

# TEST REPORT

FCC/IC UNII Test for LGSBWAC02  
Certification

APPLICANT  
LG Electronics Inc.

REPORT NO.  
HCT-RF-1908-FI010-R1

DATE OF ISSUE  
August 08, 2019

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## REPORT NO.

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## DATE OF ISSUE

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## FCC ID/IC

BEJLGSBWAC02/ 2703H-LGSBWAC02

## Applicant

LG Electronics Inc.

222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea

## Eut Type Model Name

RF Module  
LGSBWAC02

## Modulation type

OFDM

## FCC Classification

Unlicensed National Information Infrastructure(UNII)

## FCC Rule Part(s)

Part 15.407

## IC Rule Part(s)

RSS-247 Issue 2 (February 2017), RSS-Gen Issue 5(April 2018)

This test results were applied only to the test methods required by the standard.

Tested by  
Se Wook Park

(signature)

Technical Manager  
Jong Seok Lee

(signature)

HCT CO., LTD.

Soo Chan Lee

SooChan Lee / CEO  
Accredited by KOLAS, Republic of KOREA

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 02, 2019	Initial Release
1	August 08, 2019	Changed the FCC ID on Page 2

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

**Engineering Statement:**

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC / IC Rules under normal use and maintenance.

This laboratory is not accredited for the test results marked \*.

The above testing certificate is the accredited test result by KOLAS(Korea Laboratory Accreditation Scheme) / A2LA(American Association for Laboratory Accreditation)

1. GENERAL INFORMATION	5
EUT DESCRIPTION	5
ANTENNA CONFIGURATIONS	6
2. MAXIMUM OUTPUT POWER	7
3. TEST METHODOLOGY	8
EUT CONFIGURATION	8
EUT EXERCISE	8
GENERAL TEST PROCEDURES	8
DESCRIPTION OF TEST MODES	8
4. INSTRUMENT CALIBRATION	9
5. FACILITIES AND ACCREDITATIONS	9
5.1 FACILITIES	9
5.2 EQUIPMENT	9
6. ANTENNA REQUIREMENTS	9
7. MEASUREMENT UNCERTAINTY	10
8. DESCRIPTION OF TESTS	11
9. SUMMARY OF TEST RESULTS	32
10. TEST RESULT	34
10.1 26DB BANDWIDTH & 99 % BANDWIDTH	34
10.2 6DB BANDWIDTH	52
10.3 OUTPUT POWER MEASUREMENT	56
10.4 POWER SPECTRAL DENSITY	113
10.5 FREQUENCY STABILITY.	131
10.5.1 80MHz BW	131
10.6 STRADDLE CHANNEL	163
10.6.1 26dB Bandwidth	163
10.6.2 6dB Bandwidth	169
10.6.3 Output Power	175
10.6.4 Power Spectral Density	181
10.7 RADIATED SPURIOUS EMISSIONS	187
10.8 RADIATED RESTRICTED BAND EDGE	221
10.9 RECEIVER SPURIOUS EMISSIONS	239
10.10 POWERLINE CONDUCTED EMISSIONS	240
11. LIST OF TEST EQUIPMENT	244
12. ANNEX A_ TEST SETUP PHOTO	246

## 1. GENERAL INFORMATION

### EUT DESCRIPTION

Model	LGSBWAC02	
Additional Model	–	
EUT Type	RF Module	
Power Supply	DC 3.30 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	U-NII-1	20MHz BW : 5180 - 5240 40MHz BW : 5190 - 5230 80MHz BW : 5210
	U-NII-2A	20MHz BW : 5260 - 5320 40MHz BW : 5270 - 5310 80MHz BW : 5290
	U-NII-2C	20MHz BW : 5500 - 5720 40MHz BW : 5510 - 5710 80MHz BW : 5530 - 5690
	U-NII-3	20MHz BW : 5745 - 5825 40MHz BW : 5755 - 5795 80MHz BW : 5775
Antenna type	Metal press Ant	
Antenna Peak Gain	Ant.1: 1.48 dBi(UNII 1), 1.50 dBi(UNII 2A)/ 1.50 dBi(UNII 2C)/ 1.44 dBi(UNII 3) Ant.2: 1.50 dBi(UNII 1), 1.50 dBi(UNII 2A)/ 1.50 dBi(UNII 2C)/ 1.49 dBi(UNII 3)	
Straddle channel	Supported	
TDWR Band	Not Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	July 04, 2019 ~ August 01, 2019	
PMN (Product Marketing Number)	LGSBWAC02	
HVIN (Hardware Version Identification Number)	ETWCFLBC02	
FVIN (Firmware Version Identification Number)	MT7663_V1.0	
HMN (Host Marketing Name)	N/A	

## ANTENNA CONFIGURATIONS

### 1. The device employs MIMO technology. Below are the possible configurations

Configurations	SISO		SDM	CDD
	Ant1	Ant2	Ant1 + Ant2	Ant1 + Ant2
802.11a	O	O	X	O
802.11n(HT20)	O	O	O	O
802.11n(HT40)	O	O	O	O
802.11ac(VHT20)	O	O	O	O
802.11ac(VHT40)	O	O	O	O
802.11ac(VHT80)	O	O	O	O

#### Note:

1. O = Support, X = Not Support
2. SISO = Single Input Single Output
3. SDM = Spatial Diversity Multiplexing
4. CDD = Cyclic Delay Diversity

### 2. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01

Directional gain =  $10 \cdot \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi

**Cyclic Delay Diversity ( $N_{ANT}=2$  /  $N_{ss}=1$ )**

If all antennas have the same gain,  $G_{ANT}$

- Directional gain(dBi) =  $G_{ANT}$  + Array Gain
- Array Gain =  $10 \log(N_{ANT}/N_{ss})$  dB.

Band	Ant Gain (dBi)		Directional Gain = $10 \cdot \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$ dBi
UNII 1	Ant1(Aux)	1.48	4.50
	Ant2(Main)	1.50	
UNII 2A	Ant1(Aux)	1.50	4.51
	Ant2(Main)	1.50	
UNII 2C	Ant1(Aux)	1.50	4.51
	Ant2(Main)	1.50	
UNII 3	Ant1(Aux)	1.44	4.48
	Ant2(Main)	1.49	

## 2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Band	Mode	SISO				MIMO	
		Ant1 Power		Ant2 Power		Ant 1 + Ant 2 Power	
		(dBm)	(W)	(dBm)	(W)	(dBm)	(W)
UNII1	802.11a	12.74	0.019	12.21	0.017	15.41	0.035
	802.11n (HT20)	12.60	0.018	11.84	0.015	15.15	0.033
	802.11n (HT40)	13.82	0.024	13.06	0.020	16.46	0.044
	802.11ac (VHT20)	12.85	0.019	12.13	0.016	15.52	0.036
	802.11ac (VHT40)	14.08	0.026	12.96	0.020	16.57	0.045
	802.11ac (VHT80)	13.25	0.021	12.23	0.017	15.78	0.038
UNII2A	802.11a	13.73	0.024	12.75	0.019	16.28	0.042
	802.11n (HT20)	13.48	0.022	12.67	0.019	16.07	0.040
	802.11n (HT40)	13.42	0.022	12.48	0.018	15.92	0.039
	802.11ac (VHT20)	15.71	0.037	14.06	0.025	17.97	0.063
	802.11ac (VHT40)	13.80	0.024	12.83	0.019	16.35	0.043
	802.11ac (VHT80)	11.72	0.015	11.07	0.013	14.40	0.028
UNII2C	802.11a	13.34	0.022	12.71	0.019	15.83	0.038
	802.11n (HT20)	15.22	0.033	15.12	0.033	17.72	0.059
	802.11n (HT40)	14.70	0.030	14.46	0.028	17.42	0.055
	802.11ac (VHT20)	15.27	0.034	14.50	0.028	17.91	0.062
	802.11ac (VHT40)	14.64	0.029	14.52	0.028	17.46	0.056
	802.11ac (VHT80)	14.50	0.028	14.38	0.027	17.43	0.055
UNII3	802.11a	15.26	0.034	15.17	0.033	18.23	0.067
	802.11n (HT20)	15.05	0.032	15.04	0.032	18.06	0.064
	802.11n (HT40)	16.44	0.044	16.51	0.045	19.47	0.089
	802.11ac (VHT20)	14.54	0.028	14.89	0.031	17.73	0.059
	802.11ac (VHT40)	16.06	0.040	15.99	0.040	19.03	0.080
	802.11ac (VHT80)	16.34	0.043	16.61	0.046	19.49	0.089

### 3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated December 14, 2017 entitled “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part15, Subpart E” and ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’ were used in the measurement.

#### EUT CONFIGURATION

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

#### EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E. / RSS-Gen issue 5, RSS-247 issue 2.

#### GENERAL TEST PROCEDURES

##### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m 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 hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

#### DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.



## 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032 ).

For ISCED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 6. ANTENNA REQUIREMENTS

**According to FCC 47 CFR § 15.203, § 15.407:**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

\* The antennas of this E.U.T  
are permanently attached.

\* The E.U.T Complies with the requirement of § 15.203, § 15.407 / RSS-Gen

## 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicate a 95 % level of confidence.

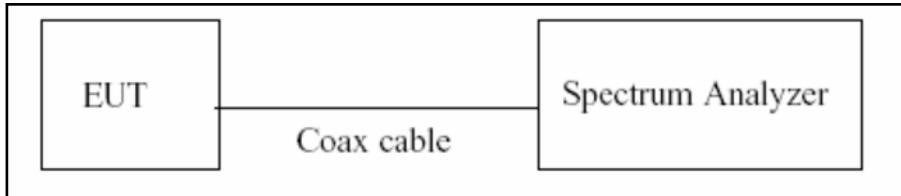
The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

## 8. DESCRIPTION OF TESTS

### 8.1. Duty Cycle

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure B.2 in KDB 789033 D02 v02r01.

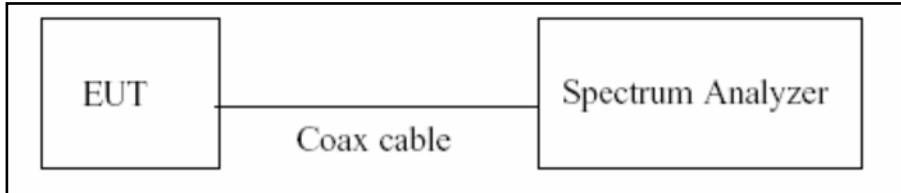
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10 \cdot \log(1 / \text{Duty Cycle})$

## 8.2. 6dB Bandwidth & 26dB Bandwidth & 99 % Bandwidth

### Limit

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### Test Configuration



### Test Procedure(26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure C.1 in KDB 789033 D02 v02r01.

1. RBW = approximately 1 % of the emission bandwidth
2. VBW > RBW
3. Detector = Peak
4. Trace mode = max hold
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.  
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

### Test Procedure (6dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure C.2 in KDB 789033 D02 v02r01.

1. RBW = 100 kHz
2. VBW  $\geq 3 \times$  RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points(upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### Note:

1. We tested X dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.
2. DFS test channels should be defined. So, We performed the OBW test to prove that no part of the fundamental emissions of any channels belong to UNII1 and UNII3 band for DFS.
3. The 26 dB bandwidth is used to determine the conducted power limits.

**Test Procedure (99 % Bandwidth measurement)**

The 99 % bandwidth is used to determine the conducted power limits(for IC).

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dBbandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized. (6.9.3 in ANSI 63.10-2013)

RBW = 1% ~ 5% of the occupied bandwidth

VBW  $\geq$  3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

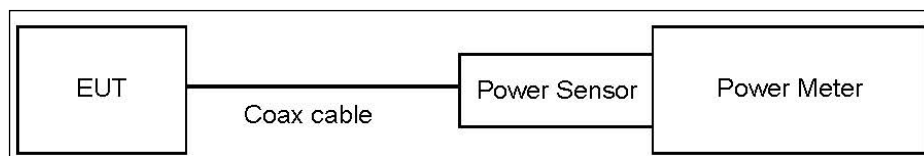
### 8.3. Output Power Measurement

#### Limit

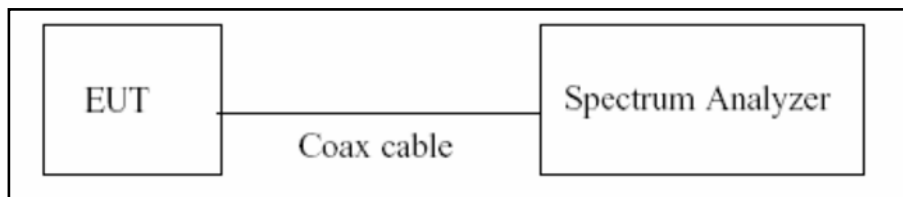
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

#### Test Configuration

##### Power Meter



##### Spectrum Analyzer(Only Straddle Channel)



#### Test Procedure(Power Meter)

We tested according to Procedure E.3.a in KDB 789033 D02 v02r01.

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

#### Test Procedure(Spectrum Analyzer)

The transmitter output is connected to the Spectrum Analyzer.

We use the spectrum analyzer's integrated band power measurement function.

We tested according to Procedure E.2.d) in KDB 789033 D02 v02r01.

1. Measure the duty cycle.
2. Set span to encompass the 26 dB EBW of the signal.
3. RBW = 1 MHz.
4. VBW  $\geq$  3 MHz.
5. Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ .
6. Sweep time = auto.
7. Detector = RMS.
8. Do not use sweep triggering. Allow the sweep to “free run”.
9. Trace average at least 100 traces in power averaging(RMS) mode
10. Integrated bandwidth = OBW
11. Add  $10\log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

### **Sample Calculation**

Total Power(dBm) = Reading Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

### **Note**

1. Spectrum reading values are not plot data.  
The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(20 dB) + Cable loss
3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	21.20
UNII 2A	21.20
UNII 2C	21.20
UNII 3	21.20

(Actual value of loss for the attenuator and cable combination)

### Limit & Ant Gain Calculation (FCC&IC)

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit (dBm)
SISO	UNII 1	802.11a/n/ac	Ant 1(Aux)	1.48	22.99
			Ant 2(Main)	1.50	22.99
	UNII 2A		Ant 1(Aux)	1.50	22.95
			Ant 2(Main)	1.50	22.95
	UNII 2C		Ant 1(Aux)	1.50	22.99
			Ant 2(Main)	1.50	22.99
	UNII 3		Ant 1(Aux)	1.44	30.00
			Ant 2(Main)	1.49	30.00
MIMO	UNII 1	802.11n/ac	Ant 1(Aux) & Ant 2(Main)	4.50	22.99
	UNII 2A			4.51	22.95
	UNII 2C			4.51	22.99
	UNII 3			4.48	30.00

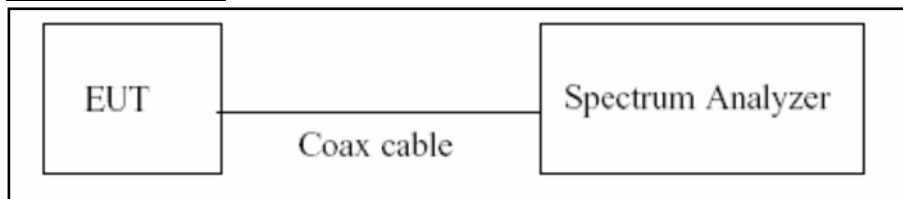


#### 8.4. Power Spectral Density

##### Limit

Band	Limit
UNII 1	11 dBm/MHz
UNII 2A, 2C	11 dBm/MHz
UNII 3	30 dBm/500 kHz

##### Test Configuration



##### Test Procedure

We tested according to Procedure F in KDB 789033 D02 v02r01.

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz(510 kHz for UNII 3)
3. VBW  $\geq$  3 MHz
4. Number of points in sweep  $\geq$  2\*span/RBW.
5. Sweep time = auto.
6. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run”.
8. Trace average at least 100 traces in power averaging(RMS) mode
9. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
10. If Method SA-2 was used, add  $10 \log(1/x)$ , where x is the duty cycle, to the peak of the spectrum.

**Sample Calculation**

Total PSD(dBm) = Reading Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

**Note**

1. Spectrum reading values are not plot data.

The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss(20 dB) + Cable loss

3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	21.20
UNII 2A	21.20
UNII 2C	21.20
UNII 3	21.20

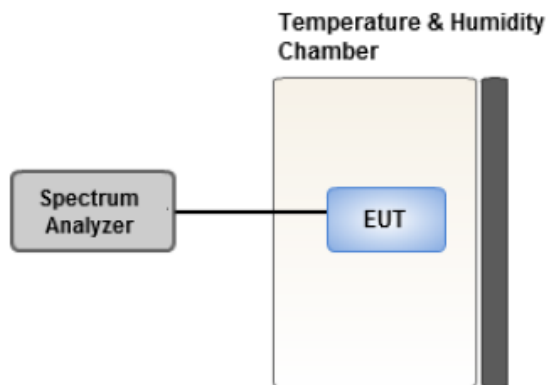
(Actual value of loss for the attenuator and cable combination)

## 8.5. Frequency Stability

### Limit

Maintained within the band

### Test Configuration



### Test Procedure

1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 °C and 50 °C.
2. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
3. The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.
4. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

## 8.6. AC Power line Conducted Emissions

### Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	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

\*Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

### Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

## 8.7. Radiated Test

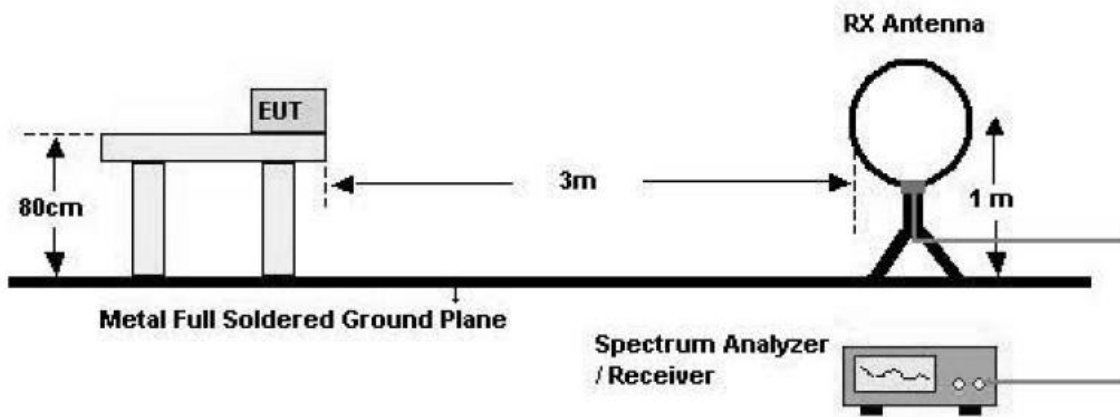
### Limit

1. UNII 1: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of  $-27$  dBm/MHz.
2. UNII 2A, 2C: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of  $-27$  dBm/MHz.
3. UNII 3: 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.
4. All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Section 15.209.

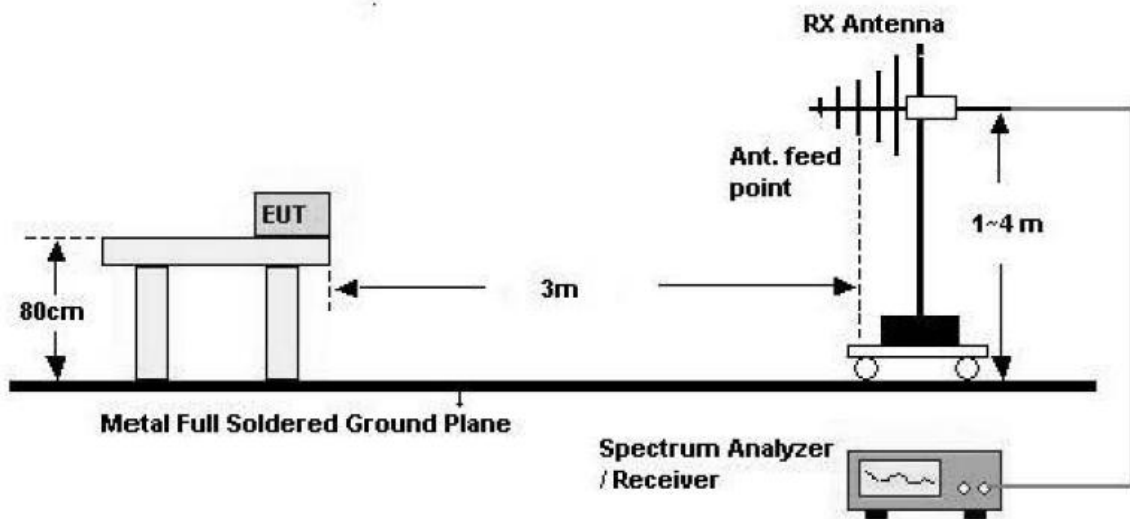
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

## Test Configuration

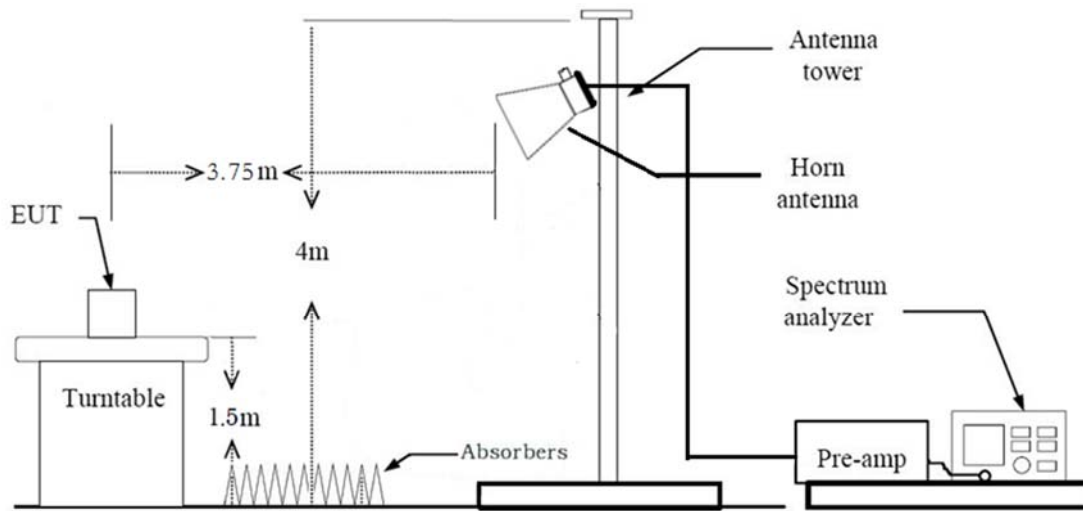
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



## Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$   
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$   
Measurement Distance : 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq 3 \cdot \text{RBW}$
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

**KDB 414788 OFS and Chamber Correlation Justification**

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

**Test Procedure of Radiated spurious emissions(Below 1GHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 100 kHz
    - VBW  $\geq 3 \times$  RBW
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
- \*In general, (1) is used mainly
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)



**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).

\*Distance extrapolation factor =  $20 \cdot \log (\text{test distance} / \text{specific distance})$  (dB)

6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting

(1) Measurement Type(Peak, G.5 in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Sweep Time = auto
- Trace mode = max hold
- Allow sweeps to continue until the trace stabilizes.

Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately  $1/x$ , where x is the duty cycle.

(2) Measurement Type(Average, G.6.d in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW(Duty cycle  $\geq$  98 percent) =  $\text{VBW} \leq \text{RBW}/100$ (i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) =  $\text{VBW} \geq 1/T$ , where T is the minimum transmission duration.
- The analyzer is set to linear detector mode.
- Detector = Peak.
- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of  $1/x$ , where x is the duty cycle.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor
11. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency
12. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

#### **Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

8. The unit was tested with its standard battery.

#### **9. Spectrum Setting**

(1) Measurement Type(Peak, G.5 in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Sweep Time = auto
- Trace mode = max hold
- Allow sweeps to continue until the trace stabilizes.

Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately  $1/x$ , where  $x$  is the duty cycle.

(2) Measurement Type(Average, G.6.d in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW(Duty cycle  $\geq$  98 percent) =  $\text{VBW} \leq \text{RBW}/100$  (i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) =  $\text{VBW} \geq 1/T$ , where  $T$  is the minimum transmission duration.
- The analyzer is set to linear detector mode.
- Detector = Peak.
- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of  $1/x$ , where  $x$  is the

10. Measured Frequency Range :

- 4500MHz ~ 5150MHz
- 5350MHz ~ 5460MHz
- 5460MHz ~ 5470MHz
- (75 MHz or more below the 5725MHz) ~ 5725MHz
- 5850MHz ~ (75 MHz or more above the 5850MHz)

11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

## 8.8. Receiver Spurious Emissions

### Limit

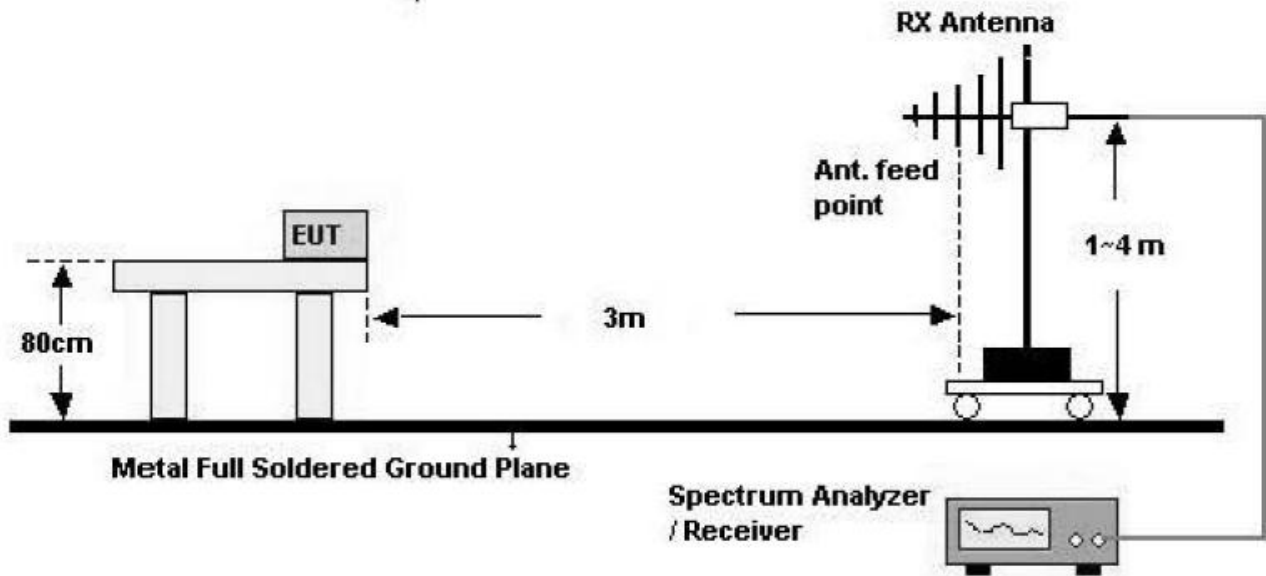
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

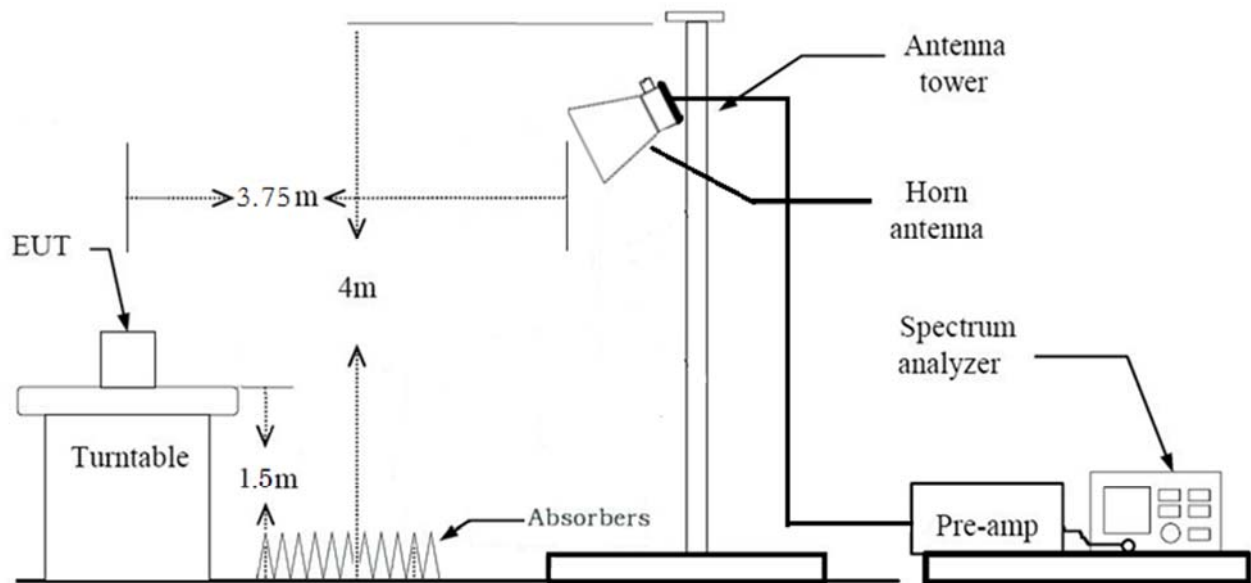
Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

## Test Configuration

30 MHz - 1 GHz



Above 1 GHz



**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log (\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 3 \cdot \text{RBW}$
  - (2) Measurement Type(Average):
    - We performed using a reduced video BW method was done with the analyzer in linear mode
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds

The actual setting value of VBW = 1 kHz
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

## 8.9. Worst case configuration and mode

### Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
2. All configurations of antenna were investigated and the worst case configuration results are reported.
  - Mode : Ant1(SISO), Ant2(SISO), Ant1+Ant2(CDD, SDM)
  - Worstcase : Ant1+Ant2(CDD)
3. EUT Axis
  - Radiated Spurious Emissions : X
  - Radiated Restricted Band Edge : Z
4. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11a : 6Mbps
  - 802.11n : MCS0
  - 802.11ac : MCS0
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
  - Position : Horizontal, Vertical, Parallel to the ground plane

### AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone + Notebook

### Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.
2. SISO & MIMO were tested and the all case results are reported.
  - Mode : Ant1(SISO), Ant2(SISO), Ant1+Ant2(CDD, SDM)

## 9. SUMMARY OF TEST RESULTS

### FCC

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§ 15.407 (for Power Measurement)	N/A	Conducted	PASS
6 dB Bandwidth	§ 15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§ 15.407(a)(1)	< 250 mW(5150-5250 MHz)  < 250 mW or 11+10 log log <sub>10</sub> (BW) dBm (5250-5350 MHz)  < 250 mW or 11+10 log log <sub>10</sub> (BW) dBm (5470-5725 MHz)  <1 W(5725-5850 MHz)		PASS
Peak Power Spectral Density	§ 15.407(a)(1),(5)	<11 dBm/ MHz (5150-5250 MHz) <11 dBm/ MHz (5250-5350 MHz) <11 dBm/ MHz (5470-5725 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§ 15.407(g) § 2.1055	Maintained within the band		PASS
AC Conducted Emissions 150 kHz-30 MHz	15.207	<FCC 15.207 limits		PASS
Undesirable Emissions	§ 15.407(b)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C) cf. Section 8.7 (UNII 3)	Radiated	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	15.205, 15.407(b)(5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

### IC

Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
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99% Bandwidth	RSS-GEN, 6.7	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247, 6.2	< 250 mW or $11+10 \log_{10}$ (BW) dBm (5470-5600, 5650-5725 MHz) Whichever power is less		PASS
	RSS-247, 6.2.4.1	<1 W (5725-5850 MHz)		
Maximum e.i.r.p	RSS-247, 6.2	< 30 mW or $1.76+10 \log_{10}$ (BW) dBm (5150-5250 MHz) < 30 mW or $1.76+10 \log_{10}$ (BW) dBm (5250-5350 MHz) < 1 W or $17+10 \log_{10}$ (BW) dBm (5470-5725 MHz) Whichever power is less		PASS
Power Spectral Density	RSS-247 6.2	<10 dBm/ MHz(e.i.r.p.) (5150-5250 MHz) <11 dBm/MHz(Conducted) (5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz)		PASS
	RSS-247, 6.2.4.1	<30 dBm/500 kHz(Conducted) (5725-5850 MHz)		
Frequency Stability	RSS-GEN 8.11	should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation.		PASS
AC Conducted Emissions 150 kHz-30 MHz	RSS-GEN, 8.8	RSS-GEN section 8.8 table 4		PASS
Undesirable Emissions	RSS-247, 6.2.1.2	26 dBc at 5250~5350 MHz (5150~5350 MHz)	RADIATED	PASS
	RSS-247, 6.2	<-27 dBm/ MHz EIRP (5150-5350 MHz, 5470-5725 MHz)		PASS
	RSS-247, 6.2.4.2	cf. Section 9.8.1 (UNII 3)		
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	RSS-Gen, 8.9 RSS-Gen, 8.10	RSS-Gen section 8.9 table 5, 6 section 8.10 table 7		PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	RSS-GEN section 7.3 table 3		PASS

## 10. TEST RESULT

### 10.1 26DB BANDWIDTH & 99 % BANDWIDTH

[ANT1]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	19.91	16.519
5200	40	19.94	16.481
5240	48	19.92	16.488
5260	52	20.03	16.484
5300	60	20.20	16.490
5320	64	20.12	16.506
5500	100	20.37	16.536
5580	116	20.01	16.527
5720	144	19.99	16.508
5745	149	20.27	16.457
5785	157	20.18	16.489
5825	165	20.11	16.486

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.42	17.611
5200	40	20.14	17.574
5240	48	20.09	17.593
5260	52	19.98	17.623
5300	60	20.24	17.590
5320	64	20.13	17.579
5500	100	20.28	17.577
5580	116	20.18	17.587
5720	144	20.09	17.563
5745	149	20.17	17.613
5785	157	20.31	17.617
5825	165	20.11	17.623

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.39	36.032
5230	46	40.12	36.055
5270	54	40.39	36.004
5310	62	40.38	36.048
5510	102	40.46	36.036
5550	110	40.09	35.964
5710	142	40.29	36.044
5755	151	40.35	36.040
5795	159	40.05	35.985

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.11	17.607
5200	40	20.36	17.600
5240	48	20.29	17.618
5260	52	20.24	17.620
5300	60	20.17	17.615
5320	64	20.15	17.601
5500	100	20.24	17.604
5580	116	20.12	17.603
5720	144	20.09	17.603
5745	149	20.16	17.583
5785	157	20.31	17.584
5825	165	20.32	17.624

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.45	36.039
5230	46	40.24	35.964
5270	54	40.59	35.997
5310	62	40.37	36.058
5510	102	40.38	36.021
5550	110	40.56	35.994
5710	142	40.32	35.986
5755	151	40.14	36.000
5795	159	40.16	36.053

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.12	75.321
5290	58	80.51	75.336
5530	106	80.38	75.313
5690	138	80.93	75.243
5775	155	81.03	75.303

**[ANT2]**

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	19.93	16.528
5200	40	19.89	16.490
5240	48	19.94	16.509
5260	52	20.05	16.491
5300	60	19.71	16.442
5320	64	20.00	16.489
5500	100	19.97	16.471
5580	116	19.92	16.504
5720	144	20.20	16.464
5745	149	20.10	16.558
5785	157	20.11	16.493
5825	165	20.07	16.499

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.44	17.618
5200	40	20.21	17.591
5240	48	20.13	17.630
5260	52	20.22	17.615
5300	60	20.30	17.582
5320	64	20.24	17.597
5500	100	20.02	17.581
5580	116	20.33	17.617
5720	144	20.28	17.582
5745	149	20.40	17.564
5785	157	20.26	17.605
5825	165	20.33	17.605

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.32	36.060
5230	46	40.54	35.972
5270	54	40.27	36.033
5310	62	40.19	36.018
5510	102	40.64	36.037
5550	110	40.28	35.978
5710	142	40.19	36.002
5755	151	40.46	36.017
5795	159	40.41	35.976

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.29	17.583
5200	40	20.50	17.606
5240	48	20.06	17.618
5260	52	20.34	17.626
5300	60	20.45	17.615
5320	64	20.22	17.602
5500	100	20.12	17.574
5580	116	20.22	17.594
5720	144	20.32	17.599
5745	149	20.44	17.602
5785	157	20.17	17.605
5825	165	20.28	17.584

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.24	36.024
5230	46	40.65	36.022
5270	54	40.25	36.034
5310	62	40.58	36.065
5510	102	40.13	36.013
5550	110	40.26	35.944
5710	142	40.11	35.988
5755	151	40.53	36.039
5795	159	40.27	35.979

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	80.95	75.278
5290	58	81.32	75.400
5530	106	81.04	75.323
5690	138	81.07	75.338
5775	155	80.90	75.342

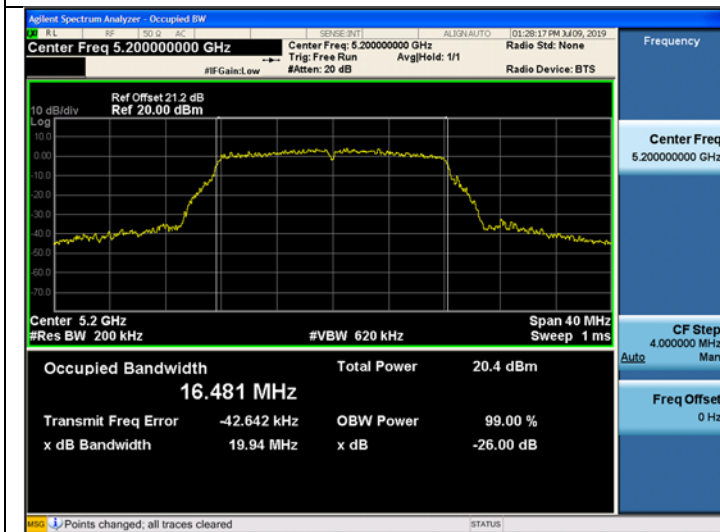
[ANT1]

■ Test Plots(802.11a)

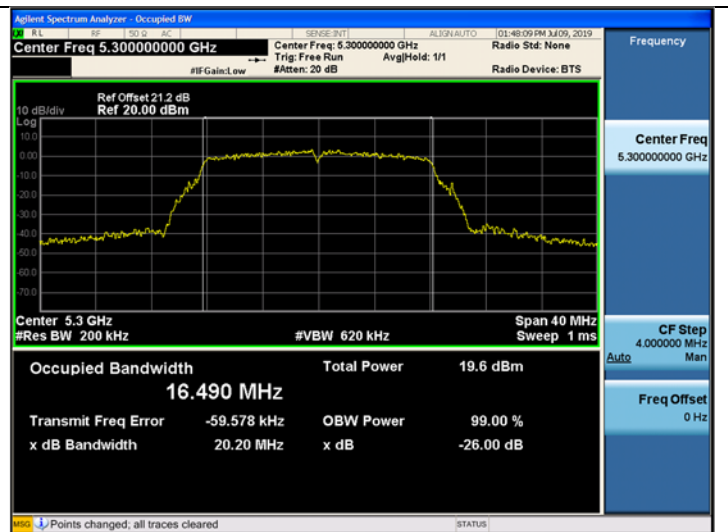
Note:

In order to simplify the report, attached plots were only the most wide channel.

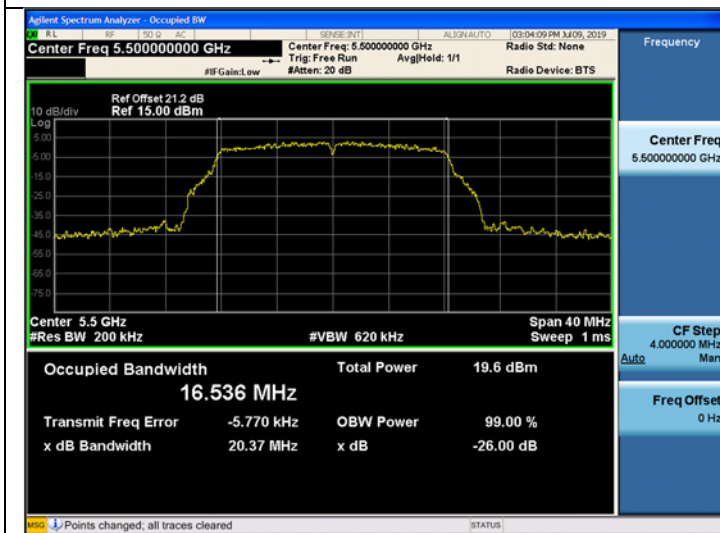
802.11a UNII 1 BAND 26dB Bandwidth (CH 40)



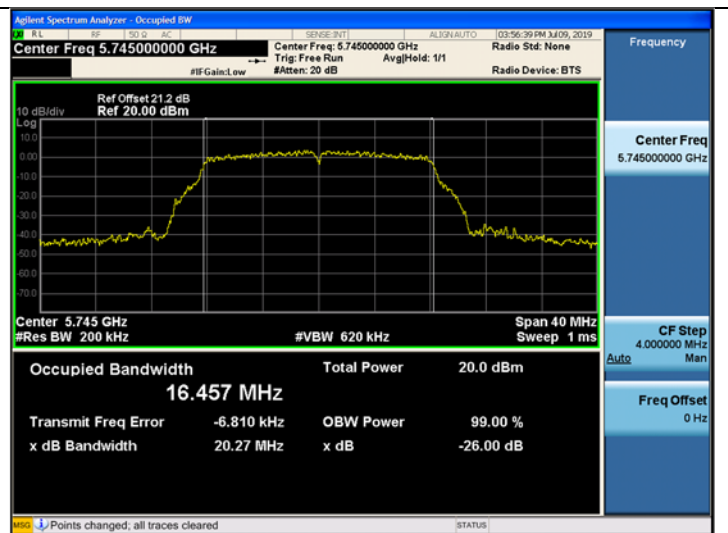
802.11a UNII 2A BAND 26dB Bandwidth (CH 60)



802.11a UNII 2C BAND 26dB Bandwidth (CH100)



802.11a UNII 3 BAND 26dB Bandwidth (CH 149)



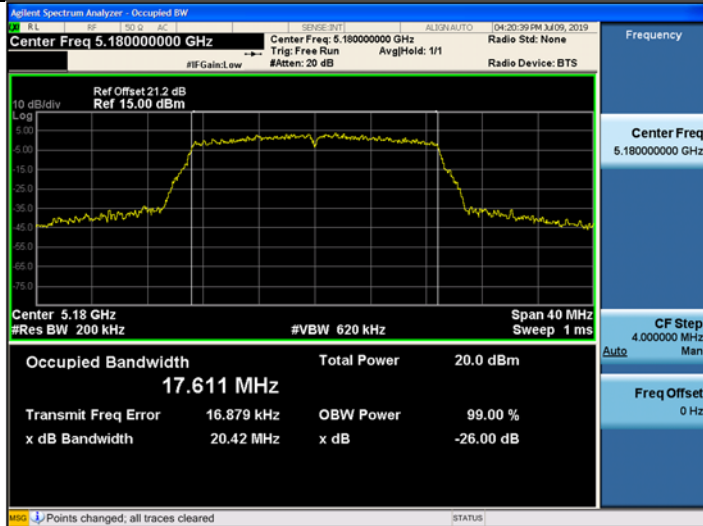


Test Plots(802.11n(HT20))

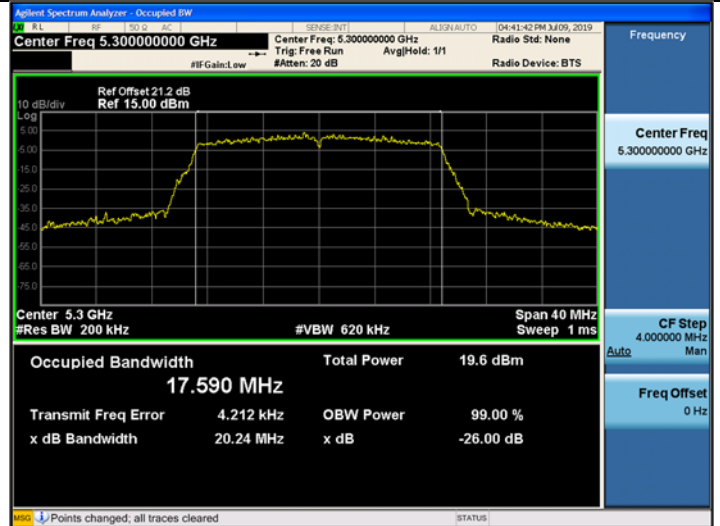
Note:

In order to simplify the report, attached plots were only the most wide channel.

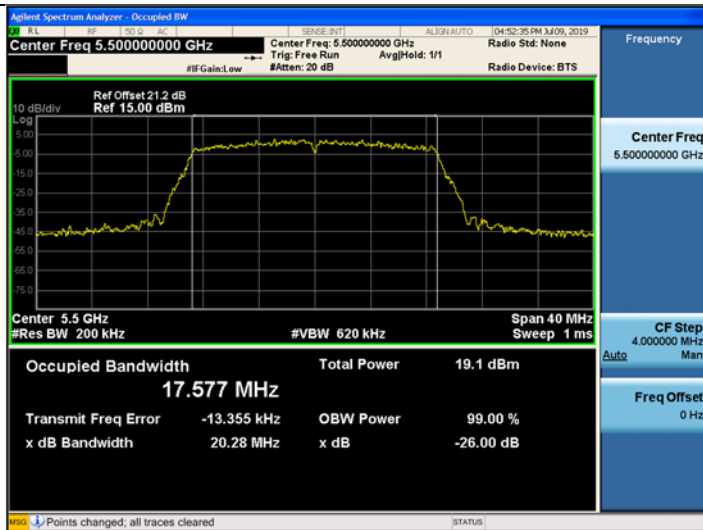
802.11n\_HT20 UNII 1 BAND 26dB Bandwidth(CH 36)



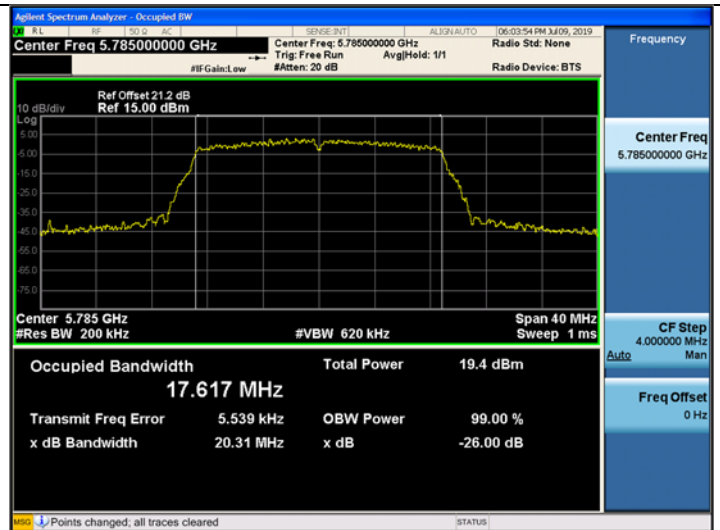
802.11n\_HT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11n\_HT20 UNII 2C BAND 26dB Bandwidth(CH 100)



802.11n\_HT20 UNII 3 BAND 26dB Bandwidth(CH 157)

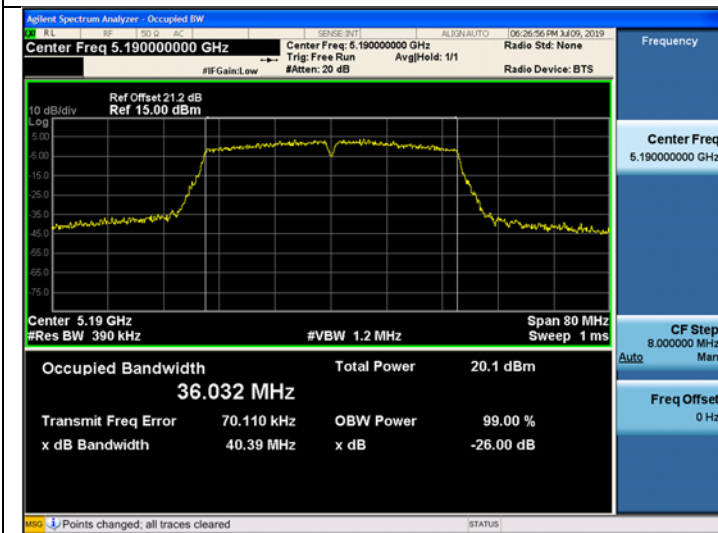


## Test Plots(802.11n(HT40))

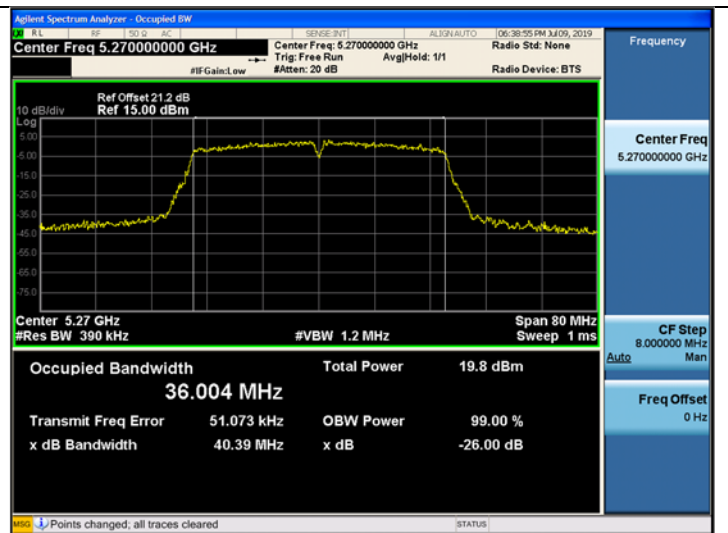
### Note:

In order to simplify the report, attached plots were only the most wide channel.

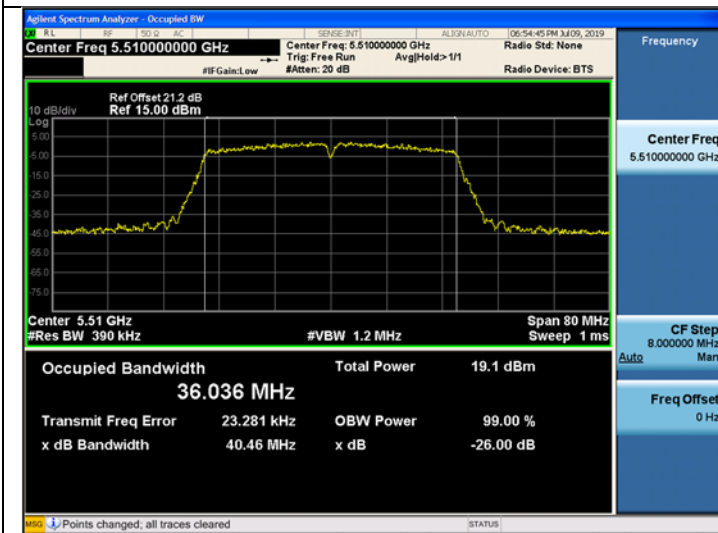
802.11n\_HT40 UNII 1 BAND 26dB Bandwidth(CH 38)



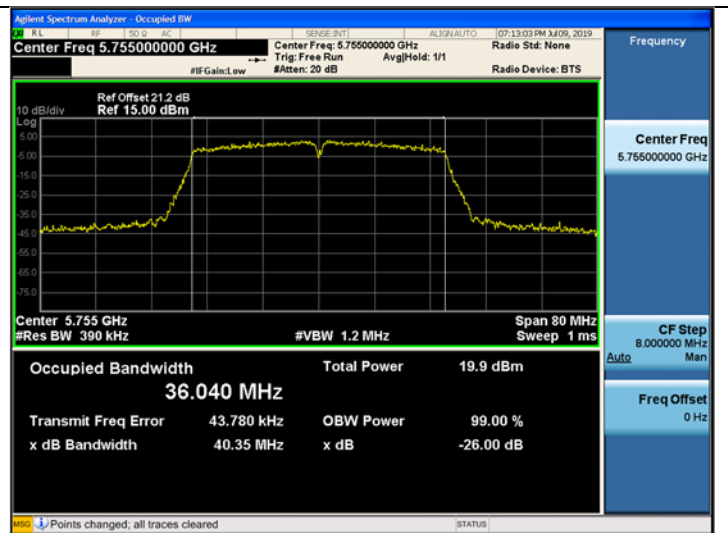
802.11n\_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11n\_HT40 UNII 2C BAND 26dB Bandwidth(CH 102)



802.11n\_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)



## Test Plots(802.11ac(VHT20))

### Note:

In order to simplify the report, attached plots were only the most wide channel.

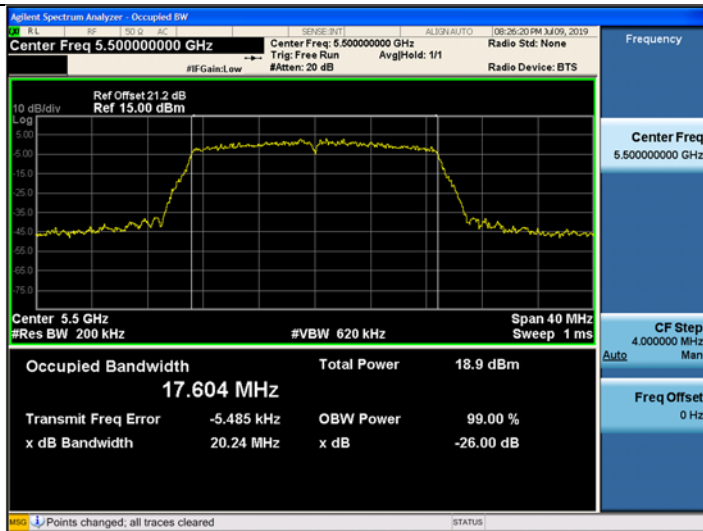
802.11ac\_VHT20 UNII 1 BAND 26dB Bandwidth(CH 40)



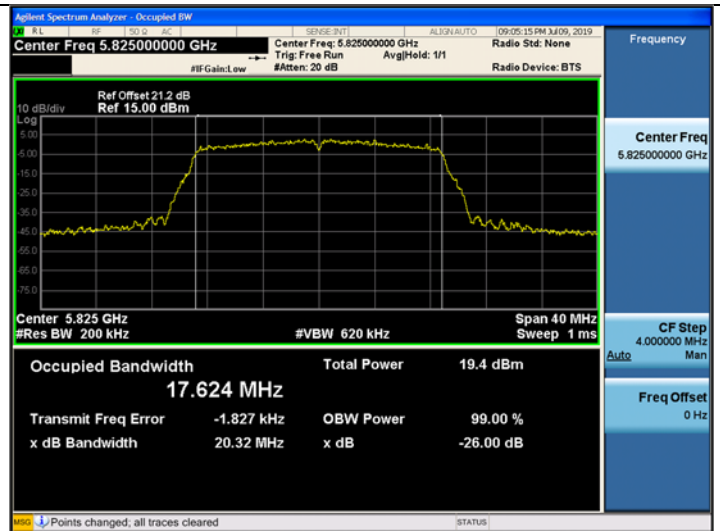
802.11ac\_VHT20 UNII 2A BAND 26dB Bandwidth(CH 52)



802.11ac\_VHT20 UNII 2C BAND 26dB Bandwidth(CH 100)



802.11ac\_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)

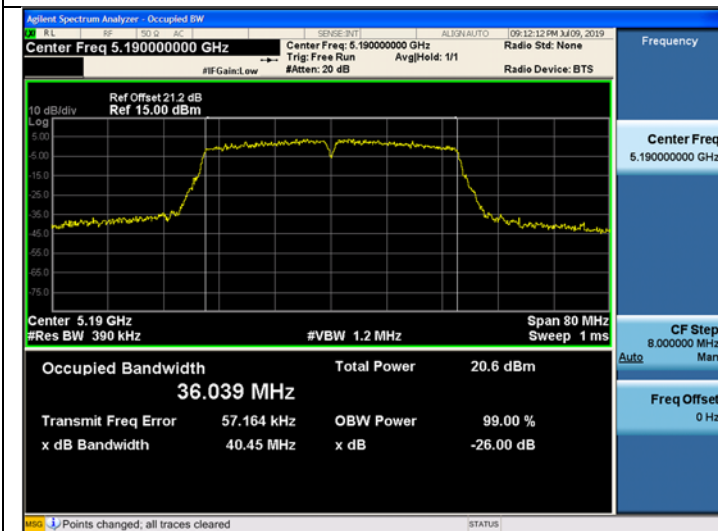


## Test Plots(802.11ac(VHT40))

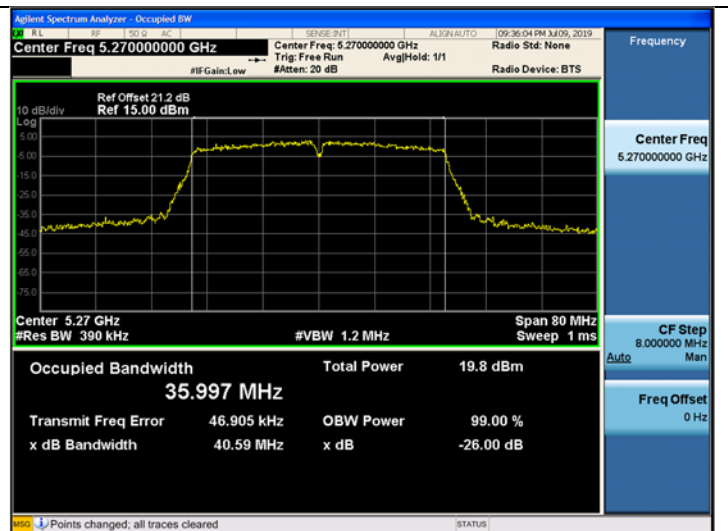
### Note:

In order to simplify the report, attached plots were only the most wide channel.

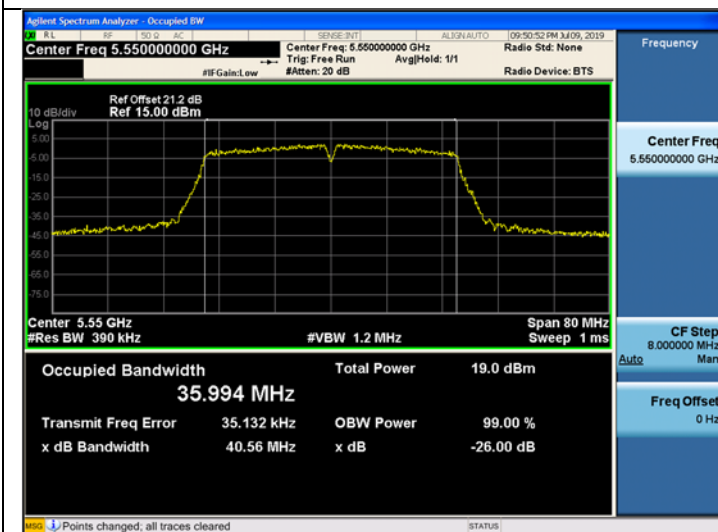
802.11ac\_VHT40 UNII 1 BAND 26dB Bandwidth(CH 38)



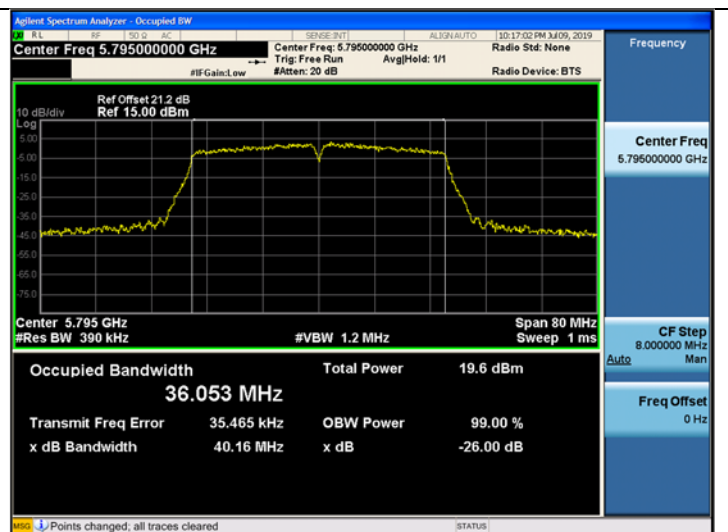
802.11ac\_VHT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11ac\_VHT40 UNII 2C BAND 26dB Bandwidth(CH 110)



802.11ac\_VHT40 UNII 3 BAND 26dB Bandwidth (CH 159)

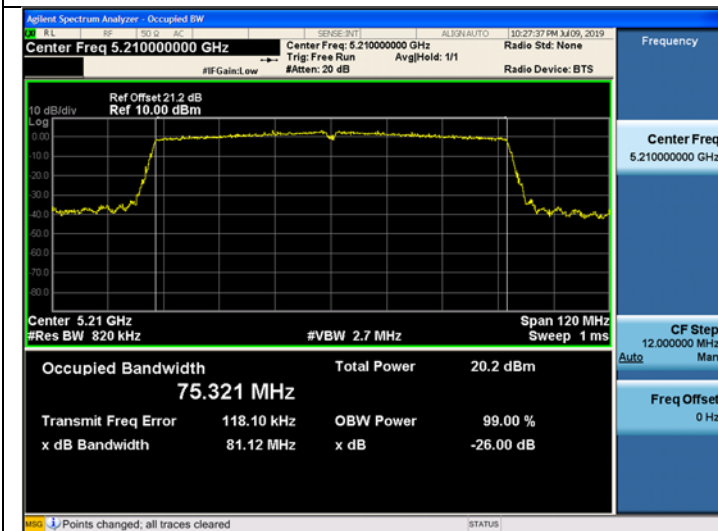


## Test Plots(802.11ac(VHT80))

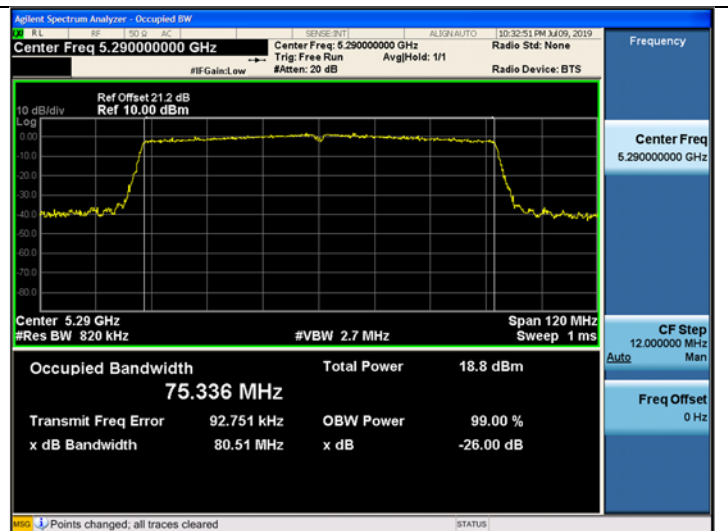
### Note:

In order to simplify the report, attached plots were only the most wide channel.

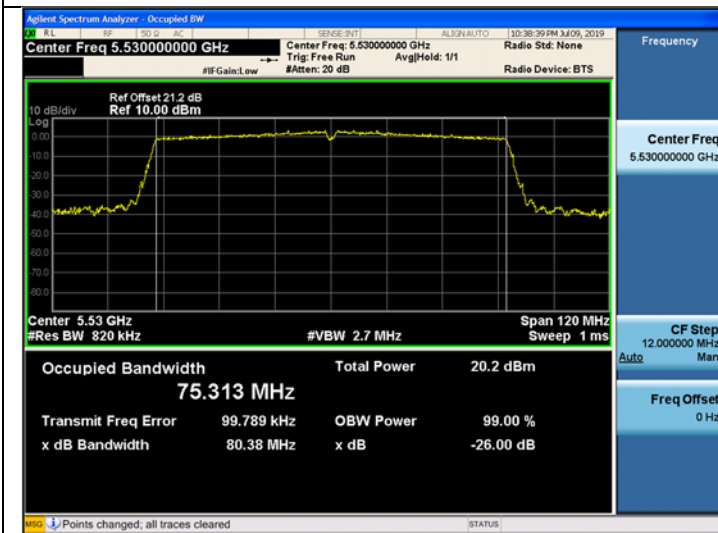
802.11ac\_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)



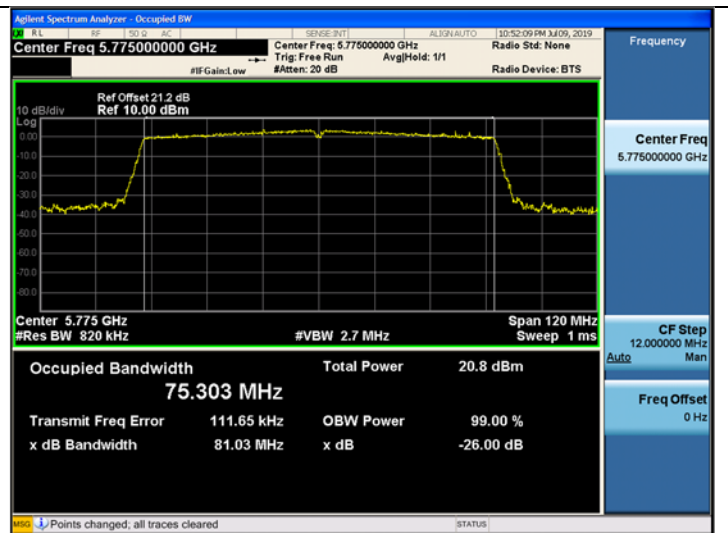
802.11ac\_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



802.11ac\_VHT80 UNII 2C BAND 26dB Bandwidth(CH 106)



802.11ac\_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)





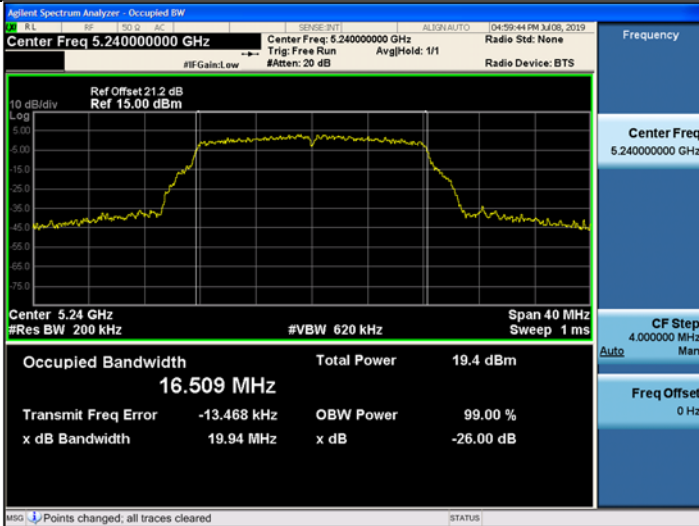
[ANT2]

Test Plots(802.11a)

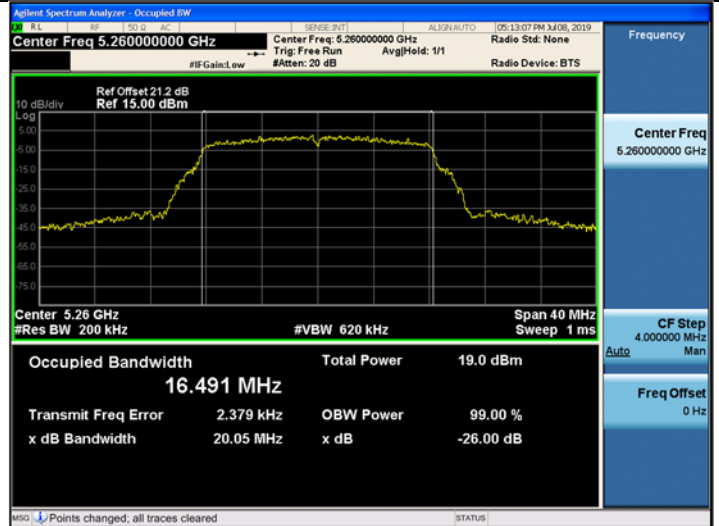
Note:

In order to simplify the report, attached plots were only the most wide channel.

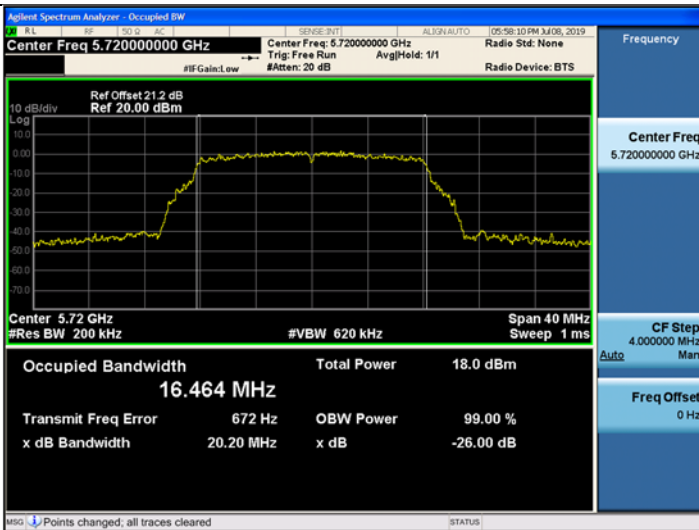
802.11a UNII 1 BAND 26dB Bandwidth (CH 48)



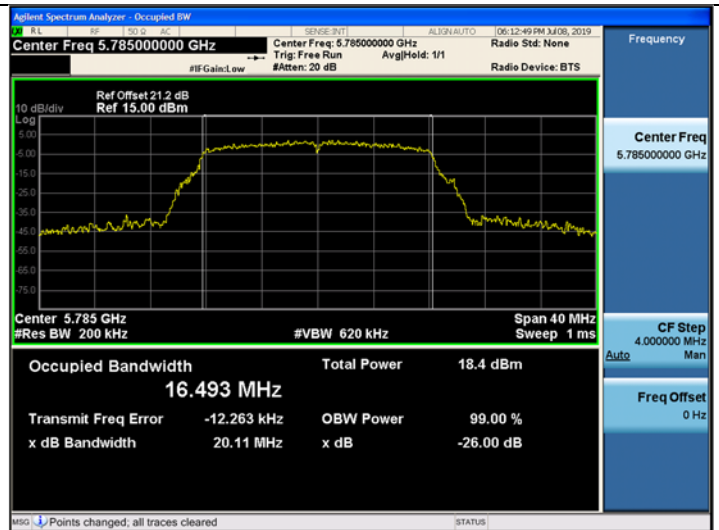
802.11a UNII 2A BAND 26dB Bandwidth (CH 52)



802.11a UNII 2C BAND 26dB Bandwidth (CH144)



802.11a UNII 3 BAND 26dB Bandwidth (CH 157)

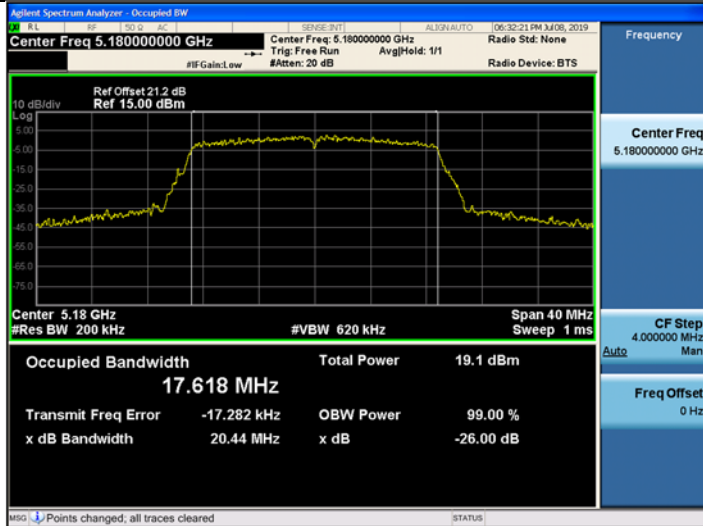


Test Plots(802.11n(HT20))

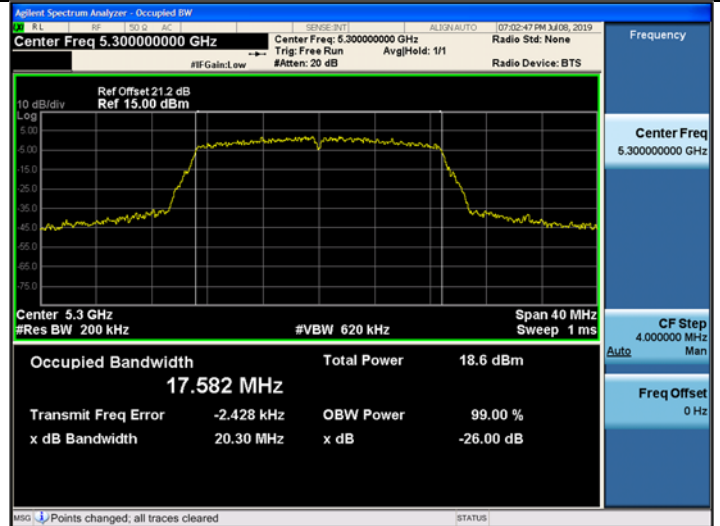
Note:

In order to simplify the report, attached plots were only the most wide channel.

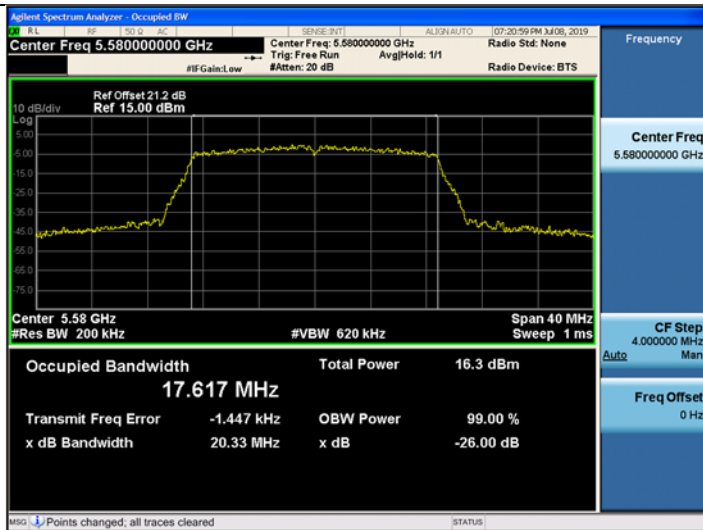
802.11n\_HT20 UNII 1 BAND 26dB Bandwidth(CH 36)



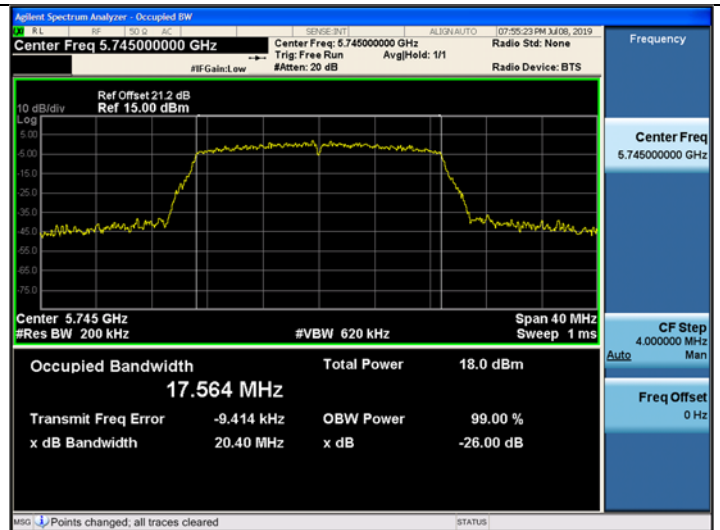
802.11n\_HT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11n\_HT20 UNII 2C BAND 26dB Bandwidth(CH 116)



802.11n\_HT20 UNII 3 BAND 26dB Bandwidth(CH 149)

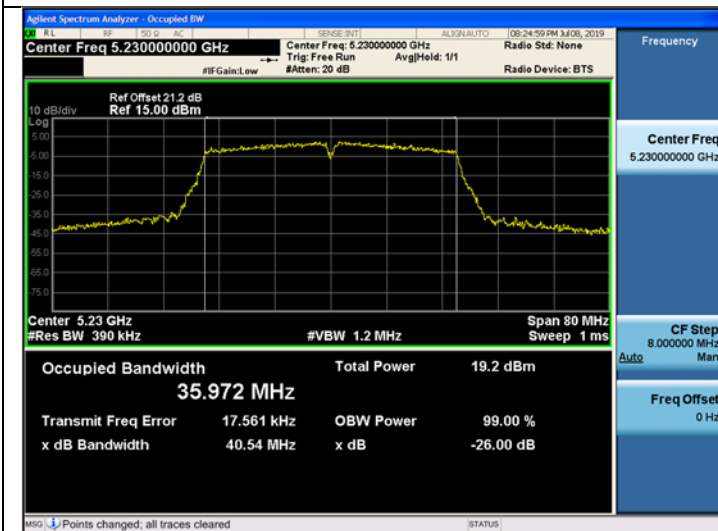


## Test Plots(802.11n(HT40))

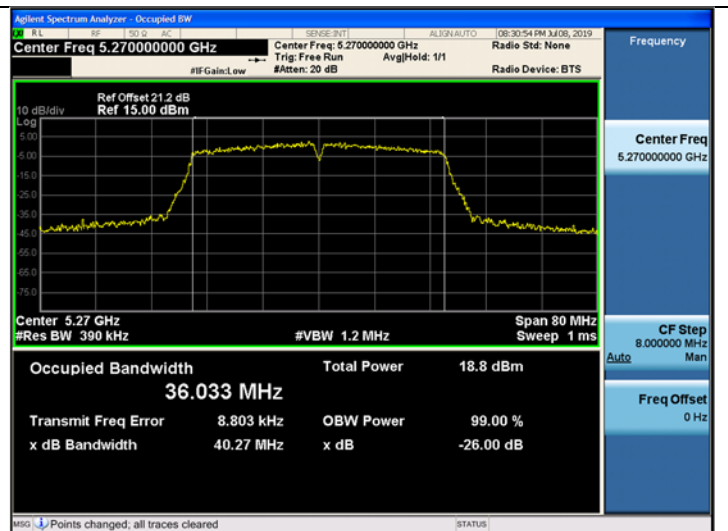
### Note:

In order to simplify the report, attached plots were only the most wide channel.

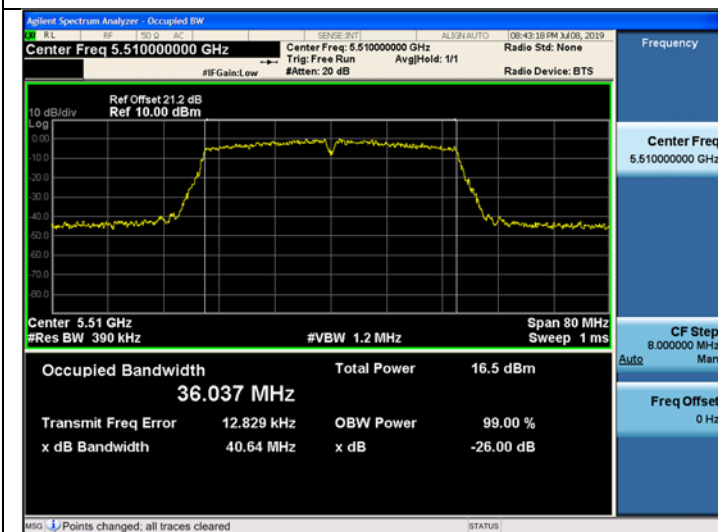
802.11n\_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)



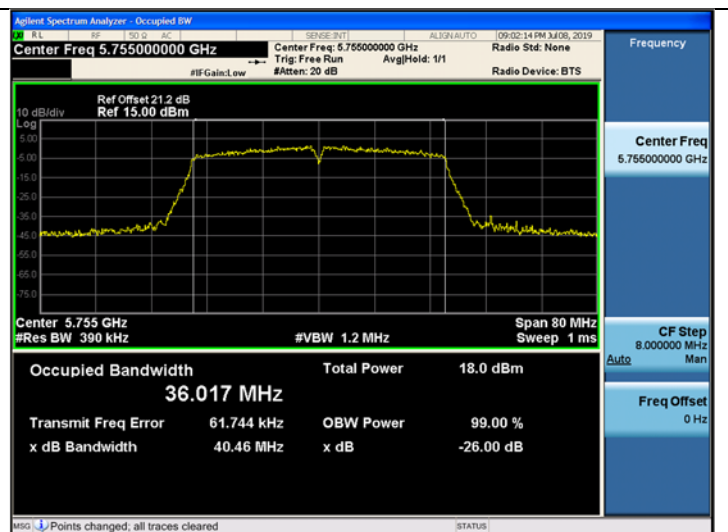
802.11n\_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11n\_HT40 UNII 2C BAND 26dB Bandwidth(CH 102)



802.11n\_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)



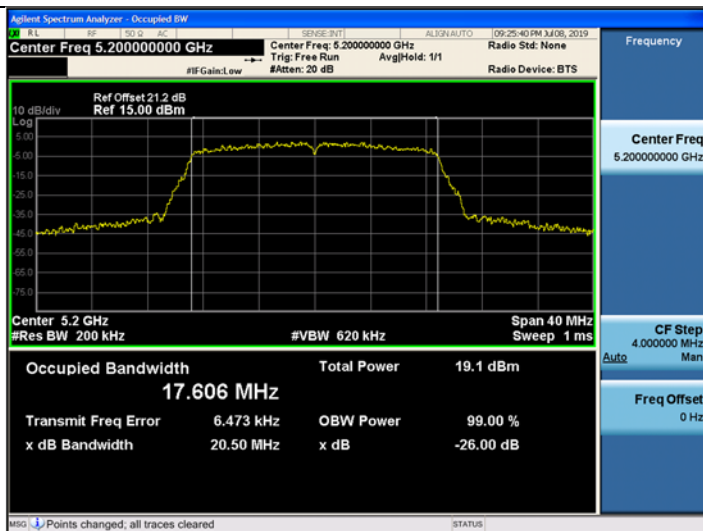


## Test Plots(802.11ac(VHT20))

### Note:

In order to simplify the report, attached plots were only the most wide channel.

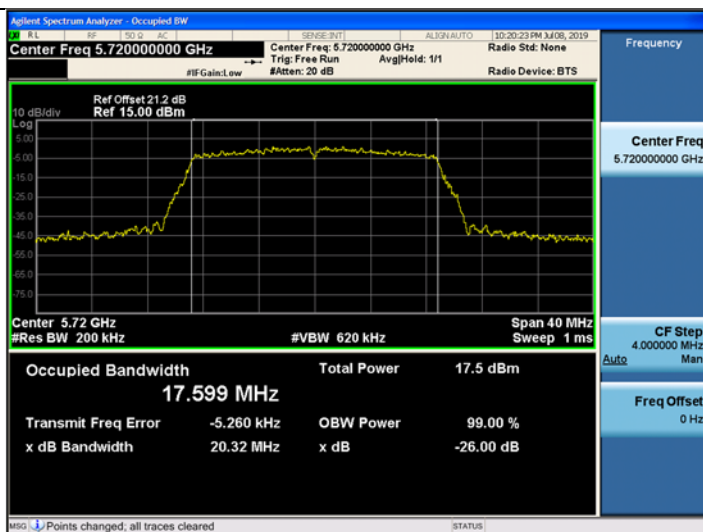
802.11ac\_VHT20 UNII 1 BAND 26dB Bandwidth(CH 40)



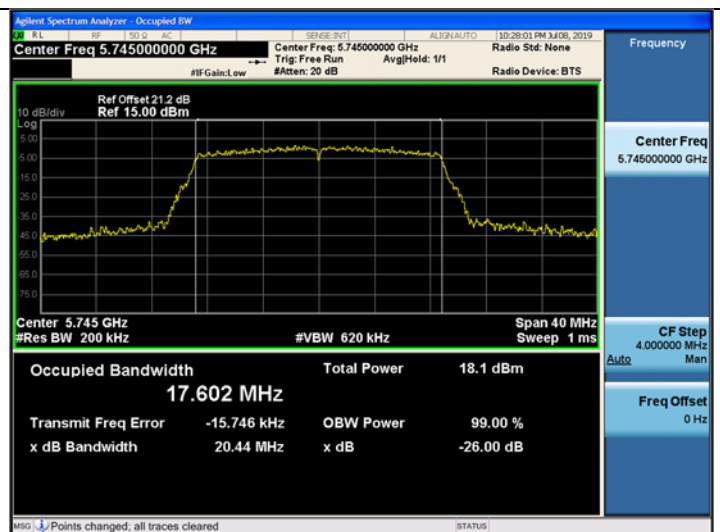
802.11ac\_VHT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11ac\_VHT20 UNII 2C BAND 26dB Bandwidth(CH 144)



802.11ac\_VHT20 UNII 3 BAND 26dB Bandwidth(CH 149)

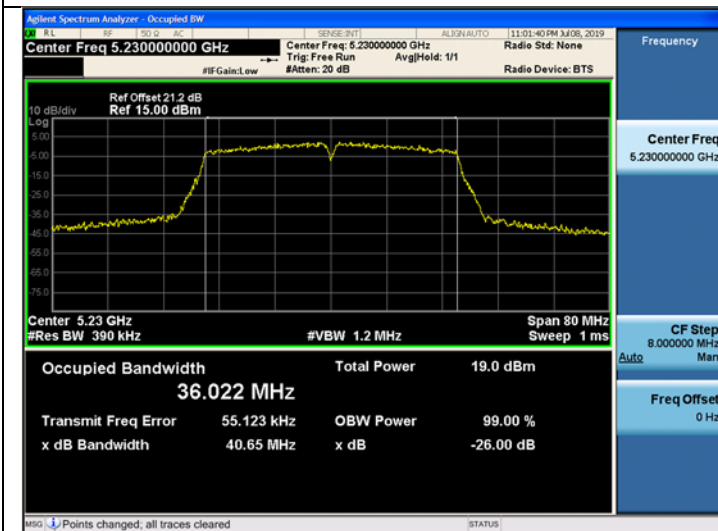


## Test Plots(802.11ac(VHT40))

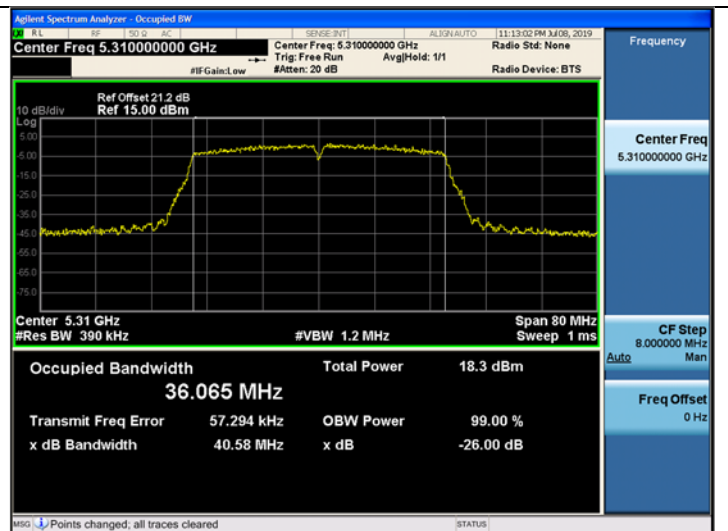
### Note:

In order to simplify the report, attached plots were only the most wide channel.

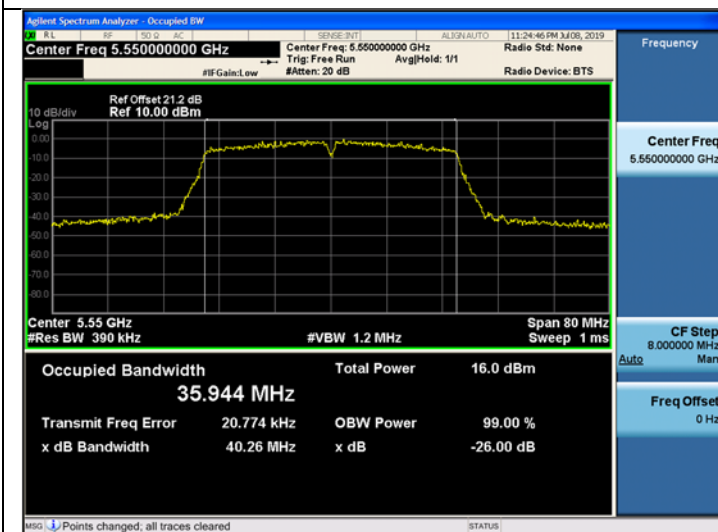
802.11ac\_VHT40 UNII 1 BAND 26dB Bandwidth(CH 46)



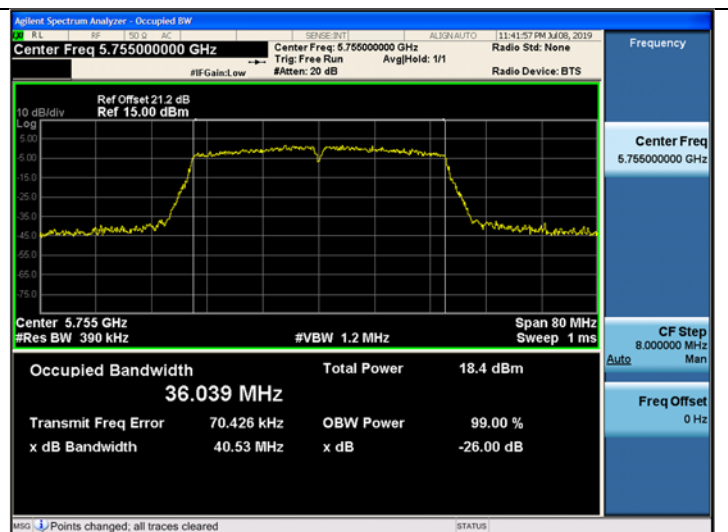
802.11ac\_VHT40 UNII 2A BAND 26dB Bandwidth (CH 62)



802.11ac\_VHT40 UNII 2C BAND 26dB Bandwidth(CH 110)



802.11ac\_VHT40 UNII 3 BAND 26dB Bandwidth (CH 151)

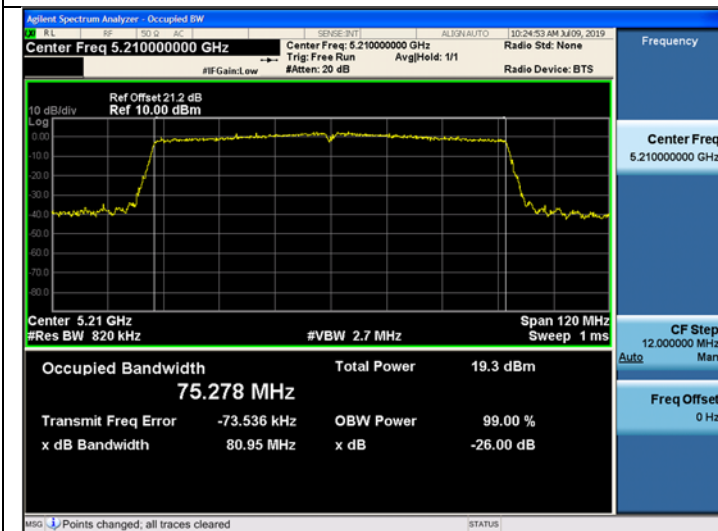


## Test Plots(802.11ac(VHT80))

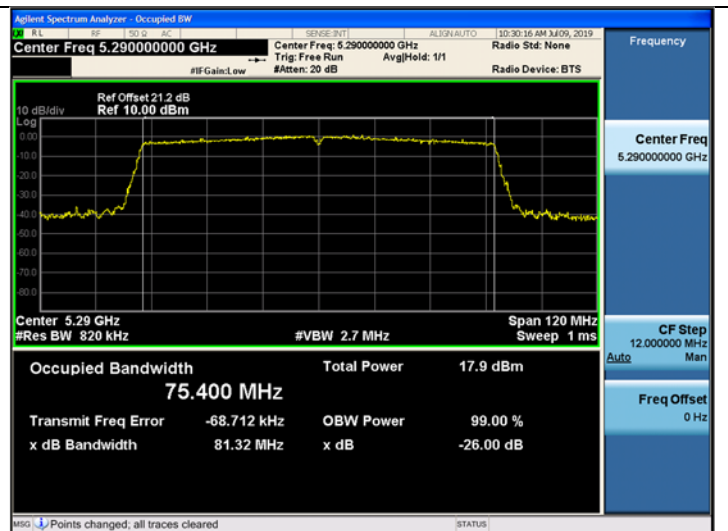
### Note:

In order to simplify the report, attached plots were only the most wide channel.

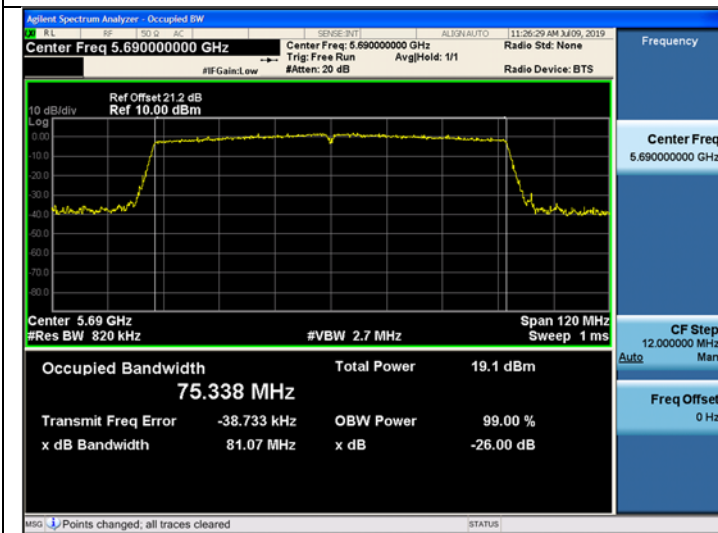
802.11ac\_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)



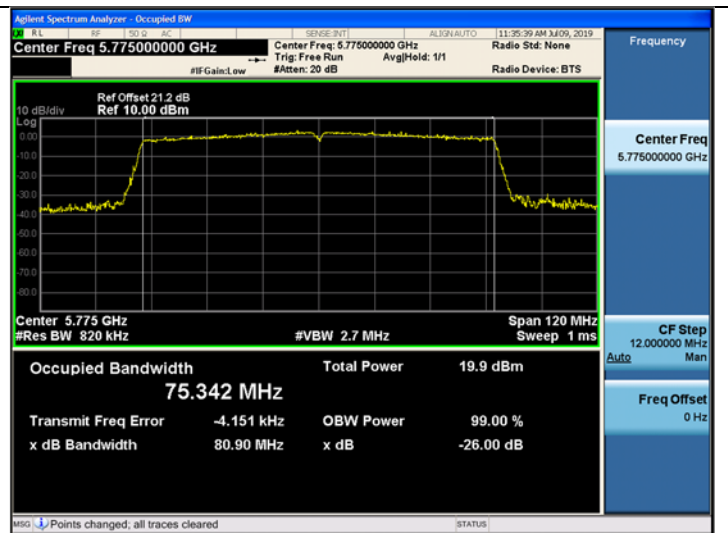
802.11ac\_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



802.11ac\_VHT80 UNII 2C BAND 26dB Bandwidth(CH 138)



802.11ac\_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)



## 10.2 6DB BANDWIDTH

### [ANT1]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.35	> 0.5	Pass
5785	157	16.37	> 0.5	Pass
5825	165	16.34	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.61	> 0.5	Pass
5785	157	17.59	> 0.5	Pass
5825	165	17.64	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.33	> 0.5	Pass
5795	159	36.36	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.63	> 0.5	Pass
5785	157	17.61	> 0.5	Pass
5825	165	17.58	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.33	> 0.5	Pass
5795	159	36.35	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.39	> 0.5	Pass

[ANT2]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.38	> 0.5	Pass
5785	157	16.36	> 0.5	Pass
5825	165	16.38	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.61	> 0.5	Pass
5785	157	17.62	> 0.5	Pass
5825	165	17.63	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.35	> 0.5	Pass
5795	159	36.37	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.62	> 0.5	Pass
5785	157	17.61	> 0.5	Pass
5825	165	17.62	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.31	> 0.5	Pass
5795	159	35.89	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.46	> 0.5	Pass