

FCC Part 15C Measurement and Test Report

For

Orantek Distribution Limited

5/F, Building E, Dakan Tech Park, Dakan Village, Xili Town, Nanshan

District, Shenzhen, China

FCC ID: WHLIP229

FCC Rules: FCC Part 15C

Product Description: Network Camera

Tested Model: IP229

Report No.: STR12088412I

Tested Date: 2012-08-31 to 2012-12-20

Issued Date: 2012-12-24

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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

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Orantek Distribution Limited
Address of applicant: 5/F, Building E, Dakan Tech Park, Dakan Village, Xili Town, Nanshan District, Shenzhen, China
Manufacturer: Orantek Distribution Limited
Address of manufacturer: 5/F, Building E, Dakan Tech Park, Dakan Village, Xili Town, Nanshan District, Shenzhen, China

General Description of EUT	
Product Name:	Network Camera
Trade Name:	/
Model No.:	IP229
Adding Model(s):	IP227, IP226, MD229, HD229, MD227, HD227, MD226, HD226
Rated Voltage:	DC 12V
Power Adapter Model:	FKS308HSC-1201000N (Input: AC 100-240V, Output: DC 12V)
<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 IP229 without circuit and electronic construction changed, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11b/g/n
Frequency Range:	2412-2462MHz
RF Output Power:	8.41dBm (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:	2.0dBi
Lowest Internal Frequency of EUT:	32.768KHz
Device Category:	Fixed Device

1.2 Test Standards

The following report is prepared on behalf of the Orantek Distribution Limited 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
Power Cable	3.0	Unshielded	With Core
Network Cable	5.0	Unshielded	Without Core

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	SAMSUNG	NP-R20	124V93FP300082V

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

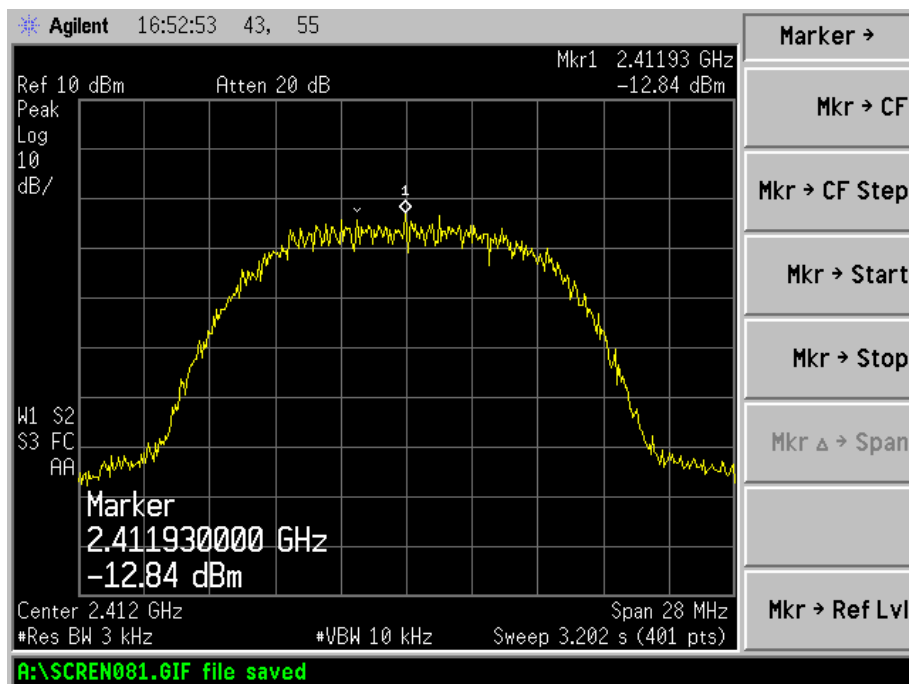
Temperature:	20° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

4.5 Summary of Test Results/Plots

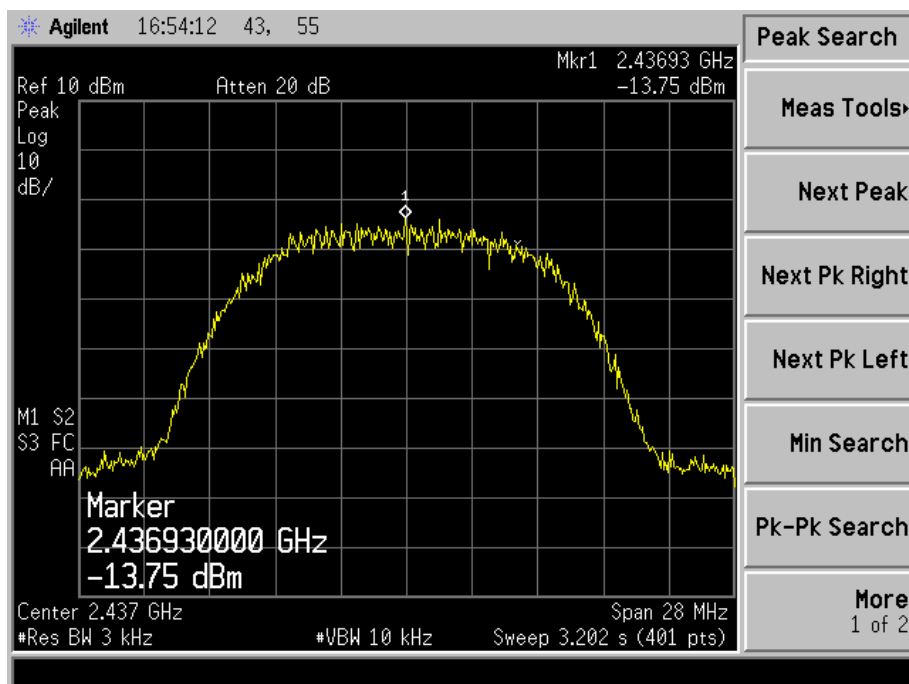
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-12.84	8
	2437	-13.75	8
	2462	-14.34	8
802.11g	2412	-16.16	8
	2437	-17.49	8
	2462	-17.38	8
802.11n HT20	2412	-15.29	8
	2437	-18.37	8
	2462	-17.02	8

Please refer to the following test plots:

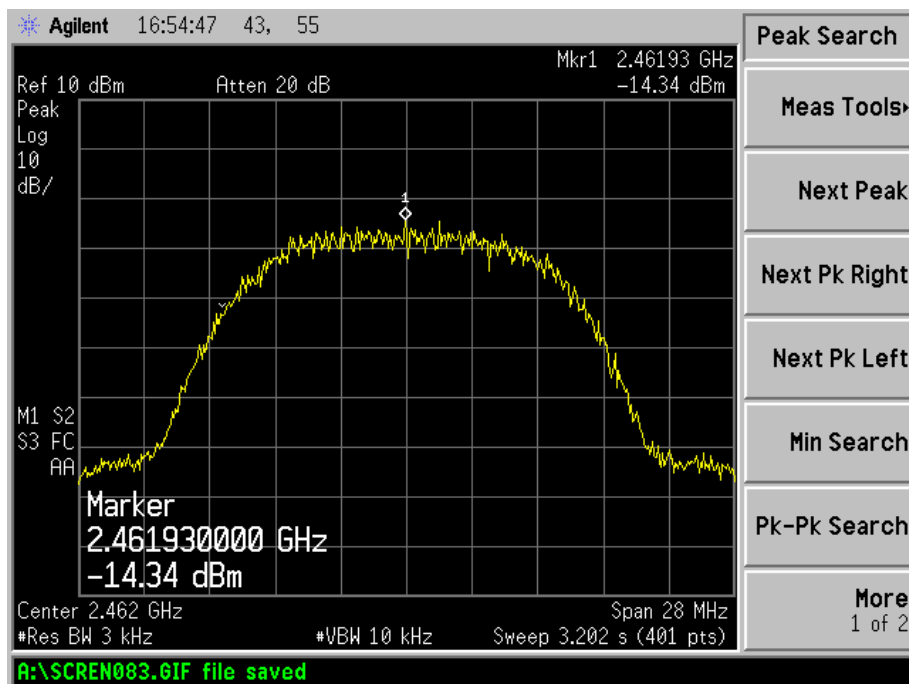
802.11b-Low Channel



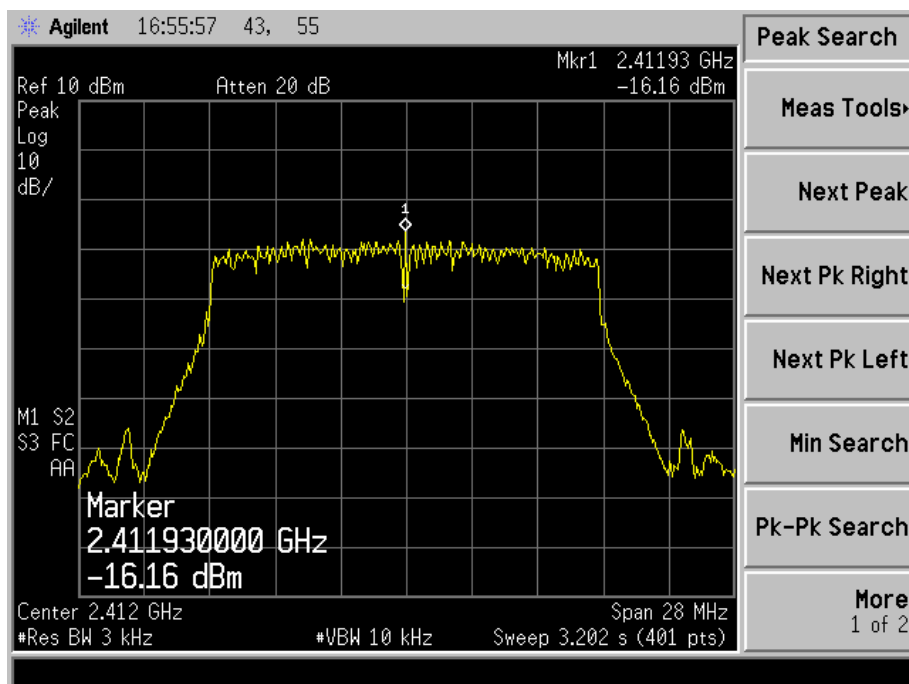
802.11b-Middle Channel



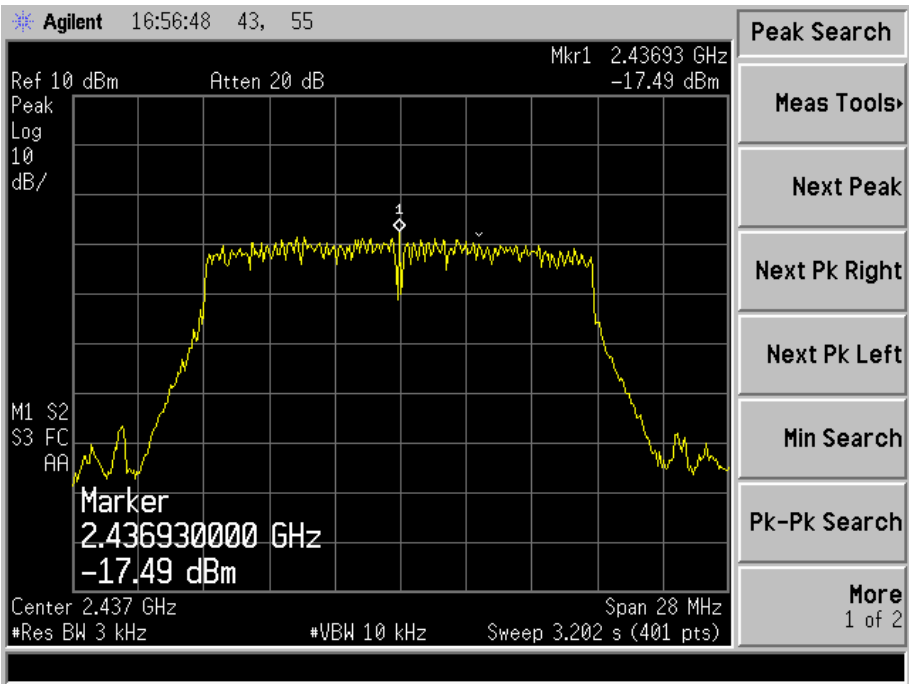
802.11b-High Channel



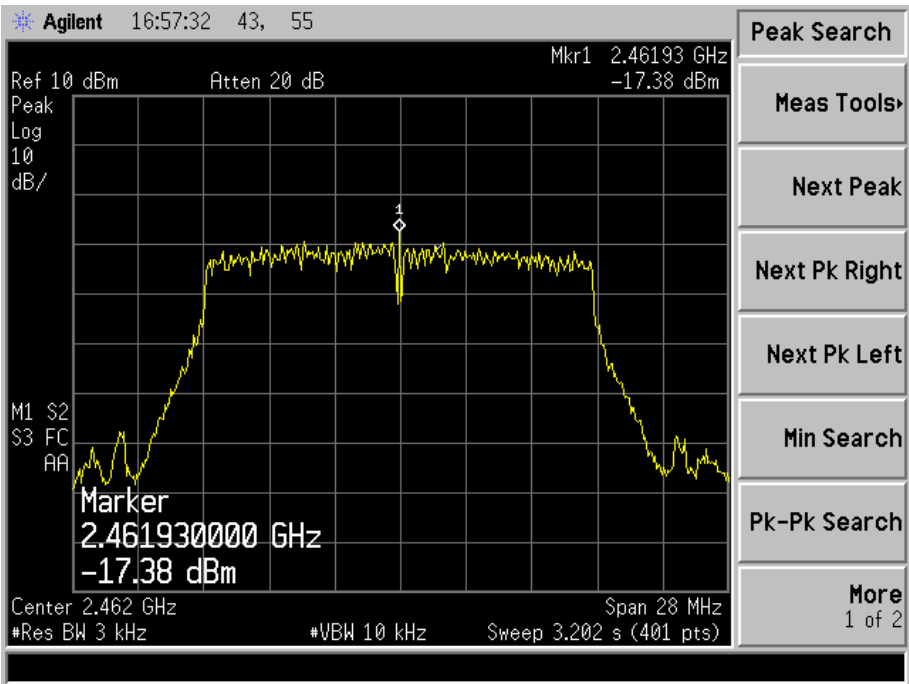
802.11g-Low Channel



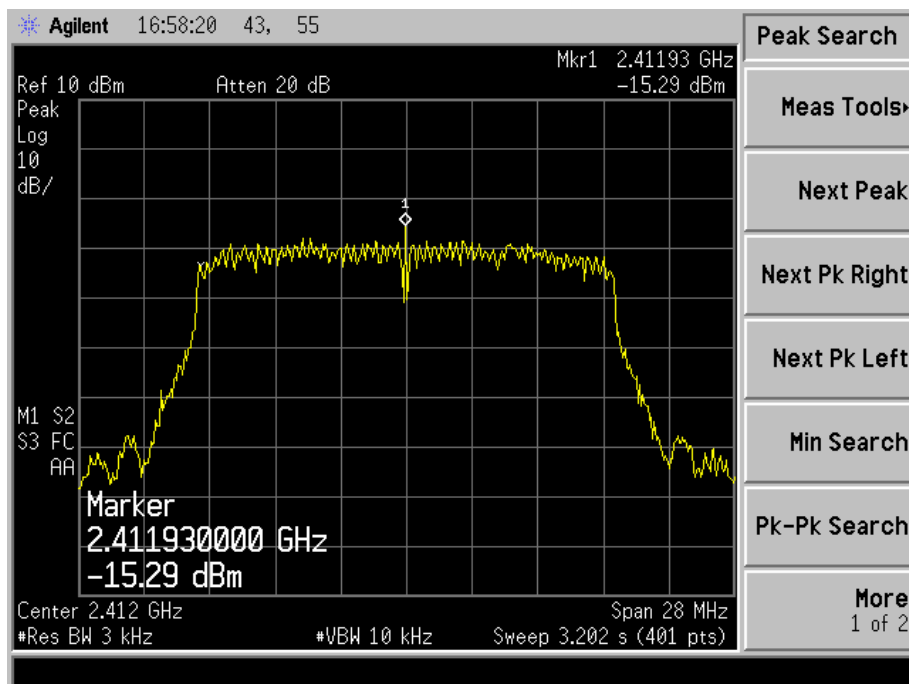
802.11g-Middle Channel



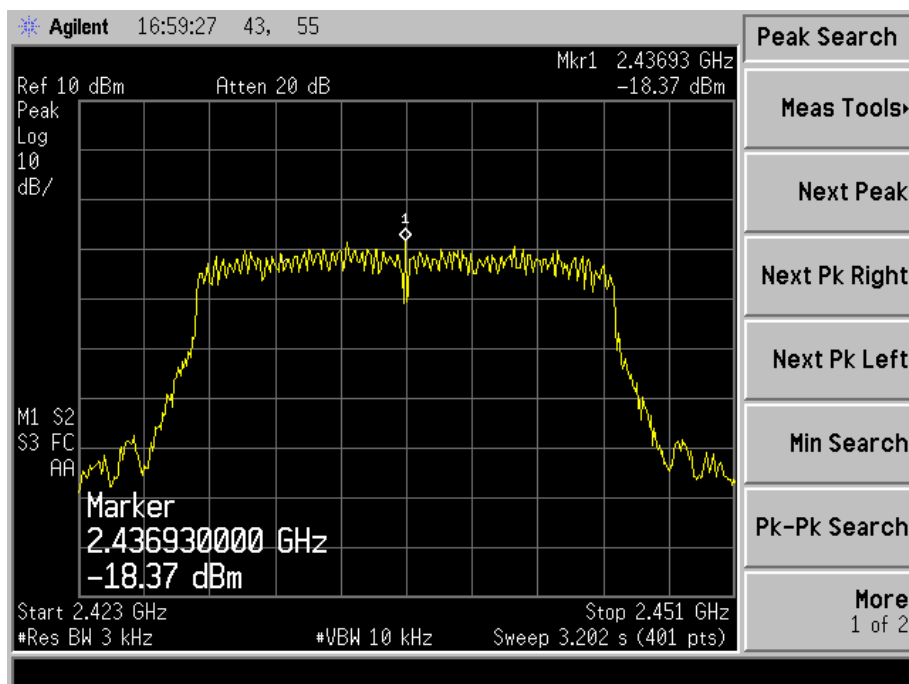
802.11g-High Channel



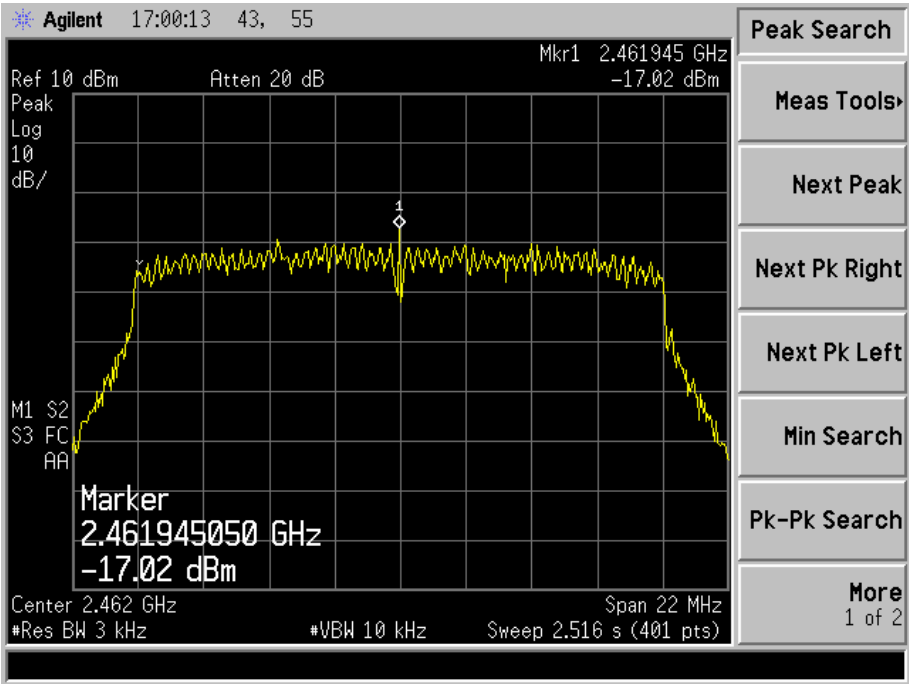
802.11n-HT20-Low Channel



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

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

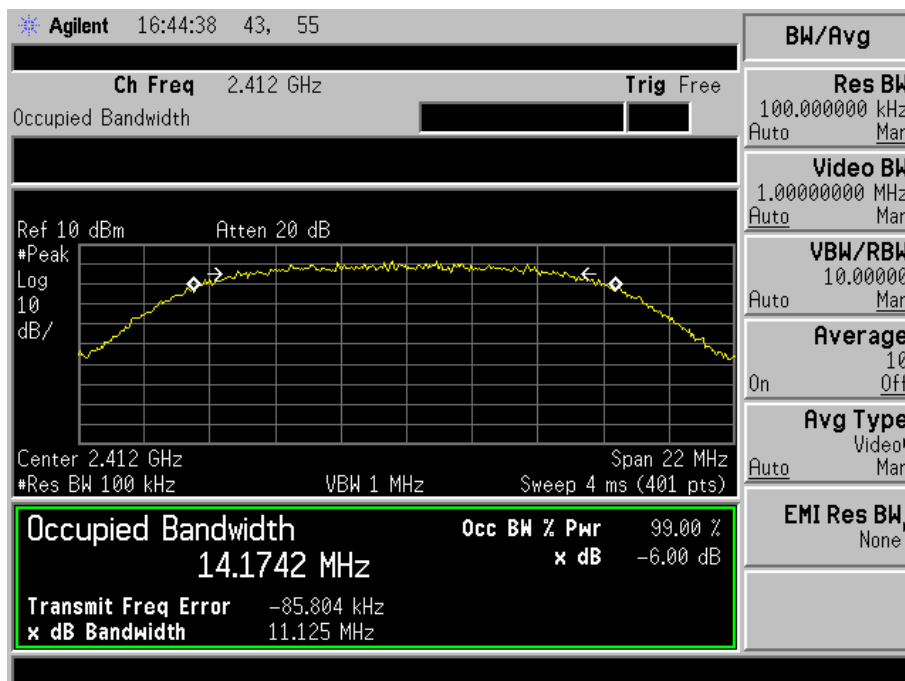
Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

5.5 Summary of Test Results/Plots

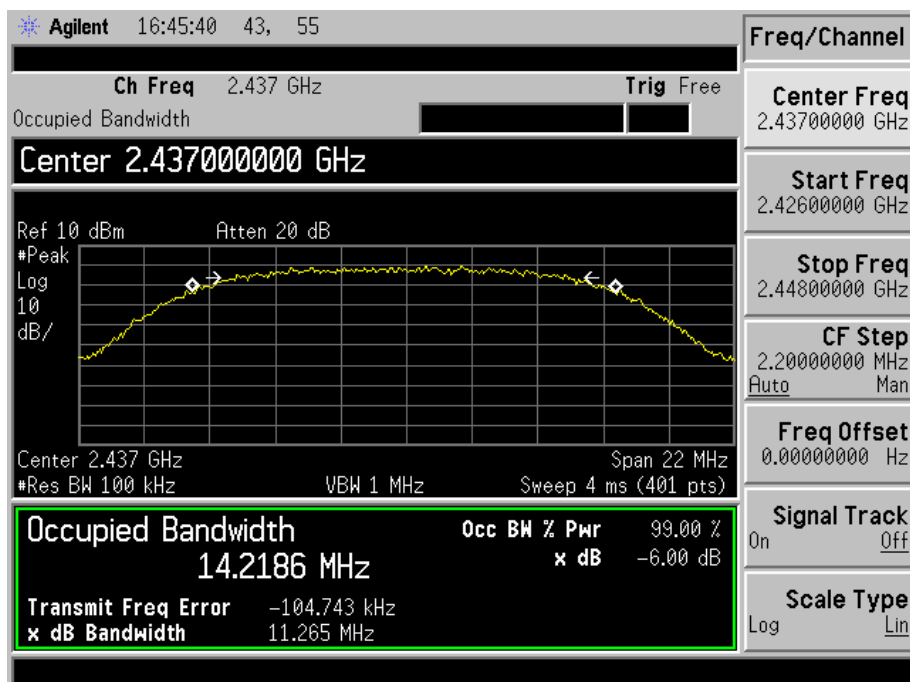
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	Limit kHz
802.11b	2412	11125	500
	2437	11265	500
	2462	11229	500
802.11g	2422	16490	500
	2437	16464	500
	2452	16481	500
802.11n-HT20	2412	17514	500
	2437	17304	500
	2462	17588	500

Please refer to the following test plots:

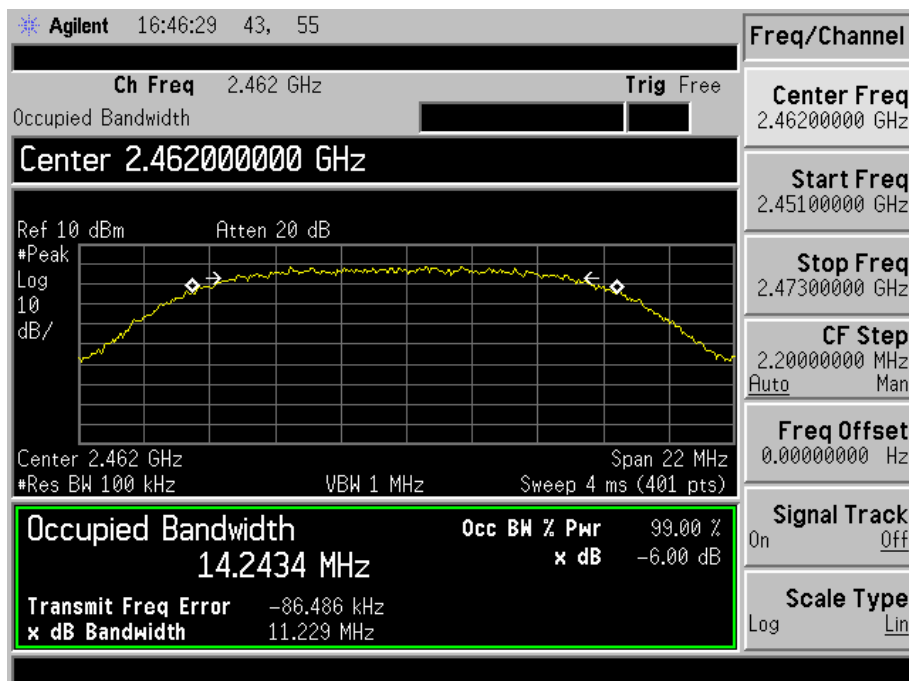
802.11b-Low Channel



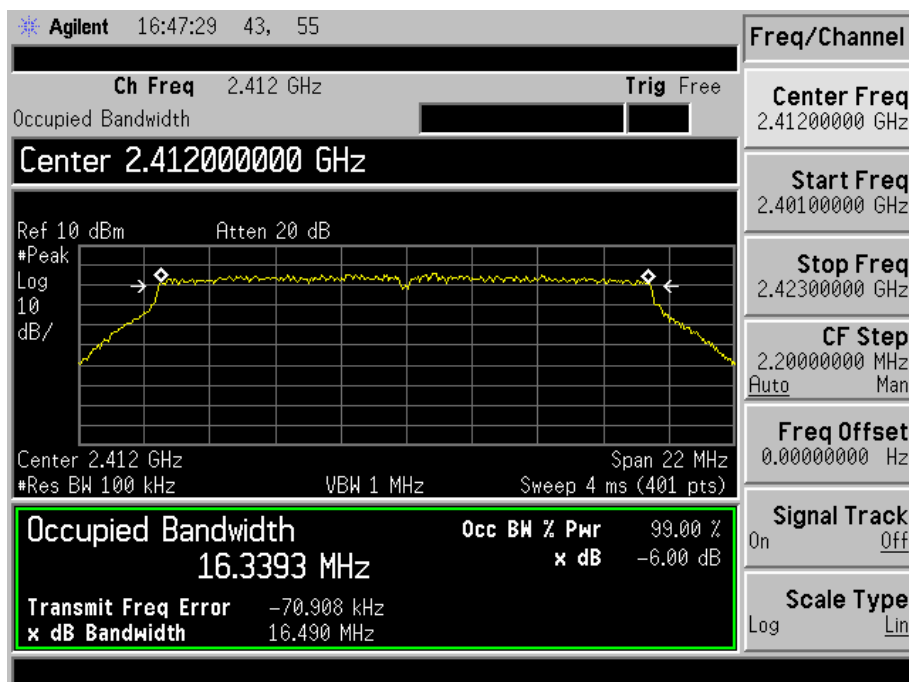
802.11b-Middle Channel



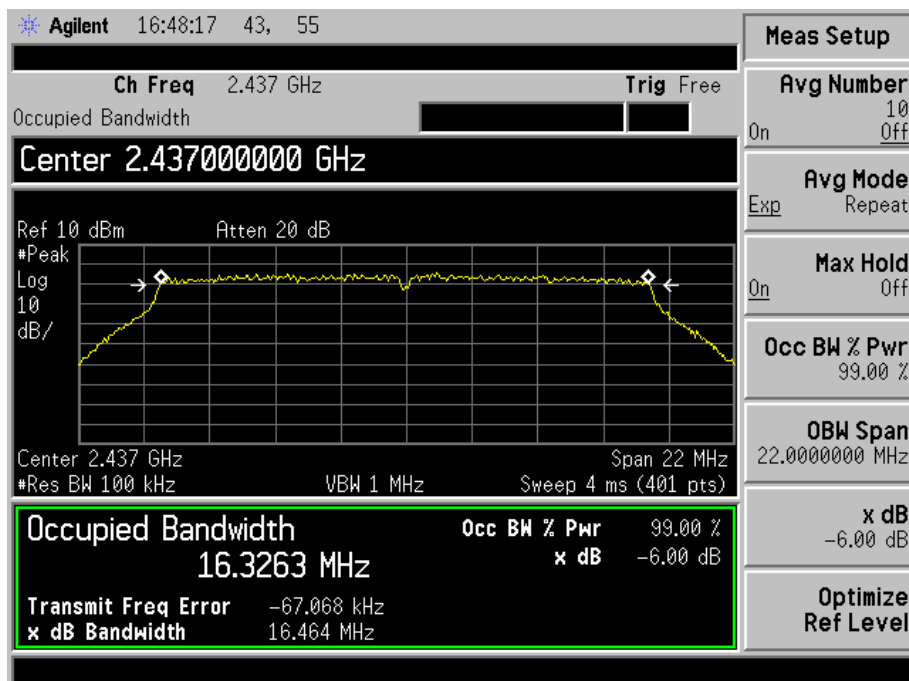
802.11b-High Channel



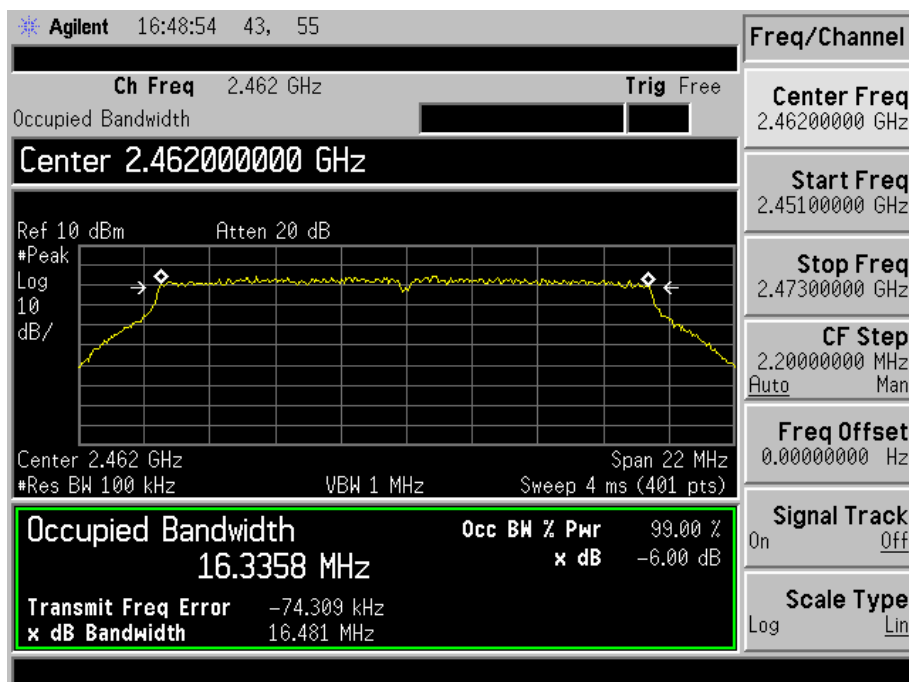
802.11g-Low Channel



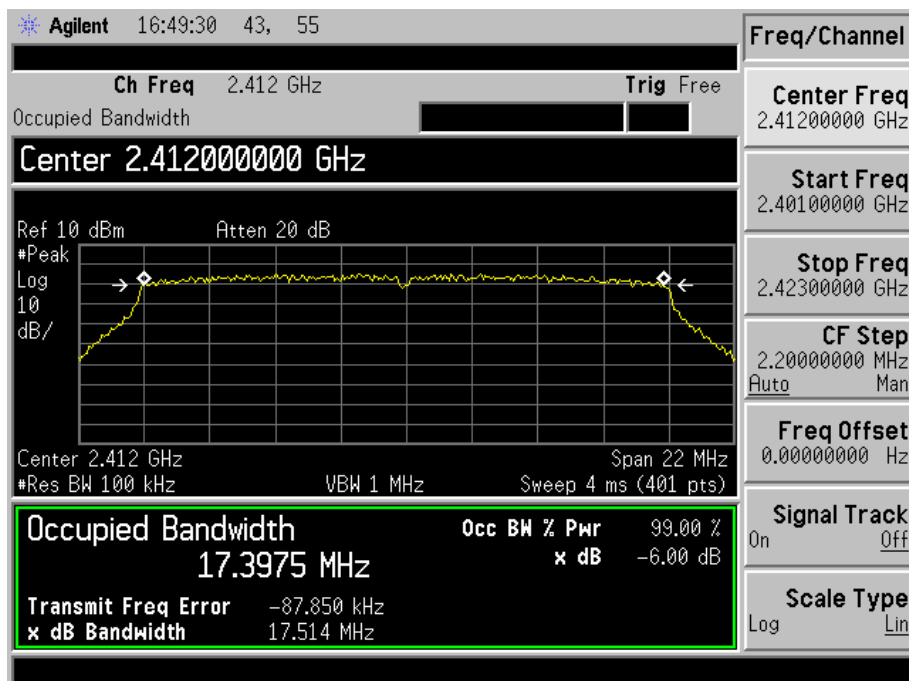
802.11g-Middle Channel



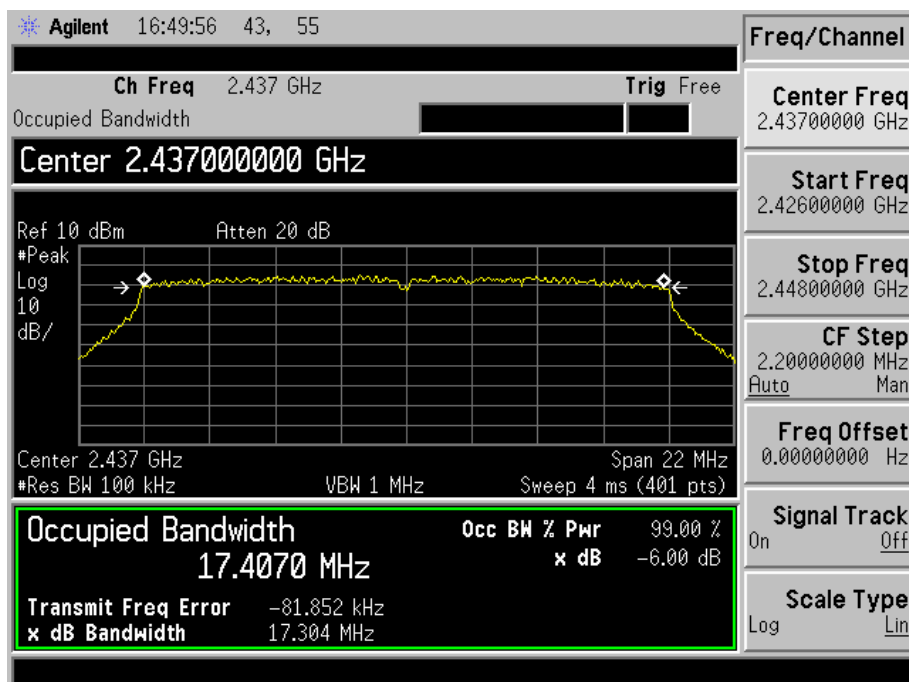
802.11g-High Channel



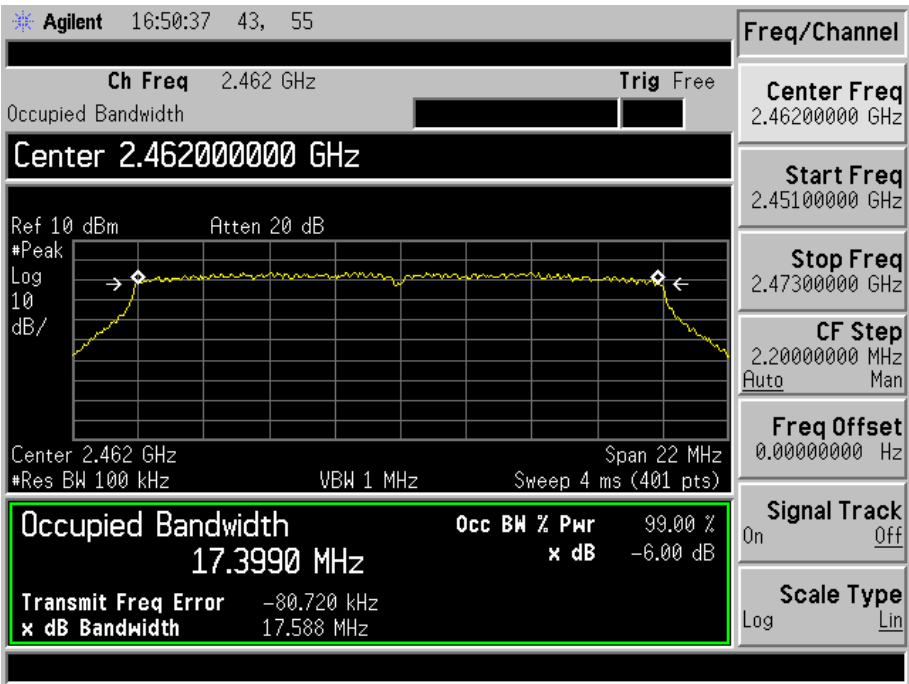
802.11n-HT20-Low Channel



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. Set the analyzer span to a minimum of 1.5 times the EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW \geq 3 MHz.
4. Ensure that the number of measurement points in the sweep \geq 2 x span/RBW.
5. Sweep time = auto couple.
6. Detector = power averaging (RMS) or sample detector when RMS not available.
7. Employ trace averaging in power averaging (RMS) mode over a minimum of 100 traces.
8. Use the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.

6.4 Environmental Conditions

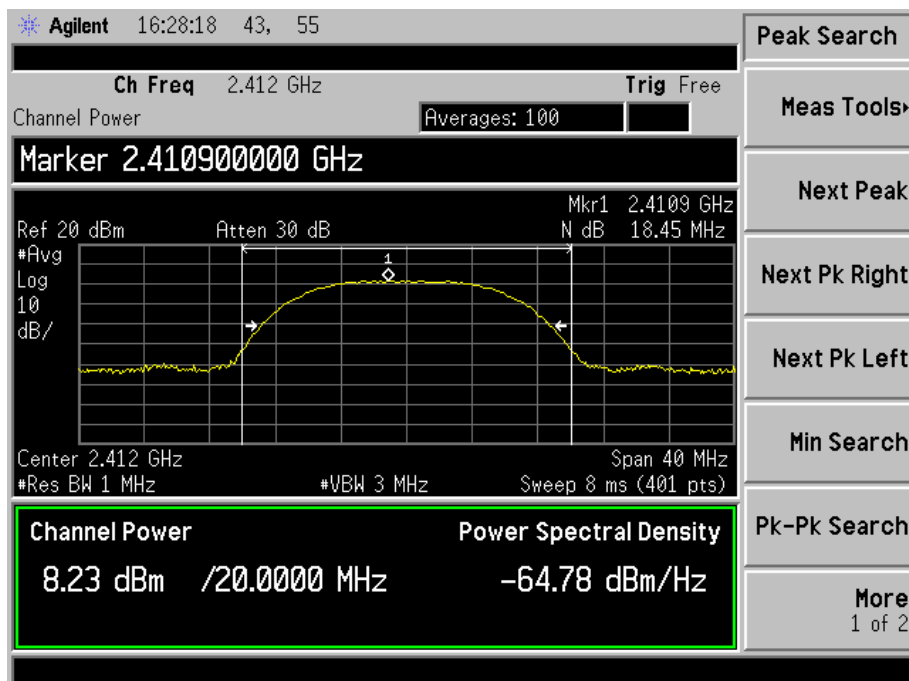
Temperature:	21° C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

6.5 Summary of Test Results/Plots

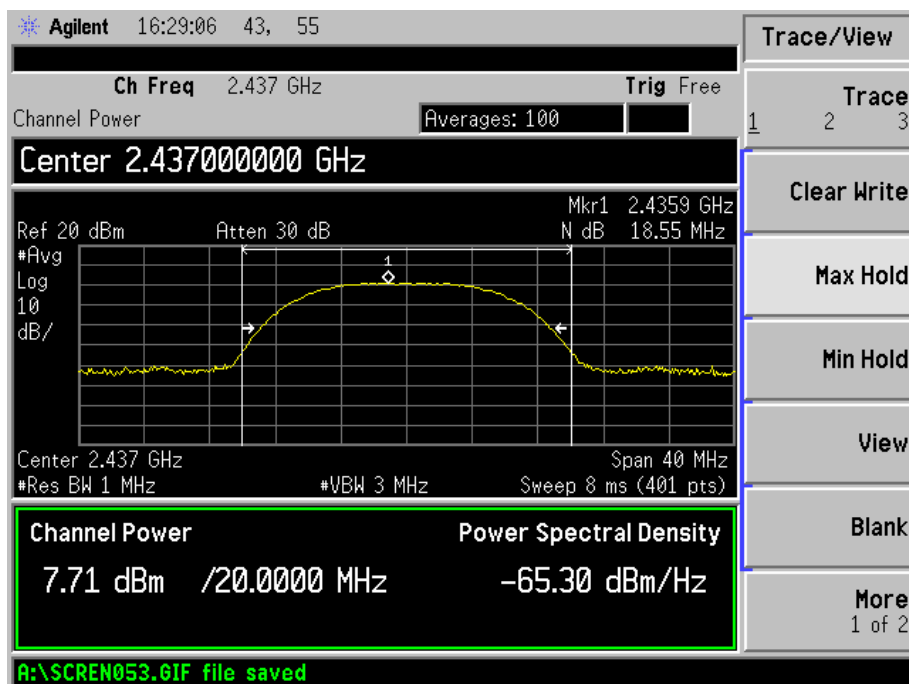
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _1Mbps	2412	8.23	6.6527	1000
	2437	7.71	5.9020	1000
	2462	7.50	5.6234	1000
802.11b _11Mbps	2412	8.41	6.9343	1000
	2437	7.85	6.0954	1000
	2462	7.69	5.8749	1000
802.11g_6Mbps	2412	6.62	4.5920	1000
	2437	5.70	3.7154	1000
	2462	5.55	3.5892	1000
802.11g_54Mbps	2412	6.65	4.6238	1000
	2437	6.22	4.1879	1000
	2462	5.76	3.7670	1000
802.11n HT20_MCS0	2412	6.82	4.8084	1000
	2437	6.60	4.5709	1000
	2462	6.08	4.0551	1000
802.11n HT20_MCS7	2412	6.93	4.9317	1000
	2437	6.59	4.5604	1000
	2462	6.08	4.0551	1000

Please refer to the following test plots:

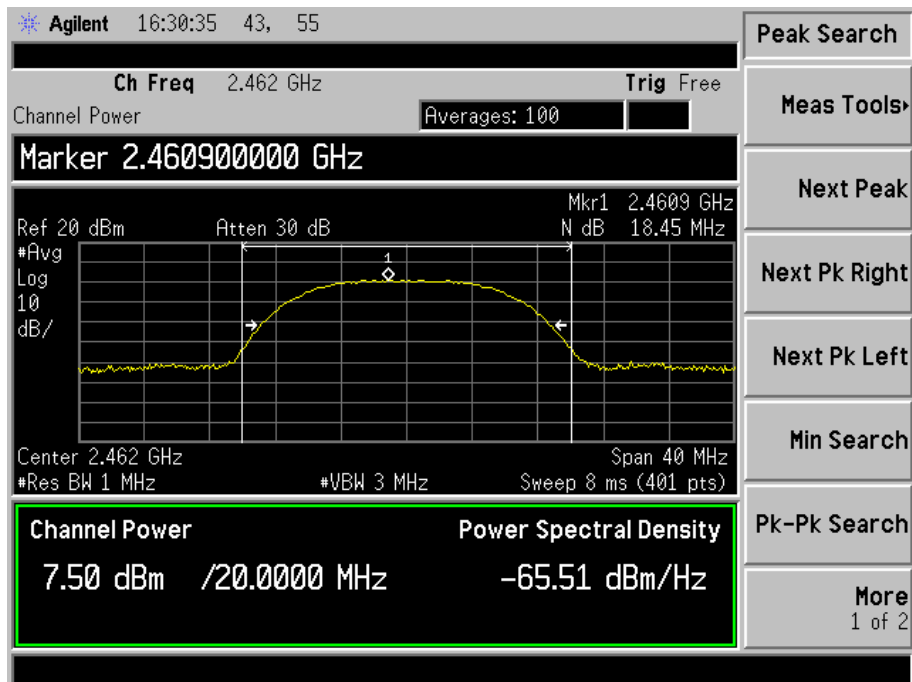
802.11b-1Mbps-Low Channel



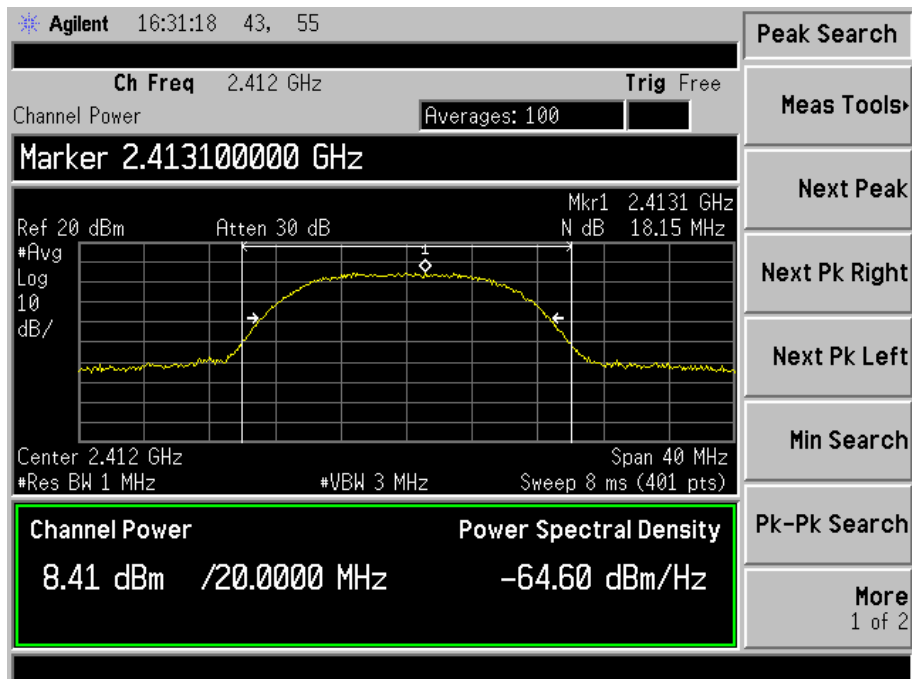
802.11b-1Mbps-Middle Channel



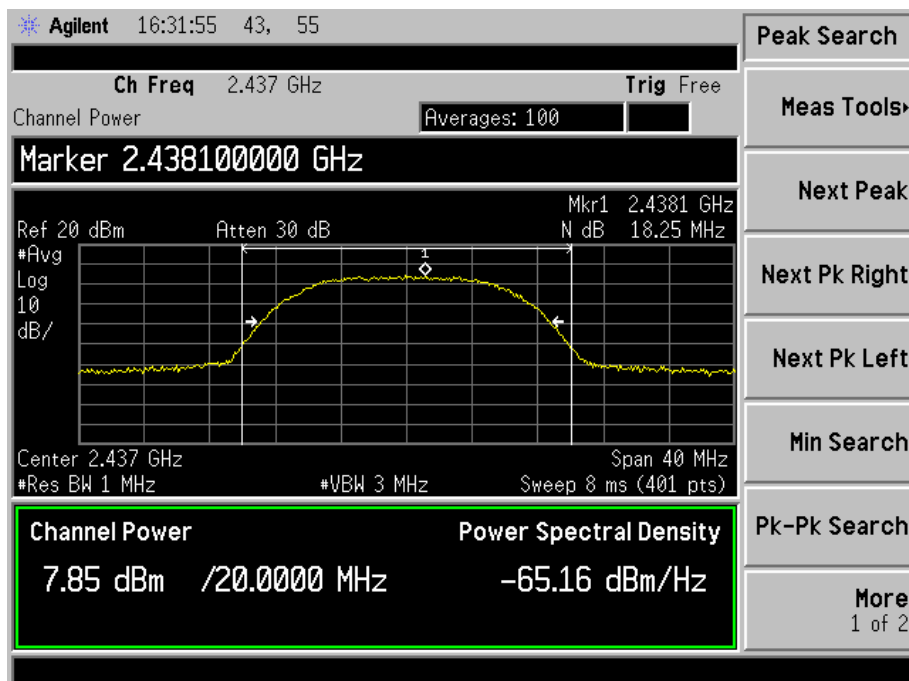
802.11b-1Mbps-High Channel



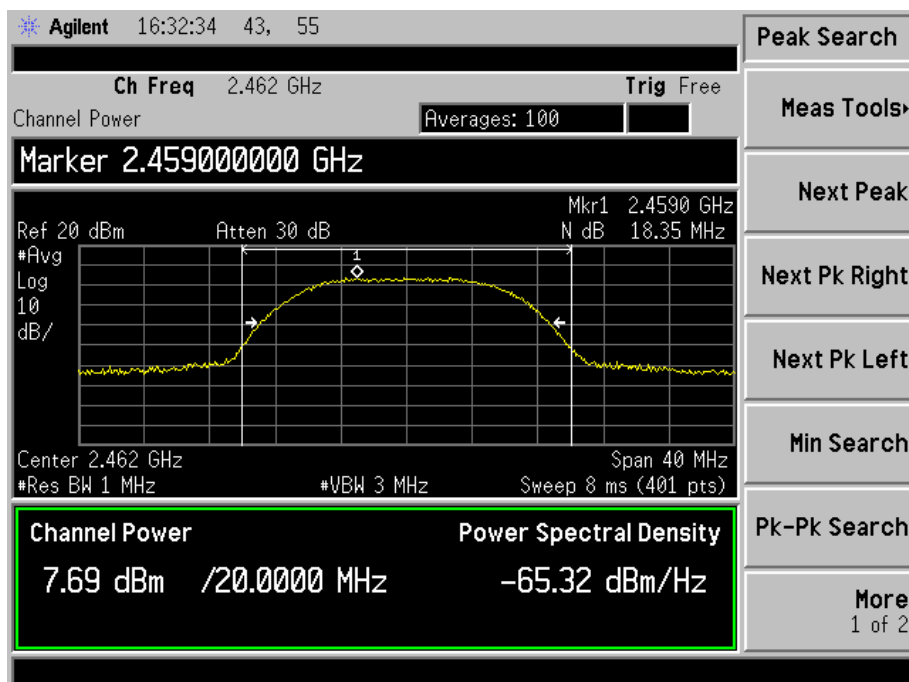
802.11b-11Mbps-Low Channel



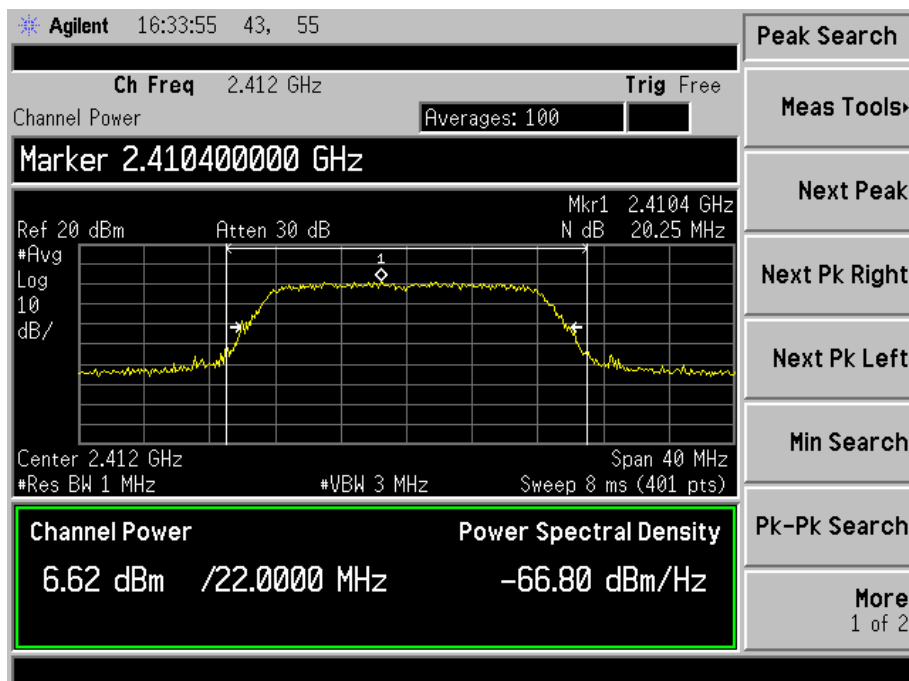
802.11b-11Mbps-Middle Channel



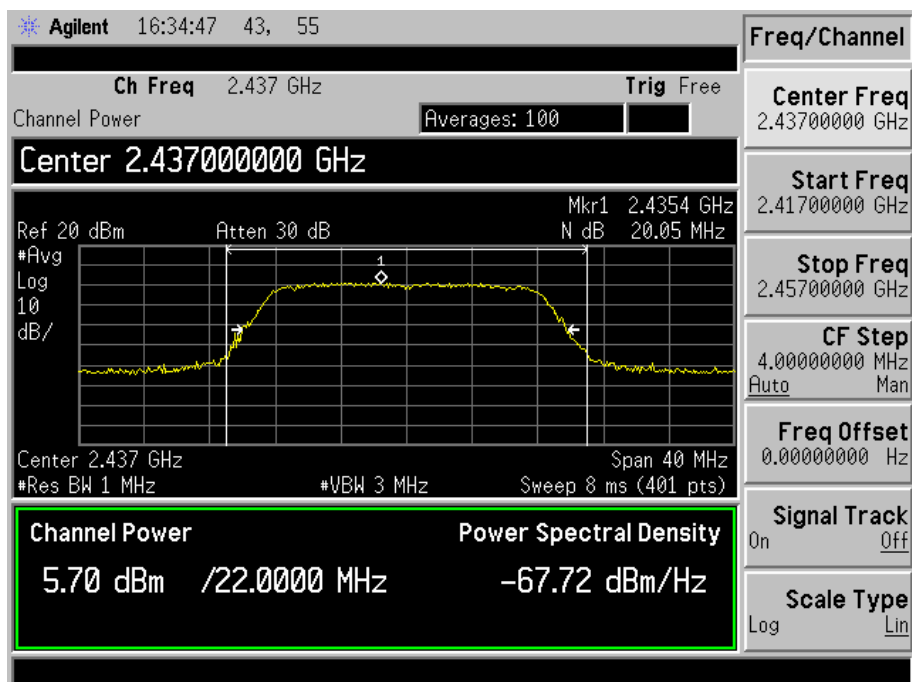
802.11b-11Mbps-High Channel



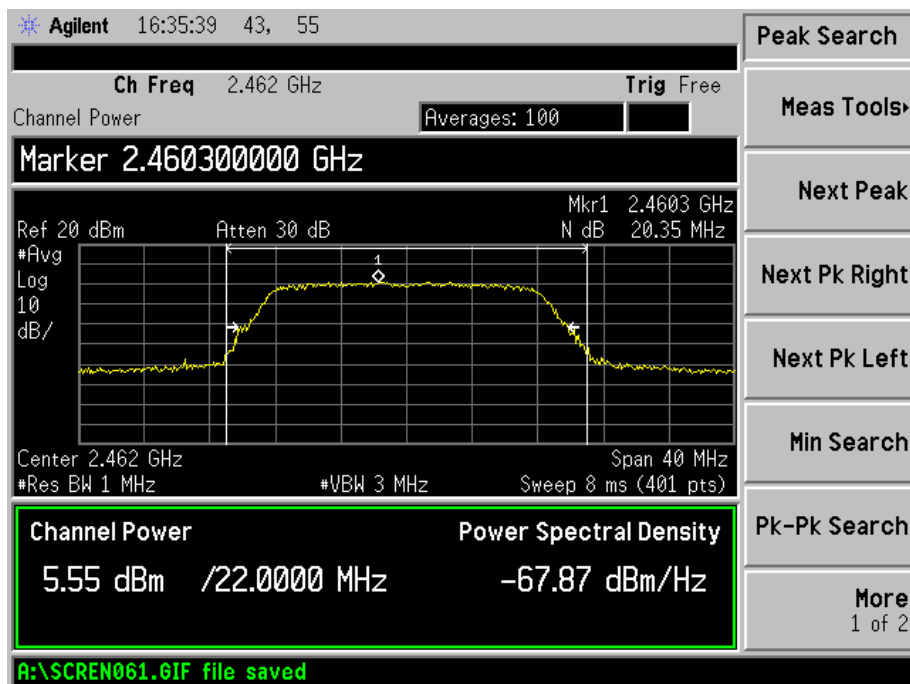
802.11g-6Mbps-Low Channel



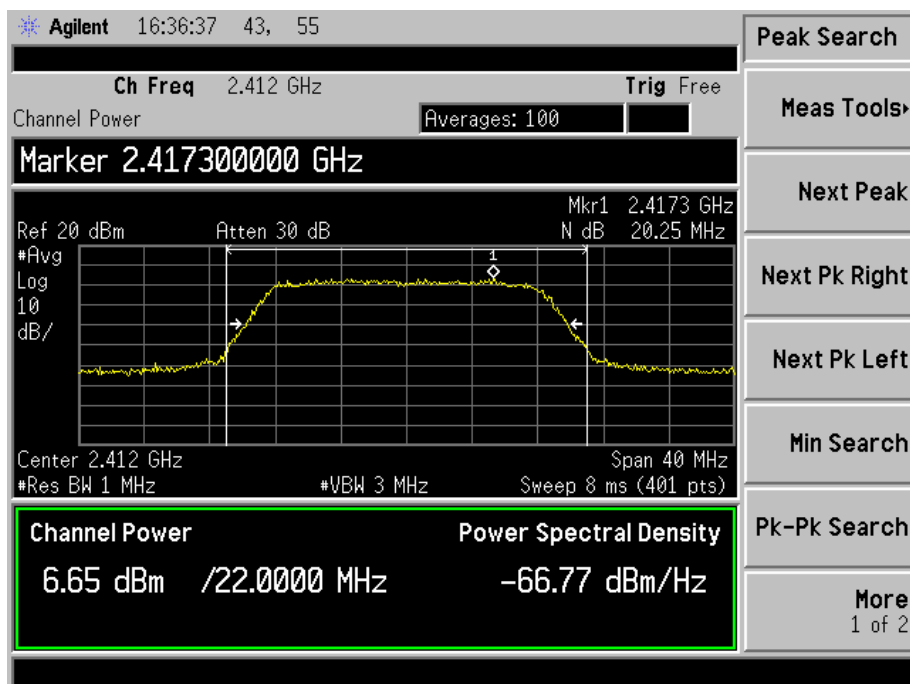
802.11g-6Mbps-Middle Channel



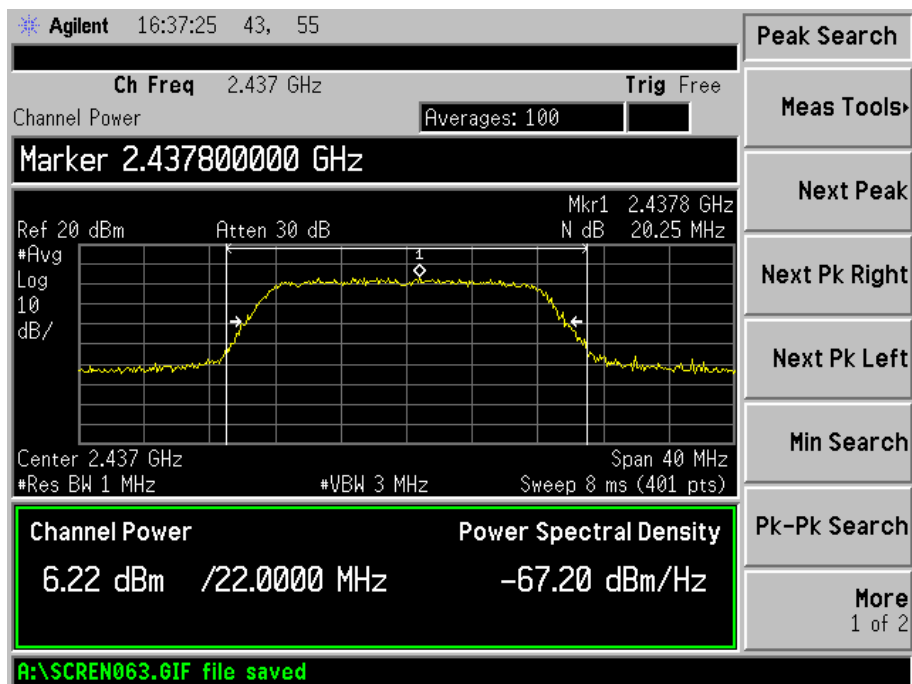
802.11g-6Mbps-High Channel



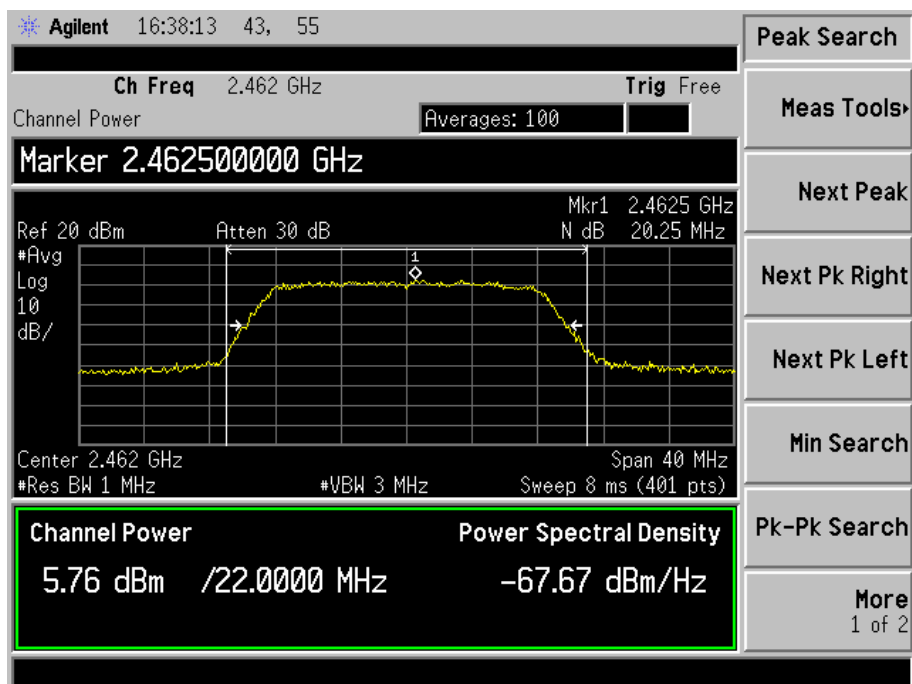
802.11g-54Mbps-Low Channel



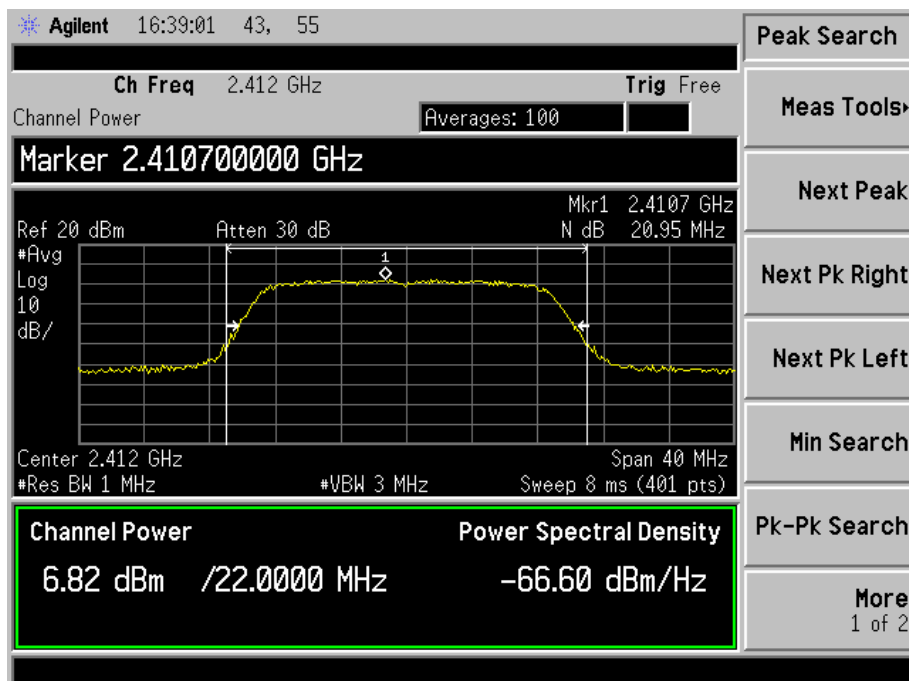
802.11g-54Mbps-Middle Channel



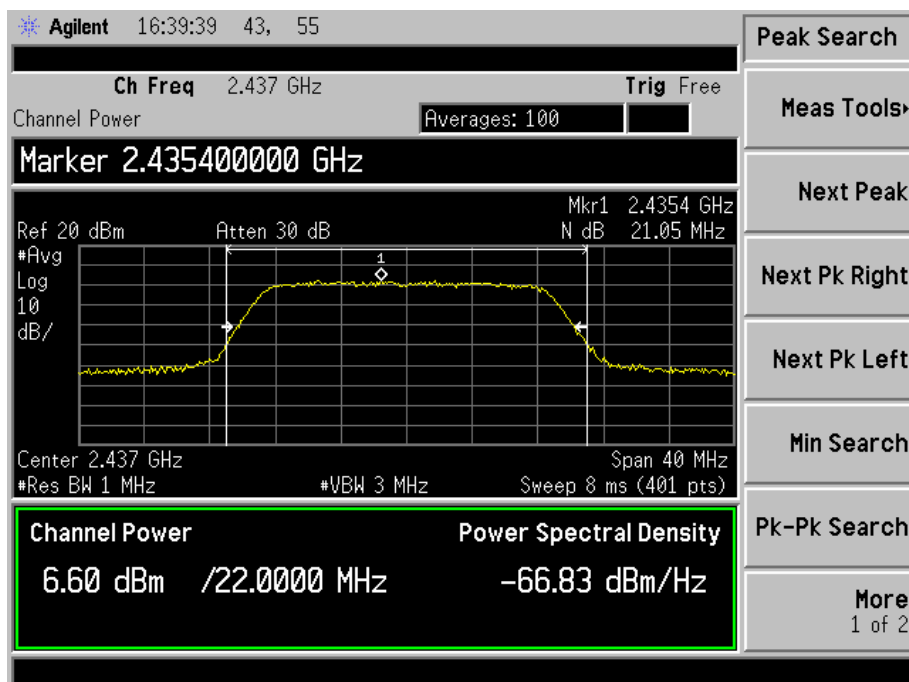
802.11g-54Mbps-High Channel



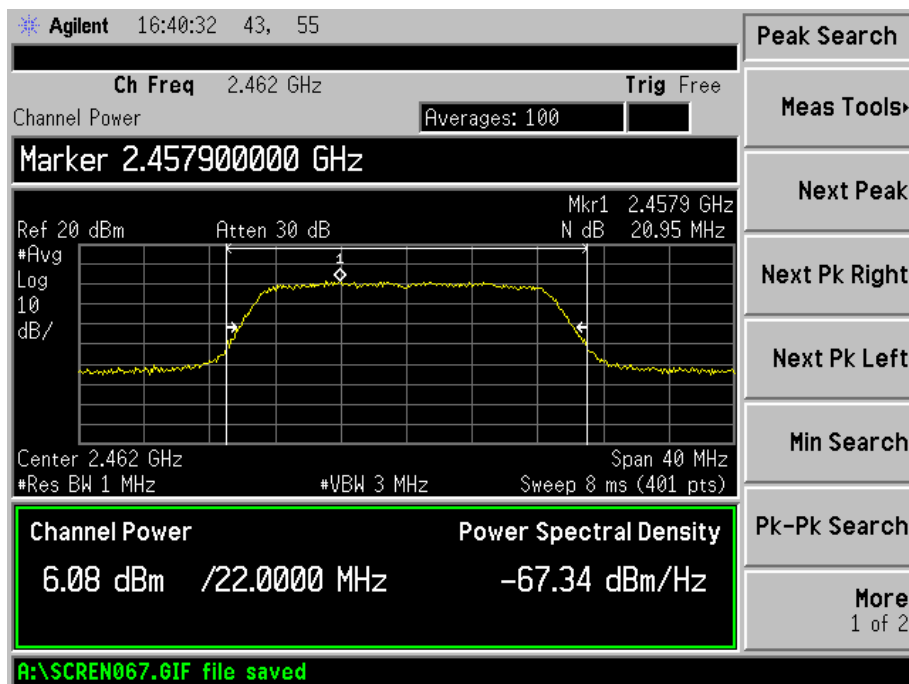
802.11n-HT20- MCS0-Low Channel



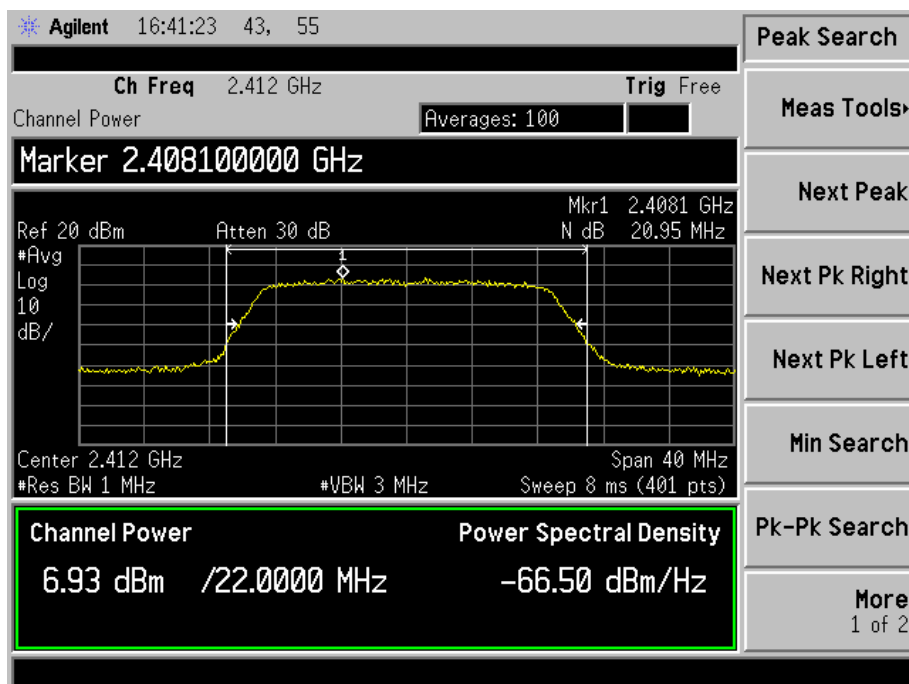
802.11n-HT20- MCS0-Middle Channel



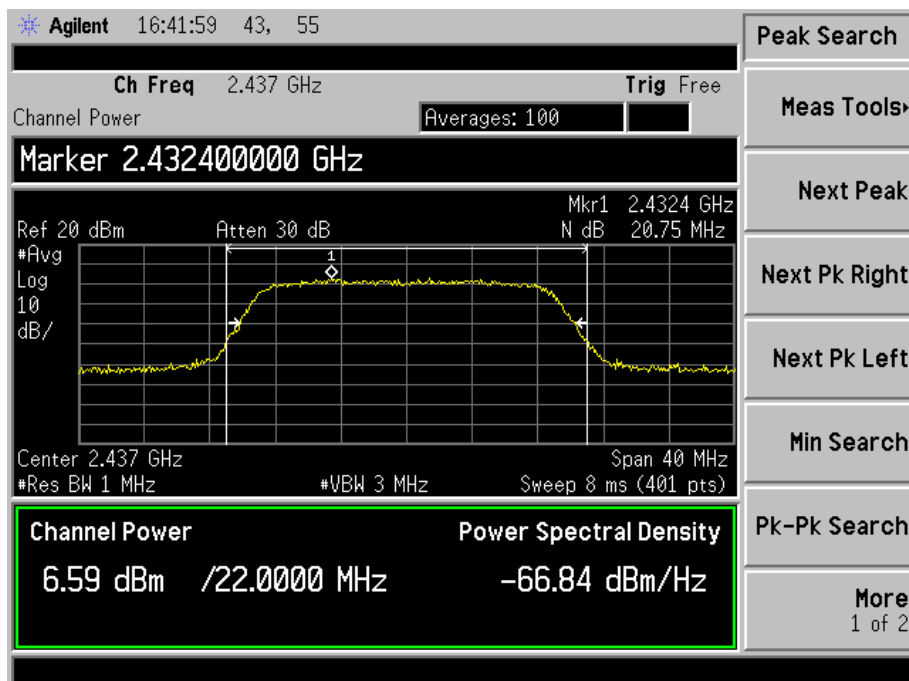
802.11n-HT20- MCS0-High Channel



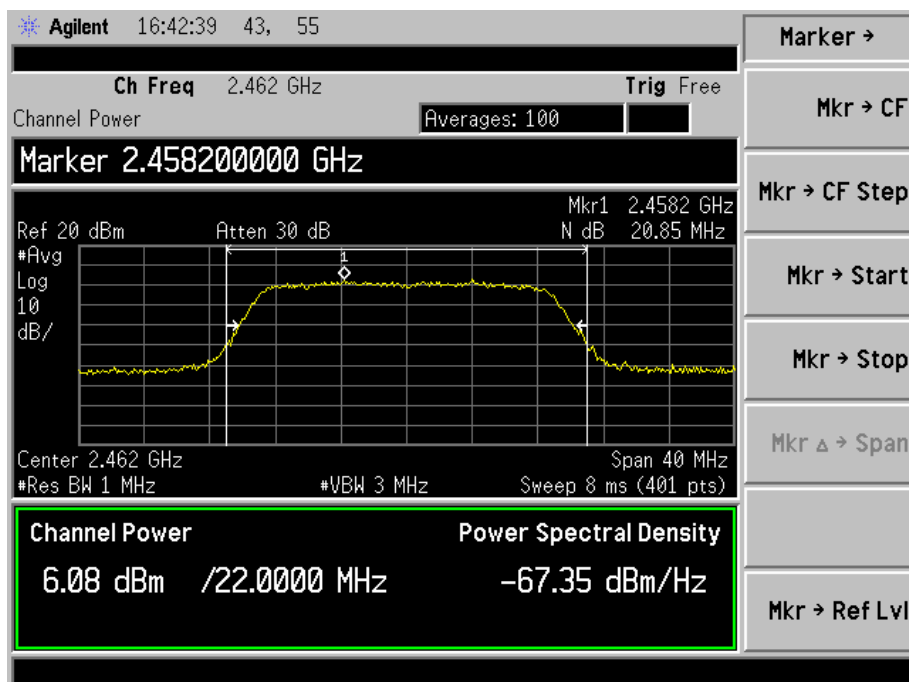
802.11n-HT20- MCS7-Low Channel



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

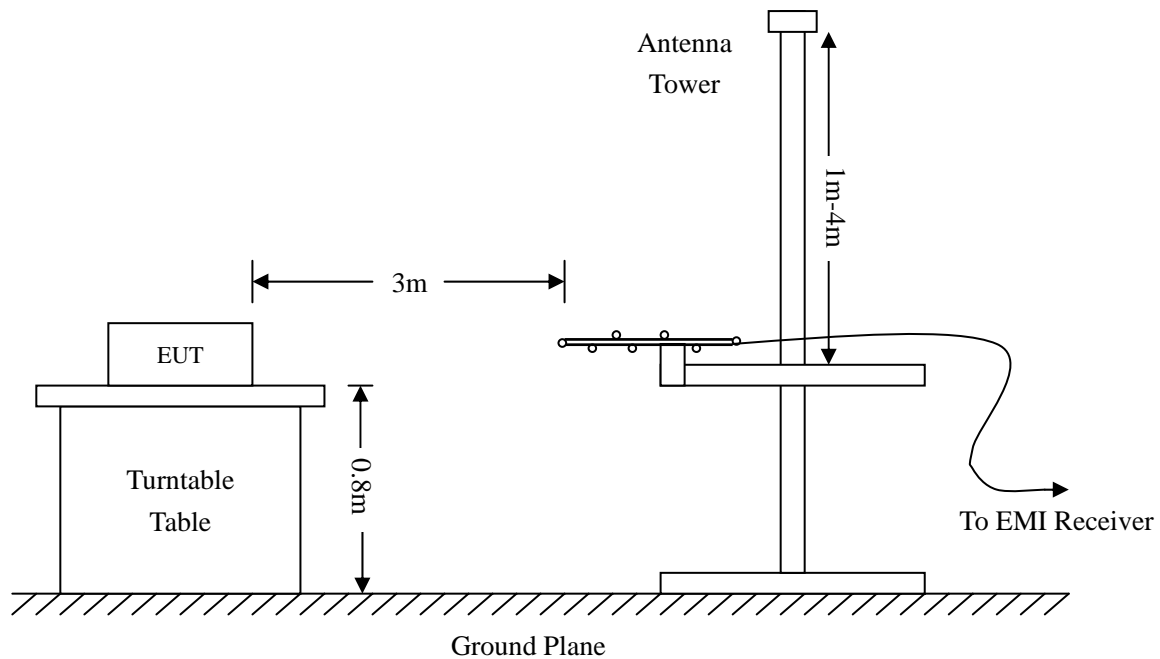
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	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

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 -6dB μ V means the emission is 6dB μ V 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

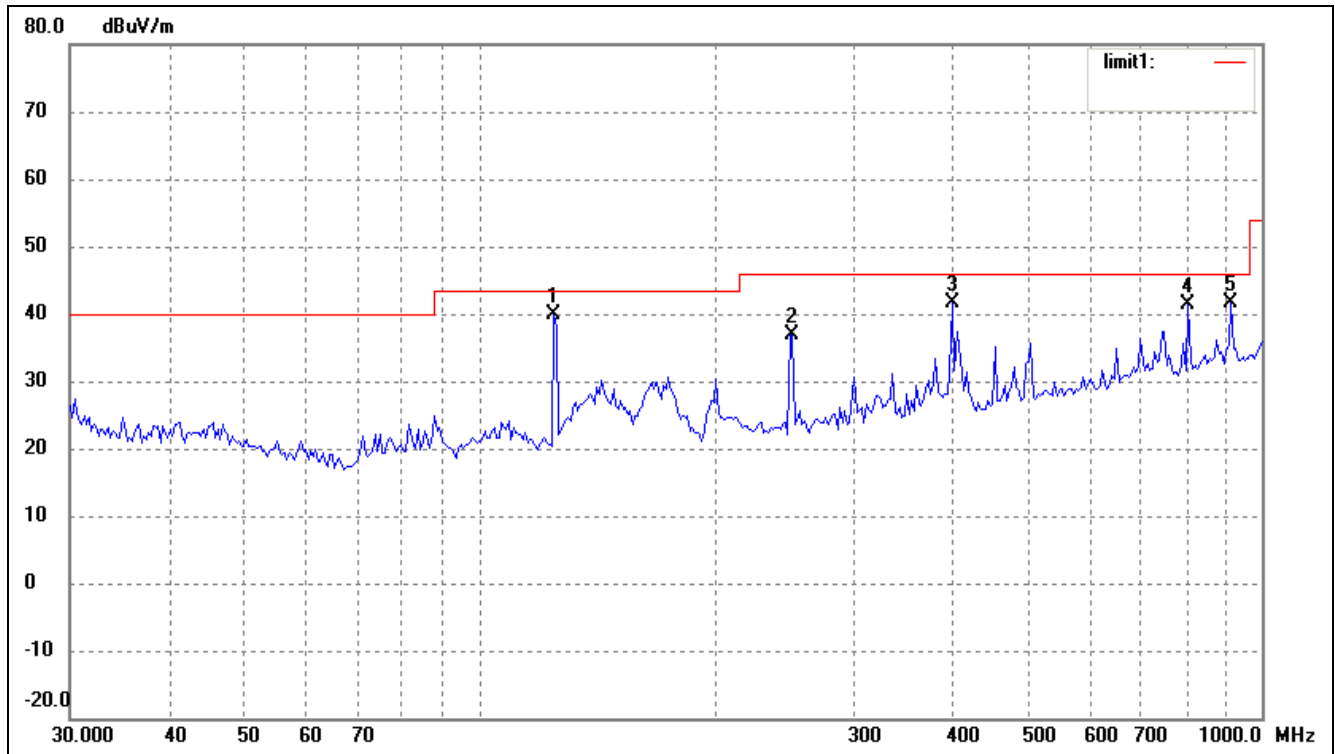
Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

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:

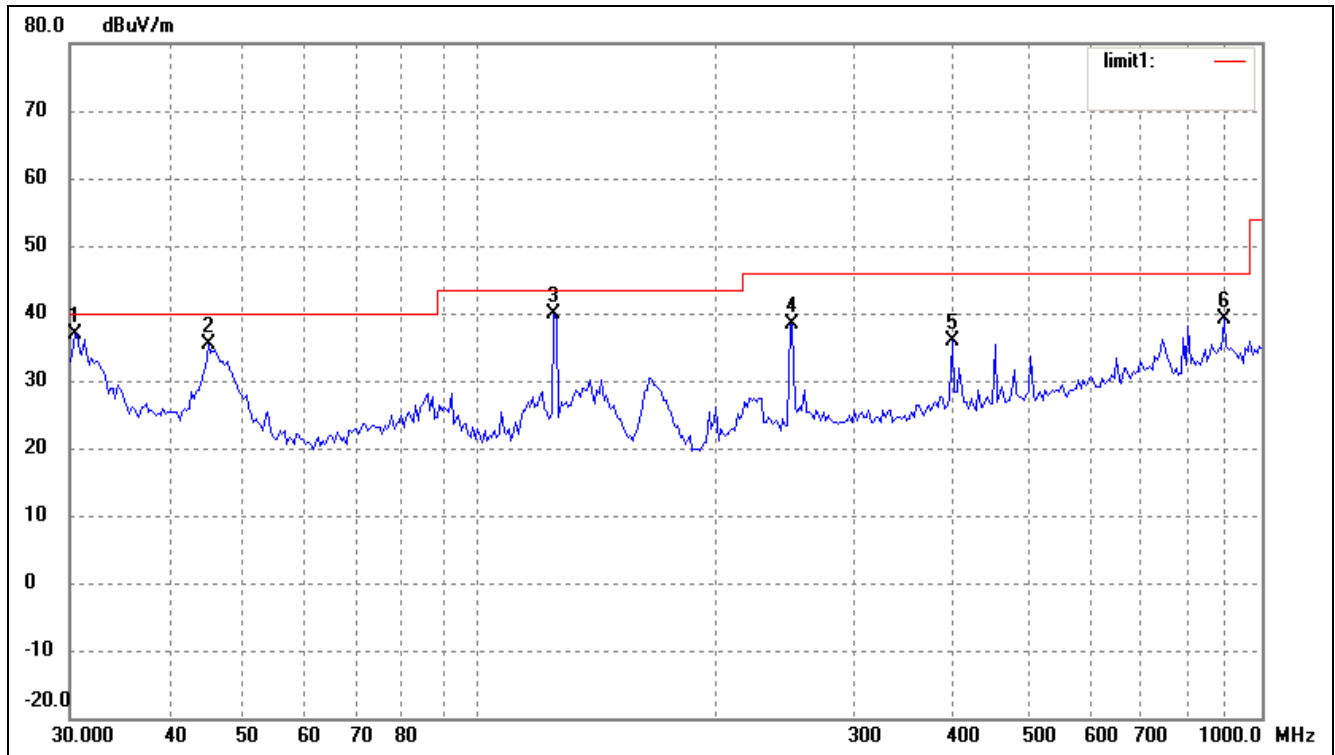
**-2.25 dB at 124.5690 MHz in the Horizontal polarization for 802.11b Middle Channel,
9kHz to 25 GHz, 3 Meters**

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:* Network Camera*Tested Model:* IP229*Operating Condition:* 802.11b Transmitting Low Channel-2412MHz*Comment:* AC120V/60Hz, Adapter 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	35.37	4.53	39.90	43.50	-3.60	264	100	peak
2	251.1804	29.62	7.34	36.96	46.00	-9.04	113	200	peak
3	401.8385	30.27	11.47	41.74	46.00	-4.26	287	100	peak
4	804.6028	25.06	16.42	41.48	46.00	-4.52	185	200	peak
5	912.8620	22.77	18.93	41.70	46.00	-4.30	110	100	QP

Test Specification: Vertical

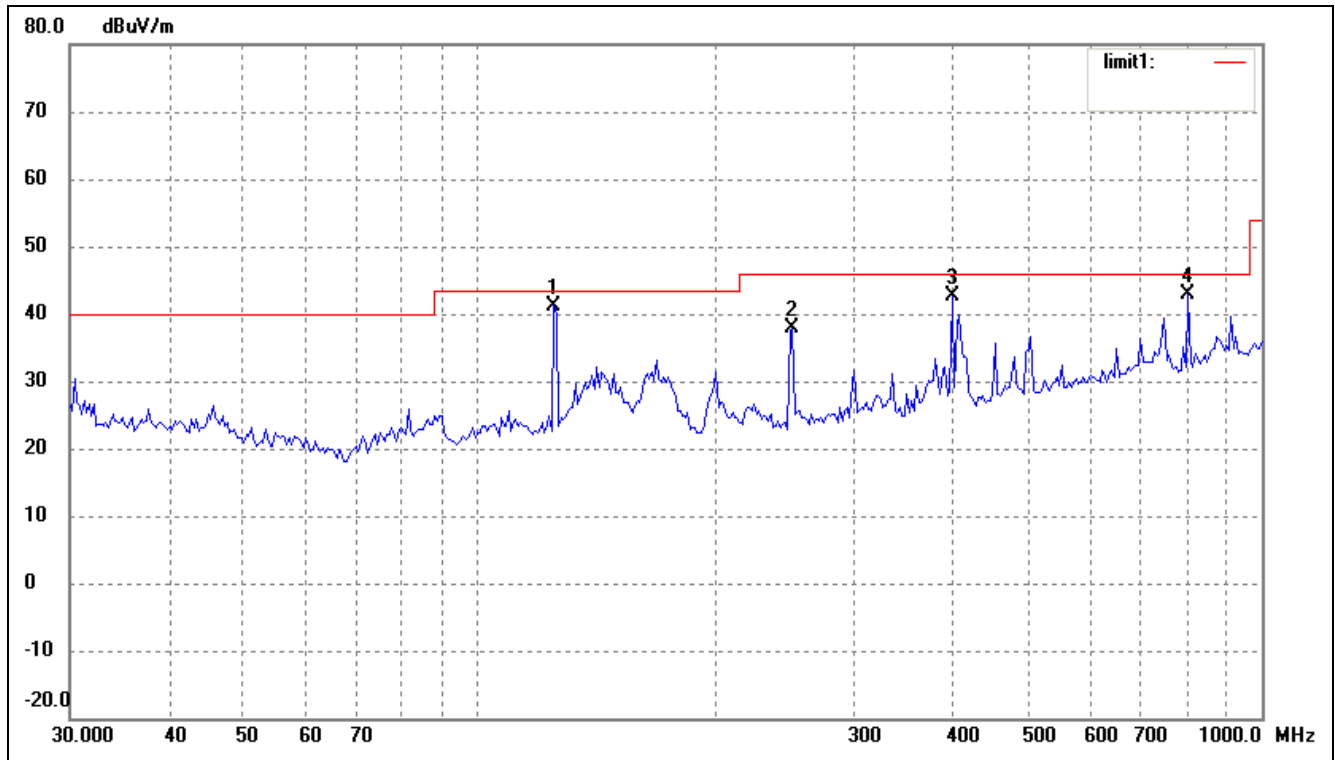


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.4238	28.84	8.11	36.95	40.00	-3.05	240	100	peak
2	45.0583	27.23	8.14	35.37	40.00	-4.63	187	100	peak
3	124.5690	35.36	4.53	39.89	43.50	-3.61	220	100	peak
4	251.1804	31.04	7.34	38.38	46.00	-7.62	359	100	peak
5	401.8385	24.42	11.47	35.89	46.00	-10.11	359	100	peak
6	893.8567	19.85	19.27	39.12	46.00	-6.88	359	100	peak

Operating Condition: 802.11b Transmitting Middle Channel-2437MHz

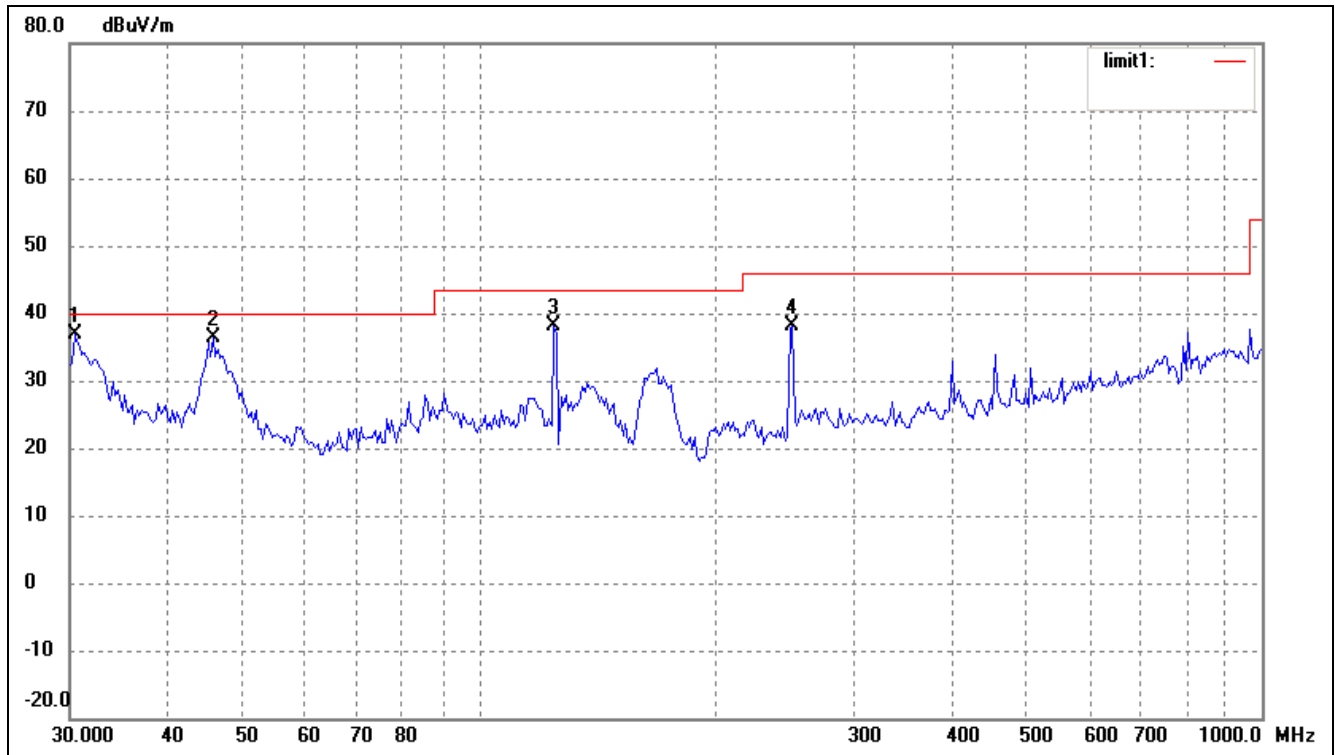
Comment: AC120V/60Hz, Adapter 12V

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	36.72	4.53	41.25	43.50	-2.25	162	100	peak
2	251.1804	30.48	7.34	37.82	46.00	-8.18	200	100	peak
3	401.8385	31.15	11.47	42.62	46.00	-3.38	359	200	peak
4	804.6028	26.56	16.42	42.98	46.00	-3.02	359	100	peak

Test Specification: Vertical

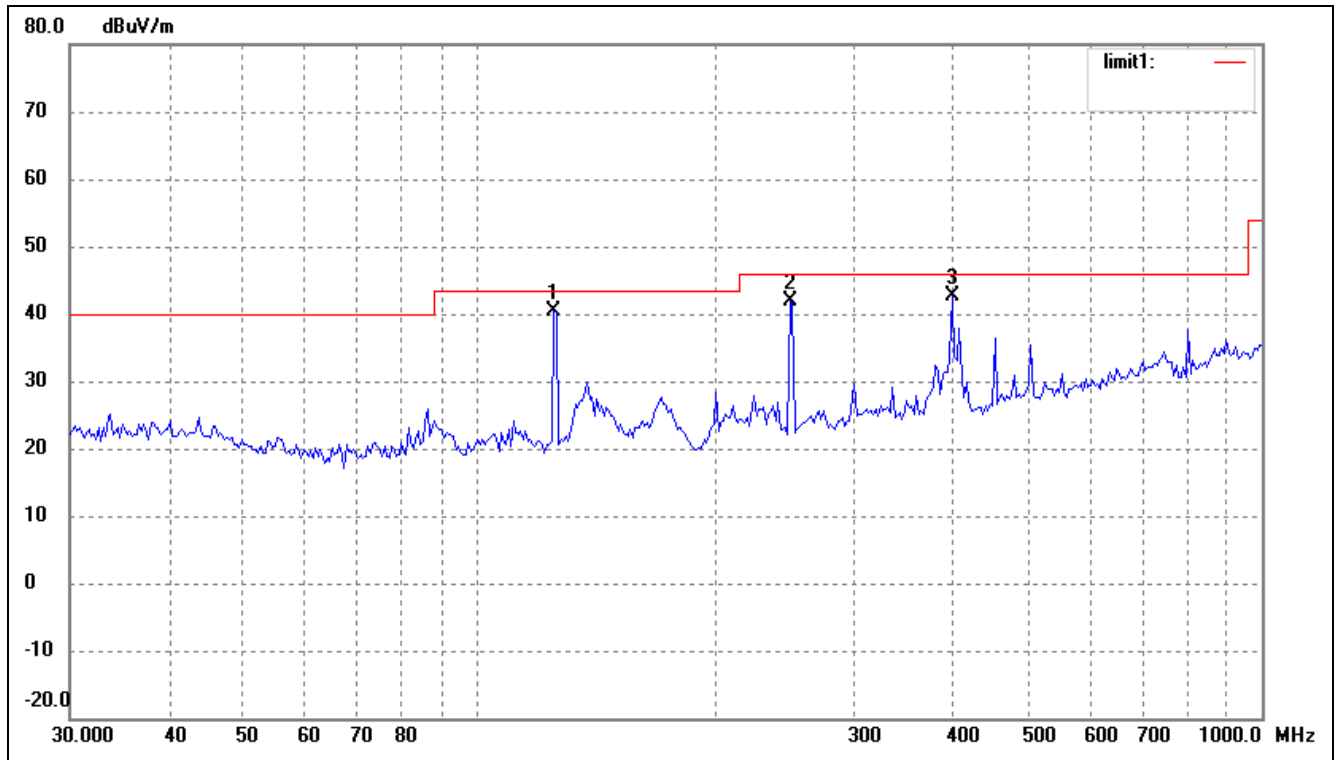


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.4238	28.68	8.11	36.79	40.00	-3.21	240	100	peak
2	45.6948	28.44	7.94	36.38	40.00	-3.62	187	100	peak
3	124.5690	33.63	4.53	38.16	43.50	-5.34	220	100	peak
4	251.1804	30.81	7.34	38.15	46.00	-7.85	359	100	peak

Operating Condition: 802.11b Transmitting High Channel-2462MHz

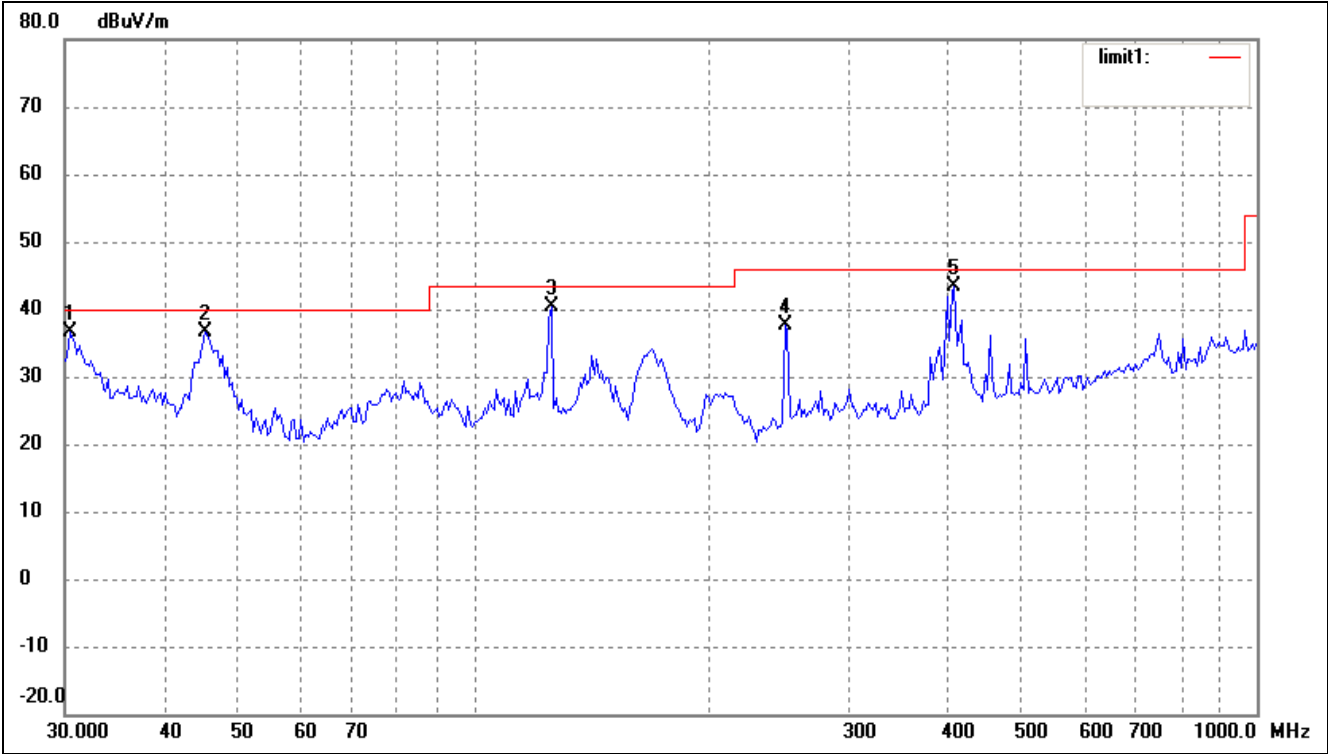
Comment: AC120V/60Hz, Adapter 12V

Test Specification: Horizontal

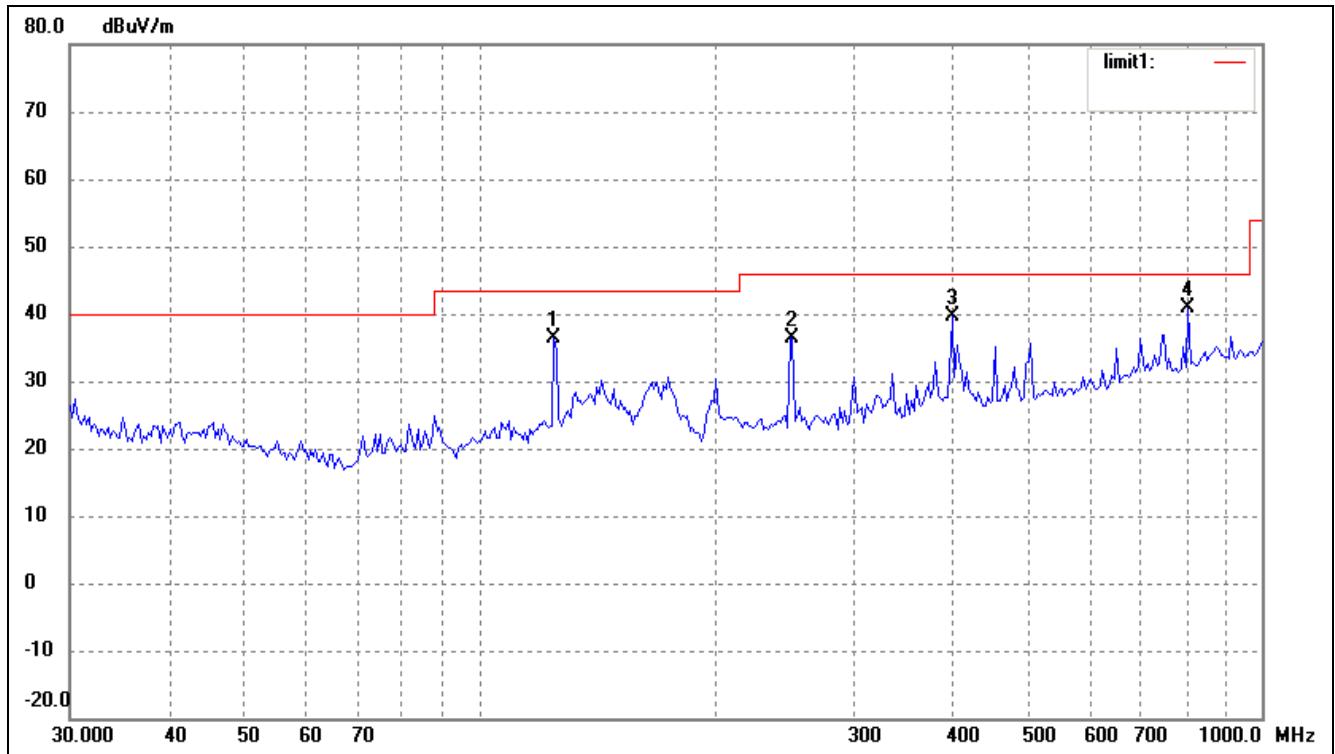


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	35.94	4.53	40.47	43.50	-3.03	162	100	peak
2	249.4250	34.65	7.27	41.92	46.00	-4.08	200	100	peak
3	401.8385	31.18	11.47	42.65	46.00	-3.35	359	100	peak

Test Specification: Vertical

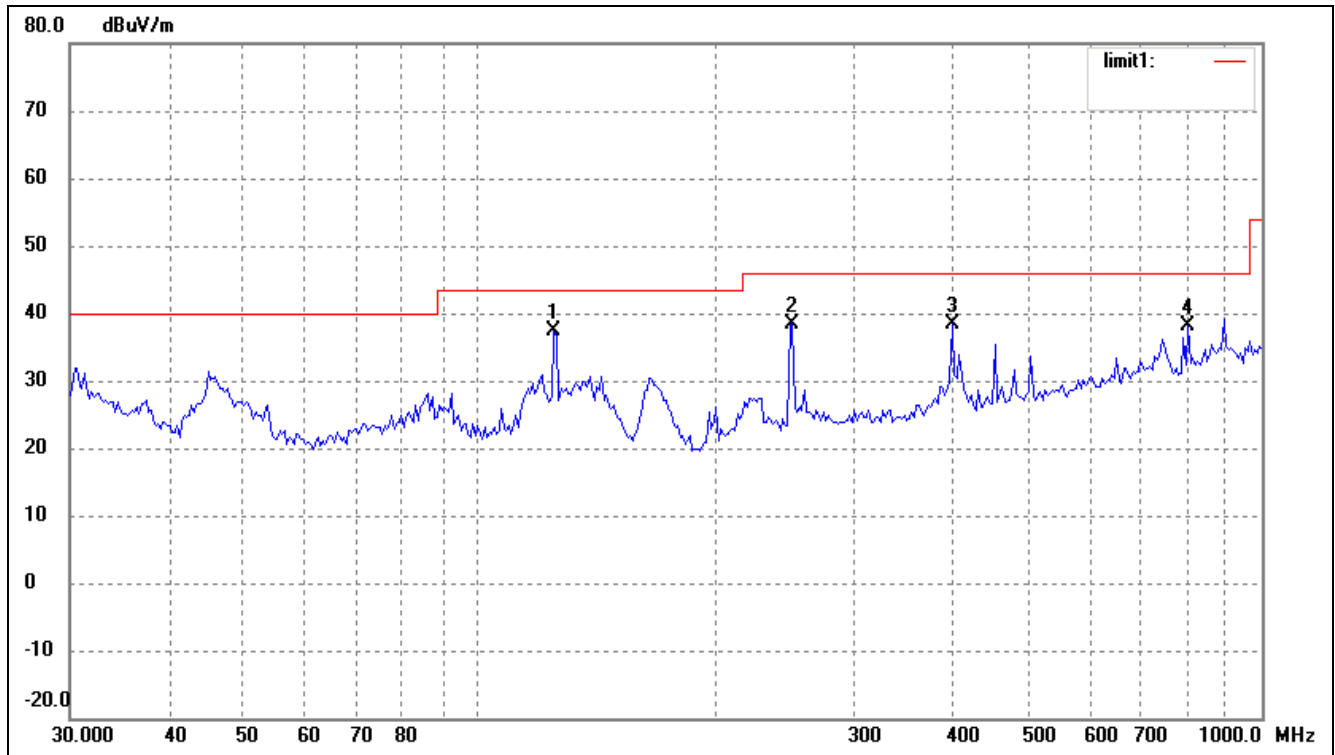


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	30.4238	28.52	8.11	36.63	40.00	-3.37	240	100	peak
2	45.3755	28.54	8.05	36.59	40.00	-3.41	187	100	peak
3	125.4457	35.83	4.46	40.29	43.50	-3.21	220	100	peak
4	249.4250	30.35	7.27	37.62	46.00	-8.38	35	100	peak
5	410.3825	32.35	11.11	43.46	46.00	-2.54	359	100	peak

Plot of Radiated Emissions Test Data (30MHz to 1GHz)*EUT:* Network Camera*Tested Model:* IP229*Operating Condition:* 802.11g Transmitting Low Channel-2412MHz*Comment:* AC120V/60Hz, Adapter 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	31.87	4.53	36.40	43.50	-7.10	264	100	peak
2	251.1803	29.12	7.34	36.46	46.00	-9.54	113	200	peak
3	401.8385	28.27	11.47	39.74	46.00	-6.26	287	100	peak
4	804.6028	24.56	16.42	40.98	46.00	-5.02	185	200	peak

Test Specification: Vertical

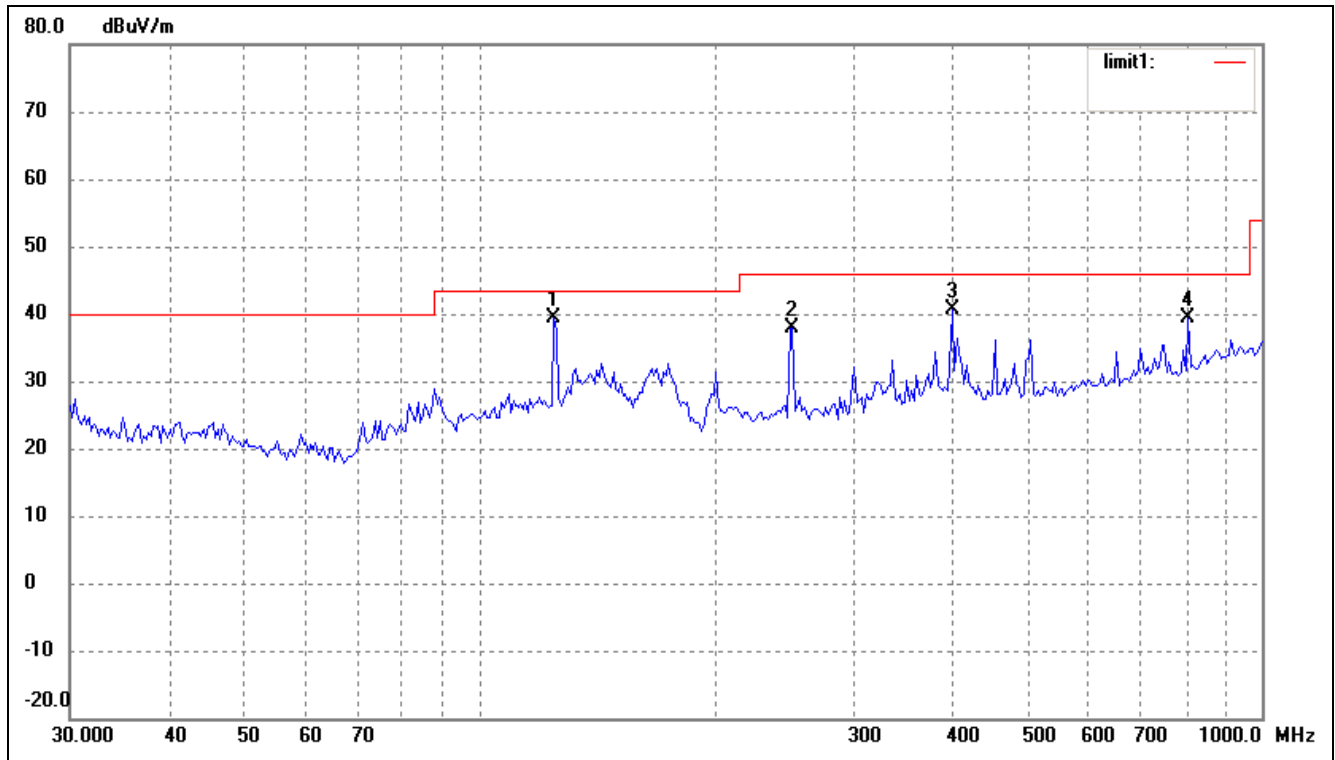


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	124.5690	32.86	4.53	37.39	43.50	-6.11	240	100	peak
2	251.1803	31.04	7.34	38.38	46.00	-7.62	187	100	peak
3	401.8385	26.92	11.47	38.39	46.00	-7.61	220	100	peak
4	804.6028	21.75	16.42	38.17	46.00	-7.83	359	100	peak

Operating Condition: 802.11g Transmitting Middle Channel-2437MHz

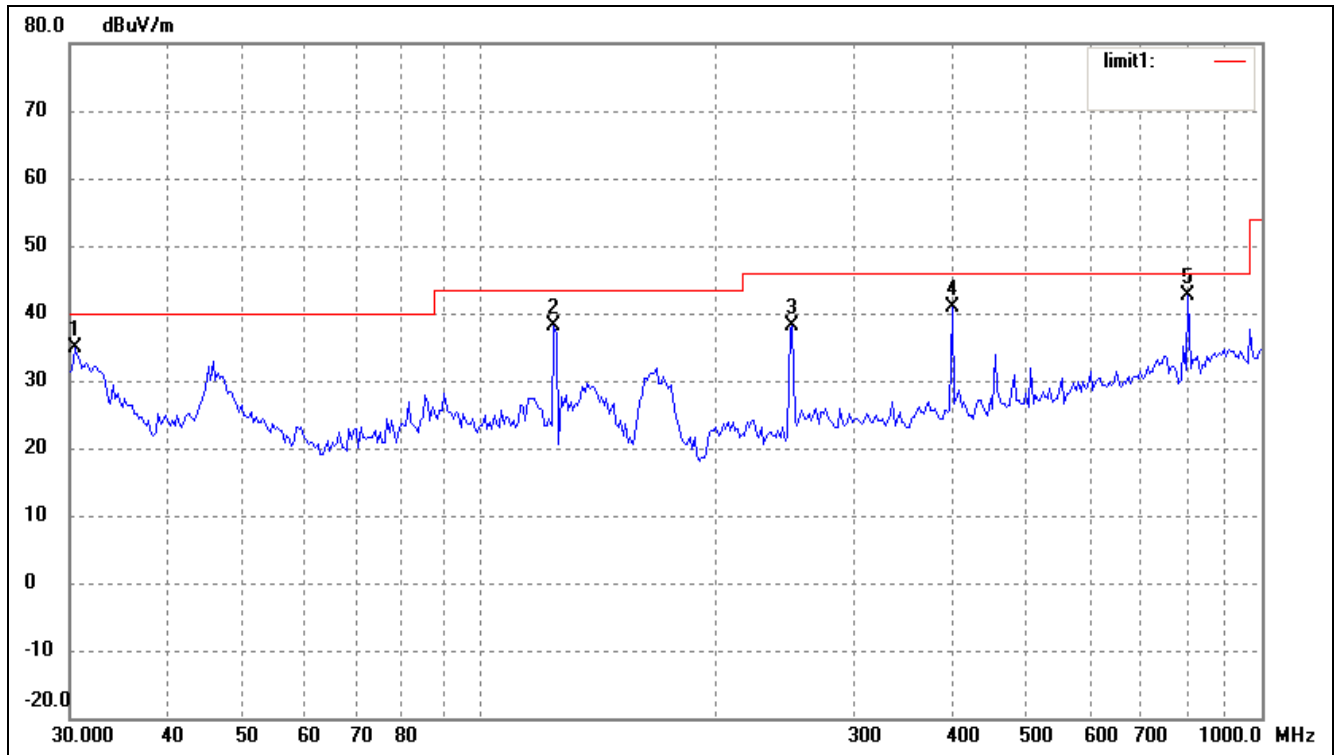
Comment: AC120V/60Hz, Adapter 12V

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	34.87	4.53	39.40	43.50	-4.10	162	100	peak
2	251.1803	30.62	7.34	37.96	46.00	-8.04	200	100	peak
3	401.8385	29.27	11.47	40.74	46.00	-5.26	359	200	peak
4	804.6028	23.06	16.42	39.48	46.00	-6.52	359	100	peak

Test Specification: Vertical

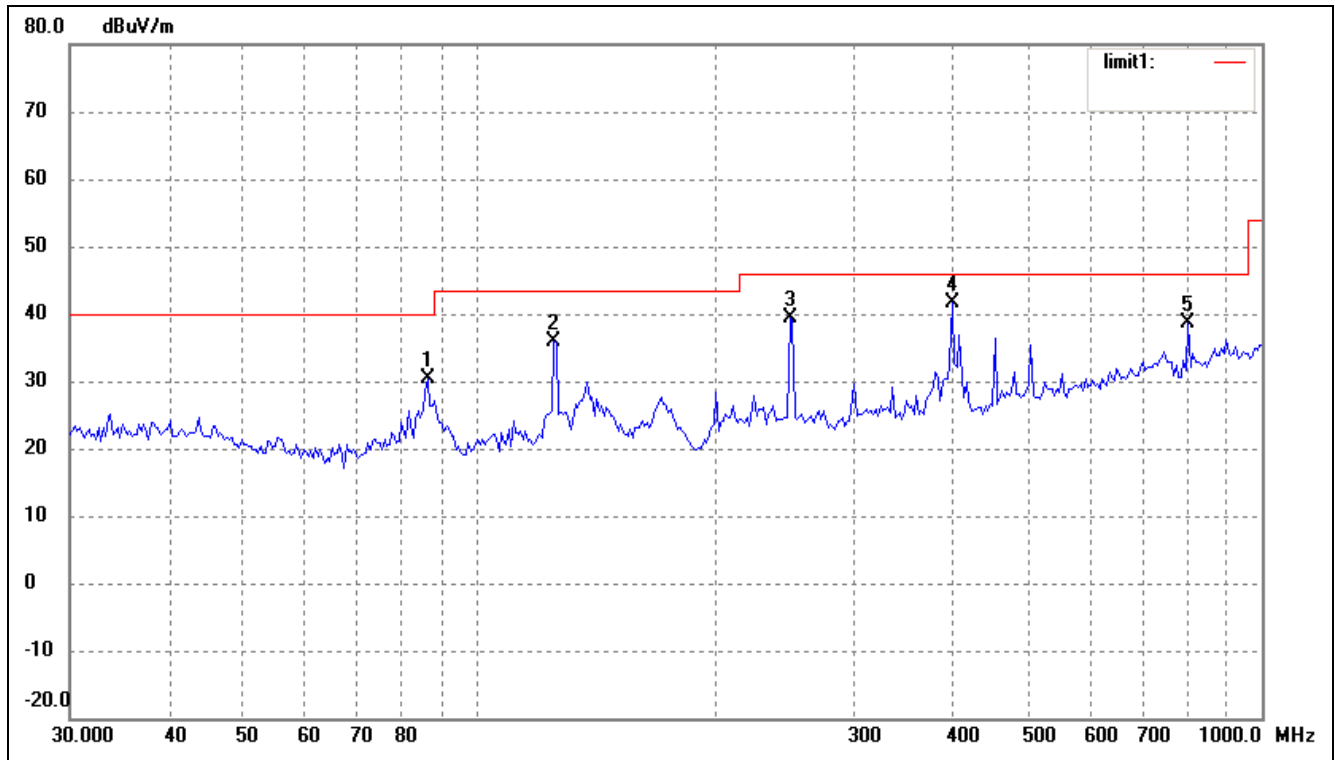


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.4237	26.68	8.11	34.79	40.00	-5.21	240	100	peak
2	124.5690	33.63	4.53	38.16	43.50	-5.34	187	100	peak
3	251.1803	30.81	7.34	38.15	46.00	-7.85	220	100	peak
4	401.8385	29.33	11.47	40.80	46.00	-5.20	359	100	peak
5	804.6028	26.24	16.42	42.66	46.00	-3.34	359	100	peak

Operating Condition: 802.11g Transmitting High Channel-2462MHz

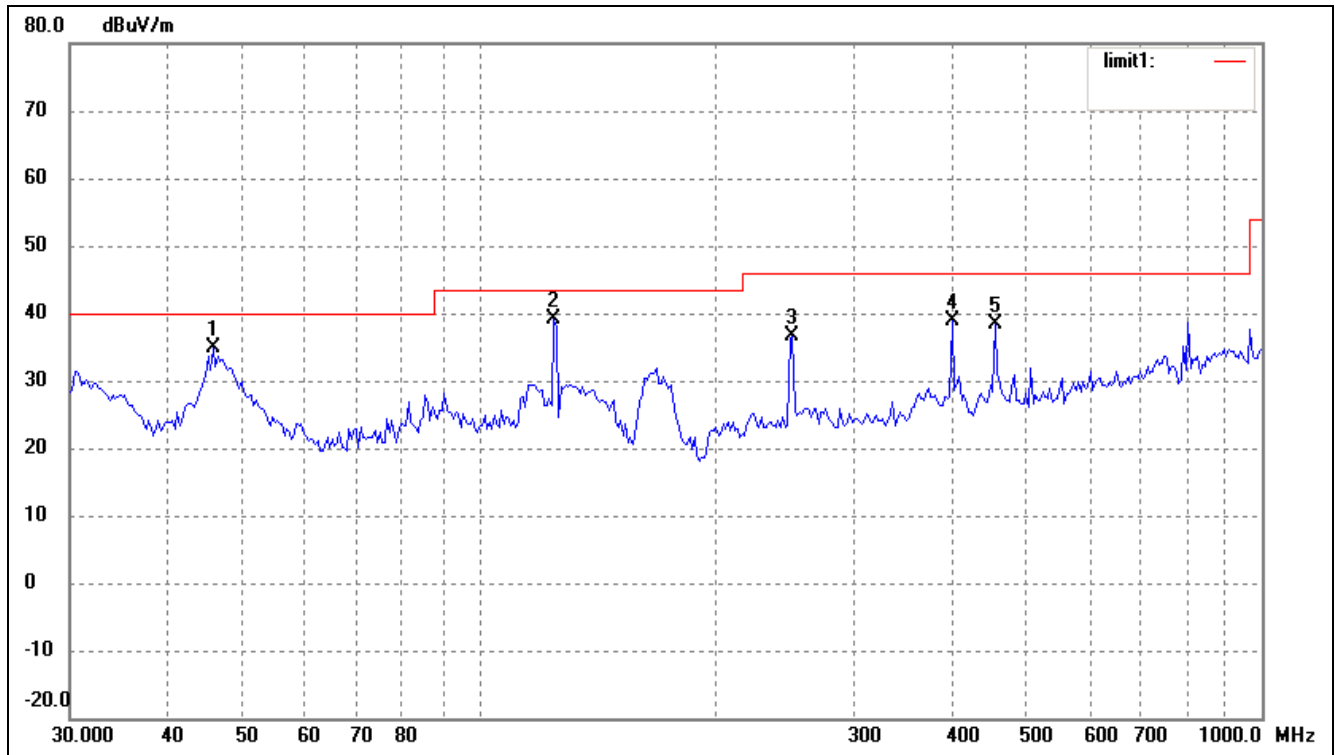
Comment: AC120V/60Hz, Adapter 12V

Test Specification: Horizontal

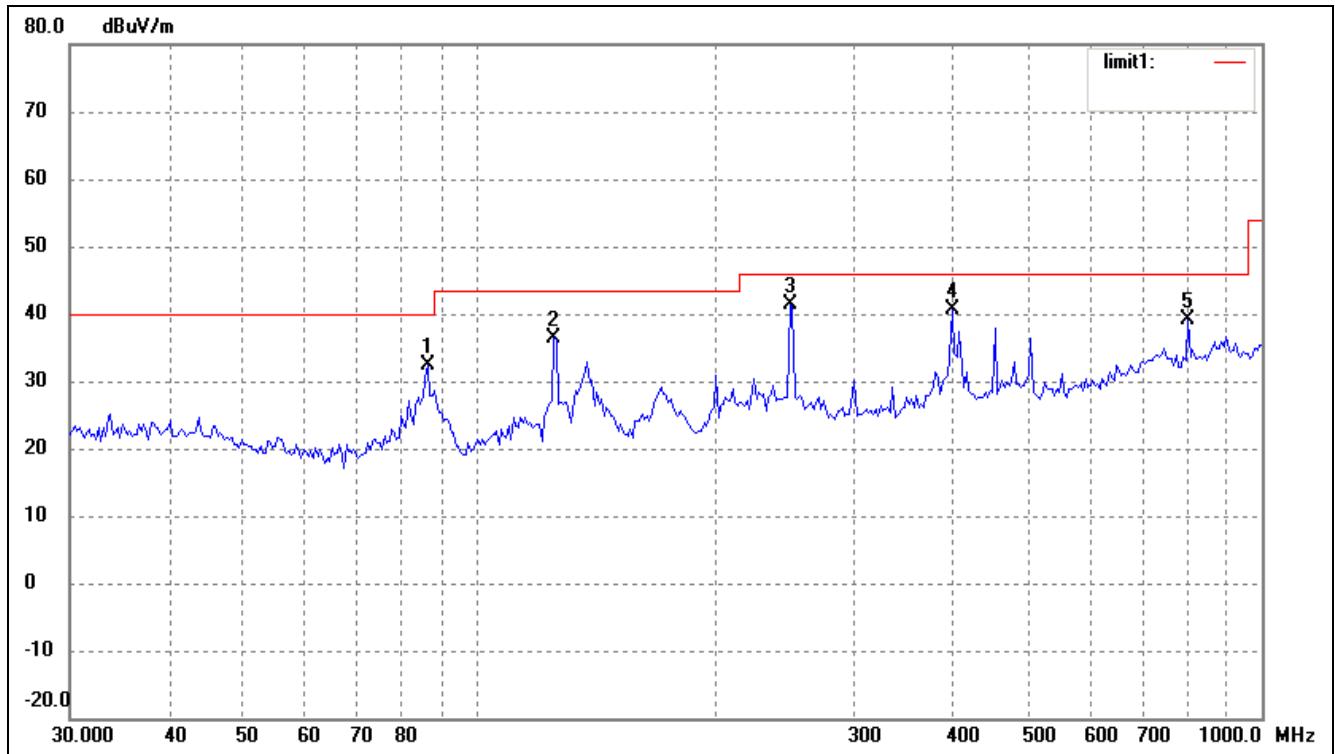


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	85.8983	26.96	3.31	30.27	40.00	-9.73	162	100	peak
2	124.5690	31.44	4.53	35.97	43.50	-7.53	200	100	peak
3	249.4250	32.15	7.27	39.42	46.00	-6.58	359	100	peak
4	401.8385	30.18	11.47	41.65	46.00	-4.35	359	100	peak
5	804.6028	22.14	16.42	38.56	46.00	-7.44	359	100	peak

Test Specification: Vertical

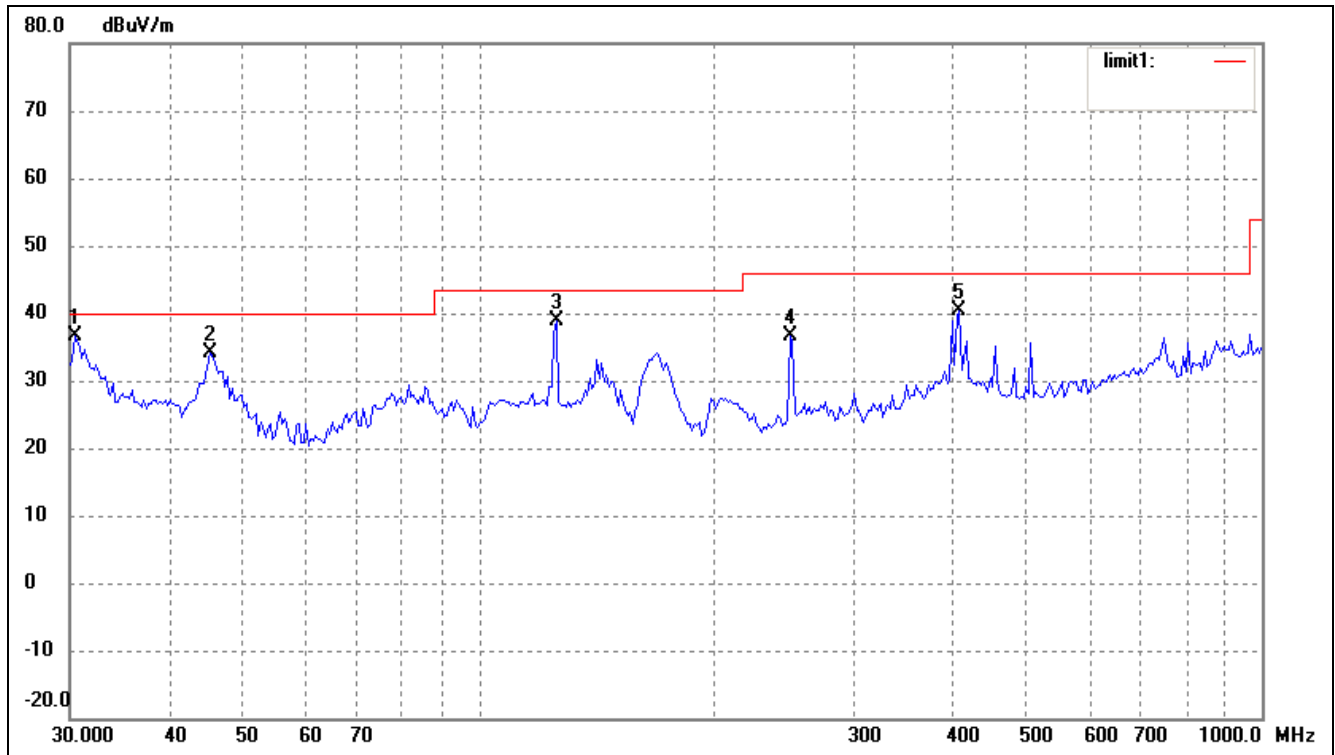


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	45.6948	26.94	7.94	34.88	40.00	-5.12	240	100	peak
2	124.5690	34.63	4.53	39.16	43.50	-4.34	187	100	peak
3	251.1803	29.31	7.34	36.65	46.00	-9.35	220	100	peak
4	401.8385	27.33	11.47	38.80	46.00	-7.20	35	100	peak
5	455.9057	26.61	11.67	38.28	46.00	-7.72	359	100	peak

Plot of Radiated Emissions Test Data (30MHz to 1GHz)*EUT:* Network Camera*Tested Model:* IP229*Operating Condition:* 802.11n-HT20 Transmitting Low Channel-2412MHz*Comment:* AC120V/60Hz, Adapter 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	85.8983	28.96	3.31	32.27	40.00	-7.73	264	100	peak
2	124.5690	31.94	4.53	36.47	43.50	-7.03	113	200	peak
3	249.4250	34.15	7.27	41.42	46.00	-4.58	287	100	peak
4	401.8385	29.18	11.47	40.65	46.00	-5.35	185	200	peak
5	804.6028	22.64	16.42	39.06	46.00	-6.94	110	100	QP

Test Specification: Vertical

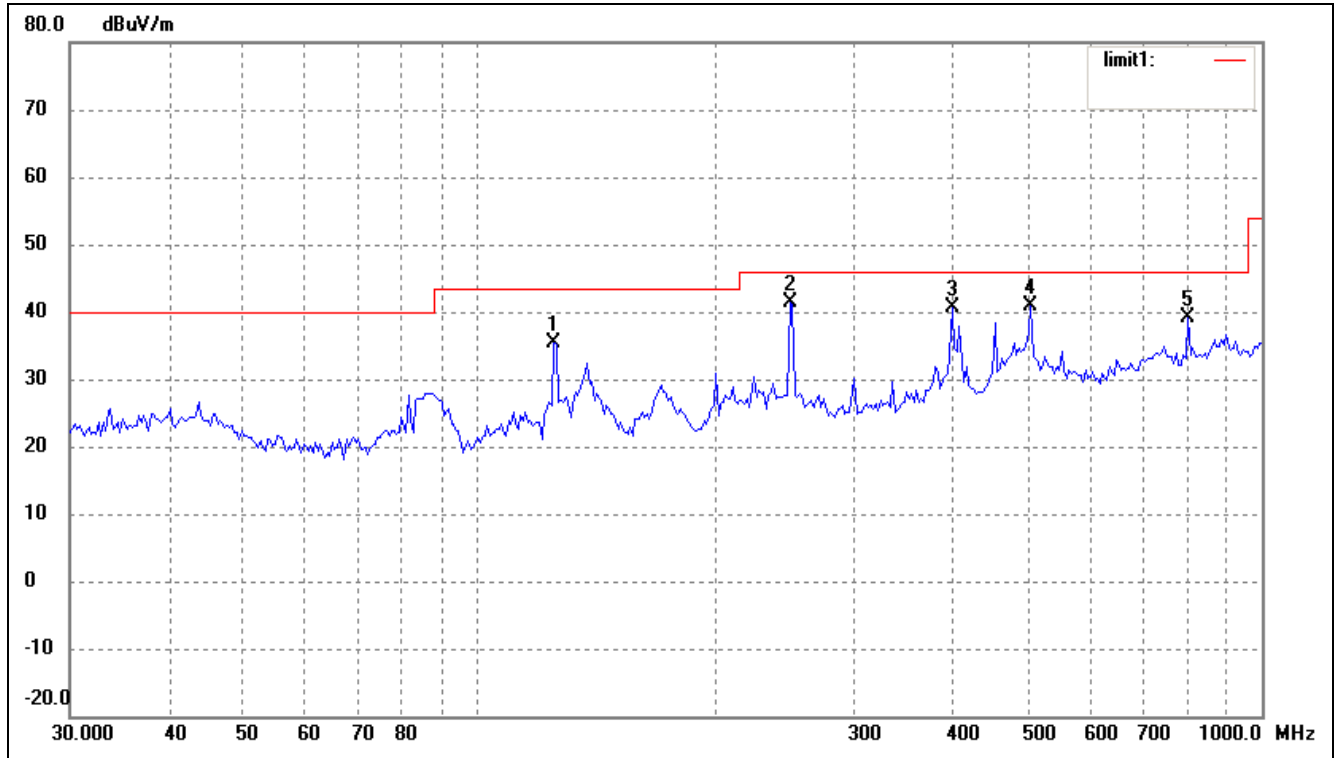


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.4237	28.52	8.11	36.63	40.00	-3.37	240	100	peak
2	45.3755	26.04	8.05	34.09	40.00	-5.91	187	100	peak
3	125.4457	34.33	4.46	38.79	43.50	-4.71	220	100	peak
4	249.4250	29.35	7.27	36.62	46.00	-9.38	359	100	peak
5	410.3824	29.35	11.11	40.46	46.00	-5.54	359	100	peak

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

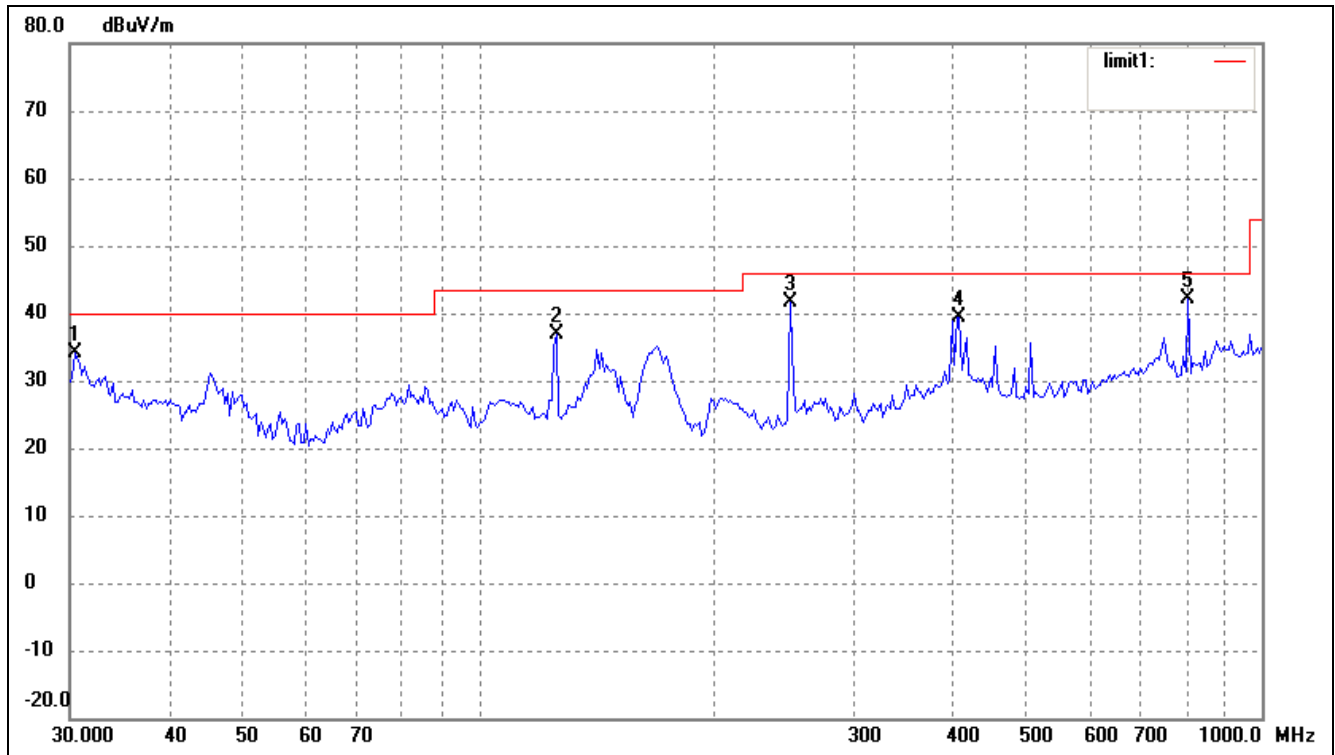
Comment: AC120V/60Hz, Adapter 12V

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	30.94	4.53	35.47	43.50	-8.03	162	100	peak
2	249.4250	34.15	7.27	41.42	46.00	-4.58	200	100	peak
3	401.8385	29.18	11.47	40.65	46.00	-5.35	359	200	peak
4	506.4791	28.40	12.43	40.83	46.00	-5.17	359	100	peak
5	804.6028	22.64	16.42	39.06	46.00	-6.94	359	100	peak

Test Specification: Vertical

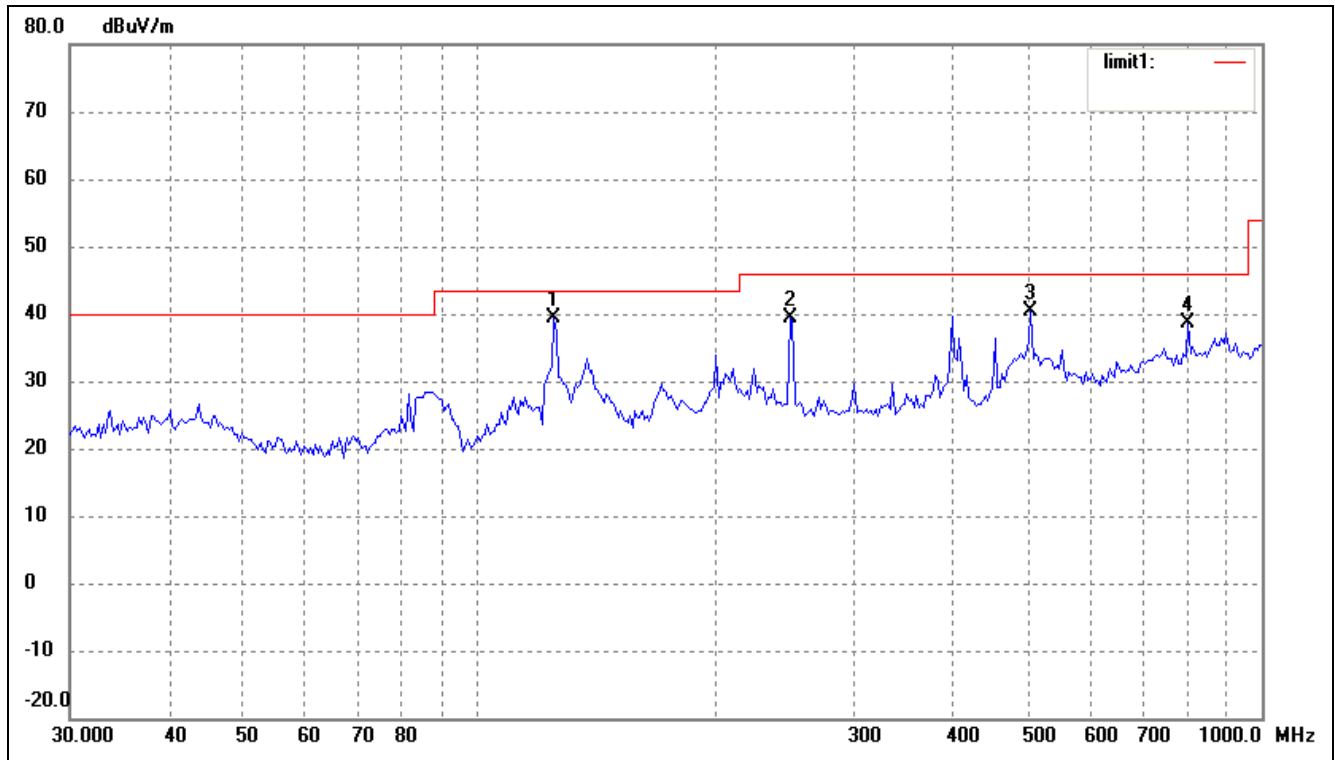


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.4237	26.02	8.11	34.13	40.00	-5.87	240	100	peak
2	125.4457	32.33	4.46	36.79	43.50	-6.71	187	100	peak
3	249.4250	34.35	7.27	41.62	46.00	-4.38	220	100	peak
4	410.3824	28.35	11.11	39.46	46.00	-6.54	359	100	peak
5	804.6028	25.66	16.42	42.08	46.00	-3.92	359	100	peak

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

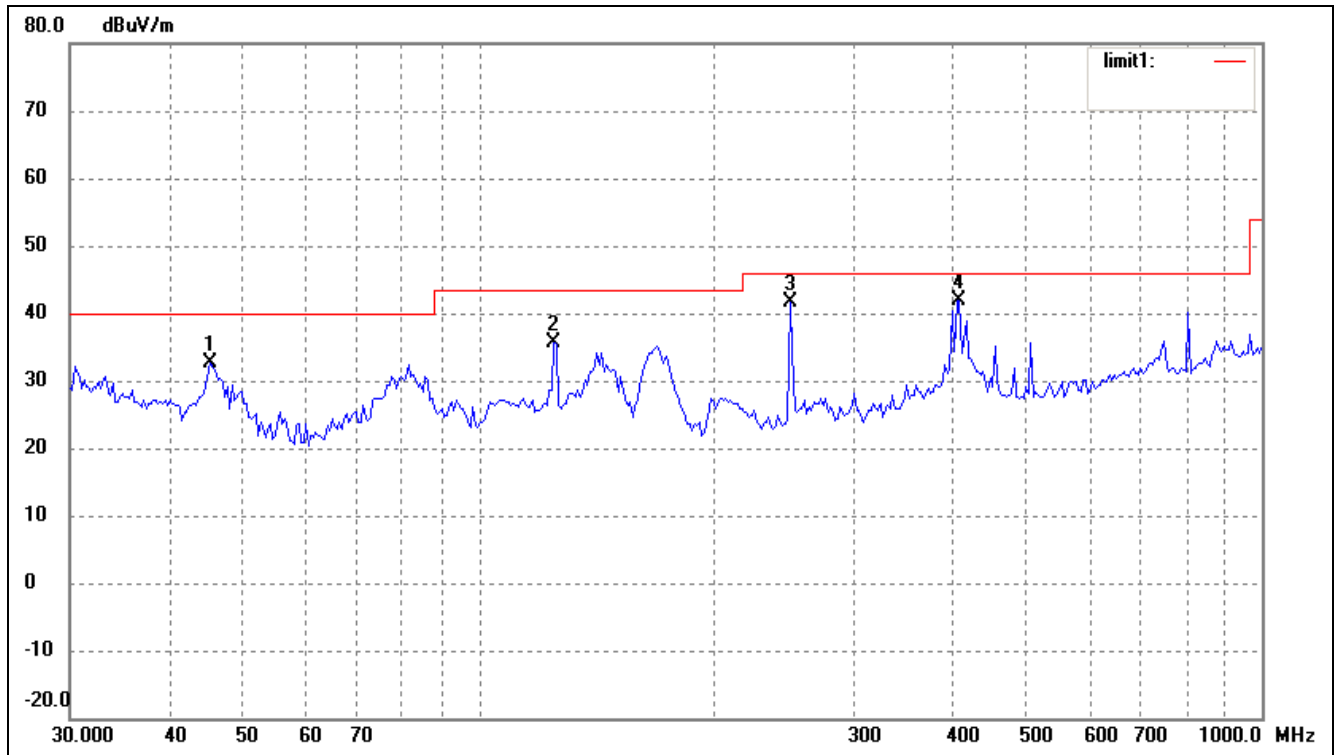
Comment: AC120V/60Hz, Adapter 12V

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	34.94	4.53	39.47	43.50	-4.03	162	100	peak
2	249.4250	32.15	7.27	39.42	46.00	-6.58	200	100	peak
3	506.4791	27.90	12.43	40.33	46.00	-5.67	359	100	peak
4	804.6028	22.14	16.42	38.56	46.00	-7.44	359	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	45.3755	24.54	8.05	32.59	40.00	-7.41	240	100	peak
2	124.5690	31.01	4.53	35.54	43.50	-7.96	187	100	peak
3	249.4250	34.35	7.27	41.62	46.00	-4.38	220	100	peak
4	410.3824	30.85	11.11	41.96	46.00	-4.04	35	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	54.25	-3.85	50.40	74.00	-23.60	H	PK
4824	39.91	-3.85	36.06	54.00	-17.94	H	AV
7236	47.35	2.23	49.58	74.00	-24.42	H	PK
7236	35.15	2.23	37.38	54.00	-16.62	H	AV
4824	50.65	-3.85	46.80	74.00	-27.20	V	PK
4824	37.47	-3.85	33.62	54.00	-20.38	V	AV
7236	47.47	2.23	49.70	74.00	-24.30	V	PK
7236	35.11	2.23	37.34	54.00	-16.66	V	AV
Middle Channel-2437MHz							
4874	60.86	-3.71	57.15	74.00	-16.85	H	PK
4874	46.62	-3.71	42.91	54.00	-11.09	H	AV
7311	47.31	1.59	48.90	74.00	-25.10	H	PK
7311	36.06	1.59	37.65	54.00	-16.35	H	AV
4874	52.58	-3.71	48.87	74.00	-25.13	V	PK
4874	39.60	-3.71	35.89	54.00	-18.11	V	AV
7311	47.38	2.23	49.61	74.00	-24.39	V	PK
7311	35.42	2.23	37.65	54.00	-16.35	V	AV
High Channel-2462MHz							
4924	63.84	-3.57	60.27	74.00	-13.73	H	PK
4924	49.63	-3.57	46.06	54.00	-7.94	H	AV
7386	48.60	1.91	50.51	74.00	-23.49	H	PK
7386	36.36	1.91	38.27	54.00	-15.73	H	AV
4924	57.69	-3.57	54.12	74.00	-19.88	V	PK
4924	43.49	-3.57	39.92	54.00	-14.08	V	AV
7386	47.17	2.20	49.37	74.00	-24.63	V	PK
7386	35.62	2.20	37.82	54.00	-16.18	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	52.73	-3.85	48.88	74.00	-25.12	H	PK
4824	39.07	-3.85	35.22	54.00	-18.78	H	AV
7236	47.13	2.26	49.39	74.00	-24.61	H	PK
7236	35.42	2.26	37.68	54.00	-16.32	H	AV
4824	47.63	-4.13	42.50	74.00	-31.50	V	PK
4824	35.14	-4.13	31.01	54.00	-22.99	V	AV
7236	48.17	2.23	50.40	74.00	-23.60	V	PK
7236	35.47	2.23	37.70	54.00	-16.30	V	AV
Middle Channel-2437MHz							
4874	53.53	-3.71	49.82	74.00	-24.18	H	PK
4874	40.62	-3.71	36.91	54.00	-17.09	H	AV
7311	48.36	2.07	49.73	74.00	-24.27	H	PK
7311	35.29	2.07	37.36	54.00	-16.64	H	AV
4874	47.88	-3.71	44.17	74.00	-29.83	V	PK
4874	36.80	-3.71	33.09	54.00	-20.91	V	AV
7311	46.88	2.23	49.11	74.00	-24.89	V	PK
7311	35.38	2.23	37.61	54.00	-16.39	V	AV
High Channel-2462MHz							
4924	63.51	-3.57	59.94	74.00	-14.06	H	PK
4924	49.77	-3.57	46.20	54.00	-7.80	H	AV
7386	49.97	1.91	51.88	74.00	-22.12	H	PK
7386	37.11	1.91	39.02	54.00	-14.98	H	AV
4924	48.84	-3.57	45.27	74.00	-28.73	V	PK
4924	37.25	-3.57	33.68	54.00	-20.32	V	AV
7386	48.12	2.23	50.35	74.00	-23.65	V	PK
7386	35.47	2.23	37.70	54.00	-16.30	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	51.90	-3.85	48.05	74.00	-25.95	H	PK
4824	39.89	-3.85	36.04	54.00	-17.96	H	AV
7236	46.83	2.20	49.03	74.00	-24.97	H	PK
7236	34.67	2.20	36.87	54.00	-17.13	H	AV
4824	45.51	-3.85	41.66	74.00	-32.34	V	PK
4824	33.89	-3.85	30.04	54.00	-23.96	V	AV
7236	46.34	2.20	48.54	74.00	-25.46	V	PK
7236	34.70	2.20	36.90	54.00	-17.10	V	AV
Middle Channel-2437MHz							
4874	56.14	-3.71	52.43	74.00	-21.57	H	PK
4874	44.29	-3.71	40.58	54.00	-13.42	H	AV
7311	47.15	2.23	49.38	74.00	-24.62	H	PK
7311	35.41	2.23	37.64	54.00	-16.36	H	AV
4874	46.48	-3.71	42.77	74.00	-31.23	V	PK
4874	34.34	-3.71	30.63	54.00	-23.37	V	AV
7311	48.23	2.26	50.49	74.00	-23.51	V	PK
7311	35.41	2.26	37.67	54.00	-16.33	V	AV
High Channel-2462MHz							
4924	63.34	-3.57	59.77	74.00	-14.23	H	PK
4924	51.48	-3.57	47.91	54.00	-6.09	H	AV
7386	50.67	1.91	52.58	74.00	-21.42	H	PK
7386	37.91	1.91	39.82	54.00	-14.18	H	AV
4924	47.10	-3.57	43.53	74.00	-30.47	V	PK
4924	35.67	-3.57	32.10	54.00	-21.90	V	AV
7386	46.40	1.91	48.31	74.00	-25.69	V	PK
7386	34.80	1.91	36.71	54.00	-17.29	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.

8.4 Environmental Conditions

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

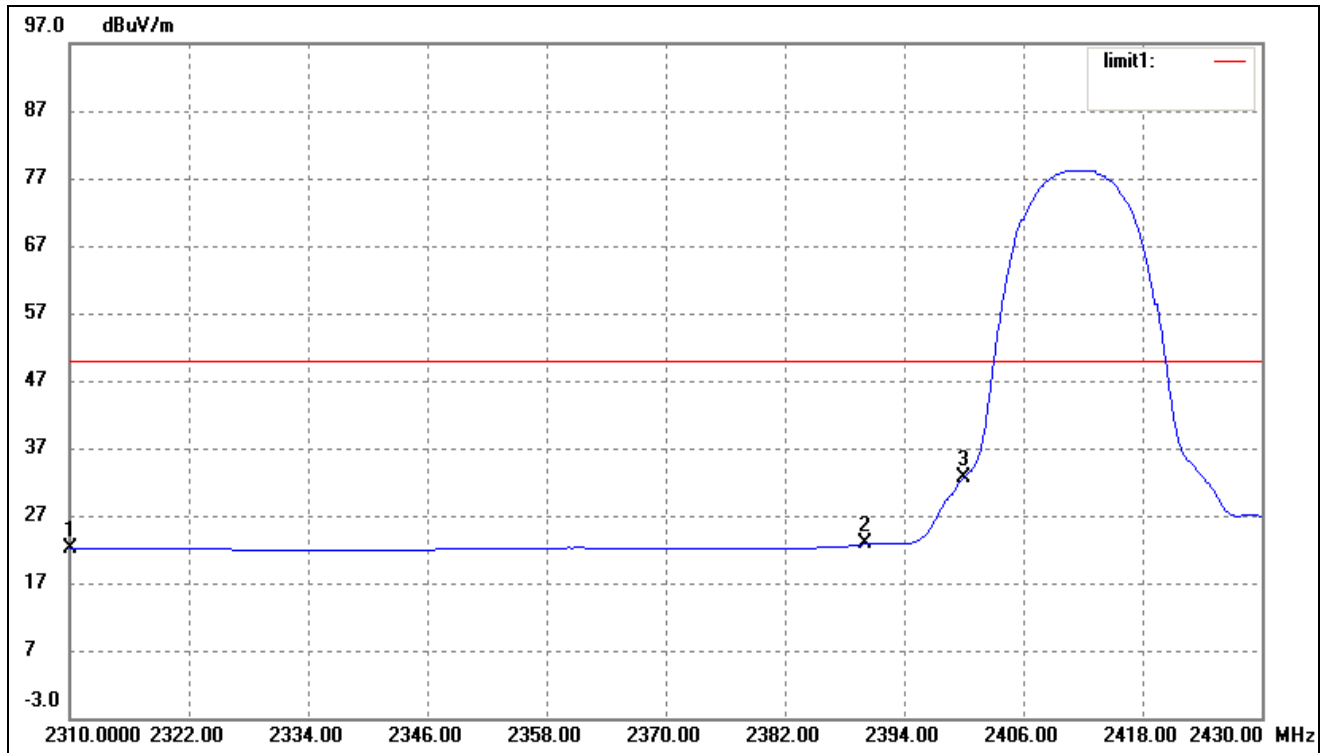
8.5 Summary of Test Results/Plots

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

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

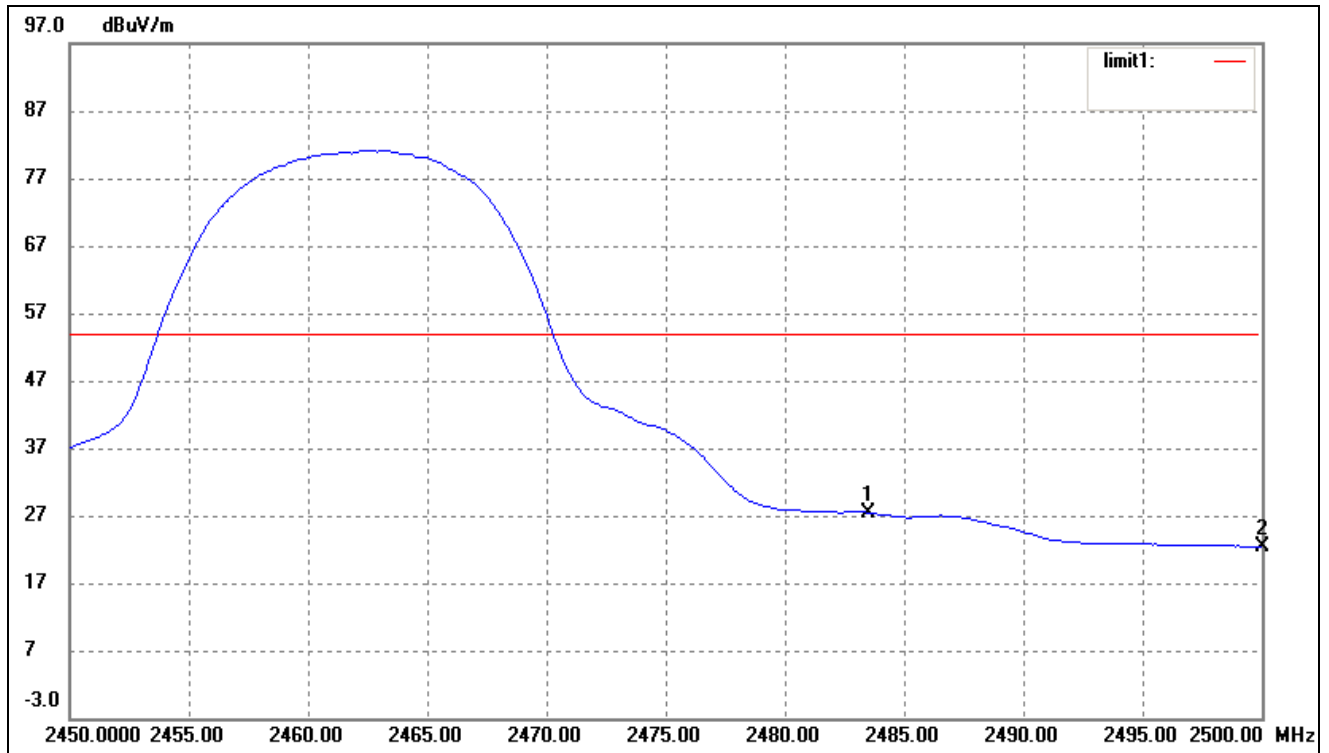
Please refer to the test plots as below.

802.11b-Lowest Bandedge



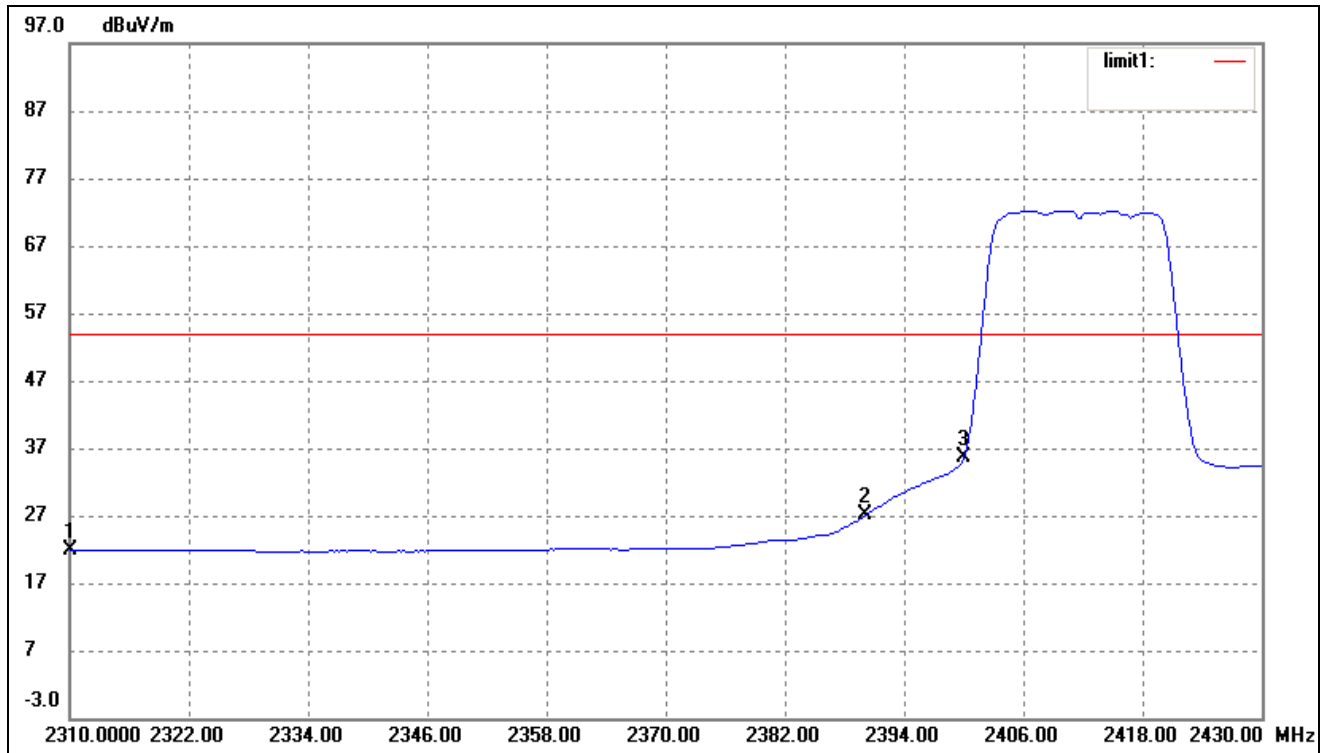
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2310.000	33.81	-11.72	22.09	50.00	-27.91	256	100	Ave
	2310.000	47.04	-11.72	35.32	74.00	-38.68	256	100	peak
2	2390.000	34.57	-11.75	22.82	50.00	-27.18	256	100	Ave
	2390.000	47.56	-11.75	35.81	74.00	-38.19	256	100	peak
3	2400.000	44.40	-11.75	32.65	50.00	-17.35	256	100	Ave
	2400.000	55.02	-11.75	43.27	74.00	-30.73	256	100	peak

802.11b-Highest Bandedge



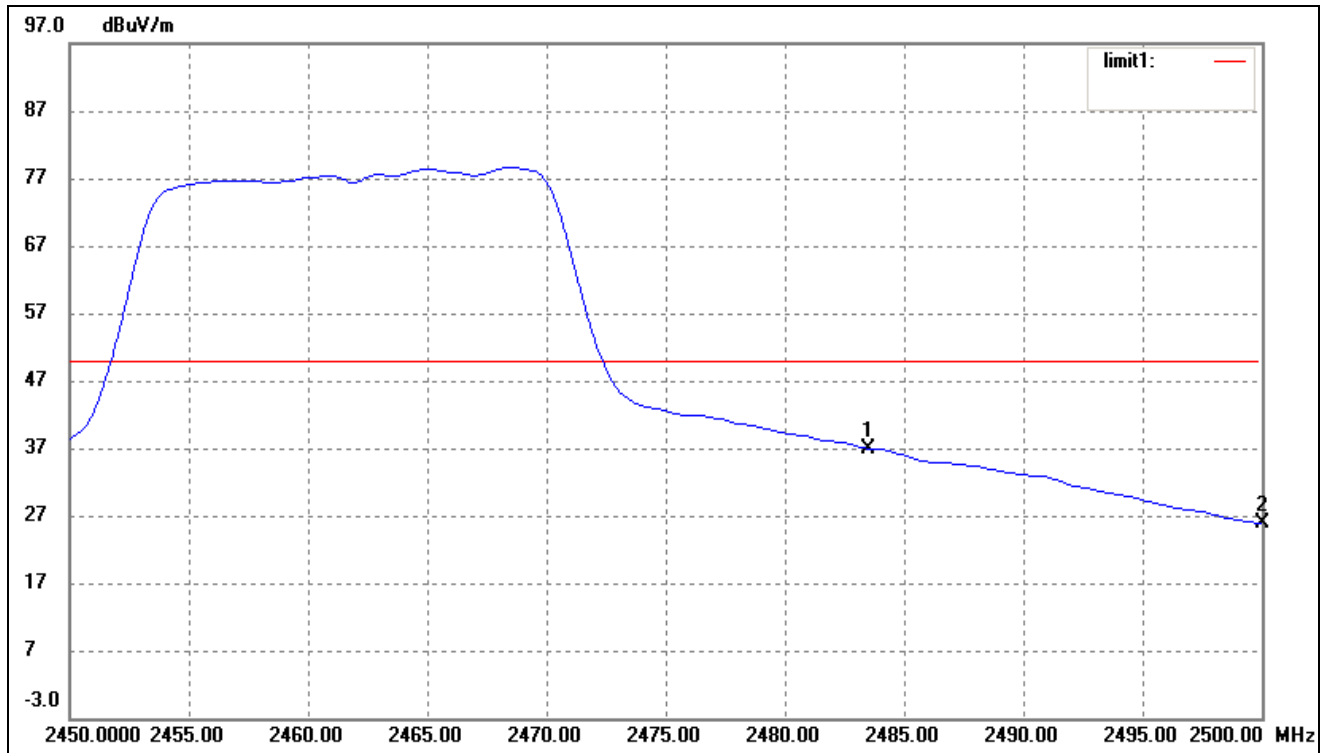
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2483.500	39.22	-11.78	27.44	54.00	-26.56	256	100	Ave
	2483.500	51.37	-11.78	39.59	74.00	-34.41	256	100	Peak
2	2500.000	34.18	-11.78	22.40	54.00	-31.60	256	100	Ave
	2500.000	46.64	-11.78	34.86	74.00	-39.14	256	100	Peak

802.11g-Lowest Bandedge



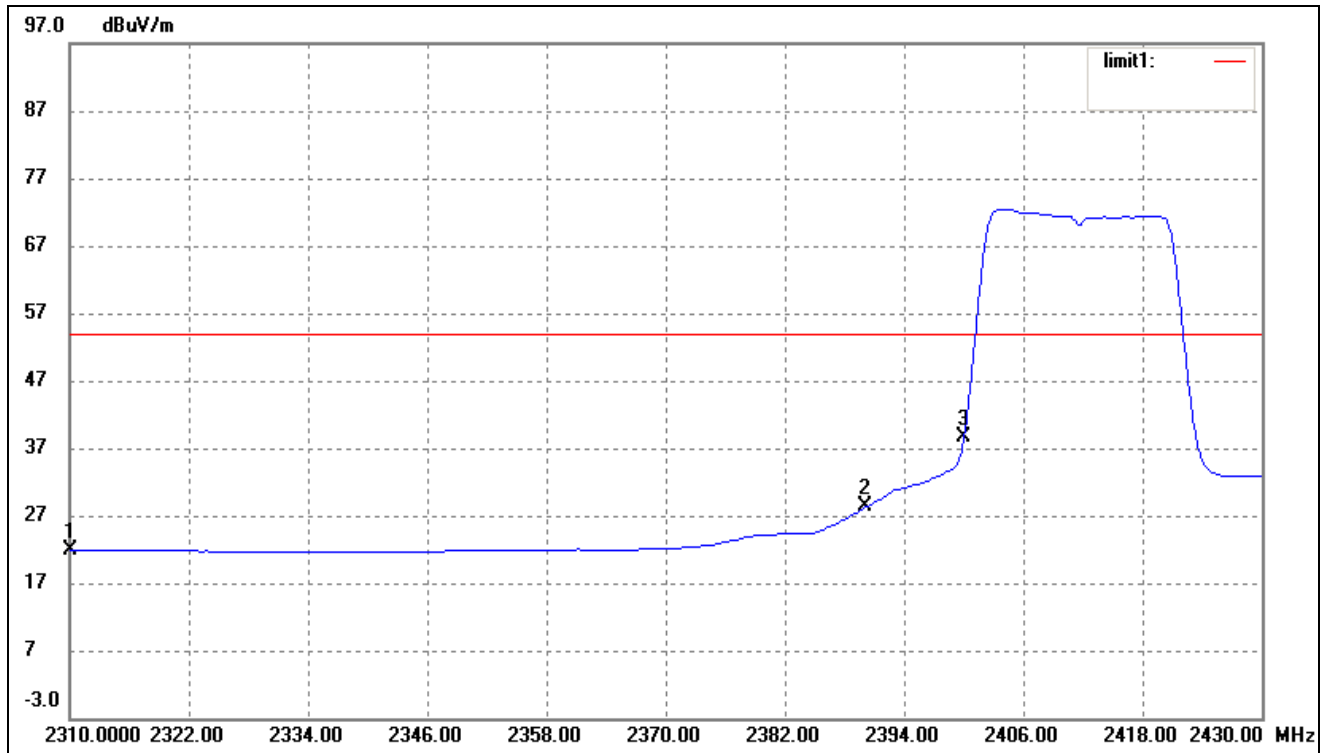
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2310.000	33.64	-11.72	21.92	54.00	-32.08	256	100	Ave
	2310.000	47.24	-11.72	35.52	74.00	-38.48	256	100	peak
2	2390.000	38.95	-11.75	27.20	54.00	-26.80	256	100	Ave
	2390.000	58.57	-11.75	46.82	74.00	-27.18	256	100	peak
3	2400.000	47.40	-11.75	35.65	54.00	-18.35	256	100	Ave
	2400.000	66.09	-11.75	54.34	74.00	-19.66	256	100	peak

802.11g-Highest Bandedge

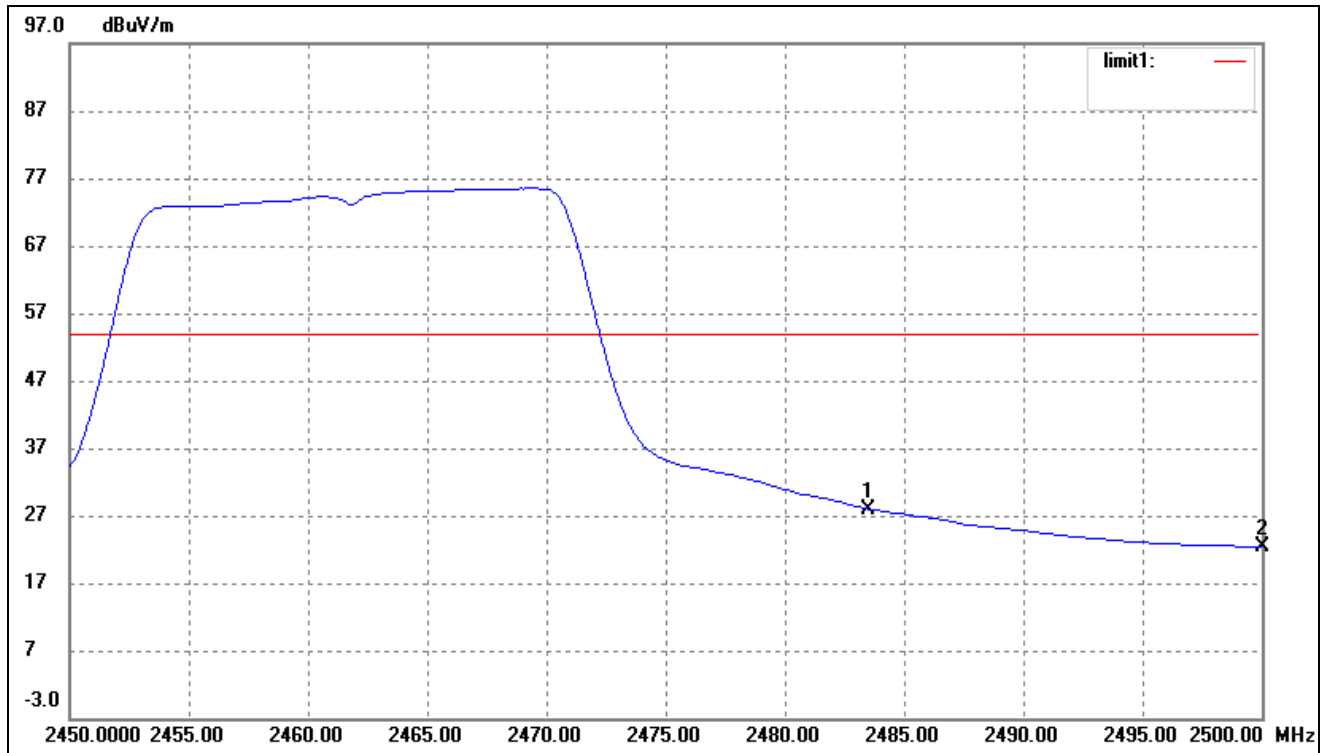


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2483.500	48.72	-11.78	36.94	50.00	-13.06	256	100	Ave
	2483.500	69.30	-11.78	57.52	74.00	-16.48	256	100	Peak
2	2500.000	37.62	-11.78	25.84	50.00	-24.16	256	100	Ave
	2500.000	58.10	-11.78	46.32	74.00	-27.68	256	100	Peak

802.11n-HT20-Lowest Bandedge



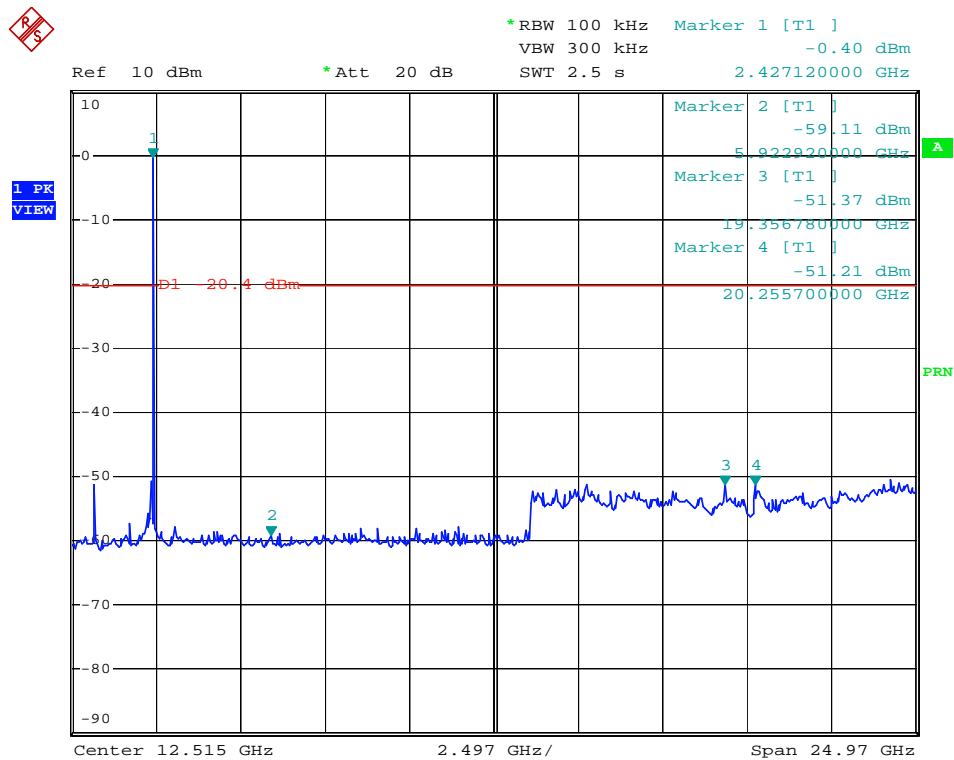
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2310.000	33.54	-11.72	21.82	54.00	-32.18	256	100	Ave
	2310.000	46.75	-11.72	35.03	74.00	-38.97	256	100	peak
2	2390.000	40.01	-11.75	28.26	54.00	-25.74	256	100	Ave
	2390.000	59.52	-11.75	47.77	74.00	-26.23	256	100	peak
3	2400.000	50.33	-11.75	38.58	54.00	-15.42	256	100	Ave
	2400.000	65.24	-11.75	53.49	74.00	-20.51	256	100	peak

802.11n-HT20-Highest Bandedge

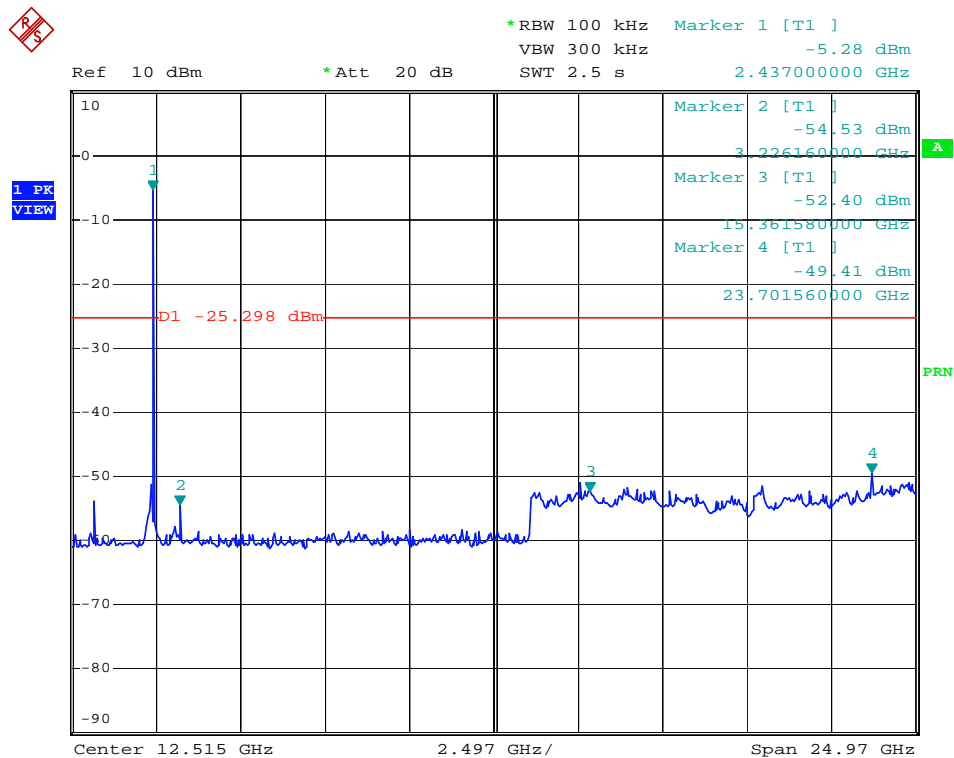
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2483.500	39.75	-11.78	27.97	54.00	-26.03	256	100	Ave
	2483.500	59.51	-11.78	47.73	74.00	-26.27	256	100	Peak
2	2500.000	34.14	-11.78	22.36	54.00	-31.64	256	100	Ave
	2500.000	47.80	-11.78	36.02	74.00	-37.98	256	100	Peak

Conducted Spurious Emissions

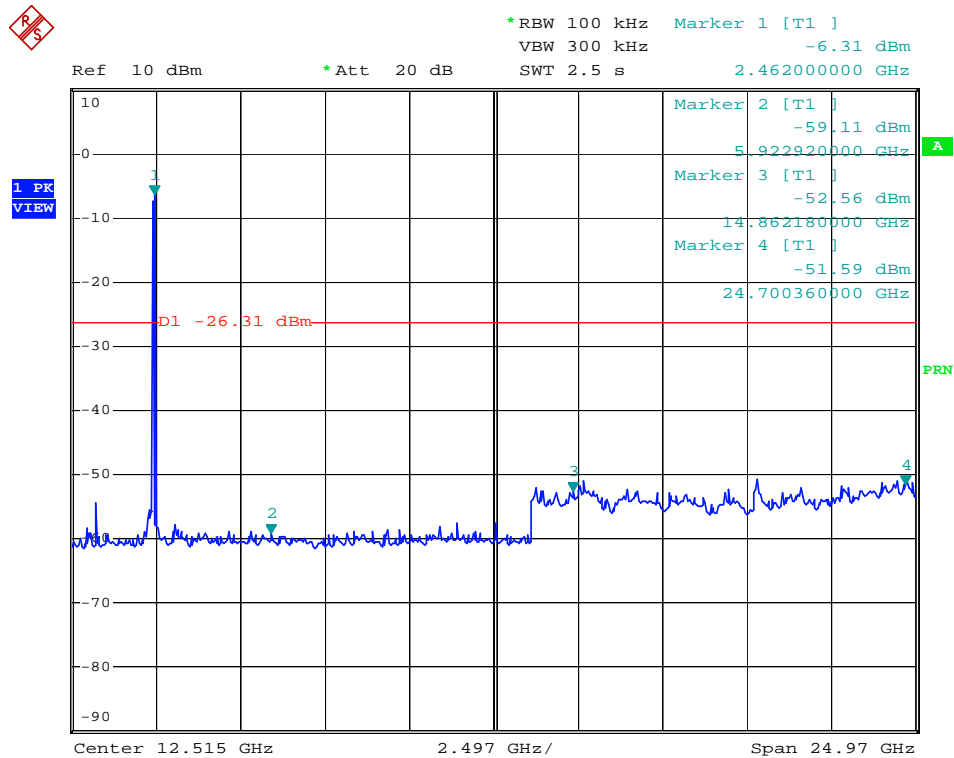
802.11b Low Bandedge



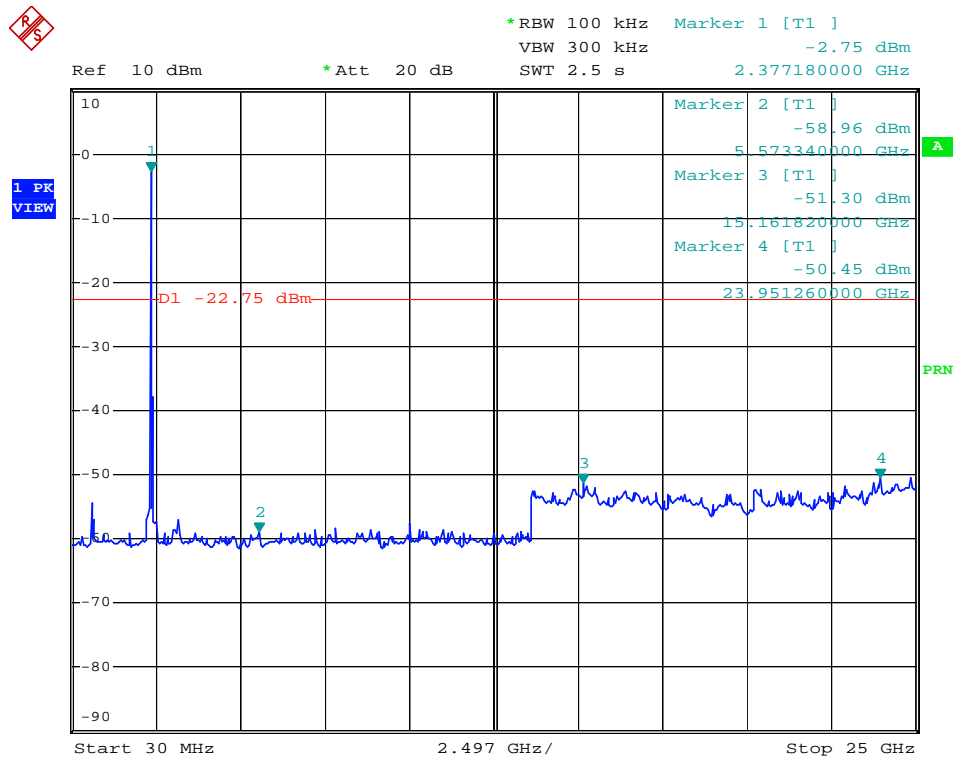
802.11b Middle Bandedge



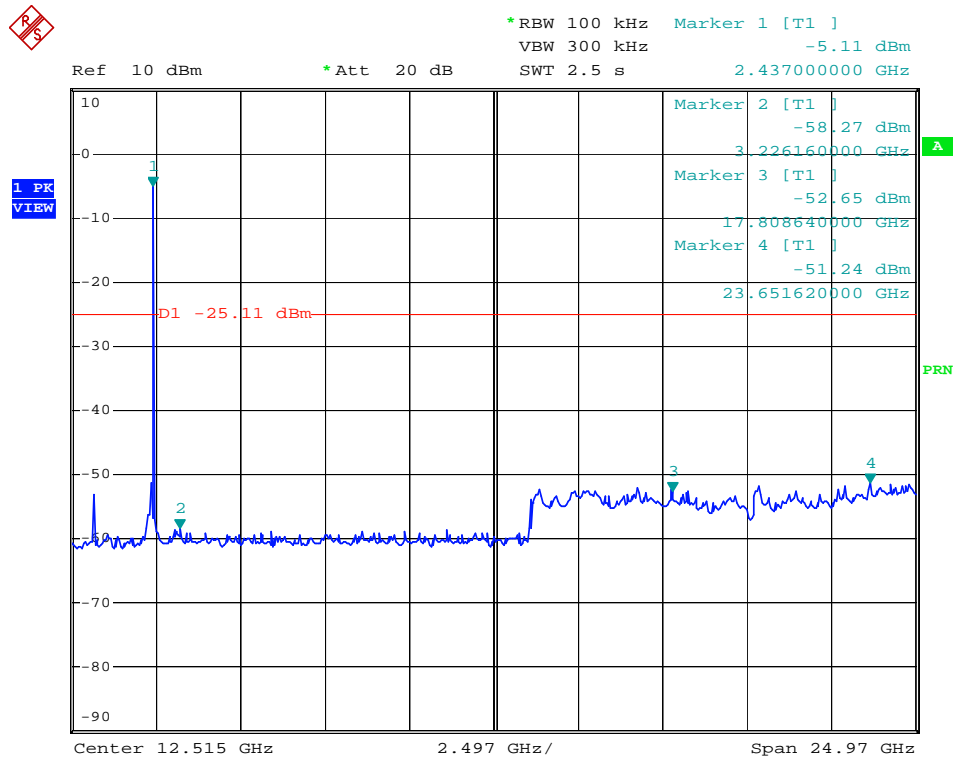
802.11b High Bandedge



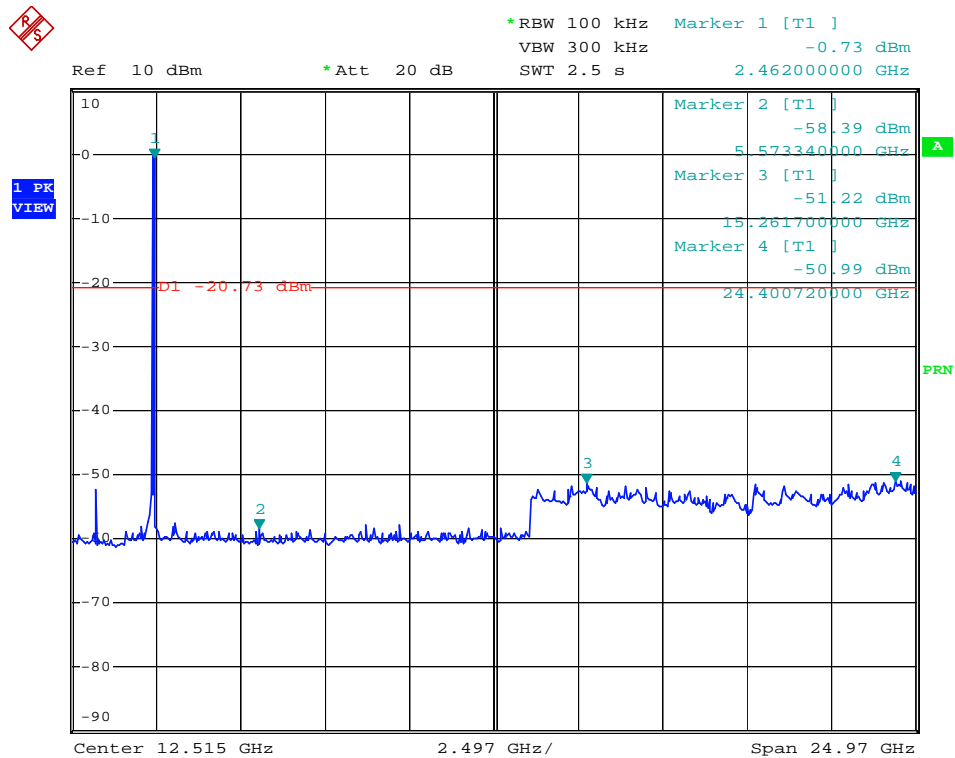
802.11g Low Bandedge



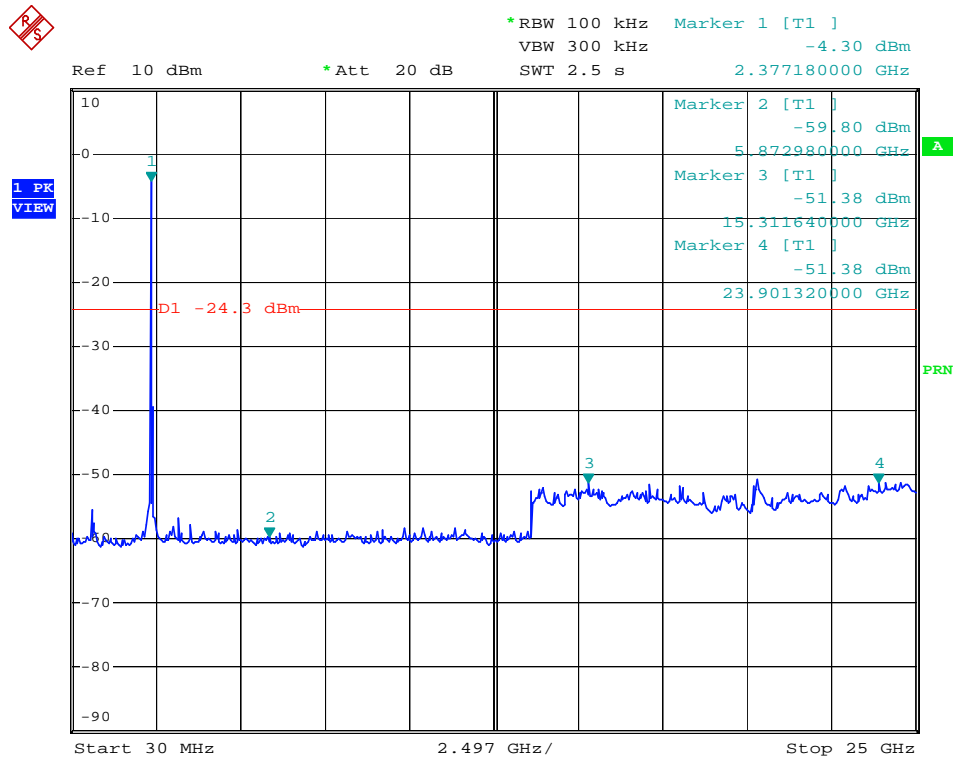
802.11g Middle Bandedge



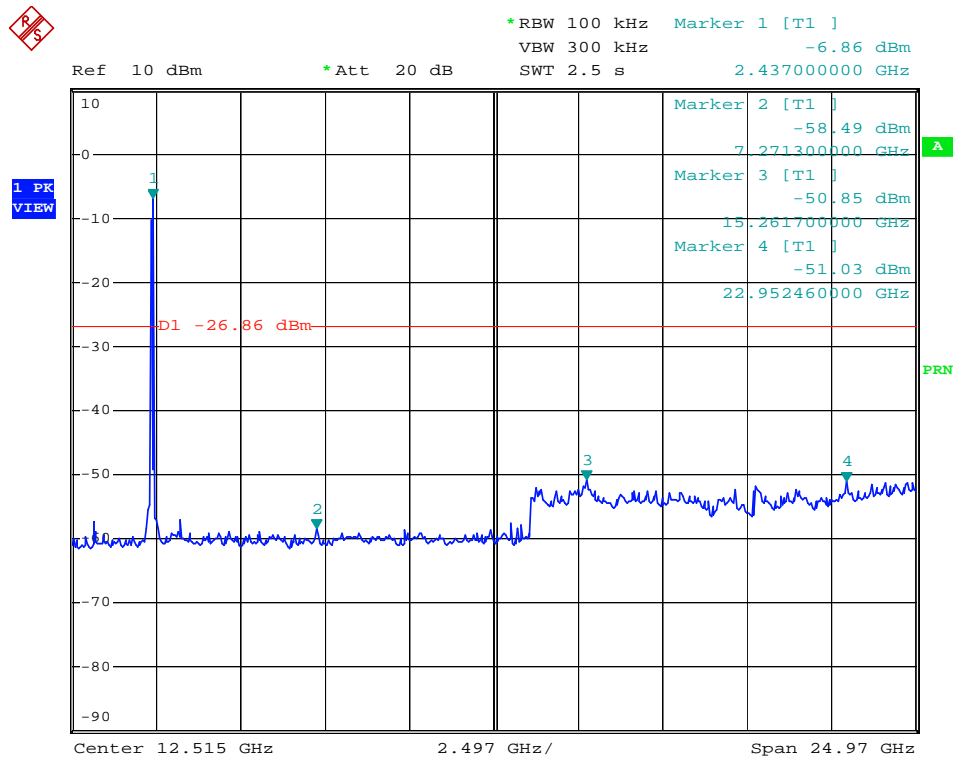
802.11g High Bandedge



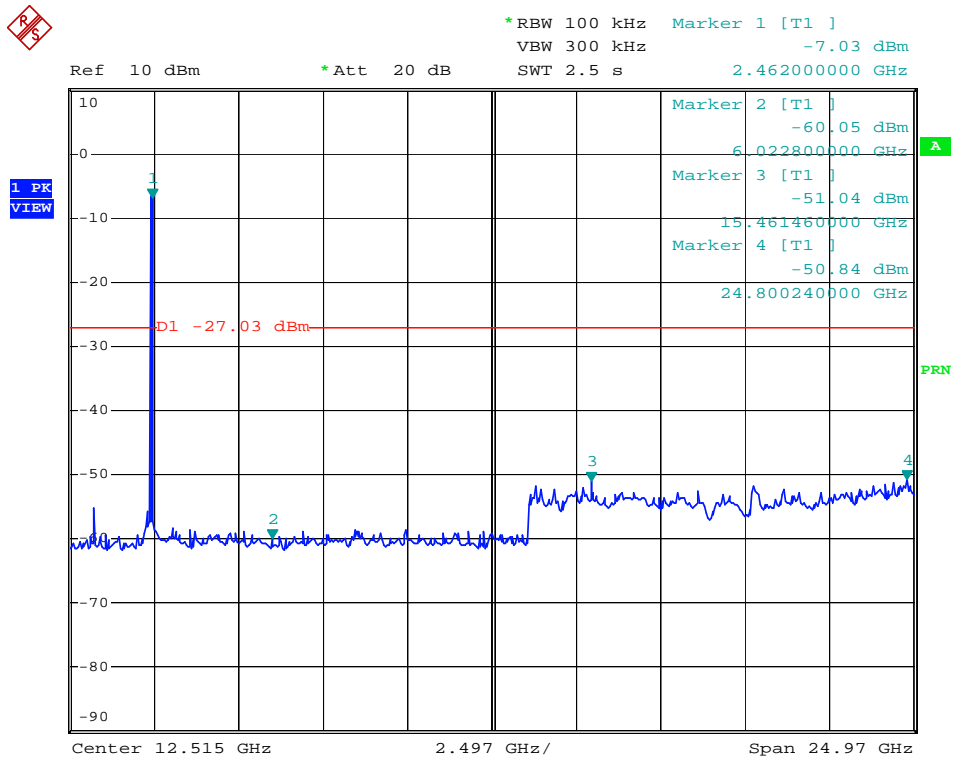
802.11n-HT20 Low Bandedge



802.11n-HT20 Middle Bandedge



802.11n-HT20 High Bandedge



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

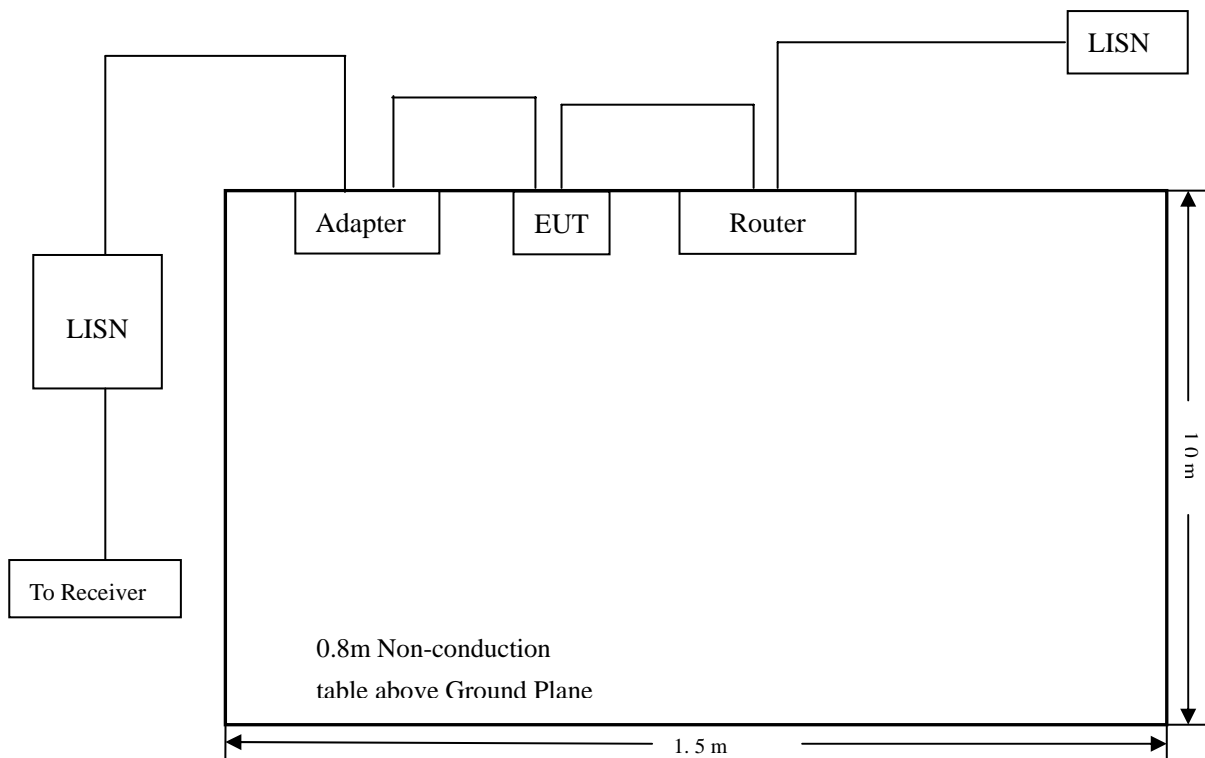
9.3 Test Procedure

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:

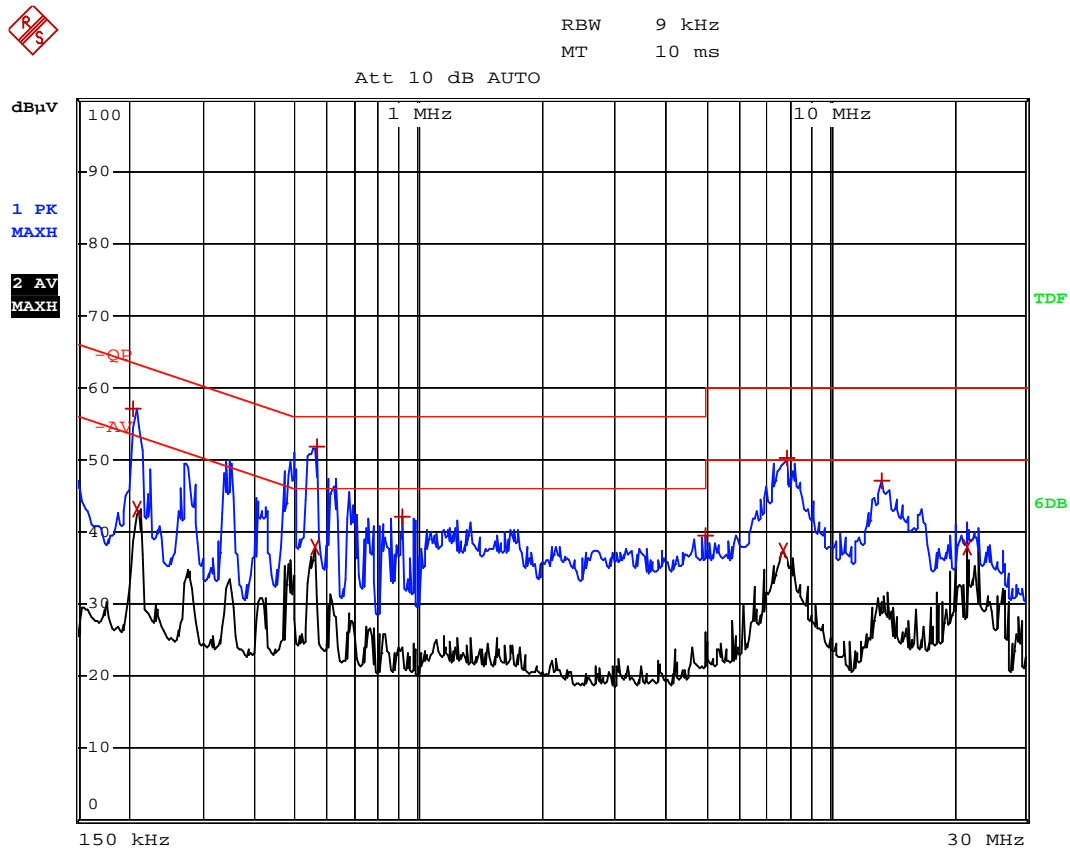
-4.20 dB at 0.566 MHz in the Line mode, Peak detector, 0.15-30MHz

9.8 Conducted Emissions Test Data

Test Specification: *Neutral*

EDIT PEAK LIST (Prescan Results)			
Trace1:		-QP	
Trace2:		-AV	
Trace3:		---	
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Max Peak	206 kHz	56.07	-7.28
2 Average	206 kHz	41.02	-12.34
1 Max Peak	486 kHz	50.85	-5.38
2 Average	542 kHz	34.29	-11.70
1 Max Peak	1.162 MHz	42.53	-13.46
1 Max Peak	2.126 MHz	38.46	-17.53
2 Average	7.714 MHz	34.11	-15.88
1 Max Peak	7.89 MHz	48.26	-11.73
1 Max Peak	13.626 MHz	42.83	-17.16
2 Average	21.662 MHz	37.67	-12.33

Test Specification: Line



EDIT PEAK LIST (Prescan Results)

Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Max Peak	206 kHz	57.07	-6.29
2 Average	210 kHz	43.30	-9.90
2 Average	558 kHz	38.02	-7.98
1 Max Peak	566 kHz	51.79	-4.20
1 Max Peak	918 kHz	42.00	-13.99
1 Max Peak	4.998 MHz	39.46	-16.53
2 Average	7.714 MHz	37.49	-12.50
1 Max Peak	7.898 MHz	50.32	-9.67
1 Max Peak	13.334 MHz	47.18	-12.81
2 Average	21.662 MHz	38.05	-11.94

***** END OF REPORT *****