IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,

SAMSUNG ELECTRONICS AMERICA, INC.

Petitioners,

v.

XIFI NETWORKS R&D, INC.

Patent Owner.

Post Grant Review No. 2025 – 00069

U.S. Patent No. 12,250,564

PETITION FOR POST GRANT REVIEW

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LIST OF CHALLENGED CLAIMS

Claims 1-29	
No.	**Claim Limitation**
1[pre]	A wireless networking device, comprising:
1[a]	a processing interface that is connected to an application interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first wireless bandwidth requirement;
1[b]	first and second actual MAC interfaces connected to the processing interface;
1[c]	first and second actual PHY interfaces respectively connected to the first and second actual MAC interfaces;
1[d]	first and second wireless transceivers respectively associated with the first and second actual PHY interfaces, wherein each of the first and second wireless transceivers is suitable for use in a wireless local area network, and the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths, and (ii) are adapted to emit radio waves in first and second different bands of frequencies;
1[e]	at least one virtual MAC interface and at least one resource monitoring interface formed in the processing interface that, during operation of the wireless networking device, feeds information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface;
1[f]	wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,
1[g]	(a) request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces,
1[h]	(b) identify at least one first and second portions of the first actual bandwidth of the first wireless transceiver, each one of the first and second identified bandwidth portions each having a set of given resources,

1[i]	(c) evaluate the data transfer characteristics of the given resources of both the first and second identified bandwidth portions,
1[j]	(d) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and
1[k]	(e) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and
1[l]	wherein, when the wireless networking is being used, the wireless networking device's utilization of the first and second identified bandwidth portions do not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first wireless transceiver for data transmission or reception purposes at the same time that the first or second identified bandwidth portions are being used for data transmission purposes.
2	The wireless networking device of claim 1, wherein the wireless networking device comprises a wireless access point.
3	The wireless networking device of claim 1, wherein the first and second frequency bands are specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.
4	The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a decision block.
5	The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a processing block.

6	The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes an ultra-streaming block.
7	The wireless networking device of claim 1, wherein the resource monitoring interface includes an RF block.
8	The wireless networking device of claim 1, wherein the processing interface comprises multiple resource monitoring interfaces.
9	The wireless networking device of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.
10	The wireless networking device of claim 1, wherein the processing interface includes a bandwidth allocator.
11	The wireless networking device of claim 1, wherein the first identified actual bandwidth portion is contiguous.
12	The wireless networking device of claim 1, wherein the second identified actual bandwidth portion is contiguous.
13	The wireless networking device of claim 1, wherein the resource monitoring interface is not contiguous with the at least one virtual MAC interface.
14	The wireless networking device of claim 1, wherein the data transfer characteristics of at least one of the first and second identified bandwidth portions of the first wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.
15[a]	The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,
15[b]	aggregate the first and second identified actual bandwidth portions to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.
16[a]	The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,
16[b]	(a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, the first identified bandwidth portion of the second wireless transceiver comprising a set of given resources,
16[c]	(b) evaluate data transfer characteristics of the given resources of the first identified bandwidth portion of the second wireless transceiver,

16[d]	(c) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than the data transfer characteristics of the first identified bandwidth portion of the second wireless transceiver, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and
16[e]	(d) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and
16[f]	wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.
17	The wireless networking device of claim 16, wherein the data transfer characteristics of at least one of the first identified bandwidth portion of the first wireless transceiver and the first identified bandwidth portion of the second wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.
18[a]	The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

18[b]	(a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources, and
18[c]	(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers; and
18[d]	wherein, when the wireless networking device is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.
19	The wireless networking device of claim 18, wherein the first data stream is substantially simultaneously transmitted to the recipient from both of the first and second wireless transceivers.
20[a]	The wireless networking device of claim 15, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,
20[b]	(a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources, and
20[c]	(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient; and
20[d]	wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available

	bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.
21	The wireless networking device of claim 20, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.
22[a]	The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,
22[b]	(a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources,
22[c]	(b) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and
22[d]	(c) use the second wireless transceiver to receive a second data stream from the recipient at least partially simultaneously with the first data stream being transmitted to the recipient from the first wireless transceiver, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and
22[e]	wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception

	purposes at the same time that the first identified bandwidth portion is being used.
23	The wireless networking device of claim 22, wherein the second data stream is received by the second wireless transceiver substantially simultaneously with the transmission of the first data stream from the first wireless transceiver.
24	The wireless networking device of claim 22, wherein the start of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the start of the transmission of the first data stream from the first wireless transceiver.
25	The wireless networking device of claim 22, wherein the end of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the end of the transmission of the first data stream from the first wireless transceiver.
26[a]	The wireless networking device of claim 22, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,
26[b]	aggregate at least one first portion of an actual bandwidth of a third wireless transceiver with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the second and third wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.
27	The wireless networking device of claim 26, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.
28[a]	The wireless networking device of claim 22, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,
28[b]	aggregate the given resources of the first and second identified actual bandwidth portions of the first wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.
29	The wireless networking device of claim 28, wherein the first data stream is substantially simultaneously transmitted by the first wireless transceiver.

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (together, "Petitioner") request Post Grant Review of claims 1-29 ("the Challenged Claims") of U.S. Patent 12,250,564 ("the '564 patent"), assigned to XiFi Networks R&D Inc., Patent Owner ("PO").

First, the Challenged Claims are obvious. Long before the earliest priority date of the '564 patent, multi-transceiver wireless networking systems were ubiquitous, and the claimed techniques for selectively using bandwidth resources were well-established. The Challenged Claims are invalid under 35 U.S.C. §103.

Second, the claims are patent-ineligible. They purport to claim the abstract idea of evaluating and selecting available communication resources. Beyond that, the claims merely recite known components (*e.g.*, applications, MAC and PHY interfaces, wireless transceivers) and vague results-oriented steps (*e.g.*, create an "association," evaluate "data transfer characteristics" and determine which one is "better")—all of which are routine and conventional techniques.

Third, the '564 patent's written description shows that the inventor did not possess many key limitations of the Challenged Claims, which were drafted more than a decade after the purported priority date to read on features of the recently adopted Wi-Fi 7 specification. The newly drafted claims go far beyond the patent's disclosure, finding closer support in the prior art than in the '564 specification.

Fourth, the Challenged Claims are indefinite because they fail to inform, with reasonable certainty, POSITAs about the scope of the Challenged Claims.

II. MANDATORY NOTICES

Pursuant to 37 C.F.R. §42.8(a)(1), the following mandatory notices are provided.

A. Real Party-in-Interest (37 C.F.R. §42.8(b)(1))

The real parties-in-interest for Petitioner are Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

B. Related Matters (37 C.F.R. §42.8(b)(2))

1. Related Patent Office Proceedings

The ’564 patent is in the same family as U.S. Patent Nos. 11,818,591, 11,849,337, 11,856,414, 11,974,143, 11,950,105, 12,003,976, 12,015,933, 12,114,177, 12,169,756, and 12,190,198. Petitioner already filed IPR petitions against the first eight patents. Petitioner is concurrently filing PGR petitions against the last two patents.

2. Related Litigation

Patent Owner is currently asserting the ’564 patent against Petitioner in *XiFi Networks R&D, Inc. v Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.*, Case No. 2:24-cv-01057-JRG (E.D. Tex.).

C. Lead and Back-Up Counsel (37 C.F.R. §§42.8(b)(3)-(4) & 42.10(a))

Electronic service may be made on the email addresses identified below and in the accompanying Power of Attorney.

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D. Payment of Fees (37 C.F.R. §§42.15(b) and 42.203)

The Office is authorized to charge the fee required for this Petition (and any additional fees) to Deposit Account No. 50-5708.

E. Requirements For Post Grant Review (37 C.F.R. §§42.201(A)-(B), 42.204(A), AND 42.208)

Petitioner certifies that the ’564 patent is available for PGR and Petitioner is not barred or estopped from requesting this proceeding.

The earliest possible effective filing date for the ’564 patent is October 30, 2013, the filing date of its earliest-filed provisional applications (61/897,219 and 61/897,216).

The ’564 patent issued on March 11, 2025, and the instant Petition was timely filed within nine months of issuance.

III. IDENTIFICATION OF CHALLENGE AND RELIEF (37 C.F.R. §42.204(B), §42.22(A)(1))

Petitioner requests PGR of claims 1-29 of the ’564 patent and that the Board cancel those claims under 35 U.S.C. §§101, 103, and/or 112.

The grounds for Petitioner’s challenge are:

No.	Claims	Grounds
1	1-29	§103: Obvious In View Of Chincholi In Combination With Choi And Clegg
2	1-29	§101: Patent-ineligible
3	1-29	§112 ¶1: Inadequate Written Description
4	1-29	§112 ¶2: Indefiniteness

IV. BACKGROUND

A. ’564 Patent

1. Priority Date

The ’564 patent is a post-AIA patent whose earliest possible priority date is October 30, 2013 via U.S. Provisional Applications 61/897,216 and 61/897,219.[1] (EX1002 ¶¶50-53)

2. Specification

The ’564 patent relates to evaluating the bandwidth requirements of applications and the bandwidth availabilities of wireless transceiver resources, and allocating bandwidth to satisfy the requirements. (EX1001, Abstract; EX1002 ¶54).

The architecture “includes an application layer, actual MAC and PHY layers, and a processing layer between the actual MAC and PHY layers.” (EX1001 at 2:57-60.) The processing layer may comprise “virtual MAC and PHY layers” that “enable simultaneous allocation of multiple PHY resources for different signal types associated with different applications.” (EX1001 at 3:52-54; EX1002 ¶55.)

In the embodiment of Figure 6, the wireless networking device uses the virtual MAC and PHY layers to configure the resources of two transceivers to each handle the bandwidth requirement of a respective application for a single recipient device using asymmetric transmit and receive cycles. (EX1001 at 5:48-67; EX1002 ¶¶56-58.)

[1] Petitioner reserves the right to challenge the priority date in other proceedings.

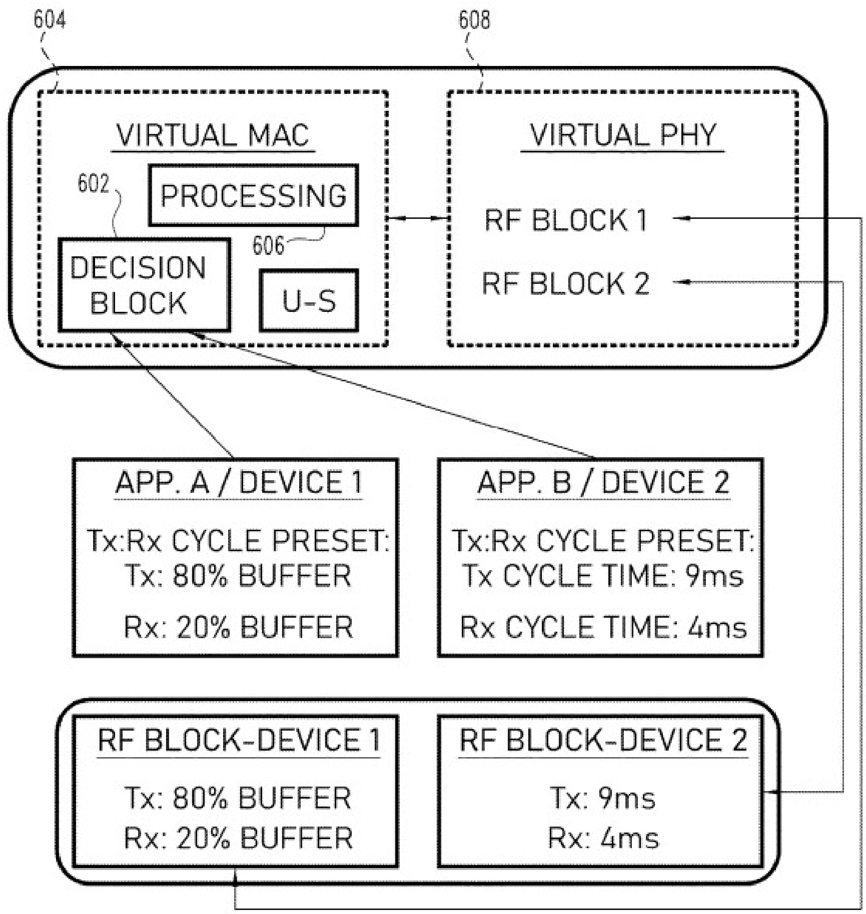


Fig. 6

3. Prosecution History (EX1004)

The ’564 patent was filed on March 29, 2024 as application 18/621,425—a continuation of application 18/532,175 now U.S. Patent 11,950,105 (“’105 patent”). The applicant’s Track One request was granted on May 7, 2024. (EX1002 ¶59) The Notice of Allowance issued on June 17, 2024. A day later, Applicant submitted amendments broadening the limitations regarding “virtual PHY interfaces” with a "resource monitoring interface." After three more claim amendments, the '564 patent issued on March 11, 2025. (EX1002 ¶60.)

B. Asserted Prior Art (EX1002, ¶¶69-77)

1. Chincholi

WO 2013/126859 ("Chincholi") has an international filing date of February 24, 2013, and published on August 29, 2013. It is prior art under §102(a)(1) and §102(a)(2).

Chincholi discloses "manag[ing] multiple radio access technology (RAT) interfaces to enable opportunistic RAT selection and aggregation for sending data traffic over the RAT interfaces." (EX1005 ¶[0003].) Chincholi discloses a network terminal ("NT"), such as an "access point," that "may be configured to work in an infrastructure mode or an adhoc mode, for example, in an IEEE 802.11 based Wi-Fi system." (EX1005 ¶[0115].) An 802.11 access point configured according to Chincholi enables "multiple RATs simultaneously [to] provide increased bandwidth and/or increased reliability for an application." (EX1005 ¶[0194].)

Chincholi discloses an "Opportunistic Multiple-Medium Access Control (MAC) Aggregation (OMMA) layer," a "single thin software layer" that "enable[s] one RAT to operate over industrial scientific medical (ISM) and another RAT to operate over a TVWS band for the same IP flow." (EX1005 ¶[0120]). Figure 5 shows an OMMA layer enabling a dual-RAT aggregation device in an 802.11n network:

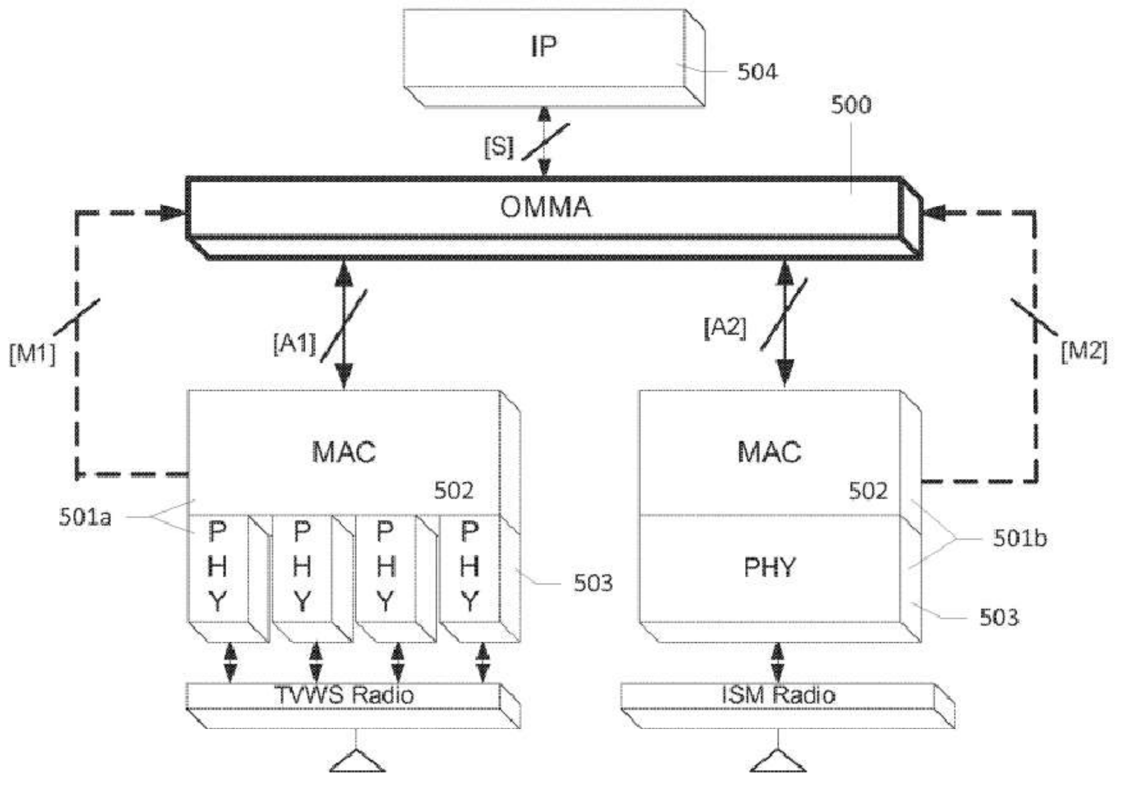


FIG. 5

The OMMA layer processes single or multiple IP flows (*i.e.*, application data streams) and uses feedback from each RAT to allocate transceiver resources to meet the IP flows' bandwidth requirements. The OMMA layer may aggregate available bandwidth of multiple transceivers, enabling communication paths between network devices using one or more RATs. (EX1005 ¶[0383].) For example, first and second packets of a single IP flow may be scheduled for simultaneous transmission to a recipient across the first and second RAT. (EX1005 ¶[0385].)

Chincholi was not before the examiner during prosecution of the ’564 patent.

2. Choi

U.S. Patent 7,206,840 (“Choi”) was filed on October 12, 2001. It is prior art under §102(a)(2).

Choi discloses a dynamic frequency selection scheme for 802.11 Wi-Fi networks. Choi’s method involves “measuring the channel quality of a plurality of frequency channels by at least one of the plurality of STAs; reporting the quality of the plurality of frequency channels in terms of a received signal strength indication (RSSI), Clear Channel Assessment (CCA) busy periods and periodicity; and, selecting one of the candidate channels based on the channel quality report for use in communication between the AP and the plurality of STAs.” EX1016 Abstract.

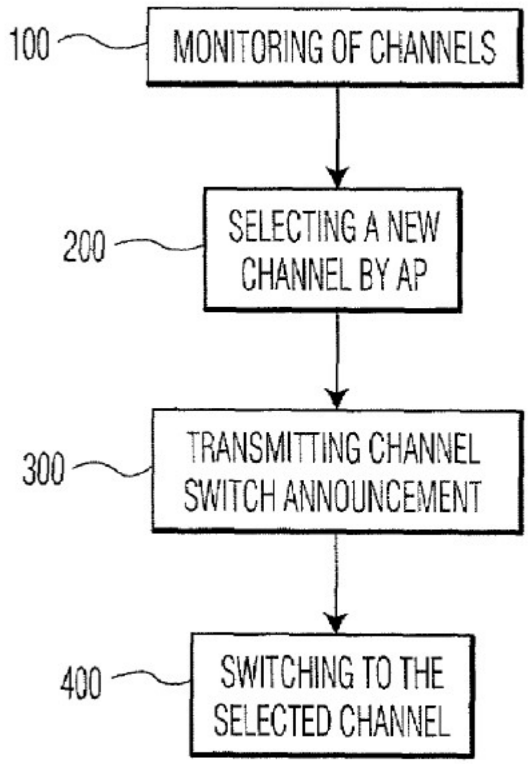


FIG. 3

Choi explains that selecting one of the candidate channels based on the channel quality report involves a determination that the selected channel will have the least RSSRI or CCA value. EX1016 at 8:19-20, Figure 7:

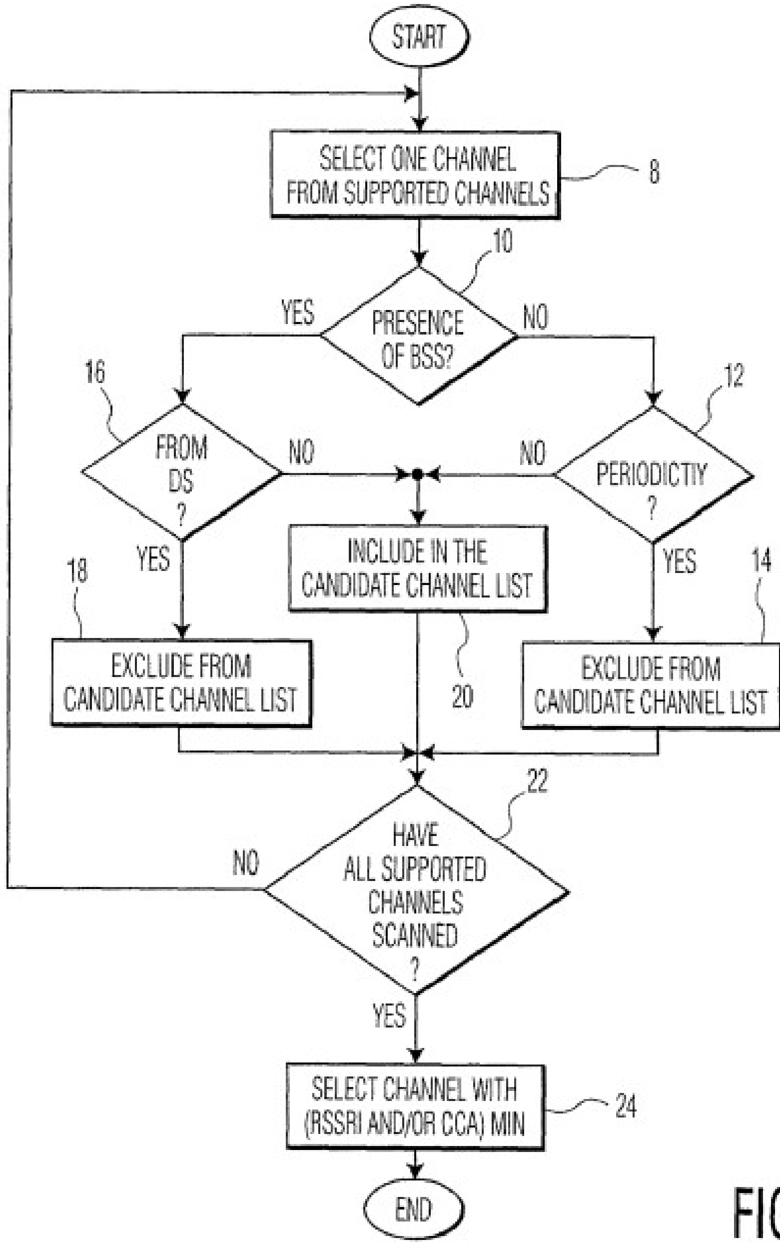


FIG. 7

Choi was not before the examiner during prosecution of the ’564 patent.

3. Clegg

U.S. Patent 9,055,592 (“Clegg”) was filed on January 7, 2013. It is prior art under §102(a)(2).

Clegg discloses systems and methods for IEEE 802.11 communication using carrier-specific interference mitigation. Clegg "utilize[s] carriers across multiple sub-channels, even across disjointed bands (*e.g.*, 2.4 GHz, 5 GHz, and/or 60 GHz bands), without regard to whether those carriers are within an otherwise unavailable sub-channel," allowing an 802.11 device to "fully utilize the available spectrum." (EX1009 at 1:32-37.)

Clegg was first disclosed by the applicant during prosecution of the '564 patent in an October 11, 2024 supplemental IDS, after the Examiner issued the first notice of allowance on June 17, 2024.

V. PERSON OF ORDINARY SKILL

A person of ordinary skill in the art as of the asserted priority date ("POSITA") had at least a Bachelor of Science in electrical engineering, computer engineering, or similar fields and at least two years of practical experience in the field of computer networks and wireless communication applications. More education can supplement for less practical experience, and vice versa.

Petitioner's expert, Dr. Almeroth, met this level by the priority date. (EX1002 ¶¶61-64.)

VI. CLAIM CONSTRUCTION

In a PGR proceeding, claim terms are to be construed in accordance with *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). No express constructions are required to find the Challenged Claims invalid. To the extent relevant, Petitioner addresses the plain meaning of certain terms in the analysis for the presented Grounds.

VII. GROUNDS

A. Ground 1: Chincholi in Combination With Choi and Clegg Render Claims 1-29 Obvious[2]

1. Overview and Motivation to Combine

Chincholi in combination with Choi and Clegg renders claims 1-29 obvious. Chincholi teaches the same architecture as the '564 patent, including a wireless networking device with multiple transceivers, each having actual MAC and PHY interfaces. Chincholi uses a single "***Opportunistic Multiple-Medium Access Control (MAC) Aggregation layer***," above the actual MAC-PHY layers of each transceiver, to aggregate available bandwidth portions to meet the requirements of data streams from applications. (EX1005 ¶[0122-0123]; EX1002 ¶78.)

[2] Unless noted otherwise, all emphases in quotes and annotations to figures from prior-art references are added.

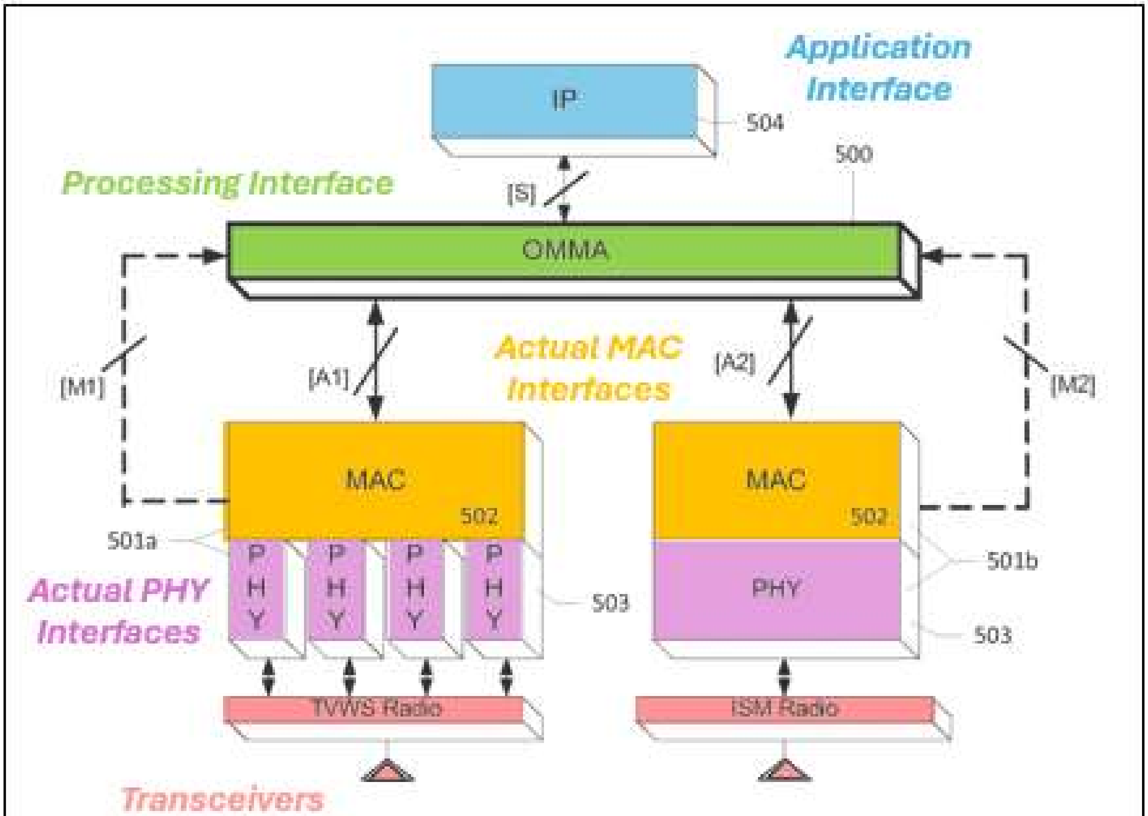


FIG. 5

Chincholi teaches continuous monitoring of the "number of available resources on the medium" and techniques for distributing IP packets across the RATs accordingly. (EX1005 ¶[0161].) Chincholi's approach enables the system to respond to bandwidth channels, or portions of bandwidth channels, becoming unavailable during transmission of a data stream. (EX1002 ¶79.) A POSITA would have understood that Chincholi's monitoring and response techniques could be further enhanced by Clegg's teachings. (EX1002 ¶79.) Clegg teaches techniques for addressing carrier-specific interference within bandwidth channels, allowing for any given channel full usage of the channel bandwidth that is not unavailable for communication. Like Chincholi, Clegg arises in the field 802.11 wireless networks and addresses the challenge of bandwidth efficiency. (EX1009 at 1:25-37.)

A POSITA would have been motivated to incorporate the teachings of Clegg to improve the Chincholi system by allowing it to more flexibly and efficiently utilize available bandwidth channels that experience carrier-specific interference within the channels. (EX1002 ¶80.) Chincholi already teaches dynamic allocation of contiguous or non-contiguous channels, and Clegg provides additional detail on how to mitigate carrier-specific interference within channels. (EX1002 ¶80.) The teachings of Clegg are complementary to Chincholi, and a POSITA would have recognized that Clegg's teachings could be easily implemented into Chincholi without technical challenge. (EX1002 ¶80.)

A POSITA would have further understood that Chincholi's monitoring and response techniques could be enhanced by the teachings of Choi. (EX1002 ¶81.) Choi teaches a dynamic frequency selection techniques for addressing interference and reduced quality of WLAN networks by measuring frequency channel characteristics and selecting the channel with minimum interference signal level. This level is based on measured Received Signal Strength Range Index (RSSRI) and Clear Channel Assessment (CCA) value. Like Chincholi, Choi arises in the field 802.11 wireless networks and is addressed to increasing bandwidth efficiency and network performance. (EX1016 at 1:20-62.)

A POSITA would have been motivated to incorporate the teachings of Choi to improve the Chincholi system by allowing it to more flexibly and efficiently utilize available bandwidth channels to minimize mutual interference. (EX1002 ¶82.) Chincholi teaches identifying available bandwidth channels for communication, receiving feedback information from each RAT, evaluating the identified channel availabilities, and switching RATs due to superior data transfer characteristics. Choi merely provides additional detail on how to apply this similar methodology to selecting and switching frequency channels. (EX1002 ¶82.) The teachings of Choi are complementary to Chincholi, and a POSITA would have recognized that Choi's teachings could be implemented into Chincholi without technical challenge and with a reasonable expectation of success. (EX1002 ¶82.)

In the analysis below, the combined prior art will be referred to as Chincholi/Choi/Clegg.

2. Claim 1

(a) 1[pre]: A wireless networking device, comprising:

Chincholi discloses "[s]ystems, methods, and instrumentalities… for managing multiple radio access technology (RAT) interfaces" (EX1005, Abstract, [0003]) and "enabl[ing] opportunistic RAT selection and aggregation for sending data traffic over the RAT interfaces." (EX1005 ¶[0003]; EX1002 ¶84.) "In multi-RAT systems reception and/or transmission may be performed over multiple RATs.

For example, ***a network terminal (NT)*** (e.g., an ***access point (AP)***…) and ***a wireless transmit/receive unit (WTRU)***… may communicate over multiple parallel paths." (EX1005 ¶[0002].)

Chincholi discloses that an NT, such as an access point, or a wireless transmit/receive unit ("WTRU") "may be configured to work in an infrastructure mode or an adhoc mode, for example, in an IEEE802.11 based Wi-Fi system," *i.e.*, both are a ***wireless networking device***. (EX1005 ¶[0115].) Thus, Chincholi/Choi/Clegg discloses a wireless networking device. (EX1002 ¶85.)

(b) 1[a]: a processing interface that is connected to an application interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first wireless bandwidth requirement;

"application interface being associated with a first application... providing, when the wireless networking device is being used, a first data stream": Chincholi discloses that "[u]sing multiple RATs simultaneously may provide the benefit of increased bandwidth for an ***application*** (*e.g.*, an IP flow) as well as increased reliability." (EX1005 ¶[0191]; EX1002 ¶¶86-87.) The first data stream of a first application is referred to as an "IP flow." (EX1005 ¶[0132] ("***A single IP flow may refer to a stream of IP packets belong to a particular application***.").) In an 802.11 embodiment (Figure 5), IP packets associated with an application data stream come from or are destined to an IP layer 504, and thus the IP flow (*i.e.* ***first data stream***) is provided by the application ***when the wireless networking device is being used***. (EX1005 ¶[0138]], Table 1 ("S" interface is for "Incoming/Outgoing IP Packets").) The "[S]" interface from the IP layer for the IP stream is therefore an ***application interface associated with a first application.*** (EX1002 ¶87.)

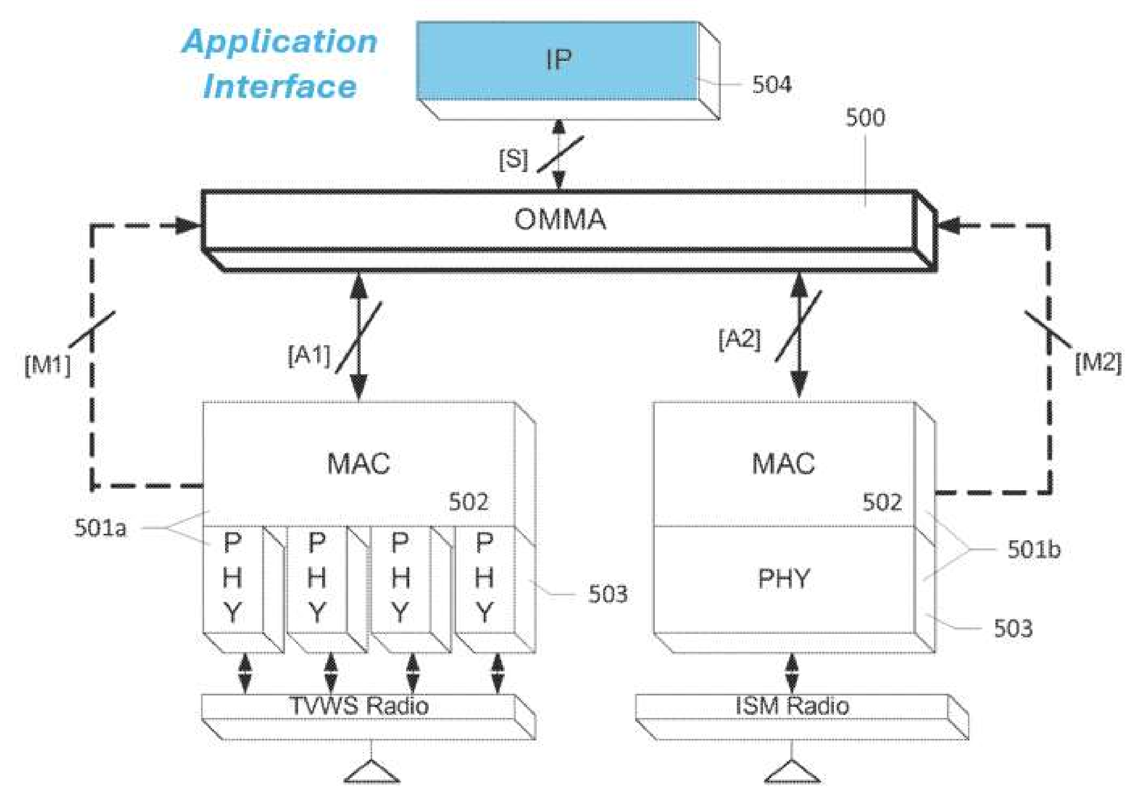


FIG. 5

"a processing interface that is connected to an application interface": Chincholi further discloses that its "application interface" is connected to a "processing interface." (EX1002 ¶88.) Chincholi's ***processing interface*** is referred an "***Opportunistic Multiple-Medium Access Control (MAC) Aggregation (OMMA) layer***." (EX1005 ¶[0003].) A POSITA would have understood that the plain meanings of "interface" and "layer" in the context of the '564 patent are congruent—underscored by the specification describing layers having the same functionality as the claimed interfaces, and the prosecution history, where Applicant interchangeably used the terms "layer" and "interface" to describe Figure 1. (EX1002 ¶88; EX1017, 8/8/23 Response to Office Action). The OMMA layer is a common layer/module between the IP layer/module and the multiple RAT layers/modules. (EX1005 ¶[0137]; ¶[0120] ("[T]he single thin software layer may enable one RAT to operate over industrial scientific medical (ISM) and another RAT to operate over a TVWS band for the same IP flow.").) Figure 5 shows an exemplary OMMA layer enabling a dual-RAT aggregation device in a 802.11n network:

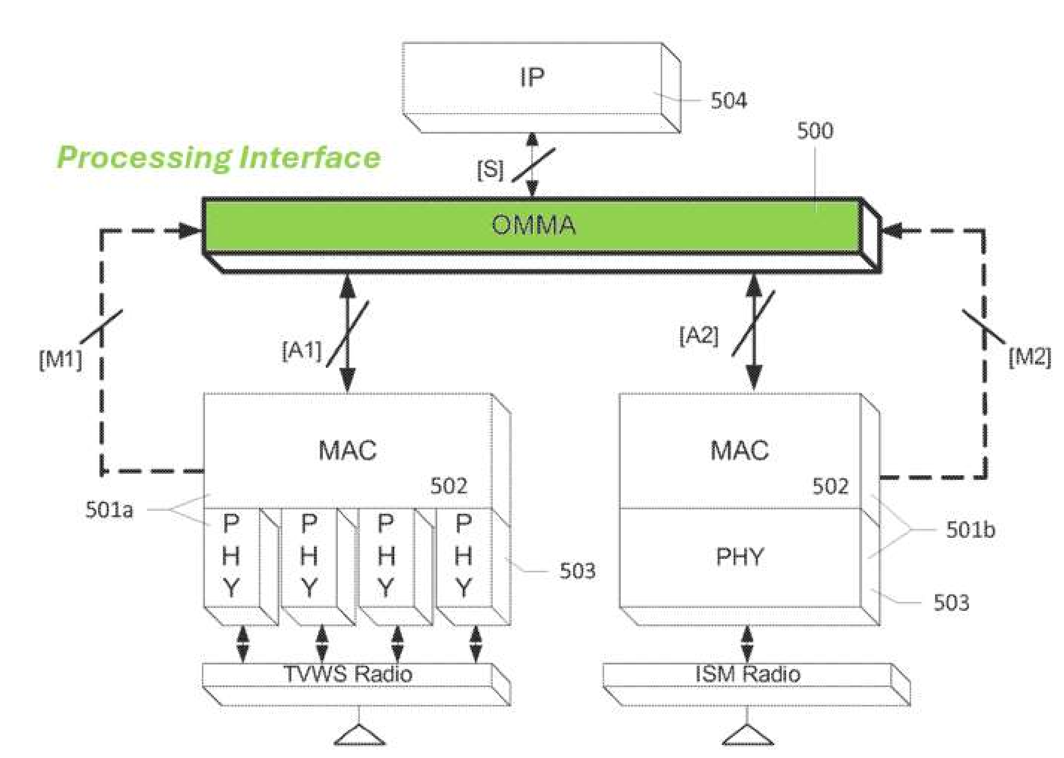


FIG. 5

The IP layer—connected to the OMMA layer—provides IP packets that the OMMA layer processes. (EX1005 ¶[0138]; EX1002 ¶89.) The OMMA "may allow for enhanced throughput and reduced latency for a single IP flow." (EX1005 ¶[0120].) The OMMA layer is therefore a processing layer, which processes IP packets and provides an ***interface*** between the IP layer and actual MAC layers, *i.e.*, a ***processing interface***.

"first application... having a first wireless bandwidth requirement": Chincholi teaches "a bandwidth requirement for an IP flow." (EX1005 ¶[260]; EX1002 at ¶90.)

(c) 1[b]: first and second actual MAC interfaces connected to the processing interface;

Chincholi discloses first and second ***actual MAC interfaces*** connected to the processing interface (*i.e.*, the common OMMA layer). Figure 5 depicts a "dual-RAT aggregation" with the common OMMA layer existing above and connected to two RATs 501a and 501b, which comprise first and second actual MAC interfaces 502, respectively. (EX1005 ¶[0138] ("***The RATs 501a, 501b may comprise a MAC layer/module 502*** and one or more physical layers/modules 503."); EX1002 ¶91.)

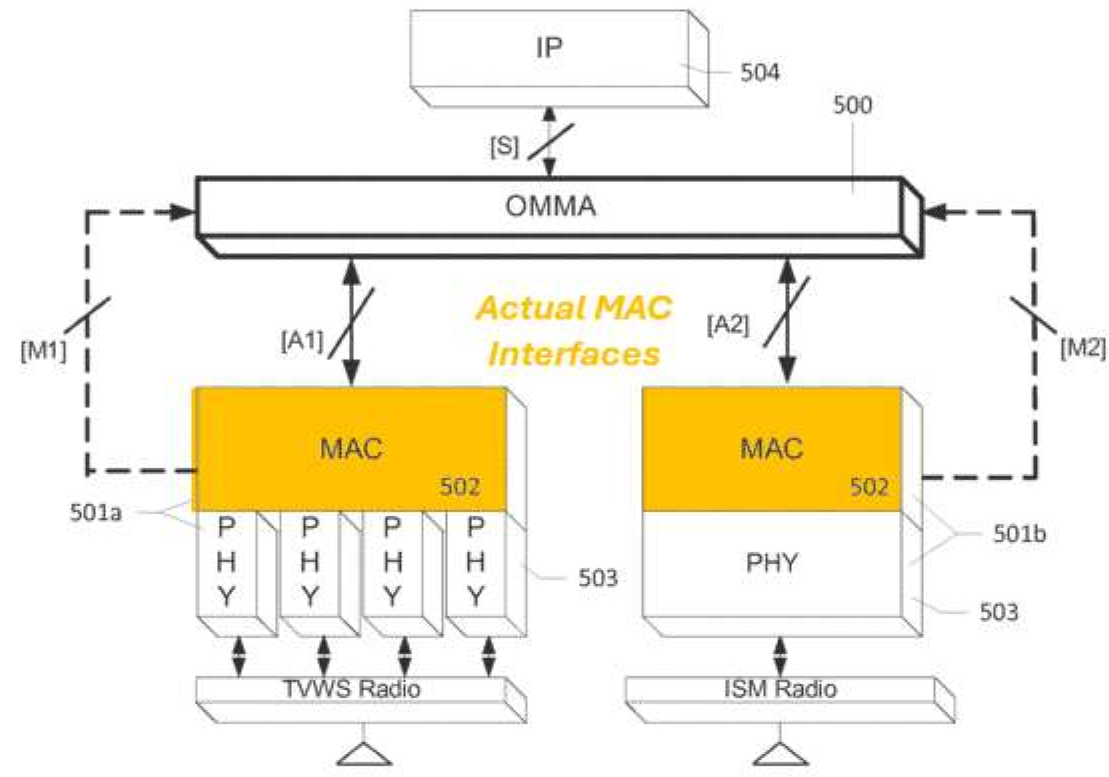


FIG. 5

(d) 1[c]: first and second actual PHY interfaces respectively connected to the first and second actual MAC interfaces;

Each RAT in Chincholi comprises ***one or more physical layers***. (EX1005 ¶[0138] ("The RATs 501a, 501b may comprise a MAC layer/module 502 and ***one or more physical layers/modules 503***."); EX1002 ¶92.) The actual PHY layers are respectively connected to the actual MAC interfaces:

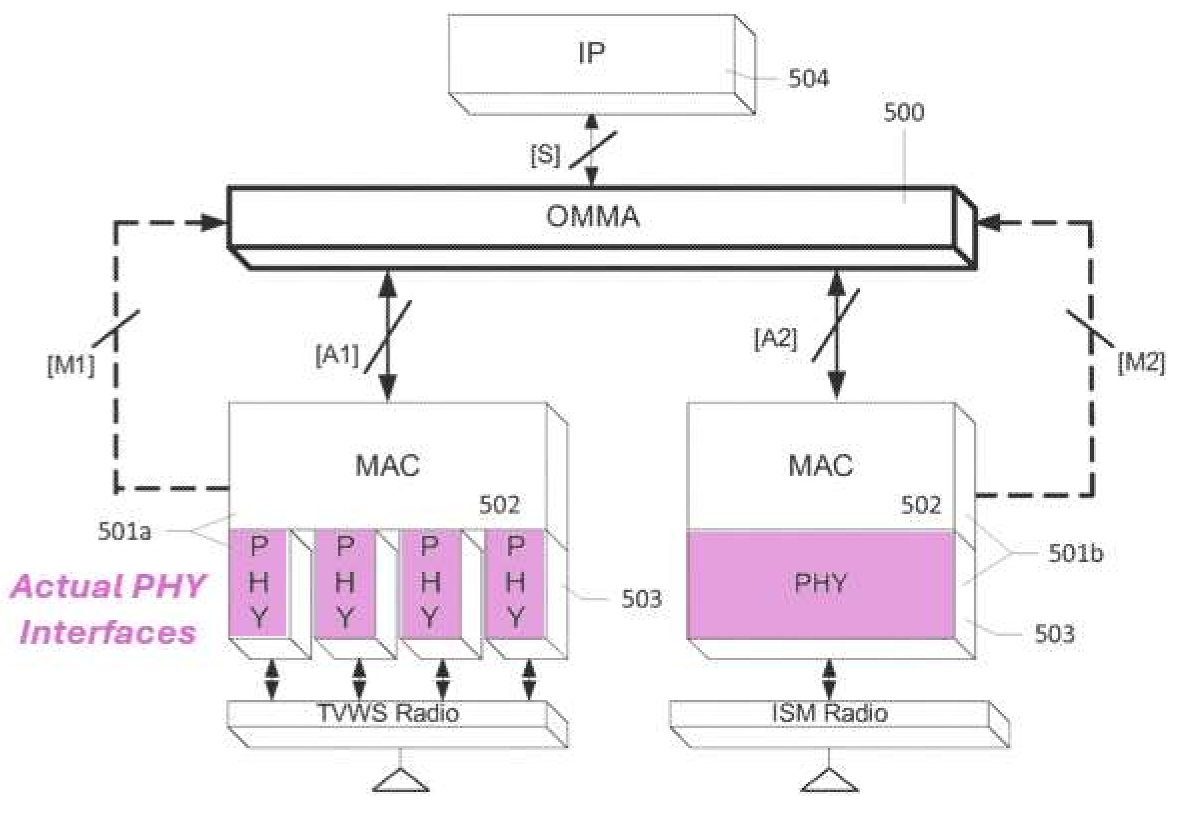


FIG. 5

(e) 1[d]: first and second wireless transceivers respectively associated with the first and second actual PHY interfaces, wherein each of the first and second wireless transceivers is suitable for use in a wireless local area network, and the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths, and (ii) are adapted to emit radio waves in first and second different bands of frequencies;

"first and second wireless transceivers respectively associated with the first and second actual PHY interfaces… suitable for use in a wireless local area network": Chincholi Figure 5 illustrates that each actual PHY interface of each RAT is associated with an ***antenna/radio frequency (RF) front-end pair***. (EX1005 ¶[0133]; EX1002 ¶¶93-94.) The ***antenna/radio frequency (RF) front-end pairs*** in Figure 5 include ***first and second transceivers***.

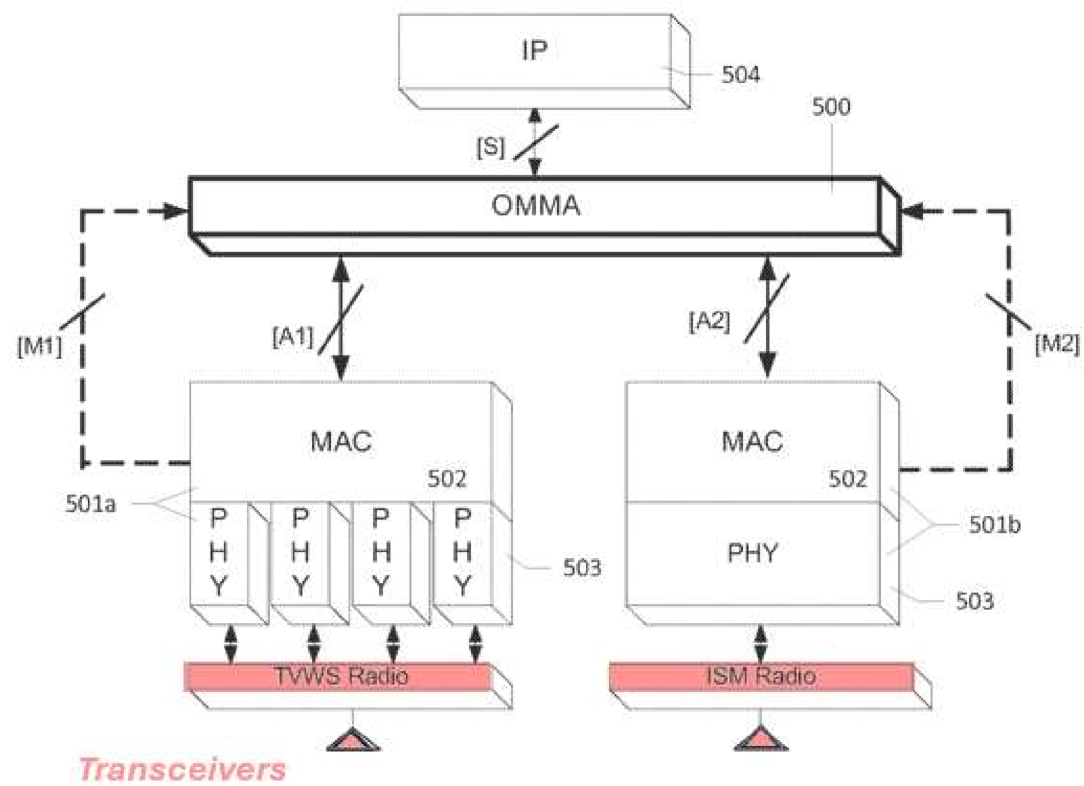


FIG. 5

A POSITA would have understood that a "transceiver" is a physical device that can both transmit and receive information. (EX1002 ¶¶94-95.) Each of Chincholi's disclosed "antenna/RF front-end pairs" is a transceiver because they operate on wireless protocols that both transmit and receive data, such as IEEE802.11, IEEE802.11ac, IEEE802.11af, LTE, etc. (EX1005 ¶[0134].)

A POSITA would have further understood that the transceivers in Figure 5 would be associated with the actual PHY layer of each respective RAT, as the PHY layer is the physical connection between a transceiver and the rest of the RAT. (EX1002 ¶96.)

Chincholi also teaches that each RAT may be implemented as a Wi-Fi RAT, and thus their associated transceivers are suitable for use in a wireless local area network. (EX1005 ¶[0134]; EX1002 ¶97.)

"the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths": A POSITA would have recognized that each transceiver has an "actual" bandwidth (*i.e.*, total bandwidth of the transceiver) with a "bandwidth availability" that may be a subset of the actual bandwidth (*i.e.*, sub-portions of the total bandwidth available for use). (EX1002 ¶98.) As Chincholi teaches, the RATs associated with each transceiver provide "meta-data feedback" allowing the OMMA layer to split IP packets amongst the RATs based on their available bandwidth. (EX1005 ¶[0138]; ¶[0161] (listing "Channel bandwidth(s)" sent by the PHY layer as an example of "feedback metric[] used by an OMMA layer"); ¶[0167] ("At startup, the OMMA layer may receive the ***available bandwidth of each of the one or more RATs***.").) Thus, Chincholi discloses that each of the two transceivers has a bandwidth availability up to an actual bandwidth. (EX1002 ¶98.)

"***the first and second wireless transceivers, respectively,…*** **(ii)** ***are adapted to emit radio waves in first and second different bands of frequencies***"**:** Chincholi discloses that each of the transceivers may be adapted to emit radio waves in respective different bands of frequencies. In the context of Figure 4, for example, Chincholi discloses that "[f]or multiple RATs 401, ***each RAT 401 may be operating on a specific band***. For example, a 802.11n PHY/MAC operating over 2.4GHz ISM band, a 802.11af PHY/MAC operating over 512 MHz-698 MHz TVWS band, an LTE RAT operating of a licensed band (*e.g.*, 700 MHz band), a Bluetooth RAT operating on 2.4 GHz ISM band, *etc.*" (EX1005 ¶[0135]; EX1002 ¶99.)

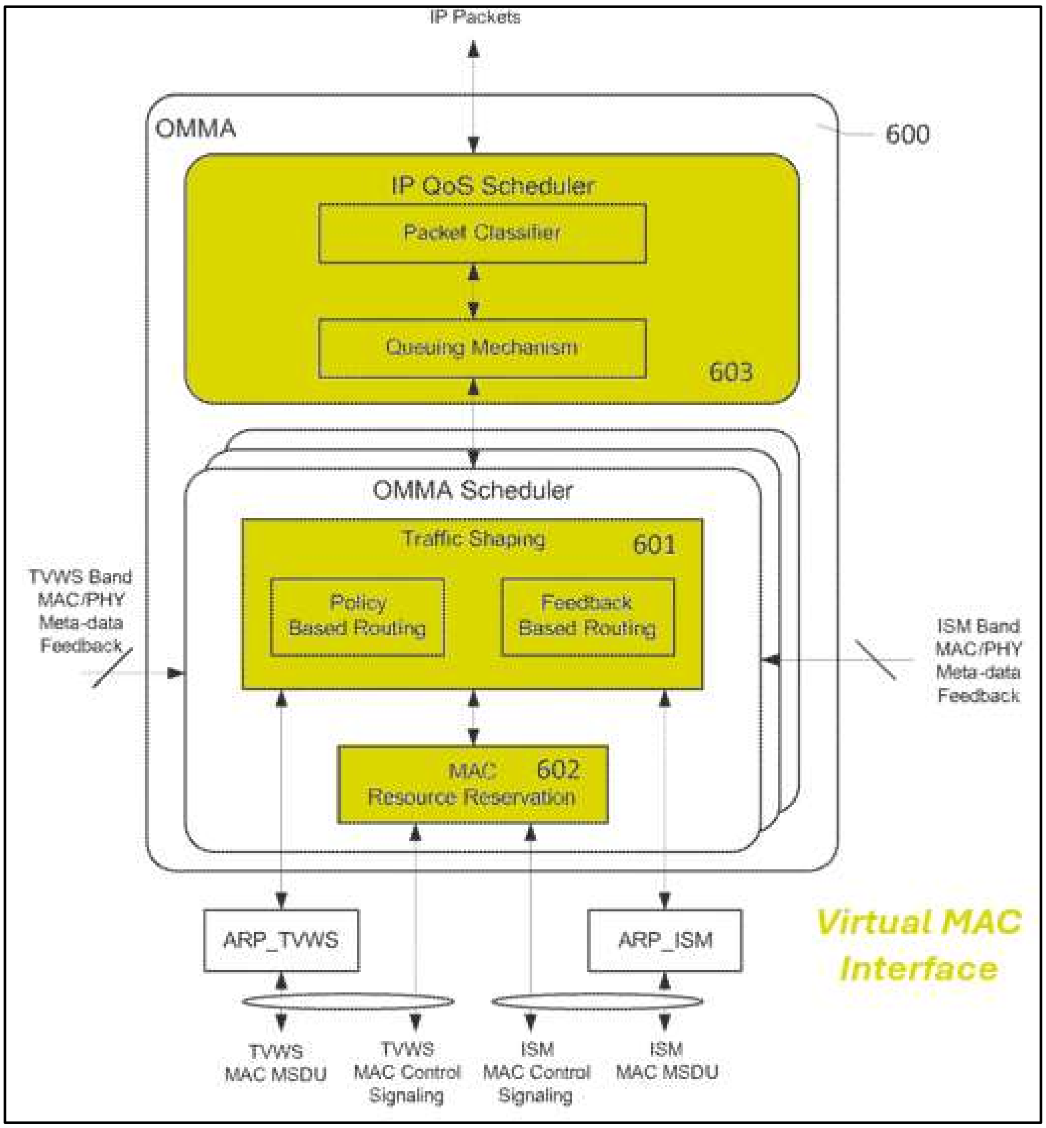
(f) 1[e]: at least one virtual MAC interface and at least one resource monitoring interface formed in the processing interface that, during operation of the wireless networking device, feeds information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface;

According to the '564 patent, the virtual MAC layers "enable[s] simultaneous allocation of multiple PHY resources for different signal types associated with different applications." (EX1001 at 3:52-54) The virtual MAC layer comprises the functionality of "decision," "processing," and "ultra streaming" blocks. (EX1001 at 4:49-52.) The patent does not disclose or describe a generic "resource monitoring interface," which as discussed above, *supra* Section IV.A.3, was added to the claim to replace the originally recited "virtual PHY interfaces" in a post-NOA broadening amendment. (EX1002 ¶100.)

The patent's description of the "virtual PHY layer" provides that a virtual PHY may include multiple RF blocks, each representing the virtual use of some set of allocated transceiver resources. (EX1001 at 4:52-54, Fig. 3 (depicting two RF blocks associated with "two sets" of transceiver resources); EX1002 ¶101) "By employing a virtual MAC and virtual PHY between an application layer and an actual MAC and PHY layer, wireless transceiver resources may be allocated more efficiently to handle various data bandwidth requirements from different applications." (EX1001 at 6:4-8.)

First, Chincholi discloses that the OMMA (*i.e.*, the processing interface) includes the claimed "***virtual MAC interface***" formed within it. Indeed, "OMMA" is an abbreviation for "opportunistic multi-medium access control ***(MAC) aggregation***," referring to how the OMMA layer aggregates multiple MAC interfaces, as depicted in Figure 5. (EX1005 ¶[0120]) The OMMA layer includes a "virtual MAC interface" because it transparently "distributes and/or combines" packets between the IP layer and the RATs. (EX1005 ¶[0192].) A POSITA would have recognized that this "virtualizes" a MAC interface because the OMMA would appear to the IP layer as a single interface for exchanging packets that are ultimately sent or received by the actual MAC-PHY pairs. (EX1002 ¶102.)

Chincholi's OMMA layer also includes all of the functionality that the '564 patent associates with the "virtual MAC interface." Figure 6 of Chincholi is a block diagram of an OMMA layer, comprising an IP QoS Scheduler, a MAC Resource Reservation module, and a Traffic Shaping module. (EX1005 ¶[0139]; EX1002 ¶103.)



The IP QoS Scheduler classifies incoming packets of a packet stream, and segregates them into distinct IP QoS streams (EX1005 ¶[0143]), which a POSITA would have recognized to fulfill the functionality of the "decision block" (EX1002 ¶104; EX1001 at 3:31-34). The MAC Resource Reservation module determines the time duration or spectral fragment/bandwidth required by a set of packets (EX1005 ¶[0142]), which a POSITA would have recognized to fulfill the functionality of the "processing block" (EX1002 ¶104; EX1001 at 3:34-36). Finally, the Traffic Shaping module determines the way packets are routed across RATs using either policy based routing or feedback based routing (EX1005 ¶[0139]), which a POSITA would have recognized to fulfill the functionality of the "ultra-streaming block" (EX1002 ¶104; EX1001 at 3:36-40). Thus, a POSITA would have recognized that Chincholi's OMMA layer includes a "***virtual MAC interface***." (EX1002 ¶104.)

Second, Chincholi discloses that its processing interface comprises the "***at least one resource monitoring interface formed in the processing interface***" that, during operation, feeds information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface. A POSITA would have understood that the "resource monitoring interface formed in the processing interface" merely requires a component capable of receiving feedback statistics regarding the available resources of the wireless transceivers. (EX1002 ¶105.)

Chincholi discloses the capability of receiving feedback statistics regarding the available resources of the transceivers. Specifically, the traffic shaping module of the OMMA (*i.e.*, part of the "virtual MAC interface") may determine packet routing using "feedback based routing." (EX1005 ¶[0139].) In feedback based routing, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of available resources on the medium***," *i.e.* information regarding bandwidth availabilities. (EX1005 ¶[0161]; EX1002 ¶106.)

Figures 28, 29, and their descriptions describe how Chincholi collects feedback from each RAT for the traffic shaping module. (EX1002 ¶107.) Figure 28 illustrates how the OMMA layer includes an OMMA Controller, which interfaces with each RAT to collect metrics regarding the channel quality and number of resources available. Specifically, using interface A2 in Figure 28, "[a] RAT (*e.g.*, ***each RAT***) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 ***per device (e.g.*, *WTRU or NT) per access category supported at that RAT***." (EX1005 ¶[0205].)

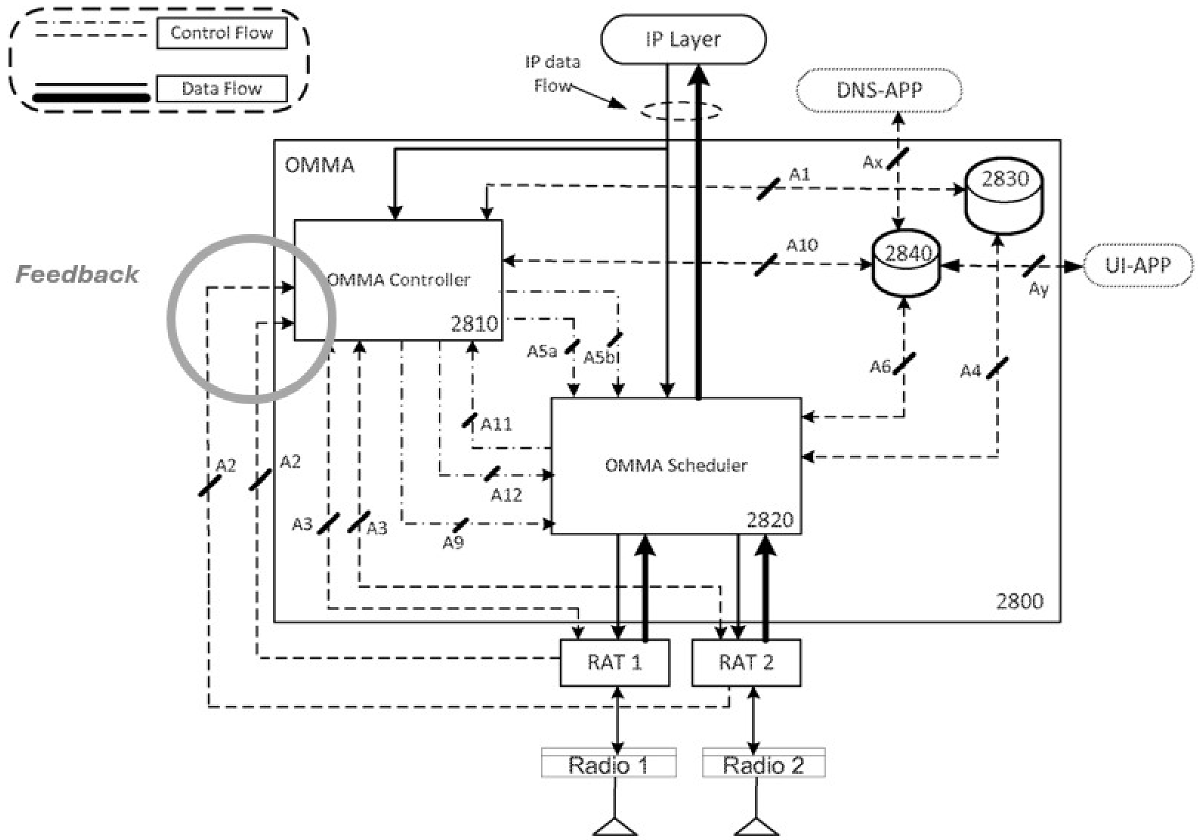


FIG. 28

The OMMA Controller includes a ***Feedback Device Classifier module 2930***. (EX1005 ¶[0205].) The Feedback Device Classifier collects information regarding the first and second transceiver resources/requirements over the "A2" interfaces in the diagram above so that this information may be fed back to the OMMA Scheduler. (*Id.*) A POSITA would have recognized that the ability of the ***Feedback Device Classifier*** module of the OMMA Controller to collect feedback per device, per access category supported by each RAT discloses the claimed "***resource monitoring interface***." (EX1002 ¶108.)

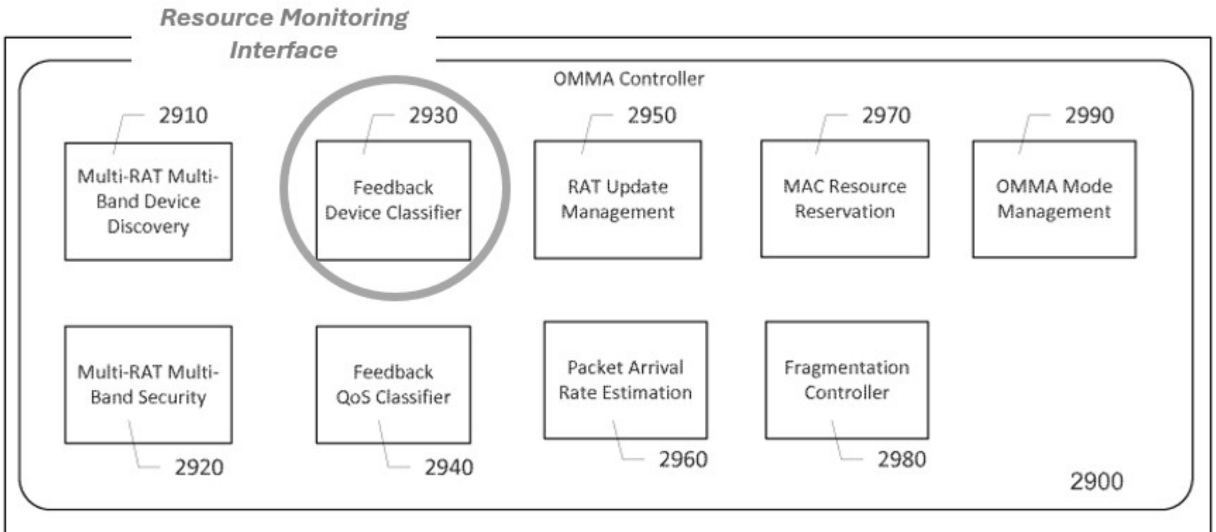


FIG. 29

(g) 1[f]: wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

Chincholi teaches that its OMMA layer (*i.e.*, processing interface) is configured to operate in a manner transparent to any higher layer. "The OMMA layer ***may be transparent***, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 ¶[0192], ¶[0126]; EX1002 ¶¶109-110) This is as opposed to a "non-transparent" configuration in which the OMMA layer would "add[] additional headers at the transmitter, and/or reads and removes the headers at the receiver." (EX1005 ¶[0126].)

(h) 1[g]: (a) request or create (i) a first association between a recipient and the first actual MAC and

PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces,

Chincholi discloses techniques for NTs and WTRUs to discover one another using active and passive scanning procedures. (EX1005 ¶[0145].) After an authentication procedure, WTRUs may transmit a request to associate with one or more RATs of the NT, and the NT may provide an association response signal accepting or rejecting the request of the WTRU. (EX1005 ¶[0149].) A POSITA would have recognized these scanning procedures disclose the ability of Chincholi's OMMA layer to request or create a first association between a recipient and the first actual MAC and PHY interfaces and a second association between the recipient and the second actual MAC and PHY interfaces. (EX1002 ¶¶111-112.)

When operating transparently with respect to higher layers, *see* limitation [1f], Chincholi's OMMA layer handles the request/response and creation of associations with WTRUs. (EX1005 ¶[0127] ("[A]ssociation request/response frames may be updated by the OMMA layer to include OMMA device discovery parameters, for example, such as but not limited to OMMA modes, OMMA schemes, OMMA packet distribution modes, etc."). A POSITA would have recognized that the request or creation by Chincholi's OMMA layer of associations between recipients and the actual MAC and PHY interfaces would be performed in a manner transparent to higher level layers. (EX1002 ¶113.)

(i) 1[h]: (b) identify at least one first and second portions of the first actual bandwidth of the first wireless transceiver, each one of the first and second identified bandwidth portions each having a set of given resources,

Chincholi teaches that NTs and WTRUs communicate with one another over "channels"—portions of a transceiver bandwidth availability. Specifically, "[t]he NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band,… ***using a channel within the band or aggregating multiple contiguous or noncontiguous channels***." (EX1005 ¶[0118], ¶[0121] ("An 802.11 based system may operate in a time division duplexing (TDD) mode, for example, ***on a band over a single 20/40MHz channel in the case of ISM band or a single 5/10/20 MHz channel in television white space (TVWS) band*** using contiguous/non-contiguous carrier aggregation."); EX1002 ¶114.)

Chincholi discloses identifying available bandwidth channels for communication. The OMMA layer receives various feedback information from each RAT. (EX1005 ¶[0123]; EX1002 ¶115) For example, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of available resources on the medium***." (EX1005 ¶[0161].) Amongst the available resources provided as part of the feedback information are the "number of channels" and "channel bandwidth" (*i.e.*, the width of the channel, such as 20/40 MHz in the case of the ISM band). (EX1005 ¶[0161].)

A POSITA would have understood that the ability of Chincholi's OMMA layer to receive from each RAT a number of channels and channel bandwidth is an identification of "at least one first and second portions of the first actual bandwidth" (*i.e.*, available channels, or an aggregation of multiple contiguous or non-contiguous channels) of the first actual bandwidth of the first wireless transceiver. (EX1002 ¶116.)

Choi also teaches an identification of first and second bandwidth portions of the first wireless transceiver. The access point of Choi comprises a "transmitter/receiver 24… coupled to an antenna." (EX1016 at 4:5.) This transceiver, like the transceiver of Chincholi, will have a first actual frequency bandwidth. (EX1002 ¶117.) Choi teaches monitoring channels available to the access point transceiver and the "status" of these channels. (EX1016 at 4:16-23, 4:36-37.) Thus, Choi's method involves identifying and monitoring a plurality (at least one first and second) of frequency channels, *i.e.* portions of the first actual bandwidth of the first wireless transceiver. (EX1002 ¶117.)

With respect to both Chincholi and Choi, a POSITA would have understood that each identified bandwidth portion is comprised of a number of frequency carriers, which are a set of given resources for the identified channel. (EX1002 ¶118.)

(j) 1[i]: (c) evaluate the data transfer characteristics of the given resources of both the first and second identified bandwidth portions,

Chincholi teaches evaluation of data transfer characteristics through a feedback-based routing mechanism, where "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the number of available resources on the medium" (***the given resources of both the first and second identified bandwidth portions***). (EX1005 ¶[0161]; EX1002 ¶119) Table 2 of Chincholi provides examples of feedback metrics used for evaluation, including "Medium Access Delay," "RSSI," "Frame error rate," "Data rate," "Queuing latency," and "End-to-end delay." (EX1005 Table 2.) These metrics are data transfer characteristics of the identified bandwidth portions of a RAT evaluated by the OMMA layer.

Choi provides further detail regarding evaluating data transfer characteristics of given resources of both the first and second bandwidth portions. Choi teaches a method and system for dynamically selecting a communication channel between an access point ("AP") and a plurality of stations ("STAs") in an IEEE 802.11 wireless local area network. (EX1016 Abstract.) Choi teaches a "channel measurement" technique wherein the AP may directly measure channel quality, request measurement of the channel by STAs, and/or receive channel measurement reports by STAs. (EX1016 at 4:20-23; *see also id.* at 4:34-39, 5:2-9, 5:56-6:3, Fig. 3 at 100; EX1002 ¶120)

Choi's technique creates a "channel quality report," whereby the "channel quality" of a plurality of "candidate" frequency channels is evaluated and measured. The channel quality report may include information regarding other BSSs in the requested frequency channel, measurement of clear channel assessment (CCA) busy periods, received signal strength indications (RSSIs), and/or interference signal levels. (EX1016 at 5:66-6:3, Claims 1, 2, 11, 13, 21, 22.) A POSITA would have recognized that these channel quality report metrics are all examples of "data transfer characteristics" of the given resources of an evaluated channel. (EX1002 ¶121.)

Chincholi in light of the further details disclosed in Choi discloses an evaluation of the data transfer characteristics of the given resources of both the first and second identified bandwidth portions. (EX1002 ¶122.)

(k) 1[j]: (d) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

Chincholi's OMMA layer allocates bandwidth resources to the transceiver resources. As Chincholi teaches, "the OMMA layer may determine a time duration and a bandwidth requirement for an IP flow." (EX1005 ¶[260].) With knowledge of this total bandwidth requirement and the feedback information indicating the number of channels available on each RAT, Chincholi teaches its "OMMA layer may intelligently manage data traffic across multiple RATs as a function of the link quality of each RAT." (EX1005 ¶[0194]; EX1002 ¶123.)

Specifically, Chincholi discloses how the OMMA layer may request resources on a RAT "based on the time duration and the bandwidth requirement for the first IP packet and the second IP packet of the IP flow." (EX1005 ¶[0260]; EX1002 ¶124) "The resources are characterized by the time duration and the bandwidth requirement." (EX1005 ¶[0260].) This functionality may be performed by a "MAC Resource Reservation module 602" of the OMMA layer, which "determine[s] an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets." (EX1005 ¶[0142].) A POSITA would have recognized that the MAC Resource Reservation module would select between available channels on the basis of data transfer characteristics and thereby use the first identified bandwidth portion of the first wireless transceiver for a data stream when the data transfer characteristics of the first bandwidth portion were better than those of the second bandwidth portion. (EX1002 ¶124.)

Choi provides further detail about dynamically selecting between available channels of a first wireless transceiver based on the evaluation of channel data transfer characteristics. (EX1002 ¶125.) After generating the "channel quality report" for a plurality of "candidate" channels, Choi teaches the ability of the AP to select a channel based on the interference signal level measurements. (EX1016 at 4:17-18, Fig. 3 at 200.) This step may entail "determin[ing] whether all channels are scanned… [and] [i]f so, the channel with the least RSSRI and/or CCA value is selected." (EX1016 at 8:18-20; Fig. 7 at 24 ("Select channel with (RSSRI and/or CCA) min").) Based on this selection, Choi teaches "movement into a new channel is performed by changing the carrier frequency of a 802.11a OFDM PHY." (EX1016 at 8:44:45.)

Thus, a POSITA would have recognized that the combined teachings of Chincholi and Choi disclose using the first bandwidth portion of the first wireless transceiver to transmit the first data stream if the data transfer characteristics of the first bandwidth portion are better than those of the second bandwidth portion. (EX1002 ¶126.)

A POSITA would have also recognized the ability to send the first data stream to the recipient using a subset of frequences corresponding to only the given resources of the first identified bandwidth portion that are available for communication. (EX1002 ¶127.) Clegg teaches an 802.11 network terminal capable of evaluating the interference levels of each carrier comprising a frequency channel. Specifically, Clegg teaches "notching out" specific OFDM subcarriers that suffer an unduly high amount of interference. (EX1009 at 7:15-19.) The remaining carriers, which are suitable for communication, are selected to comprise a "cluster of carriers for communication." (EX1009 at 4:9-10.) The cluster of carriers may comprise: "1) contiguous carriers in a single sub-channel, 2) contiguous carriers spanning across more than one sub-channel, 3) discontinuous carriers in a single sub-channel, or 4) discontinuous carriers spanning across more than one sub-channel." (EX1009 at 4:11-15.) A POSITA would have recognized that Clegg's selection of a cluster of carriers enables transmission of the first data stream using only the subset of frequencies/given resources of the first identified bandwidth portion that are not unavailable. (EX1002 ¶127.)

The Chincholi/Choi/Clegg combination would not "require" disassociation of a recipient from either or both of the actual MAC and PHY interfaces during the bandwidth management operations described above. For example, when Chincholi's system switches from one RAT to another due to superior data transfer characteristics, it maintains the association across the RATs. This is evidenced by Chincholi's disclosure that when a RAT switch occurs, "the OMMA sender may duplicate packets across the RATs to avoid out-of-order packet reception at the OMMA receiver." (EX1005 ¶[0255].) This duplication process would be unnecessary if the system required disassociation when switching between RATs. (EX1002 ¶128.)

Indeed, a POSITA would have recognized the desirability of implementing Chincholi combined with Choi and Clegg to transmit the first data stream to the recipient without requiring "disassociation" of the recipient from either or both of the first and second actual MAC and PHY interfaces. For example, in the field of 802.11 systems—where each associated terminal is assigned a unique association identifier ("AID")—it was well-known that avoiding disassociation after initial association was desirable, as repeatedly re-forming associations was inefficient and disruptive. (EX1002 ¶129; EX1008 ("Wang") at 24:42-43 ("This approach is undesirable, can be blunt and can disrupt the on-going services (e.g., requires disassociation), at 24:57-62 ("The lack of update/change of the AID values… after an initial AID assignment is inherently inflexible and can prevent the realization power saving, among other considerations, that an update/change of the AID values can provide.") Recognizing this issue, background prior art Wang described techniques in a multiple transceiver/MIMO system for effectuating an update to a recipient's unique association identifier ("AID") through various interactions with the system without requiring a disassociation of a wireless device from an access point. (EX1008 at 24:63-25:57.)

Thus, a POSITA would have recognized that in implementing the Chincholi/Choi/Clegg combination, it would be desirable to implement known dynamic AID reassignment techniques to avoid disassociation of recipients during operation including throughout any process of reallocating transceiver, channel, and/or bandwidth resources to a recipient. (EX1002 ¶130.)

(l) 1[k]: (e) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

Limitation 1[k] mirrors limitation 1[j], only reversing which portion has the better data transfer characteristics, and using the subset of frequencies corresponding to the given resources of the second identified bandwidth portion instead of the first. A POSITA would have recognized from the analysis in limitation 1[j] that Chincholi/Choi/Clegg discloses limitation 1[k]. (EX1002 ¶131.)

(m) 1[l]: wherein, when the wireless networking is being used, the wireless networking device's utilization of the first and second identified bandwidth portions do not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first wireless transceiver for data transmission or

reception purposes at the same time that the first or second identified bandwidth portions are being used for data transmission purposes.

Chincholi discloses examples of "***multi-WTRU*** multi-IP flow cases." (EX1005 ¶[0328]; EX1002 ¶132.) For example, "[a] system may comprise ***multiple WTRUs***, a single NT, and multiple IP flows from the NT to one or more WTRUs." (EX1005 ¶[0328].) This is disclosed, for example in Figure 3.

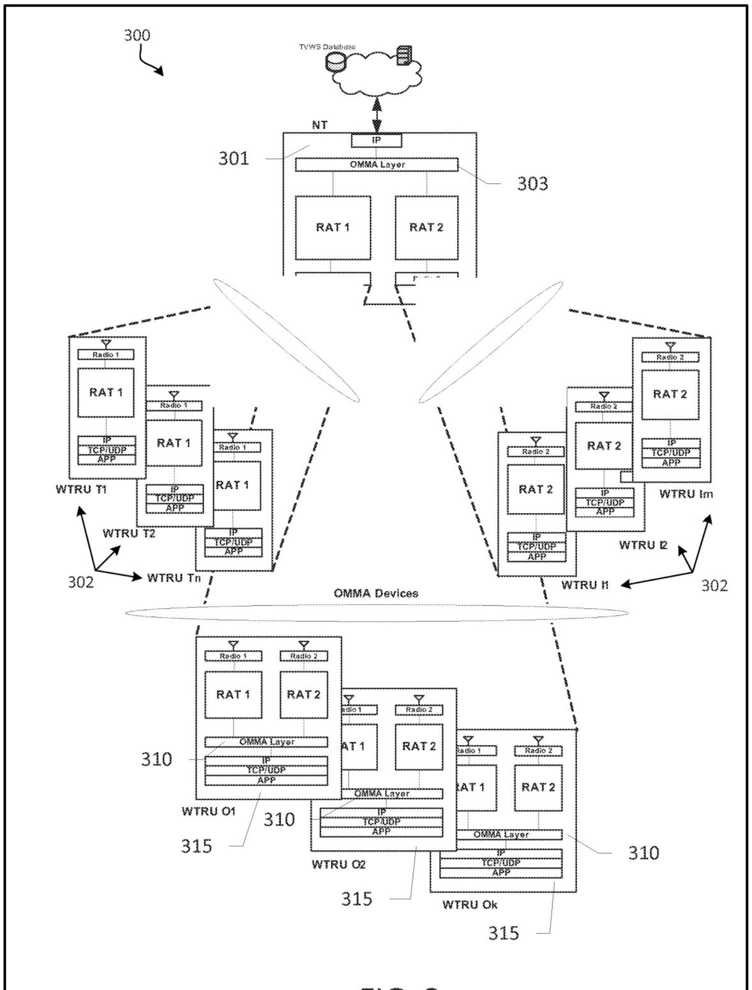


FIG. 3

To manage data flows for multiple WTRUs, Chincholi teaches techniques for queuing packets according to their access categories and/or WTRU addresses and optimizing the distribution of packets of multiple streams for multiple WTRUs across multiple RATs. (EX1005 ¶¶[0351]-[0356]; EX1002 ¶133.) For example, Chincholi discloses a MAC layer of a given transceiver may implement multiple transmission buffers, denoted Q_{ik}, where "i" refers to the WTRU for which a group of packets is designated and "k" refers to the IP flow associated with the group of packets. (EX1005 ¶[352].)

Chincholi further discloses how utilization of the available transceiver bandwidth for one WTRU does not prevent other WTRUs from utilizing a range of frequencies corresponding to the remaining transceiver bandwidth at the same time. As discussed above, Chincholi's OMMA layer receives feedback metrics from each RAT. (EX1005 ¶[0161].) Amongst the feedback metrics are the "MAC Type," for example "OFDMA." (EX1005 ¶[0161], Table 2.) OFDMA stands for "Orthogonal Frequency Division Multiple Access"—a known wireless communication technique for dividing an available bandwidth into subcarriers (*i.e.* frequency ranges) which are then allocated to different users. (EX1002 ¶134.) These subcarriers are "orthogonal" because they do not interfere with each other when simultaneously transmitted. A POSITA would have recognized that OFDMA techniques would allow multiple WTRUs to access different channels of the transceiver resources simultaneously and without interference. (EX1002 ¶134.)

Because Chincholi's RATs may provide feedback to the OMMA indicating they are operating as an OFDMA MAC Type, a POSITA would have recognized that Chincholi discloses the capability to allow multiple WTRUs to simultaneously utilize different portions of a transceiver's available bandwidth. (EX1002 ¶135.)

3. Claim 2: The wireless networking device of claim 1, wherein the wireless networking device comprises a wireless access point.

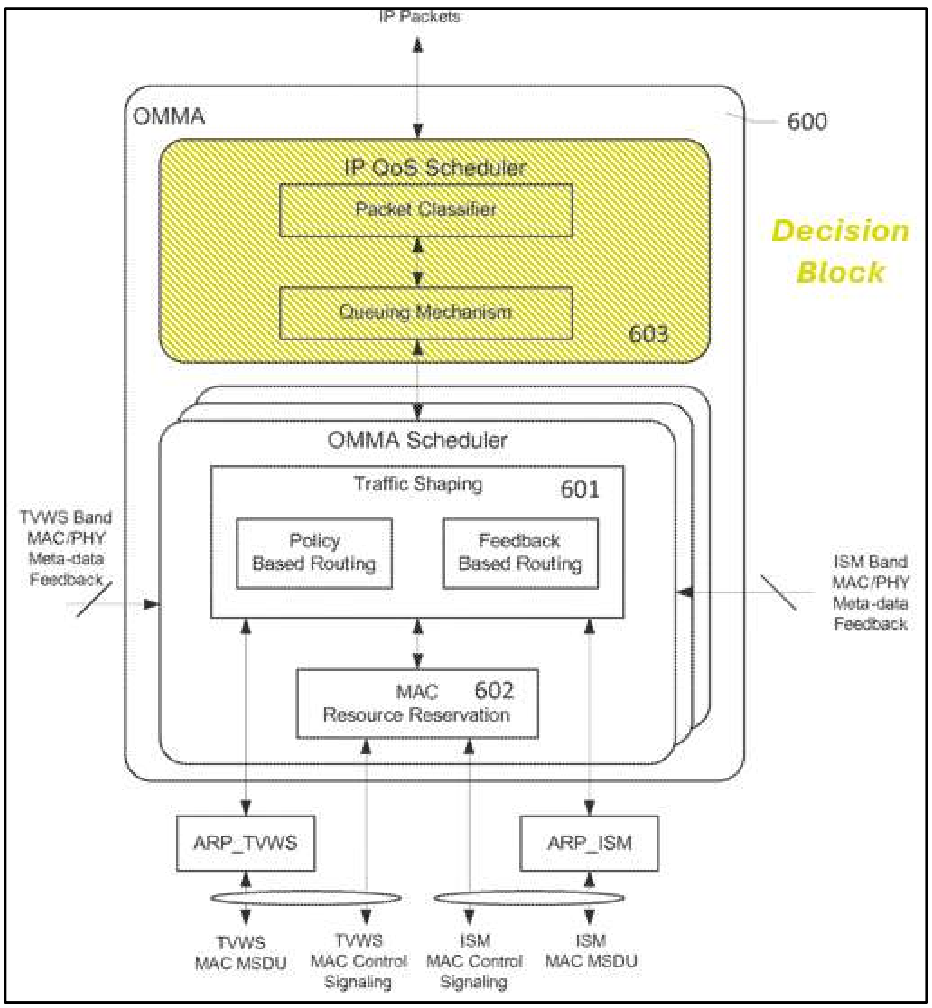
Chincholi discloses that the wireless networking device comprises a wireless access point. (EX1005 ¶[0002] ("a network terminal (NT) (*e.g.*, an ***access point***…)"); EX1002 ¶136.) Chincholi discloses that a node of its wireless communication network may include a "***WiFi access point***." (EX1005 ¶[0115].)

4. Claim 3: The wireless networking device of claim 1, wherein the first and second frequency bands are specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.

Chincholi teaches that its techniques can be used to implement an IEEE802.11-based Wi-Fi system. (EX1005 ¶[0121].) Thus, "[t]he NT 201 may operate using one flavor of the 802.11 system (*e.g.*, 11a/b/g/n) at any given time over a specific band (*e.g.*, 2.4GHz or 5GHz) when communicating with a WTRU." (EX1005 ¶[0121].) Chincholi was filed before October 30, 2013. Moreover, a POSITA would have recognized that the disclosed 802.11 standards ("11a/b/g/n") existed as of October 30, 2013. (EX1002 ¶137.)

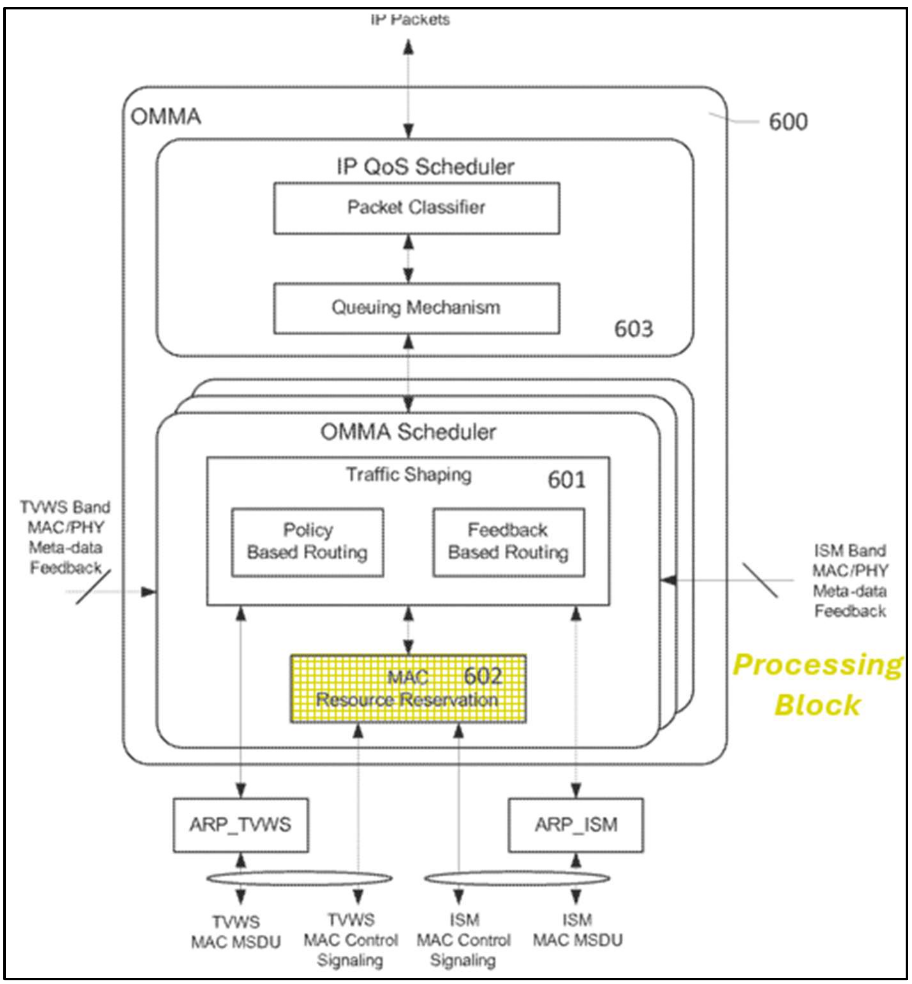
5. Claim 4: The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a decision block.

Chincholi discloses the claimed ***decision block*** in the form of the ***IP QoS Scheduler module 603***. (EX1002 ¶138.) "The ***IP QoS Scheduler 603*** may segregate single IP packet stream comprising multiple IP QoS types into distinct IP QoS streams, for example, so that the traffic shaping module 601 may treat each IP QoS stream independently and satisfy the specific QoS requirements when routing IP packets." (EX1005 ¶[0143].)



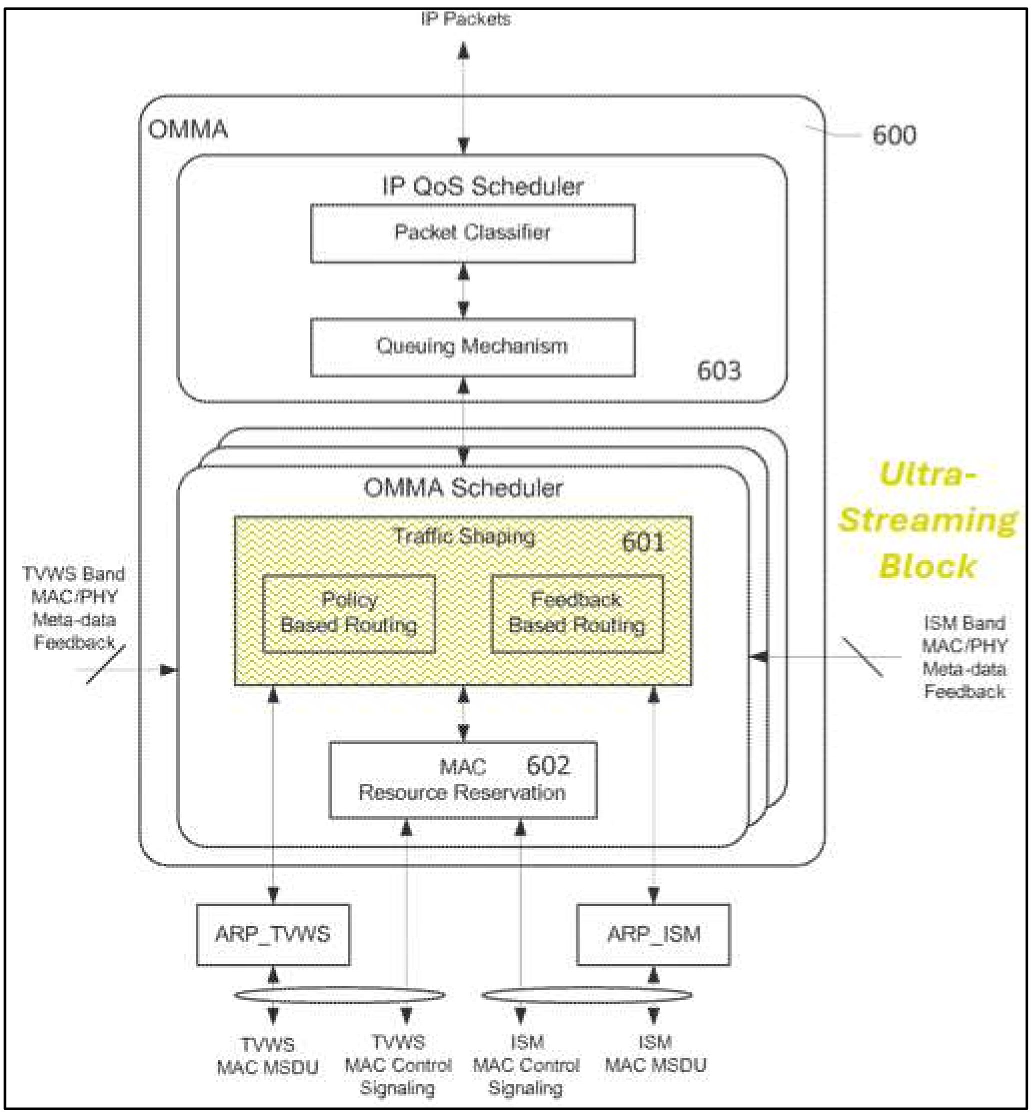
6. Claim 5: The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a processing block.

Chincholi discloses the claimed ***processing block*** in the form of the ***MAC Resource Reservation module 602***. (EX1002 ¶139.) "The ***MAC Resource Reservation module 602*** may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets. This module may transmit specific requests to the RATs over the A1/A2 interface." (EX1005 ¶[0142].)



7. Claim 6: The wireless networking device of claim 1, wherein the at least one virtual MAC interface includes an ultra-streaming block.

Chincholi discloses the claimed ***ultra-streaming block*** in the form of the ***Traffic Shaping Module 601***. (EX1002 ¶140.) "The ***traffic shaping module 601*** may [be] responsible for determining the way packets are routed across RATs. For example, the traffic shaping module may determine the way a packet is routed using policy based routing or feedback based routing." (EX1005 ¶[0139].)



8. Claim 7: The wireless networking device of claim 1, wherein the resource monitoring interface includes an RF block.

A POSITA would have understood the claimed "RF block" to merely be a component capable of receiving and reporting information about the availability of RF resources. (EX1002 ¶141.)

As discussed for limitation 1[e], Chincholi discloses that the Feedback Device Classifier Module of the OMMA Controller receives feedback metrics regarding resource availability from RATs over the "A2" interfaces so that this information may be fed back to the OMMA Scheduler. Specifically, "[each RAT] may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 per device (e.g., WTRU or NT) per access category supported at that RAT." (EX1005 ¶[0205]) Because this discloses the capability of receiving and reporting information about the availability of the transceiver resources (*i.e.*, RF resources), a POSITA would have understood the Feedback Device Classifier Module (*i.e.*, the "resource monitoring interface") to comprise an "RF block." (EX1002, ¶142.)

9. Claim 8: The wireless networking device of claim 1, wherein the processing interface comprises multiple resource monitoring interfaces.

As discussed for limitation 1[e], Chincholi discloses an OMMA Controller that interfaces with each RAT on the "A2" interfaces to collect metrics regarding channel quality and resources. (EX1005 ¶[0205]; EX1002 ¶143.) The OMMA Controller comprises a ***Feedback Device Classifier module***, which is a "resource monitoring interface" for collecting and analyzing this feedback information (EX1005 ¶[0205].)

A POSITA would have been motivated to implement multiple Feedback Device Classifier Modules into the OMMA Controller of Chincholi. (EX1002 ¶144.) In a multi-RAT system with groups of similarly configured RATs, a POSITA would have been motivated to implement virtualized physical interfaces, each capable of collecting and consolidating feedback metrics for its respective grouping of similarly configured RATs. (EX1002 ¶144.) Providing this sort of virtualized physical interface for transceivers in an 802.11 system was known to be particularly beneficial as it allows an access point to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. (EX1002 ¶144.) Virtualization of the physical interface for this purpose is taught, for example, in background reference U.S. Patent Application 2009/0141691 ("Jain"). (*See* EX1007 ¶¶[0034]-[0037]; EX1002 ¶144.)

In implementing virtualized physical interfaces, a POSITA would have recognized that each interface to a grouping of similarly configured RATs would comprise a separate, "resource monitoring interface." (EX1002, ¶145.)

10. Claim 9: The wireless networking device of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

Chincholi discloses wireless communication systems comprising multiple base stations operating in a radio access network (RAN) that communicate with wireless devices using a multiple-input, multiple-output ("MIMO") architecture. (EX1005 ¶[0109]; EX1002 ¶146.) This is disclosed in Figure 1E:

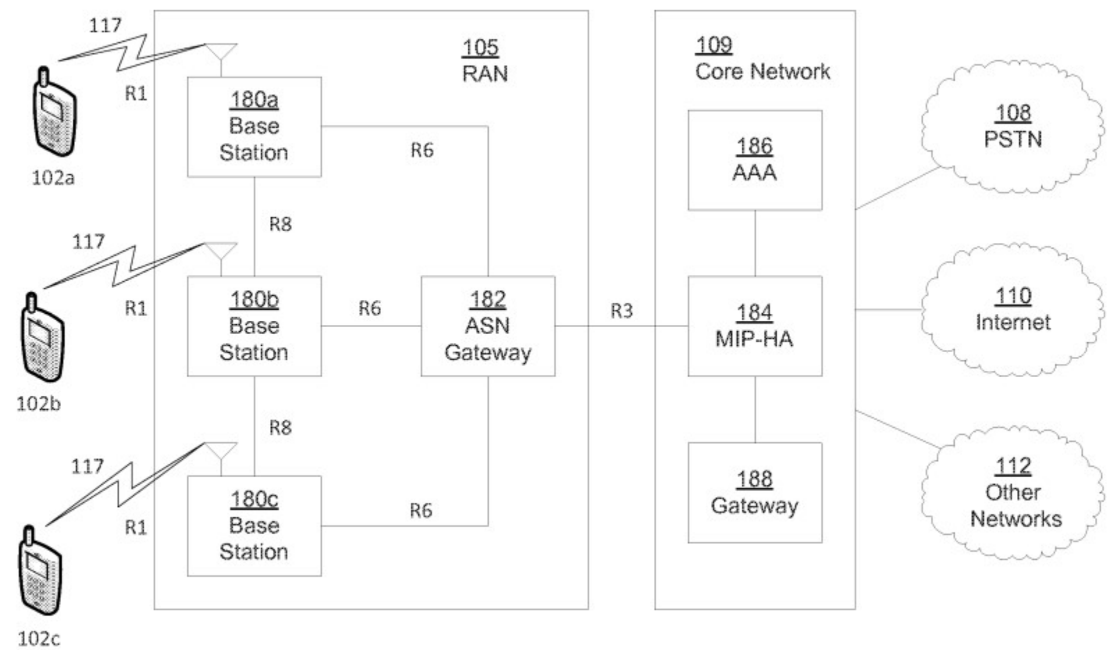


FIG. 1E

A POSITA would have recognized that each base station in Figure 1E would comprise its own OMMA layer (*i.e.*, virtual MAC interface). (EX1002 ¶147.) A POSITA would have further recognized that an additional obvious implementation would have been to combine the multiple virtual MAC interfaces of the system in

Figure 1E into a single wireless communication device. (EX1002 ¶147.) Combining this functionality into a single device could leverage common hardware increasing the efficiency of a base station. (EX1002 ¶147.)

11. Claim 10: The wireless networking device of claim 1, wherein the processing interface includes a bandwidth allocator.

A POSITA would have understood that a ***bandwidth allocator*** refers to functionality within the processing layer capable of allocating the bandwidth availabilities of multiple transceivers to meet a bandwidth requirement. (EX1002 ¶148.)

Chincholi discloses the functionality of the claimed "bandwidth allocator." (EX1002 ¶149.) Specifically, Chincholi teaches that "the traffic shaping module may determine how a packet is routed using policy based routing ***or feedback based routing***." (EX1005 ¶[0139].) In feedback based routing, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of available resources on the medium***." (EX1005 ¶[0161].) Using this feedback mechanism, the "OMMA layer may intelligently manage data traffic across multiple RATs as a function of the link quality of each RAT." (EX1005 ¶[0194].) The OMMA layer also has the capability "to readjust the assigned medium resources to a WTRU on each RAT, for example, based on global knowledge of resource assignment on other RATs." (EX1005 ¶[0196].)

Thus, the "OMMA layer may utilize MAC resource reservation to achieve ***globally optimal resource allocation across RATs***." (EX1005 ¶[0196].)

From these disclosures, a POSITA would have recognized Chincholi discloses a processing layer capable of allocating the bandwidth availabilities of multiple transceivers to meet a bandwidth requirement of one or more data streams. (EX1002 ¶150.)

12. Claim 11: The wireless networking device of claim 1, wherein the first identified actual bandwidth portion is contiguous.

Chincholi discloses that a "NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band,… using a channel within the band ***or aggregating multiple contiguous or noncontiguous channels***." (EX1005 ¶[0118].). A POSITA would have understood that where Chincholi identifies multiple contiguous channels within the band of the first identified actual bandwidth portion, that portion is contiguous. (EX1002 ¶151.)

Clegg further teaches how a "cluster of carriers" for communication may comprise: "1) ***contiguous carriers in a single sub-channel***, [or] 2) ***contiguous carriers spanning across more than one sub-channel***." (EX1009 at 4:11-15; EX1002 ¶152.)

13. Claim 12: The wireless networking device of claim 1, wherein the second identified actual bandwidth portion is contiguous.

For the same reasons discussed for Claim 11, a POSITA would have understood that where Chincholi identifies multiple contiguous channels within the band of the second identified actual bandwidth portion, that portion is contiguous. (EX1002 ¶153.)

14. Claim 13: The wireless networking device of claim 1, wherein the resource monitoring interface is not contiguous with the at least one virtual MAC interface.

As discussed for limitation 1[e], Chincholi's OMMA Controller includes a Feedback Device Classifier module. As shown in Figure 28, the OMMA Controller and the OMMA Scheduler are distinct blocks that communicate via control flow interfaces. A POSITA would have understood from this disclosure that the resource monitoring interface is not contiguous with the virtual MAC interface. (EX1002 ¶154.)

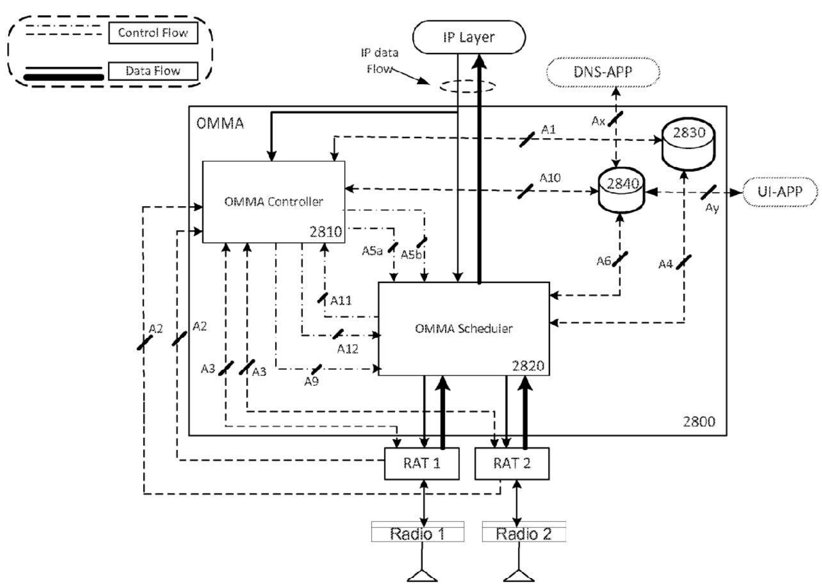


FIG. 28

15. Claim 14: The wireless networking device of claim 1, wherein the data transfer characteristics of at least one of the first and second identified bandwidth portions of the first wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

Chincholi discloses that its assessment of link quality through feedback may be impacted by "mobility of a WTRU or ***fluctuation in link quality due to other environmental effects***." (EX1005 ¶[0263].) A POSITA would have recognized that the link quality indicators used by Chincholi (RSSI, frame error rate, and average total packet delay) are representative of environmental conditions where the wireless networking device is used. (EX1002 ¶155.)

Choi discloses that its evaluation of channel quality (*i.e.*, data transfer characteristics) includes an evaluation of characteristics representative of environmental conditions where the wireless networking device is used. For example, Choi discloses that a channel measurement report frame may include detection of other BSSs in the requested frequency channel, (EX1016 at 5:66-6:21), which a POSITA would have recognized to be representative of the environmental conditions in which the wireless device was being used. (EX1002 ¶156.)

16. Claim 15: The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first and second identified actual bandwidth portions to at least

partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

As discussed for limitation 1[h], Chincholi discloses identifying available channels, or aggregations of channels, from multiple different RATs (EX1005 ¶[0118], ¶[0121].) Chincholi evaluates the available bandwidth channels with respect to the bandwidth requirement of an IP flow (EX1005 ¶[0260]). Based on its evaluation of transceiver bandwidth availability with respect to application bandwidth requirement, a POSITA would have recognized that Chincholi may "aggregate" the first and second identified bandwidth portions of a single transceiver and use those portions simultaneously for transmission of the first data stream to the recipient using the first wireless transceiver. (EX1002 ¶157; EX1005 ¶[0118] ("The NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band… ***using a channel within the band or aggregating multiple contiguous or noncontiguous channels***.").)

Chincholi discloses that the transceiver selection, data stream preparation, and simultaneous transmission is all performed by the OMMA in a manner transparent to higher levels: "[t]he OMMA layer ***may be transparent***, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 ¶[0192], ¶[0126]; EX1002 ¶158.)

17. Claim 16

(a) 16[a]: The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

See 1[f]. (EX1002 ¶159.)

(b) 16[b]: (a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, the first identified bandwidth portion of the second wireless transceiver comprising a set of given resources,

See limitation 1[h]. Just as Chincholi discloses identifying a first portion of actual bandwidth of the first wireless transceiver, it also discloses identifying a first portion of actual bandwidth of the second wireless transceiver. (EX1002 ¶160.)

(c) 16[c]: (b) evaluate data transfer characteristics of the given resources of the first identified bandwidth portion of the second wireless transceiver,

Chincholi discloses that in a "ramp up" phase, the RSSI metric may be assumed to have converged to provide a reliable indication of the instantaneous channel quality of each RAT. (EX1005 ¶[0164].) "RSSI" stands for received signal strength and is a measure of the data transfer characteristics of the wireless transceivers associated with each RAT. (EX1002 ¶161.) Chincholi further discloses that in a "steady state" phase, all feedback metrics may be assumed to have converged to provide a reliable indication of the channel quality, including medium access delay, frame error rate, etc. (EX1005 at [0165].) Thus, in both the "ramp up" and "steady state" phases, Chincholi discloses evaluating the data transfer characteristics of the given resources of the identified bandwidth portion of the second transceiver. (EX1002 ¶161.)

(d) 16[d]: (c) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than the data transfer characteristics of the first identified bandwidth portion of the second wireless transceiver, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

Chincholi discloses that the OMMA layer uses feedback metrics indicating data transfer characteristics to calculate the ratio of IP packets to distribute between the first bandwidth portions of the first and second transceivers. (EX1002 ¶162.) For example, during the "ramp up" phase, Chincholi discloses the following calculation for determining the ratio:

$$\left\lceil \frac{avg(RSSI_{ISM})}{\max(RSSI_{ISM})} \times BW_{ISM} \right\rceil : \left\lceil \left\lceil \sum_{k=1}^{N} \frac{avg(RSSI_{TV}^{k})}{\max(RSSI_{TV}^{k})} \right\rceil \times BW_{TVWS}^{k} \right\rceil.$$

(EX1005 ¶[0164].) In the "steady state" phase, Chincholi discloses the following calculation for determining the ratio:

$$\left\lceil (1 - FER_{ISM}) \times BW_{ISM} \right\rceil : \left| \left[\sum_{k=1}^{N} (1 - FER_{TVWS}^{k}) \right] \times BW_{TVWS}^{k} \right| .$$

(EX1005 ¶[0165].) A POSITA would have understood from these calculations that a higher ratio of IP packets will be allocated to the transceiver whose identified bandwidth portions have better data transfer characteristics at a given time. (EX1002 ¶162.) Further, where the data transfer characteristics of the first bandwidth portion of the first transceiver are substantially better than those of the first bandwidth portion of the second transceiver, a POSITA would understand the capability to transmit the entire first data stream using only the first bandwidth portion of the first transceiver. (EX1002 ¶162.)

Chincholi also does not "require" disassociation of recipient WTRUs from either or both of the actual MAC and PHY interfaces during operation, including during selection of a transceiver based on data transfer characteristics. (EX1002 ¶163.)

(e) 16[e]: (d) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and

second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

As discussed for limitation 16[d], Chincholi discloses the evaluation of data transfer characteristics of the bandwidth portions of the first and second wireless transceivers to make decisions regarding allocating IP packets between the bandwidth portions of the first and second transceivers. Where the data transfer characteristics of the second transceiver are substantially better than those of the first transceiver, a POSITA would have understood the capability to transmit the entire first data stream using only the second transceiver without requiring "disassociation" of the recipient from either or both of the first and second actual MAC and PHY interfaces. (EX1002 ¶164.)

(f) 16[f]: wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.

As discussed for limitation 1[l], Chincholi discloses examples of "***multi-WTRU*** multi-IP flow cases." (EX1005 ¶[0328].) For example, "[a] system may comprise ***multiple WTRUs***, a single NT, and multiple IP flows from the NT to one or more WTRUs." (*Id.*) Chincholi further teaches the use of OFDMA techniques, allowing multiple IP flows to opearate across multiple RATs in a non-interfering manner. (Ex. 1005 at [0161].) A POSITA would have recognized that Chincholi discloses the capability to allow multiple WTRUs to simultaneously utilize different portions of a transceiver's available bandwidth. (EX1002 ¶165.)

18. Claim 17: The wireless networking device of claim 16, wherein the data transfer characteristics of at least one of the first identified bandwidth portion of the first wireless transceiver and the first identified bandwidth portion of the second wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

See Claim 14. (EX1002 ¶166.)

19. Claim 18

(a) 18[a]: The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

See 1[f]. (EX1002 ¶167.)

(b) 18[b]: (a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources, and

See 16[b]. (EX1002 ¶168.)

(c) 18[c]: (b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers; and

Chincholi may "aggregate" the given resources of the identified bandwidth portions of the first and second transceivers to simultaneously transmit the first data stream to the recipient using a specific subset of frequencies corresponding to the identified potions. (EX1005 ¶[0120] ("A mechanism to aggregate two or more RATs operating independently on two or more bands to enhance the total IP throughput of the link may be described herein."; EX1002 ¶169.)

Specifically, Chincholi discloses a "multiplexing mode" where, if the channel quality for one or more RATs is determined to exceed an upper threshold, the OMMA layer may transmit different independent IP packets from the same IP flow across one or more of the RATs. (EX1005 ¶[0152].) In this scenario, Chincholi is able to reserve resources (*i.e.*, a specific subset of frequencies corresponding to the identified portions of available bandwidth) of multiple transceivers and thereby aggregate the identified bandwidth portions of a first and second transceiver for simultaneous transmission. (EX1002 ¶170.)

Chincholi discloses simultaneous transmission of a first data stream using first and second transceivers. Figure 11, for example, shows how the OMMA layer splits a single IP stream of packets (*i.e.*, "MAC Service Data Units" or "MSDUs") for transmission across two RATs simultaneously. (EX1002 ¶171.)

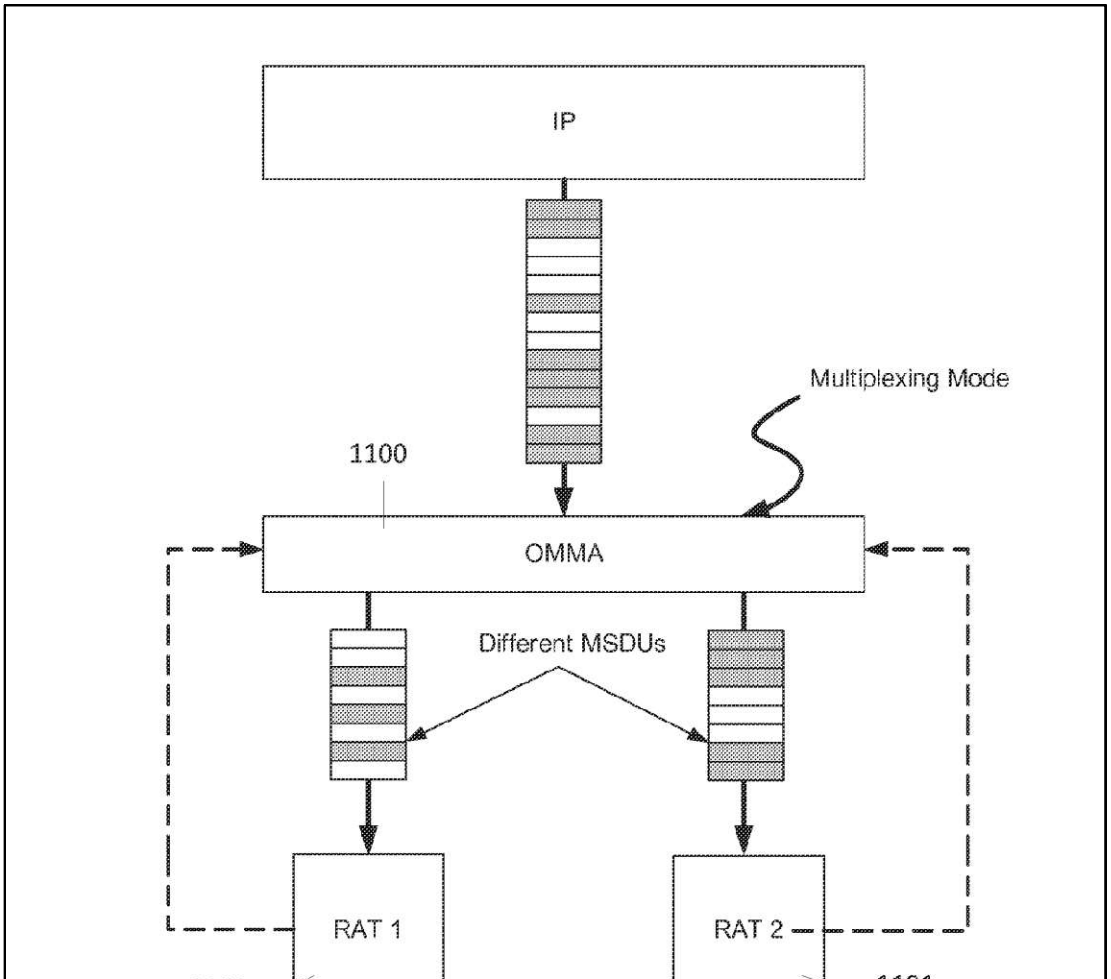


FIG. 11

Chincholi discloses "[u]sing multiple RATs ***simultaneously*** may provide increased bandwidth and/or increased reliability for an application." (EX1005 ¶[0194]; EX1002 ¶172.) Chincholi discloses that the transceiver selection, data stream preparation, and simultaneous transmission is all performed by the OMMA in a manner transparent to higher levels: "[t]he OMMA layer ***may be transparent***, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 ¶[0192], ¶[0126].)

(d) 18[d]: wherein, when the wireless networking device is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.

See 16[f]. (EX1002 ¶173.)

20. Claim 19: The wireless networking device of claim 18, wherein the first data stream is substantially simultaneously transmitted to the recipient from both of the first and second wireless transceivers.

As discussed for limitation 18[c], Chincholi's multiplexing mode discloses simultaneous transmission of the first data stream from the first and second wireless transceivers. (EX1002 ¶174.)

21. Claim 20

(a) 20[a]: The wireless networking device of claim 15, wherein the processing interface is configured to, when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

See 1[f]. (EX1002 ¶175.)

(b) 20[b]: (a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources, and

See 16[b]. (EX1002 ¶176.)

(c) 20[c]: (b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient; and

In addition to enabling simultaneous transmission of an IP flow from two transceivers, Chincholi discloses how its OMMA layer enables aggregation of the available bandwidth on two transceivers to, in a manner transparent to higher layers, provide for simultaneous receipt of an IP flow. (EX1002 ¶177.) Figure 5, for example, depicts a two-way data flow between the actual MAC layer and the OMMA layer on links "A1" and "A2":

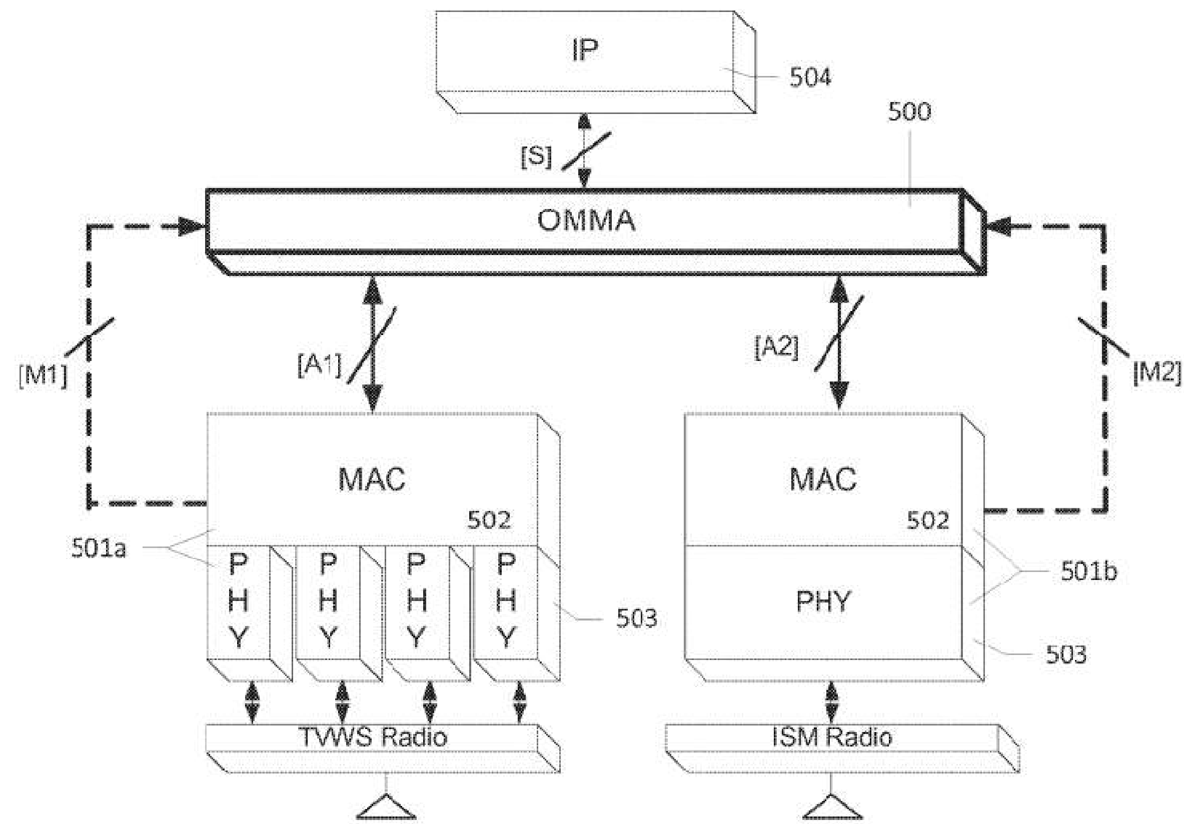


FIG. 5

Further, Table 1 of Chincholi describes the "A1" and "A2" links as involving both the "Incoming" and "Outgoing" MSDUs (MAC service data units). (EX1005 ¶[0138].) Indeed, Chincholi describes that the OMMA layer aggregates bandwidth across multiple RATs, in a manner transparent to higher levels, to either "distribute[]" or "***combine[]***" packets from different RATs. A POSITA would have understood that the ability of the OMMA layer to "combine" packets relates to combining simultaneously received packets across multiple RATs from a single IP flow prior to transmission up to the IP layer. (EX1002 ¶178.)

(d) **20[d]: wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.**

See 16[f]. (EX1002 ¶179.)

22. Claim 21: The wireless networking device of claim 20, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

As discussed for limitation 20[c], Chincholi disclosures that the OMMA layer enables aggregation of bandwidth across multiple RATs for simultaneous reception of packets by both the first and second transceivers. (EX1002 ¶180.)

23. Claim 22

(a) **22[a]: The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,**

See 1[f]. (EX1002 ¶181.)

(b) **22[b]: (a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources,**

See 16[b]. (EX1002 ¶182.)

(c) 22[c]: (b) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

Chincholi discloses the OMMA layer may request resources from a RAT "based on the time duration and the bandwidth requirement for the first IP packet and the second IP packet of the IP flow." (EX1005 ¶[0260].) "The resources are characterized by the time duration and the bandwidth requirement." (*Id.*) This functionality may be performed, for example, by a "MAC Resource Reservation module 602" of the OMMA layer, which "determine[s] an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets." (EX1005 ¶[0142].) A POSITA would have recognized that this discloses the ability to use the first wireless transceiver to transmit the first data stream to the recipient as claimed. (EX1002 ¶183.)

Also, as discussed for limitation 1[j], a POSITA would have recognized that the Chincholi/Choi/Clegg combination would not "require" disassociation of a recipient from either or both of the actual MAC and PHY interfaces during the bandwidth management operations disclosed. (EX1002 ¶184.)

(d) 22[d]: (c) use the second wireless transceiver to receive a second data stream from the recipient at least partially simultaneously with the first data stream being transmitted to the recipient from the first wireless transceiver, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and

A POSITA would have recognized that the ability to implement Chincholi's system to simultaneously transmit the first data stream using the first transceiver and receive a second data stream from the recipient using the second transceiver. (EX1002 ¶185.) Because Chincholi's system is capable of implementing multiple antenna/RF pairs, each operating on a different frequency band (EX1005 ¶[0136]), a POSITA would recognize the ability to implement Chincholi as a simultaneous transmit and receive system.

Operating a multi-transceiver system like Chincholi to simultaneously transmit from one transceiver and receive from another was well-known and obvious to a POSITA at the time of the '564 patent. (EX1002 ¶186.) This is explained, for example, in U.S. Patent 10,567,147 ("DiFazio", EX1010). DiFazio, teaches that a "full duplex" system is one that transmits and receives the radio frequency RF signal simultaneously. (EX1010 at 1:24-26.) This is most often accomplished by implementing "frequency division duplexing (FDD) where the Tx and Rx bands may be sufficiently separated in frequency such that filters can adequately attenuate any energy from the Tx signal that would leak into the Rx signal path and otherwise corrupt the Rx signal and prevent proper operation." (EX1010 at 1:26-31, *see also* 16:51-67, 17:48-18:23.) Additionally, DiFazio teaches a "full duplex single channel" (FDSC) capability, wherein a base station may even simultaneously transmit and receive data streams in a single frequency channel. (EX1010 at 13:31-56.)

A POSITA would have been motivated to implement a simultaneous transmit and receive functionality into the system taught by Chincholi to achieve greater network efficiency and throughput. (EX1002 ¶187.) As DiFazio teaches, the ability to simultaneously transmit and receive using FDSC can achieve 70% greater throughput compared to conventional half-duplex systems. (EX1010 at 16:29-30.) To the extent not explicitly disclosed by Chincholi, implementing a simultaneous transmit and receive functionality into its system would have been technologically feasible and could be accomplished in a straightforward manner with reasonable expectation of success. (EX1002 ¶187.)

Also, as discussed for limitation 1[j], a POSITA would have recognized that the Chincholi/Choi/Clegg combination would not "require" disassociation of a recipient from either or both of the actual MAC and PHY interfaces during the bandwidth management operations disclosed. (EX1002 ¶188.)

(e) 22[e]: wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes at the same time that the first identified bandwidth portion is being used.

See limitation 16[f]. (EX1002 ¶189.)

24. Claim 23: The wireless networking device of claim 22, wherein the second data stream is received by the second wireless transceiver substantially simultaneously with the transmission of the first data stream from the first wireless transceiver.

A POSITA would have recognized Chincholi, in light of DiFazio, discloses that the second data stream is received by the second transceiver simultaneously with the transmission of the first data stream from the first wireless transceiver. (EX1002 ¶190.)

25. Claim 24: The wireless networking device of claim 22, wherein the start of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the start of the transmission of the first data stream from the first wireless transceiver.

A POSITA would have recognized Chincholi, in light of DiFazio, discloses the start of reception of the second data stream by the second transceiver is simultaneous with the start of the transmission of the first data stream from the first wireless transceiver. (EX1002 ¶191.)

26. Claim 25: The wireless networking device of claim 22, wherein the end of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the end of the transmission of the first data stream from the first wireless transceiver.

A POSITA would have understood Chincholi, in light of DiFazio, discloses the end of the reception of the second data stream by the second transceiver is simultaneous with the end of the transmission of the first data stream from the first wireless transceiver. (EX1002 ¶192.)

27. Claim 26

(a) 26[a]: The wireless networking device of claim 22, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,

See 22[a]. (EX1002 ¶193.)

(b) 26[b]: aggregate at least one first portion of an actual bandwidth of a third wireless transceiver with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the second and third wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.

Chincholi Figures 4 and 5 show at least three and up to "N" number of antenna/RF front-end pairs, and thus Chincholi discloses at least a third wireless transceiver. (EX1002 ¶194.) As discussed for limitation 20[c], Chincholi discloses how its OMMA layer enables aggregation of the available bandwidth on multiple transceivers to, in a manner transparent to higher layers, provide for simultaneous receipt of an IP flow. (EX1002 ¶195.)

Thus, Chincholi discloses aggregating bandwidth portions of the second and third transceivers to cause the second and third transceivers to simultaneously receive the second data stream from the recipient. (EX1002 ¶196.)

28. Claim 27: The wireless networking device of claim 26, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

See limitation 20[c] and claim 21. (EX1002 ¶197.)

29. Claim 28

(a) 28[a]: The wireless networking device of claim 22, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,

See 22[a]. (EX1002 ¶198.)

(b) 28[b]: aggregate the given resources of the first and second identified actual bandwidth portions of the first wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

As discussed for limitation 18[c], Chincholi discloses the ability to "aggregate" the given resources of the identified bandwidth portions of the first and second transceivers to simultaneously transmit the first data stream to the recipient using a specific subset of frequencies corresponding to the identified potions. (EX1002 ¶199.)

30. Claim 29: The wireless networking device of claim 28, wherein the first data stream is substantially simultaneously transmitted by the first wireless transceiver.

As discussed for claim 28, Chincholi's multiplexing mode discloses simultaneous transmission of the first data stream from the first and second wireless transceivers. (EX1002 ¶200.)

B. Ground 2: Patent-Ineligible Under §101

1. The Claims Are Directed to Patent-Ineligible Subject Matter

The PTAB uses the Supreme Court's two-part framework in *Alice Corporation v. CLS Bank International*, 573 U.S. 208 (2014), to determine patent-eligibility. PGR2023-00023-26 at 6 (Oct. 29, 2024). The PTAB must first determine what concept the claim is directed to, and if it is directed to an abstract idea, the PTAB then "must examine the elements of the claim to determine whether it contains an inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application." *Alice*, 573 U.S. at 221; *see also* PGR2023-00023-26 at 7; MPEP §2106.

Under step one, the Challenged Claims are directed to an abstract idea without practical implementation details that would yield a technological innovation. At bottom, the focus of every Challenged Claim is **evaluating and selecting available communication resources**, which is abstract. *Ericsson Inc. v. TCL Commc'n Tech. Holdings*, 955 F.3d 1317, 1327 (Fed. Cir. 2020) ("Controlling access to resources is exactly the sort of process that can be performed in the human mind, or by a human using a pen and paper, which we have repeatedly found unpatentable.").

The '564 patent asserts that prior-art wireless architectures were unable to provide adequate resources to efficiently provide optimum range and coverage for users. (EX1001 at 1:46-60.) But rather than describe a concrete, technological improvement to address this problem, the Challenged Claims recite nothing more than a bare result: evaluate available network resources and select amongst them.

Claim 1, for example, boils down to the following simple requirements: a wireless device that (1) feeds bandwidth availability information of two transceivers to a virtual MAC interface, (2) identifies portions of bandwidth of a transceiver, (3) evaluates data transfer characteristics of the portions, and (4) determines which portion is better and uses that portion to transmit a data stream. The Federal Circuit has held similar claims cover abstract ideas. *E.g.*, *PersonalWeb Techs. LLC v. Google LLC*, 8 F.4th 1310, 1315 (Fed. Cir. 2021) (holding abstract claims directed to "(1) using a content-based identifier generated from a 'hash or message digest function,' (2) comparing that content-based identifier against something else…; and (3) providing access to, denying access to, or deleting data"); *Intell. Ventures I LLC* *v. Symantec Corp.*, 838 F.3d 1307, 1313 (Fed. Cir. 2016) (holding abstract claims directed to (1) "creating file content IDs," (2) "determining... whether each received content identifier matches a characteristic of other identifiers," and (3) "outputting... an indication of the characteristic of the data file based on said… determining."); *see also Ericsson*, 955 F.3d at 1326; *Geoscope Techs. Pte. Ltd. v. Google LLC*, No. 2024-1003, 2025 WL 1276235, at *2 (Fed. Cir. May 2, 2025).

While the Challenged Claims attempt to dress up the abstract idea with conventional features and vague, functional language, none of this is sufficient to convert the claims from the mere abstract idea into a technological improvement for implementing it. *Int'l Bus. Machines Corp. v. Zillow Grp., Inc.*, 50 F.4th 1371, 1378 (Fed. Cir. 2022) (holding ineligible claims that are "result-oriented, describing required functions (presenting, receiving, selecting, synchronizing), without explaining how to accomplish any of the tasks. The claims and specification do not disclose a technical improvement or otherwise suggest that one was achieved."). Put simply, other than requiring conventional components that make up a wireless networking device, the Challenged Claims are directed to no more than the abstract idea of collecting information (data transfer characteristics of communication resources) and analyzing that information to make a selection (of communication resources).

The results-oriented claiming of the ’564 patent further demonstrates ineligibility because “a claim that merely describes an effect or result dissociated from any method by which it is accomplished is not directed to patent-eligible subject matter.” *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1244 (Fed. Cir. 2016); *see Zillow*, 50 F.4th at 1378; *Free Stream Media Corp. v. Alphonso Inc.*, 996 F.3d 1355, 1363-64 (Fed. Cir. 2021) (holding patent directed to ineligible abstract idea because the “claims do not at all describe how [the claimed] result is achieved”); *SAP Am., Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018) (A claim must “ha[ve] the specificity required to transform [the] claim from one claiming only a result to one claiming a way of achieving it.”).

The Federal Circuit recognizes that results-oriented claiming runs headlong into the preemption problem that underlies §101. *Affinity Labs of Texas, LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1265 (Fed. Cir. 2016) (“[C]laims that are so result-focused, so functional, as to effectively cover any solution to an identified problem are frequently held ineligible under section 101.”) (citing *Elec. Power Grp. v. Alstom S.A.*, 830 F.3d 1350, 1356 (Fed. Cir. 2016)); *Halliburton Energy Servs. v. M-I LLC*, 514 F.3d 1244, 1256 n.7 (Fed. Cir. 2008) (Overbreadth and preemption effects are “inherent in open-ended functional claims.”); *Interval Licensing LLC v. AOL, Inc.*, 896 F.3d 1335, 1343 (Fed. Cir. 2018) (Results-oriented claims “fail[] to recite a practical way of applying an underlying idea… [and] instead [a]re drafted in such a result-oriented way that they amount[] to encompassing 'the principle in the abstract' no matter how implemented.")

That is the case here. Other than requiring well-known components in a networking device, all of the elements are results-oriented, *e.g.*: "providing" a data stream, transceivers "associated" with interfaces, "suitable for use" in a wireless network, "have" bandwidth availability, able to "emit radio waves," "feed information" back to MAC interface, "in a manner transparent to any layer," "create associations," "identify" portions of bandwidth, "evaluate" data transfer characteristics and determine which portions are "better," "satisfy" bandwidth requirements, and does not "prevent" another device from utilizing a portion of frequency. "[W]here, as here, the bulk of the claim provides an abstract idea, and the remaining limitations provide only necessary antecedent and subsequent components, the claim's character as a whole is directed to that abstract idea." *Ericsson*, 955 F.3d at 1326.

The '564 patent's high-level results-oriented language seeks to encompass the abstract concept of evaluating and selecting available communication resources, no matter how implemented. Indeed, the patent itself asserts that its invention spans multiple different types of radio access technologies (including Wi-Fi and cellular; 1:46-60), different protocols (including HDMI, MIMO, Wi-FI PHY and MAC, and IP; 4:1-11), and different types of devices (wireless access points, base stations, handhelds, tablets, computer, phones, TVs, DVD players, BluRay players, media player, storage devices, dongles, ***or any such devices***; 4:12-19). The ’564 patent essentially aims to preempt the concept of evaluating and selecting available communication resources.

The Challenged Claims are much like those held ineligible in *Two-Way Media Ltd. v. Comcast Cable Communications*, 874 F.3d 1329, 1337–38 (Fed. Cir. 2017). There, the claims recited a method for transmitting packets over a communications network by converting information streams into multiple streams of addressed digital packets, routing streams to users, controlling the routing in response to user signals, and monitoring the reception of packets. *Id.* at 1334-35. Finding that the claim merely recited "result-based functional language," the Federal Circuit held they were directed to the abstract idea of gathering and analyzing information. *Id.* at 1337-38. The ’564 claims similarly require nothing more than transmitting, routing, and monitoring data streams, and fail to provide specificity about how these steps are accomplished. *See Ericsson*, 955 F.3d at 1328 (functionally-drafted claims directed to idea of controlling access to resources do not "have the specificity required to transform a claim from one claiming only a result to one claiming a way of achieving it.").

The ’564 claims are also like the ineligible claims in *Rady v. Bos. Consulting*. No. 2022-2218, 2024 WL 1298742 (Fed. Cir. Mar. 27, 2024). In *Rady*, the challenged claim recited the use of "item analysis components" to gather "spectral analysis data and 3D scan data" about the imperfections of physical objects, "determine" if the data was previously recorded, and then record the instance. *Id.* at *1. The Federal Circuit found that the patent did "not purport to have invented any new measurement techniques or measurement devices," did not "provid[e] any significant details regarding how these various item analysis components function," and "relie[d] on the conventional use of existing technology." *Id.* at *3-4. The Challenged Claims have the same shortcomings—nowhere do they purport to invent new techniques, and anything that it could conceivable claim as new are simply requirements for a result (*e.g.*, in a transparent manner, determine which portions are "better," and in a way that does not "prevent" another device from utilizing a portion of frequency). *Id.* at *3 ("[F]rom an eligibility perspective, the principal shortcoming in [the] claims is that they recite generic steps and results—as opposed to a specific solution to a technological problem").

Finally, neither the fact that the claims are limited to "wireless networking devices" or that they arise in the context of wireless networks is enough. *Affinity Labs*, 838 F.3d at 1258-59 (limiting field of use of the claimed invention to cellphones "does not render the claims any less abstract"); *In re TLI Commc'ns LLC Pat. Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016) ("[T]he specification makes clear that the recited physical components merely provide a generic environment in which to carry out the abstract idea"); *Ericsson*, 955 F.3d at 1327 (limiting use of idea to mobile phones is not enough). Thus, the Challenged Claims are directed to a patent-ineligible abstract idea at step one of the *Alice* analysis.

2. No "Inventive Concept" in The Claims

Where a claim is directed to an abstract idea, it must recite an "inventive concept" that "amounts to significantly more than a patent upon the [abstract idea] itself." *Alice*, 573 U.S. at 217-18. "[C]onventional, routine and well-understood applications in the art" are insufficient to confer an inventive concept. *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1378 (Fed. Cir. 2015).

Here, the Challenged Claims recite no inventive concept, let alone anything that could constitute "significantly more" than the abstract idea. The language of the Challenged Claims confirms that they merely require conventional networking components that were well-known to POSITAs, *e.g.*: a processing interface, actual and virtual MAC and PHY interfaces, and wireless transceivers. (EX1002 ¶201.) This is further demonstrated in Ground 1, which shows how the claims merely recite routine, conventional, and well-known components in wireless communication technology. *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 2020-2320, 2021 WL 2944838, at *3 (Fed. Cir. July 14, 2021); *Riggs Tech. Holdings, LLC v. Cengage Learning, Inc.*, No. 2022-1468, 2023 WL 193162, at *3 (Fed. Cir. Jan. 17, 2023). The claims do not require any specific improvements to the existing technology to "feed" information or to "identify" portions of bandwidth. Rather, they simply recite generic components doing generic things. (EX1002 ¶201.)

As another example, the claims require "evaluat[ing] the data transfer characteristics." But it does not require a specific manner to evaluate these characteristics and it provides no guidance on how to do so. That does not suffice for eligibility. *Elec. Power*, 830 F.3d at 1356; *Alice*, 573 U.S. at 221 ("[T]ransformation into a patent-eligible application requires more than simply stat[ing] the [abstract idea] while adding the words 'apply it.'"). This problem permeates all of the claim limitations: *e.g.*, the claim requires operation "in a manner transparent to any layer of the wireless networking device" but it does not say how to implement this transparency; the claim requires that during operation it does not prevent other devices from utilizing a range of frequencies, but does not explain how it allows other devices to do so. (EX1002 ¶202.)

The '564 specification tacitly admits that the purported invention involves nothing more than conventional, routine and well-understood applications. (EX1002 ¶203.) For example, the claimed components and their combination (including the use of virtual MAC and PHY layers) do not confer an inventive concept because "[t]hose skilled in the art will appreciate that the [described] embodiments… enable wireless networking systems to operate at high levels of performance and with better efficiencies." '564 at 6:1-4; *see also* 10:49-56 (explaining POSITAs will appreciate the benefits of employing linear and radial wireless access system architectures). Accordingly, there is no inventive concept in the '564 claims that can support eligibility. *BSG Tech LLC v. Buyseasons, Inc.*, 899 F.3d 1281, 1290-91 (Fed. Cir. 2018).

3. The Dependent Claims Add Nothing Beyond the Abstract Idea of Claim 1

The remaining Challenged Claims are dependent upon claim 1, and likewise are directed to the abstract idea of evaluating and selecting available communication resources. They add nothing more than routine and conventional techniques such as:

- Requiring the device to be an access point (Claim 2),
- Using frequency bands specified in IEEE 802.11 (Claim 3),
- Using conventional functional blocks, interfaces, and components (Claims 4-10),
- Bandwidth contiguity (Claims 11-13),
- Data transfer characteristics representing environmental conditions (Claims 14, 17),
- Bandwidth aggregation and simultaneous transmission/receipt (Claims 15, 18-29), and
- Using the second transceiver (Claim 16). (EX1002 ¶204)

All of the dependent claims thus are also patent ineligible under §101. *Ameranth, Inc. v. Domino's Pizza, LLC*, 792 Fed. App'x 780, 787 (Fed. Cir. 2019) ("Dependent claims… recite limitations that do not cure the above problems….

These additional limitations in those claims are themselves routine and conventional, and thus we determine that they are also patent ineligible.”).

C. Ground 3: Invalid For Lack of Written Description

1. Background

On October 29, 2013—well after the releases of 802.11 (Wi-Fi) in 1997 and 802.11n (Wi-Fi 4, which incorporated multiple-input and multiple-output (“MIMO”) radio technology) in 2009—the ’564 inventor filed U.S. Provisional Applications 61/897,216 (’216 Appl.) and 61/897,219 (’219 Appl.). (EX1002 ¶205.) Beginning in 2021—***eight years later*** and ***after*** the release of 802.11ac (Wi-Fi 5) and 802.11ax (Wi-Fi 6 and 6E)—the inventor started filing a slew of new non-provisional patent applications claiming priority to the ’216 and ’219 Applications. (EX1002 ¶205.) The ’564 patent, filed in 2024, is one of the most recent of now 11 patents, spanning well over 250 claims that have been written since 2021. XiFi has asserted in the co-pending litigation that these newly-drafted claims now read upon features required by the latest version of the WiFi specification (802.11be, Wi-Fi 7). (EX1018 ¶2, ¶42; EX1002 ¶205.)

As demonstrated below, the Challenged Claims of the ’564 patent have gone far beyond the scope of the purported invention disclosed in the specification and are therefore invalid under Section 112. (EX1002 ¶206.)

2. Legal Standard

To meet 35 U.S.C. §112's written description requirement, the specification "must describe the invention sufficiently to convey to a person of skill in the art that the patentee had possession of the claimed invention at the time of the application, i.e., that the patentee invented what is claimed." *LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005). "This requires that the written description actually or inherently disclose the claim element." *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008). A patent can be held invalid for failure to meet the written description requirement based solely on the face of the patent specification. *Centocor Ortho Biotech, Inc. v. Abbott Lab'ys*, 636 F.3d 1341, 1347 (Fed. Cir. 2011). "Sufficiency of written description is a question of fact." *In re Xencor, Inc.*, 130 F.4th 1350, 1356 (Fed. Cir. 2025).

"The purpose of the written description requirement is to ensure the scope of the right to exclude, as set forth in the claims, does not overreach the scope of the inventor's contribution to the field of art as described in the patent specification." *ICU Med., Inc. v. Alaris Med. Sys, Inc.*, 558 F.3d 1368, 1376 (Fed. Cir. 2009) (citations omitted). Thus, a description which, in combination with knowledge in the art, merely renders a claim element obvious is not sufficient. *TurboCare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118-20 (Fed. Cir. 2001) (holding that to comply with the written description requirement the location of the spring must be actually or inherently disclosed; that the location may be obvious from the disclosure is not enough); *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). "The question is not whether a claimed invention is an obvious variant of that which is disclosed in the specification. Rather, a prior application itself must describe an invention, and do so in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought." *Lockwood*, 107 F.3d at 1572; *see also PowerOasis*, 522 F.3d at 1306; *Transperfect Glob., Inc. v. Matal*, 703 F. App'x 953, 963 (Fed. Cir. 2017); *Rivera v. Int'l Trade Comm'n*, 857 F.3d 1315, 1320 (Fed. Cir. 2017).

3. Summary of '564 Specification (EX1002 ¶¶207-209)

The '564 patent describes an alleged problem that wireless architectures were unable to provide adequate resources to efficiently provide optimum range and coverage for wireless network users, and fail to take advantage of resources available. (EX1001 at 1:46-60.) To allegedly address this issue, the patent discloses nothing more than a conventional system comprised of results-oriented components. Specifically, it describes a wireless networking system including a "a processing layer" (*id.* 2:59), which includes a "virtual MAC layer" comprised of a "decision block," "processing block," and "ultra-streaming block" (*id.* 3:49-50). The patent further describes a "virtual PHY layer" that include an "RF block" (*id.* 3:51), and wireless transceivers (*id.* 2:66).

The '564 patent describes that the decision block determines the size and type of the data stream, and the type of processing necessary to transmit it. (*Id.* 3:31-34.) The processing block then processes the stream and couples to the ultra-streaming block, which manages the processing of streams and substreams given the available resources. (*Id.* 3:34-40.) The ultra-streaming block also feeds data to and from the RF block, and monitors available resources. (*Id.* 3:40-45.)

The specification does not convey that the inventor had possession of the below limitations ("WD Limitations"). Indeed, as discussed above in Ground 1, the prior art disclosure of these features is far more robust than anything in the specification, which establishes that the Challenged Claims are not just obvious, but also invalid for lack of written description support.

4. Deficient Written Description Limitations ("WD Limitations")

(a) "in a manner transparent to any layer… above the processing interface" (Claims 1, 15-16, 18, 20, 22, 26, 28)

All Challenged Claims recite that the claimed wireless networking device must perform one or more functions "in a manner transparent to any layer… above the processing interface." The specification, however, nowhere mentions operation in a "transparent" manner as claimed—neither the word "transparent" nor any similar concept appears anywhere in the specification. (EX1002 ¶210.)

Indeed, in prosecuting an ancestor patent, Patent Owner itself could not identify anything in the common specification supporting this limitation. The limitation related to transparency first appeared during prosecution of related U.S. Patent 11,818,591 (hereafter "'591 patent") originally filed on September 7, 2021. On August 8, 2023, Applicant cancelled all originally-filed claims and added 20 new claims, including for the first time this transparency limitation. (EX1017, 8/8/2023 Claims.) Applicant "believed that the… new claims are supported by the application as originally filed," and included a chart mapping to alleged support in the specification. But nowhere did Applicant point to any disclosure related to transparency. (*Id.*, p.13-14 [pointing to the '216 provisional application's Figure 1 layer format, page 2 description about radios, and page 6 description about the RF block, but no disclosure about transparency], p.17 [pointing to the '216 provisional application's description about the RF block]; EX1002 ¶211.)

A POSITA reading the specification would not have understood that the alleged inventor possessed the claimed wireless networking device operating in a manner transparent to any layer above the processing interface. (EX1002 ¶212.) Thus, all Challenged Claims are invalid for lack of written description support.

(b) "evaluate the data transfer characteristics of the given resources…, if the data transfer characteristics of the

first identified bandwidth portion are better than those of the second identified bandwidth portion…, if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion…" (Claims 1, 14, 16-17)

The Challenged Claims require evaluation of the data transfer characteristics of the resources of two bandwidth portions of a wireless transceiver, and determination of which portion is "better." Nowhere in the specification is there any description about data transfer characteristics, any evaluation of such data transfer characteristics, or any selection of bandwidth portions based on any such evaluation. (EX1002 ¶213.) Indeed, the written description of the '564 patent never even mentions data transfer characteristics or any relative evaluation of bandwidth portions.

The limitations related to data transfer characteristics appeared in the '564 patent family for the first time in the December 7, 2023 patent application that would later issue as the '105 patent. The Examiner issued a notice of allowance for the '105 patent without any office action or expressly analyzing whether the applied-for claims were supported by the '216 and '219 provisional applications. (EX1002 ¶214.)

While the '564 specification makes some passing references to data transfer cycles (EX1001 at 3:7-12), data transfer rates (*id.* 3:21-23, 8:10-11), data transfer capability (*id.* 3:66, 8:55-56), data transfer efficiency (5:50-51), and data transfer optimization by controlling transmit and receive times (*id.* 6:9-11), it never discusses any evaluation of data transfer ***characteristics***, and—more importantly—never explains how or what it means to ***evaluate*** data transfer characteristics and determine if one is ***better*** than another. Indeed, the focus of the '564 specification is not on transfer characteristics, but on bandwidth requirements and availability. (*E.g.*, *id.* 3:20-23 ("The individual applications… may have different peak bandwidth requirements in terms of data transfer rates").) Accordingly, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device including evaluation of data transfer characteristics. (EX1002 ¶¶215-216.)

(c) "resource monitoring interface" (Claims 1, 7-8, 13)

Claim 1 of the '564 requires at least one "resource monitoring interface" in the processing interface that feeds information regarding the bandwidth availabilities of the transceivers back to the virtual MAC interface. The '564 specification nowhere describes a resource monitoring interface. While the specification describes a virtual PHY layer that is formed by RF block 112 (3:51), which communicates with the ultra-streaming block about actual resource availability (4:54-56), a generic resource monitoring interface is a broader element that is not supported by mere description of virtual PHY layers. (EX1002 ¶217.) Thus, the '564 patent fails to provide adequate written description support for this limitation because it does not convey to POSITA that the patentee had possession of the ***full scope*** of the claimed invention. *See ICU Med.*, 558 F.3d at 1378 (holding that specification teaching a medical device with a spike failed to support claims for a more generic device without a spike); *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1259 (Fed. Cir. 2004) (holding that written description requirement requires sufficient disclosure to show "the inventor actually ***invented the full scope of the invention*** as finally claimed in the patent") (emphasis added). A POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device comprising a resource monitoring interface. (EX1002 ¶217.)

The "resource monitoring interface" limitations first appeared during the prosecution of the '564 patent in an amendment from the Applicant after notice of allowance. Applicant argued there was support in the application as originally filed (¶¶[0017], [0021]-[0024]), and also in the its priority disclosures, specifically Figure 1 of the '216 Application. But these disclosures only discuss virtual PHY layers; they do not reference or describe any "resource monitoring interface," a concept which finds zero support in the specification. (EX1002 ¶218.)

(d) "the first and second wireless transceivers, respectively… are adapted to emit radio waves in first and second different bands of frequencies" (Claim 1)

The '564 patent specification fails to provide written description support for the first and second wireless transceivers respectively adapted to emit radio waves in first and second ***different*** bands of frequencies. Nowhere does the specification describe one transceiver operating in one band of frequency and another transceiver operating in a mutually exclusive, different one. Indeed, nowhere in the specification does it even use the word "***band***" or discuss the allocation of frequency spectrum to the respective transceivers. (EX1002 ¶219.)

Patent Owner touts this limitation of using multiple frequency bands, an aspect of multilink operation, as a novel feature in its complaint in the co-pending litigation. EX1018 ¶2 ("The claimed inventions enable Samsung to offer superior devices that perform multi-link WiFi operations"), ¶40 ("The XiFi Patents further allow Multi-Link Operation (MLO), which is a significant aspect of Wi-Fi 7. MLO-enabled Wi-Fi 7 devices minimize the significant overhead of switching bands."). But nowhere in the '564 specification is this concept even remotely mentioned. (EX1002 ¶220.)

A POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device wherein the first and second wireless transceivers, respectively, are adapted to emit radio waves in first and second different bands of frequencies. (EX1002 ¶221.)

(e) "request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces…" (Claim 1)

The ’564 patent specification fails to provide written description support for requesting or creating ***associations*** between a recipient and MAC/PHY interfaces. (EX1002 ¶222.)

Limitations regarding “association” between a recipient and MAC and PHY interfaces first appeared in the ’564 patent family during the prosecution of the application that later issued as the ’591 patent in an August 8, 2023 amendment. Applicant claimed that there was support in the ’216 provisional application. Specifically, Applicant cited a portion at page 6 of the ’216 provisional that mentions that an RF block (part of the virtual PHY interface) communicates with the ultra-streaming block (part of the virtual MAC interface), and Figure 1 that shows that the actual PHY layers each contains a radio. (EX1017, 8/8/23 Claims, p.14.) Applicant claimed that this was enough to “indicate, for example, that the processing interface creates an association between a recipient and each one of the… MAC and PHY layers.” (*Id.*; EX1002 ¶223.)

The cited portions of the provisional applications identified by applicant during prosecution do not indicate to a POSITA possession of the claim limitation. (EX1002 ¶224.) Nowhere do the provisional applications explain what the recipient is, or disclose any process of creating an association between the network device’s MAC and PHY interfaces and a recipient. The fact that the PHY layers contain radios does not expressly or inherently explain creating associations as claimed. Indeed, radios can broadcast information without making links or associations with recipients. (EX1002 ¶224.)

A POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device comprising a processing interface configured to request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces. (EX1002 ¶225.)

(f) transmit a data stream "without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces…" (Claims 1, 15, 22)

The '564 patent specification fails to provide written description support for transmitting a data stream ***without requiring disassociation*** of the recipient from the MAC and PHY interfaces. (EX1002 ¶226.)

Limitations related to dissociation appeared in the '564 patent family for the first time in the August 11, 2023 patent application that would later issue as the '337 patent. As discussed above, the specification does not disclose requesting or creating associations between recipients and MAC and PHY interfaces in the first place. It certainly does not teach the additional limitation of transmitting information without requiring disassociation. (EX1002 ¶227.)

Patent Owner touts "without requiring disassociation" as a novel feature in its complaint in the district court case. EX1018 ¶ 34 ("Prior to the XiFi Patents,… any switch to another band required that the association between a transmitter and a receiver on one band be broken before a new association on a different band could be made, i.e., 'break before make.' The inventions of the XiFi Patents, in contrast, allow simultaneous associations… , i.e., 'make without break.'"). But nowhere in the '564 specification is this concept mentioned or even suggested. (EX1002 ¶228.)

Further, this is a negative limitation (operation ***without*** requiring disassociation). Because the '564 specification does not even mention this concept, it also does not describe any reason to exclude operation with disassociation. *Novartis Pharms. Corp. v. Accord Healthcare, Inc.*, 38 F.4th 1013, 1017 (Fed. Cir. 2022) ("While a negative limitation need not be recited in the specification *in haec verba*, there generally must be something in the specification that conveys to a skilled artisan that the inventor intended the exclusion, such as a discussion of disadvantages or alternatives… [T]he written description requirement cannot be met through simple disregard of the presence or absence of a limitation.")

A POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device transmitting a data stream without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces. (EX1002 ¶229-230.)

(g) "do not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability" (Claims 1, 15, 18, 20, 22)

Nowhere in the ’564 specification, nor any of its priority disclosures, are there descriptions about not preventing multiple devices from using portions of the remaining bandwidth availability during operation. The patent does not disclose frequency allocation at all, much less frequency allocation in a manner that would “not prevent” other networking devices from utilizing the remaining portion of the bandwidth availability. A POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device wherein, during use, the device does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability. (EX1002 ¶¶231-232.)

This limitation first appeared in the ’564 patent family during the prosecution of the ’591 patent in an August 8, 2023 amendment. Applicant claimed that there is support at page 6 of the ’216 provisional that discusses sharing physical resources in the Figure 1 example, and thus “an access point can simultaneously transmit to two clients” [p.15-16]. Applicant goes on to suggest that the ’216 provisional describes that two clients can transmit to the access point at the same time. But this argument stretched the ’216 disclosure far beyond what a POSITA would have understood it to disclose. (EX1002 ¶233.)

First, Figure 1 of the '216 provisional describes sharing resources for a downlink transmission and does not support "two clients transmit[ing] to the access point at the same time." (EX1002 ¶234.)

Second, Figure 1 and its associated description merely discuss how a single access point might allocate its resources according to the bandwidth requirements of multiple ***applications***. Sharing transceiver resources to transmit data streams from multiple applications does not inherently disclose multiple recipients because a single recipient can receive streams from multiple applications at once. (EX1002 ¶235.) There is no disclosure of multiple clients, much less multiple clients simultaneously using portions of bandwidth while not preventing other devices from using the remaining bandwidth. (EX1002 ¶235.)

Third, the '216 provisional never discusses the concept of "remaining portions" of bandwidth availability, nor does it discuss non-prevention of other devices from using these remaining portions. (EX1002 ¶236.)

Fourth, the mere mention of resource sharing does not inherently disclose a non-prevention mechanism, especially when considering the complex technical requirements needed to ensure that multiple devices can simultaneously utilize different portions of the same bandwidth without interference or resource contention. (EX1002 ¶237.)

Fifth, the ’216 provisional fails to disclose how the system would identify and manage which portions of bandwidth are “remaining” and available for other devices while certain portions are already being utilized. (EX1002 ¶238.)

Sixth, this is a negative limitation. Nowhere in the ’564 specification does it describe any reason to exclude preventing any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability. (EX1002 ¶239.) *Novartis*, 38 F.4th at 1017.

D. Ground 4: Indefiniteness

A patent claim is “invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, ‘fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.’” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1369-70 (Fed. Cir. 2014) (citing *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014)). Merely being able to ascribe “some meaning” to a patent’s claims is insufficient to satisfy the definiteness requirement of 35 U.S.C. § 112. *Nautilus*, 572 U.S. at 911 (2014).

1. “[partially/substantially] simultaneously” (Claims 15, 18-29)

The terms “partially simultaneously” and “substantially simultaneously” are indefinite because they are terms of degree, and the patent fails to provide sufficient guidance for determining their scope.[3] When a claim uses a term of degree, the intrinsic record must provide "objective boundaries" sufficient to allow POSITAs to discern the scope of the claim with "reasonable certainty." *Interval Licensing*, 766 F.3d at 1370-74; *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1364 (Fed. Cir. 2018) (Federal Circuit "case law is clear that the objective boundaries requirement applies to terms of degree."). The claims here are particularly problematic, because they involves a "term of degree"-upon a-"term of degree," compounding uncertainty to a POSITA. (EX1002 ¶240.)

Here, nothing in the claims or intrinsic record provide guidance regarding what degree of simultaneity qualifies as "partially" simultaneous or "substantially" simultaneous. For example, it is not clear whether transmission or receipt of a data stream within one microsecond, millisecond, second, or minute is within the scope of "partially" simultaneous or "substantially" simultaneous. (EX1002 ¶241-242.) Because the '564 patent recites both "partially" and "substantially" simultaneously, there must be a difference between the two terms. But the specification fails to provide any objective guidance to understand what would be "partially"

[3] This is consistent with Ground 1 because Chincholi discloses simultaneous transmission and receipt, thus meeting any degree of "partially" or "substantially" simultaneous.

simultaneous compared to "substantially" simultaneous. *See In re Taasera Licensing LLC, Pat. Litig.*, No. 22-MD-03042, 2023 WL 8628323, at *20 (E.D. Tex. Dec. 13, 2023).

2. "better than" (Claims 1, 16)

The term "better than" is indefinite because it is indeterminable and subjective, and thus fails to inform a POSITA as to the scope of the invention. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350-51 (Fed. Cir. 2005) (Terms that depend "on the unpredictable vagaries of any one person's opinion" are indefinite.). (EX1002 ¶243.)

Exemplary claim 1 recites that the processing interface is configured to:

> ***evaluate the data transfer characteristics*** of the given resources of both the first and second identified bandwidth portions… if the data transfer characteristics of the first identified bandwidth portion are ***better than*** those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient… using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication…[, and] if the data transfer characteristics of the second identified bandwidth portion are ***better than*** those of the first identified bandwidth portion… using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication.

According to this claim language, the processing interface must evaluate the data transfer characteristics of the first and second bandwidth portions, determine which one is better, and transmit using a subset of frequencies depending on that determination. But the claim does not explain what "better" means, or how the processing interface is supposed to make that determination. (EX1002 ¶244, 247.)

The '564 specification fares no better. As discussed above, there is no description whatsoever about data transfer characteristics, let alone how to evaluate them and determine whether a bandwidth portion is "better than" another. (EX1002 ¶245.) The specification does not even do the bare minimum of repeating the claim language.

A POSITA would understand that there are many different metrics for evaluating data transfer characteristics. (EX1002 ¶246.) For example, different data links may have varying levels of bandwidth, received signal strength, frame packet error rate, frequency offset, and latency. A POSITA would not be able to evaluate which link is better without knowing which metric to use for that determination. (EX1002 ¶246.) For example, there could be situations where link A may indicate a stronger received signal than link B, but link B indicates a lower frame packet error rate. (EX1002 ¶¶246.) Neither the Challenged Claims nor the specification provide any guidance as to which link in this situation would be "better."[4] This ambiguity renders Claims 1 and 16 indefinite.

3. Claim 27

Claim 27 is indefinite because it incorrectly refers to simultaneous receipt from the ***wrong*** transceivers. (EX1002 ¶248.)

Claim 27 is a dependent claim to Claim 26, which is a dependent claim to Claim 22. Claim 22 recites the wireless networking device uses ***the first wireless transceiver*** to transmit the first data stream, and ***the second transceiver*** to receive a second data stream. Consistent with Claim 22, Claim 26 recites a wireless networking device wherein the processing interface is configured "to cause the ***second and third wireless transceivers*** to at least partially simultaneously receive a second data stream from the recipient." Claim 27, however, recites "the second data stream is substantially simultaneously received by both of the ***first and second wireless transceivers***."

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[4] This is consistent with Ground 1 because Choi teaches alternative implementations involving selection of a bandwidth channel based on any one of a number of channel metrics. While the claim scope is uncertain, Choi renders it obvious under any one of the various interpretations.

In short, Claim 27 is indefinite because it requires the ***first*** and second transceivers to simultaneously receive the second data stream, when it was previously established that this was done by the second and ***third*** transceivers. (EX1002 ¶¶249-250.) Indeed, the first transceiver is required to transmit the first data stream, not receive the second data stream.[5] Thus, Claim 27 is internally inconsistent and indefinite. *Competitive Techs., Inc. v. Fujitsu Ltd.*, 185 F. App'x 958, 965–66 (Fed. Cir. 2006) ("Because the 'address means' limitation of claim 5 requires ISA structures, and the 'sustain means' limitation of that same claim excludes ISA structures, a person of ordinary skill in the art would be unable to determine the scope of the claims. They are internally inconsistent."); *see also Fargo Elecs. Inc. v. Iris, Ltd.*, 287 F. App'x 96, 100 (Fed. Cir. 2008)).

VIII. CONCLUSION

For at least the foregoing reasons, this Petition should be instituted.

Date: July 21, 2025

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[5] This is consistent with Petitioner's obviousness ground for Claim 27 because Chincholi discloses its OMMA layer enables aggregation of the available bandwidth on any two separate transceivers to facilitate simultaneous receipt of an IP flow.

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CERTIFICATE OF COMPLIANCE

Under the provisions of 37 C.F.R. § 42.24, the undersigned hereby certifies that the word count for the foregoing Petition for post grant review (excluding the table of contents, table of authorities, mandatory notices, certificate of service or word count, and appendix of exhibits or claim listing) totals 18,699 words, which is within the word limit allowed under 37 C.F.R. § 42.24(a)(ii).

Date: July 21, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e), 42.205, the undersigned hereby certifies service on the Patent Owner of a copy of this Petition and its respective exhibits at the official correspondence address for the attorneys of record for the ’564 patent as shown in USPTO PAIR via FedEx:

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