

FCC UNII REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.**Date of Issue:**
16 January 2020**Address:**
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea**Test Site/Location:**
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA**Report No.:** HCT-RF-2001-FC017**FCC ID:** A3LSMG988B**APPLICANT:** SAMSUNG Electronics Co., Ltd.**Model:** SM-G988B/DS**Additional Model:** SM-G988B**EUT Type:** Mobile Phone**Modulation type** OFDM**FCC Classification:** Unlicensed National Information Infrastructure(NII)**FCC Rule Part(s):** Part 15.407**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 Rules under normal use and maintenance.

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Manager of Telecommunication testing center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2001-FC017	16 January 2020	- First Approval Report

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

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

The above Test Report is the accredited test result by KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SM-G988B/DS	
Additional Model	SM-G988B	
EUT Type	Mobile Phone	
Power Supply	DC 3.86 V	
Battery Information	Model: EB-BG988ABY Type: Li-ion Battery	
Travel Adapter Information	Model : EP-TA800 Manufacture: SOLU-M	
Data Cable Information	Model : EP-DG980BBE Manufacture: RF Tehck	
Ear-jack Information	Model : YBD-19HS-026 Manufacture: ALMUS	
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 Specification	Antenna type: PIFA (Planar Inverted F Antenna) Peak Gain : Ant.1: UNII 1: 0.10 dBi / UNII 2A: -1.50 dBi / UNII 2C: -1.98 dBi / UNII 3: -2.26 dBi Ant.2: UNII 1: 0.78 dBi / UNII 2A: -0.01 dBi / UNII 2C: -0.16 dBi / UNII 3: -0.18 dBi	
Straddle channel	Supported	
TDWR Band	Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	November 18, 2019 ~ January 13, 2020	

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	O	O	O	O
802.11ac	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. This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna.

	5GHz WIFI		2.4GHz WIFI		Test case
	Ant1	Ant2	Ant1	Ant2	
2.4 GHz + 5 GHz RSDB Only	A			B	O
		A	B		O
	A		B		-
		A		B	-
2.4 GHz + 5 GHz RSDB & MIMO	A	A	B		-
	A	A		B	-
	A		B	B	-
		A	B	B	-
2.4 GHz + 5 GHz RSDB MIMO	A	A	A	A	O

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) f) (ii)

Directional gain =

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

Band	Ant Gain (dBi)		N _{ANT} / N _{SS}	Directional Gain (dBi)
UNII 1	ANT1	0.10	2 / 2	3.46
	ANT2	0.78		
UNII 2A	ANT1	-1.50	2 / 2	2.29
	ANT2	-0.01		
UNII 2C	ANT1	-1.98	2 / 2	1.99
	ANT2	-0.16		
UNII 3	ANT1	-2.26	2 / 2	1.85
	ANT2	-0.18		

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	17.74	0.059	16.89	0.049	20.34	0.108
	802.11n (HT20)	17.68	0.059	16.93	0.049	20.33	0.108
	802.11n (HT40)	16.94	0.049	15.97	0.040	19.49	0.089
	802.11ac (VHT20)	17.72	0.059	17.14	0.052	20.45	0.111
	802.11ac (VHT40)	16.86	0.049	15.99	0.040	19.46	0.088
	802.11ac (VHT80)	13.81	0.024	12.95	0.020	16.41	0.044
UNII2A	802.11a	17.27	0.053	16.15	0.041	19.75	0.094
	802.11n (HT20)	17.26	0.053	16.22	0.042	19.78	0.095
	802.11n (HT40)	16.63	0.046	15.40	0.035	19.07	0.081
	802.11ac (VHT20)	17.30	0.054	16.23	0.042	19.81	0.096
	802.11ac (VHT40)	16.52	0.045	15.37	0.034	19.00	0.079
	802.11ac (VHT80)	14.38	0.027	13.23	0.021	16.85	0.048
UNII2C	802.11a	17.79	0.060	17.05	0.051	20.44	0.111
	802.11n (HT20)	17.71	0.059	17.07	0.051	20.41	0.110
	802.11n (HT40)	16.88	0.049	16.26	0.042	19.59	0.091
	802.11ac (VHT20)	17.76	0.060	17.27	0.053	20.54	0.113
	802.11ac (VHT40)	16.87	0.049	16.22	0.042	19.57	0.091
	802.11ac (VHT80)	15.87	0.039	15.15	0.033	18.53	0.071
UNII3	802.11a	17.78	0.060	16.82	0.048	20.33	0.108
	802.11n (HT20)	17.75	0.060	16.72	0.047	20.27	0.106
	802.11n (HT40)	16.18	0.041	15.28	0.034	18.76	0.075
	802.11ac (VHT20)	17.79	0.060	16.82	0.048	20.35	0.108
	802.11ac (VHT40)	16.18	0.042	15.21	0.033	18.73	0.075
	802.11ac (VHT80)	15.98	0.040	14.89	0.031	18.48	0.070

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.

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).

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."

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of §15.203, §15.407

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.

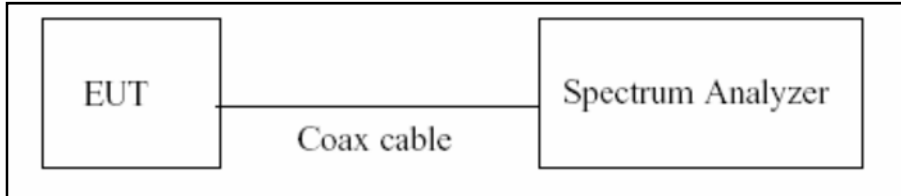
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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.

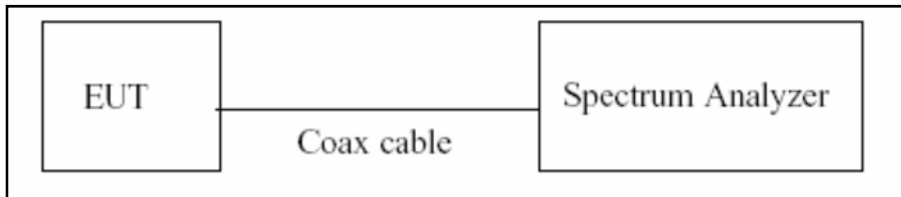
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = $T_{\text{on}} / T_{\text{total}}$ and Duty Cycle Factor = $10\log(1/\text{Duty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

8.2. 6dB Bandwidth & 26dB 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.

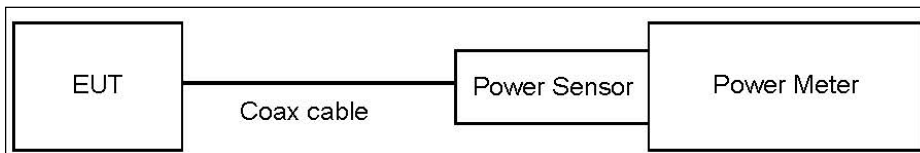
8.3. Output Power Measurement

Limit

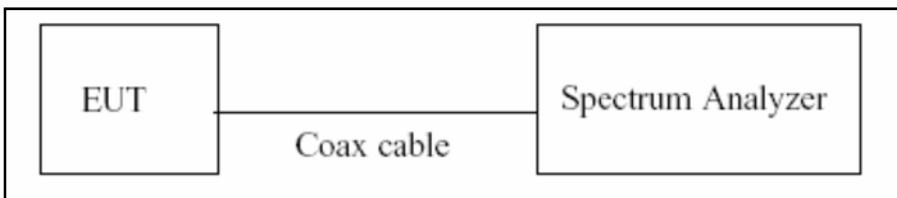
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

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 x span/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 + Cable loss

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

Band	Loss(dB)
UNII 1	10.77
UNII 2A	10.77
UNII 2C	10.77
UNII 3	10.77

[Note]

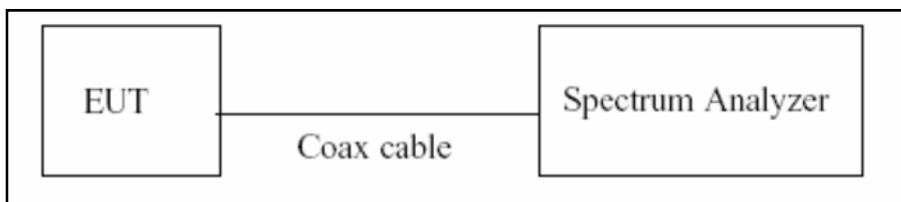
1. Ant 1 : Exten Cable loss is 0.7 dB.

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 x 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(10 dB) + Cable loss

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

Band	Loss(dB)
UNII 1	10.77
UNII 2A	10.77
UNII 2C	10.77
UNII 3	10.77

[Note]

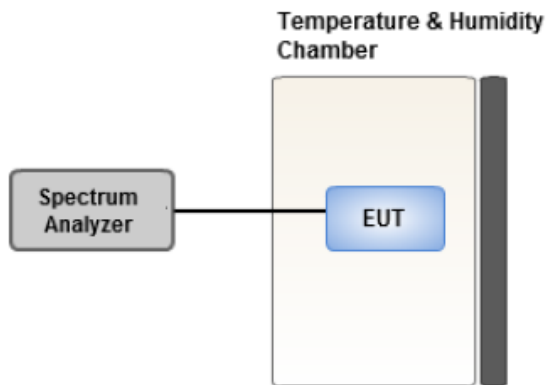
1. Ant 1 : Exten Cable loss is 0.7 dB.

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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)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

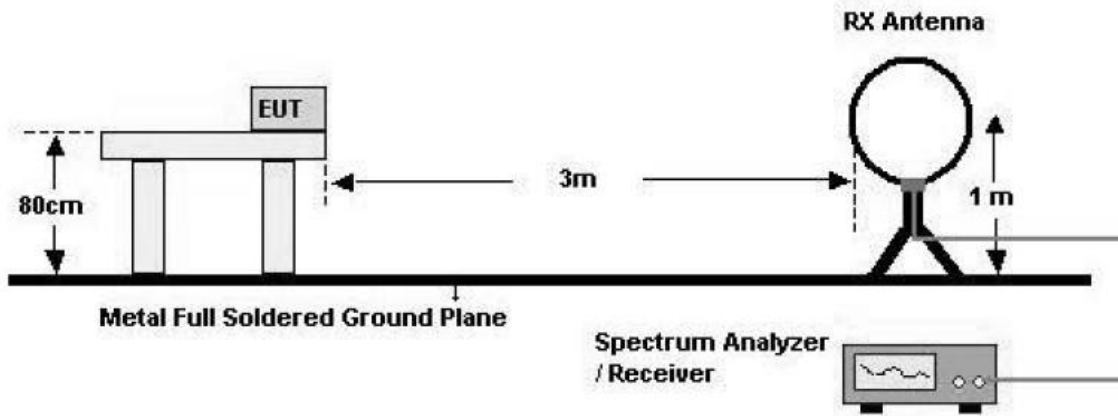
Limit

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.

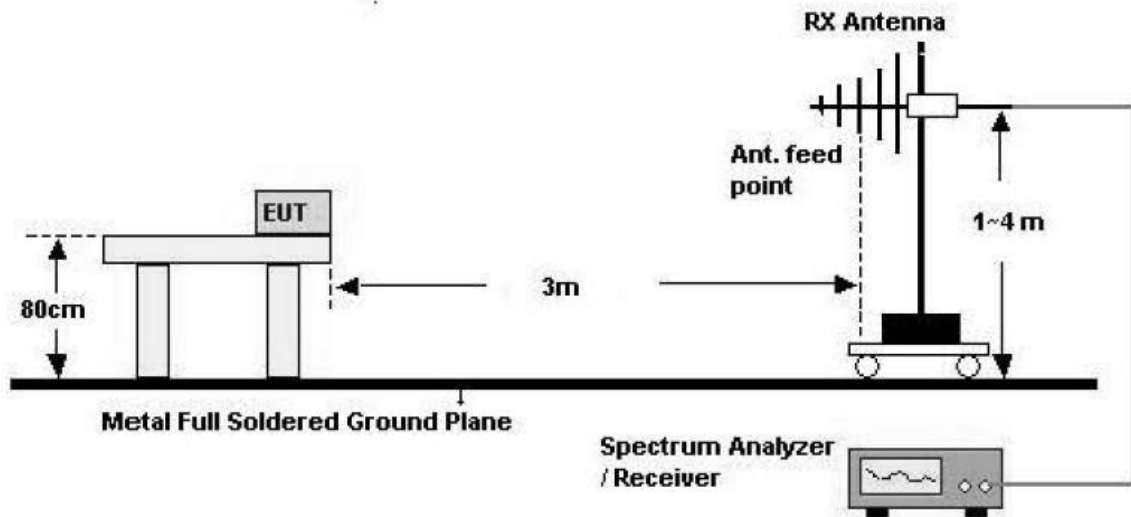
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

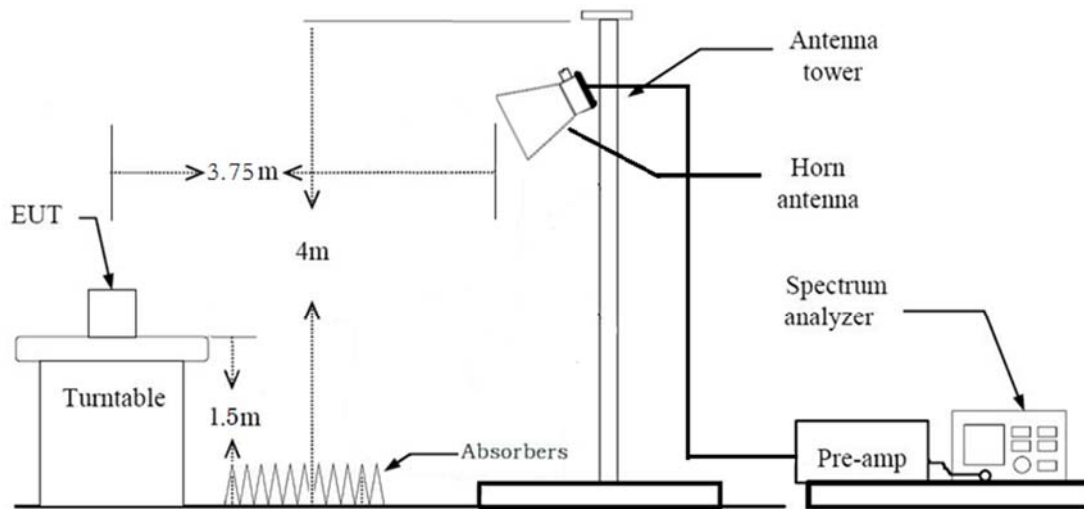
Below 30 MHz



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($0.009 \text{ MHz} - 0.490 \text{ MHz}$) = $40\log(3 \text{ m}/300 \text{ m}) = - 80 \text{ dB}$
Measurement Distance : 3 m
7. Distance Correction Factor($0.490 \text{ MHz} - 30 \text{ MHz}$) = $40\log(3 \text{ m}/30 \text{ m}) = - 40 \text{ dB}$
Measurement Distance : 3 m
8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 9 kHz
 - VBW $\geq 3 \times \text{RBW}$
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
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.

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)
7. 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.

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 = $20\log(\text{test distance} / \text{specific distance})$ (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 = $20\log(\text{test distance} / \text{specific distance})$ (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. 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)

The actual setting value of VBW

Mode	Worst Data rate (Mbps)	Duty Cycle	Duty Cycle Factor (dB)	The actual setting value of VBW (Hz)
802.11a	6	0.936	0.286	1000
802.11n(HT20)	MCS 0	0.932	0.306	1000
802.11n(HT40)	MCS 0	0.870	0.605	2000
802.11ac(VHT20)	MCS 0	0.930	0.313	1000
802.11ac(VHT40)	MCS 0	0.873	0.592	2000
802.11ac(VHT80)	MCS 0	0.857	0.673	2000

8.8. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
 - Worstcase : Stand alone
2. EUT Axis
 - Radiated Spurious Emissions : Y,Z
 - Radiated Restricted Band Edge : Y,Z
3. All datarate of operation were investigated and the worst case datarate results are reported
 - Mode : Ant1(SISO), Ant2(SISO), Ant1+Ant2(SDM), Ant1+Ant2(CDD)
 - Worstcase : Ant1+Ant2(CDD)
4. 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
5. SM-G988B/DS, SM-G988B were tested and the worst case results are reported.
(Worst case : SM-G988B/DS)

Radiated test(DBS)

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
 - Worstcase : Stand alone
2. EUT Axis
 - Radiated Spurious Emissions : Y
3. The following tables show the worst case configurations determined during testing.

Description	2.4 GHz Emission	5 GHz Emission
Antenna	Ant 1, Ant 2, Ant ALL	Ant 1, Ant 2, Ant ALL
Channel	1, 11	165
Data Rate	1 Mbps, 6.5 Mbps (MCS 0)	6.5 Mbps (MCS 0)
Mode	802.11b, 802.11ax	802.11ax

4. SM-G988B/DS, SM-G988B were tested and the worst case results are reported.
(Worst case : SM-G988B/DS)
5. Please refer to the SM-G988BDS [UNII]802.11ax Test Report.

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.

- Mode : Stand alone + External accessories(Earphone, etc)+Travel Adapter,
Stand alone + Travel Adapter

- Worstcase : Stand alone + Travel Adapter

2. SM-G988B/DS, SM-G988B were tested and the worst case results are reported.

(Worst case : SM-G988B/DS)

Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported

2. SM-G988B/DS, SM-G988B were tested and the worst case results are reported.

(Worst case : SM-G988B/DS)

9. SUMMARY OF TEST RESULTS

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 ₁₀ (BW) dBm (5250-5350 MHz) < 250 mW or 11+10 log log ₁₀ (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

10. TEST RESULT

10.1 DUTY CYCLE

Mode	Data Rate (Mbps)	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	1.429	1.526	0.936	0.286
	9	0.961	1.058	0.908	0.418
	12	0.724	0.823	0.879	0.559
	18	0.493	0.591	0.834	0.788
	24	0.372	0.470	0.792	1.015
	36	0.256	0.355	0.721	1.420
	48	0.196	0.294	0.667	1.761
	54	0.180	0.278	0.646	1.897

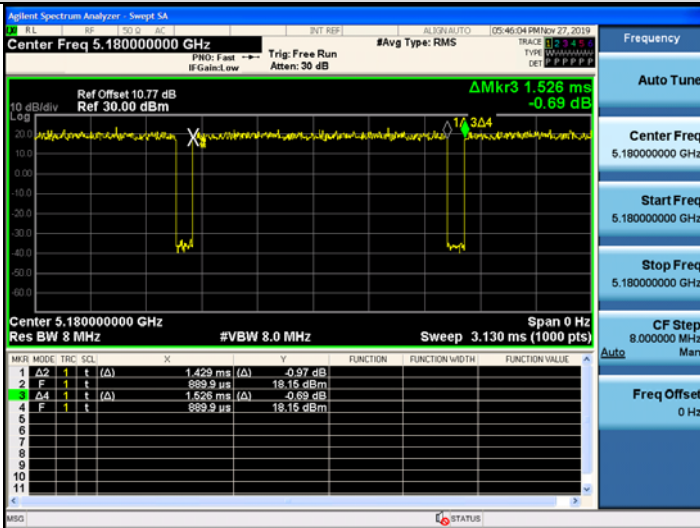
Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.336	1.433	0.932	0.306
	1	0.689	0.788	0.875	0.579
	2	0.471	0.569	0.827	0.823
	3	0.364	0.463	0.786	1.045
	4	0.257	0.355	0.723	1.410
	5	0.200	0.299	0.670	1.738
	6	0.184	0.283	0.652	1.860
	7	0.168	0.266	0.630	2.006
802.11n (HT40)	0	0.664	0.763	0.870	0.605
	1	0.352	0.451	0.780	1.078
	2	0.248	0.346	0.716	1.451
	3	0.196	0.295	0.666	1.768
	4	0.144	0.243	0.594	2.262
	5	0.116	0.215	0.539	2.681
	6	0.108	0.206	0.522	2.820
	7	0.100	0.199	0.503	2.988

Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.342	1.442	0.930	0.313
	1	0.692	0.790	0.876	0.577
	2	0.476	0.575	0.828	0.818
	3	0.368	0.467	0.789	1.030
	4	0.260	0.359	0.724	1.403
	5	0.204	0.303	0.673	1.719
	6	0.188	0.287	0.657	1.822
	7	0.172	0.271	0.635	1.972
	8	0.152	0.251	0.606	2.174
802.11ac (VHT40)	0	0.669	0.766	0.873	0.592
	1	0.356	0.454	0.783	1.060
	2	0.252	0.350	0.719	1.432
	3	0.200	0.299	0.668	1.749
	4	0.148	0.247	0.601	2.212
	5	0.120	0.219	0.549	2.602
	6	0.112	0.211	0.533	2.734
	7	0.104	0.203	0.513	2.902
	8	0.096	0.195	0.494	3.064
	9	0.088	0.187	0.471	3.273
802.11ac (VHT80)	0	0.595	0.695	0.857	0.673
	1	0.320	0.420	0.762	1.181
	2	0.228	0.327	0.697	1.567
	3	0.180	0.279	0.645	1.907
	4	0.136	0.236	0.577	2.390
	5	0.112	0.212	0.530	2.757
	6	0.104	0.203	0.512	2.903
	7	0.096	0.196	0.491	3.086
	8	0.088	0.187	0.471	3.274
	9	0.084	0.183	0.457	3.398

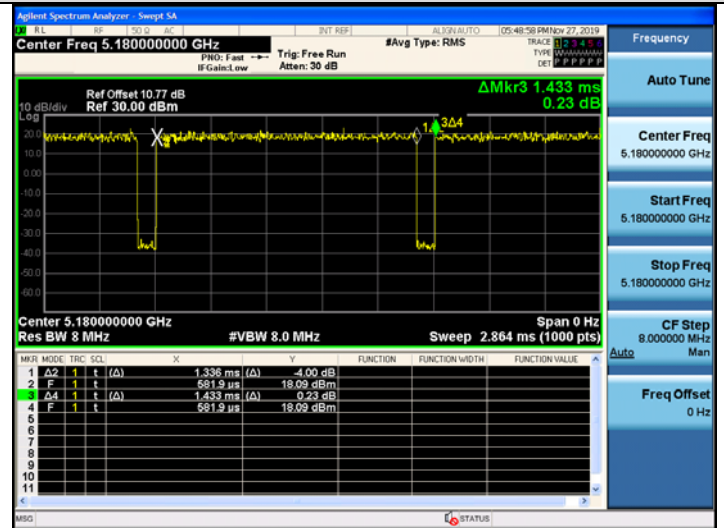
Note:

In order to simplify the report, attached plots were only lowest datarate.

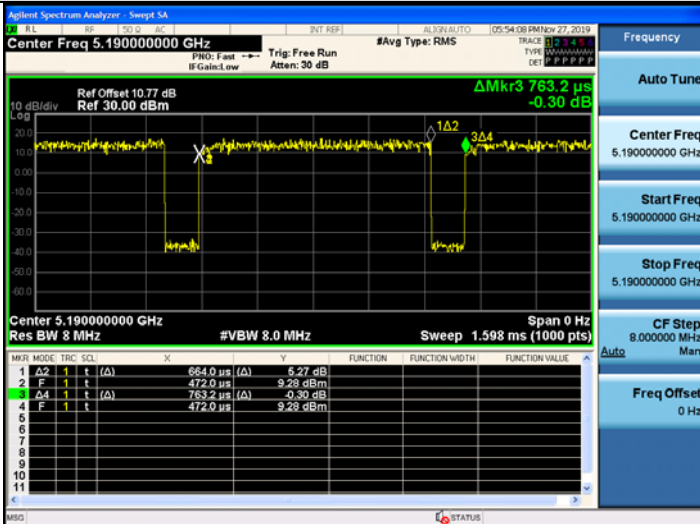
802.11a



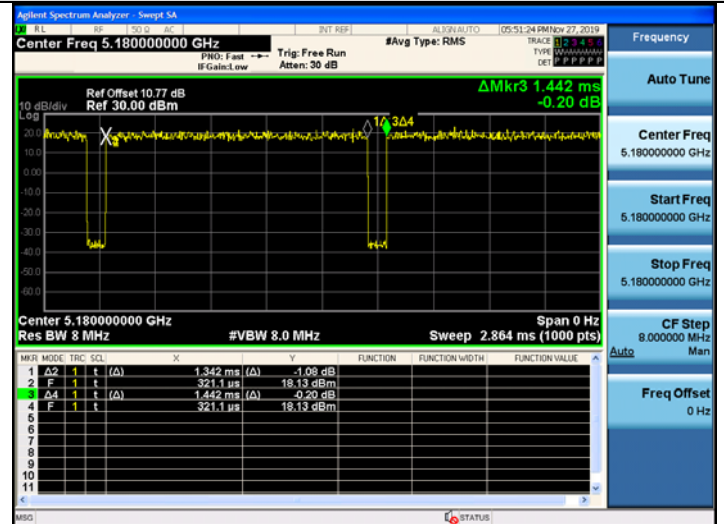
802.11n(HT20)



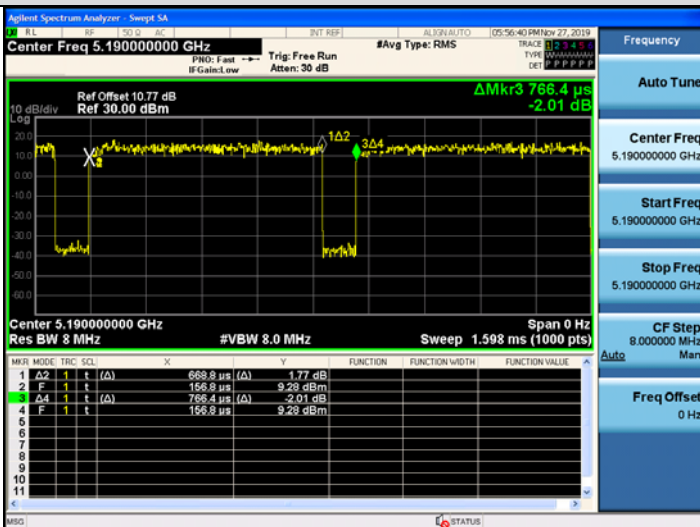
802.11n(HT40)



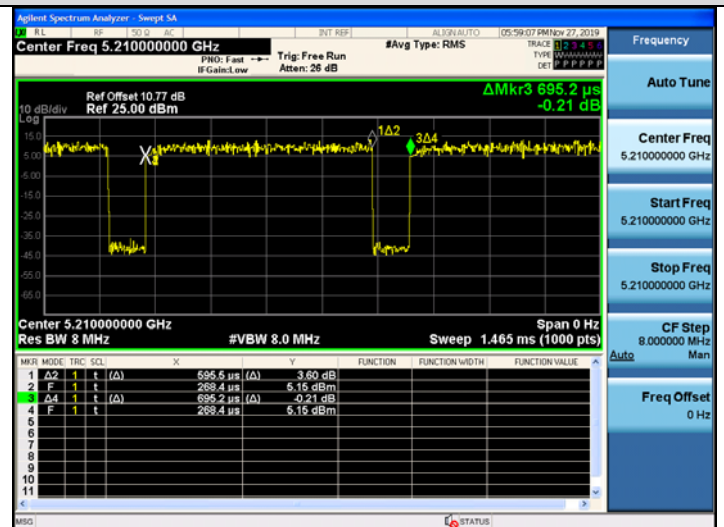
802.11ac(VHT20)



802.11ac(VHT40)



802.11ac(VHT80)



10.2 26dB BANDWIDTH

Straddle channel data in the table below are for reporting purposes only.

Straddle channel data were added in section 10.7.1.

[ANT1]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.17	16.714
5200	40	21.46	16.748
5240	48	21.38	16.731
5260	52	21.17	16.767
5300	60	21.39	16.781
5320	64	21.20	16.769
5500	100	21.39	16.821
5600	120	21.69	16.855
5720	144	21.56	16.784
5745	149	21.95	16.851
5785	157	23.73	16.865
5825	165	24.84	16.919

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.53	17.886
5200	40	21.68	17.876
5240	48	21.67	17.951
5260	52	21.69	17.908
5300	60	21.51	17.894
5320	64	21.59	17.892
5500	100	21.43	17.879
5600	120	22.17	17.946
5720	144	24.50	17.946
5745	149	23.87	18.017
5785	157	27.53	17.978
5825	165	27.13	18.029

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.95	36.305
5230	46	39.86	36.304
5270	54	39.72	36.272
5310	62	39.77	36.268
5510	102	39.85	36.305
5590	118	39.90	36.310
5710	142	39.85	36.333
5755	151	39.98	36.335
5795	159	39.88	36.256

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.53	17.886
5200	40	21.54	17.908
5240	48	21.44	17.908
5260	52	21.57	17.854
5300	60	21.67	17.874
5320	64	21.45	17.900
5500	100	21.45	17.910
5600	120	22.10	17.973
5720	144	22.67	17.936
5745	149	23.86	18.013
5785	157	22.72	18.038
5825	165	27.00	18.038

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.67	36.300
5230	46	39.69	36.295
5270	54	39.71	36.251
5310	62	39.93	36.304
5510	102	39.72	36.276
5590	118	39.75	36.361
5710	142	40.17	36.349
5755	151	39.64	36.325
5795	159	39.67	36.246

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.66	75.717
5290	58	81.52	75.677
5530	106	81.56	75.732
5610	122	81.54	75.825
5690	138	81.11	75.809
5775	155	81.62	75.811

[ANT2]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.05	16.770
5200	40	21.32	16.777
5240	48	21.35	16.814
5260	52	21.14	16.798
5300	60	21.21	16.769
5320	64	21.17	16.751
5500	100	21.73	16.822
5600	120	24.75	16.934
5720	144	26.91	17.080
5745	149	31.39	17.498
5785	157	32.49	17.785
5825	165	32.88	18.288

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.63	17.911
5200	40	21.60	17.920
5240	48	21.49	17.896
5260	52	21.77	17.897
5300	60	21.47	17.942
5320	64	21.58	17.902
5500	100	21.57	17.921
5600	120	30.91	18.079
5720	144	27.56	18.066
5745	149	37.85	18.407
5785	157	35.30	18.789
5825	165	37.46	19.506

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.65	36.282
5230	46	39.61	36.312
5270	54	40.07	36.279
5310	62	40.01	36.277
5510	102	39.69	36.290
5590	118	55.04	36.407
5710	142	58.12	36.407
5755	151	65.53	36.457
5795	159	65.71	36.342

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.57	17.904
5200	40	21.69	17.913
5240	48	21.48	17.903
5260	52	21.53	17.938
5300	60	21.64	17.917
5320	64	21.46	17.894
5500	100	21.28	17.923
5600	120	27.20	18.066
5720	144	29.33	18.262
5745	149	32.57	18.482
5785	157	35.21	18.774
5825	165	38.67	20.043

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.22	36.267
5230	46	39.82	36.321
5270	54	39.81	36.363
5310	62	39.88	36.323
5510	102	39.58	36.240
5590	118	39.82	36.368
5710	142	47.86	36.450
5755	151	48.56	36.412
5795	159	50.68	36.338

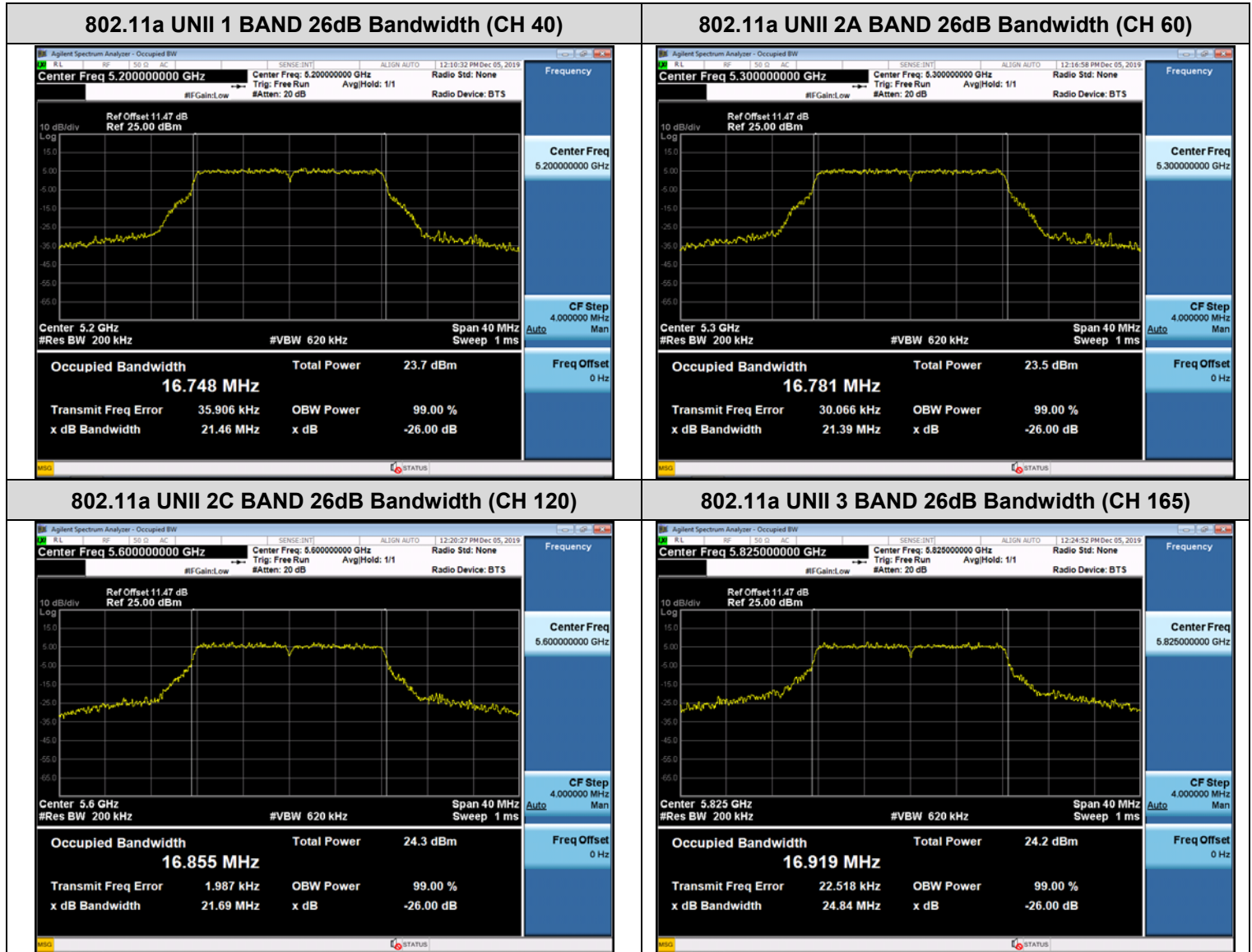
802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.56	75.717
5290	58	81.84	75.687
5530	106	81.45	75.675
5610	122	86.90	75.773
5690	138	81.64	75.728
5775	155	91.79	75.849

[ANT1]

☐ Test Plots(802.11a)

Note:

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

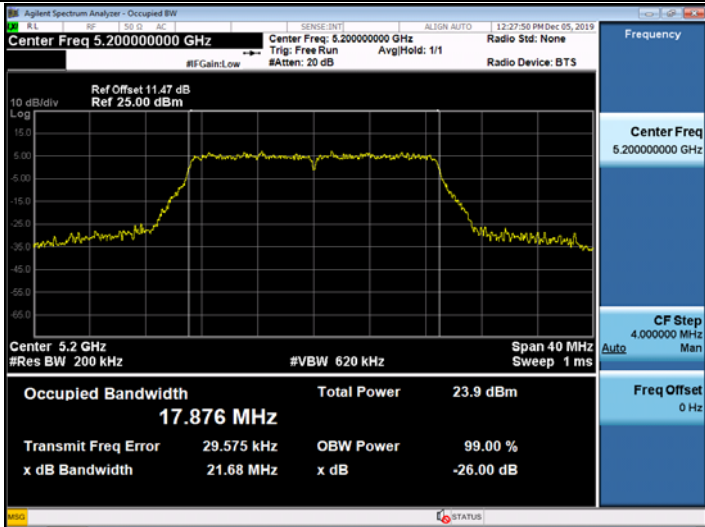


□ Test Plots(802.11n(HT20))

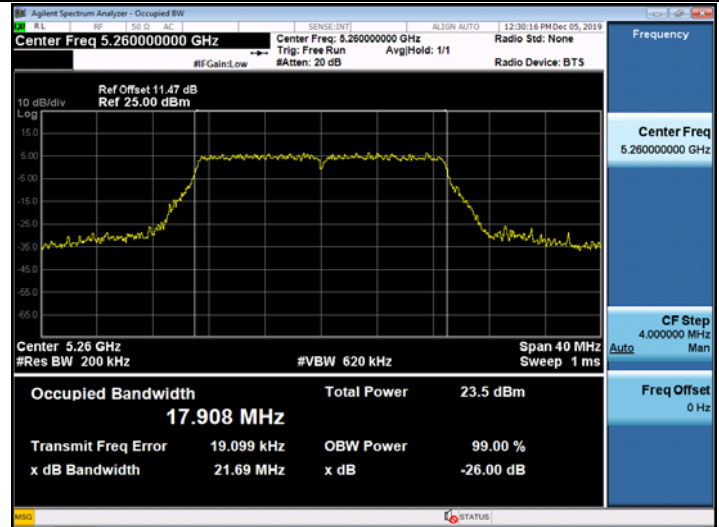
Note:

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

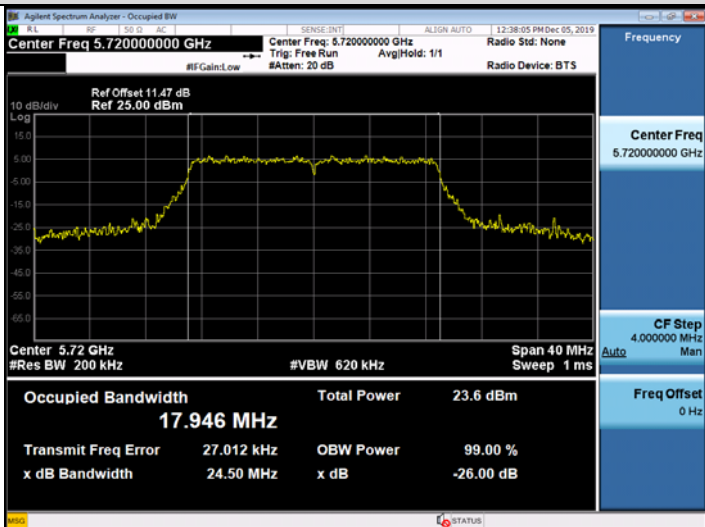
802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 40)



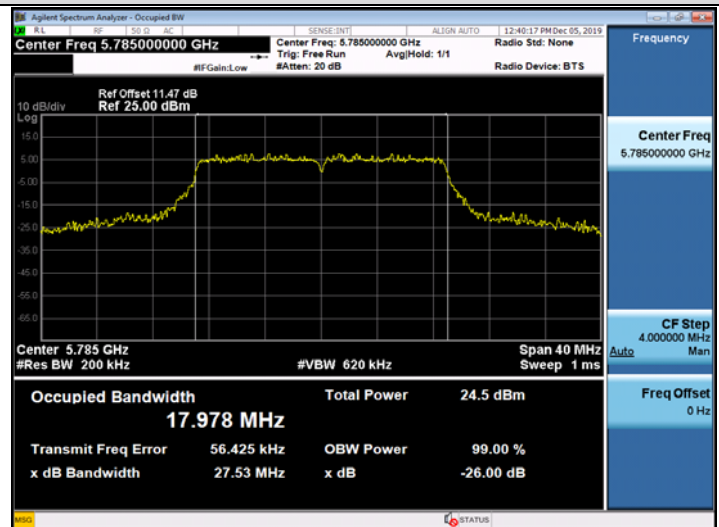
802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 52)



802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 144)



802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 157)

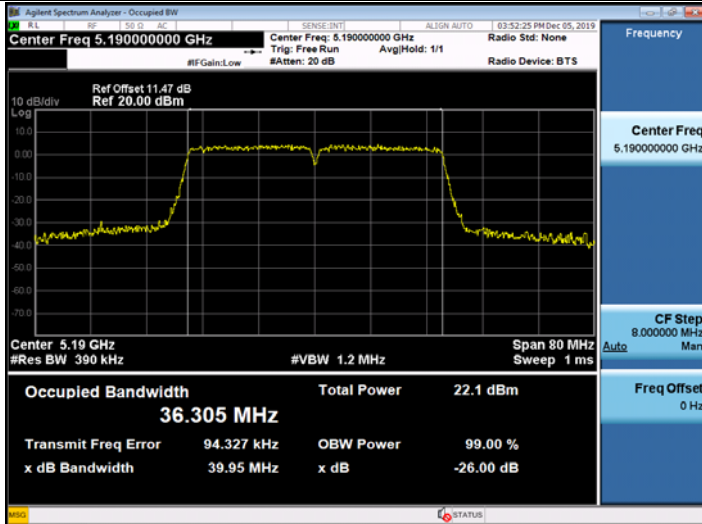


☐ Test Plots(802.11n(HT40))

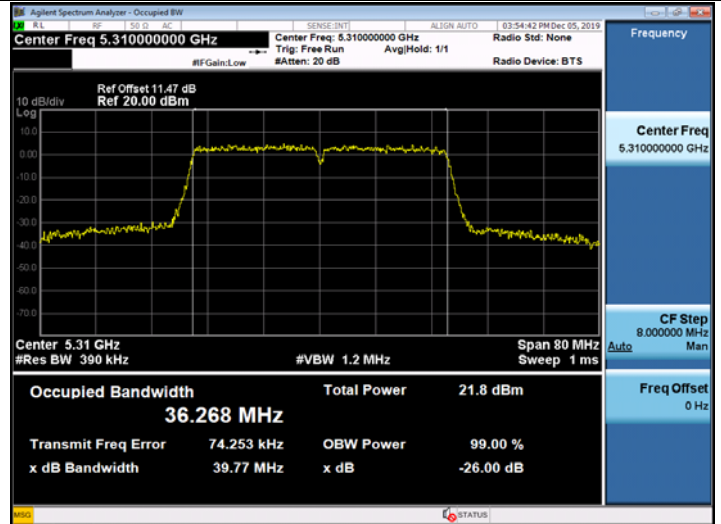
Note:

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

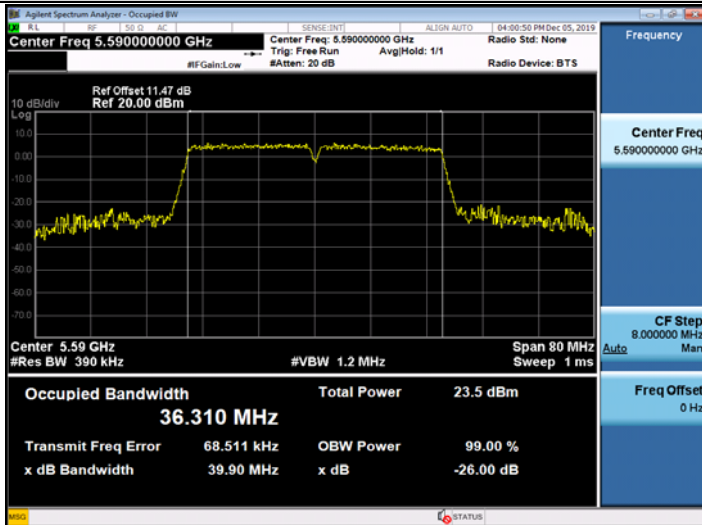
802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 38)



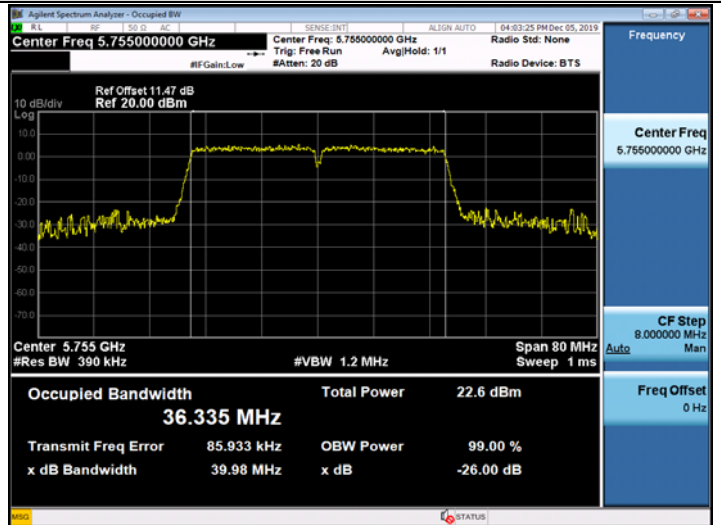
802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 62)



802.11n_HT40 UNII 2C BAND 26dB Bandwidth(CH 118)



802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)

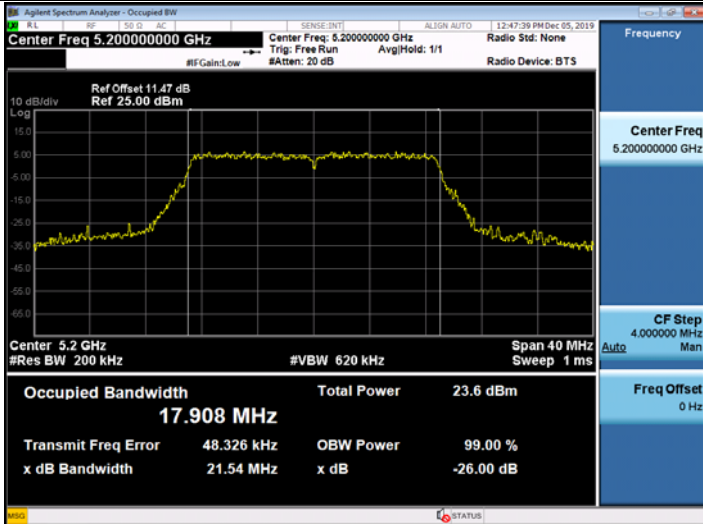


☐ Test Plots(802.11ac(VHT20))

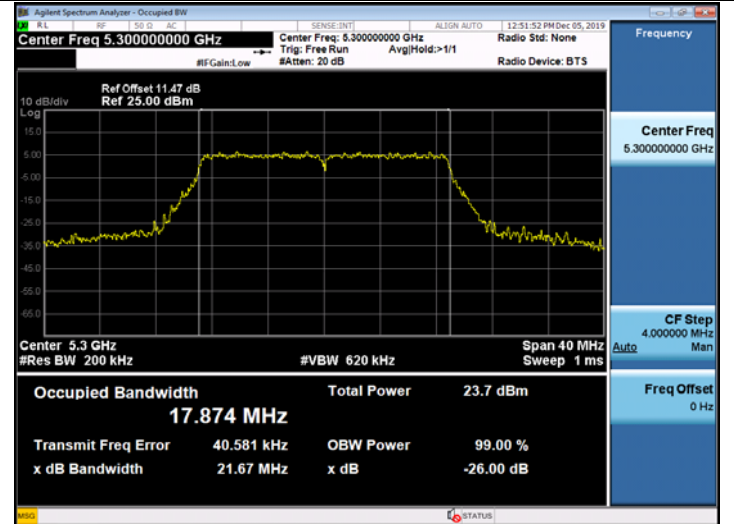
Note:

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

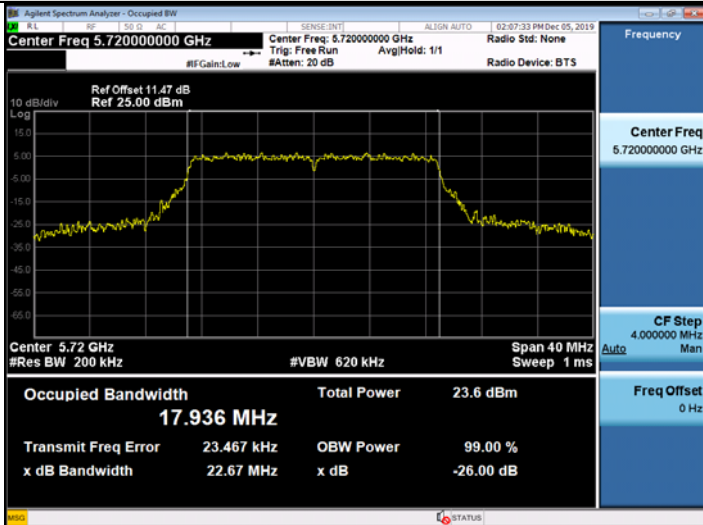
802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 40)



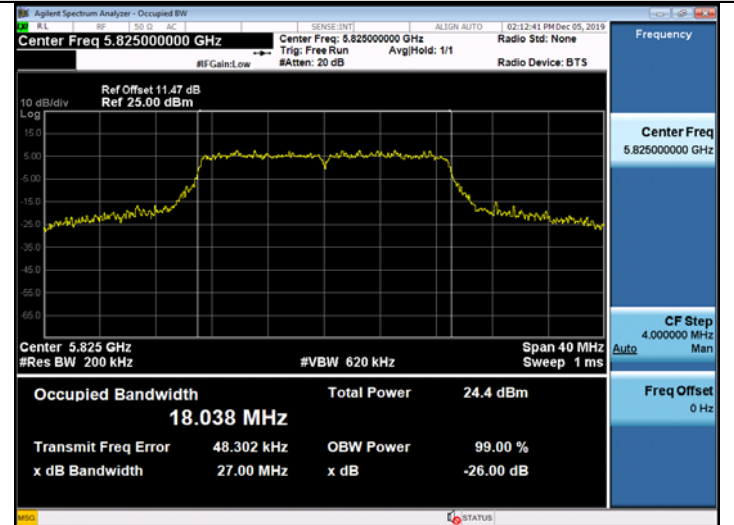
802.11ac_VHT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 144)



802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)

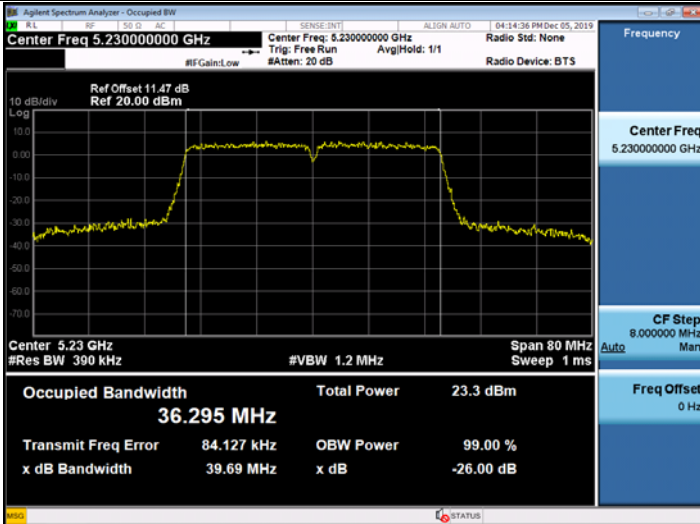


☐ Test Plots(802.11ac(VHT40))

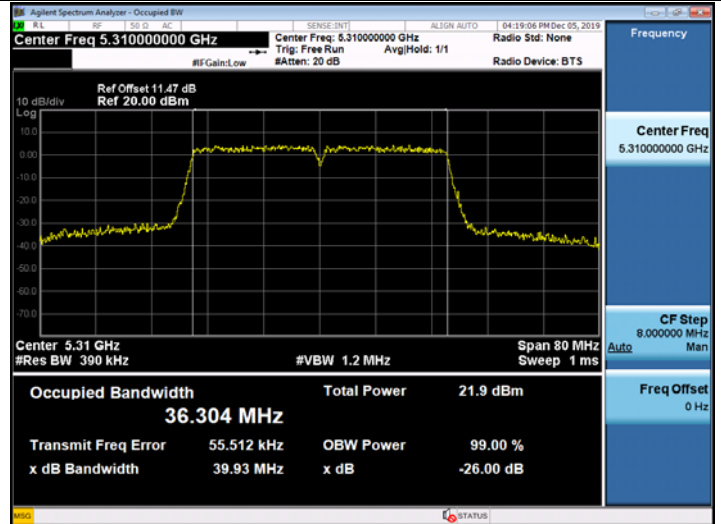
Note:

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

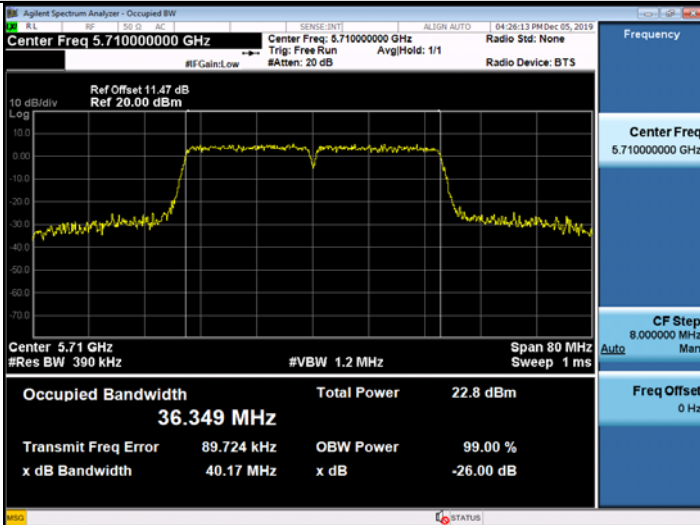
802.11ac_VHT40 UNII 1 BAND 26dB Bandwidth(CH 46)



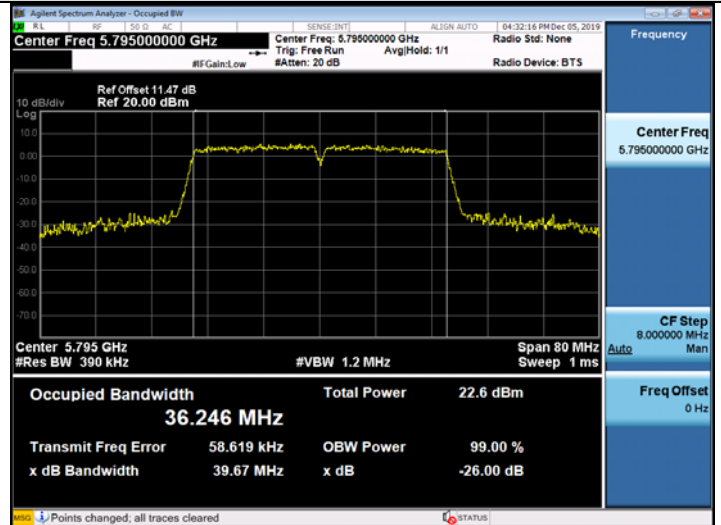
802.11ac_VHT40 UNII 2A BAND 26dB Bandwidth (CH 62)



802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 142)



802.11ac_VHT40 UNII 3 BAND 26dB Bandwidth (CH 159)

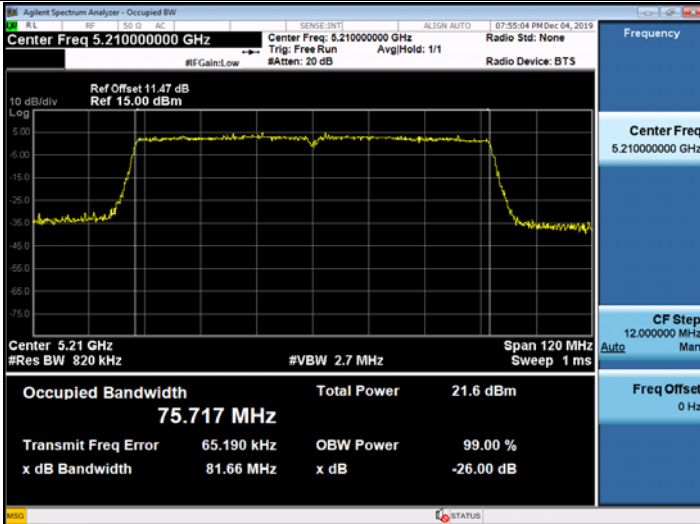


☐ Test Plots(802.11ac(VHT80))

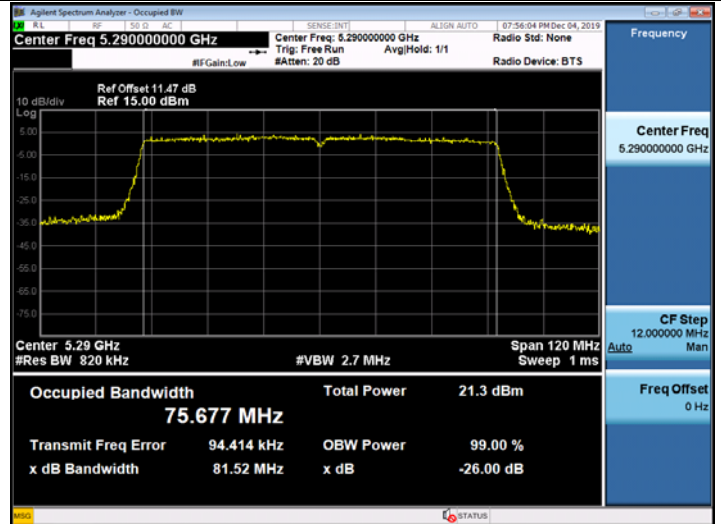
Note:

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

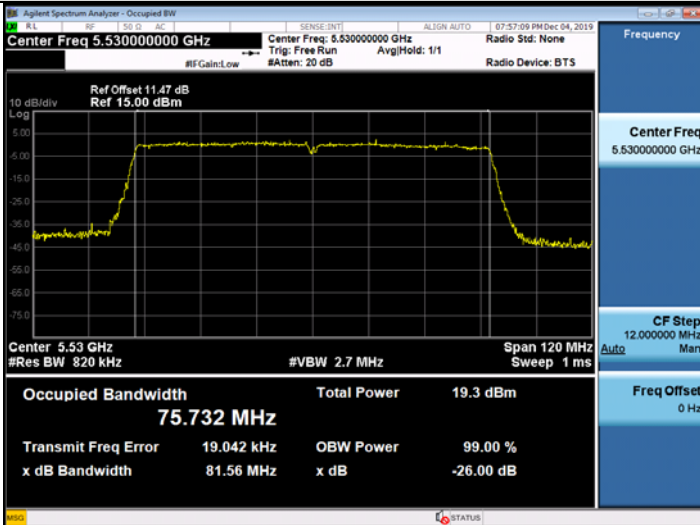
802.11ac_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)



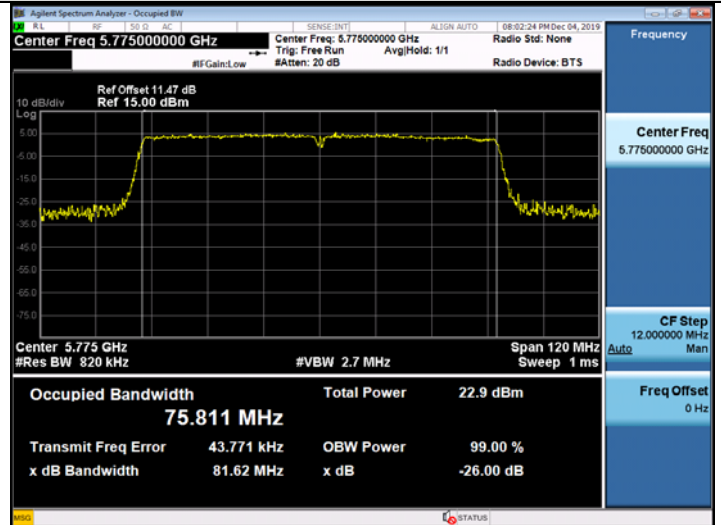
802.11ac_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



802.11ac_VHT80 UNII 2C BAND 26dB Bandwidth(CH 106)



802.11ac_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)

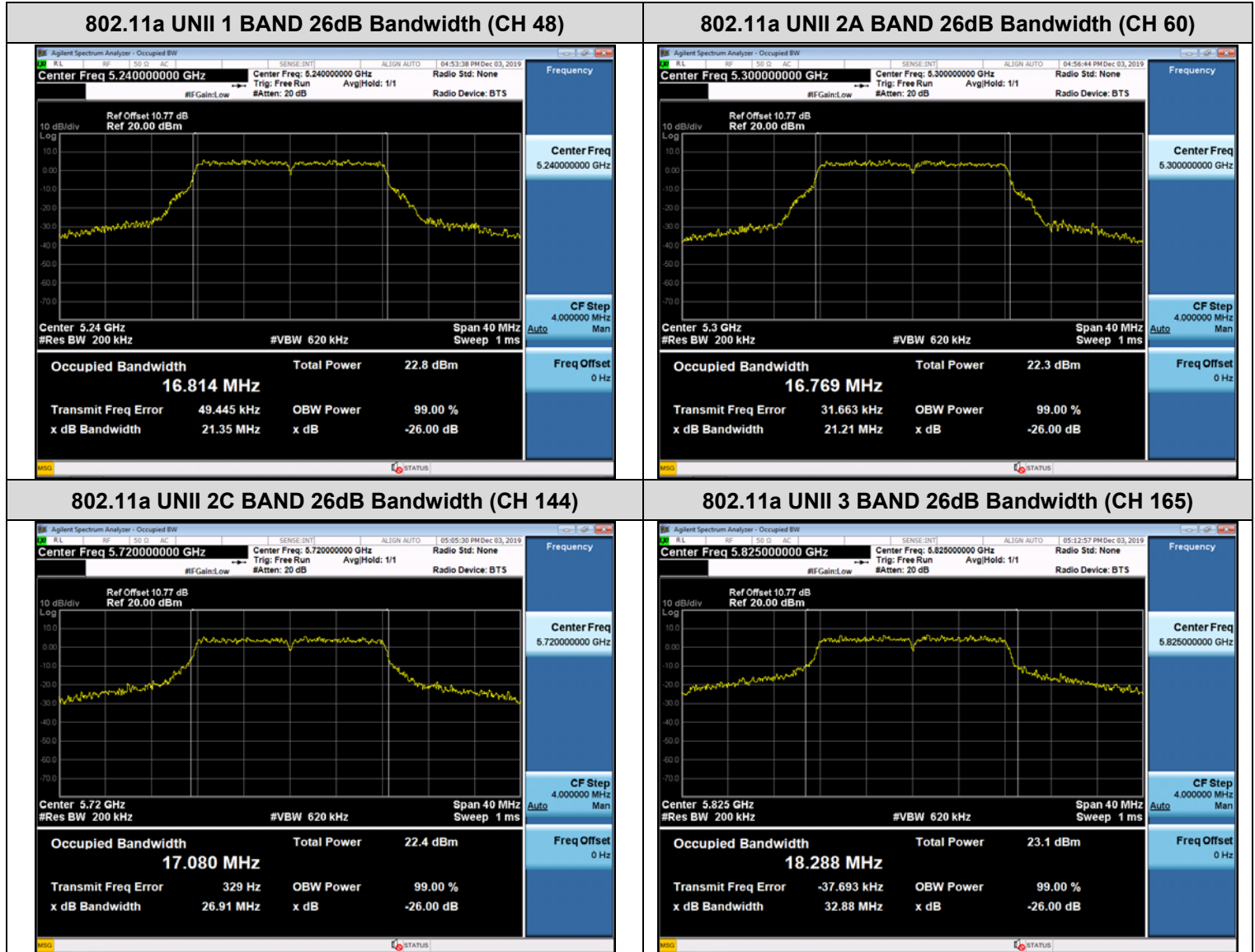


[ANT2]

☐ Test Plots(802.11a)

Note:

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

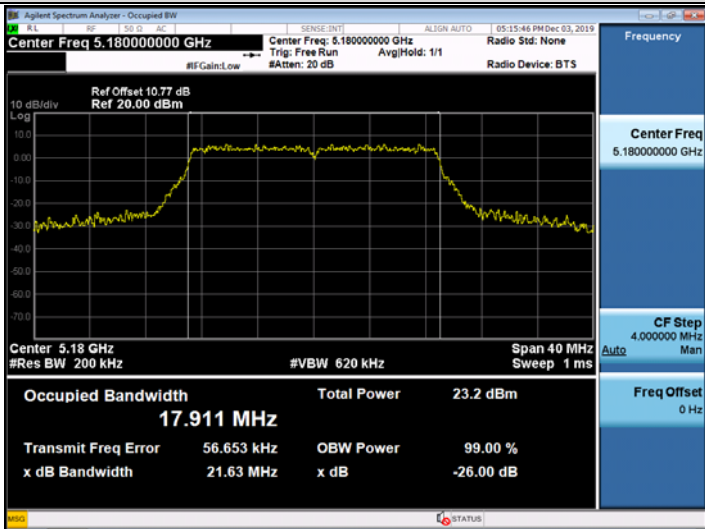


□ Test Plots(802.11n(HT20))

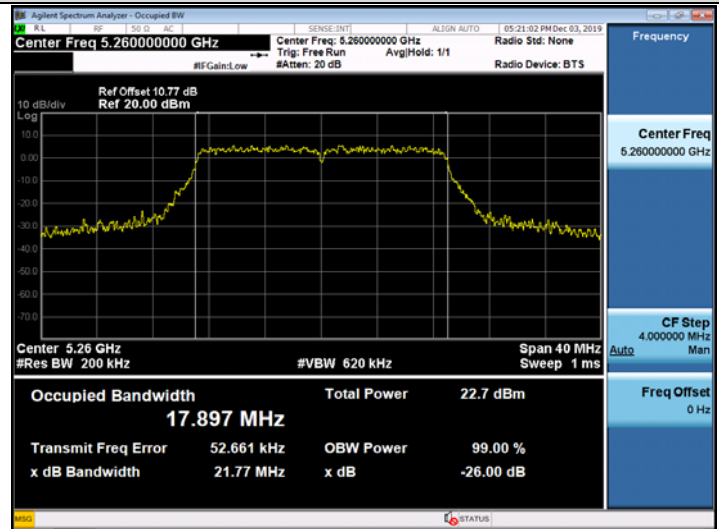
Note:

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

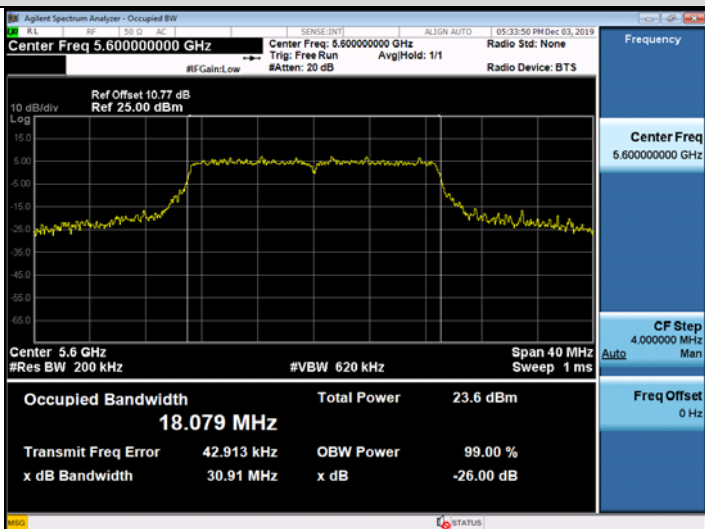
802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 36)



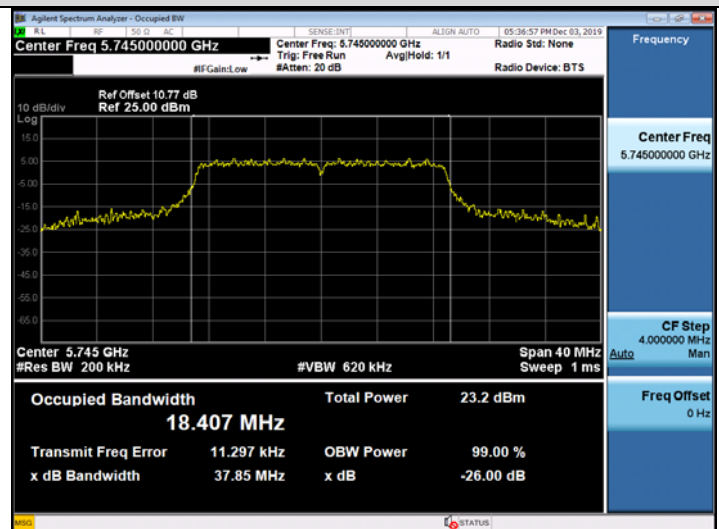
802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 52)



802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 120)



802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 149)

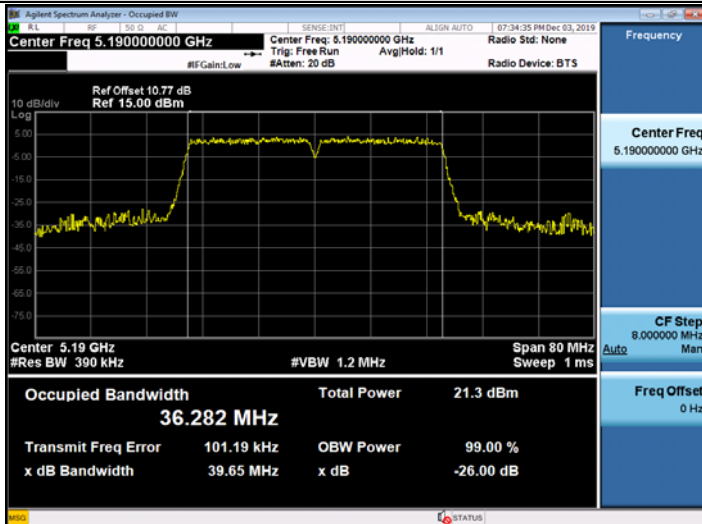


☐ Test Plots(802.11n(HT40))

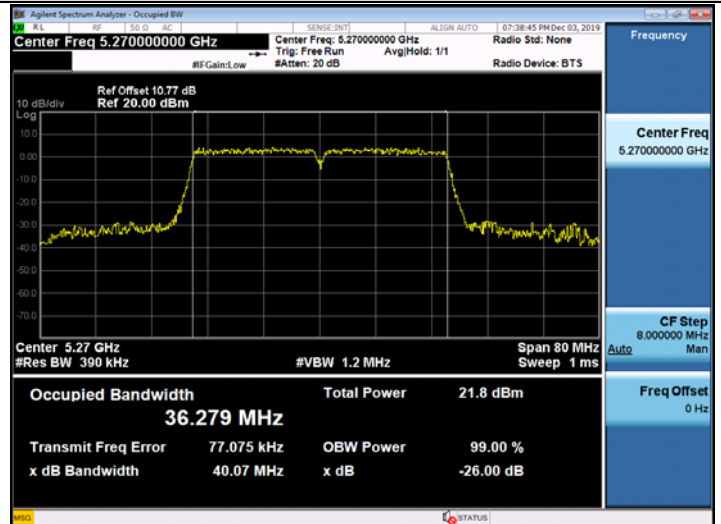
Note:

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

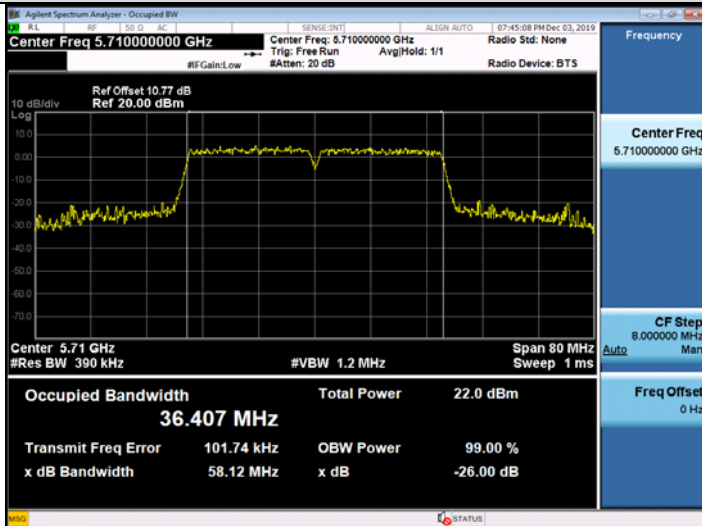
802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 38)



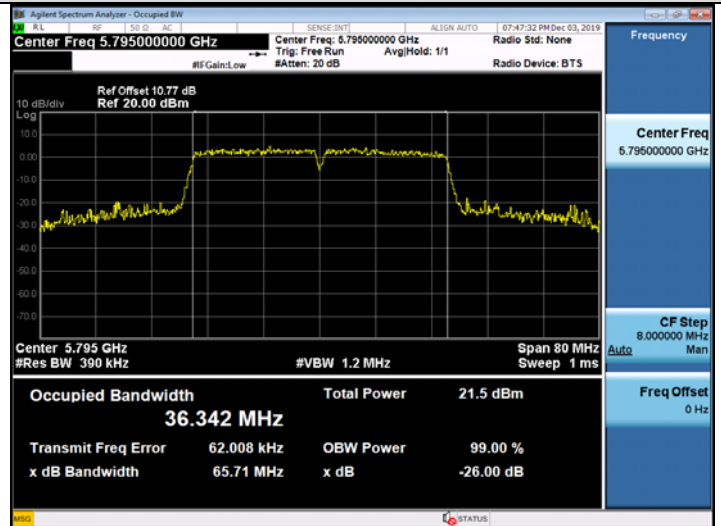
802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11n_HT40 UNII 2C BAND 26dB Bandwidth(CH 142)



802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 159)

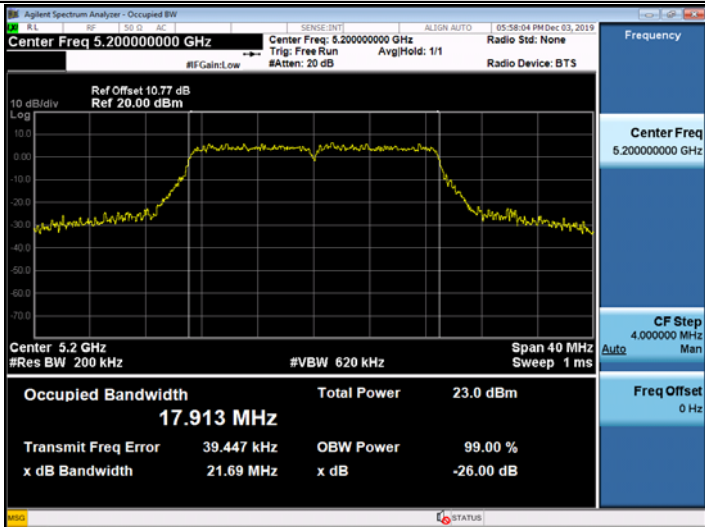


☐ Test Plots(802.11ac(VHT20))

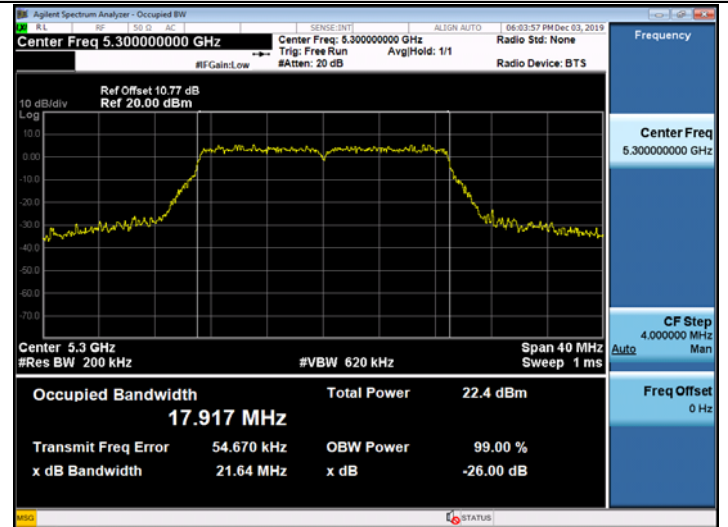
Note:

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

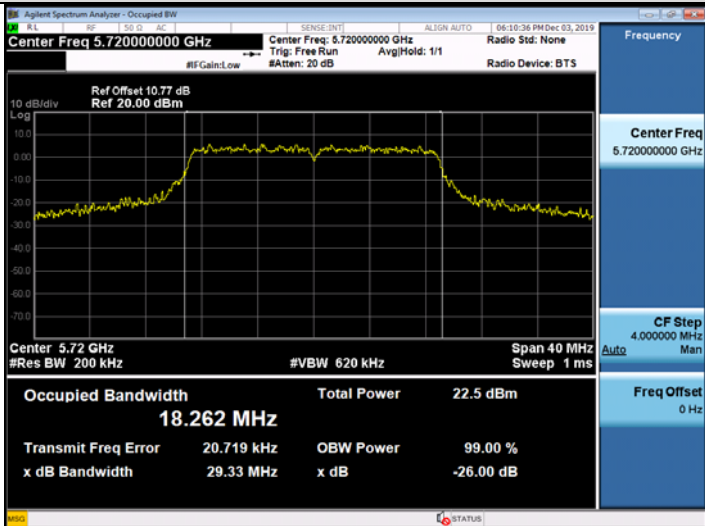
802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 40)



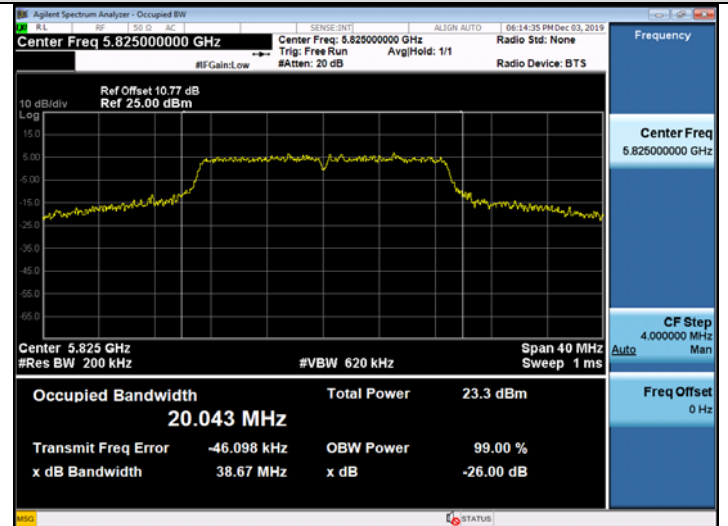
802.11ac_VHT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 144)



802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)

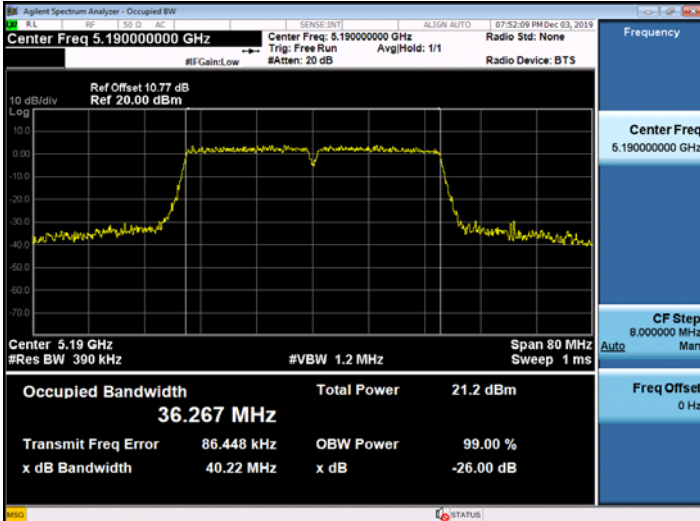


☐ Test Plots(802.11ac(VHT40))

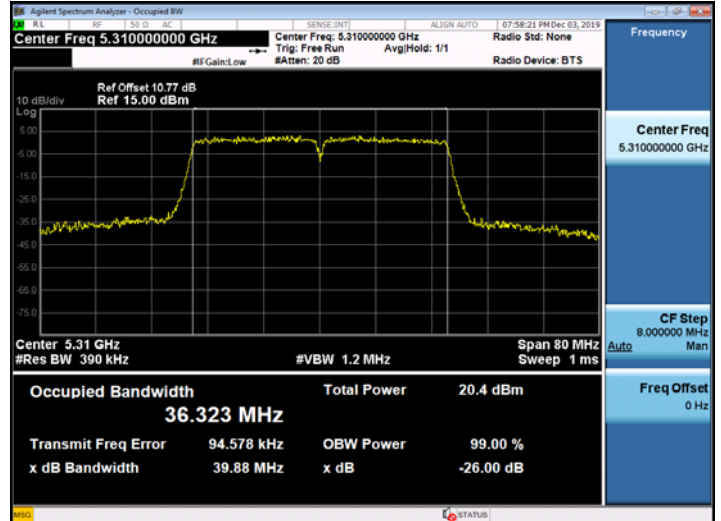
Note:

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

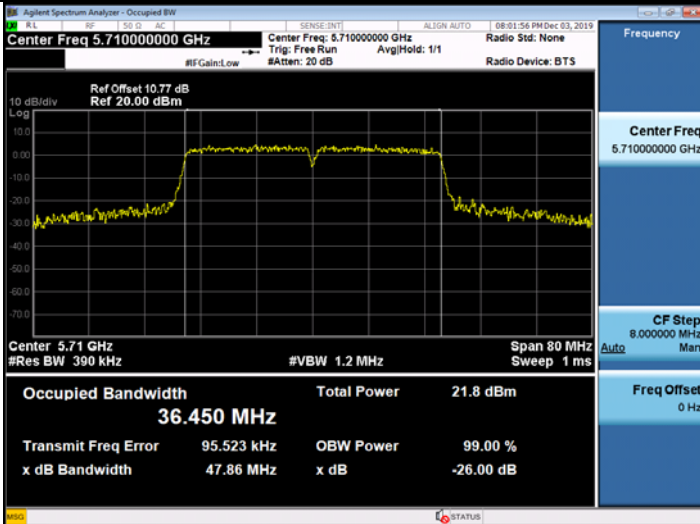
802.11ac_VHT40 UNII 1 BAND 26dB Bandwidth(CH 38)



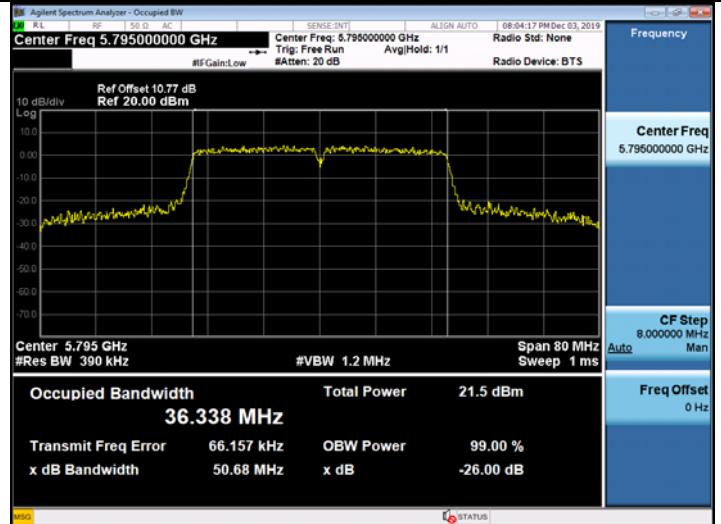
802.11ac_VHT40 UNII 2A BAND 26dB Bandwidth (CH 62)



802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 142)



802.11ac_VHT40 UNII 3 BAND 26dB Bandwidth (CH 159)

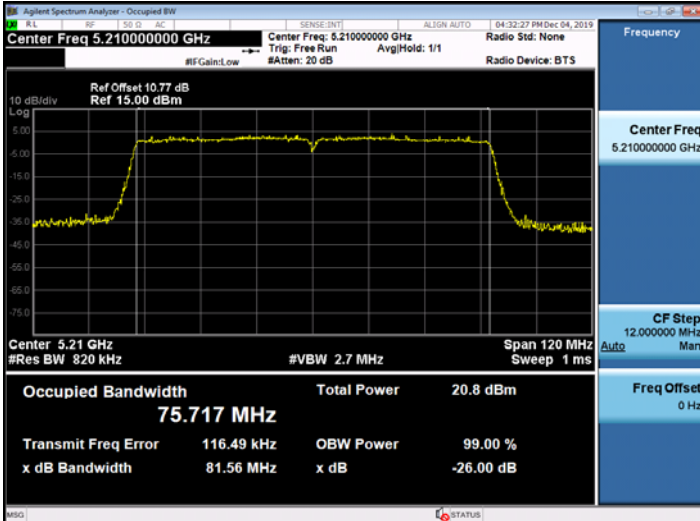


☐ Test Plots(802.11ac(VHT80))

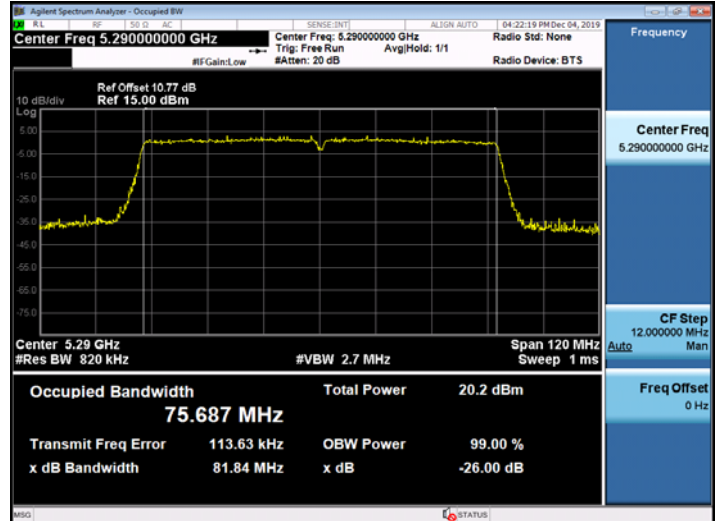
Note:

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

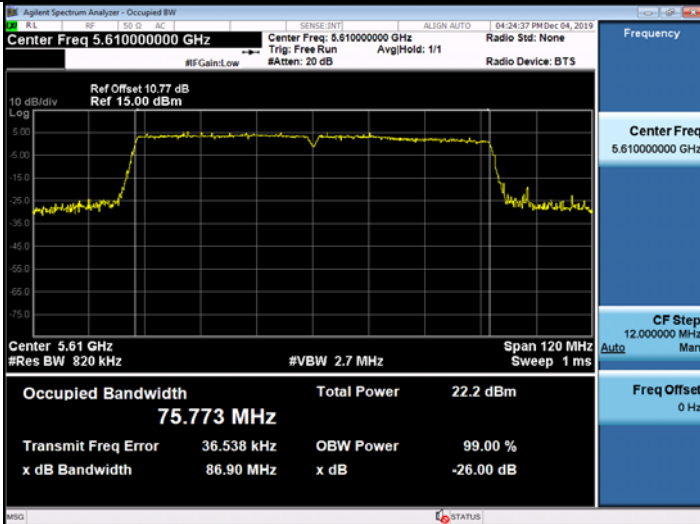
802.11ac_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)



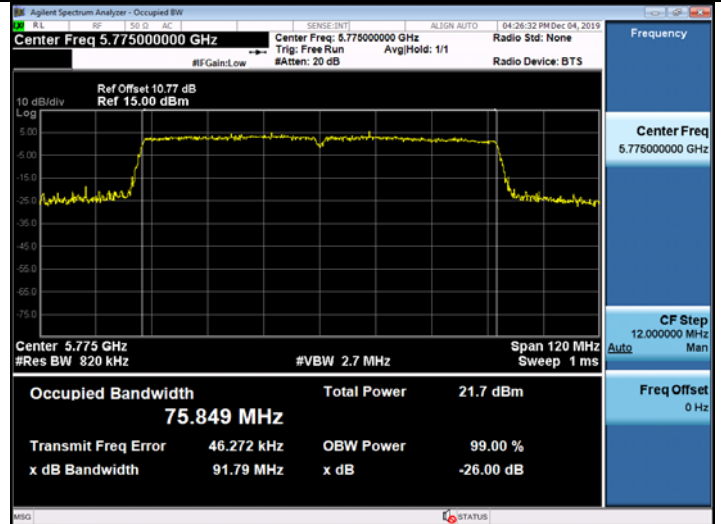
802.11ac_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



802.11ac_VHT80 UNII 2C BAND 26dB Bandwidth(CH 122)



802.11ac_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)



10.3 6dB BANDWIDTH

[ANT1]

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

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.65	> 0.5	Pass
5785	157	17.59	> 0.5	Pass
5825	165	17.62	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.38	> 0.5	Pass
5795	159	36.10	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.64	> 0.5	Pass
5785	157	17.58	> 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	36.35	> 0.5	Pass
5795	159	35.98	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.26	> 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	16.37	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.64	> 0.5	Pass
5785	157	17.61	> 0.5	Pass
5825	165	17.60	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.00	> 0.5	Pass
5795	159	35.82	> 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	17.60	> 0.5	Pass
5825	165	17.61	> 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	35.96	> 0.5	Pass

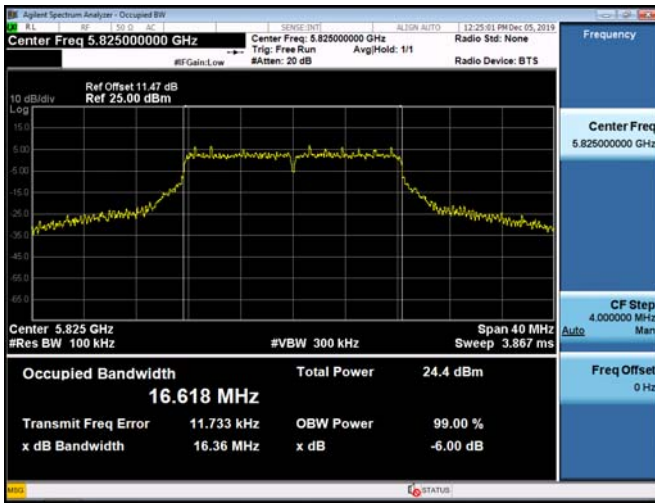
802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.48	> 0.5	Pass

[ANT1]

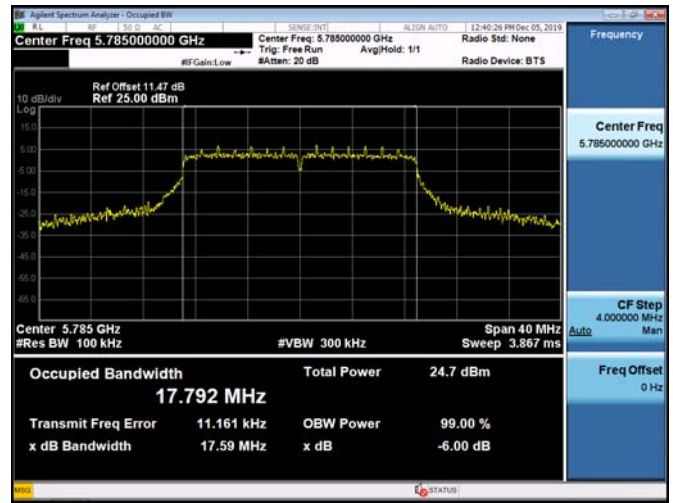
Test Plots

Note: In order to simplify the report, attached plots were only the most narrow channel.

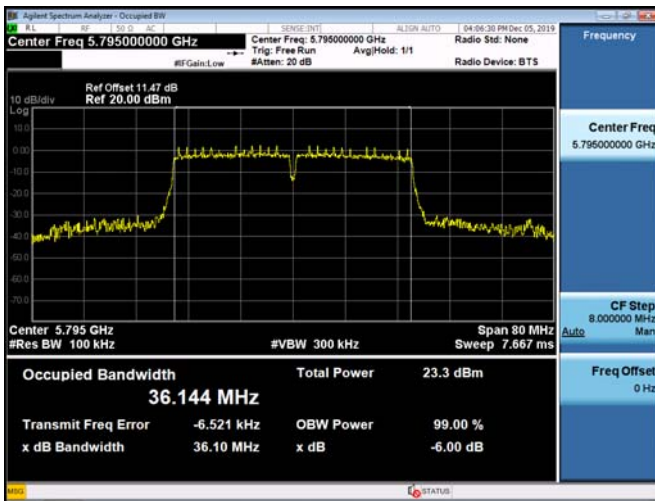
802.11a (CH.165)



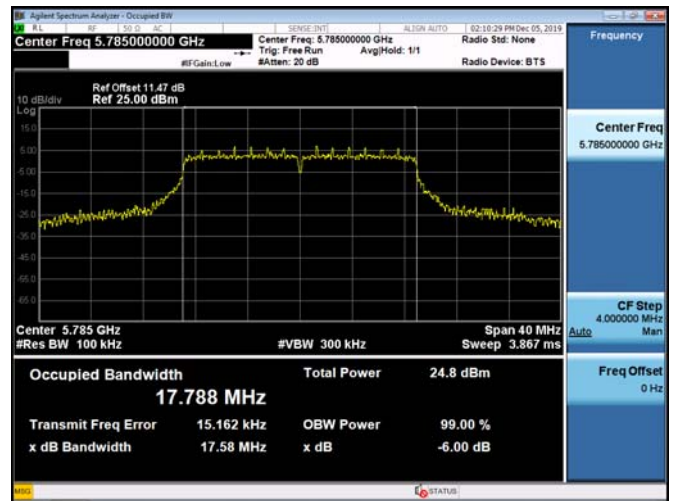
802.11n(HT20) (CH.157)



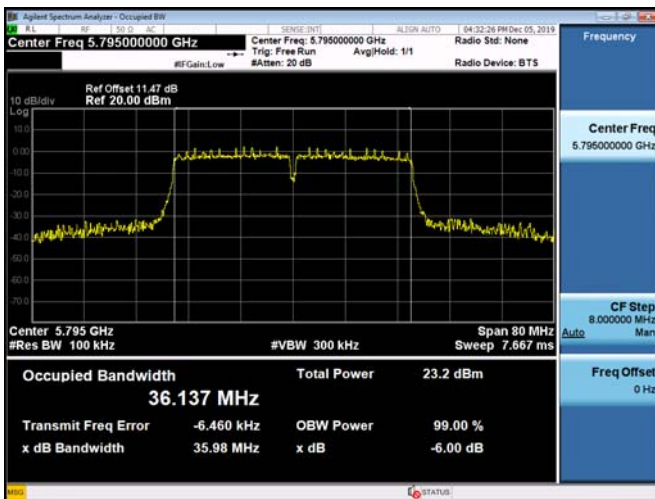
802.11n(HT40) (CH.159)



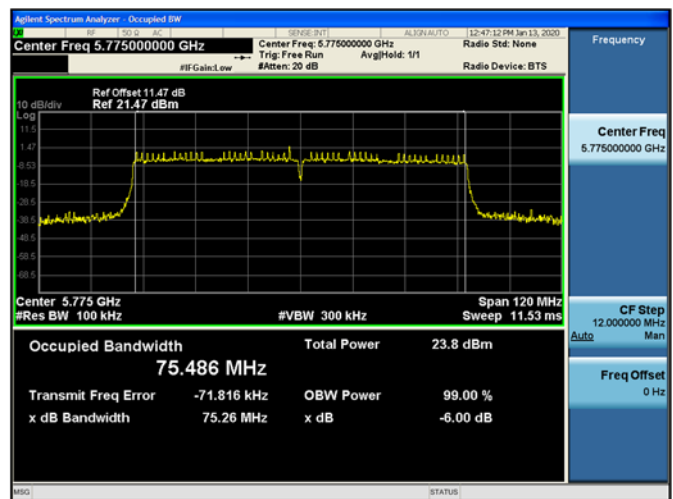
802.11ac(VHT20) (CH.157)



802.11ac(VHT40) (CH.159)



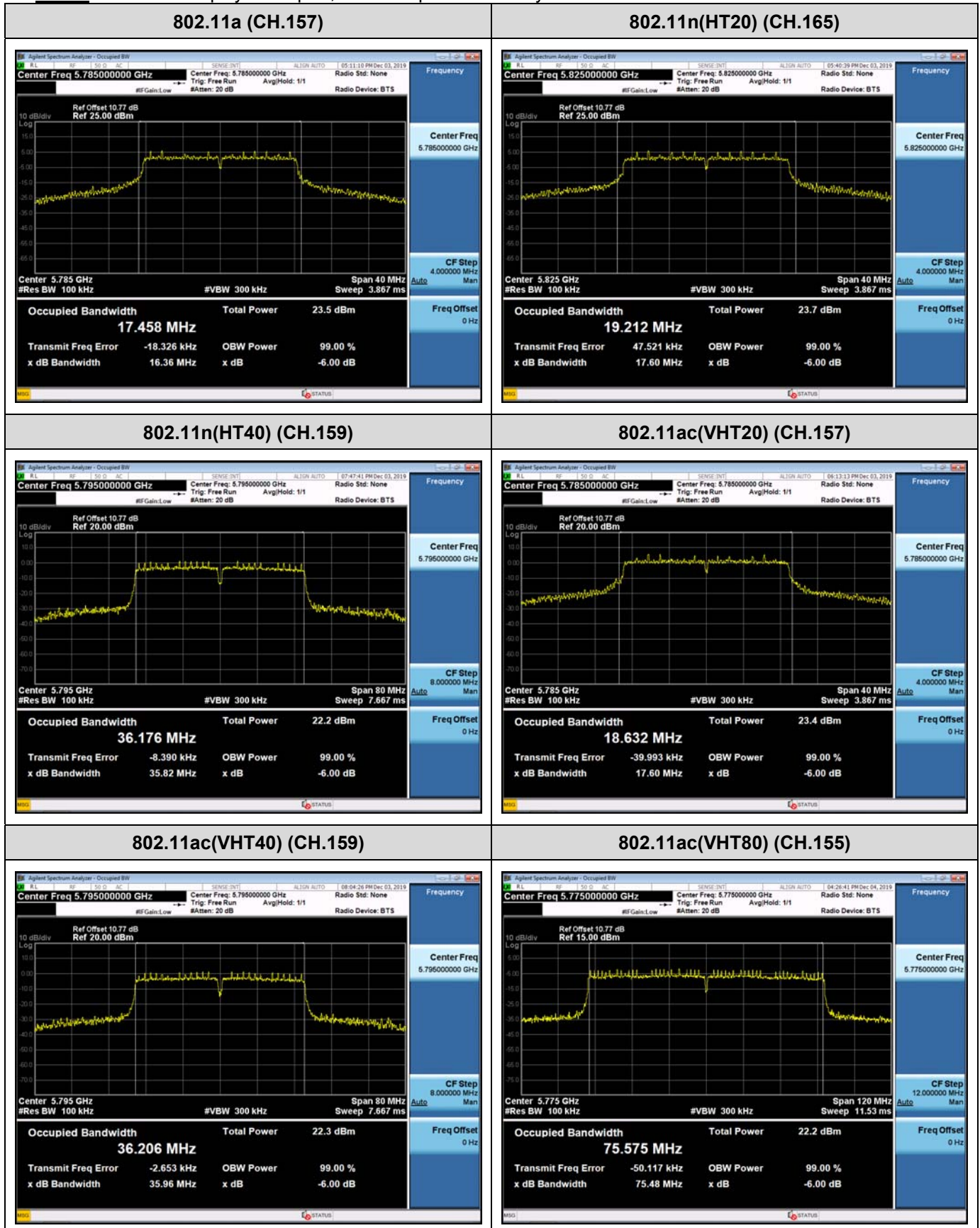
802.11ac(VHT80) (CH.155)



[ANT2]

Test Plots

Note: In order to simplify the report, attached plots were only the most narrow channel.



10.4 OUTPUT POWER MEASUREMENT

Straddle channel data in the table below are for reporting purposes only.

Straddle channel data were added in section 10.7.3.

[ANT1]

802.11a Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	17	15.84	1.897	17.74	23.98
5200	40	17	15.67	1.897	17.57	23.98
5240	48	17	15.69	1.897	17.59	23.98
5260	52	16	15.37	1.897	17.27	23.98
5300	60	16	15.37	1.897	17.27	23.98
5320	64	16	15.29	1.897	17.19	23.98
5500	100	15	13.52	1.897	15.42	23.98
5600	120	17	15.89	1.897	17.79	23.98
5720	144	16	15.17	1.897	17.07	23.98
5745	149	17	15.76	1.897	17.66	30.00
5785	157	17	15.88	1.897	17.78	30.00
5825	165	17	15.88	1.897	17.78	30.00

802.11n(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	17	15.67	2.006	17.68	23.98
5200	40	17	15.55	2.006	17.56	23.98
5240	48	17	15.52	2.006	17.53	23.98
5260	52	16	15.25	2.006	17.26	23.98
5300	60	16	15.18	2.006	17.19	23.98
5320	64	16	15.19	2.006	17.20	23.98
5500	100	14	12.37	2.006	14.38	23.98
5600	120	17	15.70	2.006	17.71	23.98
5720	144	16	15.06	2.006	17.07	23.98
5745	149	17	15.64	2.006	17.65	30.00
5785	157	17	15.74	2.006	17.75	30.00
5825	165	17	15.72	2.006	17.73	30.00