HCT CO., LTD.

CERTIFICATE OF COMPLIANCE

FCC Certification

Applicant Name:
LG Electronics MobileComm U.S.A., Inc.

Address:
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Date of Issue:
May 14, 2014

Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Report No.: HCT-R-1405-F009

HCT FRN: 0005866421

FCC ID	**: ZNFD213C**
APPLICANT	**: LG Electronics MobileComm U.S.A., Inc.**

FCC Model(s):	LG-D213c
Additional FCC Model(s):	LGD213c, D213c, LG-D213AR, LGD213AR, D213AR
EUT Type:	GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 b/g/n(2.4GHz_HT20&HT40), VoIP, Hotspot support
Max. RF Output Power:	Wi-Fi 802.11b(23.23 dBm) / Wi-Fi 802.11g (22.25 dBm) / Wi-Fi 802.11n_20 MHz (21.42 dBm) / Wi-Fi 802.11n_40 MHz (21.34 dBm)
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

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
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Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1405-F009	May 14, 2014	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	LG Electronics MobileComm U.S.A., Inc.
Address:	1000 Sylvan Avenue, Englewood Cliffs NJ 07632
FCC ID:	ZNFD213C
EUT Type:	GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 b/g/n(2.4GHz_HT20&HT40), VoIP, Hotspot support
Model name(s):	LG-D213c
Additional Model name(s):	LGD213c, D213c, LG-D213AR, LGD213AR, D213AR
Date(s) of Tests:	April 14, 2014 ~ May 12, 2014
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	GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 b/g/n(2.4GHz_HT20&HT40), VoIP, Hotspot support	
FCC Model Name	LG-D213c	
Additional FCC Model Name	LGD213c, D213c, LG-D213AR, LGD213AR, D213AR	
Power Supply	DC 3.8 V	
Battery type	Li-ion Battery(Standard)	
Frequency Range	TX: 2412 MHz ~ 2462 MHz, 2422 MHz - 2452 MHz_40 MHz BW RX: 2412 MHz ~ 2462 MHz, 2422 MHz - 2452 MHz_40 MHz BW	
Max. RF Output Power	Peak	Wi-Fi 802.11b(23.23 dBm) / Wi-Fi 802.11g (22.25 dBm) / Wi-Fi 802.11n_20 MHz (21.42 dBm) / Wi-Fi 802.11n_40 MHz (21.34 dBm)
	Average	Wi-Fi 802.11b(16.88 dBm) / Wi-Fi 802.11g (14.09 dBm) / Wi-Fi 802.11n_20 MHz (13.13 dBm) / Wi-Fi 802.11n_40 MHz (13.15 dBm)
Modulation Type	DSSS/CCK(802.11b), OFDM(802.11g, 802.11n)	
Antenna Specification	Manufacturer: LS Mtron Co. Ltd. Antenna type: SHEET METAL Antenna Peak Gain : 0.3 dBi	

3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v03r01 dated April 09, 2013 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.4-2003) Operating Under §15.247” 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 detector 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 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:

"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

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 8.7		PASS
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 8.6.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.6.2		PASS

8. TEST RESULT

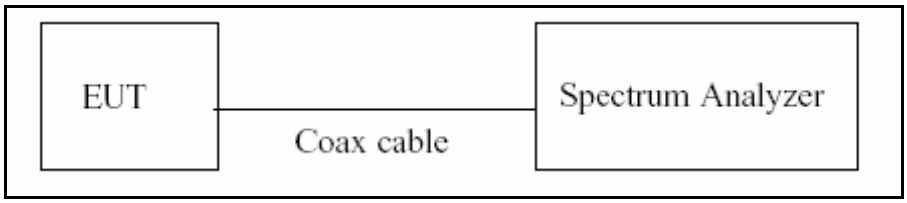
8.1 DUTY CYCLE

▣ TEST PROCEDURE

According to KDB 558074)6)b), issued 04/09/2013)

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 detector = 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 04/09/2013)

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 because 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	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.180	12.270	0.99266504	0.032
	2 Mbps	6.188	6.301	0.98206634	0.079
	5.5 Mbps	2.373	2.471	0.96033994	0.176
	11 Mbps	1.281	1.386	0.92424242	0.342
g	6 Mbs	2.010	2.130	0.94366197	0.252
	9 Mbs	1.356	1.464	0.92622951	0.333
	12 Mbs	1.023	1.131	0.90450928	0.436
	18 Mbs	0.687	0.795	0.86415094	0.634
	24 Mbs	0.526	0.632	0.83227848	0.797
	36 Mbs	0.356	0.463	0.76889849	1.141
	48 Mbs	0.273	0.380	0.71842105	1.436
	54 Mbs	0.244	0.353	0.69121813	1.604
n_20 MHz BW	6.5 Mbs	1.867	1.992	0.93724900	0.281
	13 Mbs	0.964	1.072	0.89925373	0.461
	19.5 Mbs	0.656	0.764	0.85863874	0.662
	26 Mbs	0.500	0.608	0.82236842	0.849
	39 Mbs	0.348	0.456	0.76315789	1.174
	52 Mbs	0.269	0.376	0.71542553	1.454
	58.5 Mbs	0.243	0.351	0.69230769	1.597
	65 Mbs	0.224	0.332	0.67469880	1.709
n_40 MHz BW	13.5 Mbps	0.912	1.050	0.86857143	0.612
	27 Mbps	0.484	0.590	0.82033898	0.860
	40.5 Mbps	0.336	0.444	0.75675676	1.210
	54 Mbps	0.260	0.368	0.70652174	1.509
	81 Mbps	0.188	0.294	0.63945578	1.942
	108 Mbps	0.148	0.255	0.58039216	2.363
	121.5 Mbps	0.136	0.242	0.56198347	2.503
	135 Mbps	0.128	0.234	0.54700855	2.620

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

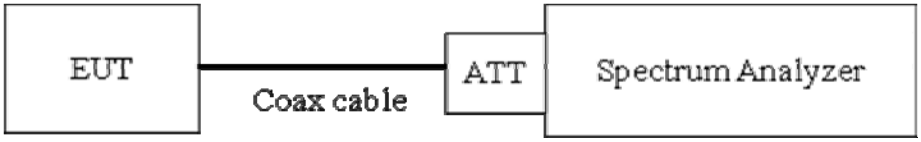
8.2 6dB BANDWIDTH (802.11b/g/n)

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 04/09/2013)

RBW = 100 kHz

VBW ≥ 3 x RBW

Detector = 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

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	10.03	0.500	Pass
2437	6	10.07	0.500	Pass
2462	11	9.13	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	16.43	0.500	Pass
2437	6	15.17	0.500	Pass
2462	11	16.38	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	17.66	0.500	Pass
2437	6	15.47	0.500	Pass
2462	11	17.63	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_40 MHz BW

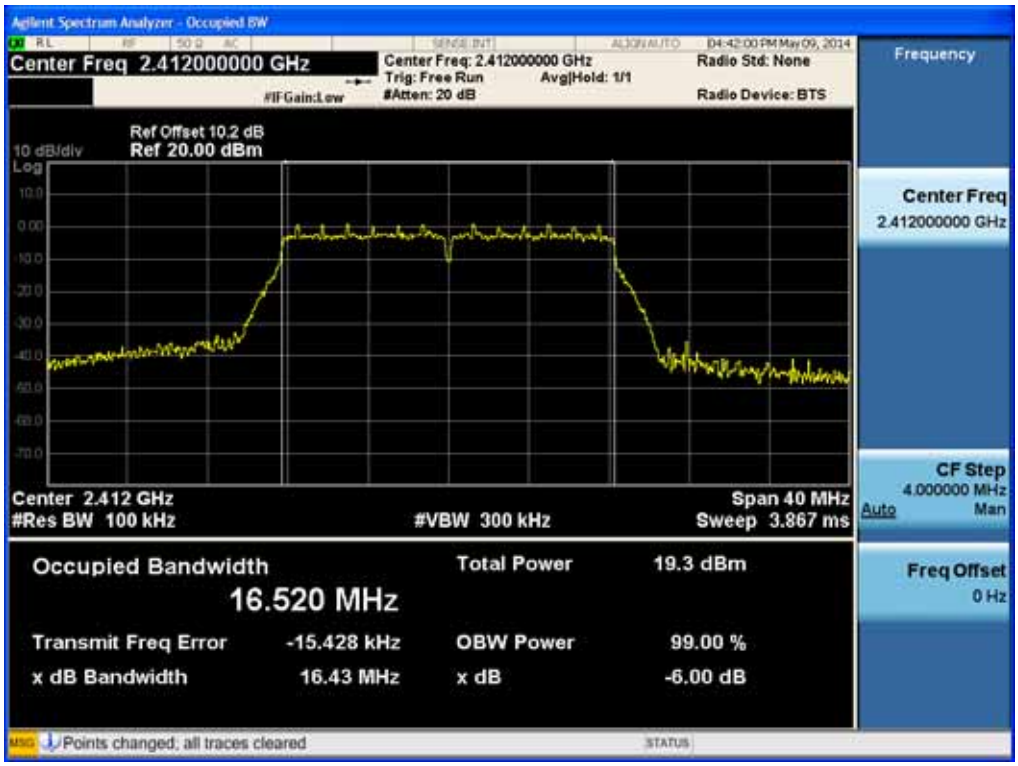
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.29	0.500	Pass
2437	6	35.25	0.500	Pass
2452	9	35.26	0.500	Pass

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

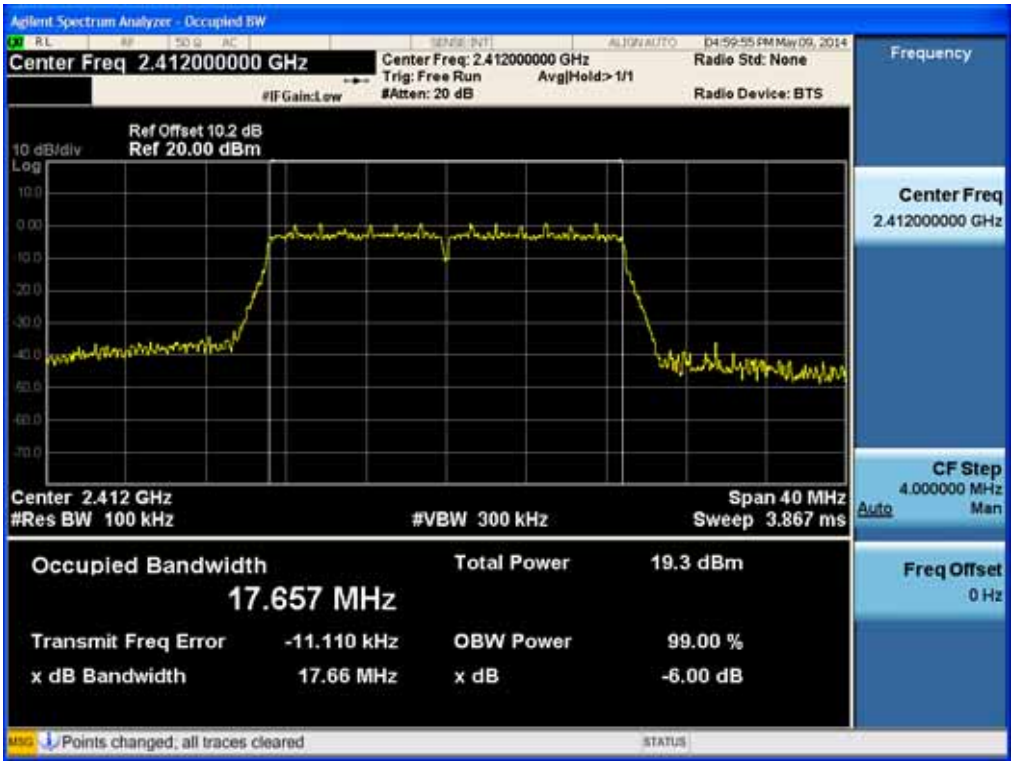
▣ RESULT PLOTS

6dB Bandwidth plot (802.11b-CH 6)

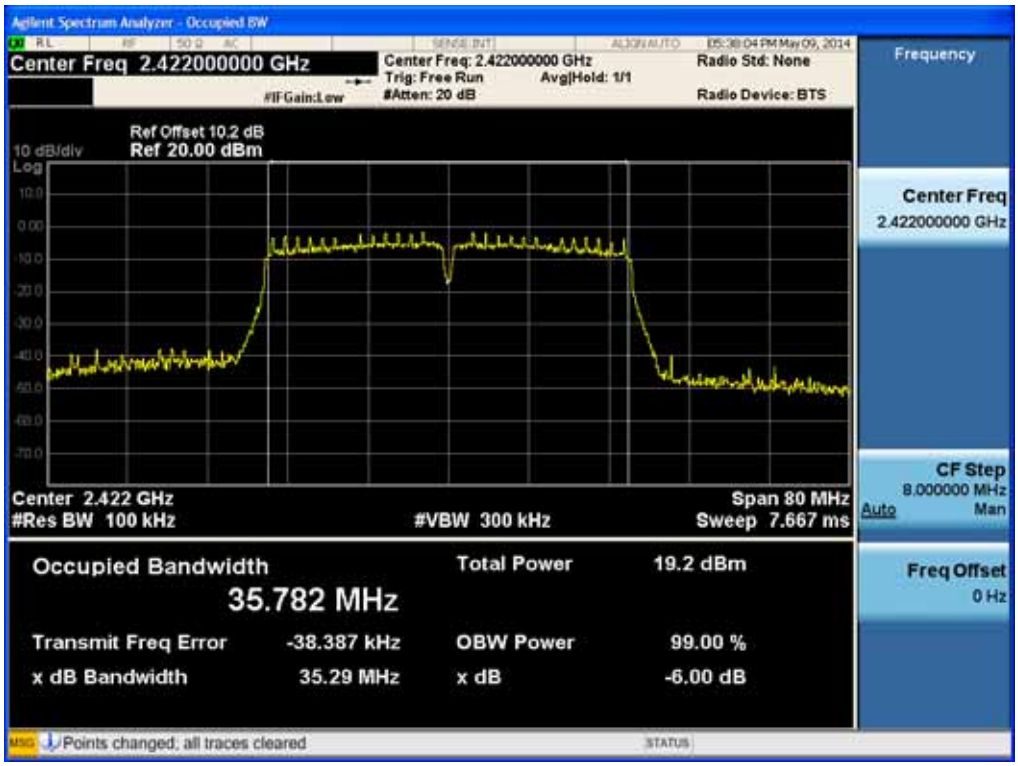
6dB Bandwidth plot (802.11g-CH 1)



6dB Bandwidth plot (802.11n-CH 1) _20 MHz BW



6dB Bandwidth plot (802.11n-CH 3) _40 MHz BW



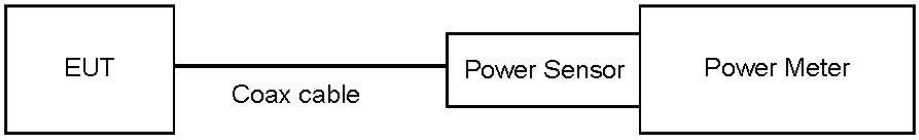
8.3 OUTPUT POWER (802.11b/g/n)

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 04/09/2013)
  1. Measure the peak power of the transmitter.
- Average Power (Procedure 9.2.3.1 in KDB 558074, issued 04/09/2013)
  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.

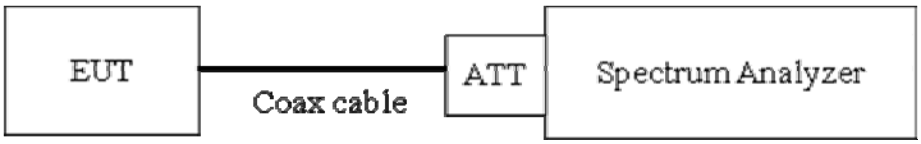
Note :

1. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 20.2 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	20.21
	2437	20.24
	2462	20.24

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

▣ TEST CONFIGURATION(40 MHz BW)



▣ TEST PROCEDURE(40 MHz BW)

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function.

The Spectrum Analyzer is set to

▪ Peak Power (Procedure 9.1.2 in KDB 558074, issued 04/09/2013)

RBW = 1 MHz

VBW ≥ 3 x RBW

SPAN ≥ 1.5 x DTS bandwidth

Detector Mode = Peak

Sweep = auto couple

Trace Mode = max hold

Allow trace to fully stabilize.

Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector).

▪ Average Power (Procedure 9.2.2.4 in KDB 558074, issued 04/09/2013)

Measure the duty cycle

Set span to at least 1.5 times the OBW

RBW = 1-5 % of the OBW, not to exceed 1 MHz.

VBW ≥ 3 x RBW.

Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

Sweep time = auto.

Detector = RMS(i.e., power averaging)

Do not use sweep triggering. Allow the sweep to "free run".

Trace average at least 100 traces in power averaging(RMS) mode.

Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.

Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

▣ Sample Calculation

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

Output Power = 10 dBm + 20 dB + 0.8 dB + 0.2 dB = 31.0 dBm

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

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	20.21
	2437	20.24
	2462	20.24

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

▣ TEST RESULTS-Peak

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	17.54	30
		2 Mbps	17.75	30
		5.5 Mbps	19.27	30
		11 Mbps	21.09	30
2437	6	1 Mbps	19.49	30
		2 Mbps	19.79	30
		5.5 Mbps	21.42	30
		11 Mbps	23.23	30
2462	11	1 Mbps	18.10	30
		2 Mbps	18.39	30
		5.5 Mbps	19.85	30
		11 Mbps	21.69	30

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	19.85	30
		9 Mbps	19.87	30
		12 Mbps	19.98	30
		18 Mbps	19.94	30
		24 Mbps	20.49	30
		36 Mbps	20.57	30
		48 Mbps	20.65	30
		54 Mbps	20.66	30
2437	6	6 Mbps	21.75	30
		9 Mbps	21.75	30
		12 Mbps	21.74	30
		18 Mbps	21.59	30
		24 Mbps	22.17	30
		36 Mbps	22.15	30
		48 Mbps	22.25	30
		54 Mbps	22.22	30
2462	11	6 Mbps	20.73	30
		9 Mbps	20.76	30
		12 Mbps	20.89	30
		18 Mbps	20.82	30
		24 Mbps	21.10	30
		36 Mbps	21.16	30
		48 Mbps	21.21	30
		54 Mbps	21.27	30

Conducted Output Power Measurements (802.11n Mode) _20 MHz BW

802.11n Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	6.5 Mbps	19.89	30
		13 Mbps	20.01	30
		19.5 Mbps	20.00	30
		26 Mbps	20.51	30
		39 Mbps	20.55	30
		52 Mbps	20.60	30
		58.5 Mbps	20.65	30
		65 Mbps	20.60	30
2437	6	6.5 Mbps	20.77	30
		13 Mbps	20.86	30
		19.5 Mbps	20.76	30
		26 Mbps	21.29	30
		39 Mbps	21.07	30
		52 Mbps	21.21	30
		58.5 Mbps	21.19	30
		65 Mbps	21.17	30
2462	11	6.5 Mbps	20.84	30
		13 Mbps	20.88	30
		19.5 Mbps	20.87	30
		26 Mbps	21.42	30
		39 Mbps	21.15	30
		52 Mbps	21.27	30
		58.5 Mbps	21.31	30
		65 Mbps	21.29	30

Conducted Output Power Measurements (802.11n Mode) _40 MHz BW

802.11n Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2422	3	13.5 Mbps	19.63	30
		27 Mbps	19.83	30
		40.5 Mbps	19.78	30
		54 Mbps	20.19	30
		81 Mbps	19.94	30
		108 Mbps	20.02	30
		121.5 Mbps	20.00	30
		135 Mbps	20.01	30
2437	6	13.5 Mbps	21.06	30
		27 Mbps	21.19	30
		40.5 Mbps	20.84	30
		54 Mbps	21.30	30
		81 Mbps	21.31	30
		108 Mbps	21.34	30
		121.5 Mbps	21.32	30
		135 Mbps	21.34	30
2452	9	13.5 Mbps	20.06	30
		27 Mbps	20.22	30
		40.5 Mbps	20.19	30
		54 Mbps	20.66	30
		81 Mbps	20.36	30
		108 Mbps	20.43	30
		121.5 Mbps	20.46	30
		135 Mbps	20.39	30

▣ TEST RESULTS-Average

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	14.75	0.032	14.78	30
		2 Mbps	14.73	0.079	14.81	30
		5.5 Mbps	14.64	0.176	14.82	30
		11 Mbps	14.66	0.342	15.00	30
2437	6	1 Mbps	16.74	0.032	16.77	30
		2 Mbps	16.63	0.079	16.71	30
		5.5 Mbps	16.70	0.176	16.88	30
		11 Mbps	16.34	0.342	16.68	30
2462	11	1 Mbps	15.48	0.032	15.51	30
		2 Mbps	15.39	0.079	15.47	30
		5.5 Mbps	15.62	0.176	15.80	30
		11 Mbps	15.26	0.342	15.60	30

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	11.76	0.252	12.01	30
		9 Mbps	11.70	0.333	12.03	30
		12 Mbps	11.59	0.436	12.03	30
		18 Mbps	11.39	0.634	12.02	30
		24 Mbps	11.24	0.797	12.03	30
		36 Mbps	10.90	1.141	12.04	30
		48 Mbps	10.70	1.436	12.14	30
		54 Mbps	10.84	1.604	12.44	30
2437	6	6 Mbps	13.84	0.252	14.09	30
		9 Mbps	13.67	0.333	14.00	30
		12 Mbps	13.57	0.436	14.00	30
		18 Mbps	13.15	0.634	13.79	30
		24 Mbps	12.98	0.797	13.78	30
		36 Mbps	12.69	1.141	13.83	30
		48 Mbps	12.41	1.436	13.85	30
		54 Mbps	12.28	1.604	13.89	30
2462	11	6 Mbps	12.53	0.252	12.78	30
		9 Mbps	12.52	0.333	12.85	30
		12 Mbps	12.41	0.436	12.85	30
		18 Mbps	12.27	0.634	12.90	30
		24 Mbps	11.84	0.797	12.64	30
		36 Mbps	11.52	1.141	12.66	30
		48 Mbps	11.27	1.436	12.71	30
		54 Mbps	11.09	1.604	12.69	30

Conducted Output Power Measurements (802.11n Mode)_ 20 MHz BW

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	11.70	0.281	11.98	30
		13 Mbps	11.48	0.461	11.94	30
		19.5 Mbps	11.35	0.662	12.01	30
		26 Mbps	11.19	0.849	12.04	30
		39 Mbps	10.91	1.174	12.09	30
		52 Mbps	10.65	1.454	12.11	30
		58.5 Mbps	10.55	1.597	12.14	30
		65 Mbps	10.39	1.709	12.10	30
2437	6	6.5 Mbps	12.76	0.281	13.04	30
		13 Mbps	12.59	0.461	13.05	30
		19.5 Mbps	12.43	0.662	13.09	30
		26 Mbps	12.28	0.849	13.13	30
		39 Mbps	11.75	1.174	12.92	30
		52 Mbps	11.50	1.454	12.96	30
		58.5 Mbps	11.39	1.597	12.99	30
		65 Mbps	11.27	1.709	12.98	30
2462	11	6.5 Mbps	12.62	0.281	12.90	30
		13 Mbps	12.43	0.461	12.89	30
		19.5 Mbps	12.27	0.662	12.93	30
		26 Mbps	12.08	0.849	12.93	30
		39 Mbps	11.52	1.174	12.70	30
		52 Mbps	11.27	1.454	12.72	30
		58.5 Mbps	11.34	1.597	12.94	30
		65 Mbps	11.06	1.709	12.77	30

Conducted Output Power Measurements (802.11n Mode) _40 MHz BW

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	13.5 Mbps	11.17	0.612	11.78	30
		27 Mbps	10.83	0.860	11.69	30
		40.5 Mbps	10.55	1.210	11.76	30
		54 Mbps	10.26	1.509	11.77	30
		81 Mbps	9.61	1.942	11.55	30
		108 Mbps	9.21	2.363	11.57	30
		121.5 Mbps	9.03	2.503	11.54	30
		135 Mbps	8.96	2.620	11.58	30
2437	6	13.5 Mbps	12.54	0.612	13.15	30
		27 Mbps	12.19	0.860	13.05	30
		40.5 Mbps	11.61	1.210	12.82	30
		54 Mbps	11.34	1.509	12.85	30
		81 Mbps	10.91	1.942	12.86	30
		108 Mbps	10.57	2.363	12.93	30
		121.5 Mbps	10.43	2.503	12.94	30
		135 Mbps	10.37	2.620	12.99	30
2452	9	13.5 Mbps	11.56	0.612	12.17	30
		27 Mbps	11.23	0.860	12.09	30
		40.5 Mbps	10.94	1.210	12.15	30
		54 Mbps	10.65	1.509	12.16	30
		81 Mbps	9.98	1.942	11.92	30
		108 Mbps	9.67	2.363	12.03	30
		121.5 Mbps	9.47	2.503	11.98	30
		135 Mbps	9.39	2.620	12.01	30

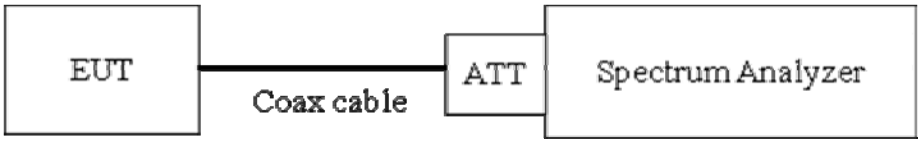
8.4 POWER SPECTRAL DENSITY (802.11b/g/n)

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 04/09/2013

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

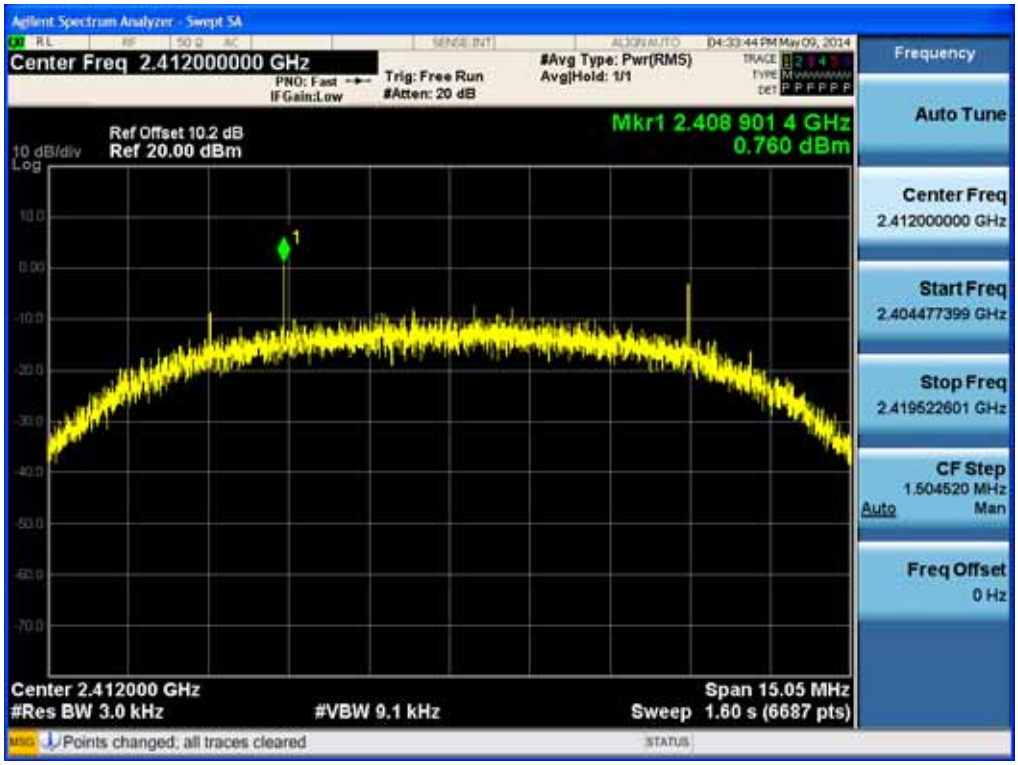
Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b	0.760	8	Pass
2437	6		-4.013	8	Pass
2462	11		-2.614	8	Pass
2412	1	802.11g	-13.436	8	Pass
2437	6		-11.221	8	Pass
2462	11		-12.717	8	Pass
2412	1	802.11n (20 MHz BW)	-13.771	8	Pass
2437	6		-11.524	8	Pass
2462	11		-12.728	8	Pass
2422	3	802.11n (40 MHz BW)	-17.064	8	Pass
2437	6		-16.334	8	Pass
2452	9		-16.058	8	Pass

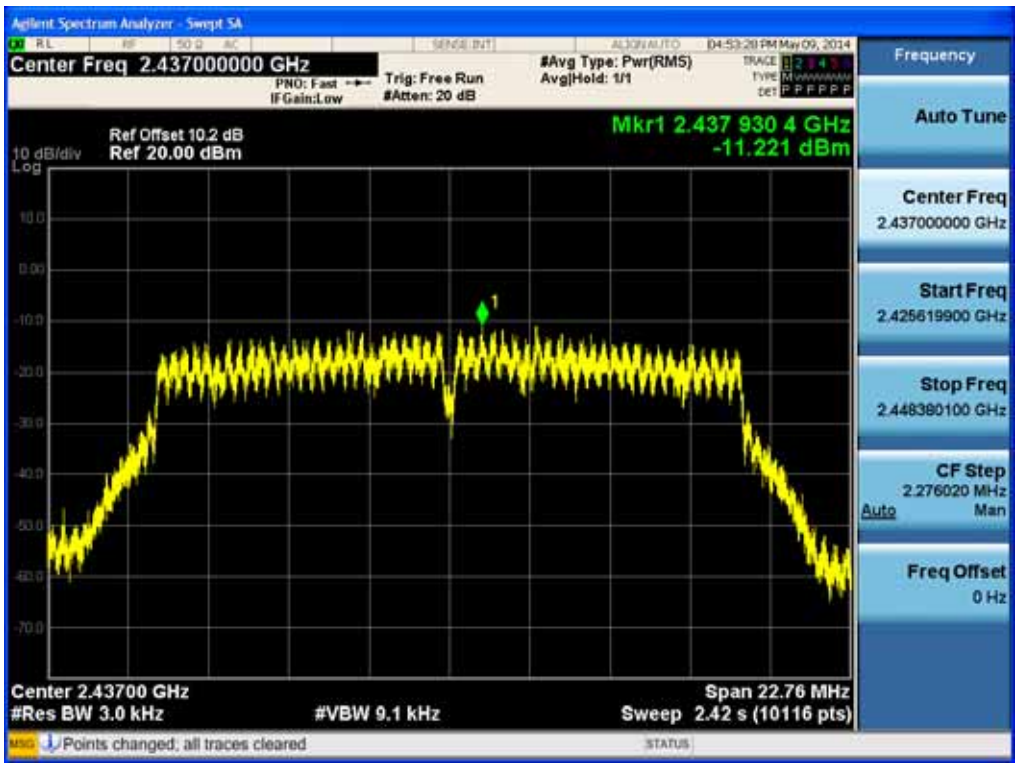
Note : In order to simplify the report, attached plots were only the highest PSD channel.

▣ RESULT PLOTS

Power Spectral Density (802.11b-CH 1)

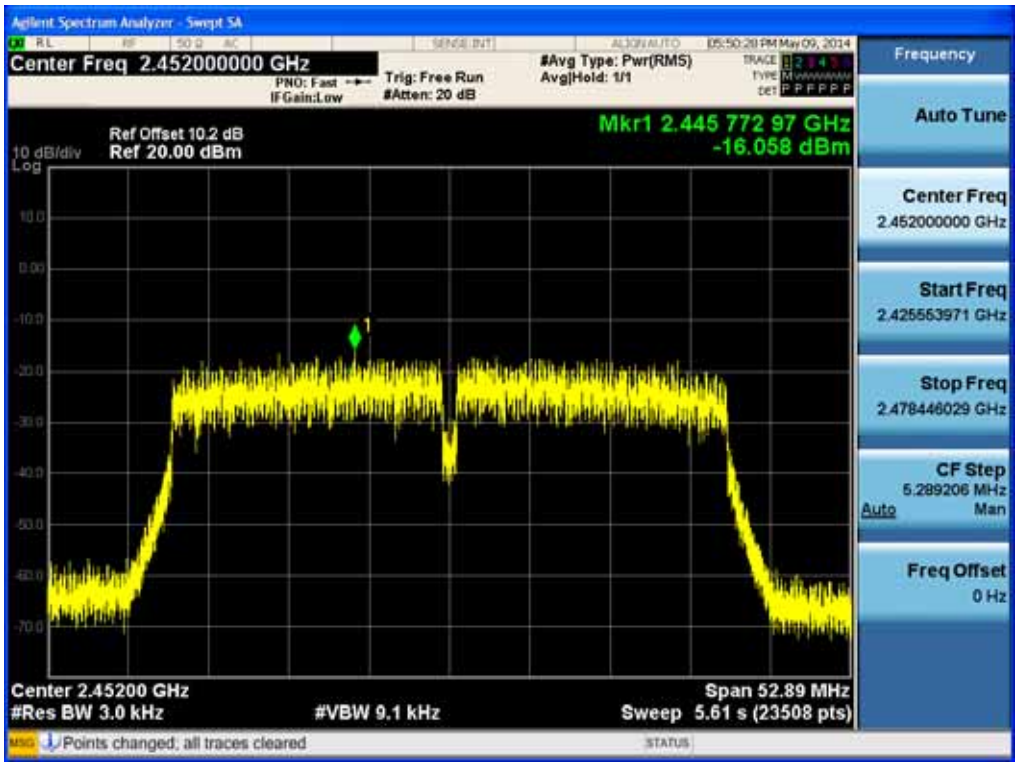


Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n-CH 6) _ 20 MHz BW

Power Spectral Density (802.11n-CH 9) _ 40 MHz BW



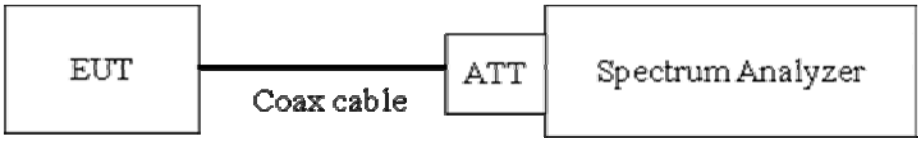
8.5 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

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 04/09/2013)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set span to encompass the spectrum to be examined

Detector = 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. 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)

4. In case of conducted spurious emissions test, please check factors blow table.

5. In order to simplify the report, attached plots were only the worst case channel.

▣ 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*	10.26
3000	10.27
4000	10.22
5000	10.48
5700*	10.42
5800*	10.48
6000	10.48
7000	10.57
8000	10.45
9000	10.50
10000	10.64
11000	10.69
12000	10.75

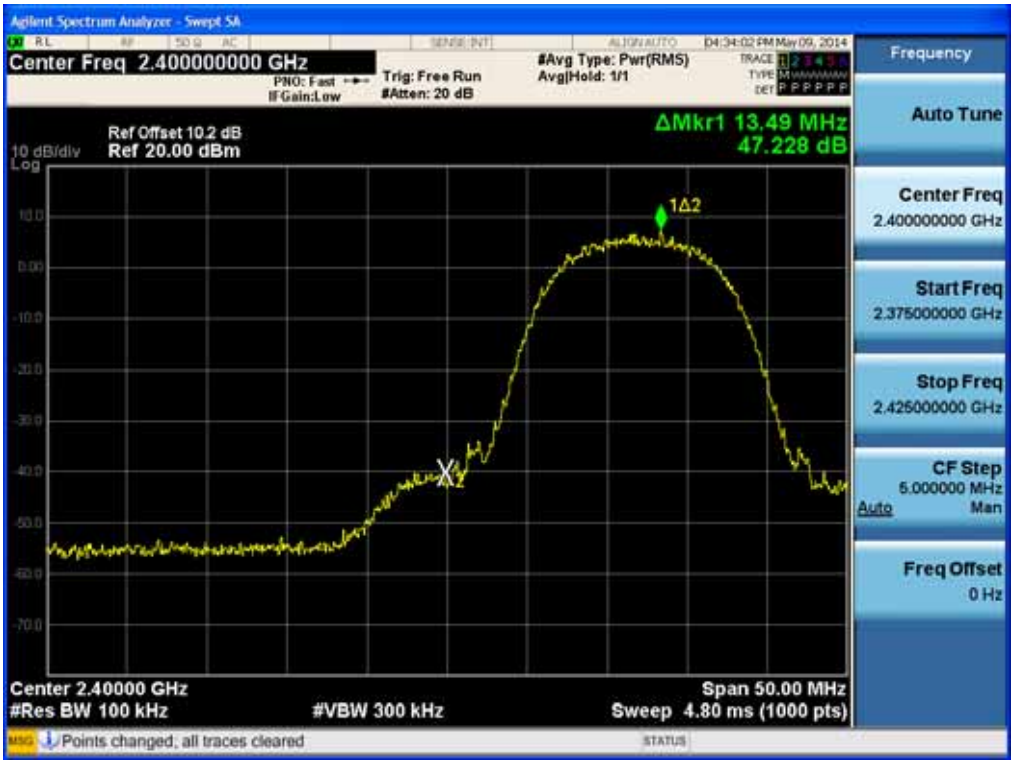
13000	10.92
14000	11.90
15000	11.00
16000	11.03
17000	10.93
18000	10.96
19000	10.85
20000	12.11
21000	11.17
22000	10.99
23000	11.12
24000	11.10
25000	11.42

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

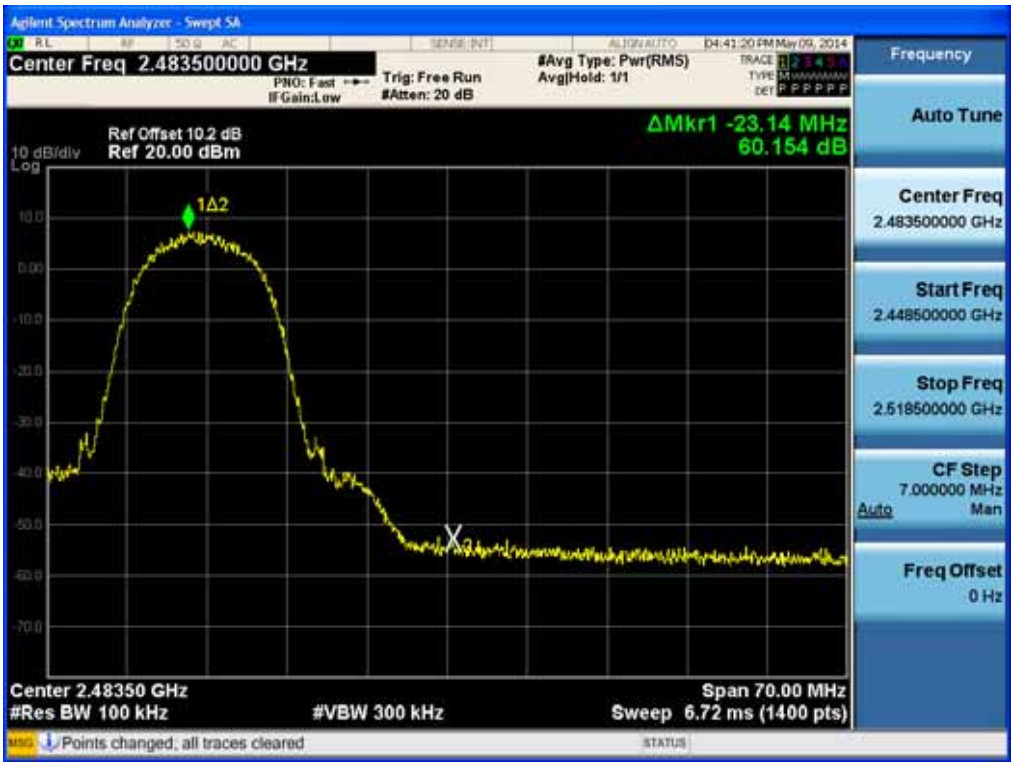
2. Factor = Cable loss + Attenuator loss

▣ RESULT PLOTS

BandEdge (802.11b-CH1)

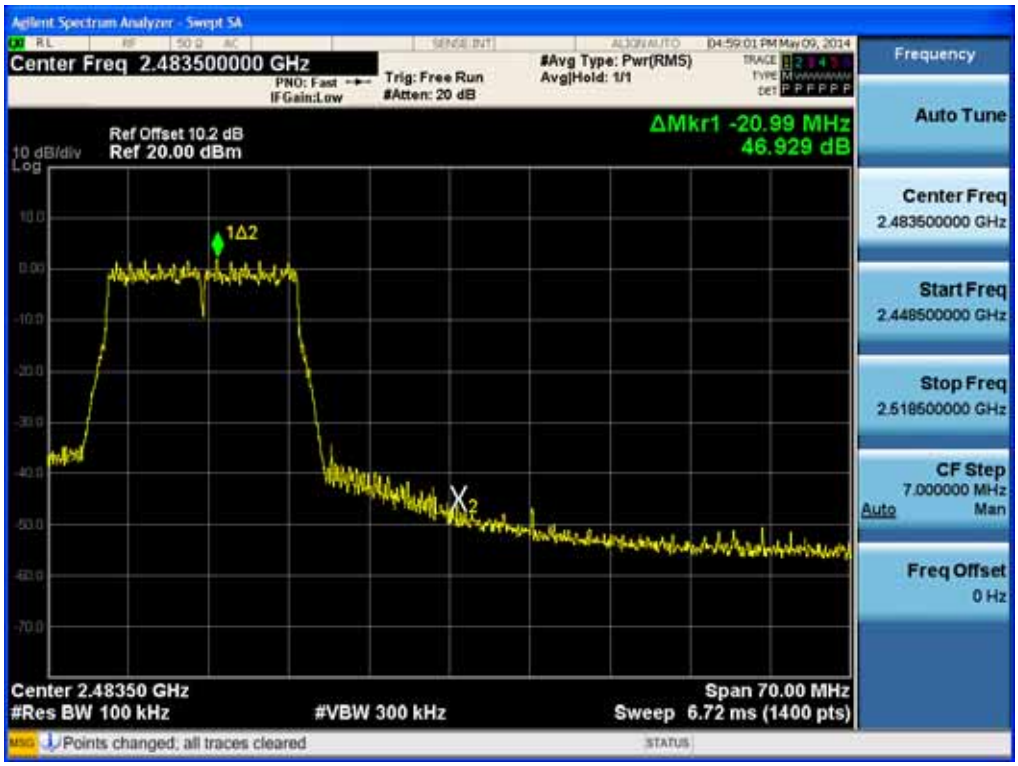


BandEdge (802.11b-CH11)



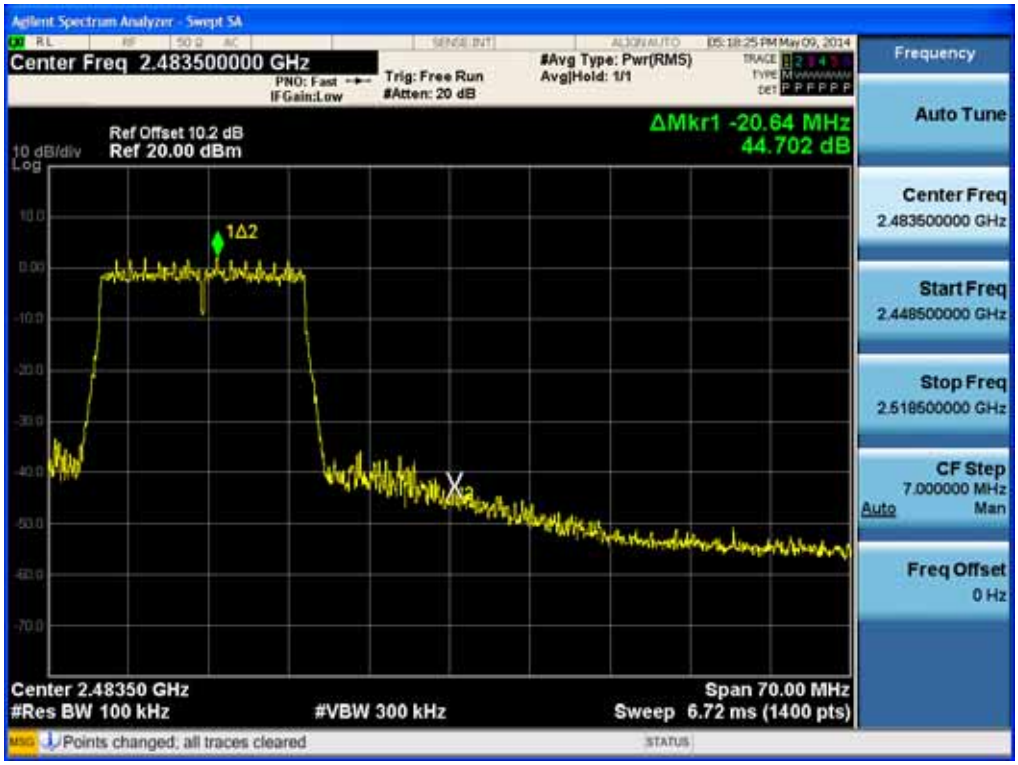
BandEdge (802.11g-CH1)

BandEdge (802.11g-CH11)

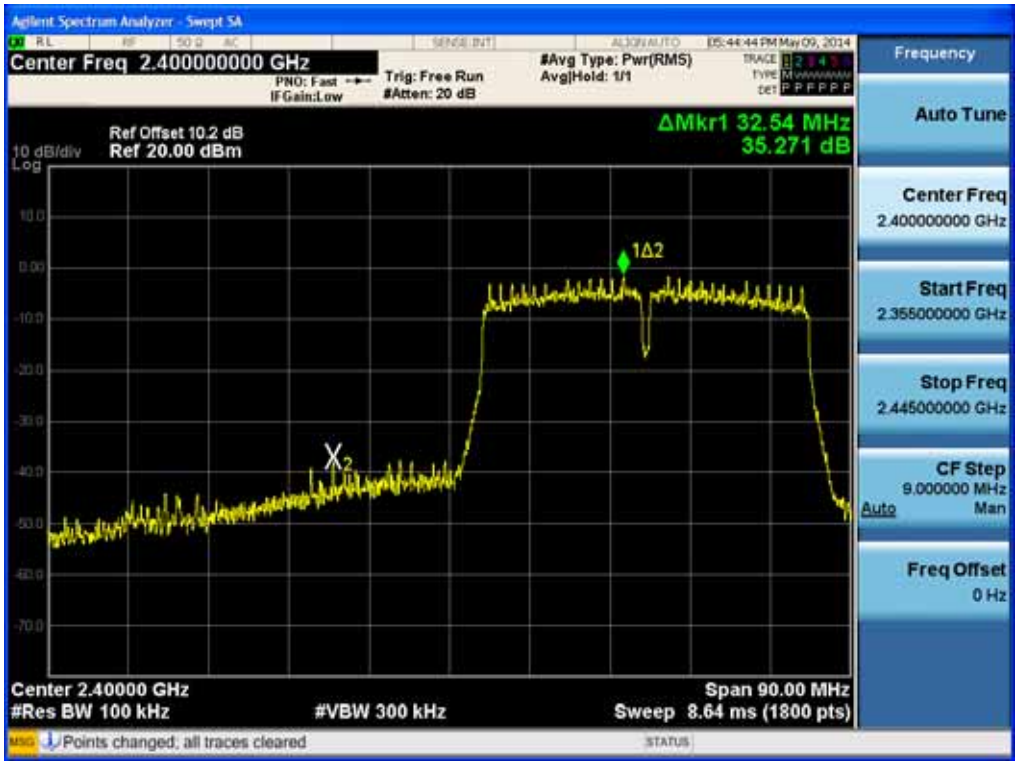


Band Edge (802.11n-CH1) _ 20 MHz BW

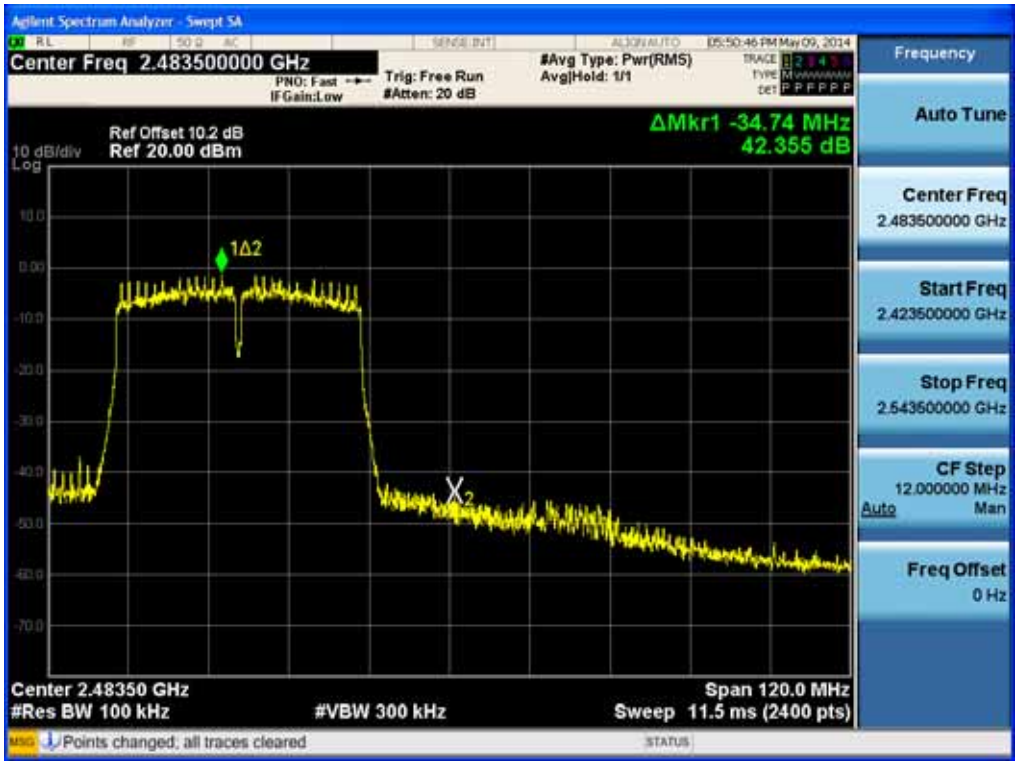
Band Edge (802.11n-CH11) _ 20 MHz BW



Band Edge (802.11n-CH1) _ 40 MHz BW

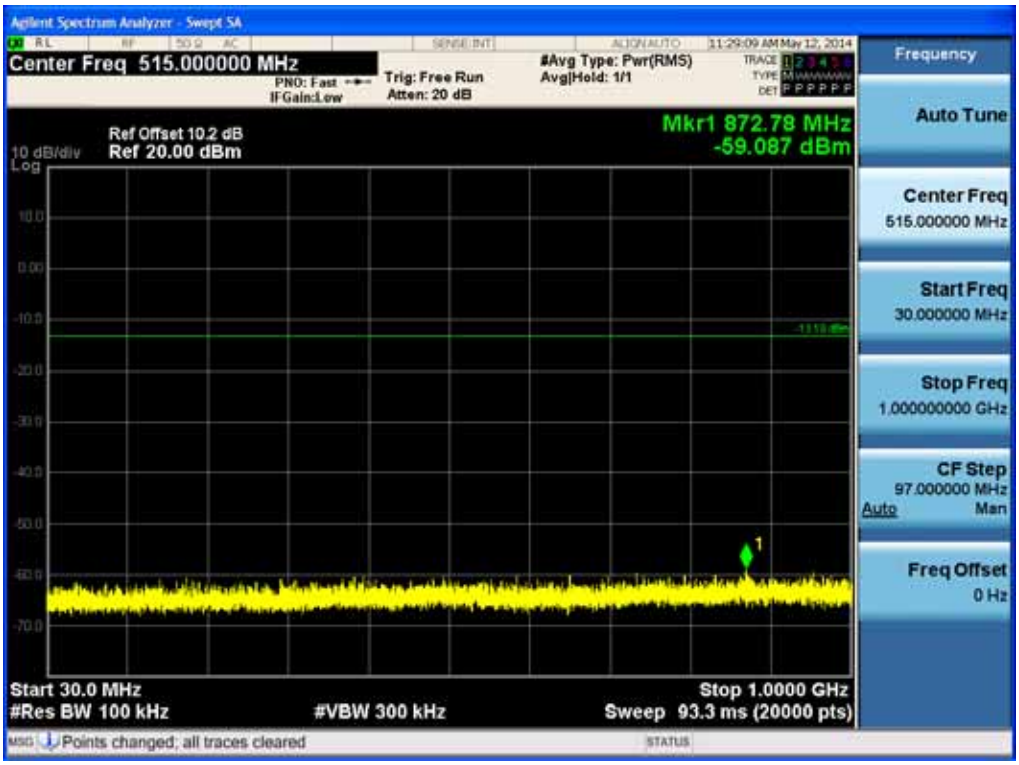


Band Edge (802.11n-CH11) _ 40 MHz BW



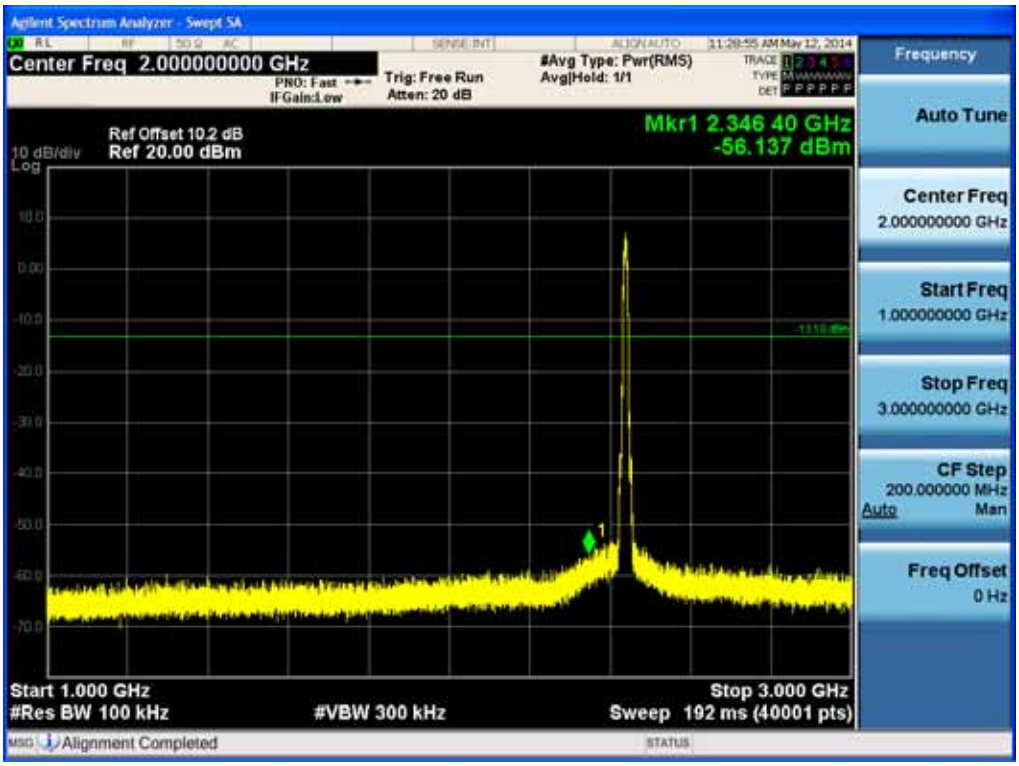
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



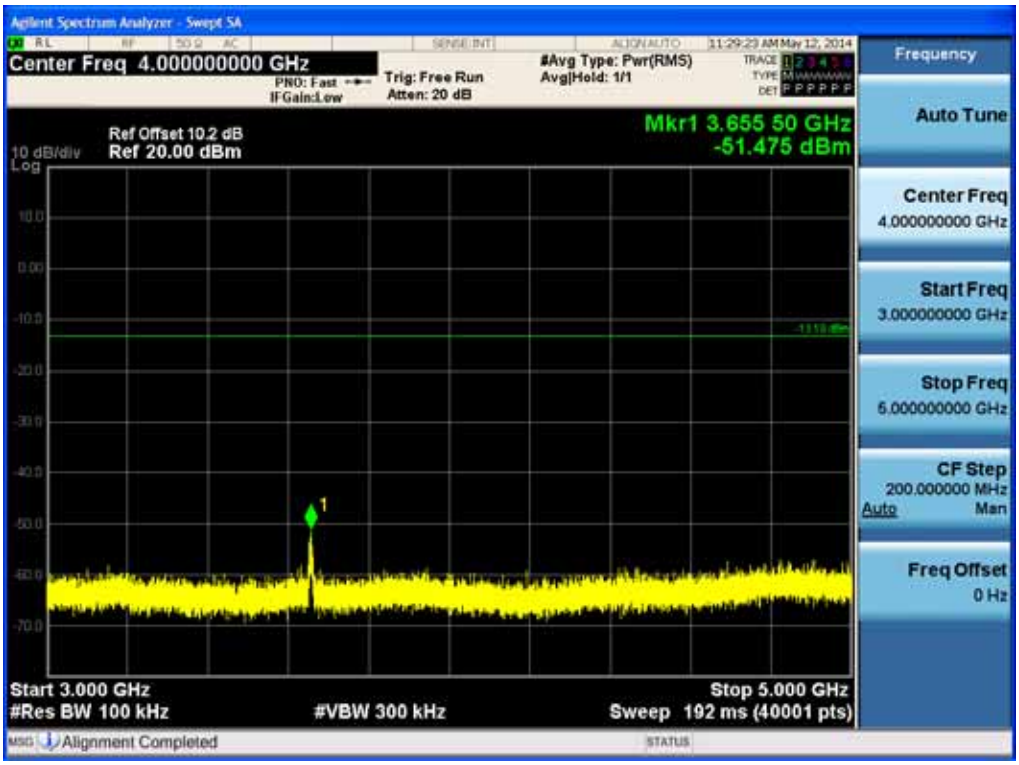
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



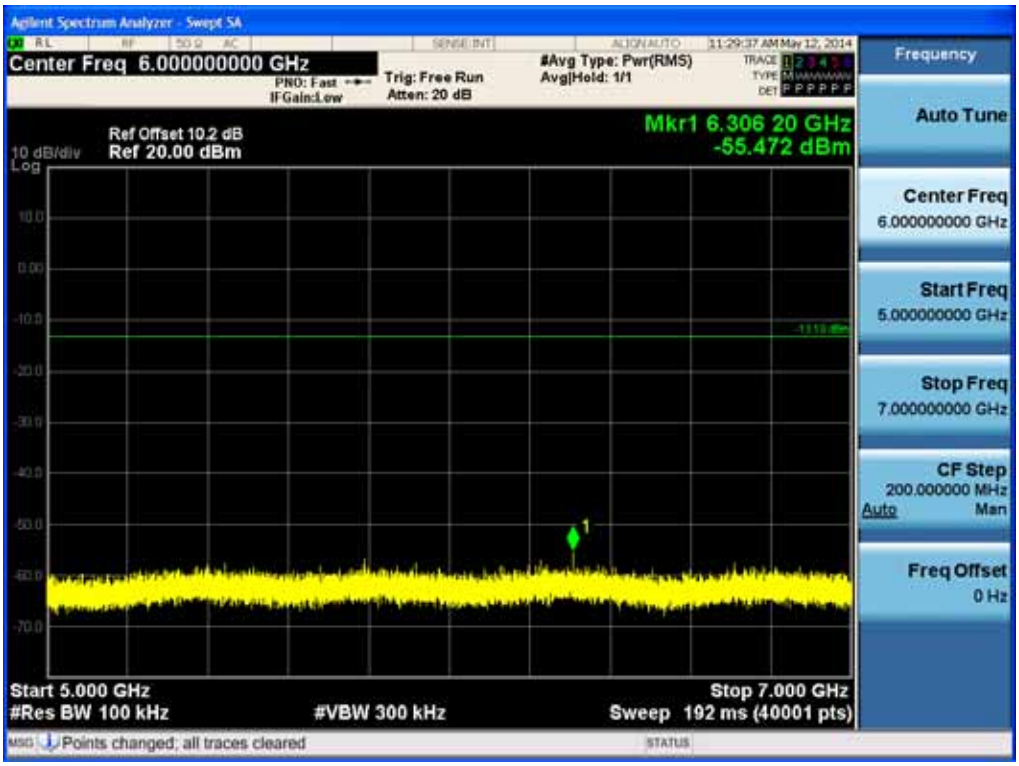
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



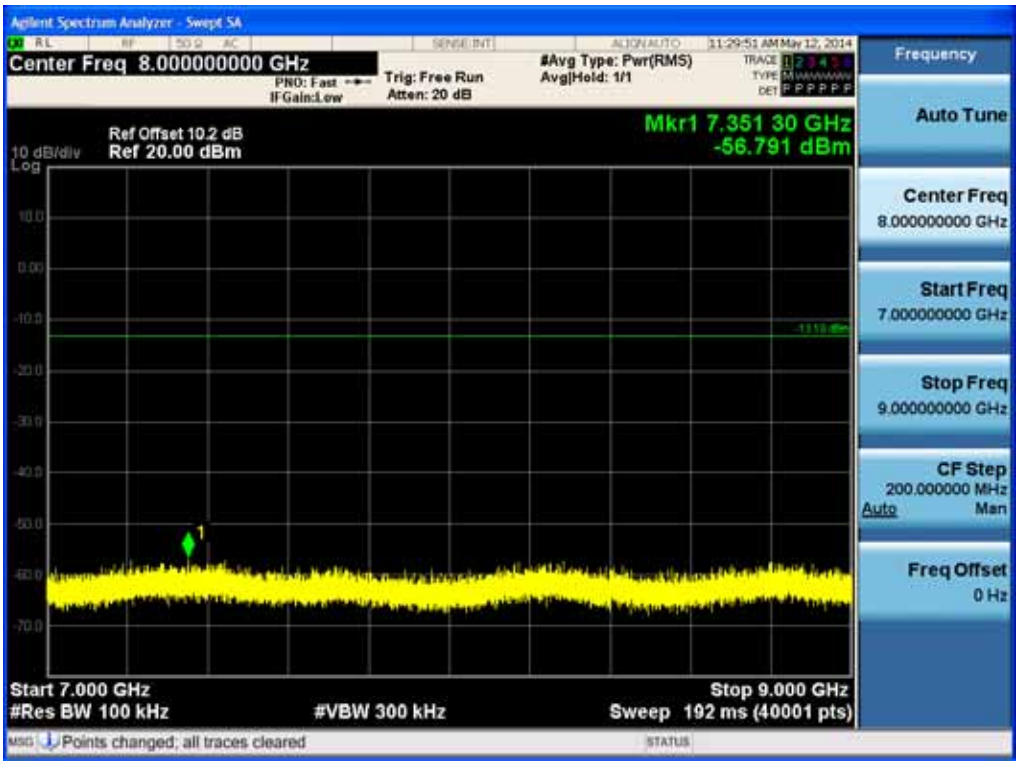
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



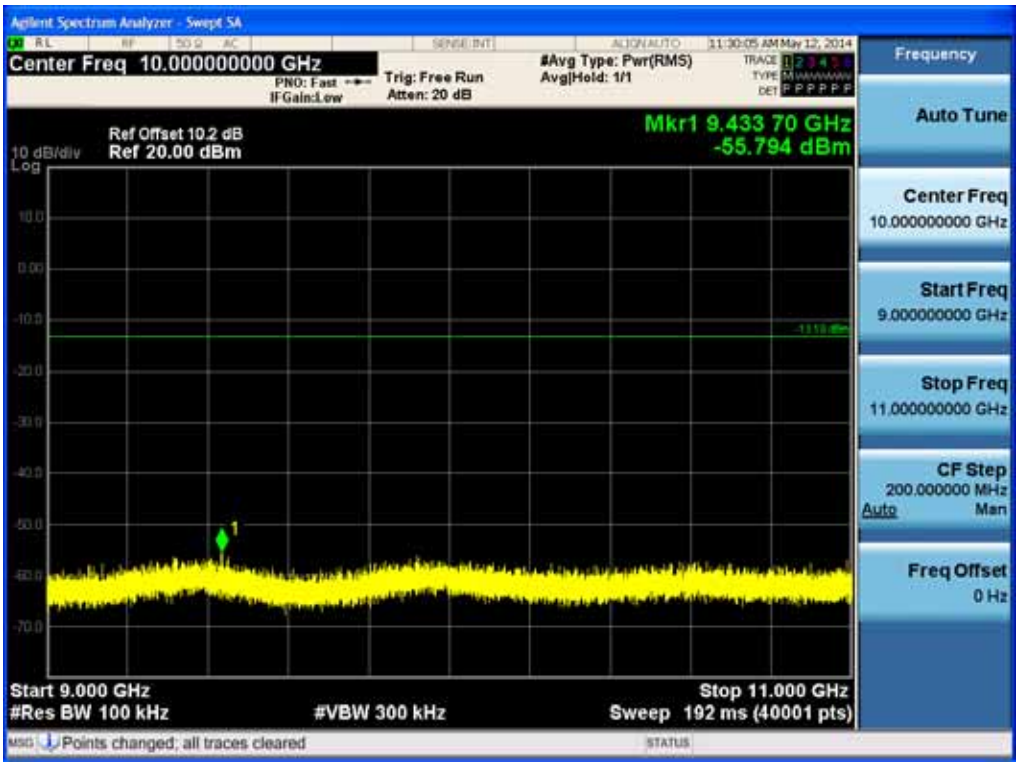
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



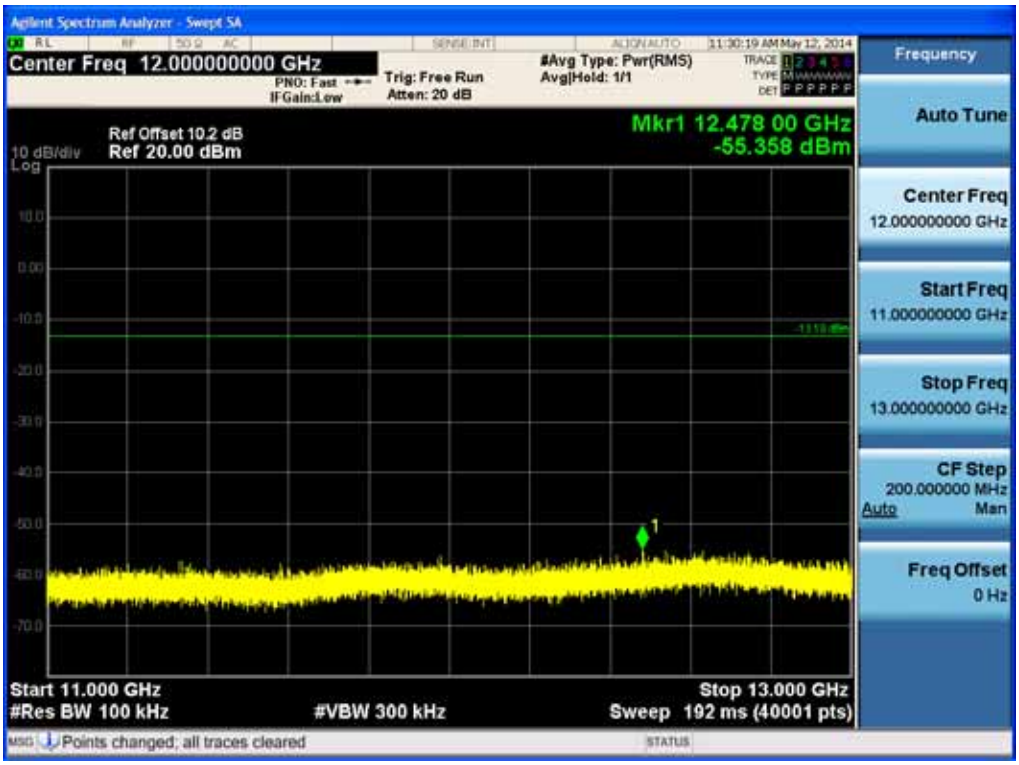
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



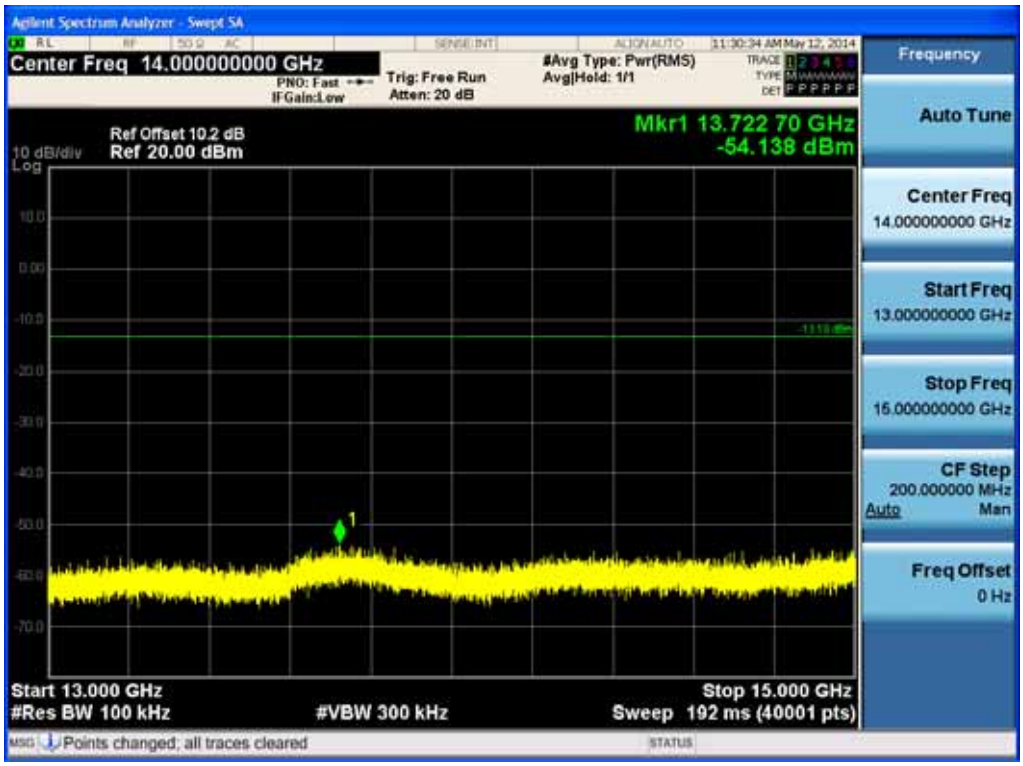
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



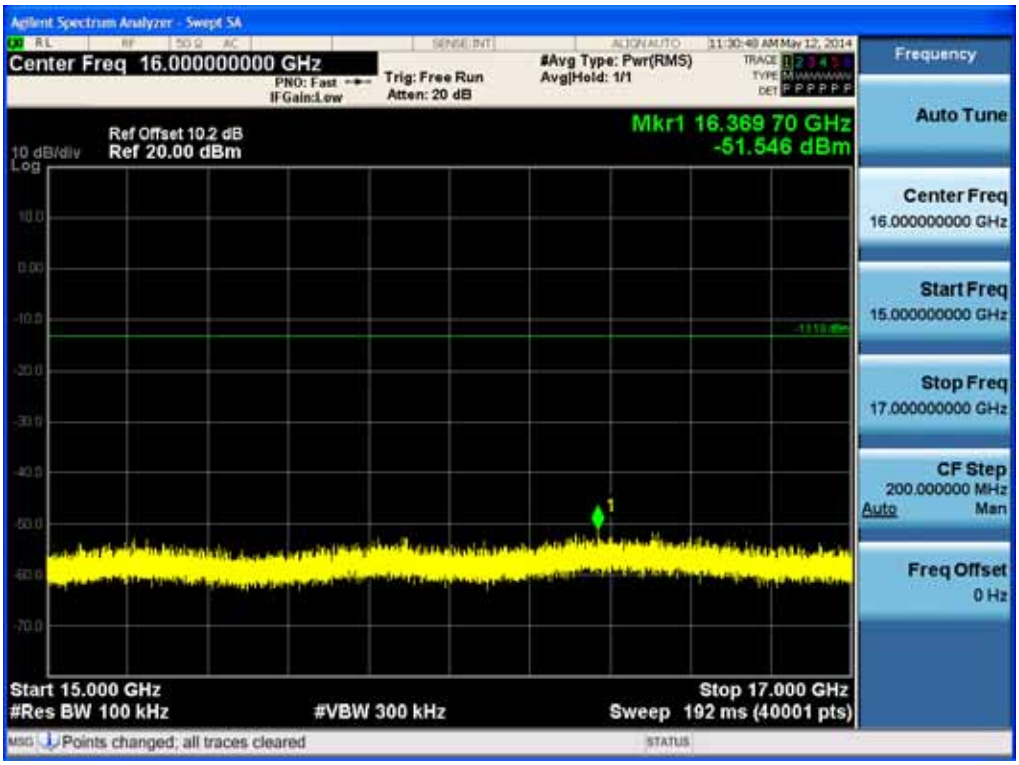
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



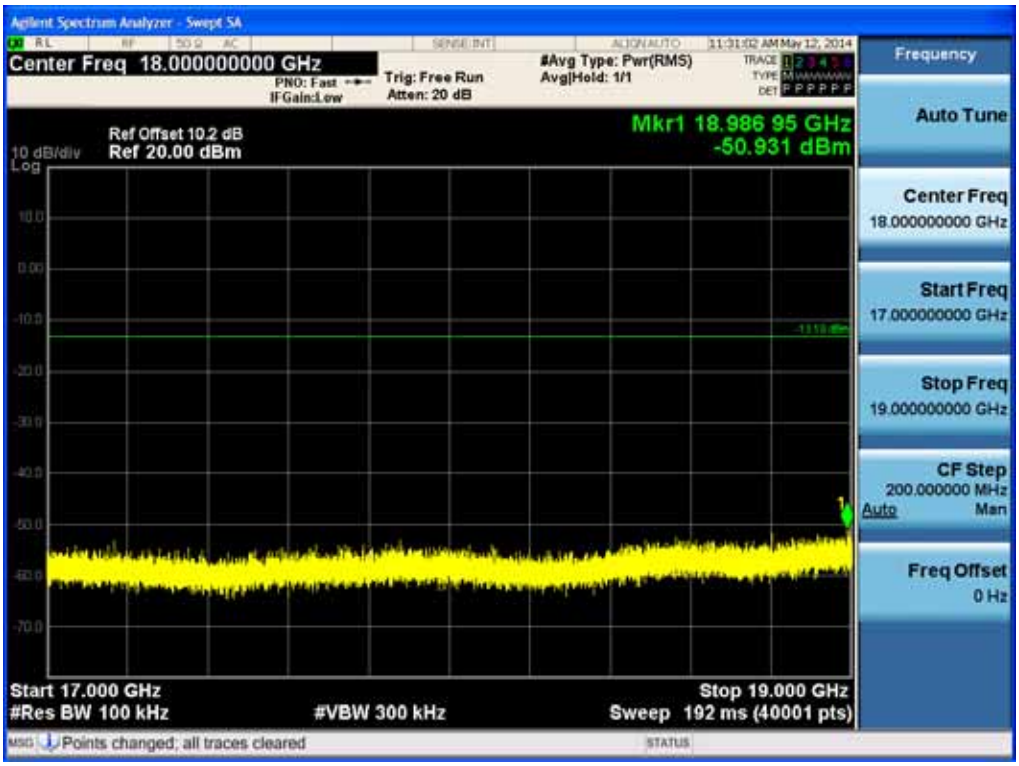
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



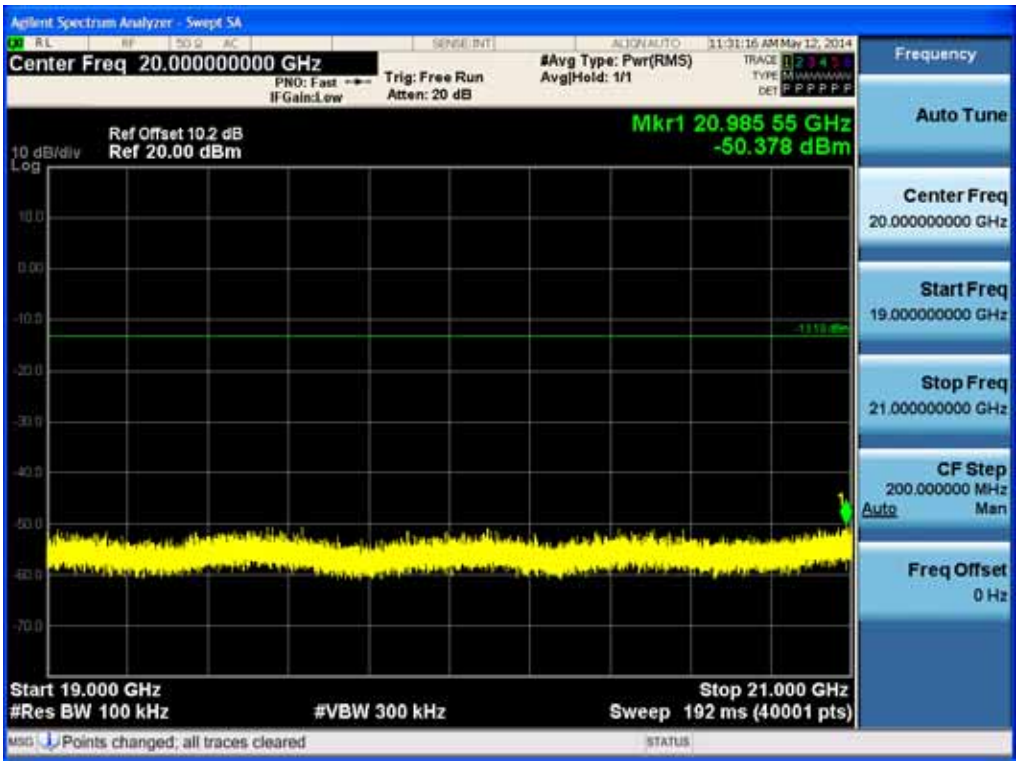
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



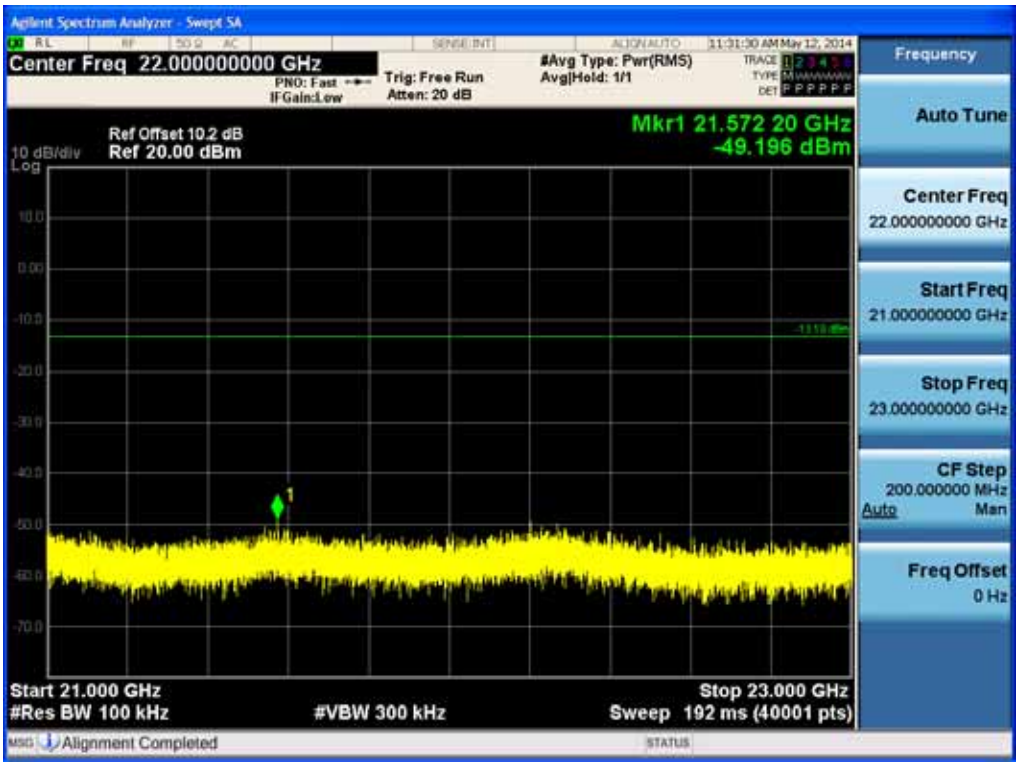
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



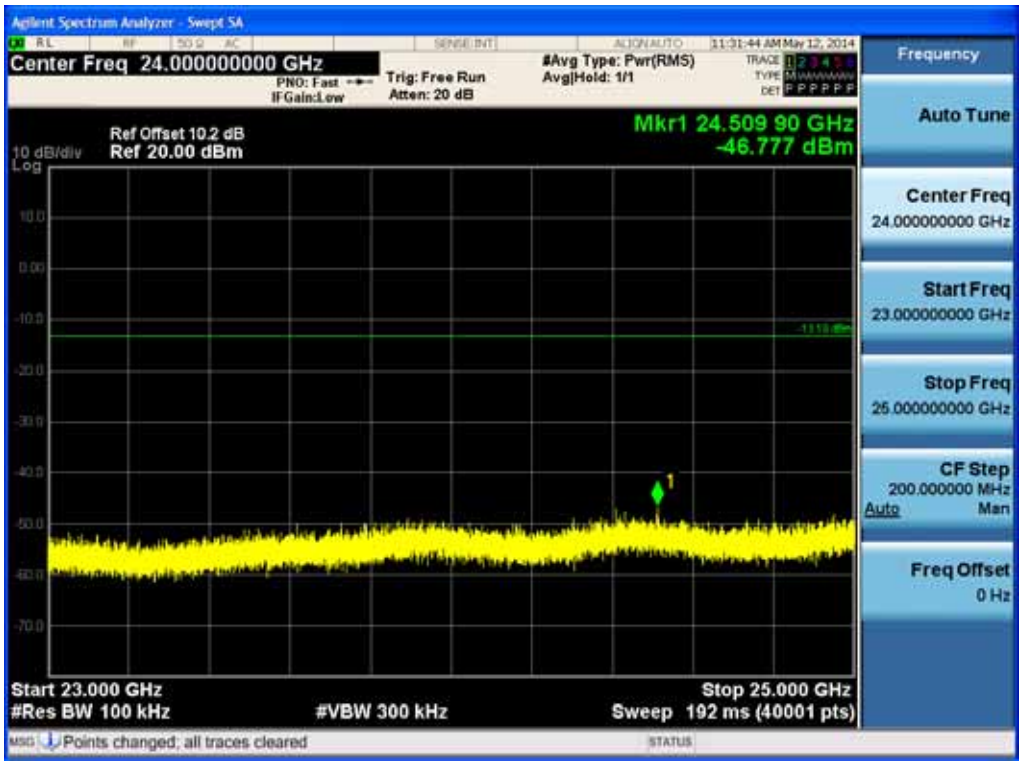
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b_Ch.6_11 Mbps)



8.6 RADIATED MEASUREMENT.

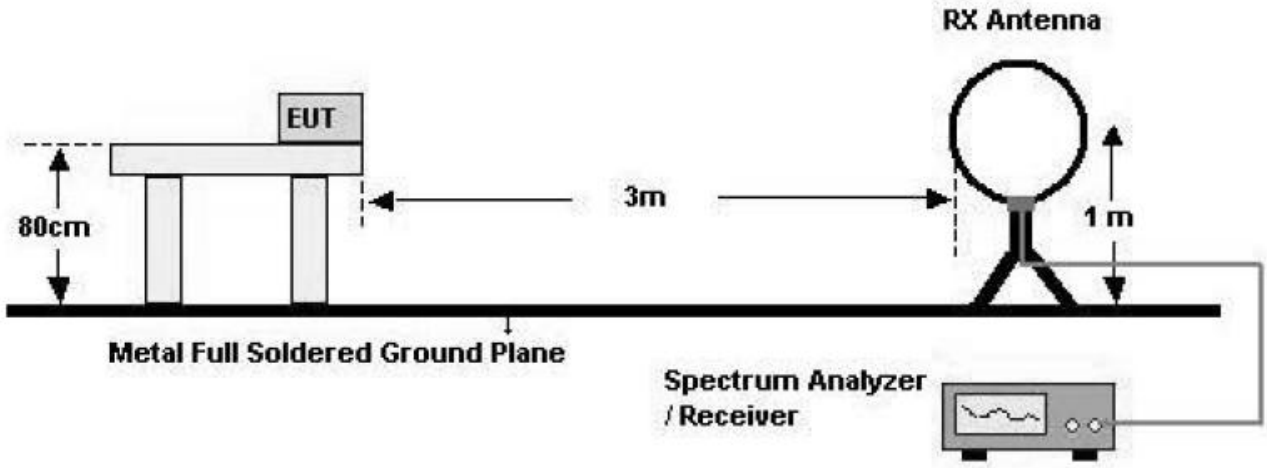
8.6.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

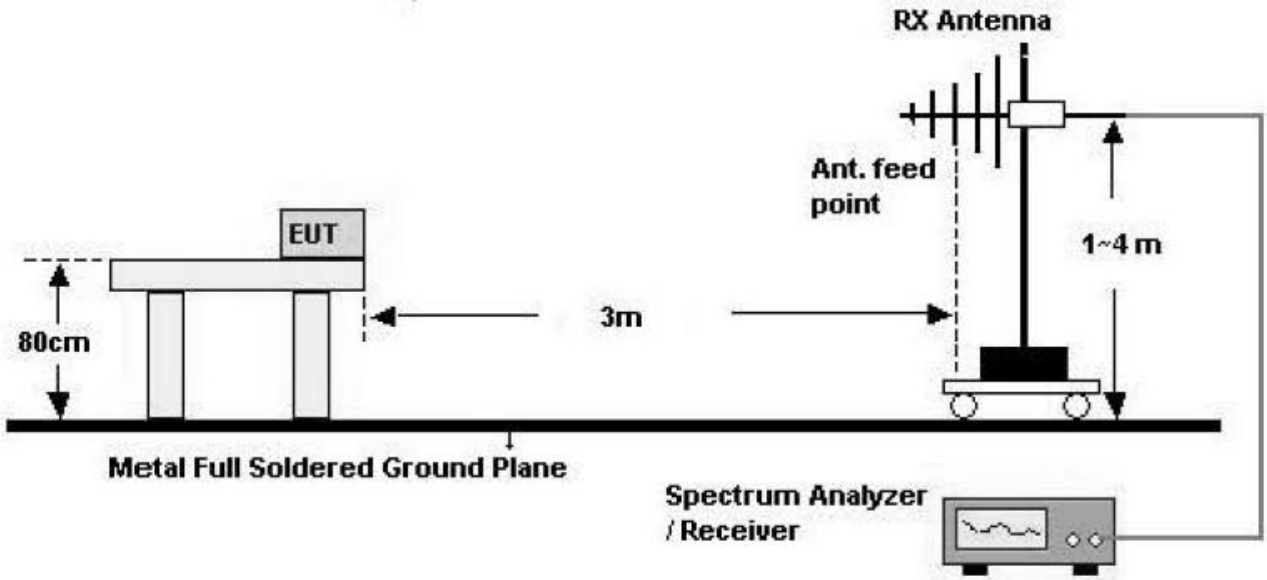
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

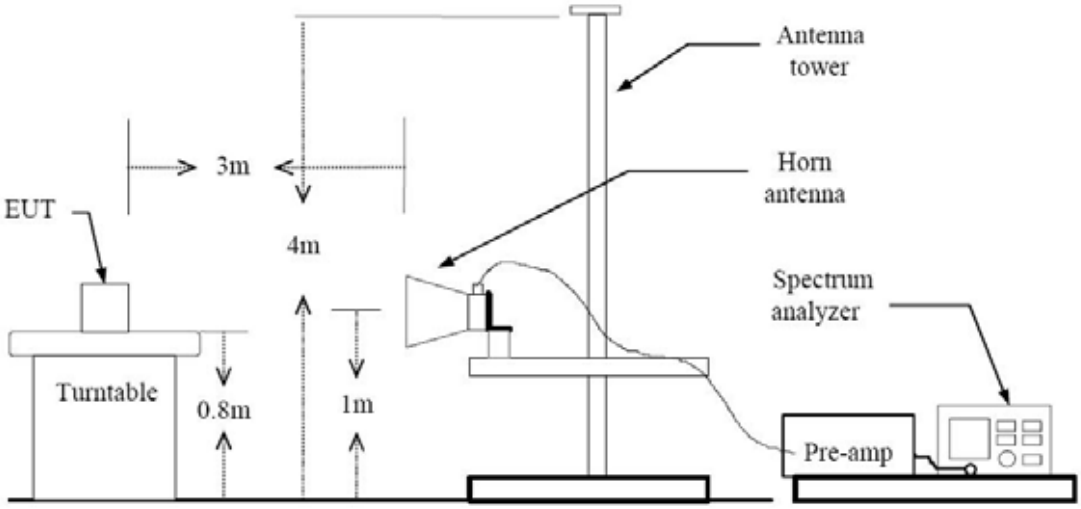
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

Method 12.1 in KDB 558074, issued 04/09/2013

Spectrum Setting

- Peak

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

RBW = cf. Table 1.

VBW ≥ 3 x RBW.

Detector = 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.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Note :

1. We are performed the RSE and radiated band edge using standard radiated method.
2. The actual setting value of VBW for 802.11 b/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	12.180	12.270	99.27	82	1000
g	6	2.010	2.130	94.37	498	1000
n_2 MHz BW	6.5	1.867	1.992	93.72	536	1000
n_40 MHz BW	13	0.912	1.050	86.86	1096	3000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

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

Notes:

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

Above 1 GHz

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

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	52.71	-4.25	V	48.46	73.98	25.52	PK
4824	39.50	-4.25	V	35.25	53.98	18.73	AV
7236	52.47	5.21	V	57.68	73.98	16.30	PK
7236	38.76	5.21	V	43.97	53.98	10.01	AV
4824	53.29	-4.25	H	49.04	73.98	24.94	PK
4824	41.27	-4.25	H	37.02	53.98	16.96	AV
7236	53.06	5.21	H	58.27	73.98	15.71	PK
7236	38.78	5.21	H	43.99	53.98	9.99	AV

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

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	52.68	-4.25	V	48.43	73.98	25.55	PK
4824	38.71	-4.25	V	34.46	53.98	19.52	AV
7236	52.17	5.21	V	57.38	73.98	16.60	PK
7236	38.66	5.21	V	43.87	53.98	10.11	AV
4824	52.86	-4.25	H	48.61	73.98	25.37	PK
4824	38.71	-4.25	H	34.46	53.98	19.52	AV
7236	52.70	5.21	H	57.91	73.98	16.07	PK
7236	38.67	5.21	H	43.88	53.98	10.10	AV

Operation Mode:	802.11 n_20 MHz BW
Transfer Rate:	6.5 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	52.50	-4.25	V	48.25	73.98	25.73	PK
4824	38.74	-4.25	V	34.49	53.98	19.49	AV
7236	52.39	5.21	V	57.60	73.98	16.38	PK
7236	38.45	5.21	V	43.66	53.98	10.32	AV
4824	53.06	-4.25	H	48.81	73.98	25.17	PK
4824	38.75	-4.25	H	34.50	53.98	19.48	AV
7236	52.49	5.21	H	57.70	73.98	16.28	PK
7236	38.45	5.21	H	43.66	53.98	10.32	AV

Operation Mode:	802.11 n_40 MHz BW
Transfer Rate:	13.5 Mbps
Operating Frequency	2422
Channel No.	03 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4844	52.65	-3.90	V	48.75	73.98	25.23	PK
4844	39.09	-3.90	V	35.19	53.98	18.79	AV
7266	52.43	4.91	V	57.34	73.98	16.64	PK
7266	38.81	4.91	V	43.72	53.98	10.26	AV
4844	52.80	-3.90	H	48.90	73.98	25.08	PK
4844	39.11	-3.90	H	35.21	53.98	18.77	AV
7266	52.57	4.91	H	57.48	73.98	16.50	PK
7266	38.88	4.91	H	43.79	53.98	10.19	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 802.11b/g/n 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 detecting antenna.

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

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	52.88	-3.93	V	48.95	73.98	25.03	PK
4874	41.00	-3.93	V	37.07	53.98	16.91	AV
7311	52.15	4.97	V	57.12	73.98	16.86	PK
7311	38.66	4.97	V	43.63	53.98	10.35	AV
4874	52.94	-3.93	H	49.01	73.98	24.97	PK
4874	41.04	-3.93	H	37.11	53.98	16.87	AV
7311	52.41	4.97	H	57.38	73.98	16.60	PK
7311	38.67	4.97	H	43.64	53.98	10.34	AV

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

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	52.62	-3.93	V	48.69	73.98	25.29	PK
4874	38.57	-3.93	V	34.64	53.98	19.34	AV
7311	52.33	4.97	V	57.30	73.98	16.68	PK
7311	38.37	4.97	V	43.34	53.98	10.64	AV
4874	52.70	-3.93	H	48.77	73.98	25.21	PK
4874	38.65	-3.93	H	34.72	53.98	19.26	AV
7311	52.54	4.97	H	57.51	73.98	16.47	PK
7311	38.42	4.97	H	43.39	53.98	10.59	AV

Operation Mode:	802.11 n_20 MHz BW
Transfer Rate:	6.5 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	51.97	-3.93	V	48.04	73.98	25.94	PK
4874	38.25	-3.93	V	34.32	53.98	19.66	AV
7311	51.99	4.97	V	56.96	73.98	17.02	PK
7311	38.45	4.97	V	43.42	53.98	10.56	AV
4874	52.04	-3.93	H	48.11	73.98	25.87	PK
4874	38.28	-3.93	H	34.35	53.98	19.63	AV
7311	52.15	4.97	H	57.12	73.98	16.86	PK
7311	38.46	4.97	H	43.43	53.98	10.55	AV

Operation Mode:	802.11 n_40 MHz BW
Transfer Rate:	13.5 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	52.20	-3.93	V	48.27	73.98	25.71	PK
4874	38.90	-3.93	V	34.97	53.98	19.01	AV
7311	52.81	4.97	V	57.78	73.98	16.20	PK
7311	39.08	4.97	V	44.05	53.98	9.93	AV
4874	52.37	-3.93	H	48.44	73.98	25.54	PK
4874	38.93	-3.93	H	35.00	53.98	18.98	AV
7311	52.84	4.97	H	57.81	73.98	16.17	PK
7311	39.11	4.97	H	44.08	53.98	9.90	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 802.11b/g/n 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 detecting antenna.

Operation Mode: 802.11 b

Transfer Rate: 1 Mbps

Operating Frequency 2462

Channel No. 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	51.52	-3.75	V	47.77	73.98	26.21	PK
4924	38.25	-3.75	V	34.50	53.98	19.48	AV
7386	53.32	5.60	V	58.92	73.98	15.06	PK
7386	38.75	5.60	V	44.35	53.98	9.63	AV
4924	51.78	-3.75	H	48.03	73.98	25.95	PK
4924	38.28	-3.75	H	34.53	53.98	19.45	AV
7386	53.78	5.60	H	59.38	73.98	14.60	PK
7386	38.76	5.60	H	44.36	53.98	9.62	AV

Operation Mode: 802.11 g

Transfer Rate: 6 Mbps

Operating Frequency 2462

Channel No. 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	52.05	-3.75	V	48.30	73.98	25.68	PK
4924	37.75	-3.75	V	34.00	53.98	19.98	AV
7386	52.29	5.60	V	57.89	73.98	16.09	PK
7386	38.60	5.60	V	44.20	53.98	9.78	AV
4924	52.18	-3.75	H	48.43	73.98	25.55	PK
4924	37.78	-3.75	H	34.03	53.98	19.95	AV
7386	52.78	5.60	H	58.38	73.98	15.60	PK
7386	38.61	5.60	H	44.21	53.98	9.77	AV

Operation Mode:	802.11 n_20 MHz BW
Transfer Rate:	6.5 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	51.81	-3.75	V	48.06	73.98	25.92	PK
4924	37.68	-3.75	V	33.93	53.98	20.05	AV
7386	52.43	5.60	V	58.03	73.98	15.95	PK
7386	38.83	5.60	V	44.43	53.98	9.55	AV
4924	51.86	-3.75	H	48.11	73.98	25.87	PK
4924	37.70	-3.75	H	33.95	53.98	20.03	AV
7386	52.59	5.60	H	58.19	73.98	15.79	PK
7386	38.85	5.60	H	44.45	53.98	9.53	AV

Operation Mode:	802.11 n_40 MHz BW
Transfer Rate:	13.5 Mbps
Operating Frequency	2452
Channel No.	09 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4904	52.41	-3.70	V	48.71	73.98	25.27	PK
4904	38.50	-3.70	V	34.80	53.98	19.18	AV
7356	52.39	6.00	V	58.39	73.98	15.59	PK
7356	39.22	6.00	V	45.22	53.98	8.76	AV
4904	52.58	-3.70	H	48.88	73.98	25.10	PK
4904	38.52	-3.70	H	34.82	53.98	19.16	AV
7356	52.55	6.00	H	58.55	73.98	15.43	PK
7356	39.25	6.00	H	45.25	53.98	8.73	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 802.11b/g/n 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 detecting antenna.

8.6.2 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:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	30.40	33.90	H	64.30	73.98	9.68	PK
2390.0	15.39	33.90	H	49.29	53.98	4.69	AV
2390.0	26.04	33.90	V	59.94	73.98	14.04	PK
2390.0	12.64	33.90	V	46.54	53.98	7.44	AV
2483.5	33.12	33.99	H	67.11	73.98	6.87	PK
2483.5	14.70	33.99	H	48.69	53.98	5.29	AV
2483.5	26.06	33.99	V	60.05	73.98	13.93	PK
2483.5	12.14	33.99	V	46.13	53.98	7.85	AV

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

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	26.91	33.90	H	60.81	73.98	13.17	PK
2390.0	13.94	33.90	H	47.84	53.98	6.14	AV
2390.0	25.64	33.90	V	59.54	73.98	14.44	PK
2390.0	11.97	33.90	V	45.87	53.98	8.11	AV
2483.5	27.59	33.99	H	61.58	73.98	12.40	PK
2483.5	13.02	33.99	H	47.01	53.98	6.97	AV
2483.5	25.00	33.99	V	58.99	73.98	14.99	PK
2483.5	11.75	33.99	V	45.74	53.98	8.24	AV

Operation Mode:	802.11n_20 MHz
Transfer Rate:	6.5 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	33.36	33.90	H	67.26	73.98	6.72	PK
2390.0	16.37	33.90	H	50.27	53.98	3.71	AV
2390.0	28.23	33.90	V	62.13	73.98	11.85	PK
2390.0	13.06	33.90	V	46.96	53.98	7.02	AV
2483.5	34.84	33.99	H	68.83	73.98	5.15	PK
2483.5	14.48	33.99	H	48.47	53.98	5.51	AV
2483.5	26.12	33.99	V	60.11	73.98	13.87	PK
2483.5	12.11	33.99	V	46.10	53.98	7.88	AV

Operation Mode:	802.11n_40 MHz
Transfer Rate:	13.5 Mbps
Operating Frequency	2422 MHz, 2452 MHz
Channel No.	03 Ch, 09 Ch

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	30.13	33.90	H	64.03	73.98	9.95	PK
2390.0	16.60	33.90	H	50.50	53.98	3.48	AV
2390.0	25.55	33.90	V	59.45	73.98	14.53	PK
2390.0	13.04	33.90	V	46.94	53.98	7.04	AV
2483.5	26.11	33.99	H	60.10	73.98	13.88	PK
2483.5	13.80	33.99	H	47.79	53.98	6.19	AV
2483.5	25.55	33.99	V	59.54	73.98	14.44	PK
2483.5	12.54	33.99	V	46.53	53.98	7.45	AV

Notes:

1. Total = Reading Value + Antenna Factor + Cable Loss
2. We have done 802.11b/g/n mode and all data rate. Worst data rate is the lowest data of each mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

8.7 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.
5. We are performed the AC Power Line Conducted Emission test for 11 Mbps, Ch.6 and 802.11b Because 802.11bmode is worst case.

▣ RESULT PLOTS

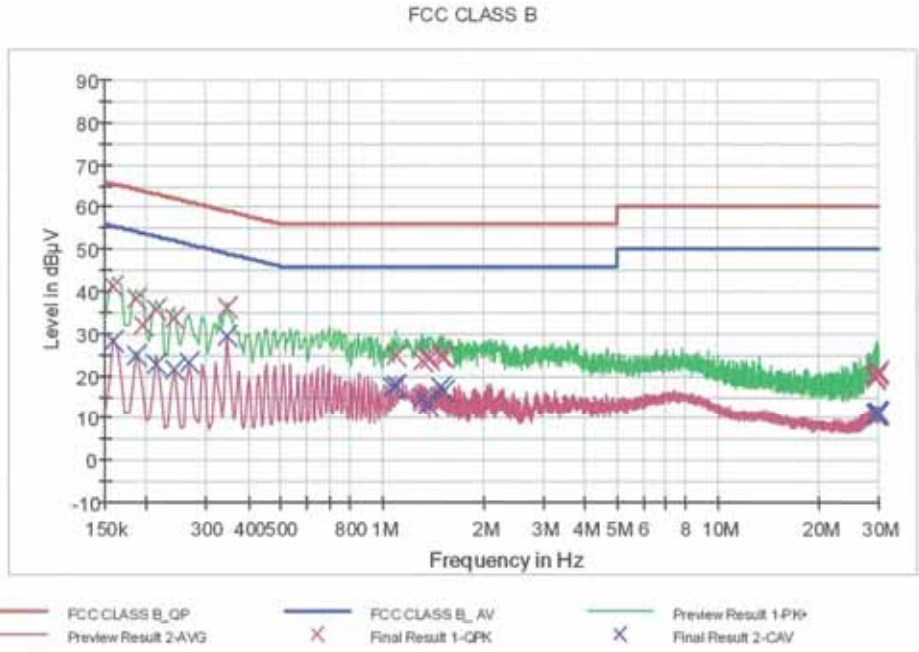
Conducted Emissions (Line 1)

EMI Auto Test(2) 1 / 2

HCT TEST Report

Common Information

EUT:	LG-D213C
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN MODE
Operator Name:	KS KANG



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	41.2	9.000	Off	L1	9.7	24.3	65.5
0.186000	38.4	9.000	Off	L1	9.7	25.8	64.2
0.195000	32.1	9.000	Off	L1	9.7	31.7	63.8
0.213000	35.8	9.000	Off	L1	9.7	27.3	63.1
0.240000	33.5	9.000	Off	L1	9.7	28.6	62.1
0.348000	36.1	9.000	Off	L1	9.7	22.9	59.0
1.098500	24.8	9.000	Off	L1	9.7	31.2	56.0
1.314500	23.7	9.000	Off	L1	9.8	32.3	56.0
1.368500	24.7	9.000	Off	L1	9.8	31.3	56.0
1.386500	23.9	9.000	Off	L1	9.8	32.1	56.0
1.499000	25.0	9.000	Off	L1	9.8	31.0	56.0
1.526000	24.6	9.000	Off	L1	9.8	31.4	56.0
29.349500	19.6	9.000	Off	L1	11.4	40.4	60.0
29.421500	19.7	9.000	Off	L1	11.4	40.3	60.0
29.691500	20.6	9.000	Off	L1	11.4	39.4	60.0
29.826500	20.7	9.000	Off	L1	11.4	39.3	60.0

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EMI Auto Test(2) 2 / 2

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
29.835500	21.0	9.000	Off	L1	11.4	39.0	60.0
29.867000	20.6	9.000	Off	L1	11.4	39.4	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	28.2	9.000	Off	L1	9.7	27.3	55.5
0.186000	25.0	9.000	Off	L1	9.7	29.2	54.2
0.213000	22.9	9.000	Off	L1	9.7	30.2	53.1
0.240000	21.4	9.000	Off	L1	9.7	30.7	52.1
0.267000	23.1	9.000	Off	L1	9.7	28.1	51.2
0.348000	29.4	9.000	Off	L1	9.7	19.6	49.0
1.071500	17.5	9.000	Off	L1	9.7	28.5	46.0
1.098500	17.9	9.000	Off	L1	9.7	28.1	46.0
1.314500	15.0	9.000	Off	L1	9.8	31.0	46.0
1.368500	12.9	9.000	Off	L1	9.8	33.1	46.0
1.499000	17.4	9.000	Off	L1	9.8	28.6	46.0
1.526000	16.5	9.000	Off	L1	9.8	29.5	46.0
29.349500	11.0	9.000	Off	L1	11.4	39.0	50.0
29.691500	11.2	9.000	Off	L1	11.4	38.8	50.0
29.826500	11.2	9.000	Off	L1	11.4	38.8	50.0
29.835500	11.2	9.000	Off	L1	11.4	38.8	50.0
29.858000	11.2	9.000	Off	L1	11.4	38.8	50.0
29.916500	11.2	9.000	Off	L1	11.4	38.8	50.0

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Conducted Emissions (Line 2)

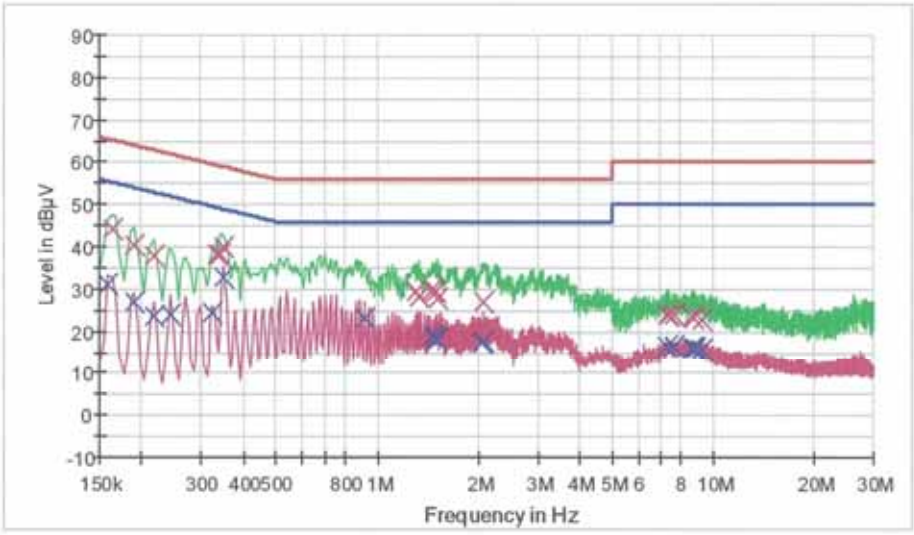
EMI Auto Test(2) 1 / 2

HCT TEST Report

Common Information

EUT:	LG-D213C
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	WLAN MODE
Operator Name:	KS KANG

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	44.1	9.000	Off	N	9.7	21.2	65.3
0.190500	40.6	9.000	Off	N	9.7	23.4	64.0
0.217500	37.9	9.000	Off	N	9.7	25.0	62.9
0.334500	38.2	9.000	Off	N	9.7	21.1	59.3
0.343500	38.2	9.000	Off	N	9.7	20.9	59.1
0.352500	40.1	9.000	Off	N	9.7	18.8	58.9
1.301000	29.4	9.000	Off	N	9.8	26.6	56.0
1.328000	28.1	9.000	Off	N	9.8	27.9	56.0
1.458500	29.7	9.000	Off	N	9.8	26.3	56.0
1.485500	29.7	9.000	Off	N	9.8	26.3	56.0
1.517000	27.8	9.000	Off	N	9.8	28.2	56.0
2.084000	27.0	9.000	Off	N	9.9	29.0	56.0
7.254500	24.1	9.000	Off	N	10.3	35.9	60.0
7.394000	23.9	9.000	Off	N	10.3	36.1	60.0
7.614500	24.1	9.000	Off	N	10.3	35.9	60.0
8.631500	23.6	9.000	Off	N	10.3	36.4	60.0

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EMI Auto Test(2) 2 / 2

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
8.690000	23.2	9.000	Off	N	10.3	36.8	60.0
9.248000	22.6	9.000	Off	N	10.4	37.4	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	31.2	9.000	Off	N	9.7	24.3	55.5
0.190500	26.9	9.000	Off	N	9.7	27.1	54.0
0.217500	23.6	9.000	Off	N	9.7	29.3	52.9
0.244500	24.2	9.000	Off	N	9.7	27.7	51.9
0.325500	24.3	9.000	Off	N	9.7	25.3	49.6
0.352500	33.0	9.000	Off	N	9.7	15.9	48.9
0.918500	23.1	9.000	Off	N	9.8	23.0	46.0
1.458500	18.9	9.000	Off	N	9.8	27.1	46.0
1.485500	18.6	9.000	Off	N	9.8	27.4	46.0
1.512500	18.1	9.000	Off	N	9.8	27.9	46.0
2.057000	17.2	9.000	Off	N	9.9	28.8	46.0
2.079500	17.8	9.000	Off	N	9.9	28.2	46.0
7.254500	16.6	9.000	Off	N	10.3	33.4	50.0
7.614500	16.3	9.000	Off	N	10.3	33.7	50.0
8.631500	16.1	9.000	Off	N	10.3	33.9	50.0
8.690000	16.0	9.000	Off	N	10.3	34.0	50.0
8.825000	15.9	9.000	Off	N	10.3	34.1	50.0
9.198500	15.7	9.000	Off	N	10.4	34.3	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	Calibration Due	Serial No.
Rohde & Schwarz	ENV216/ LISN	01/29/2014	Annual	01/29/2015	100073
Agilent	E4440A/ Spectrum Analyzer	04/09/2014	Annual	04/09/2015	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	05/14/2013	Annual	05/14/2014	MY51110063
Agilent	N1911A/Power Meter	01/24/2014	Annual	01/24/2015	MY45100523
Agilent	N1921A /POWER SENSOR	07/11/2013	Annual	07/11/2014	MY45241059
Hewlett Packard	11636B/Power Divider	10/22/2013	Annual	10/22/2014	11377
Agilent	87300B/Directional Coupler	12/18/2013	Annual	12/18/2014	3116A03621
Hewlett Packard	11667B / Power Splitter	05/29/2013	Annual	05/29/2014	05001
DIGITAL	EP-3010 /DC POWER SUPPLY	10/29/2013	Annual	10/29/2014	3110117
ITECH	IT6720 / DC POWER SUPPLY	11/05/2013	Annual	11/05/2014	0100021562870011 99
TESCOM	TC-3000C / BLUETOOTH TESTER	04/11/2014	Annual	04/11/2015	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/07/2014	Annual	05/07/2015	100422
Agilent	8493C / Attenuator(10 dB)	07/24/2013	Annual	07/24/2014	76649
WEINSCHEL	2-3 / Attenuator(3 dB)	10/28/2013	Annual	10/28/2014	BR0617

9.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Due	Calibration Interval	Calibration Due	Serial No.
Schwarzbeck	VULB 9160/ TRILOG Antenna	12/17/2012	Biennial	12/17/2014	3150
Rohde & Schwarz	ESCI / EMI TEST RECEIVER	01/24/2014	Annual	01/24/2015	100584
HD	MA240/ Antenna Position Tower	N/A	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	N/A	12
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	09/10/2013	Annual	09/10/2014	10094
CERNEX	CBL18265035 / POWER AMP	07/24/2013	Annual	07/24/2014	22966
CERNEX	CBL26405040 / POWER AMP	04/04/2014	Annual	04/04/2015	19660
Schwarzbeck	BBHA 9120D/ Horn Antenna	07/05/2013	Biennial	07/05/2015	1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	10/30/2012	Biennial	10/30/2014	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	01/24/2014	Annual	01/24/2015	839117/011
Wainwright Instrument	WHF3.0/18G-10EF / High Pass Filter	02/03/2014	Annual	02/03/2015	F6
Wainwright Instrument	WHNX6.0/26.5G-6SS / High Pass Filter	04/09/2014	Annual	04/09/2015	1
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	04/04/2014	Annual	04/04/2015	29
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	06/24/2013	Annual	06/24/2014	1
TESCOM	TC-3000C / BLUETOOTH TESTER	04/11/2014	Annual	04/11/2015	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/07/2014	Annual	05/07/2015	100422
Rohde & Schwarz	LOOP ANTENNA	08/14/2012	Biennial	08/14/2014	100179
CERNEX	CBL06185030 / POWER AMP	07/24/2013	Annual	07/24/2014	22965
CERNEX	CBLU1183540 / POWER AMP	07/24/2013	Annual	07/24/2014	22964

This equipment (CBT / BLUETOOTH TESTER) is used after 05/07/2014 and actual calibration date is 05/07/2014