RADIO TEST REPORT

Product	:	IEEE 802.11ax/ac/a/b/g/n 2x2 WiFi with Bluetooth5.2 M.2 LGA Type 1216 Module
Model Name	:	AP6275SDSR
FCC ID	:	RYK-AP6275SDSR
Test Regulation	:	FCC 47 CFR Part 15 Subpart E (Section 15.407)
Received Date	:	2022/8/31
Test Date	:	2022/8/31 ~ 2022/9/29
Issued Date	:	2022/11/30

Applicant	:	SparkLAN Communications, Inc. 5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4790471812-US-R1-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4790471812-US-R1-V0	2022/12/23	-	Initial issue

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1. Attestation of Test Results

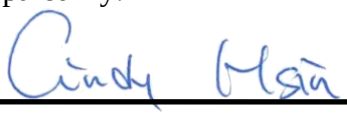
APPLICANT:	SparkLAN Communications, Inc. 5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan
MANUFACTURER:	SparkLAN Communications, Inc. 5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan
EUT DESCRIPTION:	IEEE 802.11ax/ac/a/b/g/n 2x2 WiFi with Bluetooth5.2 M.2 LGA Type 1216 Module
BRAND:	SparkLAN, Ampak
MODEL:	AP6275SDSR
SAMPLE STAGE:	Engineering Verification Test sample
DATE of TESTED:	2022/8/31 ~ 2022/9/29

APPLICABLE STANDARDS	
STANDARD	**Test Results**
FCC 47 CFR PART 15 Subpart E (Section 15.407)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:



Cindy Hsin Date : 2022/12/23
Project Handler

Approved and Authorized By:

Eric Lee Date : 2022/12/23
Senior Laboratory Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.407(e)	6dB Bandwidth	PASS
15.403(i)	26dB Bandwidth	PASS
2.1049	Occupied Bandwidth	See Note 1
15.407(a)(1/2/3)	Conducted Output Power	PASS
15.407(a)(1/2/3)	Power Spectral Density	PASS
15.407(g)	Frequency Stability	PASS
15.407(b) (1/2/3/4(i/ii)/9)	Radiated Emissions and Band Edge Measurement	PASS
15.407(b)(9)	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS
15.407(h)	Dynamic Frequency Selection & Transmit power control	See Note 2

Note:
1. The Occupied Bandwidth was reference only.
2. The "Dynamic Frequency Selection & Transmit power control measurement" was recorded in Report No.: 4790471812-US-R2-V0

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB 789033 D02 General UNII Test Procedure New Rules v02r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±2.9 dB
RF Conducted	9 kHz - 40GHz	±2.4 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.8 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.8 dB

6. Equipment under Test

6.1. Description of EUT

Product	IEEE 802.11ax/ac/a/b/g/n 2x2 WiFi with Bluetooth5.2 M.2 LGA Type 1216 Module	
Brand Name	SparkLAN, Ampak	
Model Name	AP6275SDSR	
Operating Frequency	5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz	
Modulation	1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK	
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to MCS15 802.11ac: up to MCS9 802.11ax: up to MCS11	
Number of Channel	5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
	5260 ~ 5320 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
	5500 ~ 5720 MHz	12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		6 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		3 for 802.11ac (VHT80), 802.11ax (HE80)
	5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)

Maximum Output Power	**Non-Beamforming mode:** 5180 ~ 5240 MHz: 19.97 dBm 5260 ~ 5320 MHz: 20.05 dBm 5500 ~ 5720 MHz: 20.03 dBm 5745 ~ 5825 MHz: 22.05 dBm **Beamforming mode:** 5180 ~ 5240 MHz: 19.70 dBm 5260 ~ 5320 MHz: 19.69 dBm 5500 ~ 5720 MHz: 19.73 dBm 5745 ~ 5825 MHz: 21.64 dBm
Normal Voltage	3.3Vdc
Sample ID	5297201

Note:

1. The model has two brand names as follows:

Brand	Product name	Model
SparkLAN	IEEE 802.11ax/ac/a/b/g/n 2x2 WiFi with Bluetooth5.2 M.2 LGA Type 1216 Module	AP6275SDSR
Ampak		

2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX
802.11ax (HE20)	2TX,2RX
802.11ax (HE40)	2TX,2RX
802.11ax (HE80)	2TX,2RX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40 / VHT80 and 802.11ax mode for HE20 / HE40 / HE80, therefore investigated worst case to representative mode in test report.

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Antenna 1	SparkLAN	AD-103AG	-
Antenna 2	SparkLAN	AD-301N	-
Antenna 3	SparkLAN	AD-302N	-
Antenna 4	SparkLAN	AD-303N	-
Antenna 5	SparkLAN	AD-305N	-
Antenna 6	SparkLAN	AD-308N	-
Antenna 7	SparkLAN	AD-309N	-
Antenna 8	SparkLAN	AD-310N	-
Antenna 9	SparkLAN	AD-311N	-
Antenna 10	GRAND-TEK Technology	103DG00000140	-
Antenna 11	GRAND-TEK Technology	103DG00000150	-

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Channel List

FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
42	5210MHz

FOR 5260 ~ 5320MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
58	5290MHz

FOR 5500 ~ 5720MHz

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
106	5530MHz	138	5690MHz
122	5610MHz	-	-

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	-	-

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
155	5775MHz

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	23~26°C/ 60~65%RH	3.3Vdc	2022/09/14~ 2022/09/19	Patrick Kuan
Radiated Spurious Emission	966-2	23~26°C/ 60~65%RH	3.3Vdc	2022/08/31~ 2022/09/29	Patrick Kuan
AC power Line Conducted Emission	SR1	23~26°C/ 60~65%RH	120Vac/60Hz from Host	2022/09/20~ 2022/09/20	Patrick Kuan

FCC Test Firm Registration Number: 498077

Sample Calculation:

Antenna Port Conducted Measurement:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBm) = Reading Value (dBm) +Attenuator Factor (dB) + Cable Loss (dB).
  Example: Result Value (10dBm) = Reading Value (-2dBm) +Attenuator Factor (10dB) + Cable Loss(2dB).
  *Test plot only shown the “Result Value”.

Radiated Spurious Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
  Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
  Example: Result Value (34.5dBuV/m) = Reading Value (40.1dBm) + Antenna Factor (18.7dB/m) + Cable Loss (4.2dB) - Preamp Factor (28.5dB).

AC power Line Conducted Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV) = Reading Value (dBuV) + Correction Factor (dB).
  Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).
  Example: Result Value (53.7dBuV) = Reading Value (35.1dBm) + Insertion loss(18.1dB) + Cable loss(0.5dB).

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Frequency Band (MHz)	Maximum Gain (dBi)	Remark
1	Chain (0)+(1)	SparkLAN	AD-103AG	Dipole	2400~2500	2.02	RP-SMA
					5150~5875	2.03	
2	Chain (0)+(1)	SparkLAN	AD-301N	Dipole	2400~2500	4.4	RP-SMA
					5150~5850	5.8	
3	Chain (0)+(1)	SparkLAN	AD-302N	Dipole	2400~2500	3.14	RP-SMA
					5150~5850	2.87	
4	Chain (0)+(1)	SparkLAN	AD-303N	Dipole	2400~2500	3.14	RP-SMA
					5150~5850	3.45	
5	Chain (0)+(1)	SparkLAN	AD-305N	Dipole	2400~2500	5	RP-SMA
					5150~5825	5.53	
6	Chain (0)+(1)	SparkLAN	AD-308N	Dipole	2400~2500	3	I-PEX
					5150~5825	5	
7	Chain (0)+(1)	SparkLAN	AD-309N	Dipole	2400~2500	1.68	I-PEX
					5150~5875	4.72	
8	Chain (0)+(1)	SparkLAN	AD-310N	Dipole	2400~2500	2.65	I-PEX
					5150~5875	4.86	
9	Chain (0)+(1)	SparkLAN	AD-311N	Dipole	2400~2500	2.67	I-PEX
					5150~5875	4.91	
10	Chain (0)+(1)	GRAND-TEK Technology	103DG00000140	Dipole	2400~2500	4.8	I-PEX
					5150~5875	5	
11	Chain (0)+(1)	GRAND-TEK Technology	103DG00000150	Dipole	2400~2500	2.5	I-PEX
					5150~5875	5.3	

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

6.5. Test Mode Applicability and Tested Channel Detail

- The fundamental of the dipole antenna was investigated in two orthogonal (lay and stand), it was determined that stand mode was worst-case. Therefore, all final radiated testing was performed with the dipole antenna in stand mode.
- The antennas AD-301N has the highest gain, the following conducted tests are all carried out using this antenna.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Non-Beamforming mode:

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6Mbps
	802.11ax20		OFDMA	36 to 48	36, 44, 48	MCS 0
	802.11ax40			38 to 46	38, 46	MCS 0
	802.11ax80			42	42	MCS 0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6Mbps
	802.11ax20		OFDMA	52 to 64	52, 60, 64	MCS 0
	802.11ax40			54 to 62	54, 62	MCS 0
	802.11ax80			58	58	MCS 0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6Mbps
	802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	MCS 0
	802.11ax40			102 to 142	102, 110, 134,142	MCS 0
	802.11ax80			102 to 138	106, 122, 138	MCS 0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6Mbps
	802.11ax20		OFDMA	149 to 165	149, 157, 165	MCS 0
	802.11ax40			151 to 159	151, 159	MCS 0
	802.11ax80			155	155	MCS 0
Radiated Emissions (Below 1GHz)	802.11a	5745-5825	OFDM	149 to 165	157	6Mbps
AC Power Line Conducted Emission	802.11a	5745-5825	OFDM	149 to 165	157	6Mbps

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Antenna Port Conducted Measurement	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6Mbps
	802.11ax20		OFDMA	36 to 48	36, 44, 48	MCS 0
	802.11ax40			38 to 46	38, 46	MCS 0
	802.11ax80			42	42	MCS 0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6Mbps
	802.11ax20		OFDMA	52 to 64	52, 60, 64	MCS 0
	802.11ax40			54 to 62	54, 62	MCS 0
	802.11ax80			58	58	MCS 0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6Mbps
	802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	MCS 0
	802.11ax40			102 to 142	102, 110, 134,142	MCS 0
	802.11ax80			102 to 138	106, 122, 138	MCS 0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6Mbps
	802.11ax20		OFDMA	149 to 165	149, 157, 165	MCS 0
	802.11ax40			151 to 159	151, 159	MCS 0
	802.11ax80			155	155	MCS 0

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Conducted Emissions	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6Mbps
	802.11ax20		OFDMA	36 to 48	36, 44, 48	MCS 0
	802.11ax40			38 to 46	38, 46	MCS 0
	802.11ax80			42	42	MCS 0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6Mbps
	802.11ax20		OFDMA	52 to 64	52, 60, 64	MCS 0
	802.11ax40			54 to 62	54, 62	MCS 0
	802.11ax80			58	58	MCS 0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6Mbps
	802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	MCS 0
	802.11ax40			102 to 142	102, 110, 134,142	MCS 0
	802.11ax80			102 to 138	106, 122, 138	MCS 0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6Mbps
	802.11ax20		OFDMA	149 to 165	149, 157, 165	MCS 0
	802.11ax40			151 to 159	151, 159	MCS 0
	802.11ax80			155	155	MCS 0

Beamforming mode:

Test Item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Antenna Port Conducted Measurement	802.11ax20	5180-5240	OFDM/OFDMA	36 to 48	36, 44, 48	MCS0 Nss1
	802.11ax40			38 to 46	38, 46	MCS0 Nss1
	802.11ax80			42	42	MCS0 Nss1
	802.11ax20	5260-5320	OFDM/OFDMA	52 to 64	52, 60, 64	MCS0 Nss1
	802.11ax40			54 to 62	54, 62	MCS0 Nss1
	802.11ax80			58	58	MCS0 Nss1
	802.11ax20	5500-5720	OFDM/OFDMA	100 to 144	100, 116, 140, 144	MCS0 Nss1
	802.11ax40			102 to 142	102, 110, 134,142	MCS0 Nss1
	802.11ax80			106, 122,138	106, 122, 138	MCS0 Nss1
	802.11ax20	5745-5825	OFDM/OFDMA	149 to 165	149, 157, 165	MCS0 Nss1
	802.11ax40			151 to 159	151, 159	MCS0 Nss1
	802.11ax80			155	155	MCS0 Nss1

*Note:The worst condition of radiated spurious emission and maximum conducted output power were Found in Non-Beamforming mode. Therefore Beamforming mode only test conducted output power and recorded in test report.

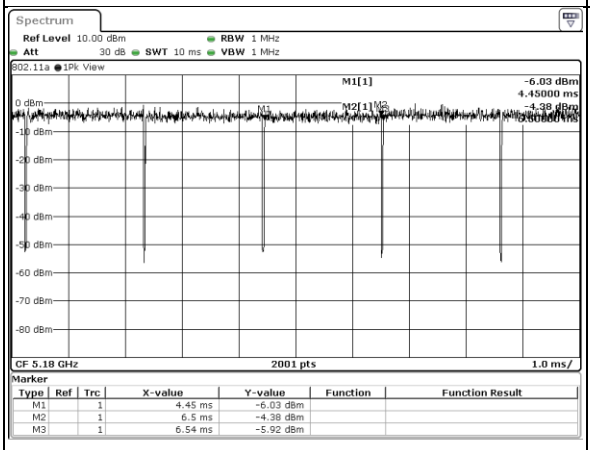
Simultaneously transmission condition:

Condition	Technology	
1	WLAN (5GHz)	BT-GFSK
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

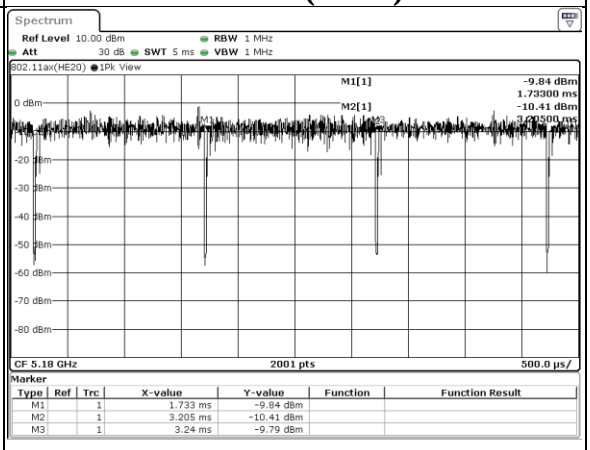
6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11a	2.050	2.090	0.9809	N/A	10Hz
802.11ax(HE20)	1.473	1.508	0.9768	0.10	1kHz
802.11ax(HE40)	0.723	0.787	0.9175	0.37	2kHz
802.11ax(HE80)	0.362	0.422	0.8577	0.67	3kHz

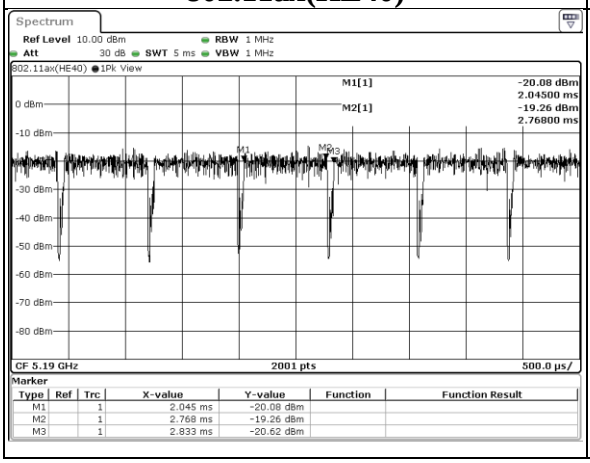
802.11a



802.11ax(HE20)



802.11ax(HE40)



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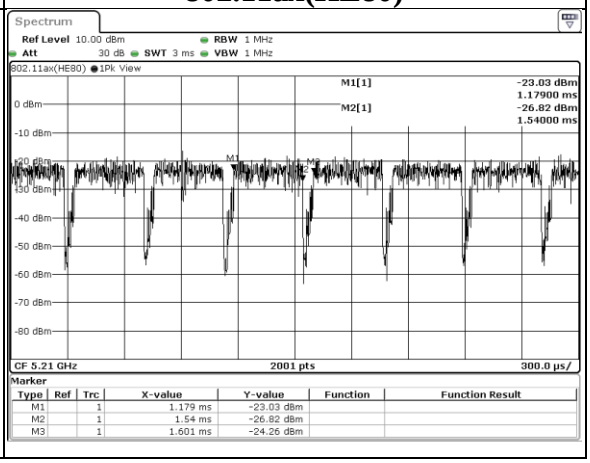


7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2022/2/8	2023/2/7
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2021/12/13	2022/12/12
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2021/12/17	2022/12/16
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2022/6/7	2023/6/6
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2022/2/16	2023/2/15
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2022/5/17	2023/5/16
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/12/3	2022/12/2
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/12/3	2022/12/2

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	2021/10/29	2022/10/28
USB Power Sensor	Anritsu	MA24408A	12031	2022/3/23	2023/3/22
Attenuator	EMCI	EMC-40ATK2W10	17002	2021/12/13	2022/12/12
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150-40-CP-AR	MAA1701-010	2022/3/11	2023/3/10
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2022/8/29	2023/8/28
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2022/8/30	2023/8/29
Cables	TITAN	CFD200	T0732ACFD20020A300-2	2022/4/9	2023/4/8

UL Software		
Description	**Name**	**Version**
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF-Conducted-FCC 15407	ver 1.1
AC power Line Conducted Emission	EZ_EMC	UL-3A1.2

8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	Lenovo	ThinkPad_T430	PB-8XTN7	Provide by lab

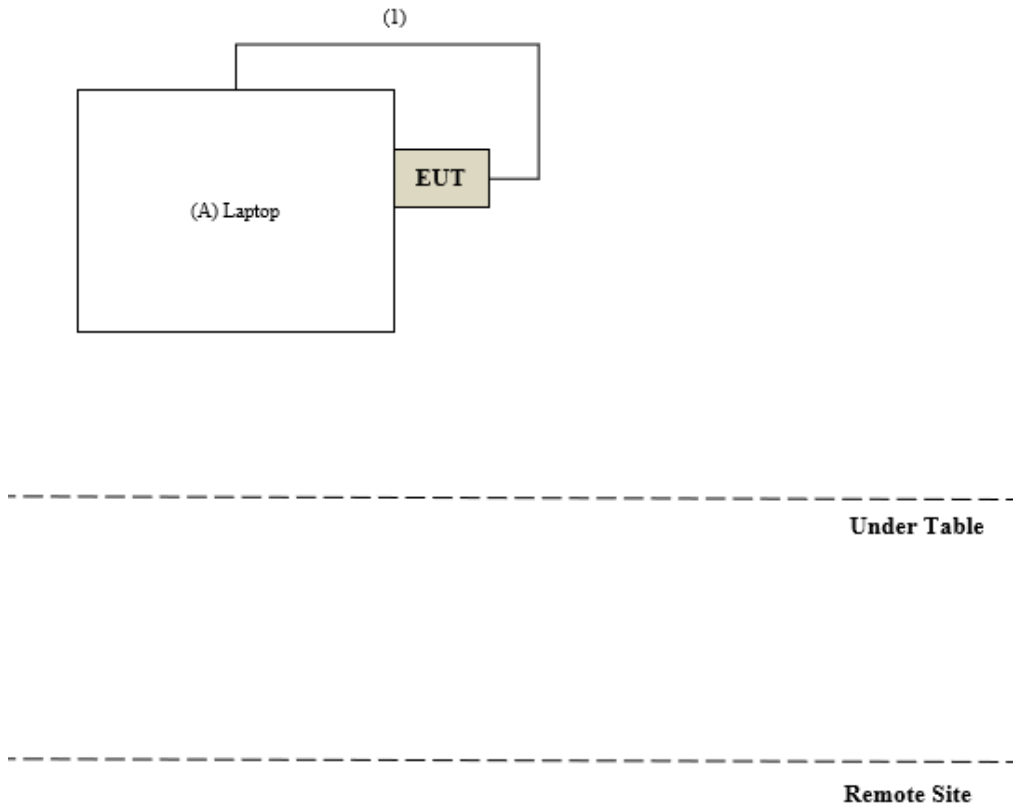
I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Type A to mini USB Type B Cable	N/A	N/A	0.9	Provide by Client

Test Setup

Controlled using a bespoke application (Typing RF command by terminal tool (ubuntu terminal)) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



9. Test Results

9.1. 6dB Bandwidth

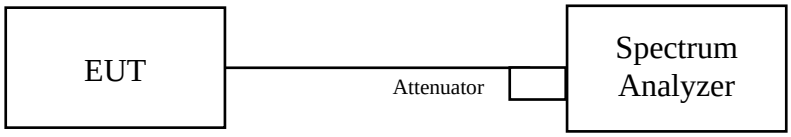
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

Test Setup

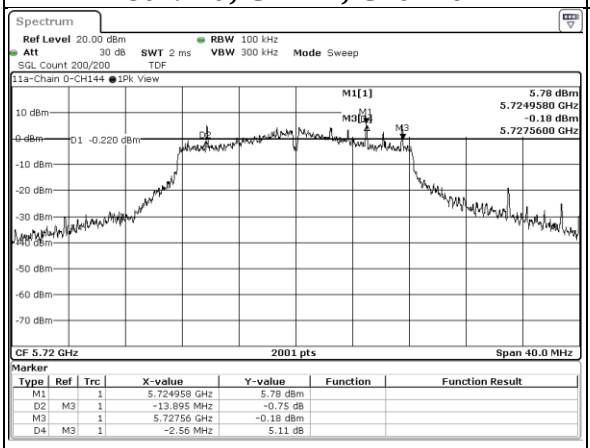


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

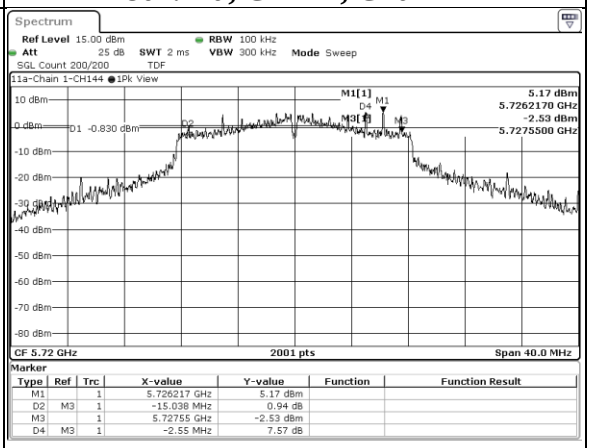
Test Data

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	144 (U-NII-2C)	5720	11.335	12.488	0.5	PASS
	144 (U-NII-2C+U-NII-3)	5720	13.895	15.038	0.5	PASS
	144 (U-NII-3)	5720	2.56	2.55	0.5	PASS
	149	5745	13.255	15.715	0.5	PASS
	157	5785	11.374	15.063	0.5	PASS
	165	5825	12.333	16.292	0.5	PASS

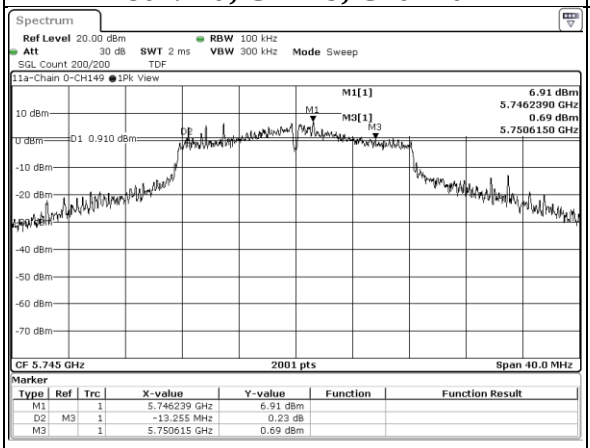
802.11a, CH144, Chain 0



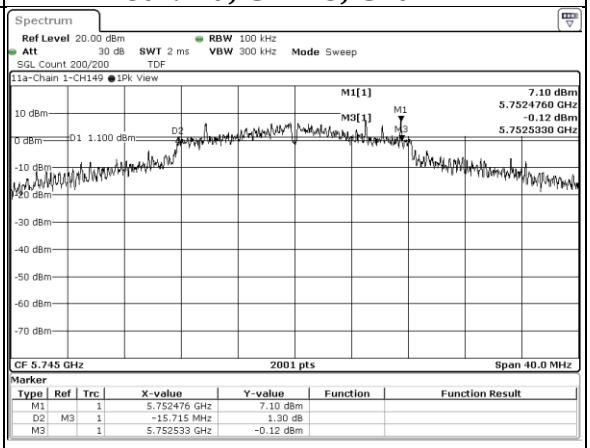
802.11a, CH144, Chain 1



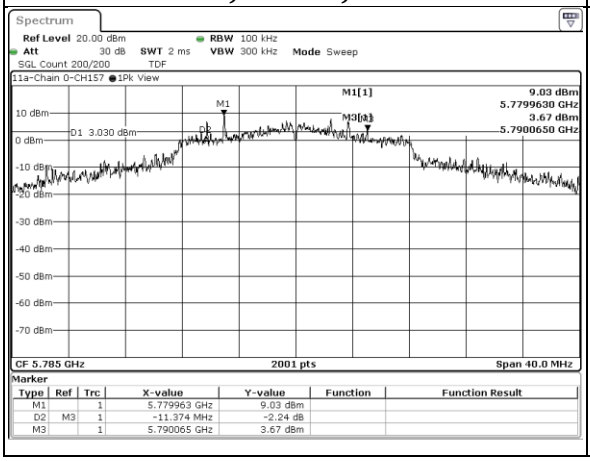
802.11a, CH149, Chain 0



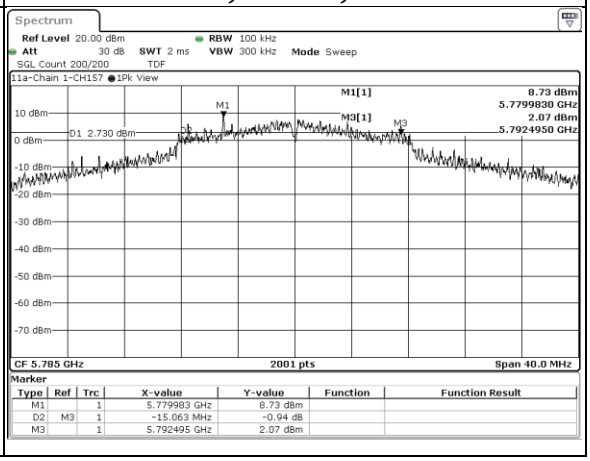
802.11a, CH149, Chain 1



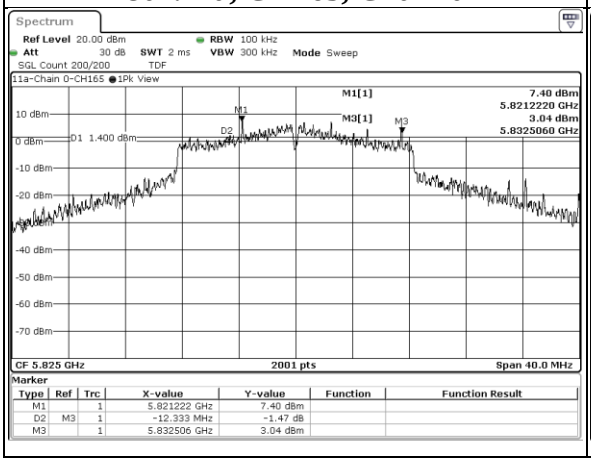
802.11a, CH157, Chain 0

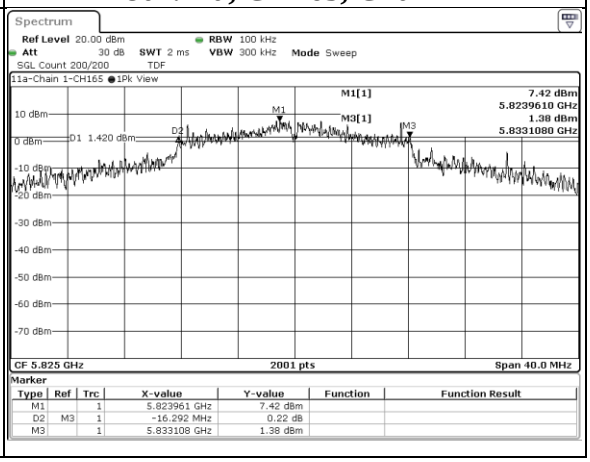


802.11a, CH157, Chain 1



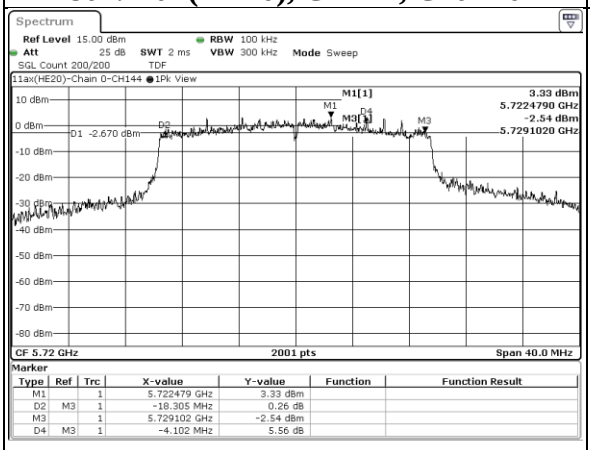
802.11a, CH165, Chain 0	802.11a, CH165, Chain 1



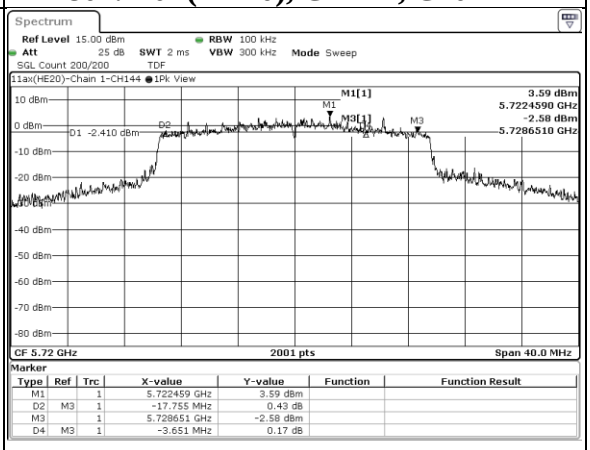


Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	144 (U-NII-2C)	5720	14.203	14.104	0.5	PASS
	144 (U-NII-2C+U-NII-3)	5720	18.305	17.755	0.5	PASS
	144 (U-NII-3)	5720	4.102	3.651	0.5	PASS
	149	5745	17.965	14.009	0.5	PASS
	157	5785	15.544	13.85	0.5	PASS
	165	5825	17.266	16.505	0.5	PASS

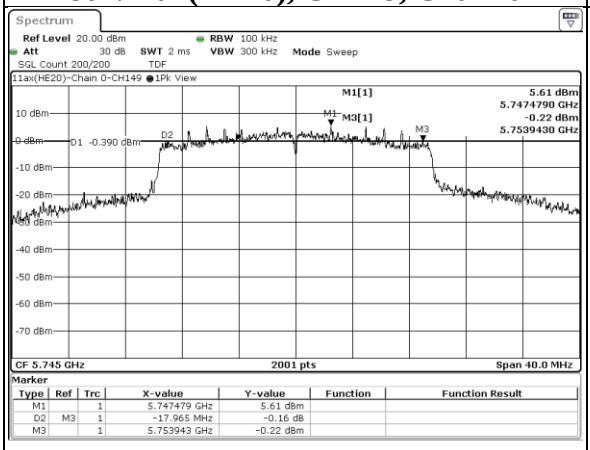
802.11ax(HE20), CH144, Chain 0



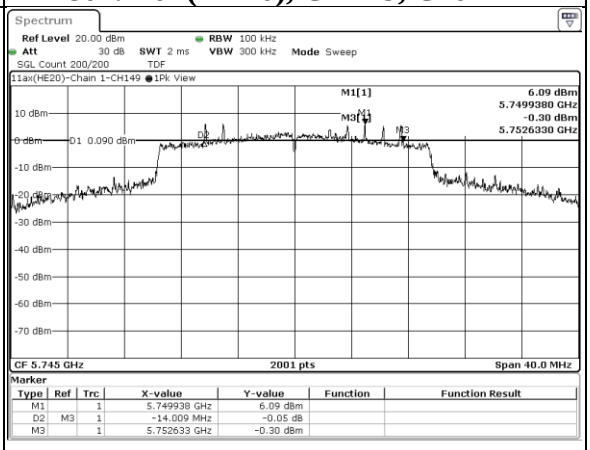
802.11ax(HE20), CH144, Chain 1



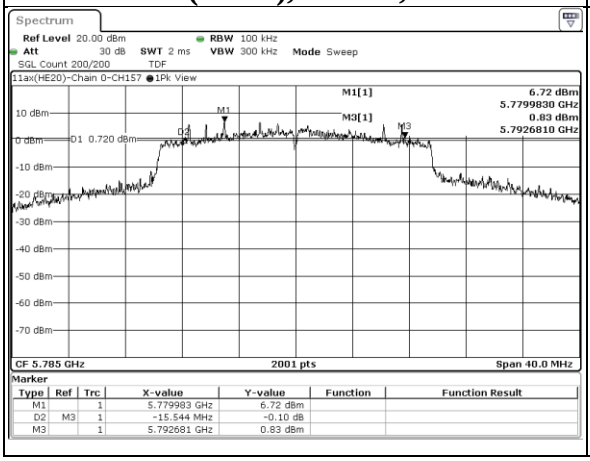
802.11ax(HE20), CH149, Chain 0



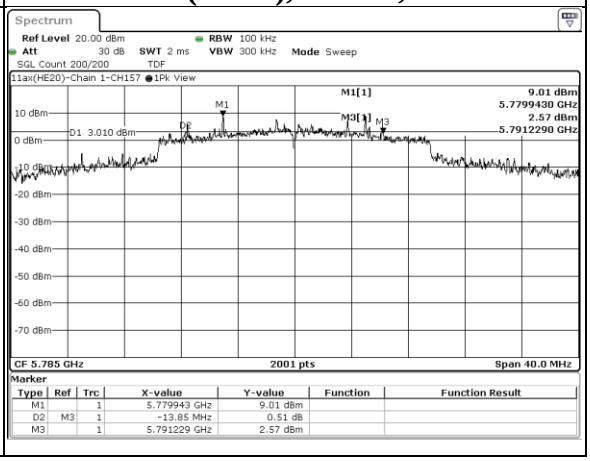
802.11ax(HE20), CH149, Chain 1



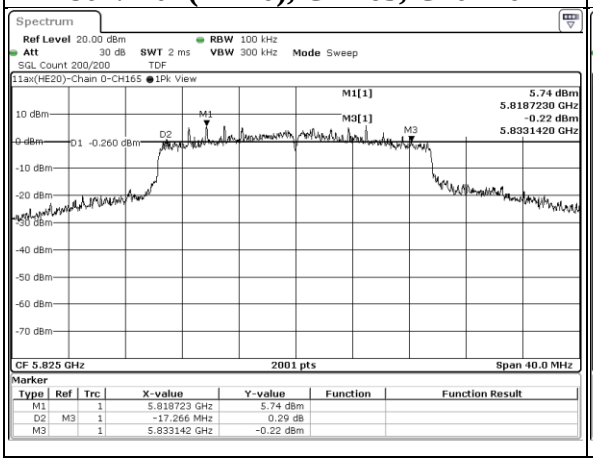
802.11ax(HE20), CH157, Chain 0

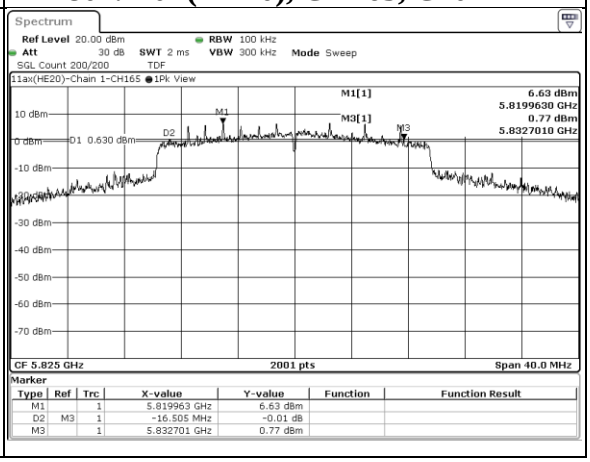


802.11ax(HE20), CH157, Chain 1



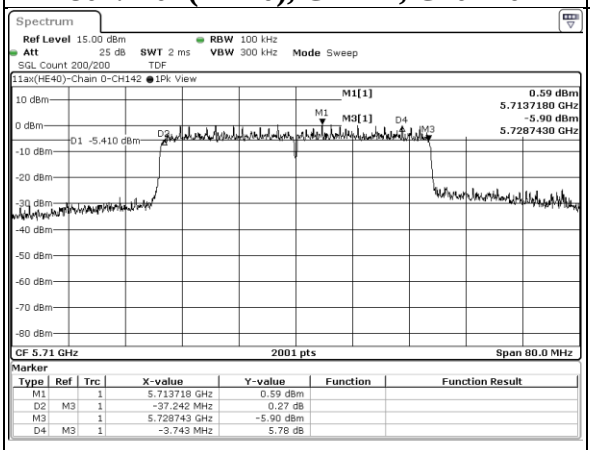
802.11ax(HE20), CH165, Chain 0	802.11ax(HE20), CH165, Chain 1



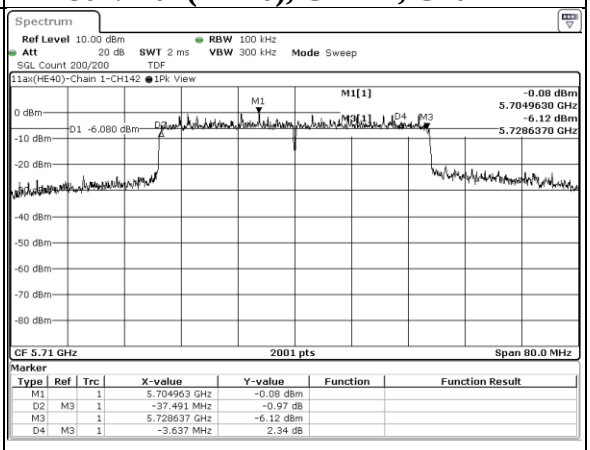


Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	142 (U-NII-2C)	5710	33.499	33.854	0.5	PASS
	142 (U-NII-2C+U-NII-3)	5710	37.242	37.491	0.5	PASS
	142 (U-NII-3)	5710	3.743	3.637	0.5	PASS
	151	5755	37.713	36.123	0.5	PASS
	159	5795	37.237	36.962	0.5	PASS

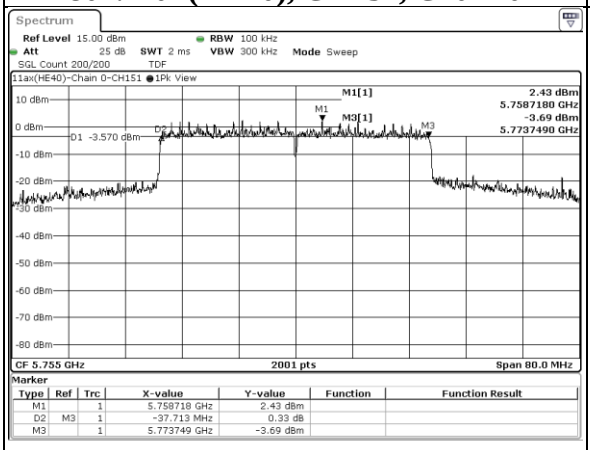
802.11ax(HE40), CH142, Chain 0



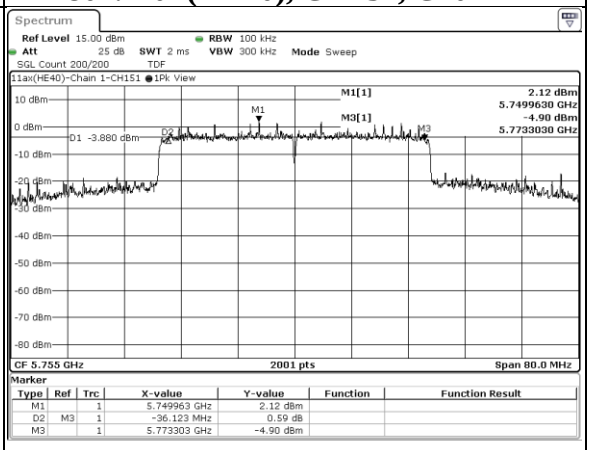
802.11ax(HE40), CH142, Chain 1



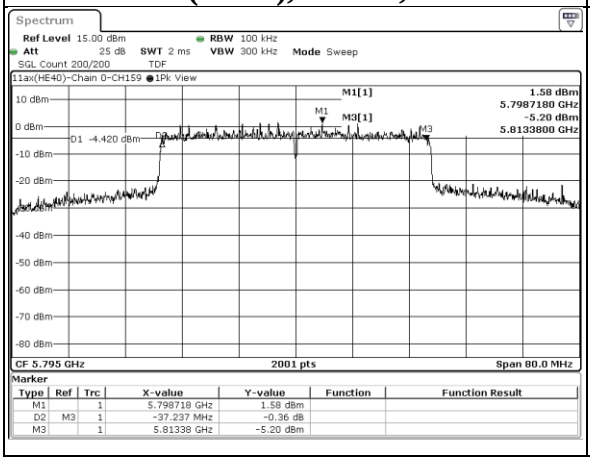
802.11ax(HE40), CH151, Chain 0



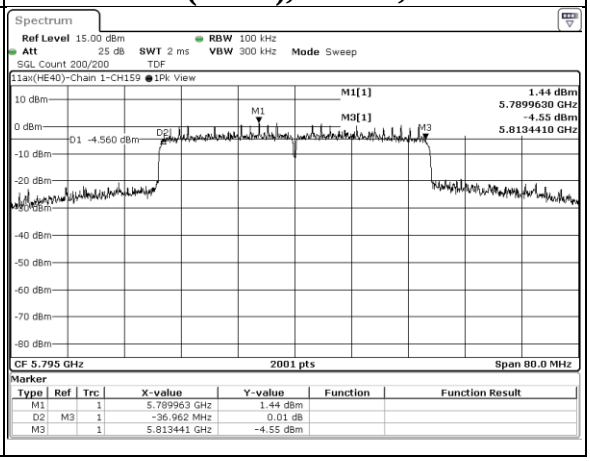
802.11ax(HE40), CH151, Chain 1



802.11ax(HE40), CH159, Chain 0

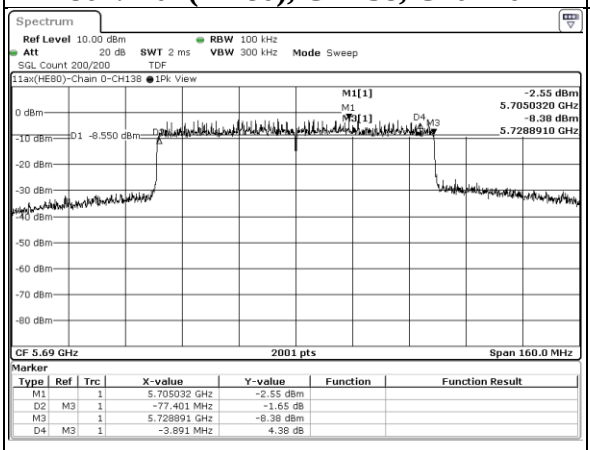


802.11ax(HE40), CH159, Chain 1

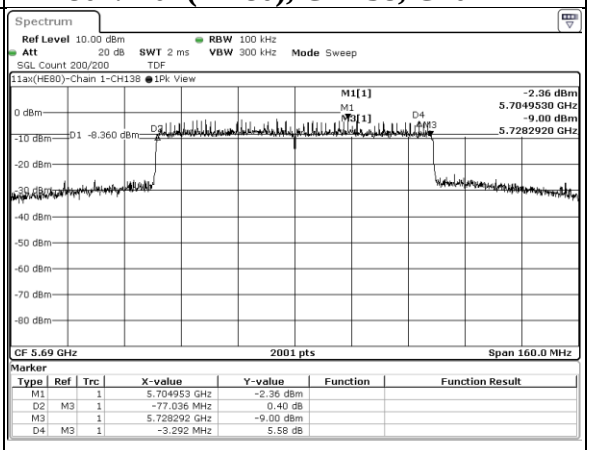


Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	138 (U-NII-2C)	5690	73.51	73.744	0.5	PASS
	138 (U-NII-2C+U-NII-3)	5690	77.401	77.036	0.5	PASS
	138 (U-NII-3)	5690	3.891	3.292	0.5	PASS
	155	5775	77.25	77.038	0.5	PASS

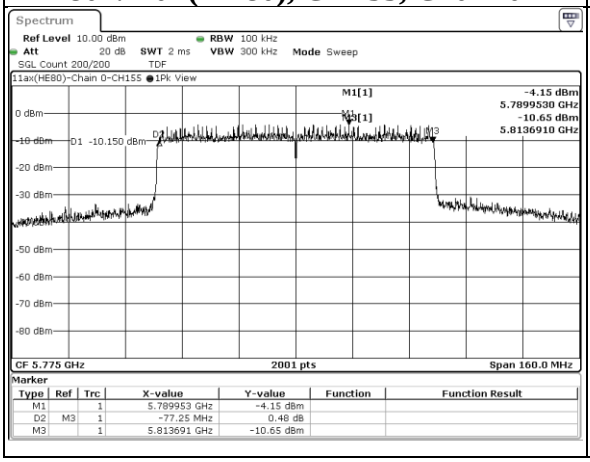
802.11ax(HE80), CH138, Chain 0



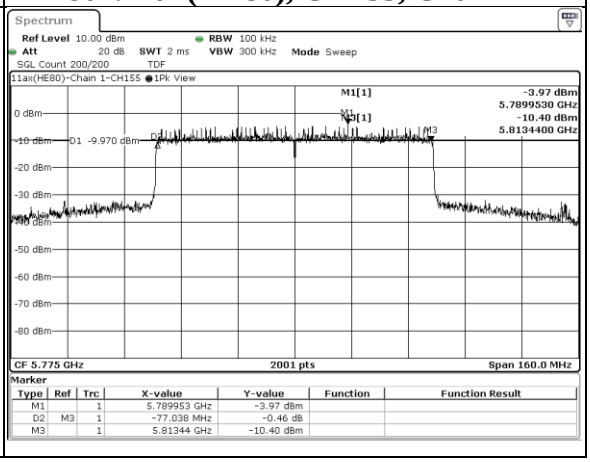
802.11ax(HE80), CH138, Chain 1



802.11ax(HE80), CH155, Chain 0



802.11ax(HE80), CH155, Chain 1

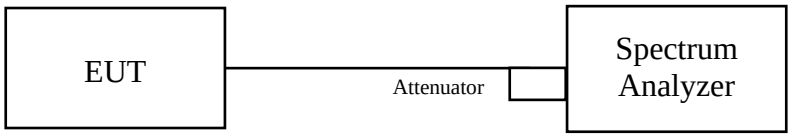


9.2. 26dB Bandwidth

Test procedure

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test Setup

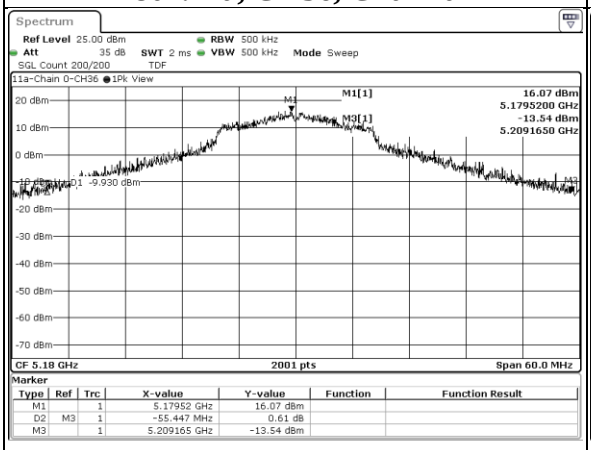


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

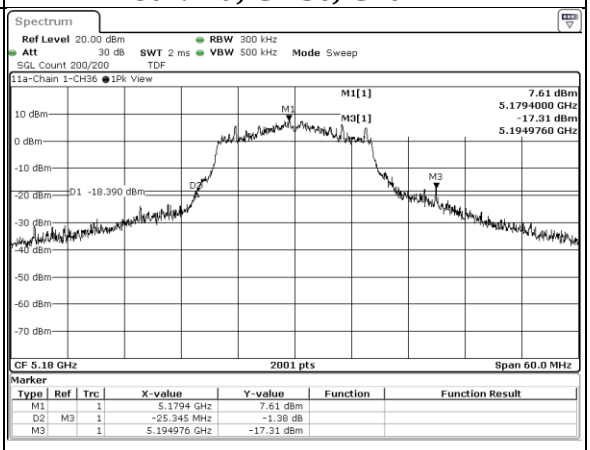
Test Data

Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	36	5180	55.447	25.345	N/A	PASS
	44	5220	25.375	26.064	N/A	PASS
	48	5240	21.07	24.399	N/A	PASS
	52	5260	52.616	28.159	N/A	PASS
	60	5300	25.454	25.735	N/A	PASS
	64	5320	20.884	20.571	N/A	PASS
	100	5500	20.202	25.666	N/A	PASS
	116	5580	26.477	29.511	N/A	PASS
	140	5700	21.31	22.382	N/A	PASS
	144 (U-NII-2C)	5720	15.708	17.151	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	25.786	24.97	N/A	PASS
	144 (U-NII-3)	5720	10.078	7.819	N/A	PASS

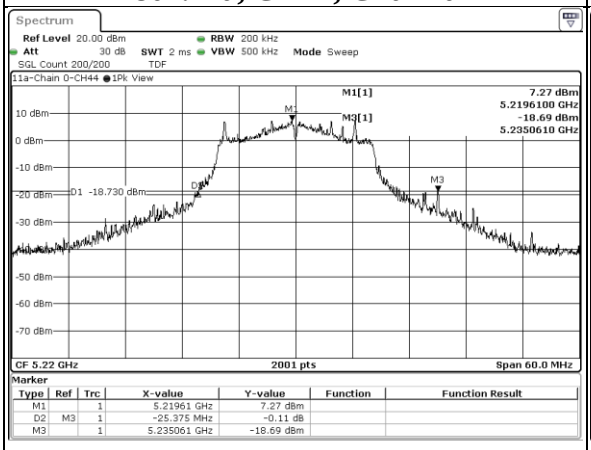
802.11a, CH36, Chain 0



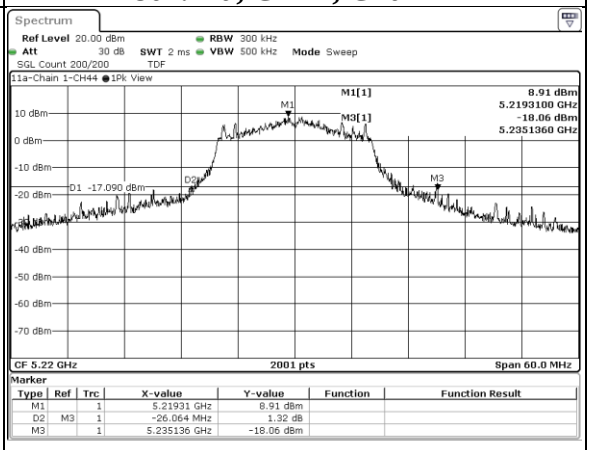
802.11a, CH36, Chain 1



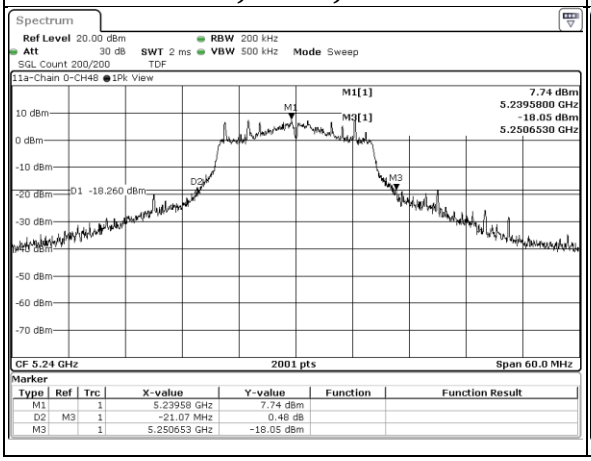
802.11a, CH44, Chain 0



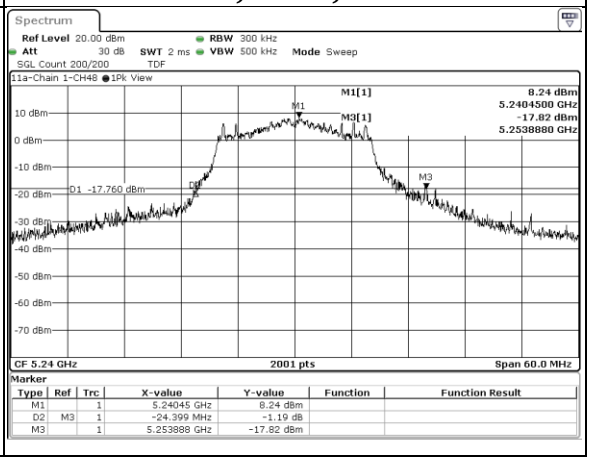
802.11a, CH44, Chain 1



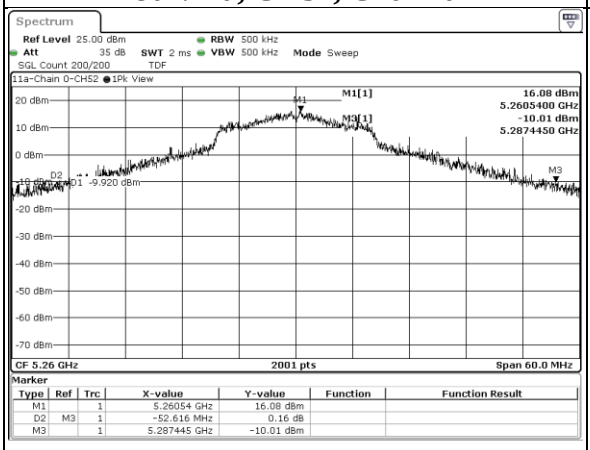
802.11a, CH48, Chain 0



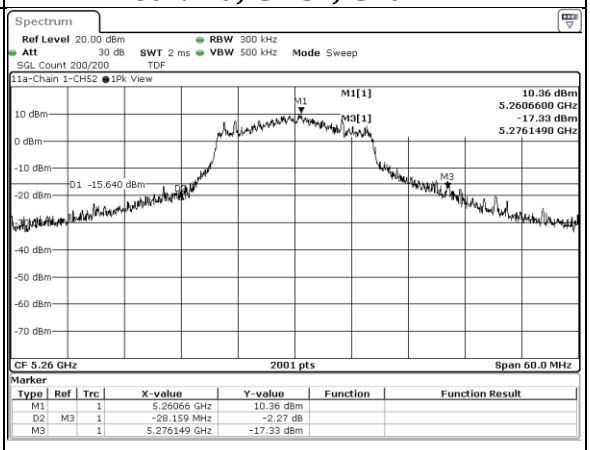
802.11a, CH48, Chain 1



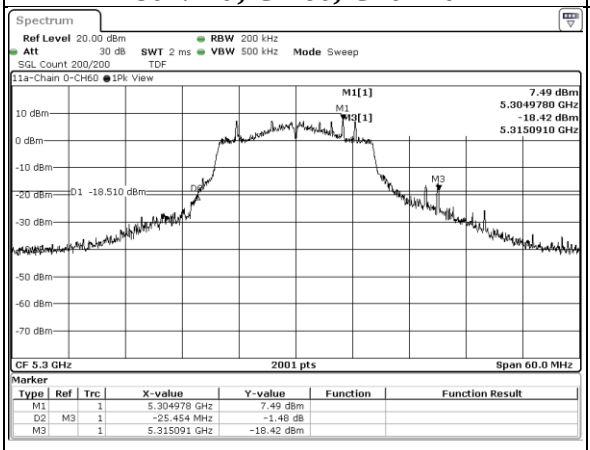
802.11a, CH52, Chain 0



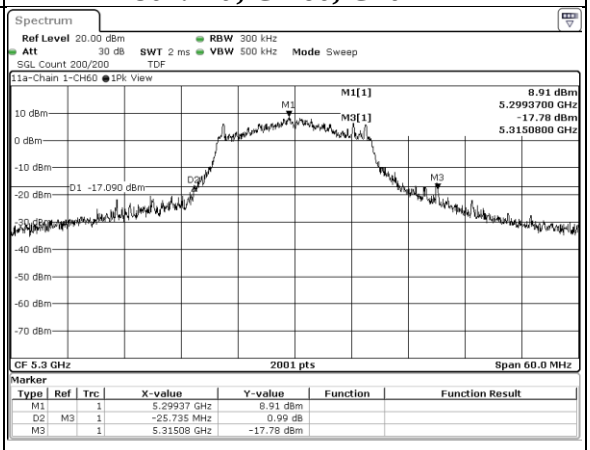
802.11a, CH52, Chain 1



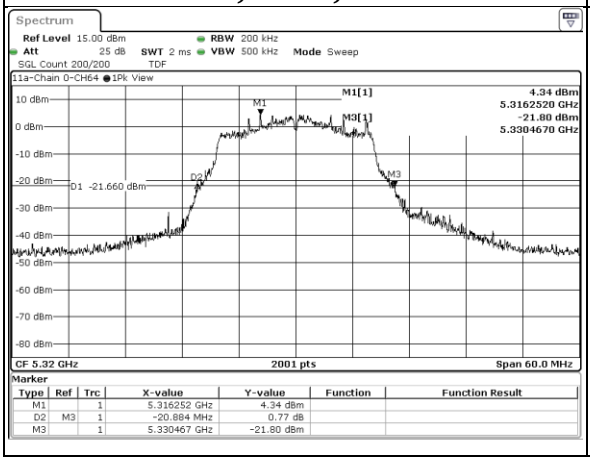
802.11a, CH60, Chain 0



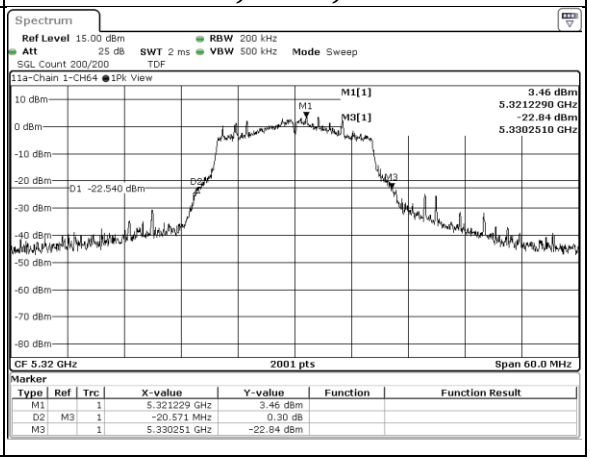
802.11a, CH60, Chain 1



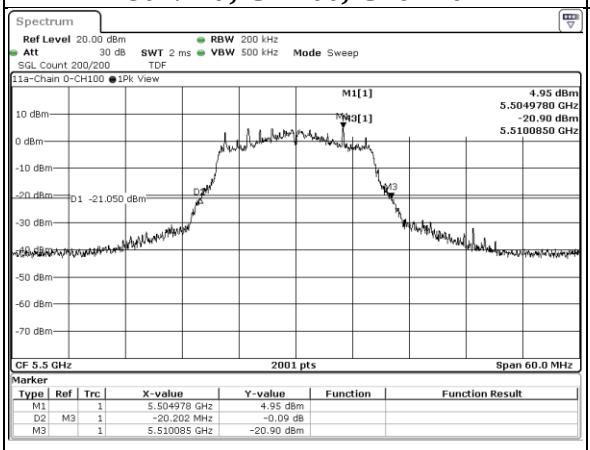
802.11a, CH64, Chain 0



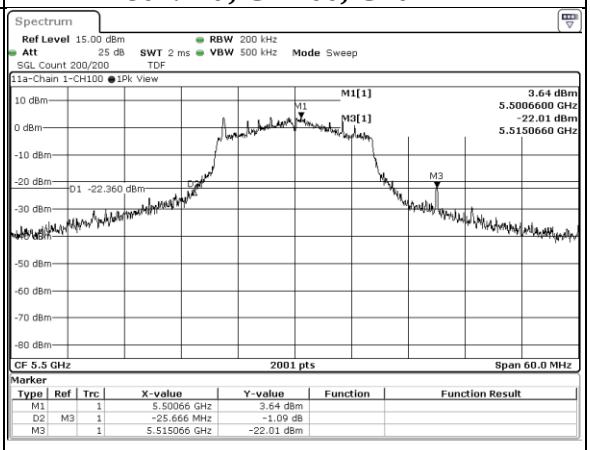
802.11a, CH64, Chain 1



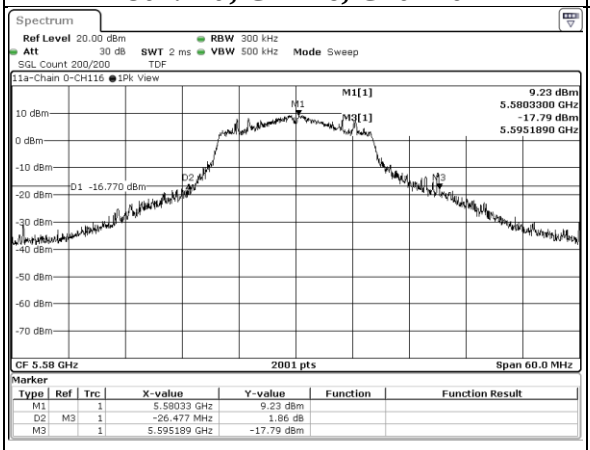
802.11a, CH100, Chain 0



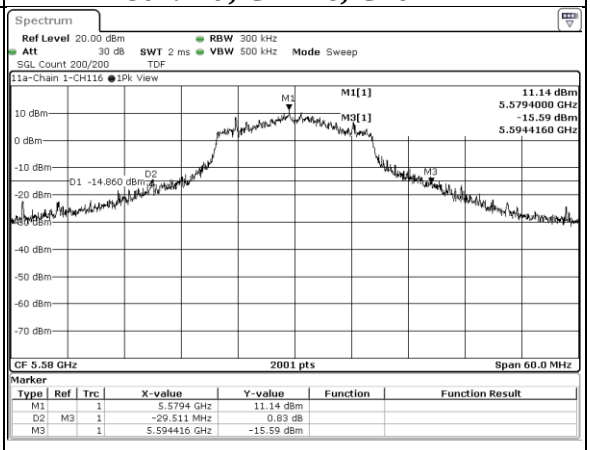
802.11a, CH100, Chain 1



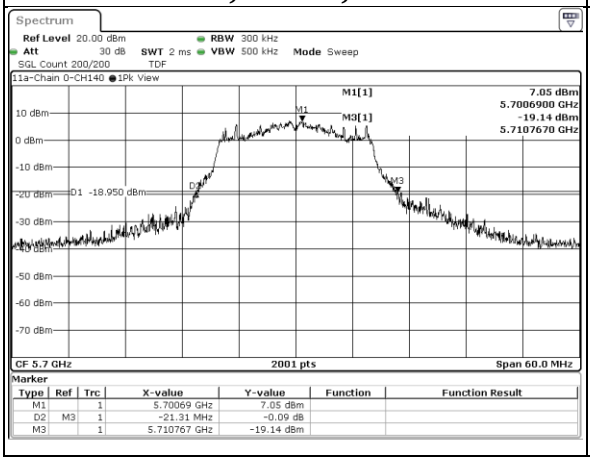
802.11a, CH116, Chain 0



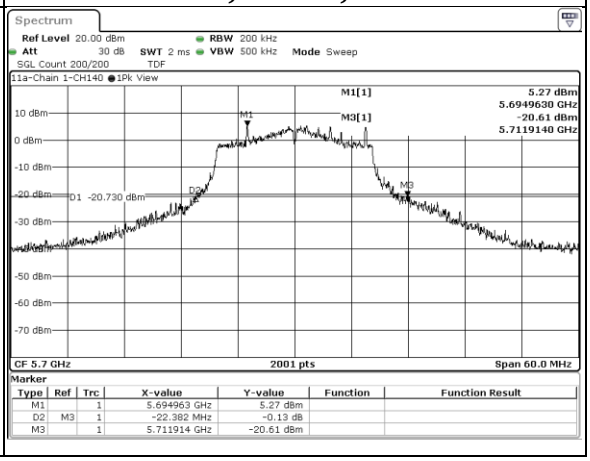
802.11a, CH116, Chain 1



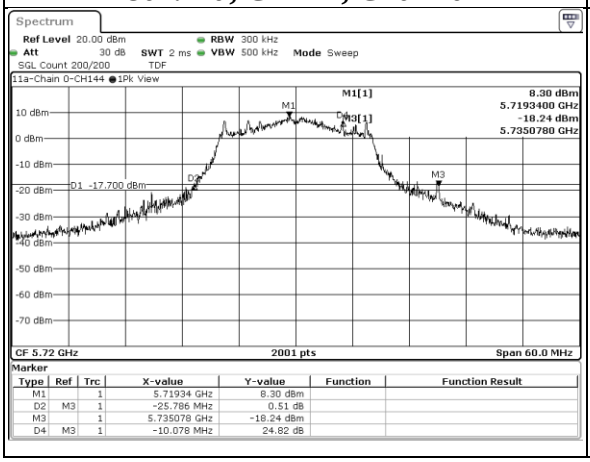
802.11a, CH140, Chain 0

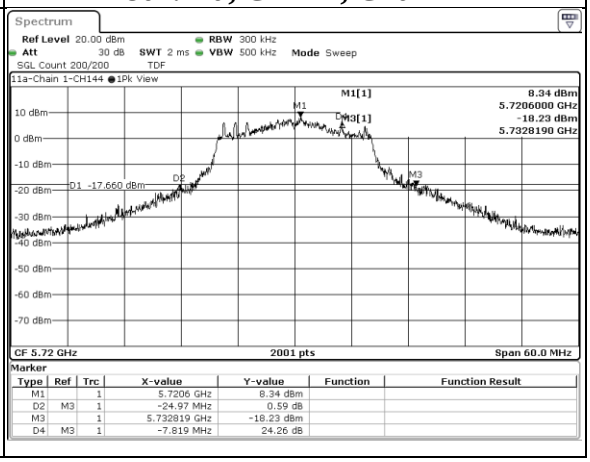


802.11a, CH140, Chain 1



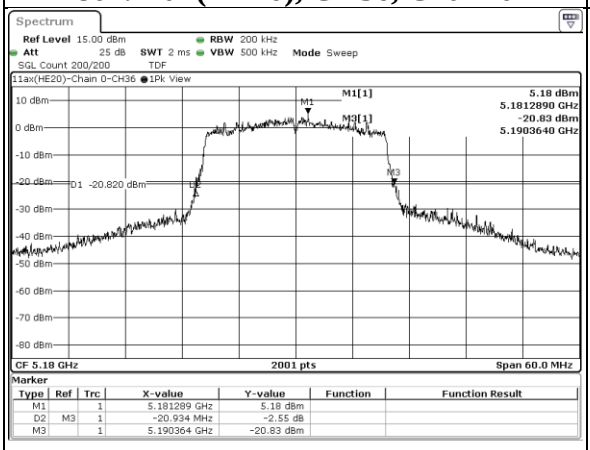
802.11a, CH144, Chain 0	802.11a, CH144, Chain 1



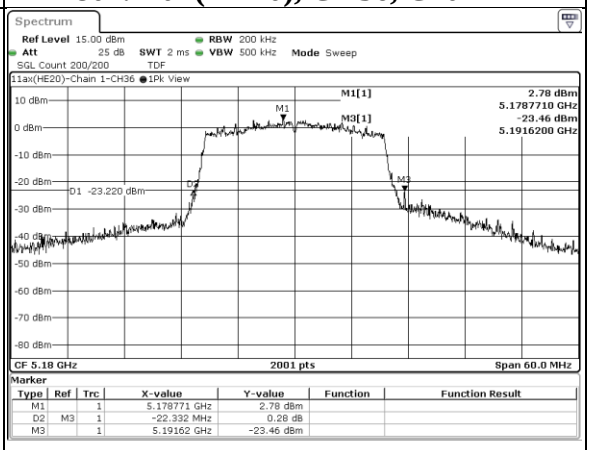


Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	36	5180	20.934	22.332	N/A	PASS
	44	5220	28.007	28.618	N/A	PASS
	48	5240	25.698	31.446	N/A	PASS
	52	5260	26.934	36.129	N/A	PASS
	60	5300	21.207	25.207	N/A	PASS
	64	5320	21.431	21.1	N/A	PASS
	100	5500	21.002	21.515	N/A	PASS
	116	5580	28.272	27.663	N/A	PASS
	140	5700	21.141	21.228	N/A	PASS
	144 (U-NII-2C)	5720	15.805	18.388	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	24.133	29.309	N/A	PASS
	144 (U-NII-3)	5720	8.328	10.921	N/A	PASS

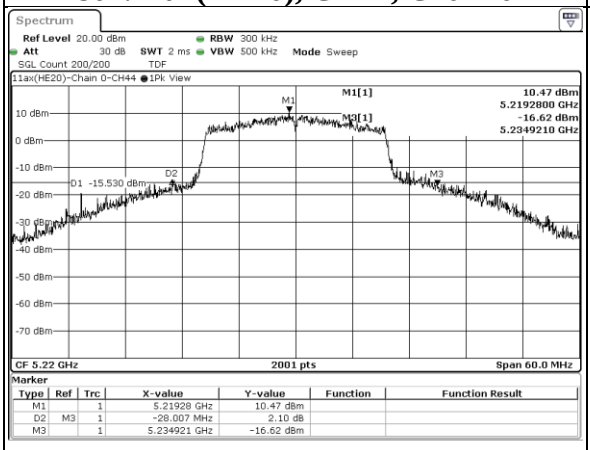
802.11ax(HE20), CH36, Chain 0



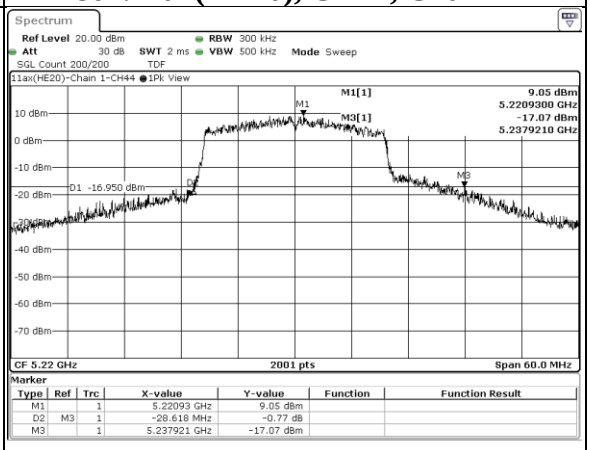
802.11ax(HE20), CH36, Chain 1



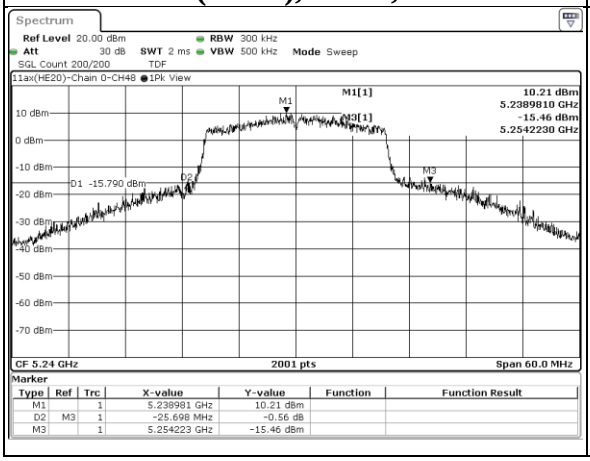
802.11ax(HE20), CH44, Chain 0



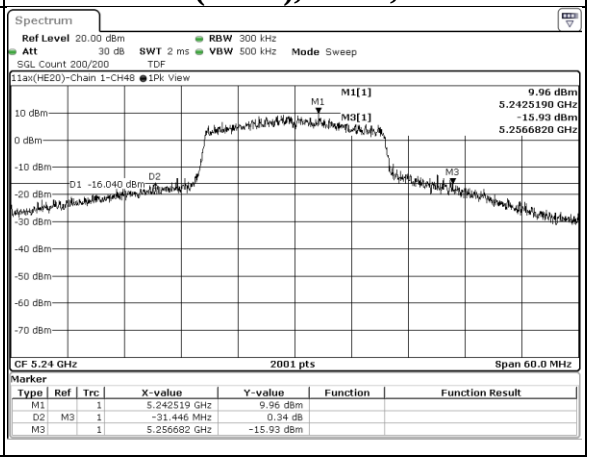
802.11ax(HE20), CH44, Chain 1



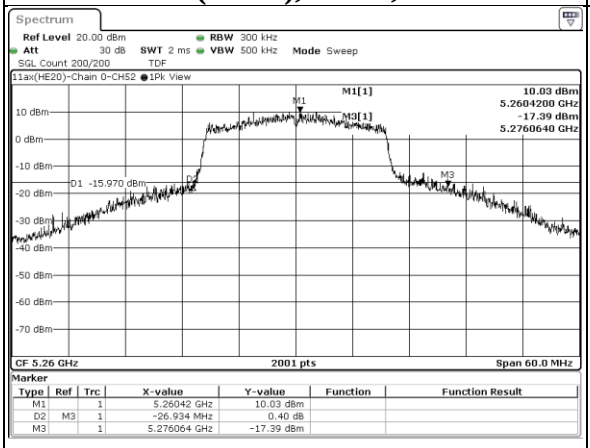
802.11ax(HE20), CH48, Chain 0



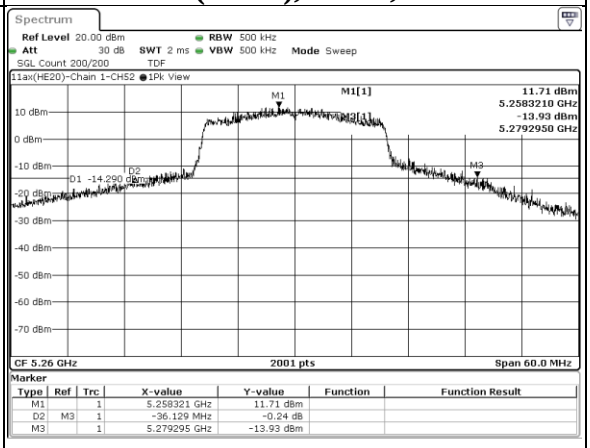
802.11ax(HE20), CH48, Chain 1



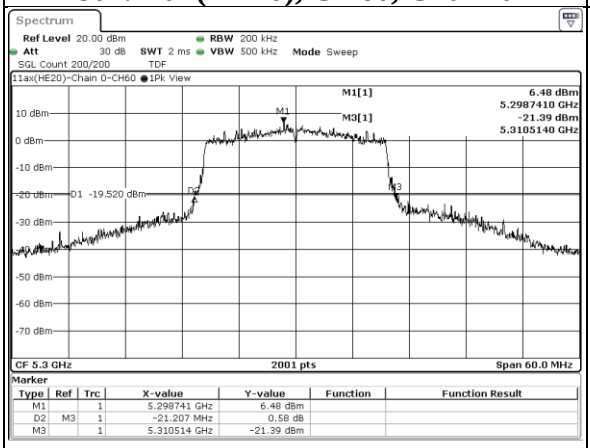
802.11ax(HE20), CH52, Chain 0



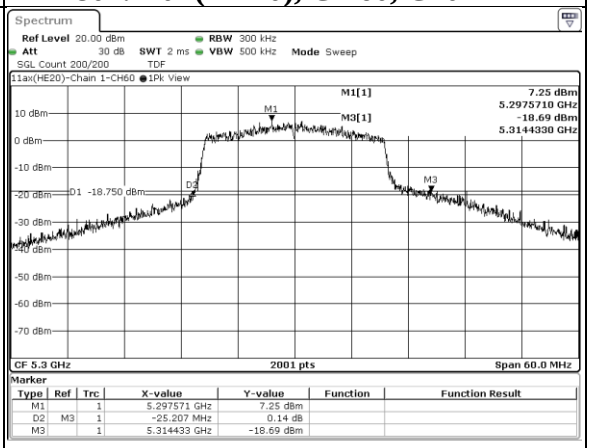
802.11ax(HE20), CH52, Chain 1



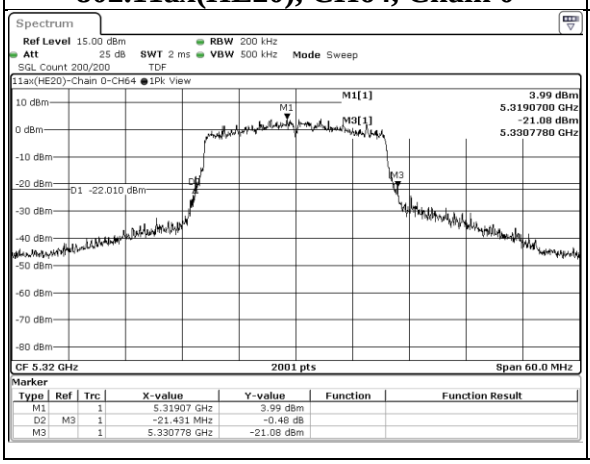
802.11ax(HE20), CH60, Chain 0



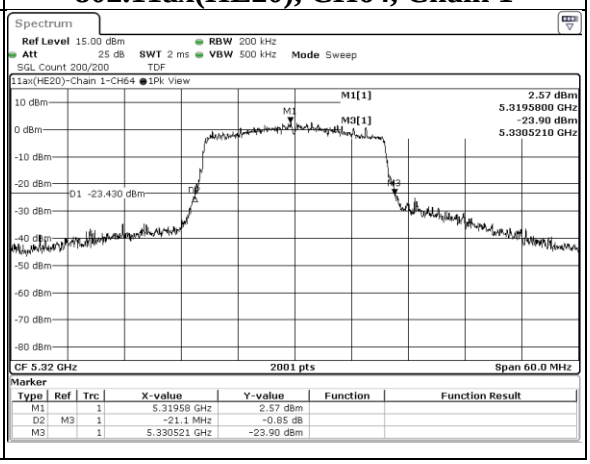
802.11ax(HE20), CH60, Chain 1



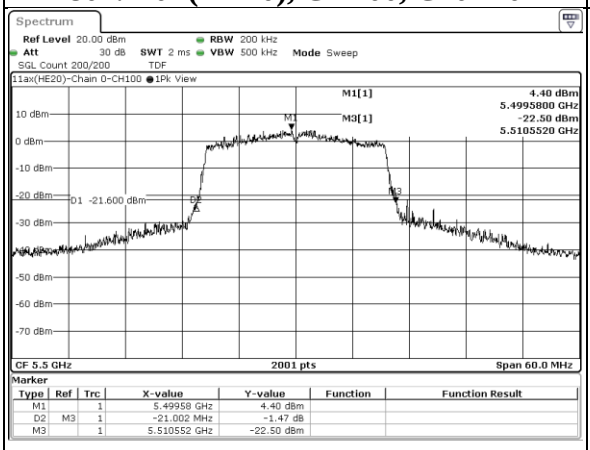
802.11ax(HE20), CH64, Chain 0



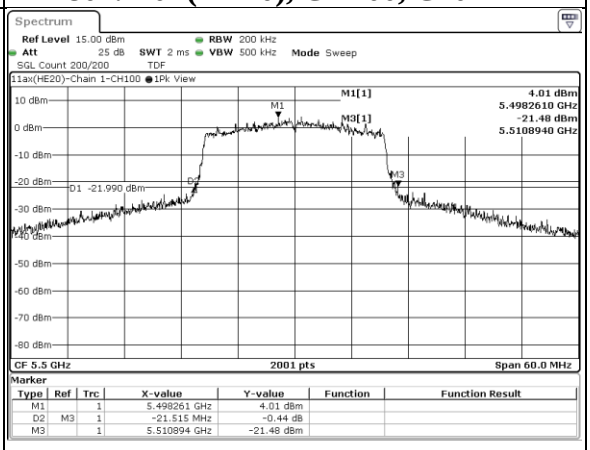
802.11ax(HE20), CH64, Chain 1



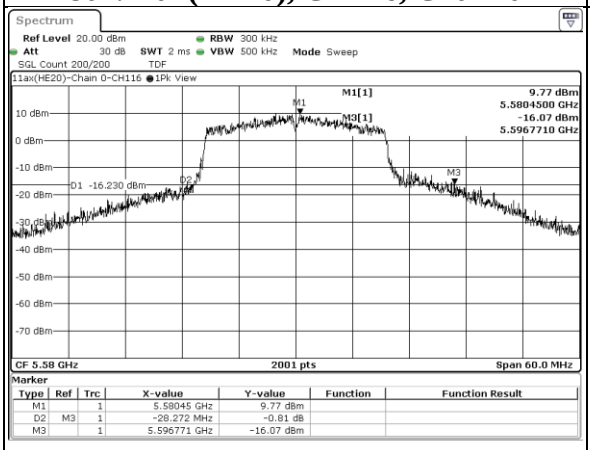
802.11ax(HE20), CH100, Chain 0



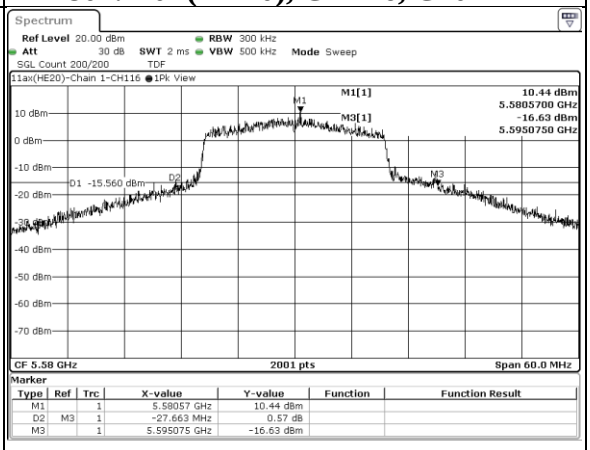
802.11ax(HE20), CH100, Chain 1



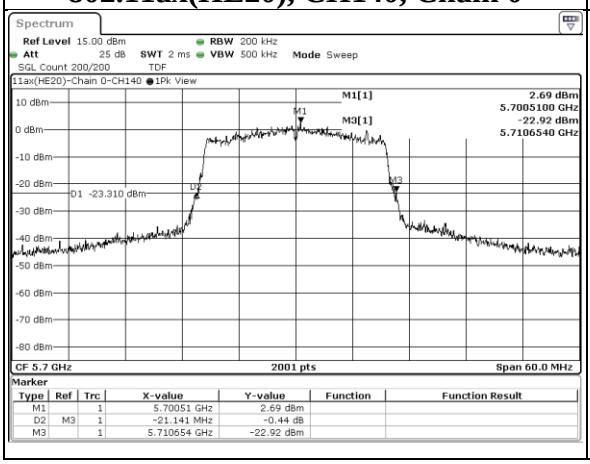
802.11ax(HE20), CH116, Chain 0



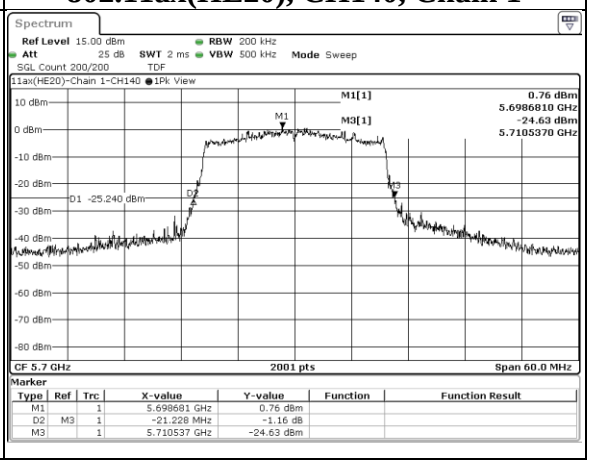
802.11ax(HE20), CH116, Chain 1



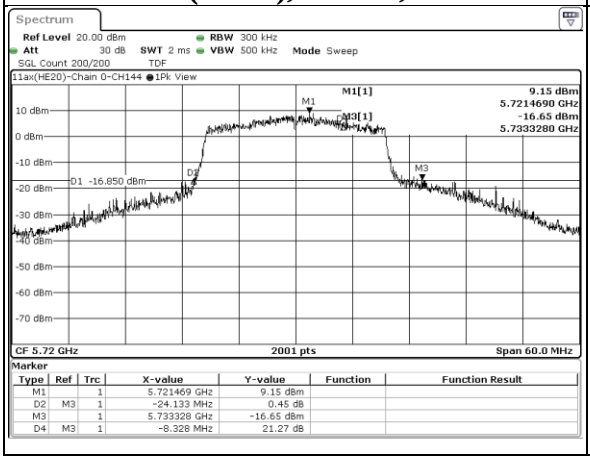
802.11ax(HE20), CH140, Chain 0

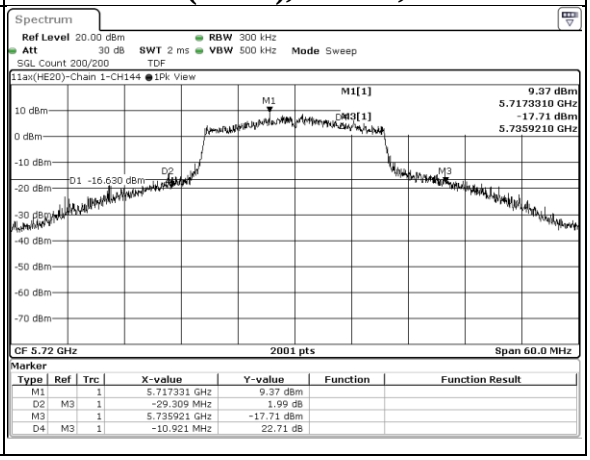


802.11ax(HE20), CH140, Chain 1



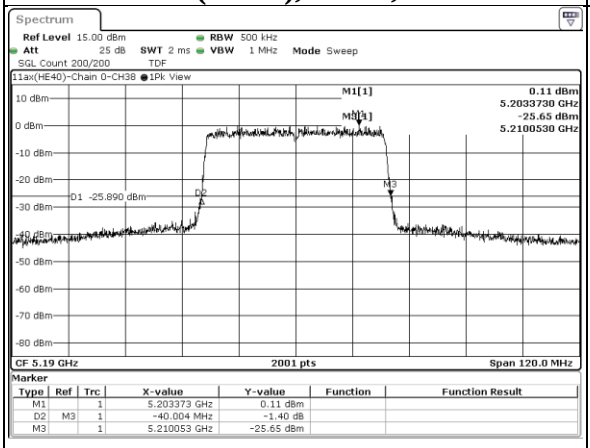
802.11ax(HE20), CH144, Chain 0	802.11ax(HE20), CH144, Chain 1



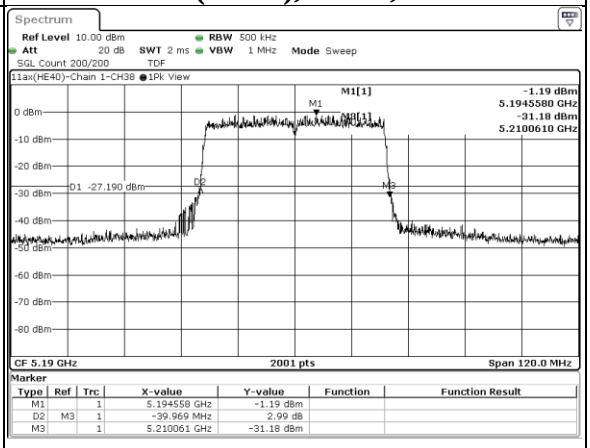


Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	38	5190	40.004	39.969	N/A	PASS
	46	5230	47.892	45.076	N/A	PASS
	54	5270	39.926	44.813	N/A	PASS
	62	5310	40.164	39.899	N/A	PASS
	102	5510	39.997	40.107	N/A	PASS
	110	5550	40.29	40.049	N/A	PASS
	134	5670	43.964	46.326	N/A	PASS
	142 (U-NII-2C)	5710	35.321	48.495	N/A	PASS
	142 (U-NII-2C+U-NII-3)	5710	55.071	73.457	N/A	PASS
	142 (U-NII-3)	5710	19.75	24.962	N/A	PASS

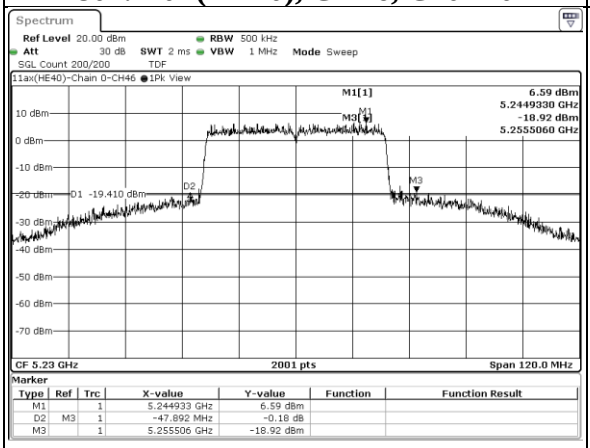
802.11ax(HE40), CH38, Chain 0



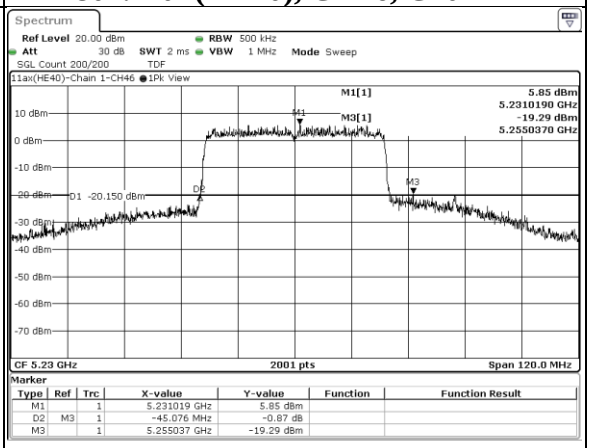
802.11ax(HE40), CH38, Chain 1



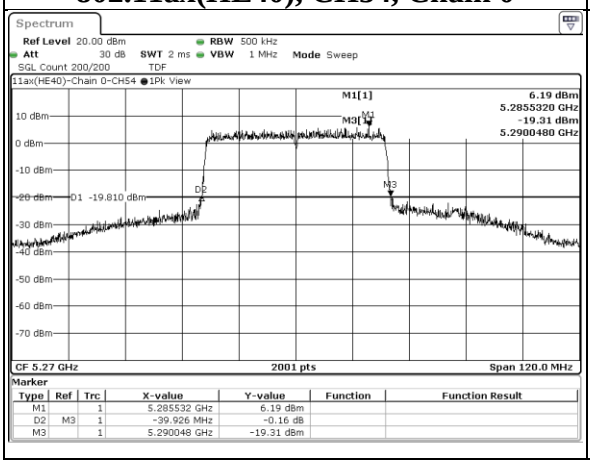
802.11ax(HE40), CH46, Chain 0



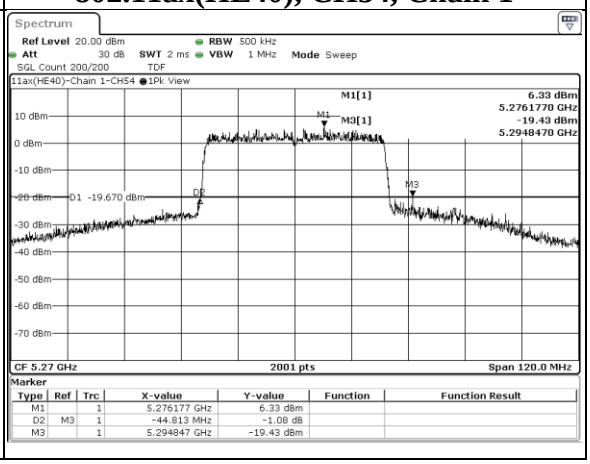
802.11ax(HE40), CH46, Chain 1



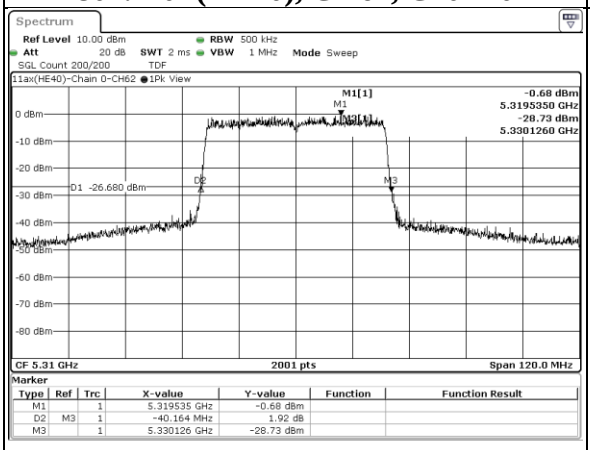
802.11ax(HE40), CH54, Chain 0



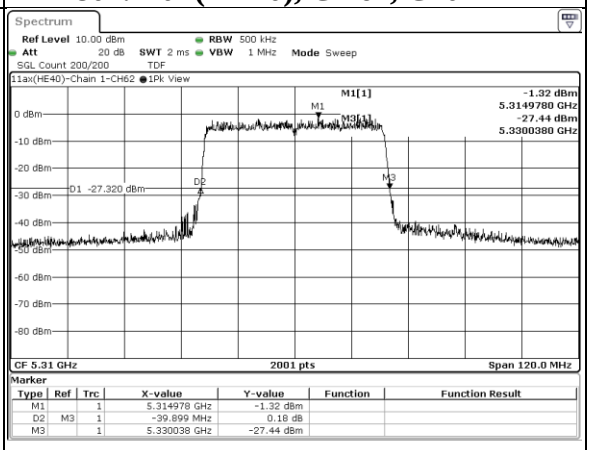
802.11ax(HE40), CH54, Chain 1



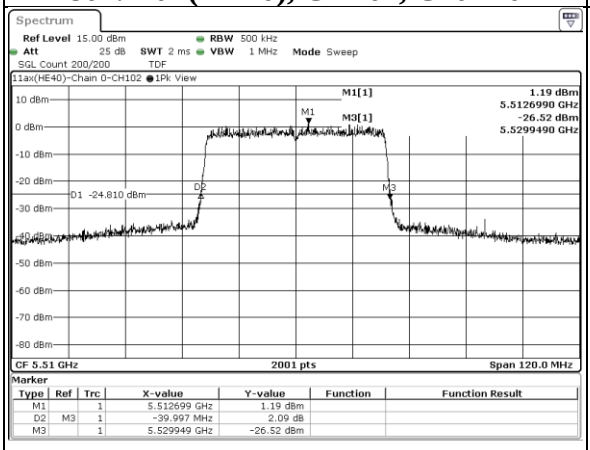
802.11ax(HE40), CH62, Chain 0



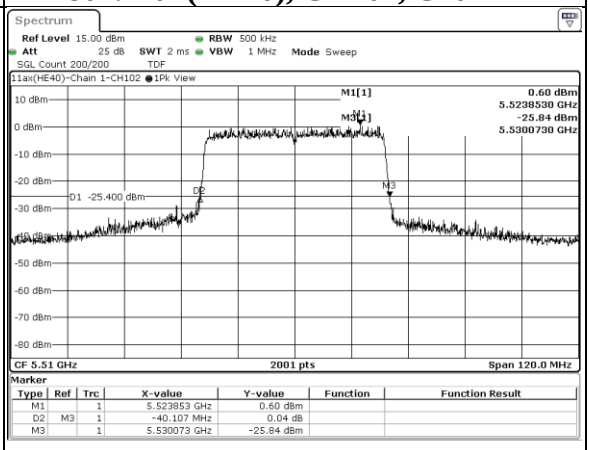
802.11ax(HE40), CH62, Chain 1



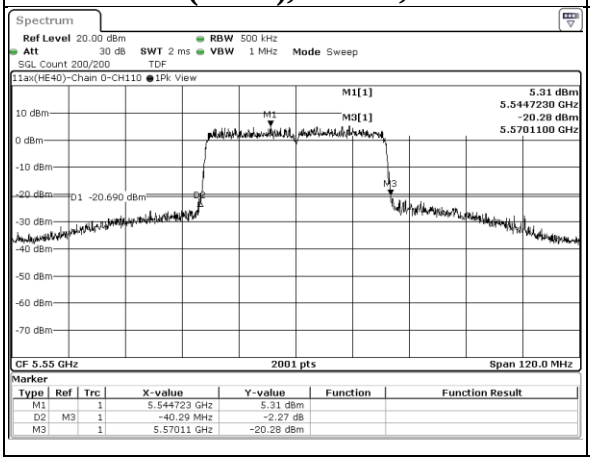
802.11ax(HE40), CH102, Chain 0



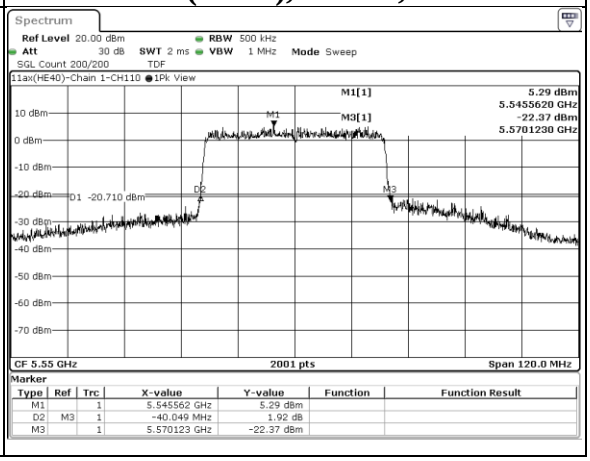
802.11ax(HE40), CH102, Chain 1



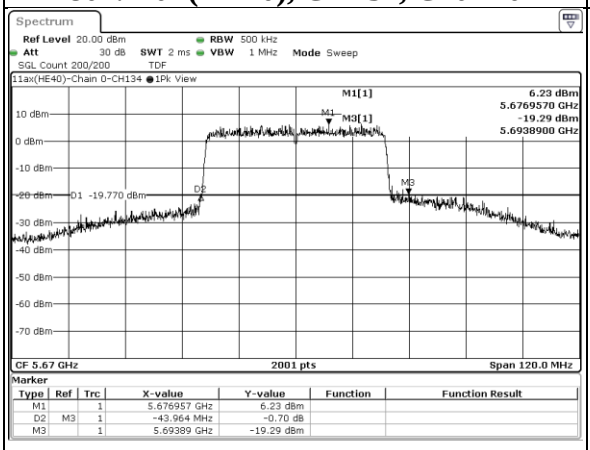
802.11ax(HE40), CH110, Chain 0



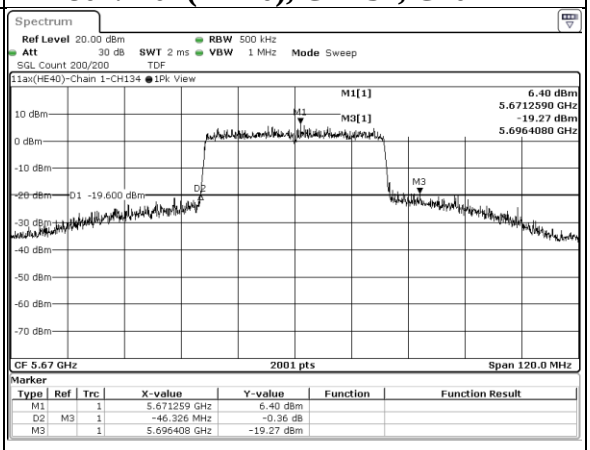
802.11ax(HE40), CH110, Chain 1



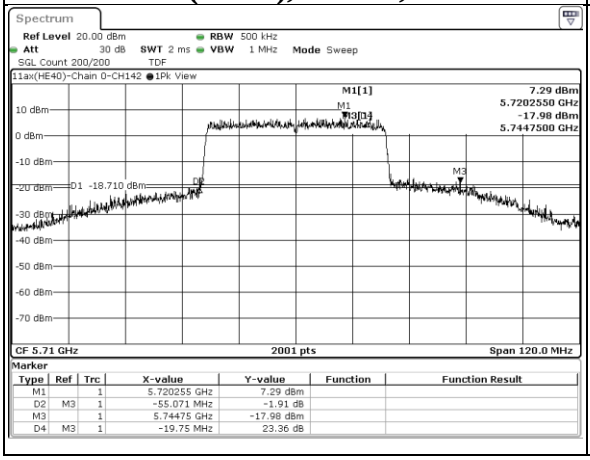
802.11ax(HE40), CH134, Chain 0



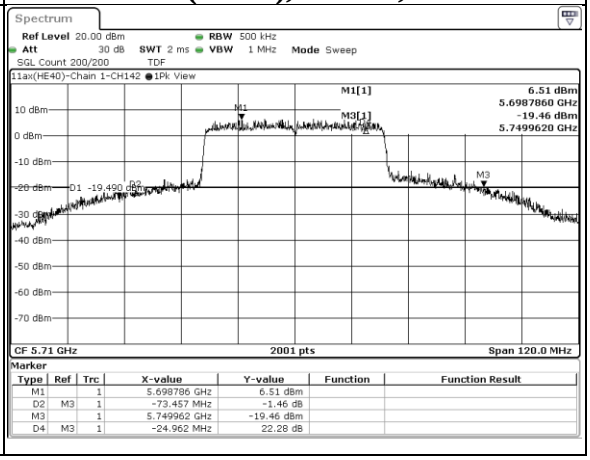
802.11ax(HE40), CH134, Chain 1



802.11ax(HE40), CH142, Chain 0

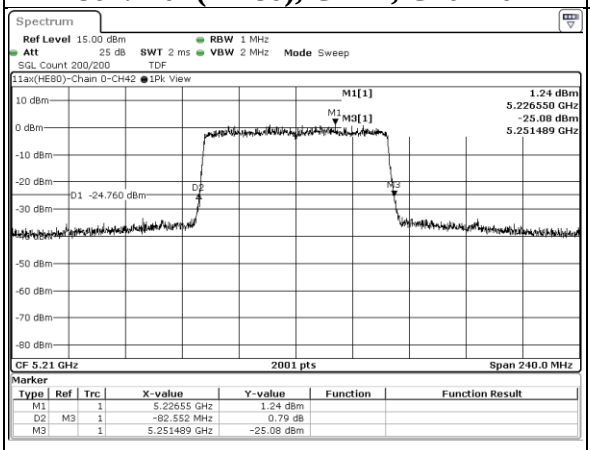


802.11ax(HE40), CH142, Chain 1

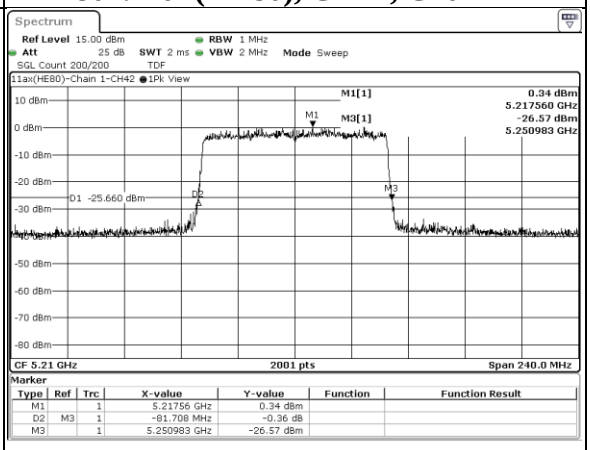


Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	42	5210	82.552	81.708	N/A	PASS
	58	5290	82.127	81.687	N/A	PASS
	106	5530	81.769	81.496	N/A	PASS
	122	5610	82.471	81.744	N/A	PASS
	138 (U-NII-2C)	5690	75.923	120.107	N/A	PASS
	138 (U-NII-2C+U-NII-3)	5690	117.393	171.756	N/A	PASS
	138 (U-NII-3)	5690	41.47	51.649	N/A	PASS

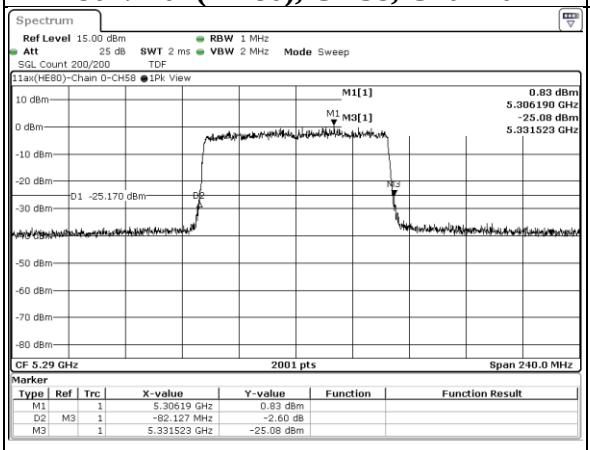
802.11ax(HE80), CH42, Chain 0



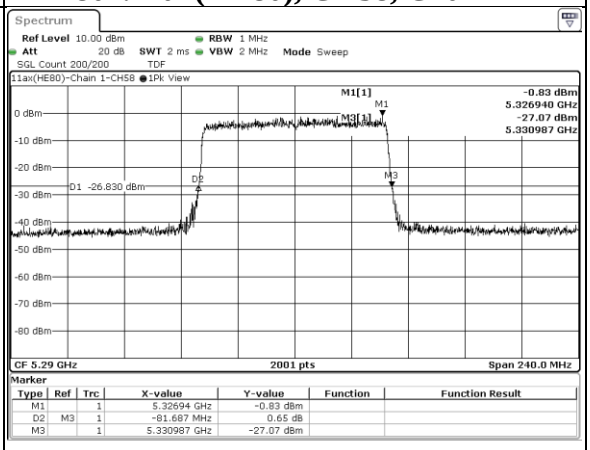
802.11ax(HE80), CH42, Chain 1



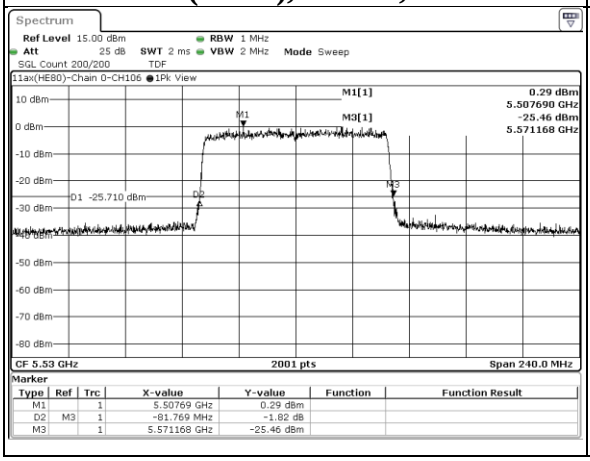
802.11ax(HE80), CH58, Chain 0



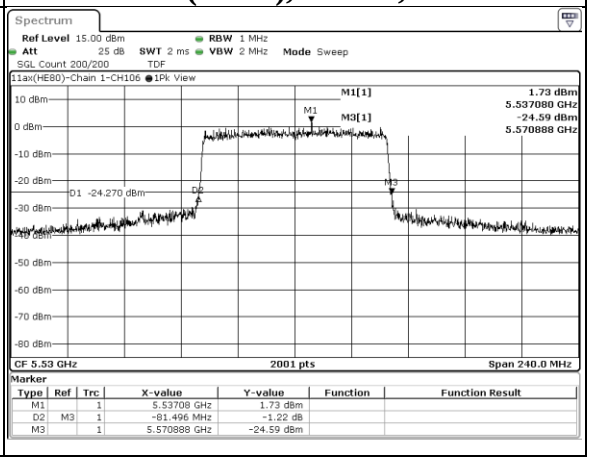
802.11ax(HE80), CH58, Chain 1



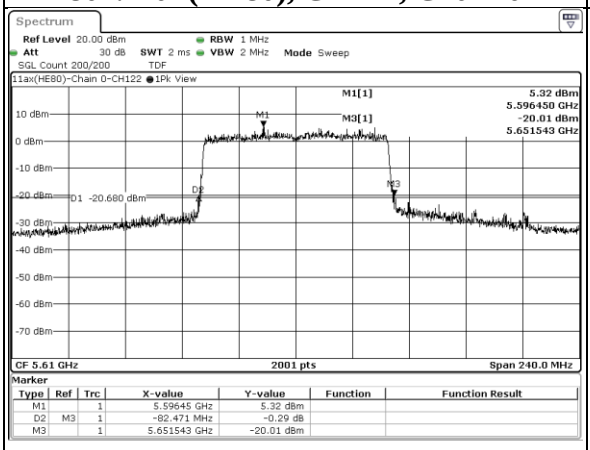
802.11ax(HE80), CH106, Chain 0



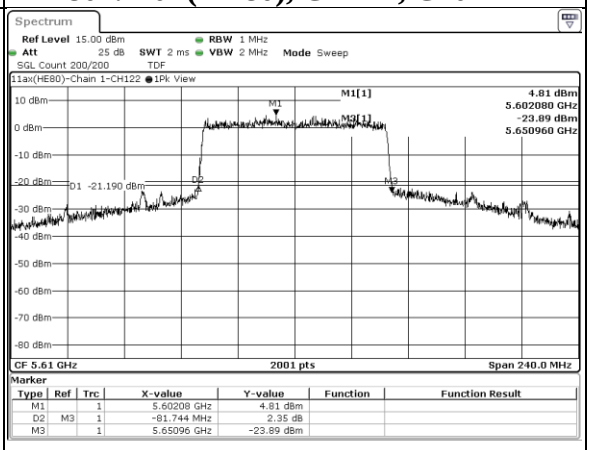
802.11ax(HE80), CH106, Chain 1



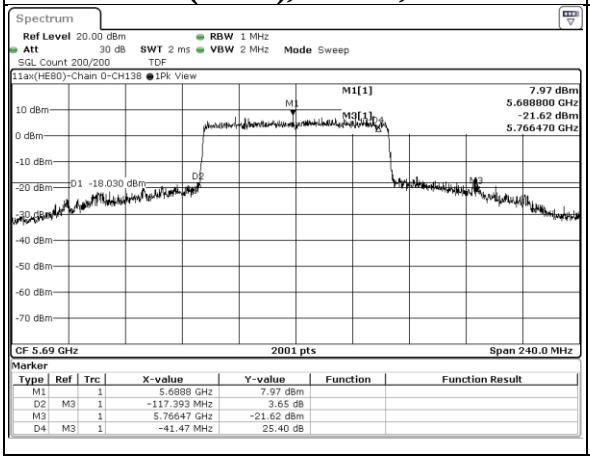
802.11ax(HE80), CH122, Chain 0



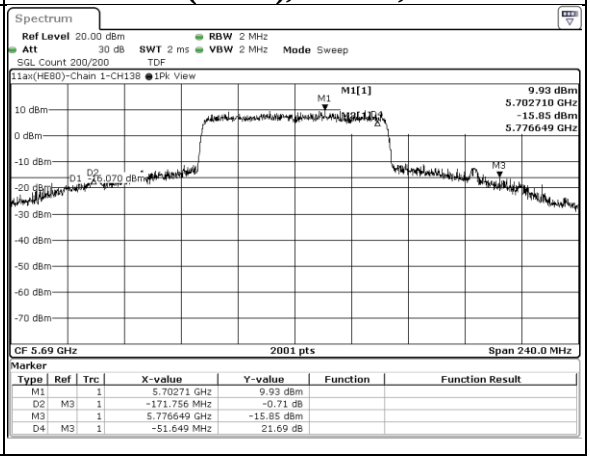
802.11ax(HE80), CH122, Chain 1



802.11ax(HE80), CH138, Chain 0



802.11ax(HE80), CH138, Chain 1

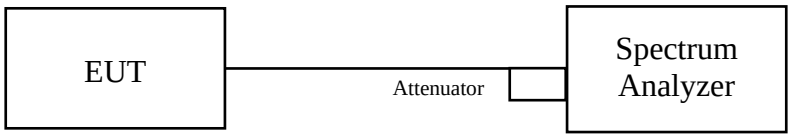


9.3. Occupied Bandwidth

Test procedure

a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f. Use the 99% power bandwidth function of the instrument (if available).
g. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test Setup

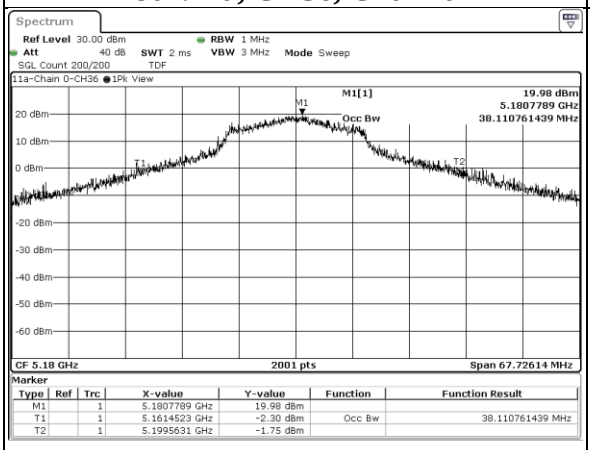


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

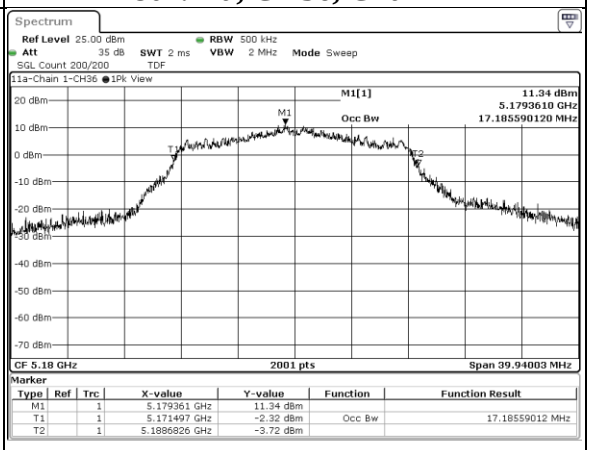
Test Data

Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	36	5180	38.111	17.186	N/A	PASS
	44	5220	17.6	17.299	N/A	PASS
	48	5240	17.51	17.214	N/A	PASS
	52	5260	38.234	18.048	N/A	PASS
	60	5300	17.343	17.377	N/A	PASS
	64	5320	17.166	16.95	N/A	PASS
	100	5500	17.185	17.033	N/A	PASS
	116	5580	18.147	18.78	N/A	PASS
	140	5700	17.385	17.333	N/A	PASS
	144 (U-NII-2C)	5720	13.646	13.809	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	17.392	18.092	N/A	PASS
	144 (U-NII-3)	5720	3.747	4.283	N/A	PASS
	149	5745	18.557	39.097	N/A	PASS
	157	5785	39.52	40.242	N/A	PASS
	165	5825	20.02	21.841	N/A	PASS

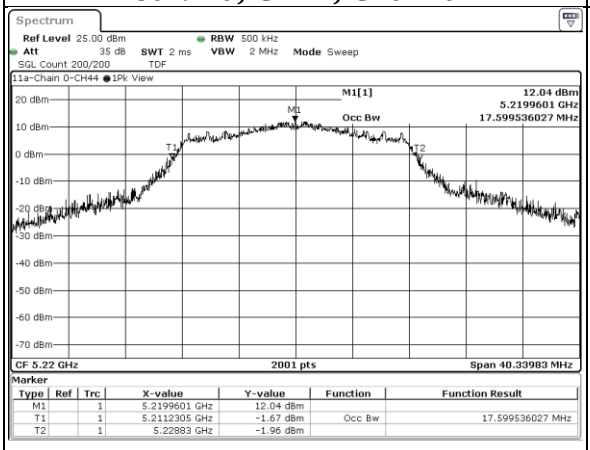
802.11a, CH36, Chain 0



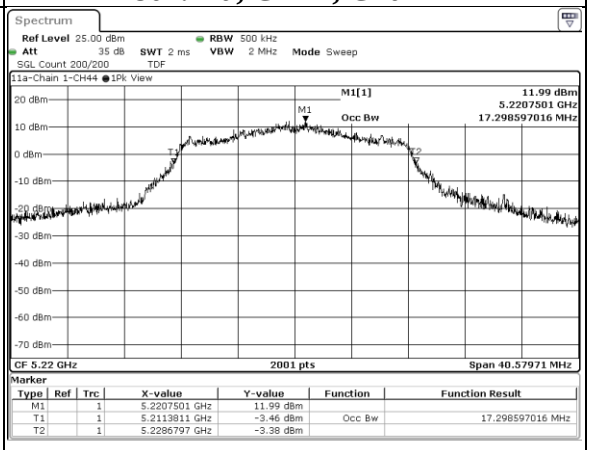
802.11a, CH36, Chain 1



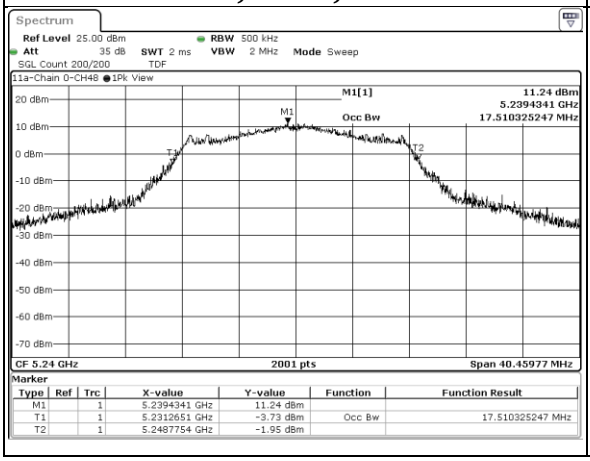
802.11a, CH44, Chain 0



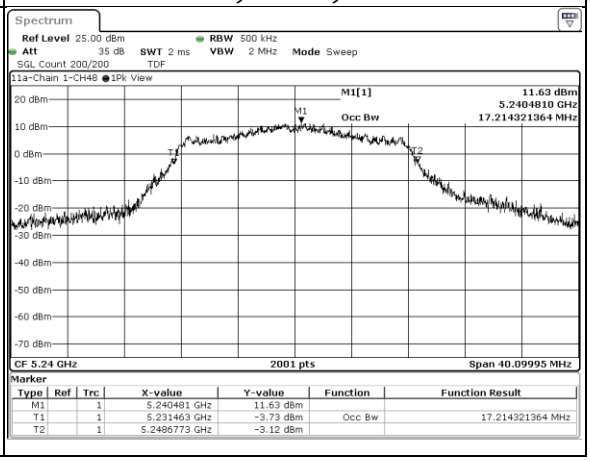
802.11a, CH44, Chain 1



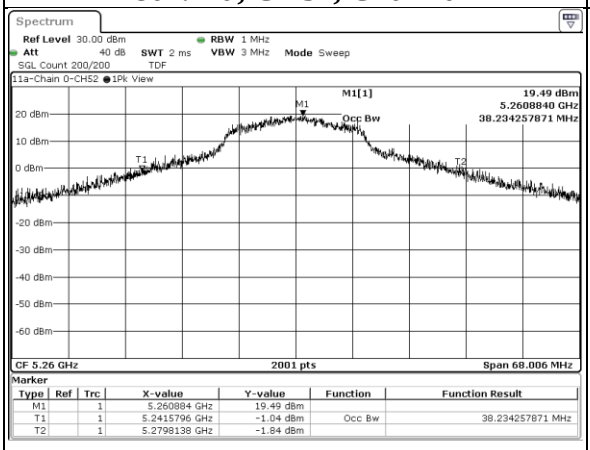
802.11a, CH48, Chain 0



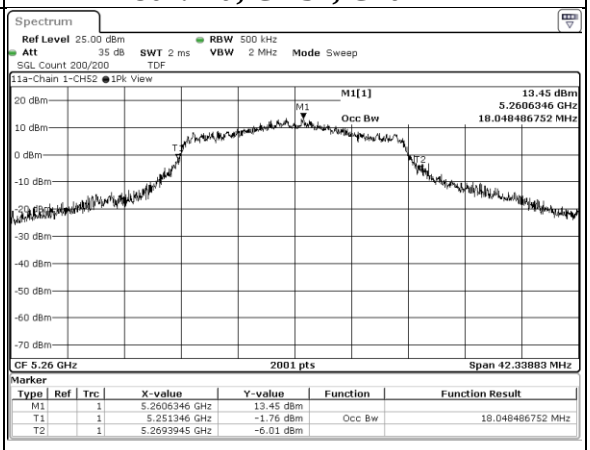
802.11a, CH48, Chain 1



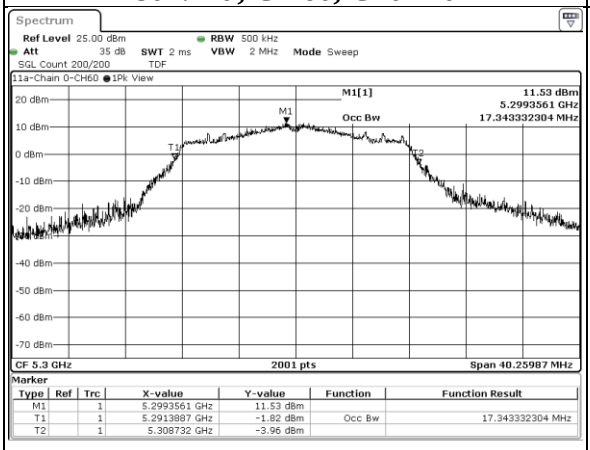
802.11a, CH52, Chain 0



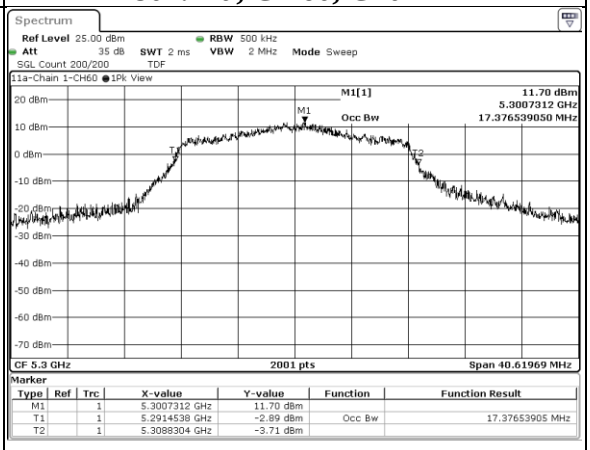
802.11a, CH52, Chain 1



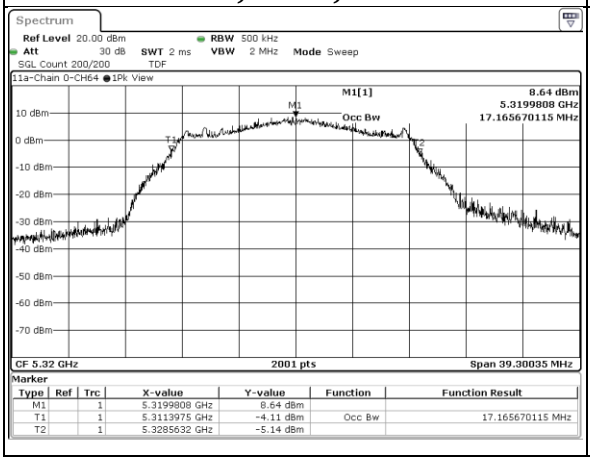
802.11a, CH60, Chain 0



802.11a, CH60, Chain 1



802.11a, CH64, Chain 0



802.11a, CH64, Chain 1