FCC TEST REPORT

Test report
On Behalf of
Shenzhen Xinweifeng Electronic Technology Co., Ltd.
For
1200Mbp dual-band WiFi Range Extender
Model No.: X12
FCC ID: 2AVG5-X12

Prepared for : Shenzhen Xinweifeng Electronic Technology Co., Ltd.
3rd. Floor, C-Block, No.369 Bulong Rd. Bantian, Longgang, Shenzhen, China

Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.
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TEST REPORT

Applicant's name ..... :	Shenzhen Xinweifeng Electronic Technology Co., Ltd.
Address ..... :	3rd. Floor, C-Block, No.369 Bulong Rd. Bantian, Longgang, Shenzhen, China
Manufacture's Name ..... :	Shenzhen Xinweifeng Electronic Technology Co., Ltd.
Address ..... :	3rd. Floor, C-Block, No.369 Bulong Rd. Bantian, Longgang, Shenzhen, China
Product description	
Trade Mark:	/
Product name ..... :	1200Mbp dual-band WiFi Range Extender
Model and/or type reference :	X12
Standards ..... :	FCC Rules and Regulations Part 15 Subpart E 15.407 ANSI C63.10: 2013

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Date of Test	
Date (s) of performance of tests	Nov,01,2019 ~ Dec,13,2019
Date of Issue	Dec.16,2019
Test Result	**Pass**

Testing Engineer : Gary Qian

(Gary Qian)

Technical Manager : Eden Hu

(Eden Hu)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15 Subpart E—Unlicensed National Information Infrastructure Devices

ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

KDB789033 D02: General UNII Test Procedures New Rules v02r01

1.2. Test Description

FCC Requirement		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.407(a)	Emission Bandwidth(26dBm Bandwidth)	PASS$_{Note1}$
FCC Part 15.407(e)	Minimum Emission Bandwidth(6dBm Bandwidth)	PASS$_{Note2}$
FCC Part 15.407(a)	Maximum Conducted Output Power	PASS
FCC Part 15.407(a)	Peak Power Spectral Density	PASS
FCC Part 15.407(g)	Frequency Stability	PASS
FCC Part 15.407(b)	Undesirable emission	PASS
FCC Part 15.407(b)/15.205/15.209	Radiated Emissions	PASS
FCC Part 15.407(h)	Dynamic Frequency Selection	PASS$_{Note\ 3}$
FCC Part 15.203/15.247(b)	Antenna Requirement	PASS

Note 1: Apply to U-NII 1, U-NII 2A, and U-NII 2C band.
Note 2: Apply to U-NII 3 band only.
Note 3: Test result see DFS report.

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen HUAK Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Uncertainty		
Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	1200Mbp dual-band WiFi Range Extender			
Model/Type reference:	X12			
Power supply:	AC 120V/60Hz			
WIFI				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac	802.11n 802.11ac	802.11ac	N/A
Operation frequency:	5180MHz-5240MHz 5745MHz-5825MHz	5190MHz-5230MHz 5755MHz-5795MHz	5210MHz; 5775MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	9	4	2	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Antenna type:	Two External antennas			
Antenna Gain:	Max. 2.0dBi for each antenna, Maximum directional gain is 5.01dBi.			

Note: For more details, please refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band:

Operating band	20MHz		40MHz		80MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
U-NII 1 (5150MHz-5250MHz)	36	5180	38	5190	42	5210
	40	5200				
	44	5220	46	5230		
	48	5240				
U-NII 3 (5725MHz-5850MHz)	149	5745	151	5755	155	5775
	153	5765				
	157	5785	159	5795		
	161	5805				
	165	5825	--	--	--	--

Note:

1. “--“Means no channel(s) available any more.
2. The line display in grey is those Channels/Frequencies select to test in this report for each operation mode.

Data Rate Used:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Maximum Conducted Output Power Power Spectral Density Emission Bandwidth(26dBm Bandwidth) Minimum Emission Bandwidth(6dBm Bandwidth) Undesirable emission Frequency Stability	11a/OFDM	6 Mbps
	11n(20MHz),11ac(20MHz)/OFDM	7.2 Mbps
	11n(40MHz),11ac(40MHz)/OFDM	15.0Mbps
	11ac(80MHz)/OFDM	65.0Mbps

2.4. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2018	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2018	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2018	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2018	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2018	1 Year
10.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Dec. 28, 2018	1 Year
11.	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	HKE-017	Dec. 28, 2018	1 Year
12.	Pre-amplifier	EMCI	EMC051845SE	HKE-015	Dec. 28, 2018	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2018	1 Year
14.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2018	N/A
15.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2018	1 Year
16.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
17.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2018	1 Year
18.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2018	1 Year
19.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2018	3 Year
20.	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	HKE-055	Dec. 28, 2018	1 Year
21.	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	HKE-056	Dec. 28, 2018	1 Year

The calibration interval was one year

2.5. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
/	/	/	/	/
/	/	/	/	/

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

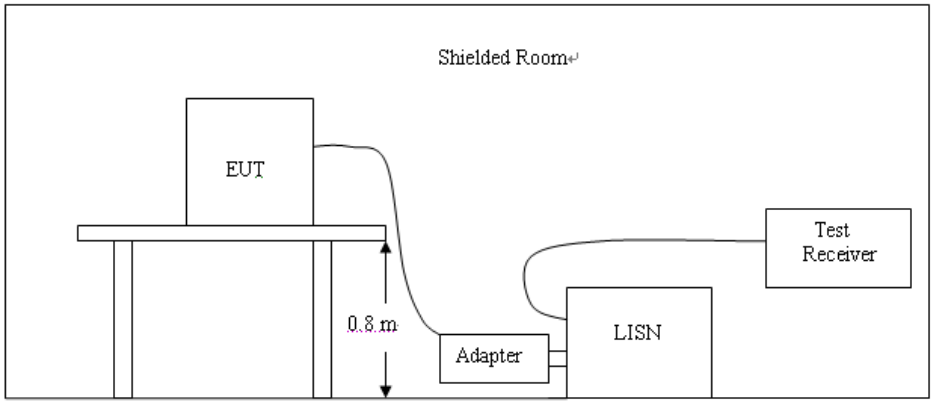
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

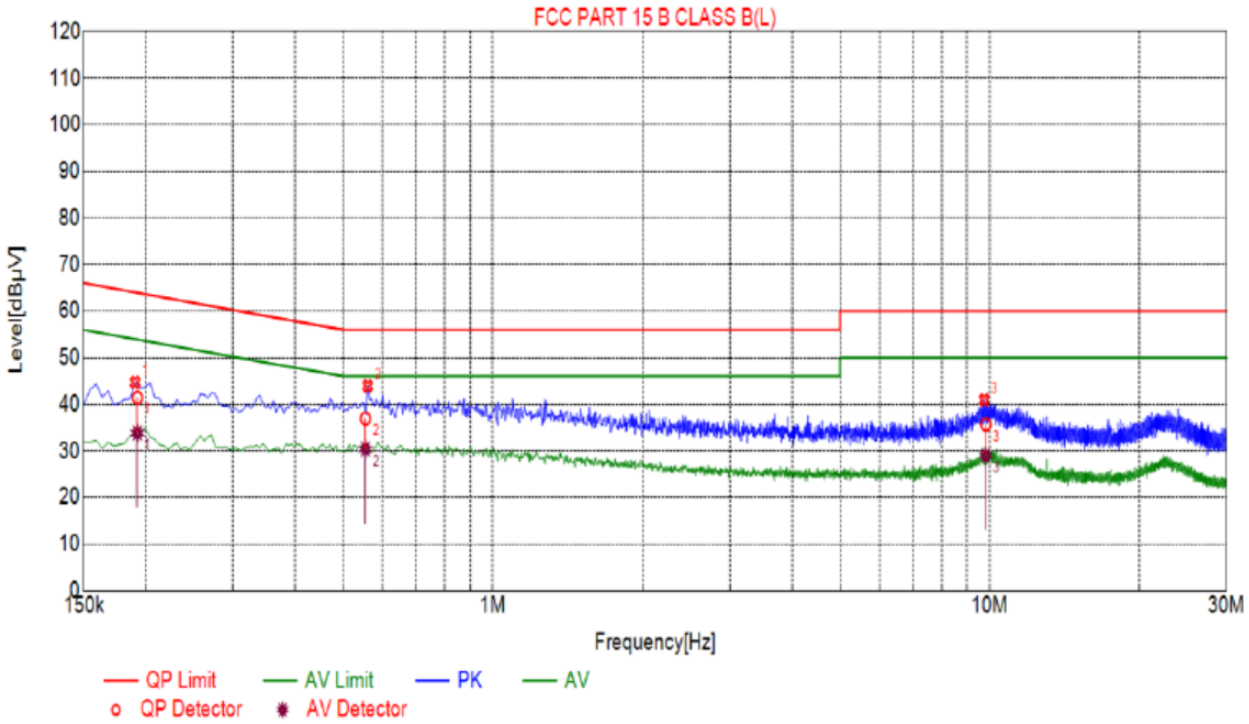
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Remark:

1. All modes of 802.11a/ n/ac were tested at Low, Middle, and High channel; only the worst result of 802.11a CH36 was reported as below:
2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:
3. Pre-test AC conducted emission at power from AC mains mode, recorded worst case.

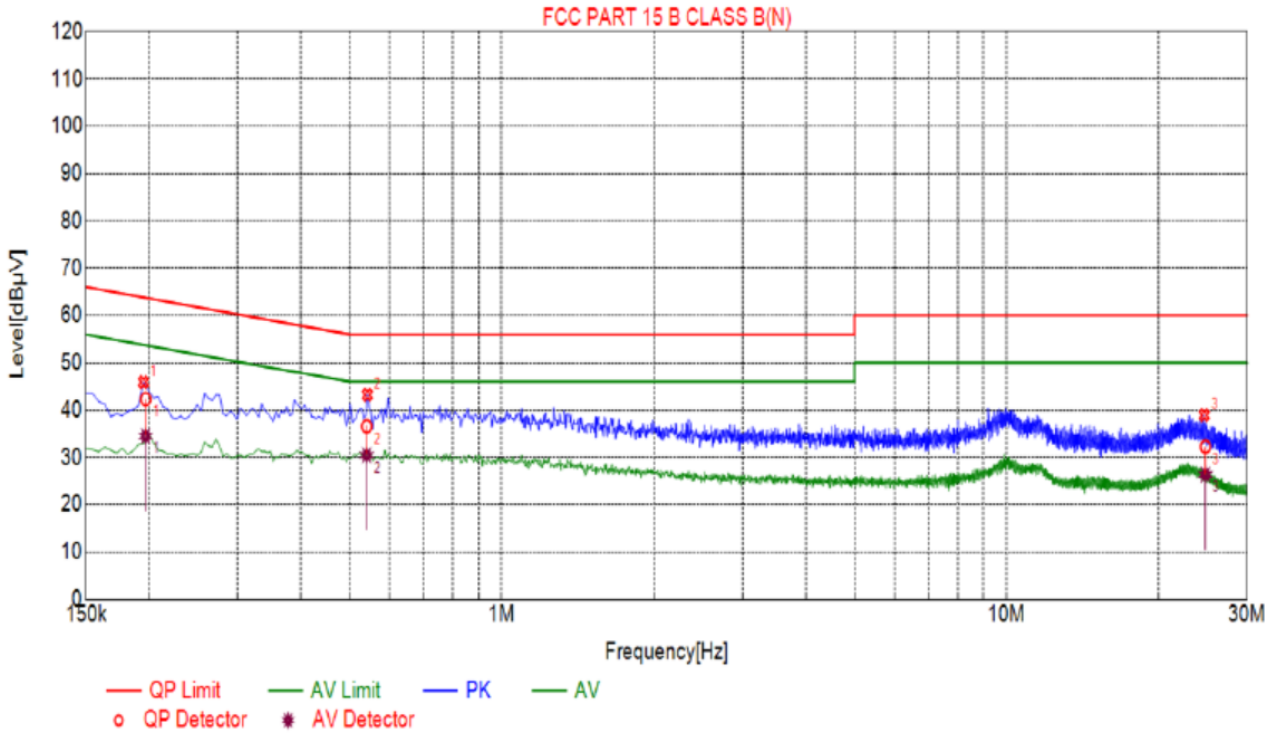
Power supply:	AC 120V/60Hz	Polarization	L



Final Data List

NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	QP Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	AV Reading [dBμV]	Type
1	0.1924	10.04	41.42	63.93	22.51	31.38	33.86	53.93	20.07	23.82	L
2	0.5539	10.06	36.95	56.00	19.05	26.89	30.44	46.00	15.56	20.38	L
3	9.8261	10.07	35.69	60.00	24.31	25.62	29.04	50.00	20.96	18.97	L

Power supply:	AC 120V/60Hz	Polarization	N



Final Data List

NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	QP Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	AV Reading [dBµV]	Type
1	0.1969	10.03	42.31	63.74	21.43	32.28	34.52	53.74	19.22	24.49	N
2	0.5399	10.05	36.59	56.00	19.41	26.54	30.52	46.00	15.48	20.47	N
3	24.7852	10.24	32.30	60.00	27.70	22.06	26.43	50.00	23.57	16.19	N

3.2. Radiated Emissions

Limit

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Undesirable emission limits

Requirement	Limit(EIRP)	Limit (Field strength at 3m) Note1
15.407(b)(1)	PK:-27(dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)		

Note1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209

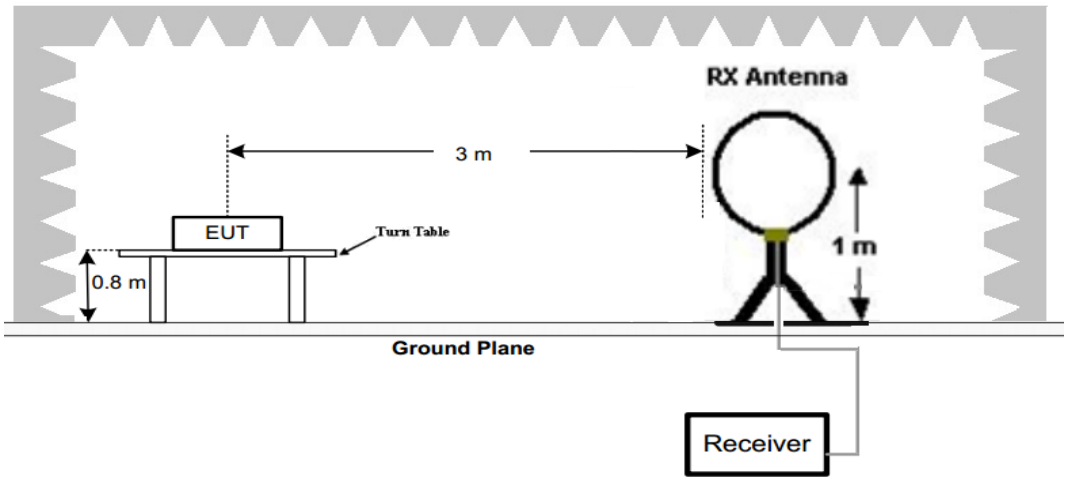
(6)In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

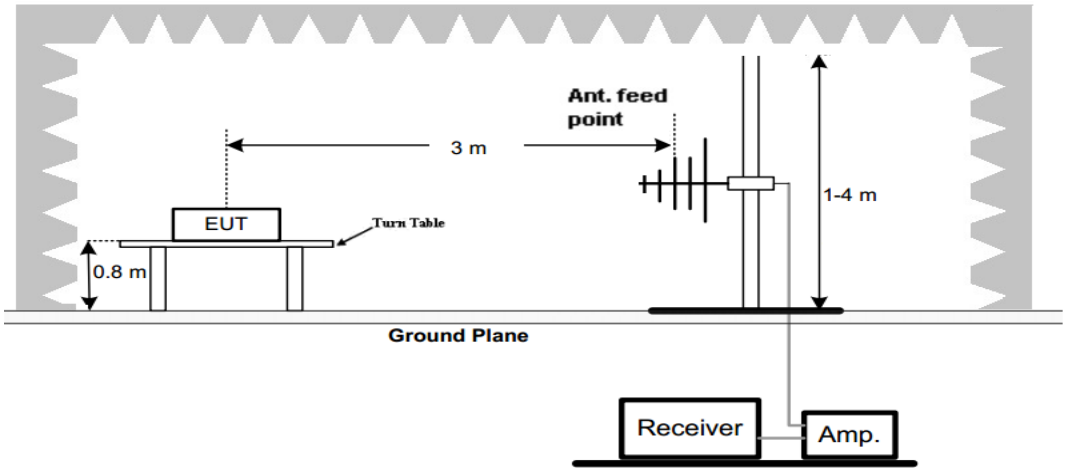
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

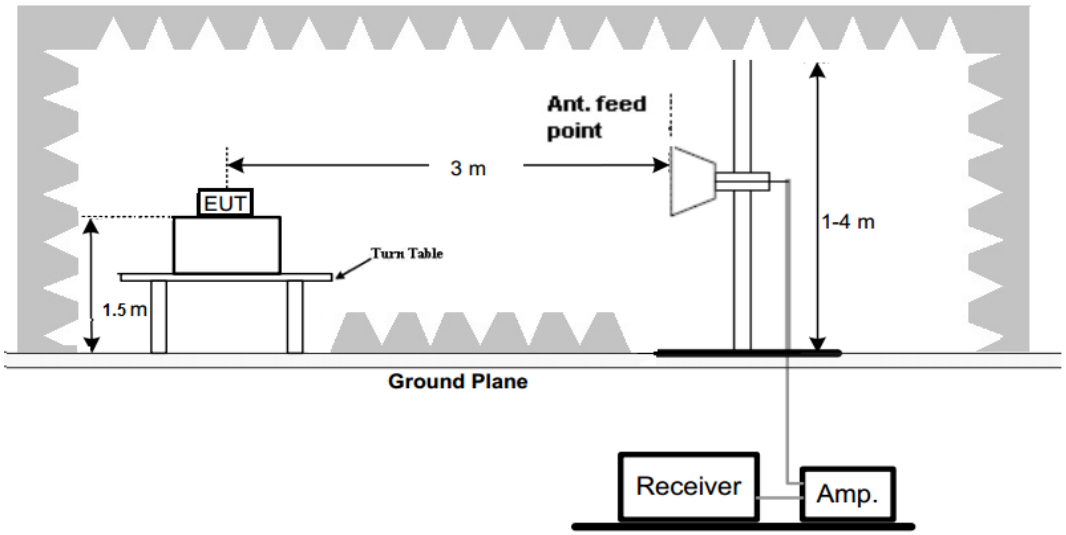
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 40GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

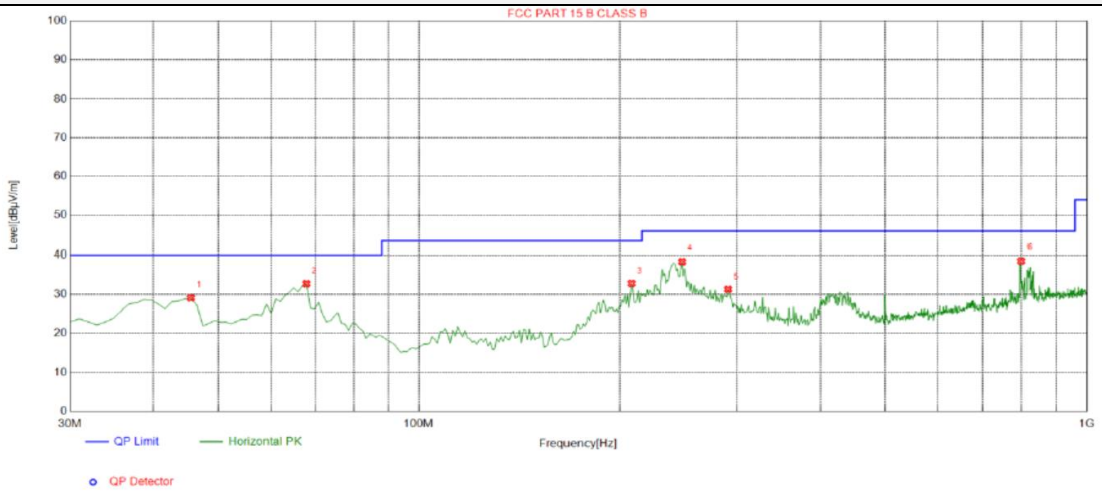
Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

TEST RESULTS

Remark:
1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80) /MIMO modes have been tested for below 1GHz test, only the worst case 802.11ac (HT20)MIMO low channel of U-NII 1 band was recorded.
3. All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80)/ MIMO modes have been tested for above 1GHz test, only the worst case 802.11ac (HT20) MIMO was recorded.
4. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

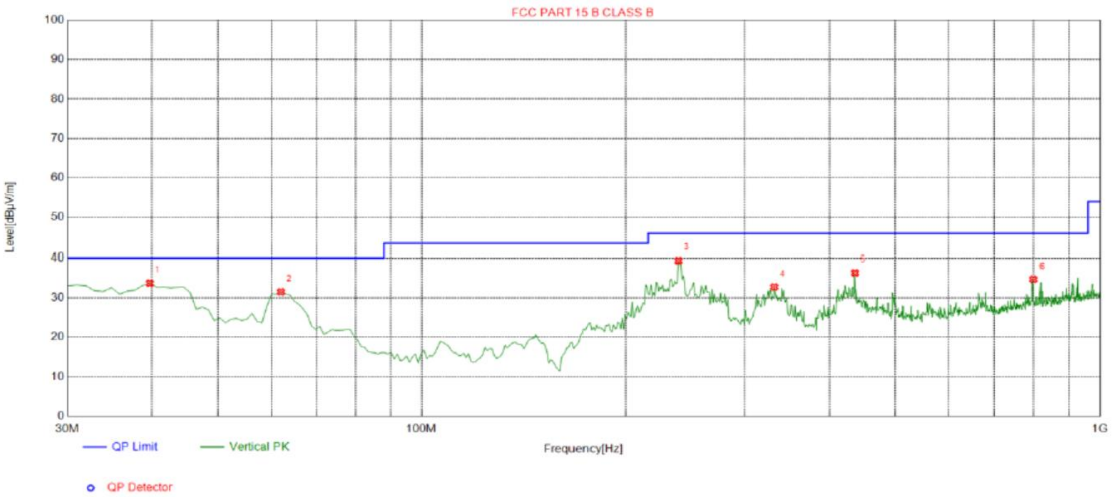
For 30MHz-1GHz

Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	45.5200	29.10	-13.65	40.00	10.90	100	28	Horizontal
2	67.8300	32.71	-17.13	40.00	7.29	100	293	Horizontal
3	208.480	32.79	-14.84	43.50	10.71	100	334	Horizontal
4	248.250	38.33	-13.47	46.00	7.67	100	124	Horizontal
5	290.930	31.28	-12.83	46.00	14.72	100	328	Horizontal
6	800.180	38.51	-3.12	46.00	7.49	100	130	Horizontal

Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.7000	33.70	-14.64	40.00	6.30	100	16	Vertical
2	62.0100	31.50	-15.66	40.00	8.50	100	297	Vertical
3	239.520	39.34	-13.88	46.00	6.66	100	22	Vertical
4	331.670	32.74	-11.60	46.00	13.26	100	348	Vertical
5	436.430	36.29	-9.57	46.00	9.71	100	49	Vertical
6	800.180	34.67	-3.12	46.00	11.33	100	64	Vertical

For 1GHz to 25GHz

Note: All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80)/MIMO modes have been tested for above 1GHz test, only the worst case 802.11ac (HT20) MIMO was recorded.

U-NII 1 & 802.11ac (HT20) MIMO Mode (above 1GHz)

LOW CH 36 /5180

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	59.25	-2.49	56.76	68.2	-11.44	peak
5150	46.1	-2.49	43.61	54	-10.39	AVG
10360	56.03	3.74	59.77	68.2	-8.43	peak
10360	41.99	3.74	45.73	54	-8.27	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	60.11	-2.49	57.62	68.2	-10.58	peak
5150	44.37	-2.49	41.88	54	-12.12	AVG
10360	57.21	3.74	60.95	68.2	-7.25	peak
10360	42.56	3.74	46.3	54	-7.7	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

MID CH 40 /5200

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
10400	56.33	3.74	60.07	68.2	-8.13	peak
10400	41.95	3.74	45.69	54	-8.31	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
10400	56.45	3.74	60.19	68.2	-8.01	peak
10400	43.08	3.74	46.82	54	-7.18	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

HIGH CH 48 /5240

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350.5	60.72	-2.11	58.61	68.2	-9.59	peak
5350.5	49.59	-4.63	44.96	54	-9.04	AVG
10480	56.95	3.75	60.7	68.2	-7.5	peak
10480	41.68	3.75	45.43	54	-8.57	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350.5	61.66	-2.11	59.55	68.2	-8.65	peak
5350.5	49.37	-4.63	44.74	54	-9.26	AVG
10480	55.42	3.75	59.17	68.2	-9.03	peak
10480	41.85	3.75	45.6	54	-8.4	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark :

(1) Measuring frequencies from 1 GHz to the 40 GHz。

(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

U-NII 3 & 802.11ac (HT20) MIMIO Mode (above 1GHz)

LOW CH 149 /5745

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5720	62.92	-4.45	58.47	68.2	-9.73	peak
5720	48.06	-4.45	43.61	54	-10.39	AVG
11490	56.13	4.21	60.34	68.2	-7.86	peak
11490	41.58	4.21	45.79	54	-8.21	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5720	61.11	-4.45	56.66	68.2	-11.54	peak
5720	48.22	-4.45	43.77	54	-10.23	AVG
11490	57.58	4.21	61.79	68.2	-6.41	peak
11490	42.73	4.21	46.94	54	-7.06	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

MID CH157 /5785

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
11570	54.19	4.26	58.45	68.2	-9.75	peak
11570	40.63	4.26	44.89	54	-9.11	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
11570	52.97	4.26	57.23	68.2	-10.97	peak
11570	39.19	4.26	43.45	54	-10.55	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

HIGH CH 165 (802.11a Mode with 5.8G)/5825

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5855	62.73	-4.63	58.1	68.2	-10.1	peak
5855	48.47	-4.63	43.84	54	-10.16	AVG
11650	55.88	4.84	60.72	68.2	-7.48	peak
11650	41.36	4.84	46.2	54	-7.8	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5855	63.01	-4.63	58.38	68.2	-9.82	peak
5855	50.84	-4.63	46.21	54	-7.79	AVG
11650	55.76	4.84	60.6	68.2	-7.6	peak
11650	40.95	4.84	45.79	54	-8.21	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark：

(1) Measuring frequencies from 1 GHz to the 40 GHz。

(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

3.3. Maximum Conducted Average Output Power

Limit

FCC requirement:
For the band 5.15-5.25 GHz.
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

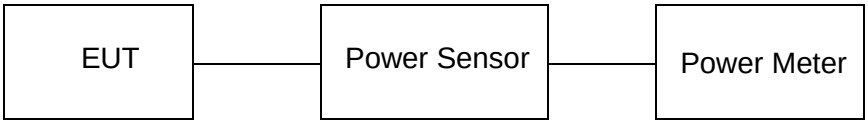
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results
For ANT1:

U-NII 1

Type	Channel	Output power Average (dBm)	Limit (dBm)	Result
802.11a	36	14.03	30.0	Pass
	40	13.76		
	48	13.28		
802.11n(HT20)	36	13.39	30.0	Pass
	40	13.32		
	48	13.20		
802.11n(HT40)	38	13.65	30.0	Pass
	46	13.48		
802.11ac(HT20)	36	13.46	30.0	Pass
	40	13.18		
	48	13.18		
802.11ac(HT40)	38	13.61	30.0	Pass
	46	13.47		
802.11ac(HT80)	42	14.01	30.0	Pass

U-NII 3

Type	Channel	Output power Average (dBm)	Limit (dBm)	Result
802.11a	149	13.38	30.00	Pass
	157	13.29		
	165	13.23		
802.11n(HT20)	149	12.35	30.00	Pass
	157	13.69		
	165	14.19		
802.11n(HT40)	151	14.61	30.00	Pass
	159	13.53		
802.11ac(HT20)	149	12.37	30.00	Pass
	157	12.59		
	165	12.72		
802.11ac(HT40)	151	13.41	30.00	Pass
	159	13.49		
802.11ac(HT80)	155	14.72	30.00	Pass

For ANT2:

U-NII 1

Type	Channel	Output power Average (dBm)	Limit (dBm)	Result
802.11a	36	13.59	30.0	Pass
	40	12.93		
	48	12.83		
802.11n(HT20)	36	12.97		
	40	13.49		
	48	13.27		
802.11n(HT40)	38	13.67		
	46	13.54		
802.11ac(HT20)	36	13.66		
	40	12.89		
	48	12.78		
802.11ac(HT40)	38	13.24		
	46	13.10		
802.11ac(HT80)	42	13.63		

U-NII 3

Type	Channel	Output power Average (dBm)	Limit (dBm)	Result
802.11a	149	13.65	30.00	Pass
	157	14.05		
	165	14.47		
802.11n(HT20)	149	13.06		
	157	12.96		
	165	13.49		
802.11n(HT40)	151	14.12		
	159	14.15		
802.11ac(HT20)	149	13.07		
	157	13.01		
	165	13.32		
802.11ac(HT40)	151	14.12		
	159	14.06		
802.11ac(HT80)	155	14.92		

Note:

1. *Measured output power at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11ac VHT20 ,IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*

For MIMO*2

U-NII 1

Type	Channel	ANT 1 Output power Average (dBm)	ANT 2 Output power Average (dBm)	MIMO*2 Output power Average (dBm)	Limit (dBm)	Result
802.11n(HT20)	36	13.39	12.97	16.20	30.0	Pass
	40	13.32	13.49	16.42		
	48	13.20	13.27	16.25		
802.11n(HT40)	36	13.65	13.67	16.67		
	40	13.48	13.54	16.52		
802.11ac(HT20)	48	13.46	13.66	16.57		
	38	13.18	12.89	16.05		
	46	13.18	12.78	15.99		
802.11ac(HT40)	36	13.61	13.24	16.44		
	40	13.47	13.10	16.30		
802.11ac(HT80)	48	14.01	13.63	16.83		

U-NII 3

Type	Channel	ANT 1 Output power Average (dBm)	ANT 2 Output power Average (dBm)	MIMO*2 Output power Average (dBm)	Limit (dBm)	Result
802.11n(HT20)	149	12.35	13.06	15.73	30.00	Pass
	157	13.69	12.96	16.35		
	165	14.19	13.49	16.86		
802.11n(HT40)	149	14.61	14.12	17.38		
	157	13.53	14.15	16.86		
802.11ac(HT20)	165	12.37	13.07	15.74		
	151	12.59	13.01	15.82		
	159	12.72	13.32	16.04		
802.11ac(HT40)	149	13.41	14.12	16.79		
	157	13.49	14.06	16.79		
802.11ac(HT80)	165	14.72	14.92	17.83		

3.4. Power Spectral Density

Limit

FCC requirement:
For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

IC requirement:

For the band 5.15-5.25 GHz.

The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Frequency band 5250-5350 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band

Frequency bands 5470-5600 MHz and 5650-5725 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

For the band 5.725 - 5.85 GHz

The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. [note1, note2]

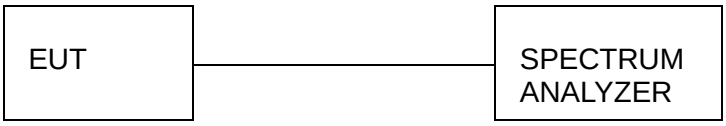
Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW ≥ 3× RBW.
4. Set the span to encompass the entire EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.

Test Configuration



Test Results

For ANT1:

U-NII 1

Type	*Channel*	*Power Spectral Density (dBm/MHz)*	*Limit (dBm/ MHz)*	*Result*
802.11a	36	4.38	17	Pass
	40	3.57		
	48	3.05		
802.11n(HT20)	36	3.34		
	40	3.07		
	48	2.66		
802.11n(HT40)	38	0.15		
	46	0.09		
802.11ac(HT20)	36	2.72		
	40	2.65		
	48	3.19		
802.11ac(HT40)	38	0.26		
	46	0.06		
802.11ac(HT80)	42	-2.38		

U-NII 3

Type	*Channel*	*Power Spectral Density (dBm/500KHz)*	*Limit (dBm/500KHz)*	*Result*
802.11a	149	1.50	30	Pass
	157	1.25		
	165	1.98		
802.11n(HT20)	149	0.97		
	157	1.91		
	165	2.50		
802.11n(HT40)	151	-0.81		
	159	-1.95		
802.11ac(HT20)	149	0.66		
	157	1.27		
	165	1.15		
802.11ac(HT40)	151	-1.60		
	159	-1.43		
802.11ac(HT80)	155	-3.45		

For ANT2:

U-NII 1

Type	*Channel*	*Power Spectral Density (dBm/MHz)*	*Limit (dBm/ MHz)*	*Result*
802.11a	36	4.60	17	Pass
	40	2.38		
	48	2.69		
802.11n(HT20)	36	2.58		
	40	3.36		
	48	3.27		
802.11n(HT40)	38	0.17		
	46	0.12		
802.11ac(HT20)	36	3.59		
	40	2.81		
	48	2.85		
802.11ac(HT40)	38	-0.44		
	46	-0.25		
802.11ac(HT80)	42	-2.66		

U-NII 3

Type	*Channel*	*Power Spectral Density (dBm/500KHz)*	*Limit (dBm/500KHz)*	*Result*
802.11a	149	2.42	30	Pass
	157	2.12		
	165	2.76		
802.11n(HT20)	149	1.44		
	157	1.36		
	165	1.37		
802.11n(HT40)	151	-1.22		
	159	-1.02		
802.11ac(HT20)	149	1.50		
	157	1.13		
	165	1.89		
802.11ac(HT40)	151	-0.57		
	159	-1.47		
802.11ac(HT80)	155	-3.89		

Note:

1. *Measured output power at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11ac VHT20 ,IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*

For MIMO:

U-NII 1

Type	Channel	ANT 1 *Power Spectral Density (dBm/MHz)*	ANT 2 *Power Spectral Density (dBm/MHz)*	MIMO*2 *Power Spectral Density (dBm/MHz)*	Limit (dBm)	Result
802.11n(HT20)	36	3.34	2.58	5.99	17	Pass
	40	3.07	3.36	6.23		
	48	2.66	3.27	5.99		
802.11n(HT40)	36	0.15	0.17	3.17		
	40	0.09	0.12	3.12		
802.11ac(HT20)	48	2.72	3.59	6.19		
	38	2.65	2.81	5.74		
	46	3.19	2.85	6.03		
802.11ac(HT40)	36	0.26	-0.44	2.93		
	40	0.06	-0.25	2.92		
802.11ac(HT80)	48	-2.38	-2.66	0.49		

U-NII 3

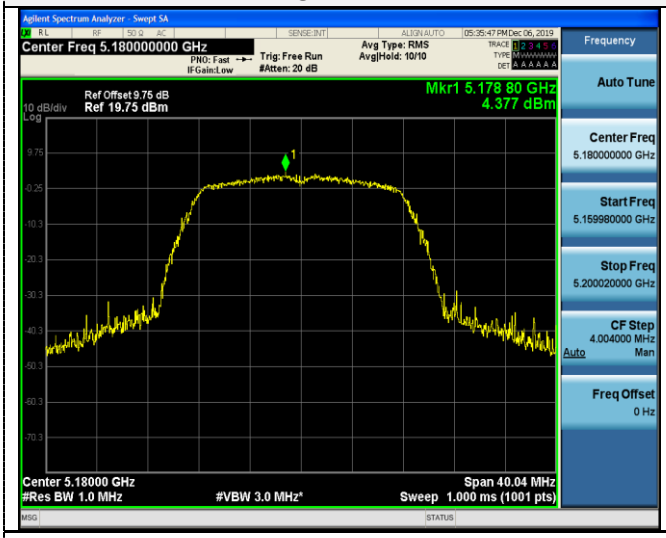
Type	Channel	ANT 1 *Power Spectral Density (dBm/500KHz)*	ANT 2 *Power Spectral Density (dBm/500KHz)*	MIMO*2 *Power Spectral Density (dBm/500KHz)*	Limit (dBm)	Result
802.11n(HT20)	149	0.97	1.44	4.22	30	Pass
	157	1.91	1.36	4.65		
	165	2.50	1.37	4.98		
802.11n(HT40)	149	-0.81	-1.22	2.00		
	157	-1.95	-1.02	1.55		
802.11ac(HT20)	165	0.66	1.50	4.11		
	151	1.27	1.13	4.21		
	159	1.15	1.89	4.55		
802.11ac(HT40)	149	-1.60	-0.57	1.96		
	157	-1.43	-1.47	1.56		
802.11ac(HT80)	165	-3.45	-3.89	-0.65		

Please refer to following test plots;

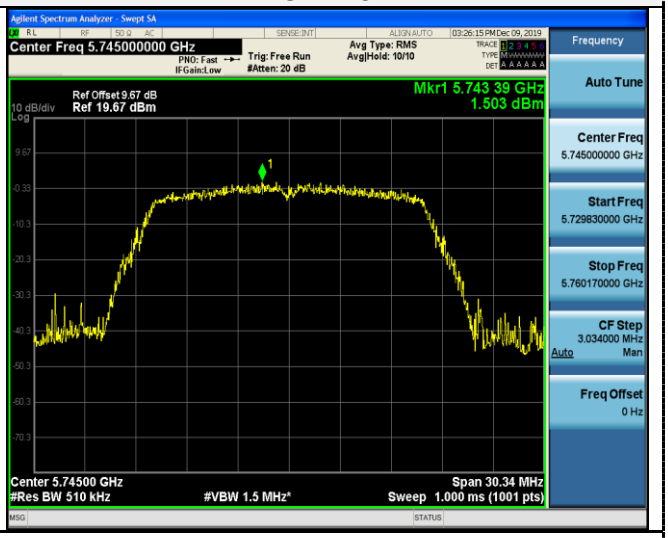
For ANT 1:

802.11a

U-NII 1

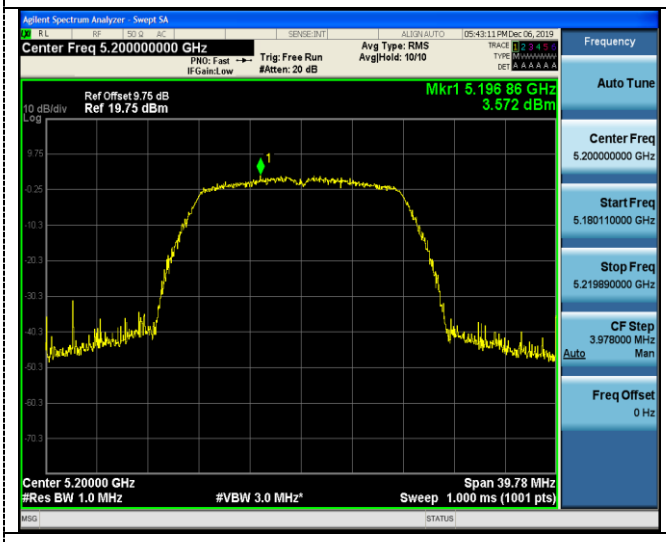


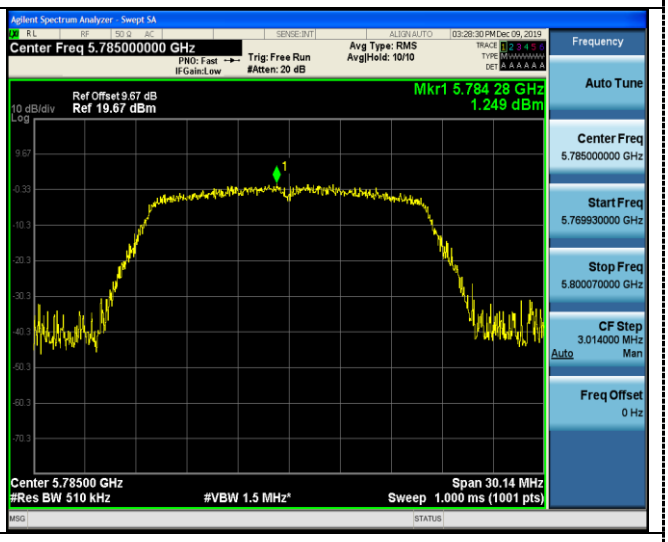
U-NII 3



CH36

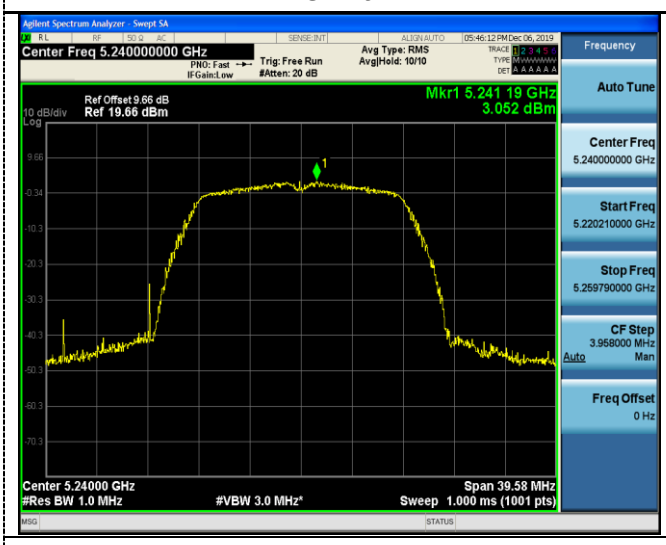
CH149

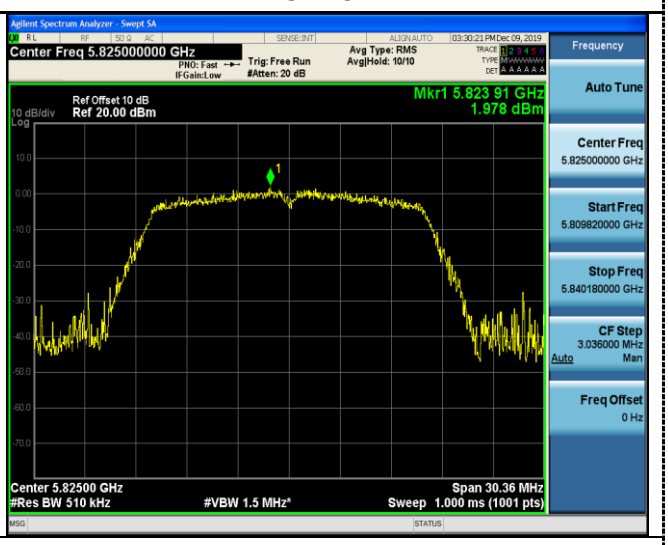




CH40

CH157





CH48

CH165

802.11n20	
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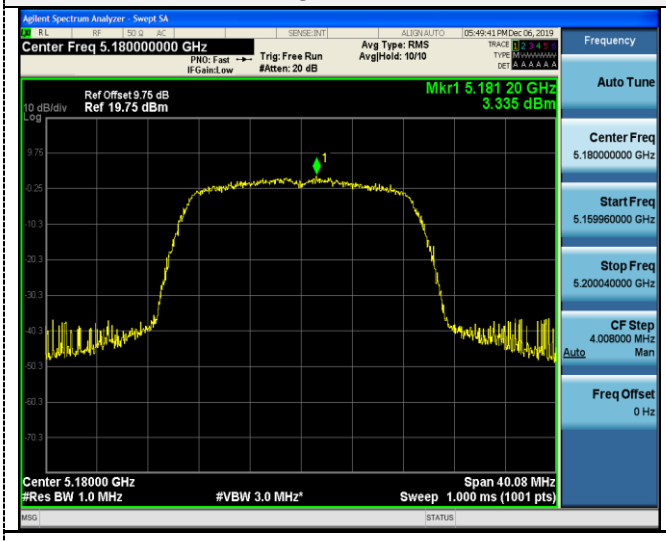
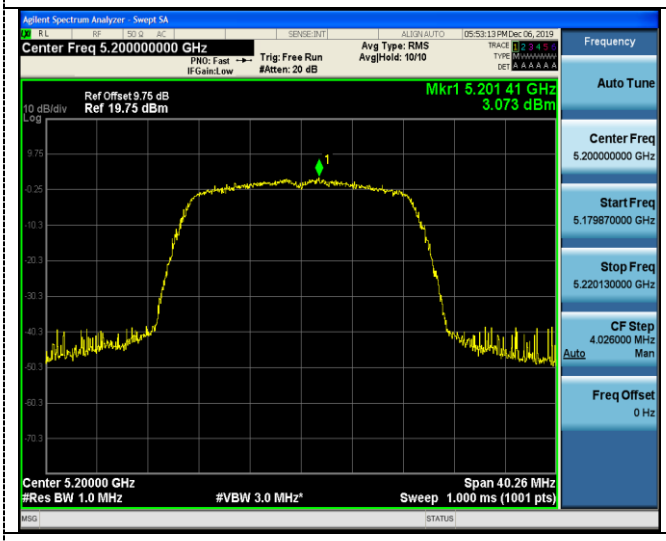
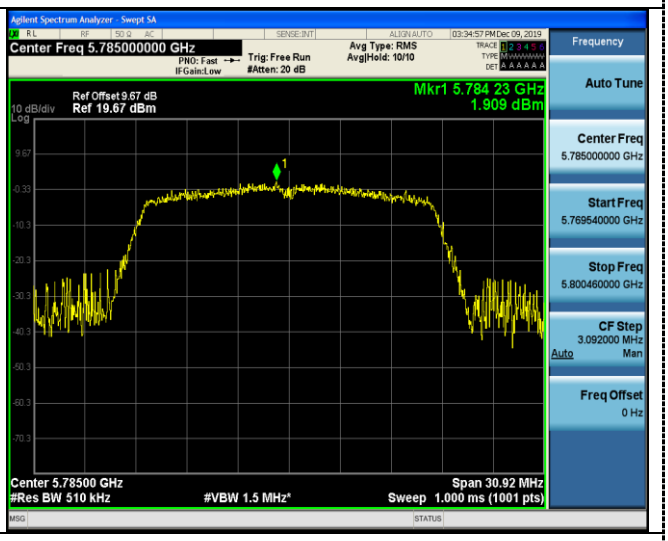
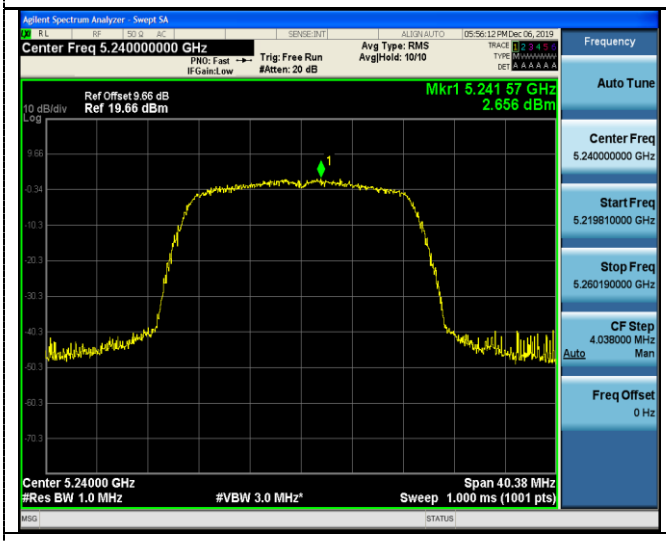
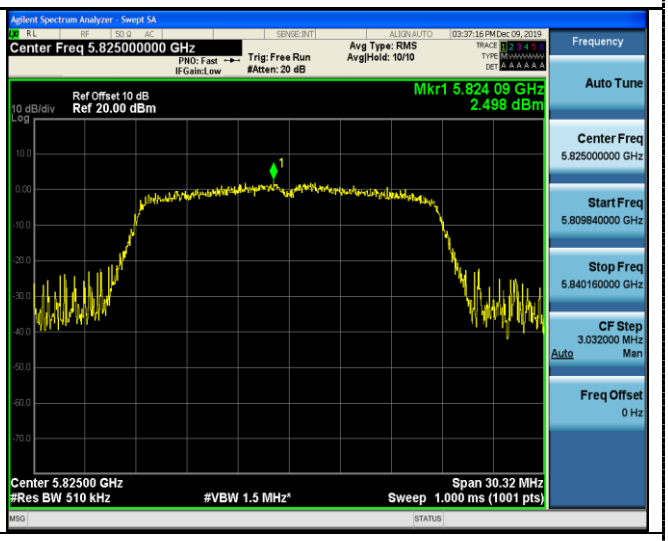
	
CH36	CH149
	
CH40	CH157
	
CH48	CH165

802.11n(HT40)	
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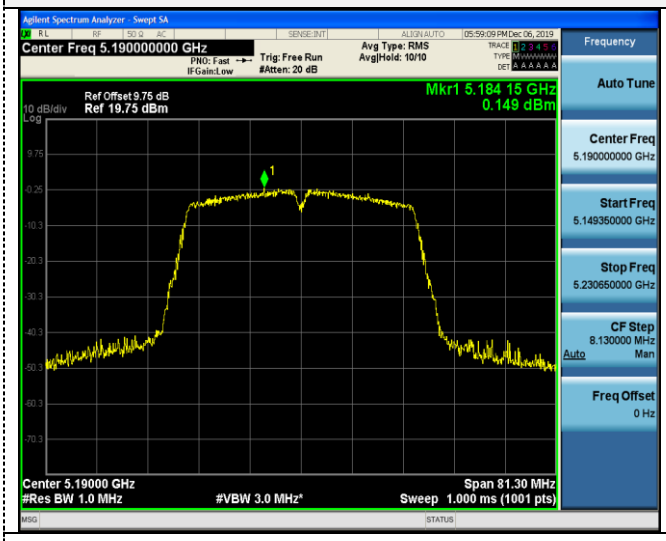
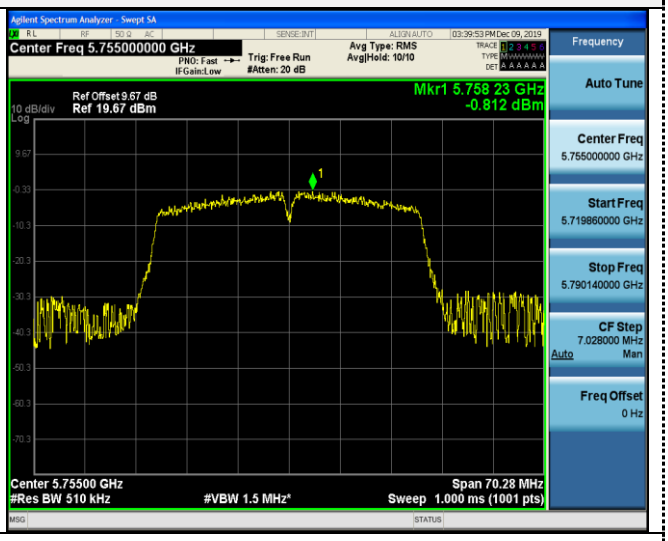
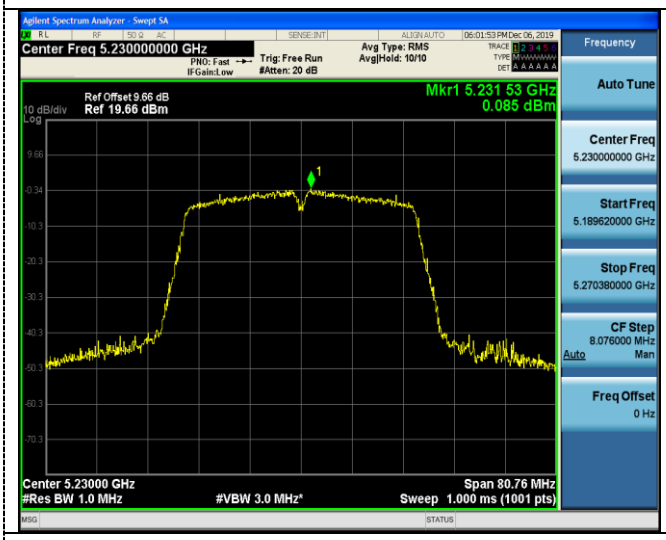
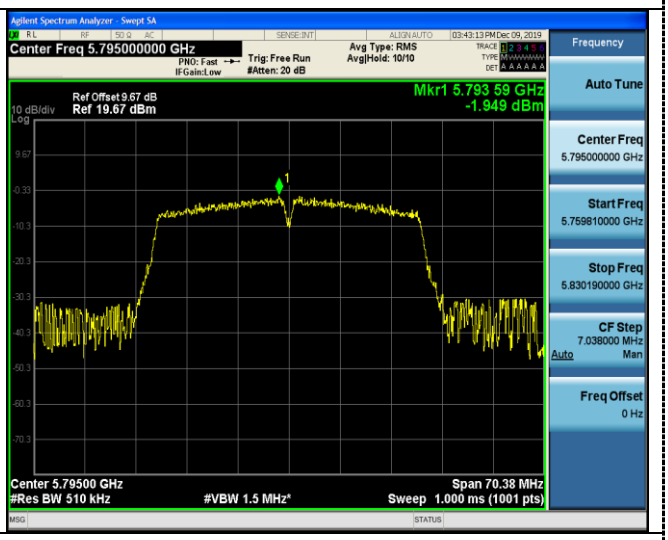
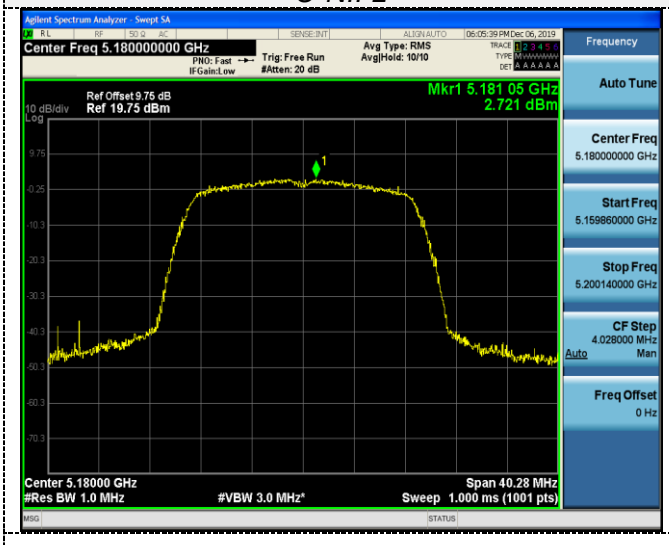
	
CH38	CH151
	
CH46	CH159

802.11ac(HT20)

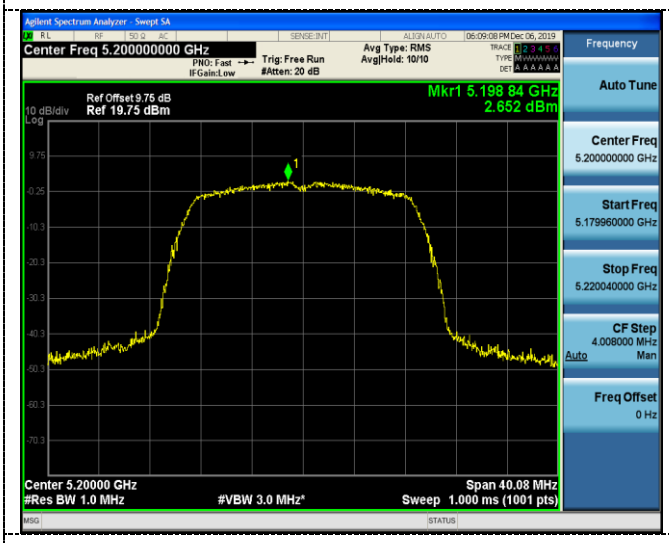
U-NII 1



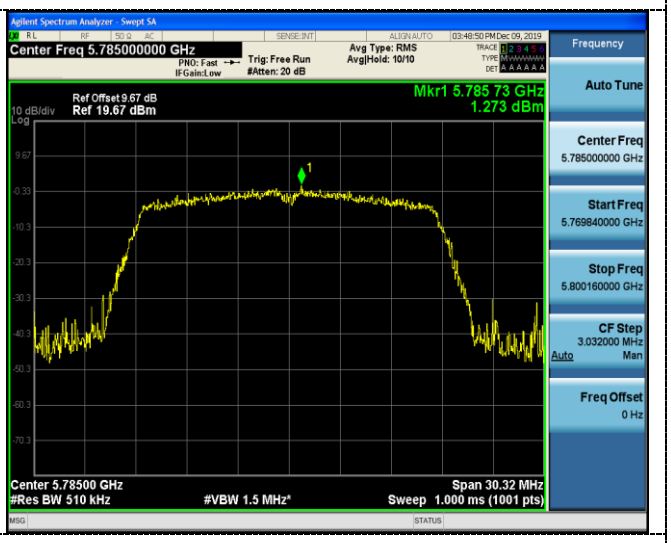
CH36

U-NII 3

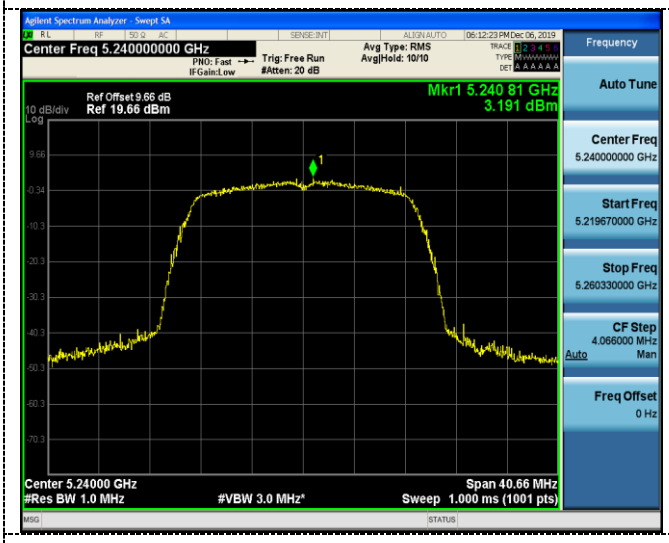
CH149



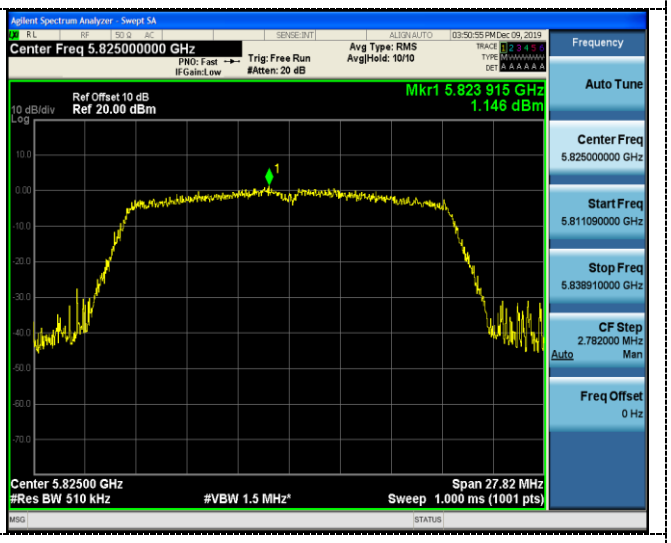
CH40



CH157



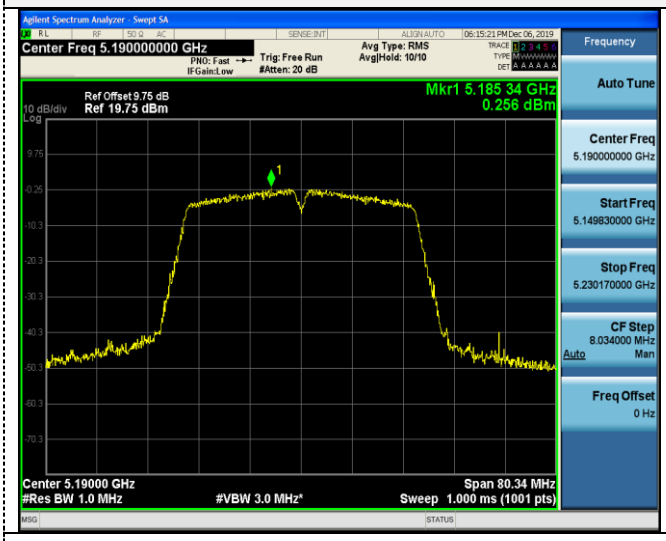
CH48



CH165

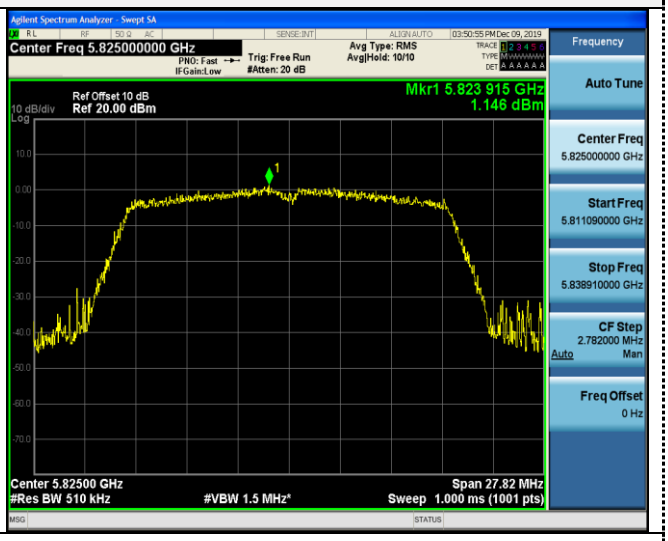
802.11ac(HT40)

U-NII 1

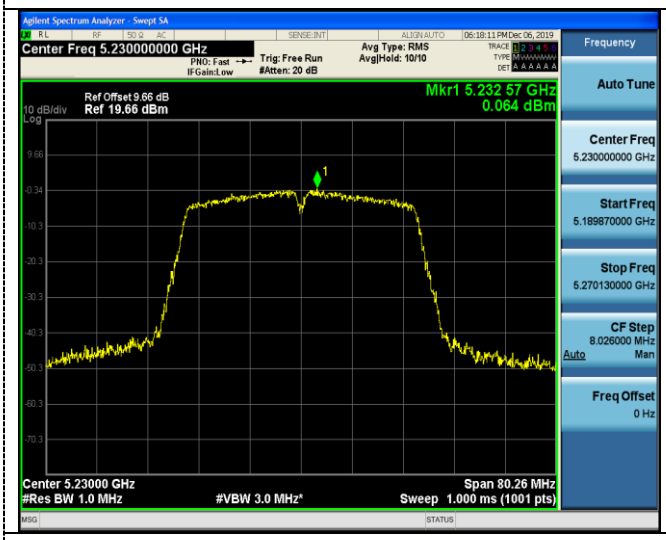


CH38

U-NII 3



CH151



CH46

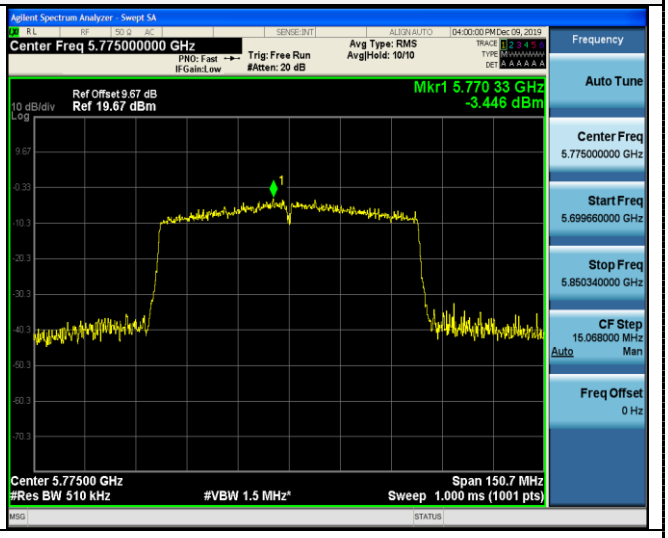
CH159

802.11ac(HT80)

U-NII 1

CH42

U-NII 3



CH155

For ANT 2:

802.11a	
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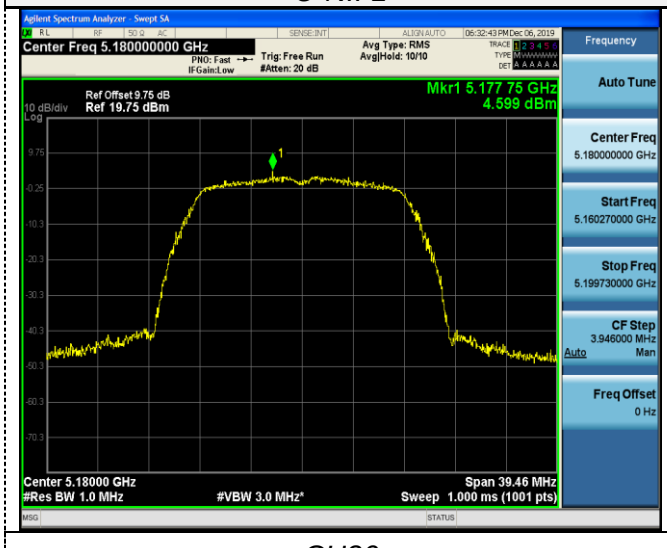
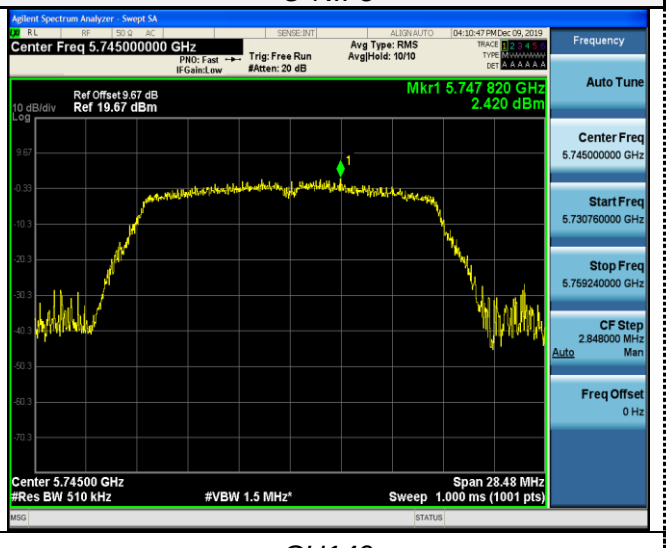
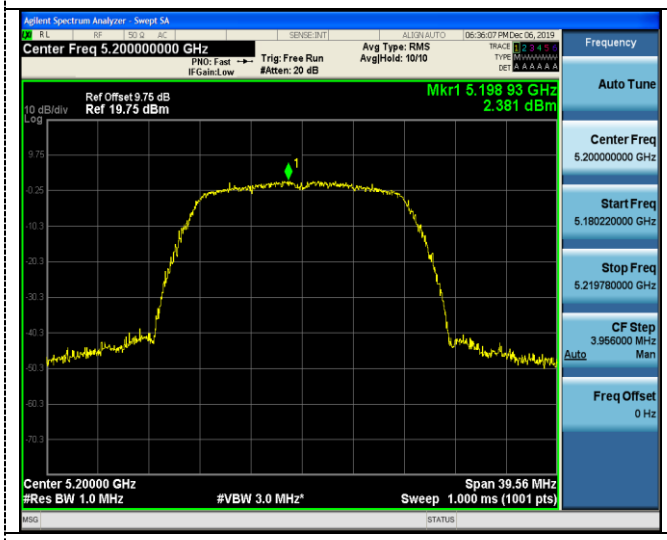
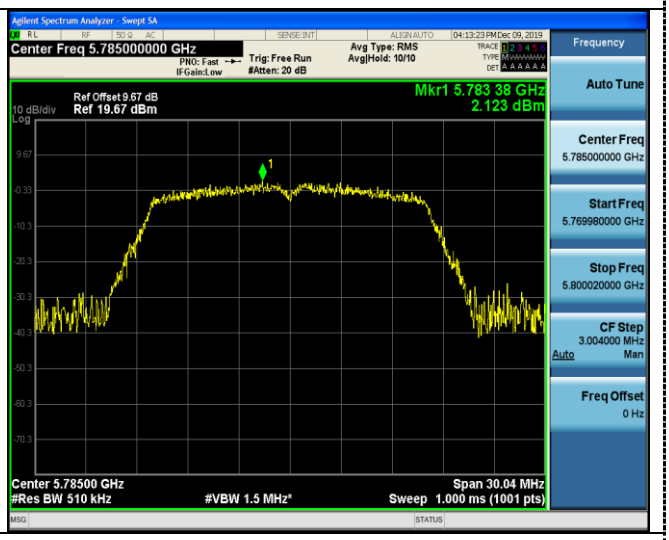
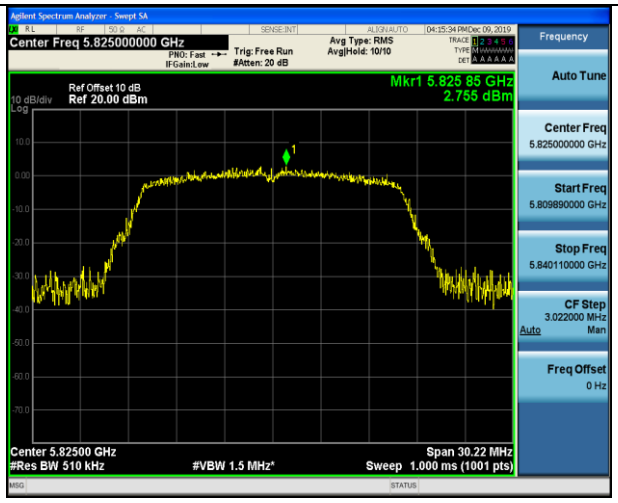
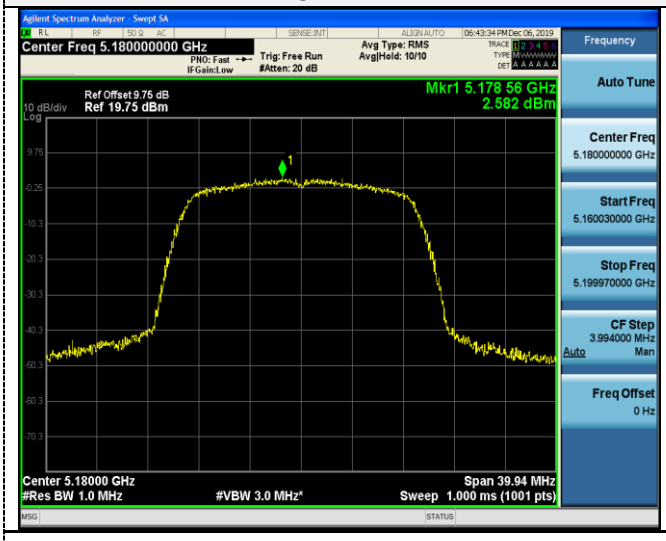
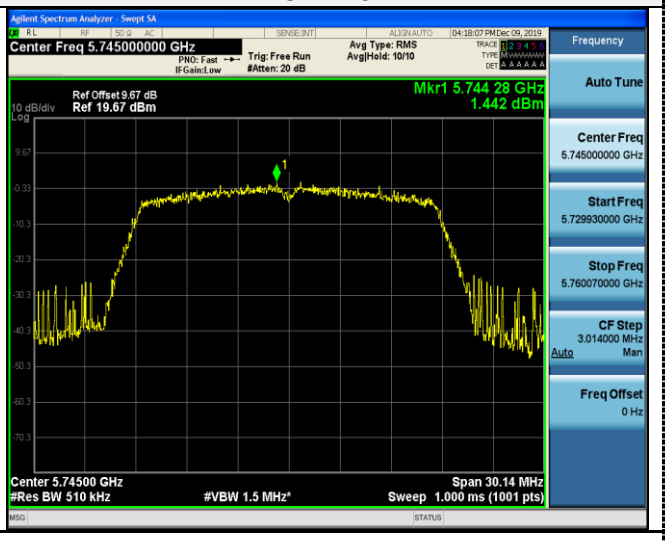
	
CH36	*CH149*
	
CH40	*CH157*
	
CH48	*CH165*

802.11n20

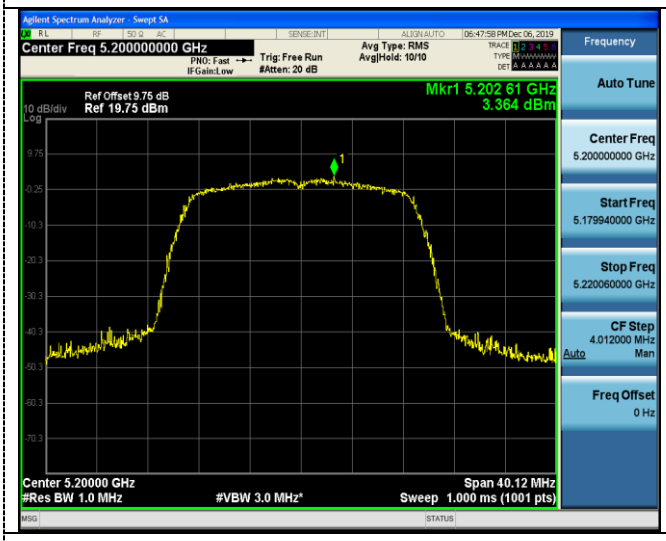
U-NII 1



U-NII 3



CH36



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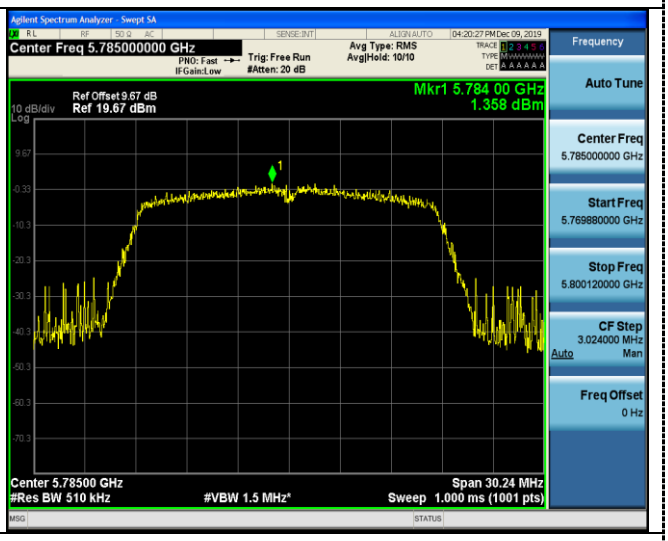

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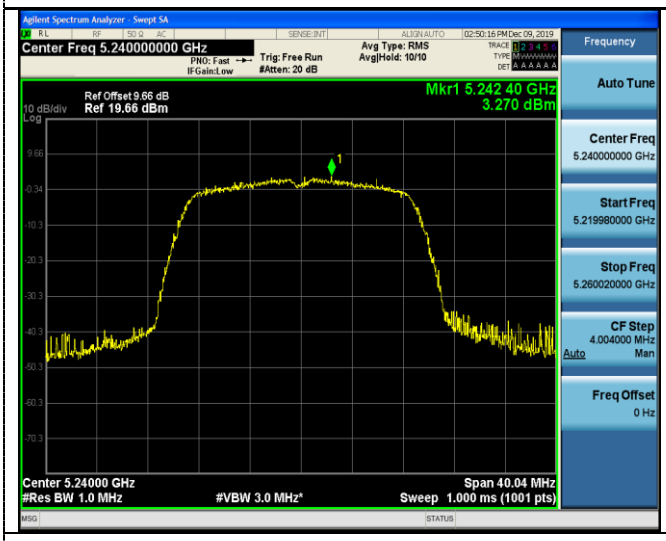

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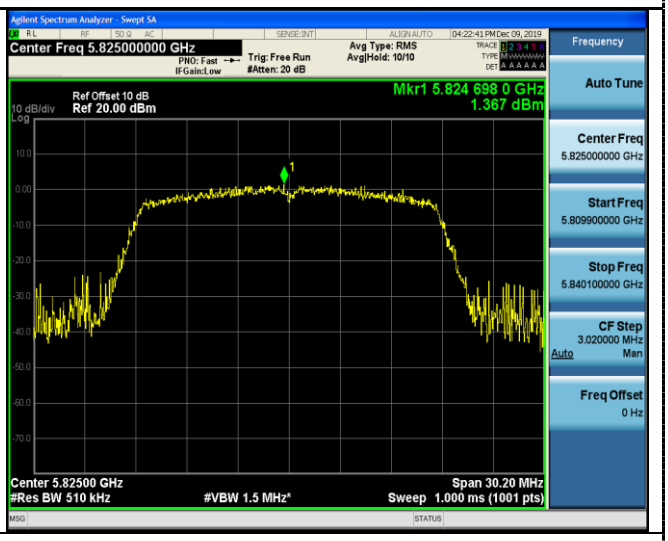
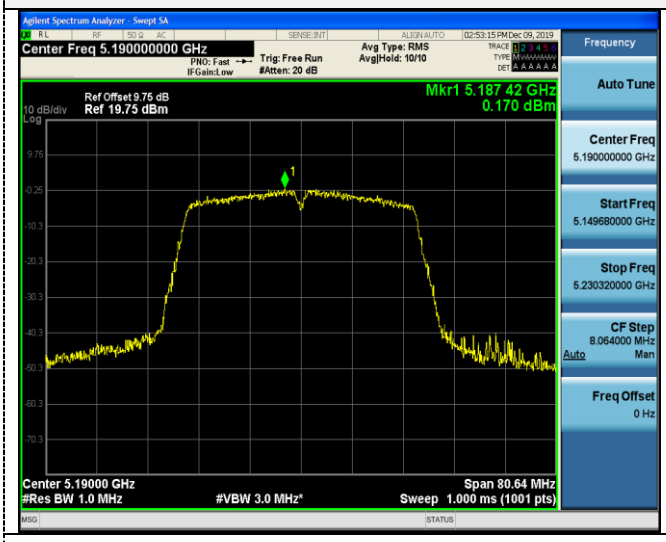


CH48

CH165

802.11n(HT40)

U-NII 1



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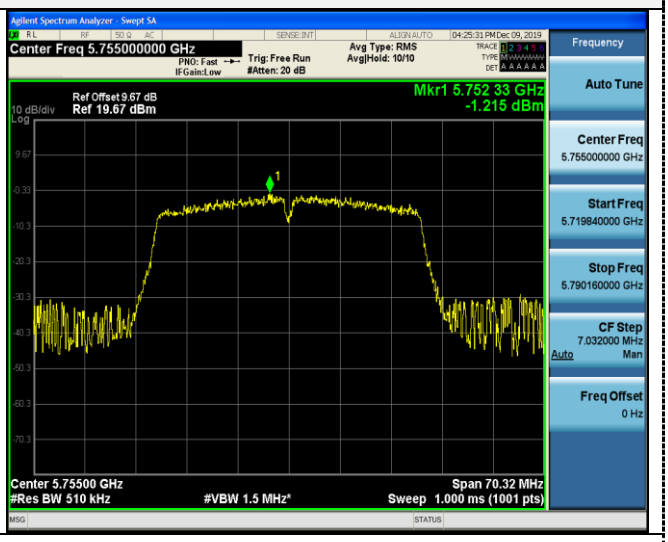
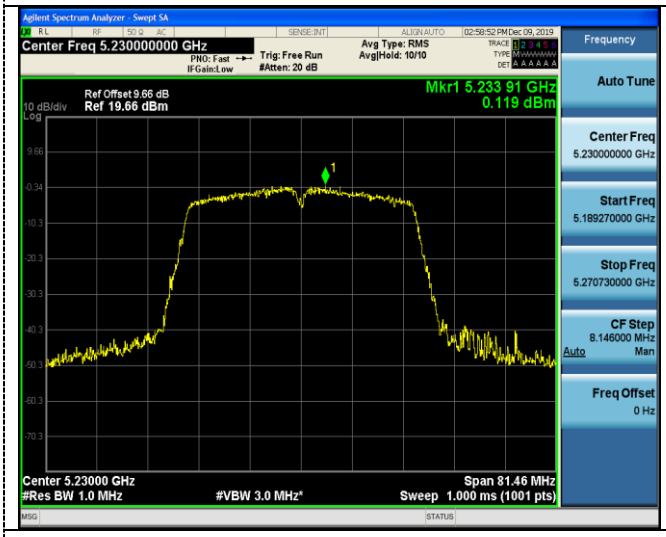
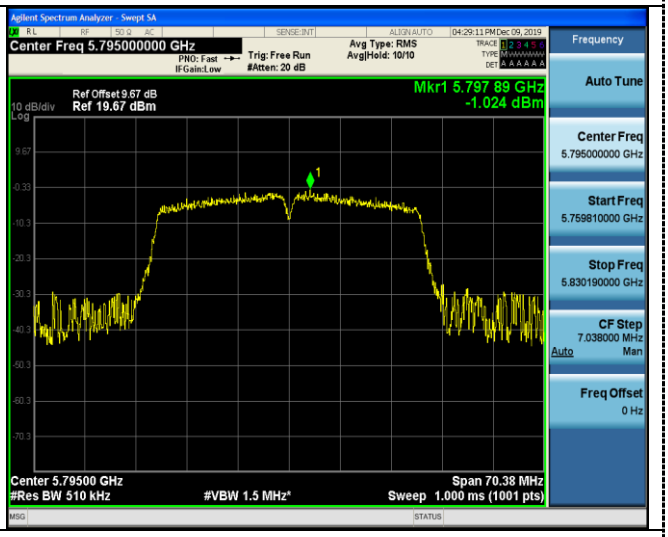


CH38



CH151

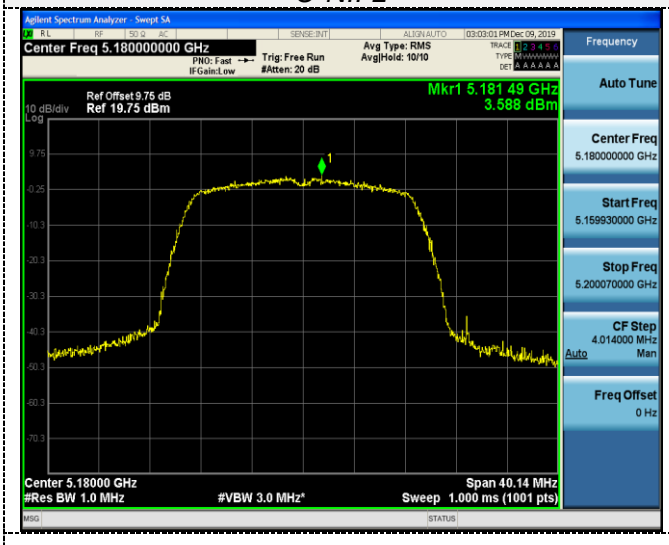


CH46

CH159

802.11ac(HT20)

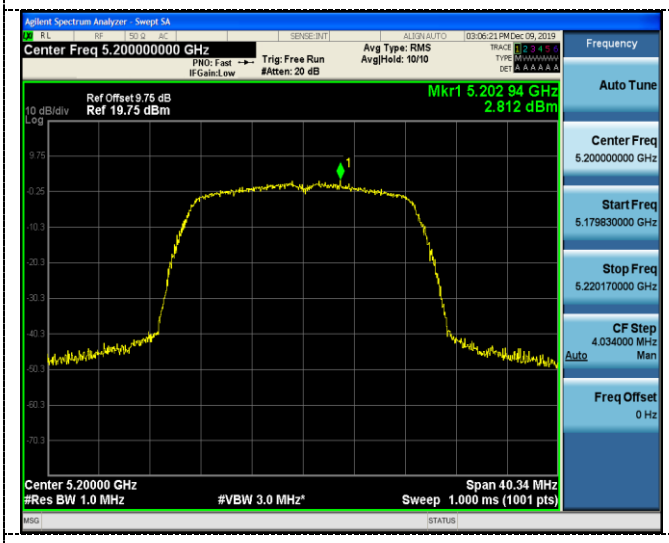
U-NII 1



CH36

U-NII 3

CH149



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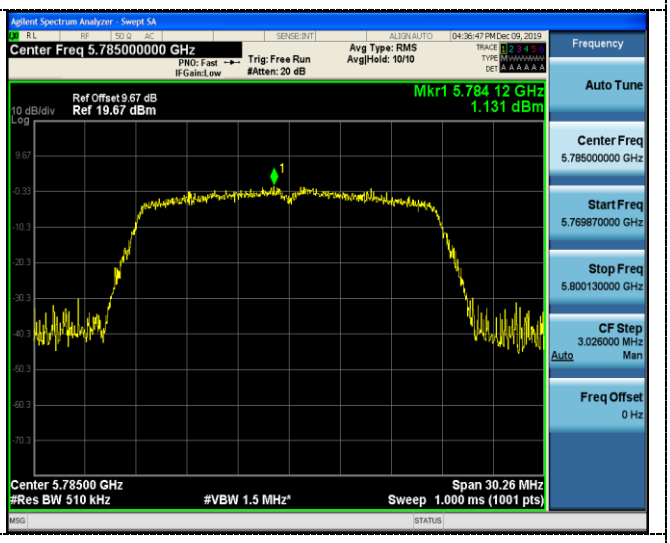

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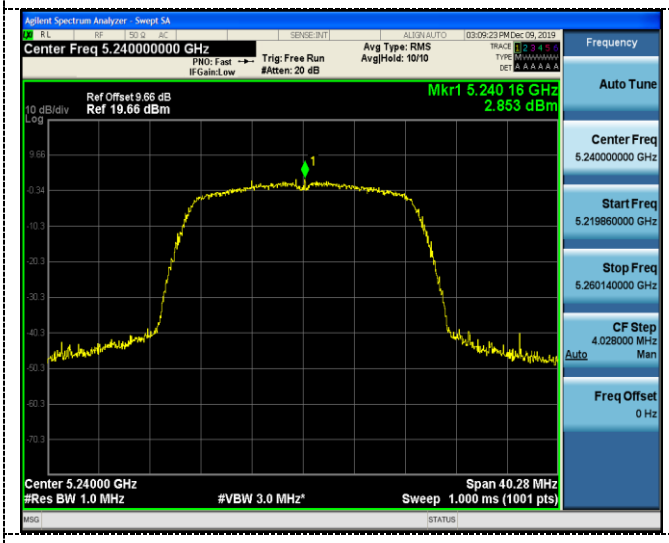

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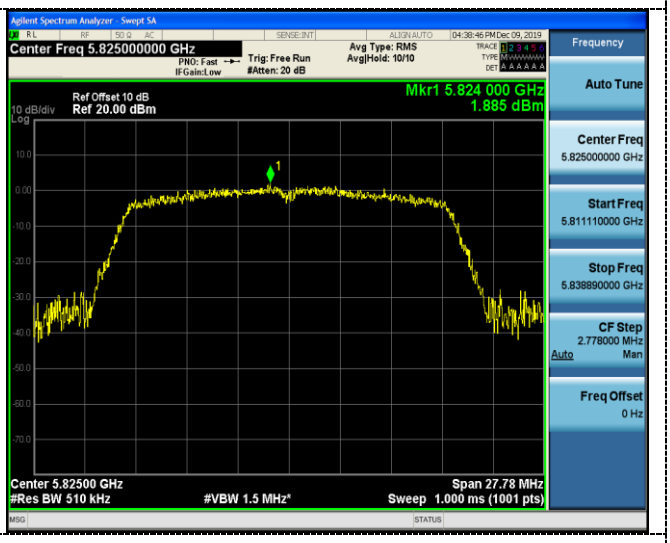
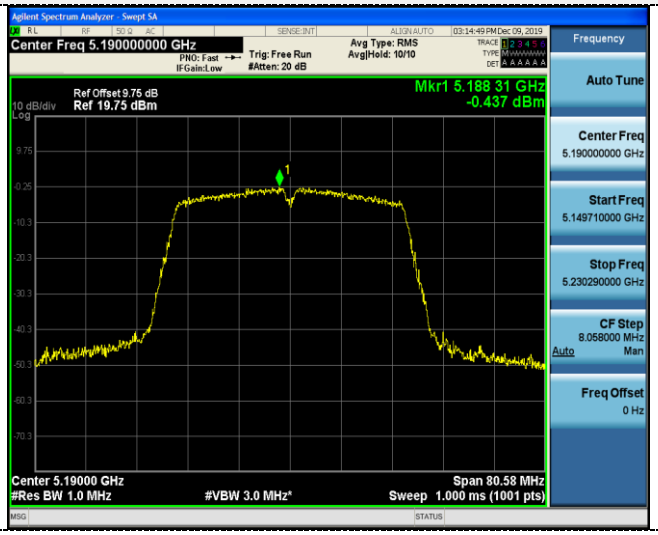


CH165

802.11ac(HT40)

U-NII 1



CH38

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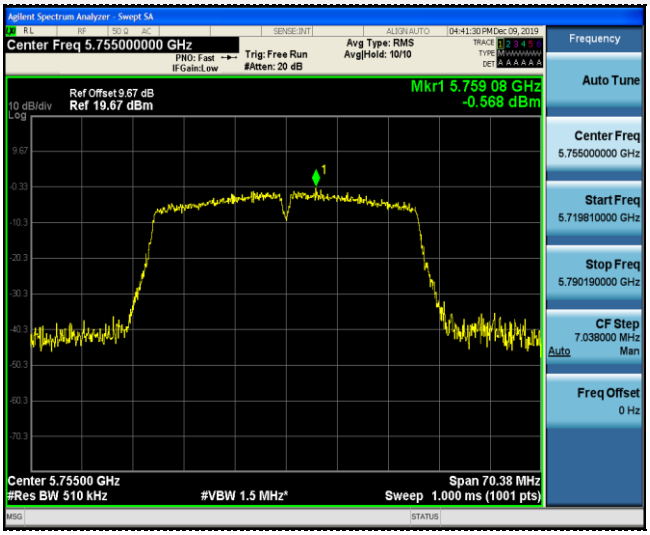

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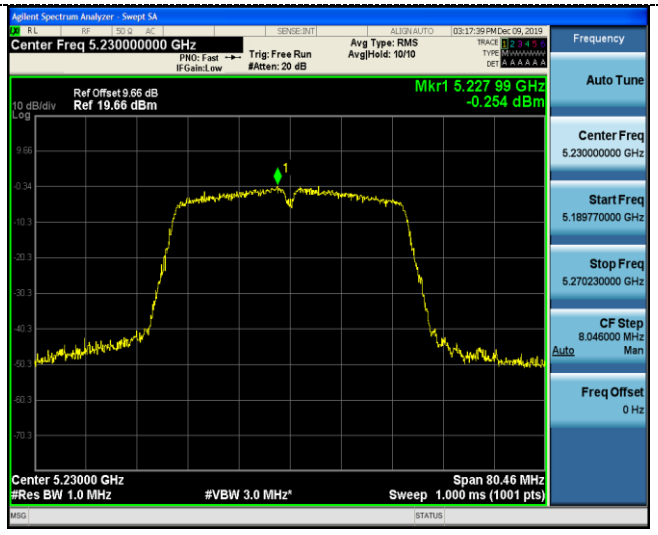

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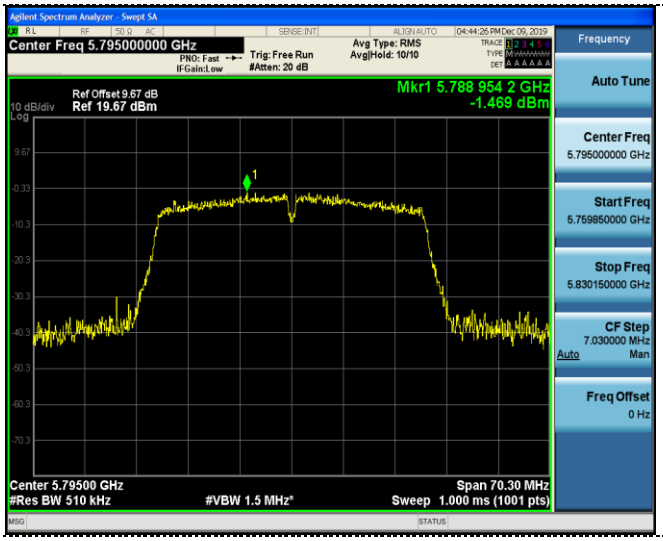


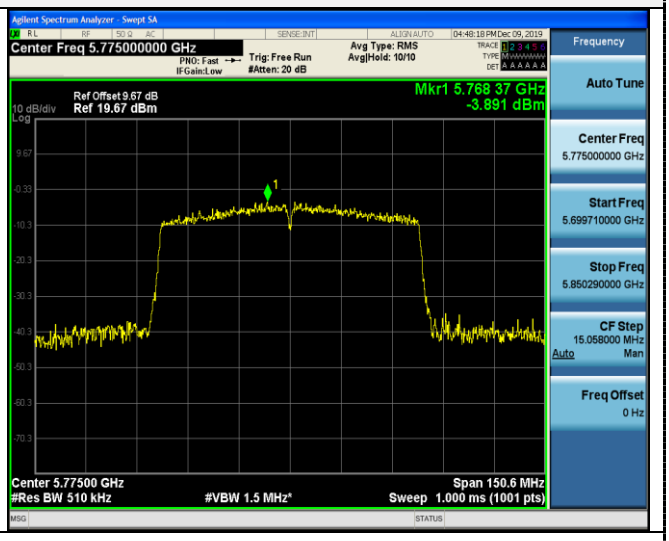
CH159

802.11ac(HT80)

U-NII 1

CH42

U-NII 3



CH155