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

FCC/IC WLAN DTS REPORT

FCC/IC Certification

Applicant Name:
Murata Manufacturing Co.,Ltd.

Address:
10-1, Higashikotari 1-chome Nagaokakyo-shi
Kyoto, 617-8555 Japan

Date of Issue:
April 01, 2015
Test Site/Location:
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,
Majang-myeo,Icheon-si, Gyeonggi-do, Korea
Report No.: HCT-R-1504-F001
HCT FRN: 0005866421
IC Recognition No.: 5944A-3

FCC ID:	**VPYLB1DM**
IC:	**772C-LB1DM**
APPLICANT:	**Murata Manufacturing Co.,Ltd.**

FCC/ IC Model(s):	LBEE6ZZ1DM
EUT Type:	Communication module
Max. RF Output Power(Peak):	Wi-Fi 802.11b(23.43dBm) / Wi-Fi 802.11g (22.22 dBm) / Wi-Fi 802.11n (22.01dBm)
Frequency Range:	2412 MHz - 2462 MHz (2.4 GHz Band)
Modulation type:	CCK/DSSS/OFDM
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	Part 15.247
IC Rule :	RSS-210 Issue 8(December 2010) , RSS-GEN Issue 4(November 2014)

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
: Jong Seok Lee
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1504-F001	April 01, 2015	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	Murata Manufacturing Co.,Ltd..
Address:	10-1, Higashikotari 1-chome Nagaokakyo-si Kyoto, 617-8555 Japan
FCC ID:	VPYLB1DM
IC:	772C-LB1DM
EUT Type:	Communication module
FCC/ IC Model name(s):	LBEE6ZZ1DM
Date(s) of Tests:	March 02, 2015 ~ March 31, 2015
Place of Tests:	HCT Co., Ltd. 74,Seoicheon-ro 578beon-gil,Majang-myeon, Icheon-si, Gyeonggi-do, Korea. (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

EUT Type	Communication module	
FCC/ IC Model Name	LBEE6ZZ1DM	
Power Supply	DC 5.0 V	
Frequency Range	TX	: 2412 MHz~2462 MHz
	RX	: 2412 MHz~2462 MHz
Max. RF Output Power	Peak	Wi-Fi 802.11b(23.43 dBm) / Wi-Fi 802.11g (22.22dBm) / Wi-Fi 802.11n (22.01 dBm)
	Average	Wi-Fi 802.11b(17.57 dBm) / Wi-Fi 802.11g (13.80 dBm) / Wi-Fi 802.11n (13.66 dBm)
Modulation Type	DSSS/CCK(802.11b), OFDM(802.11g, 802.11n)	
Antenna Specification	Manufacturer: Murata innovator in electronics Antenna type: External Antenna Peak Gain : -0.1dBi	

3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v03r02 dated June 05, 2014 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) Operating Under §15.247” and the measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.4-2003) 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 15.247 under the FCC Rules Part 15 Subpart C.

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 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average Measurement Typeor modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. 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 13.1.4.1 of ANSI C63.4. (Version: 2003)

Conducted Antenna Terminal

See Section from 9.1 to 9.2.(KDB 558074)

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.

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 :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated February 28, 2014 (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 Measurement Typeors 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:

"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

7. SUMMARY TEST OF RESULTS

7.1 FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	CONDUCTED	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	§15.247(d)	Conducted > 20 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 8.8		PASS
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 8.7.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.7.3		PASS

7.2 IC Part

Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-210 [A8.2]	> 500 kHz	CONDUCTED	PASS
99% Bandwidth	RSS-GEN [4.6.1]	N/A		N/A
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-210 [A8.4]	< 1 Watt <4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-210 [A8.2]	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-210 [A8.5]	Conducted > 20 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN [7.2.2]	cf. Section 8.8		PASS
Radiated Spurious Emissions	RSS-210 [A8.5]	cf. Section 8.7.1	RADIATED	PASS
Receiver Spurious Emissions	RSS-GEN, Section 7.2.3	cf. Section 8.7.2		PASS
Radiated Restricted Band Edge	RSS-210 [A8.5]	cf. Section 8.7.3		PASS

8. TEST RESULT

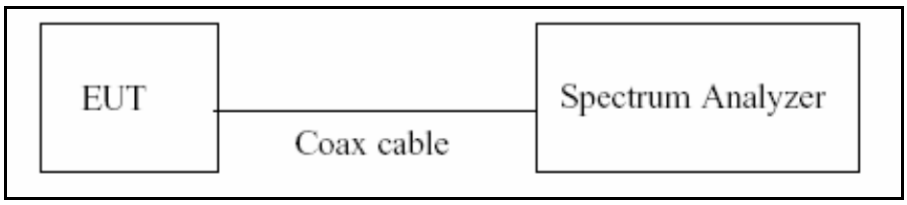
8.1 DUTY CYCLE (802.11b/g/n)

▣ TEST PROCEDURE

According to KDB558074)6)b), issued 06/05/2014)

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 ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set Measurement Typeor = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T 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 accroding to the zero-span measurement method, 6.0)b) in KDB 558074(issued 06/05/2014)

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

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

1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Measurement Typeor = 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	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
2.4 GHz Band 802.11b	1	8.595	8.685	0.98963731	0.045
	2	4.290	4.380	0.97945205	0.090
	5.5	1.620	1.690	0.95857988	0.184
	11	0.855	0.920	0.92934783	0.318
2.4 GHz Band 802.11g	6	1.420	1.490	0.95302013	0.209
	9	0.955	1.020	0.93627451	0.286
	12	0.720	0.785	0.91719745	0.375
	18	0.490	0.550	0.89090909	0.502
	24	0.374	0.434	0.86175115	0.646
	36	0.253	0.314	0.80573248	0.938
	48	0.198	0.257	0.77042802	1.133
	54	0.178	0.237	0.75105485	1.243
2.4 GHz Band 802.11n_20 MHz BW	6.5	1.330	1.395	0.95340502	0.207
	13	0.680	0.750	0.90666667	0.426
	19.5	0.468	0.530	0.88301887	0.540
	26	0.363	0.422	0.86018957	0.654
	39	0.255	0.315	0.80952381	0.918
	52	0.199	0.259	0.76833977	1.144
	58.5	0.183	0.243	0.75308642	1.232
	65	0.167	0.226	0.73893805	1.314

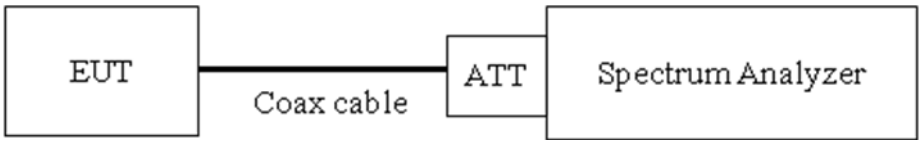
8.2 6dB BANDWIDTH (802.11b/g/n)

Test Requirements and limit, §15.247(a)(2)

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Page 5 in KDB 558074, issued 06/05/2014)

RBW = 100 kHz

VBW ≥ 3 x RBW

Measurement Typeor = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

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

▣ TEST RESULTS

2.4 GHz Band

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	10.13	0.500	Pass
2437	6	10.13	0.500	Pass
2462	11	10.13	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.39	0.500	Pass
2437	6	16.41	0.500	Pass
2462	11	16.40	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_20 MHz BW

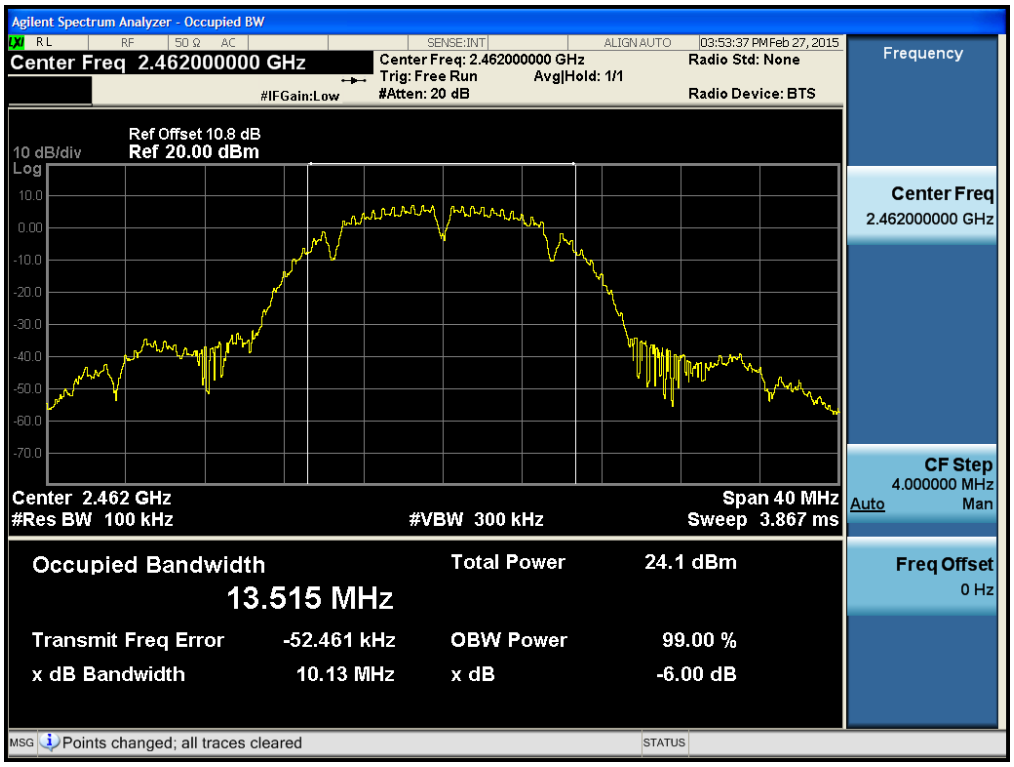
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	17.63	0.500	Pass
2437	6	17.63	0.500	Pass
2462	11	17.64	0.500	Pass

Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

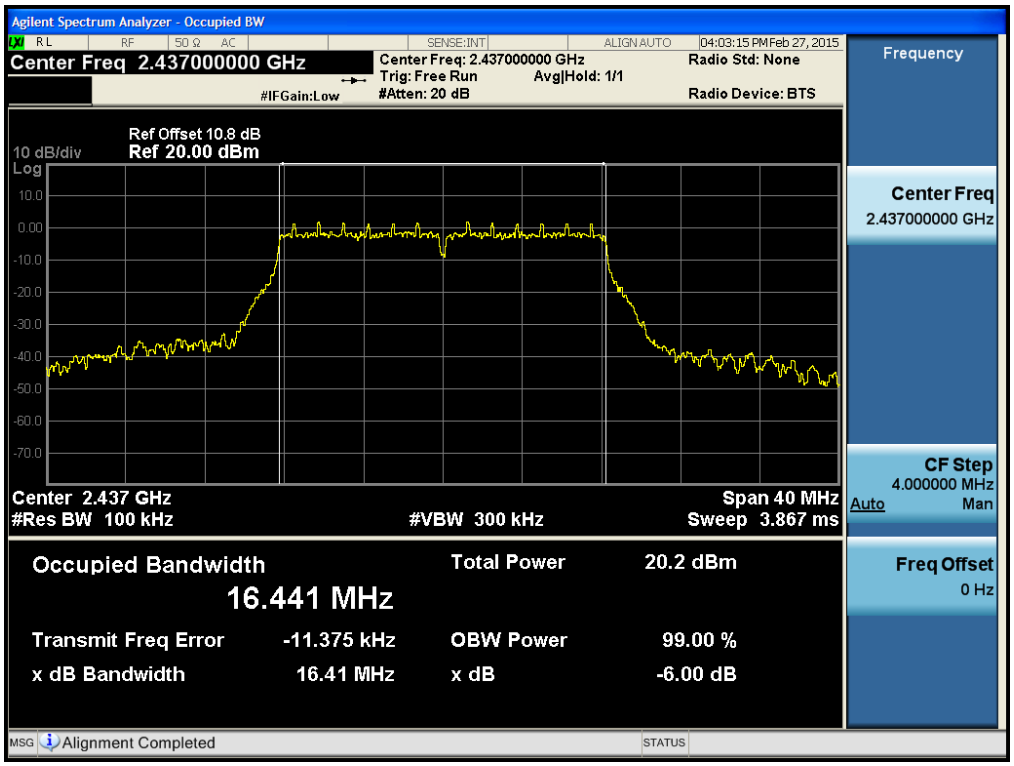
▣ RESULT PLOTS

2.4 GHz Band

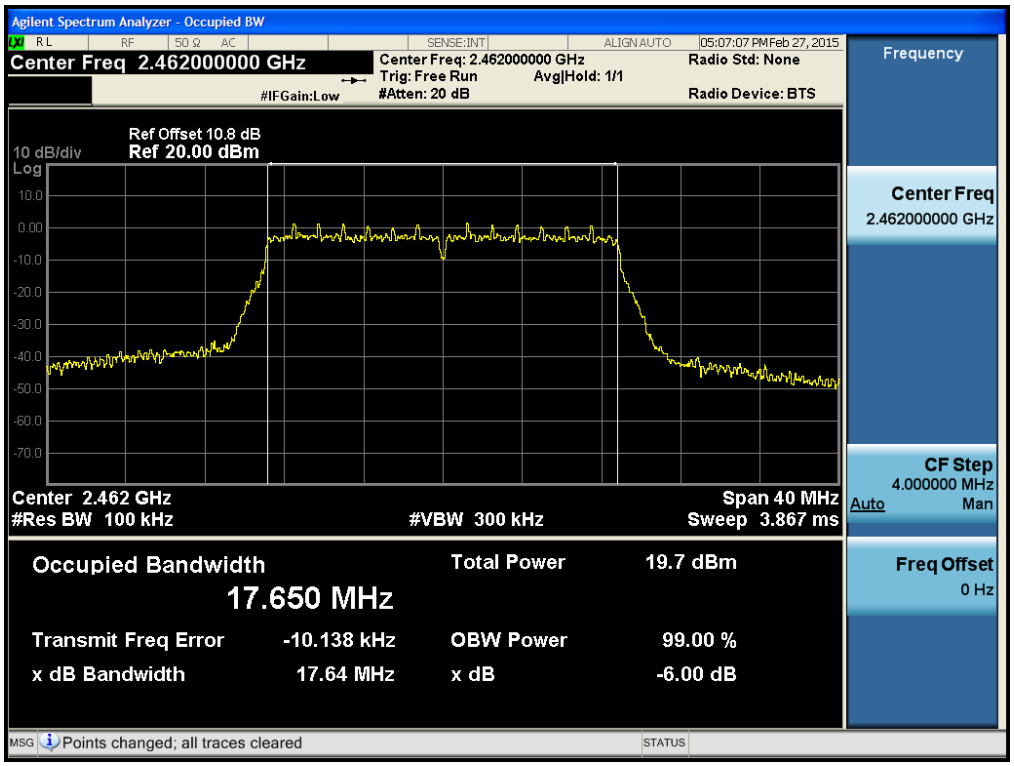
6dB Bandwidth plot (802.11b-CH 11)



6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n-CH 11)

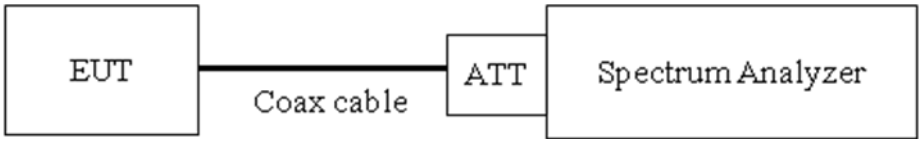


8.3 99% BANDWIDTH (802.11b/g/n)

limit

None; for IC reporting purposes only

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

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

RBW = 1% of the total span

VBW ≥ 3 x RBW

Measurement Typeor = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

▣ TEST RESULTS

2.4 GHz Band

Conducted 99% Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
2412	1	13.536
2437	6	13.583
2462	11	13.554

Conducted 99% Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
2412	1	16.851
2437	6	16.822
2462	11	16.816

Conducted 99% Bandwidth Measurements for 802.11n_20 MHz BW

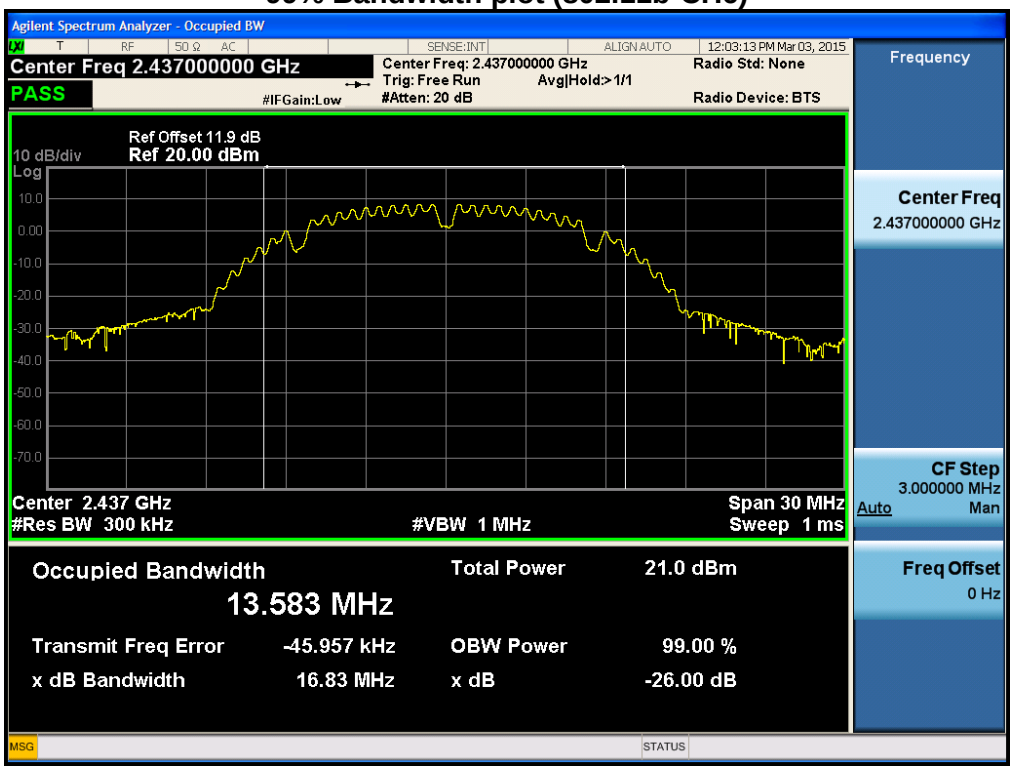
802.11n Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
2412	1	17.937
2437	6	17.936
2462	11	17.933

Note : In order to simplify the report, attached plots were only the most wide 99 % BW channel.

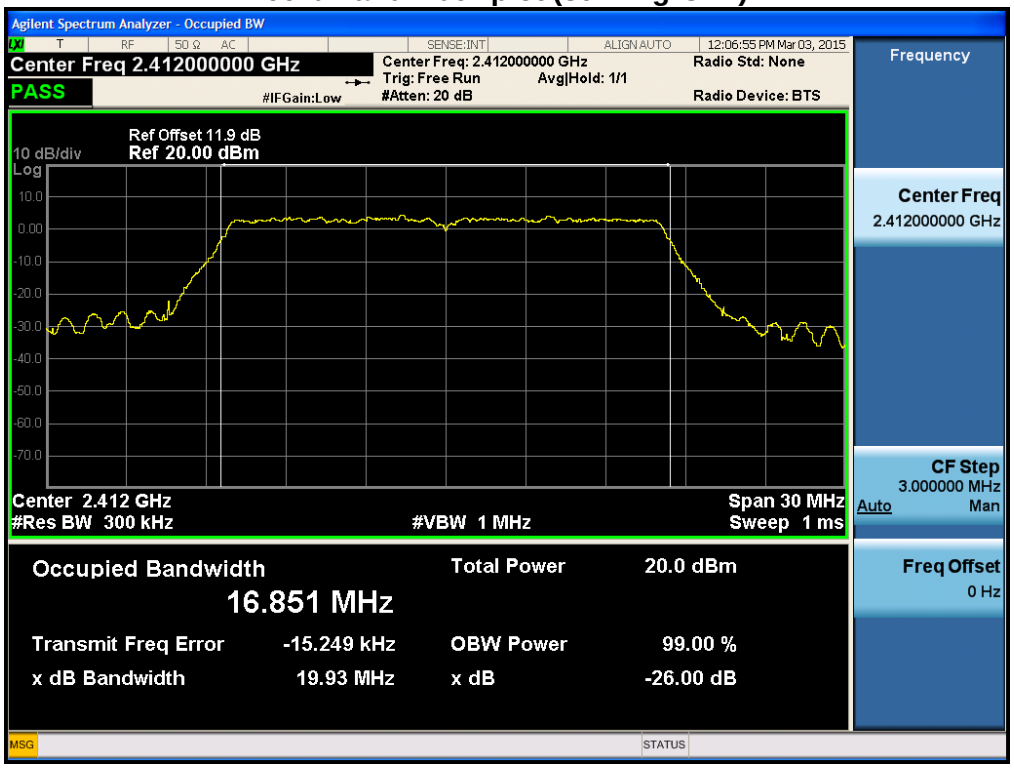
▣ RESULT PLOTS

2.4 GHz Band

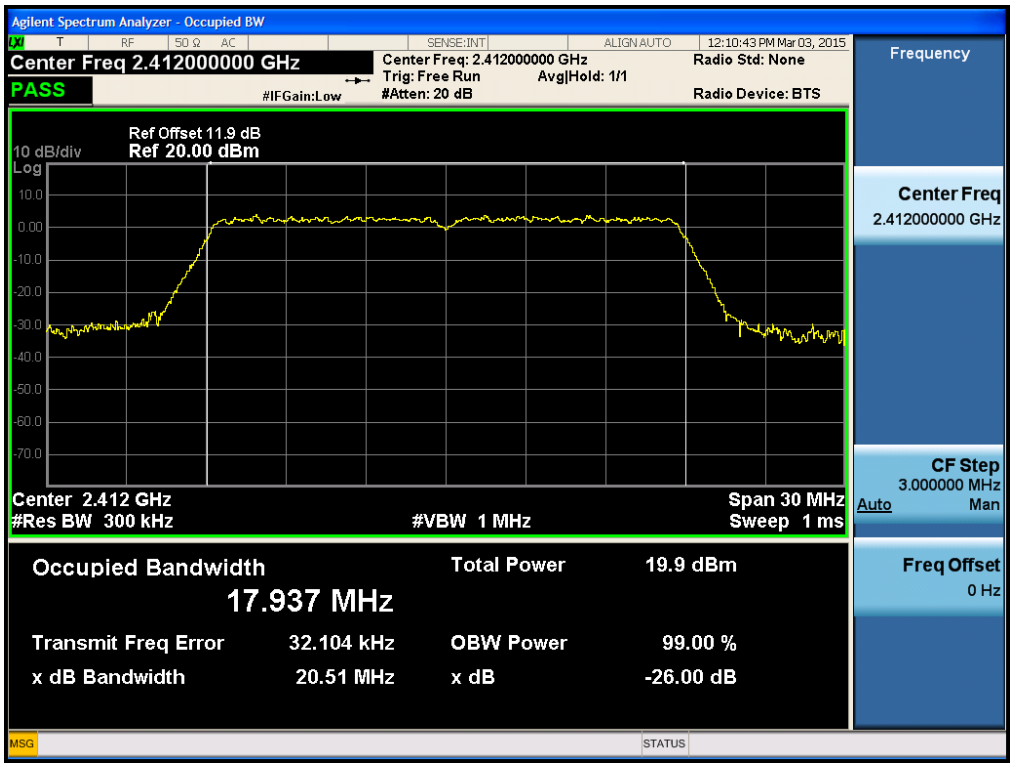
99% Bandwidth plot (802.11b-CH6)



99% Bandwidth plot (802.11g-CH1)



99% Bandwidth plot (802.11n-CH1)



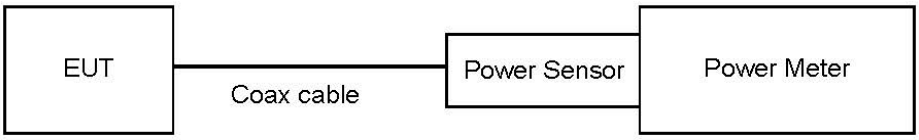
8.4 OUTPUT POWER(802.11b/g/n)

Test Requirements and limit, §15.247(b)(3)

The transmitter output is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

▣ TEST CONFIGURATION(20 MHz BW)



▣ TEST PROCEDURE(20 MHz BW)

- Peak Power (Procedure 9.1.3 in KDB 558074, issued 06/05/2014)
  1. Measure the peak power of the transmitter.
- Average Power (Procedure 9.2.3.1 in KDB 558074, issued 06/05/2014)
  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. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.2 dB is offset for 2.4 GHz Band.
   Actual value of loss for the attenuator and cable combination is below table.

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.21
	2437	10.24
	2462	10.24

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

2.4 GHz Band

▣ **TEST RESULTS**

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	1 Mbps	19.35	30
		2 Mbps	19.57	30
		5.5 Mbps	20.88	30
		11 Mbps	22.38	30
2437	6	1 Mbps	20.28	30
		2 Mbps	20.59	30
		5.5 Mbps	21.89	30
		11 Mbps	23.43	30
2462	11	1 Mbps	19.70	30
		2 Mbps	19.96	30
		5.5 Mbps	21.27	30
		11 Mbps	22.80	30

▣ TEST RESULTS

Conducted Output Power Measurements (802.11g Mode)

802.11g Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	6 Mbps	21.57	30
		9 Mbps	21.62	30
		12 Mbps	21.18	30
		18 Mbps	21.30	30
		24 Mbps	22.13	30
		36 Mbps	21.95	30
		48 Mbps	22.07	30
		54 Mbps	22.22	30
2437	6	6 Mbps	20.99	30
		9 Mbps	21.01	30
		12 Mbps	20.89	30
		18 Mbps	20.95	30
		24 Mbps	21.52	30
		36 Mbps	21.51	30
		48 Mbps	21.49	30
		54 Mbps	21.74	30
2462	11	6 Mbps	20.41	30
		9 Mbps	20.43	30
		12 Mbps	19.99	30
		18 Mbps	20.17	30
		24 Mbps	21.09	30
		36 Mbps	20.80	30
		48 Mbps	21.02	30
		54 Mbps	21.14	30

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n Mode)

802.11n Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	6.5 Mbps	21.39	30
		13 Mbps	21.24	30
		19.5 Mbps	21.11	30
		26 Mbps	21.58	30
		39 Mbps	21.67	30
		52 Mbps	21.71	30
		58.5 Mbps	22.01	30
		65 Mbps	21.91	30
2437	6	6.5 Mbps	21.16	30
		13 Mbps	21.02	30
		19.5 Mbps	20.88	30
		26 Mbps	21.41	30
		39 Mbps	21.46	30
		52 Mbps	21.55	30
		58.5 Mbps	21.77	30
		65 Mbps	21.72	30
2462	11	6.5 Mbps	20.57	30
		13 Mbps	20.44	30
		19.5 Mbps	20.33	30
		26 Mbps	20.82	30
		39 Mbps	20.90	30
		52 Mbps	20.92	30
		58.5 Mbps	21.18	30
		65 Mbps	21.13	30

▣ **TEST RESULTS-Average**

2.4 GHz Band

▣ **TEST RESULTS**

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	16.59	0.045	16.64	30
		2 Mbps	16.50	0.090	16.59	30
		5.5 Mbps	16.40	0.184	16.59	30
		11 Mbps	16.26	0.318	16.58	30
2437	6	1 Mbps	17.40	0.045	17.45	30
		2 Mbps	17.40	0.090	17.49	30
		5.5 Mbps	17.36	0.184	17.54	30
		11 Mbps	17.25	0.318	17.57	30
2462	11	1 Mbps	16.85	0.045	16.89	30
		2 Mbps	16.86	0.090	16.95	30
		5.5 Mbps	16.79	0.184	16.97	30
		11 Mbps	16.64	0.318	16.95	30

▣ TEST RESULTS

Conducted Output Power Measurements (802.11g Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	13.11	0.209	13.32	30
		9 Mbps	13.45	0.286	13.73	30
		12 Mbps	13.38	0.375	13.76	30
		18 Mbps	13.06	0.502	13.56	30
		24 Mbps	13.15	0.646	13.80	30
		36 Mbps	12.80	0.938	13.74	30
		48 Mbps	12.29	1.133	13.42	30
		54 Mbps	12.53	1.243	13.77	30
2437	6	6 Mbps	12.85	0.209	13.06	30
		9 Mbps	12.85	0.286	13.13	30
		12 Mbps	13.17	0.375	13.54	30
		18 Mbps	12.57	0.502	13.08	30
		24 Mbps	12.50	0.646	13.15	30
		36 Mbps	12.16	0.938	13.10	30
		48 Mbps	12.09	1.133	13.22	30
		54 Mbps	11.98	1.243	13.22	30
2462	11	6 Mbps	12.30	0.209	12.50	30
		9 Mbps	12.09	0.286	12.37	30
		12 Mbps	12.16	0.375	12.54	30
		18 Mbps	12.09	0.502	12.59	30
		24 Mbps	11.93	0.646	12.57	30
		36 Mbps	11.63	0.938	12.57	30
		48 Mbps	11.52	1.133	12.65	30
		54 Mbps	11.31	1.243	12.55	30

▣ TEST RESULTS

Conducted Output Power Measurements (802.11n Mode)

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6.5 Mbps	13.31	0.207	13.52	30
		13 Mbps	13.01	0.426	13.44	30
		19.5 Mbps	12.99	0.540	13.53	30
		26 Mbps	12.89	0.654	13.55	30
		39 Mbps	12.68	0.918	13.59	30
		52 Mbps	12.36	1.144	13.51	30
		58.5 Mbps	12.43	1.232	13.66	30
		65 Mbps	12.34	1.314	13.65	30
2437	6	6.5 Mbps	12.91	0.207	13.12	30
		13 Mbps	12.77	0.426	13.19	30
		19.5 Mbps	12.69	0.540	13.23	30
		26 Mbps	12.63	0.654	13.29	30
		39 Mbps	12.42	0.918	13.33	30
		52 Mbps	12.19	1.144	13.33	30
		58.5 Mbps	12.19	1.232	13.42	30
		65 Mbps	12.08	1.314	13.39	30
2462	11	6.5 Mbps	12.34	0.207	12.55	30
		13 Mbps	12.12	0.426	12.54	30
		19.5 Mbps	11.99	0.540	12.53	30
		26 Mbps	11.97	0.654	12.63	30
		39 Mbps	11.83	0.918	12.75	30
		52 Mbps	11.56	1.144	12.70	30
		58.5 Mbps	11.47	1.232	12.70	30
		65 Mbps	11.42	1.314	12.73	30

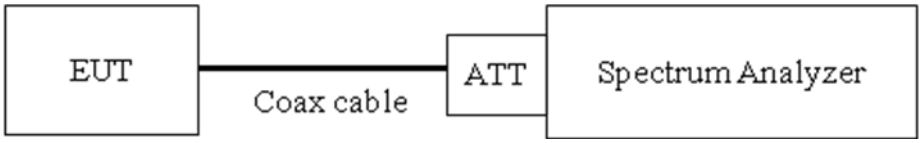
8.5 POWER SPECTRAL DENSITY (802.11b/g/n)

Test Requirements and limit, §15.247(e)

The peak power spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074, issued 06/05/2014

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

RBW = 3 kHz ≤ RBW ≤ 100 kHz.

VBW ≥ 3 x RBW.

Sweep = auto couple

Detector = peak

Trace Mode = max hold

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ Sample Calculation

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

Output Power = -5 dBm + 10 dB + 0.8 dB = 5.8 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 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.2 dB is offset for 2.4 GHz Band.

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

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.21
	2437	10.24
	2462	10.24

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

▣ TEST RESULTS

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b	-6.620	8	Pass
2437	6		-5.586		Pass
2462	11		-6.348		Pass
2412	1	802.11g	-12.057		Pass
2437	6		-13.551		Pass
2462	11		-14.283		Pass
2412	1	802.11n (20 MHz BW)	-12.580		Pass
2437	6		-12.286		Pass
2462	11		-12.845		Pass

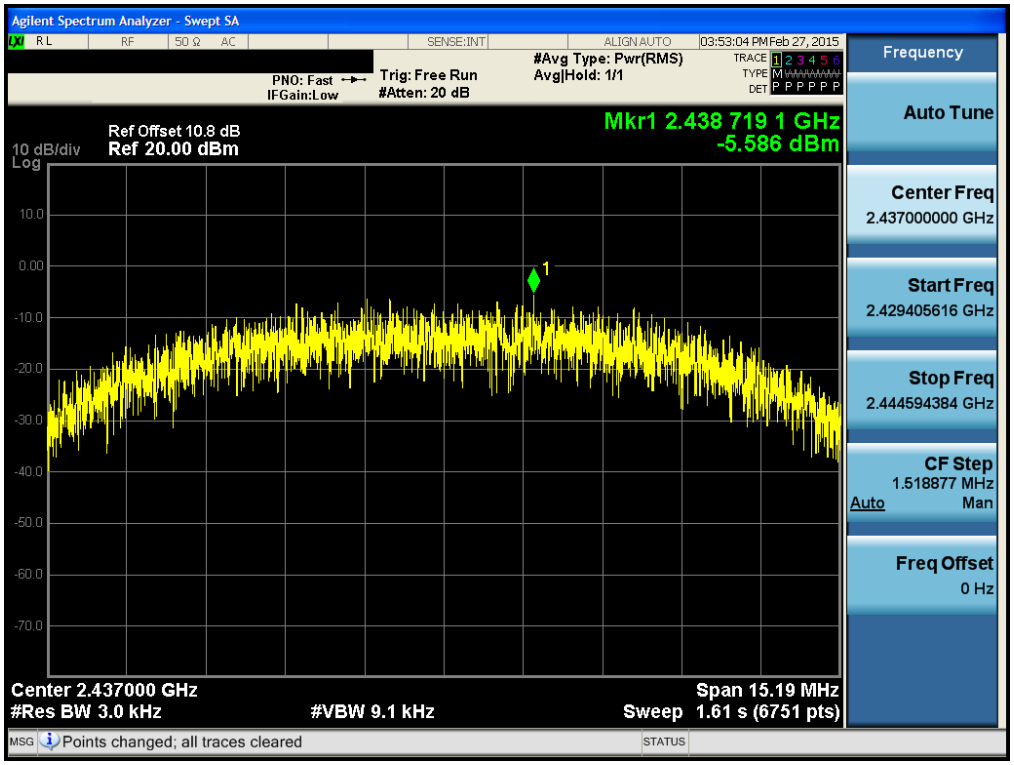
Note :

1. **In order to simplify the report, attached plots were only the highest PSD channel.**

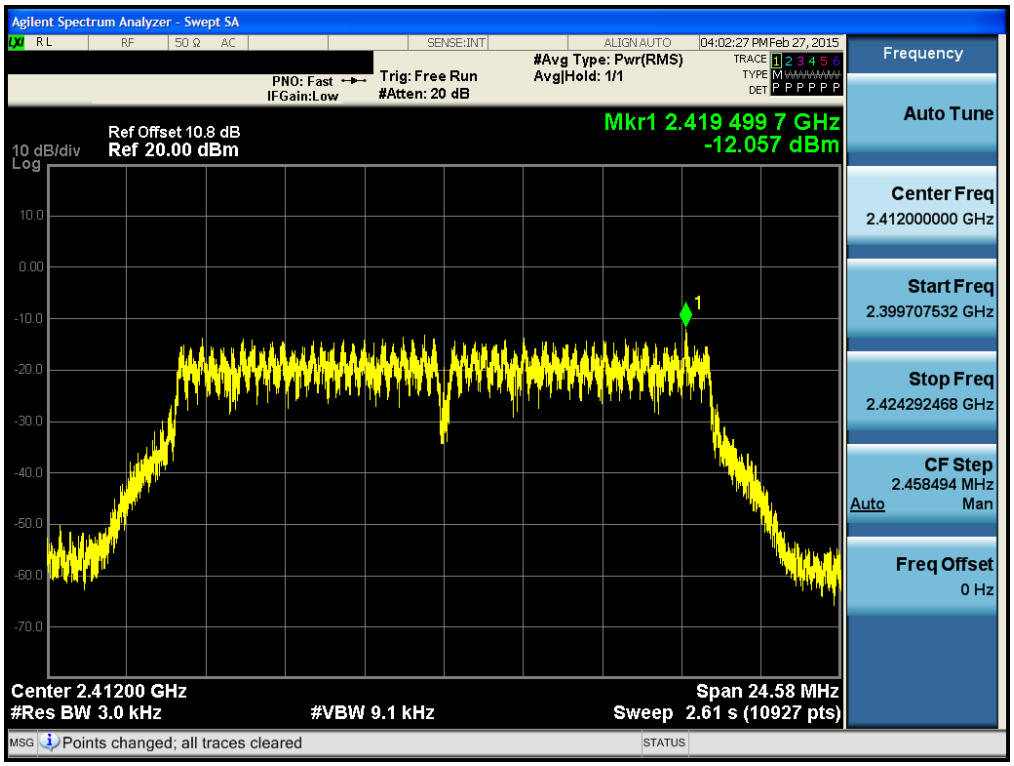
▣ RESULT PLOTS

2.4 GHz Band

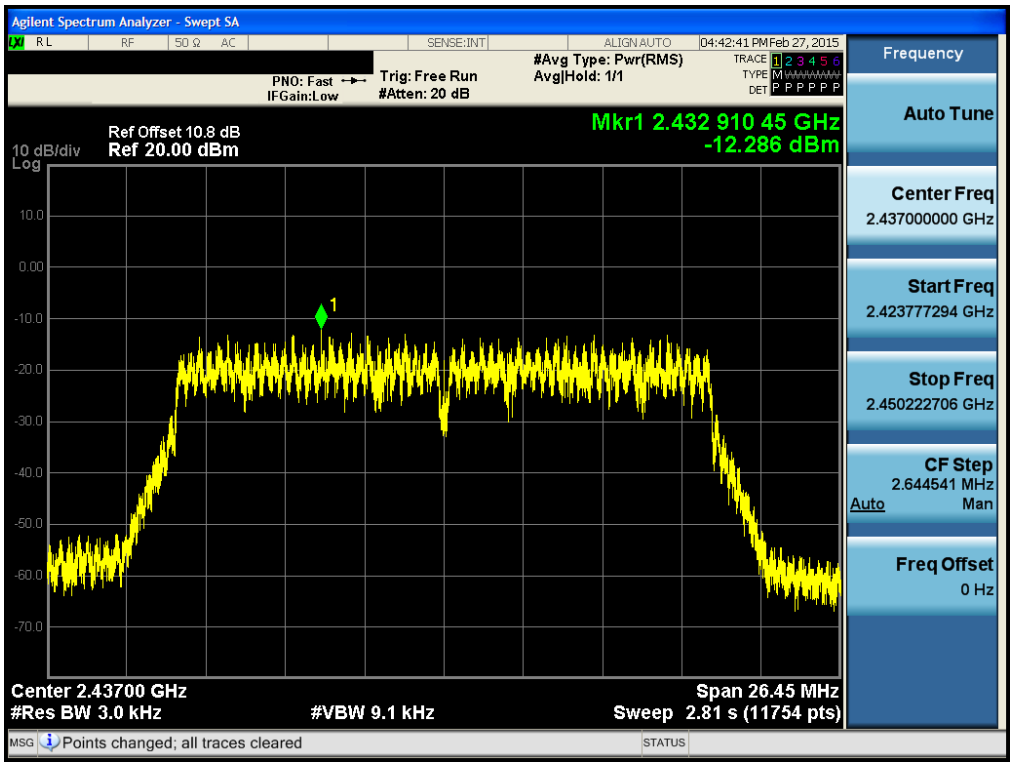
Power Spectral Density (802.11b-CH 6)



Power Spectral Density (802.11g-CH 1)



Power Spectral Density (802.11n-CH 6)



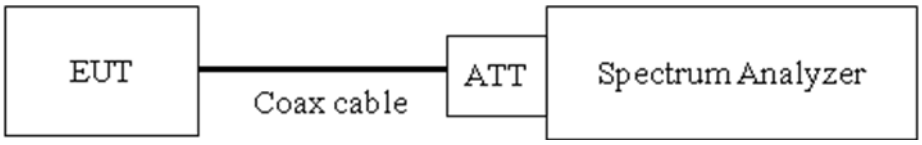
8.6 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit : 20 dBc

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 11.0 in KDB 558074, issued 06/05/2014)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set span to encompass the spectrum to be examined

Measurement Typeor = Peak

Trace Mode = max hold

Sweep time = auto couple

Ensure that the number of measurement points ≥ Span/RBW

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The band edge 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 2.4 GHz range 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)
2.4 GHz	10.2

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

4. In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ FACTORS FOR FREQUENCY

Freq(MHz)	Factor(dB)
30	9.95
100	10.01
200	10.03
300	10.04
400	10.05
500	10.04
600	10.03
700	10.09
800	10.10
900	10.08
1000	10.11
2000	10.25
2400*	10.19
2500*	10.24
3000	10.27
4000	10.22
5000	10.48
5700*	10.42
5800*	10.44
6000	10.48
7000	10.57
8000	10.45
9000	10.50
10000	10.64
11000	10.69
12000	10.75
13000	10.92
14000	11.90

15000	11.00
16000	11.03
17000	10.93
18000	10.96
19000	10.85
20000	12.11
21000	11.17
22000	10.99
23000	11.12
24000	11.10
25000	11.42
26000	11.28

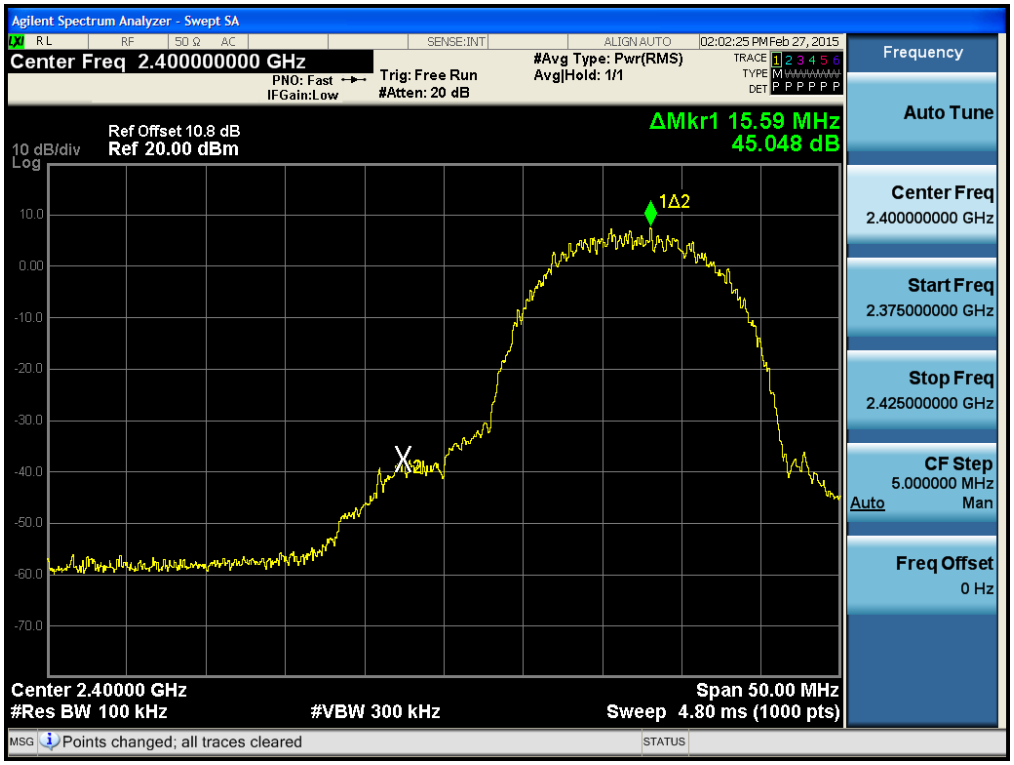
Note : 1. '*' is fundamental frequency range.

2. Factor = Cable loss + Attenuator loss

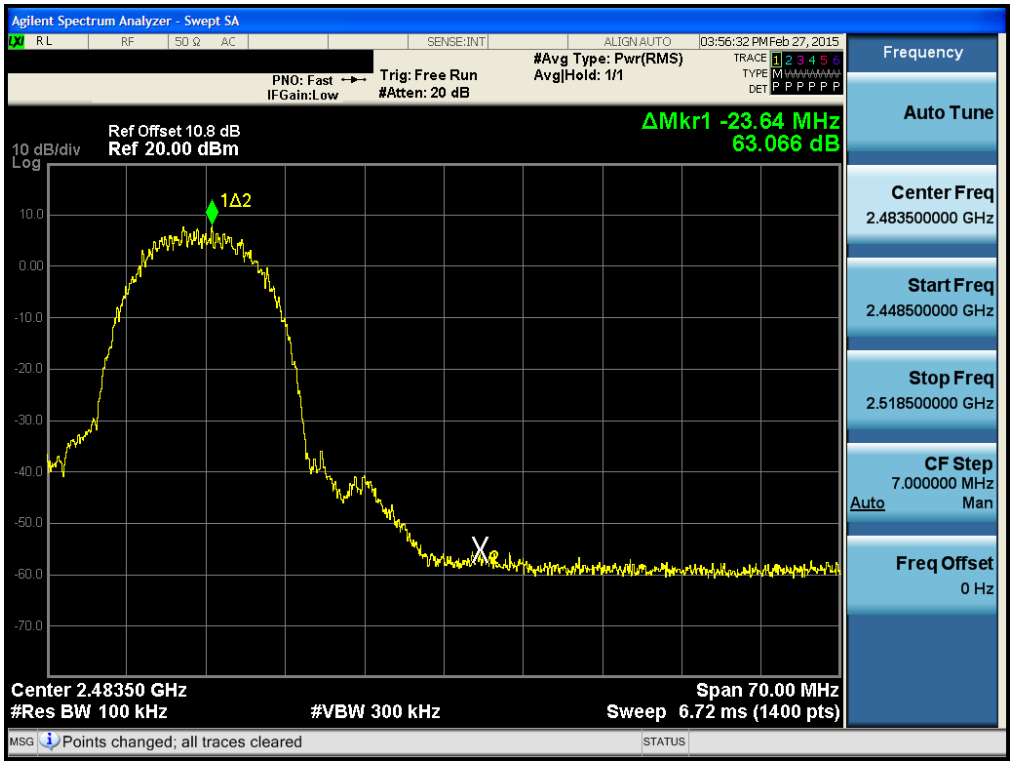
▣ RESULT PLOTS

2.4 GHz Band

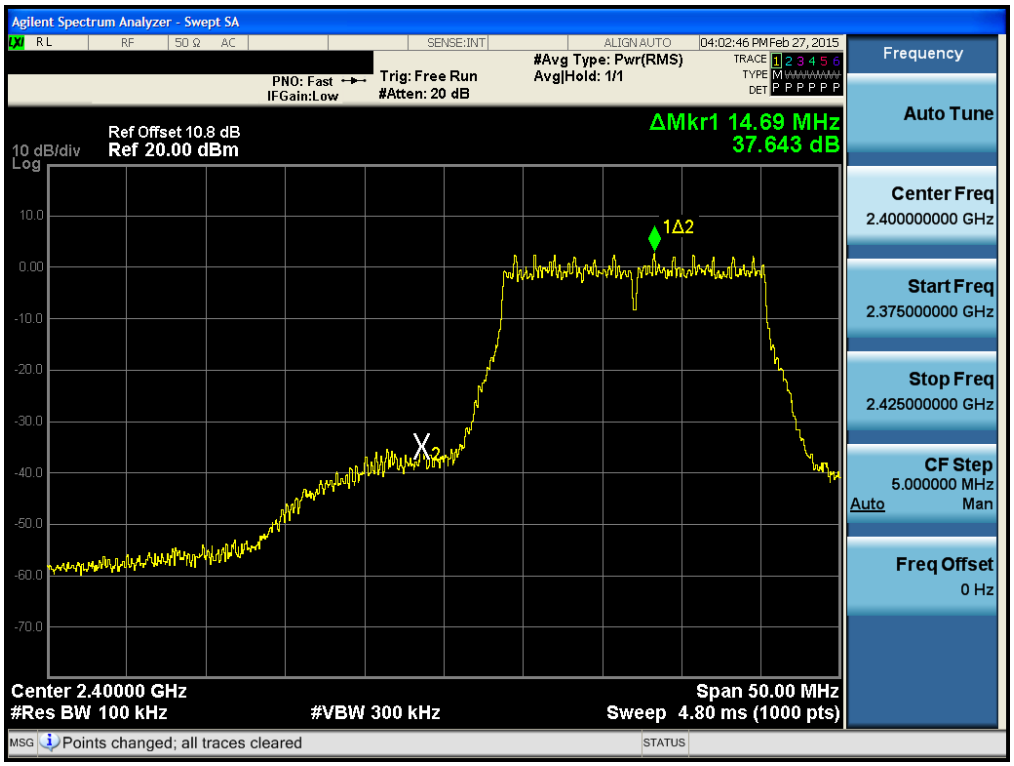
BandEdge (802.11b-CH1)



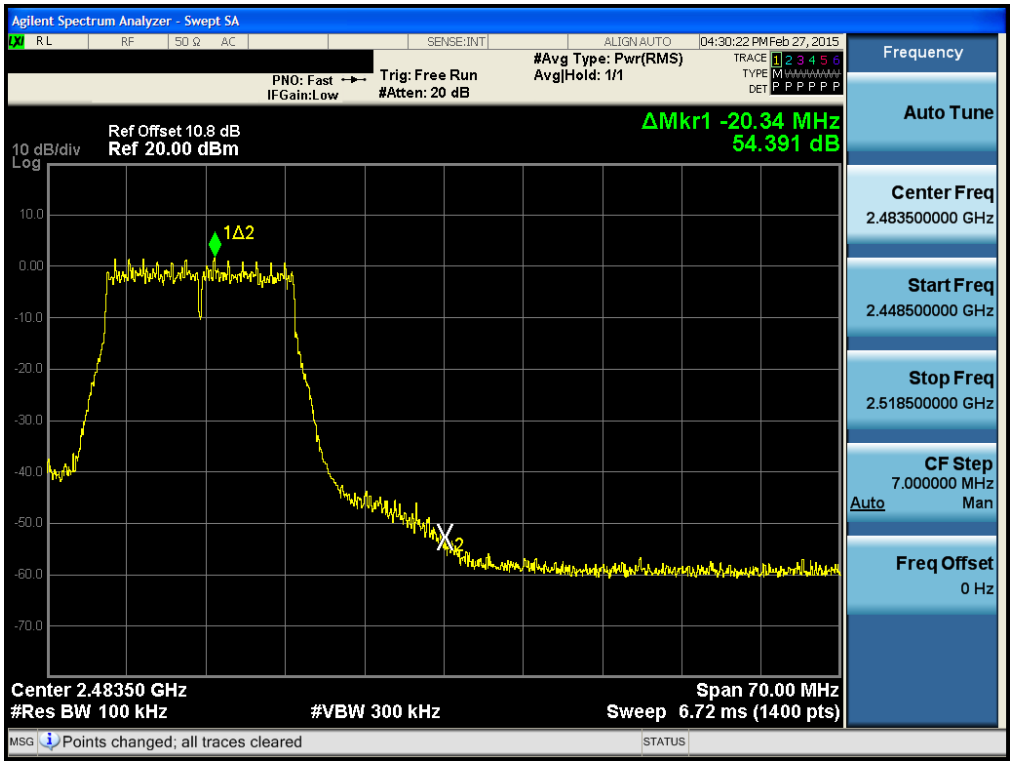
BandEdge (802.11b-CH11)



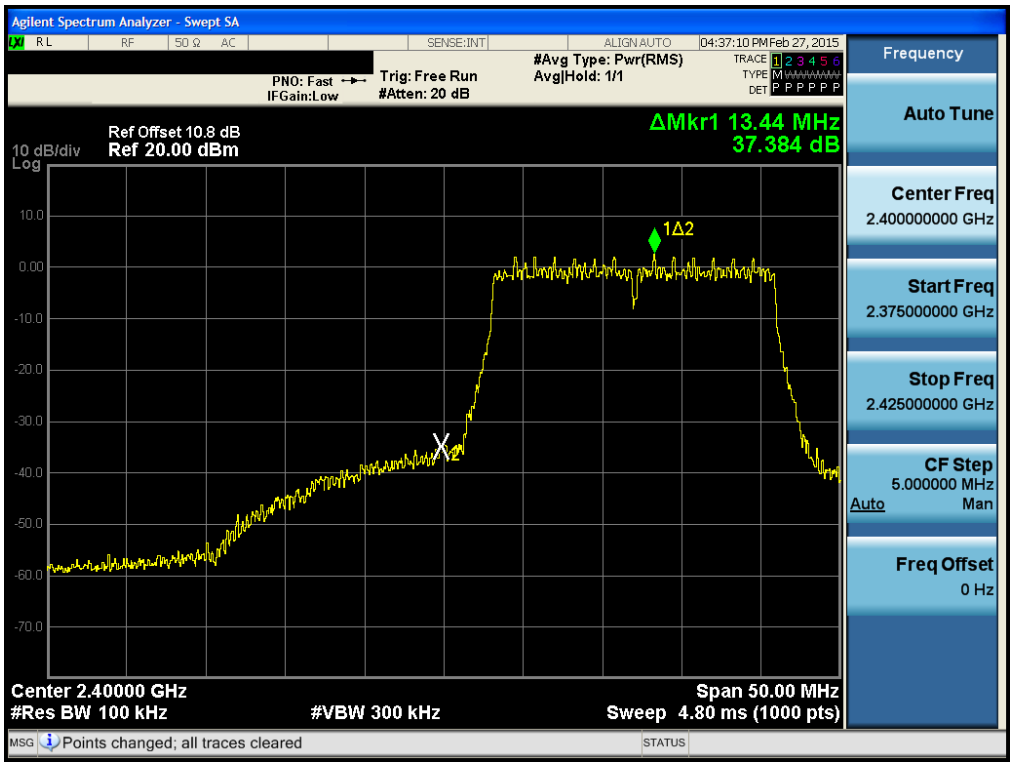
BandEdge (802.11g-CH1)



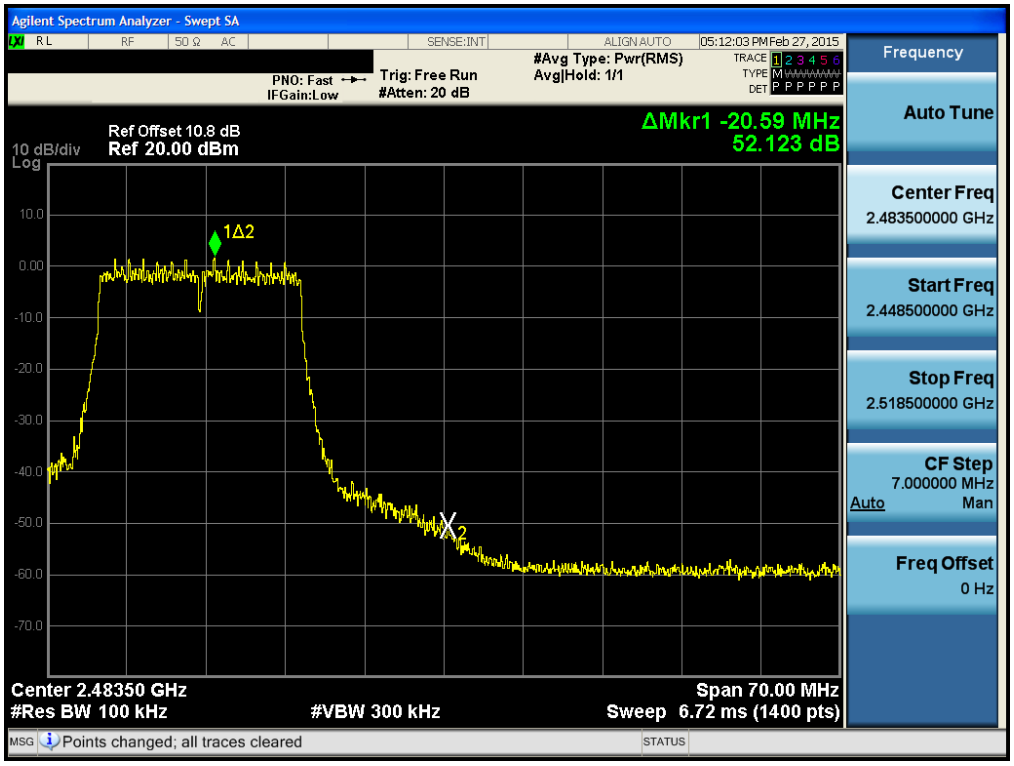
BandEdge (802.11g-CH11)



Band Edge (802.11n-CH1)



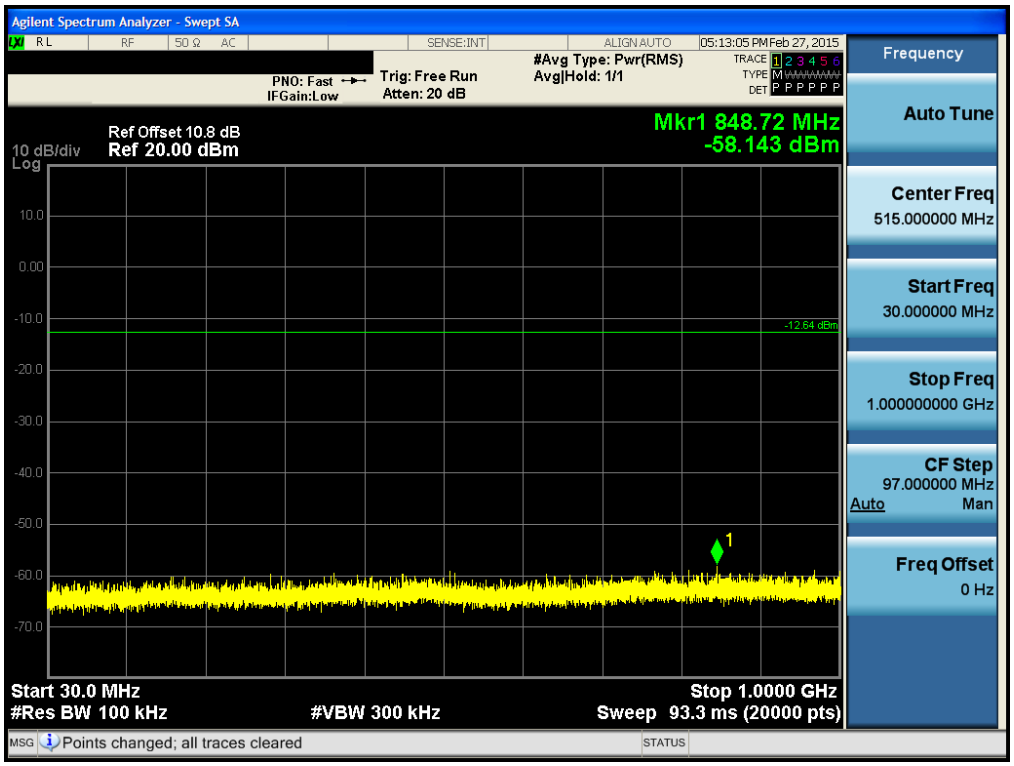
Band Edge (802.11n-CH11)



2.4 GHz Band

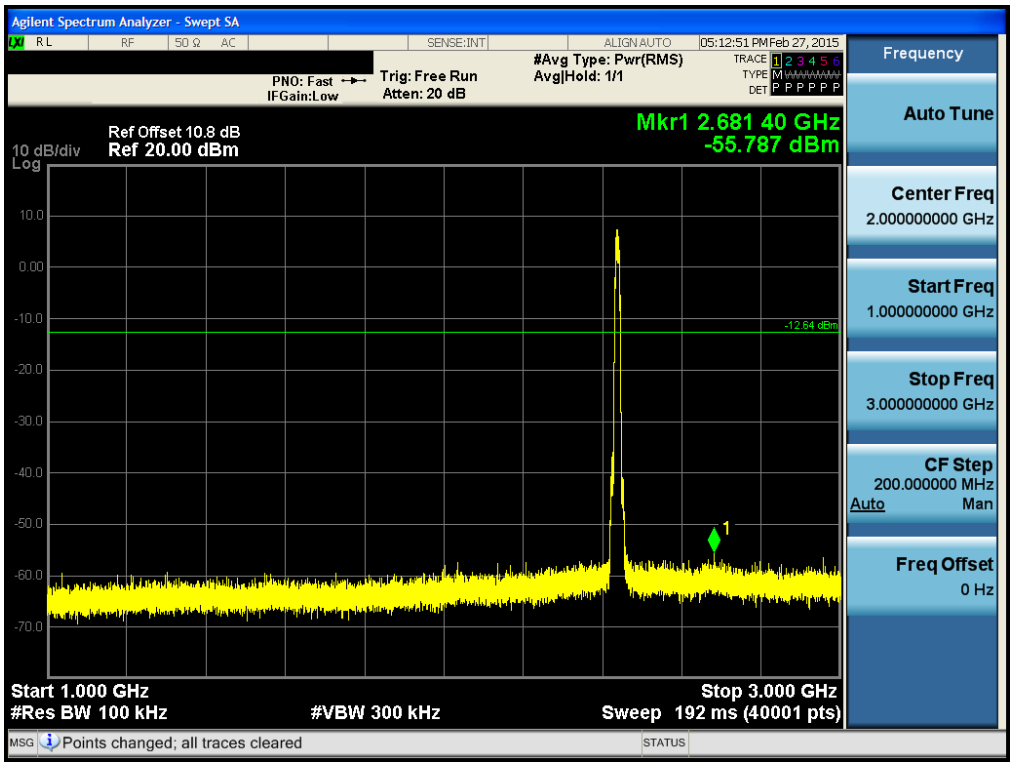
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11g-CH6)



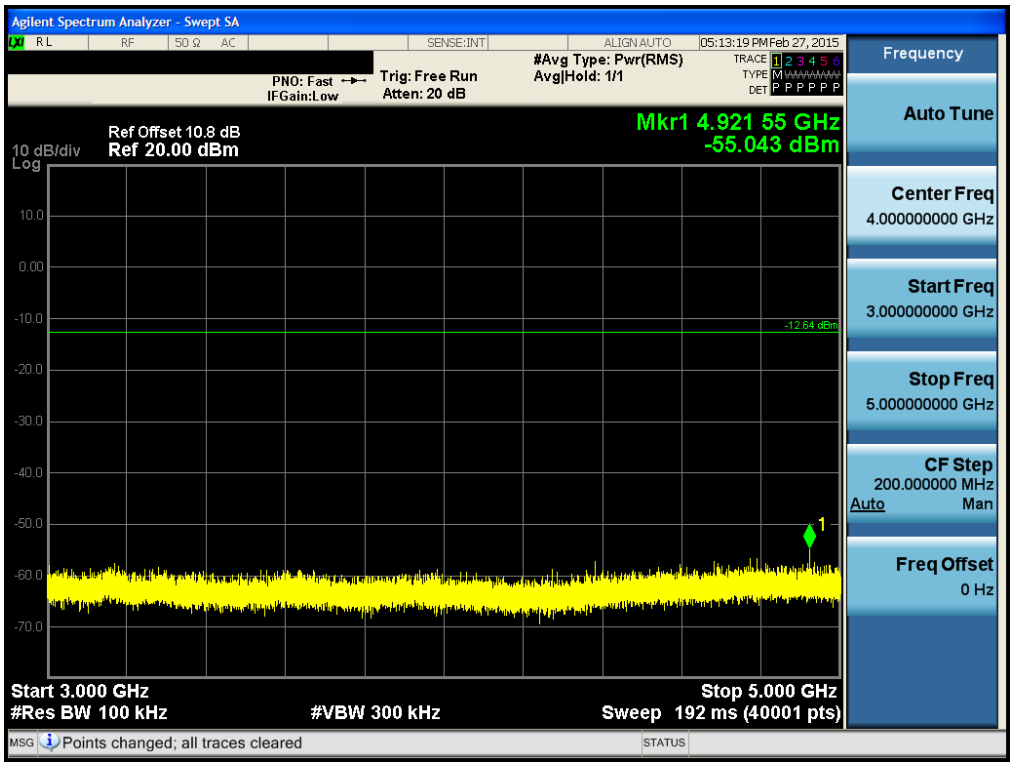
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11g-CH6)



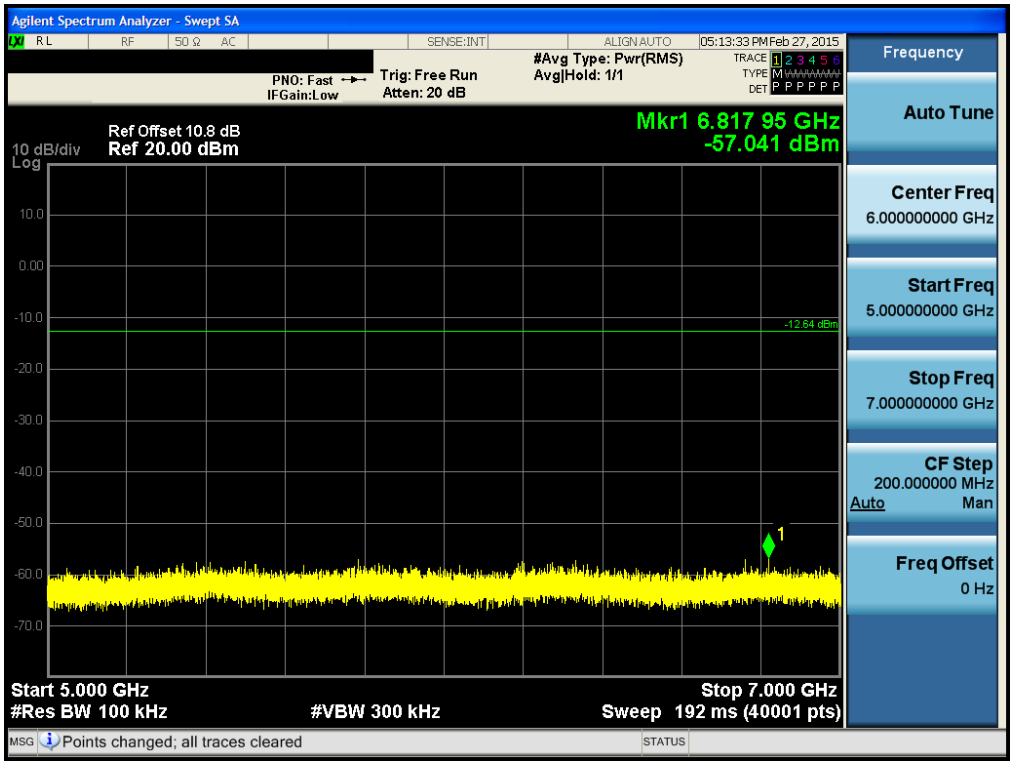
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11g-CH6)



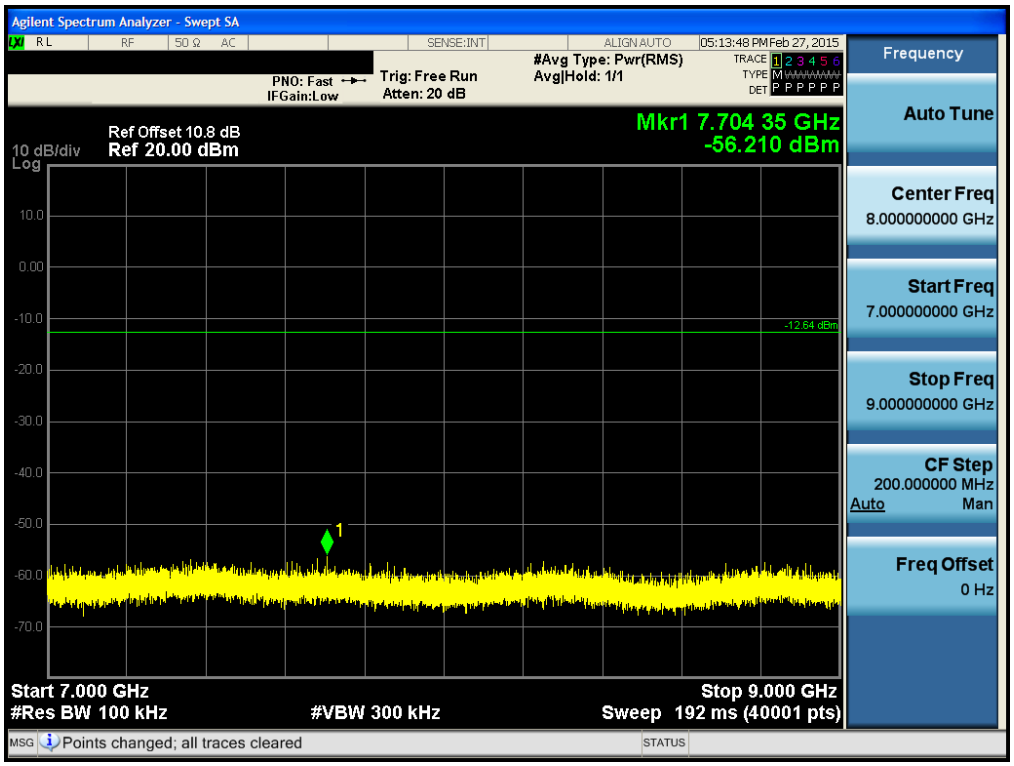
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11g-CH6)



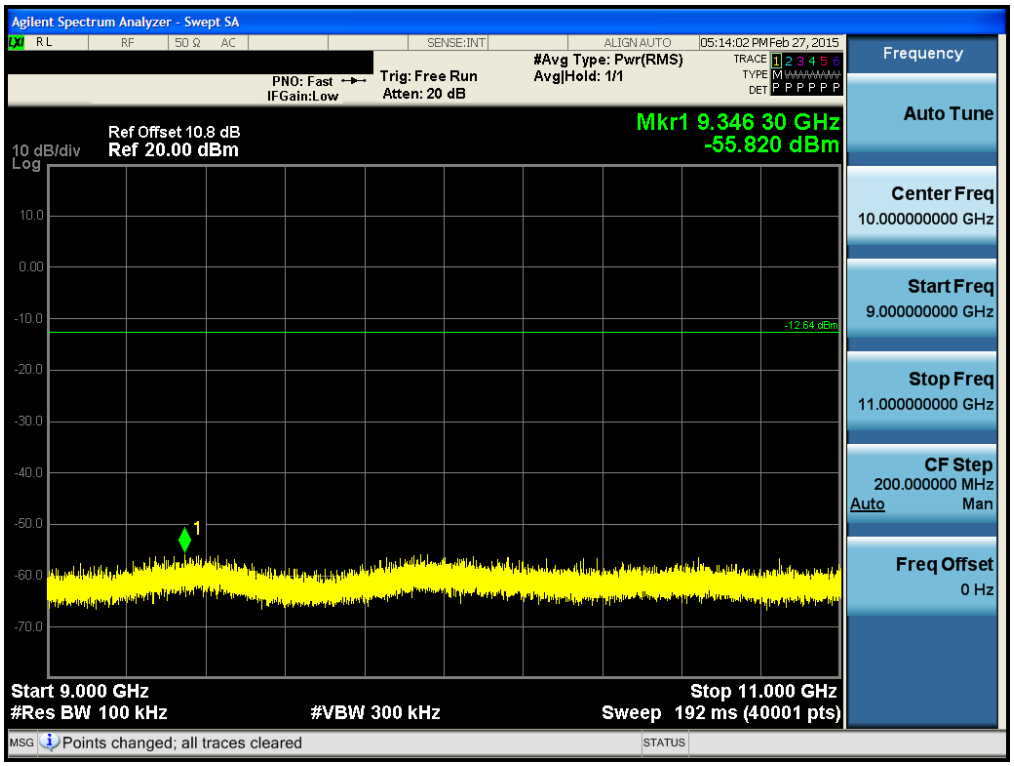
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11g-CH6)



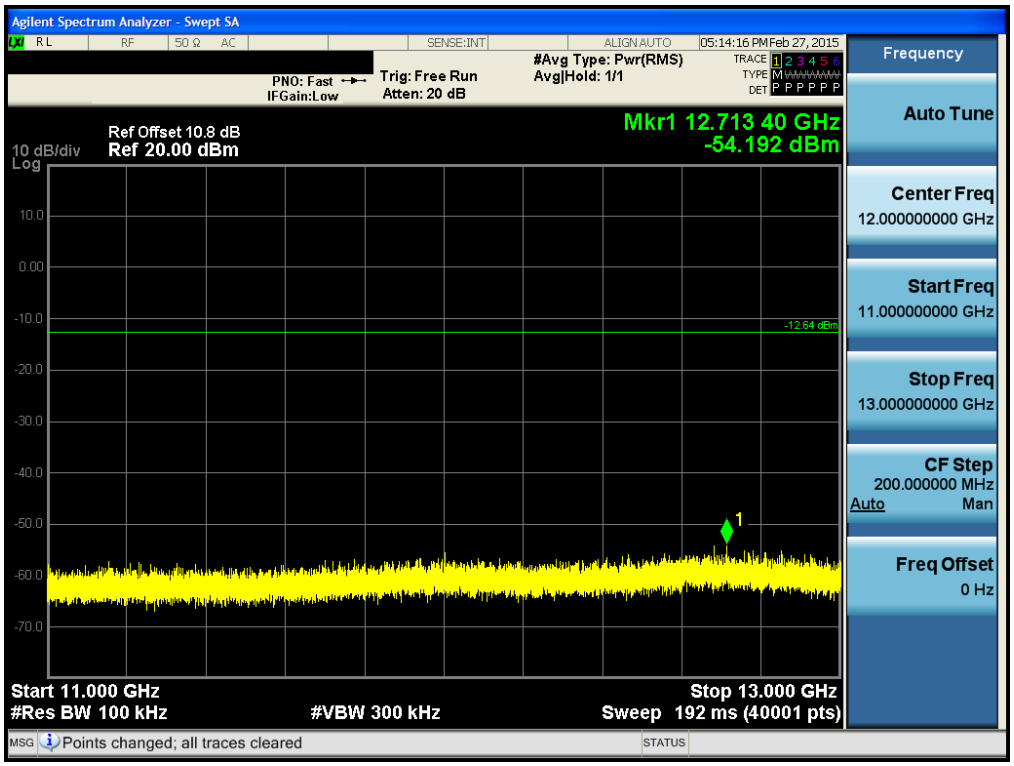
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11g-CH6)



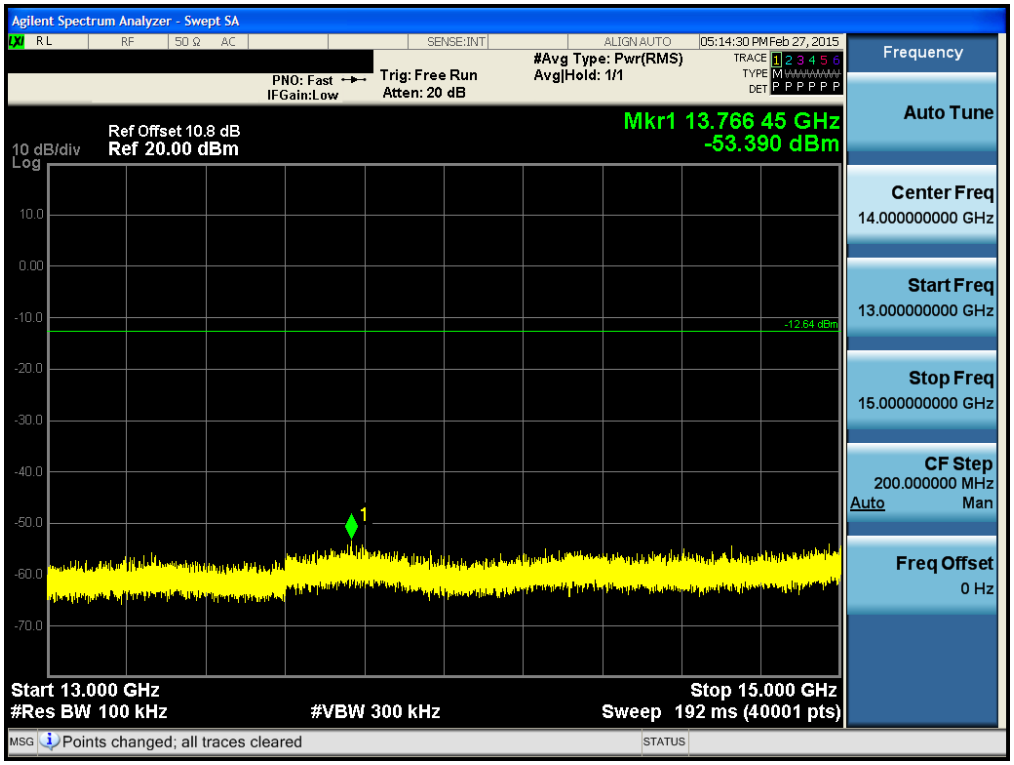
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11g-CH6)



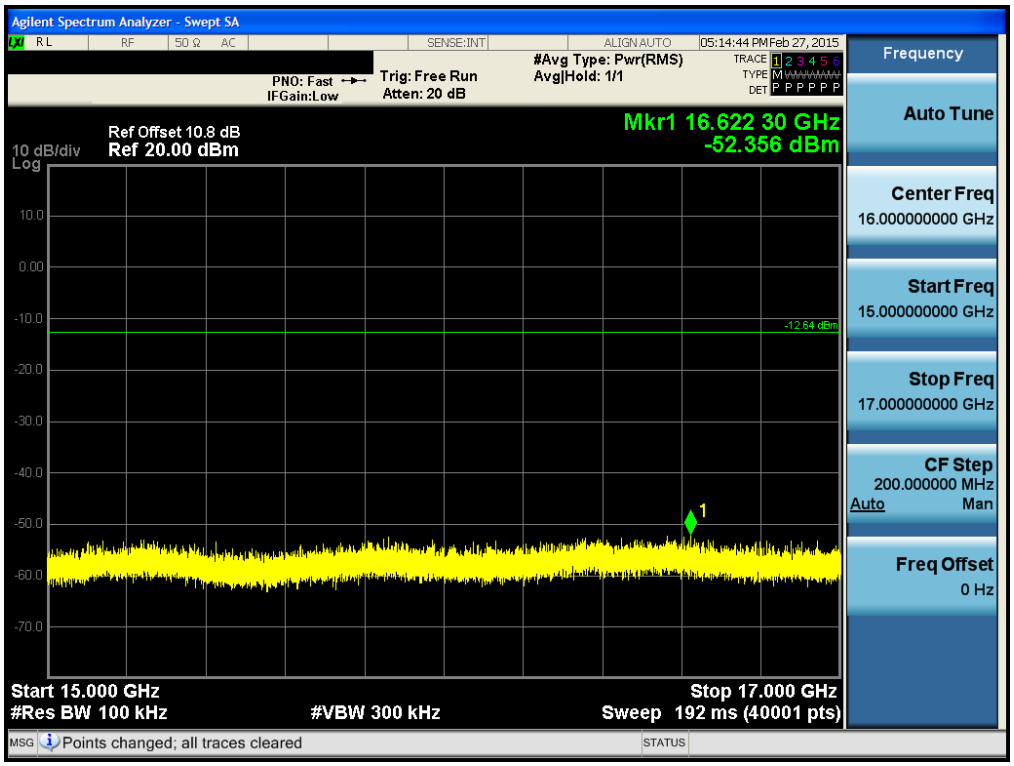
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11g-CH6)



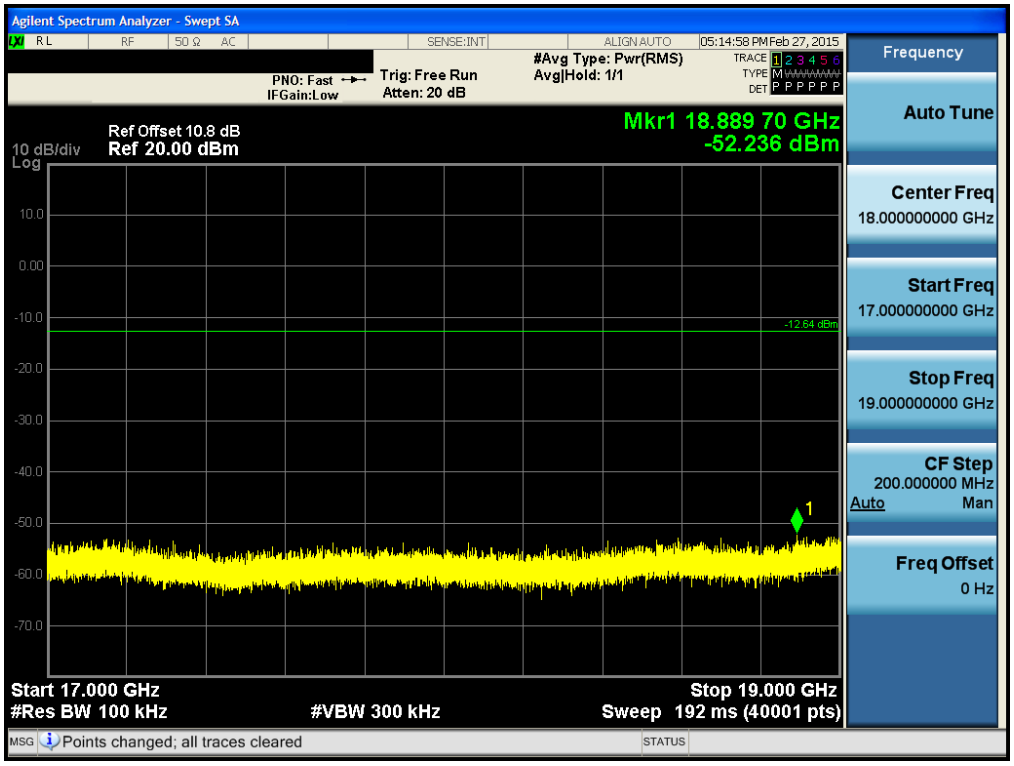
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11g-CH6)



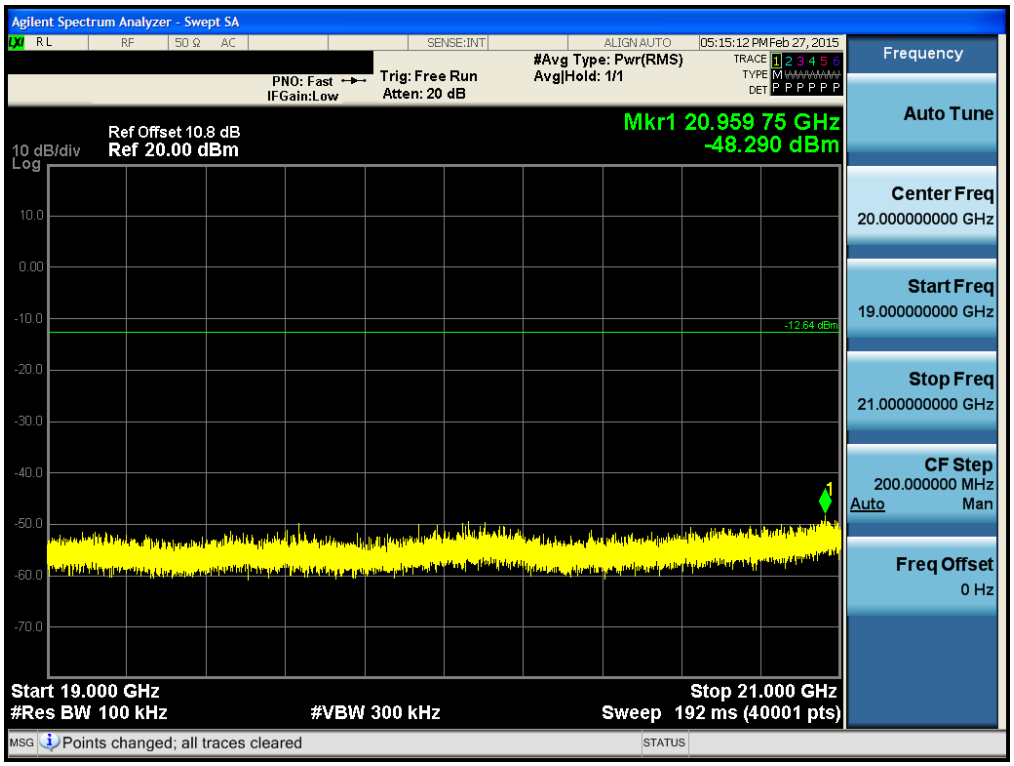
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11g-CH6)



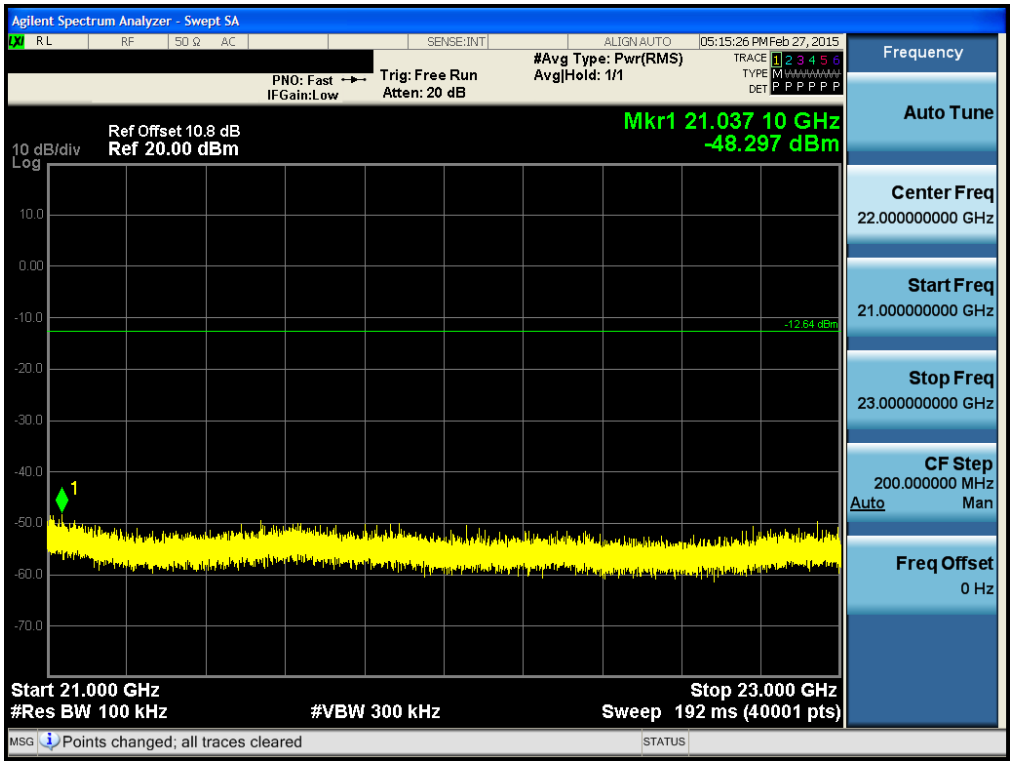
19 GHz ~ 21 GHz

19nducted Spurious Emission (802.11g-CH6)



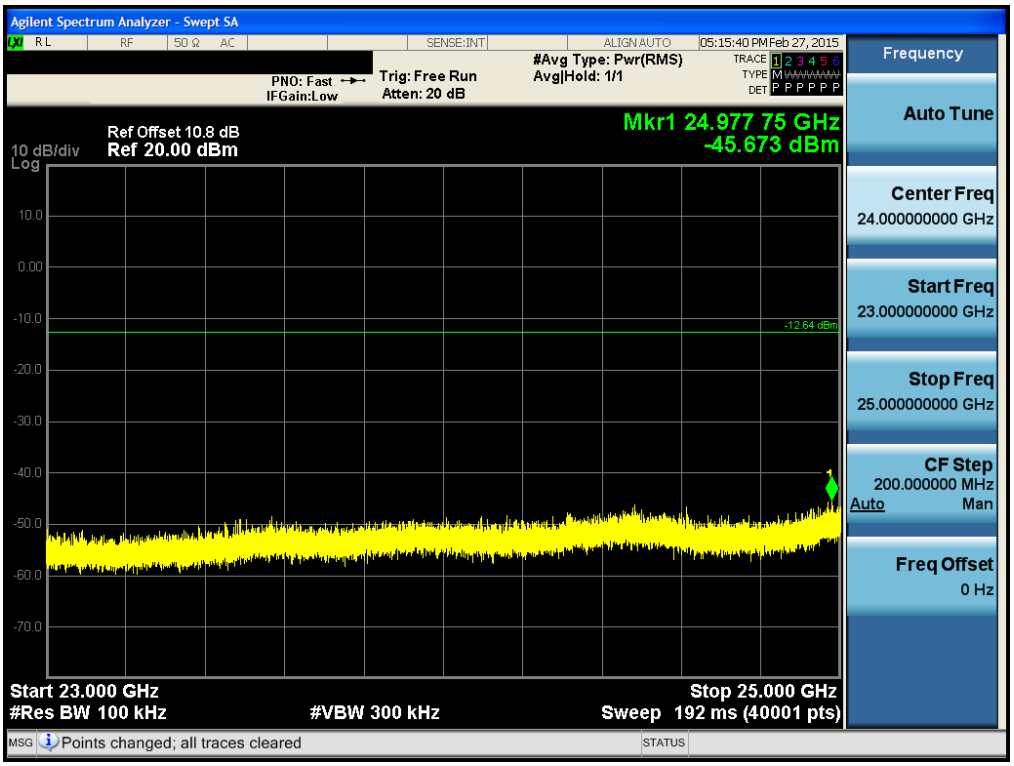
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11g-CH6)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11a-CH6)



8.7 RADIATED MEASUREMENT

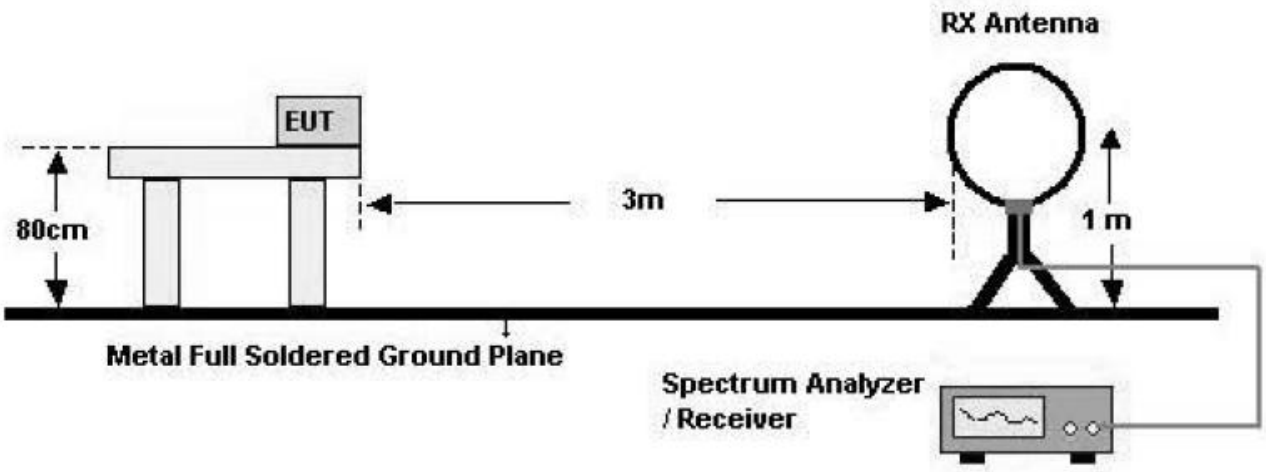
8.7.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

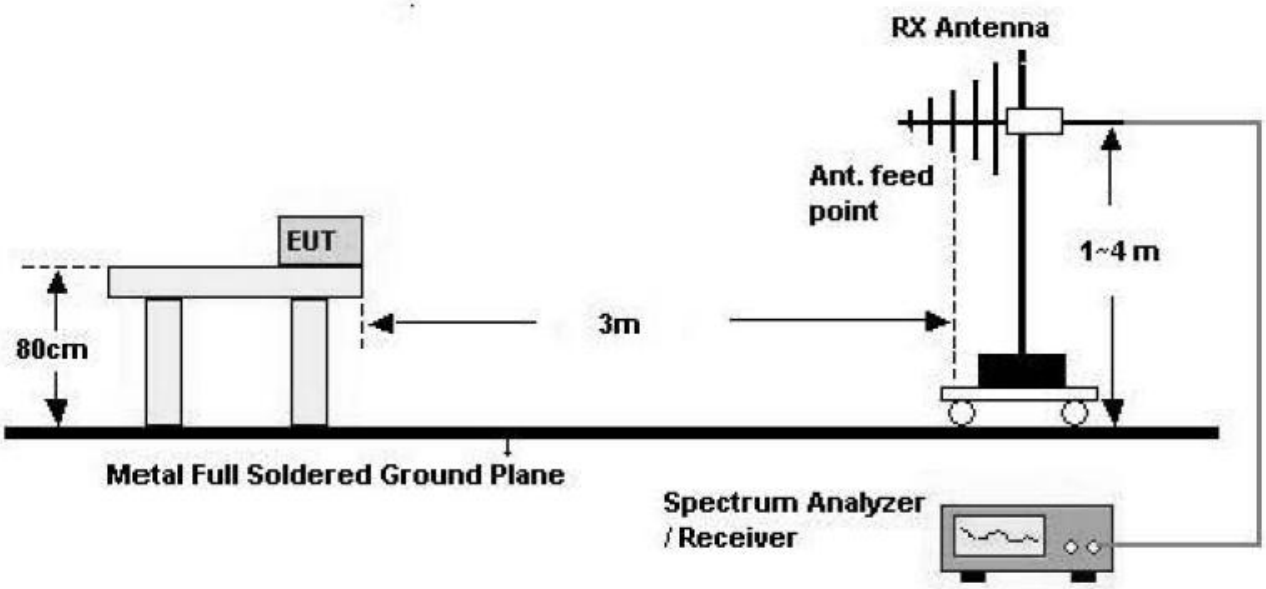
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

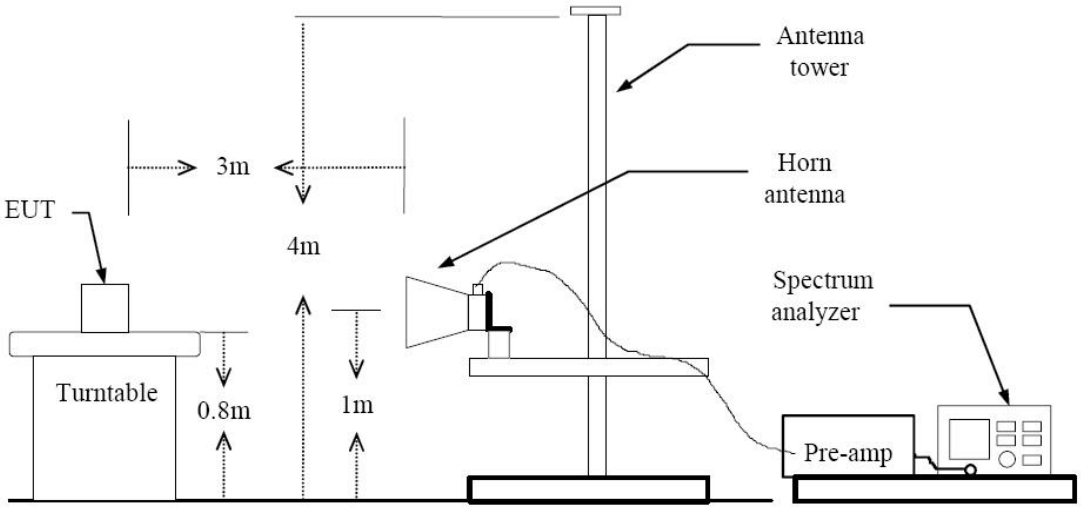
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

Method 12.1 in KDB 558074, issued 06/05/2014

Spectrum Setting

- Peak

Peak emission levels are measured by setting the instrument as follows:

RBW = cf. Table 1.

VBW ≥ 3 x RBW.

Measurement Typeor = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes.

(Note that the required measurement time may be longer for low duty cycle applications).

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

- Average

Set RBW = 1 MHz

Set VBW ≥ 1/T.(at least 100 times less than the resolution bandwidth, but no less than 10 Hz.)

Select spectrum analyzer linear display mode.

Measurement Typeor = Peak.

Sweep time = auto.

Trace mode = max hold.

Note : The actual setting value of VBW for 802.11b/g/n.

Mode	Worst Data rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle (%)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
b	1	8.595	8.685	98.96	116	1000
g	6	1.420	1.490	95.30	704	1000
n	6.5	1.330	1.395	95.34	752	1000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶/m	dBm /m	dBm	(H/V)	dB㎶/m	dB㎶/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 Measurement Typeing antenna.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶/m	dBm /m	dBm	(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 Measurement Typeor mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in Measurement Typeing antenna.

Above 1 GHz

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	54.98	-7.72	V	47.26	73.98	26.72	PK
4824	42.43	-7.72	V	34.71	53.98	19.27	AV
7236	53.65	-1.83	V	51.82	73.98	22.16	PK
7236	40.21	-1.83	V	38.38	53.98	15.60	AV
4824	56.78	-7.72	H	49.06	73.98	24.92	PK
4824	44.31	-7.72	H	36.59	53.98	17.39	AV
7236	54.55	-1.83	H	52.72	73.98	21.26	PK
7236	40.20	-1.83	H	38.37	53.98	15.61	AV

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	55.59	-7.37	V	48.22	73.98	25.76	PK
4874	42.30	-7.37	V	34.93	53.98	19.05	AV
7311	54.09	-1.64	V	52.45	73.98	21.53	PK
7311	40.65	-1.64	V	39.01	53.98	14.97	AV
4874	55.39	-7.37	H	48.02	73.98	25.96	PK
4874	42.40	-7.37	H	35.03	53.98	18.95	AV
7311	54.37	-1.64	H	52.73	73.98	21.25	PK
7311	40.43	-1.64	H	38.79	53.98	15.19	AV

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	55.25	-7.35	V	47.90	73.98	26.08	PK
4924	43.39	-7.35	V	36.04	53.98	17.94	AV
7386	53.82	-1.35	V	52.47	73.98	21.51	PK
7386	39.85	-1.35	V	38.50	53.98	15.48	AV
4924	55.38	-7.35	H	48.03	73.98	25.95	PK
4924	43.63	-7.35	H	36.28	53.98	17.70	AV
7386	53.58	-1.35	H	52.23	73.98	21.75	PK
7386	39.89	-1.35	H	38.54	53.98	15.44	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 Measurement Typeor mode and average Measurement Typeor mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done 802.11b mode and all data rate. Worst data rate is the lowest data of each mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in Measurement Typeing antenna.

Operation Mode:	802.11 g
Transfer Rate:	6 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	55.43	-7.72	V	47.71	73.98	26.27	PK
4824	41.10	-7.72	V	33.38	53.98	20.60	AV
7236	53.76	-1.83	V	51.93	73.98	22.05	PK
7236	40.12	-1.83	V	38.29	53.98	15.69	AV
4824	55.66	-7.72	H	47.94	73.98	26.04	PK
4824	41.38	-7.72	H	33.66	53.98	20.32	AV
7236	53.99	-1.83	H	52.16	73.98	21.82	PK
7236	40.22	-1.83	H	38.39	53.98	15.59	AV

Operation Mode:	802.11 g
Transfer Rate:	6 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	54.98	-7.37	V	47.61	73.98	26.37	PK
4874	43.33	-7.37	V	35.96	53.98	18.02	AV
7311	54.11	-1.64	V	52.47	73.98	21.51	PK
7311	40.40	-1.64	V	38.76	53.98	15.22	AV
4874	55.02	-7.37	H	47.65	73.98	26.33	PK
4874	41.35	-7.37	H	33.98	53.98	20.00	AV
7311	54.00	-1.64	H	52.36	73.98	21.62	PK
7311	40.41	-1.64	H	38.77	53.98	15.21	AV

Operation Mode:	802.11 g
Transfer Rate:	6 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	55.12	-7.35	V	47.77	73.98	26.21	PK
4924	40.97	-7.35	V	33.62	53.98	20.36	AV
7386	53.61	-1.35	V	52.26	73.98	21.72	PK
7386	39.86	-1.35	V	38.51	53.98	15.47	AV
4924	55.05	-7.35	H	47.70	73.98	26.28	PK
4924	40.99	-7.35	H	33.64	53.98	20.34	AV
7386	53.45	-1.35	H	52.10	73.98	21.88	PK
7386	39.87	-1.35	H	38.52	53.98	15.46	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 Measurement Typeor mode and average Measurement Typeor mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done 802.11g mode and all data rate. Worst data rate is the lowest data of each mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in Measurement Typeing antenna.

Operation Mode:	802.11 n
Transfer Rate:	6.5 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	54.43	-7.72	V	46.71	73.98	27.27	PK
4824	41.14	-7.72	V	33.42	53.98	20.56	AV
7236	54.21	-1.83	V	52.38	73.98	21.60	PK
7236	40.19	-1.83	V	38.36	53.98	15.62	AV
4824	54.58	-7.72	H	46.86	73.98	27.12	PK
4824	41.17	-7.72	H	33.45	53.98	20.53	AV
7236	54.02	-1.83	H	52.19	73.98	21.79	PK
7236	40.23	-1.83	H	38.40	53.98	15.58	AV

Operation Mode:	802.11 n
Transfer Rate:	6.5 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	54.89	-7.37	V	47.52	73.98	26.46	PK
4874	41.25	-7.37	V	33.88	53.98	20.10	AV
7311	54.11	-1.64	V	52.47	73.98	21.51	PK
7311	40.38	-1.64	V	38.74	53.98	15.24	AV
4874	55.33	-7.37	H	47.96	73.98	26.02	PK
4874	41.29	-7.37	H	33.92	53.98	20.06	AV
7311	54.32	-1.64	H	52.68	73.98	21.30	PK
7311	40.43	-1.64	H	38.79	53.98	15.19	AV

Operation Mode:	802.11 n
Transfer Rate:	6.5 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	55.13	-7.35	V	47.78	73.98	26.20	PK
4924	40.94	-7.35	V	33.59	53.98	20.39	AV
7386	53.74	-1.35	V	52.39	73.98	21.59	PK
7386	39.81	-1.35	V	38.46	53.98	15.52	AV
4924	54.97	-7.35	H	47.62	73.98	26.36	PK
4924	40.97	-7.35	H	33.62	53.98	20.36	AV
7386	53.54	-1.35	H	52.19	73.98	21.79	PK
7386	39.85	-1.35	H	38.50	53.98	15.48	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 Measurement Typeor mode and average Measurement Typeor mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done 802.11n mode and all data rate. Worst data rate is the lowest data of each mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in Measurement Typeing antenna.

8.7.2 RECEIVER SPURIOUS EMISSIONS

IC Rule(s)	**RSS-GEN**
Test Requirements:	**Below 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: Receive:

30 MHz ~ 1 GHz

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							

Above 1 GHz

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							

8.7.3 RADIATED RESTRICTED BAND EDGES

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

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

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	27.28	31.28	H	58.56	73.98	15.42	PK
2390.0	13.76	31.28	H	45.04	53.98	8.94	AV
2390.0	26.62	31.28	V	57.90	73.98	16.08	PK
2390.0	13.73	31.28	V	45.01	53.98	8.97	AV
2483.5	28.33	31.28	H	59.61	73.98	14.37	PK
2483.5	15.99	31.28	H	47.27	53.98	6.71	AV
2483.5	27.14	31.28	V	58.42	73.98	15.56	PK
2483.5	13.78	31.28	V	45.06	53.98	8.92	AV

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	35.14	31.28	H	66.42	73.98	7.56	PK
2390.0	16.83	31.28	H	48.11	53.98	5.87	AV
2390.0	30.81	31.28	V	62.09	73.98	11.89	PK
2390.0	14.92	31.28	V	46.20	53.98	7.78	AV
2483.5	36.88	31.28	H	68.16	73.98	5.82	PK
2483.5	18.04	31.28	H	49.32	53.98	4.66	AV
2483.5	29.58	31.28	V	60.86	73.98	13.12	PK
2483.5	14.24	31.28	V	45.52	53.98	8.46	AV

Operation Mode:	802.11n
Transfer Rate:	6.5 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV/m]	AN.+CL [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	35.74	31.28	H	67.02	73.98	6.96	PK
2390.0	18.99	31.28	H	50.27	53.98	3.71	AV
2390.0	33.34	31.28	V	64.62	73.98	9.36	PK
2390.0	16.55	31.28	V	47.83	53.98	6.15	AV
2483.5	38.01	31.28	H	69.29	73.98	4.69	PK
2483.5	19.40	31.28	H	50.68	53.98	3.30	AV
2483.5	29.94	31.28	V	61.22	73.98	12.76	PK
2483.5	14.96	31.28	V	46.24	53.98	7.74	AV

8.8 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

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

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

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

Note : We don't perform powerline conducted emission test. Because this EUT is used DC Voltage.

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	04/09/2014	Annual	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	05/23/2014	Annual	MY51110063
Agilent	N1911A/Power Meter	01/15/2015	Annual	MY45100523
Agilent	N1921A /POWER SENSOR	07/09/2014	Annual	MY45241059
Agilent	87300B/Directional Coupler	12/08/2014	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/19/2014	Annual	11275
ITECH	IT6720 / DC POWER SUPPLY	11/04/2014	Annual	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	04/11/2014	Annual	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/07/2014	Annual	100422
Agilent	8493C / Attenuator(10 dB)	07/21/2014	Annual	76649

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
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	09/04/2014	Annual	10094
CERNEX	CBL18265035 / POWER AMP	07/23/2014	Annual	22966
CERNEX	CBL26405040 / POWER AMP	04/04/2014	Annual	19660
Schwarzbeck	BBHA 9120D/ Horn Antenna	07/05/2013	Biennial	1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	07/05/2013	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	10/23/2014	Annual	836650/016
Wainwright Instrument	WHF3.0/18G-10EF / High Pass Filter	06/23/2014	Annual	8
Wainwright Instrument	WHNX6.0/26.5G-6SS / High Pass Filter	04/09/2014	Annual	1
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	04/04/2014	Annual	29
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	06/17/2014	Annual	1
TESCOM	TC-3000C / BLUETOOTH TESTER	04/11/2014	Annual	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/07/2014	Annual	100422
Rohde & Schwarz	LOOP ANTENNA	09/03/2014	Biennial	1513-175
CERNEX	CBL06185030 / POWER AMP	07/21/2014	Annual	22965
CERNEX	CBLU1183540 / POWER AMP	07/21/2014	Annual	22964