FCC Part 15C

Measurement and Test Report

For

Hong Kong RFID Ltd.

Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong

FCC ID: XNOHKRAR001

Report Concerns: Original Report	**Equipment Type:** Wireless 2.4GHz Active RFID Reader
Model:	HKRAR-EMWF
Report No.:	STR10078138I-1
Test Date:	2010-08-02 to 2010-08-31
Issue Date:	2010-09-02
Tested By:	Susan Su / Engineer
Reviewed By:	Lahm Peng / EMC Manager
Approved & Authorized By:	Jandy so / PSQ Manager

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Hong Kong RFID Ltd.
Address of applicant:	Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong
Manufacturer:	Hong Kong RFID Ltd.
Address of manufacturer:	Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong

General Description of E.U.T

Items	Description
EUT Description:	Wireless 2.4GHz Active RFID Reader
Trade Name:	Empress™
Model No.:	HKRAR-EMWF
Rated Voltage:	DC 5V
Max. Output Power	Max. 13.66dBm(EIRP)
Antenna Gain:	3dBi
Frequency range:	2412~2462MHz
Number of channels:	11
Channel Separation:	5MHz
Type of Antenna:	Detachable Antenna
Size:	13.8X10.7X2.6cm

Note: The test data gathered are from a production sample provided by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the Hong Kong RFID 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 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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 equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel, accordingly in reference to the Operating Instructions.

1.5 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.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
ASUS	Notebook	X50R	/

1.8 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
Power Cable	1.86	Unshielded	Without Core
RJ45 Cable	1.56	Unshielded	Without Core

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203; § 15.247(c)(1)(i)	Antenna Requirement	Compliant
§ 1.1307(b)	Maximum Permissible Exposure	Compliant
§ 15.207	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	Power Output	Compliant
§ 15.209(a)(d)	Radiated Emission	Compliant
§ 15.247(d)	Band edge	Compliant

3. CONDUCTED EMISSIONS

3.1 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.

3.2 Test Equipment List and Details

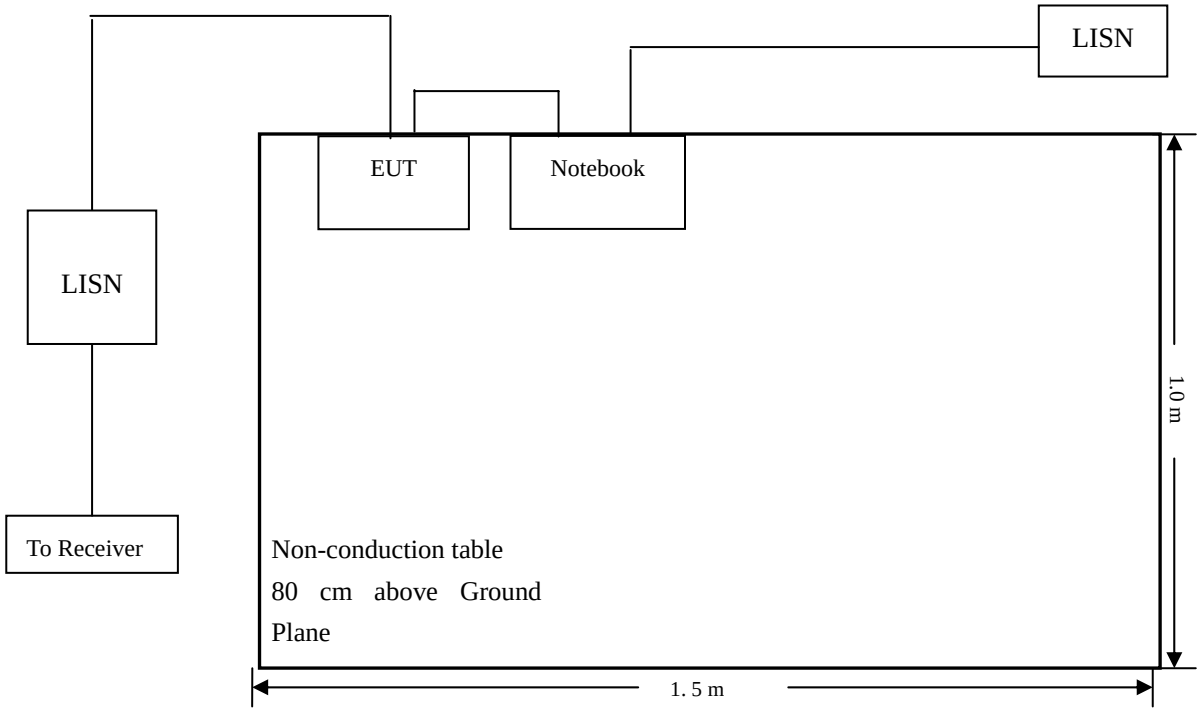
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-08-12	2011-08-11
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-08-12	2011-08-11
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-08-12	2011-08-11

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

3.3 Test Procedure

Test is conducting under the description of ANSI C63.4-2009, 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.

3.4 Basic Test Setup Block Diagram



3.5 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	52 %
ATM Pressure:	1011 mbar

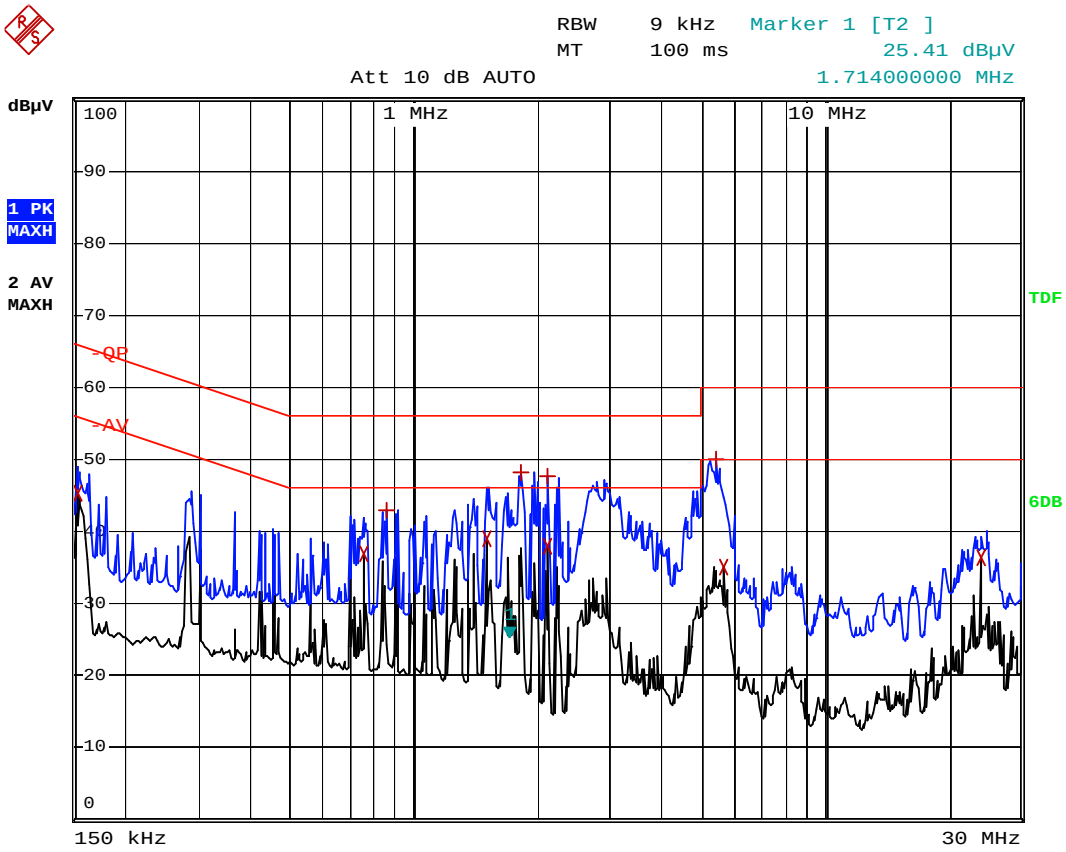
3.6 Summary of Test Results/Plots

According to the data in section 3.7, the EUT complied with the FCC 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-6.65 dBµV at **2.238 MHz** in the **Line**, **Average** detector, 0.15-30MHz

3.7 Conducted Emissions Test Data/Plots

Operating Condition: Wireless Transmitting
Test Specification: N
Comment: 120V/60Hz; DC 5V



EDIT PEAK LIST (Prescan Results)

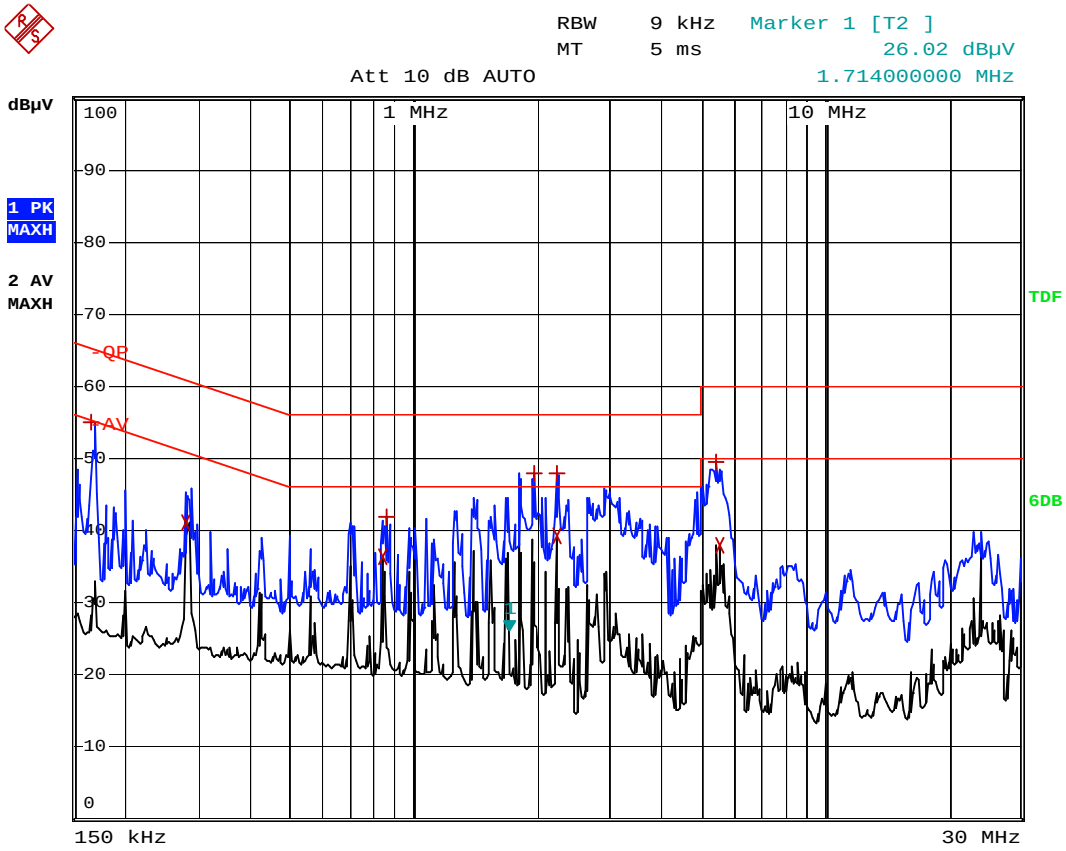
Trace1:	-QP
Trace2:	-AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	154 kHz	45.32	-10.45
2 Average	758 kHz	36.96	-9.03
1 Max Peak	862 kHz	42.78	-13.21
2 Average	1.51 MHz	38.86	-7.13
1 Max Peak	1.818 MHz	48.27	-7.72
1 Max Peak	2.122 MHz	47.66	-8.33
2 Average	2.122 MHz	38.02	-7.97
1 Max Peak	5.454 MHz	49.92	-10.07
2 Average	5.654 MHz	35.16	-14.83
2 Average	23.986 MHz	36.30	-13.69

Operating Condition: Wireless Transmitting

Test Specification: L

Comment: 120V/60Hz; DC 5V



EDIT PEAK LIST (Prescan Results)

Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	166 kHz	54.92	-10.23
2 Average	282 kHz	40.96	-9.79
2 Average	838 kHz	36.31	-9.68
1 Max Peak	862 kHz	41.97	-14.02
1 Max Peak	1.962 MHz	47.93	-8.06
1 Max Peak	2.238 MHz	48.01	-7.98
2 Average	2.238 MHz	39.34	-6.65
1 Max Peak	5.438 MHz	49.51	-10.48
2 Average	5.57 MHz	38.03	-11.96

4. §15.203 - ANTENNA REQUIREMENT

4.1 Standard Applicable

According to FCC 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.

4.2 Test Result

This product has a unique and detachable antenna, fulfill the requirement of this section.

5. POWER SPECTRAL DENSITY

5.1 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.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-08-12	2011-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-08-12	2011-08-11

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 center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW=3kHz, VBW≧RBW , Span =300kHz.
4. Repeat above procedures until all frequency measured was complete.

6.4 Environmental Conditions

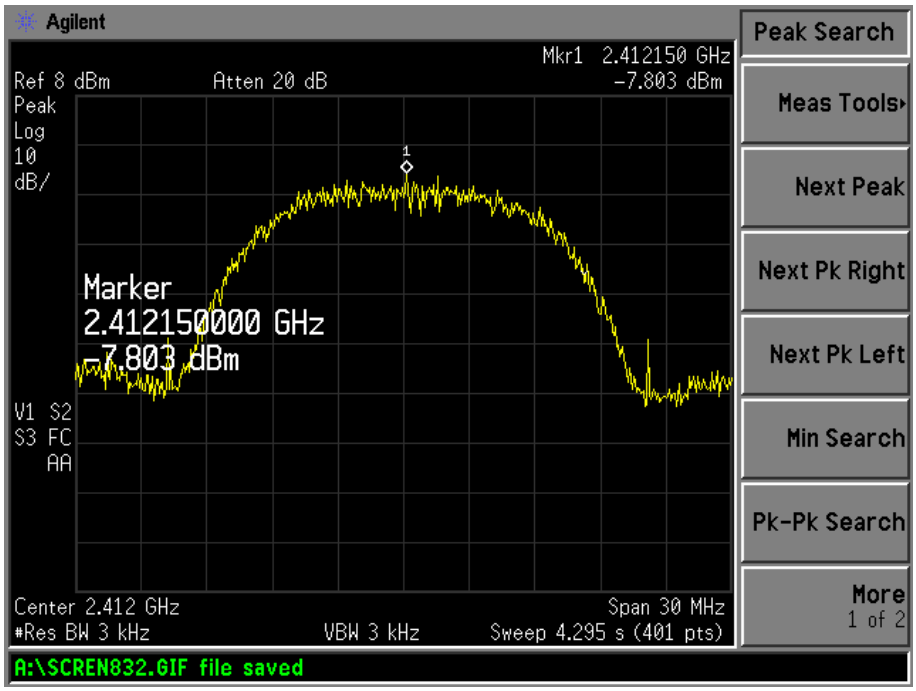
Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

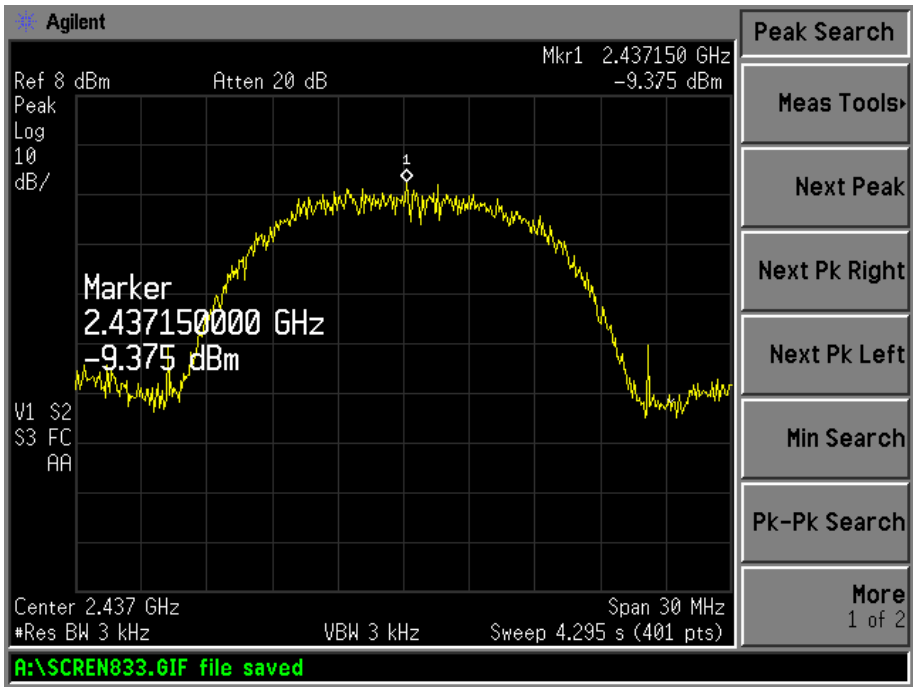
Test mode	Test channel	Reading dBm/3kHz	Antenna Gain dBi	Corrected dBm/3kHz	Limit dBm/3kHz
802.11b	Low channel (2412MHz)	-7.803	3	-4.803	8
	Middle channel (2437MHz)	-9.375	3	-6.375	8
	High channel (2462MHz)	-10.180	3	-7.180	8
802.11g	Low channel (2412MHz)	-10.210	3	-7.210	8
	Middle channel (2437MHz)	-11.740	3	-8.740	8
	High channel (2462MHz)	-13.150	3	-10.150	8

For 802.11b

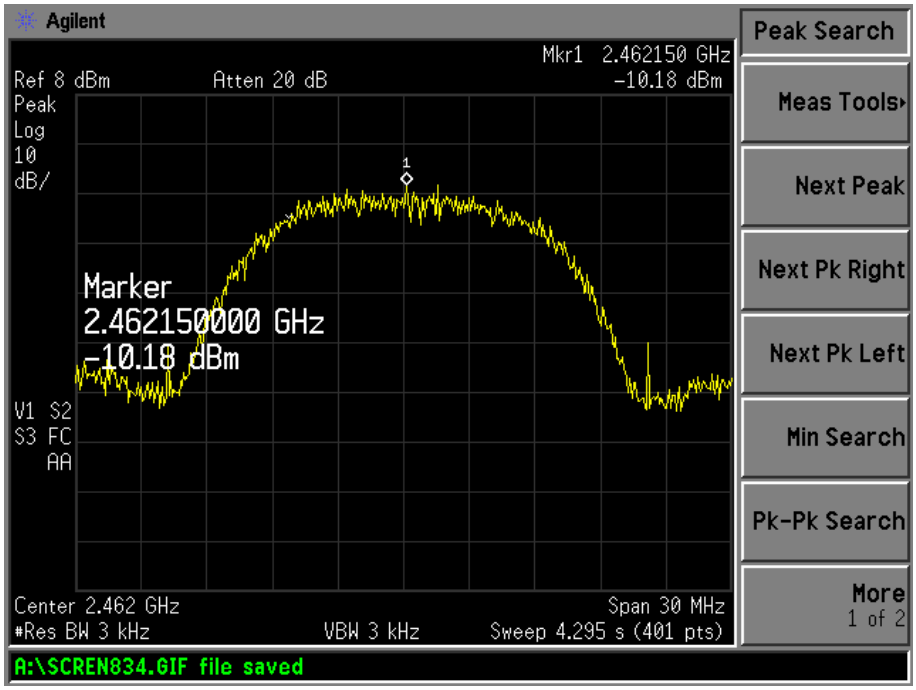
Low Channel:



Middle Channel:

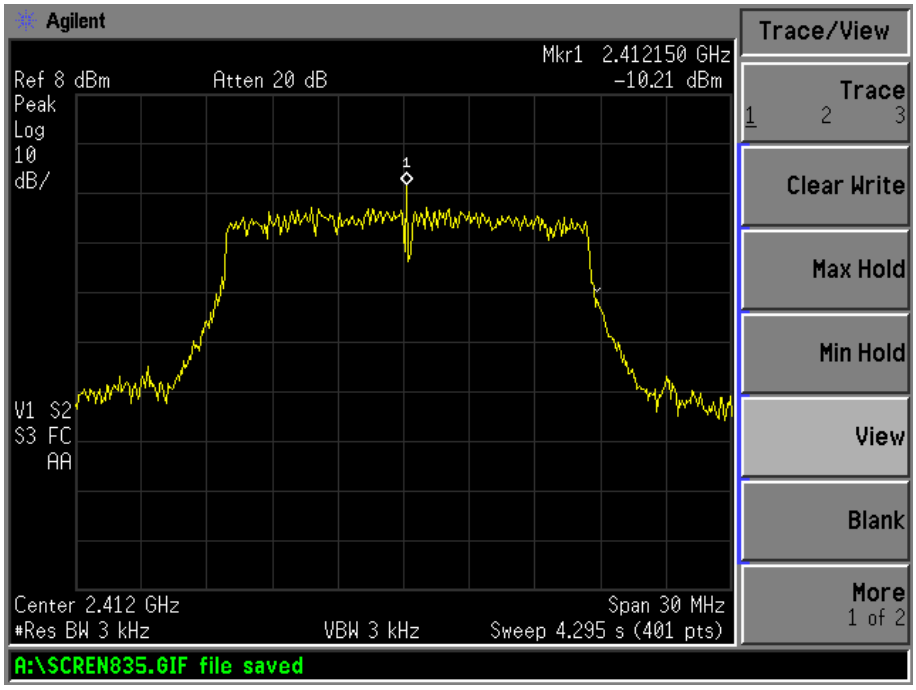


High Channel:

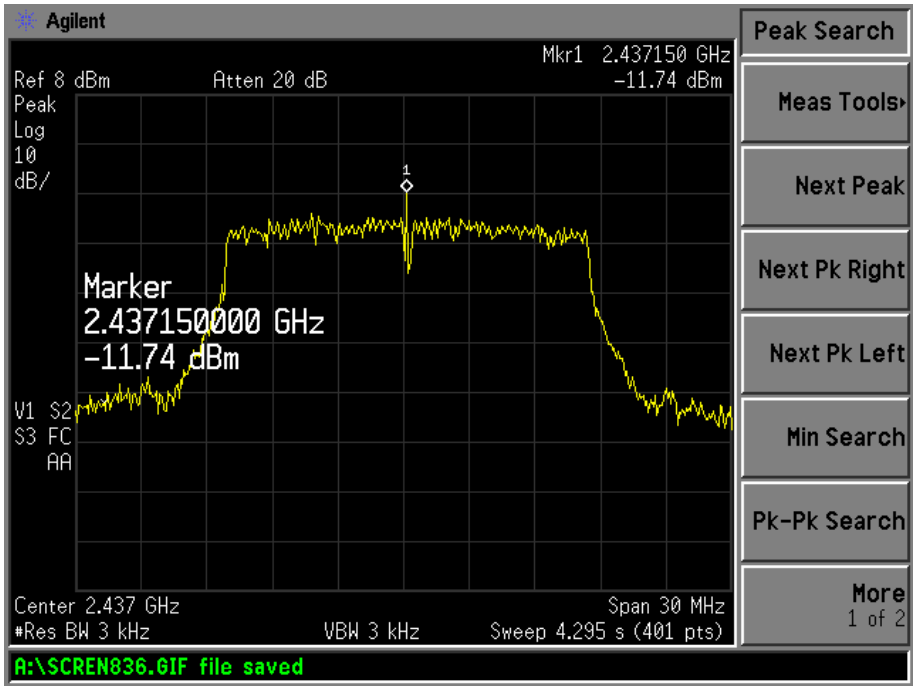


For 802.11g

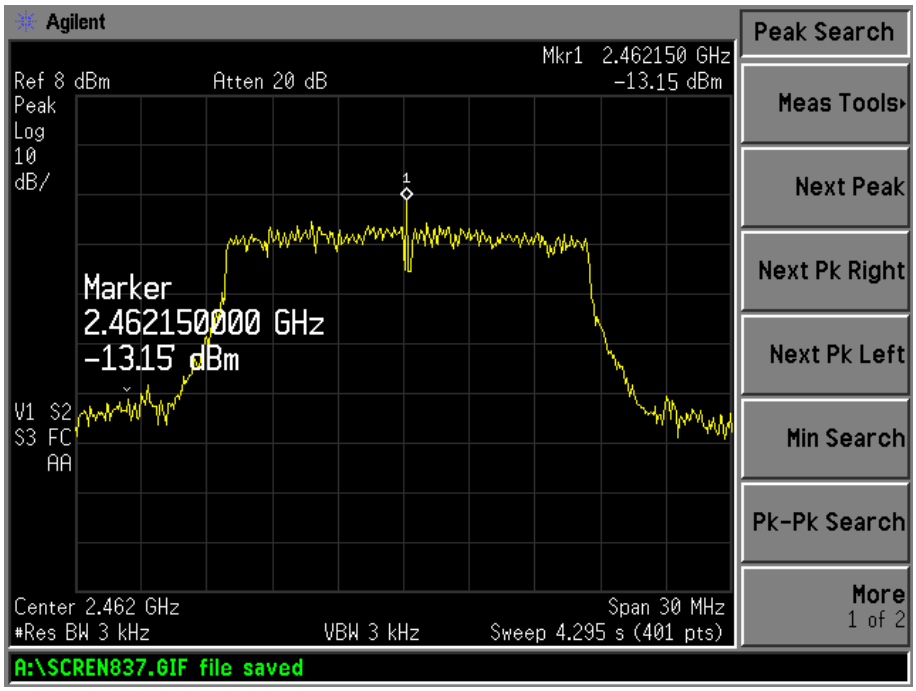
Low Channel:



Middle Channel:



High Channel:



6. 6-dB BANDWIDTH

6.1 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.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-08-12	2011-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-08-12	2011-08-11

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

6.3 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 center frequency of spectrum analyzer = operating frequency.
3. The spectrum analyzer as RBW=100KHz VBW≧RBW, Sweep=auto
4. Mark the peak frequency and –6dB (upper and lower) frequency.

6.4 Environmental Conditions

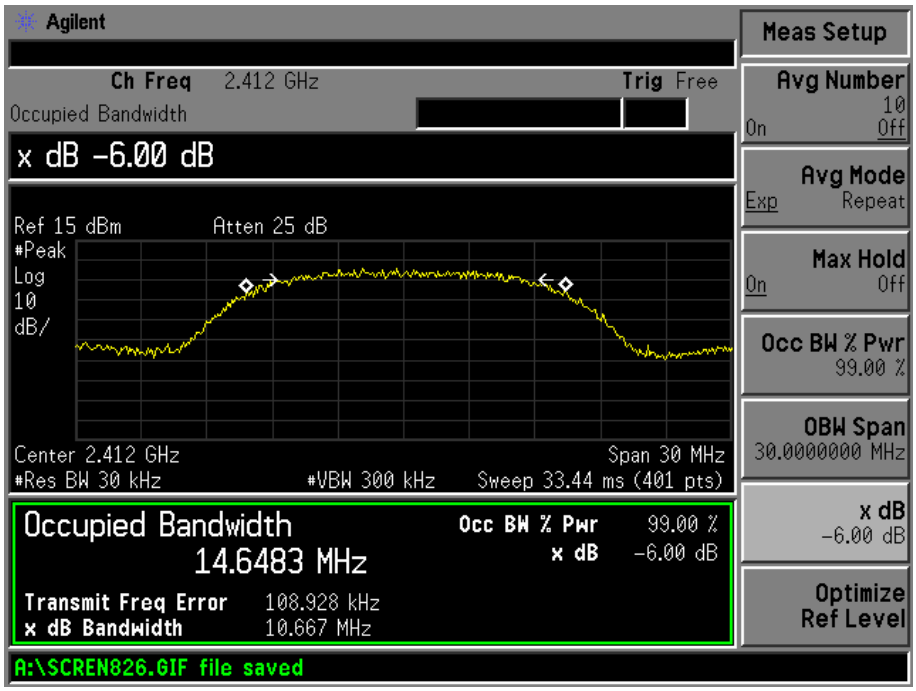
Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	1012 mbar

6.5 Summary of Test Results/Plots

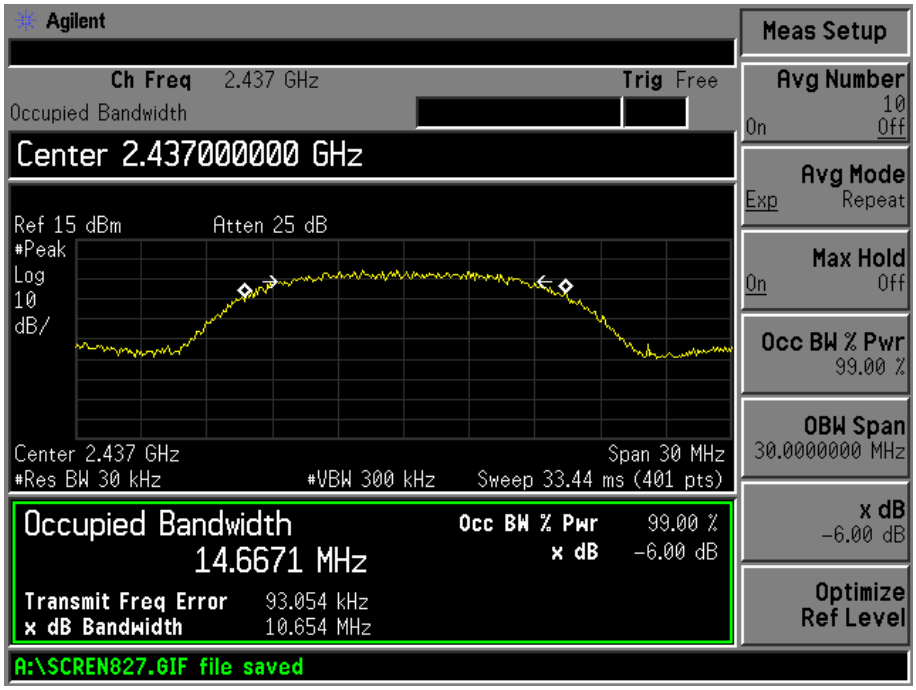
Test mode	Frequency MHz	6 dB Bandwidth kHz	Limit kHz
802.11b	2412	10667	500
	2437	10654	500
	2462	10652	500
802.11g	2412	16487	500
	2437	16495	500
	2462	16564	500

For 802.11b

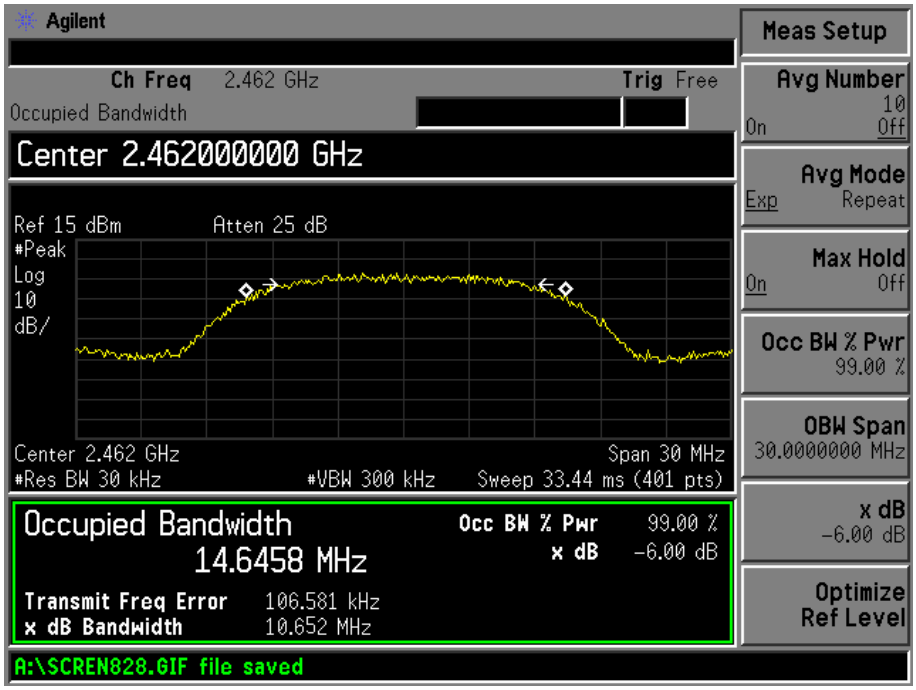
Low Channel:



Mid Channel:

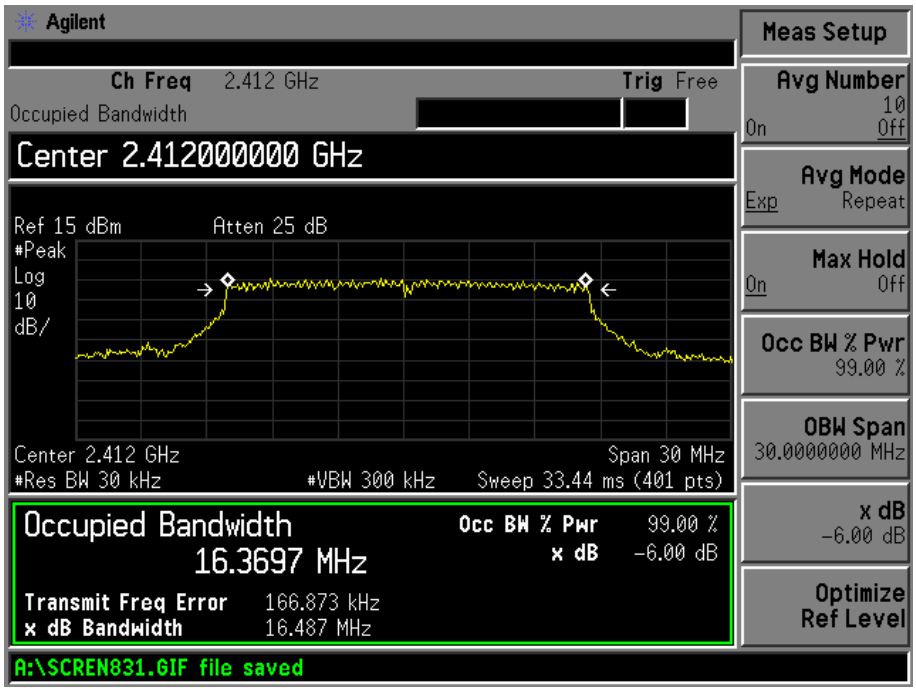


High Channel:

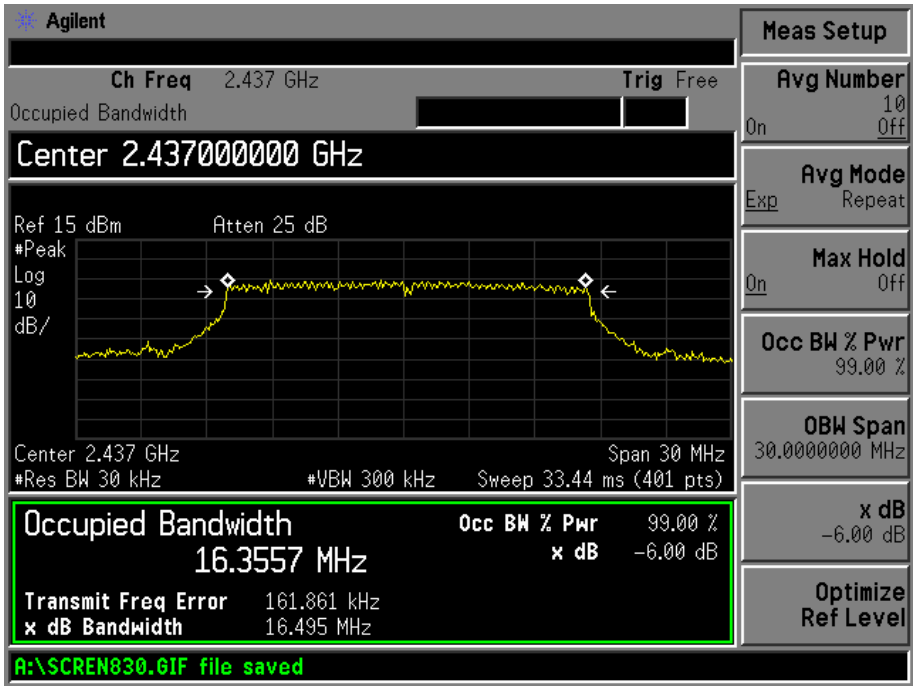


For 802.11g

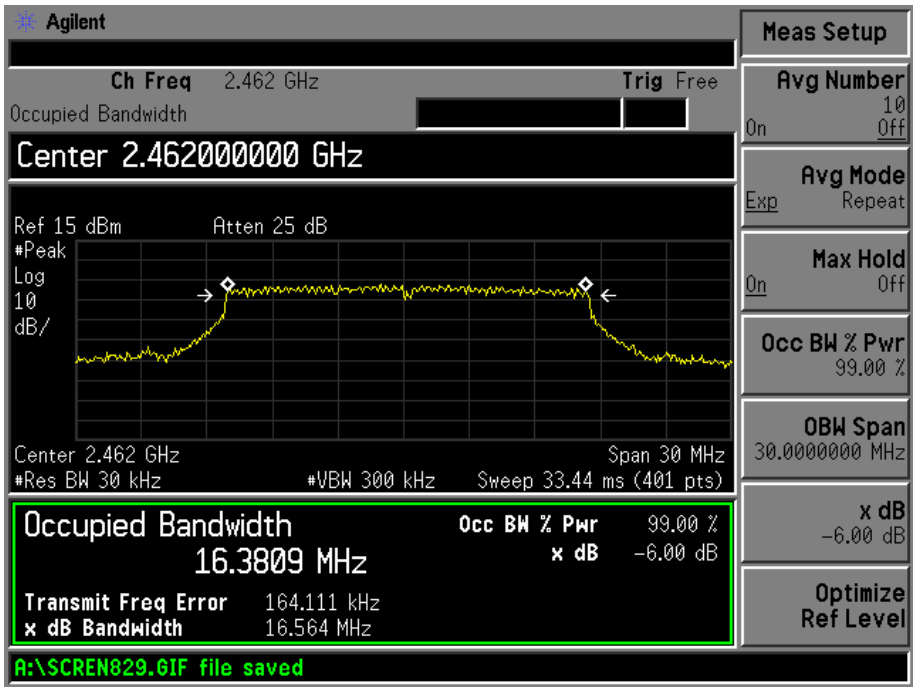
Low Channel:



Mid Channel:



High Channel:



7. POWER OUTPUT

7.1 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.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-08-12	2011-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-08-12	2011-08-11

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

7.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 (2005), the method #1 of the power output option2 was used, the following is the measurement procedure.

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.

2. Set RBW = 1 MHz, Set VBW $\geqslant$ 3 MHz.

4. Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode.

5. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to “free run”.

6. Trace average 100 traces in power averaging mode.

7. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer’s band power measurement function with band limits set equal to the EBW band edges.

7.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54 %
ATM Pressure:	1013 mbar

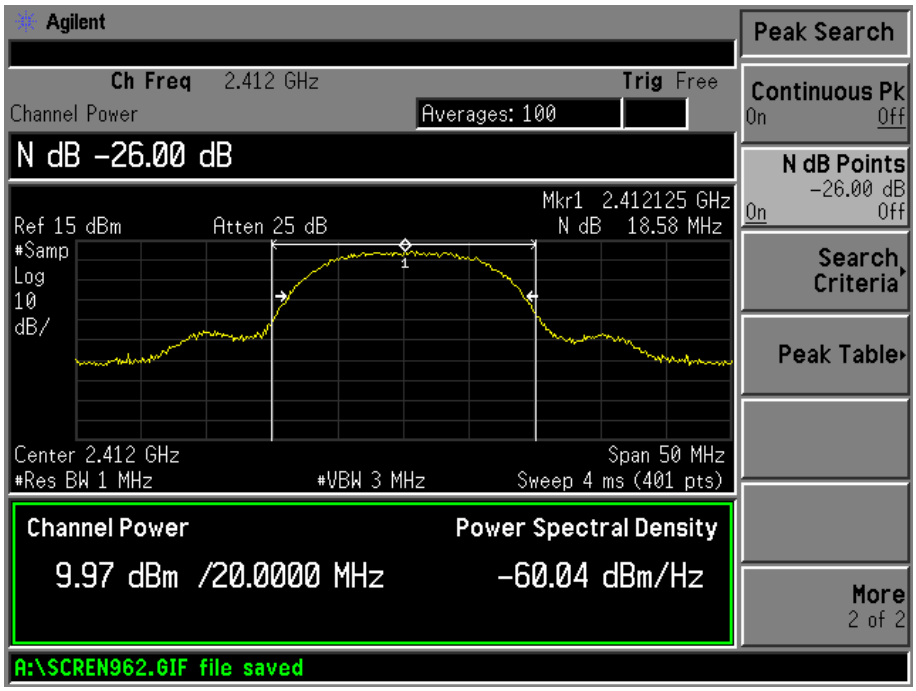
7.5 Summary of Test Results/Plots

Transmitting Mode: Transmits continuously

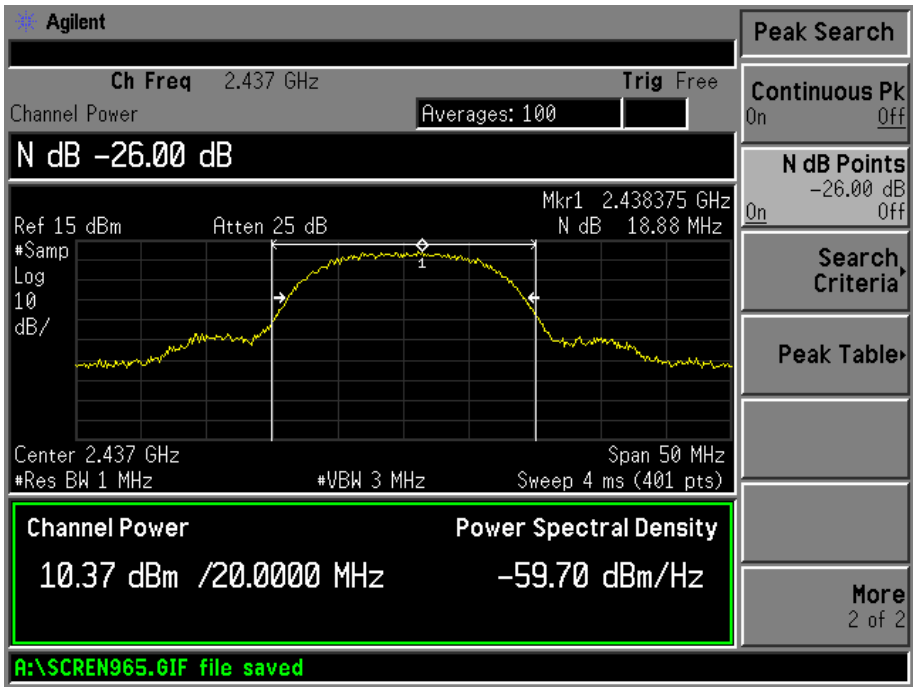
Test mode	Frequency MHz	Output Power dBm	Antenna Gain dBi	Outpput Power mW	Limit mW
11b_long_1Mbps	2412	9.97	3	19.8153	1000
	2437	10.37	3	21.7270	1000
	2462	10.19	3	20.8449	1000
11b_long_11Mbps	2412	10.54	3	22.5944	1000
	2437	10.59	3	22.8560	1000
	2462	9.94	3	19.6789	1000
11b_short_1Mbps	2412	10.66	3	23.2274	1000
	2437	10.51	3	22.4388	1000
	2462	10.11	3	20.4644	1000
11b_short_11Mbps	2412	10.59	3	22.8560	1000
	2437	10.06	3	20.2302	1000
	2462	10.34	3	21.5774	1000
11g_6Mbps	2412	8.82	3	15.2055	1000
	2437	8.53	3	14.2233	1000
	2462	8.31	3	13.5207	1000
11g_54Mbps	2412	8.75	3	14.9624	1000
	2437	8.57	3	14.3549	1000
	2462	8.26	3	13.3660	1000

For 802.11b_long_1Mbps

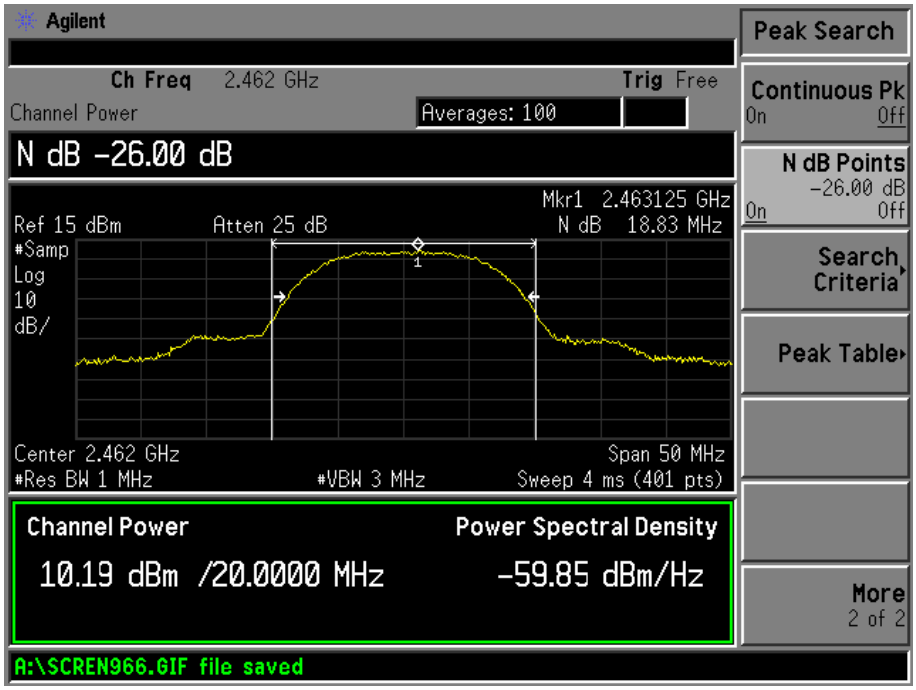
Low Channel:



Middle Channel:

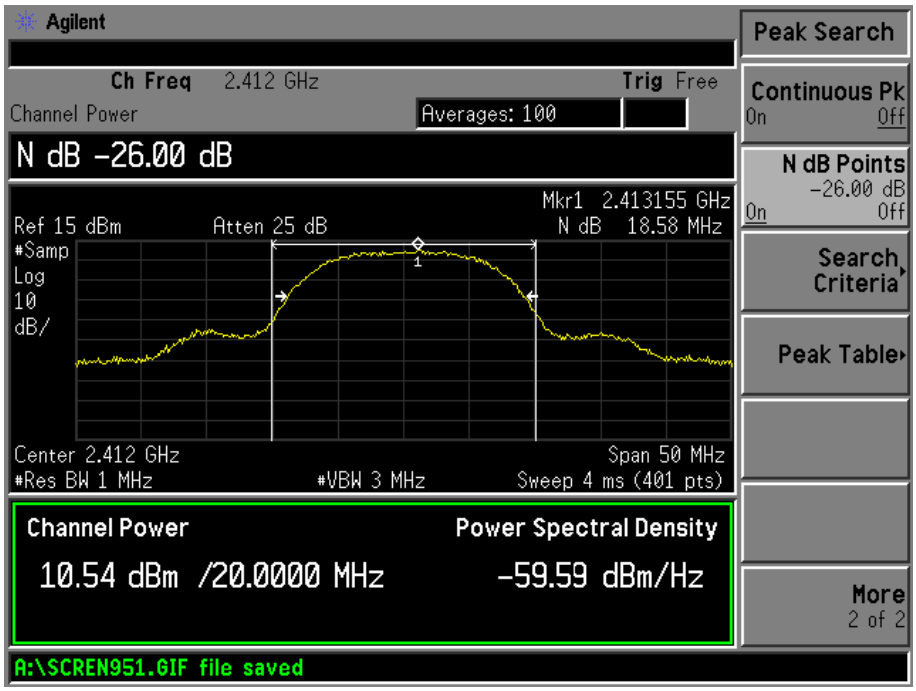


High Channel:

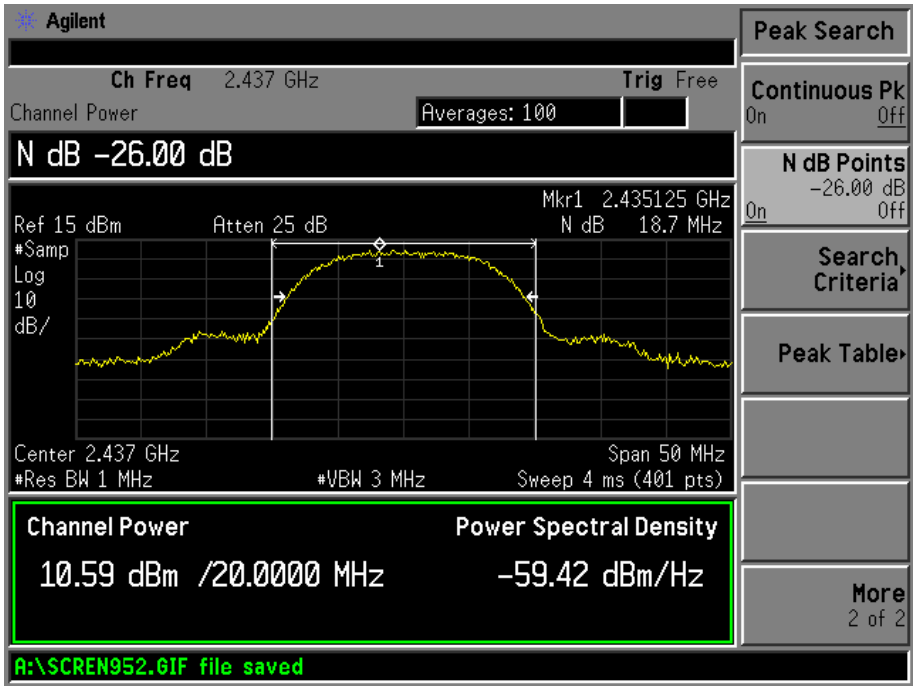


For 802.11b_long_11Mbps

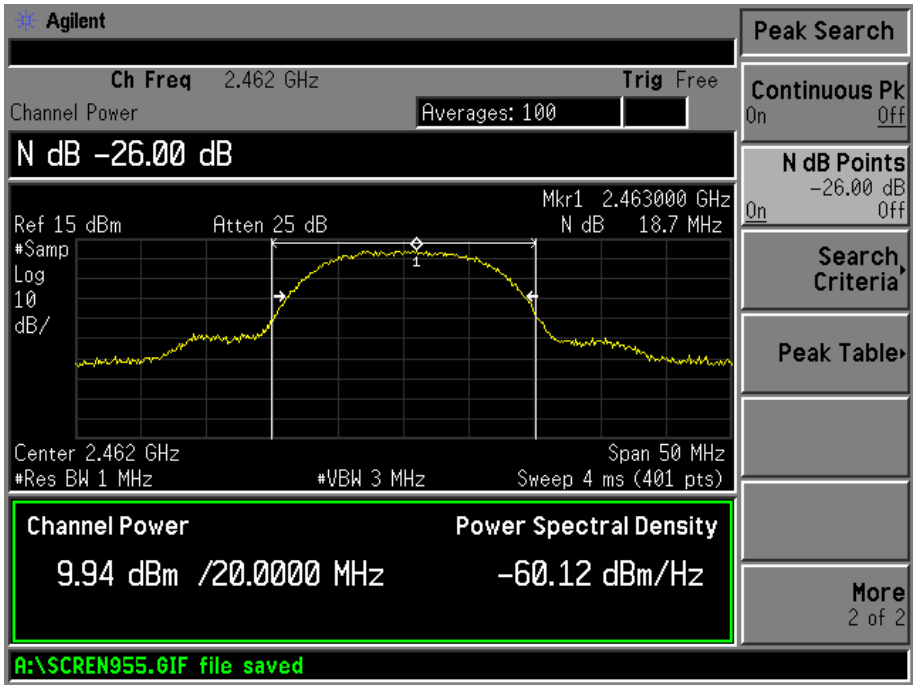
Low Channel:



Middle Channel:

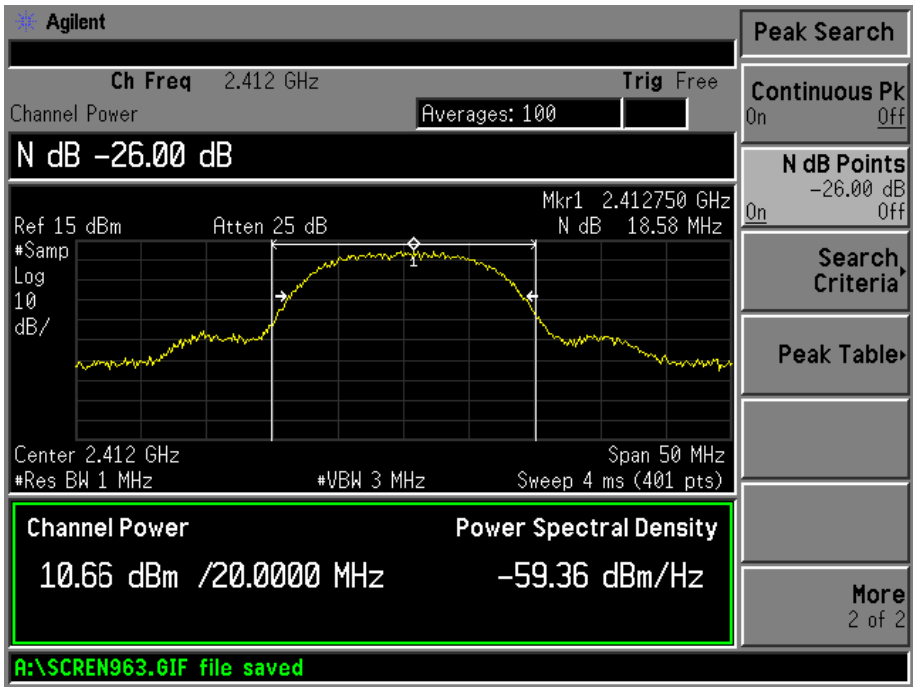


High Channel:

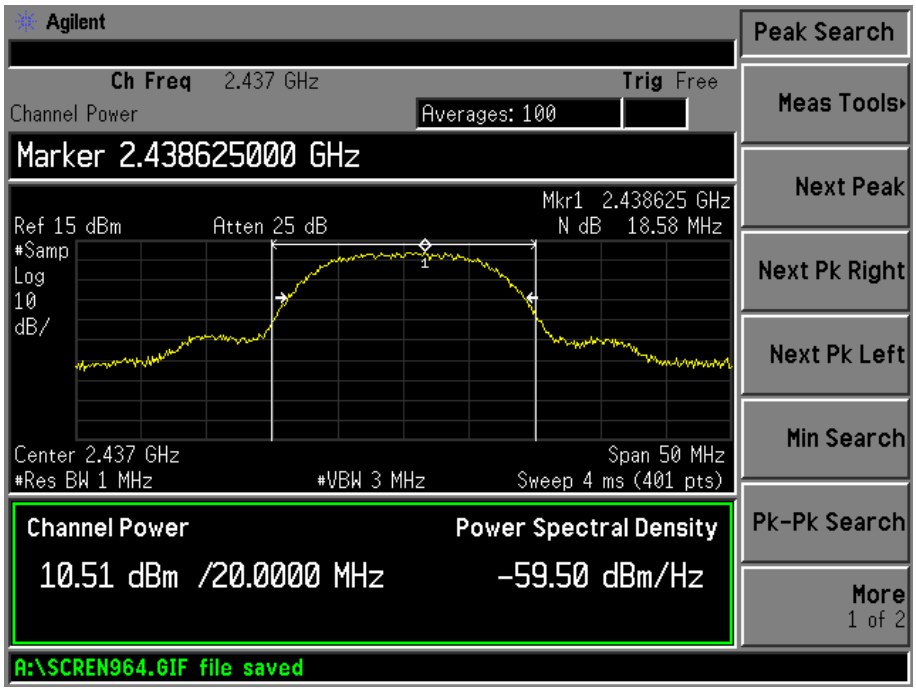


For 802.11b_short_1Mbps

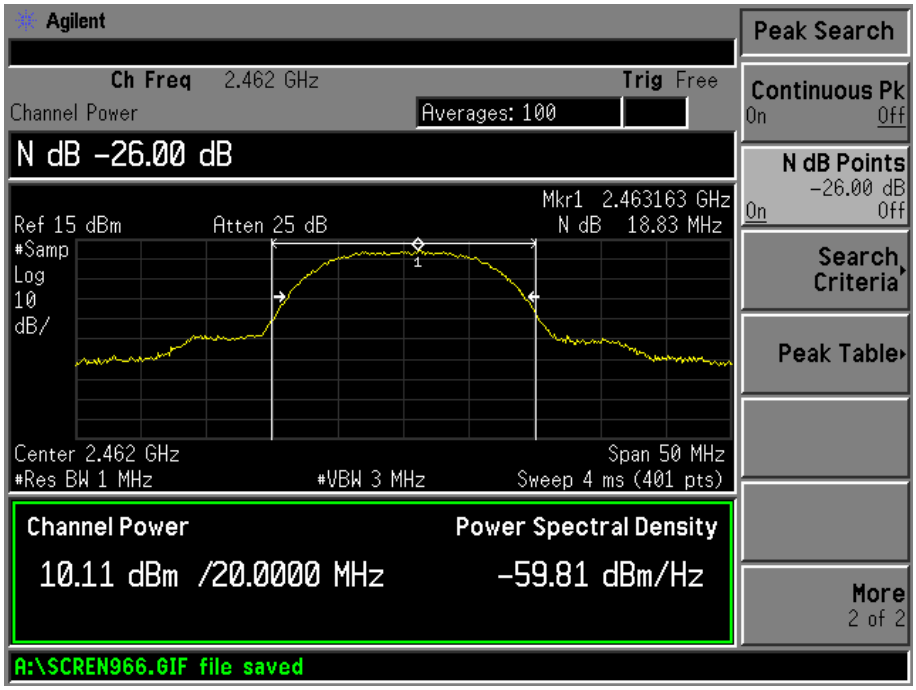
Low Channel:



Middle Channel:

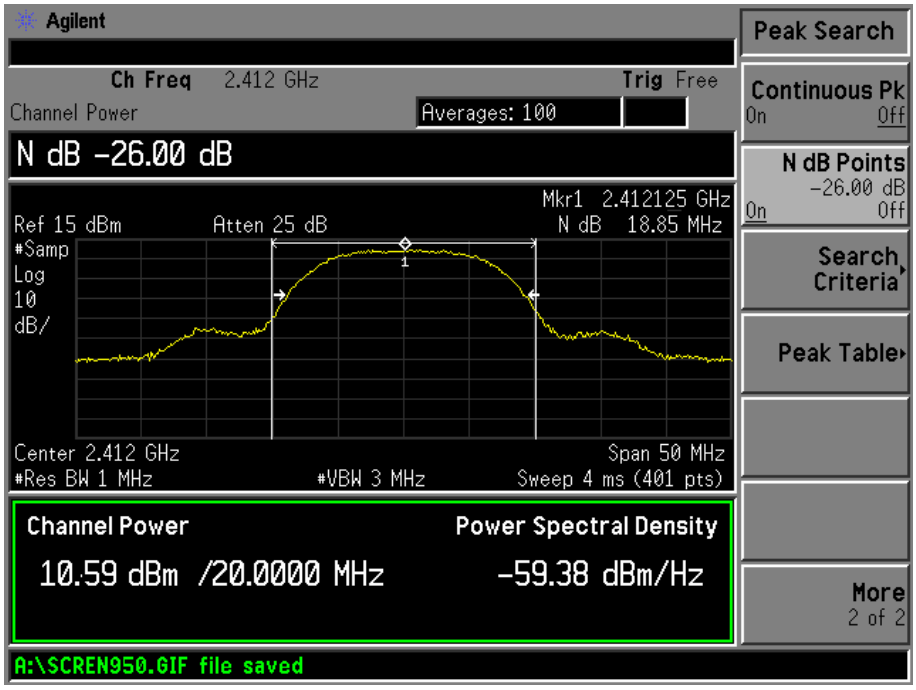


High Channel:

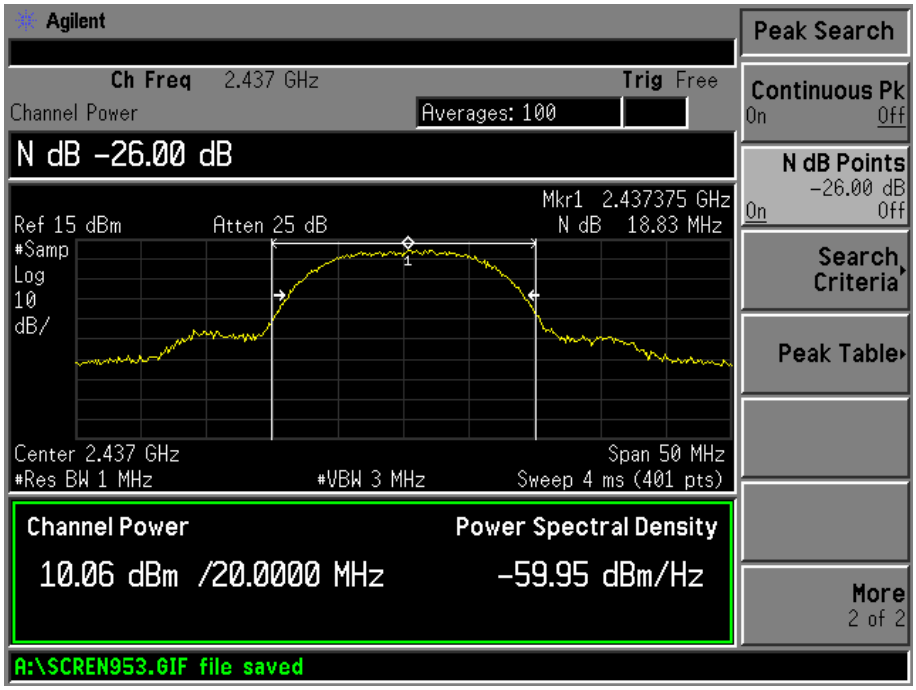


For 802.11b_Short_11Mbps

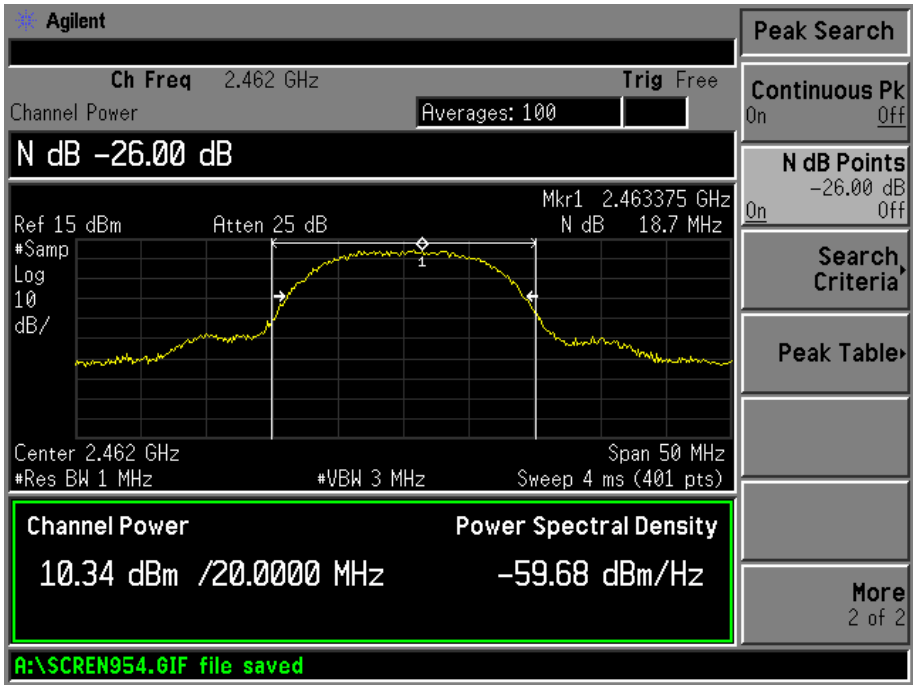
Low Channel:



Middle Channel:

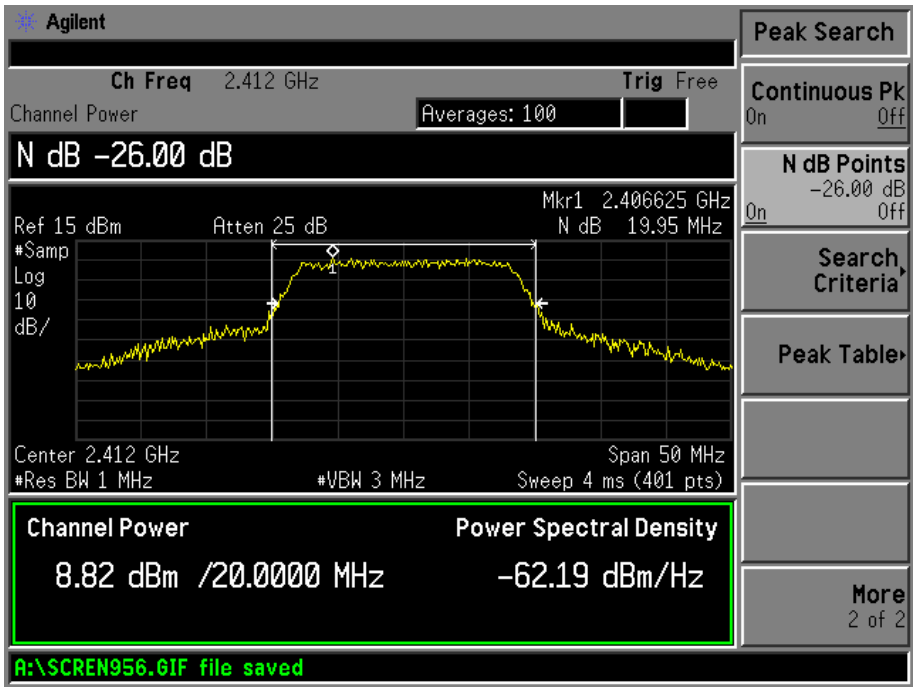


High Channel:

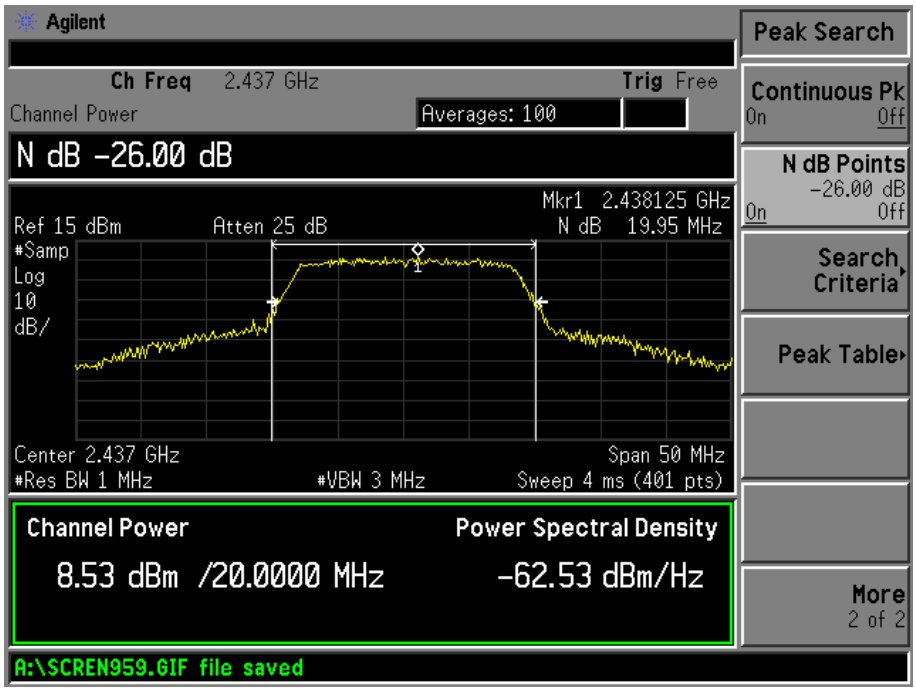


For 802.11g_6Mbps

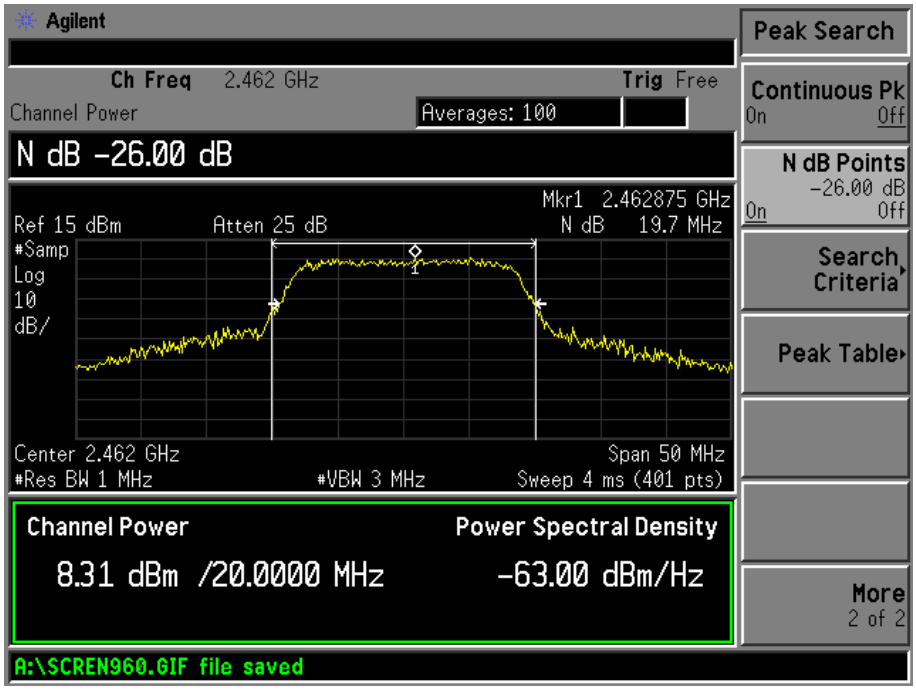
Low Channel:



Middle Channel:

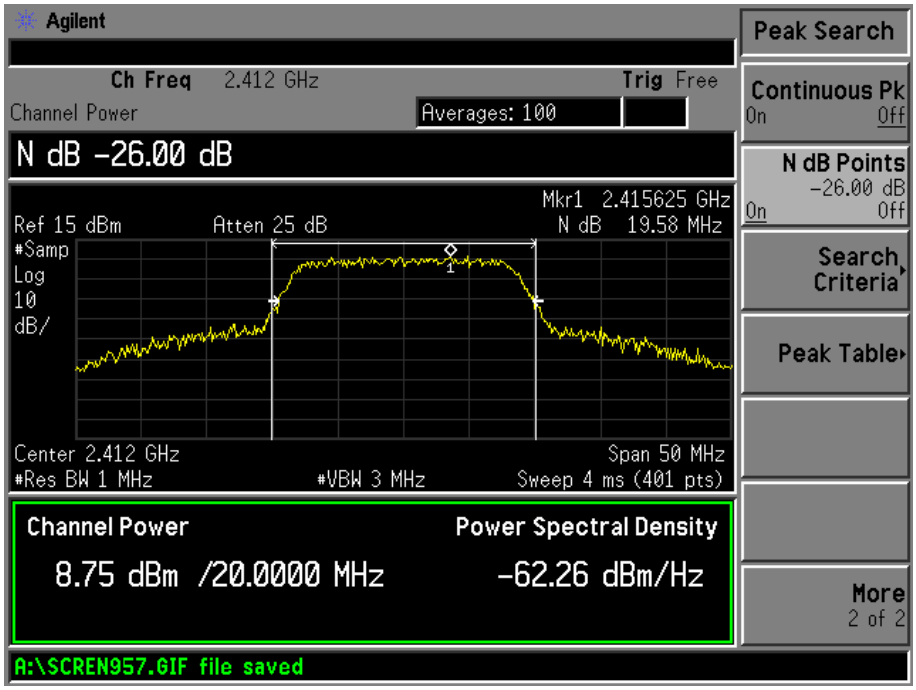


High Channel:

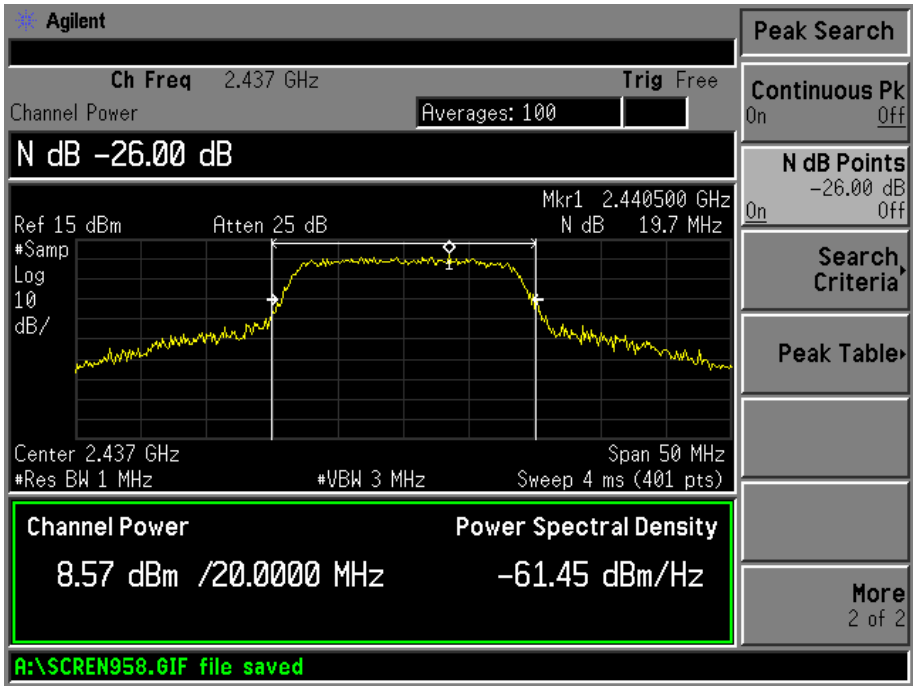


For 802.11g_54Mbps

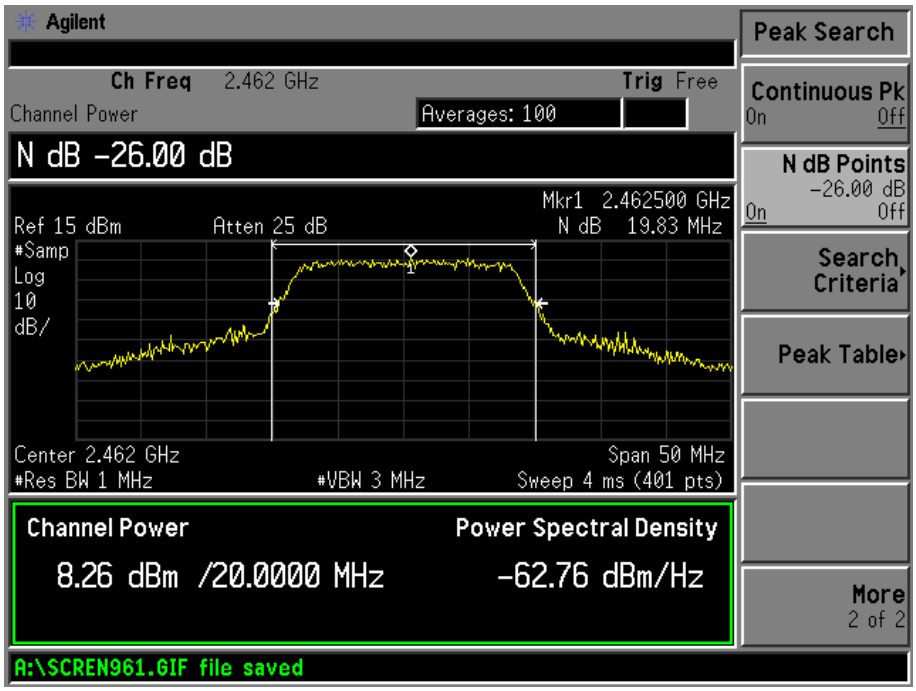
Low Channel:



Middle Channel:



High Channel:



8. FIELD STRENGTH OF SPURIOUS EMISSIONS

8.1 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.

8.2 Standard Applicable

According to §15.247(c), 15.205 15.209(b) &15.35 (b), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Section 15.209:
30 - 88 MHz 40 dBuV/m @3M
88 -216 MHz 43.5 dBuV/m @3M
216 -960 MHz 46 dBuV/m @3M
Above 960 MHz 54dBuV/m @3M

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.

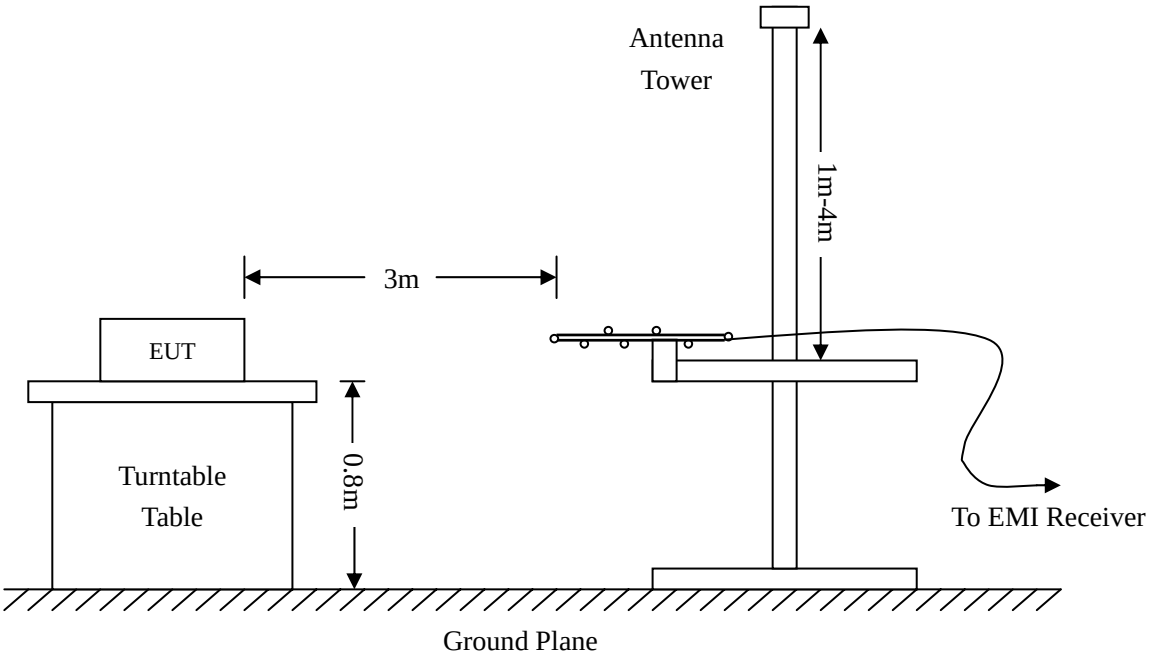
Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

8.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
Pre-amplifier	Agilent	8447F	3113A06717	2010-08-12	2011-08-11
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-08-12	2011-08-11
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2010-07-21	2011-07-20
Horn Antenna	ETS	3117	00086197	2010-07-21	2011-07-20

8.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2009 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.



8.5 Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – 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:

Margin = Corr. Ampl. – FCC Part 15 Limit

8.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	49 %
ATM Pressure:	1012 mbar

8.7 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:

-1.2 dBμV at **4824.0 MHz** in the **Vertical** polarization, **Transmitting 802.11b** test mode, **30 MHz to 25 GHz, 3Meters**

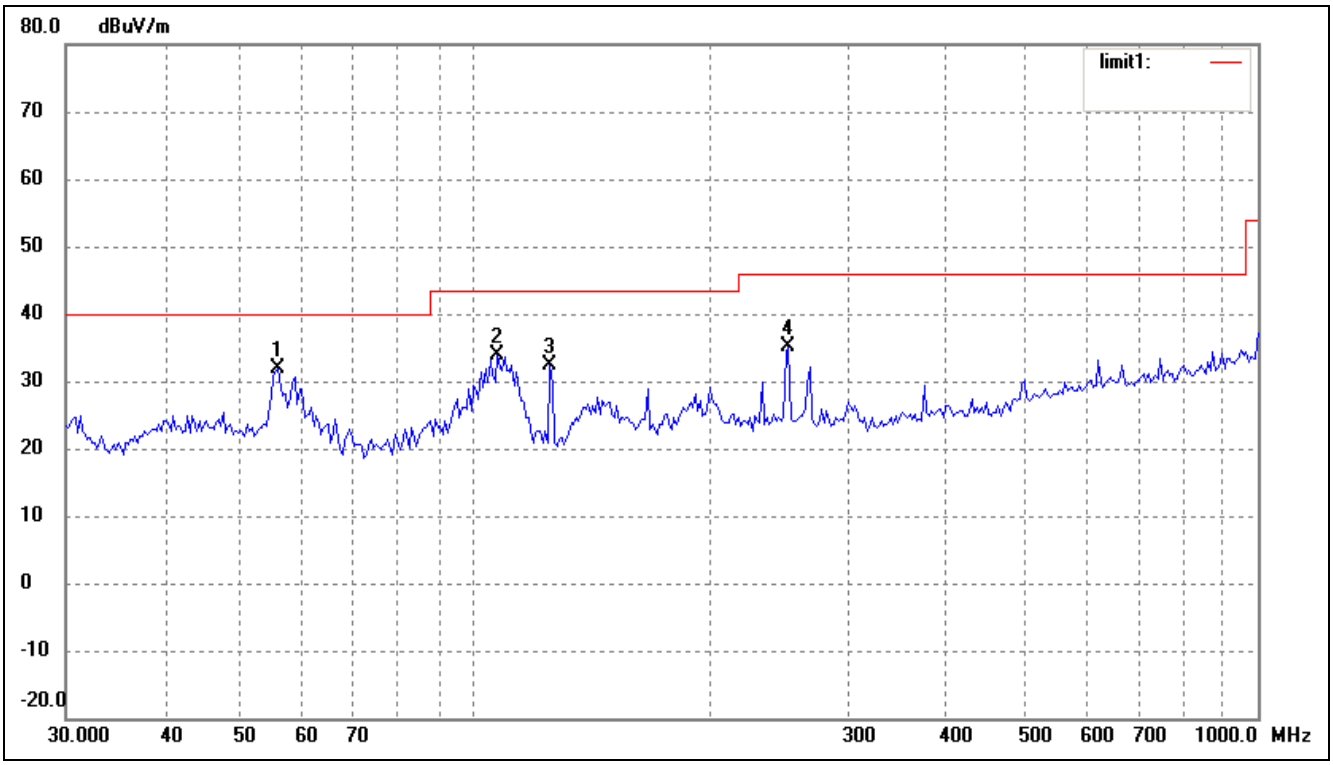
Note: *this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

Test Result/Plots:

Spurious Emission From 30 MHz to 1 GHz

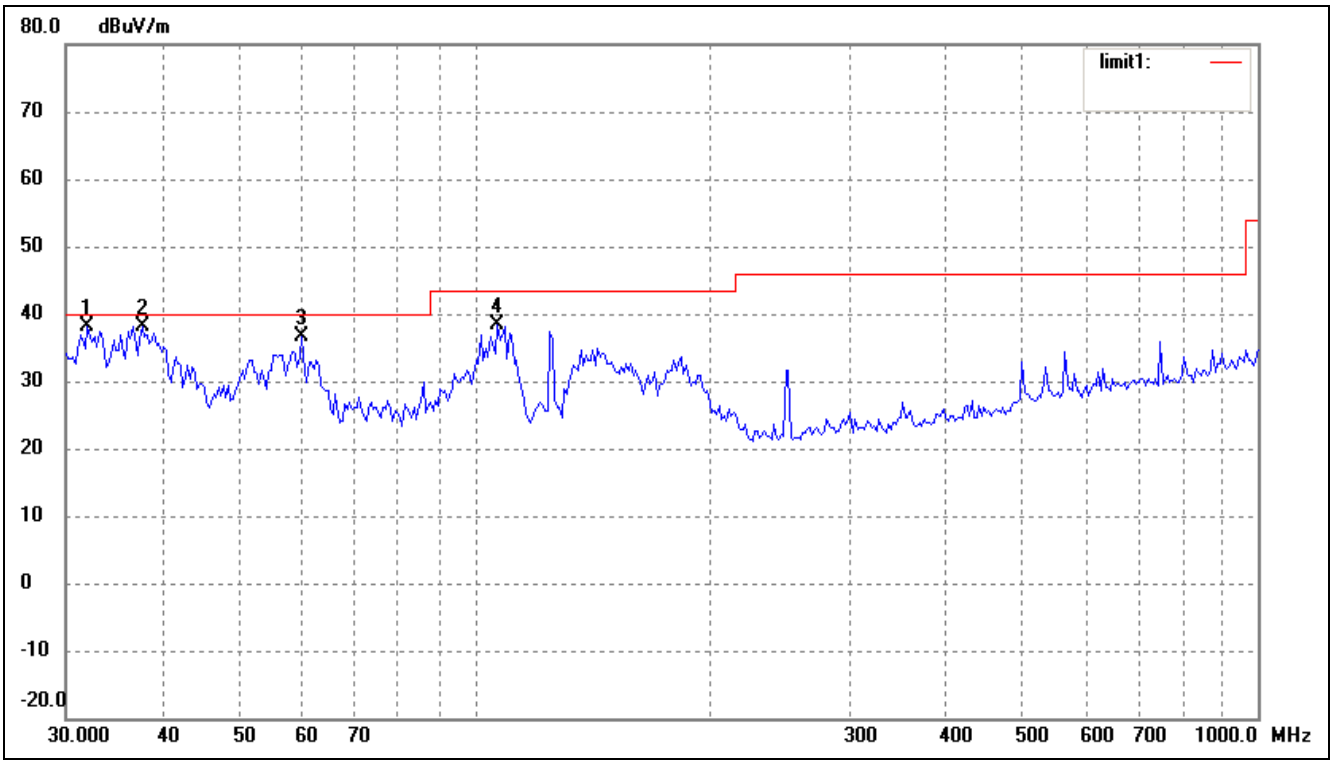
Test mode: Transmitting (802.11b Low Channel)

Horizontal



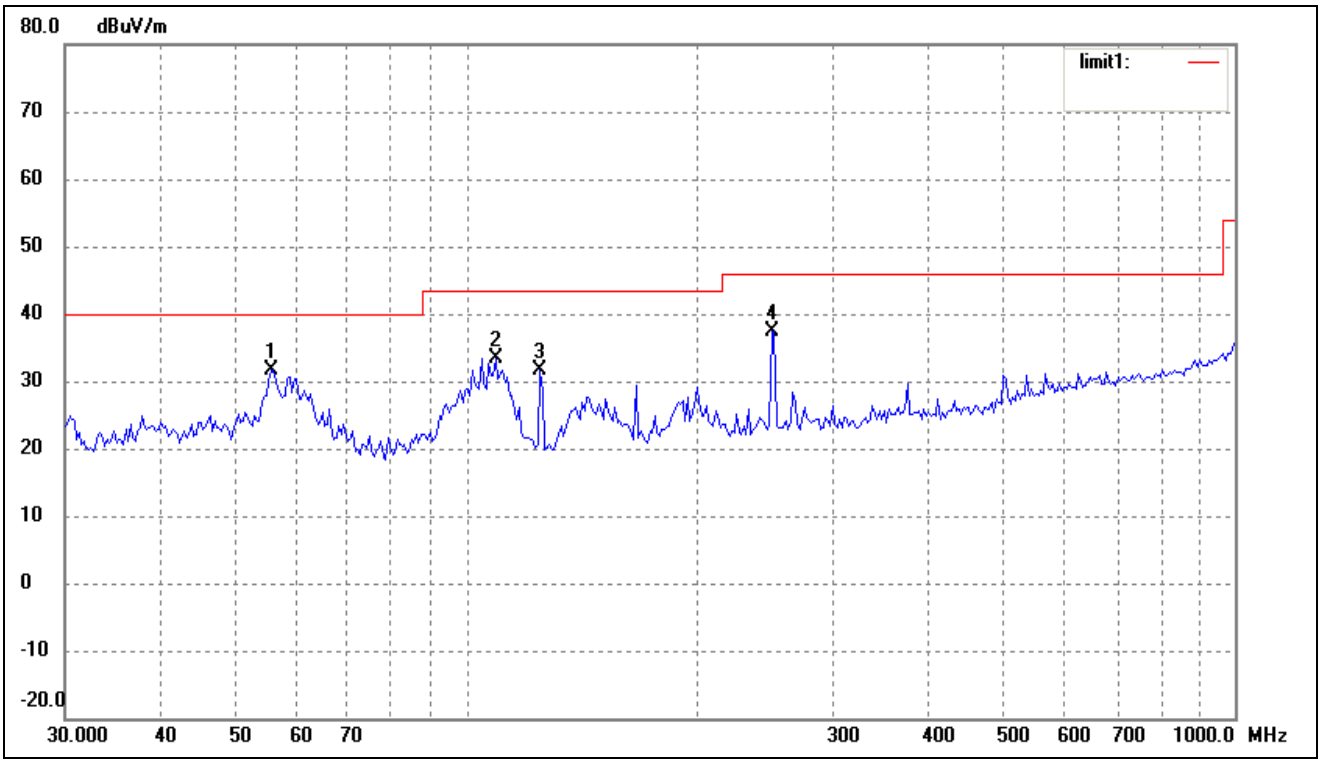
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	56.0007	24.56	7.41	31.97	40.00	-8.03	225	100	peak
2	106.7587	26.66	7.22	33.88	43.50	-9.62	64	100	peak
3	124.5690	27.68	4.63	32.31	43.50	-11.19	28	200	peak
4	251.1804	27.33	7.71	35.04	46.00	-10.96	26	100	peak

Vertical



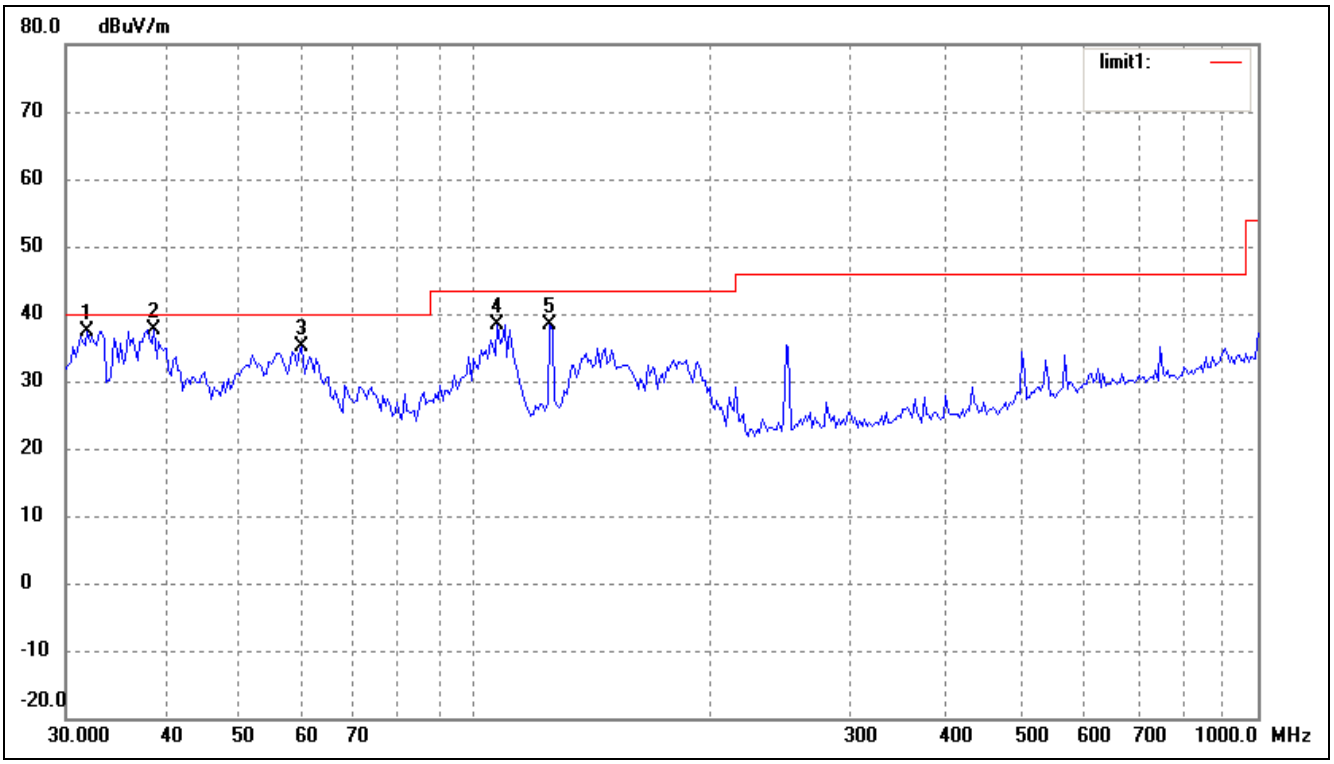
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.9546	31.61	6.62	38.23	40.00	-1.77	336	200	QP
2	37.5479	30.91	7.28	38.19	40.00	-1.81	17	200	QP
3	60.0691	29.45	7.16	36.61	40.00	-3.39	58	100	QP
4	106.7587	31.04	7.22	38.26	43.50	-5.24	182	100	QP

Spurious Emission From 30 MHz to 1 GHz
Test mode: Transmitting (802.11b Middle Channel)
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	55.6094	24.30	7.43	31.73	40.00	-8.27	338	100	peak
2	109.0286	26.42	7.03	33.45	43.50	-10.05	47	200	peak
3	124.5690	26.95	4.63	31.58	43.50	-11.92	110	100	peak
4	249.4250	29.66	7.67	37.33	46.00	-8.67	58	200	peak

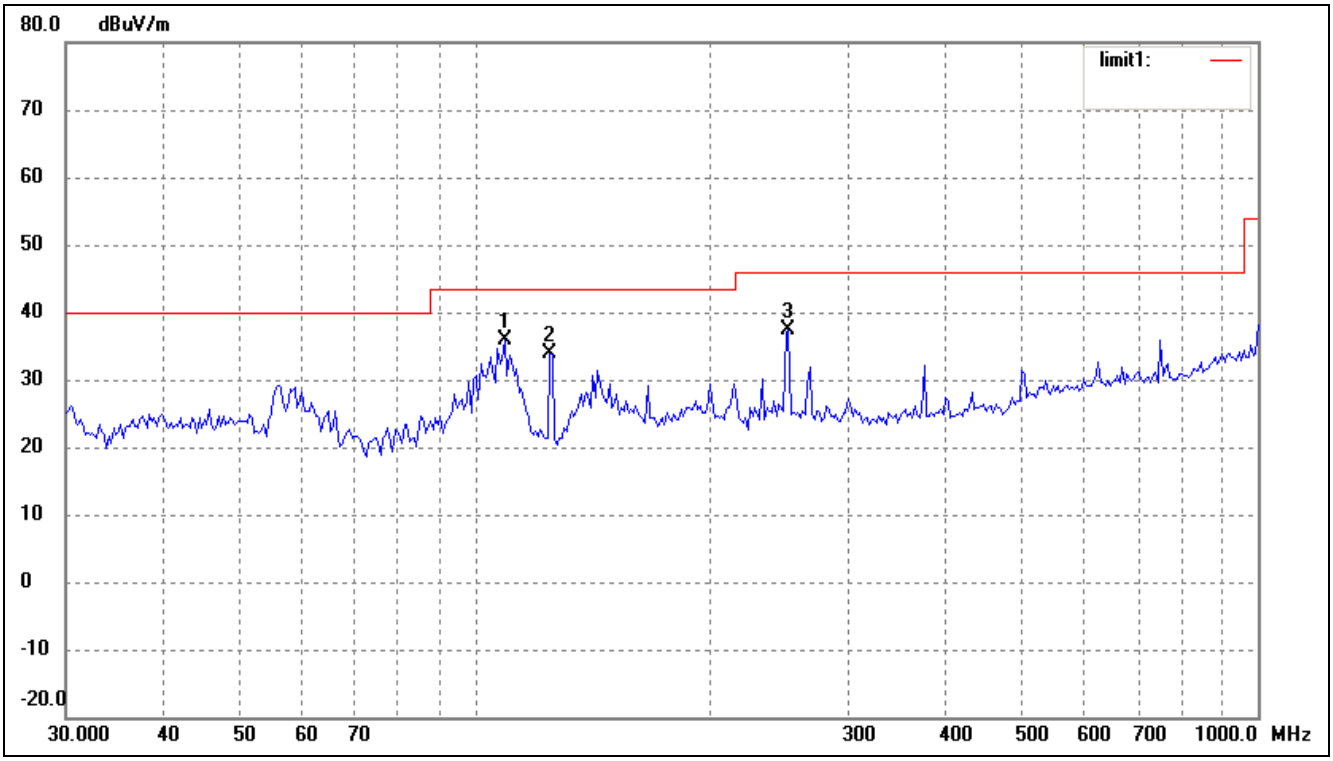
Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.9546	30.84	6.62	37.46	40.00	-2.54	327	200	QP
2	38.8879	30.04	7.64	37.68	40.00	-2.32	54	100	QP
3	60.0691	28.01	7.16	35.17	40.00	-4.83	58	100	QP
4	106.7587	31.13	7.22	38.35	43.50	-5.15	114	100	QP
5	124.5690	33.86	4.63	38.49	43.50	-5.01	58	100	QP

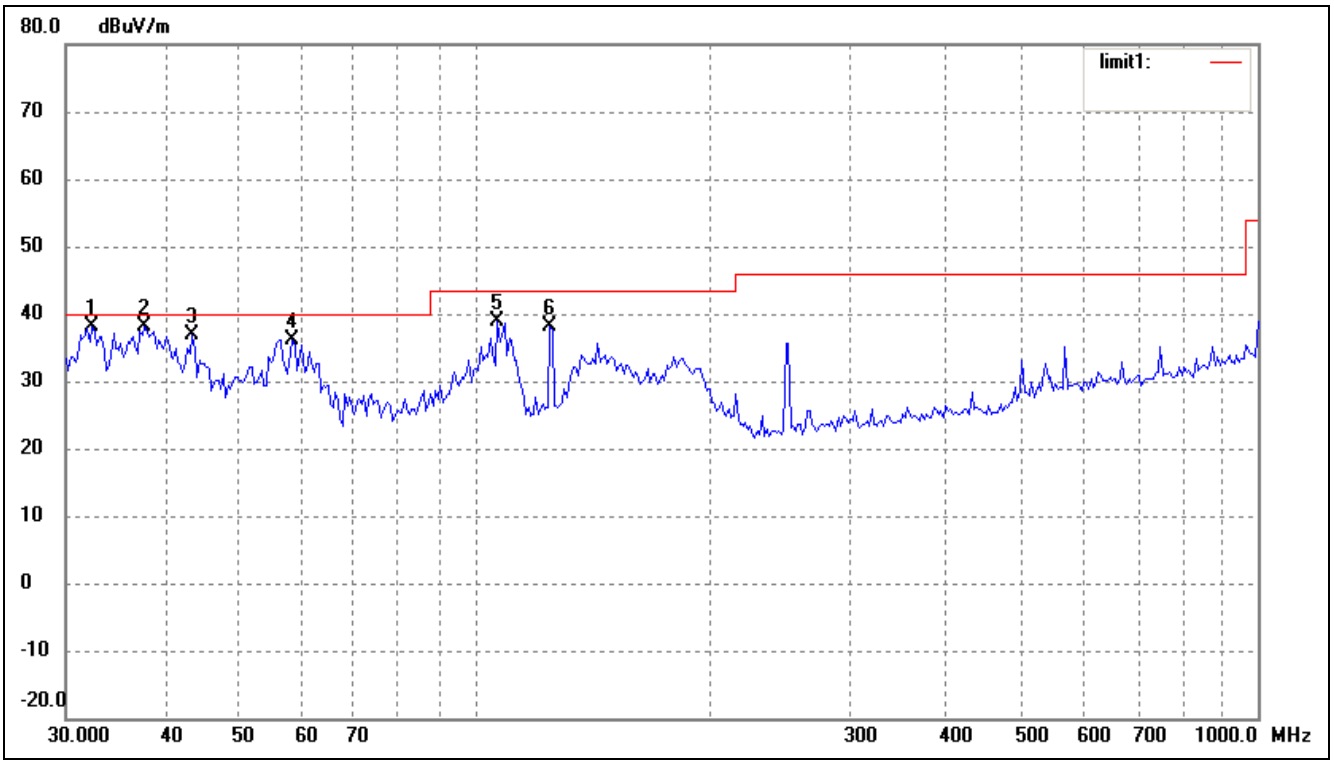
Spurious Emission From 30 MHz to 1 GHz
Test mode: Transmitting (802.11b High Channel)

Horizontal



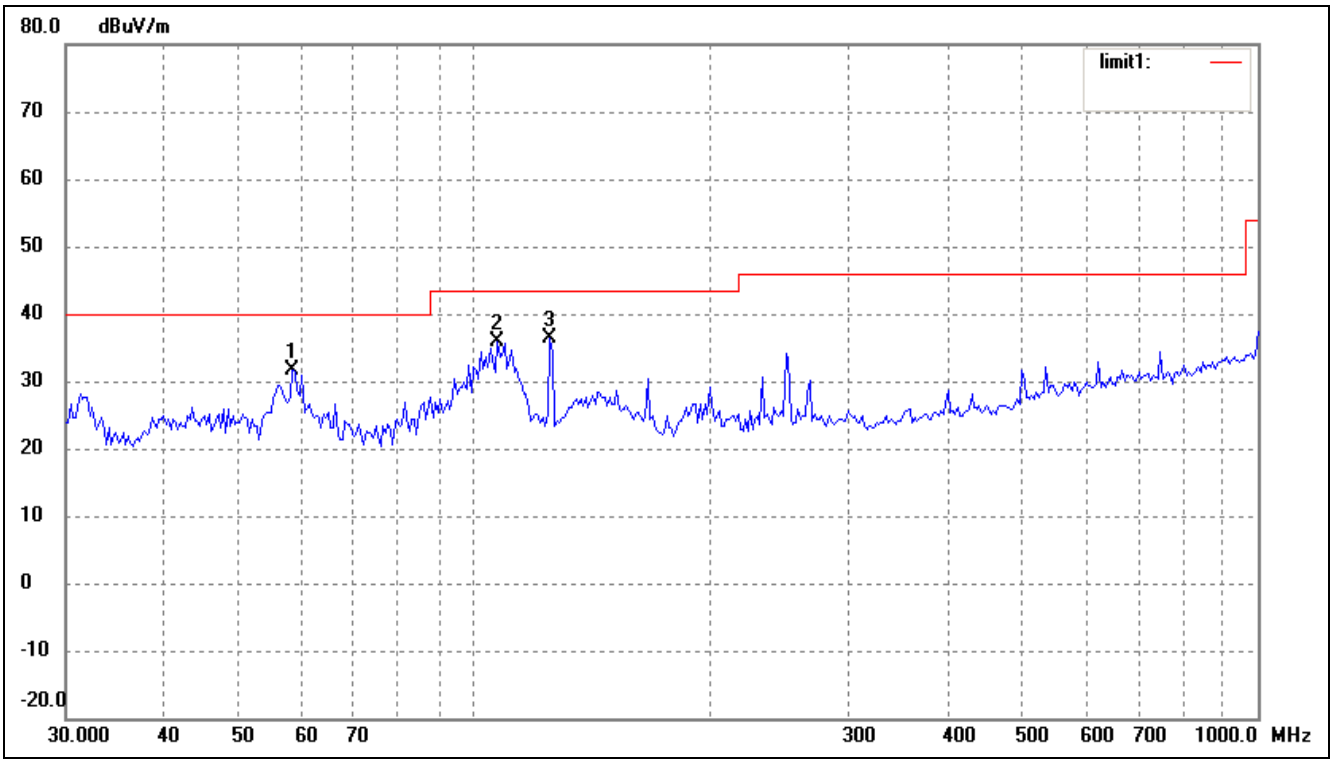
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	109.0286	28.82	7.03	35.85	43.50	-7.65	31	100	peak
2	124.5690	29.15	4.63	33.78	43.50	-9.72	47	100	peak
3	251.1804	29.55	7.71	37.26	46.00	-8.74	87	100	peak

Vertical



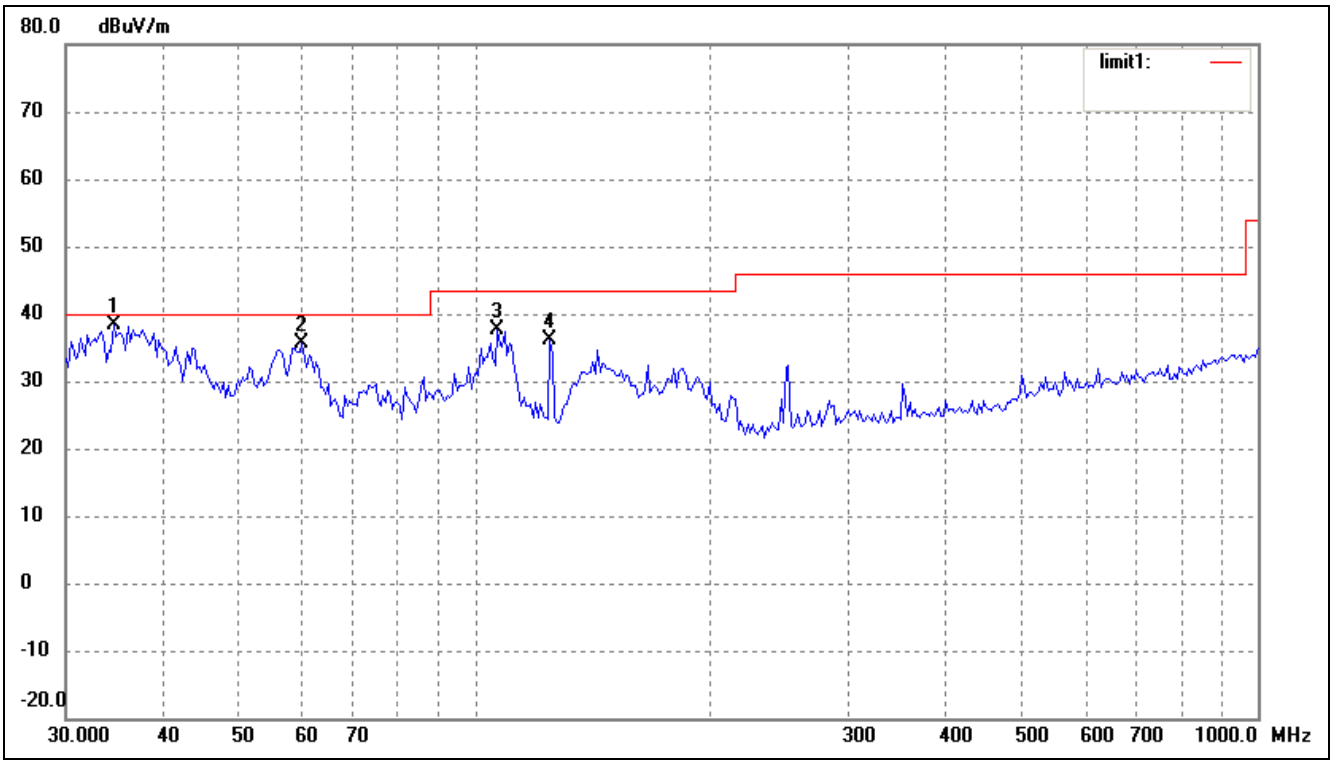
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	32.4059	31.48	6.62	38.10	40.00	-1.90	28	100	QP
2	37.8121	30.80	7.35	38.15	40.00	-1.85	247	100	QP
3	43.5057	28.82	7.97	36.79	40.00	-3.21	31	100	QP
4	58.4074	28.85	7.27	36.12	40.00	-3.88	36	100	QP
5	106.7587	31.65	7.22	38.87	43.50	-4.63	115	100	QP
6	124.5690	33.41	4.63	38.04	43.50	-5.46	25	100	QP

Spurious Emission from 30 MHz to 1 GHz
Test mode: Transmitting (802.11g Low Channel)
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	58.4074	24.40	7.27	31.67	40.00	-8.33	33	100	peak
2	106.7587	28.74	7.22	35.96	43.50	-7.54	67	100	peak
3	124.5690	31.83	4.63	36.46	43.50	-7.04	97	100	peak

Vertical

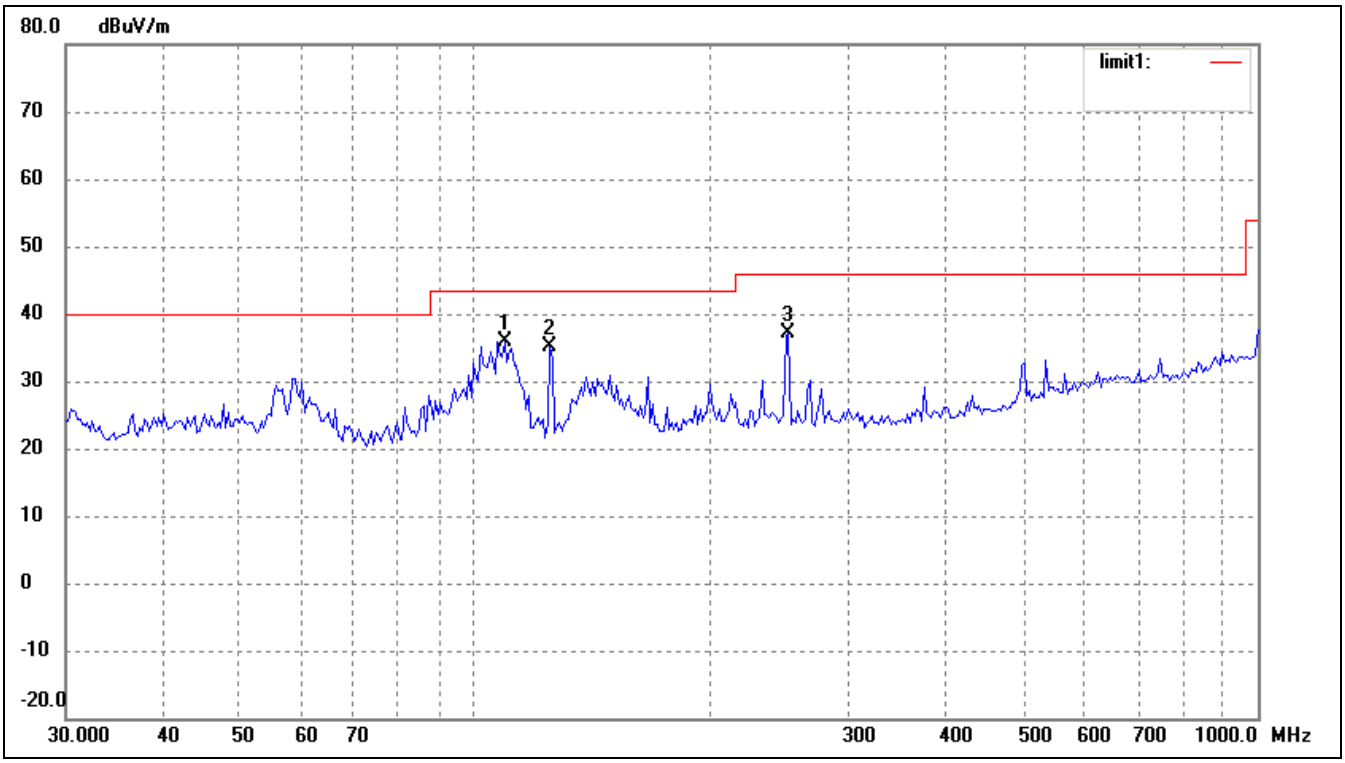


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	34.5173	31.73	6.60	38.33	40.00	-1.67	33	100	QP
2	60.0691	28.59	7.16	35.75	40.00	-4.25	88	100	QP
3	106.7587	30.42	7.22	37.64	43.50	-5.86	71	100	QP
4	124.5690	31.38	4.63	36.01	43.50	-7.49	291	100	peak

Spurious Emission From 30 MHz to 1 GHz

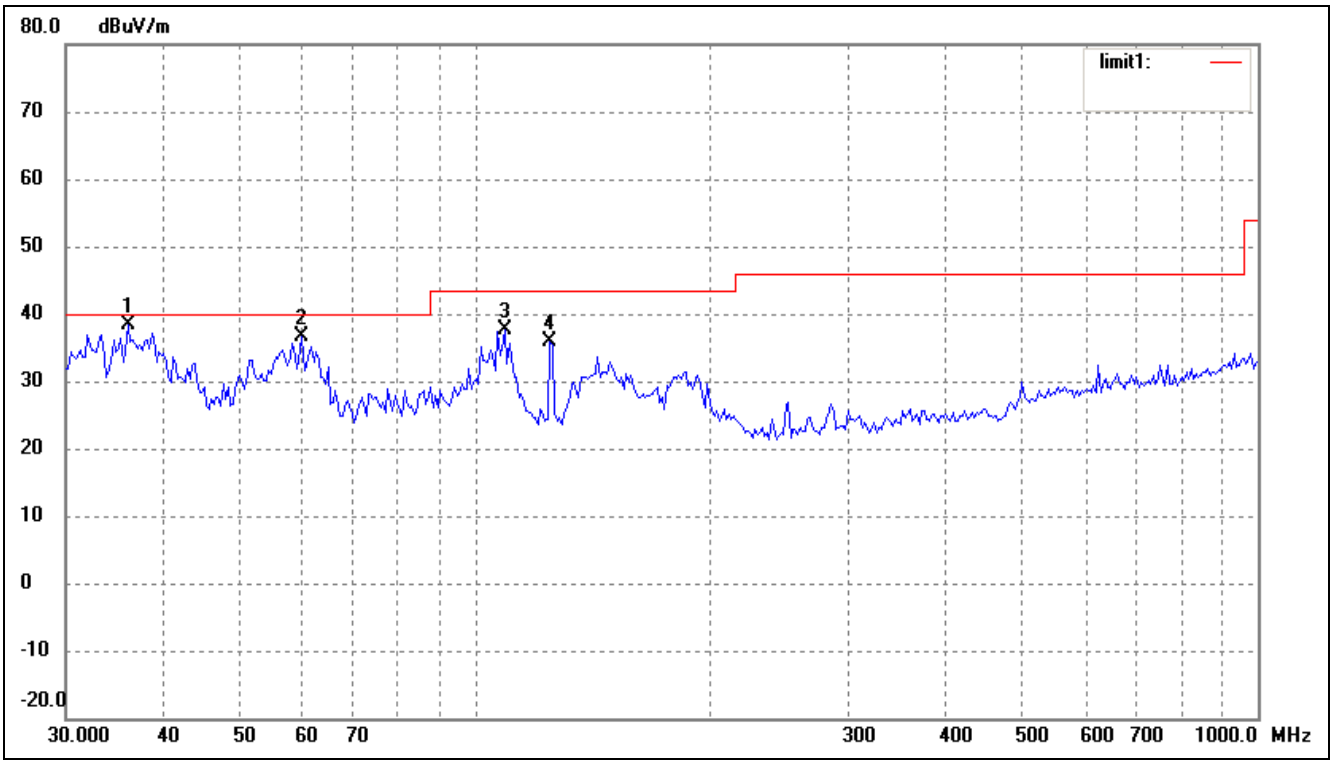
Test mode: Transmitting (802.11g Middle Channel)

Horizontal



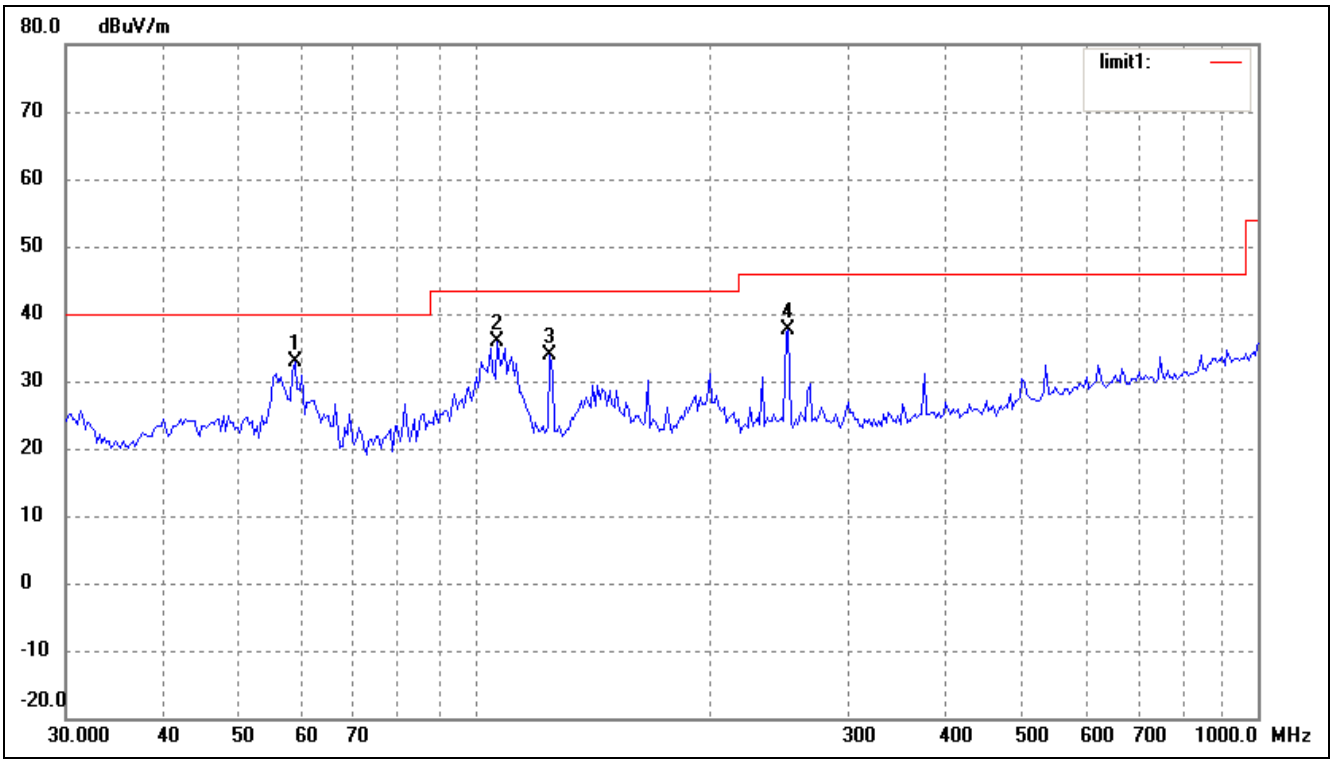
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	109.0286	28.92	7.03	35.95	43.50	-7.55	228	200	peak
2	124.5690	30.41	4.63	35.04	43.50	-8.46	47	100	peak
3	251.1804	29.49	7.71	37.20	46.00	-8.80	54	100	peak

Vertical



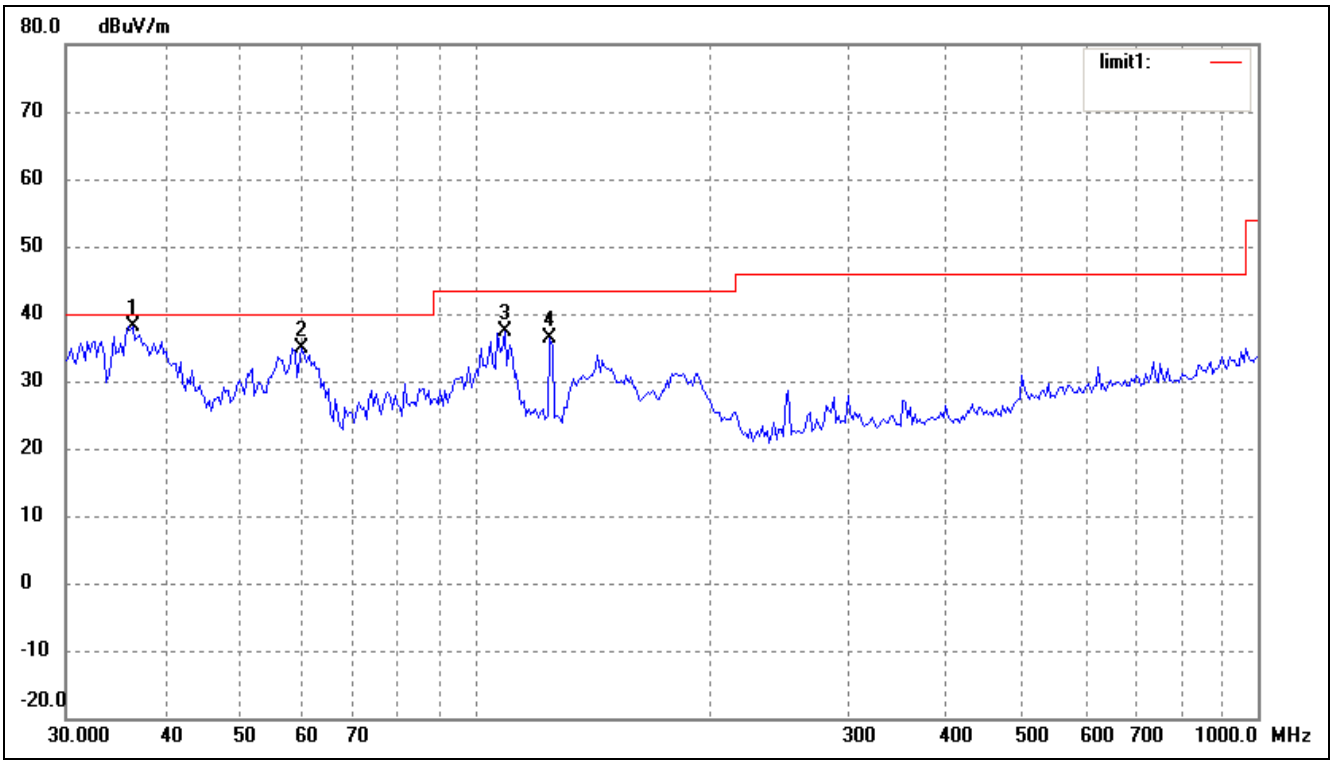
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.0007	31.39	6.87	38.26	40.00	-1.74	33	100	QP
2	60.0691	29.52	7.16	36.68	40.00	-3.32	54	100	QP
3	109.0286	30.50	7.03	37.53	43.50	-5.97	11	100	QP
4	124.5690	31.19	4.63	35.82	43.50	-7.68	57	100	peak

Spurious Emission From 30 MHz to 1 GHz
Test mode: Transmitting (802.11g High Channel)
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	58.8185	25.59	7.26	32.85	40.00	-7.15	66	100	peak
2	106.7587	28.58	7.22	35.80	43.50	-7.70	25	100	peak
3	124.5690	29.28	4.63	33.91	43.50	-9.59	102	100	peak
4	251.1804	29.91	7.71	37.62	46.00	-8.38	22	100	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.5092	31.09	7.01	38.10	40.00	-1.90	33	100	QP
2	60.0691	27.71	7.16	34.87	40.00	-5.13	98	100	QP
3	109.0286	30.32	7.03	37.35	43.50	-6.15	271	100	peak
4	124.5690	31.69	4.63	36.32	43.50	-7.18	25	100	peak

Spurious Emission Above 1GHz

Test Mode: Transmitting (802.11b)

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (1G to 25GHz)										
4824.0	PK	54.8	144	V	34.1	5.2	33.0	61.1	74	-12.9
7236.0	PK	49.7	55	V	37.4	6.1	33.5	59.7	74	-14.3
7236.0	PK	50.9	85	H	37.4	6.1	33.5	60.9	74	-13.1
4824.0	PK	48.2	255	H	34.1	5.2	33.0	54.5	74	-19.5
4824.0	AV	46.5	256	V	34.1	5.2	33.0	52.8	54	-1.2
7236.0	AV	40.7	55	V	37.4	6.1	33.5	50.7	54	-3.3
7236.0	AV	32.2	11	H	37.4	6.1	33.5	42.2	54	-11.8
4824.0	AV	38.3	58	H	34.1	5.2	33.0	44.6	54	-9.4
Middle Channel (1G to 25GHz)										
4874.0	PK	55.9	43	V	37.4	6.1	33.5	62.2	74	-11.8
7311.0	PK	48.6	53	V	34.1	5.2	33.0	58.6	74	-15.4
7311.0	PK	40.3	77	H	37.4	6.1	33.5	50.3	74	-23.7
4874.0	PK	44.8	271	H	34.1	5.2	33.0	51.1	74	-22.9
4874.0	AV	45.7	270	V	37.4	6.1	33.5	52.0	54	-2.0
7311.0	AV	39.4	5	V	34.1	5.2	33.0	49.4	54	-4.6
7311.0	AV	31.8	60	H	37.4	6.1	33.5	41.8	54	-12.2
4874.0	AV	36.3	0	H	34.1	5.2	33.0	42.6	54	-11.4
High Channel (1G to 25GHz)										
4924.0	PK	55.8	56	V	34.1	5.2	33.0	62.1	74	-11.9
7386.0	PK	48.3	45	V	37.4	6.1	33.5	58.3	74	-15.7
4924.0	PK	44.0	83	H	34.1	5.2	33.0	54.0	74	-20.0
7386.0	PK	44.4	26	H	37.4	6.1	33.5	50.7	74	-23.3
4924.0	AV	44.2	87	V	34.1	5.2	33.0	50.5	54	-3.5
7386.0	AV	39.2	221	V	37.4	6.1	33.5	49.2	54	-4.8
4924.0	AV	32.7	60	H	34.1	5.2	33.0	42.7	54	-11.3
7386.0	AV	34.0	60	H	37.4	6.1	33.5	40.3	54	-13.7

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

Spurious Emission Above 1GHz

Test Mode: Transmitting (802.11g)

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (1G to 25GHz)										
4824.0	PK	54.8	78	V	34.1	5.2	33.0	61.1	74	-12.9
7236.0	PK	48.3	270	V	37.4	6.1	33.5	58.3	74	-15.7
7236.0	PK	42.4	88	H	37.4	6.1	33.5	52.4	74	-21.6
4824.0	PK	44.8	45	H	34.1	5.2	33.0	51.1	74	-22.9
4824.0	AV	44.3	270	V	34.1	5.2	33.0	50.6	54	-3.4
7236.0	AV	37.8	90	V	37.4	6.1	33.5	47.8	54	-6.2
7236.0	AV	31.9	264	H	37.4	6.1	33.5	41.9	54	-12.1
4824.0	AV	33.9	60	H	34.1	5.2	33.0	40.2	54	-13.8
Middle Channel (1G to 25GHz)										
4874.0	PK	55.0	231	V	37.4	6.1	33.5	61.3	74	-12.7
7311.0	PK	49.2	270	V	34.1	5.2	33.0	59.2	74	-14.8
7311.0	PK	43.2	45	H	37.4	6.1	33.5	53.2	74	-20.8
4874.0	PK	45.3	180	H	34.1	5.2	33.0	51.6	74	-22.4
4874.0	AV	45.2	114	V	37.4	6.1	33.5	51.5	54	-2.5
7311.0	AV	38.2	90	V	34.1	5.2	33.0	48.2	54	-5.8
7311.0	AV	33.7	60	H	37.4	6.1	33.5	43.7	54	-10.3
4874.0	AV	33.8	54	H	34.1	5.2	33.0	40.1	54	-13.9
High Channel (1G to 25GHz)										
4924.0	PK	53.5	74	V	34.1	5.2	33.0	59.8	74	-14.2
7386.0	PK	46.9	45	V	37.4	6.1	33.5	56.9	74	-17.1
4924.0	PK	42.2	75	H	34.1	5.2	33.0	52.2	74	-21.8
7386.0	PK	43.7	45	H	37.4	6.1	33.5	50.0	74	-24.0
4924.0	AV	43.0	90	V	34.1	5.2	33.0	49.3	54	-4.7
7386.0	AV	36.4	270	V	37.4	6.1	33.5	46.4	54	-7.6
4924.0	AV	32.1	60	H	34.1	5.2	33.0	42.1	54	-11.9
7386.0	AV	33.5	60	H	37.4	6.1	33.5	39.8	54	-14.2

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

9. OUT OF BAND EMISSIONS

9.1 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.

9.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
Pre-amplifier	Agilent	8447F	3113A06717	2010-08-12	2011-08-11
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-08-12	2011-08-11
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2010-07-21	2011-07-20
Horn Antenna	ETS	3117	00086197	2010-07-21	2011-07-20

9.3 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 the spectrum analyzer as RBW, VBW=100KHz, Span=50MHz, Sweep = auto
3. Set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2438.5MHz, then mark the higher-level emission for comparing with the FCC rules.

9.4 Environmental Conditions

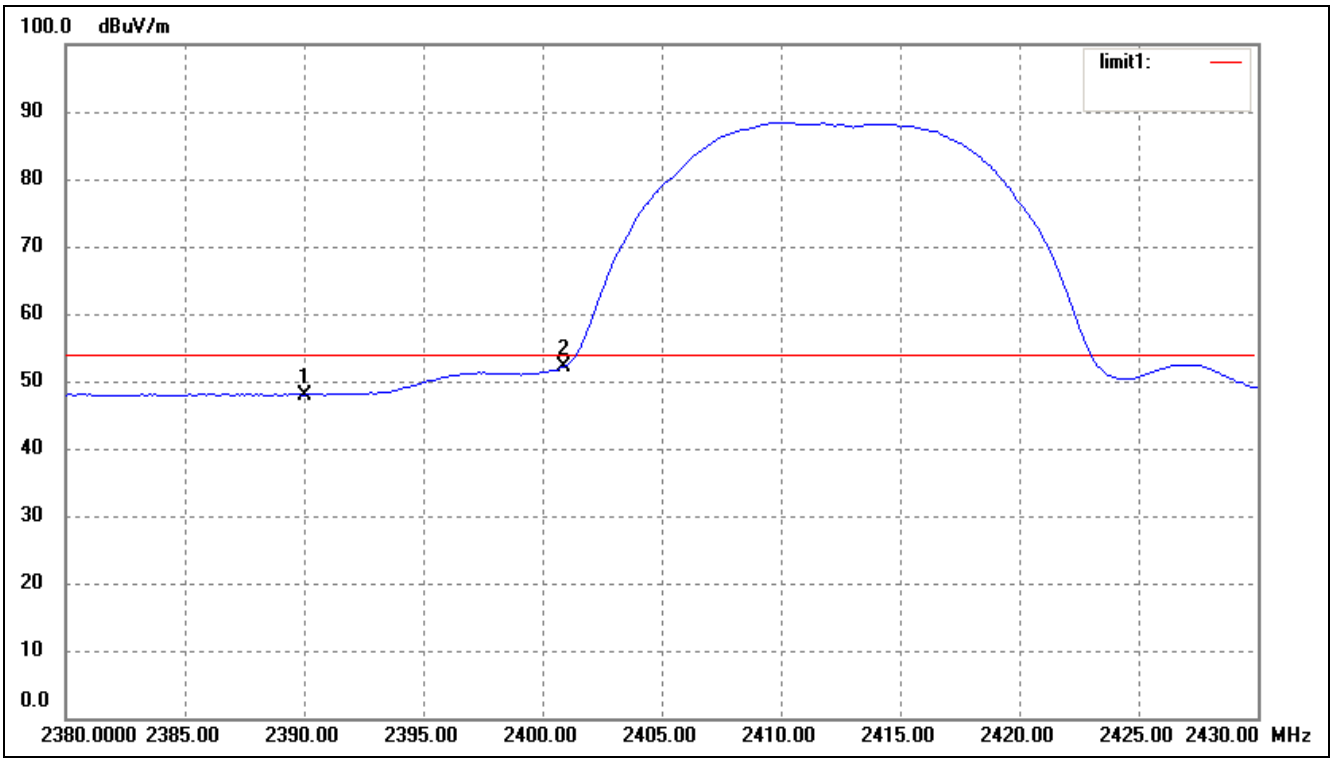
Temperature:	24 °C
Relative Humidity:	54 %
ATM Pressure:	1015 mbar

9.5 Summary of Test Results/Plots

Test mode	Frequency MHz	Limit dBuV /dB	Result
802.11b	2390.000	<54dBuv	Pass
	2400.900	>20dB Att	Pass
	2483.500	<54dBuv	Pass
802.11g	2390.000	<54dBuv	Pass
	2400.200	>20dB Att	Pass
	2483.500	<54dBuv	Pass

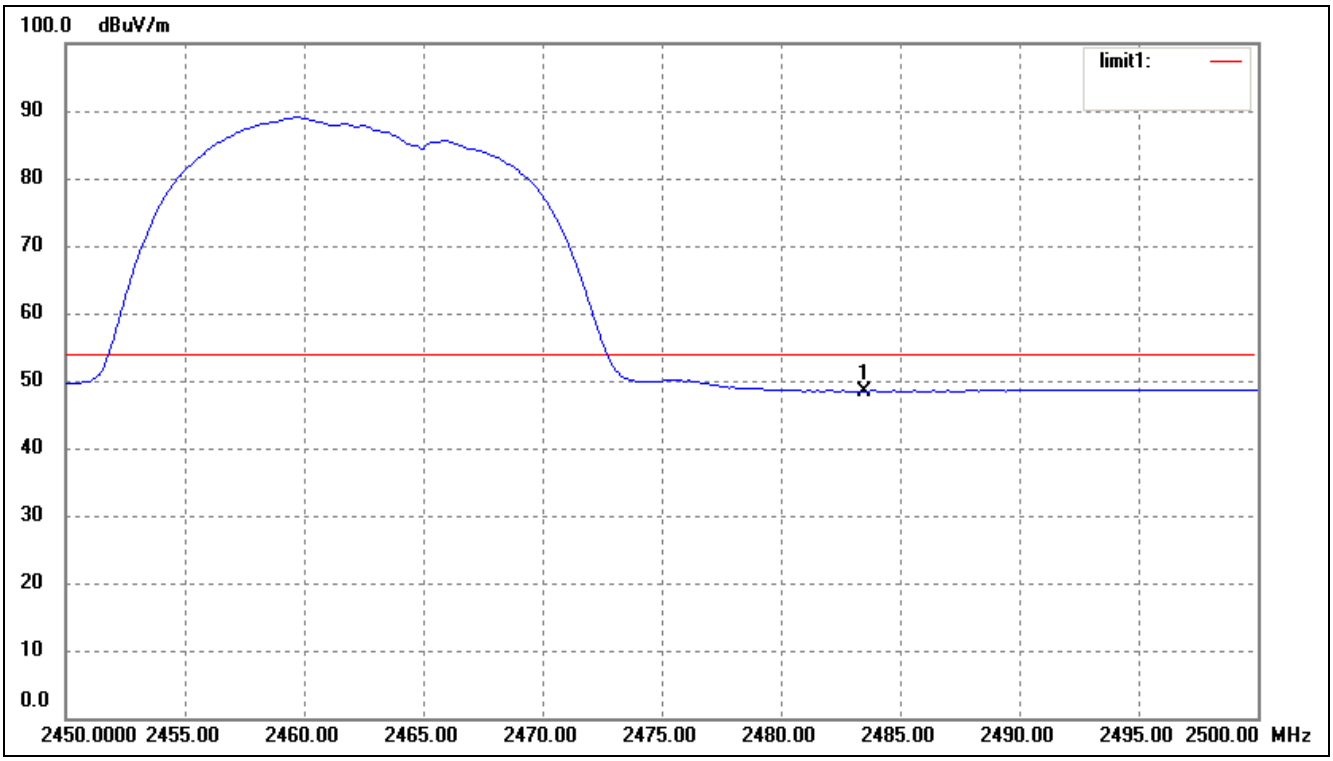
For 802.11b

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	2390.000	12.41	35.59	48.00	54.00	-6.00	72	100	Ave
	2390.000	23.91	35.59	59.28	74.00	-14.72	72	100	peak
2	2400.900	16.47	35.68	52.15	54.00	-1.85	162	100	Ave
	2400.900	27.97	35.68	63.33	74.00	-10.67	162	100	peak

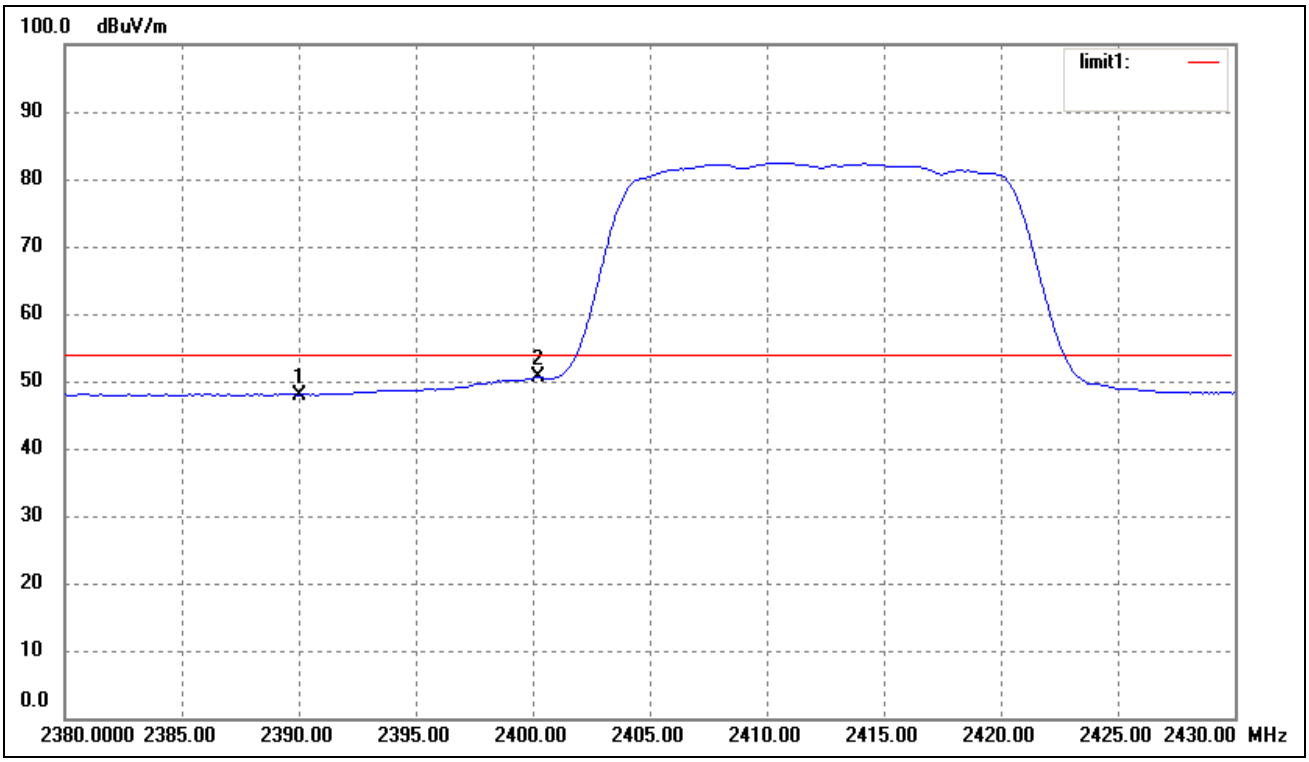
Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	2483.500	12.52	35.97	48.49	54.00	-5.51	166	200	Ave
	2483.500	24.02	35.97	59.48	74.00	-14.52	166	200	peak

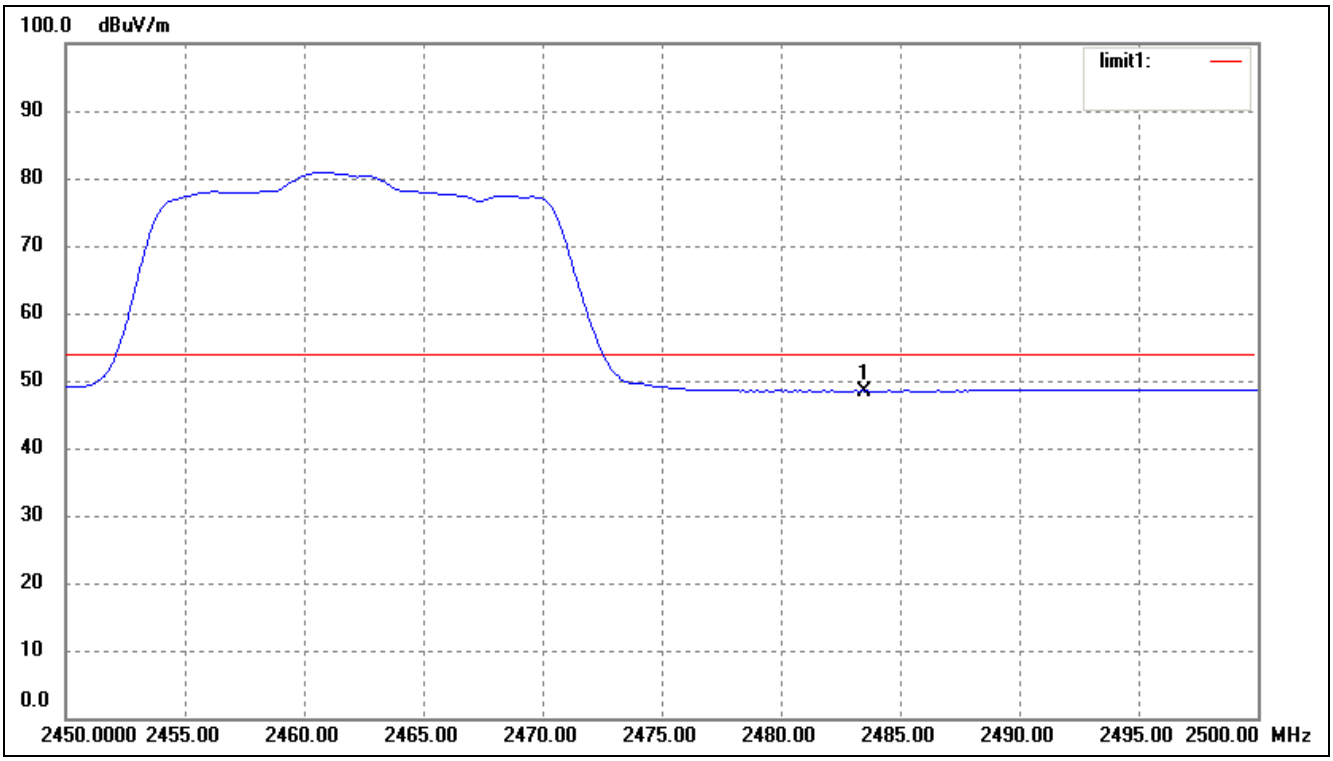
For 802.11g

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	2390.000	12.40	35.59	47.99	54.00	-6.01	0	142	Ave
	2390.000	23.90	35.59	58.17	74.00	-15.83	0	142	peak
2	2400.200	14.89	35.68	50.57	54.00	-3.43	0	142	Ave
	2400.200	27.02	35.68	61.07	74.00	-12.93	0	142	peak

Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	2483.500	12.50	35.97	48.47	54.00	-5.53	253	100	Ave
	2483.500	24.00	35.97	58.49	74.00	-15.51	253	100	peak

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