

TEST REPORT

FCC UNII Test for SM-W767

Certification

APPLICANT

SAMSUNG Electronics Co., Ltd.

REPORT NO.

HCT-RF-1907-FC005

DATE OF ISSUE

06 August 2019

HCT Co., Ltd.

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A3LSMW767

Applicant

SAMSUNG Electronics Co., Ltd.

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

Eut Type
Model Name

Note PC
SM-W767

Modulation type

OFDM

FCC Classification

Unlicensed National Information Infrastructure(UNII)

FCC Rule Part(s)

Part 15.407

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

Tested by
Jeong Ho Kim

(signature)

Technical Manager
Jong Seok Lee

(signature)

HCT CO., LTD.

Soo Chan Lee
SooChan Lee / CEO

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	06 August 2019	Initial Release

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

Engineering Statement:

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

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1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SM-W767	
Additional Model	-	
EUT Type	Note PC	
Power Supply	DC 7.70 V	
Battery Information	Model: EB-BW767ABY Type: Li-ion Battery	
Travel Adapter Information	Model : ED-TA800 Manufacture: SOLUM	
Data Cable Information	Model : ED-DW767JWE Manufacture: RFTECH	
Ear-jack Information	Model : EHS64AVFBE Manufacture: ALMUS	
CtoA Gender Information	Model : EE-UG970 Manufacture: RFTECH	
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: LDS Ant.1 Peak Gain : -1.51 dBi(UNII 1, 2A) / -2.23 dBi(UNII 2C)/ -3.42 dBi(UNII 3) Ant.2 Peak Gain : -2.82 dBi(UNII 1, 2A) / -1.84 dBi(UNII 2C)/ -3.48 dBi(UNII 3)	
Straddle channel	Supported	
TDWR Band	Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	Conducted : June 18, 2019 ~ July 22, 2019	
	Radiated : July 2, 2019 ~ July 22, 2019	

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 SISO channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna.

Frequency	Supported
2.4 GHz Ant 1 + 5 GHz Ant 2	O
2.4 GHz Ant 2 + 5 GHz Ant 1	X
2.4 GHz Ant 1 + 5 GHz Ant 1	X
2.4 GHz Ant 2 + 5 GHz Ant 2	X

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (iii)

Directional gain = $G_{ANT\ MAX} + 10 \log(N_{ANT}/N_{SS})$ dBi

($N_{ANT} = 2$, $N_{SS} = 2$, $G_{ANT\ MAX}$ is the gain of the antenna having the highest gain)

Band	Ant Gain (dBi)		N_{ANT}/N_{SS}	Directional Gain (= $G_{ANT\ MAX} + 10 \log(N_{ANT}/N_{SS})$) (dBi)
UNII 1, 2A	ANT1	-1.51	2 / 2	0.87
	ANT2	-2.82		
UNII 2C	ANT1	-2.23	2 / 2	0.98
	ANT2	-1.84		
UNII 3	ANT1	-3.42	2 / 2	-0.44
	ANT2	-3.48		

2. MAXIMUM OUTPUT POWER

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

Band	Mode	SISO				MIMO	
		Ant1 Power		Ant2 Power		Ant 1 + Ant 2 Power	
		(dBm)	(W)	(dBm)	(W)	(dBm)	(W)
UNII1	802.11a	12.96	0.020	12.92	0.020	15.95	0.039
	802.11n (HT20)	12.49	0.018	12.84	0.019	15.68	0.037
	802.11n (HT40)	11.70	0.015	11.73	0.015	14.73	0.030
	802.11ac (VHT20)	11.78	0.015	11.61	0.014	14.71	0.030
	802.11ac (VHT40)	10.74	0.012	10.76	0.012	13.76	0.024
	802.11ac (VHT80)	10.56	0.011	10.77	0.012	13.67	0.023
UNII2A	802.11a	12.86	0.019	12.95	0.020	15.88	0.039
	802.11n (HT20)	12.63	0.018	12.86	0.019	15.71	0.037
	802.11n (HT40)	11.53	0.014	11.67	0.015	14.61	0.029
	802.11ac (VHT20)	11.57	0.014	11.63	0.015	14.61	0.029
	802.11ac (VHT40)	10.68	0.012	10.49	0.011	13.59	0.023
	802.11ac (VHT80)	10.40	0.011	10.98	0.013	13.71	0.023
UNII2C	802.11a	12.64	0.018	12.63	0.018	15.65	0.037
	802.11n (HT20)	12.43	0.017	12.75	0.019	15.60	0.036
	802.11n (HT40)	11.50	0.014	11.51	0.014	14.51	0.028
	802.11ac (VHT20)	11.38	0.014	11.38	0.014	14.39	0.027
	802.11ac (VHT40)	10.38	0.011	10.40	0.011	13.37	0.022
	802.11ac (VHT80)	10.47	0.011	10.71	0.012	13.60	0.023
UNII3	802.11a	12.64	0.018	12.75	0.019	15.67	0.037
	802.11n (HT20)	12.51	0.018	12.70	0.019	15.61	0.036
	802.11n (HT40)	11.53	0.014	11.58	0.014	14.56	0.029
	802.11ac (VHT20)	11.64	0.015	11.61	0.014	14.57	0.029
	802.11ac (VHT40)	10.56	0.011	10.51	0.011	13.49	0.022
	802.11ac (VHT80)	10.32	0.011	10.61	0.012	13.48	0.022

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."

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

* 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.

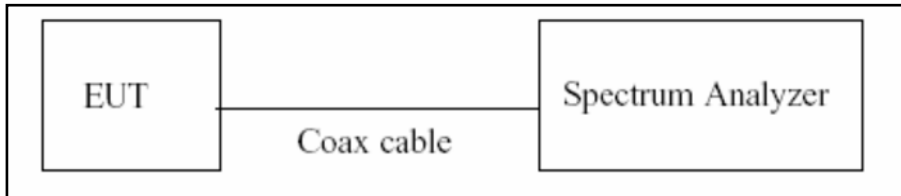
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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.

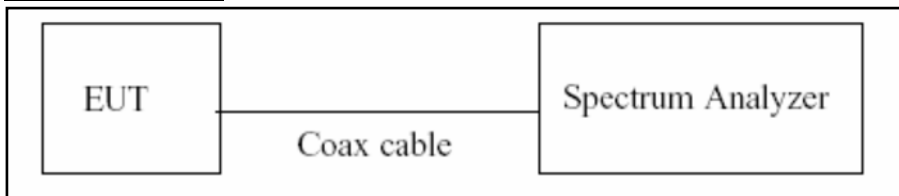
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = $T_{\text{on}} / T_{\text{total}}$ and Duty Cycle Factor = $10 \cdot \log(1/\text{Duty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

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. $VBW \geq 3 \cdot RBW$
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.

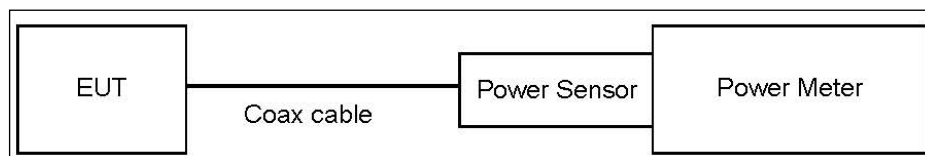
8.3. Output Power Measurement

Limit

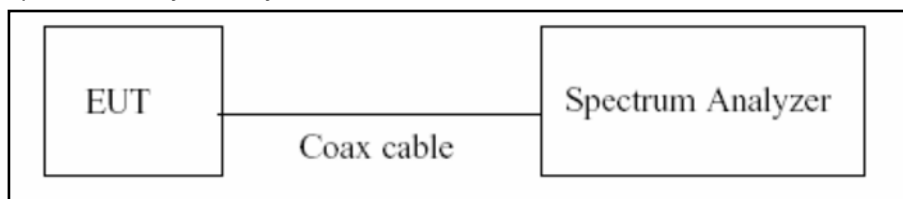
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

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

Sample Calculation

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

Note

1. Spectrum reading values are not plot data.

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

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

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

Band	Loss(dB)
UNII 1	20.63
UNII 2A	20.63
UNII 2C	20.63
UNII 3	20.63

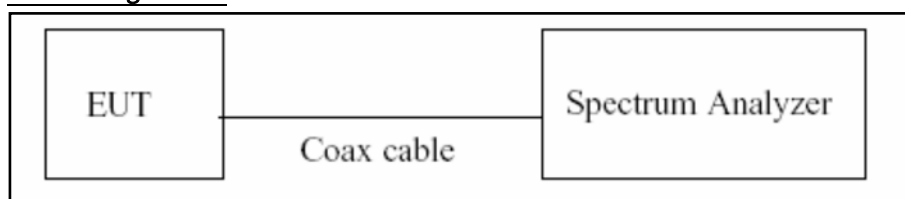
(Actual value of loss for the attenuator and cable combination)

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

Sample Calculation

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

Note

1. Spectrum reading values are not plot data.

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

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

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

Band	Loss(dB)
UNII 1	20.63
UNII 2A	20.63
UNII 2C	20.63
UNII 3	20.63

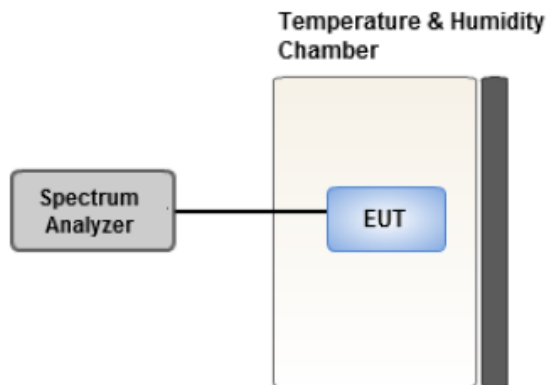
(Actual value of loss for the attenuator and cable combination)

8.5. Frequency Stability

Limit

Maintained within the band

Test Configuration



Test Procedure

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

8.6. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 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*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

8.7. Radiated Test

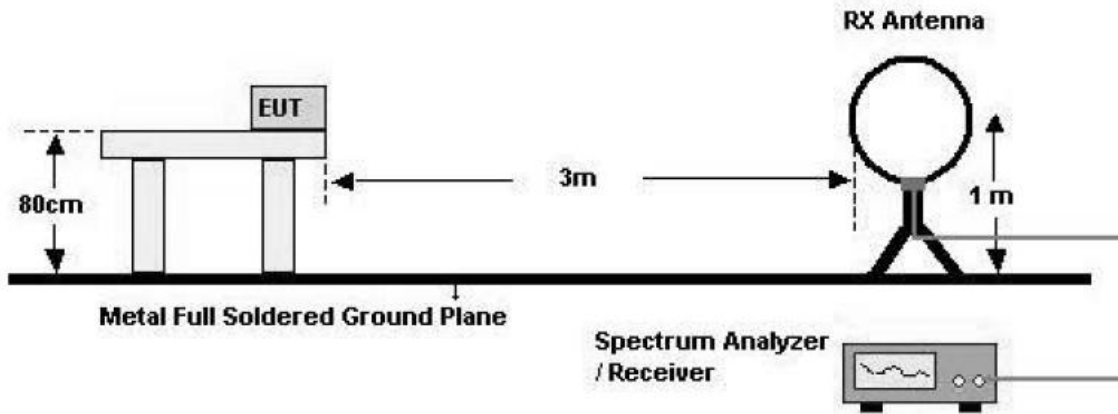
Limit

1. UNII 1: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
2. UNII 2A, 2C: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
3. UNII 3: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
4. All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Section 15.209.

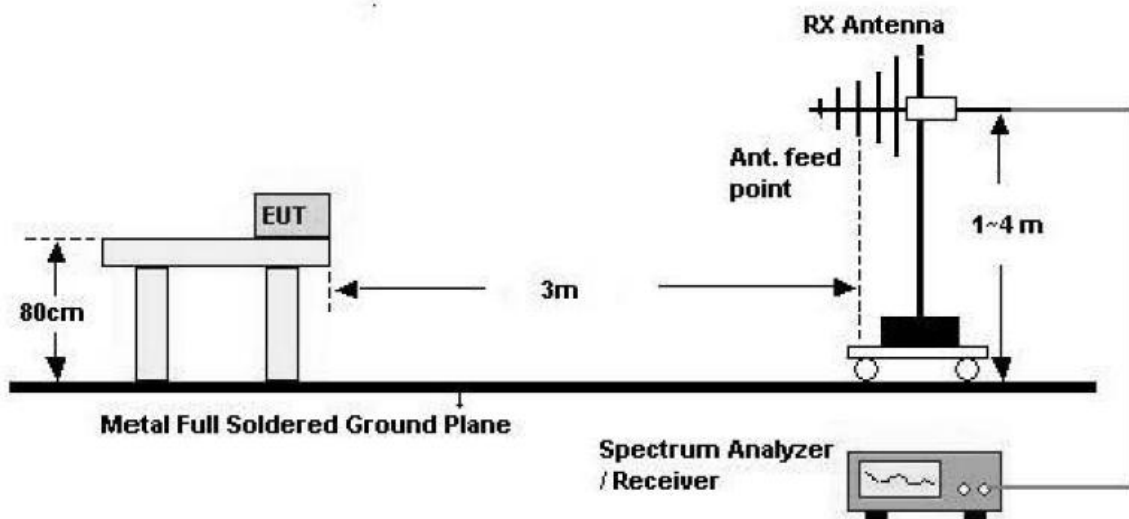
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

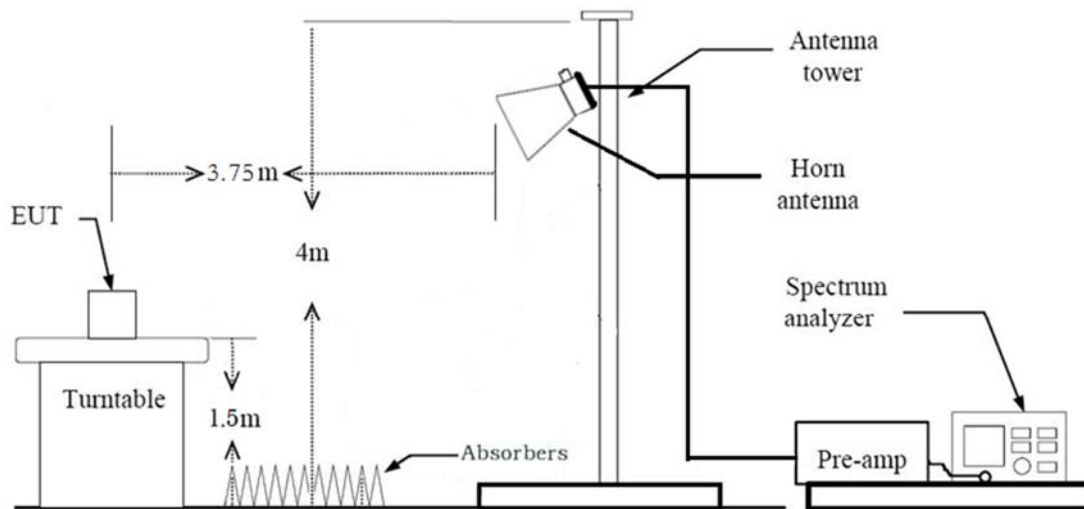
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below 30 MHz)

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

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the

regulations; however, an attempt should be made to avoid making measurements in the near field.

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

Test Procedure of Radiated spurious emissions(Below 1GHz)

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

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
 - *Distance extrapolation factor = $20 \times \log(\text{test distance} / \text{specific distance})$ (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) = VBW $\leq$ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) = VBW $\geq$ $1/T$, where T is the minimum transmission duration.
- The analyzer is set to linear detector mode.
- Detector = Peak.
- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of $1/x$, where x is the duty cycle.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor

11. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency

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

Test Procedure of Radiated Restricted Band Edge

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

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

6.

Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

8. The unit was tested with its standard battery.

9. Spectrum Setting

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

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

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

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

- RBW = 1 MHz
- VBW(Duty cycle $\geq$ 98 percent) = $VBW \leq RBW/100$ (i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) = $VBW \geq 1/T$, 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	0.975	0.110	1000
802.11n(HT20)	MCS 0	0.973	0.117	1000
802.11n(HT40)	MCS 0	0.948	0.232	3000
802.11ac(VHT20)	MCS 0	0.974	0.116	1000
802.11ac(VHT40)	MCS 0	0.949	0.227	3000
802.11ac(VHT80)	MCS 0	0.901	0.454	10000

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 :
 - (1) Stand alone (Open mode)
 - (2) Stand alone (Closed mode),
 - (3) Stand alone (Open mode) + External accessories(Travel Adapter, Earphone)
 - (4) Stand alone (Closed mode) + Travel Adapter+ External accessories(Travel Adapter, Earphone)
 - Worstcase : (1) Stand alone (Open mode)
2. EUT Axis
 - Radiated Spurious Emissions : X
 - Radiated Restricted Band Edge : X
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

Radiated test(DBS)

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

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	6	100
Data Rate	1Mbps	6Mbps
Mode	802.11b	802.11a

AC Power line Conducted Emissions

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

- Mode : (1)Stand alone (Open mode) + Travel Adapter
(2)stand alone (Closed mode) + Travel Adapter
(3)Stand alone (Open mode) + Travel Adapter +Ear-jack
(4)stand alone (Closed mode) + Travel Adapter+Ear-jack
- Worstcase : (1)Stand alone (open) + Travel Adapter

Conducted test

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

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	1.433	1.469	0.975	0.110
	9	0.960	0.997	0.963	0.166
	12	0.728	0.765	0.951	0.217
	18	0.492	0.529	0.929	0.319
	24	0.376	0.413	0.910	0.410
	36	0.256	0.292	0.877	0.571
	48	0.200	0.236	0.847	0.722
	54	0.180	0.216	0.833	0.794

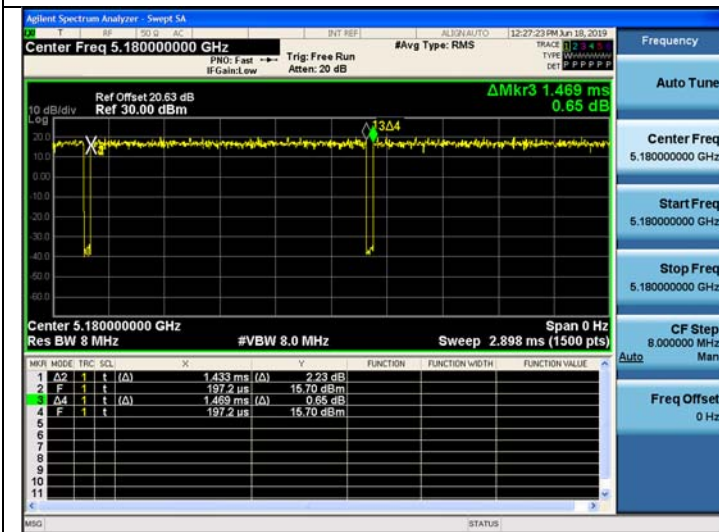
Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.340	1.377	0.973	0.117
	1	0.688	0.725	0.949	0.227
	2	0.472	0.509	0.928	0.326
	3	0.365	0.402	0.908	0.418
	4	0.256	0.292	0.877	0.570
	5	0.200	0.236	0.848	0.718
	6	0.184	0.220	0.835	0.782
	7	0.168	0.204	0.823	0.847
802.11n (HT40)	0	0.664	0.700	0.948	0.232
	1	0.352	0.388	0.907	0.423
	2	0.248	0.284	0.873	0.589
	3	0.196	0.232	0.845	0.732
	4	0.144	0.180	0.799	0.974
	5	0.116	0.152	0.761	1.187
	6	0.108	0.144	0.748	1.263
	7	0.099	0.136	0.731	1.362

Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.349	1.385	0.974	0.116
	1	0.696	0.733	0.949	0.227
	2	0.476	0.513	0.928	0.322
	3	0.368	0.405	0.908	0.419
	4	0.260	0.296	0.879	0.562
	5	0.204	0.240	0.850	0.704
	6	0.188	0.224	0.839	0.760
	7	0.172	0.208	0.827	0.824
	8	0.152	0.188	0.807	0.931
802.11ac (VHT40)	0	0.672	0.708	0.949	0.227
	1	0.356	0.392	0.909	0.415
	2	0.252	0.288	0.874	0.583
	3	0.200	0.236	0.848	0.716
	4	0.148	0.184	0.804	0.945
	5	0.120	0.156	0.769	1.139
	6	0.112	0.148	0.757	1.210
	7	0.104	0.140	0.742	1.298
	8	0.096	0.132	0.726	1.391
802.11ac (VHT80)	9	0.088	0.124	0.711	1.481
	0	0.332	0.369	0.901	0.454
	1	0.188	0.224	0.840	0.759
	2	0.140	0.176	0.794	1.000
	3	0.116	0.152	0.761	1.185
	4	0.092	0.128	0.716	1.450
	5	0.080	0.116	0.687	1.633
	6	0.076	0.112	0.675	1.704
	7	0.072	0.108	0.664	1.780
	8	0.068	0.104	0.651	1.866
	9	0.064	0.100	0.637	1.960

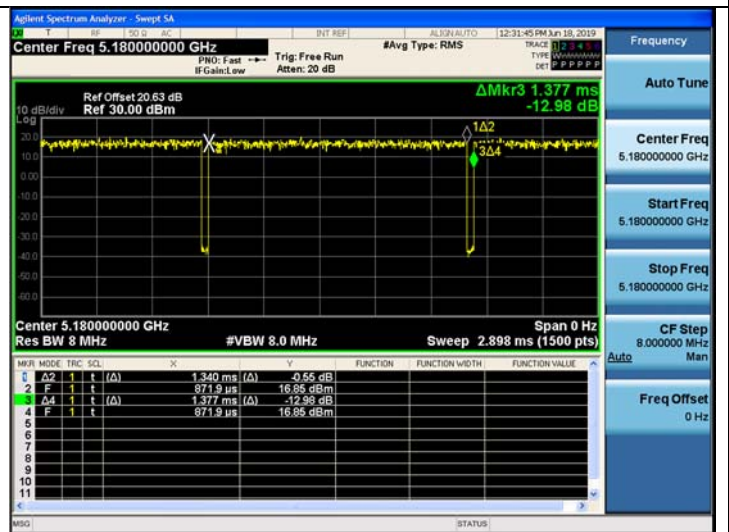
Note:

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

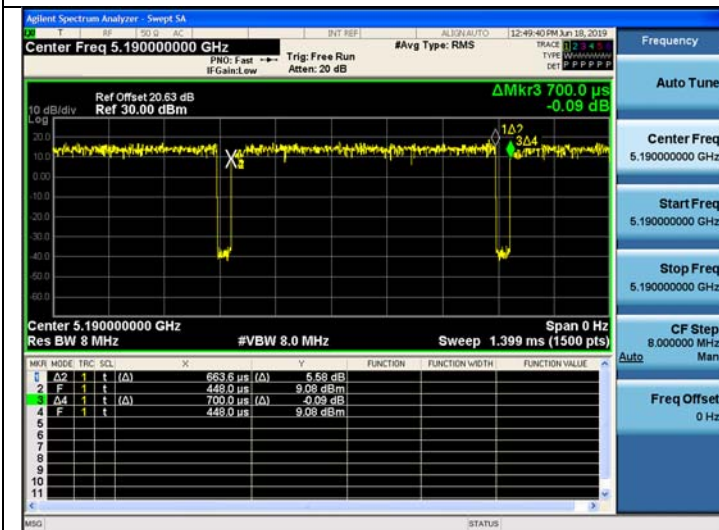
802.11a



802.11n(HT20)



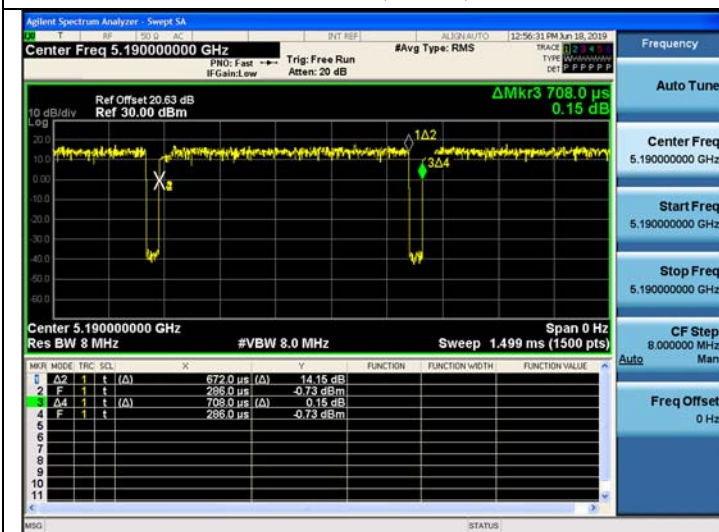
802.11n(HT40)



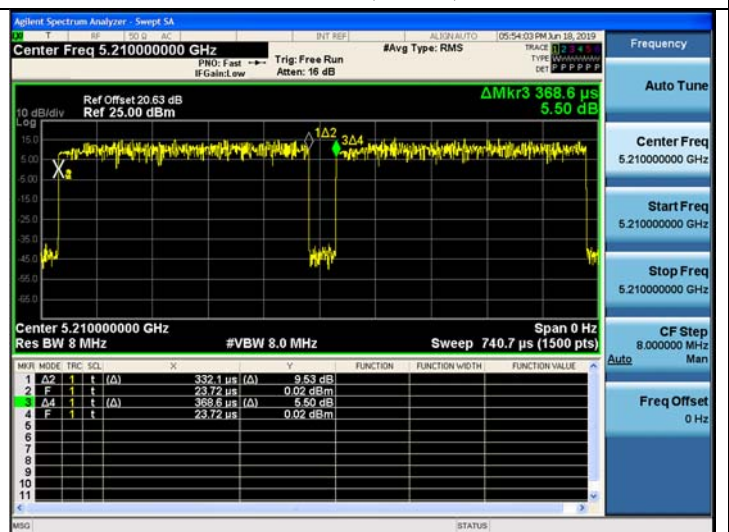
802.11ac(VHT20)



802.11ac(VHT40)



802.11ac(VHT80)



10.2 26DB BANDWIDTH

[ANT1]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.50	16.402
5200	40	20.86	16.354
5240	48	20.40	16.348
5260	52	20.26	16.350
5300	60	20.16	16.346
5320	64	20.35	16.387
5500	100	20.07	16.344
5600	120	20.96	16.389
5720	144	20.37	16.344
5745	149	20.49	16.351
5785	157	20.32	16.340
5825	165	20.48	16.341

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.64	17.570
5200	40	20.57	17.570
5240	48	20.46	17.593
5260	52	20.41	17.571
5300	60	20.52	17.585
5320	64	20.05	17.581
5500	100	20.43	17.568
5600	120	21.37	17.618
5720	144	20.67	17.587
5745	149	20.69	17.605
5785	157	20.38	17.577
5825	165	20.62	17.568

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.26	35.968
5230	46	40.31	35.911
5270	54	40.28	35.935
5310	62	40.05	35.941
5510	102	39.67	35.952
5590	118	39.79	35.953
5710	142	40.22	35.949
5755	151	39.64	35.954
5795	159	40.22	35.983

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.11	17.577
5200	40	20.55	17.564
5240	48	20.58	17.567
5260	52	20.51	17.580
5300	60	20.66	17.572
5320	64	20.63	17.570
5500	100	20.33	17.566
5600	120	21.94	17.623
5720	144	20.72	17.580
5745	149	20.26	17.557
5785	157	20.83	17.563
5825	165	20.63	17.588

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.23	35.917
5230	46	40.14	35.944
5270	54	40.03	36.009
5310	62	40.10	35.920
5510	102	39.78	35.926
5590	118	40.15	35.878
5710	142	40.46	35.985
5755	151	40.02	35.922
5795	159	39.77	35.937

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.71	75.213
5290	58	81.77	75.215
5530	106	81.38	75.209
5610	122	81.60	75.251
5690	138	81.08	75.232
5775	155	81.80	75.198

[ANT2]

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	19.99	16.342
5200	40	20.33	16.388
5240	48	20.11	16.349
5260	52	20.55	16.363
5300	60	19.69	16.361
5320	64	20.32	16.353
5500	100	19.84	16.367
5600	120	20.50	16.386
5720	144	20.45	16.350
5745	149	20.21	16.345
5785	157	20.42	16.364
5825	165	20.47	16.350

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.43	17.567
5200	40	20.56	17.575
5240	48	20.45	17.582
5260	52	20.53	17.586
5300	60	20.49	17.573
5320	64	20.57	17.565
5500	100	20.41	17.572
5600	120	20.53	17.589
5720	144	20.41	17.563
5745	149	20.58	17.590
5785	157	20.46	17.622
5825	165	20.43	17.565

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.40	35.922
5230	46	40.06	35.899
5270	54	40.19	35.921
5310	62	40.28	35.937
5510	102	39.98	36.020
5590	118	39.70	35.921
5710	142	40.13	35.975
5755	151	40.25	36.014
5795	159	39.97	35.870

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.49	17.573
5200	40	20.77	17.576
5240	48	20.02	17.579
5260	52	20.54	17.559
5300	60	20.27	17.592
5320	64	20.65	17.566
5500	100	20.58	17.560
5600	120	20.08	17.567
5720	144	20.41	17.606
5745	149	20.78	17.591
5785	157	20.71	17.561
5825	165	20.27	17.556

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.02	35.874
5230	46	39.90	35.927
5270	54	40.26	36.000
5310	62	40.03	35.934
5510	102	40.19	35.898
5590	118	39.79	35.913
5710	142	39.55	35.916
5755	151	39.67	35.928
5795	159	39.97	35.914

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.54	75.150
5290	58	81.54	75.167
5530	106	81.78	75.235
5610	122	81.39	75.240
5690	138	81.62	75.167
5775	155	81.54	75.218

[ANT1]

■ Test Plots(802.11a)

Note:

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

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



802.11a UNII 2A BAND 26dB Bandwidth (CH 64)



802.11a UNII 2C BAND 26dB Bandwidth (CH120)



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

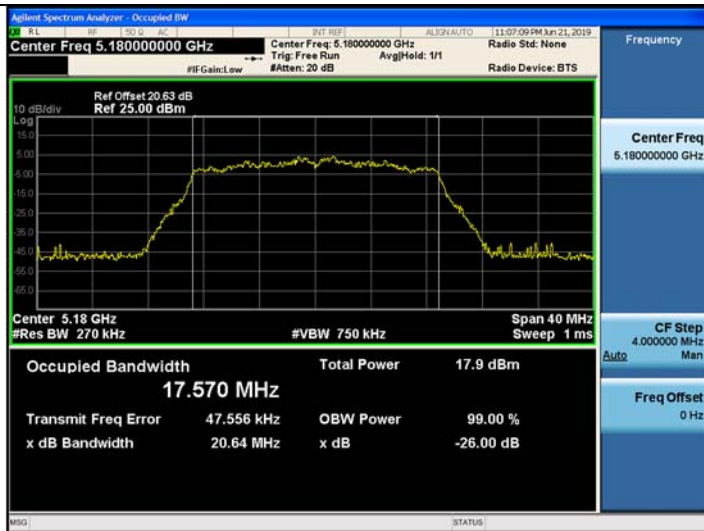


Test Plots(802.11n(HT20))

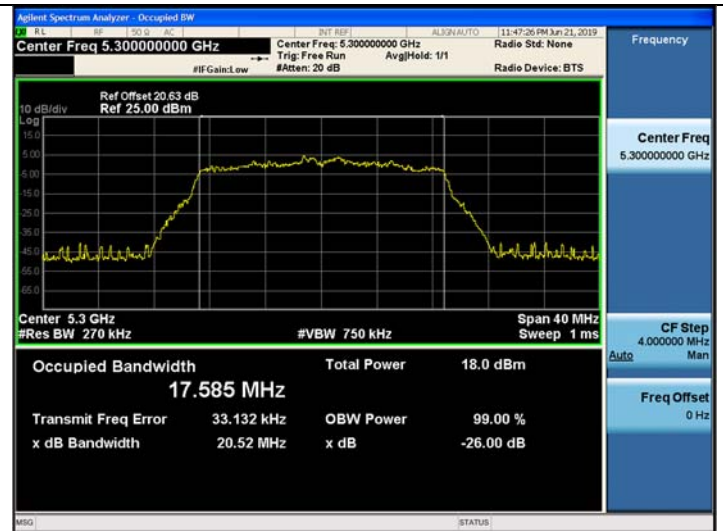
Note:

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

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



802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 60)



802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 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.

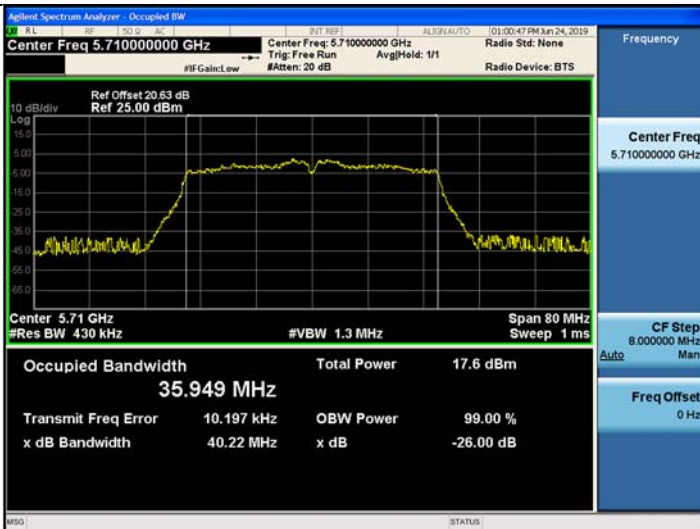
802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)



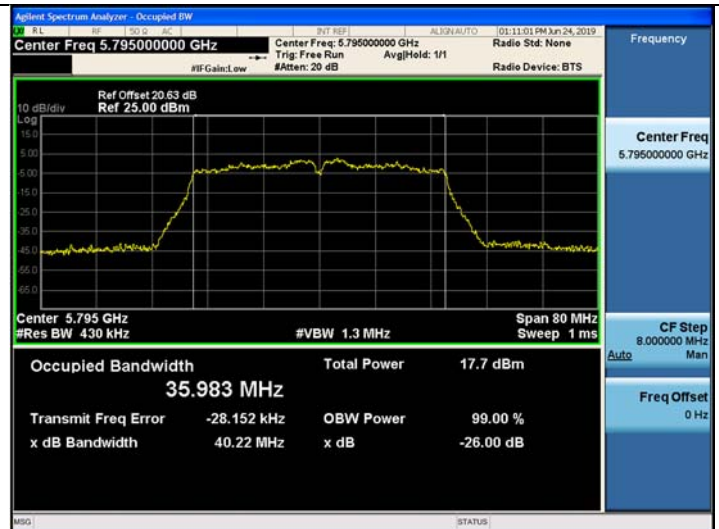
802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)



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



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

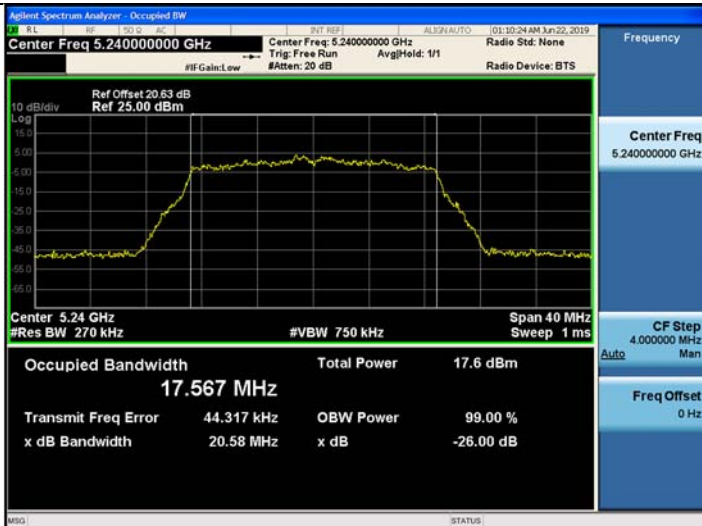


Test Plots(802.11ac(VHT20))

Note:

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

802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 48)



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



802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 120)



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

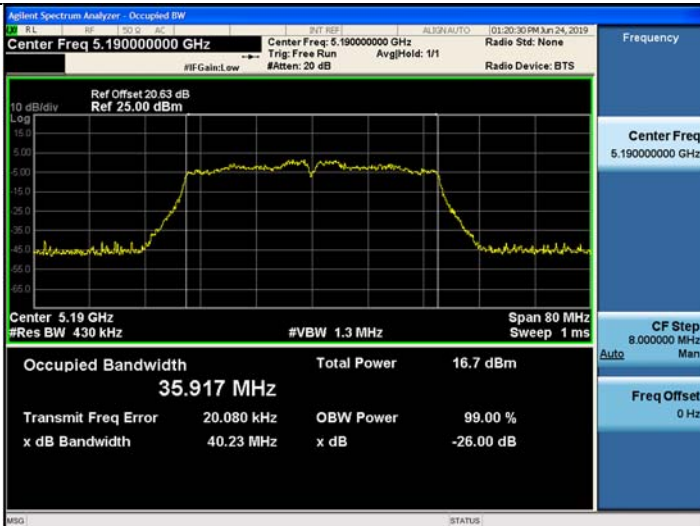


Test Plots(802.11ac(VHT40))

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 151)

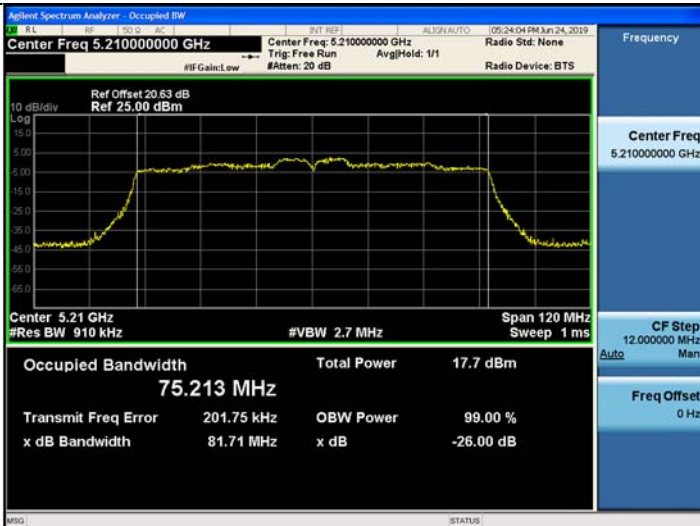


Test Plots(802.11ac(VHT80))

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)



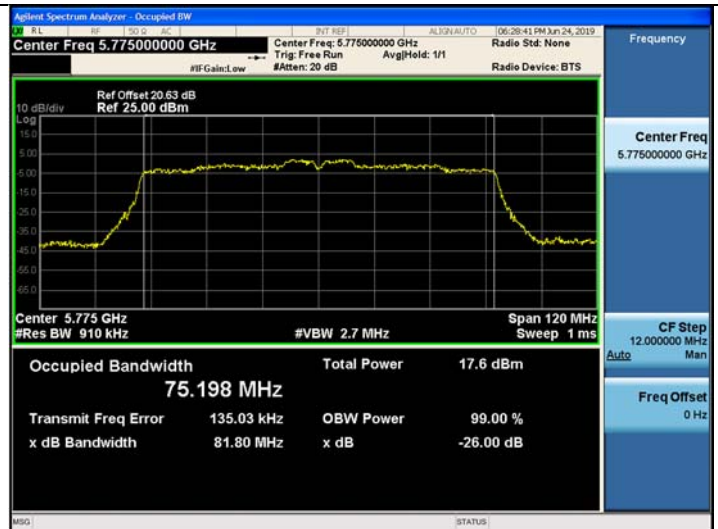
802.11ac_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



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



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



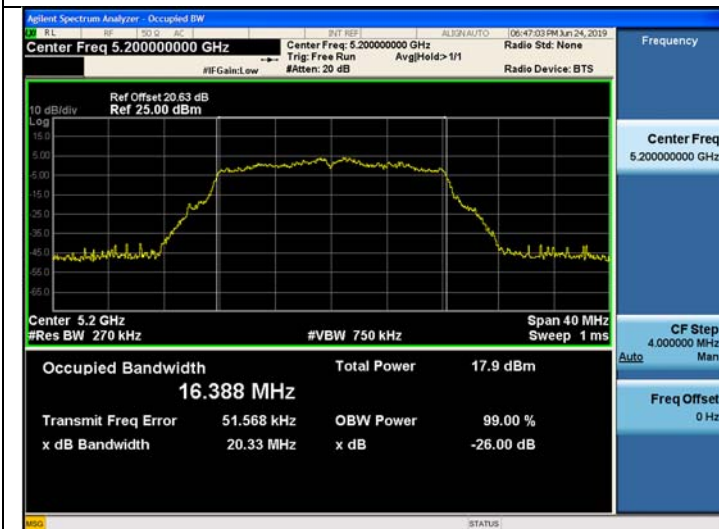
[ANT2]

■ Test Plots(802.11a)

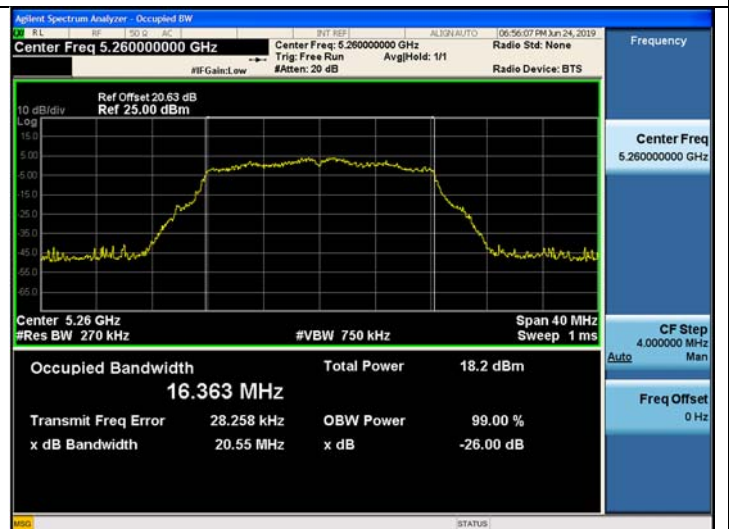
Note:

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

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



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



802.11a UNII 2C BAND 26dB Bandwidth (CH120)



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

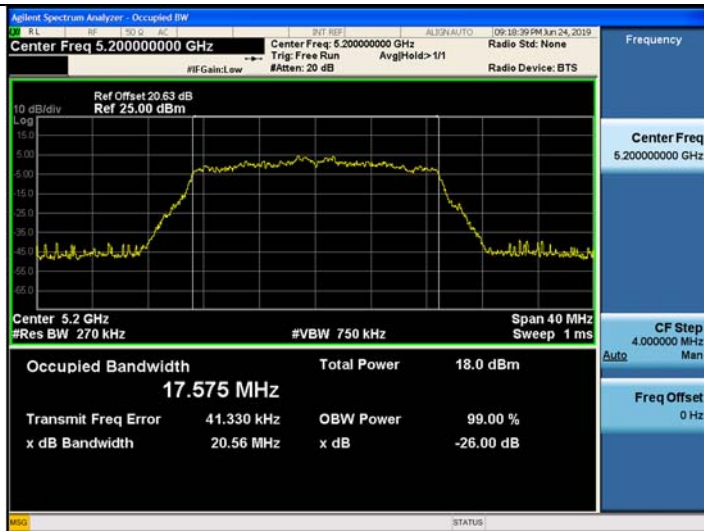


Test Plots(802.11n(HT20))

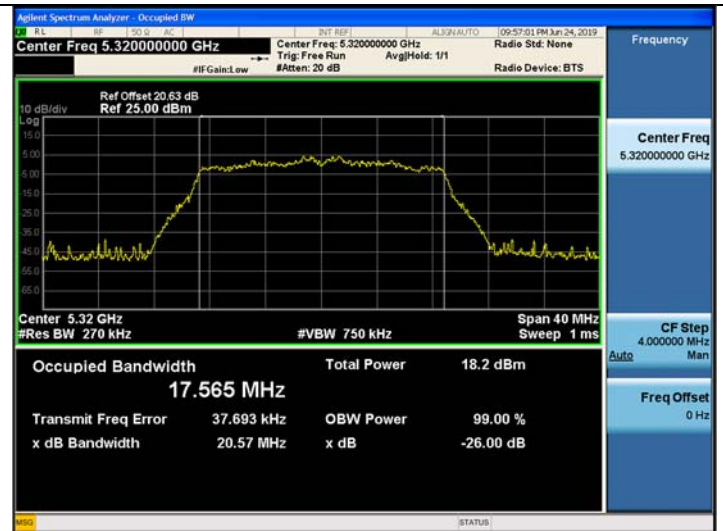
Note:

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 64)



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



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

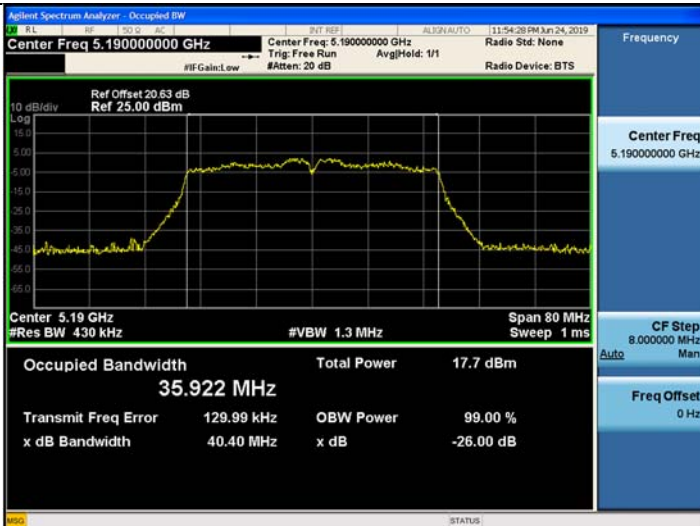


Test Plots(802.11n(HT40))

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)



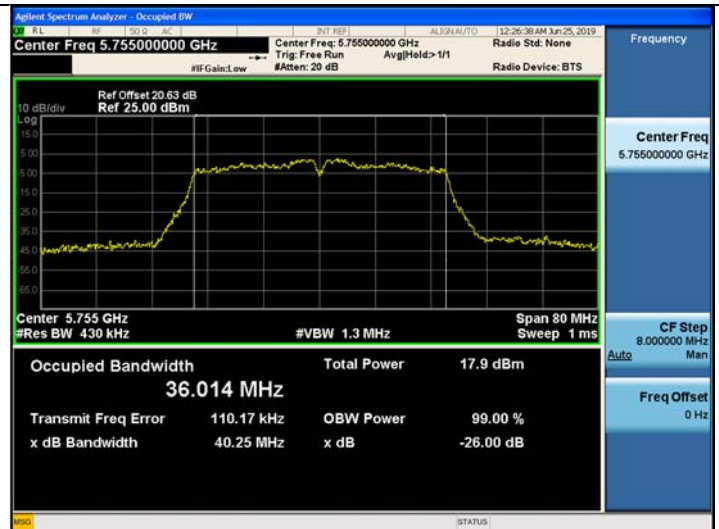
802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 62)



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))

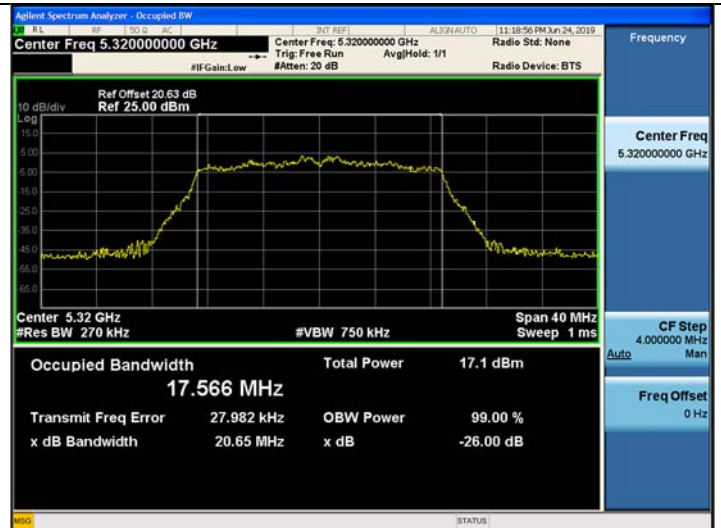
Note:

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

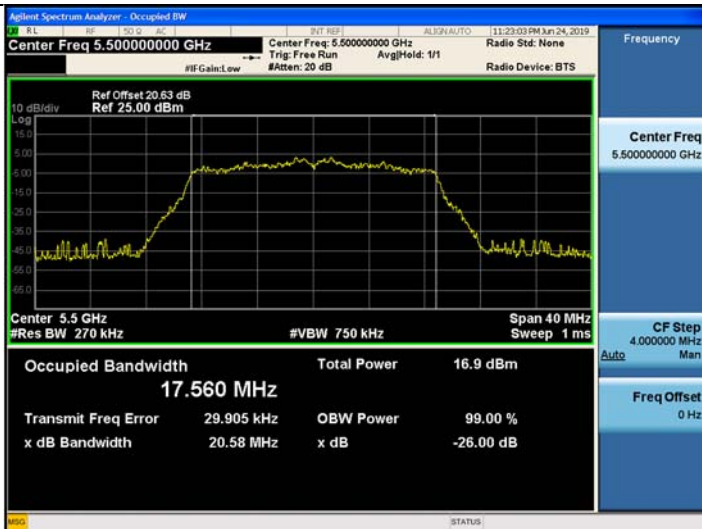
802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 40)



802.11ac_VHT20 UNII 2A BAND 26dB Bandwidth(CH 64)



802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 100)



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

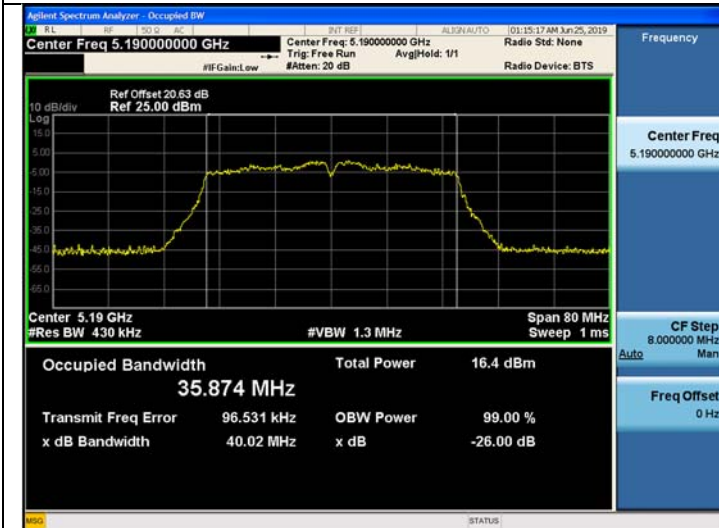


Test Plots(802.11ac(VHT40))

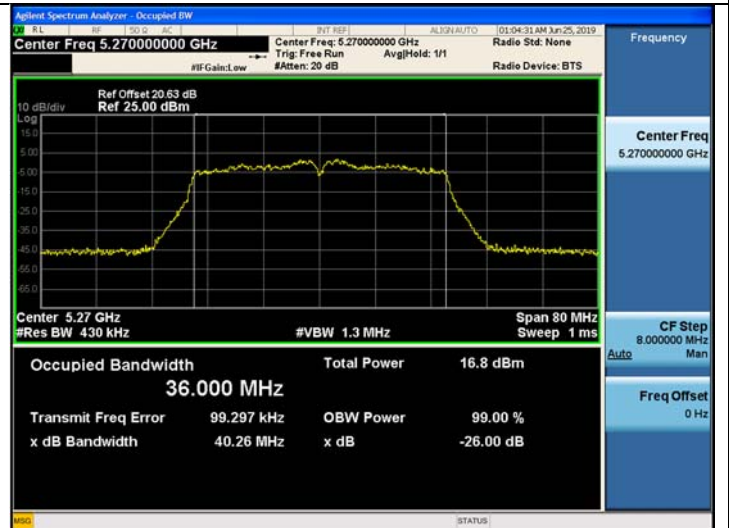
Note:

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

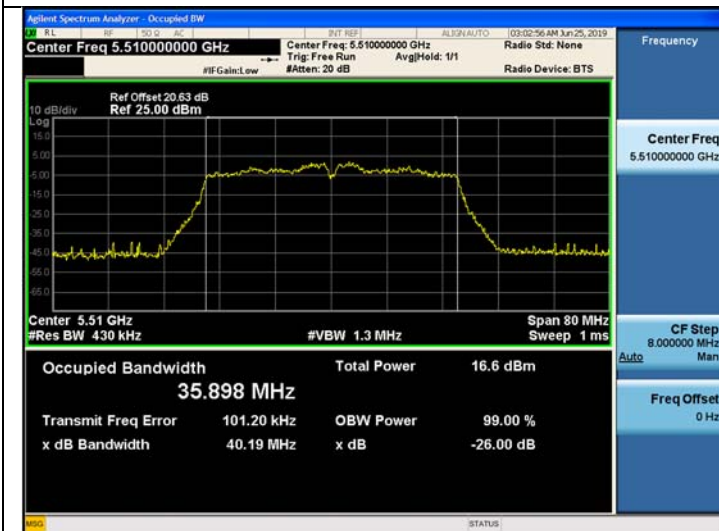
802.11ac_VHT40 UNII 1 BAND 26dB Bandwidth(CH 38)



802.11ac_VHT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 102)



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



Test Plots(802.11ac(VHT80))

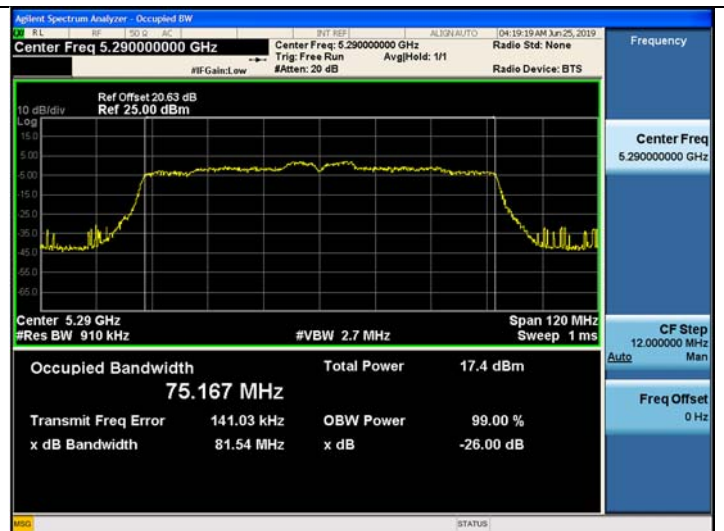
Note:

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)



10.3 6DB BANDWIDTH

[ANT1]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.08	> 0.5	Pass
5785	157	12.62	> 0.5	Pass
5825	165	10.10	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	10.17	> 0.5	Pass
5785	157	13.78	> 0.5	Pass
5825	165	12.58	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	33.86	> 0.5	Pass
5795	159	35.10	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.11	> 0.5	Pass
5785	157	13.84	> 0.5	Pass
5825	165	15.09	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.08	> 0.5	Pass
5795	159	35.06	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	63.79	> 0.5	Pass

[ANT2]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.06	> 0.5	Pass
5785	157	15.07	> 0.5	Pass
5825	165	15.09	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.11	> 0.5	Pass
5785	157	15.13	> 0.5	Pass
5825	165	12.63	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.06	> 0.5	Pass
5795	159	32.58	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.06	> 0.5	Pass
5785	157	13.83	> 0.5	Pass
5825	165	13.84	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.06	> 0.5	Pass
5795	159	35.07	> 0.5	Pass

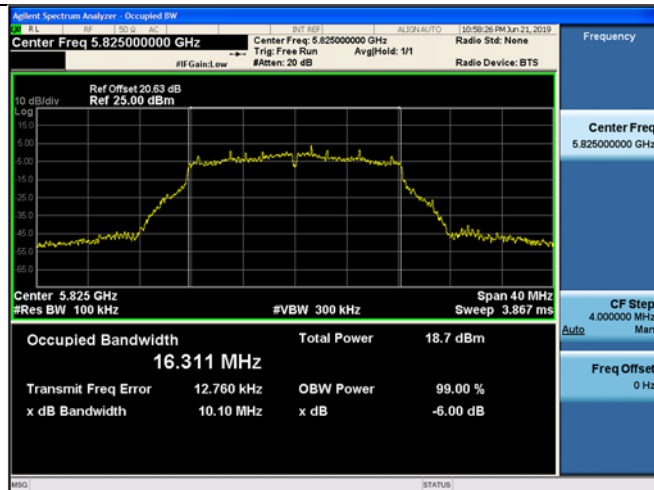
802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	70.15	> 0.5	Pass

[ANT1]

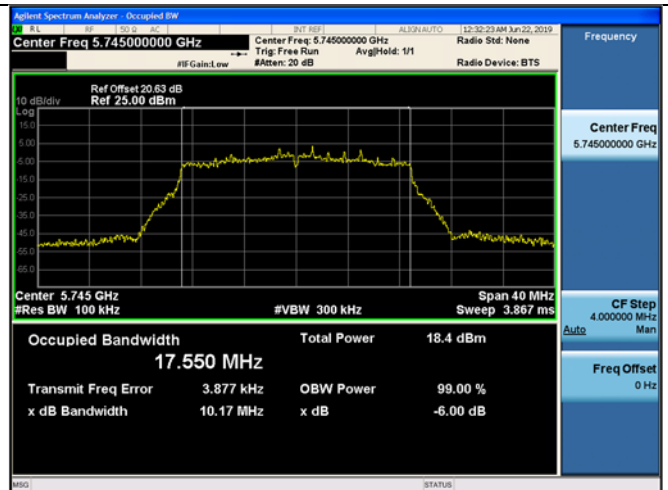
■ Test Plots

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

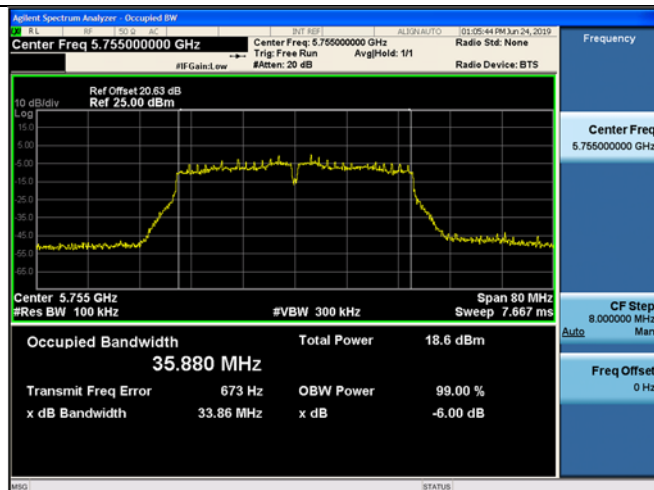
802.11a (CH.165)



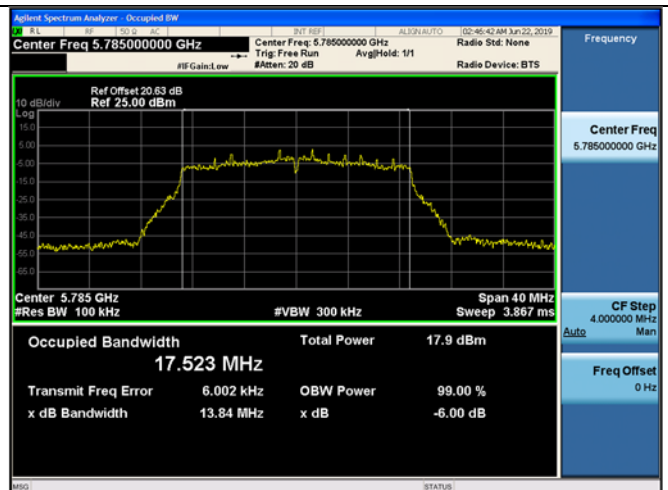
802.11n(HT20) (CH.149)



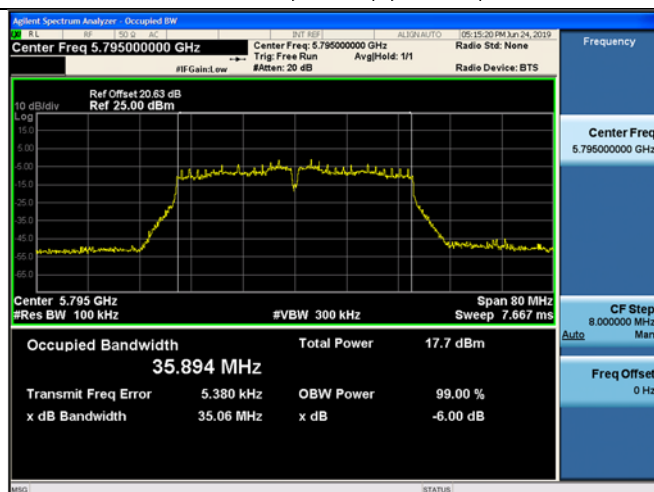
802.11n(HT40) (CH.151)



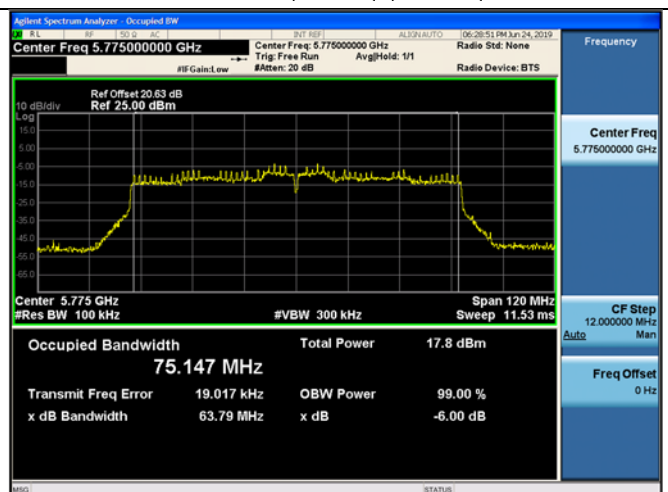
802.11ac(VHT20) (CH.157)



802.11ac(VHT40) (CH.159)



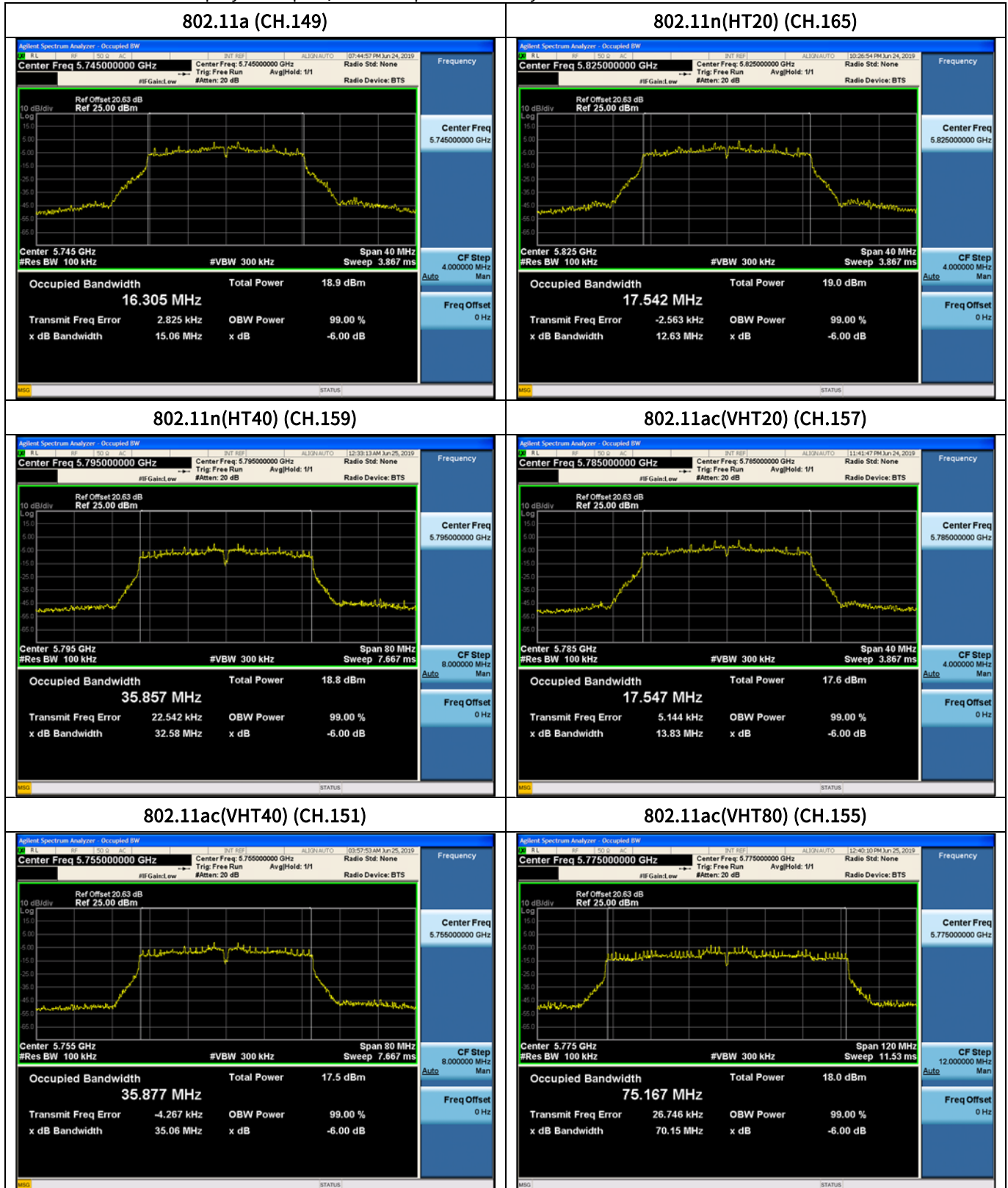
802.11ac(VHT80) (CH.155)



[ANT2]

Test Plots

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



10.4 OUTPUT POWER MEASUREMENT

[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	12.00	12.31	0.110	12.42	23.98
5200	40	12.00	12.41	0.110	12.52	23.98
5240	48	12.00	12.74	0.217	12.96	23.98
5260	52	12.00	12.68	0.110	12.79	23.98
5300	60	12.00	12.36	0.217	12.57	23.98
5320	64	12.00	12.64	0.217	12.86	23.98
5500	100	12.00	11.63	0.719	12.35	23.98
5600	120	12.00	11.85	0.793	12.64	23.98
5720	144	12.00	11.60	0.719	12.32	23.98
5745	149	12.00	11.64	0.793	12.43	30.00
5785	157	12.00	12.53	0.110	12.64	30.00
5825	165	12.00	12.45	0.110	12.56	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	12.00	12.06	0.124	12.19	23.98
5200	40	12.00	12.21	0.124	12.34	23.98
5240	48	12.00	12.36	0.124	12.49	23.98
5260	52	12.00	11.69	0.845	12.53	23.98
5300	60	12.00	11.41	0.845	12.26	23.98
5320	64	12.00	11.85	0.777	12.63	23.98
5500	100	12.00	11.60	0.777	12.38	23.98
5600	120	12.00	11.71	0.719	12.43	23.98
5720	144	12.00	11.31	0.719	12.03	23.98
5745	149	12.00	11.52	0.777	12.30	30.00
5785	157	12.00	11.67	0.845	12.51	30.00
5825	165	12.00	12.38	0.124	12.50	30.00

802.11n(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	11.00	10.97	0.423	11.39	23.98
5230	46	11.00	11.28	0.423	11.70	23.98
5270	54	11.00	11.02	0.423	11.44	23.98
5310	62	11.00	10.29	1.239	11.53	23.98
5510	102	11.00	9.89	1.342	11.23	23.98
5590	118	11.00	10.33	1.174	11.50	23.98
5710	142	11.00	9.76	0.966	10.72	23.98
5755	151	11.00	10.29	1.239	11.53	30.00
5795	159	11.00	11.11	0.423	11.53	30.00

802.11ac(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	11.00	10.49	0.763	11.25	23.98
5200	40	11.00	10.52	0.927	11.44	23.98
5240	48	11.00	11.07	0.705	11.78	23.98
5260	52	11.00	10.74	0.829	11.56	23.98
5300	60	11.00	10.58	0.829	11.41	23.98
5320	64	11.00	10.87	0.705	11.57	23.98
5500	100	11.00	10.56	0.763	11.32	23.98
5600	120	11.00	10.55	0.829	11.38	23.98
5720	144	11.00	9.81	0.829	10.63	23.98
5745	149	11.00	10.57	0.763	11.34	30.00
5785	157	11.00	10.71	0.927	11.64	30.00
5825	165	11.00	10.75	0.763	11.51	30.00

802.11ac(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	10.00	8.94	1.390	10.33	23.98
5230	46	10.00	10.33	0.415	10.74	23.98
5270	54	10.00	10.26	0.415	10.68	23.98
5310	62	10.00	9.36	1.216	10.58	23.98
5510	102	10.00	8.79	1.390	10.18	23.98
5590	118	10.00	9.09	1.289	10.38	23.98
5710	142	10.00	9.11	1.216	10.33	23.98
5755	151	10.00	9.12	1.216	10.34	30.00
5795	159	10.00	10.15	0.415	10.56	30.00

802.11ac(80MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5210	42	10.00	8.80	1.756	10.56	23.98
5290	58	10.00	8.46	1.933	10.40	23.98
5530	106	10.00	8.78	1.681	10.46	23.98
5610	122	10.00	8.83	1.637	10.47	23.98
5690	138	10.00	8.19	1.933	10.13	23.98
5775	155	10.00	8.56	1.756	10.32	30.00

[ANT2]

802.11a Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	12.00	12.62	0.110	12.73	23.98
5200	40	12.00	12.68	0.110	12.79	23.98
5240	48	12.00	12.70	0.217	12.92	23.98
5260	52	12.00	12.84	0.110	12.95	23.98
5300	60	12.00	12.45	0.217	12.66	23.98
5320	64	12.00	12.48	0.217	12.70	23.98
5500	100	12.00	11.53	0.719	12.25	23.98
5600	120	12.00	11.84	0.793	12.63	23.98
5720	144	12.00	11.67	0.719	12.39	23.98
5745	149	12.00	11.78	0.793	12.57	30.00
5785	157	12.00	12.52	0.110	12.63	30.00
5825	165	12.00	12.64	0.110	12.75	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	12.00	12.32	0.124	12.45	23.98
5200	40	12.00	12.53	0.124	12.66	23.98
5240	48	12.00	12.72	0.124	12.84	23.98
5260	52	12.00	12.02	0.845	12.86	23.98
5300	60	12.00	11.57	0.845	12.42	23.98
5320	64	12.00	11.68	0.777	12.45	23.98
5500	100	12.00	11.51	0.777	12.29	23.98
5600	120	12.00	12.03	0.719	12.75	23.98
5720	144	12.00	11.83	0.719	12.55	23.98
5745	149	12.00	11.92	0.777	12.70	30.00
5785	157	12.00	11.79	0.845	12.63	30.00
5825	165	12.00	12.56	0.124	12.69	30.00

802.11n(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	11.00	10.86	0.423	11.28	23.98
5230	46	11.00	11.30	0.423	11.73	23.98
5270	54	11.00	11.12	0.423	11.54	23.98
5310	62	11.00	10.43	1.239	11.67	23.98
5510	102	11.00	9.92	1.342	11.26	23.98
5590	118	11.00	10.33	1.174	11.51	23.98
5710	142	11.00	10.41	0.966	11.37	23.98
5755	151	11.00	10.34	1.239	11.58	30.00
5795	159	11.00	11.14	0.423	11.57	30.00

802.11ac(20MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	11.00	10.61	0.763	11.37	23.98
5200	40	11.00	10.47	0.927	11.39	23.98
5240	48	11.00	10.90	0.705	11.61	23.98
5260	52	11.00	10.80	0.829	11.63	23.98
5300	60	11.00	10.76	0.829	11.59	23.98
5320	64	11.00	10.92	0.705	11.63	23.98
5500	100	11.00	10.29	0.763	11.06	23.98
5600	120	11.00	10.55	0.829	11.38	23.98
5720	144	11.00	10.39	0.829	11.22	23.98
5745	149	11.00	10.58	0.763	11.34	30.00
5785	157	11.00	10.46	0.927	11.39	30.00
5825	165	11.00	10.85	0.763	11.61	30.00

802.11ac(40MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	10.00	9.19	1.390	10.58	23.98
5230	46	10.00	10.34	0.415	10.76	23.98
5270	54	10.00	10.07	0.415	10.49	23.98
5310	62	10.00	9.08	1.216	10.30	23.98
5510	102	10.00	8.87	1.390	10.26	23.98
5590	118	10.00	8.97	1.289	10.26	23.98
5710	142	10.00	9.18	1.216	10.40	23.98
5755	151	10.00	9.30	1.216	10.51	30.00
5795	159	10.00	9.99	0.415	10.40	30.00

802.11ac(80MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.					
5210	42	10.00	9.01	1.756	10.77	23.98
5290	58	10.00	9.05	1.933	10.98	23.98
5530	106	10.00	8.61	1.681	10.29	23.98
5610	122	10.00	9.08	1.637	10.71	23.98
5690	138	10.00	8.58	1.933	10.52	23.98
5775	155	10.00	8.86	1.756	10.61	30.00

[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)
Frequency [MHz]	Channel No.					
5180	36	12.00	12.42	12.73	15.59	23.98
5200	40	12.00	12.52	12.79	15.67	23.98
5240	48	12.00	12.96	12.92	15.95	23.98
5260	52	12.00	12.79	12.95	15.88	23.98
5300	60	12.00	12.57	12.66	15.63	23.98
5320	64	12.00	12.86	12.70	15.79	23.98
5500	100	12.00	12.35	12.25	15.31	23.98
5600	120	12.00	12.64	12.63	15.65	23.98
5720	144	12.00	12.32	12.39	15.37	23.98
5745	149	12.00	12.43	12.57	15.51	30.00
5785	157	12.00	12.64	12.63	15.65	30.00
5825	165	12.00	12.56	12.75	15.67	30.00

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)
Frequency [MHz]	Channel No.					
5180	36	12.00	12.19	12.45	15.33	23.98
5200	40	12.00	12.34	12.66	15.51	23.98
5240	48	12.00	12.49	12.84	15.68	23.98
5260	52	12.00	12.53	12.86	15.71	23.98
5300	60	12.00	12.26	12.42	15.35	23.98
5320	64	12.00	12.63	12.45	15.55	23.98
5500	100	12.00	12.38	12.29	15.35	23.98
5600	120	12.00	12.43	12.75	15.60	23.98
5720	144	12.00	12.03	12.55	15.31	23.98
5745	149	12.00	12.30	12.70	15.51	30.00
5785	157	12.00	12.51	12.63	15.58	30.00
5825	165	12.00	12.50	12.69	15.61	30.00