



Test report No. : 4790371368-US-R1-V0
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Issued date : 2022/11/9
FCC ID : RYK-WPEQ268AXB

RADIO TEST REPORT

Product : Wi-Fi 6E BT Half Min PCIe Module
Model Name : WPEQ-268AXI(BT)
Series Model : WPEQ-268AX(BT)
FCC ID : RYK-WPEQ268AXB
Test Regulation : FCC 47 CFR Part 15 Subpart E (Section 15.407)
Received Date : 2022/4/18
Test Date : 2022/4/29 ~ 2022/6/13
Issued Date : 2022/11/9

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



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Doc No: 17-EM-F0878 / 6.0



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REVISION HISTORY

Original Test Report No.: 4790371368-US-R1-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4790371368-US-R1-V0	2022/11/9	-	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: Wi-Fi 6E BT Half Min PCIe Module

BRAND: SparkLAN

MODEL: WPEQ-268AXI(BT)

SERIES MODEL: WPEQ-268AX(BT)

SAMPLE STAGE: Engineering Verification Test sample

DATE of TESTED: 2022/4/29 ~ 2022/6/13

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
Project Handler

Date : 2022/11/9

Approved and Authorized By:

Kent Liu
Senior Laboratory Engineer

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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	See Note 2

Note:

1. The Occupied Bandwidth was reference only.
2. The “Dynamic Frequency Selection measurement” was recorded in Report No.: 4790371368-US-R3-V0

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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.

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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

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6. Equipment under Test

6.1. Description of EUT

Product	Wi-Fi 6E BT Half Min PCIe Module	
Brand Name	SparkLAN	
Model Name	WPEQ-268AXI(BT)	
Series Model	WPEQ-268AX(BT)	
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	1 for 802.11ac (VHT160), 802.11ax (HE160)
		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), 1 for 802.11ac (VHT160), 802.11ax (HE160)
	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)

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Maximum Output Power	Non-Beamforming mode: 5180 ~ 5240 MHz: 20.15 dBm 5260 ~ 5320 MHz: 20.22 dBm 5500 ~ 5720 MHz: 21.99 dBm 5745 ~ 5825 MHz: 22.60 dBm
	Beamforming mode: 5180 ~ 5240 MHz: 19.95 dBm 5260 ~ 5320 MHz: 19.98 dBm 5500 ~ 5720 MHz: 21.33 dBm 5745 ~ 5825 MHz: 22.38 dBm
Normal Voltage	3.3 Vdc
Sample ID	4862912

Note:

- The models difference table as below:

Model	Difference
WPEQ-268AXI(BT)	Operating Temp -40~+75°C
WPEQ-268AX(BT)	Operating Temp -10~+65°C

- 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
802.11ac (VHT160)	2TX,2RX
802.11ax (HE20)	2TX,2RX
802.11ax (HE40)	2TX,2RX
802.11ax (HE80)	2TX,2RX
802.11ax (HE160)	2TX,2RX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40 / VHT80 / VHT160 and 802.11ax mode for HE20 / HE40 / HE80 / HE160, therefore investigated worst case to representative mode in test report.

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3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Antenna 1	SparkLAN	AD-506AX	-
Antenna 2	SparkLAN	AD-501AX	-
Antenna 3	SparkLAN	AD-312N	-
Antenna 4	SparkLAN	AD-509AX	-
Antenna 5	SparkLAN	AD-103AG	-
Antenna 6	SparkLAN	AD-302N	-
Antenna 7	SparkLAN	AD-303N	-
Antenna 8	SparkLAN	AD-315N	-
Antenna 9	SparkLAN	AD-507AX	-
Antenna 10	SparkLAN	AD-508AX	-
I-PEX Cable	SparkLAN	N/A	RP-SMA to I-PEX

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

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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

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160):

Channel	Frequency
50	5250MHz

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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	-	-

1 channels are provided for 802.11ac (VHT160), 802.11ax (HE160):

Channel	Frequency
114	5570MHz



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	2022/04/29~ 2022/06/13	Mike Cai
Radiated Spurious Emission	966-2	23~26°C/ 60~65%RH	3.3Vdc	2022/04/29~ 2022/05/24	Mike Cai
AC power Line Conducted Emission	SR1	23~26°C/ 60~65%RH	120Vac/60Hz	2022/05/24~ 2022/05/24	Mike Cai

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).

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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-506AX	Dipole	2400~2483	2.65	I-PEX
					5150~5250	4.35	
					5250~5350	4.35	
					5470~5725	4.35	
					5725~5850	4.81	
					5925~6425	4.98	
					6425~6525	4.85	
					6525~6875	4.79	
2	Chain (0)+(1)	SparkLAN	AD-501AX	Dipole	2400~2483	3.7	RP-SMA
					5150~5850	5	
					5925~7125	5	
3	Chain (0)+(1)	SparkLAN	AD-312N	Dipole	2400~2483	2.65	I-PEX
					5150~5875	4.86	
4	Chain (0)+(1)	SparkLAN	AD-509AX	Dipole	2400~2483	3.7	I-PEX
					5150~5850	5	
					5925~7125	5	
5	Chain (0)+(1)	SparkLAN	AD-103AG	Dipole	2400~2483	2.02	RP-SMA
					5150~5875	2.03	
6	Chain (0)+(1)	SparkLAN	AD-302N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	2.87	
7	Chain (0)+(1)	SparkLAN	AD-303N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	3.45	
8	Chain (0)+(1)	SparkLAN	AD-315N	Dipole	2400~2483	3	I-PEX
					5150~5875	5	
9	Chain (0)+(1)	SparkLAN	AD-507AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6525~6875	4.94	
10	Chain (0)+(1)	SparkLAN	AD-508AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6525~6875	4.94	
					6875~7125	4.94	

- Note: 1. The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.
2. For above antenna connector type: RP-SMA need to be combined with I-PEX cable.

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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.
- For AC power line conducted emissions, the pre-scan has been determined by AC power 120Vac/60Hz (worst case)
- The antennas AD-501AX has the highest gain, the following conducted tests are all carried out using this antenna.
- The antennas AD-501AX/ AD-509AX has the same type and same gain, therefore, the highest fundamental was determined antenna AD-501AX worst-case, the Antenna AD-501AX was selected for the final radiated testing.
- 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).

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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	HE0	
	802.11ax40			38 to 46	38, 46	HE0	
	802.11ax80			42	42	HE0	
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6Mbps	
	802.11ax20		OFDMA	52 to 64	52, 60, 64	HE0	
	802.11ax40			54 to 62	54, 62	HE0	
	802.11ax80			58	58	HE0	
	802.11ax160	50		50	HE0		
	Radiated Emissions (Above 1GHz)	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6Mbps
		802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	HE0
		802.11ax40			102 to 142	102, 110, 134, 142	HE0
		802.11ax80			102 to 138	106, 122, 138	HE0
		802.11ax160			114	114	HE0
	Radiated Emissions (Above 1GHz)	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6Mbps
		802.11ax20		OFDMA	149 to 165	149, 157, 165	HE0
802.11ax40		151 to 159			151, 159	HE0	
802.11ax80		155			155	HE0	
Radiated Emissions (Below 1GHz)	802.11a	5745-5825	OFDM	149 to 165	149	6Mbps	
AC Power Line Conducted Emission	802.11a	5745-5825	OFDM	149 to 165	149	6Mbps	

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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	HE0
	802.11ax40			38 to 46	38, 46	HE0
	802.11ax80			42	42	HE0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6Mbps
	802.11ax20		OFDMA	52 to 64	52, 60, 64	HE0
	802.11ax40			54 to 62	54, 62	HE0
	802.11ax80			58	58	HE0
	802.11ax160			50	50	HE0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6Mbps
	802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	HE0
	802.11ax40			102 to 142	102, 110, 134, 142	HE0
	802.11ax80			102 to 138	106, 122, 138	HE0
	802.11ax160			114	114	HE0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6Mbps
	802.11ax20		OFDMA	149 to 165	149, 157, 165	HE0
	802.11ax40			151 to 159	151, 159	HE0
	802.11ax80			155	155	HE0

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Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Conducted Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6Mbps
	802.11ax20		OFDMA	36 to 48	36, 44, 48	HE0
	802.11ax40			38 to 46	38, 46	HE0
	802.11ax80			42	42	HE0
	802.11a	5260-5320		OFDM	52 to 64	52, 60, 64
	802.11ax20		OFDMA	52 to 64	52, 60, 64	HE0
	802.11ax40			54 to 62	54, 62	HE0
	802.11ax80			58	58	HE0
	802.11ax160			50	50	HE0
	802.11a	5500-5720		OFDM	100 to 144	100, 116, 140, 144
	802.11ax20		OFDMA	100 to 144	100, 116, 140, 144	HE0
	802.11ax40			102 to 142	102, 110, 134, 142	HE0
	802.11ax80			102 to 138	106, 122, 138	HE0
	802.11ax160			114	114	HE0
	802.11a	5745-5825		OFDM	149 to 165	149, 157, 165
	802.11ax20		OFDMA	149 to 165	149, 157, 165	HE0
802.11ax40	151 to 159			151, 159	HE0	
802.11ax80	155			155	HE0	
Conducted Emissions (Below 1GHz)	802.11a	5745-5825		OFDM	149 to 165	149

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Beamforming mode:

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Antenna Port Conducted Measurement	802.11ax20	5180-5240	OFDMA	36 to 48	36, 44, 48	HE0
	802.11ax40			38 to 46	38, 46	HE0
	802.11ax80			42	42	HE0
	802.11ax20	5260-5320	OFDMA	52 to 64	52, 60, 64	HE0
	802.11ax40			54 to 62	54, 62	HE0
	802.11ax80			58	58	HE0
	802.11ax160			50	50	HE0
	802.11ax20	5500-5720	OFDMA	100 to 144	100, 116, 140, 144	HE0
	802.11ax40			102 to 142	102, 110, 134, 142	HE0
	802.11ax80			102 to 138	106, 122, 138	HE0
	802.11ax160			114	114	HE0
	802.11ax20	5745-5825	OFDMA	149 to 165	149, 157, 165	HE0
	802.11ax40			151 to 159	151, 159	HE0
	802.11ax80			155	155	HE0

* Note: The worse spurious emissions test and maximum output power was found in Non-Beamforming mode. Therefore, only the Beamforming mode test data of the RF output power were recorded in this report.

Simultaneously transmission condition:

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	BT-GFSK	WLAN (5GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

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6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11a	1.960	2.000	0.98	N/A	10Hz
802.11ax(HE20)	5.348	5.377	0.995	N/A	10Hz
802.11ax(HE40)	4.785	4.837	0.989	N/A	10Hz
802.11ax(HE80)	2.515	2.570	0.979	0.09	510Hz
802.11ax(HE160)	2.190	2.300	0.952	0.21	510Hz

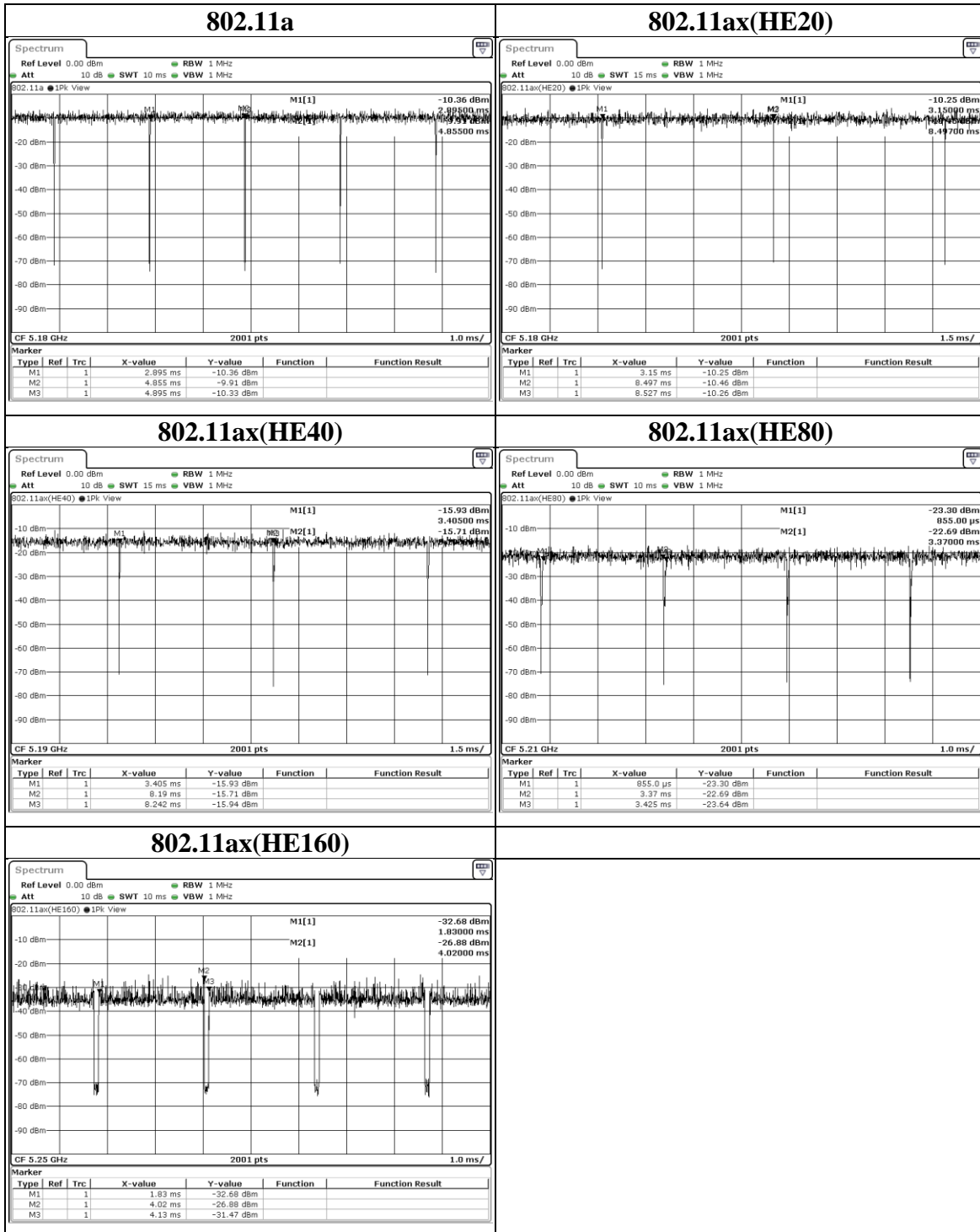
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7. Test Equipment

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	2021/6/8	2022/6/7
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2022/2/16	2023/2/15
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2021/5/19	2022/5/18
				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

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FCC ID : RYK-WPEQ268AXB

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	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20 020A300-1	2022/3/16	2023/3/15

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF Conducted Test Tools	ver 2.4.0.620b
AC power Line Conducted Emission	EZ_EMG	UL-3A1.2

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8. Description of Test Setup

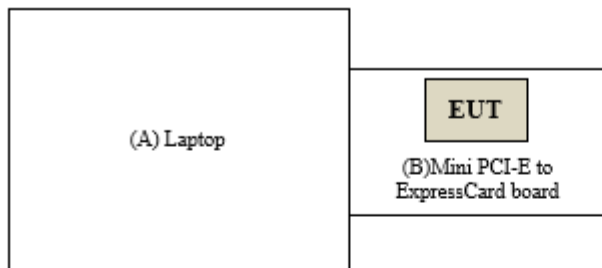
Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	Dell	Latitude E6430	2MMN3X1	Provide by lab
B	Mini PCI-E to ExpressCard board	N/A	N/A	N/A	Provide by lab

Test Setup

Controlled using a bespoke application (QSPR_Version 5.0-00197) 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



Under Table

Remote Site

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9. Test Results

9.1. 6dB Bandwidth

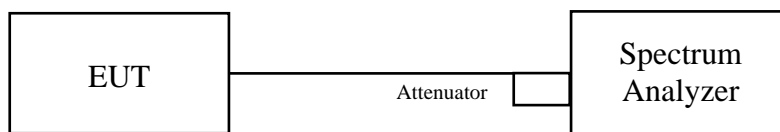
Requirements

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

Test procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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.

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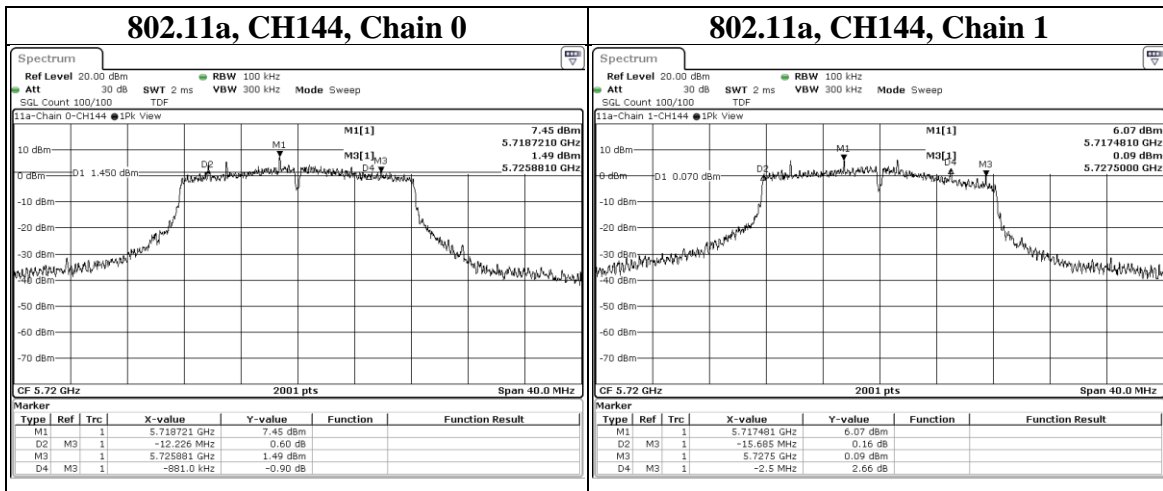
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Test Data

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	144 (U-NII-2C)	5720	11.345	13.185	0.5	Pass
	144 (U-NII-2C+U-NII-3)	5720	12.226	15.685	0.5	Pass
	144 (U-NII-3)	5720	0.881	2.5	0.5	Pass
	149	5745	14.427	15.693	0.5	Pass
	157	5785	12.549	15.036	0.5	Pass
	165	5825	15.459	12.787	0.5	Pass



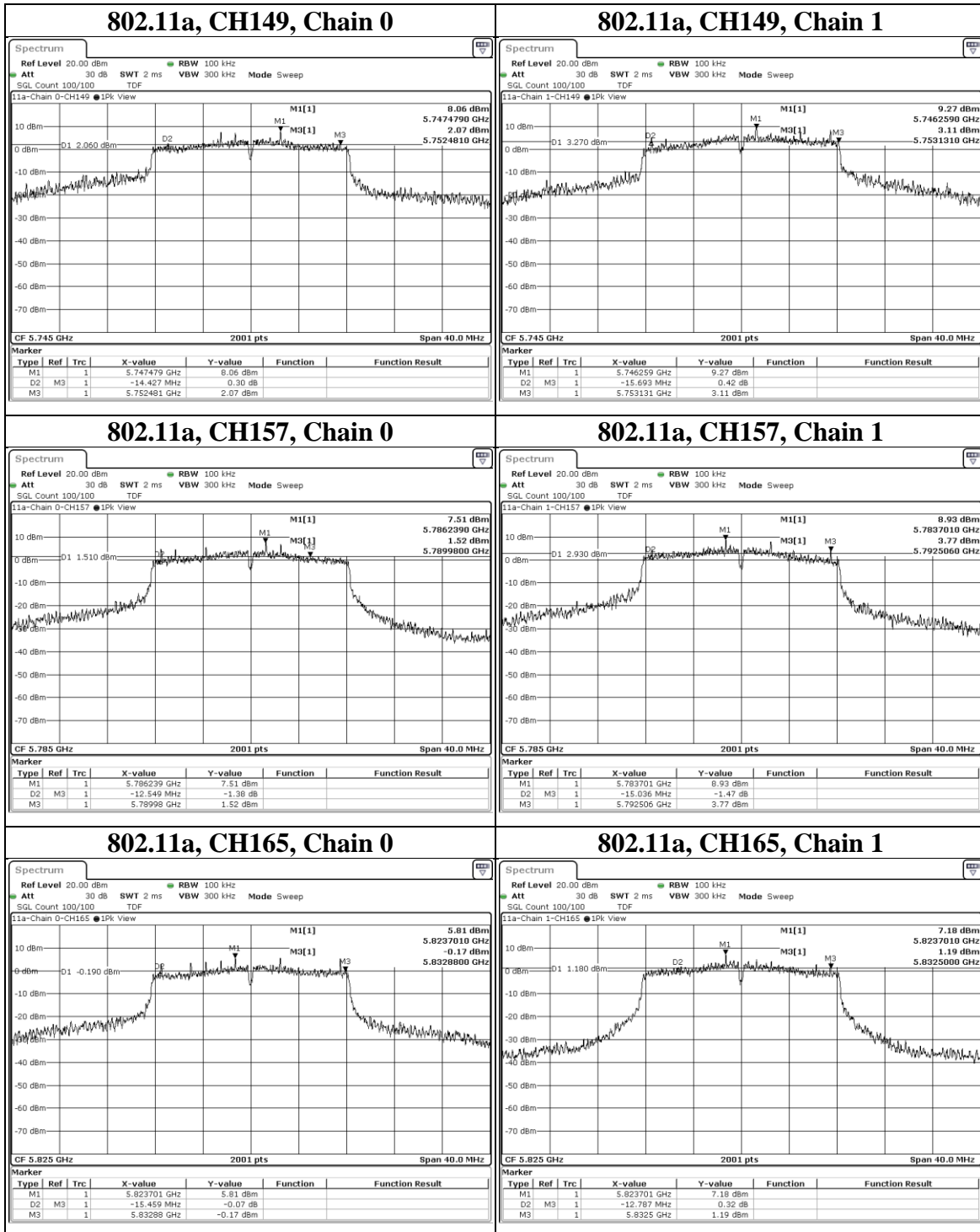
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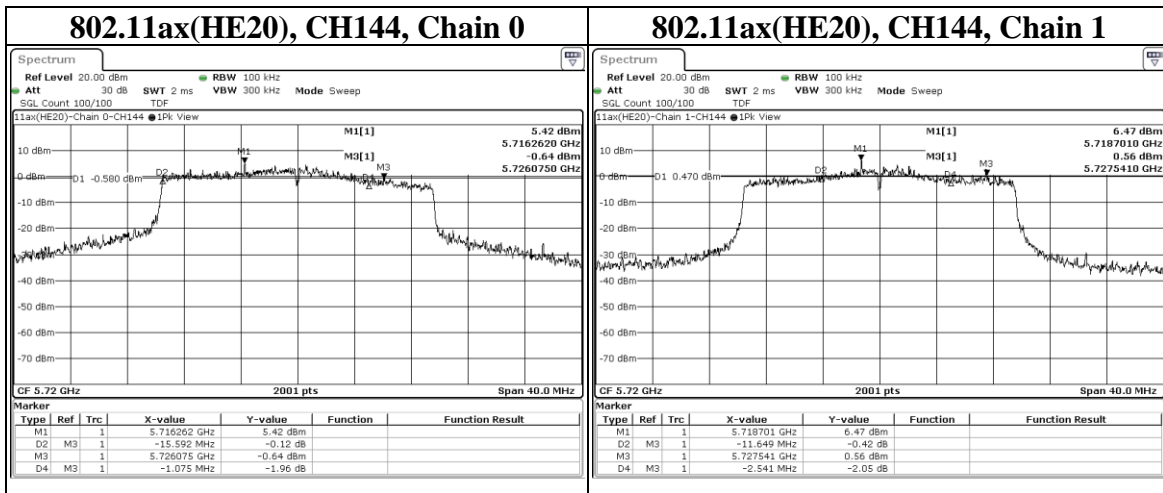
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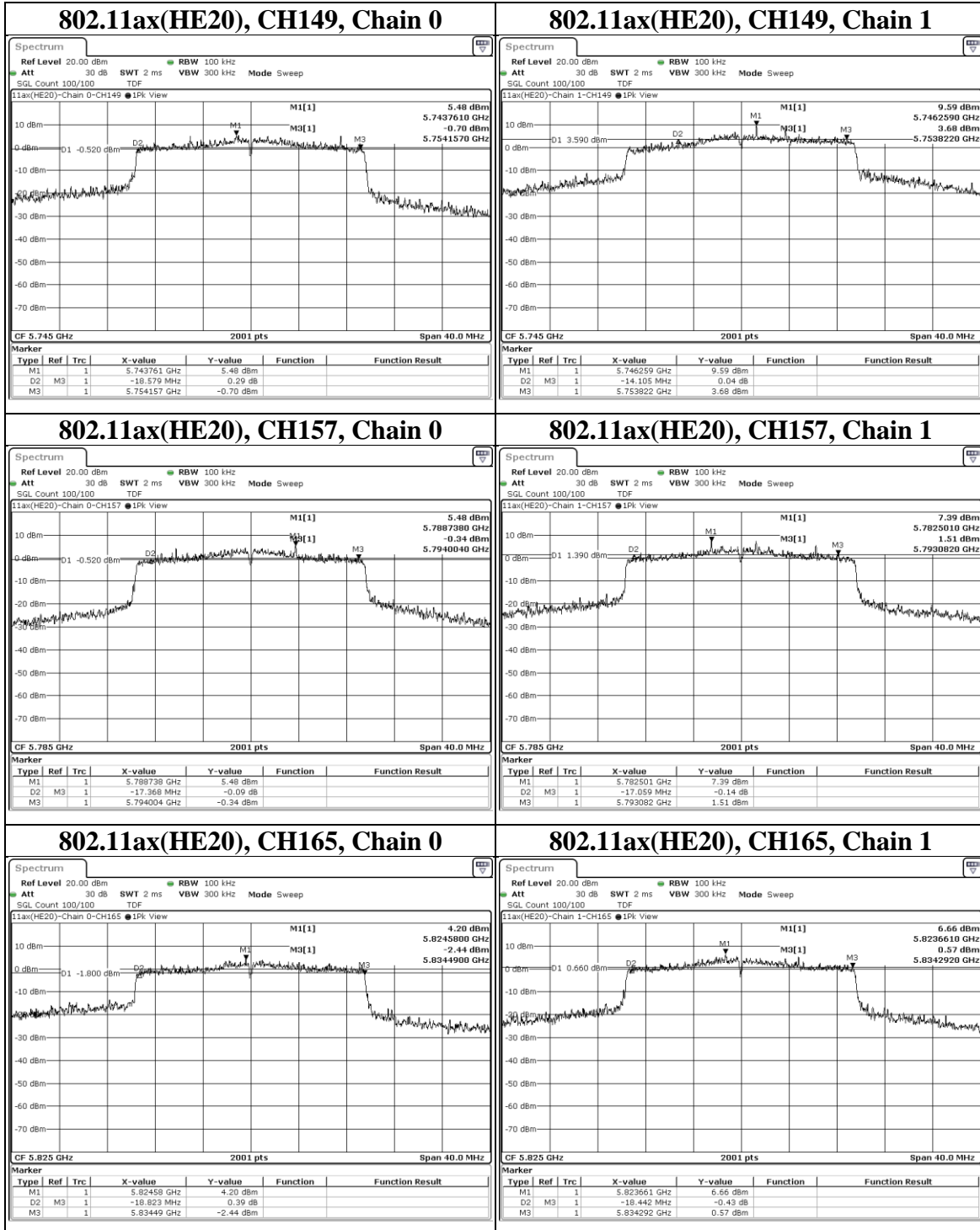
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Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	144 (U-NII-2C)	5720	14.517	9.108	0.5	Pass
	144 (U-NII-2C+U-NII-3)	5720	15.592	11.649	0.5	Pass
	144 (U-NII-3)	5720	1.075	2.541	0.5	Pass
	149	5745	18.579	14.105	0.5	Pass
	157	5785	17.368	17.059	0.5	Pass
	165	5825	18.823	18.442	0.5	Pass





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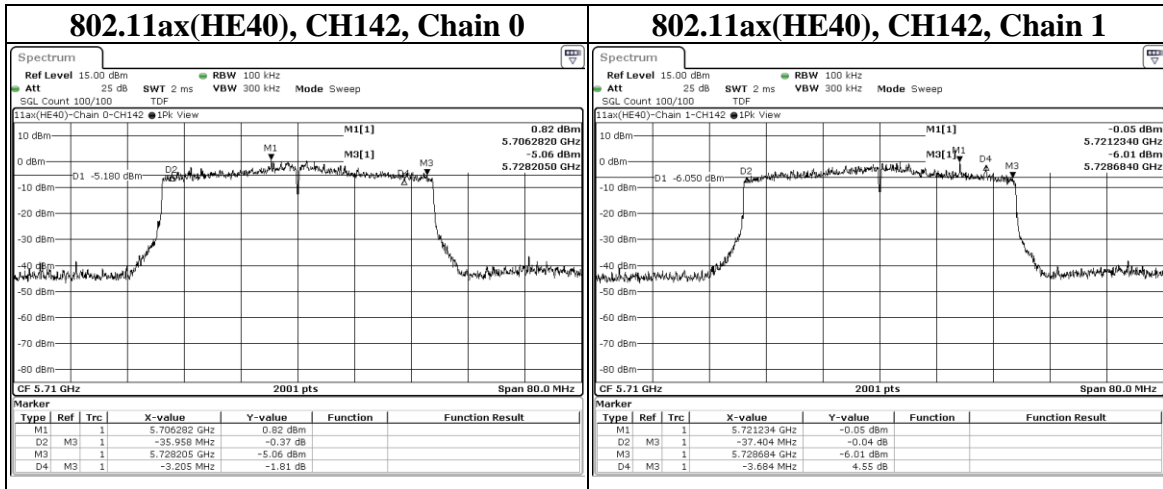
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Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	142 (U-NII-2C)	5710	32.753	33.72	0.5	Pass
	142 (U-NII-2C+U-NII-3)	5710	35.958	37.404	0.5	Pass
	142 (U-NII-3)	5710	3.205	3.684	0.5	Pass
	151	5755	38.03	24.569	0.5	Pass
	159	5795	30.364	25.533	0.5	Pass

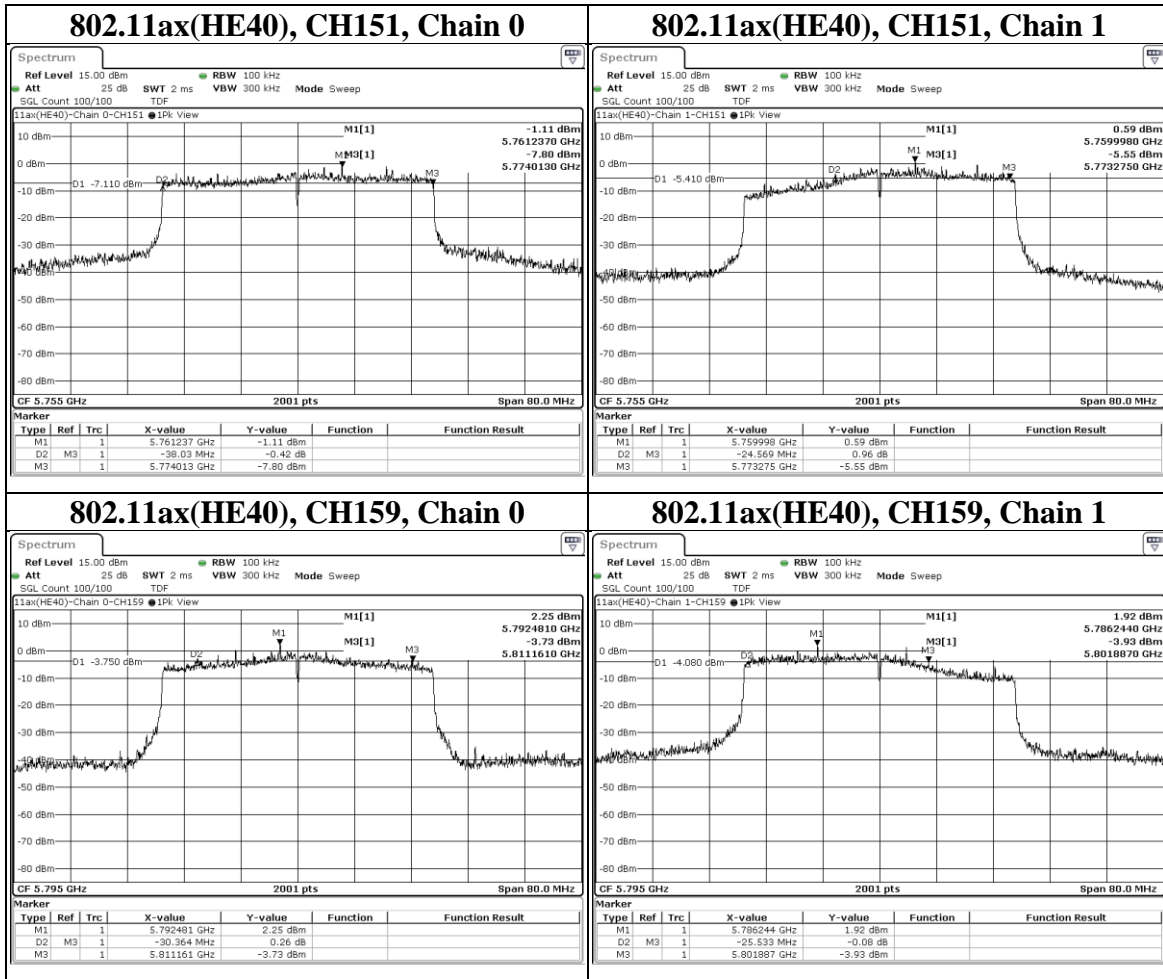


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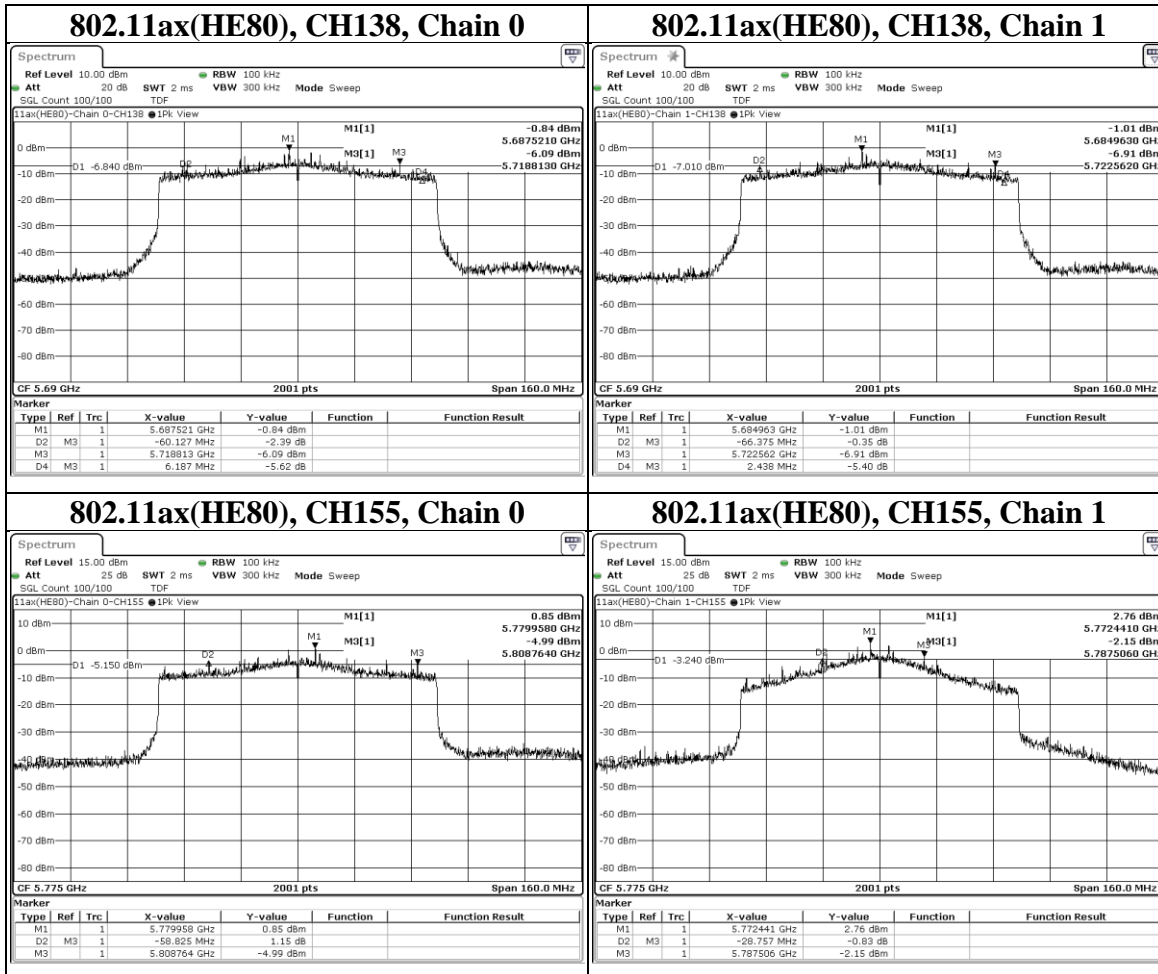
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Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	138 (U-NII-2C)	5690	66.314	68.813	0.5	Pass
	138 (U-NII-2C+U-NII-3)	5690	60.127	66.375	0.5	Pass
	138 (U-NII-3)	5690	6.187	2.438	0.5	Pass
	155	5775	58.825	28.757	0.5	Pass



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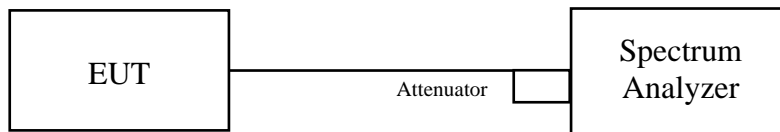


9.2. 26dB Bandwidth

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.

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Test Data

Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	36	5180	18.809	18.628	N/A	Pass
	44	5220	19.683	19.02	N/A	Pass
	48	5240	19.913	19.195	N/A	Pass
	52	5260	18.8	19.5	N/A	Pass
	60	5300	19.891	28.971	N/A	Pass
	64	5320	18.983	18.625	N/A	Pass
	100	5500	18.638	19.321	N/A	Pass
	116	5580	18.914	22.762	N/A	Pass
	140	5700	18.922	18.819	N/A	Pass
	144 (U-NII-2C)	5720	15.23	15.626	N/A	Pass
	144 (U-NII-2C+U-NII-3)	5720	19.701	19.866	N/A	Pass
	144 (U-NII-3)	5720	4.471	4.24	N/A	Pass

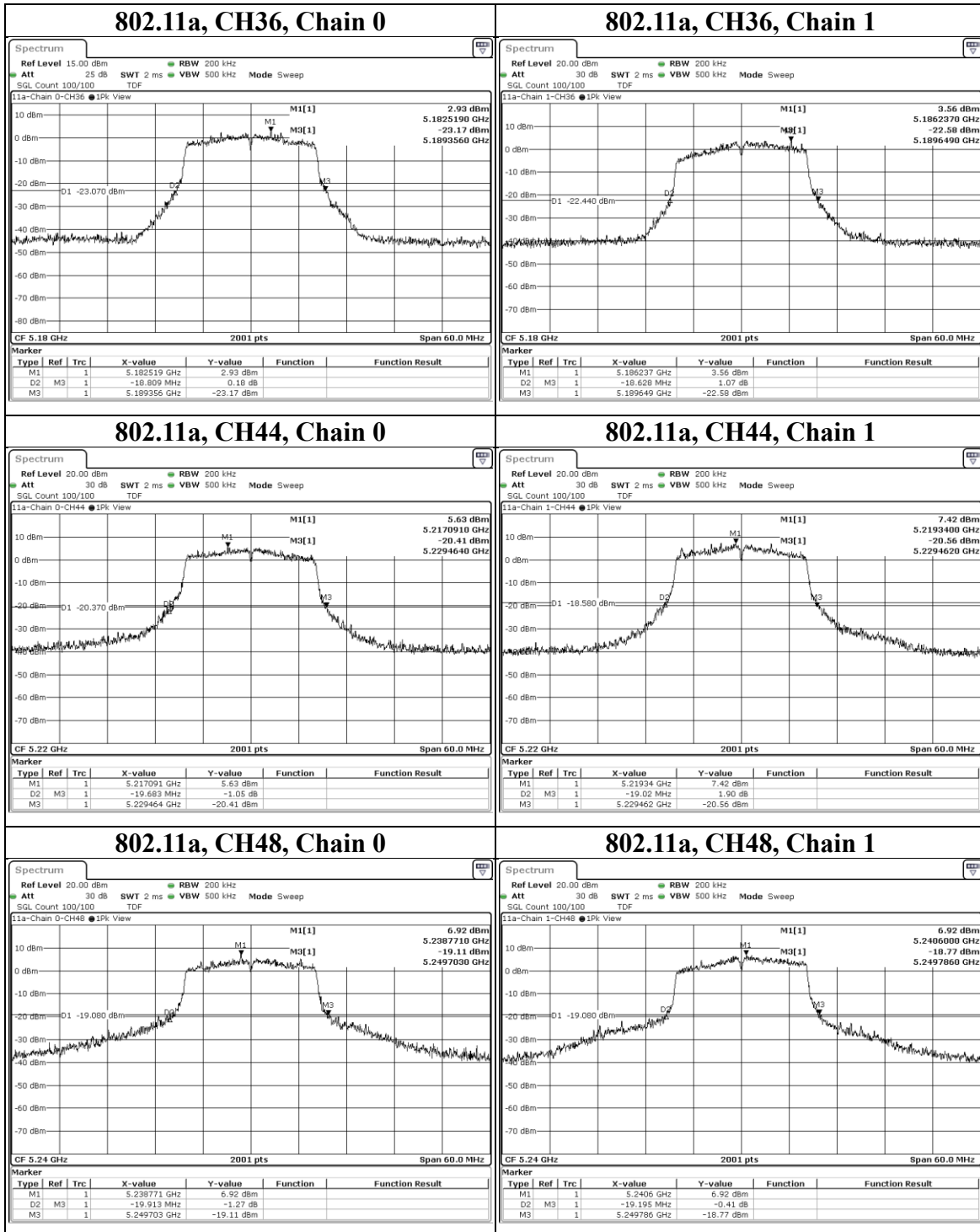
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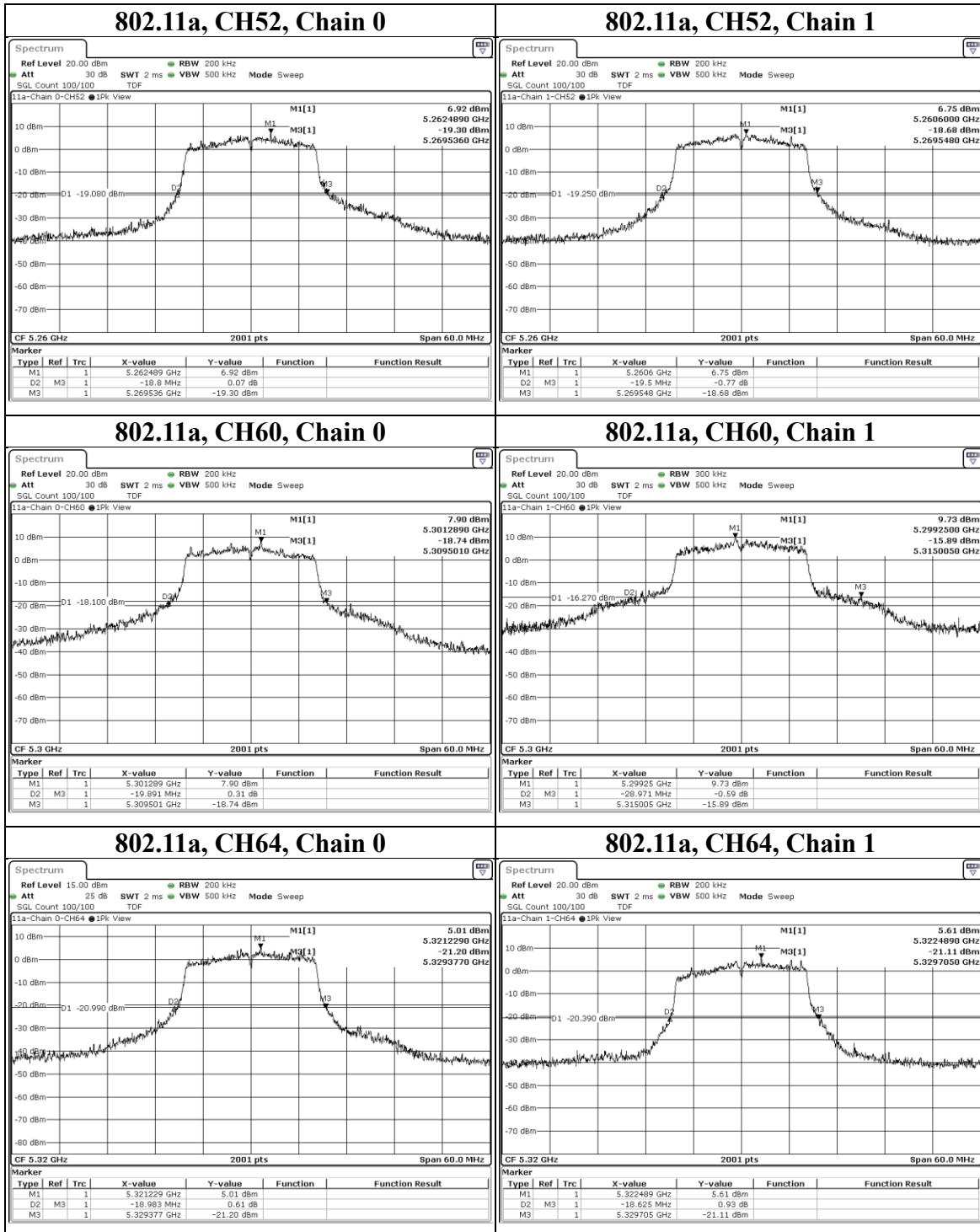


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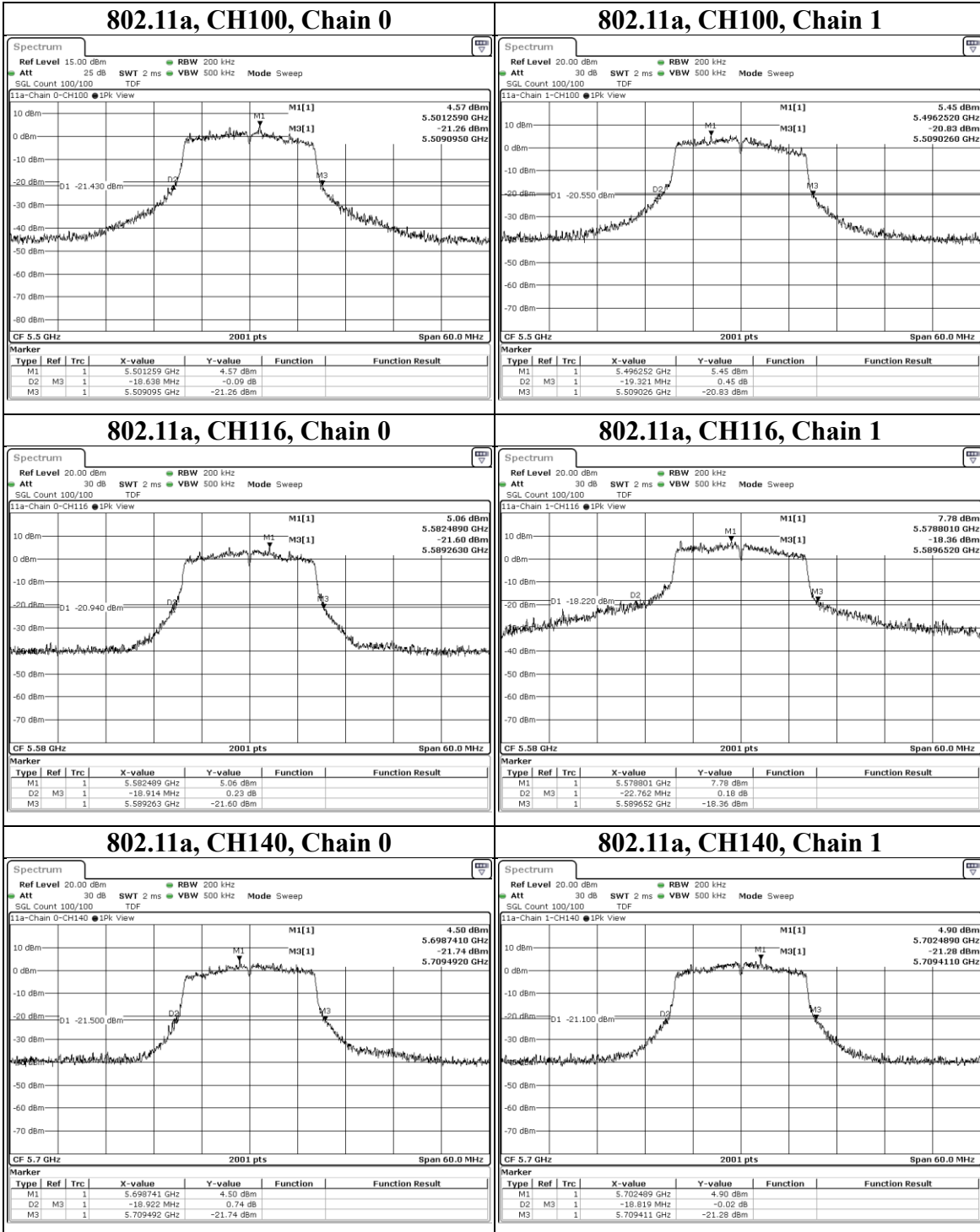
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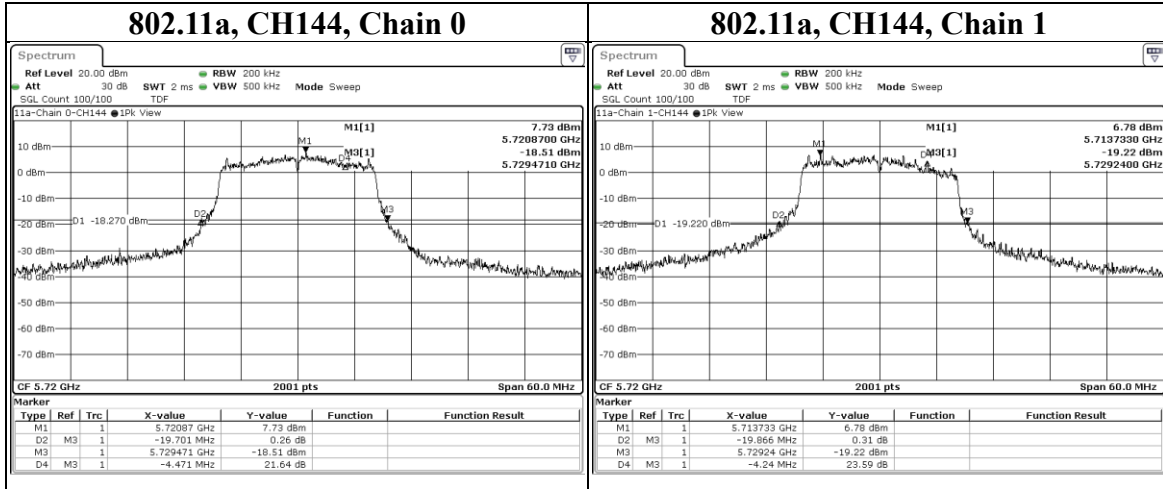


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Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	36	5180	20.405	20.282	N/A	Pass
	44	5220	20.782	27.823	N/A	Pass
	48	5240	20.801	20.692	N/A	Pass
	52	5260	20.253	21.17	N/A	Pass
	60	5300	20.533	24.339	N/A	Pass
	64	5320	20.962	20.289	N/A	Pass
	100	5500	20.411	20.676	N/A	Pass
	116	5580	20.496	26.789	N/A	Pass
	140	5700	20.29	20.541	N/A	Pass
	144 (U-NII-2C)	5720	17.113	15.329	N/A	Pass
	144 (U-NII-2C+U-NII-3)	5720	22.509	20.451	N/A	Pass
	144 (U-NII-3)	5720	5.396	5.122	N/A	Pass

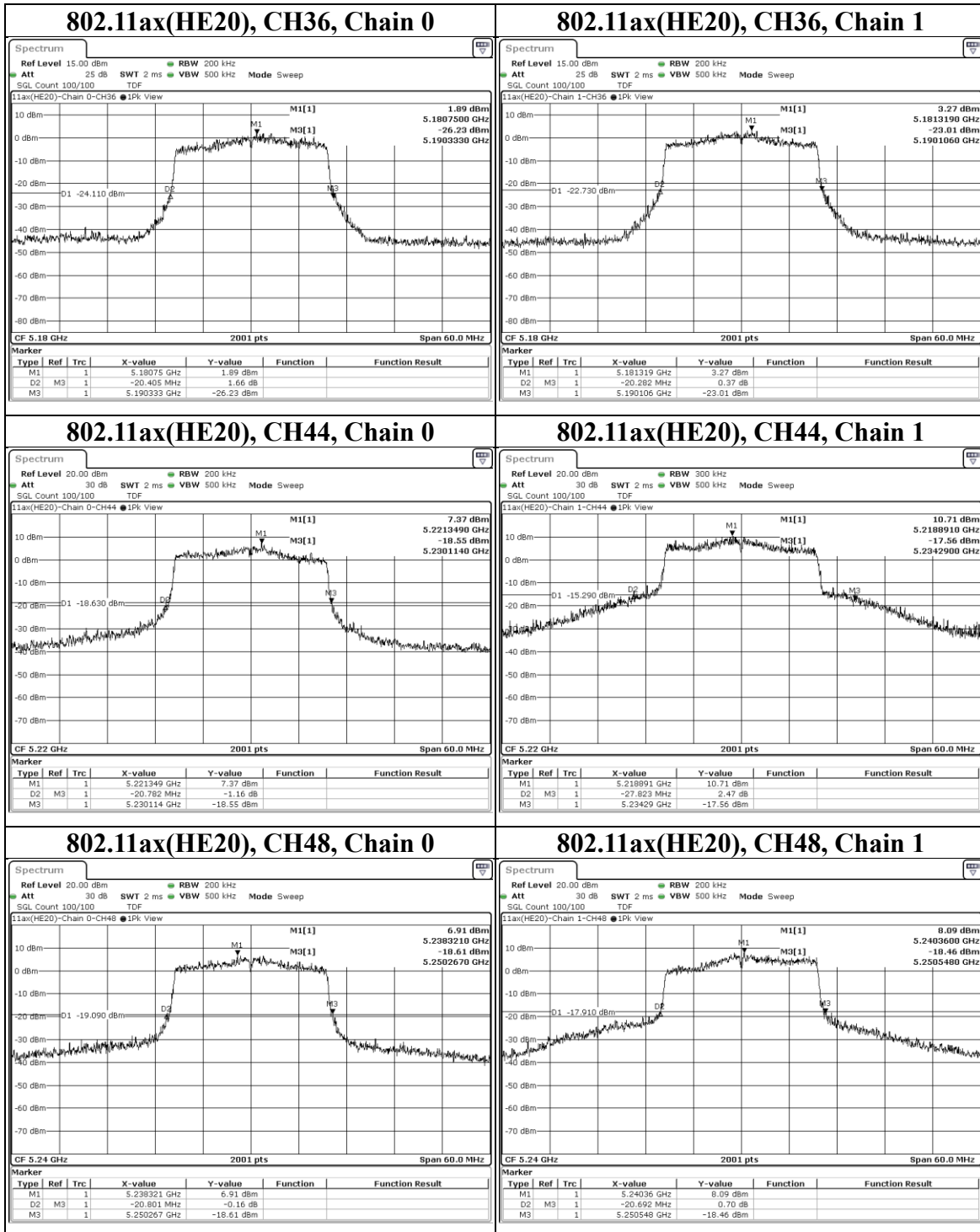
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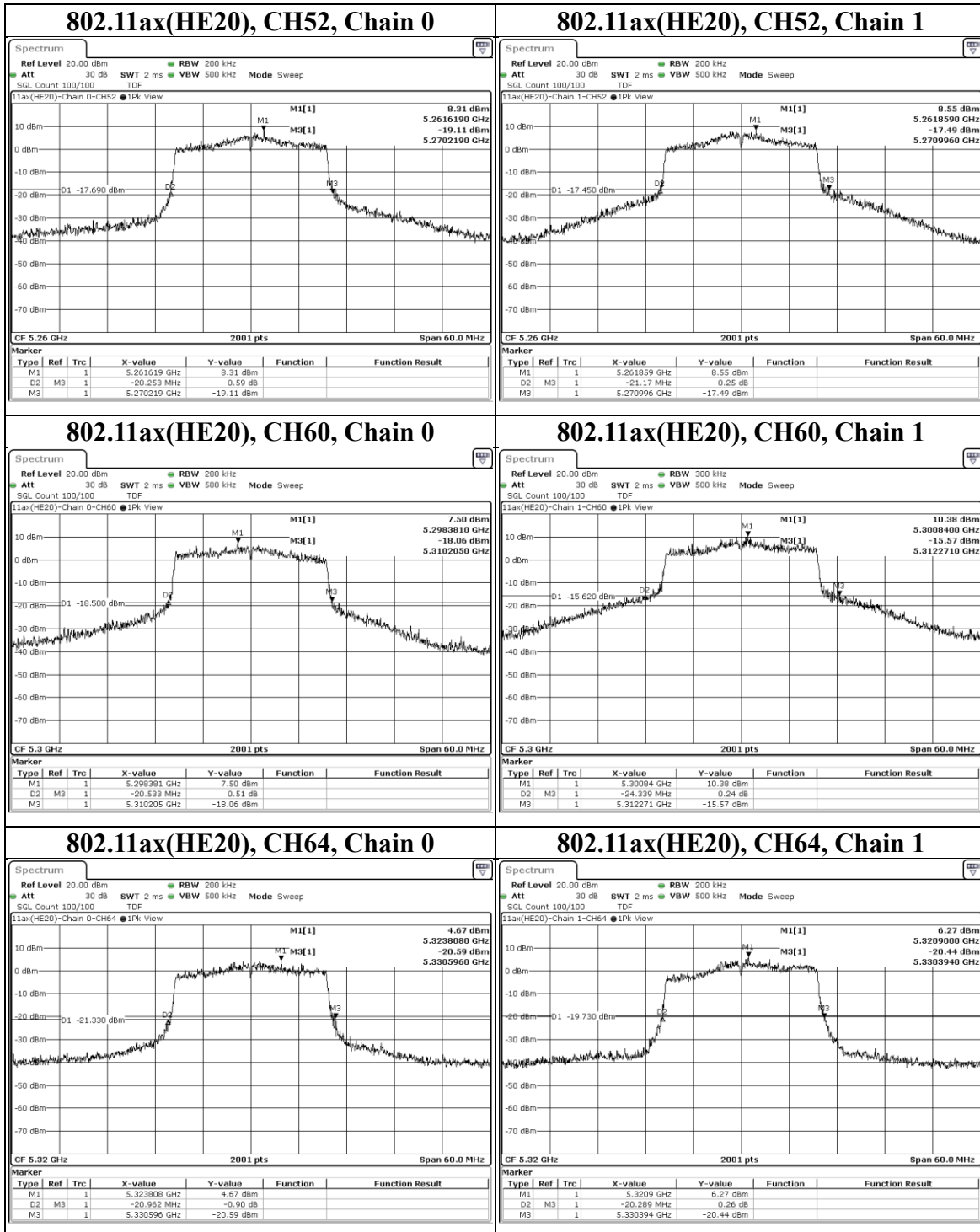


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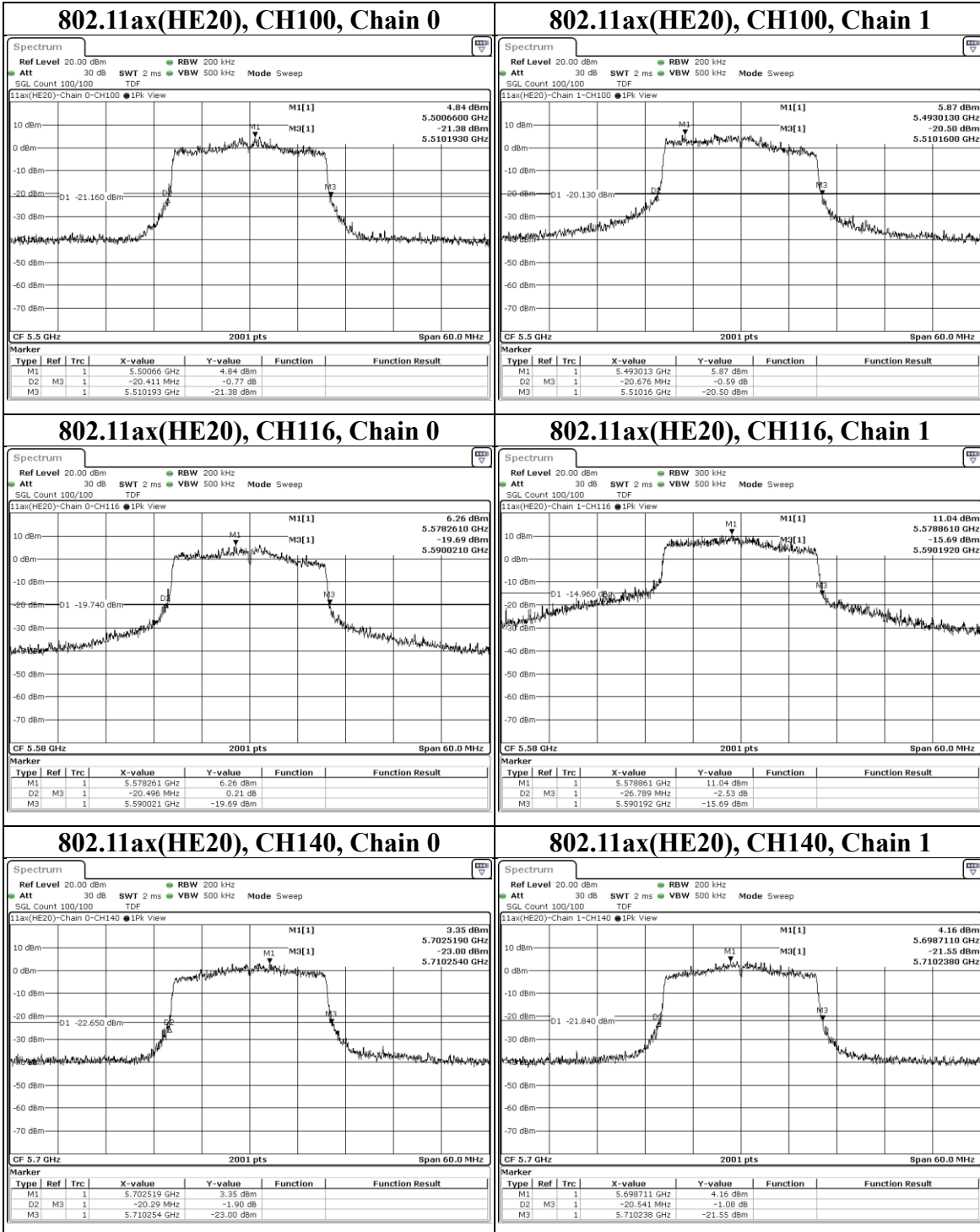
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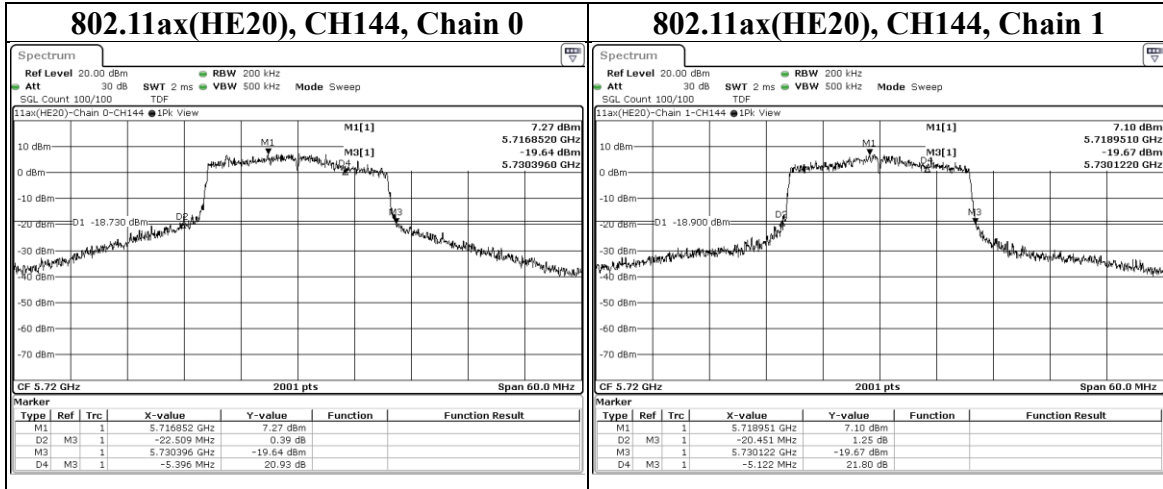


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Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	38	5190	40.144	39.455	N/A	Pass
	46	5230	39.844	40.759	N/A	Pass
	54	5270	39.993	39.72	N/A	Pass
	62	5310	40.27	40.732	N/A	Pass
	102	5510	39.97	40.816	N/A	Pass
	110	5550	39.93	39.521	N/A	Pass
	134	5670	40.208	40.605	N/A	Pass
	142 (U-NII-2C)	5710	34.999	34.83	N/A	Pass
	142 (U-NII-2C+U-NII-3)	5710	39.904	40.182	N/A	Pass
	142 (U-NII-3)	5710	4.905	5.352	N/A	Pass

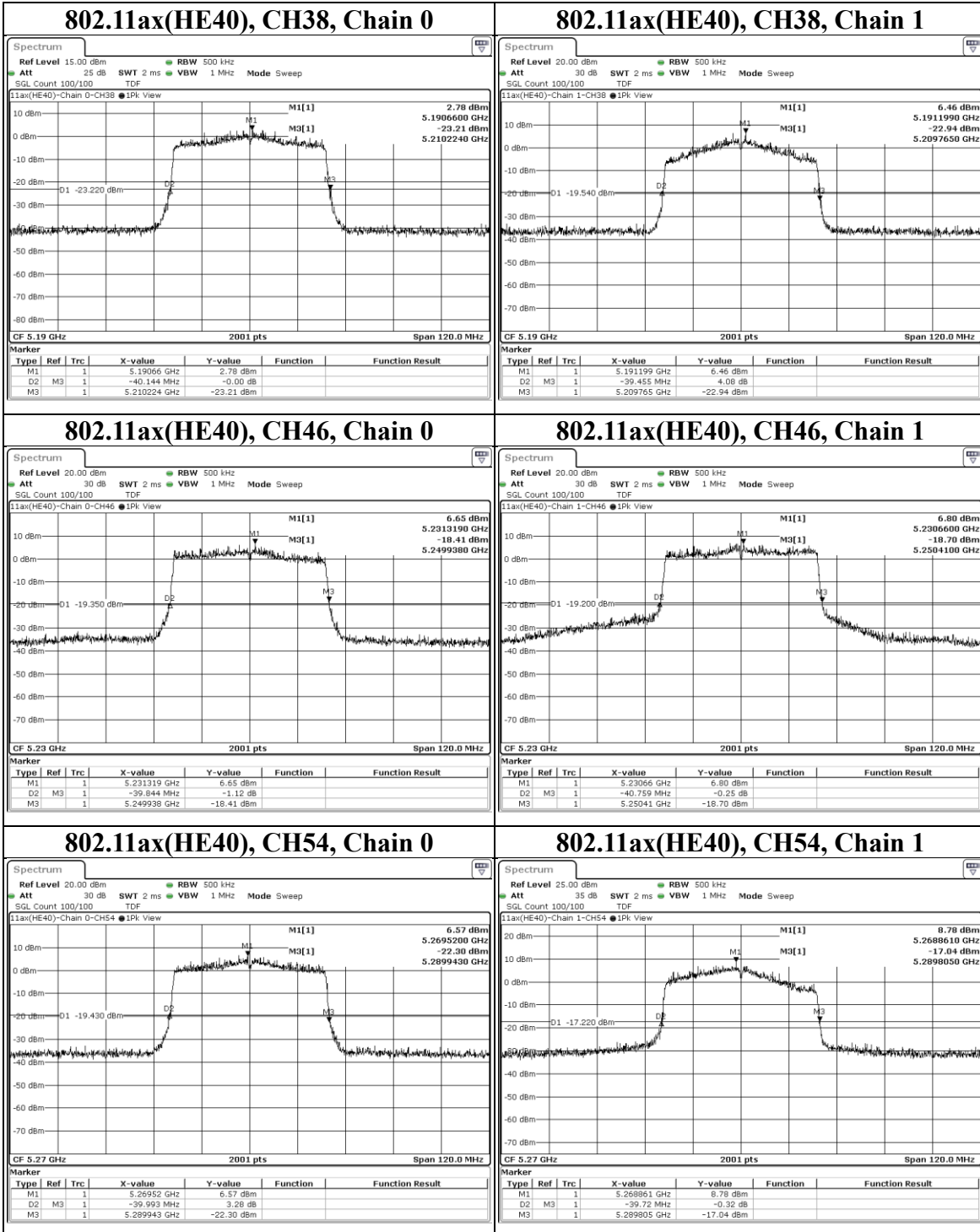
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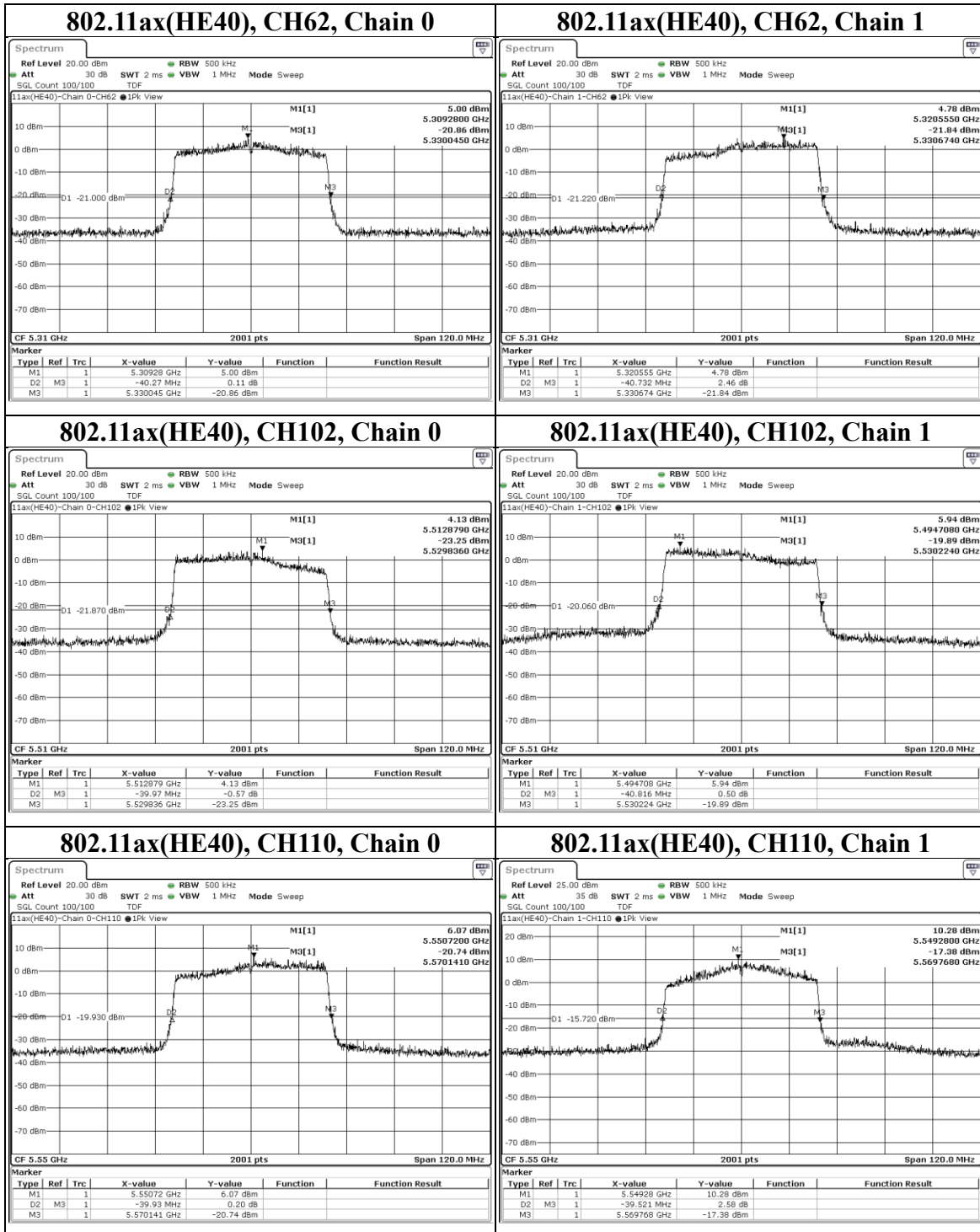
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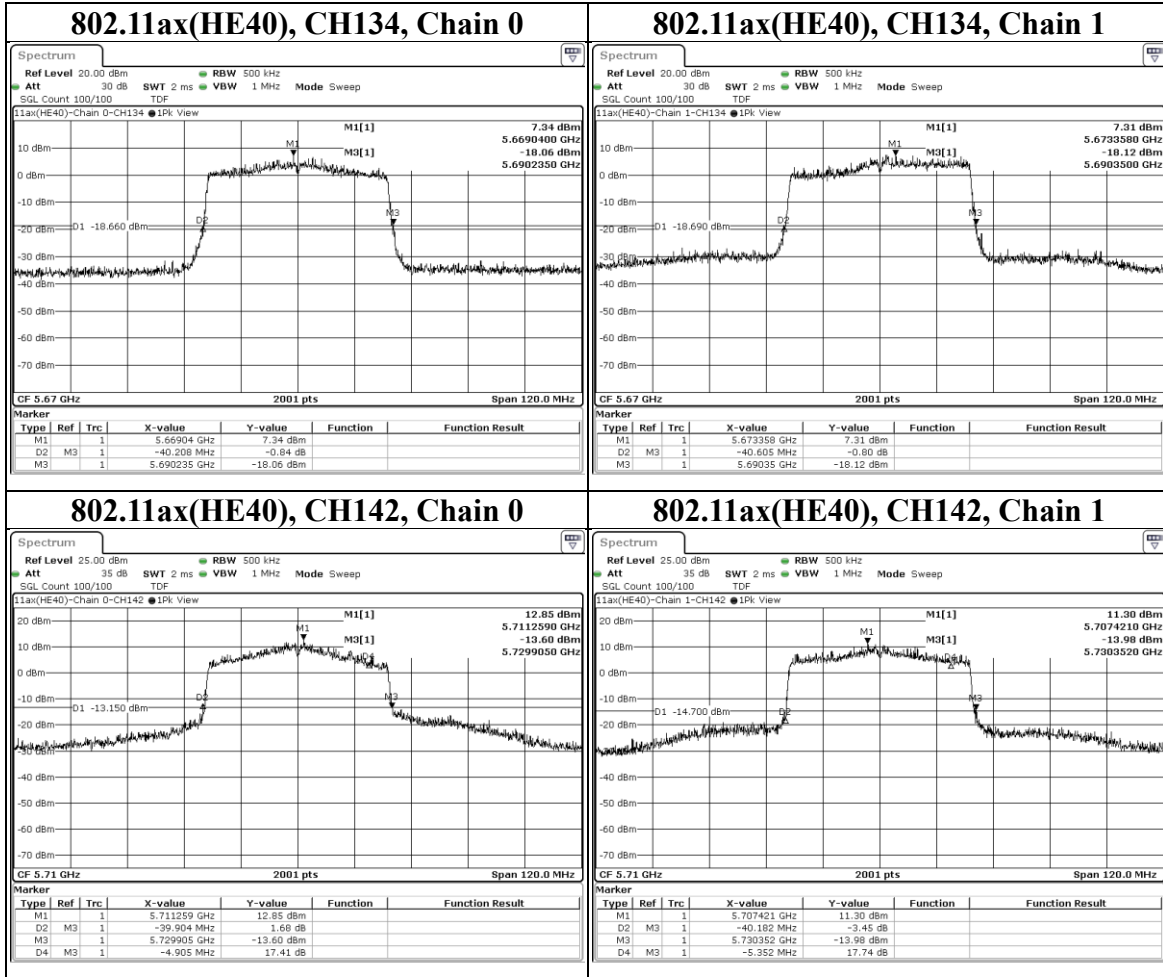


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Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	42	5210	80.545	81.2	N/A	Pass
	58	5290	80.744	81.855	N/A	Pass
	106	5530	81.377	81.094	N/A	Pass
	122	5610	81.52	80.915	N/A	Pass
	138 (U-NII-2C)	5690	75.721	91.543	N/A	Pass
	138 (U-NII-2C+U-NII-3)	5690	80.964	118.722	N/A	Pass
	138 (U-NII-3)	5690	5.243	27.179	N/A	Pass

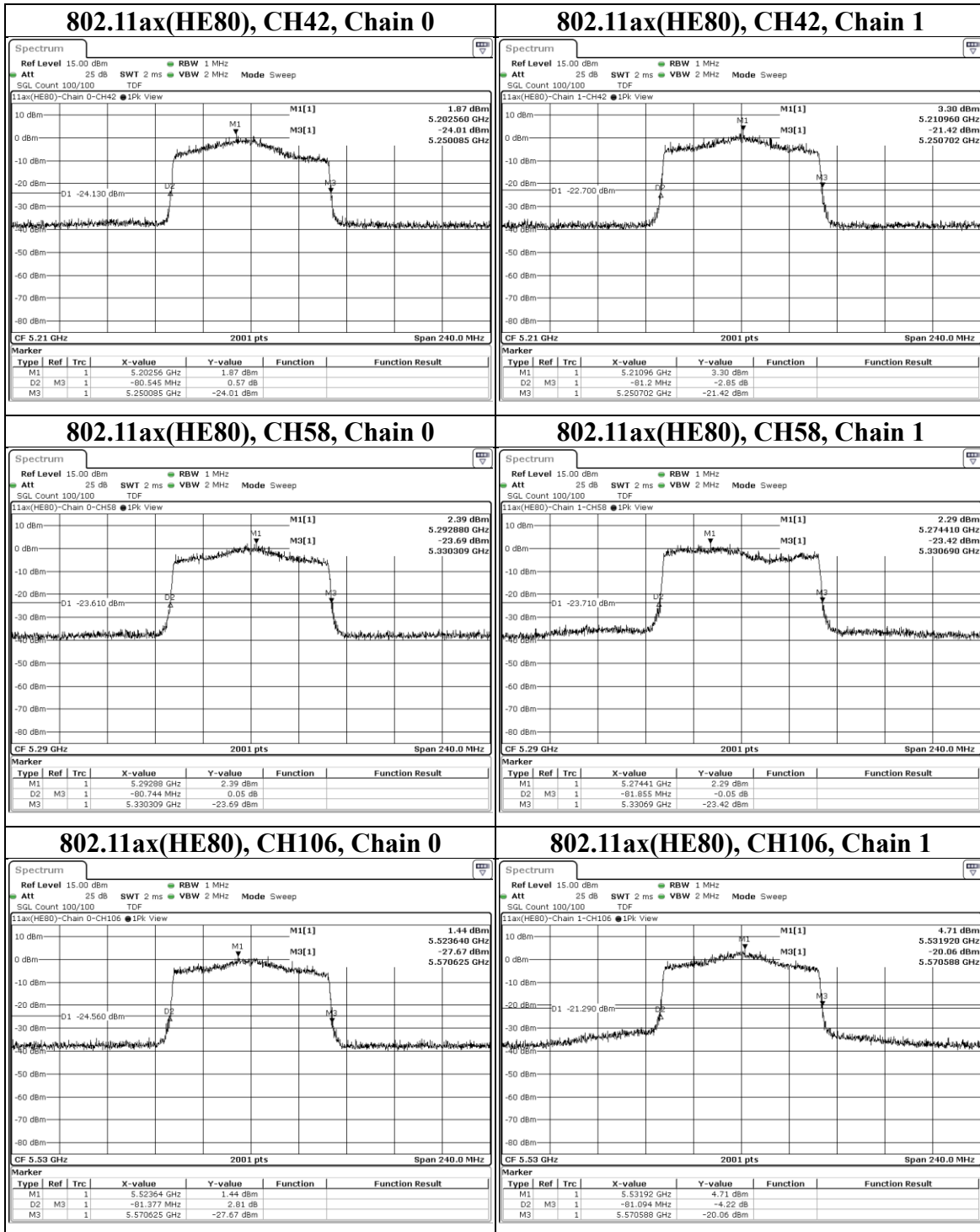
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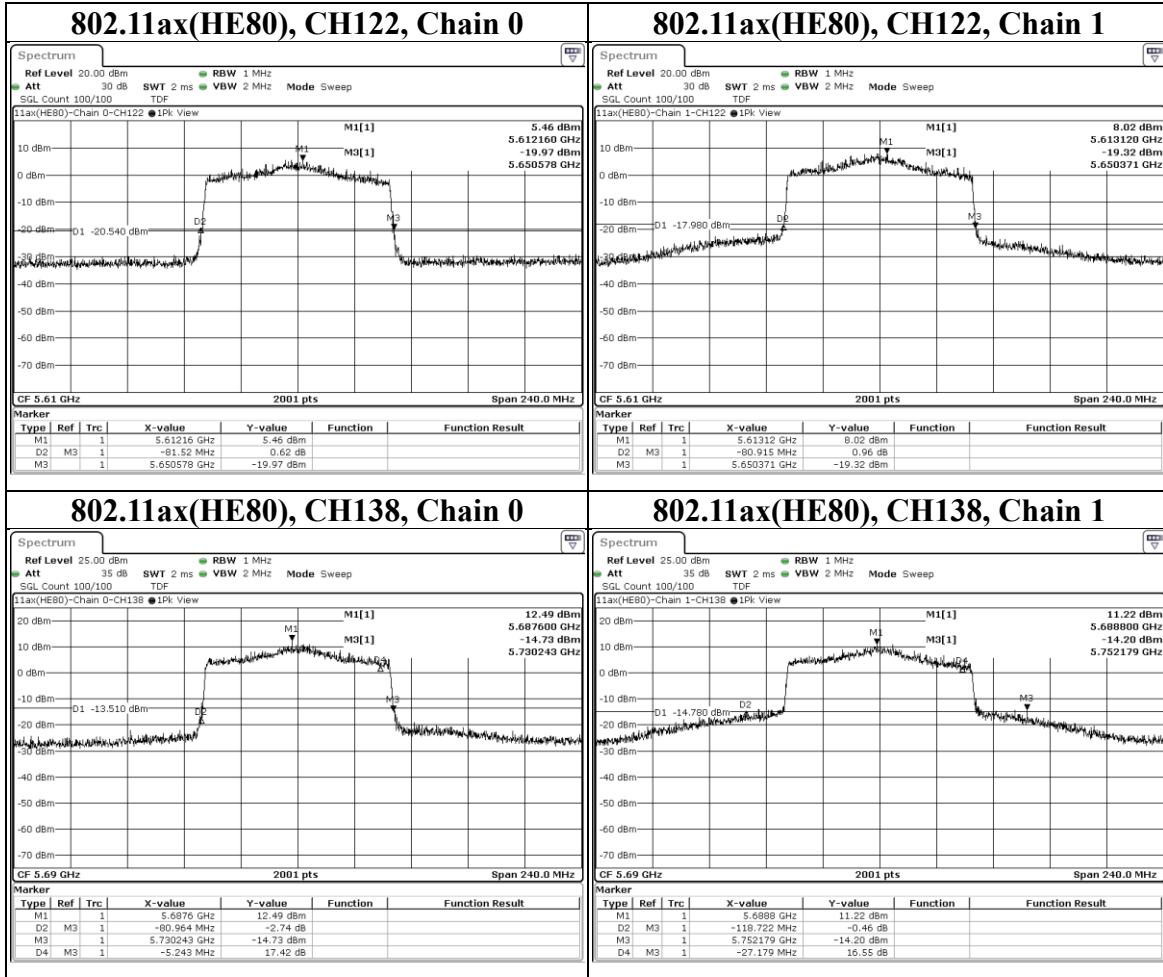
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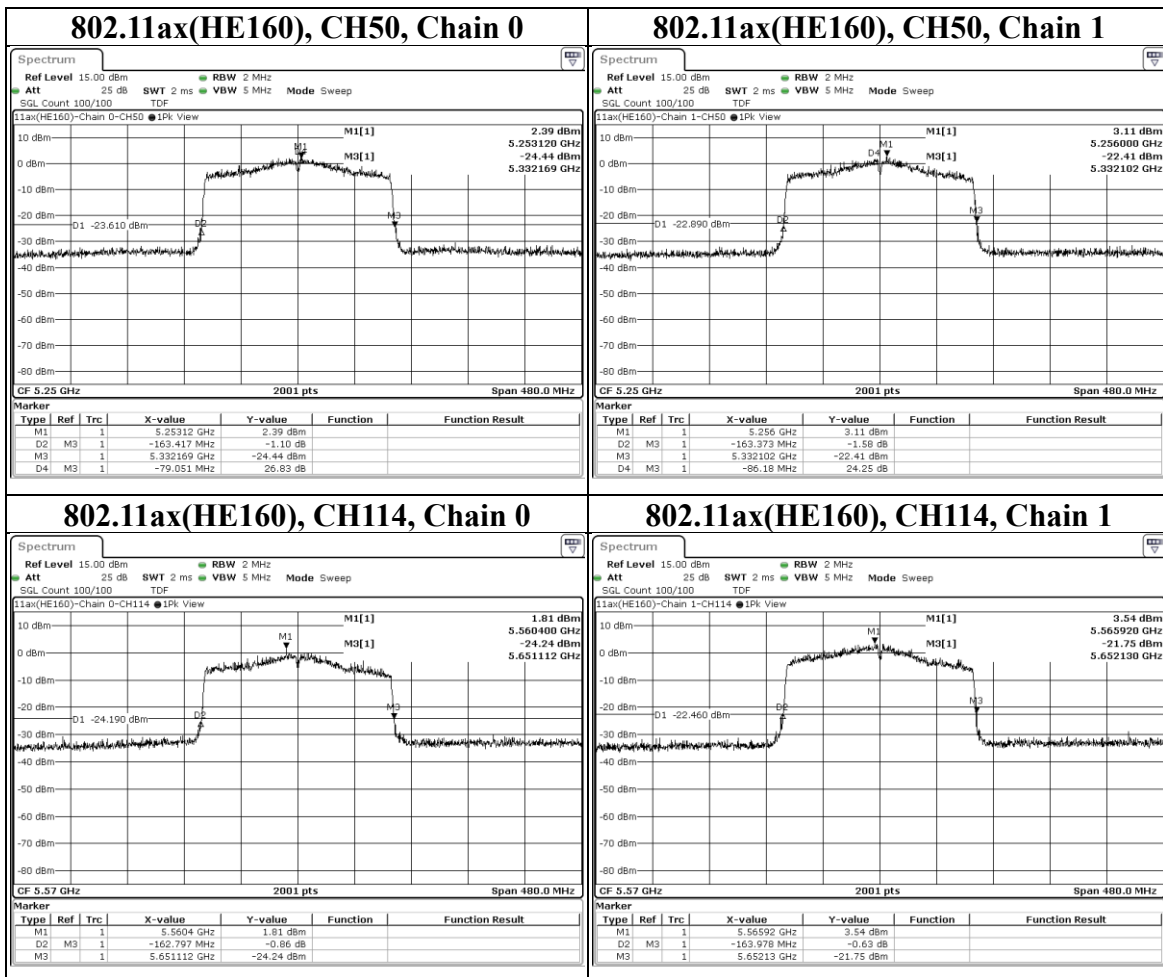
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Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE160)	50 (U-NII-1)	5250	81.248	81.271	N/A	Pass
	50 (U-NII-1 + U-NII-2A)	5250	163.417	163.373	N/A	Pass
	50 (U-NII-2A)	5250	82.169	82.102	N/A	Pass
	114	5570	162.797	163.978	N/A	Pass



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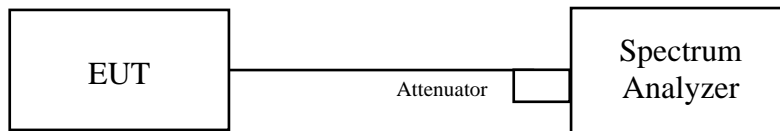
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9.3. Occupied Bandwidth

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 $\geq 3 \times$ 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	16.576	16.355	N/A	Pass
	44	5220	16.604	16.471	N/A	Pass
	48	5240	16.785	16.581	N/A	Pass
	52	5260	16.545	16.563	N/A	Pass
	60	5300	16.813	17.069	N/A	Pass
	64	5320	16.633	16.438	N/A	Pass
	100	5500	16.526	16.509	N/A	Pass
	116	5580	16.54	16.866	N/A	Pass
	140	5700	16.581	16.474	N/A	Pass
	144 (U-NII-2C)	5720	13.335	13.414	N/A	Pass
	144 (U-NII-2C+U-NII-3)	5720	16.614	16.509	N/A	Pass
	144 (U-NII-3)	5720	3.279	3.095	N/A	Pass
	149	5745	23.998	22.11	N/A	Pass
	157	5785	16.905	16.839	N/A	Pass
165	5825	17.135	16.554	N/A	Pass	

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