UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., and

SAMSUNG ELECTRONICS AMERICA, INC.,

Petitioners,

v.

XIFI NETWORKS R&D, INC.,

Patent Owner.

Case IPR2025-01204

Patent 11,818,591

PATENT OWNER'S RESPONSE
UNDER 37 C.F.R. § 42.120

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EX2003	Plaintiff's First Amended Complaint, *XiFi Networks R&D, Inc. v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.*, No. 2:24-cv-01057-JRG, Dkt. 13 (E.D. Tex. Mar. 11, 2025).
EX2004	Defendants' Answer and Affirmative Defenses to Plaintiff's First Amended Complaint, *XiFi Networks R&D, Inc. v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.*, No. 2:24-cv-01057-JRG, Dkt. 31 (E.D. Tex. Jun. 9, 2025).
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I. SUMMARY OF ARGUMENT IN LIGHT OF POST-INSTITUTION DEVELOPMENTS

Pursuant to 37 C.F.R. § 42.120, Patent Owner XiFi Networks R&D, Inc. ("XiFi") submits this Response to the Petition for *Inter Partes* Review ("IPR") of U.S. Patent No. Patent No. 11,818,591 (the "'591 patent"). Paper 3 ("Petition"). Petitioners Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, "Petitioners") challenge the validity of claims 1-26 of the '591 patent on the grounds that these claims are obvious, in violation of 35 U.S.C. § 103, in light of a combination consisting of: International Application WO 2013/126859 ("Chincholi") (EX1005) and U.S. Patent App. Pub. No. 2011/0320625 ("Riggert") (EX1006), collectively, "Ground 1."

Patent Owner filed a Preliminary Patent Owner Response ("POPR"), which included the argument, among others, that Petitioners' evidence failed to show the claimed "'virtual' MAC interface, properly understood.'" Paper 9. This body nonetheless instituted trial via an order that did not contain reasoning. Paper 12.

Since institution, the record has developed in multiple ways that weigh in favor of denying the Petition. Importantly, in the co-pending district court action, Petitioners have advanced six narrowing constructions, contrary to the positions they took in the Petition, which were based on a broader plain-and-ordinary-meaning analysis. For this procedural reason, the Petition should be terminated under 37 C.F.R. § 42.104(b)(3) and the precedential decision *Revvo Techs., Inc. v. Cerebrum*

Sensor Techs., Inc., IPR2025-00632, Paper 20 at 5 (November 3, 2025) (precedential). *See* Parts III & V.

Moreover, as to the merits, several of Petitioners' newfound claim construction positions in the district court contradict Petitioners' prior arguments about the scope of the disclosure of their asserted references and how a POSITA would view them—and demonstrate that the prior art does not cover the claims of the '591 patent. *See* Section VI. For example, Petitioners' construction for "virtual MAC interface," an agreed construction that the district court is almost certain to enter, is consistent with the arguments Patent Owner made in its POPR and shows that Chincholi—the only reference the Petition asserts contains a virtual MAC interface—does not in fact disclose one. *See* Section VI.A.1. The same is true for agreed constructions for "in a manner transparent…" and "information regarding bandwidth availabilities…" *See* Sections VI.A.2 & 3. For these reasons, the Petition should be denied on the merits.

Additionally, the parties' agreed district court constructions demonstrate Petitioners' acknowledgment that a POSITA in possession of the '591 patent would understand it in the context of a network protocol stack containing layers with specific functions and rules for how layers may communicate with each other. This Patent Owner Response addresses how a POSITA would understand the claims of the '591 patent in that context, including why a POSITA would understand claim

terms including "virtual MAC interface," "in a manner transparent to…" and "information regarding bandwidth availabilities"[1] in a way that would preclude viewing Chincholi as disclosing those claim limitations. *See* Sections VI.A.1.c; VI.A.2.b; VI.A.3.

For the same reasons, the Petition's proposed combination of Chincholi with secondary reference Riggert fails to account for the impact of accepted notions of a protocol stack on the motivation to combine. In looking for elements missing from Chincholi, Petitioners and their expert, Kevin Almeroth Ph.D., fail to address why a POSITA would look to a reference addressing a different layer in the protocol stack from the one in which the missing element resides, and demonstrates improper hindsight bias. Ultimately, as discussed below and confirmed in the Declaration of Robert Akl, D.Sc.—who worked as a POSITA in the field at the time of the inventions—the combinations asserted in the Petition do not disclose all of the limitations of the challenged claims, nor does the Petition account for technical details of the secondary reference that make combination impractical without

[1] This POR addresses the "bandwidth availabilities" term for the first time, including through offering a construction that explains why the prosecution history demands an understanding of the term that distinguishes it from Chincholi. *See* Sections III.3, VI.A.2.

extensive modification. Accordingly, Patent Owner requests that the Board confirm the patentability of the challenged claims.

II. THE '591 PATENT FOCUSES UPON THE LOWER LAYERS OF A NETWORK PROTOCOL STACK

The '591 patent was filed as U.S. Pat. App. No. 17/468,509 on September 7, 2021 and claims priority to provisional applications nos. 61/897,216 and 61/897,219, both filed on October 30, 2013.

At the time of the inventions of the '591 patent, a POSITA would have understood wireless networking devices in terms of a "protocol stack" or "layer stack," such as the Open Systems Interconnection ("OSI") model. *See* EX2020 at 2 (including agreed constructions for "virtual MAC interface" including "higher protocol stack layers" and "in a manner transparent…" including "any protocol stack layer of the wireless networking device"); *see also* EX2017 (Akl), ¶46 ("[A]t the time of its priority date, a POSITA would understand that wireless networking devices were conceptualized as a layer stack.").

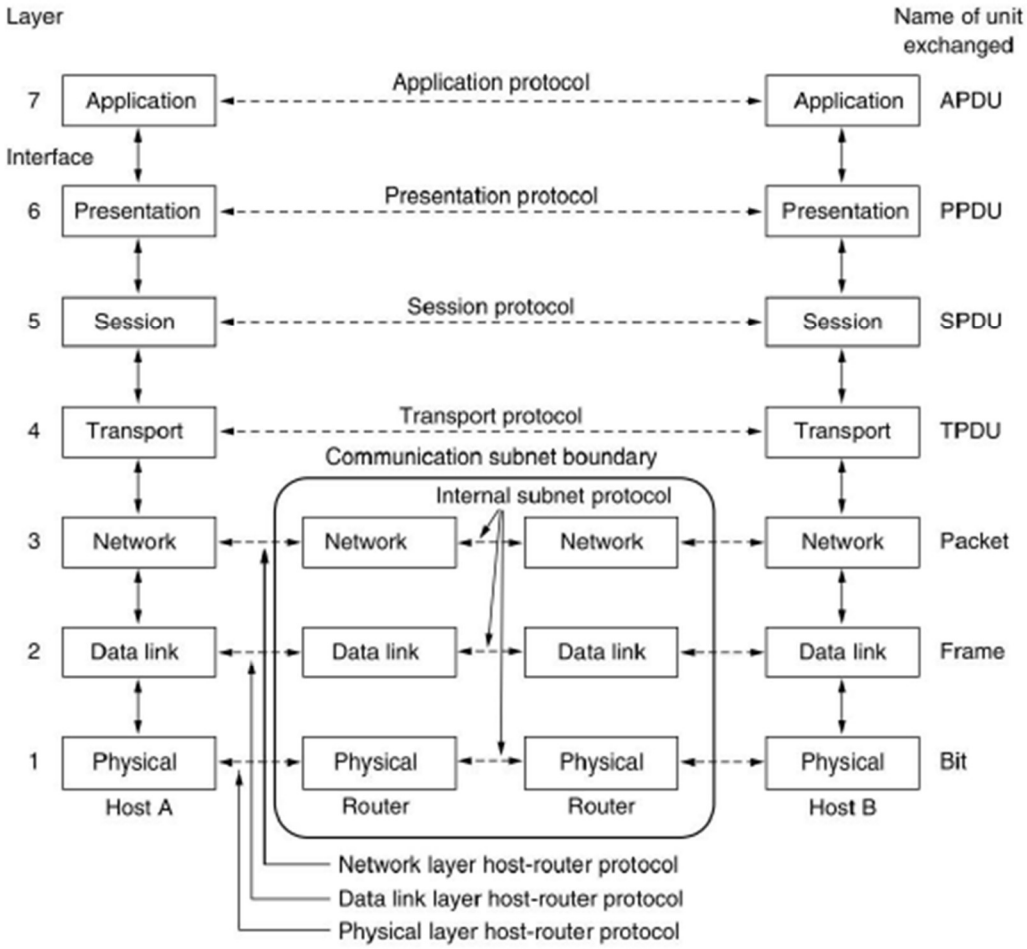


Figure 1-20. The OSI reference model.

EX2018 (Tanenbaum) at 42.

In such layer models, each layer serves a purpose. The first, or bottommost, layer is the physical layer, whose function is to govern the transmission of raw bits of data over a communication channel. *See* EX2018 (Tanenbaum) at 43; EX2017 (Akl), ¶48. Immediately above the physical layer is the data link layer, whose function is to transform the raw data as transmitted by the physical layer into data frames that appear to the next higher layer (the network layer) as error-free. *Id.* A

POSITA would understand the network layer is responsible for routing decisions across the network, and works to avoid bottlenecks and congestion. *See* EX2018 (Tanenbaum) at 43-44; EX2017 (Akl), ¶48.

A POSITA would understand that the data link layer conventionally includes two distinct sublayers. The upper sublayer, closest to the network layer, is typically referred to as the Logic Link Control ("LLC") sublayer. The lower sublayer, closest to the physical layer, is known as the medium access control ("MAC") sublayer. *See* EX2010 (Tanenbaum) at 300; EX2017 (Akl), ¶49. The physical layer, as well as the data link layer and its two conventional sublayers, is depicted below:

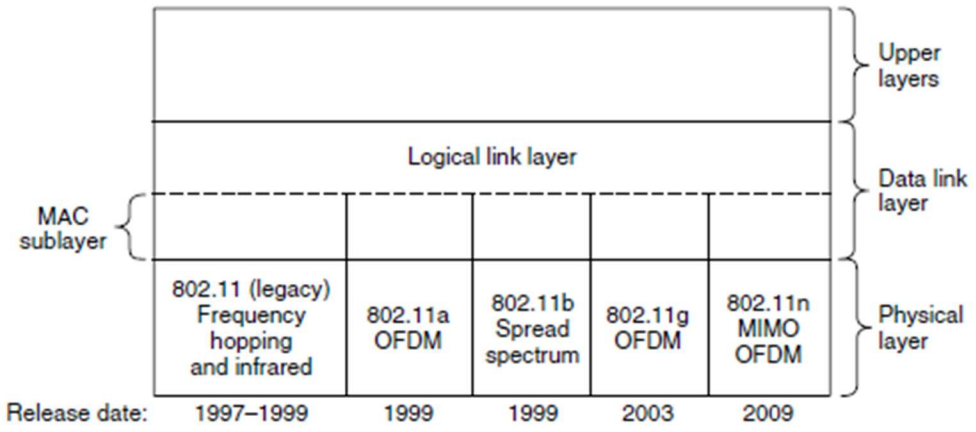


Figure 4-24. Part of the 802.11 protocol stack.

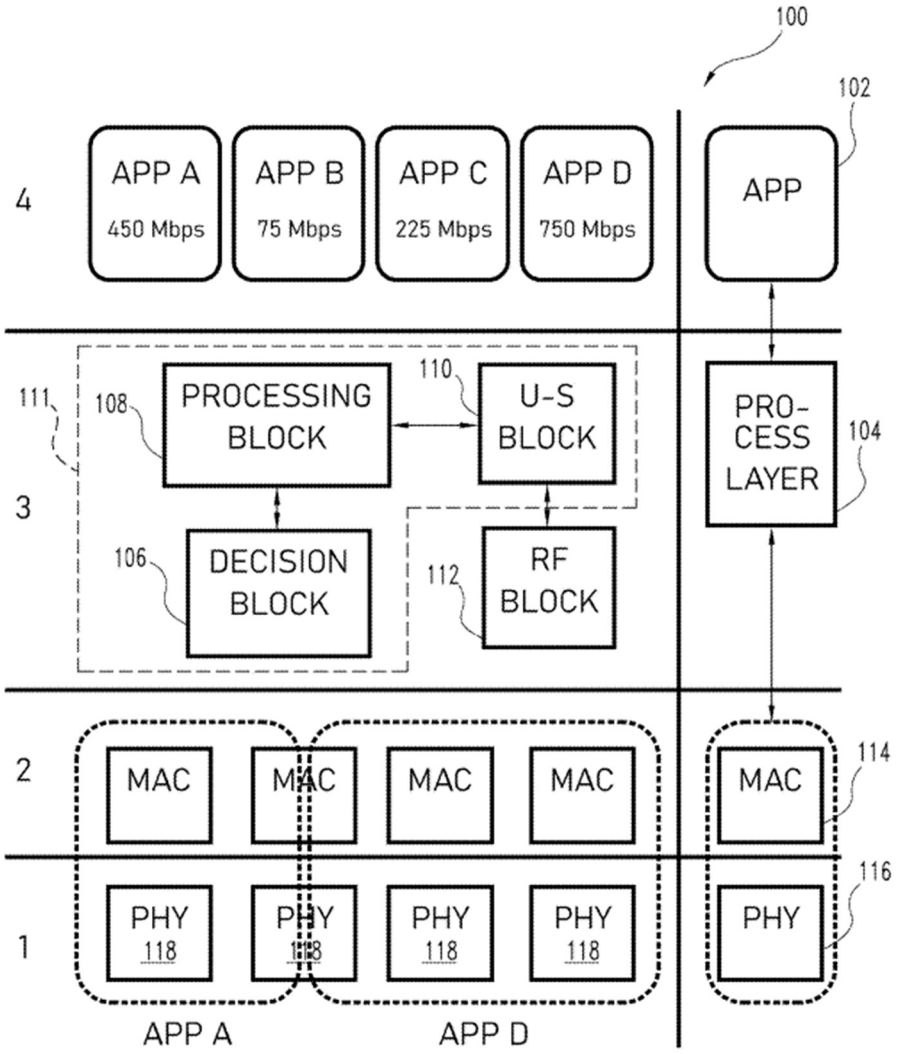
EX2010 (Tanenbaum) at 300.

These layer models "***permit[] direct interaction only between adjacent layers***." EX2019 (Basic Reference Model), § 7.5.4.2.2; EX2017 (Akl), ¶50. Because of this rule, "the network-entity cannot interact directly with the physical-entity,"

and "interaction is thus described through the Data Link Layer which intervenes transparently to convey the interaction between the Network Layer and the Physical Layer." *Id.* The MAC sublayer, likewise, would communicate with the Network Layer, via the logical link sublayer. EX2017 (Akl), ¶50 (citing EX2018 (Tanenbaum) at 41-45).

The title of the '591 patent is "Method and Apparatus for Processing Bandwidth Intensive Data Streams Using Virtual Media Access Control and Physical Layers." Consistent with that title, the inventions claimed in the '591 patent provide improved intelligent resource allocation and bandwidth utilization within wireless network systems by using virtual MAC and PHY layer interfaces. EX1001, Abstract, 2:32-39, 2:44-54, 4:14-5:13, Figs. 1-3. Key aspects of the invention of the '591 patent include the use of virtual MAC and PHY interfaces to facilitate transparent bandwidth decision making, obscuring the addresses and operation of the actual MAC and PHY layers to the upper layers, as well as allowing a single transceiver's bandwidth to be shared among two separate users simultaneously. EX1001, Abstract, Fig. 1.

An illustrative embodiment of the architecture claimed in the '591 patent is depicted in Figure 1, which shows a wireless networking system 100:



EX1001, Fig. 1.

An exemplary virtual MAC layer, as referenced in the title, is depicted as element 111. *Id.* at 3:33-34. The virtual PHY layer referenced in the title is depicted as an RF block 112. *Id.* at 3:35. Figure 1 also shows that the system includes various applications (102) with respective data needs. *Id.* at 3:3-5. It also includes a plurality of wireless transceivers which have associated pairs of actual MAC and actual PHY

components (118). *Id.* at 3:45-51. The actual MAC/PHY pairs recited by the claims send feedback information to an individual virtual PHY interface. *Id.* at 12:7-13.

The actual PHY interfaces are located in the physical layer; the actual MAC interfaces are located in the MAC sublayer of the data link layer, and the processing interface and its components are also located in the MAC sublayer. EX1001, 2:40-49 ("A virtual MAC layer and a virtual PHY layer are defined between the processing layer and the actual MAC and PHY layers."); 5:54-57 ("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…"); 3:42-51 ("one or more transceiver resources" are located in the "actual physical (PHY) layer."). Figure 1, depicted above, shows this layered relationship, where the transceiver resources 118 are shown within the actual PHY interfaces 116 on the lowest (physical) layer, with the actual MAC interfaces 114 above, and the process layer 104 containing the virtual MAC layer 111 and the virtual PHY layer 112 above that. *Id.*, Fig. 1 & 3:33-51.

The virtual MAC and virtual PHY layers are also known as interfaces. The virtual MAC interface, with bandwidth availability feedback from the virtual PHY interface, manages signals from the applications regarding sending or receiving data, and determines which resources in the wireless transceiver(s) will be used to respond to the applications. *Id.* at 4:14-44. The virtual MAC interface, with feedback from

the virtual PHY interfaces, provides the point of contact in these communications between the applications and the transceiver(s). *Id.*

The Petition challenges all 26 claims of the '591 patent: 1 independent claim (claim 1) and 25 dependent claims (claims 2-26).

III. THE BOARD SHOULD CONSTRUE THE CLAIMS CONSISTENT WITH THE PARTIES' DISPOSITIVE DISTRICT COURT CLAIM CONSTRUCTION POSITIONS AND THE INTRINSIC RECORD

Petitioners do not request construction of any claim terms from the '591 patent. Pet. at 9. In the co-pending district court proceedings, however, Petitioners and Patent Owner have both taken positions regarding claim construction, including reaching agreement regarding several terms that impact this Petition. *See* EX2020.[2] Consistent with its positions in the district court, Patent Owner offers the following proposed constructions that will impact the disposition of this matter:

[2] The parties agreed to plain and ordinary meaning for the terms "do[es] not prevent [other] / [any] wireless networking device[s] [devices] from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilit[y]/[ies]," and "without requiring [the] disassociation of the recipient." EX2020 at 2, 4. Because these agreed constructions do not impact Patent Owner's arguments here, Patent Owner does not request any constructions of those terms.

1. "virtual MAC interface"

In the district court, the parties agreed to construe "virtual MAC interface" as: "a software- or logical-based interface that is separately addressable from the recited actual MAC interfaces and that obscures the recited actual MAC interfaces from higher protocol stack layers." EX2020 at 2.

Several aspects of the parties' agreed district court construction are pertinent here. First, a "virtual MAC interface" must be "virtual," or "software- or logical-based." This is consistent with dictionary definitions from the time of the invention of the '591 patent. *See* EX2009 (2012 American Heritage Dictionary) at 906 ("virtual" means "[c]reated, simulated, or carried on by means of a computer or computer network" and "[e]xisting … not in actual fact or form"); *see also* EX2017 (Akl), ¶¶52, 55.

Second, a "virtual MAC interface" uses an address separate from the actual MAC interfaces. An "actual" MAC address is permanent and installed by the manufacturer, i.e., physical. *See* EX2017 (Akl), ¶53 (quoting EX2010 (Tanenbaum) at 339 ("MAC addresses are installed by the manufacturer and guaranteed to be unique worldwide….")). In contrast, a "virtual" MAC address is software- or logical-based. EX2017 (Akl), ¶55. Thus, a "virtual MAC interface" "is separately addressable from the recited actual MAC interfaces." *Id.*

Third, the parties agree that the virtual MAC interface "obscures the recited actual MAC interfaces from higher protocol stack layers." EX2020 at 2; *see also* EX2017 (Akl), ¶55 (by using a virtual MAC address, the virtual MAC interface "obscures the recited actual MAC interfaces from higher protocol stack layers"); EX2011 (U.S. Patent No. 8,078,208) at 6:39-40 ("A single virtual MAC address 311 hides the MAC addresses of the several NICs … ."); *id.* at Abstract (invention contains "a virtual layer that hides the multiple physical network interfaces from higher layers of a node's network protocol stack"). Higher layers are aware only of the virtual MAC address because packets are passed up the protocol stack from the virtual MAC interface with the virtual MAC address in the payload. EX2017 (Akl), ¶¶54-55. This is also consistent with applicant's statements during prosecution locating the virtual MAC interface, as a component of the processing interface, in the MAC sublayer of the data link layer. EX2023 ('105 Patent FH) at 21, 1/11/2024 Second Preliminary Amendment and Applicant Remarks (applicant remarks distinguishing prior art because bandwidth decisions were made "at a layer above the MAC/PHY layers" and that the patent required "all bandwidth allocation decisions be made in a manner transparent to the layers above the MAC/PHY interfaces"); EX2017 (Akl), ¶56; *see also* Section III.3 (explaining why processing interface is located in the MAC sublayer of the data link layer including with reference to bandwidth allocation decisions taking place "lower than the logical link

layer"). Importantly, the fact that the actual MAC addresses are obscured to higher layers means that the Petition fails, since Chincholi's OMMA does not obscure actual MAC addresses. *See infra*, Section VI.A.1.a.

2. "in a manner transparent to any layer of the wireless networking device above the processing interface"

In the district court, the parties agreed to a construction for "in a manner transparent to any layer of the wireless networking device above the processing interface" of "in a manner where any protocol stack layer of the wireless networking device above the processing interface is unaware of the operation of the processing interface." EX2020 at 2.

This agreed construction provides a useful framework for understanding the required relationship between the claimed layers in the protocol stack. First, it emphasizes that a POSITA would view the claimed wireless networking device in the context of a layer stack. This is consistent with statements applicant made during prosecution that claimed functions were "transparent to the layers of the wireless networking device above its MAC/PHY interfaces." EX2023 ('105 Patent FH) at 34, 2/5/2024 Third Preliminary Amendment and Applicant Remarks; EX2017 (Akl), ¶59; *see also* Section III.3 (explaining why processing interface is located in the MAC sublayer of the data link layer including with reference to functions about the MAC/PHY layers being transparent). Second, it affirms that a POSITA would

understand the term "transparent" to indicate that layers above a particular place in the layer stack (here, the processing interface) are unaware of the functions below. *See* EX1001, Abstract; EX2017 (Akl), ¶58.

3. "information regarding the bandwidth availabilities of the first, second, and third wireless transceivers"

In the district court, the parties put forward separate proposals for the construction of "information regarding the bandwidth availabilities of the first, second, and third wireless transceivers." EX2020 at 5:

Patent Owner Proposed Construction	Petitioners Proposed Construction
"information regarding **current** bandwidth availabilities of the recited wireless transceivers, that can be obtained directly from at least the recited actual PHY interface(s) and the recited actual MAC interface(s)"	"information regarding **current** bandwidth availabilities of each of the wireless transceivers"

Thus, the parties agree that the "information" relates to "current" bandwidth availability. *See* EX2021 (Mahon Decl.), ¶73 (Petitioners' expert in the district court noting agreement between the parties as to "current" bandwidth availabilities); EX2017 (Akl), ¶61. This is consistent with the teachings of the specification. *See, e.g.*, EX1001, 4:52-50 ("determin[ing] device availability" "involves a determination at the PHY layer as to the ***actual availability*** of the initially assigned transceiver resources"); *see also id.*, 3:24-32; 4:10-13; 4:38-48; 8:11-14; EX2017 (Akl), ¶61. This is also consistent with the claim 1's recitation of bandwidth portions

that are "available for communication." *See* EX1001, 12:25-31; EX2017 (Akl), ¶61.[3] Applying this agreed portion of the construction, the Petition fails to demonstrate that Chincholi discloses feeding back bandwidth availabilities, since it discloses instead historical statistics. *See infra*, Section VI.A.2.a.

Patent Owner also proposes, both here and in the district court, that the information regarding bandwidth availabilities, in addition to being "current," must have the capacity to "be obtained directly from at least the recited actual PHY interface(s) and the recited actual MAC interface(s)." EX2020 at 5. This construction is consistent with the intrinsic record and, when applied, provides further reasons why the Petition fails. *See infra*, Section VI.A.2.b.

The specification demonstrates direct communication between the actual PHY interfaces and actual MAC interfaces with the virtual PHY interface of the

[3] This is further consistent with the way applicant presented claims of related patents during prosecution, highlighting that availabilities were evaluated on a per-transmission-opportunity basis. *See, e.g.*, EX2024 ('337 Patent FH) at 12, 9/18/2023 amendment (bandwidth availability of each transceiver evaluated for each transmission opportunity); EX2025 ('414 patent FH) at 11, 9/18/023 amendment (feedback provided as of each transmission opportunity); EX2017 (Akl), ¶61.

processing interface. Before arriving at the virtual PHY interface, "information regarding the bandwidth availabilities" is collected in the actual PHY interfaces. *See* EX1001, 3:42-51 ("one or more transceiver resources" are located in the "actual physical (PHY) layer"); 11:64-12:6 (wireless transceivers associated with the actual PHY interfaces). The information is then communicated to the processing interface, via a virtual PHY interface and then to the virtual MAC interface. *See id.* 4:52-56 ("The virtual MAC **302** interfaces with the virtual PHY **304** to determine device availability. This further involves a determination at the PHY layer as to the actual availability of the initially assigned transceiver resources."); 12:7-14 ("wherein the processing interface comprises (i) at least one virtual MAC interface and (ii) first, second, and third virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first, second, and third wireless transceivers back to the at least one virtual MAC interface"); *see also* EX1017 (Akl), ¶61. A POSITA would understand the wireless transceivers to be associated with the actual PHY interfaces in the PHY layer, and the actual MAC interfaces to be in the MAC sublayer of the data link layer. *See supra*, Part II; EX1001, 3:33-51; EX2017 (Akl), ¶64.

These steps are exemplified by Figure 4 of the common specification, which shows a direct communication from the actual PHY interfaces (shown as Devices 1 and 2) to the virtual PHY interface:

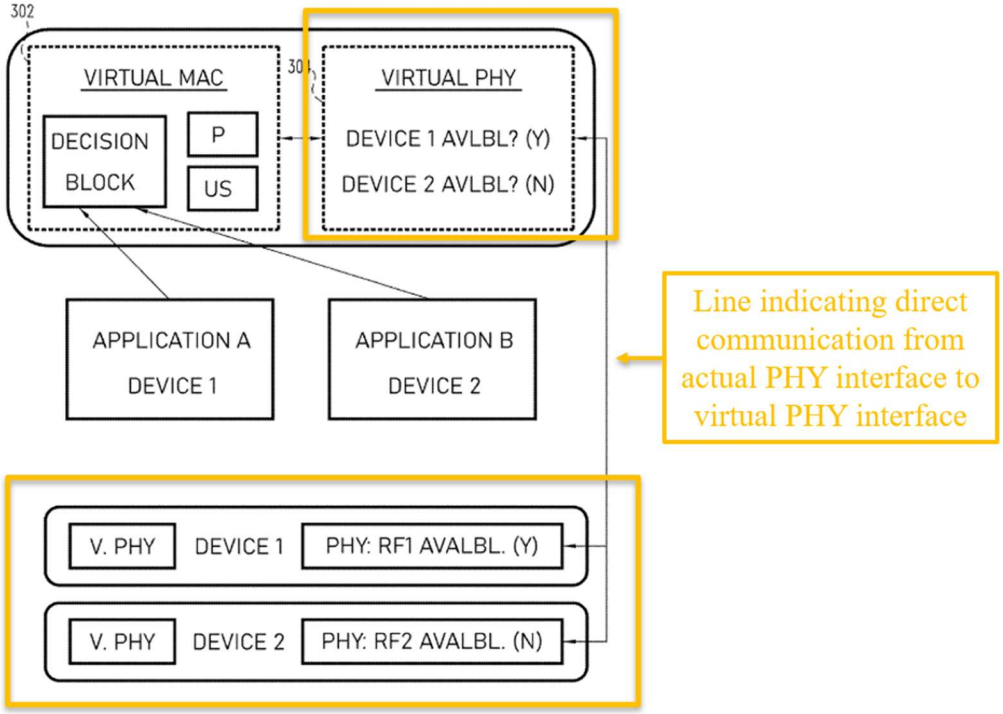


Fig. 4

Id., Fig. 4 (annotations added); *see also id.* at 4:45-64; EX2017 (Akl), ¶65. Because the specification is clear that the source of the information about the bandwidth availabilities is the physical layer, a POSITA would understand that the virtual PHY interface could be no higher in the layer stack than the adjacent data link layer. *See* EX1001, 4:54-56 ("This further involves a determination [of device availability] at the PHY layer as to the actual availability of the initially assigned transceiver resource."); EX2019 (Basic Reference Model), § 7.5.4.2.2; EX2017 (Akl), ¶65.

The file histories of the '591 patent and related patents histories repeatedly explain that the processing layer is adjacent to the actual physical layer, and that it is lower than the logical link layer—therefore in the MAC layer of the data link

layer—enabling the ability for the bandwidth availability information to be directly communicated from either or both the actual PHY interfaces and actual MAC interfaces to the processing layer. These file history statements are important to demonstrating the scope of the claims and the way in which a POSITA would understand them. *See, e.g.*, *Fenner Invs., Ltd. v. Cellco P'ship*, 778 F.3d 1320, 1323 (Fed. Cir. 2015) ("Any explanation, elaboration, or qualification presented by the inventor during patent examination is relevant, for the role of claim construction is to 'capture the scope of the actual invention' that is disclosed, described, and patented." (quoting *Retractable Techs., Inc. v. Becton, Dickinson & Co.,* 653 F.3d 1296, 1305 (Fed. Cir. 2011))); *Microsoft Corp. v. Multi-Tech. Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004) (holding statements made during prosecution relevant to all related patents). Indeed, "prosecution history is strong evidence of what a skilled artisan 'would have understood disputed claim language to mean.'" *Kaken Pharm. Co. v. Iancu*, 952 F.3d 1346, 1353 (Fed. Cir. 2020).

"Particularly useful are 'express representations made by or on behalf of the applicant to the examiner to induce a patent grant,' which include 'arguments made to convince the examiner that the claimed invention meets the statutory requirements of novelty, utility, and nonobviousness.'" *Kaken*, 952 F.3d at 1353 (quoting *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452 (Fed. Cir. 1985)). Exactly this happened during the prosecution of the '591 patent, which is the eldest asserted

patent and an ancestor the rest of the family. There, the claims issued after the examiner's acknowledgement that communication of bandwidth availabilities from the wireless transceiver circuitry (physical layer) to the distributed processing logic (data link layer) was not disclosed in the prior art. In the February 8, 2023 Office Action, the examiner noted the prior art did "not disclose 'the indicator of wireless transceiver availability is fed back from the wireless transceiver circuitry to the distributed processing logic.'" EX1004 ('591 Patent FH) at 663, 2/8/2023 Office Action. A POSITA would understand that this language references a communication from layer 1 (the Physical Layer) to layer 2 (the Data Link Layer). EX2017 (Akl), ¶66.

In response, applicant noted that this non-disclosed element was present in the claim term "wherein ... during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first, second, and third wireless transceivers back to the at least one virtual MAC interface." EX1004 ('591 Patent FH) at 554, 8/8/2023 Amendments and Response to Office Action; *see also id.* at 546-547 (language of referenced claim 22). The patent was then allowed, and the claims issued. *Id.* at 57-59, 9/9/2023 Notice of Allowability (statement of reasons for allowance of claim 22). Confirming the importance of this exchange to the allowance of the claims and to the meaning of the claim term, applicant also referenced this reason for allowance in the file histories of related patents, after

which the patent eventually issued with the "bandwidth availabilities" claim term. *See, e.g.*, EX2023 ('105 Patent FH) at 10-11, 12/8/2023 Preliminary Amendment and Applicant Remarks; EX1017 (Akl), ¶67.

Given these statements in the '591 Patent file history (and where applicant incorporated these statements into descendant patents' prosecutions), a POSITA would understand that the wireless transceiver bandwidth availability information must be able to be directly communicated to the processing interface, which must be in the same layer or an adjacent layer as the wireless transceivers. EX2017 (Akl), ¶¶66-67; *Kaken*, 952 F.3d at 1353; *Fenner*, 778 F.3d at 1323.

Further applicant statements in a related patent's file history make even clearer that a POSITA would understand that the bandwidth availabilities information must have the capacity to be provided directly by both the actual MAC interfaces and the actual PHY interfaces:

> The dashed line box surrounding two boxes labelled "MAC" 114 and "PHY" 116 in Figure 1 are schematic representations of the actual MAC and PHY layers of a wireless networking device that includes at least two wireless transceivers. A two-way arrow connects the dashed box with a "process layer" 104. This discloses that ***each actual MAC and each actual PHY in a particular wireless networking device communicates directly with the processing layer to allow it to receive information regarding bandwidth availabilities from the wireless transceiver*** associated with each MAC/PHY pair.

EX2026 ('756 Patent FH) at 8, 8/15/2024 Preliminary Amendment and Applicant Remarks; EX2017 (Akl), ¶68.

This statement by applicant demonstrates that each actual PHY interface and each actual MAC interface has the ability to communicate bandwidth availabilities directly to the processing interface. EX2017 (Akl), ¶68. Because the actual PHY interface can communicate directly with the processing interface, they must be in the same layer or in adjacent layers. *Id.* (citing EX2019 (Basic Reference Model), § 7.5.4.2.2). This is also consistent with direct communication from the actual MAC interface to the processing interface, because both are in the same layer. *Id.*

Moreover, additional statements by applicant across various file histories of related patents locate the processing interface in a layer adjacent to the physical layer—i.e., in the in the MAC sublayer of the data link layer—therefore enabling direct communication of bandwidth availabilities from the actual PHY interfaces and actual MAC interfaces to the processing interface, including when discussing the provision of information regarding bandwidth availabilities. *See* EX2027 ('177 Patent FH) at 10, 6/18/2024 Preliminary Amendment and Applicant Remarks (applicant remarks noting that the "***processing layer [operates] below the logical link layer [i.e., in the MAC sublayer of the Data Link layer] and provides information about the bandwidth availability of the transceivers associated with the actual PHY interfaces***"); EX2028 ('564 Patent FH) at 24, 6/18/2024 Amendments After Allowance (applicant remarks noting the claims recite a "'***resource monitoring interface' [that] operates in a processing layer below the***

logical link layer and provides information about the bandwidth availability of the transceivers associated with the actual PHY interfaces" to the virtual MAC interface); *id.* at 36, 6/19/2024 Amendments After Allowance (same); *see also* EX2017 (Akl), ¶69.

The '591 patent's file history, as well as additional file related file histories, includes consistent statements, distinguishing the location of the processing interface from the prior art because, previously, functions of the processing interface were performed "at a layer above the MAC/PHY layers"—indicating that the processing interface is at the MAC layer or lower. *See* EX2023 ('105 Patent FH) at 21, 1/11/2024 Second Preliminary Amendment and Applicant Remarks (applicant remarks distinguishing prior art because bandwidth decisions were made "at a layer above the MAC/PHY layers"); *id.* at 34, 2/5/2024 Third Preliminary Amendment and Applicant Remarks (applicant remarks regarding functions "transparent to the layers of the wireless networking device above its MAC/PHY interfaces"); EX2029 ('143 Patent FH) at 13, 1/9/2024 Third Preliminary Amendment and Applicant Remarks (applicant remarks distinguishing prior art because routing decisions in the prior art were made above processing layer, or "at a layer above the MAC/PHY layers"); *id.* at 24, 2/5/2024 Fourth Preliminary Amendment and Applicant Remarks (applicant remarks regarding functions "transparent to the layers of the wireless networking device above its MAC/PHY interfaces"); EX2026 ('756 Patent FH) at

18, 10/11/2024 Amendment and Response to Non-Final Office Action (applicant remarks distinguishing prior art because routing decisions in the prior art were made above processing layer, i.e., at a layer "above the data link layer"); *see also* EX2017 (Akl), ¶¶69-70.

Altogether, the specification, the '591 patent file history, and related patent file histories tell a consistent story: an important inventive aspect of the XiFi inventions is that the bandwidth availability information of the recited transceivers is collected in the actual PHY interfaces, where it can then be directly communicated to the processing interface components including the virtual PHY interface and virtual MAC interface because they are located in a layer adjacent to the actual PHY interfaces.

IV. LEVEL OF ORDINARY SKILL IN THE ART

For the purposes of these proceedings, Patent Owner does not dispute Petitioners' recitation of the ***level*** of skill for a person of ordinary skill in the art ("POSITA"). Patent Owner does not necessarily agree, however, with the statements made in the Petition and the accompanying declaration of Dr. Almeroth as to what a POSITA would have known and/or found "straightforward."

V. THE PETITION SHOULD BE TERMINATED FOR FAILURE TO COMPLY WITH 37 C.F.R. § 42.104(b)(3)

In the Petition, Petitioners argued that "[n]o express constructions are required to find the '591 patent claims invalid" and its expert "appl[ied] the plain and ordinary meaning of all claim terms as understood by a POSITA." Pet. at 9; EX1002, ¶56. However, since the Petition was filed, Petitioners have propounded narrower constructions in the co-pending district court action—constructions that are directly contrary to the positions taken in the Petition and which merit terminating the Petition. EX2020.

"It is axiomatic that claims are construed the same way for both invalidity and infringement." *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003). Indeed, the PTAB's "rules discourage petitioners from seeking broader constructions at the Board to support a patentability challenge while seeking narrower constructions in litigation to avoid infringement liability." *Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 20 at 4 (Nov. 3, 2025) (precedential) (citing Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,349-50 (Oct. 11, 2018)).

While a petitioner may be excused from offering inconsistent positions based on sufficient explanation as to "why the different positions are warranted" (*id.* at 5),

there can be no sufficient explanation here, where Petitioners maintain narrower positions with regard to at least three claim construction terms in the district court that directly contradict their positions taken here. *See Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 36 at 4 (Jan. 26, 2026) (Director Squires explaining that "in the generally rare instances where diverging constructions are advanced before two different tribunals, a party may proffer a different, broader construction before the Board when the district court *already has rejected* petitioner's narrower construction." (emphasis in original)).

For example, Petitioners here offer plain and ordinary meaning for the claim term "virtual MAC interface." Pet. at 9; EX1002, ¶56. But in the district court, they agreed to an explicit construction that mandates that the virtual MAC interface "obscures the recited actual MAC interfaces from higher protocol stack layers." EX2020 at 2. Here, however, Petitioners argued that Chincholi's OMMA contains structures comprising a virtual MAC interface, when in fact those structures pass along actual MAC addresses without obscuring them. *See* Pet. at 28-31; EX1002, ¶98 (identifying OMMA as "acting as a 'virtual MAC interface'"). But a POSITA would recognize that the OMMA merely aggregates packets and passes them along, using a "device address," thereby exposing the actual MAC addresses of Chincholi's radio access technology interfaces—the opposite of obscuring them. EX1005, [0120], [0137]-[0143], [0192], [0205], [0383]; EX2017 (Akl), ¶¶78-80; *see also*

Section VI.A.1.a. Therefore, under the construction agreed to by the Petitioners in the district court, the asserted prior art does not disclose a virtual MAC interface. *See* Section VI.A.1.a.[4]

Similarly, Petitioners here advocate for the plain and ordinary meaning of the claim term "information regarding the bandwidth availabilities…." Pet. at 9; EX1002, ¶56. As explained above, Patent Owner here argues that that term should be interpreted as relating to "current bandwidth availabilities." *See supra*, Section III.3. This is consistent with Patent Owner's position in the district court—and with Petitioners', who joined Patent Owner in supplying a claim construction position for that term that included "current bandwidth availabilities." EX2020 at 5; *see also* EX2021 (Mahon Decl.), ¶73 ("The parties appear to agree this term requires that the information fed back or provided is information regarding the 'current' bandwidth

[4] Petitioners also agreed to a narrowing construction for "in a manner transparent to any layer of the wireless networking device above the processing interface" as "in a manner where any protocol stack layer of the wireless networking device above the processing interface is unaware of the operation of the processing interface." This narrowing construction is not only inconsistent with the plain and ordinary meaning analysis supplied in the Petition, it also weighs in favor of Patent Owner's arguments on the merits. *See infra*, Section VI.A.3.

availabilities of the wireless transceivers."). But as explained below, Chincholi only discloses the ability to feed back historical statistics and metrics, rather than the "current" bandwidth availabilities that the challenged claims here require. *See infra*, Section VI.A.2.a. Again, Petitioners take a narrow position in the district court to avoid infringement, while taking a broad position before this Board to capture the disclosure of their asserted references.

Likewise, in the district court, Petitioners declined to agree with Patent Owner's position that "wireless networking device" required no construction and could be given its plain and ordinary meaning, and instead took the position that "wireless networking device" was "a device that relays or provides network access to another device." EX2020 at 4. To support that position, Petitioners' expert opined that "'client' devices in the infrastructure mode … would not qualify as a 'wireless networking device' as they are merely end-users and do not relay or provide network access to another device." EX2021 (Mahon Decl.), ¶68; *see also id.* ¶66 ("infrastructure mode involv[es] clients communicating with the network through one or more wireless access points").

However, in proceedings before the Board regarding a related patent also claiming a "wireless networking device," Petitioners' expert (applying plain and ordinary meaning) opined that primary reference Chincholi disclosed a "wireless networking device" via a client device operating in infrastructure mode—exactly the

opposite of what Petitioners argue in the district court. *See, e.g.*, *Samsung Elecs., Co. v. XiFi Networks R&D, Inc.*, IPR2025-01209, EX1002, ¶143 ("Chincholi discloses that the WTRUs of its wireless communication networks may comprise any one of a 'user equipment (UE), a mobile station, a fixed or mobile subscriber unit, a ***pager***, a ***cellular telephone***, a ***personal digital assistant (PDA)***, a ***smartphone***, a laptop, a netbook, a personal computer, a wireless sensor, consumer electronics, and the like.' Thus, a POSITA would have recognized that Chincholi discloses that the wireless networking device of claim 1 comprises a handheld computing device." (quoting EX1005 (Chincholi), [0074])); EX2030 (Mahon Dep.) at 108:2-114:19 (agreeing that Chincholi's Fig. 1A as described in EX1005 at [0074]-[0075] describes "transmission going between the devices" that include on the one hand access points and on the other hand devices such as smartphones or laptops); EX2017 (Akl), ¶51 (opining that Fig. 1A discloses communication in infrastructure mode).

In short, Petitioners are presently advancing a narrow claim construction in the district court, seeking to avoid broad application of Patent Owner's claims to their products (e.g., smartphones and tablets) while advancing a broad construction here in order to read their primary prior art reference on the claims. Were Petitioners' district court constructions applied (as they should be), the Petition fails to show the asserted references cover the challenged claims.

Because the Petitioners take inconsistent claim construction positions in the district court proceedings and in the Petition here, without sufficient explanation, Patent Owner requests that institution be vacated and terminated, and that the Petition be denied. *See, e.g.*, *Infineon Techs. Ams. Corp. v. MOSAID Techs. Inc.*, IPR2025-01171, Paper 27 at 3-4 (Feb. 19, 2026) (director review order vacating and denying institution where petitioner took inconsistent claim construction positions in the district court and before the Board); *Carbyne, Inc. v. Tritech Software Sys.*, IPR2025-00959, Paper 20 at 3-4 (Feb. 19, 2026) (same); *Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 36 at 4 (Jan. 26, 2026) (same). For further discussion, see Patent Owner's Request for Director Review (Paper 16).

VI. THE PETITION DOES NOT ESTABLISH THAT THE APPLIED REFERENCES RENDER THE CHALLENGED CLAIMS UNPATENTABLE

The Petition does not establish that Chincholi in combination with Riggert (Ground 1) discloses all of the limitations of any '591 patent claim, or that a POSITA would be motivated to combine the references. Indeed, applying the claim construction positions that Petitioners have taken in the district court, its cited references do not disclose at least the claimed "virtual MAC interface" (Section VI.A.1); the claimed "information regarding the bandwidth availabilities …" (Section VI.A.2); or the claimed "processing interface" acting "in a manner

transparent to any layer of the wireless networking device above the processing interface" (Section VI.A.3).

Further, regardless of the district court claim construction positions, Petitioners' cited references do not disclose those three terms as well as the further limitations, including the utilization of a "bandwidth portion of" a transceiver that "does not prevent other wireless networking devices … from utilizing … the remaining portion of the bandwidth availability" (Section VI.A.4) for additional reasons that do not depend on Petitioners' claim construction positions. Nor do Petitioners establish that a POSITA would have modified primary reference Chincholi with secondary reference Riggert (Section VI.B). The Board should deny the Petition for at least those reasons.

A. The Petition Does Not Establish that Chincholi Discloses Limitations Common to All Challenged Claims

It is clear that Petitioners' primary reference, Chincholi (EX1005), lacks a number of independent claim 1's limitations and the Petition makes no attempt to argue any other reference discloses these limitations.

1. Chincholi does not disclose a "virtual MAC interface"

The Petition has not established that Chincholi discloses "a virtual MAC interface." *See* Pet. at 28-31. Independent claim 1 (from which all other challenged claims depend) recites that the processing interface includes a virtual MAC interface

and first, second, and third virtual PHY interfaces. EX1001, 12:7-8. In the district court, the Petitioners take the position that a "virtual MAC interface" is "a software- or logical-based interface that is separately addressable from the recited actual MAC interfaces and that obscures the recited actual MAC interfaces from higher protocol stack layers." EX2020 at 2.

The Petition asserts that Chincholi's OMMA layer "includes the claimed 'virtual MAC interface,'" merely because it "aggregates multiple MAC interfaces," and "because it transparently 'distributes and/or combines' packets between the IP layer and the RATs." Pet. at 29. The Petition's arguments, however, fail to demonstrate why Chincholi's OMMA is "virtual," especially under the definition that Petitioners now advocate in the district court; this is particularly so because the OMMA layer does not obscure actual MAC addresses. Moreover, the Petition's functional comparison fails to actually show alike functions. Finally, because the intrinsic record demands that the virtual MAC interface be located in the second layer of a protocol stack, while the identified portions of Chincholi are located at the third layer of a protocol stack.

a. The Petition fails to show that Chincholi discloses a "virtual" MAC interface that obscures actual MAC addresses

Petitioners have failed to meet their burden because the Petition does not address why Chincholi teaches the "virtual" limitation. As explained above (Section

III.1, Part V), Petitioners do not advocate for a claim construction of virtual MAC interface in this proceeding, but in the time since the filing of the Petition have agreed to a construction in the district court that conforms to Patent Owner's arguments in its preliminary response and here: "a software- or logical-based interface that is separately addressable from the recited actual MAC interfaces and that obscures the recited actual MAC interfaces from higher protocol stack layers." EX2020 at 2; *see supra*, Section III.1.

Under this agreed construction, the Petition fails. There is no evidence in Chincholi that the actual MAC addresses of the RATs are "obscured"—rather, they are passed along and knowable to upper layers. EX2017 (Akl), ¶¶79-80; EX1005, [0142]. Indeed, Dr. Almeroth, Petitioners' expert, opines that a POSITA would have recognized that the OMMA "'virtualizes' a MAC interface because the OMMA would effectively appear to the IP layer as a single interface for exchanging packets that are ultimately sent or received by the actual MAC-PHY pairs." Pet. at 29; EX1002, ¶98 (citing EX1005, [0120] [0192]). But this merely means that the information from each RAT—including each RAT's actual MAC address—is transmitted together. EX2017 (Akl), ¶80. It does not mean that the actual MAC addresses are obscured; rather, they are apparent to the OMMA and to layers above the OMMA. *Id.* In contrast, in the '591 patent, packets are addressed using the virtual MAC address; upper layers do not see the actual MAC addresses. *See*

EX1001, 4:30-32; EX2017 (Akl), ¶81. This enables a number of recited functions and limitations discussed below in Sections VI.A.3.

Further, the Petition contains no evidence that Chincholi's OMMA meets the definition of "virtual" or "virtual MAC interface." In fact, the Petition stops one step short of claiming Chincholi's OMMA layer ***is*** a virtual MAC interface, preferring to argue that it is "***acting as*** a virtual MAC interface." Pet. at 29 (emphasis added). This is wrong for several reasons—most glaringly, because Chincholi does not disclose a ***virtual*** MAC interface at all. Indeed, Chincholi does not once contain the word "virtual" in its lengthy disclosure. *See generally* EX1005; *see also* EX2017 (Akl), ¶76. Nor does the Petition or Dr. Almeroth attempt to define "virtual," or explain why aggregation, distribution, or combination of packets between the IP layer and the RATs of Chincholi would meet an accepted definition of "virtual." *See* Pet. at 28-31; EX1002, ¶¶97-100. In fact, none of that is "virtual." Nothing in Chincholi describes or suggests a "virtual" MAC interface, either according to plain and ordinary meaning or according to the explicit claim construction agreed to by the parties. EX2017 (Akl), ¶¶78-81. Indeed, although a virtual MAC interface would have a programmed or non-static address, Chincholi's OMMA is not disclosed as being a separately addressable entity at all; it merely acts as a conduit to pass on packets received from different RATs (each with its own knowable actual MAC address), taking multiple inputs and sending them out as one

output. EX1005 at [0137]-[0143], [0383]; EX2017 (Akl), ¶78. In doing so, Chincholi's OMMA sends aggregated packets to the IP layer with the payload of each packet containing the actual MAC address of the RAT from where it originated. EX2017 (Akl), ¶79; EX1005, [0205] (OMMA layer uses "device address").

Ultimately, nothing in the four corners of Chincholi purports to characterize the OMMA as "virtual" and nothing in the Petition demonstrates that Chincholi meets the definition of "virtual MAC interface" Petitioners have now agreed to. Consequently, the Petition's attempt to map Chincholi's OMMA onto the '591 patent's virtual MAC interface fails because it ignores the requirement that the interface be, in fact, "virtual."

b. The identified elements of Chincholi do not perform the functions of the claimed "virtual MAC interface"

Instead of demonstrating that the OMMA layer fits the definition of a "virtual" MAC interface, the Petition resorts to equivalents-type arguments. First, the Petition asserts that "[t]he OMMA layer includes an interface ***acting as*** a virtual MAC interface because" the OMMA layer "aggregates multiple MAC interfaces" and "'distributes and/or combines' packets between the IP layer and the RATs." Pet. at 29 (emphasis added); EX1002, ¶98. But "acting as" a virtual MAC interface does not amount to ***being*** a virtual MAC interface—which would involve the upper layers interacting with an interface with a non-physical address.

The most that the Petition and Dr. Almeroth can do is reduce the term "virtual MAC interface" to some of its illustrative or exemplary functions and components—namely, modules referred to in the Figure 1 embodiment of the '591 patent as the "decision," "processing," and "ultra-streaming" blocks. Pet. at 28; EX1002, ¶97. The Petition and Dr. Almeroth presume that if they can match the functions in the modules of Chincholi with the blocks within the Figure 1 embodiment of the virtual MAC interface, they can show equivalence.

But to the extent functional comparison is appropriate, Chincholi is missing that functionality, and the Petition's comparison fails. EX2017 (Akl), ¶82. For example, the virtual MAC interface of the '591 patent controls the operation and bandwidth allocation decisions with respect to the actual MAC layers below it. EX1001, 2:49-53, 3:12-34, 10:12-15; EX2017 (Akl), ¶83. In contrast, Chincholi states that the OMMA layer is merely "[a] mechanism to aggregate two or more RATs ***operating independently*** on two or more bands to enhance the total IP throughput of the link." EX1005, [0120] (emphasis added). Clearly, Chincholi's "two or more RATs"—"operating independently"— *are not* directed by the OMMA layer, while the actual MAC interfaces of the '591 patent *are* directed by the virtual MAC interface. EX2017 (Akl), ¶83.

Further, the Petition asserts that certain modules within Chincholi's OMMA layer—the traffic shaping module 601, the MAC resource reservation module 602,

and the IP QoS Scheduler module 603—"include[] all of the functionality the 591 patent associates with the virtual MAC interface." Pet. at 29 (citing EX1002, ¶99; EX1005, [0139]). But the Petition points to no module "that obscures the recited actual MAC interfaces from higher protocol stack layers," as Petitioners agree the virtual MAC interface must. Pet. at 29-31; EX2020 at 2. And the Petition is wrong on the substance of its module-to-block comparisons. For example, the Petition asserts that Chincholi's IP QoS Scheduler equates to the '591 patent's decision block. Pet. at 30; EX1002, ¶100; EX1005, [0143]. But the IP QoS Scheduler "may segregate a single IP packet stream comprising multiple IP QoS types into distinct IP QoS streams." EX1005, [0143]. It does not "determine the size and type of data being received," nor does it determine the "type of processing necessary to put the stream in a format where it is capable of being transmitted"—the functions of the decision block. EX1001, 3:15-18; EX2017 (Akl), ¶85. The Petition and Dr. Almeroth make no attempt to describe why these functions are equivalent—because they are not equivalent. EX2017 (Akl), ¶85.

Similarly, the MAC resource reservation module "determine[s] an amount of time duration" for packet transmission. EX1005, [0142]. Despite the Petition's argument (Pet. at 30-31; EX1002, ¶100), this is not the same as the processing block of the '591 patent, which "processes the data stream as determined by the decision block" in order "to put the stream in a format where it is capable of being

transmitted." EX1001, 3:15-20; EX2017 (Akl), ¶86. Again, the Petition provides no explanation for why these two functions—one dealing with time, and one dealing with format for transmission—are remotely equivalent. And indeed, a POSITA would not understand them to be the same. EX2017 (Akl), ¶86.

Finally, the Petition attempts to equate the traffic shaping module of Chincholi with the ultra-streaming block of the '591 patent. Pet. at 31; EX1002, ¶100. Chincholi's "traffic shaping module may determine the way a packet is routed using policy based routing or feedback based routing." EX1005, [0139]-[0141]. Meanwhile, the '591 patent's ultra-streaming block "manages the processing of signal streams or sub-streams given the available resources (memory, processing speed, number of available radios, etc.) and packetizes sufficiently processed streams or sub-streams." EX1001, 3:20-32. The Petition does not and cannot explain how the traffic shaping module of Chincholi performs packetizing. EX2017 (Akl), ¶87. In short, even if it were enough to point to similar functionality, none of the modules in Chincholi's OMMA layer that the Petition identifies do the same things as the three blocks of the Figure 1 embodiment of the '591 patent to which the Petition compares them. This is true whether or not the Board considers the parties' agreed construction for "virtual MAC interface."

In all, the OMMA layer of Chincholi is missing both the form and function of the virtual MAC interface of the '591 patent. First, the OMMA layer is not virtual—

there is nothing in Chincholi—nor in the Petition or accompanying papers—that describes what about the OMMA layer involves hiding a physical address behind a virtual interface. Second, the OMMA layer and its modules do not perform the functions that the Figure 1 virtual MAC interface performs. And even if functional equivalence were sufficient, a POSITA would not understand the OMMA layer of Chincholi to disclose the Figure 1 embodiment of virtual MAC interface. EX2017 (Akl), ¶¶82, 84.

c. Chincholi's OMMA sits at layer 3 of a protocol stack and does not disclose a virtual MAC interface at layer 2, as disclosed in the '591 patent

As explained above, the intrinsic record commands that the processing interface of the '591 patent be in a protocol stack layer adjacent to the actual PHY layer—and indeed, that it be "at a layer lower than the logical link layer"—as a manner of distinguishing the inventions of the '591 patent and the patents in its family from the prior art. *See supra*, Section III.3. The processing interface includes the virtual MAC interface, which therefore must be no higher in the protocol stack than layer 2. *See* EX1001, 12:7-8 ("wherein the processing interface comprises (1) at least one virtual MAC interface….").

Likewise, the functions of the virtual MAC interface are quintessential layer 2 functionalities. For example, the ultra-streaming block, one component of the virtual MAC interface, carries out a monitoring function that a POSITA would

understand to be associated with layer 2. *See* EX1001, 3:26-32; EX2017 (Akl), ¶88; *supra*, Section III.3 (summarizing statements in prosecution history locating processing interface at layer 2). Further, a POSITA would understand that moving these layer 2 functions to layer 3 would break the layered abstraction and cause architectural and operational problems, including related to efficiency, scalability, and operability. EX2017 (Akl), ¶88.

On the contrary, the structures in Chincholi identified by Petitioners as the virtual MAC interface are explicitly associated with layer 3. As explained above, the Petition equates three modules of Chincholi's OMMA layer with the virtual MAC interface.[5] Dr. Almeroth concedes that the operation of OMMA he identifies as a virtual MAC interface is operating in the IP layer, stating that OMMA "'virtualizes' a MAC interface because the OMMA would effectively appear to the IP layer as a single interface for exchanging packets are ultimately sent or received by the actual MAC-PHY pairs." EX1002, ¶98; *see also* Pet. at 29 (same).

[5] A POSITA would further understand that the OMMA layer generally must be located at layer 3 because it can directly communicate with the transport layer, or layer 4. *See* EX1005, [0171]-[0186]; [0369]-[0370]; EX2017 (Akl), ¶89; EX2019 (Basic Reference Model), § 7.5.4.2.2.

Moreover, a POSITA would associate each of the traffic shaping module 601, the MAC resource reservation module 602, and the IP QoS Scheduler module 603 with the network layer (layer 3). EX2017 (Akl), ¶88. The traffic shaping module is "responsible for determining the way packets are routed" (EX1005, [0139]), which a POSITA would understand to be a network layer function because it refers to "packets," as well as how those packets are routed. EX2017 (Akl), ¶88; EX2018 (Tanenbaum) at 42 (noting "name of unit exchanged" at network layer is "packet"); *id.* at 43 (noting that a key issue for the network layer "is determining how packets are routed"). Similarly, the MAC resource reservation module determines time and bandwidth resources required "by a packet or set of packets"—again, a network layer function. EX2017 (Akl), ¶88; EX2018 (Tanenbaum) at 42-43. Finally, the IP QoS Scheduler module states in its name that it is associated with the network layer—also known as the IP layer. EX2017 (Akl), ¶88; EX2018 (Tanenbaum) at 47 (noting that layer 3 may be known as the Internet layer or the IP layer in some protocol stack models). Further, the function of the IP QoS Scheduler module is to "segregate a single IP packet stream comprising multiple IP QoS types into distinct QoS streams," again, a function explicitly associated with layer 3. EX2017 (Akl), ¶88; EX2018 (Tanenbaum) at 42-44.

Thus, because the virtual MAC interface of the '591 patent must sit at layer 2 of a protocol stack, and because the structures of Chincholi's OMMA identified in

the Petition must sit at layer 3, the Petition does not demonstrate that Chincholi discloses the virtual MAC interface of the ’591 patent.

2. Chincholi does not disclose “information regarding the bandwidth availabilities of the first, second, and third wireless transceivers”

The Petition fails to show that Chincholi discloses “information regarding the bandwidth availabilities of the first, second, and third wireless transceivers” for at least two reasons. First, Chincholi’s disclosure is contrary to the proper interpretation of the term—agreed to by both parties in the district court—that the relevant bandwidth availabilities are those that are “current,” while Chincholi only discloses reporting historical metrics and averages. Second, applicant repeatedly made clear in the prosecutions of the ’591 patent and its family members that the bandwidth availabilities information had to have a capacity to be reported directly from the actual PHY interfaces in the PHY layer to the processing interface that sat in layer 2 of a protocol stack—and that this distinguished the claimed inventions from the prior art. Meanwhile, Chincholi does only what the prior art there did—and receives bandwidth availability information indirectly, in structures that sit in layer 3 of the protocol stack. Therefore, Chincholi does not disclose the claim limitation “information regarding the bandwidth availabilities of the first, second, and third wireless transceivers.”

a. Chincholi does not disclose feeding back information regarding "current" bandwidth availabilities

As explained above in Section III.3, in the district court, the parties agreed that the "information regarding the bandwidth availabilities of the first, second, and third wireless transceivers" refers to "current" bandwidth availabilities. *See* EX1001, 4:52-59 ("determin[ing] device availability" "involves a determination at the PHY layer as to the ***actual availability*** of the initially assigned transceiver resources"); EX2017 (Akl), ¶61; EX2021 (Mahon Decl.), ¶73.

The Petition asserts that this limitation is covered by Chincholi's "feedback based routing" mode. Pet. at 31-32 (citing EX1005, [0139]). But a POSITA would understand that Chincholi's "feedback based routing" mode provides historical feedback statistics. EX1005 at [0141] ("feedback metrics" reflect "average state of the system"); [0161] & Table 2 (describing "average" metrics); EX2017 (Akl), ¶91. Because historical statistics do not constitute "current" bandwidth availabilities, a POSITA would further understand that historical feedback statistics do not provide the same information as the bandwidth availability information recited by the claim. EX2017 (Akl), ¶91. Thus, the Petition fails to show that Chincholi discloses "current" bandwidth availabilities, under the parties' agreed understanding of the claim term. This alone is sufficient to demonstrate that Chincholi does not disclose the "bandwidth availabilities" limitation, and that the Petition fails.

b. Chincholi does not disclose a capacity to feed back information directly from actual MAC and PHY interfaces

As described above, the intrinsic record compels a POSITA to understand that the information regarding the bandwidth availabilities of the recited transceivers is able to be communicated directly from either the actual MAC interfaces or the actual PHY interfaces. *See supra*, Section III.3. This is because the processing interface—where the bandwidth information is communicated—is in a protocol stack layer adjacent to the actual PHY interfaces and in the same layer as the actual MAC interfaces. *Id.*; *see, e.g.*, EX2026 ('756 Patent FH) at 8, 8/15/2024 Preliminary Amendment and Applicant Remarks ("[E]ach actual MAC and ***each actual PHY in a particular wireless networking device communicates directly with the processing layer to allow it to receive information regarding bandwidth availabilities*** from the wireless transceiver associated with each MAC/PHY pair….").

The Petition asserts that this limitation is met by the traffic shaping module, operating in "feedback based routing" mode, and as shown by Figures 28 and 29. Pet. at 30-31. As described above (Section VI.A.1.c.), the traffic shaping module "determin[es] the way a packet is routed," a function associated with the network layer. EX2017 (Akl), ¶¶88, 92; EX2018 (Tanenbaum) at 42-44. Figure 7 of Chincholi makes this even clearer, noting that OMMA's "'Feedback-Based' scheme implies that OMMA at the transmitter distributes packets per IP flow across RATs

based on feedback from lower layers i.e. MAC/PHY"—and thus, that OMMA sits above the MAC and PHY layers in the network layer. EX1005, Fig. 7; EX2017 (Akl), ¶92.

Because OMMA's traffic shaping module sits in the network layer, there is no way for bandwidth availability information to be communicated directly from actual PHY interfaces (in the physical layer—layer 1) to the OMMA's traffic shaping module (two layers away the network layer/layer 3). EX2017 (Akl), ¶92; EX2019 (Basic Reference Model), § 7.5.4.2.2 ("Since the Reference Model permits direct interaction only between adjacent layers, the network-entity cannot interact directly with the physical-entity. This interaction is thus described through the Data Link Layer which intervenes transparently to convey the interaction between the Network Layer and the Physical Layer.").

Because the intrinsic record makes clear that the bandwidth availability information must have a capacity to be communicated directly from the actual PHY interfaces in the physical layer (*see supra*, Section III.3)—and because Chincholi does not have a capacity to receive bandwidth availability information directly to the OMMA from the physical layer, the Petition fails to show that Chincholi discloses "information regarding the bandwidth availabilities of the first, second, and third wireless transceivers." EX2017 (Akl), ¶93.

3. Chincholi does not disclose a "processing interface . . . configured to" perform claimed functions "in a manner transparent to any layer of the wireless networking device above the processing interface"

The Petition has not established that Chincholi discloses a "processing interface" "configured to" perform claimed functions "in a manner transparent to any layer of the wireless networking device above the processing interface." *See* Pet. at 33-34.

The claims of the '591 patent recite a "processing interface." The processing interface is introduced in claim 1, where it is described as: containing "at least one virtual MAC interface"; and configured to perform multiple functions. EX1001, 12:7-31. All claims include those recited in claim 1, which generally include: the creation of associations between the recipient and the recited actual MAC and PHY interfaces (claim 1[g]); identifying a portion of the bandwidth of the first, second, and third wireless transceivers (claim 1[h]); and evaluating whether that portion is unavailable for communication (claim 1[i]).

In each of these instances, the prescribed functions are recited as being performed "in a manner transparent to any layer of the wireless networking device above the processing interface." EX1001, 12:16-18. According to the construction agreed by the parties in the district court, this means that these claimed functions are performed "in a manner where any protocol stack layer of the wireless networking

device above the processing interface is unaware of the operation of the processing interface." EX2020 at 2.

The Petition attempts to demonstrate that Chincholi discloses these transparent operations by pointing to a mode in Chincholi disclosed as being transparent. Chincholi's transparent mode is disclosed in a single sentence and described as one in which "[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" without the inclusion of an additional header. EX1005, [0192], [0126]; *see* Pet. at 35-36; EX1002, ¶107. But as explained above, declining to add additional headers does not render the communication transparent (i.e., such that the higher layers are unaware of the lower layers' operation). EX2017 (Akl), ¶¶80, 95. Nor does Chincholi's discussion of its transparent mode explain how any equivalent functions would be performed transparently. Pet. at 35-36; EX1002, ¶¶107-117. This is insufficient to demonstrate that the three functions (claims 1[g]-1[i]) are in fact performed transparently, or that Chincholi achieves the transparent bandwidth decision making of the '591 patent, achieved by obscuring the addresses and operation of the actual MAC and PHY layers to the upper layers. EX1001, Abstract; EX2017 (Akl), ¶96.

This particular manner of achieving transparency—through the use of the virtual MAC interface—is incorporated into the claim limitations reciting the three

functions that must be performed by the processing interface "in a manner transparent to any layer of the wireless networking device above the processing interface." EX1001, 12:7-31; EX2017 (Akl), ¶97. That is because the "processing interface" itself must contain the virtual MAC interface and virtual PHY interfaces as claimed in limitation 1[e]—which is the same processing interface of claim limitations 1[f]-1[i] that must act in a manner transparent to the layers above. EX2017 (Akl), ¶97. Therefore, regardless of whether Chincholi discloses transparency in some respect, it does not disclose transparency achieved by the processing interface of the '591 patent. *See* Section VI.A.2; EX2017 (Akl), ¶97. This is what is claimed and what is required.

Moreover, as described above, the processing interface must be located in layer 2 of the protocol stack. *See supra*, Section III.3; Section VI.A.1.a; Section VI.A.2.b. The Petition cites to Chincholi's statement that "[t]he OMMA layer may be transparent in it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." Pet. at 35 (citing (EX1005 [0192], [0126]). As discussed above, distribution of packets is a function that takes place at the network layer, or layer 3 of the protocol stack. EX2017 (Akl), ¶¶80, 98; EX2018 (Tanenbaum) at 42-44. Because Chincholi discloses transparency only at a layer above layer 3—not at a layer above layer 2—it does not disclose transparency at any layer above the processing interface, as the processing interface of the '591 patent is

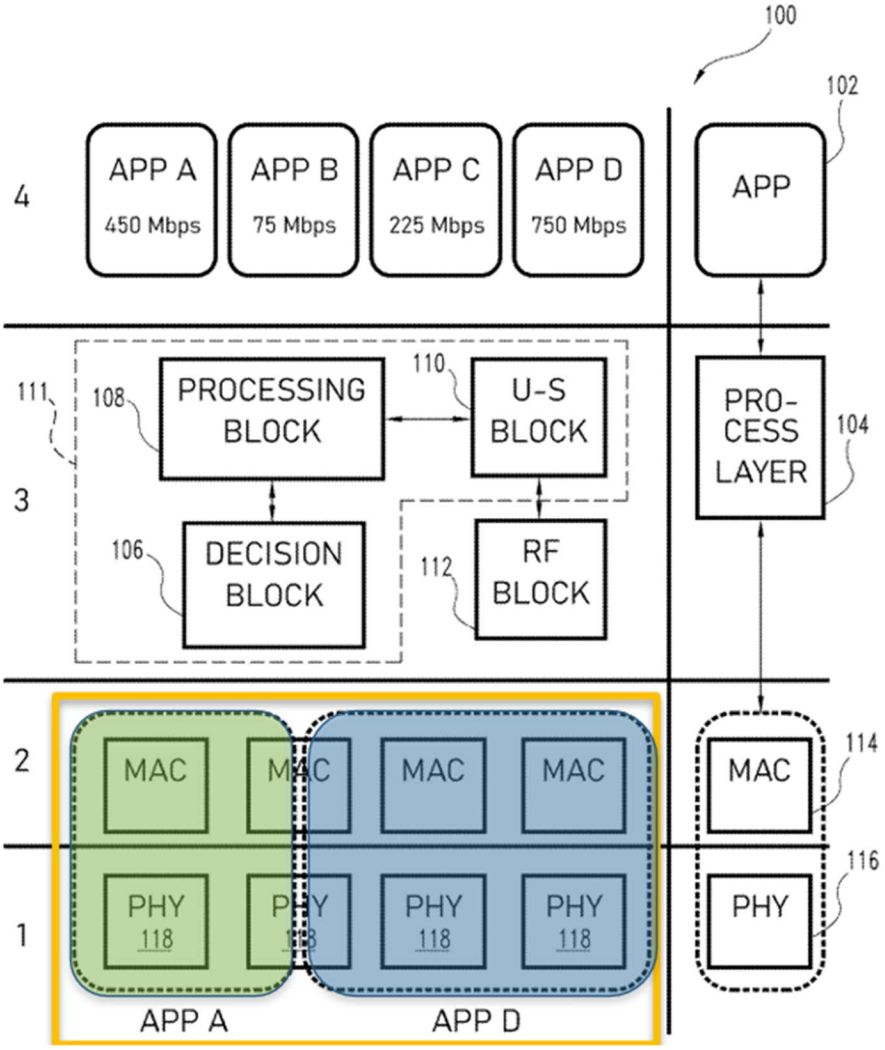
located in layer 2. *See* EX2023 ('105 patent FH) at 34, 2/5/2024 Third Preliminary Amendment and Applicant Remarks (applicant statements that claimed functions were "transparent to the layers of the wireless networking device above its MAC/PHY interfaces"); EX2017 (Akl), ¶98; *see also* Section VI.A.1.c.

The Petition, by asserting Chincholi discloses transparency generally when what is required is transparency by a processing interface that includes a virtual MAC interface (and which indeed achieves transparency by that virtual MAC interface), fails to demonstrate that any claim is unpatentable. Further, the Petition does not disclose a processing interface at layer 2—or transparency at any layer above that layer. Because the Petition makes no attempt to show that Chincholi discloses the processing interface of the '591 patent and its claimed transparent functions, Petitioners have failed to meet their burden.

4. Chincholi does not disclose utilization of a portion of transceiver bandwidth by one wireless networking device that "does not prevent" another wireless networking device from using remaining bandwidth

The Petition has not established that Chincholi discloses utilization of a portion of transceiver bandwidth by a first wireless networking device that "does not prevent" another wireless networking device from using remaining bandwidth unused by the first wireless networking device. *See* Pet. at 44-46.

Claim 1 of the ’591 patent provides that a first device’s utilization of the first available bandwidth portion of the recited transceiver “does not prevent” any other device from using the remaining portions of the that first available bandwidth portion at the same time. EX1001, 12:45-54. The parties agree that this term carries its plain and ordinary meaning. EX2020 at 3. A POSITA would understand this to mean that two devices or two applications could share a single MAC/PHY pair at the same time, and the relevant functionality is depicted in Figure 1, where App A and App D are shown sharing the use of the second MAC/PHY pair:



EX1001, Fig. 1 (annotations added); EX2017 (Akl), ¶100. This ability to share a single transceiver's bandwidth among two separate users denoted by the use of different applications is a key benefit of the invention. EX2017 (Akl), ¶100.

In attempting to match this limitation, the Petition relies upon Chincholi's disclosure of "***multi-WTRU*** multi-IP flow cases," where packets are queued and distributed in an optimized manner. Pet. at 44-45 (citing EX1005, [0328], [0351]-[0356]). But a system comprising multiple WTRUs and where packets are queued

and distributed sequentially is not necessarily a system where a single transceiver's resources are shared simultaneously. EX2017 (Akl), ¶101.

Indeed, the Petition and Dr. Almeroth identify no passage in Chincholi that expressly discloses the claimed functionality, i.e., having one portion of the transmitter's available bandwidth be used for one recipient/application at the same time another portion of that transmitter is used for another recipient/application. Nor has Dr. Almeroth pointed to such functionality in any other reference that is a part of Ground 1. For this reason, the Petition must fail. *See, e.g.*, 37 C.F.R. § 42.104(b)(4) ("The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon . . . ."); *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) ("The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.").

In fact, Chincholi discloses the opposite of two WTRUs being able to use different portions of a bandwidth portion (*e.g.*, a channel in the 5 GHz Wi-Fi band) at the same time; in Chincholi's architecture, only one WTRU can access a channel at a time. *See, e.g.*, EX1005, [0118]. For example, Chincholi explains that its WTRUs "may ***contend with each other***" for channel access if they share an operating frequency. EX1005, [0117] (emphasis added); *see also id.* [0130], [0119]. Thus, Chincholi makes clear that different WTRUs communicating in the same band

"contend" for channel access, meaning the winner of the contention "locks out" the others from using that channel at the same time, and, therefore, the WTRUs do not share the channel bandwidth at the same time. EX2017 (Akl), ¶101.[6]

The Petition's only argument—and Dr. Almeroth's only opinion addressing this topic—relates to a passing reference in Chincholi to a technique known as Orthogonal Frequency Division Multiple Access ("OFDMA"). EX1002, ¶126 (citing EX1005, [0161] & Table 2, which lists that Chincholi may report when a MAC type is "OFDMA," among other options). But Chincholi does not discuss the operation of OFMDA, nor do any of the standards cited in Chincholi—such as 802.11 a/b/g/n—implement OFDMA; likewise, Chincholi does not discuss how to modify the then-existing standards to provide for implementing OFDMA in a Wi-Fi-only WTRU. EX1005, [0116]; EX2017 (Akl), ¶103.

[6] While Chincholi does disclose that "[a] WTRU may be able to communicate (e.g., simultaneously) with a NT over, for example, an ISM channel and a TVWS channel" (EX1005, [0117]), such capability exists only where the two WTRUs are using different bands. EX2017 (Akl), ¶102. This demonstrates that Chincholi does not teach sharing bandwidth at the transceiver—only "contending" for the transceiver, or operating on different bands and therefore not sharing. *Id.*

Instead of basing his analysis on the actual disclosure of Chincholi, Dr. Almeroth claims that OFDMA "was a known wireless communication technique for dividing an available bandwidth into smaller subcarriers (*i.e.* frequency ranges) which are then allocated to different users." EX1002, ¶126. But this naked expert statement, failing to cite to anything in Chincholi that discloses such transmission (rather than feedback) does not establish unpatentability. *See, e.g.*, *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1004 (Fed. Cir. 2023) ("To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petition must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness."); *see also Magnum Oil.*, 829 F.3d at 1380 (Board may not base obviousness determination on conclusory statements without explanation).

B. The Petition Does Not Establish that Chincholi in View of Riggert Renders Any Challenged Claim Unpatentable

In addition to failing to meet its burden to demonstrate the claim limitations described above in Section VI.A, the Petition also fails to demonstrate that a POSITA would have been motivated to combine Chincholi with Riggert, or that a POSITA would have had a reasonable expectation of success in so doing. In assessing the asserted combinations, it bears emphasizing that Chincholi is the only reference relied on for the limitations reciting "virtual MAC interface" (Section

VI.A.1.), a "processing interface configured to" perform claimed functions "in a manner transparent to any layer of the wireless networking device[s]" (Section VI.A.3), and utilization of bandwidth by one wireless networking device that "does not prevent" another wireless networking device from using remaining bandwidth (Section VI.A.4). Consequently, without reaching analysis of the secondary reference, the Petition fails based on Chincholi alone.

The Petition does not establish that a POSITA would have modified Chincholi with Riggert. The Petition contends that a POSITA would have been motivated to add Riggert's bondable virtual interface to Chincholi's OMMA layer to supply the missing "virtual PHY interfaces." Pet. at 33-35; EX1002, ¶¶103-106. Purportedly, this would be done to enhance Chincholi's otherwise "static (and limited) interfaces," thereby adding "flexibility" to the system. Pet. at 11-14. This begs the question of why Chincholi recognized the value of a purportedly "virtualized" OMMA, yet was willing to accept otherwise static, inflexible physical interfaces. Even allowing for this inconsistency, the Petition still fails to carry its burden to show that a POSITA ***would*** combine Chincholi with Riggert. This is for at least three different reasons.

First, neither the Petition nor Dr. Almeroth address clear disclosures in Riggert that differentiate the role of its bondable virtual interface from that of the virtual PHY interfaces in the '591 patent. But while the '591 patent's virtual PHYs

are used for feedback (EX1001, 12:7-14), the "bondable virtual interfaces" of Riggert have a different purpose. The bondable virtual interfaces of Riggert (which is directed to "network streaming") are used for actual transmission of data (streaming video), not for feedback. EX1006, Fig. 5, [0002], [0057]-[0058]. As shown in Figures 8 and 9 of Riggert, the bondable virtual interface 236 receives data from an "application" 230 and transmits it to bondable virtual interface 336, where it is then sent to the application 330. The application 230 represents a streaming application like Netflix on a server, and application 330 represents that application on a user device:

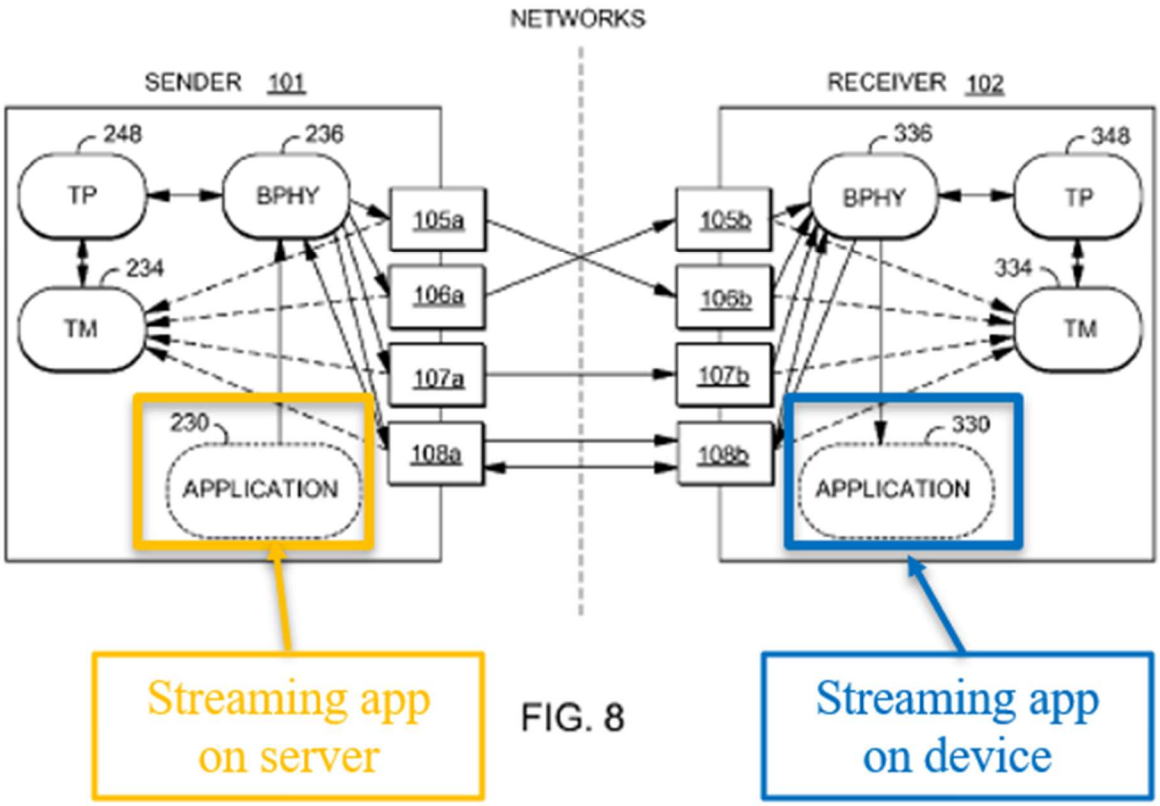


FIG. 8

EX1006, Fig. 8 (annotations added); EX2017 (Akl), ¶110. Thus, any feedback that is transmitted in Riggert's system is across devices. EX2017 (Akl), ¶110. Meanwhile, Chincholi, to the extent it discloses feedback transmission at the OMMA layer, only discloses collection of data within a single device. *See* Pet. at 31 (quoting EX1005, [0161]). Both the Petition and Dr. Almeroth fail to address this evidence, and thus they do not address why a POSITA would be motivated to combine Riggert—with its disclosure of cross-device transmission, with Chincholi, which discloses only transmission of metrics within a single device. Further, Riggert's bondable virtual interfaces communicate directly with applications, and operate at the application layer, or layer 7 in the layer stack. EX2017 (Akl), ¶110 (citing EX1006, [0113]-[0114]). The Petition and Dr. Almeroth offer no explanation for how or why the bondable virtual interfaces (at layer 7) would be added to the OMMA layer (at layer 3) to perform a different function from the one Chincholi describes, which is, in any event, different from what is disclosed by the '591 patent's virtual PHY interfaces (at layer 2). EX2017 (Akl), ¶111. In view of the evidence that the Petition does not address, a POSITA would not look to Riggert to modify Chincholi. *Id*.

Second, the Petition's claim that a POSITA would be motivated to combine Riggert and Chincholi out of a desire to further virtualize network components is nothing more than applying results-oriented hindsight, armed with the '591 patent.

See, e.g., *Insite Vision Inc. v. Sandoz, Inc.*, 783 F.3d 853, 859 (Fed. Cir. 2015) ("'In considering motivation in the obviousness analysis, the problem examined is not the specific problem solved by the invention.' 'Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness.'" (internal quotations omitted)).[7]

Third, even if a POSITA were somehow motivated to combine Riggert with Chincholi and were able to do it, the combination proposed by Dr. Almeroth does not amount to the virtual PHY interface of the '591 patent. Dr. Almeroth opines that a POSITA would have been motivated to implement a Riggert's "bondable virtual interface" "between the OMMA layer and the RATs in Chincholi." EX1002, ¶¶71-73. As explained above (*supra*, Section VI.A.1.c), the OMMA layer of Chincholi

[7] This conclusion is underscored by the Petition's dependence upon U.S. Patent Application 2009/0141691 to Jain (EX1007) as supplying the alleged motivation to combine Chincholi and Riggert. Pet. at 12, 32. Jain is not part of Ground 1 and should be disregarded. *See Meta Platforms, Inc. v. Eight kHz, LLC*, IPR2023-01023, Paper 10, at 31 (PTAB Jan. 9, 2024) (criticizing supporting assertions with reference that "is not relied upon as the basis for this challenge"). Without Jain, all that remains is the roadmap of the '591 patent itself—constituting impermissible hindsight.

sits in layer 3; meanwhile, a POSITA would understand Chincholi's RATs to sit at layers 1 and 2. EX2017 (Akl), ¶112. A POSITA would understand that at the top of the RAT—and forming the border between layer 2 and layer 3—would be a "MAC service access point," or "MAC SAP," through which communications to higher layers would flow. *Id.* Because Dr. Almeroth opines that Riggert's bondable virtual interface would be combined with Chincholi "***between the OMMA layer and the RATs***," a POSITA would understand that to be above the RAT's MAC SAP, and therefore, within layer 3. That bondable virtual interface would not be able to serve as the claimed virtual PHY interface at that layer location, because the virtual PHY interface must have the capacity to be fed information regarding the bandwidth availabilities of the wireless transceivers directly from the actual PHY interfaces in layer 1. *See* EX1001, 12:7-14; EX2017 (Akl), ¶112; Section III.3, *supra*. A bondable virtual interface at layer 3 could not communicate directly with the actual PHY interfaces at layer 1, and therefore, cannot serve as the claimed virtual PHY interface. EX2017 (Akl), ¶112; EX2019 (Basic Reference Model), § 7.5.4.2.2.

Finally, if, as the Petitioners claim, "virtualization" of network elements was well-understood and appreciated at the time of the invention, then there would be no reason for Chincholi to not have included a virtual PHY interface, especially if—as the Petition asserts—Chincholi includes an OMMA that "act[s]" like a virtual MAC interface. EX2017 (Akl), ¶113.

By not explaining the inconsistency between the alleged motivation and the actual work done (and not done) by Chincholi, the Petition invites the Board to employ hindsight in lieu of a POSITA's level of knowledge, using the '591 patent claims as a roadmap, instead of introducing evidence demonstrating how or why a POSITA would have combined Chincholi and Riggert. *See, e.g.*, *Hamilton Beach Brands, Inc. v. f'real Foods, LLC*, 908 F.3d 1328, 1342 (Fed. Cir. 2018) (rejecting motivation to combine argument as improper hindsight where "the prior art does not identify a reason *why* a POSITA would have been motivated to combine those limitations"); *KSR Int'l Co.*, 550 U.S. at 418 ("[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does."); *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068-70 (Fed. Cir. 2018) (finding that a reference's "statements regarding preferences are relevant to a finding regarding whether a skilled artisan would be motivated to combine that reference with another reference" and must be considered to avoid hindsight bias).

VII. CONCLUSION

The Petition does not establish that any of the challenged claims are unpatentable. Patent Owner's claims should be confirmed.

Dated: March 17, 2026

Respectfully Submitted,

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WORD-COUNT CERTIFICATE

The undersigned certifies that the foregoing Patent Owner Response complies with the type-volume limitation of 37 C.F.R. § 42.24(a) and (b) and contains 12,411 words in 14-point Times New Roman font as calculated by the word count feature of Microsoft Office. This word count is inclusive of all text and footnotes but does not include the table of contents, table of authorities, certificates or service or word count, or appendix of exhibits or claim listing.

Dated: March 17, 2026

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CERTIFICATE OF SERVICE

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