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

FCC/ISED UNII REPORT

Certification

Applicant Name:
LG Electronics Inc.

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

Date of Issue:
November 24, 2017
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-1711-F013
ISED Registration Number: 5944A-5

FCC ID : BEJ-WC1NP8
ISED ID : 2703H-WC1NP8
APPLICANT : LG Electronics Inc.

Model: WC1NP8

EUT Type: RF Module

Modulation type OFDM

FCC Classification: Unlicensed National Information Infrastructure(UNII)

FCC Rule Part(s): Part 15.407

ISED Rule Part(s): RSS-247 Issue 2(February 2017) , RSS-Gen Issue 4(November 2014)

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	15.95	14.60	18.29
	802.11n	20	5180 – 5240	15.06	14.36	17.63
	802.11n	40	5190 - 5230	12.60	11.93	15.28
UNII3	802.11a	20	5745 – 5825	16.27	15.94	19.12
	802.11n	20	5745 – 5825	15.91	15.58	18.76
	802.11n	40	5755 – 5795	14.30	13.32	16.69

Engineering Statement:

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

Report prepared by : Kyung Soo Kang
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1711-F013	November 24, 2017	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	LG Electronics Inc.
Address:	222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea
FCC ID:	BEJ-WC1NP8
ISED ID:	2703H-WC1NP8
EUT Type:	RF Module
Model:	WC1NP8
Date(s) of Tests:	October 24, 2017 ~ November 21, 2017
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

2. EUT DESCRIPTION

Model	WC1NP8	
EUT Type	RF Module	
Power Supply	3.3 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)
	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)
Modulation Type	OFDM(802.11a, 802.11n)	
Antenna Specification	Manufacturer: INPAQ TECHNOLOGY CO., LTD Antenna type: FPCB Antenna Peak Gain : cf. Section 6	

2.1 EUT OPERATING MODE

▣ Operating mode

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

Note :

1. In case of radiation test, we have done all test case. Worst case is MIMO(Ant 0 & 1).

3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04 dated May 2, 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.

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 / RSS-Gen issue 4, RSS-247 issue 2.

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 3.75 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 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033 D02 v01r04)

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
Especially, all antenna 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 / RSS-Gen(Issue 4) Section 8.3

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

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

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

▣ Directional Gain Calculations

▪ **If any transmit signals are correlated with each other (802.11a/n)**

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

▣ Antenna Gain

5GHz Band (UNII 1)

Antenna Gain	Ant 0	-2.04 dBi
	Ant 1	-0.60 dBi
Directional Antenna Gain	Ant 0 & 1	1.72 dBi

5GHz Band (UNII 3)

Antenna Gain	Ant 0	-1.16 dBi
	Ant 1	0.17 dBi
Directional Antenna Gain	Ant 0 & 1	2.54 dBi

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

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

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70

8. SUMMARY OF TEST RESULTS

8.1 FCC Part

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) <-27 dBm/MHz EIRP(Worst) (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

8.2 IC Part

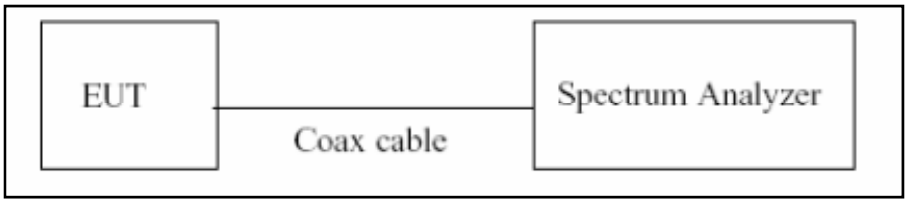
Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
99% Bandwidth(IC)	RSS-Gen, 6.6	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247, 6.2	< 250 mW or 11+10 log $_{10}$ (BW) dBm (5250-5350 MHz) < 250 mW or 11+10 log $_{10}$ (BW) dBm (5470-5600, 5650-5725 MHz) Whichever power is less		PASS
	RSS-247, 6.2.4 1	<1 W (5725-5850 MHz)		
Maximum e.i.r.p	RSS-247, 6.2	< 30 mW or 1.76+10 log $_{10}$ (BW) dBm (5150-5250, 5250-5350 MHz, for devices installed in vehicles) < 1 W or 17+10 log $_{10}$ (BW) dBm (5470-5600, 5650-5725 MHz) Whichever power is less		
Power Spectral Density	RSS-247 6.2	<10 dBm/ MHz(e.i.r.p.) (5150-5250 MHz) <11 dBm/MHz(Conducted) (5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz)		PASS
	RSS-247, 6.2.4 1	<30 dBm/500 kHz(Conducted) (5725-5850 MHz)		
AC Conducted Emissions 150 kHz-30 MHz	RSS-Gen, 8.8	RSS-Gen section 8.8 table 3		NA
Undesirable Emissions	RSS-247, 6.2.1 2	26 dBc at 5250~5350 MHz (5150~5350 MHz)		PASS
	RSS-247, 6.2	<-27 dBm/ MHz EIRP (5150-5350 MHz, 5470-5725 MHz)	RADIATED	PASS
	RSS-247, 6.2.4 2	<-17 dBm/MHz EIRP within 5715-5725 MHz and 5850-5860 MHz, <-27 dBm/MHz EIRP outside 5715-5860 MHz (5725~5850 MHz)		
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	RSS-Gen, 8.9 RSS-Gen, 8.10	RSS-Gen section 8.9 table 4, 5 section 8.10 table 6		PASS
Receiver Spurious Emissions	RSS-Gen, 5 RSS-Gen, 7.1.2	RSS-Gen section 7.1.2 table 2		PASS

9. TEST RESULT

9.1 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 v01r04)

The largest available 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 available 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

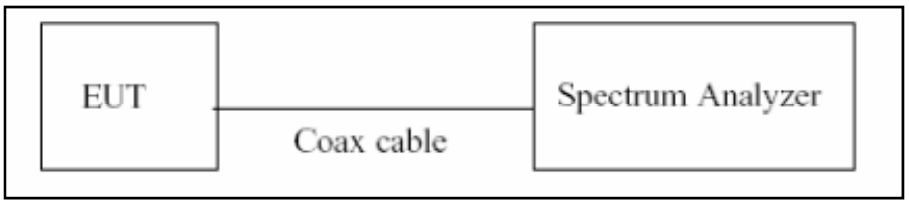
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11a	6	2.063	2.188	0.94257722	0.257
	9	1.382	1.517	0.91142437	0.403
	12	1.043	1.152	0.90547553	0.431
	18	0.704	0.827	0.85046654	0.703
	24	0.532	0.639	0.83298495	0.794
	36	0.364	0.489	0.74386972	1.285
	48	0.276	0.383	0.72222309	1.413
	54	0.248	0.400	0.62018380	2.075
Mode	**MCS INDEX**	**T_{on} (ms)**	**T_{total} (ms)**	**Duty Cycle**	**Duty Cycle Factor (dB)**
802.11n_HT20	0	1.924	2.041	0.94267516	0.256
	1	0.981	1.087	0.90283401	0.444
	2	0.669	0.774	0.86363636	0.637
	3	0.509	0.634	0.80324021	0.952
	4	0.352	0.458	0.76855895	1.143
	5	0.272	0.379	0.71767810	1.441
	6	0.248	0.382	0.64921466	1.876
	7	0.228	0.335	0.68121563	1.667
802.11n_HT40	0	0.947	1.072	0.88339552	0.538
	1	0.492	0.589	0.83531409	0.782
	2	0.340	0.445	0.76404494	1.169
	3	0.264	0.371	0.71159030	1.478
	4	0.188	0.303	0.62046205	2.073
	5	0.152	0.250	0.60800000	2.161
	6	0.140	0.255	0.54901961	2.604
	7	0.129	0.235	0.54893617	2.605

9.2 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 v01r04, 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 v01r04)

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.

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

▣ 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 v01r04)

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

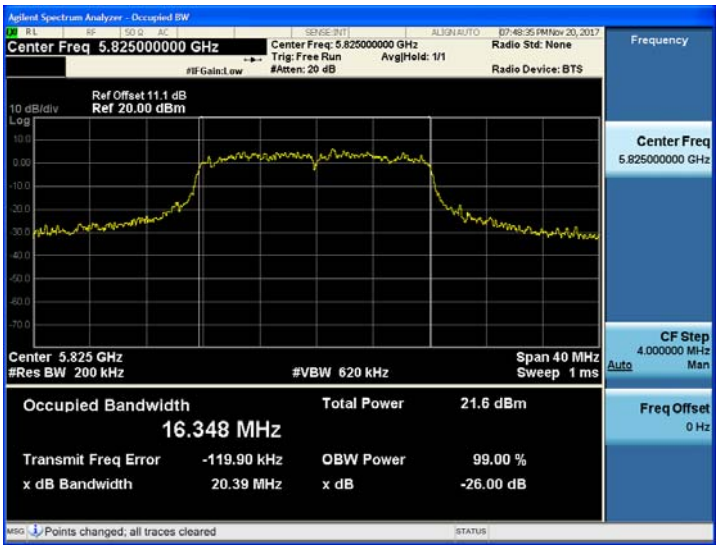
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.46	N/A	Pass
5200	40	19.56	N/A	Pass
5240	48	19.26	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	19.12	N/A	Pass
5785	157	19.87	N/A	Pass
5825	165	20.39	N/A	Pass

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND 26dB Bandwidth (CH 40)	802.11a UNII 3 BAND 26dB Bandwidth (CH 165)
	

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

▣ TEST RESULTS for Ant. 0_802.11n_HT20

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	20.10	N/A	Pass
5200	40	20.65	N/A	Pass
5240	48	20.46	N/A	Pass

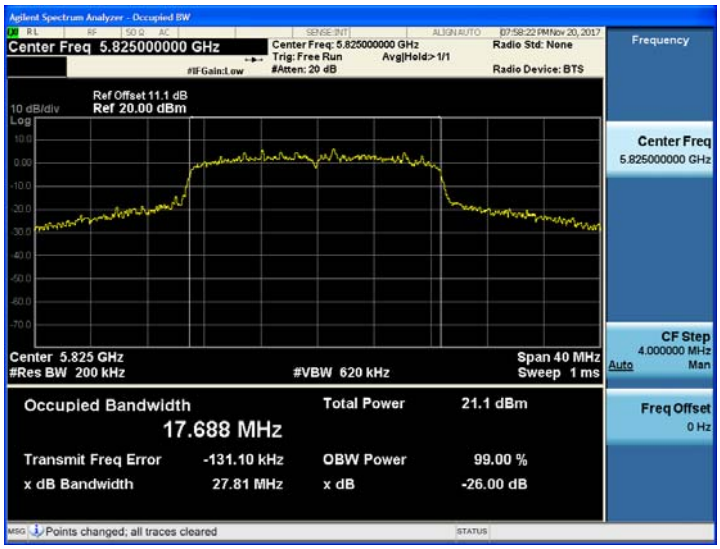
Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	19.93	N/A	Pass
5785	157	20.56	N/A	Pass
5825	165	27.81	N/A	Pass

▣ TEST Plot for 802.11n_HT20

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

802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 165)



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

▣ TEST RESULTS for Ant.0_802.11n_HT40

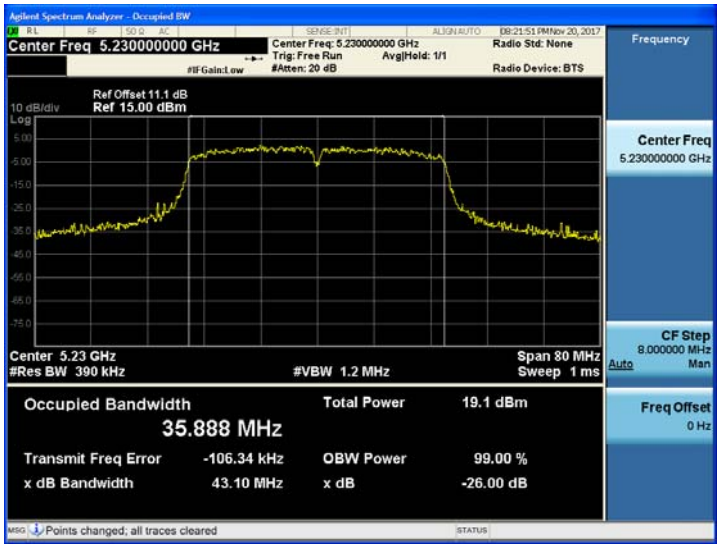
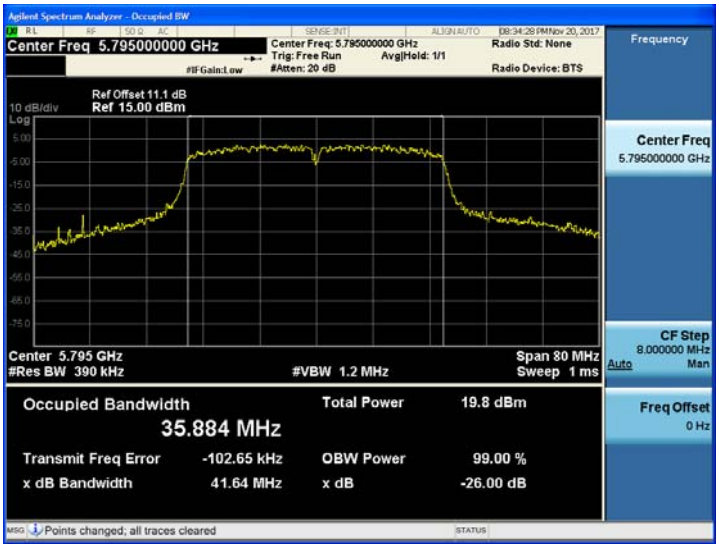
Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	39.92	N/A	Pass
5230	46	43.10	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	40.40	N/A	Pass
5795	159	41.64	N/A	Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)	802.11n_HT40 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_802.11a

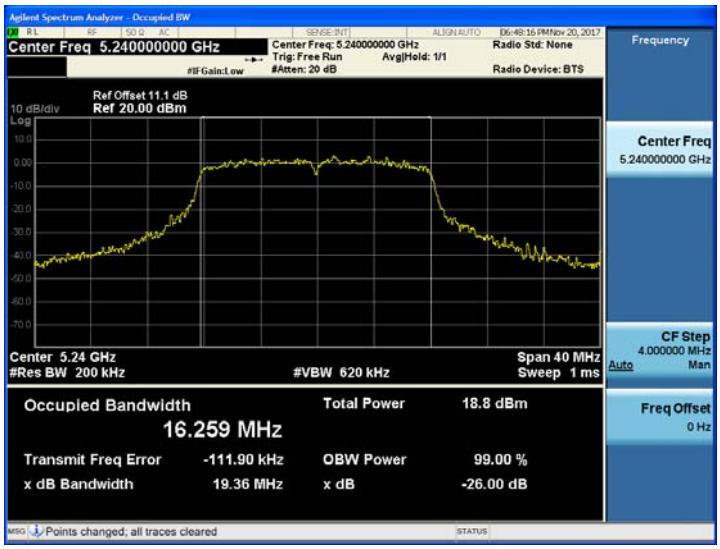
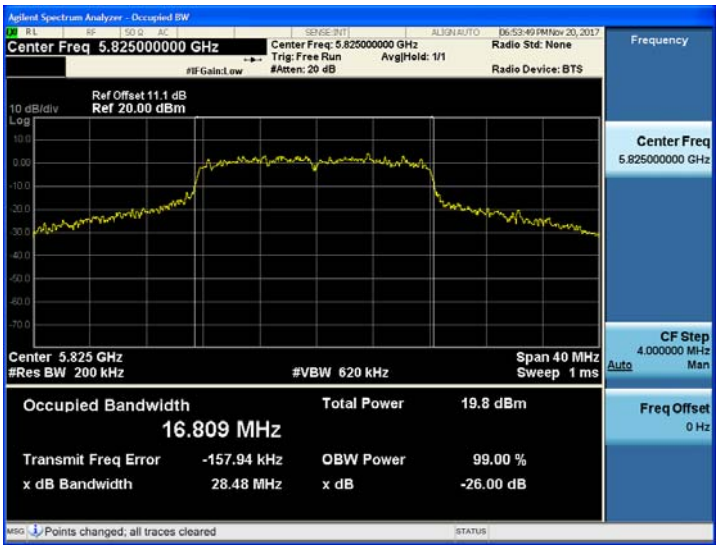
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	18.49	N/A	Pass
5200	40	18.81	N/A	Pass
5240	48	19.36	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	21.80	N/A	Pass
5785	157	19.61	N/A	Pass
5825	165	28.48	N/A	Pass

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND 26dB Bandwidth (CH 48)	802.11a UNII 3 BAND 26dB Bandwidth (CH 165)
	

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

▣ TEST RESULTS for Ant. 1_802.11n_HT20

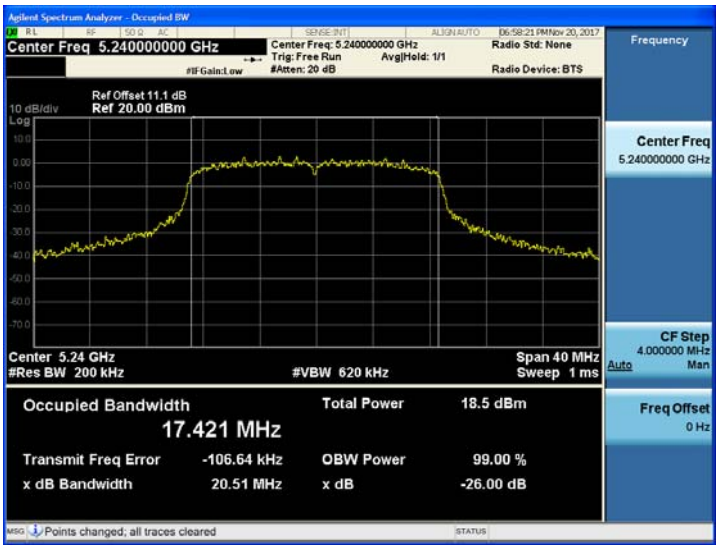
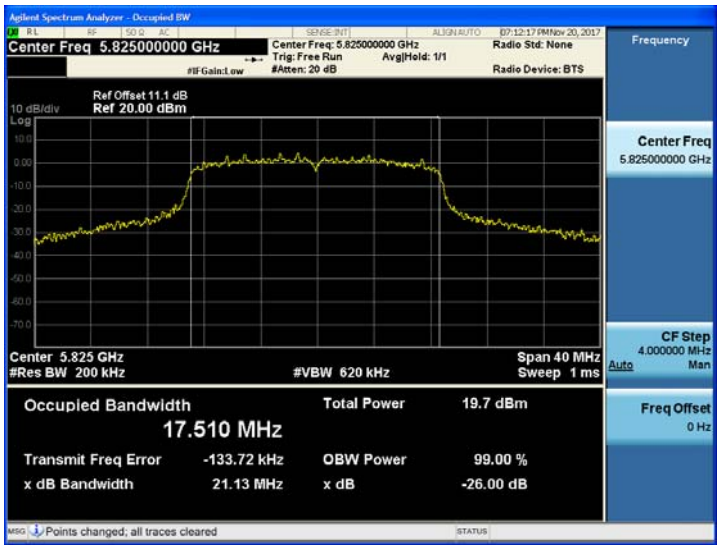
Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	19.67	N/A	Pass
5200	40	19.62	N/A	Pass
5240	48	20.51	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	20.02	N/A	Pass
5785	157	19.48	N/A	Pass
5825	165	21.13	N/A	Pass

▣ TEST Plot for 802.11n_HT20

802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 48)	802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 165)
	

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

▣ TEST RESULTS for Ant.1_802.11n_HT40

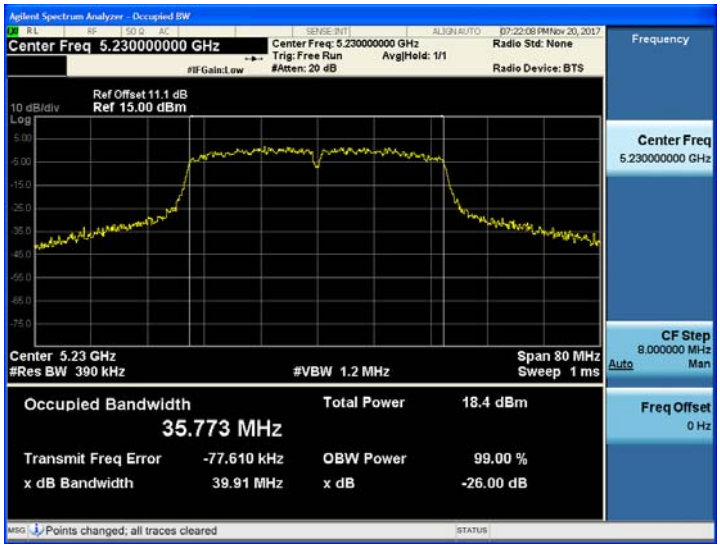
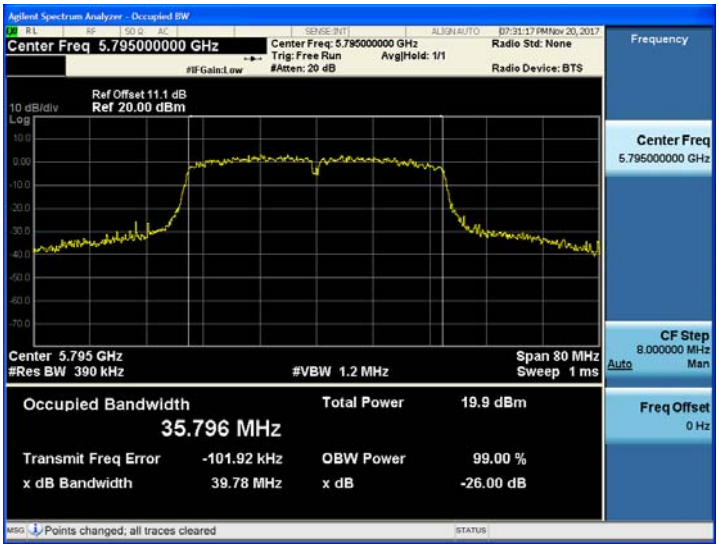
Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	39.89	N/A	Pass
5230	46	39.91	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	39.72	N/A	Pass
5795	159	39.78	N/A	Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)	802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 159)
	

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_HT20

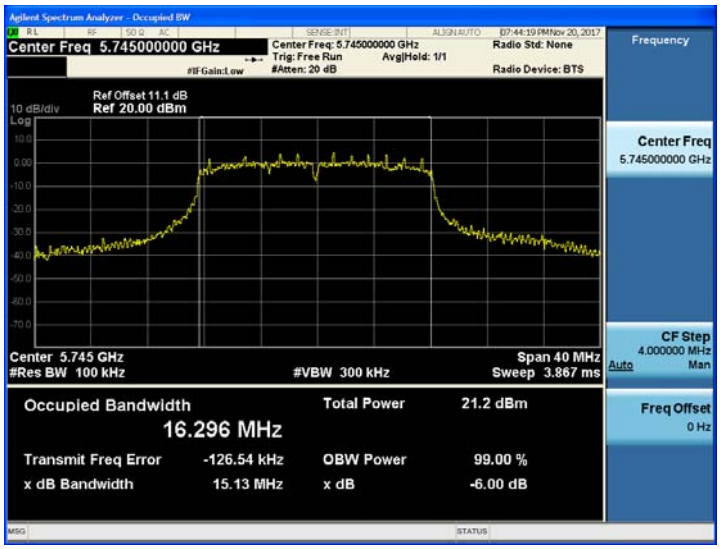
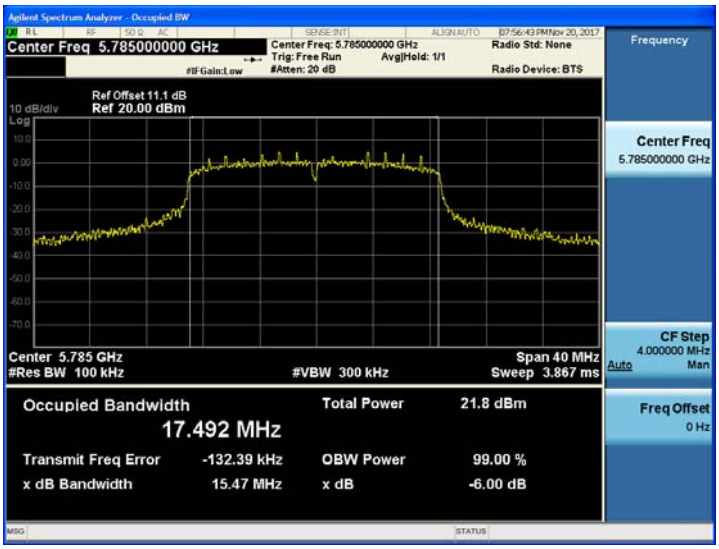
Conducted 6 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.13	0.5	Pass
5785	157	15.11	0.5	Pass
5825	165	15.09	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.09	0.5	Pass
5785	157	15.47	0.5	Pass
5825	165	15.17	0.5	Pass

▣ TEST Plot for 802.11a/n_HT20

802.11a UNII 3 BAND 6dB Bandwidth (CH.149)	802.11n_HT20 UNII 3 BAND 6dB Bandwidth(CH.157)
	

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

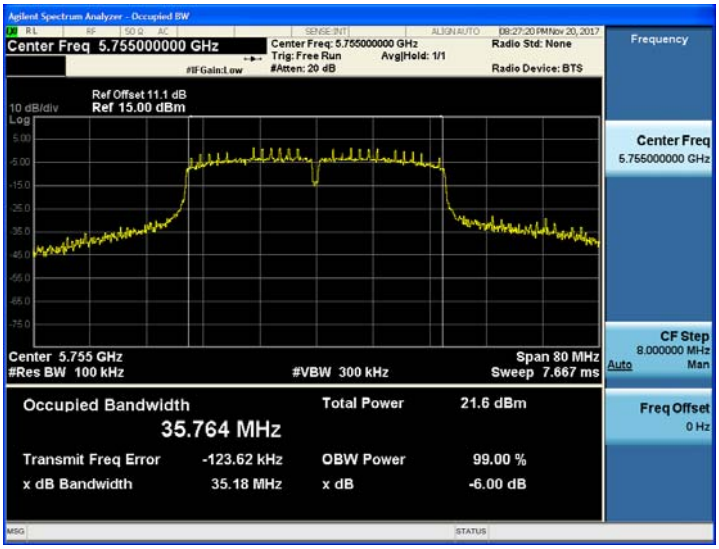
▣ TEST RESULTS for Ant.0_802.11n_HT40

Conducted 6 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.18	0.5	Pass
5795	159	35.13	0.5	Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 3 BAND 6dB Bandwidth(CH.151)



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

▣ TEST RESULTS for Ant.1_802.11a/n_HT20

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	15.09	0.5	Pass
5785	157	15.10	0.5	Pass
5825	165	15.12	0.5	Pass

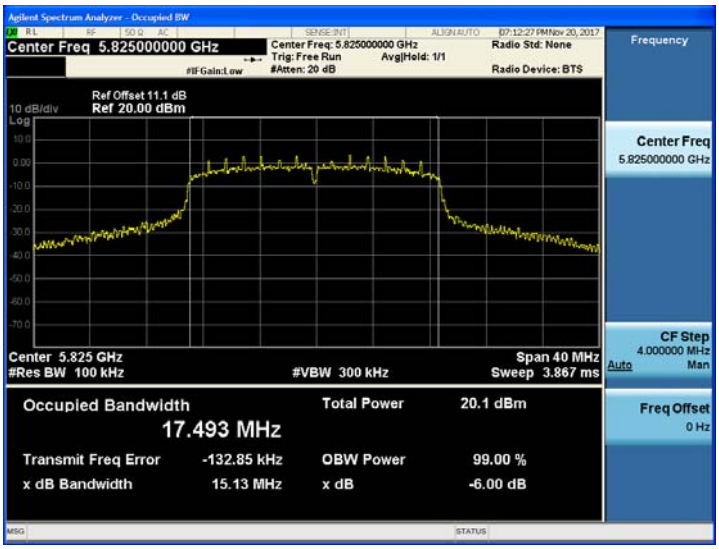
Conducted 6 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.13	0.5	Pass
5785	157	15.04	0.5	Pass
5825	165	15.13	0.5	Pass

▣ TEST Plot for 802.11a/n_HT20

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

802.11n_HT20 UNII 3 BAND 6dB Bandwidth(CH.165)



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

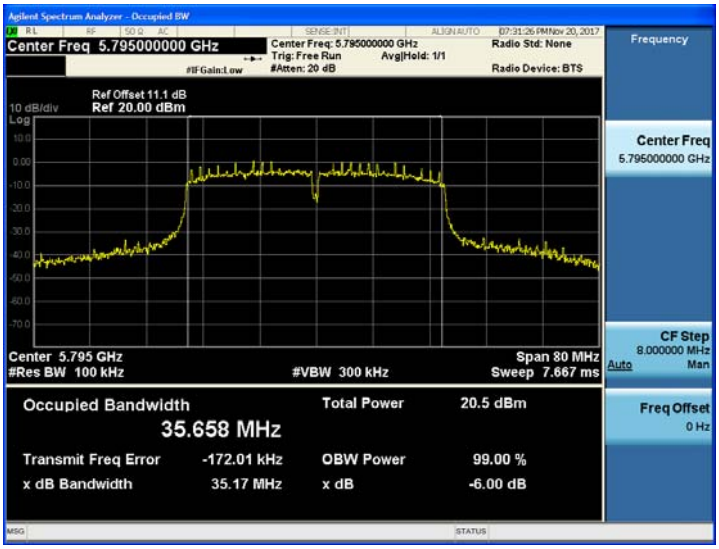
▣ TEST RESULTS for Ant.1_802.11n_HT40

Conducted 6 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.14	0.5	Pass
5795	159	35.17	0.5	Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 3 BAND 6dB Bandwidth(CH.159)



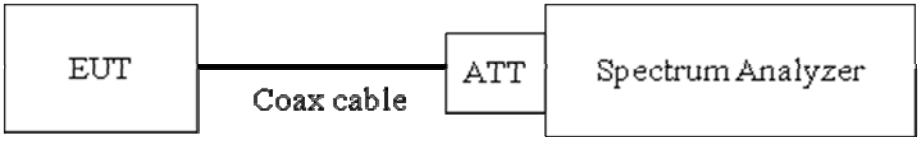
Note : In order to simplify the report, attached plots were only the most wide channel.

9.3 99% BANDWIDTH MEASUREMENT

None; for IC reporting purposes only

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

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to as close to 1% of the selected span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RBW = 1% of the total span
VBW ≥ 3 x RBW
Detector = Peak
Trace mode = max hold
Sweep = auto couple
Allow the trace to stabilize

▣ TEST RESULTS for Ant.0_802.11a

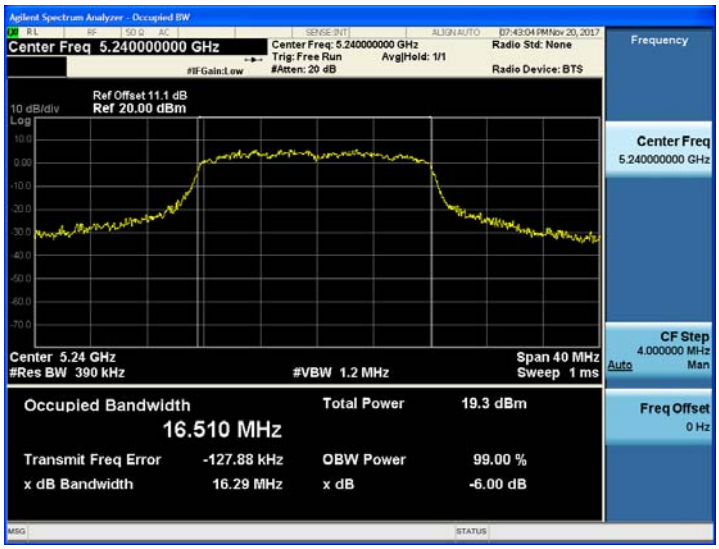
99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	16.351
5200	40	16.475
5240	48	16.510

99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	16.457
5785	157	16.486
5825	165	16.527

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND 99% Bandwidth (CH 48)	802.11a UNII 3 BAND 99% Bandwidth (CH 165)
	

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

▣ TEST RESULTS for Ant.0_802.11n_HT20

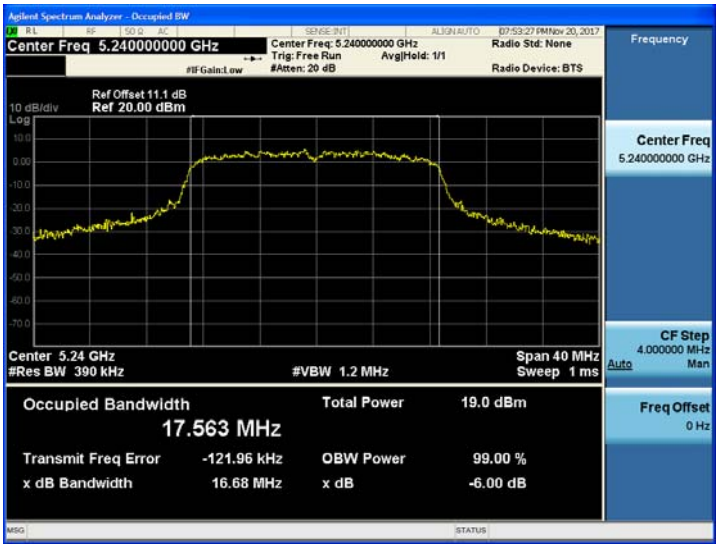
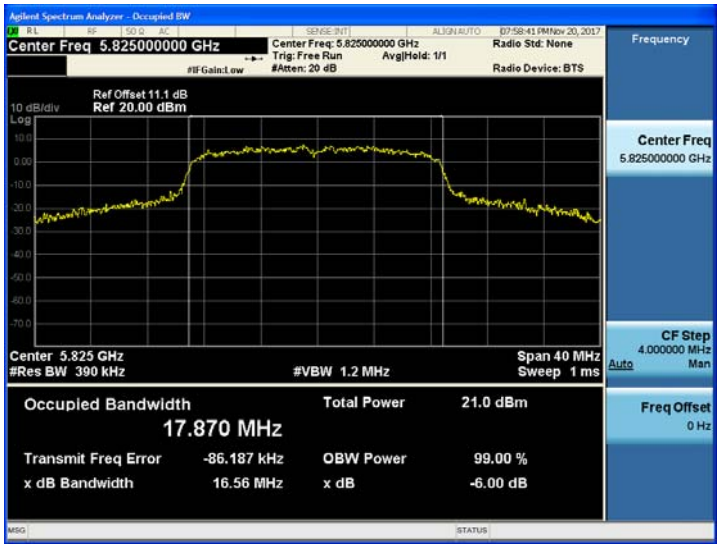
99% Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	17.462
5200	40	17.548
5240	48	17.563

99% Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	17.516
5785	157	17.586
5825	165	17.870

▣ TEST Plot for 802.11n_HT20

802.11n_HT20 UNII 1 BAND 99% Bandwidth(CH 48)	802.11n_HT20 UNII 3 BAND 99% Bandwidth(CH 165)
	

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

▣ TEST RESULTS for Ant.0_802.11n_HT40

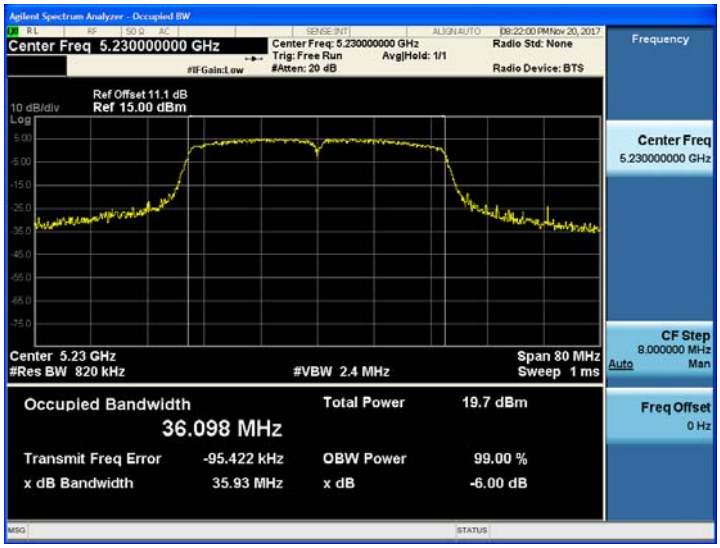
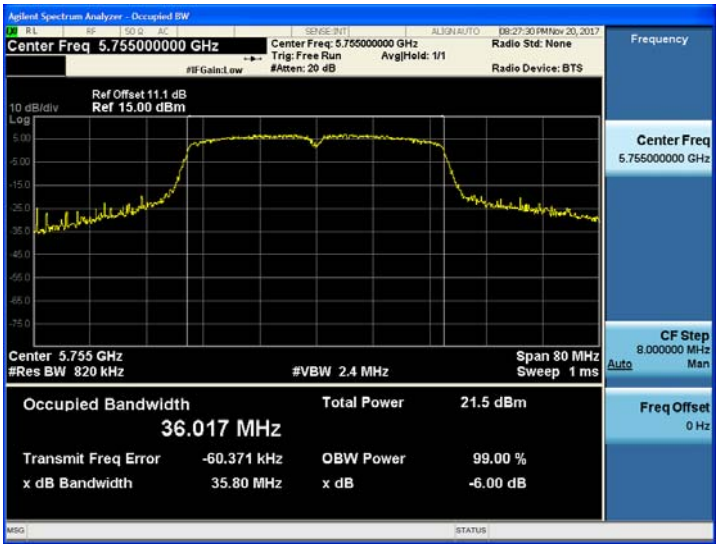
99% Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5190	38	35.943
5230	46	36.098

99% Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	36.017
5795	159	36.009

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND 99% Bandwidth(CH 46)	802.11n_HT40 UNII 3 BAND 99% Bandwidth (CH 151)
	

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

▣ TEST RESULTS for Ant.1_802.11a

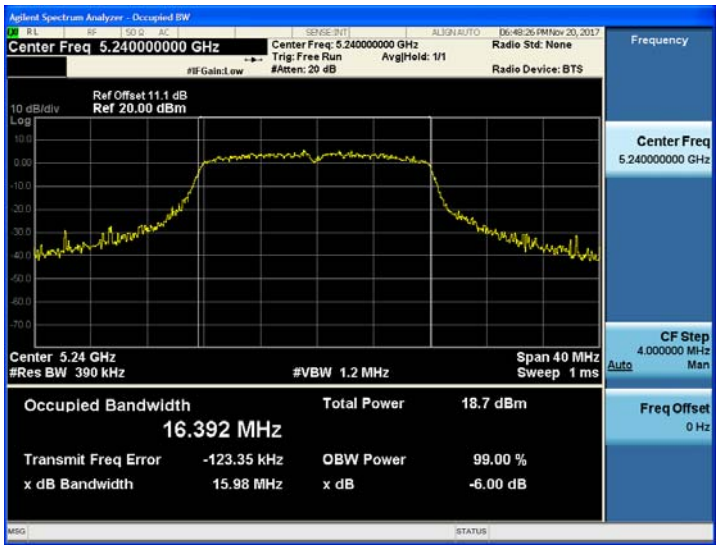
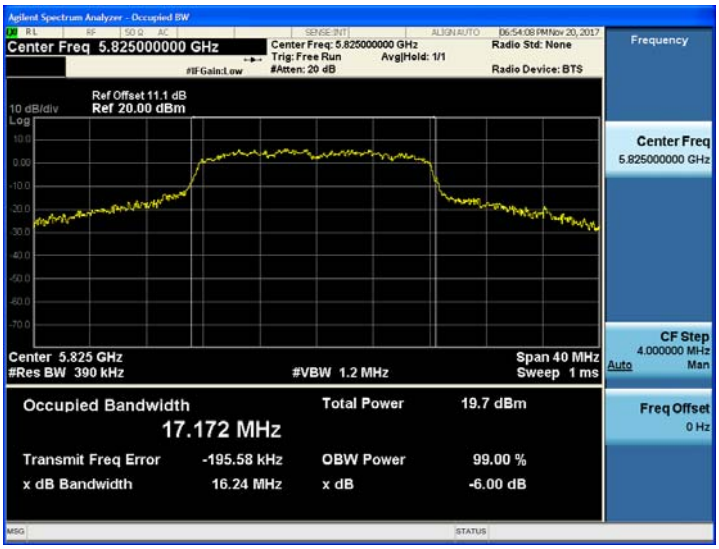
99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	16.344
5200	40	16.389
5240	48	16.392

99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	16.586
5785	157	16.425
5825	165	17.172

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND 99% Bandwidth (CH 48)	802.11a UNII 3 BAND 99% Bandwidth (CH 165)
	

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

▣ TEST RESULTS for Ant.1_802.11n_HT20

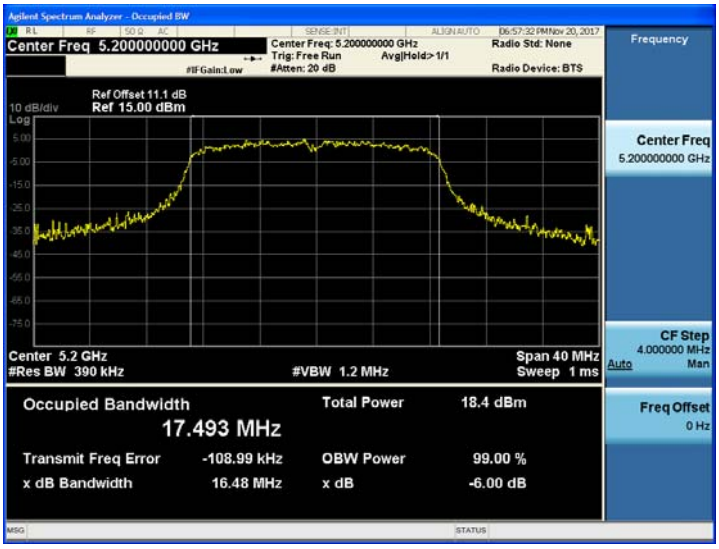
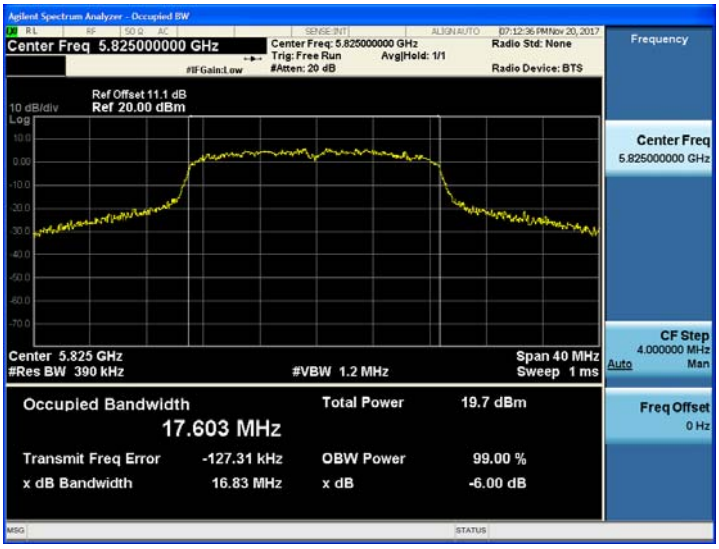
99% Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	17.457
5200	40	17.493
5240	48	17.480

99% Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	17.558
5785	157	17.499
5825	165	17.603

▣ TEST Plot for 802.11n_HT20

802.11n_HT20 UNII 1 BAND 99% Bandwidth(CH 40)	802.11n_HT20 UNII 3 BAND 99% Bandwidth(CH 165)
	

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

▣ TEST RESULTS for Ant.1_802.11n_HT40

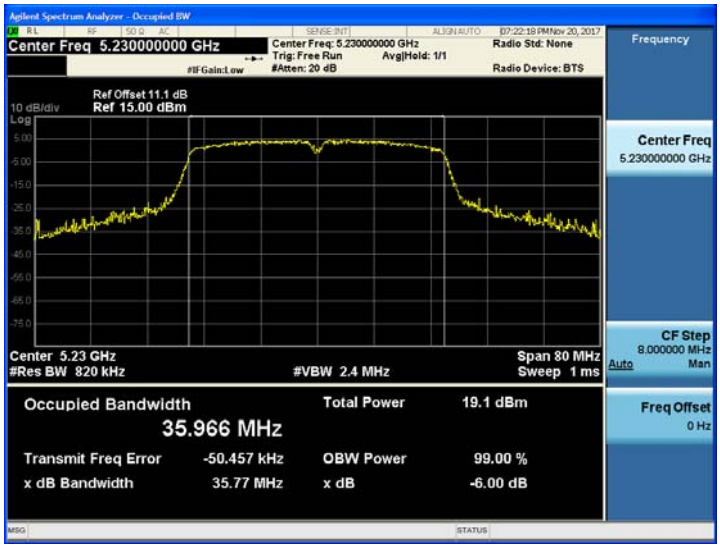
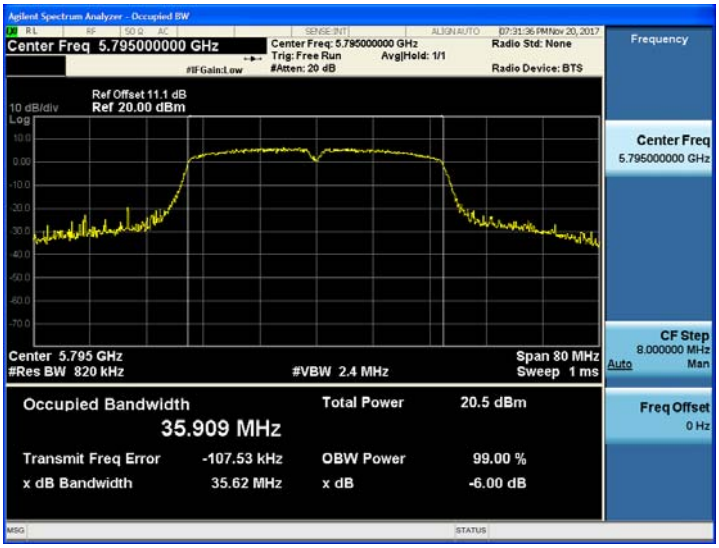
99% Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5190	38	35.939
5230	46	35.966

99% Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	35.894
5795	159	35.909

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND 99% Bandwidth(CH 46)	802.11n_HT40 UNII 3 BAND 99% Bandwidth (CH 159)
	

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

9.4 OUTPUT POWER MEASUREMENT

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	23.98
UNII 3	802.11a, n	30.00

Maximum Conducted Output Power:

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit (dBm)
SISO	UNII 1	802.11a/n	Ant 0	-2.04	30.00
			Ant 1	-0.60	30.00
	UNII 3		Ant 0	-1.16	30.00
			Ant 1	0.17	30.00
MIMO	UNII 1	802.11a/n	Ant 0 & 1	1.72	30.00
	UNII 3			2.54	30.00

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

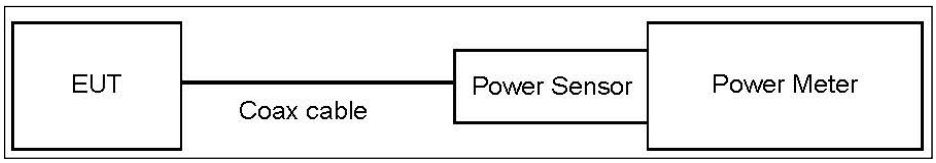
Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20}+\ldots+10^{GN/20})^2/N]$ dBi (802.11a/n)

(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 D02 v01r04).

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 :

1. We apply to the offset in the 5 GHz range that was rounded off to the closest 10 dB.
2. We apply the offset of Ant.0 and Ant.1 respectively.
   The offset of the 5 GHz band on Ant.0, 1 are 11.1dB.
   Actual value of loss for the attenuator and cable combination is below table.

ANT	Band	Loss(dB)
0, 1	5 GHz	11.1

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

3. MIMO output power results are calculated by each antenna output power on MIMO operating mode.
   So, in case of MIMO output power, we attached only MIMO output power except each antenna power result.

▣ Sample Calculation (Conducted)

ANT.0

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

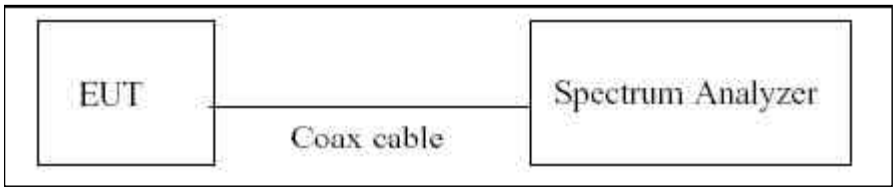
Ex) Output Power = 10 dBm + 20 dB + 1.17 dB + 0.2 dB = 31.0 dBm

ANT.1

Output Power = Reading Value + ATT loss + Cable loss(2 ea) + Duty Cycle Factor

Ex) Output Power = 10 dBm + 20 dB + 2.05 dB + 0.2 dB = 31.7 dBm

▣ TEST PROCEDURE(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 D02 v01r04.

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)

ANT.0

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

ANT.1

Output Power = Reading Value + ATT loss + Cable loss(2 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 Output 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. We apply the offset of Ant.0 and Ant.1 respectively.

The offset of the 5 GHz band on Ant.0, 1 are 11.1dB.

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

ANT	Band	Loss(dB)
0, 1	5 GHz	11.1

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

4. MIMO output power results are calculated by each antenna output power on MIMO operating mode.

So, in case of MIMO output power, we attached only MIMO output power except each antenna power result.

Ant.0

802.11a (UNII 1)

▣ TEST RESULTS

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

802.11a 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	9.98	0.26	10.23	23.98
		9	9.86	0.40	10.26	23.98
		12	9.76	0.43	10.19	23.98
		18	9.66	0.70	10.36	23.98
		24	8.89	0.79	9.68	23.98
		36	8.43	1.29	9.71	23.98
		48	8.17	1.41	9.58	23.98
		54	8.04	2.07	10.11	23.98
5200	40	6	15.04	0.26	15.29	23.98
		9	15.55	0.40	15.95	23.98
		12	14.76	0.43	15.19	23.98
		18	14.64	0.70	15.34	23.98
		24	12.86	0.79	13.65	23.98
		36	12.46	1.29	13.74	23.98
		48	12.11	1.41	13.53	23.98
		54	11.90	2.07	13.98	23.98
5240	48	6	14.85	0.26	15.11	23.98
		9	14.76	0.40	15.16	23.98
		12	14.06	0.43	14.50	23.98
		18	13.97	0.70	14.68	23.98
		24	12.03	0.79	12.82	23.98
		36	11.69	1.29	12.97	23.98
		48	11.60	1.41	13.02	23.98
		54	11.29	2.07	13.37	23.98

Ant.1

802.11a (UNII 1)

▣ TEST RESULTS

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

802.11a 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	8.68	0.26	8.93	23.98
		9	8.65	0.40	9.05	23.98
		12	8.54	0.43	8.97	23.98
		18	8.45	0.70	9.15	23.98
		24	7.82	0.79	8.62	23.98
		36	7.28	1.29	8.57	23.98
		48	6.98	1.41	8.40	23.98
		54	6.79	2.07	8.86	23.98
5200	40	6	14.34	0.26	14.60	23.98
		9	14.15	0.40	14.55	23.98
		12	13.37	0.43	13.80	23.98
		18	13.31	0.70	14.01	23.98
		24	11.40	0.79	12.19	23.98
		36	11.01	1.29	12.29	23.98
		48	10.77	1.41	12.18	23.98
		54	10.56	2.07	12.63	23.98
5240	48	6	14.31	0.26	14.57	23.98
		9	14.14	0.40	14.54	23.98
		12	13.40	0.43	13.83	23.98
		18	13.39	0.70	14.10	23.98
		24	11.43	0.79	12.23	23.98
		36	11.17	1.29	12.45	23.98
		48	10.85	1.41	12.27	23.98
		54	10.66	2.07	12.74	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	12.61	23.98
		9	12.69	23.98
		12	12.61	23.98
		18	12.79	23.98
		24	12.18	23.98
		36	12.17	23.98
		48	12.02	23.98
		54	12.52	23.98
5200	40	6	17.96	23.98
		9	18.29	23.98
		12	17.53	23.98
		18	17.71	23.98
		24	15.96	23.98
		36	16.06	23.98
		48	15.89	23.98
		54	16.34	23.98
5240	48	6	17.85	23.98
		9	17.87	23.98
		12	17.18	23.98
		18	17.41	23.98
		24	15.54	23.98
		36	15.72	23.98
		48	15.66	23.98
		54	16.07	23.98

Ant.0

802.11a (UNII 3)

▣ TEST RESULTS

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

802.11a 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	15.57	0.26	15.83	30
		9	15.46	0.40	15.86	30
		12	14.71	0.43	15.14	30
		18	14.50	0.70	15.20	30
		24	12.84	0.79	13.64	30
		36	12.37	1.29	13.65	30
		48	12.10	1.41	13.52	30
		54	11.92	2.07	13.99	30
5785	157	6	15.82	0.26	16.07	30
		9	15.86	0.40	16.27	30
		12	15.08	0.43	15.51	30
		18	15.07	0.70	15.77	30
		24	13.23	0.79	14.02	30
		36	12.87	1.29	14.15	30
		48	12.62	1.41	14.03	30
		54	12.43	2.07	14.51	30
5825	165	6	15.36	0.26	15.61	30
		9	15.79	0.40	16.20	30
		12	15.02	0.43	15.46	30
		18	14.59	0.70	15.30	30
		24	12.85	0.79	13.64	30
		36	12.36	1.29	13.64	30
		48	12.27	1.41	13.68	30
		54	12.04	2.07	14.11	30

Ant.1

802.11a (UNII 3)

▣ TEST RESULTS

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

802.11a 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	14.18	0.26	14.44	30
		9	14.01	0.40	14.41	30
		12	13.27	0.43	13.70	30
		18	13.27	0.70	13.97	30
		24	11.44	0.79	12.23	30
		36	11.05	1.29	12.34	30
		48	10.63	1.41	12.04	30
		54	10.53	2.07	12.60	30
5785	157	6	15.62	0.26	15.88	30
		9	15.53	0.40	15.94	30
		12	14.82	0.43	15.25	30
		18	14.82	0.70	15.52	30
		24	12.97	0.79	13.76	30
		36	12.57	1.29	13.86	30
		48	12.21	1.41	13.62	30
		54	12.22	2.07	14.29	30
5825	165	6	15.02	0.26	15.28	30
		9	14.93	0.40	15.33	30
		12	14.31	0.43	14.74	30
		18	14.16	0.70	14.87	30
		24	12.42	0.79	13.21	30
		36	12.02	1.29	13.30	30
		48	11.73	1.41	13.14	30
		54	11.53	2.07	13.61	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)	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	6	18.17	30
		9	18.18	30
		12	17.46	30
		18	17.62	30
		24	15.97	30
		36	16.03	30
		48	15.82	30
		54	16.33	30
5785	157	6	18.99	30
		9	19.12	30
		12	18.39	30
		18	18.66	30
		24	16.90	30
		36	17.02	30
		48	16.84	30
		54	17.41	30
5825	165	6	18.46	30
		9	18.79	30
		12	18.12	30
		18	18.10	30
		24	16.44	30
		36	16.48	30
		48	16.42	30
		54	16.87	30

Ant.0

802.11n_HT20 (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5180~5240)

802.11n_HT20 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	9.70	0.26	9.95	23.98
		1	9.30	0.44	9.74	23.98
		2	9.38	0.64	10.02	23.98
		3	8.93	0.95	9.88	23.98
		4	8.63	1.14	9.78	23.98
		5	8.11	1.44	9.55	23.98
		6	8.04	1.88	9.91	23.98
		7	7.89	1.67	9.56	23.98
5200	40	0	14.81	0.26	15.06	23.98
		1	14.38	0.44	14.83	23.98
		2	14.42	0.64	15.06	23.98
		3	12.86	0.95	13.81	23.98
		4	12.46	1.14	13.60	23.98
		5	12.12	1.44	13.56	23.98
		6	12.12	1.88	13.99	23.98
		7	11.88	1.67	13.55	23.98
5240	48	0	14.51	0.26	14.77	23.98
		1	13.64	0.44	14.08	23.98
		2	13.69	0.64	14.32	23.98
		3	12.10	0.95	13.05	23.98
		4	11.75	1.14	12.89	23.98
		5	11.47	1.44	12.91	23.98
		6	11.37	1.88	13.25	23.98
		7	11.16	1.67	12.82	23.98

Ant.1

802.11n_HT20 (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5180~5240)

802.11n_HT20 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	8.50	0.26	8.76	23.98
		1	8.15	0.44	8.60	23.98
		2	8.19	0.64	8.83	23.98
		3	7.69	0.95	8.64	23.98
		4	7.26	1.14	8.40	23.98
		5	6.93	1.44	8.37	23.98
		6	6.83	1.88	8.71	23.98
		7	6.68	1.67	8.35	23.98
5200	40	0	13.90	0.26	14.16	23.98
		1	13.06	0.44	13.51	23.98
		2	12.96	0.64	13.60	23.98
		3	11.41	0.95	12.36	23.98
		4	11.02	1.14	12.17	23.98
		5	10.77	1.44	12.21	23.98
		6	10.65	1.88	12.52	23.98
		7	10.44	1.67	12.10	23.98
5240	48	0	14.11	0.26	14.36	23.98
		1	13.24	0.44	13.68	23.98
		2	13.09	0.64	13.72	23.98
		3	11.58	0.95	12.53	23.98
		4	11.08	1.14	12.22	23.98
		5	10.87	1.44	12.31	23.98
		6	10.66	1.88	12.54	23.98
		7	10.60	1.67	12.27	23.98

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

Conducted Output Power Measurements (802.11n_HT20 Mode: 5180~5240)

802.11n_HT20 Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5180	36	0	12.39	23.98
		1	12.20	23.98
		2	12.46	23.98
		3	12.29	23.98
		4	12.13	23.98
		5	11.99	23.98
		6	12.34	23.98
		7	11.99	23.98
5200	40	0	17.63	23.98
		1	17.21	23.98
		2	17.37	23.98
		3	16.13	23.98
		4	15.92	23.98
		5	15.92	23.98
		6	16.30	23.98
		7	15.87	23.98
5240	48	0	17.58	23.98
		1	16.89	23.98
		2	17.04	23.98
		3	15.80	23.98
		4	15.57	23.98
		5	15.63	23.98
		6	15.91	23.98
		7	15.56	23.98

Ant.0

802.11n_HT20 (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5745~5825)

802.11n_HT20 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	15.43	0.26	15.69	30
		1	14.34	0.44	14.79	30
		2	14.42	0.64	15.06	30
		3	12.95	0.95	13.90	30
		4	12.58	1.14	13.72	30
		5	12.40	1.44	13.85	30
		6	12.07	1.88	13.94	30
		7	11.84	1.67	13.51	30
5785	157	0	15.65	0.26	15.91	30
		1	15.37	0.44	15.82	30
		2	14.74	0.64	15.37	30
		3	13.16	0.95	14.11	30
		4	12.84	1.14	13.99	30
		5	12.54	1.44	13.98	30
		6	12.47	1.88	14.35	30
		7	12.38	1.67	14.04	30
5825	165	0	15.23	0.26	15.49	30
		1	14.86	0.44	15.30	30
		2	14.73	0.64	15.37	30
		3	13.26	0.95	14.21	30
		4	12.80	1.14	13.94	30
		5	12.54	1.44	13.98	30
		6	11.95	1.88	13.82	30
		7	11.85	1.67	13.52	30

Ant.1

802.11n_HT20 (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5745~5825)

802.11n_HT20 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	13.93	0.26	14.19	30
		1	12.91	0.44	13.35	30
		2	12.78	0.64	13.42	30
		3	11.40	0.95	12.35	30
		4	11.06	1.14	12.21	30
		5	10.78	1.44	12.22	30
		6	10.61	1.88	12.48	30
		7	10.46	1.67	12.13	30
5785	157	0	15.32	0.26	15.58	30
		1	14.50	0.44	14.95	30
		2	14.45	0.64	15.09	30
		3	12.90	0.95	13.85	30
		4	12.62	1.14	13.77	30
		5	12.31	1.44	13.75	30
		6	12.32	1.88	14.19	30
		7	12.13	1.67	13.79	30
5825	165	0	14.69	0.26	14.95	30
		1	14.05	0.44	14.49	30
		2	13.87	0.64	14.51	30
		3	12.42	0.95	13.37	30
		4	12.12	1.14	13.26	30
		5	11.86	1.44	13.30	30
		6	11.62	1.88	13.50	30
		7	11.46	1.67	13.13	30

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

Conducted Output Power Measurements (802.11n_HT20 Mode: 5745~5825)

802.11n_HT20 Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	0	17.98	30
		1	17.11	30
		2	17.29	30
		3	16.17	30
		4	16.01	30
		5	16.08	30
		6	16.25	30
		7	15.86	30
5785	157	0	18.76	30
		1	18.41	30
		2	18.24	30
		3	16.99	30
		4	16.89	30
		5	16.88	30
		6	17.28	30
		7	16.93	30
5825	165	0	18.23	30
		1	17.91	30
		2	17.96	30
		3	16.81	30
		4	16.62	30
		5	16.66	30
		6	16.67	30
		7	16.34	30

Ant.0

802.11n_HT40 (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5190~5230)

802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	0	6.86	0.54	7.40	23.98
		1	6.47	0.78	7.25	23.98
		2	6.03	1.17	7.20	23.98
		3	5.64	1.48	7.12	23.98
		4	5.23	2.07	7.31	23.98
		5	4.74	2.16	6.90	23.98
		6	4.52	2.60	7.12	23.98
		7	4.37	2.60	6.97	23.98
5230	46	0	12.06	0.54	12.60	23.98
		1	11.73	0.78	12.51	23.98
		2	11.21	1.17	12.38	23.98
		3	10.47	1.48	11.95	23.98
		4	10.06	2.07	12.14	23.98
		5	9.64	2.16	11.81	23.98
		6	9.72	2.60	12.33	23.98
		7	9.58	2.60	12.19	23.98

Ant.1

802.11n_HT40 (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5190~5230)

802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	0	5.66	0.54	6.20	23.98
		1	5.19	0.79	5.98	23.98
		2	4.93	1.17	6.10	23.98
		3	4.27	1.48	5.75	23.98
		4	3.74	2.08	5.82	23.98
		5	3.40	2.15	5.55	23.98
		6	3.21	2.60	5.82	23.98
		7	2.86	2.62	5.48	23.98
5230	46	0	11.39	0.54	11.93	23.98
		1	11.12	0.79	11.91	23.98
		2	10.63	1.17	11.80	23.98
		3	10.08	1.48	11.57	23.98
		4	9.64	2.08	11.71	23.98
		5	8.91	2.15	11.06	23.98
		6	8.94	2.60	11.54	23.98
		7	8.64	2.62	11.25	23.98

▣ TEST RESULTS _ Sum Data of Ant.0 and Ant.1 (UNII 1)

Conducted Output Power Measurements (802.11n_HT40 Mode: 5190~5230)

802.11n_HT40 Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5190	38	0	9.83	23.98
		1	9.65	23.98
		2	9.68	23.98
		3	9.47	23.98
		4	9.61	23.98
		5	9.26	23.98
		6	9.50	23.98
		7	9.27	23.98
5230	46	0	15.28	23.98
		1	15.23	23.98
		2	15.11	23.98
		3	14.77	23.98
		4	14.94	23.98
		5	14.45	23.98
		6	14.95	23.98
		7	14.74	23.98

Ant.0

802.11n_HT40 (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5755~5795)

802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5755	151	0	13.76	0.54	14.30	30
		1	12.85	0.78	13.63	30
		2	12.52	1.17	13.69	30
		3	11.92	1.48	13.40	30
		4	11.35	2.07	13.42	30
		5	11.08	2.16	13.24	30
		6	10.76	2.60	13.36	30
		7	10.55	2.60	13.15	30
5795	159	0	12.89	0.54	13.43	30
		1	13.32	0.78	14.10	30
		2	12.92	1.17	14.08	30
		3	12.37	1.48	13.85	30
		4	12.00	2.07	14.08	30
		5	11.59	2.16	13.75	30
		6	11.26	2.60	13.86	30
		7	11.08	2.60	13.69	30

Ant.1

802.11n_HT40 (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5755~5795)

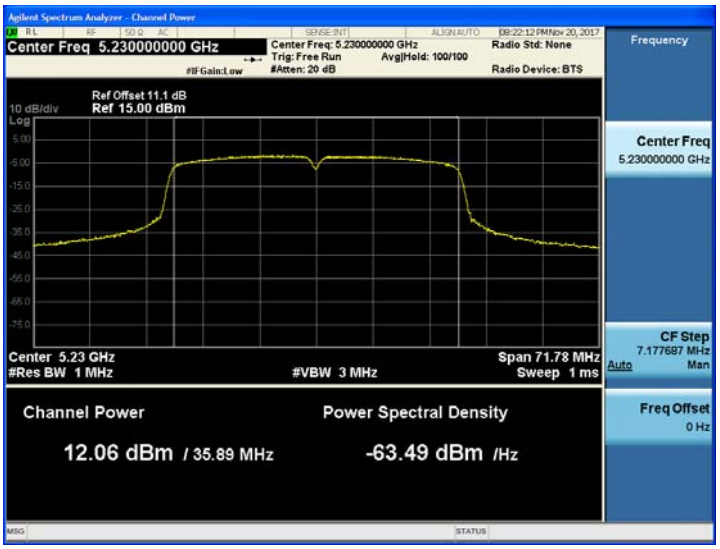
802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5755	151	0	11.57	0.54	12.11	30
		1	11.40	0.79	12.18	30
		2	10.93	1.17	12.11	30
		3	10.33	1.48	11.81	30
		4	9.81	2.08	11.89	30
		5	9.27	2.15	11.42	30
		6	9.44	2.60	12.05	30
		7	9.22	2.62	11.84	30
5795	159	0	12.79	0.54	13.32	30
		1	12.46	0.79	13.24	30
		2	12.05	1.17	13.22	30
		3	11.72	1.48	13.21	30
		4	11.07	2.08	13.14	30
		5	10.79	2.15	12.94	30
		6	10.57	2.60	13.17	30
		7	10.45	2.62	13.07	30

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

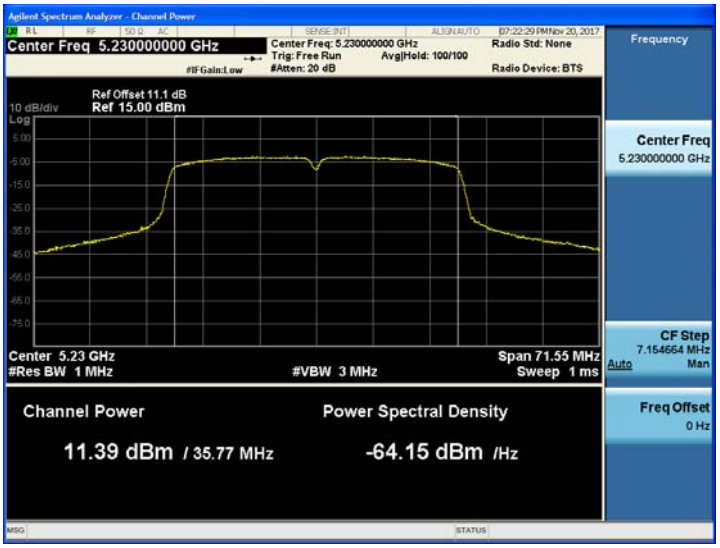
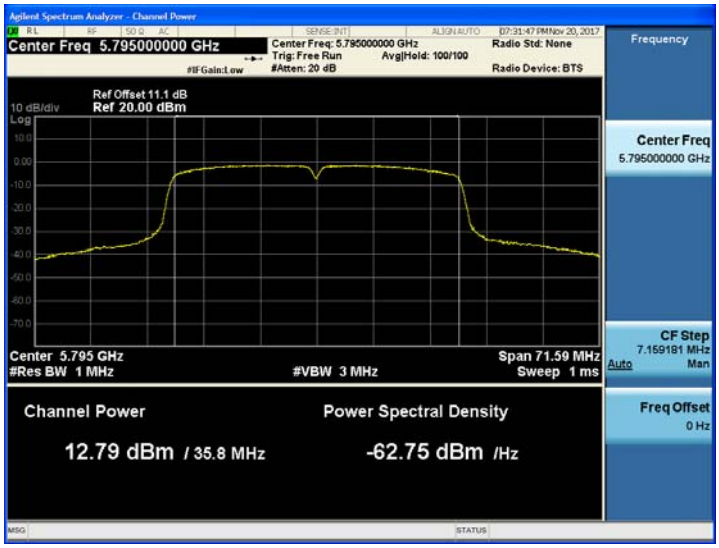
Conducted Output Power Measurements (802.11n_HT40 Mode: 5755~5795)

802.11n_HT40 Mode		MCS Index	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5755	151	0	16.28	30
		1	15.95	30
		2	15.95	30
		3	15.65	30
		4	15.70	30
		5	15.39	30
		6	15.74	30
		7	15.53	30
5795	159	0	16.39	30
		1	16.69	30
		2	16.67	30
		3	16.55	30
		4	16.63	30
		5	16.36	30
		6	16.53	30
		7	16.40	30

▣ TEST Plot for Ant.0_802.11n_HT40

802.11n_HT40 UNII 1 BAND Average Power (5190 MHz ~5230 MHz) CH 46 MCS0	802.11n_HT40 UNII 3 BAND Average Power (5755 MHz ~5795 MHz) CH 151 MCS0
	

▣ TEST Plot for Ant.1_802.11n_HT40

802.11n_HT40 UNII 1 BAND Average Power (5190 MHz ~5230 MHz) CH 46 MCS0	802.11n_HT40 UNII 3 BAND Average Power (5755 MHz ~5795 MHz) CH 159 MCS0
	

9.5 POWER SPECTRAL DENSITY

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The maximum permissible peak power spectral density is 11 dBm/ MHz for UNII 1 and 30 dBm/500 kHz for UNII 3.

▣ LIMIT

Power Spectral Density

Band	Mode	Limit
UNII 1	802.11a, n	11 dBm/MHz
UNII 3	802.11a, n	30 dBm/500 kHz

Power Spectral Density

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit
SISO	UNII 1	802.11a/n	Ant 0	-2.04	11 dBm/MHz
			Ant 1	-0.60	11 dBm/MHz
	UNII 3		Ant 0	-1.16	30 dBm/500 kHz
			Ant 1	0.17	30 dBm/500 kHz
MIMO	UNII 1	802.11a/n	Ant 0 & 1	1.72	11 dBm/MHz
	UNII 3			2.54	30 dBm/500 kHz

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

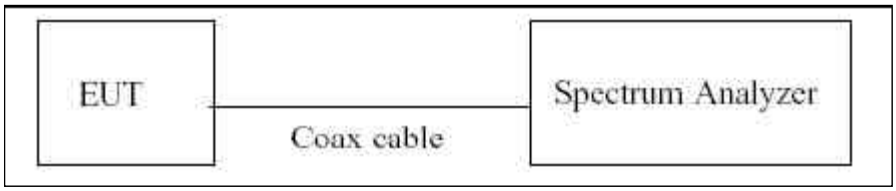
Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20}+\ldots+10^{GN/20})^2/N]$ dBi (802.11a/n)

(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



▣ TEST PROCEDURE

We tested according to Method in KDB 789033 D02 v01r04.

The spectrum analyzer is set to :

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz(510 kHz for UNII 3)
3. VBW ≥ 3 MHz
4. Number of points in sweep ≥ 2*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

ANT.0

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

Ex) PSD = 10 dBm + 20 dB + 1.17 dB + 0.2 dB = 31.0 dBm

ANT.1

PSD = Reading Value + ATT loss + Cable loss(2 ea) + Duty Cycle Factor

Ex) PSD = 10 dBm + 20 dB + 2.05 dB + 0.2 dB = 31.7 dBm

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 + Cable loss
3. We apply the offset of Ant.0 and Ant.1 respectively.
   The offset of the 5 GHz band on Ant.0, 1 are 11.1dB.
   Actual value of loss for the attenuator and cable combination is below table.

ANT	Band	Loss(dB)
0, 1	5 GHz	11.1

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

4. MIMO output power results are calculated by each antenna output power on MIMO operating mode.
So, in case of MIMO output power, we attached only MIMO output power except each antenna power result.

Ant.0

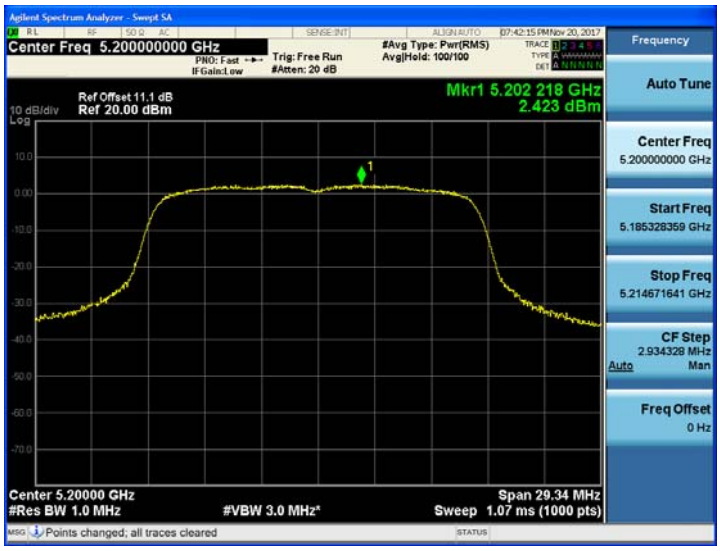
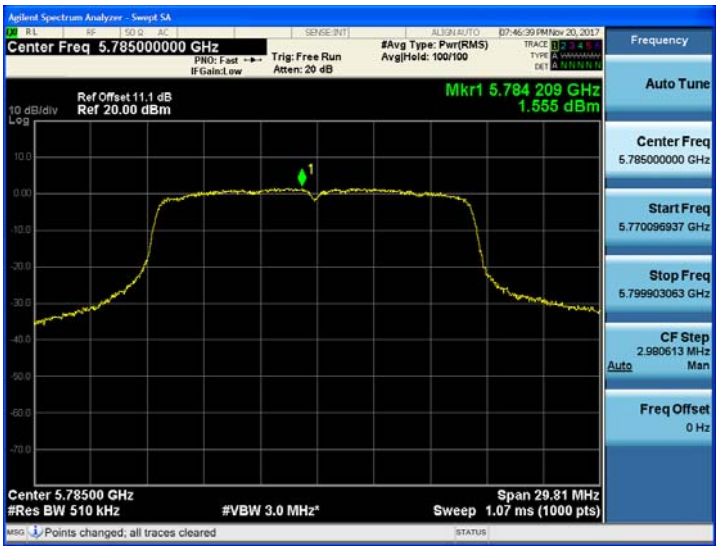
▣ 802.11a

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11a	-1.361	0.703	-0.658	11	Pass
5200	40		2.423	0.403	2.826		Pass
5240	48		2.223	0.403	2.626		Pass
5745	149		0.768	0.403	1.171	30	Pass
5785	157		1.555	0.403	1.958		Pass
5825	165		1.190	0.403	1.593		Pass

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND PSD CH 40	802.11a UNII 3 BAND PSD CH 157
	

Ant.1

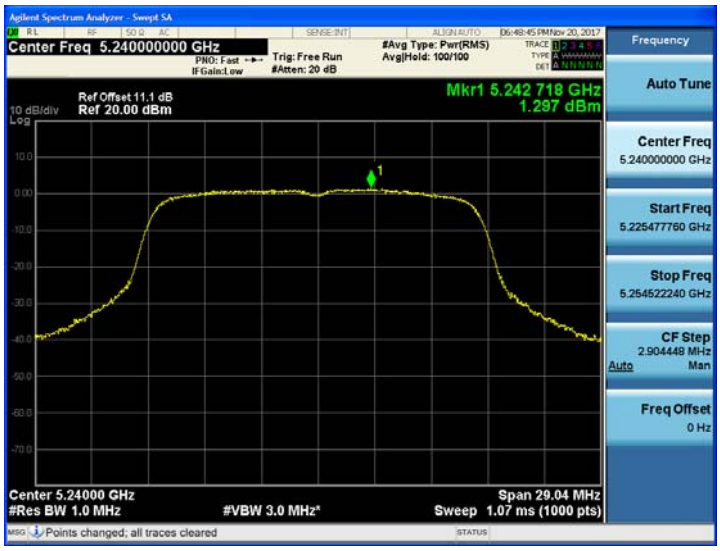
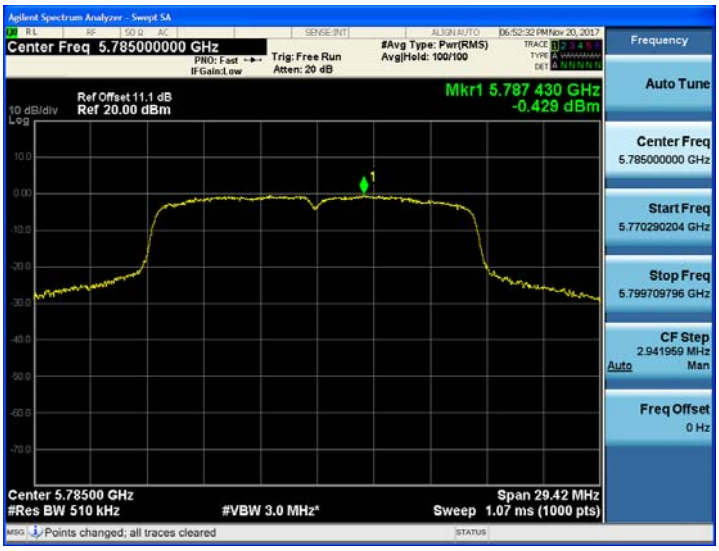
▣ 802.11a

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11a	-2.828	0.703	-2.125	11	Pass
5200	40		1.141	0.257	1.398		Pass
5240	48		1.297	0.257	1.554		Pass
5745	149		-1.133	0.257	-0.876	30	Pass
5785	157		-0.429	0.403	-0.026		Pass
5825	165		-0.589	0.403	-0.186		Pass

▣ TEST Plot for 802.11a

802.11a UNII 1 BAND PSD CH 48	802.11a UNII 3 BAND PSD CH 157
	

▣ **Sum Data of Ant.0 and Ant.1**

▣ **TEST RESULTS**

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			Measured Power Density (dBm)	Limit (dBm)	Pass/Fail
5180	36	802.11a (MIMO)	1.65	11	Pass
5200	40		5.15		Pass
5240	48		5.12		Pass
5745	149		3.22	30	Pass
5785	157		4.03		Pass
5825	165		3.76		Pass

Ant.0

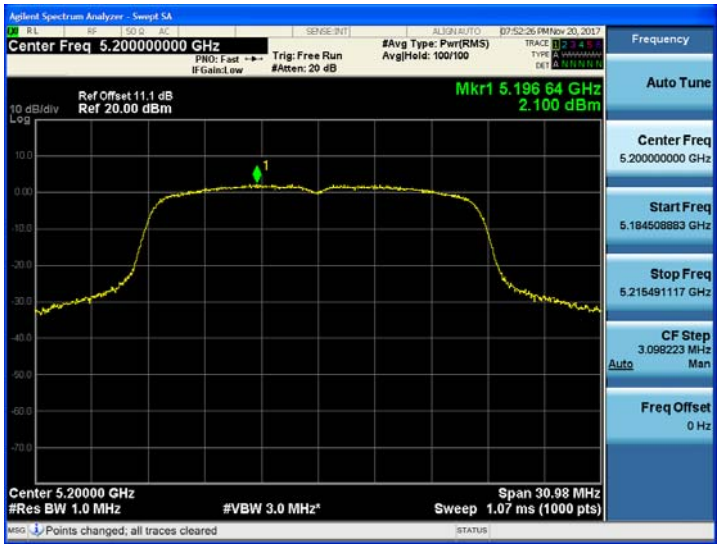
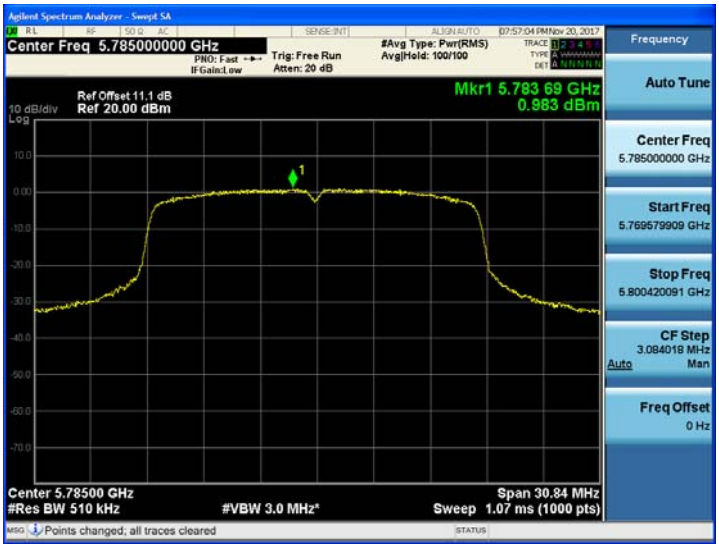
▣802.11n_HT20

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11n _HT20	-1.551	0.637	-0.914	11	Pass
5200	40		2.100	0.256	2.356		Pass
5240	48		1.436	0.256	1.692		Pass
5745	149		0.195	0.256	0.451	30	Pass
5785	157		0.983	0.256	1.239		Pass
5825	165		0.496	0.256	0.752		Pass

▣ TEST Plot for 802.11n_HT20

802.11n_HT20 UNII 1 BAND PSD CH 40	802.11n_HT20 UNII 3 BAND PSD CH 157
	

Ant.1

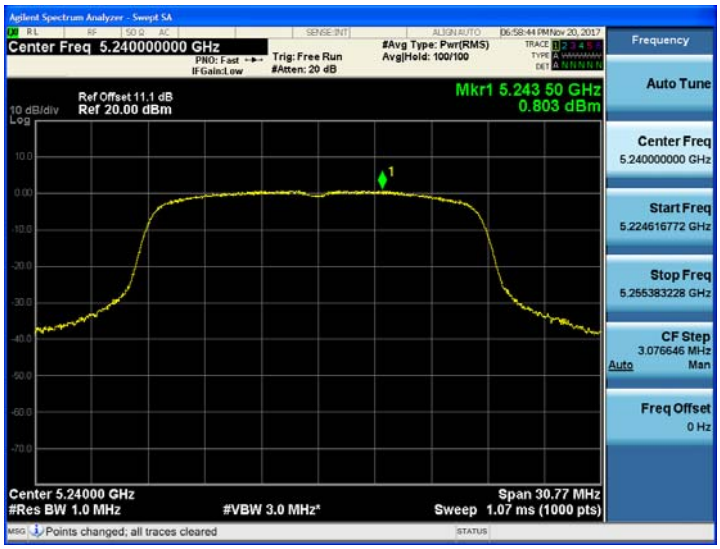
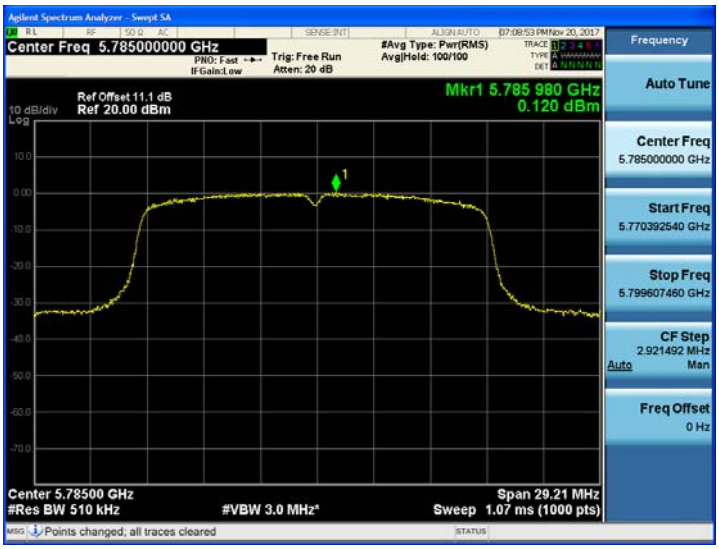
▣802.11n_HT20

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11n _HT20	-3.175	0.637	-2.538	11	Pass
5200	40		0.789	0.256	1.045		Pass
5240	48		0.803	0.256	1.059		Pass
5745	149		-1.511	0.256	-1.255	30	Pass
5785	157		0.120	0.256	0.376		Pass
5825	165		-0.913	0.256	-0.657		Pass

▣ TEST Plot for 802.11n_HT20

802.11n_HT20 UNII 1 BAND PSD CH 48	802.11n_HT20 UNII 3 BAND PSD CH 157
	

▣ **Sum Data of Ant.0 and Ant.1**

▣ **TEST RESULTS**

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			Measured Power Density (dBm)	Limit (dBm)	Pass/Fail
5180	36	802.11n_ HT20 (MIMO)	1.32	11	Pass
5200	40		4.74		Pass
5240	48		4.39		Pass
5745	149		2.65	30	Pass
5785	157		3.83		Pass
5825	165		3.09		Pass

Ant.0

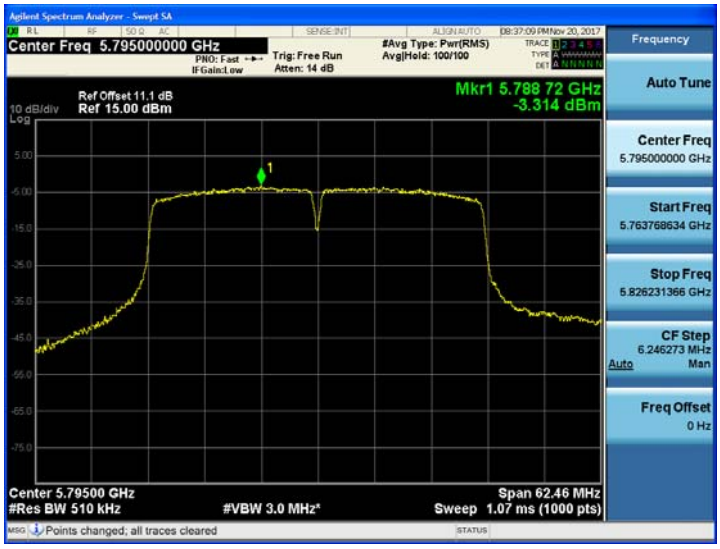
▣ 802.11n_HT40

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5190	38	802.11n _HT40	-6.982	0.538	-6.444	11	Pass
5230	46		-1.733	0.538	-1.195		Pass
5755	151		-3.651	0.538	-3.113	30	Pass
5795	159		-3.314	0.782	-2.532		Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND PSD CH 46	802.11n_HT40 UNII 3 BAND PSD CH 159
	

Ant.1

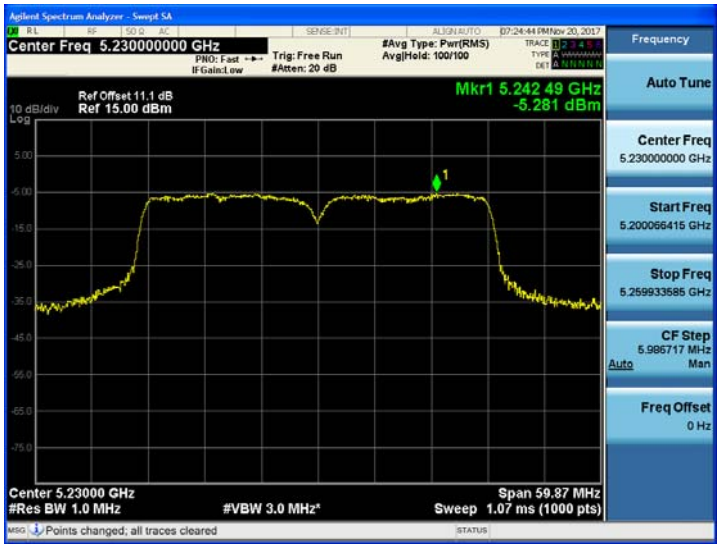
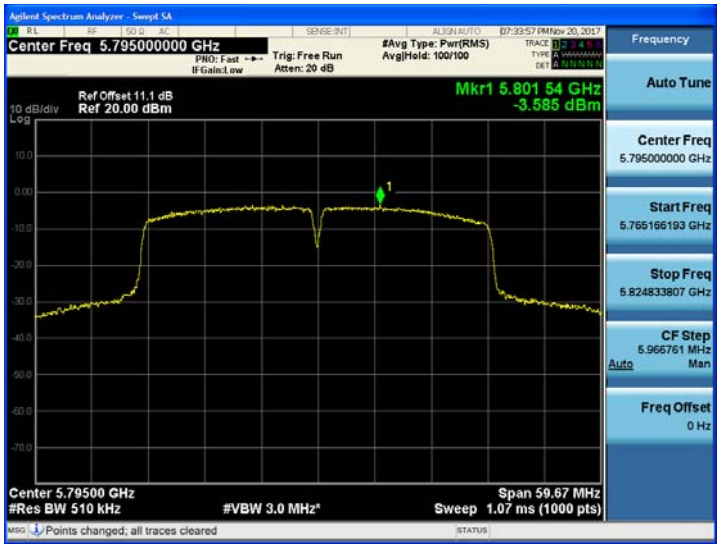
▣ 802.11n_HT40

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5190	38	802.11n _HT40	-8.286	0.537	-7.749	11	Pass
5230	46		-5.281	0.537	-4.744		Pass
5755	151		-5.006	0.785	-4.221	30	Pass
5795	159		-3.585	0.537	-3.048		Pass

▣ TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 1 BAND PSD CH 46	802.11n_HT40 UNII 3 BAND PSD CH 159
	

▣ **Sum Data of Ant.0 and Ant.1**

▣ **TEST RESULTS**

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			Measured Power Density (dBm)	Limit (dBm)	Pass/Fail
5190	38	802.11n _HT40 (MIMO)	-4.06	11	Pass
5230	46		0.22		Pass
5755	151		-0.64	30	Pass
5795	159		0.22		Pass

9.6 FREQUENCY STABILITY

The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 ℃ and 50 ℃. The temperature was incremented by 10 ℃ intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

[Ant.0]

20 MHz BW

OPERATING BAND: UNII Band 1

OPERATING FREQUENCY: 5,180,000,000 Hz

CHANNEL: 36

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5180021.50	21.50
100%		-30	5180002.38	2.38
100%		-20	5180005.58	5.58
100%		-10	5180009.26	9.26
100%		0	5180013.61	13.61
100%		+10	5180017.21	17.21
100%		+30	5180026.60	26.60
100%		+40	5180030.28	30.28
100%		+50	5180035.35	35.35
Max	3.60	+20	5180017.15	17.15
Min	3.35	+20	5180014.36	14.36

Note:

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

OPERATING BAND: UNII Band 3

OPERATING FREQUENCY: 5,745,000,000 Hz

CHANNEL: 149

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5745020.87	20.87
100%		-30	5745000.70	0.70
100%		-20	5745004.67	4.67
100%		-10	5745008.49	8.49
100%		0	5745012.67	12.67
100%		+10	5745016.20	16.2
100%		+30	5745024.28	24.28
100%		+40	5745027.58	27.58
100%		+50	5745032.52	32.52
Max	3.60	+20	5745016.69	16.69
Min	3.35	+20	5745011.90	11.9

Note:

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

40 MHz BW

OPERATING BAND: UNII Band 1

OPERATING FREQUENCY: 5,190,000,000 Hz

CHANNEL: 38

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5190020.96	20.96
100%		-30	5190001.89	1.89
100%		-20	5190005.18	5.18
100%		-10	5190009.27	9.27
100%		0	5190013.56	13.56
100%		+10	5190016.74	16.74
100%		+30	5190026.06	26.06
100%		+40	5190029.53	29.53
100%		+50	5190034.48	34.48
Max	3.60	+20	5190016.67	16.67
Min	3.35	+20	5190014.37	14.37

Note:

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

OPERATING BAND: UNII Band 3

OPERATING FREQUENCY: 5,755,000,000 Hz

CHANNEL: 151

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5755021.11	21.11
100%		-30	5755000.20	0.20
100%		-20	5755003.90	3.9
100%		-10	5755007.97	7.97
100%		0	5755012.86	12.86
100%		+10	5755016.80	16.8
100%		+30	5755024.37	24.37
100%		+40	5755028.07	28.07
100%		+50	5755032.90	32.90
Max	3.60	+20	5755016.22	16.22
Min	3.35	+20	5755011.23	11.23

Note:

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

[Ant.1]

20 MHz BW

OPERATING BAND: UNII Band 1

OPERATING FREQUENCY: 5,180,000,000 Hz

CHANNEL: 36

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5180020.54	20.54
100%		-30	5180000.02	0.02
100%		-20	5180005.08	5.08
100%		-10	5180009.61	9.61
100%		0	5180012.85	12.85
100%		+10	5180016.73	16.73
100%		+30	5180024.16	24.16
100%		+40	5180028.98	28.98
100%		+50	5180033.14	33.14
Max	3.60	+20	5180017.30	17.30
Min	3.35	+20	5180013.23	13.23

Note:

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

OPERATING BAND: UNII Band 3

OPERATING FREQUENCY: 5,745,000,000 Hz

CHANNEL: 149

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5745019.87	19.87
100%		-30	5745000.23	0.23
100%		-20	5745004.21	4.21
100%		-10	5745008.11	8.11
100%		0	5745011.49	11.49
100%		+10	5745015.30	15.3
100%		+30	5745023.99	23.99
100%		+40	5745027.99	27.99
100%		+50	5745031.73	31.73
Max	3.60	+20	5745016.49	16.49
Min	3.35	+20	5745012.23	12.23

Note:

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

40 MHz BW

OPERATING BAND: UNII Band 1

OPERATING FREQUENCY: 5,190,000,000 Hz

CHANNEL: 38

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5190020.05	20.05
100%		-30	5190001.47	1.47
100%		-20	5190004.75	4.75
100%		-10	5190008.16	8.16
100%		0	5190013.13	13.13
100%		+10	5190016.53	16.53
100%		+30	5190024.82	24.82
100%		+40	5190028.60	28.60
100%		+50	5190033.02	33.02
Max	3.60	+20	5190015.08	15.08
Min	3.35	+20	5190012.93	12.93

Note:

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

OPERATING BAND: UNII Band 3

OPERATING FREQUENCY: 5,755,000,000 Hz

CHANNEL: 151

REFERENCE VOLTAGE: 3.45 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.45	+20(Ref)	5755020.57	20.57
100%		-30	5755000.41	0.41
100%		-20	5755004.92	4.92
100%		-10	5755008.65	8.65
100%		0	5755013.65	13.65
100%		+10	5755016.81	16.81
100%		+30	5755025.50	25.5
100%		+40	5755028.74	28.74
100%		+50	5755032.04	32.04
Max	3.60	+20	5755015.57	15.57
Min	3.35	+20	5755013.58	13.58

Note:

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

9.7 RADIATED MEASUREMENT

9.7.1 RADIATED SPURIOUS EMISSIONS.

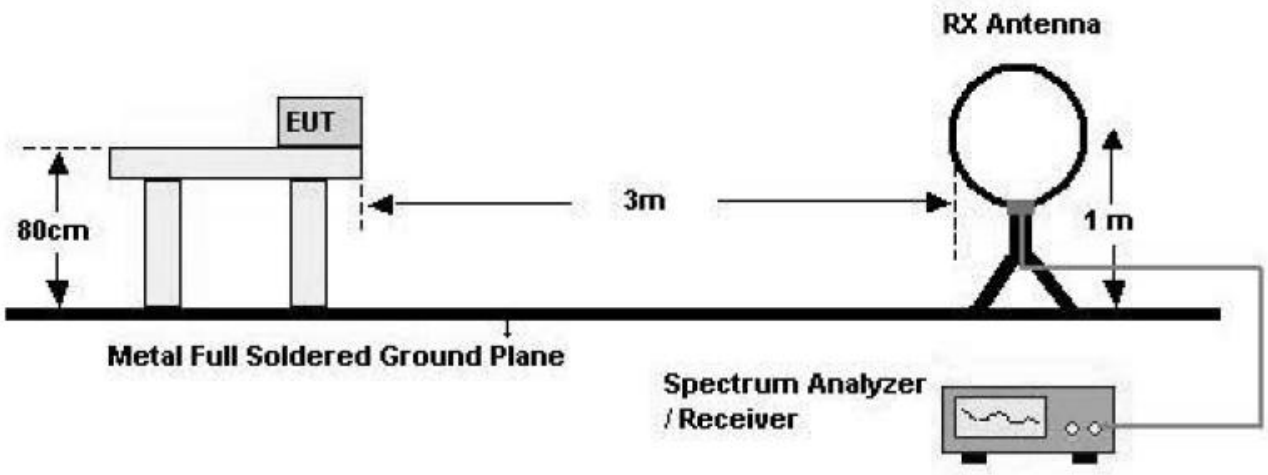
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

▣ §15.407, KDB 789033 D02

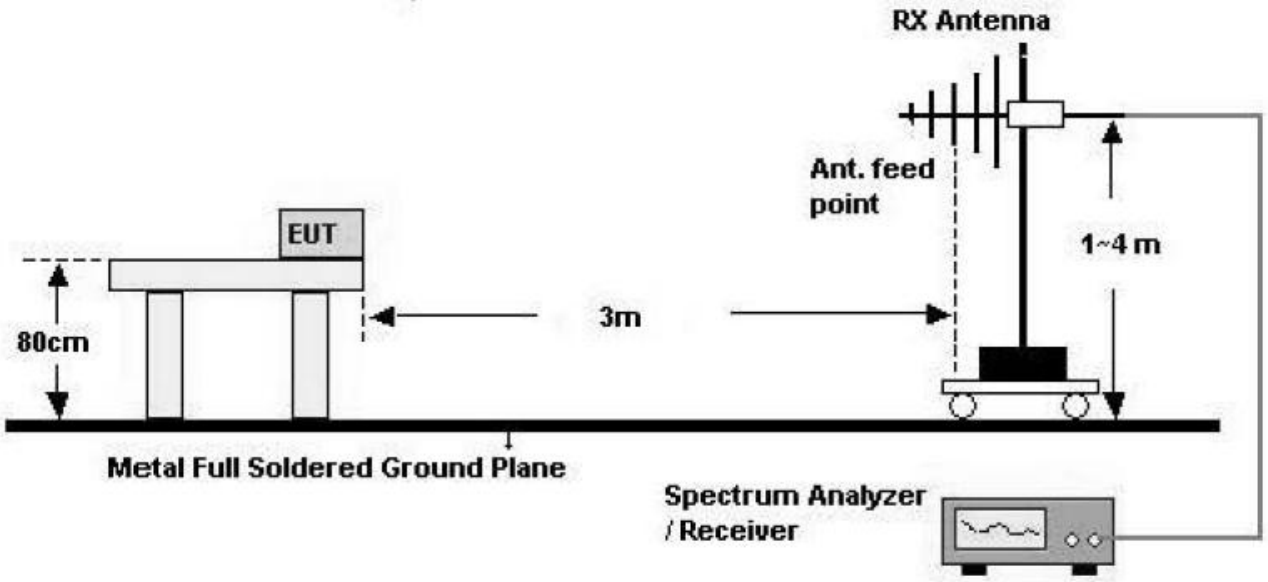
All harmonics that do not lie in a restricted band are subject to a peak limit of -27 dBm/MHz. At a distance of 3 meters the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2 dB to the EIRP limit of -27 dBm/MHz to obtain the limit for out of band spurious emissions of 68.2 dBμV/m. Espectally, for transmitter operating in the 5725 Mhz – 5850 MHz : all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequency 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

TEST CONFIGURATION

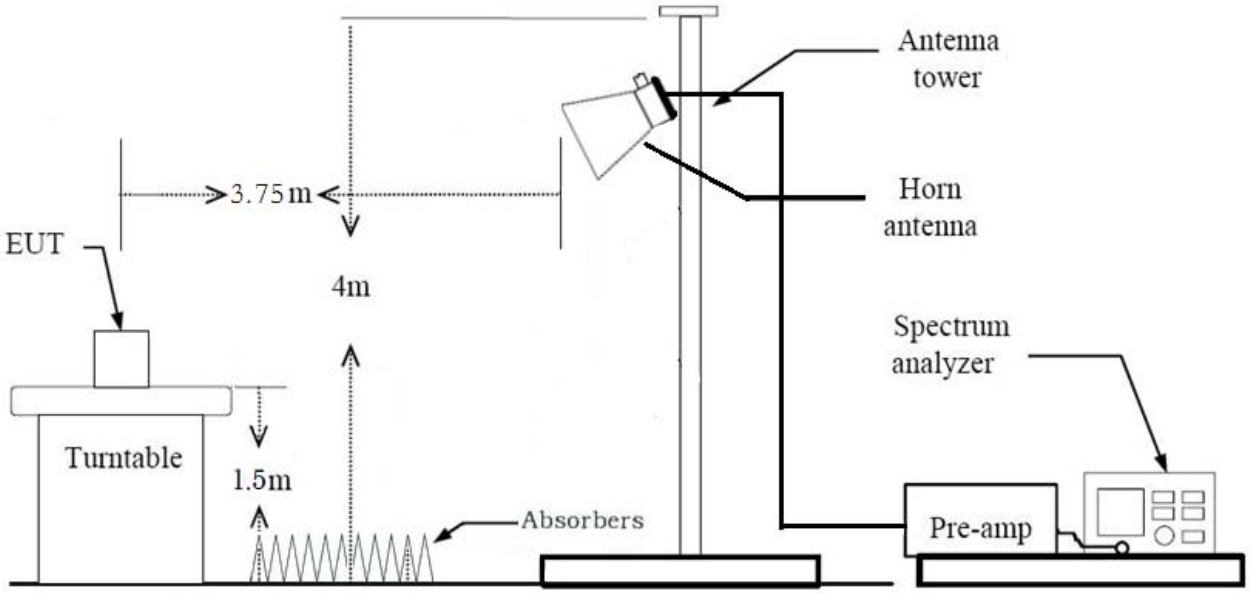
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

ANSI C63.10:2013

Method G)5) in KDB 789033 D02 v01r04 (Peak)

Method G)6)d) in KDB 789033 D02 v01r04 (Average)

. Spectrum setting:

- Peak.

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Sweep Time = auto
5. Trace mode = max hold
6. Allow sweeps to continue until the trace stabilizes.
7. 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.

- Average (Method VB :Averaging using reduced video bandwidth)

1. RBW = 1 MHz
2. VBW
   2.1. If the EUT is configured to transmit with duty cycle ≥ 98 percent, set VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
   2.2. If the EUT duty cycle is < 98 percent, set VBW ≥ 1/T, where T is the minimum transmission

duration.

3. The analyzer is set to linear detector mode.
4. Detector = Peak.
5. Sweep time = auto.
6. Trace mode = max hold.
7. Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimym number of traces by a factor of 1/x, where x is the duty cycle.

Note :

1. We used the Method VB for 802.11a/n(HT20, HT40) mode to perform the average filed strength measurements.
2. The actual setting value of VBW for 802.11a/n(HT20, HT40)
3. 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).
4. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Mode	Worst Data rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle (%)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
a	**6**	**2.063**	**2.188**	**0.94257722**	**485**	**1000**
n_HT20	**MCS 0**	**1.924**	**2.041**	**0.94267516**	**520**	**1000**
n_HT40	**MCS 0**	**0.947**	**1.072**	**0.88339552**	**1056**	**3000**

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV	dB /m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
6. The test results for below 30 MHz is correlated to an open site.
   The result on OATS is about 2 dB higher than semi-anechoic chamber (10 m chamber)

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV	dB /m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	52.86	2.95	V	55.81	68.20	12.39	PK
15540	47.84	4.28	V	52.12	73.98	21.86	PK
15540	34.16	4.28	V	38.44	53.98	15.54	AV
10360	51.57	2.95	H	54.52	68.20	13.68	PK
15540	46.69	4.28	H	50.97	73.98	23.01	PK
15540	32.76	4.28	H	37.04	53.98	16.94	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	51.36	2.51	V	53.87	68.20	14.33	PK
15600	47.60	3.01	V	50.61	73.98	23.37	PK
15600	34.14	3.01	V	37.15	53.98	16.83	AV
10400	50.27	2.51	H	52.78	68.20	15.42	PK
15600	46.58	3.01	H	49.59	73.98	24.39	PK
15600	33.30	3.01	H	36.31	53.98	17.67	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	54.84	2.35	V	57.19	68.20	11.01	PK
15720	47.43	2.80	V	50.23	73.98	23.75	PK
15720	34.59	2.80	V	37.39	53.98	16.59	AV
10480	53.11	2.35	H	55.46	68.20	12.74	PK
15720	46.99	2.80	H	49.79	73.98	24.19	PK
15720	33.57	2.80	H	36.37	53.98	17.61	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	54.14	2.95	V	57.09	68.20	11.11	PK
15540	47.51	4.28	V	51.79	73.98	22.19	PK
15540	33.88	4.28	V	38.16	53.98	15.82	AV
10360	53.02	2.95	H	55.97	68.20	12.23	PK
15540	46.88	4.28	H	51.16	73.98	22.82	PK
15540	32.57	4.28	H	36.85	53.98	17.13	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_HT20. Worst case is MCS0 in 802.11n_HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	52.23	2.51	V	54.74	68.20	13.46	PK
15600	47.76	3.01	V	50.77	73.98	23.21	PK
15600	34.13	3.01	V	37.14	53.98	16.84	AV
10400	48.92	2.51	H	51.43	68.20	16.77	PK
15600	46.91	3.01	H	49.92	73.98	24.06	PK
15600	33.51	3.01	H	36.52	53.98	17.46	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	54.99	2.35	V	57.34	68.20	10.86	PK
15720	48.44	2.80	V	51.24	73.98	22.74	PK
15720	34.38	2.80	V	37.18	53.98	16.80	AV
10480	53.22	2.35	H	55.57	68.20	12.63	PK
15720	46.81	2.80	H	49.61	73.98	24.37	PK
15720	33.27	2.80	H	36.07	53.98	17.91	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11n_HT40
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10380	52.30	2.78	V	55.08	68.20	13.12	PK
15570	46.76	3.26	V	50.02	73.98	23.96	PK
15570	34.38	3.26	V	37.64	53.98	16.34	AV
10380	51.67	2.78	H	54.45	68.20	13.75	PK
15570	45.91	3.26	H	49.17	73.98	24.81	PK
15570	33.08	3.26	H	36.34	53.98	17.64	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT40. Worst case is MCS0 in 802.11n_ HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 1
Operation Mode:	802.11n_ HT40
Transfer MCS Index:	0
Operating Frequency	5230 MHz
Channel No.	46 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10460	52.02	2.77	V	54.79	68.20	13.41	PK
15690	46.91	4.46	V	51.37	73.98	22.61	PK
15690	34.66	4.46	V	39.12	53.98	14.86	AV
10460	51.22	2.77	H	53.99	68.20	14.21	PK
15690	45.80	4.46	H	50.26	73.98	23.72	PK
15690	33.92	4.46	H	38.38	53.98	15.60	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT40. Worst case is MCS0 in 802.11n_ HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5745MHz
Channel No.	149 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	52.49	2.51	V	55.00	73.98	18.98	PK
11490	39.20	2.51	V	41.71	53.98	12.27	AV
17235	46.06	8.98	V	55.04	68.20	13.16	PK
11490	51.56	2.51	H	54.07	73.98	19.91	PK
11490	38.24	2.51	H	40.75	53.98	13.23	AV
17235	45.57	8.98	H	54.55	68.20	13.65	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	52.66	2.81	V	55.47	73.98	18.51	PK
11570	38.90	2.81	V	41.71	53.98	12.27	AV
17355	46.69	8.60	V	55.29	68.20	12.91	PK
11570	51.51	2.81	H	54.32	73.98	19.66	PK
11570	37.22	2.81	H	40.03	53.98	13.95	AV
17355	45.91	8.60	H	54.51	68.20	13.69	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	51.02	2.48	V	53.50	73.98	20.48	PK
11650	38.52	2.48	V	41.00	53.98	12.98	AV
17475	47.59	10.11	V	57.70	68.20	10.50	PK
11650	50.57	2.48	H	53.05	73.98	20.93	PK
11650	37.81	2.48	H	40.29	53.98	13.69	AV
17475	46.68	10.11	H	56.79	68.20	11.41	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5745 MHz
Channel No.	149 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	52.36	2.51	V	54.87	73.98	19.11	PK
11490	38.97	2.51	V	41.48	53.98	12.50	AV
17235	46.70	8.98	V	55.68	68.20	12.52	PK
11490	51.59	2.51	H	54.10	73.98	19.88	PK
11490	37.66	2.51	H	40.17	53.98	13.81	AV
17235	45.81	8.98	H	54.79	68.20	13.41	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	53.71	2.81	V	56.52	73.98	17.46	PK
11570	39.22	2.81	V	42.03	53.98	11.95	AV
17355	46.16	8.60	V	54.76	68.20	13.44	PK
11570	52.97	2.81	H	55.78	73.98	18.20	PK
11570	38.67	2.81	H	41.48	53.98	12.50	AV
17355	45.21	8.60	H	53.81	68.20	14.39	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	52.62	2.48	V	55.10	73.98	18.88	PK
11650	38.93	2.48	V	41.41	53.98	12.57	AV
17475	47.26	10.11	V	57.37	68.20	10.83	PK
11650	52.00	2.48	H	54.48	73.98	19.50	PK
11650	37.92	2.48	H	40.40	53.98	13.58	AV
17475	46.55	10.11	H	56.66	68.20	11.54	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII3
Operation Mode:	802.11n_ HT40
Transfer MCS Index:	0
Operating Frequency	5755 MHz
Channel No.	151 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11510	51.17	2.58	V	53.75	73.98	20.23	PK
11510	38.79	2.58	V	41.37	53.98	12.61	AV
17265	46.02	8.16	V	54.18	68.20	14.02	PK
11510	50.69	2.58	H	53.27	73.98	20.71	PK
11510	38.27	2.58	H	40.85	53.98	13.13	AV
17265	45.55	8.16	H	53.71	68.20	14.49	PK

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT40. Worst case is MCS0 in 802.11n_ HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Band :	UNII 3
Operation Mode:	802.11n_ HT40
Transfer MCS Index:	0
Operating Frequency	5795 MHz
Channel No.	159 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11590	50.68	2.54	V	53.22	73.98	20.76	PK
11590	38.70	2.54	V	41.24	53.98	12.74	AV
17385	47.28	10.05	V	57.33	68.20	10.87	PK
11590	49.12	2.54	H	51.66	73.98	22.32	PK
11590	38.59	2.54	H	41.13	53.98	12.85	AV
17385	45.84	10.05	H	55.89	68.20	12.31	PK

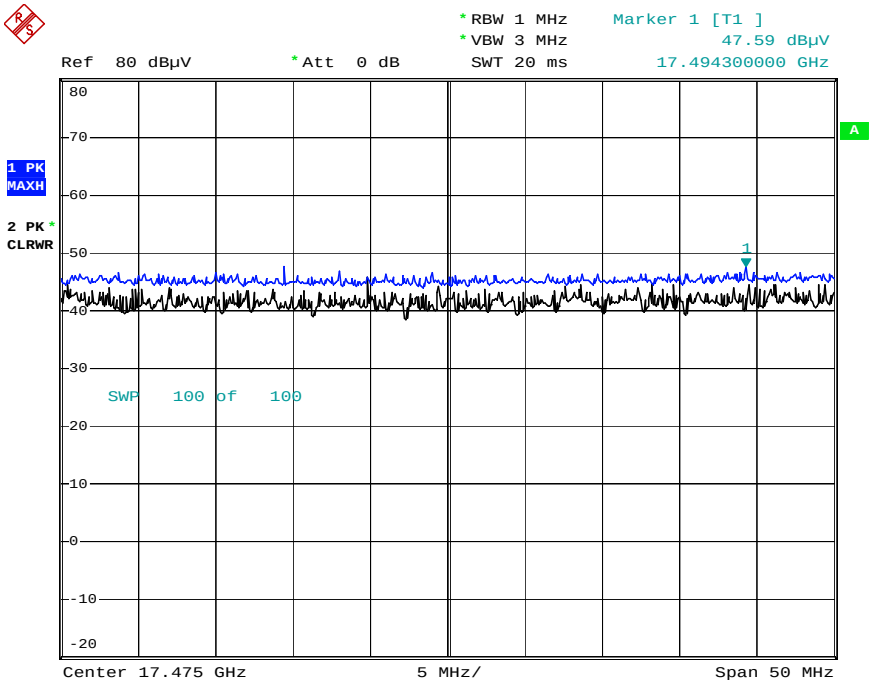
*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT40. Worst case is MCS0 in 802.11n_ HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

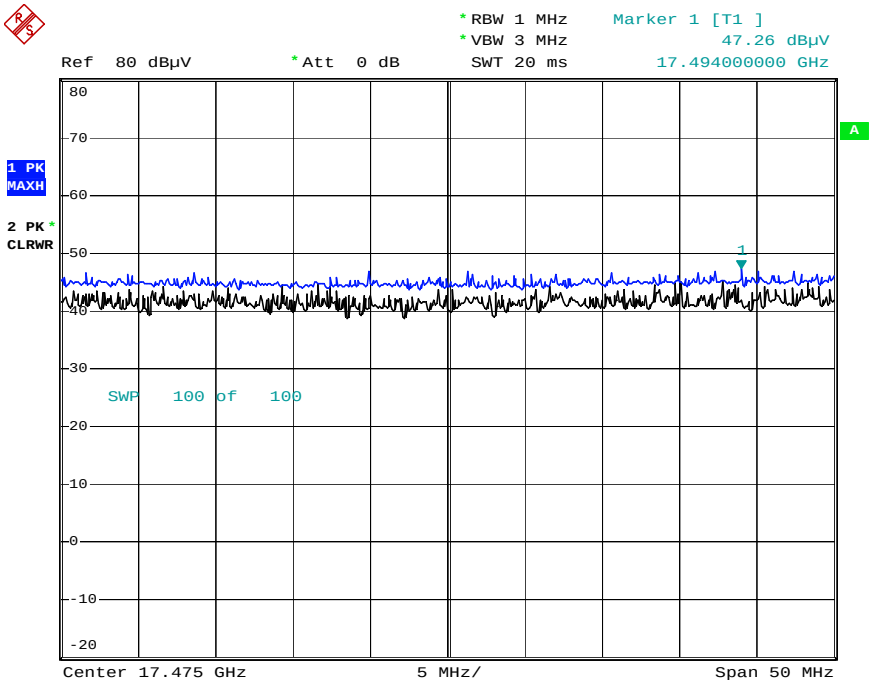
▣ RESULT PLOTS(Worst case : Y-V)

Radiated Spurious Emissions plot –Peak Reading (802.11a, Ch.165 3rd Harmonic)



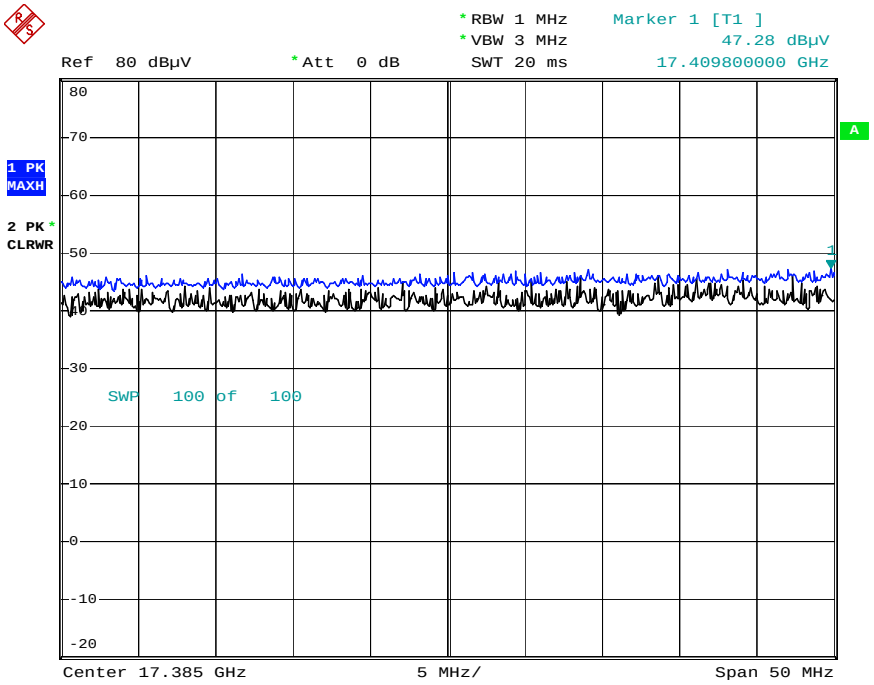
Date: 17.NOV.2017 09:21:31

Radiated Spurious Emissions plot –Peak Reading (802.11n_HT20, Ch.165 3rd Harmonic)



Date: 17.NOV.2017 09:19:51

Radiated Spurious Emissions plot – Average Reading (802.11n_HT40, Ch.159 3rd Harmonic)



Note : Only the worst case plots for Radiated Spurious Emissions.

9.7.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	62.58	3.26	H	65.84	73.98	8.14	PK
5150	46.98	3.26	H	50.24	53.98	3.74	AV
5150	62.10	3.26	V	65.36	73.98	8.62	PK
5150	45.81	3.26	V	49.07	53.98	4.91	AV

Band :	UNII 1
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	63.76	3.26	H	67.02	73.98	6.96	PK
5150	46.71	3.26	H	49.97	53.98	4.01	AV
5150	62.44	3.26	V	65.7	73.98	8.28	PK
5150	45.86	3.26	V	49.12	53.98	4.86	AV

Band :	UNII 1
Operation Mode:	802.11 n_HT40
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

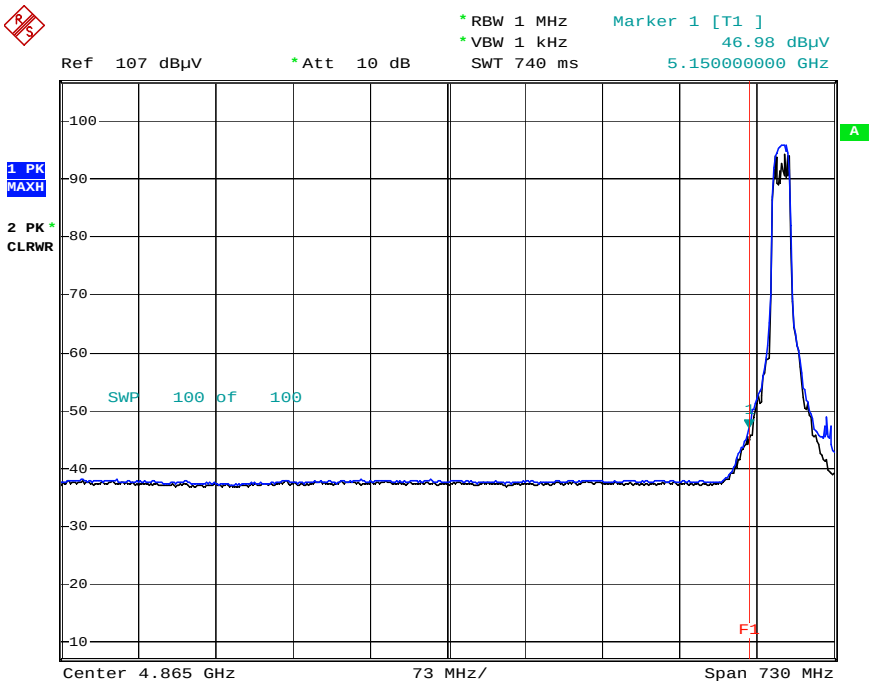
Frequency [MHz]	Reading [dBuV]	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	63.31	3.26	H	66.57	73.98	7.41	PK
5150	44.51	3.26	H	47.77	53.98	6.21	AV
5150	62.57	3.26	V	65.83	73.98	8.15	PK
5150	43.57	3.26	V	46.83	53.98	7.15	AV

Notes:

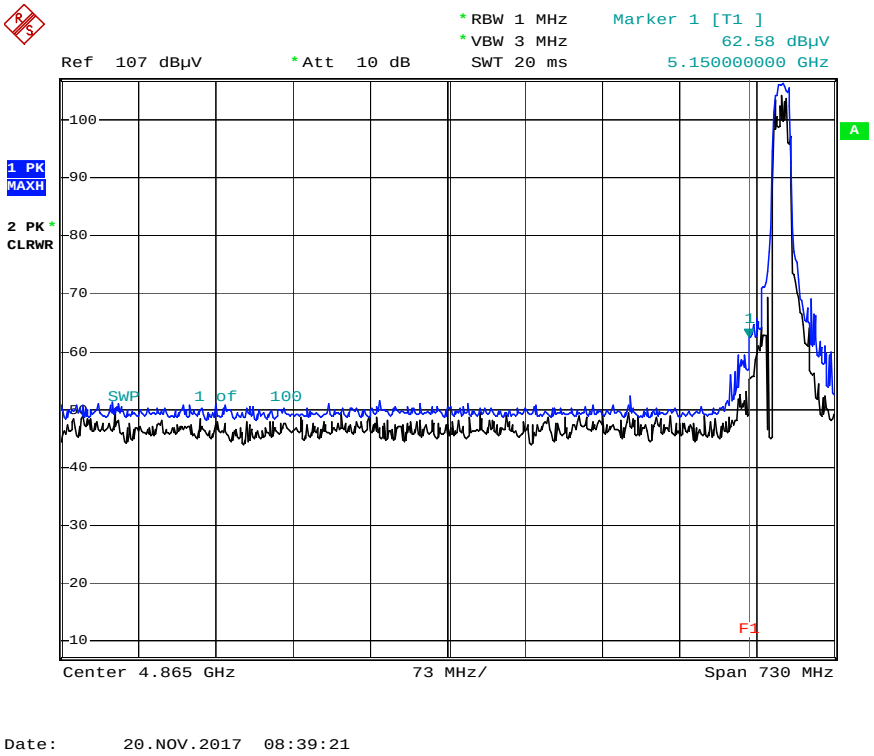
1. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + ATT + D.F.
2. We have done all data rate in 802.11a/n mode test. . Worst case of EUT is lowest data rate in 802.11a/n.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. '*' is radiated band edge test frequency.(not restricted band emissions)
5. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
6. The worst limit for UNII 3 according to 15.407(4)(i) is -27 dBm(68.2 dBuV/m).
   The band edge results at 5850 MHz comply to the worst limit.

▣ RESULT PLOTS

Radiated Restricted Band Edges plot –Average Reading (802.11a, Ch.36, X-H)

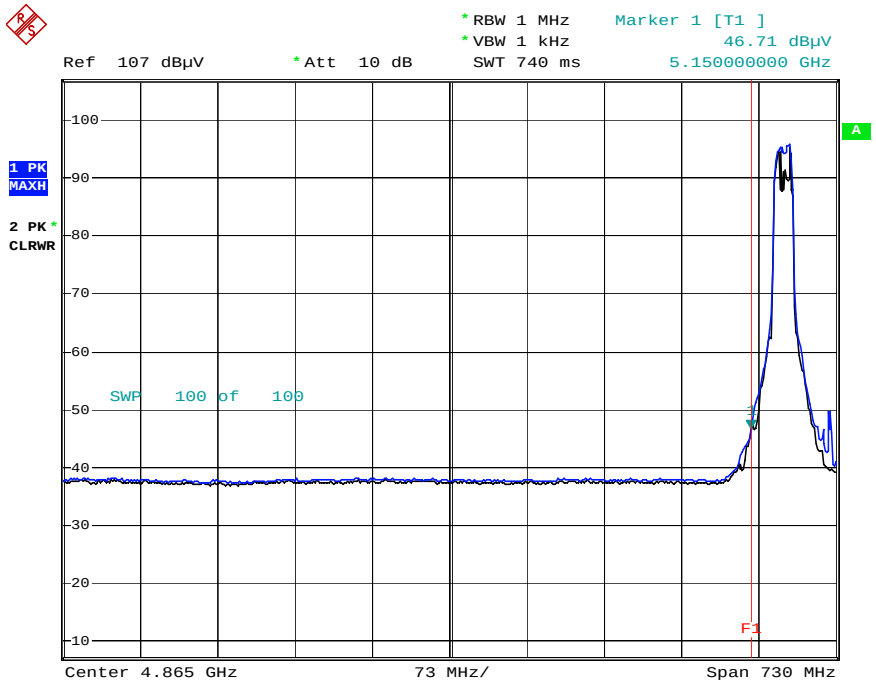


Radiated Restricted Band Edges plot – Peak Reading (802.11a, Ch.36, X-H)



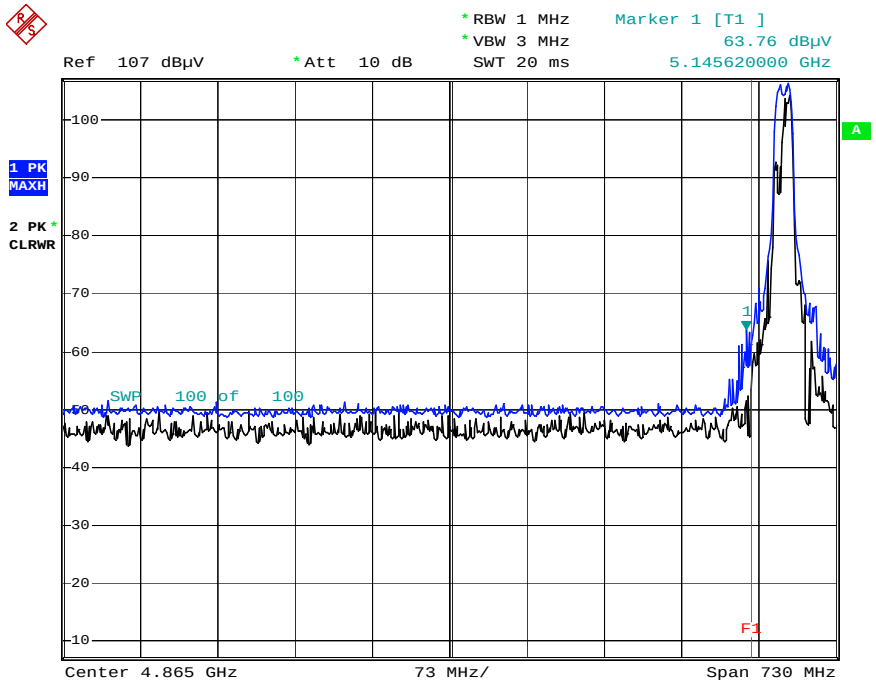
Note : Only the worst case plots for Radiated Restricted Band Edges.

Radiated Restricted Band Edges plot –Average Reading (802.11n_HT20, Ch.36, Y-H)



Date: 20.NOV.2017 08:50:42

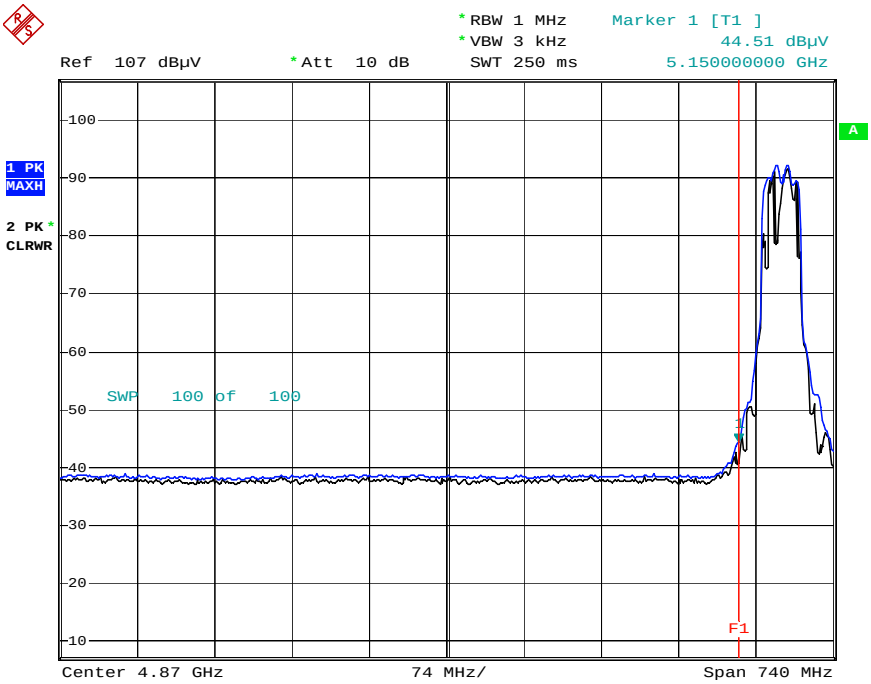
Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT20, Ch.36, Y-H)



Date: 20.NOV.2017 08:51:52

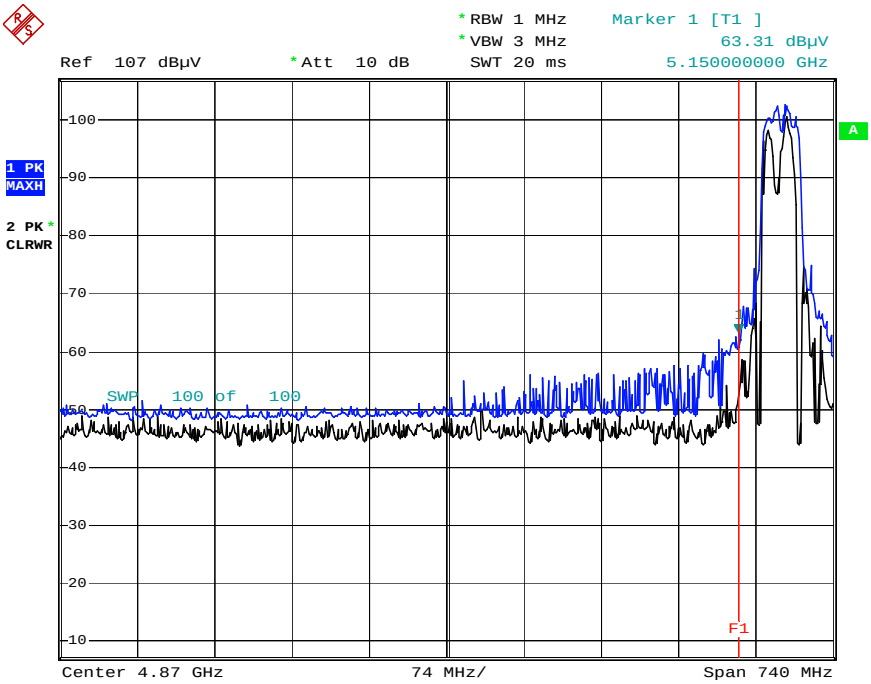
Note : Only the worst case plots for Radiated Restricted Band Edges.

Radiated Restricted Band Edges plot –Average Reading (802.11n_HT40, Ch.38, X-H)



Date: 20.NOV.2017 08:59:21

Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT40, Ch.38, X-H)

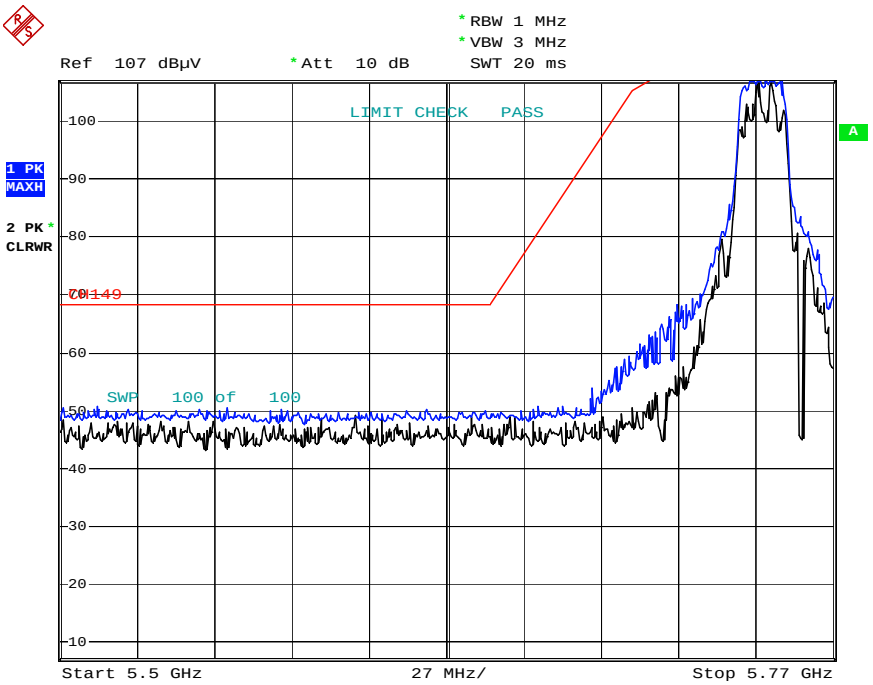


Date: 20.NOV.2017 08:01:33

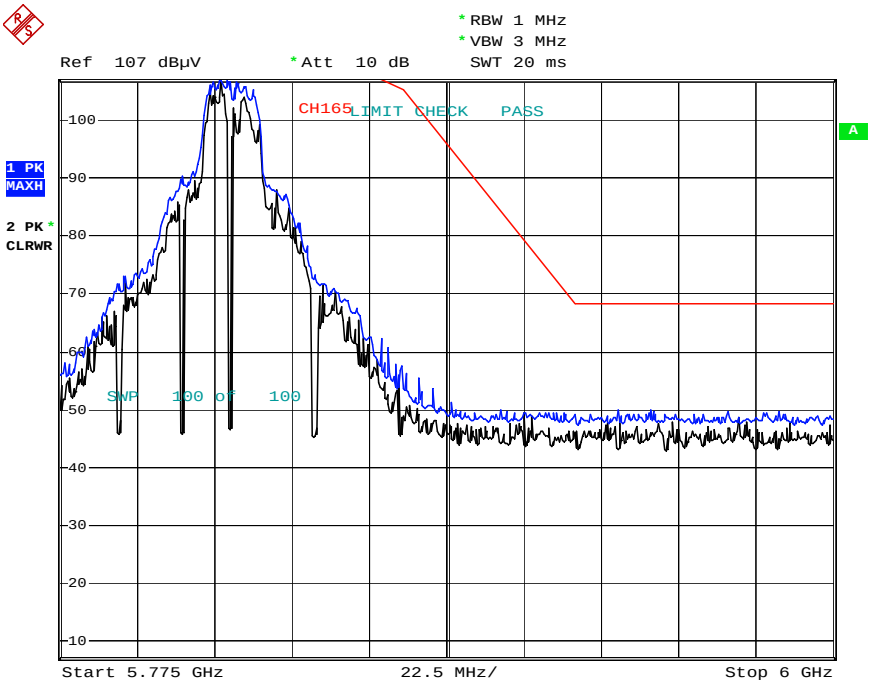
Note : Only the worst case plots for Radiated Restricted Band Edges.

▣ RESULT PLOTS (UNII 3)

Radiated Restricted Band Edges plot – Peak Reading (802.11a)

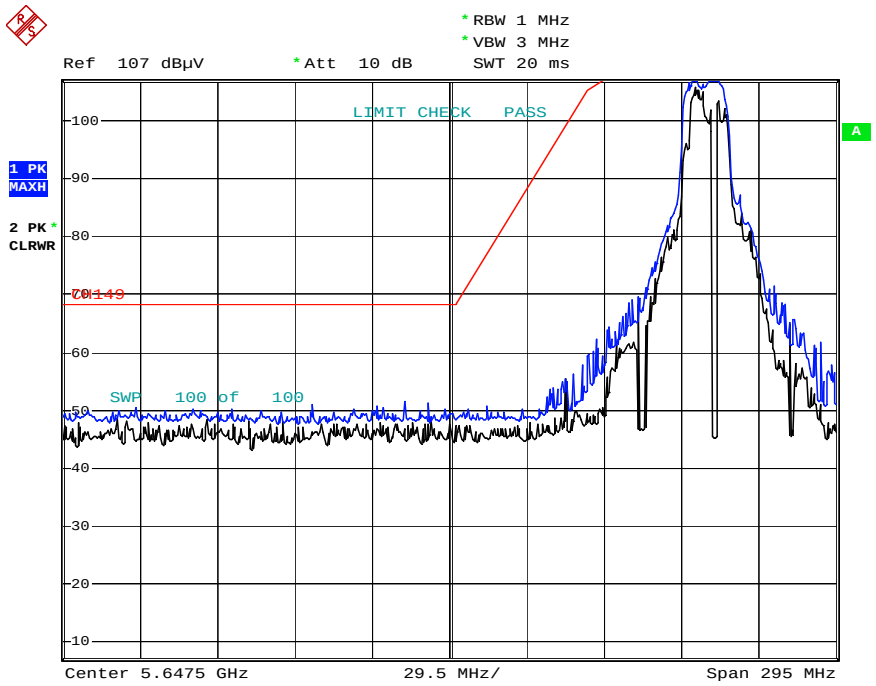


Date: 20.NOV.2017 08:41:41

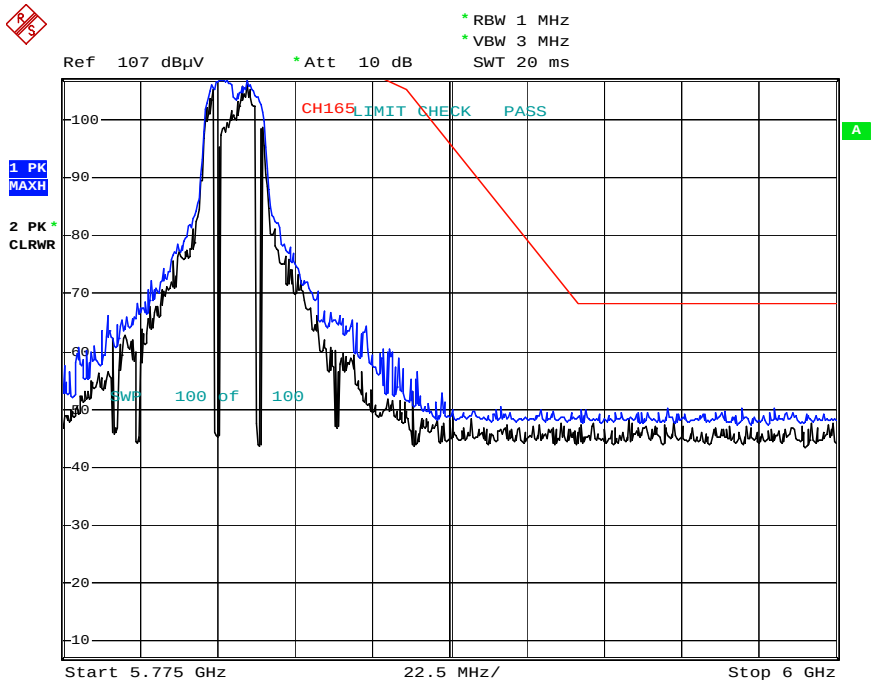


Date: 20.NOV.2017 08:43:07

Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT20)

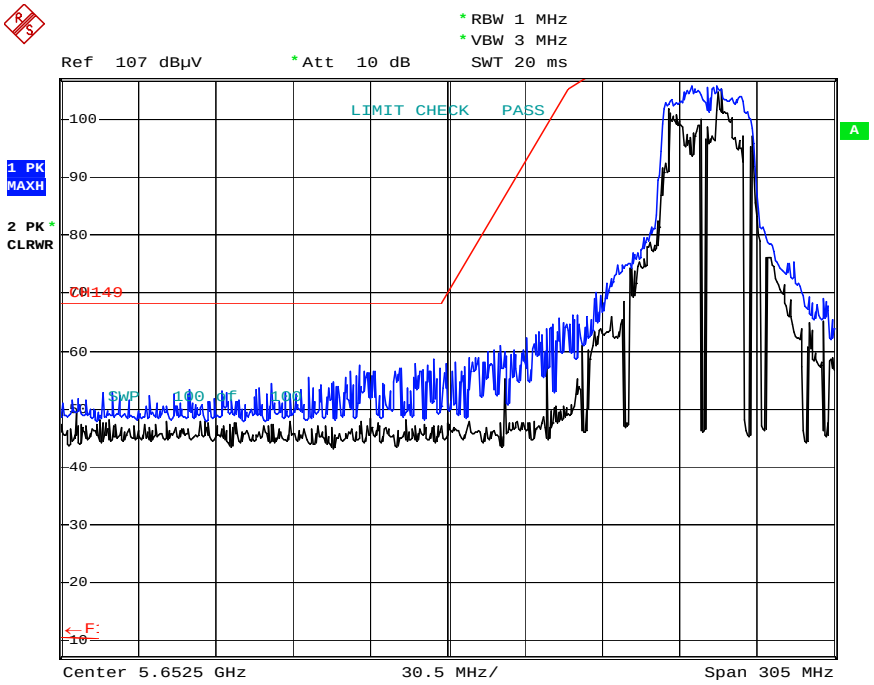


Date: 20.NOV.2017 08:53:37

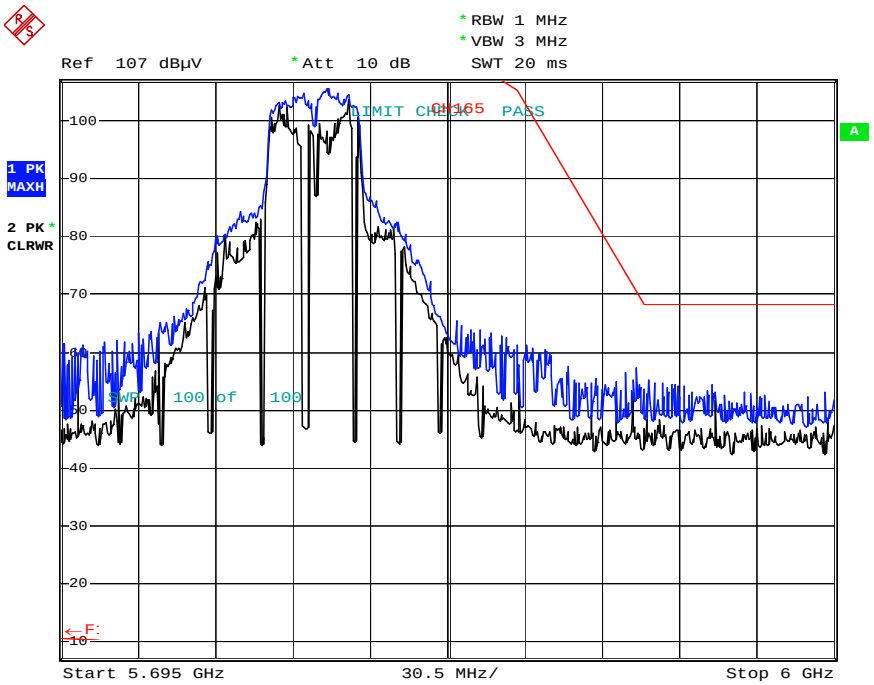


Date: 20.NOV.2017 08:55:10

Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT40)



Date: 20.NOV.2017 08:05:01



Date: 20.NOV.2017 08:06:44

9.8 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBµV)	
	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

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 Appendix 1 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 groundplane.
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

▣ RESULT PLOTS

Conducted Emissions (Line 1)

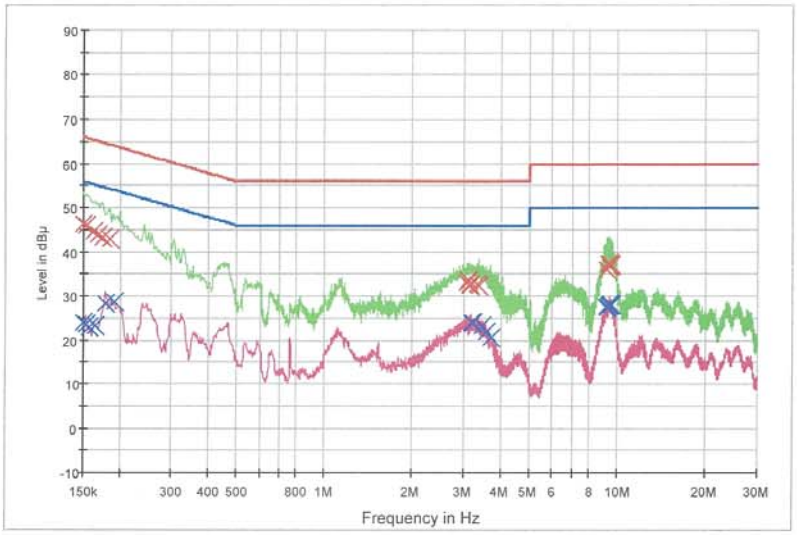
WLAN 5GHz MODE_H 1 / 2

HCT TEST Report

Common Information

EUT:	WC1NP8
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN 5GHz MODE_H

FCC CLASS B



FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_ AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V
0.150000	46.3	9.000	Off	L1	9.6	19.7	66.0
0.154000	45.9	9.000	Off	L1	9.6	19.9	65.8
0.162000	44.7	9.000	Off	L1	9.6	20.7	65.4
0.168000	43.9	9.000	Off	L1	9.6	21.2	65.1
0.174000	43.3	9.000	Off	L1	9.6	21.5	64.8
0.186000	42.8	9.000	Off	L1	9.6	21.4	64.2
3.068000	33.2	9.000	Off	L1	9.8	22.8	56.0
3.108000	33.8	9.000	Off	L1	9.8	22.2	56.0
3.142000	32.6	9.000	Off	L1	9.8	23.4	56.0
3.156000	32.3	9.000	Off	L1	9.8	23.7	56.0
3.346000	32.9	9.000	Off	L1	9.8	23.1	56.0
3.382000	32.2	9.000	Off	L1	9.8	23.8	56.0
9.224000	36.2	9.000	Off	L1	10.0	23.8	60.0
9.332000	37.6	9.000	Off	L1	10.0	22.4	60.0
9.372000	37.3	9.000	Off	L1	10.1	22.7	60.0
9.434000	37.3	9.000	Off	L1	10.1	22.7	60.0
9.466000	36.9	9.000	Off	L1	10.1	23.1	60.0
9.504000	37.0	9.000	Off	L1	10.1	23.0	60.0

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WLAN 5GHz MODE_H 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBμ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V
0.150000	24.0	9.000	Off	L1	9.6	32.0	56.0
0.154000	23.5	9.000	Off	L1	9.6	32.3	55.8
0.158000	22.8	9.000	Off	L1	9.6	32.8	55.6
0.164000	23.3	9.000	Off	L1	9.6	31.9	55.3
0.178000	28.4	9.000	Off	L1	9.6	26.2	54.6
0.192000	28.6	9.000	Off	L1	9.6	25.3	53.9
3.192000	24.0	9.000	Off	L1	9.8	22.0	46.0
3.196000	23.9	9.000	Off	L1	9.8	22.1	46.0
3.212000	23.9	9.000	Off	L1	9.8	22.1	46.0
3.444000	23.3	9.000	Off	L1	9.8	22.7	46.0
3.586000	22.0	9.000	Off	L1	9.8	24.0	46.0
3.716000	20.6	9.000	Off	L1	9.8	25.4	46.0
9.198000	27.3	9.000	Off	L1	10.0	22.7	50.0
9.236000	27.5	9.000	Off	L1	10.0	22.5	50.0
9.334000	27.8	9.000	Off	L1	10.1	22.2	50.0
9.394000	28.2	9.000	Off	L1	10.1	21.8	50.0
9.430000	27.9	9.000	Off	L1	10.1	22.1	50.0
9.504000	27.9	9.000	Off	L1	10.1	22.1	50.0

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Conducted Emissions (Line 2)

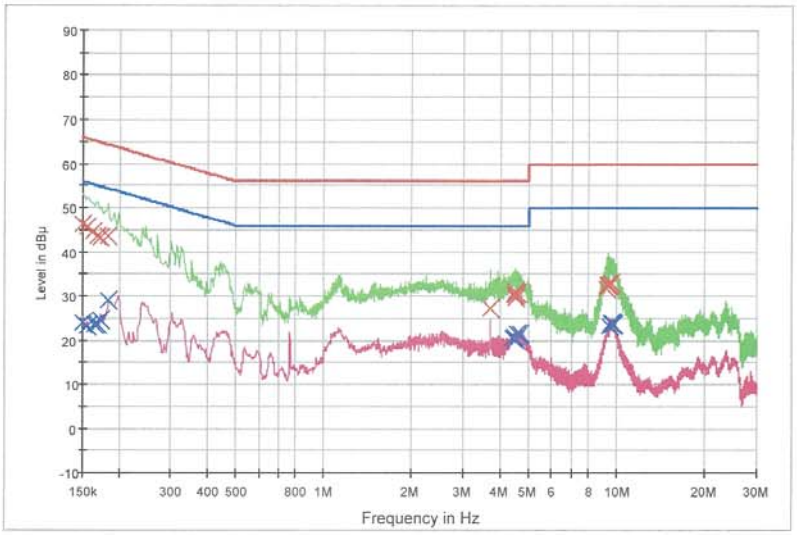
WLAN 5GHz MODE_N 1 / 2

HCT TEST Report

Common Information

EUT:	WC1NP8
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN 5GHz MODE_N

FCC CLASS B



FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_ AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V
0.150000	46.4	9.000	Off	N	9.6	19.6	66.0
0.156000	45.5	9.000	Off	N	9.6	20.1	65.7
0.162000	44.5	9.000	Off	N	9.6	20.8	65.4
0.168000	43.6	9.000	Off	N	9.6	21.4	65.1
0.172000	43.2	9.000	Off	N	9.6	21.7	64.9
0.184000	43.5	9.000	Off	N	9.6	20.8	64.3
3.712000	27.3	9.000	Off	N	9.8	28.7	56.0
4.482000	30.2	9.000	Off	N	9.8	25.8	56.0
4.500000	29.7	9.000	Off	N	9.8	26.3	56.0
4.526000	31.1	9.000	Off	N	9.8	24.9	56.0
4.530000	30.5	9.000	Off	N	9.8	25.5	56.0
4.582000	30.5	9.000	Off	N	9.8	25.5	56.0
9.236000	31.6	9.000	Off	N	10.0	28.4	60.0
9.332000	32.6	9.000	Off	N	10.1	27.4	60.0
9.368000	32.5	9.000	Off	N	10.1	27.5	60.0
9.392000	32.8	9.000	Off	N	10.1	27.2	60.0
9.406000	32.3	9.000	Off	N	10.1	27.7	60.0
9.504000	33.1	9.000	Off	N	10.1	26.9	60.0

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Final Result 2

Frequency (MHz)	CAverage (dBμ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V
0.150000	23.8	9.000	Off	N	9.6	32.2	56.0
0.156000	23.2	9.000	Off	N	9.6	32.5	55.7
0.164000	23.5	9.000	Off	N	9.6	31.8	55.3
0.168000	23.6	9.000	Off	N	9.6	31.4	55.1
0.172000	24.4	9.000	Off	N	9.6	30.4	54.9
0.184000	29.1	9.000	Off	N	9.6	25.2	54.3
4.406000	20.6	9.000	Off	N	9.8	25.4	46.0
4.482000	20.7	9.000	Off	N	9.8	25.3	46.0
4.500000	20.3	9.000	Off	N	9.8	25.7	46.0
4.588000	21.5	9.000	Off	N	9.8	24.5	46.0
4.644000	21.3	9.000	Off	N	9.8	24.7	46.0
4.660000	21.4	9.000	Off	N	9.8	24.6	46.0
9.392000	23.2	9.000	Off	N	10.1	26.8	50.0
9.502000	23.8	9.000	Off	N	10.1	26.2	50.0
9.598000	23.8	9.000	Off	N	10.1	26.2	50.0
9.642000	23.7	9.000	Off	N	10.1	26.3	50.0
9.654000	23.8	9.000	Off	N	10.1	26.2	50.0
9.710000	23.6	9.000	Off	N	10.1	26.4	50.0

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10. LIST OF TEST EQUIPMENT

10.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/23/2016	Annual	100073
Rohde & Schwarz	ESCI / Test Receiver	12/23/2016	Annual	100584
Agilent	N9020A / Signal Analyzer	06/13/2017	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	11/30/2016	Annual	MY49431210
Agilent	N1911A / Power Meter	04/17/2017	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/17/2017	Annual	MY52260025
Hewlett Packard	E3632A / DC Power Supply	04/11/2017	Annual	KR75306225
Agilent	8493C / Attenuator(10 dB)	07/10/2017	Annual	07560
Rohde & Schwarz	EMC32 / Software	-	-	-

10.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	MA4000-EP / Antenna Position Tower	N/A	N/A	N/A
Innco system	CT0800 / Turn Table	N/A	N/A	N/A
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
ETS	2090 / Controller(Turn table)	N/A	N/A	1646
Rohde & Schwarz	Loop Antenna	04/19/2017	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	12/11/2015	Biennial	9120D-1191
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	04/25/2017	Biennial	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	09/21/2017	Annual	836650/016
Wainwright Instruments	WHKX10-2700-3000-18000-40SS / High Pass Filter	08/01/2017	Annual	4
Wainwright Instruments	WHKX8-6090-7000-18000-40SS / High Pass Filter	07/11/2017	Annual	5
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/30/2017	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/24/2017	Annual	2
H.P.	8491A / Attenuator(10 dB)	08/01/2017	Annual	18593
CERNEX	CBLU1183540 / Power Amplifier	01/25/2017	Annual	24614
CERNEX	CBL06185030 / Power Amplifier	01/25/2017	Annual	24615
CERNEX	CBL18265035 / Power Amplifier	01/23/2017	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/30/2017	Annual	25956