UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

COBBLESTONE WIRELESS, LLC, *Plaintiff,* v. CISCO SYSTEMS, INC. *Defendant*.	Case No. 2:23-cv-00454 (Lead Case)
COBBLESTONE WIRELESS, LLC, *Plaintiff*, V. HEWLETT PACKARD ENTERPRISE COMPANY; ARUBA NETWORKS, LLC. *Defendants*.	Case No. 2:23-cv-00457 (Member Case)

PLAINTIFF COBBLESTONE WIRELESS, LLC'S PRELIMINARY DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS

I. Patent Rule 3-1: Disclosure of Asserted Claims and Infringement Contentions

Pursuant to Patent Rule 3-1, Plaintiff Cobblestone Wireless, LLC submits the following Preliminary Disclosure of Asserted Claims and Infringement Contentions. This disclosure is based on the information available to Cobblestone as of the date of this disclosure, and Cobblestone reserves the right to amend this disclosure to the full extent permitted, consistent with the Court's Rules and Orders.

A. Patent Rule 3-1(a): Asserted Claims

Cobblestone asserts that Defendant Cisco Systems, Inc. infringes the following claims (collectively, "Asserted Claims"):

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000001

(1) U.S. Patent No. 7,924,802 (the "'802 patent" or "Asserted Patent"), claims 1, 2-4, 7-9.

B. Patent Rule 3-1(b): Accused Instrumentalities of which Cobblestone is aware

Cobblestone asserts that the Asserted Claims are infringed by the various instrumentalities used, made, sold, offered for sale, or imported into the United States by Defendant, including certain Cisco 802.11ac and 802.11ax-compliant station and access point products that support 80+80 MHz channel width ("Accused Instrumentalities"). Defendant's Accused Instrumentalities of which Cobblestone is presently aware are described in more detail in the accompanying preliminary infringement contention chart, Exhibit A.

Cobblestone reserves the right to accuse additional products from Defendant to the extent Cobblestone becomes aware of additional products during the discovery process. Unless otherwise stated, Cobblestone's assertions of infringement apply to all variations, versions, and applications of each of the Accused Instrumentalities, on information and belief, that different variations, versions, and applications of each of the Accused Instrumentalities are substantially the same for purposes of infringement of the Asserted Claims.

C. Patent Rule 3-1(c): Claim Charts

Cobblestone's analysis of Defendant's products is based upon limited information that is publicly available, and based on Cobblestone's own investigation prior to any discovery in these actions. Specifically, Cobblestone's analysis is based on certain limited resources that evidence certain products made, sold, used, or imported into the United States by Defendant.

Cobblestone reserves the right to amend or supplement these disclosures for any of the following reasons:

(1) Defendant and/or third parties provide evidence relating to the Accused Instrumentalities;

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000002

(2) Cobblestone's position on infringement of specific claims may depend on the claim constructions adopted by the Court, which has not yet occured; and

(3) Cobblestone's investigation and analysis of Defendant's Accused Instrumentalities is based upon public information and Cobblestone's own investigations. Cobblestone reserves the right to amend these contentions based upon discovery of non-public information that Cobblestone anticipates receiving during discovery.

Attached as Exhibit A, and incorporated herein in its entirety, is a chart identifying where each element of the Asserted Claims are found in the Accused Instrumentalities.

Unless otherwise indicated, the information provided that corresponds to each claim element is considered to indicate that each claim element is found within each of the different variations, versions, and applications of each of the respective Accused Instrumentalities described above.

D. Patent Rule 3-1(d): Literal Infringement / Doctrine of Equivalents

With respect to the patents at issue, each element of each Asserted Claim is considered to be literally present. Cobblestone also contends that each Asserted Claim is infringed or has been infringed under the doctrine of equivalents in Defendant's Accused Instrumentalities. Cobblestone also contends that Defendant both directly and indirectly infringes the Asserted Claims. For example, the Accused Instrumentalities are provided by the Defendant to customers, who are actively encouraged and instructed (for example, through Defendant's online instructions on its website and instructions, manual, or user guides that are provided with the Accused Instrumentalities) by the Defendant to use the Accused Instrumentalities in ways that directly infringe the Asserted Claims. Defendant therefore specifically intends for and induces its customers to infringe the Asserted Claims under Section 271(b) through the customers' normal and customary use of the Accused Instrumentalities. In addition, Defendant is contributorily

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000003

infringing the Asserted Claims under Section 271(c) and/or Section 271(f) by selling, offering for sale, or importing the Accused Instrumentalities into the United States, which constitute a material part of the inventions claimed in the Asserted Claims, are especially made or adapted to infringe the Asserted Claims, and are otherwise not staple articles or commodities of commerce suitable for non-infringing use.

E. Patent Rule 3-1(e): Priority Dates

The Asserted Claims of the '802 patent are entitled to a priority date at least as early as January 23, 2008, the filing date of Application No. 12/018,370.

A diligent search continues for additional responsive information and Cobblestone reserves the right to supplement this response.

F. Patent Rule 3-1(f): Identification of Instrumentalities Practicing the Claimed Invention

At this time, Cobblestone does not identify any of its instrumentalities as practicing the Asserted Claims. A diligent search continues for additional responsive information and Cobblestone reserves the right to supplement this response.

II. Patent Rule 3-2: Document Production Accompanying Disclosure

Pursuant to Patent Rule 3-2, Cobblestone submits the following Document Production Accompanying Disclosure, along with an identification of the categories to which each of the documents corresponds.

F. Patent Rule 3-2(a) documents:

Cobblestone is presently unaware of any documents sufficient to evidence any discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, the inventions recited in the Asserted Claims of the Asserted Patents prior to the application dates or priority dates for the Asserted Patents. A diligent search continues for such documents and

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000004

Cobblestone reserves the right to supplement this response.

G. Patent Rule 3-2(b) documents:

Cobblestone identifies the following non-privileged documents as related to evidencing conception and reduction to practice of each claimed invention of the Asserted Patent: COBB_CISCO_HPE_000001 - COBB_CISCO_HPE_000022. A diligent search continues for additional documents and Cobblestone reserves the right to supplement this response.

H. Patent Rule 3-2(c) documents:

Cobblestone identifies the following documents as being the file history for the Asserted Patent: COBB_CISCO_HPE_000023 - COBB_CISCO_HPE_000117.

Dated: December 11, 2023

Respectfully submitted,

/s/ Reza Mirzaie
Reza Mirzaie
CA State Bar No. 246953
Marc A. Fenster
CA State Bar No. 181067
Neil A. Rubin
CA State Bar No. 250761
Christian W. Conkle
CA State Bar No. 306374
Amy E. Hayden
CA State Bar No. 287026
Jonathan Ma
CA State Bar No. 312773
Jacob R. Buczko
CA State Bar No. 269408
Peter Tong
TX State Bar No. 24119042
Matthew D. Aichele
VA State Bar No. 77821
RUSS AUGUST & KABAT
12424 Wilshire Boulevard, 12th Floor
Los Angeles, CA 90025
Telephone: 310-826-7474
Email: rmirzaie@raklaw.com
Email: mfenster@raklaw.com
Email: nrubin@raklaw.com
Email: cconkle@raklaw.com

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000005

Email: ahayden@raklaw.com
Email: jma@raklaw.com
Email: jbuczko@raklaw.com
Email: ptong@raklaw.com
Email: maichele@raklaw.com

ATTORNEYS FOR PLAINTIFF COBBLESTONE WIRELESS, LLC

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000006

CERTIFICATE OF SERVICE

I certify that this document is being served upon counsel of record for Defendant on December 11, 2023 via e-mail.

/s/ Reza Mirzaie
Reza Mirzaie

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000007

U.S. Patent No. 7,924,802 ("'802 Patent")

Accused Instrumentalities: Cisco 802.11ac and/or 802.11ax-compliant station and access point products that support 80+80 MHz channel width, and all versions and variations thereof since the issuance of the asserted patent.

Based upon publicly available information and without the benefit of discovery in this case, the Accused Instrumentalities include, but are not limited to the following products:

Product Name
Cisco C9130AX AP
Cisco C9124AX AP
Cisco C9136I AP
Cisco CW9166D1 AP
Cisco CW9166I AP
Cisco IW9167 AP
Cisco Catalyst 9163E AP
Cisco Meraki CW9162
Cisco Meraki CW9164
Cisco Meraki CW9166
Cisco Meraki CW9166D1
Cisco Meraki MR36

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000008

Cisco Meraki MR44
Cisco Meraki MR46(E)
Cisco Meraki MR53
Cisco Meraki MR55
Cisco Meraki MR56
Cisco Meraki MR57

alone, or in combination, with the following:

Product Name
Cisco 3504 WLAN Controller
Cisco 5520 WLAN Controller
Cisco 8540 WLAN Controller
Cisco Catalyst 9800-40 Wireless Controller
Cisco Catalyst 9800-80 Wireless Controller
Cisco Catalyst 9800 Cloud Wireless Controller
Cisco Catalyst 9800-L Wireless Controller
Cisco Catalyst 9800 Embedded Wireless Controller
Cisco Catalyst 9800-L Wireless Controller

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000009

Cisco Catalyst 9800-CL Wireless Controller

Claim 1

Claim 1	Public Documentation
[1pre] A method of transmitting information in a wireless communication channel comprising:	To the extent the preamble is found to be limiting, the Accused Instrumentalities perform a method of transmitting information in a wireless communication channel. For example, Cisco's Accused Instrumentalities support 80+80 MHz channel width, which transmits information in a wireless communication channel. For example, at least Cisco-Meraki MR53 of the Accused Instrumentalities is based on 802.11ac Wave 2, which supports 80+80 MHz channel width. Cisco-Meraki MR56 and Cisco-Meraki MR55 products are based on 802.11ax, capable of 80+80 and 160MHz channels. *See, e.g.*: 

Claim 1	Public Documentation

802.11ac

The Cisco Meraki MR53 sets the new standard in wireless. Designed specifically for high density and next generation deployments, it's the world's fastest cloud-managed wireless access point.

Using wider channel bandwidths, more efficient transmission technologies, and less crowded channels at 5 GHz help the MR53 achieve speeds up to 2.5 Gbps, while also providing administrators complete visibility and control.

CHANNEL BANDWIDTH

The MR53 increases the channel bandwidth — the size of the pipe used to transmit data — up to 160 MHz. These wider channels enable faster transmissions and increase aggregate performance in dense multi-client environments.



MODULATION

With enhanced modulation, the MR53 encodes data more efficiently. By sending more data over the air in less time, the MR53 can support more clients at once, and speeds uploads and downloads of large files and video.



SPECTRUM

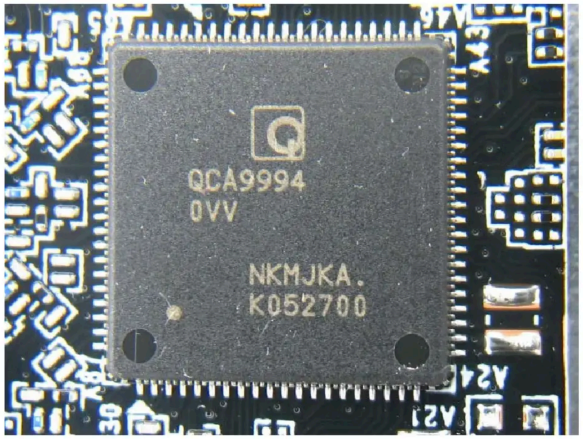
The MR53's 802.11ac radio operates exclusively in the 5 GHz band, a less-crowded spectrum enabling wider channels with less interference. A second radio is dedicated to supporting legacy 802.11b/g/n clients at 2.4 GHz.

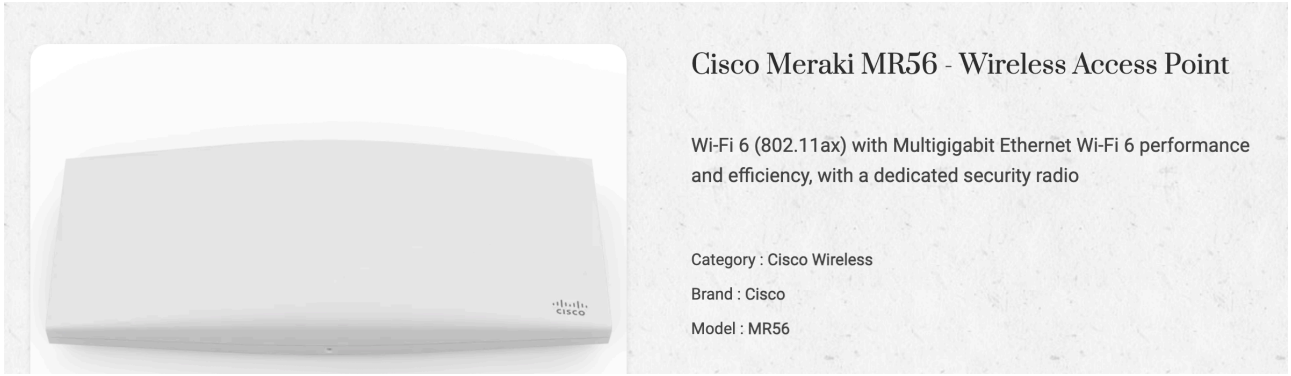


https://meraki.cisco.com/solutions/80211ac

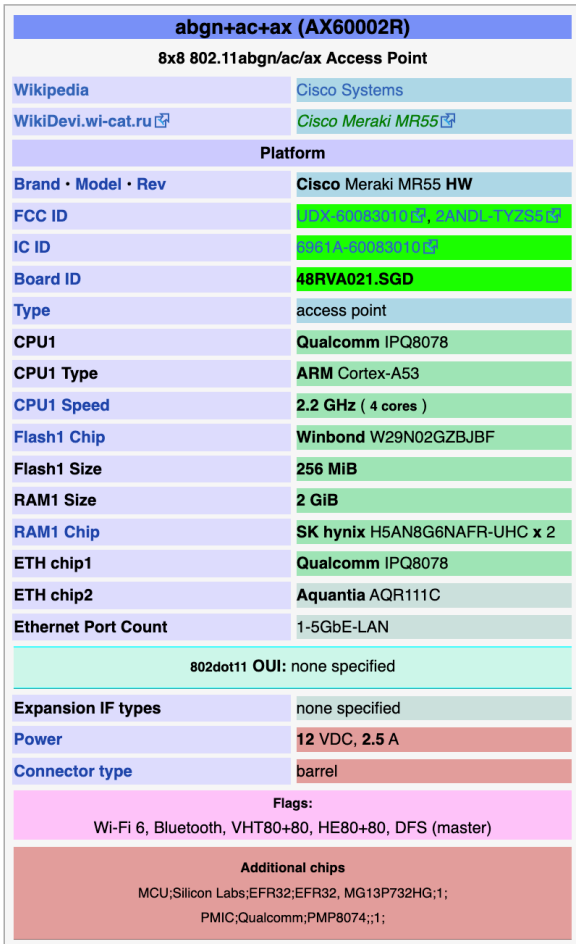
Feature	802.11ac Wave 1	802.11ac Wave 2			
PHY Rate	1.3 Gbps	1.3 Gbps	1.73 Gbps	2.6 Gbps	3.5 Gbps
# of Spatial Streams	3	3	4	3	4
Modulation	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Channel Width	20, 40, 80 MHz	20, 40, 80 MHz	20, 40, 80 MHz	20, 40, 80, 80+80, 160 MHz	20, 40, 80, 80+80, 160 MHz
MIMO	Single User	Single User Multi User	Single User Multi User	Single User Multi User	Single User Multi User
802.11 protocol support	a, n, ac	a, n, ac	a, n, ac	a, n, ac	a, n, ac

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000011

Claim 1	Public Documentation
	https://www.networxsecurity.org/members-area/glossary/i/ieee-80211ac.html Cisco-Meraki MR53 uses the Qualcomm QCA9994 SOC, which is capable of the 80+80 channel.  https://fccid.io/UDX-60042010/Internal-Photos/UDX-60042010-Internal-Photos-2980467  **QCA9994 SoC** **Wave-2 802.11ac Solution with MU-MIMO and 160MHz for Enterprise Networks** The QCA9994 is a Wave-2 802.11ac radio that enables premium Wi-Fi access points to support more devices and more demanding applications in the enterprise and carrier hotspots. The dual-band, 4x4 solution delivers peak data rates up to 1.7 Gbps, and uses Multi-User MIMO to maintain faster connections on increasingly crowded networks. The QCA9994 also supports 160MHz and 80+80MHz channels to double the capacity at close range. https://www.qualcomm.com/products/technology/wi-fi/qca9994

Claim 1	Public Documentation
	 802.11ax, 802.11ac Wave 2, and 802.11n Capabilities • UL/DL OFDMA, TWT support, BSS coloring • 8×8 multiple input, multiple output (MIMO) with 8 spatial streams • 4×4 multiple input, multiple output (MIMO) with 4 spatial streams • UL/DL SU-MIMO and MU-MIMO Support • Maximal ratio combining (MRC) and beamforming • 20 and 40 MHz channels (802.11n) 20, 40, and 80 MHz channels (802.11ac Wave 2) • 160 MHz (80+80); 20, 40 and 80MHz channels (802.11ax), 160 MHz (80+80) • Up to 1024 QAM on both 2.4 GHz and 5 GHz bands • Packet aggregation https://www.metapoint.in/product/cisco-meraki-mr56-wireless-access-point

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000013

Claim 1	Public Documentation
	 http://en.techinfodepot.shoutwiki.com/wiki/Cisco_Meraki_MR55

Claim 1	Public Documentation

Capabilities	MR44	MR45	MR55	MR36	MR46	MR56
802.11ax Compliance	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Wi-Fi 6-Certified	Certified	-	-	Certified	Certified	Certified
2.4 GHz Radio Information	802.11b/g/n/ax 2x2:2	802.11b/g/n/ax 4x4:4	802.11b/g/n/ax 4x4:4	802.11b/g/n/ax 2x2:2	802.11b/g/n/ax 4x4:4	802.11b/g/n/ax 4x4:4
5 GHz Radio Information	802.11a/n/ac/ax 4x4:4	802.11a/n/ac/ax 4x4:4	802.11a/n/ac/ax 8x8:8	802.11a/n/ac/ax 2x2:2	802.11a/n/ac/ax 4x4:4	802.11a/n/ac/ax 8x8:8

https://documentation.meraki.com/MR/Wi-Fi_Basics_and_Best_Practices/Wi-Fi_6_(802.11ax)_Technical_Guide

Very high throughput (VHT) stations and access points have the 80+80 MHz channel capability and is made up of two 80MHz RF transmission frequency ranges. It is capable of high-throughput (HT) (for example, 802.11n) features, and operates in 5GHz bands. A single physical layer protocol data unit (PPDU) is used for both 80+80 MHz RF frequency ranges.

Claim 1	Public Documentation
	4.3.14 Very high throughput (VHT) STA The IEEE 802.11 VHT STA operates in frequency bands below 6 GHz excluding the 2.4 GHz band. A VHT STA is an HT STA that, in addition to features supported as an HT STA, supports VHT features identified in Clause 9, Clause 10, Clause 11, Clause 14, Clause 17, and Clause 21. The main PHY features in a VHT STA that are not present in an HT STA are the following: — Mandatory support for 40 MHz and 80 MHz channel widths — Mandatory support for VHT single-user (SU) PPDUs — Optional support for 160 MHz and 80+80 MHz channel widths — Optional support for VHT sounding protocol to support beamforming — Optional support for VHT multi-user (MU) PPDUs — Optional support for VHT-MCSs 8 and 9 IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 4.3.14. **4.3.13 High-throughput (HT) STA** The IEEE 802.11 HT STA provides PHY and MAC features that can support a throughput of 100 Mb/s and greater, as measured at the MAC data service access point (SAP). An HT STA supports HT features as identified in Clause 10 and Clause 19. An HT STA operating in the 5 GHz band supports transmission and reception of frames that are compliant with mandatory PHY specifications as defined in Clause 17. An HT STA operating in the 2.4 GHz band supports transmission and reception of frames that are compliant with mandatory PHY specifications as defined in Clause 16 and Clause 18. An HT STA is also a QoS STA. The HT features are available to HT STAs associated with an HT AP. A subset of the HT features is available for use between two HT STAs that are members of the same IBSS. Similarly, a subset of the HT features is available for use between two HT STAs that have established mesh peering (see 9.4.2.56 for details). IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 4.3.13.

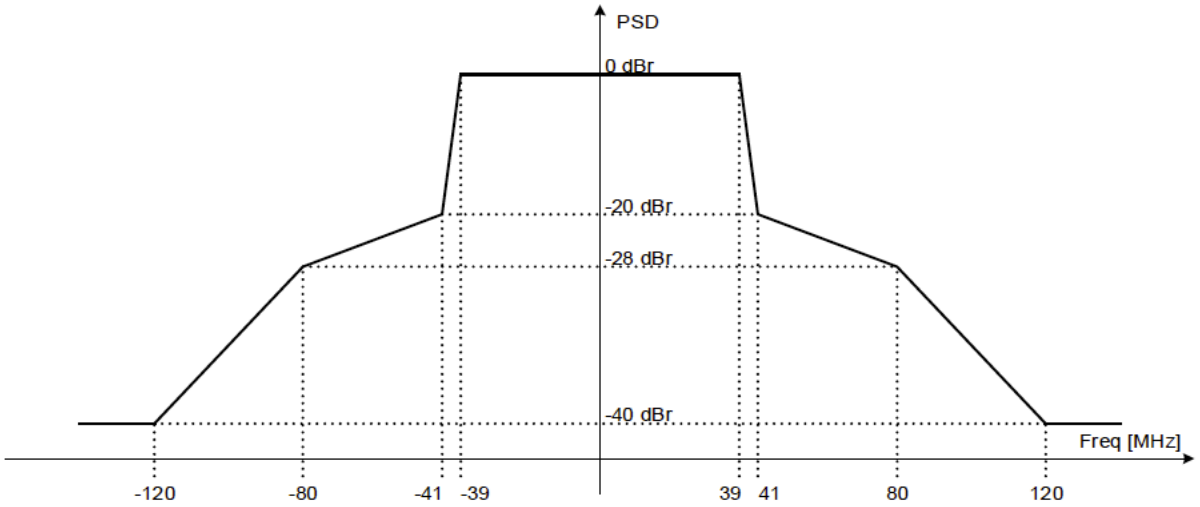
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000016

Claim 1	Public Documentation
	3. Definitions, acronyms, and abbreviations **3.1 Definitions** **80+80 MHz mask physical layer (PHY) protocol data unit (PPDU):** A PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21 and that is one of the following: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 3.1. **4.3.15a High-efficiency (HE) STA** The IEEE 802.11 HE STA operates in frequency bands between 1 GHz and 7.125 GHz. In the 5 GHz and 6 GHz bands, the following apply: — An HE STA is also a VHT STA if operating in the 5 GHz band, except that a 20 MHz-only HE STA does not support 40 MHz and 80 MHz channel widths — An HE STA is also a STA that supports the OFDM PHY defined in Clause 17 if operating in the 6 GHz band — Support for 20 MHz operating channel width is mandatory in an HE STA — Support for 40 MHz and 80 MHz operating channel width is mandatory in an HE STA that is not a 20 MHz-only non-AP HE STA — Support for 160 MHz and 80+80 MHz operating channel width is optional in an HE STA IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 4.3.15a. **3.2 Definitions specific to IEEE 802.11**

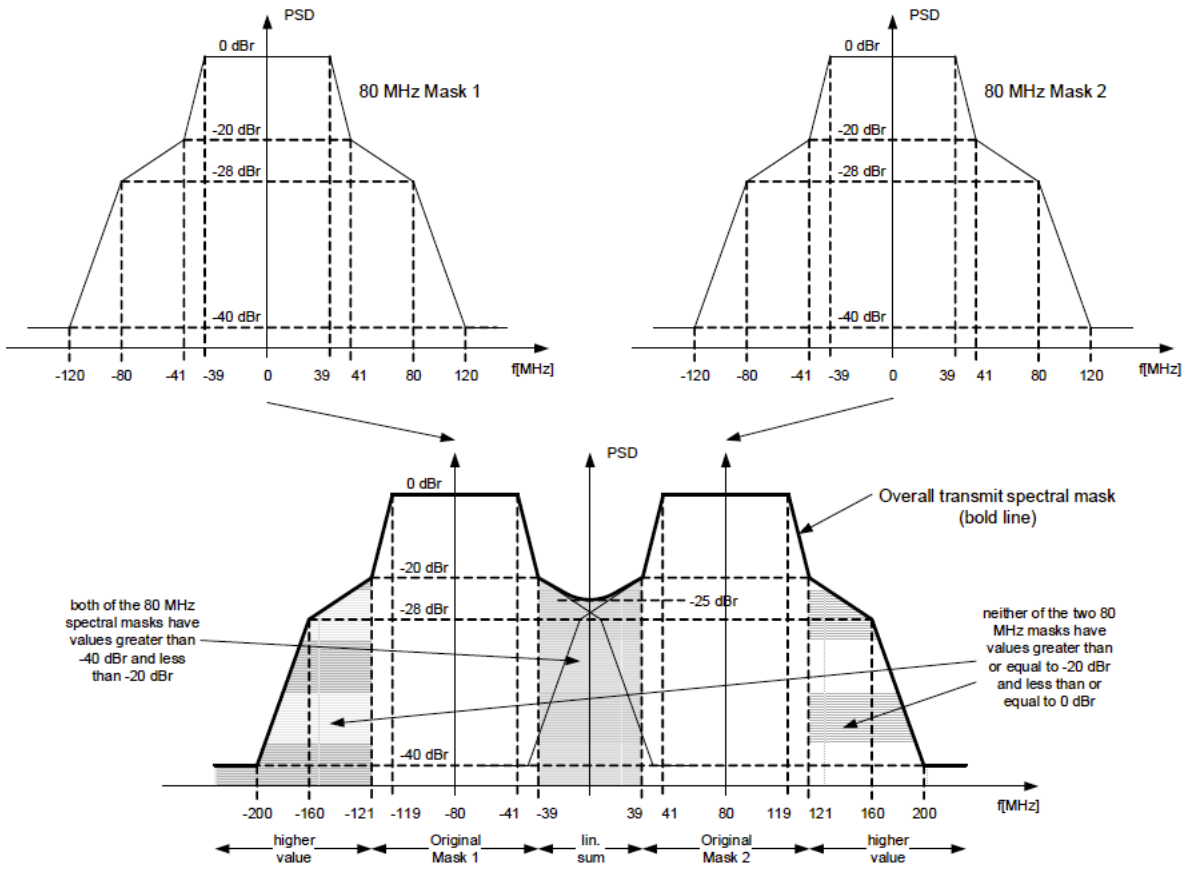
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000017

Claim 1	Public Documentation
	80+80 MHz mask physical layer (PHY) protocol data unit (PPDU): ~~A PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21) and that is one~~ One of the following PPDUs: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. c) An 80+80 MHz high-efficiency (HE) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 27. **80+80 MHz physical layer (PHY) protocol data unit (PPDU):** A Clause 21 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80), or a Clause 21 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80), or a Clause 27 80+80 MHz high-efficiency (HE) PPDU with the TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 3.2
[1a] transmitting first information across a first frequency range using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency; and	The Accused Instrumentalities perform a method including transmitting first information across a first frequency range using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency. For example, the Accused Instrumentalities transmit first information across a first frequency range, through the first 80MHz RF channel using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency. The values of lower and higher frequencies are defined by the spectral masks. **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000018

Claim 1	Public Documentation
	For an 80 MHz mask PPDU of non-HT, non-HT duplicate, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 78 MHz, –20 dBr at 41 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at 120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 39 and 41 MHz, 41 and 80 MHz, and 80 and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39 MHz, 41 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 21-31 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 21-31—Example transmit spectral mask for 80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-31

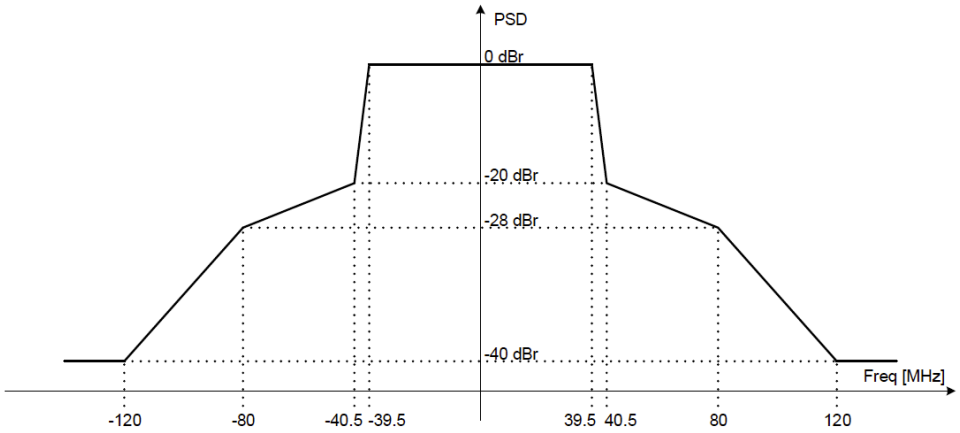
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000019

Claim 1	Public Documentation
	 **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33 **21.3.14 Channelization**

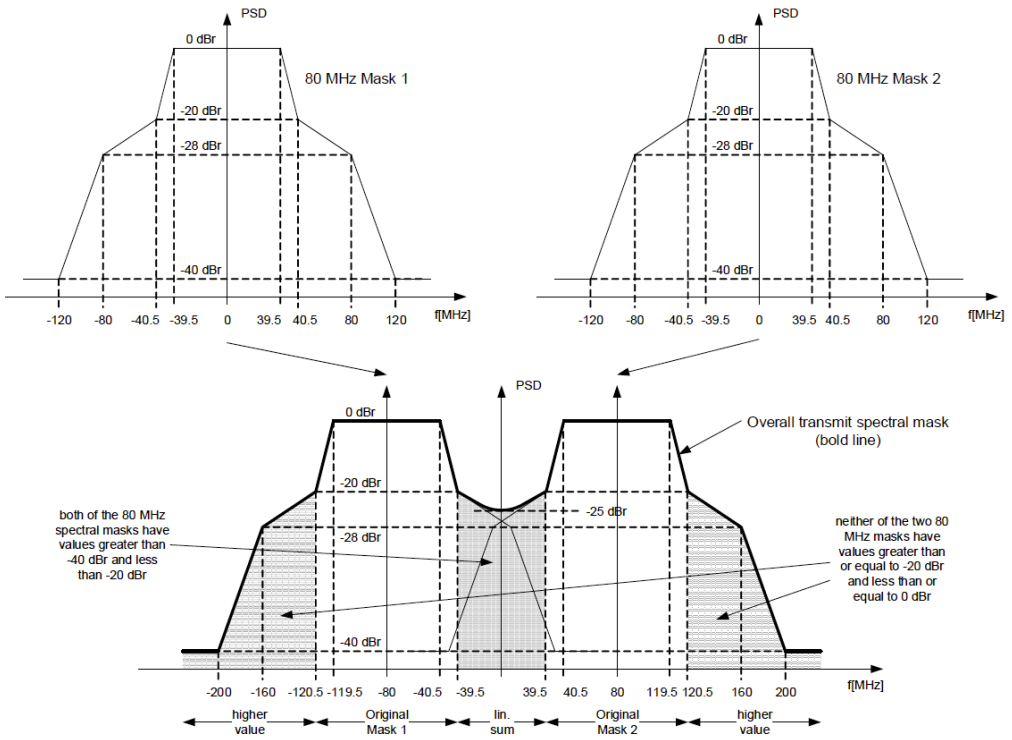
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000020

Claim 1	Public Documentation
	For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used. A channel specified by channel starting frequency = 5000 MHz dot11CurrentChannelWidth = 80+80 MHz dot11CurrentChannelCenterFrequencyIndex0 =155 dot11CurrentChannelCenterFrequencyIndex1 = 106 dot11CurrentPrimaryChannel = 161 is an 80+80 MHz channel in which frequency segment 0 has 80 MHz bandwidth and center frequency of 5775 MHz. Frequency segment 1 also has 80 MHz bandwidth and center frequency of 5530 MHz. The primary 20 MHz channel is centered at 5805 MHz. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14 **27.3.19 Transmit specification** **27.3.19.1 Transmit spectral mask** For an 80 MHz mask PPDU of HE format, the interim transmit spectral mask shall have a 0 dBr bandwidth of 79 MHz, –20 dBr at 40.5 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at 120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets between 39.5 MHz and 40.5 MHz, 40.5 MHz and 80 MHz, and 80 MHz and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39.5 MHz, 40.5 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-49 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000021

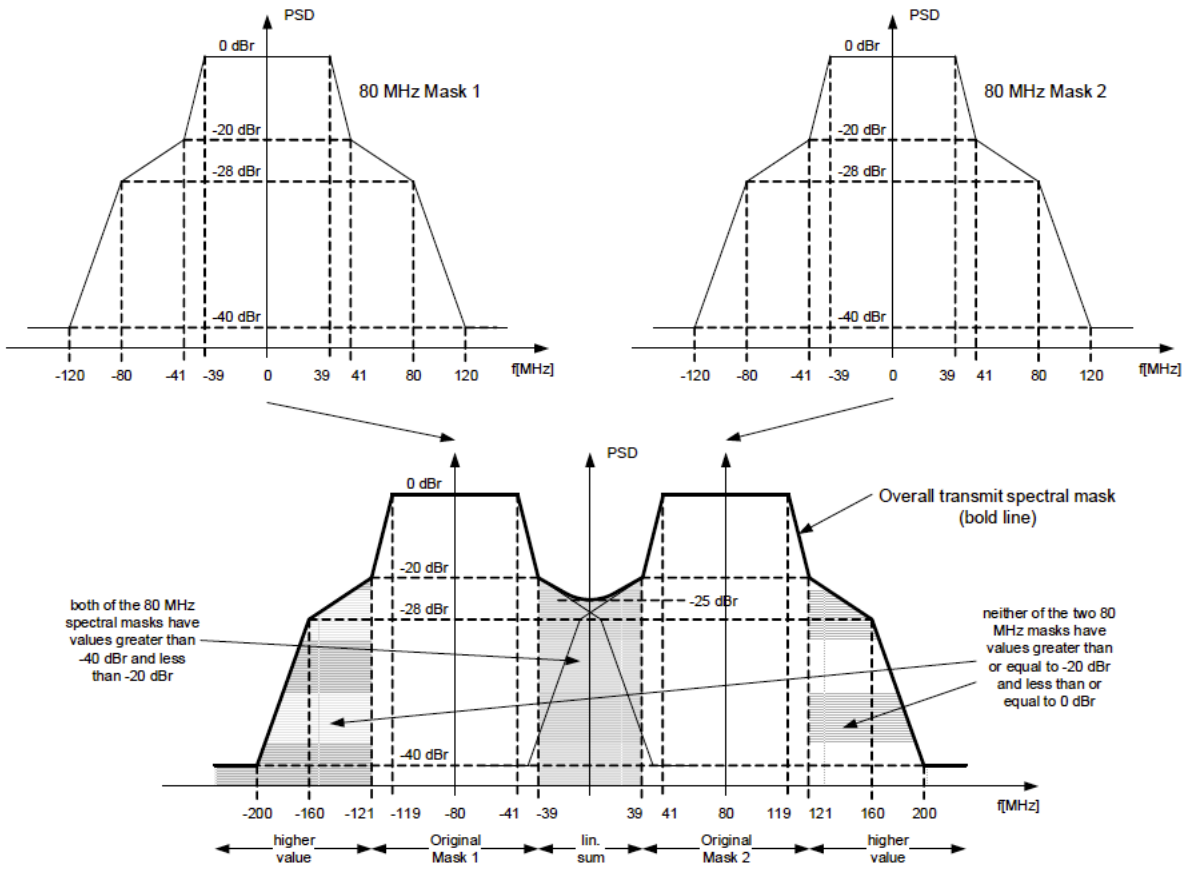
Claim 1	Public Documentation
	 **Figure 27-49—Example transmit spectral mask for an 80 MHz mask PPDU** and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz. Different center frequency separation between the two 80 MHz frequency segments of the spectral mask and different peak levels of each 80 MHz frequency segment of the spectral mask are possible. In such cases, a similar procedure in determining the spectral mask as in Figure 27-51 is followed.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000022

Claim 1	Public Documentation
	 **Figure 27-51—Example transmit spectral mask for an 80+80 MHz mask PPDU** (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1, Figure 27-49, Figure 27-51).
[1b] simultaneously transmitting second information across a second frequency range using the same wireless transmitter, the second frequency range having a second center frequency greater than	The Accused Instrumentalities perform a method including simultaneously transmitting second information across a second frequency range using the same wireless transmitter, the second frequency range having a

Claim 1	Public Documentation
the first center frequency, a second highest frequency, and a second lowest frequency.	second center frequency greater than the first center frequency, a second highest frequency, and a second lowest frequency. For example, the Accused Instrumentalities simultaneously transmit second information across a second frequency range, through the second 80MHz RF channel, using the same wireless transmitter, the second frequency range having a second center frequency greater than the first center frequency, a second highest frequency, and a second lowest frequency. The values of lower and higher frequencies are defined by the spectral masks. The same station / access point provides supports to concurrent 80+80 MHz RF channels. **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000024

Claim 1	Public Documentation
	 **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU** (IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33).

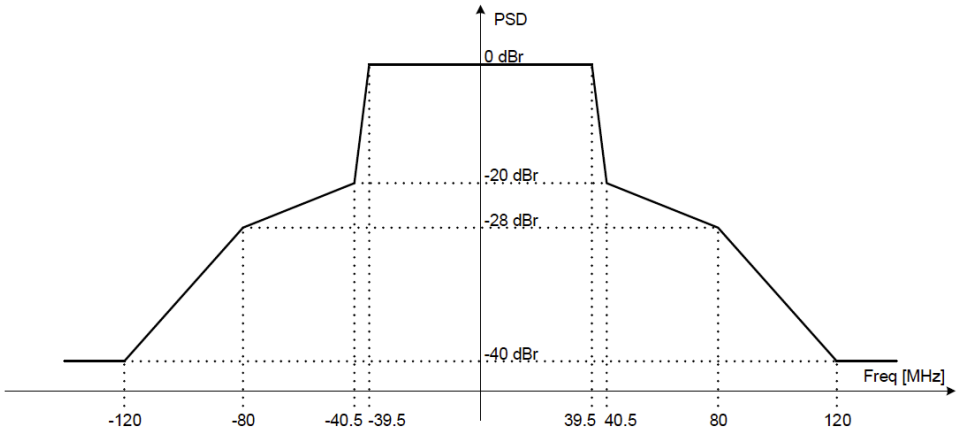
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000025

Claim 1	Public Documentation
	4.3.14 Very high throughput (VHT) STA The IEEE 802.11 VHT STA operates in frequency bands below 6 GHz excluding the 2.4 GHz band. A VHT STA is an HT STA that, in addition to features supported as an HT STA, supports VHT features identified in Clause 9, Clause 10, Clause 11, Clause 14, Clause 17, and Clause 21. The main PHY features in a VHT STA that are not present in an HT STA are the following: — Mandatory support for 40 MHz and 80 MHz channel widths — Mandatory support for VHT single-user (SU) PPDUs — Optional support for 160 MHz and 80+80 MHz channel widths — Optional support for VHT sounding protocol to support beamforming — Optional support for VHT multi-user (MU) PPDUs — Optional support for VHT-MCSs 8 and 9 (IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 4.3.14). **21.3.14 Channelization** For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used.

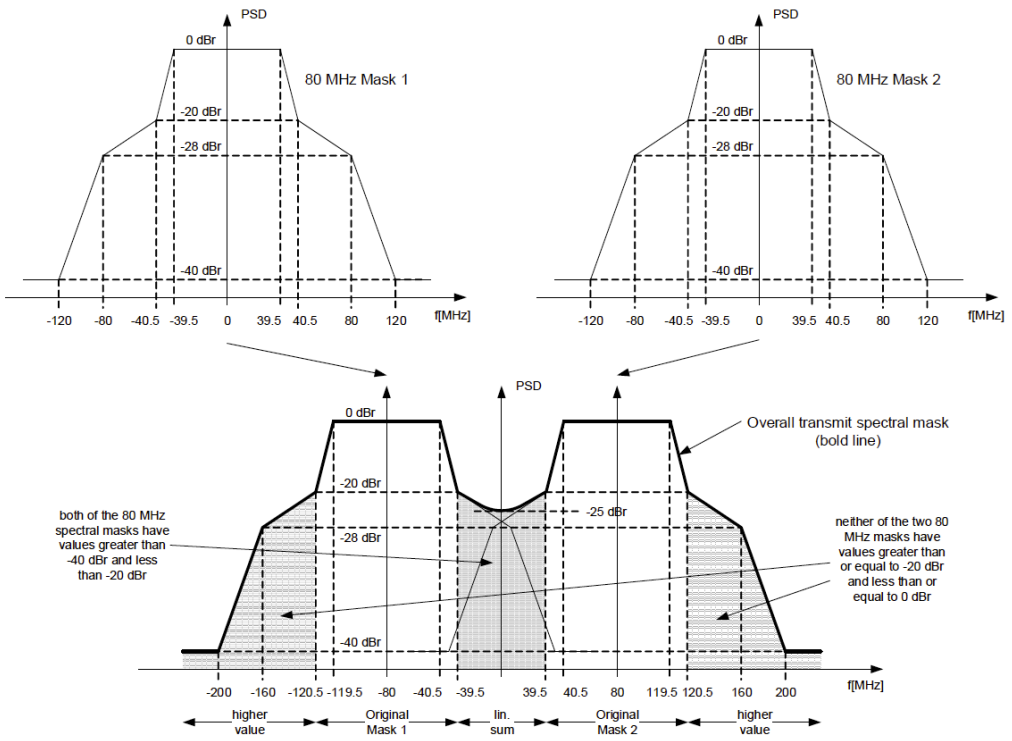
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000026

Claim 1	Public Documentation
	A channel specified by channel starting frequency = 5000 MHz dot11CurrentChannelWidth = 80+80 MHz dot11CurrentChannelCenterFrequencyIndex0 =155 dot11CurrentChannelCenterFrequencyIndex1 = 106 dot11CurrentPrimaryChannel = 161 is an 80+80 MHz channel in which frequency segment 0 has 80 MHz bandwidth and center frequency of 5775 MHz. Frequency segment 1 also has 80 MHz bandwidth and center frequency of 5530 MHz. The primary 20 MHz channel is centered at 5805 MHz. (IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14). **27.3.19 Transmit specification** **27.3.19.1 Transmit spectral mask** For an 80 MHz mask PPDU of HE format, the interim transmit spectral mask shall have a 0 dBr bandwidth of 79 MHz, –20 dBr at 40.5 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at 120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets between 39.5 MHz and 40.5 MHz, 40.5 MHz and 80 MHz, and 80 MHz and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39.5 MHz, 40.5 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-49 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000027

Claim 1	Public Documentation
	For an 80+80 MHz mask PPDU of HE format, the overall transmit spectral mask is constructed in the following manner. First, the 80 MHz interim spectral mask is placed on each of the two 80 MHz segments. For each frequency at which either of the 80 MHz interim spectral mask has a value equal to 0 dBr, then 0 dBr shall be taken as the overall interim spectral mask value. Then, for each frequency at which both of the 80 MHz interim spectral masks have values greater than –40 dBr and less than –20 dBr, the sum of the two interim mask values (summed in linear domain) shall be taken as the overall interim spectral mask value. Next, for each frequency at which neither of the two 80 MHz interim masks has a value greater than or equal to –20 dBr, the higher value of the two interim masks shall be taken as the overall interim spectral mask value. Finally, for any frequency region where the overall interim spectral mask value has not been defined yet, linear interpolation (in dB domain) between the nearest two frequency points with the overall interim spectral mask value defined shall be used to define the overall interim spectral mask value. The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz. Different center frequency separation between the two 80 MHz frequency segments of the spectral mask and different peak levels of each 80 MHz frequency segment of the spectral mask are possible. In such cases, a similar procedure in determining the spectral mask as in Figure 27-51 is followed.  **Figure 27-49—Example transmit spectral mask for an 80 MHz mask PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000028

Claim 1	Public Documentation
	 **Figure 27-51—Example transmit spectral mask for an 80+80 MHz mask PPDU** (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1, Figure 27-49, Figure 27-51).

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000029

Claim 1	Public Documentation
	4.3.15a High-efficiency (HE) STA The IEEE 802.11 HE STA operates in frequency bands between 1 GHz and 7.125 GHz. In the 5 GHz and 6 GHz bands, the following apply: — An HE STA is also a VHT STA if operating in the 5 GHz band, except that a 20 MHz-only HE STA does not support 40 MHz and 80 MHz channel widths — An HE STA is also a STA that supports the OFDM PHY defined in Clause 17 if operating in the 6 GHz band — Support for 20 MHz operating channel width is mandatory in an HE STA — Support for 40 MHz and 80 MHz operating channel width is mandatory in an HE STA that is not a 20 MHz-only non-AP HE STA — Support for 160 MHz and 80+80 MHz operating channel width is optional in an HE STA (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 4.3.15a). **27.3.19.3 Transmit center frequency and symbol clock frequency tolerance** Transmit signals with TXVECTOR parameter CH_BANDWIDTH set to CBW160 or CBW80+80 may be generated using two separate RF LOs, one for each of the lower and upper 80 MHz frequency portions. (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.3). **27.3.12.11 Segment deparser** NOTE—As per Table 21-7 (center frequency for frequency segment iSeg = 0), $f_c^{(0)}$ is always less than $f_c^{(1)}$ in the case of an 80+80 MHz HE PPDU. Hence, $d''_{k,i,n,0,r,u}$ (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while $d''_{k,i,n,1,r,u}$ (frequency subblock 1) is always transmitted in the frequency segment higher in frequency. (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.12.11).

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000030

Claim 2

Claim 2	Public Documentation
[2] The method of claim 1 wherein frequency difference between the first center frequency and the second center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range.	The Accused Instrumentalities perform a method wherein frequency difference between the first center frequency and the second center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range. *See, e.g.*: **21. Very high throughput (VHT) PHY specification** **21.1 Introduction** **21.1.1 Introduction to the VHT PHY** Clause 21 specifies the PHY entity for a very high throughput (VHT) orthogonal frequency division multiplexing (OFDM) system operating in the 5 GHz band. In addition to the requirements in Clause 21, a VHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory PHY specifications defined in Clause 19 in the 5 GHz band. The VHT PHY provides support for 20 MHz, 40 MHz, 80 MHz, and 160 MHz contiguous channel widths and support for 80+80 MHz noncontiguous channel width. (IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 3, 2020) at 21.1.1). **21.3.14 Channelization**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000031

Claim 2	Public Documentation
	Table 21-22—Fields to specify VHT channels

Field	Meaning
dot11CurrentChannelWidth	Channel width. Possible values represent 20 MHz, 40 MHz, 80 MHz, 160 MHz, and 80+80 MHz channels.
dot11CurrentChannelCenterFrequencyIndex0	For a 20 MHz, 40 MHz, 80 MHz, or 160 MHz channel, denotes the channel center frequency. For an 80+80 MHz channel, denotes the center frequency of the frequency segment 0, which is the frequency segment containing the primary channel. Valid range is 1 to 200. See Equation (21-102).
dot11CurrentChannelCenterFrequencyIndex1	For an 80+80 MHz channel, denotes the center frequency of the frequency segment 1, which is the frequency segment that does not contain the primary channel. Valid range is 1 to 200. See Equation (21-102). For a 20 MHz, 40 MHz, 80 MHz, or 160 MHz channel, set to 0.
dot11CurrentPrimaryChannel	Denotes the location of the primary 20 MHz channel. Valid range is 1 to 200. See Equation (21-103).

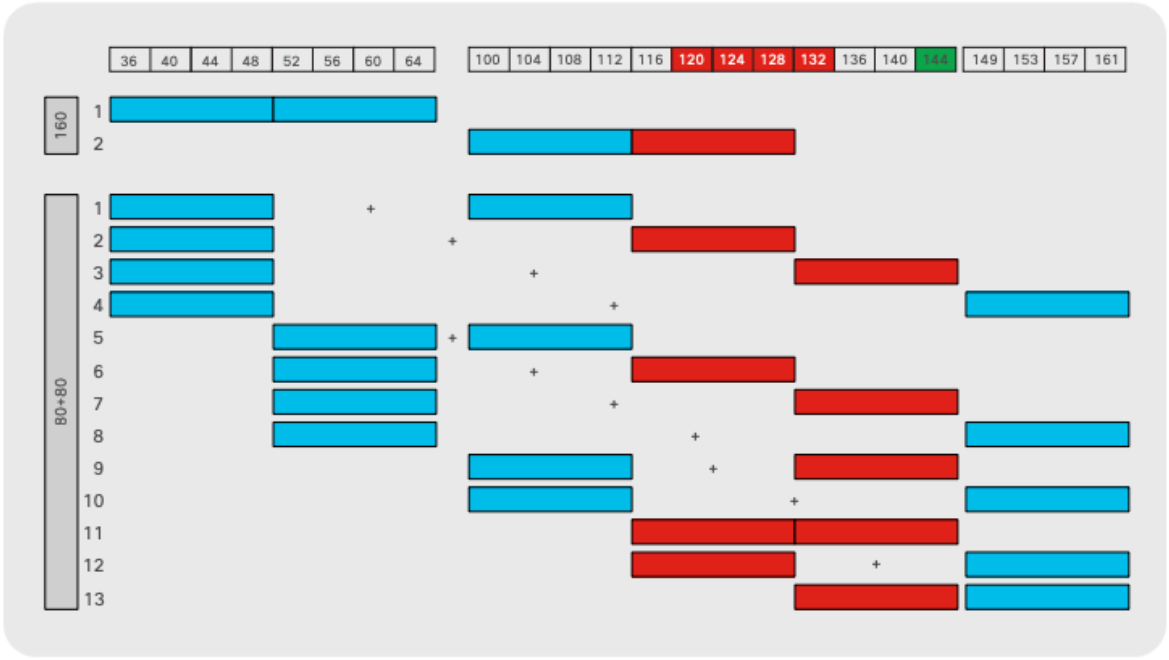
A channel center frequency of 5 GHz shall be indicated by dot11ChannelStartingFactor = 8000 and dot11CurrentPrimaryChannel = 200.

For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000032

Claim 2	Public Documentation
	A channel specified by Channel starting frequency = 5000 MHz dot11CurrentChannelWidth = 80+80 MHz dot11CurrentChannelCenterFrequencyIndex0 =155 dot11CurrentChannelCenterFrequencyIndex1 = 106 dot11CurrentPrimaryChannel = 161 is an 80+80 MHz channel in which frequency segment 0 has 80 MHz bandwidth and center frequency of 5775 MHz. Frequency segment 1 also has 80 MHz bandwidth and center frequency of 5530 MHz. The primary 20 MHz channel is centered at 5805 MHz. (IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 3, 2020) at 21.3.14, Table 21-22). Thus, for the example 80+80 MHz channel above, from clause 21.3.14, the frequency difference between the first and second center frequencies is 275 MHz, which is greater than 80 MHz, which is the sum of one-half the first frequency range (40 MHz) and one-half the second frequency range (40 MHz). **27. High-efficiency (HE) PHY specification** **27.1 Introduction** **27.1.1 Introduction to the HE PHY** Clause 27 specifies the PHY entity for a high-efficiency (HE) orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 27, an HE STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory requirements of the following PHY specifications: — Clause 19 and Clause 21 if the HE STA supports an operating channel width greater than or equal to 80 MHz and is operating in the 5 GHz band. For 5 GHz band operation, the HE PHY is based on the VHT PHY defined in Clause 21, which in turn is based on the HT PHY defined in Clause 19, which in turn is further based on the OFDM PHY defined in Clause 17.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000033

Claim 2	Public Documentation
	The HE PHY provides support for 20 MHz, 40 MHz, 80 MHz, and 160 MHz contiguous channel widths and support for 80+80 MHz noncontiguous channel width, depending on the frequency band and capability. For (IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.1.1). For example, the following Cisco document illustrates 80+80 MHz channel combinations. Figure 6. Channel options for 160 MHz and 80+80 MHz  https://www.cisco.com/c/dam/en/us/products/collateral/wireless/aironet-3600-series/white-paper-c11-713103.pdf (accessed Dec. 11, 2023)

Claim 3

Claim 3	Public Documentation
[3] The method of claim 1 wherein the first and second information are transmitted using the same power amplifier in said wireless transmitter.	The Accused Instrumentalities perform a method wherein the first and second information are transmitted using the same power amplifier in said wireless transmitter. For example, Cisco's Accused Instrumentalities support 80+80 MHz channel width, which transmits information in a wireless communication channel. For example, at least Cisco-Meraki MR53 of the Accused Instrumentalities is based on 802.11ac Wave 2, which supports 80+80 and 160 MHz channels. Cisco-Meraki MR53 further uses Skyworks PA: SKY85405, which supports 80+80 and 160MHz channels. Thus, there is evidence that the PA modules in the phone use a single PA for UL CA. Cisco-Meraki MR56 and Cisco-Meraki MR55 products are based on 802.11ax, capable of 80+80 and 160MHz channels. *See, e.g.*: 

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000035

Claim 3	Public Documentation

802.11ac

The Cisco Meraki MR53 sets the new standard in wireless. Designed specifically for high density and next generation deployments, it's the world's fastest cloud-managed wireless access point.

Using wider channel bandwidths, more efficient transmission technologies, and less crowded channels at 5 GHz help the MR53 achieve speeds up to 2.5 Gbps, while also providing administrators complete visibility and control.

CHANNEL BANDWIDTH

The MR53 increases the channel bandwidth — the size of the pipe used to transmit data — up to 160 MHz. These wider channels enable faster transmissions and increase aggregate performance in dense multi-client environments.



MODULATION

With enhanced modulation, the MR53 encodes data more efficiently. By sending more data over the air in less time, the MR53 can support more clients at once, and speeds uploads and downloads of large files and video.



SPECTRUM

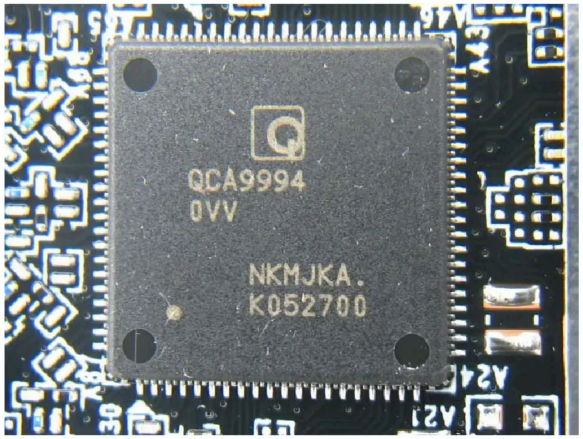
The MR53's 802.11ac radio operates exclusively in the 5 GHz band, a less-crowded spectrum enabling wider channels with less interference. A second radio is dedicated to supporting legacy 802.11b/g/n clients at 2.4 GHz.

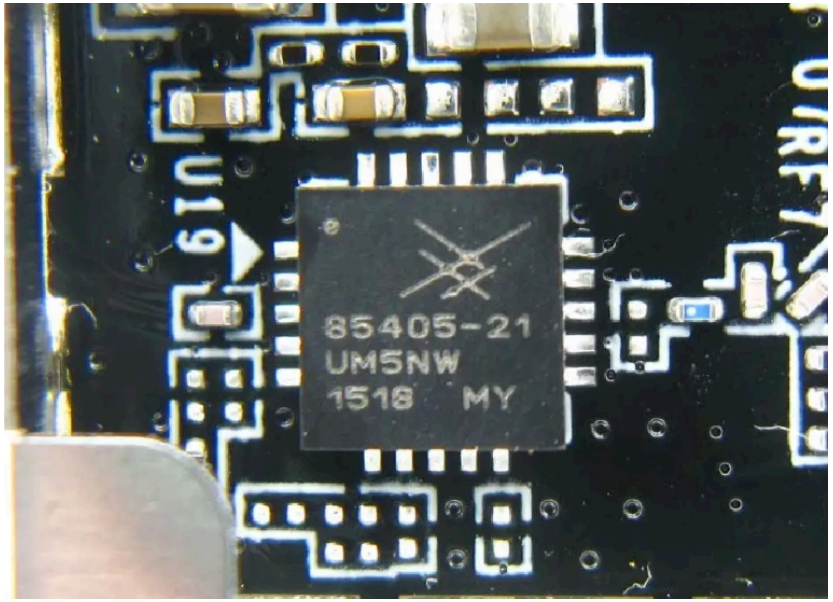
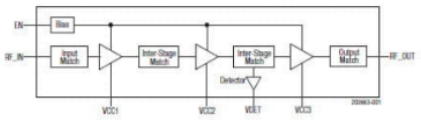


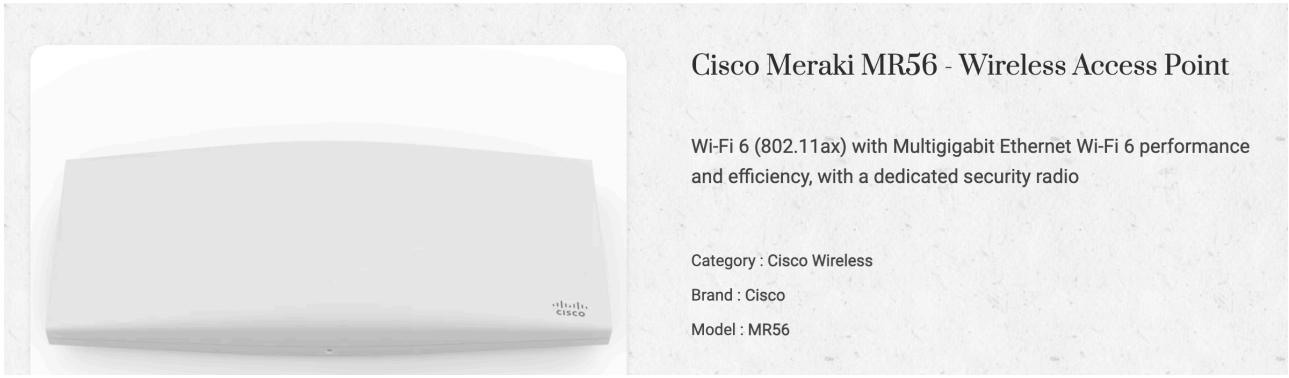
https://meraki.cisco.com/solutions/80211ac

Feature	802.11ac Wave 1	802.11ac Wave 2			
PHY Rate	1.3 Gbps	1.3 Gbps	1.73 Gbps	2.6 Gbps	3.5 Gbps
# of Spatial Streams	3	3	4	3	4
Modulation	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Channel Width	20, 40, 80 MHz	20, 40, 80 MHz	20, 40, 80 MHz	20, 40, 80, 80+80, 160 MHz	20, 40, 80, 80+80, 160 MHz
MIMO	Single User	Single User Multi User	Single User Multi User	Single User Multi User	Single User Multi User
802.11 protocol support	a, n, ac	a, n, ac	a, n, ac	a, n, ac	a, n, ac

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000036

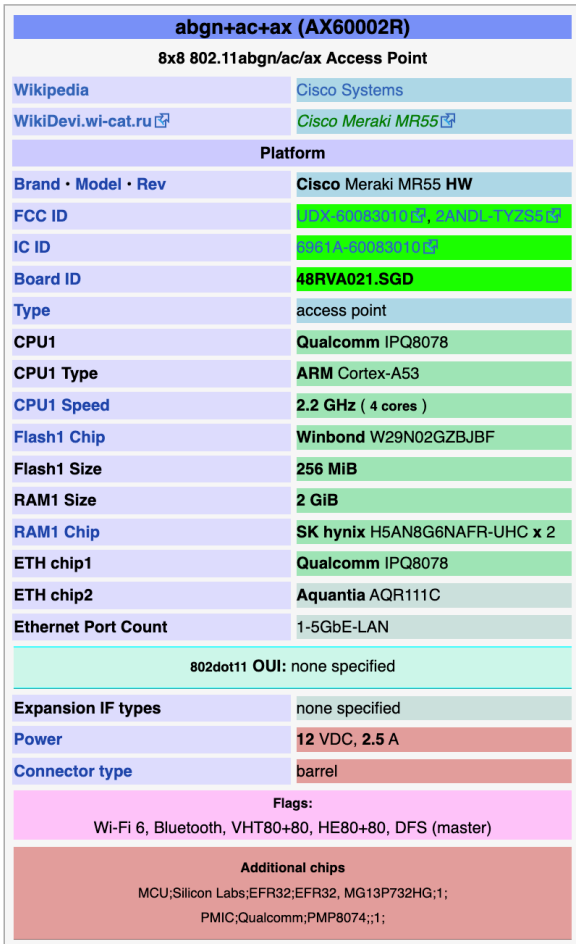
Claim 3	Public Documentation
	https://www.networxsecurity.org/members-area/glossary/i/ieee-80211ac.html Cisco-Meraki MR53 uses the Qualcomm QCA9994 SOC, which is capable of the 80+80 channel.  https://fccid.io/UDX-60042010/Internal-Photos/UDX-60042010-Internal-Photos-2980467  **QCA9994 SoC** **Wave-2 802.11ac Solution with MU-MIMO and 160MHz for Enterprise Networks** The QCA9994 is a Wave-2 802.11ac radio that enables premium Wi-Fi access points to support more devices and more demanding applications in the enterprise and carrier hotspots. The dual-band, 4x4 solution delivers peak data rates up to 1.7 Gbps, and uses Multi-User MIMO to maintain faster connections on increasingly crowded networks. The QCA9994 also supports 160MHz and 80+80MHz channels to double the capacity at close range. https://www.qualcomm.com/products/technology/wi-fi/qca9994

Claim 3	Public Documentation
	 https://fccid.io/UDX-60042010/Internal-Photos/UDX-60042010-Internal-Photos-2980467 Skyworks Ramps Production of Precision Analog ICs Supporting Enterprise Access Points, Cable Set-Top Boxes and Wireless Video Systems WOBURN, Mass., Mar 08, 2011 (BUSINESS WIRE) -- Skyworks Solutions, Inc. (NASDAQ:SWKS), an innovator of high reliability analog and mixed signal semiconductors enabling a broad range of end markets, is ramping production of various precision analog ICs in support of several customers launching fiber to the curb (FTTC), fiber to the home (FTTH), cable set-top boxes and wireless video systems. Cisco and Motorola, among others, are leveraging Skyworks' industry-leading power amplifiers, LNAs, gain blocks, attenuators, pin and varactor diodes, as well as switches to enable greater network reliability. https://investors.skyworksinc.com/news-releases/news-release-details/skyworks-ramps-production-precision-analog-ics-supporting **SKY85405-211** **High-Power (+19 dBm) 802.11ac WLAN Power Amplifier with Integrated Power Detector** Skyworks SKY85405-211 is a 5 GHz Microwave Monolithic Integrated Circuit (MMIC) power amplifier (PA) with superior output power, linearity, and efficiency. These features make the SKY85405-211 ideal for Wireless Local Area Network (WLAN IEEE 802.11ac) applications in Power over Ethernet (PoE) devices. The device is fabricated using Indium Gallium Phosphide (InGaP) Heterojunction Bipolar Transistor (HBT) technology. The device is internally matched and mounted in a 20-pin, 4 x 4 mm Quad Flat No-Lead (QFN) surface-mount technology... 

Claim 3	Public Documentation
	Specifications |			
---	---	---	---
Product Lifecycle	In Production	Frequency Range (GHz)	5.15-5.93
Test Frequency (GHz)	TBD	Gain Typ. (dB)	31
Power Added Efficiency (%)	TBD	OIP3 (dBm)	
$P_{1\,dB}$ (dBm)	28	V_{CC} (V)	3.3
Quiescent Current Typ. (mA)	170	Noise Figure Typ. (dB)	TBD
Package	QFN, 20-pin	Package (mm)	4 x 4	 https://www.skyworksinc.com/en/Products/Amplifiers/SKY85405-211 

Claim 3	Public Documentation
	802.11ax, 802.11ac Wave 2, and 802.11n Capabilities • UL/DL OFDMA, TWT support, BSS coloring • 8×8 multiple input, multiple output (MIMO) with 8 spatial streams • 4×4 multiple input, multiple output (MIMO) with 4 spatial streams • UL/DL SU-MIMO and MU-MIMO Support • Maximal ratio combining (MRC) and beamforming • 20 and 40 MHz channels (802.11n) 20, 40, and 80 MHz channels (802.11ac Wave 2) • 160 MHz (80+80); 20, 40 and 80MHz channels (802.11ax), 160 MHz (80+80) • Up to 1024 QAM on both 2.4 GHz and 5 GHz bands • Packet aggregation https://www.metapoint.in/product/cisco-meraki-mr56-wireless-access-point

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000040

Claim 3	Public Documentation
	 http://en.techinfodepot.shoutwiki.com/wiki/Cisco_Meraki_MR55

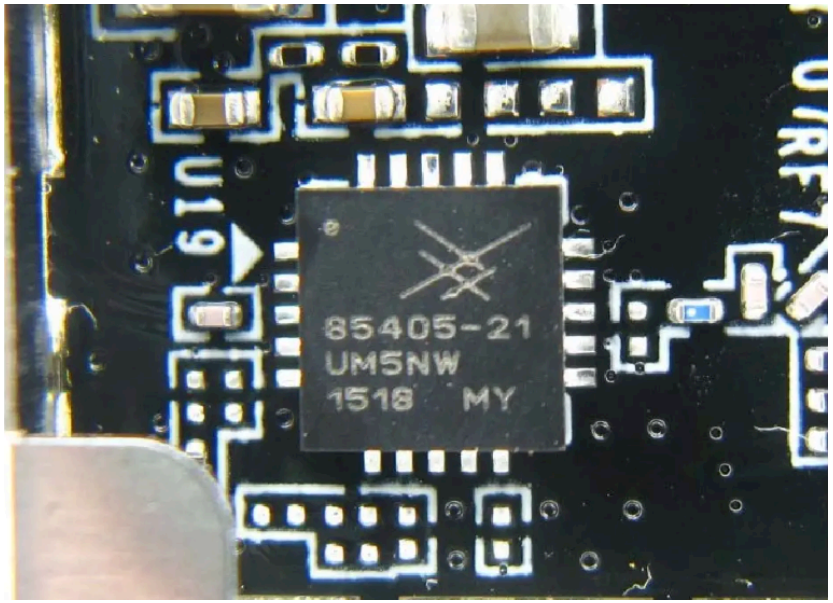
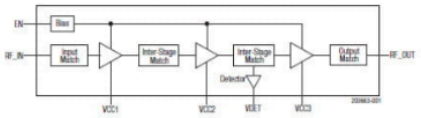
Claim 3	Public Documentation
	<table><tr><th>Capabilities</th><th>MR44</th><th>MR45</th><th>MR55</th><th>MR36</th><th>MR46</th><th>MR56</th></tr><tr><td>802.11ax Compliance</td><td>Compatible</td><td>Compatible</td><td>Compatible</td><td>Compatible</td><td>Compatible</td><td>Compatible</td></tr><tr><td>Wi-Fi 6-Certified</td><td>Certified</td><td>-</td><td>-</td><td>Certified</td><td>Certified</td><td>Certified</td></tr><tr><td>2.4 GHz Radio Information</td><td>802.11b/g/n/ax 2x2:2</td><td>802.11b/g/n/ax 4x4:4</td><td>802.11b/g/n/ax 4x4:4</td><td>802.11b/g/n/ax 2x2:2</td><td>802.11b/g/n/ax 4x4:4</td><td>802.11b/g/n/ax 4x4:4</td></tr><tr><td>5 GHz Radio Information</td><td>802.11a/n/ac/ax 4x4:4</td><td>802.11a/n/ac/ax 4x4:4</td><td>802.11a/n/ac/ax 8x8:8</td><td>802.11a/n/ac/ax 2x2:2</td><td>802.11a/n/ac/ax 4x4:4</td><td>802.11a/n/ac/ax 8x8:8</td></tr></table> https://documentation.meraki.com/MR/Wi-Fi_Basics_and_Best_Practices/Wi-Fi_6_(802.11ax)_Technical_Guide

Claim 4

Claim 4	Public Documentation
[4] The method of claim 3 wherein the bandwidth of said power amplifier is greater than the difference between the first lowest frequency and the second highest frequency.	The Accused Instrumentalities perform the method of claim 3 wherein the bandwidth of said power amplifier is greater than the difference between the first lowest frequency and the second highest frequency. For example, the Accused Instrumentalities perform the method of claim 3 wherein the bandwidth of said power amplifier is greater than the difference between the first lowest frequency and the second highest frequency, at least when transmitted using the identified power amplifier. *See, e.g.*

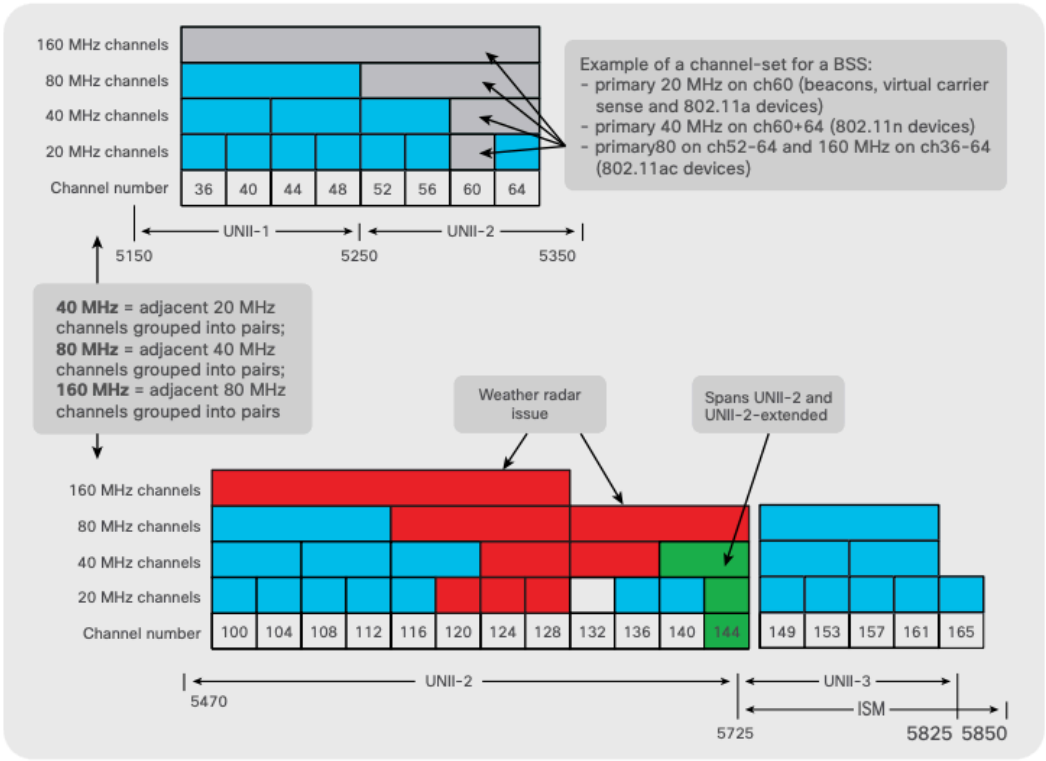
Claim 4	Public Documentation
	21. Very high throughput (VHT) PHY specification **21.1 Introduction** **21.1.1 Introduction to the VHT PHY** Clause 21 specifies the PHY entity for a very high throughput (VHT) orthogonal frequency division multiplexing (OFDM) system operating in the 5 GHz band. In addition to the requirements in Clause 21, a VHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory PHY specifications defined in Clause 19 in the 5 GHz band. The VHT PHY provides support for 20 MHz, 40 MHz, 80 MHz, and 160 MHz contiguous channel widths and support for 80+80 MHz noncontiguous channel width. IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 3, 2020) at 21.1.1. **27. High-efficiency (HE) PHY specification** **27.1 Introduction** **27.1.1 Introduction to the HE PHY** Clause 27 specifies the PHY entity for a high-efficiency (HE) orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 27, an HE STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory requirements of the following PHY specifications: — Clause 19 and Clause 21 if the HE STA supports an operating channel width greater than or equal to 80 MHz and is operating in the 5 GHz band. For 5 GHz band operation, the HE PHY is based on the VHT PHY defined in Clause 21, which in turn is based on the HT PHY defined in Clause 19, which in turn is further based on the OFDM PHY defined in Clause 17.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000043

Claim 4	Public Documentation
	The HE PHY provides support for 20 MHz, 40 MHz, 80 MHz, and 160 MHz contiguous channel widths and support for 80+80 MHz noncontiguous channel width, depending on the frequency band and capability. For IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.1.1.  https://fccid.io/UDX-60042010/Internal-Photos/UDX-60042010-Internal-Photos-2980467 **SKY85405-211** **High-Power (+19 dBm) 802.11ac WLAN Power Amplifier with Integrated Power Detector** Skyworks SKY85405-211 is a 5 GHz Microwave Monolithic Integrated Circuit (MMIC) power amplifier (PA) with superior output power, linearity, and efficiency. These features make the SKY85405-211 ideal for Wireless Local Area Network (WLAN IEEE 802.11ac) applications in Power over Ethernet (PoE) devices. The device is fabricated using Indium Gallium Phosphide (InGaP) Heterojunction Bipolar Transistor (HBT) technology. The device is internally matched and mounted in a 20-pin, 4 x 4 mm Quad Flat No-Lead (QFN) surface-mount technology... 

Claim 4	Public Documentation
	Specifications |			
---	---	---	---
Product Lifecycle	In Production	Frequency Range (GHz)	5.15-5.93
Test Frequency (GHz)	TBD	Gain Typ. (dB)	31
Power Added Efficiency (%)	TBD	OIP3 (dBm)	
P_{1dB} (dBm)	28	V_{CC} (V)	3.3
Quiescent Current Typ. (mA)	170	Noise Figure Typ. (dB)	TBD
Package	QFN, 20-pin	Package (mm)	4 x 4	 https://www.skyworksinc.com/en/Products/Amplifiers/SKY85405-211

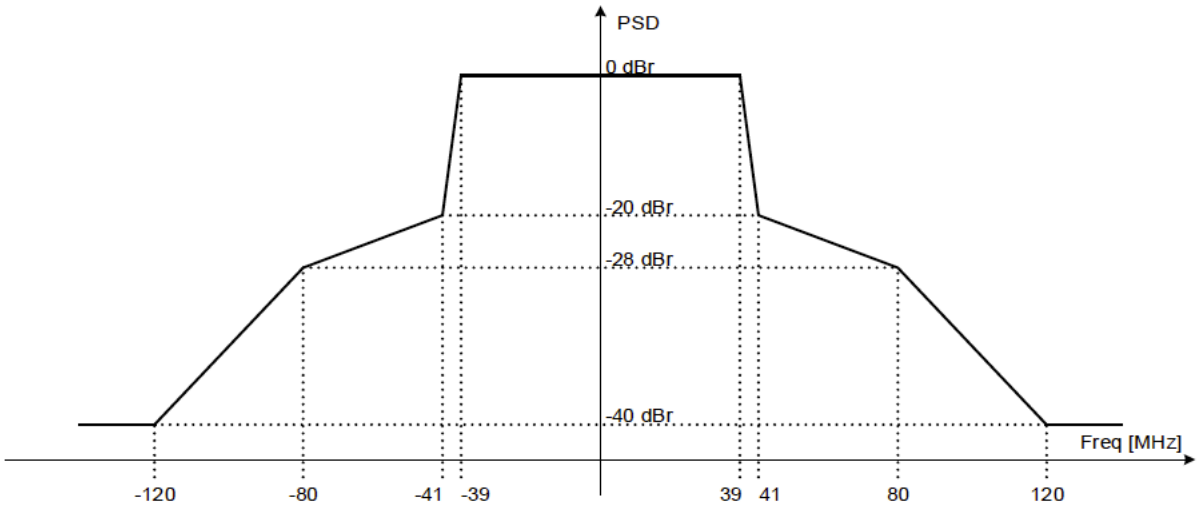
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000045

Claim 4	Public Documentation
	Figure 4. 802.11ac channelization (United States)  https://www.skyworksinc.com/en/Products/Amplifiers/SKY85405-211 For example, the total frequency range of all 80 MHz channels falls within the frequency range of the power amplifier shown above. Therefore, the bandwidth of said power amplifier is greater than the difference between any allowable lowest frequency of the lower 80 MHz segment of any 80+80 MHz channel, and any allowable highest frequency of the upper 80 MHz segment of any 80+80 MHz channel under 802.11ac, or any such channel in the 5GHz band under 802.11ax.

Claim 7

Claim 7	Public Documentation
[7] The method of claim 1 wherein the first information and the second information are the same data transmitted across two different frequencies.	The Accused Instrumentalities perform a method wherein the first information and the second information are the same data transmitted across two different frequencies. For example, signals are transmitted on 80+80 MHz, one for the lower 80MHz frequency segment and one for the upper 80 MHz frequency segment with the same PPDU transmission, where the center frequency of frequency segment (0) is less than the center frequency of frequency segment (1). An 80+80MHz NON-HT Duplicate PPDU transmitted using the 80+80 MHz (i.e. different frequencies) transmit spectral mask sends copies of the same data on each of the 80MHz segments. *See, e.g.*: **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask** For an 80 MHz mask PPDU of non-HT, non-HT duplicate, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 78 MHz, –20 dBr at 41 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at

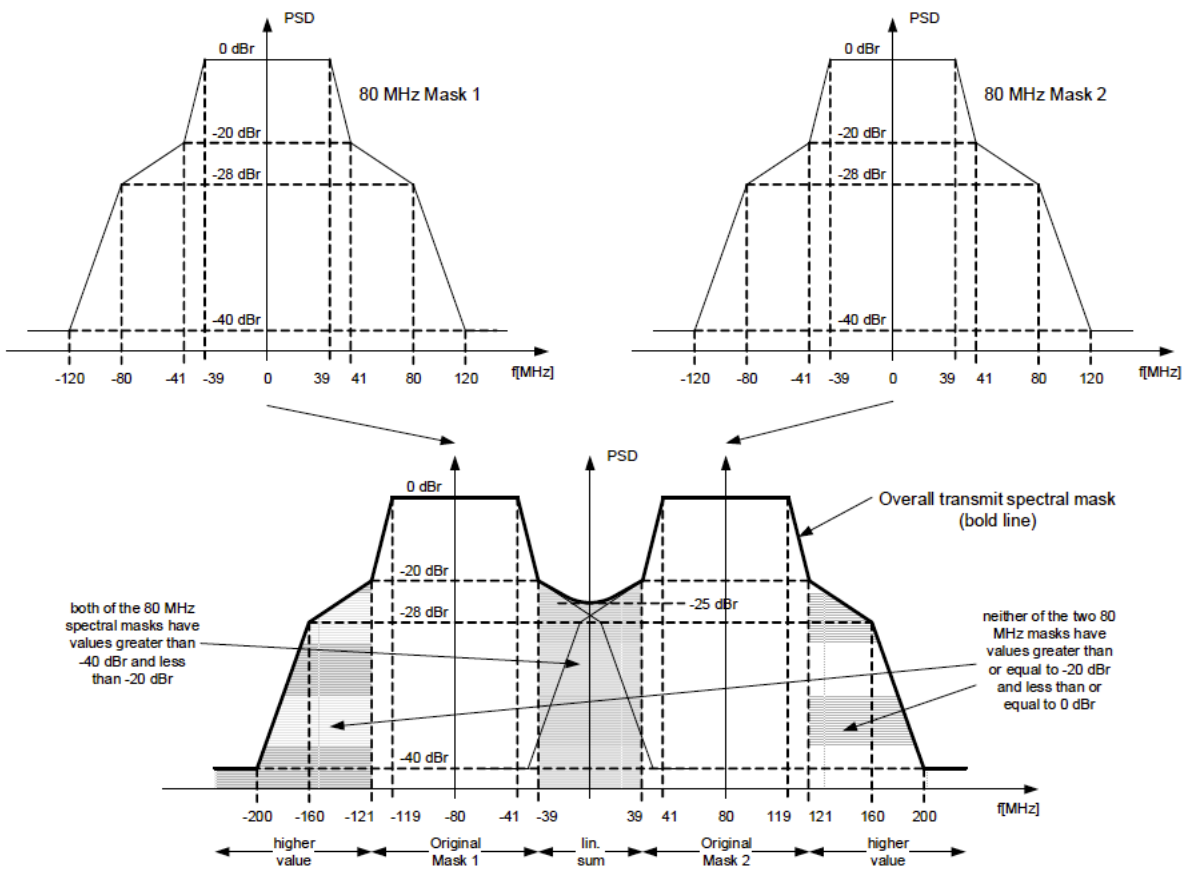
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000047

Claim 7	Public Documentation
	120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 39 and 41 MHz, 41 and 80 MHz, and 80 and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39 MHz, 41 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 21-31 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 21-31—Example transmit spectral mask for 80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-31 **21.3.14 Channelization** For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000048

Claim 7	Public Documentation
	A channel specified by channel starting frequency = 5000 MHz dot11CurrentChannelWidth = 80+80 MHz dot11CurrentChannelCenterFrequencyIndex0 =155 dot11CurrentChannelCenterFrequencyIndex1 = 106 dot11CurrentPrimaryChannel = 161 is an 80+80 MHz channel in which frequency segment 0 has 80 MHz bandwidth and center frequency of 5775 MHz. Frequency segment 1 also has 80 MHz bandwidth and center frequency of 5530 MHz. The primary 20 MHz channel is centered at 5805 MHz. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14. **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000049

Claim 7	Public Documentation
	 **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33

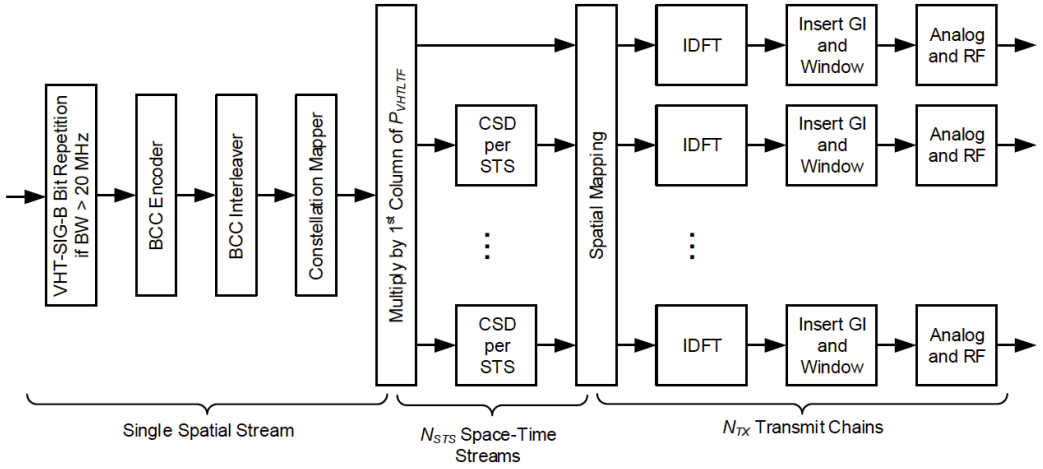
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000050

Claim 7	Public Documentation
	3. Definitions, acronyms, and abbreviations **3.1 Definitions** **80+80 MHz mask physical layer (PHY) protocol data unit (PPDU):** A PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21 and that is one of the following: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) **multi-user multiple input, multiple output (MU-MIMO):** A technique by which multiple stations (STAs), each with one or more antennas, either simultaneously transmit to a single STA or simultaneously receive from a single STA independent data streams over the same radio frequencies. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 3.1. **3.2 Definitions specific to IEEE Std 802.11** **downlink multi-user multiple input, multiple output (DL-MU-MIMO):** A technique by which an access point (AP) with more than one antenna transmits a physical layer (PHY) protocol data unit (PPDU) to multiple receiving non-AP stations (STAs) over the same radio frequencies, wherein each non-AP STA simultaneously receives one or more distinct space-time streams.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000051

Claim 7	Public Documentation
	non-high-throughput (non-HT) duplicate: A transmission format of the physical layer (PHY) that duplicates a 20 MHz non-HT transmission in two or more 20 MHz channels and allows a station (STA) in a non-HT basic service set (BSS) on any one of the 20 MHz channels to receive the transmission. A non-HT duplicate format is one of the following: a) 40 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in two adjacent 20 MHz channels. b) 80 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in four adjacent 20 MHz channels. c) 160 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in eight adjacent 20 MHz channels. d) 80+80 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in two frequency segments of four adjacent 20 MHz channels where the two frequency segments of channels are not adjacent. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 3.2. **21.3.3 Transmitter block diagram**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000052

Claim 7	Public Documentation
	Figure 21-6 and Figure 21-7 show the transmit process for generating the VHT-SIG-B field of a VHT SU PPDU and VHT MU PPDU, respectively, in 20 MHz, 40 MHz, and 80 MHz channel widths. Figure 21-8 and Figure 21-9 show the transmit process for generating the VHT_SIG-B field of a 160 MHz and 80+80 MHz VHT SU PPDU, respectively.  **Figure 21-6—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT SU PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.3 and Fig. 21-6. **21.3.10.9.3 Segment deparser** NOTE—As per Table 21-7, $f_c^{(0)}$ (center frequency for frequency segment i_{Seg}=0) is always less than $f_c^{(1)}$ in case of 80+80 MHz VHT PPDU transmissions. Hence, $d''_{k,i,n,0,u}$ (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while $d''_{k,i,n,1,u}$ (frequency subblock 1) is always transmitted in the frequency segment higher in frequency. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.10.9.3. **21.3.10.12 Non-HT duplicate transmission**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000053

Claim 7	Public Documentation
	In an 80+80 MHz non-HT duplicate transmission, data transmission in each frequency segment shall be as defined for an 80 MHz non-HT duplicate transmission in Equation (21-100). IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.10.12. **21. Very high throughput (VHT) PHY specification** **21.1 Introduction** **21.1.1 Introduction to the VHT PHY** Clause 21 specifies the PHY entity for a very high throughput (VHT) orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 21, a VHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory PHY specifications defined in Clause 19. The VHT PHY is based on the HT PHY defined in Clause 19, which in turn is based on the OFDM PHY defined in Clause 17. The VHT PHY extends the maximum number of space-time streams supported to eight and provides support for downlink multi-user (MU) transmissions. A downlink MU transmission supports up to four users with up to four space-time streams per user with the total number of space-time streams not exceeding eight. NOTE—MU transmission is different from VHT SU group addressed transmission. The VHT PHY provides support for 20 MHz, 40 MHz, 80 MHz, and 160 MHz contiguous channel widths and support for 80+80 MHz noncontiguous channel width. The VHT PHY data subcarriers are modulated using binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), 16-quadrature amplitude modulation (16-QAM), 64-QAM, and 256-QAM. Forward error correction (FEC) coding (convolutional or LDPC coding) is used with coding rates of 1/2, 2/3, 3/4, and 5/6. A VHT STA shall support the following features: — Non-HT and non-HT duplicate formats (transmit and receive) for all channel widths supported by the VHT STA — HT-mixed format (transmit and receive) — VHT format (transmit and receive) — 20 MHz, 40 MHz, and 80 MHz channel widths — Single spatial stream VHT-MCSs 0 to 7 (transmit and receive) in all supported channel widths — Binary convolutional coding IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.1.1. **19.2.4 Effect of CH_BANDWIDTH, CH_OFFSET, and MCS parameters on PPDU format**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000054

Claim 7	Public Documentation

Table 19-2—Interpretation of FORMAT, CH_BANDWIDTH, and CH_OFFSET parameters *(continued)*

FORMAT	CH_BANDWIDTH	CH_OFFSET
NON_HT	NON_HT_CBW20 and the SECONDARY_CHANNEL_OFFSET parameter of the PHYCONFIG_VECTOR is SECONDARY_CHANNEL_ABOVE	CH_OFF_20L: *40 MHz non-HT lower format*—The STA transmits an ERP-DSSS, ERP-CCK, ERP-OFDM, or OFDM format PPDU, in the lower 20 MHz of a 40 MHz channel.
NON_HT	NON_HT_CBW40	CH_OFF_40: *Non-HT duplicate format*—The STA transmits an ERP-OFDM or OFDM format PPDU in each of the 20 MHz channels of a 40 MHz channel. The upper channel (higher frequency) is rotated by +90° relative to the lower channel. See 19.3.11.12.

IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) 19.2.4, Table 19-2.

9.4.2.249 HE Operation element

The Channel Center Frequency Segment 0 field indicates the channel center frequency index for the 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz channel on which the BSS operates in the 6 GHz band. If the BSS channel width is 160 MHz or 80+80 MHz, then the Channel Center Frequency Segment 0 field indicates the channel center frequency index of the primary 80 MHz.

The Channel Center Frequency Segment 1 field indicates the channel center frequency index of the 160 MHz channel on which the BSS operates in the 6 GHz band. If the channel width is 80+80 MHz, then it indicates the channel center frequency index of the secondary 80 MHz.

IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 9.4.2.249.

26.17.2 HE BSS operation in the 6 GHz band

26.17.2.1 General

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000055

Claim 7	Public Documentation
	A 6 GHz AP or 6 GHz mesh STA shall include the 6 GHz Operation Information field in the HE Operation elements it transmits. The AP or mesh STA shall set the Channel Width subfield, the Channel Center Frequency Segment 0, and the Channel Center Frequency Segment 1 subfields of the 6 GHz Operation Information field as defined in Table 26-15, based on the Rx HE-MCS Map ≤ 80 MHz, Rx HE-MCS Map 160 MHz, and Rx HE-MCS Map 80+80 MHz subfields of the Supported HE MCS And NSS Set field in the HE Capabilities element transmitted by the AP. **Table 26-15—6 GHz BSS channel width** **Channel Width field** / **Center Frequency Segment 1 field** / **BSS channel width (MHz)** 0 / 0 / 20 1 / 0 / 40 2 / 0 / 80 3 / CCFS1 > 0 and |CCFS1 – CCFS0| = 8 / 160 3 / CCFS1 > 0 and |CCFS1 – CCFS0| > 16 / 80+80 NOTE—CCFS0 represents the value of the Channel Center Frequency Segment 0 field, and CCFS1 represents the value of the Channel Center Frequency Segment 1 field. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 26.17.2.1. **27.3.2.2 Resource unit, guard, and DC subcarriers** respectively. The same structure as used for the 80 MHz HE MU PPDU formats or HE TB PPDU formats using OFDMA transmission is used for both the primary 80 MHz and secondary 80 MHz channels in the 160 MHz and 80+80 MHz HE MU PPDU or HE TB PPDU formats using OFDMA transmission. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.2.2.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000056

Claim 7	Public Documentation
	27.3.10 Mathematical description of signals For a 160 MHz HE PPDU transmission or a noncontiguous 80+80 MHz transmission, each half 80 MHz bandwidth is divided into 1024 subcarriers, and the subcarriers on which the signal is transmitted in each 80 MHz bandwidth is identical to an 80 MHz HE PPDU transmission, depending on non-OFDMA or OFDMA transmission within the corresponding 80 MHz. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.10. **27.3.19.3 Transmit center frequency and symbol clock frequency tolerance** Transmit signals with TXVECTOR parameter CH_BANDWIDTH set to CBW160 or CBW80+80 may be generated using two separate RF LOs, one for each of the lower and upper 80 MHz frequency portions. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.3. **27.3.19 Transmit specification** **27.3.19.1 Transmit spectral mask**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000057

Claim 7	Public Documentation
	For an 80+80 MHz mask PPDU of HE format, the overall transmit spectral mask is constructed in the following manner. First, the 80 MHz interim spectral mask is placed on each of the two 80 MHz segments. For each frequency at which either of the 80 MHz interim spectral mask has a value equal to 0 dBr, then 0 dBr shall be taken as the overall interim spectral mask value. Then, for each frequency at which both of the 80 MHz interim spectral masks have values greater than –40 dBr and less than –20 dBr, the sum of the two interim mask values (summed in linear domain) shall be taken as the overall interim spectral mask value. Next, for each frequency at which neither of the two 80 MHz interim masks has a value greater than or equal to –20 dBr, the higher value of the two interim masks shall be taken as the overall interim spectral mask value. Finally, for any frequency region where the overall interim spectral mask value has not been defined yet, linear interpolation (in dB domain) between the nearest two frequency points with the overall interim spectral mask value defined shall be used to define the overall interim spectral mask value. The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz. Different center frequency separation between the two 80 MHz frequency segments of the spectral mask and different peak levels of each 80 MHz frequency segment of the spectral mask are possible. In such cases, a similar procedure in determining the spectral mask as in Figure 27-51 is followed. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1. **27.3.12.11 Segment deparser** NOTE—As per Table 21-7 (center frequency for frequency segment iSeg = 0), $f_c^{(0)}$ is always less than $f_c^{(1)}$ in the case of an 80+80 MHz HE PPDU. Hence, $d''_{k,i,n,0,r,u}$ (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while $d''_{k,i,n,1,r,u}$ (frequency subblock 1) is always transmitted in the frequency segment higher in frequency. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.12.11.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000058

Claim 7	Public Documentation
	3.2 Definitions specific to IEEE 802.11 **80+80 MHz mask physical layer (PHY) protocol data unit (PPDU):** A ~~PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21) and that is one~~ One of the following PPDUs: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. c) An 80+80 MHz high-efficiency (HE) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 27. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 3.2. **27.1.4 PPDU formats** The structure of the PPDU transmitted by an HE STA is determined by the TXVECTOR parameters as defined in Table 27-1. The FORMAT parameter determines the overall structure of the PPDU and can take on one of the following values: — Non-HT format (NON_HT), based on Clause 17 or Clause 18 and including non-HT duplicate format. — HT-mixed format (HT_MF) as specified in Clause 19. — HT-greenfield format (HT_GF) as specified in Clause 19. — VHT format (VHT) as defined in Clause 21. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.1.4.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000059

Claim 7	Public Documentation
	27.2.2 TXVECTOR and RXVECTOR parameters **Table 27-1—TXVECTOR and RXVECTOR parameters** IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.2.2, Table 27-1. **19.2.2 TXVECTOR and RXVECTOR parameters**

Parameter	Condition	Value	TXVECTOR	RXVECTOR
FORMAT		Determines the format of the PPDU. Enumerated type: NON_HT indicates Clause 15, Clause 16, Clause 17, Clause 18, or non-HT duplicate PPDU format. In this case, the modulation is determined by the NON_HT_ MODULATION parameter. HT_MF indicates HT-mixed format. HT_GF indicates HT-greenfield format. VHT indicates VHT format. HE_SU indicates HE SU PPDU format. HE_MU indicates HE MU PPDU format. HE_ER_SU indicates HE ER SU PPDU format. HE_TB indicates HE TB PPDU format.	Y	Y

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000060

Claim 7	Public Documentation
	Table 19-1—TXVECTOR and RXVECTOR parameters

Parameter	Condition	Value	TXVECTOR See NOTE 1	RXVECTOR
FORMAT		Determines the format of the PPDU. Enumerated type: NON_HT indicates DSSS, HR/DSSS, OFDM or ERP PPDU formats or non-HT duplicates PPDU format. In this case, the modulation is determined by the NON_HT_MODULATION parameter. HT_MF indicates HT-mixed format. HT_GF indicates HT-greenfield format.	Y	Y
NON_HT_MODULATION	FORMAT is NON_HT	Enumerated type: ERP-DSSS ERP-CCK ERP-OFDM OFDM NON_HT_DUP_OFDM	Y	Y
	Otherwise	Not present		

IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 19.2.2, Table 19-1.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000061

Claim 7	Public Documentation
	21. Very high throughput (VHT) PHY specification **21.1 Introduction** **21.1.1 Introduction to the VHT PHY** Clause 21 specifies the PHY entity for a very high throughput (VHT) orthogonal frequency division multiplexing (OFDM) system operating in the 5 GHz band. In addition to the requirements in Clause 21, a VHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory PHY specifications defined in Clause 19 in the 5 GHz band. The VHT PHY is based on the HT PHY defined in Clause 19, which in turn is based on the OFDM PHY defined in Clause 17. The VHT PHY extends the maximum number of space-time streams supported to eight and provides support for downlink multi-user (MU) transmissions. A downlink MU transmission supports up to four users with up to four space-time streams per user with the total number of space-time streams not exceeding eight. IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 21.1.1. **19.2.4 Effect of CH_BANDWIDTH, CH_OFFSET, and MCS parameters on PPDU format**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000062

Claim 7	Public Documentation

Table 19-2—Interpretation of FORMAT, CH_BANDWIDTH, and CH_OFFSET parameters

FORMAT	CH_BANDWIDTH	CH_OFFSET
HF_MF, HF_GF	HT_CBW20	CH_OFF_20: *20 MHz HT format*—The STA has a 20 MHz operating channel width and transmits an HT-mixed or HT-greenfield format PPDU of 20 MHz bandwidth. CH_OFF_20U: *40 MHz HT upper format*—The STA transmits an HT-mixed or HT-greenfield format PPDU of 20 MHz bandwidth in the upper 20 MHz of a 40 MHz channel. CH_OFF_20L: *40 MHz HT lower format*—The STA transmits an HT-mixed or HT-greenfield format PPDU of 20 MHz bandwidth in the lower 20 MHz of a 40 MHz channel.
HT_MF, HT_GF	HT_CBW40	CH_OFF_40: *40 MHz HT format*—The STA transmits an HT-mixed or HT-greenfield format PPDU of 40 MHz bandwidth.
NON_HT	NON_HT_CBW20 and the SECONDARY_CHANNEL_OFFSET parameter of the PHYCONFIG_VECTOR is SECONDARY_CHANNEL_NONE	CH_OFF_20: *20 MHz non-HT format*—The STA has a 20 MHz operating channel width and transmits an ERP-DSSS, ERP-CCK, ERP-OFDM, or OFDM format PPDU.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000063

Claim 7	Public Documentation
	Table 19-2—Interpretation of FORMAT, CH_BANDWIDTH, and CH_OFFSET parameters *(continued)*

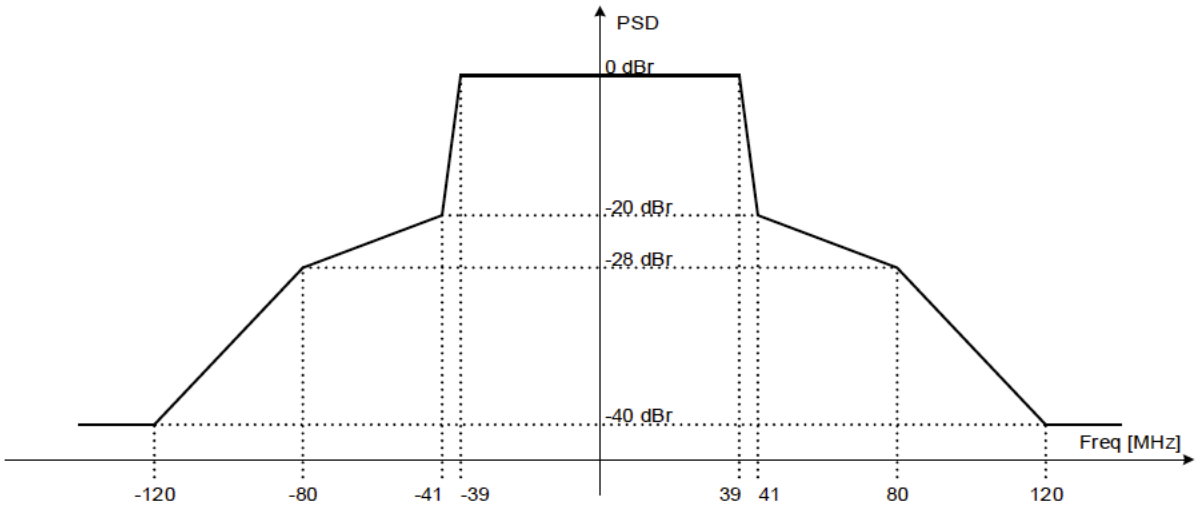
FORMAT	CH_BANDWIDTH	CH_OFFSET
NON_HT	NON_HT_CBW20 and the SECONDARY_CHANNEL_OFFSET parameter of the PHYCONFIG_VECTOR is SECONDARY_CHANNEL_BELOW	CH_OFF_20U: *40 MHz non-HT upper format*—The STA transmits an ERP-DSSS, ERP-CCK, ERP-OFDM, or OFDM format PPDU, in the upper 20 MHz of a 40 MHz channel.
NON_HT	NON_HT_CBW20 and the SECONDARY_CHANNEL_OFFSET parameter of the PHYCONFIG_VECTOR is SECONDARY_CHANNEL_ABOVE	CH_OFF_20L: *40 MHz non-HT lower format*—The STA transmits an ERP-DSSS, ERP-CCK, ERP-OFDM, or OFDM format PPDU, in the lower 20 MHz of a 40 MHz channel.
NON_HT	NON_HT_CBW40	CH_OFF_40: *Non-HT duplicate format*—The STA transmits an ERP-OFDM or OFDM format PPDU in each of the 20 MHz channels of a 40 MHz channel. The upper channel (higher frequency) is rotated by +90° relative to the lower channel. See 19.3.11.12.

IEEE 802.11-2020, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 19.2.4, Table 19-2.

Claim 8

Claim 8	Public Documentation
[8] The method of claim 1 wherein the first information and the second information are from the same data stream.	The Accused Instrumentalities perform a method wherein the first information and the second information are from the same data stream. For example, the 80+80MHz transmission has first and second information with the same PPDU transmission. A single STA transmits independent data streams over different groups of subcarriers. An 80+80MHz HE PPDU is equal to CBW 80+80 (i.e. same data stream) transmitted using the 80+80 MHz transmit spectral mask. *See, e.g.*: **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask** For an 80 MHz mask PPDU of non-HT, non-HT duplicate, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 78 MHz, –20 dBr at 41 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000065

Claim 8	Public Documentation
	120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 39 and 41 MHz, 41 and 80 MHz, and 80 and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39 MHz, 41 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 21-31 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 21-31—Example transmit spectral mask for 80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-31. **21.3.14 Channelization** For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used.

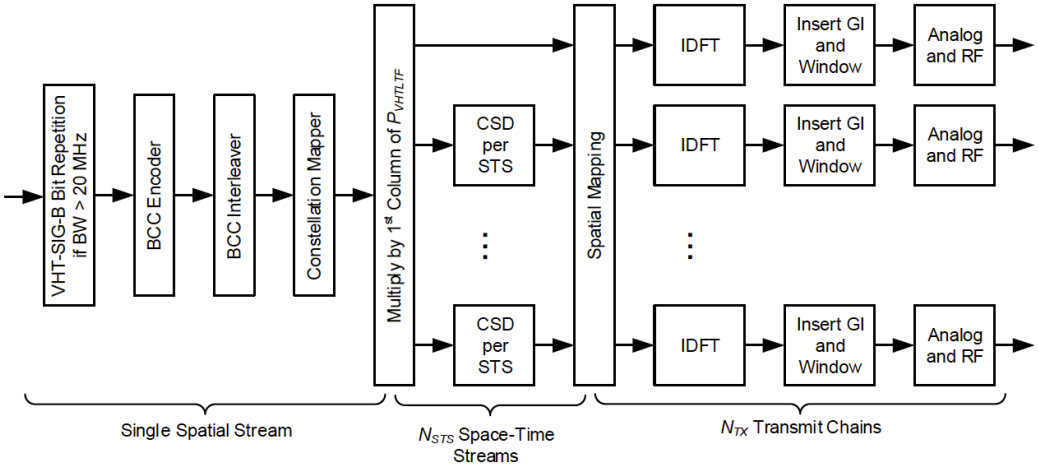
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000066

Claim 8	Public Documentation
	A channel specified by channel starting frequency = 5000 MHz dot11CurrentChannelWidth = 80+80 MHz dot11CurrentChannelCenterFrequencyIndex0 =155 dot11CurrentChannelCenterFrequencyIndex1 = 106 dot11CurrentPrimaryChannel = 161 is an 80+80 MHz channel in which frequency segment 0 has 80 MHz bandwidth and center frequency of 5775 MHz. Frequency segment 1 also has 80 MHz bandwidth and center frequency of 5530 MHz. The primary 20 MHz channel is centered at 5805 MHz. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14. **3. Definitions, acronyms, and abbreviations** **3.1 Definitions** **80+80 MHz mask physical layer (PHY) protocol data unit (PPDU):** A PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21 and that is one of the following: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) **multi-user multiple input, multiple output (MU-MIMO):** A technique by which multiple stations (STAs), each with one or more antennas, either simultaneously transmit to a single STA or simultaneously receive from a single STA independent data streams over the same radio frequencies. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 3.1. **3.2 Definitions specific to IEEE Std 802.11**

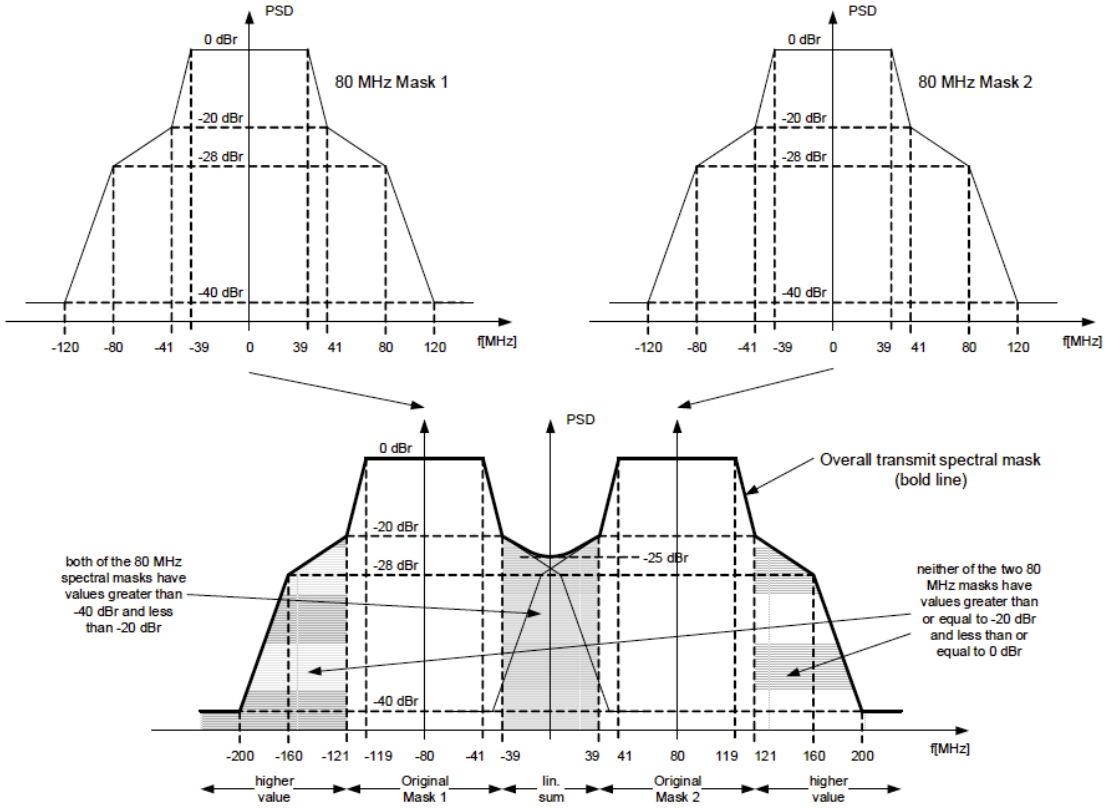
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000067

Claim 8	Public Documentation
	downlink multi-user multiple input, multiple output (DL-MU-MIMO): A technique by which an access point (AP) with more than one antenna transmits a physical layer (PHY) protocol data unit (PPDU) to multiple receiving non-AP stations (STAs) over the same radio frequencies, wherein each non-AP STA simultaneously receives one or more distinct space-time streams. **non-high-throughput (non-HT) duplicate:** A transmission format of the physical layer (PHY) that duplicates a 20 MHz non-HT transmission in two or more 20 MHz channels and allows a station (STA) in a non-HT basic service set (BSS) on any one of the 20 MHz channels to receive the transmission. A non-HT duplicate format is one of the following: a) 40 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in two adjacent 20 MHz channels. b) 80 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in four adjacent 20 MHz channels. c) 160 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in eight adjacent 20 MHz channels. d) 80+80 MHz non-HT duplicate: A transmission format of the PHY that replicates a 20 MHz non-HT transmission in two frequency segments of four adjacent 20 MHz channels where the two frequency segments of channels are not adjacent. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 3.2. **21.3.3 Transmitter block diagram**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000068

Claim 8	Public Documentation
	Figure 21-6 and Figure 21-7 show the transmit process for generating the VHT-SIG-B field of a VHT SU PPDU and VHT MU PPDU, respectively, in 20 MHz, 40 MHz, and 80 MHz channel widths. Figure 21-8 and Figure 21-9 show the transmit process for generating the VHT_SIG-B field of a 160 MHz and 80+80 MHz VHT SU PPDU, respectively.  **Figure 21-6—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT SU PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.3 and Fig. 21-6. **21.3.10.9.3 Segment deparser** NOTE—As per Table 21-7, $f_c^{(0)}$ (center frequency for frequency segment i_{Seg}=0) is always less than $f_c^{(1)}$ in case of 80+80 MHz VHT PPDU transmissions. Hence, $d''_{k,i,n,0,u}$ (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while $d''_{k,i,n,1,u}$ (frequency subblock 1) is always transmitted in the frequency segment higher in frequency. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.10.9.3. **21.3.10.12 Non-HT duplicate transmission**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000069

Claim 8	Public Documentation
	In an 80+80 MHz non-HT duplicate transmission, data transmission in each frequency segment shall be as defined for an 80 MHz non-HT duplicate transmission in Equation (21-100). IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.10.12 **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask**  **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000070

Claim 8	Public Documentation
	IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33. **9.4.2.249 HE Operation element** The Channel Center Frequency Segment 0 field indicates the channel center frequency index for the 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz channel on which the BSS operates in the 6 GHz band. If the BSS channel width is 160 MHz or 80+80 MHz, then the Channel Center Frequency Segment 0 field indicates the channel center frequency index of the primary 80 MHz. The Channel Center Frequency Segment 1 field indicates the channel center frequency index of the 160 MHz channel on which the BSS operates in the 6 GHz band. If the channel width is 80+80 MHz, then it indicates the channel center frequency index of the secondary 80 MHz. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 9.4.2.249. **26.17.2 HE BSS operation in the 6 GHz band** **26.17.2.1 General** A 6 GHz AP or 6 GHz mesh STA shall include the 6 GHz Operation Information field in the HE Operation elements it transmits. The AP or mesh STA shall set the Channel Width subfield, the Channel Center Frequency Segment 0, and the Channel Center Frequency Segment 1 subfields of the 6 GHz Operation Information field as defined in Table 26-15, based on the Rx HE-MCS Map ≤ 80 MHz, Rx HE-MCS Map 160 MHz, and Rx HE-MCS Map 80+80 MHz subfields of the Supported HE MCS And NSS Set field in the HE Capabilities element transmitted by the AP.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000071

Claim 8	Public Documentation
	Table 26-15—6 GHz BSS channel width **Channel Width field** | **Center Frequency Segment 1 field** | **BSS channel width (MHz)** 0 | 0 | 20 1 | 0 | 40 2 | 0 | 80 3 | CCFS1 > 0 and |CCFS1 – CCFS0| = 8 | 160 3 | CCFS1 > 0 and |CCFS1 – CCFS0| > 16 | 80+80 NOTE—CCFS0 represents the value of the Channel Center Frequency Segment 0 field, and CCFS1 represents the value of the Channel Center Frequency Segment 1 field. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 26.17.2.1 and Table 26-15. **27.3.2.2 Resource unit, guard, and DC subcarriers** respectively. The same structure as used in the 80 MHz HE MU PPDU formats or HE TB PPDU formats using OFDMA transmission is used for both the Primary 80 MHz and Secondary 80 MHz channels in the 160 MHz and 80+80 MHz HE MU PPDU formats or HE TB PPDU formats using OFDMA transmission. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.2.2. **27.3.10 Mathematical description of signals** For a 160 MHz HE PPDU transmission or a noncontiguous 80+80 MHz transmission, each half 80 MHz bandwidth is divided into 1024 subcarriers, and the subcarriers on which the signal is transmitted in each 80 MHz bandwidth is identical to an 80 MHz HE PPDU transmission, depending on non-OFDMA or OFDMA transmission within the corresponding 80 MHz. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.10. **27.3.19.3 Transmit center frequency and symbol clock frequency tolerance**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000072

Claim 8	Public Documentation
	Transmit signals with TXVECTOR parameter CH_BANDWIDTH set to CBW160 or CBW80+80 may be generated using two separate RF LOs, one for each of the lower and upper 80 MHz frequency portions. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.3. Different center frequency separation between the two 80 MHz frequency segments of the spectral mask and different peak levels of each 80 MHz frequency segment of the spectral mask are possible. In such cases, a similar procedure in determining the spectral mask as in Figure 27-51 is followed. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1. **27.3.12.11 Segment deparser** NOTE—As per Table 21-7 (center frequency for frequency segment iSeg = 0), $f_c^{(0)}$ is always less than $f_c^{(1)}$ in the case of an 80+80 MHz HE PPDU. Hence, $d''_{k,i,n,0,r,u}$ (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while $d''_{k,i,n,1,r,u}$ (frequency subblock 1) is always transmitted in the frequency segment higher in frequency. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.12.11. **3. Definitions, acronyms, and abbreviations** **3.1 Definitions** **orthogonal frequency division multiple access (OFDMA):** An orthogonal frequency division multiple (OFDM)-based multiple access technique by which multiple stations (STAs) either simultaneously transmit to a single STA or simultaneously receive from a single STA independent data streams over different groups of subcarriers. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 3.1. **3.2 Definitions specific to IEEE 802.11**

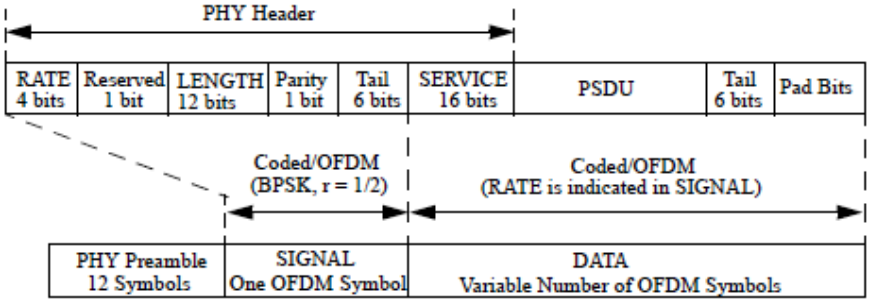
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000073

Claim 8	Public Documentation
	80+80 MHz mask physical layer (PHY) protocol data unit (PPDU): ~~A PPDU that is transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21) and that is one~~ One of the following PPDUs: a) An 80+80 MHz very high throughput (VHT) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. b) An 80+80 MHz non-high-throughput (non-HT) duplicate PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 21. c) An 80+80 MHz high-efficiency (HE) PPDU (TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80) transmitted using the 80+80 MHz transmit spectral mask defined in Clause 27. CH_BANDWIDTH equal to CBW80+80), or a Clause 27 80+80 MHz high-efficiency (HE) PPDU with the TXVECTOR parameter CH_BANDWIDTH equal to CBW80+80. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 3.2.

Claim 9

Claim 9	Public Documentation
[9 pre] The method of claim 1 wherein first information and second information comprise a plurality of OFDM symbols,	The Accused Instrumentalities perform a method wherein first information and second information comprise a plurality of OFDM symbols. *See, e.g.*:

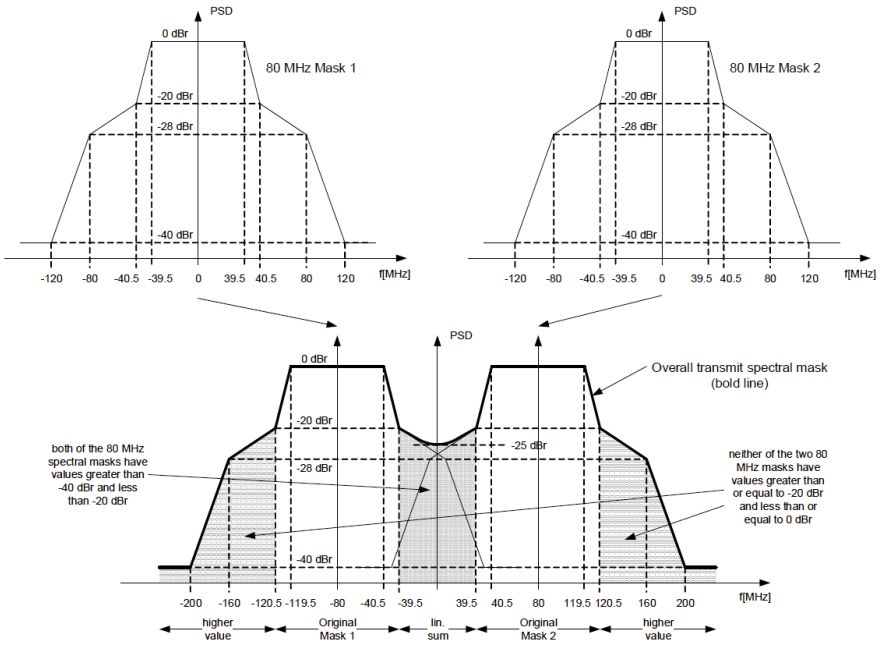
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000074

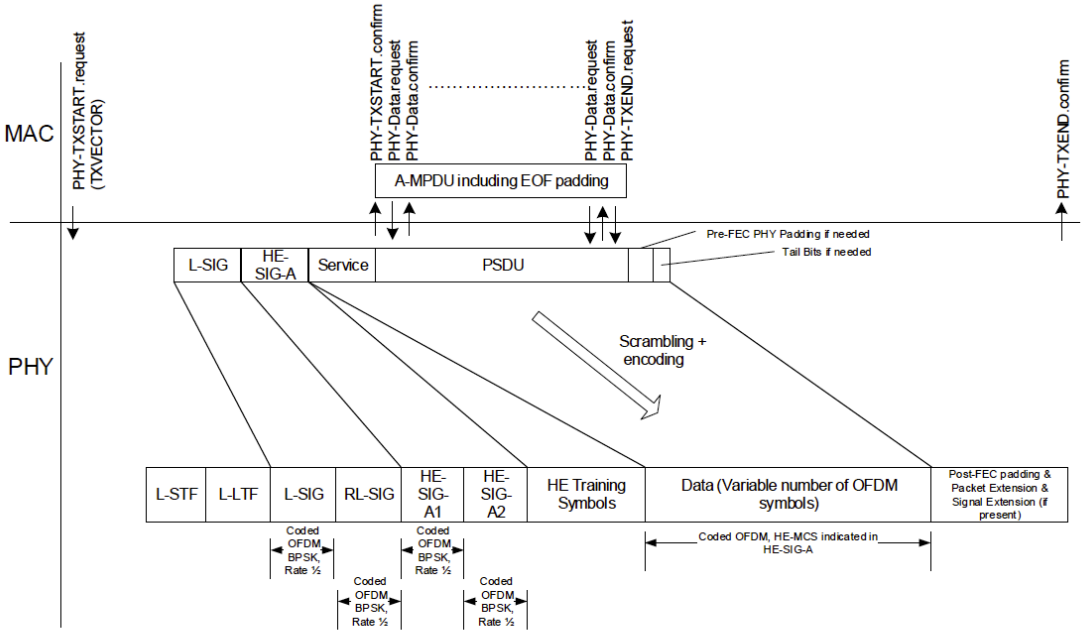
Claim 9	Public Documentation
	17.3.2 PPDU format **17.3.2.1 General** Figure 17-1 shows the format for the PPDU including the OFDM PHY preamble, OFDM PHY header, PSDU, tail bits, and pad bits. The PHY header contains the following fields: LENGTH, RATE, a reserved bit, an even parity bit, and the SERVICE field. In terms of modulation, the LENGTH, RATE, reserved bit, and parity bit (with 6 zero tail bits appended) constitute a separate single OFDM symbol, denoted SIGNAL, which is transmitted with the most robust combination of BPSK modulation and a coding rate of R = 1/2. The SERVICE field of the PHY header and the PSDU (with 6 zero tail bits and pad bits appended), denoted as DATA, are transmitted at the data rate described in the RATE field and may constitute multiple OFDM symbols. The tail bits in the SIGNAL symbol enable decoding of the RATE and LENGTH fields immediately after the reception of the tail bits. The RATE and LENGTH fields are required for decoding the DATA part of the packet. In addition, the CCA mechanism is augmented by predicting the duration of the packet from the contents of the RATE and LENGTH fields, even if the data rate is not supported by the STA. Each of these fields is described in detail in 17.3.3, 17.3.4, and 17.3.5.  **Figure 17-1—PPDU format** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 17.3.2.1 and Figure 17-1

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000075

Claim 9	Public Documentation
	For an 80+80 MHz mask PPDU of HE format, the overall transmit spectral mask is constructed in the following manner. First, the 80 MHz interim spectral mask is placed on each of the two 80 MHz segments. For each frequency at which either of the 80 MHz interim spectral mask has a value equal to 0 dBr, then 0 dBr shall be taken as the overall interim spectral mask value. Then, for each frequency at which both of the 80 MHz interim spectral masks have values greater than –40 dBr and less than –20 dBr, the sum of the two interim mask values (summed in linear domain) shall be taken as the overall interim spectral mask value. Next, for each frequency at which neither of the two 80 MHz interim masks has a value greater than or equal to –20 dBr, the higher value of the two interim masks shall be taken as the overall interim spectral mask value. Finally, for any frequency region where the overall interim spectral mask value has not been defined yet, linear interpolation (in dB domain) between the nearest two frequency points with the overall interim spectral mask value defined shall be used to define the overall interim spectral mask value. The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000076

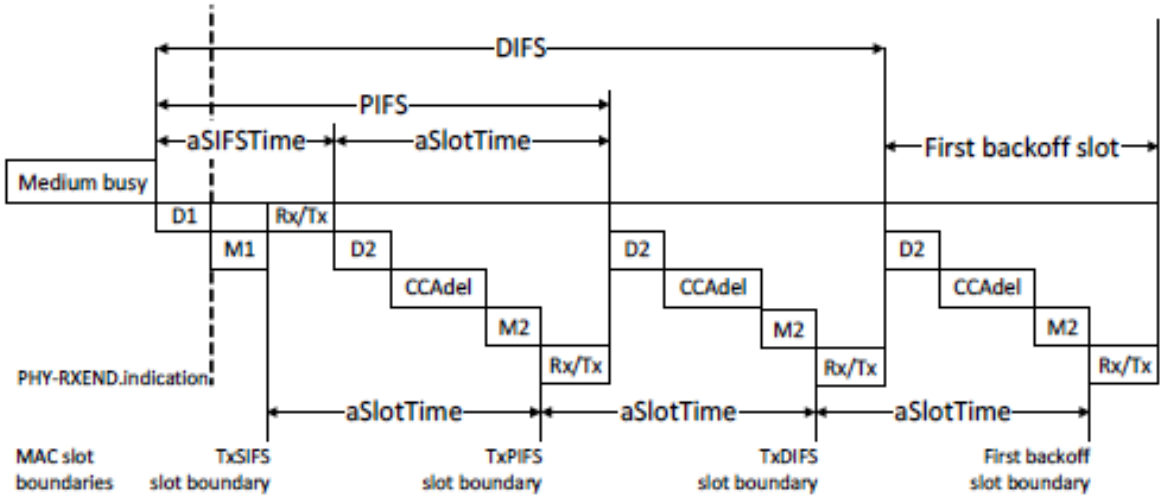
Claim 9	Public Documentation
	 **Figure 27-51—Example transmit spectral mask for an 80+80 MHz mask PPDU** IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1, Figure 27-51. **27.3.21 HE transmit procedure**

Claim 9	Public Documentation
	 **Figure 27-54—PHY transmit procedure for an HE SU PPDU** IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.21, Figure 27-54. **27.4.4 HE PHY** NOTE—This is the maximum length in octets for an HE SU PPDU with a bandwidth of 160 MHz or 80+80 MHz using 2×996 RU, HE-MCS 11, 8 spatial streams, 0.8 µs GI duration, 1x HE-LTF, LDPC coding, 0 µs duration of the PE field, pre-FEC padding factor value of 4, and limited by 398 possible Data field OFDM symbols in aPPDUMaxTime. This is the maximum PSDU length an HE PHY could support assuming no restrictions in MAC. See 10.3.2 and 9.2.4.7.1 for additional restrictions on the maximum number of octets the MAC could support. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.4.4, Table 27-54.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000078

Claim 9	Public Documentation
[9a] wherein a first symbol is transmitted during a first time slot across the first frequency range and a second symbol is transmitted during the first time slot across the second frequency range, and	The Accused Instrumentalities perform a method wherein a first symbol is transmitted during a first time slot across the first frequency range and a second symbol is transmitted during the first time slot across the second frequency range. For example, 80+80MHz has PHY transmission time (PHY TXSTART). “first symbol” is transmitted in first time slot in the first frequency range and PHY transmission time (PHY TXSTART). “second symbol” is transmitted in the first time slot in the second frequency range. *See, e.g.*, **10.3.7 DCF timing relations**

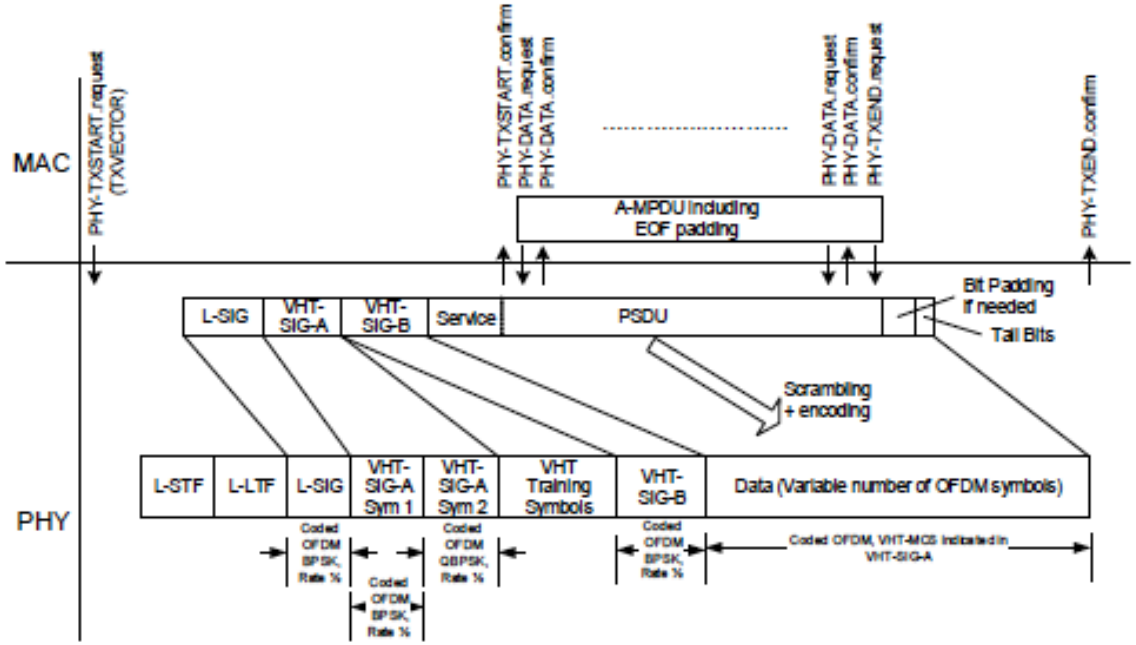
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000079

Claim 9	Public Documentation
	 D1 = aRxPHYDelay (referenced from the end of the last symbol of a PPDU on the medium) D2 = D1 + aAirPropagationTime Rx/Tx = aRxTxTurnaroundTime (begins with a PHY-TXSTART.request) M1 = M2 = aMACProcessingDelay CCAdel = aCCATime – D1 **Figure 10-19—DCF timing relationships** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 10.3.7 and Figure 10-19. **21.3.19 PHY transmit procedure**

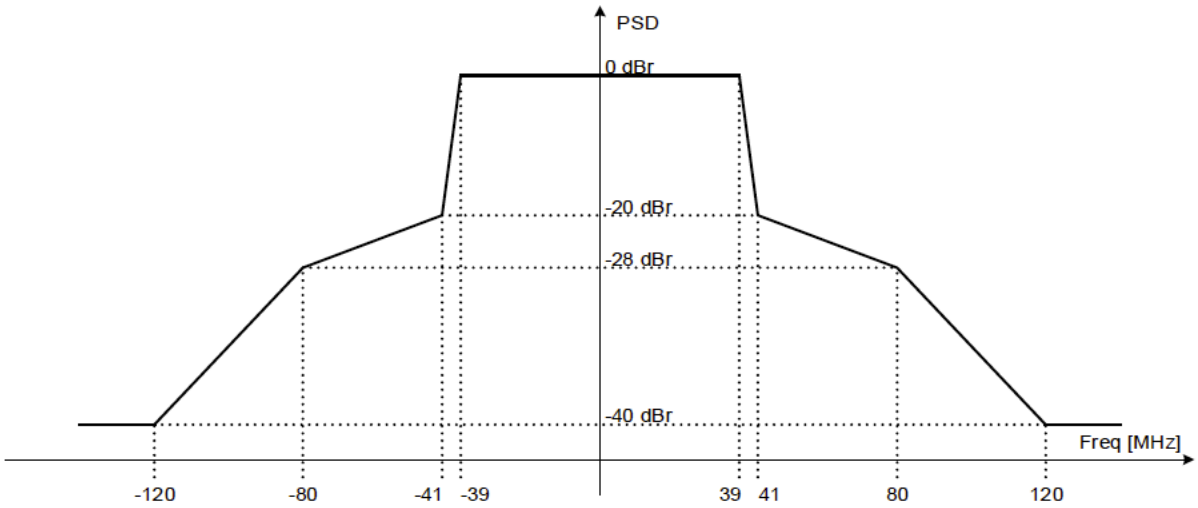
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000080

Claim 9	Public Documentation
	There are two paths for the transmit PHY procedure: — The first path, for which typical transmit procedures are shown in Figure 21-34, is selected if the FORMAT parameter of the PHY-TXSTART.request(TXVECTOR) primitive is VHT. These transmit procedures do not describe the operation of optional features, such as LDPC, STBC or MU. — The second path is to follow the transmit procedure in Clause 17 if the FORMAT parameter of the PHY-TXSTART.request(TXVECTOR) primitive is NON_HT and the NON_HT_MODULATION parameter is set to NON_HT_DUP_OFDM except that the signal referred to in Clause 17 is instead generated simultaneously on each of the 20 MHz channels that are indicated by the CH_BANDWIDTH parameter as defined in 21.3.8 and 21.3.10.12. NOTE 1—For a VHT MU PPDU the A-MPDU is per user in the MAC sublayer and the VHT Training Symbols, VHT-SIG-B, and Data are per user in the PHY in Figure 21-34, with the number VHT Training Symbols depending on the total number of space-time streams across all users. NOTE 2—The transmit procedure for NON_HT format where NON_HT_MODULATION is OFDM is specified in 21.2.5.2. The transmit procedure for HT_MF and HT_GF formats is specified in 21.2.5.3. In both paths, in order to transmit data, the MAC generates a PHY-TXSTART.request primitive, which causes the PHY entity to enter the transmit state. Further, the PHY is set to operate at the appropriate frequency through station management via the PLME, as specified in 21.4. Other transmit parameters, such as VHT-MCS Coding types and transmit power, are set via the PHY SAP using the PHY-TXSTART.request(TXVECTOR) primitive, as described in 21.2.2. The remainder of the clause applies to the first path. The PHY indicates the state of the primary channel and other channels (if any) via the PHY-CCA.indication primitive (see 21.3.18.5 and 8.3.5.12). Transmission of the PPDU shall be initiated by the PHY after receiving the PHY-TXSTART.request(TXVECTOR) primitive. The TXVECTOR elements for the PHY-TXSTART.request primitive are specified in Table 21-1. Transmission of the PHY preamble may start if TIME_OF_DEPARTURE_REQUESTED is false, and shall start immediately if TIME_OF_DEPARTURE_REQUESTED is true, based on the parameters passed in the PHY-TXSTART.request primitive.

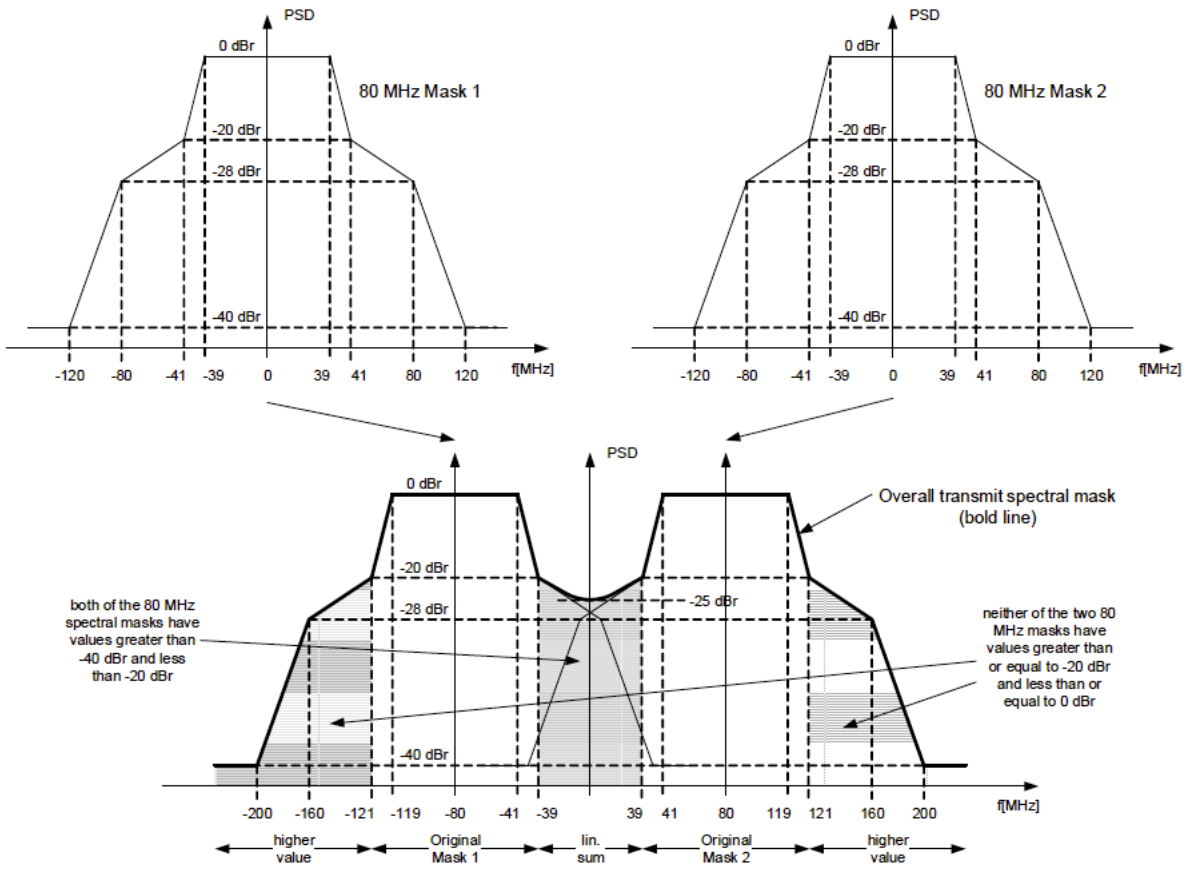
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000081

Claim 9	Public Documentation
	 NOTE—This procedure does not describe the operation of optional features, such as MU-MIMO, LDPC or STBC. **Figure 21-34—PHY transmit procedure for SU transmission** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.19 and Figure 21-34. **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask** For an 80 MHz mask PPDU of non-HT, non-HT duplicate, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 78 MHz, –20 dBr at 41 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at

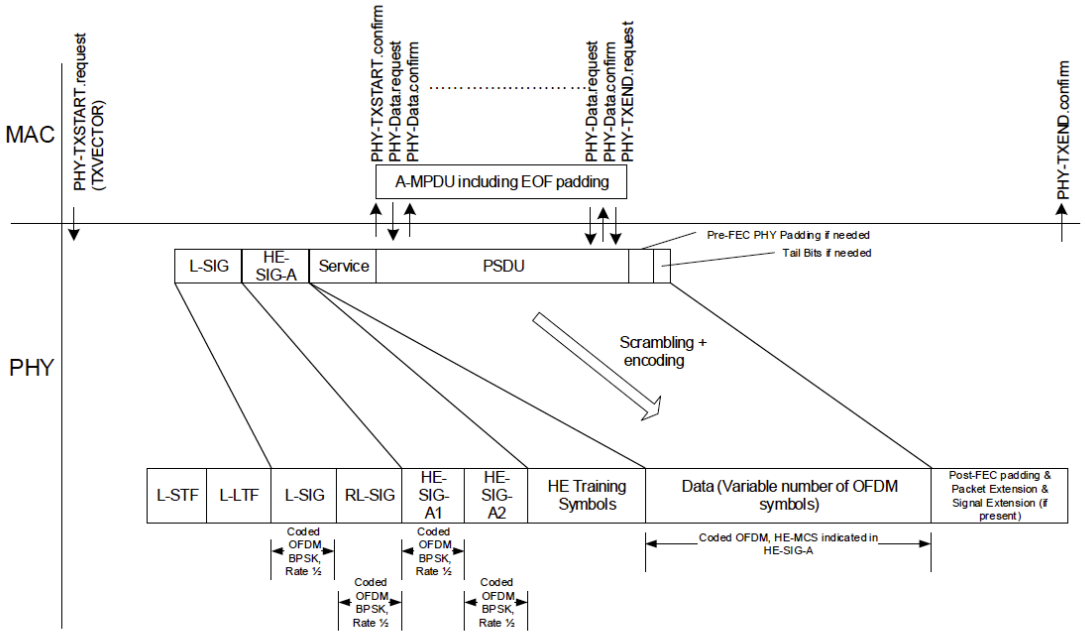
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000082

Claim 9	Public Documentation
	120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 39 and 41 MHz, 41 and 80 MHz, and 80 and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39 MHz, 41 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 21-31 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 21-31—Example transmit spectral mask for 80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-31.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000083

Claim 9	Public Documentation
	 **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33. **21.3.14 Channelization**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000084

Claim 9	Public Documentation
	For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14. **27.3.21 HE transmit procedure**  **Figure 27-54—PHY transmit procedure for an HE SU PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000085

Claim 9	Public Documentation
	In all options, in order to transmit data, the MAC generates a PHY-TXSTART.request primitive, which causes the PHY entity to enter the transmit state. Further, the PHY is set to operate at the appropriate frequency through station management via the PLME, as specified in 27.4. Other transmit parameters, such as HE-MCS, coding types, and transmit power, are set via the PHY-SAP using the PHYTXSTART.request(TXVECTOR) primitive, as described in 27.2.2. After transmitting a PPDU that carries a Trigger frame, the MAC sublayer issues a PHY-TRIGGER.request with a TRIGVECTOR parameter that provides the PHY entity with the information needed to demodulate the expected HE TB PPDU response. The remainder of this subclause applies to the first four options. The PHY indicates the state of the primary channel and other channels (if any) via the PHY-CCA.indication primitive (see 21.3.18.5 and 8.3.5.12). Transmission of the PPDU shall be initiated by the PHY after receiving the PHY-TXSTART.request(TXVECTOR) primitive. The TXVECTOR parameters for the PHY-TXSTART.request primitive are specified in Table 27-1. A packet extension and/or a signal extension may be present in the PPDU. The PHY-TXEND.confirm primitive is generated at the latest of the actual ending time of the PPDU, the end of the packet extension if present, and the end of the signal extension if present. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.21, Figure 27-54. **27.4.4 HE PHY**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000086

Claim 9	Public Documentation

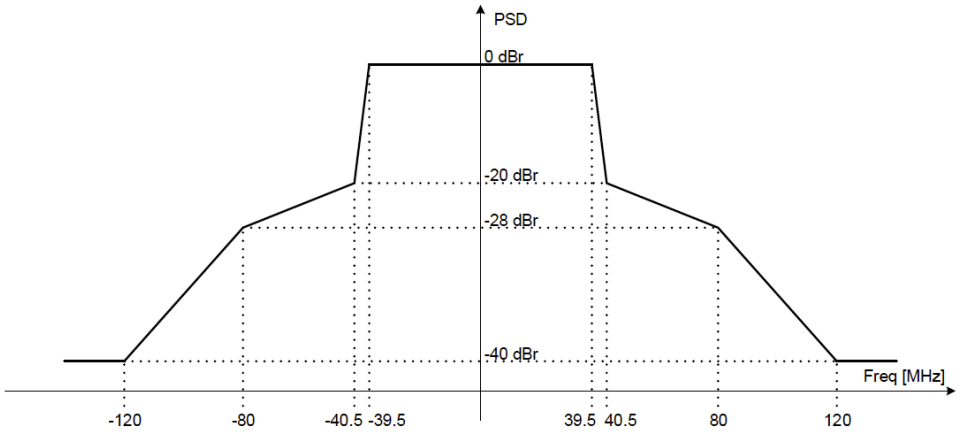
Table 27-54—HE PHY characteristics

Characteristic	Value
aTxPHYDelay	Implementation dependent
aRxPHYDelay	Implementation dependent
aSignalExtension	0 µs if operating in the 5 GHz or 6 GHz band 6 µs if operating in the 2.4 GHz band
aSlotTime	If operating in the 2.4 GHz band: If dot11OperatingClassesRequired is false, long = 20 µs If dot11OperatingClassesRequired is true, long = 20 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95) If dot11OperatingClassesRequired is false, short = 9 µs If dot11OperatingClassesRequired is true, short = 9 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95) If operating in the 5 GHz or 6 GHz band: If dot11OperatingClassesRequired is false, 9 µs If dot11OperatingClassesRequired is true, 9 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95)
aSIFSTime	10 µs if operating in the 2.4 GHz band 16 µs if operating in the 5 GHz or 6 GHz band
aCCAMidTime	25 µs
aPPDUMaxTime	5.484 ms
aPSDUMaxLength	6 500 631 octets (see NOTE)
aRxPHYStartDelay	32 µs for HE SU and HE TB PPDUs. 40 µs for HE ER SU PPDUs. $32 + 4 \times N_{HE\text{-}SIG\text{-}B}$ µs for HE MU PPDUs, where $N_{HE\text{-}SIG\text{-}B}$ is the number of OFDM symbols in the HE-SIG-B field.

NOTE—This is the maximum length in octets for an HE SU PPDU with a bandwidth of 160 MHz or 80+80 MHz using 2×996 RU, HE-MCS 11, 8 spatial streams, 0.8 µs GI duration, 1x HE-LTF, LDPC coding, 0 µs duration of the PE field, pre-FEC padding factor value of 4, and limited by 398 possible Data field OFDM symbols in aPPDUMaxTime. This is the maximum PSDU length an HE PHY could support assuming no restrictions in MAC. See 10.3.2 and 9.2.4.7.1 for additional restrictions on the maximum number of octets the MAC could support.

IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.4.4, Table 27-54.

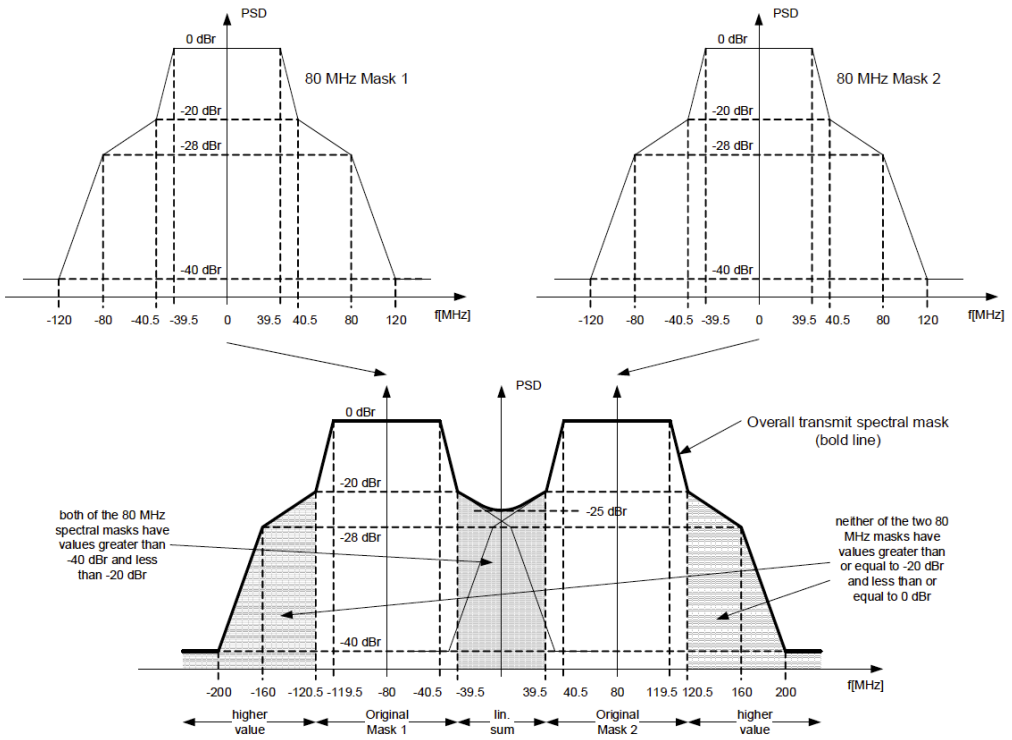
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000087

Claim 9	Public Documentation
	27.3.19 Transmit specification **27.3.19.1 Transmit spectral mask** For an 80 MHz mask PPDU of HE format, the interim transmit spectral mask shall have a 0 dBr bandwidth of 79 MHz, –20 dBr at 40.5 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at 120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets between 39.5 MHz and 40.5 MHz, 40.5 MHz and 80 MHz, and 80 MHz and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39.5 MHz, 40.5 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-49 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 27-49—Example transmit spectral mask for an 80 MHz mask PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000088

Claim 9	Public Documentation
	For an 80+80 MHz mask PPDU of HE format, the overall transmit spectral mask is constructed in the following manner. First, the 80 MHz interim spectral mask is placed on each of the two 80 MHz segments. For each frequency at which either of the 80 MHz interim spectral mask has a value equal to 0 dBr, then 0 dBr shall be taken as the overall interim spectral mask value. Then, for each frequency at which both of the 80 MHz interim spectral masks have values greater than –40 dBr and less than –20 dBr, the sum of the two interim mask values (summed in linear domain) shall be taken as the overall interim spectral mask value. Next, for each frequency at which neither of the two 80 MHz interim masks has a value greater than or equal to –20 dBr, the higher value of the two interim masks shall be taken as the overall interim spectral mask value. Finally, for any frequency region where the overall interim spectral mask value has not been defined yet, linear interpolation (in dB domain) between the nearest two frequency points with the overall interim spectral mask value defined shall be used to define the overall interim spectral mask value. The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000089

Claim 9	Public Documentation
	 **Figure 27-51—Example transmit spectral mask for an 80+80 MHz mask PPDU** IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1, Figure 27-49, Figure 27-51.
[9b] wherein a third symbol is transmitted during a second time slot across the first frequency range and a fourth symbol is transmitted during the second time slot across a second frequency range.	The Accused Instrumentalities perform a method wherein a third symbol is transmitted during a second time slot across the first frequency range and a fourth symbol is transmitted during the second time slot across a second frequency range.

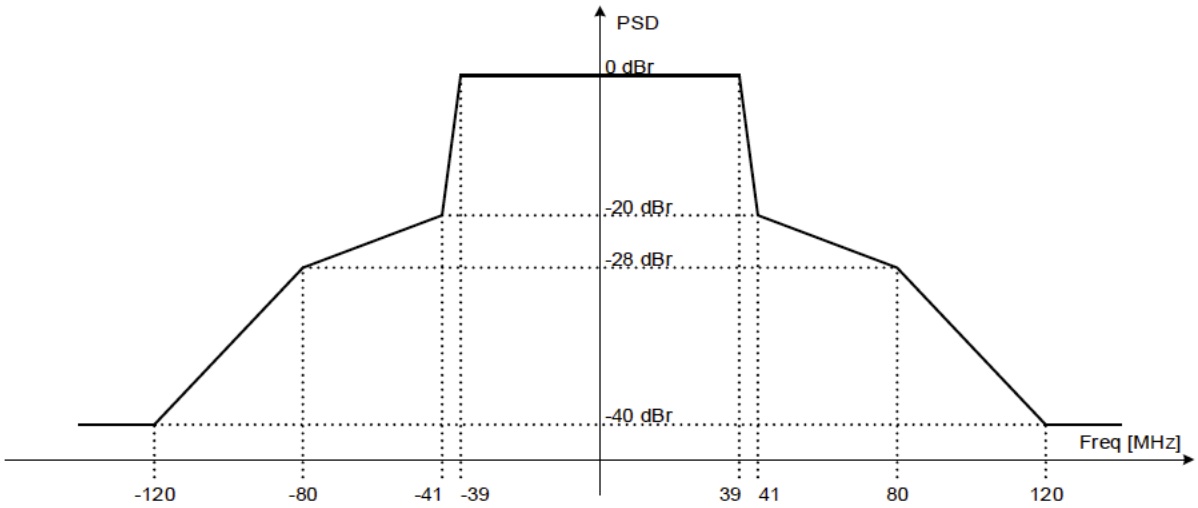
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000090

Claim 9	Public Documentation
	For example, the 80+80MHz has PHY transmission time (PHY TXSTART). “third symbol” is transmitted in the second slot in the first frequency range and PHY transmission time (PHY TXSTART). “fourth symbol” is transmitted in the second time slot in the second frequency range. *See, e.g.*, **21.3.19 PHY transmit procedure** There are two paths for the transmit PHY procedure: — The first path, for which typical transmit procedures are shown in Figure 21-34, is selected if the FORMAT parameter of the PHY-TXSTART.request(TXVECTOR) primitive is VHT. These transmit procedures do not describe the operation of optional features, such as LDPC, STBC or MU. — The second path is to follow the transmit procedure in Clause 17 if the FORMAT parameter of the PHY-TXSTART.request(TXVECTOR) primitive is NON_HT and the NON_HT_MODULATION parameter is set to NON_HT_DUP_OFDM except that the signal referred to in Clause 17 is instead generated simultaneously on each of the 20 MHz channels that are indicated by the CH_BANDWIDTH parameter as defined in 21.3.8 and 21.3.10.12. NOTE 1—For a VHT MU PPDU the A-MPDU is per user in the MAC sublayer and the VHT Training Symbols, VHT-SIG-B, and Data are per user in the PHY in Figure 21-34, with the number VHT Training Symbols depending on the total number of space-time streams across all users. NOTE 2—The transmit procedure for NON_HT format where NON_HT_MODULATION is OFDM is specified in 21.2.5.2. The transmit procedure for HT_MF and HT_GF formats is specified in 21.2.5.3. In both paths, in order to transmit data, the MAC generates a PHY-TXSTART.request primitive, which causes the PHY entity to enter the transmit state. Further, the PHY is set to operate at the appropriate frequency through station management via the PLME, as specified in 21.4. Other transmit parameters, such as VHT-MCS Coding types and transmit power, are set via the PHY SAP using the PHY-TXSTART.request(TXVECTOR) primitive, as described in 21.2.2. The remainder of the clause applies to the first path. The PHY indicates the state of the primary channel and other channels (if any) via the PHY-CCA.indication primitive (see 21.3.18.5 and 8.3.5.12). Transmission of the PPDU shall be initiated by the PHY after receiving the PHY-TXSTART.request(TXVECTOR) primitive. The TXVECTOR elements for the PHY-TXSTART.request primitive are specified in Table 21-1. Transmission of the PHY preamble may start if TIME_OF_DEPARTURE_REQUESTED is false, and shall start immediately if TIME_OF_DEPARTURE_REQUESTED is true, based on the parameters passed in the PHY-TXSTART.request primitive.

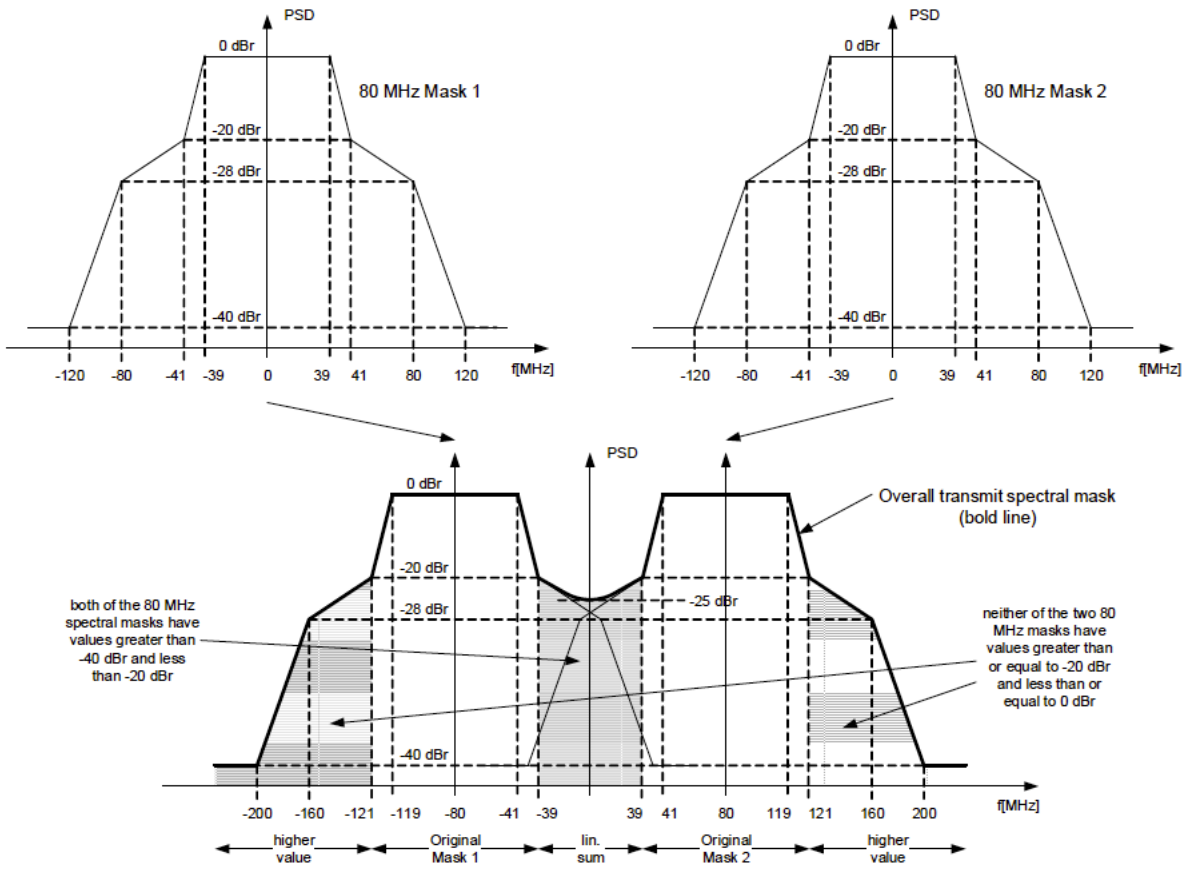
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000091

Claim 9	Public Documentation
	IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.19 and Figure 21-34. **21.3.17 VHT transmit specification** **21.3.17.1 Transmit spectrum mask** For an 80 MHz mask PPDU of non-HT, non-HT duplicate, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 78 MHz, –20 dBr at 41 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at

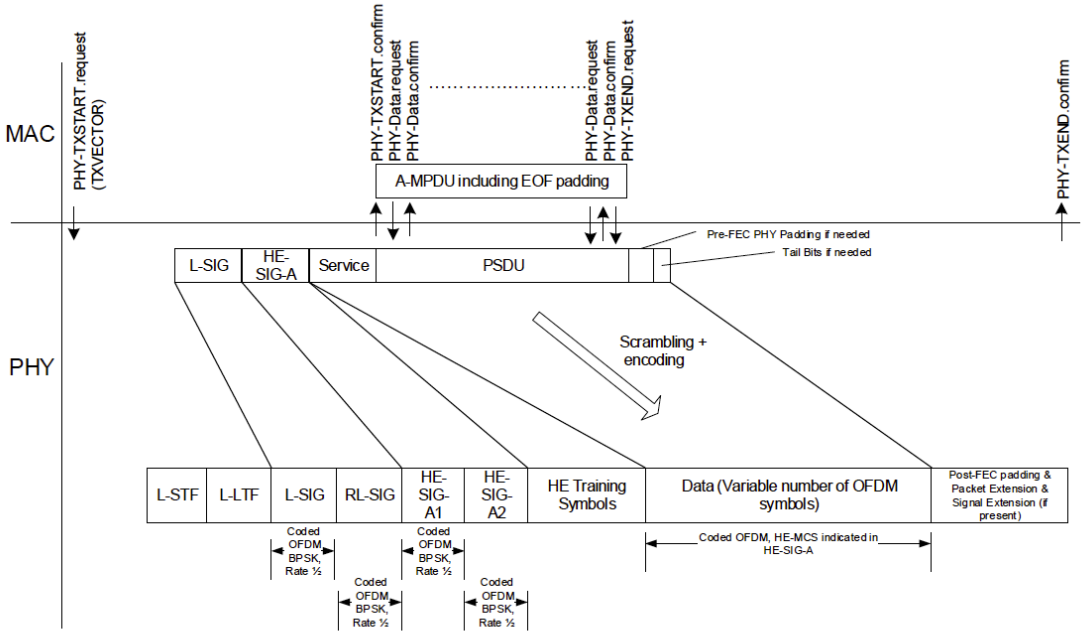
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000092

Claim 9	Public Documentation
	120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 39 and 41 MHz, 41 and 80 MHz, and 80 and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39 MHz, 41 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 21-31 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 21-31—Example transmit spectral mask for 80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-31.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000093

Claim 9	Public Documentation
	 **Figure 21-33—Example transmit spectral mask for 80+80 MHz mask PPDU** IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.17.1 and Figure 21-33. **21.3.14 Channelization**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000094

Claim 9	Public Documentation
	For an 80+80 MHz channel, any two channels that would each be allowed as 80 MHz channels and whose center frequencies are separated by greater than 80 MHz (difference between dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 corresponds to a frequency difference greater than 80 MHz) may be used. IEEE 802.11-2016, Part 11: Wireless LAN MAC and PHY Specifications (Dec. 7, 2016) at 21.3.14. **27.3.21 HE transmit procedure**  **Figure 27-54—PHY transmit procedure for an HE SU PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000095

Claim 9	Public Documentation
	In all options, in order to transmit data, the MAC generates a PHY-TXSTART.request primitive, which causes the PHY entity to enter the transmit state. Further, the PHY is set to operate at the appropriate frequency through station management via the PLME, as specified in 27.4. Other transmit parameters, such as HE-MCS, coding types, and transmit power, are set via the PHY-SAP using the PHYTXSTART.request(TXVECTOR) primitive, as described in 27.2.2. After transmitting a PPDU that carries a Trigger frame, the MAC sublayer issues a PHY-TRIGGER.request with a TRIGVECTOR parameter that provides the PHY entity with the information needed to demodulate the expected HE TB PPDU response. The remainder of this subclause applies to the first four options. The PHY indicates the state of the primary channel and other channels (if any) via the PHY-CCA.indication primitive (see 21.3.18.5 and 8.3.5.12). Transmission of the PPDU shall be initiated by the PHY after receiving the PHY-TXSTART.request(TXVECTOR) primitive. The TXVECTOR parameters for the PHY-TXSTART.request primitive are specified in Table 27-1. A packet extension and/or a signal extension may be present in the PPDU. The PHY-TXEND.confirm primitive is generated at the latest of the actual ending time of the PPDU, the end of the packet extension if present, and the end of the signal extension if present. IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.21, Figure 27-54. **27.4.4 HE PHY**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000096

Claim 9	Public Documentation

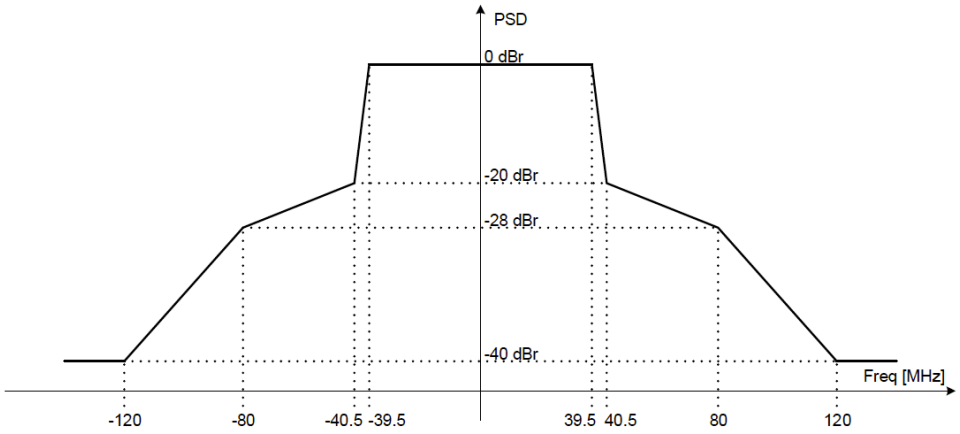
Table 27-54—HE PHY characteristics

Characteristic	Value
aTxPHYDelay	Implementation dependent
aRxPHYDelay	Implementation dependent
aSignalExtension	0 µs if operating in the 5 GHz or 6 GHz band 6 µs if operating in the 2.4 GHz band
aSlotTime	If operating in the 2.4 GHz band: If dot11OperatingClassesRequired is false, long = 20 µs If dot11OperatingClassesRequired is true, long = 20 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95) If dot11OperatingClassesRequired is false, short = 9 µs If dot11OperatingClassesRequired is true, short = 9 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95) If operating in the 5 GHz or 6 GHz band: If dot11OperatingClassesRequired is false, 9 µs If dot11OperatingClassesRequired is true, 9 µs plus any coverage-class-dependent aAirPropagationTime (see Table 9-95)
aSIFSTime	10 µs if operating in the 2.4 GHz band 16 µs if operating in the 5 GHz or 6 GHz band
aCCAMidTime	25 µs
aPPDUMaxTime	5.484 ms
aPSDUMaxLength	6 500 631 octets (see NOTE)
aRxPHYStartDelay	32 µs for HE SU and HE TB PPDUs. 40 µs for HE ER SU PPDUs. $32 + 4 \times N_{HE\text{-}SIG\text{-}B}$ µs for HE MU PPDUs, where $N_{HE\text{-}SIG\text{-}B}$ is the number of OFDM symbols in the HE-SIG-B field.

NOTE—This is the maximum length in octets for an HE SU PPDU with a bandwidth of 160 MHz or 80+80 MHz using 2×996 RU, HE-MCS 11, 8 spatial streams, 0.8 µs GI duration, 1x HE-LTF, LDPC coding, 0 µs duration of the PE field, pre-FEC padding factor value of 4, and limited by 398 possible Data field OFDM symbols in aPPDUMaxTime. This is the maximum PSDU length an HE PHY could support assuming no restrictions in MAC. See 10.3.2 and 9.2.4.7.1 for additional restrictions on the maximum number of octets the MAC could support.

IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.4.4, Table 27-54.

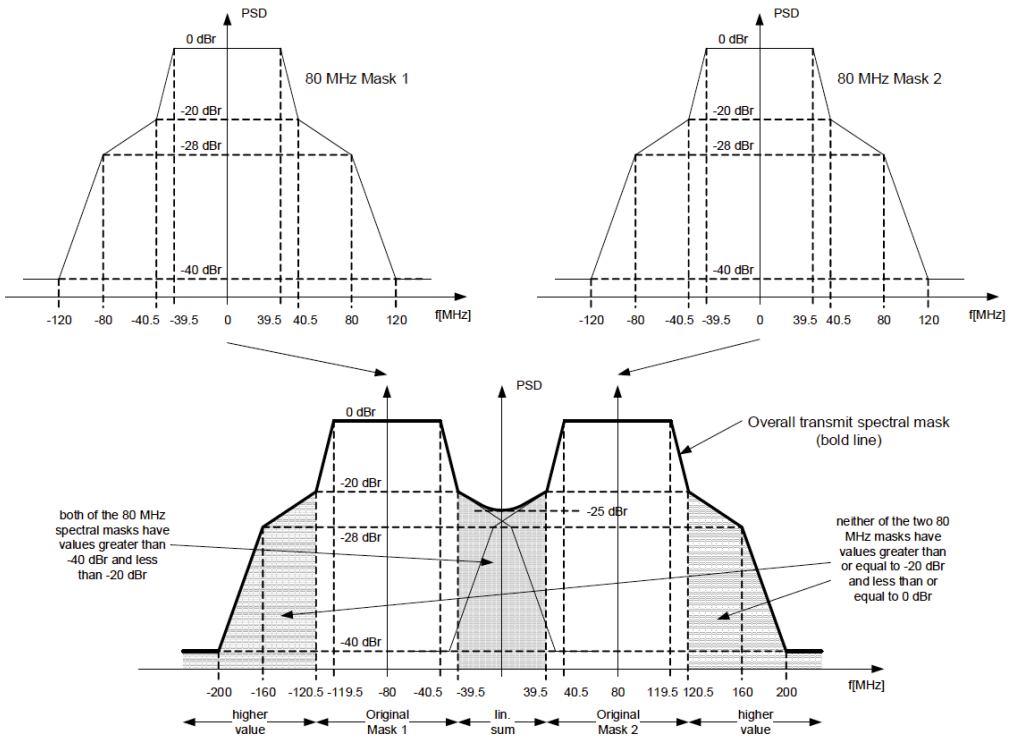
Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000097

Claim 9	Public Documentation
	27.3.19 Transmit specification **27.3.19.1 Transmit spectral mask** For an 80 MHz mask PPDU of HE format, the interim transmit spectral mask shall have a 0 dBr bandwidth of 79 MHz, –20 dBr at 40.5 MHz frequency offset, –28 dBr at 80 MHz frequency offset, and –40 dBr at 120 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets between 39.5 MHz and 40.5 MHz, 40.5 MHz and 80 MHz, and 80 MHz and 120 MHz shall be linearly interpolated in dB domain from the requirements for 39.5 MHz, 40.5 MHz, 80 MHz, and 120 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-49 shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –59 dBm/MHz.  **Figure 27-49—Example transmit spectral mask for an 80 MHz mask PPDU**

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000098

Claim 9	Public Documentation
	For an 80+80 MHz mask PPDU of HE format, the overall transmit spectral mask is constructed in the following manner. First, the 80 MHz interim spectral mask is placed on each of the two 80 MHz segments. For each frequency at which either of the 80 MHz interim spectral mask has a value equal to 0 dBr, then 0 dBr shall be taken as the overall interim spectral mask value. Then, for each frequency at which both of the 80 MHz interim spectral masks have values greater than –40 dBr and less than –20 dBr, the sum of the two interim mask values (summed in linear domain) shall be taken as the overall interim spectral mask value. Next, for each frequency at which neither of the two 80 MHz interim masks has a value greater than or equal to –20 dBr, the higher value of the two interim masks shall be taken as the overall interim spectral mask value. Finally, for any frequency region where the overall interim spectral mask value has not been defined yet, linear interpolation (in dB domain) between the nearest two frequency points with the overall interim spectral mask value defined shall be used to define the overall interim spectral mask value. The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask and –59 dBm/MHz at any frequency offset. Figure 27-51 shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –59 dBm/MHz.

Hewlett Packard, et al. v. Cobblestone Wireless
Exhibit 1011
Page 000099

Claim 9	Public Documentation
	 **Figure 27-51—Example transmit spectral mask for an 80+80 MHz mask PPDU** IEEE 802.11ax-2021, Part 11: Wireless LAN MAC and PHY Specifications (Feb. 9, 2021) at 27.3.19.1, Figure 27-49, Figure 27-51.