RADIO TEST REPORT

Product	:	WLAN and BT Wireless Module
Model Name	:	WBU058-BGA-V11
Series Model	:	WBU058-BGA-V13, WBU058-BGA-V15
FCC ID	:	RX3-WBU058BGA
Test Regulation	:	FCC 47 CFR Part 15 Subpart E (Section 15.407)
Received Date	:	2024/8/9
Test Date	:	2024/08/13 ~ 2024/09/06
Issued Date	:	2024/10/7

Applicant	:	Hon Hai Precision Industry Co., Ltd. No.151, Sec. 1, Nankan Rd., Lujhu Dist.,Taoyuan City 33859, Taiwan
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

REVISION HISTORY

Original Test Report No.: 4791426387A-US-R1-V0

Revision	Test report No.	Date	Page revised	Contents
Original	4791426387A-US-R1-V0	2024/10/7	-	Initial issue

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1. Attestation of Test Results

APPLICANT:	Hon Hai Precision Industry Co., Ltd. No.151, Sec. 1, Nankan Rd., Lujhu Dist.,Taoyuan City 33859, Taiwan
MANUFACTURER:	HON HAI PRECISION IND. CO., LTD No.151, Sec. 1, Nankan Rd., Lujhu Dist.,Taoyuan City 33859, Taiwan
EUT DESCRIPTION:	WLAN and BT Wireless Module
BRAND:	FOXCONN
MODEL:	WBU058-BGA-V11
SERIES MODEL:	WBU058-BGA-V13, WBU058-BGA-V15
SAMPLE STAGE:	Engineering Verification Test Sample
DATE of TESTED:	2024/08/13 ~ 2024/09/06

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

Cindy Hsin Date : 2024/10/7
Project Handler

Approved and Authorized By:

Eric Lee Date : 2024/10/7
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) (1/2/3/4/5/9)	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.: 4791426387A-US-R3-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 A, B and 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, Simple acceptance (Section 3.1.4 of IEC Guide 115) 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.

Determining compliance based on the results of the compliance measurement, not considering measurement instrumentation uncertainty.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	3.1 dB
RF Conducted	9 kHz - 40GHz	2.3 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	3.2 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	6.1 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	5.1 dB

6. Equipment under Test

6.1. Description of EUT

Product	WLAN and BT Wireless Module
Brand Name	FOXCONN
Model Name	WBU058-BGA-V11
Series Model	WBU058-BGA-V13, WBU058-BGA-V15
Normal Voltage	3.3Vdc from Host

Operating Frequency	5180 ~ 5240MHz, 5260 ~ 5320MHz, 5500 ~ 5720MHz, 5745 ~ 5825MHz
Modulation	1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Transfer Rate	802.11a: up to 54 Mbps
	802.11n: up to MCS15
	802.11ac: up to MCS9
	802.11ax: up to MCS11
Maximum Output Power	5180 ~ 5240 MHz: 11.48 dBm
	5260 ~ 5320 MHz: 11.37 dBm
	5500 ~ 5720 MHz: 11.47 dBm
	5745 ~ 5825 MHz: 8.97 dBm
Sample ID	Conducted Test:7472206
	Radiated Test:7528177

Note:

1. The differences between the models are shown in the table below.:

Model	Light Sensor	IR	Power Switch	Thermal Sensor	MIC
WBU058-BGA-V11	V	V	V	-	-
WBU058-BGA-V13	V	V	V	V	-
WBU058-BGA-V15	V	V	V	-	V

1. EUT provides a complete 2Tx port and 2Rx port. Please refer to the following working transmission conditions:

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

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual, the laboratory shall not be held responsible

6.2. Channel List

FOR 5180 ~ 5240MHz
4 channels are provided for 5G WLAN 20MHz bandwidth system:

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

2 channels are provided for 5G WLAN 40MHz bandwidth system:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1 channel are provided for 5G WLAN 80MHz bandwidth system:

Channel	Frequency (MHz)
42	5210

FOR 5260 ~ 5320MHz
4 channels are provided for 5G WLAN 20MHz bandwidth system:

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

2 channels are provided for 5G WLAN 40MHz bandwidth system:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270	62	5310

1 channel are provided for 5G WLAN 80MHz bandwidth system:

Channel	Frequency (MHz)
58	5290

FOR 5500 ~ 5720MHz
12 channels are provided for 5G WLAN 20MHz bandwidth system:

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

6 channels are provided for 5G WLAN 40MHz bandwidth system:

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

3 channel are provided for 5G WLAN 80MHz bandwidth system:

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

FOR 5745 ~ 5825MHz:
5 channels are provided for 5G WLAN 20MHz bandwidth system:

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

2 channels are provided for 5G WLAN 40MHz bandwidth system:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

1 channel are provided for 5G WLAN 80MHz bandwidth system:

Channel	Frequency (MHz)
155	5775

6.3. Test Condition

Test Item	Test Site No.	Environmental	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	23~25°C/ 63~67%RH	3.3Vdc	2024/08/20~ 2024/09/06	Rex Chen/ Jubo Shen
Radiated Spurious Emission	966-2	22~26°C/ 62~68%RH	3.3Vdc	2024/08/13~ 2024/08/28	Rex Chen
AC power Line Conducted Emission	SR1	24°C/ 62%RH	120Vac/ 60Hz	2024/08/21	Rex Chen

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 (40.1dBuV) + 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 (35.1dBuV) + Insertion loss(18.1dB) + Cable loss(0.5dB).

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Frequency Range	Brand Name	Model Name	Maximum Gain (dBi)	Ant. Type	Connector Type
WLAN ANT1	Chain0	2.412~2.472GHz 5.15~5.25GHz 5.25~5.35GHz 5.47~5.725GHz 5.725~5.85GHz 5.925~6.425GHz 6.425~6.525GHz 6.525~6.875GHz 6.875~7.125GHz	FOXCONN	WBU058-BGA	2.412~2.472GHz: 3.91 5.15~5.25GHz: 4.11 5.25~5.35GHz: 5.18 5.47~5.725GHz: 4.62 5.725~5.85GHz: 4.28 5.925~6.425GHz: 3.34 6.425~6.525GHz: 3.35 6.525~6.875GHz: 4.88 6.875~7.125GHz: 4.72	Printing	N/A
WLAN ANT2	Chain1	2.412~2.472GHz 5.15~5.25GHz 5.25~5.35GHz 5.47~5.725GHz 5.725~5.85GHz 5.925~6.425GHz 6.425~6.525GHz 6.525~6.875GHz 6.875~7.125GHz	FOXCONN	WBU058-BGA	2.412~2.472GHz: 4.94 5.15~5.25GHz: 3.8 5.25~5.35GHz: 3.76 5.47~5.725GHz: 3.36 5.725~5.85GHz: 3.34 5.925~6.425GHz: 3.07 6.425~6.525GHz: 3.39 6.525~6.875GHz: 4.01 6.875~7.125GHz: 2.97	Printing	N/A

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, the laboratory shall not be held responsible.

6.5. Test Mode Applicability and Tested Channel Detail

Test Item	Mode	Frequency Range(MHz)	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Bandedge	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6 Mbps
	802.11ac20		OFDM	36 to 48	36, 44, 48	MCS0 Nss1
	802.11ac40			38 to 46	38, 46	MCS0 Nss1
	802.11ac80			42	42	MCS0 Nss1
	802.11ax20		OFDM	36 to 48	36, 44, 48	MCS0 Nss1
	802.11ax40			38 to 46	38, 46	MCS0 Nss1
	802.11ax80			42	42	MCS0 Nss1
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6 Mbps
	802.11ac20		OFDM	52 to 64	52, 60, 64	MCS0 Nss1
	802.11ac40			54 to 62	54, 62	MCS0 Nss1
	802.11ac80			58	58	MCS0 Nss1
	802.11ax20		OFDM	52 to 64	52, 60, 64	MCS0 Nss1
	802.11ax40			54 to 62	54, 62	MCS0 Nss1
	802.11ax80			58	58	MCS0 Nss1
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6 Mbps
	802.11ac20		OFDM	100 to 144	100, 116, 140, 144	MCS0 Nss1
	802.11ac40			102 to 142	102, 110, 134,142	MCS0 Nss1
	802.11ac80			106 to 138	106, 122, 138	MCS0 Nss1
	802.11ax20		OFDM	100 to 144	100, 116, 140, 144	MCS0 Nss1
	802.11ax40			102 to 142	102, 110, 134,142	MCS0 Nss1
	802.11ax80			106 to 138	106, 122, 138	MCS0 Nss1
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6 Mbps
	802.11ac20		OFDM	149 to 165	149, 157, 165	MCS0 Nss1
	802.11ac40			151 to 159	151, 159	MCS0 Nss1
	802.11ac80			155	155	MCS0 Nss1
	802.11ax20		OFDM	149 to 165	149, 157, 165	MCS0 Nss1
	802.11ax40			151 to 159	151, 159	MCS0 Nss1
	802.11ax80			155	155	MCS0 Nss1
Radiated Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6 Mbps
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6 Mbps
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6 Mbps
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6 Mbps
Radiated Emissions (Below 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36	6 Mbps
AC Power Line Conducted Emission	802.11a	5180-5240	OFDM	36 to 48	36	6 Mbps

Test Item	Mode	Frequency Range(MHz)	Modulation Type	Available Channel	Test Channel	Data Rate
Antenna Port Conducted Measurement	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6 Mbps
	802.11ac20		OFDM	36 to 48	36, 44, 48	MCS0 Nss1
	802.11ac40			38 to 46	38, 46	MCS0 Nss1
	802.11ac80			42	42	MCS0 Nss1
	802.11ax20		OFDM	36 to 48	36, 44, 48	MCS0 Nss1
	802.11ax40			38 to 46	38, 46	MCS0 Nss1
	802.11ax80			42	42	MCS0 Nss1
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6 Mbps
	802.11ac20		OFDM	52 to 64	52, 60, 64	MCS0 Nss1
	802.11ac40			54 to 62	54, 62	MCS0 Nss1
	802.11ac80			58	58	MCS0 Nss1
	802.11ax20		OFDM	52 to 64	52, 60, 64	MCS0 Nss1
	802.11ax40			54 to 62	54, 62	MCS0 Nss1
	802.11ax80			58	58	MCS0 Nss1
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6 Mbps
	802.11ac20		OFDM	100 to 144	100, 116, 140, 144	MCS0 Nss1
	802.11ac40			102 to 142	102, 110, 134,142	MCS0 Nss1
	802.11ac80			106 to 138	106, 122, 138	MCS0 Nss1
	802.11ax20		OFDM	100 to 144	100, 116, 140, 144	MCS0 Nss1
	802.11ax40			102 to 142	102, 110, 134,142	MCS0 Nss1
	802.11ax80			106 to 138	106, 122, 138	MCS0 Nss1
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6 Mbps
	802.11ac20		OFDM	149 to 165	149, 157, 165	MCS0 Nss1
	802.11ac40			151 to 159	151, 159	MCS0 Nss1
	802.11ac80			155	155	MCS0 Nss1
	802.11ax20		OFDM	149 to 165	149, 157, 165	MCS0 Nss1
	802.11ax40			151 to 159	151, 159	MCS0 Nss1
	802.11ax80			155	155	MCS0 Nss1

- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Y plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Y plane.

  The EUT has 3 types of Models: WBU058-BGA-V11, WBU058-BGA-V13, and WBU058-BGA-V15, The above Model was pre-tested radiated emission, the worst case was found in Model: WBU058-BGA-V11, and therefore only the worst case test data was recorded in this report.

- The radiated spurious emission test was performed in all test modes. The worst case weas 802.11a, and therefore, only the worst case data is shown in this report to represent all test modes.

- In the transmit mode, 802.11a channel 36 has the highest RF output power. Therefore, the AC conduction were performed using this worst-case mode.
- In the transmit mode, 802.11a channel 36 has the worst case of Tx spurious emission (above 1GHz). Therefore, all final tests for the spurious emission (below 1GHz) were performed using this worst-case mode.

- 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.

- 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).

Simultaneously transmission condition:

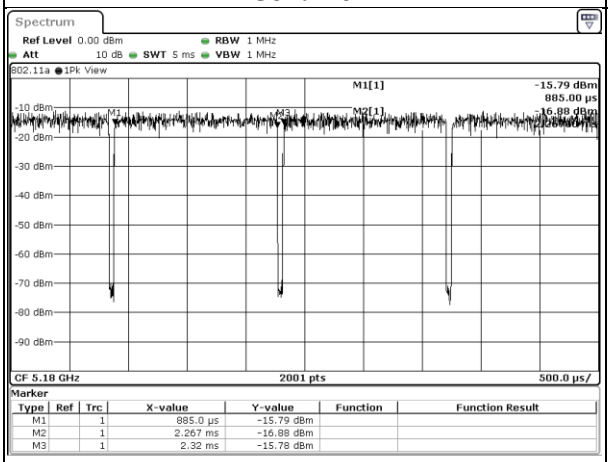
Condition	Technology	
1	WLAN (5GHz)	BT LE
2	WLAN (5GHz)	BT EDR

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

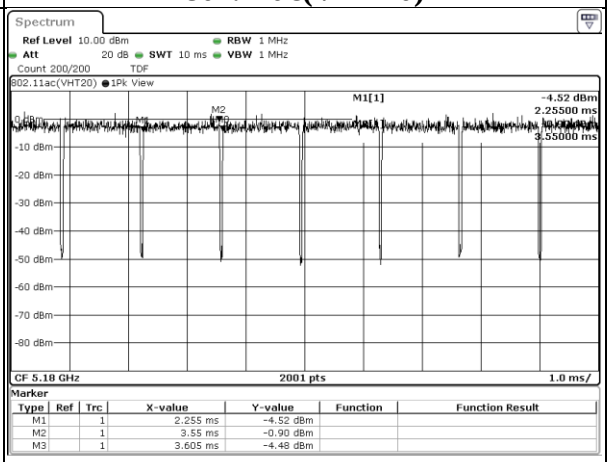
6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11a	1.382	1.435	0.9631	0.16	1kHz
802.11ac(VHT20)	1.295	1.350	0.9593	0.18	1kHz
802.11ac(VHT40)	0.647	0.695	0.9309	0.31	2kHz
802.11ac(VHT80)	0.323	0.368	0.8777	0.57	5.1kHz
802.11ax(HE20)	1.000	1.065	0.9390	0.27	1kHz
802.11ax(HE40)	0.543	0.588	0.9235	0.35	2kHz
802.11ax(HE80)	0.296	0.340	0.8706	0.60	5.1kHz

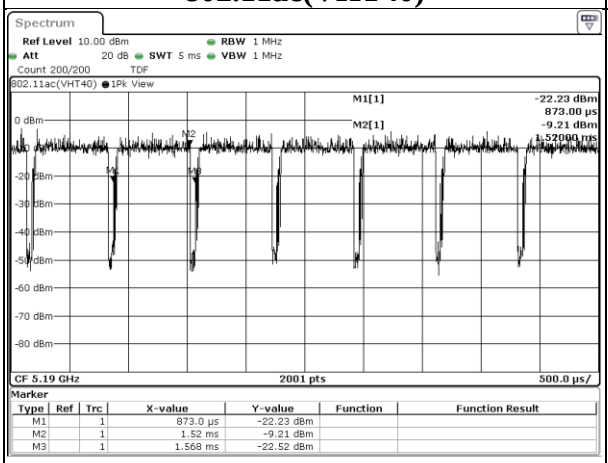
802.11a



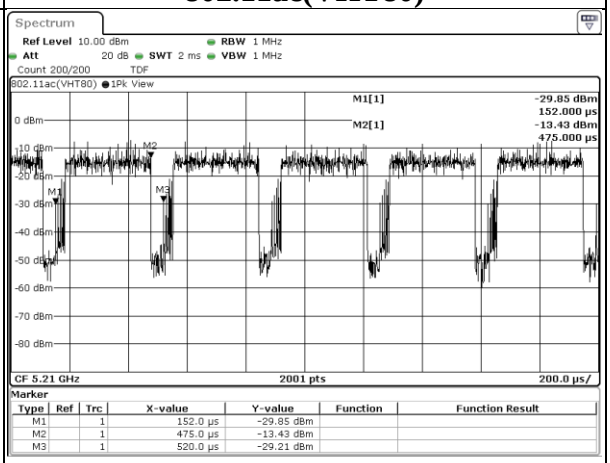
802.11ac(VHT20)



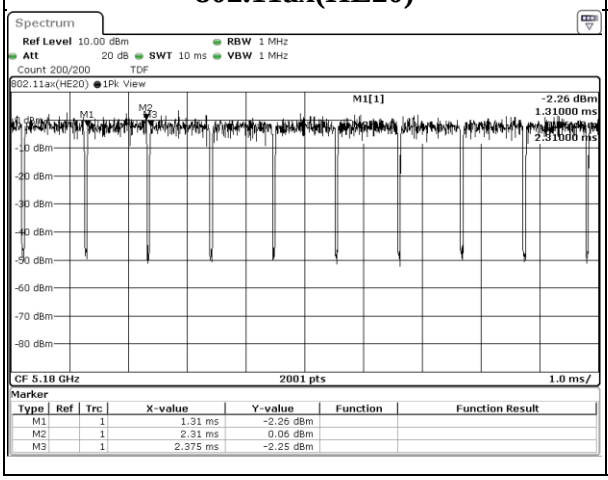
802.11ac(VHT40)



802.11ac(VHT80)



802.11ax(HE20)



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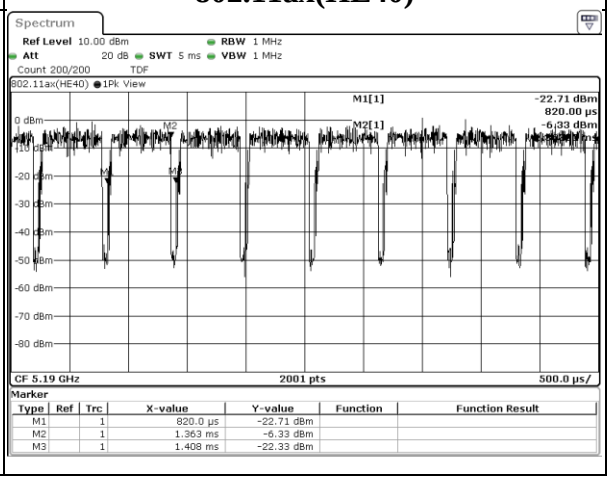
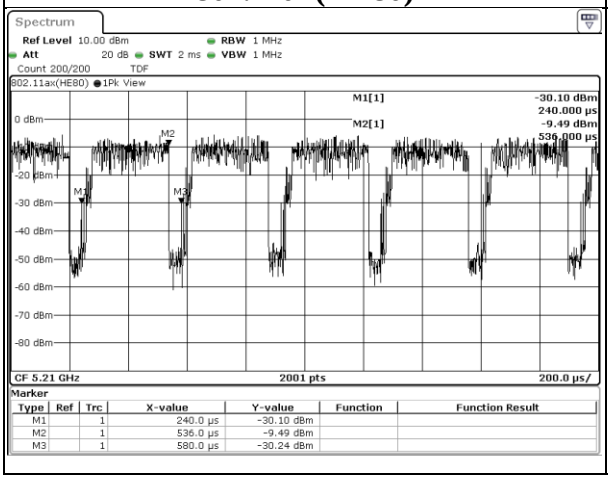


802.11ax(HE80)	
	

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2024/3/29	2025/3/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2023/11/22	2024/11/21
Loop Antenna	ETS lindgren	6502	00213440	2023/12/13	2024/12/12
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2024/1/5	2025/1/4
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2023/12/8	2024/12/7
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2023/12/27	2024/12/26
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2024/5/28	2025/5/27
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2024/1/23	2025/1/22
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2024/4/16	2025/4/15
Cables (9k-18 GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2023/11/29	2024/11/28
Cables (18-40GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2023/11/29	2024/11/28

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Signal Analyzer	Rohde & Schwarz	FSVA3044	101281	2024/3/18	2025/3/17
Signal Analyzer	Rohde & Schwarz	FSV40	101490	2023/9/13	2024/9/12
Attenuator	EMCI	EMC-40ATK2W10	17002	2023/11/15	2024/11/14
USB Power Sensor	Anritsu	MA24408A	12031	2024/7/13	2025/7/12
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2024/3/6	2025/3/5
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2023/10/23	2024/10/22
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2024/5/14	2025/5/13
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2023/9/7	2024/9/6
Cables	TITAN	CFD200	T0732ACFD 20020A300-2	2024/5/14	2025/5/13

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

Tx Mode

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	DELL	Latitude E5470	3JFKWF2	Provided by Lab
B	DC Power Supply	Gwinstek	GPD-2303S	N/A	Provided by Lab

I/O Cables

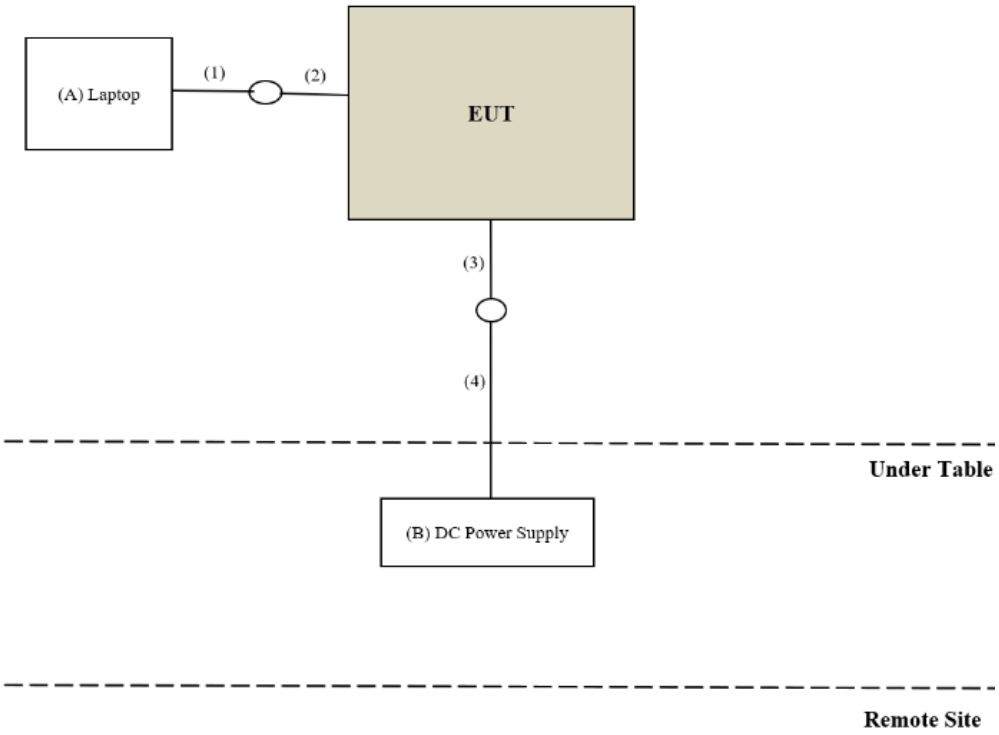
ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Cable	UGREEN	VW-1	0.53	Supplied by client
2	DC Cable	TAYA	PT0020-2	0.1	Supplied by client
3	DC Cable	TAYA	PT0020-2	0.1	Supplied by client
4	DC Cable	TAYA	PT0020-2	2	Provided by Lab

Test Setup

Controlled using a bespoke application (MT7961 QA 0.0.2.39) 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

Tx Mode



9. Test Results

9.1. 6dB Bandwidth

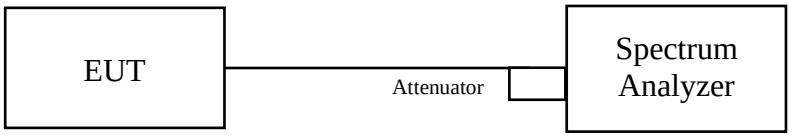
Requirements

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.
f. The plot of the test result only shows the worst case of channels as a representative.

Test Setup

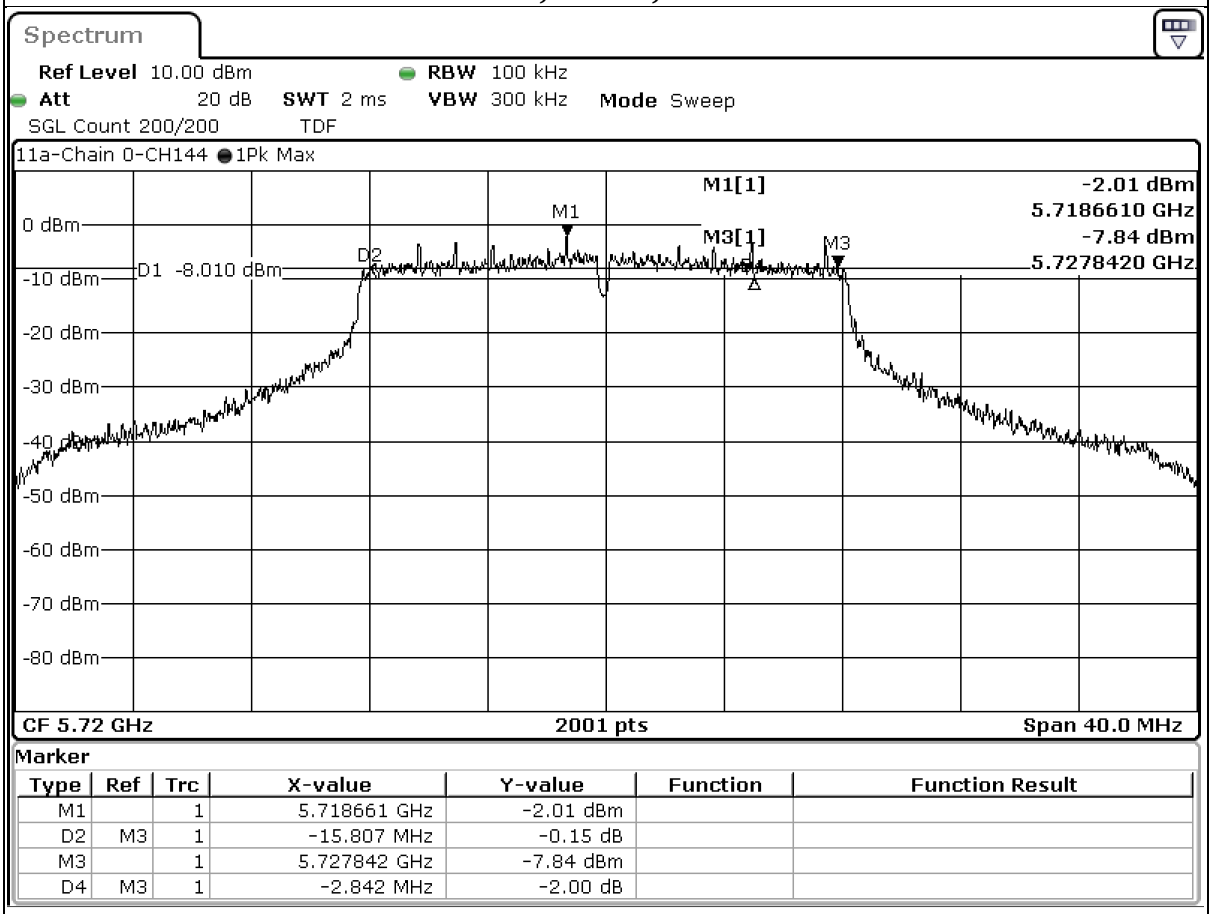


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

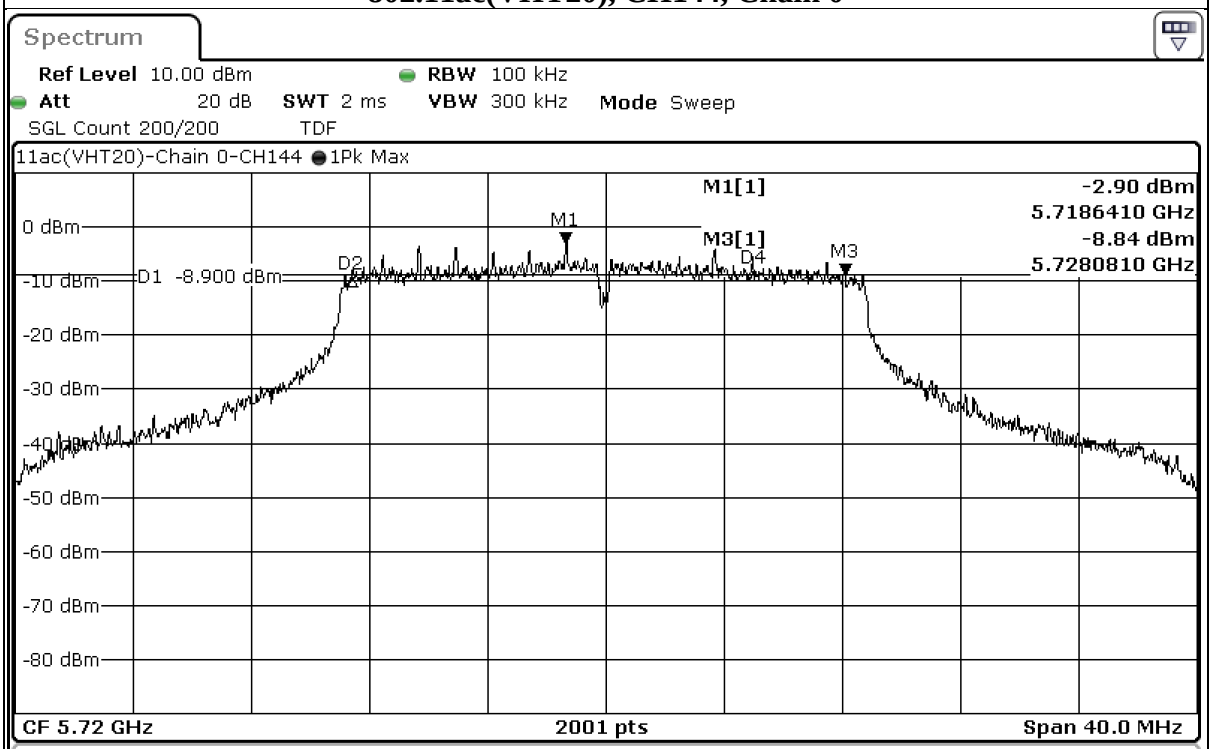
Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	144 (U-NII-2C)	5720	12.965	13.263	0.5	PASS
	144 (U-NII-2C+U-NII-3)	5720	15.807	16.352	0.5	PASS
	144 (U-NII-3)	5720	2.842	3.089	0.5	PASS
	149	5745	16.331	16.334	0.5	PASS
	157	5785	16.327	16.343	0.5	PASS
	165	5825	16.05	16.339	0.5	PASS

802.11a, CH144, Chain 0



Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT20)	144 (U-NII-2C)	5720	13.615	13.879	0.5	PASS
	144 (U-NII-2C+U-NII-3)	5720	16.696	17.604	0.5	PASS
	144 (U-NII-3)	5720	3.081	3.725	0.5	PASS
	149	5745	17.59	17.572	0.5	PASS
	157	5785	17.099	17.591	0.5	PASS
	165	5825	17.316	17.596	0.5	PASS

802.11ac(VHT20), CH144, Chain 0

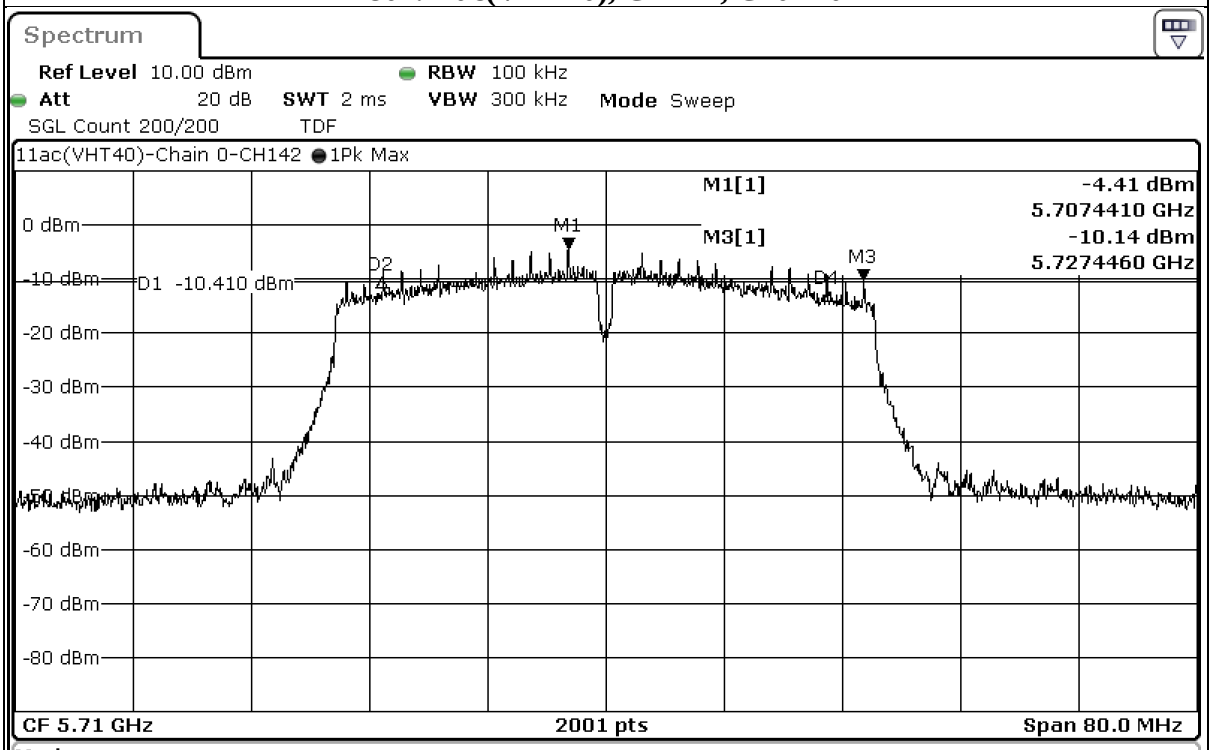


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.718641 GHz	-2.90 dBm		
D2	M3	1	-16.696 MHz	-0.36 dB		
M3		1	5.728081 GHz	-8.84 dBm		
D4	M3	1	-3.081 MHz	0.90 dB		

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT40)	142 (U-NII-2C)	5710	30.132	32.621	0.5	PASS
	142 (U-NII-2C+U-NII-3)	5710	32.578	35.095	0.5	PASS
	142 (U-NII-3)	5710	2.446	2.474	0.5	PASS
	151	5755	33.883	35.051	0.5	PASS
	159	5795	33.82	35.022	0.5	PASS

802.11ac(VHT40), CH142, Chain 0

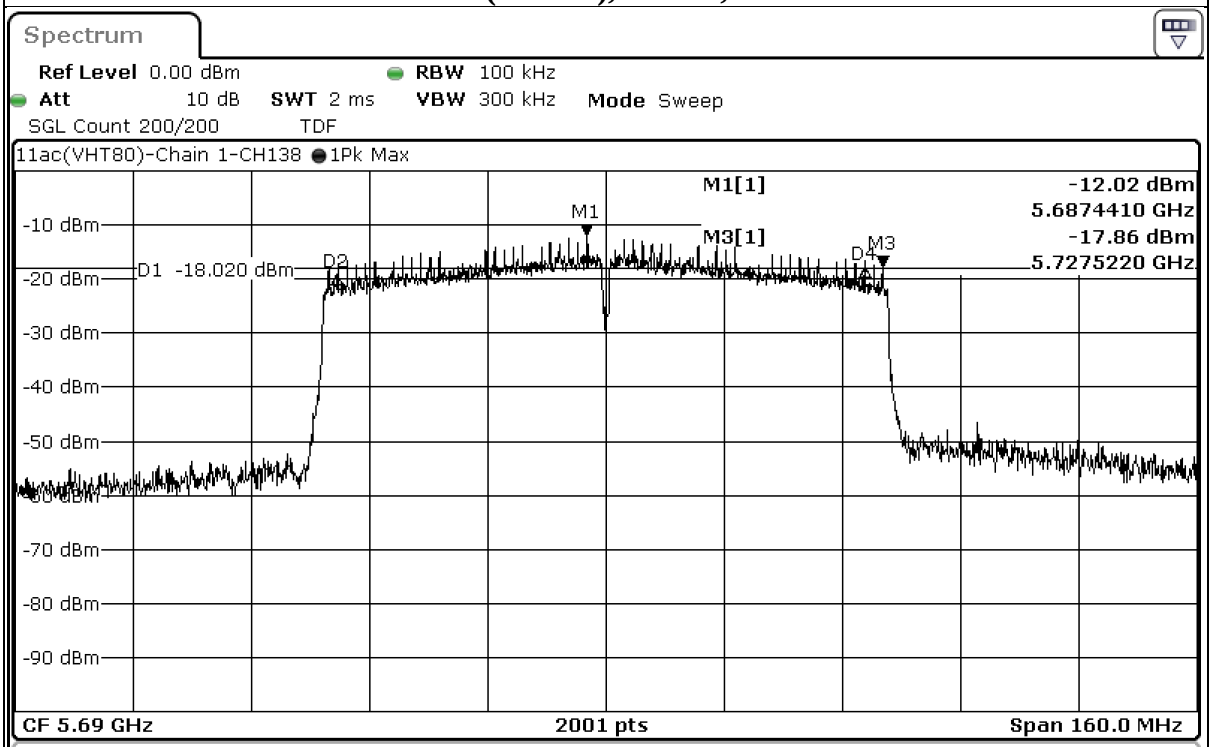


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.707441 GHz	-4.41 dBm		
D2	M3	1	-32.578 MHz	0.57 dB		
M3		1	5.727446 GHz	-10.14 dBm		
D4	M3	1	-2.446 MHz	-2.00 dB		

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT80)	138 (U-NII-2C)	5690	72.623	71.354	0.5	PASS
	138 (U-NII-2C+U-NII-3)	5690	75.15	73.876	0.5	PASS
	138 (U-NII-3)	5690	2.527	2.522	0.5	PASS
	155	5775	75.158	75.16	0.5	PASS

802.11ac(VHT80), CH138, Chain 1

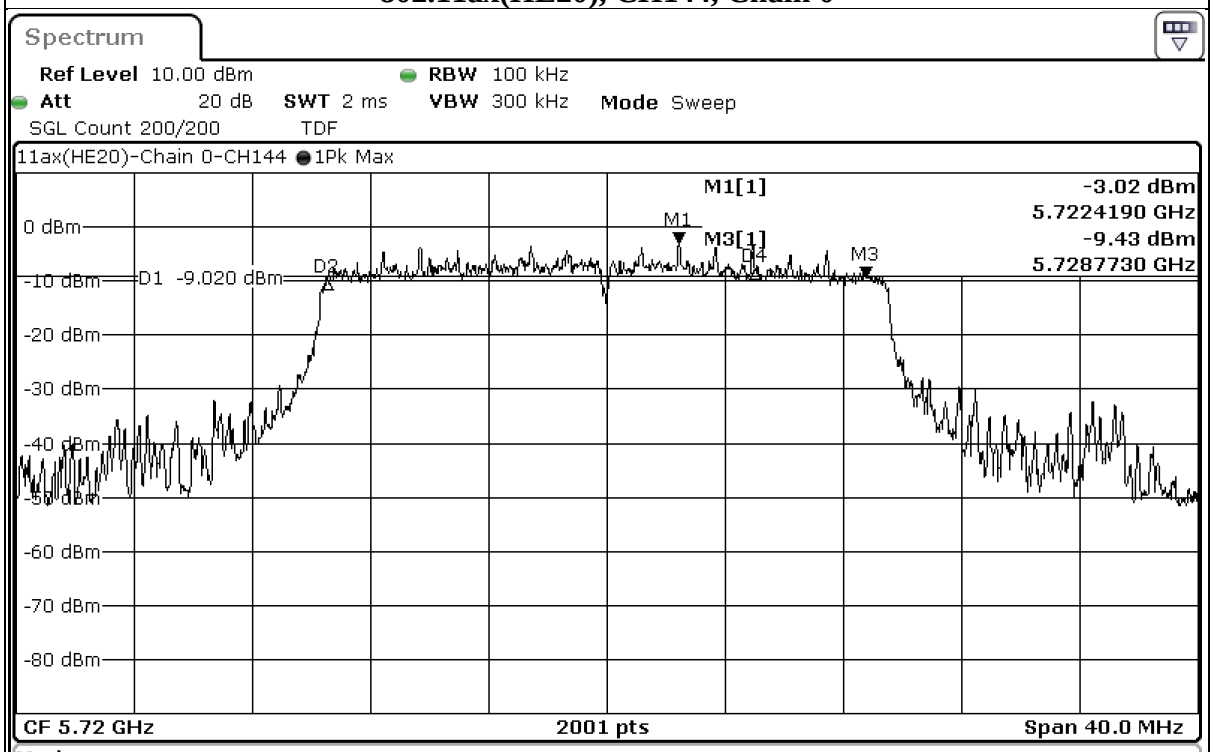


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.687441 GHz	-12.02 dBm		
D2	M3	1	-73.876 MHz	-1.26 dB		
M3		1	5.727522 GHz	-17.86 dBm		
D4	M3	1	-2.522 MHz	0.20 dB		

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	144 (U-NII-2C)	5720	14.449	14.471	0.5	PASS
	144 (U-NII-2C+U-NII-3)	5720	18.222	18.713	0.5	PASS
	144 (U-NII-3)	5720	3.773	4.242	0.5	PASS
	149	5745	18.88	18.811	0.5	PASS
	157	5785	18.459	18.366	0.5	PASS
	165	5825	18.598	17.856	0.5	PASS

802.11ax(HE20), CH144, Chain 0

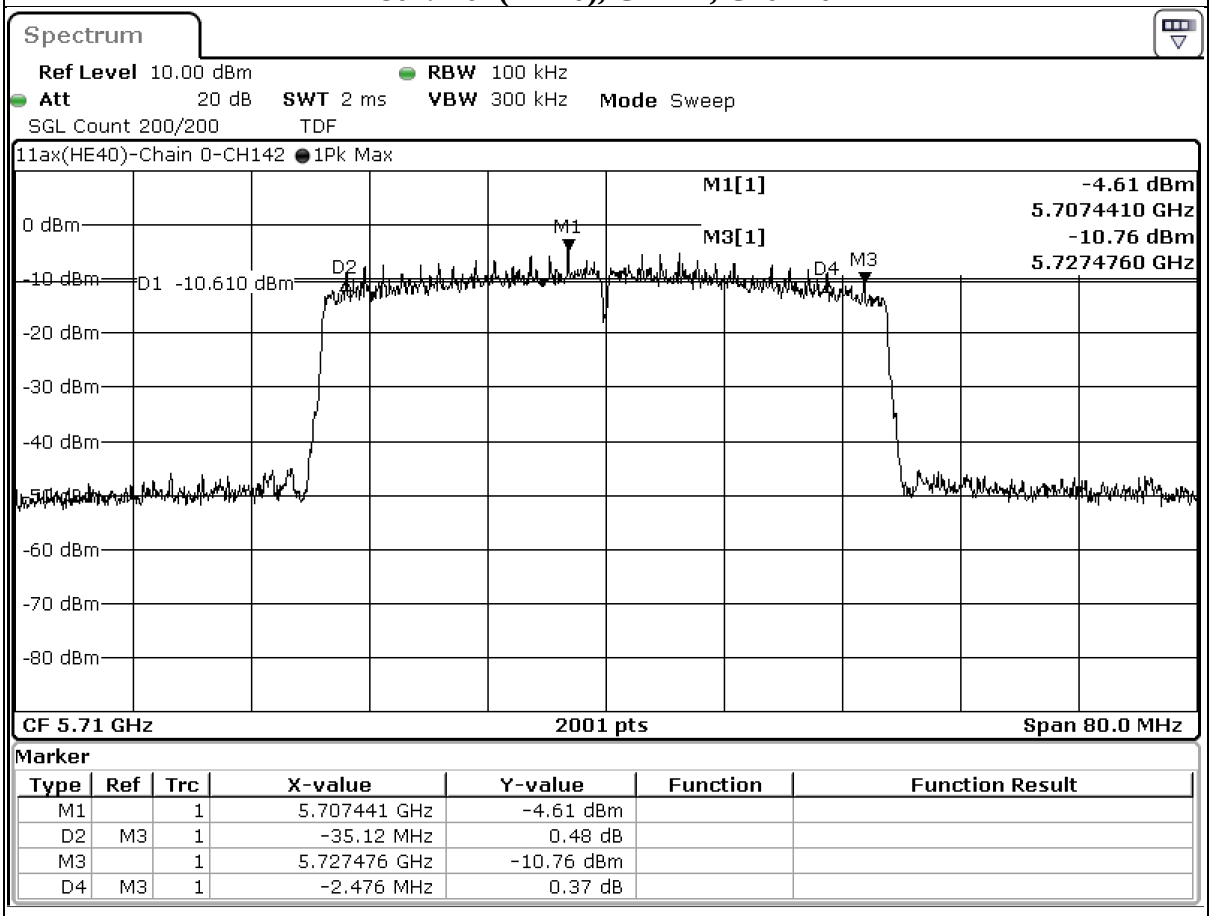


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.722419 GHz	-3.02 dBm		
D2	M3	1	-18.222 MHz	-0.17 dB		
M3		1	5.728773 GHz	-9.43 dBm		
D4	M3	1	-3.773 MHz	1.73 dB		

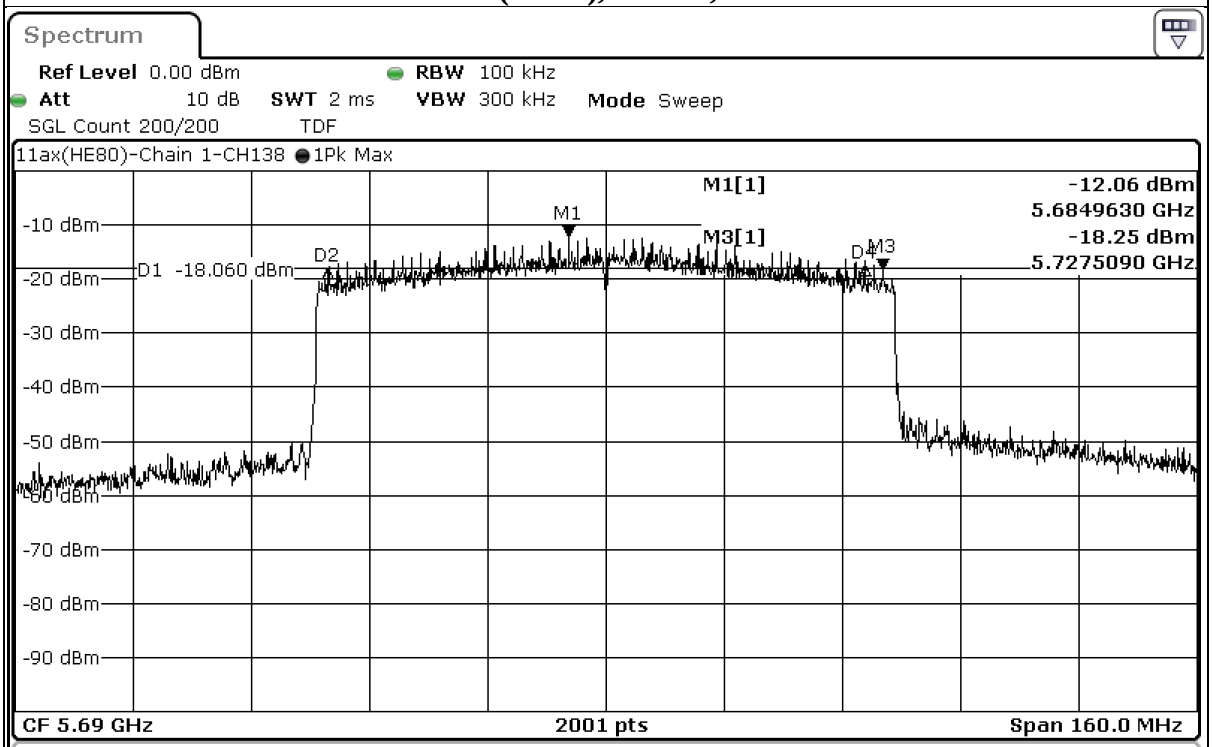
Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	142 (U-NII-2C)	5710	32.644	32.648	0.5	PASS
	142 (U-NII-2C+U-NII-3)	5710	35.12	35.139	0.5	PASS
	142 (U-NII-3)	5710	2.476	2.491	0.5	PASS
	151	5755	35.122	35.963	0.5	PASS
	159	5795	35.123	35.107	0.5	PASS

802.11ax(HE40), CH142, Chain 0



Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	138 (U-NII-2C)	5690	72.629	72.6	0.5	PASS
	138 (U-NII-2C+U-NII-3)	5690	75.156	75.109	0.5	PASS
	138 (U-NII-3)	5690	2.527	2.509	0.5	PASS
	155	5775	75.88	75.145	0.5	PASS

802.11ax(HE80), CH138, Chain 1



Marker

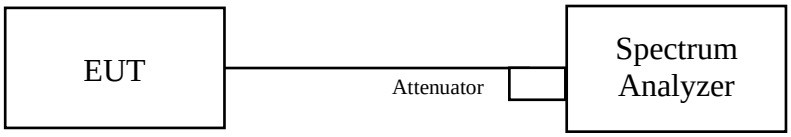
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.684963 GHz	-12.06 dBm		
D2	M3	1	-75.109 MHz	0.21 dB		
M3		1	5.727509 GHz	-18.25 dBm		
D4	M3	1	-2.509 MHz	0.68 dB		

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%.
f. The plot of the test result only shows the worst case of channels as a representative.

Test Setup

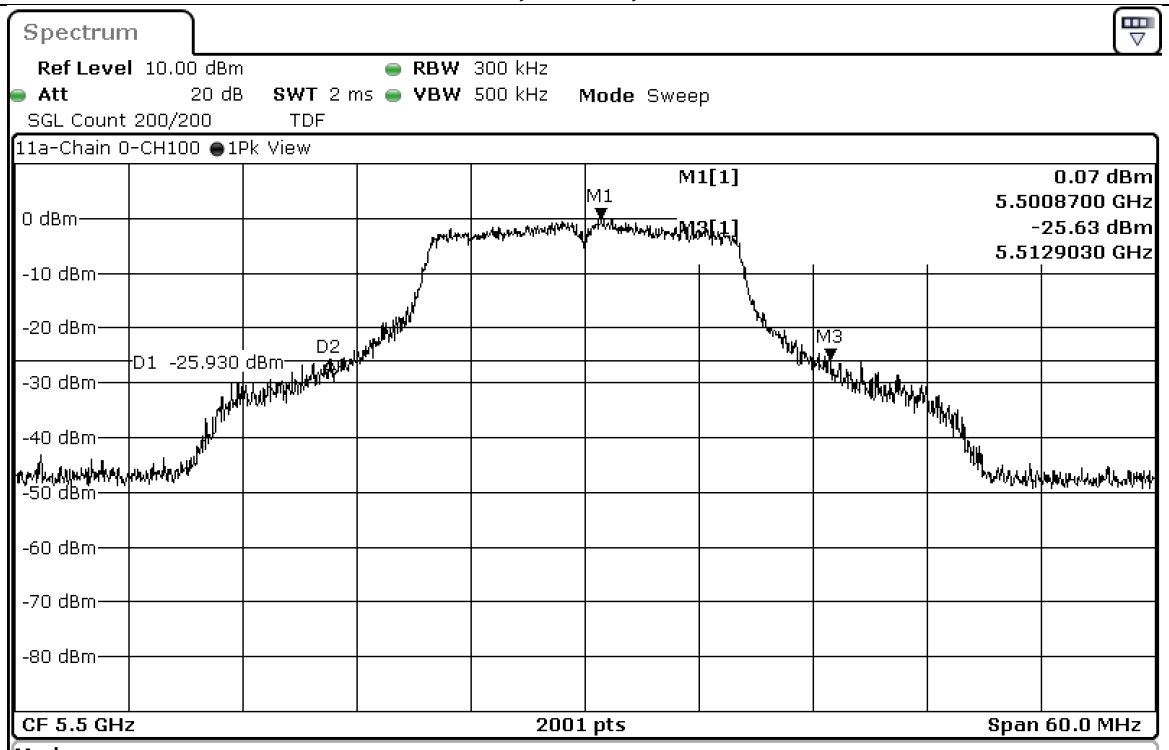


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

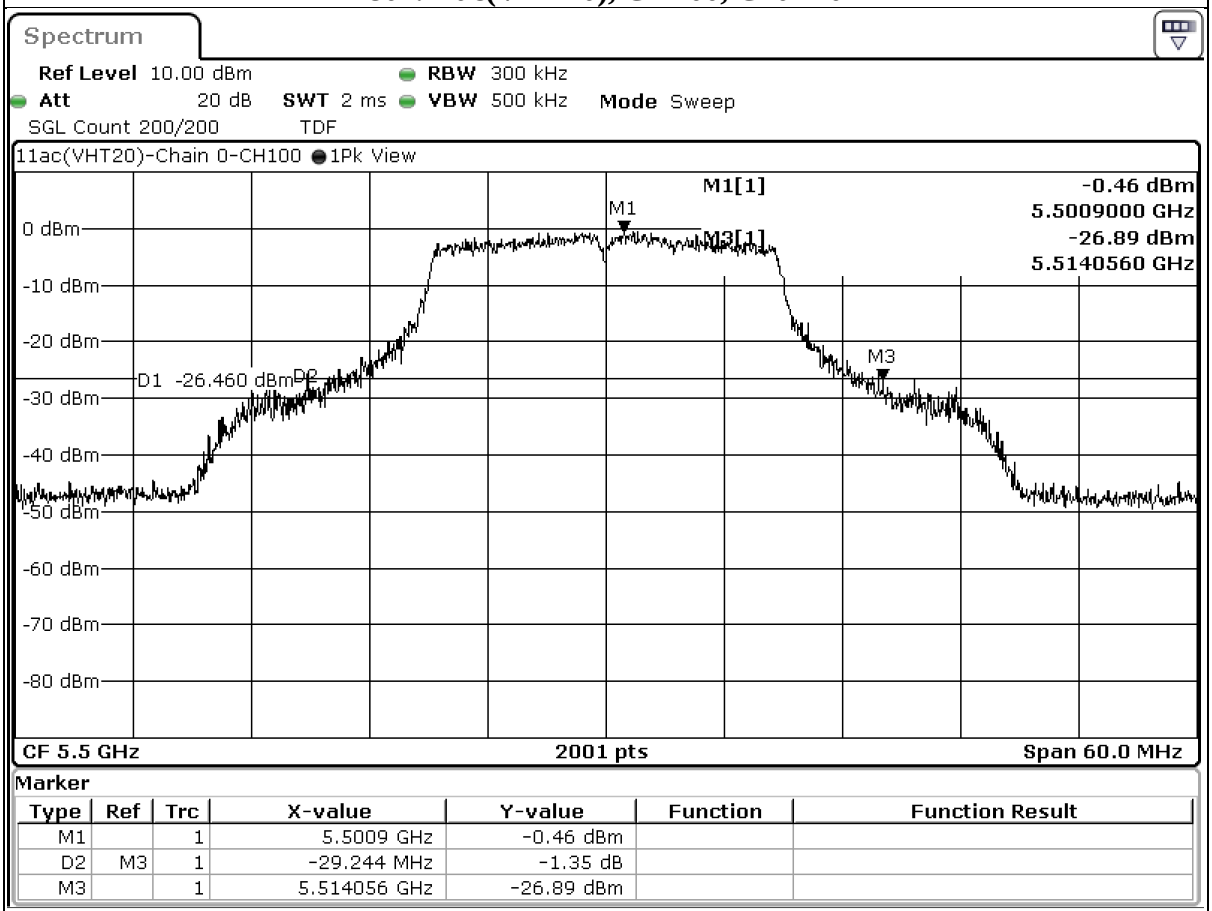
Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	36	5180	24.274	22.748	N/A	PASS
	44	5220	23.512	23.724	N/A	PASS
	48	5240	19.728	19.449	N/A	PASS
	52	5260	24.523	23.236	N/A	PASS
	60	5300	23.835	25.585	N/A	PASS
	64	5320	23.728	22.808	N/A	PASS
	100	5500	26.317	23.203	N/A	PASS
	116	5580	23.602	24.372	N/A	PASS
	140	5700	22.868	23.858	N/A	PASS
	144 (U-NII-2C)	5720	17.454	16.597	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	24.335	22.878	N/A	PASS
	144 (U-NII-3)	5720	6.881	6.281	N/A	PASS

802.11a, CH100, Chain 0



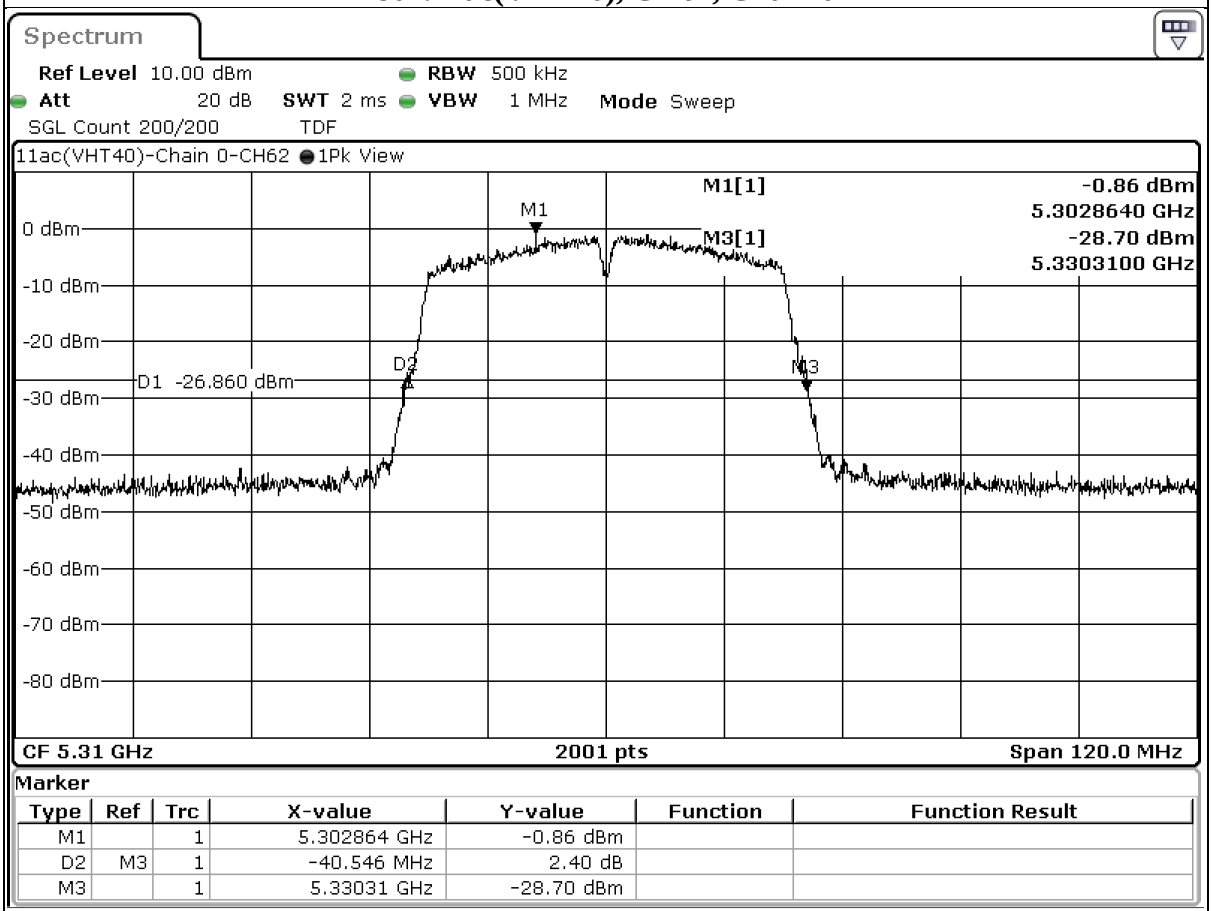
Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT20)	36	5180	24.845	25.74	N/A	PASS
	44	5220	27.462	23.689	N/A	PASS
	48	5240	20.161	19.839	N/A	PASS
	52	5260	26.695	24.032	N/A	PASS
	60	5300	26.853	24.882	N/A	PASS
	64	5320	27.017	23.557	N/A	PASS
	100	5500	29.244	23.681	N/A	PASS
	116	5580	26.622	24.06	N/A	PASS
	140	5700	28.944	25.013	N/A	PASS
	144 (U-NII-2C)	5720	18.749	17.064	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	27.555	24.281	N/A	PASS
	144 (U-NII-3)	5720	8.806	7.217	N/A	PASS

802.11ac(VHT20), CH100, Chain 0



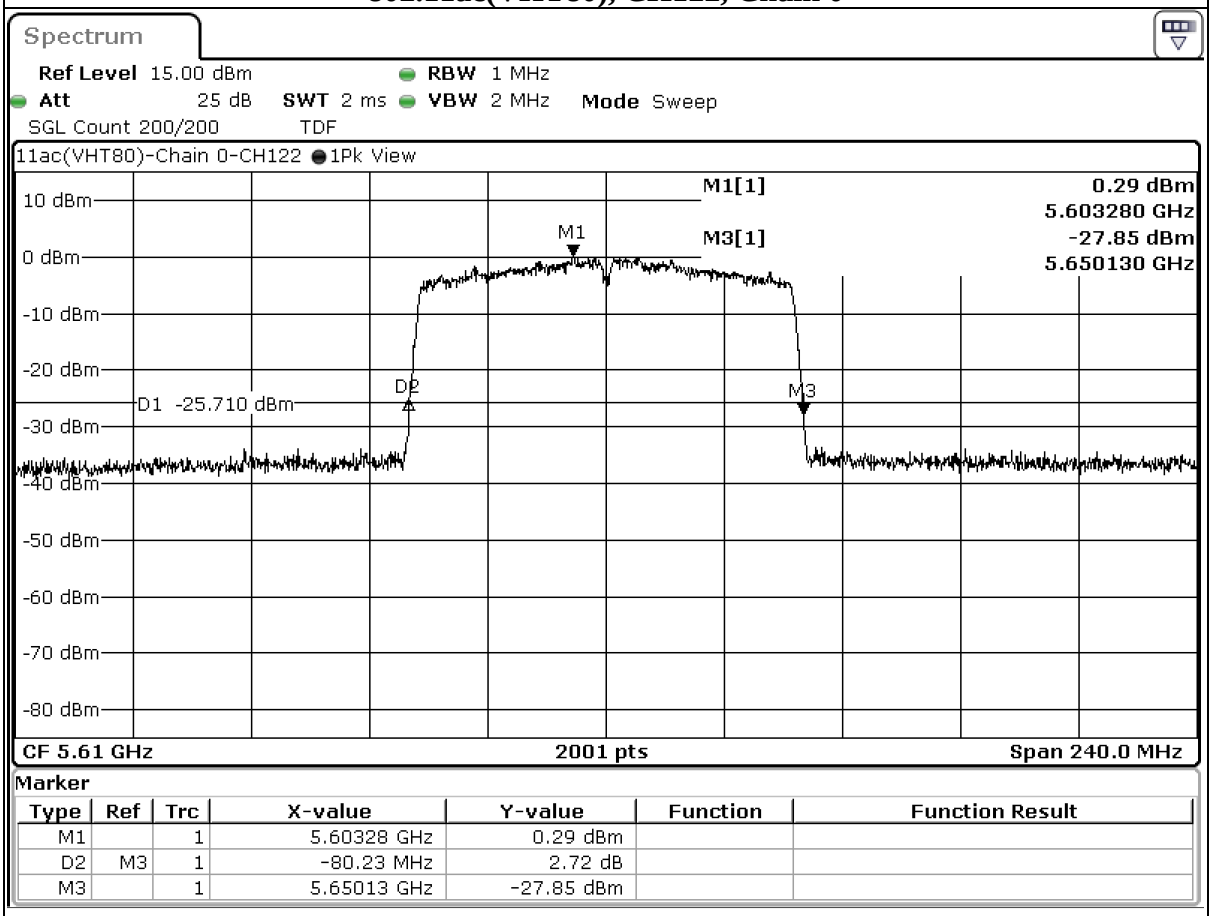
Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT40)	38	5190	40.053	39.888	N/A	PASS
	46	5230	40.058	39.685	N/A	PASS
	54	5270	39.927	39.275	N/A	PASS
	62	5310	40.546	39.573	N/A	PASS
	102	5510	40.321	39.814	N/A	PASS
	110	5550	40.324	39.843	N/A	PASS
	134	5670	40.068	39.729	N/A	PASS
	142 (U-NII-2C)	5710	35.286	35.05	N/A	PASS
	142 (U-NII-2C+U-NII-3)	5710	40.329	39.684	N/A	PASS
	142 (U-NII-3)	5710	5.043	4.634	N/A	PASS

802.11ac(VHT40), CH62, Chain 0



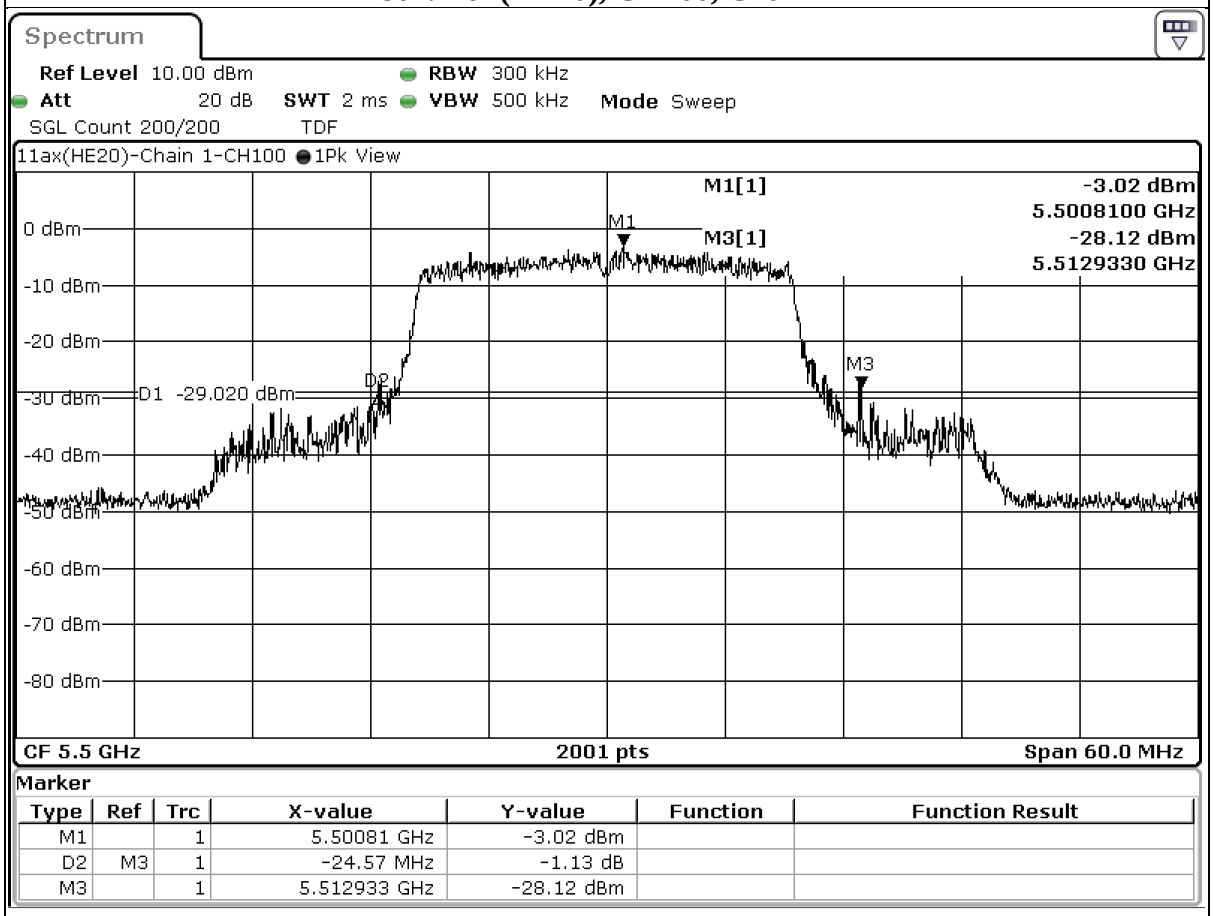
Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT80)	42	5210	80.111	79.674	N/A	PASS
	58	5290	80.095	79.449	N/A	PASS
	106	5530	79.922	79.683	N/A	PASS
	122	5610	80.23	79.494	N/A	PASS
	138 (U-NII-2C)	5690	75.081	74.736	N/A	PASS
	138 (U-NII-2C+U-NII-3)	5690	80.083	79.606	N/A	PASS
	138 (U-NII-3)	5690	5.002	4.87	N/A	PASS

802.11ac(VHT80), CH122, Chain 0



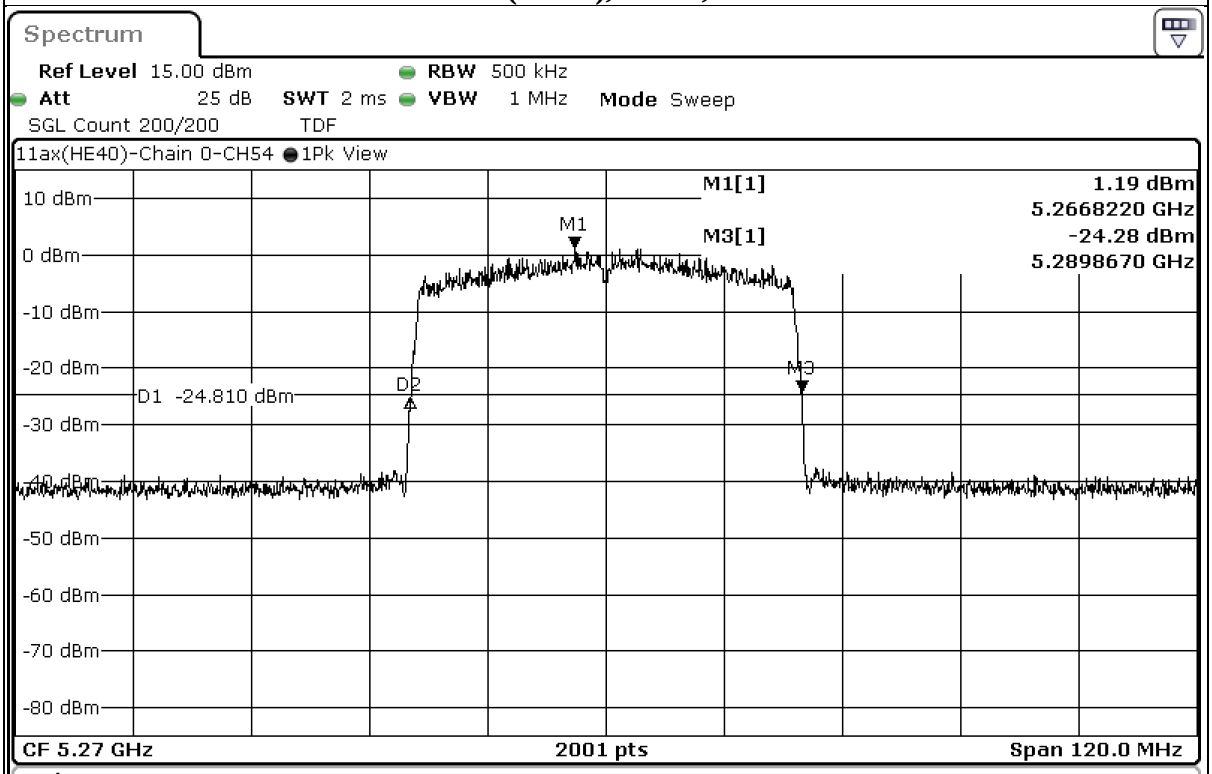
Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	36	5180	22.881	22.776	N/A	PASS
	44	5220	23.493	21.285	N/A	PASS
	48	5240	19.881	19.797	N/A	PASS
	52	5260	22.403	22.414	N/A	PASS
	60	5300	22.388	23.25	N/A	PASS
	64	5320	24.008	22.201	N/A	PASS
	100	5500	22.451	24.57	N/A	PASS
	116	5580	21.688	22.27	N/A	PASS
	140	5700	23.156	21.078	N/A	PASS
	144 (U-NII-2C)	5720	16.025	16.015	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	22.339	21.587	N/A	PASS
	144 (U-NII-3)	5720	6.314	5.572	N/A	PASS

802.11ax(HE20), CH100, Chain 1



Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	38	5190	39.643	39.492	N/A	PASS
	46	5230	39.509	39.605	N/A	PASS
	54	5270	39.713	39.511	N/A	PASS
	62	5310	39.563	39.467	N/A	PASS
	102	5510	39.58	39.513	N/A	PASS
	110	5550	39.668	39.581	N/A	PASS
	134	5670	39.494	39.536	N/A	PASS
	142 (U-NII-2C)	5710	34.807	34.831	N/A	PASS
	142 (U-NII-2C+U-NII-3)	5710	39.457	39.488	N/A	PASS
	142 (U-NII-3)	5710	4.65	4.657	N/A	PASS

802.11ax(HE40), CH54, Chain 0

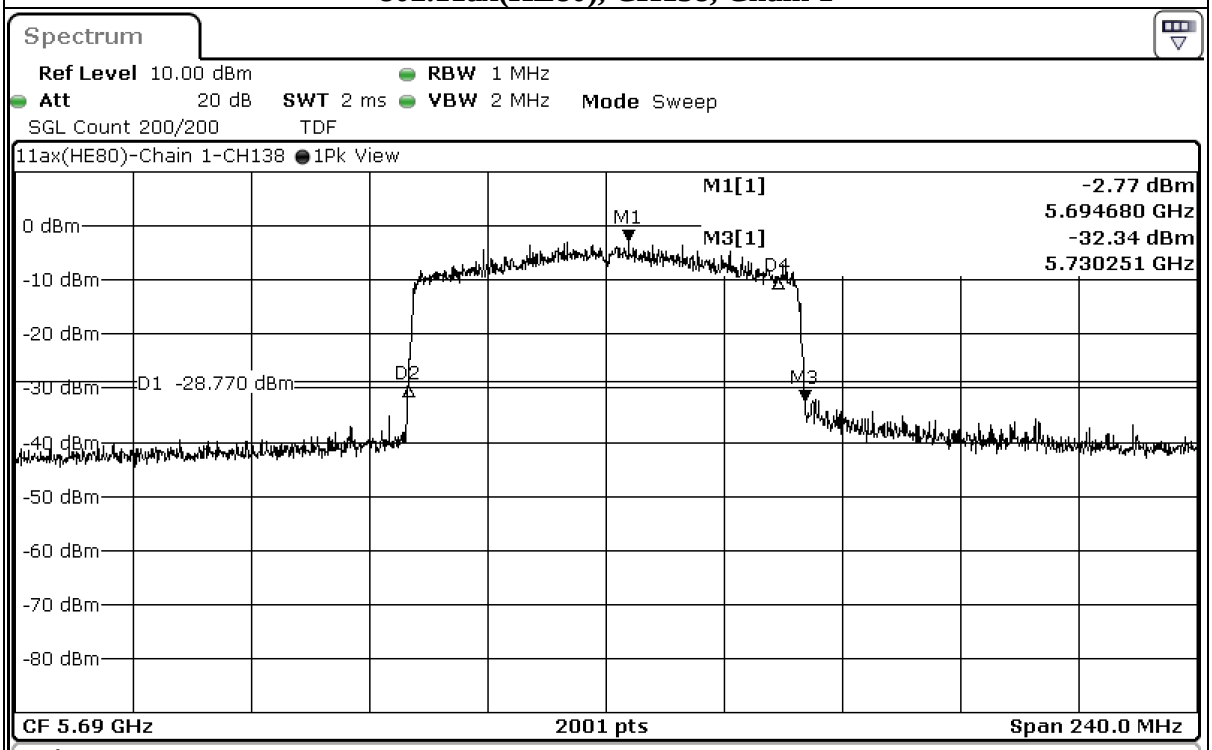


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.266822 GHz	1.19 dBm		
D2	M3	1	-39.713 MHz	-0.93 dB		
M3		1	5.289867 GHz	-24.28 dBm		

Mode	CH	Freq (MHz)	26dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	42	5210	80.405	80.284	N/A	PASS
	58	5290	80.078	80.331	N/A	PASS
	106	5530	80.073	80.183	N/A	PASS
	122	5610	80.282	80.29	N/A	PASS
	138 (U-NII-2C)	5690	75.188	75.182	N/A	PASS
	138 (U-NII-2C+U-NII-3)	5690	80.217	80.433	N/A	PASS
	138 (U-NII-3)	5690	5.029	5.251	N/A	PASS

802.11ax(HE80), CH138, Chain 1



Marker

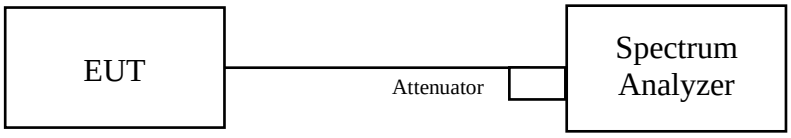
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.69468 GHz	-2.77 dBm		
D2	M3	1	-80.433 MHz	2.82 dB		
M3		1	5.730251 GHz	-32.34 dBm		
D4	M3	1	-5.251 MHz	22.80 dB		

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.
h. The plot of the test result only shows the worst case of channels as a representative.

Test Setup

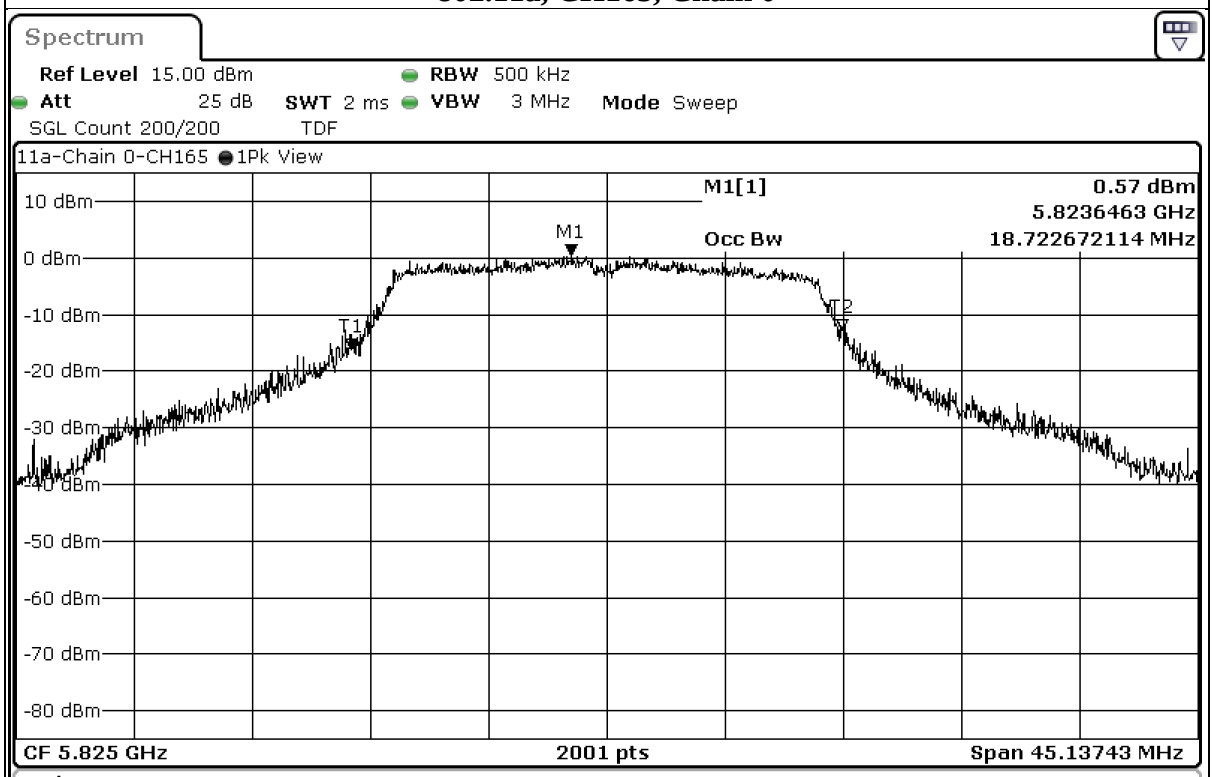


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11a	36	5180	18.427	17.708	N/A	PASS
	44	5220	18.478	17.809	N/A	PASS
	48	5240	17.068	16.82	N/A	PASS
	52	5260	18.655	17.695	N/A	PASS
	60	5300	18.452	17.776	N/A	PASS
	64	5320	18.526	17.771	N/A	PASS
	100	5500	18.487	17.781	N/A	PASS
	116	5580	18.417	17.749	N/A	PASS
	140	5700	18.4	17.83	N/A	PASS
	144 (U-NII-2C)	5720	14.345	14.006	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	18.356	17.771	N/A	PASS
	144 (U-NII-3)	5720	4.01	3.765	N/A	PASS
	149	5745	18.638	17.766	N/A	PASS
	157	5785	18.56	17.711	N/A	PASS
	165	5825	18.723	17.7	N/A	PASS

802.11a, CH165, Chain 0

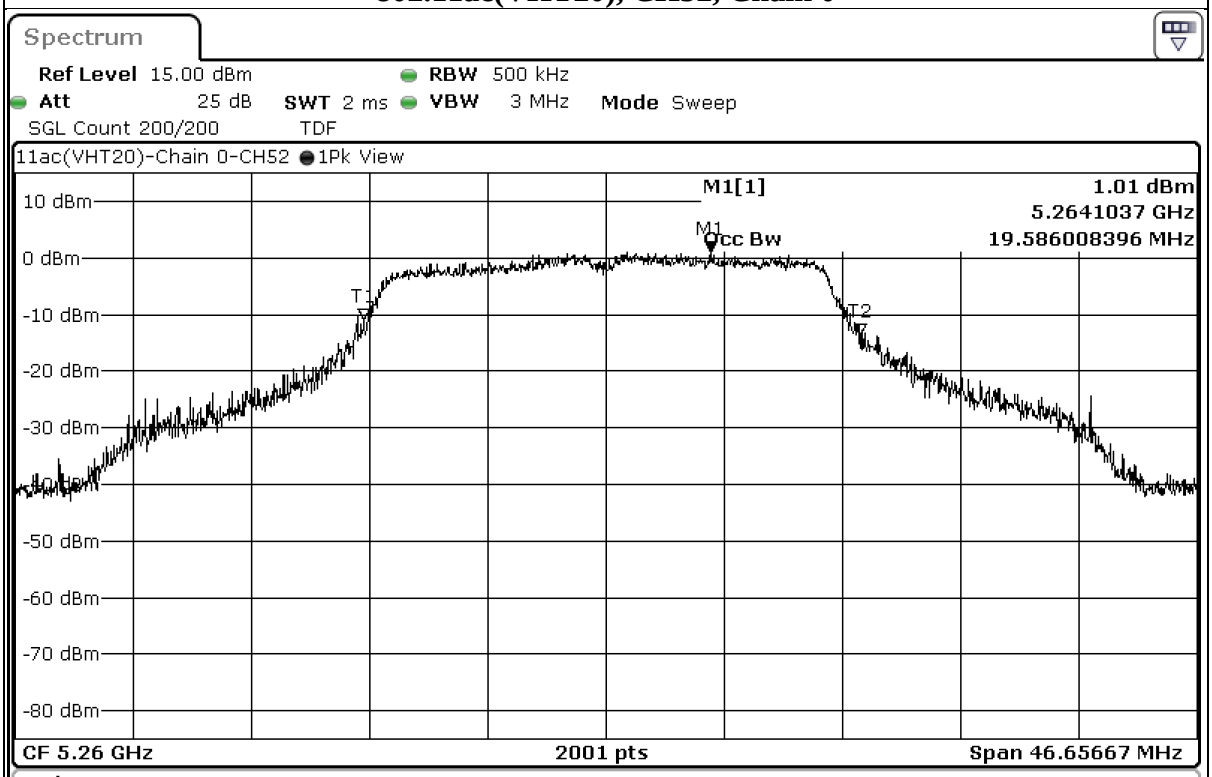


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.8236463 GHz	0.57 dBm		
T1		1	5.8152552 GHz	-16.33 dBm	Occ Bw	18.722672114 MHz
T2		1	5.8339779 GHz	-12.77 dBm		

Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT20)	36	5180	19.55	18.68	N/A	PASS
	44	5220	19.423	18.657	N/A	PASS
	48	5240	18.034	17.722	N/A	PASS
	52	5260	19.586	18.591	N/A	PASS
	60	5300	19.393	18.703	N/A	PASS
	64	5320	19.372	18.703	N/A	PASS
	100	5500	19.452	18.713	N/A	PASS
	116	5580	19.426	18.563	N/A	PASS
	140	5700	19.483	18.645	N/A	PASS
	144 (U-NII-2C)	5720	14.967	14.403	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	19.583	18.647	N/A	PASS
	144 (U-NII-3)	5720	4.616	4.244	N/A	PASS
	149	5745	19.498	18.65	N/A	PASS
	157	5785	19.513	18.661	N/A	PASS
	165	5825	19.526	18.631	N/A	PASS

802.11ac(VHT20), CH52, Chain 0

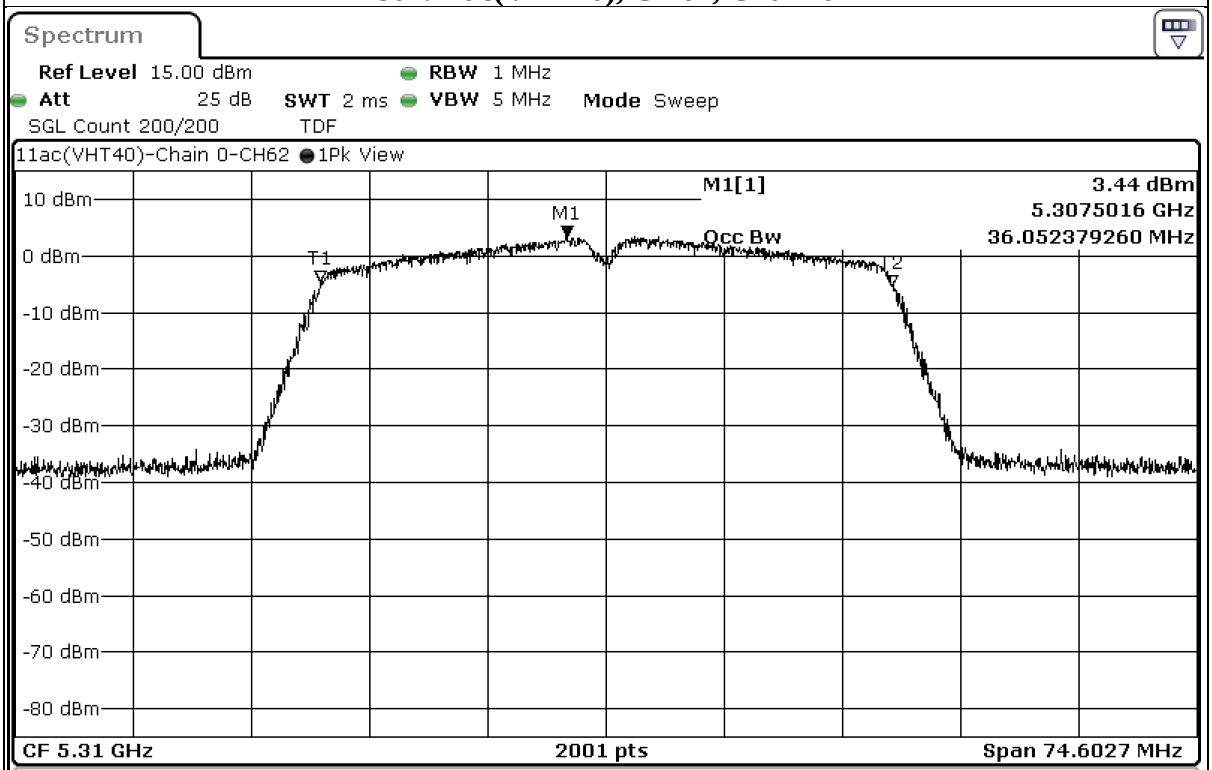


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.2641037 GHz	1.01 dBm		
T1		1	5.2504402 GHz	-10.88 dBm	Occ Bw	19.586008396 MHz
T2		1	5.2700262 GHz	-13.63 dBm		

Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT40)	38	5190	36.018	35.975	N/A	PASS
	46	5230	35.903	35.938	N/A	PASS
	54	5270	35.942	35.822	N/A	PASS
	62	5310	36.052	35.976	N/A	PASS
	102	5510	36.018	35.896	N/A	PASS
	110	5550	36.016	35.936	N/A	PASS
	134	5670	35.863	35.941	N/A	PASS
	142 (U-NII-2C)	5710	33.063	33.081	N/A	PASS
	142 (U-NII-2C+U-NII-3)	5710	35.976	35.938	N/A	PASS
	142 (U-NII-3)	5710	2.914	2.857	N/A	PASS
	151	5755	35.98	35.941	N/A	PASS
	159	5795	36.016	35.976	N/A	PASS

802.11ac(VHT40), CH62, Chain 0

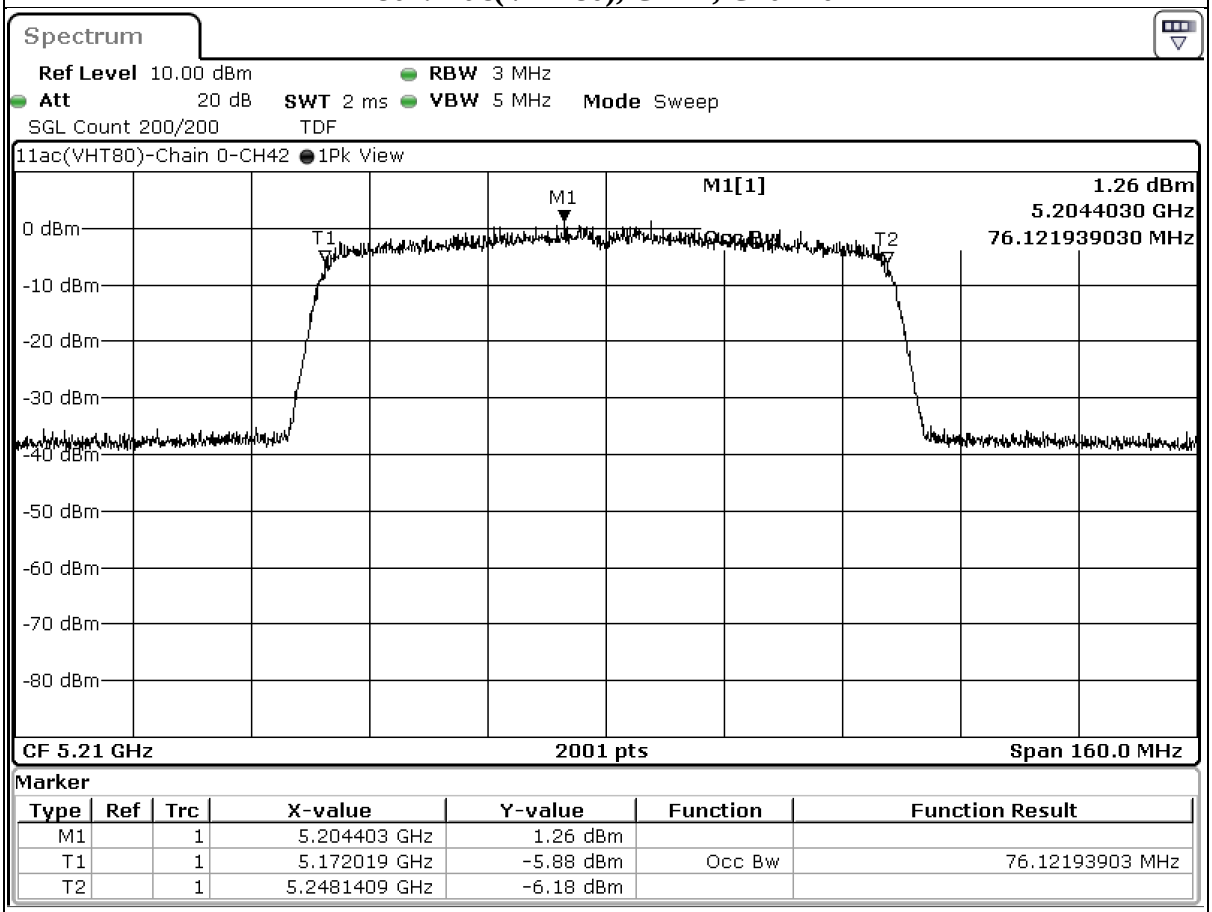


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.3075016 GHz	3.44 dBm		
T1		1	5.2919925 GHz	-4.51 dBm	Occ Bw	36.05237926 MHz
T2		1	5.3280448 GHz	-5.36 dBm		

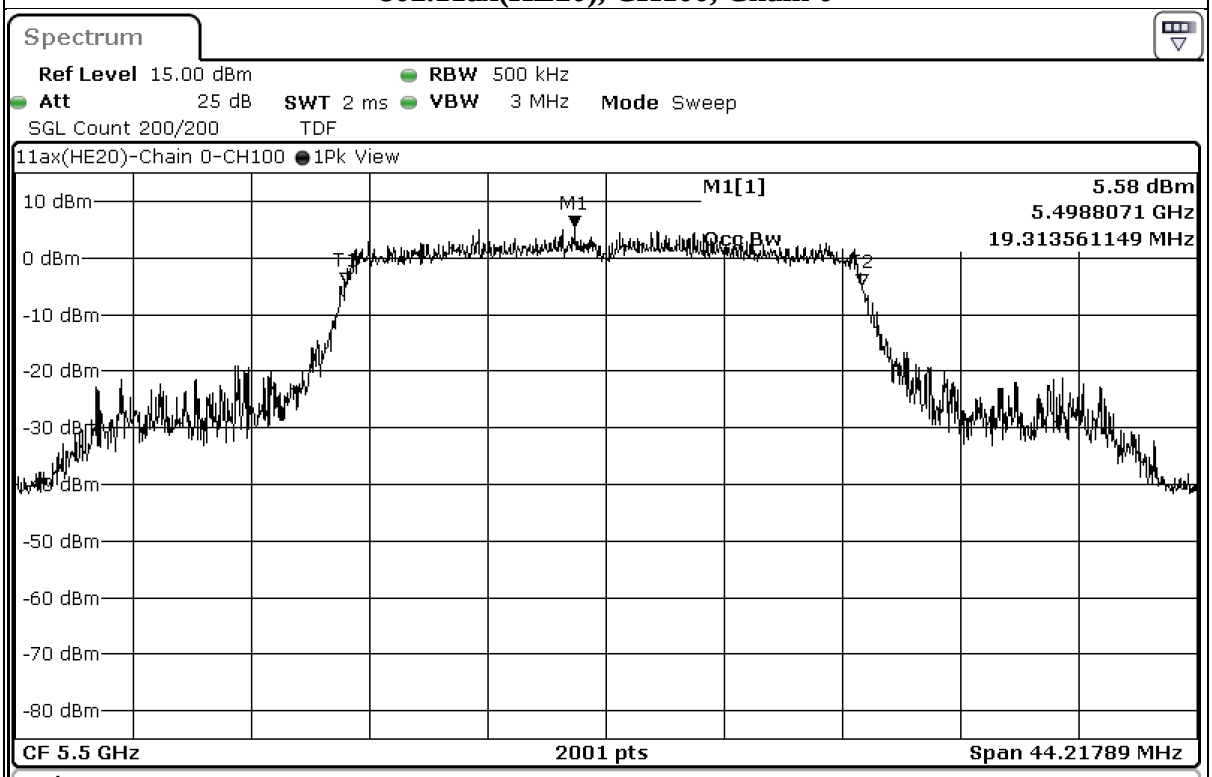
Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT80)	42	5210	76.122	76.042	N/A	PASS
	58	5290	75.802	75.642	N/A	PASS
	106	5530	75.802	75.562	N/A	PASS
	122	5610	75.962	75.802	N/A	PASS
	138 (U-NII-2C)	5690	73.061	72.741	N/A	PASS
	138 (U-NII-2C+U-NII-3)	5690	75.882	75.562	N/A	PASS
	138 (U-NII-3)	5690	2.821	2.821	N/A	PASS
	155	5775	75.882	75.962	N/A	PASS

802.11ac(VHT80), CH42, Chain 0



Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE20)	36	5180	19.273	19.304	N/A	PASS
	44	5220	19.27	19.257	N/A	PASS
	48	5240	18.901	18.884	N/A	PASS
	52	5260	19.257	19.235	N/A	PASS
	60	5300	19.287	19.274	N/A	PASS
	64	5320	19.295	19.222	N/A	PASS
	100	5500	19.314	19.273	N/A	PASS
	116	5580	19.209	19.196	N/A	PASS
	140	5700	19.243	19.266	N/A	PASS
	144 (U-NII-2C)	5720	14.675	14.692	N/A	PASS
	144 (U-NII-2C+U-NII-3)	5720	19.196	19.187	N/A	PASS
	144 (U-NII-3)	5720	4.521	4.495	N/A	PASS
	149	5745	19.24	19.174	N/A	PASS
	157	5785	19.257	19.226	N/A	PASS
	165	5825	19.244	19.183	N/A	PASS

802.11ax(HE20), CH100, Chain 0

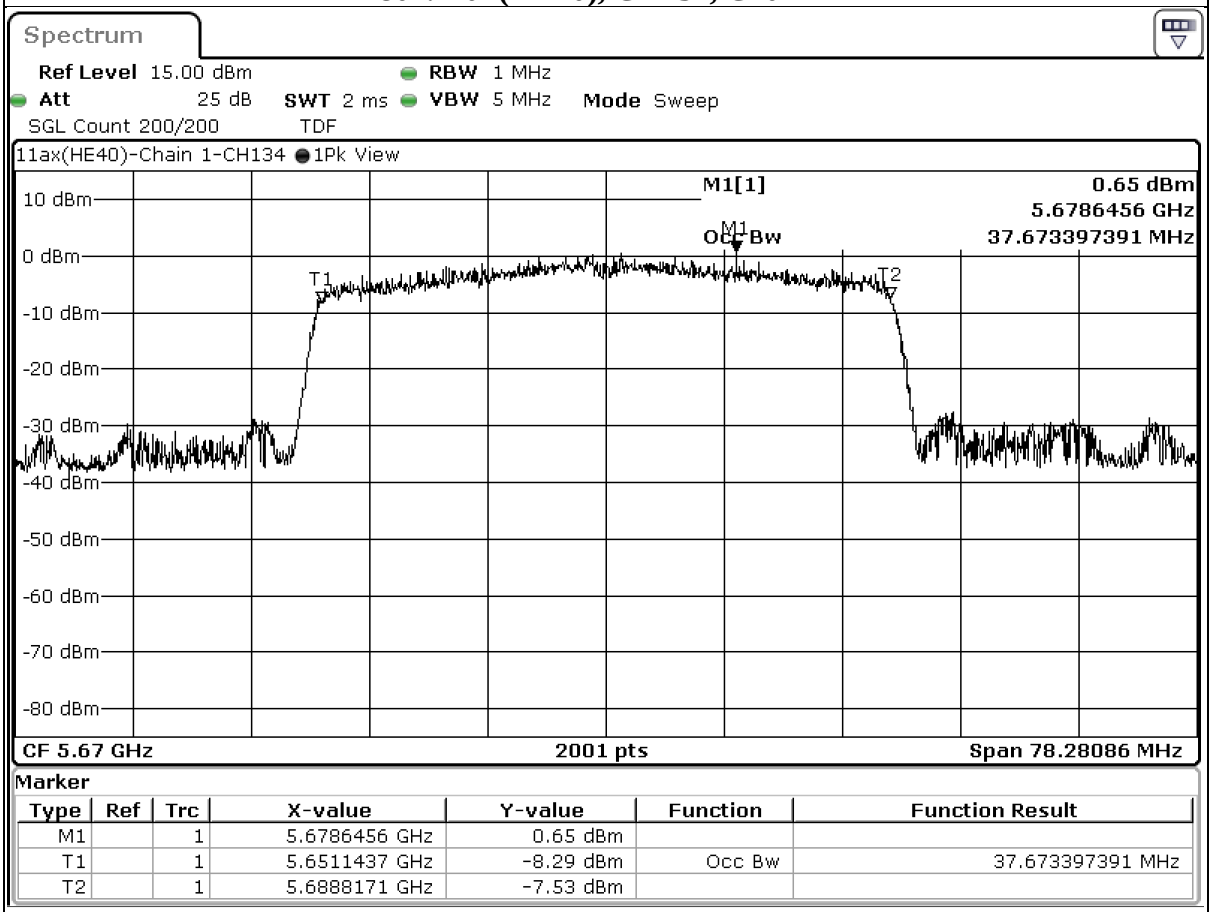


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.4988071 GHz	5.58 dBm		
T1		1	5.4902548 GHz	-4.57 dBm	Occ Bw	19.313561149 MHz
T2		1	5.5095684 GHz	-4.76 dBm		

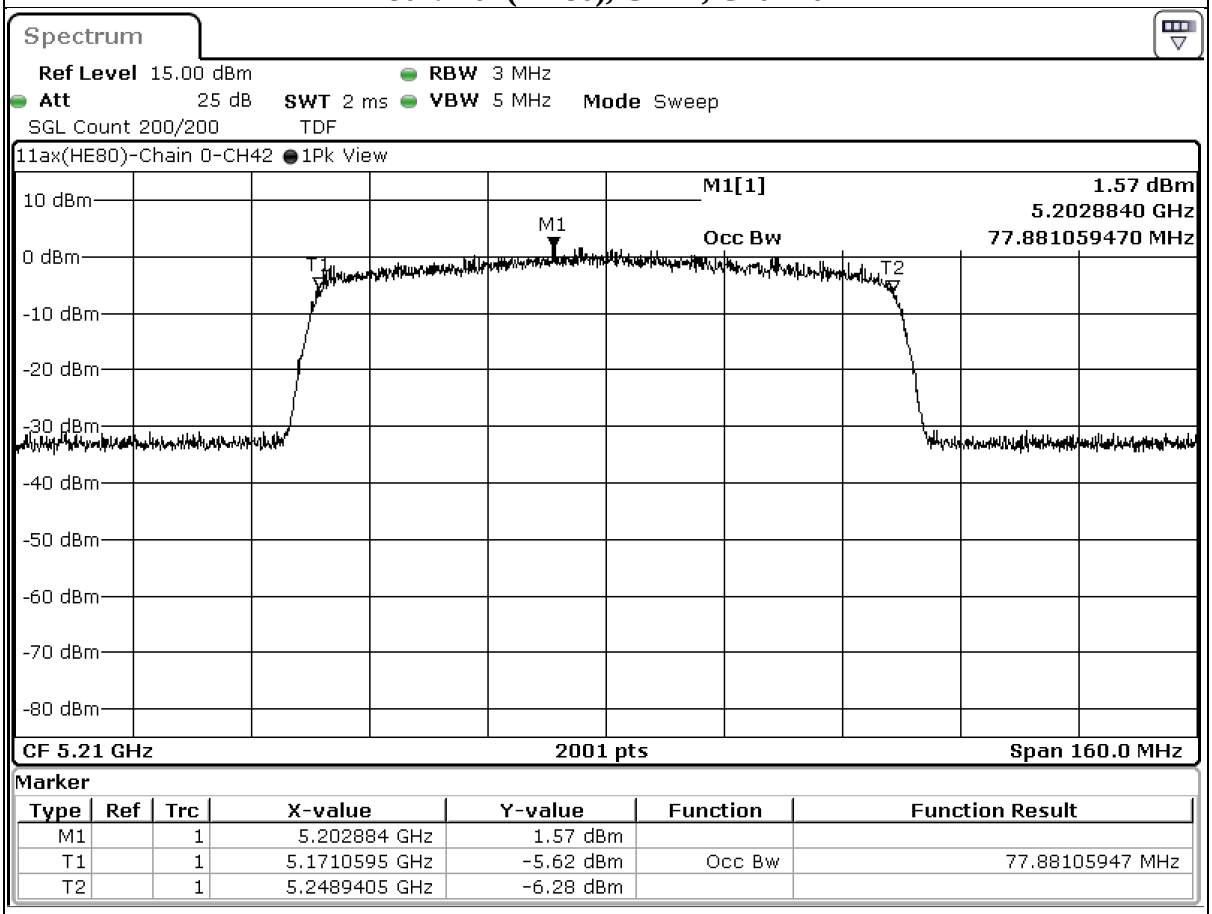
Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE40)	38	5190	37.595	37.518	N/A	PASS
	46	5230	37.596	37.597	N/A	PASS
	54	5270	37.519	37.481	N/A	PASS
	62	5310	37.636	37.518	N/A	PASS
	102	5510	37.596	37.518	N/A	PASS
	110	5550	37.558	37.596	N/A	PASS
	134	5670	37.596	37.673	N/A	PASS
	142 (U-NII-2C)	5710	33.896	33.857	N/A	PASS
	142 (U-NII-2C+U-NII-3)	5710	37.558	37.519	N/A	PASS
	142 (U-NII-3)	5710	3.662	3.662	N/A	PASS
	151	5755	37.559	37.559	N/A	PASS
	159	5795	37.596	37.478	N/A	PASS

802.11ax(HE40), CH134, Chain 1



Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ax(HE80)	42	5210	77.881	77.801	N/A	PASS
	58	5290	77.561	77.081	N/A	PASS
	106	5530	77.721	77.401	N/A	PASS
	122	5610	77.561	77.641	N/A	PASS
	138 (U-NII-2C)	5690	73.941	73.781	N/A	PASS
	138 (U-NII-2C+U-NII-3)	5690	77.641	77.481	N/A	PASS
	138 (U-NII-3)	5690	3.701	3.701	N/A	PASS
	155	5775	77.641	77.641	N/A	PASS

802.11ax(HE80), CH42, Chain 0



9.4. Conducted output power

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
		Fixed point-to-point Access Point	1 Watt (30 dBm) If G_{TX} > 23 dBi, then P_{Out} = 30 – (G_{TX} – 23)
		Indoor Access Point	1 Watt (30 dBm) If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
	√	Client device	250mW (24 dBm) If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-2A	√		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-2C	√		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-3	√		For Point-to-multipoint systems (P2M): 1 Watt (30 dBm). If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 1 Watt (30 dBm)
U-NII-4		Indoor Access Point	Maximum e.i.r.p. 4 W
		Subordinate Device	Maximum e.i.r.p. 4 W
	√	Client Device	Maximum e.i.r.p. 1 W

Note:

1. P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi, B is the 26 dB emission bandwidth in megahertz
2. If EUT with Multiple Transmitter Output:
   a. Directional Gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{Gn/20})^2$ / Nant] dBi.
      N*a*nt: Number of Transmit Antennas
      G1, G2,..., Gn: Gain of Individual Antennas
      Example: two antenna and gain 5 dBi / 3dBi, so if it was used for TxBF power measurement
      Directional Gain = 10 log[(105/20 + 103/20)2 / 2] dBi = 7.07 dBi
   b. Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices, CDD
      Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;
      Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;
      Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20-MHz channel widths with NANT ≥ 5.
      Example: Maximum antenna gain = 5 dBi and NANT ≤ 4, so if it was used for CDD power measurement
      Directional Gain = 5 dBi + Array Gain = 5 dBi + 0 dB = 5 dBi
   c. For power measurement of KDB 662911 is used with multiple transmitter output. Total conducted power is the sum of the conducted power levels measured at the various output ports.
3. Straddle Channel Power in each band = Straddle Channel Total Power * (Each band EBW / Straddle Channel Total EBW).
   Example: if CH144 EBW (Total) = 20MHz, within UNII-2C Band is 15MHz, within UNII-3 Band is 5MHz, Total Power = 20dBm.
   Calculation for UNII-2C Band Power= 20dBm * (5/20) = 13.97 dBm
   Calculation for UNII-3 Band Power= 20dBm * (15/20) = 18.75 dBm.

Test Procedure

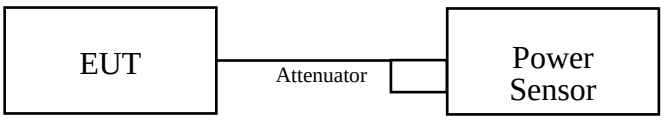
For Average Power Measurement

Test method PM

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. Duty factor is not added to measured value.

Test Setup

For Average Power Measurement



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

Test Data

Mode	CH	Freq. (MHz)	AVG Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
			Chain0	Chain1						
802.11a	36	5180	9.98	6.12	14.06	11.48	23.98	15.59	30	Pass
	44	5220	10.12	5.58	13.9	11.43	23.98	15.54	30	Pass
	48	5240	9.89	5.52	13.305	11.24	23.98	15.35	30	Pass
	52	5260	10.05	5.14	13.397	11.27	23.98	16.45	30	Pass
	60	5300	9.87	5.98	13.677	11.36	23.98	16.54	30	Pass
	64	5320	9.84	6.08	13.709	11.37	23.98	16.55	30	Pass
	100	5500	9.92	5.74	13.552	11.32	23.98	15.94	30	Pass
	116	5580	10.11	5.09	13.49	11.3	23.98	15.92	30	Pass
	140	5700	10.42	4.8	14.028	11.47	23.98	16.09	30	Pass
	144	5720	10.45	4.53	13.932	11.44	23.98	16.06	30	Pass
	2c-144	5720	9.01	3.14	10.023	10.01	23.2	14.63	30	Pass
	3-144	5720	4.96	-1.08	3.917	5.93	30	10.21	36.02	Pass
	149	5745	7.87	2.48	7.889	8.97	30	13.25	36.02	Pass
	157	5785	7.91	2.27	7.87	8.96	30	13.24	36.02	Pass
	165	5825	7.72	2.41	7.656	8.84	30	13.12	36.02	Pass
802.11ac (VHT20)	36	5180	9.08	5.14	11.35	10.55	23.98	14.66	30	Pass
	44	5220	9.13	5.26	11.535	10.62	23.98	14.73	30	Pass
	48	5240	9.42	5.35	12.19	10.86	23.98	14.97	30	Pass
	52	5260	9.21	5.03	11.508	10.61	23.98	15.79	30	Pass
	60	5300	9.1	5.64	11.803	10.72	23.98	15.9	30	Pass
	64	5320	9.03	5.54	11.588	10.64	23.98	15.82	30	Pass
	100	5500	9.46	5.58	12.445	10.95	23.98	15.57	30	Pass
	116	5580	8.97	5.84	11.722	10.69	23.98	15.31	30	Pass
	140	5700	9.4	5.16	11.995	10.79	23.98	15.41	30	Pass
	144	5720	9.51	5.17	12.218	10.87	23.98	15.49	30	Pass
	2c-144	5720	7.84	3.64	8.395	9.24	23.32	13.86	30	Pass
	3-144	5720	4.56	-0.1	3.837	5.84	30	10.12	36.02	Pass
	149	5745	7.44	3.08	7.586	8.8	30	13.08	36.02	Pass
	157	5785	7.57	2.48	7.482	8.74	30	13.02	36.02	Pass
	165	5825	7.43	2.42	7.278	8.62	30	12.9	36.02	Pass
802.11ac (VHT40)	38	5190	8.04	4.14	8.954	9.52	23.98	13.63	30	Pass
	46	5230	9.11	5.43	11.641	10.66	23.98	14.77	30	Pass
	54	5270	9.02	5.12	11.22	10.5	23.98	15.68	30	Pass
	62	5310	8.84	5.98	11.614	10.65	23.98	15.83	30	Pass
	102	5510	9.4	5.07	11.912	10.76	23.98	15.38	30	Pass
	110	5550	9.45	4.6	11.695	10.68	23.98	15.3	30	Pass
	134	5670	9.3	4.31	11.22	10.5	23.98	15.12	30	Pass
	142	5710	9.42	3.96	11.246	10.51	23.98	15.13	30	Pass
	2c-142	5710	8.84	3.42	9.863	9.94	23.98	14.56	30	Pass
	3-142	5710	0.39	-5.37	1.384	1.41	30	5.69	36.02	Pass
	151	5755	7.86	2.06	7.709	8.87	30	13.15	36.02	Pass
	159	5795	7.57	1.89	7.261	8.61	30	12.89	36.02	Pass
802.11ac (VHT80)	42	5210	4.61	0.73	4.074	6.1	23.98	10.21	30	Pass
	58	5290	8.94	5.45	11.35	10.55	23.98	15.73	30	Pass
	106	5530	9.04	4.43	10.789	10.33	23.98	14.95	30	Pass
	122	5610	9.52	4.21	11.588	10.64	23.98	15.26	30	Pass
	138	5690	9.6	4.62	12.023	10.8	23.98	15.42	30	Pass
	2c-138	5690	9.32	4.35	11.272	10.52	23.98	15.14	30	Pass
	3-138	5690	-2.44	-7.51	0.748	-1.26	30	3.02	36.02	Pass
	155	5775	7.56	1.94	7.261	8.61	30	12.89	36.02	Pass

Mode	CH	Freq. (MHz)	AVG Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
			Chain0	Chain1						
802.11ax (HE20)	36	5180	9.32	5.23	11.885	10.75	23.98	14.86	30	Pass
	44	5220	9.45	5.19	12.106	10.83	23.98	14.94	30	Pass
	48	5240	9.58	5.35	12.503	10.97	23.98	15.08	30	Pass
	52	5260	9.52	4.93	12.078	10.82	23.98	16	30	Pass
	60	5300	9.17	5.68	11.967	10.78	23.98	15.96	30	Pass
	64	5320	9.2	5.71	12.05	10.81	23.98	15.99	30	Pass
	100	5500	9.45	5.72	12.531	10.98	23.98	15.6	30	Pass
	116	5580	9.08	5.95	12.023	10.8	23.98	15.42	30	Pass
	140	5700	9.37	5.39	12.106	10.83	23.98	15.45	30	Pass
	144	5720	9.57	5.08	12.274	10.89	23.98	15.51	30	Pass
	2c-144	5720	8.13	3.78	8.892	9.49	23.04	14.11	30	Pass
	3-144	5720	4.08	-0.8	3.388	5.3	30	9.58	36.02	Pass
	149	5745	7.53	2.91	7.621	8.82	30	13.1	36.02	Pass
	157	5785	7.53	2.65	7.499	8.75	30	13.03	36.02	Pass
	165	5825	7.33	3.01	7.413	8.7	30	12.98	36.02	Pass
802.11ax (HE40)	38	5190	8.17	4.45	9.354	9.71	23.98	13.82	30	Pass
	46	5230	9.36	5.69	12.331	10.91	23.98	15.02	30	Pass
	54	5270	9.23	5.28	11.749	10.7	23.98	15.88	30	Pass
	62	5310	9.22	6.18	12.503	10.97	23.98	16.15	30	Pass
	102	5510	9.41	5.11	11.967	10.78	23.98	15.4	30	Pass
	110	5550	9.62	4.62	12.05	10.81	23.98	15.43	30	Pass
	134	5670	9.43	4.52	11.614	10.65	23.98	15.27	30	Pass
	142	5710	9.47	4.25	11.508	10.61	23.98	15.23	30	Pass
	2c-142	5710	8.93	3.71	10.162	10.07	23.98	14.69	30	Pass
	3-142	5710	0.18	-5.03	1.355	1.32	30	5.6	36.02	Pass
	151	5755	7.82	2.57	7.852	8.95	30	13.23	36.02	Pass
	159	5795	7.58	2.54	7.516	8.76	30	13.04	36.02	Pass
802.11ax (HE80)	42	5210	4.75	0.95	4.227	6.26	23.98	10.37	30	Pass
	58	5290	9.25	5.84	12.246	10.88	23.98	16.06	30	Pass
	106	5530	9.22	4.8	11.376	10.56	23.98	15.18	30	Pass
	122	5610	9.67	4.39	12.023	10.8	23.98	15.42	30	Pass
	138	5690	9.75	4.78	12.445	10.95	23.98	15.57	30	Pass
	2c-138	5690	9.47	4.49	11.668	10.67	23.98	15.29	30	Pass
	3-138	5690	-2.28	-7.07	0.787	-1.04	30	3.24	36.02	Pass
	155	5775	7.75	2.15	7.603	8.81	30	13.09	36.02	Pass

Note: Record the total power of the CH144* value for reference purposes.

9.5. Power Spectral Density

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
		Fixed point-to-point Access Point	17dBm/ MHz If G_{TX} > 23 dBi, then PSD = 17 – (G_{TX} – 23)
		Indoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
	√	Client device	11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2A	√		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2C	√		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-3	√		For Point-to-multipoint systems (P2M): 30dBm/ 500kHz. If G_{TX} > 6 dBi, then PSD = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 30dBm/ 500kHz
U-NII-4		Indoor Access Point	Maximum e.i.r.p. PSD 20 dBm/MHz
		Subordinate Device	Maximum e.i.r.p. PSD 20 dBm/MHz
		Client Device	Maximum e.i.r.p. PSD 14 dBm/MHz

Note:

1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. If EUT with Multiple Transmitter Output:
   a. Directional Gain = 10 log[$(10^{G1/20} + 10^{G2/20} + ... + 10^{Gn/20})^2$ / Nant] dBi.
      N*a*nt: Number of Transmit Antennas
      G1, G2,..., Gn: Gain of Individual Antennas
      Example: two antenna and gain 5 dBi / 3dBi, so if it was used for power density measurement
      Directional Gain = 10 log[$(10^{5/20} + 10^{3/20})^2$ / 2] dBi = 7.07 dBi
   b. "PSD per chain" of the report shown is maximum value for each chain, at the "Total PSD" is summing entire spectra across corresponding frequency bins on the various outputs by computer, refer KDB 662911 Method a) for calculating total power density.
   c. Method a) of power density measurement of KDB 662911 is used for calculating total power density with multiple transmitter output. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
4. Refer to section 6.6 for duty cycle spectrum plot. (If duty cycle<98%)

Test procedure

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method as below:

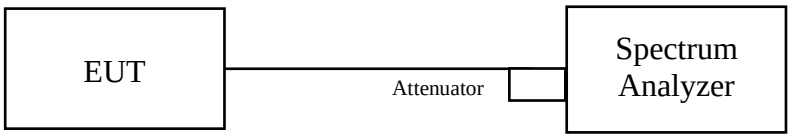
a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 1 MHz, Set VBW ≥ 3 RBW, Detector = RMS
c. Sweep time = auto, trigger set to "free run".
d. Trace average at least 100 traces in power averaging mode.
e. Record the max value. (if Duty cycle <98 %, add 10 log (1/duty cycle))
f. The plot of the test result only shows the worst case of channels as a representative.

For U-NII-3 band:

Using method as below:

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10 log (500 kHz/300kHz)
e. Sweep time = auto, trigger set to "free run".
f. Trace average at least 100 traces in power averaging mode.
g. Record the max value. (if Duty cycle <98 %, add 10 log (1/duty cycle))
h. The plot of the test result only shows the worst case of channels as a representative.

Test Setup



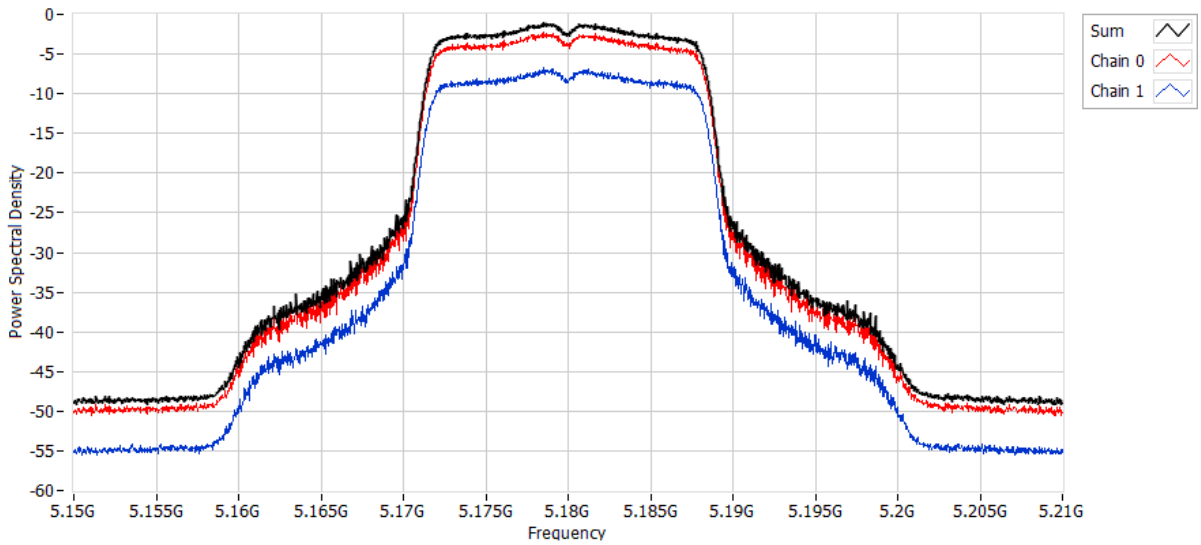
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	36	5180	6.97	-0.95	10.03	PASS
	44	5220	6.97	-1.29	10.03	PASS
	48	5240	6.97	-1.73	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	36	5180	-2.31	-6.67
	44	5220	-2.61	-6.99
	48	5240	-3.14	-6.73

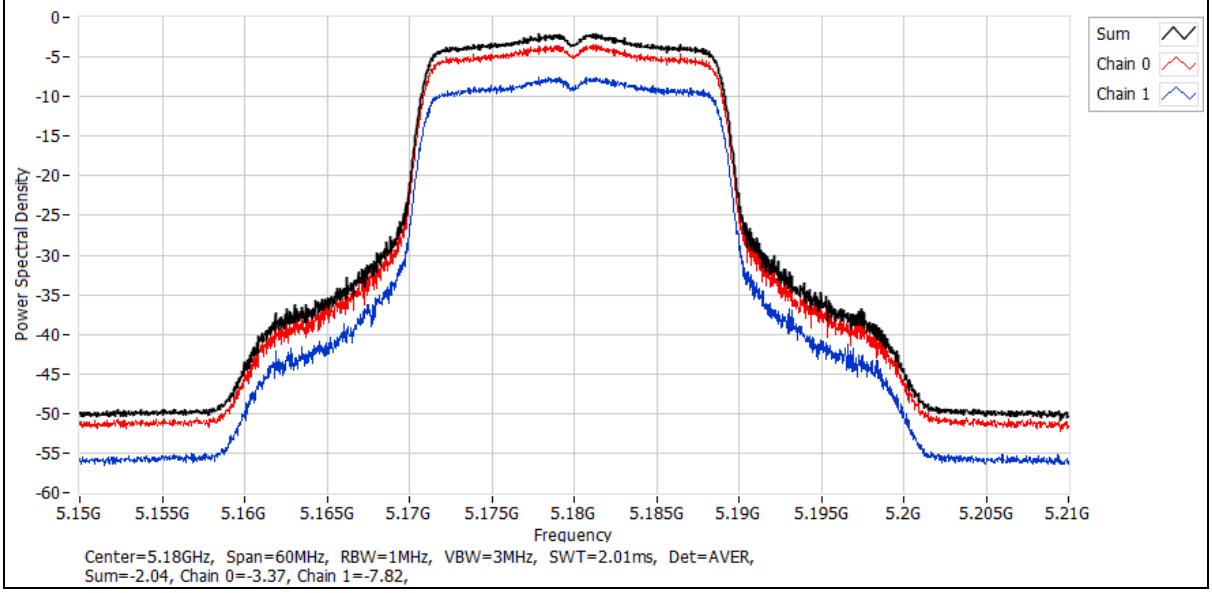
802.11a, CH36



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	36	5180	6.97	-2.04	10.03	PASS
	44	5220	6.97	-2.52	10.03	PASS
	48	5240	6.97	-2.1	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	36	5180	-3.37	-7.52
	44	5220	-3.85	-7.82
	48	5240	-3.4	-7.14

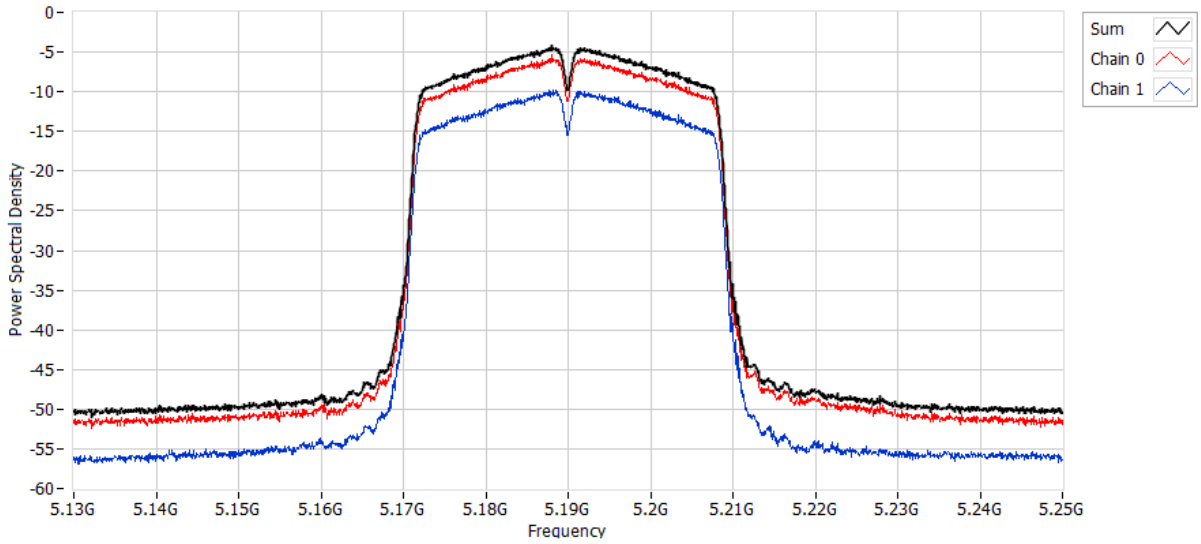
802.11ac(VHT20), CH36



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	38	5190	6.97	-4.16	10.03	PASS
	46	5230	6.97	-4.72	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	38	5190	-5.41	-9.71
	46	5230	-6.19	-9.85

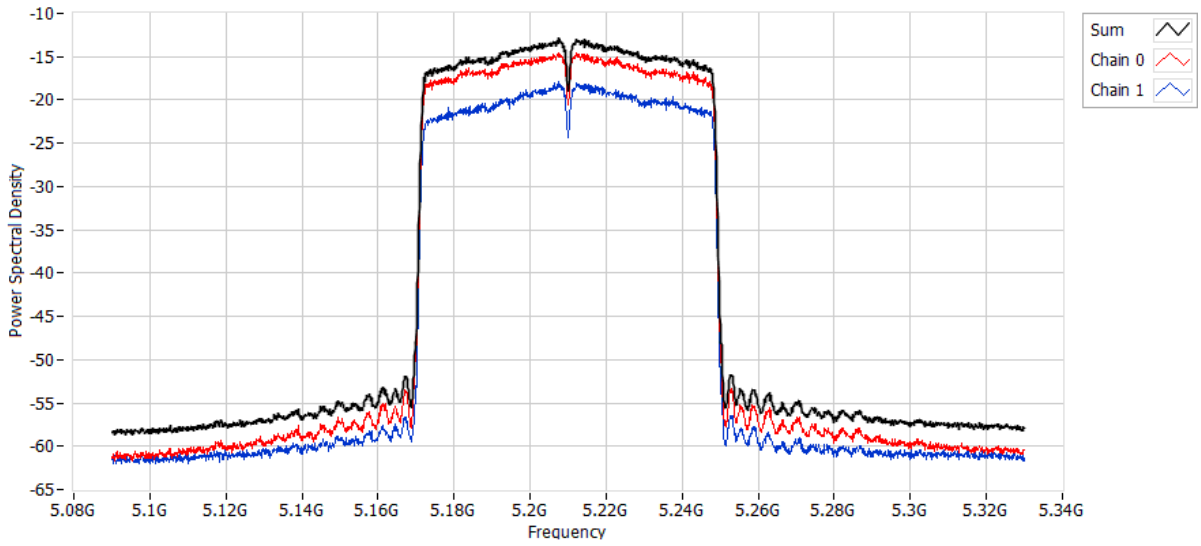
802.11ac(VHT40), CH38



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	42	5210	6.97	-12.85	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	42	5210	-14.52	-17.81

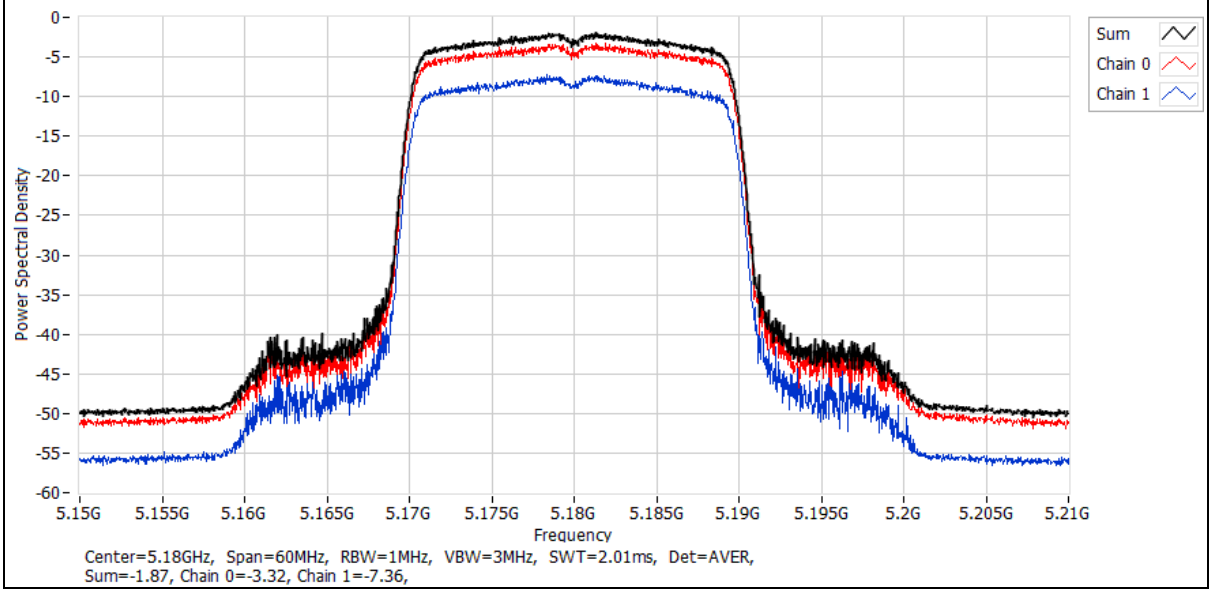
802.11ac(VHT80), CH42



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE20)	36	5180	6.97	-1.87	10.03	PASS
	44	5220	6.97	-2.48	10.03	PASS
	48	5240	6.97	-2.26	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE20)	36	5180	-3.28	-7.27
	44	5220	-3.86	-7.79
	48	5240	-3.51	-7.31

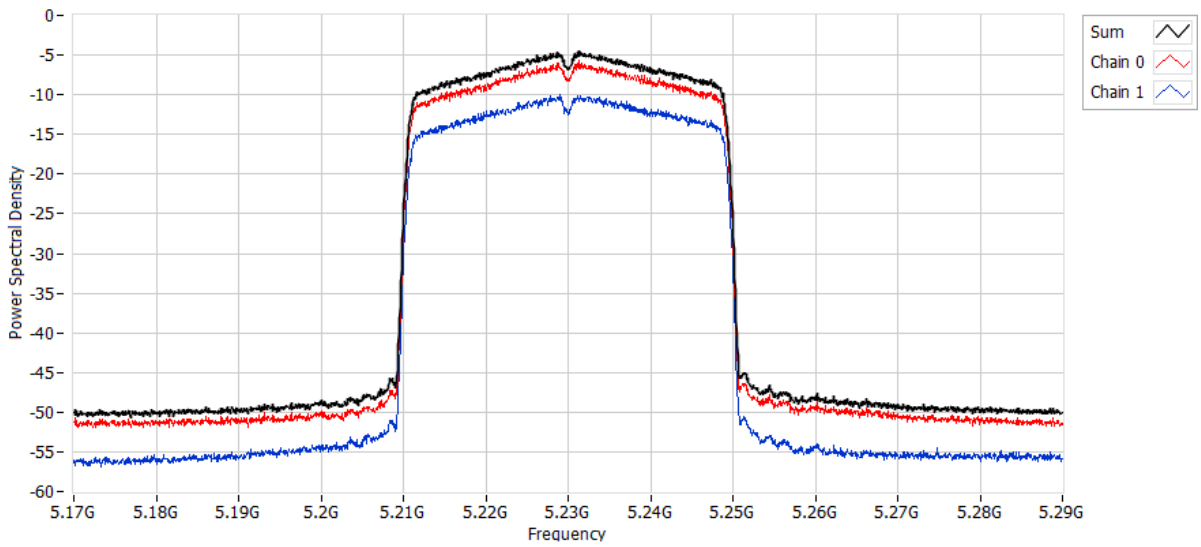
802.11ax(HE20), CH36



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE40)	38	5190	6.97	-5.6	10.03	PASS
	46	5230	6.97	-4.48	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE40)	38	5190	-7.05	-10.71
	46	5230	-5.69	-9.98

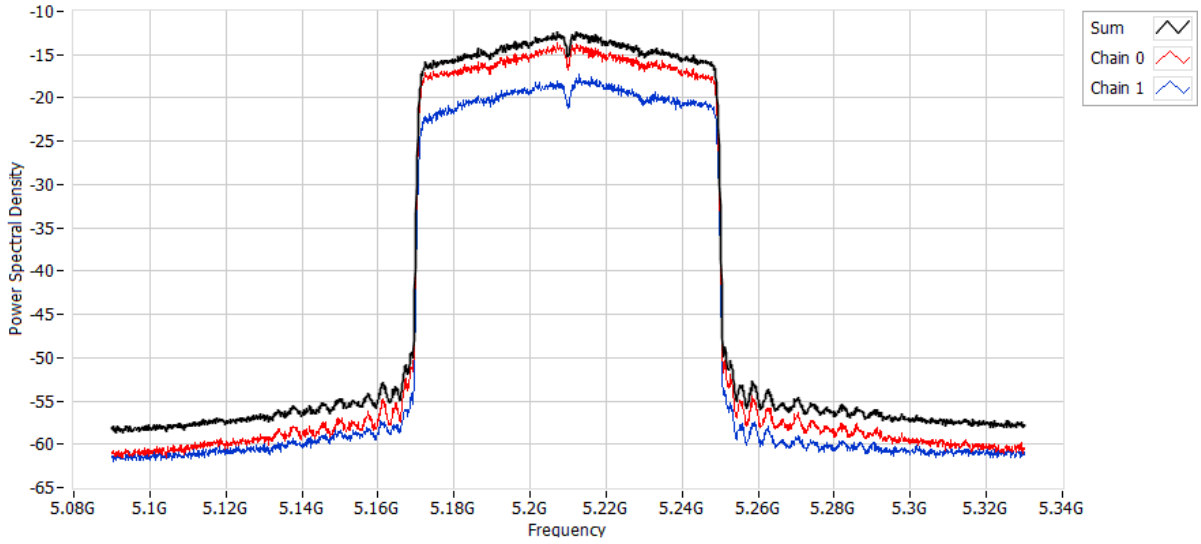
802.11ax(HE40), CH46



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE80)	42	5210	6.97	-12.39	10.03	PASS

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE80)	42	5210	-13.61	-17.29

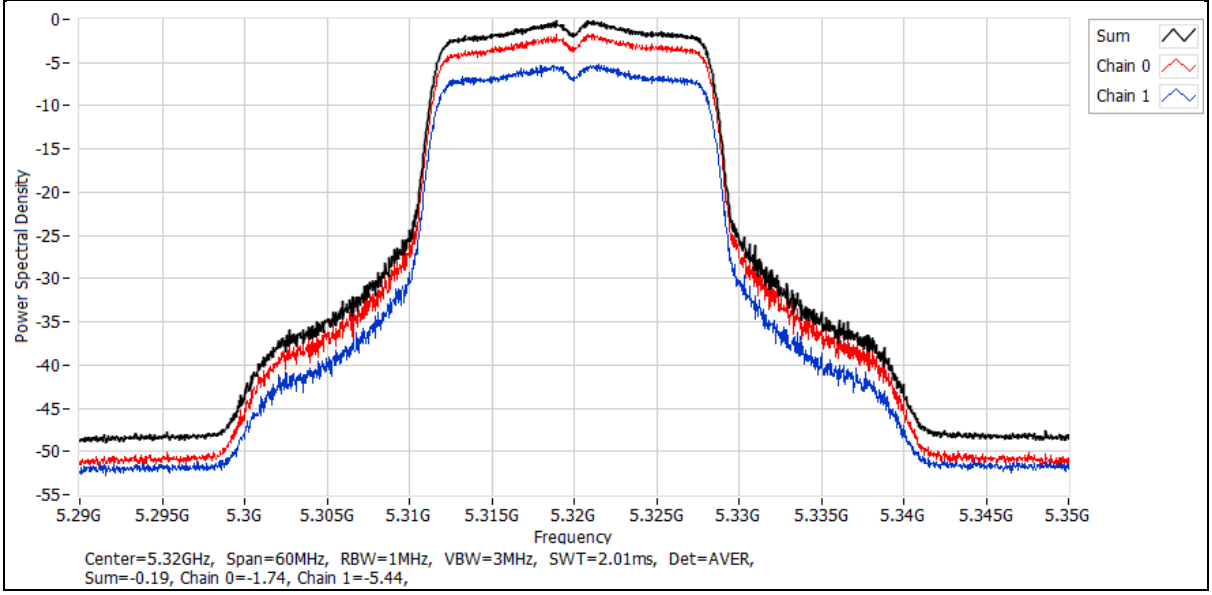
802.11ax(HE80), CH42



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	52	5260	7.51	-1.53	9.49	PASS
	60	5300	7.51	-0.73	9.49	PASS
	64	5320	7.51	-0.19	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	52	5260	-2.86	-6.82
	60	5300	-2.35	-5.43
	64	5320	-1.7	-5.19

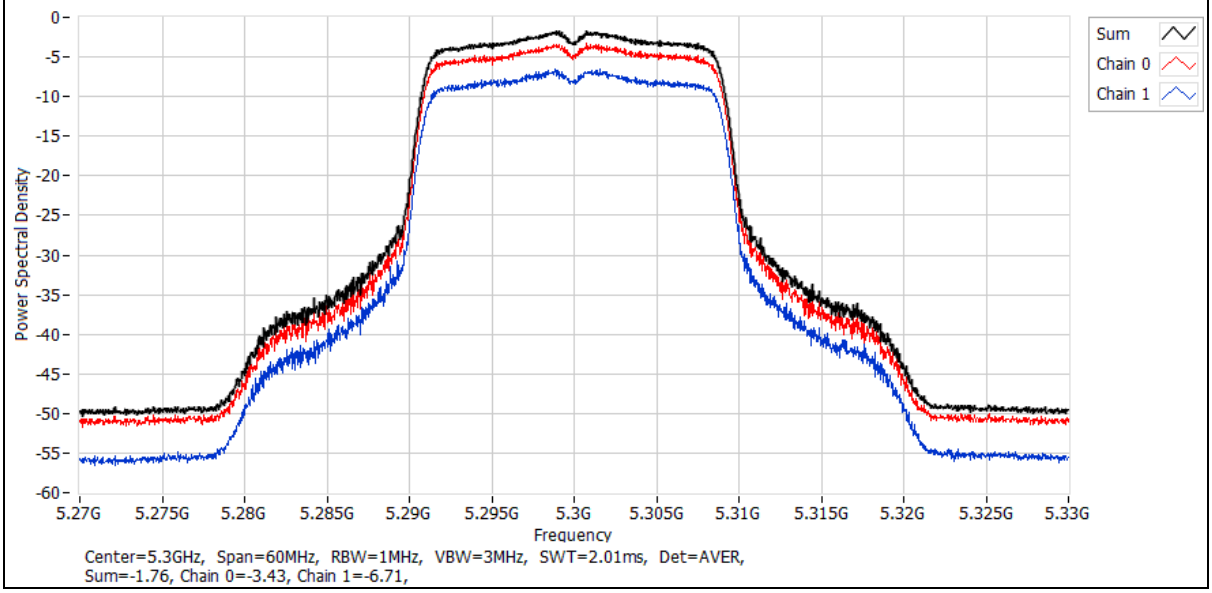
802.11a, CH64



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	52	5260	7.51	-2.36	9.49	PASS
	60	5300	7.51	-1.76	9.49	PASS
	64	5320	7.51	-1.76	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	52	5260	-3.74	-7.44
	60	5300	-3.29	-6.51
	64	5320	-3.29	-6.53

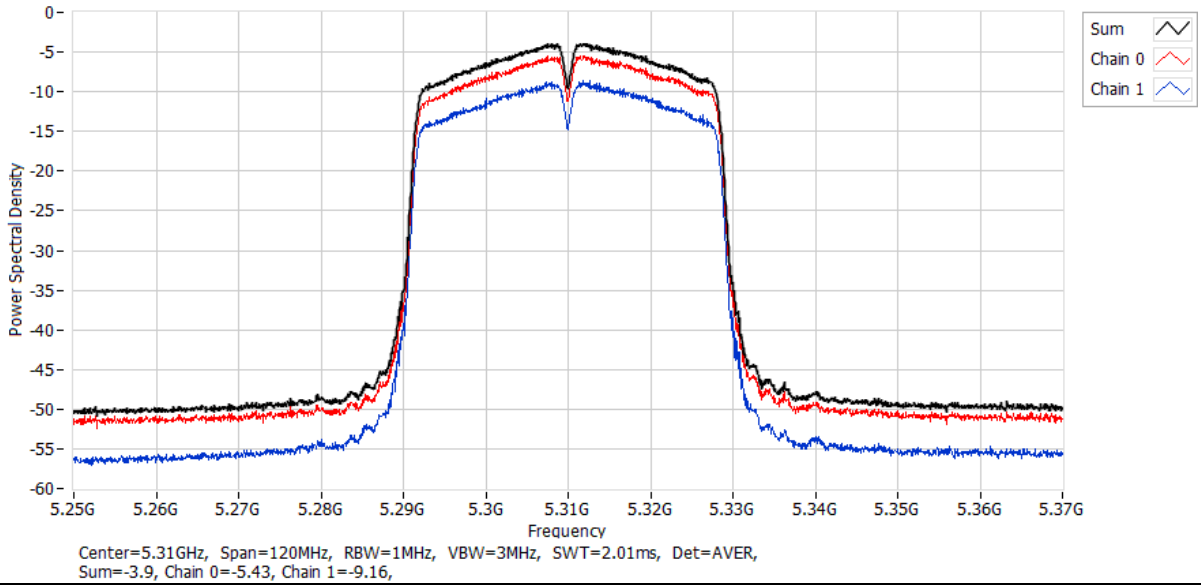
802.11ac(VHT20), CH60



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	54	5270	7.51	-4.47	9.49	PASS
	62	5310	7.51	-3.9	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	54	5270	-5.89	-9.47
	62	5310	-5.43	-8.59

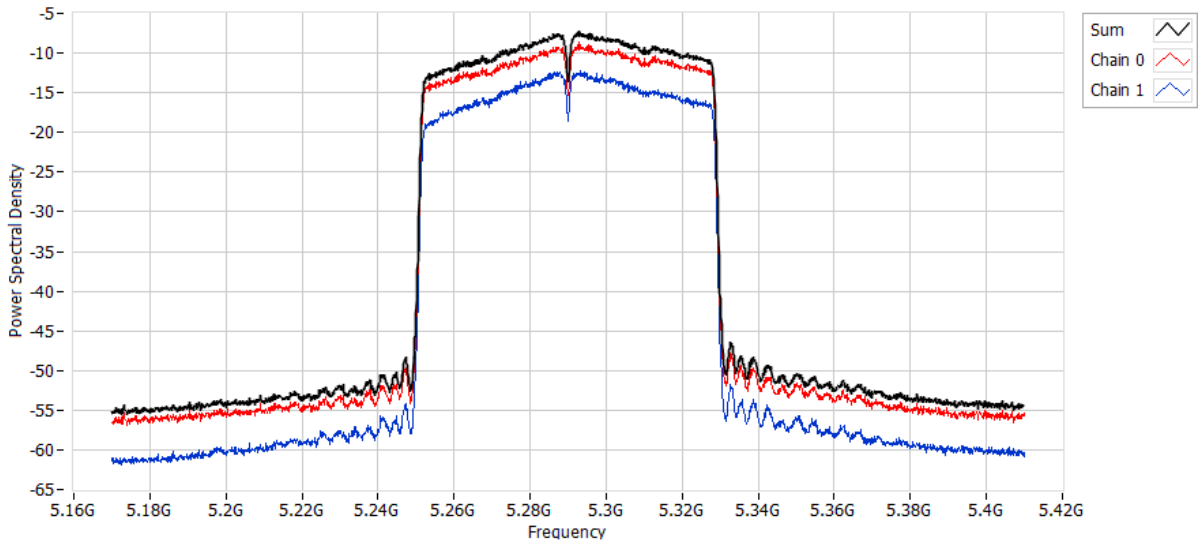
802.11ac(VHT40), CH62



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	58	5290	7.51	-7.15	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	58	5290	-8.65	-12.21

802.11ac(VHT80), CH58

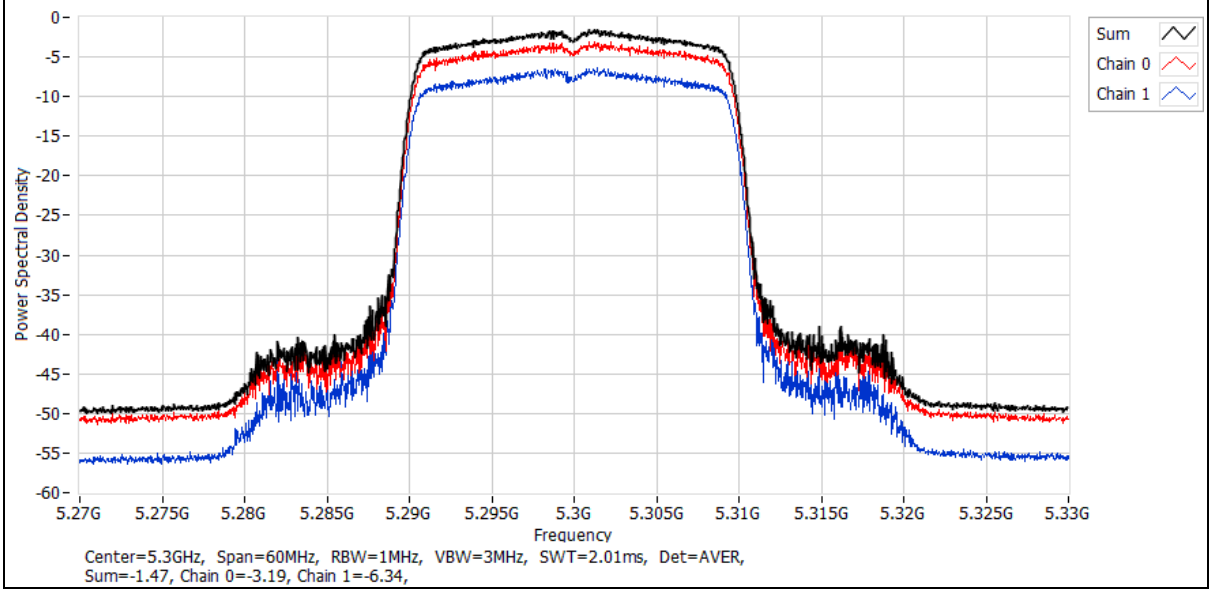


Center=5.29GHz, Span=240MHz, RBW=1MHz, VBW=3MHz, SWT=2.01ms, Det=AVER,
Sum=-7.15, Chain 0=-8.65, Chain 1=-12.5,

Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE20)	52	5260	7.51	-2.24	9.49	PASS
	60	5300	7.51	-1.47	9.49	PASS
	64	5320	7.51	-1.67	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE20)	52	5260	-3.52	-7.42
	60	5300	-3.07	-6.34
	64	5320	-3.08	-6.43

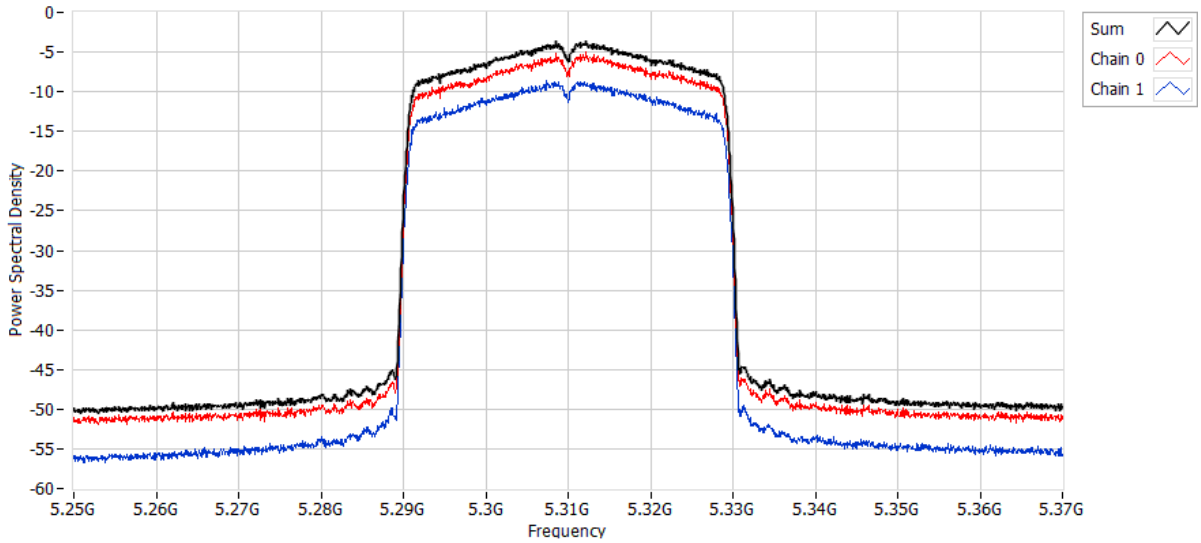
802.11ax(HE20), CH60



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE40)	54	5270	7.51	-4.55	9.49	PASS
	62	5310	7.51	-3.55	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE40)	54	5270	-5.92	-9.67
	62	5310	-4.94	-8.67

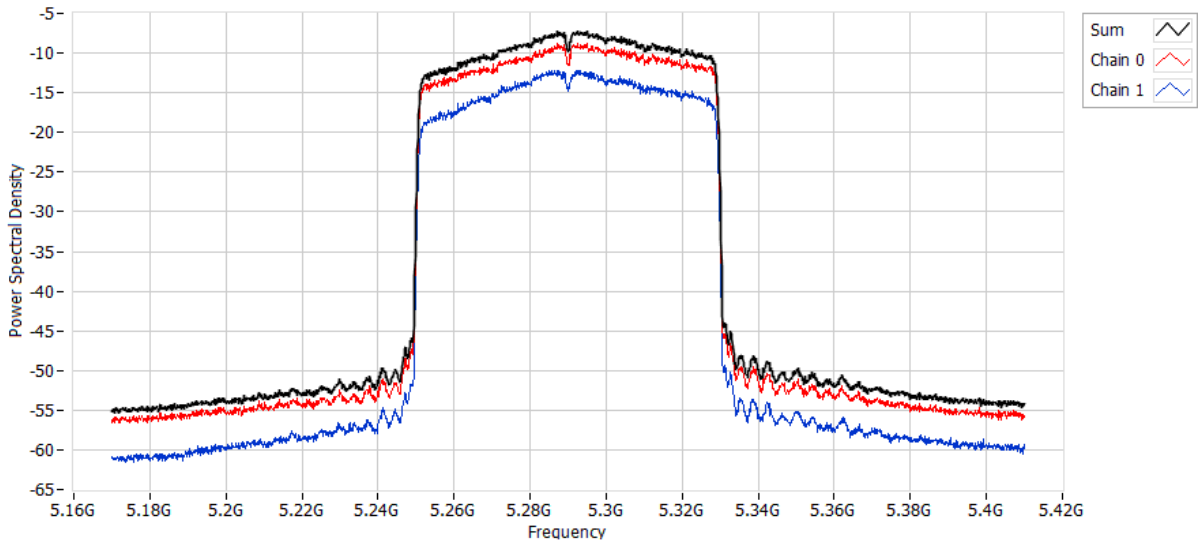
802.11ax(HE40), CH62



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE80)	58	5290	7.51	-7.19	9.49	PASS

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE80)	58	5290	-8.72	-12.25

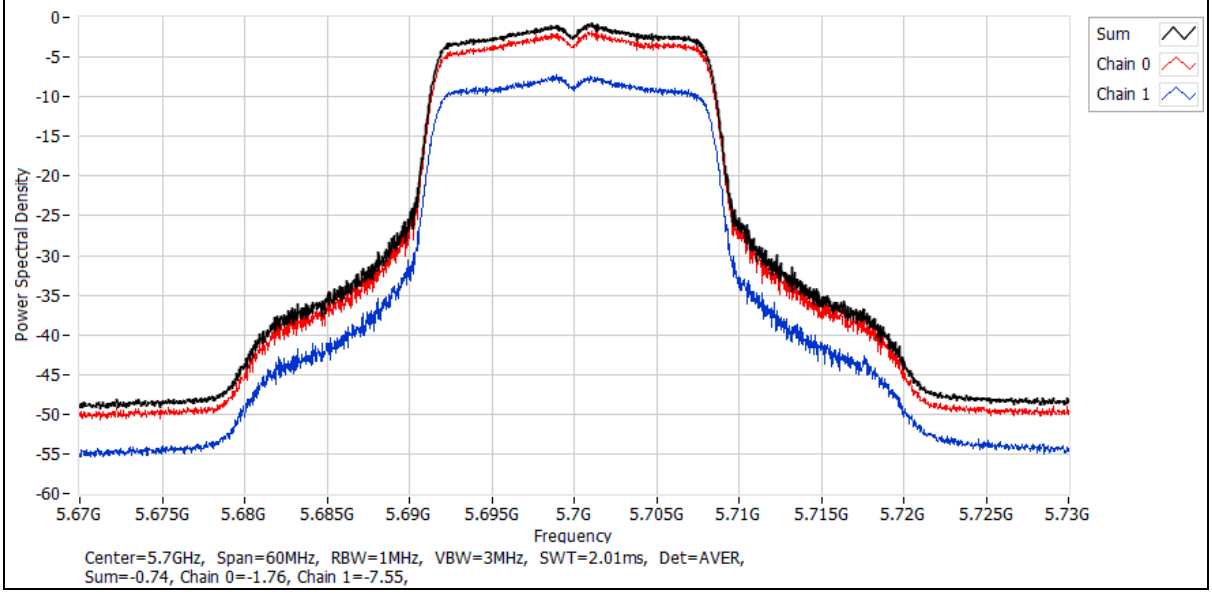
802.11ax(HE80), CH58



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	100	5500	7.02	-1.11	9.98	PASS
	116	5580	7.02	-1.43	9.98	PASS
	140	5700	7.02	-0.74	9.98	PASS
	144	5720	7.02	-1.13	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	100	5500	-2.19	-6.85
	116	5580	-2.49	-7.65
	140	5700	-1.76	-7.3
	144	5720	-1.99	-7.89

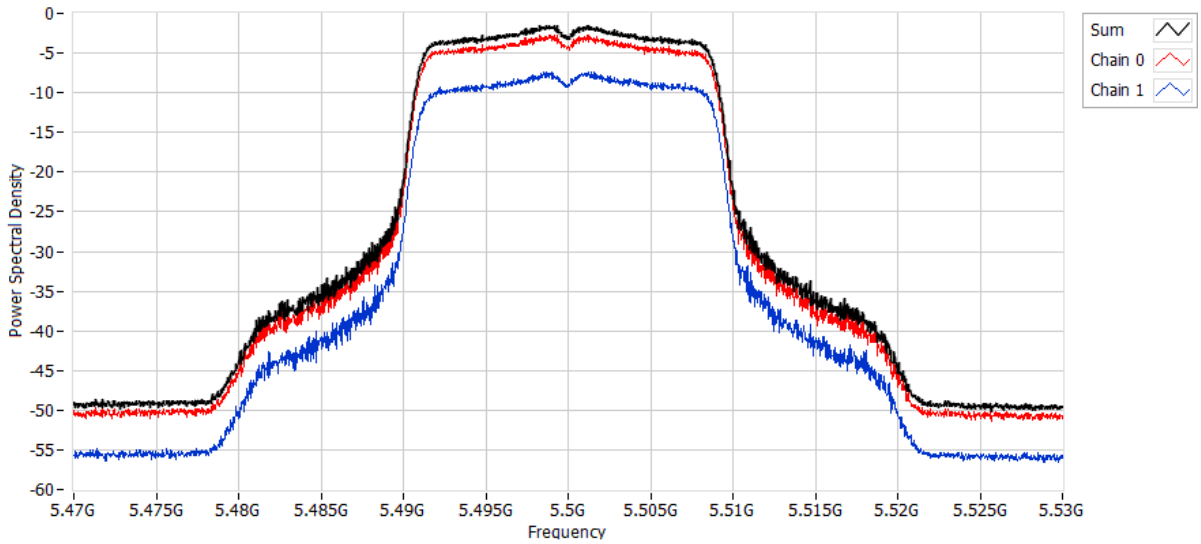
802.11a, CH140



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	100	5500	7.02	-1.55	9.98	PASS
	116	5580	7.02	-1.99	9.98	PASS
	140	5700	7.02	-1.89	9.98	PASS
	144	5720	7.02	-2.05	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	100	5500	-2.74	-7.33
	116	5580	-3.14	-7.98
	140	5700	-2.94	-8.48
	144	5720	-3.01	-8.83

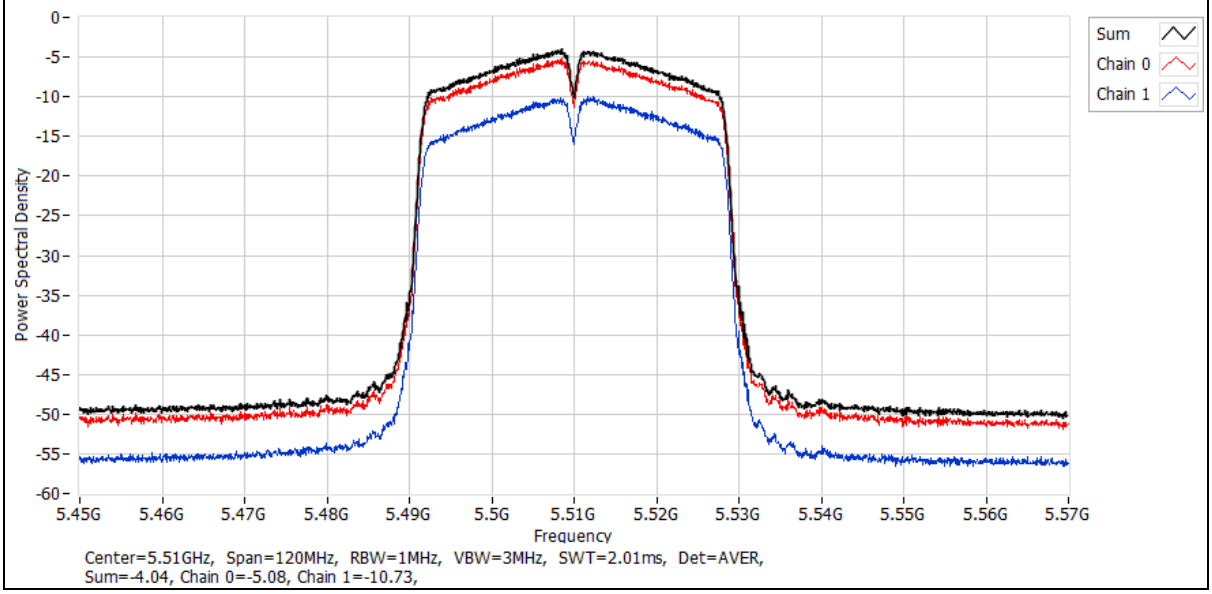
802.11ac(VHT20), CH100



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	102	5510	7.02	-4.04	9.98	PASS
	110	5550	7.02	-4.19	9.98	PASS
	134	5670	7.02	-4.29	9.98	PASS
	142	5710	7.02	-4.41	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	102	5510	-5.08	-9.98
	110	5550	-5.39	-10.36
	134	5670	-5.39	-10.47
	142	5710	-5.37	-10.84

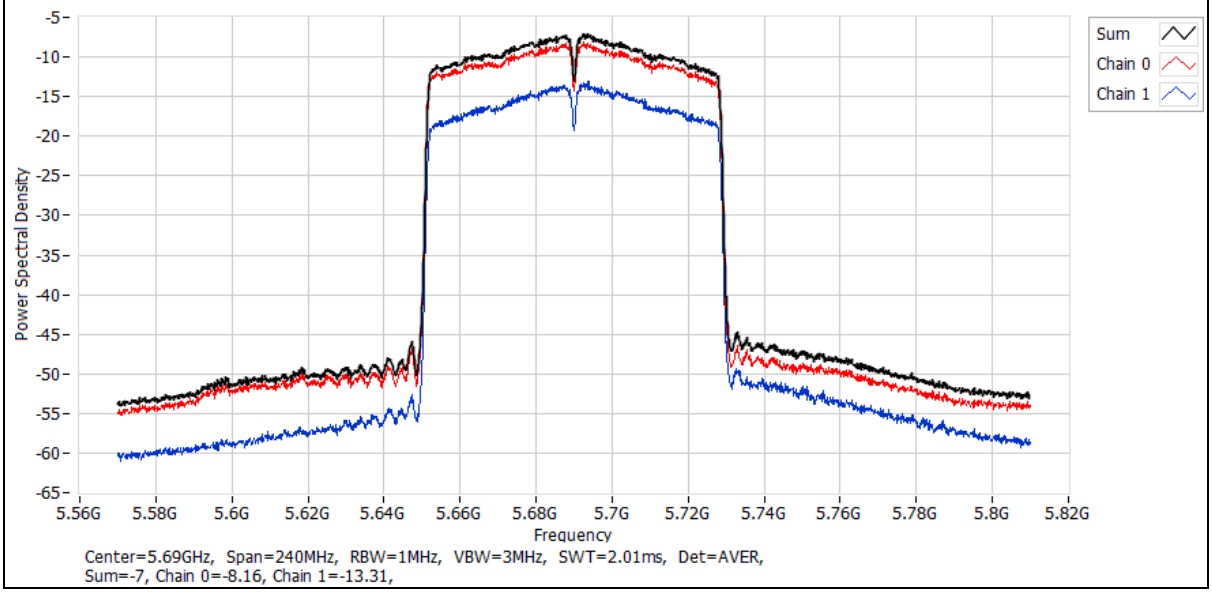
802.11ac(VHT40), CH102



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	106	5530	7.02	-7.75	9.98	PASS
	122	5610	7.02	-7.72	9.98	PASS
	138	5690	7.02	-7	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	106	5530	-8.87	-13.58
	122	5610	-8.67	-14.37
	138	5690	-8.16	-13.14

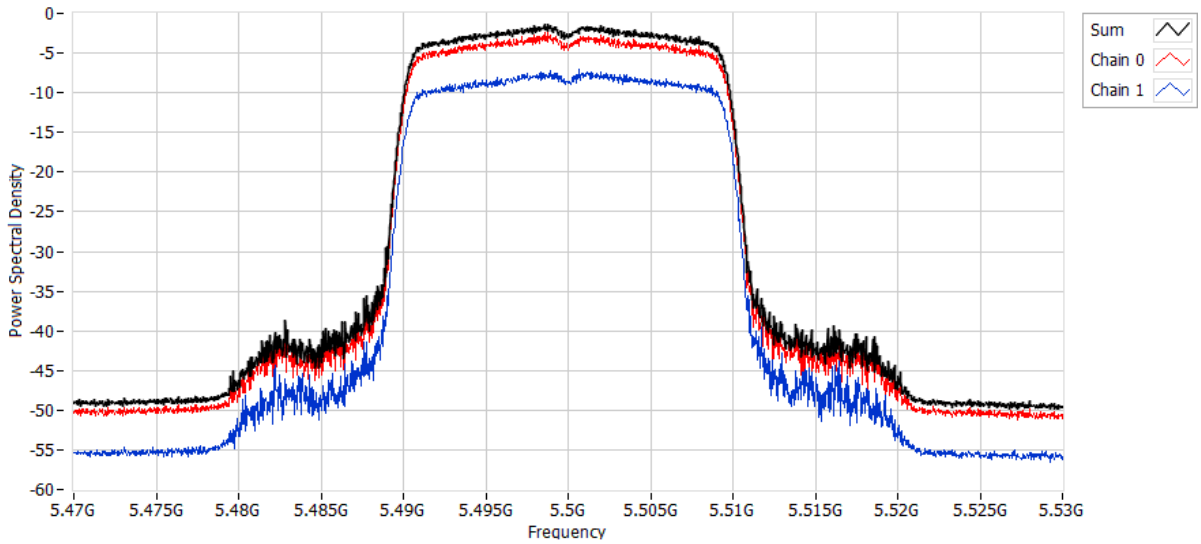
802.11ac(VHT80), CH138



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE20)	100	5500	7.02	-1.33	9.98	PASS
	116	5580	7.02	-1.82	9.98	PASS
	140	5700	7.02	-1.73	9.98	PASS
	144	5720	7.02	-2.1	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE20)	100	5500	-2.41	-7.01
	116	5580	-3.01	-7.6
	140	5700	-2.72	-7.93
	144	5720	-3.11	-8.43

802.11ax(HE20), CH100

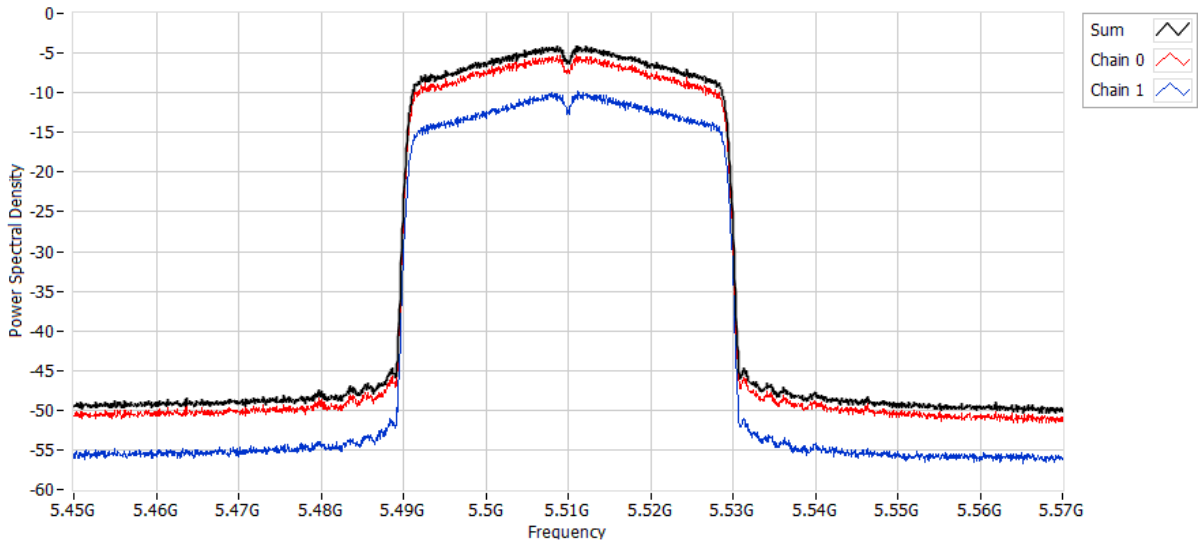


Center=5.5GHz, Span=60MHz, RBW=1MHz, VBW=3MHz, SWT=2.01ms, Det=AVER,
Sum=-1.33, Chain 0=-2.41, Chain 1=-7.91,

Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE40)	102	5510	7.02	-4.06	9.98	PASS
	110	5550	7.02	-4.1	9.98	PASS
	134	5670	7.02	-4.11	9.98	PASS
	142	5710	7.02	-4.37	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE40)	102	5510	-5.31	-9.84
	110	5550	-5.16	-10.23
	134	5670	-5.19	-10.21
	142	5710	-5.4	-10.57

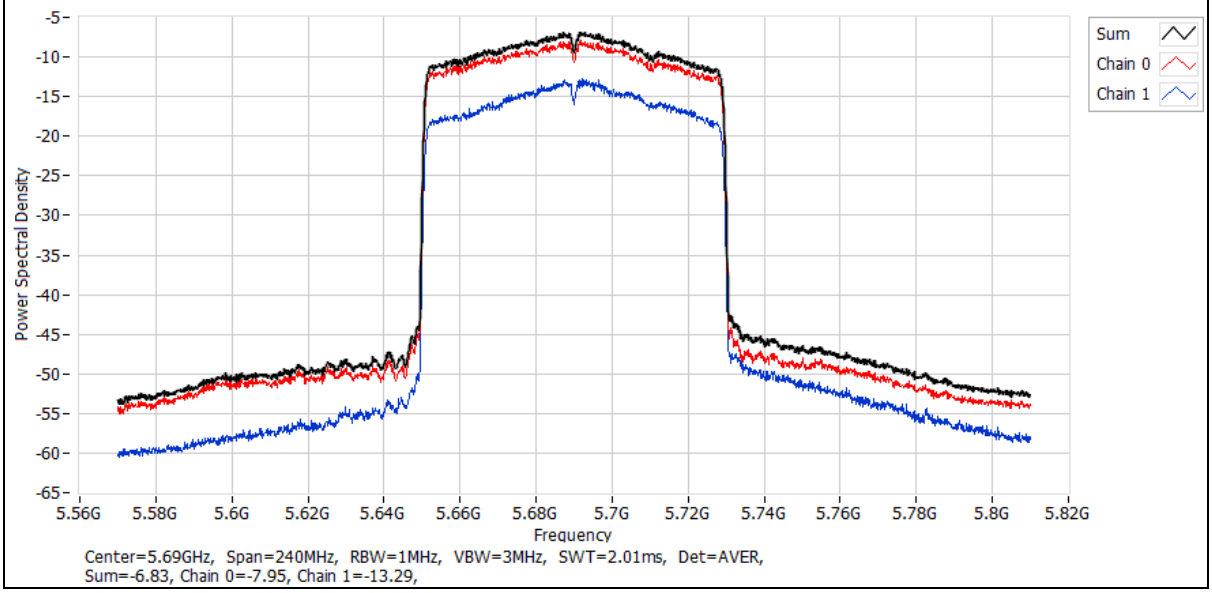
802.11ax(HE40), CH102



Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ax(HE80)	106	5530	7.02	-7.55	9.98	PASS
	122	5610	7.02	-7.21	9.98	PASS
	138	5690	7.02	-6.83	9.98	PASS

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ax(HE80)	106	5530	-8.81	-13.1
	122	5610	-8.22	-13.66
	138	5690	-7.95	-12.81

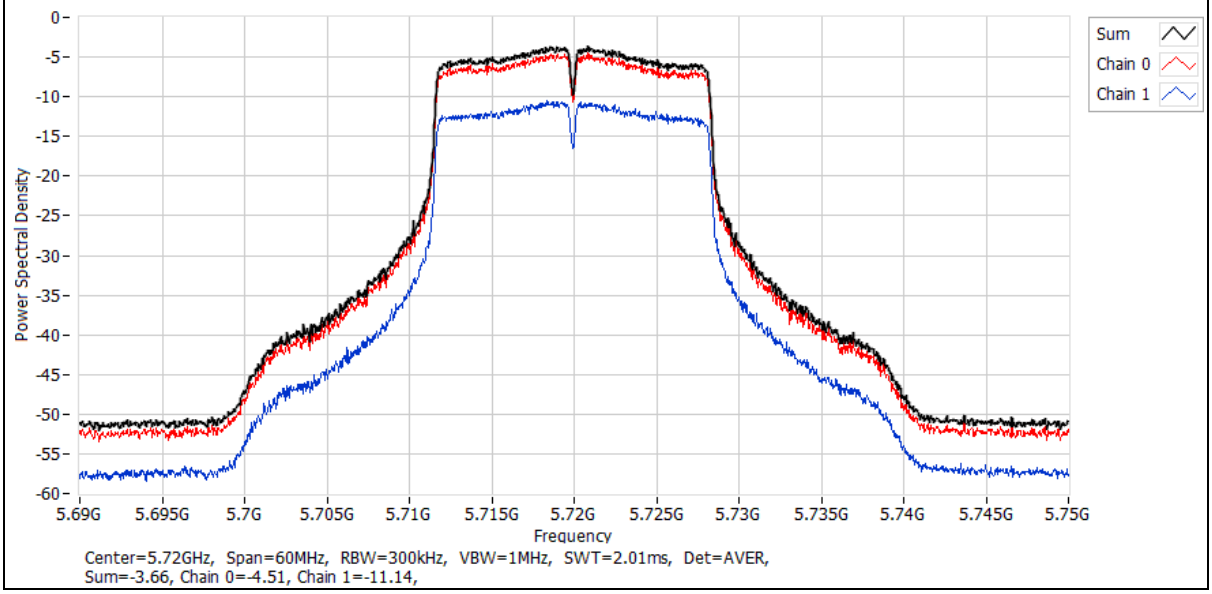
802.11ax(HE80), CH138



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11a	144	5720	2.22	6.83	-1.44	29.17	PASS
	149	5745	2.22	6.83	-4.16	29.17	PASS
	157	5785	2.22	6.83	-3.84	29.17	PASS
	165	5825	2.22	6.83	-3.56	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11a	144	5720	-4.51	-10.53
	149	5745	-7.31	-13.12
	157	5785	-6.99	-12.68
	165	5825	-6.77	-11.83

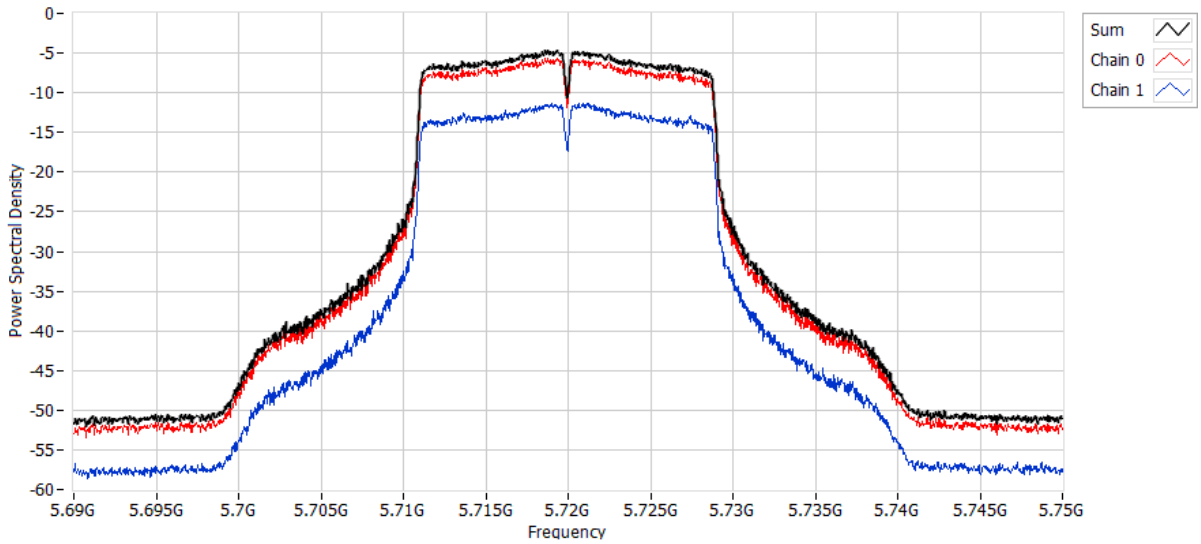
802.11a, CH144



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT20)	144	5720	2.22	6.83	-2.49	29.17	PASS
	149	5745	2.22	6.83	-4.6	29.17	PASS
	157	5785	2.22	6.83	-4.35	29.17	PASS
	165	5825	2.22	6.83	-3.98	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	144	5720	-5.68	-11.32
	149	5745	-7.85	-13.21
	157	5785	-7.59	-13.1
	165	5825	-7.31	-12.35

802.11ac(VHT20), CH144

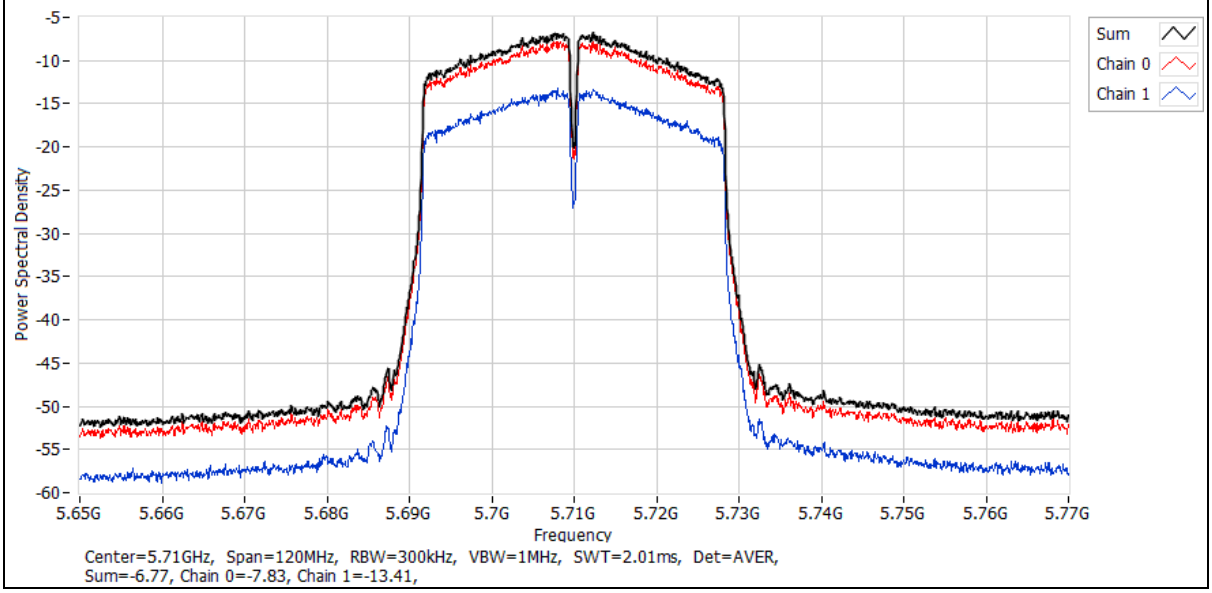


Center=5.72GHz, Span=60MHz, RBW=300kHz, VBW=1MHz, SWT=2.01ms, Det=AVER,
Sum=-4.7, Chain 0=-5.68, Chain 1=-11.66,

Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT40)	142	5710	2.22	6.83	-4.55	29.17	PASS
	151	5755	2.22	6.83	-6.64	29.17	PASS
	159	5795	2.22	6.83	-6.19	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	142	5710	-7.78	-13.21
	151	5755	-9.75	-15.41
	159	5795	-9.32	-14.68

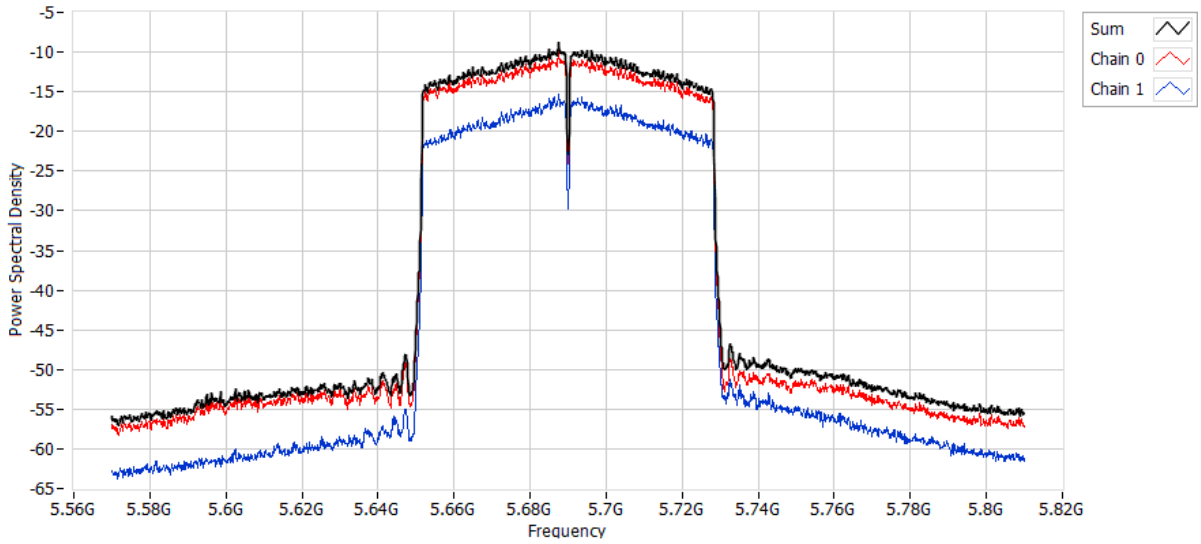
802.11ac(VHT40), CH142



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT80)	138	5690	2.22	6.83	-6.53	29.17	PASS
	155	5775	2.22	6.83	-9.59	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	138	5690	-9.83	-15.32
	155	5775	-12.71	-18.58

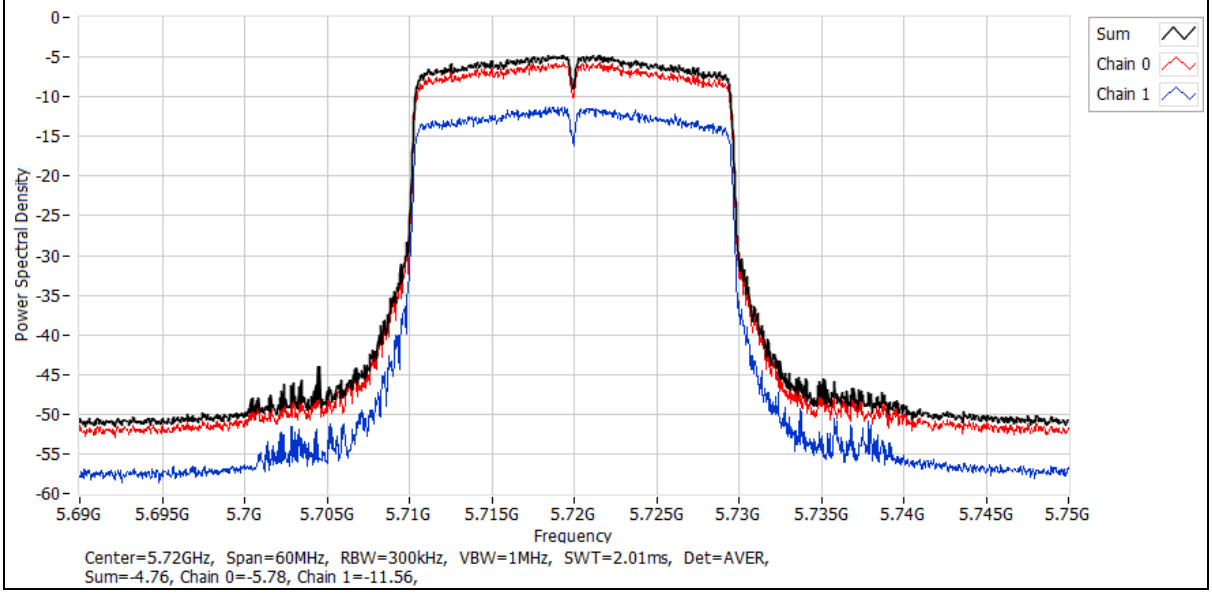
802.11ac(VHT80), CH138



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ax(HE20)	144	5720	2.22	6.83	-2.54	29.17	PASS
	149	5745	2.22	6.83	-4.33	29.17	PASS
	157	5785	2.22	6.83	-4.45	29.17	PASS
	165	5825	2.22	6.83	-4.03	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ax(HE20)	144	5720	-5.69	-11.27
	149	5745	-7.59	-13.27
	157	5785	-7.63	-13.01
	165	5825	-7.4	-12.03

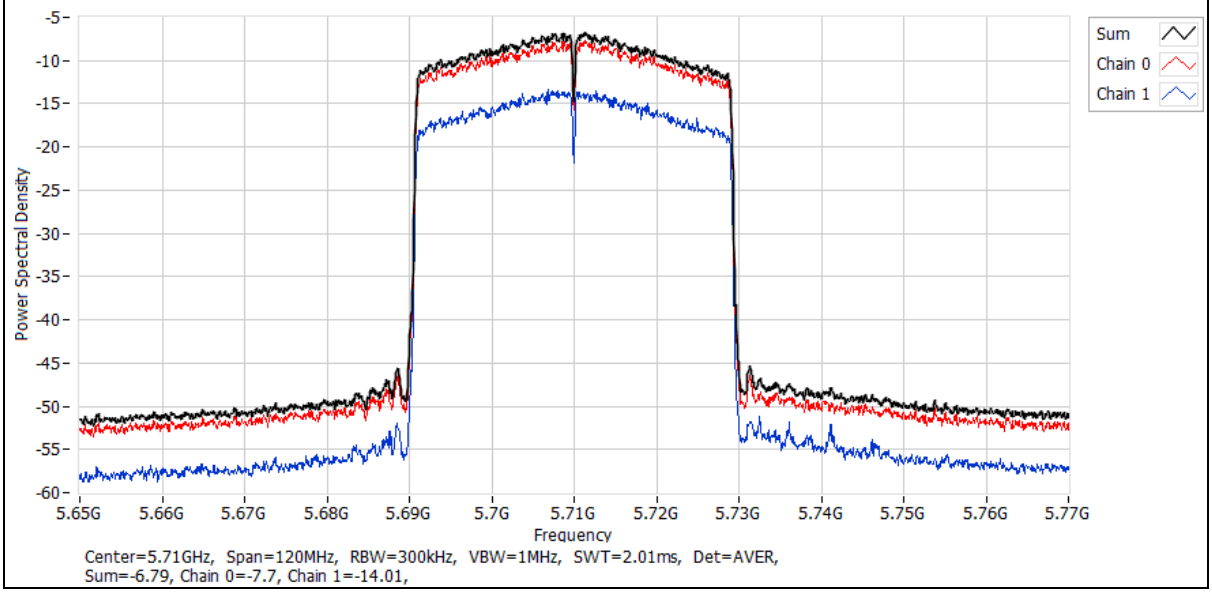
802.11ax(HE20), CH144



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ax(HE40)	142	5710	2.22	6.83	-4.57	29.17	PASS
	151	5755	2.22	6.83	-6.51	29.17	PASS
	159	5795	2.22	6.83	-6.07	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ax(HE40)	142	5710	-7.7	-13.35
	151	5755	-9.68	-15.43
	159	5795	-9.26	-14.99

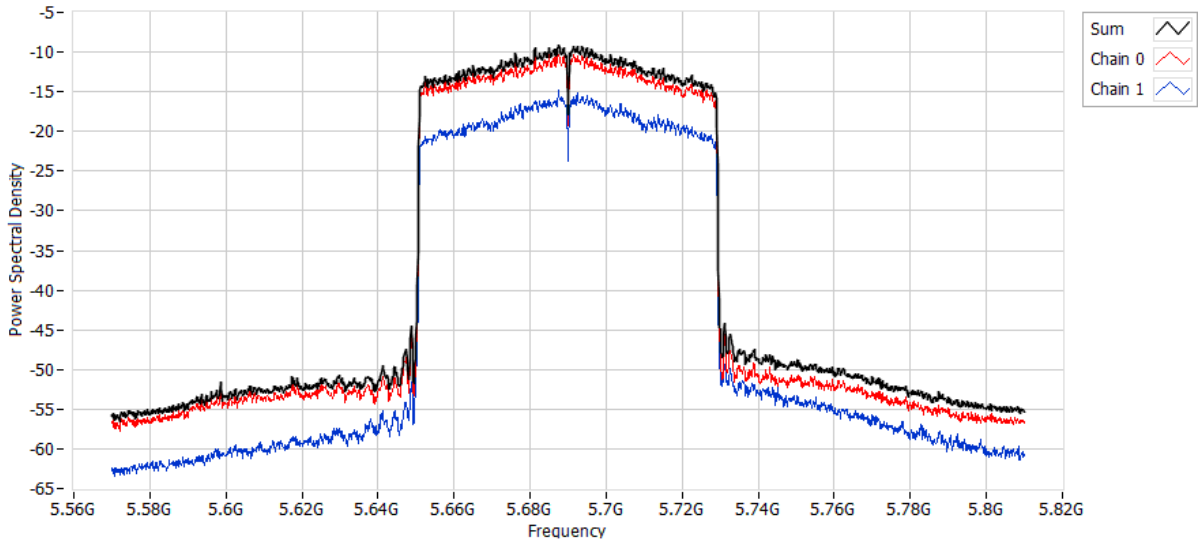
802.11ax(HE40), CH142



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ax(HE80)	138	5690	2.22	6.83	-6.86	29.17	PASS
	155	5775	2.22	6.83	-9.04	29.17	PASS

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ax(HE80)	138	5690	-10.33	-14.88
	155	5775	-12.17	-18.29

802.11ax(HE80), CH138



9.6. Frequency Stability

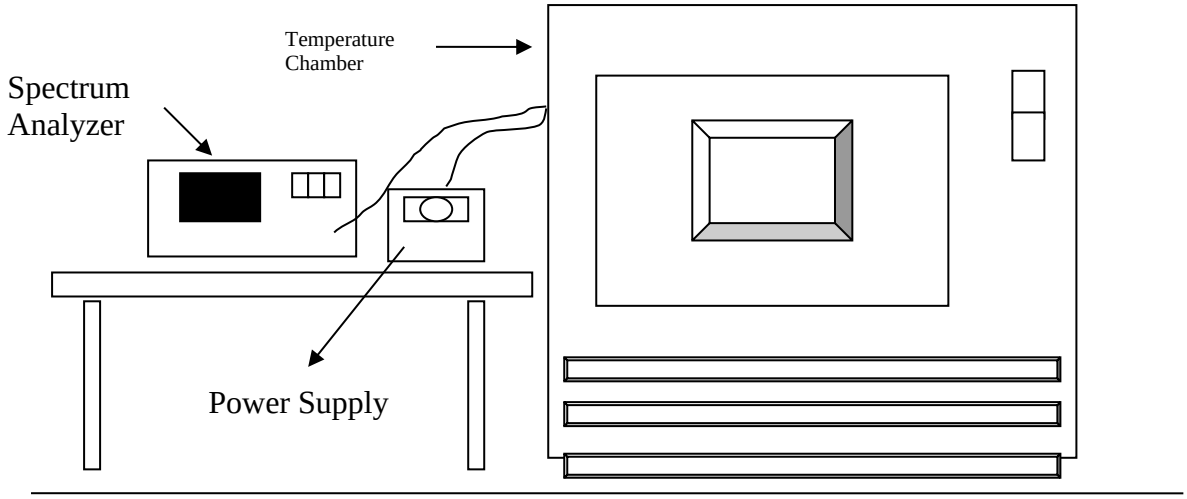
Requirements

The frequency of the carrier signal shall be maintained within band of operation.

Test procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal voltage.
b. Turn the EUT on and couple its output to a spectrum analyzer.
c. Turn the EUT off and set the chamber to the highest temperature specified.
d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Test Setup



Test Data

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	5	5180.0017	0.33	5180.001	0.19	5180.0024	0.46	5179.998	-0.39
40	5	5180.0142	2.74	5180.0098	1.89	5180.0132	2.55	5180.0113	2.18
30	5	5180.0139	2.68	5180.0128	2.47	5180.0101	1.95	5180.0113	2.18
20	5	5179.9794	-3.98	5179.9793	-4.00	5179.9782	-4.21	5179.9772	-4.40
10	5	5180.025	4.83	5180.0213	4.11	5180.0245	4.73	5180.0219	4.23
0	5	5180.0181	3.49	5180.0197	3.80	5180.0173	3.34	5180.0164	3.17
-10	5	5180.0055	1.06	5180.0029	0.56	5180.0017	0.33	5180.0022	0.42
-20	5	5179.9821	-3.46	5179.9818	-3.51	5179.9798	-3.90	5179.9812	-3.63
-30	5	5179.9857	-2.76	5179.9824	-3.40	5179.9843	-3.03	5179.9859	-2.72
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	5.75	5179.98	-3.86	5179.9799	-3.88	5179.9779	-4.27	5179.9767	-4.50
20	5	5179.9794	-3.98	5179.9793	-4.00	5179.9782	-4.21	5179.9772	-4.40
20	4.25	5179.9788	-4.09	5179.9791	-4.03	5179.9779	-4.27	5179.9771	-4.42

9.7. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	**Applicable To**	**EIRP Limit**	**Equivalent Field Strength at 3m**
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
	*1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		
5850~5895 MHz	RSS-247 clause 6.2.5.3	**5725 MHz and below:** PK:27 (dBm/MHz) *1 PK:15.6 (dBm/MHz) *2 PK:10 (dBm/MHz) *3 PK:-27 (dBm/MHz) *4 **5895 MHz and above:** AV:-27 (dBm/MHz) *a AV:15&-7 (dBm/MHz) *b AV:-5&-27 (dBm/MHz) *c	**5725 MHz and below:** PK:122.2 (dBμV/m) *1 PK:110.8 (dBμV/m) *2 PK:105.2 (dBμV/m) *3 PK:68.2 (dBμV/m) *4 **5895 MHz and above:** AV: 68.2 (dBμV/m) *a AV:110.2&88.2 (dBμV/m) *b AV:90.2&68.2 (dBμV/m) *c
	*1 5 MHz below the 5725 MHz band edge. *2 5 MHz below the 5725 MHz band edge decreasing linearly to 10 dBm/MHz at 25 MHz below *3 25 MHz below the 5725 MHz band edge decreasing linearly to -27 dBm/MHz at 75 MHz below *4 More than 75 MHz below the 5725 MHz band edge. *a Fixed outdoor access points and fixed outdoor client devices shall not exceed -27 dBm/MHz e.i.r.p. spectral density at or above the 5895 MHz band edge. *b Indoor access points or indoor subordinate devices shall not exceed 15 dBm/MHz e.i.r.p. spectral density at the 5895 MHz band edge and shall decrease linearly to not exceed -7 dBm/MHz e.i.r.p. spectral density at or above 5925 MHz. *c Client devices shall not exceed -5 dBm/MHz e.i.r.p. spectral density at the 5895 MHz band edge and shall decrease linearly to not exceed -27 dBm/MHz e.i.r.p. spectral density at or above 5925 MHz.		

Note:
The following formula is used to convert the effective isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts).

Test Procedures

[For 9 kHz ~ 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

Peak

Frequency	RBW	VBW
9 kHz~150 kHz	200 Hz	600 Hz
150 kHz~30 MHz	10 kHz	30 kHz
30 MHz~1 GHz	120 kHz	360 kHz
Above 1GHz	1 MHz	3 MHz

Average for above 1GHz

RBW	VBW
1MHz	Refer to section 6.6 for duty cycle.

d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
e. Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
f. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
g. Test data of Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
h. Test data of Notation "@" = Fundamental Frequency
i. Test data of Notation " * " = Only required peak limit or the peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.