

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC., AND HP INC.,
Petitioners

v.

XR COMMUNICATIONS, LLC, D/B/A VIVATO TECHNOLOGIES,
Patent Owner

IPR2022-00367
Patent No. 10,715,235

PATENT OWNER RESPONSE

Table of Contents

I.	Introduction.....	2
II.	'235 Patent and Challenged Claims	3
A.	Summary of '235 patent (Ex. 1001)	3
B.	Prosecution History.....	8
C.	Challenged Claims	8
D.	Level of Skill in the Art	10
E.	Claim Construction	10
III.	Petitioner's Asserted Grounds and References.....	12
A.	Burke Primary Reference.....	12
B.	Shull Secondary Reference	14
IV.	Ground 1: The Petition fails to show single-reference obviousness in view of Burke alone	14
A.	Under Federal Circuit law, single-reference obviousness requires substantial evidence that supplying the missing limitations would have been obvious to a POSITA.....	15
B.	The Petition fails to present substantial evidence that the proposed modification to Burke's mobile station would supply the missing limitations (Limitations [8a], [8d], and [8e])	16
1.	Figures 2 and 12 of Burke disclose a mobile station with only a single antenna element.....	19
2.	It would not be obvious how to modify Burke's mobile station to practice Limitations [8a], [8d], and [8e].....	22
V.	Ground 2: The Petition fails to show obviousness of Claims 13 and 14 in view of Burke in combination with Schurr.....	33
VI.	Conclusion	33

Patent Owner's Exhibit List

Exhibit No.	Description
2001	Complaint, <i>XR Communications v. Apple Inc.</i> , W.D. Tex. Case No. 21-cv-00620-ADA
2002	Complaint, <i>XR Communications v. HP Inc.</i> , W.D. Tex. Case No. 21-cv-00694-ADA
2003	Scheduling Order, <i>XR Communications v. Apple Inc.</i> , W.D. Tex. Case No. 21-cv-00620-ADA, Dkt. No. 27 (W.D. Tex., Jan. 13, 2022)
2004	Scheduling Order, <i>XR Communications v. HP Inc.</i> , W.D. Tex. Case No. 21-cv-00694-ADA, Dkt. No. 24 (W.D. Tex., Jan. 13, 2022)
2005	Notice of Agreed Extension of Deadline, <i>XR Communications v. Apple Inc.</i> , W.D. Tex. Case No. 21-cv-00620-ADA, Dkt. No. 27 (W.D. Tex., Jan. 13, 2022)
2006	Notice of Agreed Extension of Deadline, <i>XR Communications v. HP Inc.</i> , W.D. Tex. Case No. 21-cv-00694-ADA, Dkt. No. 24 (W.D. Tex., Jan. 13, 2022)
2007	Exhibit A-14 to Defendants' Preliminary Invalidity Contentions in <i>XR Communications v. Apple Inc.</i> , W.D. Tex. Case No. 21-cv-00620-ADA and <i>XR Communications v. HP Inc.</i> , W.D. Tex. Case No. 21-cv-00694-ADA
2008	Excerpts of Defendants' Preliminary Invalidity Contentions in <i>XR Communications v. Apple Inc.</i> , W.D. Tex. Case No. 21-cv-00620-ADA and <i>XR Communications v. HP Inc.</i> , W.D. Tex. Case No. 21-cv-00694-ADA
2009	Claim Construction Order, <i>XR Comm'ns LLC v. Cisco Sys., Inc.</i> , Case No. 6:21-cv-00623-ADA, Dkt. No. 56 (W.D. Tex. Sept. 30, 2022)
2010	Declaration of Branimir Vojcic, D.Sc.

I. Introduction

The Petition challenges claims 8-14 of U.S. Patent No. 10,715,235 (Ex. 1001). The Petition argues that claims 8-12 are obvious in view of Burke, and that dependent claims 13 and 14 are obvious in view of Burke combined with Schull. But the Petition's theory for claims 8-12 fails under the law of single-reference obviousness, and this failure as to independent claim 8 also applies to dependent claims 13 and 14. Each ground therefore fails to establish invalidity.

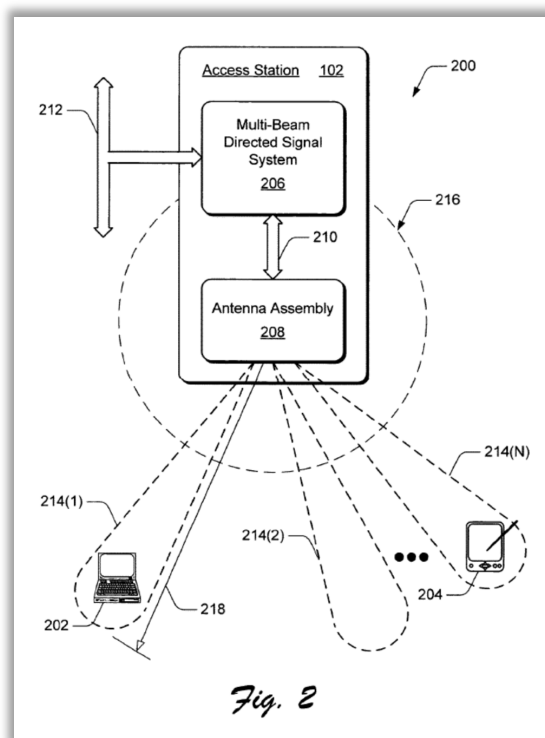
Each challenged claim of the '235 patent requires at least: (1) receiving a first signal transmission from a remote station via *a first antenna element of an antenna*; (2) receiving a second signal transmission from the remote station *via a second antenna element of the antenna*; and (3) receiving the first / second transmissions via the first / second antenna elements occur *simultaneously*. Petition argues this would be obvious in view of Burke's mobile station. But Burke's mobile station uses an antenna with only a single antenna element—not two antenna elements, as required by the challenged claims. Likewise, Burke does not teach or suggest receiving a first / second signal transmission at the first / second antenna elements, respectively. Nor does Burke teach or suggest that the reception occurs simultaneously. Lacking these disclosures, Petitioners argue that modifying Burke's mobile station to use an antenna array to meet every requirement of the challenged claims would be obvious. But Petitioners' arguments are driven by hindsight and an

improper attempt to fit Burke's different system into the challenged claims by using the '235 specification and claims as a roadmap. Petitioners also fail to show that, of all the possible techniques available, a POSITA would be motivated or understand how to modify Burke's system to perform as required in the challenged claims with a reasonable expectation of success. Petitioners' motivation to combine arguments are conclusory and rely on impermissible hindsight.

II. '235 Patent and Challenged Claims

A. Summary of '235 patent (Ex. 1001)

The '235 Patent (Ex. 1001) is entitled "Directed wireless communication" and relates to "a multi-beam directed signal system [] implemented to communicate over a wireless communication link via an antenna assembly with client devices." '235 patent at 3:11-15. The '235 patent focuses on updating the spatial distribution of the beams based on feedback information. EX-2010, Declaration of Branimir Vojcic, D.Sc. ("Vojcic Decl."), ¶¶26-31. The '235 Patent describes systems that operate in the field of wireless communications, including "WiFi" networks that operate in accordance with "IEEE 802.11" standards. *Id.* ¶ 26. The '235 Patent generally relates to "beamforming," which is depicted in several figures, including Figures 2, 3, 5, 6, 12, 14, and 15. *Id.*



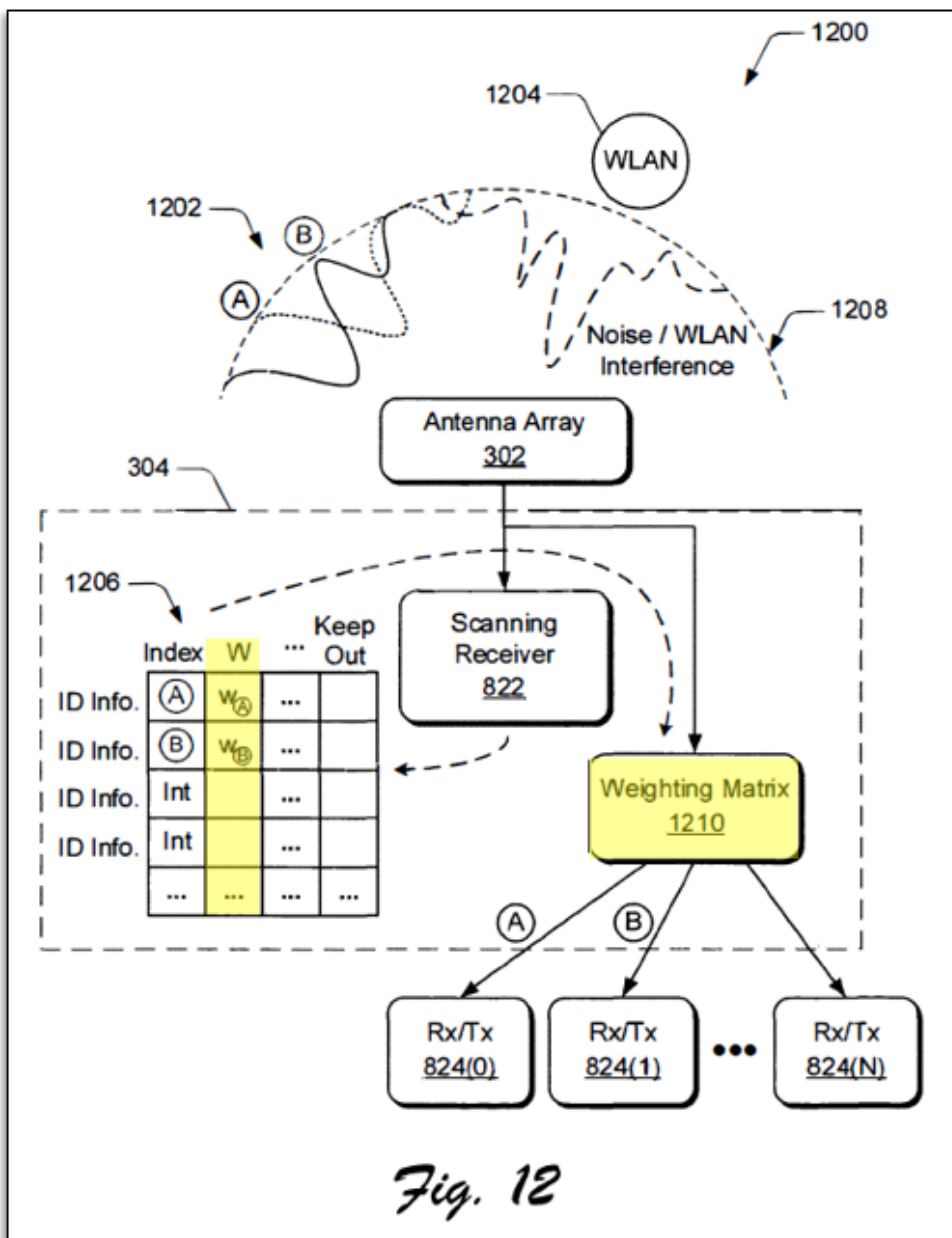
As the patent explains, “beamforming” refers to when the “electromagnetic waves are *focused* in a desired direction,” unlike a conventional omni-directional transmission that transmits in all directions. ’235 Patent, 5:22-55. For example, the system enables patterns of electromagnetic signals that provide “a first transmission peak” at a first device, “a second transmission peak” at a second device, and “a first transmission null” at a third device. EX-2010 (Vojcic Decl.) ¶ 27. In this example, the system advantageously improves communications with the first and second devices, while blocking interference from the third device. *Id.*

In one embodiment, the ’235 Patent discloses a wireless communications apparatus that comprises an “antenna array 302” with a plurality of “antenna

elements” to emanate an array of multiple directed communication beams 214(1), 214(2),...214(N). EX-1001, FIGS. 2, 3; *see* EX-2010 (Vojcic Decl.) ¶ 28. The ’235 Patent teaches receiving signal transmissions simultaneously via directed communication beams. EX-1001, 3:38-52 (“An increase in communication range is achieved by beamforming directed communication beams which simultaneously transmit directed signals and receive communication signals from different directions via receive and transmit beam-forming networks.”). In one embodiment, “antenna array 302 can include sixteen antenna elements...” from which “sixteen different communication beams 602(0), 602(1),...,602(15) are formed,” each of which may have beam patterns that “differ in width, shape, number, angular coverage, azimuth, and so forth.” EX-1001, 9:12-34; *see* EX-1001, 6:61-7:5 (“directed communication beams 214 of antenna array 302 can be directionally controllable”). In one embodiment, only thirteen of the antenna elements and beams are used for transmission and reception. EX-1001, 9:34-60; EX-2010 (Vojcic Decl.) ¶ 28.

The ’235 Patent apparatus receives signal transmissions via the directed communication beams from other devices or “nodes within the wireless routing network.” EX-1001, 24:25-34; *see* EX-2010 (Vojcic Decl.) ¶ 29. Further, the ’235 Patent apparatus determines a **set of weighting values** based on multiple received signals from each node. For example, as shown in Figure 12 below, “communication

and/or data transfer signals are received from sources 1202 (e.g., sources A and B).” EX-1001, 24:25-34. These signals are provided to a “signal control and coordination logic 304” which includes a “scanning receiver 822 that is configured to update routing information 1206 with regard to the received signals.” EX-1001, 24:35-25:30. More specifically, the routing information 1206 includes a routing table, and the “routing table includes stored weighting values (w) each associated with a particular signal source 1202 (e.g., sources A and B)...[a] description of the received signal(s) can be stored in the routing table in the form of the pattern of weighting of the signal(s). In this example, a polynomial expansion in z , $w(z)=w_0+w_1z+w_2z^2+w_3z^3+w_4z^4+\dots+w_iz^i$ can be utilized to establish the values of the weights (w_i) to be applied to a weight vector.” *Id.* This is depicted in Figure 12 below:



After determining a set of weighting values based on the received signals, the “stored weighting values associated with each connection, data signal, and/or source are utilized in a weighting matrix 1210 which operates to apply the latest weighting values to the received signals and also to transmitted signals.” EX-1001, 25:1-29;

EX-2010 (Vojcic Decl.) ¶ 30.

Figure 12 depicts determining weighting values from received signals from a particular node in the network and “apply[ing] the latest weighting values...to transmitted signals” to that same node. EX-1001, FIG. 12; EX-2010 (Vojcic Decl.) ¶ 31. In Figure 12, the apparatus receives signals via antenna array 302 from a particular node (e.g., 1202 A), determines and stores weighting values for that node (e.g., $w_{(A)}$ in routing table 1206), and then applies the weighting values that are particular to that node when transmitting signals to that node (e.g., transmissions to 1202 A via transceiver 824(0)). *Id.*

B. Prosecution History

The '235 Patent recites a Provisional Patent Application No. 60/423,660, filed on Nov. 4, 2002, but it claims priority to at least February 1, 2002. As described in Patent Owner’s Preliminary Response, the '235 Patent claims are entitled to a priority date at least as early as February 1, 2002, as corroborated by evidence contained within U.S. Provisional Application No. 60/423,660, filed November 4, 2002. *See* EX-1002, 265-272.

C. Challenged Claims

The Petition challenges claims 8-14 of the '235 patent. Pet. at 2. Independent claim 8 recites:

[8pre]	A method for use in a wireless communications
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	system, the method comprising:
[8a]	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,
[8b]	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;
[8c]	determining first signal information for the first signal transmission;
[8d]	determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;
[8e]	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
[8f]	transmitting to the remote station a third signal comprising content based on the set of weighting values.

The remaining claims (claims 9-14) are dependent claims that further limit the prior independent claims.

D. Level of Skill in the Art

For purposes of this Patent Owner's Response and IPR, Patent Owner adopts Petitioner's definition of a person of ordinary skill in the art (POSITA)—i.e., “a Bachelor's degree in 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 Master's or Doctorate degree in electrical engineering with a year of related work experience in wireless communication systems.” EX-1003 at 15. Attached hereto as EX-2010 is the Declaration of Branimir Vojcic in support of this Patent Owner Response. Dr. Vojcic is a POSITA under this definition and was a POSITA at least as of November 3, 2003. EX-2010, ¶ 16.

E. Claim Construction

Petitioners have asserted that claim construction is not necessary in this proceeding. Petition (“Pet.”) at 3. In district court litigation, Petitioners argued for express constructions of various terms of the challenged claims, including “transmission peaks,” “transmission nulls,” “remote station,” “transmitting to the remote station a third signal comprising content based on the set of weighting values.” The district court construed all contested terms to have their plain and

ordinary meaning, as follows. *See* Ex-2009, *XR Comm'ns LLC v. Cisco Sys.*, No. 6:21-cv-00623-ADA, Dkt. No. 56 (W.D. Tex. Sept. 30, 2022).

Term	Court's Final Construction
"transmission peaks" U.S. Patent No. 10,715,235, Cls. 2, 4, 8, 12, 16	Plain-and-ordinary meaning ¹ ¹ – Note not for the jury: The plain-and-ordinary meaning of "transmission peaks" includes relative maxima.
"transmission nulls" U.S. Patent No. 10,715,235, Cls. 2, 4, 8, 12, 16	Plain and ordinary meaning wherein the plain-and-ordinary meaning is "portions of one or more spatially distributed patterns of electromagnetic signals where transmissions of no or insignificant energy are selectively directed."
"third signal comprising content based on the set of weighting values" U.S. Patent No. 10,715,235, Cls. 1, 8 and 15	Plain-and-ordinary meaning wherein the plain-and-ordinary means that the "third signal" is "based on the set of weighting values."
"the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals" U.S. Patent No. 10,715,235, Cl. 8	Not indefinite. Plain-and- ordinary meaning.
"remote station" U.S. Patent No. 10,715,235, Cls. 1,4,8,9,12,15	Plain and ordinary meaning.

Patent Owner does not believe that any express constructions are necessary to resolve the disputes in this IPR. Patent Owner believes that Petitioner fails to show invalidity of the challenged claims either without without claim construction or under the district court's constructions above.

III. Petitioner's Asserted Grounds and References

The Petition asserts two grounds unpatentability (Pet. at 2):

- Ground 1: Claims 8-12 are obvious over Burke
- Ground 2: Claims 13-14 are obvious over Burke in view of Shull

A. Burke Primary Reference

U.S. Patent No. 7,155,231 to Burke et al. ("Burke," Ex. 1006) relates generally to wireless communication, and more specifically to an improved method and apparatus for space-time pre-correction of transmitted wireless signals. EX-1006, 1:15-19. Burke is directed to CDMA systems in which mobile stations communicate with a base station. EX-1006, 3:25-54. Burke's Figure 2 depicts a base station 104 communicating with a mobile station 106. EX-1006, 4:6-62. The mobile station 106 is shown with "antenna 112," which is an antenna comprising a single antenna element. *Id.* Figure 12 depicts Burke's preferred embodiment of mobile station 106, in which antenna 112 is a "single antenna." EX-1006, 25:56-67.

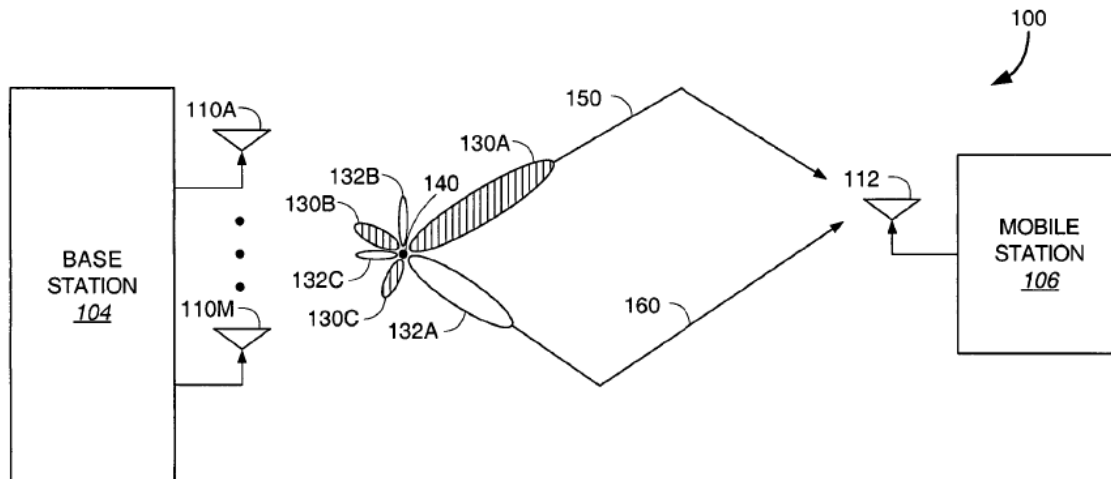


FIG. 2

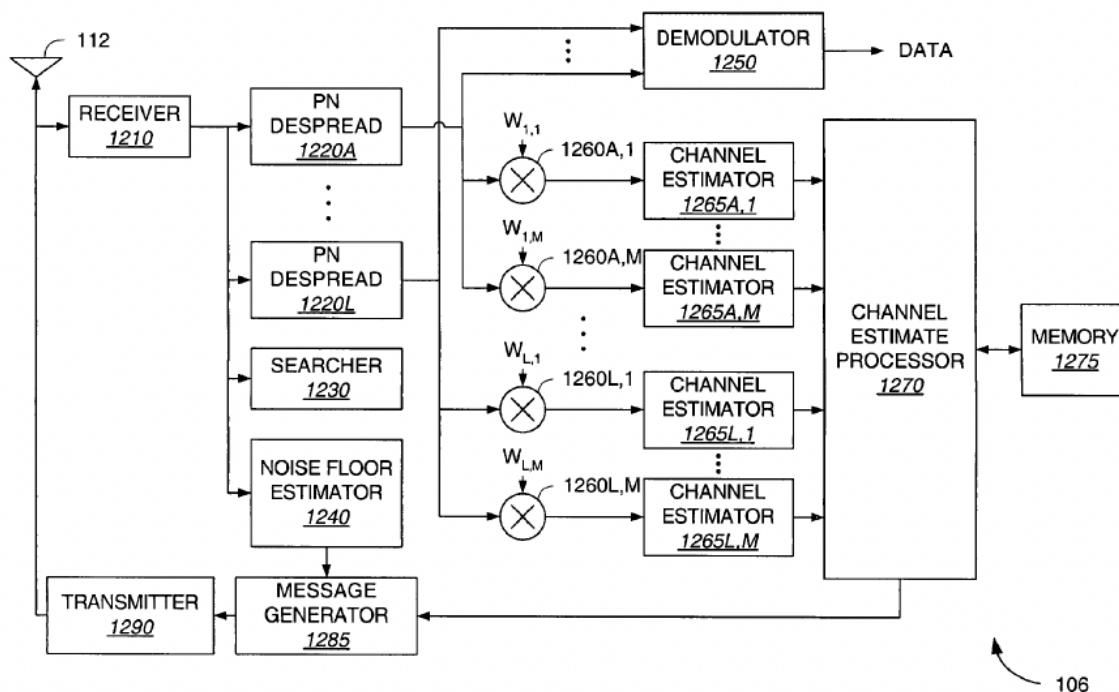


FIG. 12

Burke does state, in a single sentence, that antenna 112 “may be a single antenna, or an array of diversity antennas for deploying diversity techniques known

in the art.” EX-1006, 25:59-61. However, Burke does *not* disclose how to implement its teachings in the event that the mobile station were modified to include an antenna array comprising multiple antenna elements. For example, Burke does not indicate what aspects of Figure 12 (if any) would be compatible with a mobile station 106 modified to possess an array of multiple antenna elements.

B. Shull Secondary Reference

U.S. Patent No. 6,006,077 to Shull (Ex. 1007 or “Shull”) is directed to an improved method for calculating the Radio Signal Strength Indication (RSSI) between a mobile station and various base stations. EX-1007, 1:21-32, 2:30-33. In Shull’s method, a mobile phone can obtain signal strength readings with the receiver set at two different, known gain levels. Shull, Abstract. Shull’s mobile phone possesses only a single antenna element (“antenna 12” in Figure 1). EX-1007, 4:29-59.

IV. Ground 1: The Petition fails to show single-reference obviousness in view of Burke alone

The Petition’s theory fails under the law of single-reference obviousness. Each challenged claim of the ’235 patent requires “receiving 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” (Limitation [8a]), “determining second signal information for the second signal transmission, wherein the second signal information is different than

the first signal information” (Limitation [8d]), and “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” (Limitation [8e]). The Petition admits that Burke’s mobile station does not perform Limitations [8a], [8d], and [8e]. The Petition provides insufficient evidence that that Burke renders these limitations obvious to a POSITA.

A. Under Federal Circuit law, single-reference obviousness requires substantial evidence that supplying the missing limitations would have been obvious to a POSITA.

“Though less common . . . 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). Importantly, this requires substantial evidence and non-conclusory reasoning that the missing limitation would be obvious. *Id.* at 1362–63.

The *Arendi* case is instructive. There, the Federal Circuit reversed the Board’s finding of obviousness because the Board erred in relying on “common sense” to supply a claim limitation that was missing from the one prior art reference relied on to show obviousness. The Federal Circuit noted that only conclusory statements and evidence supported the Board’s rationale, and that this was insufficient and did not constitute substantial evidence.

In *Arendi*, the Federal Circuit held that statements about what a POSITA would have known or done “cannot be used as a wholesale substitute for reasoned analysis and evidentiary support, especially when dealing with a limitation missing from the prior art references specified.” *Id.* at 1362. Further, where there is a limitation missing from the prior art, the Federal Circuit’s “search for a reasoned basis for resort to common sense must be *searching*. And, this is particularly true where the missing limitation goes to the heart of an invention.” *Id.* (emphasis added).

Likewise, the Federal Circuit has limited the application of single-reference obviousness in other cases, such as *Kotzab*. See, e.g., *In re Kotzab*, 217 F.3d 1365, 1371–72 (Fed. Cir. 2000) (reference teaching one sensor per valve did not render obvious claims for one sensor for multiple valves, despite alleged “simplicity” of proposed modification extending a sensor to multiple valves).

B. The Petition fails to present substantial evidence that the proposed modification to Burke’s mobile station would supply the missing limitations (Limitations [8a], [8d], and [8e])

Petitioners rely exclusively on single-reference obviousness in view of Burke to satisfy Limitations [8a], [8d], and [8e] for all asserted grounds. The Petition relies on Burke’s mobile station to show that these limitations would be obvious. However, Petitioners concede that Burke’s mobile station does not actually disclose these limitations. Most importantly, Burke’s mobile station only possesses a single antenna element, in contrast to the ’235 Patent’s requirement of an antenna with

distinct first and second antenna elements. EX-2010 (Declaration of Branimir Vojcic) (“Vojcic Decl.”) ¶ 37.

Yet, the ’235 Patent’s requirement of distinct first and second antenna elements goes to the heart of the invention of Claim 8. For example, Limitation [8a] requires that each distinct antenna element receive distinct signal transmissions simultaneously. Limitation [8d] requires determining second signal information corresponding to the second signal received with the second antenna element, and the second signal information must be different than the first signal information determined in Limitation [8c]. And Limitation [8e] requires determining a set of weighting values based on both the first signal information and the second signal information, which necessarily depends on the distinct antenna elements recited in Limitation [8a].

However, beyond a conclusory assertion by their expert, Dr. Akl, that Burke’s mobile station could be modified to use an array of multiple antenna elements, Petitioners have failed to introduce supporting evidence that a POSITA would understand the purportedly modified Burke mobile station to perform each specific aspect of Limitations [8a], [8d], and [8e]. Petitioners’ reliance on the testimony of Dr. Akl to support its arguments fails, because Dr. Akl does not provide evidence or analysis showing that Limitations [8a], [8d], and [8e] result from nothing more than replacing Burke’s single antenna with an array of antennas.

Because Dr. Akl fails to address how a modified Burke mobile station would practice the specifics of Limitations [8a], [8d], and [8e]—and Burke itself also fails to describe this—his opinion is an unsupported assertion that cannot carry Petitioners’ burden to prove invalidity. Such *ipse dixit* is an insufficient evidentiary basis and cannot substitute for disclosure in a prior art reference itself. And none of the prior art beyond Burke that is cited in the Petition fills this evidentiary gap. *See* Patent Trial and Appeal Board Consolidated Trial Practice Guide 36 (Nov. 2019) at 36 (“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.” (citing *K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365 (Fed. Cir. 2014))).

Here, because Burke does not disclose how its mobile station would operate if its single antenna were replaced with an array of antenna elements, the Petition was required to introduce evidence and explanation for how a modified Burke mobile station would operate and why it would perform Limitations [8a], [8d], and [8e]. No such explanation is present in the Petition. Instead, Petitioner’s argument and Dr. Akl’s testimony are an invocation of “common sense” within the knowledge of an ordinarily skilled artisan. *See, e.g.*, Pet. at 27-29, citing EX-1003, ¶¶ 84-85. But even such “common sense” arguments must be supported by evidence and a

reasoned explanation that is particular to each challenged claim element. *Arendi*, 832 F.3d at 1363. And here, where the “missing limitation goes to the heart of an invention,” that requirement is particularly strong. In the absence of such support, Petitioner’s and Dr. Akl’s assertions are insufficient to demonstrate obviousness as required under Petitioner’s burden. Further, as explained below and in the accompanying declaration of Dr. Branimir Vojcic (EX-2010), a POSITA would not understand Burke to teach or suggest the challenged claims; nor be motivated to (or know how to) modify Burke’s system to arrive at the claimed invention.

1. Figures 2 and 12 of Burke disclose a mobile station with only a single antenna element.

The Petition relies on Burke’s Figure 2 and Figure 12 to show obviousness of Limitation [8a]. Pet. at 26-30. However, Figures 2 and 12 in Burke clearly show that the mobile station only possesses a single antenna element, and this is corroborated by specific technical aspects of Burke’s disclosure. EX-2010 (Vojcic Decl.) ¶¶ 37-38; EX-1006, FIGs. 2, 12.

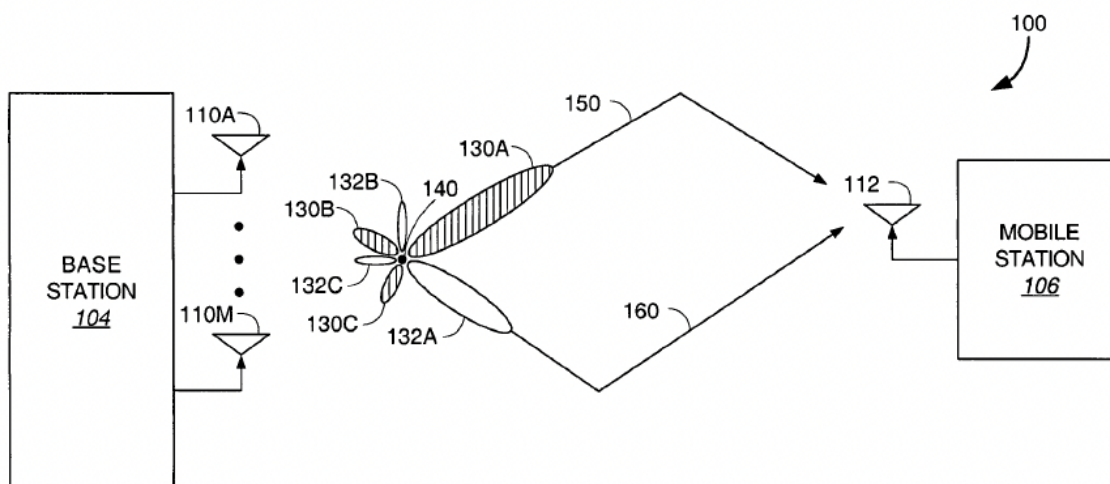


FIG. 2

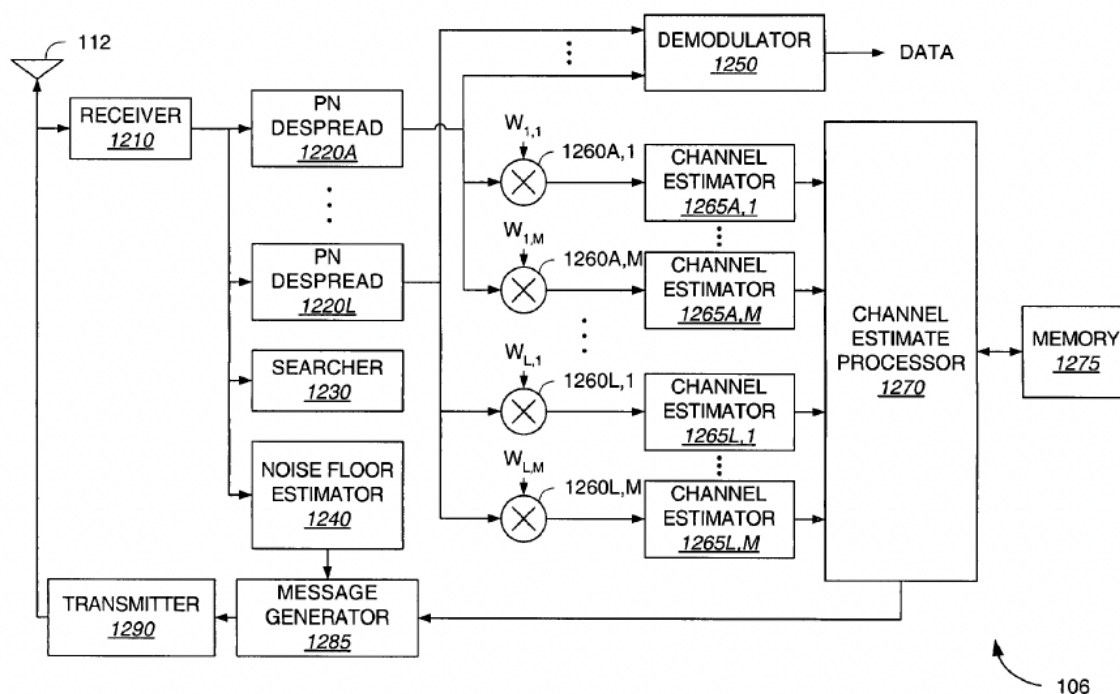
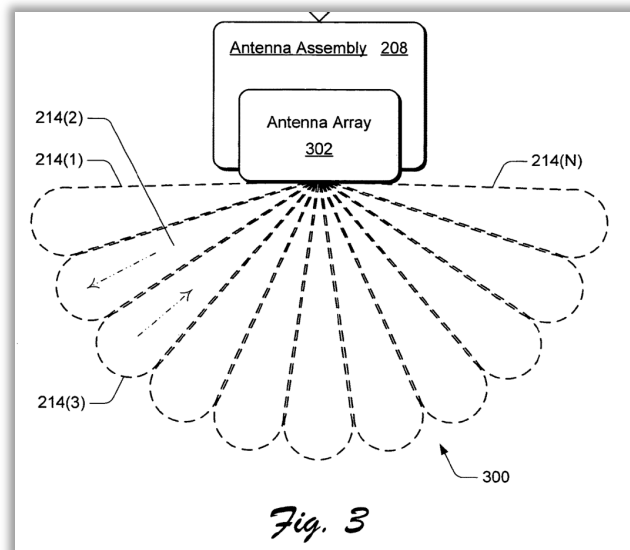


FIG. 12

The Petition's reliance on Figure 2 and 12 of Burke clearly contrasts with the disclosure of the '235 patent. The challenged claims require an antenna comprising

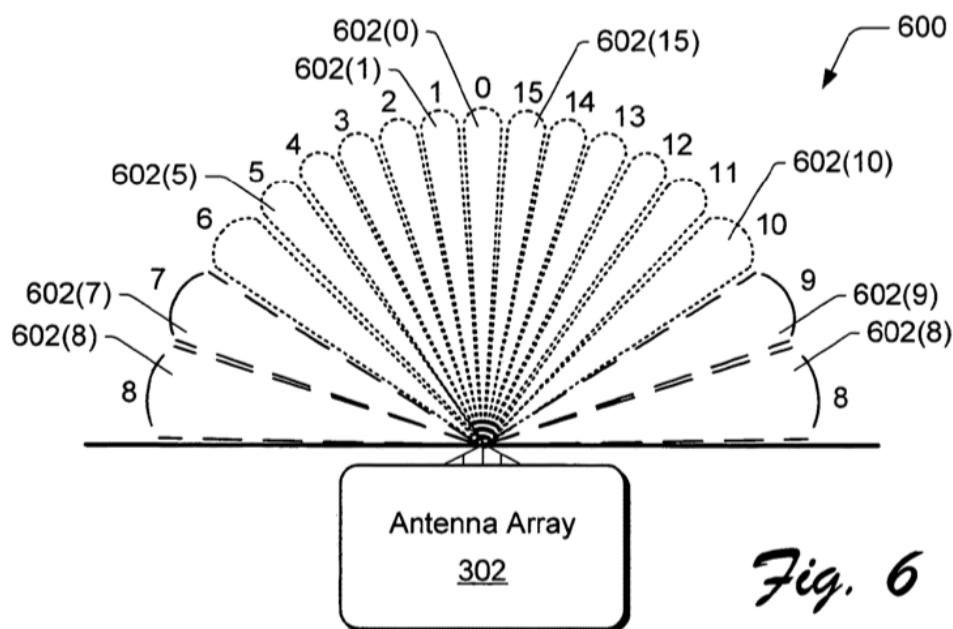
at least a first antenna element and a second antenna element—not a single antenna element, as disclosed in Burke’s mobile station. EX-1001, Claim 8.

An antenna array comprising multiple antenna elements is also disclosed in the ’235 specification. For example, Figure 3 of the ’235 Patent depicts “an exemplary communication beam array 300.” ’376 Patent at 5:55-67. As shown in Figure 3, such an array has multiple antenna elements which form multiple different beams for receiving different signals.



’235 Patent, Figure 3. In one embodiment, “antenna array 302 can include sixteen antenna elements...” from which “sixteen different communication beams 602(0), 602(1),...,602(15) are formed.” EX-1001, 9:12-34; *see* EX-1001, 6:61-7:5 (“directed communication beams 214 of antenna array 302 can be directionally controllable”). The array of different antenna elements is also illustrated in Figure 6 (“Antenna Array 302”), Figure 8A (“Antenna Array 302”), and Figure 13 (“antenna

elements 400(1)...400(15)”), reproduced below.



In contrast, Burke’s Figure 2 and 12, shows only a single antenna at the mobile station. A POSITA would understand Burke’s mobile system to be a different arrangement than the antenna array described and claimed in the ’235 Patent. Thus, Burke’s disclosures fail to teach or suggest Limitation [8a].

2. It would not be obvious how to modify Burke’s mobile station to practice Limitations [8a], [8d], and [8e].

The Petition argues that Burke’s mobile station renders obvious Limitation [8a], [8d], and [8e]. As to Limitation [8a], the Petition specifically focuses on Figures 2, 5, 6, and 12 in Burke. Pet. at 26-30. Figures 2, 5, and 6 in Burke describe details of the base station’s transmission operations. Only Figure 12 in Burke focuses on the mobile station’s receive operations.

As shown above, Figure 12 only discloses a single antenna element in the mobile station, and other aspects of Burke, relied on by Petitioner, require that the antenna in Figure 12 contains only a single element. EX-2010 (Vojcic Decl.) ¶¶ 37-38. So, Petitioners argue that it would be obvious to modify Figure 12 in Burke’s mobile station to use an antenna array, citing a single sentence in Burke which states that antenna 112 “may be a single antenna, or an array of diversity antennas for deploying diversity techniques known in the art.” EX-1006, 25:58-61. But this single sentence does not indicate to a POSITA how Burke’s mobile station would purportedly operate if it were modified to possess an antenna array. EX-2010 (Vojcic Decl.) ¶¶ 37-40.

The Petition cites no other disclosure in Burke regarding how Burke’s mobile station would operate if its single antenna were replaced with an antenna array. Beyond a conclusory assertion by their expert, Dr. Akl, that Burke’s mobile station could be modified to use an array of multiple antenna elements, Petitioners have failed to introduce supporting evidence that a POSITA would understand such a modified Burke mobile station to perform each specific aspect of Limitations [8a], [8d], and [8e].

The Petition has also failed to show why a POSITA would be motivated to modify Burke’s mobile station to perform Limitations [8a], [8d], and [8e] specifically, based only on Burke’s reference to an “array of diversity antennas for

deploying diversity techniques known in the art.” EX-1006, 25:58-61. This reference is too broad and non-specific to show obviousness of Limitations [8a], [8d], and [8e]. Petitioners’ argument assumes that all arrays of diversity antennas are useful in receiving different signals from the same remote station simultaneously, determining different signal information for each signal, and determining a set of weighting values based on the different signal information, as disclosed in the ’235 patent—but Petitioners fail to support this assumption.

a. Limitation [8a]

Beginning with Limitation [8a], the Petition fails to explain how to modify Burke’s Figure 12 to perform Limitation [8a], and further fails to prove that such a modification would be predictable. Pet. at 26-30. Instead, the Petition argues that one specific modification to Burke would be obvious (i.e., replace the mobile station’s single antenna 112 with an array of antenna elements). *Id.* But the Petition does not go on to address how that modification would actually impact Burke’s Figure 12, or how the modified Figure 12 would practice Limitation [8a], which requires, *inter alia*, simultaneous transmission of different signals with distinct antenna elements. Pet. at 26-30; EX-2010, ¶ 41.

This is insufficient under binding precedent, such as *Arendi*. There is a single reference in Burke to the possibility of replacing the single antenna in the mobile station with an antenna array. But this disclosure does not indicate to a POSITA that

Burke's mobile station would operate correctly or in accordance with Limitation [8a] if the single antenna used throughout in Burke were replaced with an antenna array. EX-2010, ¶ 39.

Burke itself provides evidence that replacing Burke's single antenna with an array would not be a simple task. Specific portions of Burke require that transmissions be received by the same antenna, rather than two different antenna elements. EX-2010, ¶ 38. For example, Dr. Akl relies on Figure 12 and associated discussion, which shows the output of the receiver connected to a plurality of PN despreaders and channel estimators. EX-1003 at 51-52. These structures, as disclosed in Burke, operate on signals received from a single antenna. EX-1006, Figure 12. Both of the multipaths (which correspond to Dr. Akl's "first signal transmission" and "second signal transmission") are received by the same antenna and go into the same processing pipeline. *Id.* Thus, a POSITA would understand that these portions of Burke show a single antenna element receiving the "first signal transmission" and "second signal transmission."

In view of Burke's consistent and repeated disclosure of a mobile station with a single antenna, a POSITA would understand, as indicated by Burke's reference to "diversity techniques known in the art," that substantial modifications and additions would be required to make Burke's system work with an antenna array, because the modified Burke mobile station would rely on diversity techniques outside the scope

of Burke. EX-2010, ¶ 39, citing EX-1006, 25:58-61. Such a combination would not be obvious, and Burke does not imply or suggest that it would be. EX-2010, ¶ 39. Notably, Burke simply states that “diversity techniques” were known in the art. Burke does not state or suggest that a purported modification of replacing a single antenna with an array of diversity antennas was known in the art. EX-2010, ¶ 39. Nor does Burke state that the remaining, missing elements for Limitation [8a] are known in the art.

Although Burke indicates that substantial modifications to Figure 12 would be required to accommodate an antenna array, Petitioners neither explain which elements of Figure 12 could be predictably preserved nor specify which elements beyond antenna 112 would be modified, if any. Pet. at 26-30. For example, Petitioners do not indicate which of the elements of Figure 12, or a modified Figure 12, has a known function, what that function is, and why that function is predictable in the context of an antenna array with multiple antenna elements. Pet. at 26-30.

To prove that modifying Burke’s Figure 12 to perform Limitations [8a] would be obvious, Petitioners cite Dr. Akl’s declaration at paragraphs 84-85. Pet. at 27-28. However, Dr. Akl’s declaration at paragraphs 84-85 fails to describe how Burke’s Figure 12 would change, beyond replacing the single antenna element with an array of multiple elements. Further, there is no evidence that this modification alone would result in the entirety of Limitation [8a] being performed. Dr. Akl’s declaration at

paragraphs 84-85 entirely fails to describe why Figure 12 would perform in accordance with Limitation [8a] simply by replacing the antenna with an array of multiple elements. EX-1003 (Akl Decl.) ¶¶ 84-85. For example, Dr. Akl never explains how Burke's receiver structure with despreaders and channel estimators in Figure 12 would perform Limitation [8a], which would require *simultaneously* processing the signals from additional antennas in "an array of diversity antennas." EX-2010, ¶ 39.

Indeed, Dr. Akl skips the critical step of explaining *how* the modified Figure 12 would perform Limitation [8a]. Dr. Akl's only explanation is:

"Because antenna arrays can be used to receive signals using different antennas similar to the manner in which different antennas of an antenna array can be used to transmit different signals (see e.g., EX-1006, 25:58-61; EX-1012, 2:8-40, 20:50-22:21, FIG. 5), it would have been obvious to a POSITA that the first signal transmission transmitted over a signal path 150 ("first signal transmission") would have been received via one of the antennas, e.g., a first antenna ("first antenna element") of the array of antennas in antenna 112, and a second signal transmission transmitted over signal path 160 would have been received via a second antenna ("second antenna element") of the array of antennas in antenna 112 ("antenna")." EX-1003 (Akl Decl.) ¶ 85.

Dr. Akl's argument in paragraph 85 is conclusory and insufficient because it fails to describe how Figure 12 would need to be modified to perform Limitation [8a]. Dr. Akl does not even state which aspects of Figure 12 would be modified beyond antenna 112, and he fails to explain how Figure 12 would perform Limitation [8a] assuming that the only modification is to replace the single antenna element 112 with an antenna array. EX-1003 (Akl Decl.) ¶ 85.

Dr. Akl's argument in paragraph 85 is nothing more than an assumption that antenna array reception using different antennas is "similar to" antenna array transmission using different antennas. EX-1003 (Akl Decl.) ¶85. But this assumption is unsupported by any explanation of how to modify Figure 12 in Burke to perform Limitation [8a] with multiple antenna elements. *Id.* Indeed, Dr. Akl does not describe any specific proposed modifications to Figure 12 beyond replacing the antenna with an antenna array. *Id.* This does not suffice.

Dr. Akl's cited portions of Burke do not fill this gap, either. The single sentence in Burke about an "array of diversity antennas" does not explain how to modify Figure 12 to perform Limitation [8a] (or [8d] or [8e], for that matter). EX-1006, 25:58-61. Next, Dr. Akl's citation to Figure 5 also does not explain how to modify Figure 12 to perform Limitation [8a]. Figure 5 is a transmission operation, not a receive operation; it is insufficient, by itself, to render obvious Dr. Akl's proposed modification to the receive operation in Figure 12.

Dr. Akl's remaining citations to Burke as to Limitation [8a] all concern receive operations using a single antenna element—not multiple antenna elements. For example, Dr. Akl's references to EX-1006, 7:66-8:2, 6:30-42, 26:16-22, 5:54-55, 7:18-25, and 5:9-32 each involve a mobile station with a single antenna element.

The only place Dr. Akl even addresses the significance of replacing Burke's antenna element with an array of multiple elements is in the context of Limitation [8a]. Beyond Burke, Petitioners (and Dr. Akl) also reference Hottinen, Walton, and Goldsmith to “demonstrate that a POSITA would have been motivated to implement Burke's disclosure (EX-1006, 25:58-61) for its technological benefits like improved short term channel estimation and receiver performance gain with a reasonable expectation of success because it was implemented in similar wireless communications systems.” Pet. at 28; EX-1003 (Akl. Decl.) ¶ 85. But Hottinen, Walton, and Goldsmith do not describe how to modify Burke's mobile station, or Burke's Figure 12, in the manner of Limitations [8a] (or [8d] or [8e], for that matter). EX-2010, ¶¶ 42-43. Indeed, Dr. Akl merely asserts that these references illustrate that similar wireless communications systems had implemented mobile stations with multiple receive antennas. EX-1003, ¶ 85. This does not address how to modify Burke's Figure 12 to accommodate the requirement in Limitation [8a] regarding simultaneous reception. EX-2010, ¶¶ 42-43.

Notably, as to Limitation [8a], Dr. Akl does not assert that Hottinen, Walton,

and Goldsmith disclose **simultaneous** reception with multiple receive antennas. EX-1003 (Akl Decl.) ¶ 85. His reliance on Hottinen, Walton, and Goldsmith is limited. Dr. Akl only relies on these references to show a motivation to implement multiple receive antennas and as “examples of the well-known understanding a POSITA would have had that different receiving antennas in an antenna array would have been used to receive two signal transmissions transmitted from two antennas in an antenna array of a transmitting device.” Pet. at 28; EX-1003 (Akl Decl.) ¶85. This does not address the “simultaneous” requirement in Limitation [8a]. It therefore fails under *Arendi*, as it does not address

b. Limitations [8d] and [8e]

For Limitations [8d] and [8e], Dr. Akl does not cure these deficiencies—instead, he specifically relies on the unmodified Figure 12 in Burke, once again skipping over the critical step of addressing the impact from modifying Figure 12 to use an array of antennas. EX-2010, ¶¶ 44-45. For Limitations [8d] and [8e], the Petition asserts that these limitations would also be obvious in view of Figures 5, 6, and 12 of Burke and the accompanying text. Pet. at 34-35, 40-43. But because the Petition never addresses how the necessary modification for Limitation [8a] (replacing Burke’s single antenna element with an array of antenna elements) would impact Figure 12, the Petition similarly fails to explain how a modified Figure 12 would render obvious Limitations [8d] and [8e]. For example, the Petition does not

explain how a *modified* Figure 12 with multiple antenna elements would perform Limitation [8d] or Limitation [8e]. Instead, the Petition improperly assumes that Figure 12 in its *unmodified* form would render these limitations obvious, which fails to account for the necessary modification required for the Petition's theory as to Limitation [8a]. Pet. at 34-35, 40-43.

As with his analysis of Limitation [8a], Dr. Akl's citations to Burke in this analysis of Limitations [8d] and [8e] do not fill the gaps in his single-reference obviousness analysis. In discussing Limitations [8d] and [8e], again, Dr. Akl only references the unmodified receive operation in Figure 12 that relies on a single antenna element. None of the cited disclosures in Burke address *how* the mobile station would practice Limitations [8d] and [8e] if it were modified to possess multiple antenna elements. None of them address the specific requirement in Limitation [8d] requiring that both first and second signal information be determined from different signals that are each received with a different antenna element simultaneously, or the requirement in Limitation [8e] requiring determining a set of weighting values based on the first and second signal information.

More specifically, as to Limitation [8d], Dr. Akl only relies on obviousness to show the "different signal information" requirement—but he never does so in the context of Burke's *modified* Figure 12, comprising an antenna array with several antenna elements. His analysis of Limitation [8d] presupposes only one antenna

element in the mobile station (as disclosed in Burke). EX-2010, ¶¶45-46. Indeed, Dr. Akl's analysis of Limitation [8d] does not even address the requirement in [8a] to receive two different signals with two different elements. He writes that "additional corroborating references, Ali, Banerjee, and Sriram, also explain that a **single signal** received by different antennas in an antenna array receiver, such as a RAKE receiver, would exhibit multipath components corresponding to delays introduced due to multipath effects and the signal would be processed accordingly," but this clearly does not address **two** antenna elements that receive **two** signals. EX-1003, ¶ 96 (emphasis added); EX-2010, ¶¶45-46.

And as to Limitation [8e], Dr. Akl only relies on Burke's disclosure of a pre-correction processor implemented in the mobile station. EX-1003, ¶¶ 98-99. But Dr. Akl fails to explain how the pre-correction processor 310 would be modified to accommodate an antenna 112 comprising multiple antenna elements. *Id.* Indeed, the entirety of Dr. Akl's analysis for Limitation [8e] assumes, without evidence, that Burke would operate in exactly the same manner with an antenna array. *Id.* ¶¶ 98-100. This does not account for Dr. Akl's proposed modification in Limitation [8a] and is therefore insufficient to show obviousness. EX-2010, ¶¶47.

To show single-reference obviousness, Petitioners were required to articulate how to modify Burke's Figure 12 to perform Limitations [8a], [8d], and [8e], and to show that such a modification would be predictable. Here, while Dr. Akl's assertion

that different prior art references disclose the use of multiple receive antennas may indicate that “a POSITA would be motivated to implement Burke’s disclosure (EX-1006, 25:58-61),” it is irrelevant to meet Petitioners’ burden to show how to modify Burke’s Figure 12 to perform Limitations [8a], [8d], and [8e], even assuming that a POSITA were motivated to modify Figure 12 to use an antenna array.

Dr. Akl does not contend that it would be obvious to combine Burke with Hottinen, Walton, and Goldsmith. EX-1003 (Akl Decl.) ¶ 85. Nor does Dr. Akl contend that Hottinen or Walton disclose Limitations [8a], [8d], or [8e]. Goldsmith, a textbook dated as of 2005, is not prior art to the ’235 patent, and Dr. Akl also does not contend that Goldsmith itself discloses Limitations [8a], [8d], or [8e]. There are no asserted Grounds that rely on a combination with multiple references. Accordingly, none of these references fill the gap in the Petitioners’ obviousness analysis. It necessarily fails. EX-2010 (Vojcic Decl.) ¶¶ 47-48.

V. Ground 2: The Petition fails to show obviousness of Claims 13 and 14 in view of Burke in combination with Schurr

Claims 13 and 14 depend from independent Claim 8. The Petition’s theory for Claim 8 fails under the law of single-reference obviousness, as explained above. Because the Petition fails to show that Claims 8-12 are unpatentable, it also fails as to Claims 13 and 14 for the same reasons.

VI. Conclusion

For the foregoing reasons, the Petition fails to show any challenged claims are

unpatentable, under any asserted Ground.

Respectfully submitted,

Dated: October 20, 2022

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CERTIFICATION REGARDING WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Patent Owner certifies that there are 7,295 words in the paper excluding the portions exempted under 37 C.F.R. §42.24(a)(1).

Dated: October 20, 2022

/s/ Reza Mirzaie
Reza Mirzaie

CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e)(1))

The undersigned hereby certifies that the above document was served on October 20, 2022, by filing this document through the Patent Trial and Appeal Board End to End system as well as delivering a copy via electronic mail upon the following attorneys of record for Petitioners:

Dated: October 20, 2022

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