

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Juhyung Son, et al. Attorney Docket No. 39843-0201IP1
U.S. Patent No.: 12,004,262
Issue Date: June 4, 2024
Appl. Serial No.: 17/670,419
Filing Date: February 11, 2022
Title: WIRELESS COMMUNICATION METHOD USING BSS
IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL
USING SAME

DECLARATION OF DR. CHRISTOPHER J. HANSEN, PH.D.

I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable under Section 1001 of Title 18 of the United States Code.

Date: June 29, 2025

By: 
Christopher J. Hansen

Table of Contents

I.	ASSIGNMENT.....	4
II.	QUALIFICATIONS AND BACKGROUND INFORMATION.....	4
III.	OVERVIEW OF CONCLUSIONS FORMED	9
IV.	LEVEL OF ORDINARY SKILL IN THE ART.....	9
V.	LEGAL STANDARDS	10
	A. Terminology.....	10
	B. Prior Art	11
	C. Anticipation.....	12
	D. Obviousness	12
VI.	MATERIALS CONSIDERED	16
VII.	THE '262 PATENT	19
	A. Overview of the '262 Patent	19
	B. Prosecution History of the '262 Patent.....	24
VIII.	OVERVIEW OF THE PRIOR ART	27
	A. 802.11ax/D1.0.....	27
	B. Yang 29	
	C. 802.11-2016	30
	D. 802.11-17/0250r2.....	31
	E. 802.11-16/1415r0.....	32
	F. 802.11-17-0230r1	34
IX.	MANNER IN WHICH THE PRIOR ART REFERENCES RENDER THE '262 CLAIMS UNPATENTABLE	35
	A. Ground 1A: 802.11ax/D1.0 Renders Obvious Claims 1-4.....	35
	1. Claim 1	35
	2. Claim 2	54
	3. Claim 3	55
	4. Claim 4	65
	B. Ground 1B –802.11ax/D1.0, Yang, and 802.11-2016 Render Claims 1-4 Obvious	66
	1. Combination of 802.11ax/D1.0, Yang, and 802.11-2016 (“D1.0- Yang-802.11-2016 Combination”)	66
	2. Claim 1	69
	3. Claim 2	76
	4. Claim 3	77
	5. Claim 4	85

C.	Ground 2A – Yang, 802.11-17/0250r2, and 802.11-16/1415r0 Render Claims 1, 2, and 4 Obvious.....	85
1.	Combination of Yang, 802.11-17/0250r2, and 802.11-16/1415r0 (“Yang-0250r2-1415r0 Combination”).....	85
2.	Claim 1	90
3.	Claim 2	108
4.	Claim 4	109
D.	Ground 2B – Yang, 802.11-17/0250r2, 802.11-16/1415r0, 802.11-2016, and 802.11-17-0230r1 Render Claim 3 Obvious.....	110
1.	Combination of Yang, 802.11-17/0250r2, 802.11-16/1415r0, 802.11-2016, and 802.11-17-0230r1	111
2.	Claim 3	112
X.	CONCLUSION.....	122

I. ASSIGNMENT

1. I have been retained by Counsel at Fish & Richardson P.C. on behalf of Samsung Electronics Co., Ltd. (“Samsung” or “Petitioner”) to offer technical opinions related to U.S. Patent No. 12,004,262 (“the ‘262 Patent”) (SAMSUNG-1001). I understand that Samsung is requesting that the Patent Trial and Appeal Board (“PTAB” or “Board”) institute an *inter partes* review (“IPR”) proceeding of the ‘262 Patent.

2. I have been asked to provide my independent analysis of the ‘262 Patent based on the prior art publications cited in this declaration.

3. I am not and never have been, an employee of Samsung. I received no compensation for this declaration beyond my normal hourly compensation based on my time actually spent analyzing the ‘262 Patent, the prior art publications cited below, and issues related thereto, and I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ‘262 Patent.

II. QUALIFICATIONS AND BACKGROUND INFORMATION

4. I am over the age of 18 and am competent to write this declaration. I have personal knowledge, or have developed knowledge of these technologies based upon education, training, or experience, related to the matters set forth herein.

5. My qualifications are summarized here and explained in more detail

in my curriculum vitae, which is attached as Appendix A to this report. Appendix A also includes a list of my publications and the cases in which I have testified at deposition, hearing, or trial within the past four years.

6. I received a B.S. in electrical engineering from Rensselaer Polytechnic Institute in 1987. I received an M.S. in electrical engineering from University of Massachusetts, Amherst in 1989. I received a Ph.D. in electrical engineering from University of California, Los Angeles in 1997.

7. I have over 25 years of experience working with wireless communications and IEEE standards and over 15 years of experience working in 802.11 WLAN chipsets and cellular base-station systems development.

8. A copy of my curriculum vitae listing my full employment history is included as Appendix A. I will briefly summarize aspects of my experience below.

9. From 1989 through 1992, my work focused on radio frequency (RF) and microwave systems and circuit development for radar systems and cellular (mobile) radio. This work included the development of feed-forward amplifiers used in commercial base station equipment.

10. From 1997 through 1999, I was employed by two Silicon Valley startup companies developing advanced digital communications technology for asymmetrical digital subscriber line (ADSL) and high bit-rate digital subscriber line (HDSL2) systems.

11. From 2000 through 2012, I was employed by Broadcom Corporation, where I served as system engineer for the IEEE 802.11a/b/g wireless local area network chipsets including analysis of radio and baseband DSP architectures for the physical layer design, and then project manager and lead system engineer for Broadcom's proposal to the IEEE 802.11m task group. My responsibilities focused on technology developments and contributions to a number of the IEEE 802.11 standards, and in particular the IEEE 802.11n standard which incorporated a MIMO-OFDM physical layer and enhanced MAC layer for higher throughput wireless networks. My work covered many topics including preamble design, advanced channel coding, channel estimation, and multiple antenna beamforming.

12. From June 2012 through July 2013, I was employed at Apple Inc., where I served as senior wireless system architect for analysis of the IEEE.11 wireless networks for iOS products.

13. From August 2013 to present, I have worked as a self-employed consultant while continuing to participate in the IEEE.

14. I am currently President of Covariant Corporation, which is a consulting firm that provides expertise on the IEEE 802.11 standards and product development.

15. I am named inventor on more than 125 issued patents, including many standard essential patents for the IEEE 802.11 standards. A listing of my patents is

included in my curriculum vitae, which I have included as an appendix to this declaration. I am also an author on 7 peer-reviewed technical papers, including recent research work on methods for more reliable Wi-Fi networks.

16. I have been a member of the Institute of Electrical and Electronics Engineers (“IEEE”) since 1989. I became a senior member of the IEEE in 2011. I began participating in the IEEE’s standards-setting process in January 2000.

17. During my 12 years working for Broadcom, I was one of Broadcom’s lead representatives in the IEEE 802.11 standards-setting process. Specifically, I took on a number of significant roles during the development of the IEEE 802.11h, IEEE 802.11n, and the IEEE 802.11ad amendment. For IEEE 802.11n, these roles included making multiple technical contributions and attending all meetings of the study group responsible for defining the scope of the standard and all meetings of the task group responsible for writing the standard.

18. I was significantly involved in the development of IEEE 802.11n as part of my duties at Broadcom. I attended all meetings of the High Throughput Study Group, which was responsible for defining the scope of IEEE 802.11n, and all meetings of the Task Group for 802.11n (TGn), which was responsible for writing the IEEE 802.11n specifications.

19. I was largely responsible for defining the Medium Access Controller (MAC) portion and the physical layer (PHY) of Broadcom’s IEEE 802.11n

contributions as well as technical simulations that were used to justify the design choices used in those contributions.

20. My curriculum vitae, included as an appendix to this declaration, includes a list of publications on which I am a named author. It contains further details regarding my experience, education, publications, and other qualifications to render an expert opinion in connection with this proceeding.

21. In writing this Declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of wireless networking, digital communications, and communications standards; my experience with developing and implementing the 802.11 standard; my experience in training other engineers in these subjects; and my experience in working with others involved in these fields.

22. I have no financial interest in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

23. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '262 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the earliest possible priority date. Any figures that appear within this

document have been prepared with the assistance of Counsel and reflect my understanding of the '262 Patent and the prior art discussed below.

III. OVERVIEW OF CONCLUSIONS FORMED

24. This declaration explains the conclusions that I have formed based on my analysis of all of the considered materials and my personal experience. To summarize those conclusions, based upon my knowledge and experience and my review of the prior art references listed above, I believe that:

25. Ground 1A: 802.11ax/D1.0 renders claims 1-4 obvious.

26. Ground 1B: 802.11ax/D1.0 in view of Yang and 802.11-2016 renders claims 1-4 obvious.

27. Ground 2A: Yang in view of 802.11-17/0250r2 and 802.11-16/1415r0 renders claims 1, 2, and 4 obvious.

28. Ground 2B: Yang in view of 802.11-17/0250r2, 802.11-16/1415r0, 802.11-2016, and 802.11-17-0230r1 renders claim 4 obvious.

29. In support of these conclusions, I provide an overview of the references in Section VIII and more detailed comments regarding the obviousness of claims 1-4 (“the Challenged Claims”) of the '262 Patent in Section IX.

IV. LEVEL OF ORDINARY SKILL IN THE ART

30. For purposes of this IPR, my opinion is that a person of ordinary skill in the art as of the Critical Date of the '262 Patent (“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. Increased educational experience can make up for less work experience, and vice versa.

31. My analysis in this declaration is offered from the vantage point of a POSITA. The relevant timeframe that I considered for purposes of my analysis in this declaration is the time leading up to the Critical Date of the '262 Patent. As I describe further below, I have taken April 14, 2017 to be the Critical Date, or earliest effective filing date of the '262 Patent.

32. Based on my experiences, I believe that I have a good understanding of the capabilities of a POSITA. Indeed, I have trained, participated in standards and industry organizations, and mentored many such persons over the course of my career. Based on my knowledge, skill, and experience, I have an understanding of the capabilities of a POSITA. For example, from my industry experience, I am familiar with what a POSITA would have known and found predictable in the art. Furthermore, I possess those capabilities myself.

V. LEGAL STANDARDS

A. Terminology

33. I have been informed by Counsel and understand that the best

indicator of claim meaning is its usage in the context of the patent specification as understood by a POSITA. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent's history of examination before the Patent Office. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill at the time of the earliest effective filing date of the '262 Patent (not today). The '262 Patent was filed February 11, 2022, and claims priority to three Korean applications, the earliest of which was filed April 14, 2017 (i.e., KR10-2017-0048762). For purposes of the analysis in this declaration, I refer to April 14, 2017 as the "Critical Date" of the '262 Patent. Although I have not independently verified that the Challenged Claims are actually supported by the earliest Korean application, all the prior art that I have relied upon in this declaration precedes the Critical Date. I have used the Critical Date of the '262 Patent as the point in time for claim interpretation purposes, as well as for purposes of evaluating all other matters from the perspective of a POSITA. My opinions would not change even if another date were taken as the Critical Date of the '262 Patent.

B. Prior Art

34. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as being

anticipated or obvious.

35. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art at the time of the invention, and that this viewpoint prevents one from using his or her own insight or hindsight in deciding whether a claim is anticipated or rendered obvious.

C. Anticipation

36. I understand that patents or printed publications that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

37. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

38. I understand that a prior art reference “anticipates” an asserted claim, and thus renders the claim invalid, if all limitations of the claim are disclosed in that prior art reference, either explicitly or inherently (i.e., necessarily present).

D. Obviousness

39. I understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention

was made to a POSITA.

40. I have been informed by Counsel and understand that a claim is unpatentable for obviousness and that obviousness may be based upon a combination of references. I am informed by Counsel and understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. However, I am informed by Counsel and understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.

41. I am informed by Counsel and understand that when a patented invention is a combination of known elements, a court determines whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue by considering the teachings of prior art references, the effects of demands known to people working in the field or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.

42. I am informed by Counsel and understand that a patent claim composed of several limitations is not proved obvious merely by demonstrating that each of its limitations was independently known in the prior art. I am informed by Counsel and understand that identifying a reason those elements

would be combined can be important because inventions in many instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. I am informed by Counsel and understand that it is improper to use hindsight in an obviousness analysis, and that a patent's claims should not be used as a "roadmap."

43. I am informed by Counsel and understand that an obviousness inquiry requires consideration of the following factors: (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called "secondary considerations" of non-obviousness, which include: (i) "long felt need" for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) "copying" of the claimed invention by others.

44. I have been informed by Counsel and understand that an obviousness evaluation can be based on a single reference or a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but that the nexus linking two or more prior art references is sometimes simple common sense. I have been informed by Counsel and understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the

marketplace.

45. I have been informed by Counsel and understand that if a technique has been used to improve one device, and a person of ordinary skill at the time of invention would have recognized that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

46. I have been informed by Counsel and understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I have been informed by Counsel and understand that a person of ordinary skill looking to overcome a problem will often be able to fit together the teachings of multiple prior art references. I have been informed by Counsel and understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill would have employed at the time of invention.

47. I have been informed by Counsel and understand that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill at the time of invention, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

48. I have been informed by Counsel and understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

49. In sum, my understanding is that prior art teachings are properly combined where one of ordinary skill having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

50. I have been informed by Counsel and understand that in an *inter partes* review, “the petitioner shall have the burden of proving a proposition of unpatentability,” including a proposition of obviousness, “by a preponderance of the evidence.” 35 U.S.C. §316(e).

VI. MATERIALS CONSIDERED

51. My analysis and conclusions set forth in this declaration are based on my educational background and experiences in the field (*see* Section II). Based on my knowledge and experience, I believe that I am considered to be an expert in the field. Also, based on my knowledge and experience, I understand and know of the

capabilities of persons of ordinary skill in the field around the Critical Date, and I trained, participated in organizations, and worked closely with many such persons in the field during that time frame.

52. As part of my independent analysis for this declaration, I have considered the following: the background knowledge/technologies that were commonly known to persons of ordinary skill in this art during the time before the Critical Date; my own knowledge and experiences gained from my work experience in the field of the '262 Patent and related disciplines, including work I performed reviewing and voting on the 802.11ax standard as it was developed; and my experience in working with others involved in this field and related disciplines.

53. I have reviewed the '262 Patent (SAMSUNG-1001), and relevant excerpts of the prosecution history (SAMSUNG-1002) of the '262 Patent. Among various documents and publications, I have also reviewed the following references:

Exhibit No.	Reference
SAMSUNG-1005	IEEE P802.11ax/D1.0 Draft Standard for Information technology– Telecommunications and information exchange between systems Local and metropolitan area networks– Specific requirements. Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. Amendment 6: Enhancements for High Efficiency WLAN, IEEE Computer Society (November 2016) (“802.11ax/D1.0”)
SAMSUNG-1006	U.S. Patent Publication No. 2017/0367129 A1 to Yang (“Yang”)
SAMSUNG-1007	Patil et al, IEEE 802.11-17/0250r2 Proposed resolution for

Exhibit No.	Reference
	comments related to Various CIDs in 27.5.2, IEEE Computer Society (“802.11-17/0250r2”)
SAMSUNG-1008	Patil et al, IEEE 802.11-16/1415r0 Proposed Resolution for CID 72 (BSS Color Change Procedure, IEEE Computer Society (November 2016) (“802.11-16/1415r0”)
SAMSUNG-1009	U.S. Patent Publication No. 2018/0048427 A1 to Lou, et al. (“Lou”)
SAMSUNG-10010	IEEE Std 802.11-2016, IEEE Standard for Information Technology—Telecommunications and information exchange between systems, Local and metropolitan area networks—Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, IEEE Computer Society (December 2016) (“802.11-2016”)
SAMSUNG-1011	Patil et al., IEEE 802.11-17-0230r1 (March 2017) (“802.11-17-0230r1”)
SAMSUNG-1012	Official IEEE 802.11 Working Group Project Timelines, https://ieee802.org/11/Reports/802.11_Timelines.htm
SAMSUNG-1013	Stanley, IEEE 802.11-16-1094r2 (September 2016)
SAMSUNG-1014	IEEE P802.11-REVMc/D8.0 Draft Standard for Information technology– Telecommunications and information exchange between systems Local and metropolitan area networks—Specific requirements. Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, IEEE Computer Society (August 2016) (“P802.11-REVMc/D8.0”)

54. Counsel has informed me that I should consider these materials through the lens of a POSITA as of the Critical Date of the ’262 Patent (April 14, 2017).

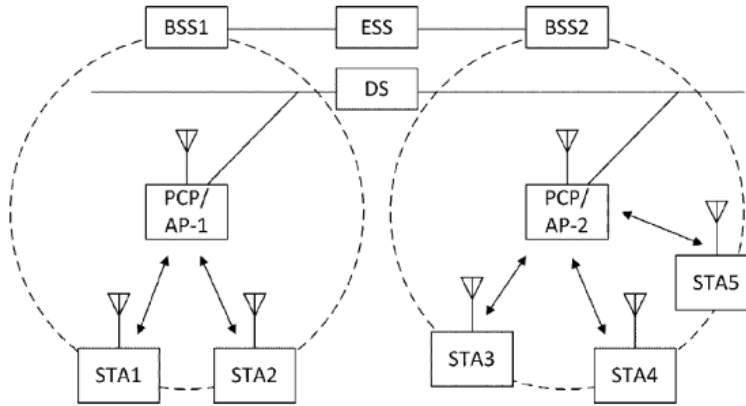
55. My analysis and conclusions set forth in this declaration are based on the perspective of a POSITA.

VII. THE '262 PATENT

A. Overview of the '262 Patent

56. The '262 Patent relates to wireless LAN technology and generally describes “a wireless communication method and a wireless communication terminal using a BSS identifier.” SAMSUNG-1001, 1:24-26. According to the '262 Patent, a “wireless LAN system includes one or more basic service sets (BSS),” where each “BSS represents a set of apparatuses which are successfully synchronized with each other to communicate with each other.” *Id.*, 7:20-8:17, FIGS 1-2. In general, the BSS may be classified as an “infrastructure BSS” (e.g., having one or more access point stations (AP STAs) and one or more non-AP STAs) or an “independent BSS (IBSS)” (e.g., having non-AP STAs only), examples of which are shown in FIGS. 1 and 2, respectively. *Id.*

57. For instance, in the example “infrastructure BSS” shown in FIG. 1, an AP STA “AP-1” and three non-AP STAs “STA1,” “STA2,” and “STA3” are members of a first BSS “BSS1.” SAMSUNG-1001, 7:31-36, FIG. 1. In contrast, an AP STA “AP-2,” and three non-AP “STA3,” STA4,” “STA5” are members of a second, different “BSS2.” *Id.*



SAMSUNG-1001, FIG. 1 (Infrastructure BSS)

58. In the example “Independent BSS” shown in FIG. 2, two non-AP STAs “STA6” and “STA7” are members of a third BSS “BSS3.” SAMSUNG-1001, 8:3-17.

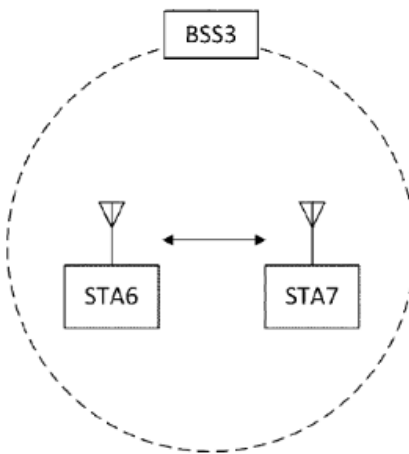


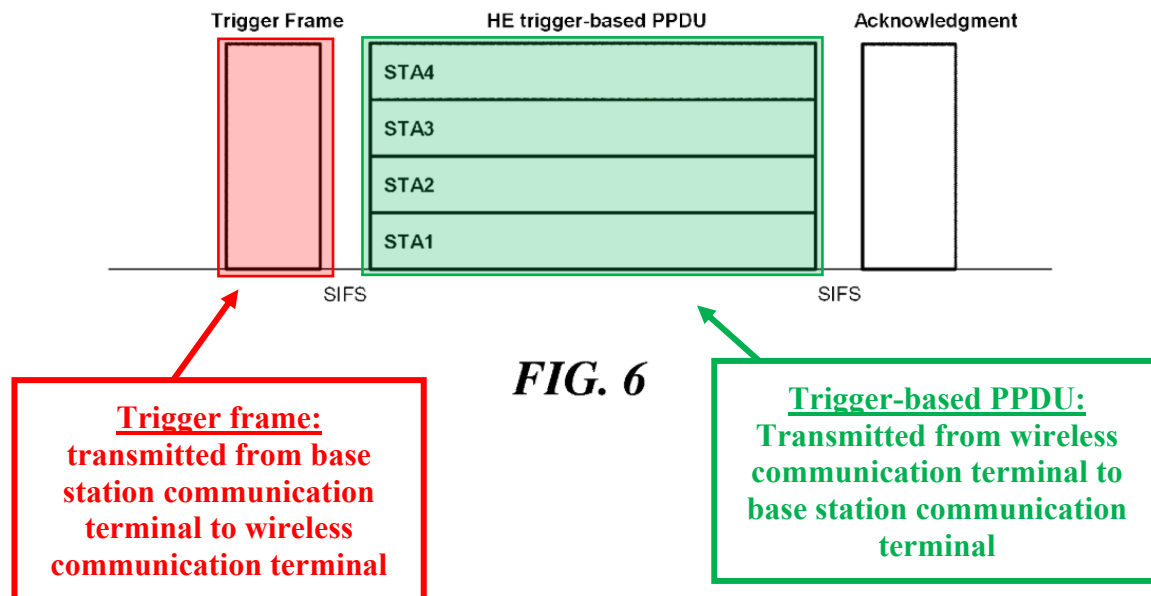
FIG. 2

SAMSUNG-1001, FIG. 2 (Independent BSS)

59. Further, the '262 Patent describes techniques whereby a STA (e.g., an AP STA) can solicit data transmission from another STA (e.g., a non-AP STA)

through the use of a trigger frame. SAMSUNG-1001, 11:31-12:8, FIG. 6.

60. For example, FIG. 6 shows example transmissions between a “base wireless communication terminal” (an alternative term for an AP STA) and a “wireless communication terminal” (an alternative term for a non-AP STA). *Id.*



SAMSUNG-1001, FIG. 6 (annotated)

61. In this example, “[t]he base wireless communication terminal may transmit a trigger frame including trigger information for triggering transmission of at least one wireless communication terminal.” SAMSUNG-1001, 11:35-38.

62. In response, “[a]t least one wireless communication terminal receiving the trigger frame ... may transmit a trigger based PPDU [physical layer protocol data unit] based on the trigger information.” SAMSUNG-1001, 11:39-45. In

particular, “[t]he trigger based PPDU may indicate a PPDU including a response frame to a trigger frame,” such as “an HE [high efficiency] trigger-based PPDU.” *Id.* Further, “[o]ne or more wireless communication terminals may simultaneously transmit a trigger-based PPDU to the base wireless communication terminal using at least one of MU-MIMO and OFDMA,” such as by “transmit[ting] the trigger-based PPDU within a predetermined time from receiving a trigger frame including trigger information or UMRS.” *Id.*, 11:45-52.

63. Further, the '262 Patent describes that a PPDU having a trigger frame can include information regarding the identity of a specific BSS (referred to as the “BSS color”) for transmitting a responsive trigger-based PPDU. SAMSUNG-1001, 30:6-67, FIG. 14. *See also id.*, 20:1-2 (“the BSS color is one kind of BSS identifier”).

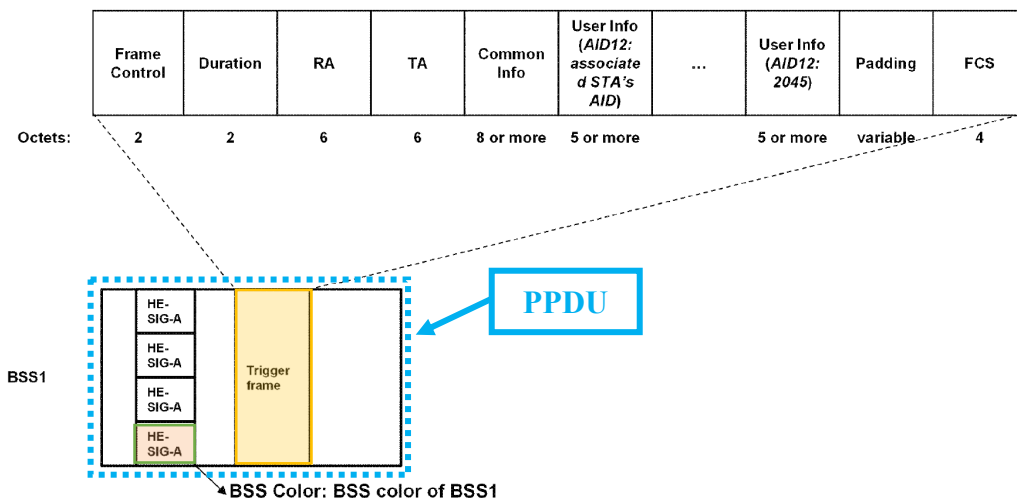


FIG. 14

SAMSUNG-1001, FIG. 14 (annotated)

64. For example, “[w]hen the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, [a] wireless communication terminal ... may set a value of the BSS color indicated by the trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame.” SAMSUNG-1001, 54:25-30.

65. Alternatively, “[i]f the PPDU containing the trigger frame does not indicate BSS color, the wireless communication terminal ... may set a value of the BSS color indicated by the trigger-based PPDU according to the active BSS color of the wireless communication terminal” (i.e., “the BSS color actually used by the wireless communication terminal”). SAMSUNG-1001, 54:30-37.

66. Further, the ’262 Patent describes that a base communication terminal can initiate a change in BSS color. For example, “the wireless communication terminal ... may receive information on the BSS color change from the base wireless communication terminal,” including a “BSS color change time point.” SAMSUNG-1001, 54:37-44. “[W]hen the BSS color change time point indicated by the information on the BSS color change is reached, the wireless communication terminal ... may set the active BSS color to a value of the BSS color indicated by the information on the BSS color change.” *Id.* In at least some cases, “the BSS color change time point may be set based on a target beacon transmission time transmitted by the base wireless communication terminal.” *Id.*,

53:45-47.

B. Prosecution History of the '262 Patent

67. The '262 Patent issued on June 4, 2024 from U.S. Patent Application No. 17/670,419 (“the '419 application”), which was filed on February 11, 2022 with four claims. SAMSUNG-1002, 746-751, 774-910. During the course of prosecution, the Examiner repeatedly rejected the claims of the '419 application on (i) double patenting grounds in view of claims of a parent patent (i.e., U.S. Patent No. 11,284,475 B2), (ii) double patenting grounds in view of claims 21-23 of a co-pending application (i.e., U.S. Application No. 17/670,424) (provisional rejections), and (iii) prior art grounds in view of various combinations of U.S. Patent Pub. No. US 2017/0325202 to Verma (“Verma”); U.S. Patent Pub. No. 2018/0110046 to Patil, et al. (“Patil”); US 2018/0146426 to Park, et al. (“Park”); and/or U.S. Patent Pub. No. 2017/0367129 to Yang, et al. (“Yang”). SAMSUNG-1002, 245-436.

68. In Applicant’s reply dated December 11, 2023, Application amended each of the independent claims to recite “wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,” and argued that the cited references failed to disclose or render obvious at least the following limitations recited in each of the independent claims:

(i) “when the format of the PPDU including the trigger frame is a PPDU

format in which a physical layer signaling field including the field for indicating the BSS is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal,” and

(ii) “the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element.”

SAMSUNG-1002, 223-233.

69. The Examiner allowed the claims in view of Applicant’s amendments and arguments, and in view of Applicant filing terminal disclaimer with respect to U.S. Patent No. 11,284,475 B2 and U.S. Application No. 17/670,424.

SAMSUNG-1002, 34-44, 218-220.

70. After allowance of the claims and concurrently with paying the issue fee, Applicant amended each of the independent claims as follows:

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color to be indicated by a trigger-based PPDU based on ~~the value of~~ the BSS color indicated by the ~~PPDU including the trigger frame field~~,

when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

SAMSUNG-1002, 26-30.

71. The examiner entered these post-allowance claim amendments.

SAMSUNG-1002, 18-19.

72. Despite the allowance, there is no indication that the Examiner considered 802.11ax/D1.0, which in my opinion renders obvious the Challenged Claims as set forth in Ground 1A. *See* Section IX.A.

73. Further, although the Examiner indicated that he considered Yang, there is no indication that the Examiner considered Yang in combination with 802.11ax/D1.0 and 802.11-2016, which in my opinion renders obvious the Challenged Claims as set forth in Ground 1B. *See* Section IX.B. Indeed, the limitations that purportedly were not described in the references cited during prosecution are rendered obvious in view of at least 802.11ax/D1.0. *See* Section IX.B.2, [1.5], [1.7].

74. Further, although the Examiner indicated that he had considered Yang and 802.11-16/1415r2 (a revised version of 802.11-16/1415r0 cited in this Petition), in my opinion there is no indication that the Examiner considered Yang and either of 802.11-16/1415r0 or 802.11-16/1415r2 in combination 802.11-17/0250r2, 802.11-2016, or 802.11-17-0230r1, which renders obvious the Challenged Claims as set forth in Grounds 2B and/or 2C. *See* Sections IX.C-D. Indeed, the limitations that purportedly were not described in the references cited during prosecution are rendered obvious in view of at least 802.11-17/0250r2. *See*

Section IX.C.2 [1.5], [1.7].

VIII. OVERVIEW OF THE PRIOR ART

A. 802.11ax/D1.0

75. 802.11ax/D1.0 is a draft specification “[p]repared by the 802.11 Working Group of the LAN/MAN Standards Committee of the IEEE Computer Society,” and represents a proposed amendment to the then-existing “IEEE P802.11REVmc/D8.0” draft standard, later finalized as 802.11-2016. SAMSUNG-1005, 1:1-2:7; SAMSUNG-1011 (“IEEE Std P802.11-2016” receiving final approval from the revision committee (“RevCom”) in December 2016 after ballot approval of draft D8.0 in September 2016); SAMSUNG-1012, Introduction (“P80.211REVmc Draft 8.0 ... approved by the 802.11 working group on 2016-09-14). *See generally* SAMSUNG-1014 (having similar disclosure as 802.11-2016). SAMSUNG-1005, 1:1-2:7. The proposed amendment at least in part “defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer for high efficiency operation in frequency bands between 1 GHz and 6 GHz.” SAMSUNG-1005, 2:1-3.

76. Among other features, 802.11ax/D1.0 proposes enhancements relating to basic service set (BSS) color. 802.11ax/D1.0 explains that “BSS Color is an identifier of the BSS and is used to assist a receiving STA [station] in identifying the BSS from which a PPDU originates,” and can be signaled between STAs in

order to coordinate communications between them. SAMSUNG-1005, 36-39. A BSS (Basic Service Set) can include a group of wireless devices that communicate with each other using a single access point (AP) (e.g., in infrastructure mode) or directly with each other (e.g., in ad-hoc mode).

77. For example, 802.11ax/D1.0 discloses that a first STA (e.g., an AP STA) can transmit a PPDU including a trigger frame to a second STA (e.g., a non-AP STA), which triggers the transmission of a responding “trigger-based PPDU” from the second STA to the first STA. SAMSUNG-1005, 167:42-170:16. *See also* SAMSUNG-1005, Section 27.5.2.3. Among other information, the trigger frame can include a field signaling the BSS color of the first STA, which allows the second STA to synchronize its communications with the first STA (e.g., by using the signaled BSS color for the trigger-based PPDU in responding to the first STA). SAMSUNG-1005, 226:22-27, 196:33-197-28.

78. 802.11ax/D1.0 also discloses specific techniques that allow STAs to dynamically change BSS colors during operation (e.g., when an AP STA detects that other neighboring AP STAs are using the same BSS color). SAMSUNG-1005, 206:22-60. For example, 802.11ax/D1.0 discloses techniques that allow an AP STA to “announce” a BSS color change to one or more non-AP STAs, including timing information that coordinate the change in BSS color. *Id.*

B. Yang

79. Yang discloses “a system and method for digital communications, and, in particular embodiments, to a system and method for changing an identifier of a basic service set (BSS).” SAMSUNG-1006, [0001].

80. Yang discloses an example “processing system” for performing these methods. SAMSUNG-1006, [0095], FIG. 12. Among other components, this example processing system includes a “processor” (described as “any component or collection of components adapted to perform computations and/or other processing related tasks”). SAMSUNG-1006, [0095], FIG. 12.

81. Yang also discloses “a transceiver” that is “adapted to transmit and receive signaling over a telecommunications network” and “may be installed in a host device.” SAMSUNG-1006, [0098], FIG. 13.

82. Further, Yang discloses a technique whereby an AP triggers a transmission by a non-AP through the use of a trigger frame. Specifically, Yang discloses that an AP “may send a Trigger frame to [a] trigger station to transmit on the UL as a part of an UL MU transmission,” and “[s]ubsequently, [the] station ... transmits a HE Trigger-based PPDU (such as HE Trigger-based PPDU 260 in FIG. 2D).” SAMSUNG-1006, [0047]. As Yang explains, the “Trigger frame” may “grant[] the station a UL transmission opportunity” (e.g., to transmit a trigger-based PPDU to the AP in response to the trigger frame). SAMSUNG-1006,

[0049].

83. Further, Yang discloses several different “high efficiency (HE) physical (PHY) protocol data unit (PPDU) formats,” each of which includes an “HE-SIG-A field’ with “a BSS Color subfield, which contains a 6-bit identifier of the BSS (referred to as a BSS Color) that the transmitting station or AP belongs to.” SAMSUNG-1006, [0032], [0034], FIGS. 2A-2D. Specifically, “[t]he BSS Color is used to assist a receiving station or AP in identifying the BSS from which the received PPDU originates so that the station may use the channel access rules for spatial reuse or may enter a doze state of a power save (PS) mode.” SAMSUNG-1006, [0034].

C. 802.11-2016

84. 802.11-2016 is a specification “[p]repared by the 802.11 Working Group of the LAN/MAN Standards Committee of the IEEE Computer Society.” SAMSUNG-1010, p.1. 802.11-2016 details, among other features, “[t]echnical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions,” and “gives users, in one document, the IEEE 802.11 standard for wireless local area networks (WLANs) with all of the amendments that have been published to date” (i.e., December 2016). SAMSUNG-1010, p.2, 10.

85. As discussed above, 802.11-2016 was published after the preceding “P802.11REVmc/D8.0” draft standard received (i) ballot approval from the 802.11 working group in September 2016 and (ii) final approval from the revision committee in December 2016. SAMSUNG-1005, 1:1-2:7; SAMSUNG-1011; SAMSUNG-1012, Introduction.

D. 802.11-17/0250r2

86. 802.11-17/0250r2 is a document submitted for consideration by the IEEE 802.11 working group in connection with the development of the IEEE 802.11ax standard, and includes proposed revisions with respect to several features described in Section 27.5.2 of the then-current working draft of the standard, referring to “UL MU operation.” SAMSUNG-1007, Title, p.2 (“A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft,” and “[e]diting instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).”). *See also* SAMSUNG-1005, Section 27.5.2 (“UL MU operation”).

87. Among other features, 802.11-17/0250r2 discloses specific techniques for signaling BSS color between an AP and a STA in the context of trigger-based PPDU transmissions. SAMSUNG-1007, p.17-20.

88. In particular, 802.11-17/0250r2 discloses that “[a] non-AP HE STA

transmitting an HE trigger-based PPDU in response to a Trigger frame sets a TXVECTOR parameter” differently, depending on certain conditions.

SAMSUNG-1007, p. 17. For instance, for the “BSS_COLOR” parameter specifically, “[i]f the preceding Trigger frame was received in an HE PPDU,” the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the RXVECTOR parameter BSS_COLOR of the HE PPDU” (representing the BSS color identified in the BSS Color subfield of the HE-SIG-A field of the received PPDU). SAMSUNG-1007, p. 17.

89. However, “[i]f the Trigger frame was received in a non-HE PPDU” (i.e., in which the “HE-SIG-A field” with “a BSS Color subfield” is not present), the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the BSS Color subfield of the most recently received HE Operation element for that BSS.” SAMSUNG-1007, p.17.

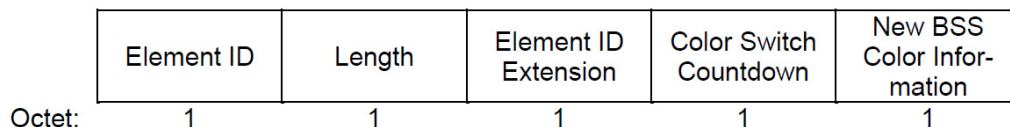
E. 802.11-16/1415r0

90. 802.11-16/1415r0 is a document submitted for consideration by the IEEE 802.11 working group in connection with the development of the IEEE 802.11ax standard, and includes proposed revisions with respect to the “BSS Color Change Procedure” described in the then-current working draft of the standard. SAMSUNG-1008, Title, p.2 (“A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax

Draft,” and “[e]diting instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).”).

91. Among other features, 802.11-16/1415r0 discloses a “BSS Color Change Procedure” that allows an AP to cause a new BSS color to be used at a specific time by each device of the BSS, and without requiring the use of an additional “Transitory BSS Color.” *See generally* SAMSUNG-1008.

92. In particular, 802.11-16/1415r0 discloses a “BSS Color Change Announcement element [that] is used by an HE AP to advertise a BSS Color change and the value of the new BSS color.” SAMSUNG-1008, p.6. An example of a “BSS Color Change Announcement element” is provided in the first figure on p.6.



SAMSUNG-1005, p.6

93. Among other fields, “BSS Color Change Announcement element” includes a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color.” SAMSUNG-1008, p.6.

94. Further, when advertising the new BSS Color, the AP STA also

provides the non-AP STA with timing information (“Color Switch Countdown”) regarding when the BSS Color change information occurs (e.g., such that the non-AP STA can synchronize the BSS color change with the AP STA in order to maintain communications between them).

F. 802.11-17-0230r1

95. 802.11-17-0230r1 is a document submitted for consideration by the IEEE 802.11 working group in connection with the development of the IEEE 802.11ax standard, and includes proposed revisions with respect to a “Multiple BSSID set” described in the then-current working draft of the standard. SAMSUNG-1011, Title, p.2 (“A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft,” and “[e]diting instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).”).

96. Among other features, 802.11-17-0230r1 discloses a technique for determining whether a PPDU is an inter-BSS PPDU or an intra-BSS PPDU based at least the PARTIAL_AID. For example, 802.11-17-0230r1 discloses that when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the

Partial BSS Color field in the most recently received HE Operation element is 1, a frame is a “intra-BSS frame.” SAMSUNG-1011, p.10.

97. However, when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame (e.g., a PPDU frame) is a “inter-BSS frame.” SAMSUNG-1011, p.10.

IX. MANNER IN WHICH THE PRIOR ART REFERENCES RENDER THE ‘262 CLAIMS UNPATENTABLE

A. Ground 1A: 802.11ax/D1.0 Renders Obvious Claims 1-4

98. 802.11ax/D1.0 renders obvious all limitations of claims 1-4.

1. Claim 1

99. 802.11ax/D1.0 renders obvious claim 1.

[1.pre] A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

100. To the extent that the preamble is limiting, 802.11ax/D1.0 renders obvious [1.pre].

101. 802.11ax/D1.0 discloses a “[h]igh efficiency (HE) STA”¹ configured to conduct wireless communications, such as in “frequency bands between 1 GHz and 5 GHz. SAMSUNG-1005, 9:1-65. *See also* SAMSUNG-1005, Section 28 “High Efficiency (HE) PHY specification” (e.g., SAMSUNG-1005, 212:45-58, describing “protocol functions” including “[a] function that defines the characteristics and method of transmitting and receiving data through a wireless medium between two or more STAs”). As 802.11ax/D1.0 explains, the term “HE STA” can refer either to “an AP STA”² (*base wireless communication terminal*) or “a non-AP STA”³ (*wireless communication terminal wirelessly communicating with the base wireless communication terminal*). SAMSUNG-1005, 209:54.

[1.1] a transceiver configured to transmit and receive wireless signals; and

102. 802.11ax/D1.0 renders obvious [1.1].

¹ The term “STA” would be understood to include a “station” or device for wireless communications. *See also* SAMSUNG-1005, 6:41-42.

² The term “AP STA” would be understood by a POSITA to refer to an “access point station” for wireless communications.

³ The term “non-AP STA” would be understood by a POSITA to refer to a station other than an access point station, such as a client device.

103. For example, 802.11ax/D1.0 discloses that a “STA” (e.g., a non-AP STA) can employ techniques that “allow multiple STAs to transmit simultaneously over the same frequency resource to the receiver,” a concept that is “very similar to SU-MIMO where multiple space-time streams are transmitted simultaneously over the same frequency resource utilizing spatial multiplexing through multiple antennas at the transmitter and receiver”) (*a transceiver configured to transmit and receive wireless signals*). SAMSUNG-1005, 239:56-62. Further, 802.11ax/D1.0 provides several “transmitter block diagrams,” each depicting example configurations of “blocks” or functional modules for transmitting wireless signals. *See generally* SAMSUNG-1005, 242:32-249:38.

104. To the extent that 802.11ax/D1.0 does not expressly disclose a “transceiver,” a POSITA would have found it obvious in view of 802.11ax/D1.0 to configure a STA (e.g., a non-AP STA) to include a transceiver, e.g., including “multiple antennas,” a “transmitter,” and a “receiver,” in order to facilitate the transmission of wireless signals to and the reception of wireless signals from other devices, such as in accordance with 802.11ax/D1.0’s example “transmitter block diagrams.” SAMSUNG-1005, 242:32-249:38.

105. Further, a POSITA would have appreciated that it was well-known by the Critical Date for a wireless device to include “a transceiver adapted to transmit and receive signaling over the telecommunications network,” for example by

“transmit[ting] and receiv[ing] signaling over a wireless medium” (*a transceiver configured to transmit and receive wireless signals*). See also SAMSUNG-1006, [0098]-[0099], FIG. 13.

[1.2] a processor configured to process the wireless signals,

106. 802.11ax/D1.0 renders obvious [1.1].

107. As discussed with respect to [1.1], 802.11ax/D1.0 provides several “transmitter block diagrams,” each depicting example configurations of “blocks” or functional modules for transmitting wireless signals. See generally SAMSUNG-1005, Section 28.3.5.

108. To the extent that 802.11ax/D1.0 does not expressly disclose a “processor” configured to process wireless signals, a POSITA would have understood that it was commonplace to use one or more processors to perform computer operations like those recited in claim 1. See also SAMSUNG-1006, [0095], [0098] (“signal processor 1310 [which] may include any component or collection of components adapted to convert a baseband signal into a data signal suitable for communication over the device-side interface(s) 1312, or vice-versa”), FIGS. 12-13. A POSITA would have found it obvious in view of 802.11ax/D1.0 to configure a STA (e.g., a non-AP STA) to include a “processor” to facilitate at least the transmission of wireless signals to other devices, such as in accordance with the operations depicted in 802.11ax/D1.0’s “transmitter block diagrams.”

109. Further, a POSITA would have found it obvious in view of 802.11ax/D1.0 to configure such a processor to perform each of the operations recited in claim 1. *See* [1.3]-[1.7].

[1.3] wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

110. 802.11ax/D1.0 renders obvious [1.3].

111. 802.11ax/D1.0 discloses that an HE AP (***base wireless communication terminal***) “uses [a] Trigger frame to initiate MU OFDMA or MU-MIMO transmissions in the UL direction.” Further, 802.11ax/D1.0 discloses specific operation modes whereby a STA (e.g., a non-AP STA) (***wireless communication terminal***) sends a HE-trigger based PPDU in response to the Trigger frame. SAMSUNG-1005, 167:42-170:16 (e.g., “A STA shall not send an HE trigger-based PPDU unless it is explicitly triggered by an AP in one of the operation modes described in this subclause”).

112. Specifically, “[t]he “Trigger frame identifies non-AP STAs (***wireless communication terminals***) participating in the MU UL transmissions and assigns transmission resources.” SAMSUNG-1005, 9:60-65. For instance, a “Trigger frame solicits and allocates resources for UL MU transmissions a SIFS after the PPDU that carries the Trigger frame” and “carries other information required by the responding STA to send an HE trigger-based PPDU.” SAMSUNG-1005,

41:36-39 (emphasis added).

113. In view of 802.11ax/D1.0, a POSITA would have understood that 802.11ax/D1.0's STA (e.g., non-AP STA) *receives a PPDU including a trigger frame*, and in response to the trigger frame “send[s] a HE trigger-based PPDU (*...for triggering transmission to the base wireless communication terminal*). See also SAMSUNG-1005, 42:56-57 (describing the signaling of example parameters of a “HE trigger-based PPDU that is the response to the Trigger frame”); 43:7-48:17.

114. Further, a POSITA would have understood that such a trigger frame *indicates specific resource units that are allocated to the STA* (e.g., by “solicit[ing] and allocat[ing] resources” for the transmission of the trigger-based PPDU). SAMSUNG-1005, 41:36-39. For example, 802.11ax/D1.0 discloses that “[t]he frame format for the Trigger frame” includes one or more “User Info” fields. SAMSUNG-1005, 41:37-54, FIG. 9-52c.

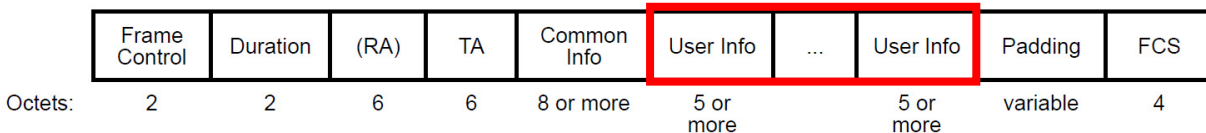


Figure 9-52c—Trigger frame

SAMSUNG-1005, FIG. 9-52c (annotated)

115. Further, 802.11ax/D1.0 discloses that a “User Info” field of the trigger frame includes a “RU Allocation subfield” that “indicates the RU used by the HE

trigger-based PPDU of the STA identified by the AID12 subfield” (*the trigger frame indicates a resource unit which is allocated to the wireless communication terminal*). SAMSUNG-1005, 45-19-46:56; FIG. 9-52e.

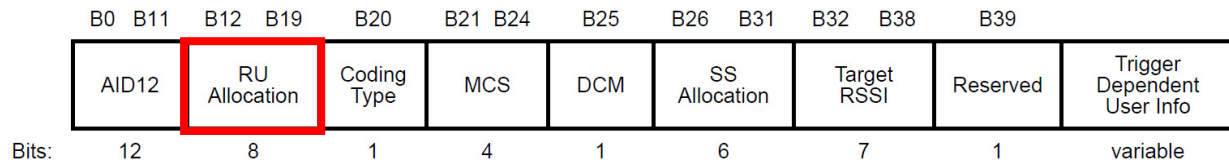


Figure 9-52e—User Info field

SAMSUNG-1005, FIG. 9-52e (annotated)

See also SAMSUNG-1005, Section 28.3.3.2 (defining specific “resource units (RUs)” for downlink and uplink transmission, such as for “HE trigger-based PPDU formats”); 172:32-34 (describing that, in certain “random access” use cases, a STA can “randomly select resource units (RUs) assigned by an AP in a soliciting Trigger frame that contains RUs for random access”); 45:34-43 (describing a “User Info field” in the trigger frame that “identifies an RU for random access” and a “RU Allocation subfield in the User Info field” that “indicates that RU used by the HE-trigger-based PPDU of the STA”).

[1.4], [1.9] when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color to be indicated by a trigger-based PPDU based on the BSS color indicated by the field, ... wherein the BSS color is one of identifiers identifying a BSS

116. 802.11ax/D1.0 renders obvious [1.4] and [1.9].

117. 802.11ax/D1.0 discloses several different formats for a PPDU,

including several “high efficiency” (HE) *physical layer PPDU formats*.

SAMSUNG-1005, Sections 28.1.1 (“Clause 28 specifies the PHY entity for a high efficiency (HE) orthogonal frequency division multiplexing (OFDM) system”); Section 28.3.4 (describing several “HE PPDU formats,” including “HE SU PPDU,” “ME MU PPDU,” “HE extended range SU PPDU,” and “HE trigger-based PPDU”). *See also* SAMSUNG-1005, Section 28.1.4 (describing “PPDU formats” generally).

118. For example, 802.11ax/D1.0 discloses that HE physical layer PPDU formats (e.g., including an “HE SU PPDU,” an “HE extended range SU PPDU,” and “HE MU PPDU”) include an HE-SIG-A field including a “BSS Color field” that indicates “an identifier of the BSS” (*at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included ... wherein the BSS color is one of identifiers identifying a BSS*). SAMSUNG-1005, Table 28-16 (273:63), Table 28-17 (276:38).

B8-B13	BSS Color	6	The BSS Color field is an identifier of the BSS
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SAMSUNG-1005, Table 28-16 (HE-SIG-A field of an HE SU PPDU and HE extended range SU PPDU) (273:63) (annotated)

B5-B10	BSS Color	6	The BSS Color field is an identifier of the BSS
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SAMSUNG-1005, Table 28-17 (HE-SIG-A field of an HE MU PPDU) (276:38)

(annotated)

119. For these HE PPDU formats, “[t]he structure of the PPDU transmitted by an HE STA is determined by TXVECTOR parameters” generated by the HE STA. SAMSUNG-1005, 213:31-35. Specifically, “[u]sing the TXVECTOR, the MAC [Media Access Control layer] supplies the PHY [Physical layer] with per-PPDU transmit parameters.” SAMSUNG-1005, 214, 11-12.

120. Further, a device (e.g., a STA) receiving a PPDU generates a corresponding RXVECTOR reporting the contents of the received PPDU. Specifically, “[u]sing the RXVECTOR, the PHY informs the MAC of the received PPDU parameters.” SAMSUNG-1005, 214, 11-12.

121. In view of 802.11ax/D1.0, a POSITA would have recognized that a device transmitting a PPDU would refer to a TXVECTOR for specific parameters to include in the PPDU, and would include such parameters in one or more physical layer signaling fields in the PPDU (e.g., a HE-SIG-A field, including a BSS Color field).

122. Further, a POSITA would have recognized that a device receiving the PPDU generates an RXVECTOR reporting the parameters included in the received PPDU (e.g., the contents of a HE-SIG-A field, including a BSS Color field). *See also* SAMSUNG-1005, 369:33-37 (“After RL-SIG, the PHY entity shall receive two symbols of HE-SIG-A immediately followed by HE-STF. The PHY entity

shall check CRC of HE-SIG-A. If the CRC check is valid, the PHY entity shall report TXOP, BSS Color and check Format field” from the received HE-SIG-A); SAMSUNG-1010, Section 8.3.5.13 (describing that a “PHY-RXSTART.indication” primitive is used to “indicat[e] by the PHY to the local MAC entity that the PHY has received a valid start of a PPDU, including a valid PHY header” and includes a parameter “RXVECTOR” that “represents a list of parameters that the PHY provides the local MAC entity upon receipt of a valid PHY header.”).

123. Specifically, 802.11ax/D1.0 discloses that the TXVECTOR and the RXVECTOR can each include a field “BSS_COLOR,” which “is an identifier of the BSS and is used to assist a receiving STA in identifying the BSS from which a PPDU originates.” SAMSUNG-1005, 226:22-27, 196:33-197-28.

BSS_COLOR	FORMAT is HE_SU, HE_MU, HE_EXT_SU or HE_TRIG	Set to a value of the AP's choosing within the range 0 to 63 (see 27.11 (Setting TXVECTOR parameters for an HE PPDU)).	Y	Y
	Otherwise	Not present	N	N

SAMSUNG-1005, Table 28-1 (226:22-27) (annotated)

124. In view of 802.11ax/D1.0, a POSITA would have recognized that the “BSS_COLOR” field indicates either the contents of the BSS Color field of a PPDU that will be transmitted by the device (e.g., in the case of BSS_COLOR in a TXVECTOR) or the contents of the BSS Color field of a PPDU that was received

by the device (e.g., in the case of BSS_COLOR in a RXVECTOR). BSS_COLOR in an RXVECTOR at a non-AP STA, for example, would be set according to the BSS_COLOR provided in the trigger frame including the corresponding HE-SIG-A field having a BSS_COLOR field. *Id.*

125. 802.11ax/D1.0 further discloses that a STA transmits a trigger-based PPDU differently, depending on whether the RXVECTOR includes the “BSS_COLOR” field (representing whether the trigger frame includes the corresponding HE-SIG-A field having a BSS Color field). SAMSUNG-1005, Section 27.5.2.3 (“STA behavior”). For example, “[a] STA transmitting an HE trigger-based PPDU in response to a Trigger frame sets the TXVECTOR parameter” of the HE trigger-based PPDU differently based on criteria specified in 802.11ax/D1.0. *Id.* For the “BSS_COLOR” parameter specifically, “[i]f the preceding Trigger frame was received in an HE PPDU” (*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included*), 802.11ax/D1.0 explains that the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the RXVECTOR parameter BSS_COLOR of the HE PPDU” (*...set a value of a BSS color to be indicated by a trigger-based PPDU based on the BSS color indicated by the field*).

[1.5], [1.7] when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal; ... wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element

126. 802.11ax/D1.0 renders obvious [1.5] and [1.7].

127. As discussed above with respect to [1.4], 802.11ax/D1.0 discloses that a STA transmits a trigger-based PPDU differently, depending on whether the RXVECTOR includes the “BSS_COLOR” field (representing whether the trigger frame includes the corresponding HE-SIG-A field having a BSS Color field). SAMSUNG-1005, Section 27.5.2.3 (“STA behavior”).

128. In particular, 802.11ax/D1.0 discloses that in the RXVECTOR for a received PPDU, the “BSS_COLOR” field is included in HE PPDU formats (i.e., “HE_SU,” “HE_MU,” “HE_EXT_SU,” and “HE_TRIG”), and is otherwise “[n]ot present.” SAMSUNG-1005, 226:23-27.

BSS_COLOR	FORMAT is HE_SU, HE_MU, HE_EXT_SU or HE_TRIG	Set to a value of the AP's choosing within the range 0 to 63 (see 27.11 (Setting TXVECTOR parameters for an HE PPDU)).	Y	Y
	Otherwise	Not present	N	N

SAMSUNG-1005, Table 28-1 (226:22-27) (annotated)

129. Further, “[i]f the Trigger frame was received in a non-HE PPDU” (i.e., in which the “BSS_COLOR” field of the RXVECTOR is “[n]ot present,” indicating an absence of a BSS Color field in the PPDU) (***when the format of the***

PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included), the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the BSS Color subfield of the most recently received HE Operation element for that BSS.” (*...set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, where the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element*). SAMSUNG-1005, 168:15-16.

130. A POSITA would have understood that “the value of the BSS Color subfield of the most recently received HE Operation element for that BSS” (as disclosed by 802.11ax/D1.0), would have been “the active BSS color” that is “actually used by the wireless communication terminal and set by an Operation element,” as called for in [1.5].

131. In particular, according to 802.11ax/D1.0, upon receiving a trigger frame with a HE-SIG-A field with a BSS Color field, a STA would transmit a trigger-based PPDU using the BSS color indicated by that BSS Color field, thereby “actually using” the indicated BSS color. *See* [1.4]. This BSS color also would have been indicated in a “BSS Color subfield of the HE Operation” transmitted to the STA. *See, e.g.,* SAMSUNG-1005, 196:36-52 (“[a]n HE STA transmitting an

HE Operation element shall select a value in the range 1 to 63 to include in the BSS Color subfield of the HE Operation element that it transmits and shall maintain that single value of the BSS Color subfield for the lifetime of the BSS. An HE STA that transmitted an HE Operation element shall set the TXVECTOR parameter BSS_COLOR of an HE PPDU to the value indicated in the BSS Color subfield of its HE Operation element.”).

132. Further, a 802.11ax/D1.0 teaches that if no further trigger frames having the BSS Color field are subsequently received (e.g., if the subsequent trigger frames were non-HE PPDU that do not include the BSS Color Field in the HE-SIG-A field), the STA would continue using the most recently indicated BSS Color subfield in an “HE Operation element” transmitted to the STA, as 802.11ax/D1.0 teaches that the indicated BSS color subfield is intended to be “maintained ... for the lifetime of the BSS.” SAMSUNG-1005, 168:15-16, 196:36-52.

133. Petitioner’s mapping of [1.5] to IEEE 802.11ax/D1.0 is also consistent with the disclosure of the ’262 Patent regarding the use of an “active BSS color,” which may be set to “the value of the BSS Color field of the HE-SIG-A field of the PPDU and the value of the BSS Color field of the HE Operation element”:

The wireless communication terminal may set the value of the BSS color received from the base wireless communication terminal to the value of the active BSS color. In this case, the active BSS color may

indicate a BSS color actually used by the wireless communication terminal. In more detail, the BSS color set by the wireless communication terminal to the value of the BSS Color field of the HE-SIG-A field of the PPDU and the value of the BSS Color field of the HE Operation element may be referred to as an active BSS color. Therefore, the wireless communication terminal may set the value of the active BSS color to the value of the BSS color indicated by the PPDU transmitted by the wireless communication terminal. Specifically, the wireless communication terminal sets the value of the active BSS color to the value of the BSS Color field of the HE-SIG-A field of the PPDU transmitted by the wireless communication terminal. For example, the base wireless communication terminal may set the value of the active BSS color with BSS_COLOR of the TXVECTOR parameter and set the value of the active BSS color in the BSS Color field of the HE-SIG-A field of the PPDU.

SAMSUNG-1005, 20:29-49.

[1.6] transmit the trigger-based PPDU based on the trigger frame,

134. 802.11ax/D1.0 renders obvious [1.6].

135. As discussed with reference to [1.3], 802.11ax/D1.0 discloses that a STA (e.g., a non-AP STA) (***wireless communication terminal***) sends a HE-trigger based PPDU in response to the Trigger frame (***transmit the trigger-based PPDU based on the trigger frame***). SAMSUNG-1005, 167:42-170:16 (e.g., “A STA shall not send an HE trigger-based PPDU unless it is explicitly triggered by an AP in one of the operation modes described in this subclause”). *See also* SAMSUNG-

1005, Section 27.5.2.3 (“A STA transmitting an HE trigger-based PPDU in response to a Trigger frame sets the TXVECTOR parameter as follows ...”).

[1.8] wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change, and

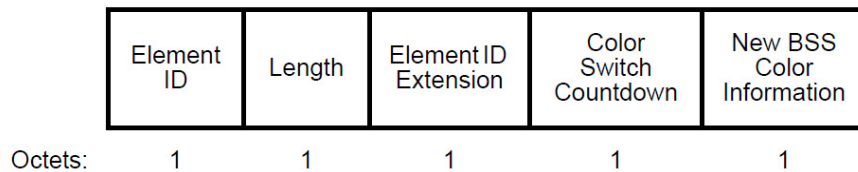
136. 802.11ax/D1.0 renders obvious [1.8].

137. 802.11ax/D1.0 discloses “a HE AP *[base wireless communication terminal]* that sets up a BSS selects a BSS Color as defined in 27.11.4 (BSS_COLOR),” and “may choose to change the BSS Color under certain conditions” (e.g., “when it detects that there is at least one other OBSS [overlapping BSS] AP in the neighborhood that uses the same color as the BSS Color of its BSS”). SAMSUNG-1005, 206:24-27. *See also* SAMSUNG-1005, 190:6-9 (referring to “Overlapping basic service sets (OBSSs)”).

138. Specifically, “[a]n HE AP shall announce its decision to change the BSS Color via the BSS Color Change Announcement element which is carried in the Beacon, Probe Response and (Re)Association Response frames” and “may also advertise the BSS Color change event via the HE BSS Color Change announcement frame.” SAMSUNG-1005, 206:31-37. “The BSS Color change announcement should be advertised for a period of time that is sufficient for all STAs in the BSS, including STAs in power save mode, to have the opportunity to

receive at least one BSS Color Change.” *Id.*

139. An example of a “BSS Color Change Announcement element” is provided in 802.11ax/D1.0, Section 9.4.2.222. SAMSUNG-1005, 94:1-46.



SAMSUNG-1005, FIG. 9-589cx

140. Among other fields, “BSS Color Change Announcement element” includes a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color.” SAMSUNG-1005, 94:22-26.

141. Further, 802.11ax/D1.0 discloses a specific mechanism for synchronizing the change in BSS color between an AP STA (*base wireless communication terminal*) and a non-AP STA (*wireless communication terminal*) based on the information included in the “BSS Color Change Announcement element.” SAMSUNG-1005, 206:39-56. In particular:

BSS Color change TBTT is the one at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color.

During the time leading up to the BSS Color change TBTT, an HE AP shall continue to advertise the existing BSS Color via the BSS Color subfield in HE Operation element.

At the BSS Color change TBTT, an HE AP shall:

- Set the BSS Color Disabled subfield in the HE Operation element to 0
- Start advertising the new BSS Color via BSS Color subfield in the HE Operation element
- Start using the new BSS color

A HE non-AP STA that receives a BSS Color Change Announcement element shall start using the BSS Color specified in the received BSS Color Change Announcement element subsequent to the BSS Color change TBTT.

SAMSUNG-1005, 206:39-56.

142. That is, 802.11ax/D1.0 discloses that a non-AP STA receives an announcement from an AP STA advertising a new BSS Color (e.g., via the “BSS Color Change Announcement”) (*the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal*).

143. Further, when advertising the new BSS Color, the AP STA also provides the non-AP STA with timing information regarding when the BSS Color change information occurs (e.g., such that the non-AP STA can synchronize the BSS color change with the AP STA in order to maintain communications between them). In particular, the non-AP STA receives a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color” (*a BSS color change time point*), and uses this field to determine the “BSS Color change

TBTT ... at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color.” SAMSUNG-1005, 206: 40-41; *see also infra*, Claim [2]; SAMSUNG-1005, 141:30-51; SAMSUNG-1010, 620: 27-40; 651:23-38.

144. Based on these teachings from 802.11ax/D1.0, a POSITA would have understood that upon receipt by the non-AP STA of the BSS color change announcement and upon reaching the indicated BSS color change time (*when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached*), the non-AP STA would start using the new BSS color (*...the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change*). Indeed, as taught by 802.11ax/D1.0, this synchronized change in BSS color would allow devices to avoid BSS collisions (e.g., when neighboring AP STAs are using the same BSS color). SAMSUNG-1005, 206:22-60.

145. Petitioner’s mapping of [1.8] to 802.11ax/D1.0 is also consistent with the disclosure of the ’262 Patent regarding the changing of BSS color:

When the wireless communication terminal receives the information on the BSS color change and reaches the BSS color change time point indicated by the information on the BSS color change, the wireless communication terminal may set the active BSS color to a value of the BSS color indicated by the information on the BSS color change. In this

case, the value of the BSS color indicated by the information on the BSS color change may be a value indicated by the New BSS Color subfield of the BSS Color Change Announcement element. The BSS color change time point may be determined based on target beacon transmission times (TBTT).

SAMSUNG-1005, 20:49-60.

2. Claim 2

[2] The wireless communication terminal of claim 1, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

146. 802.11ax/D1.0 renders obvious claim 2.

147. As discussed with reference to [1.8], 802.11ax/D1.0 discloses that a non-AP STA receives, from a AP STA, a “BSS Color Change Announcement element” including a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color” ***(a target beacon transmission time transmitted by the base wireless communication terminal)***, and uses this field to determine the “BSS Color change TBTT ... at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color” ***(BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal)***. SAMSUNG-1005, 94:22-26; 206:39-56.

148. Further, a POSITA would have recognized that it was commonplace for an AP STA to signal the TBTT to a non-AP STA. For example, 802.11ax/D1.0

discloses that “[a]n HE AP may transmit beacon frames” that indicate a “Beacon interval” representing the occurrence of each TBTT (e.g., “[t]he TBTT repeats every Beacon interval as indicated in the Beacon frame”). SAMSUNG-1005, 141:30-51. As confirmed by 802.11-2016, an AP STA transmits one or more beacon frames indicating a “Beacon interval,” which “represents the number of time units (TUs) between target beacon transmission times (TBTTs).” SAMSUNG-1010, p.694 (“Beacon frame format”); p.724 (“Beacon Interval field”). This would have been known and recognized by a POSITA reviewing 802.11ax/D1.0.

3. Claim 3

[3] The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

149. 802.11ax/D1.0 renders obvious claim 3.

150. First, 802.11ax/D1.0 discloses that, for some PPDU formats (e.g., formats other than “HE_SU,” “HE_MU,” HE_EXT_SU,” or “HE_TRIG”), a TXVECTOR and/or RXVECTOR parameter can include a field “PARTIAL_AID.” SAMSUNG-1005, 223:11-17.

PARTIAL_AID	FORMAT is HE_SU, HE_MU, HE_EXT_SU or HE_TRIG	Not present	N	N
	Otherwise	See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters).		

SAMSUNG-1005, Table 28-1 (223:11-17) (annotated)

151. A POSITA would have recognized that by virtue of the “PARTIAL_AID” being present in the TXVECTOR used to populate parameters of a PPDU for transmission to another device (e.g., from an AP STA to a non-AP STA), the “PARTIAL_AID” would be included as a parameter in the transmitted PPDU to indicate the Partial AID (*a Partial Association ID (AID) field*). Similarly, a POSITA would have recognized that upon receipt of the PPDU, the receiving device (e.g., a non-AP STA) would report the Partial AID in the PPDU using the “PARTIAL_AID” in a RXVECTOR. *See also* [1.4], [1.9] *supra*.

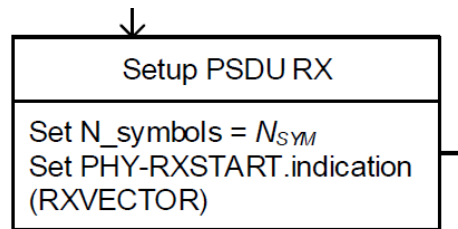
152. Indeed, as confirmed by 802.11-2016, for a Very High Throughput (VHT) PPDU format (i.e., non-HE PPDU format), a PPDU includes a field VHT-SIG-A having a “NSTS/Partial AID” field for indicating a Partial AID in accordance with the TXVECTOR” (SAMSUNG-1010, Table 21-12 (p.2544).

B10-B21	NSTS/Partial AID	12	<p>For a VHT MU PPDU: NSTS is divided into 4 user positions of 3 bits each. User position p, where $0 \leq p \leq 3$, uses bits $B(10 + 3p)$ to $B(12 + 3p)$. The number of space-time streams for user u are indicated at user position $p = \text{USER_POSITION}[u]$ where $u = 0, 1, \dots, \text{NUM_USERS} - 1$ and the notation $A[b]$ denotes the value of array A at index b. Zero space-time streams are indicated at positions not listed in the USER_POSITION array. Each user position is set as follows:</p> <ul style="list-style-type: none"> Set to 0 for 0 space-time streams Set to 1 for 1 space-time stream Set to 2 for 2 space-time streams Set to 3 for 3 space-time streams Set to 4 for 4 space-time streams Values 5-7 are reserved <p>For a VHT SU PPDU:</p> <p>B10-B12</p> <ul style="list-style-type: none"> Set to 0 for 1 space-time stream Set to 1 for 2 space-time streams Set to 2 for 3 space-time streams Set to 3 for 4 space-time streams Set to 4 for 5 space-time streams Set to 5 for 6 space-time streams Set to 6 for 7 space-time streams Set to 7 for 8 space-time streams <p>B13-B21</p> <p>Partial AID: Set to the value of the TXVECTOR parameter PARTIAL_AID. Partial AID provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20).</p>
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SAMSUNG-1010, Table 21-12 (annotated)

153. Further, in view of 802.11-2016, a POSITA would have recognized that a device receiving the PPDU would generate an RXVECTOR reporting the parameters included in the received PPDU (e.g., the contents of a VHT-SIG-A field including “NSTS/Partial AID”). *See also* SAMSUNG-1010, p.2599 (first paragraph) (“After receiving a valid L-SIG and VHT-SIG-A indicating a supported mode, the PHY entity shall begin receiving the VHT training symbols and VHT-SIG-B. If the received group ID in VHT-SIG-A has a value indicating a VHT SU PPDU (see 10.20 (Group ID and partial AID in VHT PPDU)), the PHY entity may choose not to decode VHT-SIG-B.”). *See also* SAMSUNG-1010, Section

8.3.5.13 (describing that a “PHY-RXSTART.indication” primitive is used to “indicat[e] by the PHY to the local MAC entity that the PHY has received a valid start of a PPDU, including a valid PHY header” and includes a parameter “RXVECTOR” that “represents a list of parameters that the PHY provides the local MAC entity upon receipt of a valid PHY header.”), FIG. 21-37 (depicting the setting of “PHY-RXSTART.indication” and generation of “RXVECTOR” in connection with the receipt of a VHT PPDU).



SAMSUNG-1010, FIG. 21-37 (excerpt)

154. Further, a POSITA would have recognized that, as of the Critical Date, “PARTIAL_AID” in a TXVECTOR (an in turn, the value of the Partial AID field of a transmitted PPDU) was commonly determined based, at least in part, of a value of an AID field (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*).

155. For example, 802.11ax/D1.0’s Table 28-1 refers to a “corresponding entry in Table 21-1”), which a POSITA would have understood to refer to Table 21-1 of P802.11-REVmc/D8.0 (and later, 802.11-2016) (SAMSUNG-1010), the base version of the IEEE 802.11 specification of which 802.11ax/D1.0 was

intended to amend. SAMSUNG-1005, i:1-3 (indicating that “IEEE P802.11ax™/D1.0, November 2016” is an “amendment to IEEE P802.11REVmc™/D8.0”). For reference, the relevant portion of Table 21-1 of 802.11-2016 is reproduced below:

Parameter	Condition	Value	TXVECTOR	RXVECTOR
GROUP_ID	FORMAT is VHT	Indicates the group ID. Integer: range 0-63 (see Table 21-12) A value of 0 or 63 indicates a VHT SU PPDU. A value in the range 1 to 62 indicates a VHT MU PPDU.	Y	Y
	Otherwise	Not present	N	N
PARTIAL_AID	FORMAT is VHT and GROUP_ID is 0 or 63	Provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20). Integer: range 0-511.	Y	Y
	Otherwise	Not present	N	N

SAMSUNG-1010, Table 21-1 (p.2506)

156. As shown above, the “PARTIAL_AID” field, when present, “[p]rovides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20 (Group ID and partial AID in VHT PPDU)),” and includes an integer in a “range 0-511.” SAMSUNG-1010, Table 21-1 (p.2506). Further, as shown in Table 10-9 of 802.11-2016’s Section 10-20, the “PARTIAL_AID” (and in turn the Partial AID field of the transmitted PPDU) is calculated based on an “AID” field *(the partial AID field is a signaling field used to indicate a value obtained based on an AID value)* when a PPDU is either (i) “[s]ent by an AP and addressed to a STA associated with that AP,” or (ii) “sent by a DLS or TDLS STA in a direct path

to a DLS or TDLS peer STA.” SAMSUNG-1010, Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

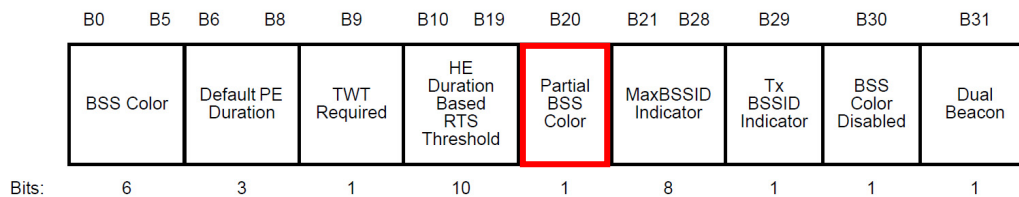
Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(AID + (BSSID[44:47] \oplus BSSID[40:43]) \times 2^5) \bmod 2^9 \text{ (10-12)}$ 
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: — A PPDU sent to an IBSS STA — A PPDU sent by an AP to a non associated STA — Any other condition not explicitly listed elsewhere in the table		

SAMSUNG-1010, Table 10-9 (annotated)

157. Further, as corroborated by Lou, it was commonly understood by the Critical Date that according to a precursor standard to the IEEE 802.11ax standard (i.e., IEEE 802.11ac), a VHT PPDU format can include a data field that includes “a partial association identifier (PAID) (compressed from association identifier (AID) and BSS identifier (ID) (BSSID)),” which may be “derived from the 48-bit BSSID and the 16-bit AID of the STA(s) (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*). SAMSUNG-1009, [0081]-[0082].

158. Second, 802.11ax/D1.0 discloses that a non-AP STA can determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on a partial BSS color indicated with the “PARTIAL_AID” field.

159. For example, 802.11ax/D1.0 discloses that a “HE Operation element” includes several fields for providing a STA (e.g., a non-AP STA) with parameters regarding BSS color, including a “Partial BSS Color field [that] indicates whether or not the BSS applies an AID assignment rule using the partial BSS color bits.” SAMSUNG-1005, 91:26-37, 92:1-5.



SAMSUNG-1005, FIG. 9-589cr (91:26-37)

160. Specifically, “[i]f the Partial BSS Color field is set to 1, then the 4 least significant bits of BSS color are used in AID assignment.” SAMSUNG-1005, 912:1-5. However, “[i]f the Partial BSS Color field is set to 0, no partial BSS color bits are used in the AID assignment.” *Id.*

161. Further, 802.11ax/D1.0 discloses that when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame is a “intra-BSS frame.” SAMSUNG-1005, 149:23-41. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU

(including its constituent frames) would have been an intra-BSS PPDU.

162. However, when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame is a “inter-BSS frame.” SAMSUNG-1005, 149:46-150:8-12. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU (including its constituent frames) would have been an inter-BSS PPDU.

163. Further, a POSITA would have found it obvious to make the aforementioned determination whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color, *specifically when the value of the partial AID field is non-zero*. For example, as confirmed by 802.11-2016, a POSITA would have recognized that it was commonplace to set “PARTIAL_AID” to zero to indicate situations where “[a] PPDU [is] sent to an IBSS STA,” “[a] PPDU [is] sent by an AP to a non associated STA,” or “[a]ny other condition not explicitly listed elsewhere in the table.” SAMSUNG-1010, Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(\text{AID} + (\text{BSSID}[44:47] \oplus \text{BSSID}[40:43]) \times 2^5) \bmod 2^9$ (10-12)
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: — A PPDU sent to an IBSS STA — A PPDU sent by an AP to a non associated STA — Any other condition not explicitly listed elsewhere in the table		

Partial AID field set to zero to signal specific edge cases

SAMSUNG-1010, Table 10-9

164. Further, Lou confirms that in a similar context (e.g., transmitting data between STAs on a wireless network), it was common practice to set a “PARTIAL_AID” to zero to indicate similar use cases as in 802.11-2016.

600

Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in direct path to a DLS or TDLS peer STA	63	$(dec(AID[0:8]) + dec(BSSID[44:47] \oplus BSSID[40:43]) \times 2^5) \bmod 2^9 \quad (9-8a)$ <p>where $\oplus$ is a bitwise exclusive OR operation $\bmod X$ indicates the X-modulo operation $dec(A[b:c])$ is the cast to decimal operator where digit b is scaled by 2^0 and c by 2^{c-b}</p>
Otherwise (see NOTE)	63	0

Partial AID field set to zero to signal specific edge cases

NOTE - The last row covers the following cases:

- A PPDU sent to an IBSS STA
- A PPDU sent by an AP to a non associated STA
- Any other condition not explicitly listed elsewhere in the table

FIG. 6

SAMSUNG-1009, FIG. 6 (annotated)

165. A POSITA would have recognized that in these specific situations identified by 802.11-2016 (and as corroborated by Lou), the “PARTIAL_AID” is set to a pre-determined value (i.e., zero) to indicate the occurrence of certain specific edge cases (e.g., a PPDU being sent by IBSS STA or to a non associated STA) rather than to indicate a value derived based on a BSSID and/or AID. Thus, a POSITA would have recognized that when the “PARTIAL_AID” is zero, it

would not have been logical to use the aforementioned technique in 802.11ax/D1.0 (which relies on a PARTIAL_AID having a value derived based on a BSSID and/or AID) to determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU.

4. Claim 4

[4.pre] A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

166. 802.11ax/D1.0 renders obvious claim 4.

167. To the extent that the preamble is limiting, 802.11ax/D1.0 renders obvious [4.pre]. As discussed with reference to [1.pre], 802.11ax/D1.0 discloses a “[h]igh efficiency (HE) STA” configured to conduct wireless communications, such as in “frequency bands between 1 GHz and 5 GHz. SAMSUNG-1005, 9:1-65. *See also* SAMSUNG-1005, Section 28 “High Efficiency (HE) PHY specification” (e.g., SAMSUNG-1005, 212:45-58, describing “protocol functions” including “[a] function that defines the characteristics and method of transmitting and receiving data through a wireless medium between two or more STAs”). As IEEE 802.11ax/D1.0 explains, the term “HE STA” can refer either to “an AP

STA” (*base wireless communication terminal*) or “a non-AP STA”⁴ (*wireless communication terminal wirelessly communicating with the base wireless communication terminal*). SAMSUNG-1005, 209:54.

168. Further, as discussed below, 802.11ax/D1.0 renders obvious operating a wireless communication terminal in accordance with claim 4 for the reasons described above with respect to claim 1 elements.

[4.1]-[4.7]

169. 802.11ax/D1.0 renders obvious each of [4.1]-[4.7]. *See* [1.3]-[1.9].

B. Ground 1B –802.11ax/D1.0, Yang, and 802.11-2016 Render Claims 1-4 Obvious

170. The teachings of 802.11ax/D1.0, in view of Yang and 802.11-2016 further render obvious all limitations of claims 1-4.

1. Combination of 802.11ax/D1.0, Yang, and 802.11-2016 (“D1.0-Yang-802.11-2016 Combination”)

Obviousness of Combining 802.11ax/D1.0 with Yang

171. As discussed with respect to Ground 1A, among other features, 802.11ax/D1.0 proposes enhancements relating to basic service set (BSS) color, including (i) configuring a trigger frame to include a field signaling the BSS color

⁴ The term “non-AP STA” would be understood by a POSITA to refer to a station other than an access point station, such as a client device.

of a first STA, which allows a second STA to synchronize its communications with the first STA), and (ii) allowing STAs to dynamically change BSS colors during operation (e.g., by configuring an AP STA to “announce” a BSS color change to one or more non-AP STAs).

172. A POSITA would have understood that a STA as described in 802.11ax/D1.0 would be equipped with certain conventional components such as a transceiver configured to transmit and receive wireless signals and a processor configured to process the wireless signals, which would allow the STA to carry out the capabilities described in 802.11ax/D1.0. Such features are thus rendered obvious by 802.11ax/D1.0 alone. Nonetheless, to the extent details of these components are not expressly disclosed in 802.11ax/D1.0, these features also would have been obvious in view of Yang.

173. Like 802.11ax/D1.0, Yang describes techniques “for changing an identifier of a basic service set (BSS).” SAMSUNG-1006, [0001]. Further, Yang discloses specific components for performing these techniques, including (i) a “processing system” including a “processor” (SAMSUNG-1006, [0095], FIG. 12), and (ii) “a transceiver” that “may be installed in a host device” (SAMSUNG-1006, [0098], FIG. 13).

174. In view of Yang, a POSITA would have found it obvious to implement the techniques described by 802.11ax/D1.0 using conventional

components like those described in Yang (e.g., a “processing system” and a “transceiver”). A POSITA would have sought to implement 802.11ax/D1.0’s STAs with such components as described in Yang to enhance and facilitate the processing and communication capabilities of the STAs. Indeed, such components were commonly used to perform operations such as processing data in connection with wireless transmissions and/or transmitting and receiving wireless signals, and the components would have been beneficial to enable the STAs to implement the functions and capabilities described in 802.11ax/D1.0. A POSITA would have reasonably expected success since these components were well known and commonly implemented in such STAs by the Critical Date.

Obviousness of Combining 802.11ax/D1.0-Yang with 802.11-2016

175. As discussed with reference to Ground 1A, 802.11ax/D1.0 is a draft specification representing a proposed amendment to the P802.11REVmc/D8.0 draft standard, which was later finalized as 802.11-2016. SAMSUNG-1005, 1:1-2:7; SAMSUNG-1011; SAMSUNG-1012. The proposed amendment at least in part “defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer for high efficiency operation in frequency bands between 1 GHz and 6 GHz.” SAMSUNG-1005, 2:1-3.

176. In view of 802.11ax/D1.0 and 802.11-2016, a POSITA would have understood that 802.11ax/D1.0 was specifically intended to modify certain features

described in 802.11-2016 and/or include additional features beyond those described in 802.11-2016 (e.g., in order to provide “high efficiency operation in frequency bands between 1 GHz and 6 GHz, as described by 802.11-2016).

SAMSUNG-1005, 2:1-3. Accordingly, a POSITA would have found it obvious to look to 802.11-2016 for details regarding pre-existing features not explicitly described in 802.11ax/D1.0 (e.g., by using 802.11-2016 as a starting point, and modifying and/or adding certain features as specified by 802.11ax/D1.0). The disclosures of 802.11ax/D1.0 and 802.11-2016 are complementary to each other, and it would have been obvious to combine their teachings to implement a more complete system. A POSITA would have reasonably expected success combining 802.11ax/D1.0 and 802.11-2016, along with Yang, because the teachings of the references were well known and directed to a common WLAN system.

2. Claim 1

177. The D1.0-Yang-802.11-2016 combination renders obvious claim 1.

[1.pre] A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

178. To the extent that the preamble is limiting, the D1.0-Yang-802.11-2016 combination renders obvious [1.pre].

179. Yang explains that “[t]he Institute of Electrical and Electronics Engineers (IEEE) Standard 802.11 is a set of physical (PHY) layer and media

access control (MAC) layer specifications for implementing wireless fidelity (Wi-Fi) communications in the 2.4 GHz, 5 GHz, and 60 GHz frequency bands.”

SAMSUNG-1006, [0002]. Further, Yang discloses that “[a] basic service set (BSS) provides the basic building-block of an 802.11 communications system,” and that “[i]n an infrastructure mode of 802.11,” a BSS may be formed by “an access point (AP)” (*a base wireless communication terminal*) and “one or more associated stations (STAs)” (*one or more wireless communication terminals wirelessly communicating with the base wireless communication terminal*). *Id.*

See also SAMSUNG-1006, [0030]-[0031], FIG. 1.

180. In view of Yang, a POSITA would have found it obvious to implement the features described in 802.11ax/D1.0, at least in part using STAs like those described in Yang.

[1.1] a transceiver configured to transmit and receive wireless signals; and

181. The D1.0-Yang-802.11-2016 combination renders obvious [1.1].

182. Yang discloses “an embodiment processing system 1200” for performing the methods described in Yang. SAMSUNG-1006, [0095]. The “processing system” includes “one or more of the interfaces 1210, 1212, 1214 [which] may be adapted to communicate data, control, or management messages from the processor 1204 to applications installed on the host device and/or a remote device.” SAMSUNG-1006, [0095], FIG. 12. Yang also discloses that “one

or more of the interfaces 1210, 1212, 1214 connects the processing system 1200 to a transceiver adapted to transmit and receive signaling over the telecommunications network,” for example by “transmit[ing] and receiv[ing] signaling over a wireless medium” (*a transceiver configured to transmit and receive wireless signals*). SAMSUNG-1006, [0098]-[0099], FIG. 13.

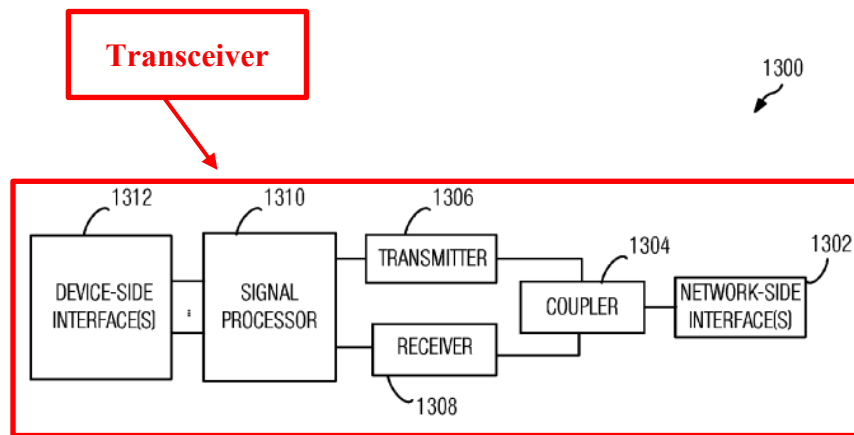


Fig. 13

SAMSUNG-1006, FIG. 13 (annotated)

183. To the extent that Yang does not expressly describe that the aforementioned components are included in a STA (wireless communication terminal), a POSITA would have found it obvious to configure a STA to include these components in order to facilitate wireless communications between the STA and other devices (e.g., an AP), such as to perform the methods described in Yang and/or 802.11ax/D1.0.

[1.2] a processor configured to process the wireless signals,

184. The D1.0-Yang-802.11-2016 combination renders obvious [1.2].

185. Yang discloses that the “processing system 1200” also includes a “processor 1204 [which] may be any component or collection of components adapted to perform computations and/or other processing related tasks” (*a processor configured to process the wireless signals*). SAMSUNG-1006, [0095], FIG. 12.

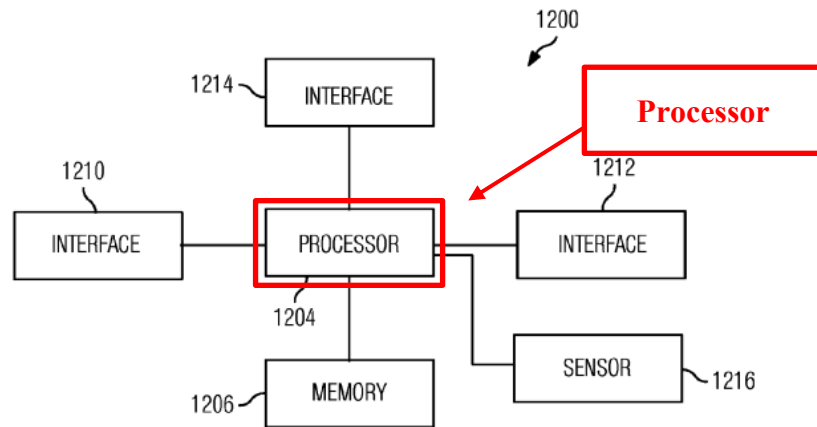


Fig. 12

SAMSUNG-1006, FIG. 12 (annotated)

186. Yang also discloses that the “transceiver” also includes a “signal processor 1310 [which] may include any component or collection of components adapted to convert a baseband signal into a data signal suitable for communication over the device-side interface(s) 1312, or vice-versa” (*a processor configured to process the wireless signals*). SAMSUNG-1006, [0098], FIG. 13.

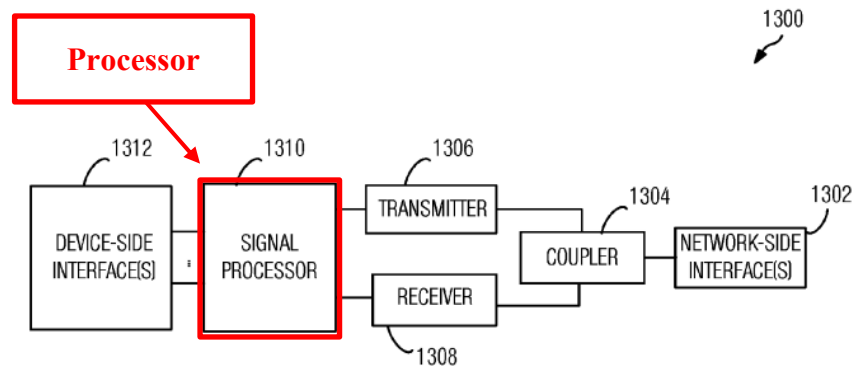


Fig. 13

SAMSUNG-1006, FIG. 13 (annotated)

187. To the extent that Yang does not expressly describe that the aforementioned processors are included in a STA (*wireless communication terminal*), a POSITA would have found it obvious to configure a STA to include these components in order to facilitate wireless communications between the STA and other devices (e.g., a AP), such as to perform the methods described in Yang and/or 802.11ax/D1.0.

188. Further, in view of Yang, a POSITA would have found it obvious to configure Yang's processor(s) to perform each of the operations recited in claim 1. See [1.3]-[1.7].

[1.3] wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

189. The D1.0-Yang-802.11-2016 combination renders obvious [1.2], for

at least the same reasons as discussed in Ground 1A [1.3].

[1.4], [1.9] when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color to be indicated by a trigger-based PPDU based on the BSS color indicated by the field, ... wherein the BSS color is one of identifiers identifying a BSS

190. The D1.0-Yang-802.11-2016 combination renders obvious [1.4] and [1.9], for at least the same reasons as discussed in Ground 1A [1.3] and [1.9].

191. For example, as discussed with respect to Ground 1A, 802.11ax/D1.0 discloses several different formats for a PPDU, including several “high efficiency” (HE) ***physical layer PPDU formats*** that include an HE-SIG-A field including a “BSS Color field” indicating “an identifier of the BSS” ***(at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included ... wherein the BSS color is one of identifiers identifying a BSS)***. SAMSUNG-1005, Sections 28.1.1, Section 28.3.4, Table 28-16 (273:63), Table 28-17 (276:38). *See also* SAMSUNG-1005, Section 28.1.4 (describing “PPDU formats” generally).

192. Further, in view of both 802.11ax/D1.0 and 802.11-2016, a POSITA would have recognized that a device receiving the PPDU generates an RXVECTOR reporting the parameters included in the received PPDU (e.g., the contents of a HE-SIG-A field, including a BSS Color field); Section IX.A.1, [1.5], [1.7]. For example, 802.11ax/D1.0 describes that a STA’s “PHY entity shall report

TXOP, BSS Color and check Format field” from a received HE-SIG-A.

SAMSUNG-1005, 369:33-37. Further, 802.11-2016 describes that a “PHY-RXSTART.indication” primitive is used to “indicat[e] by the PHY to the local MAC entity that the PHY has received a valid start of a PPDU, including a valid PHY header” and includes a parameter “RXVECTOR” that “represents a list of parameters that the PHY provides the local MAC entity upon receipt of a valid PHY header.”).

193. Further, as discussed with respect to Ground 1A, 802.11ax/D1.0 discloses that a STA transmits a trigger-based PPDU differently, depending on whether an RXVECTOR includes the “BSS_COLOR” field (representing whether a PPDU having a trigger frame includes the corresponding HE-SIG-A field having a BSS Color field), which corresponds to the limitations of [1.4] and [1.9] as discussed above with respect to Ground 1. SAMSUNG-1005, Section 27.5.2.3 (“STA behavior”); Section IX.A.1, [1.4], [1.9].

[1.5], [1.7] when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal; ... wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element

194. The D1.0-Yang-802.11-2016 combination renders obvious [1.5] and [1.7], for at least the same reasons as discussed in Ground 1A [1.5] and [1.7].

[1.6] transmit the trigger-based PPDU based on the trigger frame,

195. The D1.0-Yang-802.11-2016 combination renders obvious [1.6], for at least the same reasons as discussed in Ground 1A [1.6].

[1.8] wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change, and

196. The D1.0-Yang-802.11-2016 combination renders obvious [1.8], for at least the same reasons as discussed in Ground 1A [1.8].

3. Claim 2

[2] The wireless communication terminal of claim 1, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

197. The D1.0-Yang-802.11-2016 combination renders obvious claim 2.

198. As discussed with reference to Ground 1A [1.8], 802.11ax/D1.0 discloses that a non-AP STA receives, from a AP STA, a “BSS Color Change Announcement element” including a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color” (***a target beacon transmission time transmitted by the base wireless communication terminal***), and uses this field to determine the “BSS Color change TBTT ... at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color” (***BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal***). SAMSUNG-1005,

94:22-26; 206:39-56.

199. Further, a POSITA would have recognized that it was commonplace for an AP STA to signal the TBTT to a non-AP STA. For example, 802.11ax/D1.0 discloses that “[a]n HE AP may transmit beacon frames” that indicate a “Beacon interval” representing the occurrence of each TBTT (e.g., “[t]he TBTT repeats every Beacon interval as indicated in the Beacon frame”). SAMSUNG-1005, 141:30-51. Further, as described by 802.11-2016, it was commonplace as of the Critical Date for an AP STA to transmit one or more beacon frames indicating a “Beacon interval,” which “represents the number of time units (TUs) between target beacon transmission times (TBTTs).” SAMSUNG-1010, p.694 (“Beacon frame format”); p.724 (“Beacon Interval field”). This would have been known and recognized by a POSITA reviewing 802.11ax/D1.0, and in any event, is explicitly addressed in the combination with 802.11-2016.

200. In view of 802.11ax/D1.0 and 802.11-2016, a POSITA would have found it obvious for an AP STA to explicitly signal the TBTT to a non-AP STA, such that the non-AP STA can determine a specific time for a BSS color change.

4. Claim 3

[3] The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

201. The D1.0-Yang-802.11-2016 combination renders obvious claim 3.

202. As discussed with respect to Ground 1A [3], as an initial matter, 802.11ax/D1.0 discloses that, for some PPDU formats (e.g., formats other than “HE_SU,” “HE_MU,” HE_EXT_SU,” or “HE_TRIG”), a TXVECTOR and/or RXVECTOR parameter can include a field “PARTIAL_AID.” SAMSUNG-1005, 223:11-17.

PARTIAL_AID	FORMAT is HE_SU, HE_MU, HE_EXT_SU or HE_TRIG	Not present	N	N
	Otherwise	See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters).		

SAMSUNG-1005, Table 28-1 (223:11-17) (annotated)

203. In view of 802.11-2016, a POSITA would have recognized that by virtue of the “PARTIAL_AID” being present in the TXVECTOR for a PPDU for transmission to another device (e.g., from an AP STA to a non-AP STA), the “PARTIAL_AID” would be included as a parameter in the transmitted PPDU to indicate the Partial AID (*a Partial Association ID (AID) field*). Similarly, a POSITA would have recognized that upon receipt of the PPDU, the receiving device (e.g., a non-AP STA) would report the Partial AID in the PPDU using the “PARTIAL_AID” in a RXVECTOR. *See also* [1.4], [1.9] *supra*.

204. Specifically, 802.11-2016 discloses that for a VHT PPDU format (i.e., non-HE PPDU format), a PPDU includes a field VHT-SIG-A having a

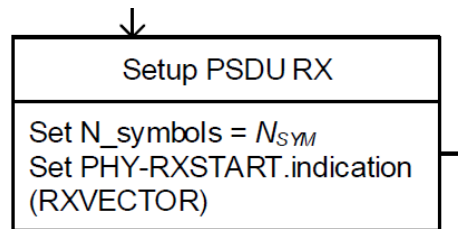
“NSTS/Partial AID” field for indicating a Partial AID in accordance with the
TXVECTOR” (SAMSUNG-1010, Table 21-12 (p.2544)).

B10-B21	NSTS/Partial AID	12	<p>For a VHT MU PPDU: NSTS is divided into 4 user positions of 3 bits each. User position p, where $0 \leq p \leq 3$, uses bits $B(10 + 3p)$ to $B(12 + 3p)$. The number of space-time streams for user u are indicated at user position $p = \text{USER_POSITION}[u]$ where $u = 0, 1, \dots, \text{NUM_USERS} - 1$ and the notation $A[b]$ denotes the value of array A at index b. Zero space-time streams are indicated at positions not listed in the USER_POSITION array. Each user position is set as follows:</p> <ul style="list-style-type: none">Set to 0 for 0 space-time streamsSet to 1 for 1 space-time streamSet to 2 for 2 space-time streamsSet to 3 for 3 space-time streamsSet to 4 for 4 space-time streamsValues 5-7 are reserved <p>For a VHT SU PPDU: B10-B12</p> <ul style="list-style-type: none">Set to 0 for 1 space-time streamSet to 1 for 2 space-time streamsSet to 2 for 3 space-time streamsSet to 3 for 4 space-time streamsSet to 4 for 5 space-time streamsSet to 5 for 6 space-time streamsSet to 6 for 7 space-time streamsSet to 7 for 8 space-time streams <p>B13-B21</p> <p>Partial AID: Set to the value of the TXVECTOR parameter PARTIAL_AID. Partial AID provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20).</p>
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SAMSUNG-1010, Table 21-12 (annotated)

Further, in view of 802.11-2016, a POSITA would have recognized that a device receiving the PPDU would generate an RXVECTOR reporting the parameters included in the received PPDU (e.g., the contents of a VHT-SIG-A field including “NSTS/Partial AID”). *See* SAMSUNG-1010, p.2599 (first paragraph) (“After receiving a valid L-SIG and VHT-SIG-A indicating a supported mode, the PHY entity shall begin receiving the VHT training symbols and VHT-SIG-B. If the received group ID in VHT-SIG-A has a value indicating a VHT SU

PPDU (see 10.20 (Group ID and partial AID in VHT PPDU)), the PHY entity may choose not to decode VHT-SIG-B.”). *See also* SAMSUNG-1010, Section 8.3.5.13 (describing that a “PHY-RXSTART.indication” primitive is used to “indicat[e] by the PHY to the local MAC entity that the PHY has received a valid start of a PPDU, including a valid PHY header” and includes a parameter “RXVECTOR” that “represents a list of parameters that the PHY provides the local MAC entity upon receipt of a valid PHY header.”), FIG. 21-37 (depicting the setting of “PHY-RXSTART.indication” and generation of “RXVECTOR” in connection with the receipt of a VHT PPDU).



SAMSUNG-1010, FIG. 21-37 (excerpt)

205. Further, a POSITA would have recognized that, as of the Critical Date, “PARTIAL_AID” in a TXVECTOR (an in turn, the value of the Partial AID field of a transmitted PPDU) was commonly determined based, at least in part, of a value of an AID field (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*).

206. For example, 802.11ax/D1.0’s Table 28-1 refers to a “corresponding entry in Table 21-1”), which a POSITA would have understood to refer to Table

21-1 of P802.11-REVmc/D8.0 (and later, 802.11-2016) (SAMSUNG-1010), the base version of the 802.11 specification of which 802.11ax/D1.0 was intended to amend. SAMSUNG-1005, i:1-3 (indicating that “IEEE P802.11ax™/D1.0, November 2016” is an “amendment to IEEE P802.11REVmc™/D8.0”). For reference, the relevant portion of Table 21-1 of 802.11-2016 is reproduced below:

Parameter	Condition	Value	TXVECTOR	RXVECTOR
GROUP_ID	FORMAT is VHT	Indicates the group ID. Integer: range 0-63 (see Table 21-12) A value of 0 or 63 indicates a VHT SU PPDU. A value in the range 1 to 62 indicates a VHT MU PPDU.	Y	Y
	Otherwise	Not present	N	N
PARTIAL_AID	FORMAT is VHT and GROUP_ID is 0 or 63	Provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20). Integer: range 0-511.	Y	Y
	Otherwise	Not present	N	N

SAMSUNG-1010, Table 21-1 (p.2506)

207. As shown above, 802.11-2016 discloses that the “PARTIAL_AID” field, when present, “[p]rovides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20 (Group ID and partial AID in VHT PPDU)),” and includes an integer in a “range 0-511.” SAMSUNG-1010, Table 21-1 (p.2506). Further, as shown in Table 10-9 of 802.11-2016’s Section 10-20, the “PARTIAL_AID” (and in turn the Partial AID field of the transmitted PPDU) is calculated based on an “AID” field (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*) when a PPDU is either (i)

“[s]ent by an AP and addressed to a STA associated with that AP,” or (ii) “sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA.” SAMSUNG-1010, Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

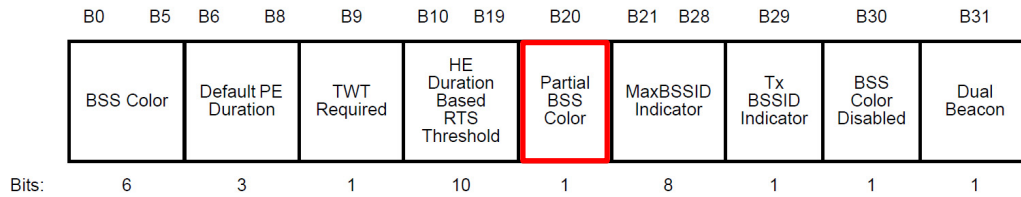
Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(AID + (BSSID[44:47] \oplus BSSID[40:43]) \times 2^5) \bmod 2^9$ (10-12)
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: — A PPDU sent to an IBSS STA — A PPDU sent by an AP to a non associated STA — Any other condition not explicitly listed elsewhere in the table		

Partial AID field obtained based on an AID value

SAMSUNG-1010, Table 10-9 (annotated)

208. Second, 802.11ax/D1.0 discloses that a non-AP STA can determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on a partial BSS color indicated with the “PARTIAL_AID” field.

209. For example, 802.11ax/D1.0 discloses that a “HE Operation element” includes several fields for providing a STA (e.g., a non-AP STA) with parameters regarding BSS color, including a “Partial BSS Color field [that] indicates whether or not the BSS applies an AID assignment rule using the partial BSS color bits.” SAMSUNG-1005, 91:26-37, 92:1-5.



SAMSUNG-1005, FIG. 9-589cr (91:26-37)

210. Specifically, “[i]f the Partial BSS Color field is set to 1, then the 4 least significant bits of BSS color are used in AID assignment.” SAMSUNG-1005, 912:1-5. However, “[i]f the Partial BSS Color field is set to 0, no partial BSS color bits are used in the AID assignment.” *Id.*

211. Further, 802.11ax/D1.0 discloses that when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame is a “intra-BSS frame.” SAMSUNG-1005, 149:23-41. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU (including its constituent frames) would have been an intra-BSS PPDU.

212. However, when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most

recently received HE Operation element is 1,” a frame is a “inter-BSS frame.”

SAMSUNG-1005, 149:46-150:8-12. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU (including its constituent frames) would have been an inter-BSS PPDU.

213. Further, a POSITA would have found it obvious to make the aforementioned determination whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color, *specifically when the value of the partial AID field is non-zero*. For example, in view of 802.11-2016, a POSITA would have recognized that it was commonplace to set “PARTIAL_AID” to zero to indicate situations where “[a] PPDU [is] sent to an IBSS STA,” “[a] PPDU [is] sent by an AP to a non associated STA,” or “[a]ny other condition not explicitly listed elsewhere in the table.” SAMSUNG-1010, Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(AID + (BSSID[44:47] \oplus BSSID[40:43]) \times 2^5) \bmod 2^9$ (10-12)
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: <ul style="list-style-type: none">— A PPDU sent to an IBSS STA— A PPDU sent by an AP to a non associated STA— Any other condition not explicitly listed elsewhere in the table		

Partial AID field set to zero to signal specific edge cases

SAMSUNG-1010, Table 10-9

214. A POSITA would have recognized that in these specific situations identified by 802.11-2016, the “PARTIAL_AID” is set to a pre-determined value (i.e., zero) to indicate the occurrence of certain specific edge cases (e.g., a PPDU being sent by IBSS STA or to a non associated STA) rather than to indicate a value derived based on a BSSID and/or AID. Thus, a POSITA would have recognized that when the “PARTIAL_AID” is zero, it would not have made sense to use the aforementioned technique in 802.11ax/D1.0 (which relies on a PARTIAL_AID having a value derived based on a BSSID and/or AID) to determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU.

5. Claim 4

215. The D1.0-Yang-802.11-2016 combination renders obvious claim 4, for at least the same reasons as discussed in Ground 1A.

**C. Ground 2A – Yang, 802.11-17/0250r2, and 802.11-16/1415r0
Render Claims 1, 2, and 4 Obvious**

216. The combined teachings of Yang in view of 802.11-17/0250r2 and 802.11-16/1415r0 render obvious claims 1, 2, and 4.

1. Combination of Yang, 802.11-17/0250r2, and 802.11-16/1415r0 (“Yang-0250r2-1415r0 Combination”)

Integration of 802.11-17/0250r2

217. As discussed in Section VIII.B, Yang discloses techniques for changing the BSS color that is used by an AP and a STA during communications (e.g., to avoid BSS color collisions with an “overlapping” BSS (OBSS)). *See, e.g.,*

SAMSUNG-1006, [0050]-[0050]). To the extent that Yang does not expressly describe how a BSS color is initially selected by an AP and communicated to a STA, Yang nevertheless implies that, in at least some circumstances, the BSS color indicated in the “Trigger frame” would be used in the responsive trigger-based PPDU transmitted by the STA to the AP. SAMSUNG-1006, [0047].

218. For example, Yang describes a scenario in which an “AP 320” and a “STA 330” are members of a BSS identified by a BSS color “Color 1.”

SAMSUNG-1006, [0047]. In this example, “AP 360 may send a Trigger frame to trigger station 370 to transmit on the UL as a part of an UL MU transmission” (which may be transmitted according to a HE PPDU format including a field indicating a BSS color, as discussed with reference to [1.3]), and “[s]ubsequently, station 370 transmits a HE Trigger-based PPDU (such as HE Trigger-based PPDU 260 in FIG. 2D) with the BSS Color subfield in the HE-SIG-A field (such as HE-SIG-A 270 in FIG. 2D) set to a value of “Color 1”. SAMSUNG-1006, [0047].

219. In view of Yang, a POSITA would have looked to other references for specific guidance regarding how an initial BSS color can be signaled by an AP to a STA. One such reference is 802.11-17/0250r2, which discloses specific techniques for signaling BSS color between an AP and a STA in the context of trigger-based PPDU transmissions. SAMSUNG-1007, p.17-20.

220. For example, as discussed above, 802.11-17/0250r2 discloses that “[a]

non-AP HE STA transmitting an HE trigger-based PPDU in response to a Trigger frame sets a TXVECTOR parameter” differently, depending on whether the PPDU includes a “BSS_COLOR parameter.” SAMSUNG-1007, p. 17.

221. In view of 802.11-17/0250r2, a POSITA would have configured Yang’s system to perform initial BSS color signaling in accordance with IEEE 802.11-17/0250r2 technique (e.g., based on BSS color signaling in a PPDU having a trigger frame soliciting a trigger-based PPDU), in order to facilitate the coordination of BSS color between an AP and a STA.

222. For example, in view of 802.11-17/0250r2, a POSITA would have found it obvious to configure the STA such that, “[i]f the preceding Trigger frame was received in an HE PPDU,” the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the RXVECTOR parameter BSS_COLOR of the HE PPDU” (representing the BSS color identified in the BSS Color subfield of the HE-SIG-A field of the received PPDU). SAMSUNG-1007, p. 17;

223. Further, view of 802.11-17/0250r2, a POSITA would have found it obvious to configure the STA such that, “[i]f the Trigger frame was received in a non-HE PPDU” (i.e., in which the “HE-SIG-A field’ with “a BSS Color subfield” is not present), the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the BSS Color subfield of the most recently

received HE Operation element for that BSS.” SAMSUNG-1007, p.17.

224. A POSITA would have recognized that employing such a technique in Yang’s system would be beneficial, as it allows an AP and STA to synchronize the use of BSS color between them under a wide variety of circumstances (e.g., in both situations in which the triggering PPDU explicitly indicates BBS color and situations in which the trigger PDDU does not explicitly indicate BBS color). Accordingly, the communications between the AP and STA can be maintained in a more reliable manner. A POSITA would have reasonably expected success implementing the combination because the techniques were well known and directed to a common WLAN system.

Integration of 802.11-16/1415r0

225. Yang discloses techniques that “allow an AP to change a BSS Color value used in the BSS that the AP serves, e.g., when a BSS Color collision occurs.” SAMSUNG-1006, [0050]. As an example, Yang discloses that “an AP initiates a BSS Color Change procedure when there is a need to change the current BSS Color value of the BSS that the AP serves,” which an example of which includes two “stages.” SAMSUNG-1006, [0051].

226. During the first stage, “the AP uses a pre-specified Transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDU transmitted by the AP as soon as the AP determines to change the BSS

Color value, e.g., after the detection of a collision with the current BSS Color value.” SAMSUNG-1006, [0051].

227. During the second stage, “the AP uses the new BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDU that the AP transmits after the one or more conditions, as mentioned above, are met.”

SAMSUNG-1006, [0054]. Yang discloses that one such condition can include the expiration of “a time T.” SAMSUNG-1006, [0053].

228. In view of Yang, a POSITA would have recognized that allowing an AP to switch BSS color is beneficial, as it allows the BSS to avoid collisions (e.g., with other BSSs having the same BSS color). However, a POSITA would have recognized several deficiencies in Yang’s BSS change color technique, including (i) requiring the use of a “Transitory BSS Color” (thereby increasing the number of BSS colors that are in use, which may be undesirable for a dense networking environment with many other BSSs in close proximity and many BSS colors may already be in use), and (ii) an inability for the AP to select a specific time at which the STAs switch to the new BSS.

229. To address these deficiencies, a POSITA would have looked to other references regarding alternative techniques for coordinating a BSS color switch between an AP and a STA. One such reference is 802.11-16/1415r0, which discloses a “BSS Color Change Procedure” that allows an AP to cause a new BSS

color to be used at a specific time by each device of the BSS, and without requiring the use of an additional “Transitory BSS Color.” *See generally* SAMSUNG-1008.

230. In view of 802.11-16/1415r0, a POSITA would have found it obvious to modify Yang’s system to perform 802.11-16/1415r0’s “BSS Color Change Procedure” instead, in order to (i) avoid the use of “Transitory BSS Colors” (thereby reducing the number of BSS that are in use), and (ii) allow an AP to select specific time at which the STAs switch to a new BSS (thereby allowing the AP and STAs to remain synchronized in time with respect to BSS color changes). A POSITA would have reasonably expected success implementing the combination because the techniques were well known and directed to a common WLAN system.

2. Claim 1

231. Yang, 802.11-17/0250r2, and 802.11-16/1415r0 render obvious claim 1.

[1.pre] A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

232. To the extent that the preamble is limiting, the Yang-0250r2-1415r0 combination renders obvious [1.pre].

233. For example, Yang explains that “[t]he Institute of Electrical and Electronics Engineers (IEEE) Standard 802.11 is a set of physical (PHY) layer and

media access control (MAC) layer specifications for implementing wireless fidelity (Wi-Fi) communications in the 2.4 GHz, 5 GHz, and 60 GHz frequency bands.”

SAMSUNG-1006, [0002]. Further, Yang discloses that “[a] basic service set (BSS) provides the basic building-block of an 802.11 communications system,” and that “[i]n an infrastructure mode of 802.11,” a BSS may be formed by “an access point (AP)” (*a base wireless communication terminal*) and “one or more associated stations (STAs)” (*one or more wireless communication terminals wirelessly communicating with the base wireless communication terminal*). *Id.*

See also SAMSUNG-1006, [0030]-[0031], FIG. 1.

[1.1] a transceiver configured to transmit and receive wireless signals; and

234. The Yang-0250r2-1415r0 combination renders obvious [1.1].

235. For example, Yang discloses “an embodiment processing system 1200” for performing the methods described in Yang. SAMSUNG-1006, [0095]. The “processing system” includes “one or more of the interfaces 1210, 1212, 1214 [which] may be adapted to communicate data, control, or management messages from the processor 1204 to applications installed on the host device and/or a remote device.” SAMSUNG-1006, [0095], FIG. 12. Yang also discloses that “one or more of the interfaces 1210, 1212, 1214 connects the processing system 1200 to a transceiver adapted to transmit and receive signaling over the telecommunications network,” for example by “transmit[ting] and receiv[ing]

signaling over a wireless medium” (*a transceiver configured to transmit and receive wireless signals*). SAMSUNG-1006, [0098]-[0099], FIG. 13.

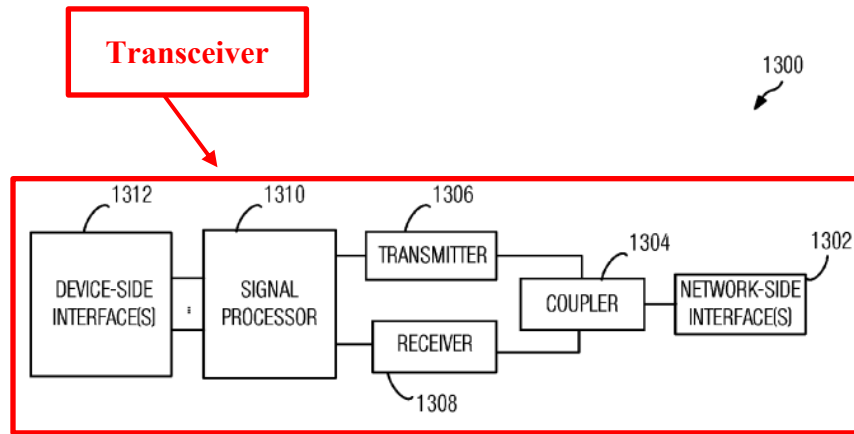


Fig. 13

SAMSUNG-1006, FIG. 13 (annotated)

236. To the extent that Yang does not expressly describe that the aforementioned components are included in a STA (wireless communication terminal), a POSITA would have found it obvious to configure a STA to include these components in order to facilitate wireless communications between the STA and other devices (e.g., an AP), such as to perform the methods described in Yang.

[1.2] a processor configured to process the wireless signals,

237. The Yang-0250r2-1415r0 combination renders obvious [1.2].

238. For example, Yang discloses that the “processing system 1200” also includes a “processor 1204 [which] may be any component or collection of components adapted to perform computations and/or other processing related

tasks” (*a processor configured to process the wireless signals*). SAMSUNG-1006, [0095], FIG. 12.

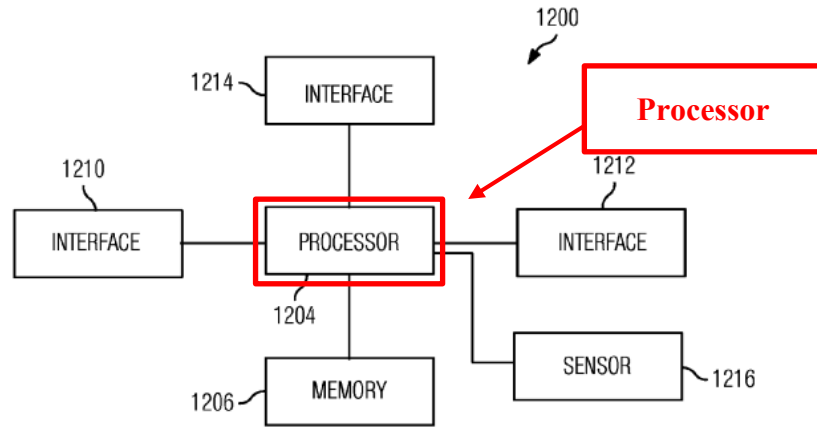


Fig. 12

SAMSUNG-1006, FIG. 12 (annotated)

239. Yang also discloses that the “transceiver” also includes a “signal processor 1310 [which] may include any component or collection of components adapted to convert a baseband signal into a data signal suitable for communication over the device-side interface(s) 1312, or vice-versa” (*a processor configured to process the wireless signals*). SAMSUNG-1006, [0098], FIG. 13.

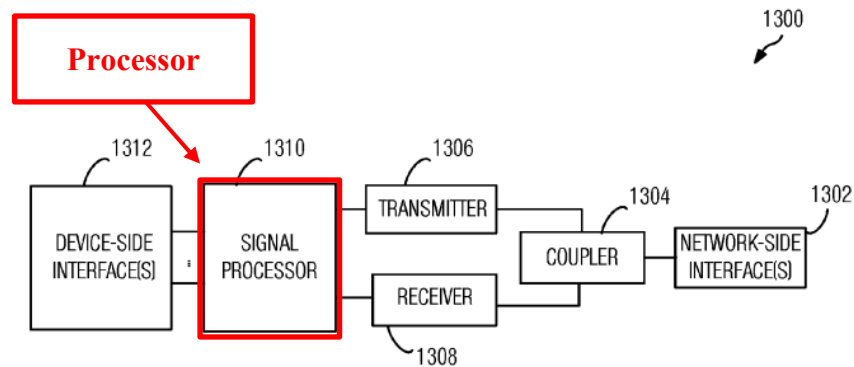


Fig. 13

SAMSUNG-1006, FIG. 13 (annotated)

240. To the extent that Yang does not expressly describe that the aforementioned processors are included in a STA (***wireless communication terminal***), a POSITA would have found it obvious to configure a STA to include these components in order to facilitate wireless communications between the STA and other devices (e.g., a AP), such as to perform the methods described in Yang.

241. Further, in view of Yang, 802.11-17/0250r2, and 802.11-16/1415r0, a POSITA would have found it obvious to configure Yang's processor(s) to perform each of the operations recited in claim 1. *See* [1.3]-[1.7].

[1.3] wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

242. The Yang-0250r2-1415r0 combination renders obvious [1.3].

243. For example, Yang discloses that an AP “may send a Trigger frame to

[a] trigger station to transmit on the UL as a part of an UL MU transmission,” and “[s]ubsequently, [the] station ... transmits a HE Trigger-based PPDU (such as HE Trigger-based PPDU 260 in FIG. 2D).” SAMSUNG-1006, [0047]. Further, Yang discloses that a “Trigger frame” can be included in an “DL [downlink] HE PPDU” that is received by a STA from an AP. SAMSUNG-1006, [0066] (describing a “DL HE PPDU” can “include a Trigger frame that triggers the UL MU transmission” from the STA to the AP) *(receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal)*. SAMSUNG-1006, [0066].

244. Further, Yang discloses that a “Trigger frame” may “grant[] the station a UL transmission opportunity.” SAMSUNG-1006, [0049]. In view of Yang, a POSITA would have understood that a “transmission opportunity” would include specific network resources (e.g., time and/or frequency resources) that are allocated to the station for transmitting an uplink signal *(the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal)*.

245. Further, in view of 802.11-17/0250r2, a POSITA also would have understood that a “trigger frame” indicates one or more resource units allocated to a STA. Like Yang, 802.11-17/0250r2 discloses techniques relating to the transmission of a HE trigger-based PPDU in response to a received trigger frame.

SAMSUNG-1007, p.17-20 (describing the trigger of a “HE trigger-based PPDU” by an AP). Further, 802.11-17/0250r2 discloses that an “eliciting Trigger frame” may include a “RU [resource unit] Allocation field” (e.g., for indicating a resource unit allocation to a STA). SAMSUNG-1007, p.18. In view of 802.11-17/0250r2, a POSITA would have recognized that Yang’s “Trigger unit” includes a field that explicitly indicates a resource unit allocation to the STA, and indeed this further would have been obvious to coordinate the transmission of a responsive HE trigger-based PPDU by the STA to the AP.

[1.4], [1.9] when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color to be indicated by a trigger-based PPDU based on the BSS color indicated by the field, ... wherein the BSS color is one of identifiers identifying a BSS

246. The Yang-0250r2-1415r0 combination renders obvious [1.4] and [1.9].

247. To start, Yang discloses several different “high efficiency (HE) physical (PHY) protocol data unit (PPDU) formats,” including (i) “a HE single user (SU) PPDU format” and “a HE Extended Range SU PPDU format” that “are used for a single-user transmission,” (ii) “a HE multi-user (MU) PPDU format that is used for a MU transmission that is not a response to a Trigger frame,” and (iii) “a HE Trigger-based PPDU format that is used for a transmission that is a response to a Trigger frame.” SAMSUNG-1006, [0032], FIGS. 2A-2D.

248. Further, Yang discloses that each of the HE PHY PPDU formats includes an “HE-SIG-A field” with “a BSS Color subfield, which contains a 6-bit identifier of the BSS (referred to as a BSS Color) that the transmitting station or AP belongs to” (*a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included*). SAMSUNG-1006, [0034]. Specifically, “[t]he BSS Color is used to assist a receiving station or AP in identifying the BSS from which the received PPDU originates so that the station may use the channel access rules for spatial reuse or may enter a doze state of a power save (PS) mode” (*the BSS color is one of identifiers identifying a BSS*). SAMSUNG-1006, [0034].

249. Although Yang discloses techniques for changing the BSS color that is used by an AP and a STA during communications (e.g., to avoid BSS color collisions with an “overlapping” BSS (OBSS)) (*see, e.g., SAMSUNG-1006, [0050]-[0050]*), Yang does not expressly describe how a BSS color is initially selected by an AP and communicated to a STA. Nevertheless, Yang indicates that, in at least some circumstances, the BSS color indicated in the “Trigger frame” would be used in the responsive trigger-based PPDU transmitted by the STA to the AP. SAMSUNG-1006, [0047]. For example, Yang describes a scenario in which an “AP 320” and a “STA 330” are members of a BSS identified by a BSS color

“Color 1.” SAMSUNG-1006, [0047]. In this example, “AP 360 may send a Trigger frame to trigger station 370 to transmit on the UL as a part of an UL MU transmission” (which may be transmitted according to a HE PPDU format including a field indicating a BSS color, as discussed with reference to [1.3]), and “[s]ubsequently, station 370 transmits a HE Trigger-based PPDU (such as HE Trigger-based PPDU 260 in FIG. 2D) with the BSS Color subfield in the HE-SIG-A field (such as HE-SIG-A 270 in FIG. 2D) set to a value of “Color 1”. SAMSUNG-1006, [0047].

250. In view of Yang, a POSITA would have looked to other references for specific guidance regarding how an initial BSS color can be signaled by an AP to a STA. One such reference is 802.11-17/0250r2, which discloses specific techniques for signaling BSS color between an AP and a STA in the context of trigger-based PPDU transmissions. SAMSUNG-1007, p.17-20.

251. For example, 802.11-17/0250r2 discloses that “[a] non-AP HE STA transmitting an HE trigger-based PPDU in response to a Trigger frame sets a TXVECTOR parameter” differently, depending on certain conditions.⁵

⁵ A POSITA would have understood that “TXVECTOR” and “RXVECTOR” refers to parameters indicate the contents to a PPDU transmitted

SAMSUNG-1007, p. 17. For the “BSS_COLOR” parameter specifically, “[i]f the preceding Trigger frame was received in an HE PPDU” (*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included*), the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the RXVECTOR parameter BSS_COLOR of the HE PPDU” (representing the BSS color identified in the BSS Color subfield of the HE-SIG-A field of the received PPDU) (*...set a value of a BSS color to be indicated by a trigger-based PPDU based on the BSS color*

by a device and the contents of a PPDU received by a device, respectively. For example, according to the HE PPDU formats, “[t]he structure of the PPDU transmitted by an HE STA is determined by TXVECTOR parameters.”

SAMSUNG-1005, 213:31-35. Specifically, “[u]sing the TXVECTOR, the MAC [Media Access Control layer] supplies the PHY [Physical layer] with per-PPDU transmit parameters.” SAMSUNG-1005, 214, 11-12. Further, a device (e.g., a STA) receiving a PPDU generates a corresponding RXVECTOR reporting the contents of the received PPDU. Specifically, “[u]sing the RXVECTOR, the PHY informs the MAC of the received PPDU parameters.” SAMSUNG-1005, 214, 11-12.

indicated by the field). SAMSUNG-1007, p. 17.

252. In view of 802.11-17/0250r2, it would have been obvious to configure Yang's system to perform initial BSS color signaling in accordance with 802.11-17/0250r2 technique (e.g., based on BSS color signaling in a PPDU having a trigger frame soliciting a trigger-based PPDU), and a POSITA would have sought to do so to facilitate the coordination of BSS color between an AP and a STA.

[1.5], [1.7] when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal; ... wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element

253. The Yang-0250r2-1415r0 combination renders obvious [1.5] and [1.7].

254. As discussed with reference to [1.4], Yang discloses several HE PPDU formats, each of which includes "HE-SIG-A field" with "a BSS Color subfield" for indicating a BSS color. SAMSUNG-1006, [0032], FIGS. 2A-2D. However, Yang does not explicitly discuss coordinating BSS color between an AP and a STA when a PPDU has a format that does not indicate BSS color (e.g., a non-HE PPDU format). *See generally* SAMSUNG-1006.

255. In view of Yang, a POSITA would have looked to other references for specific guidance as to how to coordinate BSS color between an AP and a STA when a PPDU has a format that does not indicate BSS color (e.g., such that Yang's

system would remain compatible with PPDU formats, such as non HE PPDU formats). One such reference is 802.11-17/0250r2, which discloses that a STA transmits a trigger-based PPDU differently, depending on whether the trigger frame includes the “BSS_COLOR” field. SAMSUNG-1007, p. 17.

256. Specifically, 802.11-17/0250r2 discloses that “[i]f the Trigger frame was received in a non-HE PPDU” (i.e., in which the “HE-SIG-A field’ with “a BSS Color subfield” is not present) (*when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included*), the “BSS_COLOR” parameter of the TXVECTOR for the trigger-based PPDU is “set to the value of the BSS Color subfield of the most recently received HE Operation element for that BSS.” (*...set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, where the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element*). SAMSUNG-1007, p.17.

257. “[T]he value of the BSS Color subfield of the most recently received HE Operation element for that BSS” (as disclosed by 802.11-17/0250r2), constitutes “the active BSS color” that is “actually used by the wireless communication terminal and set by an Operation element,” as called for in [1.5].

258. In particular, upon receiving a trigger frame with an HE-SIG-A field with a BSS Color subfield, a STA would transmit a trigger-based PPDU using the BSS color indicated by that BSS Color subfield, thereby “actually using” the indicated BSS color. *See* [1.4]. This BSS color is indicated in an “HE Operation element” transmitted by the AP to the STA (e.g., in order to announce or indicate BSS color information, such as the BSS color “currently being used by the BSS”). SAMSUNG-1006, [0083]; SAMSUNG-1007, p.17.

259. If no further trigger frames having the “BSS_COLOR” field are subsequently received (e.g., if the subsequent trigger frames were non-HE PPDU that do not include the BSS Color subfield), a POSITA would have understood from 802.11-17/0250r2 that the STA would continue using its most recently indicated BSS Color subfield in an “HE Operation element” transmitted to the STA. SAMSUNG-1007, p.17.

260. Petitioner’s mapping of [1.5] to Yang and 802.11-17/0250r2 is also consistent with the disclosure of the ’262 Patent regarding the use of an “active BSS color”:

The wireless communication terminal may set the value of the BSS color received from the base wireless communication terminal to the value of the active BSS color. In this case, the active BSS color may indicate a BSS color actually used by the wireless communication terminal. In more detail, the BSS color set by the wireless

communication terminal to the value of the BSS Color field of the HE-SIG-A field of the PPDU and the value of the BSS Color field of the HE Operation element may be referred to as an active BSS color.

Therefore, the wireless communication terminal may set the value of the active BSS color to the value of the BSS color indicated by the PPDU transmitted by the wireless communication terminal. Specifically, the wireless communication terminal sets the value of the active BSS color to the value of the BSS Color field of the HE-SIG-A field of the PPDU transmitted by the wireless communication terminal. For example, the base wireless communication terminal may set the value of the active BSS color with BSS_COLOR of the TXVECTOR parameter and set the value of the active BSS color in the BSS Color field of the HE-SIG-A field of the PPDU.

SAMSUNG-1001, 20:29-49.

[1.6] transmit the trigger-based PPDU based on the trigger frame,

261. The Yang-0250r2-1415r0 combination renders obvious [1.6].

262. For example, as discussed with reference to [1.3], Yang discloses that that an AP “may send a Trigger frame to [a] trigger station to transmit on the UL as a part of an UL MU transmission,” and “[s]ubsequently, [the] station ... transmits a HE Trigger-based PPDU (such as HE Trigger-based PPDU 260 in FIG. 2D)

(transmit the trigger-based PPDU based on the trigger frame). SAMSUNG-1006, [0047].

¶ ***[1.8] wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is***

reached, the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change, and

263. The Yang-0250r2-1415r0 combination renders obvious [1.8].

264. For example, Yang discloses techniques that “allow an AP to change a BSS Color value used in the BSS that the AP serves, e.g., when a BSS Color collision occurs.” SAMSUNG-1006, [0050]. As an example, Yang discloses that “an AP initiates a BSS Color Change procedure when there is a need to change the current BSS Color value of the BSS that the AP serves,” which an example of which includes two “stages.” SAMSUNG-1006, [0051].

265. During the first stage, “the AP uses a pre-specified Transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDU transmitted by the AP as soon as the AP determines to change the BSS Color value, e.g., after the detection of a collision with the current BSS Color value.” SAMSUNG-1006, [0051].

266. During the second stage, “the AP uses the new BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDU that the AP transmits after the one or more conditions, as mentioned above, are met.” SAMSUNG-1006, [0054]. Yang discloses that one such condition can include the expiration of “a time T.” SAMSUNG-1006, [0053].

267. Based on these teachings from Yang, a POSITA would have recognized that allowing an AP to switch BSS color is beneficial, as it allows the

BSS to avoid collisions (e.g., with other BSSs having the same BSS color).

However, a POSITA would have recognized several deficiencies in Yang's BSS change color technique, including (i) requiring the use of a "Transitory BSS Color" (thereby increasing the number of BSS colors that are in use, which may be undesirable for a dense networking environment with many other BSSs in close proximity and many BSS colors may already be in use), and (ii) an inability for the AP to select a specific time at which the STAs switch to the new BSS.

268. To at least partially address these deficiencies, a POSITA would have looked to other references regarding alternative techniques for coordinating a BSS color switch between an AP and a STA. One such reference is 802.11-16/1415r0, which discloses a "BSS Color Change Procedure" that allows an AP to cause a new BSS color to be used at a specific time by each device of the BSS, and without requiring the use of an additional "Transitory BSS Color." *See generally* SAMSUNG-1008.

269. In particular, 802.11-16/1415r0 discloses a "BSS Color Change Announcement element [that] is used by an HE AP to advertise a BSS Color change and the value of the new BSS color." SAMSUNG-1008, p.6. An example of a "BSS Color Change Announcement element" is provided in the first figure on p.6.

	Element ID	Length	Element ID Extension	Color Switch Countdown	New BSS Color Information
Octet:	1	1	1	1	1

SAMSUNG-1005, p.6

270. Among other fields, the “BSS Color Change Announcement element” includes a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color.” SAMSUNG-1008, p.6.

271. Further, 802.11-16/1415r0 discloses a specific mechanism for synchronizing the change in BSS color between an AP STA (*base wireless communication terminal*) and a non-AP STA (*wireless communication terminal*) based on the information included in the “BSS Color Change Announcement element.” SAMSUNG-1008, p.7. In particular:

BSS Color change TBTT is the one at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color.

During the time leading up to the BSS Color change TBTT, an HE AP shall continue to advertise the existing BSS Color via the BSS Color subfield in HE Operation element.

At the BSS Color change TBTT, an HE AP shall:

- set the BSS Color Disable bit subfield value to 0 in HE Operation element
- start advertising the new BSS Color via BSS Color subfield in HE Operation element
- start using the new BSS Color

A non-AP STA that receives a BSS Color Change Announcement element shall start using the BSS Color specified in the received BSS Color Change Announcement element subsequent to the BSS Color change TBTT.

SAMSUNG-1008, p.7.

272. That is, 802.11-16/1415r0 discloses that a non-AP STA receives an

announcement from an AP STA advertising a new BSS Color (e.g., via the “BSS Color Change Announcement”) (*the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal*).

273. Further, when advertising the new BSS Color, the AP STA also provides the non-AP STA with timing information regarding when the BSS Color change information occurs (e.g., such that the non-AP STA can synchronize the BSS color change with the AP STA in order to maintain communications between them). In particular, the non-AP STA receives a “Color Switch Countdown” field that “is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color” (*a BSS color change time point*), and uses this field to determine the “BSS Color change TBTT ... at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color.” SAMSUNG-1008, p.7.

274. Based on these teachings from 802.11-16/1415r0 in combination with Yang and 802.11-17/0250r2, , a POSITA would have understood and found it obvious that upon the non-AP STA receiving the BSS color change announcement and reaching the indicated BSS color change time (*when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point*

indicated by the information on the BSS color change is reached), the non-AP STA would start using the new BSS color (*...the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change*).

275. Petitioner's mapping of [1.8] to 802.11ax/D1.0 is also consistent with the disclosure of the '262 Patent regarding the changing of BSS color:

When the wireless communication terminal receives the information on the BSS color change and reaches the BSS color change time point indicated by the information on the BSS color change, the wireless communication terminal may set the active BSS color to a value of the BSS color indicated by the information on the BSS color change. In this case, the value of the BSS color indicated by the information on the BSS color change may be a value indicated by the New BSS Color subfield of the BSS Color Change Announcement element. The BSS color change time point may be determined based on target beacon transmission times (TBTT).

SAMSUNG-1001, 20:49-60.

3. Claim 2

[2] The wireless communication terminal of claim 1, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

276. The Yang-0250r2-1415r0 combination renders obvious claim 2.

277. As discussed with reference to [1.8], 802.11-16/1415r0 discloses that a non-AP STA receives, from a AP STA, a "BSS Color Change Announcement element" including a "Color Switch Countdown" field that "is set to the number of

TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color” (*a target beacon transmission time transmitted by the base wireless communication terminal*), and uses this field to determine the “BSS Color change TBTT ... at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color” (*BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal*). SAMSUNG-1008, p.7.

278. Further, a POSITA would have recognized that it was commonplace for an AP STA to signal the TBTT to a non-AP STA. For example, as confirmed by 802.11ax/D1.0, it was commonplace as of the Critical Date for an “[a]n HE AP [to] transmit beacon frames” that indicate a “Beacon interval” representing the occurrence of each TBTT (e.g., “[t]he TBTT repeats every Beacon interval as indicated in the Beacon frame”). SAMSUNG-1005, 141:30-51. As confirmed by 802.11-2016, it was commonplace as of the Critical Date for an AP STA to transmit one or more beacon frames indicating a “Beacon interval,” which “represents the number of time units (TUs) between target beacon transmission times (TBTTs).” SAMSUNG-1010, pp.694, 724.

4. Claim 4

279. The Yang-0250r2-1415r0 combination renders obvious claim 4.

[4.pre] A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

280. To the extent that the preamble is limiting, the Yang-0250r2-1415r0 combination renders obvious [4.pre].

281. As discussed with reference to [1.pre], Yang discloses that “[a] basic service set (BSS) provides the basic building-block of an 802.11 communications system,” and that “[i]n an infrastructure mode of 802.11,” a BSS may be formed by “an access point (AP)” (*a base wireless communication terminal*) and “one or more associated stations (STAs)” (*one or more wireless communication terminals wirelessly communicating with the base wireless communication terminal*). *Id.* See also SAMSUNG-1006, [0030]-[0031], FIG. 1; *supra*, [1.pre].

282. Further, as discussed below, Yang, 802.11-17/0250r2, and 802.11-16/1415r0 renders obvious operating a wireless communication terminal in accordance with claim 4.

[4.1]-[4.7]

283. The Yang-0250r2-1415r0 combination renders obvious [4.1]-[4.7] for each of the reasons discussed above with respect to the corresponding elements in claim 1. See [1.3]-[1.9].

D. Ground 2B – Yang, 802.11-17/0250r2, 802.11-16/1415r0, 802.11-2016, and 802.11-17-0230r1 Render Claim 3 Obvious

284. The combined teachings of Yang in view of 802.11-17/0250r2,

802.11-16/1415r0, 802.11ax/D1.0, 802.11-2016, and 802.11-17-0230r1 render obvious claim 3.

1. Combination of Yang, 802.11-17/0250r2, 802.11-16/1415r0, 802.11-2016, and 802.11-17-0230r1

285. Yang discloses several different “high efficiency (HE) physical (PHY) protocol data unit (PPDU) formats.” SAMSUNG-1006, [0032], FIGS. 2A-2D. However, Yang does not expressly address certain legacy non-HE PPDU formats, such as Very High Throughput (VHT) formats.

286. In view of Yang, a POSITA would have looked to other references for specific guidance regarding how to perform operations pertaining to signaling and synchronizing BSS color between devices in the context of non-HE PPDU formats, such that wireless devices can reliably signal and synchronize BSS color between them in a variety of network environments (e.g., legacy network environments that do not utilize HE PPDU).

287. Three such references are 802.11ax/D1.0, 802.11-2016, and 802.11-17-0230r1. As discussed in further detail below, each of these references includes specific teaching regarding the signaling and synchronization of BSS color between wireless devices using legacy PPDU formats, such as VHT PPDU formats. In view of these references, a POSITA would have found it obvious to modify the Yang-802.11-17/0250r2-802.11-16/1415r0 system to additionally incorporate the VHT PPDU-based techniques in these references, such that the

resulting system maintains communications compatibility with both HE-based systems and legacy VHT-based systems. A POSITA would have reasonably expected success implementing the combination because the techniques were well known and directed to a common WLAN system.

2. *Claim 3*

[3] The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

288. The combination of Yang in view of 802.11-17/0250r2, 802.11-16/1415r0, 802.11ax/D1.0, 802.11-2016, and 802.11-17-0230r1 renders obvious claim 3.

289. As discussed with reference to [1.4], Yang discloses several different “high efficiency (HE) physical (PHY) protocol data unit (PPDU) formats,” including (i) “a HE single user (SU) PPDU format” and “a HE Extended Range SU PPDU format” that “are used for a single-user transmission,” (ii) “a HE multi-user (MU) PPDU format that is used for a MU transmission that is not a response to a Trigger frame,” and (iii) “a HE Trigger-based PPDU format that is used for a transmission that is a response to a Trigger frame.” SAMSUNG-1006, [0032], FIGS. 2A-2D.

290. Further, 802.11ax/D1.0 discloses that, in other PPDU formats (e.g.,

formats other than “HE_SU,” “HE_MU,” HE_EXT_SU,” or “HE_TRIG”), a

TXVECTOR and/or RXVECTOR parameter can include a field

“PARTIAL_AID.” SAMSUNG-1005, 223:11-17.

PARTIAL_AID	FORMAT is HE_SU, HE_MU, HE_EXT_SU or HE_TRIG	Not present	N	N
	Otherwise	See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters).		

SAMSUNG-1005, Table 28-1 (223:11-17) (annotated)

291. A POSITA would have recognized that by virtue of the “PARTIAL_AID” being present in the TXVECTOR for a PPDU for transmission to another device (e.g., from an AP STA to a non-AP STA), the “PARTIAL_AID” would be included as a parameter in the transmitted PPDU to indicate the Partial AID (*a Partial Association ID (AID) field*). Similarly, a POSITA would have recognized that upon receipt of the PPDU, the receiving device (e.g., a non-AP STA) would report the Partial AID in the PPDU using the “PARTIAL_AID” in a RXVECTOR. *See also* Section IX.C.2., [1.4], [1.9] *supra*.

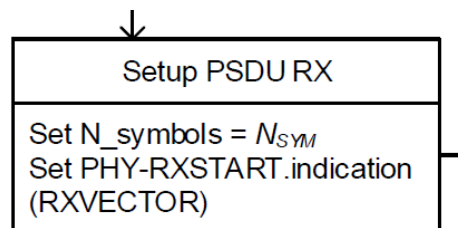
292. Indeed, as 802.11-2016 discusses, for a VHT PPDU format (i.e., non-HE PPDU format), a PPDU includes a field VHT-SIG-A having a “NSTS/Partial AID” field for indicating a Partial AID in accordance with the TXVECTOR” (SAMSUNG-1010, Table 21-12 (p.2544).

B10-B21	NSTS/Partial AID	12	<p>For a VHT MU PPDU: NSTS is divided into 4 user positions of 3 bits each. User position p, where $0 \leq p \leq 3$, uses bits $B(10 + 3p)$ to $B(12 + 3p)$. The number of space-time streams for user u are indicated at user position $p = \text{USER_POSITION}[u]$ where $u = 0, 1, \dots, \text{NUM_USERS} - 1$ and the notation $A[b]$ denotes the value of array A at index b. Zero space-time streams are indicated at positions not listed in the USER_POSITION array. Each user position is set as follows:</p> <ul style="list-style-type: none"> Set to 0 for 0 space-time streams Set to 1 for 1 space-time stream Set to 2 for 2 space-time streams Set to 3 for 3 space-time streams Set to 4 for 4 space-time streams Values 5-7 are reserved <p>For a VHT SU PPDU:</p> <p>B10-B12</p> <ul style="list-style-type: none"> Set to 0 for 1 space-time stream Set to 1 for 2 space-time streams Set to 2 for 3 space-time streams Set to 3 for 4 space-time streams Set to 4 for 5 space-time streams Set to 5 for 6 space-time streams Set to 6 for 7 space-time streams Set to 7 for 8 space-time streams <p>B13-B21</p> <p>Partial AID: Set to the value of the TXVECTOR parameter PARTIAL_AID. Partial AID provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20 (Group ID and partial AID in VHT PPDU(s))).</p>
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SAMSUNG-1010, Table 21-12 (annotated)

293. Further, in view of 802.11-2016, a POSITA would have recognized that a device receiving the PPDU would generate an RXVECTOR reporting the parameters included in the received PPDU (e.g., the contents of a VHT-SIG-A field including “NSTS/Partial AID”). *See also* SAMSUNG-1010, p.2599 (first paragraph) (“After receiving a valid L-SIG and VHT-SIG-A indicating a supported mode, the PHY entity shall begin receiving the VHT training symbols and VHT-SIG-B. If the received group ID in VHT-SIG-A has a value indicating a VHT SU PPDU (see 10.20 (Group ID and partial AID in VHT PPDU(s))), the PHY entity may choose not to decode VHT-SIG-B.”). *See also* SAMSUNG-1010, Section

8.3.5.13 (describing that a “PHY-RXSTART.indication” primitive is used to “indicat[e] by the PHY to the local MAC entity that the PHY has received a valid start of a PPDU, including a valid PHY header” and includes a parameter “RXVECTOR” that “represents a list of parameters that the PHY provides the local MAC entity upon receipt of a valid PHY header.”), FIG. 21-37 (depicting the setting of “PHY-RXSTART.indication” and generation of “RXVECTOR” in connection with the receipt of a VHT PPDU).



SAMSUNG-1010, FIG. 21-37 (excerpt)

294. A POSITA would have recognized that, as of the Critical Date, “PARTIAL_AID” in a TXVECTOR (an in turn, the value of the Partial AID field of a transmitted PPDU) was commonly determined based, at least in part, on a value of an AID field (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*).

295. For example, 802.11ax/D1.0’s Table 28-1 refers to a “corresponding entry in Table 21-1”), which a POSITA would have understood to refer to Table 21-1 of P802.11-REVmc/D8.0 (and later, 802.11-2016) (SAMSUNG-1010), the base version of the IEEE 802.11 specification of which 802.11ax/D1.0 was

intended to amend. SAMSUNG-1005, i:1-3 (indicating that “IEEE P802.11ax™/D1.0, November 2016” is an “amendment to IEEE P802.11REVmc™/D8.0”). For reference, the relevant portion of Table 21-1 of 802.11-2016 is reproduced below:

Parameter	Condition	Value	TXVECTOR	RXVECTOR
GROUP_ID	FORMAT is VHT	Indicates the group ID. Integer: range 0-63 (see Table 21-12 (Fields in the VHT-SIG-A field)) A value of 0 or 63 indicates a VHT SU PPDU. A value in the range 1 to 62 indicates a VHT MU PPDU.	Y	Y
	Otherwise	Not present	N	N
PARTIAL_AID	FORMAT is VHT and GROUP_ID is 0 or 63	Provides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20 (Group ID and partial AID in VHT PPDU(s))). Integer: range 0-511.	Y	Y
	Otherwise	Not present	N	N

SAMSUNG-1010, Table 21-1 (2502:3-24)

296. As shown above, the “PARTIAL_AID” field, when present, “[p]rovides an abbreviated indication of the intended recipient(s) of the PSDU (see 10.20 (Group ID and partial AID in VHT PPDU(s))),” and includes an integer in a “range 0-511.” SAMSUNG-1010, Table 21-1 (p.2506). Further, as shown in Table 10-9 of 802.11-2016’s Section 10-20, the “PARTIAL_AID” is calculated based on an “AID” field (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*) when a PPDU is either (i) “[s]ent by an AP and addressed to a STA associated with that AP,” or (ii) “sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA.” SAMSUNG-1010,

Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(\text{AID} + (\text{BSSID}[44:47] \oplus \text{BSSID}[40:43]) \times 2^5) \bmod 2^9 \text{ (10-12)}$
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: — A PPDU sent to an IBSS STA — A PPDU sent by an AP to a non associated STA — Any other condition not explicitly listed elsewhere in the table		

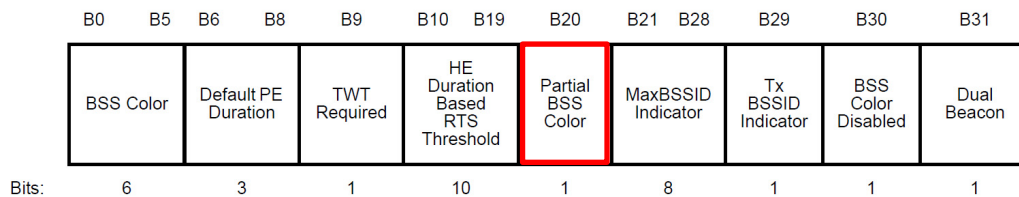
Partial AID field obtained based on an AID value

SAMSUNG-1010, Table 10-9

297. Further, as corroborated by Lou, it was commonly understood by the Critical Date that according to a precursor standard to the IEEE 802.11ax standard (i.e., IEEE 802.11ac), a VHT PPDU format can include a data field that includes “a partial association identifier (PAID) (compressed from association identifier (AID) and BSS identifier (ID) (BSSID)),” which may be “derived from the 48-bit BSSID and the 16-bit AID of the STA(s) (*the partial AID field is a signaling field used to indicate a value obtained based on an AID value*). SAMSUNG-1009, [0081]-[0082].

298. Second, 802.11ax/D1.0 discloses that a non-AP STA can determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on a partial BSS color indicated with the “PARTIAL_AID” field.

299. For example, 802.11ax/D1.0 discloses that a “HE Operation element” includes several fields for providing a STA (e.g., a non-AP STA) with parameters regarding BSS color, including a “Partial BSS Color field [that] indicates whether or not the BSS applies an AID assignment rule using the partial BSS color bits.” SAMSUNG-1005, 91:26-37, 92:1-5.



SAMSUNG-1005, FIG. 9-589cr (91:26-37)

300. Specifically, “[i]f the Partial BSS Color field is set to 1, then the 4 least significant bits of BSS color are used in AID assignment.” SAMSUNG-1005, 912:1-5. However, “[i]f the Partial BSS Color field is set to 0, no partial BSS color bits are used in the AID assignment.” *Id.*

301. Further, 802.11ax/D1.0 discloses that when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame is a “intra-BSS frame.” SAMSUNG-1005, 149:23-41. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU

(including its constituent frames) would have been an intra-BSS PPDU.

302. However, when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame is a “inter-BSS frame.” SAMSUNG-1005, 149:46-150:8-12. In view of 802.11ax/D1.0, a POSITA would have understood that, in such a situation, a received PPDU (including its constituent frames) would have been an inter-BSS PPDU.

303. 802.11-17-0230r1 discloses a similar technique as in 802.11ax/D1.0 for determining whether a PPDU is an inter-BSS PPDU or an intra-BSS PPDU based at least the PARTIAL_AID. For example, 802.11-17-0230r1 discloses that when “[t]he value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1, a frame is a “intra-BSS frame.” SAMSUNG-1011, p.10. In view of 802.11-17-0230r1, a POSITA would have understood that, in such a situation, a received PPDU would have been an intra-BSS PPDU.

304. However, when “[t]he value of RXVECTOR parameter

PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1,” a frame (e.g., a PPDU frame) is a “inter-BSS frame.” SAMSUNG-1011, p.10. In view of 802.11-17-0230r1, a POSITA would have understood that, in such a situation, a received PPDU would have been an inter-BSS PPDU.

305. Further, a POSITA would have found it obvious to make the aforementioned determination whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color, *specifically when the value of the partial AID field is non-zero*. For example, as confirmed by 802.11-2016, a POSITA would have recognized that it was commonplace to set “PARTIAL_AID” to zero to indicate situations where “[a] PPDU [is] sent to an IBSS STA,” “[a] PPDU [is] sent by an AP to a non associated STA,” or “[a]ny other condition not explicitly listed elsewhere in the table.” SAMSUNG-1010, Table 10-9 (p.1374).

Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID

Condition	GROUP_ID	PARTIAL_AID
Addressed to AP	0	BSSID[39:47]
Addressed to Mesh STA	0	RA[39:47]
Sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA	63	$(\text{AID} + (\text{BSSID}[44:47] \oplus \text{BSSID}[40:43]) \times 2^5) \bmod 2^9$ (10-12)
Otherwise (see NOTE)	63	0
NOTE—The last row covers the following cases: — A PPDU sent to an IBSS STA — A PPDU sent by an AP to a non associated STA — Any other condition not explicitly listed elsewhere in the table		

Partial AID field set to zero

SAMSUNG-1010, Table 10-9

306. A POSITA would have recognized that in these situations identified by 802.11-2016, the “PARTIAL_AID” is set to a pre-determined value (i.e., zero) to indicate the occurrence of certain specific edge cases (e.g., a PPDU being sent by IBSS STA or to a non associated STA) rather than to indicate a value derived based on a BSSID and/or AID. Thus, a POSITA would have recognized that when the “PARTIAL_AID” is zero, it would not have made sense to use the aforementioned technique in 802.11ax/D1.0 (which relies on a PARTIAL_AID having a value derived based on a BSSID and/or AID) to determine whether a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU.

307. Accordingly, in view of 802.11ax/D1.0, 802.11-2016, and 802.11-17-0230r1, a POSITA would have found it obvious to configure Yang’s processor to *determine a PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the*

partial BSS color when the value of the partial AID field is non-zero, in order to differentiate between intra-BSS PPDU and inter-BSS PPDU in a wider array of use cases than those explicitly described by Yang (e.g., when the PPDU is in a format other than an HE PPDU).

X. CONCLUSION

308. For all the reasons I have noted in the foregoing paragraphs, claims 1-4 of the '262 Patent are obvious in view of the references discussed above.

309. I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

APPENDIX A

CHRISTOPHER J. HANSEN

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I. SUMMARY

- Senior electrical engineer - more than 25 years in industry plus Ph.D. (UCLA 1997).
- Named inventor on more than 125 issued patents, including many related to IEEE802.11/Wi-Fi and Bluetooth wireless standards.
- Technical skills encompass wireless network physical layer (PHY) design, systems engineering, communication theory, integrated circuit (IC) design, signal processing, RF/microwave systems, intellectual property, and standardization.
- Experience with multiple successful product developments (802.11 WLAN chipsets and cellular base-station systems), research in new technologies (802.11n MIMO and 60 GHz), and leading standards bodies (IEEE 802.11, Bluetooth SIG, Wireless Gigabit Alliance).

II. EXPERIENCE

Covariant Corporation, Los Altos, California

President

August 2013 – present

- Consulting in wireless communication systems, signal processing, standards, and intellectual property.
- Recent clients include Octoscope, Google, and Peraso Technologies.
- Example projects:
 - Developed and executed IEEE 802.11 standards strategy for a technology startup company. Led standards participation in industry special interest group and IEEE 802.11ay and 802.11md task groups. Developed simulations in Matlab to support standards contributions.

- Developed Matlab tools to predict mmwave system performance including impact of cascade non-linearities and temperature variations.
- Analyzed patent portfolio for potential standards related patents related to IEEE 802.11 standards and Wi-Fi Alliance specifications. Developed claim charts for appropriate patents.
- Developed Matlab simulation tools as part of technical support for patent litigation. Analyzed performance benefits of physical layer features in IEEE 802.11 standards.
- Reviewed C, assembler, Verilog, and VHDL code for technical support in patent litigation.
- Developed and prototyped novel radar detection algorithms in Matlab and C for specialized radio receiver,

Apple, Cupertino, California

Senior Wireless System Architect

June 2012 – July 2013

- Analysis of 802.11 wireless networks for iOS products.

Broadcom Corporation, Sunnyvale, California

Associate Technical Director, Office of the CTO

March 2011 – May 2012

Senior Principal Scientist, Office of the CTO

March 2007 - March 2011

Principal Scientist, Office of the CTO

March 2006 - March 2007

Engineering Manager, Wireless LAN Business Unit

June 2004 - March 2006

Senior Staff Scientist, Wireless LAN Business Unit

January 2000 - June 2004

- Analysis and development of new wireless networking technologies for application to WiGig (60 GHz wireless), WirelessHD, Bluetooth, Wimedia Ultrawideband, IEEE 802.11, and 802.15 systems. Investigation of inter-networking, antenna systems, beamforming techniques, signal processing and advanced devices employing multiple wireless technologies.
- Secretary, board member, and vice chair of the Technical Working Group of the Wireless Gigabit Alliance.
- Vice chair of the IEEE 802.11ad (60 GHz MAC/PHY) task group.
- Developed BT/802.11 technology and co-chaired the Bluetooth SIG 802.11 AMP (Alternate MAC/PHY) Study Group. The resulting specification was the hallmark feature of the Bluetooth 3.0 release.
- Developed significant intellectual property related to wireless networks and contributed to the management of company patent portfolio through patent review committee.

- Project manager and lead physical layer (PHY) systems engineer for 802.11n proposal to the IEEE. Key elements of this proposal and further contributions became the basis of the IEEE 802.11n standard including MIMO-OFDM physical layer and enhanced MAC layer for higher throughput wireless networks. Made contributions in the areas of preamble design, advanced channel coding, MIMO-OFDM, channel estimation, and multiple antenna beamforming. (See: https://en.wikipedia.org/wiki/IEEE_802.11n-2009)
- Led Broadcom effort to standardize power control and dynamic frequency selection for wireless networks in IEEE 802.11 Task Group H. Proposal is now part of 802.11h standard. (See: https://en.wikipedia.org/wiki/IEEE_802.11h-2003)
- System engineering for 802.11a/b/g wireless local area network chipsets, including analysis of radio and base-band dsp architectures for the physical layer design. Developed signal processing algorithms, channel models, radio system models, and laboratory radios.
- Designed and developed MATLAB and bit accurate C models for the physical layers of 802.11 WLAN chipsets. These included models for equalizers, convolutional coders/decoders, beamforming, nonlinear distortion in radio transceivers, and radio channels.
- Analyzed and debugged first silicon versions of commercially successful 802.11a/b/g integrated circuit products.
- Developed radar detection and dynamic frequency selection hardware and software for 802.11a chipsets to meet ETSI (European) and FCC (U.S.) regulations.

Excess Bandwidth Corporation (now Conexant), Santa Clara, California

Principal Systems Engineer

1998–1999

- System engineering and architecture for HDSL2/G.shdsl digital subscriber line modems, including MATLAB and C code to simulate equalizers, error correcting codes, timing recovery, digital phase locked loops, waiting time jitter, and performance in crosstalk.
- Developed DSP software in C and assembler (TI C6x) for prototype HDSL2/G.shdsl modem. Implemented modules for adaptive equalization, timing recovery, and activation frame handshake.

Amati Communications Corporation (now Texas Instruments)

San Jose, California

Senior Research Engineer

1997-1998

- Developed, analyzed, and implemented advanced equalizer training algorithms for discrete multi-tone (DMT) based asymmetric digital subscriber line (ADSL) models.

AT&T Bell Laboratories, Whippany, New Jersey

Member of Technical Staff

1990-1992

- Developed RF and analog circuit designs for AT&T Autoplex 1000 fiber optic micro-cell radio transceiver.
- Managed testing group and developed test program for high power 900 MHz feed-forward linear amplifier used in cellular telephone base stations.

MIT Lincoln Laboratory, Lexington, Massachusetts

Member of Technical Staff

1989-1990

- Developed signal processing software and RF hardware for experimental X-band and Ka-band radar.
- Conducted radar measurements at Lincoln Laboratory sites in Lexington, MA and Kwajalein Atoll, U.S. Marshall Islands.

III. LITIGATION EXPERIENCE

- NXP B.V. v. Broadcom Corp., No. 5:14-cv-826 (N.D. Cal.). Retained on behalf of Broadcom.
- Linex Techs., Inc. v. Hewlett-Packard Co. et al., No. 4:13-cv-00159 (N.D. Cal.). Retained on behalf of Broadcom.
- TomTom Int'l, B.V. v. Broadcom Corp., No. 8:14-cv-475 (C.D. Cal.). Retained on behalf of Broadcom.
- Certain Electronics Products, Including Products with Near-Field Communication ("NFC") System-Level Functionality and/or Battery Power-Up Functionality, Components Thereof, and Products Containing Same, No. 337-TA-950 (ITC). Retained on behalf of Dell.
- NXP B.V. et al. v. Dell Inc., No. 1:14-cv-00146 (D. Del.). Retained on behalf of Dell.
- California Institute of Tech. v. Broadcom Ltd. et al., No. 2:16-cv-3714 (C.D. Cal.). Retained on behalf of Broadcom. Deposed.
- Nokia Techs. Oy et al. v. Apple Inc., Nos. 2:16-cv-1440, 2:16-cv-1441 (E.D. Tex.). Retained on behalf of Apple Inc.

- Certain Electronic Devices, Including Mobile Phones, Tablet Computers, and Components Thereof, Nos. 337-TA-1038, 337-TA-1039 (ITC). Retained on behalf of Apple Inc.
- Ruckus Wireless, Inc., Belkin International, Inc., Amazon.com, Inc., Netgear, Inc., and Roku, Inc. v. Hera Wireless S.A., U.S. Patent and Trademark Office *Inter Partes Review*. Retained on behalf of Ruckus Wireless (Arris, Inc.).
- Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof, Inv. No. 3337-TA-1065; Qualcomm Inc. v. Apple Inc, Civ. Action No. 3:17-cv-01375-JAH-MDD. Retained on behalf of Apple.
- VLSI Technology LLC v. Intel Corporation, No. 1:18-cv-00966 (Delaware). Retained on behalf of Intel Corporation.
- Nokia Techs. Oy v. Lenovo (Shanghai) Elects. Tech. Co. Ltd, et al., No. 5:19-cv-427 (E.D.N.C.) and In re Certain Electronic Devices, Including Computers, Tablet Computers, and Components and Modules Thereof, Inv. No. 337-TA-1208 (U.S.I.T.C). Retained on behalf of Lenovo.
- Koss Corporation v. Apple, Inc, No. 6:20-cv-00665 (W.D. Texas). Retained on behalf of Apple, Inc. Deposed.
- Aegis 11 S.A. v. Hisense Company, Ltd. and Hisense USA Corporation, No. 1:20-cv-03891 (N.D. Georgia). Retained on behalf of Hisense.
- Mediatek, Inc. v. NXP Semiconductors, No. 2:21-cv-04970 (C.D. California), In the Matter of Certain Integrated Circuits And Products Containing Same, Inv. No. 337-TA-1272. Retained on behalf of NXP. Deposed. Testified at evidentiary hearing.
- One-E-Way, Inc. v. Apple Inc., No. 2:20-cv-06339-JAK-PD (C.D. Cal.)
- NXP Semiconductors v. Mediatek, Inc. In the Matter of Certain Integrated Circuits And Products Containing Same, Inv. No. 337-TA-1287. Retained on behalf of NXP. Deposed.
- Intellectual Ventures v. General Motors, No. 6:21-cv-1088 (W.D. Texas). Retained on behalf of General Motors.
- XR Communications, LLC v. Hewlett Packard, 6:21-cv-00694 (W.D. Texas). Retained on behalf of Hewlett Packard.
- American Patents, LLC v. Marvell Semiconductors, 6:22-cv-771 (W.D. Texas). Retained on behalf of Marvell Semiconductors.
- TexasLDPC, Inc. v. Broadcom, C.A. No. 18-1966-SB (Delaware). Retained on behalf of Broadcom.

- Atlas Global Technologies v. OnePlus, 6:21-cv-01217-ADA. Retained on behalf of OnePlus.
- LG Electronics Inc. v. TCL Electronics Holding Ltd., 2:22-cv-122-JRG. Retained on behalf of LG Electronics Inc.
- Atlas Global Technologies v. TP-Link, 2:21-cv-430-JRG. Retained on behalf of TP-Link. Deposed. Testified at Trial.
- Panasonic Automotive Systems Co., Ltd. v. UNM Rainforest Innovations, U.S. Patent and Trademark Office *Inter Partes Review*. Retained on behalf of Panasonic.
- Intellectual Ventures I, LLC v. Ubiquiti, Inc., C.A. No. 23-cv-00865-GBW. Retained on behalf of Ubiquiti.
- Motorola Mobility LLC v. Ericsson AB, Certain Cellular Base Station Communications Equipment Components Thereof, And Products Containing Same. ITC 337-TA-. Retained on behalf of Ericsson.

IV. EDUCATION

Ph.D., Electrical Engineering University of California, Los Angeles Dissertation: <i>Probing Techniques for Multiuser Channels with Power Control</i> Research Area: Wireless and Digital Communications Advisor: Gregory J. Pottie	1997
M.S., Electrical Engineering University of Massachusetts, Amherst Concentration: Signal Processing and Microwave Systems	1989
B.S., Electrical Engineering Rensselaer Polytechnic Institute	1987

V. HONORS AND AFFILIATIONS

- Institute of Electrical and Electronics Engineers (IEEE) Senior Member.
- Member, Society for Industrial and Applied Mathematics.
- Reviewer, IEEE Communications Magazine, 2014 - present.
- Board of Directors, PATCA - Professional and Technical Consultants Association, Silicon Valley, 2007 - present.
- Vice Chair, IEEE 802.11ad Task Group, 2011-2012.
- Secretary, Wireless Gigabit Alliance, 2010-2012.
- Rockwell graduate fellowship recipient, UCLA, 1992-1996.
- Eta Kappa Nu, Electrical Engineering Honor Society, Rensselaer Polytechnic Institute, 1987.

VI. SKILLS

- Architecture and analysis of wireless digital communication systems, including 802.11a/b/g/n/ac/ad/ax/ay, Bluetooth, Wimedia UWB, WirelessHD, and WiGig.

- DSP Programming (TI TMS320C62x and 320C5x) in C and assembler and general programming in C++, C, Matlab, and Python.
- RF/microwave/mmwave laboratory and over-the-air channel measurements.
- Extra class Amateur Radio license (W6COV) and Commercial General Radiotelephone license.

VII. PUBLICATIONS

C. J. Hansen, “Semi-blind Channel Estimation on 802.11 OFDM Data Symbols”, International Conference on Computing, Networking and Communications (ICNC 2024), February 2024.

A. Tompkins, et al, “A 16-Element Phased-Array Transceiver in 130-nm SiGe BiCMOS for Fixed Wireless Access Covering the Full 57-71 GHz Band”, IEEE Radio and Wireless Symposium (RWS), January 2020.

C. J. Hansen, “Internetworking with Bluetooth Low Energy”, ACM GetMobile, Vol 19, Issue #2, April 2015.

C. J. Hansen, “WiGig – Multigigabit Wireless Communication in the 60 GHz Band”, IEEE Communications Magazine, December 2011.

C. J. Hansen and G. J. Pottie, “A Distributed Access Algorithm for Cellular Personal Communication Systems with Channel Partitioning”, IEEE Transactions on Vehicular Technology, January 1999.

C. J. Hansen and G. J. Pottie, “Distributed Access Control in Wireless and Wireline Systems,” International Symposium on Information Theory, Whistler, B.C., 1995.

C. J. Hansen, C. C. Wang, and G. J. Pottie, “Distributed Dynamic Channel Resource Allocation in Wireless Communication Systems”, Asilomar Conference on Signals, Systems, and Computers, 1994.

VIII. PATENTS

Named inventor on the following United States patents:

<i>US Patent Number</i>	<i>Patent Title</i>
11,297,625	Method, system and apparatus for signaling station capabilities to establish wireless connections
11,121,818	Method and apparatus for unsolicited block acknowledgements
10,886,975	Single-carrier wideband beamforming method and system
10,820,328	Method and apparatus for de-centralized spatial reuse in wireless communications systems
10,784,990	Method and apparatus for encoding and modulating data for wireless transmission
10,735,133	Method and apparatus for configurable MIMO processing in wireless communications
10,716,117	Method, system and apparatus for signaling station capabilities to establish wireless connections
10,681,632	System and method for low power signaling in a wireless local area network
10,630,359	Method and apparatus for beamforming training using frames
10,498,419	Method and apparatus for determining direction for transmission to establish wireless connections
10,243,635	Method and apparatus for beamforming training using frames
10,236,964	Method and apparatus for beamforming training in basic service set discovery
10,110,273	Interference mitigation in wireless communication systems
10,015,741	System and method for low power signaling in a wireless local area network
9,960,865	Filtering of Wi-Fi physical layer measurements
9,949,227	Location determination
9,680,563	System and method for partial bandwidth communication
9,596,637	Dynamically adapting wireless communication
9,826,373	WLAN transmitter having high data throughput
9,622,216	Method and system for low rate MAC/PHY for 60 GHz transmission
9,516,483	Wireless communication between stations of differing protocols
9,356,673	Communication device incorporating beamforming handshaking
9,344,535	Multiple protocol wireless communications in a WLAN
9,307,350	Protocol adaptation layer for wireless communications
9,300,368	Method and system for 60 GHz antenna adaptation and user coordination based on base station beacons
9,247,439	High data throughput wireless local area network receiver

9,241,331	Method and system for optimal beamforming in wireless networks
9,198,035	Simple pairing to generate private keys for different protocol communications
9,130,705	Transmitting high rate data within a MIMO WLAN
9,104,569	Method and apparatus for signal detection and decoding
9,037,092	Method, apparatus and computer program for determining whether a received signal comprises a first signal component
9,025,491	High speed data transmission utilizing a high frequency physical layer for a wireless personal area network device
8,996,949	Encoding system and method for a transmitter in wireless communications
8,965,431	Multimode control device for allocating resources to communication devices that use differing protocols and methods for use therewith
8,964,895	WLAN transmitter having high data throughput
8,964,521	Method and system for compromise greenfield preambles for 802.11N
8,929,317	Transmission of wide bandwidth signals in a network having legacy devices
8,917,676	Device and method for transmitting long training sequence for wireless communications
8,909,272	Control device for allocating resources to communication devices that use differing protocols and methods for use therewith
8,897,320	High data throughput WLAN frame format
8,892,056	Protocol adaptation layer for wireless communications
8,891,642	Mixed mode preamble for MIMO wireless communications
8,805,277	Method and system for Bluetooth 802.11 alternate MAC/PHY (AMP) transmit power control (TPC)
8,804,685	Dual mode operation in a wireless network
8,774,327	Adjustable RF receiver
8,750,252	Long training sequence method and device for wireless communications
8,743,994	Feedback of channel information in a closed loop beamforming wireless communication system
8,737,189	Method and system for compromise greenfield preambles for 802.11n
8,725,101	Wireless device and method of operation
8,644,770	Protocol adaptation layer for wireless communications
8,644,284	Dual mode operation in a wireless network
8,638,263	Platform enhancements for planar array antennas
8,634,777	Pairing with directional code sequence
8,630,367	Signaling format for wireless communications

8,620,368	Method and system for 60 GHz antenna adaptation and user coordination based on base station beacons
8,611,821	Communication device that detects and adapts to the presence of other devices and methods for use therewith
8,588,283	Method and system for frame formats for MIMO channel measurement exchange
8,577,416	Transceiver with plural space hopping array antennas and methods for use therewith
8,576,695	Preamble formats for MIMO wireless communications
8,553,659	Method and system for optimal beamforming in wireless networks
8,548,087	Long training sequence for MIMO WLAN systems
8,520,669	High data throughput wireless local area network receiver
8,437,419	Method and system for frame formats for MIMO channel measurement exchange
8,437,362	Asymmetrical MIMO wireless communications
8,407,556	LDPC (low density parity check) coding and interleaving implemented in MIMO communication systems
8,406,204	Transmission of wide bandwidth signals in a network having legacy devices
8,385,844	Transceiver with plural space hopping phased array antennas and methods for use therewith
8,369,784	High speed data transmission utilizing a high frequency physical layer for a wireless personal area network device
8,363,642	High data throughput wireless local area network receiver
8,351,399	MIMO wireless communication greenfield preamble formats
8,345,732	Feedback of channel information in a closed loop beamforming wireless communication system
8,320,877	Method and system for 60 GHz location determination and coordination of WLAN/WPAN/GPS multimode devices
8,284,867	Mixed mode preamble for MIMO wireless communications
8,284,651	Preamble formats for MIMO wireless communications
8,265,185	Method and system for encoding a signal for wireless communications
8,254,407	Asymmetrical MIMO wireless communications
8,233,565	Method and system for high speed wireless data transmission between communication devices
8,213,395	Method and system for dual mode operation in wireless networks
8,195,092	Method and system for utilizing a high frequency PHY layer for high speed data transmission between wireless devices
8,190,162	Radar detection circuit for a WLAN transceiver
8,184,679	RF transceiver having adaptive modulation

8,176,380	Algebraic construction of LDPC (low density parity check) codes with corresponding parity check matrix having CSI (cyclic shifted identity) sub-matrices
8,175,542	Transceiver with plural space hopping phased array antennas and methods for use therewith
8,170,504	Modified preamble for programmable transmitter
8,170,496	Transceiver with space hopping phased array antenna and methods for use therewith
8,170,495	Collaborative pairing transceiver with space hopping phased array antenna and methods for use therewith
8,169,998	Method and system for an AD HOC wireless network with master control of network parameters
8,144,798	Long training sequence for MIMO WLAN systems
8,126,425	Method and system for 60 GHZ location determination based on varying antenna direction and coordination of WLAN/WPAN/GPS multimode devices
8,095,162	Control device for allocating resources to communication devices that use differing protocols and methods for use therewith
8,094,749	Signaling format for wireless communications
8,089,890	Transmitting high rate data within a MIMO WLAN
8,085,871	Adaptive modulation in a multiple input multiple output wireless communication system with optional beamforming
8,081,926	Method and system for multisession communication using multiple physical (PHY) layers
8,081,104	Radar detection circuit for a WLAN transceiver
8,077,810	Apparatus for high data throughput reception in a WLAN
8,059,740	WLAN transmitter having high data throughput
8,041,333	Method and system for 60 GHz antenna adaptation and user coordination based on base station beacons
8,032,167	Multimode control device for allocating resources to communication devices that use differing protocols and methods for use therewith
8,031,806	Mixed mode preamble for MIMO wireless communications
7,995,667	Reduced latency concatenated reed solomon-convolutional coding for MIMO wireless LAN
7,991,056	Method and system for encoding a signal for wireless communications
7,991,009	Preamble formats for MIMO wireless communications
7,978,729	High data throughput WLAN frame format
7,974,591	Modified preamble for programmable transmitter
7,957,450	Method and system for frame formats for MIMO channel measurement exchange
7,940,751	Personal area network data encapsulation in WLAN communications

7,924,943	Method and system for optional closed loop mechanism with adaptive modulations for multiple input multiple output (MIMO) wireless local area network (WLAN) system
7,920,526	Long training sequence method and device for wireless communications
7,912,449	Method and system for 60 GHz location determination and coordination of WLAN/WPAN/GPS multimode devices
7,894,852	Channel reciprocity matrix determination in a wireless MIMO communication system
7,873,022	Multiple input multiple output wireless local area network communications
7,865,142	Method and system for multisession bluetooth communication using multiple physical (PHY) layers
7,840,184	Method and system for utilizing a 60 GHZ PHY layer for high speed data transmission between bluetooth devices
7,826,547	Mixed mode preamble for MIMO wireless communications
7,801,098	Parallel MAC/PHY for enhanced transmission rate in a wireless network
7,796,696	Asymmetrical multiple stream wireless communication using STBC
7,773,565	MIMO wireless communication greenfield preamble formats
7,746,886	Asymmetrical MIMO wireless communications
7,702,291	Radar detection from pulse record with interference
7,701,382	Radar detection circuit for a WLAN transceiver
7,680,059	Multiple protocol wireless communications in a WLAN
7,617,439	Algebraic construction of LDPC (Low Density Parity Check) codes with corresponding parity check matrix having CSI (Cyclic Shifted Identity) sub-matrices
7,593,692	Radar detection circuit for a WLAN transceiver
7,590,429	RF transceiver configuring for a MIMO communication
7,590,189	Signaling format for wireless communications
7,586,881	MIMO wireless communication greenfield preamble formats
7,583,933	Dynamic frequency selection in a wireless communication network
7,570,619	Long training sequence method and device for wireless communications
7,564,914	Method and system for frame formats for MIMO channel measurement exchange
7,558,537	Modified preamble for programmable transmitter
7,555,053	Long training sequence for MIMO WLAN systems
7,539,501	High data throughput wireless local area network receiver
7,516,390	LDPC (Low Density Parity Check) coding and interleaving implemented in MIMO communication systems
7,502,408	RF transceiver having adaptive modulation

7,466,773	WLAN receiver having an iterative decoder
7,444,134	Device and method for transmitting long training sequence for wireless communications
7,423,989	Preamble formats for MIMO wireless communications
7,417,974	Transmitting high rate data within a MIMO WLAN
7,400,643	Transmission of wide bandwidth signals in a network having legacy devices
7,330,501	Orthogonal normalization for a radio frequency integrated circuit
7,324,785	Transmit power control of wireless communication devices
7,269,430	Frame format for high data throughput wireless local area network transmissions
7,242,961	Channel reciprocity matrix determination in a wireless MIMO communication system
7,233,773	Configuring a MIMO communication
7,162,204	Configurable spectral mask for use in a high data throughput wireless communication
7,158,759	Dynamic frequency selection in a wireless communication network
7,020,220	Digital estimation and correction of I/Q mismatch in direct conversion receivers