

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Juhyung Son, et al.	Attorney Docket No. 39843-0194IP1
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Filing Date:	May 6, 2020	
Title:	WIRELESS COMMUNICATION METHOD AND WIRELESS COMMUNICATION TERMINAL, WHICH USE DISCONTINUOUS CHANNEL	

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES
PATENT NO. 11,470,595 PURSUANT TO 35 U.S.C. §§ 311–319,
37 C.F.R. § 42**

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EXHIBITS

- SAMSUNG-1001 U.S. Patent No. 11,470,595 to Son, et al. (“the ’595 Patent”)
- SAMSUNG-1002 Excerpts from the Prosecution History of the ’595 Patent (“the Prosecution History”)
- SAMSUNG-1003 Declaration and Curriculum Vitae of Dr. R. Michael Buehrer
- SAMSUNG-1004 Complaint, *Wilus Institute of Standards and Technology Inc., v. Samsung Electronics Co., LTD., et al.*, 2-24-cv-00746 (EDTX) filed September 11, 2024
- SAMSUNG-1005 U.S. Patent Publication No. US2016/0330300A1 (“Josiam”)
- SAMSUNG-1006 U.S. Provisional Application No. 62/216,514 (“Josiam Provisional”)
- SAMSUNG-1007 U.S. Patent Publication No. US2016/0174200A1 (“Seok”)
- SAMSUNG-1008 U.S. Patent Publication No. US2016/0330058A1 (“Chen”)
- SAMSUNG-1009 U.S. Patent Publication No. US2017/0070998A1 (“Wu”)
- SAMSUNG-1010 U.S. Provisional Application No. 62/215,054 (“Wu Provisional”)
- SAMSUNG-1011 December 7, 2015 IEEE 802.11ax Draft Specification Framework
- SAMSUNG-1012 IEEE 802.11ac-2013 Specification
- SAMSUNG-1013 Ron Porat et al., *SIG-B Encoding Structure* (Jul. 13, 2015) IEEE 802.11-15/0873
- SAMSUNG-1014 Yujin Noh et al., *Preamble Structure in 802.11ax* (May 2015) IEEE 802.11-15/0575r0
- SAMSUNG-1015 Jiayin Zhang et al., *Preamble Structure for 11ax System* (Jan. 2015) IEEE 802.11-15/0101r1
- SAMSUNG-1016 U.S. Patent Publication No. US2016/0150514A1 (“Kwon”)

- SAMSUNG-1017 Joonsuk Kim et al., *HE-SIG-B Structure* (Jul. 11, 2015) IEEE 802.11-15/0821r2
- SAMSUNG-1018 Hongyuan Zhang et al., *BW Field in HE-MU Format* (Jul. 25, 2016) IEEE 802.11-16/0898
- SAMSUNG-1019 Andreas F. Molisch, *Wireless Communications* (2nd ed. 2011)
- SAMSUNG-1020 Sanghyun Kim et al., *Wider-Bandwidth Operation of IEEE 802.11 for Extremely High Throughput: Challenges and Solutions for Flexible Puncturing*, 8 IEEE Access 213840 (2020)
- SAMSUNG-1021 Coke Morgan Stewart, *Interim Processes for PTAB Workload Management* (Mar. 26, 2025)
- SAMSUNG-1022 Patent Trial and Appeal Board (PTAB) Boardside Chat: Interim Processes Relating to institution in AIA Proceedings (Apr. 17, 2025)
- SAMSUNG-1023 *Fintiv* Stipulation

LISTING OF CHALLENGED CLAIMS

Claim 1	
[1.pre]	A wireless communication terminal, the terminal comprising:
[1.1]	a processor;
[1.2]	wherein the processor is configured to:
[1.3]	receive a wireless packet including an High Efficiency Signal A (HE-SIG-A) field and an High Efficiency Signal B (HE-SIG-B) field,
[1.4]	obtain bandwidth information indicated via a bandwidth field included in the HE-SIG-A field,
[1.5]	obtain information of an unassigned resource unit via at least one subfield included in the HE-SIG-B field,
[1.6]	wherein the bandwidth field is related to bandwidth over which the received wireless packet is transmitted, and is used to obtain the information of the unassigned resource unit, and
[1.7]	decode a data of the received wireless packet based on the bandwidth information and the information of the unassigned resource unit,
[1.8]	wherein the unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field and the at least one subfield, and
[1.9]	wherein the information of the unassigned resource unit includes information of a C26 field indicating whether a user is allocated to a center 26-tone resource unit of 80 MHz upon the bandwidth related to a transmission of the received wireless packet indicated by the bandwidth field being 80 MH or more, not 20 MHz or 40 MHz.
Claim 2	
[2.pre]	The wireless communication terminal of claim 1,

[2.1]	wherein the HE-SIG-B field consists of HE-SIG-B content channel 1 and HE-SIG-B content channel 2 in units of 20 MHz respectively, and
[2.2]	wherein the C26 field is carried in both the HE-SIG-B content channel 1 and the HE-SIG-B content channel 2.
Claim 3	
[3]	The wireless communication terminal of claim 2, wherein when the received wireless packet is transmitted in a total bandwidth of 80 MHz, both of a C26 field carried in the HE-SIG-B content channel 1 and a C26 field carried in the HE-SIG-B content channel 2 indicate whether a user is allocated to a center 26-tone resource unit in the total bandwidth of 80 MHz.
Claim 4	
[4]	The wireless communication terminal of claim 3, wherein when the C26 field indicates that a user is allocated to the center 26-tone resource unit, a user field corresponding to the center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 1.
Claim 5	
[5]	The wireless communication terminal of claim 2, wherein when the received wireless packet is transmitted in a total bandwidth of 160 MHz or 80+80 MHz, the total bandwidth includes a first 80 MHz bandwidth and a second 80 MHz bandwidth, a first C26 field carried in the HE-SIG-B content channel 1 indicates whether a user is allocated to a first center 26-tone resource unit in the first 80 MHz bandwidth, and a second C26 field carried in the HE-SIG-B content channel 2 indicates whether a user is allocated to a second center 26-tone resource unit in the second 80 MHz bandwidth.
Claim 6	
[6]	The wireless communication terminal of claim 5, wherein when the first C26 field indicates that a user is allocated to the first center 26-tone resource unit, a user field corresponding to the first center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 1, and wherein when the second C26 field indicates that a user is allocated to the second center 26-tone resource unit, a

	user field corresponding to the second center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 2.
Claim 7	
[7.pre]	A wireless communication method of a wireless communication terminal, the method comprising:
[7.1]	receiving a wireless packet including an high efficiency (HE)-signal (SIG)-A and HE-SIG-B;
[7.2]	obtaining bandwidth information indicated via a bandwidth field included in the HE-SIG-A;
[7.3]	obtaining information of an unassigned resource unit via at least one subfield included in the HE-SIG-B,
[7.4]	wherein the bandwidth field is related to bandwidth over which the received wireless packet is transmitted, and
[7.5]	wherein the bandwidth field of HE-SIG-A is used to obtain the information of the unassigned resource unit; and
[7.6]	decoding a data of the received wireless packet based on the total bandwidth information and the information of the unassigned resource unit,
[7.7]	wherein the unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field and the at least one subfield, and
[7.8]	wherein the information of the unassigned resource unit includes information of a C26 field indicating whether a user is allocated to a center 26-tone resource unit of 80 MHz upon the bandwidth related to a transmission of the received wireless packet indicated by the bandwidth field being 80 MH or more, not 20 MHz or 40 MHz.
Claim 8	
[8.pre]	The wireless communication method of claim 7,
[8.1]	wherein the HE-SIG-B field consists of HE-SIG-B content channel 1 and HE-SIG-B content channel 2 in units of 20 MHz respectively, and

[8.2]	wherein the C26 field is carried in both the HE-SIG-B content channel 1 and the HE-SIG-B content channel 2.
Claim 9	
[9]	The wireless communication method of claim 8, wherein when the received wireless packet is transmitted in a total bandwidth of 80 MHz, both of a C26 field carried in the HE-SIG-B content channel 1 and a C26 field carried in the HE-SIG-B content channel 2 indicate whether a user is allocated to a center 26-tone resource unit in the total bandwidth of 80 MHz.
Claim 10	
[10]	The wireless communication method of claim 9, wherein when the C26 field indicates that a user is allocated to the center 26-tone resource unit, a user field corresponding to the center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 1.
Claim 11	
[11]	The wireless communication method of claim 8, wherein when the received wireless packet is transmitted in a total bandwidth of 160 MHz or 80+80 MHz, the total bandwidth includes a first 80 MHz bandwidth and a second 80 MHz bandwidth, a first C26 field carried in the HE-SIG-B content channel 1 indicates whether a user is allocated to a first center 26-tone resource unit in the first 80 MHz bandwidth, and a second C26 field carried in the HE-SIG-B content channel 2 indicates whether a user is allocated to a second center 26-tone resource unit in the second 80 MHz bandwidth.
Claim 12	
[12]	The wireless communication method of claim 11, wherein when the first C26 field indicates that a user is allocated to the first center 26-tone resource unit, a user field corresponding to the first center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 1, and wherein when the second C26 field indicates that a user is allocated to the second center 26-tone resource unit, a user field corresponding to the second center 26-tone resource unit is carried in a user specific field of the HE-SIG-B content channel 2.

Samsung Electronics Co., Ltd. (“Petitioner” or “Samsung”) petitions for *Inter Partes* Review (“IPR”) of claims 1-12 (“the Challenged Claims”) of U.S. Patent No. 11,470,595 (“the ’595 patent”). Compelling evidence presented in this Petition demonstrates at least a reasonable likelihood that Samsung will prevail with respect to at least one of the Challenged Claims.

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the ’595 patent is available for IPR. This petition is being filed within one year of service of a complaint against Samsung. 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. R. Michael Buehrer provides supporting testimony in his Declaration. *See* SAMSUNG-1003.

Ground	Claim(s)	35 U.S.C. § 103
1A	1-12	Josiam
1B	1-6	Josiam, Seok
2	1-12	Chen, Wu

The ’595 patent claims priority to other applications, the earliest of which

was filed December 24, 2015 (“Critical Date”). SAMSUNG-1001, Cover. Each reference forming the grounds of this Petition is prior art to the ’595 patent assuming the ’595 patent is entitled to its earliest proclaimed priority date (Critical Date), which Petitioner does not concede.

Reference	Publication Date	Filing Date	Priority Date
Josiam	11/10/2016	4/4/2016	9/10/2015
Seok	6/16/2016	12/10/2015	N/A
Chen	11/10/2016	8/25/2015	N/A
Wu	3/9/2017	9/7/2016	9/7/2015

Chen and Seok qualify as prior art under AIA §102 based at least on their filing dates. Josiam and Wu qualify as prior art under AIA §102 because the relevant subject matter relied upon herein is fully supported by respective provisional applications filed before the Critical Date. *See Penumbra, Inc. v. Rapidpulse, Inc.*, IPR2021-01466, Paper 34 at 28-35 (PTAB March 10, 2023) (precedential). Where appropriate, parallel citations to Josiam and Wu’s respective provisional applications are included and/or Dr. Buehrer explains that a POSITA would have understood the relied upon portions in Josiam and Wu as being supported by their respective provisional applications. *See generally* SAMSUNG-1003; SAMSUNG-1006 (Josiam Provisional); SAMSUNG-1010 (Wu Provisional).

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

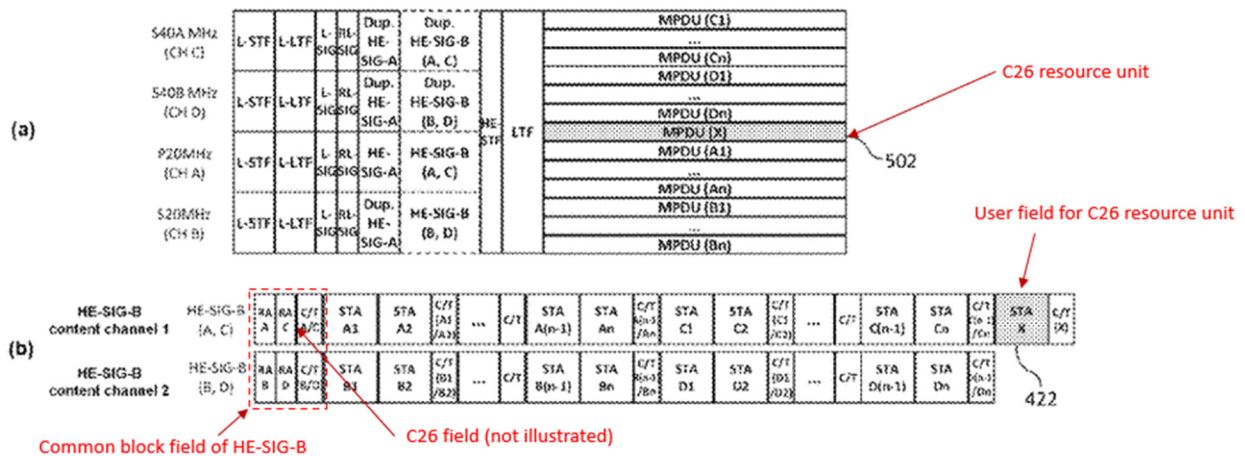
For purposes of this IPR, a person of ordinary skill in the art (“POSITA”) would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and at least 3 years of experience in the research, design or development of wireless communication devices, systems, and/or networks, or the equivalent, as of the Critical Date. SAMSUNG-1003, [26]. Increased educational experience can make up for less work experience, and vice versa. *Id.*

II. THE ’595 PATENT

A. Brief Description

The ’595 patent is directed to “a method of signaling allocation information

According to the '595 patent, “[w]hen a PPDU is transmitted in a total bandwidth of 80MHz or more, a center 26-tone RU 502 as shown in Fig. 38 (a) may additionally be used. . . . [T]he common block field of the HE-SIG-B may further include a C26 field (not illustrated) indicating whether a user is allocated to the center 26-tone RU 502. The C26 field may consist of a 1-bit indicator located before or after the RA field in the common block field.” *Id.*



Claims 7-12 recite method claims, and claims 1-6 recite apparatus claims, which include a processor configured to perform steps corresponding to the methods described in claims 7-12, respectively. Petitioner treats claims 7-12 as exemplary of the '595 patent's claims.

During prosecution, the '595 patent was twice rejected as obvious in view of

Chen (U.S. Patent Pub. No. 2016/0330058 A1), Hedayat (U.S. Patent No. 10,219,271 B1), and Noh (U.S. Patent Pub. No. 2017/0041929 A1). SAMSUNG-1002, 64-79, 113-130. Applicant first responded by amending the independent claims to additionally recite “wherein the unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field and the at least one subfield” and argued that neither Chen nor Hedayat taught the newly added limitation. *Id.*, 92-102. Specifically, Applicant argued the examiner’s reliance on Chen was misplaced because Chen’s method of indicating an unassigned resource unit using a “special (e.g., blank or null) PAID¹ which is not decodable by or known to any of the scheduled [stations]” meant that Chen’s stations “implicitly recognize that the RU was unallocated or skipped if the PAID is not decodable or known.” *Id.*, 98-99. According to Applicant, this may result in a station recognizing an allocated resource as “not allocated or skipped if it is not recognized or decoded due to an error.” *Id.*, 98-66.

The examiner found Applicant’s arguments unpersuasive, pointing to

¹ A partial AID (PAID) is a form of station ID carried in the station-specific part of HE-SIG-B. SAMSUNG-1003, [84] n.1 (citing SAMSUNG-1008, [0033], [0037], [0039], [0047], [0063]).

paragraph [0090] of Chen, “which states that one alternative for RU assignment is to explicitly indicate the non-allocated RU in the HE-SIG-B field.” *Id.*, 66-67.

Specifically, the examiner found that Chen taught

wherein the unassigned resource unit is explicitly indicated with the information of the unassigned resource unit (*non-allocated RU is explicitly indicated*; see paragraph [0090]) based on the bandwidth field and the at least one subfield (*RU pattern is determined by channel BW (i.e. BW field) in conjunction with the other fields*; see paragraphs [0098] and [0103]; *RU allocation is explicitly indicated in HE-SIG-B (i.e. subfield)*; see paragraph [0090])

Id., 69 (emphasis original).

Applicant responded by first arguing that Chen’s disclosure in paragraph [0090] did not teach the previously added limitation because that limitation requires “both ‘the bandwidth field and the at least one subfield’ are based for explicitly indicating the unassigned resource unit.” *Id.*, 51-53. Applicant did not address whether Hedayat, alone or in combination with Chen, satisfies this limitation. *Id.*

Applicant also further amended the claims to recite “the information of the unassigned resource unit includes information of a C26 field indicating whether a user is allocated to a center 26-tone resource unit of 80MHz upon the bandwidth related to a transmission of the received wireless packet indicated by the bandwidth field being 80MH or more, not 20 MHz or 40MHZ.” *Id.*, 48, 53-54.

Applicant argued that the amended claim was allowable over Hedayat’s disclosure,

which disclosed using a C26 field for 20MHz PPDU. *Id.*, 53-54.

Following this amendment, the examiner issued a notice of allowance. *Id.*, 20-29. The examiner found that “[t]he independent claims are directed towards the idea of obtaining information about unassigned resource units, information which indicates whether the center 2Mhz chunk (a 26 tone RU) in an 80MHz or greater block is allocated to a user, using a particular configuration of information in HE-SIG-A and HE-SIG-B fields of HEW [high efficiency wireless] communication.” *Id.*, 27. According to the examiner,

HEW communication is known in the art, and ***the general idea of indicating unassigned RUs using HE-SIG-A and HE-SIG-B fields is also known (see e.g. Chen (US20160330058 A1) at paragraph [0093] and Fig. 14).*** It is also known in the art that [for some] blocks (20MHz, 80MHz, and 80+80MHz), the center 2MHz chunk may need to be allocated separately (see Hedayat (US 10219271 B1) Col. 18 Lines 40-50), while for example the 40MHz block does not have the center RU.

Id. The examiner noted that the claims were allowed because of Applicant’s negative limitation amendment:

The independent claims have been specifically amended to require that the claimed process of indication and allocation only be performed on 80MHz or greater PPDUs, and not the 20MHz PPDU indicated by Hedayat. The examiner does not believe one of ordinary skill in the art would have found it obvious to modify Hedayat to exclude performing the claimed process on 20MHz PPDUs, as Hedayat teaches directly away from this, and would result in an inferior system.

Id.

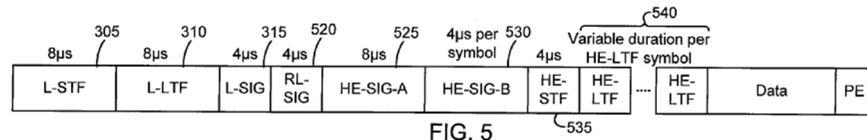
Notably, the examiner maintained his citation to the same method in Chen that Applicant argued did not teach indicating information of an unassigned resource based on HE-SIG-A and HE-SIG-B. *Id.* Despite having the opportunity to address the examiner's findings, Applicant paid the issue fee without commenting on the examiner's reasons for allowance. *Id.*, 18-19.

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. [GROUND 1A] – Josiam

1. Josiam

Josiam “relates to signaling and addressing in WLAN systems.” SAMSUNG-1005, [0002]; SAMSUNG-1006, 1-7. Specifically, Josiam discloses methods for resource unit arrangement and signaling in a high efficiency (HE) multi-user (MU) physical layer convergence protocol (PLCP) protocol data unit (PPDU). SAMSUNG-1005, [0002]-[0003]; SAMSUNG-1006, 1-9, 11. Josiam discloses “a header for a HE PPDU transmission,” which includes “HE signal A (HE-SIG-A) and HE signal B (HE-SIG-B) fields 525 and 530, respectively.” SAMSUNG-1005, [0074], [0093]-[0094], [0102], Fig. 5; SAMSUNG-1006, 1-3, 7-8, 16, Figs. 1-3.



SAMSUNG-1005, Fig. 5; SAMSUNG-1006, 1-3, 7-8, 16, Figs. 1-3.

Josiam discloses an “HE-SIG-B multiplexing scheme 2900 for 80MHz including 2 channels, each carrying independent information per a 20 MHz HE-SIG-B channel.” SAMSUNG-1005, [0165]; SAMSUNG-1006, 24-25, Fig. 29. For example, as illustrated in Figure 29 below, “an 80MHz MU PPDU includes two channels 2915 and 2920. . . . Each HE-SIG-B channel 2915 and 2920 carries different information and the HE-SIG-B channels 2915 and 2920 are duplicated per 40MHz, i.e., HE-SIG-B channel 1 2915 is carried in channel A & C of 80MHz while HE-SIG-B Channel 2 [] 2920 is carried in B & D of 80MHz.” *Id.*

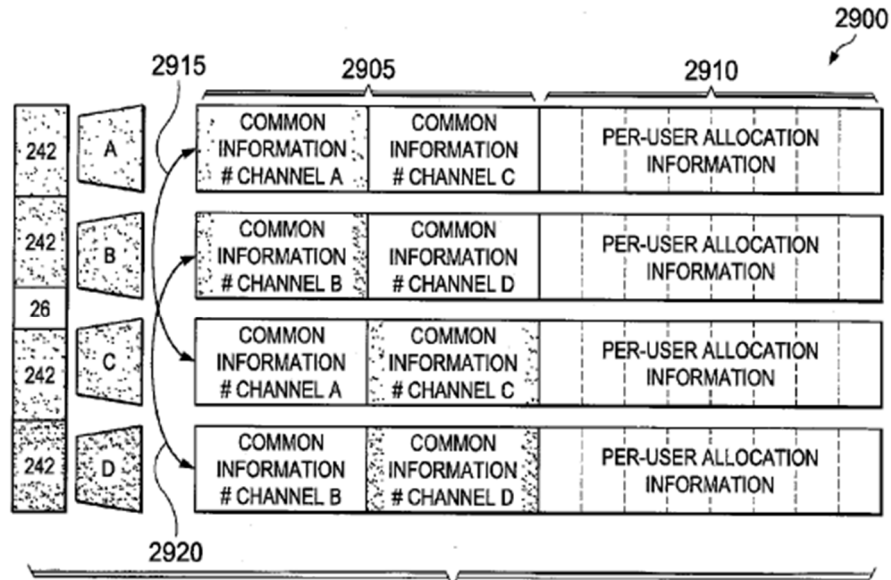


FIG. 29

SAMSUNG-1005, Fig. 29; SAMSUNG-1006, Fig. 29

Josiam discloses a resource unit allocation index carried in the common field² of HE-SIG-B, which “can communicate indices that indicate unused resources and used resources.” SAMSUNG-1005, [0154], Table 3; SAMSUNG-1006, 21-22. Josiam further discloses a method for signaling whether one or more center 26-tone resource units in an 80 or 160MHz PPDU is assigned to a user. SAMSUNG-1005, [0110], [0118], [0126], [0169], [0173], [0190]; SAMSUNG-

² A POSITA would have understood that the “common field” of HE-SIG-B was also referred to as the “common part,” “common portion,” or “common block.” SAMSUNG-1003, [93] n.2.

1006, 9-11, 24-25, 29-30, Figs. 10-11. For example, Josiam explains that “[t]he common information portion 2905 of one of the HE-SIG-B channels also includes 1 bit indicating whether the center 26-tone RU is assigned to a[] user or not. . . . If the bit is set to 1, the per-user allocation information is carried at the end, after the user allocations for segments A & C are carried.” SAMSUNG-1005, [0169], Fig. 11; SAMSUNG-1006, 11, Fig. 11.

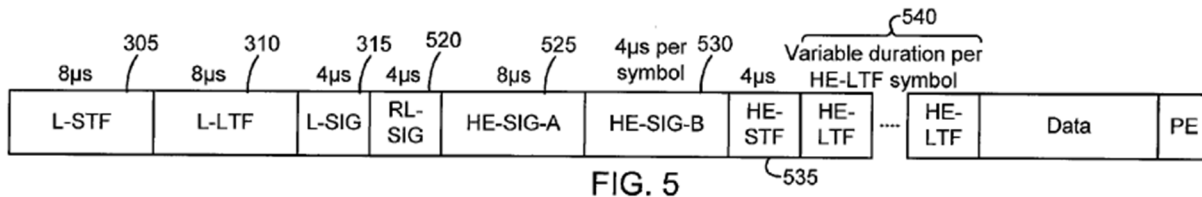
2. Claim 7

[7.pre]

To the extent the preamble is limiting, Josiam discloses “methods for efficient signaling and addressing in WLAN systems.” SAMSUNG-1003, [112]; SAMSUNG-1005, [0004]; SAMSUNG-1006, 7-8. Josiam’s methods describe at least one station (i.e., a wireless communication terminal). *Id.*

[7.1]

Josiam renders obvious receiving an HE PPDU (*wireless packet*) including HE-SIG-A and HE-SIG-B fields. SAMSUNG-1003, [113]; SAMSUNG-1005, [0074], [0093]-[0094], [0102], Fig. 5; SAMSUNG-1006, 1-8, 16, Figs. 1-5. A POSITA would have understood that a PPDU is a wireless packet. *Id.*; SAMSUNG-1005, [0003] (“*The data packet* transmitted is called a HE physical layer convergence procedure (PLCP) protocol data unit (PPDU).”); SAMSUNG-1006, 1.



SAMSUNG-1005, Fig. 5; SAMSUNG-1006, 1-8, 16, Figs. 1-5

[7.2]

Josiam renders obvious obtaining bandwidth information indicated via a bandwidth field included in the HE-SIG-A. SAMSUNG-1005, [0094], [0105], [0123], [0132]; SAMSUNG-1006, 8-9, 13, 16; SAMSUNG-1003, [114]-[116]. For example, Josiam discloses that “[t]he size of the RU position index carried in the block of user allocation information varies *according to the bandwidth information signaled in the HE-SIG-A.*” SAMSUNG-1005, [0132], SAMSUNG-1006, 16. A POSITA would have understood that the bandwidth information signaled in HE-SIG-A would be carried in a field within the HE-SIG-A. SAMSUNG-1003, [114]; SAMSUNG-1007, [0125], [0193]; SAMSUNG-1006, Fig. 2; SAMSUNG-1012, 259-260, Table 22-12; SAMSUNG-1015, 13.

Moreover, a POSITA would have understood Josiam’s disclosure as building upon VHT-SIG fields of 802.11ac (Wi-Fi 5). SAMSUNG-1003, [115]; SAMSUNG-1005, [0102]; SAMSUNG-1006, 1-2; SAMSUNG-1007, [0124]. A POSITA would have understood that the previous generation VHT-SIG-A field includes a bandwidth field, which indicates the bandwidth of the PPDU (e.g., 20,

40, 80, or 160MHz), and would have found it obvious to carry this field over into HE-SIG-A. SAMSUNG-1007, [0125], [0193]; SAMSUNG-1003, [115] (citing SAMSUNG-1006, Fig. 2; SAMSUNG-1012, 259-260, Table 22-12; SAMSUNG-1015, 13 (“[The] 11ax PPDU should also contain HE-SIG-A *to carry some similar fields as in HT-SIG/VHT-SIG-A of 11n/ac, e.g., BW, GI.*”)).

Finally, including a bandwidth field in HE-SIG-A was within the general knowledge of a POSITA at the time of the ’595 patent’s earliest priority date. SAMSUNG-1003, [116]; SAMSUNG-1011, 4-8; SAMSUNG-1015, 13; SAMSUNG-1016, [0078]-[0079]. For example, the December 6, 2015 802.11ax Draft Specification Framework *includes a bandwidth field in HE-SIG-A*, and a POSITA would have found it obvious that this field was included in the PPDU described in Josiam, which is directed to 802.11 communications. SAMSUNG-1011, 4-8; SAMSUNG-1003, [116]; SAMSUNG-1005, [0003]; SAMSUNG-1006, 1, 7.

[7.3]

Josiam renders obvious obtaining resource unit allocation information via at least a common field (*at least one subfield*) included in HE-SIG-B. SAMSUNG-1005, [0104], [0111], [0154], [0159], [0167]-[0171]; SAMSUNG-1006, 8, 11, 21-20, 24; SAMSUNG-1003, [117]-[121]. This resource unit allocation information may *include information of an unassigned resource unit. Id.* The unassigned

resource unit may fall within a 242-tone segment corresponding to a 20MHz channel or may be one or more 26-tone resource units (“C26 resource units³”) that do not fall within any 242-tone segment corresponding to a 20MHz channel. *Id.* A POSITA *would have understood the common field as a subfield of HE-SIG-B.* *Id.*; SAMSUNG-1005, [0105]-[0106], [0156]-[0157]; SAMSUNG-1006, 11, 23; SAMSUNG-1011, 8-9.

For example, Josiam teaches obtaining information of an unassigned resource unit through a resource unit allocation index included in the common portion of HE-SIG-B. SAMSUNG-1005, [0154], Table 3; SAMSUNG-1006, 21-22; SAMSUNG-1003, [118]. Specifically, Josiam states that “the RU allocation index can communicate indices that indicate unused resources [*information of an unassigned resource unit*] and used resources. The total number of per-STA information fields that follow changes depending on the number of used resources indicated by the index. No per-STA information fields are sent for resources indicated to be unused in the resource allocation index.” SAMSUNG-1005, [0154],

³ As used in this petition, a “C26 resource unit” refers to one or more 26-tone resource units in an 80 or 160MHz tone plan that does not fall within any 242-tone segment corresponding to a 20MHz channel.

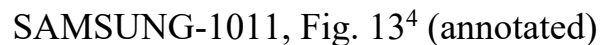
Table 3; SAMSUNG-1006, 21-22. As one example, Josiam explains that a 26-tone resource unit within a 242-tone segment “*may not be used* or allocated to any STA-ID to improve padding efficiency.” *Id.* Thus, a POSITA would have understood Josiam as obtaining *information of an unassigned resource unit* (e.g., an unused resource unit within a 242-tone segment) via *at least one subfield* (e.g., the common field) of HE-SIG-B. SAMSUNG-1003, [118].

TABLE 3

RU indexes for improved padding efficiency									
#1	#2	#3	#4	#5	#6	#7	#8	#9	Num User
176		106		X		106			64
240	52		52	X	52		52		1

SAMSUNG-1005, Table 3; SAMSUNG-1006, 21-22

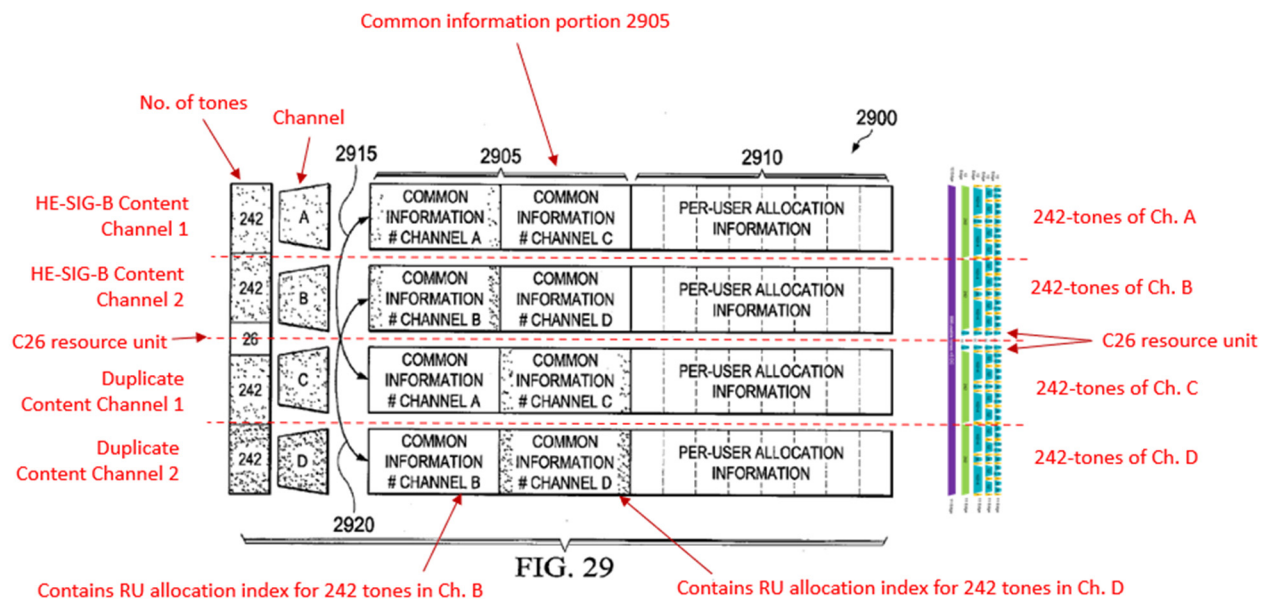
As another example, Josiam teaches an additional method for obtaining information as to whether one or more C26 resource units are assigned to a user. SAMSUNG-1005, [0118], [0165]-[0169], [0190]; SAMSUNG-1006, 11-12, 24, 29-30; SAMSUNG-1003, [119]. This is because the tone plans for 80 and 160MHz bandwidths are not aligned with 20MHz segments. SAMSUNG-1005, [0188]; SAMSUNG-1006, 24, 29; SAMSUNG-1003, [119]. For example, an 80MHz bandwidth consists of 996 usable tones, 968 of which may be broken into four 242-tone segments corresponding to four 20MHz channels. *Id.* That leaves one 26-tone resource unit in the center of the 80MHz bandwidth, in which 13 tones are



SAMSUNG-1005, [0158]-[0159], [0164]-[0170], [0187]-[0190], Figs. 27, 29, 37;
SAMSUNG-1006, 23-25, 29-30, Figs. 27, 29, 37; SAMSUNG-1003, [120].

⁴ This figure is also reproduced on multiple lines in SAMSUNG-1005, Fig. 16 and identically in SAMSUNG-1006, Fig. 16. The IEEE figure is used here for readability purposes.

Because the C26 resource unit falls between two 20MHz channels corresponding to two different HE-SIG-B content channels, a POSITA would have understood that allocation information for the entire C26 resource unit does not fall within the resource unit allocation for the 242-tones corresponding to either 20MHz channel. SAMSUNG-1003, [120]; SAMSUNG-1005, [0118], [0165]-[0169], [0190]; SAMSUNG-1006, 11-12, 24, 29-30. Indeed, the draft specification framework recognized this issue, noting that “[s]ignaling for the center 26 unit in 80MHz is TBD.” SAMSUNG-1011, 9.



SAMSUNG-1005, Fig. 29; SAMSUNG-1006, Fig. 29 illustrated with SAMSUNG-1011, Fig. 13⁵ (annotated)

To handle this situation, Josiam discloses including an indication bit in the common field of HE-SIG-B that *indicates whether “the central 26 tone RU is assigned to a[] user or not.”* SAMSUNG-1005, [169]; SAMSUNG-1006, 24. “If the bit is set to 1, the per-user allocation information is carried at the end, after the user segments for A & C are carried.” SAMSUNG-1005, [0169]; SAMSUNG-1006, 24. A POSITA would have understood that, if the bit is set to zero, this indicates that the C26 resource unit is not assigned to any user (i.e., an unassigned resource unit). *Id.*; SAMSUNG-1003, [121]. Thus, a POSITA would have understood Josiam as obtaining *information of an unassigned resource unit* (e.g., an unassigned C26 resource unit) via *at least one subfield* (e.g., the common field) of HE-SIG-B. SAMSUNG-1003, [121].

[7.4]

As discussed above for [7.2], a POSITA would have understood Josiam as teaching a *bandwidth field that indicates the bandwidth of the PPDU*.

SAMSUNG-1003, [122]; SAMSUNG-1005, [0094], [0105], [0123], [0132];

⁵ See *supra* note 4.

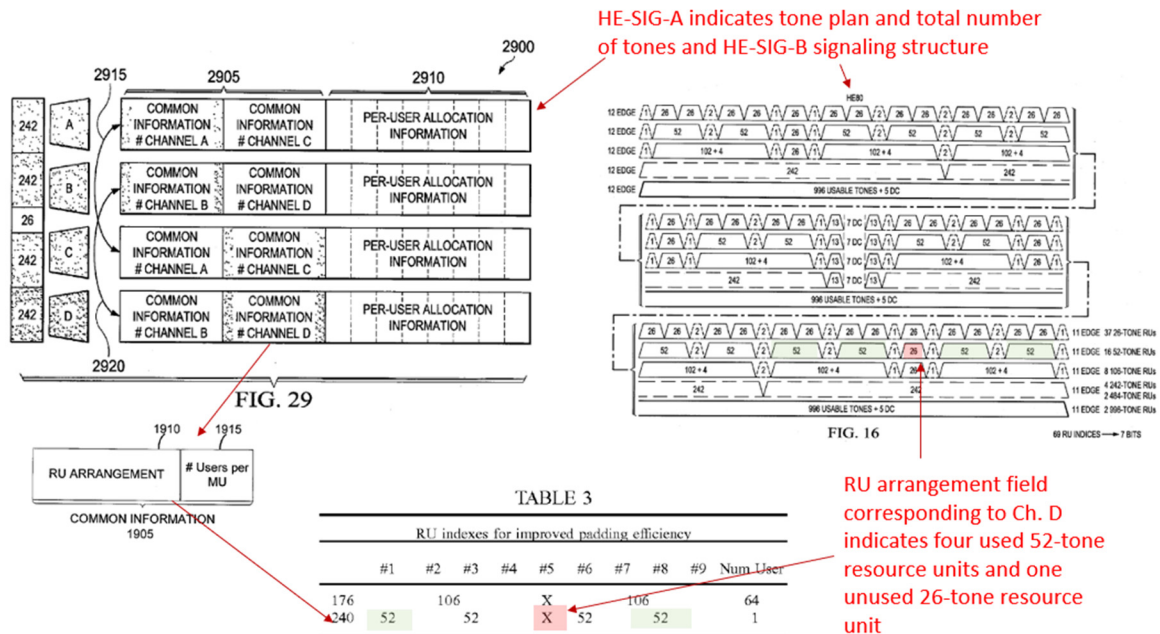
SAMSUNG-1006, 8-9, 13, 16; *see* [7.2]. A POSITA would have understood the bandwidth of the PPDU (*a wireless packet*) as related to the bandwidth over which the wireless packet is transmitted. *Id.*

[7.5]

Josiam renders obvious wherein the bandwidth field of HE-SIG-A is used to obtain the information of the unassigned resource unit (e.g., an unused resource unit within a 242-tone segment or an unused C26 resource unit). SAMSUNG-1003, [123]-[127]. As discussed for [7.2], the bandwidth field of HE-SIG-A indicates the bandwidth of the PPDU. *See* [7.2]. The number of HE-SIG-B content channels and the length of the common field in each content channel varies based on the bandwidth. SAMSUNG-1005, [0156]-[0192]; SAMSUNG-1006, 22-30; *see* [7.2]; SAMSUNG-1003, [123].

As one example, information of an unassigned resource unit in an 80MHz PPDU may be obtained via and indicated by the bandwidth field of HE-SIG-A and the RU allocation index of HE-SIG-B. SAMSUNG-1005, [0130]-[0138], [0164]-[0175], Figs. 11, 14-16, 29; SAMSUNG-1006, 11-12, 15-17, 24-29; SAMSUNG-1003, [124]. The bandwidth field first indicates the total bandwidth of the PPDU, thus indicating, among other things, the total number of possible tones (here, 996 tones for 80MHz) and HE-SIG-B signaling structure (here, two HE-SIG-B content channels containing resource unit allocation information for two segments of 242-

tones corresponding to alternating 20MHz channels). *Id.* The RU allocation index for one or more of the four 242-tone segments may include a value (e.g., 240) indicating that a 26-tone resource unit within the 242-tones corresponding to a particular 20MHz segment is not assigned to a user. SAMSUNG-1005, [0135]-[0140], [0150]-[0155], Table 3, Figs. 17, 23, 29; SAMSUNG-1003, [124]. By these two fields, a station may determine that a particular resource unit within the overall 80MHz bandwidth (i.e., 996-tones) is unassigned. SAMSUNG-1005, [0135]-[0138] (“Given the fixed location of the RUs in the OFDMA tone plan, the enumeration of possible RU arrangements *over a specific bandwidth* is specified and signaled.”), Fig. 17; SAMSUNG-1006, 16-17; SAMSUNG-1003, [124].



SAMSUNG-1005, Fig. 29 illustrated with SAMSUNG-1005, Table 3, Figs. 16, 19; SAMSUNG-1006, 22, Figs. 16, 19, 29 (annotated).

As another example, Josiam teaches that the number of indication bits in the common part of HE-SIG-B—which indicate information as to whether one or more C26 resource units is unassigned—is determined *based on the bandwidth as indicated by the bandwidth field of HE-SIG-A*. SAMSUNG-1003, [125]-[126]. For example, Josiam teaches that, in an 80MHz PPDU, “[t]he common portion 2905 of one of the HE-SIG-B channels also includes 1 bit indicating whether the central 26 tone RU is assigned to a[] user or not.” SAMSUNG-1005, [0165]-[0169]; SAMSUNG-1006, 24. In a 160MHz PPDU, “[t]wo 26 tone RUs are signaled using 1 bit separately[,] . . . one in HE-SIG-B channel-1 3715 and the other in HE-SIG-B channel-2 3720.” SAMSUNG-1005, [0190]; SAMSUNG-1006, 29-30. No indication bit for a C26 resource unit is included in 20 or 40MHz PPDUs. SAMSUNG-1003, [125]. *Compare* SAMSUNG-1005, [0156]-[0163]; SAMSUNG-1006, 22-24, *with* SAMSUNG-1005, [0164]-[0192]; SAMSUNG-1006, 24-30.

Because the bandwidth as indicated by the bandwidth field of HE-SIG-A triggers the number of indication bits for one or more C26 resource units in the common part of HE-SIG-B, a POSITA would have understood *Josiam’s bandwidth field* as being used to obtain the information of the allocation of the C26 RU—i.e., *information of an unassigned resource unit*. SAMSUNG-1003, [126]; *see* [7.8].

Thus, a POSITA would have understood that the bandwidth field of HE-SIG-A is used to obtain the information of the unassigned resource unit (e.g., an unused resource unit within a 242-tone segment or an unused C26 resource unit). SAMSUNG-1003, [127].

[7.6]

Josiam explains that “[t]he header to both SU and MU PPDU includes information necessary *to decode the PPDU*.” SAMSUNG-1005, [0003]; SAMSUNG-1006, 1. As explained above for [7.2], a bandwidth field in Josiam’s HE-SIG-A is used to determine the PPDU bandwidth. *See* [7.2]. A POSITA would have understood that a receiving station uses the PPDU bandwidth information to determine how many 20MHz channels are used, possible resource unit arrangements (i.e., tone plans), number of HE-SIG-B channels, and number of C26 resource units. SAMSUNG-1005, [0095]-[0101], [0104], [0136]-[0138], [0156]-[0192]; SAMSUNG-1006, 7-12, 15-17, 23-30; SAMSUNG-1017, 9; SAMSUNG-1011, 7-11, 17-20, 23-25; SAMSUNG-1003, [128]. Thus, a POSITA would have understood that the *data of the received wireless packet is decoded based on the bandwidth of the PPDU* as indicated by the bandwidth field of HE-SIG-A. SAMSUNG-1003, [128].

A POSITA would have also understood that the information of the unassigned resource unit is used to decode data of the received wireless packet.

SAMSUNG-1003, [129]-[130]. Josiam teaches that “[t]he STAs decode each HE-SIG-B in each 20MHz segment to identify which section carries information for them.” SAMSUNG-1005, [0115]; SAMSUNG-1006, 11. For example, Josiam explains that a station “uses the common information portion 2605 and the position of the STA’s per-user allocation to unambiguously identify the RU including the STA’s data.” SAMSUNG-1005, [0157], Fig. 26; SAMSUNG-1006, 22-23. As Dr. Buehrer explains, information of an unassigned resource unit (e.g., an unused resource unit within a 242-tone segment or an unused C26 resource unit) is used to determine that (a) the unassigned resource unit does not need to be decoded as part of the decoding processing and (b) the position of a station’s per-user allocation. For example, if the indication bit is 0, a station will know not to expect a user field for the C26 resource unit. SAMSUNG-1003, [129]; SAMSUNG-1005, [0154] (“No per-STA information fields are sent for resources indicated to be unused in the resource allocation index.”), SAMSUNG-1006, 21-22; SAMSUNG-1006, 21-22; SAMSUNG-1005, [0169] (“If the bit is set to 1, the per-user allocation information [for the center 26-tone resource unit] is carried at the end, after the user allocations for segments A & C are carried.”); SAMSUNG-1006, 24.

Additionally, one or more resource units not being allocated to a user may change the length of the user-specific field of HE-SIG-B. SAMSUNG-1003, [130]. Josiam explains that, “if the [indication] bit [for a C26 resource unit] is set to 1, the

per-user allocation information [i.e., a user field] is carried at the end, after the user allocations for segments A & C are carried [i.e., carried in the user specific field].” SAMSUNG-1005, [0169]; SAMSUNG-1006, 24. A POSITA would have understood that, if an indication bit for a C26 resource unit is set to 0, a per-user allocation information would not be carried in the user-specific field. SAMSUNG-1003, [130]. A receiving station uses the number of resource units to determine the length (specifically the number of user fields) of the user-specific field of HE-SIG-B, and thus properly decode HE-SIG-B to obtain the station’s assigned resource unit and decode data therein. *Id.*; SAMSUNG-1005, [0142], [0149], [0170]; SAMSUNG-1006, 18-19, 24; SAMSUNG-1008, [0089]-[0093]. From this disclosure, a POSITA would have further understood that Josiam renders obvious that the information of an unassigned resource unit is used to decode data of the received PPDU. SAMSUNG-1003, [130].

[7.7]

Josiam renders obvious that the bandwidth field of HE-SIG-A and the common field (*at least one subfield*) of HE-SIG-B provide information specifically indicating that a particular resource unit is unassigned (e.g., through an RU allocation index or indication bits for a C26 resource unit). SAMSUNG-1003, [131]-[137]. By contrast, a POSITA would have understood that, in some circumstances, the non-assignment of a resource unit may be implicitly derived

based on other information. SAMSUNG-1003, [131].

For example, the '595 patent states that “whether the center 26-tone RU [] is assigned may be *implicitly identified*” based on the nulling of nearby channels. SAMSUNG-1001, 47:22-51; *see also* SAMSUNG-1005, [0193]-[0198] (“If the STA 111 determines that the non-contiguous channel bonding field is set to indicate null channels, the *STA 111 then interprets the RU arrangement* in the common information portion to have null RUs that are adjacent to the nulled channels and determines the number of per-STA fields based on the channel bonding field and the RU arrangement.”); SAMSUNG-1006, 31-33.

A POSITA would have understood Josiam’s methods as rendering obvious that an unassigned resource unit is *explicitly indicated* with the information of the unassigned resource unit based on the bandwidth of the PPDU (as indicated by the *bandwidth field of HE-SIG-A*) and the common field (*at least one subfield*) of HE-SIG-B. SAMSUNG-1003, [133]. This satisfies the interpretation of “explicitly indicated with the information of the unassigned resource unit based on the bandwidth field of HE-SIG-A and a subfield of HE-SIG-B” that Wilus has advanced for purposes of infringement. SAMSUNG-1003, [133] (citing SAMSUNG-1004, 28).

For example, a POSITA would have understood Josiam as rendering obvious that an unassigned resource unit is explicitly identified with the

information of the unassigned resource unit when the resource unit allocation index (carried in the common field of HE-SIG-B) is set to a value that indicates an unassigned resource unit in a 242-tone portion of a PPDU. SAMSUNG-1003, [134]; SAMSUNG-1005, [0154] (“[T]he RU allocation index *can communicate indices that indicate unused resources* and used resources.”), [0169] (“The common information portion 2905 of one of the HE-SIG-B channels also *includes 1 bit indicating whether* the central 26 tone RU is assigned to a[] user or not.”); SAMSUNG-1006, 11, 21-22; *see* [7.3], [7.5]. As explained above for [7.5], the location of the unassigned resource unit within the overall PPDU is determined based on the bandwidth indicated by the bandwidth field of HE-SIG-A. *See* [7.5].

As another example, a POSITA would have understood Josiam as rendering obvious that an unassigned resource unit (e.g., a C26 resource unit) is explicitly identified with the information of the unassigned resource unit based on Josiam’s bandwidth field indicating a PPDU of 80MHz or greater and one or more of Josiam’s indication bits (carried in the common field of HE-SIG-B) indicating that one or more corresponding C26 resource units is not assigned to a user.

SAMSUNG-1003, [135]; SAMSUNG-1005, [0110], [0118], [0126], [0169], [0173], [0190], Figs. 10-11; SAMSUNG-1006, 9-11, 24-25, 29-30, Figs. 10-11. As discussed above for [7.5], Josiam teaches that the number of C26 resource units varies based on the PPDU bandwidth: zero C26 resource units for 20 and 40MHz

PPDUs, one C26 resource unit for 80MHz PPDUs, and two C26 resource units for 160 (or 80+80MHz) PPDUs; *Id.*; *see* [7.5], [7.8]. Thus, a POSITA would have further understood that an unassigned resource unit (e.g., a C26 resource unit) is explicitly indicated based on the bandwidth of the PPDU (indicated by the bandwidth field of HE-SIG-A) and the one or more C26 indication bits in the common field (“at least one subfield”) of HE-SIG-B. SAMSUNG-1003, [136].

As a result, a POSITA would have understood that Josiam renders obvious that an unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field of HE-SIG-A and the common field of HE-SIG-B. SAMSUNG-1003, [137].

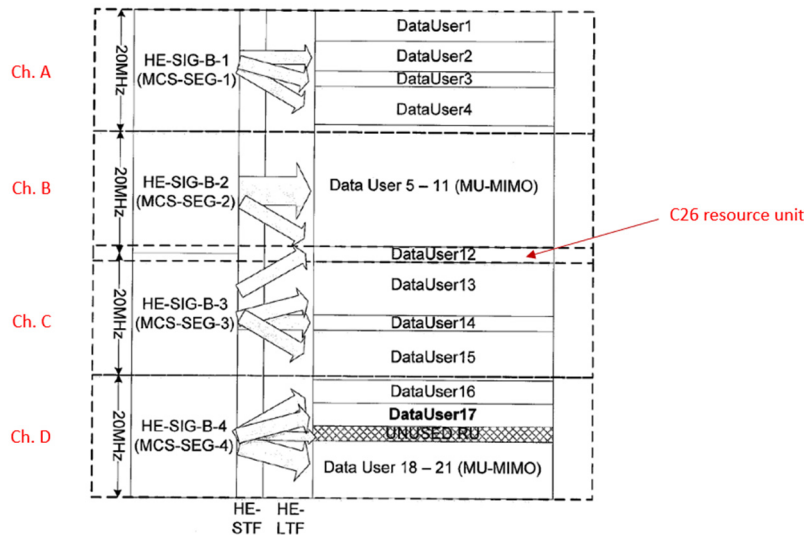
[7.8]

Josiam renders obvious that the resource unit allocation information includes information of a C26 field indicating whether a user is allocated to a C26 resource unit of 80MHz by way of indication bits included in the common field of HE-SIG-B. SAMSUNG-1005, [0110], [0118], [0126], [0169], [0173], [0190], Figs. 10-11; SAMSUNG-1006, 9-11, 24-25, 29-30, Figs. 10-11; SAMSUNG-1003, [138]-[144]. For example, Josiam explains that

In an embodiment of the present disclosure, *the resource allocation for the 26 tone RU split around the DC tones of an 80 MHz MU PPDU may be indicated by an extra bit in either of the 20 MHz segments or duplicated in both 20 MHz segments surrounding the DC tones*. The presence of the extra bit is triggered by the bandwidth signaling when set to 80 MHz. The

extra bit comes immediately preceding the 5 bit RU arrangement indication for the 20 MHz segment. The STAID and user specific portion also follow the same order of indication as the RU arrangement indication.

SAMSUNG-1005, [0118]; SAMSUNG-1006, 11-12.



SAMSUNG-1005, Fig. 11; SAMSUNG-1006, Fig. 11 (annotated)

Josiam additionally teaches that, in an 80MHz PPDU, “[t]he common portion 2905 of one of the HE-SIG-B channels also includes **1 bit indicating whether the central 26 tone RU is assigned to a[] user or not.**” SAMSUNG-1005, [0165]-[0169]; SAMSUNG-1006, 24. In a 160MHz PPDU, “[t]wo 26 tone RUs are signaled using 1 bit separately[,]. . . one in HE-SIG-B channel-1 3715 and the other in HE-SIG-B channel-2 3720.” SAMSUNG-1005, [0190]; SAMSUNG-1006, 29-30.

No indication bit for a C26 resource unit is included in 20 or 40MHz PPDUs. SAMSUNG-1003, [140]. Compare SAMSUNG-1005, [0156]-[0163];

SAMSUNG-1006, 22-24, *with* SAMSUNG-1005, [0164]-[0192]; SAMSUNG-1006, 24-30. Moreover, as Dr. Buehrer explains, the extra indication bit used for signaling the use of a C26 resource unit is not required for 20 or 40MHz PPDU's because the tone plans for those transmission bandwidths do not include a 26-tone resource unit that falls between channels. SAMSUNG-1003, [140]-[143]; SAMSUNG-1005, [0130]-[0134], Figs. 14-16; SAMSUNG-1006, 5-8.

A POSITA would have understood Josiam's indication bit as corresponding to the claimed "**C26 field**." SAMSUNG-1003, [144]. This aligns with the '595 patent's disclosure, which states that the "C26 field may consist of a 1-bit indicator before or after the [resource allocation] field in the common block field." SAMSUNG-1001, 22:29-51, Fig. 15; SAMSUNG-1003, [144].

3. Claim 8

[8.pre]-[8.1]

Josiam renders obvious that the HE-SIG-B field consists of HE-SIG-B content channel 1 and HE-SIG-B content channel 2 in units of 20MHz respectively. SAMSUNG-1005, [0158]-[0159], [0164]-[0170], [0187]-[0190], Figs. 27, 29, 37; SAMSUNG-1006, 23-25, 29-30, Figs. 27, 29, 37; SAMSUNG-1003, [145]. For example, Josiam's Figure 29, reproduced below, "illustrates an example of HE-SIG-B multiplexing scheme 2900 for 80MHz *including 2 channels, each carrying independent information per a 20MHz HE-SIG-B*

channel.” SAMSUNG-1005, [0164], Fig. 29; SAMSUNG-1006, 24-25, Fig. 29.

Josiam explains that “each HE-SIG-B channel 2915 and 2920 carries different information and the HE-SIG-B channels 2915 and 2920 are duplicated per 40MHz, i.e., HE-SIG-B Channel 1 2915 is carried in channel A & C of 80MHz while HE-SIG-B Channel [] 2920 is carried in B & D of 80MHz.” SAMSUNG-1005, [0165]; SAMSUNG-1006, 24-25, Fig. 29.

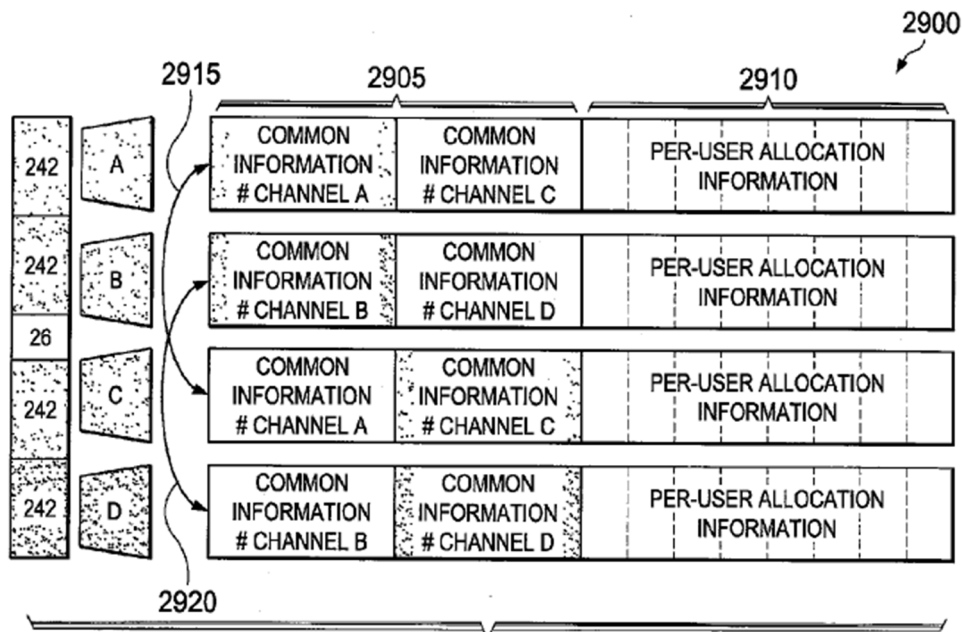


FIG. 29

SAMSUNG-1005, Fig. 29; SAMSUNG-1006, Fig. 29

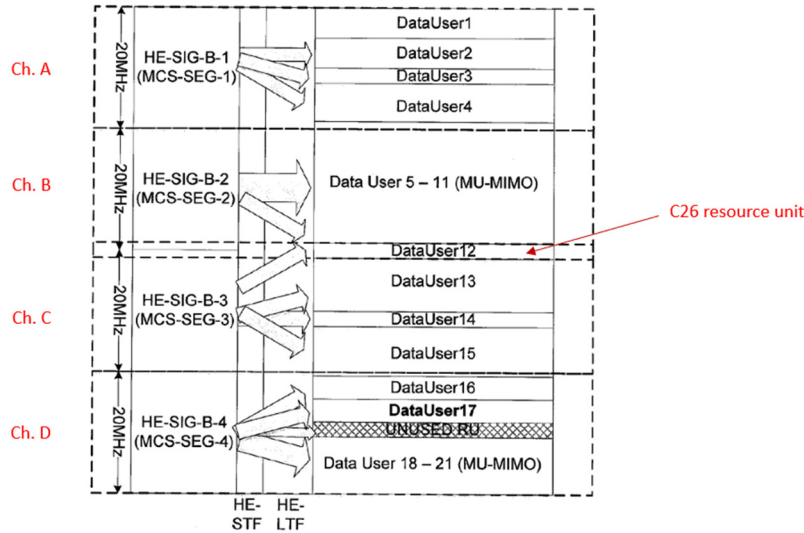
[8.2]

Josiam renders obvious that the C26 field (e.g., Josiam’s indication bit) is carried in both the HE-SIG-B content channel 1 and the HE-SIG-B content channel 2. SAMSUNG-1005, [0118], [0169], [0190]; SAMSUNG-1006, 11-12, 24, 30; SAMSUNG-1003, [146]-[148].

For example, Josiam teaches that a C26 field may be carried in both HE-SIG-B content channels: “[t]wo 26 tone RUs are signaled using 1 bit separately. By convention *one in HE-SIG-B channel-1* [] and *the other in HE-SIG-B channel-2*.” SAMSUNG-1005, [0190]; SAMSUNG-1006, 29-30; *see* §§III.A.6-7. To the extent Patent Owner argues that the claim requires the same C26 field to be carried in both HE-SIG-B content channels, Petitioner submits that such an interpretation is improper in light of claims 11-12, which depend on claim 8 and require two separate C26 fields in each HE-SIG-B content channel. SAMSUNG-1003, [148]; *see* §§III.A.6-7. In any event, Josiam renders obvious including the same C26 field in both HE-SIG-B content channels for the reasons discussed below for [9]. SAMSUNG-1003, [148]; *see* §III.A.4.

4. Claim 9

Josiam describes an 80MHz PPDU in which “[t]he common information portion [] of one of the HE-SIG-B channels also includes 1 bit indicating whether the central 26 tone RU is assigned to a[] user or not.” SAMSUNG-1005, [0169]; SAMSUNG-1006, 24. While this embodiment does not explicitly disclose including a C26 field in both content channels, an earlier embodiment explains that “the resource allocation for the 26 tone RU split around the DC tones of an 80MHz MU PPDU may be *indicated by an extra bit in either of the 20MHz segments or duplicated in both*.” SAMSUNG-1005, [0118]; SAMSUNG-1006, 11-12.



SAMSUNG-1005, Fig. 11; SAMSUNG-1006, Fig. 11 (annotated)

In light of Josiam's teaching, a POSITA would have found it obvious to duplicate the indication bit in both HE-SIG-B content channels in an 80MHz PPDU. SAMSUNG-1003, [149]-[151]; SAMSUNG-1005, [0118]; SAMSUNG-1006, 11-12. For example, a POSITA would have been motivated to duplicate the indication bit in both HE-SIG-B content channels to balance the signaling load between the two channels and reduce the need for padding in the other HE-SIG-B content channel. SAMSUNG-1003, [150]; SAMSUNG-1005, [0159], [0179], [0181]; SAMSUNG-1006, 10, 23, 27. Specifically, a POSITA would have understood that the HE-SIG-B content channels should be equal in length to ensure symbol alignment. *Id.* A POSITA would have understood that duplicating the indication bit for the C26 resource unit in both HE-SIG-B content channels may reduce the need for a padding bit to be added to the other HE-SIG-B content

channel to balance the length between the two channels. *Id.*

Moreover, a POSITA would have understood that because the two HE-SIG-B content channels should be equal in length, duplicating the indication bit for a C26 resource unit in both HE-SIG-B content channels would have been an obvious design choice. SAMSUNG-1003, [151]; SAMSUNG-1005, [0159], [0179], [0181]; SAMSUNG-1006, 10, 23, 27. Duplicating the indication bit would have been a predictable solution in light of Josiam's teachings that the indication bit for the C26 resource unit in an 80MHz PPDU may be duplicated in both 20MHz channels carrying the C26 resource unit and that indication bits may be placed in both HE-SIG-B content channels for 160MHz PPDU's. SAMSUNG-1003, [151]; SAMSUNG-1005, [0118], [0187]; SAMSUNG-1006, 11-12, 30.

5. Claim 10

In the 80MHz PPDU described for claim 9, Josiam explains that, "if the [indication] bit is set to 1 [i.e., the C26 field], the per-user allocation information [i.e., *a user field*] is carried at the end, after the user allocations for segments A & C are carried [i.e., *carried in the user specific field*]." SAMSUNG-1005, [0169]; SAMSUNG-1006, 24; §III.A.4. As illustrated below in Figure 29, the content channel carrying segments A & C correspond to HE-SIG-B content channel 1 2915. SAMSUNG-1005, [0165], Fig. 29; SAMSUNG-1006, 26-27; SAMSUNG-1003, [152].

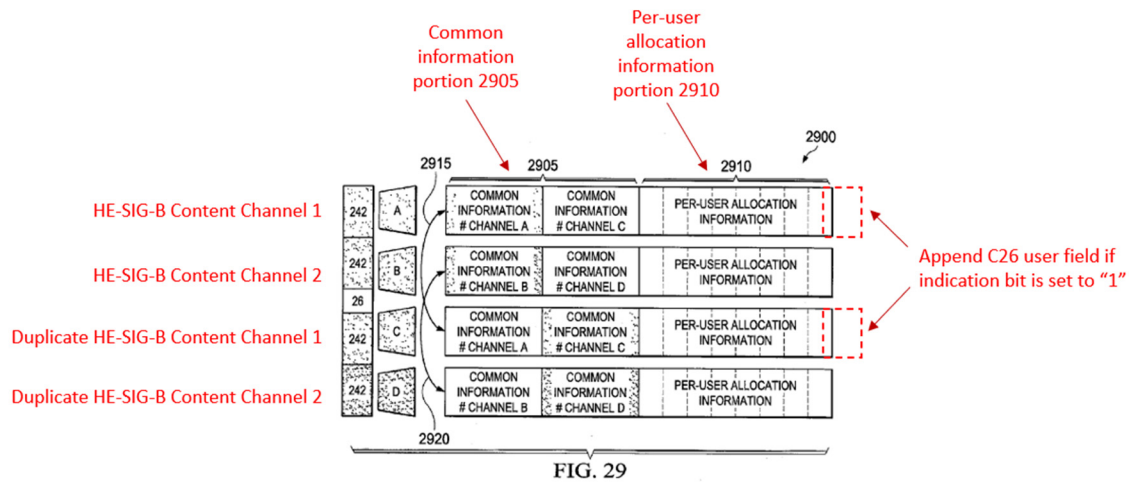


FIG. 29

SAMSUNG-1005, Fig. 29; SAMSUNG-1006, Fig. 29 (annotated)

6. Claim 11

Josiam describes “an example channel structure and duplication scheme 3700 for multiplexing control information in HE-SIG-B for 160MHz.” SAMSUNG-1005, [0187]; SAMSUNG-1006, 30. Josiam explains that “[t]he 160 MHz tone plan is built as two concatenated 80MHz tone plans,” i.e., a first and second 80MHz bandwidth. SAMSUNG-1005, [0188]; SAMSUNG-1006, 30. In scheme 3700, “[t]wo 26 tone RUs are signaled using 1 bit separately. By convention, one in HE-SIG-B channel-1 3715 and the other in HE-SIG-B channel-2 3720.” SAMSUNG-1005, [0187]; SAMSUNG-1006, 30. A POSITA would have understood Josiam’s indication bits in content channel 1 and content channel 2 as indicating whether a user is allocated to C26 resource units in the first and second 80MHz bandwidths, respectively. *Id.*; SAMSUNG-1003, [153].

To the extent Patent Owner argues that the claims require performance on

both 160MHz and 80+80MHz bandwidth configurations, Josiam's disclosure renders obvious using the above-described methods for 80+80MHz bandwidths. SAMSUNG-1003, [154]. As Dr. Buehrer explains, a POSITA would have understood that an "80+80MHz" PPDU refers to a 160MHz PPDU that is transmitted using two non-contiguous 80+80MHz channels. *Id.*; SAMSUNG-1012, 31, 247, 260, 262-263, 268-269, 300-302. Indeed, using non-contiguous 80+80MHz bandwidths was included in the previous generation of 802.11ac (Wi-Fi 5). *Id.*

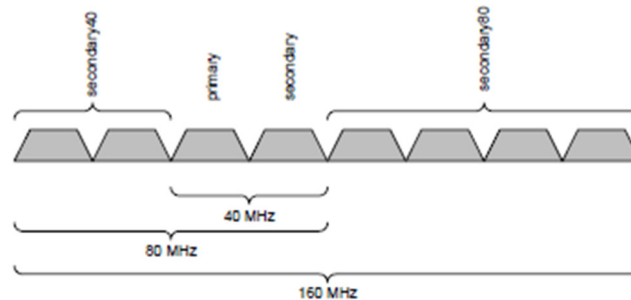


Figure 7-1—The channel-list parameter element for 40 MHz, 80 MHz, and 160 MHz channel width

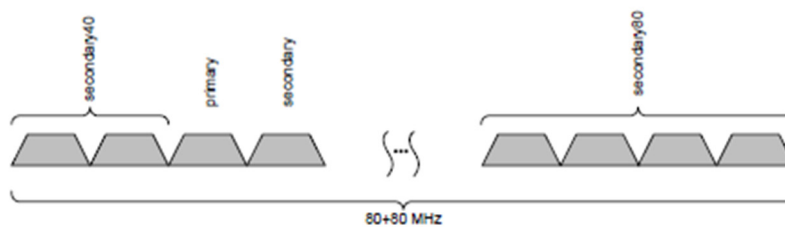


Figure 7-2—The channel-list parameter element for 80+80 MHz channel width

SAMSUNG-1012, Fig. 7

A POSITA would have understood that Josiam's methods for 160MHz PPDUs may be used for both contiguous 160MHz bandwidths and non-contiguous

80+80MHz bandwidths because these bandwidths are treated similarly for the purposes of resource unit allocation. SAMSUNG-1003, [154]-[155]; SAMSUNG-1011, 20, 24-25, 28 (“The indicated 20 MHz channel(s) can be either Primary20, Primary40, Primary80 or **160/80+80 MHz**.”); SAMSUNG-1005, [0188] (“The 160MHz tone plan is built as **two concatenated 80MHz tone plans** that are not aligned with 20MHz segments.”).

7. Claim 12

As discussed above for claim 11, Josiam teaches that “[t]wo 26 tone RUs are signaled using 1 bit separately. . . . [T]he common portion 3705 in each of the HE-SIG-B channels 3715 and 3720 also includes 1 bit indicated if the central 26 tone RU is assigned to a[] user or not.” SAMSUNG-1005, [0190]; SAMSUNG-1006, 30; *see* §III.A.6. Josiam further teaches that “[i]f the [indication] bit is set to 1, the per-user allocation information [i.e., **user fields**] is carried at the end, after the user allocations for the other segments are carried [i.e., **carried in the user-specific fields**].” *Id.* A POSITA would have understood this disclosure as teaching that, when the indication bit in an HE-SIG-B channel is set to 1, a user-specific field for the C26 resource unit corresponding to that content channel is included in the HE-SIG-B user-specific field. *Id.*; SAMSUNG-1003, [156]

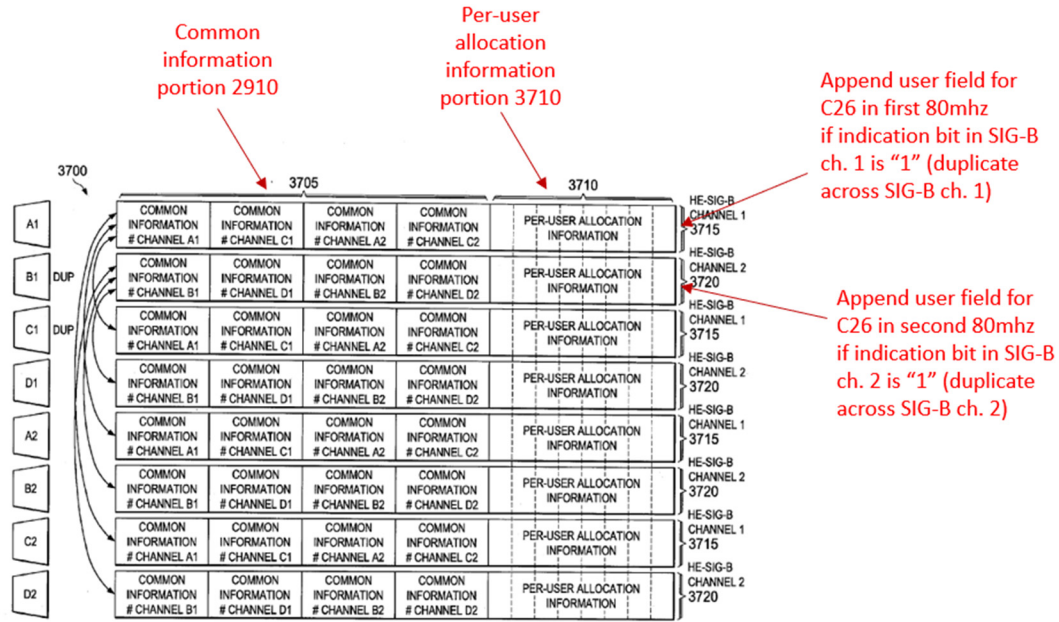


FIG. 37

SAMSUNG-1005, Fig. 37; SAMSUNG-1006, Fig. 37 (annotated)

8. Claims 1-6

Claims 1-6 recite “[a] wireless communication terminal, the terminal comprising a processor, wherein the processor is configured to” perform the methods of claims 7-12, respectively. SAMSUNG-1003, [157]. To the extent the preamble is limiting, Josiam discloses “a STA [(station), i.e., a wireless communication terminal] for identifying scheduling information in a WLAN.” *Id.*; SAMSUNG-1005, [0005]; SAMSUNG-1006, 7-8. Josiam discloses that the STA includes a “controller/processor 240 . . . capable of executing . . . operations for using or implementing efficient signaling and addressing in a WLAN system.” SAMSUNG-1005, [0077]. Although Josiam’s provisional does not explicitly

disclose that the stations have a processor, a POSITA would have understood that the stations described in Josiam's provisional application require a processor.

SAMSUNG-1003, [157]. For example, Josiam's provisional states that the stations receive and decode a wireless packet. SAMSUNG-1006, 8, 10-11, 15, 31. Josiam's provisional application also discloses "[p]rocessing at the STA to interpret RU arrangement when non-contiguous channel bonding is used." SAMSUNG-1006, 33. Based on these disclosures in the Josiam provisional, a POSITA would have understood that a station necessarily has a processor to perform at least the decoding of a received wireless packet. SAMSUNG-1003, [157].

Additionally, a POSITA would have found it obvious to use a processor to perform Josiam's methods. SAMSUNG-1003, [158]. Using a processor to perform methods associated with the decoding of a received wireless packet was well known in the art and within the general knowledge of a POSITA. SAMSUNG-1003, [158]; *see, e.g.*, SAMSUNG-1007, [0046]-[0047]; SAMSUNG-1008, [0068]-[0075] ("The processor[] may be configured to receive a PPDU and identify the preamble therefrom. . . . The processor[] may be further configured to identify a first part of the HEW preamble (e.g., HE-SIG-A) to decode a second part of the preamble (e.g., HE-SIG-B).").

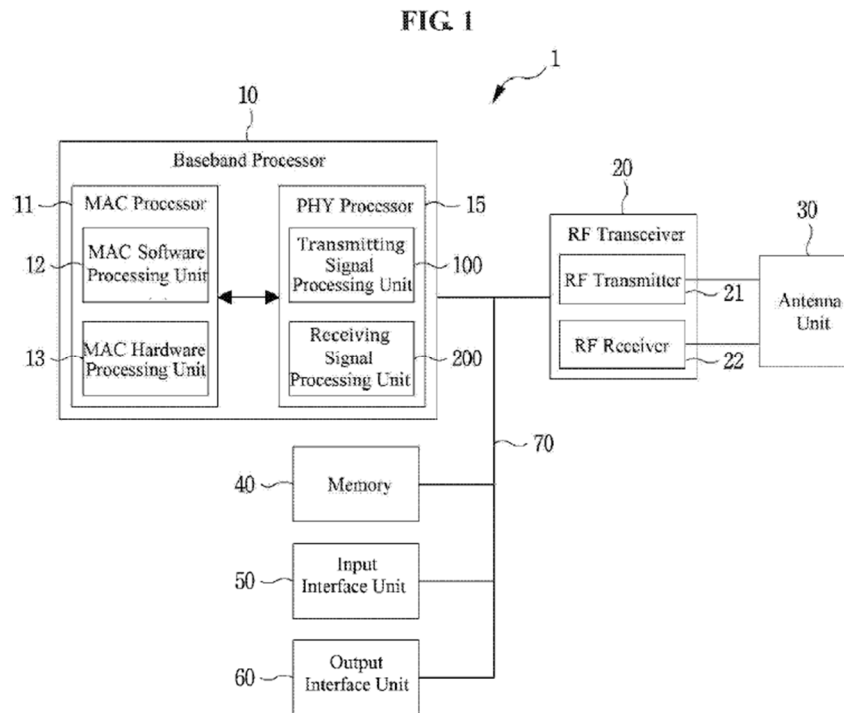
For similar reasons to those described above with respect to claims 7-12, a POSITA would have understood Josiam as rendering obvious a processor (e.g.,

controller/processor 240), wherein the processor is configured to perform the steps recited in the remaining limitations of claim 1 and claims 2-6. SAMSUNG-1003, [159]; *see* §III.A.1-7.

B. [GROUND 1B] – Josiam-Seok

1. Seok

Seok relates to “Wireless Local Area Networks (WLANs), and more particularly, to a method and apparatus for resource allocation for multiple user transmission in a High Efficiency WLAN (HEW).” SAMSUNG-1007, [0003]; SAMSUNG-1003, [94]. Seok discloses “a WLAN device 1,” which includes “a baseband processor 10.” SAMSUNG-1007, [0046]. “The baseband processor 10 may be simply referred to as a processor and may perform baseband signal processing.” *Id.*, [0047].



SAMSUNG-1007, Fig. 1

2. Claims 1-6

Claims 1-6 recite “[a] wireless communication terminal, the terminal comprising: a processor, wherein the processor is configured to” perform the methods of claims 7-12, respectively. SAMSUNG-1003, [160]. To the extent the preamble is limiting, Seok describes a wireless communication terminal (e.g., WLAN device 1). *Id.*; SAMSUNG-1007, [0044]-[0053]. Seok discloses that the terminal comprises “a baseband processor 10,” which “may be simply referred to as a processor and may perform baseband signal processing.” SAMSUNG-1007, [0044]-[0045].

The Josiam-Seok combination renders obvious a processor (e.g., a baseband processor per Seok) configured to perform the remaining limitations of claim 1 and claims 2-6, per Josiam's teachings. SAMSUNG-1003, [95]-[98], [162]; SAMSUNG-1007, [0044]-[0045]; *see* §III.A.1-7.

Combining the teachings of Josiam with Seok would have merely involved combining prior art elements according to known methods to yield predictable results. SAMSUNG-1003, [96]. Seok discloses communication devices, stations and APs in an IEEE 802.11ax Wi-Fi network (e.g., HE-WLAN). SAMSUNG-1007, [0044]-[0045]. Seok specifically discusses implementation of HE MU PPDU preamble designs with HE-SIG-A and HE-SIG-B fields. SAMSUNG-1007, [0097]-[0118]. A POSITA would have been motivated to combine the teachings of Josiam with Seok to realize implementation details and to achieve an operable station that would be capable of carrying out the techniques described in Josiam through, for example, the inclusion of processing circuitry and radio circuitry for receiving and processing transmissions that include HE MU PPDU. SAMSUNG-1003, [95].

The combination would have been predictable and foreseeable, at least because:

1) Seok discloses communications between a station and an AP within a HE-WLAN environment, consistent with IEEE 802.11; and

2) the combination merely involves incorporating known hardware and software elements expressly disclosed by Seok to implement the HE MU PPDU described by Josiam. SAMSUNG-1003, [97]; SAMSUNG-1007, [0044]-[0045]; [0097]-[0118].

The combination also would have been obvious and predictable because elements of the combined system would each perform similar functions they had been known to perform prior to the combination. SAMSUNG-1003, [98]. For example, the station in the Josiam-Seok combination would perform the same functions contemplated by Josiam but would include specific circuitry like that disclosed in Seok to carry out those functions. *Id.* Thus, a POSITA would have had a reasonable expectation of success implementing the combination. *Id.*

For these reasons and similar reasons to those discussed in Ground 1A, a POSITA would have understood Josiam-Seok as rendering obvious a processor configured to perform the remaining limitations of claim 1 and claims 2-6.

SAMSUNG-1003, [162]; *see* §III.A.

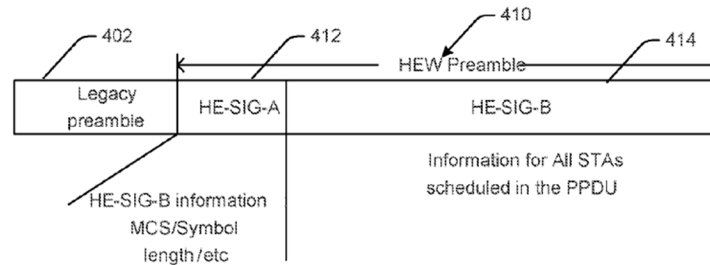
C. [GROUND 2] – Chen-Wu

1. Chen

Chen relates to “resource unit (RU) allocation in high efficiency (HE) Wi-Fi preambles,” particularly in IEEE 802.11ax or High-Efficiency WLAN.

SAMSUNG-1008, [0002]-[0003]; SAMSUNG-1003, [99]-[100]. Chen discloses

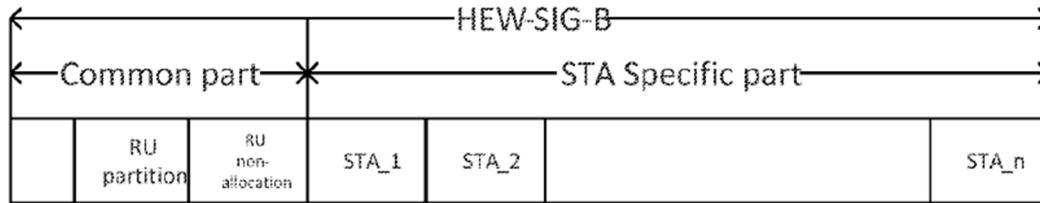
“identifying an RU for transmitting and receiving data based at least in part on a received PPDU.” SAMSUNG-1008, [0101]-[0104]. Chen’s PPDU includes HE-SIG-A and HE-SIG-B fields. *Id.*, [0035], [0076], [0101]-[0104], Fig. 4.



SAMSUNG-1008, Fig. 4

Chen further discloses methods for identifying an unassigned resource unit. SAMSUNG-1008, [0090]-[0093], Figs. 12-14. For example, Chen describes a method for “[e]xplicit indication of [a] non-allocated RU in the common part⁶ of HE-SIG-B.” SAMSUNG-1008, [0093], Fig. 14. Specifically, Chen discloses that, “[a]fter the RU allocation information (e.g., the allocation pattern in the common part of HE-SIG-B), there may be RU non-allocation information. This non-allocation information may indicate the non-allocated RUs.” SAMSUNG-1008, [0093].

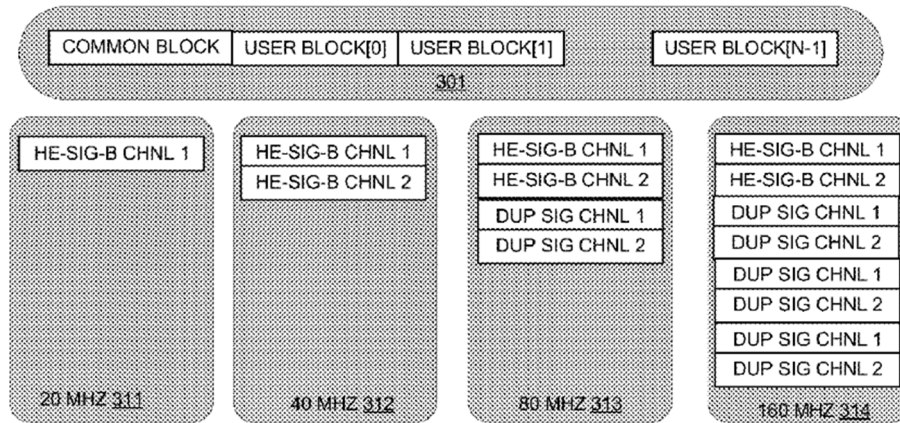
⁶ See *supra* note 2.



SAMSUNG-1008, Fig. 14

2. Wu

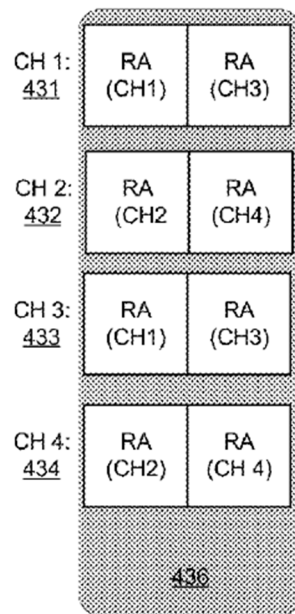
Wu relates to resource allocation indication in 802.11ax wireless networking. SAMSUNG-1009, [0003]-[0004]; SAMSUNG-1010, 2; SAMSUNG-1003, [101]-[103]. Wu discloses methods for “HE-SIG-B . . . common field formats and indications.” SAMSUNG-1009, [0005]; SAMSUNG-1010, 1-2. Wu describes an HE-SIG-B duplication scheme, in which SIG-B information for each 20MHz segment of an HE PPDU is included in one of two HE-SIG-B content channels and replicated across each 20MHz segment in an alternating fashion as depicted below in Figure 3. SAMSUNG-1009, [0036], Fig. 3; SAMSUNG-1010, 4.



SAMSUNG-1009, Fig. 3; SAMSUNG-1010, 4

Each of Wu's HE-SIG-B content channels includes "a common block[and] multiple user blocks." SAMSUNG-1009, [0036], Fig. 3; SAMSUNG-1010, 4. Wu explains that the common block may carry resource unit allocation information in the form of "RU indexes in the HE-SIG-B" which "are used for a look-up table (LUT) to obtain the resource allocation information." SAMSUNG-1009, [0036]; SAMSUNG-1010, 5-6. Specifically, "a fixed format common field in the HE-SIG-B is defined for each operation bandwidth." SAMSUNG-1009, [0036]; SAMSUNG-1010, 10. For example, when the operation bandwidth is 80MHz "there are two RA LUTs on each of the HE-SIG-B common field," which indicate resource allocation for each of the four 20MHz channels of the 80MHz transmission. SAMSUNG-1009, [0039]; SAMSUNG-1010, 12. In one embodiment illustrated below, HE-SIG-B content channel 1 carries resource unit allocation for channels 1 and 3, and content channel 2 carries resource unit allocation for channels 2 and 4. SAMSUNG-1009, [0039], Fig. 4C; SAMSUNG-

1010, 12.



SAMSUNG-1009, Fig. 4C; SAMSUNG-1010, 12

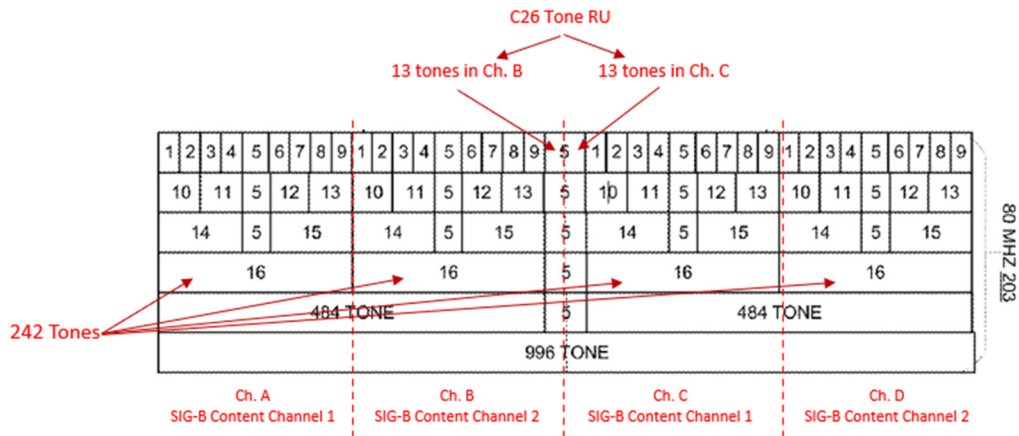
Wu discloses a method for signaling one or more “middle 26-tone RU for 80MHz and 160MHz” by including “a one-bit indication in the HE-SIG-B common [field].” SAMSUNG-1009, [0043]-[0044], [0046], Figs. 5-6; SAMSUNG-1010, 27.

3. Chen-Wu Combination

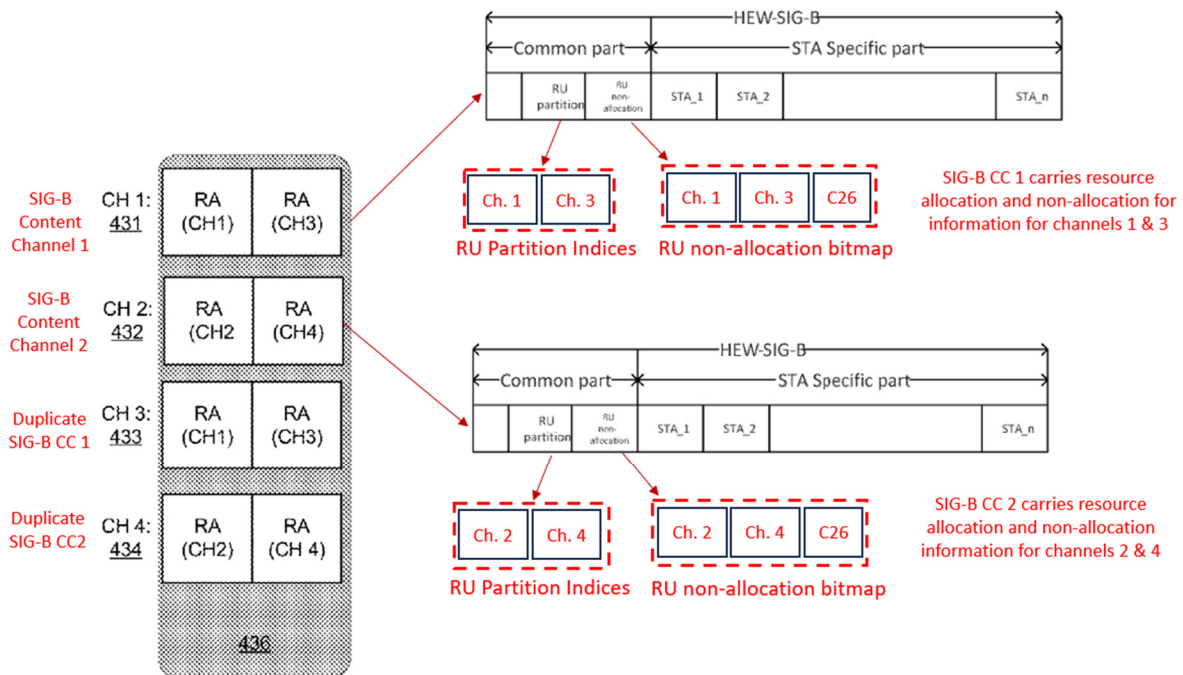
In Chen-Wu, a method of signaling a non-allocated resource unit, per Chen, would have been combined with a method of carrying HE-SIG-B information in two content channels, per Wu. SAMSUNG-1003, [104]-[111]. In the combination, the HE-SIG-B information (e.g., resource unit allocation, non-allocation, and station assignment information) would be partitioned into segments corresponding to each 20MHz channel used. SAMSUNG-1003, [104]; SAMSUNG-1008, [0084]-

[0087] (“Each allocation pattern may be one partitioning of the whole band (e.g., 80MHz or a subchannel 20MHz)”); SAMSUNG-1009, [0035]-[0042], [0072]; SAMSUNG-1010, 3-4, 10, 12. The information would be carried in an HE-SIG-B content channel corresponding to the 20MHz channel. SAMSUNG-1003, [104]; SAMSUNG-1009, [0036], Fig. 3; SAMSUNG-1010, 4.

For example, an 80MHz PPDU would be transmitted over four 20MHz channels, each of which carries either an HE-SIG-B content channel 1 or an HE-SIG-B content channel 2. SAMSUNG-1003, [105]; SAMSUNG-1009, [0036], [0039], Figs. 3, 4C; SAMSUNG-1010, 4, 12. Each HE-SIG-B content channel would carry resource unit allocation information for the tones in 242-tone segments that correspond to the 20MHz channels that carry the content channel. *Id.*; SAMSUNG-1009, [0042]; SAMSUNG-1010, 12. This indication would cover 968 (242 tones x 4 channels) of the 996 available tones in an 80MHz PPDU. SAMSUNG-1003, [105]; SAMSUNG-1009, [0035], Fig. 2; SAMSUNG-1010, 3, 5, 12, 27. Thus, an additional indication bit would be included in each HE-SIG-B content channel to indicate the use of a C26 resource unit located in the middle of the 80MHz PPDU, per Wu. SAMSUNG-1003, [105]; SAMSUNG-1009, [0043], [0044], Fig. 5; SAMSUNG-1010, 27.



SAMSUNG-1009, Fig. 2; SAMSUNG-1010, 3 (annotated)



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Fig. 4; SAMSUNG-1010, 4, 12 (annotated)

A POSITA would have been motivated and found it obvious to combine the method of signaling a non-allocated resource unit, per Chen, with a method of carrying HE-SIG-B information in two content channels, per Wu, for several

reasons. SAMSUNG-1003, [106]-[111]. First, splitting resource allocation information between two content channels would reduce signaling overhead as compared to signaling all resource allocation information for all channels in a single HE-SIG-B field. SAMSUNG-1003, [106]; SAMSUNG-1013, 8-10. As Dr. Buehrer explains,

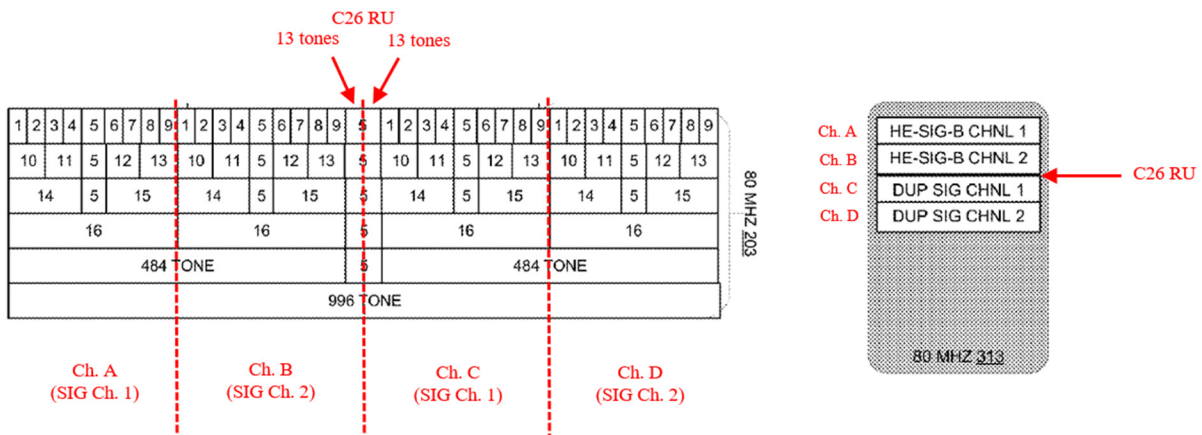
[A] POSITA would have been motivated to use a content channel scheme (like the one described in Wu) because it strikes a balance between channel use efficiency and complexity. SAMSUNG-1012, 9-10; SAMSUNG-1013, 5-9. Putting all of the signaling into a single 20 MHz channel would have eased complexity (since only a single channel would need to be decoded for the signaling information) but would have increased the duration of the HE-SIG-B (which is overhead), thus reducing the efficiency of the transmission. *Id.* However, dividing the HE-SIG-B across all channels, while minimizing HE-SIG-B duration, would have increased complexity considerably, since in the worst case, the receiver would need to decode the HE-SIG-B on all eight 20 MHz channels of a 160 MHz PPDU. *Id.* In my opinion, using two content channels is an obvious balance between these two extremes.

SAMSUNG-1003, [107].

Moreover, by the Critical Date, the relevant standards organization, TGax, had adopted the SIG-B replication structure described in Wu into the draft 802.11ax Specification Framework. SAMSUNG-1011, 8-12, Figs. 4-5, 6-7; SAMSUNG-1003, [108]. But methods for indicating the non-allocation of a resource unit had not yet been decided. SAMSUNG-1003, [108].

Chen teaches methods for indicating the non-allocation of a resource unit by including non-allocation information in the common field of HE-SIG-B. *See* §III.C.1. However, as Dr. Buehrer explains, Chen's method does not contemplate

the HE-SIG-B content channel structure described in Wu and adopted into the draft standard. SAMSUNG-1003, [109]. Specifically, a POSITA would have understood that, because a center or middle 26-tone RU falls between two 20MHz channels carried in two different HE-SIG-B content channels, it does not clearly fall within the common field of a particular content channel. *Id.*; SAMSUNG-1009, [0035]-[0036], [0041]-[0043], Figs. 2-4; SAMSUNG-1010, 3-6, 27-28 (“The middle 26 tone RU for 80 MHz [bandwidth] can not be signaled in the existing [resource unit allocation tables].”); *see* §III.A.2 (discussing resource unit arrangement in 80MHz and larger PPDUs). Indeed, the draft specification recognized this issue, noting that “[s]ignaling for the center 26 unit in 80MHz is TBD.” SAMSUNG-1011, 9.



SAMSUNG-1009, Figs. 2-3 (annotated); SAMSUNG-1010, 3-4

A POSITA would have understood that a separate method for indicating the C26 resource unit, e.g., as described in Wu, would have been one such solution for indicating allocation of a C26 resource unit. SAMSUNG-1003, [110]. Thus, Wu’s method of indicating a C26 resource unit reflects a known solution to a known

problem. *Id.* But Wu does not explicitly disclose a method for indicating the non-allocation of a resource unit apart from the C26 resource unit. *Id.* As a result, a POSITA would have found it obvious to combine the method for indicating the non-allocation of resource units within each 242-tone portion of the PPDU corresponding to a 20MHz channel, per Chen, with the method for indicating the special case of a C26 resource unit in 80MHz or larger PPDU, per Wu.

SAMSUNG-1003, [110]; SAMSUNG-1008, [0089]-[0093], Figs. 12-14; SAMSUNG-1009, [0007], [0041]-[0047], Figs. 4-6; SAMSUNG-1010, 3-6, 10-13, 27-28.

Moreover, combining Chen and Wu's teachings would have been well within the skill of a POSITA prior to the earliest effective filing date. SAMSUNG-1003, [111]. Indeed, the combination would have amounted to nothing more than the application of a known technique of splitting HE-SIG-B information into two content channels to a known method of indicating resource unit allocation and non-allocation information to yield predictable results. *Id.*; SAMSUNG-1008, [0090]-[0093], Figs. 12-14; SAMSUNG-1009, [0036], Fig. 3; SAMSUNG-1010, 4. Given that Chen teaches that allocation information may be indicated on a per 20MHz basis, and that the edge case of the allocation of a C26 resource unit may be accounted for through the methods described in Wu, a POSITA would have naturally expected success when applying Wu's techniques to Chen's methods.

SAMSUNG-1003, [111]; SAMSUNG-1008, [0084]-[0087]; SAMSUNG-1009, [0007], [0043]-[0047]; SAMSUNG-1010, 27. Moreover, a POSITA would have found the Chen-Wu combination predictable given that the standards body had adopted the two-content-channel approach for signaling HE-SIG-B and noted that indication of C26 resource units was to be determined. SAMSUNG-1011, 8-12; SAMSUNG-1003, [111].

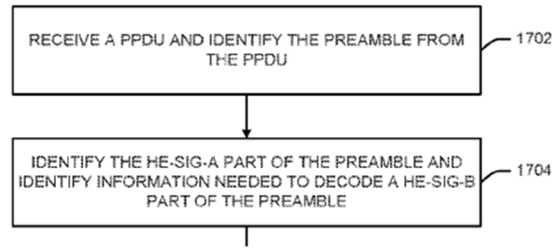
4. Claim 7

[7.pre]

To the extent the preamble is limiting, Chen describes “systems and methods for Wi-Fi, and more particularly to resource unit (RU) allocation in high efficiency (HE) Wi-Fi preambles.” SAMSUNG-1008, [0002]; SAMSUNG-1003, [163]. Chen’s methods involve a wireless communication terminal (e.g., wireless access point). SAMSUNG-1008, [0033].

[7.1]

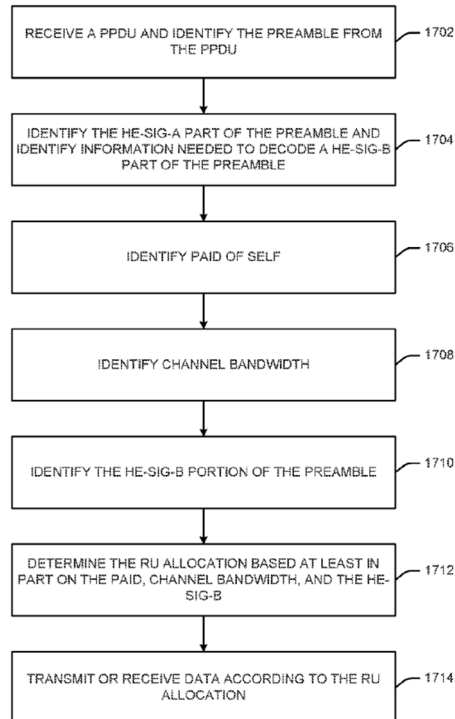
Chen teaches receiving an HE PPDU (i.e., a *wireless packet*) including *HE-SIG-A and HE-SIG-B fields*. SAMSUNG-1008, [0101]-[0104], Fig. 17, [0077], Fig. 5; SAMSUNG-1003, [164]. A POSITA would have understood that a PPDU is a wireless packet. SAMSUNG-1003, [164]; SAMSUNG-1005, [0003] (“The *data packet* transmitted is called a HE physical layer convergence procedure (PLCP) protocol data unit (PPDU).”); SAMSUNG-1006, 1.



SAMSUNG-1008, Fig. 17 (excerpt)

[7.2]

The Chen-Wu combination renders obvious this limitation. SAMSUNG-1003, [165]-[168]. Chen explains that bandwidth information “may be communicated to [a station] by [an access point], such as on the PPDU transmitted by the [access point] and received by the [station].” SAMSUNG-1008, [0102]. In the method described in Chen’s Figure 17, the channel bandwidth is identified at block 1708, which is after the HE-SIG-A is identified (block 1704) and before the HE-SIG-B is identified (block 1710). SAMSUNG-1008, [0101]-[0103], Fig. 17.



SAMSUNG-1008, Fig. 17

Chen further teaches that the “*HE-SIG-A may carry an indication of the total channel bandwidth* available in MU-MIMO mode (e.g., 20MHz channel, 40MHz channel, or 80MHz channel).” SAMSUNG-1008, [0061]. A POSITA would have understood that the indication of the total channel bandwidth in the HE-SIG-A would be carried in a field. SAMSUNG-1003, [166]; SAMSUNG-1007, [0125], [0193]; SAMSUNG-1006, Fig. 2; SAMSUNG-1012, 259-260, Table 22-12; SAMSUNG-1015, 13. Indeed, at no point during prosecution did Applicant dispute the examiner’s finding that Chen teaches obtaining bandwidth information indicated via a bandwidth field included in the HE-SIG-A. *See* SAMSUNG-1002, 68, 120 (citing SAMSUNG-1008, [0061]).

Moreover, as discussed above for [7.2] in Ground 1A, a POSITA would have understood that including a bandwidth field indicating the PPDU bandwidth in 802.11ac was a well-known technique, was within the general knowledge of a POSITA for 802.11ax, and it would have been obvious to a POSITA to include such a field in the Chen-Wu combination. SAMSUNG-1003, [167]-[168]; *see* §III.A.2.

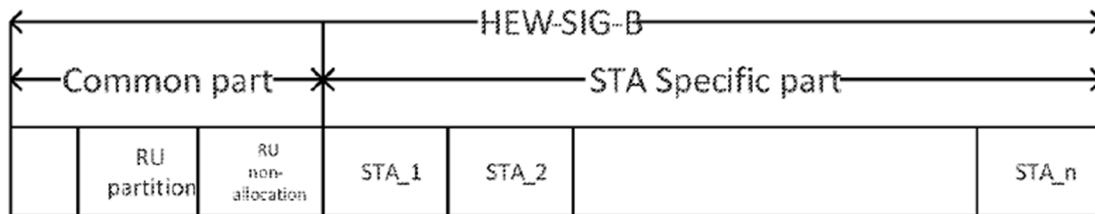
[7.3]

Chen-Wu renders obvious obtaining information of an unassigned resource unit via at least a common field in the HE-SIG-B. SAMSUNG-1003, [169]-[175]. A POSITA would have understood the common field⁷ as a subfield of HE-SIG-B. SAMSUNG-1003, [169]; SAMSUNG-1005, [0105]-[0106], [0156]-[0157]; SAMSUNG-1006, 11, 23; SAMSUNG-1011, 8-9; SAMSUNG-1009, [0072], Fig. 14; SAMSUNG-1010, 4.

For example, Chen teaches including information of non-allocated resource units in the common field of HE-SIG-B. SAMSUNG-1008, [0090]-[0093], Fig. 14; SAMSUNG-1003, [170]. Chen describes a method of “*explicitly indicating [a] non-allocated RU in the common part* of the HE-SIG-B.” SAMSUNG-1008,

⁷ *See supra* note 2.

[0090]. Chen’s Figure 14, reproduced below, “depicts a datagram illustrating an example HE-SIG-B portion 1400 indicating a sequence of RU allocation information with an unallocated RU.” SAMSUNG-1008, [0093]. Chen explains that, “after the RU allocation information (e.g., the allocation pattern in the common part of HE-SIG-B), there may be RU non-allocation information. This non-allocation information may indicate the non-allocated RUs. The non-allocation may be realized by a bit map. If there are M RU partitions in the current PPDU, M bits may be used to indicate which RU is non-allocated.” *Id.*



SAMSUNG-1008, Fig. 14

From this disclosure, a POSITA would have understood Chen-Wu as teaching that information of an unassigned resource unit is obtained via at least the RU non-allocation information in the common field of HE-SIG-B. SAMSUNG-1003, [171]. Petitioner notes that Applicant did not dispute the examiner’s finding that the “unassigned RUs can be not allocated by using RU allocation field.” SAMSUNG-1002, 68, 120 (citing SAMSUNG-1008, [0093], Fig. 14).

Chen-Wu further renders obvious obtaining information of an unassigned resource unit via at least one subfield of HE-SIG-B based on Wu’s teachings.

SAMSUNG-1003, [172]. Wu teaches that “the middle 26-tone RU for 80MHz and 160MHz can be signaled by . . . a one bit indication in the HE-SIG-B common [field].” SAMSUNG-1009, [0043]; SAMSUNG-1010, 27. For example, Wu explains that, in an 80MHz PPDU, “*one-bit in the common field of HE-SIG-B is used to indicate whether the middle 26-tone RU is used*. If the bit is set, it indicates the RU is used.” SAMSUNG-1009, [0044], Fig. 5; SAMSUNG-1010, 27. A POSITA would have understood that a bit has two possible values (i.e., zero or one), and that if the bit is not set (e.g., the bit is zero), the bit indicates that the C26 resource unit is not used (i.e., unassigned). SAMSUNG-1003, [172].

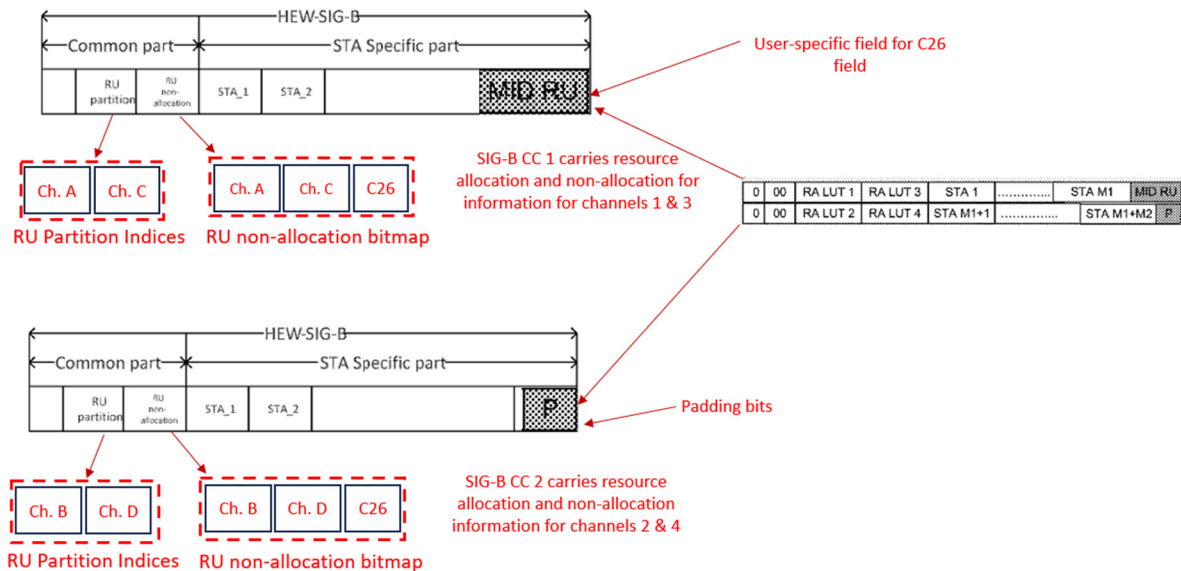
In the Chen-Wu combination, it would have been obvious to a POSITA to combine RU non-allocation information, per Chen, with an indication bit for indicating whether a user is assigned to a C26 resource unit, per Wu. SAMSUNG-1003, [173]. As discussed above in §III.C.3, a POSITA would have understood that, because a C26 resource unit falls between two 20MHz channels, an additional signaling bit would be required to indicate resource unit allocation information for a C26 resource unit. SAMSUNG-1003, [173]; SAMSUNG-1009, [0035]-[0036], [0041]-[0043], Figs. 2-4; SAMSUNG-1010, 3-6, 27-28; *see* §III.C.3; *see also* §III.A.2 (discussing resource unit arrangement in 80MHz and larger PPDUs). As one example, it would have been obvious to a POSITA to append indication bits (per Wu) to one or more of the RU non-allocation bitmaps according to the

bandwidth of the PPDU as indicated by the bandwidth field (per Chen).

SAMSUNG-1003, [174]; SAMSUNG-1008, [0089]-[0093], Figs. 12-14;

SAMSUNG-1009, [0007], [0041]-[0047], Figs. 4-6; SAMSUNG-1010, 3-6, 10-13,

27-28; *see* §III.C.3.



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 5;

SAMSUNG-1010, 4, 12, 27 (annotated)

Based on the combined teachings of Chen and Wu, a POSITA would have understood Chen-Wu as further rendering obvious that information of an unassigned resource unit (e.g., information indicating whether a C26 resource unit is allocated to a user) is obtained via at least the RU non-allocation information (e.g., a non-allocation bitmap, per Chen, including an indication bit for a C26 resource unit, per Wu) in the common field of HE-SIG-B. SAMSUNG-1003,

[175].

[7.4]

As discussed above for [7.2], the Chen-Wu combination renders obvious a bandwidth field in HE-SIG-A. SAMSUNG-1003, [176]; *see* [7.2]. For example, Chen teaches that the “HE-SIG-A may carry an indication of the *total channel bandwidth*.” SAMSUNG-1008, [0061]. A POSITA would have understood the term “total channel bandwidth” to refer to the bandwidth over which the PPDU (i.e., received wireless packet) is transmitted. SAMSUNG-1003, [176]. Petitioner notes that Applicant did not dispute the examiner’s finding that Chen teaches this limitation. *See* SAMSUNG-1002, 68, 120 (citing SAMSUNG-1008, [0061]).

Additionally, as discussed for [7.2], including a bandwidth field in HE-SIG-A to indicate the bandwidth of the PPDU was well known in the art, and it would have been obvious to a POSITA to include the known bandwidth field in HE-SIG-A. SAMSUNG-1003, [177]; *see* [7.2]; SAMSUNG-1007, [0125], [0193]; SAMSUNG-1012, 259-260, Table 22-12; SAMSUNG-1015, 13.

[7.5]

Chen-Wu renders obvious using the bandwidth field of HE-SIG-A to obtain the information of the unassigned resource unit. SAMSUNG-1003, [178]-[184]. As one example, a POSITA would have understood the Chen-Wu combination as rendering obvious that RU non-allocation information in HE-SIG-B indicates the

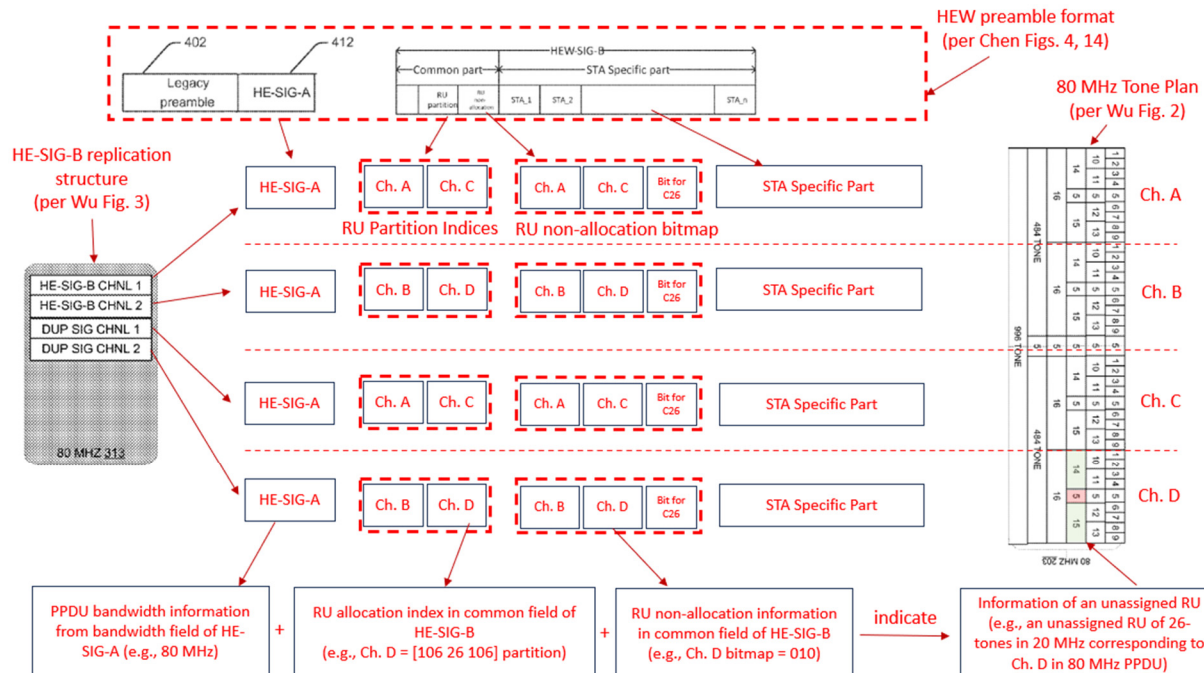
location of a non-allocated RU within a 20MHz channel, while the bandwidth field of HE-SIG-A indicates where in the overall bandwidth the non-allocated RU is located by defining the number of 20MHz channels and the arrangement and length of the HE-SIG-B content channels. SAMSUNG-1003, [178]; SAMSUNG-1008, [0101], [0098]; SAMSUNG-1009, [0036]; SAMSUNG-1010, 10. Chen teaches that “*RU allocation may be determined based at least in part on the PAID, channel bandwidth, and the HE-SIG-B.*” SAMSUNG-1008, [0101], [0098].⁸ Moreover, Wu teaches “a fixed format common field in the HE-SIG-B is defined for each operation bandwidth. Therefore, *the length and format of the common field are predefined [based on the bandwidth]*. In this approach, there is no [additional]⁹ indication needed in the HE-SIG-A.” SAMSUNG-1009, [0036]; SAMSUNG-1010, 10. As explained above for [7.2] and [7.4], a POSITA would

⁸ Petitioner notes that Applicant did not dispute the examiner’s finding that Chen teaches this limitation. *See* SAMSUNG-1002, 68, 102 (citing SAMSUNG-1008, [0093], [0098], [0103], Fig. 14).

⁹ Wu discloses other embodiments for “flexible signaling of resource allocation” using “additional indication in the HE-SIG-A.” SAMSUNG-1009, [0048]; SAMSUNG-1010, 14.

have understood Chen's HE-SIG-A as including a bandwidth field that indicates the operation bandwidth of the PPDU. SAMSUNG-1003, [180]; *see* [7.2], [7.4].

For example, if the bandwidth field of HE-SIG-A indicates a PPDU bandwidth of 80MHz, and the resource unit allocation field of the common field of HE-SIG-B indicates that the 20MHz corresponding to the fourth channel is partitioned into 106, 26, and 106-tone resource units, the resource unit non-allocation information may indicate that the 26-tone resource unit is not assigned to any user through, e.g., a bitmap per Chen. SAMSUNG-1003, [181]; SAMSUNG-1008, [0075], [0089]-[0093], Figs. 4, 12-14; SAMSUNG-1009, [0035]-[0043], Figs. 2-4; SAMSUNG-1010, 2-6, 10-14.



SAMSUNG-1008, Figs. 4, 14 illustrated with SAMSUNG-1009, Figs. 2, 3; SAMSUNG-1010, 3-4 (annotated).

Thus, a POSITA would have understood the combined teachings of Chen and Wu as rendering obvious that the bandwidth field of HE-SIG-A is used to obtain the information of an unassigned resource unit. SAMSUNG-1003, [182].

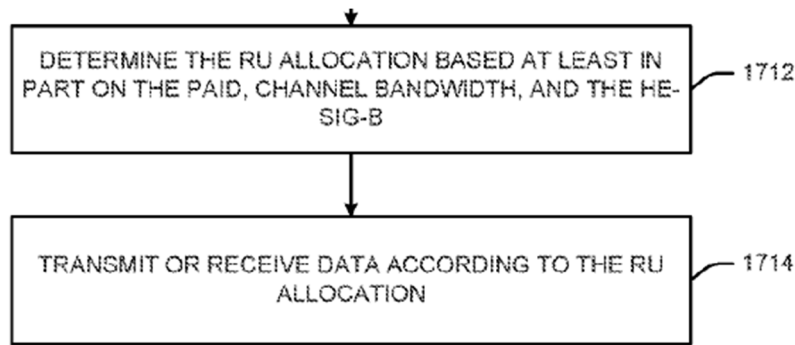
The Chen-Wu combination additionally renders obvious the use of the bandwidth field to obtain information of an unassigned resource unit when the unassigned resource unit is a C26 resource unit. SAMSUNG-1003, [183]-[184]. Wu teaches that “the middle 26-tone RU for 80MHz and 160MHz can be signaled by . . . a one bit indication in the HE-SIG-B common fi[el]d.” SAMSUNG-1009, [0043]; SAMSUNG-1010, 27. Wu explains that when the bandwidth is 80MHz, one bit is included in the common field to indicate the presence of the C26 resource unit. SAMSUNG-1009, [0044], Fig. 5; SAMSUNG-1010, 27. When the bandwidth is 160MHz, one bit is included in the common field of each HE-SIG-B content channel to indicate the presence of a C26 resource unit in each 80MHz portion of a 160MHz PPDU. SAMSUNG-1009, [0046], Fig. 6; SAMSUNG-1010, 27. No indication bit for a C26 resource unit is included in 20 or 40MHz PPDUs. SAMSUNG-1003, [184]; *see* SAMSUNG-1009, [0007], [0035], [0043]; SAMSUNG-1010, 3, 27, 40.

A POSITA would have understood that in the Chen-Wu combination, the bandwidth field is used to determine how many C26 resource units to expect and the location of the C26 resource units within the overall bandwidth. SAMSUNG-

1003, [184]; SAMSUNG-1009, [0043]-[0047]; SAMSUNG-1010, 27-28. For example, when the bandwidth field indicates a bandwidth of less than 80MHz, no C26 resource units are present. *Id.* When the bandwidth field indicates 80MHz, one C26 resource unit is present and the bit in HE-SIG-B indicates whether they are unassigned. *Id.* Similarly, when the bandwidth field indicates 160MHz, two C26 resource units are present, and two bits in the HE-SIG-B indicates whether either or both are unassigned. *Id.* In this sense, a POSITA would have understood the Chen-Wu combination as rendering obvious that the bandwidth field of HE-SIG-A is used to obtain information of an unassigned resource unit (e.g., an unassigned C26 resource unit). SAMSUNG-1003, [184].

[7.6]

Chen-Wu renders obvious this limitation. SAMSUNG-1003, [185]-[189]. For example, Chen teaches “an example method 1700 for identifying an RU for transmitting or *receiving data based at least in part on a received PPDU.*” SAMSUNG-1008, [0101]. Chen explains that data is received according to an RU allocation, which is determined “based at least in part on the PAID, *channel bandwidth*, and the *HE-SIG-B.*” SAMSUNG-1008, [0101]-[0103], Fig. 17.



SAMSUNG-1008, Fig. 17 (excerpt)

A POSITA would have understood that the bandwidth field of HE-SIG-A informs a receiving station on which channels to receive the PPDU. SAMSUNG-1003, [186]; SAMSUNG-1017, 9; SAMSUNG-1011, 7-11, 17-20, 23-25. Moreover, the possible resource unit arrangements, number of HE-SIG-B channels, and number of C26 resource units varies based on the bandwidth of the PPDU. SAMSUNG-1003, [186]; SAMSUNG-1008, [0034]-[0037], [0072], [0083]-[0088]; SAMSUNG-1009, [0034]-[0039], [0041]-[0047]; SAMSUNG-1010, 2-6, 10-13, 27-28, 40; SAMSUNG-1013, 8-10; SAMSUNG-1011, 7-11, 17-20, 23-25. Thus, a POSITA would have understood Chen-Wu as rendering obvious decoding a packet based on the PPDU bandwidth as indicated by the bandwidth field of HE-SIG-A. SAMSUNG-1003, [186].

In the Chen-Wu combination, a POSITA would have also found it obvious that the information of the unassigned resource unit is used to decode data of the received wireless packet. SAMSUNG-1003, [187]-[189]. Chen explains that “after the STA 140 knows the RU allocation pattern and non-allocated RUs, the STA 140

may remove the non-allocated RUs from the allocation pattern and use its STA position in the STA list in the STA specific part *to derive the RU assignment for itself.*” SAMSUNG-1008, [0093].

For example, as discussed for [7.5], information from the bandwidth field of HE-SIG-A (e.g., a total PPDU bandwidth of 80MHz) and the common field of HE-SIG-B indicate information of an unassigned resource unit (e.g., information of an unassigned 26-tone resource unit in the bandwidth corresponding to a fourth 20MHz channel in a bandwidth of 80MHz). SAMSUNG-1003, [188]; *see* [7.5]. In such a case, a station considers the information of the unassigned resource unit when determining which of the resource units in the partition corresponds to its station assignment. SAMSUNG-1003, [188]; SAMSUNG-1003, [0090]-[0093], Figs. 12-14. For example, if the resource unit allocation field indicates that a 20MHz segment of bandwidth is partitioned into resource units of [106 26 106] tones, if a receiving station's PAID is located in the position that would otherwise correspond to the unassigned 26-tone resource unit, the station would understand that it is assigned to a second 106-tone resource unit and not the 26-tone resource unit per the RU non-allocation information. SAMSUNG-1003, [188]; SAMSUNG-1008, [0090]-[0093].

Additionally, a POSITA would have understood that one or more resource units not being allocated to a user may change the length of the user-specific field

of HE-SIG-B. SAMSUNG-1003, [189]. For example, as discussed below for claim 10, if indication bits indicate that a C26 resource unit is used (per Wu), the per-user allocation information is carried at the end, after the user allocations for segments A & C are carried. SAMSUNG-1003, [189]; SAMSUNG-1009, cl. 10, [0044]-[0045]; SAMSUNG-1010, 27-28; *see* §III.C.7. A POSITA would have understood that the indication bits indicate that a C26 resource unit is not used, a per-user allocation would not be carried in the user-specific field. SAMSUNG-1003, [189]. A receiving station uses the number of resource units to determine the length (specifically the number of user fields) of the user-specific field of HE-SIG-B, and thus properly decode HE-SIG-B to obtain the station's assigned resource unit and decode data therein. SAMSUNG-1003, [189]; SAMSUNG-1008, [0076], [0089]-[0093], [0101]-[0103], Fig. 17. Thus, a POSITA would have further understood that Chen-Wu renders obvious that the information of an unassigned resource unit is used to decode data of the received PPDU. SAMSUNG-1003, [189].

[7.7]

Chen-Wu renders obvious wherein the unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field and the at least one subfield (e.g., common field of HE-SIG-B). SAMSUNG-1003, [190]-[196].

Specifically, a POSITA would have understood Chen-Wu as rendering

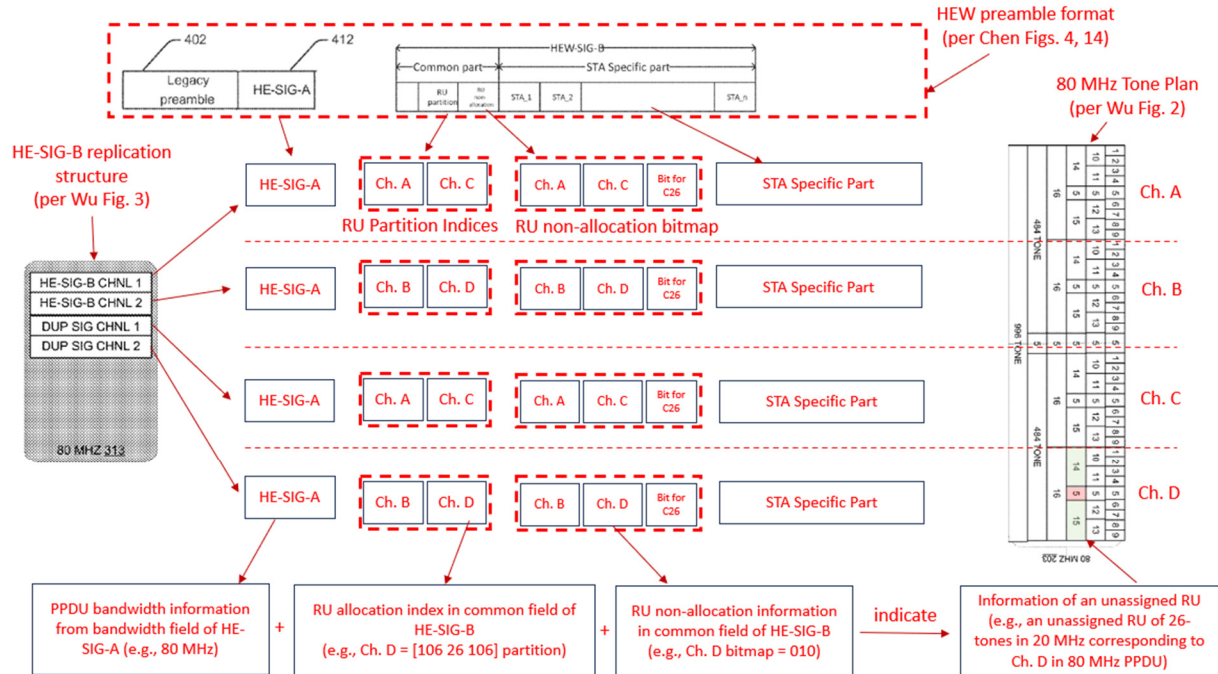
obvious that the bandwidth field of HE-SIG-A and the common field of HE-SIG-B provide information specifically indicating that a particular resource unit is unassigned (e.g., RU non-allocation information per Chen and/or an additional indication bit for one or more C26 resource units per Wu). SAMSUNG-1003, [191]; SAMSUNG-1008, [0089]-[0093]; SAMSUNG-1009, [0007], [0035], [0043]-[0047]; SAMSUNG-1010, 3, 27, 40. By contrast, a POSITA would have understood that, in some circumstances, the non-assignment of a resource unit may be implicitly derived based on other information. SAMSUNG-1003, [191]-[192].

For example, the '595 patent explains that “whether the center 26-tone RU [] is assigned may be implicitly identified” based on nulling of resource units in surrounding channels. SAMSUNG-1001, 47:22-51; *see also* SAMSUNG-1005, [0193]-[0198] (“If the STA 111 determines that the non-contiguous channel bonding field is set to indicate null channels, the STA 111 then interprets the RU arrangement in the common information portion to have null RUs that are adjacent to the nulled channels and determines the number of per-STA fields based on the channel bonding field and the RU arrangement.”); SAMSUNG-1006, 31-33.

A POSITA would have understood Chen-Wu’s methods as rendering obvious that an unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth of the PPDU (as indicated by the *bandwidth field of HE-SIG-A*) and the common field (*at least*

one subfield) of HE-SIG-B. SAMSUNG-1003, [193]. This satisfies the interpretation of “explicitly indicated with the information of the unassigned resource unit based on the bandwidth field of HE-SIG-A and a subfield of HE-SIG-B” that Wilus has advanced for purposes of infringement. SAMSUNG-1003, [193] (citing SAMSUNG-1004, 28).

For example, a POSITA would have understood information of non-allocated resource units as explicitly indicating a non-allocated (i.e., unassigned) resource unit. SAMSUNG-1003, [194]; SAMSUNG-1008, [0093] (“*Explicit indication of the non-allocated RU* in the common part of HE-SIG-B may be understood with reference to FIG. 14.”). This indication is carried in the common field of HE-SIG-B (i.e., the at least one subfield) and, as explained for [7.5], the location of the unassigned resource unit within the overall PPDU is determined based on the bandwidth indicated by the bandwidth field of HE-SIG-A. SAMSUNG-1003, [194]; *see* [7.5].



SAMSUNG-1008, Figs. 4, 14 illustrated with SAMSUNG-1009, Figs. 2, 3; SAMSUNG-1010, 3-4 (annotated).

As another example, a POSITA would have understood information of the use of the C26 resource unit (per Wu) as explicitly indicating whether a C26 resource unit is unassigned. SAMSUNG-1003, [195]. Wu teaches that this indication is carried in the common field of HE-SIG-B (i.e., the at least one subfield) and varies based on the bandwidth of the PPDU. SAMSUNG-1009, [0007], [0035], [0043]-[0047]; SAMSUNG-1010, 3, 27, 40. For example, no indication is carried in 20 and 40MHz PPDU's, an indication of a single 26-tone resource unit is carried in both HE-SIG-B content channels in an 80MHz PPDU, and an indication of one of two 26-tone resource units are carried in each HE-SIG-

B content channel in a 160MHz PPDU. *Id.*; SAMSUNG-1003, [195]. As explained above, in the Chen-Wu combination, it would have been obvious to a POSITA to include an indication bit (per Wu) in an RU non-allocation bitmap (per Chen), and a POSITA would have understood that in the Chen-Wu combination, the bandwidth field is used to determine how many C26 resource units to expect. SAMSUNG-1003, [195]; *see* §III.C.3.

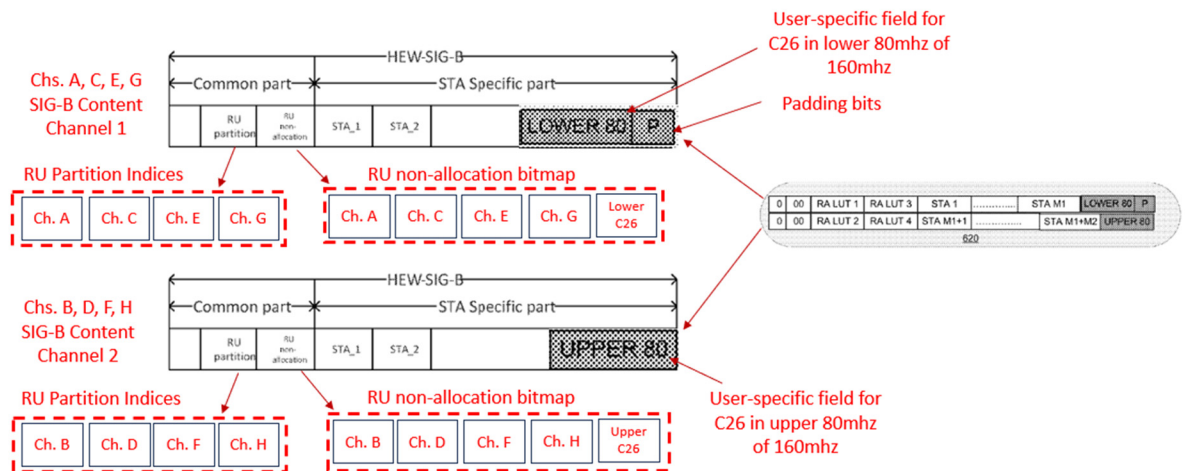
Thus, Chen-Wu renders obvious that an unassigned resource unit is explicitly indicated with the information of the unassigned resource unit based on the bandwidth field of HE-SIG-A and the common field of HE-SIG-B. SAMSUNG-1003, [196].

[7.8]

Chen-Wu renders obvious this limitation. SAMSUNG-1003, [197]-[200]. Wu teaches “the middle 26-tone RU for 80MHz and 160MHz can be signaled by . . . [a] one-bit indication in the HE-SIG-B common [field].” SAMSUNG-1009, [0043], SAMSUNG-1010, 27. For example, Wu explains that, in an 80MHz PPDU, “one-bit in the common field of HE-SIG-B is used to indicate whether the middle 26-tone RU is used. If the bit is set, it indicates the RU is used.” SAMSUNG-1009, [0044], Fig. 5; SAMSUNG-1010, 27. A POSITA would have understood that a bit has two possible values (i.e., zero or one), and that if the bit is not set (e.g., the bit is zero), the bit indicates that the C26 resource unit is not used

(i.e., unassigned). SAMSUNG-1003, [197]. A POSITA would have understood the indication bit as corresponding to the claimed “C26 field.” SAMSUNG-1003, [197]. This aligns with the ’595 patent’s disclosure, which states that the “C26 field may consist of a 1-bit indicator before or after the [resource allocation] field in the common block field.” SAMSUNG-1001, 22:29-51, Fig. 15. A POSITA would have understood the common field as a subfield of HE-SIG-B. *Id.*; SAMSUNG-1009, [0036]; SAMSUNG-1010, 4; SAMSUNG-1011, 8-9; SAMSUNG-1003, [197].

In the Chen-Wu combination, it would have been obvious to a POSITA to include an indication bit (per Wu) in the RU non-allocation bitmap (per Chen). SAMSUNG-1003, [198]; *see* §III.C.3. For example, it would have been obvious to include an indication bit as the last bit in RU allocation bitmaps (per Chen) because the bitmaps are similarly indication bits for indicating an unassigned resource unit. SAMSUNG-1003, [198]; *see* SAMSUNG-1008, [0093] (“The non-allocation [of resource units] may be realized by bit map.”). It would have been obvious to a POSITA to split the RU non-allocation information between HE-SIG-B content channels according to the content channel partition scheme discussed in Wu and well known to a POSITA. SAMSUNG-1003, [198]; SAMSUNG-1009, [0035]-[0042], [0072]; SAMSUNG-1010, 3-4, 10, 12; SAMSUNG-1011, 8-12, Figs. 4-5, 6-7; SAMSUNG-1012, 8-10; *see* §III.C.3.



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 5;

SAMSUNG-1010, 4, 12, 27 (annotated)

Wu teaches that an indication bit is only included when the bandwidth is 80MHz or more, not 20MHz or 40MHz. SAMSUNG-1009, [0043]-[0044], [0046]-[0047]; SAMSUNG-1010, 27. Moreover, as Dr. Buehrer explains, in the Chen-Wu system, the extra indication bit used for signaling the use of a C26 resource unit is not required for 20 or 40MHz PPDU's because the tone plans for those transmission bandwidths do not include a 26-tone resource unit that falls between channels. SAMSUNG-1003, [199]; SAMSUNG-1009, [0035], Fig. 2; SAMSUNG-1010, 3, 27; *see* §III.A.2 limitation [7.8]. Thus, signaling the non-allocation of all resource units in 20 and 40MHz can be handled by the RU non-allocation information, per Chen. SAMSUNG-1003, [199]; SAMSUNG-1008, [0090]-[0093]; *see* [7.3].

For these reasons, a POSITA would have understood Chen-Wu as rendering

obvious wherein the information of the unassigned resource unit (e.g., information indicated by Chen-Wu's RU non-allocation information) includes information of a C26 field (e.g., an indication bit per Wu) indicating whether a user is allocated to a C26 resource unit of 80MHz upon the bandwidth related to a transmission of the received wireless packet indicated by the bandwidth field being 80 MH or more, not 20MHz or 40MHz. SAMSUNG-1003, [200].

5. Claim 8

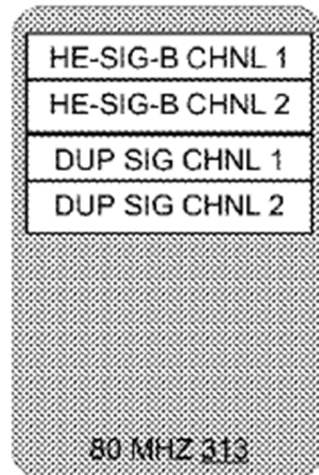
[8.pre]

[8.1]

Chen-Wu uses two HE-SIG-B content channels, which carry information for alternating 20MHz segments. SAMSUNG-1003, [201]; *see* §III.C.3. Specifically, Wu teaches

Different bandwidth configuration results in different number of HE-SIG-B channels. 20-MHz resource blocks 311 use one HE-SIG-B channel-1. **40-MHz resource block 312 uses two HE-SIG-B channels, HE-SIG-B Channel-1 and HE-SIG-B Channel-2.** 80-MHz resource block 313 uses four HE-SIG-B channels, HE-SIG-B Channel-1, HE-SIG-B Channel-2 and one set of duplicated Channel-1 and Channel-2. 160-MHz resource block 313 uses eight HE-SIG-B channels, HE-SIG-B Channel-1, HE-SIG-B Channel-2 and three sets of duplicated Channel-1 and Channel-2.

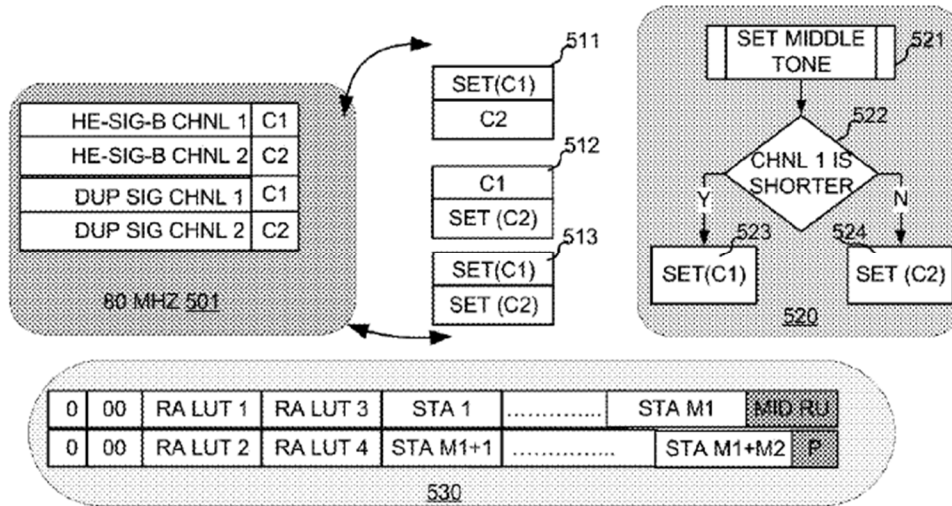
SAMSUNG-1009, [0036], Fig. 3; SAMSUNG-1010, 4; SAMSUNG-1003, [201].



SAMSUNG-1009, Fig. 3; SAMSUNG-1010, 4.

[8.2]

Chen-Wu renders obvious that the C26 field is carried in both HE-SIG-B content channels. SAMSUNG-1003, [202]-[204]. Wu teaches “[i]n a third embodiment [of an 80MHz transmission] as shown in 513, *duplicated bits are set in both* [HE-SIG-B] ch-1 and [HE-SIG-B] ch-2.” SAMSUNG-1009, [0044], Fig. 5, cl. 8-9; SAMSUNG-1010, 27.

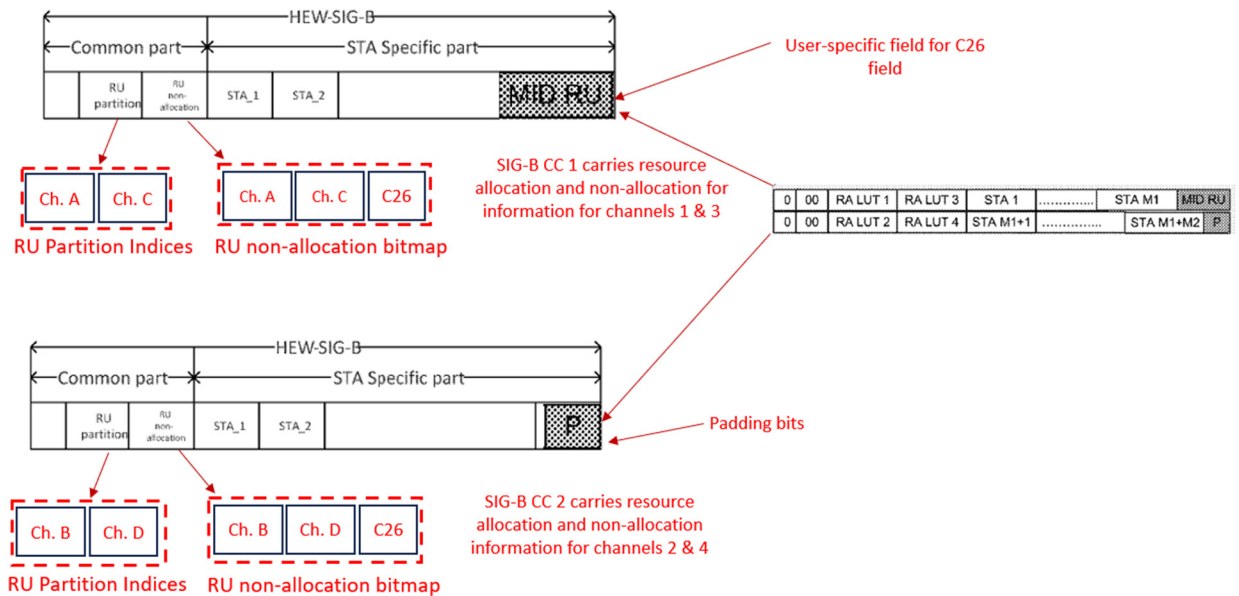


SAMSUNG-1009, Fig. 5; SAMSUNG-1010, 4, 27

Wu further describes a 160MHz transmission in which “one-bit in ch-1 of the HE-SIG-B common field is defined to be the middle 26-tone indicator for the middle 26-tone RU of the lower 80MHz. One-bit in ch-2 of the HE-SIG-B common field is defined to be the middle 26-tone indicator for the middle 26-tone RU of the upper 80MHz.” SAMSUNG-1009, [0046], Fig. 6, cl. 12-13; SAMSUNG-1010, 27.

As discussed above for [7.8], it would have been obvious to include indication bits (per Wu) in an RU non-allocation information bitmap (per Chen). SAMSUNG-1003, [204]; §III.C.4. For example, in an 80MHz PPDU, a POSITA would have found it obvious to append an indication bit at the end of the RU non-allocation bitmap in both channels, as taught by Wu. SAMSUNG-1003, [204]; SAMSUNG-1009, [0044], Fig. 5; SAMSUNG-1010, 27; *see* §III.C.6; *see also* §III.C.8 (explaining that a 160MHz PPDU would also have an indication bit in

HE-SIG-B content channel).



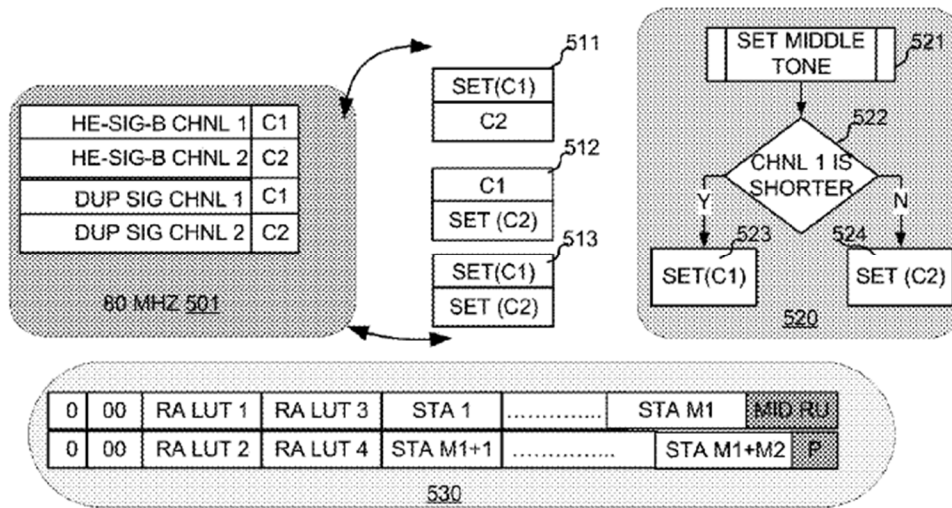
SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 5;

SAMSUNG-1010, 4, 12, 27 (annotated)

6. Claim 9

In the Chen-Wu combination, when the received wireless packet is transmitted in a total bandwidth of 80MHz, both a C26 field carried in the HE-SIG-B content channel 1 and a C26 field carried in the HE-SIG-B content channel 2 indicate whether a user is allocated to a C26 resource unit in the total bandwidth of 80MHz. SAMSUNG-1003, [205]. Wu teaches “[i]n a third embodiment [of an 80MHz transmission] as shown in 513, *duplicated bits are set in both* [SIG-B] ch-1 and [SIG-B] ch-2.” SAMSUNG-1009, [0044], Fig. 5, cl. 8-9; SAMSUNG-1010,

27; SAMSUNG-1003, [205].



SAMSUNG-1009, Fig. 5; SAMSUNG-1010, 4, 27

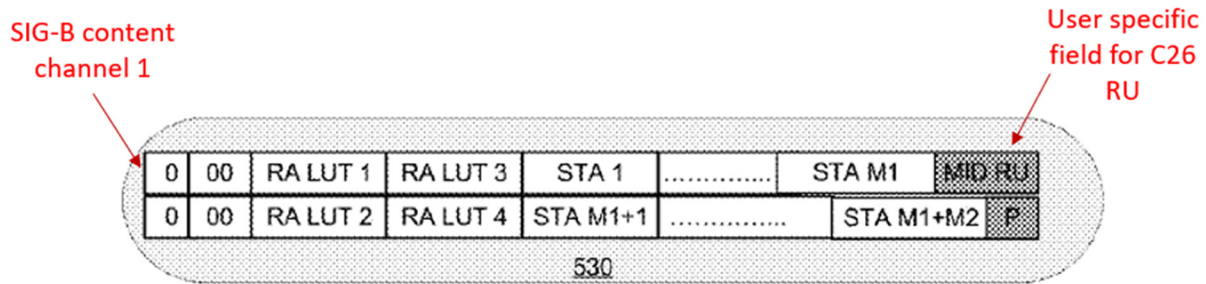
7. Claim 10

Chen-Wu renders obvious that when the C26 field indicates that a user is allocated to the C26 resource unit, a user field corresponding to the C26 resource unit carried in a user specific field of the HE-SIG-B content channel 1.

SAMSUNG-1003, [206]-[207]. Wu teaches “wherein the operation bandwidth is 80 MHz and the middle RU indicator is set to 1, the user specific field for the middle 26 tone RU of 80 Mhz channel is placed on a fixed HE-SIG-B channel.”

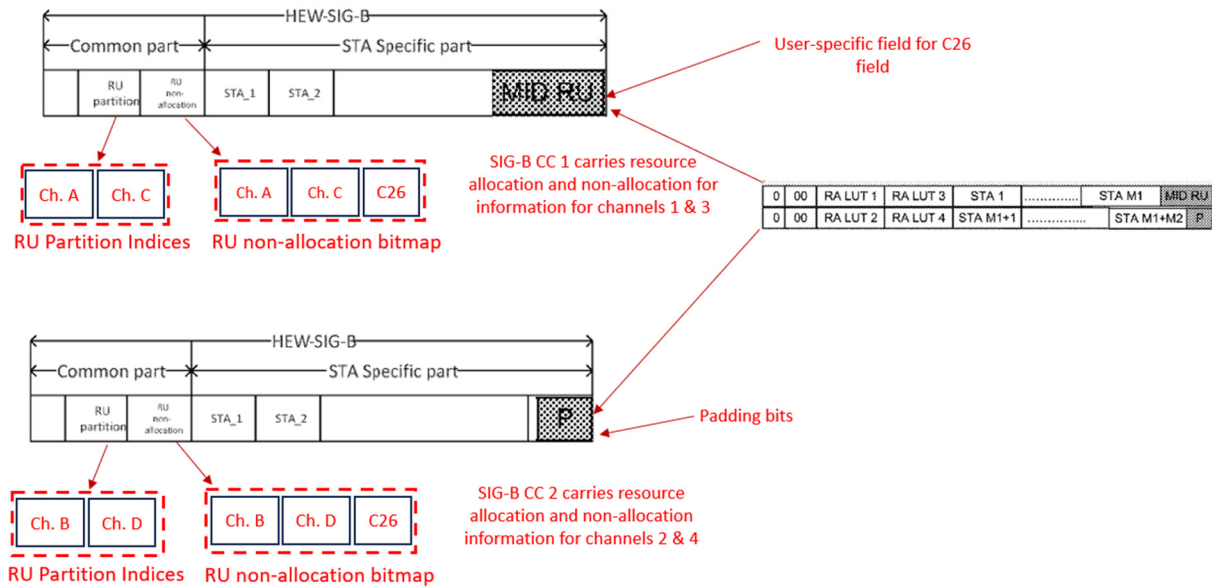
SAMSUNG-1009, cl. 10, [0044]-[0045]; SAMSUNG-1010, 27-28. Wu’s Figure 5 depicts the user-specific field for the C26 tone resource unit as being carried in a user specific field of the HE-SIG-B content channel 1. SAMSUNG-1009, [0044]-[0045], Fig. 5; SAMSUNG-1010, 27; *see also* SAMSUNG-1010, 27 (“The user specific field for the STA assigned to the middle RU shall be placed in a

predefined position. For 80MHz, it can be placed at the end of HE-SIG-B channel 1 or 2 or both.”).



SAMSUNG-1009, Fig. 5; SAMSUNG-1010, 27 (annotated)

In the Chen-Wu combination, a POSITA would have found it obvious to include a user field for the C26 resource unit in a user specific field of the HE-SIG-B content channel 1 when the indication bits in the common field indicate a user is allocated to the C26 resource unit, per Wu. SAMSUNG-1003, [207]; *see* III.C.3.



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 5;

SAMSUNG-1010, 4, 12, 27 (annotated)

8. Claim 11

Chen-Wu renders obvious that in 160 (or 80+80)MHz PPDU's, a first C26 field in HE-SIG-B channel 1 indicates whether a user is allocated to a C26 resource unit in a first 80MHz bandwidth and a second C26 field in HE-SIG-B channel 2 indicates whether a user is allocated to a C26 resource unit in a second 80MHz bandwidth. SAMSUNG-1003, [208]-[211].

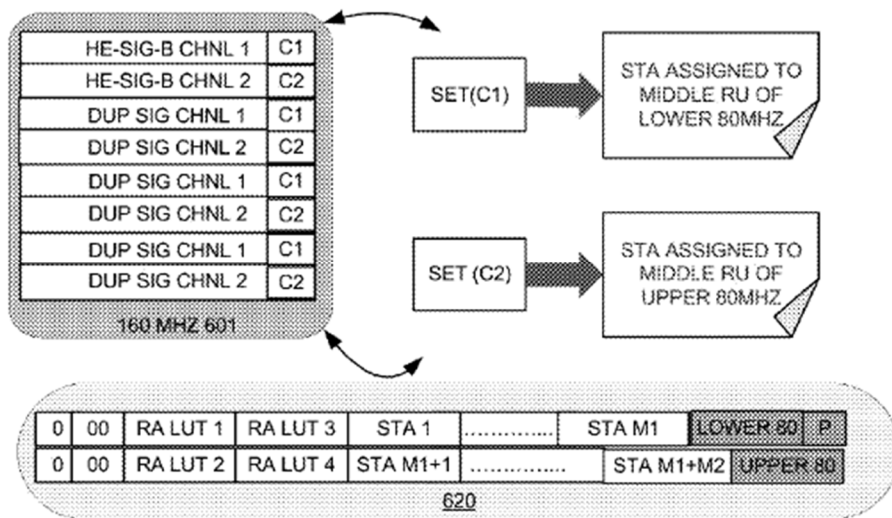
Wu discloses

One 160 MHz HE-SIG-B channel 601 includes a HE-SIG-B Ch-1, a HE-SIG-B Ch-2, and three sets of a HE-SIG-B Duplicated Ch-1, and a HE-SIG-B Duplicated Ch-2. A one-bit in the common field of HE-SIG-B is used to indicate whether the middle 26-tone RU is used. If the bit is set, it indicates the RU is used. In one embodiment, one-bit in ch-1 of the HE-SIG-B

common field is defined to be the middle 26-tone indicator [i.e., ***first C26 field***] for the middle 26-tone RU [i.e., ***first center 26-tone RU***] of the lower 80 MHz [i.e., ***first 80MHz bandwidth***]. One-bit in ch-2 of the HE-SIG-B common field is defined to be the middle 26-tone indicator [i.e., ***second C26 field***] for the middle 26-tone RU [i.e., ***second center 26-tone RU***] of the upper 80 MHz [i.e., ***second 80MHz bandwidth***].

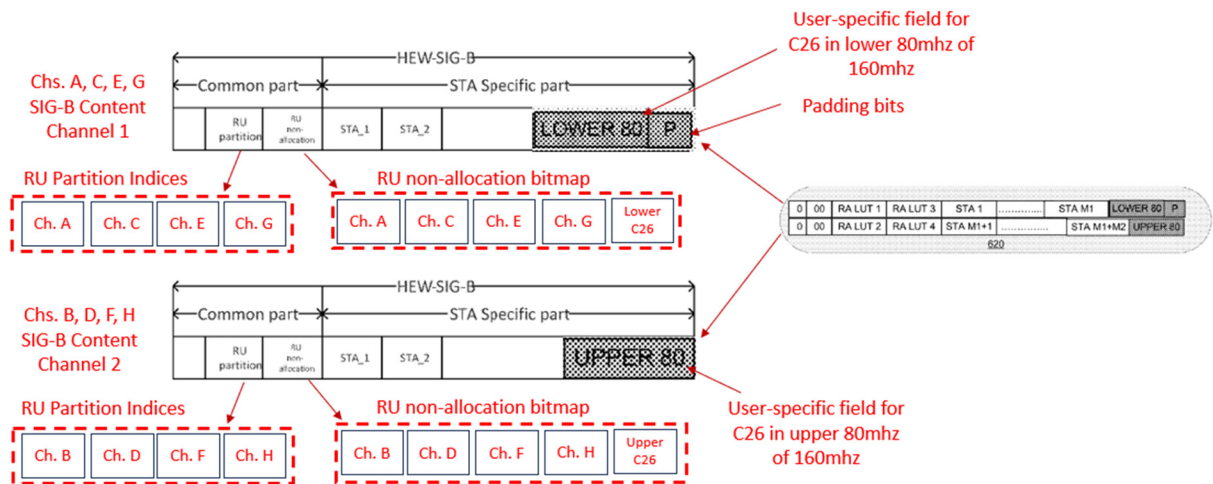
SAMSUNG-1009, [0046], Fig. 6; SAMSUNG-1010, 4, 13, 27; *see also*

SAMSUNG-1009, cl. 12-13.



SAMSUNG-1009, Fig. 6; SAMSUNG-1010, 4, 13, 27.

In the Chen-Wu combination, a POSITA would have found it obvious to include a first indication bit in the resource unit non-allocation bitmap in HE-SIG-B content channel 1 and to include a second indication bit in the resource unit non-allocation bitmap in HE-SIG-B content channel 2, per Wu. SAMSUNG-1003, [211].



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 6;

SAMSUNG-1010, 4, 12, 27 (annotated)

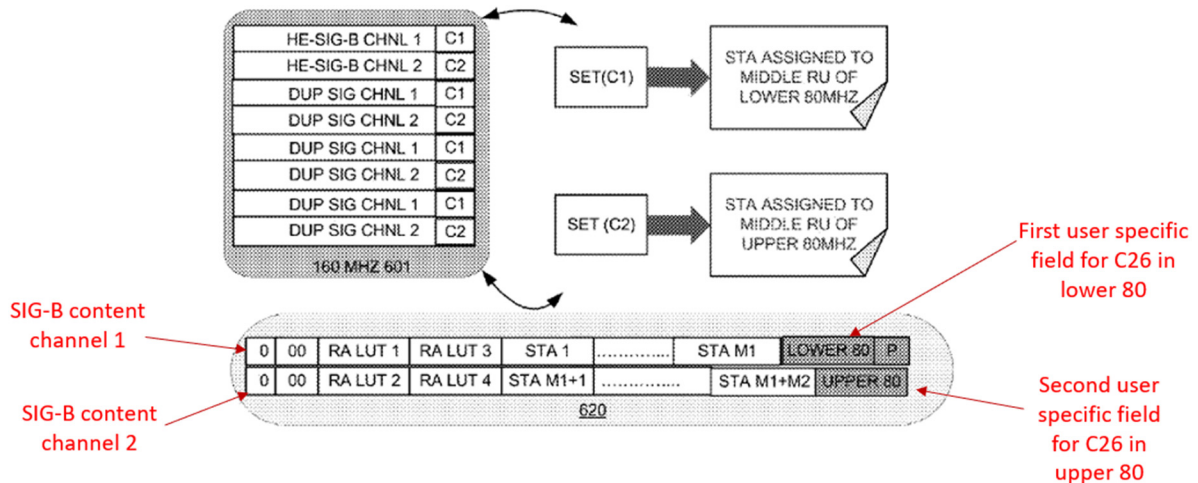
To the extent Patent Owner argues that the claims require performance on both 160MHz and 80+80MHz bandwidth configurations, Chen-Wu renders obvious using the above-described methods for 80+80MHz bandwidths for similar reasons to those described above in Ground 1A. SAMSUNG-1003, [211]; *see* §III.A.6.

9. Claim 12

As discussed above for claim 11, Chen-Wu renders obvious a first and second C26 field indicating that a user is allocated to first and second C26 resource units, respectively. SAMSUNG-1003, [212]; §III.C.8. Chen-Wu further renders obvious carrying user fields for the first and second C26 resource units in HE-SIG-B content channels 1 and 2, respectively, when a user is allocated to the

corresponding C26 resource unit. SAMSUNG-1003, [212]-[217].

Wu teaches placing “two user specific fields for middle RU of lower and upper 80 MHz when operation bandwidth is 160MHz.” SAMSUNG-1009, [0046]-[0047], Fig. 6, cl. 12-13 (“*[T]he user specific field for middle 26 tone RU of lower 80 Mhz is placed at the end of HE-SIG-B channel 1 and the user specific field of middle 26 tone RU of upper 80 MHz is placed at the end of HE-SIG-B channel 2.*”); SAMSUNG-1010, 27-28.



SAMSUNG-1009, Fig. 6; SAMSUNG-1010, 27-28 (annotated)

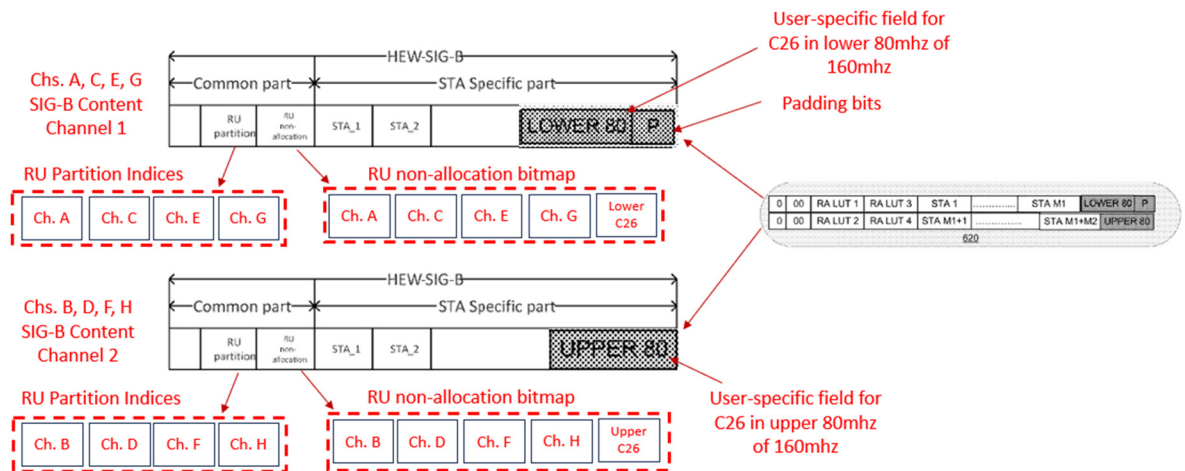
A POSITA would have understood Wu as teaching that the first and second user specific fields are carried in HE-SIG-B content channels 1 and 2, respectively, when a corresponding indication bit for the first or second C26 resource units is set. SAMSUNG-1003, [214]; SAMSUNG-1009, cl. 13, [0034], [0072], Figs. 6, 14; SAMSUNG-1010, 27-28. This aligns with Wu’s disclosure for an 80MHz PPDU

described above for claim 10, which includes a user field when the indication bit is set. SAMSUNG-1003, [214]; SAMSUNG-1009, cl. 10, [0044]-[0045]; SAMSUNG-1010, 27-28; *see* §III.C.7.

Further, a POSITA would have understood that the purpose of the indication bit is to inform a receiving station whether a C26 resource unit is assigned to a user, and thus whether a user field is included for that C26 resource unit. SAMSUNG-1003, [215]; SAMSUNG-1009, [0046] (“***If the bit is set, it indicates the RU is used.***”). This contrasts with the other method described in Wu where a user field for the C26 resource units is always included in the HE-SIG-B content channels, and if a particular C26 resource unit is not assigned to a user, it is set to a null station ID. SAMSUNG-1003, [215]; *see* SAMSUNG-1009, [0045]. *Compare* SAMSUNG-1010, 27 (“One indication method is [a] 1 bit indication in the common field.”), *with id.*, 28 (“Method 2: Always define . . . two user specific fields for the middle RU of lower and upper 80 MHz when operation BW is 160 MHz. . . . No need for the 1 bit indication in the common field.”).

Moreover, a POSITA would have understood that if the C26 resource unit *is assigned*, a station receives its assignment to the C26 resource unit through the user field in the user-specific part of HE-SIG-B. SAMSUNG-1003, [216]; SAMSUNG-1008, [0037], [0039], [0071], [0091]; SAMSUNG-1009, [0038]; SAMSUNG-1010, 11.

In the Chen-Wu combination, a POSITA would have found it obvious to include user fields for first and second C26 resource units in HE-SIG-B content channels 1 and 2, respectively, when a user is allocated to the corresponding C26 resource unit. SAMSUNG-1003, [217].



SAMSUNG-1008, Fig. 14 modified with SAMSUNG-1009, Figs. 4, 6;

SAMSUNG-1010, 4, 12, 27 (annotated)

10. Claims 1-6

Claims 1-6 recite “[a] wireless communication terminal, the terminal comprising a processor, wherein the processor is configured to” perform the methods of claims 7-12, respectively. SAMSUNG-1003, [218]. To the extent the preamble is limiting, Chen describes “a Wi-Fi access point (AP) [that] may be configured to identify a number of user devices or stations (STA) with which it is to facilitate wireless communications.” *Id.*; SAMSUNG-1008, [0033]. Chen

teaches that the stations may include “one or more processor(s) 300.” SAMSUNG-1008, [0068]. For similar reasons to those discussed above with respect to claims 7-12, a POSITA would have understood Chen-Wu as rendering obvious a processor (e.g., processor 300) configured to perform the remaining limitations of claim 1 and claims 2-6. SAMSUNG-1003, [218]; *see* §§III.C.1-9.

IV. TRIAL SHOULD BE INSTITUTED

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. *See* SAMSUNG-1021; SAMSUNG-1022; Video at <https://uspto.cosocloud.com/p9xpz6s4jn75/>; SAMSUNG-1023.

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 '595 patent is the subject of civil action *Wilus Institute of Standards and Technology Inc., v. Samsung Electronics Co., LTD., et al.*, 2-24-cv-00746 (EDTX)

filed September 11, 2024; and *Wilus Institute of Standards and Technology Inc. v. HP Inc.*, 2-24-cv-00752 (EDTX) filed September 13, 2024. Petitioner is not aware of any disclaimers, reexamination certificates, or IPR petitions addressing the '595 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.

Petitioner consents to electronic service by email at IPR39843-0194IP1@fr.com (referencing No. 39843-0194IP1 and cc'ing PTABInbound@fr.com).

Respectfully submitted,

Dated May 13, 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 13,987 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated May 13, 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 May 13, 2025, a complete and entire copy of this Petition for Inter Partes Review and all supporting exhibits were provided by Express Mail, to the Patent Owner, by serving the correspondence address of record as follows:

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