

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Geonjung Ko, et al.	Attorney Docket No. 39843-0196IP1
U.S. Patent No.:	11,129,163	
Issue Date:	September 21, 2021	
Appl. Serial No.:	16/121,546	
Filing Date:	September 4, 2018	
Title:	WIRELESS COMMUNICATION METHOD AND WIRELESS COMMUNICATION TERMINAL IN BASIC SERVICE SET OVERLAPPING WITH ANOTHER BASIC SERVICE SET	

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES
PATENT NO. 11,129,163 PURSUANT TO 35 U.S.C. §§ 311–319,
37 C.F.R. § 42

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EXHIBITS

- SAMSUNG-1001 U.S. Pat. No. 11,129,163 to Ko, et al. (“the ’163 Patent”)
- SAMSUNG-1002 Excerpts from the Prosecution History of the ’163 Patent (“the Prosecution History”)
- SAMSUNG-1003 Declaration and Curriculum Vitae of Dr. Mark P. Mahon
- SAMSUNG-1004 Complaint, *Wilus Institute of Standards and Technology Inc., v. Samsung Electronics Co., Ltd., et al.*, 2-24-cv-00765 (EDTX) filed September 20, 2024
- SAMSUNG-1005 U.S. Pat. App. Pub. No. 2017/0223731 (“Lee”)
- SAMSUNG-1006 Robert Stacey et al., *Proposed TGax Draft Specification*, IEEE 802.11-16/0024r1 (Mar. 2, 2016), available at <https://mentor.ieee.org/802.11/dcn/16/11-16-0024-01-00ax-proposed-draft-specification.docx> (“Stacey”)
- SAMSUNG-1007 U.S. Pat. App. Pub. No. 2016/0345258 (“Zhou”)
- SAMSUNG-1008 U.S. Provisional App. No. 62/165,782 (“Zhou Provisional”)
- SAMSUNG-1009 European Pat. App. Pub. No. 2930997 (“Choudhury”)
- SAMSUNG-1010 Int’l Pub. No. WO 2015/120488 (“Liu”)
- SAMSUNG-1011 U.S. Pat. App. Pub. No. 2015/0312386 (“Lee”)
- SAMSUNG-1012 U.S. Pat. No. 9,172,447 (“Park”)
- SAMSUNG-1013 U.S. Pat. No. 7,848,330 (“Nishibayashi”)
- SAMSUNG-1014 U.S. Pat. No. 7,769,043 (“Cimini”)
- SAMSUNG-1015 European Pat. No. 3139690 (“Kim”)
- SAMSUNG-1016 Int’l Pub. No. WO 2015/198157 (“Seok”)
- SAMSUNG-1017 Int’l Pub. No. WO 2011/159831 (“Wentink”)
- SAMSUNG-1018 Int’l Pub. No. WO 2014/179713 (“Oteri”)

SAMSUNG-1019 Kurose and Ross, Computer Networking: A Top-Down
Approach, 8th Ed, 2021 (“Kurose”)

SAMSUNG-1020 IEEE 802.11-2016

SAMSUNG-1021 Declaration of Christopher Hansen, PH.D.

SAMSUNG-1022 *Fintiv* Stipulation

LISTING OF CHALLENGED CLAIMS

Claim 1	
[1.1]	A wireless communication terminal communicating wirelessly, the wireless communication terminal comprising:
[1.2]	a transceiver; and
[1.3]	a processor,
[1.4]	wherein the processor is configured to receive a physical layer convergence procedure (PLCP) Processing Data Unit (PPDU) by using the transceiver, and not to use a Basic Service Set (BSS) color when signaling information indicates that an operation based on the BSS color is not allowed,
[1.5]	wherein the BSS color is an identifier of a BSS,
[1.6]	wherein the signaling information is transmitted from a base wireless communication terminal to which the wireless communication terminal is associated.
Claim 2	
[2.1]	The wireless communication terminal of claim 1, wherein the processor is configured not to set an Intra-BSS Network Allocation Vector (NAV) by using the BSS color indicated by a signaling field of the PPDU when the signaling information indicates that the operation based on the BSS color is not allowed,
[2.2]	wherein the Intra-BSS NAV is different from a Basic NAV and is a NAV which is set based on an Intra-BSS PPDU,
[2.3]	wherein the Basic NAV is set based on an Inter-BSS PPDU or a PPDU which is not able to be identified as the Inter-BSS PPDU or the Intra-BSS PPDU.
Claim 3	
[3.1]	The wireless communication terminal of claim 2, wherein the PPDU includes a TXOP Duration field in the signaling field of the PPDU and a medium access control (MAC) frame which includes a duration field,
[3.2]	wherein the TXOP Duration field indicates information used for setting the Intra-BSS NAV and the Basic NAV,
[3.3]	wherein the duration field indicates information used for setting the Intra-BSS NAV and the Basic NAV,

[3.4]	wherein the processor is configured not to use the TXOP Duration field for setting the Intra-BSS NAV or the Basic NAV when the wireless communication terminal gets a valid signaling field of the MAC frame.
Claim 4	
[4.1]	The wireless communication terminal of claim 1, wherein the processor is configured to signal that the operation based on the BSS color is not allowed when the wireless communication terminal recognizes that a BSS color collision has occurred,
[4.2]	wherein the BSS color collision represents that different BSSs correspond to one BSS color.
Claim 5	
[5]	The wireless communication terminal of claim 4, wherein the processor is configured to determine that BSS color collision has occurred based on address fields of a medium access control (MAC) frame.
Claim 6	
[6.1]	The wireless communication terminal of claim 1, wherein the operation based on the BSS color includes entering a doze state of a power save operation based on a BSS color indicated by a signaling field of the PPDU,
[6.2]	wherein the power save operation is an operation for the wireless communication terminal to enter the doze state until an end of a received PPDU which is an Intra-BSS PPDU.
Claim 7	
[7]	The wireless communication terminal of claim 1, wherein the processor is configured not to perform a spatial reuse operation when the BSS color indicated by the signaling field of the PPDU is a predetermined value.
Claim 8	
[8]	The wireless communication terminal of claim 7, wherein the predetermined value is 0.
Claim 9	
[9.1]	An operation method of a wireless communication terminal communicating wirelessly, the method comprising:

[9.2]	receiving a physical layer convergence procedure (PLCP) Processing Data Unit (PPDU); and
[9.3]	not using a Basic Service Set (BSS) color when signaling information indicates that an operation based on the BSS color is not allowed,
[9.4]	wherein the BSS color is an identifier of a BSS,
[9.5]	wherein the signaling information is transmitted from a base wireless communication terminal to which the wireless communication terminal is associated.
Claim 10	
[10.1]	The method of claim 9, wherein the method further comprises not setting an Intra-BSS Network Allocation Vector (NAV) by using the BSS color indicated by a signaling field of the PPDU when the signaling information indicates that the operation based on the BSS color is not allowed,
[10.2]	wherein the Intra-BSS NAV is different from a Basic NAV and is a NAV which is set based on an Intra-BSS PPDU,
[10.3]	wherein the Basic NAV is set based on an Inter-BSS PPDU or a PPDU which is not able to be identified as the Inter-BSS PPDU or the Intra-BSS PPDU.
Claim 11	
[11.1]	The method of claim 10, wherein the PPDU includes a TXOP Duration field in the signaling field of the PPDU and a medium access control (MAC) frame which includes a duration field,
[11.2]	wherein the TXOP Duration field indicates information used for setting the Intra-BSS NAV and the Basic NAV,
[11.3]	wherein the duration field indicates information used for setting the Intra-BSS NAV and the Basic NAV,
[11.4]	wherein the method further comprises not using the TXOP Duration field for setting the Intra-BSS NAV or the Basic NAV when the wireless communication terminal gets a valid signaling field of the MAC frame.
Claim 12	
[12.1]	The method of claim 9, wherein the method further comprises signal that the operation based on the BSS color is not allowed when the

	wireless communication terminal recognizes that a BSS color collision has occurred,
[12..2]	wherein the BSS color collision represents that different BSSs correspond to one BSS color.
Claim 13	
[13]	The method of claim 12, wherein the signaling that a BSS color collision has occurred comprises determining that BSS color collision has occurred based on address fields of a medium access control (MAC) frame.
Claim 14	
[14.1]	The method of claim 9, wherein the operation based on the BSS color includes entering a doze state of a power save operation based on a BSS color indicated by the signaling field of the PPDU,
[14.2]	wherein the power save operation is an operation for the wireless communication terminal to enter the doze state until an end of a received PPDU which is an Intra-BSS PPDU.
Claim 15	
[15]	The method of claim 9, wherein the method further comprises not performing a spatial reuse operation when the BSS color indicated by the signaling field of the PPDU is a predetermined value.
Claim 16	
[16]	The method of claim 15, wherein the predetermined value is 0.

Samsung Electronics Co., Ltd. (“Petitioner” or “Samsung”) petitions for
Inter Partes Review (“IPR”) of claims 1-16 (“the Challenged Claims”) of U.S.
Patent No. 11,129,163 (“the ’163 Patent”).

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the ’163 Patent is available for IPR. This petition is
being filed within one year of service of a complaint against Samsung.

SAMSUNG-1004. Samsung is not barred or estopped from requesting review of
the Challenged Claims on the below-identified grounds.

B. Challenge and Relief Requested

Samsung requests an IPR of the Challenged Claims on the grounds noted
below. Dr. Mahon provides supporting testimony in his Declaration. SAMSUNG-
1003, ¶¶4-238.

Ground	Claims	35 U.S.C. §103
1A	1, 7, 9, 15	Lee
1B	2-3, 6, 10-11, 14	Lee-Stacey
1C	4-5, 12-13	Lee-Zhou
1D	7-8, 15-16	Lee-Choudhury
2A	1, 7-9, 15, 16	Choudhury
2B	2, 3, 6, 10, 11, 14	Choudhury-Stacey

Ground	Claims	35 U.S.C. §103
2C	4, 5, 12, 13	Choudhury-Zhou

The '163 Patent claims priority as early as 3/4/2016 (“Critical Date”).

SAMSUNG-1001, Cover. Petitioner does not concede that the Challenged Claims are entitled to the claimed priority. The references are prior art:

Reference	Filing Date	Publication Date
Lee	7/28/2015	8/3/2017
Stacey	N/A	3/2/2016
Zhou	5/22/2015	9/24/2016
Choudhury	1/26/2015	10/14/2015

Lee is a national stage application of PCT/KR2015/007832, which was filed on July 28, 2015. SAMSUNG-1005, Cover. Thus, Lee’s effective filing date is July 28, 2015, making it prior art to the '163 Patent.

Stacey was published to the IEEE Mentor platform on March 2, 2016, before the '163 Patent priority date. SAMSUNG-1021, ¶¶17-45. IEEE Mentor is accessible to members of the public. *Id.*

Zhou claims priority to U.S. Provisional App. No. 62/165,782 (“Zhou Provisional”). SAMSUNG-1007, Cover; *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 (Mar. 10, 2023) (precedential as to section II.E.3). To

show that the requirements of *Penumbra* are met, each citation to Zhou in the grounds below includes a parallel citation to the portion of the Zhou Provisional describing the same subject matter. The Zhou Provisional and the Zhou Publication are substantially identical in their technical disclosure, including the same figures and materially indistinguishable text regarding BSS color collision detection and resolution. SAMSUNG-1007; SAMSUNG-1008. In fact, claims 1-5 of the Zhou Provisional are carried forward into the Zhou Publication, demonstrating direct claim-level support.

Choudhury was published on October 14, 2015, before the '163 Patent.

C. Claim Construction

Petitioner submits that no formal claim constructions are necessary because “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Petitioner reserves the right to respond to any constructions offered by Patent Owner or adopted by the Board. Petitioner is not conceding that each challenged claim satisfies all statutory requirements, nor is Petitioner waiving any arguments concerning claim scope or grounds that can only be raised in district court. For this petition, Petitioner applies prior art in a manner consistent with Patent Owner’s allegations of infringement before the district court.

D. Level of Ordinary Skill in the Art

For purposes of this IPR, a person of ordinary skill in the art (“POSITA”) would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and at least 3 years of experience in the research, design or development of wireless communication devices, systems, and/or networks, or the equivalent, as of the Critical Date. SAMSUNG-1003, ¶¶33-35. Increased educational experience can make up for less work experience, and vice versa. *Id.*

II. THE ’163 PATENT

A. Brief Description

The ’163 Patent is directed to a wireless device that receives data frames and classifies them as Intra-Basic Service Set (“BSS”) frames or Inter-BSS frames based on BSS color. SAMSUNG-1001, Abstract, 12:61-65. When the wireless device receives signaling information indicating that an operation based on BSS color is not allowed, the device does not perform operations based on the BSS color. *Id.*, cl. 1. SAMSUNG-1003, ¶70.

B. Prosecution History

Examination included a non-final rejection, responsive arguments and amendment, and a subsequent final rejection. SAMSUNG-1002, 184-200, 170-180, 138-154. The applicant then requested an examiner interview. *Id.*, 113-120. After the interview, the applicant submitted remarks stating that the examiner

agreed to withdraw the prior art-based rejections. *Id.*, 113-120, 94-98.

SAMSUNG-1003, ¶71.

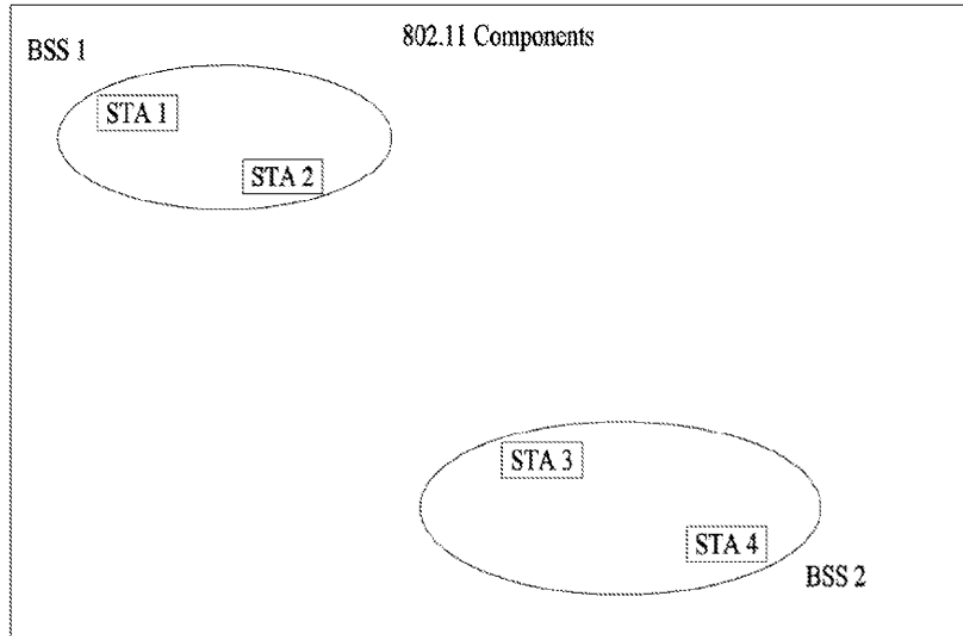
III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

Dr. Mahon provides a technology overview at SAMSUNG-1003, ¶¶58-69.

A. GROUND 1A: Lee renders claims 1, 7, 9, and 15 obvious

1. Lee

Lee discloses a method for performing a clear channel assessment (“CCA”) by a station (“STA”) in a wireless communication system. SAMSUNG-1005, Abstract. The method is performed in a Wireless Local Area Network (“WLAN”) system, like those contemplated in IEEE 802.11ax (*i.e.*, Wi-Fi 6), that includes multiple basic service sets (“BSSs”), as shown in Figure 1, below. *Id.*, [0033], [0062]; SAMSUNG-1003, ¶72. A BSS is “a set of stations (STAs) capable of communicating with each other by successfully establishing synchronization.” SAMSUNG-1005, [0034].



SAMSUNG-1005, Fig. 1.

CCA is a process performed by a STA to determine whether a wireless medium is busy such that the STA cannot transmit. SAMSUNG-1005, [0063].

The medium is determined to be busy or idle based on comparison of the strength of a received signal (*i.e.*, “reception level”) to a CCA level. *Id.*, [0012]-[0013]. If the received signal strength is higher than the CCA level, “the STA may not perform transmission....” *Id.*, [0013]. Conversely, if the received signal strength is lower than the CCA level, “the STA may perform transmission....” *Id.*, [0014]. Lee contemplates that different CCA levels may be applied based on whether a frame is associated with the STA’s BSS or another BSS. *Id.*, [0007], [0067]. In this regard, Lee explains that 802.11ax includes “various methods ... to increase a CCA level” with the goal of “increase[ing] a frequency reuse rate.” *Id.*, [0062].

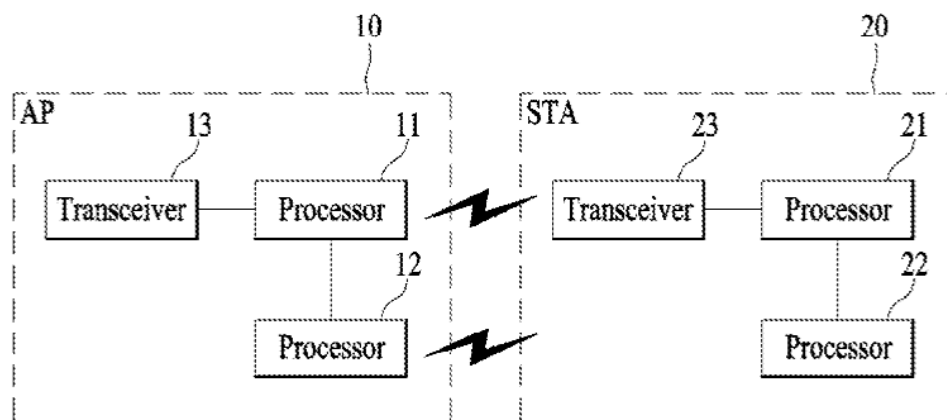
SAMSUNG-1003, ¶73.

Lee describes a method of CCA whereby a STA “receiv[es] a frame including a coloring bit” as part of a Physical Layer Convergence Procedure (“PLCP”) Protocol Data Unit (altogether, “PPDU”). SAMSUNG-1005, [0007], [0016]; SAMSUNG-1003, ¶74. The “coloring bit”—or “BSS coloring bit”—is an identifier for a BSS that is checked by the STA upon receipt of a PPDU. SAMSUNG-1005, [0064]. The received frame may also include a “coloring disable bit.” *Id.*, [0068]. Both “[t]he coloring bit and the coloring disable bit can be included in a HE-SIG field” of the PPDU. *Id.*, [0017]; [0016]; SAMSUNG-1003, ¶74. Further, the system “may use a reserved field of a legacy BSS coloring bit ... field without separately defining a coloring disable bit.” SAMSUNG-1005, [0075].

In Lee, a STA receives a frame and analyzes the coloring bit. SAMSUNG-1005, [0067]. If the coloring bit indicates that the frame was transmitted by a device within the STA’s BSS, the STA changes the CCA level to a “first level.” *Id.* Alternatively, if the coloring bit indicates that the frame was transmitted by a device outside of the STA’s BSS, the STA changes the CCA level to a “second level.” *Id.* STAs generally perform CCA by using a lower CCA level for frames from within the STA’s BSS (*i.e.*, intra-BSS frames) than for frames from outside the STA’s BSS (*i.e.*, inter-BSS frames). SAMSUNG-1003, ¶75; SAMSUNG-

1001, 32:67-33:3; SAMSUNG-1005, [0015]. In other words, Lee’s “first level” is generally lower than the “second level.” SAMSUNG-1003, ¶75. Once the CCA level is set, the STA then “perform[s] CCA according to the first level or the second level.” SAMSUNG-1005, [0067]. However, “if the coloring disable bit indicates that the frame corresponds to a trigger frame related to multiuser transmission, the STA may not perform the change of the CCA level irrespective of information indicated by the coloring bit.” *Id.*, [0068].

The Lee Device (“LD”) includes the STA components shown in Fig. 8 below. The LD “can include a processor 21 ... and a transceiver 23.” SAMSUNG-1005, [0093]. The transceiver “can transmit and receive a radio signal.” *Id.* The processor is connected to the transceiver and implements the IEEE 802 physical layer and/or a Medium Access Control (“MAC”) layer. *Id.* Further, “[t]he processor 11/21 can be configured to perform operations according to [Lee’s] ... invention.” *Id.* SAMSUNG-1003, ¶76.



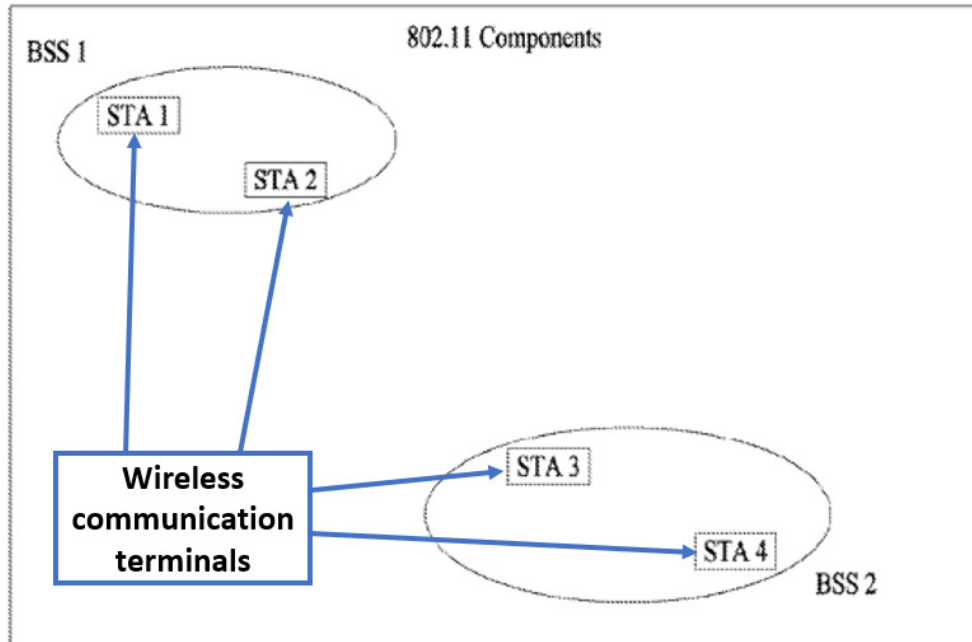
SAMSUNG-1005, Fig. 8.

2. Analysis

[1.1]

To the extent the preamble is limiting, Lee renders it obvious. SAMSUNG-1003, ¶83. Lee teaches a method of CCA “which is performed by a[] STA in a wireless communication system....” SAMSUNG-1005, [0007]. Lee explains that a STA “may be called another name such as a *terminal*, a wireless transmit/receive unit (WTRU), a user equipment (UE), a mobile station (MS), a *mobile terminal*, a mobile subscriber unit, or the like.” *Id.*, [0035].¹ Fig. 1 shows several STAs (*i.e.*, “wireless communication terminal[s] communicating wirelessly”) operating and communicating wirelessly within a Wireless Local Area Network (WLAN) system:

¹ Emphasis added unless otherwise indicated.

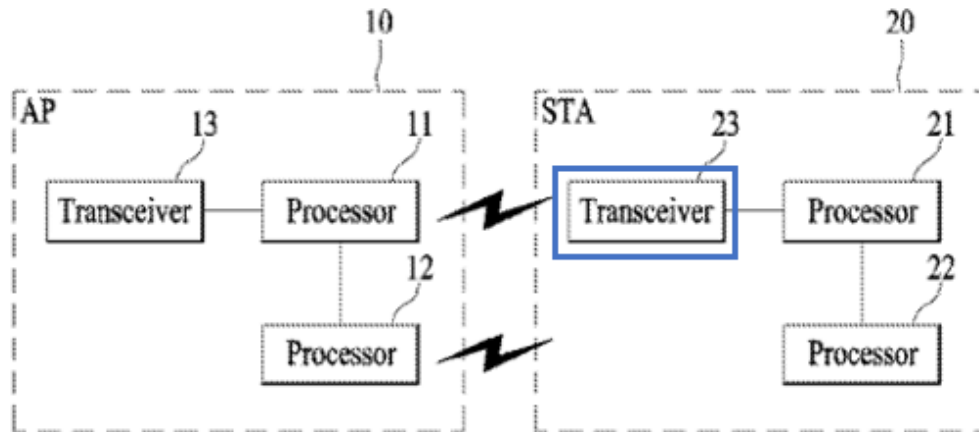


SAMSUNG-1005, Fig. 1 (annotated).

[1.2]

Lee renders [1.2] obvious. SAMSUNG-1003, ¶84.

Lee explains that “STA 20 can include ... a transceiver 23.” SAMSUNG-1005, [0093]. Lee further discloses that “[t]he transceiver 13/23 can transmit and receive a radio signal” and “can implement a physical layer according to IEEE 802 system.” *Id.* Fig. 8 illustrates a STA comprising a transceiver:

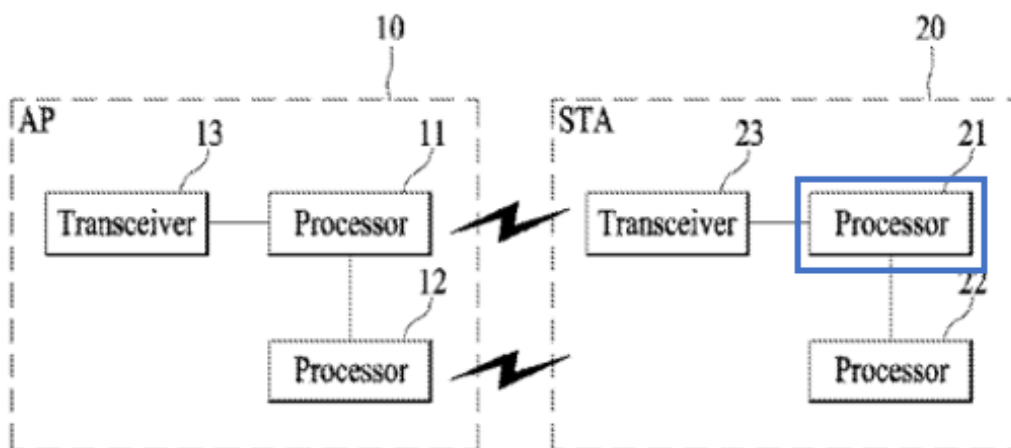


SAMSUNG-1005, Fig. 8 (annotated).

[1.3]

Lee renders [1.3] obvious. SAMSUNG-1003, ¶85.

Lee explains that “STA 20 can include a processor....” SAMSUNG-1005, [0093]. Lee further discloses that “[t]he processor 11/21 can implement a physical layer and/or a MAC layer according to IEEE 802 system....” *Id.* Fig. 8 illustrates a wireless device including a processor:



SAMSUNG-1005, Fig. 8 (annotated).

[1.4]

Lee renders [1.4] obvious. SAMSUNG-1003, ¶¶86-89.

Lee discloses that “[t]he processor 11/21 can be configured to perform operations according to ... the present invention.” SAMSUNG-1005, [0093]. The processor is “connected with the transceiver,” which can “receive a radio signal.” *Id.* The STA receives a frame, which “may correspond to a HE-PPDU (high efficiency PLCP protocol data unit) frame,” that includes a “coloring bit” and a “coloring disable bit.” *Id.*, [0016], [0067]-[0068]. Based on Lee’s disclosure, a POSITA would have found it obvious that the PPDU and frame are received by the STA’s processor using the STA’s transceiver. SAMSUNG-1003, ¶86.

In addition, in Lee, the “coloring disable bit can be included in a HE-SIG field” of the PPDU. SAMSUNG-1005, [0017]. The ’163 Patent explains that the HE-SIG-A field of the PPDU may be the “signaling field” and, further, that the “signaling field” may include “signaling information.” SAMSUNG-1001, 14:46-47, 21:40-44. Thus, a POSITA would have understood or found it obvious that Lee’s coloring disable bit in the PPDU’s HE-SIG field is signaling information. SAMSUNG-1003, ¶87.

Lee further explains that the STA performs a CCA level change based on the “coloring bit” in the received frame. Specifically, the STA sets the CCA level to a “first level” if “the coloring bit indicates a BSS to which the STA belongs,” and a

“second level” if “the coloring bit indicates a BSS to which the STA does not belong....” SAMSUNG-1005, [0067]. Once the CCA level is set, “the STA can perform CCA according to the first level or the second level.” *Id.* Because Lee’s CCA level is set using the value of the coloring bit, Lee’s CCA level change is an operation based on the BSS color. SAMSUNG-1003, ¶88.

However, “if the coloring *disable* bit indicates that the frame corresponds to a trigger frame related to multiuser transmission, the STA *may not* perform the change of the CCA level *irrespective of information indicated by the coloring bit.*” SAMSUNG-1005, [0068]. In this way, Lee’s “coloring *disable* bit” disables use of the BSS color and the STA operates “*without regard to information indicated by the coloring bit.*” *Id.*, Abstract, [0007]-[0008], cls. 1, 6. Through this disclosure, Lee renders obvious that the “coloring bit” is not used when the “coloring disable bit” (*i.e.*, signaling information) indicates that a CCA level change (*i.e.*, an operation based on the BSS color) is not allowed. SAMSUNG-1003, ¶89.

[1.5]

Lee renders [1.5] obvious. SAMSUNG-1003, ¶90.

Lee’s “BSS coloring bits can be differently set according to a BSS.” SAMSUNG-1005, [0064]. Lee further explains that a STA checks the coloring bit to determine whether “*the coloring bit indicates a BSS* to which the STA belongs

thereto” or “*the coloring bit indicates a BSS* to which the STA does not belong.”

Id., [0067]. As Dr. Mahon explains, BSS color was a well-known BSS identifier and, by using the coloring bit to determine whether a received PPDU originated from a device within the STA’s BSS, Lee uses its coloring bit in a manner consistent with the well-known use of BSS color and renders obvious that the “coloring bit” is an identifier of a BSS. SAMSUNG-1003, ¶¶90; SAMSUNG-1006, 51; SAMSUNG-1010, 5; SAMSUNG-1011, [0014].

[1.6]

Lee renders [1.6] obvious. SAMSUNG-1003, ¶¶91-93.

Lee explains that an access point (“AP”) “can transmit a trigger frame” and “a trigger frame is received [by a STA] from an AP....” SAMSUNG-1005, [0065], [0069]. The trigger frame received by the STA includes the “coloring disable bit,” which “can be included in the HE-SIG field.” *Id.*, [0068], [0017]. As discussed above at [1.4], a POSITA would have understood or found obvious that data included in the HE-SIG field of a PPDU—such as the “coloring disable bit” here—constitutes signaling information. SAMSUNG-1003, ¶91.

Lee also discloses that “the AP is an entity that provides an *associated STA*, *which is associated with the corresponding AP*, with an access to a distribution system (DS) through a radio medium.” SAMSUNG-1005, [0036]. The AP “may be called a concentrated controller, a *base station (BS)*, a Node-B, a *BTS (base*

transceiver system), a site controller, or the like.” *Id.*, [0036]. As Dr. Mahon explains, an AP is a well-known type of base wireless communication terminal and, from Lee’s disclosure, a POSITA would have understood or found obvious that Lee’s AP serves as a base wireless communication terminal. SAMSUNG-1003, ¶92; SAMSUNG-1001, 7:49-53, 10:34-35.

Therefore, Lee renders obvious that the “coloring disable bit” (*i.e.*, signaling information) is transmitted from an AP (*i.e.*, a base wireless communication terminal) to which the STA is associated. SAMSUNG-1003, ¶93.

[7]

Lee renders [7] obvious. SAMSUNG-1003, ¶¶94-97.

Lee discloses that “IEEE 802.11ax considers a case that there are huge number of STAs and APs.” SAMSUNG-1005, [0062]. Thus, “various methods are used to increase a CCA level” in order to “increase a frequency reuse rate.” *Id.* A POSITA would have understood or found obvious that CCA level change is a spatial reuse operation because the STA performs CCA to determine whether the wireless medium is busy or idle—that is, to determine whether the STA can reuse the medium by transmitting its own data. SAMSUNG-1003, ¶94; SAMSUNG-1005, [0064], [0086]; SAMSUNG-1015, [0077], [0122]. As explained above in [1.4], in Lee, CCA (*i.e.*, a spatial reuse operation) is not performed when the coloring disable bit indicates that a received frame is a trigger frame related to

multiuser transmission. SAMSUNG-1005, [0068].

Lee further describes that its system “may use a reserved field of a legacy BSS coloring bit ... field without separately defining a coloring disable bit.” SAMSUNG-1005, [0075]. Through this disclosure, a POSITA would have understood or found obvious that, in Lee, the field of the legacy BSS coloring bit can be used to implement the coloring disable bit functionality. SAMSUNG-1003, ¶95. In this regard, instead of setting the coloring disable bit to a predetermined value (*e.g.*, 1), Lee’s system sets the legacy BSS coloring bit to a predetermined value (*e.g.*, 0) to indicate that the frame corresponds to a trigger frame and, consequently, that BSS color should not be used for CCA. SAMSUNG-1003, ¶95.

Lastly, Lee discloses that the coloring bit may be in the HE-SIG field of the PPDU. SAMSUNG-1005, [0017]. As described above in [1.4], the ’163 Patent explains that the HE-SIG-A field may be the “signaling field” that contains “signaling information.” SAMSUNG-1001, 14:46-47, 21:40-44. A POSITA would thus have understood or found obvious that the value indicated by Lee’s coloring bit is the BSS color indicated by the signaling field of the PPDU. SAMSUNG-1003, ¶96.

Therefore, Lee renders obvious that CCA level change is not performed (*i.e.*, the processor is configured not to perform a spatial reuse operation) when the BSS color indicated by the legacy coloring bit (*i.e.*, the signaling field of the PPDU) is a

predetermined value. SAMSUNG-1003, ¶97.

[9.1]

To the extent the preamble is limiting, Lee renders it obvious. SAMSUNG-1003, ¶98. Lee teaches an operation method of a STA, which is a wireless communication terminal communicating wirelessly. §III.A.2.[1.1].

[9.2]

Lee renders [9.2] obvious. SAMSUNG-1003, ¶99. Lee discloses receiving a PPDU. §III.A.2.[1.4].

[9.3]

Lee renders [9.3] obvious. SAMSUNG-1003, ¶100. Lee discloses not performing a CCA level change based on the coloring bit (*i.e.*, not using a BSS color) when a coloring disable bit (*i.e.*, signaling information) indicates CCA level change (*i.e.*, an operation based on the BSS color) is not allowed. §III.A.2.[1.4].

[9.4]

Lee renders [9.4] obvious. SAMSUNG-1003, ¶101. Lee makes clear that a “coloring bit” is an identifier of a BSS. §III.A.2.[1.5].

[9.5]

Lee renders [9.5] obvious. SAMSUNG-1003, ¶102. Lee discloses that the “coloring disable bit” (*i.e.*, signaling information) is transmitted from an AP (*i.e.*, a base wireless communication terminal) to which the STA is associated. §III.A.2.[1.6].

[15]

Lee renders [15] obvious. SAMSUNG-1003, ¶103. Lee discloses that CCA level change is not performed (*i.e.*, the processor is configured not to perform a spatial reuse operation) when the legacy BSS coloring bit (*i.e.*, the BSS color indicated by the signaling field of the PPDU) is set to a predetermined value. §III.A.2.[7].

B. GROUND 1B: Lee-Stacey renders claims 2-3, 6, 10-11, and 14 obvious

1. Lee-Stacey

(a) Stacey

Stacey teaches a device using two network allocation vectors (“NAVs”)—an intra-BSS NAV and a regular NAV. SAMSUNG-1006, 39-40. The intra-BSS NAV is set based on an intra-BSS frame. *Id.* The regular NAV is set based on an inter-BSS frame or a frame that cannot be identified as an inter- or intra-BSS frame. *Id.* To determine the BSS from which a PPDU originates (*i.e.*, to determine whether the PPDU is an inter- or intra-BSS PPDU), Stacey uses the BSS Color as an identifier of the BSS. *Id.*, 51. SAMSUNG-1003, ¶77.

Stacey further teaches that a STA may “receive[] a valid HE-SIG-A in a HE PPDU” and that the HE-SIG-A may include a “TXOP Duration Field.” SAMSUNG-1006, 39. The STA may also receive a valid frame in a PLCP Service Data Unit (PSDU) that includes a “valid Duration field.” *Id.* Both the HE-SIG-A

“TXOP Duration Field” and the “valid Duration field” of the PSDU are used to update the intra-BSS NAV and the regular NAV. *Id.* Further, Stacey teaches that “[w]hen a STA receives both a valid HE-SIG-A in a HE PPDU and a valid frame in the PSDU of the HE PPDU, the STA shall not update its Intra-BSS NAV or regular NAV with the information from the TXOP Duration field in the HE-SIG-A.” *Id.*; SAMSUNG-1003, ¶78.

Stacey also discloses that “[a]n HE non-AP STA that is in intra-PPDU power save mode may enter the doze state until the end of a received PPDU” under three conditions. SAMSUNG-1006, 51-52. Each of the three conditions requires, among other things, that “[t]he value of the RXVECTOR parameter BSS_COLOR [is] equal to the BSS color of the BSS with which the STA is associated....” *Id.* In other words, the STA may only enter a doze state when the received PPDU is an intra-BSS PPDU and other conditions are met. SAMSUNG-1003, ¶¶77-79.

(b) Combination

Lee provides a method of performing CCA (*i.e.*, a spatial reuse operation) based on BSS color. SAMSUNG-1005, Abstract, [0007], [0067]. Lee further discloses a “coloring disable bit” which, along with the BSS color, may be included in the HE-SIG field of the PPDU. *Id.*, [0017], [0068]. According to Lee, when a device receives a frame and the “coloring disable bit” indicates the frame is a trigger frame, the device does not perform the CCA level change procedure

regardless of BSS color. *Id.* According to Lee, CCA level change should not be performed based on a trigger frame sent by an AP because this may result in the receiving device interfering with transmission of trigger-based PPDU's sent by other STAs in the BSS (*i.e.*, PPDU's sent by other STAs in response to the trigger frame sent by the AP). *Id.*, [0069]. SAMSUNG-1003, ¶¶104-109.

Lee recognizes that, in certain situations, BSS color-based operations should not be performed; namely, CCA level change should not be performed when the STA receives a trigger frame with the “coloring disable bit” set. Through this disclosure, it would have been obvious to a POSITA that there may be other situations where operations based on BSS color should not be performed and/or should be disallowed. *Id.*, ¶105. A POSITA also would have readily appreciated and found obvious that, in such situations, the “coloring disable bit” could be used to signal that BSS color is disabled and, therefore, other operations based on BSS color should not be performed. *Id.* SAMSUNG-1003, ¶105.

Stacey discloses performing several processes—including NAV setting, power save mode, and spatial reuse—based on BSS color. SAMSUNG 1006, 39, 49, 51-52. Stacey also indicates that an AP selects from a finite number of BSS color values. SAMSUNG-1006, 51. A POSITA would therefore have found obvious that an AP may incidentally select the same BSS color as another AP, leading to a BSS color collision. SAMSUNG-1003, ¶106. It would have also been

obvious to a POSITA that, in such a situation, operations that are normally based on BSS color—including NAV setting, power save operations, and spatial reuse operations—should not be performed (at least not using BSS color). *Id.*, ¶106. Thus, a POSITA would have been motivated to combine the BSS color-based operations in Stacey with Lee’s “coloring disable bit” such that, upon an AP’s recognition of a BSS color collision, the AP can signal to STAs in the BSS that operations based on BSS color are disabled and/or disallowed. *Id.*, ¶106. A POSITA would have understood that this combination offers several benefits, including (1) effective channel contention/conflict handling capability through Lee’s coloring disable bit, (2) channel access optimization through minimization of channel contention/conflict, and (3) improved power efficiency through Stacey’s power save mechanism. *Id.*, ¶106. Such benefits would have provided additional motivation to combine Lee and Stacey. *Id.*, ¶106.

In addition, as Dr. Mahon explains, a POSITA would have been motivated to search for—and combine Lee with—references describing the 802.11ax standard amendment, which is expressly referenced in Lee. SAMSUNG-1003, ¶107; SAMSUNG-1005, [0004]. While Lee focuses on CCA operations, a POSITA would have appreciated that Stacey, being a draft of the 802.11ax standard amendment, includes standard implementation details and describes other operations that naturally combine with Lee’s coloring disable bit. SAMSUNG-

1003, ¶107. For instance, as described above, a POSITA would have understood the 802.11ax standard amendment uses BSS color for various operations, and would have naturally looked to references like Stacey that detail such BSS color-based operations. SAMSUNG-1003, ¶107.

A POSITA attempting to combine Lee and Stacey in this manner would have enjoyed a reasonable expectation of success. SAMSUNG-1003, ¶108. A POSITA would have appreciated the technical overlap among the references—both relate to IEEE 802.11 standards development and, as a result, a POSITA would have appreciated that the two references could be seamlessly integrated. *Id.*, ¶108. A POSITA would have found the Lee-Stacey combination to be the mere combination of prior art elements (*i.e.*, Lee’s coloring disable bit and Stacey’s BSS color-based operations) according to known methods to yield predictable results (*i.e.*, not performing BSS color-based operations when the coloring disable bit indicates that such operations should not be performed). *Id.*, ¶108. A POSITA would have further found this combination to be the application of a known technique (*i.e.*, Lee’s coloring disable bit) to a known device or method (*i.e.*, the BSS color-based operations performed by the device described in Stacey) to yield predictable results. SAMSUNG-1003, ¶108. For these reasons, a POSITA would have found the Lee-Stacey combination obvious. SAMSUNG-1003, ¶108.

In operation, the resulting Lee-Stacey device (“LSD”) receives frames that

include both a BSS color and a coloring disable bit. SAMSUNG-1003, ¶109.

Under normal operation, the LSD performs inter-/intra-BSS NAV setting, power save operations, and spatial reuse operations based on BSS color. *Id.*, ¶109.

However, when the LSD receives a frame whereby the coloring disable bit indicates that operations based on BSS color are not allowed, the LSD does not perform inter-/intra-BSS NAV setting, power save operations (*e.g.*, entering a doze state until the end of a received intra-BSS PPDU), or spatial reuse operations using BSS color. *Id.*, ¶109.

2. Analysis

[2.1]

The LSD renders [2.1] obvious. SAMSUNG-1003, ¶110-111.

In Stacey, “[t]he BSS color is an identifier of the BSS” and is used to classify a PPDU as either an inter- or intra-BSS PPDU. SAMSUNG-1006, 51; 26, 48. Stacey further provides that the intra-BSS NAV is updated based on an intra-BSS PPDU. *Id.*, 39. SAMSUNG-1003, ¶110.

Thus, under normal operation, the LSD sets its intra-BSS NAV using the BSS color indicated by the signaling field of the PPDU. SAMSUNG-1003, ¶111; SAMSUNG-1006, 26, 39, 48, 51. However, when the LSD receives a frame whereby the coloring disable bit (*i.e.*, signaling information as described by Lee) indicates that operations based on BSS color are not allowed, the LSD does not

update its intra-BSS NAV using the BSS color indicated by a signaling field of the PPDU. SAMSUNG-1003, ¶111.

[2.2]

The LSD renders [2.2] obvious. SAMSUNG-1003, ¶112-113.

Stacey explains that “[f]or the two NAVs maintained by a HE STA, one is identified as Intra-BSS NAV, and the second one is identified as regular NAV.” SAMSUNG-1006, 39. Stacey discloses that the “Intra-BSS NAV” is updated based on an intra-BSS PPDU. *Id.*

Moreover, the ’163 patent explains that the claimed “Basic NAV” is updated based on an inter-BSS PPDU or a PPDU that cannot be identified as an intra- or inter-BSS PPDU. SAMSUNG-1001, 14:18-26, cl. 1. Stacey’s regular NAV is similarly set based on an inter-BSS PPDU or a PPDU that cannot be identified as an intra- or inter-BSS PPDU and, therefore, a POSITA would have understood or found obvious that Stacey’s regular NAV is the claimed “Basic NAV.” SAMSUNG-1003, ¶112; SAMSUNG-1006, 39.

Thus, the LSD maintains two different NAVs—an intra-BSS NAV and a regular NAV (*i.e.*, Basic NAV). SAMSUNG-1003, ¶113. The LSD’s intra-BSS NAV is different from its regular NAV and is set based on an intra-BSS PPDU. *Id.*, ¶113.

[2.3]

The LSD renders [2.3] obvious. SAMSUNG-1003, ¶114-115.

Stacey provides that the regular NAV (*i.e.*, the Basic NAV) is set based on an inter-BSS PPDU. SAMSUNG-1006, 39. The regular NAV (*i.e.*, the Basic NAV) is also updated based on a PSDU frame that cannot be identified as either intra- or inter-BSS. *Id.* A POSITA would have understood that a PSDU is a subcomponent of a PPDU—the PSDU is the PPDU’s payload and contains data that is eventually decoded by the MAC layer. SAMSUNG-1003, ¶114; SAMSUNG-1013, 7:63-67. Thus, a POSITA would have understood or found obvious that Stacey’s regular NAV (*i.e.*, Basic NAV) is set based on an inter-BSS PPDU or a PPDU (containing a PSDU) that cannot be identified as either inter-BSS or intra-BSS. *Id.*, ¶114.

The LSD therefore maintains the regular NAV (*i.e.*, the Basic NAV) separately from the intra-BSS NAV, with the regular NAV being set based on inter-BSS PPDU and/or PPDU that cannot be identified as inter- or intra-BSS PPDU. SAMSUNG-1003, ¶115.

[3.1]

The LSD renders [3.1] obvious. SAMSUNG-1003, ¶116-117.

In Stacey, the NAV is set based on a PPDU that includes a TXOP Duration field. SAMSUNG-1006, 39. Stacey also explains that the NAV can be set based

on “any valid Duration field in the PSDU” when the STA “receives at least one valid frame in a PSDU.” *Id.* A POSITA would have understood or found obvious that a PSDU contains one or more MAC Protocol Data Units (“MPDUs”), otherwise known as MAC frames. SAMSUNG-1003, ¶116; SAMSUNG-1012, 1:49-53; SAMSUNG-1013, 7:63-67; SAMSUNG-1014, 3:64-66. A POSITA would have thus understood or found obvious that Stacey’s “valid frame in a PSDU” with a “valid duration field” is a valid MAC frame. SAMSUNG-1003, ¶116; SAMSUNG-1006, 39.

Therefore, the LSD operates on a PPDU that includes (1) a TXOP Duration field in the HE-SIG-A (*i.e.*, the signaling field) of the PPDU, and (2) a MAC frame including a valid duration field. SAMSUNG-1003, ¶117.

[3.2]

The LSD renders [3.2] obvious. SAMSUNG-1003, ¶118.

Stacey discloses that a STA that receives a PPDU and identifies the PPDU as an intra-BSS PPDU “can update its Intra-BSS NAV with the information from the TXOP Duration field in the HE-SIG-A.” SAMSUNG-1006, 39. Similarly, Stacey discloses that a STA that receives a PPDU and identifies the PPDU as an inter-BSS PPDU “can update its regular NAV with the information from the TXOP Duration field in the HE-SIG-A.” *Id.* Thus, in the context of the LSD, the TXOP Duration field indicates information used for setting the intra-BSS NAV

and the regular NAV (*i.e.*, the Basic NAV). SAMSUNG-1003, ¶118.

[3.3]

The LSD renders [3.3] obvious. SAMSUNG-1003, ¶119.

Stacey discloses that a STA that receives a valid frame in a PSDU (*i.e.*, a MAC frame) and identifies the frame as an intra-BSS frame, “can update its Intra-BSS NAV with the information from any valid Duration field in the PSDU.”

SAMSUNG-1006, 39. Similarly, Stacey discloses that a STA that receives a valid frame in a PSDU (*i.e.*, a MAC frame) and identifies the frame as an inter-BSS frame, “can update its regular NAV with the information from any valid Duration field in the PSDU.” *Id.* Thus, in the context of the LSD, the Duration field of the MAC frame indicates information used for setting the intra-BSS NAV and the regular NAV (*i.e.*, the Basic NAV). SAMSUNG-1003, ¶119.

[3.4]

The LSD renders [3.4] obvious. SAMSUNG-1003, ¶120.

Stacey states that “[w]hen a STA receives both a valid HE-SIG-A in a HE PPDU and a valid frame in the PSDU of the HE PPDU, the STA shall not update its Intra-BSS NAV or regular NAV with the information from the TXOP Duration field in the HE-SIG-A.” SAMSUNG-1006, 39. Thus, the LSD does not use the TXOP Duration field for setting the intra-BSS NAV or the regular NAV (*i.e.*, the Basic NAV) when it receives a valid frame in the PSDU (*i.e.*, a valid MAC frame).

SAMSUNG-1003, ¶120.

[6.1]

The LSD renders [6.1] obvious. SAMSUNG-1003, ¶121.

In Stacey, a STA “in intra-PPDU power save mode may enter the doze state until the end of a received PPDU” when, among other conditions, “[t]he value of the RXVECTOR parameter BSS_COLOR [is] equal to the BSS color of the BSS with which the STA is associated.” SAMSUNG-1006, 51-52. Thus, under normal operation, the LSD enters a doze state of a power save operation based on the BSS color indicated by a signaling field of the PPDU. SAMSUNG-1003, ¶121; SAMSUNG-1006, 51-52. However, when the LSD receives a frame whereby the coloring disable bit (as described by Lee) indicates that operations based on BSS color are not allowed, the LSD does not enter a doze state of a power save operation based on the BSS color indicated by a signaling field of the PPDU. SAMSUNG-1003, ¶121.

[6.2]

The LSD renders [6.2] obvious. SAMSUNG-1003, ¶122.

As explained with reference to [6.1], Stacey states that a STA “in intra-PPDU power save mode may enter the doze state until the end of a received PPDU” when, among other conditions, “[t]he value of the RXVECTOR parameter BSS_COLOR [is] equal to the BSS color of the BSS with which the STA is

associated.” SAMSUNG-1006, 51-52. In other words, Stacey requires that a received PPDU be an intra-BSS PPDU—as determined using BSS color—for a STA to enter a doze state. SAMSUNG-1003, ¶122. Thus, under normal operation, the LSD performs a power save operation whereby it enters a doze state until the end of a received intra-BSS PPDU. *Id.*, ¶122.

[10.1]

The LSD renders [10.1] obvious. SAMSUNG-1003, ¶123. Under normal operation, the LSD sets its intra-BSS NAV using the BSS color indicated by the signaling field of the PPDU. §III.B.2.[2.1]. However, when the LSD receives a frame whereby the coloring disable bit (*i.e.*, signaling information as described by Lee) indicates that operations based on BSS color are not allowed, the LSD does not update its intra-BSS NAV using the BSS color indicated by a signaling field of the PPDU. *Id.*

[10.2]

The LSD renders [10.2] obvious. SAMSUNG-1003, ¶124. The LSD operates two NAVs—an intra-BSS NAV and a regular NAV (*i.e.*, a Basic NAV). §III.B.2.[2.2]. The LSD’s intra-BSS NAV is different from the regular NAV and is set based on an intra-BSS PPDU. *Id.*

[10.3]

The LSD renders [10.3] obvious. SAMSUNG-1003, ¶125. The LSD sets its regular NAV (*i.e.*, its Basic NAV) based on an inter-BSS PPDU or a PPDU that is

not able to be identified as an inter- or intra-BSS PPDU. §III.B.2.[2.3].

[11.1]

The LSD renders [11.1] obvious. SAMSUNG-1003, ¶126. The LSD receives a PPDU that includes a TXOP Duration field in the HE-SIG-A field (*i.e.*, in a signaling field). §III.B.2.[3.1]. The PPDU received by the LSD also includes a duration field in the PSDU (*i.e.*, in a MAC frame). *Id.*

[11.2]

The LSD renders [11.2] obvious. SAMSUNG-1003, ¶127. The LSD uses information in the TXOP Duration field of a received PPDU to set both the intra-BSS NAV and the regular NAV (*i.e.*, the Basic NAV). §III.B.2.[3.2].

[11.3]

The LSD renders [11.3] obvious. SAMSUNG-1003, ¶128. The LSD uses information in the Duration field of the PSDU (*i.e.*, the MAC frame) to set both the intra-BSS NAV and the regular NAV (*i.e.*, the Basic NAV). §III.B.2.[3.3].

[11.4]

The LSD renders [11.4] obvious. SAMSUNG-1003, ¶129. The LSD does not set the intra-BSS NAV or the regular NAV (*i.e.*, the Basic NAV) using the TXOP Duration field when it receives a valid frame in the PSDU (*i.e.*, a valid MAC frame). §III.B.2.[3.4].

[14.1]

The LSD renders [14.1] obvious. SAMSUNG-1003, ¶130. Under normal

operation, the LSD enters a doze state of a power save operation based on a BSS color indicated by the signaling field of a PPDU. §III.B.2.[6.1]. When the LSD receives a frame whereby the coloring disable bit (as described by Lee) indicates that operations based on BSS color are not allowed, the LSD does not enter a doze state of a power save operation based on the BSS color indicated by a signaling field of the PPDU. *Id.*

[14.2]

The LSD renders [14.2] obvious. SAMSUNG-1003, ¶131. Under normal operation, the LSD performs a power save operation whereby it enters a doze state until the end of a received intra-BSS PPDU. §III.B.2.[6.2]; SAMSUNG-1006, 51-52.

C. GROUND 1C: Lee-Zhou renders claims 4-5 and 12-13 obvious

1. Lee-Zhou

(a) Zhou

Zhou teaches a “wireless system” that “may detect that two BSSs are associated with a color collision.” SAMSUNG-1007, [0005]; SAMSUNG-1008, [0004]. A color collision occurs when “the two BSSs are using the same color bits.” SAMSUNG-1007, [0005]; SAMSUNG-1008, [0004]. As one way of determining whether a color collision has occurred, Zhou describes “receiv[ing] frames ... that have identical color values” and “comparing the MAC addresses” of

two received frames to “determine that the frames are from different BSSs.”

SAMSUNG-1007, [0070]; SAMSUNG-1008, [0071]. SAMSUNG-1003, ¶80.

Zhou further describes that the device may report the detected color collision to an AP in the form of a “collision report.” SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072]. The collision report “may be a single bit indicating that a collision occurred.” SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072]. In response to the collision report, the AP may transmit a “color change announcement” that includes a “scheduled change time.” SAMSUNG-1007, [0081]; SAMSUNG-1008, [0082]. The color change announcement also includes “an indication of a transmission restriction mode” that “indicates whether the associated STAs ... are allowed to transmit before the scheduled change time.” SAMSUNG-1007, [0063], [0081]; SAMSUNG-1008, [0064], [0082]. SAMSUNG-1003, ¶81.

(b) Combination

Lee provides a method of performing a spatial reuse operation (*i.e.*, CCA level change) based on BSS color. SAMSUNG-1005, Abstract, [0007], [0067]. Lee further discloses a “coloring disable bit” that, along with the BSS color, may be included in the HE-SIG field of the PPDU. *Id.*, [0017], [0068]. In Lee, when a device receives a frame and the “coloring disable bit” indicates the frame is a trigger frame, the device does not perform the CCA level change procedure

regardless of BSS color. *Id.* According to Lee, CCA level change should not be performed based on a trigger frame received from an AP because this may result in the receiving device interfering with transmission of trigger-based PPDU by other STAs in the BSS (*i.e.*, PPDU sent by other STAs in response to the trigger frame sent by the AP). *Id.*, [0069]; SAMSUNG-1003, ¶¶132-137.

Lee recognizes that, in certain situations, BSS color-based operations should not be performed; namely, CCA level change should not be performed when the STA receives a trigger frame with the “coloring disable bit” set. SAMSUNG-1003, ¶133. From Lee’s disclosure, a POSITA would have further understood or found obvious that there may be other situations where BSS color-based operations should not be performed. *Id.*, ¶133. A POSITA would have appreciated the value in having STAs detect and signal such situations, and would have been motivated to search for and combine Lee with references that describe such functionality. *Id.*, ¶133.

Zhou discloses a STA that detects a color collision—which is where two BSSs incidentally operate using the same BSS color—and reports the color collision to an AP. SAMSUNG-1007, [0005], [0070]-[0071]; SAMSUNG-1008, [0004], [0071]-[0072]. A color collision may be recognized by comparing the MAC addresses of two received frames with identical color values. SAMSUNG-1007, [0070]; SAMSUNG-1008, [0071]. The “collision report” may be a single bit

transmitted by the STA. SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072].

Zhou further discloses that, in response to a collision report, an AP may prevent STAs from transmitting until a color change occurs. SAMSUNG-1007, [0063], [0081]; SAMSUNG-1008, [0064], [0082]. A POSITA would have understood or found obvious that a BSS color collision interferes with operations—including NAV setting, power save operations, and spatial reuse operations—that depend on BSS color-based PPDU classification. SAMSUNG-1003, ¶134. But a POSITA would also have known or found obvious that PPDU classification can be performed using other identifiers that are unaffected by BSS color collisions, including MAC address. *Id.*, ¶134. As such, a POSITA would have recognized that it may be preferable to simply signal that operations normally based on BSS color (*e.g.*, NAV setting, power save operations, and spatial reuse operations) should not be performed using BSS color—as opposed to preventing STAs from transmitting altogether. *Id.*, ¶134. Thus, a POSITA would have been motivated to combine the teachings of Lee and Zhou such that the resulting device can (1) receive a “coloring disable bit” indicating that operations based on BSS color are not allowed, (2) recognize a BSS color collision, and (3) transmit a collision report indicating that operations based on BSS color are not allowed. *Id.*, ¶134.

In addition, as Dr. Mahon explains, a POSITA would have been motivated to search for—and combine Lee with—references describing the 802.11 standard,

which is expressly referenced in Lee. SAMSUNG-1003, ¶135; SAMSUNG-1005, [0003]-[0004]. Zhou explains that its STAs and APs “may communicate according to the WLAN radio and baseband protocol for physical (PHY) and medium access control (MAC) layers from IEEE 802.11 and versions including, but not limited to, 802.11b, 802.11g, 802.11a, 802.11n, 802.11ac, 802.11ad, 802.11ah, etc.” SAMSUNG-1007, [0047]; SAMSUNG-1008, [0049]. While Lee focuses on CCA operations, a POSITA would have appreciated that Zhou may include 802.11 standard implementation details or additional features, like its BSS color collision detection and reporting functionality, that naturally combine with Lee’s coloring disable bit. SAMSUNG-1003, ¶135.

A POSITA attempting to combine Lee and Zhou in this manner would have enjoyed a reasonable expectation of success. SAMSUNG-1003, ¶136. A POSITA would have found the Lee-Zhou combination to be the mere combination of prior art elements (*i.e.*, Lee’s coloring disable bit and Zhou’s BSS color collision recognition and reporting functionality) according to known methods to yield predictable results (*i.e.*, a device that can (1) receive a “coloring disable bit,” (2) recognize a BSS color collision, and (3) transmit a collision report). *Id.*, ¶136. A POSITA would have further found this combination to be the application of a known technique (*i.e.*, Zhou’s BSS color collision detection and reporting functionality) to a known device or method (*i.e.*, the Lee device, which receives a

coloring disable bit) to yield predictable results. SAMSUNG-1003, ¶136. For these reasons, a POSITA would have found the Lee-Zhou combination obvious. SAMSUNG-1003, ¶136.

In operation, the Lee-Zhou device (“LZD”) receives frames that include both a BSS color and a coloring disable bit in the HE-SIG field. SAMSUNG-1003, ¶137. When the LZD receives a frame whereby the coloring disable bit indicates that operations based on BSS color are not allowed—for instance, due to an AP’s or another STA’s recognition of a color collision—the LZD does not use BSS color to perform those operations. *Id.*, ¶137. Moreover, the LZD is capable of recognizing a color collision by receiving two frames with identical color values, decoding and comparing the frames’ MAC addresses, and determining based on the MAC addresses that the frames are from different BSSs. *Id.*, ¶137. When the LZD recognizes a color collision, it sends a single-bit “collision report” to the AP, which indicates that other STAs in the BSS should not perform operations based on BSS color. *Id.*, ¶137.

2. Analysis

[4.1]

The LZD renders [4.1] obvious. SAMSUNG-1003, ¶138.

In Zhou, a device can “detect that two BSSs are associated with a color collision....” SAMSUNG-1007, [0005]; SAMSUNG-1008, [0004]. Zhou

provides that, upon detection of a collision, the device can send a single-bit collision report to an AP. SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072].

The LZD thus uses the single-bit collision report to signal that operations based on BSS color are not allowed when it recognizes that a BSS color collision has occurred. SAMSUNG-1003, ¶138.

[4.2]

The LZD renders [4.2] obvious. SAMSUNG-1003, ¶139.

In Zhou, a “color collision” is when “two BSSs are using the same color bits...” SAMSUNG-1007, [0005]; SAMSUNG-1008, [0004]. Thus, in the context of the LZD, a BSS color collision represents that different BSSs correspond to one BSS color. SAMSUNG-1003, ¶139.

[5]

The LZD renders [5] obvious. SAMSUNG-1003, ¶140.

In Zhou, a device can detect a color collision by “receiv[ing] frames ... that have identical color values” and “comparing the MAC addresses” of two received frames to “determine that the frames are from different BSSs.” SAMSUNG-1007, [0070]; SAMSUNG-1008, [0071]. Thus, the LZD determines that a BSS color collision has occurred based on MAC addresses (*i.e.*, address fields of a MAC frame). SAMSUNG-1003, ¶140.

[12.1]

The LZD renders [12.1] obvious. SAMSUNG-1003, ¶141. The LZD uses

the single-bit collision report to signal that operations based on BSS color are not allowed when it recognizes that a BSS color collision has occurred. §III.C.2.[4.1].

[12.2]

The LZD renders [12.2] obvious. SAMSUNG-1003, ¶142. In the context of the LZD, a BSS color collision represents that different BSSs correspond to one BSS color. §III.C.2.[4.2].

[13]

The LZD renders [13] obvious. SAMSUNG-1003, ¶143. The LZD determines that a BSS color collision has occurred based on MAC addresses (*i.e.*, address fields of a MAC frame). §III.C.2.[5].

D. GROUND 1D: Lee-Choudhury renders claims 7-8 and 15-16 obvious

1. Lee-Choudhury

(a) Choudhury

Choudhury describes a device that determines whether to reuse a wireless channel. SAMSUNG-1009, [0009], [0025]. The device may receive a “COLOR field” that indicates the BSS associated with a transmitting device. SAMSUNG-1009, [0025]. Choudhury explains that the device uses the COLOR field to determine whether an ongoing transmission is an “intra-BSS transmission.” *Id.* If the transmission is an “intra-BSS transmission” (*i.e.*, a transmission from a STA in the device’s BSS), the STA will not reuse the wireless channel. *Id.* However, if

the transmission is from an “OBSS STA” (*i.e.*, a STA in a different BSS), the device may be able to use the channel by, for example, performing CCA with a higher CCA threshold. *Id.* Choudhury further describes that a device can signal that it is experiencing high interference such that other STAs should not reuse the channel. *Id.*, [0026]. A device may signal a high interference state through either a designated bit or by setting the COLOR field to a specific value (*e.g.*, “0000”). *Id.*, [0026], [0029]. According to Choudhury, a STA that decodes a value of “0000” in the COLOR field of a received transmission may be “required to defer channel access” (*i.e.*, not reuse the wireless channel). *Id.*, [0029].

(b) Combination

Lee provides a method of performing a CCA level change based on BSS color, which may be included in the HE-SIG field of a PPDU. SAMSUNG-1005, Abstract, [0007], [0017], [0067]. Lee further discloses a “coloring disable bit.” *Id.*, [0068]. According to Lee, when a device receives a frame and the “coloring disable bit” indicates the frame is a trigger frame, the device does not perform the CCA level change procedure regardless of BSS color. *Id.* Lee also discloses that the device “may use a reserved field of a legacy BSS coloring bit ... field without separately defining a coloring disable bit.” *Id.*, [0075]. Based on this disclosure, a POSITA would have understood or found obvious that Lee’s “coloring disable bit” can be implemented using the legacy BSS color field such that when the legacy

BSS color field is set to a predetermined value, the device does not perform a CCA level change. SAMSUNG-1003, ¶144.

Because Lee does not disclose the predetermined value that should be used to implement the coloring disable bit in the legacy BSS color field, a POSITA would have looked to similar art—like Choudhury—for guidance on implementation options. SAMSUNG-1003, ¶145. Choudhury describes a STA that determines whether to reuse a wireless channel based on BSS color. SAMSUNG-1009, [0025]. In Choudhury, when the STA receives information indicating that another device is experiencing high interference, the STA could be “required to defer channel access.” *Id.*, [0029]. Devices may signal a high interference state through either a designated bit or by using the COLOR field (*e.g.*, setting it to “0000”). *Id.*, [0026], [0029]. A POSITA would have understood or found obvious the benefit of using the COLOR field, as opposed to a designated bit, to signal a high interference state or that BSS color is disabled—specifically, doing so requires less bandwidth and improves communication efficiency. SAMSUNG-1003, ¶145.

A POSITA reading Choudhury would have appreciated the benefits of using a value of zero as the predetermined BSS color value. SAMSUNG-1003, ¶146. For instance, a POSITA would have understood that using a value at the extremes of the possible BSS color range as the predetermined value—*i.e.*, zero or the

maximum possible value—is preferable to choosing a value in the middle of the possible BSS color range as it simplifies implementation. *Id.*, ¶146. A POSITA would have further understood that choosing zero as the predetermined value is preferable to choosing the maximum possible BSS color value because, for instance, future wireless systems may comprise larger BSS color fields. *Id.*, ¶146. Thus, a POSITA would have been motivated to combine Choudhury’s use of a predetermined BSS color value of zero with Lee’s coloring bit to signal that BSS color is disabled. *Id.*, ¶146.

A POSITA attempting to combine Lee and Choudhury in this manner would have enjoyed a reasonable expectation of success. SAMSUNG-1003, ¶147. A POSITA would have found the Lee-Choudhury combination to be the mere combination of prior art elements (*i.e.*, Lee’s coloring bit and Choudhury’s use of a predetermined value of zero) according to known methods to yield predictable results (*i.e.*, a device that does not perform a CCA level change when it receives a coloring bit set to zero). *Id.*, ¶147. A POSITA would have further found this combination to be the application of a known technique (*i.e.*, Choudhury’s use of a predetermined value of zero) to a known device or method (*i.e.*, the device described in Lee) to yield predictable results. *Id.*, ¶147. For these reasons, a POSITA would have found the Lee-Choudhury combination obvious. SAMSUNG-1003, ¶147.

Moreover, a POSITA would have found the Lee-Choudhury combination obvious to try. SAMSUNG-1003, ¶148. Both Lee and Choudhury describe a finite set of options to signal that a spatial reuse operation—CCA level change in Lee and channel reuse in Choudhury—should not be performed. *Id.*, ¶148. Specifically, a designated field (*i.e.*, the coloring disabled bit in Lee and the Low Power/High Interference Indicator in Choudhury) or the legacy BSS color field may be used. *Id.*, ¶148. The legacy BSS color field has a finite set of values, and use of the value zero was known and described in Choudhury. *Id.*, ¶148. Thus, it would have been obvious for a POSITA to try implementing Lee’s coloring disable signaling function using a predetermined value of zero in the BSS color field. *Id.*, ¶148.

In operation, the Lee-Choudhury Device (“LCD”) receives a frame that includes a coloring bit in the HE-SIG field. SAMSUNG-1003, ¶149. When the device receives a frame with a predetermined coloring bit value of zero, the device does not perform a CCA level change. *Id.*, ¶149.

2. Analysis

[7]

The LCD renders [7] obvious. SAMSUNG-1003, ¶¶150-152.

In Lee, CCA (*i.e.*, a spatial reuse operation) is not performed when the coloring disable bit indicates a received frame is a trigger frame related to multi-

user transmission. §III.A.2.[1.4]; §III.A.2.[7]. Lee further describes that its system, “may use a reserved field of a legacy BSS coloring bit ... field without separately defining a coloring disable bit.” SAMSUNG-1005, [0075].

Choudhury similarly describes that a “reserved value” of zero for the COLOR field may be used to signal that an operation based on BSS color is not allowed. SAMSUNG-1009, [0029]. Specifically, Choudhury discloses that when a device decodes a value of “0000” in the COLOR field of a received transmission, the device “could be required to defer channel access.” SAMSUNG-1009, [0029]. A POSITA would have understood or found obvious that this deferral of channel access means the receiving device does not reuse the wireless channel, which constitutes not performing a spatial reuse operation. SAMSUNG-1009, [0025], [0009]; SAMSUNG-1003, ¶151.

The LCD is thus configured not to perform a CCA level change (*i.e.*, a spatial reuse operation) when the coloring bit is set to zero (*i.e.*, the BSS color indicated by the signaling field of the PPDU is a predetermined value). SAMSUNG-1003, ¶152.

[8]

The LCD renders [8] obvious. SAMSUNG-1003, ¶153. Lee teaches a device that is configured not to perform CCA level change (*i.e.*, a spatial reuse operation) when the legacy BSS coloring bit is set to a predetermined value. §

III.A.2.[7]. Choudhury discloses that a device that receives a frame with a BSS color of zero is required to defer channel access (*i.e.*, not reuse the wireless channel). SAMSUNG-1009, [0029]. The LCD is therefore configured not to perform a CCA level change (*i.e.*, a spatial reuse operation) when the legacy BSS coloring bit is set to a predetermined value of zero. SAMSUNG-1003, ¶153.

[15]

The LCD renders [15] obvious. SAMSUNG-1003, ¶154. The LCD is configured not to perform a CCA level change (*i.e.*, a spatial reuse operation) when the coloring bit is set to zero (*i.e.*, the BSS color indicated by the signaling field of the PPDU is a predetermined value). §III.D.2.[7].

[16]

The LCD renders [16] obvious. SAMSUNG-1003, ¶155. The LCD is configured not to perform a CCA level change (*i.e.*, a spatial reuse operation) when the legacy BSS coloring bit is set to a predetermined value of zero. §III.D.2[8].

E. GROUND 2A: Choudhury renders claims 1, 7, 8, 9, 15, and 16 obvious

1. Choudhury

Supra §III.D.1.(a). SAMSUNG-1003, ¶82.

2. Analysis

[1.1]

To the extent the preamble is limiting, Choudhury renders obvious [1.1]. SAMSUNG-1003, ¶¶156-158. For example, Choudhury discloses wireless

communication terminals through its teaching of “**wireless networking stations**” (STAs) operating in basic service set (BSS) architectures, which communicate wirelessly to perform channel access determinations. SAMSUNG-1009, [0003]. Specifically, Choudhury teaches that wireless networking stations are part of a system that facilitates communication within a wireless network. *Id.*, [0002]-[0003], [0018], [0020], [0030], Abstract, FIGs. 2, 5; SAMSUNG-1003, ¶156.

Further, Choudhury describes “systems and techniques for establishing channel sharing criteria in wireless local area networks.” SAMSUNG-1009, [0001]. In FIG. 1, Choudhury illustrates “a heterogeneous **wireless** network environment 100 comprising APs 102A and 102B serving networks 104A and 104B, respectively.” SAMSUNG-1009, [0020], FIG. 1. Both networks 104A and 104B include wireless STAs 106A-106C and 106D-106F, which are wireless communication terminals. SAMSUNG-1009, [0020]. Additionally, Choudhury discloses that these STAs are capable of conducting “bidirectional wireless communications.” SAMSUNG-1009, [0037]-[0038]; SAMSUNG-1003, ¶157.

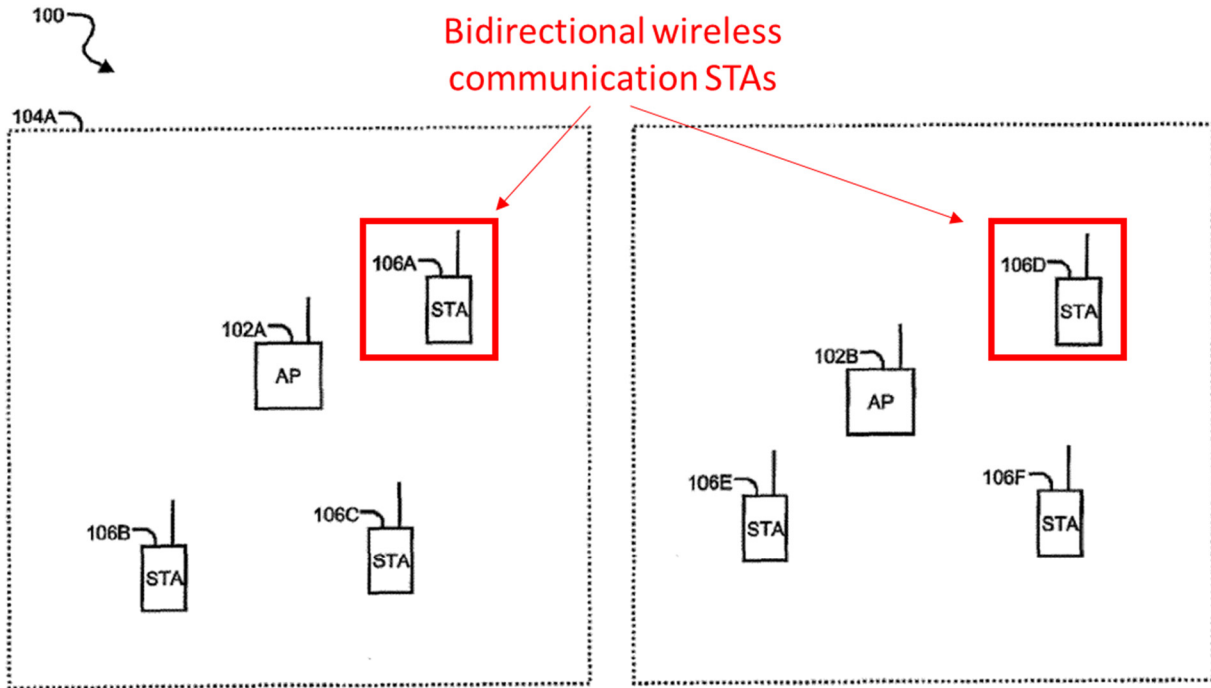


Fig. 1

SAMSUNG-1009, FIG. 1 (annotated).

A POSITA would have understood or found obvious that the wireless STAs described in Choudhury function as wireless communication terminals capable of bidirectional wireless communication. SAMSUNG-1009, [0004], [0037]-[0038], [0030], FIG. 2; SAMSUNG-1003, ¶158.

[1.2]

Choudhury renders obvious [1.2]. SAMSUNG-1003, ¶¶159-161. As discussed above (supra §III.E.2.[1.1]), Choudhury discloses wireless networking stations that include both transmitting and receiving functionalities, which perform bidirectional communication within a Basic Service Set (BSS). Specifically,

Choudhury describes “transmitting wireless networking station[s]” and “monitoring wireless networking station[s],” both of which include a transmitter and a receiver to enable bidirectional communication. SAMSUNG-1009, [0003]-[0004]; SAMSUNG-1003, ¶159.

A POSITA would have understood or found obvious that devices designed for bidirectional wireless communication include a transceiver, which integrates both a transmitter and a receiver. SAMSUNG-1003, ¶160. Choudhury discloses this functionality by describing its wireless networking stations as having a “communicating means such as a transmitter TX 562 and a receiver RX 564 for bidirectional wireless communications.” SAMSUNG-1009, [0038], FIG. 5. Additionally, the ability of these stations to receive COLOR field information and decode transmission parameters further suggest the inclusion of transceiver functionality. SAMSUNG-1009, [0025], [0029]; SAMSUNG-1003, ¶160.

Therefore, based on Choudhury’s disclosure, a POSITA would have recognized or found obvious the use of a transmitter and receiver functioning as a transceiver in a wireless communication device, enabling Choudhury’s bidirectional wireless communication. SAMSUNG-1003, ¶161; SAMSUNG-1005, [0093], FIG. 8; *supra* §III.A.2.[1.2].

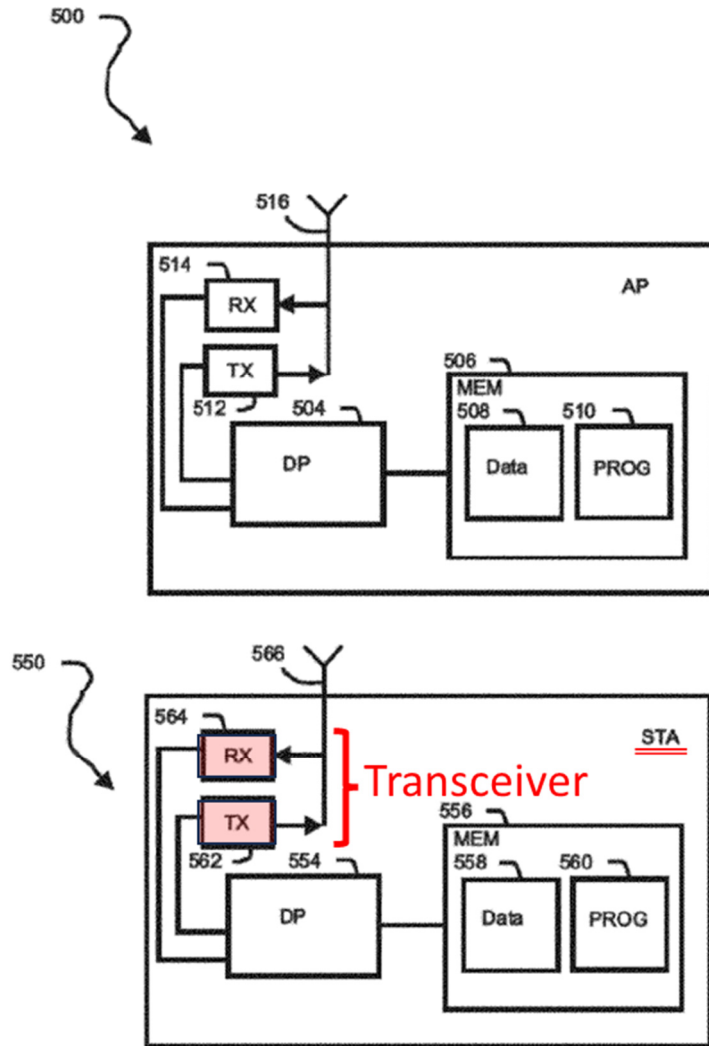


Fig. 5

SAMSUNG-1009, FIG. 5 (annotated).

[1.3]

Choudhury renders obvious [1.3]. SAMSUNG-1003, ¶¶162-164.

Choudhury's wireless communication stations include "at least one processor and memory storing a program of instructions," which is for executing operations such as configuring signal fields and determining channel reuse eligibility.

SAMSUNG-1009, [0003]-[0006]. A POSITA would have recognized or found obvious that these decision-making processes, including decoding COLOR fields and modifying channel access behavior, would use programmable processing capabilities. SAMSUNG, [0029]; SAMSUNG-1003, ¶162.

In addition, Choudhury's FIG. 5 illustrates that the wireless communication station includes "processing means such as at least one data processor (DP) 554." SAMSUNG-1009, [0037]-[0038], FIG. 5. Choudhury further discloses that DP 554 can be implemented using different types of processors, including general-purpose computers, microprocessors, digital signal processors (DSPs), and multi-core processors, all of which function as the processor. SAMSUNG-1009, [0041]; SAMSUNG-1003, ¶163.

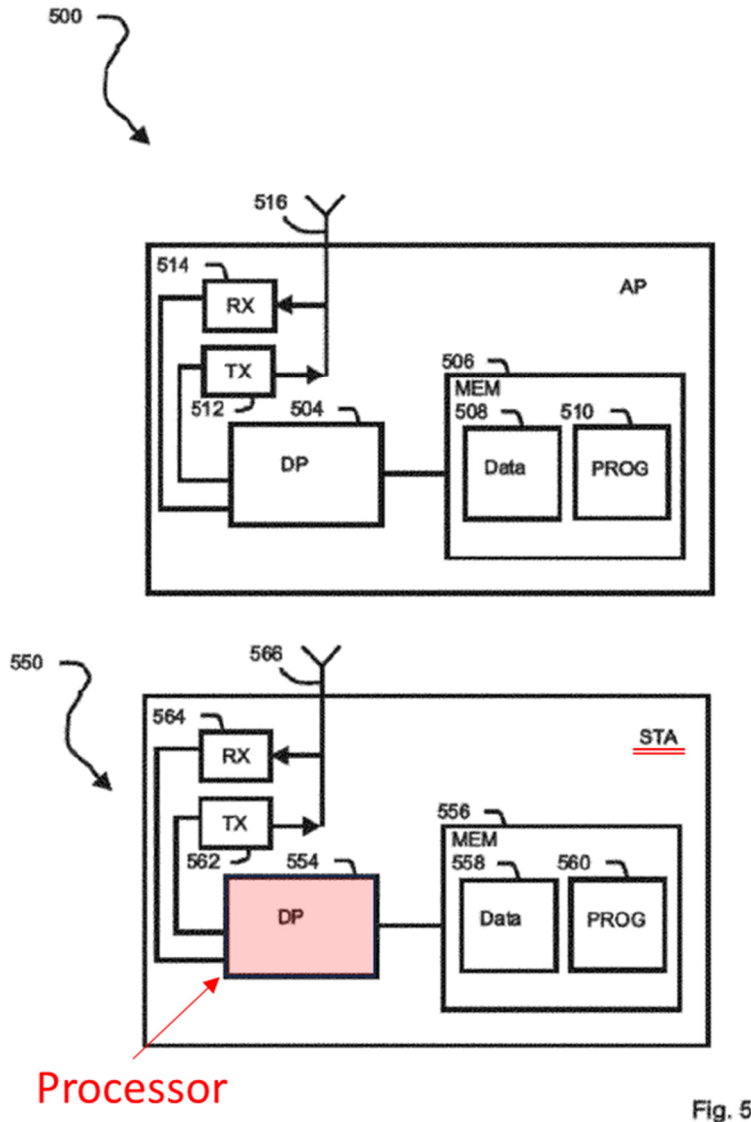


Fig. 5

SAMSUNG-1009, FIG. 5 (annotated).

Therefore, a POSITA would have found it obvious to include a processor in Choudhury's wireless communication device to enable operations for bidirectional communication and decision-making. SAMSUNG-1009, [0038]; SAMSUNG-1003, ¶164.

[1.4]

Choudhury renders obvious [1.4]. SAMSUNG-1003, ¶¶165-174.

Choudhury's wireless networking stations (STAs) are configured to receive transmissions in a wireless network. SAMSUNG-1009, [0003]-[0004], [0030].

Specifically, Choudhury teaches that STAs have "a receiver RX 564 for bidirectional wireless communications," which functions as part of a transceiver.

SAMSUNG-1009, [0038], FIG. 5. These stations include "at least one processor" that processes received signals. SAMSUNG-1009, [0003], [0037]-[0038], [0041].

A POSITA would have understood or found obvious that the processor in Choudhury's STA receives PPDU's using the transceiver, as PPDU's are the standard frame format in IEEE 802.11 networks that Choudhury explicitly addresses. SAMSUNG-1009, [0020]-[0021] ("transmitted PPDU"), [0025], [0027], [0029]-[0030]; SAMSUNG-1003, ¶165.

Choudhury discloses that PPDU's received by the STA contain signaling information that can indicate whether operations based on BSS color should be performed. Choudhury teaches multiple forms of signaling information, including: (1) a "Low Power/High Interference Indicator" bit, and (2) a reserved COLOR field value. SAMSUNG-1009, [0026], [0029]. The "Low Power/High Interference Indicator" and the COLOR field represent signaling information because each is located in the "signal field (SIG)" and signal information that a STA uses to react

to a received PPDU. *Id.*, [0009], [0020] (“SIG-A”), [0023] (“1-bit indicator in the SIG”), [0026]-[0027], [0029]-[0031]; SAMSUNG-1003, ¶¶166-167.

The “Low Power/High Interference Indicator” or the presence of the reserved value in the COLOR field indicate whether an operation based on the BSS color is not allowed. SAMSUNG-1003, ¶167. The table below illustrates operations related to a value of the “Low Power/High Interference Indicator” and the COLOR Field:

COLOR Field	Low Power/High Interference Indicator	Receiving STA
Not used	1	Limit Access
Not used	0	Allow Access
STA in same BSS (that is, same COLOR field as receiving STA)	0 or 1	Limit Access
STA in different BSS (different COLOR field from receiving STA)	0	Allow Access
STA in different BSS (different COLOR field from receiving STA)	1	Limit Access

The third through fifth rows at the bottom of the table indicate how the STA operates when the COLOR Field is used. As shown in the third row, when the BSS COLOR indicates that the transmitting STA is in the same BSS as the receiving STA, the receiving STA determines that the PPDU is part of an “intra-BSS transmission” and “will not re-use the channel” (i.e., limits access to the channel) because it decoded “a valid SIG field from the same BSS.” SAMSUNG-1009, [0025]. In this case, the value of the “Low Power/High Interference Indicator” does not matter because receiving STAs always limit channel access by

not re-using the channel when a transmission is from another station in the same BSS. *Id.*; SAMSUNG-1003, ¶168.

The fourth and fifth rows in the table indicate how receiving STAs operate when the BSS COLOR indicates that the transmitting STA is in a different BSS than the receiving STA. In the fourth row where the BSS COLOR indicates a different BSS and the “Low Power/High Interference Indicator” equals 0, the receiving STA determines that the transmission is “from an OBSS STA” and “use[s] the channel without special restrictions (for example, being allowed to use a higher CCA threshold)” (i.e., allows access to the channel). SAMSUNG-1009, [0025]. By allowing access and re-using the channel when the fourth row conditions are met, the STA performs an operation based on the BSS COLOR. SAMSUNG-1003, ¶169.

In the fifth row where the BSS COLOR indicates a different BSS and the “Low Power/High Interference Indicator” equals 1, the receiving STA acts differently than when the fourth row conditions are met. Specifically, the receiving STA detects that the “Low Power/High Interference Indicator” equals 1 and, thus, limits channel access by not re-using the channel because it knows that, when the “Low Power/High Interference Indicator” equals 1, “any STA that is able to decode its SIG should not re-use the channel.” SAMSUNG-1009, [0026]. With this operation, when the fifth row conditions are met, the receiving STA does not

use BSS COLOR because the “Low Power/High Interference Indicator” indicated that the operation based on BSS COLOR (e.g., allowing access and re-using the channel) is not allowed. SAMSUNG-1003, ¶170.

For these reasons, the Low Power/High Interference Indicator functions as signaling information that, when set to “1”, indicates that devices receiving a transmission from an OBSS STA with the indicator set to 1 are “required to defer channel access,” regardless of the BSS color information. SAMSUNG-1009, [0029]. A POSITA would have understood or found obvious that this signaling information indicates that an operation based on BSS color (namely, channel access determination based on BSS identification) is not allowed. SAMSUNG-1003, ¶171.

As another example, Choudhury teaches that “the COLOR field concept can be generalized to achieve the functionality of both the low power indicator and the COLOR field.” SAMSUNG-1009, [0029]. “For example, the first three bits of the COLOR [field] can be used to set the basic service set identification (BSS ID) and the fourth bit can be used as a low power/high interference indicator” or “reserved values may be used for the entire 4-bit field.” *Id.* For instance, a STA may use a value of ‘0000’ in the COLOR field to indicate high interference and that devices decoding ‘0000’ are “required to defer channel access.” *Id.* In this instance, a POSITA would have understood or found obvious that a COLOR field value of

“0000” does not represent a valid BSS identifier, but rather serves as signaling information that BSS color-based operations should not be performed.

SAMSUNG-1003, ¶172. When a device receives a PPDU with this reserved value, it cannot use the BSS color for its intended purpose of BSS identification because no valid BSS color has been provided. SAMSUNG-1009, [0025], [0029]; SAMSUNG-1003, ¶172. Accordingly, when the COLOR field is set to the reserved value of “0000,” it indicates that operations based on BSS COLOR are not allowed and the receiving STA does not use BSS COLOR. *Id.*

Based on Choudhury’s teachings, a POSITA would have found it obvious that the processor would be configured to receive the PPDU using the transceiver, and not use the BSS color when the signaling information, such as the “Low Power/High Interference Indicator” or the COLOR ‘0000’ value, indicates that operations based on the BSS color are not allowed. SAMSUNG-1009, [0020]. SAMSUNG-1003, ¶¶173-174.

[1.5]

Choudhury renders obvious [1.5]. SAMSUNG-1003, ¶¶175-178. Choudhury’s COLOR field is used to identify the Basic Service Set (BSS) by assigning a unique color to each BSS, thereby enabling STAs to distinguish between different BSSs. Specifically, Choudhury relies on the COLOR field as defined by 802.11ah and explains “the COLOR bit [in the COLOR field] can be

used to set the basic service set identification (BSS ID)”. SAMSUNG-1009, [0029]. Thus, the COLOR field functions as an identifier for each BSS. *Id.*; SAMSUNG-1003, ¶175.

Further, in Choudhury, all STAs within the same BSS set the same COLOR field value, ensuring that STAs are aware of ongoing intra-BSS transmissions. SAMSUNG-1009, [0025]. This ability to identify and distinguish BSSs based on the COLOR field helps avoid interference by preventing transmission overlap in the same BSS. *Id.*; SAMSUNG-1003, ¶176.

Additionally, the IEEE 802.11ah standard, cited by Choudhury, confirms that the COLOR field is used for BSS identification. SAMSUNG-1009, [0020]-[0021]. The standard elaborates that “each BSS has a different color [field],” which helps STAs identify whether a transmission is within their own BSS after decoding the SIG field. SAMSUNG-1009, [0021]. A POSITA would have understood that the BSS color serves as an identifier for the BSS. *Id.*; SAMSUNG-1003, ¶177.

Based on the disclosures in Choudhury and the IEEE 802.11ah standard, a POSITA would have recognized that the COLOR field is used to identify the BSS. SAMSUNG-1009, [0020]-[0021]; SAMSUNG-1003, ¶178; SAMSUNG-1009, [0024]-[0030].

[1.6]

Choudhury renders obvious [1.6]. SAMSUNG-1003, ¶¶179-183. As discussed above (*supra* §III.E.2.[1.4]), Choudhury discloses signaling information in the form of either a Low Power/High Interference Indicator or a reserved COLOR field value of “0000”. SAMSUNG-1009, [0026], [0029]. Choudhury further teaches that this signaling information is transmitted within a wireless network environment comprising access points (APs) and stations (STAs). SAMSUNG-1009, [0020]-[0021], FIG. 1.

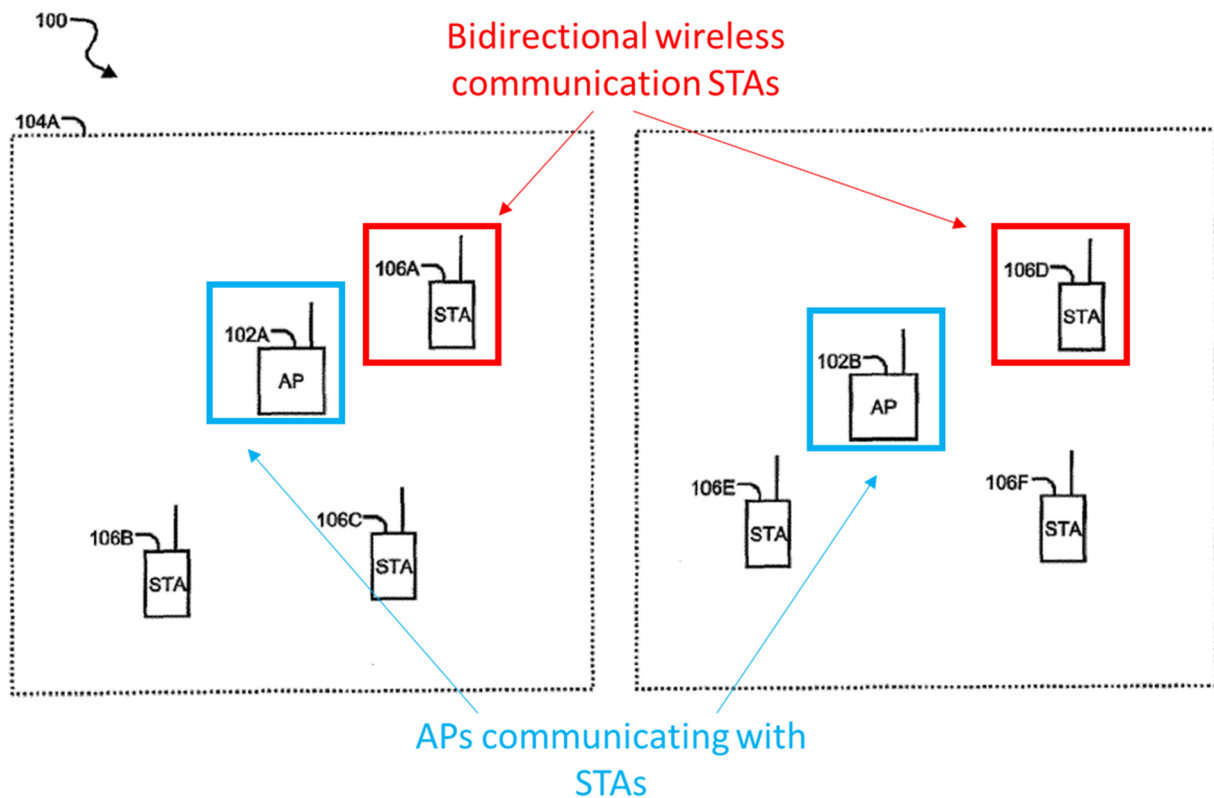


Fig. 1

SAMSUNG-1009, FIG. 1 (annotated).

Choudhury discloses that “one or more wireless network APs and STAs are

configured to transmit and to recognize a signal field” containing this signaling information. SAMSUNG-1009, [0030]. In the context of IEEE 802.11 networks described by Choudhury, APs function as base wireless communication terminals that manage network access and provide connectivity for associated STAs. SAMSUNG-1009, [0018]-[0020], [0034]-[0035]. Specifically, Choudhury explains that the “AP enforces rules” that determine which STAs can operate within a network, indicating the AP’s role as a base terminal managing associated devices. SAMSUNG-1009, [0034]; SAMSUNG-1003, ¶180.

Choudhury’s network architecture, illustrated in FIG. 1, shows APs (102A, 102B) serving networks (104A, 104B) containing STAs (106A-C, 106D-F). SAMSUNG-1009, [0020], FIG. 1. This architecture establishes an association relationship between STAs and their respective APs. SAMSUNG-1009, [0020]-[0021], [0025], [0029]. It would have known to a POSITA that in IEEE 802.11 networks, STAs associate with an AP to participate in the network, and the AP provides management functions including transmission of control and signaling information to these associated STAs. SAMSUNG-1003, ¶181; SAMSUNG-1009, [0025], [0029], [0018]-[0020], [0027], [0032]-[0038], FIGs. 1, 2, 4, 5.

Furthermore, Choudhury describes scenarios where APs coordinate with STAs to manage interference and channel access. SAMSUNG-1009, [0020], [0025], [0029], [0034]-[0035]. The communication of signaling information,

including the Low Power/High Interference Indicator or reserved COLOR values, occurs within this established network hierarchy where APs act as base terminals directing the behavior of associated STAs. SAMSUNG-1003, ¶182. Indeed, as Dr. Mahon explains, an AP is a particular type of STA in a BSS and can suffer from high interference in a similar manner to other STAs in the BSS (e.g., when interference is present throughout a BSS). *Id.* (citing SAMSUNG-1017, [0058]; SAMSUNG-1018, [0183]). Thus, a POSITA would have understood or found obvious that, in Choudhury, APs use the Low Power/High Interference Indicator or the reserved COLOR value to signal that operations based on BSS COLOR are not allowed. *Id.*

A POSITA would have understood or found obvious, based on this disclosure, that the signaling information, including the Low Power/High Interference Indicator or the COLOR field value of “0000,” would be transmitted from a base wireless communication terminal (AP) to which the wireless communication terminal (STA) is associated. SAMSUNG-1009, [0025], [0029]; SAMSUNG-1003, ¶183.

[7]

Choudhury renders obvious [7]. SAMSUNG-1003, ¶¶184-188. Choudhury discloses disabling spatial reuse operations when a BSS color field is set to a predetermined value indicative of high interference. For example, Choudhury

discloses that a STA may utilize a value of ‘0000’ in the COLOR field to signify a high interference environment, instructing that STAs decoding such a value are “required to defer channel access.” SAMSUNG-1009, [0029], [0033].

A POSITA would have found it obvious that deferring channel access in Choudhury would have included the act of refraining from initiating spatial reuse operations, as spatial reuse involves initiating transmission in the presence of other ongoing transmissions. SAMSUNG-1009, [0029]; SAMSUNG-1003, ¶185. A POSITA would have understood or found obvious that the deferment of channel access would have precluded the execution of spatial reuse procedures by Choudhury’s STA, thereby selectively disabling spatial reuse. SAMSUNG-1003, ¶185.

Moreover, Choudhury discloses the importance of dynamically adapting spatial reuse behavior based on interference levels indicated by BSS color values. SAMSUNG-1009, [0026]. This teaching would have motivated a POSITA to configure the STA such that it abstains from spatial reuse operations upon detection of a specific BSS color predetermined to denote a high-interference condition. SAMSUNG-1009, [0026], [0029]; SAMSUNG-1003, ¶186.

Additionally, Choudhury’s use of the ‘0000’ COLOR value as a control mechanism to inform STAs to defer from channel access would have served as a signal to disable transmission attempts during such interference conditions.

SAMSUNG-1009, [0029]. Therefore, the STA's behavior of not performing spatial reuse when the COLOR value matches a predetermined value would have been an expected and logical implementation for a POSITA designing interference-aware communication terminals based on Choudhury. SAMSUNG-1009, [0009], [0028]-[0034]; SAMSUNG-1003, ¶187.

Furthermore, the objective of minimizing collisions and enhancing network efficiency under high interference conditions would have naturally led a POSITA to implement spatial reuse restrictions contingent upon predetermined BSS color values. SAMSUNG-1009, [0028]–[0029]. A POSITA would have understood that Choudhury had laid out the rationale for such restrictions, thereby rendering the configuration of the STA (*processor*) to inhibit spatial reuse in response to specific COLOR field values obvious. SAMSUNG-1009, [0033], [0017], [0023], [0025], [0028]-[0029], [0033]-[0034], FIGs. 1, 2, 4-5; SAMSUNG-1003, ¶188.

[8]

Choudhury renders obvious [8]. SAMSUNG-1003, ¶¶189-193. As discussed above (*supra* §§ III.D.1.(a), III.E.2.[7]), Choudhury uses a specific BSS color value—namely, ‘0000’—as a reserved indicator to signify a high-interference environment. SAMSUNG-1009, [0029]; SAMSUNG-1003, ¶189.

Choudhury's value ‘0000’ as presented in Choudhury directly corresponds to the decimal value of 0 under universally recognized binary-to-decimal encoding

schemes, a fact that would have been immediately apparent to a POSITA.

SAMSUNG-1009, [0025], [0029]. Given that the COLOR field is typically parsed as a binary value and often internally treated as its decimal equivalent within protocol stacks and hardware registers, the use of a decimal ‘0’ would have been viewed by a POSITA as synonymous with ‘0000’. SAMSUNG-1009, [0029], [0025]; SAMSUNG-1003, ¶190.

As discussed above (*supra* §III.E.2.[7]), Choudhury discloses that the ‘0000’ value was not only reserved but also deliberately excluded from legitimate BSS color assignments, precisely to designate exceptional network conditions, including elevated interference scenarios that necessitate refraining from spatial reuse. SAMSUNG-1009, [0029]. This teaching would have provided both the motivation and the technical basis for a POSITA to configure a wireless communication terminal such that spatial reuse operations would be disabled upon detecting this predetermined value—specifically, a value of 0. SAMSUNG-1003, ¶¶191-192.

Thus, a POSITA would have found it obvious to implement a system wherein the spatial reuse operation is disabled upon detection of a BSS color field set to 0, consistent with the functional behavior and reserved signaling disclosed in Choudhury. SAMSUNG-1009, [0029]; SAMSUNG-1003, ¶193.

[9.1]

Choudhury renders obvious [9.1]. *Supra* §§III.E.2.[1.1], III.E.2.[1.2], III.E.2.[1.3]. SAMSUNG-1003, ¶194.

[9.2]

Choudhury renders obvious [9.2]. *Supra* §III.E.2.[1.4]. SAMSUNG-1003, ¶195.

[9.3]

Choudhury renders obvious [9.3]. *Supra* §III.E.2.[1.4]. SAMSUNG-1003, ¶196.

[9.4]

Choudhury renders obvious [9.4]. *Supra* §III.E.2.[1.5]. SAMSUNG-1003, ¶197.

[9.5]

Choudhury renders obvious [9.5]. *Supra* §III.E.2.[1.6]. SAMSUNG-1003, ¶198.

[15]

Choudhury renders obvious [15]. *Supra* §III.E.2.[7]. SAMSUNG-1003, ¶199.

[16]

Choudhury renders obvious [16]. *Supra* §III.E.2.[8]. SAMSUNG-1003, ¶200.

F. GROUND 2B: Choudhury-Stacey renders claims 2-3, 6, 10-11, and 14 obvious

1. Choudhury-Stacey

(a) Stacey

Supra §III.B.1.(a). SAMSUNG-1003, ¶¶77-79.

(b) Combination – Choudhury Stacey Device (CSD)

As discussed above (*supra* §III.E.1), Choudhury teaches techniques for BSS color-based operations within wireless networks. SAMSUNG-1009, [0001], [0003]-[0007], [0021]-[0030], FIGs. 1, 2, 3, 5; *Supra* §III.D.1.(a). Specifically, Choudhury discloses that the COLOR field indicates the BSS associated with a given transmission. SAMSUNG-1009, [0025]. Choudhury further describes the concept of disabling BSS color operation through dedicated signaling by teaching that “[a] STA may use a value of ‘0000’ in the COLOR field to indicate high interference” where “devices decoding ‘0000’ are required to defer channel access.” SAMSUNG-1009, [0029]; SAMSUNG-1003, ¶201. Through this disclosure, it would have been obvious to a POSITA that a COLOR value of zero serves as a form of signaling to disable BSS color-based operations. SAMSUNG-1003, ¶201. A POSITA would have appreciated that this form of in-band signaling serves a similar role to Lee’s “coloring disable bit” by selectively disabling BSS color-based behaviors under certain interference conditions. *Id.*, ¶201; *Supra* §§III.A.1, III.B.1.(b). Given Choudhury’s similarities to Lee, a POSITA would

have been motivated to combine Stacey with Choudhury for reasons similar to those discussed above for the combination of Lee and Stacey. *Id.*

Stacey describes a framework for implementing dual NAV mechanisms, teaching that “[f]or the two NAVs maintained by a HE STA, one is identified as Intra-BSS NAV, and the second one is identified as regular NAV.” SAMSUNG-1006, 39-40 (Section 25.2.1). Stacey also describes how a STA may conditionally update its NAV based on whether a received frame is identified as intra-BSS or inter-BSS via the BSS Color subfield in the HE-SIG-A field. *Id.* Furthermore, Stacey discloses power save operations that are responsive to BSS identification, including a mode in which an HE non-AP STA enters a doze state “until the end of a received PPDU” when specific conditions related to BSS color are met. *Id.*, 60 (Section 25.13.1); SAMSUNG-1009, [0020]–[0021]. From these disclosures, a POSITA would have understood that BSS color is used for multiple medium access control functions. SAMSUNG-1003, ¶202. Stacey further elaborates on TXOP Duration field usage and power save operations based on frame identification. *Id.*; SAMSUNG-1003, ¶202.

In view of the above, a POSITA would have been motivated to combine Choudhury’s signaling techniques with Stacey’s BSS color-dependent operations – namely, NAV setting, spatial reuse, and power save features – so as to conditionally disable these operations when high interference is indicated.

SAMSUNG-1003, ¶203. The Choudhury-Stacey combination enables a system in which receipt of a frame with COLOR=0000 disables BSS color-based interpretation by the receiving STA. In other words, the reserved color value (e.g., “0000”) indicates that the BSS color is not valid or representative of any BSS, thereby suppressing inter-/intra-BSS NAV updates, spatial reuse behavior, and power save responses that would otherwise rely on BSS color. *Id.*, ¶203. Such a combination effectively achieves dynamic interference mitigation and improved coordination in dense deployments, while preserving the BSS color framework under normal conditions. *Id.*, ¶203. A POSITA would have understood or found obvious that this approach avoids misclassification of inter-BSS traffic as intra-BSS traffic, prevents unintended channel access behaviors, and maintains protocol compliance while disabling color-based logic only when appropriate. *Id.*, ¶203.

Additionally, a POSITA would have recognized multiple technical benefits arising from the Choudhury-Stacey combination, including: (1) improved interference management via Choudhury’s COLOR=0000 signaling, which prompts deferral of medium access when high interference is detected; (2) enhanced spatial reuse efficiency through conditional NAV setting based on valid BSS color identification, as taught by Stacey; and (3) increased power efficiency by leveraging Stacey’s power save mechanisms in conjunction with BSS color suppression signaling. *Id.*, ¶204. These technical benefits would have provided

further motivation to combine Choudhury and Stacey. *Id.*, ¶204.

A POSITA attempting to combine Choudhury and Stacey in the manner described would have had a reasonable expectation of success. *Id.*, ¶205. Both references teach enhancements of the IEEE 802.11 protocol and share common context in MAC layer improvements, making their integration straightforward and predictable to a skilled artisan. *Id.*, ¶205. A POSITA would have found the Choudhury-Stacey combination to constitute a mere combination of prior art elements (*i.e.*, Choudhury's high interference signaling and Stacey's BSS color-based operations) according to known methods to yield predictable results (*i.e.*, disabling BSS color-dependent operations in the presence of interference). *Id.*, ¶205. A POSITA would further have understood this to be the application of a known technique (*i.e.*, conditional suppression of BSS color functionality) to a known system (*i.e.*, BSS color-based NAV and power save operations as taught by Stacey) to achieve a predictable and desirable outcome. SAMSUNG-1003, ¶205. For these reasons, a POSITA would have found the Choudhury-Stacey combination to be obvious. SAMSUNG-1003, ¶205.

In operation, the resulting Choudhury-Stacey device (CSD) receives transmissions that include a COLOR field value. SAMSUNG-1003, ¶206. Under normal operation, the CSD performs intra-BSS/inter-BSS NAV setting, spatial reuse behavior, and power save mode activation based on BSS color identification.

SAMSUNG-1003, ¶206. However, when the CSD receives a frame with COLOR=0000, the CSD suppresses operations that would otherwise depend on BSS color—namely, it refrains from updating either NAV, does not engage in spatial reuse behavior, and does not enter power save mode based on BSS classification. *Id.*, ¶206. As Dr. Mahon explains, because the COLOR value of zero signals high interference and does not relate to an actual BSS, the CSD does not perform operations based on BSS color since the CSD does not have a valid BSS color value to use for BSS identification. *Id.*, ¶206. Through this behavior, the CSD efficiently mitigates interference and optimizes network operation in accordance with teachings from both Choudhury and Stacey. *Id.*, ¶206.

2. Analysis

[2.1]

The CSD renders obvious [2.1]. *Supra* §III.B.2.[2.1]. SAMSUNG-1003, ¶207. Choudhury discloses that when a STA decodes a reserved COLOR field value of ‘0000’, it defers channel access and suspends BSS color-based operations. SAMSUNG-1009,[0029]. This reserved value signals high interference, and makes the processor disable Intra-BSS NAV updates that rely on BSS color. Stacey teaches maintaining separate NAVs (Intra-BSS and Basic) based on BSS classification. SAMSUNG-1006, 39. A POSITA would have combined teachings - Choudhury’s ‘0000’ signaling with Stacey’s NAV framework, configuring the

processor to bypass Intra-BSS NAV updates when ‘0000’ is detected.

SAMSUNG-1009, [0029]; SAMSUNG-1006, 39; SAMSUNG-1003, ¶207.

[2.2]

The CSD renders obvious [2.2]. *Supra* §III.B.2.[2.2]. SAMSUNG-1003, ¶208. As discussed above (§§III.B.2.[2.2], III.B.1.(a)), Stacey differentiates Intra-BSS NAV (for same-BSS transmissions) from Basic NAV (for inter-BSS/unclassified frames). SAMSUNG-1006, 39. Choudhury’s ‘0000’ COLOR value forces STAs to treat PPDU as unclassifiable, triggering Basic NAV updates under Stacey’s rules. SAMSUNG-1003, ¶208.

[2.3]

The CSD renders obvious [2.3]. *Supra* §III.B.2.[2.3]. SAMSUNG-1003, ¶209. As discussed above, (§III.F.2.[2.2]), Stacey mandates Basic NAV updates for inter-BSS PPDU or frames that cannot be classified. SAMSUNG-1006, 39. Choudhury’s ‘0000’ value creates unclassifiable PPDU by invalidating BSS color identification, directly invoking Stacey’s Basic NAV protocol. SAMSUNG-1003, ¶209.

[3.1]

The CSD renders obvious [3.1]. *Supra* §III.B.2.[3.1]. SAMSUNG-1003, ¶210. A POSITA would have recognized that Choudhury’s PPDU structure includes HE-SIG-A fields with TXOP Duration data, while Stacey teaches using TXOP Duration for NAV updates. SAMSUNG-1009, [0025]; SAMSUNG-1006,

39. A POSITA would have understood or found obvious that the CSD processes TXOP Duration in HE-SIG-A alongside MAC frame Duration fields, as both references operate within IEEE 802.11ax standards. SAMSUNG-1003, ¶210.

[3.2]

The CSD renders obvious [3.2]. *Supra* §III.B.2.[3.2]. SAMSUNG-1003, ¶211. Stacey discloses that TXOP Duration fields in HE-SIG-A dictate NAV settings for Intra-BSS and Basic NAVs. SAMSUNG-1006, 37, 39. A POSITA would have been motivated to implement Choudhury’s ‘0000’ value to trigger Stacey’s rule to prioritize Basic NAV updates, addressing the “information used for setting.” SAMSUNG-1003, ¶211.

[3.3]

The CSD renders obvious [3.3]. *Supra* §III.B.2.[3.3]. SAMSUNG-1003, ¶212. Stacey teaches MAC frame Duration fields to override HE-SIG-A TXOP data when valid frames are present. SAMSUNG-1006, 39. A POSITA would have understood or found obvious that in the CSD, Choudhury’s ‘0000’ COLOR value ensures MAC frame data takes precedence. SAMSUNG-1003, ¶212. Thus, aligning with the claimed use of Duration fields for NAV updates. SAMSUNG-1003, ¶212.

[3.4]

The CSD renders obvious [3.4]. *Supra* §III.B.2.[3.4]. SAMSUNG-1003, ¶213.

[6.1]

The CSD renders obvious [6.1]. *Supra* §III.B.2.[6.1]. SAMSUNG-1003, ¶214. A POSITA would have understood that Choudhury's '0000' COLOR value performs full channel deferral, precluding power save mode entry. SAMSUNG-1009, [0029]. Stacey ties doze state activation to valid BSS color matches (SAMSUNG-1006, 51-52), and a POSITA would have understood or found obvious that deferred access under Choudhury suspends power save operations. SAMSUNG-1003, ¶214.

[6.2]

The CSD renders obvious [6.2]. *Supra* §III.B.2.[6.2]. SAMSUNG-1003, ¶215. Stacey teaches BSS color matching for doze state entry. SAMSUNG-1006, 51-52. A POSITA would have understood that Choudhury's '0000' creates a non-matching condition by reserving the COLOR field, preventing STA compliance with Stacey's power save criteria. Thus, a POSITA would have recognized that CSD teachings directly corresponds to the claimed suspension of power save operations. SAMSUNG-1003, ¶215.

[10.1]

The CSD renders obvious [10.1]. *Supra* §§III.B.2.[10.1], III.F.2.[2.1]. SAMSUNG-1003, ¶216.

[10.2]

The CSD renders obvious [10.2]. *Supra* §§III.B.2.[10.2], III.F.2.[2.2].

SAMSUNG-1003, ¶217.

[10.3]

The CSD renders obvious [10.3]. *Supra* §§III.B.2.[10.3], III.F.2.[2.3].

SAMSUNG-1003, ¶218.

[11.1]

The CSD renders obvious [11.1]. *Supra* §§III.B.2.[11.1], III.F.2.[3.1].

SAMSUNG-1003, ¶219.

[11.2]

The CSD renders obvious [11.2]. *Supra* §§III.B.2.[11.2], III.F.2.[3.2].

SAMSUNG-1003, ¶220.

[11.3]

The CSD renders obvious [11.3]. *Supra* §§III.B.2.[11.3], III.F.2.[3.3].

SAMSUNG-1003, ¶221.

[11.4]

The CSD renders obvious [11.4]. *Supra* §§III.B.2.[11.4], III.F.2.[3.4].

SAMSUNG-1003, ¶222.

[14.1]

The CSD renders obvious [14.1]. *Supra* §§III.B.2.[14.1], III.F.2.[6.1].

SAMSUNG-1003, ¶223.

[14.2]

The CSD renders obvious [14.2]. *Supra* §§III.B.2.[14.2], III.F.2.[6.2].

SAMSUNG-1003, ¶224.

G. GROUND 2C: Choudhury-Zhou renders claims 4-5, 12, and 13 obvious

1. Choudhury-Zhou

(a) Zhou

Supra §III.C.1.(a). SAMSUNG-1003, ¶¶80-81.

(b) Combination – Choudhury Zhou Device (CZD)

A POSITA would have been motivated to combine Choudhury and Zhou to address BSS color collision detection and signaling in dense wireless networks.

SAMSUNG-1003, ¶225. As discussed above (*supra* §§III.E.1, III.C.1.(a)),

Choudhury discloses a mechanism by which the validity of BSS color-based operations may be conditionally disabled based on network conditions.

SAMSUNG-1003, ¶225. A POSITA would have appreciated that this technique effectively prevents color-based interpretation and classification of incoming frames when interference is detected. *Id.*, ¶225. Given Choudhury's similarities to Lee, a POSITA would have been motivated to combine Zhou with Choudhury for reasons similar to those discussed above for the combination of Lee and Zhou.

Supra §III.C.1.(a)-(b).

Although Choudhury describes high interference scenarios, Choudhury does not disclose any mechanism by which a STA can detect a BSS color collision – *i.e.*, a scenario in which two overlapping BSSs incidentally use the same BSS color

– prior to such signaling. *Id.*, ¶226. Zhou addresses this deficiency by teaching a method of detecting BSS color collisions and reporting them to an AP.

SAMSUNG-1007, [0005], [0070]-[0071]; SAMSUNG-1008, [0004], [0071]-[0072]. Upon detection, the STA transmits a “collision report” to the AP.

SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072]. Zhou further discloses that, upon receiving such a collision report, the AP may take remedial action – including preventing STAs from transmitting until a new BSS color is assigned.

SAMSUNG-1007, [0063], [0081]; SAMSUNG-1008, [0064], [0082].

A POSITA would have found it obvious to integrate Zhou’s MAC-based collision detection and reporting mechanism with Choudhury’s signaling framework. SAMSUNG-1003, ¶227. Through such a combination, the resulting device, CZD, can (1) detect a BSS color collision by analyzing MAC addresses in received frames; (2) transmit a collision report to the AP upon detection of such a collision; and (3) disable BSS color-based operations by setting COLOR = ‘0000’ in outgoing frames, thereby prompting receiving STAs to defer channel access and suppress color-based functionality. *Id.*, ¶227.

A POSITA would have recognized that the CZD offers several distinct advantages, including: (1) enabling proactive detection of BSS color collisions through Zhou’s MAC address-based analysis; (2) permitting flexible and efficient signaling of collision conditions via Choudhury’s reserved COLOR field values;

and (3) avoiding unnecessary transmission suppression by allowing continued operation using alternate identifiers, such as MAC addresses, when BSS color is deemed unreliable. SAMSUNG-1003, ¶228. A POSITA would have appreciated that such a system provides more nuanced interference management than disabling transmissions entirely, as proposed by Zhou. *Id.*, ¶228.

A POSITA would have had a reasonable expectation of success in combining Choudhury and Zhou. SAMSUNG-1003, ¶229. Both references address similar problems in the same technical domain – namely, efficient channel access and collision avoidance in IEEE 802.11ax networks – and provide complementary teachings. *Id.*, ¶229. A POSITA would have found the Choudhury-Zhou combination to be the mere combination of prior art elements (*i.e.*, Choudhury’s high interference signaling and Zhou’s BSS color collision detection and reporting) according to known methods to yield predictable results (*i.e.*, detection of BSS color collisions and subsequent signaling to disable BSS color-based operations). *Id.*, ¶229; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 401 (2007). A POSITA would further have understood this to be the application of a known technique (Zhou’s MAC-based collision detection) to a known system (Choudhury’s signaling protocol using reserved COLOR values) to achieve predictable outcomes in network coordination and interference mitigation. SAMSUNG-1003, ¶229. For these reasons, a POSITA would have found the

Choudhury-Zhou combination obvious. *Id.*

In operation, the resulting CZD receives frames that include BSS color information in the COLOR field. SAMSUNG-1003, ¶230. Under normal circumstances, the CZD interprets this BSS color for classification and channel access decisions. *Id.* However, the CZD is capable of detecting BSS color collisions by comparing MAC addresses in two or more frames with identical COLOR values. *Id.* When the CZD detects such a collision – indicating that multiple BSSs are using the same color – it transmits a one-bit “collision report” to the AP. *Id.* In response, either the AP or the CZD itself sets COLOR = ‘0000’ in transmitted frames, thereby signaling to other STAs that BSS color-based operations are disallowed. *Id.* The result is a more robust system that can dynamically suppress unreliable BSS color usage in response to real-time collision detection. *Id.*

2. Analysis

[4.1]

The CZD renders obvious [4.1]. *Supra* §III.C.2.[4.1]. SAMSUNG-1003, ¶231. As discussed above (§§III.C.2.[4.1], III.E.1), upon detection of a collision, CZD sends a single-bit collision report (SAMSUNG-1007, [0071]; SAMSUNG-1008, [0072]) and CZD’s STAs transmit ‘0000’ to disable BSS COLOR (SAMSUNG-1009, [0029]), signaling BSS color-based operations are disallowed.

SAMSUNG-1003, ¶231.

[4.2]

The CZD renders obvious [4.2]. *Supra* §III.C.2.[4.2]. SAMSUNG-1003, ¶232. In CZD, a BSS color collision represents that different BSSs correspond to one BSS color. SAMSUNG-1007, [0005]; SAMSUNG-1008, [0004]; SAMSUNG-1003, ¶232.

[5]

The CZD renders obvious [5]. *Supra* §III.C.2.[5]. SAMSUNG-1003, ¶233. As discussed above (§§III.C.2.[5], III.C.1.(a)), Zhou teaches detecting BSS color collisions by comparing MAC addresses of frames with identical color values. SAMSUNG-1007, [0070]; SAMSUNG-1003, ¶233.

[12.1]

The CZD renders obvious [12.1]. *Supra* §§III.C.2.[12.1], III.G.2.[4.1]. SAMSUNG-1003, ¶234.

[12.2]

The CZD renders obvious [12.2]. *Supra* §§III.C.2.[12.2], III.G.2.[4.2]. SAMSUNG-1003, ¶235.

[13]

The CZD renders obvious [13]. *Supra* §§III.C.2.[13], III.G.2.[5]. SAMSUNG-1003, ¶236.

IV. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION

Petitioner believes that discretionary denial is unwarranted, and yet, Petitioner intends to utilize the bifurcated briefing process contemplated by the March 26, 2025, Stewart Memorandum to rebut contentions if offered by Patent Owner to the contrary. SAMSUNG-1022.

V. CONCLUSION AND FEES

The Challenged Claims are unpatentable. Petitioner authorizes charge of fees to Deposit Account 06-1050.

VI. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(a)(1)

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

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Samsung”) are the real parties-in-interest.

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

The '163 Patent is the subject of civil action *Wilus Institute of Standards and Technology Inc., v. Samsung Electronics Co., LTD., et al.*, 2-24-cv-00765 (EDTX) filed September 20, 2024; and *Wilus Institute of Standards and Technology Inc. v. HP Inc.*, 2-24-cv-00764 (EDTX) filed September 20, 2024. Petitioner is not aware of any disclaimers, reexamination certificates, or IPR petitions addressing the '163 Patent.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above.

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Respectfully submitted,

Dated April 30, 2025

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CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,993 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated April 30, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) et seq. and 42.105(b), the undersigned certifies that on April 30, 2025, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided by Federal Express, to the Patent Owner, by serving the correspondence address of record as follows:

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