74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC UNII REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
June 15, 2021

Test Site/Location:
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Report No.: HCT-RF-2105-FC038-R2

FCC ID:	**A3LSMG990U**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**
Model:	SM-G990U
Additional Model:	SM-G990U1/DS, SM-G990U1
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.

REVIEWED BY

Report prepared by : Jeong Ho Kim
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

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 (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2105-FC038	May 26, 2021	- First Approval Report
HCT-RF-2105-FC038-R1	June 08, 2021	- Revised on Page 8
HCT-RF-2105-FC038-R2	June 15, 2021	- Added the Additional Model.

Table of Contents

1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SM-G990U	
Additional Model	SM-G990U1/DS, SM-G990U1	
EUT Type	Mobile Phone	
Power Supply	DC 3.88 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
Straddle channel	Supported	
TDWR Band	Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	April 01, 2021 ~ May 26, 2021	
Serial number	Radiated: UDE0597M Conducted: UDJ0410M	

ANTENNA CONFIGURATIONS

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

Configurations	SISO		SDM	CDD
	Ant.1	Ant.2	Ant.1 + Ant.2	Ant.1 + Ant.2
802.11a	X	X	X	O
802.11n	X	X	O	O
802.11ac	X	X	O	O
802.11ax(HE20)	X	X	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.

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5GHz WiFi Ant.1	5GHz WiFi Ant.2
2.4 GHz WiFi + 5GHz WiFi MIMO	On		On	On
2.4 GHz WiFi + 5GHz WiFi MIMO		On	On	On
2.4 GHz WiFi MIMO + 5GHz WiFi MIMO	On	On	On	On

Non-DBS	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Bluetooth Ant.1
2.4 GHz WiFi MIMO + 5GHz WiFi MIMO + Bluetooth	On	On	On

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)
U-NII	ANT.1	-6.2	2 / 2	CDD : -4.84 SDM : -6.20
	ANT.2	-9.9		

2. MAXIMUM OUTPUT POWER

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

Band	Mode	Ant.1 Power		Ant.2 Power		MIMO Ant.1 + Ant.2 Power	
		(dBm)	(W)	(dBm)	(W)	(dBm)	(W)
UNII1	802.11a	17.76	0.060	17.45	0.056	20.60	0.115
	802.11n (HT20)	17.69	0.059	17.48	0.056	20.59	0.115
	802.11n (HT40)	16.42	0.044	16.55	0.045	19.50	0.089
	802.11ac (VHT20)	17.76	0.060	17.57	0.057	20.64	0.116
	802.11ac (VHT40)	16.38	0.043	16.46	0.044	19.43	0.088
	802.11ac (VHT80)	14.00	0.025	14.00	0.025	17.01	0.050
UNII2A	802.11a	17.88	0.061	17.09	0.051	20.50	0.112
	802.11n (HT20)	17.93	0.062	17.16	0.052	20.57	0.114
	802.11n (HT40)	16.80	0.048	16.29	0.043	19.56	0.090
	802.11ac (VHT20)	17.95	0.062	17.30	0.054	20.65	0.116
	802.11ac (VHT40)	16.75	0.047	16.23	0.042	19.51	0.089
	802.11ac (VHT80)	12.59	0.018	11.35	0.014	15.03	0.032
UNII2C	802.11a	17.92	0.062	17.47	0.056	20.71	0.118
	802.11n (HT20)	17.87	0.061	17.53	0.057	20.72	0.118
	802.11n (HT40)	16.89	0.049	16.70	0.047	19.81	0.096
	802.11ac (VHT20)	17.96	0.063	17.53	0.057	20.76	0.119
	802.11ac (VHT40)	16.89	0.049	16.56	0.045	19.74	0.094
	802.11ac (VHT80)	15.47	0.035	15.57	0.036	18.53	0.071
UNII3	802.11a	17.69	0.059	17.84	0.061	20.77	0.120
	802.11n (HT20)	17.63	0.058	17.78	0.060	20.71	0.118
	802.11n (HT40)	16.64	0.046	16.90	0.049	19.70	0.093
	802.11ac (VHT20)	17.67	0.059	17.82	0.061	20.76	0.119
	802.11ac (VHT40)	16.63	0.046	16.82	0.048	19.73	0.094
	802.11ac (VHT80)	14.99	0.032	15.70	0.037	18.37	0.069

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 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.

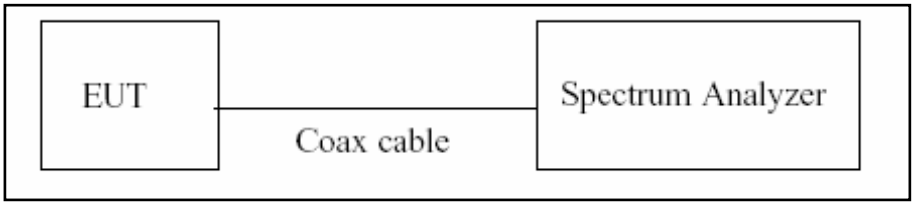
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (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.

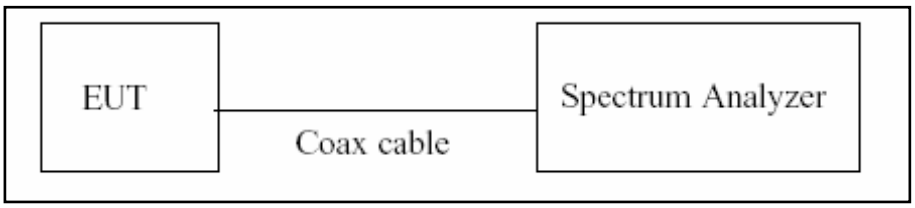
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

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 ≥ 3 x 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 lever 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.

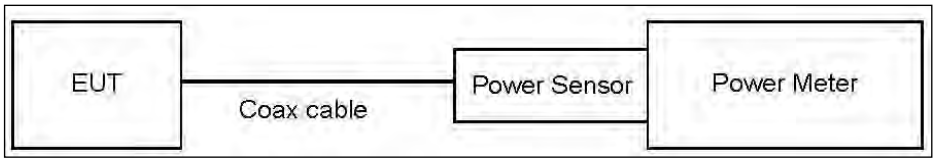
8.3. Output Power Measurement

Limit

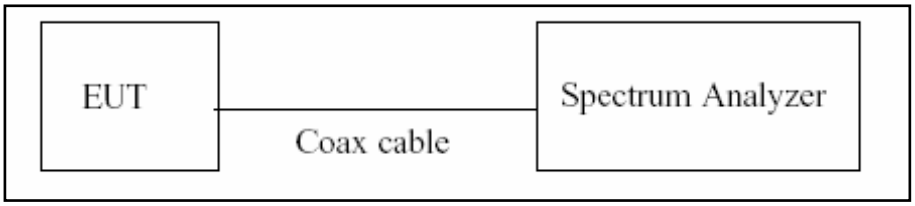
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

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 ≥ 3 MHz.
5. Number of points in sweep ≥ 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 10log(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(10 dB) + Cable loss + EUT Cable loss
3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	20.82
UNII 2A	20.82
UNII 2C	20.82
UNII 3	20.82

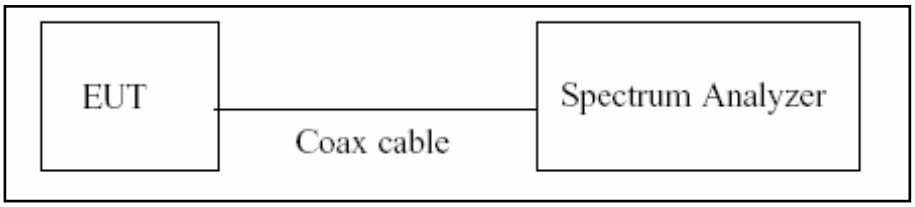
(Actual value of loss for the attenuator and cable combination)

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 ≥ 3 MHz
4. Number of points in sweep ≥ 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 + EUT Cable loss
3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	20.82
UNII 2A	20.82
UNII 2C	20.82
UNII 3	20.82

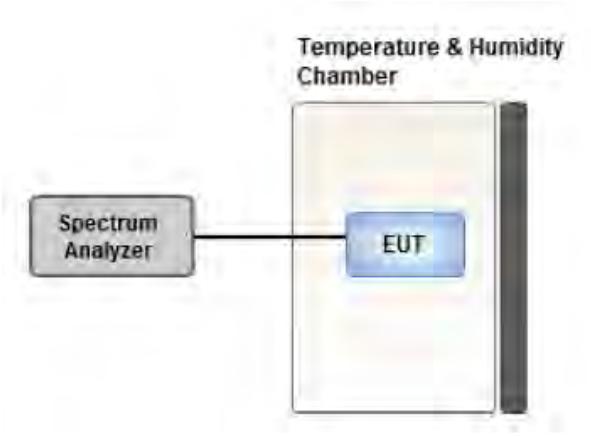
(Actual value of loss for the attenuator and cable combination)

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 ℃ and 50 ℃.
2. The temperature was incremented by 10 ℃ 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 battety 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 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBμV)	
	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.

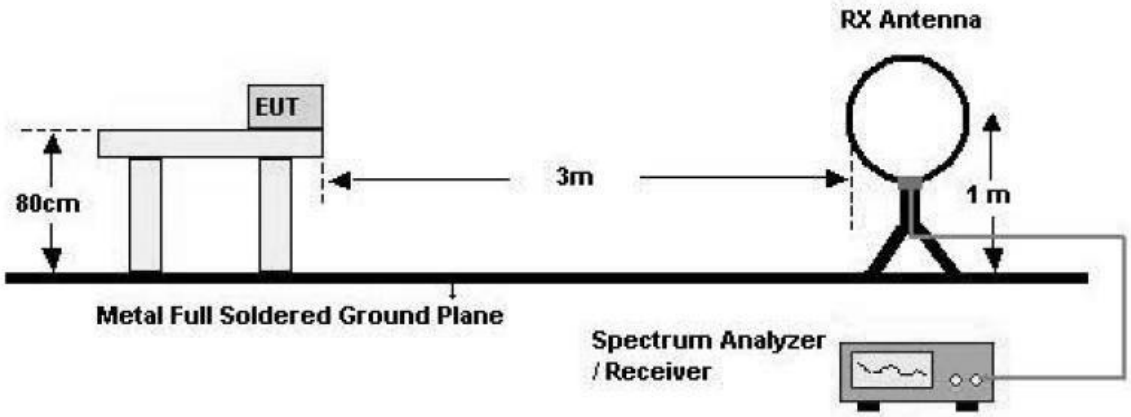
3. UNII 3: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below 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.

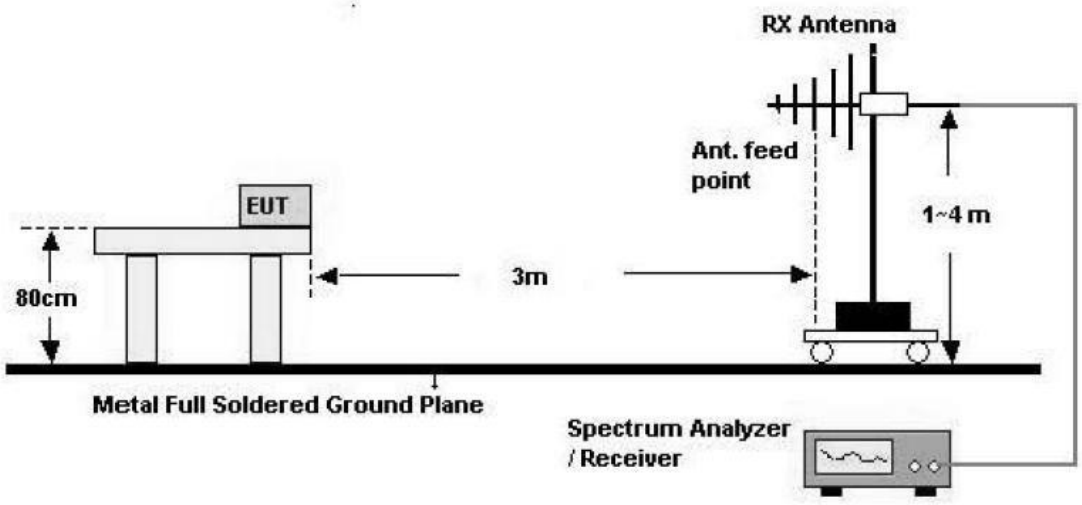
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

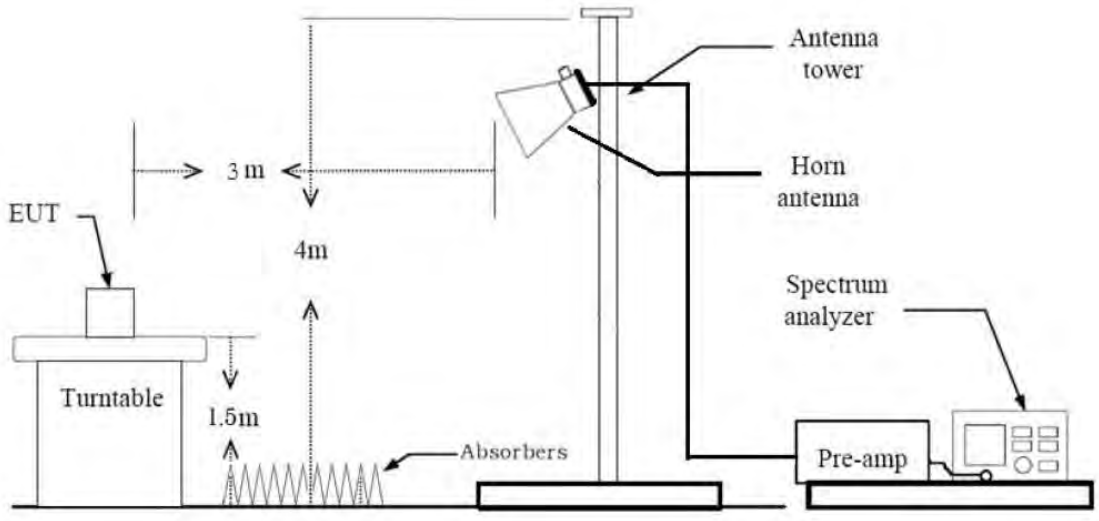
Below 30 MHz



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) = 40log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3 x 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. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x 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
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. 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 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

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

- RBW = 1 MHz
- VBW ≥ 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 ≥ 98 percent) = VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) = VBW ≥ 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 minimym number of traces by a factor of 1/x, where x is the duty cycle.

9. 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
10. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency
11. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
12. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.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 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

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

- RBW = 1 MHz
- VBW ≥ 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 ≥ 98 percent) = VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) = VBW ≥ 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 minimym number of traces by a factor of 1/x, where x is the duty cycle.

9. Measured Frequency Range :
   - 4 500 MHz ~ 5 150 MHz
   - 5 350 MHz ~ 5 460 MHz
   - 5 460 MHz ~ 5 470 MHz
   - (75 MHz or more below the 5 725 MHz) ~ 5 725 MHz
   - 5 850 MHz ~ (75 MHz or more above the 5 850 MHz)
10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Attenuator + Distance Factor(D.F)

The actual setting value of VBW (for MIMO)

Mode	Worst Data rate (Mbps)	Duty Cycle	Duty Cycle Factor (dB)	The actual setting value of VBW (Hz)
802.11a	6	0.936	0.289	1000
802.11n(HT20)	MCS 0	0.930	0.315	1000
802.11n(HT40)	MCS 0	0.869	0.607	3000
802.11ac(VHT20)	MCS 0	0.930	0.313	1000
802.11ac(VHT40)	MCS 0	0.871	0.601	3000
802.11ac(VHT80)	MCS 0	0.771	1.132	5000

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 : Z
   - Radiated Restricted Band Edge : Y
3. All datarate of operation were investigated and the worst case datarate results are reported
   - Mode : Ant.1(SISO), Ant.2(SISO), Ant.1+Ant.2(SDM), Ant.1+Ant.2(CDD)
   - Worstcase : Ant.1+Ant.2(CDD)
   - 802.11a : 6 Mbps
   - 802.11n_HT20 : MCS0
   - 802.11n_HT40 : MCS0
   - 802.11ac_VHT20 : MCS0
   - 802.11ac_VHT40 : MCS0
   - 802.11ac_VHT80 : MCS0
4. Radiated Spurious Emission
   - All modulation of operation were investigated and the worst case modulation results are reported.
     (Worstcase : 802.11a_6 Mbps)
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
6. SM-G990U, SM-G990U1/DS, SM-G990U1 were tested and the worst case results are reported.
(Worst case : SM-G990U)
7. We were performed the RSE test in condition of co-location. There has no significant emission raised.
   - WWAN+WLAN 5GHz+BT

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 : X,Y
3. Test case

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Test case
2.4 GHz WiFi + 5GHz WiFi MIMO	On		On	On	-
2.4 GHz WiFi + 5GHz WiFi MIMO		On	On	On	Case 1
2.4 GHz WiFi MIMO + 5GHz WiFi MIMO	On	On	On	On	Case 2

Non-DBS	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Bluetooth Ant.1	Test case
5GHz WiFi MIMO + Bluetooth	On	On	On	Case 3

4. The following tables show the worst case configurations determined during testing.
   (Worst case: The lowest margin condition the channels and modes were selected for test.)

Test case	Description	2.4 GHz Emission	5 GHz Emission	Bluetooth Emission
1	Antenna	Ant 2	Ant All	-
	Channel	9	116	-
	Data Rate	1 Mbps	6 Mbps	-
	Mode	802.11b	802.11a	-

Test case	Description	2.4 GHz Emission	5 GHz Emission	Bluetooth Emission
2	Antenna	Ant All	Ant All	-
	Channel	11	116	-
	Data Rate	6 Mbps	6 Mbps	-
	Mode	802.11g	802.11a	-

Test case	Description	5 GHz Emission	Bluetooth Emission
3	Antenna	Ant All	Ant 1
	Channel	116	78
	Data Rate	6 Mbps	1 Mbps
	Mode	802.11a	π/4DQPSK

5. SM-G990U, SM-G990U1/DS, SM-G990U1 were tested and the worst case results are reported.
(Worst case : SM-G990U)

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-G990U, SM-G990U1/DS, SM-G990U1 were tested and the worst case results are reported.
(Worst case : SM-G990U)

Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.
2. SM-G990U, SM-G990U1/DS, SM-G990U1 were tested and the worst case results are reported.
(Worst case : SM-G990U)

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),(2)(3)	< 250 mW(5150-5250 MHz) < 250 mW or 11+10log$_{10}$ (BW) dBm (5250-5350 MHz) < 250 mW or 11+10log$_{10}$ (BW) dBm (5470-5725 MHz) <1 W(5725-5850 MHz)		PASS
Maximum Power Spectral Density	§15.407(a)(1),(2),(3)	<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 15.407(b)(8)	<FCC 15.207 limits		PASS
Undesirable Emissions	§15.407(b) (1)(2)(3)(4)	<-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)(9), (10)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

10. TEST RESULT

10.1 DUTY CYCLE

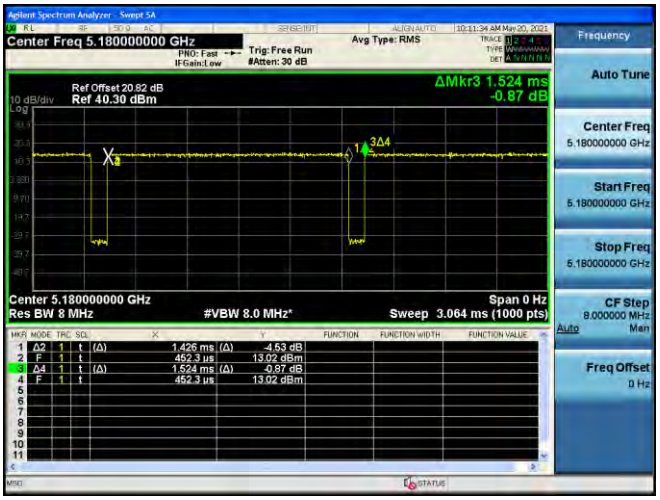
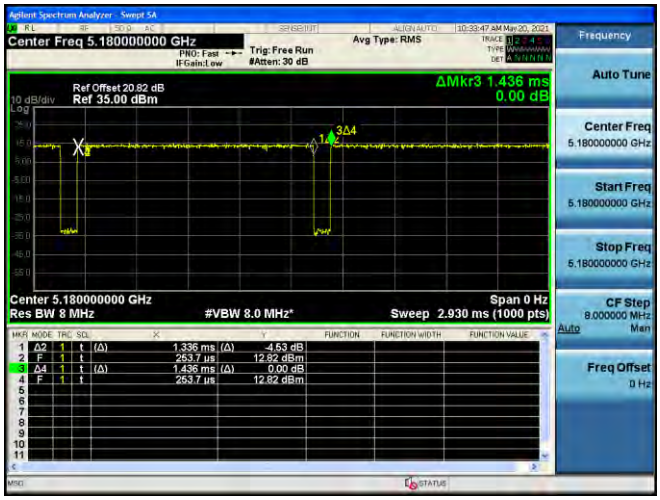
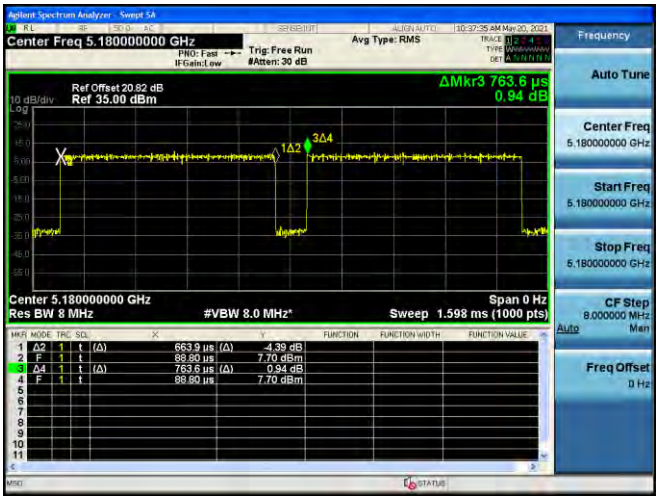
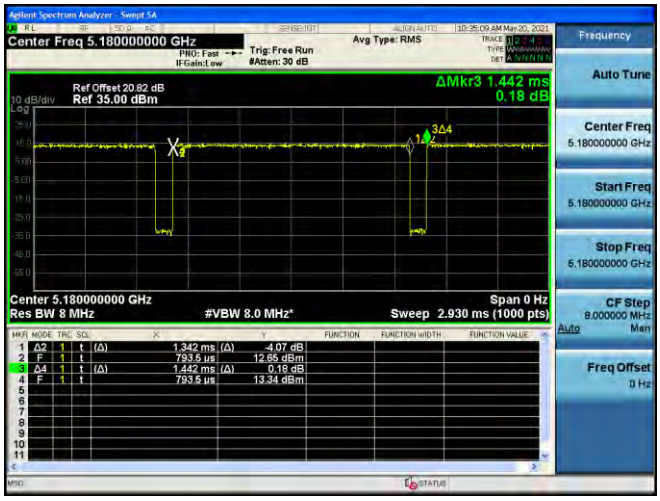
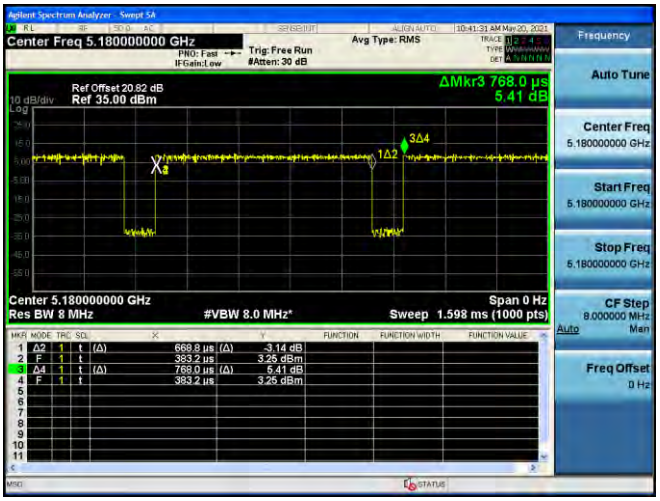
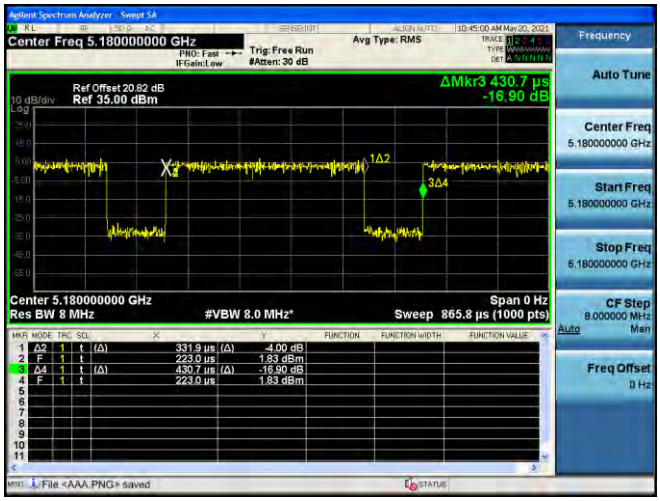
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	1.426	1.524	0.936	0.289
	9	0.959	1.058	0.906	0.428
	12	0.724	0.822	0.881	0.551
	18	0.491	0.591	0.832	0.800
	24	0.372	0.470	0.792	1.015
	36	0.256	0.354	0.723	1.409
	48	0.196	0.295	0.666	1.765
	54	0.180	0.279	0.647	1.892

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.336	1.436	0.930	0.315
	1	0.688	0.786	0.875	0.580
	2	0.472	0.571	0.828	0.821
	3	0.364	0.463	0.786	1.045
	4	0.256	0.354	0.723	1.408
	5	0.200	0.299	0.668	1.749
	6	0.184	0.283	0.651	1.863
	7	0.168	0.267	0.631	2.002
802.11n (HT40)	0	0.664	0.764	0.869	0.607
	1	0.352	0.451	0.780	1.078
	2	0.248	0.346	0.716	1.451
	3	0.196	0.295	0.665	1.772
	4	0.144	0.243	0.594	2.264
	5	0.116	0.215	0.540	2.675
	6	0.108	0.207	0.522	2.823
	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	0.792	0.874	0.585
	2	0.477	0.575	0.829	0.814
	3	0.368	0.467	0.788	1.032
	4	0.260	0.359	0.725	1.399
	5	0.204	0.303	0.673	1.722
	6	0.188	0.287	0.656	1.832
	7	0.172	0.271	0.634	1.980
	8	0.152	0.251	0.607	2.172
802.11ac (VHT40)	0	0.669	0.768	0.871	0.601
	1	0.355	0.454	0.782	1.070
	2	0.252	0.351	0.718	1.438
	3	0.199	0.299	0.667	1.761
	4	0.148	0.247	0.600	2.221
	5	0.120	0.219	0.549	2.605
	6	0.112	0.211	0.531	2.746
	7	0.104	0.204	0.513	2.895
	8	0.096	0.194	0.493	3.072
	9	0.088	0.187	0.471	3.272
802.11ac (VHT80)	0	0.332	0.431	0.771	1.132
	1	0.189	0.288	0.655	1.839
	2	0.140	0.240	0.585	2.330
	3	0.116	0.216	0.538	2.688
	4	0.092	0.191	0.482	3.169
	5	0.080	0.179	0.447	3.499
	6	0.076	0.175	0.435	3.617
	7	0.072	0.171	0.421	3.758
	8	0.068	0.168	0.407	3.906
	9	0.064	0.163	0.393	4.061

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 26 dB BANDWIDTH

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

Straddle channel data were added in section 10.7.1.

[ANT.1]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.57	16.722
5200	40	21.50	16.823
5240	48	21.34	16.887
5260	52	21.74	16.861
5300	60	21.41	16.896
5320	64	21.13	16.709
5500	100	21.08	16.631
5600	120	21.64	16.777
5720	144	21.29	16.804
5745	149	21.37	16.812
5785	157	21.41	16.812
5825	165	21.29	16.821

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.35	17.830
5200	40	22.83	18.028
5240	48	22.79	18.034
5260	52	21.64	17.955
5300	60	21.99	17.976
5320	64	21.88	17.828
5500	100	21.37	17.755
5600	120	21.70	17.963
5720	144	22.21	17.916
5745	149	21.59	17.925
5785	157	21.48	17.923
5825	165	21.99	17.902

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.52	36.140
5230	46	46.09	36.380
5270	54	43.72	36.383
5310	62	39.38	36.141
5510	102	39.44	36.206
5590	118	39.81	36.380
5710	142	43.33	36.356
5755	151	48.53	36.350
5795	159	41.16	36.258

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.86	17.844
5200	40	22.43	17.934
5240	48	21.68	17.970
5260	52	22.72	17.955
5300	60	21.57	17.930
5320	64	22.40	17.790
5500	100	21.21	17.766
5600	120	21.57	17.915
5720	144	22.14	17.957
5745	149	21.74	17.928
5785	157	21.68	17.923
5825	165	21.60	17.891

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.66	36.144
5230	46	39.90	36.383
5270	54	40.45	36.404
5310	62	39.59	36.205
5510	102	39.43	36.224
5590	118	40.07	36.388
5710	142	39.90	36.337
5755	151	40.01	36.353
5795	159	39.55	36.286

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	80.73	75.384
5290	58	80.82	75.490
5530	106	81.48	75.442
5610	122	81.52	75.671
5690	138	81.66	75.761
5775	155	81.17	75.748

[ANT.2]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	23.96	16.852
5200	40	26.74	17.032
5240	48	26.97	17.009
5260	52	25.91	16.989
5300	60	27.62	16.984
5320	64	21.75	16.797
5500	100	20.88	16.620
5600	120	28.06	17.071
5720	144	23.46	17.052
5745	149	28.86	17.042
5785	157	24.40	17.011
5825	165	24.94	16.958

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	24.91	17.946
5200	40	26.73	18.032
5240	48	25.56	18.014
5260	52	25.02	18.039
5300	60	25.77	18.040
5320	64	24.98	17.880
5500	100	21.39	17.789
5600	120	27.39	18.083
5720	144	27.23	18.095
5745	149	27.00	18.104
5785	157	27.80	18.079
5825	165	24.95	18.070

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.48	36.242
5230	46	71.18	36.517
5270	54	71.47	36.490
5310	62	39.52	36.189
5510	102	39.26	36.195
5590	118	73.17	36.510
5710	142	65.25	36.541
5755	151	74.91	36.553
5795	159	71.32	36.461

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	24.70	17.888
5200	40	25.33	18.082
5240	48	26.05	18.016
5260	52	26.17	18.003
5300	60	25.74	18.005
5320	64	25.97	17.917
5500	100	21.43	17.799
5600	120	28.31	18.031
5720	144	28.03	18.079
5745	149	26.34	18.061
5785	157	28.29	18.024
5825	165	24.47	18.026

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.41	36.204
5230	46	50.76	36.422
5270	54	49.93	36.548
5310	62	39.64	36.211
5510	102	40.07	36.244
5590	118	51.25	36.444
5710	142	51.40	36.508
5755	151	59.75	36.546
5795	159	48.03	36.444

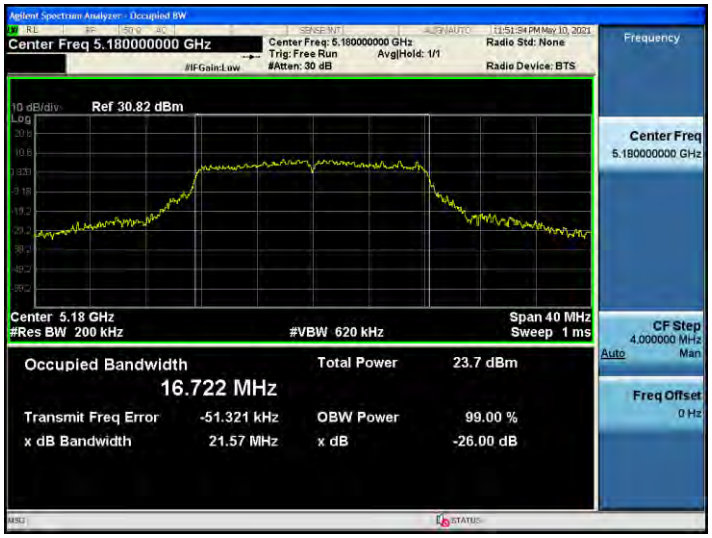
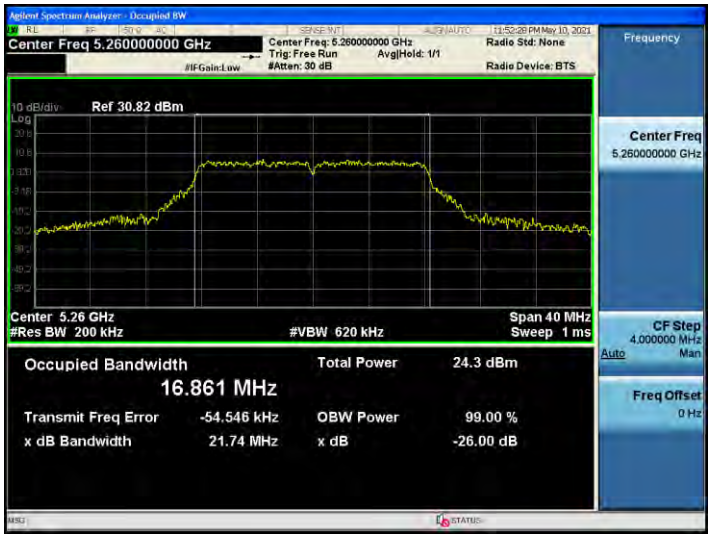
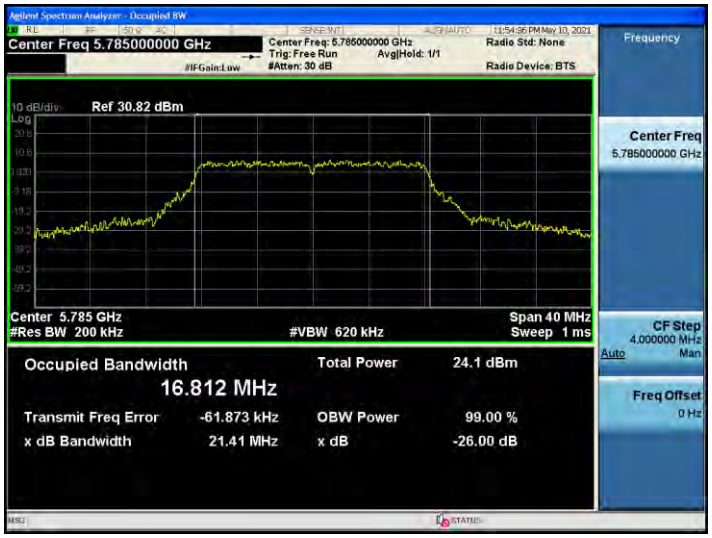
802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	80.49	75.436
5290	58	81.12	75.436
5530	106	80.97	75.489
5610	122	81.87	75.767
5690	138	99.15	75.882
5775	155	87.68	75.906

[ANT.1]

▣ Test Plots(802.11a)

Note:

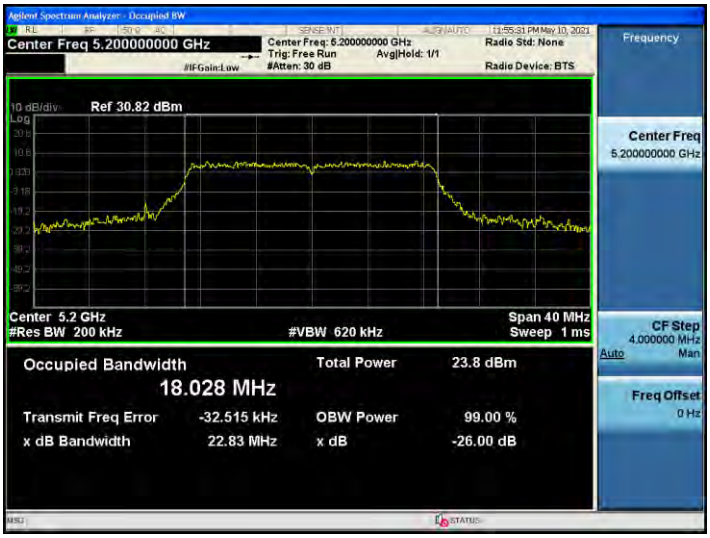
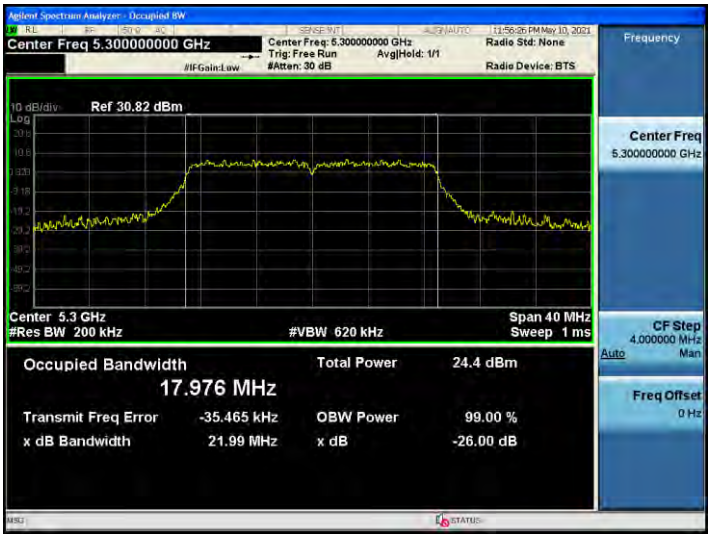
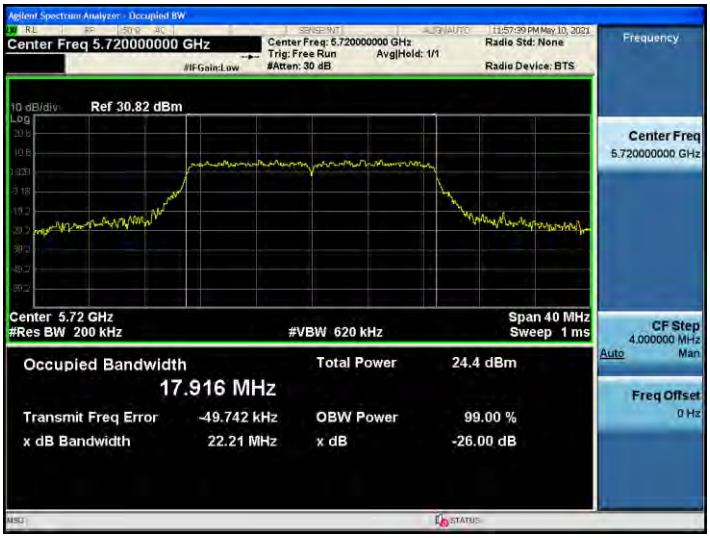
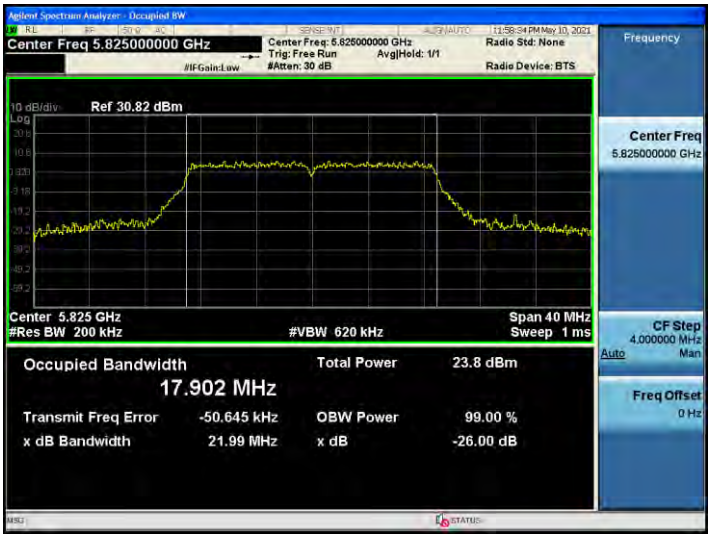
In order to simplify the report, attached plots were only the most wide channel.

802.11a UNII 1 BAND 26dB Bandwidth (CH 36)	802.11a UNII 2A BAND 26dB Bandwidth (CH 52)
	
802.11a UNII 2C BAND 26dB Bandwidth (CH 120)	**802.11a UNII 3 BAND 26dB Bandwidth (CH 157)**
	

▣ Test Plots(802.11n(HT20))

Note:

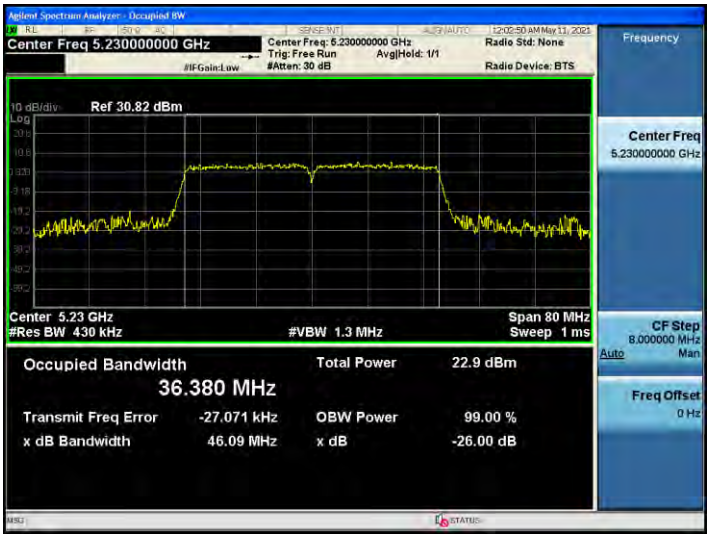
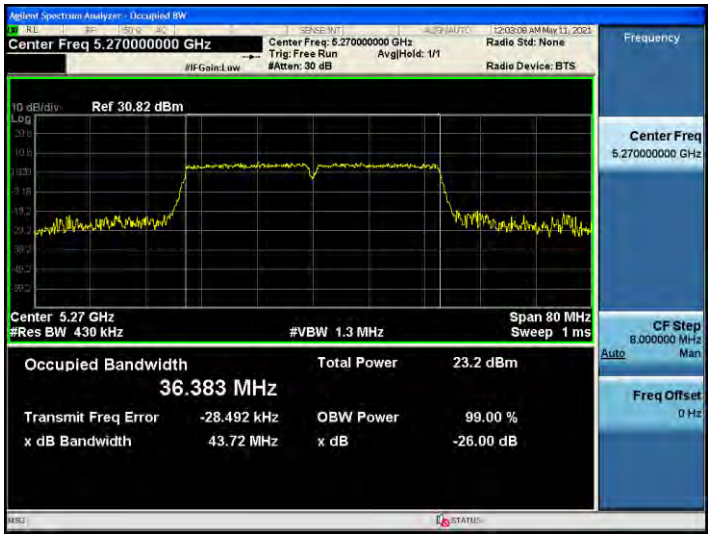
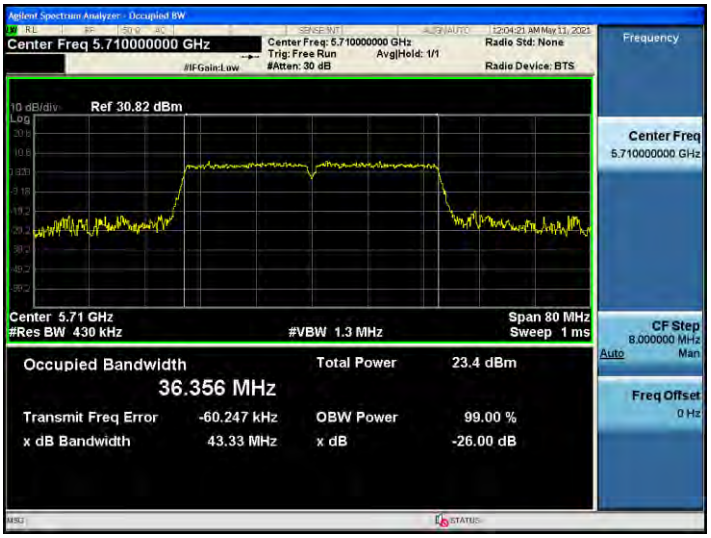
In order to simplify the report, attached plots were only the most wide channel.

802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 40)	802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 60)
	
802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 144)	**802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 165)**
	

▣ Test Plots(802.11n(HT40))

Note:

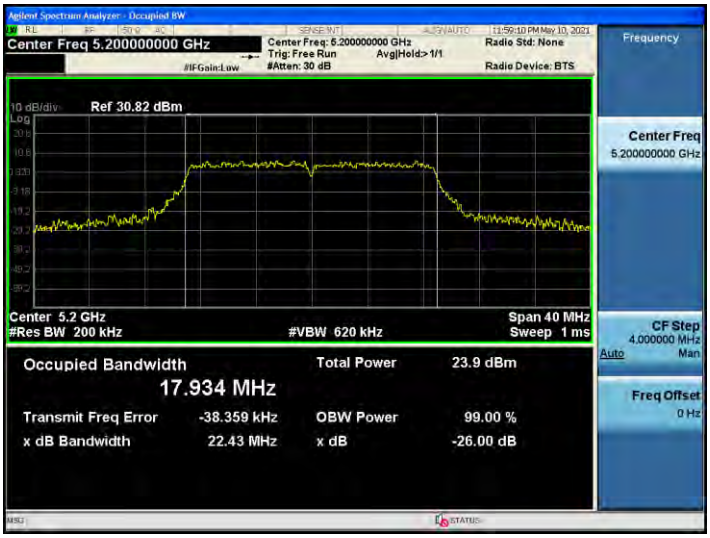
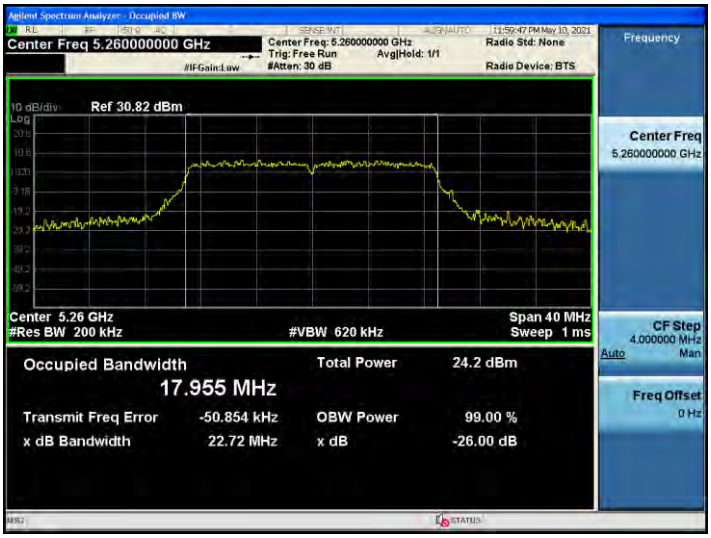
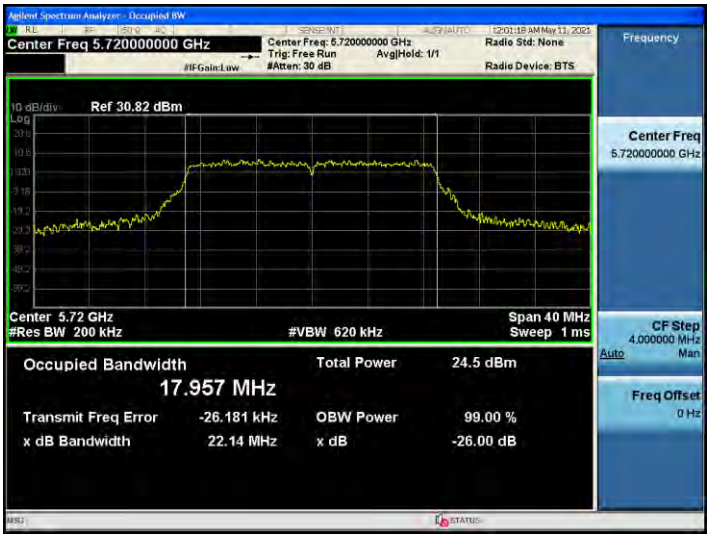
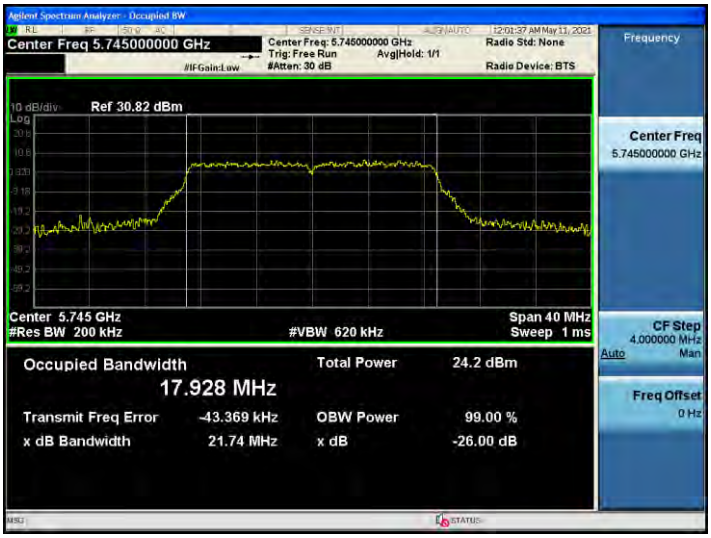
In order to simplify the report, attached plots were only the most wide channel.

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 142)	**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 144)	**802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 149)**
	

▣ Test Plots(802.11ac(VHT40))

Note:

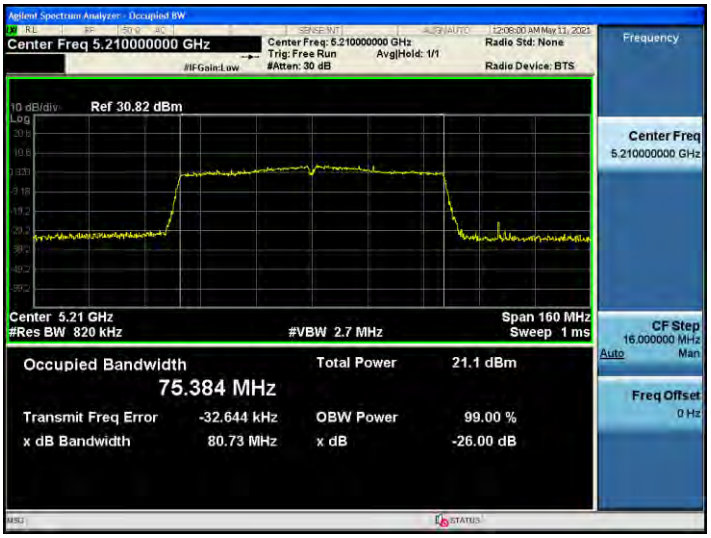
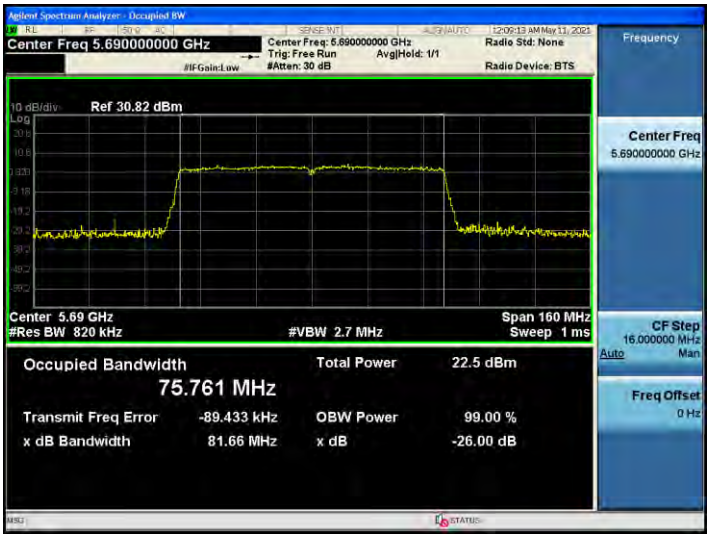
In order to simplify the report, attached plots were only the most wide channel.

802.11ac_VHT40 UNII 1 BAND 26dB Bandwidth(CH 46)	802.11ac_VHT40 UNII 2A BAND 26dB Bandwidth (CH 54)
	
802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 118)	**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)**
	

[ANT.2]

▣ Test Plots(802.11a)

Note:

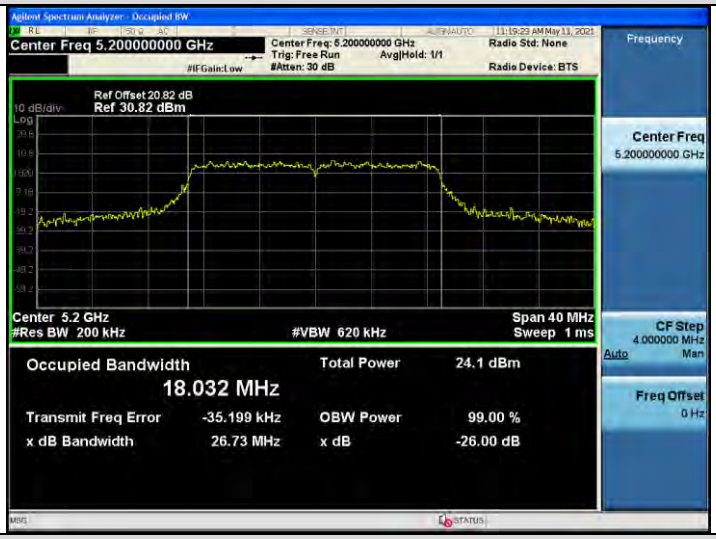
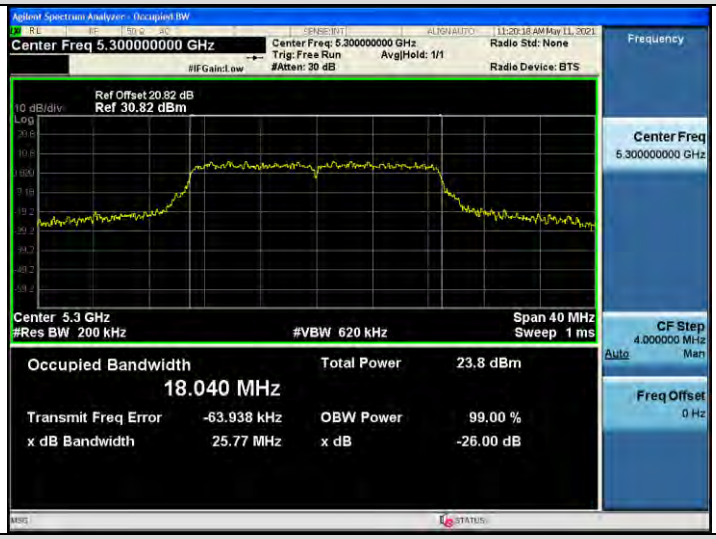
In order to simplify the report, attached plots were only the most wide channel.

802.11a UNII 1 BAND 26dB Bandwidth (CH 48)	802.11a UNII 2A BAND 26dB Bandwidth (CH 60)
	
802.11a UNII 2C BAND 26dB Bandwidth (CH 120)	**802.11a UNII 3 BAND 26dB Bandwidth (CH 149)**
	

▣ Test Plots(802.11n(HT20))

Note:

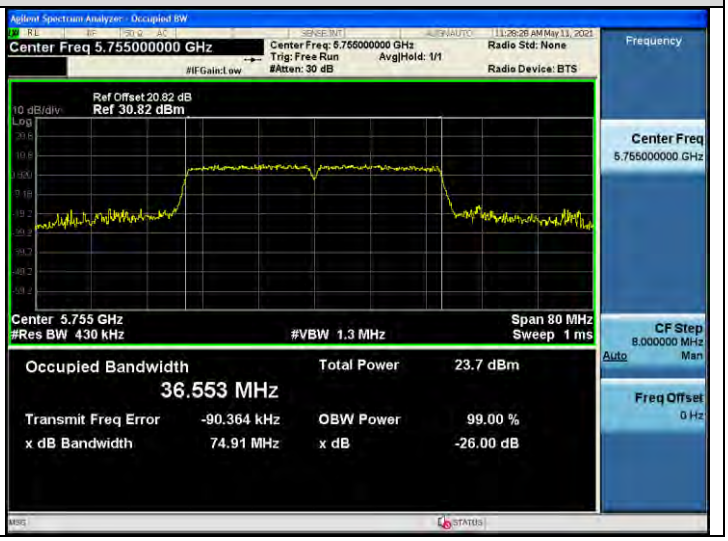
In order to simplify the report, attached plots were only the most wide channel.

802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 40)	802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 60)
	
802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 120)	**802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 157)**
	

▣ Test Plots(802.11n(HT40))

Note:

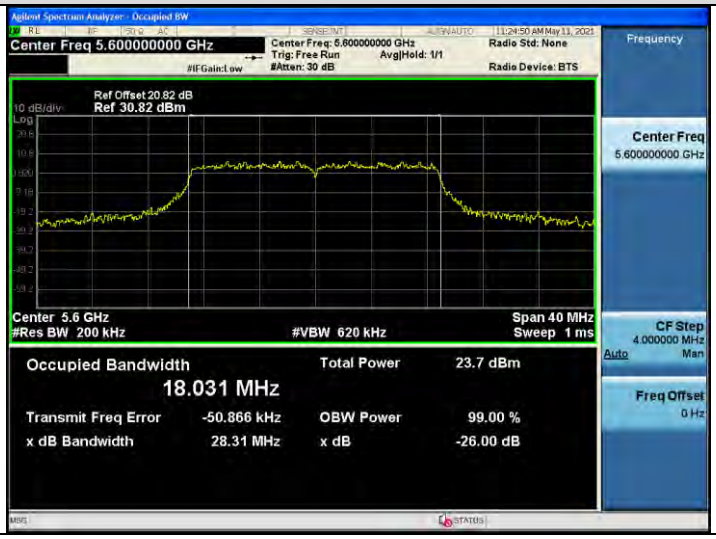
In order to simplify the report, attached plots were only the most wide channel.

802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)	802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)
	
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:

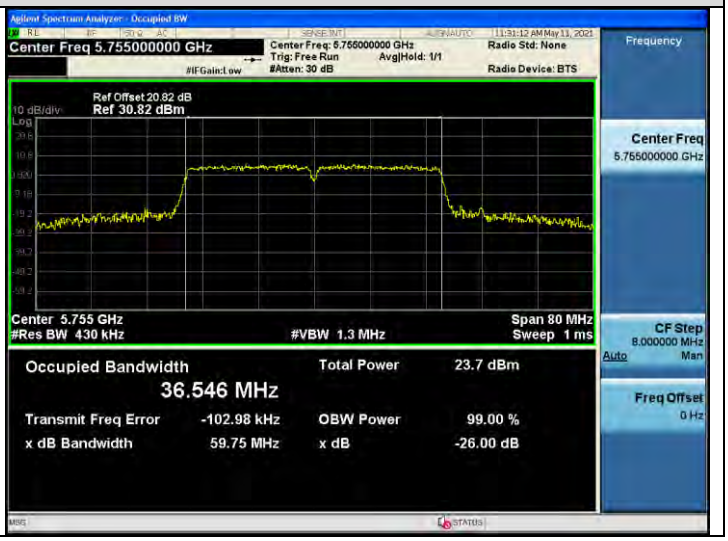
In order to simplify the report, attached plots were only the most wide channel.

802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 48)	802.11ac_VHT20 UNII 2A BAND 26dB Bandwidth(CH 52)
	
802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 120)	**802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 157)**
	

▣ 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 54)
	
802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 142)	**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)**
	

10.3 6dB BANDWIDTH

[ANT.1]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.38	> 0.5	Pass
5785	157	16.40	> 0.5	Pass
5825	165	16.40	> 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	17.61	> 0.5	Pass
5825	165	17.61	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.34	> 0.5	Pass
5795	159	35.83	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.68	> 0.5	Pass
5785	157	17.61	> 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	36.30	> 0.5	Pass
5795	159	36.11	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.72	> 0.5	Pass

[ANT.2]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.38	> 0.5	Pass
5785	157	16.39	> 0.5	Pass
5825	165	16.39	> 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	17.64	> 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	36.30	> 0.5	Pass
5795	159	36.28	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.61	> 0.5	Pass
5785	157	17.56	> 0.5	Pass
5825	165	17.62	> 0.5	Pass

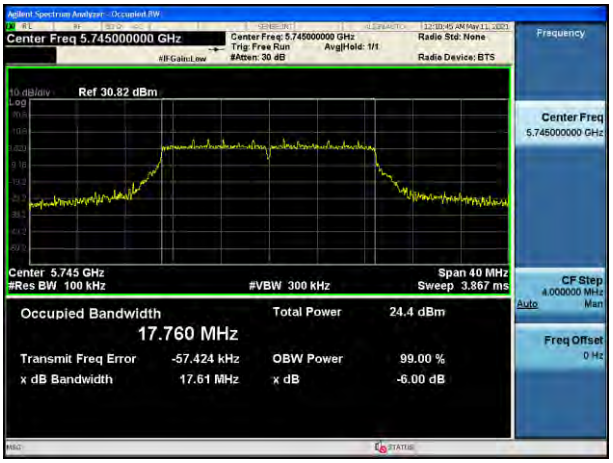
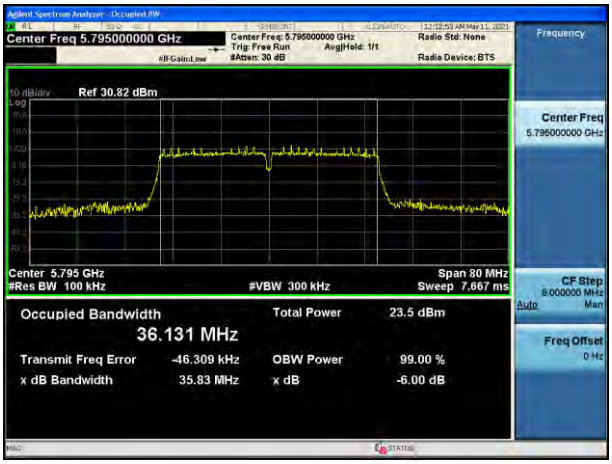
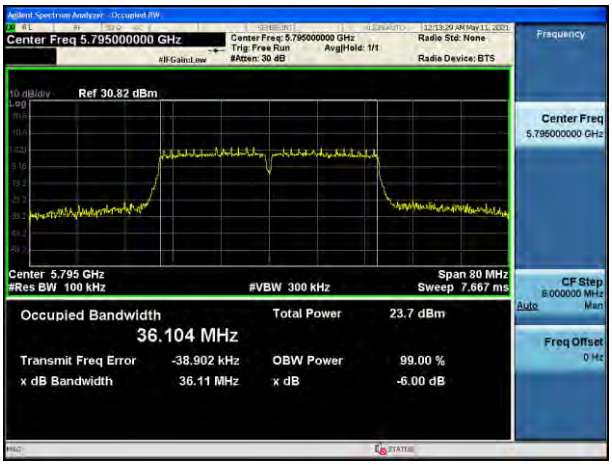
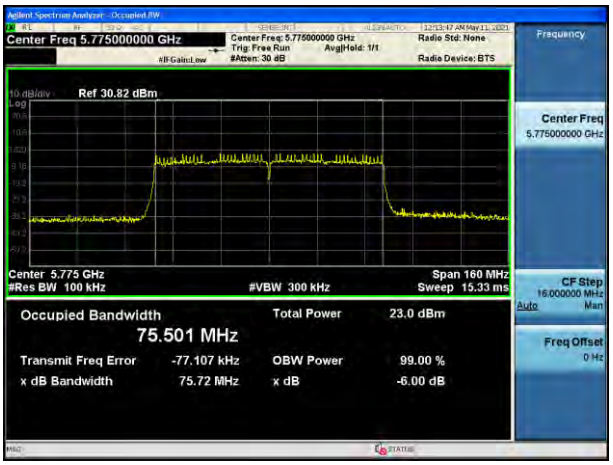
802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.32	> 0.5	Pass
5795	159	35.95	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.02	> 0.5	Pass

[ANT.1]

▣ Test Plots

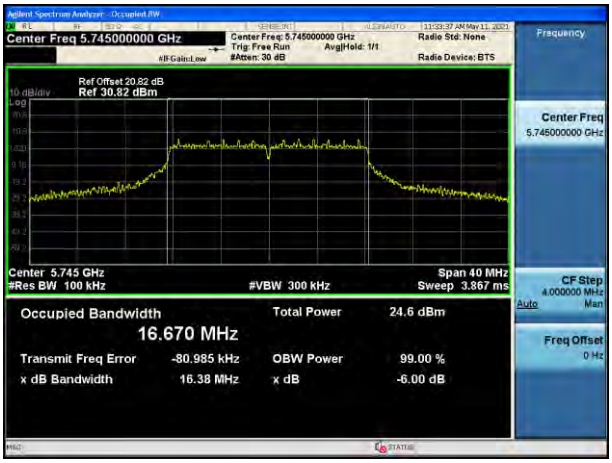
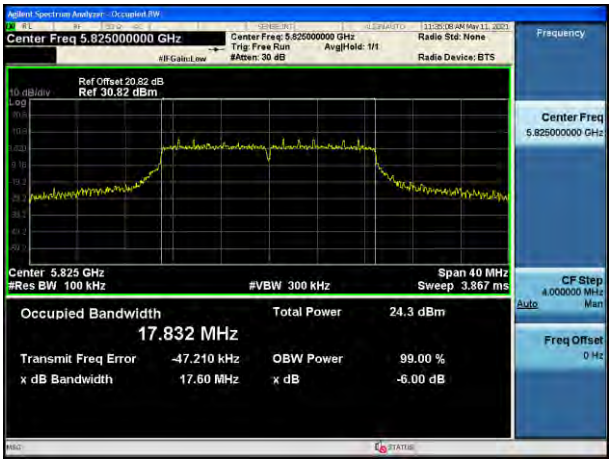
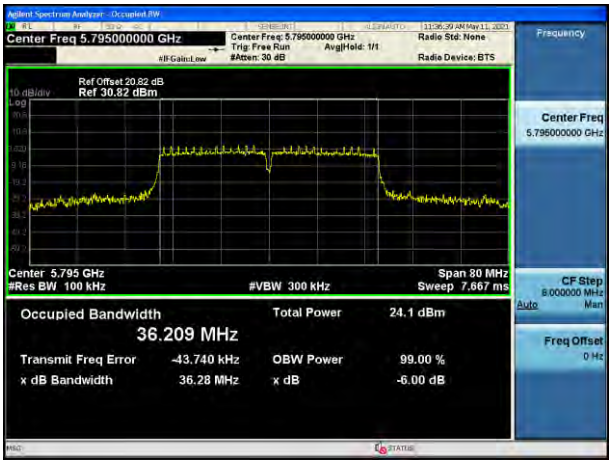
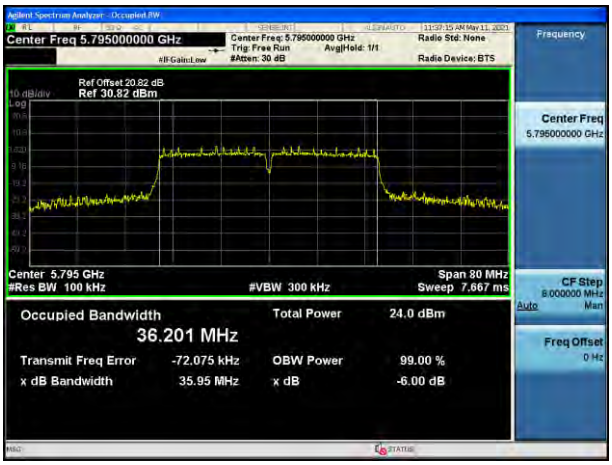
Note: In order to simplify the report, attached plots were only the most narrow channel.

802.11a (CH.149)	802.11n(HT20) (CH.149)
	
802.11n(HT40) (CH.159)	**802.11ac(VHT20) (CH.165)**
	
802.11ac(VHT40) (CH.159)	**802.11ac(VHT80) (CH.155)**
	

[ANT.2]

▣ Test Plots

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

802.11a (CH.149)	802.11n(HT20) (CH.165)
	
802.11n(HT40) (CH.159)	**802.11ac(VHT20) (CH.157)**
	
802.11ac(VHT40) (CH.159)	**802.11ac(VHT80) (CH.155)**
	

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.

[ANT.1]

802.11a Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5180	36	17	16.94	0.289	17.23	23.98	6
5200	40	17	17.05	0.289	17.34	23.98	6
5240	48	17	17.47	0.289	17.76	23.98	6
5260	52	17	17.46	0.289	17.74	23.98	6
5300	60	17	17.57	0.289	17.86	23.98	6
5320	64	17	17.59	0.289	17.88	23.98	6
5500	100	14.5	14.46	0.289	14.75	23.98	6
5600	120	17	17.39	0.289	17.68	23.98	6
5720	144	17	17.64	0.289	17.92	23.98	6
5745	149	17	17.40	0.289	17.69	30.00	6
5785	157	17	17.29	0.289	17.57	30.00	6
5825	165	17	16.99	0.289	17.28	30.00	6

802.11n(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	17	16.88	0.315	17.20	23.98	MCS0
5200	40	17	17.04	0.315	17.36	23.98	MCS0
5240	48	17	17.38	0.315	17.69	23.98	MCS0
5260	52	17	17.44	0.315	17.75	23.98	MCS0
5300	60	17	17.61	0.315	17.93	23.98	MCS0
5320	64	17	17.55	0.315	17.86	23.98	MCS0
5500	100	15	15.44	0.315	15.75	23.98	MCS0
5600	120	17	17.43	0.315	17.75	23.98	MCS0
5720	144	17	17.56	0.315	17.87	23.98	MCS0
5745	149	17	17.32	0.315	17.63	30.00	MCS0
5785	157	17	17.22	0.315	17.53	30.00	MCS0
5825	165	17	16.88	0.315	17.19	30.00	MCS0

802.11n(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	14.5	13.30	0.607	13.91	23.98	MCS0
5230	46	16	15.81	0.607	16.42	23.98	MCS0
5270	54	16	16.19	0.607	16.80	23.98	MCS0
5310	62	13	13.15	0.607	13.76	23.98	MCS0
5510	102	11.5	11.17	0.607	11.77	23.98	MCS0
5590	118	16	16.12	0.607	16.73	23.98	MCS0
5710	142	16	16.29	0.607	16.89	23.98	MCS0
5755	151	16	16.03	0.607	16.64	30.00	MCS0
5795	159	16	15.71	0.607	16.32	30.00	MCS0

802.11ac(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	17	16.95	0.313	17.26	23.98	MCS0
5200	40	17	17.14	0.313	17.45	23.98	MCS0
5240	48	17	17.44	0.313	17.76	23.98	MCS0
5260	52	17	17.46	0.313	17.77	23.98	MCS0
5300	60	17	17.63	0.313	17.95	23.98	MCS0
5320	64	17	17.50	0.313	17.82	23.98	MCS0
5500	100	15	15.46	0.313	15.77	23.98	MCS0
5600	120	17	17.39	0.313	17.71	23.98	MCS0
5720	144	17	17.65	0.313	17.96	23.98	MCS0
5745	149	17	17.36	0.313	17.67	30.00	MCS0
5785	157	17	17.29	0.313	17.60	30.00	MCS0
5825	165	17	16.97	0.313	17.28	30.00	MCS0

802.11ac(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	14.5	13.30	0.601	13.90	23.98	MCS0
5230	46	16	15.78	0.601	16.38	23.98	MCS0
5270	54	16	16.15	0.601	16.75	23.98	MCS0
5310	62	13	13.06	0.601	13.66	23.98	MCS0
5510	102	11.5	11.14	0.601	11.74	23.98	MCS0
5590	118	16	16.01	0.601	16.61	23.98	MCS0
5710	142	16	16.29	0.601	16.89	23.98	MCS0
5755	151	16	16.02	0.601	16.63	30.00	MCS0
5795	159	16	15.70	0.601	16.30	30.00	MCS0

802.11ac(80MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5210	42	14.5	12.87	1.132	14.00	23.98	MCS0
5290	58	12.5	11.46	1.132	12.59	23.98	MCS0
5530	106	11.5	10.49	1.132	11.62	23.98	MCS0
5610	122	15	14.23	1.132	15.37	23.98	MCS0
5690	138	15	14.34	1.132	15.47	23.98	MCS0
5775	155	15	13.86	1.132	14.99	30.00	MCS0

[ANT.2]

802.11a Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5180	36	17	17.14	0.289	17.43	23.98	6
5200	40	17	17.16	0.289	17.45	23.98	6
5240	48	17	17.12	0.289	17.41	23.98	6
5260	52	17	16.68	0.289	16.96	23.98	6
5300	60	17	16.80	0.289	17.09	23.98	6
5320	64	17	16.66	0.289	16.95	23.98	6
5500	100	14.5	13.86	0.289	14.15	23.98	6
5600	120	17	16.88	0.289	17.17	23.98	6
5720	144	17	17.18	0.289	17.47	23.98	6
5745	149	17	17.55	0.289	17.84	30.00	6
5785	157	17	17.51	0.289	17.80	30.00	6
5825	165	17	17.21	0.289	17.50	30.00	6

802.11n(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	17	17.06	0.315	17.37	23.98	MCS0
5200	40	17	17.17	0.315	17.48	23.98	MCS0
5240	48	17	17.15	0.315	17.46	23.98	MCS0
5260	52	17	16.75	0.315	17.07	23.98	MCS0
5300	60	17	16.85	0.315	17.16	23.98	MCS0
5320	64	17	16.61	0.315	16.93	23.98	MCS0
5500	100	15	14.79	0.315	15.11	23.98	MCS0
5600	120	17	16.87	0.315	17.18	23.98	MCS0
5720	144	17	17.22	0.315	17.53	23.98	MCS0
5745	149	17	17.45	0.315	17.77	30.00	MCS0
5785	157	17	17.46	0.315	17.78	30.00	MCS0
5825	165	17	17.15	0.315	17.46	30.00	MCS0

802.11n(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	14.5	13.85	0.607	14.46	23.98	MCS0
5230	46	16	15.95	0.607	16.55	23.98	MCS0
5270	54	16	15.68	0.607	16.29	23.98	MCS0
5310	62	13	12.46	0.607	13.07	23.98	MCS0
5510	102	11.5	10.39	0.607	11.00	23.98	MCS0
5590	118	16	15.62	0.607	16.22	23.98	MCS0
5710	142	16	16.09	0.607	16.70	23.98	MCS0
5755	151	16	16.13	0.607	16.74	30.00	MCS0
5795	159	16	16.29	0.607	16.90	30.00	MCS0

802.11ac(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	17	17.23	0.313	17.54	23.98	MCS0
5200	40	17	17.26	0.313	17.57	23.98	MCS0
5240	48	17	17.19	0.313	17.50	23.98	MCS0
5260	52	17	16.78	0.313	17.09	23.98	MCS0
5300	60	17	16.99	0.313	17.30	23.98	MCS0
5320	64	17	16.88	0.313	17.19	23.98	MCS0
5500	100	15	14.82	0.313	15.14	23.98	MCS0
5600	120	17	16.88	0.313	17.19	23.98	MCS0
5720	144	17	17.22	0.313	17.53	23.98	MCS0
5745	149	17	17.51	0.313	17.82	30.00	MCS0
5785	157	17	17.46	0.313	17.77	30.00	MCS0
5825	165	17	17.16	0.313	17.47	30.00	MCS0

802.11ac(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	14.5	13.75	0.601	14.35	23.98	MCS0
5230	46	16	15.86	0.601	16.46	23.98	MCS0
5270	54	16	15.63	0.601	16.23	23.98	MCS0
5310	62	13	12.36	0.601	12.96	23.98	MCS0
5510	102	11.5	10.31	0.601	10.91	23.98	MCS0
5590	118	16	15.56	0.601	16.16	23.98	MCS0
5710	142	16	15.96	0.601	16.56	23.98	MCS0
5755	151	16	16.22	0.601	16.82	30.00	MCS0
5795	159	16	16.22	0.601	16.82	30.00	MCS0

802.11ac(80MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5210	42	14.5	12.87	1.132	14.00	23.98	MCS0
5290	58	12.5	10.22	1.132	11.35	23.98	MCS0
5530	106	11.5	10.08	1.132	11.21	23.98	MCS0
5610	122	15	14.29	1.132	15.42	23.98	MCS0
5690	138	15	14.43	1.132	15.57	23.98	MCS0
5775	155	15	14.57	1.132	15.70	30.00	MCS0

[MIMO]

802.11a Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5180	36	17	17.23	17.43	20.34	23.98	6
5200	40	17	17.34	17.45	20.40	23.98	6
5240	48	17	17.76	17.41	20.60	23.98	6
5260	52	17	17.74	16.96	20.38	23.98	6
5300	60	17	17.86	17.09	20.50	23.98	6
5320	64	17	17.88	16.95	20.45	23.98	6
5500	100	14.5	14.75	14.15	17.47	23.98	6
5600	120	17	17.68	17.17	20.44	23.98	6
5720	144	17	17.92	17.47	20.71	23.98	6
5745	149	17	17.69	17.84	20.77	30.00	6
5785	157	17	17.57	17.80	20.70	30.00	6
5825	165	17	17.28	17.50	20.40	30.00	6

802.11n(20MHz) Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5180	36	17	17.20	17.37	20.30	23.98	MCS0
5200	40	17	17.36	17.48	20.43	23.98	MCS0
5240	48	17	17.69	17.46	20.59	23.98	MCS0
5260	52	17	17.75	17.07	20.43	23.98	MCS0
5300	60	17	17.93	17.16	20.57	23.98	MCS0
5320	64	17	17.86	16.93	20.43	23.98	MCS0
5500	100	15	15.75	15.11	18.45	23.98	MCS0
5600	120	17	17.75	17.18	20.48	23.98	MCS0
5720	144	17	17.87	17.53	20.72	23.98	MCS0
5745	149	17	17.63	17.77	20.71	30.00	MCS0
5785	157	17	17.53	17.78	20.67	30.00	MCS0
5825	165	17	17.19	17.46	20.34	30.00	MCS0

802.11n(40MHz) Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5190	38	14.5	13.91	14.46	17.20	23.98	MCS0
5230	46	16	16.42	16.55	19.50	23.98	MCS0
5270	54	16	16.80	16.29	19.56	23.98	MCS0
5310	62	13	13.76	13.07	16.44	23.98	MCS0
5510	102	11.5	11.77	11.00	14.41	23.98	MCS0
5590	118	16	16.73	16.22	19.49	23.98	MCS0
5710	142	16	16.89	16.70	19.81	23.98	MCS0
5755	151	16	16.64	16.74	19.70	30.00	MCS0
5795	159	16	16.32	16.90	19.63	30.00	MCS0

802.11ac(20MHz) Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5180	36	17	17.26	17.54	20.41	23.98	MCS0
5200	40	17	17.45	17.57	20.52	23.98	MCS0
5240	48	17	17.76	17.50	20.64	23.98	MCS0
5260	52	17	17.77	17.09	20.46	23.98	MCS0
5300	60	17	17.95	17.30	20.65	23.98	MCS0
5320	64	17	17.82	17.19	20.53	23.98	MCS0
5500	100	15	15.77	15.14	18.47	23.98	MCS0
5600	120	17	17.71	17.19	20.47	23.98	MCS0
5720	144	17	17.96	17.53	20.76	23.98	MCS0
5745	149	17	17.67	17.82	20.76	30.00	MCS0
5785	157	17	17.60	17.77	20.70	30.00	MCS0
5825	165	17	17.28	17.47	20.39	30.00	MCS0

802.11ac(40MHz) Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5190	38	14.5	13.90	14.35	17.14	23.98	MCS0
5230	46	16	16.38	16.46	19.43	23.98	MCS0
5270	54	16	16.75	16.23	19.51	23.98	MCS0
5310	62	13	13.66	12.96	16.34	23.98	MCS0
5510	102	11.5	11.74	10.91	14.35	23.98	MCS0
5590	118	16	16.61	16.16	19.40	23.98	MCS0
5710	142	16	16.89	16.56	19.74	23.98	MCS0
5755	151	16	16.63	16.82	19.73	30.00	MCS0
5795	159	16	16.30	16.82	19.58	30.00	MCS0

802.11ac(80MHz) Mode		Power Level Setting	Ant.1 Measured Power (dBm) + Duty Cycle Factor	Ant.2 Measured Power (dBm) + Duty Cycle Factor	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate (Mbps)
Frequency [MHz]	Channel No.						
5210	42	14.5	14.00	14.00	17.01	23.98	MCS0
5290	58	12	12.59	11.35	15.03	23.98	MCS0
5530	106	11.5	11.62	11.21	14.43	23.98	MCS0
5610	122	15	15.37	15.42	18.40	23.98	MCS0
5690	138	15	15.47	15.57	18.53	23.98	MCS0
5775	155	15	14.99	15.70	18.37	30.00	MCS0

10.5 POWER SPECTRAL DENSITY

[ANT.1]

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase Datarate (Mbps)	Limit
Frequency [MHz]	Channel No.					
5180	36	6.786	0.289	7.075	6	11 dBm/MHz
5200	40	5.752	0.289	6.041	6	
5240	48	6.207	0.289	6.496	6	
5260	52	6.018	0.289	6.307	6	
5300	60	6.180	0.289	6.469	6	
5320	64	7.202	0.289	7.491	6	
5500	100	4.304	0.289	4.593	6	
5600	120	6.276	0.289	6.565	6	
5720	144	6.444	0.289	6.733	6	
5745	149	3.351	0.289	3.640	6	30 dBm/500kHz
5785	157	3.526	0.289	3.815	6	
5825	165	3.098	0.289	3.387	6	

802.11n(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.489	0.315	6.804	MCS0	11 dBm/MHz
5200	40	5.444	0.315	5.759	MCS0	
5240	48	5.832	0.315	6.147	MCS0	
5260	52	6.012	0.315	6.327	MCS0	
5300	60	5.802	0.315	6.117	MCS0	
5320	64	6.749	0.315	7.064	MCS0	
5500	100	4.961	0.315	5.276	MCS0	
5600	120	5.865	0.315	6.180	MCS0	
5720	144	6.021	0.315	6.336	MCS0	
5745	149	2.918	0.315	3.233	MCS0	30 dBm/500kHz
5785	157	3.384	0.315	3.699	MCS0	
5825	165	2.607	0.315	2.922	MCS0	

802.11n(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	-0.206	0.607	0.401	MCS0	11 dBm/MHz
5230	46	1.574	0.607	2.181	MCS0	
5270	54	1.750	0.607	2.357	MCS0	
5310	62	-0.114	0.607	0.493	MCS0	
5510	102	-1.804	0.607	-1.197	MCS0	
5590	118	1.972	0.607	2.579	MCS0	
5710	142	2.144	0.607	2.751	MCS0	
5755	151	-0.935	0.607	-0.328	MCS0	30 dBm /500kHz
5795	159	-0.895	0.607	-0.288	MCS0	

802.11ac(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.495	0.313	6.808	MCS0	11 dBm/MHz
5200	40	5.413	0.313	5.726	MCS0	
5240	48	5.748	0.313	6.061	MCS0	
5260	52	5.707	0.313	6.020	MCS0	
5300	60	5.810	0.313	6.123	MCS0	
5320	64	6.812	0.313	7.125	MCS0	
5500	100	4.914	0.313	5.227	MCS0	
5600	120	5.954	0.313	6.267	MCS0	
5720	144	6.241	0.313	6.554	MCS0	
5745	149	2.951	0.313	3.264	MCS0	30 dBm/500kHz
5785	157	2.935	0.313	3.248	MCS0	
5825	165	2.842	0.313	3.155	MCS0	

802.11ac(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	0.177	0.601	0.778	MCS0	11 dBm/MHz
5230	46	1.414	0.601	2.015	MCS0	
5270	54	2.231	0.601	2.832	MCS0	
5310	62	-0.186	0.601	0.415	MCS0	
5510	102	-2.308	0.601	-1.707	MCS0	
5590	118	1.679	0.601	2.280	MCS0	
5710	142	2.090	0.601	2.691	MCS0	
5755	151	-0.948	0.601	-0.347	MCS0	30 dBm/500kHz
5795	159	-0.860	0.601	-0.259	MCS0	

802.11ac(80MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5210	42	-3.008	1.132	-1.876	MCS0	11 dBm/MHz
5290	58	-4.965	1.132	-3.833	MCS0	
5530	106	-5.290	1.132	-4.158	MCS0	
5610	122	-3.044	1.132	-1.912	MCS0	
5690	138	-2.548	1.132	-1.416	MCS0	
5775	155	-6.050	1.132	-4.918	MCS0	30 dBm/500kHz

[Ant.2]

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase Datarate (Mbps)	Limit
Frequency [MHz]	Channel No.					
5180	36	6.505	0.289	6.794	6	11 dBm/MHz
5200	40	5.713	0.289	6.002	6	
5240	48	5.678	0.289	5.967	6	
5260	52	5.325	0.289	5.614	6	
5300	60	5.471	0.289	5.760	6	
5320	64	6.368	0.289	6.657	6	
5500	100	3.662	0.289	3.951	6	
5600	120	5.489	0.289	5.778	6	
5720	144	5.822	0.289	6.111	6	
5745	149	3.447	0.289	3.736	6	30 dBm/500kHz
5785	157	3.460	0.289	3.749	6	
5825	165	3.016	0.289	3.305	6	

802.11n(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.483	0.315	6.798	MCS0	11 dBm/MHz
5200	40	5.039	0.315	5.354	MCS0	
5240	48	5.286	0.315	5.601	MCS0	
5260	52	5.020	0.315	5.335	MCS0	
5300	60	4.919	0.315	5.234	MCS0	
5320	64	6.168	0.315	6.483	MCS0	
5500	100	4.178	0.315	4.493	MCS0	
5600	120	5.258	0.315	5.573	MCS0	
5720	144	5.701	0.315	6.016	MCS0	
5745	149	2.978	0.315	3.293	MCS0	30 dBm/500kHz
5785	157	3.028	0.315	3.343	MCS0	
5825	165	2.693	0.315	3.008	MCS0	

802.11n(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	0.357	0.607	0.964	MCS0	11 dBm/MHz
5230	46	1.063	0.607	1.670	MCS0	
5270	54	1.278	0.607	1.885	MCS0	
5310	62	-0.864	0.607	-0.257	MCS0	
5510	102	-3.257	0.607	-2.650	MCS0	
5590	118	0.998	0.607	1.605	MCS0	
5710	142	1.542	0.607	2.149	MCS0	
5755	151	-0.790	0.607	-0.183	MCS0	30 dBm /500kHz
5795	159	-0.718	0.607	-0.111	MCS0	

802.11ac(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.141	0.313	6.454	MCS0	11 dBm/MHz
5200	40	5.291	0.313	5.604	MCS0	
5240	48	5.184	0.313	5.497	MCS0	
5260	52	5.023	0.313	5.336	MCS0	
5300	60	4.840	0.313	5.153	MCS0	
5320	64	5.843	0.313	6.156	MCS0	
5500	100	4.050	0.313	4.363	MCS0	
5600	120	5.237	0.313	5.550	MCS0	
5720	144	5.385	0.313	5.698	MCS0	
5745	149	3.157	0.313	3.470	MCS0	30 dBm/500kHz
5785	157	2.854	0.313	3.167	MCS0	
5825	165	2.897	0.313	3.210	MCS0	

802.11ac(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	-0.288	0.601	0.313	MCS0	11 dBm/MHz
5230	46	1.284	0.601	1.885	MCS0	
5270	54	1.147	0.601	1.748	MCS0	
5310	62	-1.076	0.601	-0.475	MCS0	
5510	102	-3.359	0.601	-2.758	MCS0	
5590	118	1.195	0.601	1.796	MCS0	
5710	142	1.613	0.601	2.214	MCS0	
5755	151	-0.535	0.601	0.066	MCS0	30 dBm/500kHz
5795	159	-0.715	0.601	-0.114	MCS0	

802.11ac(80MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5210	42	-3.481	1.132	-2.349	MCS0	11 dBm/MHz
5290	58	-5.878	1.132	-4.746	MCS0	
5530	106	-6.204	1.132	-5.072	MCS0	
5610	122	-2.654	1.132	-1.522	MCS0	
5690	138	-2.868	1.132	-1.736	MCS0	
5775	155	-5.078	1.132	-3.946	MCS0	30 dBm/500kHz

[MIMO]

802.11a Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase Datarate (Mbps)	Limit
Frequency [MHz]	Channel No.					
5180	36	7.075	6.794	9.947	6	11 dBm/MHz
5200	40	6.041	6.002	9.031	6	
5240	48	6.496	5.967	9.250	6	
5260	52	6.307	5.614	8.984	6	
5300	60	6.469	5.760	9.139	6	
5320	64	7.491	6.657	10.104	6	
5500	100	4.593	3.951	7.294	6	
5600	120	6.565	5.778	9.199	6	
5720	144	6.733	6.111	9.443	6	
5745	149	3.640	3.736	6.698	6	30 dBm/500kHz
5785	157	3.815	3.749	6.792	6	
5825	165	3.387	3.305	6.356	6	

802.11n(20MHz) Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.804	6.798	9.811	MCS0	11 dBm/MHz
5200	40	5.759	5.354	8.571	MCS0	
5240	48	6.147	5.601	8.892	MCS0	
5260	52	6.327	5.335	8.869	MCS0	
5300	60	6.117	5.234	8.708	MCS0	
5320	64	7.064	6.483	9.793	MCS0	
5500	100	5.276	4.493	7.912	MCS0	
5600	120	6.180	5.573	8.897	MCS0	
5720	144	6.336	6.016	9.189	MCS0	
5745	149	3.233	3.293	6.273	MCS0	30 dBm/500kHz
5785	157	3.699	3.343	6.534	MCS0	
5825	165	2.922	3.008	5.975	MCS0	

802.11n(40MHz) Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	0.401	0.964	3.702	MCS0	11 dBm/MHz
5230	46	2.181	1.670	4.944	MCS0	
5270	54	2.357	1.885	5.138	MCS0	
5310	62	0.493	-0.257	3.145	MCS0	
5510	102	-1.197	-2.650	1.148	MCS0	
5590	118	2.579	1.605	5.130	MCS0	
5710	142	2.751	2.149	5.471	MCS0	
5755	151	-0.328	-0.183	2.756	MCS0	30 dBm / 500kHz
5795	159	-0.288	-0.111	2.812	MCS0	

802.11ac(20MHz) Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.808	6.454	9.645	MCS0	11 dBm/MHz
5200	40	5.726	5.604	8.676	MCS0	
5240	48	6.061	5.497	8.799	MCS0	
5260	52	6.020	5.336	8.702	MCS0	
5300	60	6.123	5.153	8.676	MCS0	
5320	64	7.125	6.156	9.678	MCS0	
5500	100	5.227	4.363	7.827	MCS0	
5600	120	6.267	5.550	8.934	MCS0	
5720	144	6.554	5.698	9.158	MCS0	
5745	149	3.264	3.470	6.379	MCS0	30 dBm/ 500kHz
5785	157	3.248	3.167	6.218	MCS0	
5825	165	3.155	3.210	6.193	MCS0	

802.11ac(40MHz) Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	0.778	0.313	3.562	MCS0	11 dBm/MHz
5230	46	2.015	1.885	4.960	MCS0	
5270	54	2.832	1.748	5.334	MCS0	
5310	62	0.415	-0.475	3.003	MCS0	
5510	102	-1.707	-2.758	0.809	MCS0	
5590	118	2.280	1.796	5.055	MCS0	
5710	142	2.691	2.214	5.469	MCS0	
5755	151	-0.347	0.066	2.874	MCS0	30 dBm/ 500kHz
5795	159	-0.294	-0.114	2.807	MCS0	

802.11ac(80MHz) Mode		ANT.1 Measured Power(dBm) + Duty Cycle Factor (dB)	ANT.2 Measured Power(dBm) + Duty Cycle Factor (dB)	MIMO Result (dBm)	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5210	42	-1.876	-2.349	0.904	MCS0	11 dBm/MHz
5290	58	-3.833	-4.746	-1.256	MCS0	
5530	106	-4.158	-5.072	-1.581	MCS0	
5610	122	-1.912	-1.522	1.297	MCS0	
5690	138	-1.416	-1.736	1.437	MCS0	
5775	155	-4.918	-3.946	-1.395	MCS0	30 dBm/500kHz

[ANT.1]

▣ Test Plots(802.11a)

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 157)
	

▣ Test Plots(802.11n(HT20))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 157)
	

▣ Test Plots(802.11n(HT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

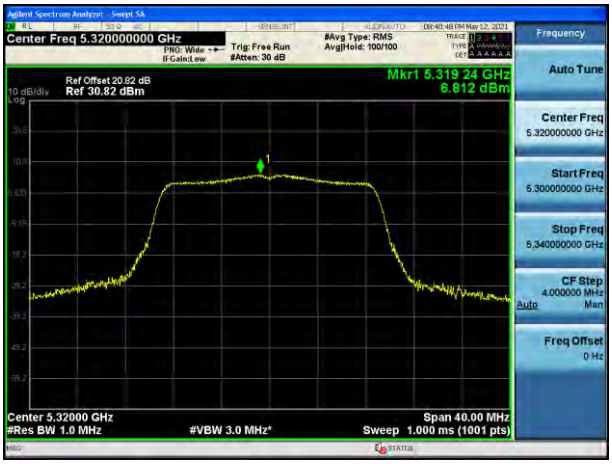
UNII 1 (Ch. 46)	UNII 2A (Ch. 54)
	

UNII 2C (Ch. 142)	UNII 3 (Ch. 159)
	

▣ Test Plots(802.11ac(VHT20))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 149)
	

▣ Test Plots(802.11ac(VHT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 46)	UNII 2A (Ch. 54)
	

UNII 2C (Ch. 142)	UNII 3 (Ch. 159)
	

▣ Test Plots(802.11ac(VHT80))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 42)	UNII 2A (Ch. 58)
	

UNII 2C (Ch. 138)	UNII 3 (Ch. 155)
	

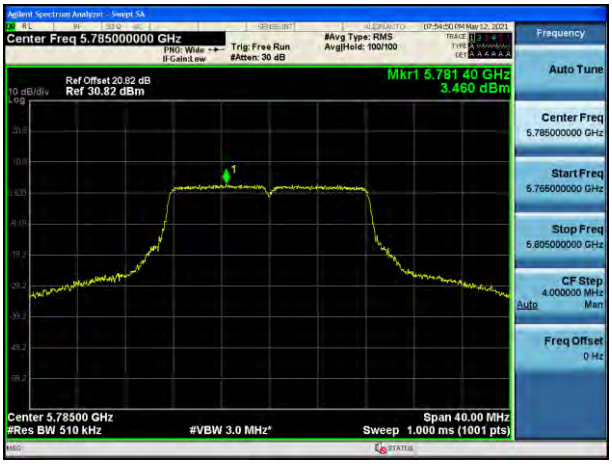
[ANT.2]

▣ Test Plots(802.11a)

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 157)
	

▣ Test Plots(802.11n(HT20))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 157)
	

▣ Test Plots(802.11n(HT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 46)	UNII 2A (Ch. 54)
	

UNII 2C (Ch. 142)	UNII 3 (Ch. 159)
	

▣ Test Plots(802.11ac(VHT20))

Note:

In order to simplify the report, attached plots were only channel of highest power.

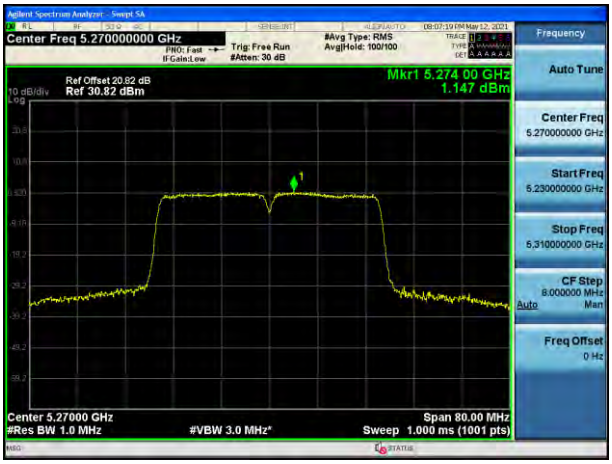
UNII 1 (Ch. 36)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 144)	UNII 3 (Ch. 149)
	

▣ Test Plots(802.11ac(VHT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 46)	UNII 2A (Ch. 54)
	

UNII 2C (Ch. 142)	UNII 3 (Ch. 151)
	

▣ Test Plots(802.11ac(VHT80))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 42)	UNII 2A (Ch. 58)
	

UNII 2C (Ch. 122)	UNII 3 (Ch. 155)
	

10.6 FREQUENCY STABILITY.

10.6.1 80MHz BW

[ANT.1]

Startup after the EUT is energized

OPERATING BAND: UNII Band 1
OPERATING FREQUENCY: 5,210,000,000 Hz
CHANNEL: 42
REFERENCE VOLTAGE: 3.88 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.88	+20(Ref)	5210023.66	23.66
100%		-30	5210047.99	47.99
100%		-20	5210041.19	41.19
100%		-10	5210035.42	35.42
100%		0	5210030.61	30.61
100%		+10	5210027.58	27.58
100%		+30	5210025.94	25.94
100%		+40	5210036.32	36.32
100%		+50	5210041.43	41.43
LOW	3.65	+20	5210041.55	41.55
HIGH	4.47	+20	5210038.38	38.38

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2A
OPERATING FREQUENCY: 5,290,000,000 Hz
CHANNEL: 58
REFERENCE VOLTAGE: 3.88 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.88	+20(Ref)	5290017.64	17.64
100%		-30	5290041.16	41.16
100%		-20	5290033.59	33.59
100%		-10	5290026.52	26.52
100%		0	5290022.59	22.59
100%		+10	5290019.25	19.25
100%		+30	5290020.37	20.37
100%		+40	5290029.11	29.11
100%		+50	5290033.97	33.97
LOW	3.65	+20	5290035.78	35.78
HIGH	4.47	+20	5290033.13	33.13

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2C
OPERATING FREQUENCY: 5,530,000,000 Hz
CHANNEL: 106
REFERENCE VOLTAGE: 3.88 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.88	+20(Ref)	5530031.69	31.69
100%		-30	5530042.52	42.52
100%		-20	5530034.61	34.61
100%		-10	5530028.55	28.55
100%		0	5530024.44	24.44
100%		+10	5530020.84	20.84
100%		+30	5530021.68	21.68
100%		+40	5530030.56	30.56
100%		+50	5530034.66	34.66
LOW	3.65	+20	5530033.24	33.24
HIGH	4.47	+20	5530036.50	36.50

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 3
OPERATING FREQUENCY: 5,775,000,000 Hz
CHANNEL: 155
REFERENCE VOLTAGE: 3.88 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.88	+20(Ref)	5775027.64	27.64
100%		-30	5775051.40	51.40
100%		-20	5775043.47	43.47
100%		-10	5775036.80	36.80
100%		0	5775032.26	32.26
100%		+10	5775028.53	28.53
100%		+30	5775031.22	31.22
100%		+40	5775041.11	41.11
100%		+50	5775045.93	45.93
LOW	3.65	+20	5775045.82	45.82
HIGH	4.47	+20	5775043.69	43.69

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

2 minutes after the EUT is energized

OPERATING BAND: UNII Band 1
OPERATING FREQUENCY: 5,210,000,000 Hz
CHANNEL: 42
REFERENCE VOLTAGE: 3.88 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.88	+20(Ref)	5210047.23	47.23
100%		-30	5210070.32	70.32
100%		-20	5210063.57	63.57
100%		-10	5210057.26	57.26
100%		0	5210052.88	52.88
100%		+10	5210050.36	50.36
100%		+30	5210050.36	50.36
100%		+40	5210058.80	58.80
100%		+50	5210063.00	63.00
LOW	3.65	+20	5210066.03	66.03
HIGH	4.47	+20	5210061.56	61.56

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.