IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.
NOKIA OF AMERICA CORPORATION
Petitioners,

v.

XR COMMUNICATIONS LLC
Patent Owner.

IPR2024-00613
PATENT NO. 10,715,235

PETITIONERS' NOTICE OF APPEAL

Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

Notice is hereby given, pursuant to 37 C.F.R. § 90.2(a) and 35 U.S.C. §§ 141(c), 142, and 319, that Petitioners Ericsson Inc. and Nokia of America Corporation ("Petitioners") appeal to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board in Case No. IPR2024-00613, entered October 3, 2025 (Paper No. 22) (attached as Exhibit A). This notice is timely filed within 63 days of the issuance of the Final Written Decision. For the limited purpose of providing the Director with the information specified in 37 C.F.R. § 90.2(a)(3)(ii), Petitioner indicates that the issues on appeal may include, but are not limited to, the following:

1. Whether the PTAB erred in finding that Petitioner has not shown by a preponderance of the evidence that claims 1-5, 8-12, and 15-19 of U.S. Patent No. 10,715,235 ("the '235 Patent") are unpatentable;

2. Whether the PTAB erred in finding that Petitioner has not shown by a preponderance of the evidence that claims 1-5, 8-12, and 15-19 of the '235 Patent are unpatentable under 35 U.S.C. § 103 as obvious in view of U.S. Patent No. 7,248,841 ("Agee");

3. Whether the PTAB erred in finding that Petitioner has not shown by a preponderance of the evidence that claims 1-5, 8-12, and 15-19 of the '235 Patent are unpatentable under 35 U.S.C. § 103 as obvious in view Agee and U.S. Patent No. 3,255,450 ("Butler");

Simultaneous with this submission and in accordance with 37 C.F.R. § 90.2(a), a copy of this Notice of Appeal is being filed with the Director of the United States Patent and Trademark Office, filed with the Patent Trial and Appeal Board, and served upon Patent Owner in accordance with 37 C.F.R. § 42.6(e). In addition, this Notice of Appeal, along with the required docketing fees, is being filed with the Clerk's Office for the United States Court of Appeal for the Federal Circuit in accordance with Fed. Cir. R. 15(a)(1).

Respectfully submitted,

Dated: December 1, 2025

/Patrick D. McPherson/
Patrick D. McPherson, Reg. No. 46,255
PDMcPherson@duanemorris.com
Duane Morris LLP
901 New York Ave. NW Suite 700 East
Washington, D.C. 20001

ATTORNEY FOR PETITIONERS

CERTIFICATE OF FILING

The undersigned hereby certifies that, in addition to being filed electronically via PTAB P-TACTS, the foregoing document was filed by Express Mail on December 1, 2025, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark
Office c/o Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450.

CERTIFICATE OF FILING

The undersigned hereby certifies that a true and correct copy of the foregoing document was filed electronically by CM/ECF on December 1, 2025, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing document was served on December 1, 2025, by email at the following addresses:

Reza Mirzaie
Philip Wang
RUSS, AUGUST & KABAT
rmirzaie@raklaw.com
pwang@raklaw.com

Dated: December 1, 2025

/Patrick D. McPherson/
Patrick D. McPherson, Reg. No. 46,255
PDMcPherson@duanemorris.com
Duane Morris LLP
901 New York Ave. NW Suite 700 East
Washington, D.C. 20001

ATTORNEY FOR PETITIONERS

EXHIBIT A

Trials@uspto.gov
571-272-7822

Paper 22
Date: October 3, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC. and
NOKIA OF AMERICA CORPORATION,
Petitioner,

v.

XR COMMUNICATIONS LLC,
Patent Owner.

IPR2024-00613
Patent 10,715,235 B2

Before MIRIAM L. QUINN, NORMAN H. BEAMER,
and KARA L. SZPONDOWSKI, *Administrative Patent Judges.*

SZPONDOWSKI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

We instituted an *inter partes* review of claims 1–5, 8–12, and 15–19 of U.S. Patent No. 10,715,235 B2 (Ex. 1001, the "'235 patent"), in response to a Petition (Paper 3, "Pet.") filed by Ericsson Inc. and Nokia of America Corporation (collectively, "Petitioner"). Paper 9 ("Inst. Dec.").
XR Communications LLC ("Patent Owner") filed a Response to the Petition (Paper 14, "PO Resp."), and Petitioner filed a Reply (Paper 15, "Reply").

We held an oral hearing in this proceeding on July 9, 2025, and a copy of the transcript is entered into the record. Paper 19 ("Tr.").

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. Petitioner has the burden of proving unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

Based on the complete record, we determine that Petitioner has not shown, by a preponderance of the evidence, that claims 1–5, 8–12, and 15–19 of the '235 patent are unpatentable.

B. Real Parties-in-Interest

Petitioner identifies "Ericsson Inc., and corporate parent Telefonaktiebolaget LM Ericsson, and Nokia of America Corporation" as the real parties-in-interest. Pet. 90. Patent Owner identifies itself as the real party-in-interest. Paper 6, 2 (identifying "XR Communications LLC d/b/a Vivato Technologies").

C. Related Matters

Petitioner identifies the following litigations as matters related to the '235 patent: *XR Communications LLC v. AT&T Services Inc.;* No. 2:23-cv-00202-JRG-RSP (E.D. Tex.); *XR Communications LLC v. Verizon Communications, Inc.*, No. 2:23-cv-00203-JRG-RSP (E.D. Tex.); and *XR Communications LLC v. T-Mobile USA, Inc.,* No. 2:23-cv-00204-JRG-RSP (E.D. Tex.). Pet. 90–91. Petitioner adds that, "to the best knowledge of Petitioner[], the '235 [p]atent is (or was) involved in the [following additional] litigations:" *XR Communications, LLC v. Amazon.com, Inc.,* , No. 6:21-cv-0619-ADA (W.D. Tex.); *XR Communications, LLC v. Apple Inc.*, No. 6:21-cv-0620-ADA (W.D. Tex.); *XR Communications, LLC v. ASUSTek Computer Inc.*, No. 6:21-cv-0622-ADA (W.D. Tex.); *XR Communications, LLC v. Google LLC*, No. 6:21-cv-0625-ADA (W.D. Tex.); *XR Communications, LLC v. Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc.*, No. 6:21-cv-0626-ADA (W.D. Tex.); *XR Communications, LLC v. HP Inc.*, No. 6:21-cv-0694-ADA (W.D. Tex.); and *XR Communications, LLC v. Microsoft Corporation*, No. 6:21-cv-0695-ADA (W.D. Tex.). *Id.* at 91.

Patent Owner identifies the three Eastern District of Texas litigations identified by Petitioner as matters related to the '235 patent, and identifies Petitioner as intervenors. Paper 6, 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] is implemented to communicate over a wireless communication link via an antenna assembly with client devices implemented for wireless communication within the wireless system." Ex. 1001, 3:11–15. "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.

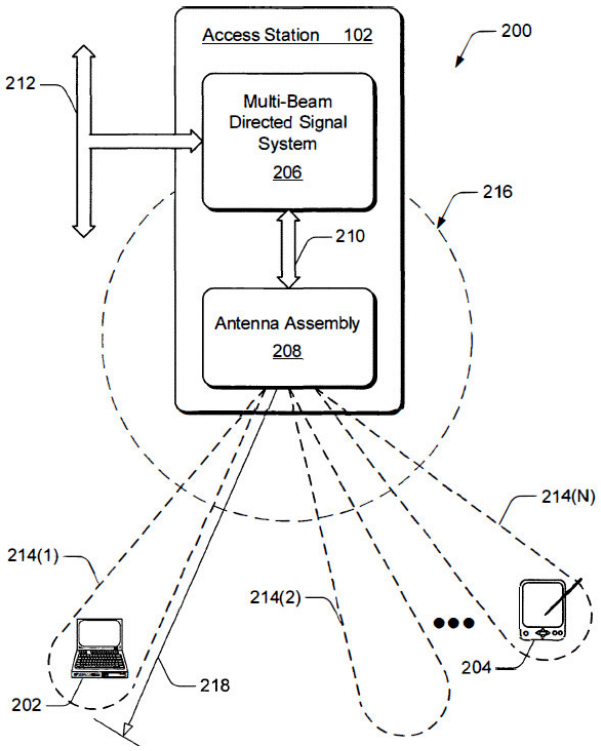


Figure 2 depicts access station 102 including multi-beam directed signal system 206 and antenna assembly 208. As shown, "antenna assembly 208 can be implemented as two or more antennas . . . to emanate multiple directed communication beams 214(1), 214(2), . . . , 214(N)." Ex. 1001, 4:54–57. "[C]lient 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. Illustrative Claims

The three challenged independent claims (claims 1, 8, and 15) are reproduced below with Petitioner's identifiers in brackets.

> 1. [1.0] A receiver for use in a wireless communications system, the receiver comprising:
>
> an antenna, wherein the antenna comprises a first antenna element and a second antenna element;
>
> [1.1] a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and
>
> [1.2] a processor operatively coupled to the transceiver, the processor configured to:
>
> [1.3] 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;
>
> [1.4] determine first signal information for the first signal transmission;
>
> [1.5] determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;
>
> [1.6] determine a set of weighting values based on the first signal information and the second signal information, [1.7] wherein the set of weighting values is configured to be used by the transceiver to construct one or more beam-formed transmission signals;

[1.8] 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, 32:33–58.

8. A method in a wireless communications system, the method comprising:

[8.1] receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna simultaneously, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls;

[8.2] determining first signal information for the first signal transmission;

[8.3] determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

[8.4] determining 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 remote station to construct one or more beam-formed transmission signals; and

[8.5] transmitting to the remote station a third signal comprising content based on the set of weighting values.

Id. at 33:48–34:2.

15. An apparatus for use in a wireless communications system, the apparatus comprising:

an antenna;

[15.1] a transceiver operatively coupled to the antenna; and

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

[15.3] receive a first signal transmission from a remote station via the antenna, [15.4] the first signal transmission comprising first signal information, wherein the first signal

> information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data;
>
> [15.5] receive a second signal transmission from the remote station via the antenna, the second signal transmission comprising second signal information;
>
> [15.6] 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;
>
> [15.7] cause the transceiver to generate a third signal comprising content based on the set of weighting values.

Id. at 34:35–57.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–5, 8–12, and 15–19 are unpatentable based on the following challenge:

Claims Challenged	35 U.S.C. §[1]	References/Basis
1–5, 8–12, 15–19	103(a)	Agee[2] alone or in combination with Butler[3]

Pet. 29–30. In support of its challenges, Petitioner relies on the Declaration of Dr. Mark P. Mahon (Ex. 1003). Patent Owner relies on the Declaration of

[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2011. The changes to 35 U.S.C. §§ 102 and 103 in the AIA do not apply to any patent application filed before March 16, 2013. Because neither party disputes that the application for the '235 patent has an effective filing date before March 16, 2013, we refer to the pre-AIA version of the statute. *See* Pet. 30 (arguing that Agee is prior art under pre-AIA §§ 102(a), 102(e), and 102(g)); PO Resp. 7–8 (stating that the '235 patent application claims priority through continuation applications dated November 2, 2002).

[2] US 7,248,841 B2; issued July 24, 2007 (Ex. 1004, "Agee").

[3] US 3,255,450; issued June 7, 1966 (Ex. 1005, "Butler").

Branimir Vojcic, D.Sc. (Ex. 2002). A deposition transcript has been submitted to the record for Dr. Mahon (Ex. 2003).

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

1. Agee (Ex. 1004)

Agee, titled "Method and Apparatus for Optimization of Wireless Multipoint Electromagnetic Communication Networks," issued July 24, 2007, from an application filed June 10, 2001. Ex. 1004, codes (22), (45), (54). Agee is directed to "the field of high performance broadband wireless networks designed for data transmissions in the high, very high, and ultrahigh frequency bands of the electromagnetic spectrum." *Id.* at 1:27–30.

Agee describes a multiple-input, multiple-output ("MIMO") network with multiple nodes, where each node includes an antennae array, transceivers (one per antenna), and reciprocal uplinks and downlinks. *Id.* at 45:5–8, Figs. 13A, 13B.

> The antennae array is spatially and/or polarization diverse and transmits and receives signal energy during alternating time slots (or sequences of time slots in TDD-TDMA systems). Each transceiver is a vector OFDM ["Orthogonal frequency-division multiplexing"] transceiver, with digital signal processing elements, that downconverts, A/D converts, and frequency channelizes data induced on each antenna (or other diversity channel) during receive time slots, and inverse channelizes, D/A converts, and upconverts data intended for each antenna (or diversity channel) during transmit time slots; linearly combines data received over each diversity channel, on each frequency channel and receive time slot; redundantly distributes data intended for each diversity channel, on each frequency channel and transmit time slots; and computes combiner and distributer weights that exploit the, narrowband, MIMO channels response on each frequency channel and time slot.

Id. at 45:8–24, Fig. 15. In an embodiment, "the transceiver sends the transmission signal through Butler Mode Forming circuitry . . . where the transmission is reciprocally formed with the shared Receiver feeds and the number of nodes out equals the number of antenna." *Id.* at 45:55–61; *see also id.* at Fig. 25. The weights are substantively null-steering and are used to form a beam in the direction of the originating signal to improve performance of the overall network. *Id.* at 67:42–51.

The substantively nulling combiner weights are formed using an FFT-based least-squares algorithms that adapt the weighting values to values that minimize the mean-square error (MSE) between the combiner output data and a known segment of transmitted pilot data. Ex. 1004, 64:43–48; *see also id.* at Figs. 35, 36 (illustrating the operations used to implement the technique during receive and transmit operations). "The preferred pilot data is applied to an entire OFDM symbol at the start of an adaptation frame comprising a single OFDM symbol containing pilot data followed by a stream of OFDM symbols containing information data." *Id.* at 64:50–54. Agee will be discussed in further detail in the analysis below.

2. Butler (Ex. 1005)

Butler, entitled "Multiple Beam Antenna System Employing Multiple Directional Couplers in the Leadin," issued June 7, 1966, from an application filed June 15, 1960. Ex. 1005, 1. Butler is directed "to circuits and components . . . for directional beam steering through selective phasing of signals from a plurality of antennas." *Id.* at 1:11–14.

Butler discloses what is commonly referred to as a "Butler matrix." *See, e.g.*, Pet. 7 ("By 2002 . . ., the Butler matrix was well known and referenced in hundreds of patents throughout the world." (referencing

Ex. 1003 ¶¶ 284–291)). Figures 3 and 4 of Butler illustrate the operation of the Butler matrix. Ex. 1005, Figs. 3, 4; *see also id.* at 3:28–4:3 (describing Figures 3 and 4); Ex. 1003 ¶ 319 ("The Butler matrix and its operation is shown by the Figs. 3 and 4 of Butler's patent.").

II. ANALYSIS

A. Applicable Law

A claim is unpatentable under 35 U.S.C. § 103(a) if "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 skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.[4] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A patent claim "is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR*, 550 U.S. at 418. "[A] patent can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention." *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016). An obviousness determination based on a combination of references requires finding "both 'that a skilled artisan would have been

[4] Patent Owner has not presented objective evidence of non-obviousness.

motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.'" *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted). Further, an assertion of obviousness "cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at 418.

In an *inter partes* review, the petitioner bears the burden of persuasion to prove "unpatentability by a preponderance of the evidence." *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (quoting 35 U.S.C. § 316(e)). This burden of persuasion never shifts to the patent owner. *Dynamic Drinkware*, 800 F.3d at 1378 (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–1327 (Fed. Cir. 2008). Petitioner must explain with particularity how the prior art would have rendered the challenged claims unpatentable. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(b)(4) (2024) ("The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon."). "[T]here is a significant difference between a petitioner's burden to establish a 'reasonable likelihood of success' at institution, and actually proving invalidity by a preponderance of the evidence at trial." *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016)

B. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art "would have been familiar with wireless communications networks,

including the design of beamforming using multiple antennas." Pet. 6. Petitioner contends that a person having ordinary skill in the art would have at least a Bachelor's degree in Electrical Engineering or equivalent, and at least two years of work experience. *Id.* at 6–7. Petitioner adds that "[a] more advanced degree can substitute for some work experience." *Id.* at 7 (referencing Ex. 1003 ¶¶ 37–39). Patent Owner does not challenge Petitioner's proposed definition. PO Resp. 8.

In our Institution Decision, we adopted Petitioner's proposed definition, finding it to be consistent with the prior art of record and the skill reflected in the Specification of the '235 patent, and previous proceedings concerning the '235 patent. Inst. Dec. 13 (citing IPR2022-00367, Paper 10 at 24 (PTAB July 14, 2022); IPR2022-01155, Paper 11 at 13–14 (PTAB Jan. 5, 2023)). We continue to do so here.

C. Claim Construction

The parties agree that the claims of the '235 patent should be given their plain and ordinary meaning. Pet. 6; PO Resp. 8. Patent Owner also provides claim constructions adopted in related district court litigations for certain terms. PO Resp. 9–10.

We determine that we need not expressly construe any claim terms to resolve the parties' disputes on the current record. *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. Claims 1–5, 8–12, and 15–19 as unpatentable over Agee alone or in combination with Butler

Petitioner contends that Agee, alone or in combination with Butler, teaches or suggests each limitation of claims 1–5, 8–12, and 15–19. Pet. 30–86. Patent Owner disputes Petitioner's contentions. PO Resp. 11–43. As Patent Owner states, the alternative challenges are essentially the same, and Petitioner does not rely on any specific teachings or modifications to Agee based on Butler. *Id.* at 12–13. Rather, Butler is relied upon to "explain[] how a POSITA would understand Agee's discussion of a Butler matrix." Pet. 30. There is no dispute over the disclosure in Butler; the dispute primarily concerns whether Agee, alone or in combination with Butler, teaches limitations [1.3]–[1.6] in claim 1, and the commensurate limitations in claims 8 and 15.[5] We address Petitioner's contentions and Patent Owner's arguments below.

1. Independent claim 1

Independent claim 1 recites, in part:

> the processor configured to:
>
> [1.3] 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;
>
> [1.4] determine first signal information for the first signal transmission;

[5] Patent Owner also presents arguments against dependent claims 4, 5, 8, 11, 12, 17, and 18, and additional arguments against independent claims 8 and 15, which we do not reach. PO Resp. 22–43. *See Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984, 990 (Fed. Cir. 2020) (nonprecedential) (stating that the "Board need not address issues that are not necessary to the resolution of the proceeding.").

> [1.5] determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;
>
> [1.6] determine a set of weighting values based on the first signal information and the second signal information, [1.7] wherein the set of weighting values is configured to be used by the transceiver to construct one or more beam-formed transmission signals; [and]
>
> [1.8] 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 [1.3]–[1.8]). We focus on limitations [1.3]–[1.6].

We agree with Patent Owner that, at times, Petitioner's contentions for limitations [1.3]–[1.6] are unclear and lack coherency. PO Resp. 15. As Patent Owner points out, claim 1 requires that the "first signal transmission" and "second signal transmission" in limitation [1.3] are used to determine the "first signal information" and "second signal information [which] is different from the first signal information" in limitations [1.4] and [1.5], which are further used to "determine a set of weighting values" in limitation [1.6]. *Id.* Then, those "weighting values" are used in limitations [1.7] and [1.8]. That is, there is a relationship between the limitations, and Petitioner's advancement of alternative theories for limitation [1.3] renders it difficult in some instances to understand how Petitioner is later applying Agee to limitations [1.4], [1.5], and [1.6]. *See Netflix, Inc. v. DivX, LLC*, 84 F.4t h 1371, 1377 (Fed. Cir. 2023) (stating that "the Board should also not have to decode a petition to locate additional arguments beyond the ones clearly made"). As discussed below, Petitioner takes various positions on how these limitations are taught in Agee. Primarily, we focus on limitations

[1.4], [1.5], and [1.6], although we provide a discussion of limitation [1.3] for context.

a) Limitation [1.3]

Limitation [1.3] recites "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." Ex. 1004, 32:42–45.

Petitioner contends that Agee discloses limitation [1.3] in three ways: (1) using a Butler Matrix operation; (2) other disclosures in Agee, including Agee's detection of "pilot signals"; and (3) Agee's use of OFDM which transmits (and receives) multiple different OFDM tones simultaneously.[6] Pet. 44.

First, Petitioner contends that Agee's disclosure of a Butler Matrix teaches the "simultaneously" claim limitation. Pet. 44–45 (citing Ex. 1004, Fig. 25); *see also id.* at 47 (comparing the Butler matrix from Butler's patent to Agee's Butler matrix). Petitioner argues that Agee's Butler Matrix "provides the data for the 'FFT-LS' algorithm." *Id.* at 44–45; *see* Ex. 1003 ¶ 303 ("The [base station] uses the 'feeds' from the Butler matrix (with the different signal information from different antennas) to adaptively determine 'weights' using Agee's 'Multilink Rx Weight Adaptation Algorithm' depicted in Fig[ure] 24."). Petitioner contends that "Agee uses 'combiner output' to reference the Butler matrix output which consists of 'combined'

[6] In the Preliminary Response, Patent Owner argued that the Petition failed to present a coherent theory for limitations [1.3] – [1.6]. *See* Prelim. Resp. 1. In the Institution Decision, we focused on Petitioner's theory related to Agee's pilot signals. *See* Inst. Dec. 17, 24–28.

different signals received on multiple antennas and output on the RF feeds." Pet. 46 (citing Ex. 1003 ¶¶ 439–448). Thus, according to Petitioner, the "combiner output" of the Butler Matrix is the input to the Multilink Weight Adaptation Algorithm. Ex. 1003 ¶ 439. Therefore, Petitioner contends, "the different signals from different antennas are output on the Butler matrix outputs that are received to the BS processing circuitry including the Multilink Adaptation Algorithm." Pet. 47.

Second, Petitioner contends that Agee's transceiver, and the antennas associated with it, rely on simultaneous reception of signals from the same remote station. Pet. 49 (citing Ex. 1003 ¶¶ 454–484); *see* Ex. 1003 ¶ 454 (stating that "even if Agee's Butler matrix operation were not considered, Agee's transceiver (and the antennas associated with it) rely upon simultaneous reception of signals from the same remote station"); *see, e.g.*, Ex. 1004, 56:23–24 ("A MIMO transceiver contains and uses simultaneously a multiple of single RF feeds. A signal passes between the Butler Mode Forming element and a Band Pass Filter . . ."") (cited at Pet. 49).

Petitioner contends that Agee uses a time-division duplex (TDD) system "in which each node 'receives' at very specific times," i.e., in a specific time slot. Pet. 49–50 (citing Ex. 1004, 30:7–9, Fig. 15); *see also id.* at 50 (citing Ex. 1004, Fig. 17). Petitioner contends that "Agee's weights are calculated based upon the different information that is received simultaneously during the receive time slots." *Id.* at 51 (citing Ex. 1004, 45:8–22).

Petitioner also contends that "Agee relies upon specific timing for the receiver to detect the specific 'pilot signals' from each transmitter." Pet. 51 (citing Ex. 1004, 64:44–67:27, Figs. 35–38). According to Petitioner, "[t]he

'pilot signals' are received on Agee's Butler matrix antennas (and their radio OFDM transceivers and the processor) simultaneously." *Id.* at 51–52. Petitioner contends that "the receiver must necessarily sample the received signals on all antennas all at the 'start of the adaptation frame' (TDD frame) or potentially miss the pilot tones on one or more antennas." *Id.* at 52 (citing Ex. 1003 ¶¶ 469–475). Petitioner contends that "Agee uses 'pseudodelays' that are 'unique to each transmit node' and include specific time offsets for each different transmitting node." *Id.* (citing Ex. 1004, 65:24–46). Petitioner contends that the timing of target and observed pseudodelays, as shown in Figures 38A and 38B, "has to be based upon using the antennas to simultaneously (receive[] (and pass to the processor) the signals from the known 'target' node (performing the transmission)." *Id.* at 52–54 (citing Ex. 1003 ¶¶ 478–484).

Third, Petitioner also contends that Agee uses OFDM, which "uses different frequency 'bins' to separately transmit (and receive) OFDM 'tones' simultaneously on each antenna." Pet. 53 (citing Ex. 1004, 35:10–26, 45:4–26, 23:62–64, 22:53–56; Ex. 1003 ¶¶ 485–514). According to Petitioner, "[e]ach OFDM tone is a different claimed 'signal transmission' on its own distinct frequency carrying different information and is received on each antenna." *Id.* Petitioner contends that "in each time slot, Agee's BS receives simultaneously 32 different OFDM tones transmitted on different frequencies ('frequency bins')." *Id.* at 57 (citing Ex. 1004, 47:6–39); *see also id.* at 54–56 (describing Agee's transmissions of OFDM tones in connection with Figures 15, 17, 22, and 26).

Petitioner contends that "Agee's Butler matrix processes each of these 32 different OFDM transmissions (tones) separately for each separate

antenna." Pet. 57. As will be discussed below, Petitioner contends that the Butler matrix measures different signal strengths on different antennas at different phases of a wave. *Id.* Moreover, "[b]ecause different frequencies have different wavelengths, the measurements at each antenna for each tone (frequency bin) will be different." *Id.* at 57–58. Therefore, Petitioner argues, "Agee's Butler matrix measures (and combines) a different signal strength at each antenna for each of the 32 OFDM tones because they are transmitted using different frequencies." *Id.* at 58 (citing Ex. 1003 ¶¶ 503–504); *see also id.* at 59 (referring to Figure 30). As such, Petitioner contends that "[e]ach OFDM tone (frequency bin) is a different claimed signal transmission." *Id.* at 59 (emphasis omitted).

Thus, Petitioner relies on a Butler matrix in some capacity for each of the three theories presented for limitation [1.3]. *See* Pet. 44 (Butler matrix theory), 49 (relying on Agee's disclosure of a Butler matrix to simultaneously receive signals), 57 (relying on Agee's Butler matrix to process the 32 different OFDM tones). As Petitioner's counsel stated at the hearing, "[t]he Butler matrix is being relied upon for the receive element – the simultaneously aspect of the receive element. Everything else is explained as part of the rest of the Agee processing." Tr. 30:14–16; *see also id.* at 32:19–20 (stating that the Butler matrix "was used for the simultaneously aspect"). There appears to be no dispute that Agee, through at least its Butler matrix circuitry, teaches limitation [1.3].[7]

[7] In two prior *inter partes* review proceedings involving the '235 patent, the "simultaneously" aspect of limitation [1.3] was disputed. *See* Pet. 4–6, 25–27 (referring to IPR2022-00367 and IPR2022-01155); *see also id.* at 29 (stating that "rather than explicitly describe[ing] a 'receiver' that receives

b) Use of a Butler Matrix to Satisfy Limitations [1.4]-[1.7]

Petitioner also argues that using a Butler matrix satisfies limitations [1.4]–[1.7]. *E.g.*, Pet. 19 (stating that there is "overwhelming evidence that using a Butler matrix satisfies" limitations [1.4]–[1.7]). In support of this argument, Petitioner relies on statements made about the Littlejoe[8] document by the Applicant[9] during prosecution of the '235 patent and by Patent Owner in previous *inter partes* review proceedings. *See* Pet. 19–29; Reply 7–8, 10.

By way of background, during prosecution of the '235 patent, the Examiner rejected the claims based on the combination of Crilly[10] and Ishii[11], relying on Ishii to teach "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*." Ex. 1002, 205–208; *see* Pet. 20–21. Petitioner asserts that Crilly does not

---

two signals simultaneously from the same remote unit, the '235 specification only uses the already-known operation of a Butler matrix"). However, Patent Owner does not raise those arguments in this proceeding. *See* PO Resp.; Tr. 6:25–26 (Petitioner's counsel stating that "in the Patent Owner's response, there isn't really any arguments about simultaneously as there had been previously").

[8] Ed Casas, "Beamforming for *Little Joe*," ViVATO Technical Report, Feb. 1, 2002 ("Littlejoe"). Little Joe was included as Document C in the provisional application to which the '235 patent claims priority. Ex. 1002, 130.

[9] To prevent confusion, we use the term "Applicant" to describe the prosecution before the Examiner and "Patent Owner" to describe the proceedings before the Board.

[10] Crilly et al., US 2002/0158801 A1, published Oct. 31, 2002.

[11] Ishii et al., US 6,714,584 B1, issued Mar. 30, 2004.

disclose a Butler matrix, but the '235 patent does, so "[t]he only reasonable conclusion that can be drawn from [a comparison between the '235 patent and Crilly] and the Examiner's findings is that a Butler matrix discloses the scope of the 'simultaneously' elements." *See* Pet. 21–22. Applicant argued that Crilly was not prior art based upon Littlejoe's disclosures, and described how Littlejoe disclosed each of the pending claim limitations in order to pre-date Crilly. Ex. 1002, 129–134. The Examiner then withdrew the Crilly reference and issued a new rejection over Chen[12] and Ishii. Ex. 1002, 88–108. Similarly, in IPR2022–00367, in arguing to establish priority date of the '235 patent, Patent Owner argued that Littlejoe disclosed the receipt of a first and second signal transmission from the same remote station simultaneously. *See* Pet. 19; Ex. 1010, 16–19.

Petitioner essentially relies on these statements to ascertain the scope of the claims, as compared to the disclosures in Agee. That is, Petitioner argues that the prior art (Agee, Butler) has "exactly what the Applicant said [in Littlejoe] corresponded to the claims." Tr. 6:12–14; Pet. 61. Petitioner argues that Applicant's arguments "demonstrate conclusively that Littlejoe's disclosure of a Butler matrix necessarily satisfies the claim elements related to receiving signal transmissions simultaneously and using the signal informations within each signal transmission to calculate beamforming weights (elements 1.3–1.7)." Pet. 19; *see also id.* at 20–25. Accordingly, Petitioner argues that "the scope of elements 1.3–1.7 . . . encompass the operation of a Butler matrix beamformer." *Id.* at 25; *see also id.* at 19 (arguing that there is "overwhelming evidence that using a Butler matrix

[12] Chen et al., US 2002/0137538 A1, published Sept. 26, 2002.

satisfies" limitations [1.3]-[1.7], based on Applicant's statements regarding the Littlejoe document during prosecution). According to Petitioner, Applicant's arguments to the Examiner and Patent Owner's arguments to the Board support that "the long-known operation of a Butler matrix provides implicit support for these" limitations.[13] *Id.* at 19–20.

Patent Owner does not dispute Petitioner's assertions with respect to the statements made about Littlejoe's disclosure during prosecution or before the Board. *See* PO Resp. Indeed, Littlejoe explicitly describes a Butler matrix. Ex. 1009, 134, 135, 137. However, we are not persuaded on this record that Applicant's statements about Littlejoe during prosecution and before the Board demonstrate that mere use of a Butler matrix satisfies limitations [1.4–1.7], or that Petitioner has established that Agee and Butler disclose exactly what was said about or disclosed in Littlejoe. Littlejoe discloses "a high-performance WLAN Access Point product using a 16-element linear array" that "uses two separate RF beamformers." Ex. 1009, 134. The "searcher" beamformer "is for receiving only and uses a 16-port Butler matrix whose outputs are connected to 16 standard WLAN cards installed in a PC." *Id.* Further, "[a]n application on the PC obtains the received signal levels for each received packet." *Id.*; *see also id.* at 137

[13] We note that Petitioner's arguments regarding Littlejoe, and the Butler matrix's implicit disclosure of these limitations, are difficult to reconcile with Petitioner's statements that, by 2002, "the Butler matrix was well known and referenced in hundreds of patents throughout the world." Pet. 7 (citing Ex. 1003 ¶¶ 284–291); *see also* Ex. 1003 ¶ 284 (Dr. Mahon, stating that "the Butler matrix is pervasively well known having been cited by at least 1600 patents" between June 15, 1960 and February 1, 2002); Tr. 7:12–13 (Petitioner's counsel stating that the Butler matrix is "[e]xceedingly well-known technology in the industry").

(stating that "[t]he beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers"). And "[t]his signal level information is used to compute the complex weights." *Id.* at 134; *see also id.* at 137 (stating that "[t]he beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13.'").

For limitations [1.4] and [1.5], Applicant quoted Littlejoe's disclosure that "[t]he beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers." Ex. 1002, 3. For limitations [1.6] and [1.7], Applicant quoted Littlejoe's disclosure that "[t]he beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13.'"). *Id.*

As shown above, Littlejoe discloses more than just a Butler matrix, and explicitly discloses the use of "signal level information" or "signal strength" being used by the beamforming application to calculate weights. Although Petitioner argues that the WLAN card beamformers in Littlejoe are the same as the multi-weight adaptation algorithm in Agee (Tr. 33:2–4, Pet. 61, Reply 10–11), Agee makes no mention of using signal level information or signal strength in its Multi-Weight Adaptation Algorithm, as will be discussed further below. *See also* Tr. 20:5–21:5. Nor does Petitioner provide any citations from or discussion of Butler, or any other prior art document, that supports the arguments that the functionality described in

limitations [1.4], [1.5], [1.6], and [1.7] is implicit in the use of a Butler matrix. We, therefore, find that Petitioner's contentions do not sufficiently support that mere use of a Butler matrix teaches or suggests limitations [1.4]–[1.7]. We now provide further discussion for limitations [1.4]–[1.6] .

c) Limitations [1.4] and [1.5]

Limitation [1.4] recites "determine first signal information for the first signal transmission" and limitation [1.5] recites "determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information." Ex. 1001, 32:46–50.

Petitioner contends that Agee discloses limitations [1.4] and [1.5] by using the "signal strength" measured on each antenna. Pet. 61 (citing Ex. 1003 ¶¶ 515–536). That is, Petitioner equates the recited "signal information" to the "signal strength." *Id.* at 61–62. Petitioner, with supporting testimony from Dr. Mahon, provides an explanation as to how a Butler matrix measures different signal strengths (i.e., signal informations) received on each antenna. *See id.* at 9–18, 62. Generally, Petitioner contends that the relative amplitude of the signal wave of the "signal transmissions" received by the antennas is the "signal strength," which varies depending on the "phase" of the wave. *Id.* at 10 (citing Ex. 1003 ¶¶ 330–335). According to Petitioner, "circuitry sampling the signal (wave) at each antenna element of an antenna array at the same time will detect different 'amplitudes' (or signal strengths) depending upon the angle of arrival of the signal's phase front with respect to the relative orientation of the antenna elements in the array." *Id.* at 10–11 (citing Ex. 1003 ¶¶ 335–336). Petitioner contends that because of the physical separation of the

antennas, each sample reflects a different "phase," and these different phases are used by the Butler matrix to create beams for a transmit beam, or combine to form receive "beams" on the feed outputs. *Id.* at 11–13 (citing Ex. 1003 ¶¶ 337–340).

Based upon the foregoing, Petitioner contends that "Agee's Butler matrix measures different signal informations (signal strengths) received on each antenna even for the same signal wave due to the phase difference resulting from the antennas' spatial separation." Pet. 62. Petitioner also contends that "Agee's Butler matrix measures a different signal strength for each of the 32 OFDM tones (channels) on each antenna." *Id.* Petitioner contends that "these measurements are used to calculate the weights." *Id.*

Petitioner contends that, "[i]n Agee's Butler matrix, signal informations (signal strengths) from multiple antennas are combined on each Butler combiner output. Thus, each individual Butler combiner output by itself is a determination of a first signal information (from a first antenna's signal) and second signal information (from a second antenna's signal) as claimed." Pet. 64 (referencing Ex. 1003 ¶ 533). Petitioner adds that "Agee also teaches the Butler outputs collectively ("combiner output data") constitute a determination of different signal information[]. . . . Each [separate Butler] output is a determination of different signal informations resulting from multiple signals on multiple antennas connected to that output." *Id.* (referencing Ex. 1003 ¶ 534; Ex. 1004, Fig. 25).

Patent Owner argues that Agee "does not teach anything about 'signal strength' or about a Butler matrix deriving or determining 'signal strength.'" PO Resp. 21. We agree. Although Petitioner asserts that "Agee's Butler matrix measures different signal informations (signal strengths) received on

each antenna" and "Agee's Butler matrix measures a different signal strength for each of the 32 OFDM tones (channels) on each antenna" (Pet. 62), Agee does not describe that its Butler Forming Mode circuitry determines (or measures) signal strength. Rather, Petitioner relies on unsupported testimony from Dr. Mahon. Pet. 61 (citing Ex. 1003 ¶¶ 513–536). Although Dr. Mahon affirmatively states that Agee discloses measuring the "signal strength" for limitations [1.4] and [1.5], he only quotes Agee's column 45, lines 4–28 to conclude that "such measurements are detecting and processing the signal strength in the passages regarding the OFDM vector receiver receiving and detecting data induced on each antenna." Ex. 1003 ¶ 524. However, the testimony provides no further explanation as to why this is the case other than quoting the paragraph. *See* 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential). Agee is not self-explanatory on this point. *See Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017). Consequently, assessing the probative value of the testimony, we find that the bare, unintelligible statements regarding Agee and how it allegedly teaches "signal strength" are entitled to little weight.[14]

[14] We recognize that at the Decision on Institution stage, the panel credited Dr. Mahon's testimony with respect to how the Butler matrix detects different phased signals at the antenna for limitations [1.3]–[1.5]. Inst. Dec. 24–28. Upon review of the full record, and in consideration of the preponderance of the evidence standard, however, we no longer view the testimony sufficiently supported. The "Board has an obligation to assess the question anew after trial based on a totality of the record, particularly where

Further, it is unclear from both Petitioner's contentions and Dr. Mahon's testimony whether Petitioner is arguing that such functionality is inherent in Agee's Butler matrix, common knowledge, how a person of ordinary skill in the art would understand Agee in light of general Butler matrix functionality, or something else entirely. *See Netflix,* 84 F.4th at 1377 (stating that "the Board should . . . not have to decode a petition to locate additional arguments beyond the ones clearly made"). Petitioner also does not provide sufficient support for these contentions from Butler.

In sum, Petitioner relies on Dr. Mahon's testimony for the contentions in limitations [1.4] and [1.5], at least with regard to determining "signal strength" as the recited determining first and second "signal information." As explained in our Consolidated Trial Practice Guide[15] (Nov. 2019) at 36:

> Expert testimony, however, cannot take the place of a disclosure in a prior art reference, when that disclosure is required as part of the unpatentability analysis . . . Similarly, in an obviousness analysis, conclusory assertions from a third party about general knowledge in the art cannot, without supporting evidence of record, supply a limitation that is not evidently and indisputably within the common knowledge of those skilled in the art. *K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365 (Fed. Cir. 2014). Furthermore, because an *inter partes* review may only be requested "on the basis of prior art consisting of patents or printed publications," 35

---

the standard changes." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1377 (Fed. Cir. 2016). "[T]he Board is not bound by any findings made in its Institution Decision. At that point, the Board is considering the matter preliminarily without the benefit of a full record. The Board is free to change its view of the merits after further development of the record, and should do so if convinced its initial inclinations were wrong." *TriVascular*, 812 F.3d at 1068.

[15] Available at https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf

> U.S.C. § 311(b), expert testimony cannot take the place of disclosure from patents or printed publications. In other words, expert testimony may explain "patents and printed publications," but is not a substitute for disclosure in a prior art reference itself.

To that end, we find Petitioner's contentions and evidence are insufficient as to limitations [1.4] and [1.5].

However, even assuming, *arguendo*, that Petitioner's reliance on Dr. Mahon's testimony is sufficient to show that limitations [1.4] and [1.5] are taught by Agee, i.e., that it is "evidently and indisputably within the common knowledge of those skilled in the art," Petitioner still must show that the set of weighting values is determined based upon the signal strength, as recited in limitation [1.6]. As we discuss below, Petitioner's contentions and evidence are insufficient for limitation [1.6].

Aside from the "signal strength," Petitioner points to various other signal measurements to teach the recited "signal information," such as frequency information and timing information. Pet. 62–63. As discussed below, we agree with Patent Owner that the Petition does not clearly articulate any theory regarding frequency information or timing information. PO Resp. 16–18.

Petitioner further contends that "Agee's 32 different OFDM tones are all separate transmissions at different frequencies and thus provide 'frequency information.'" Pet. 63 (citing Ex. 1003 ¶ 528). Petitioner also contends that "Agee's measured signals provide the pilot signal's 'observed timing offset' – which is used to provide 'timing information' for Agee's system to properly detect and use the pilot signal to calculate weights to receive (and transmit) data." *Id.* (citing Ex. 1003 ¶ 529). However,

although Petitioner identifies these other forms of "signal information," it is unclear from the Petition how or if Petitioner is applying this "signal information" to the weight calculation in limitation [1.6] because Petitioner only refers to signal strength in connection with limitation [1.6]. *See id.* at 69 (stating "[t]hus, Agee uses the different signal informations (e.g., signal strengths received on the different antennas in the Butler matrix including for different OFDM tones) to calculate weights used for receive and transmit beamforming"). Similarly, Petitioner also identifies "antenna pointing direction information," "null/zero location information," "peak location information," "peaks," and "pseudodelays," in connection with limitations [1.4] and [1.5], (Pet. 62–63), but Petitioner does not discuss these other forms in connection with limitation [1.6]. *See* Pet. 64–69; PO Resp. 18–19.

Because these other "signal information" theories are not carried through to the remaining limitations, we do not address them further for failure to provide argument and evidence to support the ground presented on those incomplete theories. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(4); *see In re Magnum*, 829 F.3d at 1381 ("[T]he Board must base its decision on arguments that were advanced by a party").

d) Limitation [1.6]

Limitation [1.6] recites "determine a set of weighting values based on the first signal information and the second signal information." Ex. 1001, 32:51–53.

For each of the three theories presented for limitation [1.3], Petitioner relies on the output from Agee's Butler matrix received into Agee's Multi-

Weight Adaptation Algorithm[16] (limitation [1.6]). Pet. 45 (stating that "Agee's Butler matrix provides the data for the 'FFT-LS' algorithm – the basis of the Multilink Weight Adaptation Algorithm (the data received by the processor"), 64–65 (stating that Agee's pilot data signal is the "combiner output data"[17] received from the Butler matrix). Petitioner also argues that Agee "calculates weights using multiple different OFDM tones." *Id.* at 67–68. Petitioner contends that "Agee uses the different signal informations (e.g., signal strengths received on the different antennas in the Butler matrix including for the different OFDM tones) to calculate weights used for receive and transmit beamforming." *Id.* at 69; *see also id.* at 62 (arguing that "Agee's Butler matrix measures a different signal strength for each of the 32 OFDM tones (channels) on each antenna . . . these measurements are used to calculate the weights").

Petitioner explains that "Agee's Butler matrix output is the input to the algorithms described in Figs. 25, 30." Pet. 69 (referencing Ex. 1004, 48:19–46, 57:25–43, Fig. 15); Ex. 1003 ¶¶ 566–570).

Figure 25 of Agee is reproduced below.

[16] Agee also refers to this as the "Multilink RX weight adaptation algorithm," the "Multilink Receive weight adaptation algorithm" or the "Multilink Adaptation Algorithm." Pet. 40 n.8.
[17] Petitioner also states that "Agee uses 'combiner output' to reference the Butler matrix output." Pet. 45.

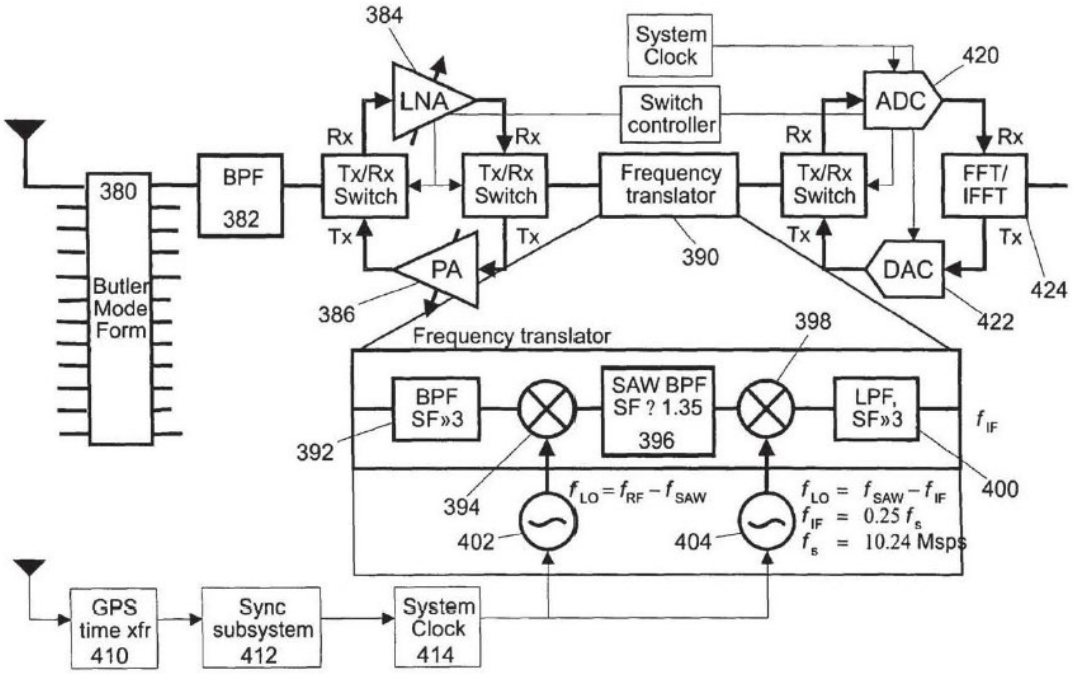


FIG. 25

Figure 25 illustrates a MIMO transceiver where "the transceiver sends the transmission signal through Butler Mode Forming circuitry" 380, "where the transmission is reciprocally formed with the shared Receiver feeds, and the number of modes out equals the number of antennae." Ex. 1004, 45:55–61. Agee further states that "[t]he Butler Mode Forming circuitry also provides the spatial signal separation adaptation, preferentially with a FFT-LS algorithm that integrates the link separation operation with the pilot/data sorting, link detection, multilink combination, and equalizer weight calculation operations." *Id.* at 45:62–66.

Petitioner contends that Agee's Figures 35 and 37 illustrate the calculation of combiner weights, and Figure 30 demonstrates that the "combiner weights W" are applied to the received RF data to recover the received information using a Multilink Adaptation Algorithm. Pet. 65–69 (citing Ex. 1004, 58:43–59:21, 63:58–67, 66:21–67:27, Figs. 30, 35, 37).

Figure 30 is reproduced below.

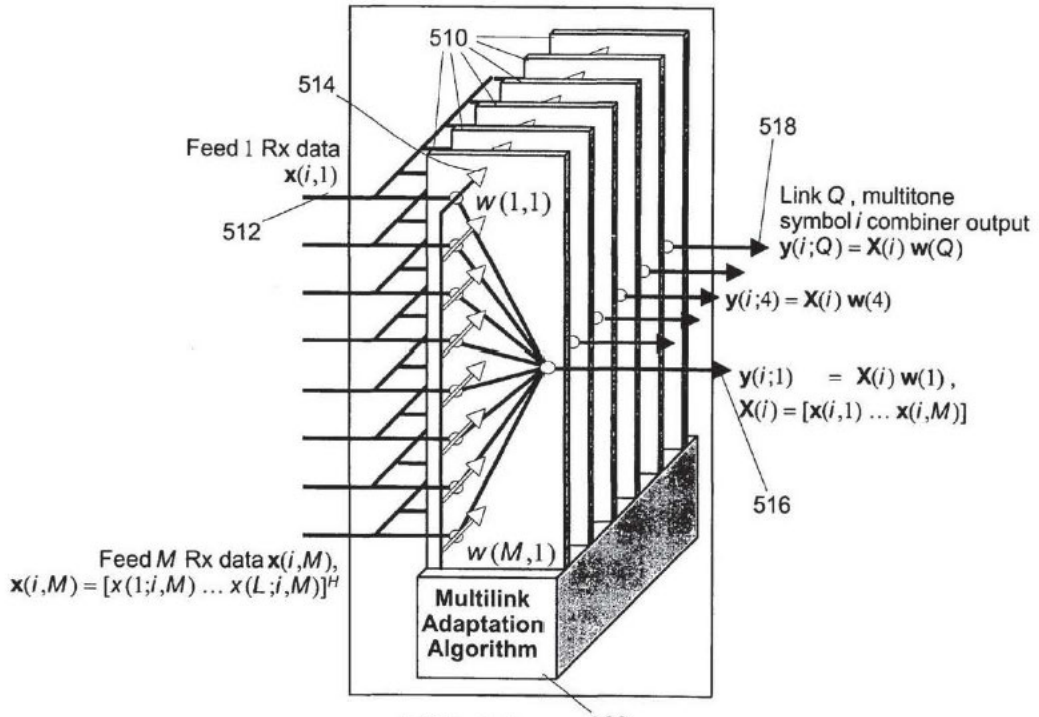


FIG. 30

Figure 30 depicts antennae feed 512 across diversity modes and multilinks through the Multilink Adaptation Algorithm element 500 to and from the Link and multitone symbol distributor/combiner outputs 516, 518. Ex. 1004, 36:30–34. Agee states that "[r]eceived data passes through both a Multilink weight adaptation algorithm and (to which that part is combined) a Multilink diversity combining of the Reception weights." *Id.* at 58:46–48. The pilot signal is shown as "x" arriving from the RF feeds. Ex. 1003 ¶ 551.

The specific calculation of the weights using the FFT-LS algorithm is taught by Agee in Figures 35–37. *See* Ex. 1003 ¶ 541. Dr. Mahon states that "Agee details the calculations and math theory behind the calculations in columns 64–68." Ex. 1003 ¶ 544. Figure 35 is reproduced below.

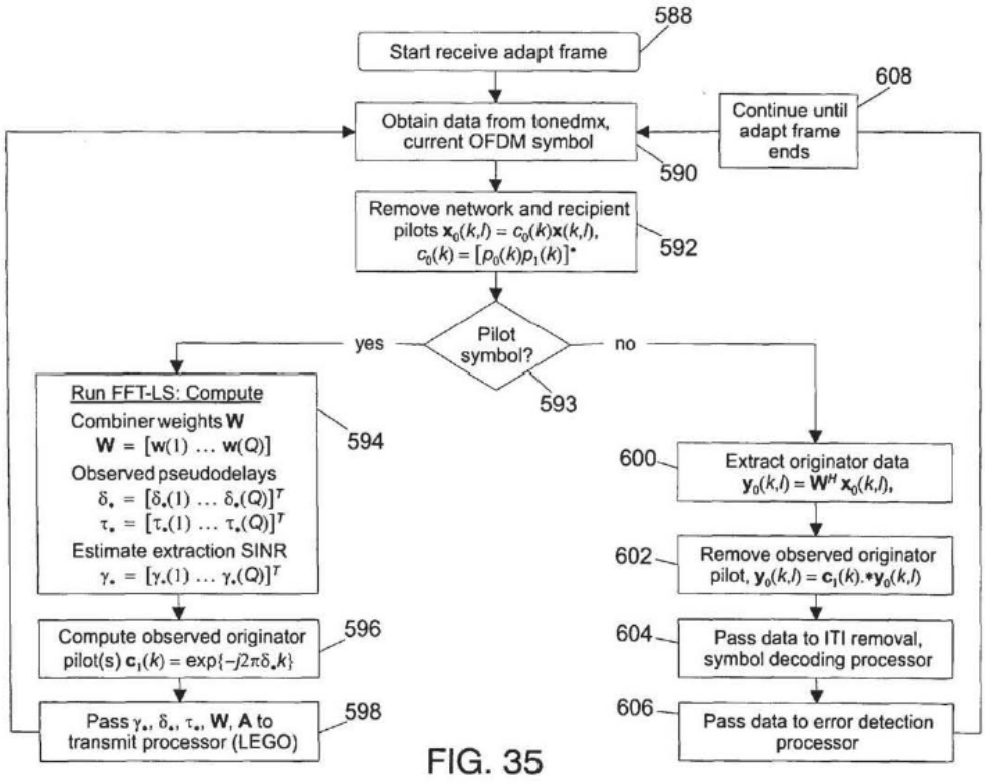


FIG. 35

Figure 35 illustrates the FFT-based LS algorithm used in the preferred embodiment. Ex. 1004, 36:51–52. Figure 35 shows that if the received data is a pilot symbol, then block 594 runs the FFT-LS algorithm to calculate "combiner weights W." Ex. 1003 ¶ 545; *see also* Pet. 68 (summarizing Figure 35 as showing receiving the pilot symbol tones, the weights' calculation that occurs at block 594 (which corresponds to Figure 37), and then using the calculated weights to receive data, illustrated by element 600).

Figure 37 is reproduced below.

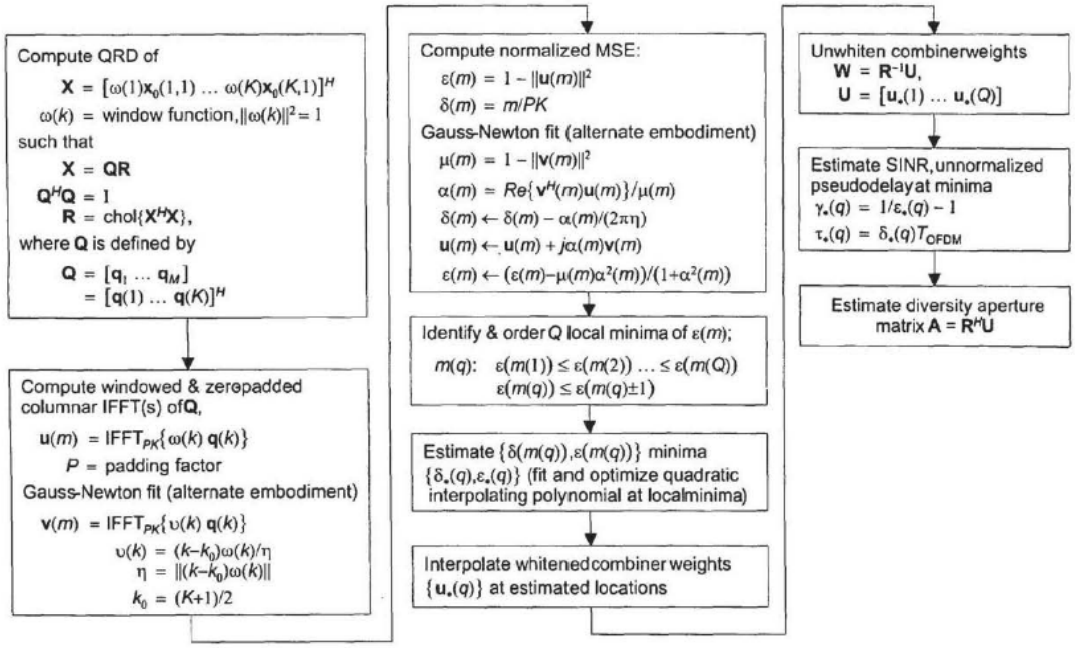


FIG. 37

Figure 37 shows the FFT-based LS algorithm used in the preferred embodiment, as shown in block 594 of Figure 35. Ex. 1004, 36:56–57; Ex. 1003 ¶ 547. The Butler matrix outputs are denoted as processing the pilot signal, which is shown as the "x_0" in Figure 37 and is used at the start of the algorithm on the top left of the figure. Pet. 66; Ex. 1003 ¶¶ 547, 549; Ex. 1004, 66:21–67:55; *see also* Tr. 13:9–10 (Petitioner's counsel acknowledging that Figure 37 is used for pilot signals).

Patent Owner argues that Petitioner fails to show that Agee determines weighting values based on signal strength. PO Resp. 21. We agree. The majority of Petitioner's argument for limitation [1.6] reproduces Agee's description of its calculation of combiner weights and related figures, some of which are reproduced above. As is evident, Agee's weight calculation is complex, and Petitioner has not sufficiently explained how the

signal strength purportedly determined at the Butler matrix or as an output of the Butler Matrix is applicable to Agee's weight calculation. As discussed above, Agee does not expressly describe anything related to signal strength or determining weighting values based on signal strength. *See id.* at 21–22. Petitioner does not cite to any support in Agee that indicates that the Multilink Weight Adaptation Algorithm "uses the signal strength information." *See* Pet. 61; Ex. 1003 ¶ 516. Again, although Petitioner argues that Agee performs the same "determine" steps as Littlejoe (*e.g.*, Pet. 61), Petitioner has not sufficiently explained how Agee discloses using a determined signal strength of the pilot signal (or some other signal information) in the Multilink Weight Adaptation Algorithm.

We agree with Patent Owner that "the cited disclosures from Agee teach determinations based on the actual OFDM tones and symbols, not based on 'signal strength.'" PO Resp. 22 (citing Pet. 68, Ex. 1004, 65:24–46 ("K is the number of tones used in a single FFT-base LS algorithm used to calculate 'combiner weights.'). Petitioner also states that Agee calculates weights based on tones. *See, e.g.,* Pet. 67 (stating that "Agee teaches that it calculates weights using multiple different OFDM tones for each time slot"); *id.* at 68 (stating "[b]ased on the pilot tones on each antenna, Agee calculates the "combiner weights W . . . used in subsequent data recovery operations"); *id.* (stating that "[t]he description of Figure 30 teaches (consistent with Figs. 35–37 above) that the received pilot data tones ('x') is received by the FFT-LS algorithm to calculate the weights"). However, Petitioner has not sufficiently tied Agee's disclosure of calculating weights based on tones to determination of weights based on signal strength.

Further, as to the role of the Butler matrix in the calculation of weights, the Petition summarily states that Agee's Butler matrix output is the input to the algorithms described in Figures 25 and 30. Pet. 69 (citing Ex. 1004, 48:19–46, 57:25–43, Fig. 15). But as Patent Owner argues and we agree, the output of the Butler matrix is combined from multiple signals. PO Resp. 20. And Petitioner does not explain sufficiently how a signal that combines multiple signals has signal strength information that is then used by Agee's algorithms to calculate the required weights. Petitioner's attempt to validate its assertions on this point relies, not on Agee or Butler, but rather, on a prosecution history statement for the '235 patent concerning Littlejoe. Reply 3–8. This is insufficient to show that the asserted prior art teaches or suggests the weight determination required by limitation 1.6. In any event, a generic statement that a Butler matrix processes and outputs "signal information" does not prove that Agee's Butler mode forming circuitry (or any Butler matrix of Agee) outputs a signal with a signal strength information that Agee then uses elsewhere to determine the weights.

Although Dr. Mahon testifies that "Agee's system receives the different tones with different informations and uses those various informations to calculate the weights for beamforming," the statement is factually unsupported, and he does not explain how the "different informations" are used to calculate the weights for beamforming, or whether those "different informations" include signal strength. Ex. 1003 ¶ 553. Dr. Mahon also reproduces large portions of Agee's specification relating to the above reproduced figures in his Declaration, but does not explain the import, or how they relate to the weight calculation based on "signal strength" or any other form of signal information. Ex. 1003 ¶¶ 538, 549, 556. Agee is

an extensive, dense reference, and none of the identified portions of Agee are self-explanatory on this point. Further, although Dr. Mahon testifies that "Agee teaches that it calculates weights using multiple different OFDM tones for each time slot," he does not explain how this relates to calculating weights based upon the signal strength, i.e., the signal information. Ex. 1003 ¶ 554; *see also id.* ¶¶ 556–563.

Petitioner concludes the analysis of limitation [1.6] by stating "[t]hus, Agee uses the different *signal informations (e.g., signal strengths received on the different antennas in the Butler matrix including for the different OFDM tones*) to calculate weights used for receive and transmit beamforming." Pet. 69 (emphasis added). As discussed above, Petitioner does not mention "frequency information," "timing information" or any other type of "signal information" in the assertions for limitation [1.6]. However, to the extent Petitioner is relying on either of these to teach the recited "signal information," Petitioner also has not sufficiently explained how the "timing information" and "frequency information" is used in connection with Agee's Multilink Weight Adaptation Algorithm. We agree with Patent Owner that there is no explanation in the Petition how "frequency information" is used to determine weighting values in limitation [1.6]. PO Resp. 16–17. As Patent Owner argues, the Petition asserts that Agee's weighting value is determined in the same way for each individual tone (Pet. 67–68), but there is no contention that this involves frequency information. PO Resp. 16. Further, Petitioner "cites nothing in Agee which indicates that weights are determined based on the specific frequency k." *Id.* at 17. We also agree with Patent Owner that Petitioner does not sufficiently

explain or address use of "timing information" in Agee to calculate weights. *Id.* at 18.

Thus, we find that Petitioner's contentions as to this limitation lack sufficient specificity to explain how Agee alone, or in combination with Butler, teaches limitation [1.6]. *See Netflix*, 84 F.4th at 1377 ("Ultimately, it is the petitioner's burden to present a clear argument."); *Intelligent Bio-Sys.*, 821 F.3d at 1369 ("It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify 'with particularity' the 'evidence that supports the grounds for the challenge to each claim.'" (quoting 35 U.S.C. § 312(a)(3))).

e) Limitations [1.7] and [1.8]

Limitation [1.7] recites "wherein the set of weighting values is configured to be used by the transceiver to construct one or more beam-formed transmission signals" and limitation [1.8] recites "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, 32:53–58. Because we determine that Petitioner has not shown that the combination of Agee and Butler teaches "determin[ing] a set of weighting values based on the first signal information and the second signal information," Petitioner also has not shown that Agee and Butler teaches or suggests limitations [1.7] and [1.8], which recite limitations reliant on those weighting values.

f) Conclusion

For the reasons discussed above, we find that Petitioner's contentions are insufficient, and we, therefore, determine that Petitioner has not

demonstrated by a preponderance of the evidence that claim 1 is unpatentable over Agee alone or in combination with Butler.

2. Independent claims 8 and 15 and dependent claims 2–5, 11, 12, and 16–19

Independent claims 8 and 15 recite, for the most part, similar subject matter as claim 1. *Compare* Ex. 1001, 32:33–58 (claim 1), *with id.* at 33:48–34:2 (claim 8) and *id.* at 33:48–34:2 (claim 15). Both independent claims 8 and 15 recite commensurate limitations to limitations [1.3]–[1.6]. With the exception of one limitation in independent claim 8,[18] Petitioner relies on its contentions with respect to claim 1 for how Agee teaches or suggests the subject matter of claims 8 and 15. *See* Pet. 76–79, 80–81. Patent Owner provides the same arguments as with claim 1 for claims 8 and 15, as well as additional arguments that we need not reach. *See* PO Resp. 34–39. Dependent claims 2–5, 11, 12, and 16–19 depend, directly or indirectly, from either independent claim 1, 8, or 15. Patent Owner also presents arguments against dependent claims 4, 5, 8, 11, 12, 17, and 18, which we need not reach. *Id.* at 22–33, 39–43.

Accordingly, for the same reasons as claim 1, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 8 and 15 are unpatentable over Agee alone or in combination with Butler. Similarly, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 2–5, 11, 12, and 16–19, which

[18] In a limitation not in claim 1, claim 8 recites "wherein the set of weighting values is to be configured to be used by the remote station to construct one or more beam-formed transmission signals." Ex. 1001, 33:65–67. Petitioner separately addresses this limitation. *See* Pet. 76–79.

depend from claims 1, 8, and 15, are unpatentable over Agee alone or in combination with Butler.

III. CONCLUSION

For the foregoing reasons, we are not persuaded that Petitioner has established by a preponderance of the evidence that claims 1–5, 8–12, and 15–19 of the '235 patent are unpatentable.

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 8–12, 15–19	103(a)	Agee, Butler		1–5, 8–12, 15–19

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–5, 8–12, and 15–19 of the '235 patent have *not* 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.

FOR PETITIONER:

Patrick McPherson
Kevin Anderson
DUANE MORRIS LLP
PDMcPherson@duanemorris.com
KPAnderson@duanemorris.com

FOR PATENT OWNER:

Reza Mirzaie
Philip Wang
RUSS, AUGUST & KABAT
rmirzaie@raklaw.com
pwang@raklaw.com