[] 214(N) with a second channel of the multi-beam directed signal system 206.” *Id.* at 5:16–21.

“Communication and/or data transfer signals . . . are considered desired signals [if] they are from nodes within the wireless routing network.” Ex. 1001, 24:27–31. “[S]ignals such as noise and WLAN interference associated with another external wireless system 1204 are not desired.” *Id.* at 24:31–33. “These signals, both desired and undesired, are received via antenna array 302 [of antenna assembly 208] and are provided to the signal control and coordination logic 304.” *Id.* at 24:34–36; *see also id.* at Fig. 3. Using logic 304, “multi-beam directed signal system 206 is configured to control the transmission amplitude frequency band and directionality of data packets to other nodes[,] and [thereby] assist in reducing the effects associated with received noise and interference.” *Id.* at 25:22–29.

“[S]canning receiver 822 [of system 206] . . . is configured to update routing information 1206 with regard to the received signals[and, for example,] . . . may identify information about different classes of interferers . . . within the routing information 1206.” Ex. 1001, 24:41–44; *see also id.* at Fig. 8B. “[R]outing information 1206 includes connection indexed routing table(s) based on identification information, such as . . . identifiers of the desired sources and other identifiers for the desired sources and other identifiers for the interferers.” *Id.* at 24:44–49. “Further, the

routing table includes stored weighting values (w) each associated with a particular signal source 1202 [of desired signals.]” *Id.* at 24:49–51. The stored weighting values are used in weighting matrix 1210, which applies the latest weighting values to received signals and transmitted signals. *Id.* at 25:16–19.

E. Challenged Claims

The Petition challenges claims 1–7, 15, and 16. Pet. 7. Claims 1, 6, and 15 are independent. We reproduce claim 1, which is representative, below.

1. A receiver for use in a wireless communications system, the receiver comprising:

[1a] an antenna, wherein the antenna comprises a first antenna element and a second antenna element;

[1b] a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

[1c] a processor operatively coupled to the transceiver, the processor configured to:

[1c-1] receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously;

[1c-2] determine first signal information for the first signal transmission;

[1c-3] determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

[1c-4] determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the transceiver to construct one or more beam-formed transmission signals;

[1c-5] cause the transceiver to transmit a third signal to the remote station via the antenna, the third signal comprising content based on the set of weighting values.

Ex. 1001, 32:33–58¹.

F. Prior Art and Asserted Grounds

Petitioner asserts that the Challenged Claims are unpatentable based on two grounds:

Claims Challenged	35 U.S.C. §	References/Basis
1–5, 15, 16	103	Saunders ² , Hottinen ³
6, 7	103	Saunders, Hottinen, Shull ⁴

Pet. 8.

Petitioner relies on the declaration testimony of Dr. Robert Akl (Ex. 1026) in support of these grounds.

The following subsections provide brief descriptions of the asserted prior art references.

1. Saunders (Ex. 1027)

Saunders, titled “Apparatus and Method for Adaptive Beamforming in an Antenna Array,” issued February 29, 2000. Ex. 1027, codes (54), (45). Saunders “relates . . . to communication systems using an adaptive beamforming technique.” *Id.* at 1:5–7. We reproduce Saunders’s Figure 3, with Petitioner’s annotations, below.

¹ We include labels for the limitations as used by Petitioner.

² US 6,031,877; issued Feb. 29, 2000 (Ex. 1027, “Saunders”).

³ WO 02/47286 A2; published June 13, 2002 (Ex. 1011, “Hottinen”).

⁴ US 6,006,077; issued Dec. 21, 1999 (Ex. 1007, “Shull”).

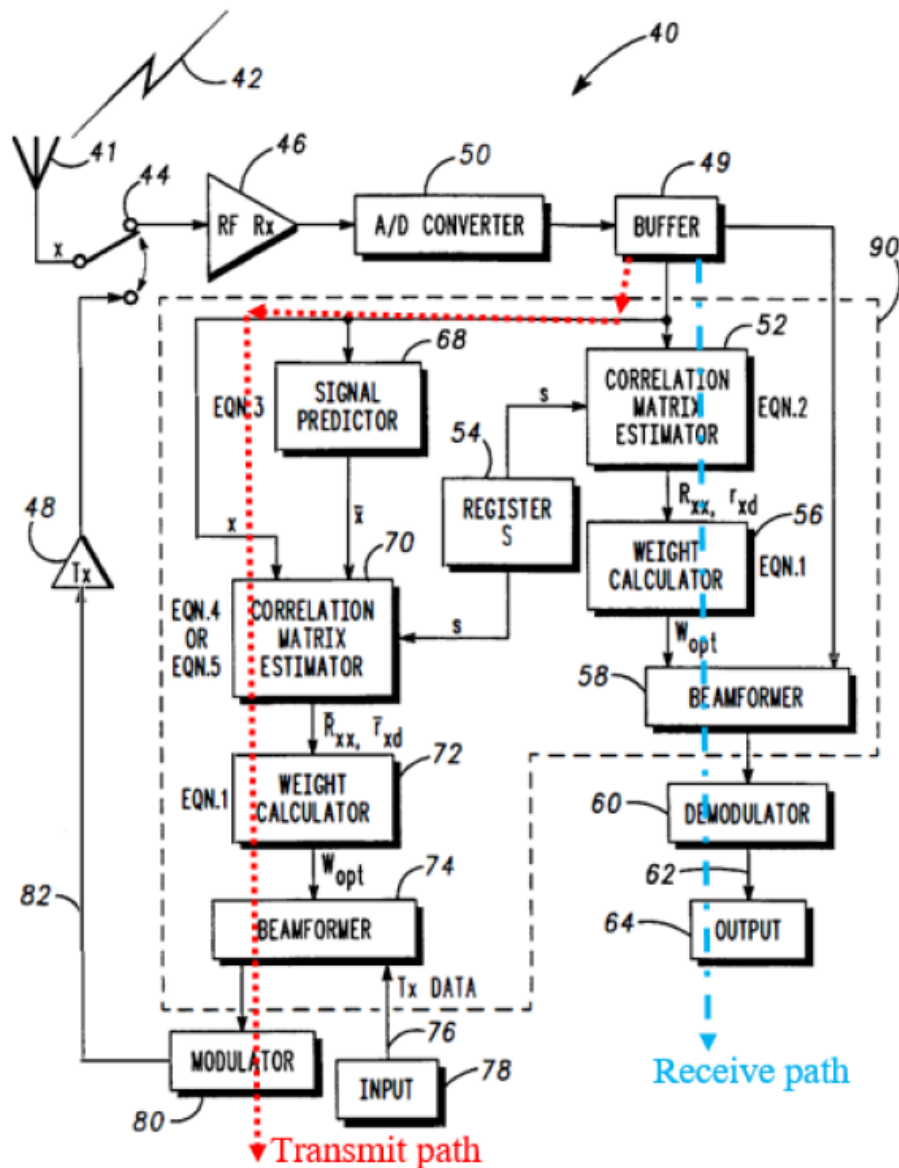


FIG. 3

Pet. 18. Figure 3 depicts “a functional diagram . . . for adaptive beamforming.” Ex. 1027, 5:16–17. Petitioner’s annotations identify a transmit path and a receive path. Communication device 40 may be a base station or a mobile unit that includes an array of antenna elements 41 for receiving and transmitting encoded signals 42. *Id.* at 5:19–22. In a receive path, signals received by antenna elements 41 are stored in buffer 49 and

then inputted into correlation matrix estimator 52. *Id.* at 5:26–31.

Correlation matrix estimator 52 calculates R_{xx} and r_{xd} . *Id.* at 5:33–34; *see also id.* at 2:19–36 (providing equation 2 and its parameters, including R_{xx} and r_{xd}). Weight calculator 56 receives R_{xx} and r_{xd} to calculate w_{opt} , which are the beamforming coefficients for the receive path applied by beamformer 58. *Id.* at 5:35–39.

In a transmit path, the data stored in buffer 49 is input into signal predictor 68, which then calculates an estimate of x , according to equation 3. Ex. 1027, 5:43–45; *see also id.* at 4:3–21 (providing equation 3 and its parameters). The data in buffer 49 are also input into correlation matrix estimator 70, which produces estimates for R_{xx} and r_{xd} using either equation 4 or equation 5. *Id.* at 5:45–49; *see also id.* at 4:22–30, 5:1–15 (providing equations 4 and 5). Weight calculator 72 calculates w_{opt} for the transmit path from the calculated R_{xx} and r_{xd} estimates using equation 1. *Id.* at 5:50–52. Beamformer 74 applies w_{opt} to data 76, which is then encoded as output signals 82 transmitted by antenna elements 41. *Id.* at 5:55–59.

2. *Hottinen (Ex. 1011)*

Hottinen is a Patent Cooperation Treaty application titled “Method for Controlling the Weighting of a Data Signal in the at least Two Antenna Elements of a Radio Connection Unit, Radio Connection Unit, Module and Communications System,” which published June 13, 2002. Ex. 1011, codes (54), (43). Hottinen is directed “to a method for controlling the

weighting of a data signal in the at least two antenna elements of a first radio connection unit of a radio communications system.” Ex. 1011, 1⁵.

In one of Hottinen’s disclosed methods, weighting factors are determined at a second radio connection unit based on at least two beams of a data signal transmitted in parallel from a first radio connection unit to the second radio connection unit, where the two beams are at least partly different data streams. Ex. 1011, 3–4. Once determined, the weight information is transmitted to the first radio connection unit, which uses the information to transmit a data signal. *Id.* at 4. In this way, the second radio connection unit provides performance feedback to the first radio connection unit. *Id.*

Alternatively, the first radio connection unit can calculate the weighting factors from other feedback information send from the second radio communication unit. Ex. 1011, 5.

3. *Shull (Ex. 1007)*

Shull is a U.S. patent titled “Received Signal Strength Determination Methods and Systems,” and issued December 21, 1999, from an application, US 08/942,645, filed October 2, 1997. Ex. 1007, codes (54), (45), (21), (22). Shull relates to determining the signal strength of signals received in a communications network. *Id.* at 1:6–8. We reproduce Shull’s Figure 3, below, which is a flowchart illustrating Shull’s signal strength determining method. *Id.* at 4:12–13.

⁵ We use the pagination of the publication, which appears at the top center of each page other than the title page. This use is consistent with Petitioner’s citations to Hottinen. *See, e.g.*, Pet. 20 (providing quotations from Hottinen, where the citations match publication’s pages containing the quoted information).

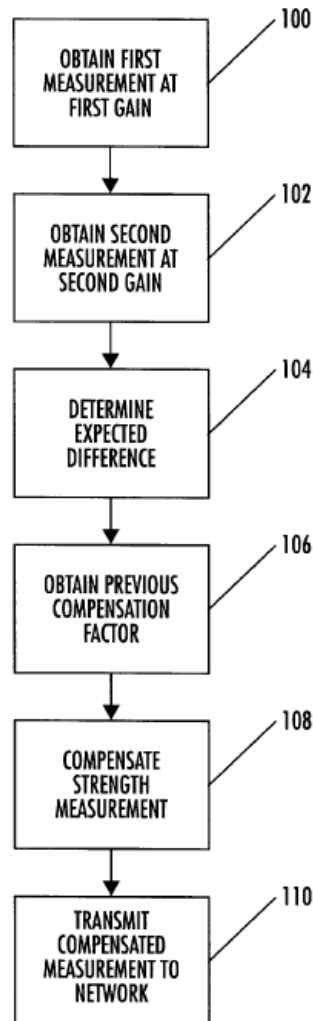


FIG. 3.

At step 100, a receiver is set to a first gain level and a first signal strength measurement of a received signal is obtained. Ex. 1007, 7:63–65. Then, at step 102, the receiver is set to a second gain level and a second signal strength measurement is obtained. *Id.* at 7:65–8:1. At step 104, Shull’s apparatus determines the expected difference between the first signal strength measurement and the second signal strength measurement based on the two gain levels. *Id.* at 8:1–4. “For example, if the gain level is dropped by 20 dB, the expected difference between the two readings would be

20 dB.” *Id.* at 8:4–6. At this step, the apparatus determines the actual difference between the two measurements, by subtracting the two values from steps 100 and 102. *Id.* at 8:6–9.

At step 106, the apparatus retrieves a previously determined compensation factor associated with the second signal strength measurement from memory of the receiver, and the actual difference (from step 104) is compared to the expected difference to provide a signal strength compensating factor. Ex. 1007, 8:10–15. At step 108, the apparatus generates a compensated signal strength measurement, based on the signal strength compensating factor and the previously determined compensation factor associated with the second signal strength measurement, such as “by summing the signal strength compensating factor, the previously determined compensation factor associated with the second signal strength measurement and the first signal strength measurement.” *Id.* at 8:15–25. Finally, at step 110, the apparatus transmits the compensated signal strength measurement from step 108 to the communication network. *Id.* at 8:25–27.

II. ANALYSIS OF PETITIONER’S CHALLENGES

A. *Applicable Law*

Petitioner’s asserted grounds of unpatentability are based on obviousness under 35 U.S.C. § 103.

Section 103(a) forbids issuance of a patent when “the differences between the subject matter sought to be patented 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). 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 ordinary skill in the art; and (4) when available, objective evidence, such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“[O]bviousness must be determined in light of *all the facts*, and . . . a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine” teachings from multiple references. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (emphasis added); *see also PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014) (“The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact.”).

B. Level of Ordinary Skill in the Art

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Petitioner contends:

A person of ordinary skill in the art at the time of the ’235 Patent . . . would have had a Bachelor of Science degree in an academic discipline emphasizing electrical engineering or a related field, in combination with training or at least two years of related work experience in wireless communication systems, or the equivalent. Alternatively, the person could have also had a Masters or Doctorate degree in electrical engineering with a year of related work experience in wireless communication systems.

Pet. 10 (citing Ex. 1026 ¶¶ 24–25). Patent Owner does not address the level of ordinary skill in the art in the Preliminary Response.

For the purposes of this Decision, we apply Petitioner’s definition of the level of ordinary skill in the art. We determine that this definition is consistent with the prior art of record, and the skill reflected in the Specification of the ’235 patent, based on our review of the limited record.

C. Claim Construction

In *inter partes* reviews, we interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). Under this standard, we construe the 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.” *Id.*

Petitioner states that “[n]o formal claim constructions are necessary for this [P]etition.” Pet. 3. Patent Owner states that “[t]he Board need not construe any terms for purposes of this institution decision.” Prelim. Resp. 7.

We determine that we need not expressly construe any claim terms to resolve the parties’ disputes on the record before us. *See 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)). To the extent that the scope of any particular claim term requires discussion, however, we provide it in our assessment of the challenges, which we turn to next.

*D. Ground 1: Claims 1–5, 15, and 16 as unpatentable over
Saunders and Hottinen*

Petitioner contends that the combination of Saunders and Hottinen teaches or suggests each limitation of claims 1–5, 15, and 16. Pet. 8, 17–49.

*1. Petitioner proposed combination of Saunders and
Hottinen*

Petitioner contends that Saunders discloses a communication device and method where weights, or beamforming coefficients, are applied to data that is transmitted from the communication device to another device.

Pet. 22–23 (referencing Ex. 1027, Abstract, 5:16–59 (describing Saunders’s Figure 3)). Petitioner contends that “Saunders discloses optimizing the beamforming of a communication device that receives a signal from another device and using the optimization to communicate with the other device.”

Id. at 23 (referencing Ex. 1026 ¶ 60).

Petitioner contends that a person having ordinary skill in the art would have wanted to optimize the device transmitting signals to a receiver to improve communications between the devices, as optimizing the transmission “improv[es] signal directivity, channel path gain, and minimize[es] signal loss.” Pet. 23. Petitioner contends that “Hottinen teaches that a second radio connection unit can determine feedback information including weight information and then transmit that feedback information to . . . a first radio connection unit.” *Id.* (referencing Ex. 1011, 3–4, 7–8, 21–22). Petitioner adds that “[t]he first radio connection unit receives the feedback information including the weight information and configures its beams that are to be used for transmission of the data signals from the first radio connection unit to the second radio connection unit.” *Id.* at 23–24 (referencing Ex. 1011, 3–8, 13–14, 21–22, 23). Petitioner

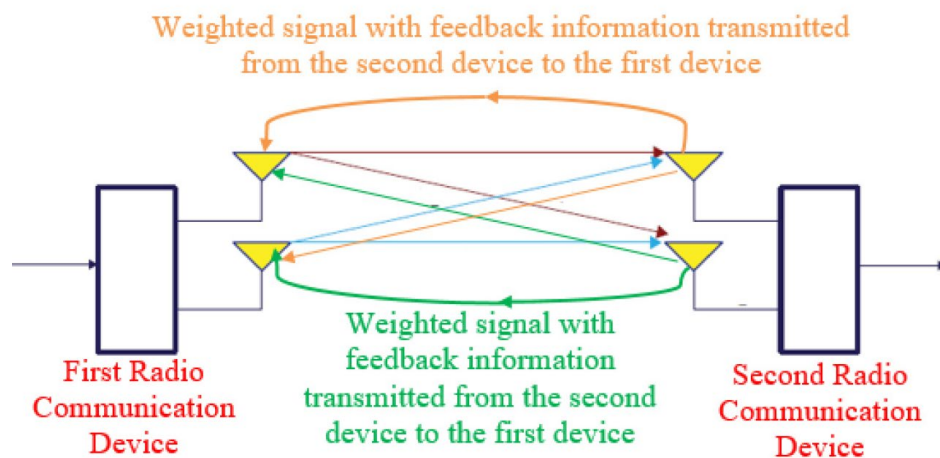
concludes that “[b]y combining the teachings of Saunders and Hottinen, weights and beam forming can be utilized at both devices to optimize the beams used for data communications between the antenna element arrays of both devices.” *Id.* at 24 (referencing Ex. 1026 ¶¶ 61–62).

Petitioner clarifies its proposed combination:

in the combination of Saunders and Hottinen, a “second radio communication device” refers to Hottinen’s “second radio connection unit” and the communication device in Saunders that receives a signal, and determines and applies weights/beamforming coefficients to data to be transmitted to another device. The “first radio communication device” refers to Hottinen’s “first communication unit” and the device in Saunders from which the beamformed signals transmitted from the second radio communication device are received.□ In the combined Saunders-Hottinen system, the first radio communication device corresponds to the “transmitter,” and the second radio communication device corresponds to the “receiver.”

Id.

We reproduce a figure from Petitioner’s declarant, Dr. Akl, below, to further illustrate Petitioner’s combination.



Pet. 25 (referencing Ex. 1041, 38; Ex. 1026, 37 (¶ 63)). Petitioner contends that this illustration depicts “[w]eighted signal with feedback information transmitted from the second device to the first device.” *Id.*

The maroon and blue arrows depict communications from an antenna element array of the first radio communication device to an antenna element array of the second radio communication device, and the orange and green arrows depict communications from the antenna element array of the second radio communication device to the antenna element array of the first radio communication device.

Id. (referencing Ex. 1026 ¶ 63). Petitioner concludes that a person having ordinary skill in the art “would have recognized that combining the teachings of Hottinen and Saunders would have optimized the beams formed at the first radio communication device based on feedback information provided by the second radio communication device resulting in improved communications between the two devices.” *Id.* at 26 (referencing Ex. 1026 ¶ 64).

Petitioner also contends that a person having ordinary skill in the art would have had a reasonable expectation of success in combining the systems of Saunders and Hottinen. Pet. 26; *see also id.* at 26–27 (supporting the contention with respect to reasonable expectation of success).

Patent Owner does not specifically address Petitioner’s contentions with respect to its reasons for combining Saunders and Hottinen, including the contentions with respect to reasonable expectation of success. We address Petitioner’s reasoning in our analysis of claim 1, below.

2. *Independent claims 1 and 15*

We turn our analysis now to the scope and content of the prior art and any differences between the prior art and the subject matter of independent

claim 1, on a limitation-by-limitation basis. For claim 15, Petitioner relies on its analysis of claim 1. *See* Pet. 47–48 (referencing, for each limitation of claim 15, the analysis for the corresponding limitation for claim 1).

a) Preamble

The preamble of claim 1 recites “[a] receiver for use in a wireless communications system.” Ex. 1001, 32:33–34. Petitioner contends that Saunders discloses a receiver used in a wireless communications system, which may be part of a base station. Pet. 27–28 (referencing Ex. 1027, Abstract, 1:5–8, 1:10–28, 5:16–30, 6:10–29, Fig. 3; Ex. 1026 ¶ 72); *see id.* at 28 (reproducing an annotated version of Saunders’s Figure 3, labeling encoded signals 42 as “Received signals” and apparatus 40 as “Receiver/second radio communication device”).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing that Saunders, as modified by Hottinen, teaches or suggests the subject matter of the preamble. In view of this determination, we need not resolve whether the preamble is limiting.

b) Limitation [1a]

Claim 1 recites “an antenna, wherein the antenna comprises a first antenna element and a second antenna element.” Ex. 1001, 32:35–36 (limitation [1a]). Petitioner contends that Saunders’s array of antenna elements 41 corresponds to the recited antenna, and includes at least a first and a second antenna element. Pet. 28–29 (referencing Ex. 1027, 5:16–30, Fig. 3; Ex. 1026 ¶¶ 73–76; Ex. 1041, 38–39, 168); *see also id.* at 29 (providing an annotated version of Saunders’s Figure 3, identifying the first and second antenna elements).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing that Saunders teaches or suggests the subject matter of limitation [1a] of claim 1. Patent Owner does not dispute Petitioner's contentions with respect to this limitation in the Preliminary Response.

c) Limitation [1b]

Claim 1 recites “a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna.” Ex. 1001, 32:37–39 (limitation [1b]). Petitioner contends that Saunders's transmitters 48 and receivers 46 together correspond to the recited transceiver and are coupled to antenna elements 41. Pet. 29–30 (referencing Ex. 1027, 5:16–59, Fig. 3; Ex. 1026 ¶ 77); *see also id.* at 30 (providing an annotated version of Saunders's Figure 3, identifying the transmitter, receiver, antenna, and modulator). Petitioner adds that Saunders's communications system transmits and receives electromagnetic signals using the antenna. *Id.* at 30–32 (referencing Ex. 1027, 6:10–18; Ex. 1026 ¶ 78; Ex. 1010, 1:20–25; Ex. 1029, 4–6, Figs. 1.3, 1.4).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing that Saunders teaches or suggests the subject matter of limitation [1b] of claim 1. Patent Owner does not dispute Petitioner's contentions with respect to this limitation in the Preliminary Response.

d) Limitation [1c]

Claim 1 recites “a processor operatively coupled to the transceiver.” Ex. 1001, 32:40 (limitation [1c]). Petitioner contends that Saunders's microprocessor 90 corresponds to the recited processor. Pet. 33 (referencing

Ex. 1027, 5:60–65, Fig. 3; Ex. 1026 ¶ 79); *see also id.* (providing an annotated version of Saunders’s Figure 3, identifying the transmitter, receiver, modulator, and processor).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing that Saunders teaches or suggests the subject matter of limitation [1c] of claim 1. Patent Owner does not dispute Petitioner’s contentions with respect to this limitation in the Preliminary Response.

e) Processor configuration limitations

Claim 1 also recites

the processor configured to:

[1c-1] receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously;

[1c-2] determine first signal information for the first signal transmission;

[1c-3] determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

[1c-4] determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the transceiver to construct one or more beam-formed transmission signals; [and]

[1c-5] cause the transceiver to transmit a third signal to the remote station via the antenna, the third signal comprising content based on the set of weighting values.

Ex. 1001, 32:40–58 (collectively, the “processor configuration” limitations).

Although we present each individual processor configuration limitation separately, because of the interrelationship of the limitations, we reserve our

analysis and conclusions until we have presented the parties' contentions with respect to each of the processor configuration limitations.

(1) Limitation 1c-1

With respect to limitation [1c-1], Petitioner contends that, in the combined Saunders-Hottinen wireless communication system, signals are transmitted from a first radio communication device to a second radio communication device, and that these signals are received by several elements of Saunders's antenna elements 41. Pet. 34 (referencing Ex. 1011, 7, 24; Ex. 1027, 5:16–59, Fig. 3). Petitioner contends that,

because Hottinen teaches that the first radio communication device uses two antenna elements of a transceiver to transmit signals to the second radio communication device and that the same number of transmit and receive antenna elements can be used, it would have been obvious to a [person having ordinary skill in the art] that, in the combination of Saunders and Hottinen, the second radio communication device includes two antenna elements to receive first and second signal transmissions from the two antenna elements of the first radio communication device.

Id. (referencing Ex. 1011, 2, 7, 24; Ex. 1026 ¶ 80).

Petitioner contends that Hottinen teaches that the user station communicates with a separate base station. Pet. 35. Petitioner contends that, as such, the combined teachings of Saunders and Hottinen renders obvious the first radio communication device being a remote station. *Id.* (referencing Ex. 1011, 1, 10, 11, 17; Ex. 1027, 6:10–29, 1:10–28; Ex. 1026 ¶ 81).

Petitioner also contends that Hottinen teaches that the second radio communication device determines weight information and transmits that weight information to the first radio communication device. Pet. 35

(referencing Ex. 1011, 3). Petitioner adds that “[t]he first radio communication device uses the received weight information to configure ‘at least two suitable beams’ for parallel and simultaneous transmissions to the second radio communication device.” *Id.* at 35–36 (referencing Ex. 1011, 3–4, 21–22). Petitioner contends that these two beams are at least partially different streams. *Id.* at 36 (quoting Hottinen that “[a]t least partly different symbols are therefore transmitted in parallel using the at least two formed beams” (Ex. 1011, 6)). Petitioner adds that “[t]he first radio communication device can perform channel encoding such that ‘different encoded bits are transmitted from different beams with assigned power.’” *Id.* (quoting Ex. 1011, 22; referencing Ex. 1026 ¶¶ 82–85).

Petitioner contends that Saunders’s beamforming coefficients are determined using a signal vector that includes signal values received simultaneously, based on Dr. Akl’s testimony. Pet. 36–37 (referencing Ex. 1026 ¶¶ 82–87). Dr. Akl testifies that, as illustrated in a 2×2 multiple in-multiple out (“MIMO”) system, two transmitted signals with different data can be transmitted and received simultaneously. *See* Ex. 1026 ¶¶ 83–85 (relying on Ex. 1041, 38–39, 168, 170, Figs. 2.14, 6.2). Dr. Akl testifies that, in the MIMO system, two signals that are transmitted simultaneously at the speed of light would be received at the same time, with any offset or delay being insubstantial. *Id.* ¶ 85. Dr. Akl testifies that a person having ordinary skill in the art “would have understood that signals transmitted simultaneously in MIMO systems from one set of transmitting antenna elements to a set of receiving antenna elements would have been received simultaneously as well.” *Id.*

Dr. Akl further testifies that Saunders teaches determining beam coefficients based on signal vector values received at the same time. Ex. 1026 ¶ 87. Dr. Akl testifies that “[i]f the signals were not simultaneously received, the expressions would have incorporated compensation factors to compensate for the delays and offsets,” and no such factors are disclosed in Saunders and Hottinen. *Id.*; *see also* Pet. 37–38 (relying on this testimony from Dr. Akl).

Petitioner concludes that

As explained in more detail below in [1c-2]-[1c-5], after simultaneously receiving the two signals, the second radio communication device generates weights to be used by the first and second radio communication devices, and sends feedback information back to the first radio communication device. The first radio communication device uses the feedback information to configure the next two parallel and simultaneous signals sent to the second radio communication device. Accordingly, Saunders in view of Hottinen renders obvious [1c-1].

Pet. 38 (referencing Ex. 1026 ¶ 88).

(2) *Limitation 1c-2*

With respect to limitation [1c-2], Petitioner contends that Saunders teaches processing a received signal in a transmit path and a receive path.

Pet. 38–39 (referencing Ex. 1027, Abstract, 1:5–8, 5:60–65, Fig. 3).

Petitioner contends that Saunders determines beamforming coefficients (“ W_{opt} ”) for each of these paths. *Id.* at 39 (referencing Ex. 1027, 5:16–65; Ex. 1026 ¶ 89).

Petitioner contends that Hottinen also teaches determining signal information from received signals, and producing a covariance matrix and weight information. Pet. 39–40 (referencing Ex. 1011, 3–7, 13, 22–24; Ex. 1026 ¶ 90).

(3) *Limitation 1c-3*

With respect to limitation [1c-3], Petitioner contends that Hottinen teaches that the first radio communication device transmits two signals, and that these signals “include at least partly different content, symbols, and encoded bits.” Pet. 40 (referencing Ex. 1011, 6, 33). Petitioner contends that this demonstrates that “the two signals received by the Saunders-Hottinen receiving device are different.” *Id.* Petitioner concludes “that when different signals are received by the second radio communication device, the signal information (e.g., matrix values) determined from the received first signal transmission, as explained above in [1c-2], would have been different from the signal information determined from the received second signal transmission.” *Id.* (referencing Ex. 1026 ¶ 91).

Petitioner also contends that Saunders “teaches that information from the various antenna elements 41 can be combined to yield signal information x, which, in the case of two received signals as described above, is a combination of first signal information determined for the first signal transmission and second signal information determined for the second signal transmission.” Pet. 40 (referencing Ex. 1027, 5:26–29, Fig. 3; Ex. 1026 ¶ 91 (providing the identical statement, without further explanation)).

(4) *Limitation 1c-4*

With respect to limitation [1c-4], Petitioner contends that Saunders teaches, in its transmit path, that weighting values are determined based on information from received signal information and predicted signal information. Pet. 41 (referencing Ex. 1027, 5:26–59, Fig. 3; Ex. 1026 ¶ 92); *see also id.* at 42 (providing an annotated version of Saunders’s Figure 3, highlighting a portion of the transmit path).

Petitioner also contends that “the set of weighting values W_{opt} are provided to a beamformer 74, which combines these values with input data 76 received from an input device” Pet. 42 (referencing Ex. 1027, 5:43–59). Petitioner contends that this output is used to construct transmission signals to a destination device. *Id.* at 42–43 (referencing Ex. 1027, 5:43–59; Ex. 1026 ¶ 93). Dr. Akl’s testimony repeats Petitioner’s contentions. *See* Ex. 1026 ¶¶ 92–93.

Petitioner also contends that “the second radio communication device in the Saunders-Hottinen combination also determines covariance matrices and weight values that can be used for transmission back to the first radio communication device.” Pet. 43 (referencing Ex. 1011, Abstract, 3–4, 13, 24; Ex. 1026 ¶ 94). Dr. Akl’s testimony repeats this contention. *See* Ex. 1026 ¶ 94. Petitioner does not explain further how these Hottinen teachings are employed in the Saunders-Hottinen combination.

Patent Owner argues that “[t]he Petition fails to identify any teaching in the combined Saunders-Hottinen system . . . that renders [the subject matter of limitation [1c-4]] obvious.” Prelim. Resp. 8. Patent Owner argues that Petitioner principally relies on Saunders’s disclosure that the set of weighting values W_{opt} are determined based on “x,” which is a signal vector received at “n branches” of an antenna array. *Id.* Patent Owner argues that “x” represents information from a single signal, not two different signals as required by the limitation. *Id.* Patent Owner explains that “Saunders describes that the ‘received signal vector, $x(k)$ of a frame k can be derived . . . once per burst transmission’ . . . , which confirms that ‘x’ refers to information about a single received frame, not two different signals from the same remote station.” *Id.* (quoting Ex. 1027, 3:54–63).

Patent Owner continues that “Petitioner[] do[es] not identify any disclosure in Saunders that indicates that ‘x’ refers to two different signals from the same remote station . . . [or] that indicates that ‘x’ refers to two different signals received simultaneously from the same remote station.” Prelim. Resp. 8–9. Patent Owner argues that Dr. Akl’s testimony, upon which Petitioner relies, “does not address the requirement that both signals be received from the same remote station.” *Id.* at 9. Patent Owner also argues that Dr. Akl’s testimony is contradicted by Saunders’s express disclosure that the received signal vector is from a single signal “x.” *Id.*

Patent Owner also argues that, with respect to Hottinen,

Neither Hottinen, paragraph 94 of Dr. Akl’s declaration, nor the other (uncited) portions of the Petition and supporting declaration at issue describe how a single radio communication device in Petitioner[’s] Saunders-Hottinen system would determine a set of weighting values based on both “the first signal information and the second signal information” originating from the same remote station, where that set of weighting values is used to construct beam-formed transmission signals.

PO Resp. 10. Patent Owner adds that “the Petition does not substantively articulate how Hottinen teaches limitation [1c-4].”

(5) *Limitation 1c-5*

With respect to limitation [1c-5], Petitioner contends that, “[a]s explained above in [1c-4], Saunders teaches that the set of weighting values W_{opt} is configured to be used by the transceiver to construct one or more beam-formed transmission signals.” Pet. 43; *see id.* at 43–44 (describing the operation of Saunders’ beamformer 74 (referencing Ex. 1027, 5:43–59; Ex. 1026 ¶ 95)).

Petitioner adds that “Hottinen teaches that weighting values calculated at the receiving second radio communication device can be transmitted back to the first radio communication transmitting device so that the first radio communication transmitting device can use the weighted values to configure beams for transmission to the second radio communication receiving device.” Pet. 44 (referencing Ex. 1011, 3–4, 8, 10, 20–22, 27–28).

Petitioner contends that the combined Saunders-Hottinen system determines two sets of weights—one set used to beamform the transmission signal, as taught by Saunders, and one set provided as content and included in the transmission signal to be used by the first radio. *Id.* (referencing Ex. 1011, Abstract, 3–4, 13, 24; Ex. 1026 ¶ 96).

(6) *Analysis and conclusion as to the processor configuration limitations*

For the reasons below, we determine that Petitioner has not demonstrated sufficiently that the combination of Saunders and Hottinen teaches or suggests a processor configured as recited in claim 1. Specifically, we determine that Petitioner fails to explain sufficiently how the combined system includes a processor that is configured to receive, from a remote station, a first signal transmission via the first antenna element and a second signal transmission via the second antenna element simultaneously, where the second signal information is different than the first signal information—requirements recited in limitations [1c-1] and [1c-2].

We summarize our understanding of Petitioners contentions with respect to limitations [1c-1] and [1c-2] here. Petitioner identifies “the first radio communication device” as corresponding to the recited remote station, relying primarily on teachings from Hottinen. Pet. 34–35. Petitioner

identifies the “second radio communication device” as the device that determines weights from information sent from the first radio communication device, again primarily relying on Hottinen. *Id.* at 35.

Petitioner contends that the first radio communication device sends two beams to the second radio communication device, and that these beams are sent in “parallel and simultaneous transmissions.” Pet. 35–36. Petitioner contends that these two beams are at least partially different streams of information. *Id.* at 36. Again, these teachings are primarily from Hottinen. *See id.* at 35–36.

Petitioner then turns to Saunders’s teaching of its calculation of beamforming coefficients, which is governed by Saunders’s equation 1. Pet. 36–37. This equation includes the received signal vector “*x*,” which is the combination of signals received at multiple antenna elements. *Id.* at 37. Petitioner, relying on testimony from Dr. Akl, contends that signals transmitted simultaneously, such as those sent from the first radio communication device, would be received simultaneously, because Saunders’s equation 1 does not have compensation factors. To illustrate its position, Petitioner assumes an antenna array with two elements, with each element receiving the two beams sent from the first radio communication device’s two antenna elements of the proposed Saunders-Hottinen combination. *See id.* at 35.

Petitioner, however, does not sufficiently explain, for purposes of institution, how Saunders’s equation 1 teaches or suggests that its multiple antenna elements are each receiving, simultaneously, two information signals, each including different information as required by claim 1. We agree with Patent Owner that “the Petition fails to show that ‘*x*’ refers to

information for two different signals received from the same remote station. Rather, Saunders defines ‘x’ as a ‘received signal vector at n branches (i.e. n antenna elements).’” Prelim. Resp. 8 (emphasis omitted). Petitioner does not direct us to any teaching in Saunders that the components (that is, x_1 , x_2 , x_3 , . . . $x_{(n-2)}$) of the received signal vector are not a single information stream, received at multiple antenna components (or that these components would be multiple information streams).

Dr. Akl’s supporting testimony relies on teachings of a MIMO system, from Zarrinkoub. *See* Ex. 1026 ¶¶ 74–76, 83–85 (citing Ex. 1041, 38–39, 168, 170⁶). Dr. Akl testifies that “Zarrinkoub explains that multiple transmit antenna elements can be used in beam forming to shape the overall antenna radiation pattern (or the beam) in order to maximize the overall antenna gain in the direction of the mobile terminal.” *Id.* at 76 (citing Ex. 1041, 39). We reproduce Zarrinkoub’s Figure 2.14, upon which Dr. Akl relies, below.

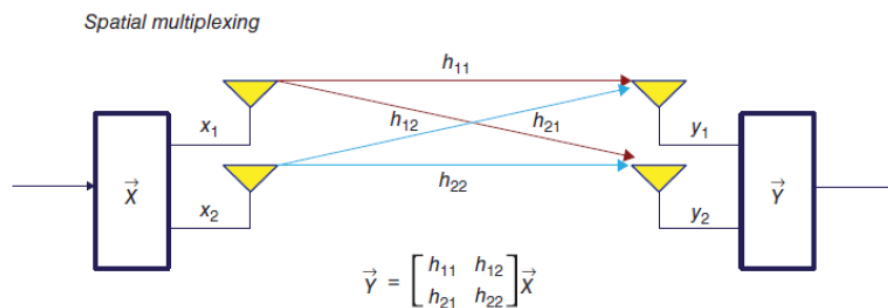


Figure 2.14 MIMO spatial multiplexing

Ex. 1041, 38. “Figure 2.14 illustrates the spatial multiplexing for a 2×2 antenna configuration.” *Id.* This figure “illustrates a MIMO system in

⁶ Like Petitioner, we cite to the page number of the publication, rather than the pagination of the exhibit provided by Petitioner. For example, page 38 of the publication is page 58 of the exhibit.

which two antenna elements are used to transmit two different signals to two receiving antenna elements of a receiving device.” Ex. 1026 ¶ 74 (citing Ex. 1041, 38).

Dr. Akl testifies “from Saunders’[s] equation 1 and other equations (up to equation 5), that the signals in the Saunders-Hottinen system are received simultaneously.” Ex. 1026 ¶ 87. Dr. Akl fails to explain adequately how the vector “y” of Zarrinkoub relates to Saunders’s received signal vector, “x.” That is, Dr. Akl fails to explain adequately that Saunders’s “x” vector would be calculated based on values from different information streams received at the different antenna elements. Because Dr. Akl fails to link the teachings of MIMO from Zarrinkoub, or otherwise explain how Saunders’s received signal vector, “x,” is based on signals containing different information, we afford his testimony on this issue little weight.

Further, claim 1 requires the processor be configured to determine a set of weighting values based on the first and second signal information. Ex. 1001, 33:14–15, 33:25–29 (limitation [1c-4]). We determine that Petitioner fails to demonstrate sufficiently that the proposed Saunders-Hottinen combination teaches or suggests the subject matter of limitation [1c-4]. As we describe above, Petitioner fails to explain adequately how Saunders’s received signal vector, “x,” is based on two signals containing different information. And Petitioner relies primarily on Saunders in support of Petitioner’s contention that the Saunders-Hottinen combination teaches or suggests the subject matter of limitation [1c-4]. Pet. 41–43. Also, to the extent Petitioner relies on teachings from Hottinen, this reliance is not clearly explained. *See id.* at 43; *see also* Prelim. Resp. 10

(“Neither Hottinen, paragraph 94 of Dr. Akl’s declaration, nor the other (uncited) portions of the Petition and supporting declaration at issue describe how a single radio communication device in Petitioners’ Saunders-Hottinen system would” satisfy the requirements of limitation [1c-4].); 35 U.S.C. § 312)(a)(3) (requiring that “the petition identifies, in writing *and with particularity*, . . . the evidence that supports the grounds for the challenge to each claim” (emphasis added)).

Even if we accept Petitioner’s position with respect to its Saunders-Hottinen combination teaching or suggesting the processor configuration limitations, we determine that Petitioner has not provided a sufficient reason to combine the teachings of Saunders and Hottinen to arrive at a first radio communication device that transmits first and second transmissions with differing information as Petitioner contends. Petitioner relies on Hottinen’s teachings of two differing beams sent from the first radio communication device to serve as the input for the second radio communication device to calculate the set of weighting values. Petitioner does not explain sufficiently why a person having ordinary skill in the art would have relied on this specific teaching for the transmissions sent from the remote station, or the role played by the two beams containing different information in determining weighting values.

Petitioner contends that a person having ordinary skill in the art would have “want[ed] to optimize the settings of the device transmitting signals to the receiving device,” and that a person having ordinary skill in the art would have understood “that optimizing data transmissions for a transmitting device improves communication from the transmitting device to the receiving device by improving signal directivity, channel path gain, and

minimizing signal loss.” Pet. 23. Therefore, Petitioner contends, a person having ordinary skill in the art would have turned to Hottinen’s teachings directed to a second radio communication device providing feedback for a first radio communication device. *Id.* at 23–24. Petitioner fails to explain sufficiently, however, how Hottinen’s teaching of a remote station sending two differing beams simultaneously optimizes the settings of the device transmitting signals or otherwise factors into the second device providing feedback. Absent reasoning supporting this specific modification, Petitioner’s selectively incorporating this apparent disparate teaching from Hottinen seems based more on hindsight reconstruction of the claimed invention than an obvious modification. *See ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998) (“[O]bviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention.”).

Petitioner describes that Hottinen teaches that the first radio communication device uses the received weighting values—the weighting values that are the result of the processor of the second communication device being configured to determine such weighting values—to form two suitable beams. Pet. 35–36. Neither Petitioner nor Dr. Akl explains why a person having ordinary skill in the art would have structured the combined Saunders-Hottinen system to include these two beams from the first radio communication device. *See id.*; *see also* Ex. 1026 ¶ 82 (describing that the two beams are the result of applying the weighting values in Hottinen, but not providing a reason why the combined Saunders-Hottinen system would include these beams to improve transmission from the first radio communication device).

f) Conclusion

For the reasons discussed above, we determine that the information presented in the Petition does not show a reasonable likelihood that claim 1 is unpatentable under 35 U.S.C. § 103 over Saunders and Hottinen.

Also, for independent claim 15, Petitioner relies on its contentions for claim 1. *See* Pet. 47–48. For the reasons discussed above, we determine that the information presented in the Petition does not show a reasonable likelihood that claim 15 is unpatentable under 35 U.S.C. § 103 over Saunders and Hottinen.

3. Dependent claims 2–5, 16

Petitioner also contends that dependent claims 2–5 and 16, which depend directly or indirectly from either claim 1 or claim 15, are unpatentable as obvious over Saunders and Hottinen. Pet. 8, 44–47, 49.

For the reasons discussed above in connection with our analysis of claims 1 and 15, we determine that the information presented in the Petition does not show a reasonable likelihood that claims 2–5 and 16 are unpatentable under 35 U.S.C. § 103 over Saunders and Hottinen.

E. Ground 2: Claims 6 and 7 as unpatentable over Saunders, Hottinen, and Shull

Petitioner contends that the combined teachings of Saunders, Hottinen, and Shull render obvious the subject matter of independent claim 6 and claim 7, which depends from independent claim 6. Pet. 8, 52–59. Petitioner relies on its contentions for claim 1 for much of the subject matter of claim 6, including the equivalent processor configuration limitations of claim 6 addressed above in our analysis of claim 1. *See* Pet. 53 (cross-referencing analysis from claim 1 for limitations [6c-1] through [6c-5],

which are equivalent to limitations [1c-1] through [1c-5], and not relying on Shull for any additional teaching directed to these limitations).

Accordingly, for the reasons discussed above in connection with our analysis of claim 1, we determine that the information presented in the Petition does not show a reasonable likelihood that claims 6 and 7 are unpatentable under 35 U.S.C. § 103 over Saunders, Hottinen, and Shull.

F. Discretion under 35 U.S.C. § 314(a) – Fintiv and General Plastic

Patent Owner argues that we should exercise our discretion under 35 U.S.C. § 314(a) and not institute trial, given the state of the parallel district court litigation, and the serial relationship of this Petition with an earlier-filed petition by Petitioner. Prelim. Resp. 13–26 (relying on precedential decisions in *Apple Inc., v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020), and *General Plastic Indus. Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (Sept. 6, 2017)). Because we do not institute trial based on our analysis of the merits of the Petition, we need not determine whether discretionary denial is appropriate in this case.

III. CONCLUSION

Based on the information presented, we determine Petitioner has not established a reasonable likelihood that it would prevail with respect to any of the Challenged Claims. Accordingly, we do not institute an *inter partes* review.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), the Petition is
denied.

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Patent 10,715,235 B2

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