

FCC Part 15C Measurement and Test Report

For

Y-cam Solutions Ltd

3 Dee Road, Richmond, Surrey. United Kingdom

FCC ID: V4FCUBEHD720

FCC Rules:	<u>FCC Part 15C</u>
Product Description:	<u>Y-cam Cube</u>
Tested Model:	<u>Cube HD 720</u>
Report No.:	<u>STR13018545I</u>
Tested Date:	<u>2013-01-23 to 2013-02-20</u>
Issued Date:	<u>2013-02-20</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd

TABLE OF CONTENTS

1. GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	4
1.5 EUT SETUP AND TEST MODE.....	5
2. SUMMARY OF TEST RESULTS	6
3. ANTENNA REQUIREMENT	7
3.1 STANDARD APPLICABLE.....	7
3.2 EVALUATION INFORMATION.....	7
4. POWER SPECTRAL DENSITY	8
4.1 STANDARD APPLICABLE.....	8
4.2 TEST EQUIPMENT LIST AND DETAILS.....	8
4.3 TEST PROCEDURE.....	8
4.4 ENVIRONMENTAL CONDITIONS.....	8
4.5 SUMMARY OF TEST RESULTS/PLOTS.....	9
5. 6DB BANDWIDTH	15
5.1 STANDARD APPLICABLE.....	15
5.2 TEST EQUIPMENT LIST AND DETAILS.....	15
5.3 TEST PROCEDURE.....	15
5.4 ENVIRONMENTAL CONDITIONS.....	15
5.5 SUMMARY OF TEST RESULTS/PLOTS.....	16
6. RF OUTPUT POWER	22
6.1 STANDARD APPLICABLE.....	22
6.2 TEST EQUIPMENT LIST AND DETAILS.....	22
6.3 TEST PROCEDURE.....	22
6.4 ENVIRONMENTAL CONDITIONS.....	22
6.5 SUMMARY OF TEST RESULTS/PLOTS.....	23
7. FIELD STRENGTH OF SPURIOUS EMISSIONS	33
7.1 MEASUREMENT UNCERTAINTY.....	33
7.2 STANDARD APPLICABLE.....	33
7.3 TEST EQUIPMENT LIST AND DETAILS.....	33
7.4 TEST PROCEDURE.....	34
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	34
7.6 ENVIRONMENTAL CONDITIONS.....	34
7.7 SUMMARY OF TEST RESULTS/PLOTS.....	35
8. OUT OF BAND EMISSIONS	57
8.1 STANDARD APPLICABLE.....	57
8.2 TEST EQUIPMENT LIST AND DETAILS.....	57
8.3 TEST PROCEDURE.....	57
8.4 ENVIRONMENTAL CONDITIONS.....	58
8.5 SUMMARY OF TEST RESULTS/PLOTS.....	58
9. CONDUCTED EMISSIONS	73
9.1 MEASUREMENT UNCERTAINTY.....	73
9.2 TEST EQUIPMENT LIST AND DETAILS.....	73
9.3 TEST PROCEDURE.....	73
9.4 BASIC TEST SETUP BLOCK DIAGRAM.....	73
9.5 ENVIRONMENTAL CONDITIONS.....	74
9.6 TEST RECEIVER SETUP.....	74
9.7 SUMMARY OF TEST RESULTS/PLOTS.....	74
9.8 CONDUCTED EMISSIONS TEST DATA.....	74

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Y-cam Solutions Ltd
 Address of applicant: 3 Dee Road, Richmond, Surrey. United Kingdom

Manufacturer: Y-cam Solutions Ltd
 Address of manufacturer: 3 Dee Road, Richmond, Surrey. United Kingdom

General Description of EUT	
Product Name:	Y-cam Cube
Trade Name:	Y-cam
Model No.:	Cube HD 720
Adding Model(s):	Cube HD 720 White, Cube HD 720 Black
Rated Voltage:	12V
<p><i>Note: The test data is gathered from a production sample, provided by the manufacturer. The other model listed in the report has different appearance only of Cube HD 720 without circuit and electronic construction changed, declared by the manufacturer.</i></p>	

Technical Characteristics of EUT	
Support Standards:	802.11b/g/n
Frequency Range:	2412-2462MHz
RF Output Power:	10.94 dBm (Conducted)
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Modulation:	CCK, BPSK, QPSK, 16QAM, 64QAM
Quantity of Channels:	11
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	2.5 dBi
Lowest Internal Frequency of EUT:	32.768kHz
Device Category:	Fixed Device

1.2 Test Standards

The following report is prepared on behalf of the Y-cam Solutions Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The public notice KDB 558074 for digital transmission systems shall be performed also.

1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz
TM2	802.11g	2412MHz, 2437MHz, 2462MHz
TM3	802.11n-HT20	2412MHz, 2437MHz, 2462MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
USB Cable	0.2	Shielded	Without Ferrite
Network Cable	1.0	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
PC	Samsung	R20	/
Adapter	Ktec	KSA0101200100D5	/

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
RJ45 Cable	4.0	Unshielded	Without Ferrite
DC Line	3.0	Unshielded	Without Ferrite

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)(d)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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.

3.2 Evaluation Information

This product has a permanent antenna, fulfill the requirement of this section.

4. Power Spectral Density

4.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, 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.

4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.3 Test Procedure

According to the KDB 558074, the test method of power spectral density as below:

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set analyzer center frequency to DTS channel center frequency.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW \geq 3 kHz.
5. Set the VBW \geq 3 x RBW.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.4 Environmental Conditions

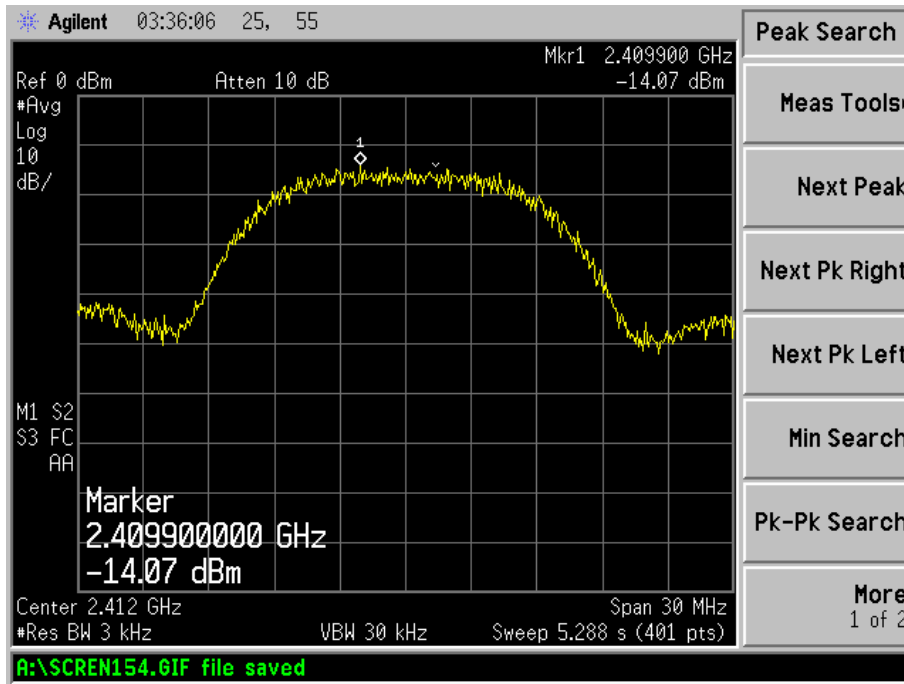
Temperature:	20° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

4.5 Summary of Test Results/Plots

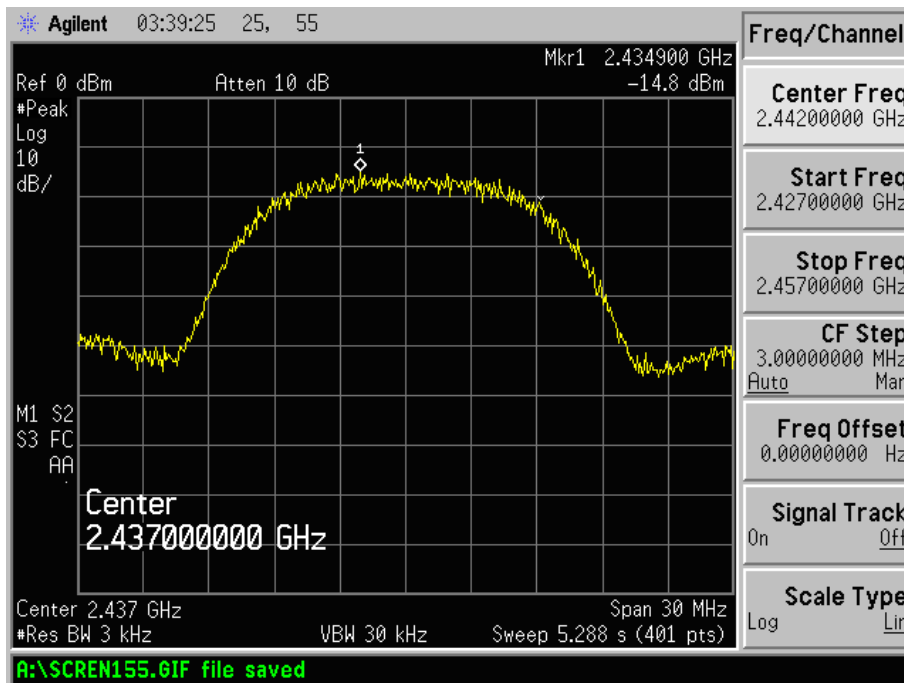
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-14.07	8
	2437	-14.80	8
	2462	-15.91	8
802.11g	2412	-19.82	8
	2437	-20.57	8
	2462	-21.79	8
802.11n HT20	2412	-18.73	8
	2437	-19.47	8
	2462	-20.59	8

Please refer to the following test plots:

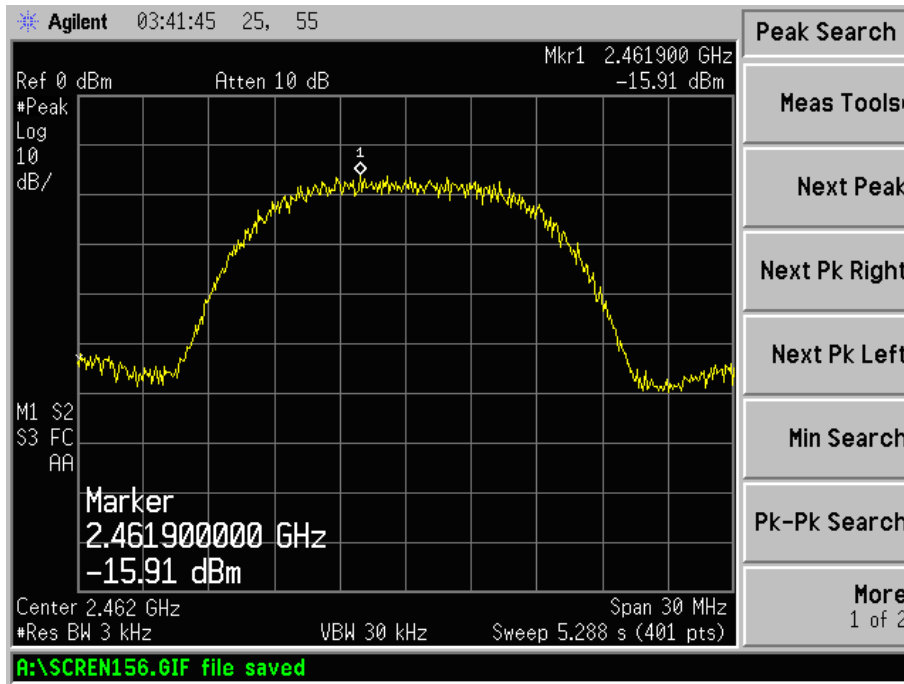
802.11b-Low Channel



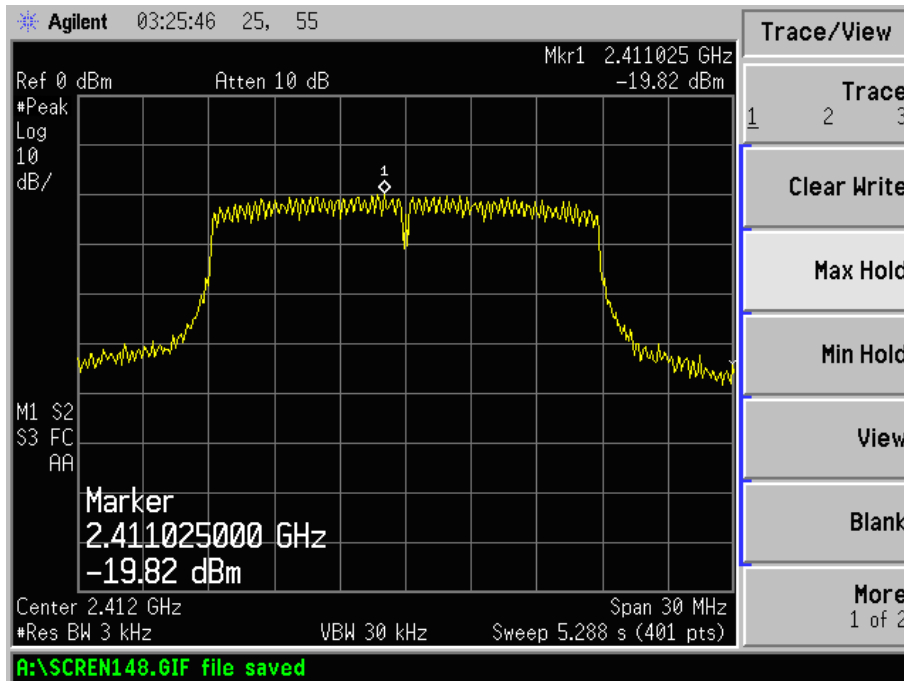
802.11b-Middle Channel



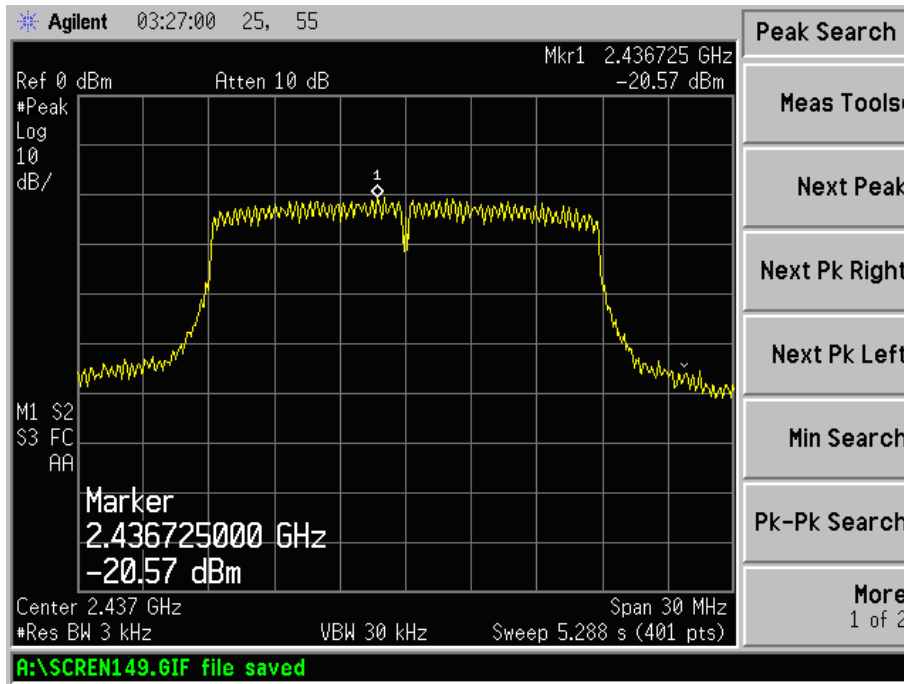
802.11b-High Channel



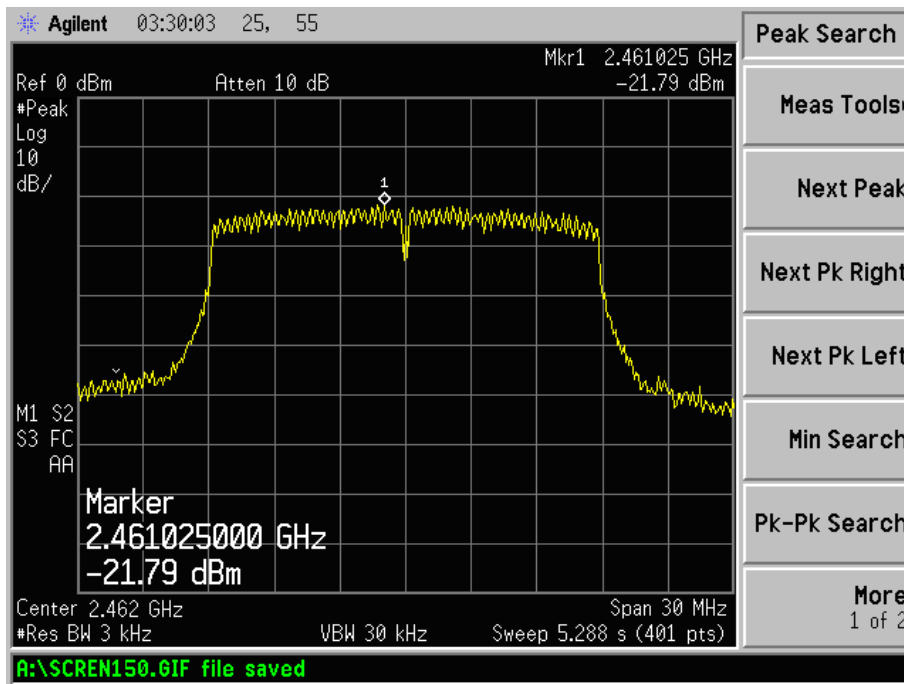
802.11g-Low Channel



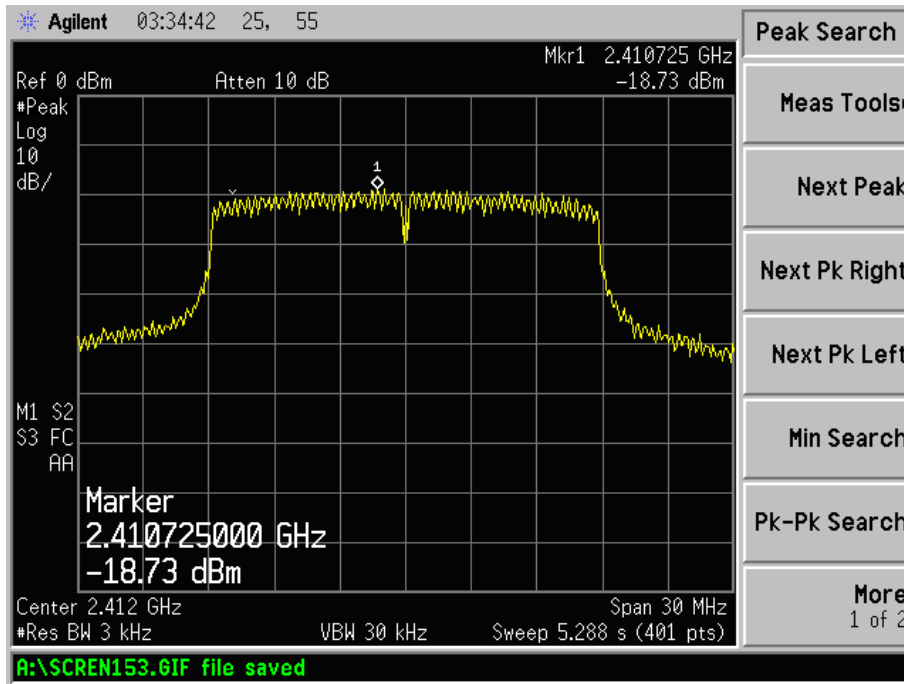
802.11g-Middle Channel



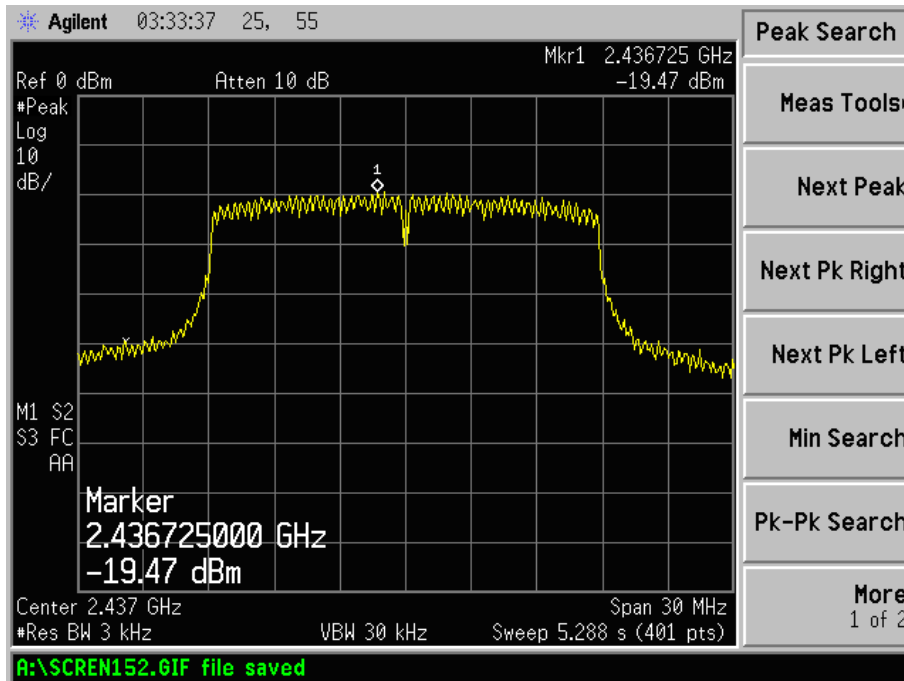
802.11g-High Channel



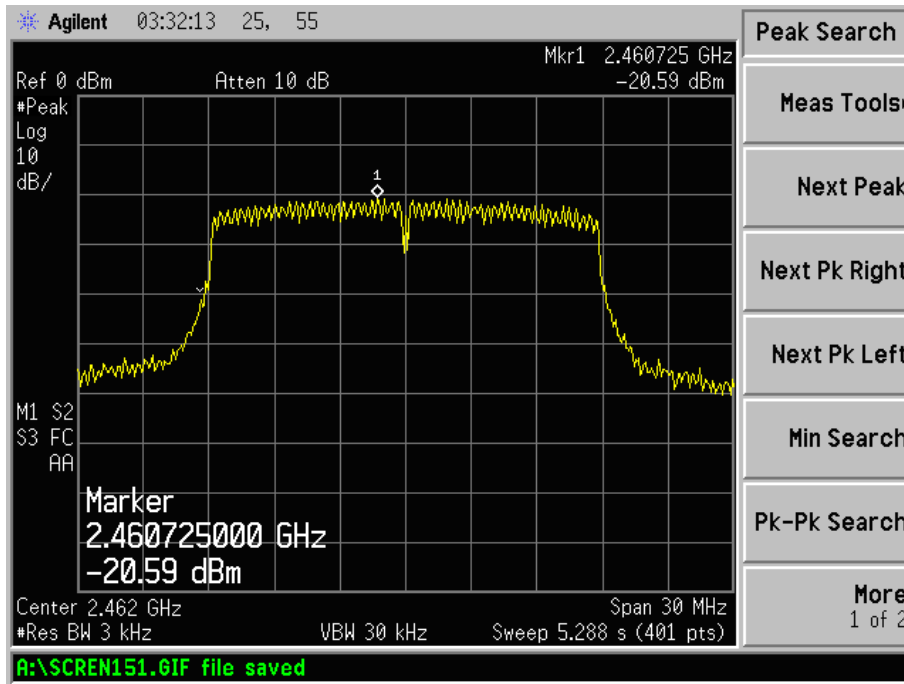
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



5. 6dB Bandwidth

5.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission..

5.4 Environmental Conditions

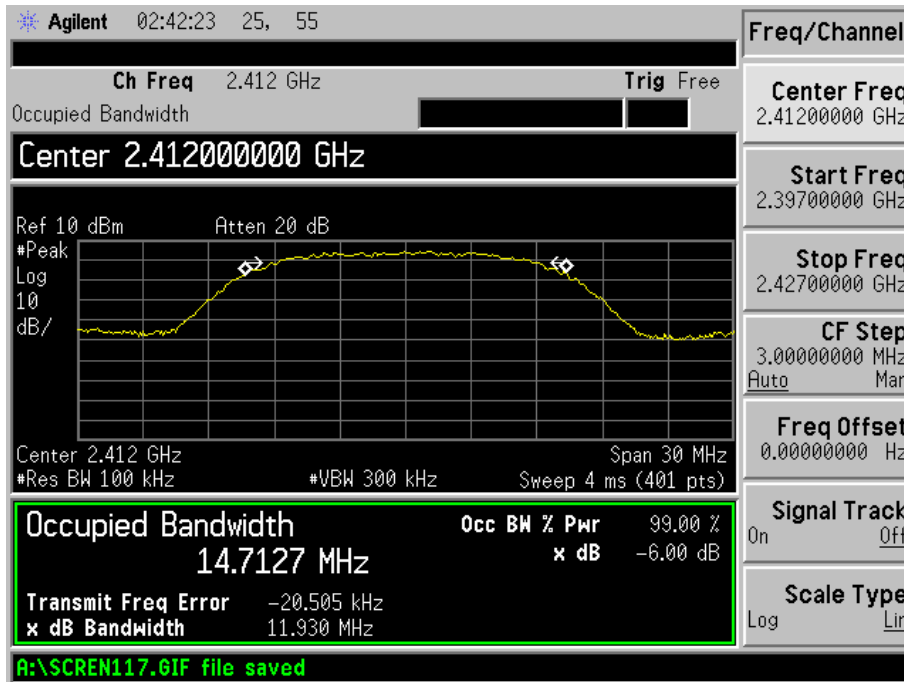
Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

5.5 Summary of Test Results/Plots

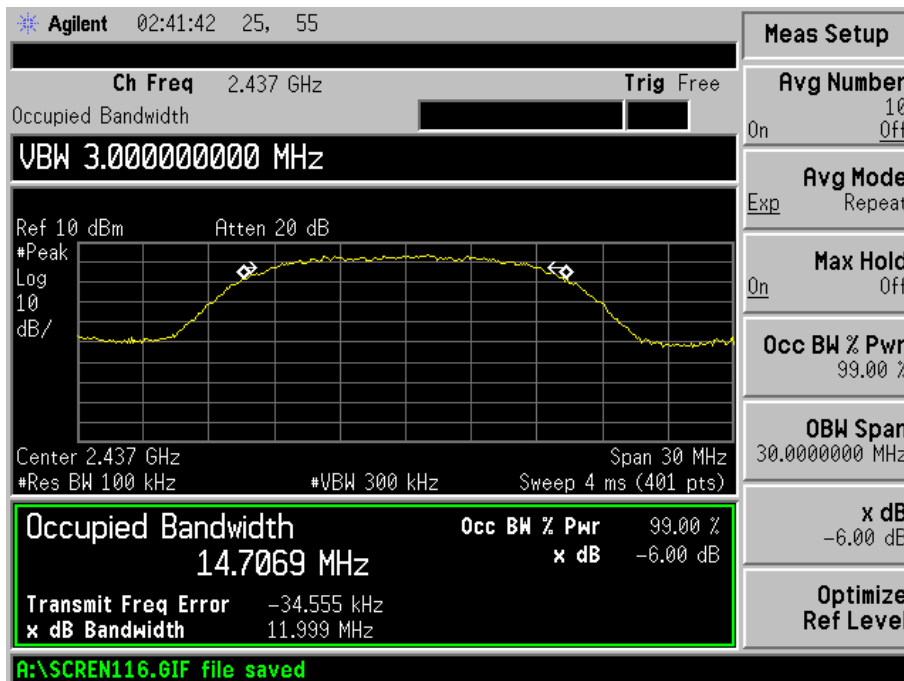
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	Limit kHz
802.11b	2412	11930	500
	2437	11999	500
	2462	12175	500
802.11g	2412	16555	500
	2437	16490	500
	2462	16492	500
802.11n-HT20	2412	16532	500
	2437	16469	500
	2462	16380	500

Please refer to the following test plots:

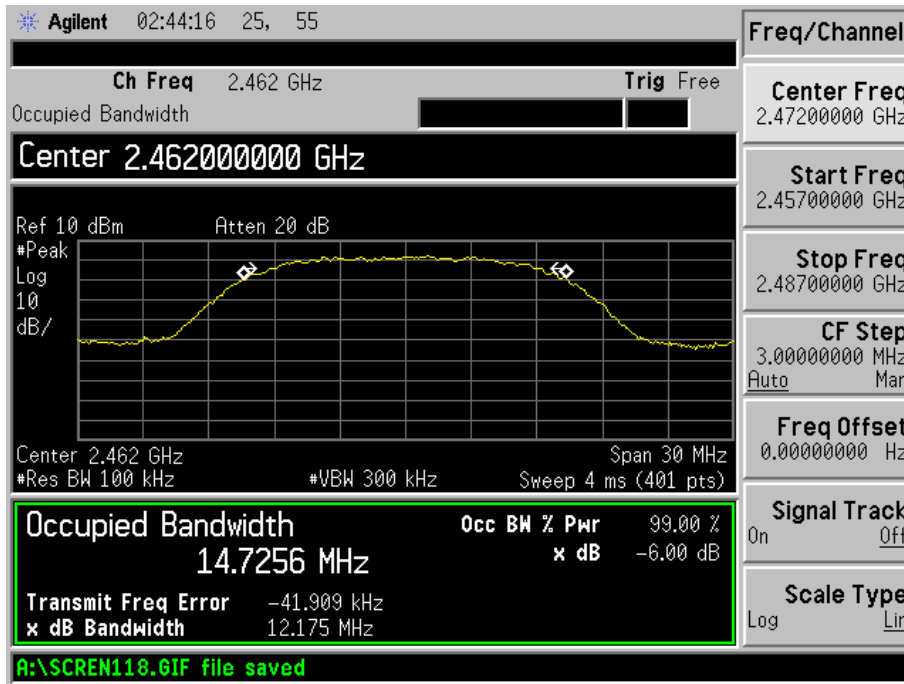
802.11b-Low Channel



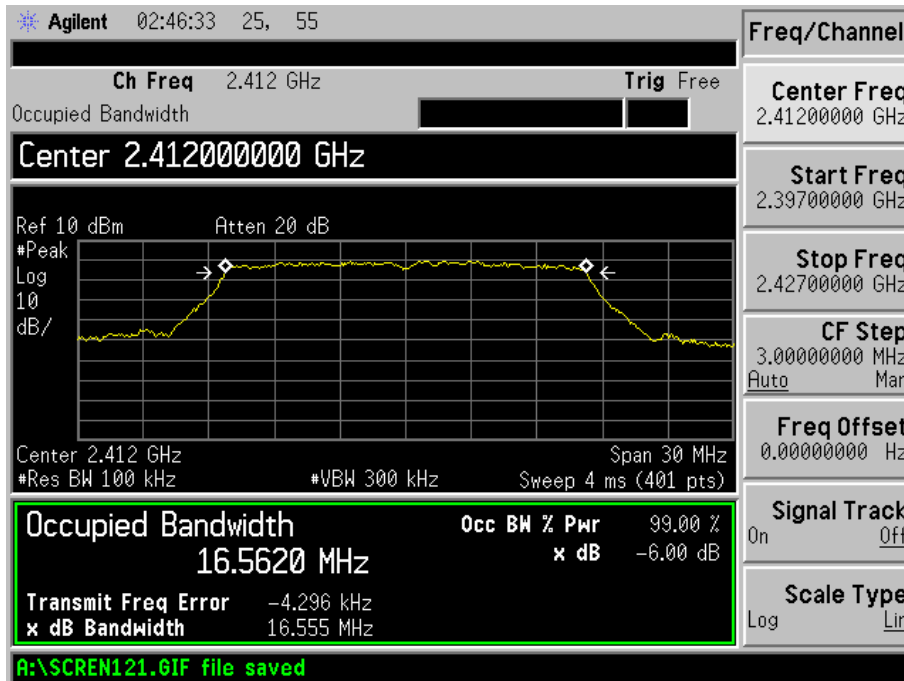
802.11b-Middle Channel



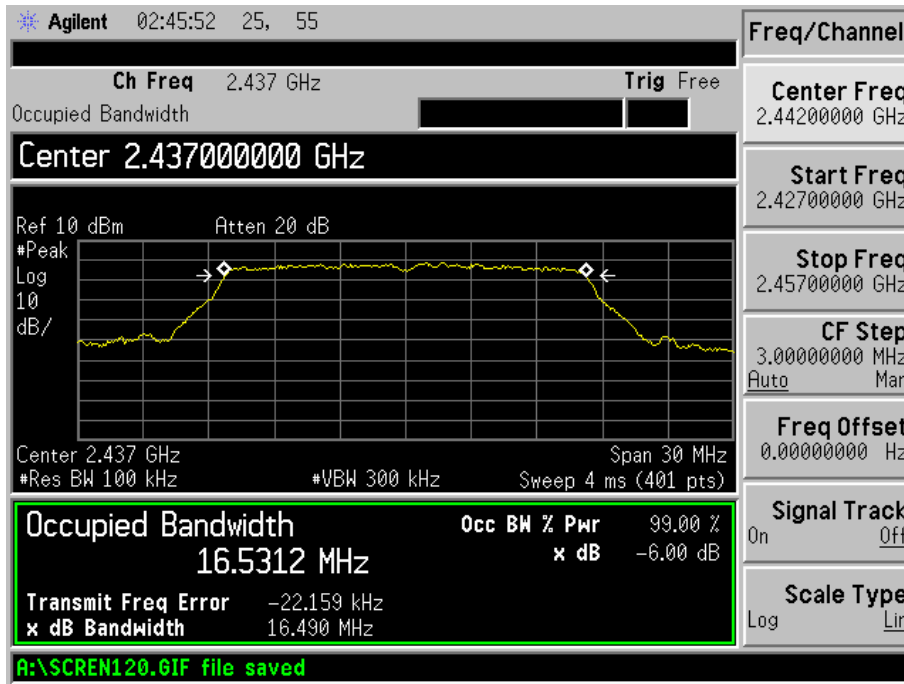
802.11b-High Channel



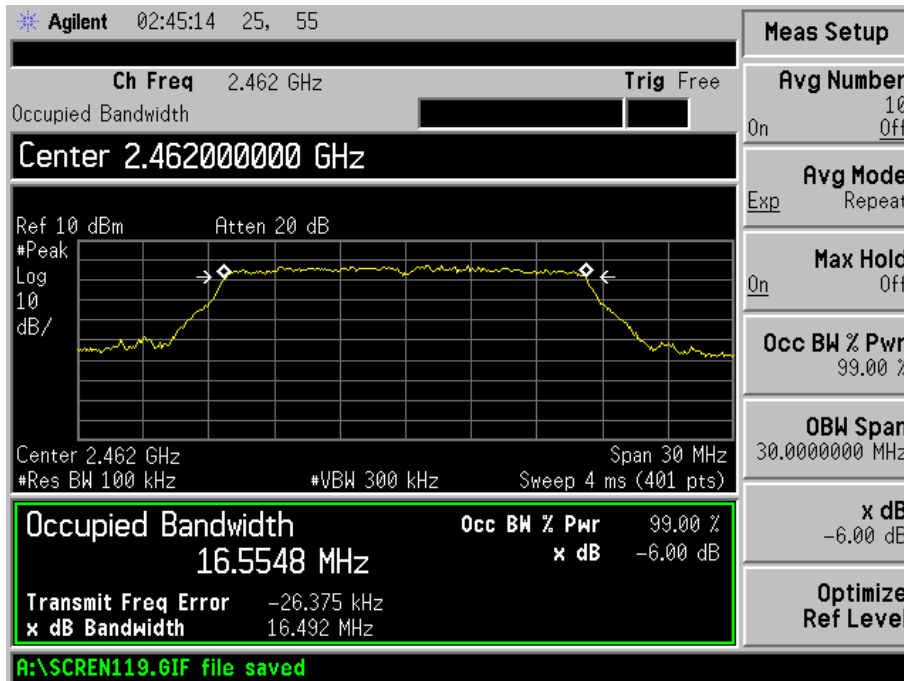
802.11g-Low Channel



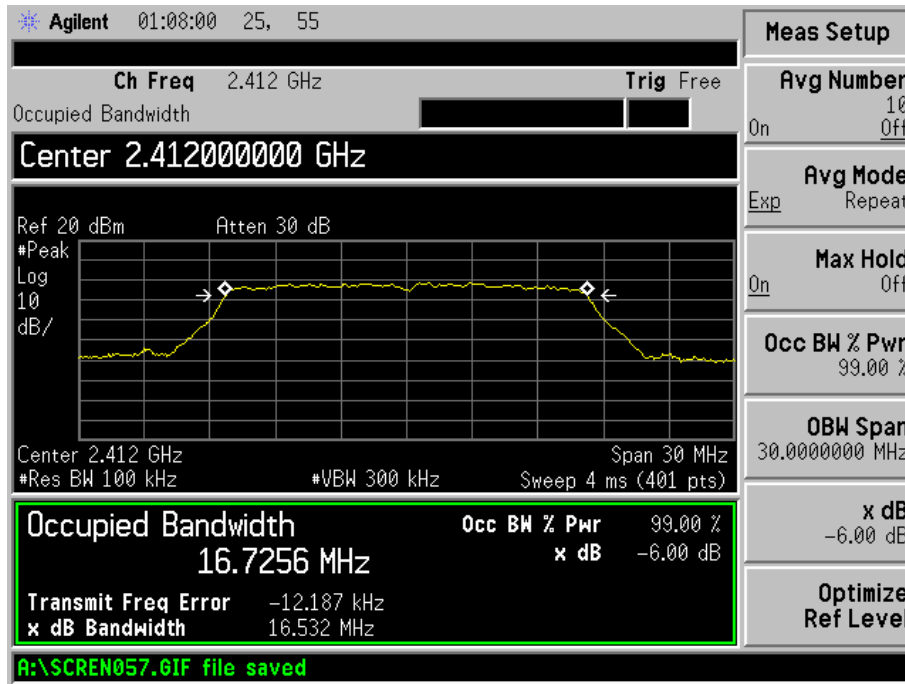
802.11g-Middle Channel



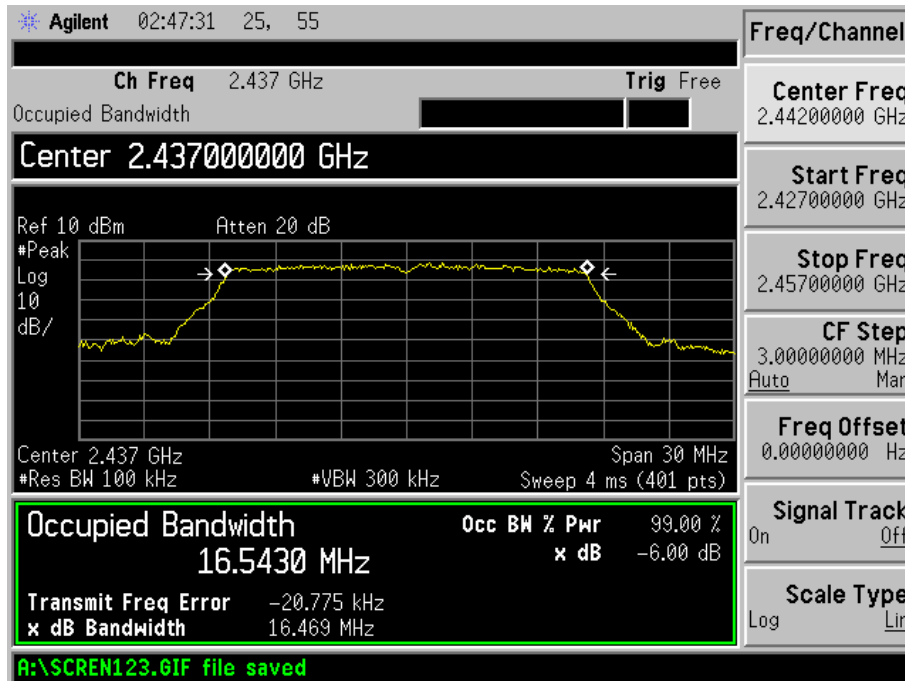
802.11g-High Channel



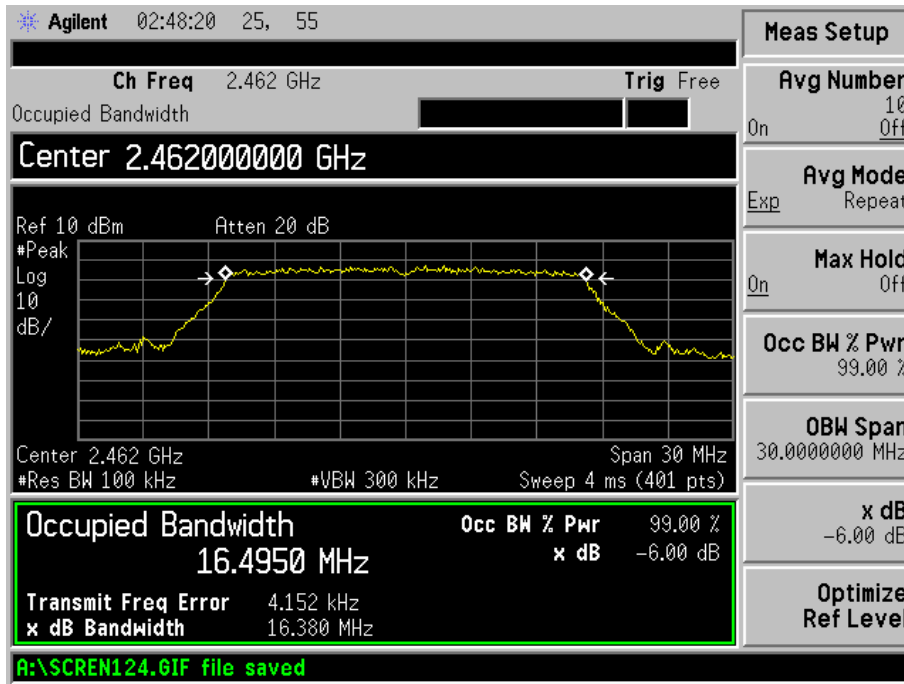
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



6. RF Output Power

6.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 (2012),

1. This procedure provides an integrated measurement alternative when the maximum available RBW < EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Set the span to a value that is 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

6.4 Environmental Conditions

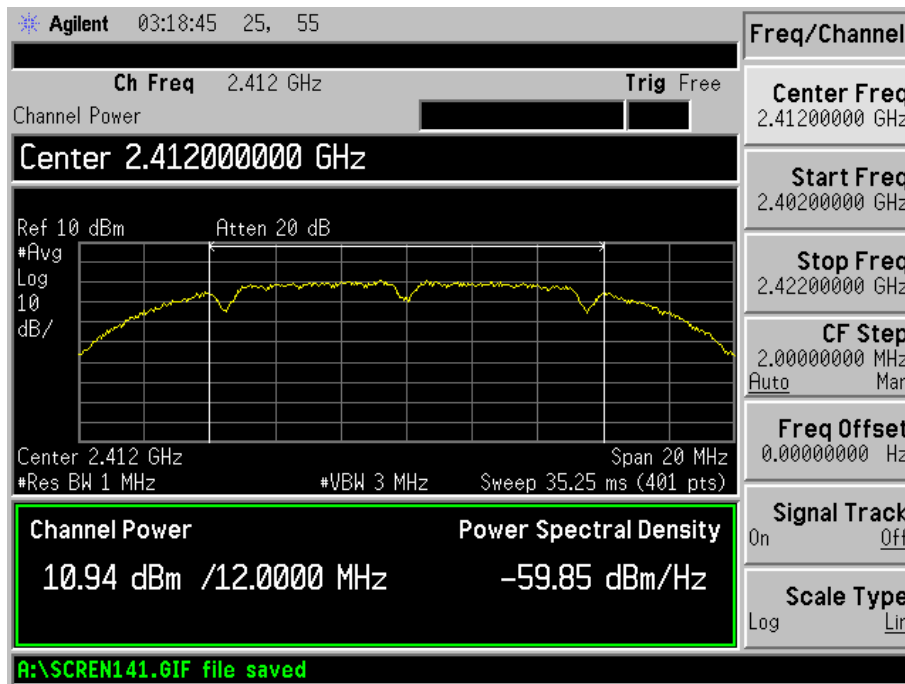
Temperature:	21° C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

6.5 Summary of Test Results/Plots

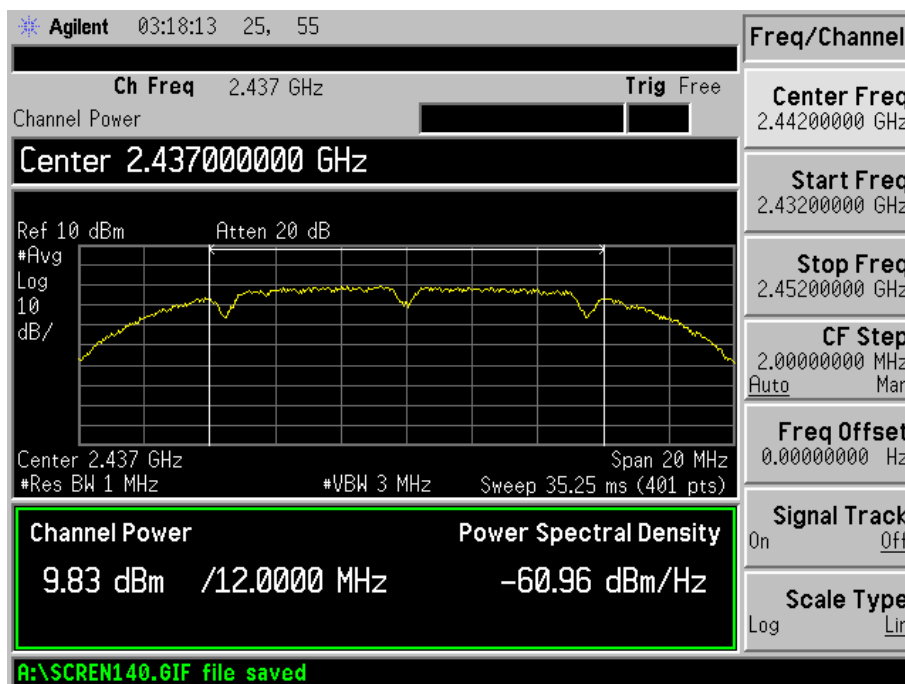
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_short_1Mbps	2412	10.94	12.4165	1000
	2437	9.83	9.6161	1000
	2462	8.43	6.9663	1000
802.11b_short_11Mbps	2412	10.91	12.3310	1000
	2437	10.16	10.3753	1000
	2462	8.40	6.9183	1000
802.11g_6Mbps	2412	7.06	5.0816	1000
	2437	6.35	4.3152	1000
	2462	4.89	3.0832	1000
802.11g_54Mbps	2412	7.02	5.0350	1000
	2437	6.23	4.1976	1000
	2462	4.76	2.9923	1000
802.11n HT20_MCS0	2412	7.08	5.1050	1000
	2437	6.33	4.2954	1000
	2462	4.67	2.9309	1000
802.11n HT20_MCS7	2412	7.12	5.1523	1000
	2437	6.16	4.1305	1000
	2462	4.85	3.0549	1000

Please refer to the following test plots:

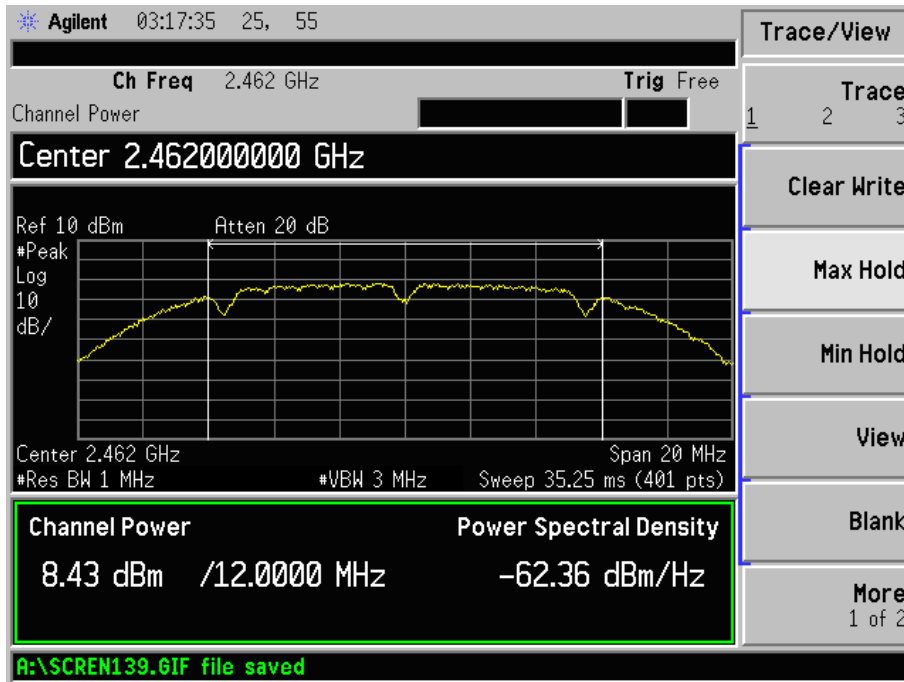
802.11b-short-1Mbps-Low Channel



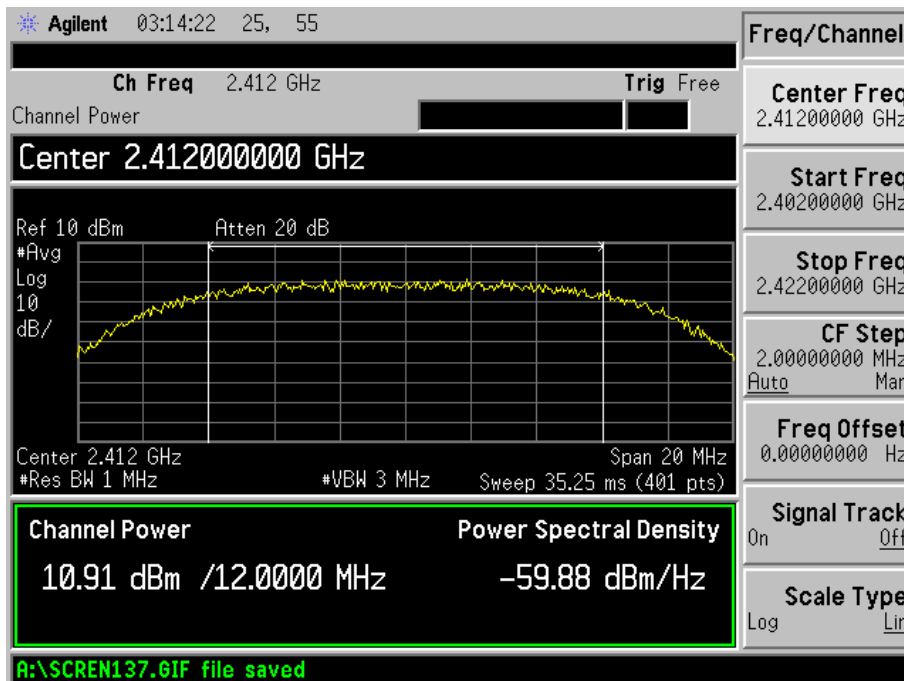
802.11b-short-1Mbps-Middle Channel



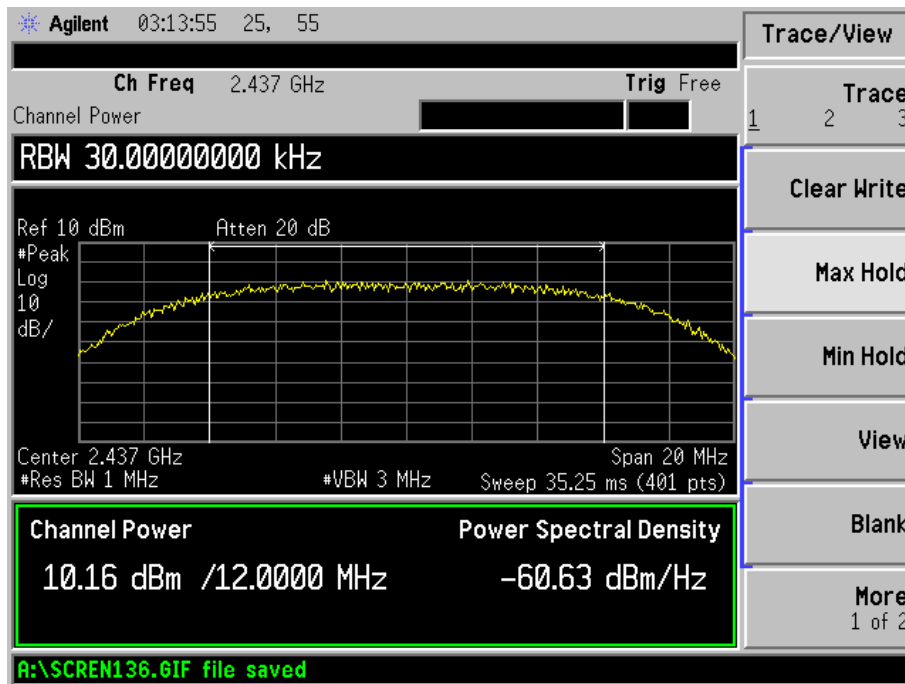
802.11b-short-1Mbps-High Channel



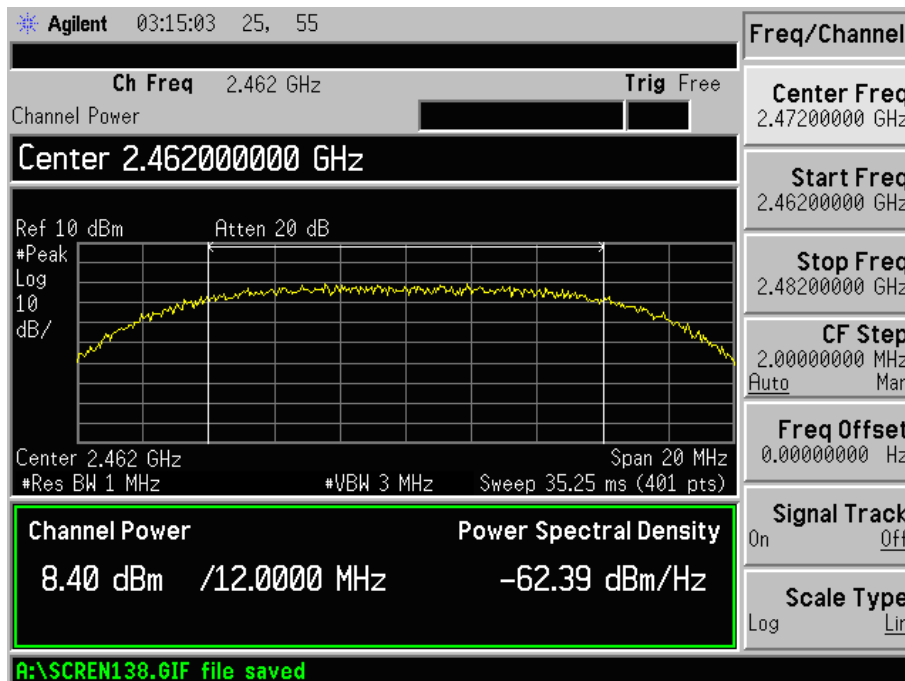
802.11b-short-11Mbps-Low Channel



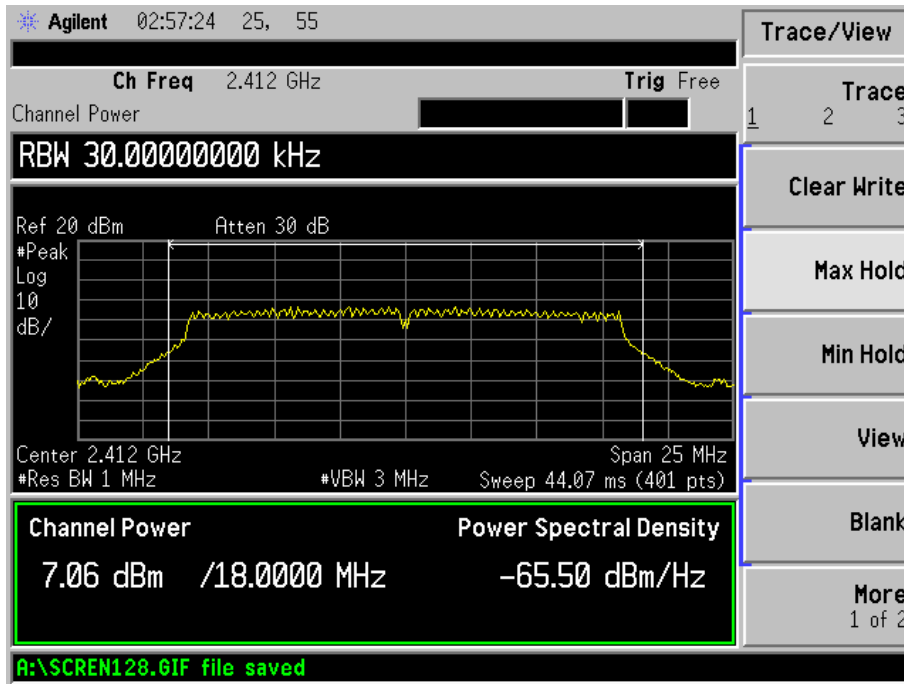
802.11b-short-11Mbps-Middle Channel



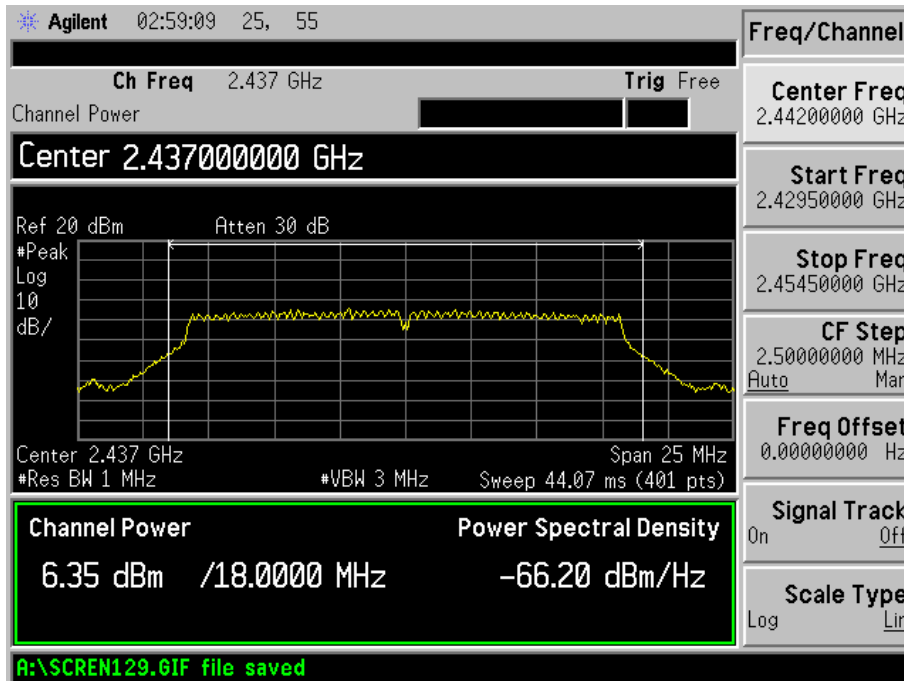
802.11b-short-11Mbps-High Channel



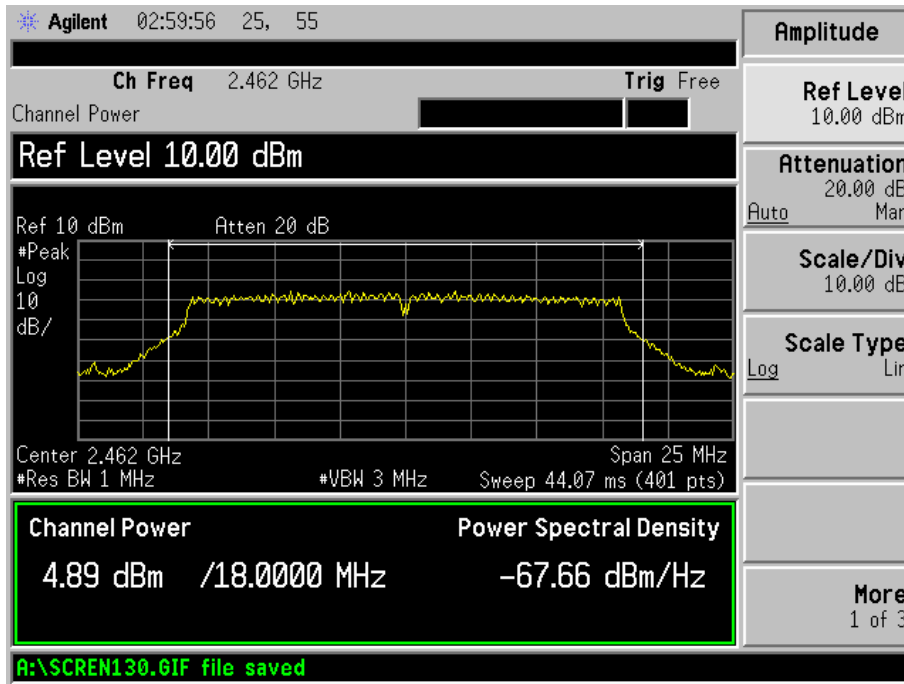
802.11g-6Mbps-Low Channel



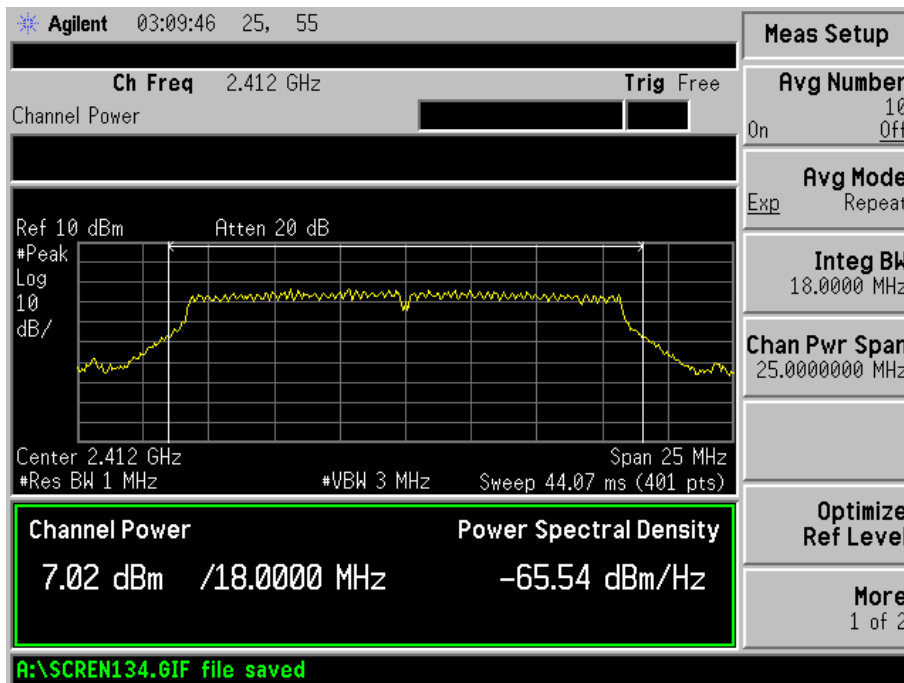
802.11g-6Mbps-Middle Channel



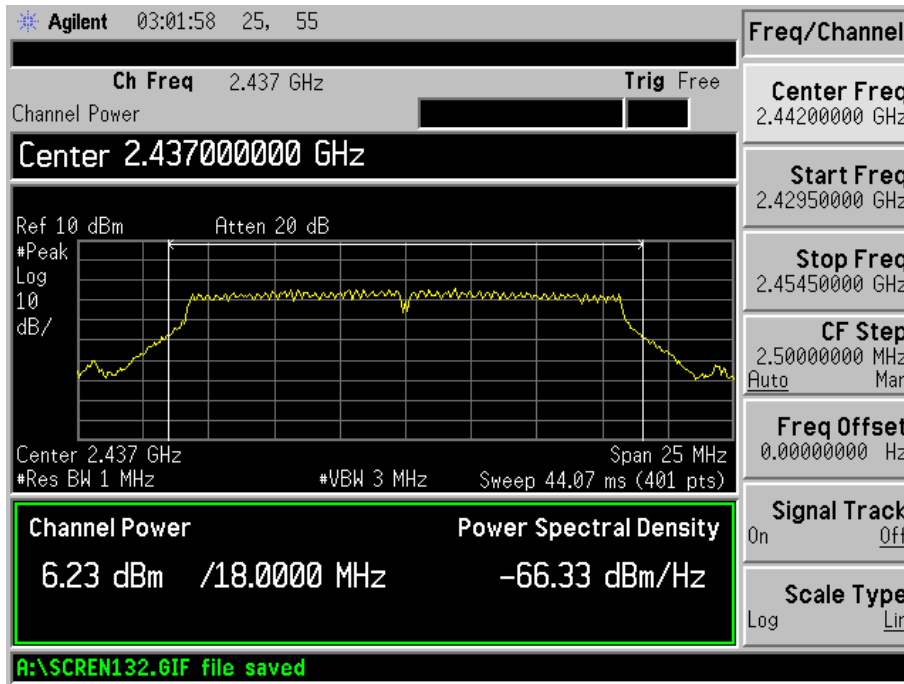
802.11g-6Mbps-High Channel



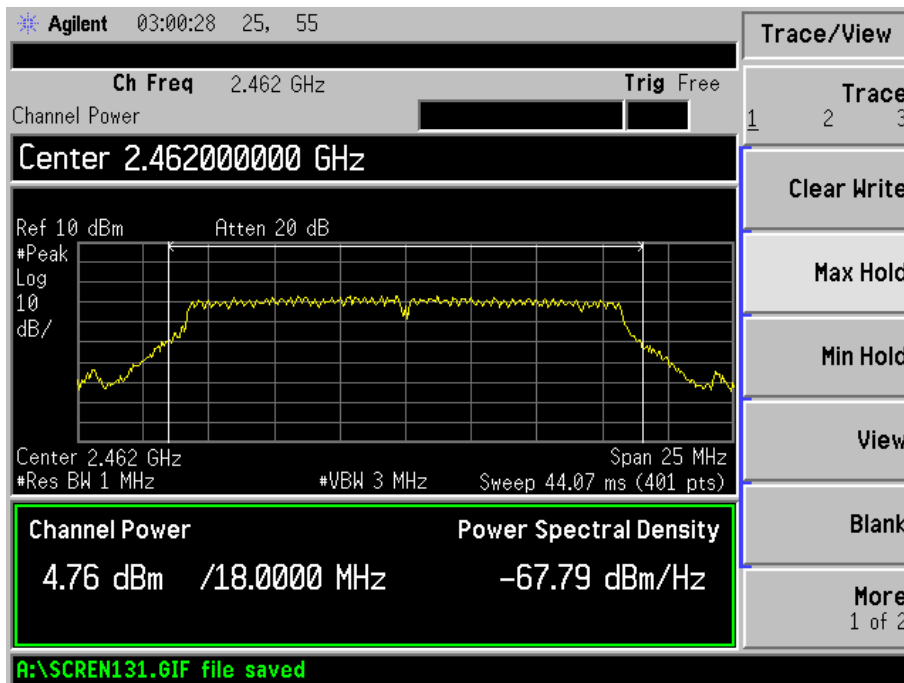
802.11g-54Mbps-Low Channel



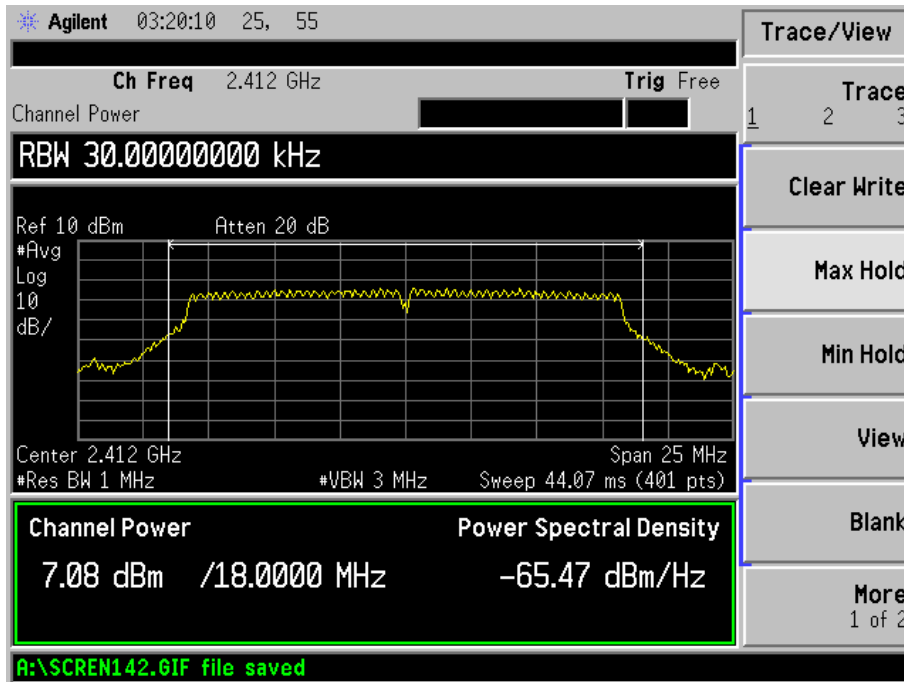
802.11g-54Mbps-Middle Channel



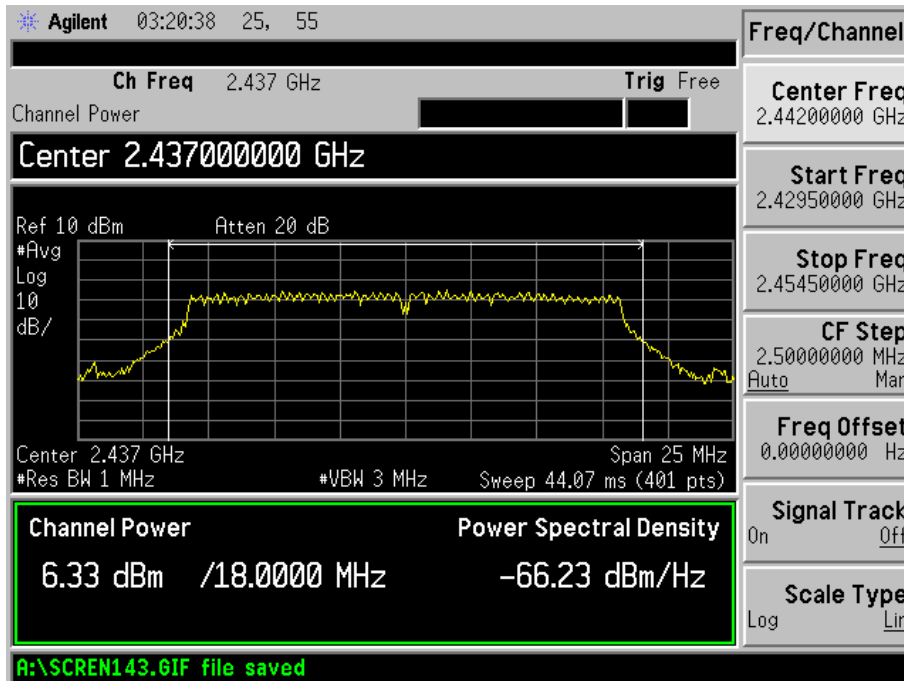
802.11g-54Mbps-High Channel



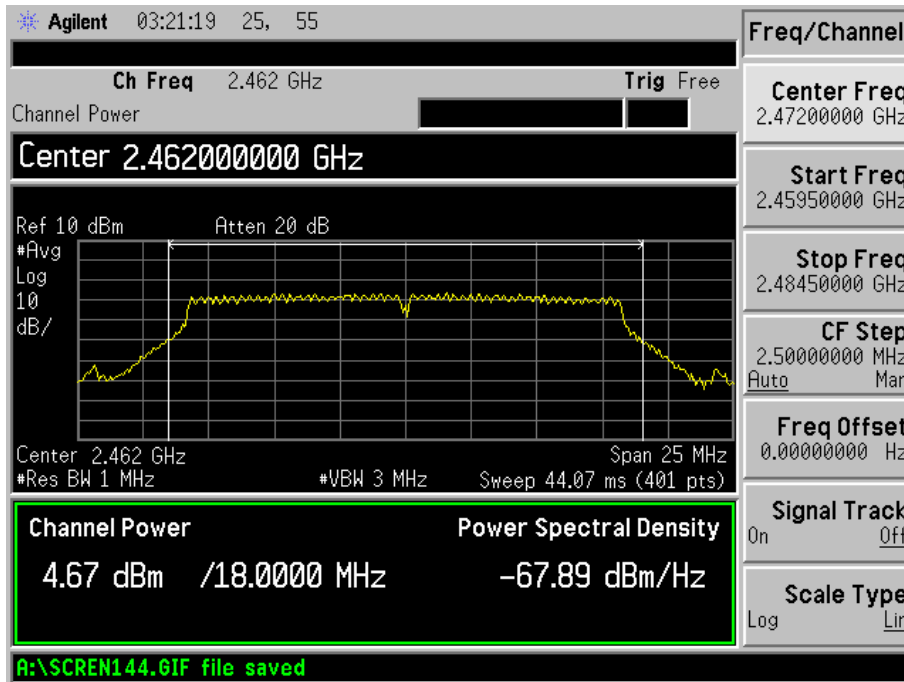
802.11n-HT20-MCS0-Low Channel



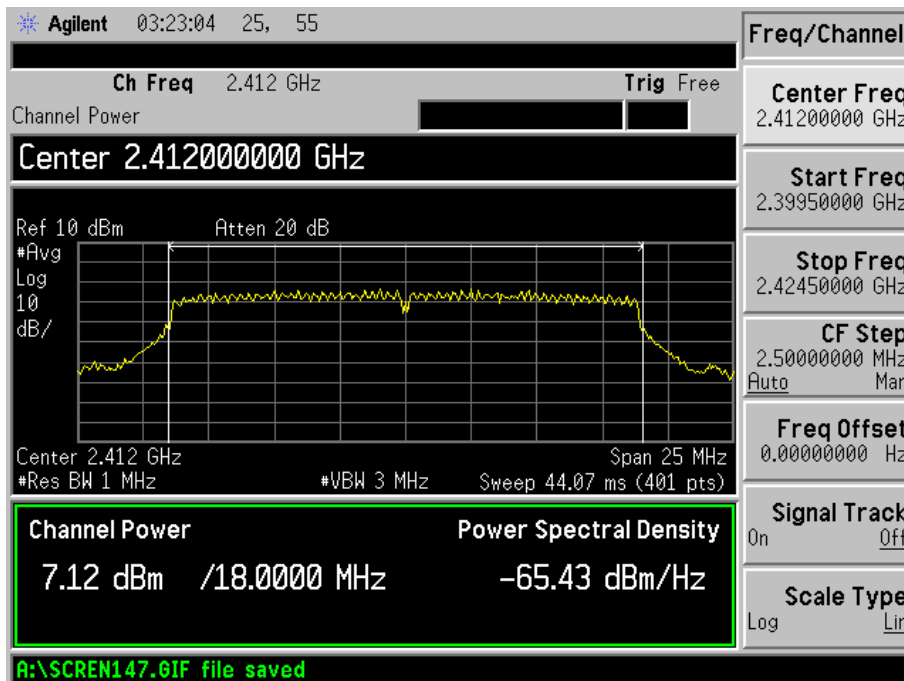
802.11n-HT20-MCS0-Middle Channel



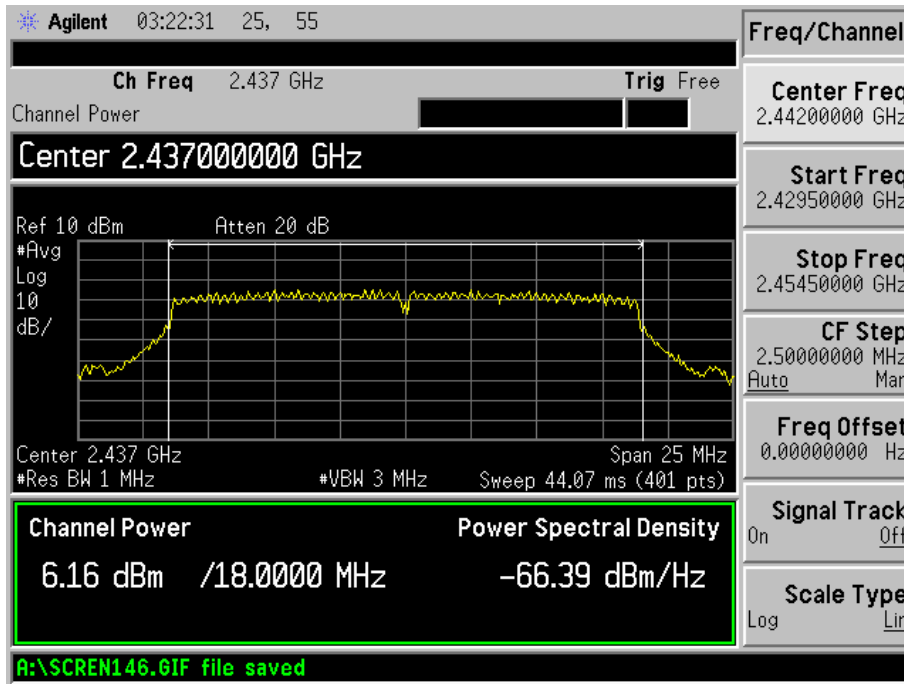
802.11n-HT20-MCS0-High Channel



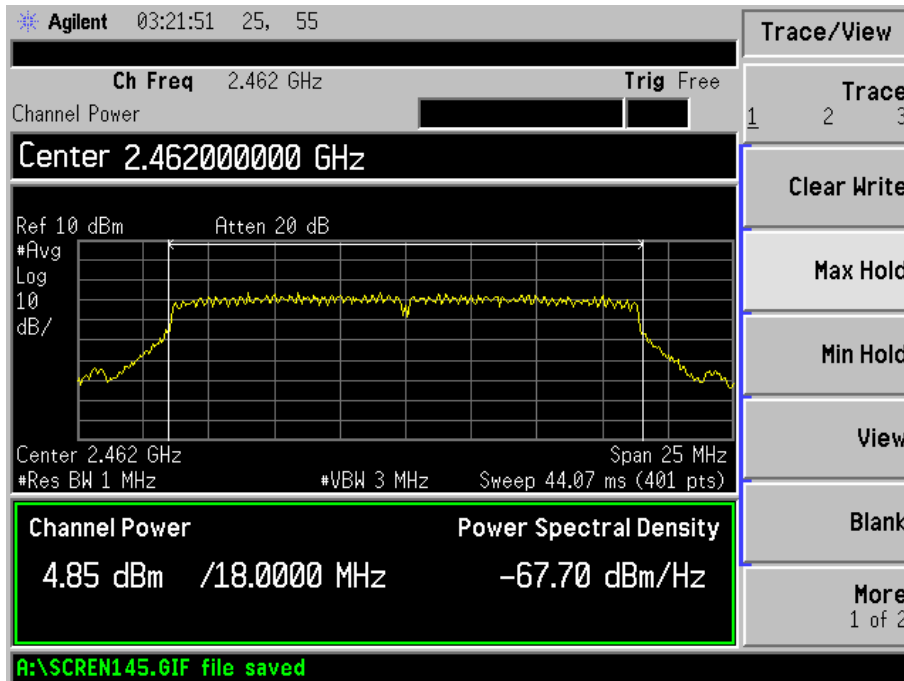
802.11n-HT20-MCS7-Low Channel



802.11n-HT20-MCS7-Middle Channel



802.11n-HT20-MCS7-High Channel



7. Field Strength of Spurious Emissions

7.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

7.2 Standard Applicable

According to §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).

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

7.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Horn Antenna	ETS	3116B	00088203	2012-02-25	2013-02-24
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2012-02-25	2013-02-24

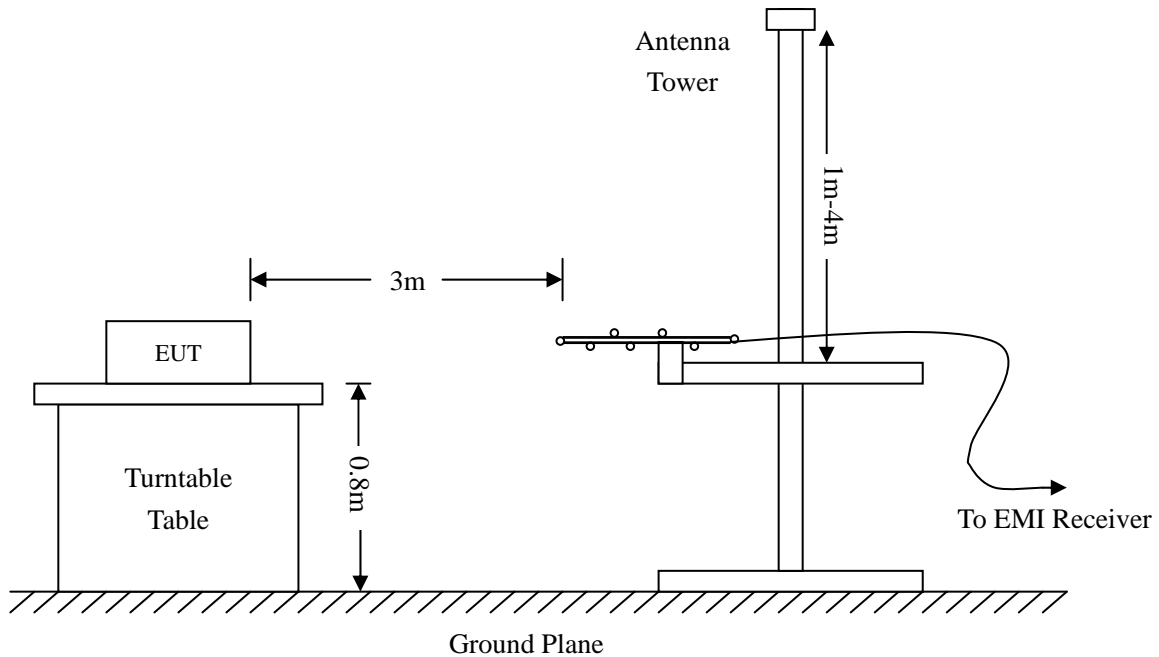
Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

7.6 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

7.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst margin of:

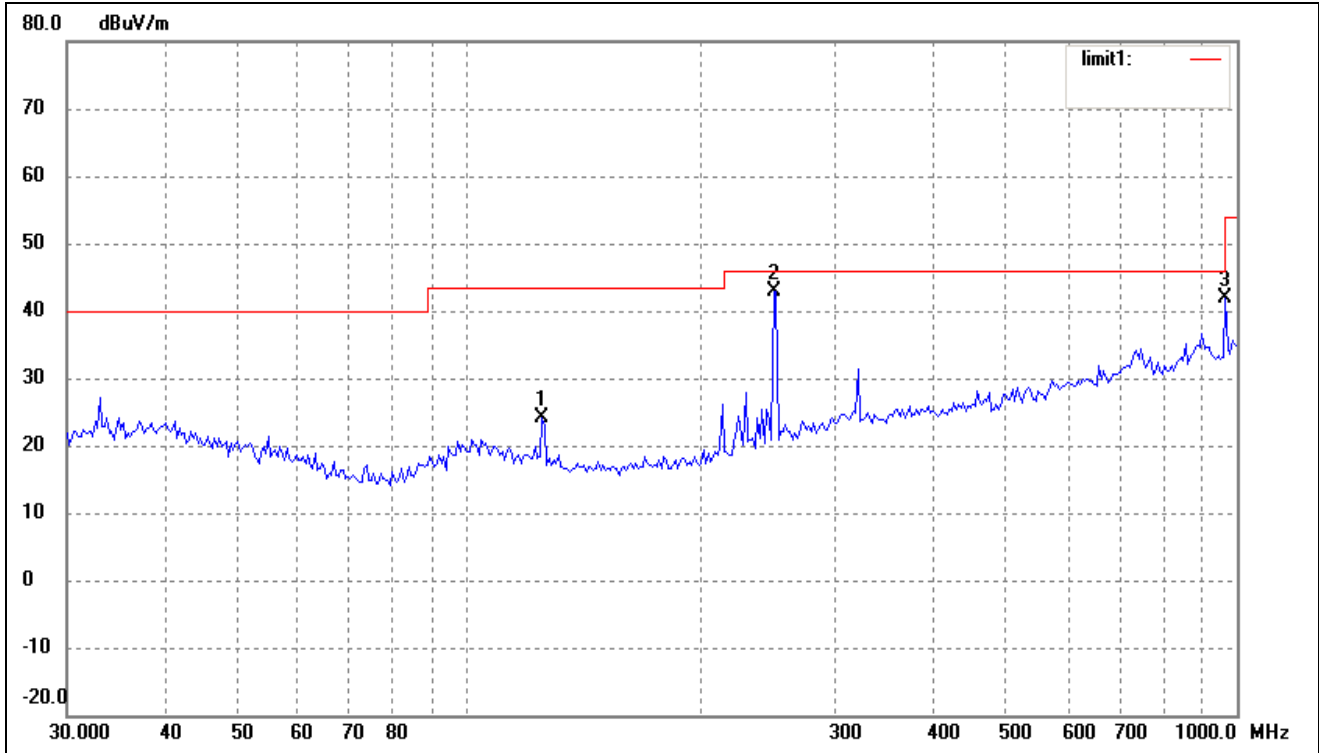
**-2.25 dB μ V at 251.1804 MHz in the Horizontal polarization for 802.11n-HT20 Low Channel, 9kHz to 25 GHz,
3 Meters**

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

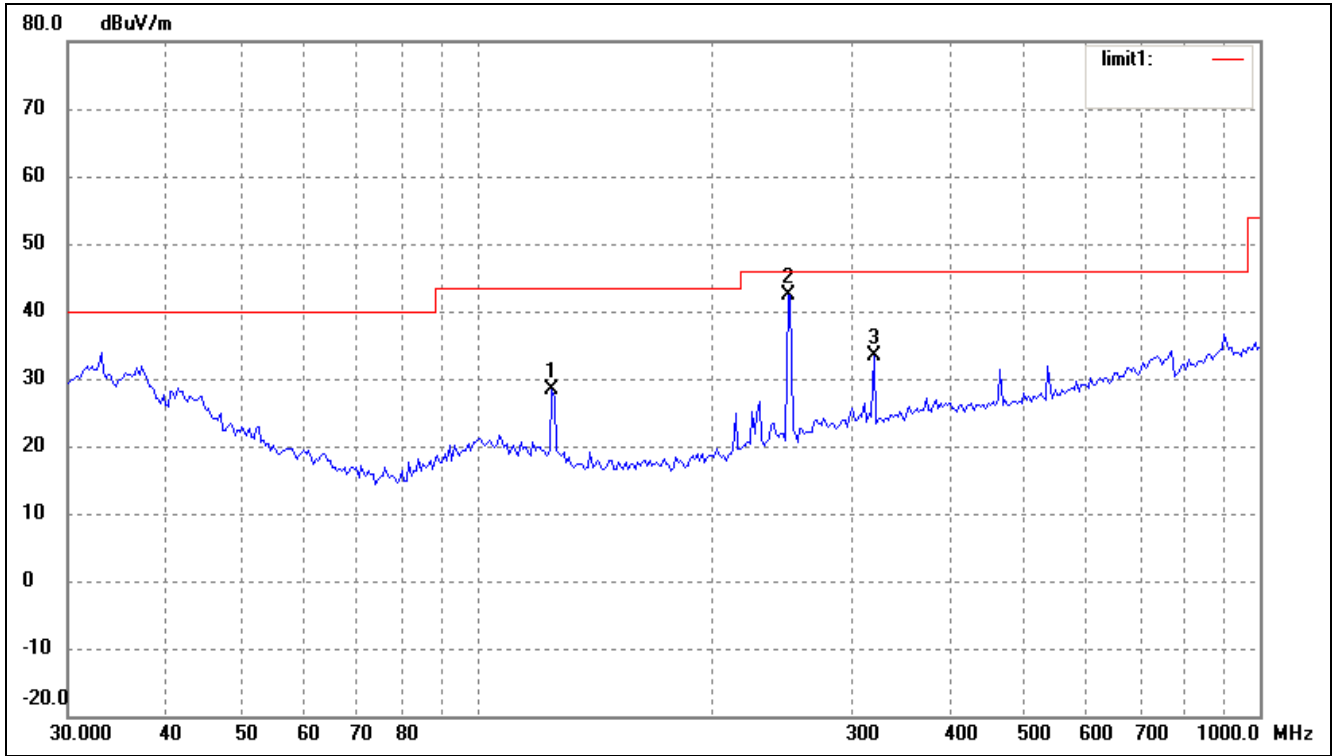
EUT: *Y-cam Cube*
 Tested Model: *Cube HD 720*
 Operating Condition: *802.11b Transmitting Low Channel-2412MHz*
 Comment: *AC 120V/60Hz, DC 12V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	19.63	4.53	24.16	43.50	-19.34	264	100	peak
2	249.4250	35.58	7.27	42.85	46.00	-3.15	113	200	peak
3	965.5421	23.52	18.37	41.89	54.00	-12.11	287	100	peak

Test Specification: Vertical

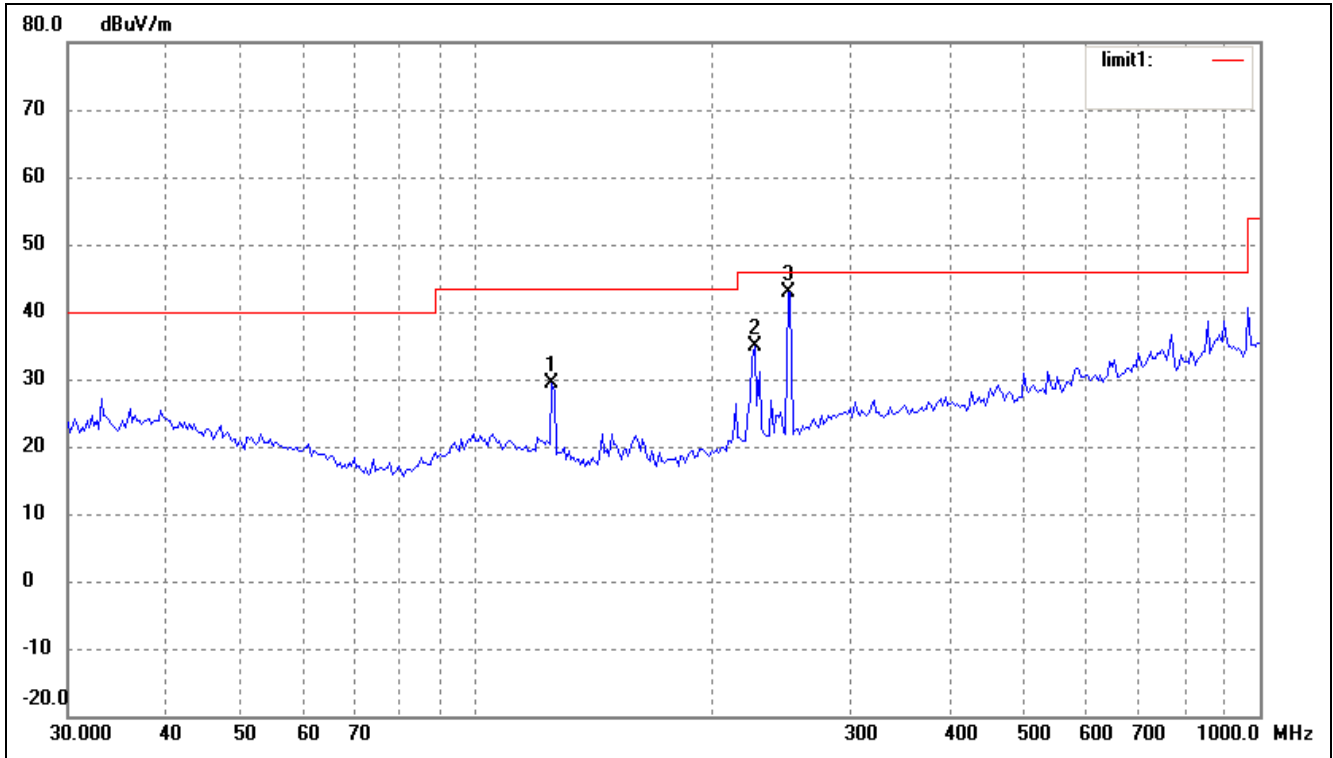


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	23.88	4.53	28.41	43.50	-15.09	240	100	peak
2	249.4250	35.19	7.27	42.46	46.00	-3.54	187	100	peak
3	321.0608	22.95	10.46	33.41	46.00	-12.59	220	100	peak

Operating Condition: 802.11b Transmitting Middle Channel-2437MHz

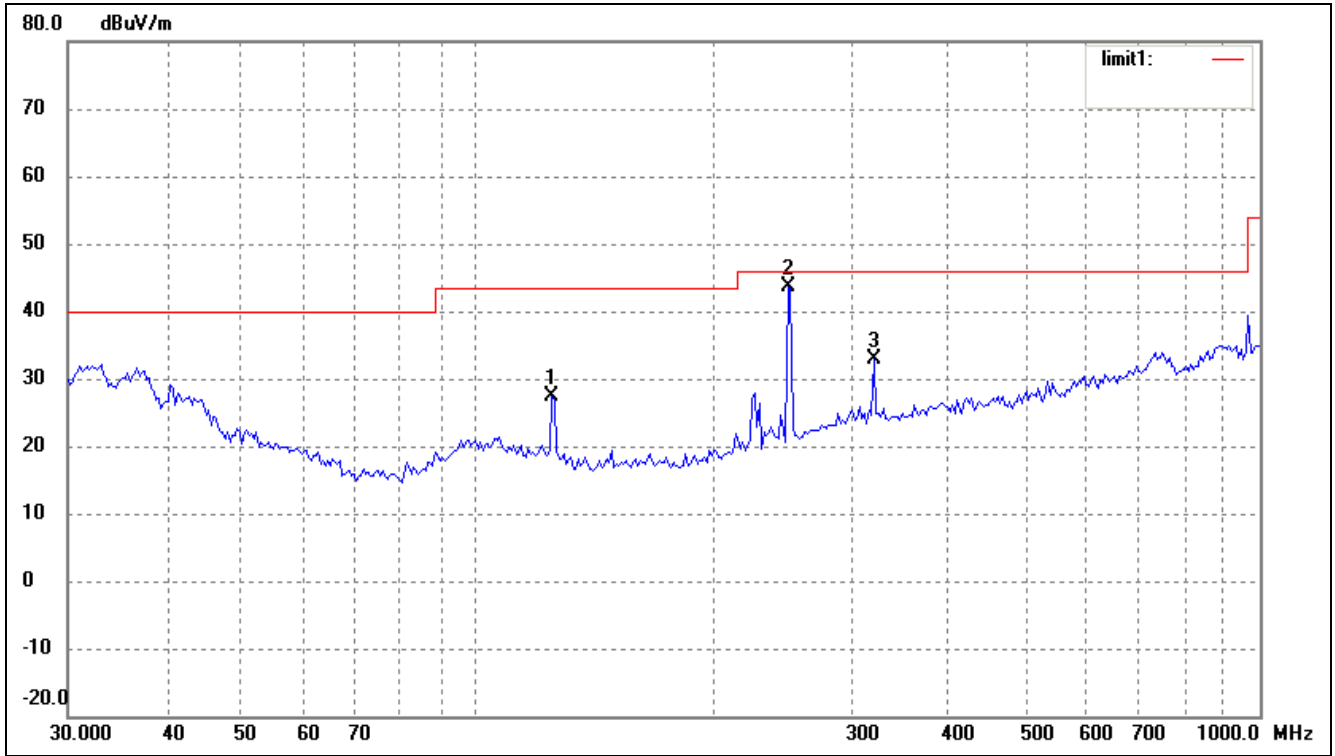
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	24.85	4.53	29.38	43.50	-14.12	162	100	peak
2	226.0994	28.66	6.26	34.92	46.00	-11.08	200	100	peak
3	249.4250	35.66	7.27	42.93	46.00	-3.07	295	100	peak

Test Specification: Vertical

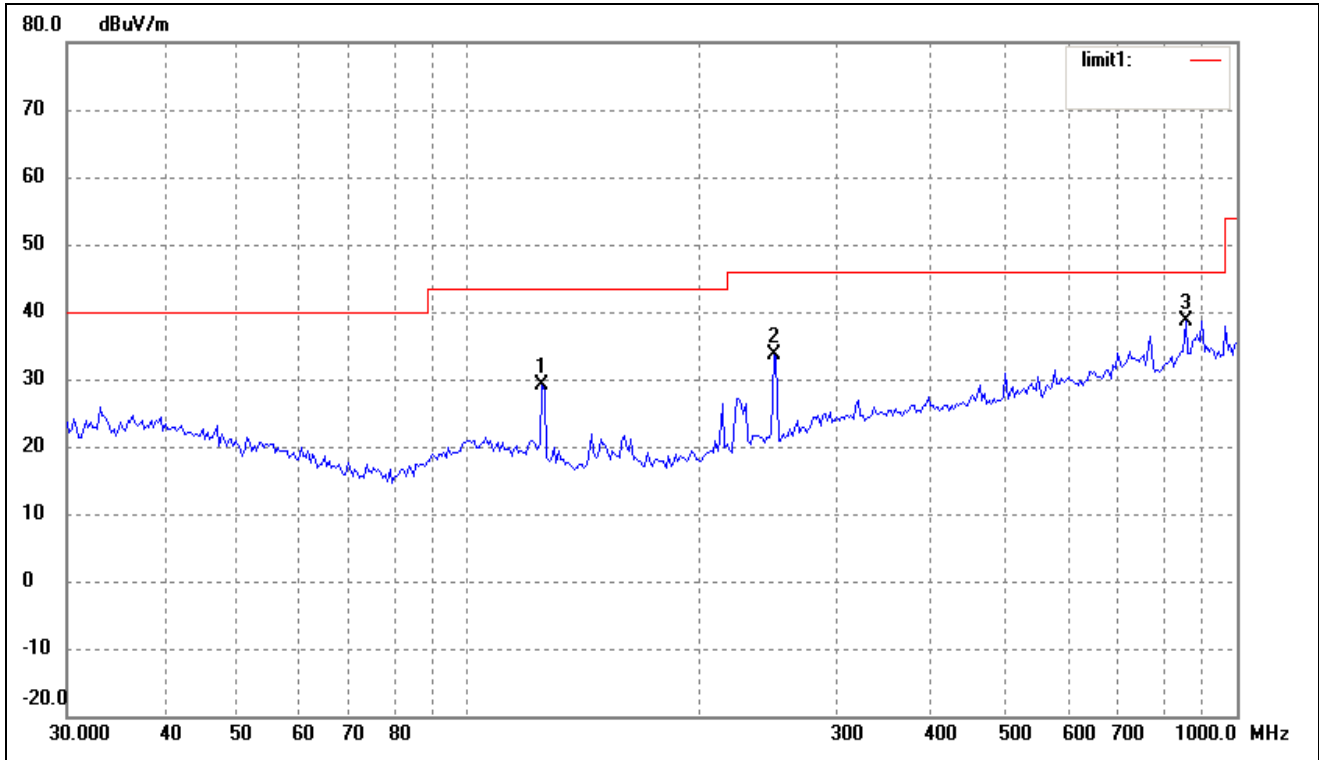


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	22.90	4.53	27.43	43.50	-16.07	240	100	peak
2	249.4250	36.38	7.27	43.65	46.00	-2.35	187	100	peak
3	321.0608	22.43	10.46	32.89	46.00	-13.11	220	100	peak

Operating Condition: 802.11b Transmitting High Channel-2462MHz

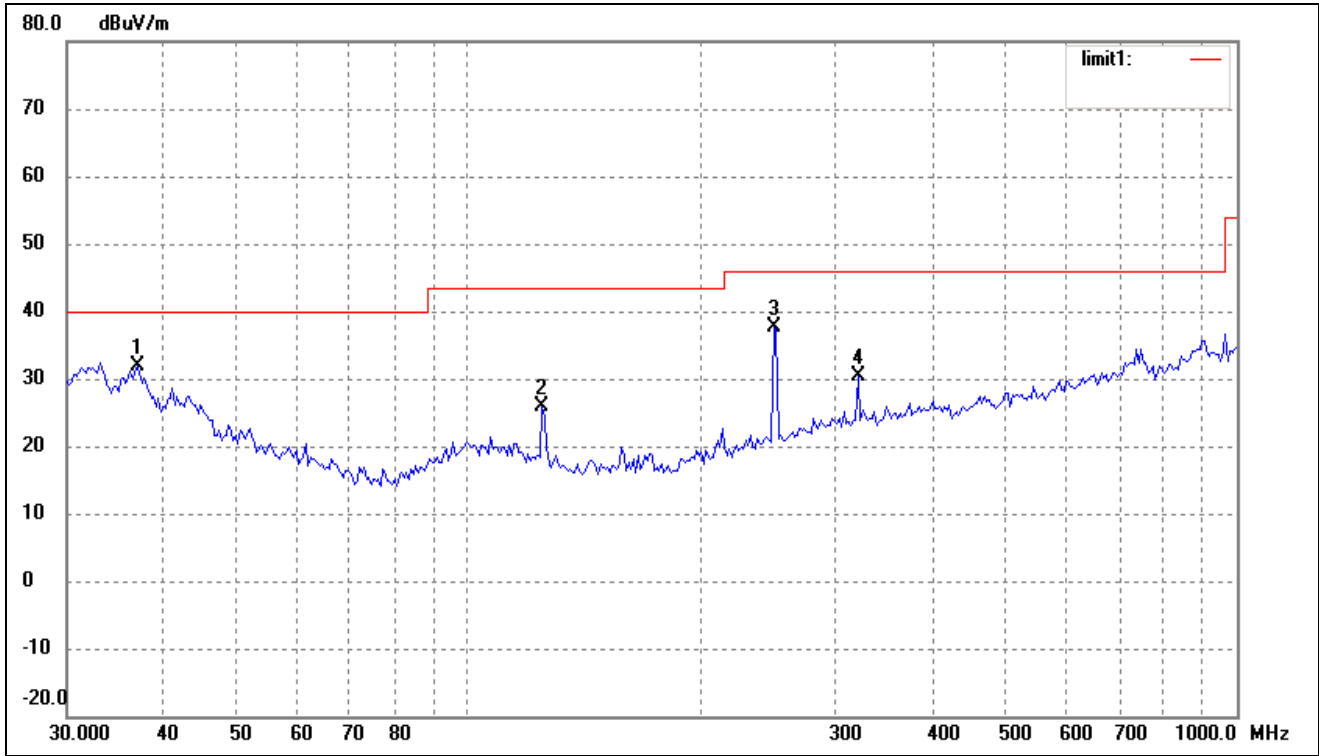
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	24.55	4.53	29.08	43.50	-14.42	162	100	peak
2	249.4250	26.28	7.27	33.55	46.00	-12.45	200	100	peak
3	857.0247	20.75	17.97	38.72	46.00	-7.28	154	100	peak

Test Specification: Vertical

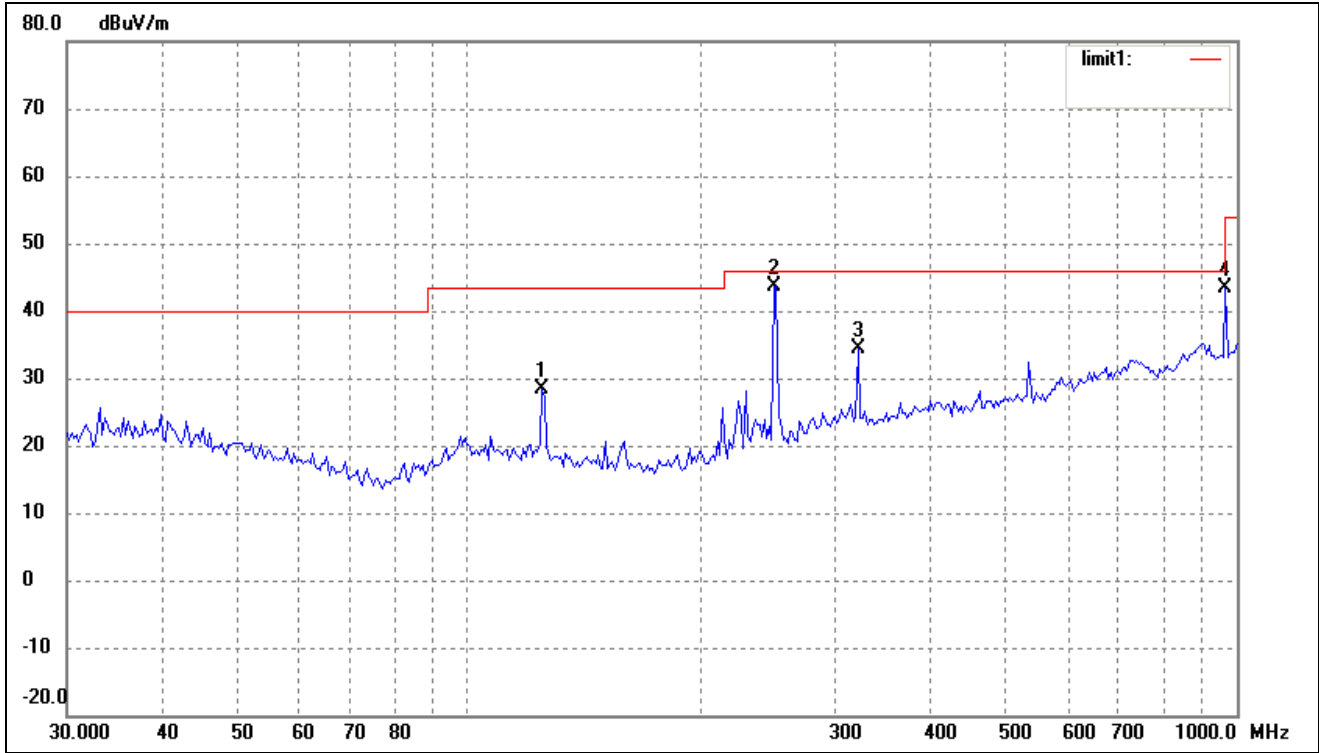


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	37.0249	22.79	9.21	32.00	40.00	-8.00	240	100	peak
2	124.5690	21.26	4.53	25.79	43.50	-17.71	187	100	peak
3	249.4250	30.37	7.27	37.64	46.00	-8.36	220	100	peak
4	321.0608	19.91	10.46	30.37	46.00	-15.63	247	100	peak

Operating Condition: 802.11g Transmitting Low Channel-2412MHz

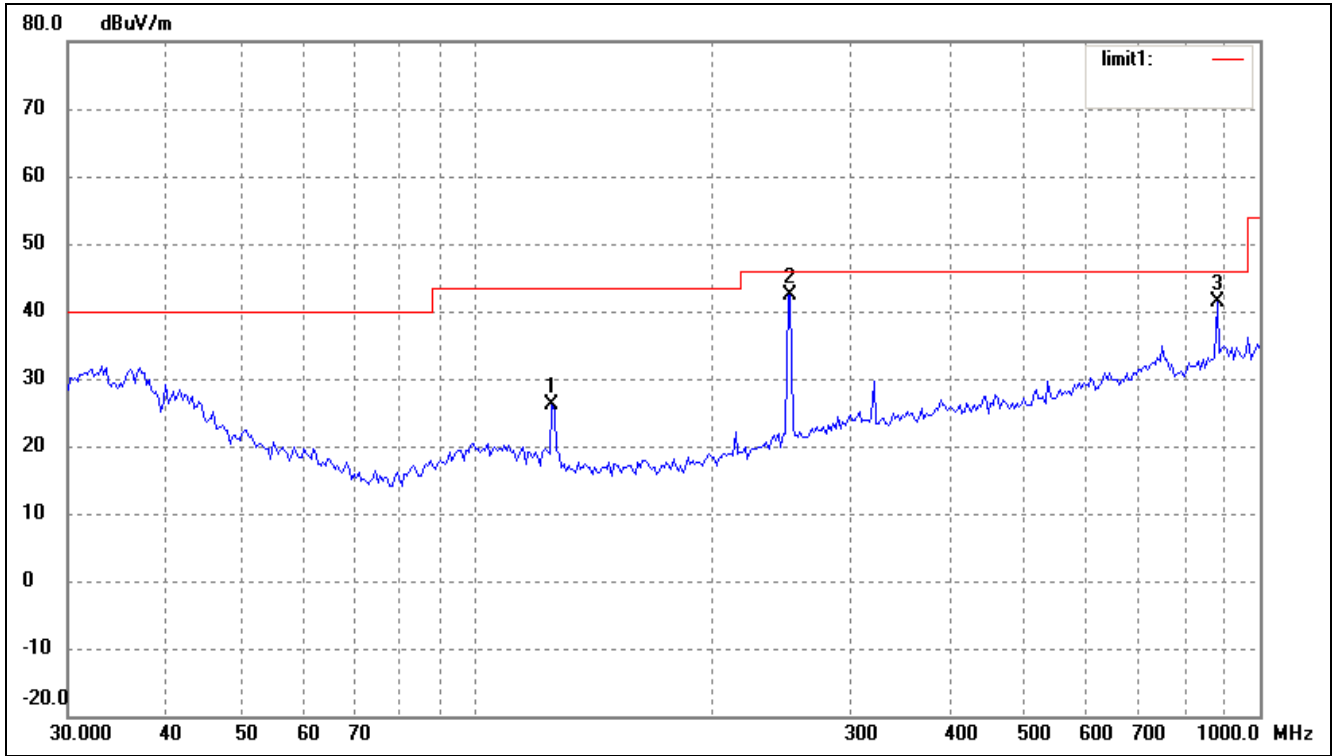
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	23.89	4.53	28.42	43.50	-15.08	115	200	peak
2	249.4250	36.35	7.27	43.62	46.00	-2.38	227	100	peak
3	321.0608	23.85	10.46	34.31	46.00	-11.69	165	200	peak
4	965.5421	24.94	18.37	43.31	54.00	-10.69	110	100	QP

Test Specification: Vertical

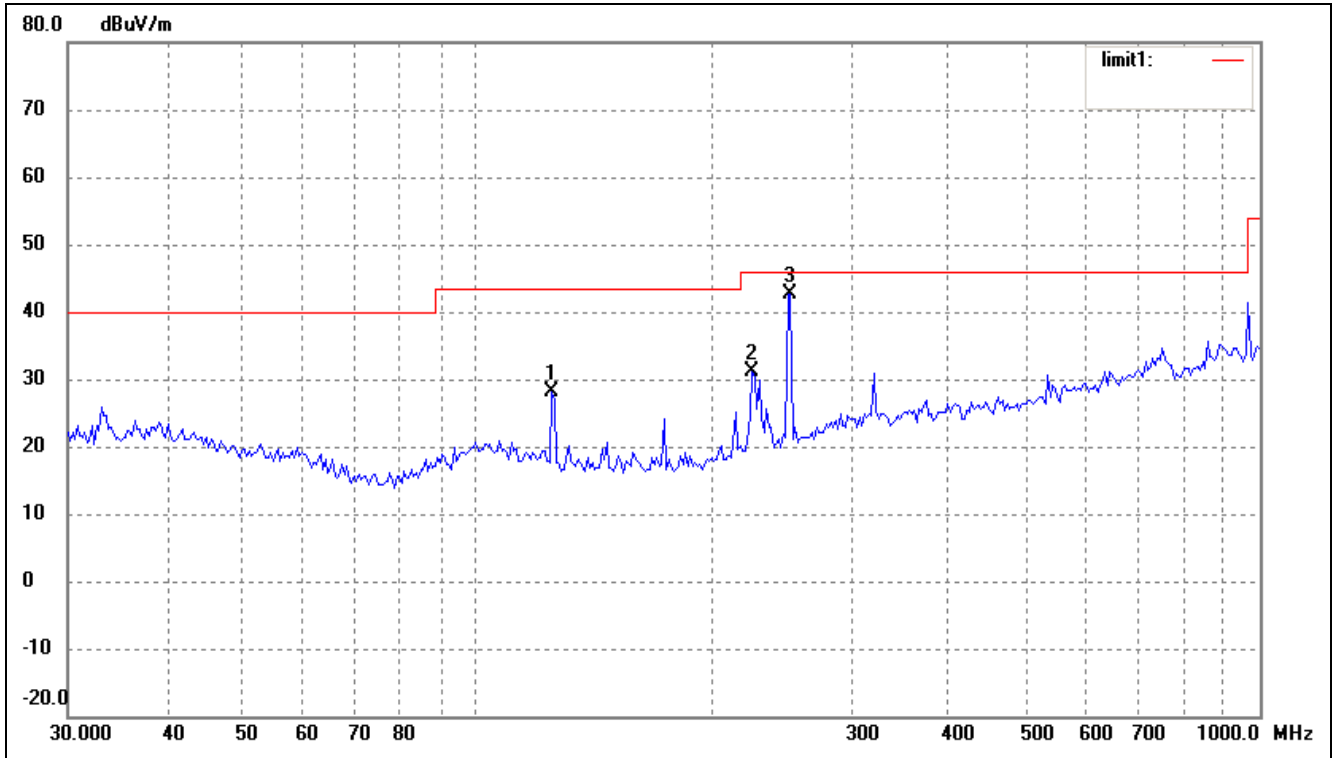


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	21.71	4.53	26.24	43.50	-17.26	221	100	peak
2	251.1804	34.95	7.34	42.29	46.00	-3.71	137	100	peak
3	881.4067	22.41	19.03	41.44	46.00	-4.56	216	100	peak

Operating Condition: 802.11g Transmitting Middle Channel-2437MHz

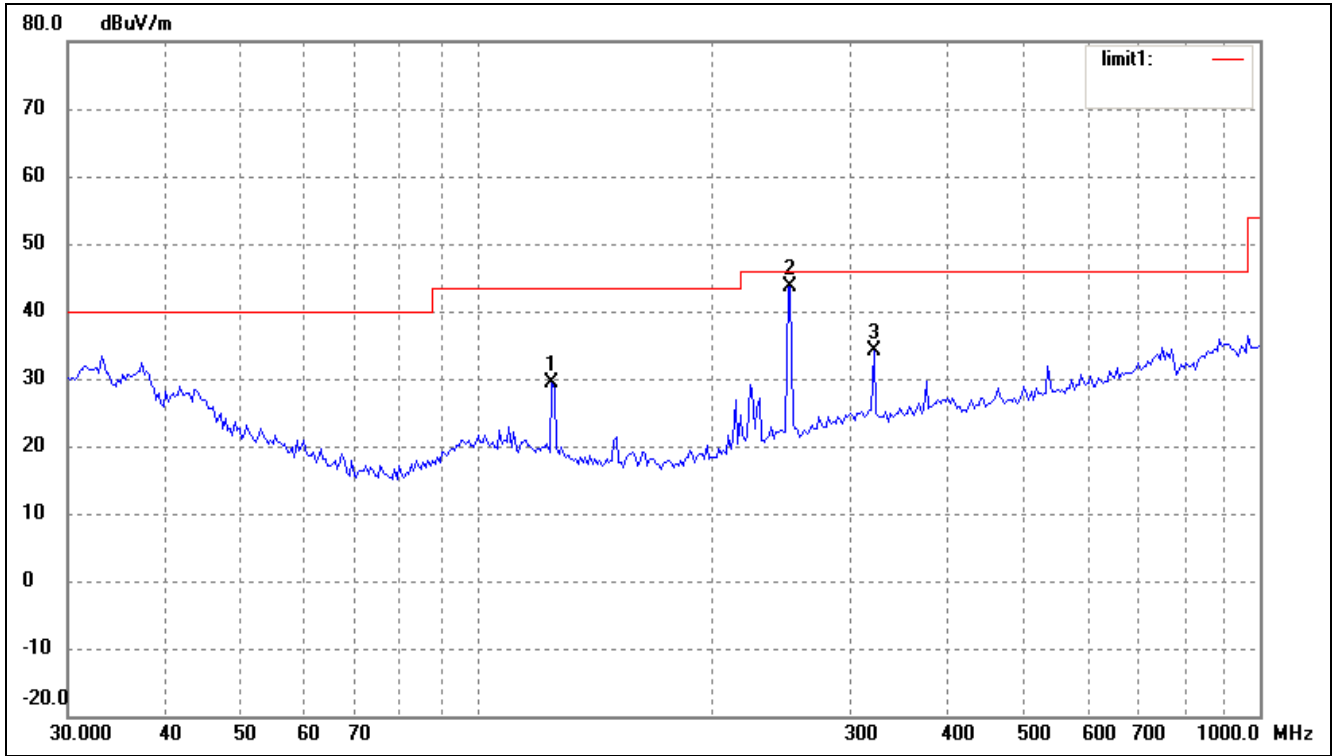
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	23.51	4.53	28.04	43.50	-15.46	147	100	peak
2	224.5193	25.07	6.17	31.24	46.00	-14.76	207	100	peak
3	251.1804	35.26	7.34	42.60	46.00	-3.40	128	100	peak

Test Specification: Vertical

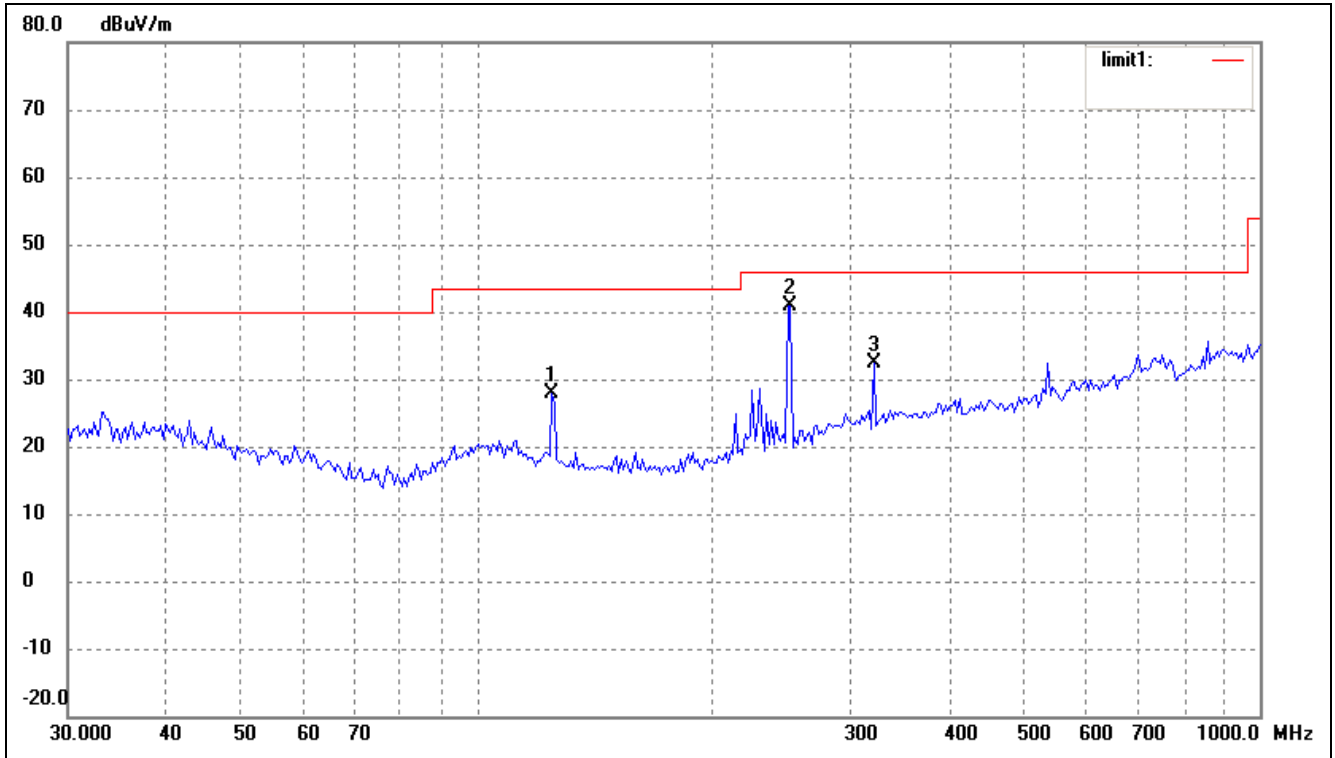


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	24.97	4.53	29.50	43.50	-14.00	221	100	peak
2	251.1804	36.24	7.34	43.58	46.00	-2.42	176	100	peak
3	321.0608	23.68	10.46	34.14	46.00	-11.86	263	100	peak

Operating Condition: 802.11g Transmitting High Channel-2462MHz

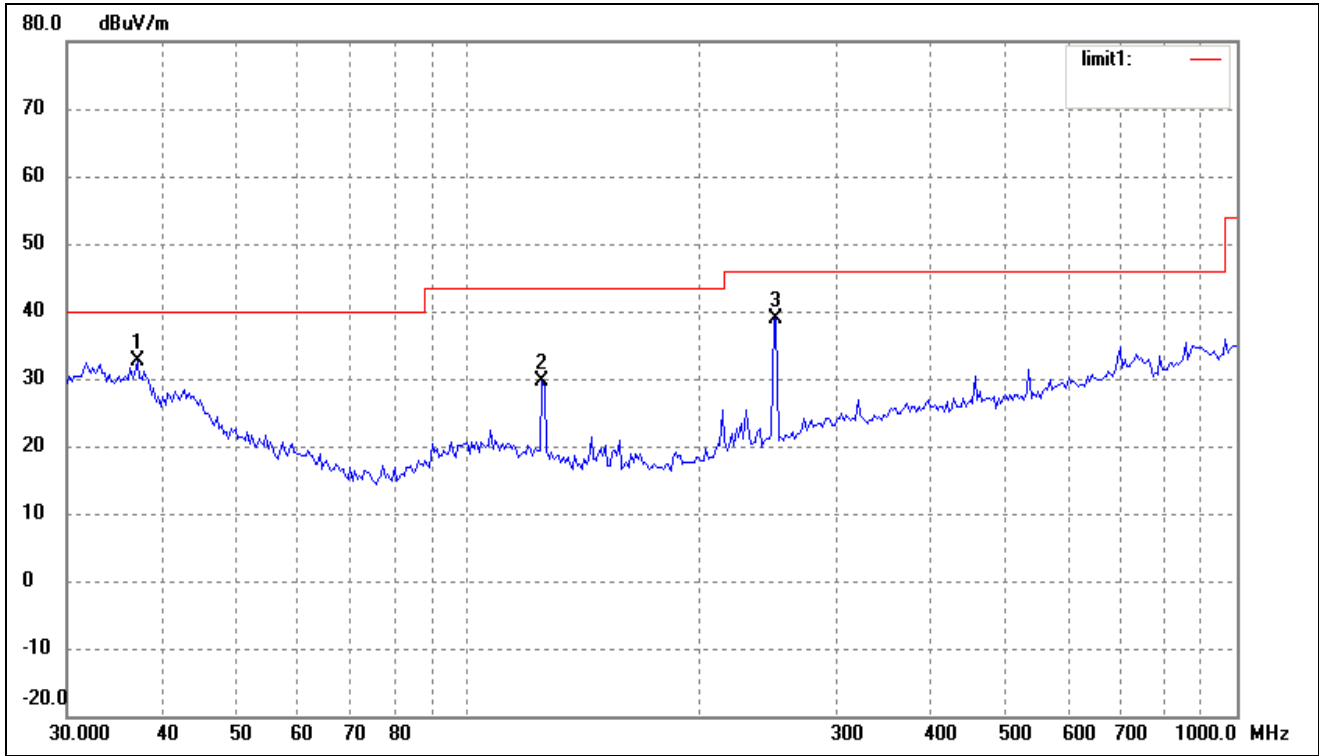
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	23.30	4.53	27.83	43.50	-15.67	134	100	peak
2	251.1804	33.64	7.34	40.98	46.00	-5.02	221	100	peak
3	321.0608	21.97	10.46	32.43	46.00	-13.57	148	100	peak

Test Specification: Vertical

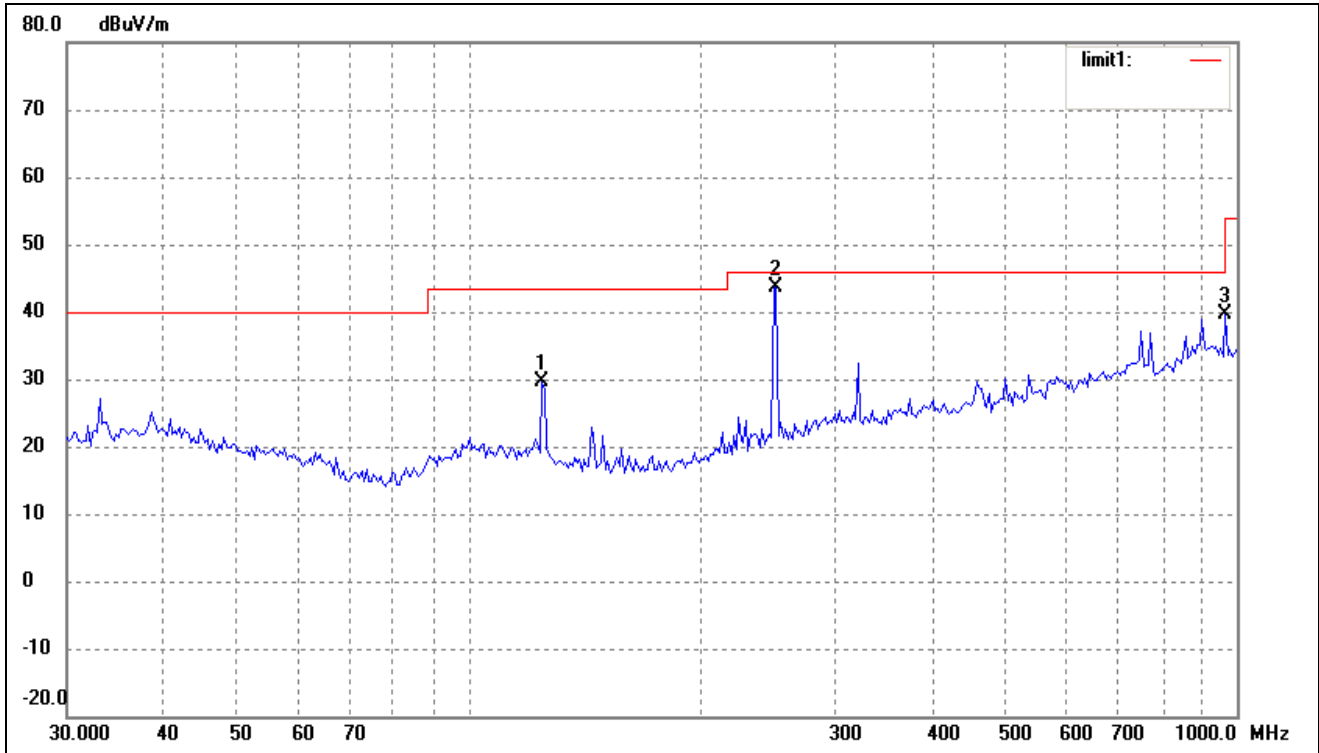


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	37.0249	23.37	9.21	32.58	40.00	-7.42	213	100	peak
2	124.5690	25.10	4.53	29.63	43.50	-13.87	243	100	peak
3	251.1804	31.60	7.34	38.94	46.00	-7.06	105	100	peak

Operating Condition: 802.11n-HT20 Transmitting Low Channel-2412MHz

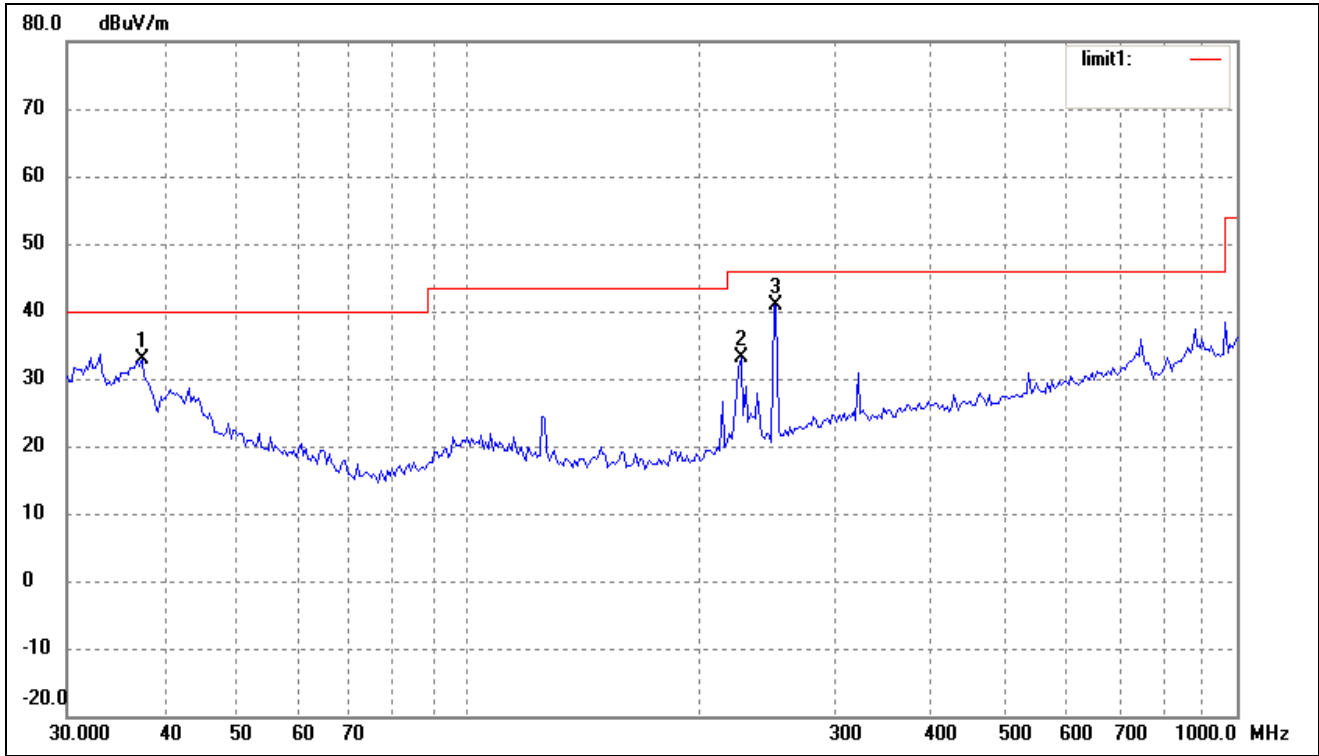
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	25.00	4.53	29.53	43.50	-13.97	287	100	peak
2	251.1804	36.41	7.34	43.75	46.00	-2.25	185	200	peak
3	965.5421	21.31	18.37	39.68	54.00	-14.32	110	100	QP

Test Specification: Vertical

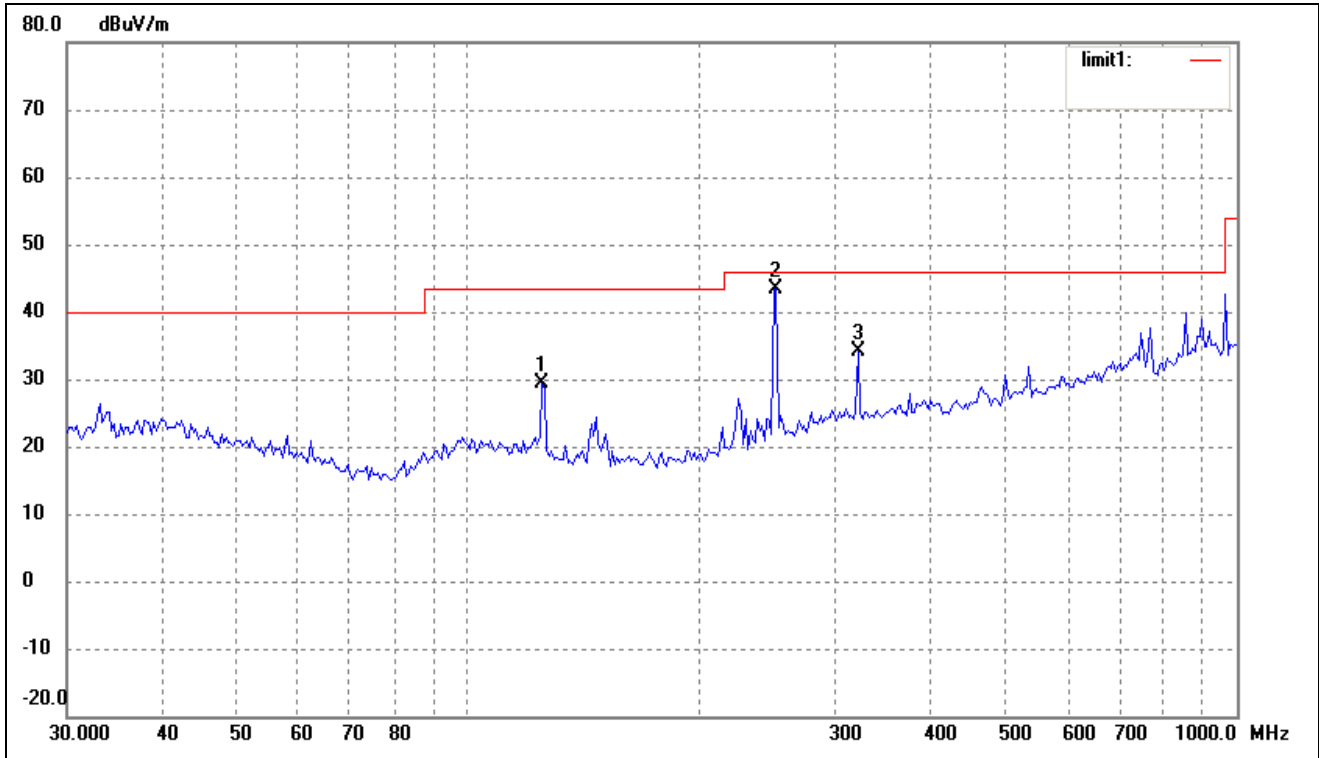


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	37.5479	23.48	9.29	32.77	40.00	-7.23	242	100	peak
2	226.0994	26.98	6.26	33.24	46.00	-12.76	176	100	peak
3	251.1804	33.51	7.34	40.85	46.00	-5.15	217	100	peak

Operating Condition: 802.11n-HT20 Transmitting Middle Channel-2437MHz

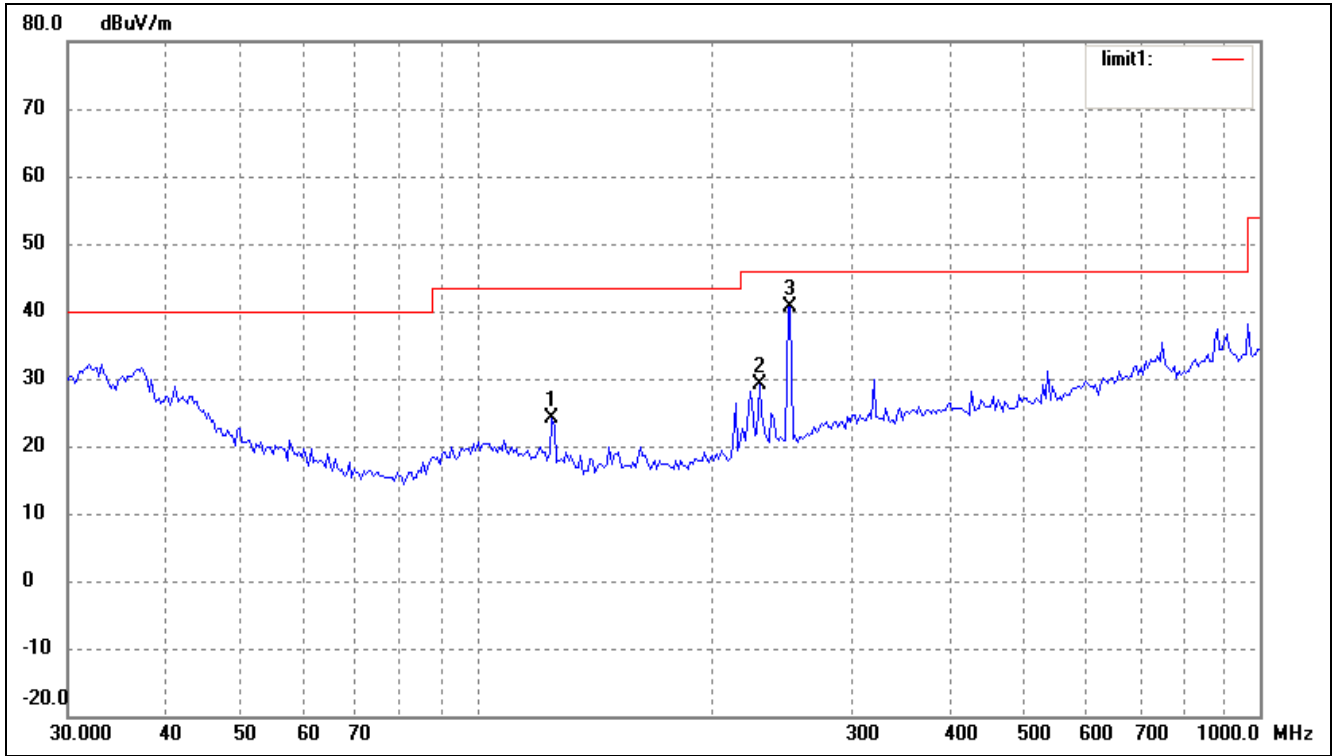
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	24.80	4.53	29.33	43.50	-14.17	241	100	peak
2	251.1804	36.03	7.34	43.37	46.00	-2.63	201	100	peak
3	321.0608	23.71	10.46	34.17	46.00	-11.83	187	100	peak

Test Specification: Vertical

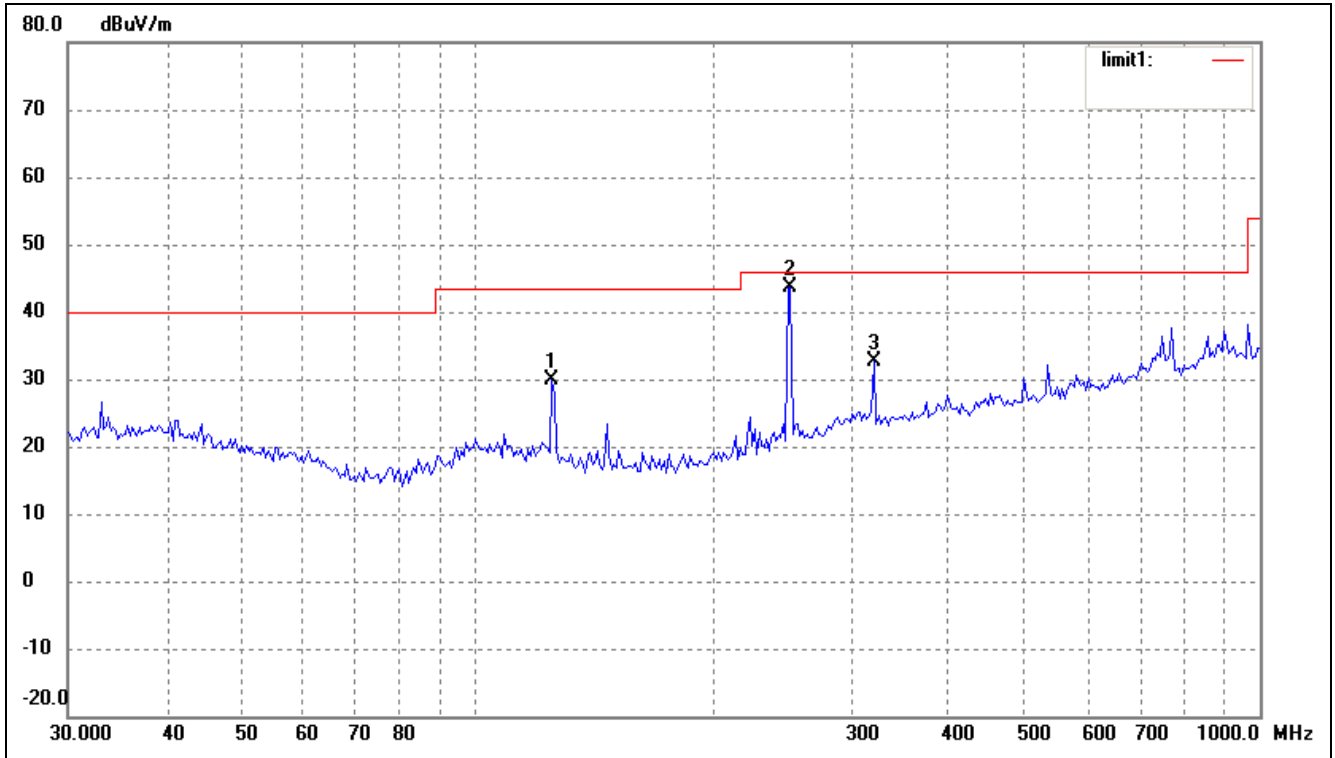


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	19.53	4.53	24.06	43.50	-19.44	234	100	peak
2	229.2931	22.59	6.42	29.01	46.00	-16.99	192	100	peak
3	251.1804	33.35	7.34	40.69	46.00	-5.31	254	100	peak

Operating Condition: 802.11n-HT20 Transmitting High Channel-2462MHz

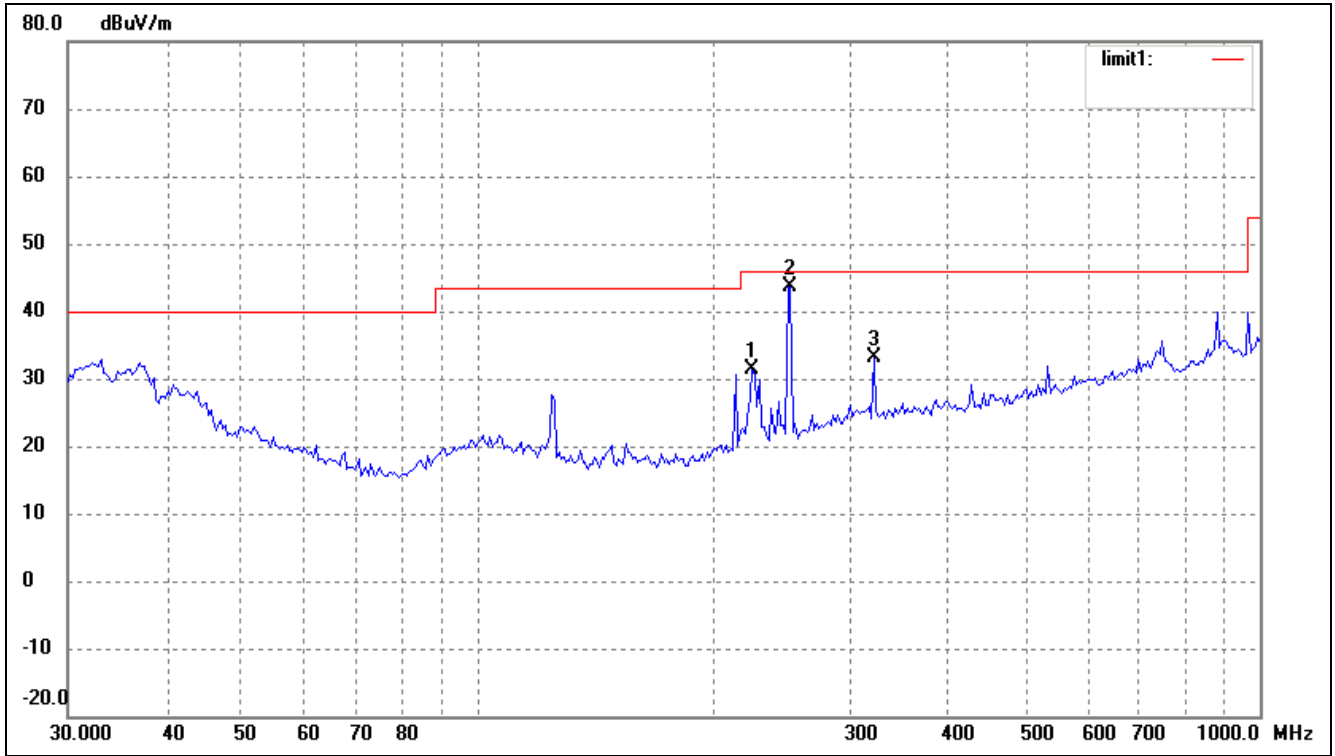
Comment: AC 120V/60Hz, DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	25.34	4.53	29.87	43.50	-13.63	138	100	peak
2	251.1804	36.26	7.34	43.60	46.00	-2.40	294	100	peak
3	321.0608	22.20	10.46	32.66	46.00	-13.34	168	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	224.5193	25.22	6.17	31.39	46.00	-14.61	234	100	peak
2	251.1804	36.35	7.34	43.69	46.00	-2.31	124	100	peak
3	321.0608	22.71	10.46	33.17	46.00	-12.83	264	100	peak

Spurious Emissions Above 1GHz

Test Mode: 802.11b

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	65.96	-3.88	62.08	74.00	-11.92	H	PK
4824.000	48.24	-3.88	44.36	54.00	-9.64	H	AV
7236.000	49.61	1.14	50.75	74.00	-23.25	H	PK
7236.000	38.46	1.14	39.60	54.00	-14.40	H	AV
4824.000	65.80	-3.88	61.92	74.00	-12.08	V	PK
4824.000	48.16	-3.88	44.28	54.00	-9.72	V	AV
7236.000	51.58	1.14	52.72	74.00	-21.28	V	PK
7236.000	38.83	1.14	39.97	54.00	-14.03	V	AV
Middle Channel-2437MHz							
4874.000	63.48	-3.75	59.73	74.00	-14.27	H	PK
4874.000	50.01	-3.75	46.26	54.00	-7.74	H	AV
7311.000	48.20	1.47	49.67	74.00	-24.33	H	PK
7311.000	37.10	1.47	38.57	54.00	-15.43	H	AV
4874.000	67.31	-3.75	63.56	74.00	-10.44	V	PK
4874.000	54.12	-3.75	50.37	54.00	-3.63	V	AV
7311.000	53.73	1.47	55.20	74.00	-18.80	V	PK
7311.000	42.50	1.47	43.97	54.00	-10.03	V	AV
High Channel-2462MHz							
4924.000	60.49	-3.59	56.90	74.00	-17.10	H	PK
4924.000	45.98	-3.59	42.39	54.00	-11.61	H	AV
7386.000	45.31	1.79	47.10	74.00	-26.90	H	PK
7386.000	36.08	1.79	37.87	54.00	-16.13	H	AV
4924.000	61.87	-3.59	58.28	74.00	-15.72	V	PK
4924.000	46.73	-3.59	43.14	54.00	-10.86	V	AV
7386.000	45.49	1.79	47.28	74.00	-26.72	V	PK
7386.000	36.52	1.79	38.31	54.00	-15.69	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	59.30	-3.88	55.42	74.00	-18.58	H	PK
4824.000	44.04	-3.88	40.16	54.00	-13.84	H	AV
7236.000	46.30	1.14	47.44	74.00	-26.56	H	PK
7236.000	34.49	1.14	35.63	54.00	-18.37	H	AV
4824.000	63.89	-3.88	60.01	74.00	-13.99	V	PK
4824.000	48.32	-3.88	44.44	54.00	-9.56	V	AV
7236.000	55.09	1.14	56.23	74.00	-17.77	V	PK
7236.000	39.34	1.14	40.48	54.00	-13.52	V	AV
Middle Channel-2437MHz							
4874.000	57.27	-3.75	53.52	74.00	-20.48	H	PK
4874.000	44.57	-3.75	40.82	54.00	-13.18	H	AV
7311.000	46.80	1.47	48.27	74.00	-25.73	H	PK
7311.000	35.72	1.47	37.19	54.00	-16.81	H	AV
4874.000	60.00	-3.75	56.25	74.00	-17.75	V	PK
4874.000	48.08	-3.75	44.33	54.00	-9.67	V	AV
7311.000	50.07	1.47	51.54	74.00	-22.46	V	PK
7311.000	37.35	1.47	38.82	54.00	-15.18	V	AV
High Channel-2462MHz							
4924.000	52.59	-3.59	49.00	74.00	-25.00	H	PK
4924.000	40.03	-3.59	36.44	54.00	-17.56	H	AV
7386.000	45.41	1.79	47.20	74.00	-26.80	H	PK
7386.000	34.91	1.79	36.70	54.00	-17.30	H	AV
4924.000	54.82	-3.59	51.23	74.00	-22.77	V	PK
4924.000	42.37	-3.59	38.78	54.00	-15.22	V	AV
7386.000	45.57	1.79	47.36	74.00	-26.64	V	PK
7386.000	35.03	1.79	36.82	54.00	-17.18	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	57.35	-3.88	53.47	74.00	-20.53	H	PK
4824.000	42.00	-3.88	38.12	54.00	-15.88	H	AV
7236.000	46.08	1.14	47.22	74.00	-26.78	H	PK
7236.000	33.94	1.14	35.08	54.00	-18.92	H	AV
4824.000	58.74	-3.88	54.86	74.00	-19.14	V	PK
4824.000	43.15	-3.88	39.27	54.00	-14.73	V	AV
7236.000	47.27	1.14	48.41	74.00	-25.59	V	PK
7236.000	33.81	1.14	34.95	54.00	-19.05	V	AV
Middle Channel-2437MHz							
4874.000	52.35	-3.75	48.60	74.00	-25.40	H	PK
4874.000	40.48	-3.75	36.73	54.00	-17.27	H	AV
7311.000	46.21	1.47	47.68	74.00	-26.32	H	PK
7311.000	34.62	1.47	36.09	54.00	-17.91	H	AV
4874.000	52.14	-3.75	48.39	74.00	-25.61	V	PK
4874.000	40.05	-3.75	36.30	54.00	-17.70	V	AV
7311.000	46.99	1.47	48.46	74.00	-25.54	V	PK
7311.000	34.56	1.47	36.03	54.00	-17.97	V	AV
High Channel-2462MHz							
4924.000	48.01	-3.59	44.42	74.00	-29.58	H	PK
4924.000	35.63	-3.59	32.04	54.00	-21.96	H	AV
7386.000	44.87	1.79	46.66	74.00	-27.34	H	PK
7386.000	33.83	1.79	35.62	54.00	-18.37	H	AV
4924.000	49.84	-3.59	46.25	74.00	-27.75	V	PK
4924.000	35.32	-3.59	31.73	54.00	-22.27	V	AV
7386.000	45.25	1.79	47.04	74.00	-26.96	V	PK
7386.000	33.84	1.79	35.63	54.00	-18.37	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz..

8. Out of Band Emissions

8.1 Standard Applicable

According to §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).

8.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24

8.3 Test Procedure

According to the KDB 558074, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the DA 00-705, the band-edge conducted test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2380MHz to 2410MHz for low bandedge, 2470MHz to 2500MHz for the high bandedge)

RBW = 100kHz, VBW = 300kHz

Sweep = auto; Detector function = peak; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the limit specified in this section (at least 20dB attenuation).

8.4 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

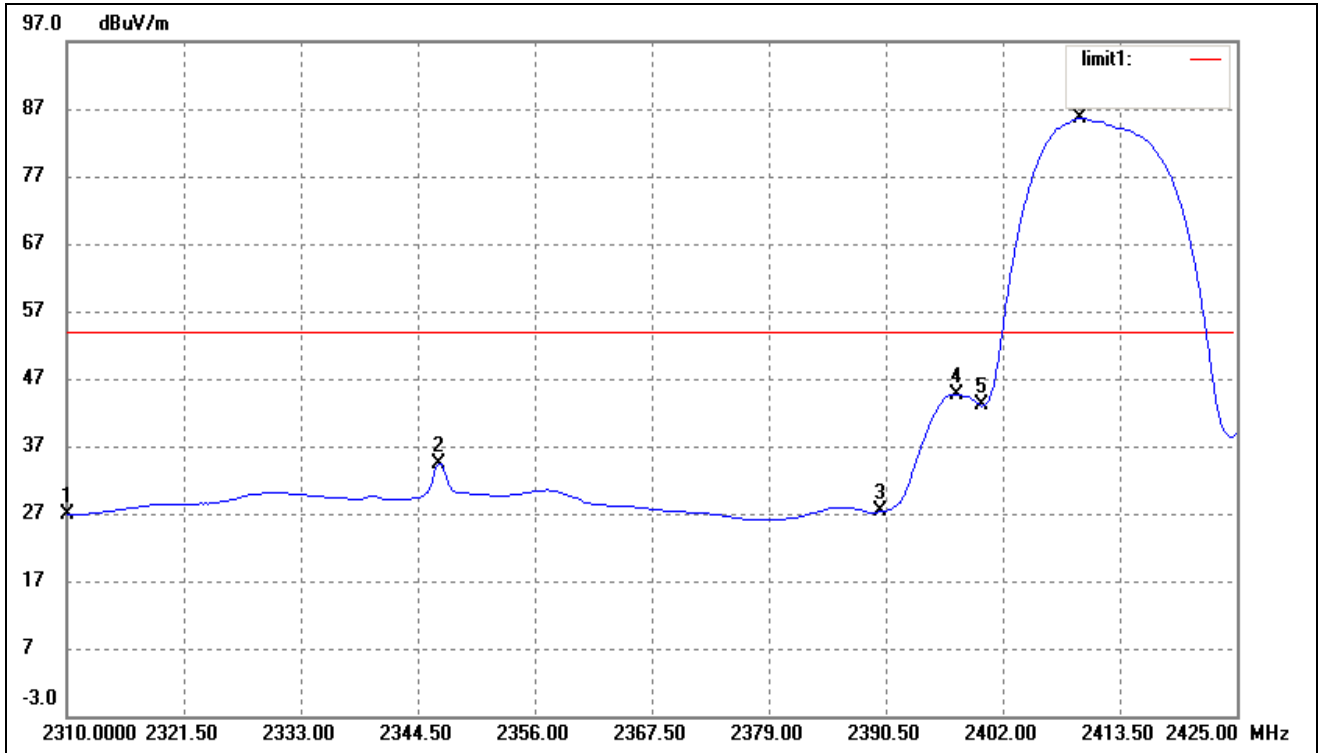
8.5 Summary of Test Results/Plots

Test Mode	Test Frequency MHz	Limit dBuV / dBc	Result
802.11b	2390.00	<54 dBuV	Pass
	2400.00	>20 dBc	Pass
	2483.50	<54 dBuV	Pass
802.11g	2390.00	<54 dBuV	Pass
	2400.00	>20 dBc	Pass
	2483.50	<54 dBuV	Pass
802.11n-HT20	2390.00	<54 dBuV	Pass
	2400.00	>20 dBc	Pass
	2483.50	<54 dBuV	Pass
802.11n-HT40	2390.00	<54 dBuV	Pass
	2400.00	>20 dBc	Pass
	2483.50	<54 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.247(d) requirements.

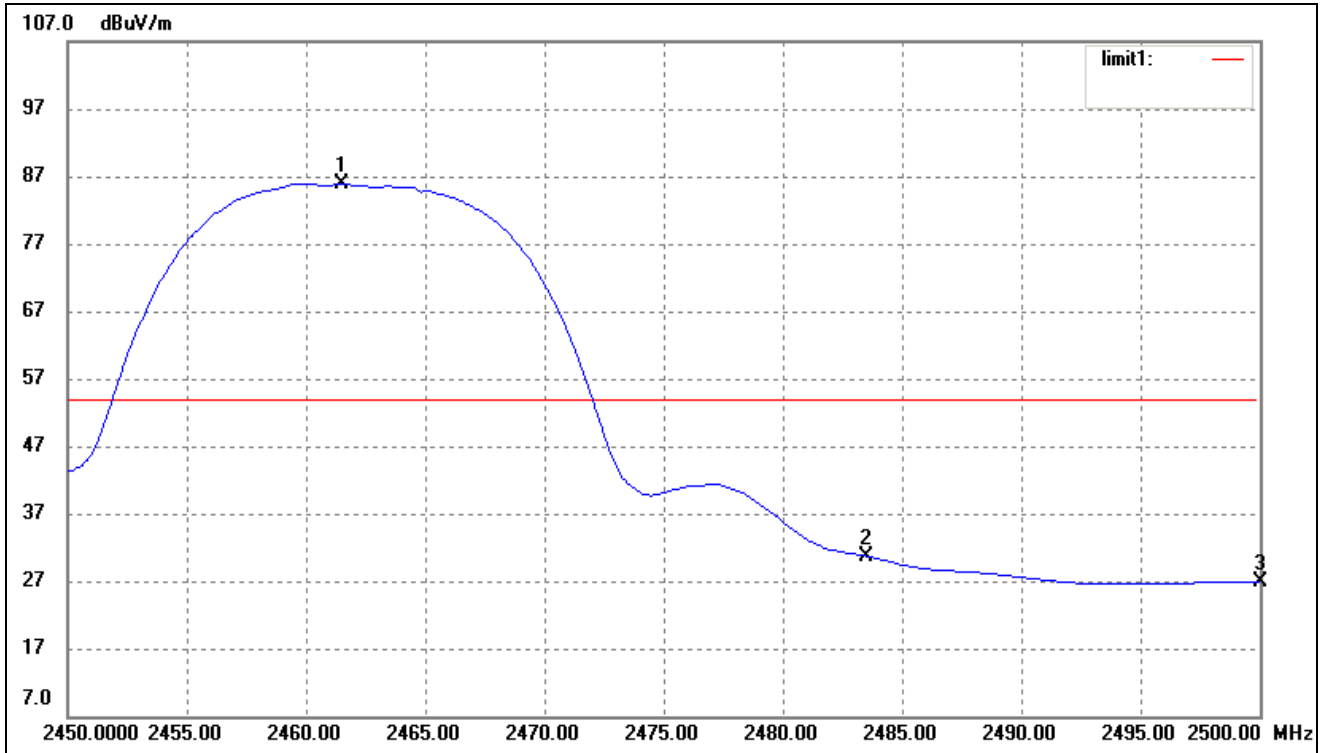
Please refer to the test plots as below.

802.11b-Lowest Bandedge



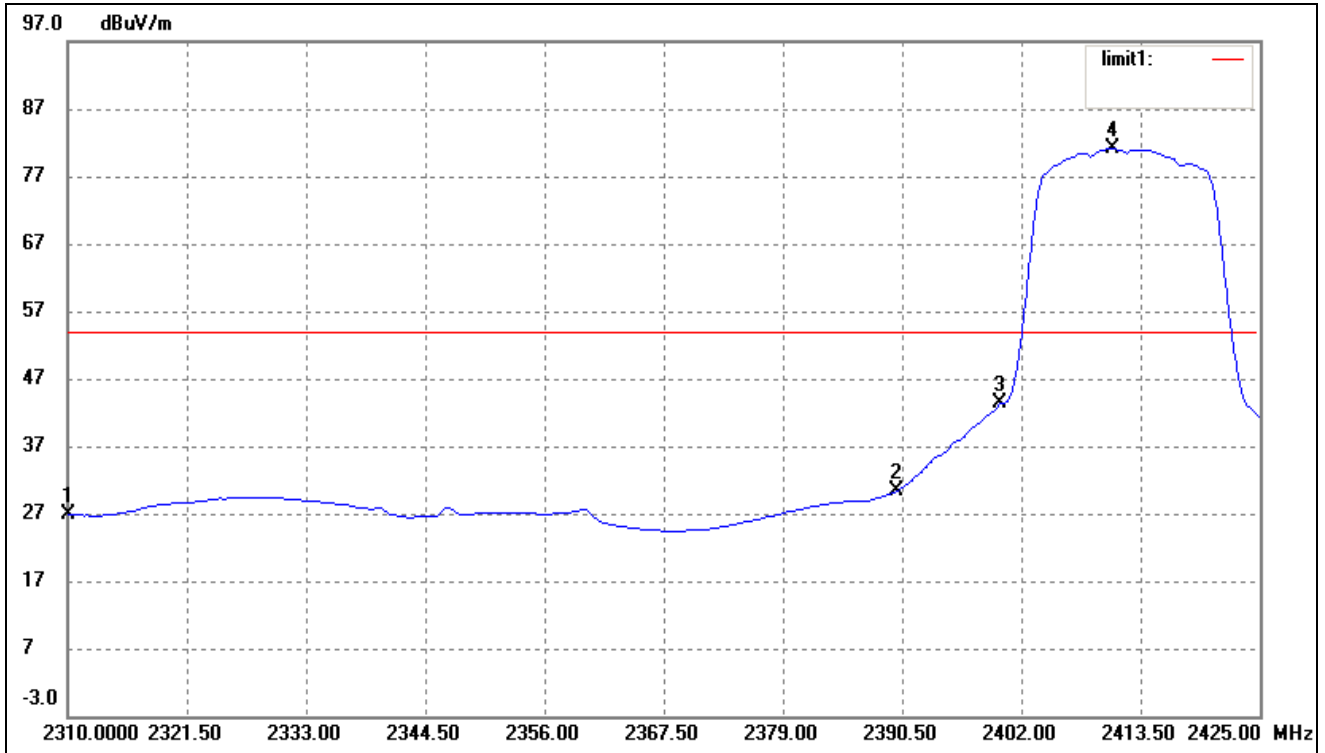
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.49	-11.72	26.77	54.00	-27.23	Average Detector
	2310.000	55.66	-11.72	43.94	74.00	-30.06	Peak Detector
2	2346.570	46.22	-11.74	34.48	54.00	-19.52	Average Detector
	2346.570	46.22	-11.74	51.26	74.00	-22.74	Peak Detector
3	2390.000	39.11	-11.75	27.36	54.00	-26.64	Average Detector
	2390.000	55.37	-11.75	43.62	74.00	-30.38	Peak Detector
4	2397.400	56.48	-11.75	44.73	54.00	-9.27	Average Detector
	2397.400	56.48	-11.75	62.96	74.00	-11.04	Peak Detector
5	2400.000	54.88	-11.75	43.13	Delta=42.48 dBc		Average Detector
6	2409.590	97.36	-11.75	85.61			Average Detector

802.11b-Highest Bandedge



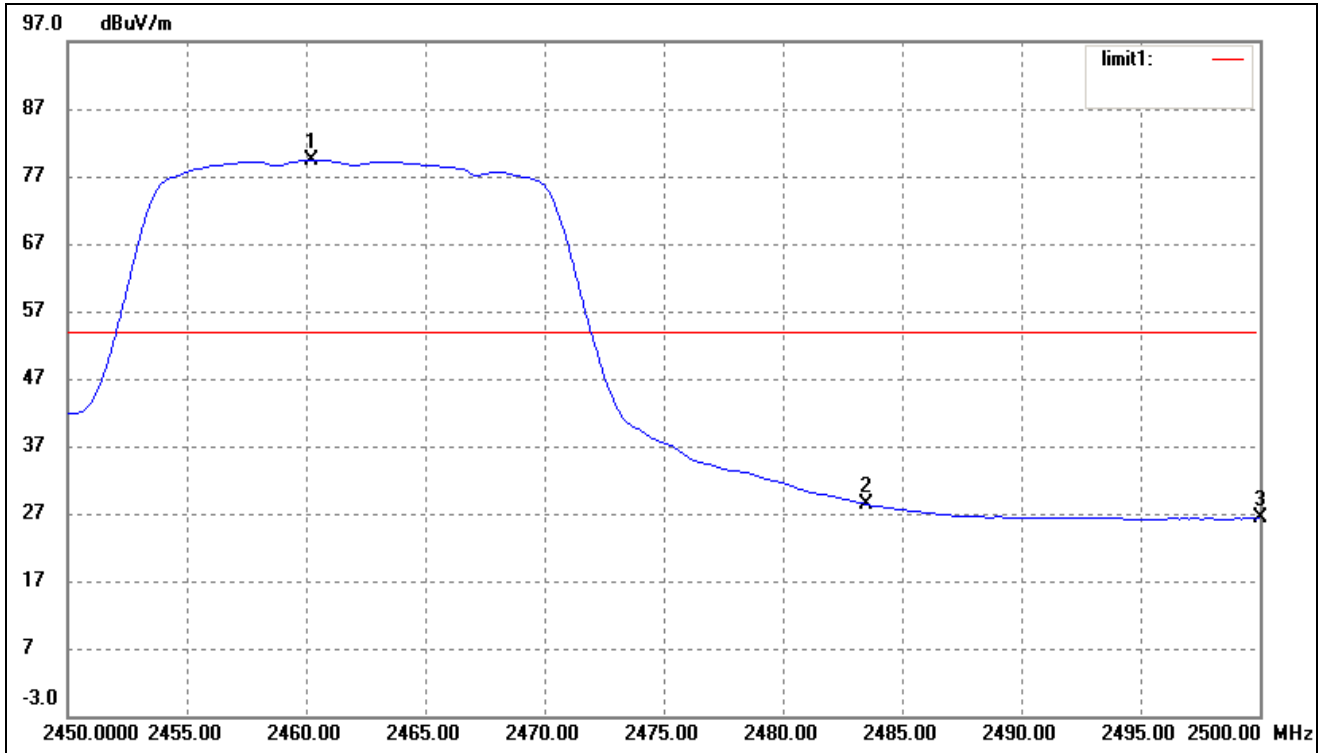
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2461.500	97.69	-11.77	85.92	/	/	Average Detector
	2461.100	105.88	-11.77	94.11	/	/	Peak Detector
2	2483.500	Delta =51.06 dBc		38.86	54.00	-15.14	Average Detector
	2483.500			43.05	74.00	-30.95	Peak Detector
3	2500.000	38.65	-11.78	26.87	54.00	-27.13	Average Detector
	2500.000	50.99	-11.78	39.21	74.00	-34.79	Peak Detector

802.11g-Lowest Bandedge



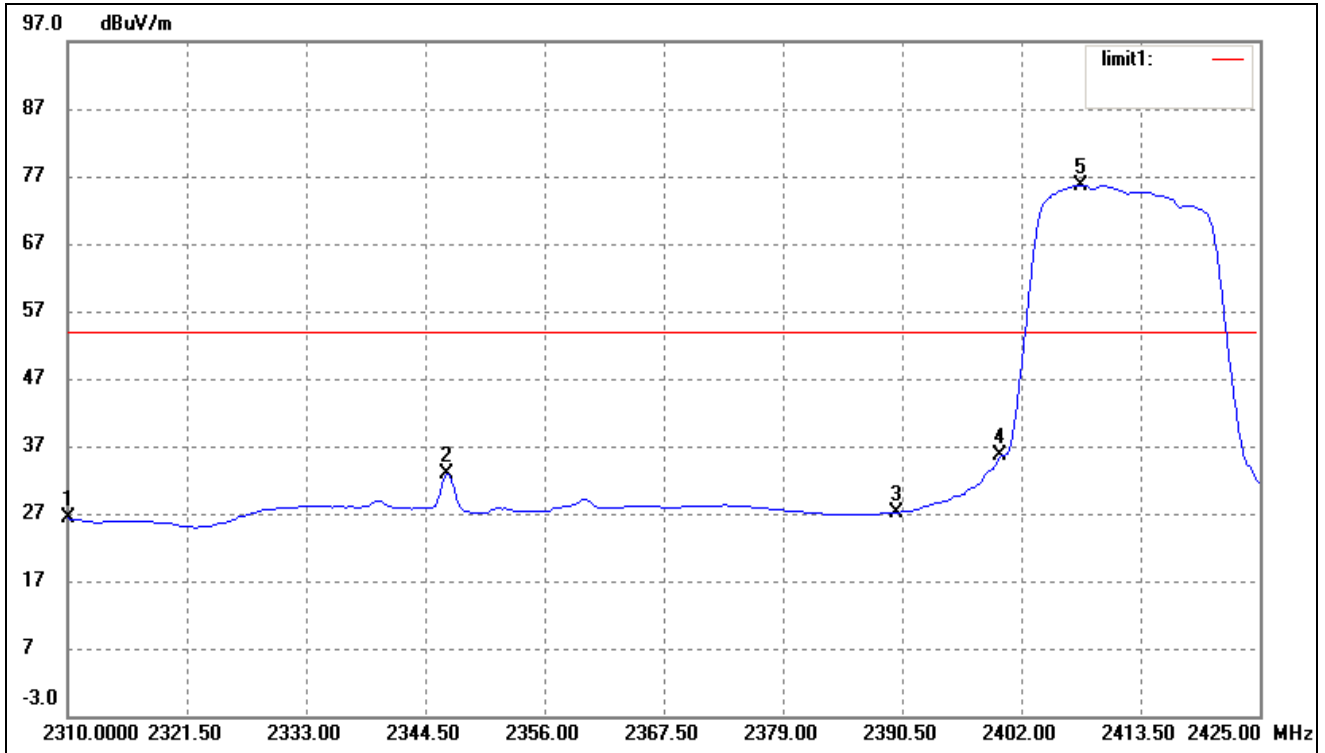
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.65	-11.72	26.93	54.00	-27.07	Average Detector
		55.25	-11.72	43.53	74.00	-30.47	Peak Detector
2	2390.000	42.20	-11.75	30.45	54.00	-23.55	Average Detector
		57.56	-11.75	45.81	74.00	-28.19	Peak Detector
3	2400.000	55.20	-11.75	43.45	Delta=37.64 dBc		Average Detector
4	2410.740	92.84	-11.75	81.09			Average Detector

802.11g-Highest Bandedge



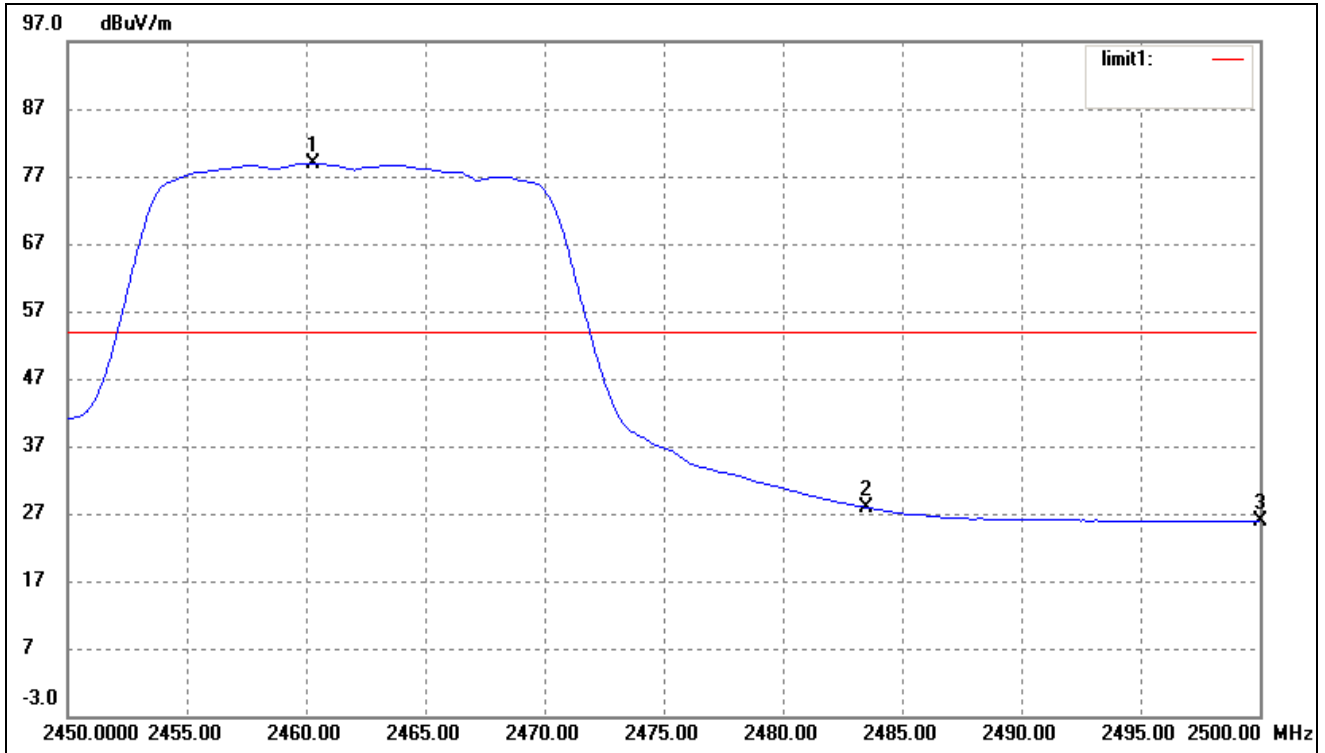
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.200	91.24	-11.77	79.47	/	/	Average Detector
	2458.200	102.63	-11.77	90.86	/	/	Peak Detector
2	2483.500	Delta =48.08 dBc		31.39	54.00	-22.61	Average Detector
	2483.500			42.78	74.00	-31.22	Peak Detector
3	2500.000	38.06	-11.78	26.28	54.00	-27.72	Average Detector
	2500.000	51.57	-11.78	39.79	74.00	-34.21	Peak Detector

802.11n-HT20-Lowest Bandedge



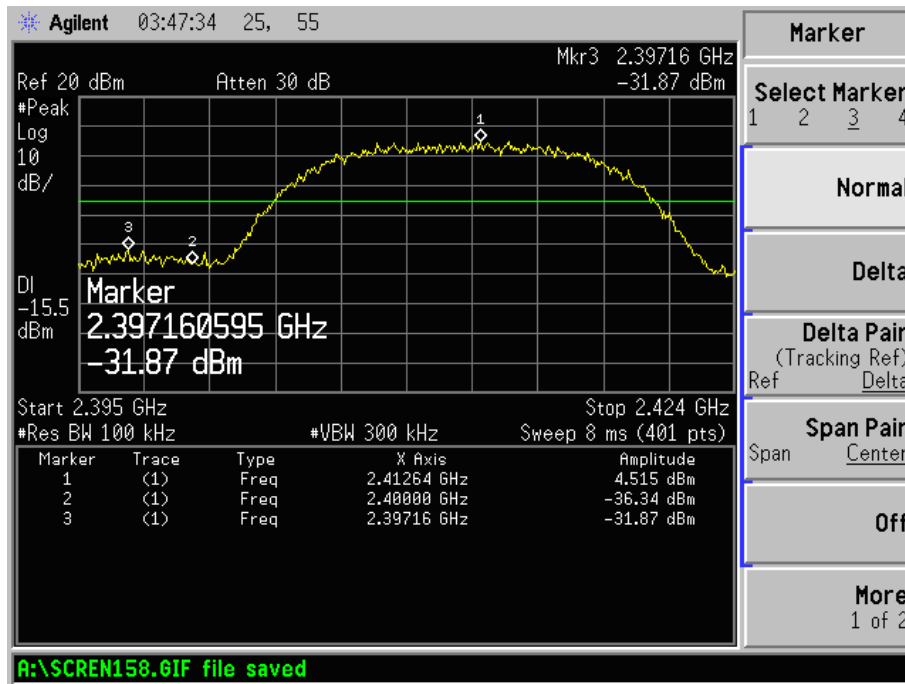
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.12	-11.72	26.40	54.00	-27.60	Average Detector
	2310.000	53.69	-11.72	41.97	74.00	-32.03	Peak Detector
2	2346.570	44.52	-11.74	32.78	54.00	-21.22	Average Detector
	2346.570	44.52	-11.74	48.12	74.00	-25.88	Peak Detector
3	2390.000	38.96	-11.75	27.21	54.00	-26.79	Average Detector
	2390.000	52.95	-11.75	41.20	74.00	-32.80	Peak Detector
4	2400.000	47.38	-11.75	35.63	Delta=40.01 dBc		Average Detector
5	2407.750	87.39	-11.75	75.64		Average Detector	

802.11n-HT20-Highest Bandedge

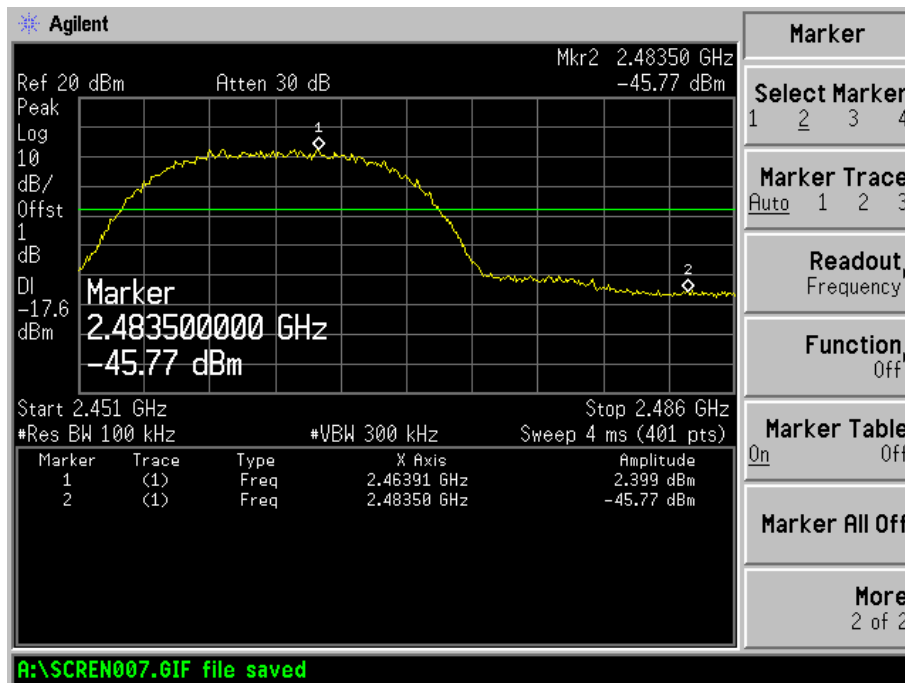


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.300	90.65	-11.77	78.88	/	/	Average Detector
	2458.200	101.65	-11.77	89.88	/	/	Peak Detector
2	2483.500	Delta =47.78 dBc		31.10	54.00	-22.9	Average Detector
	2483.500			42.10	74.00	-31.90	Peak Detector
3	2500.000	37.69	-11.78	25.91	54.00	-28.09	Average Detector
	2500.000	50.24	-11.78	38.46	74.00	-35.54	Peak Detector

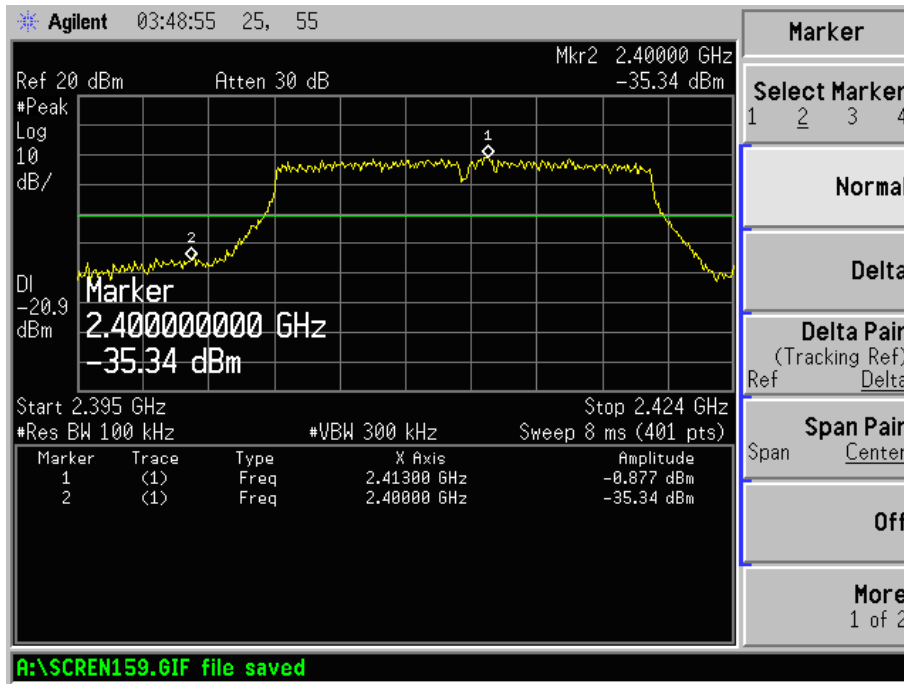
Bandedge (Conducted)
802.11b-Lowest Bandedge



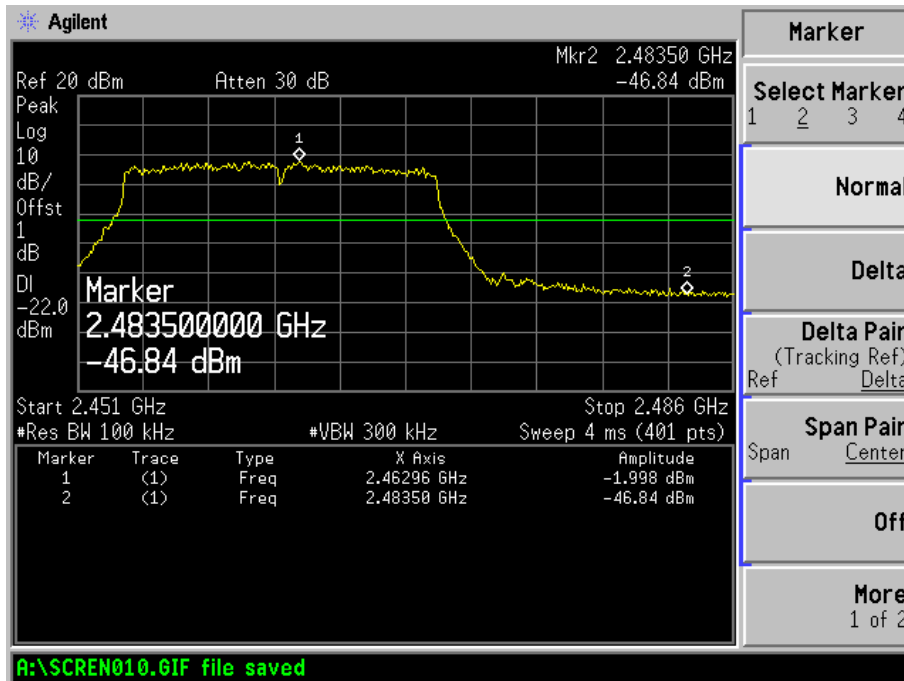
802.11b-Highest Bandedge



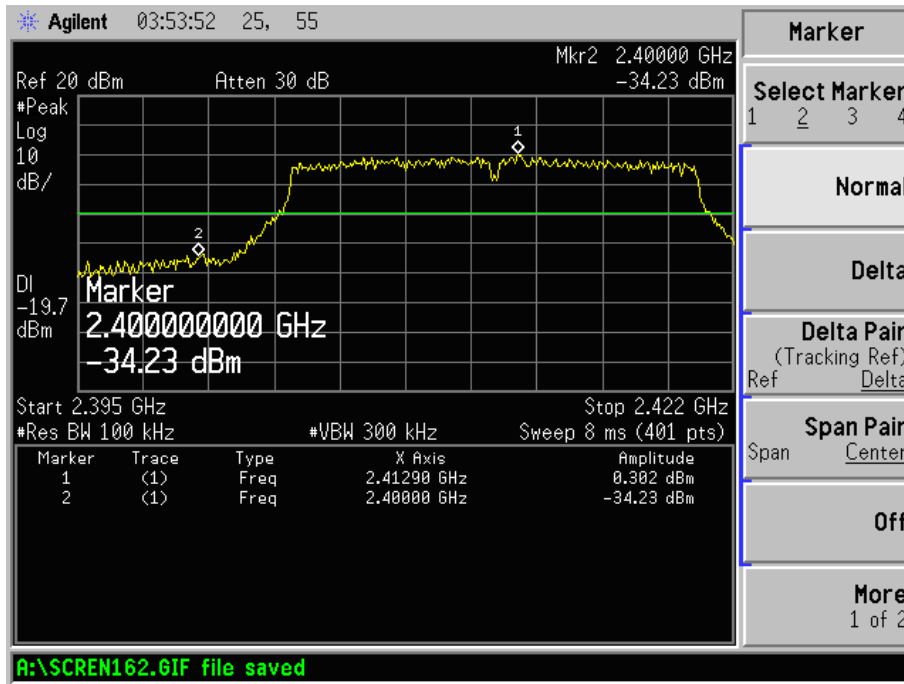
802.11g-Lowest Bandedge



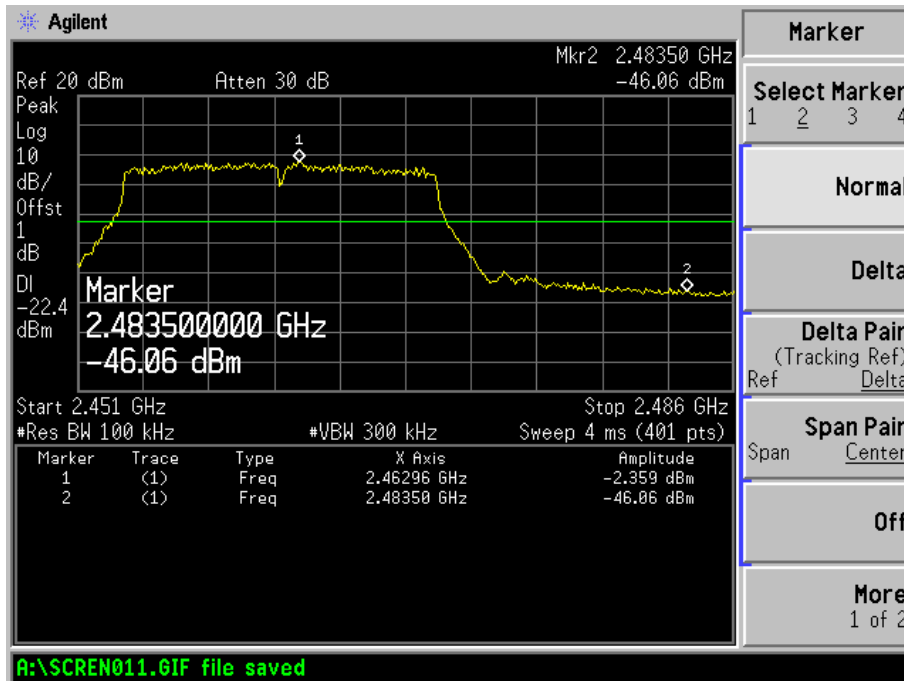
802.11g-Highest Bandedge



802.11n-HT20-Lowest Bandedge

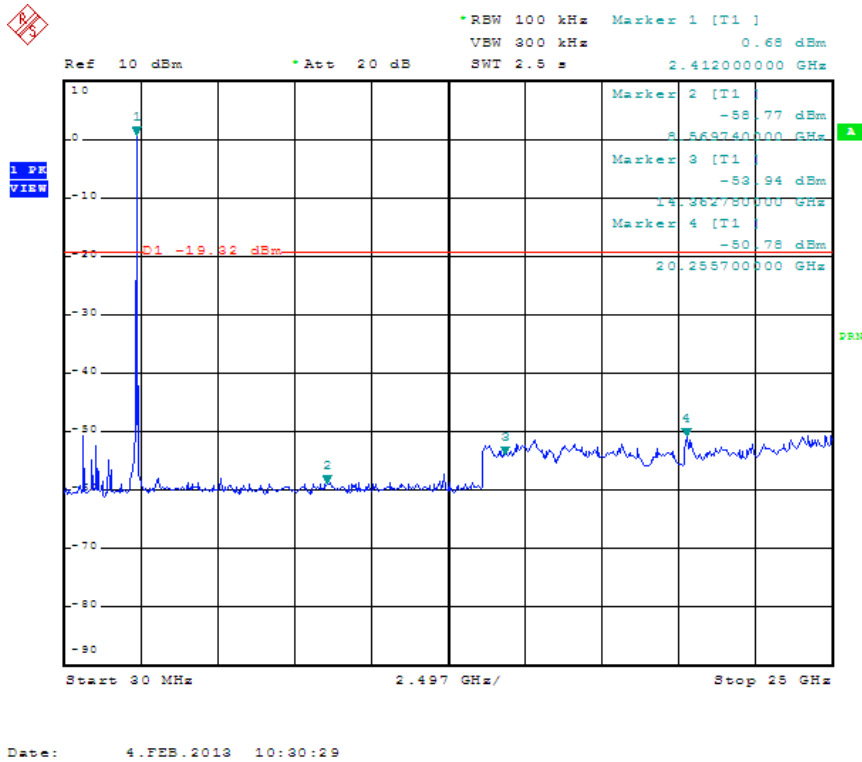


802.11n-HT20-Highest Bandedge

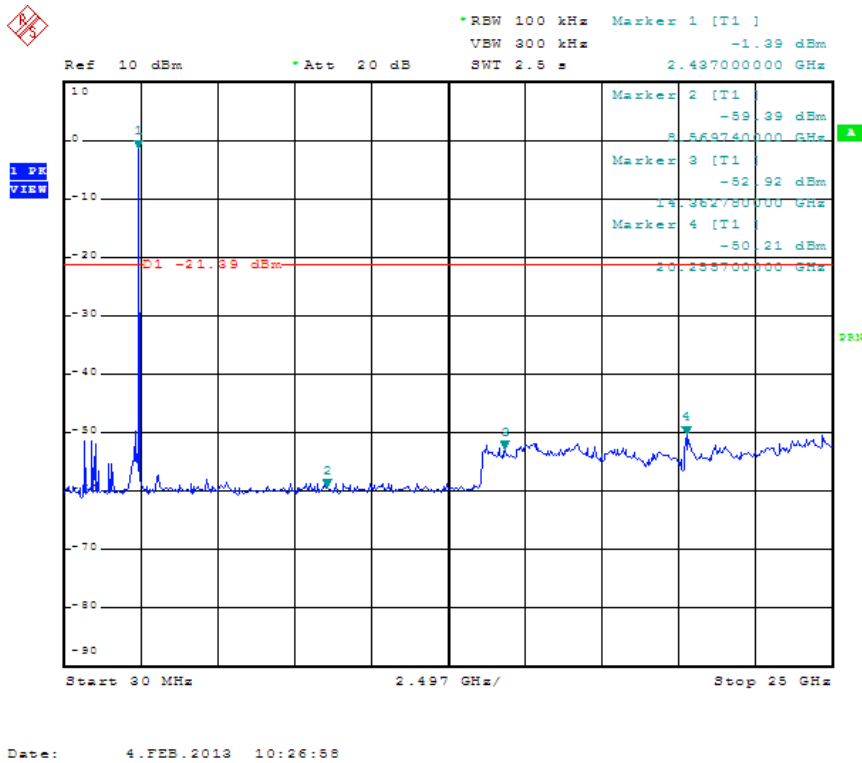


Conducted Spurious Emissions

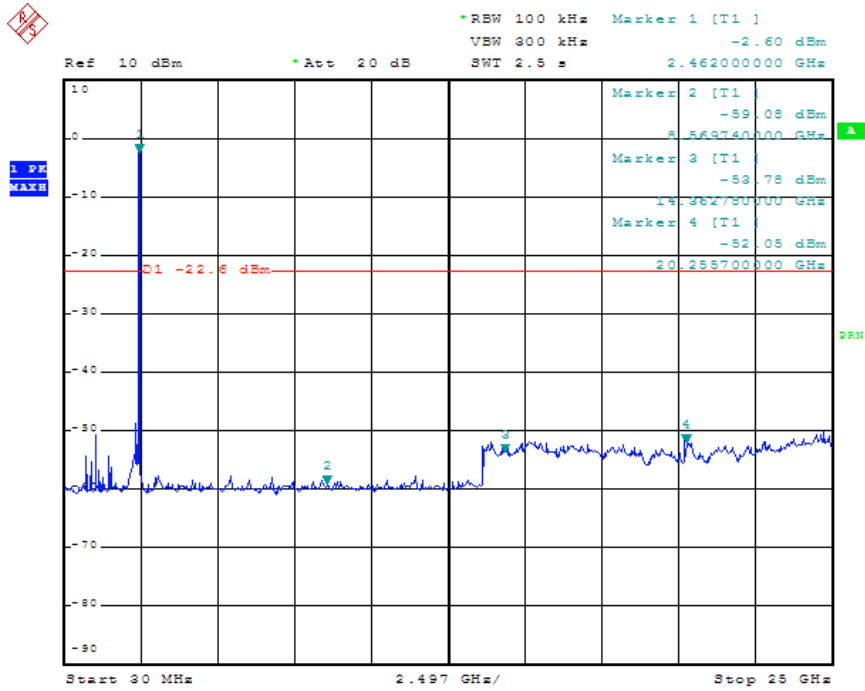
802.11b Low Bandedge



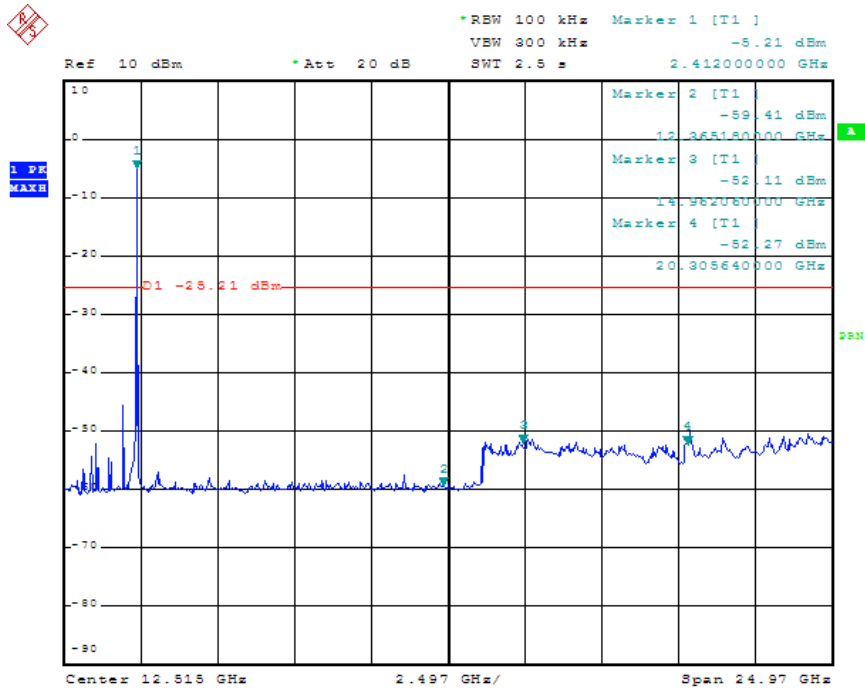
802.11b Middle Bandedge



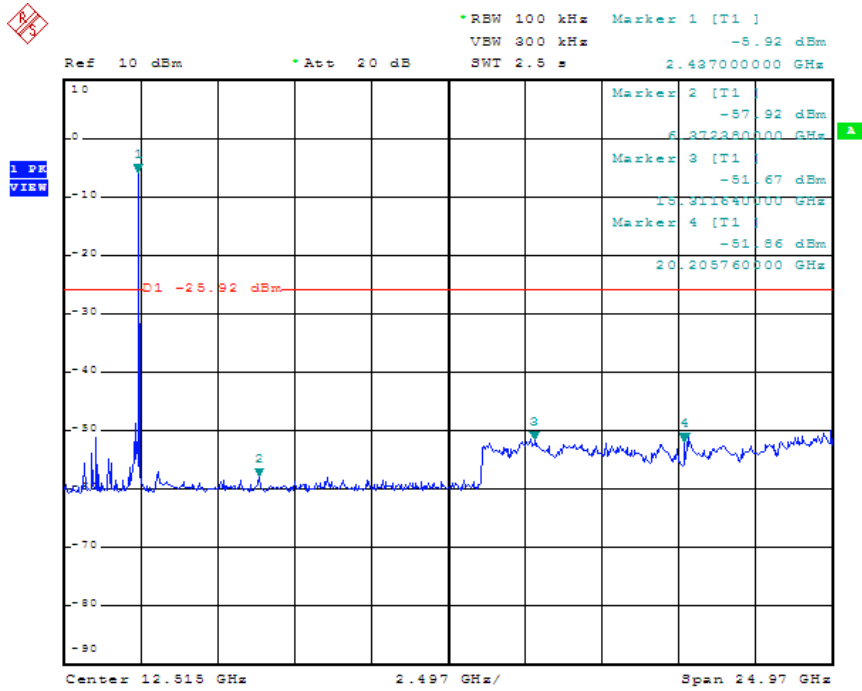
802.11b High Bandedge



802.11g Low Bandedge

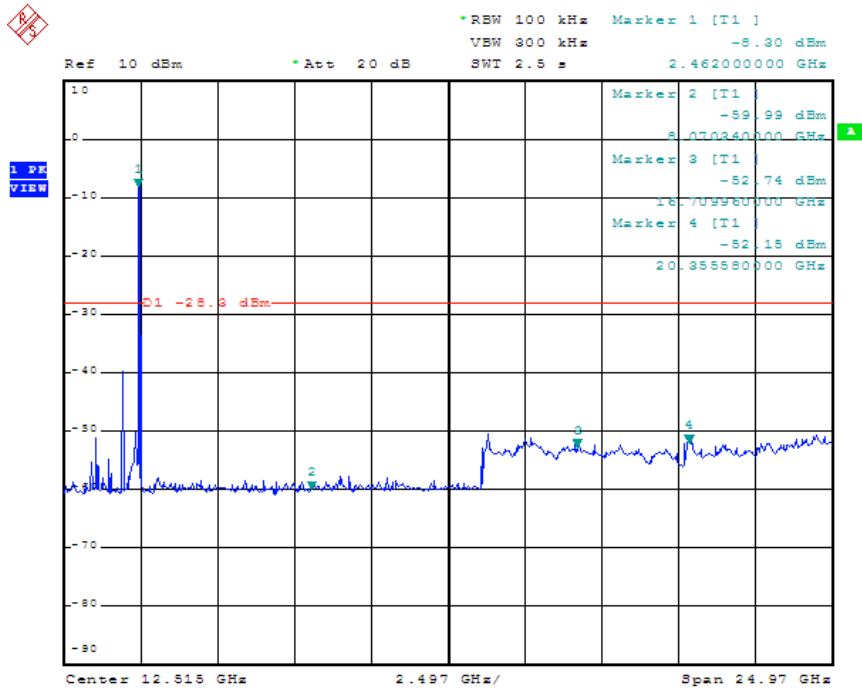


802.11g Middle Bandedge



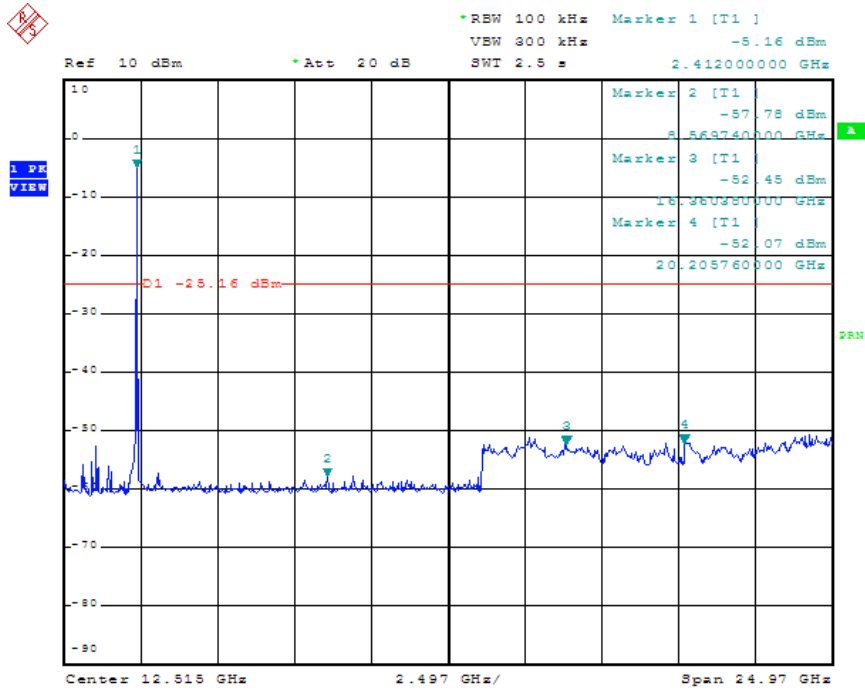
Date: 4.FEB.2013 10:52:11

802.11g High Bandedge

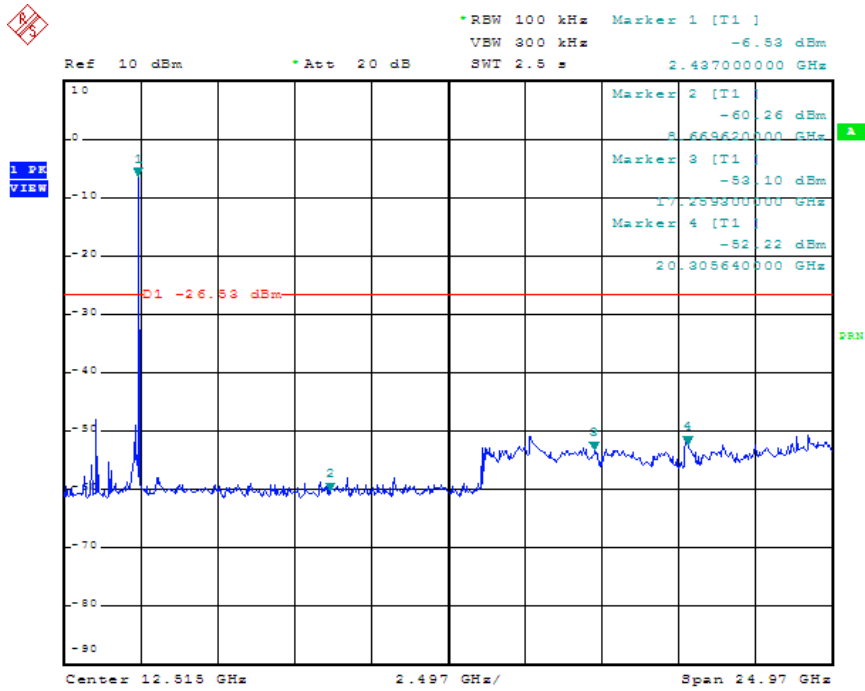


Date: 4.FEB.2013 10:58:11

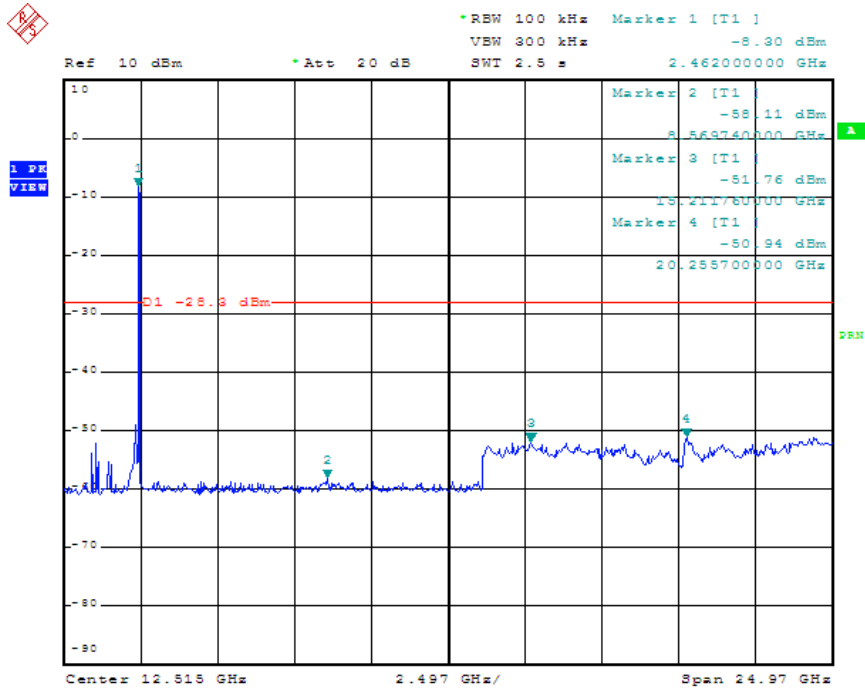
802.11n-HT20 Low Bandedge



802.11n-HT20 Middle Bandedge



802.11n-HT20 High Bandedge



Date: 4.FEB.2013 11:01:09

9. Conducted Emissions

9.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

9.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2012-03-28	2013-03-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2012-03-28	2013-03-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2012-03-28	2013-03-27

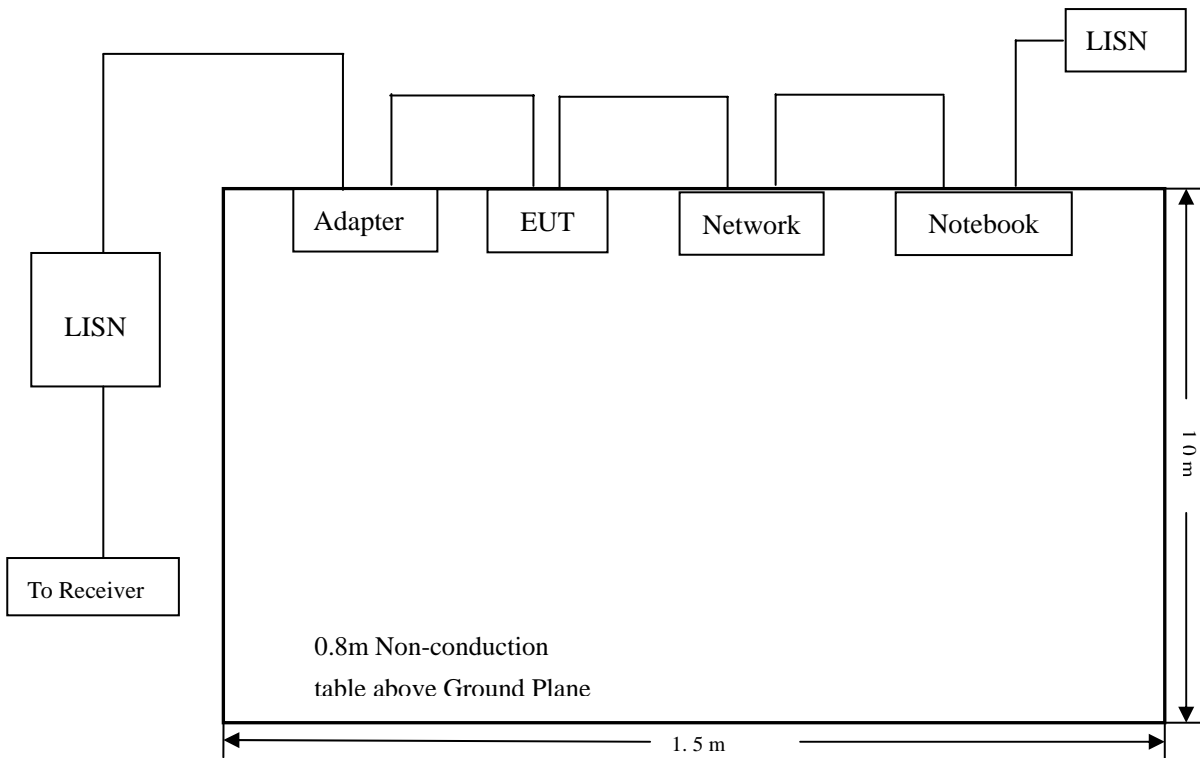
9.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

9.4 Basic Test Setup Block Diagram



9.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

9.6 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
 Stop Frequency..... 30 MHz
 Sweep Speed Auto
 IF Bandwidth..... 10 kHz
 Quasi-Peak Adapter Bandwidth 9 kHz
 Quasi-Peak Adapter Mode Normal

9.7 Summary of Test Results/Plots

According to the data in section 3.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

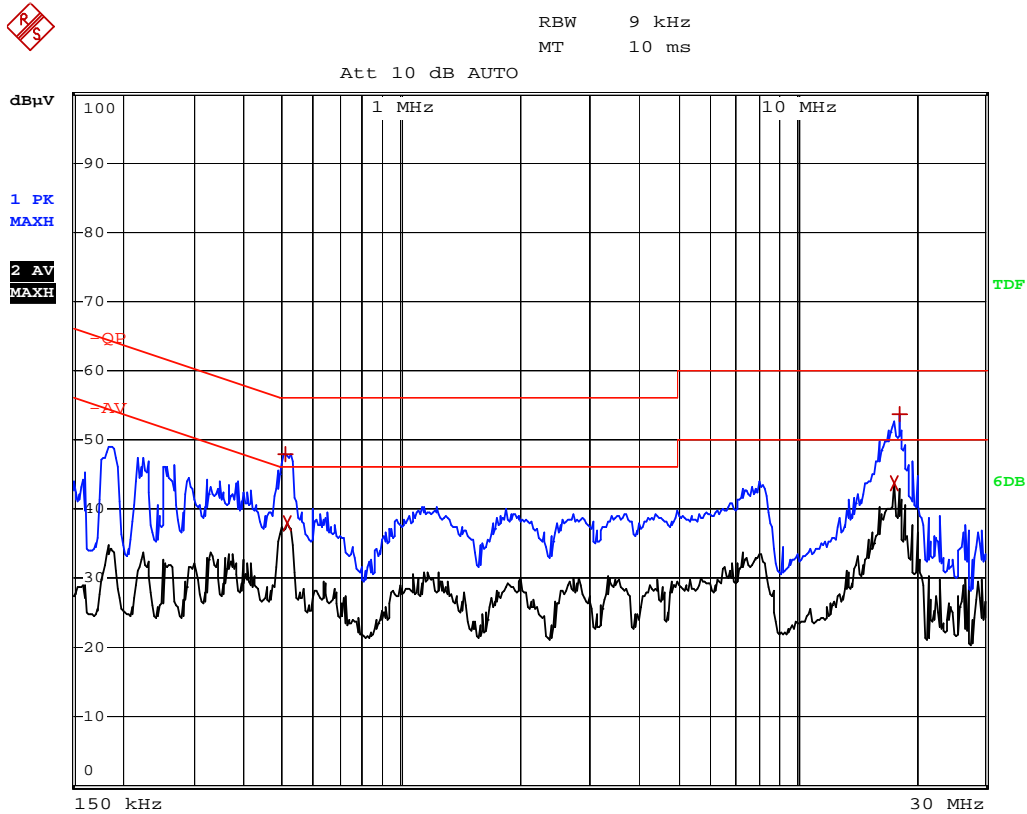
-5.77 dBµV at 17.694 MHz in the Line mode, Quasi Peak detector, 0.15-30MHz

9.8 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

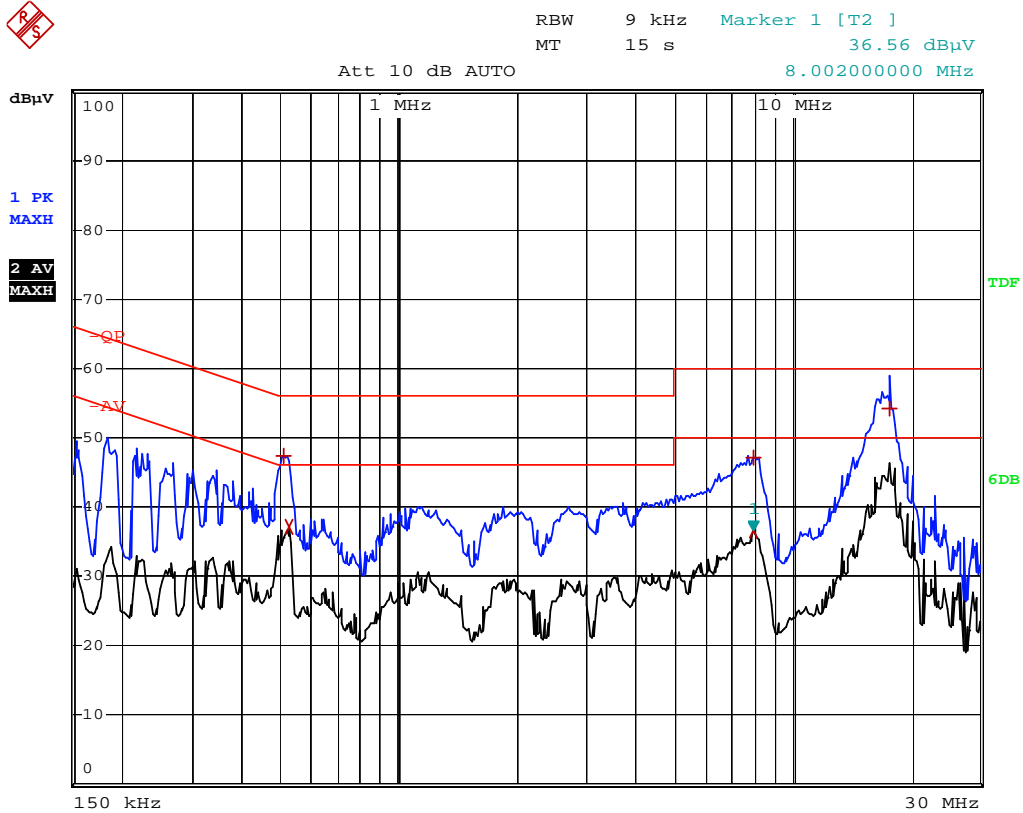
EUT: *Y-cam Cube*
 Tested Model: *Cube HD 720*
 Operating Condiation: *Transmitting*
 Comment: *AC 120V/60Hz, 12V DC*

Test Specification: *Neutral*



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	510 kHz	47.99	-8.00
2 Average	514 kHz	37.81	-8.18
2 Average	17.694 MHz	43.64	-6.35
1 Max Peak	18.302 MHz	53.55	-6.44

Test Specification: Line



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	510 kHz	47.33	-8.66
2 Average	526 kHz	37.04	-8.95
2 Average	8.002 MHz	36.56	-13.43
1 Max Peak	8.006 MHz	47.06	-12.93
1 Quasi Peak	17.694 MHz	54.22	-5.77

**** END OF REPORT ****