UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
Petitioner,

v.

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC,
Patent Owner.

Case IPR2025-00934
Patent 11,159,210

PATENT OWNER'S RESPONSE (CORRECTED)

Table of Contents

Patent Owner's Exhibit List for IPR2025-00934

Pursuant to 37 C.F.R. § 42.63(e), Wilus Institute of Standards and Technology Inc. hereby submits its exhibit list associated with the above-captioned *inter partes* review of U.S. Patent No. 11,159,210.

Exhibit	Description
2001	Order, *Wilus Institute of Standards and Technology Inc., v. HP Inc.*, Case No. 2:24-cv-00752-JRG-RSP, Dkt. No. 130 (E.D. Tex., June 11, 2025) ("Docket Control Order")
2002	U.S. Publ. No. 2017/0181136 ("Bharadwaj '136")
2003	Excerpts of Defendants' P.R. 3-3 and 3-4 Invalidity Contentions and Subject Matter Eligibility Contentions in the consolidated case, *Wilus Institute of Standards and Technology Inc., v. HP Inc.*, Case No. 2:24-cv-00752-JRG-RSP (E.D. Tex.), dated February 13, 2025.
2004	Docket Navigator Stay Statistics
2005	Excerpt from U.S. District Court – National Judicial Caseload Profile for the Eastern District of Texas, March 31, 2025, https://www.uscourts.gov/sites/default/files/document/fcms_na_distprofile0331.2025.pdf
2006	Judge Rodney Gilstrap's median time to trial from July 22, 2024 until July 22, 2025, retrieved from www.docketnavigator.com
2007	D. Crouch, *Estoppel Gutted: A Pelican's Guide to Patent Litigation*, Patently-O, https://patentlyo.com/patent/2025/05/estoppel-pelicans-litigation.html (May 7, 2025)
2008	Declaration of Jin Sam Kwak
2009	List of Licensees to Wifi 6 from Sisvel, https://www.sisvel.com/licensing-programmes/Wi-Fi/wifi-6/#tab-list-of-licensees

2010	Letter re "Notice of Wi-Fi 6 License offer" from Sisvel to Samsung Electronics Co., Ltd. with Attachments 1-2, April 8, 2022
2011	Intentionally Omitted
2012	Application Data Sheet and Acknowledge Receipt for U.S. Appl. No. 17/656,916 on March 29, 2022
2013	Information Disclosure Statement for U.S. Appl. No. 17/656,916 on March 29, 2022
2014	Korean Patent No. 10-2082093, retrieved from the File History of U.S. Appl. No. 17/656,916
2015	HE-SIG-B Compression Mode (dated March 14, 2016)
2016	CIDs on Signaling for UL HE MU PPDU (dated January 16, 2017)
2017	Email from Alex Gelberg (district court trial counsel for Petitioner) dated August 27, 2025 to counsel for WILUS
2018	Declaration of Todor V. Cooklev, Ph.D. in support of Patent Owner's Response
2019	February 10, 2026 deposition transcript of Christopher J. Hansen, Ph.D.
2020	Redacted version of the January 28, 2026 Opening Report of Dr. Harry Bims (Corrected), submitted on behalf of Samsung Electronics Co. Ltd. in *Wilus Institute of Standards and Technology Inc. v. Samsung Electronics Co, Ltd. et al.*, No. 2:24-cv-00765-JRG (E.D. Tex.)
2021	CIDs on Signaling for UL HE MU PPDU (dated January 16, 2017) (version of Ex. 2016, including redline), *available for download from* https://mentor.ieee.org/802.11/documents?is_dcn=CIDs%20on%20Signaling%20for%20UL%20HE%20MU%20PPDU
2022	LinkedIn Profile for Youhan Kim, retrieved February 27, 2026 and *available at* https://www.linkedin.com/in/youhan-kim-36ab46a/

2023	LinkedIn Profile for John (Ju-Hyung) Son, retrieved February 27, 2026 and *available at* https://www.linkedin.com/in/jhson/
2024	Lochan Verma and Mohammad Fakharzadeh, *WiFi on Steroids: 802.11ac and 802.11ad*, IEEE Wireless Communications (December 2013), *available at* https://www.researchgate.net/profile/Mohammad-Fakharzadeh/publication/260711060_Wifi_on_steroids_80211AC_and_80211AD/links/5538fe430cf247b8587e8a1c/Wifi-on-steroids-80211AC-and-80211AD.pdf
2025	Article Preview for *Collision-Aware Rate Adaptation in mult-rate WLANs: Design and Implementation*, retrieved February 27, 2026 and *available at* https://www.sciencedirect.com/science/article/abs/pii/S1389128610001593

I. Introduction

Both challenged independent claims (claims 1 and 6) require that for a received PPDU, "the number of MU-MIMO users indicates a single user" "***when*** a SIG-B compression field of the HE-SIG-A indicates full bandwidth multi User Multiple Input Multiple Output (MU-MIMO) transmission," as required by the logical interaction between limitations [1.5]/[1.7] and [6.3]/[6.5]. However, the Petition makes no showing that such a scenario is disclosed or rendered obvious by the prior art.

Regarding disclosure, highly skilled professionals believed that such a scenario "cannot" occur in the prior art. *See* Ex. 1035 at page 484, CID 9770; Ex. 2021 at 3 (restating CID 9770). And regarding obviousness, the Petition sets forth ***no*** obviousness rationale whatsoever for this claim requirement.

Accordingly, the Petition fails to set forth any ground of invalidity that could even potentially show that any challenged claim is unpatentable.

II. Background of the '210 Patent

The '210 Patent was filed on December 31, 2019, and issued on October 26, 2021. It is a continuation of U.S. Patent No. 10,567,047 filed on July 8, 2019 which is a continuation of PCT Application No. PCT/KR2018/000443, filed on January 9, 2018. Ex. 1001 ('210 patent) at pgs. 1-2. The PCT Application further claims priority to Korean Application Nos. 10-2017-0003147 on January 29, 2017, and 10-2017-

08927 on January 18, 2018. ’210 Patent at 1:9-18. The ’210 Patent lists Juhyung Son, Jinsam Kwak, Geonjung Ko, Woojin Ahn as inventors. Wilus Institute of Standards and Technology Inc. (“Wilus”) is the sole assignee of record.

The ’210 patent describes that there is a continued need “for providing a high-efficiency and high-performance wireless LAN communication technology in a high-density environment” and recognizes that “in a next generation wireless LAN environment, communication having high frequency efficiency needs to be provided indoors/outdoors under the presence of high-density stations and access points (AP).” ’210 Patent at 2:35-44; Ex. 2018, ¶¶32–33. The techniques provided in the ’210 Patent can advantageously increase the total resource utilization rate, and improve the performance of the wireless LAN system. ’210 Patent, 4:15-23. The ’210 Patent is utilized by products that implement the Wi-Fi 6 (802.11ax) standard for wireless communications and is widely licensed by the industry.

A High Efficiency Multi-User PHY Protocol Data Unit (HE MU PPDU) is used for OFDMA (Orthogonal Frequency Division Multiple Access) and/or MU-MIMO transmission methods to enable an Access Point (AP) to send data to multiple stations (STAs) simultaneously. MU-MIMO achieves multi-user access by transmitting different spatial streams to different users, while OFDMA divides the available bandwidth into smaller Resource Units (RUs) allocated to different users. The preamble of an HE MU PPDU contains the HE-SIG-A (High Efficiency Signal

A) and HE-SIG-B (High Efficiency Signal B) fields. The '210 patent discloses techniques for configuring and using a combination of subfields in HE-SIG-A and HE-SIG-B to enable correct decoding of resources for full-bandwidth (BW) MU-MIMO transmissions without OFDMA. This approach prevents misinterpretation of the HE-SIG-B field and ensures proper decoding and resource allocation for both the MU-MIMO or single-user (non-MU-MIMO) transmissions. Ex. 2018, ¶34.

An important recognition of the '210 patent was that the SIGB Compression field of the HE-SIG-A could be used to indicate full-bandwidth MU-MIMO transmission even when the relevant PPDU is only targeted to a single user, "to reduce the signaling overhead of the HE-SIG-B of the uplink transmission." Ex. 1001, 19:1–24. This understanding is contrary to how skilled artisans at the time interpreted the most recent draft of the 802.11ax standard, such that a single user "cannot" be indicated when SIG-B Compression field is set to 1. *See* Ex. 1035 at page 484, CID 9770; Ex. 2021 at 3 (restating CID 9770); Ex. 2018, ¶35.

Representative Claim 1 of the '210 patent recites the following:

> [1pre] A wireless communication terminal, the terminal comprising:
> [1.1] a communication unit; and
> [1.2] a processor configured to process signals transmitted and received through the communication unit, wherein the processor is configured to:

[1.3] receive, through the communication unit, a high efficiency multi-user PHY protocol data unit (HE MU PPDU), wherein a preamble of the HE MU PPDU includes high efficiency signal A field (HE-SIG-A) and high efficiency signal B field (HE-SIG-B), and

[1.4] decode the received HE MU PPDU based on information obtained from the preamble,

[1.5] wherein when a SIG-B compression field of the HE-SIG-A indicates full bandwidth multi User-Multiple Input Multiple Output(MU-MIMO) transmission, a format of user field(s) included in a user specific field of the HE-SIG-B is identified based on a number of MU-MIMO users indicated by a subfield of the HE-SIG-A,

[1.6] wherein when the number of MU-MIMO users indicates two or more users, the user specific field of the HE-SIG-B includes user fields for MU-MIMO allocation, and

[1.7] wherein when the number of MU-MIMO users indicates a single user, the user specific field of the HE-SIG-B includes one user field for non-MU-MIMO allocation.

Independent Claim 6 (reproduced below) also recites similar elements as Claim 1.

[6pre] A wireless communication method of a wireless communication terminal, the method comprising:

[6.1] receiving a high efficiency multi-user PHY protocol data unit (HE MU PPDU), wherein a preamble of the HE

> MU PPDU includes high efficiency signal A field (HE-SIG-A) and high efficiency signal B field (HE-SIG-B); and
>
> [6.2] decode the received HE MU PPDU based on information obtained from the preamble,
>
> [6.3] wherein when a SIG-B compression field of the HE-SIG-A indicates full bandwidth multi User-Multiple Input Multiple Output (MUMIMO) transmission, a format of user field(s) included in a user specific field of the HE-SIG-B is identified based on a number of MU-MIMO users indicated by a subfield of the HE-SIG-A,
>
> [6.4] wherein when the number of MU-MIMO users indicates two or more users, the user specific field of the HE-SIG-B includes user fields for MU-MIMO allocation, and
>
> [6.5] wherein when the number of MU-MIMO users indicates a single user, the user specific field of the HE-SIG-B includes one user field for non-MU-MIMO allocation.

As shown above, limitations 6.3 and 6.5 are substantively identical to limitations 1.5 and 1.7. Ex. 2018, ¶¶35–37.

III. Claim Construction

The Federal Circuit has held that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). This

principle applies equally to IPR proceedings. *See, e.g., Apple Inc. v. Uniloc Luxembourg S.A.*, IPR2018-00420, Paper 7 at 8 (PTAB, Aug. 6, 2018).

For purposes of this response, Patent Owner does not believe any terms need express construction. However, it is helpful to emphasize a logical necessity of the claim language, such that "the processor" of claim 1 (or the device performing the method of claim 6) must be configured to receive a HE MU PPDU such that "the number of MU-MIMO users indicates a single user" ***and*** "a SIG-B compression field of the HE-SIG-A indicates full bandwidth MU-MIMO transmission" simultaneously. Ex. 2018, ¶¶38–45.

Claim 1 recites a "processor" that "is configured to… receive a [HE MU PPDU], wherein a preamble of the HE MU PPDU includes [HE-SIG-A] and [HE-SIG-B] field… [1.5] **wherein when a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission**, a format of user field(s) included in a user specific field of the HE-SIG-B is identified based on a number of MU-MIMO users indicated by a subfield of the HE-SIG-A,… [1.7] wherein the number of MU-MIMO users indicates a single user, the user specific field of the HE-SIG-B includes one user field for non-MU-MIMO allocation."

As shown above, limitation [1.7] recites that "*when the number of MU-MIMO users indicates a single user*, the user specific field of the HE-SIG-B includes one user field for non-MU-MIMO allocation." A POSITA would understand that "the

number of MU-MIMO users" which must indicate "a single user" derives antecedent basis from limitation [1.5]'s recitation of "a number of MU-MIMO users indicated by a subfield of the HE-SIG-A." And limitation [1.5] specifies that this number of users is indicated "***when*** a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission." Ex. 2018, ¶39–41.

Accordingly, "the number of MU-MIMO users" that "indicates a single user" (in limitation [1.7] must be the ***same*** "number of MU-MIMO users indicated by a subfield of the HE-SIG-A" that is identified "***when a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission***" (in limitation [1.5]). In other words, the "number of MU-MIMO users" must be indicated by a subfield of the HE-SIG-A simultaneously with ("when") a SIG-B compression field of the HE-SIG-A indicates full bandwidth MU-MIMO transmission. Ex. 2018, ¶42.

As noted above, both claims 1 and 6 have a similar structure. This claim interpretation is therefore likewise applicable to claim 6, such that in order to practice limitation [1.7], in the decoding process, the number of MU-MIMO users must indicate a single user (as recited in limitation [6.5]) ***simultaneously with*** the SIG-B compression field of the HE-SIG-A indicating full bandwidth MU-MIMO transmission (as recited in limitation [6.3]). Ex. 2018, ¶43.

Notably, Samsung advanced the same position in the related district court litigation. For instance, Samsung's expert Dr. Harry Bims provided the opinion in

his expert report, served by Samsung, that "[a]cceptable alternative designs [to the invention claimed in the '210 patent] include systems that use HE MU PPDU transmissions for the multiple user case and use HE SU PPDU transmissions for the single user case." Ex. 2020 (Bims Report) at ¶1263. In other words, according Samsung and its expert, so long as a system only uses full-bandwidth multi-user MIMO transmission in "the multiple user case" (and restricts the single user case to single-user transmissions), the invention of the '210 patent is not practiced.

As explained in further detail below, although the Petition's theories provide examples of ways in which an *unclaimed* "number of users" may indicate a single user (such as when the SIGB Compression field does ***not*** indicate full-bandwidth MU-MIMO transmission), the Petition fails to show that this would ever occur such that the ***claimed*** "number of MU-MIMO users" (i.e., the same "number of MU-MIMO users" that is indicated by a subfield of the HE-SIG-A "***when*** a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission") would "indicate[] a single user" as the claims require. Instead, as discussed herein, when a SIG-B compression field of the HE-SIG-A indicates full bandwidth MU-MIMO transmission, even professionals having far greater than ordinary skill in the art believed that the "[n]umber of MU-MIMO users ***cannot*** be 1," such that the hexadecimal value of 0x0 that would correspond to the number of

users being set to 1 should be "reserved." *See* Ex. 2021 at 3; Ex. 1035 at page 484, CID 9770; Ex. 2018, ¶44.

IV. The Petition's Ground 1A (802.11ax_D1.0)

802.11ax_D1.0 (sometimes referred to herein as "D1.0" for brevity) is a draft specification of the 802.11ax standard. The Petition contends that D1.0 was publicly accessible as of December 1, 2016. Pet. 17. For this proceeding only, Patent Owner does not contest the public accessibility of D1.0 as of December 1, 2016.

The Petition relies on B22 of the HE-SIG-A field of a PPDU as being the claimed "SIG-B compression field of the HE-SIG-A" as recited in limitation [6.3] (and the similar limitation [1.5]). Pet. 34–35; *id.*, 59 (the Petition's analysis for [1.5] merely incorporating the [6.3] analysis by reference). This field is shown in Table 28-17 of D1.0, a portion of which is reproduced below.

Table 28-17—HE-SIG-A field of an HE MU PPDU *(continued)*

	B15-B17	Bandwidth	3	Set to 0 for full 20 MHz Set to 1 for full 40 MHz Set to 2 for full 80 MHz Set to 3 for full 160 MHz and 80+80 MHz Set to 4 for preamble puncturing in 80 MHz, where in the preamble only the secondary 20 MHz is punctured Set to 5 for preamble puncturing in 80 MHz, where in the preamble only one of the two 20 MHz sub-channels in secondary 40 MHz is punctured Set to 6 for preamble puncturing in 160 MHz or 80+80 MHz, where in the primary 80 MHz of the preamble only the secondary 20 MHz is punctured Set to 7 for preamble puncturing in 160 MHz or 80+80 MHz, where in the primary 80 MHz of the preamble the primary 40 MHz is present.
	B18-B21	Number Of HE-SIG-B Symbols Or MU-MIMO Users	4	If the SIGB Compression field is 0, indicates the number of OFDM symbols in the HE-SIG-B field minus 1. If the SIGB Compression field is 1, indicates the number of MU-MIMO users minus 1.
	B22	SIGB Compression	1	Set to 1 for full BW MU-MIMO. Set to 0 otherwise.
	B23-B24	GI+LTF Size	2	Indicates the GI duration and HE-LTF size: Set to 0 to indicate a 4x HE-LTF and 0.8 µs GI Set to 1 to indicate a 2x HE-LTF and 0.8 µs GI Set to 2 to indicate a 2x HE-LTF and 1.6 µs GI Set to 3 to indicate a 4x HE-LTF and 3.2 µs GI
	B25	Doppler	1	Set to 0 if Doppler mode is not used Set to 1 if Doppler mode is used

Ex. 1004, 302–303.

The Petition additionally relies on bits 18–21 of the HE-SIG-A field as indicating "a number of MU-MIMO users" as claimed. *See* Pet. 35 (noting that "the number of STAs in the MU-MIMO group is indicated in the SIGB Number of Symbols/Number of MU-MIMO Users field in the HE-SIG-A field").

As explained below, D1.0 does not either disclose or render obvious that this "number of MU-MIMO users" could "indicate[] a single user" ***when*** (i.e.,

simultaneously with) "a SIG-B compression field of the HE-SIG-A indicat[ing] full bandwidth [MU-MIMO] transmission," as the claim would require under the Petition's claim mapping. Ex. 2018, ¶¶45–61.

A. 802.11ax_D1.0 does not disclose indicating a single user when the SIG-B Compression field indicates full-bandwidth MU-MIMO transmission as would be required to satisfy limitations [1.5] / [1.7] and [6.3] / [6.5].

The Petition's theory is that "the number of user block fields… varies depending on the number of indicated users" in the HE-SIG-A field, such that "only a single (i.e., one) user block would be provided for the case where a single user is indicated for non-MU-MIMO allocation." Pet. 45. *Id.*, ¶119. The Petition further alleges that this "one user block field would have included a single (i.e., one) user field" in this alleged scenario of "transmissions to single users." *Id.* ¶120.

The problem with the Petition's theory, however, is that the Petition provides no evidence that there ever would (or could) be a case "where a single user is indicated" ***while*** the SIG-B Compression field indicates full-bandwidth MU-MIMO transmission. The Petition's theory is based on the premise that "the number of users indicated in the SIG-A field" ***would*** be set to a single user (value 0x0). And as discussed above, this "single user" would need to be indicated "***when*** a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO]

transmission." But as explained below, a POSITA would have interpreted D1.0 as ***prohibiting*** this scenario.

For instance, in the context of "an MU-MIMO allocation" (i.e., an allocation where the "SIG-B compression field" is set to 1 to indicate full-bandwidth MU-MIMO transmission), D1.0 teaches that the "Spatial Configuration subfield encoding" of Table 28-24 applies. *See* Ex. 1004 at 322 (internal page 296). And Table 28-24 makes clear that the number of users (i.e., "N_{user}") in this context is a number ranging from a minimum of "2" to a maximum of "8." *Id.* at 323–324; Ex. 2018, ¶50.

Table 28-24—Spatial Configuration subfield encoding

N_{user}	B3...B0	Nsts [1]	Nsts [2]	Nsts [3]	Nsts [4]	Nsts [5]	Nsts [6]	Nsts [7]	Nsts [8]	Total Nsts	Number of entries
2	0000-0011	1-4	1							2-5	10
	0100-0110	2-4	2							4-6	
	0111-1000	3-4	3							6-7	
	1001	4	4							8	
3	0000-0011	1-4	1	1						3-6	13
	0100-0110	2-4	2	1						5-7	
	0111-1000	3-4	3	1						7-8	
	1001-1011	2-4	2	2						6-8	
	1100	3	3	2						8	
4	0000-0011	1-4	1	1	1					4-7	11
	0100-0110	2-4	2	1	1					6-8	
	0111	3	3	1	1					8	
	1000-1001	2-3	2	2	1					7-8	
	1010	2	2	2	2					8	

Table 28-24—Spatial Configuration subfield encoding *(continued)*

5	0000-0011	1-4	1	1	1	1				5-8	6
	0100-0101	2-3	2	1	1	1				7-8	
6	0000-0010	1-3	1	1	1	1	1			6-8	4
	0011	2	2	1	1	1	1			8	
7	0000-0001	1-2	1	1	1	1	1	1		7-8	2
8	0000	1	1	1	1	1	1	1	1	8	1

Furthermore, the Petition identifies no disclosure in D1.0 (or any other evidence) that a full-bandwidth ***multi-user*** MIMO allocation could ever be directed to only a ***single*** user in the context of D1.0. Thus, in light of these teachings of D1.0 discussed above, a POSITA reviewing D1.0 would understand that when B22 (i.e., the SIG-B compression field) of the HE-SIG-A is set to 1 (thus indicating multi-user MIMO transmission), the number of users indicated by B18-21 (i.e., the field specifying the "number of MU-MIMO users minus 1") "cannot" have a value of 0x0 and thus cannot indicate that the number of MU-MIMO users is 1. *See* Ex. 2021, 3. Ex. 2018, ¶¶50–51.

This understanding is further confirmed by evidence confirming that even persons of significantly *greater* than ordinary skill in the art had this understanding. For instance, a January 9, 2017 comment on D1.0 by Youhan Kim[1] noted that in light of D1.0's teachings, the "[n]umber of MU-MIMO users ***cannot be*** 1 (value 0x0)." Ex. 1035 at page 484, CID 9770. Mr. Kim drew this conclusion based on the D1.0 draft that did not explicitly teach that the number of MU-MIMO users ***could*** be 1, "because the Spatial Config subfield in HE-SIG-B has ***Nuser >=2.***" *Id.* Mr. Kim thus believed that the logical conclusion from the teachings of D1.0 was that

[1] Youhan Kim, according to his LinkedIn Profile, has a Ph.D. in Electronic and Electrical Engineering, and has been working on relevant wireless networking technology since September 2006, and worked at Qualcomm and predecessor companies since 2009. Ex. 2022.

the value 0x0 (i.e., setting the number of MU-MIMO users to be 1) simply could not be used, and thus should be "reserved" when MU-MIMO transmission was indicated. And the Petition concedes that such comments are "evidence of how a POSITA at that time was interpreting 802.11ax-D1.0." Pet. 46 n.1. Accordingly, there is no need to speculate as to what a POSITA would have understood; there is contemporaneous evidence that even a skilled artisan, when reviewing D1.0, would have understood that the "[n]umber of MU-MIMO users ***cannot*** be 1" such that the input corresponding to that invalid number of users should never be placed into the "Number of … MU-MIMO Users field of HE-SIG-A."

This was not some fringe or unreasonable opinion but was rather confirmed by another highly skilled individual, John (Ju-Hyung) Son, the lead inventor of the '210 patent.[2] Ex. 2018, ¶¶52-54. Specifically, in response to that comment, Dr.

[2] John Son received a Ph.D. in Electronics from Seoul National University in 2007, and has been working in standardization and development for networking technology since 2008. *See* Ex. 2023. Although John Son is listed as the lead author of Ex. 2021, Lochan Verma is also named in Exhibit 2021. As of December 2013, Mr. Verma had "a decade of industry experience in wireless communications" and "authored more than 20 patents and international

Son "[a]gree[d] in principle with the comment," but recognized a potential "use case for setting the value 0x0 for the "Number of Users Symbols or MU-MIMO Users field of HE-SIG-A in HE MU PPDU is the" specific use case of "UL HE MU PPDU," in which a "non-AP STA transmitter" could "reduce HE-SIG-B overhead by setting SIGB compression field to 1 while the number of MU-MIMO Users field is set to 0. Therefore, the value 0x0 should not be reserved." Ex. 2021 at 3. In other words, the inventor of the '210 patent recognized something that other highly skilled artisans such as Youhan Kim failed to recognize—that there is a valuable use case for setting the Number of MU-MIMO Users field to 0x0 even when the SIG-B Compression field is 1.[3] Ex. 2018, ¶54.

---

publications." *See* Ex. 2024 at 6. Mr. Verma additionally holds a master's degree in Electrical Engineering and Computer Science from Seoul National University. *See* Ex. 2025 at 9.

[3] Additionally, another skilled artisan was unsure even of whether the HE MU PPDU could ***ever*** be targeted to a single user, as shown in CID 5264, cited by the Petition (*see* Pet. 46 n.6). *See* Ex. 1035, 142 (CID 5264: "[I]s it allowed to use the HE MU PPDU for a single user?"); Ex. 1036, 3 (same). The commentor Dorothy Stanley noted that such a usage would be inconsistent with the teachings of D1.0

After recognizing this advantage of setting the SIG-B Compression field to 1 while the Number of MU-MIMO Users is set to 0x0 (indicating a single user), Dr. Son proposed that D1.0 be ***modified*** to allow for the "SIGB Compression field" to be "set to 1 (indicating full bandwidth MU-MIMO transmission) ***and*** the Number Of HE-SIG-B Symbols Or MU-MIMO Users field in the HE-SIG-A field of an HE MU PPDU" to be "set to 0 (indicating 1 MU-MIMO user)" simultaneously. Ex. 2018, ¶55.

Dr. Son's modification to D1.0 was a meaningful change not reflected in D1.0 itself, as Samsung's expert Dr. Hansen was unable to identify any similar teaching in D1.0. *See* Ex. 2019 at 31:13–21 ("Q. So specifically, this bottom paragraph on page 3 of Exhibit 1036 states that the MU-MIMO Users field can indicate one MU-MIMO user. I didn't see anything like that in the 802.11ax D1.0 draft. Did I miss

---

itself. *See id.* (noting that if it ***is*** "allowed to use the HE MU PPDU for a single user," a "statement [in D1.0] is incorrect"). The fact that a person of likely *greater* than ordinary skill in the art (*see* Ex. 2019, 13:22–14:4) was unsure of whether a HE MU PPDU could *ever* target a single user is further evidence that a person of ordinary skill in the art would not have understood this to be possible in the specific scenario where full-bandwidth MU-MIMO is indicated. *See* Ex. 2018, ¶55 n.3.

something? A. Yeah. I really don't—don't know the answer to that."); Ex. 2018, ¶55–56.

Accordingly, D1.0 does not disclose that the number of MU-MIMO users could indicate a single user "when a SIG-B compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission" as all challenged claims require.

B. The Petition fails to show 802.11ax_D1.0 <u>renders obvious</u> indicating a single user while the SIG-B Compression field indicates full-bandwidth MU-MIMO transmission as would be required to satisfy limitations [1.5] / [1.7] and [6.3] / [6.5].

The Petition provides several allegations regarding why it would supposedly have been obvious to include a single User field in the HE-SIG-B "when a single user is indicated in the HE-SIG-A field." *See, e.g.*, Ex. Pet. 41; *id.* 47–48 (alleging what would be obvious "when a single user is indicated by the HE-SIG-A"). However, the Petition sets forth no obviousness rationale as to why it would supposedly have been obvious for a single user to be indicated in the HE-SIG-A field ***when the SIG-B compression field is set to 1***, as the claims would require under the Petition's claim mapping.

As explained in the preceding subsection, a POSITA would have understood D1.0's disclosure to ***prohibit*** indication of a single user "when a SIG-B compression

field of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission" as all challenged claims require, such that this setting "cannot" occur. Ex. 1035, p. 484, CID 9770 (reaching this conclusion because he believed that the "Number of MU-MIMO users ***cannot*** be 1 (value 0x0)"); Ex. 1036, 3 (same). Given that the Petition presents no obviousness theory as to this point, the Petition's Ground 1A cannot succeed. Ex. 2018, ¶¶58–59.

V. The Petition's Ground 1B (802.11ax_D1.0 in combination with Bharadwaj)

For Ground 1B, the Petition merely incorporates by reference its analysis of Ground 1A for limitations [6.3] and [6.5] (which are equivalent to limitations [1.5] and [1.7] respectively, and require that the decoded PPDU simultaneously indicate full bandwidth MU-MIMO transmission "when the number of MU-MIMO users indicates a single user"). *See* Pet. 59 (Petition's analysis for limitations [1.5] and [1.7] merely incorporating by reference the [6.3] and [6.5] theories). Accordingly, the Petition's Ground 1B fails for at least the same reasons as the Petition's Ground 1A. Ex. 2018, ¶60

VI. The Petition's Ground 2

Like with the Petition's Ground 1, the Petition's Ground 2 glosses over the clear claim requirement that the number of users indicated must be a "single user" "***when*** a SIG-B Compression field of the HE-SIG-A indicates full bandwidth [MU-

MIMO]" as required by all independent claims. As explained below, a POSITA would have understood Bharadwaj in the same way in relevant respect as D1.0, and the Petition provides no theory as to why it would even allegedly be obvious to a POSITA in view of Bharadwaj (alone or in combination with Sun) to have the HE-SIG-A field indicate a single user "***when*** a SIG-B Compression field of the HE-SIG-A indicates full bandwidth [MU-MIMO]" as required. *See* Ex. 2018, ¶¶61–77.

A. A POSITA would not have understood Bharadwaj to disclose or render obvious a single user being indicated when full bandwidth MU-MIMO is also indicated.

Bharadwaj, like D1.0, relates to 802.11, including 802.11ax. *See, e.g.*, Ex. 1013, [0064], [00143] (indicating that IEEE 801.11ax or "some future version of IEEE 802.11" is used). Bharadwaj was filed on December 21, 2016, after the December 1, 2016 date that the Petition contends that D1.0 was publicly accessible, such that under the Petition's allegations a POSITA reviewing Bharadwaj would have had access to D1.0. *See* Ex. 2019, 24:25–25:7.

The Petition's theory with respect to its Ground 2 combination involving Bharadwaj fail at least for similar reasons as to D1.0; a POSITA would have understood that, based on heavily overlapping teachings between D1.0 and Bharadwaj, that the nearly identical disclosures in relevant respect between D1.0 and Bharadwaj should be interpreted the same way. Ex. 2018, ¶¶61–62.

For instance, Samsung's expert was unable to identify how the bits 18-21 of the HE-SIG-A (i.e., the Number of MU-MIMO Users field of the HE-SIG-A) should be interpreted differently between D1.0 and Bharadwaj other than to vaguely note that "there could be differences between them" (Ex. 2019 at 10:8–11:2), and for the reasons addressed above, a POSITA would ***not*** have understood the Number of MU-MIMO users to indicate a single user while the SIGB Compression bit is set to 1 in the context of D1.0 (and as explained below, the conclusion would have been the same regarding Bharadwaj). Ex. 2018, ¶62.

As explained above regarding Ground 1, D1.0 teaches a spatial configuration table corresponding to full-bandwidth MU-MIMO transmission that only accounts for MU-MIMO users being greater than or equal to two users. *See* Ex. 1004, 323–24 (Table 28-24). On this basis, a POSITA would have understood that the number of MU-MIMO users "***cannot be***" a single user. Ex. 1035 at page 484, CID 9770. Table 28-24 of Ex. 1004 is reproduced below:

Table 28-24—Spatial Configuration subfield encoding

N_{user}	B3...B0	Nsts [1]	Nsts [2]	Nsts [3]	Nsts [4]	Nsts [5]	Nsts [6]	Nsts [7]	Nsts [8]	Total Nsts	Number of entries
2	0000-0011	1-4	1							2-5	10
	0100-0110	2-4	2							4-6	
	0111-1000	3-4	3							6-7	
	1001	4	4							8	
3	0000-0011	1-4	1	1						3-6	13
	0100-0110	2-4	2	1						5-7	
	0111-1000	3-4	3	1						7-8	
	1001-1011	2-4	2	2						6-8	
	1100	3	3	2						8	
4	0000-0011	1-4	1	1	1					4-7	11
	0100-0110	2-4	2	1	1					6-8	
	0111	3	3	1	1					8	
	1000-1001	2-3	2	2	1					7-8	
	1010	2	2	2	2					8	

Table 28-24—Spatial Configuration subfield encoding *(continued)*

5	0000-0011	1-4	1	1	1	1				5-8	6
	0100-0101	2-3	2	1	1	1				7-8	
6	0000-0010	1-3	1	1	1	1	1			6-8	4
	0011	2	2	1	1	1	1			8	
7	0000-0001	1-2	1	1	1	1	1	1		7-8	2
8	0000	1	1	1	1	1	1	1	1	8	1

Ex. 1004, 323–24 (Table 28-24).

Bharadwaj has a table that is identical in terms of substance to D1.0's spatial configuration table, reproduced below. Ex. 1013 at [0036] & FIG. 7.

Nuser	B3 … B0	Nsts [1]	Nsts [2]	Nsts [3]	Nsts [4]	Nsts [5]	Nsts [6]	Nsts [7]	Nsts [8]	Number of Entries
2	0000~0011	1~4	1							10
	0100~0110	2~4	2							
	0111~1000	3~4	3							
	1001	4	4							
3	0000~0011	1~4	1	1						13
	0100~0110	2~4	2	1						
	0111~1000	3~4	3	1	705					
	1001~1011	2~4	2	2						
	1100	3	3	2						
4	0000~0011	1~4	1	1	1					11
	0100~0110	2~4	2	1	1					
	0111	3	3	1	1					
	1000~1001	2~3	2	2	1					
	1010	2	2	2	2					
5	0000~0011	1~4	1	1	1	1				6
	0100~0101	2~3	2	1	1	1				
6	0000~0010	1~3	1	1	1	1	1			4
	0011	2	2	1	1	1	1			
7	0000~0001	1~2	1	1	1	1	1	1		2
8	0000	1	1	1	1	1	1	1	1	1

Ex. 1013, FIG. 7.

As noted above, a POSITA reading the substantively identical table in the context of D1.0 would have understood that the number of MU-MIMO users field

"cannot" indicate a single MU-MIMO user, because "Nuser" must be a value from 2 to 8. The same understanding would have applied to Bharadwaj, given its identical teachings in relevant respect. Ex. 2018, ¶¶63–65. And importantly, neither D1.0 nor Bharadwaj teaches what the inventors of the '210 patent recognized, which was that "setting the value 9 for the Number of… MU-MIMO Users field of the HE-SIG-A in HE MU PPDU is the UL HE MU PPDU case," in order to "reduce HE-SIG-B overhead by setting SIGB Compression field to 1 while the number of MU-MIMO Users field is set to 0." Ex. 2021 at 3; *id.* (proposing a change indicating that "the SIGB Compression field… is set to 1 (indicating full bandwidth MU-MIMO transmission) and the Number Of… MU-MIMO Users field… is set to 0 (indicating 1 MU-MIMO user)" simultaneously); Ex. 1001, 19:1–24 (noting that "the SIG-B compression field may be set according to different rules between when the UL/DL field indicates downlink transmission and when it indicates uplink transmission," such that "when the UL/DL field indicates uplink transmission, the value of the SIG-B compression field may ***always*** be set to 1" even though only a single user is indicated (because in uplink transmission, only a single AP will be receiving the PPDU), in order "to reduce the signaling overhead of the HE-SIG-B of the uplink transmission").

Thus, because Bharadwaj has an identical teaching to D1.0 that conveys to a POSITA that Nuser must be >= 2 such that Nuser ***cannot*** be 1 when SIGB

Compression is set to 1 (and no teaching similar to that of the '210 patent that the SIGB Compression bit can operate differently depending on context, e.g., to reduce overhead in uplink transmissions), a POSITA would have interpreted Bharadwaj the same as D1.0, such that a POSITA would have understood that the Number of MU-MIMO users ***cannot*** be a single user when SIGB Compression is set to 1. Ex. 2018, ¶¶65–71.

B. The Petition's combination with Sun does not cure Bharadwaj's deficiency.

The Petition alleges that a POSITA would have combined Bharadwaj with Sun, such that Sun's HE-SIG-B formatting would be used "[w]hen a single user is indicated" in the HE-SIG-A. Ex. 1003, ¶172. As noted above, Bharadwaj does not disclose that a single user ***would*** be indicated simultaneously with the SIGB Compression field being set to 1 and indicating full-bandwidth MU-MIMO transmission, as the claims require. But in any event, even if a POSITA would have combined Bharadwaj with Sun, the combination would not satisfy the claim requirements. Ex. 2018, ¶¶72–77.

First, the Petition fails to allege (much less show) that Sun cures any deficiency of Bharadwaj in disclosing or rendering obvious that the number of MU-MIMO users would be indicated as a single user in the HE-SIG-A "***when*** [the] SIG-B Compression field of the HE-SIG-A indicates full-bandwidth [MU-MIMO]

transmission" as limitations [1.5]/[1.7] and [6.3]/[6.5] require. Ex. 2018, ¶73. For example, the Petition identifies no teaching in Sun that allegedly discloses or even relates to simultaneous indication of (1) a single user and (2) SIG-B Compression field indicating full-bandwidth MU-MIMO transmission.

Furthermore, the Petition's analysis of limitations [1.7] (and [6.5]) does not even allege that the ***claimed*** "number of MU-MIMO users" (i.e., the number of MU-MIMO users indicated simultaneously with the SIGB Compression field indicating full-bandwidth MU-MIMO transmission) would indicate a single user. *See generally* Pet. 73–74, 80; Ex. 2018, ¶74–77.

Additionally, even if the Petition ***had*** shown that it would be obvious to indicate a single user when the SIG-B compression field indicates full-bandwidth MU-MIMO transmission (something the Petition does not even *allege* in its analysis of limitations [1.7] and [6.5]), the Petition would *still* fail to show that a combination with Sun for limitations [1.7] and [6.5] would have been obvious in a way that satisfies the claim requirements. For instance, as explained by Dr. Cooklev, a POSITA would have understood that the HE-SIG-B formats that the Petition relies upon from both Bharadwaj and Sun are inconsistent with full-bandwidth MU-MIMO transmission mode, because they both include common fields which are prohibited in the case of full-bandwidth MU-MIMO transmission. Ex. 2018, ¶¶75–77. Accordingly, it would not have been obvious to use those HE-SIG-B formats to

arrive at the requirement that "the user specific field of the HE-SIG-B includes one user field for non-MU-MIMO allocation" in the full-bandwidth MU-MIMO transmission mode scenario. *Id.*

In sum, as explained in the previous subsection, the Petition fails to show that discloses or renders obvious that a single user would be indicated "when a SIG-B Compression of the HE-SIG-A indicates full bandwidth [MU-MIMO] transmission" as the claims require. Furthermore, even if Bharadwaj counterfactually *did* disclose or render obvious such a scenario, the Petition fails to make any plausible showing that a POSITA would have looked to Sun and combined it with Bharadwaj in any manner that would both be consistent with the language of claims 1 and 6 and be consistent with the theory set forth in the Petition. Ex. 2018, ¶77.

VII. Conclusion

For the reasons set forth above, Patent Owner respectfully requests that the Board find all challenged claims not unpatentable.

Date: March 23, 2026

Respectfully submitted,

/James A. Milkey/
James A. Milkey, Reg. No. 79,503
Russ, August & Kabat
12424 Wilshire Blvd., 12th Floor
Los Angeles, CA 90025

Counsel for Patent Owner

CERTIFICATION REGARDING WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Patent Owner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this **PATENT OWNER'S RESPONSE (CORRECTED)**, that the amount of words in this paper is 5031. Pursuant to 37 C.F.R. § 42.24, this word count is in compliance with the word limit set forth in 37 C.F.R. § 42.24(b)(2) excluding the portions exempted under 37 C.F.R. § 42.24(a)(1).

Date: March 23, 2026

Respectfully submitted,
/James A. Milkey /
James A. Milkey, Reg. No. 79,503
Russ, August & Kabat
12424 Wilshire Blvd., 12th Floor
Los Angeles, CA 90025

Attorney for Patent Owner

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

The undersigned hereby certifies that the above document was served on March 23, 2026, by filing this document through the Patent Trial and Appeal Case Tracking System as well as delivering a copy via electronic mail upon the following attorneys of record for the Petitioners:

W. Karl Renner
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
Tel: 202-783-5070
Fax: 877-769-7945
Email: IPR39843-0195IP1@fr.com

Jeremy J. Monaldo, Reg. No. 58,680
Nicholas Stephens, Reg. No. 74,320
Rishi Gupta, Reg. No. 64,768
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
Tel: 202-783-5070
Fax: 877-769-7945
PTABInbound@fr.com

Date: March 23, 2026

/ James A. Milkey /

RUSS AUGUST & KABAT
12424 Wilshire Blvd., 12th Fl.
Los Angeles, CA 90025
(310) 826-7474

James A. Milkey
Reg. No. 79,503
Attorney for Patent Owner