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

FCC/IC UNII REPORT

FCC/IC Certification

Applicant Name:
LG Electronics Inc.

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

Date of Issue:
December 15, 2015
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-1512-F018
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID:	**BEJ-WC1NP6**
IC:	**2703H-WC1NP6**
APPLICANT:	**LG Electronics Inc.**

FCC/IC Model(s): WC1NP6

EUT Type: RF Module

Modulation type OFDM

FCC Classification: Unlicensed National Information Infrastructure(UNII)

FCC Rule Part(s): Part 15.407

IC Rule Part(s) : RSS-247 Issue 1 (May 2015) , 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	12.80	11.74	15.30
	802.11n	20	5180 – 5240	12.99	11.89	15.47
	802.11n	40	5190 - 5230	14.83	12.46	16.74
UNII3	802.11a	20	5745 – 5825	12.44	13.17	15.82
	802.11n	20	5745 – 5825	11.95	12.69	15.34
	802.11n	40	5755 – 5795	12.71	11.73	15.24

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

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

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

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1512-F018	December 15, 2015	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	LG Electronics Inc.
Address:	222, LG-ro, Jinwi-myeon, Pyeongtaek-si, 451-713 Gyeonggi-do, South Korea
FCC ID:	BEJ-WC1NP6
IC:	2703H- WC1NP6
EUT Type:	RF Module
FCC/IC Model name(s):	WC1NP6
Date(s) of Tests:	November 12, 2015 ~ December 03, 2015
Place of Tests:	HCT Co., Ltd. 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do,17383, Rep. of KOREA (IC Recognition No. : 5944A-5)

2. EUT DESCRIPTION

FCC/IC Model name(s):	WC1NP6	
EUT Type	RF Module	
Power Supply	DC 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 Antenna type: PCB 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 : In case of radiation test, we have done all test case. Worst case is MIMO(Ant 0 & 1).
So, we attached the results of only worst case.

3. TEST METHODOLOGY

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

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E / the RSS-GEN issue 4, RSS-247 issue 1.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

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

4. INSTRUMENT CALIBRATION

The. measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards

Especially, all antenna for measurement is calibrated in accordance with the requirements of C64.5 (latest edition).

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 7.1.2

"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 7.1.2

▣ Directional Gain Calculations

- **If any transmit signals are correlated with each other(802.11a,n,ac),**

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

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

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

▣ Antenna Gain

5GHz Band (UNII 1)

Antenna Gain	Ant 0	2.86 dBi
	Ant 1	2.30 dBi
Directional Antenna Gain	Ant 0 & 1	5.59 dBi

5GHz Band (UNII 3)

Antenna Gain	Ant 0	3.48 dBi
	Ant 1	3.87 dBi
Directional Antenna Gain	Ant 0 & 1	6.69 dBi

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

7. SUMMARY OF TEST RESULTS

7.1 FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§15.407 (for Power Measurement)	NA	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) <1 W (5725-5850 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1), (5)	<11 dBm/ MHz (5150-5250 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§15.407(g)	NA		NA
AC Conducted Emissions 150 kHz-30 MHz	§15.207	<FCC 15.207 limits		NA
Undesirable Emissions	§15.407(b)(1), (2), (3)	<-27 dBm/MHz EIRP (5150-5250 MHz) <-17 dBm/MHz EIRP within 5715-5725 MHz and 5850-5860 MHz, <-27 dBm/MHz EIRP outside 5715-5850 MHz(UNII3)	RADIATED	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	§15.205, 5.407(b)(1), (5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

7.2 IC Part

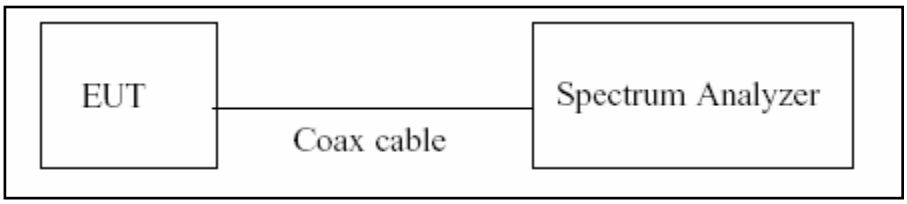
Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
99% Bandwidth(IC)	RSS-GEN, 6.6	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1)	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247, 6.2	< 250 mW or 11+10 log $_{10}$ (BW) dBm (5250-5350 MHz) < 250 mW or 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	< 200 mW or 10+10 log $_{10}$ (BW) dBm (5150-5250 MHz) < 1 W or 17+10 log $_{10}$ (BW) dBm (5250-5350 MHz) < 1 W or 17+10 log $_{10}$ (BW) dBm (5470-5725 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

8. TEST RESULT

8.1 DUTY CYCLE

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

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, (B.2 in KDB 789033 D02, issued 06/06/2014)
The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)
The zero-span method was used becaure all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

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

▣ **Duty Cycle Factor**

Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11a	6	2.064	2.177	0.94809371	0.231
	9	1.386	1.458	0.95061728	0.220
	12	1.044	1.098	0.95081967	0.219
	18	0.705	0.741	0.95141700	0.216
	24	0.534	0.561	0.95187166	0.214
	36	0.363	0.387	0.93798450	0.278
	48	0.276	0.300	0.92000000	0.362
	54	0.248	0.272	0.91176471	0.401
802.11n_20 MHz BW	MCS Index 0	1.921	2.019	0.95146112	0.216
	MCS Index 1	0.979	1.032	0.94864341	0.229
	MCS Index 2	0.662	0.693	0.95526696	0.199
	MCS Index 3	0.507	0.533	0.95121951	0.217
	MCS Index 4	0.352	0.377	0.93368700	0.298
	MCS Index 5	0.271	0.295	0.91864407	0.369
	MCS Index 6	0.246	0.271	0.90774908	0.420
	MCS Index 7	0.228	0.253	0.90118577	0.452
802.11n_40 MHz BW	MCS Index 0	0.945	1.040	0.90865385	0.416
	MCS Index 1	0.492	0.542	0.90774908	0.420
	MCS Index 2	0.340	0.374	0.90909091	0.414
	MCS Index 3	0.264	0.288	0.91666667	0.378
	MCS Index 4	0.188	0.212	0.88679245	0.522
	MCS Index 5	0.152	0.176	0.86363636	0.637
	MCS Index 6	0.140	0.164	0.85365854	0.687
	MCS Index 7	0.128	0.152	0.84210526	0.746

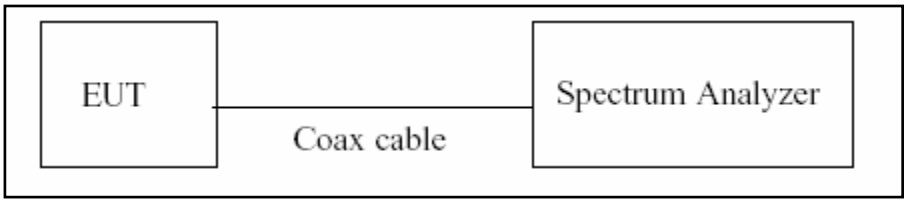
8.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT

Test Requirements and limit, §15.407 / RSS-GEN(Issue 4) 6.6, RSS-247(Issue 1) Section 6.2

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

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

▣ TEST CONFIGURATION



▣ TEST PROCEDURE (26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

1. RBW = approximately 1 % of the emission bandwidth
2. VBW > RBW
3. Detector = Peak
4. Trace mode = max hold
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

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

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

The transmitter output is connected to the Spectrum Analyzer.

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

1. RBW = 100 kHz
2. VBW ≥ 3*RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points(upper and lower frequencies) that are attenuated by 6 dB relative to the maximum lever measured in the fundamental emission.

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

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

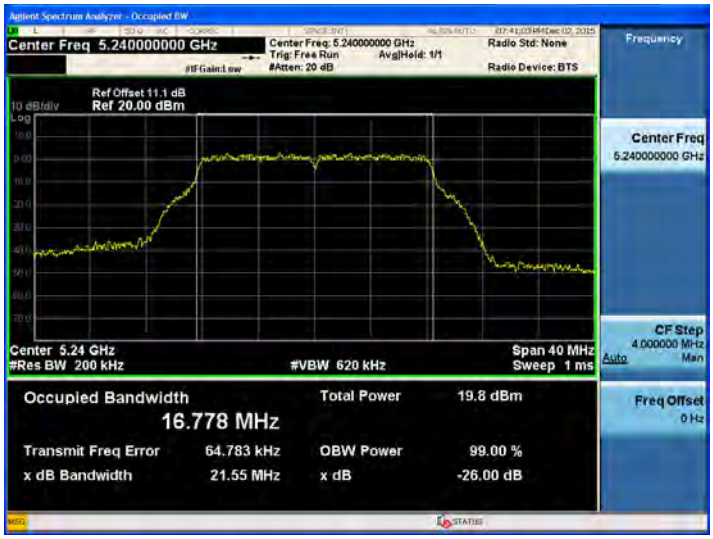
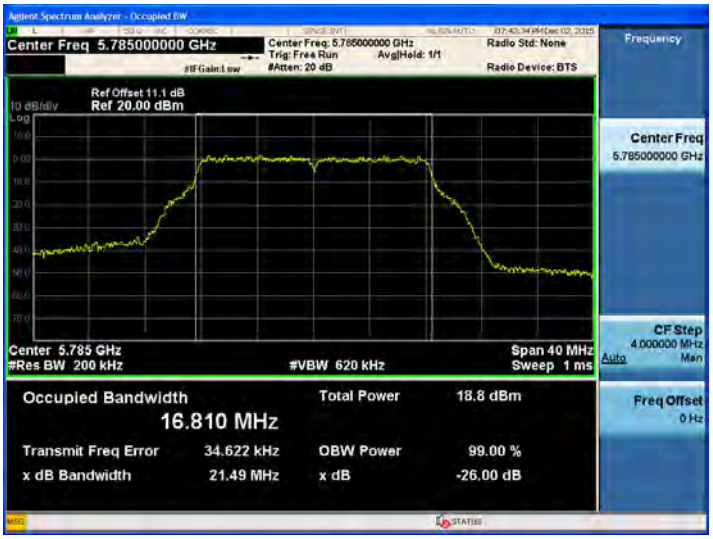
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	21.270	N/A	Pass
5200	40	21.430	N/A	Pass
5240	48	21.550	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	21.480	N/A	Pass
5785	157	21.490	N/A	Pass
5825	165	21.460	N/A	Pass

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

802.11a UNII 1 BAND 26dB Bandwidth (CH48)	802.11a UNII 3BAND 26dB Bandwidth (CH 157)
	

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

▣ TEST RESULTS Ant 0_ 802.11n _20MHz BW

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	21.560	N/A	Pass
5200	40	21.740	N/A	Pass
5240	48	21.760	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	21.580	N/A	Pass
5785	157	21.710	N/A	Pass
5825	165	21.820	N/A	Pass

▣ TEST Plot for 802.11n _20MHz BW

802.11n_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 48)	802.11n_20 MHz BW UNII 2A BAND 26dB Bandwidth(CH 165)
	

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

▣ TEST RESULTS Ant 0_802.11n_40MHz BW

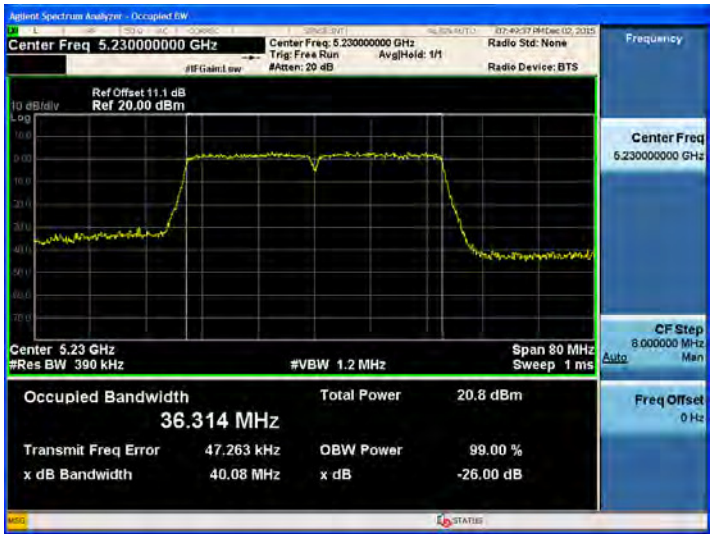
Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	40.050	N/A	Pass
5230	46	40.080	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	39.750	N/A	Pass
5795	159	40.000	N/A	Pass

▣ TEST Plot for 802.11n_40MHz BW

802.11n_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 46)	802.11n_40 MHz BW UNII 2A 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_20 MHz BW

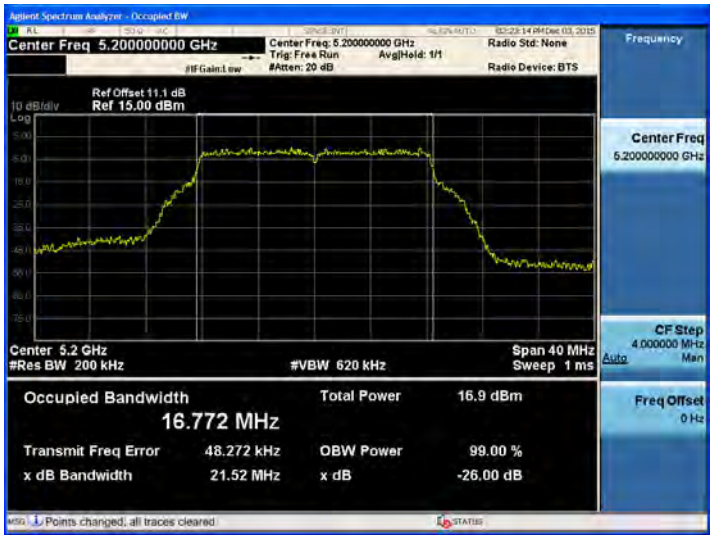
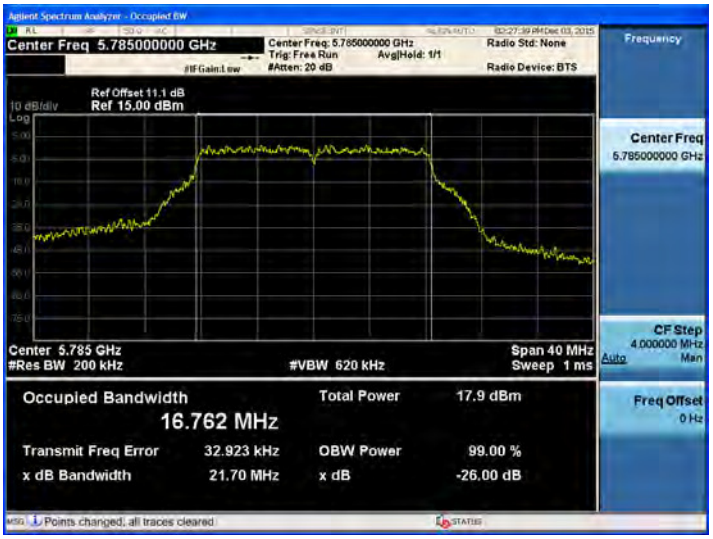
Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	21.378	N/A	Pass
5200	40	21.517	N/A	Pass
5240	48	21.412	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	21.633	N/A	Pass
5785	157	21.698	N/A	Pass
5825	165	21.356	N/A	Pass

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

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

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

▣ TEST RESULTS Ant 1_ 802.11n _20MHz BW

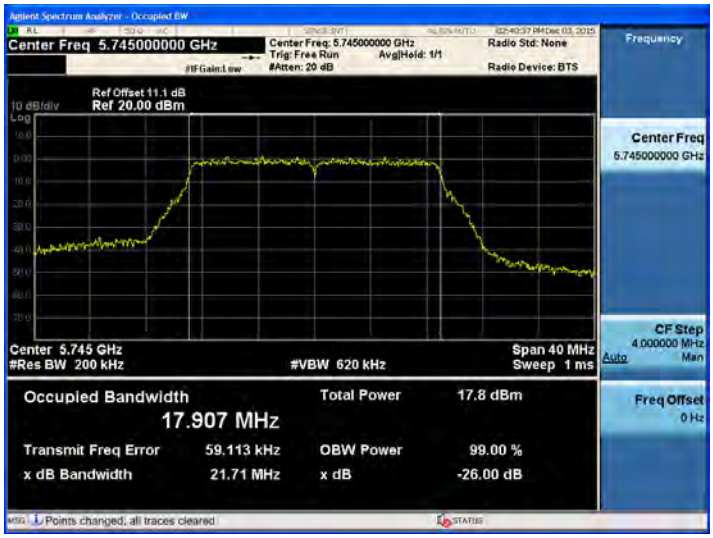
Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	21.756	N/A	Pass
5200	40	21.464	N/A	Pass
5240	48	21.672	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n 20M BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	21.709	N/A	Pass
5785	157	21.681	N/A	Pass
5825	165	21.642	N/A	Pass

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

802.11n_20 MHz BW UNII 1 BAND 26dB Bandwidth(CH 36)	802.11n_20 MHz BW UNII 2A BAND 26dB Bandwidth(CH 149)
	

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

▣ TEST RESULTS Ant 1_802.11n_40MHz BW

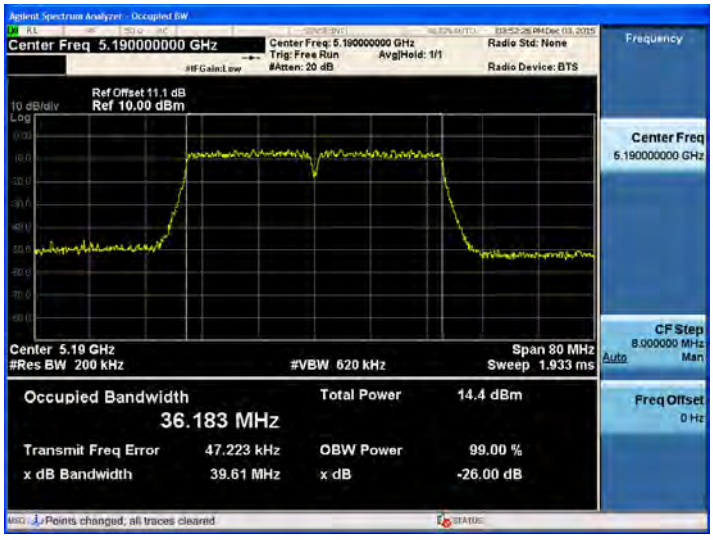
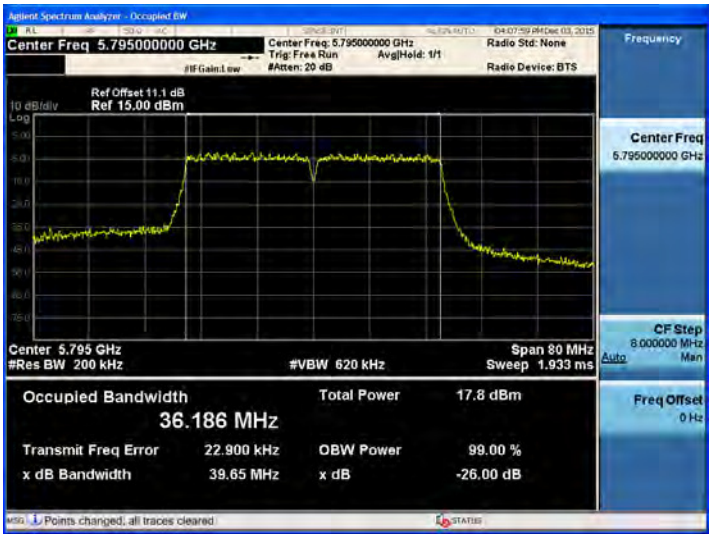
Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	39.608	N/A	Pass
5230	46	39.397	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_40 M BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	39.455	N/A	Pass
5795	159	39.646	N/A	Pass

▣ TEST Plot for Ant 1_802.11n_40MHz BW

802.11n_40 MHz BW UNII 1 BAND 26dB Bandwidth(CH 38)	802.11n_40 MHz BW UNII 2A BAND 26dB Bandwidth (CH 159)
	

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

Conducted 6 dB Bandwidth_Ant.0

▣ TEST RESULTS for Ant.0_802.11a/n_20MHz BW

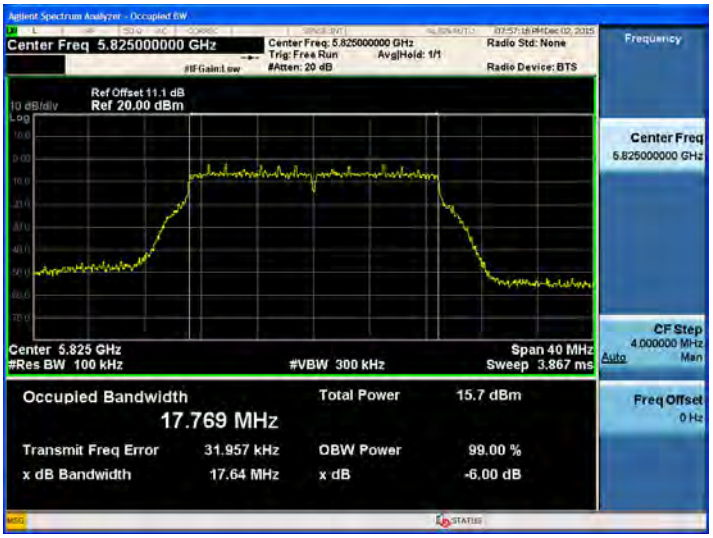
Conducted 6 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.390	0.5	Pass
5785	157	16.400	0.5	Pass
5825	165	16.400	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_20MHz BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.610	0.5	Pass
5785	157	17.620	0.5	Pass
5825	165	17.640	0.5	Pass

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

802.11a UNII 3 BAND 6dB Bandwidth (CH.157)	802.11n_20 MHz BW 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.0_ 802.11n _40MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11n_40MHz BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.020	0.5	Pass
5795	159	36.130	0.5	Pass

▣ TEST Plot for Ant.0_ 802.11n _40MHz BW

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

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

Conducted 6 dB Bandwidth_Ant.1

▣ TEST RESULTS for Ant.1_802.11a/n_20MHz BW

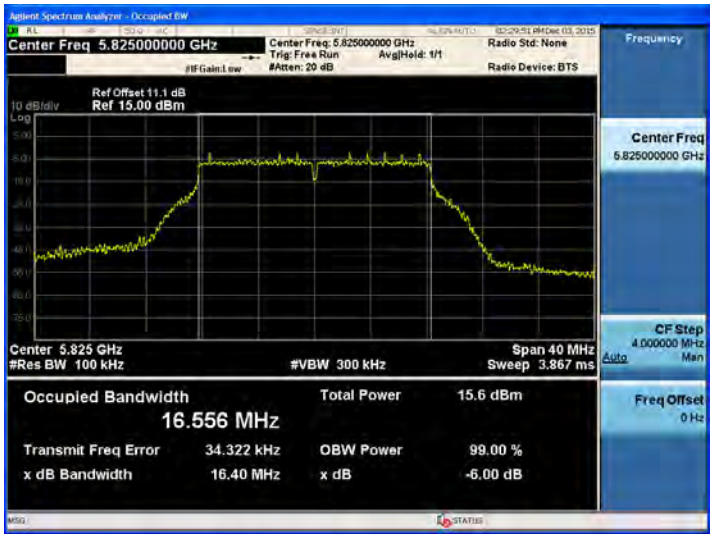
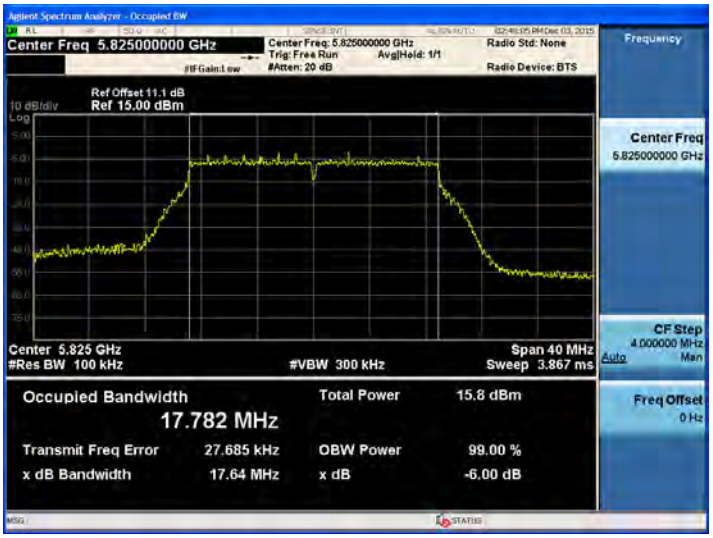
Conducted 6 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.386	0.5	Pass
5785	157	16.379	0.5	Pass
5825	165	16.403	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_20MHz BW

802.11n(20MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.632	0.5	Pass
5785	157	17.604	0.5	Pass
5825	165	17.644	0.5	Pass

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

802.11a UNII 3 BAND 6dB Bandwidth (CH.165)	802.11n_20 MHz BW UNII 3 BAND 6dB Bandwidth(CH.165)
	

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

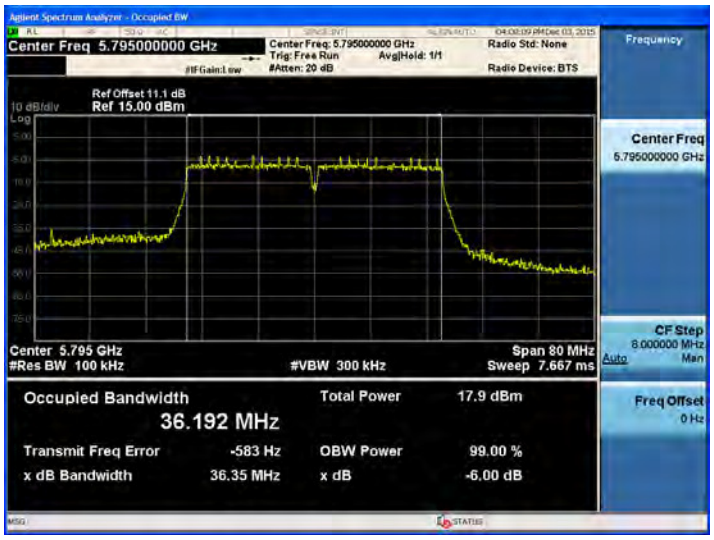
▣ TEST RESULTS for Ant.1_ 802.11n _40MHz BW

Conducted 6 dB Bandwidth Measurements for 802.11n_40MHz BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.350	0.5	Pass
5795	159	36.353	0.5	Pass

▣ TEST Plot for Ant.1_ 802.11n _40MHz BW

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



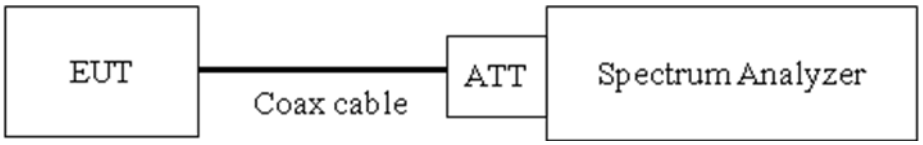
Note : In order to simplify the report, attached plots were only the most wide channel.

8.3 99% BANDWIDTH MEASUREMENT

limit

The 99 % bandwidth is used to determine the conducted power limits.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer.

RBW = 1% ~ 5% of the occupied bandwidth
VBW ≒ 3 x RBW
Detector = Peak
Trace mode = max hold
Sweep = auto couple
Allow the trace to stabilize

Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

▣ TEST RESULTS for Ant.0_20MHz BW

Conducted 99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	16.759
5200	40	16.766
5240	48	16.778
5745	149	16.749
5785	157	16.810
5825	165	16.799

▣ TEST Plot for Ant.0_20MHz BW

802.11a UNII 1 BAND 99% Bandwidth (CH.48)	802.11a UNII 3 BAND 99% Bandwidth (CH.157)
	

▣ TEST Plot for Ant.0 _20MHz BW

Conducted 99% Bandwidth Measurements for 802.11n_20 MHz BW

802.11n Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	17.926
5200	40	17.896
5240	48	17.918
5745	149	17.940
5785	157	17.946
5825	165	17.929

▣ TEST Plot Ant.0 _20MHz BW

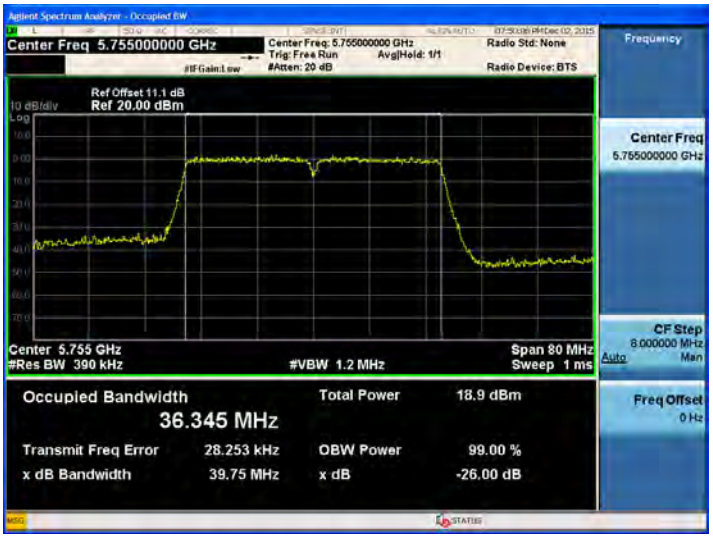
802.11n_20MHz BW UNII 1 BAND 99% Bandwidth(CH.36)	802.11n_20MHz BW UNII 3 BAND 99% Bandwidth(CH.157)
	

▣ TEST RESULTS for Ant.0_40MHz BW

Conducted 99% Bandwidth Measurements for 802.11n_40 MHz BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5190	38	36.345
5230	46	36.314
5755	151	36.345
5795	159	36.270

▣ TEST Plot Ant.0_40MHz BW

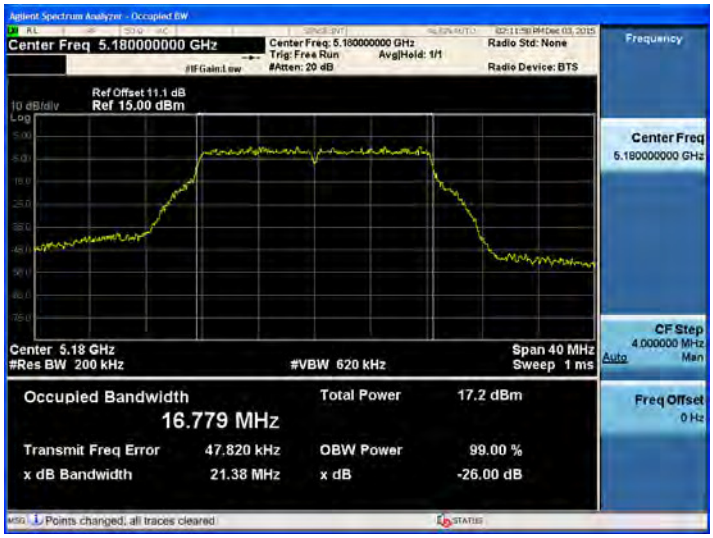
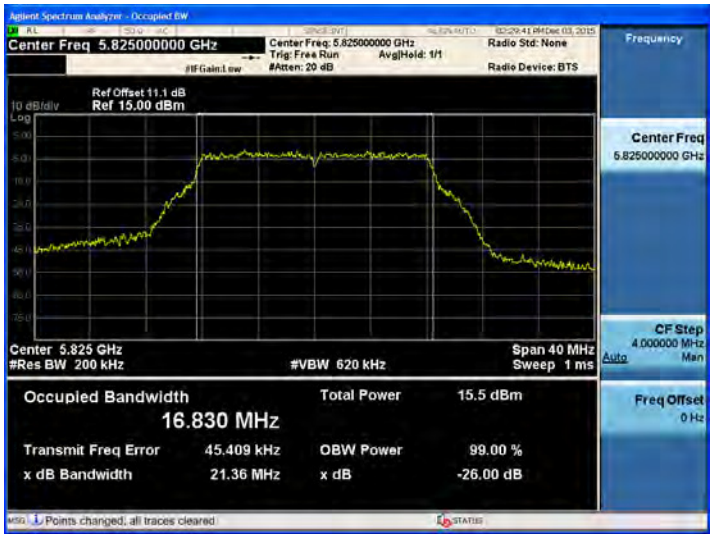
802.11n_40MHz BW UNII 1 BAND 99% Bandwidth(CH.38)	802.11n_40MHz BW UNII 3 BAND 99% Bandwidth(CH.151)
	

▣ TEST RESULTS for Ant.1_20MHz BW

Conducted 99% Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	16.779
5200	40	16.772
5240	48	16.773
5745	149	16.821
5785	157	16.762
5825	165	16.830

▣ TEST Plot for Ant.1_20MHz BW

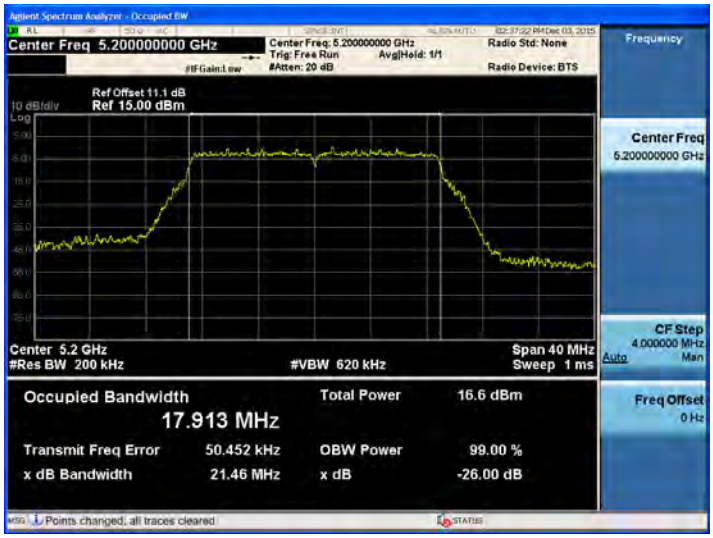
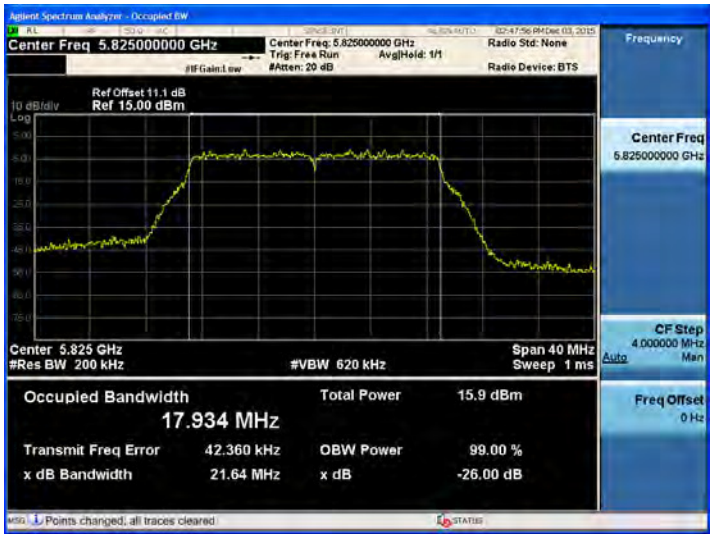
802.11a UNII 1 BAND 99% Bandwidth (CH.36)	802.11a UNII 3 BAND 99% Bandwidth (CH.165)
	

▣ TEST Plot for Ant.1 _20MHz BW

Conducted 99% Bandwidth Measurements for 802.11n_20 MHz BW

802.11n Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5180	36	17.892
5200	40	17.913
5240	48	17.891
5745	149	17.907
5785	157	17.872
5825	165	17.934

▣ TEST Plot Ant.1 _20MHz BW

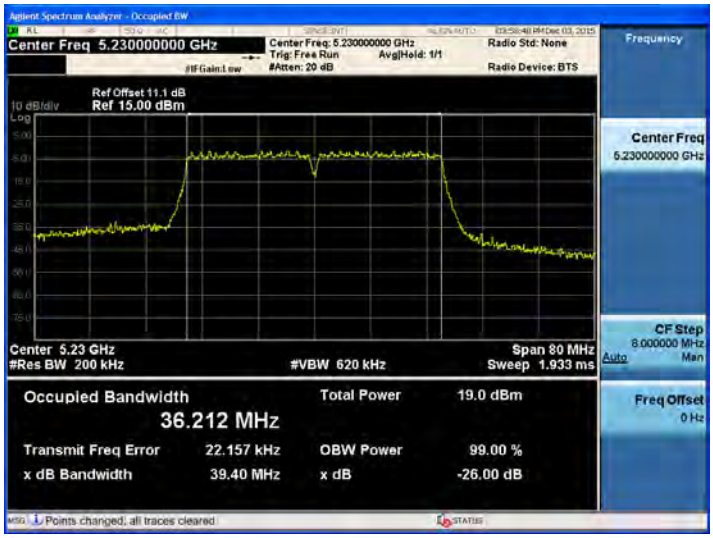
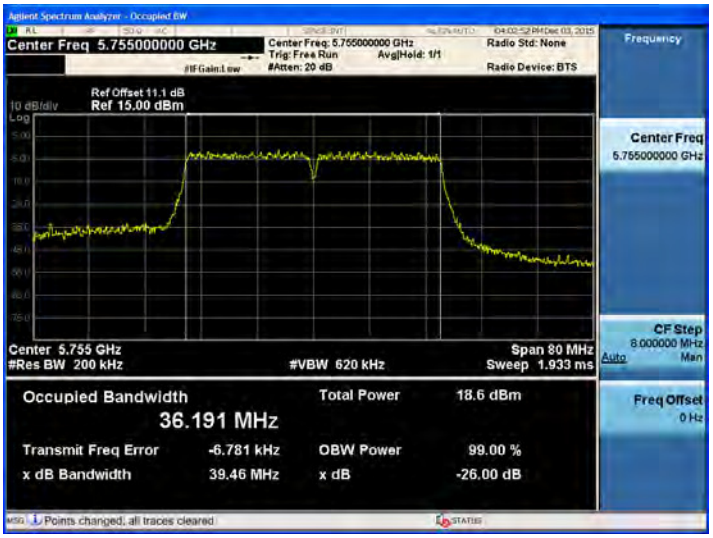
802.11n_20MHz BW UNII 1 BAND 99% Bandwidth(CH.40)	802.11n_20MHz BW UNII 3 BAND 99% Bandwidth(CH.165)
	

▣ TEST RESULTS for Ant.1_40MHz BW

Conducted 99% Bandwidth Measurements for 802.11n_40 MHz BW

802.11n(40MHz) Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
5190	38	36.183
5230	46	36.212
5755	151	36.191
5795	159	36.186

▣ TEST Plot Ant.1_40MHz BW

802.11n_40MHz BW UNII 1 BAND 99% Bandwidth(CH.46)	802.11n_40MHz BW UNII 3 BAND 99% Bandwidth(CH.151)
	

8.4 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.407(a)(1) / RSS-247(Issue 1) 6.2

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(For FCC)	Limit(For IC)
UNII 1	802.11a,n	23.98 dBm	23.01 dBm(e.i.r.p.)
UNII 3	802.11a,n	30 dBm	30 dBm

1. Maximum Conducted Output Power(for FCC):

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit (dBm)
SISO	UNII 1	802.11a, n	Ant 0	2.86	23.98
			Ant 1	2.30	23.98
	UNII 3		Ant 0	3.48	30.00
			Ant 1	3.87	30.00
MIMO(CDD,SDM)	UNII 1	802.11a, n	Ant 0 & 1	5.59	23.98
	UNII 3			6.69	29.31

2. Maximum Conducted Output Power(for IC):

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit (dBm)
SISO	UNII 1	802.11a, n	Ant 0	2.86	20.15
			Ant 1	2.30	20.70
	UNII 3		Ant 0	3.48	30.00
			Ant 1	3.87	30.00
MIMO(CDD,SDM)	UNII 1	802.11a, n	Ant 0 & 1	5.59	17.42
	UNII 3			6.69	29.31

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

(according to KDB662911 D01 v02r01)

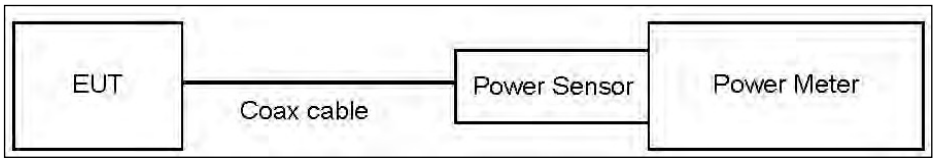
2. Limit is calculated by antenna gain.

3. Limit of UNII1 for IC is used the conducted level.

Limit = e.i.r.p limit – Antenna gain

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

▣ TEST CONFIGURATION(20 MHz BW)



▣ TEST PROCEDURE(20 MHz BW)

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

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

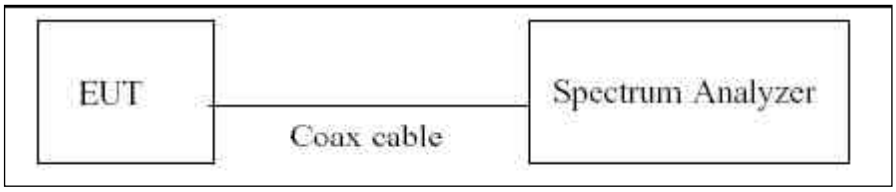
Note :

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

Band	Loss(dB)
UNII 1, 3	11.1

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

▣ TEST CONFIGURATION(40 MHz BW)



▣ TEST PROCEDURE(40 MHz BW)

▪ Average Power

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

The Spectrum Analyzer is set to

1. Measure the duty cycle.
2. Set span to encompass the 26 dB EBW of the signal.
3. RBW = 1 MHz.
4. VBW ≥ 3 MHz.
5. Number of points in sweep ≥ 2*span/RBW.
6. Sweep time = auto.
7. Detector = RMS.
8. Do not use sweep triggering. Allow the sweep to "free run".
9. Trace average at least 100 traces in power averaging(RMS) mode
10. Integrated bandwidth = OBW
11. Add 10log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

▣ Sample Calculation (Conducted)

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

▣ Sample Calculation (EIRP)

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

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

2. Spectrum offset = Attenuator loss + Cable loss

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

Band	Loss(dB)
UNII 1, 3	11.1

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

Ant.0_802.11a_20MHz BW (UNII 1)

▣ TEST RESULTS

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

802.11a(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	11.75	0.23	11.98	20.15
		9	11.64	0.22	11.86	20.15
		12	11.58	0.22	11.80	20.15
		18	11.56	0.22	11.78	20.15
		24	11.93	0.21	12.14	20.15
		36	11.90	0.28	12.18	20.15
		48	11.89	0.36	12.25	20.15
		54	11.76	0.40	12.16	20.15
5200	40	6	11.68	0.23	11.91	20.15
		9	11.73	0.22	11.95	20.15
		12	11.84	0.22	12.06	20.15
		18	11.69	0.22	11.91	20.15
		24	12.10	0.21	12.31	20.15
		36	11.90	0.28	12.18	20.15
		48	11.98	0.36	12.34	20.15
		54	11.75	0.40	12.15	20.15
5240	48	6	12.17	0.23	12.40	20.15
		9	12.16	0.22	12.38	20.15
		12	12.17	0.22	12.39	20.15
		18	12.20	0.22	12.42	20.15
		24	12.41	0.21	12.62	20.15
		36	12.37	0.28	12.65	20.15
		48	12.44	0.36	12.80	20.15
		54	12.31	0.40	12.71	20.15

Ant.1_802.11a_20MHz BW (UNII 1)

▣ TEST RESULTS

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

802.11a(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	10.60	0.23	10.83	20.70
		9	10.48	0.21	10.69	20.70
		12	10.51	0.20	10.71	20.70
		18	10.57	0.22	10.79	20.70
		24	10.74	0.22	10.96	20.70
		36	10.79	0.30	11.09	20.70
		48	10.65	0.36	11.01	20.70
		54	10.66	0.40	11.06	20.70
5200	40	6	10.58	0.23	10.81	20.70
		9	10.53	0.21	10.74	20.70
		12	10.51	0.20	10.71	20.70
		18	10.59	0.22	10.81	20.70
		24	10.79	0.22	11.01	20.70
		36	10.75	0.30	11.05	20.70
		48	10.78	0.36	11.14	20.70
		54	10.66	0.40	11.06	20.70
5240	48	6	11.09	0.23	11.32	20.70
		9	11.03	0.21	11.24	20.70
		12	11.08	0.20	11.28	20.70
		18	11.22	0.22	11.44	20.70
		24	11.40	0.22	11.62	20.70
		36	11.29	0.30	11.59	20.70
		48	11.38	0.36	11.74	20.70
		54	11.24	0.40	11.64	20.70

▣ 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	14.43	17.42
		9	14.30	17.42
		12	14.28	17.42
		18	14.31	17.42
		24	14.58	17.42
		36	14.66	17.42
		48	14.66	17.42
		54	14.64	17.42
5200	40	6	14.39	17.42
		9	14.38	17.42
		12	14.42	17.42
		18	14.39	17.42
		24	14.69	17.42
		36	14.64	17.42
		48	14.77	17.42
		54	14.63	17.42
5240	48	6	14.89	17.42
		9	14.84	17.42
		12	14.86	17.42
		18	14.95	17.42
		24	15.14	17.42
		36	15.15	17.42
		48	15.30	17.42
		54	15.20	17.42

Ant.0_802.11a _20MHz BW (UNII 3)

▣ TEST RESULTS

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

802.11a (20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	6	11.46	0.23	11.69	30
		9	11.25	0.22	11.47	30
		12	11.44	0.22	11.66	30
		18	11.48	0.22	11.70	30
		24	11.68	0.21	11.89	30
		36	11.61	0.28	11.89	30
		48	11.60	0.36	11.96	30
		54	11.49	0.40	11.89	30
5785	157	6	11.85	0.23	12.08	30
		9	11.86	0.22	12.08	30
		12	11.89	0.22	12.11	30
		18	11.89	0.22	12.11	30
		24	12.16	0.21	12.37	30
		36	12.07	0.28	12.35	30
		48	12.08	0.36	12.44	30
		54	11.94	0.40	12.34	30
5825	165	6	9.12	0.23	9.35	30
		9	9.14	0.22	9.36	30
		12	9.08	0.22	9.30	30
		18	9.11	0.22	9.33	30
		24	9.41	0.21	9.62	30
		36	9.33	0.28	9.61	30
		48	9.25	0.36	9.61	30
		54	9.24	0.40	9.64	30

Ant.1_802.11a _20MHz BW (UNII 3)

▣ TEST RESULTS

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

802.11a (20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	6	12.06	0.23	12.29	30
		9	11.90	0.21	12.11	30
		12	11.80	0.20	12.00	30
		18	11.81	0.22	12.03	30
		24	12.11	0.22	12.33	30
		36	12.09	0.30	12.39	30
		48	12.05	0.36	12.41	30
		54	11.92	0.40	12.32	30
5785	157	6	12.48	0.23	12.71	30
		9	12.42	0.21	12.63	30
		12	12.44	0.20	12.64	30
		18	12.55	0.22	12.77	30
		24	12.83	0.22	13.05	30
		36	12.70	0.30	13.00	30
		48	12.81	0.36	13.17	30
		54	12.65	0.40	13.05	30
5825	165	6	9.93	0.23	10.16	30
		9	9.95	0.21	10.16	30
		12	9.96	0.20	10.16	30
		18	10.06	0.22	10.28	30
		24	10.32	0.22	10.54	30
		36	10.15	0.30	10.45	30
		48	10.25	0.36	10.61	30
		54	10.17	0.40	10.57	30

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

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

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	6	15.01	29.31
		9	14.81	29.31
		12	14.84	29.31
		18	14.88	29.31
		24	15.12	29.31
		36	15.15	29.31
		48	15.20	29.31
		54	15.12	29.31
5785	157	6	15.41	29.31
		9	15.37	29.31
		12	15.39	29.31
		18	15.46	29.31
		24	15.73	29.31
		36	15.69	29.31
		48	15.82	29.31
		54	15.71	29.31
5825	165	6	12.77	29.31
		9	12.78	29.31
		12	12.75	29.31
		18	12.83	29.31
		24	13.10	29.31
		36	13.05	29.31
		48	13.13	29.31
		54	13.13	29.31

Ant.0_802.11n _20MHz BW (UNII 1)

▣ TEST RESULTS

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

802.11n(20MHz) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	11.68	0.22	11.90	20.15
		1	11.62	0.23	11.85	20.15
		2	11.69	0.20	11.89	20.15
		3	12.01	0.22	12.23	20.15
		4	11.98	0.30	12.28	20.15
		5	11.87	0.37	12.24	20.15
		6	11.93	0.42	12.35	20.15
		7	11.86	0.45	12.31	20.15
5200	40	0	11.66	0.22	11.88	20.15
		1	11.73	0.23	11.96	20.15
		2	11.62	0.20	11.82	20.15
		3	12.08	0.22	12.30	20.15
		4	11.95	0.30	12.25	20.15
		5	11.76	0.37	12.13	20.15
		6	11.81	0.42	12.23	20.15
		7	11.80	0.45	12.25	20.15
5240	48	0	12.27	0.22	12.49	20.15
		1	12.35	0.23	12.58	20.15
		2	12.37	0.20	12.57	20.15
		3	12.68	0.22	12.90	20.15
		4	12.62	0.30	12.92	20.15
		5	12.62	0.37	12.99	20.15
		6	12.52	0.42	12.94	20.15
		7	12.51	0.45	12.96	20.15

Ant.1_802.11n _20MHz BW (UNII 1)

▣ TEST RESULTS

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

802.11n(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	10.55	0.22	10.77	20.70
		1	10.43	0.23	10.66	20.70
		2	10.51	0.20	10.71	20.70
		3	10.92	0.20	11.12	20.70
		4	10.71	0.29	11.00	20.70
		5	10.63	0.37	11.00	20.70
		6	10.53	0.40	10.93	20.70
		7	10.66	0.45	11.11	20.70
5200	40	0	10.48	0.22	10.70	20.70
		1	10.42	0.23	10.65	20.70
		2	10.35	0.20	10.55	20.70
		3	10.86	0.20	11.06	20.70
		4	10.91	0.29	11.20	20.70
		5	10.78	0.37	11.15	20.70
		6	10.56	0.40	10.96	20.70
		7	10.67	0.45	11.12	20.70
5240	48	0	11.21	0.22	11.43	20.70
		1	11.20	0.23	11.43	20.70
		2	11.26	0.20	11.46	20.70
		3	11.66	0.20	11.86	20.70
		4	11.60	0.29	11.89	20.70
		5	11.51	0.37	11.88	20.70
		6	11.44	0.40	11.84	20.70
		7	11.44	0.45	11.89	20.70

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

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

802.11n(20MHz) Mode		Rate (Mbps)	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5180	36	0	14.36	17.42
		1	14.29	17.42
		2	14.33	17.42
		3	14.70	17.42
		4	14.67	17.42
		5	14.65	17.42
		6	14.68	17.42
		7	14.74	17.42
5200	40	0	14.32	17.42
		1	14.34	17.42
		2	14.22	17.42
		3	14.71	17.42
		4	14.75	17.42
		5	14.66	17.42
		6	14.63	17.42
		7	14.71	17.42
5240	48	0	14.99	17.42
		1	15.03	17.42
		2	15.04	17.42
		3	15.41	17.42
		4	15.43	17.42
		5	15.47	17.42
		6	15.42	17.42
		7	15.45	17.42

Ant.0_802.11n _20MHz BW (UNII 3)

▣ TEST RESULTS

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

802.11n(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	11.25	0.22	11.47	30
		1	11.32	0.23	11.55	30
		2	11.33	0.20	11.53	30
		3	11.73	0.22	11.95	30
		4	11.64	0.30	11.94	30
		5	11.44	0.37	11.81	30
		6	11.43	0.42	11.85	30
		7	11.47	0.45	11.92	30
5785	157	0	11.09	0.22	11.31	30
		1	11.13	0.23	11.36	30
		2	11.13	0.20	11.33	30
		3	11.52	0.22	11.74	30
		4	11.44	0.30	11.74	30
		5	11.41	0.37	11.78	30
		6	11.33	0.42	11.75	30
		7	11.33	0.45	11.78	30
5825	165	0	9.35	0.22	9.57	30
		1	9.30	0.23	9.53	30
		2	9.25	0.20	9.45	30
		3	9.70	0.22	9.92	30
		4	9.61	0.30	9.91	30
		5	9.60	0.37	9.97	30
		6	9.55	0.42	9.97	30
		7	9.45	0.45	9.90	30

Ant.1_802.11n _20MHz BW (UNII 3)

▣ TEST RESULTS

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

802.11n(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	11.76	0.22	11.98	30
		1	11.89	0.23	12.12	30
		2	11.91	0.20	12.11	30
		3	12.17	0.20	12.37	30
		4	12.12	0.29	12.41	30
		5	12.00	0.37	12.37	30
		6	12.04	0.40	12.44	30
		7	12.03	0.45	12.48	30
5785	157	0	11.74	0.22	11.96	30
		1	11.72	0.23	11.95	30
		2	11.72	0.20	11.92	30
		3	12.17	0.20	12.37	30
		4	12.17	0.29	12.46	30
		5	12.17	0.37	12.54	30
		6	12.29	0.40	12.69	30
		7	11.95	0.45	12.40	30
5825	165	0	10.08	0.22	10.30	30
		1	10.17	0.23	10.40	30
		2	10.21	0.20	10.41	30
		3	10.51	0.20	10.71	30
		4	10.56	0.29	10.85	30
		5	10.45	0.37	10.82	30
		6	10.43	0.40	10.83	30
		7	10.40	0.45	10.85	30

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

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

802.11n(20MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5745	149	0	14.74	29.31
		1	14.85	29.31
		2	14.84	29.31
		3	15.17	29.31
		4	15.19	29.31
		5	15.10	29.31
		6	15.16	29.31
		7	15.21	29.31
5785	157	0	14.65	29.31
		1	14.67	29.31
		2	14.64	29.31
		3	15.07	29.31
		4	15.12	29.31
		5	15.18	29.31
		6	15.24	29.31
		7	15.11	29.31
5825	165	0	12.95	29.31
		1	12.99	29.31
		2	12.95	29.31
		3	13.33	29.31
		4	13.40	29.31
		5	13.42	29.31
		6	13.42	29.31
		7	13.40	29.31

Ant.0_802.11n _40MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_40M BW Mode: 5190~5230)

802.11n(40MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	0	9.11	0.42	9.52	20.15
		1	9.05	0.42	9.47	20.15
		2	8.89	0.41	9.31	20.15
		3	9.12	0.38	9.50	20.15
		4	8.99	0.52	9.52	20.15
		5	8.84	0.64	9.48	20.15
		6	8.65	0.69	9.34	20.15
		7	8.70	0.75	9.45	20.15
5230	46	0	14.21	0.42	14.62	20.15
		1	14.17	0.42	14.59	20.15
		2	14.14	0.41	14.55	20.15
		3	14.42	0.38	14.80	20.15
		4	14.30	0.52	14.83	20.15
		5	14.17	0.64	14.81	20.15
		6	14.13	0.69	14.82	20.15
		7	14.01	0.75	14.76	20.15

Ant.1_802.11n _40MHz BW (UNII 1)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_40M BW Mode: 5190~5230)

802.11n(40MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	0	7.06	0.44	7.49	20.70
		1	6.98	0.42	7.41	20.70
		2	7.00	0.43	7.42	20.70
		3	7.05	0.38	7.43	20.70
		4	6.89	0.54	7.44	20.70
		5	7.11	0.64	7.74	20.70
		6	7.11	0.69	7.80	20.70
		7	7.01	0.77	7.78	20.70
5230	46	0	11.65	0.44	12.08	20.70
		1	11.70	0.42	12.12	20.70
		2	11.75	0.43	12.18	20.70
		3	12.04	0.38	12.42	20.70
		4	11.92	0.54	12.46	20.70
		5	11.71	0.64	12.35	20.70
		6	11.68	0.69	12.37	20.70
		7	11.61	0.77	12.39	20.70

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

Conducted Output Power Measurements (802.11n_40MHz Mode: 5190~5230)

802.11n(40MHz) Mode		Rate (Mbps)	Sum Power of Ant.0 & 1	Limit (dBm)
Frequency [MHz]	Channel No.			
5190	38	0	11.57	17.42
		1	11.51	17.42
		2	11.43	17.42
		3	11.54	17.42
		4	11.55	17.42
		5	11.66	17.42
		6	11.61	17.42
		7	11.67	17.42
5230	46	0	16.45	17.42
		1	16.45	17.42
		2	16.46	17.42
		3	16.70	17.42
		4	16.74	17.42
		5	16.68	17.42
		6	16.69	17.42
		7	16.67	17.42

Ant.0_802.11n_40MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_40M BW Mode: 5755~5795)

802.11n(40MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5755	151	0	11.99	0.42	12.40	30
		1	12.06	0.42	12.48	30
		2	12.06	0.41	12.48	30
		3	12.28	0.38	12.65	30
		4	12.18	0.52	12.71	30
		5	12.07	0.64	12.71	30
		6	11.98	0.69	12.67	30
		7	11.93	0.75	12.68	30
5795	159	0	11.24	0.42	11.65	30
		1	11.23	0.42	11.65	30
		2	11.19	0.41	11.60	30
		3	11.50	0.38	11.88	30
		4	11.23	0.52	11.75	30
		5	11.08	0.64	11.71	30
		6	11.13	0.69	11.81	30
		7	11.05	0.75	11.80	30

Ant.1_802.11n_40MHz BW (UNII 3)

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n_40M BW Mode: 5755~5795)

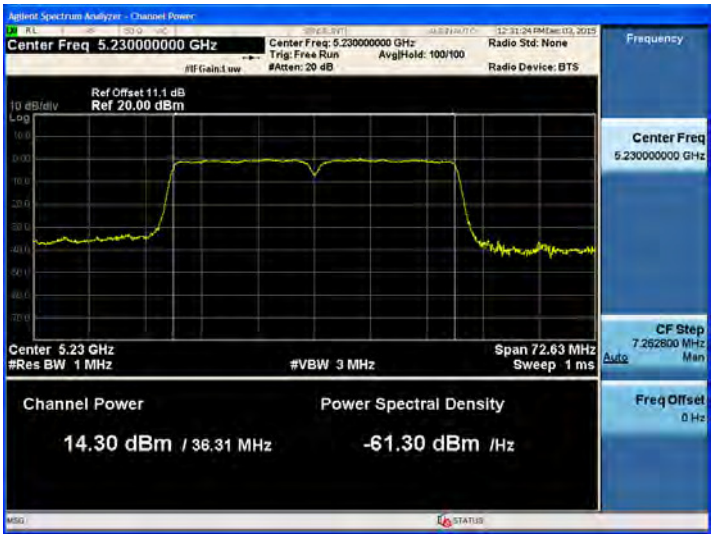
802.11n(40MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5755	151	0	11.20	0.44	11.64	30
		1	10.90	0.42	11.33	30
		2	10.99	0.43	11.42	30
		3	11.22	0.38	11.60	30
		4	11.05	0.54	11.59	30
		5	11.06	0.64	11.69	30
		6	10.88	0.69	11.57	30
		7	10.96	0.77	11.73	30
5795	159	0	10.36	0.44	10.79	30
		1	10.35	0.42	10.77	30
		2	10.27	0.43	10.69	30
		3	10.53	0.38	10.91	30
		4	10.38	0.54	10.93	30
		5	10.28	0.64	10.91	30
		6	10.29	0.69	10.98	30
		7	10.24	0.77	11.01	30

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

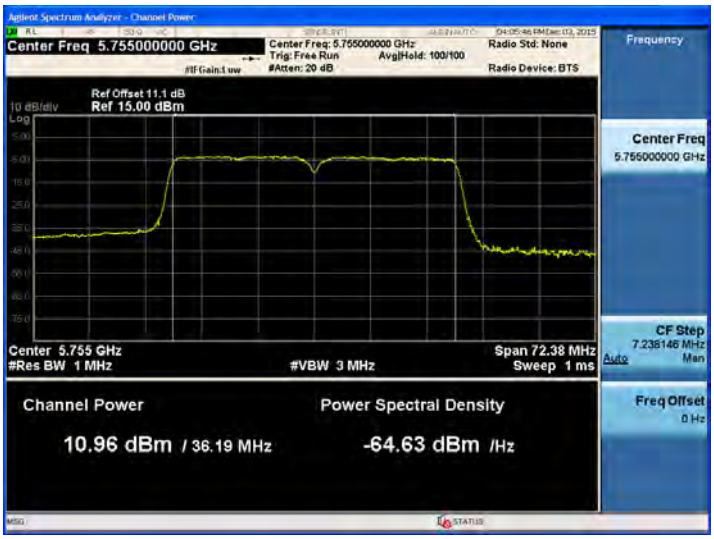
Conducted Output Power Measurements (802.11n_40MHz Mode: 5755~5795)

802.11n(40MHz) Mode		Rate (Mbps)	Measured Power (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.			
5755	151	0	15.04	29.31
		1	14.93	29.31
		2	14.98	29.31
		3	15.15	29.31
		4	15.18	29.31
		5	15.23	29.31
		6	15.15	29.31
		7	15.24	29.31
5795	159	0	14.24	29.31
		1	14.23	29.31
		2	14.17	29.31
		3	14.42	29.31
		4	14.36	29.31
		5	14.33	29.31
		6	14.42	29.31
		7	14.42	29.31

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

802.11n_40 MHz BW UNII 1 BAND Average Power (5190 MHz ~5230 MHz) CH 46 MCS 4	802.11n_40 MHz BW UNII 3 BAND Average Power (5755 MHz ~5795 MHz) CH 151 MCS 5
	

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

802.11n_40 MHz BW UNII 1 BAND Average Power (5190 MHz ~5230 MHz) CH 46 MCS 7	802.11n_40 MHz BW UNII 3 BAND Average Power (5755 MHz ~5795 MHz) CH 151 MCS 7
	

8.5 POWER SPECTRAL DENSITY

Test Requirements and limit, §15.247(a)(1),(5) / RSS-247(Issue 1) 6.2

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.

▣ Limit

Band	Mode	Limit(For FCC)	Limit(For IC)
UNII 1	802.11a,n	11 dBm/MHz	10 dBm/MHz(e.i.r.p.)
UNII 3	802.11a,n	30 dBm/500 kHz	30 dBm/500 kHz

1. Power Spectral Density(for FCC):

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit
SISO	UNII 1	802.11a, n	Ant 0	2.86	11 dBm/MHz
			Ant 1	2.30	11 dBm/MHz
	UNII 3		Ant 0	3.48	30 dBm/500 kHz
			Ant 1	3.87	30 dBm/500 kHz
MIMO(CDD,SDM)	UNII 1	802.11a, n	Ant 0 & 1	5.59	11 dBm/MHz
	UNII 3			6.69	29.31 dBm/500 kHz

2. Power Spectral Density(for IC):

Operating Mode	Band	Mode	Operating Ant.	Ant. Gain (dBi)	Limit
SISO	UNII 1	802.11a, n	Ant 0	2.86	7.14 dBm/MHz
			Ant 1	2.30	7.70 dBm/MHz
	UNII 3		Ant 0	3.48	30 dBm/500 kHz
			Ant 1	3.87	30 dBm/500 kHz
MIMO(CDD,SDM)	UNII 1	802.11a, n	Ant 0 & 1	5.59	4.41 dBm/MHz
	UNII 3			6.69	29.31 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

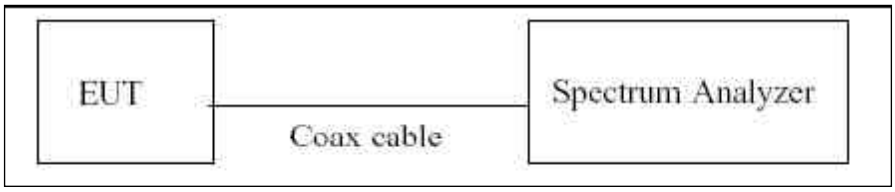
(according to KDB662911 D01 v02r01)

2. Limit is calculated by antenna gain.

3. Limit of UNII1 for IC is used the conducted level.

Limit = e.i.r.p limit – Antenna gain

▣ TEST CONFIGURATION



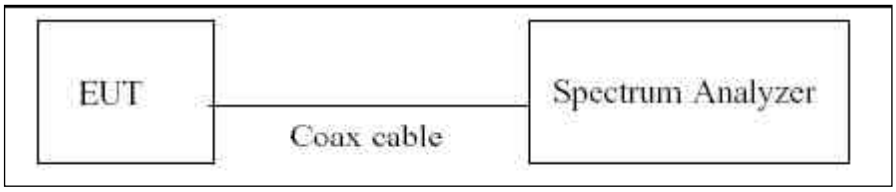
▣ TEST PROCEDURE

We tested according to Method in KDB 789033(issued 06/06/2014).

The spectrum analyzer is set to :

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz.
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.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to Method in KDB 789033(issued 06/06/2014).

The spectrum analyzer is set to :

11. Set span to encompass the entire emission bandwidth(EBW) of the signal.
12. RBW = 1 MHz(510 kHz for UNII 3)
13. VBW ≥ 3 MHz
14. Number of points in sweep ≥ 2*span/RBW.
15. Sweep time = auto.
16. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
17. Do not use sweep triggering. Allow the sweep to “free run”.
18. Trace average at least 100 traces in power averaging(RMS) mode
19. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
20. 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

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

Output Power = -5 dBm + 10 dB + 0.8 dB + 0.21 dB = 16.01 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 to the offset in the UNII band that was rounded off to the closest tenth dB.
   Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1, 3	11.1

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

▣ **Ant.0**

▣ **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	0.749	0.362	1.111	7.14	Pass
5200	40		0.636	0.362	0.998	7.14	Pass
5240	48		1.269	0.362	1.631	7.14	Pass
5765	153		-1.991	0.362	-1.629	30	Pass
5785	157		-2.018	0.362	-1.656	30	Pass
5825	165		-5.395	0.401	-4.994	30	Pass
5180	36	802.11n 20MHz BW	1.225	0.420	1.645	7.14	Pass
5200	40		1.349	0.217	1.566	7.14	Pass
5240	48		2.111	0.369	2.480	7.14	Pass
5765	153		-2.030	0.217	-1.813	30	Pass
5785	157		-2.842	0.452	-2.390	30	Pass
5825	165		-4.739	0.420	-4.319	30	Pass
5190	38	802.11n 40MHz BW	-5.526	0.416	-5.110	7.14	Pass
5230	46		0.019	0.522	0.541	7.14	Pass
5755	151		-4.701	0.637	-4.064	30	Pass
5795	159		-5.717	0.378	-5.339	30	Pass

▣ **Ant.1**

▣ **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	-0.318	0.300	-0.018	7.70	Pass
5200	40		-0.438	0.362	-0.076	7.70	Pass
5240	48		-0.293	0.362	0.069	7.70	Pass
5765	153		-2.631	0.362	-2.269	30	Pass
5785	157		-2.034	0.362	-1.672	30	Pass
5825	165		-4.512	0.362	-4.150	30	Pass
5180	36	802.11n 20MHz BW	-0.820	0.200	-0.620	7.70	Pass
5200	40		-0.825	0.287	-0.538	7.70	Pass
5240	48		-0.766	0.452	-0.314	7.70	Pass
5765	153		-2.841	0.452	-2.389	30	Pass
5785	157		-2.956	0.401	-2.555	30	Pass
5825	165		-4.963	0.452	-4.511	30	Pass
5190	38	802.11n 40MHz BW	-7.168	0.687	-6.481	7.70	Pass
5230	46		-2.538	0.542	-1.996	7.70	Pass
5755	151		-5.622	0.775	-4.847	30	Pass
5795	159		-6.694	0.775	-5.919	30	Pass

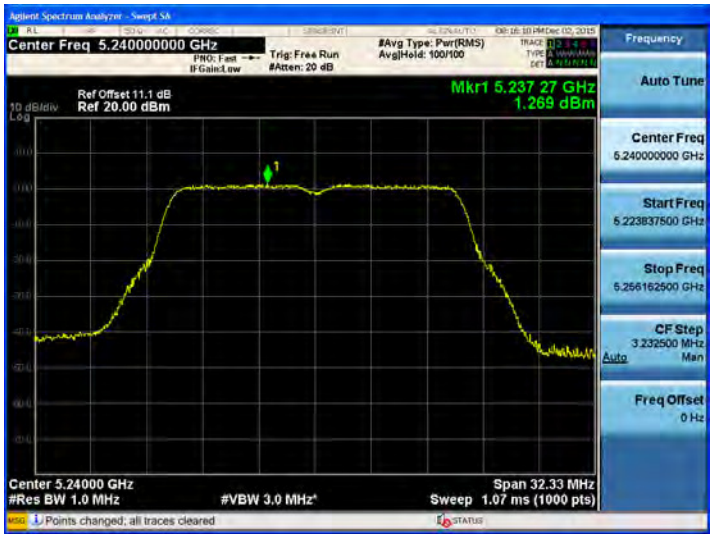
▣ **Sum Data of Ant.0 and Ant.1**

▣ **TEST RESULTS**

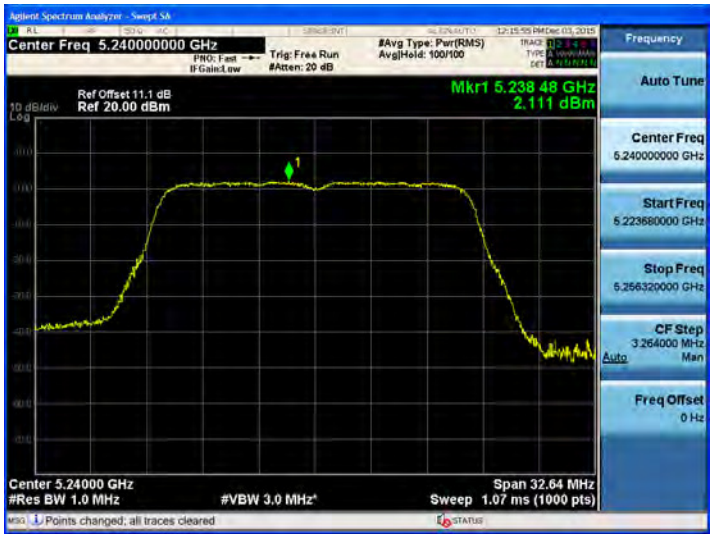
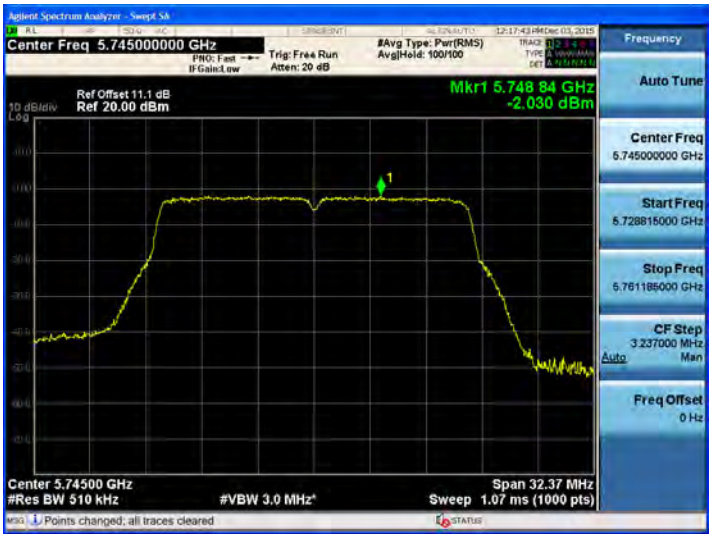
Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			Measured Power Density (dBm)	Limit (dBm)	Pass/Fail
5180	36	802.11a	3.58	4.41	Pass
5200	40		3.49		Pass
5240	48		3.90		Pass
5765	153		1.07	29.31	Pass
5785	157		1.35		Pass
5825	165		-1.55		Pass
5180	36	802.11n 20MHz BW	3.60	4.41	Pass
5200	40		3.59		Pass
5240	48		4.20		Pass
5765	153		0.91	29.31	Pass
5785	157		0.54		Pass
5825	165		-1.40		Pass
5190	38	802.11n 40MHz BW	-2.76	4.41	Pass
5230	46		2.38		Pass
5755	151		-1.44	29.31	Pass
5795	159		-2.61		Pass

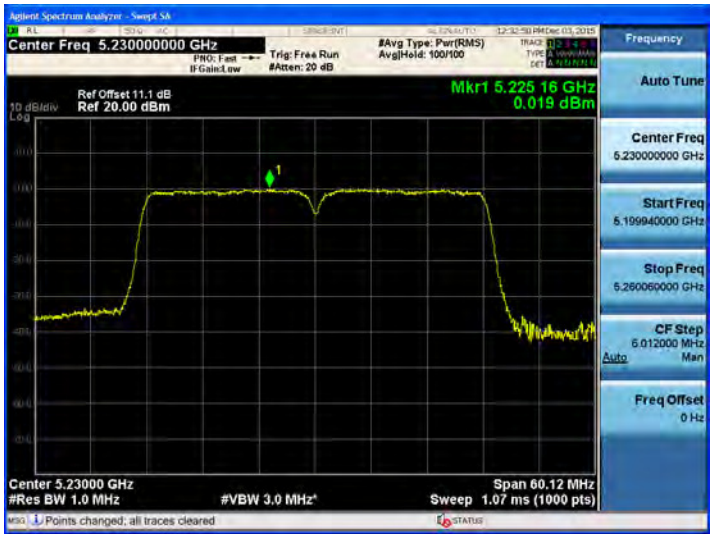
▣ TEST Plot for 802.11a 20MHz BW_Ant.0

802.11a_20MHz BW UNII 1 BAND PSD CH 48	802.11a_20MHz BW UNII 3 BAND PSD CH 149
	

▣ TEST Plot for 802.11n 20MHz BW_Ant.0

802.11n_20MHz BW UNII 1 BAND PSD CH 48 for FCC	802.11n_20MHz BW UNII 3 BAND PSD CH 149 for FCC
	

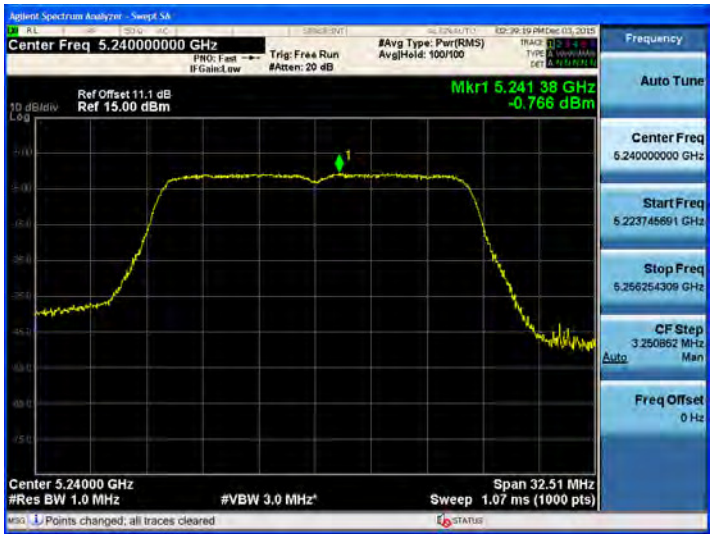
▣ TEST Plot for 802.11n 40MHz BW_Ant.0

802.11n_40MHz BW UNII 1 BAND PSD CH 46 for FCC	802.11n_40MHz BW UNII 3 BAND PSD CH 151 for FCC
	

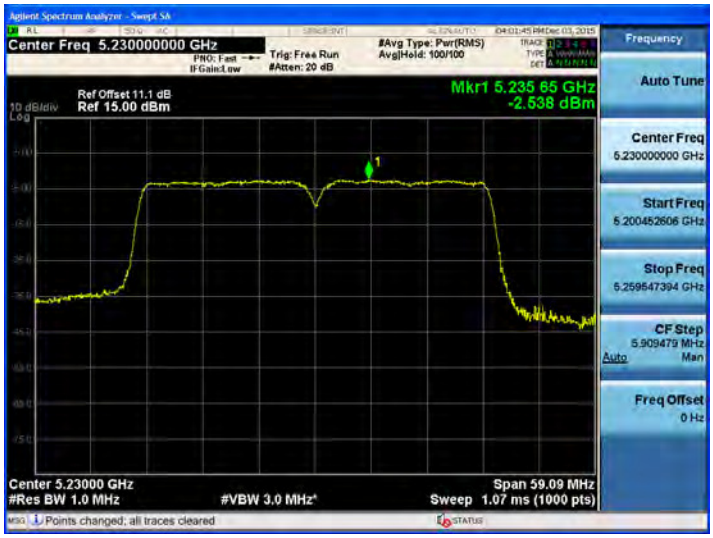
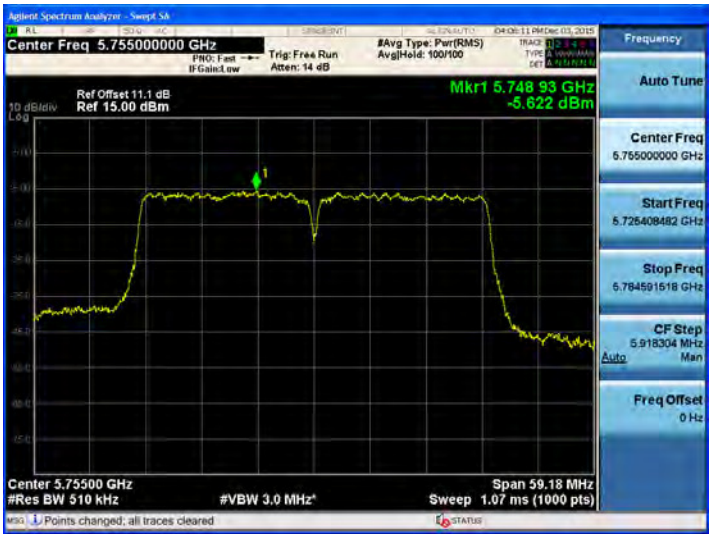
▣ TEST Plot for 802.11a 20MHz BW_Ant.1

802.11a_20MHz BW UNII 1 BAND PSD CH 48 for FCC	802.11a_20MHz BW UNII 3 BAND PSD CH 157 for FCC
	

▣ TEST Plot for 802.11n 20MHz BW_Ant.1

802.11n_20MHz BW UNII 1 BAND PSD CH 48 for FCC	802.11n_20MHz BW UNII 3 BAND PSD CH 149 for FCC
	

▣ TEST Plot for 802.11n 40MHz BW_Ant.1

802.11n_40MHz BW UNII 1 BAND PSD CH 46 for FCC	802.11n_40MHz BW UNII 3 BAND PSD CH 151 for FCC
	

8.6 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.

20 MHz BW

OPERATING BAND: UNII Band 1
OPERATING FREQUENCY: 5,180,000,000 Hz
CHANNEL: 36
REFERENCE VOLTAGE: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.3	+20(Ref)	5180025.05	25.05
100%		-30	5180005.43	5.43
100%		-20	5180019.82	19.82
100%		-10	5179996.08	-3.92
100%		0	5179988.17	-11.83
100%		+10	5180029.11	29.11
100%		+30	5180000.16	0.16
100%		+40	5180010.84	10.84
100%		+50	5179997.78	-2.22
115%	3.795	+20	5180025.05	18.23
Batt. Endpoint	2.805	+20	5180005.43	23.92

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: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.3	+20(Ref)	5745023.60	23.60
100%		-30	5744984.54	-15.46
100%		-20	5744987.08	-12.92
100%		-10	5744986.55	-13.45
100%		0	5745001.72	1.72
100%		+10	5745008.44	8.44
100%		+30	5745017.20	17.2
100%		+40	5745024.59	24.59
100%		+50	5745010.96	10.96
115%	3.795	+20	5745009.89	9.89
Batt. Endpoint	2.805	+20	5745019.41	19.41

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: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.3	+20(Ref)	5190021.21	21.21
100%		-30	5189981.59	-18.41
100%		-20	5189986.66	-13.34
100%		-10	5189984.06	-15.94
100%		0	5190009.47	9.47
100%		+10	5190018.42	18.42
100%		+30	5189979.67	-20.33
100%		+40	5190017.68	17.68
100%		+50	5190029.44	29.44
115%	3.795	+20	5190028.45	28.45
Batt. Endpoint	2.805	+20	5190008.73	8.73

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: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (kHz)	Frequency Error (kHz)
100%	3.3	+20(Ref)	5755018.63	18.63
100%		-30	5754981.57	-18.43
100%		-20	5754986.21	-13.79
100%		-10	5754994.18	-5.82
100%		0	5755011.18	11.18
100%		+10	5755017.76	17.76
100%		+30	5755015.69	15.69
100%		+40	5754995.32	-4.68
100%		+50	5755025.34	25.34
115%	3.795	+20	5755009.78	9.78
Batt. Endpoint	2.805	+20	5755015.18	15.18

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.

8.7 RADIATED MEASUREMENT

8.7.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209, §15.407 / RSS-247(Issue 1) 6.2

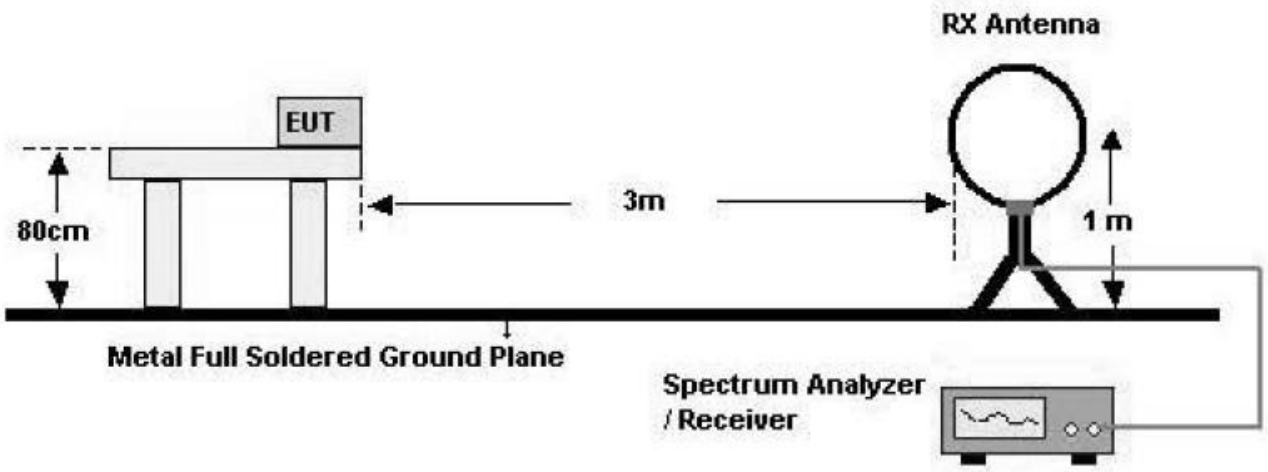
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

▣ §15.407 / RSS-247(Issue 1), KDB 789033 D02

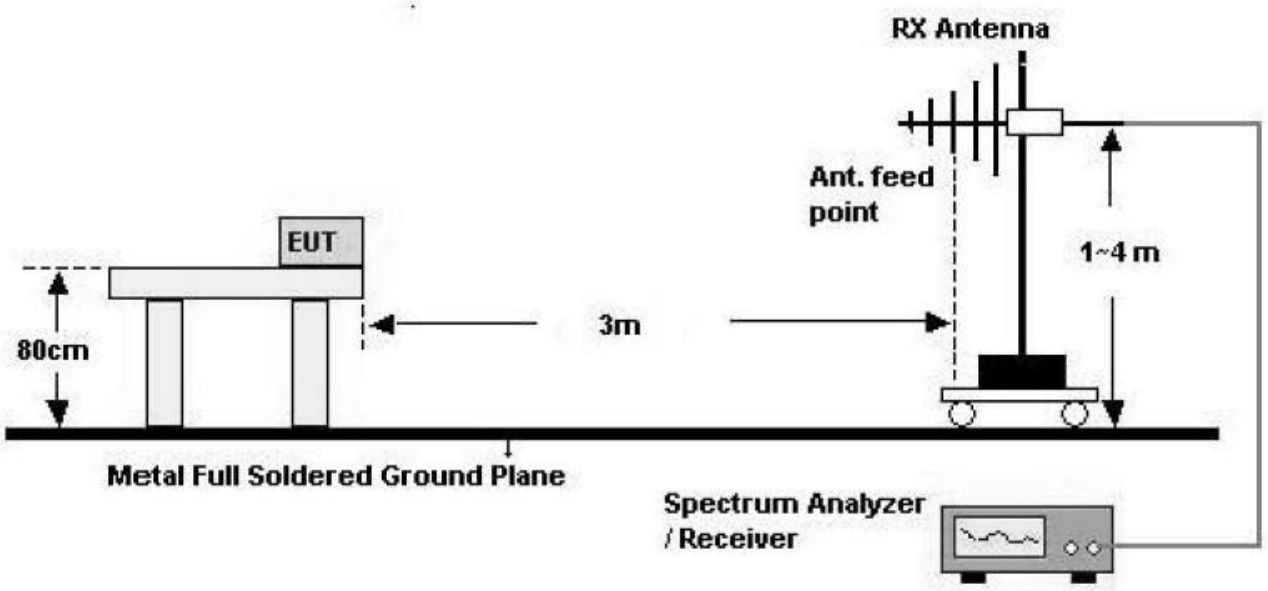
All harmonics that do not lie in a restricted band are subject to a peak limit of -27 dBm/MHz. At a distance of 3 meters the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2 dB to the EIRP limit of -27 dBm/MHz to obtain the limit for out of band spurious emissions 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

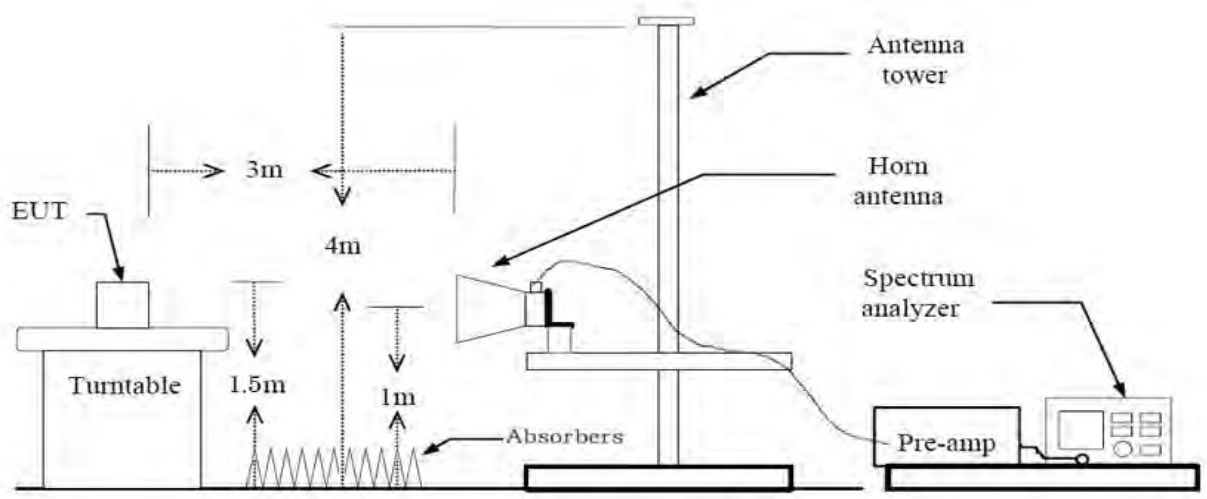
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

ANSI C63.10:2013

Method G)5) in KDB 789033, issued 06/06/2014 (Peak)

Method G)6)d) in KDB 789033, issued 06/06/2014 (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_20,n_40 mode to perform the average filed strength measurements.
2. The actual setting value of VBW for 802.11a/n_20,n_40

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**	**2.064**	**2.177**	**94.81**	**484**	**1000**
n_20	**6.5**	**1.921**	**2.019**	**95.15**	**521**	**1000**
n_40	**MCS Index 0**	**0.945**	**1.040**	**90.87**	**1058**	**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.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/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_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	67.31	-6.00	V	61.31	68.20	6.89	PK
15540	62.83	-6.13	V	56.70	73.98	17.28	PK
15540	49.43	-6.13	V	43.30	53.98	10.68	AV
10360	67.77	-6.00	H	61.77	68.20	6.43	PK
15540	62.88	-6.13	H	56.75	73.98	17.23	PK
15540	49.46	-6.13	H	43.33	53.98	10.65	AV

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.

Band :	UNII 1
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	67.68	-6.03	V	61.65	68.20	6.55	PK
15600	63.61	-6.71	V	56.90	73.98	17.08	PK
15600	49.92	-6.71	V	43.21	53.98	10.77	AV
10400	68.09	-6.03	H	62.06	68.20	6.14	PK
15600	63.64	-6.71	H	56.93	73.98	17.05	PK
15600	49.94	-6.71	H	43.23	53.98	10.75	AV

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.

Band :	UNII 1
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	68.09	-6.20	V	61.89	68.20	6.31	PK
15720	63.48	-6.46	V	57.02	73.98	16.96	PK
15720	49.83	-6.46	V	43.37	53.98	10.61	AV
10480	68.55	-6.20	H	62.35	68.20	5.85	PK
15720	63.57	-6.46	H	57.11	73.98	16.87	PK
15720	49.87	-6.46	H	43.41	53.98	10.57	AV

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

Band :	UNII 1
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	65.97	-6.00	V	59.97	68.20	8.23	PK
15540	62.86	-6.13	V	56.73	73.98	17.25	PK
15540	49.39	-6.13	V	43.26	53.98	10.72	AV
10360	66.21	-6.00	H	60.21	68.20	7.99	PK
15540	62.91	-6.13	H	56.78	73.98	17.20	PK
15540	49.42	-6.13	H	43.29	53.98	10.69	AV

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	66.91	-6.03	V	60.88	68.20	7.32	PK
15600	63.60	-6.71	V	56.89	73.98	17.09	PK
15600	49.88	-6.71	V	43.17	53.98	10.81	AV
10400	67.39	-6.03	H	61.36	68.20	6.84	PK
15600	63.58	-6.71	H	56.87	73.98	17.11	PK
15600	49.91	-6.71	H	43.20	53.98	10.78	AV

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	66.34	-6.20	V	60.14	68.20	8.06	PK
15720	63.53	-6.46	V	57.07	73.98	16.91	PK
15720	49.80	-6.46	V	43.34	53.98	10.64	AV
10480	66.61	-6.20	H	60.41	68.20	7.79	PK
15720	63.61	-6.46	H	57.15	73.98	16.83	PK
15720	49.85	-6.46	H	43.39	53.98	10.59	AV

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10380	62.97	-5.67	V	57.30	68.20	10.90	PK
15570	63.37	-5.86	V	57.51	73.98	16.47	PK
15570	49.73	-5.86	V	43.87	53.98	10.11	AV
10380	62.99	-5.67	H	57.32	68.20	10.88	PK
15570	63.38	-5.86	H	57.52	73.98	16.46	PK
15570	49.75	-5.86	H	43.89	53.98	10.09	AV

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_40 MHz BW. Worst case is MCS 0 in 802.11n_40 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5230 MHz
Channel No.	46 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10460	65.89	-6.20	V	59.69	68.20	8.51	PK
15690	63.44	-6.34	V	57.10	73.98	16.88	PK
15690	50.24	-6.34	V	43.90	53.98	10.08	AV
10460	66.19	-6.20	H	59.99	68.20	8.21	PK
15690	63.50	-6.34	H	57.16	73.98	16.82	PK
15690	50.26	-6.34	H	43.92	53.98	10.06	AV

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_40 MHz BW. Worst case is MCS 0 in 802.11n_40 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 3
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5745MHz
Channel No.	149 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	70.89	-5.43	V	65.46	73.98	8.52	PK
11490	55.64	-5.43	V	50.21	53.98	3.77	AV
17235	62.71	-1.30	V	61.41	68.20	6.79	PK
11490	71.32	-5.43	H	65.89	73.98	8.09	PK
11490	56.02	-5.43	H	50.59	53.98	3.39	AV
17235	62.74	-1.30	H	61.44	68.20	6.76	PK

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.

Band :	UNII 3
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	70.32	-5.41	V	64.91	73.98	9.07	PK
11570	55.79	-5.41	V	50.38	53.98	3.60	AV
17355	62.53	-0.40	V	62.13	68.20	6.07	PK
11570	70.66	-5.41	H	65.25	73.98	8.73	PK
11570	56.17	-5.41	H	50.76	53.98	3.22	AV
17355	62.49	-0.40	H	62.09	68.20	6.11	PK

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.

Band :	UNII 3
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	65.23	-5.43	V	59.80	73.98	14.18	PK
11650	51.13	-5.43	V	45.70	53.98	8.28	AV
17475	61.89	-0.28	V	61.61	68.20	6.59	PK
11650	65.60	-5.43	H	60.17	73.98	13.81	PK
11650	51.57	-5.43	H	46.14	53.98	7.84	AV
17475	61.93	-0.28	H	61.65	68.20	6.55	PK

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

Band :	UNII 3
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5745 MHz
Channel No.	149 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	68.56	-5.43	V	63.13	73.98	10.85	PK
11490	54.54	-5.43	V	49.11	53.98	4.87	AV
17235	63.95	-1.30	V	62.65	68.20	5.55	PK
11490	68.92	-5.43	H	63.49	73.98	10.49	PK
11490	55.01	-5.43	H	49.58	53.98	4.40	AV
17235	63.98	-1.30	H	62.68	68.20	5.52	PK

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 3
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	67.02	-5.41	V	61.61	73.98	12.37	PK
11570	53.63	-5.41	V	48.22	53.98	5.76	AV
17355	62.31	-0.40	V	61.91	68.20	6.29	PK
11570	67.31	-5.41	H	61.90	73.98	12.08	PK
11570	54.02	-5.41	H	48.61	53.98	5.37	AV
17355	62.44	-0.40	H	62.04	68.20	6.16	PK

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 3
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	65.95	-5.43	V	60.52	73.98	13.46	PK
11650	51.63	-5.43	V	46.20	53.98	7.78	AV
17475	61.90	-0.28	V	61.62	68.20	6.58	PK
11650	66.20	-5.43	H	60.77	73.98	13.21	PK
11650	51.95	-5.43	H	46.52	53.98	7.46	AV
17475	61.92	-0.28	H	61.64	68.20	6.56	PK

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_20 MHz BW. Worst case is MCS 0 in 802.11n_20 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII3
Operation Mode:	802.11n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5755 MHz
Channel No.	151 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11510	67.18	-5.23	V	61.95	73.98	12.03	PK
11510	53.48	-5.23	V	48.25	53.98	5.73	AV
17265	62.41	-1.12	V	61.29	68.20	6.91	PK
11510	67.50	-5.23	H	62.27	73.98	11.71	PK
11510	53.95	-5.23	H	48.72	53.98	5.26	AV
17265	62.44	-1.12	H	61.32	68.20	6.88	PK

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_40 MHz BW. Worst case is MCS 0 in 802.11n_40 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 3
Operation Mode:	802.11n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5795 MHz
Channel No.	159 Ch

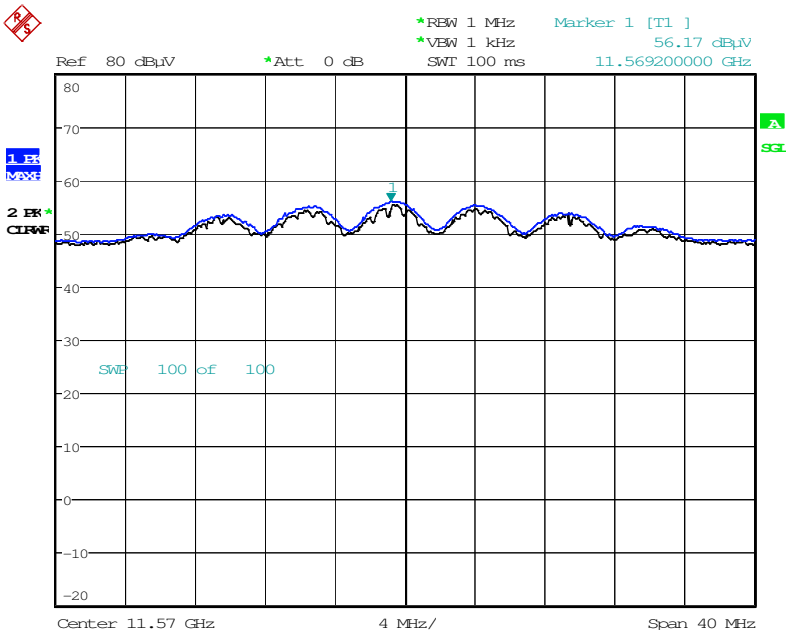
Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11590	65.81	-5.35	V	60.46	73.98	13.52	PK
11590	52.11	-5.35	V	46.76	53.98	7.22	AV
17385	62.39	-0.10	V	62.29	68.20	5.91	PK
11590	66.11	-5.35	H	60.76	73.98	13.22	PK
11590	52.50	-5.35	H	47.15	53.98	6.83	AV
17385	62.42	-0.10	H	62.32	68.20	5.88	PK

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_40 MHz BW. Worst case is MCS 0 in 802.11n_40 MHz BW.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

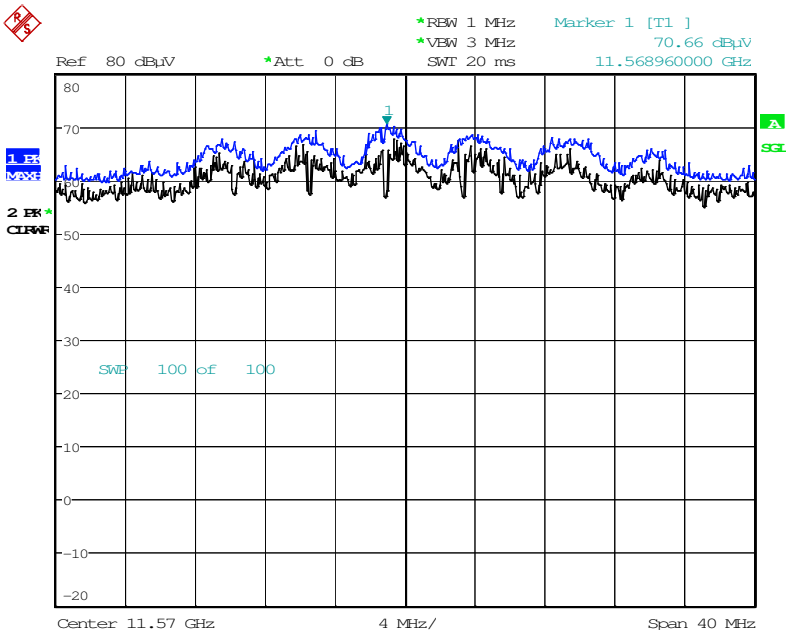
▣ RESULT PLOTS

Radiated Spurious Emissions plot –Average Reading (802.11a_20M, Ch.157 2nd Harmonic)



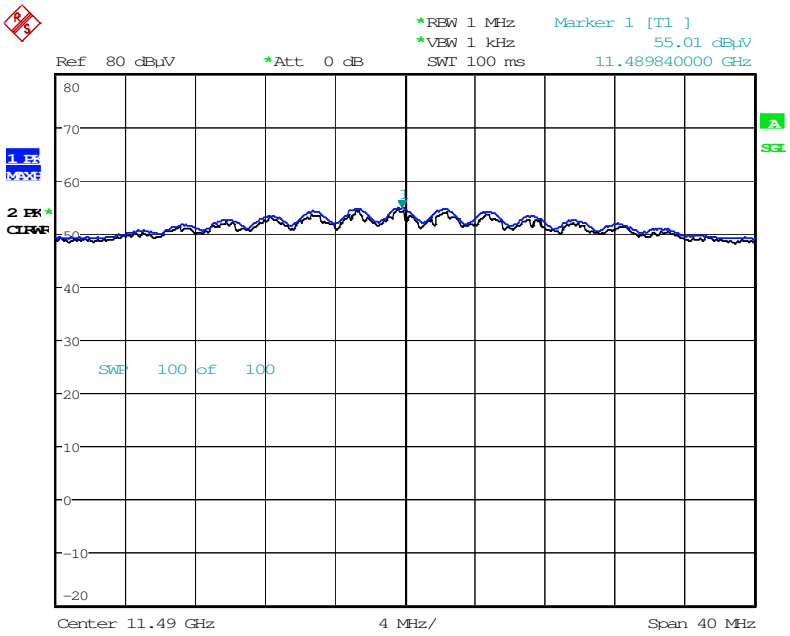
Date: 1.DEC.2015 05:12:53

Radiated Spurious Emissions plot – Peak Reading (802.11a_20M, Ch.157 2nd Harmonic)



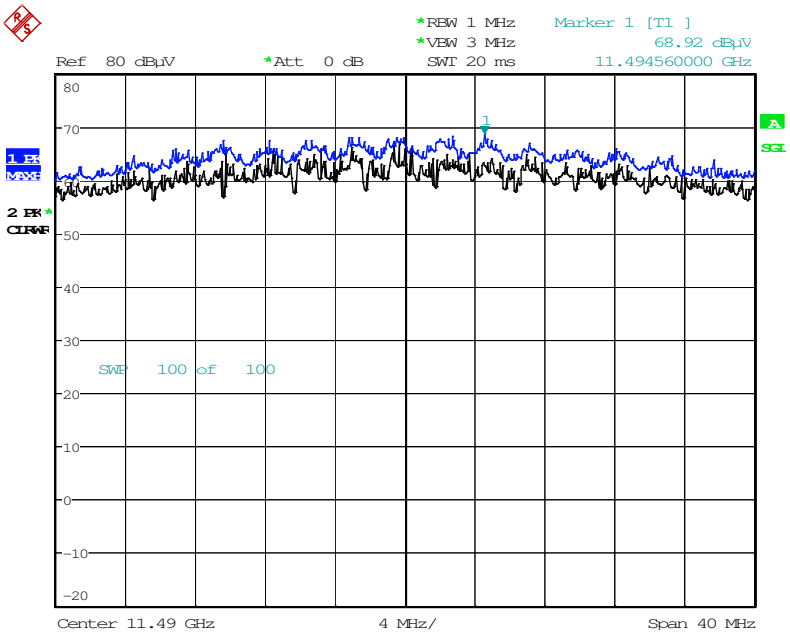
Date: 1.DEC.2015 05:13:23

Radiated Spurious Emissions plot –Average Reading (802.11n_20M, Ch.149 2nd Harmonic)



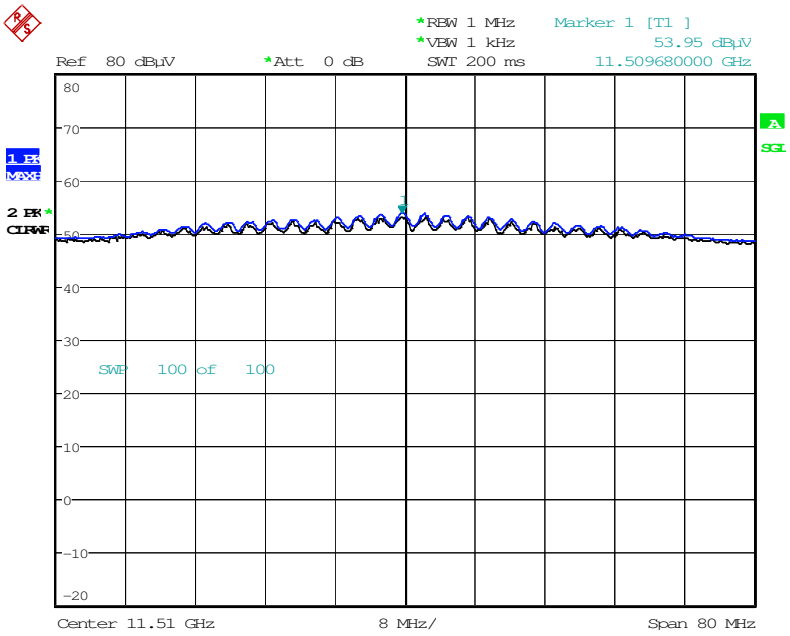
Date: 1.DEC.2015 05:21:59

Radiated Spurious Emissions plot – Peak Reading (802.11n_20M, Ch.149 2nd Harmonic)



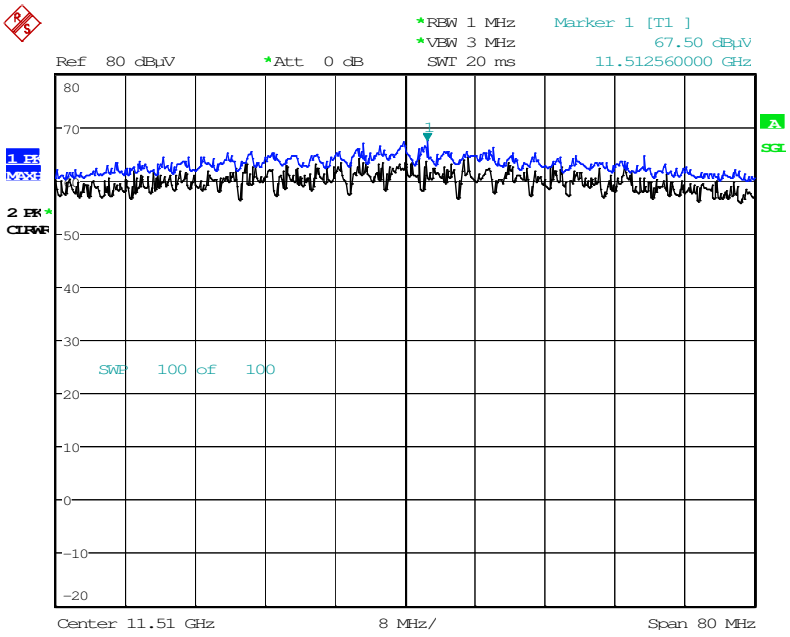
Date: 1.DEC.2015 05:20:23

Radiated Spurious Emissions plot –Average Reading (802.11n_40M, Ch.151 2nd Harmonic)



Date: 1.DEC.2015 05:30:55

Radiated Spurious Emissions plot – Peak Reading (802.11n_40M, Ch.151 2nd Harmonic)



Date: 1.DEC.2015 05:31:13

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

8.7.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

Test Requirements and limit, §15.407, §15.205, §15.209 / RSS-GEN(Issue 4) 8.10

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_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP+ATT. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	52.44	8.18	H	60.62	73.98	13.36	PK
5150	38.21	8.18	H	46.39	53.98	7.59	AV
5150	53.43	8.18	V	61.61	73.98	12.37	PK
5150	39.72	8.18	V	47.9	53.98	6.08	AV

Band :	UNII 1
Operation Mode:	802.11 n_20 MHz BW
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	49.45	8.18	H	57.63	73.98	16.35	PK
5150	36.84	8.18	H	45.02	53.98	8.96	AV
5150	50.53	8.18	V	58.71	73.98	15.27	PK
5150	38.24	8.18	V	46.42	53.98	7.56	AV

Band :	UNII 1
Operation Mode:	802.11 n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	53.57	8.18	H	61.75	73.98	12.23	PK
5150	40.89	8.18	H	49.07	53.98	4.91	AV
5150	53.26	8.18	V	61.44	73.98	12.54	PK
5150	40.54	8.18	V	48.72	53.98	5.26	AV

Band :	UNII 3
Operation Mode:	802.11 a_20 MHz BW
Transfer Rate:	6 Mbps
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading DBuV	AN.+CL-AMP+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
*5850	48.55	11.47	H	60.02	78.20	18.18	PK
*5850	48.11	11.47	V	59.58	78.20	18.62	PK
*5860	47.32	11.47	H	58.79	68.20	9.41	PK
*5860	46.89	11.47	V	58.36	68.20	9.84	PK

Band :	UNII 3
Operation Mode:	802.11 n_20MHz BW
Transfer MCS Index:	0
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading DBuV	AN.+CL-AMP+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
*5850	48.79	11.47	H	60.26	78.20	17.94	PK
*5850	48.64	11.47	V	60.11	78.20	18.09	PK
*5860	46.90	11.47	H	58.37	68.20	9.83	PK
*5860	46.77	11.47	V	58.24	68.20	9.96	PK

Band :	UNII 3
Operation Mode:	802.11 n_40 MHz BW
Transfer MCS Index:	0
Operating Frequency	5795 MHz
Channel No.	159 Ch

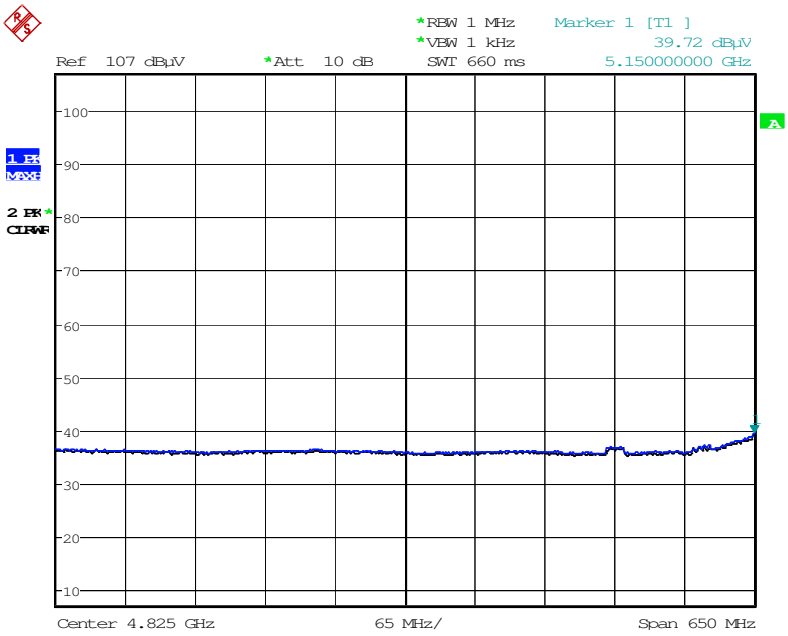
Frequency [MHz]	Reading DBuV	AN.+CL-AMP+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
*5850	48.06	11.47	H	59.53	78.20	18.67	PK
*5850	47.84	11.47	V	59.31	78.20	18.89	PK
*5860	47.48	11.47	H	58.95	68.20	9.25	PK
*5860	47.18	11.47	V	58.65	68.20	9.55	PK

Notes:

1. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + ATT
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)

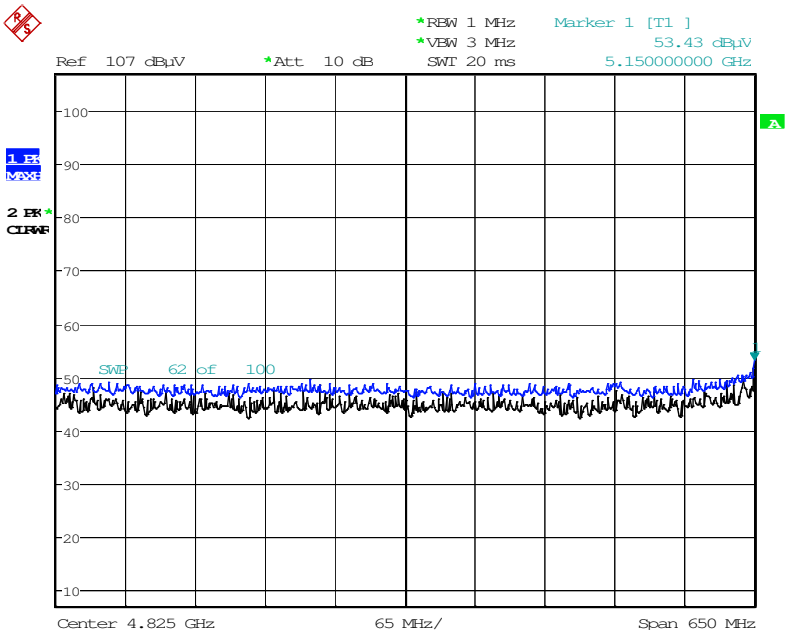
▣ RESULT PLOTS

Radiated Restricted Band Edges plot – Average Reading (802.11a_20M, Ch.36)



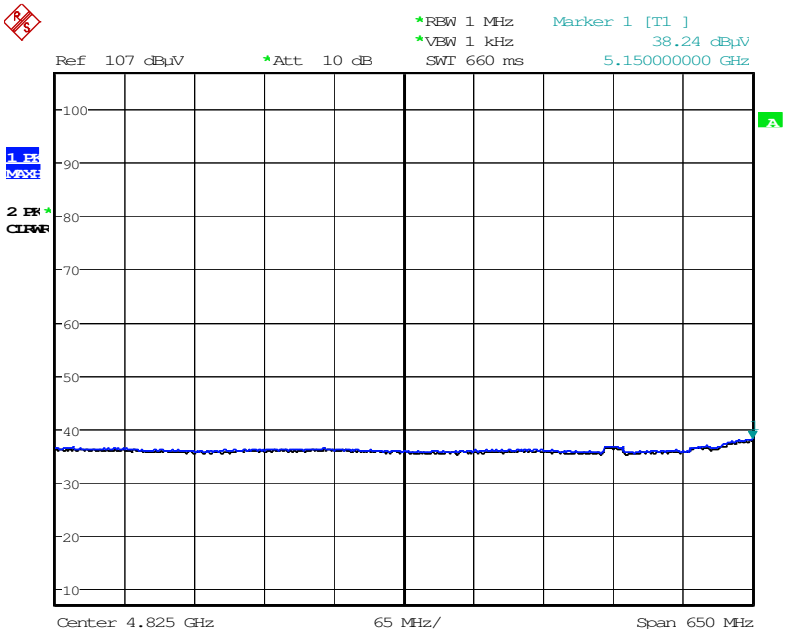
Date: 18.NOV.2015 05:15:52

Radiated Restricted Band Edges plot – Peak Reading (802.11a_20M, Ch.36)



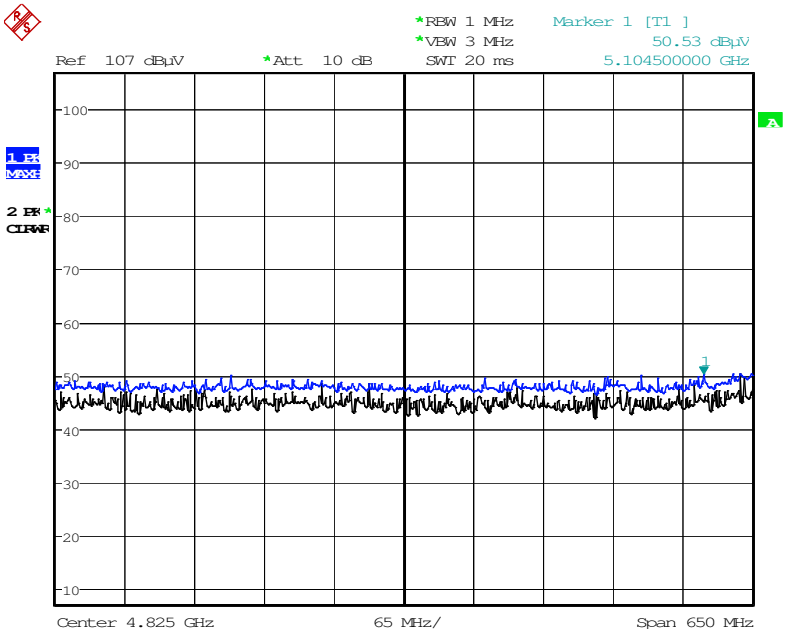
Date: 18.NOV.2015 05:14:54

Radiated Restricted Band Edges plot – Average Reading (802.11n_20M, Ch.36)



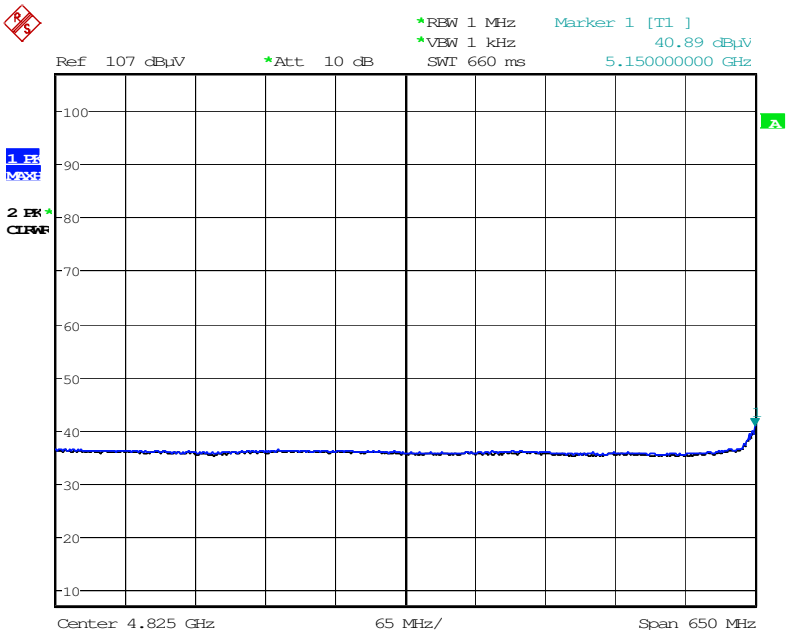
Date: 18.NOV.2015 05:17:27

Radiated Restricted Band Edges plot – Peak Reading (802.11n_20M, Ch.36)



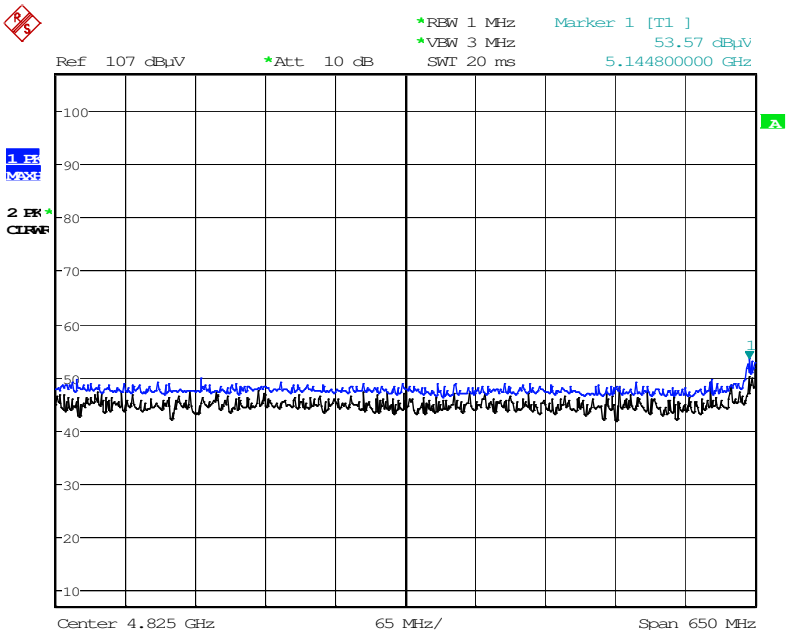
Date: 18.NOV.2015 05:18:14

Radiated Restricted Band Edges plot – Average Reading (802.11 n_40M, Ch.38)



Date: 18.NOV.2015 05:23:22

Radiated Restricted Band Edges plot – Peak Reading (802.11n_40M, Ch.38)



Date: 18.NOV.2015 05:23:49

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

8.7.3 RECEIVER SPURIOUS EMISSIONS

IC Rule(s) **RSS-GEN**

Test Requirements: **Blow the table**

Operating conditions: **Under normal test conditions**

Method of testing: **Radiated**

S/A. Settings: **F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)**
F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)

Mode of operation: **Receive**

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receiver

30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV	dB /m	dB	(H/V)	dBμV/m	dBμV/m	dB
220.39	15.08	10.80	1.27	H	25.88	46	20.12
632.18	15.24	20.50	1.96	V	35.74	46	10.26
850.37	15.44	23.90	2.38	H	39.34	46	6.66

Above 1 GHz

Frequency	Reading	Ant. factor+Cable loss- Amp Gain	Ant. POL	Total	Limit	Margin	Detect mode
(MHz)	(dBμV)	(dB)	(H/V)	(dBμV/m)	(dBμV/m)	(dB)	
1701	51.59	-12.78	V	38.81	73.98	35.17	PK
3702	50.94	-7.21	H	43.73	73.98	30.25	PK
6103	48.72	4.02	V	52.74	73.98	21.24	PK

Note : The result using peak detect mode is lower than average limit. So, there is no data for average detect mode.

8.8 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207 / RSS-GEN(Issue 4) 8.8

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)

EMI Auto Test(13) 1 / 2

HCT TEST Report

Common Information

EUT:	WC1NP6
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN MODE_5G
Operator Name:	KS KANG

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.6	9.000	Off	N	9.6	11.4	66.0
0.154000	53.4	9.000	Off	N	9.6	12.4	65.8
0.164000	52.1	9.000	Off	N	9.6	13.2	65.3
0.172000	47.9	9.000	Off	N	9.6	17.0	64.9
0.178000	47.4	9.000	Off	N	9.6	17.2	64.6
0.182000	47.7	9.000	Off	N	9.6	16.7	64.4
1.126000	42.9	9.000	Off	N	9.7	13.1	56.0
1.140000	44.4	9.000	Off	N	9.7	11.6	56.0
1.146000	44.7	9.000	Off	N	9.7	11.3	56.0
1.152000	43.8	9.000	Off	N	9.7	12.2	56.0
1.156000	45.1	9.000	Off	N	9.7	10.9	56.0
1.162000	44.0	9.000	Off	N	9.7	12.0	56.0
13.522000	25.3	9.000	Off	N	10.1	34.7	60.0
13.532000	25.5	9.000	Off	N	10.1	34.5	60.0
13.578000	25.5	9.000	Off	N	10.1	34.5	60.0
13.628000	25.3	9.000	Off	N	10.1	34.7	60.0

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EMI Auto Test(13) 2 / 2

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
13.652000	25.4	9.000	Off	N	10.1	34.6	60.0
13.678000	24.8	9.000	Off	N	10.1	35.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.156000	33.8	9.000	Off	N	9.6	21.9	55.7
0.160000	33.6	9.000	Off	N	9.6	21.9	55.5
0.164000	32.9	9.000	Off	N	9.6	22.4	55.3
0.168000	31.9	9.000	Off	N	9.6	23.2	55.1
0.174000	29.3	9.000	Off	N	9.6	25.5	54.8
0.178000	29.1	9.000	Off	N	9.6	25.5	54.6
1.128000	35.7	9.000	Off	N	9.7	10.3	46.0
1.140000	36.6	9.000	Off	N	9.7	9.4	46.0
1.146000	36.7	9.000	Off	N	9.7	9.3	46.0
1.152000	36.5	9.000	Off	N	9.7	9.5	46.0
1.156000	36.7	9.000	Off	N	9.7	9.3	46.0
1.164000	36.8	9.000	Off	N	9.7	9.2	46.0
13.412000	19.0	9.000	Off	N	10.1	31.0	50.0
13.448000	18.8	9.000	Off	N	10.1	31.2	50.0
13.476000	18.9	9.000	Off	N	10.1	31.1	50.0
13.522000	18.9	9.000	Off	N	10.1	31.1	50.0
13.578000	19.1	9.000	Off	N	10.1	30.9	50.0
13.628000	19.0	9.000	Off	N	10.1	31.0	50.0

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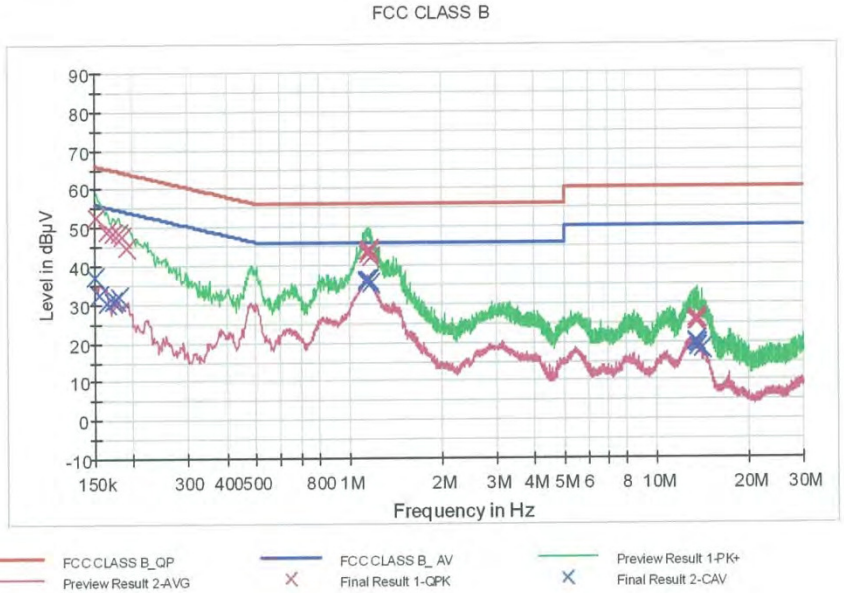
Conducted Emissions (Line 2)

EMI Auto Test(13) 1 / 2

HCT TEST Report

Common Information

EUT:	WC1NP6
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN MODE_5G
Operator Name:	KS KANG



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.152000	52.8	9.000	Off	L1	9.6	13.1	65.9
0.164000	48.9	9.000	Off	L1	9.6	16.4	65.3
0.172000	48.3	9.000	Off	L1	9.6	16.6	64.9
0.180000	48.2	9.000	Off	L1	9.6	16.3	64.5
0.184000	47.4	9.000	Off	L1	9.6	16.9	64.3
0.190000	44.6	9.000	Off	L1	9.6	19.4	64.0
1.146000	43.6	9.000	Off	L1	9.7	12.4	56.0
1.152000	43.0	9.000	Off	L1	9.7	13.0	56.0
1.158000	44.1	9.000	Off	L1	9.7	11.9	56.0
1.162000	43.9	9.000	Off	L1	9.7	12.1	56.0
1.168000	43.2	9.000	Off	L1	9.7	12.8	56.0
1.184000	42.1	9.000	Off	L1	9.7	13.9	56.0
13.360000	26.2	9.000	Off	L1	10.1	33.8	60.0
13.504000	25.1	9.000	Off	L1	10.1	34.9	60.0
13.524000	25.4	9.000	Off	L1	10.1	34.6	60.0
13.528000	25.1	9.000	Off	L1	10.1	34.9	60.0

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EMI Auto Test(13) 2 / 2

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
13.542000	26.1	9.000	Off	L1	10.1	33.9	60.0
13.560000	25.2	9.000	Off	L1	10.1	34.8	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	37.0	9.000	Off	L1	9.6	19.0	56.0
0.156000	32.5	9.000	Off	L1	9.6	23.2	55.7
0.164000	30.1	9.000	Off	L1	9.6	25.2	55.3
0.172000	30.8	9.000	Off	L1	9.6	24.1	54.9
0.176000	31.3	9.000	Off	L1	9.6	23.4	54.7
0.180000	31.8	9.000	Off	L1	9.6	22.7	54.5
1.134000	35.9	9.000	Off	L1	9.7	10.1	46.0
1.144000	36.2	9.000	Off	L1	9.7	9.8	46.0
1.152000	36.1	9.000	Off	L1	9.7	9.9	46.0
1.160000	36.4	9.000	Off	L1	9.7	9.6	46.0
1.168000	36.3	9.000	Off	L1	9.7	9.7	46.0
1.184000	35.4	9.000	Off	L1	9.7	10.6	46.0
13.360000	19.6	9.000	Off	L1	10.1	30.4	50.0
13.368000	20.1	9.000	Off	L1	10.1	29.9	50.0
13.514000	18.6	9.000	Off	L1	10.1	31.4	50.0
13.524000	18.7	9.000	Off	L1	10.1	31.3	50.0
13.560000	19.3	9.000	Off	L1	10.1	30.7	50.0
14.006000	18.4	9.000	Off	L1	10.1	31.6	50.0

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9. LIST OF TEST EQUIPMENT

9.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216/ LISN	01/13/2015	Annual	100073
Agilent	E4440A/ Spectrum Analyzer	03/18/2015	Annual	US45303008
Agilent	N9020A / SIGNAL ANALYZER	06/30/2015	Annual	MY51110085
Agilent	N9020A / SIGNAL ANALYZER	07/02/2015	Annual	MY50510304
Agilent	N1911A/Power Meter	07/09/2015	Annual	MY45100523
Agilent	N1921A /POWER SENSOR	07/09/2015	Annual	MY45241059
Agilent	87300B/Directional Coupler	12/08/2014	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/15/2015	Annual	5001
Hewlett Packard	E3632A / DC POWER SUPPLY	03/11/2015	Annual	KR75303962
Agilent	8493C / Attenuator(10 dB)	07/21/2015	Annual	07560

9.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Schwarzbeck	VULB 9160/ TRILOG Antenna	10/10/2014	Biennial	3368
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Schwarzbeck	BBHA 9120D/ Horn Antenna	05/07/2015	Biennial	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	04/30/2015	Biennial	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	01/22/2015	Annual	839117/011
Wainwright Instrument	WHF3.0/18G-10EF / High Pass Filter	06/29/2015	Annual	8
Wainwright Instrument	WHKX8-6090-7000-18000-40SS / High Pass Filter	08/03/2015	Annual	5
Wainwright Instrument	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/29/2015	Annual	2
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	06/15/2015	Annual	1
Rohde & Schwarz	LOOP ANTENNA	09/03/2014	Biennial	1513-175
CERNEX	CBL26405040 / POWER AMP	07/21/2015	Annual	19660
CERNEX	CBL18265035 / POWER AMP	07/27/2015	Annual	22966
CERNEX	CBL06185030 / POWER AMP	07/21/2015	Annual	22965