HCT CO.,LTD
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC UNII REPORT

FCC Certification

Applicant Name:
LG Electronics Inc.

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

Date of Issue:
January 14, 2016
Test Site/Location:
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-R-1601-F041
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID : BEJTL3LNB

APPLICANT : LG Electronics Inc.

FCC Model(s): TL3LNB

EUT Type: Car Telematics Device

Modulation type OFDM

FCC Classification: Unlicensed National Information Infrastructure(UNII)

FCC Rule Part(s): Part 15.407

Band	Mode	Channel Bandwidth (MHz)	Frequency Range (MHz)	Ant.0 Power (dBm)	Ant.1 Power (dBm)	Ant. 0 & 1 Power (dBm)
UNII1	802.11a	20	5180 – 5240	5.11	4.79	7.96
	802.11n	20	5180 – 5240	3.95	3.75	6.86
	802.11n	40	5190 - 5230	3.71	3.86	6.80
	802.11ac	20	5180 – 5240	2.01	1.73	4.88
	802.11ac	40	5190 - 5230	1.67	1.81	4.75
	802.11ac	80	5210	0.86	0.44	3.67
UNII3	802.11a	20	5745 – 5825	6.50	6.86	9.69
	802.11n	20	5745 – 5825	4.39	4.88	7.65
	802.11n	40	5755 – 5795	2.91	3.91	6.45
	802.11ac	20	5745 – 5825	2.28	2.74	5.53
	802.11ac	40	5755 – 5795	1.37	1.94	4.67
	802.11ac	80	5775	0.52	0.91	3.73

.

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.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
: Kyung Soo Kang
Test Engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1601-F041	January 14, 2016	- First Approval Report

Table of Contents

1. GENERAL INFORMATION 5

2. EUT DESCRIPTION 5

2.1 EUT OPERATING MODE 6

3. TEST METHODOLOGY 7

3.1 EUT CONFIGURATION 7
3.2 EUT EXERCISE 7
3.3 GENERAL TEST PROCEDURES 7
3.4 DESCRIPTION OF TEST MODES 7

4. INSTRUMENT CALIBRATION 8

5. FACILITIES AND ACCREDITATIONS 8

5.1 FACILITIES 8
5.2 EQUIPMENT 8

6. ANTENNA REQUIREMENTS 9

7. SUMMARY OF TEST RESULTS 10

8. TEST RESULT 11

8.1 DUTY CYCLE 11
8.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT 14
8.3 OUTPUT POWER MEASUREMENT 36
8.4 POWER SPECTRAL DENSITY 76
8.5 FREQUENCY STABILITY. 92
8.6 RADIATED MEASUREMENT 98
8.6.1 RADIATED SPURIOUS EMISSIONS. 98
8.6.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS 135
8.7 POWERLINE CONDUCTED EMISSIONS 150

9. LIST OF TEST EQUIPMENT 151

9.1 LIST OF TEST EQUIPMENT(Conducted Test) 151
9.2 LIST OF TEST EQUIPMENT(Radiated Test) 152

1. GENERAL INFORMATION

Applicant:	LG Electronics, Inc
Address:	222, LG-ro, Jinwi-myeon, Pyeongtaek-si, 451-713 Gyeonggi-do, South Korea
FCC ID:	BEJTL3LNB
EUT Type:	Car Telematics Device
Model name(s):	TL3LNB
Date(s) of Tests:	October 28, 2015 ~ January 14, 2016
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea (IC Recognition No. : 5944A-5)

2. EUT DESCRIPTION

FCC Model Name	TL3LNB	
EUT Type	Car Telematics Device	
Power Supply	DC 12.0 V	
Frequency Range	TX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5745 MHz - 5825 MHz (UNII 3)
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1) / 5755 MHz - 5795 MHz (UNII 3)
	80 MHz BW:	5210 MHz(UNII 1)/ 5775 MHz (UNII 3)
	RX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5745 MHz - 5825 MHz (UNII 3)
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1)/ 5755 MHz - 5795 MHz (UNII 3)
	80 MHz BW:	5210 MHz(UNII 1)/ 5775 MHz (UNII 3)
Modulation Type	OFDM(802.11a, 802.11n, 802.11ac)	
Antenna Specification	Manufacturer: AMOTECH Antenna type: INTERNAL ANTENNA Peak Gain : cf. Section 6	

2.1 EUT OPERATING MODE

▣ Operating mode

Mode	Operating Mode	Operating Ant.
802.11a/n/ac	SISO	Ant 0
		Ant 1
	MIMO(CDD,SDM)	Ant 0 & 1

Note : In case of radiation test, we have done all test case. Worst case is MIMO(Ant 0 & 1).
So, we attached the results of only worst case.

3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v01 dated June 06, 2014 entitled " Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part15, Subpart E" and the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) were used in the measurement.

3.1 EUT CONFIGURATION

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

3.2 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.

3.3 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 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033)

3.4 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.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

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 equipments, which is traceable to recognized national standards.
All equipments(spectrum, antenna, accessory, etc.) for measurement is calibrated in accordance with the requirements of C63.5 (Version: 2006).

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, 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 July 07, 2015 (Registration Number: 90661)

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

▣ Directional Gain Calculations

- **If any transmit signals are correlated with each other(802.11a/n_HT20)**

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

- **If all transmit signals are completely uncorrelated with each other(802.11n/ac)**

  Directional gain = $10*\log[(10^{G1/10} + 10^{G2/10}+\ldots+10^{GN/10})/N]$ dBi

▣ Antenna Gain

5GHz Band (UNII 1)

Antenna Gain	802.11a/n/ac	Ant 0	3.84 dBi
		Ant 1	4.90 dBi
Directional Antenna Gain	802.11a/n_HT20	Ant 0 & 1	7.40 dBi
	802.11n/ac_VHT20/ ac_VHT40/ac_VHT80		4.40 dBi

5GHz Band (UNII 3)

Antenna Gain	802.11a/n/ac	Ant 0	4.80 dBi
		Ant 1	4.65 dBi
Directional Antenna Gain	802.11a/n_HT20	Ant 0 & 1	7.74 dBi
	802.11n/ac_VHT20/ ac_VHT40/ac_VHT80		4.73 dBi

Note : This EUT is supported CDD and SDM for 802.11n_HT20. So, we applied the CDD mode for antenna gain. Because highest gain is CDD mode and worst case is CDD mode.

7. SUMMARY OF TEST RESULTS

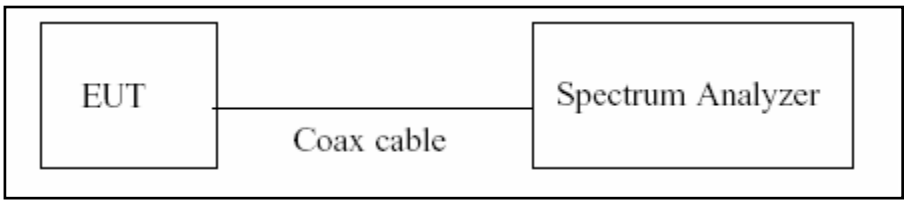
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§15.407 (for Power Measurement)	N/A	CONDUCTED	PASS
6 dB Bandwidth	§15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 250 mW (5150-5250 MHz) < 250 mW or 11+10 log $\log_{10}$ (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)	NA		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) <-17 dBm/MHz EIRP within 5715-5725 MHz and 5850-5860 MHz (UNII3) <-27 dBm/MHz EIRP outside 5715-5860 MHz (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

8. TEST RESULT

8.1 DUTY CYCLE

The zero-span mode on a spectrum analyzer or EMI receiver ,if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/*T*, where *T* is defined in section B)1)a), and the number of sweep points across duration *T* exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if *T* ≤ 16.7 microseconds.)

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, (B.2 in KDB 789033 D02, issued 06/06/2014)

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used becaure all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

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 = 10*log(1/Duty Cycle)

▣ Duty Cycle Factor

Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11a	6	2.042	2.139	0.95465171	0.202
	9	1.371	1.469	0.93328795	0.300
	12	1.032	1.130	0.91327434	0.394
	18	0.696	0.795	0.87547170	0.578
	24	0.528	0.627	0.84210526	0.746
	36	0.360	0.456	0.78947368	1.027
	48	0.276	0.375	0.73600000	1.331
	54	0.249	0.348	0.71551724	1.454
802.11n_20 MHz BW	MCS 0	1.906	2.004	0.95109780	0.218
	MCS 1	0.971	1.070	0.90747664	0.422
	MCS 2	0.660	0.755	0.87417219	0.584
	MCS 3	0.505	0.600	0.84166667	0.749
	MCS 4	0.350	0.445	0.78651685	1.043
	MCS 5	0.271	0.369	0.73441734	1.341
	MCS 6	0.243	0.341	0.71260997	1.471
	MCS 7	0.223	0.320	0.69687500	1.568
802.11n_40 MHz BW	MCS 0	0.940	1.040	0.90384615	0.439
	MCS 1	0.490	0.585	0.83760684	0.770
	MCS 2	0.340	0.435	0.78160920	1.070
	MCS 3	0.264	0.362	0.72928177	1.371
	MCS 4	0.188	0.284	0.66197183	1.792
	MCS 5	0.152	0.250	0.60800000	2.161
	MCS 6	0.141	0.238	0.59243697	2.274
	MCS 7	0.128	0.226	0.56637168	2.469

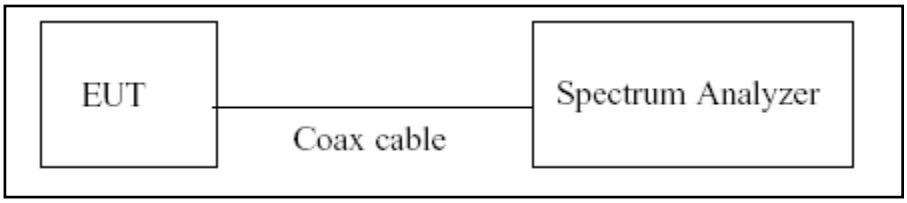
Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ac_20 MHz BW	MCS 0	1.921	2.019	0.95146112	0.216
	MCS 1	0.979	1.077	0.90900650	0.414
	MCS 2	0.670	0.768	0.87239583	0.593
	MCS 3	0.504	0.602	0.83720930	0.772
	MCS 4	0.356	0.452	0.78761062	1.037
	MCS 5	0.276	0.374	0.73796791	1.320
	MCS 6	0.252	0.350	0.72000000	1.427
	MCS 7	0.228	0.324	0.70370370	1.526
	MCS 8	0.200	0.298	0.67114094	1.732
5.8 GHz Band 802.11ac_40 MHz BW	MCS 0	0.942	1.041	0.90489914	0.434
	MCS 1	0.492	0.588	0.83673469	0.774
	MCS 2	0.342	0.441	0.77551020	1.104
	MCS 3	0.267	0.366	0.72950820	1.370
	MCS 4	0.192	0.291	0.65979381	1.806
	MCS 5	0.156	0.253	0.61660079	2.100
	MCS 6	0.144	0.241	0.59751037	2.237
	MCS 7	0.132	0.229	0.57641921	2.393
	MCS 8	0.116	0.214	0.54205607	2.660
	MCS 9	0.108	0.205	0.52682927	2.783
5.8 GHz Band 802.11ac_80 MHz BW	MCS 0	0.460	0.558	0.82437276	0.839
	MCS 1	0.252	0.348	0.72413793	1.402
	MCS 2	0.180	0.278	0.64748201	1.888
	MCS 3	0.148	0.246	0.60162602	2.207
	MCS 4	0.112	0.208	0.53846154	2.688
	MCS 5	0.096	0.192	0.50000000	3.010
	MCS 6	0.088	0.184	0.47826087	3.203
	MCS 7	0.084	0.181	0.46408840	3.334
	MCS 8	0.076	0.173	0.43930636	3.572
	MCS 9	0.072	0.169	0.42603550	3.706

8.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033 D02(issued 06/06/2014), at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

The 26 dB bandwidth is used to determine the conducted power limits.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE (26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.
The Spectrum Analyzer is set to(C.1 in KDB 789033 D02, issued 06/06/2014)

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 %.

Note : We tested 26 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.

▣ TEST PROCEDURE (for the band 5.725-5.85 GHz, 6 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to(C.2 in KDB 789033 D02, issued 06/06/2014)

1. RBW = 100 kHz
2. VBW ≥ 3*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 : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

▣ TEST RESULTS for Ant.0_802.11a_20 MHz BW

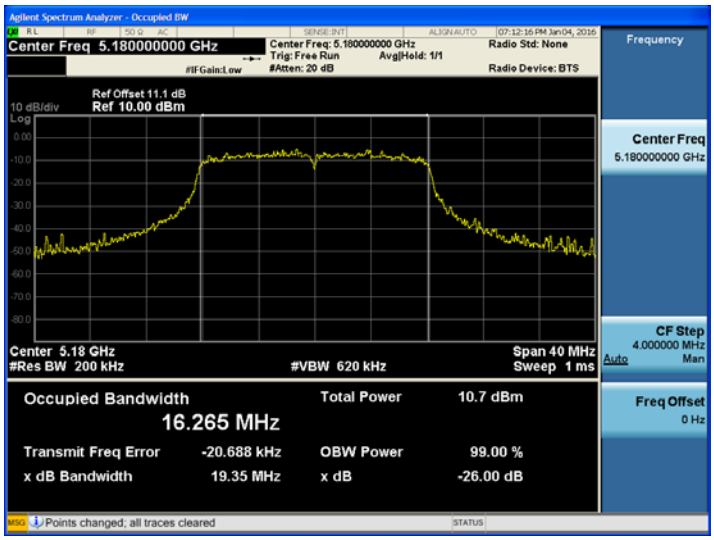
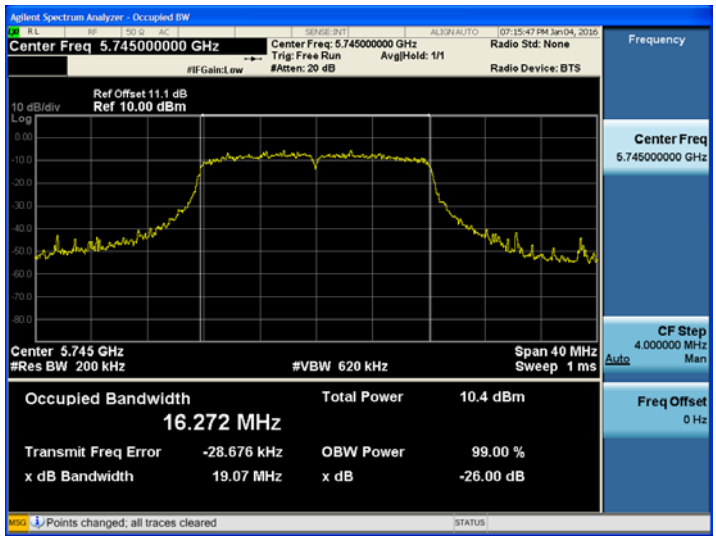
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.353	N/A	Pass
5200	40	18.768	N/A	Pass
5240	48	18.582	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.070	N/A	Pass
5785	157	18.793	N/A	Pass
5825	165	18.759	N/A	Pass

▣ TEST Plot for Ant.0_802.11a _20MHz BW

802.11a UNII 1 BAND 26dB Bandwidth (CH36)	802.11a UNII 3 BAND 26dB Bandwidth (CH 149)
	

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

▣ TEST RESULTS for Ant.1_802.11a_20 MHz BW

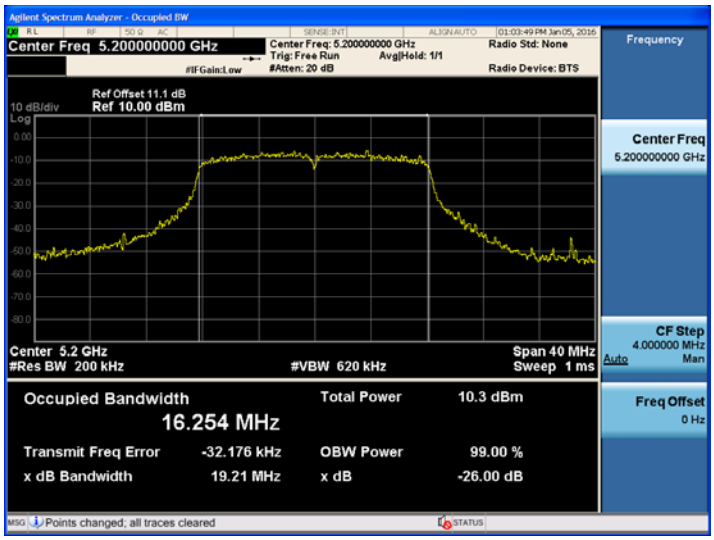
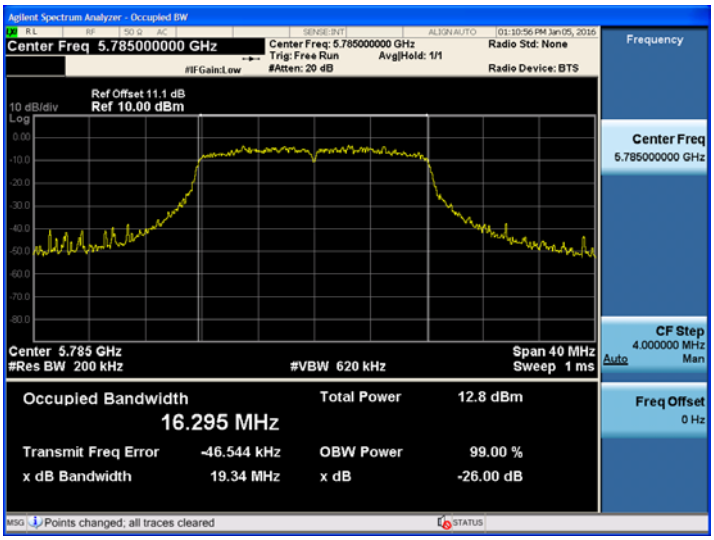
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	18.972	N/A	Pass
5200	40	19.208	N/A	Pass
5240	48	18.685	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.208	N/A	Pass
5785	157	19.339	N/A	Pass
5825	165	18.984	N/A	Pass

▣ TEST Plot for Ant.1_802.11a _20MHz BW

802.11a UNII 1 BAND 26dB Bandwidth (CH40)	802.11a UNII 3 BAND 26dB Bandwidth (CH 157)
	

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

▣ TEST RESULTS for Ant.0_802.11n _20MHz BW

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

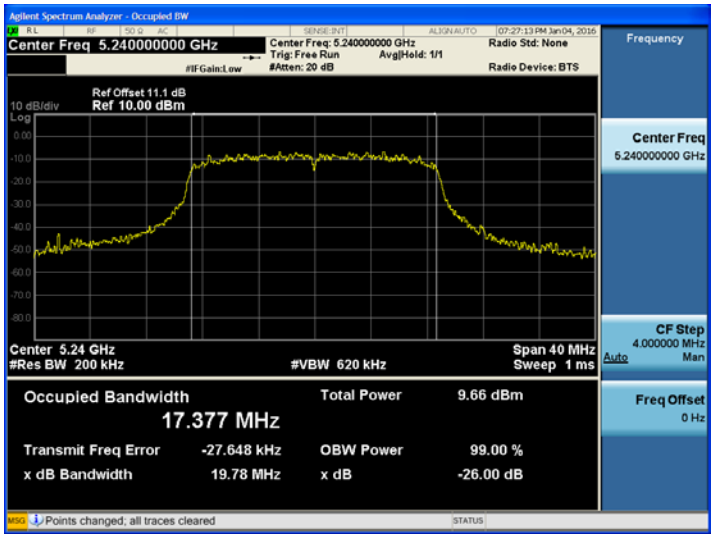
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.697	N/A	Pass
5200	40	19.669	N/A	Pass
5240	48	19.784	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

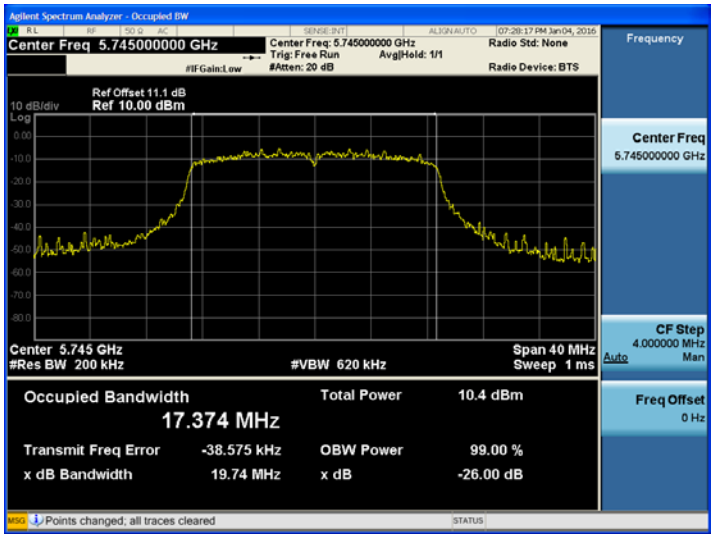
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.743	N/A	Pass
5785	157	19.561	N/A	Pass
5825	165	19.702	N/A	Pass

▣ TEST Plot for Ant.0_802.11n _20MHz BW

802.11n_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 48)



802.11n_20 MHz BW UNII 3 BAND 26dB Bandwidth(CH 149)



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

▣ TEST RESULTS for Ant.1_802.11n _20MHz BW

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

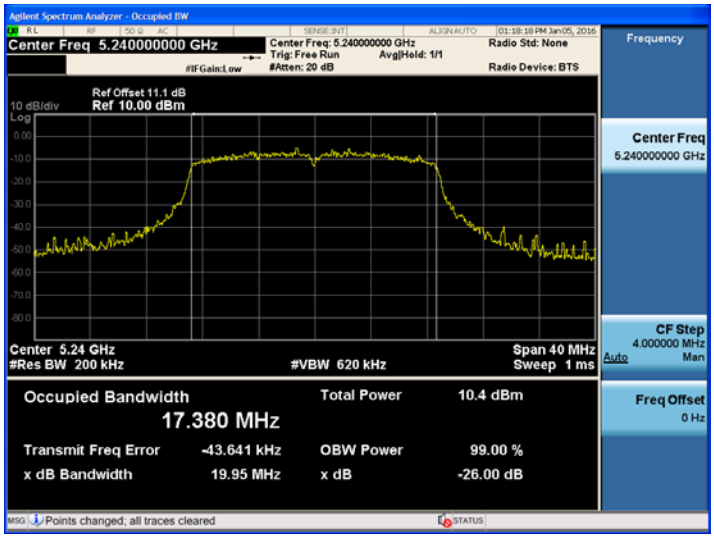
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.635	N/A	Pass
5200	40	19.768	N/A	Pass
5240	48	19.955	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

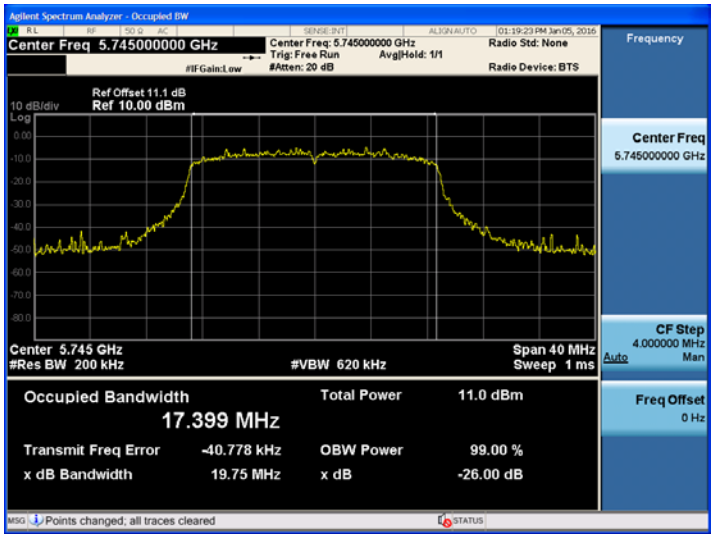
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.749	N/A	Pass
5785	157	19.518	N/A	Pass
5825	165	19.567	N/A	Pass

▣ TEST Plot for Ant.1_802.11n _20MHz BW

802.11n_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 48)



802.11n_20 MHz BW UNII 3 BAND 26dB Bandwidth(CH 149)



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

▣ TEST RESULTS for Ant.0 802.11n_40MHz BW

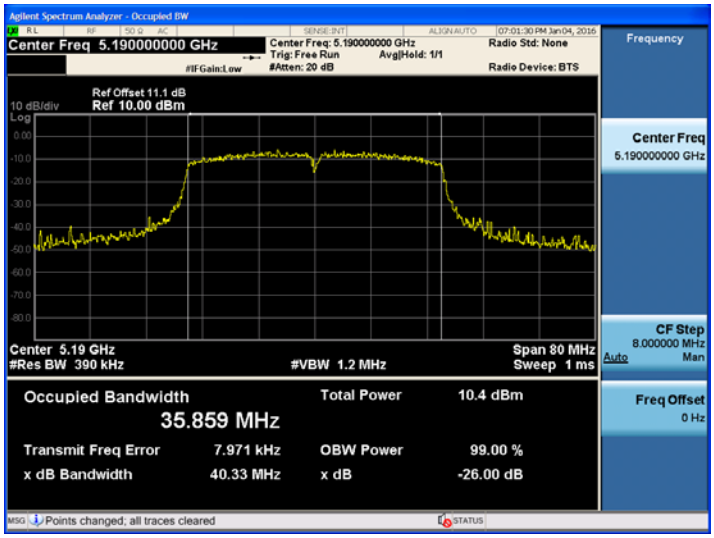
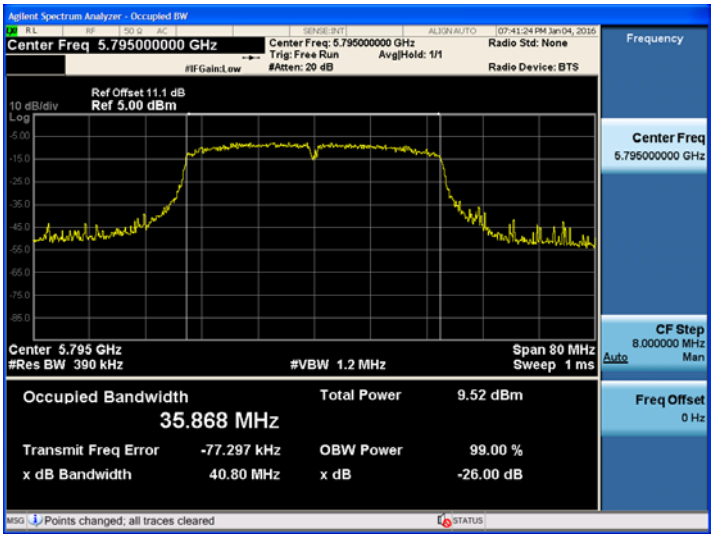
Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	40.334	N/A	Pass
5230	46	40.108	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	39.886	N/A	Pass
5795	159	40.796	N/A	Pass

▣ TEST Plot for Ant.0_802.11n_40MHz BW

802.11n_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 38)	802.11n_40 MHz BW UNII 3 BAND 26dB Bandwidth (CH 159)
	

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

▣ TEST RESULTS for Ant.1 802.11n_40MHz BW

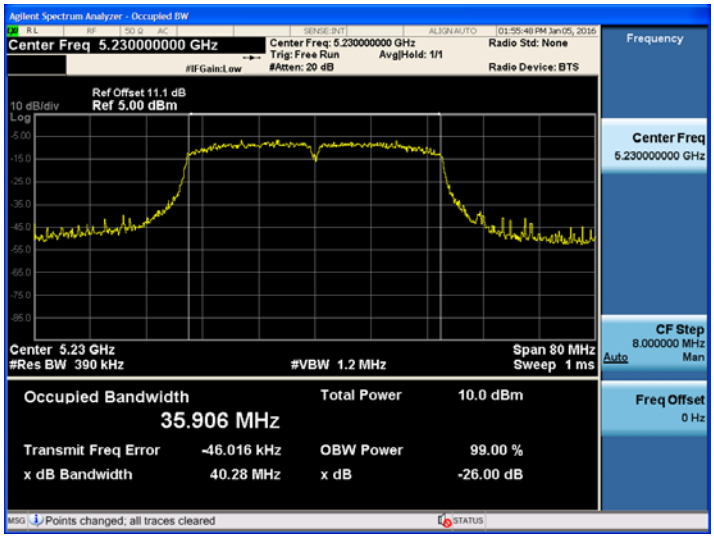
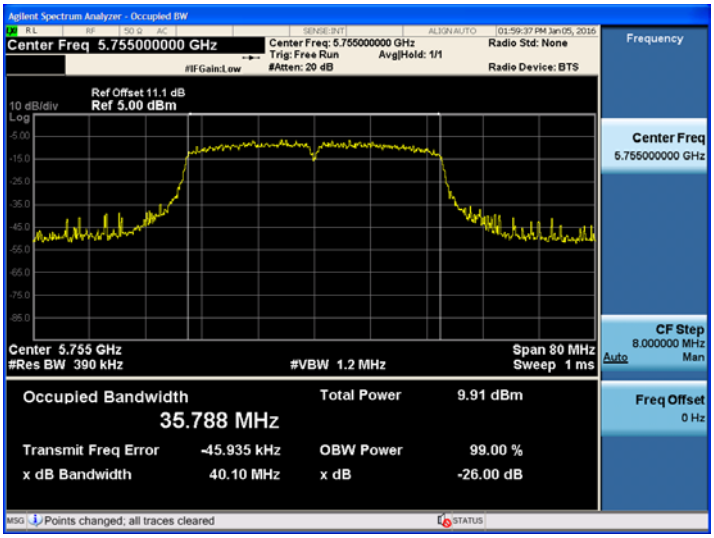
Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	40.119	N/A	Pass
5230	46	40.278	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	40.096	N/A	Pass
5795	159	39.706	N/A	Pass

▣ TEST Plot for Ant.1_802.11n_40MHz BW

802.11n_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 46)	802.11n_40 MHz BW UNII 3 BAND 26dB Bandwidth (CH 151)
	

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

▣ TEST RESULTS for Ant.0_802.11ac _20MHz BW

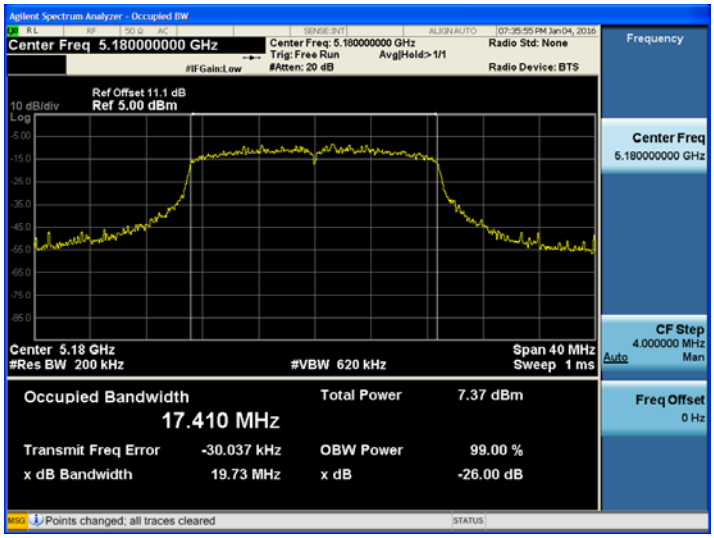
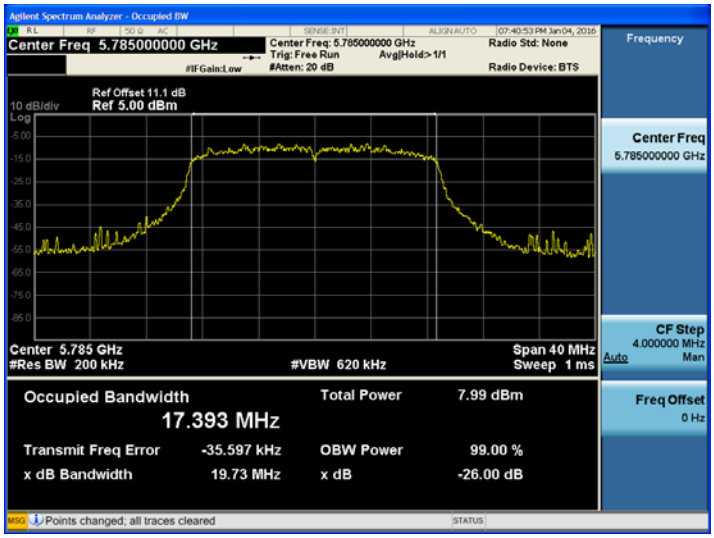
Conducted 26 dB Bandwidth Measurements for 802.11ac 20M BW

802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.726	N/A	Pass
5200	40	19.649	N/A	Pass
5240	48	19.663	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac 20M BW

802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.601	N/A	Pass
5785	157	19.732	N/A	Pass
5825	165	19.562	N/A	Pass

▣ TEST Plot for Ant.0_802.11ac _20MHz BW

802.11ac_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 36)	802.11ac_20 MHz BW UNII 3 BAND 26dB Bandwidth(CH 157)
	

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

▣ TEST RESULTS for Ant.1_802.11ac _20MHz BW

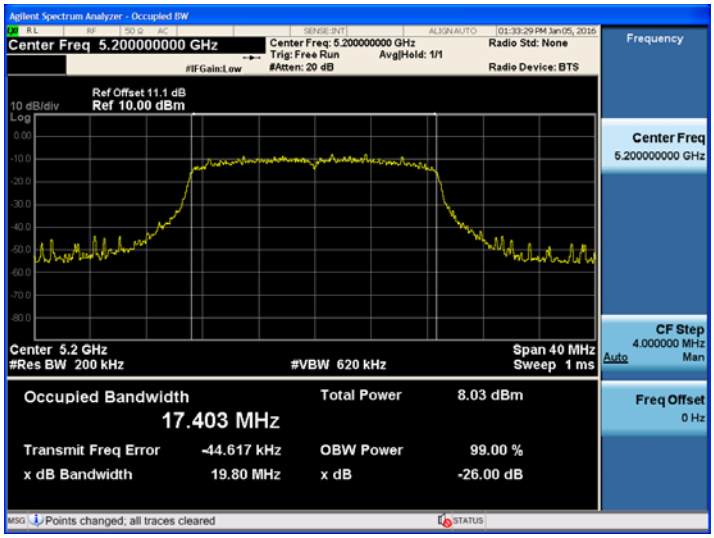
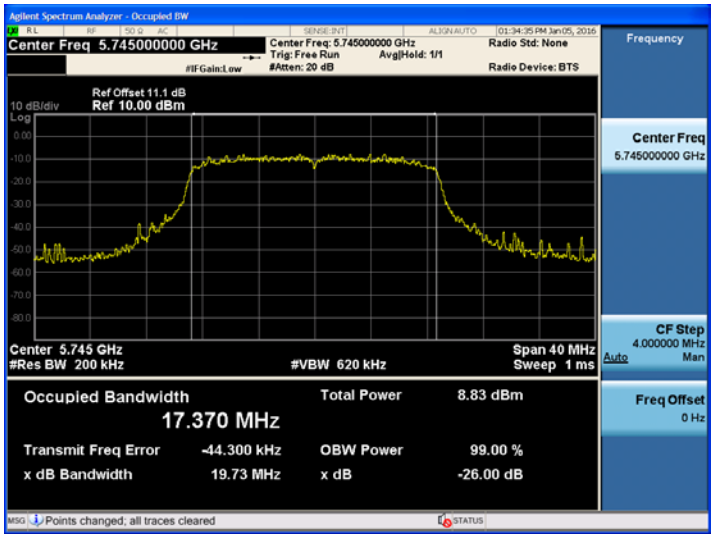
Conducted 26 dB Bandwidth Measurements for 802.11ac 20M BW

802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.694	N/A	Pass
5200	40	19.797	N/A	Pass
5240	48	19.783	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac 20M BW

802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.728	N/A	Pass
5785	157	19.513	N/A	Pass
5825	165	19.584	N/A	Pass

▣ TEST Plot for Ant.1_802.11ac _20MHz BW

802.11ac_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 40)	802.11ac_20 MHz BW UNII 3 BAND 26dB Bandwidth(CH 149)
	

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

▣ TEST RESULTS for Ant.0_802.11ac_40MHz BW

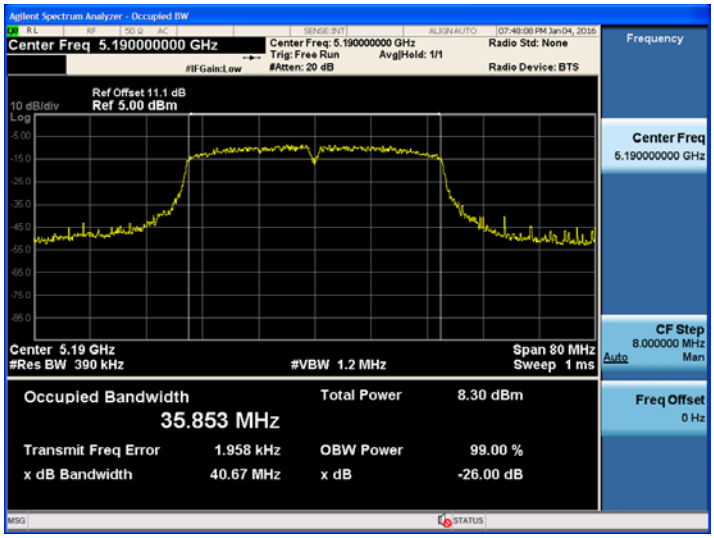
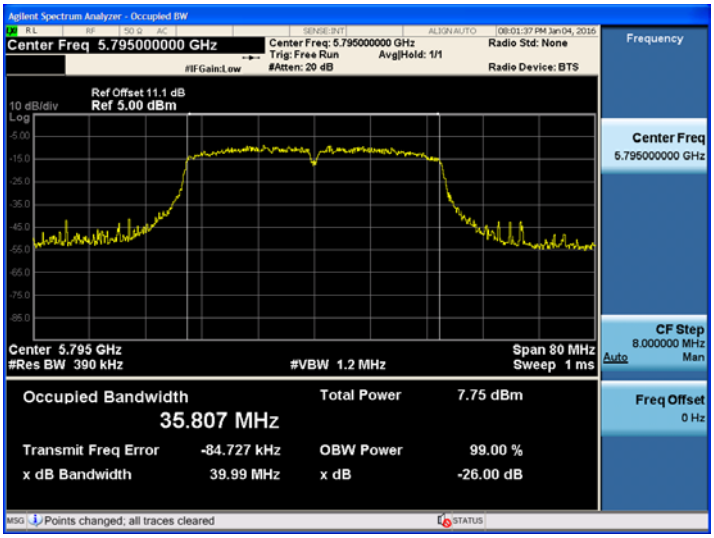
Conducted 26 dB Bandwidth Measurements for 802.11ac_40 M BW

802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	40.668	N/A	Pass
5230	46	40.372	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac_40 M BW

802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	39.609	N/A	Pass
5795	159	39.988	N/A	Pass

▣ TEST Plot for Ant.0_802.11ac_40MHz BW

802.11ac_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 38)	802.11ac_40 MHz BW UNII 3 BAND 26dB Bandwidth (CH 159)
	

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

▣ TEST RESULTS for Ant.1_802.11ac_40MHz BW

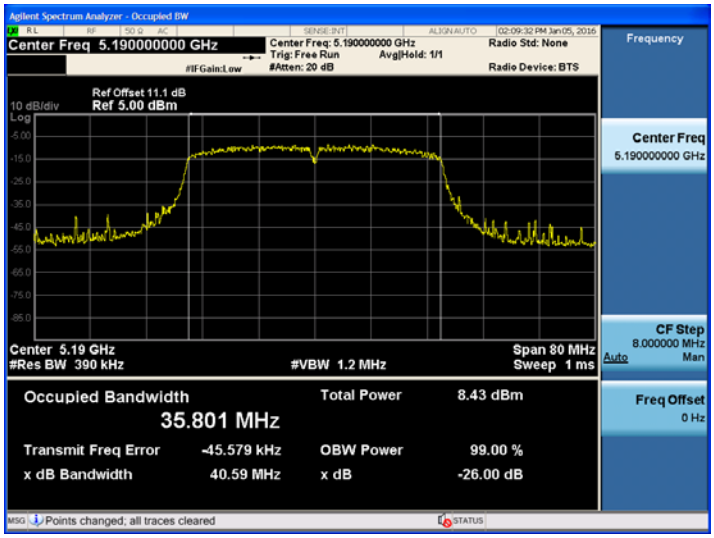
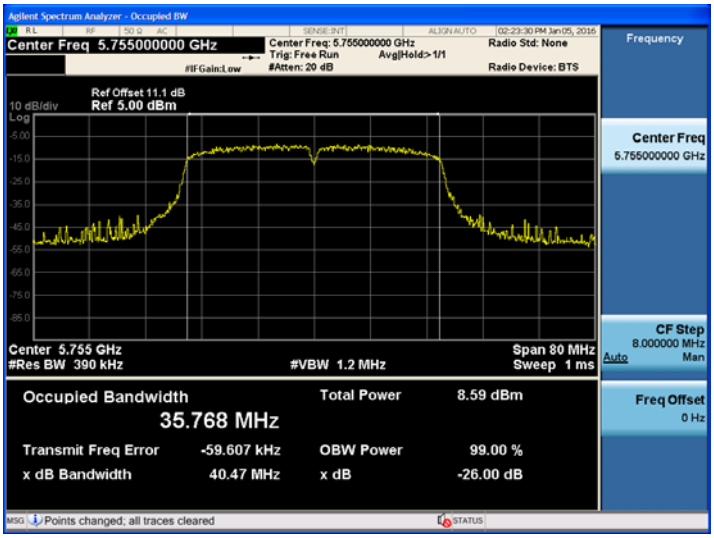
Conducted 26 dB Bandwidth Measurements for 802.11ac_40 M BW

802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	40.595	N/A	Pass
5230	46	40.327	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac_40 M BW

802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	40.466	N/A	Pass
5795	159	40.129	N/A	Pass

▣ TEST Plot for Ant.1_802.11ac_40MHz BW

802.11ac_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 38)	802.11ac_40 MHz BW UNII 3 BAND 26dB Bandwidth (CH 151)
	

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

▣ TEST RESULTS for Ant.0_802.11ac_80MHz BW

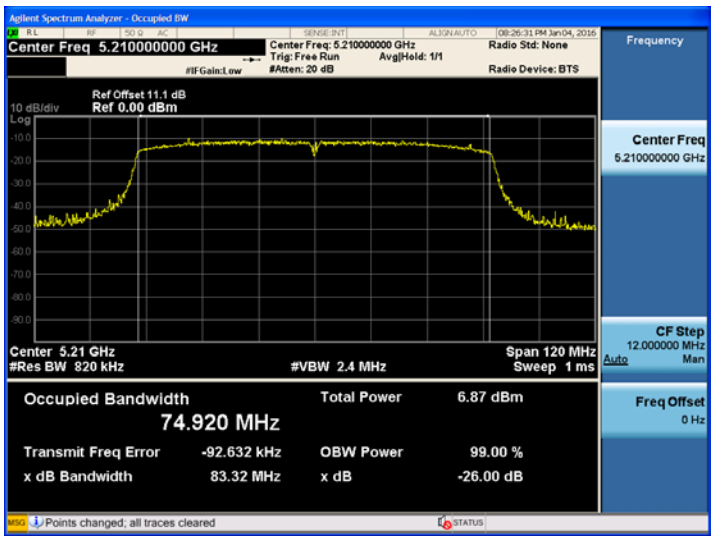
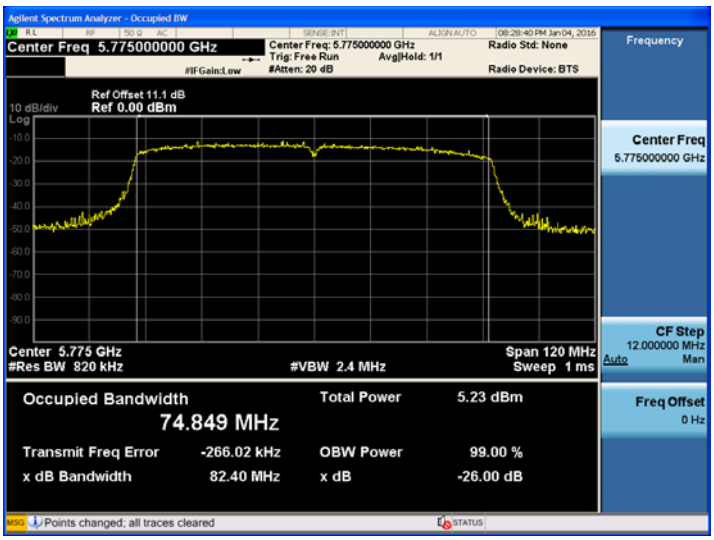
Conducted 26 dB Bandwidth Measurements for 802.11ac_80M BW

802.11ac(80M) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5210	42	83.322	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac_80M BW

802.11ac(80M) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	82.397	N/A	Pass

▣ TEST Plot for Ant.0_802.11ac _80MHz BW

802.11ac_80 MHz BW UNII 1 BAND 26dB Bandwidth(CH 42)	802.11ac_80 MHz BW UNII 3 BAND 26dB Bandwidth(CH 155)
	

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

▣ TEST RESULTS for Ant.1_802.11ac_80MHz BW

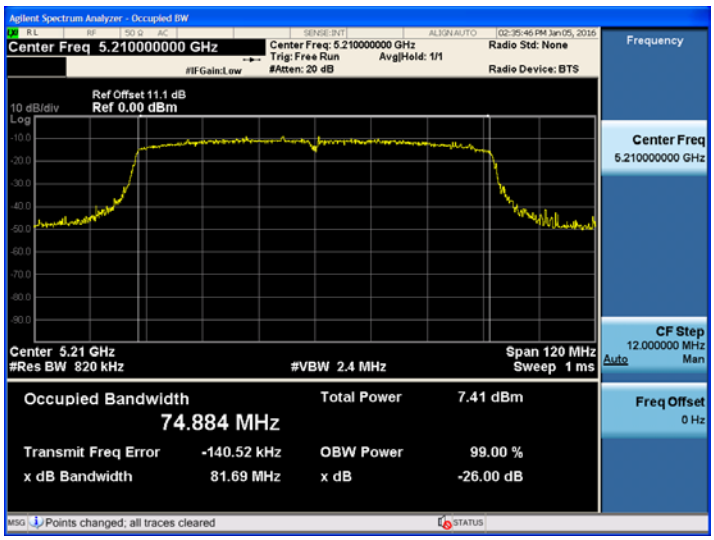
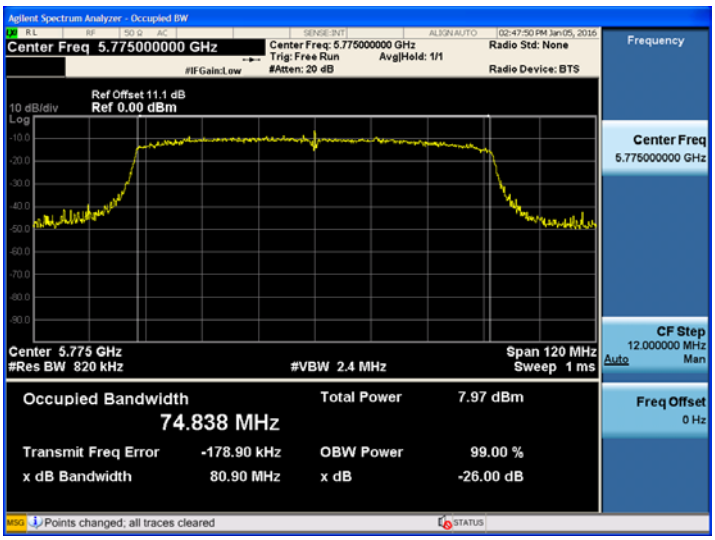
Conducted 26 dB Bandwidth Measurements for 802.11ac_80M BW

802.11ac(80M) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5210	42	81.693	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac_80M BW

802.11ac(80M) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	80.899	N/A	Pass

▣ TEST Plot for Ant.1_802.11ac _80MHz BW

802.11ac_80 MHz BW UNII 1 BAND 26dB Bandwidth(CH 42)	802.11ac_80 MHz BW UNII 3 BAND 26dB Bandwidth(CH 155)
	

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

Conducted 6 dB Bandwidth

▣ TEST RESULTS for Ant.0_802.11a/n/ac _20MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	14.685	0.5	Pass
5785	157	14.415	0.5	Pass
5825	165	15.146	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_20MHz BW

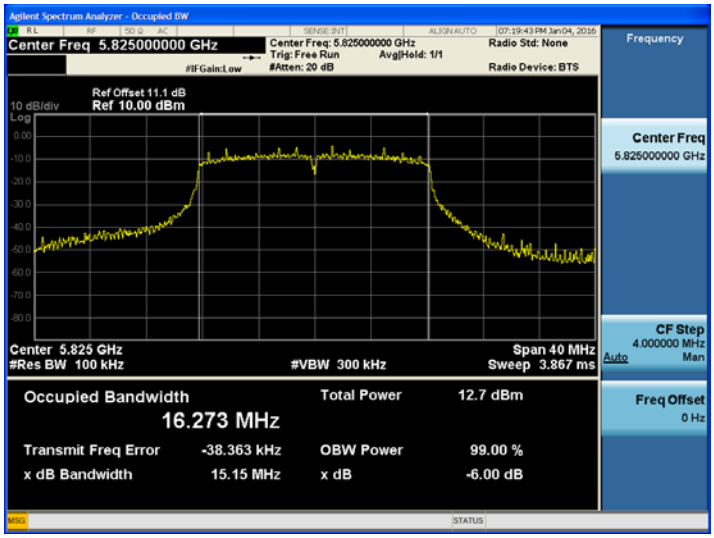
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.168	0.5	Pass
5785	157	15.174	0.5	Pass
5825	165	15.111	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11ac_20MHz BW

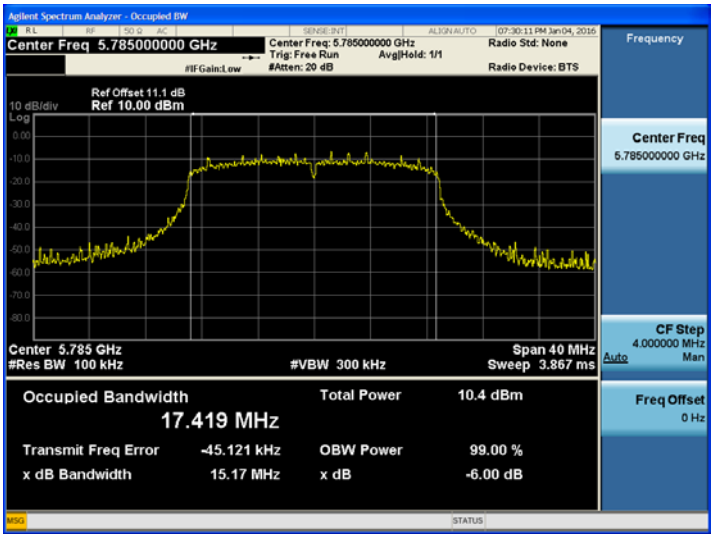
802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.124	0.5	Pass
5785	157	15.105	0.5	Pass
5825	165	14.670	0.5	Pass

▣ TEST PlotS for 802.11a/n/ac _20MHz BW

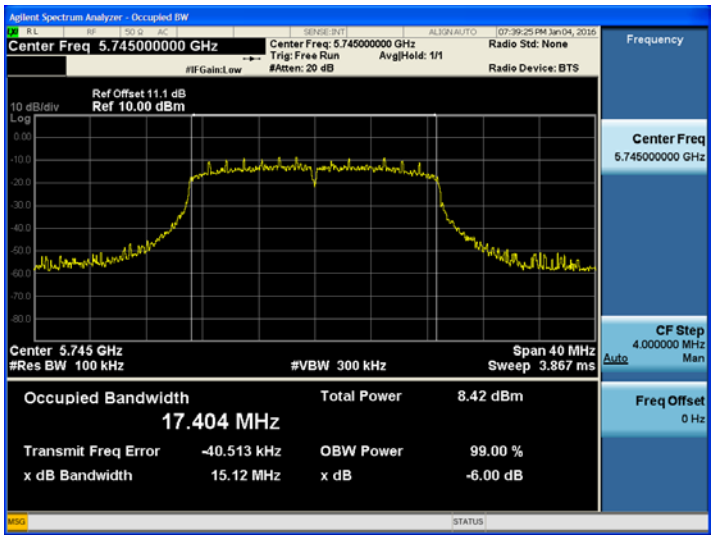
802.11a UNII 3 BAND 6dB Bandwidth (CH.165)



802.11n_20 MHz BW UNII 3 BAND 6dB Bandwidth(CH.157)



802.11ac_20 MHz BW UNII 3 BAND 6dB Bandwidth(CH.149)



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

▣ TEST RESULTS for Ant.1_802.11a/n/ac _20MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.100	0.5	Pass
5785	157	15.090	0.5	Pass
5825	165	15.110	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_20MHz BW

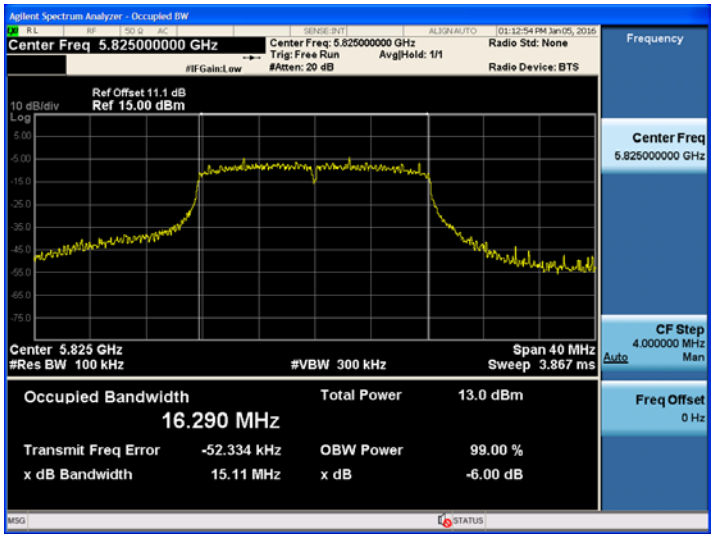
802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.147	0.5	Pass
5785	157	15.006	0.5	Pass
5825	165	15.108	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11ac_20MHz BW

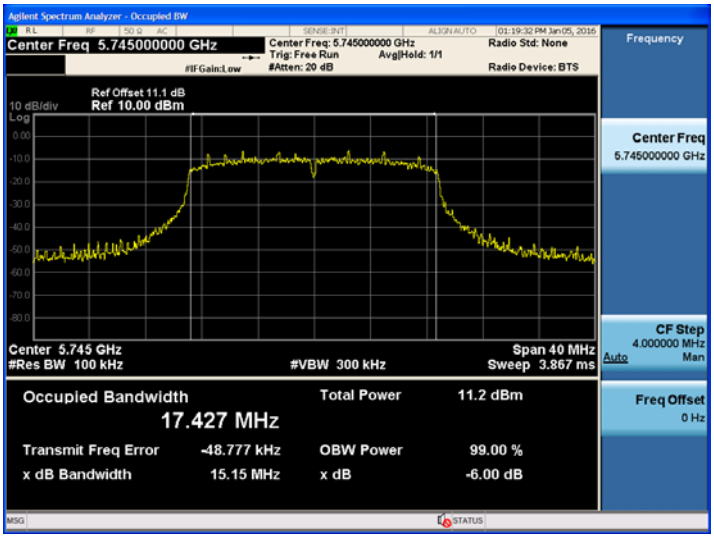
802.11ac(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.119	0.5	Pass
5785	157	15.179	0.5	Pass
5825	165	15.000	0.5	Pass

▣ TEST PlotS for Ant.1_802.11a/n/ac _20MHz BW

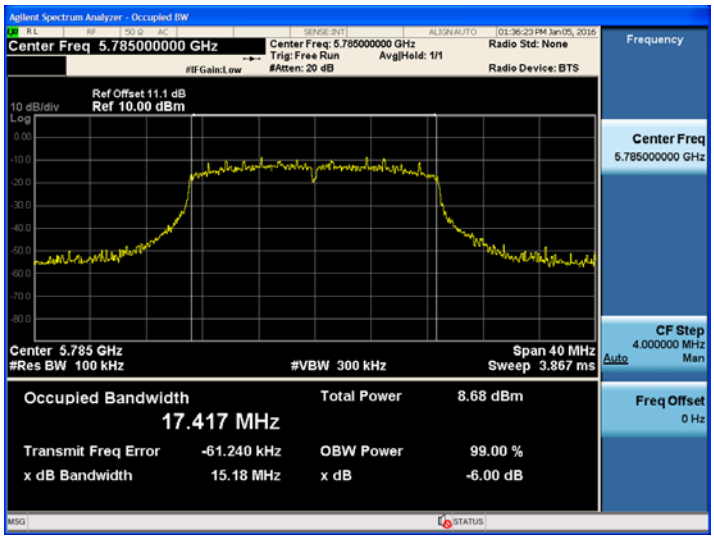
802.11a UNII 3 BAND 6dB Bandwidth (CH.165)



802.11n_20 MHz BW UNII 3 BAND 6dB Bandwidth(CH.149)



802.11ac_20 MHz BW UNII 3 BAND 6dB Bandwidth(CH.157)



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

▣ TEST RESULTS for Ant.0_802.11n/ac _40MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11n_40MHz BW

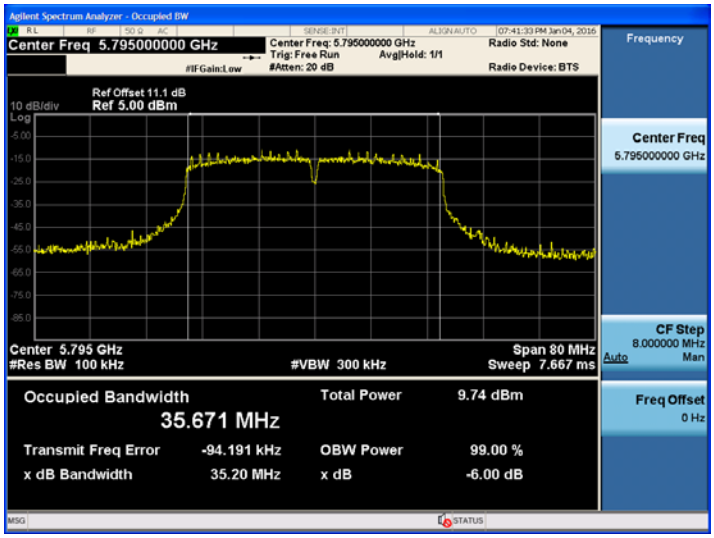
802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.177	0.5	Pass
5795	159	35.205	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11ac_40MHz BW

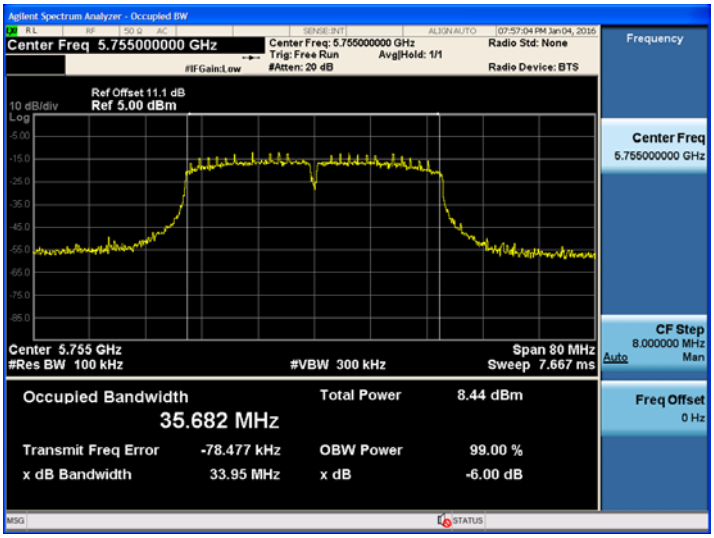
802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	33.954	0.5	Pass
5795	159	33.920	0.5	Pass

▣ TEST Plots for Ant.0_802.11n/ac _40MHz BW_802.11ac _80MHz BW

802.11n_40 MHz UNII 3 BAND 6dB Bandwidth (CH.159)



802.11ac_40 MHz BW UNII 3 BAND 6dB Bandwidth(CH.151)



▣ TEST RESULTS for Ant.1_802.11n/ac _40MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11n_40MHz BW

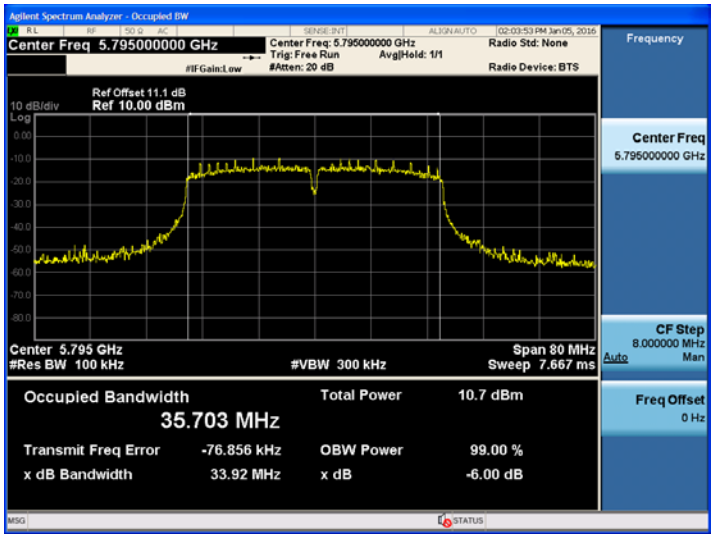
802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.177	0.5	Pass
5795	159	35.205	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11ac_40MHz BW

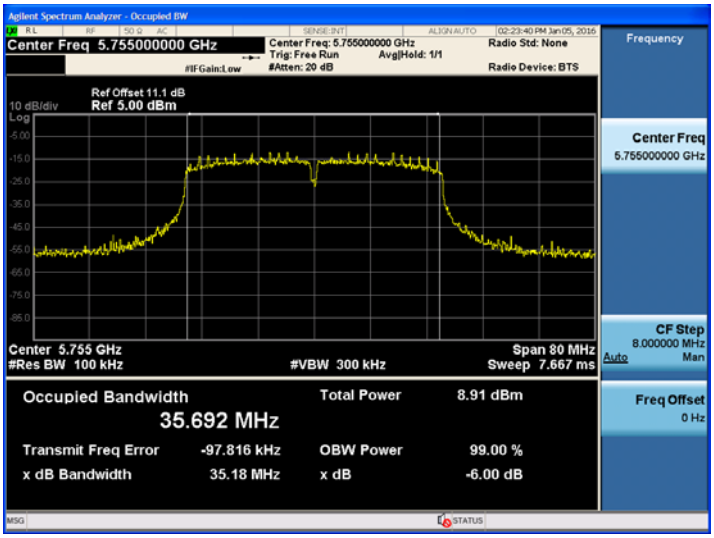
802.11ac(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	33.954	0.5	Pass
5795	159	33.920	0.5	Pass

▣ TEST Plots for Ant.1_802.11n/ac _40MHz BW_802.11ac _80MHz BW

802.11n_40 MHz UNII 3 BAND 6dB Bandwidth (CH.159)



802.11ac_40 MHz BW UNII 3 BAND 6dB Bandwidth(CH.151)



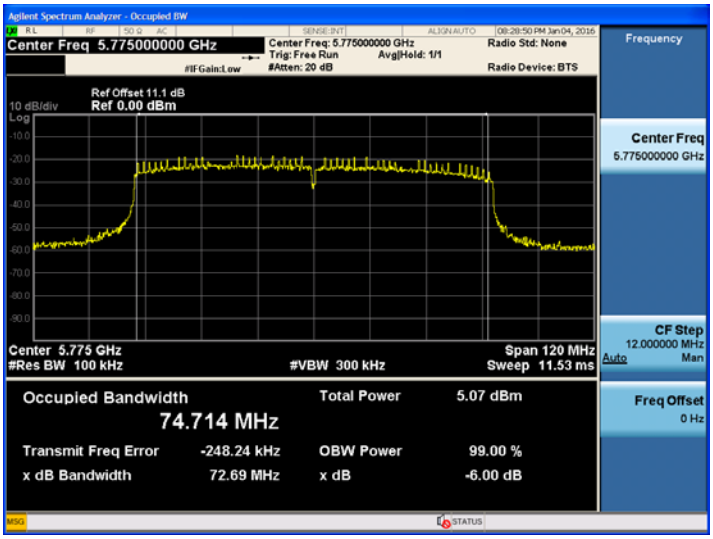
▣ TEST RESULTS Ant.0_for 802.11ac _80MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11ac_80MHz BW

802.11ac(80MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	72.691	0.5	Pass

▣ TEST Plots for Ant.0_802.11ac _80MHz BW

802.11ac_80 MHz BW UNII 3 BAND 6dB Bandwidth(CH.155)



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

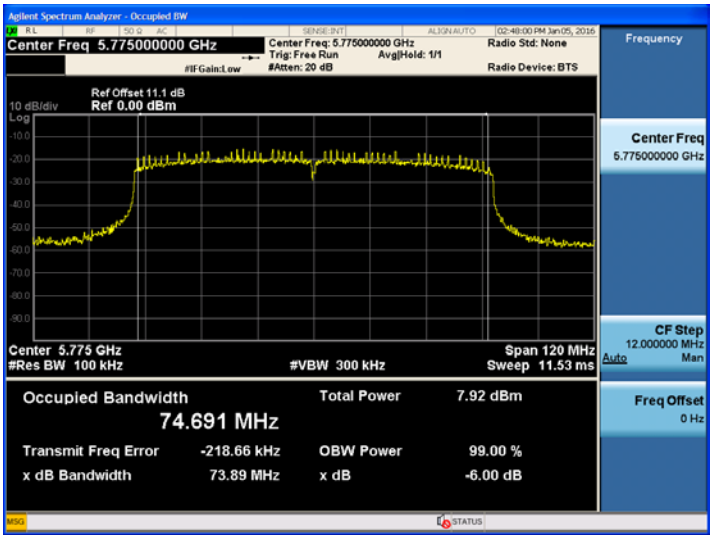
▣ TEST RESULTS Ant.1_for 802.11ac _80MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11ac_80MHz BW

802.11ac(80MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	73.889	0.5	Pass

▣ TEST Plots for Ant.1_802.11ac _80MHz BW

802.11ac_80 MHz BW UNII 3 BAND 6dB Bandwidth(CH.155)



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

8.3 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.407(a)(1)

A transmitter antenna terminal of EUT is connected to the input of a Power meter or Spectrum Analyzer .Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

▣ Limit

Band	Mode	Limit (dBm)
UNII 1	802.11a,n,ac	23.98
UNII 3	802.11a,n,ac	30.00

Maximum Conducted Output Power:

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit (dBm)
SISO	UNII 1	802.11a/n/ac	Ant 0	3.84	23.98
			Ant 1	4.90	23.98
	UNII 3		Ant 0	4.80	30.00
			Ant 1	4.65	30.00
MIMO(CDD)	UNII 1	802.11a/n_HT20	Ant 0 & 1	7.40	22.58
	UNII 3			7.74	28.26
MIMO(SDM)	UNII 1	802.11n/ac_VHT20/ ac_VHT40/ac_VHT80	Ant 0 & 1	4.40	23.98
	UNII 3			4.73	30.00

Note : 1. If all antenna gains are not equal,

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

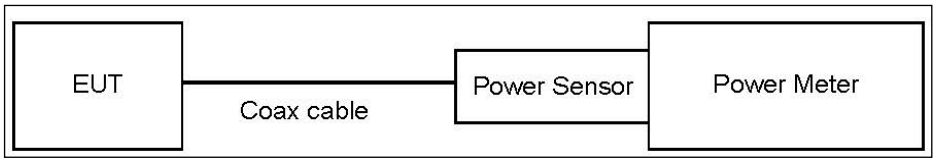
Directional gain = $10*\log[(10^{G1/10} + 10^{G2/10}+\ldots+10^{GN/10})/N]$ dBi (SDM)

(according to KDB662911 D01 v02r01)

2. Limit is calculated by antenna gain.

3. The limits of maximum conducted power were applied the antenna gain. Therefore, if conducted power is pass, e.i.r.p. is also pass. So, we attached only conducted power table.

▣ TEST CONFIGURATION(20 MHz BW)



▣ TEST PROCEDURE(20 MHz BW)

▪ Average Power (Procedure E.3.a in KDB 789033, issued 06/06/2014).

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.

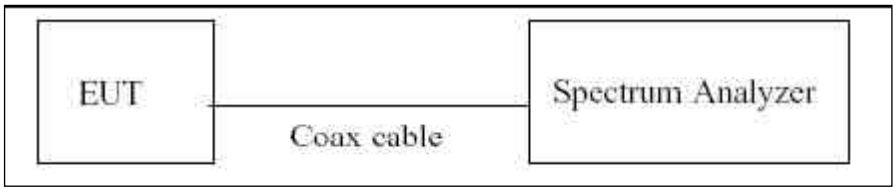
Note :

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

Band	Loss(dB)
UNII 1, 2A, 2C, 3	11.1

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

▣ TEST CONFIGURATION(40 MHz BW & 80 MHz BW)



▣ TEST PROCEDURE(40 MHz BW & 80 MHz BW)

▪ Average Power

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function. We tested according to Method SA-2 in KDB 789033(issued 06/06/2014).

The Spectrum Analyzer is set to

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*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 (Conducted)

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor

▣ Sample Calculation (EIRP)

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor + Ant gain

Note: 1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss + Cable loss

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

Band	Loss(dB)
UNII 1, 3	11.1

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

Ant.0

802.11a_20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11a_20M BW Mode: 5180~5240)

802.11a(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	4.50	0.20	4.70	23.98
		9	4.42	0.30	4.72	23.98
		12	4.34	0.39	4.73	23.98
		18	4.18	0.58	4.76	23.98
		24	4.33	0.75	5.08	23.98
		36	4.05	1.03	5.08	23.98
		48	3.77	1.33	5.10	23.98
		54	3.66	1.45	5.11	23.98
5200	40	6	3.31	0.20	3.51	23.98
		9	3.22	0.30	3.52	23.98
		12	3.16	0.39	3.55	23.98
		18	2.98	0.58	3.56	23.98
		24	3.12	0.75	3.87	23.98
		36	2.85	1.03	3.88	23.98
		48	2.57	1.33	3.90	23.98
		54	2.44	1.45	3.89	23.98
5240	48	6	4.51	0.20	4.71	23.98
		9	4.40	0.30	4.70	23.98
		12	4.33	0.39	4.72	23.98
		18	4.16	0.58	4.74	23.98
		24	4.34	0.75	5.09	23.98
		36	4.05	1.03	5.08	23.98
		48	3.77	1.33	5.10	23.98
		54	3.65	1.45	5.10	23.98

Ant.1

802.11a _20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11a_20M BW Mode: 5180~5240)

802.11a(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	3.66	0.21	3.87	23.98
		9	3.55	0.31	3.86	23.98
		12	3.50	0.38	3.88	23.98
		18	3.32	0.58	3.90	23.98
		24	3.49	0.72	4.21	23.98
		36	3.20	1.02	4.22	23.98
		48	2.93	1.32	4.25	23.98
		54	2.83	1.43	4.26	23.98
5200	40	6	2.78	0.21	2.99	23.98
		9	2.69	0.31	3.00	23.98
		12	2.62	0.38	3.00	23.98
		18	2.44	0.58	3.02	23.98
		24	2.61	0.72	3.33	23.98
		36	2.34	1.02	3.36	23.98
		48	2.10	1.32	3.42	23.98
		54	1.96	1.43	3.39	23.98
5240	48	6	4.17	0.21	4.38	23.98
		9	4.08	0.31	4.39	23.98
		12	4.01	0.38	4.39	23.98
		18	3.88	0.58	4.46	23.98
		24	3.99	0.72	4.71	23.98
		36	3.71	1.02	4.73	23.98
		48	3.47	1.32	4.79	23.98
		54	3.34	1.43	4.77	23.98

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 1)

Conducted Output Power Measurements (802.11a Mode: 5180~5240)

802.11a Mode		Rate (Mbps)	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5180	36	6	7.32	22.58
		9	7.32	22.58
		12	7.34	22.58
		18	7.36	22.58
		24	7.68	22.58
		36	7.68	22.58
		48	7.71	22.58
		54	7.72	22.58
5200	40	6	6.27	22.58
		9	6.28	22.58
		12	6.29	22.58
		18	6.31	22.58
		24	6.62	22.58
		36	6.64	22.58
		48	6.68	22.58
		54	6.66	22.58
5240	48	6	7.56	22.58
		9	7.56	22.58
		12	7.57	22.58
		18	7.61	22.58
		24	7.91	22.58
		36	7.92	22.58
		48	7.96	22.58
		54	7.95	22.58

Ant.0

802.11a _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11a_20M BW Mode: 5745~5825)

802.11a (20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	6	3.75	0.20	3.95	30
		9	3.64	0.30	3.94	30
		12	3.57	0.39	3.96	30
		18	3.40	0.58	3.98	30
		24	3.59	0.75	4.34	30
		36	3.30	1.03	4.33	30
		48	3.02	1.33	4.35	30
		54	2.91	1.45	4.36	30
5785	157	6	5.66	0.20	5.86	30
		9	5.56	0.30	5.86	30
		12	5.49	0.39	5.88	30
		18	5.32	0.58	5.90	30
		24	5.48	0.75	6.23	30
		36	5.20	1.03	6.23	30
		48	4.91	1.33	6.24	30
		54	4.81	1.45	6.26	30
5825	165	6	5.86	0.20	6.06	30
		9	5.74	0.30	6.04	30
		12	5.70	0.39	6.09	30
		18	5.50	0.58	6.08	30
		24	5.75	0.75	6.50	30
		36	5.44	1.03	6.47	30
		48	5.16	1.33	6.49	30
		54	5.04	1.45	6.49	30

Ant.1

802.11a _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11a_20M BW Mode: 5745~5825)

802.11a (20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	6	4.09	0.21	4.30	30
		9	3.98	0.31	4.29	30
		12	3.91	0.38	4.29	30
		18	3.77	0.58	4.35	30
		24	3.91	0.72	4.63	30
		36	3.65	1.02	4.67	30
		48	3.39	1.32	4.71	30
		54	3.27	1.43	4.70	30
5785	157	6	6.26	0.21	6.47	30
		9	6.14	0.31	6.45	30
		12	6.07	0.38	6.45	30
		18	5.92	0.58	6.50	30
		24	6.08	0.72	6.80	30
		36	5.78	1.02	6.80	30
		48	5.54	1.32	6.86	30
		54	5.41	1.43	6.84	30
5825	165	6	6.33	0.21	6.54	30
		9	6.21	0.31	6.52	30
		12	6.16	0.38	6.54	30
		18	5.98	0.58	6.56	30
		24	6.07	0.72	6.79	30
		36	5.80	1.02	6.82	30
		48	5.54	1.32	6.86	30
		54	5.40	1.43	6.83	30

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 3)

Conducted Output Power Measurements (802.11a Mode: 5745~5825)

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	6	7.14	28.26
		9	7.13	28.26
		12	7.14	28.26
		18	7.18	28.26
		24	7.50	28.26
		36	7.51	28.26
		48	7.54	28.26
		54	7.54	28.26
5785	157	6	9.19	28.26
		9	9.18	28.26
		12	9.18	28.26
		18	9.22	28.26
		24	9.53	28.26
		36	9.53	28.26
		48	9.57	28.26
		54	9.57	28.26
5825	165	6	9.32	28.26
		9	9.30	28.26
		12	9.33	28.26
		18	9.34	28.26
		24	9.66	28.26
		36	9.66	28.26
		48	9.69	28.26
		54	9.67	28.26

Ant.0

802.11n _20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_20M BW Mode: 5180~5240)

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	2.95	0.22	3.17	23.98
		1	2.78	0.42	3.20	23.98
		2	2.62	0.58	3.20	23.98
		3	2.98	0.75	3.73	23.98
		4	2.69	1.04	3.73	23.98
		5	2.42	1.34	3.76	23.98
		6	2.31	1.47	3.78	23.98
		7	2.19	1.57	3.76	23.98
5200	40	0	3.07	0.22	3.29	23.98
		1	2.91	0.42	3.33	23.98
		2	2.73	0.58	3.31	23.98
		3	3.07	0.75	3.82	23.98
		4	2.81	1.04	3.85	23.98
		5	2.54	1.34	3.88	23.98
		6	2.42	1.47	3.89	23.98
		7	2.32	1.57	3.89	23.98
5240	48	0	3.10	0.22	3.32	23.98
		1	2.97	0.42	3.39	23.98
		2	2.81	0.58	3.39	23.98
		3	3.15	0.75	3.90	23.98
		4	2.84	1.04	3.88	23.98
		5	2.60	1.34	3.94	23.98
		6	2.46	1.47	3.93	23.98
		7	2.38	1.57	3.95	23.98

Ant.1

802.11n _20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_20M BW Mode: 5180~5240)

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	2.41	0.22	2.63	23.98
		1	2.25	0.41	2.66	23.98
		2	2.08	0.61	2.69	23.98
		3	2.45	0.78	3.23	23.98
		4	2.16	1.04	3.20	23.98
		5	1.92	1.34	3.26	23.98
		6	1.82	1.46	3.28	23.98
		7	1.70	1.60	3.30	23.98
5200	40	0	2.54	0.22	2.76	23.98
		1	2.38	0.41	2.79	23.98
		2	2.22	0.61	2.83	23.98
		3	2.59	0.78	3.37	23.98
		4	2.30	1.04	3.34	23.98
		5	2.08	1.34	3.42	23.98
		6	1.93	1.46	3.39	23.98
		7	1.82	1.60	3.42	23.98
5240	48	0	2.90	0.22	3.12	23.98
		1	2.76	0.41	3.17	23.98
		2	2.57	0.61	3.18	23.98
		3	2.91	0.78	3.69	23.98
		4	2.62	1.04	3.66	23.98
		5	2.39	1.34	3.73	23.98
		6	2.25	1.46	3.71	23.98
		7	2.15	1.60	3.75	23.98

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 1)

Conducted Output Power Measurements (802.11n_20MHz BW Mode: 5180~5240)

802.11n(20MHz) Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5180	36	0	5.92	22.58
		1	5.95	22.58
		2	5.96	22.58
		3	6.50	22.58
		4	6.48	22.58
		5	6.53	22.58
		6	6.55	22.58
		7	6.55	22.58
5200	40	0	6.04	22.58
		1	6.08	22.58
		2	6.09	22.58
		3	6.61	22.58
		4	6.61	22.58
		5	6.67	22.58
		6	6.66	22.58
		7	6.67	22.58
5240	48	0	6.23	22.58
		1	6.29	22.58
		2	6.30	22.58
		3	6.81	22.58
		4	6.78	22.58
		5	6.85	22.58
		6	6.83	22.58
		7	6.86	22.58

Ant.0

802.11n _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_20M BW Mode: 5745~5825)

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	3.48	0.22	3.70	30
		1	3.32	0.42	3.74	30
		2	3.15	0.58	3.73	30
		3	3.52	0.75	4.27	30
		4	3.24	1.04	4.28	30
		5	2.99	1.34	4.33	30
		6	2.85	1.47	4.32	30
		7	2.76	1.57	4.33	30
5785	157	0	3.38	0.22	3.60	30
		1	3.22	0.42	3.64	30
		2	3.07	0.58	3.65	30
		3	3.40	0.75	4.15	30
		4	3.10	1.04	4.14	30
		5	2.87	1.34	4.21	30
		6	2.75	1.47	4.22	30
		7	2.65	1.57	4.22	30
5825	165	0	3.55	0.22	3.77	30
		1	3.39	0.42	3.81	30
		2	3.22	0.58	3.80	30
		3	3.59	0.75	4.34	30
		4	3.30	1.04	4.34	30
		5	3.05	1.34	4.39	30
		6	2.92	1.47	4.39	30
		7	2.82	1.57	4.39	30

Ant.1

802.11n _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_20M BW Mode: 5745~5825)

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	3.94	0.22	4.16	30
		1	3.78	0.41	4.19	30
		2	3.64	0.61	4.25	30
		3	3.96	0.78	4.74	30
		4	3.69	1.04	4.73	30
		5	3.42	1.34	4.76	30
		6	3.33	1.46	4.79	30
		7	3.23	1.60	4.83	30
5785	157	0	3.96	0.22	4.18	30
		1	3.79	0.41	4.20	30
		2	3.65	0.61	4.26	30
		3	3.99	0.78	4.77	30
		4	3.70	1.04	4.74	30
		5	3.45	1.34	4.79	30
		6	3.35	1.46	4.81	30
		7	3.25	1.60	4.85	30
5825	165	0	4.02	0.22	4.24	30
		1	3.84	0.41	4.25	30
		2	3.68	0.61	4.29	30
		3	4.03	0.78	4.81	30
		4	3.75	1.04	4.79	30
		5	3.52	1.34	4.86	30
		6	3.38	1.46	4.84	30
		7	3.28	1.60	4.88	30

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 3)

Conducted Output Power Measurements (802.11n_20MHz Mode: 5745~5825)

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	0	6.95	28.26
		1	6.98	28.26
		2	7.01	28.26
		3	7.52	28.26
		4	7.52	28.26
		5	7.56	28.26
		6	7.57	28.26
		7	7.60	28.26
5785	157	0	6.91	28.26
		1	6.94	28.26
		2	6.98	28.26
		3	7.48	28.26
		4	7.46	28.26
		5	7.52	28.26
		6	7.54	28.26
		7	7.56	28.26
5825	165	0	7.02	28.26
		1	7.05	28.26
		2	7.06	28.26
		3	7.59	28.26
		4	7.58	28.26
		5	7.64	28.26
		6	7.63	28.26
		7	7.65	28.26

Ant.0

802.11ac _20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11ac_20M BW Mode: 5180~5240)

802.11ac(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	1.01	0.22	1.23	23.98
		1	0.85	0.41	1.26	23.98
		2	0.68	0.59	1.27	23.98
		3	1.03	0.77	1.80	23.98
		4	0.76	1.04	1.80	23.98
		5	0.49	1.32	1.81	23.98
		6	0.41	1.43	1.84	23.98
		7	0.27	1.53	1.80	23.98
5200	40	0	0.10	1.73	1.83	23.98
		1	1.12	0.22	1.34	23.98
		2	0.97	0.41	1.38	23.98
		3	0.80	0.59	1.39	23.98
		4	1.17	0.77	1.94	23.98
		5	0.88	1.04	1.92	23.98
		6	0.61	1.32	1.93	23.98
		7	0.51	1.43	1.94	23.98
5240	48	0	0.40	1.53	1.93	23.98
		1	0.21	1.73	1.94	23.98
		2	1.19	0.22	1.41	23.98
		3	1.05	0.41	1.46	23.98
		4	0.87	0.59	1.46	23.98
		5	1.23	0.77	2.00	23.98
		6	0.93	1.04	1.97	23.98
		7	0.67	1.32	1.99	23.98

Ant.1

802.11ac _20MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11ac_20M BW Mode: 5180~5240)

802.11ac(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	0.36	0.22	0.58	23.98
		1	0.19	0.40	0.59	23.98
		2	0.03	0.60	0.63	23.98
		3	0.39	0.78	1.17	23.98
		4	0.12	1.02	1.14	23.98
		5	-0.12	1.32	1.20	23.98
		6	-0.22	1.42	1.20	23.98
		7	-0.34	1.55	1.21	23.98
5200	40	0	-0.51	1.74	1.23	23.98
		1	0.48	0.22	0.70	23.98
		2	0.31	0.40	0.71	23.98
		3	0.16	0.60	0.76	23.98
		4	0.54	0.78	1.32	23.98
		5	0.25	1.02	1.27	23.98
		6	0.02	1.32	1.34	23.98
		7	-0.09	1.42	1.33	23.98
5240	48	0	-0.20	1.55	1.35	23.98
		1	-0.38	1.74	1.36	23.98
		2	0.90	0.22	1.12	23.98
		3	0.75	0.40	1.15	23.98
		4	0.47	0.60	1.07	23.98
		5	0.88	0.78	1.66	23.98
		6	0.59	1.02	1.61	23.98
		7	0.37	1.32	1.69	23.98

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 1)

Conducted Output Power Measurements (802.11ac_20MHz BW Mode: 5180~5240)

802.11ac(20MHz) Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5180	36	0	3.93	23.98
		1	3.95	23.98
		2	3.97	23.98
		3	4.51	23.98
		4	4.49	23.98
		5	4.53	23.98
		6	4.54	23.98
		7	4.53	23.98
5200	40	0	4.55	23.98
		1	4.04	23.98
		2	4.07	23.98
		3	4.10	23.98
		4	4.65	23.98
		5	4.62	23.98
		6	4.66	23.98
		7	4.66	23.98
5240	48	0	4.66	23.98
		1	4.67	23.98
		2	4.28	23.98
		3	4.32	23.98
		4	4.28	23.98
		5	4.84	23.98
		6	4.80	23.98
		7	4.85	23.98

Ant.0

802.11ac _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11ac_20M BW Mode: 5745~5825)

802.11ac(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	1.37	0.22	1.59	30
		1	1.22	0.41	1.63	30
		2	1.04	0.59	1.63	30
		3	1.43	0.77	2.20	30
		4	1.13	1.04	2.17	30
		5	0.88	1.32	2.20	30
		6	0.78	1.43	2.21	30
		7	0.66	1.53	2.19	30
5785	157	0	0.48	1.73	2.21	30
		1	1.31	0.22	1.53	30
		2	1.15	0.41	1.56	30
		3	0.99	0.59	1.58	30
		4	1.41	0.77	2.18	30
		5	1.12	1.04	2.16	30
		6	0.87	1.32	2.19	30
		7	0.77	1.43	2.20	30
5825	165	0	0.62	1.53	2.15	30
		1	0.45	1.73	2.18	30
		2	1.44	0.22	1.66	30
		3	1.26	0.41	1.67	30
		4	1.08	0.59	1.67	30
		5	1.49	0.77	2.26	30
		6	1.21	1.04	2.25	30
		7	0.93	1.32	2.25	30

Ant.1

802.11ac _20MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_20M BW Mode: 5745~5825)

802.11ac(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	1.81	0.22	2.03	30
		1	1.66	0.40	2.06	30
		2	1.55	0.60	2.15	30
		3	1.96	0.78	2.74	30
		4	1.63	1.02	2.65	30
		5	1.37	1.32	2.69	30
		6	1.32	1.42	2.74	30
		7	1.13	1.55	2.68	30
5785	157	0	0.97	1.74	2.71	30
		1	1.77	0.22	1.99	30
		2	1.62	0.40	2.02	30
		3	1.42	0.60	2.02	30
		4	1.83	0.78	2.61	30
		5	1.52	1.02	2.54	30
		6	1.31	1.32	2.63	30
		7	1.20	1.42	2.62	30
5825	165	0	1.07	1.55	2.62	30
		1	0.89	1.74	2.63	30
		2	1.83	0.22	2.05	30
		3	1.65	0.40	2.05	30
		4	1.49	0.60	2.09	30
		5	1.86	0.78	2.64	30
		6	1.57	1.02	2.59	30
		7	1.34	1.32	2.66	30

▣ TEST RESULTS_Sum Data of Ant.0 and Ant.1 (UNII 3)

Conducted Output Power Measurements (802.11ac_20MHz Mode: 5745~5825)

802.11ac(20MHz) Mode		MCS Index	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	0	4.83	30
		1	4.86	30
		2	4.91	30
		3	5.49	30
		4	5.43	30
		5	5.46	30
		6	5.49	30
		7	5.45	30
5785	157	0	5.48	30
		1	4.78	30
		2	4.81	30
		3	4.82	30
		4	5.41	30
		5	5.36	30
		6	5.43	30
		7	5.43	30
5825	165	0	5.40	30
		1	5.42	30
		2	4.87	30
		3	4.87	30
		4	4.90	30
		5	5.46	30
		6	5.43	30
		7	5.47	30