

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

Applicant: Sharp Corporation, Mobile Communication B.U.
2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi,
Hiroshima 739-0192, Japan

Manufacturer: Sharp Corporation
1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan

Product Name: Smart Phone

Report Number: ER/2018/30033

FCC ID: APYHRO00260

FCC Rule Part: §15.407, Cat: NII

Issue Date: Apr. 11, 2018

Date of Test: Mar. 05, 2018~Mar. 29, 2018

Date of EUT Received: Mar. 05, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

Marcus Tseng

Marcus Tseng / Engineer

Approved By:

Jim Chang

Jim Chang / Manager



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1. GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Smart Phone	
Hardware Version:	DVT	
Software Version:	N/A	
Power Supply:	3.85V from Rechargeable Li-ion Battery	
	Battery:	Model No.: UBATIA286AFN2, Supplier: SHARP CORPORATION

WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
11a_20	5180~5240	4	14.81	OFDM
	5260~5320	4	14.75	
	5500~5700	11	14.72	
11n_HT / ac_VHT 20M	5180~5240	4	HT: 17.72 (Worst Case)	OFDM
	5260~5320	4	HT: 17.64 (Worst Case)	
	5500~5700	11	HT: 17.80 (Worst Case)	
11n_HT / ac_VHT 40M	5190~5230	2	HT: 17.57 (Worst Case)	OFDM
	5270~5310	2	HT: 17.61 (Worst Case)	
	5510~5670	5	HT: 17.79 (Worst Case)	
11ac VHT80M	5210	1	14.72	OFDM
	5290	1	14.54	
	5530~5610	2	17.98	
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps 802.11 ac_20MHz: 6.5 –173.3Mbps 802.11 ac_40MHz: 13.5 –400.0Mbps 802.11 ac_80MHz: 29.3 – 866.7Mbps			
Antenna Designation:	IFA Antenna, 5150~5250MHz Gain: -3.6dBi (Main) / -3.9dBi(Aux) 5250~5350MHz Gain: -3.6dBi (Main) / -3.9dBi(Aux) 5470~5725MHz Gain: -1.7dBi (Main) / -3.6dBi(Aux)			

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

KDB 789033 D02 v01r04 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

KDB 644545 D03 v01 Guidance for IEEE 802.11ac

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

(TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & AC Power Line Conducted Emission



Fig. 2-2 Conducted (Antenna Port) Emission

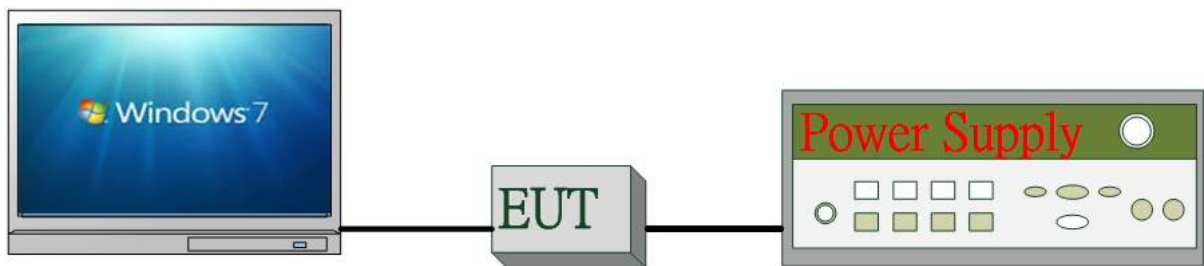


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Anritsu	E3640A	MY52410006	N/A	Unshielded
3.	Notebook	Lenovo	T440	P0000564	Shielded	Unshielded

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3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	26 dB Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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4. DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
38	5190
46	5230

802.11ac VHT80 Mode	
channel	Frequency
42	5210

Operated band in 5250 MHz ~5350 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
channel	Frequency
52	5260
56	5280
60	5300
64	5320

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
54	5270
62	5310

802.11ac VHT80 Mode	
Channel	Frequency
58	5290

Operated band in 5470 MHz ~5725 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
102	5510
110	5550
118	5590
126	5630
134	5670

802.11ac VHT80 Mode	
channel	Frequency
106	5530
122	5610

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.
4. The given UE is pre-scanned among 802.11n and ac modes, and 802.11n yields the highest reading that generates the highest emission.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5700	100 to 140	100,116,140	OFDM	6	MAIN
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS8	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5700	100 to 140	100,116,140	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS8	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case E1 position was reported.

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ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5700	100 to 140	100,116,140	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS8	MIMO

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6. CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	2017/06/06	2018/06/05
Coaxial Cables	N/A	WK CE Cable	N/A	2018/01/02	2019/01/01
Notebook	Lenovo	T440P	P0000564	N/A	N/A
LISN	SCHWARZBECK	NSLK 8127	8127-649	2017/05/22	2018/05/21

6.3 EUT Setup

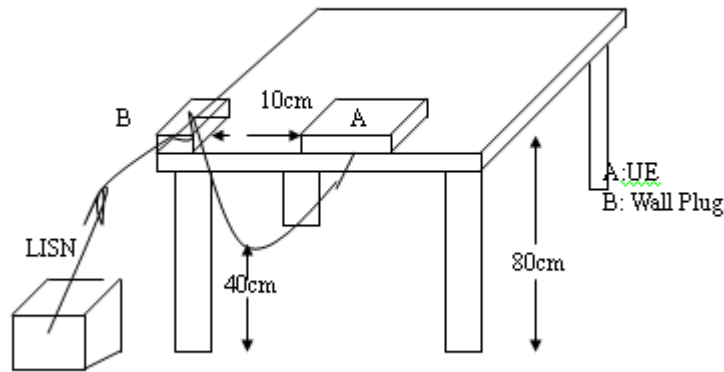
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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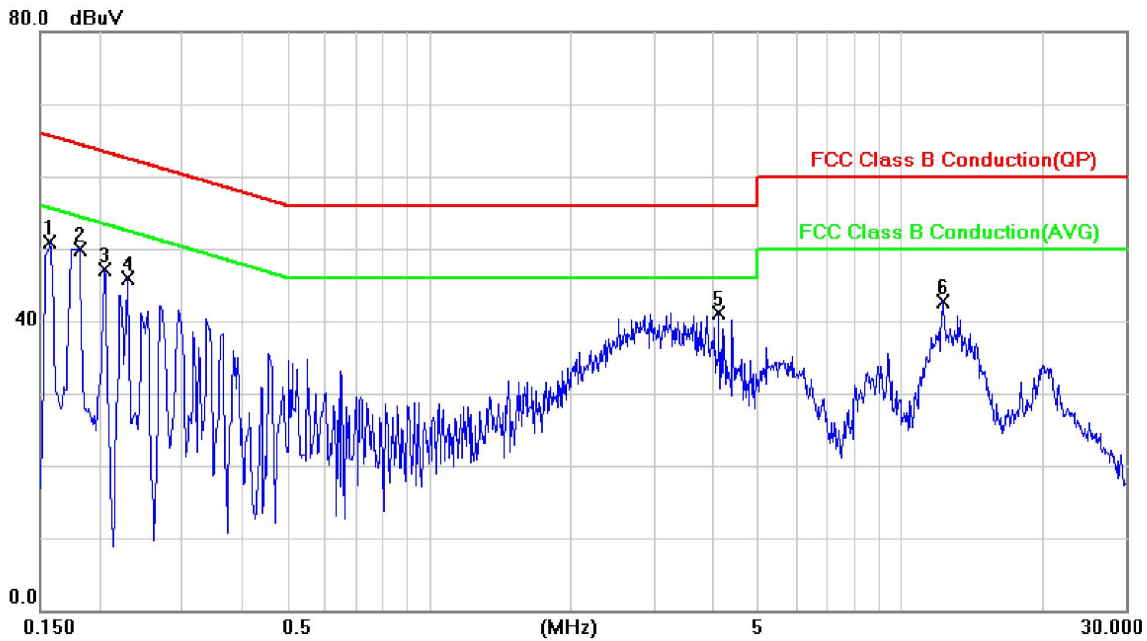
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Site Conduction Room	Phase: L1	Temperature: 20 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode: Operation		
Note:		

Conducted Emission

File :Data Data :#2 Date: 2018/3/28 Time: 下午 11:50:24



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1580	50.75	0.07	50.82	65.57	-14.75	peak	
2	*	0.1820	49.84	0.07	49.91	64.39	-14.48	peak	
3		0.2060	47.04	0.07	47.11	63.37	-16.26	peak	
4		0.2300	45.85	0.07	45.92	62.45	-16.53	peak	
5		4.1180	40.80	0.21	41.01	56.00	-14.99	peak	
6		12.3180	42.37	0.38	42.75	60.00	-17.25	peak	

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Site Conduction Room

Phase: **N**

Temperature: 20 °C

Limit: FCC Class B Conduction(QP)

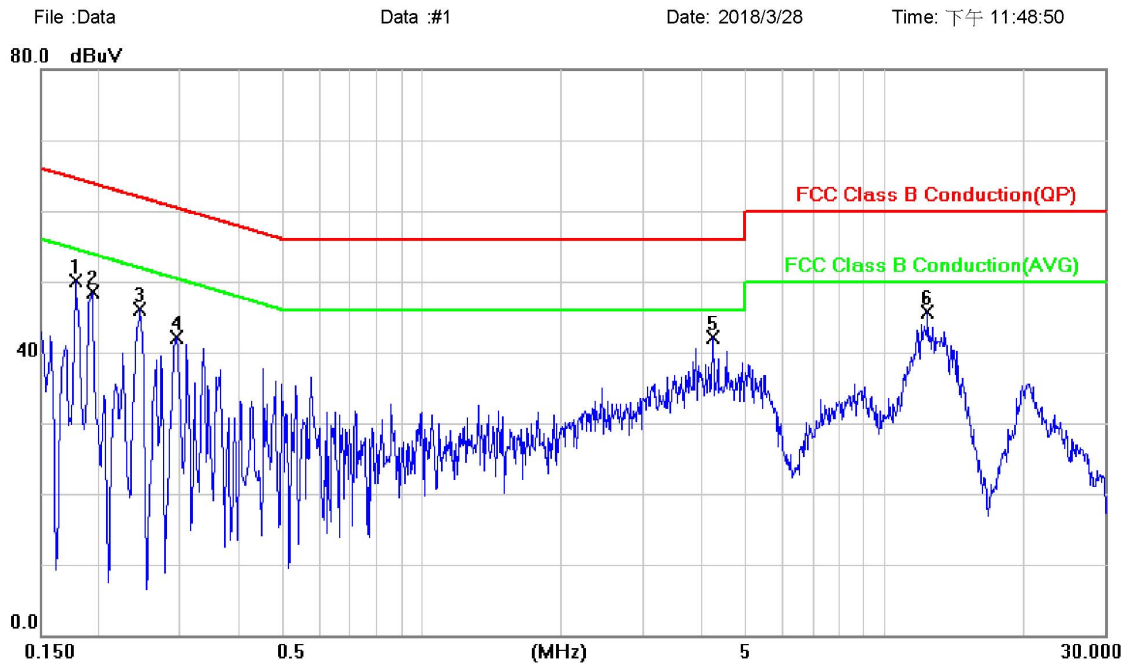
Power: AC 120V/60Hz

Humidity: 58 %

Mode: Operation

Note:

Conducted Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1780	49.96	0.07	50.03	64.58	-14.55	peak	
2		0.1940	48.47	0.07	48.54	63.86	-15.32	peak	
3		0.2460	46.01	0.07	46.08	61.89	-15.81	peak	
4		0.2940	41.94	0.07	42.01	60.41	-18.40	peak	
5	*	4.2500	41.86	0.22	42.08	56.00	-13.92	peak	
6		12.4260	45.22	0.39	45.61	60.00	-14.39	peak	

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7. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	98.37	0.07	0.49	1.00
802.11n_20	98.02	0.09	1.00	1.00
802.11n_40	96.37	0.16	1.08	2.00
802.11ac_80	92.68	0.33	2.19	3.00

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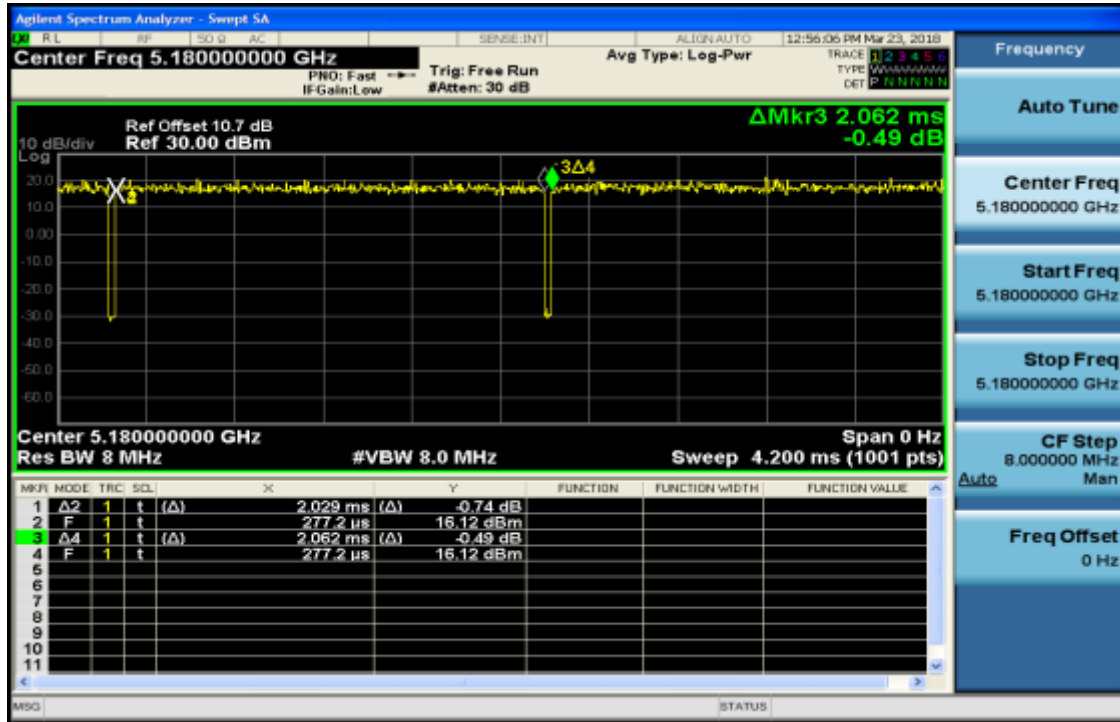
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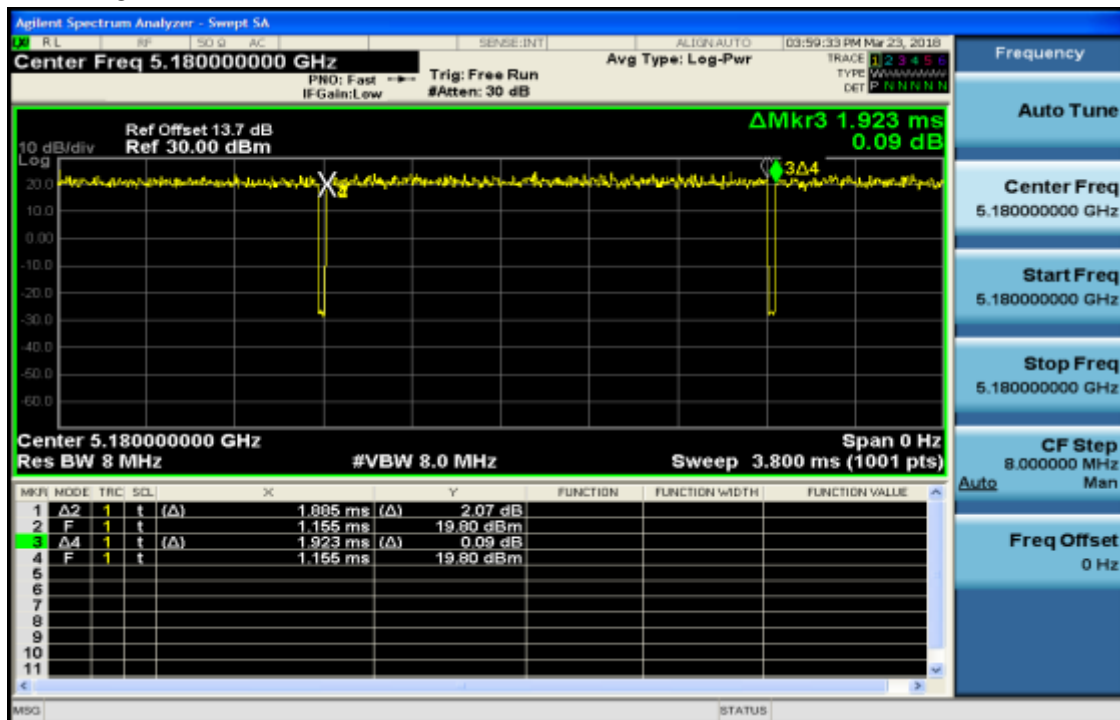
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DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



802.11n HT20

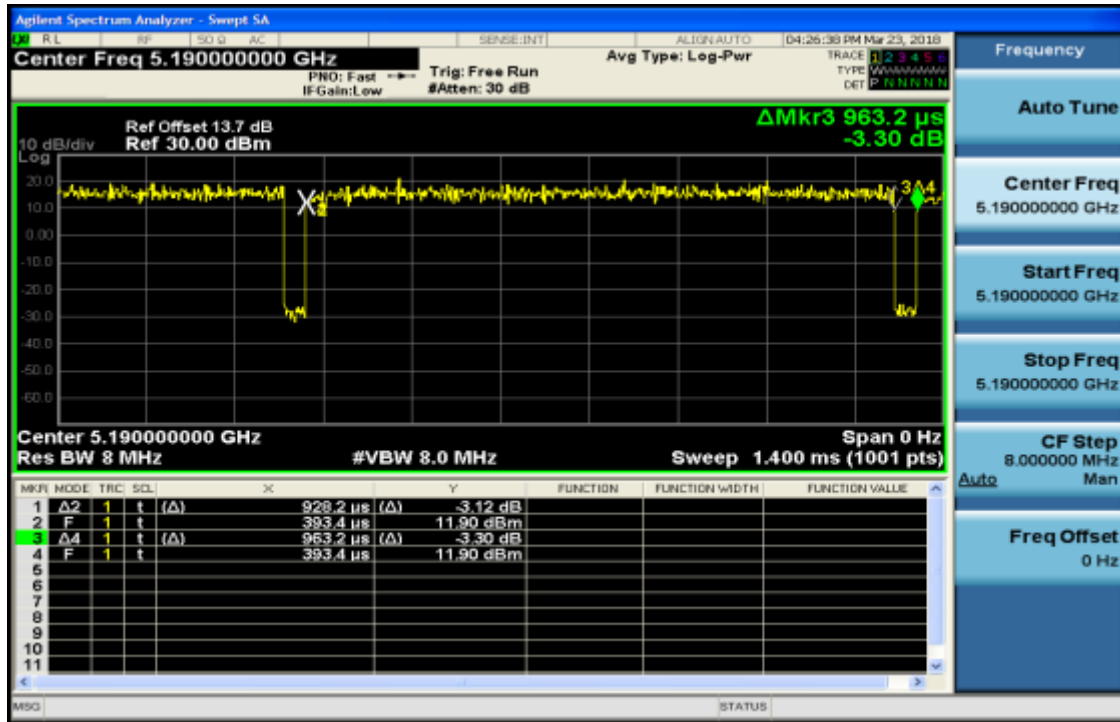


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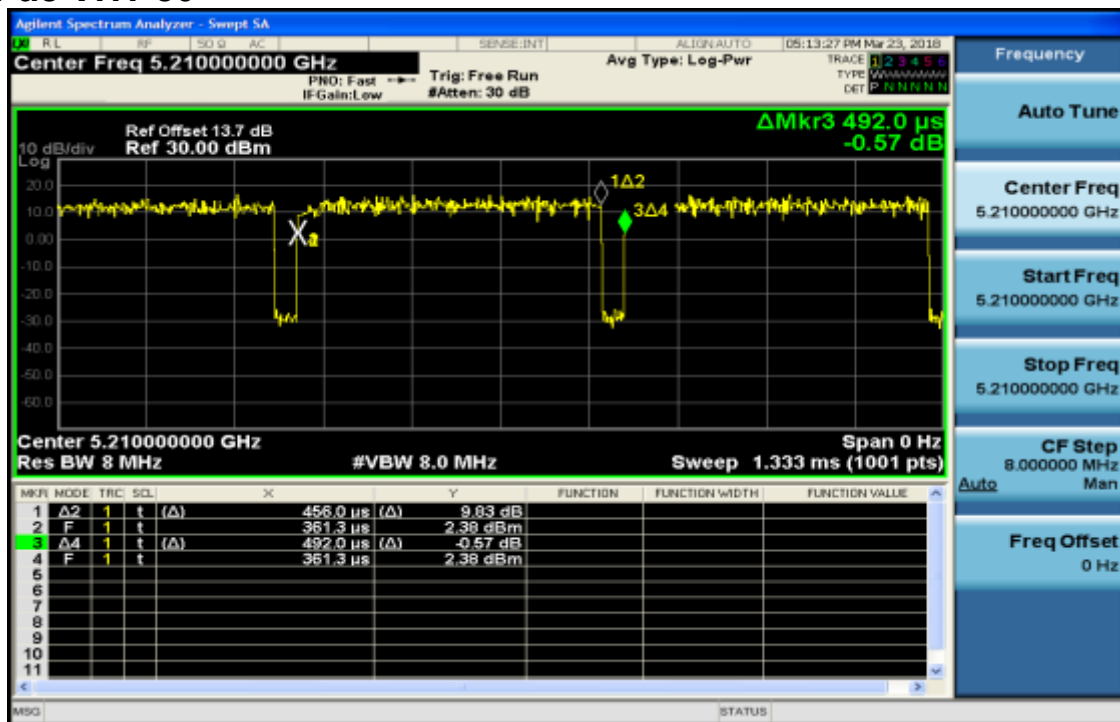
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802.11n HT 40



802.11 ac VHT 80



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8. 26DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

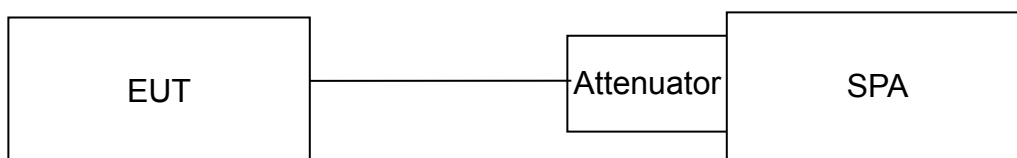
8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
 - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - b. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Repeat above procedures until all test default channel measured were complete.

8.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY54200716	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
Notebook	Lenovo	T440	P0000564	N/A	N/A

8.4 Test Set-up



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8.5 Measurement Result

26dB Bandwidth

802.11a_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.31	13.286
5220	22.05	13.434
5240	20.96	13.214
5260	21.64	13.352
5300	21.57	13.338
5320	21.35	13.295
5500	21.84	13.393
5580	21.25	13.274
5700	21.58	13.341

802.11n_HT20_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.82	13.583
5220	22.49	13.520
5240	22.47	13.516
5260	22.60	13.540
5300	22.55	13.531
5320	23.61	13.732
5500	22.33	13.489
5580	22.01	13.426
5700	22.57	13.536

802.11n_HT20_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.49	13.519
5220	22.68	13.556
5240	23.70	13.747
5260	22.13	13.450
5300	22.35	13.493
5320	23.01	13.620
5500	22.60	13.542
5580	22.17	13.458
5700	22.51	13.524

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802.11n_HT40_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	42.32	16.266
5230	41.82	16.214
5270	42.14	16.247
5310	41.70	16.202
5510	42.25	16.258
5550	41.92	16.225
5670	41.84	16.216

802.11n_HT40_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	42.24	16.257
5230	41.95	16.228
5270	42.11	16.244
5310	41.79	16.211
5510	41.90	16.222
5550	42.26	16.259
5670	42.28	16.262

802.11ac_VHT80_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	85.55	19.322
5290	82.00	19.138
5530	84.73	19.281
5610	84.98	19.293

802.11ac_VHT80_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	84.88	19.288
5290	84.52	19.270
5530	85.33	19.311
5610	85.65	19.327

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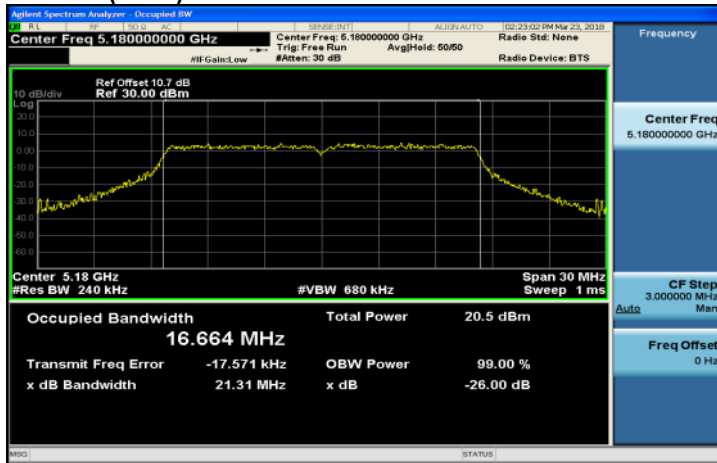
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f (886-2) 2298-0488

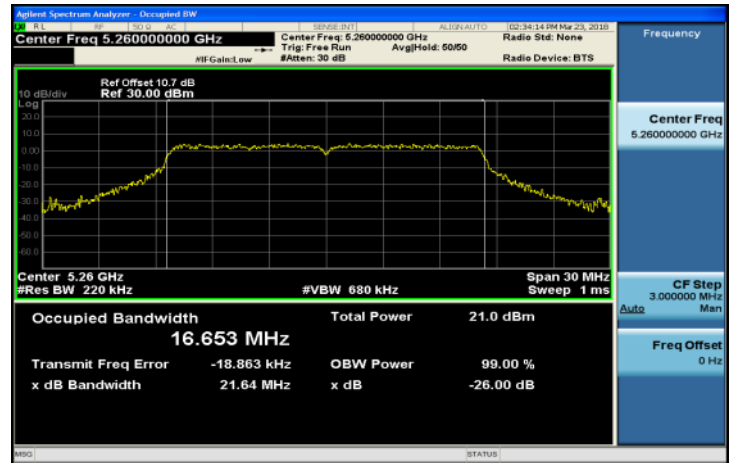
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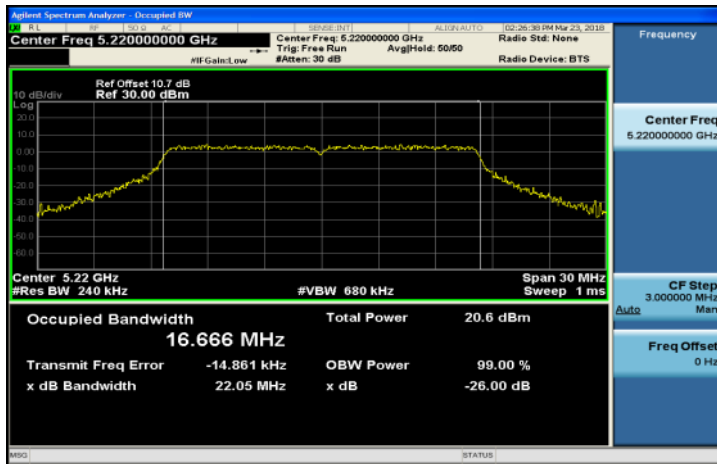
802.11a (Main) 5180MHz



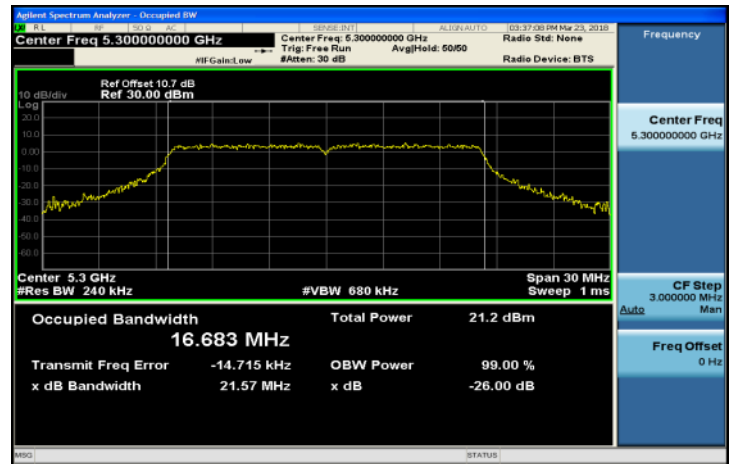
5260MHz



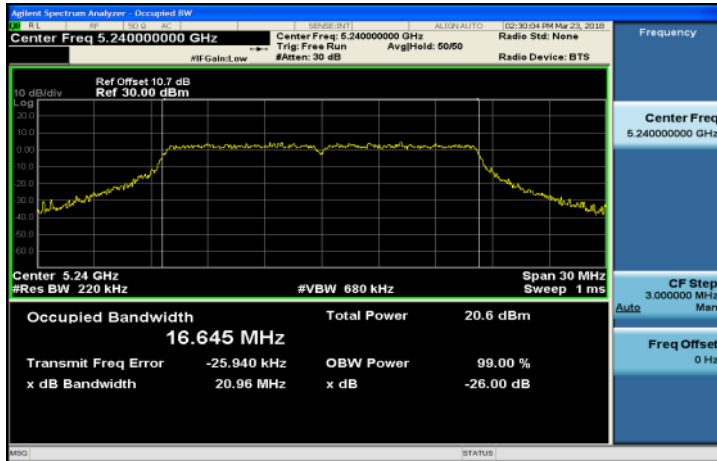
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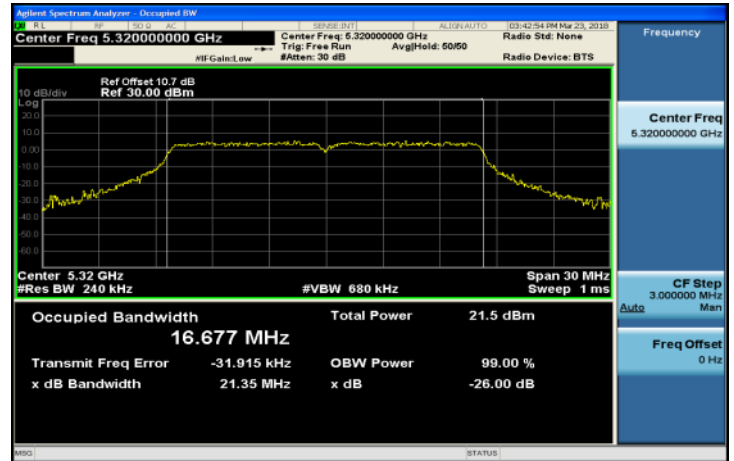
5300MHz



5240MHz



5320MHz

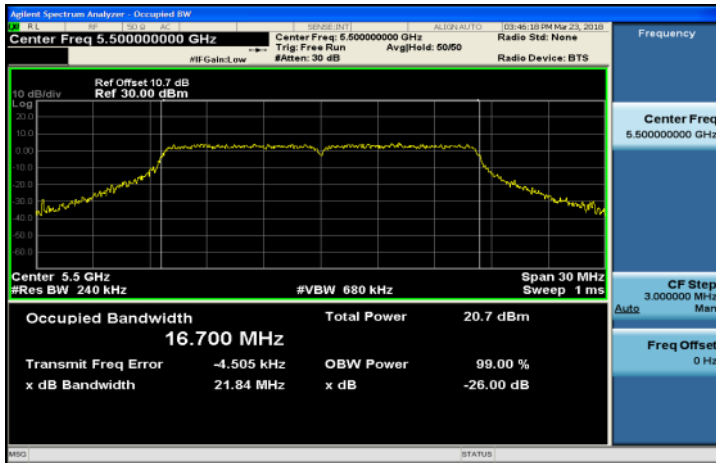


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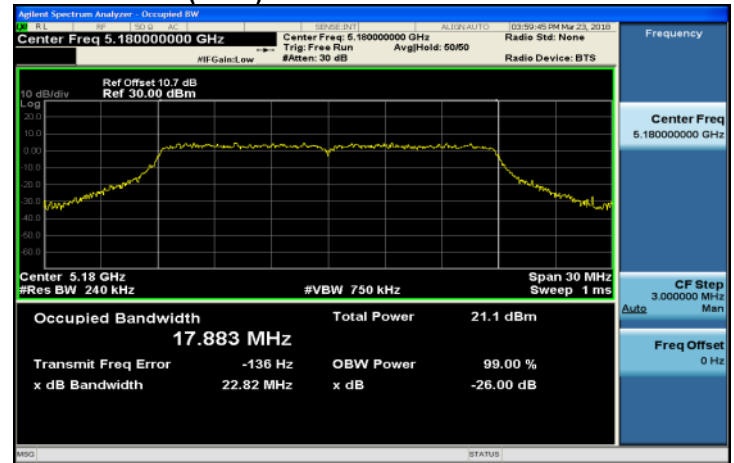
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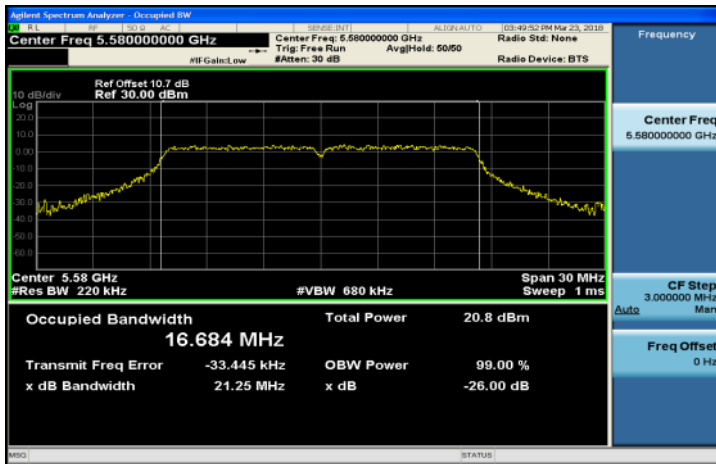
5500MHz



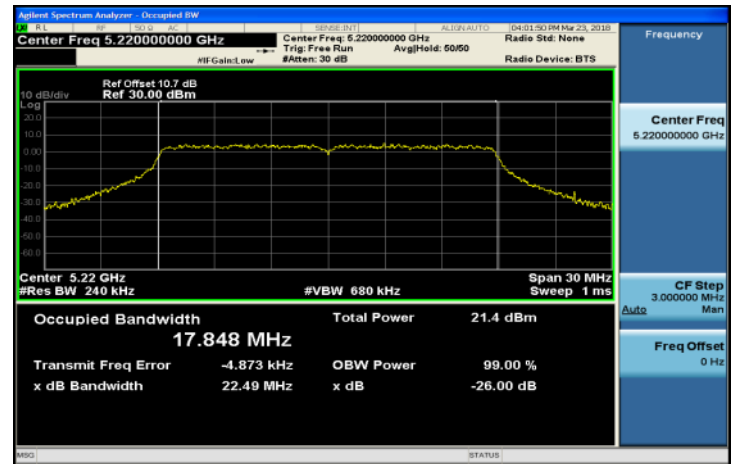
802.11n HT20 (Main) 5180 MHz



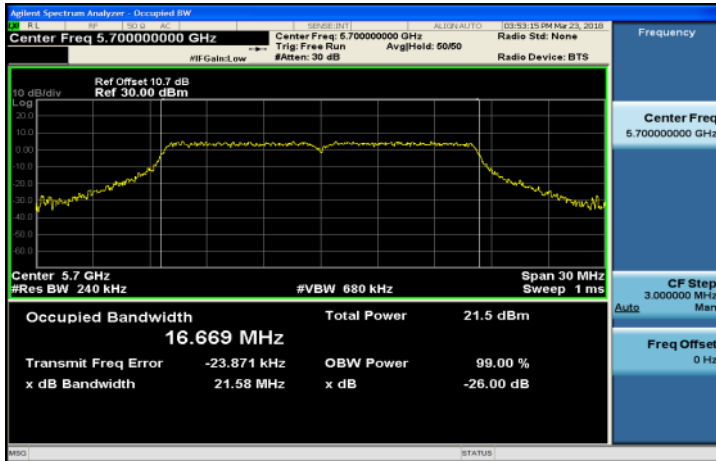
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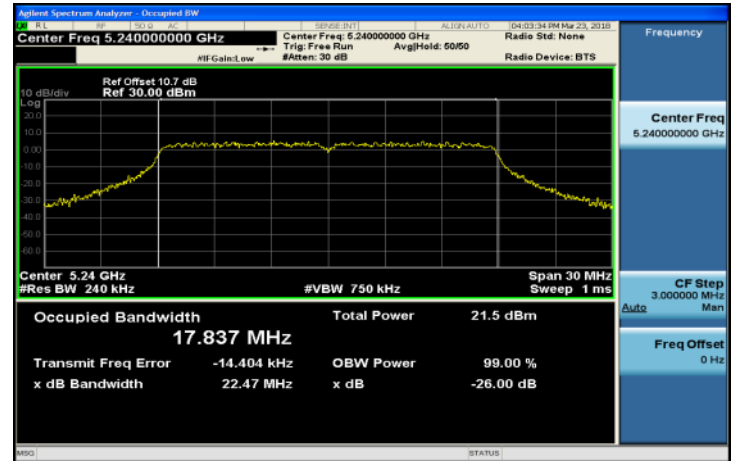
5220 MHz



5700MHz



5240 MHz

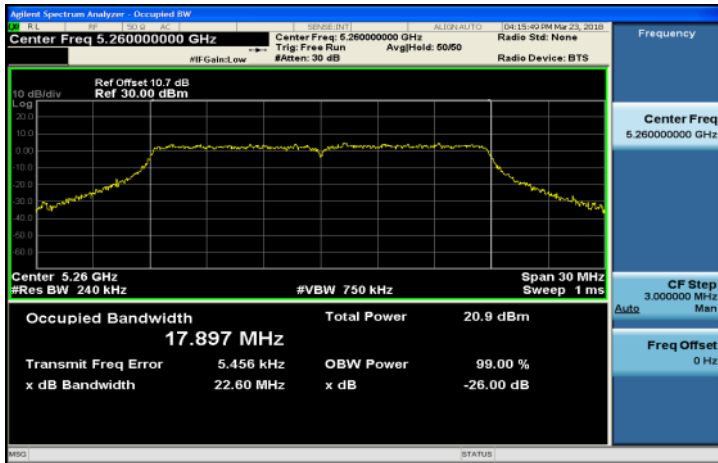


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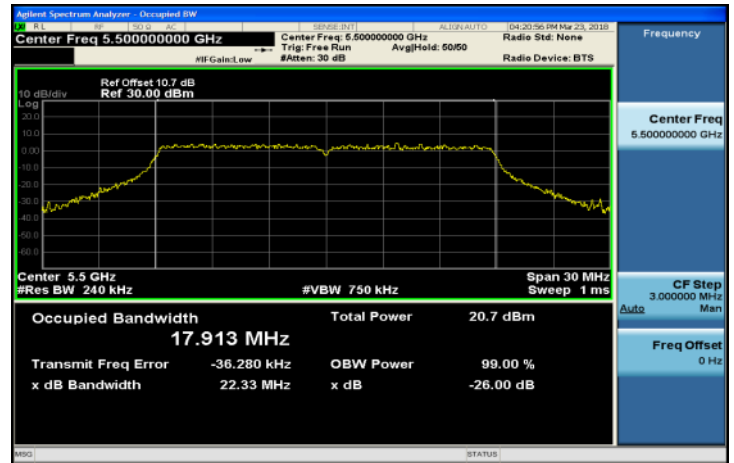
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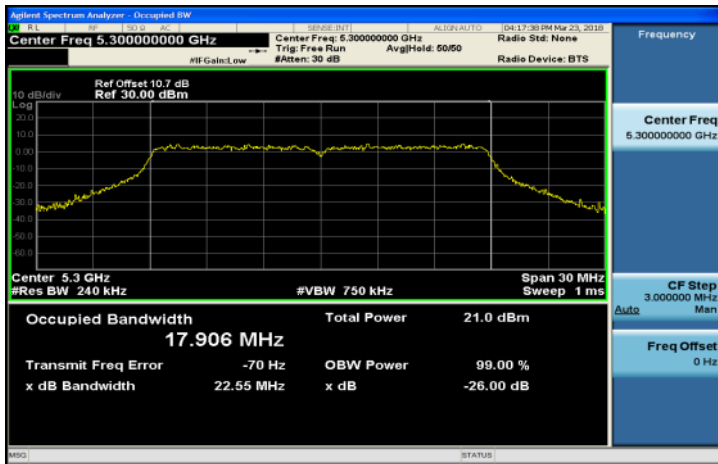
5260 MHz



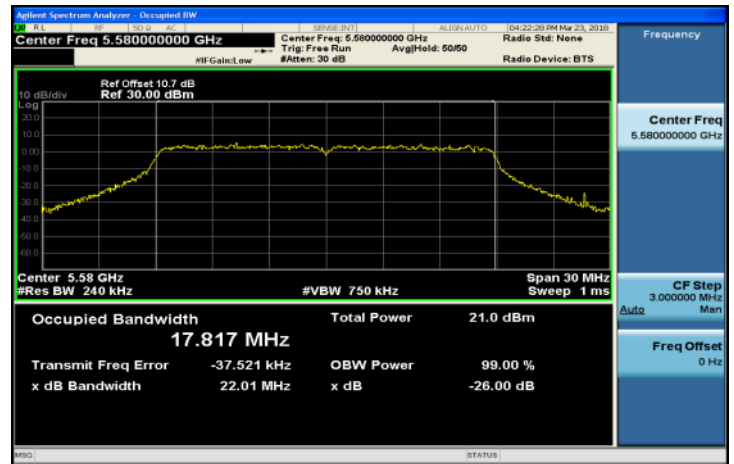
5500 MHz



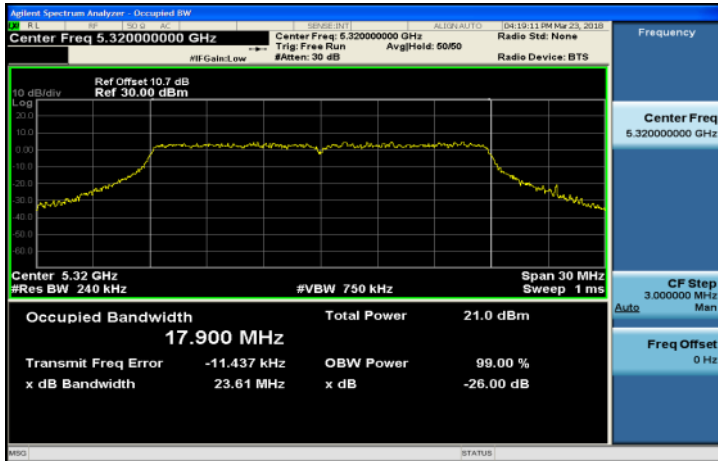
5300 MHz



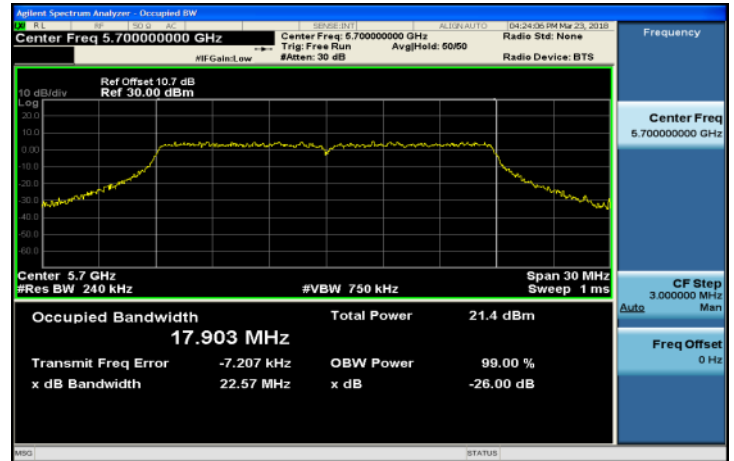
5580 MHz



5320 MHz



5700 MHz

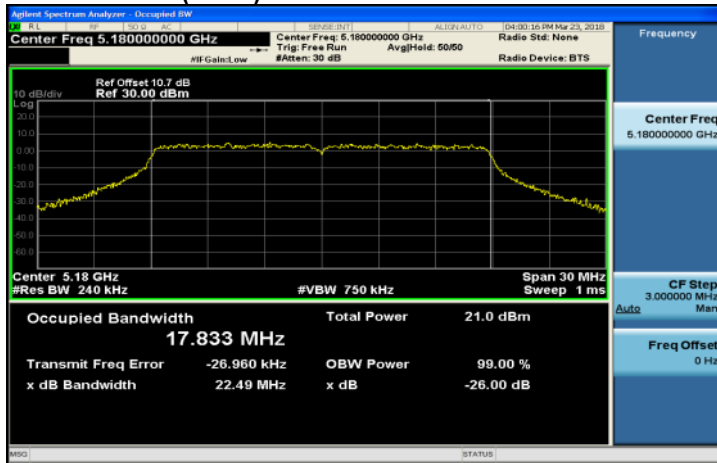


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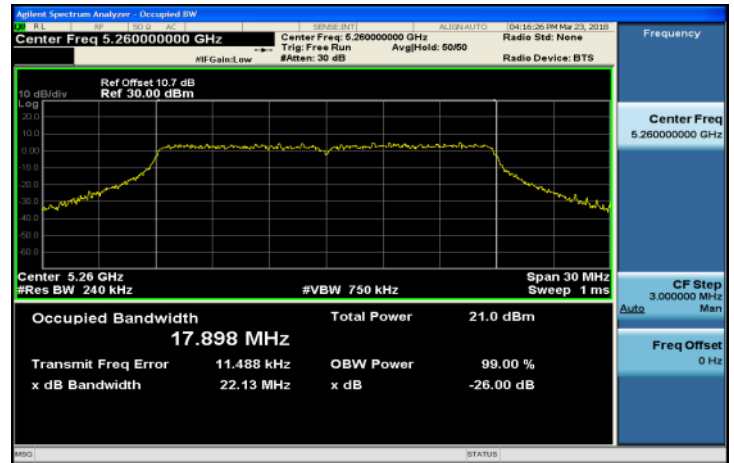
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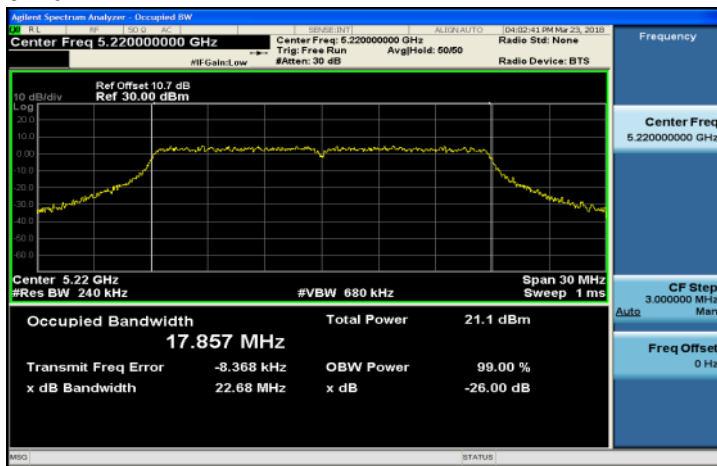
802.11n HT20 (Aux1) 5180 MHz



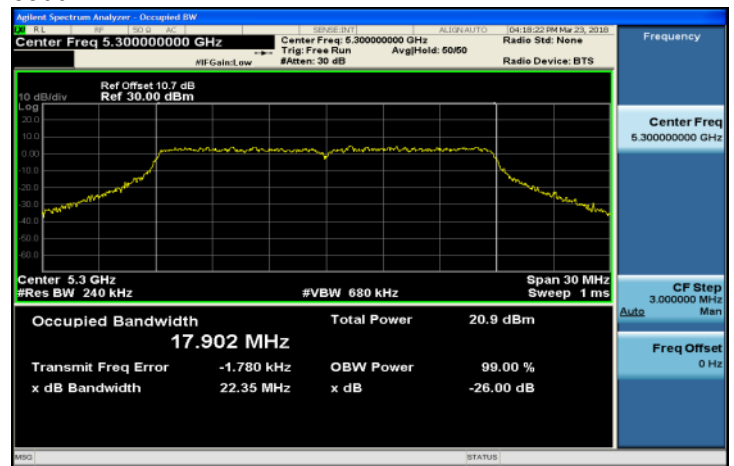
5260 MHz



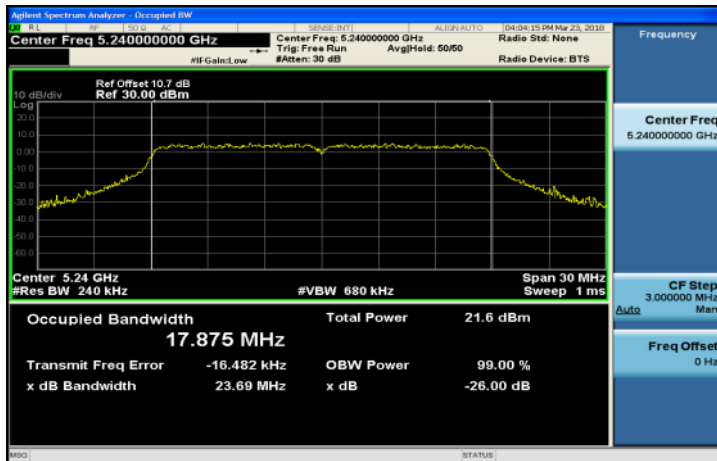
5220 MHz



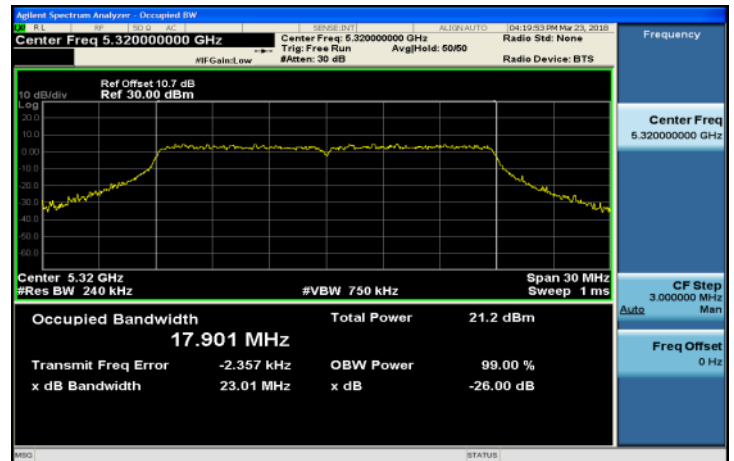
5300 MHz



5240 MHz



5320 MHz

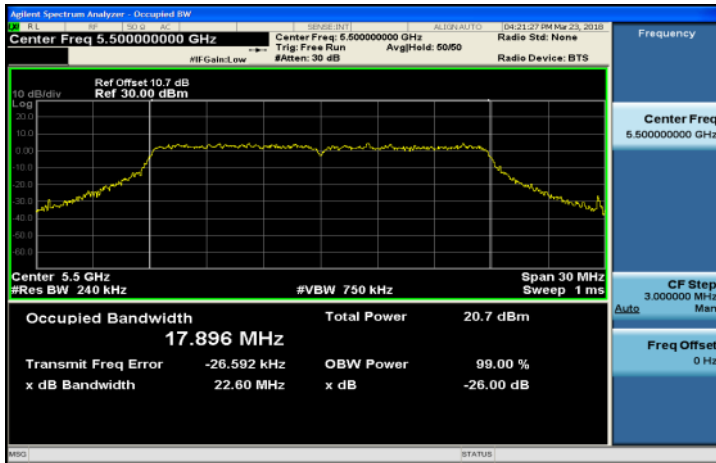


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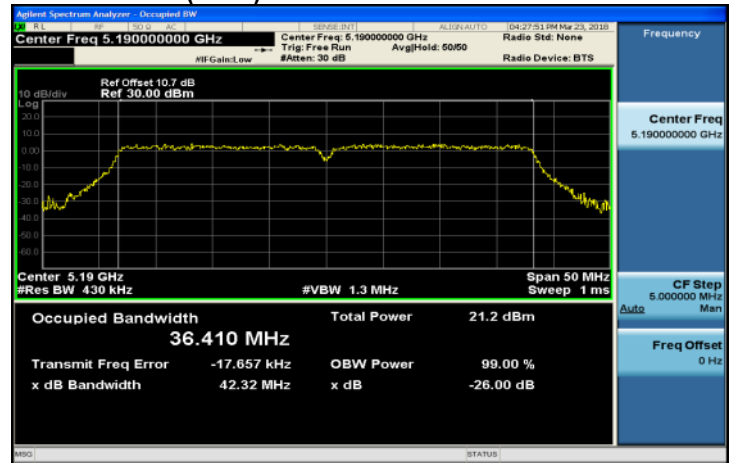
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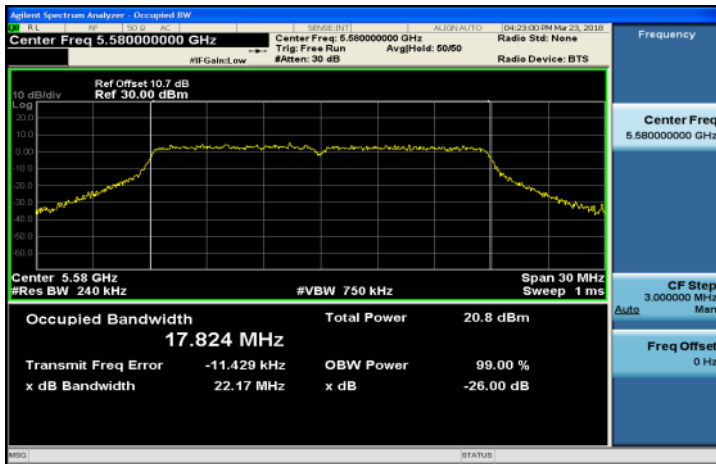
5500 MHz



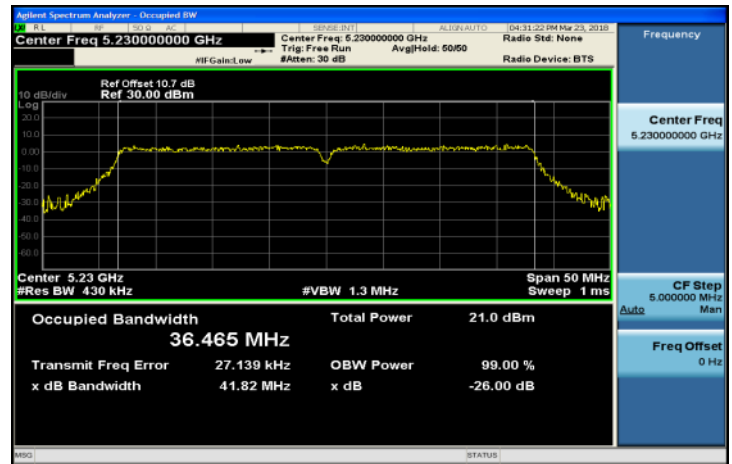
802.11n HT40 (Main) 5190 MHz



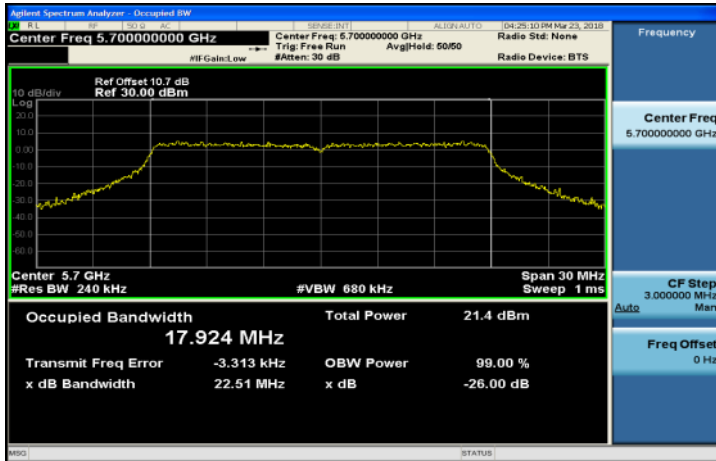
5580 MHz



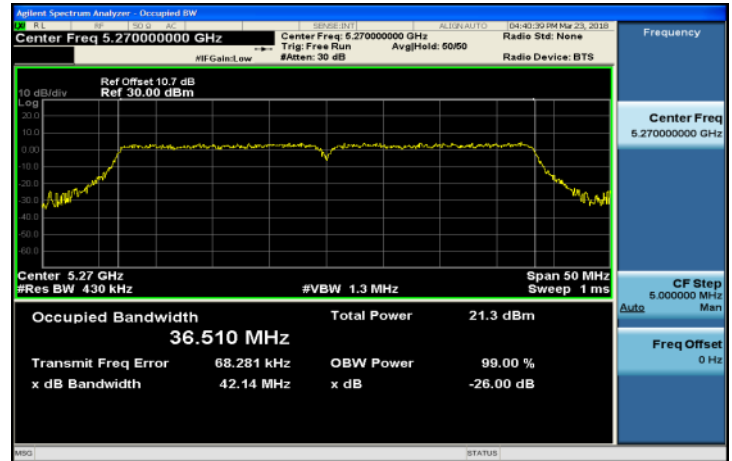
5230 MHz



5700 MHz



5270 MHz

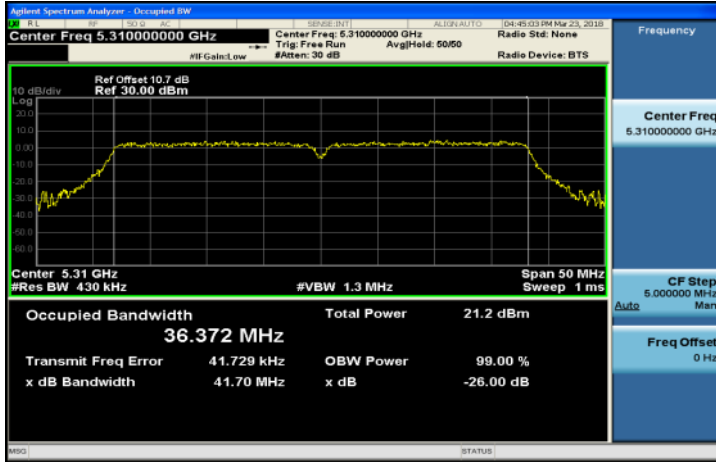


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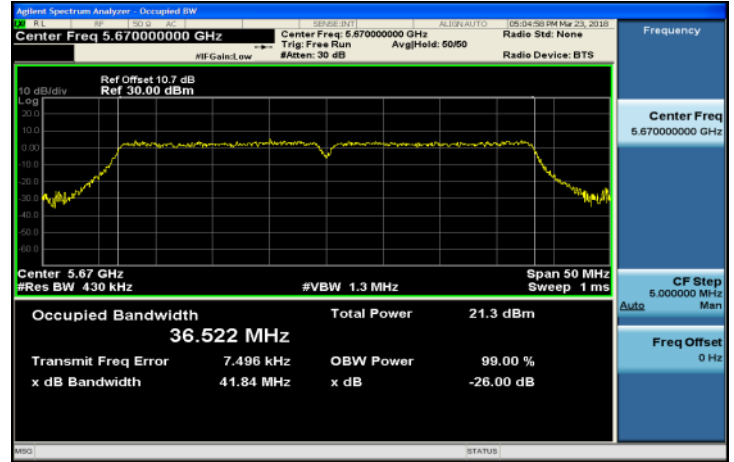
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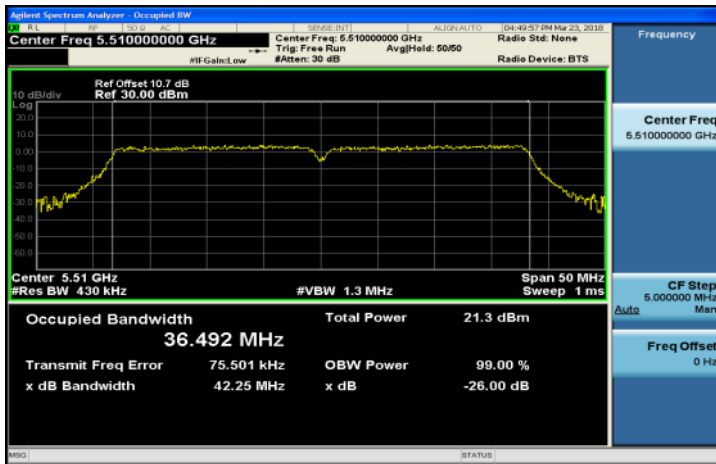
5310MHz



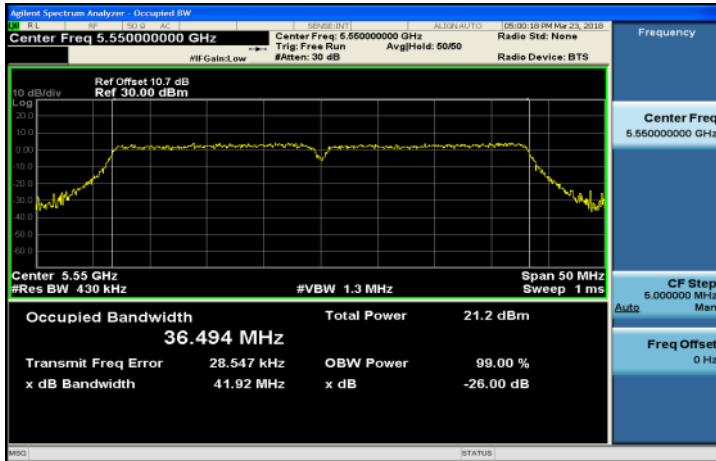
5670 MHz



5510 MHz



5550 MHz

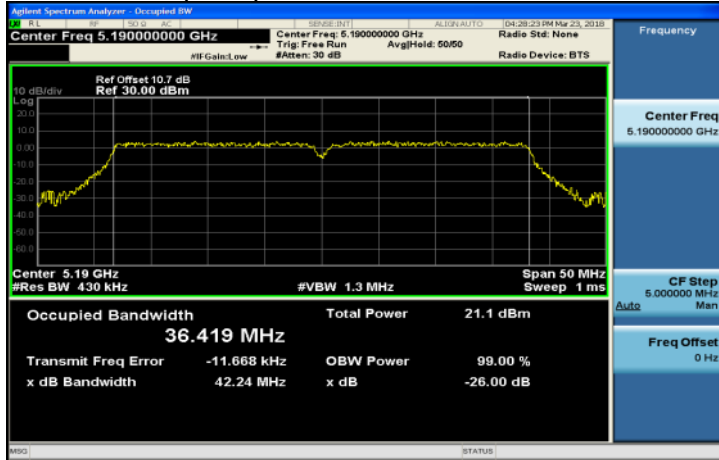


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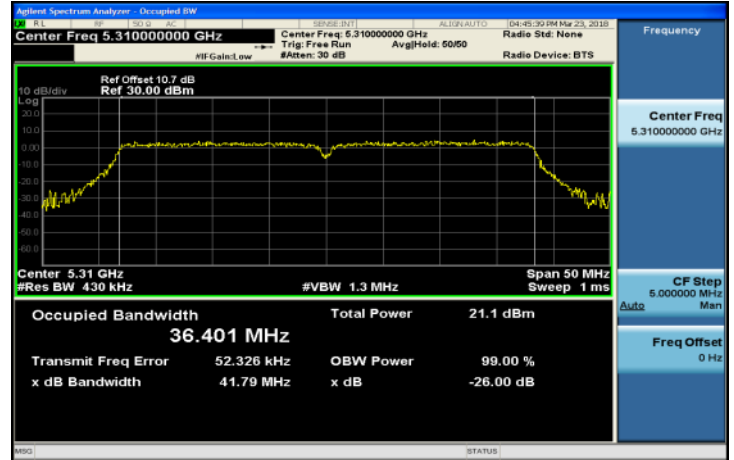
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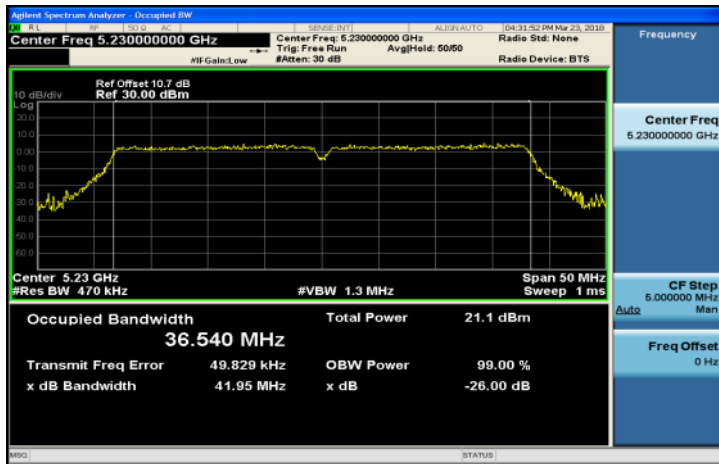
802.11n HT40 (Aux1) 5190 MHz



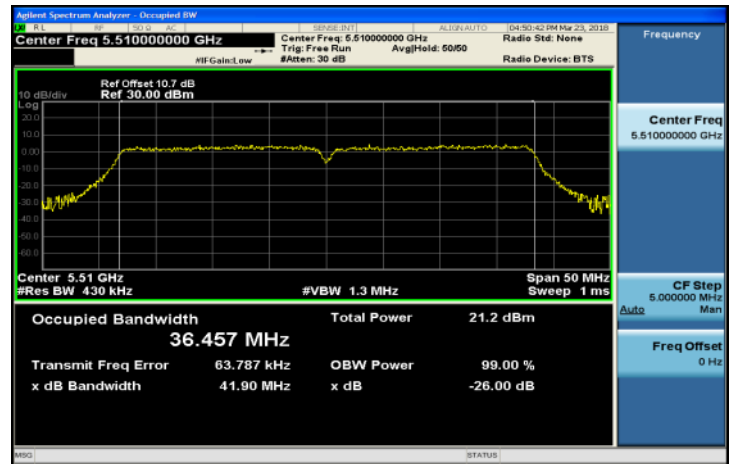
5310MHz



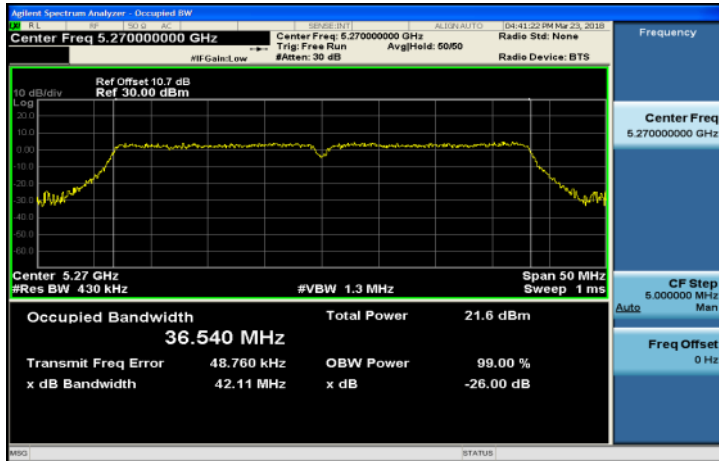
5230 MHz



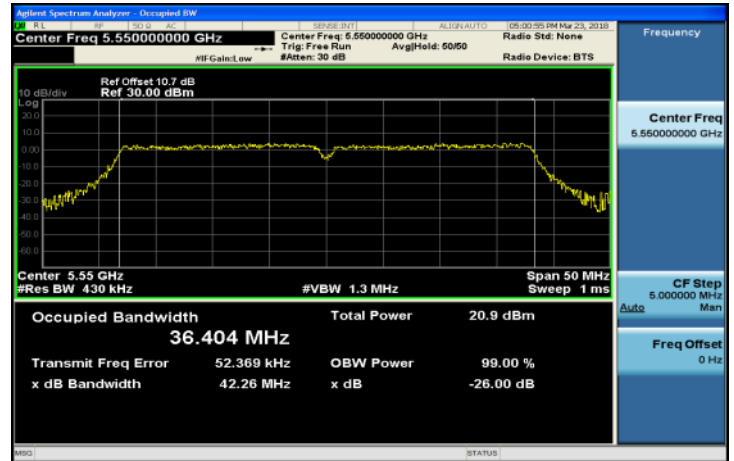
5510 MHz



5270 MHz



5550 MHz

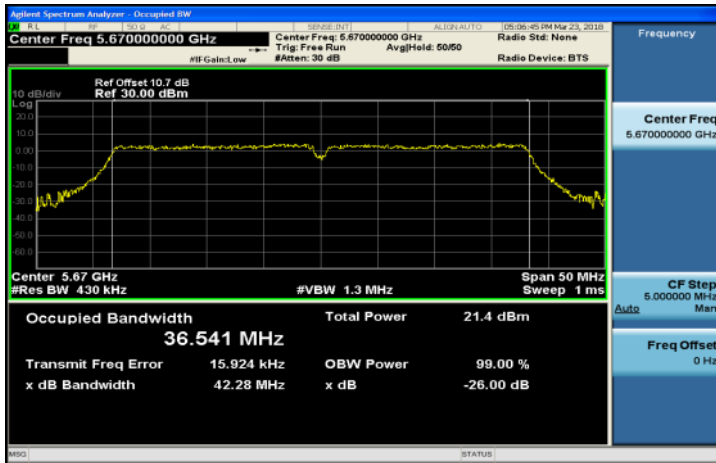


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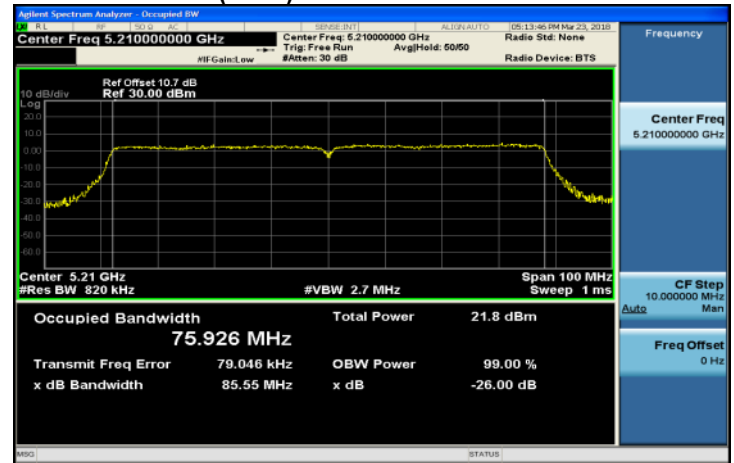
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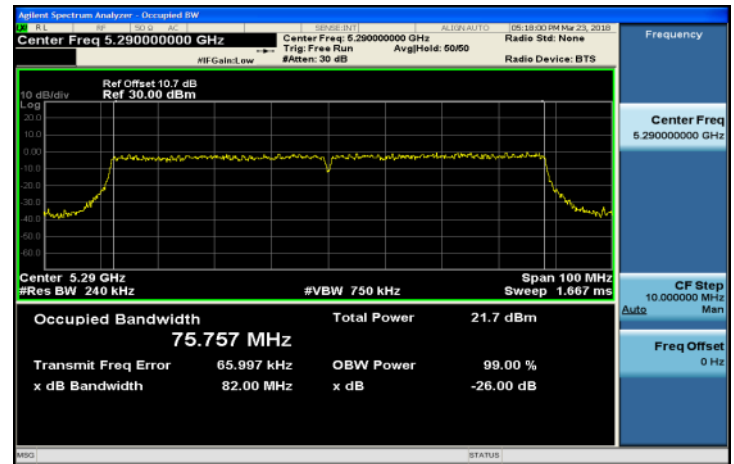
5670 MHz



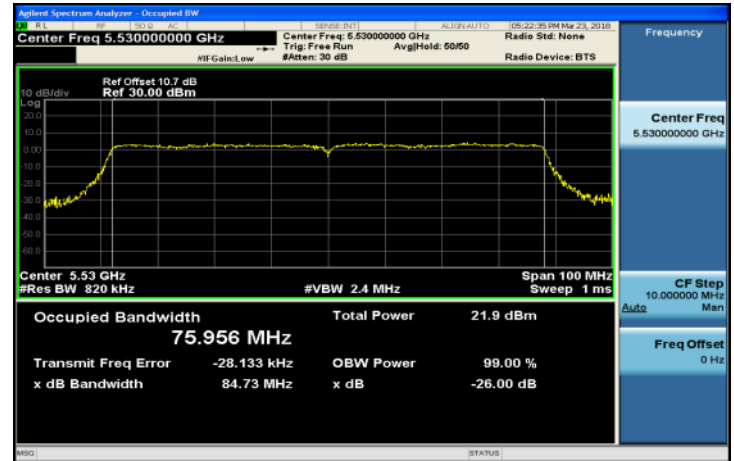
802.11ac VHT80 (Main) 5210 MHz



5290 MHz



5530 MHz

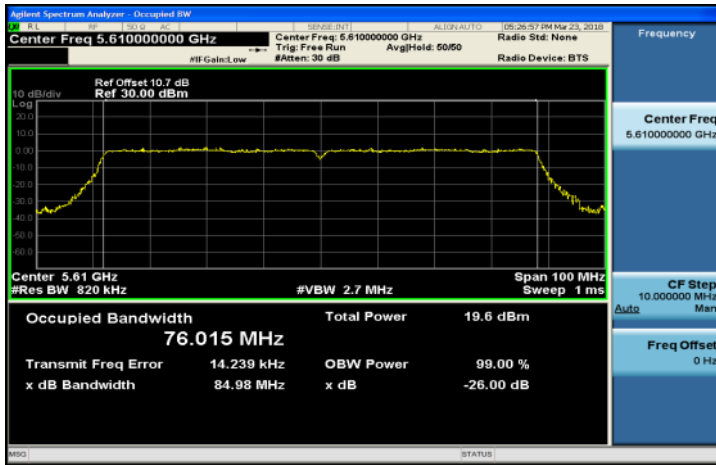


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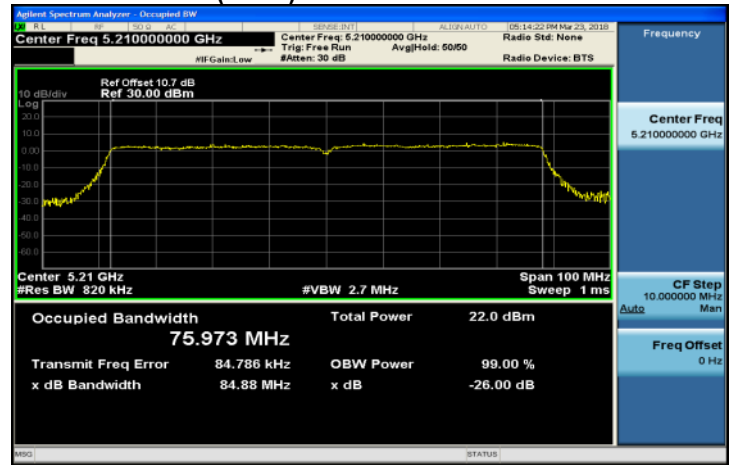
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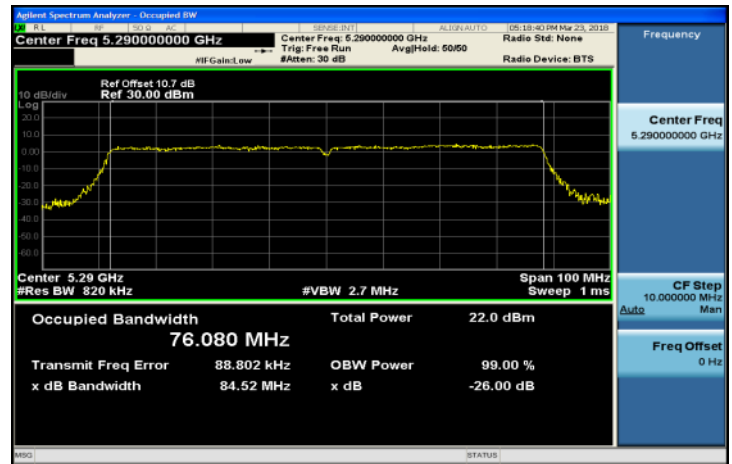
5610 MHz



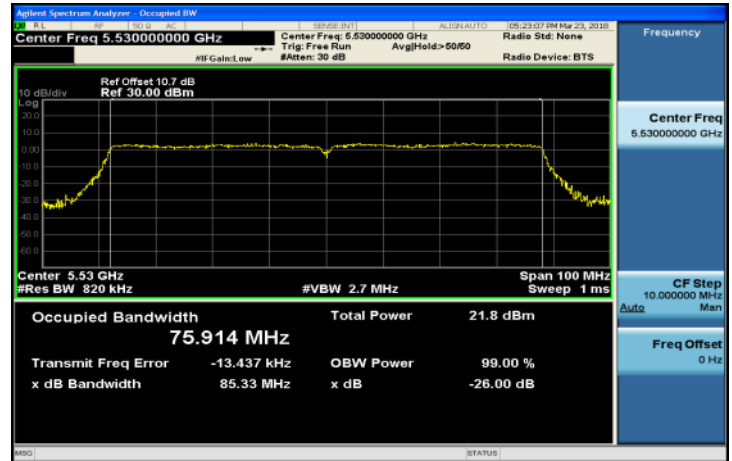
802.11ac VHT80 (Aux1) 5210 MHz



5290 MHz



5530 MHz

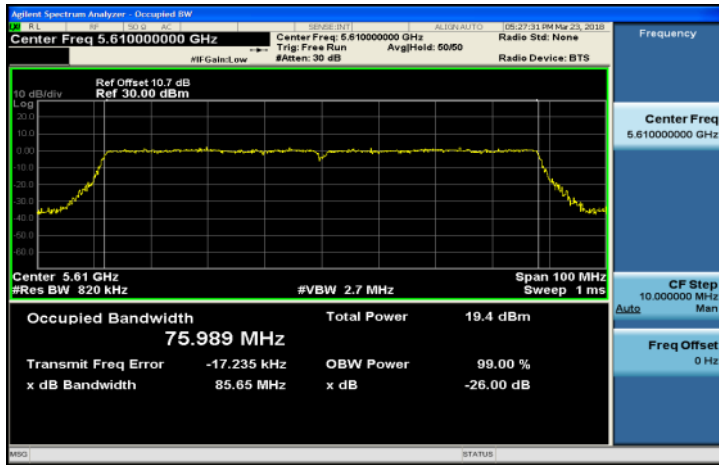


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5610 MHz



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9. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	1 Watt(30dBm)
		Fixed point-to-point Aceso Ponit	1 Watt(30dBm)
	√	Mobile and portable clinet device	250mW(23.98dBm)
U-NII-2A	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3			1 Watt(30dBm)

If transmitting antennas of directional gain greater than 6 dBi are used, both the transmit power and the power spectral density shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
UNII-1	$-3.6+3.01=-0.59\text{dBi}$	23.98dBm
UNII-2A	$-3.6+3.01=-0.59\text{dBi}$	23.98dBm
U-NII-2C	$-1.7+3.01=1.31\text{dBi}$	23.98dBm

Therefore the limit no needs to reduce for the UNII-1, U-NII-2A and U-NII-2C band.

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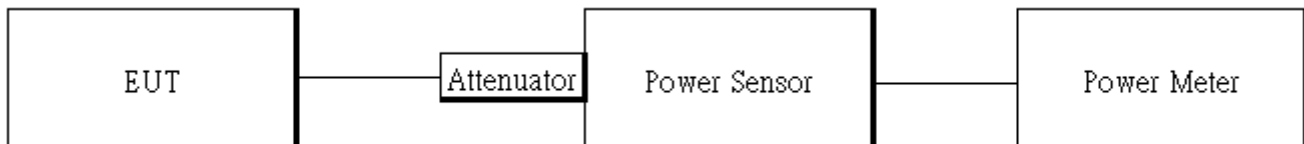
9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
Notebook	Lenovo	T440	P0000564	N/A	N/A

9.4 Test Set-up



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9.5 Measurement Result

Conducted output power

802.11a_Main

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	11.75	14.962	23.98	PASS
44	5220	6	14.65	29.176	23.98	PASS
48	5240	6	14.81	30.271	23.98	PASS
52	5260	6	14.75	29.855	23.98 or $11+10\log(B) = 24.35$	PASS
60	5300	6	14.64	29.109	23.98 or $11+10\log(B) = 24.34$	PASS
64	5320	6	11.51	14.158	23.98 or $11+10\log(B) = 24.29$	PASS
100	5500	6	11.59	14.421	23.98 or $11+10\log(B) = 24.39$	PASS
116	5580	6	14.72	29.650	23.98 or $11+10\log(B) = 24.27$	PASS
140	5700	6	11.80	15.136	23.98 or $11+10\log(B) = 24.34$	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	12.01	11.27	14.74	29.813	23.98	PASS
44	5220	MCS8	14.56	14.36	17.55	56.878	23.98	PASS
48	5240	MCS8	14.87	14.38	17.72	59.159	23.98	PASS
52	5260	MCS8	14.59	14.52	17.64	58.122	23.98 or $11+10\log(B) = 24.45$	PASS
60	5300	MCS8	14.48	14.42	17.54	56.734	23.98 or $11+10\log(B) = 24.49$	PASS
64	5320	MCS8	11.83	11.75	14.88	30.750	23.98 or $11+10\log(B) = 24.62$	PASS
100	5500	MCS8	12.07	11.61	14.93	31.149	23.98 or $11+10\log(B) = 24.49$	PASS
116	5580	MCS8	14.76	14.66	17.80	60.236	23.98 or $11+10\log(B) = 24.43$	PASS
140	5700	MCS8	11.94	11.85	14.98	31.503	23.98 or $11+10\log(B) = 24.52$	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	11.8	11.12	14.65	29.165	23.98	PASS
46	5230	MCS8	14.59	14.2	17.57	57.211	23.98	PASS
54	5270	MCS8	14.54	14.32	17.61	57.634	23.98 or $11+10\log(B) = 27.24$	PASS
62	5310	MCS8	11.67	11.58	14.80	30.204	23.98 or $11+10\log(B) = 27.20$	PASS
102	5510	MCS8	11.89	11.64	14.94	31.205	23.98 or $11+10\log(B) = 27.22$	PASS
110	5550	MCS8	14.64	14.59	17.79	60.124	23.98 or $11+10\log(B) = 27.22$	PASS
134	5670	MCS8	11.86	11.77	14.99	31.555	23.98 or $11+10\log(B) = 27.22$	PASS

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802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)			RESULT
			CH 0	CH 1						
42	5210	MCS8	11.77	10.94	14.72	29.661	23.98			PASS
58	5290	MCS8	11.25	11.14	14.54	28.460	23.98	or $11+10\log(B) =$	30.14	PASS
106	5530	MCS8	11.51	11.30	14.75	29.876	23.98	or $11+10\log(B) =$	30.28	PASS
122	5610	MCS8	14.67	14.59	17.98	62.765	23.98	or $11+10\log(B) =$	30.29	PASS

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10. POWER SPECTRAL DENSITY

10.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	17dBm/ MHz
		Fixed point-to-point Acess Ponit	
	√	Mobile and portable clinet device	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3			30dBm/ 500kHz

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

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
UNII-1	-3.6+3.01=-0.59dBi	11dBm
UNII-2A	-3.6+3.01=-0.59dBi	11dBm
U-NII-2C	-1.7+3.01=1.31dBi	11dBm

Therefore the limit needs to reduce for the UNII-1, U-NII-2A and U-NII-2C band.

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10.2 Measurement Procedure

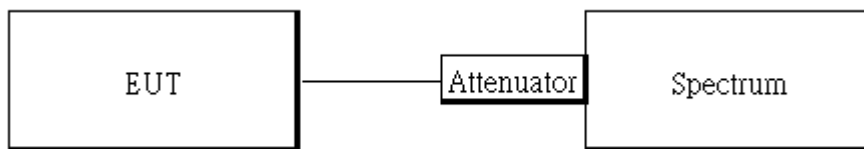
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band:**
Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. Use the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome.

10.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY54200716	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
Notebook	Lenovo	T440	P0000564	N/A	N/A

10.4 Test Set-up



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10.5 Measurement Result

POWER DENSITY 802.11a MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	1.23	0.07	1.30	11	-9.70
5220	1.69	0.07	1.76	11	-9.24
5240	1.09	0.07	1.16	11	-9.84
5260	2.57	0.07	2.64	11	-8.36
5300	1.85	0.07	1.92	11	-9.08
5320	1.96	0.07	2.03	11	-8.97
5500	1.45	0.07	1.52	11	-9.48
5580	1.27	0.07	1.34	11	-9.66
5700	2.11	0.07	2.18	11	-8.82
5745		0.07	0.00	30	-30.00
5785		0.07	0.00	30	-30.00
5825		0.07	0.00	30	-30.00

POWER DENSITY 802.11n HT20 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	4.37	0.09	4.46	11	-6.54
5220	4.54	0.09	4.63	11	-6.37
5240	4.50	0.09	4.59	11	-6.41
5260	4.14	0.09	4.23	11	-6.77
5300	3.86	0.09	3.95	11	-7.05
5320	4.77	0.09	4.86	11	-6.14
5500	4.10	0.09	4.19	11	-6.81
5580	4.38	0.09	4.47	11	-6.53
5700	4.75	0.09	4.84	11	-6.16
5745		0.09	0.00	30	-30.00
5785		0.09	0.00	30	-30.00
5825		0.09	0.00	30	-30.00

POWER DENSITY 802.11n HT40 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5190	0.8	0.16	0.96	11	-10.04
5230	0.81	0.16	0.97	11	-10.03
5270	1.8	0.16	1.96	11	-9.04
5310	1.27	0.16	1.43	11	-9.57
5510	0.89	0.16	1.05	11	-9.95
5550	0.39	0.16	0.55	11	-10.45
5670	0.91	0.16	1.07	11	-9.93
5755		0.16	0.00	30	-30.00
5795		0.16	0.00	30	-30.00

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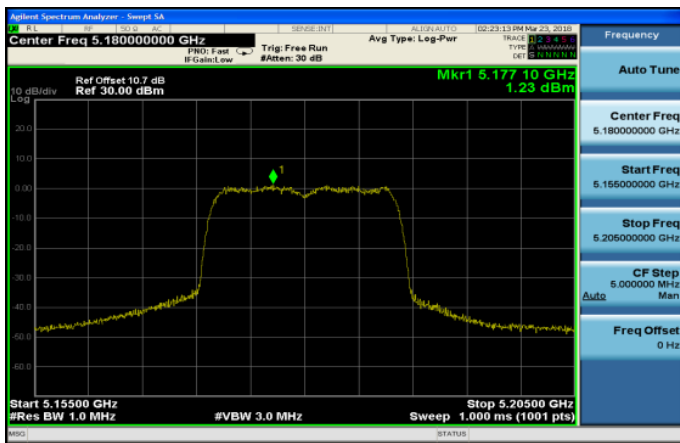
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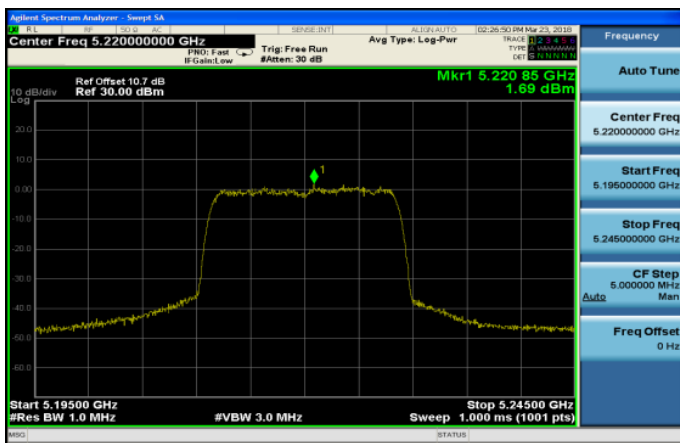
POWER DENSITY 802.11ac VHT80 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5210	-2.52	0.33	-2.19	11	-13.19
5290	-2.77	0.33	-2.44	11	-13.44
5530	-2.53	0.33	-2.20	11	-13.20
5610	-5.23	0.33	-4.90	11	-15.90
5775		0.33	0.00	30	-30.00

802.11a 5150~5250 MHz

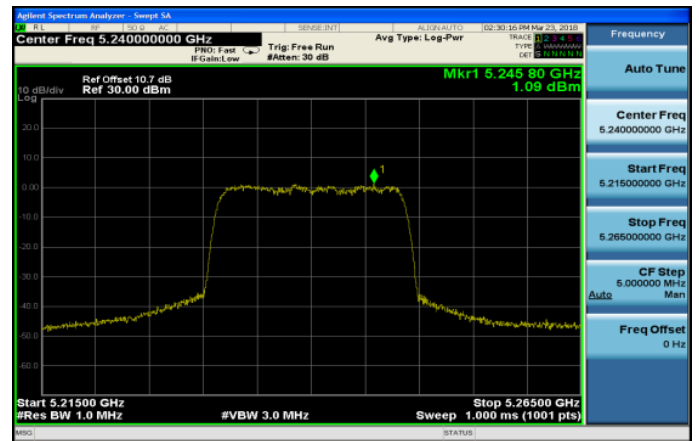
Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

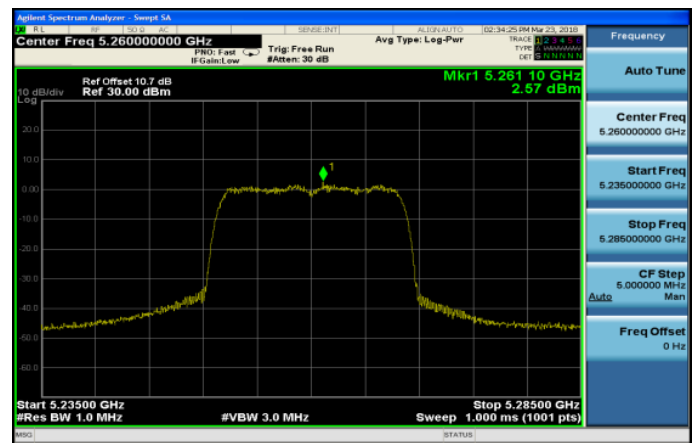


Peak Power Spectral Density Data Plot (CH High 5240 MHz)



802.11a 5250~5350 MHz

Peak Power Spectral Density Data Plot (CH Low 5260 MHz)

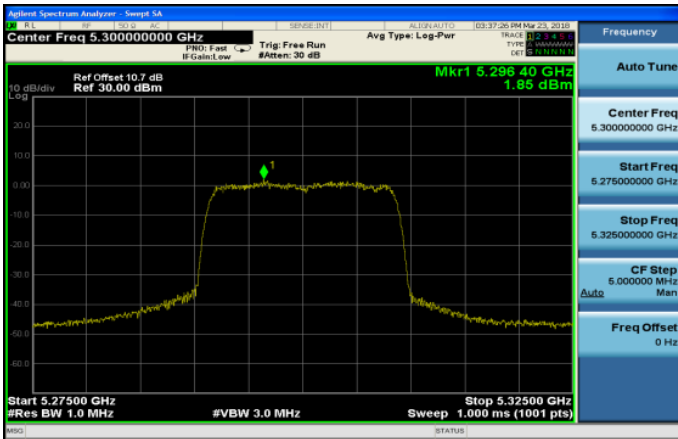


Peak Power Spectral Density Data Plot (CH Mid 5300 MHz)

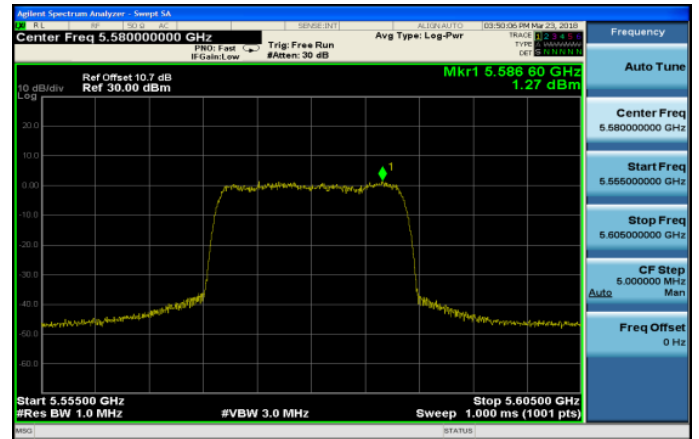
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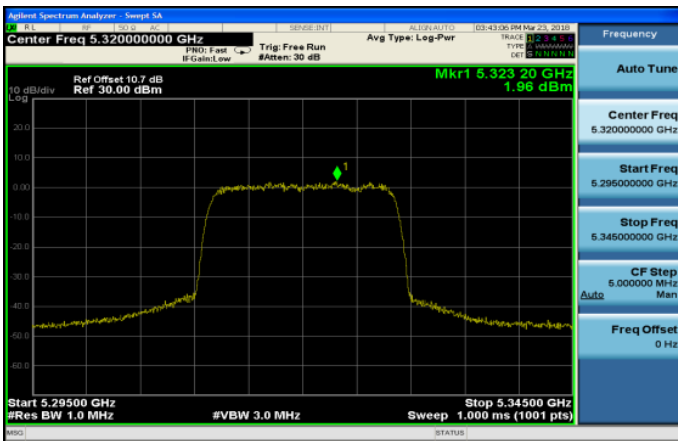
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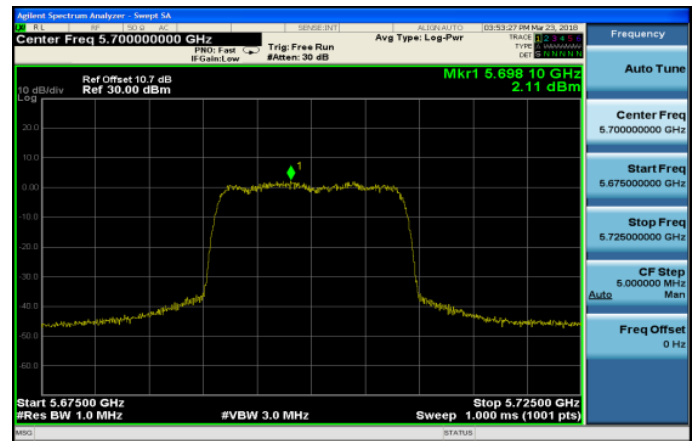
Peak Power Spectral Density Data Plot (CH High 5320 MHz)



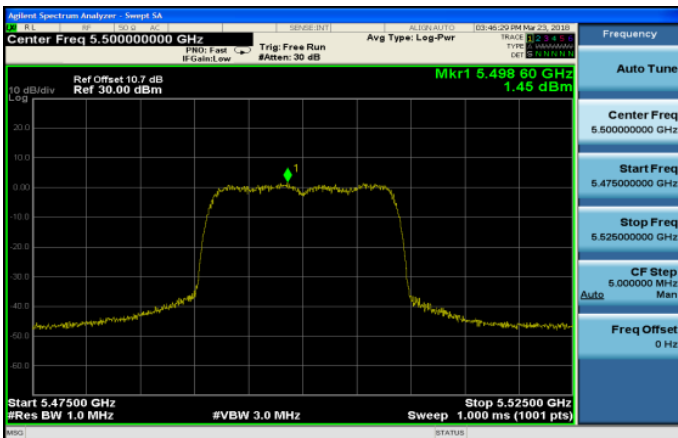
Peak Power Spectral Density Data Plot (CH High 5700 MHz)



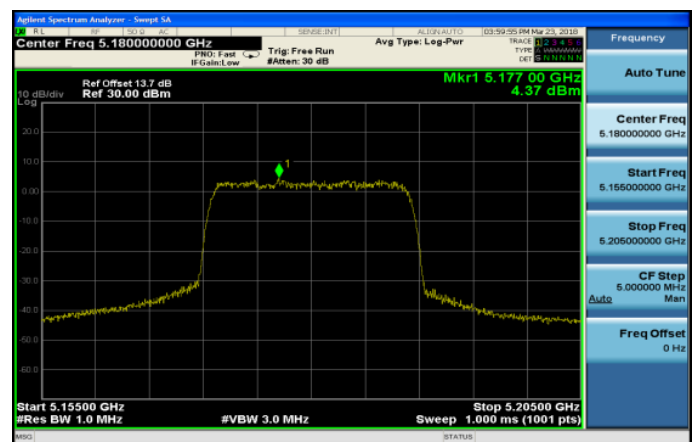
802.11a 5470~5725 MHz
Peak Power Spectral Density Data Plot (CH Low 5500 MHz)



802.11n HT20, 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



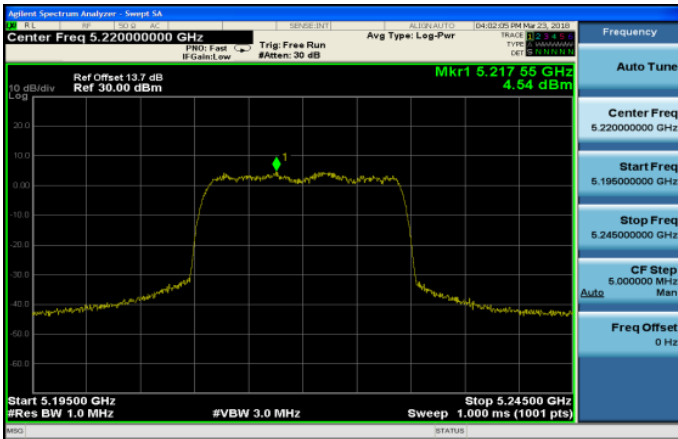
Peak Power Spectral Density Data Plot (CH Mid 5580 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

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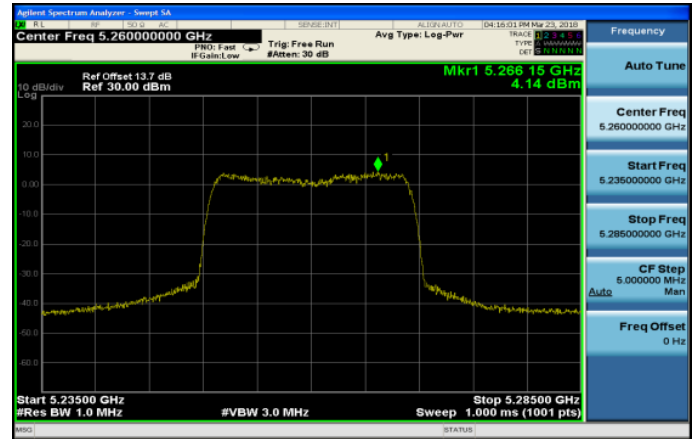


Peak Power Spectral Density Data Plot (CH High 5240 MHz)

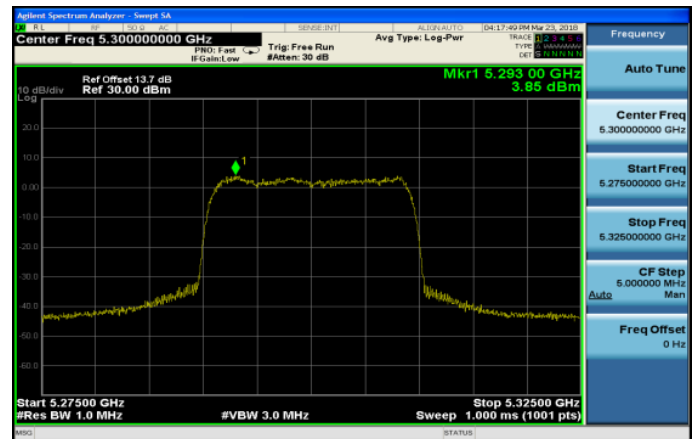


802.11n HT20, 5250~5350 MHz

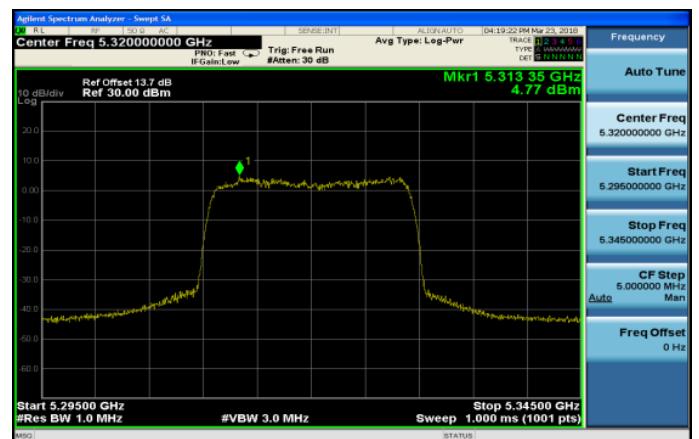
Peak Power Spectral Density Data Plot (CH Low 5260MHz)



Peak Power Spectral Density Data Plot (CH Mid 5300 MHz)



Peak Power Spectral Density Data Plot (CH High 5320 MHz)



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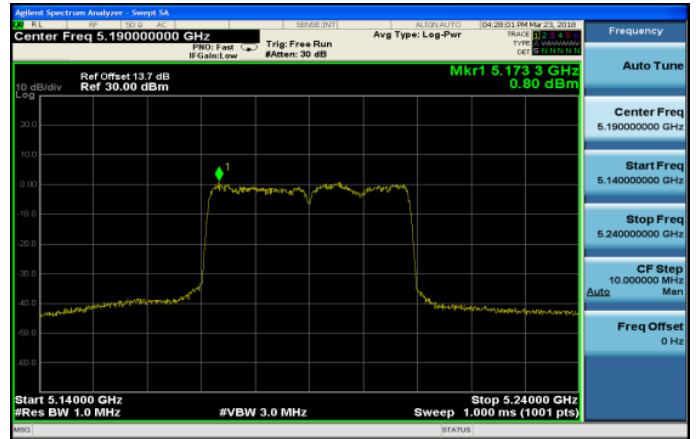
802.11n HT20, 5470~5725 MHz

Peak Power Spectral Density Data Plot (CH Low 5500 MHz)

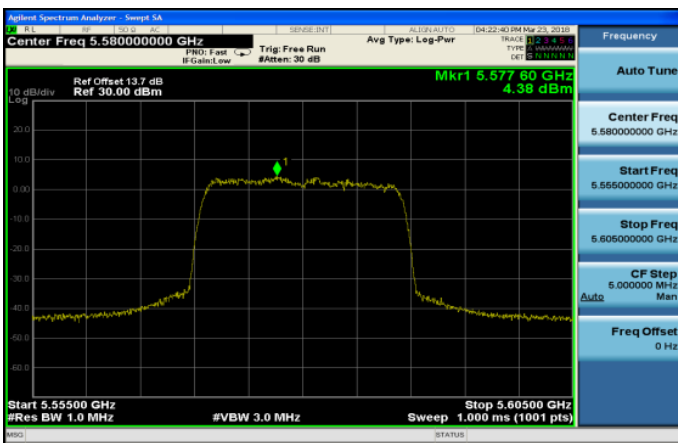


802.11n HT40, 5150~5250 MHz

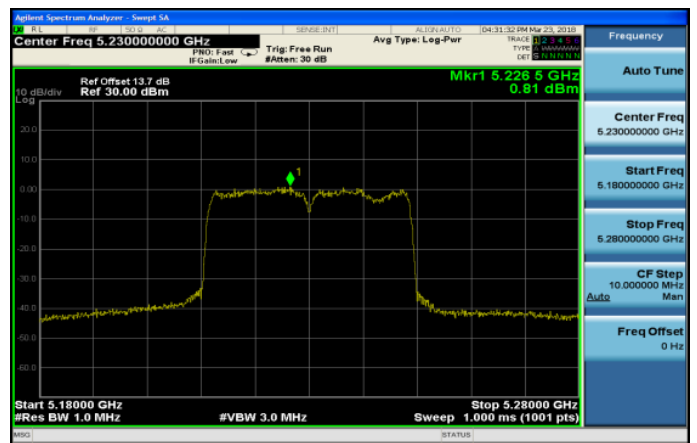
Peak Power Spectral Density Data Plot (CH Low 5190 MHz)



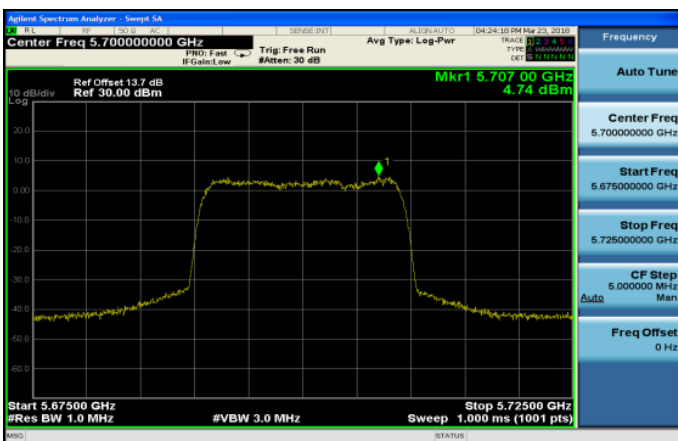
Peak Power Spectral Density Data Plot (CH Mid 5580MHz)



Peak Power Spectral Density Data Plot (CH High 5230 MHz)



Peak Power Spectral Density Data Plot (CH High 5700 MHz)



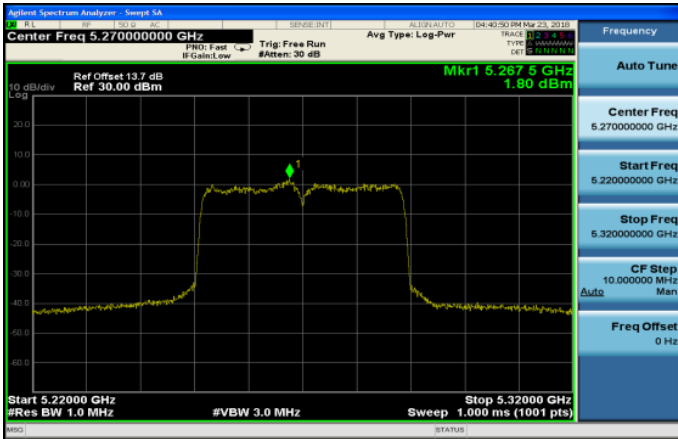
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802.11n HT40, 5250~5350 MHz

Peak Power Spectral Density Data Plot (CH Low 5270 MHz)

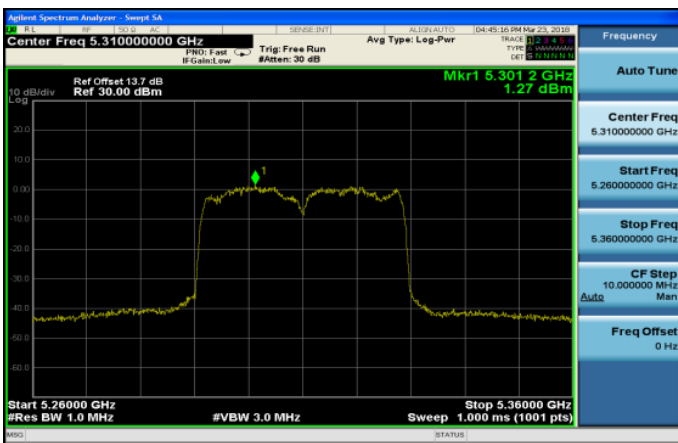


802.11n HT40, 5470~5725 MHz

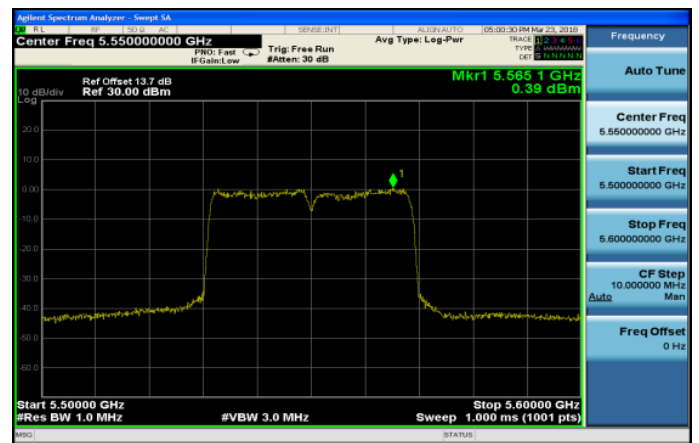
Peak Power Spectral Density Data Plot (CH Low 5510 MHz)



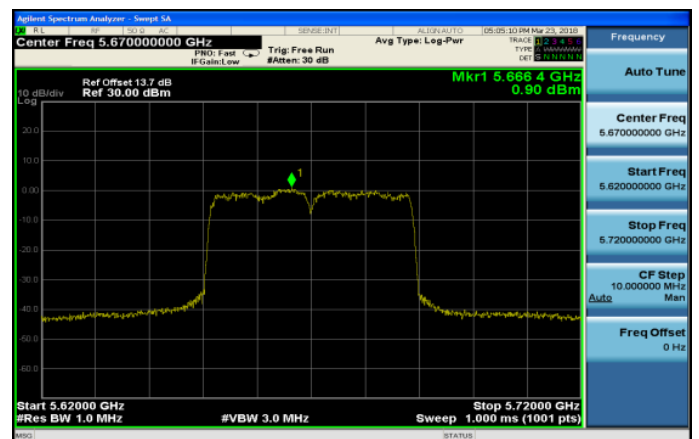
Peak Power Spectral Density Data Plot (CH High 5310 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5550 MHz)



Peak Power Spectral Density Data Plot (CH High 5670 MHz)



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802.11ac VHT80, 5150~5250 MHz

Peak Power Spectral Density Data Plot (CH Mid 5210 MHz)



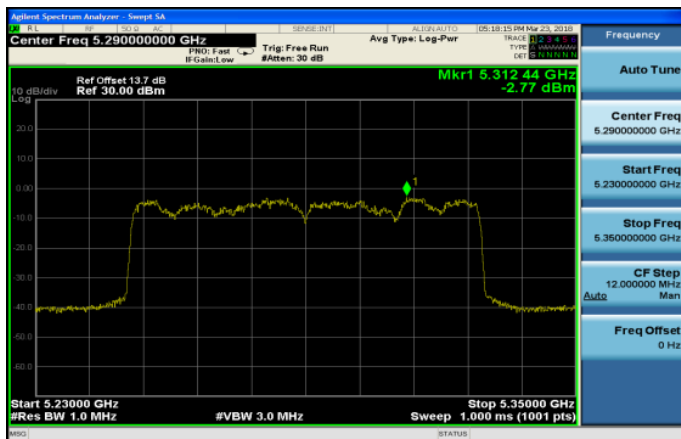
802.11ac VHT80, 5470~5725 MHz

Peak Power Spectral Density Data Plot (CH Low 5530 MHz)



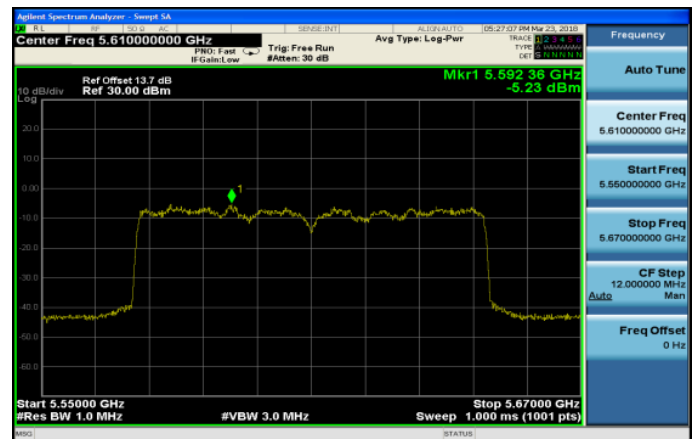
802.11ac VHT80, 5250~5350 MHz

Peak Power Spectral Density Data Plot (CH Mid 5290 MHz)



802.11ac VHT80, 5470~5725 MHz

Peak Power Spectral Density Data Plot (CH High 5610 MHz)



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11. UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

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 5.725-5.85 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.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBµV/m)	AV 54 (dBµV/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBµV/m)
15.407(b)(2)		
15.407(b)(3)		
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
<p>*1 beyond 75 MHz or more above of the bandedge. *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.</p>		

$EIRP = (E \cdot d)^2 / 30$, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	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 (dBµV/m) = 20 log Emission level (dBµV/m)

11.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2017/08/04	2018/08/03
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
Spectrum Analyzer	Agilent	E4446A	MY51100003	2017/05/10	2018/05/09
EMI Test Receiver	R&S	ESCI7	100760	2017/06/06	2018/06/05
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	2018/01/02	2019/01/01
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01
Notebook	Lenovo	T440	P0000564	N/A	N/A

Note: N.C.R refers to Not Calibrated Required.

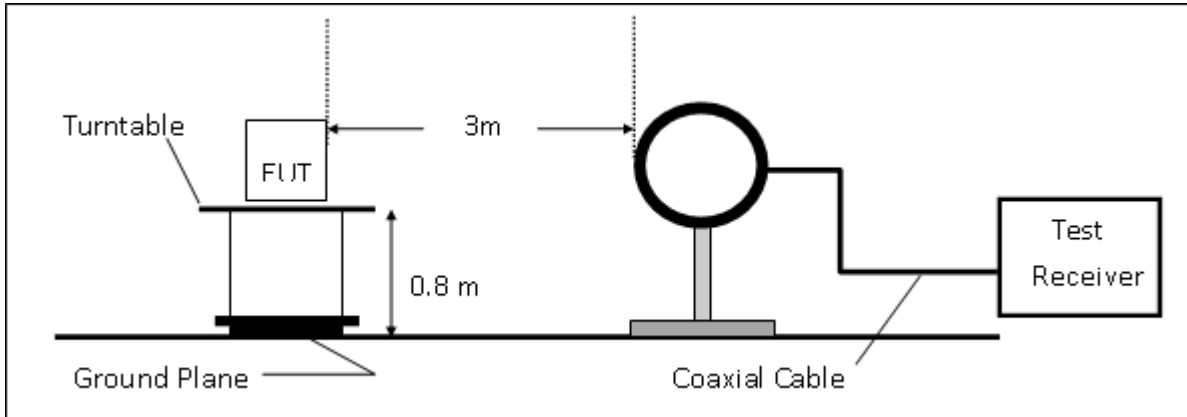
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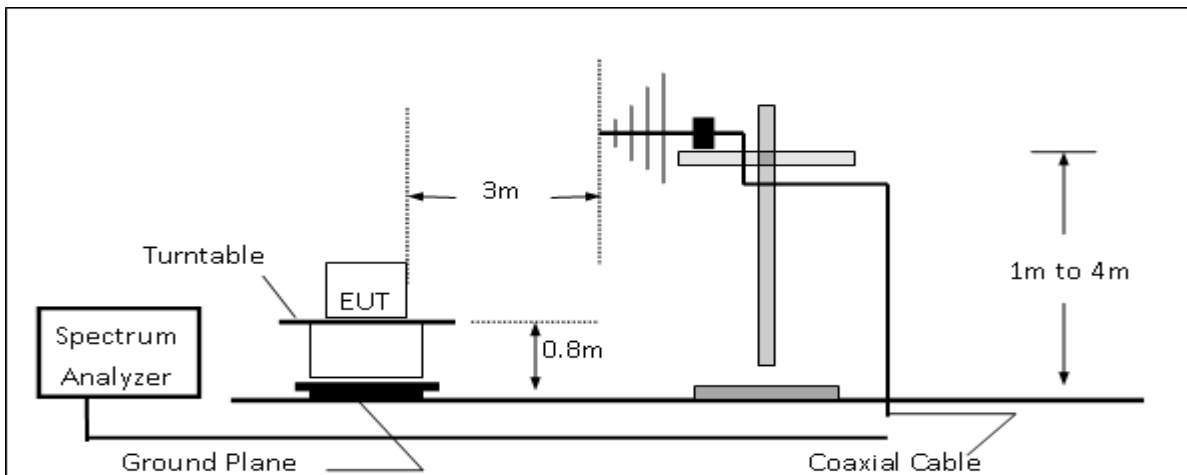
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11.3 Test SET-UP

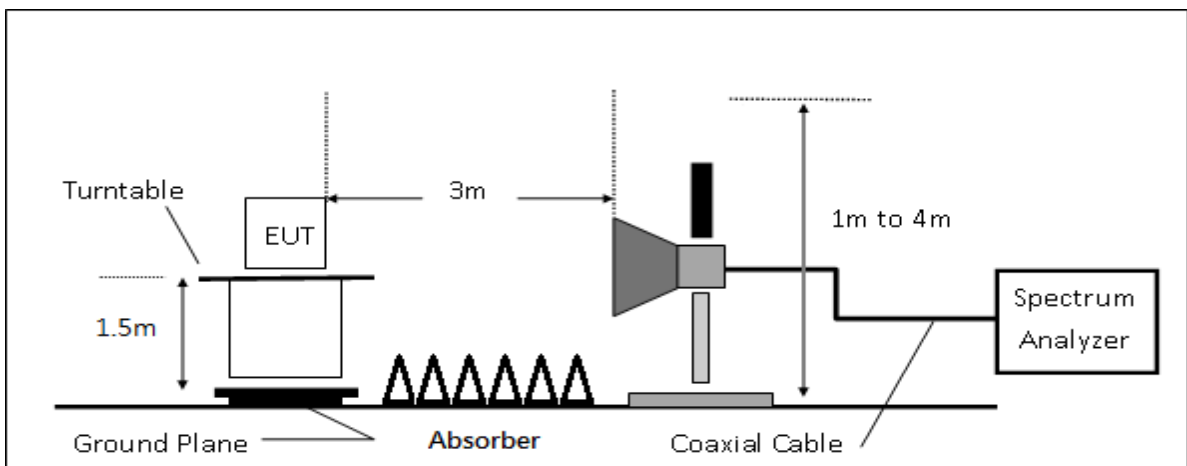
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
4. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency measured were complete.

11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Refer to next page for tabular data sheets.

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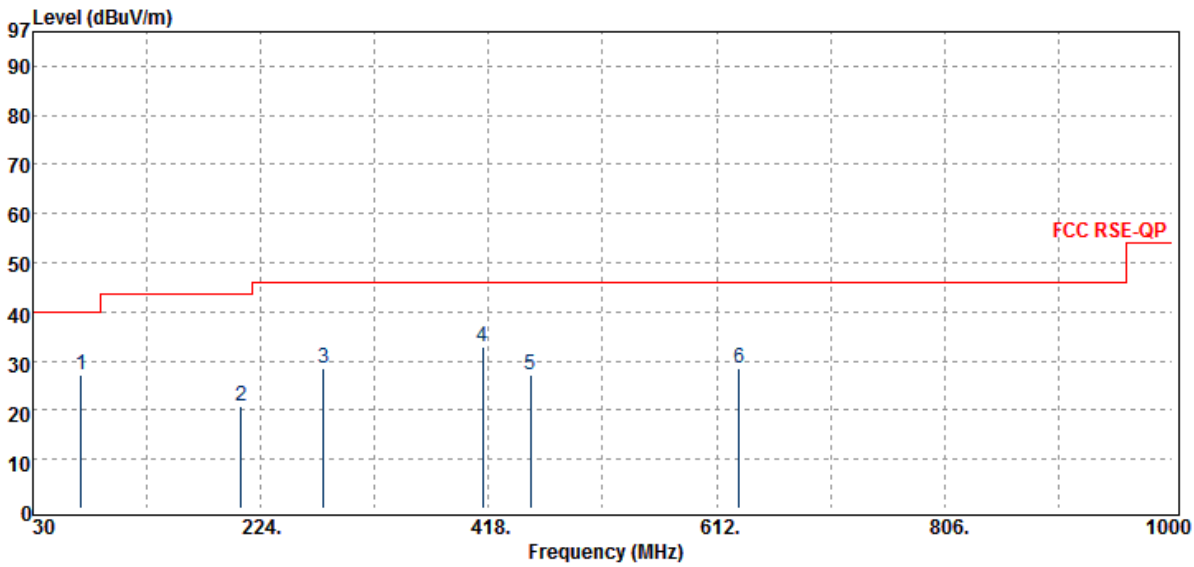
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Radiated Spurious Emission Measurement Result

Below 1GHz Worst-Case Data:

802.11a 5150~5250 MHz

Operation Band	:802.11aB1	Test Date	:2018-03-28
Fundamental Frequency	:5220 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



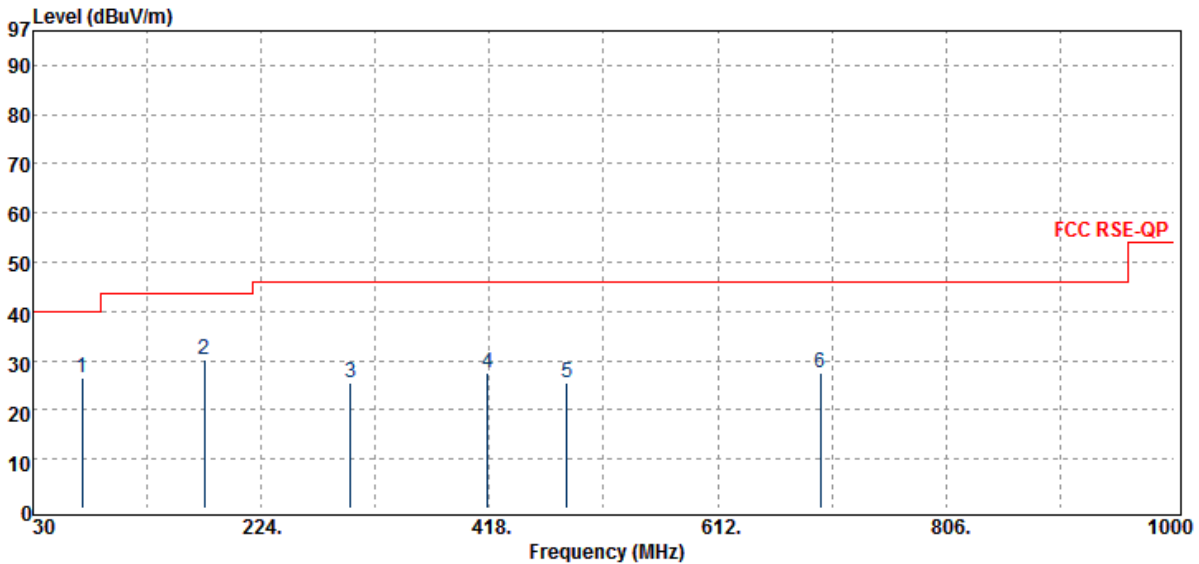
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	37.40	-10.23	27.17	40.00	-12.83
207.51	S	Peak	30.14	-9.26	20.88	43.50	-22.62
277.35	S	Peak	34.88	-6.27	28.61	46.00	-17.39
413.15	S	Peak	35.79	-2.95	32.84	46.00	-13.16
453.89	S	Peak	29.53	-2.41	27.12	46.00	-18.88
631.40	S	Peak	27.60	0.77	28.37	46.00	-17.63

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Operation Band	:802.11aB1	Test Date	:2018-03-28
Fundamental Frequency	:5220 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	36.85	-10.42	26.43	40.00	-13.57
175.50	S	Peak	38.21	-7.89	30.32	43.50	-13.18
299.66	S	Peak	30.87	-5.52	25.35	46.00	-20.65
416.06	S	Peak	30.31	-2.91	27.40	46.00	-18.60
483.96	S	Peak	28.12	-2.70	25.42	46.00	-20.58
699.30	S	Peak	25.62	1.74	27.36	46.00	-18.64

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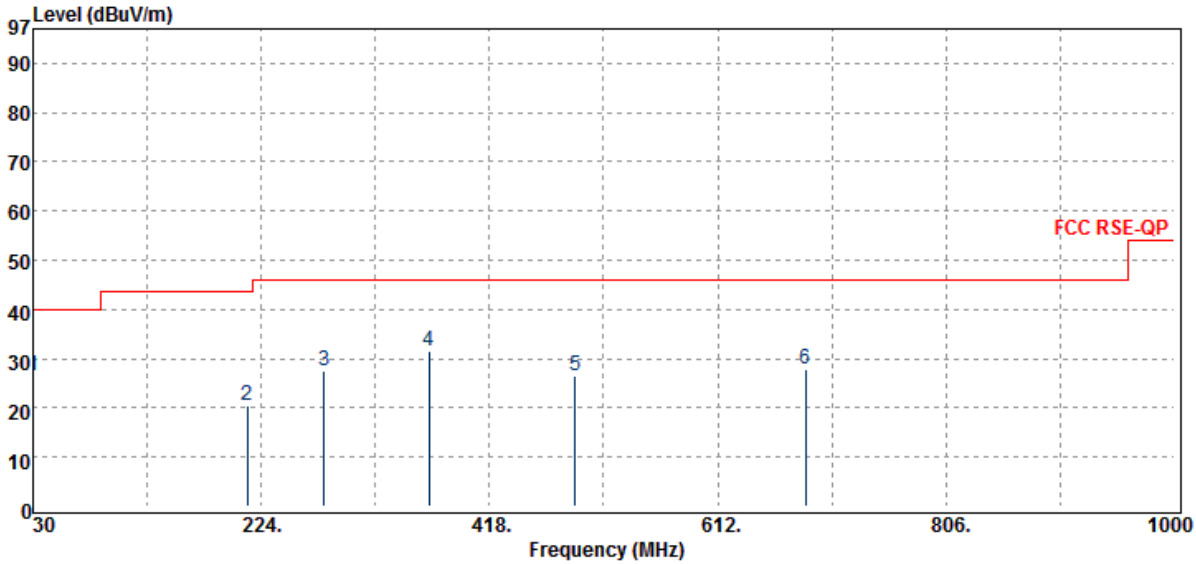
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802.11a 5250~5350 MHz

Operation Band	:802.11aB2	Test Date	:2018-03-28
Fundamental Frequency	:5300 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
30.00	S	Peak	35.53	-8.96	26.57	40.00	-13.43
212.36	S	Peak	29.69	-9.20	20.49	43.50	-23.01
277.35	S	Peak	33.81	-6.27	27.54	46.00	-18.46
366.59	S	Peak	35.48	-4.02	31.46	46.00	-14.54
490.75	S	Peak	28.70	-2.32	26.38	46.00	-19.62
686.69	S	Peak	26.24	1.70	27.94	46.00	-18.06

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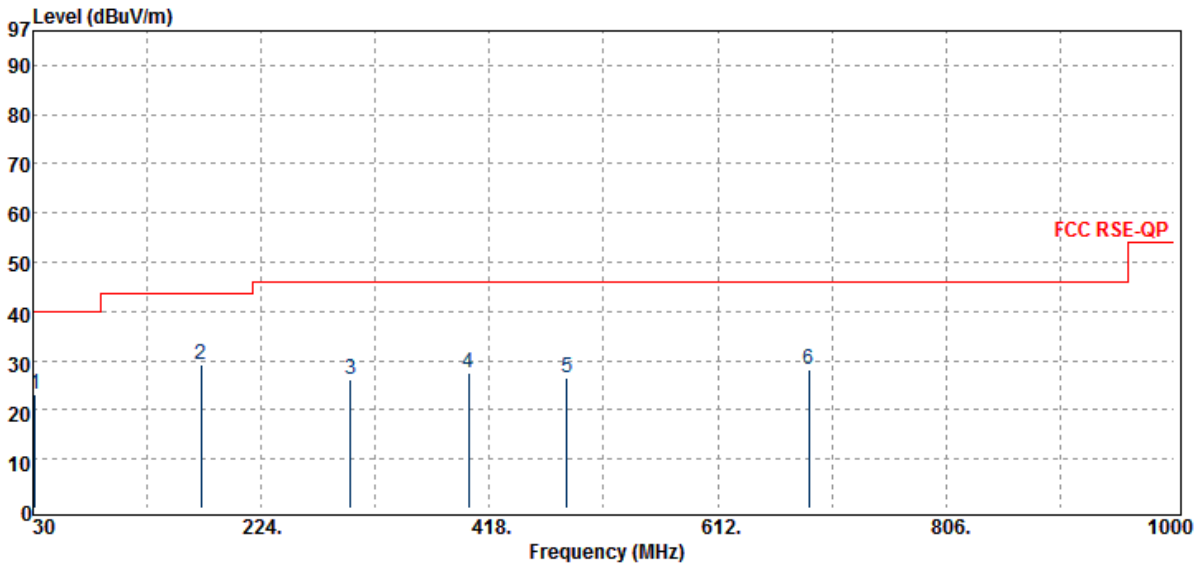
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Operation Band :802.11aB2
 Fundamental Frequency :5300 MHz
 Operation Mode :Tx CH MID
 EUT Pol. :H Plane

Test Date :2018-03-28
 Temp./Humi. :23 deg_C / 62 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	31.92	-8.88	23.04	40.00	-16.96
172.59	S	Peak	36.95	-7.60	29.35	43.50	-14.15
299.66	S	Peak	31.84	-5.52	26.32	46.00	-19.68
400.54	S	Peak	30.88	-3.37	27.51	46.00	-18.49
483.96	S	Peak	29.14	-2.70	26.44	46.00	-19.56
689.60	S	Peak	26.15	1.88	28.03	46.00	-17.97

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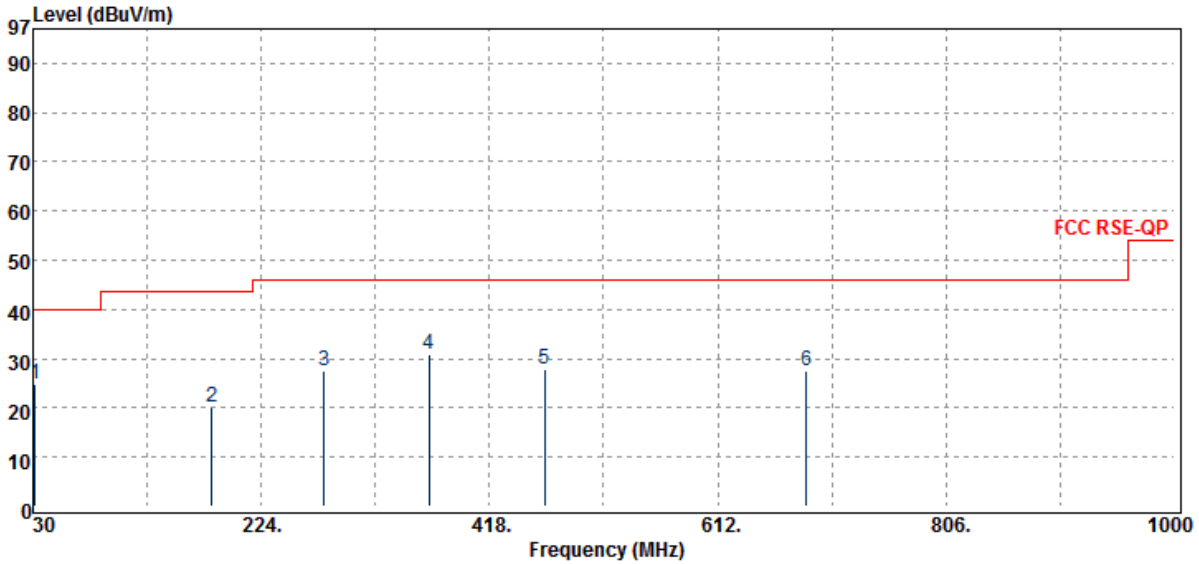
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802.11a, 5470~5725 MHz

Operation Band :802.11aB3
Fundamental Frequency :5580 MHz
Operation Mode :Tx CH MID
EUT Pol. :H Plane

Test Date :2018-03-28
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



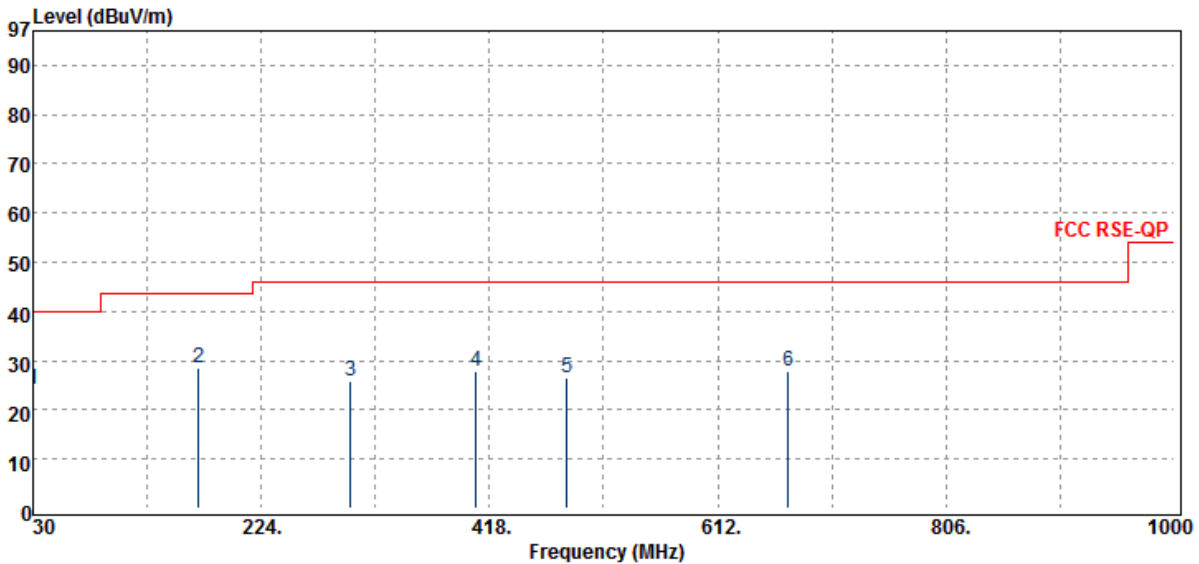
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	33.82	-8.88	24.94	40.00	-15.06
182.29	S	Peak	28.59	-8.37	20.22	43.50	-23.28
277.35	S	Peak	33.81	-6.27	27.54	46.00	-18.46
366.59	S	Peak	35.01	-4.02	30.99	46.00	-15.01
464.56	S	Peak	29.98	-2.08	27.90	46.00	-18.10
687.66	S	Peak	25.88	1.76	27.64	46.00	-18.36

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Operation Band	:802.11aB3	Test Date	:2018-03-28
Fundamental Frequency	:5580 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
30.00	S	Peak	33.24	-8.96	24.28	40.00	-15.72
170.65	S	Peak	35.95	-7.38	28.57	43.50	-14.93
299.66	S	Peak	31.30	-5.52	25.78	46.00	-20.22
406.36	S	Peak	30.79	-2.93	27.86	46.00	-18.14
483.96	S	Peak	29.25	-2.70	26.55	46.00	-19.45
672.14	S	Peak	26.87	0.99	27.86	46.00	-18.14

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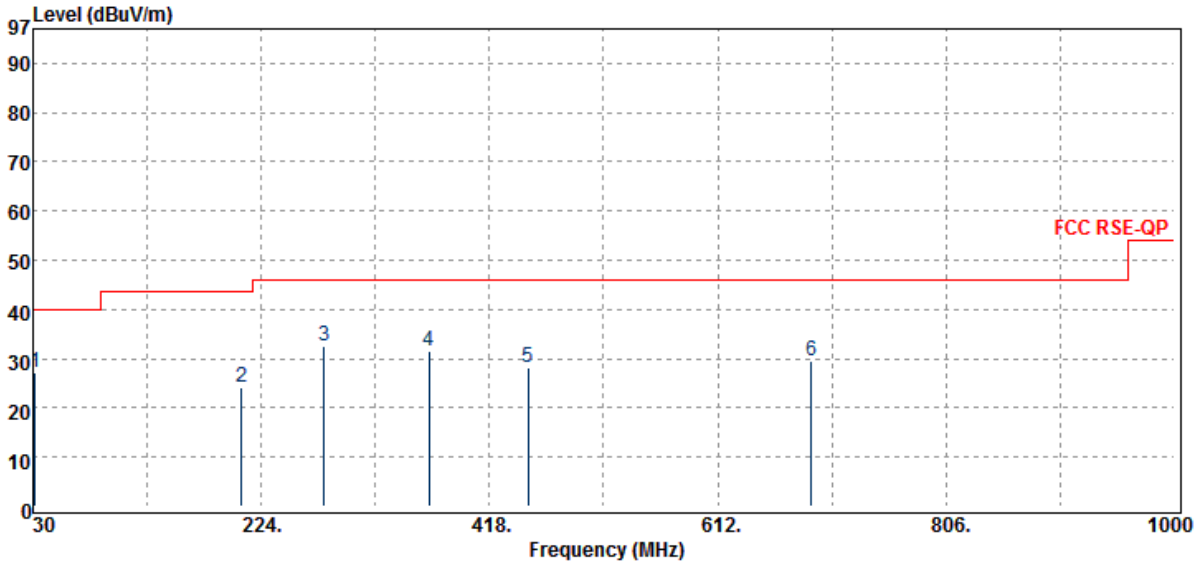
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802.11ac VHT80 5150~5250 MHz

Operation Band :802.11ac80B1
 Fundamental Frequency :5210 MHz
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane

Test Date :2018-03-28
 Temp./Humi. :23 deg_C / 62 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	35.96	-8.88	27.08	40.00	-12.92
207.51	S	Peak	33.38	-9.26	24.12	43.50	-19.38
277.35	S	Peak	38.84	-6.27	32.57	46.00	-13.43
366.59	S	Peak	35.54	-4.02	31.52	46.00	-14.48
450.98	S	Peak	30.78	-2.61	28.17	46.00	-17.83
691.54	S	Peak	27.89	1.57	29.46	46.00	-16.54

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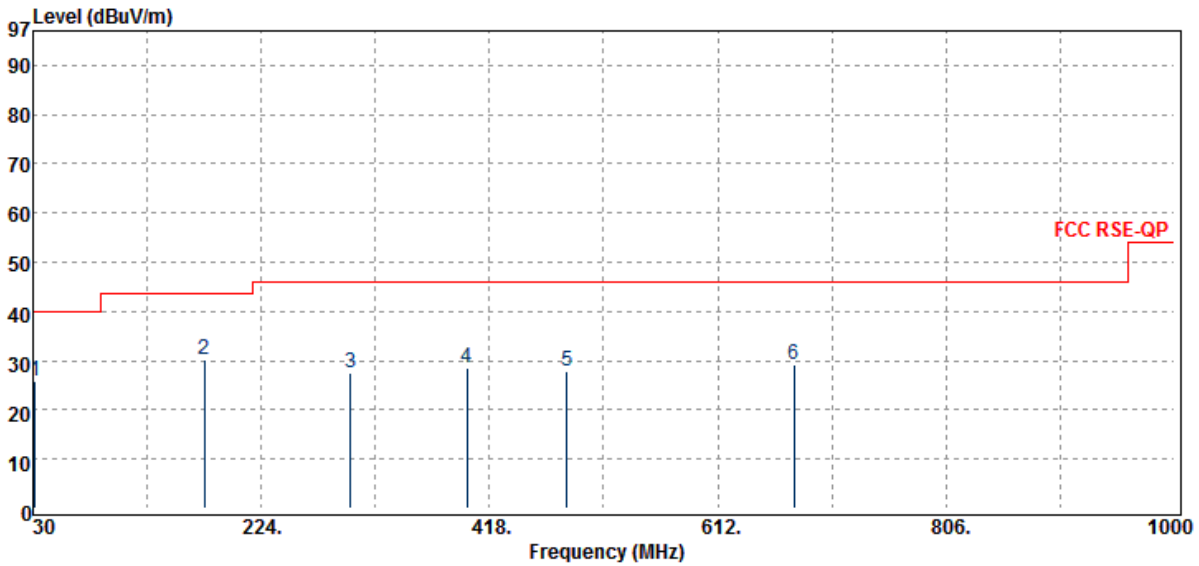
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Operation Band :802.11ac80B1
Fundamental Frequency :5210 MHz
Operation Mode :Tx CH LOW
EUT Pol. :H Plane

Test Date :2018-03-28
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	34.56	-8.88	25.68	40.00	-14.32
175.50	S	Peak	38.19	-7.89	30.30	43.50	-13.20
299.66	S	Peak	32.99	-5.52	27.47	46.00	-18.53
398.60	S	Peak	32.05	-3.41	28.64	46.00	-17.36
483.96	S	Peak	30.51	-2.70	27.81	46.00	-18.19
676.99	S	Peak	27.73	1.40	29.13	46.00	-16.87

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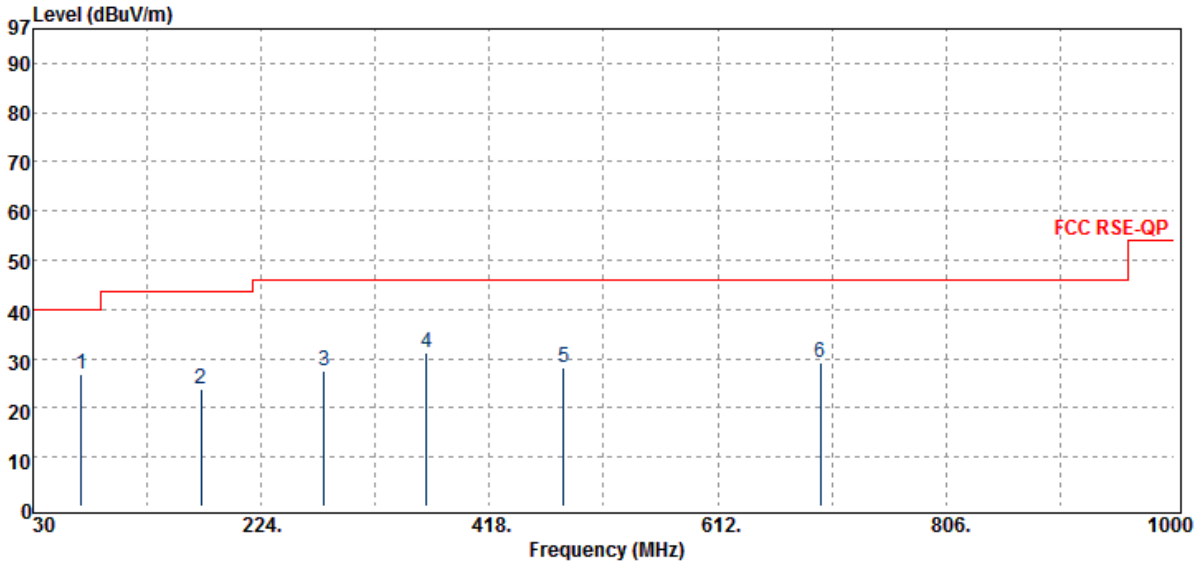
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802.11ac VHT80 5250~5350 MHz

Operation Band :802.11ac80B2
Fundamental Frequency :5290 MHz
Operation Mode :Tx CH HIGH
EUT Pol. :H Plane

Test Date :2018-03-28
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	36.99	-10.23	26.76	40.00	-13.24
172.59	S	Peak	31.60	-7.60	24.00	43.50	-19.50
277.35	S	Peak	33.92	-6.27	27.65	46.00	-18.35
364.65	S	Peak	35.38	-4.07	31.31	46.00	-14.69
481.05	S	Peak	30.31	-2.22	28.09	46.00	-17.91
699.30	S	Peak	27.41	1.74	29.15	46.00	-16.85

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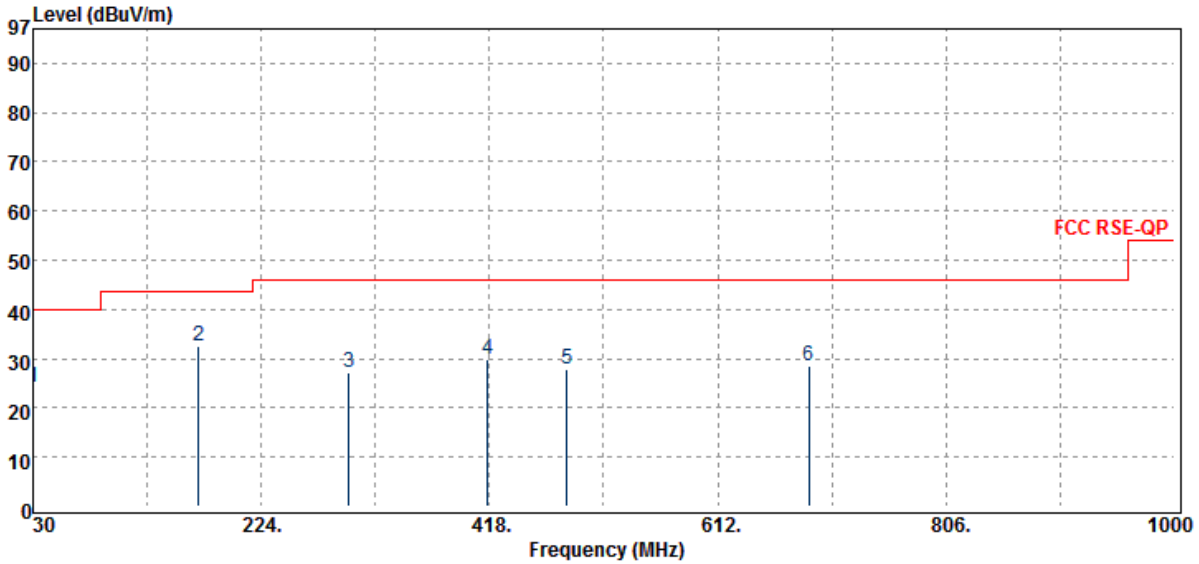
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Operation Band	:802.11ac80B2	Test Date	:2018-03-28
Fundamental Frequency	:5290 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
30.00	S	Peak	33.02	-8.96	24.06	40.00	-15.94
170.65	S	Peak	39.95	-7.38	32.57	43.50	-10.93
298.69	S	Peak	32.69	-5.55	27.14	46.00	-18.86
416.06	S	Peak	32.87	-2.91	29.96	46.00	-16.04
483.96	S	Peak	30.72	-2.70	28.02	46.00	-17.98
689.60	S	Peak	26.72	1.88	28.60	46.00	-17.40

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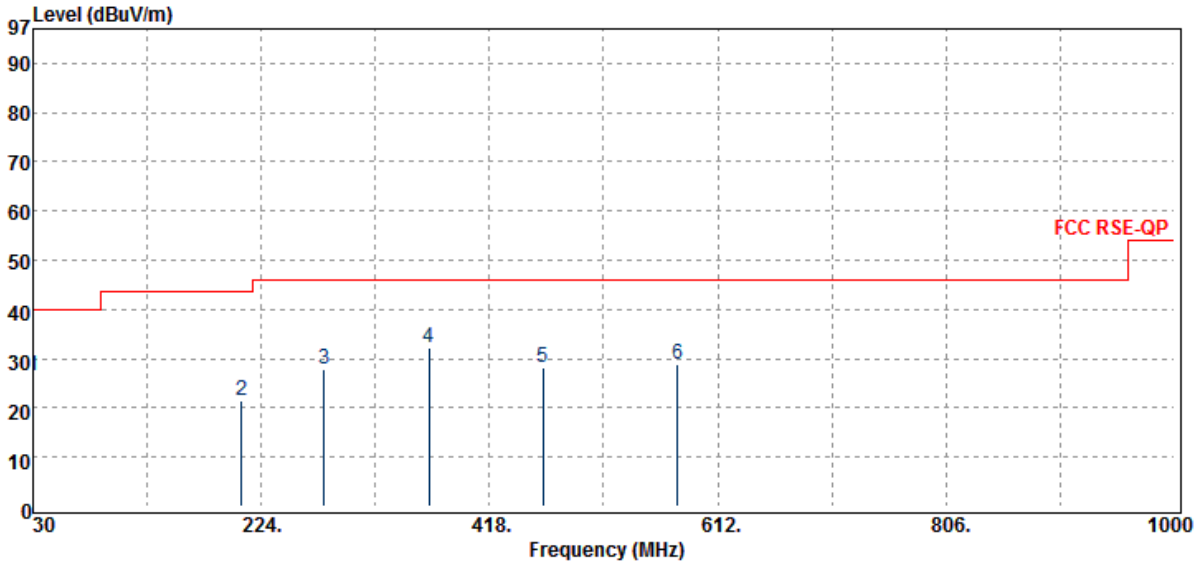
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802.11ac VHT80 5470~5725 MHz

Operation Band :802.11ac80B3
Fundamental Frequency :5530 MHz
Operation Mode :Tx CH LOW
EUT Pol. :H Plane

Test Date :2018-03-28
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
30.00	S	Peak	35.42	-8.96	26.46	40.00	-13.54
207.51	S	Peak	30.67	-9.26	21.41	43.50	-22.09
277.35	S	Peak	34.11	-6.27	27.84	46.00	-18.16
366.59	S	Peak	36.35	-4.02	32.33	46.00	-13.67
463.59	S	Peak	30.29	-2.16	28.13	46.00	-17.87
578.05	S	Peak	28.92	-0.05	28.87	46.00	-17.13

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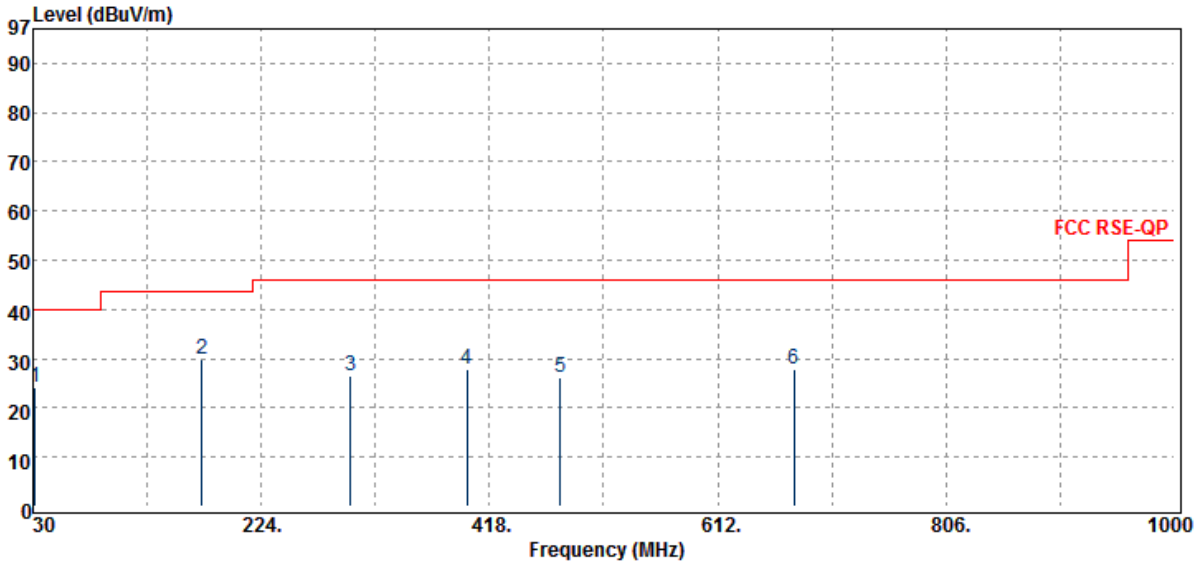
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Operation Band	:802.11ac80B3	Test Date	:2018-03-28
Fundamental Frequency	:5530 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	33.15	-8.88	24.27	40.00	-15.73
173.56	S	Peak	37.61	-7.70	29.91	43.50	-13.59
299.66	S	Peak	32.20	-5.52	26.68	46.00	-19.32
398.60	S	Peak	31.12	-3.41	27.71	46.00	-18.29
478.14	S	Peak	28.48	-2.17	26.31	46.00	-19.69
676.99	S	Peak	26.54	1.40	27.94	46.00	-18.06

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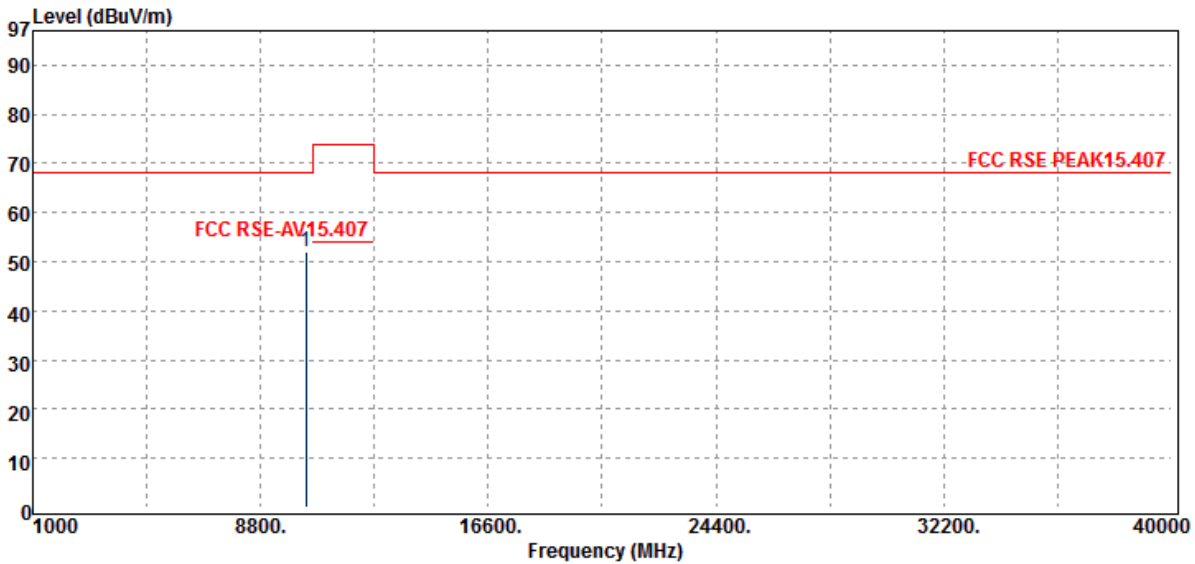
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Above 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz

Operation Band	:802.11aB1	Test Date	:2018-03-28
Fundamental Frequency	:5180 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Safe Margin dB
10360.00	H	Peak	31.56	20.41	51.97	68.30	-16.33

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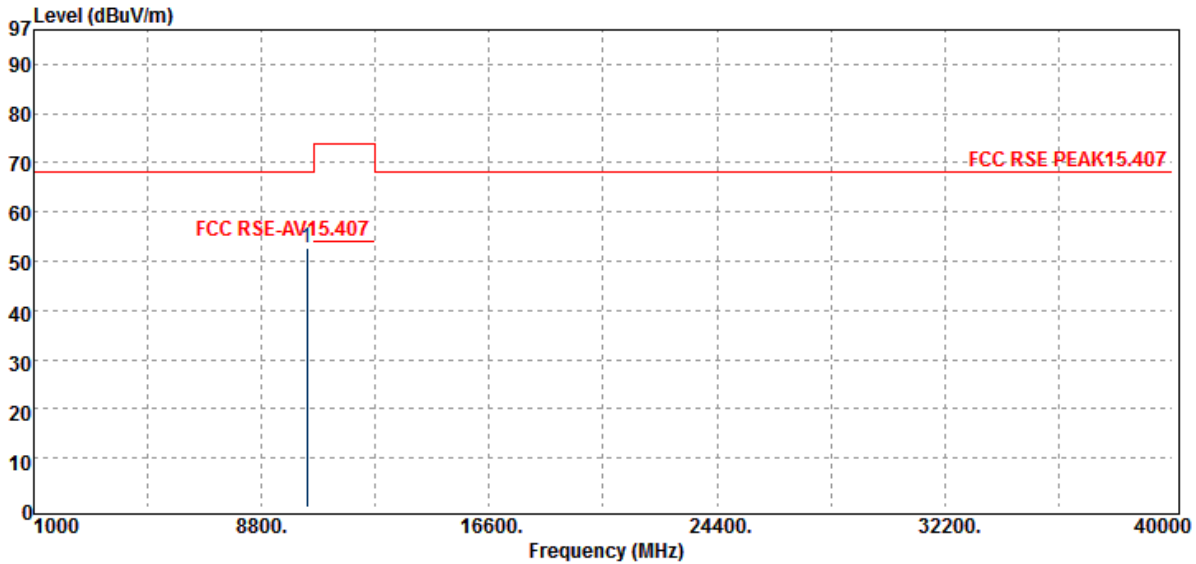
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Operation Band :802.11aB1
 Fundamental Frequency :5180 MHz
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane

Test Date :2018-03-28
 Temp./Humi. :23 deg_C / 62 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
10360.00	H	Peak	32.34	20.41	52.75	68.30	-15.55

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