

FCC Part 15C

Measurement and Test Report

For

KAGA Electronics (USA) Inc

2480 North First Street, Suite 100 San Jose, CA, 95131

FCC ID: XXCRLM561148AX

Report Concerns: Original Report	Equipment Type: 802.11b/g MiniPCI Type III Wireless Adapter
Model:	<u>RLM561-148AX</u>
Report No.:	<u>STR110180271</u>
Test Date:	<u>2011-01-06 to 2011-01-19</u>
Issue Date:	<u>2010-01-24</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: KAGA Electronics (USA) Inc
 Address of applicant: 2480 North First Street, Suite 100 San Jose, CA, 95131

Manufacturer: KAGA Electronics (USA) Inc
 Address of manufacturer: 2480 North First Street, Suite 100 San Jose, CA, 95131

General Description of E.U.T

Items	Description
EUT Description:	802.11b/g MiniPCI Type III Wireless Adapter
Trade Name:	KAGA
Model No.:	RLM561-148AX
Rated Voltage:	DC 3.3V
RF Output Power	Max. 15.42dBm
Antenna Gain:	2
Frequency range:	2412MHz~2462MHz
Number of channels:	11
Channel Separation:	5MHz
Type of Antenna:	Detachable Antenna
Size:	6.0X5.1X0.4cm

Note: The test data is gathered from a production sample, provided by the manufacture.

1.2 Test Standards

The following report is prepared on behalf of the KAGA Electronics (USA) Inc 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 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.

1.4 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 Exercise Software

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

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
PC	LENOVO	M2620V	11S30001652001037880BP
Display	LENOVO	LX-L17AB	4M0233274805856

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203; § 15.247(c)(1)(i)	Antenna Requirement	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

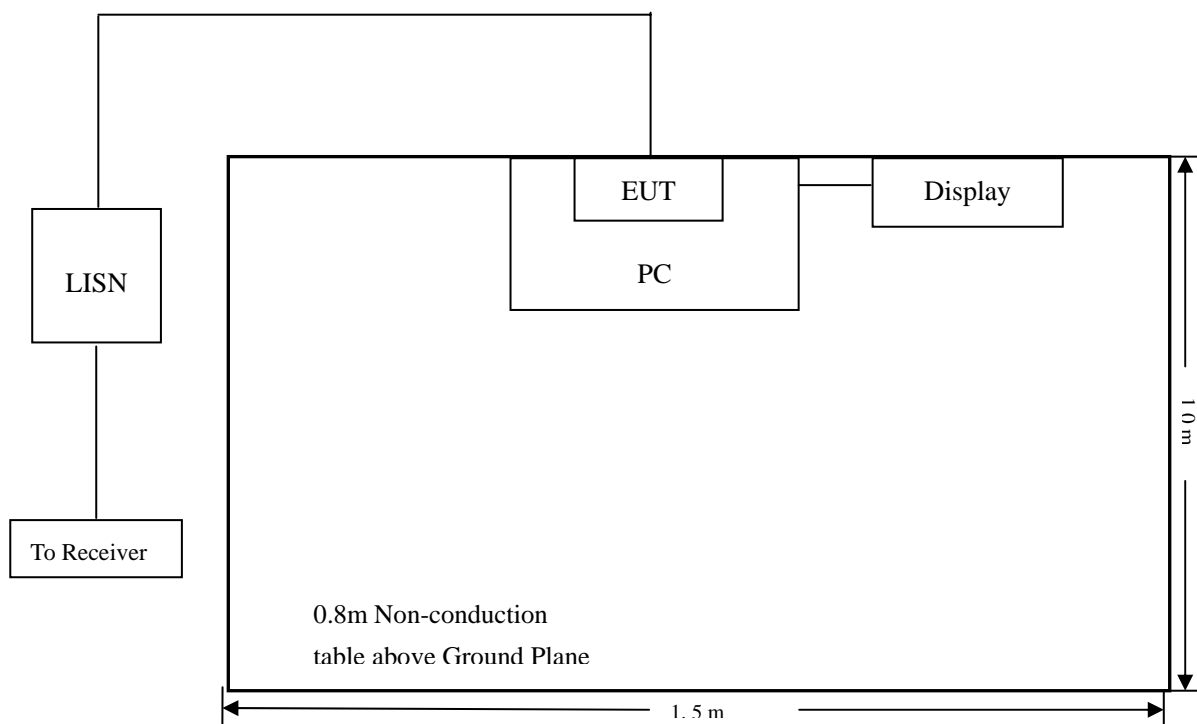
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-08-12	2011-08-11
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-08-12	2011-08-11
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-08-12	2011-08-11

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 C63.4-2003, 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.

3.4 Basic Test Setup Block Diagram



3.5 Environmental Conditions

Temperature:	20° 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:

-2.2 dBµV at 2.206 MHz in the Line Ave Detector, 0.15-30MHz

3.7 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC 15.207	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBµV	QP/Ave/Pk	Line/Neutral	dBµV	dB
2.206	43.83	Ave	Line	46.00	-2.2
1.322	43.51	Ave	Line	46.00	-2.5
1.982	43.48	Ave	Line	46.00	-2.5
2.702	43.54	Ave	Neutral	46.00	-2.5
2.046	43.26	Ave	Neutral	46.00	-2.7
2.630	43.21	Ave	Neutral	46.00	-2.8
2.410	43.02	Ave	Neutral	46.00	-3.0
1.974	42.93	Ave	Neutral	46.00	-3.1
2.778	42.87	Ave	Neutral	46.00	-3.1
0.150	46.72	Ave	Line	56.00	-9.3
1.690	46.14	Pk	Line	56.00	-9.9
1.982	45.89	Pk	Line	56.00	-10.1
2.278	45.89	Pk	Line	56.00	-10.1
2.702	45.74	Pk	Neutral	56.00	-10.3
2.498	45.65	Pk	Line	56.00	-10.4
17.33	49.47	Pk	Line	60.00	-10.5
2.630	45.34	Pk	Neutral	56.00	-10.7
16.598	48.14	Pk	Neutral	60.00	-11.9
0.154	52.76	Pk	Line	65.78	-13.0
5.554	45.05	Pk	Neutral	60.00	-15.0
0.170	47.93	Pk	Neutral	64.96	-17.0
0.158	47.67	Pk	Neutral	65.57	-17.9

Plot of Conducted Emissions Test Data

Conducted Disturbance

EUT: 802.11b/g MiniPCI Type III Wireless Adapter

M/N: RLM561-148AX

Operating Condition: Transmitting

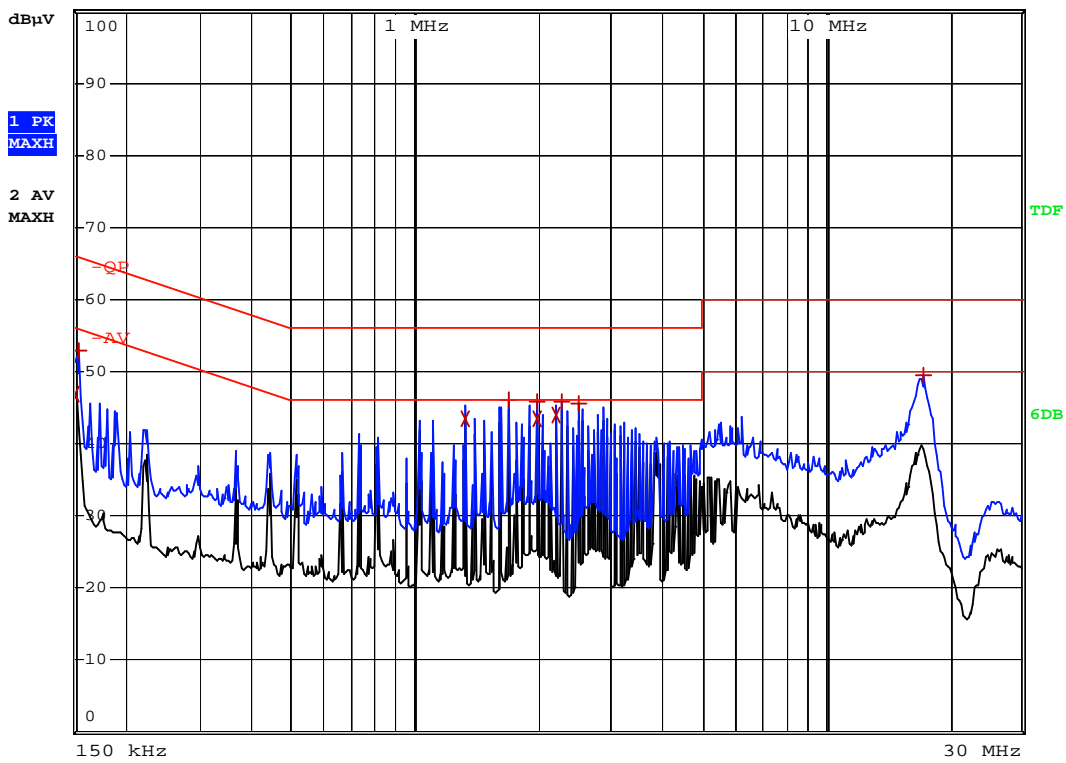
Test Specification: L

Comment: Install in the PC



RBW 9 kHz
MT 5 ms

Att 10 dB AUTO



Date: 14.JAN.2011 11:00:23

Plot of Conducted Emissions Test Data

Conducted Disturbance

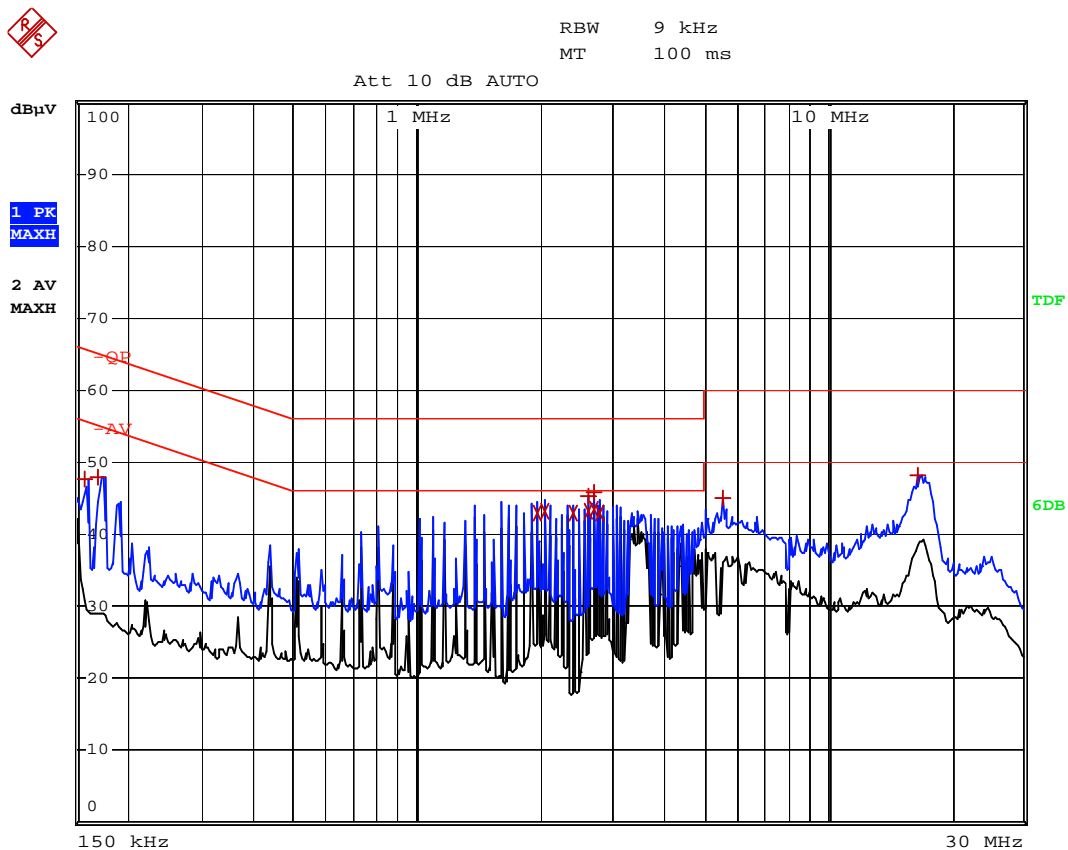
EUT: 802.11b/g MiniPCI Type III Wireless Adapter

M/N: RLM561-148AX

Operating Condition: Transmitting

Test Specification: L

Comment: Install in the PC



Date: 14.JAN.2011 10:54:23

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 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	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, VBW=3KHz, Span = 20MHz.
4. Repeat above procedures until all frequency measured was complete.

5.4 Environmental Conditions

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

5.5 Summary of Test Results/Plots

Chain 0:

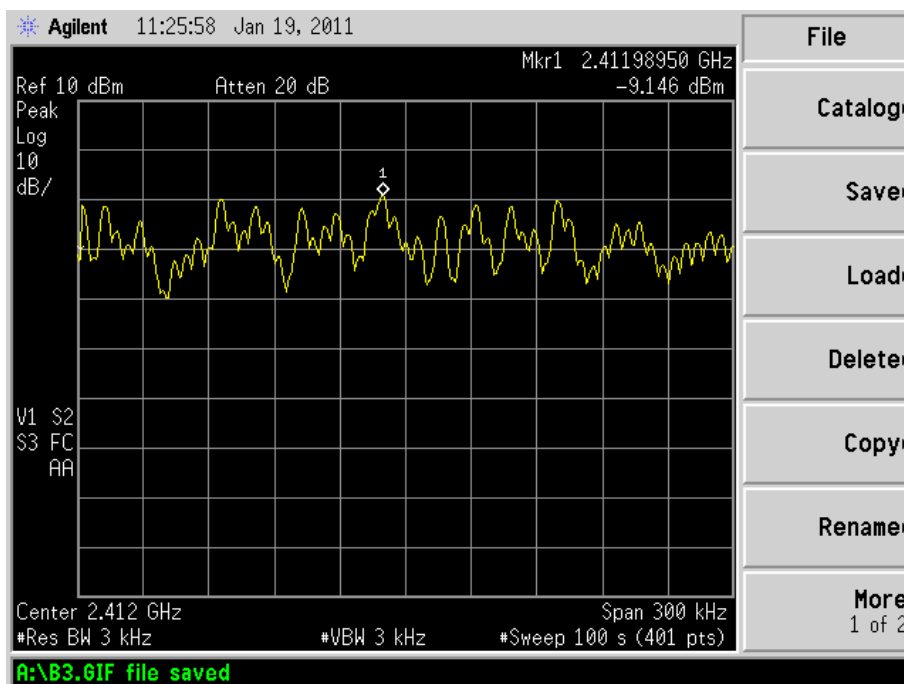
Test mode	Test channel	Reading dBm/3kHz	Limit dBm/3kHz
802.11b	Low channel (2412MHz)	-9.146	8
	Middle channel (2437MHz)	-10.400	8
	High channel (2462MHz)	--11.490	8
802.11g	Low channel (2412MHz)	-17.820	8
	Middle channel (2437MHz)	-17.420	8
	High channel (2462MHz)	-17.090	8

Chain 1:

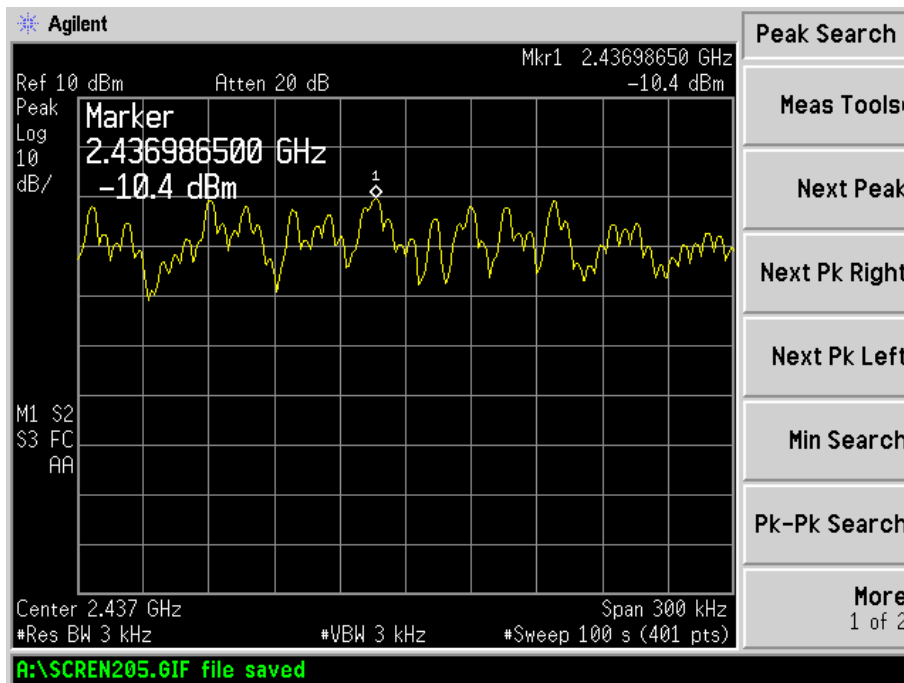
Test mode	Test channel	Reading dBm/3kHz	Limit dBm/3kHz
802.11b	Low channel (2412MHz)	-9.571	8
	Middle channel (2437MHz)	-9.934	8
	High channel (2462MHz)	-11.49	8
802.11g	Low channel (2412MHz)	-18.47	8
	Middle channel (2437MHz)	-17.41	8
	High channel (2462MHz)	-17.37	8

For 802.11b (Chain 0)

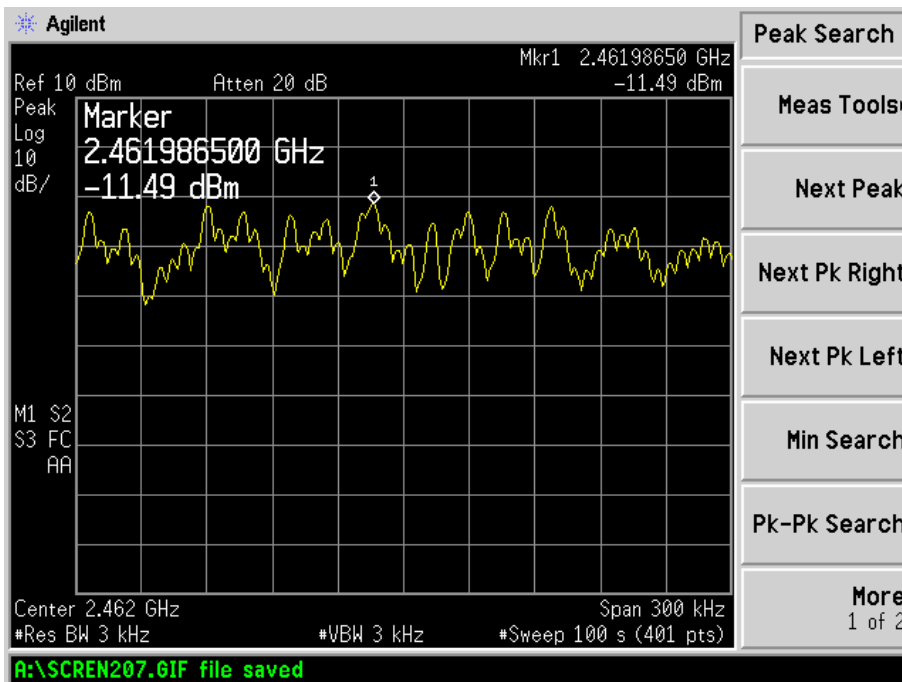
Low Channel:



Middle Channel:

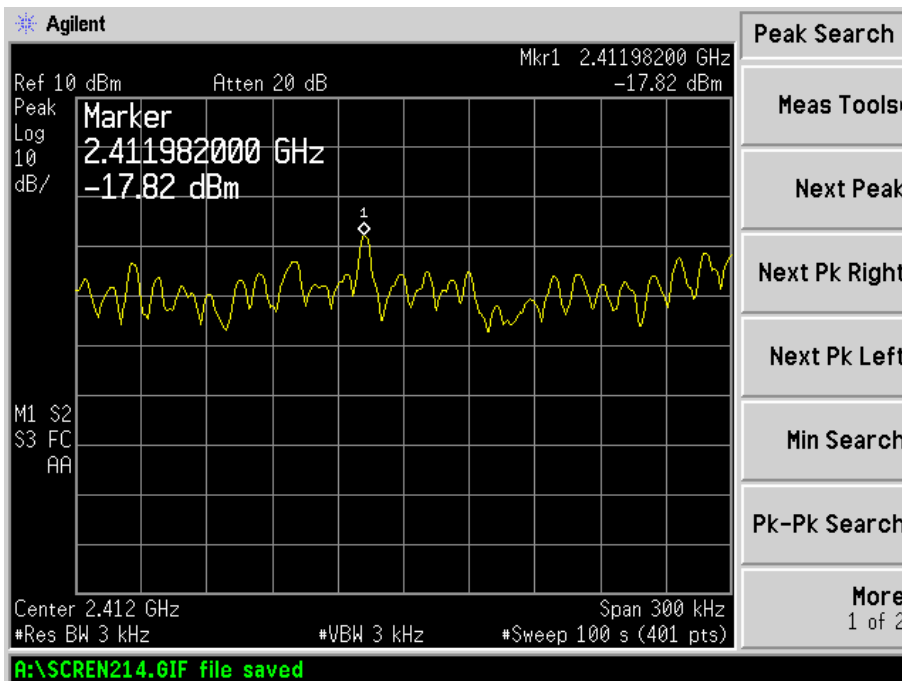


High Channel:

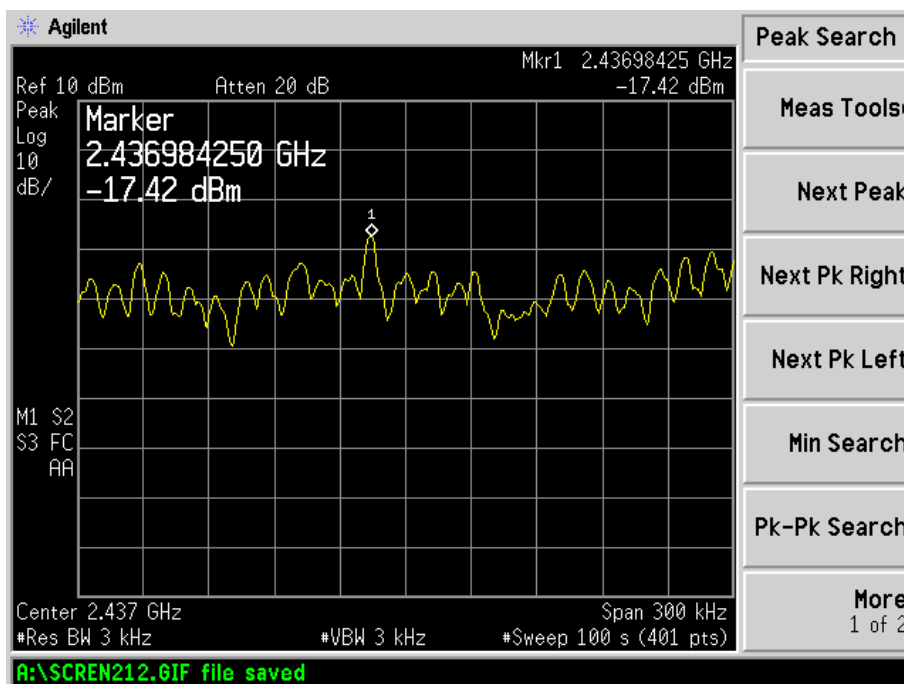


For 802.11g (Chain 0)

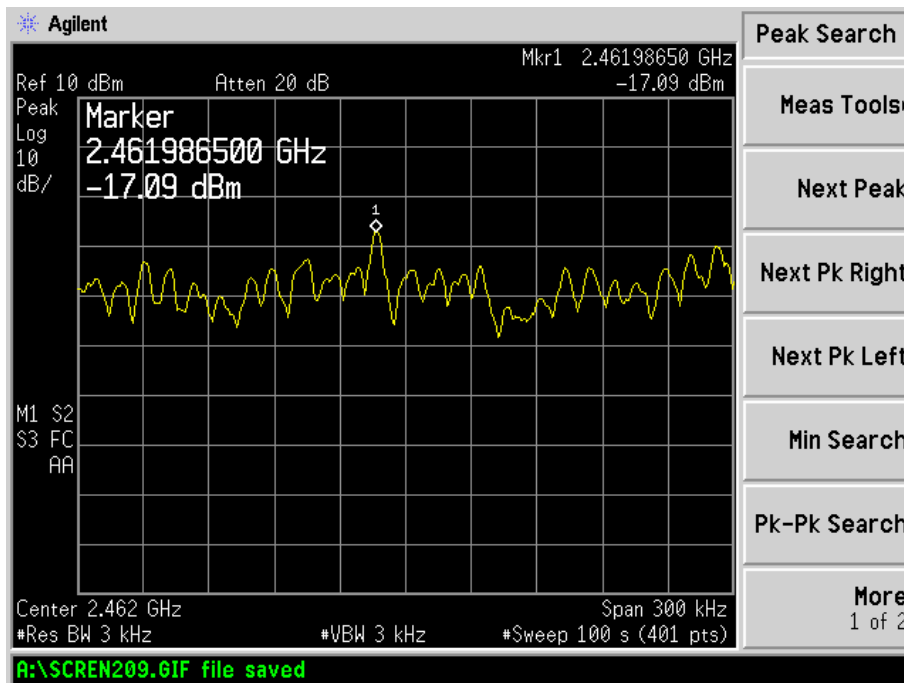
Low Channel:



Middle Channel:

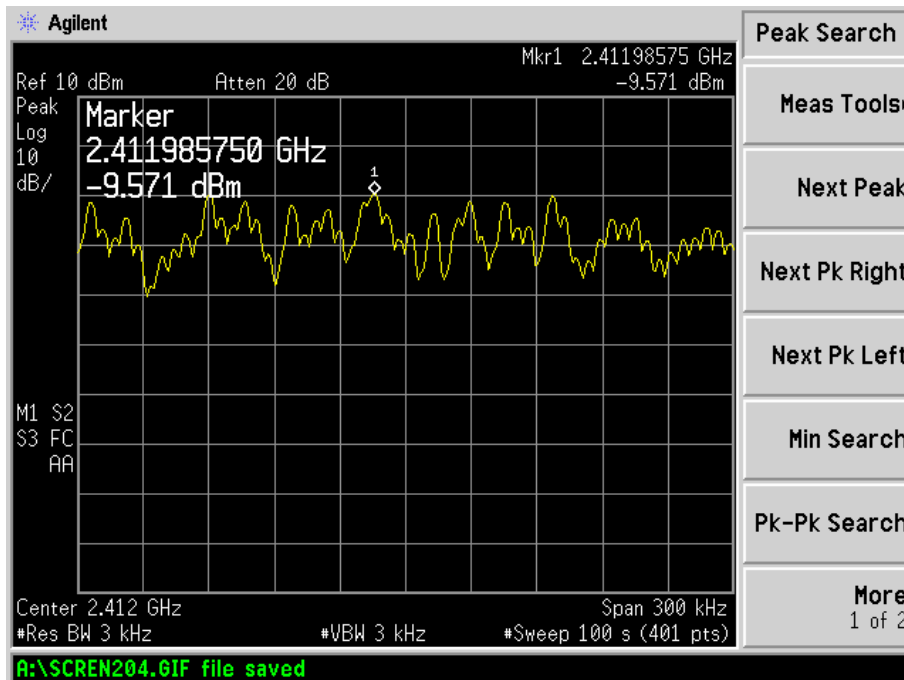


High Channel:

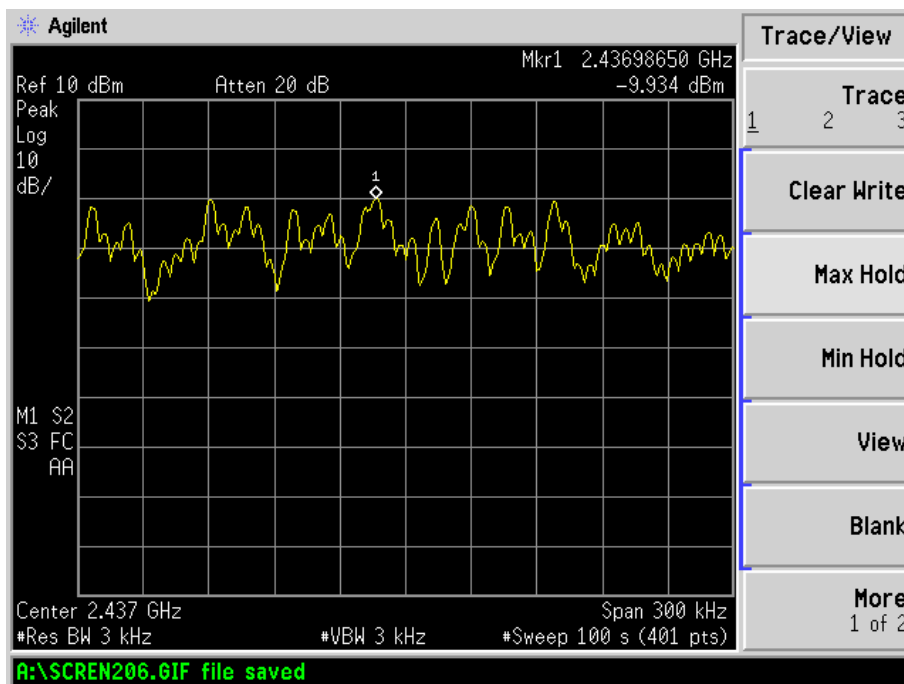


For 802.11b (Chain 1)

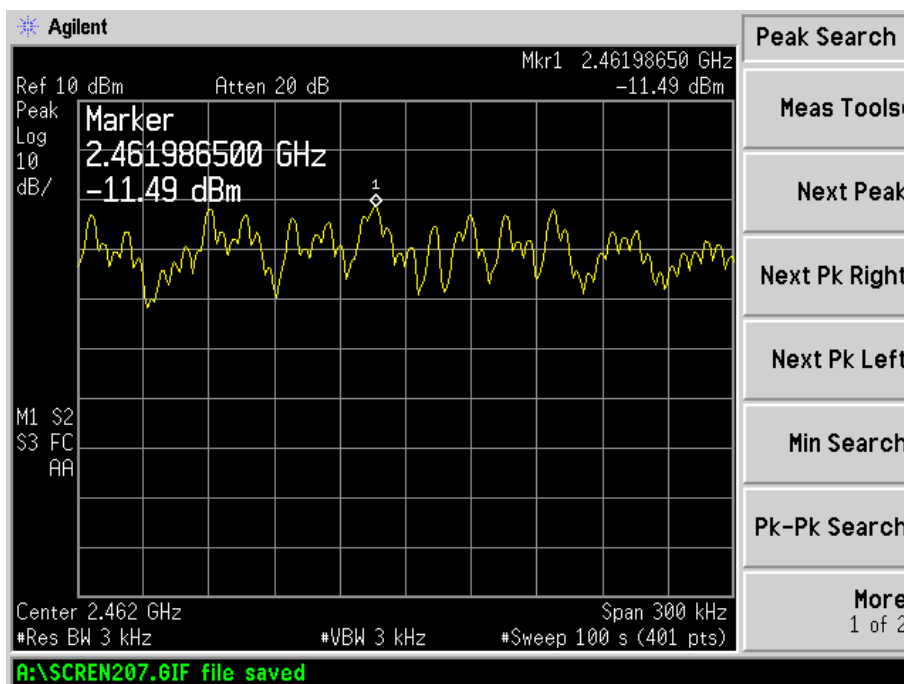
Low Channel:



Middle Channel:

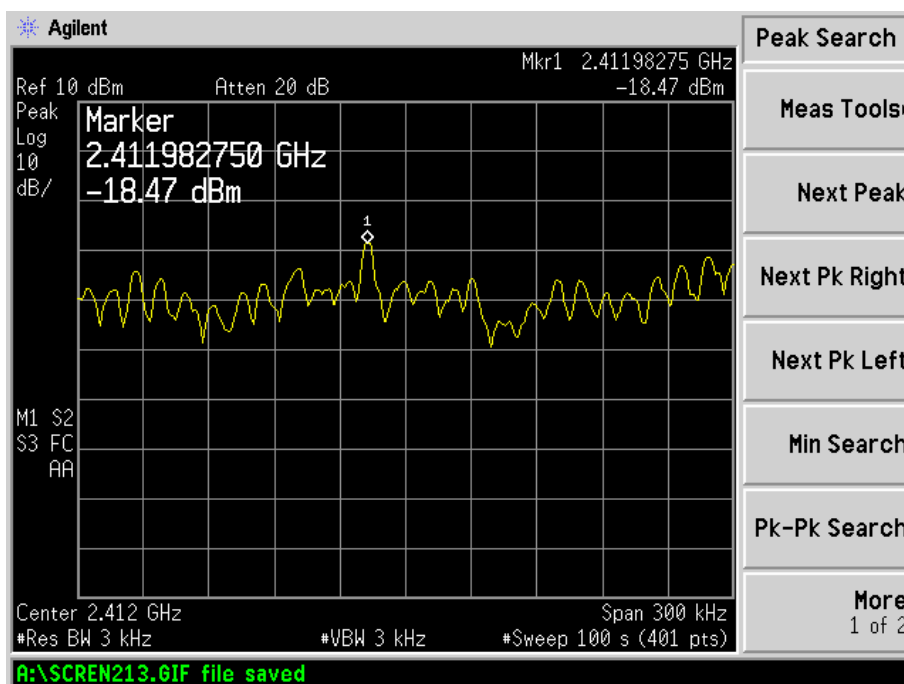


High Channel:

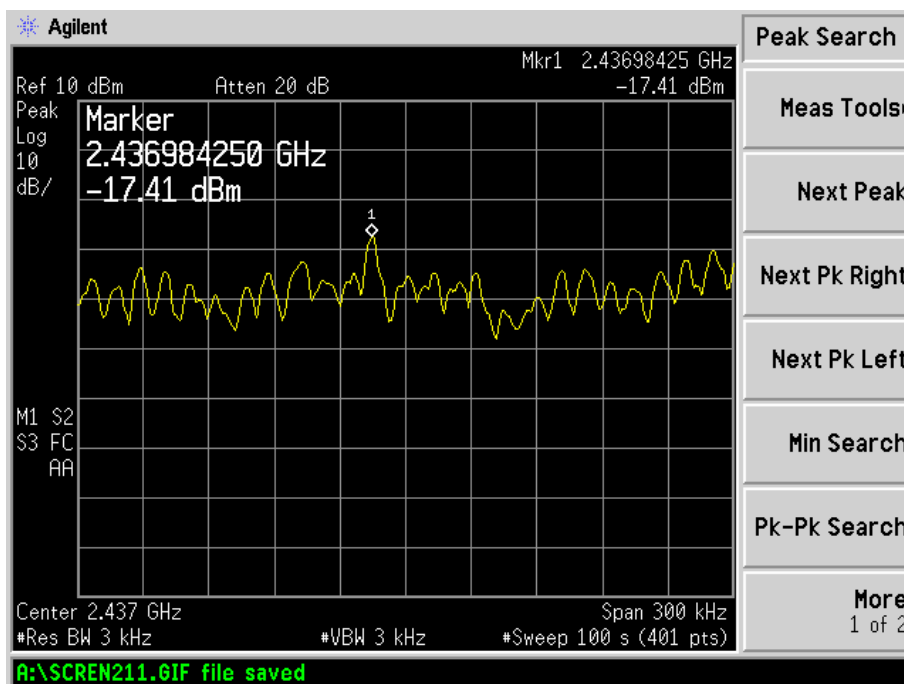


For 802.11g (Chain 1)

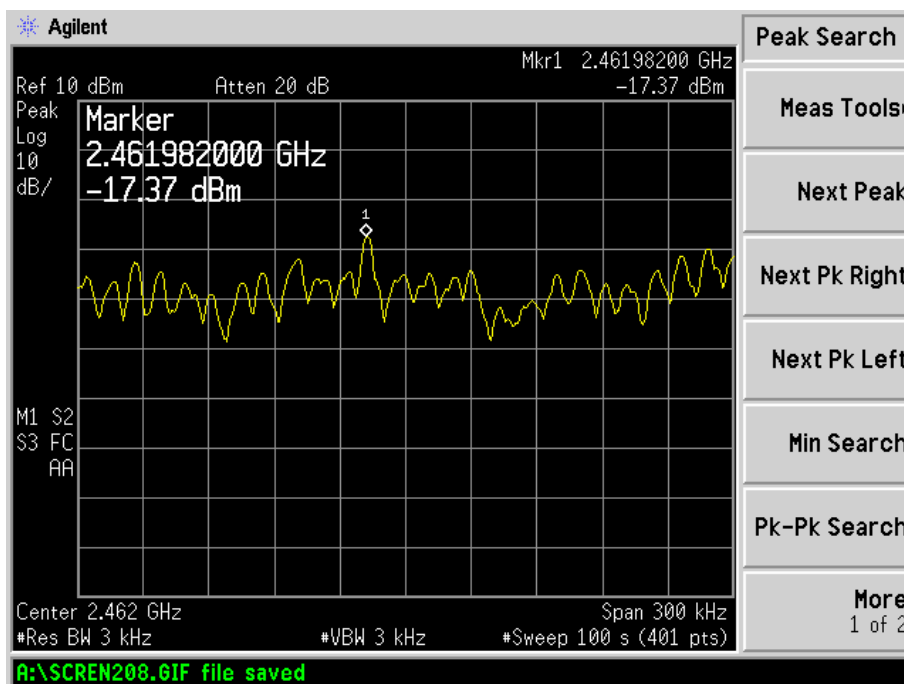
Low Channel:



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	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 (1 % of Bandwidth.), Sweep=auto
4. Mark the peak frequency and –6dB (upper and lower) frequency.

6.4 Environmental Conditions

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

6.5 Summary of Test Results/Plots

Chain 0:

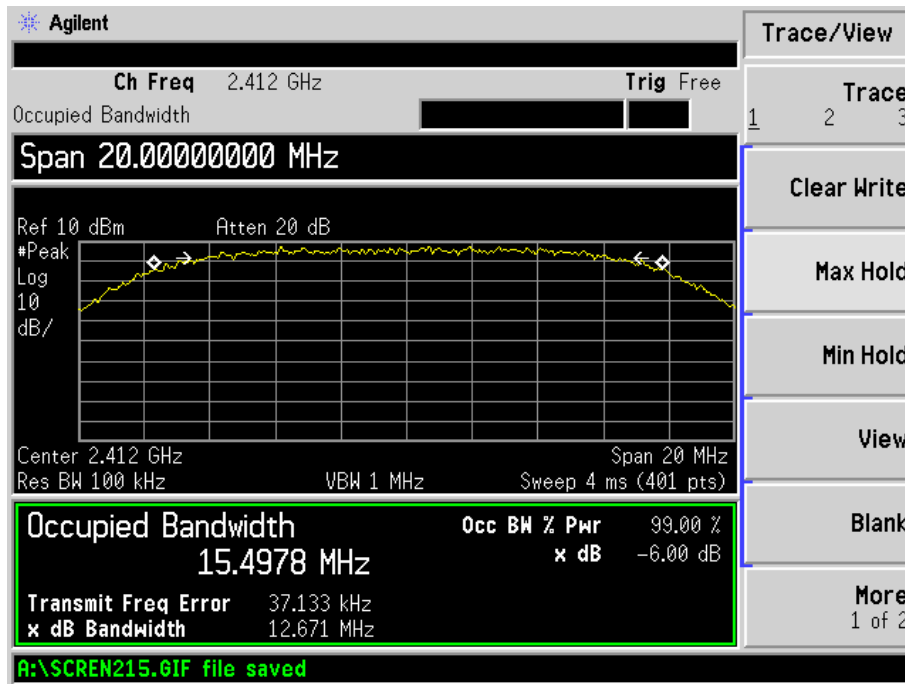
Test mode	Frequency MHz	6 dB Bandwidth kHz	Limit kHz
802.11b	2412	12671	500
	2437	12852	500
	2462	12822	500
802.11g	2412	16541	500
	2437	16526	500
	2462	16564	500

Chain 1:

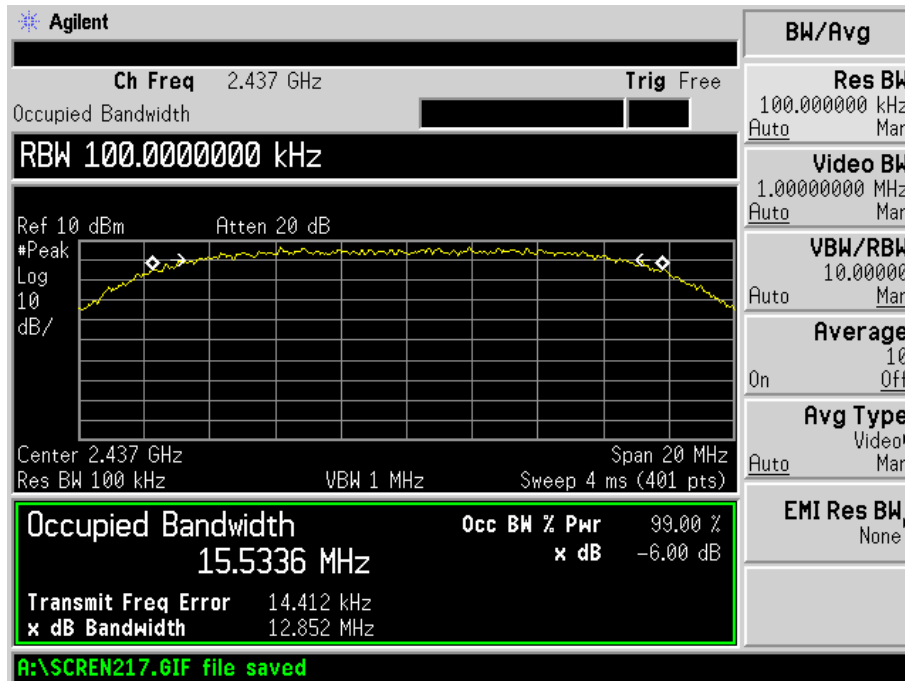
Test mode	Frequency MHz	6 dB Bandwidth kHz	Limit kHz
802.11b	2412	12658	500
	2437	12844	500
	2462	12768	500
802.11g	2412	16516	500
	2437	16543	500
	2462	16561	500

For 802.11b (Chain 0)

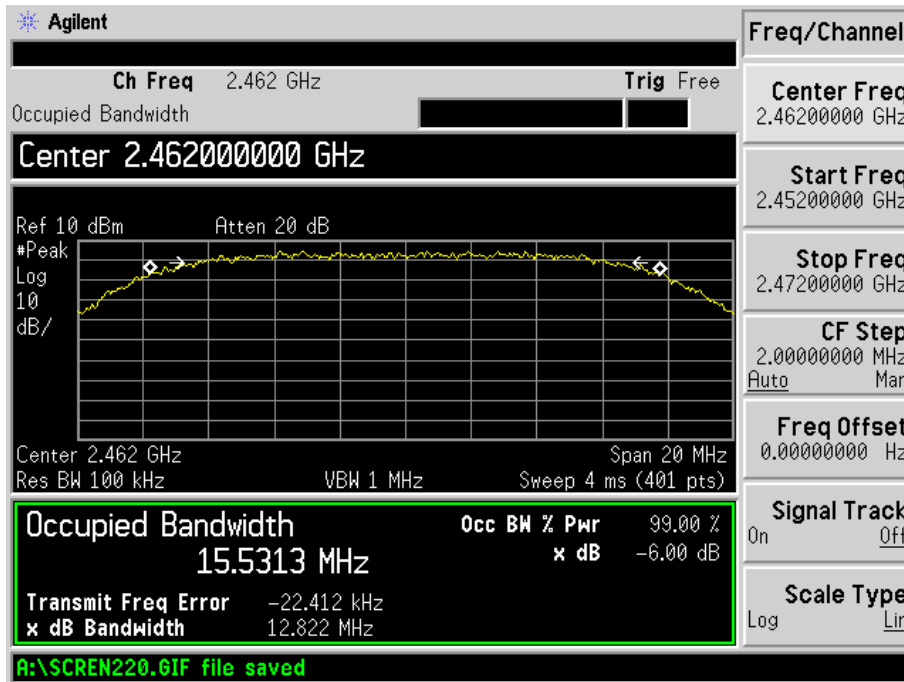
Low Channel:



Mid Channel:

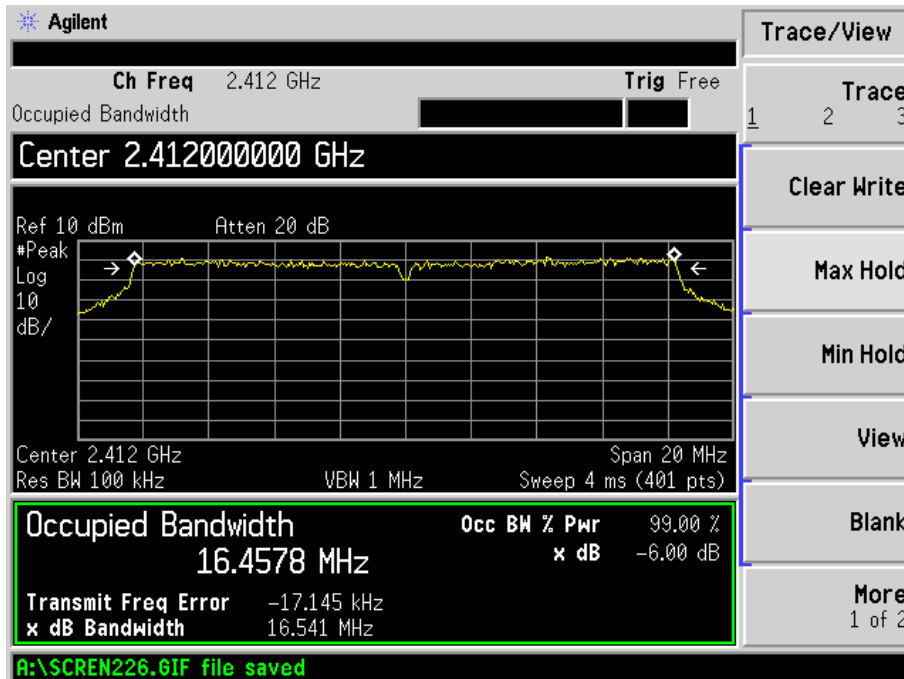


High Channel:

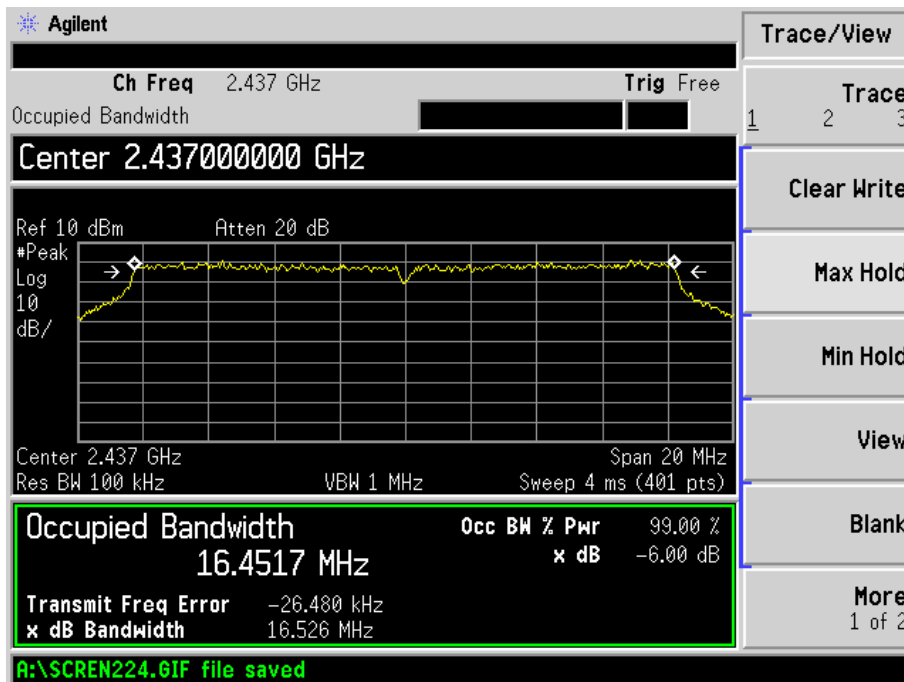


For 802.11g (Chain 0)

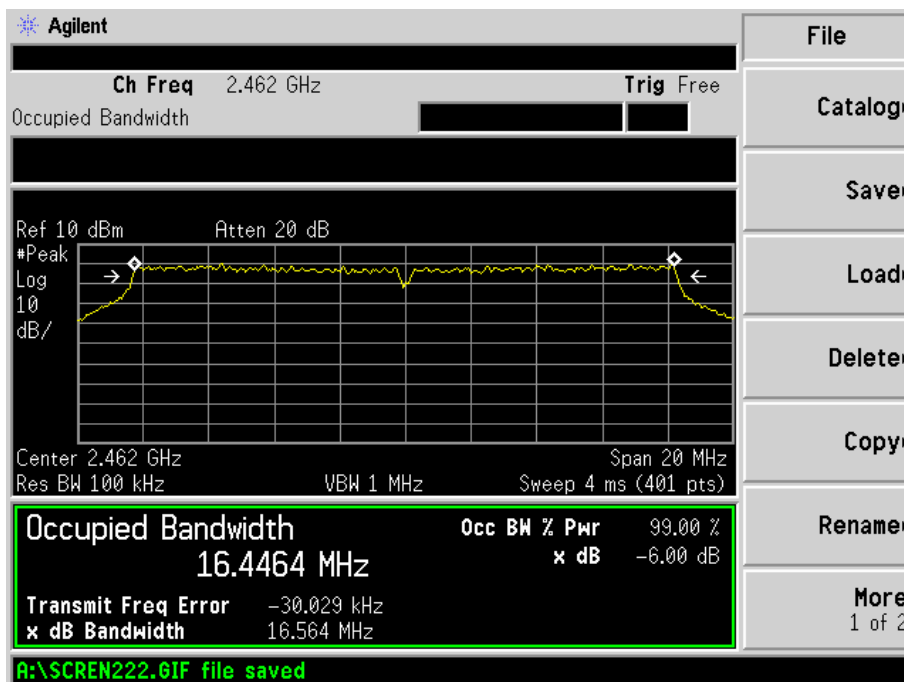
Low Channel:



Mid Channel:

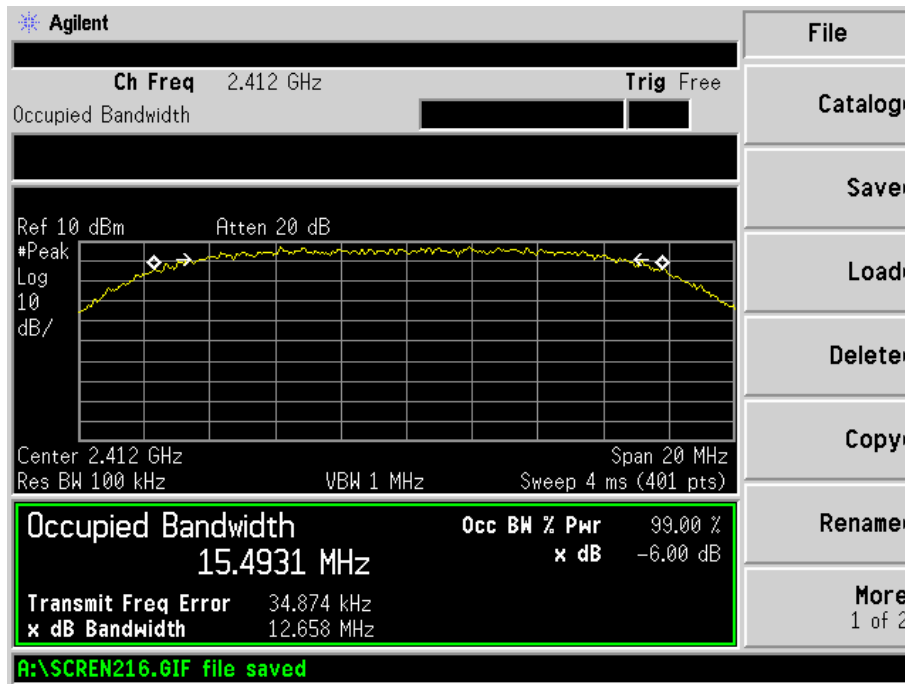


High Channel:

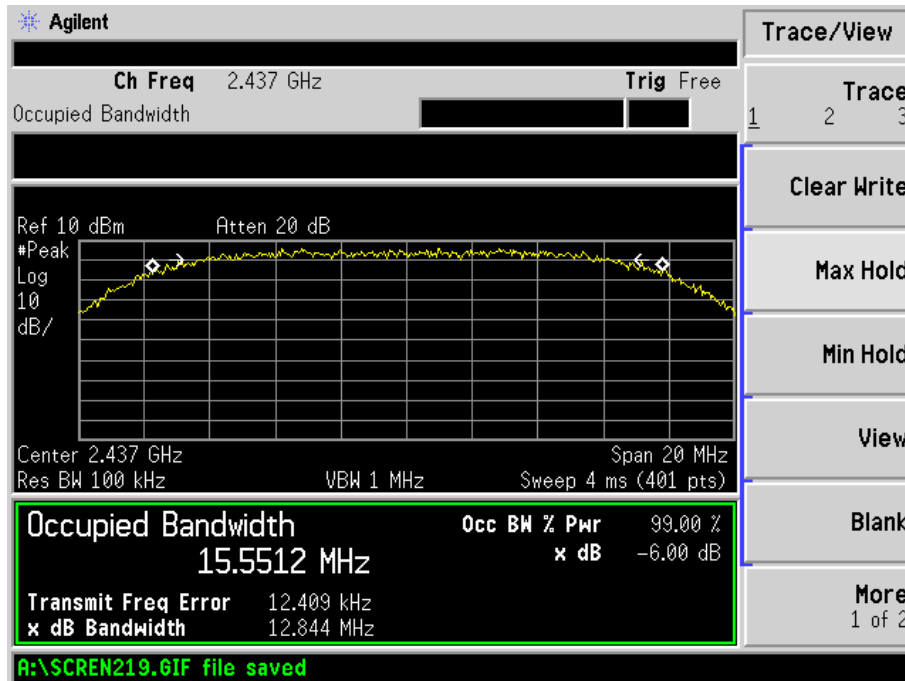


For 802.11b (Chain 1)

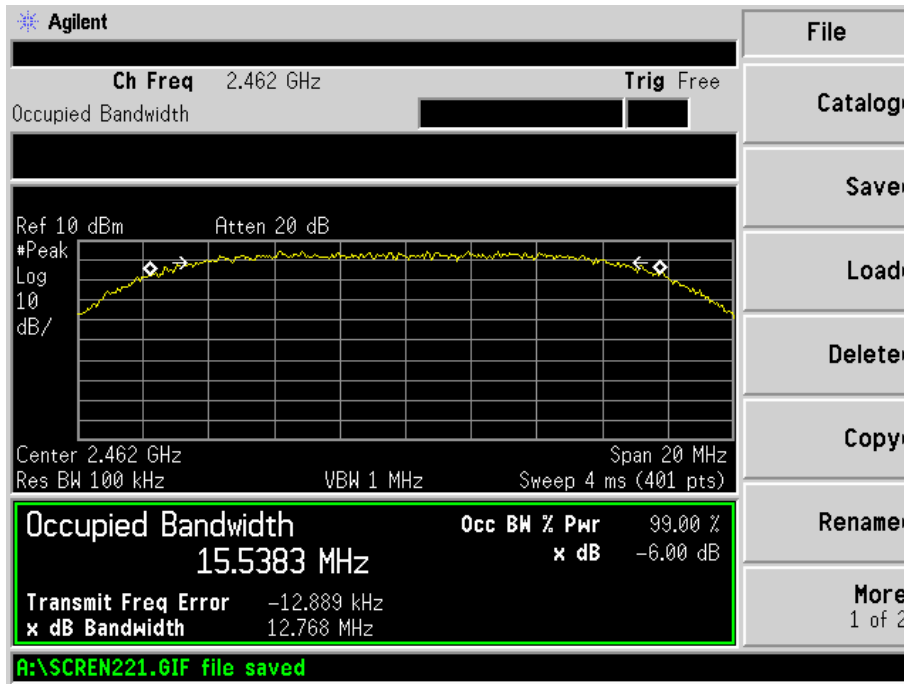
Low Channel:



Mid Channel:

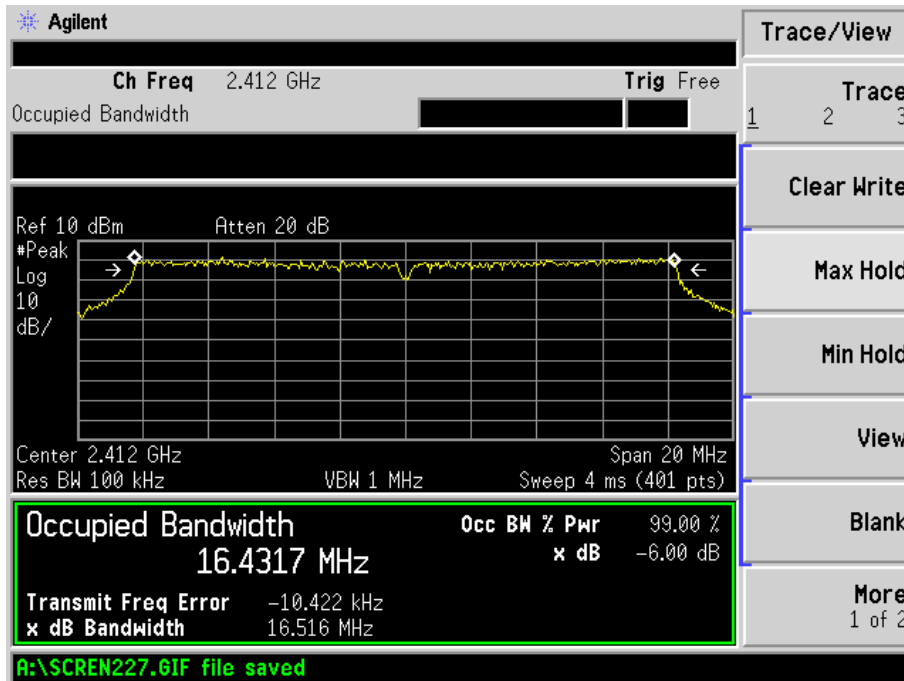


High Channel:

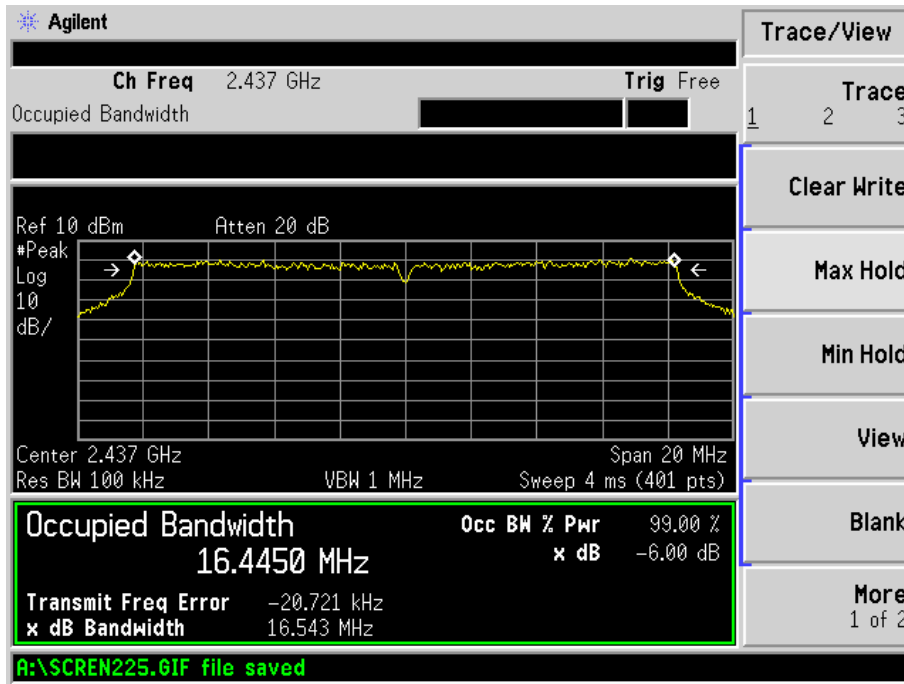


For 802.11g (Chain 1)

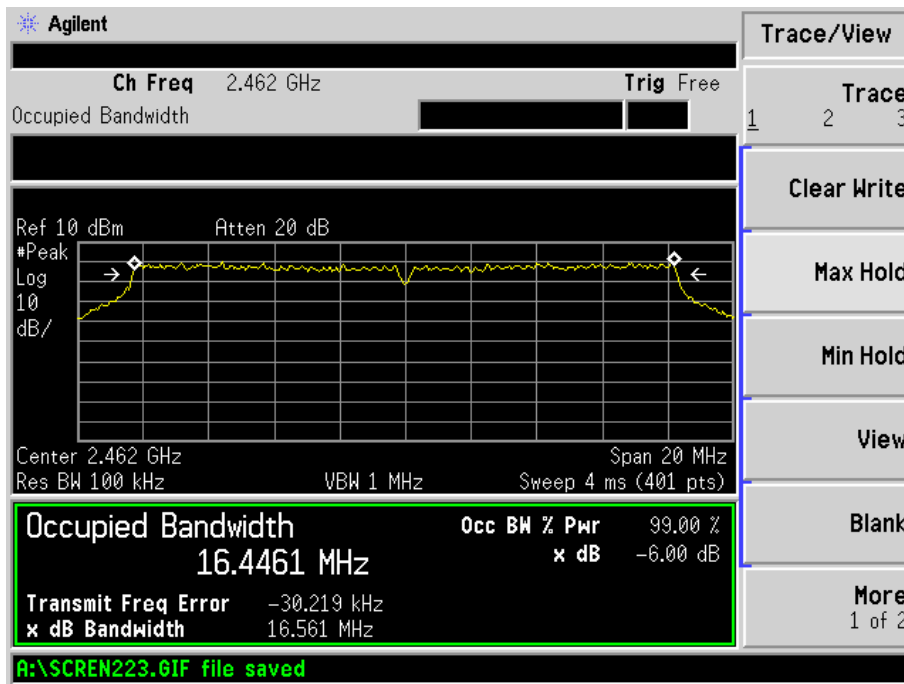
Low Channel:



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

7.5 Summary of Test Results/Plots

Chain 0:

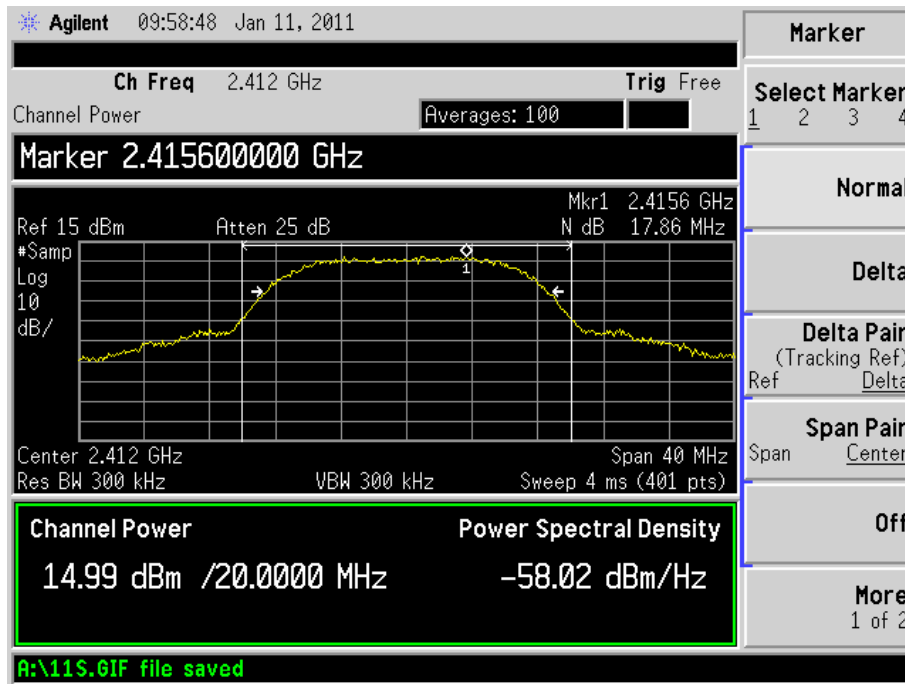
Test mode	Frequency MHz	Reading dBm	Output power W	Limit W
802.11b (1M Short)	2412	14.99	0.03155	1
	2437	14.91	0.03097	1
	2462	14.98	0.03148	1
802.11b (1M Long)	2412	14.99	0.03155	1
	2437	14.82	0.03034	1
	2462	15.03	0.03184	1
802.11b(11M Short)	2412	14.95	0.03126	1
	2437	14.69	0.02944	1
	2462	15.04	0.03192	1
802.11b (11M Long)	2412	14.97	0.03141	1
	2437	14.87	0.03069	1
	2462	14.95	0.03126	1
802.11g (6M)	2412	12.31	0.01702	1
	2437	12.21	0.01663	1
	2462	12.27	0.01687	1
802.11g (54M)	2412	12.29	0.01694	1
	2437	12.21	0.01663	1
	2462	12.24	0.01675	1

Chain 1:

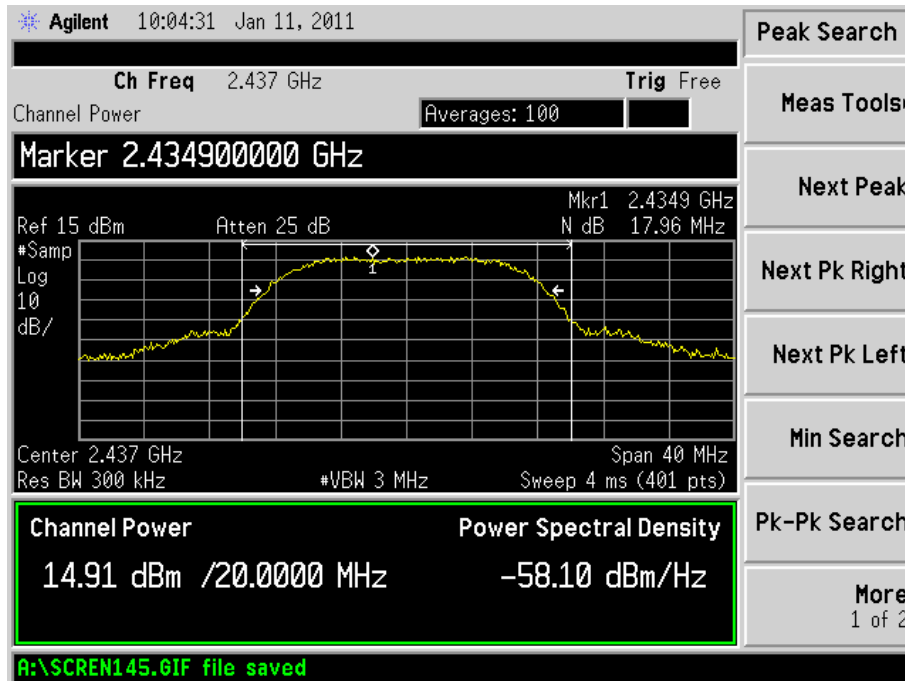
Test mode	Frequency MHz	Reading dBm	Output power W	Limit W
802.11b (1M Short)	2412	15.15	0.03273	1
	2437	15.05	0.03199	1
	2462	14.97	0.03141	1
802.11b (1M Long)	2412	15.10	0.03236	1
	2437	15.06	0.03206	1
	2462	14.97	0.03141	1
802.11b(11M Short)	2412	15.11	0.03243	1
	2437	15.02	0.03177	1
	2462	15.29	0.03381	1
802.11b (11M Long)	2412	15.07	0.03214	1
	2437	15.05	0.03199	1
	2462	15.42	0.03483	1
802.11g (6M)	2412	12.26	0.01683	1
	2437	12.39	0.01734	1
	2462	12.15	0.01641	1
802.11g (54M)	2412	12.23	0.01671	1
	2437	12.36	0.01722	1
	2462	12.18	0.01652	1

For 802.11b_1M Short rate (Chain 0)

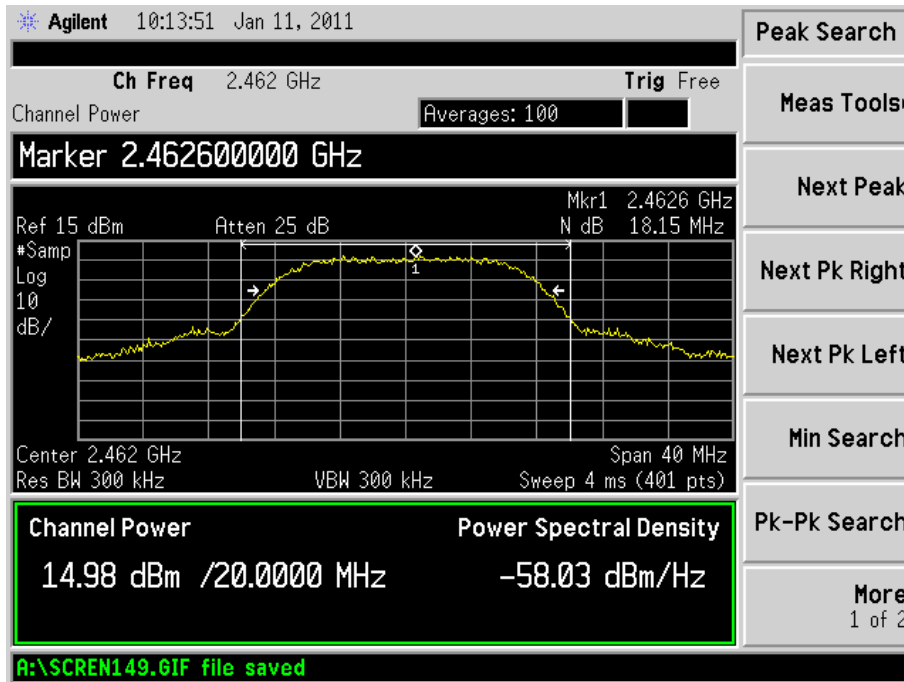
Low Channel:



Middle Channel:

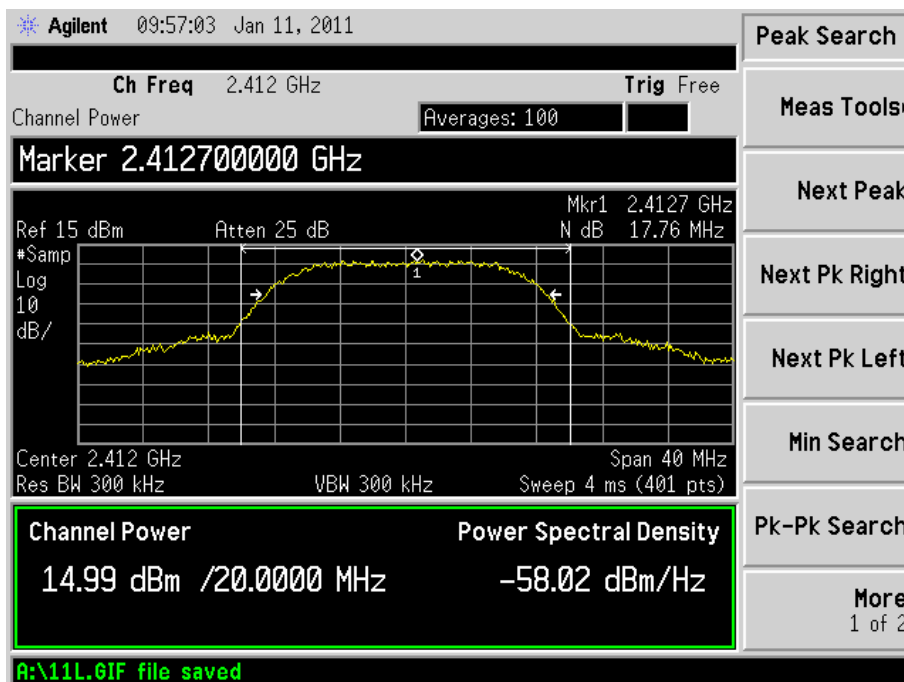


High Channel:

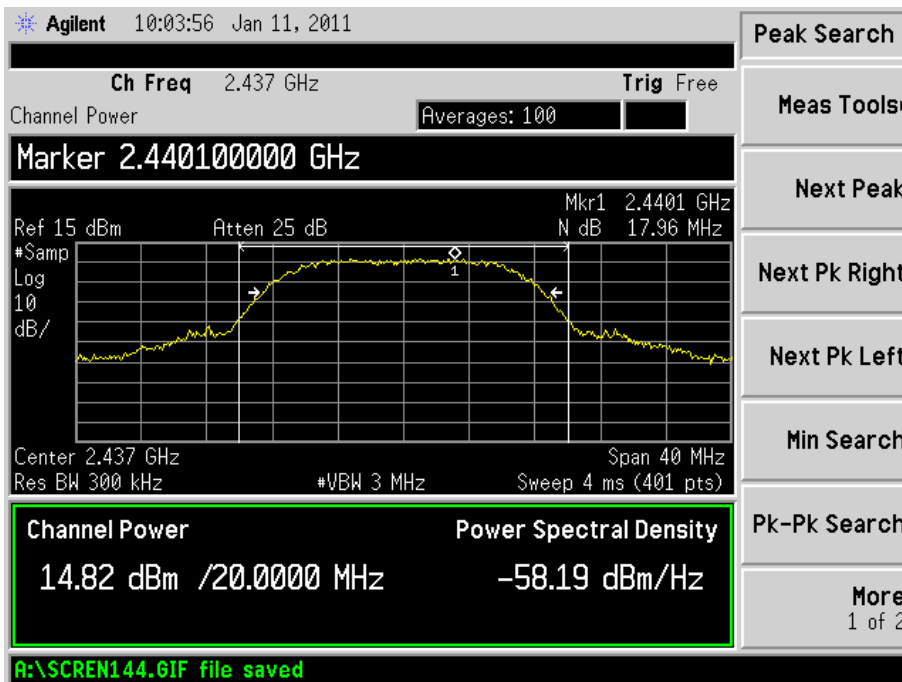


For 802.11b_11M Short rate (Chain 0)

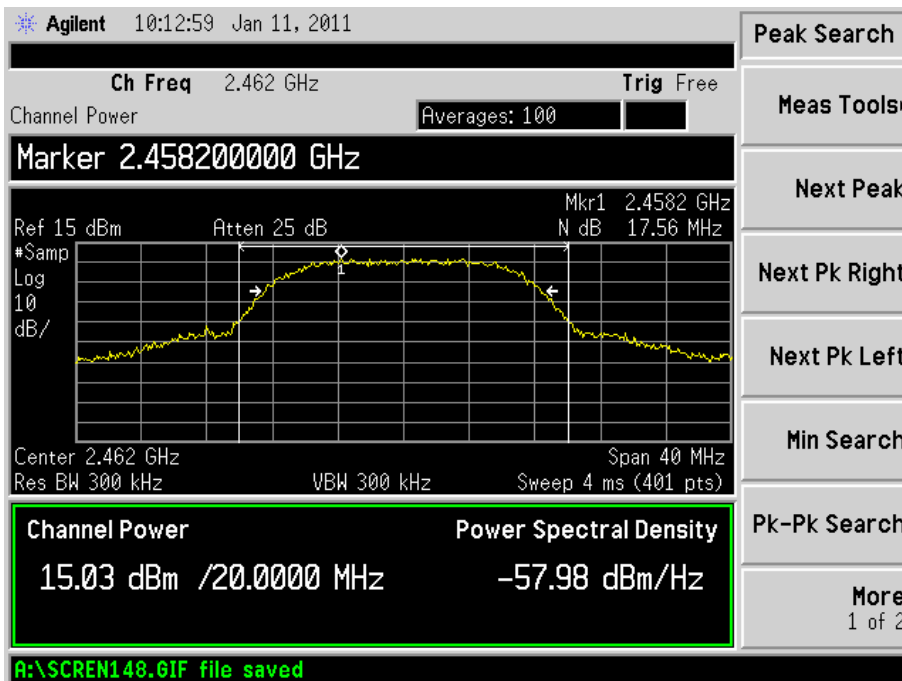
Low Channel:



Middle Channel:

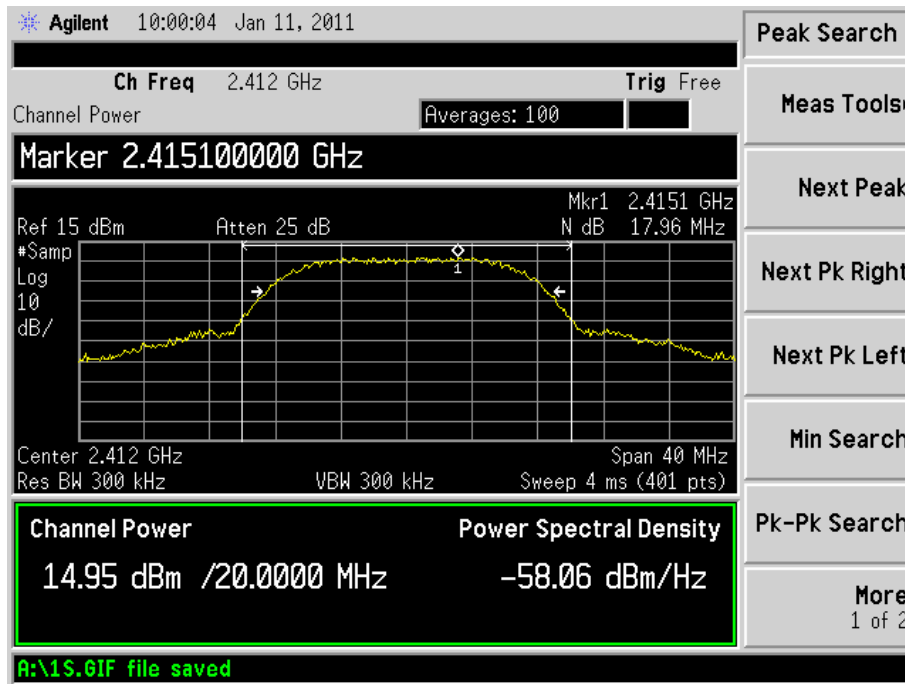


High Channel:

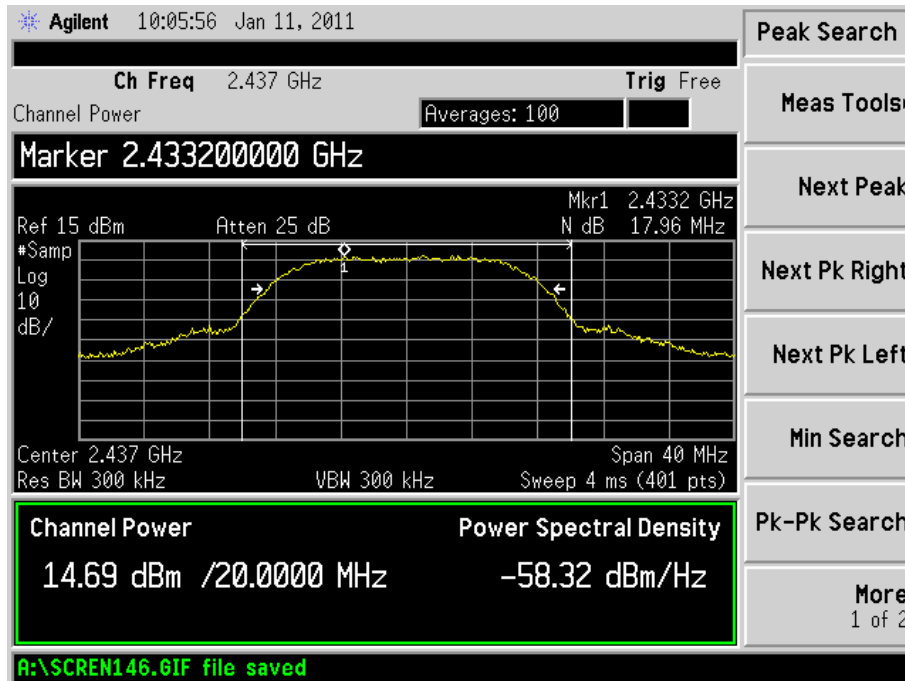


For 802.11b_1M Long rate (Chain 0)

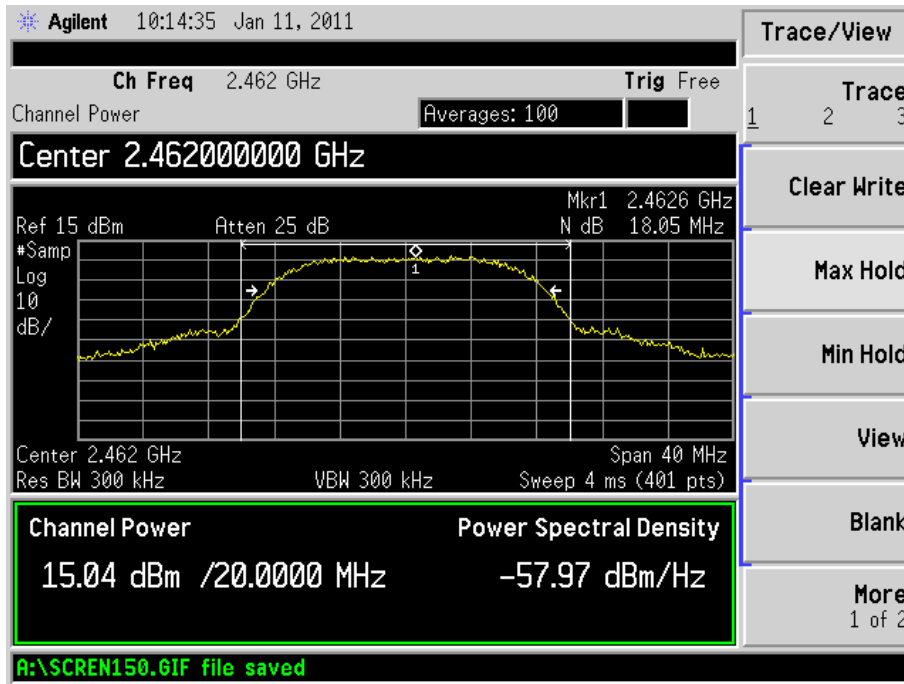
Low Channel:



Middle Channel:

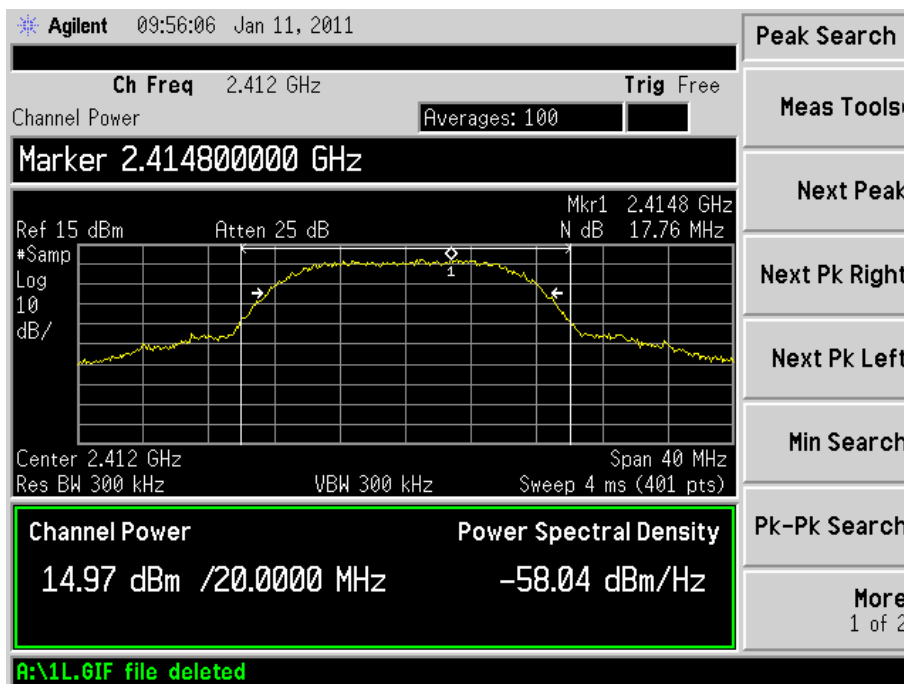


High Channel:

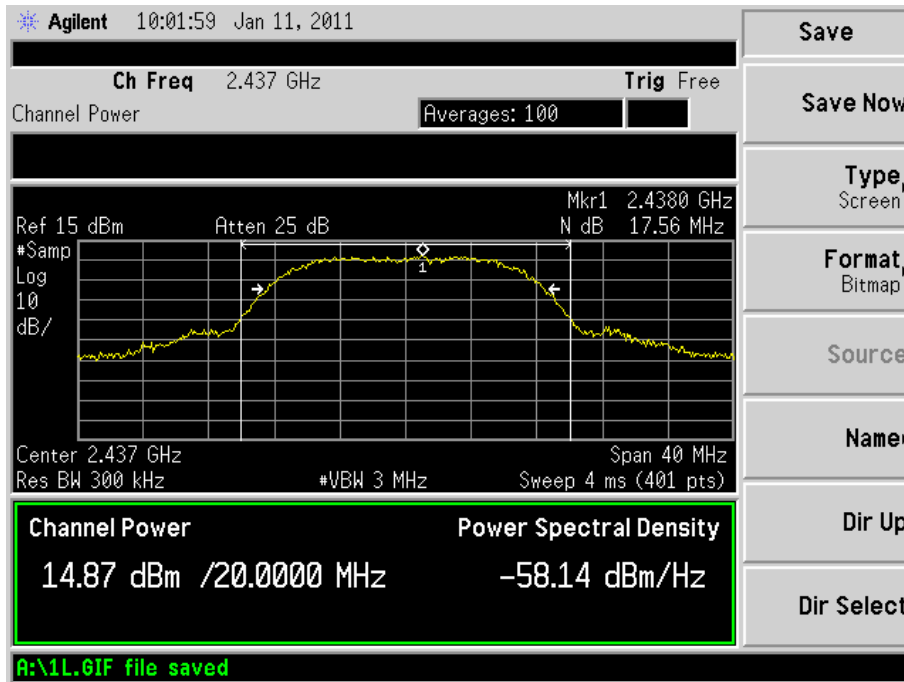


For 802.11b_11M Long rate (Chain 0)

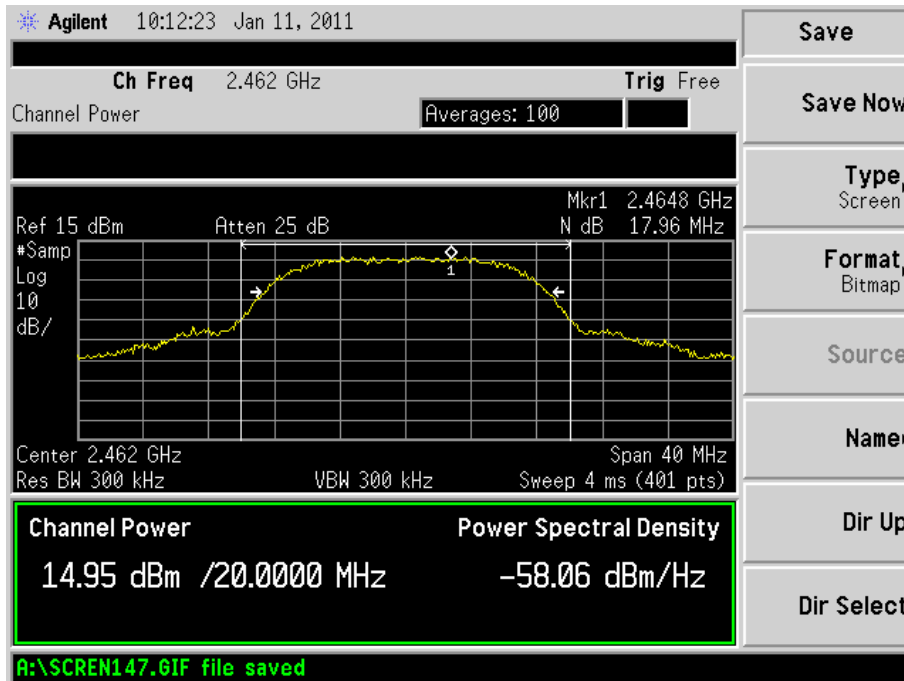
Low Channel:



Middle Channel:

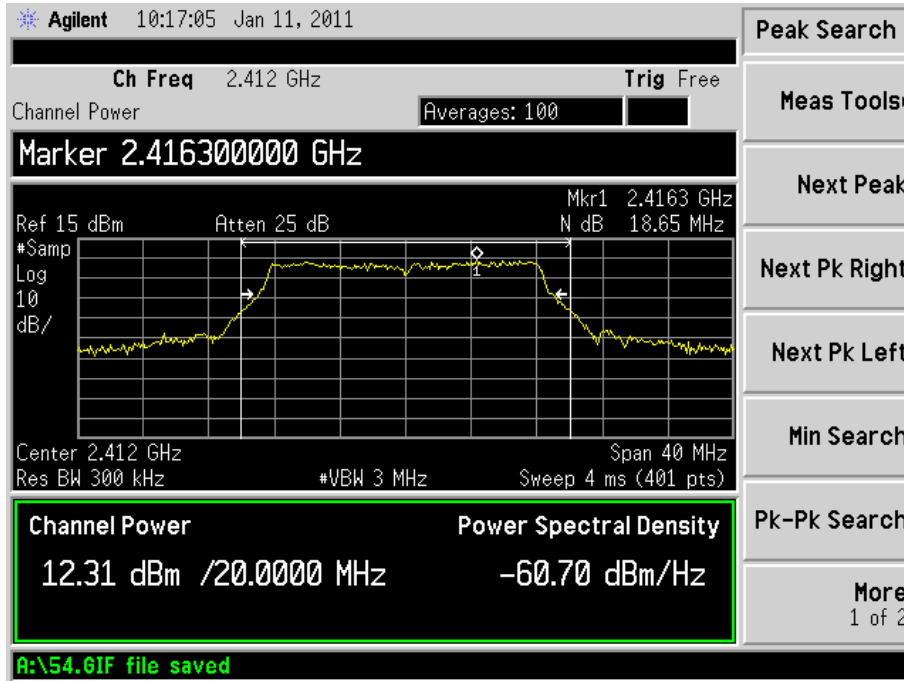


High Channel:

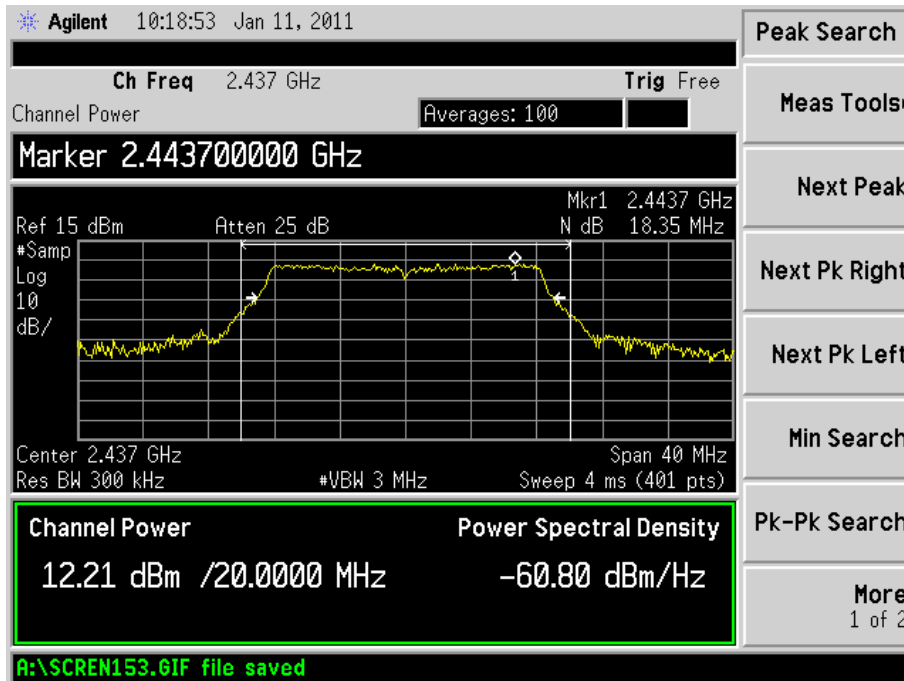


For 802.11g_6M rate (Chain 0)

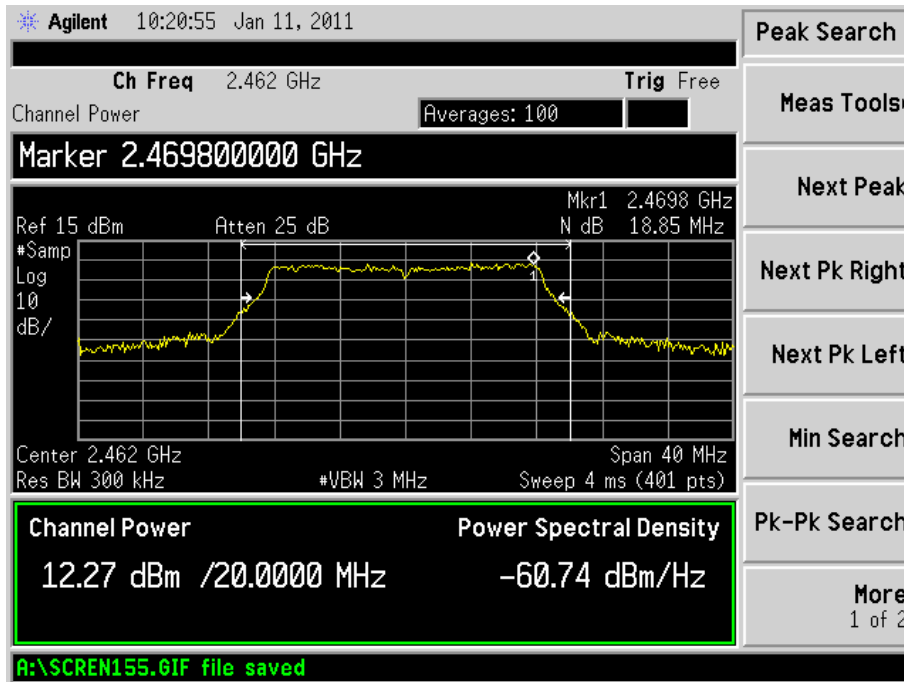
Low Channel:



Middle Channel:

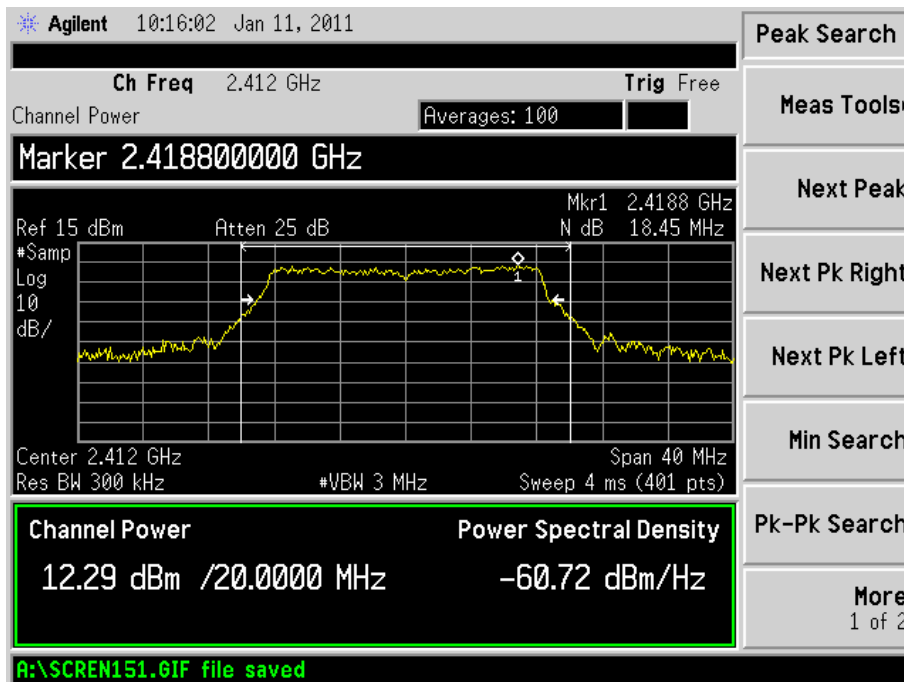


High Channel:

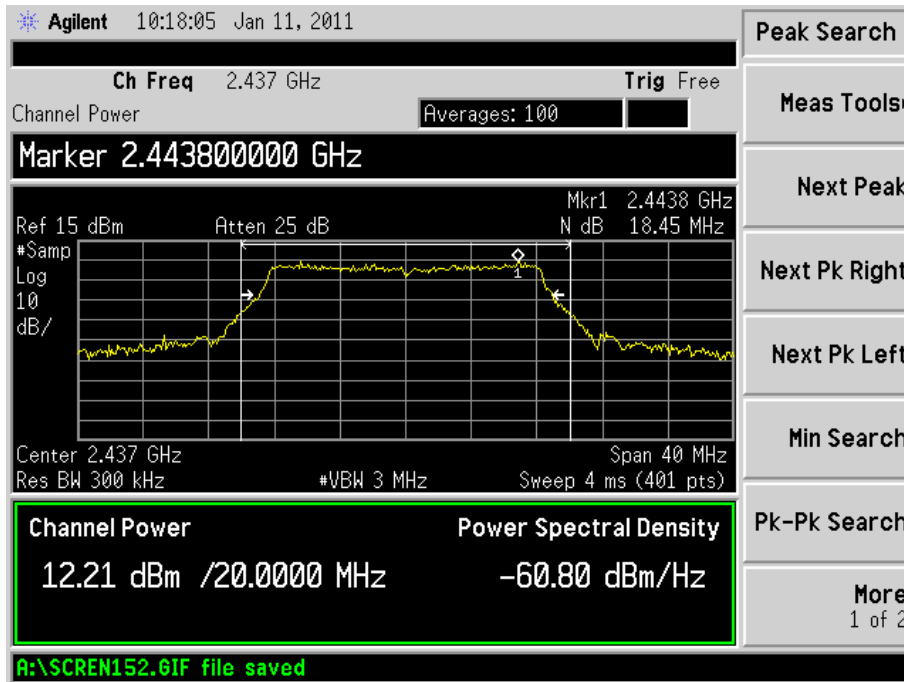


For 802.11g_54M rate (Chain 0)

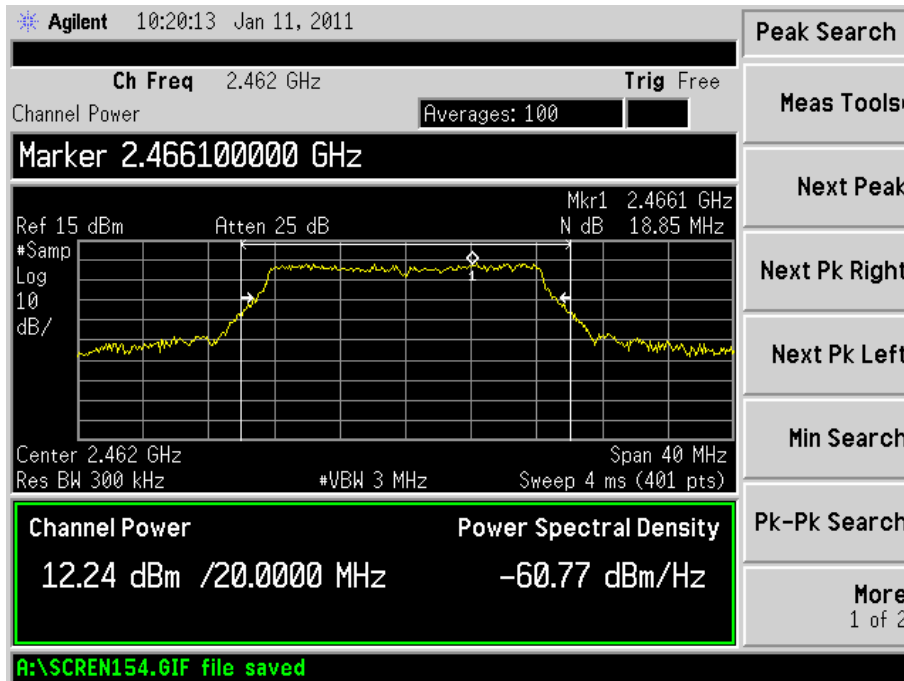
Low Channel:



Middle Channel:

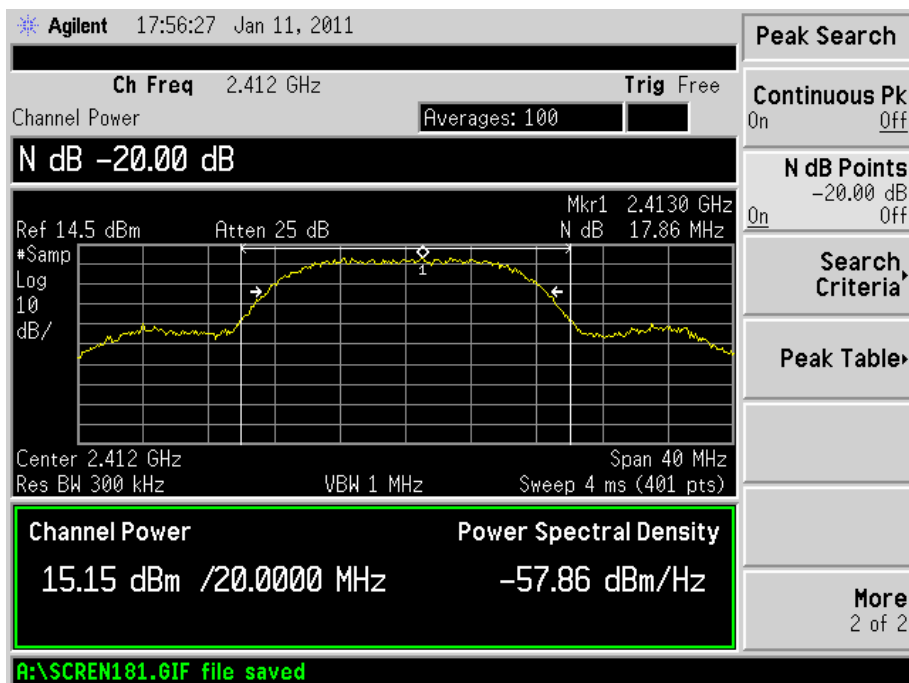


High Channel:

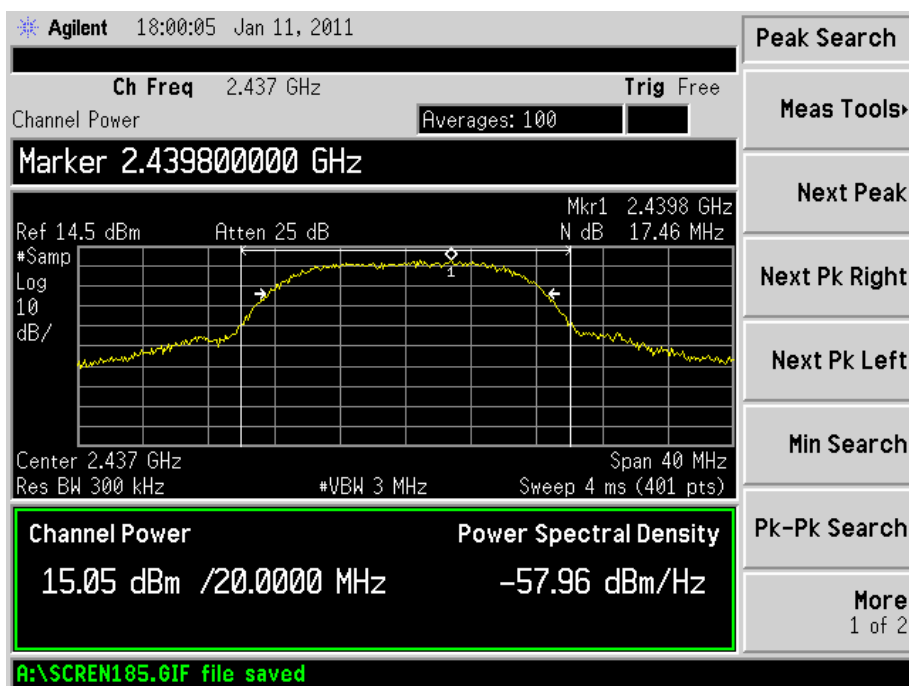


For 802.11b_1M Short rate (Chain 1)

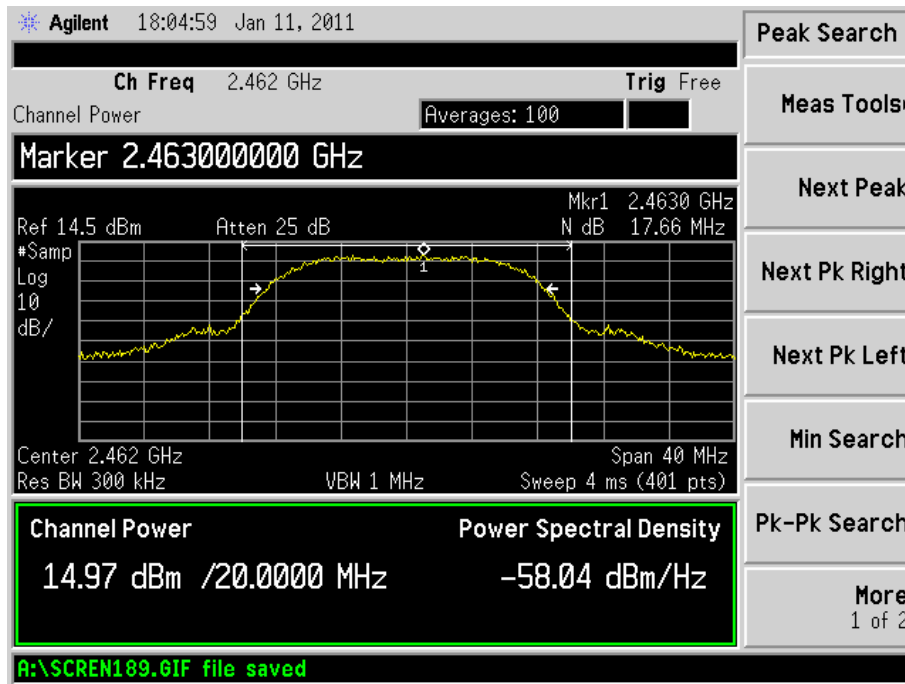
Low Channel:



Middle Channel:

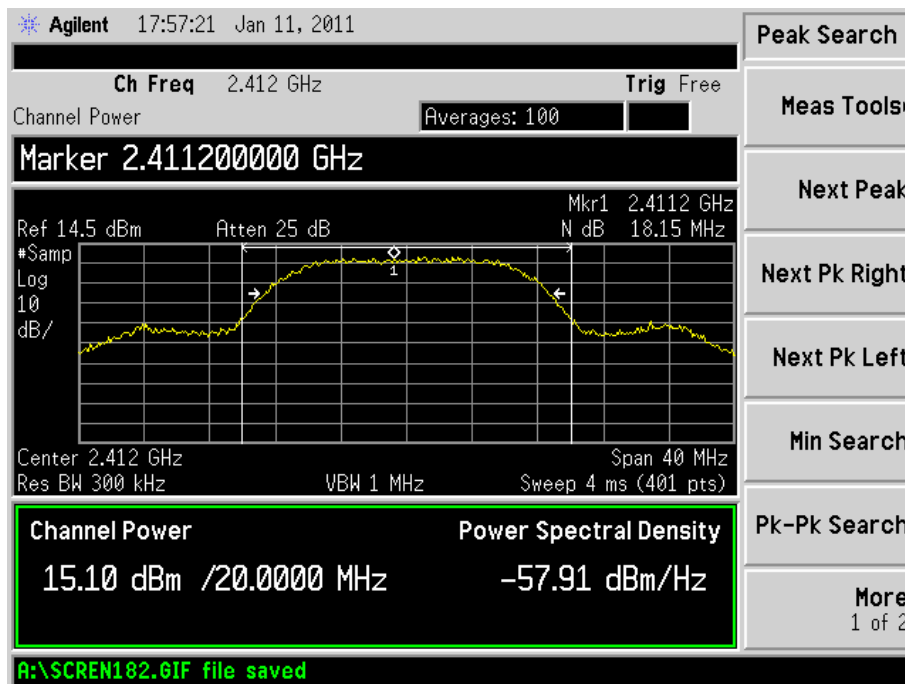


High Channel:

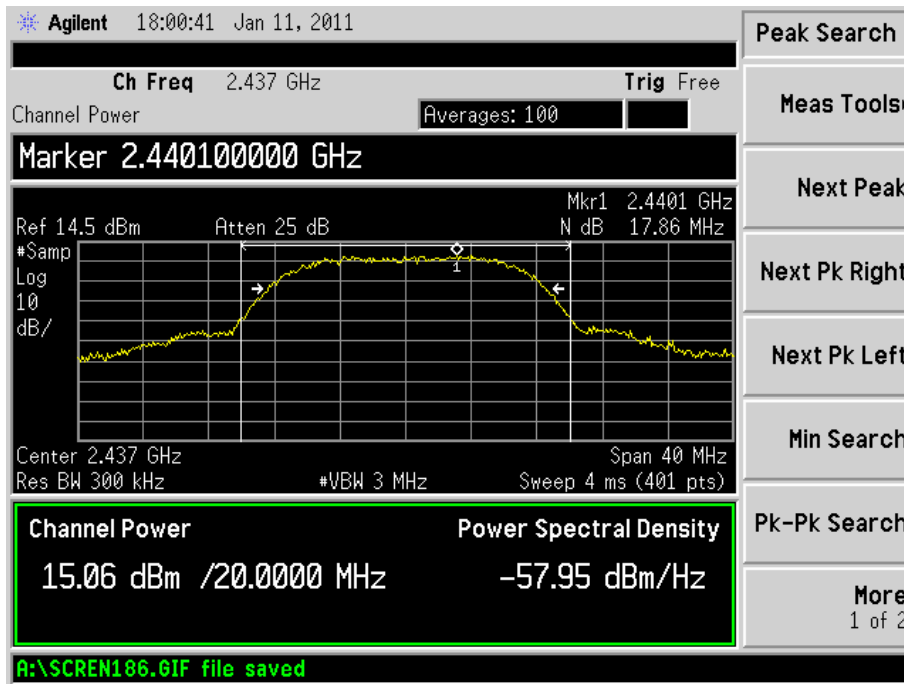


For 802.11b_11M Short rate (Chain 1)

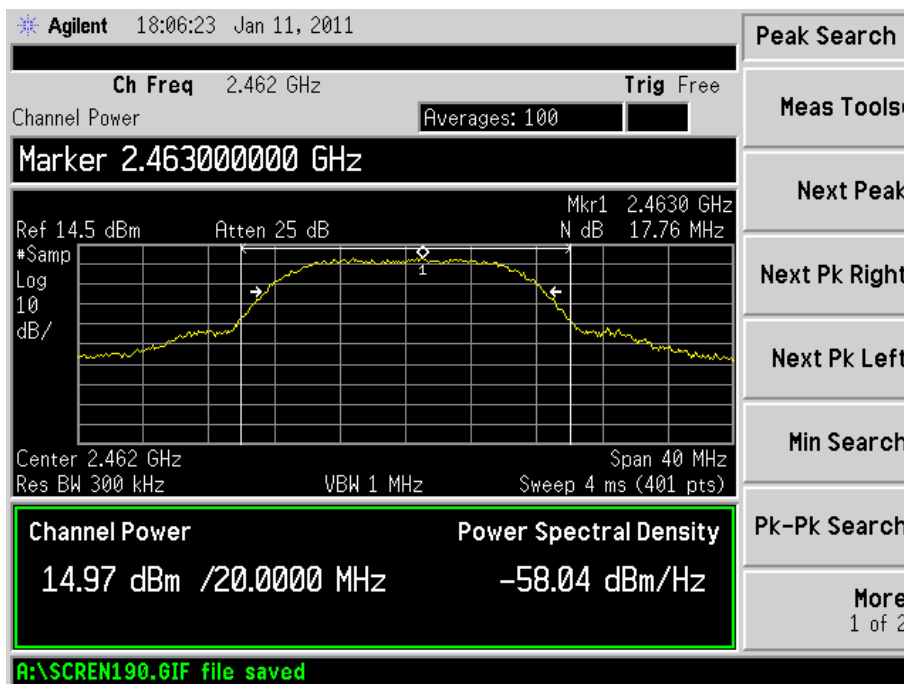
Low Channel:



Middle Channel:

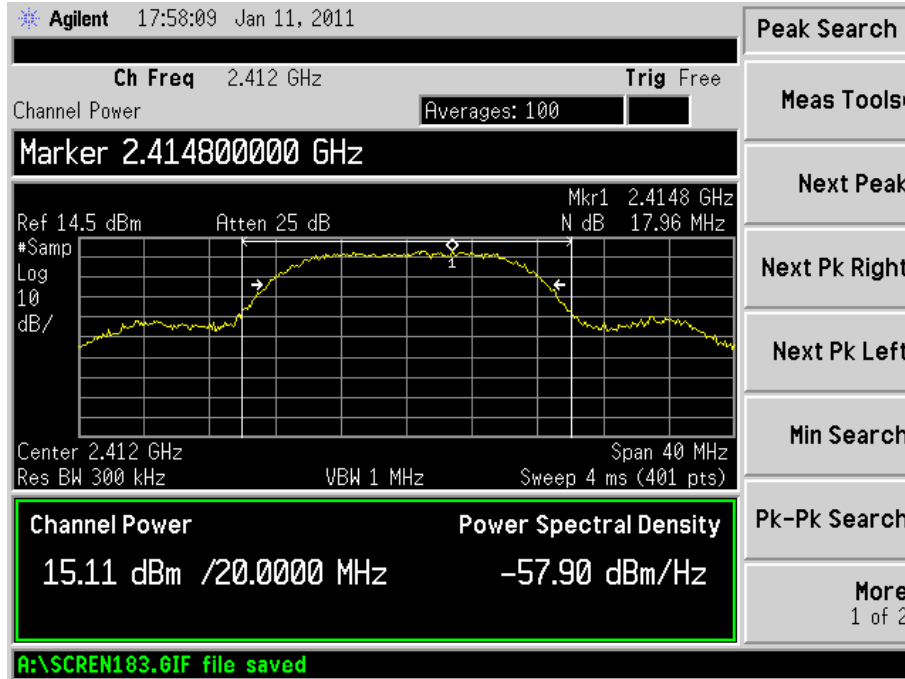


High Channel:

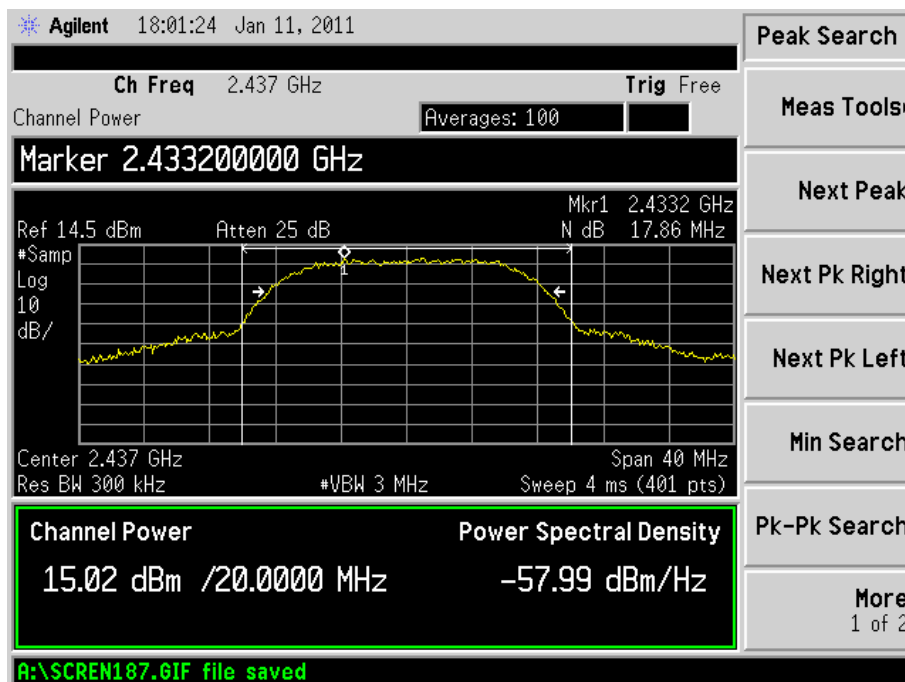


For 802.11b_1M Long rate (Chain 1)

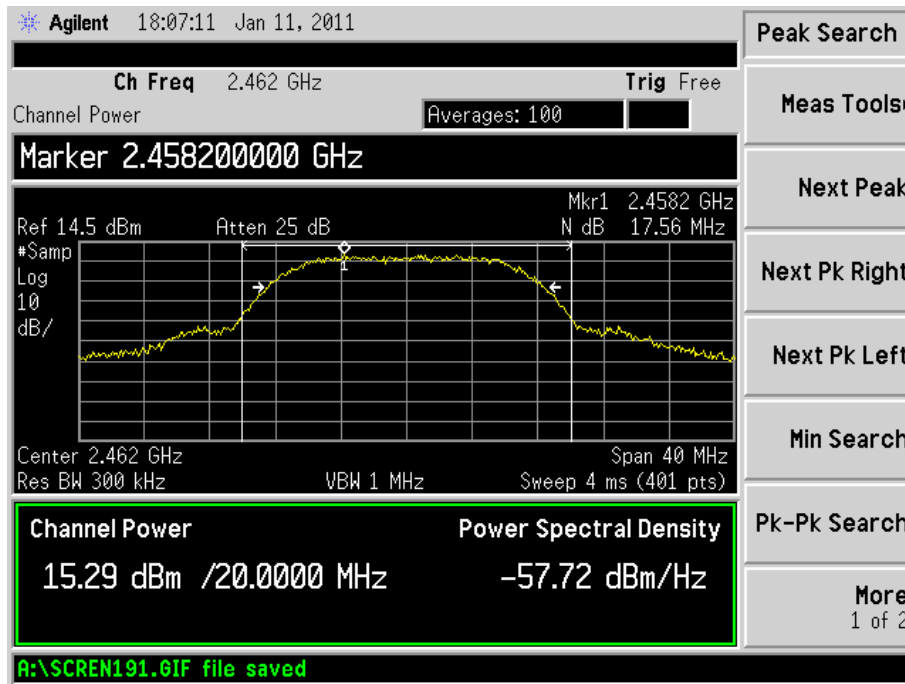
Low Channel:



Middle Channel:

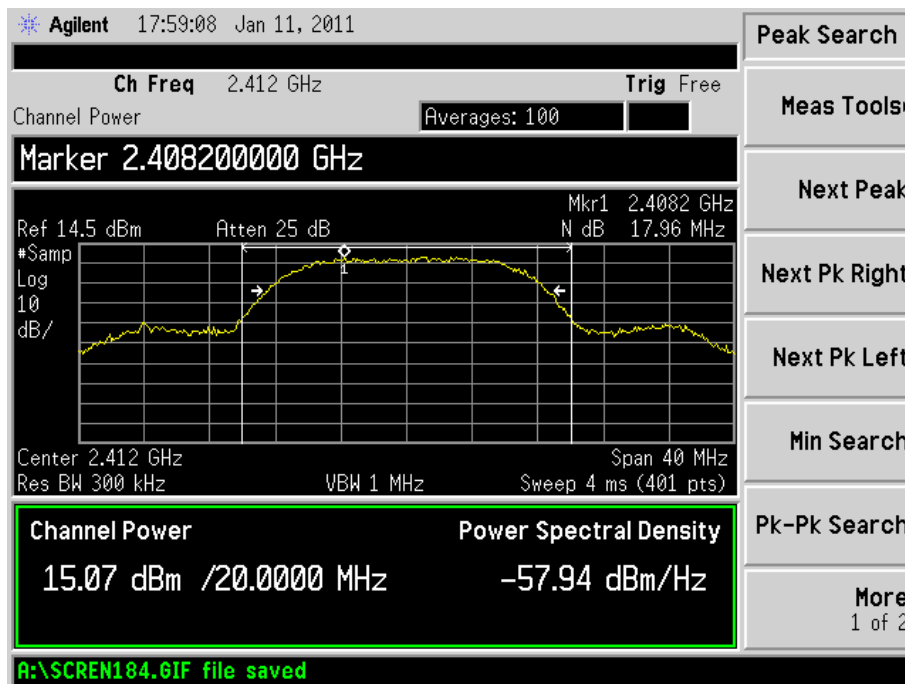


High Channel:

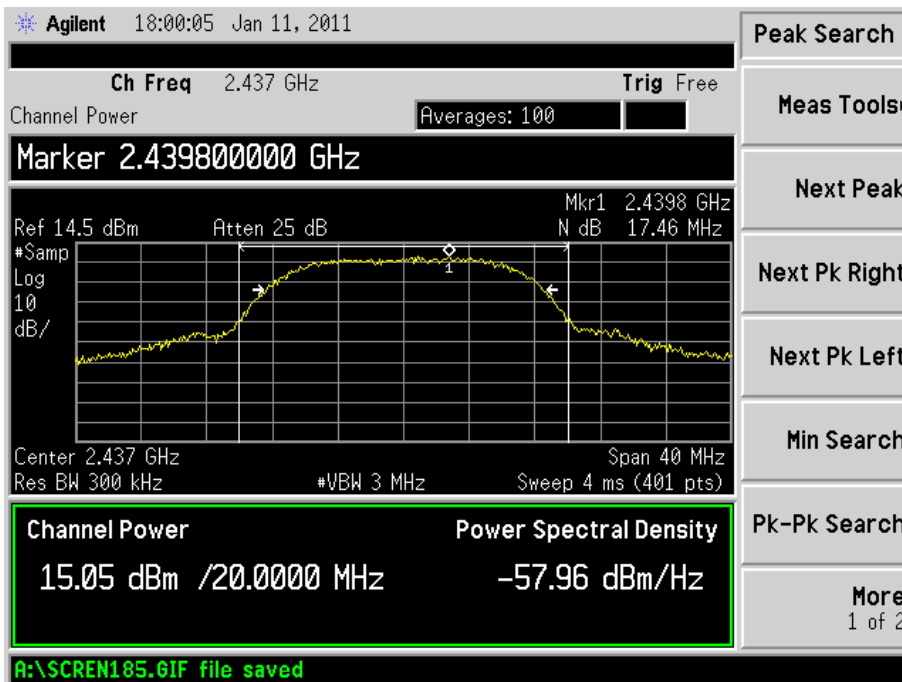


For 802.11b_11M Long rate (Chain 1)

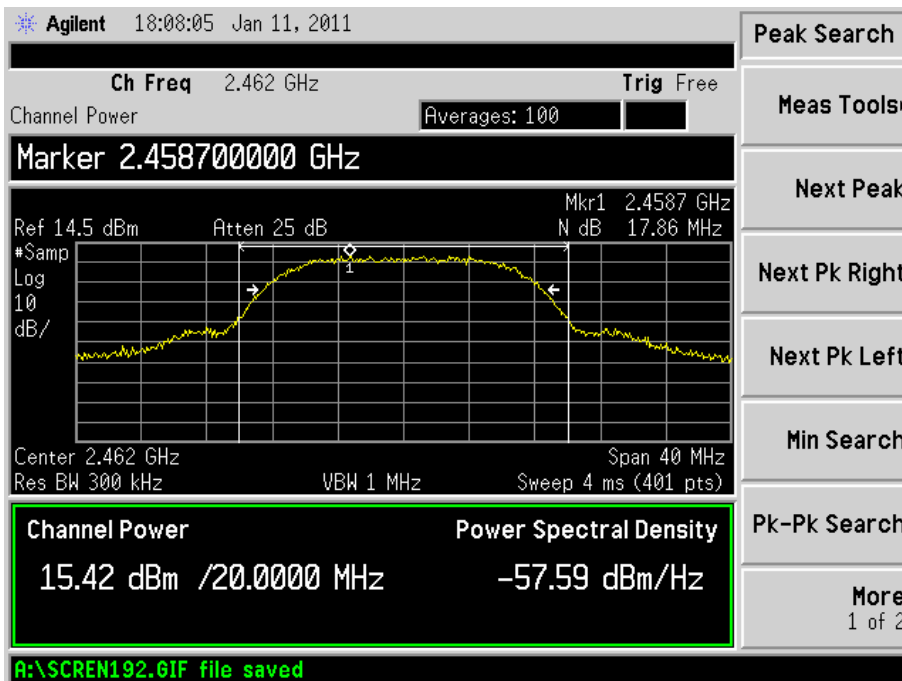
Low Channel:



Middle Channel:

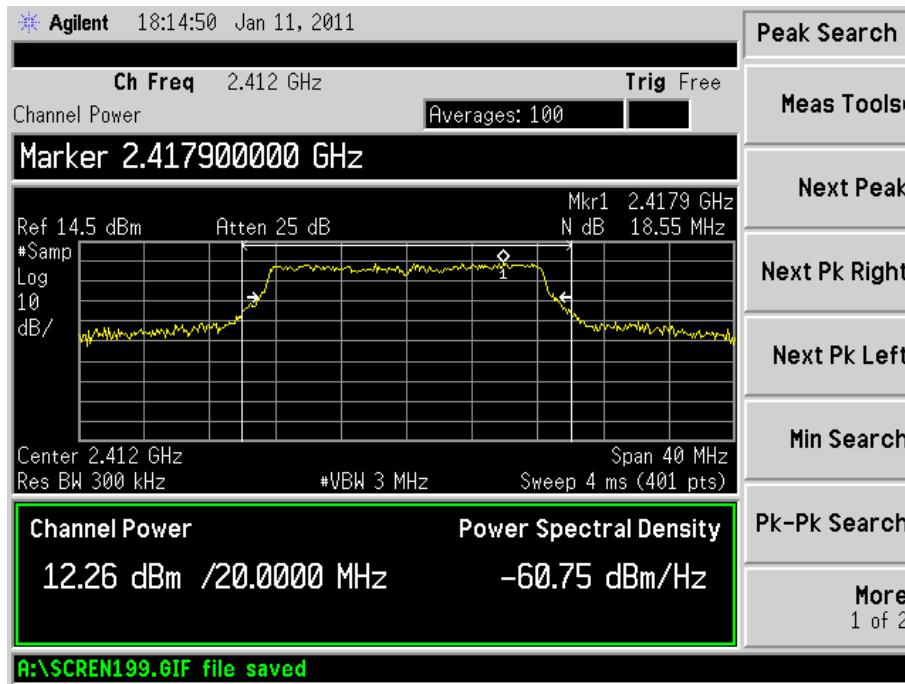


High Channel:

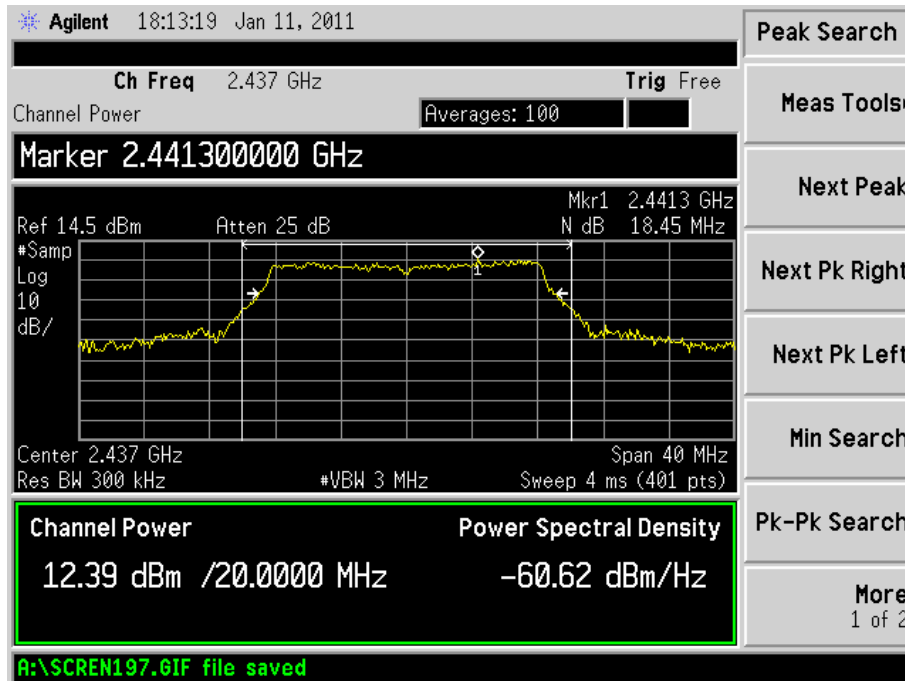


For 802.11g_6M rate (Chain 1)

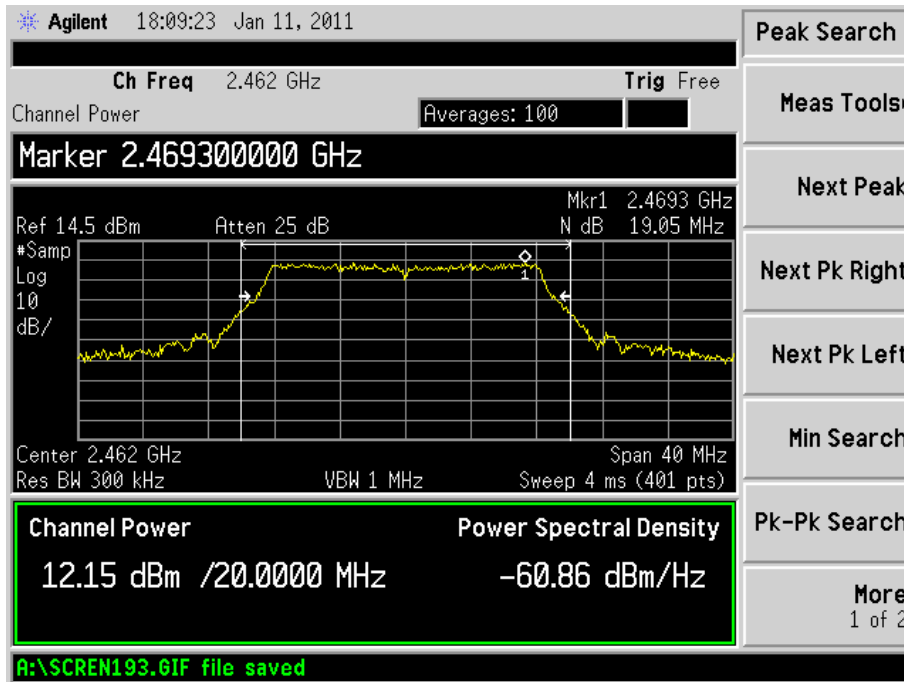
Low Channel:



Middle Channel:

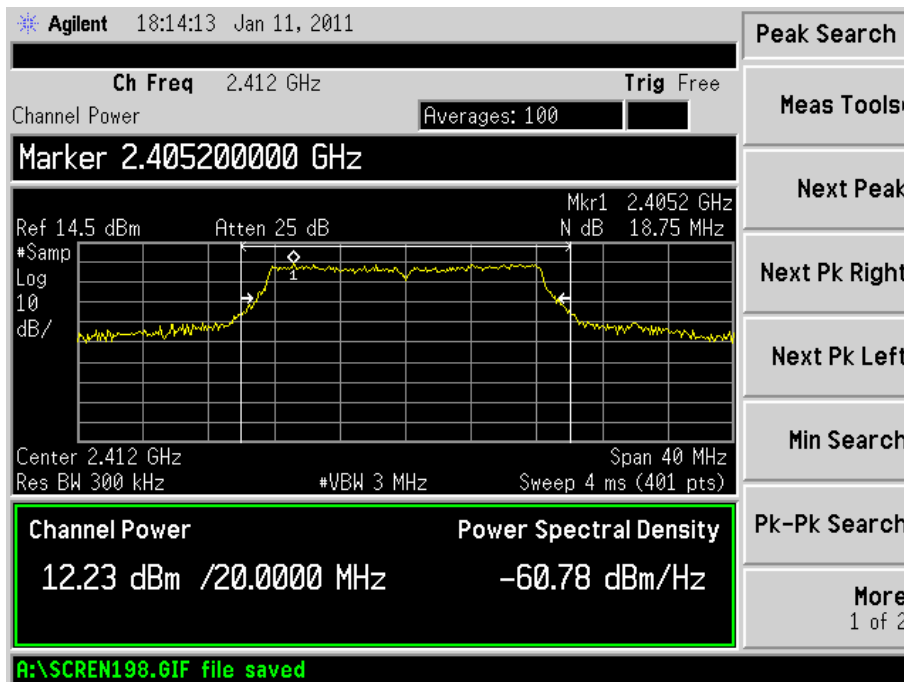


High Channel:

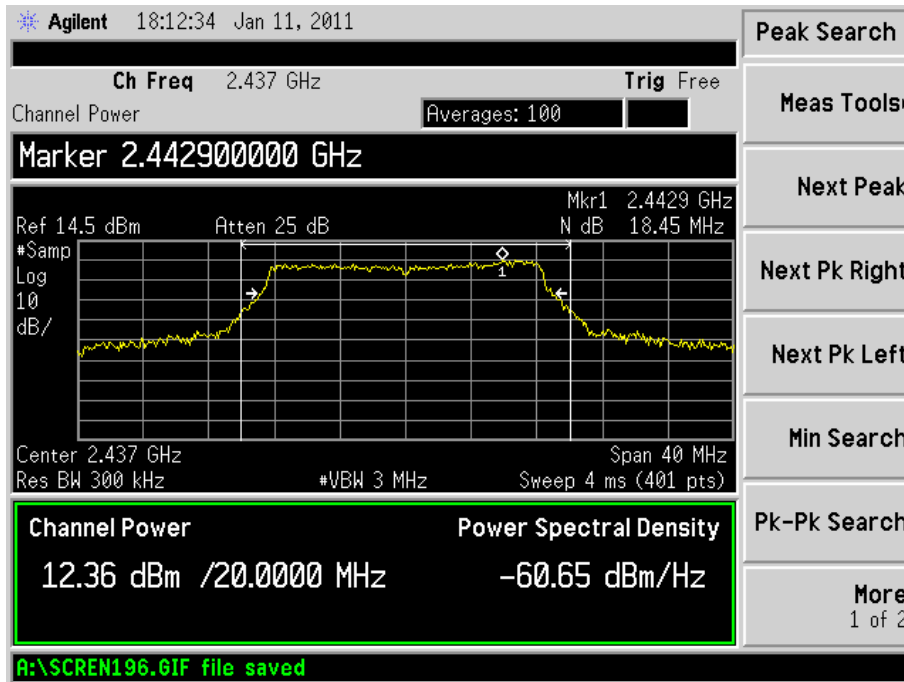


For 802.11g_54M rate (Chain 1)

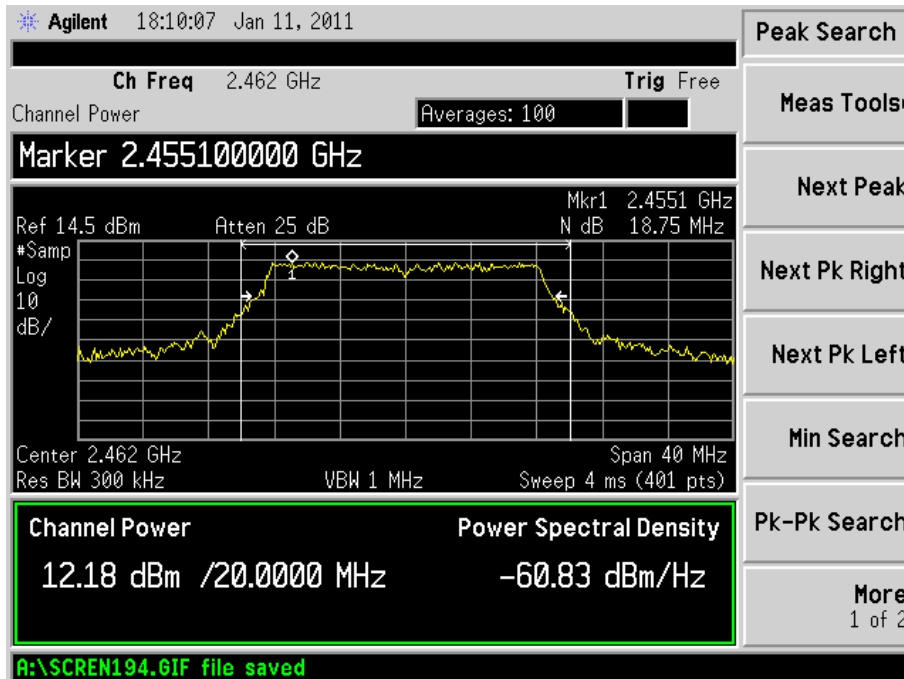
Low Channel:



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

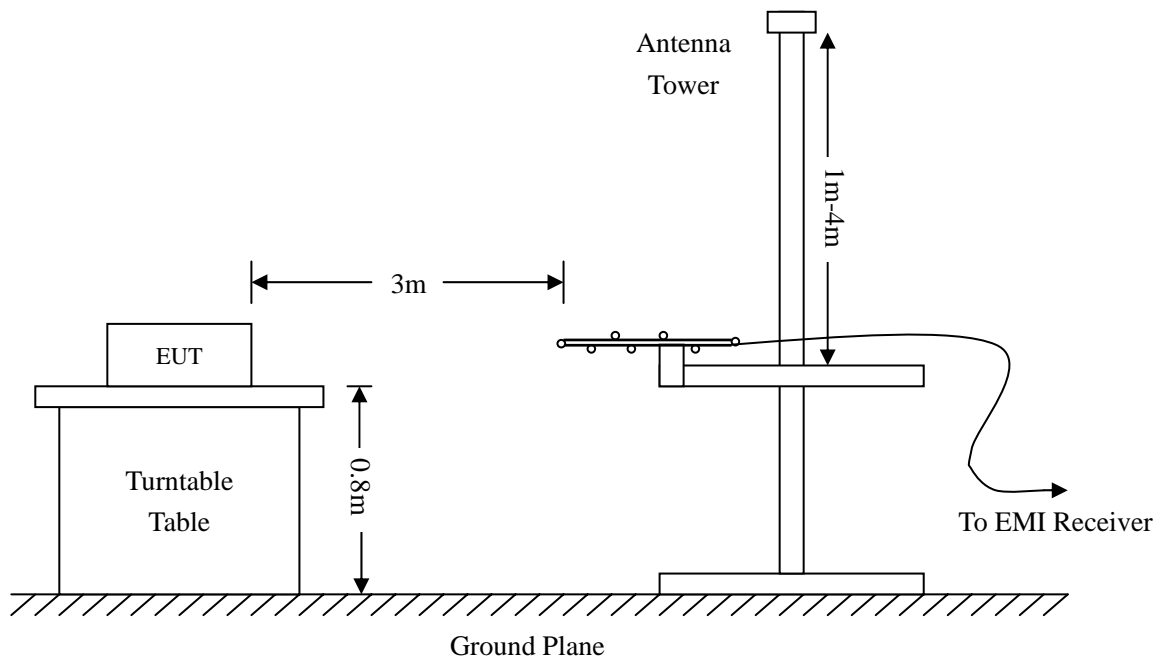
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
Pre-amplifier	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 C63.4-2003 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.



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:

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

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

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

8.6 Environmental Conditions

Temperature:	22° C
Relative Humidity:	52%
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:

-2.1dBμV at 7236MHz in the Vertical polarization, Transmitting 802.11b Low Channel test mode with, 30 MHz to 25 GHz, 3Meters

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

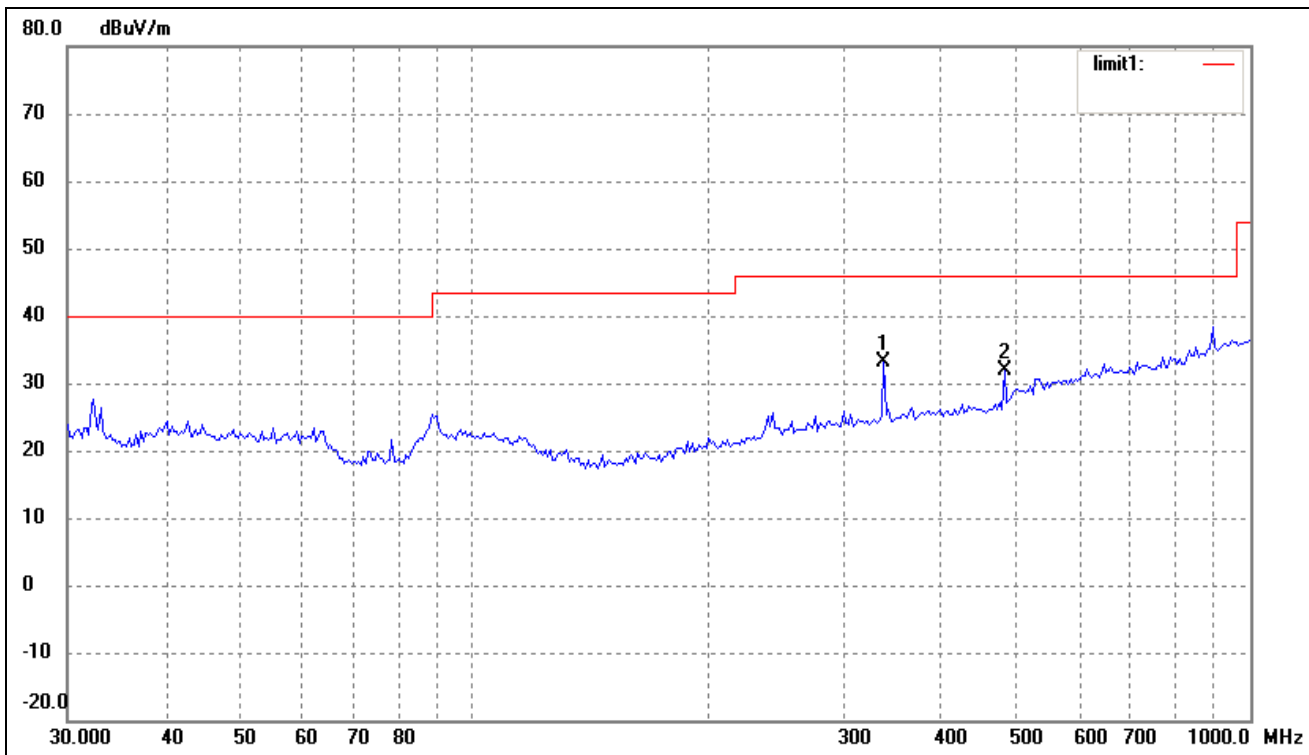
Test Result/Plots:

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11b) Low Channel

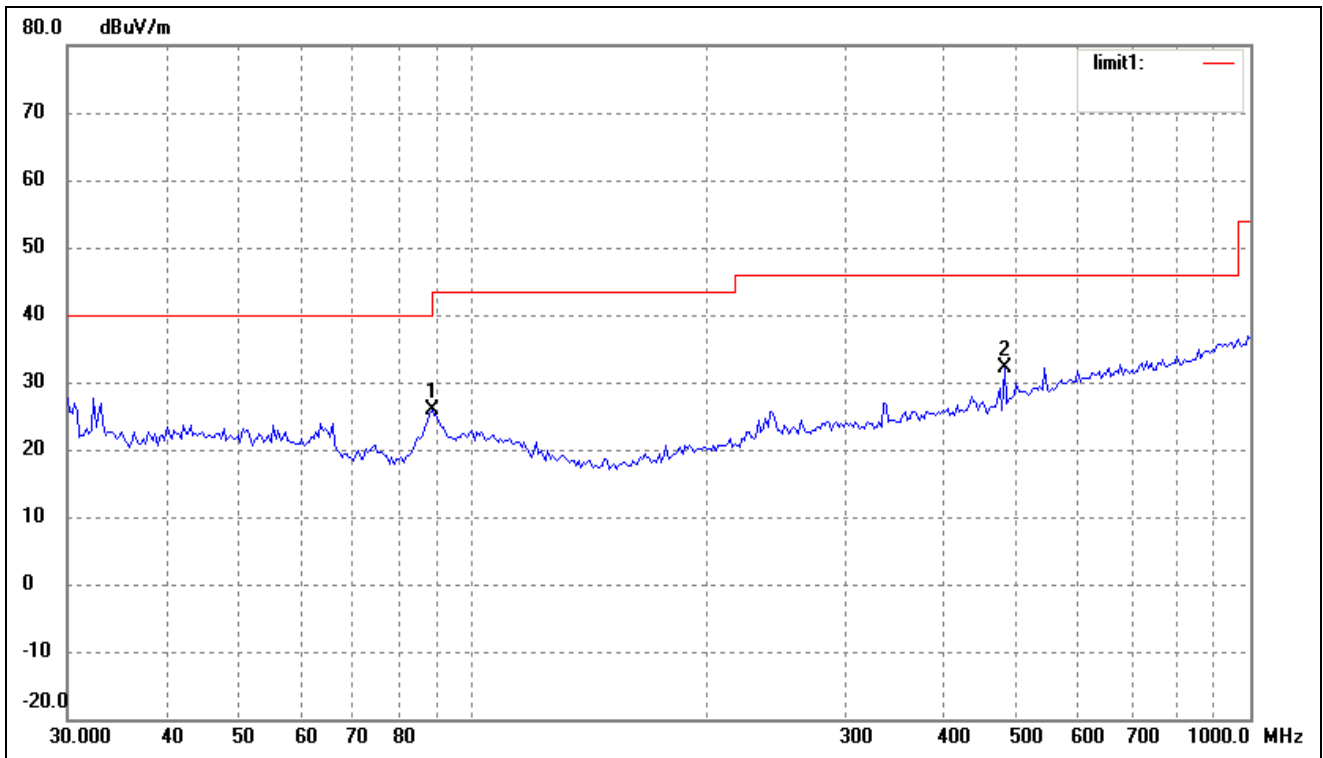
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	337.2155	23.97	9.18	33.15	46.00	-12.85	251	100	peak
2	482.2156	20.56	11.23	31.79	46.00	-14.21	107	200	peak

Vertical



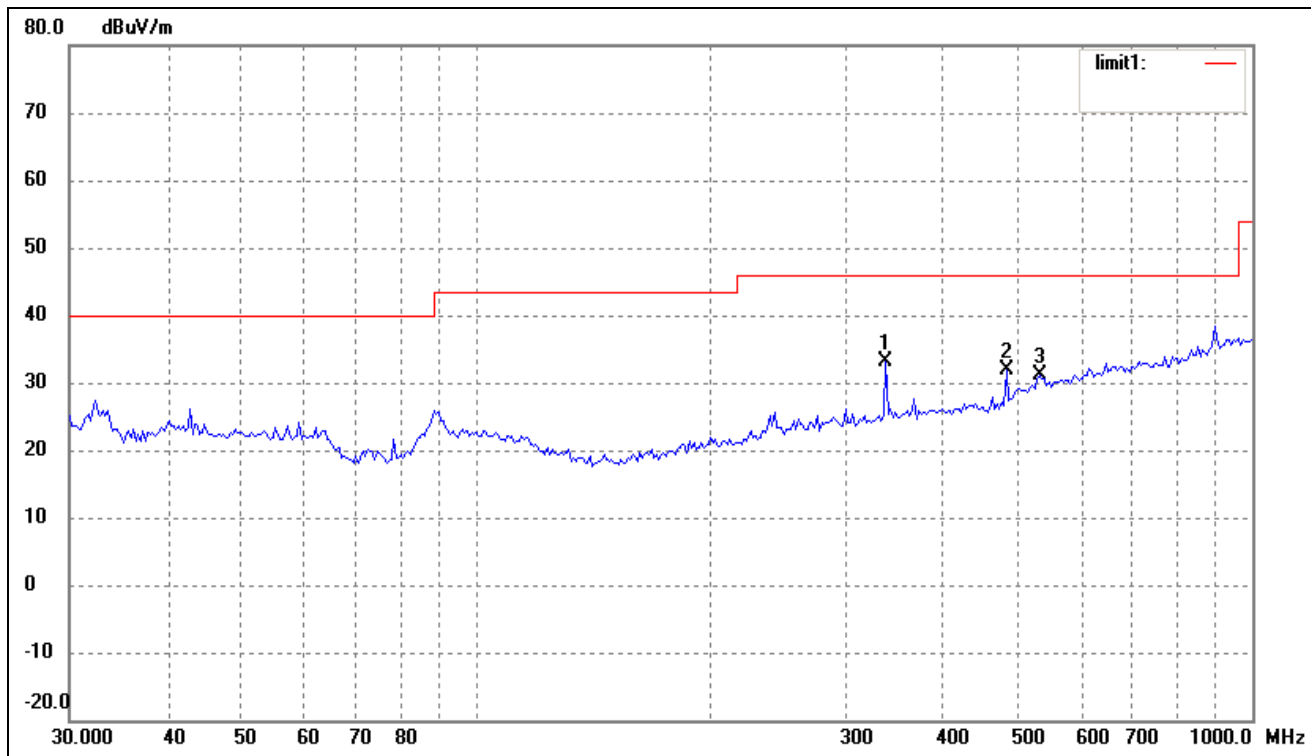
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	88.3421	19.99	6.00	25.99	43.50	-17.51	260	100	peak
2	482.2156	20.80	11.23	32.03	46.00	-13.97	138	100	peak

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11b) Middle Channel

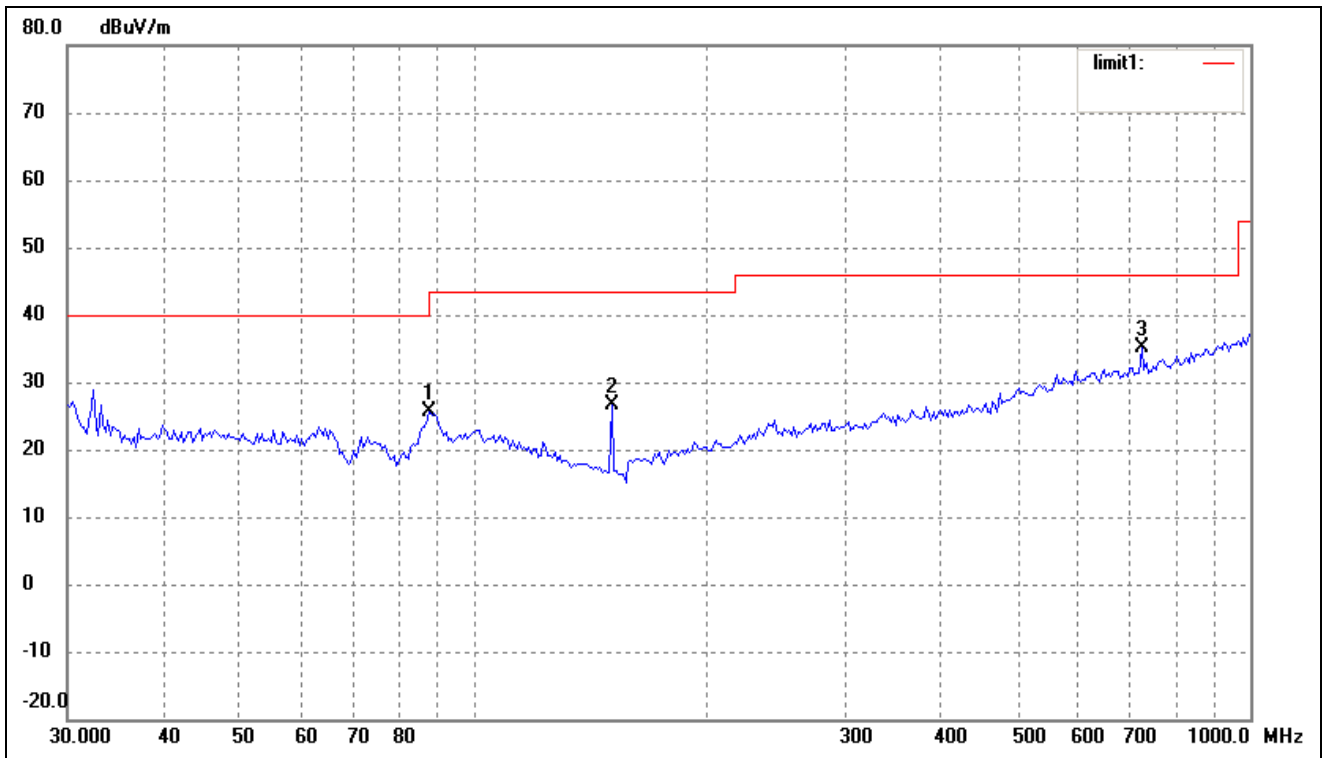
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	337.2155	23.97	9.18	33.15	46.00	-12.85	117	100	peak
2	482.2156	20.56	11.23	31.79	46.00	-14.21	255	100	peak
3	531.9635	17.46	13.59	31.05	46.00	-14.95	130	200	peak

Vertical



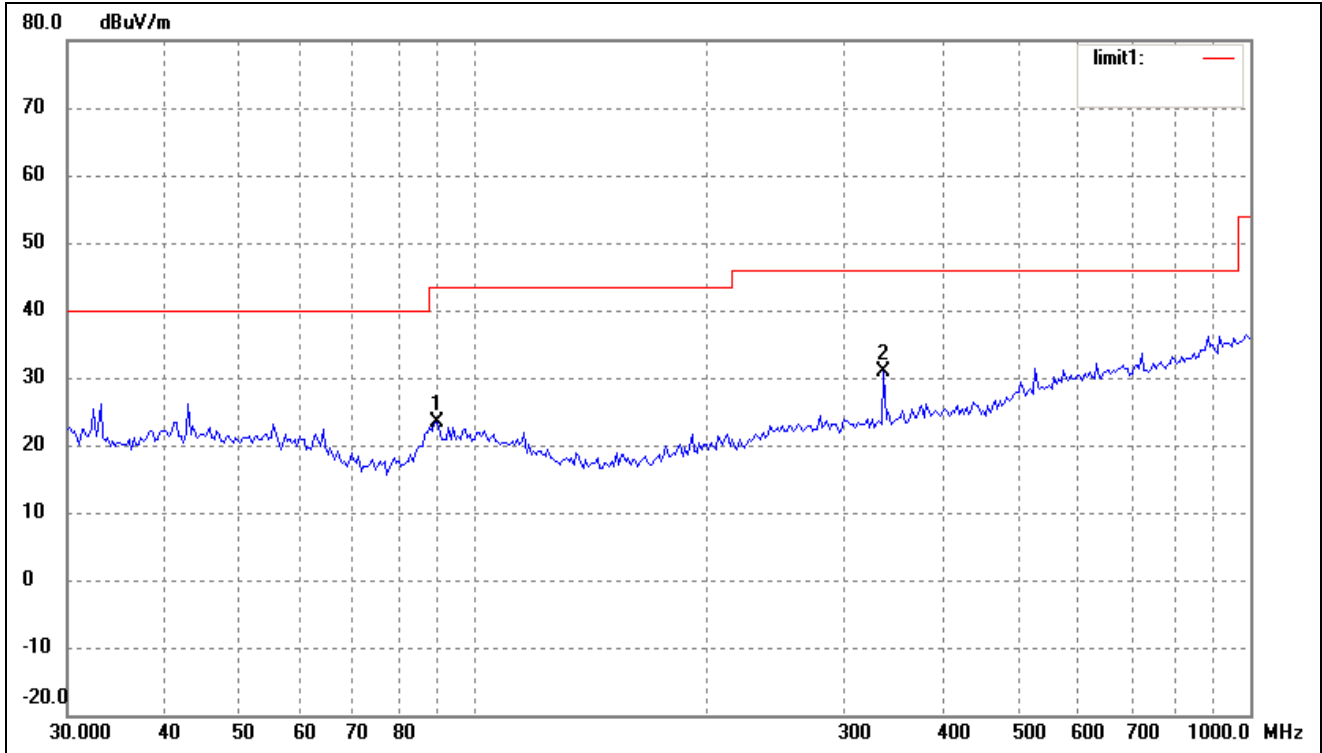
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	87.7248	19.89	5.81	25.70	40.00	-14.30	147	100	peak
2	150.5378	23.18	3.33	26.51	43.50	-16.99	249	100	peak
3	724.2611	19.04	16.02	35.06	46.00	-10.94	100	100	peak

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11b) High Channel

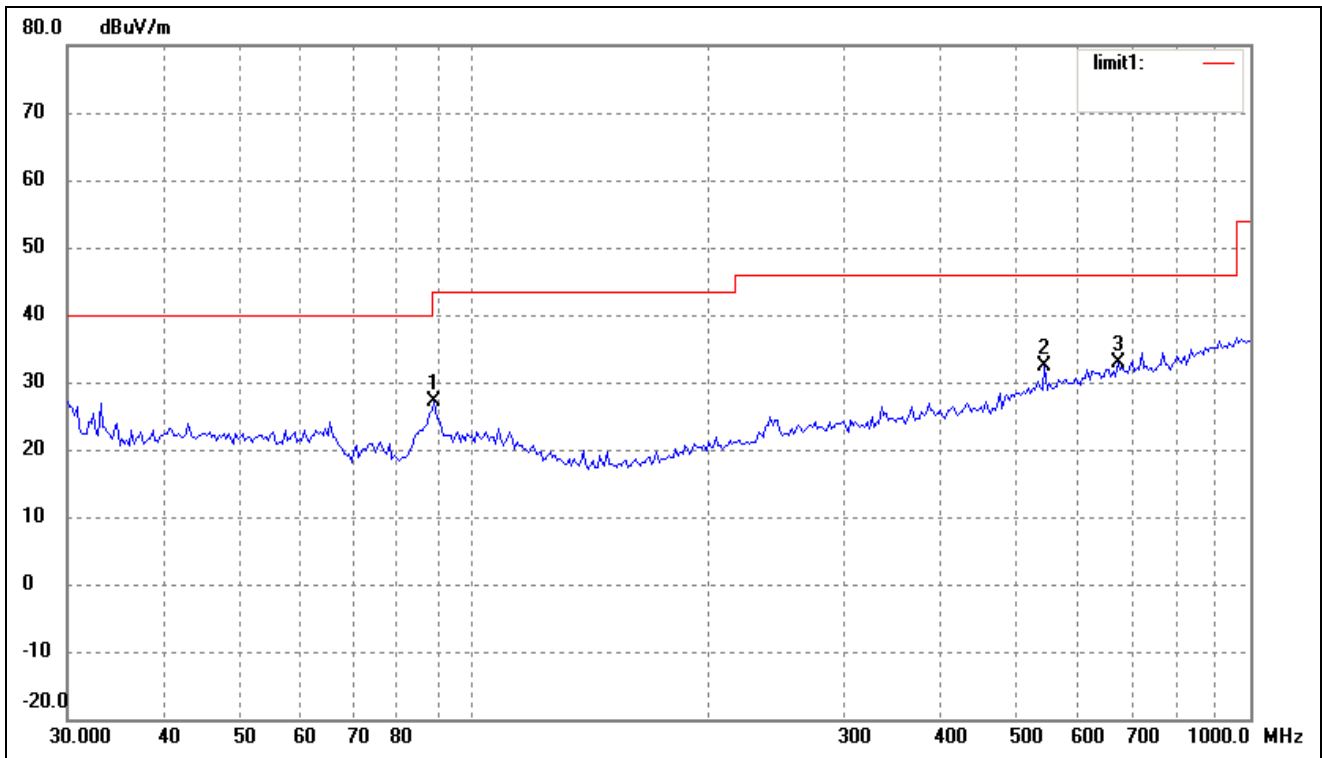
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	89.5900	17.04	6.40	23.44	43.50	-20.06	265	100	peak
2	337.2155	21.65	9.18	30.83	46.00	-15.17	193	100	peak

Vertical



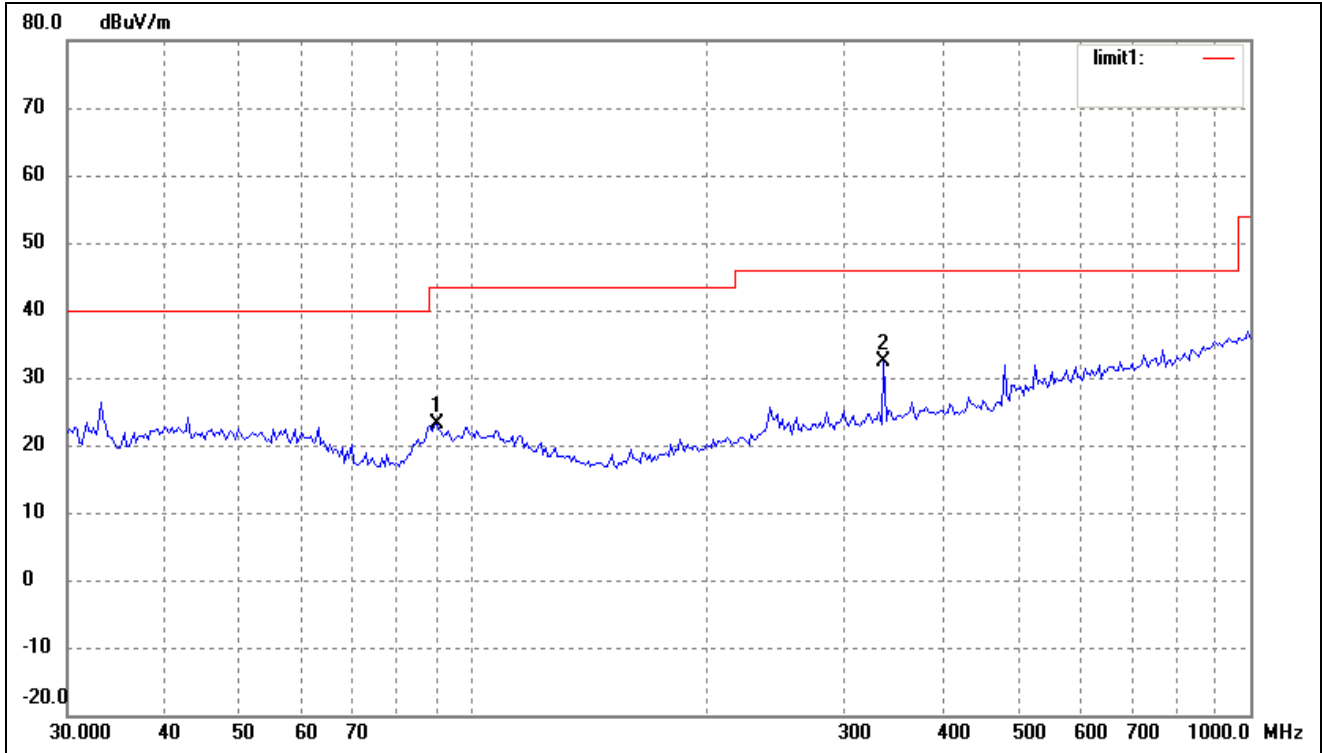
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	88.9639	20.88	6.20	27.08	43.50	-16.42	164	100	peak
2	543.2742	18.53	13.83	32.36	46.00	-13.64	258	100	peak
3	675.2080	17.30	15.53	32.83	46.00	-13.17	130	100	peak

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11g) Low Channel

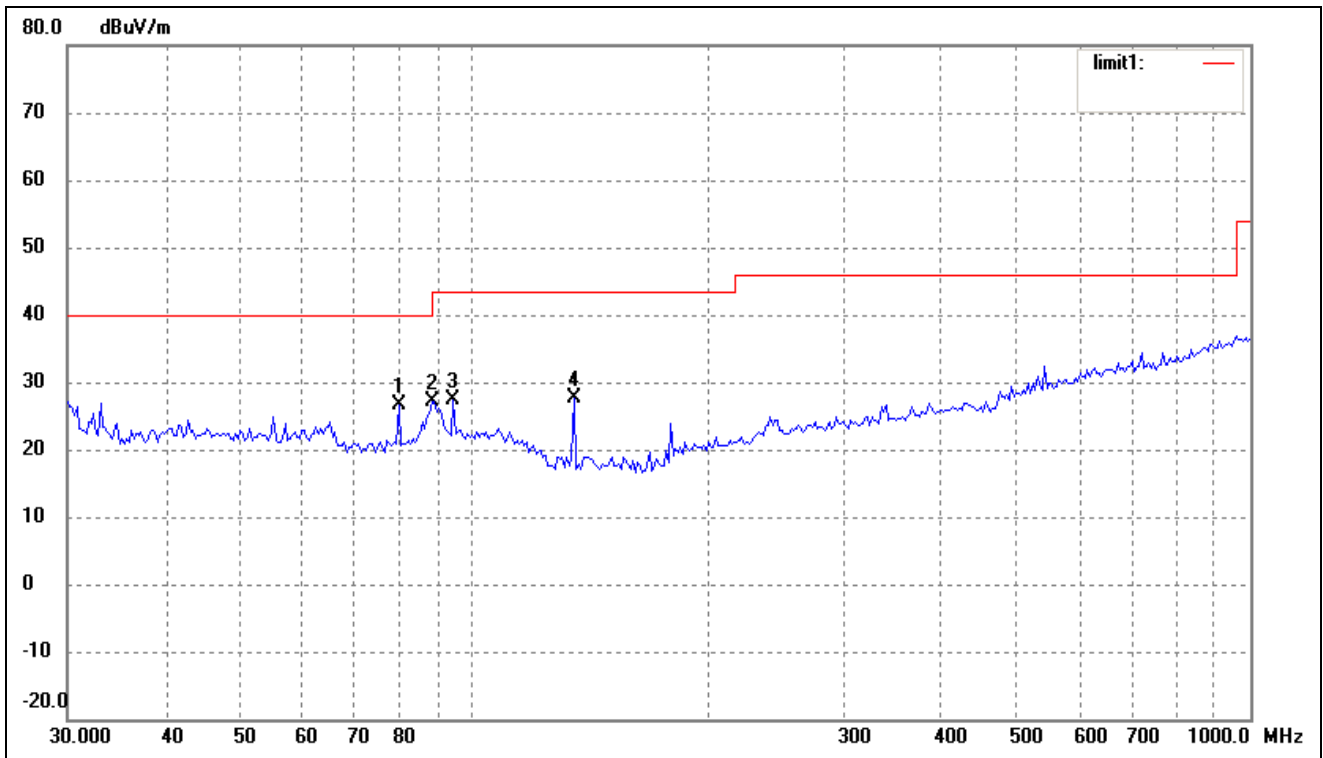
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	89.5900	16.67	6.40	23.07	43.50	-20.43	167	100	peak
2	337.2155	23.28	9.18	32.46	46.00	-13.54	150	100	peak

Vertical



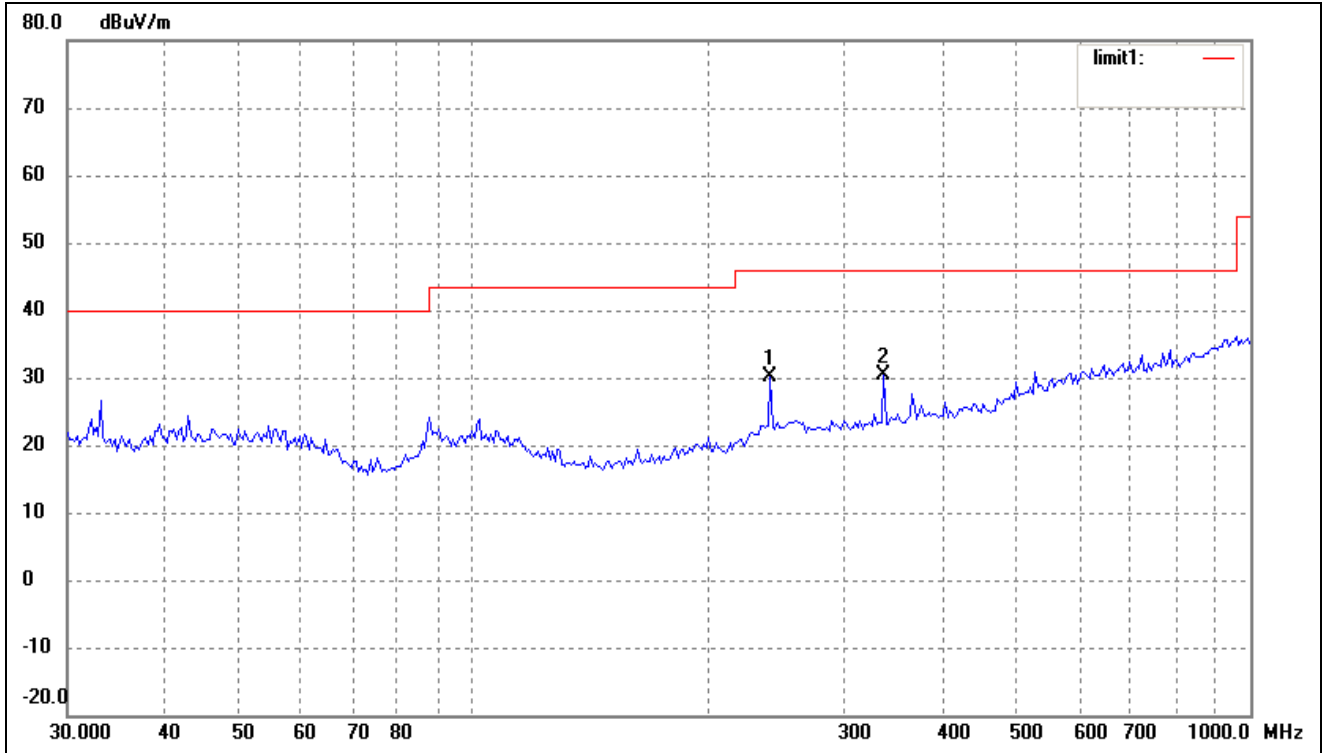
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	80.0806	23.42	3.17	26.59	40.00	-13.41	246	100	peak
2	88.3421	21.20	6.00	27.20	43.50	-16.30	160	200	peak
3	94.0979	20.14	7.30	27.44	43.50	-16.06	90	100	peak
4	134.5592	24.17	3.57	27.74	43.50	-15.76	100	100	peak

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11g) Middle Channel

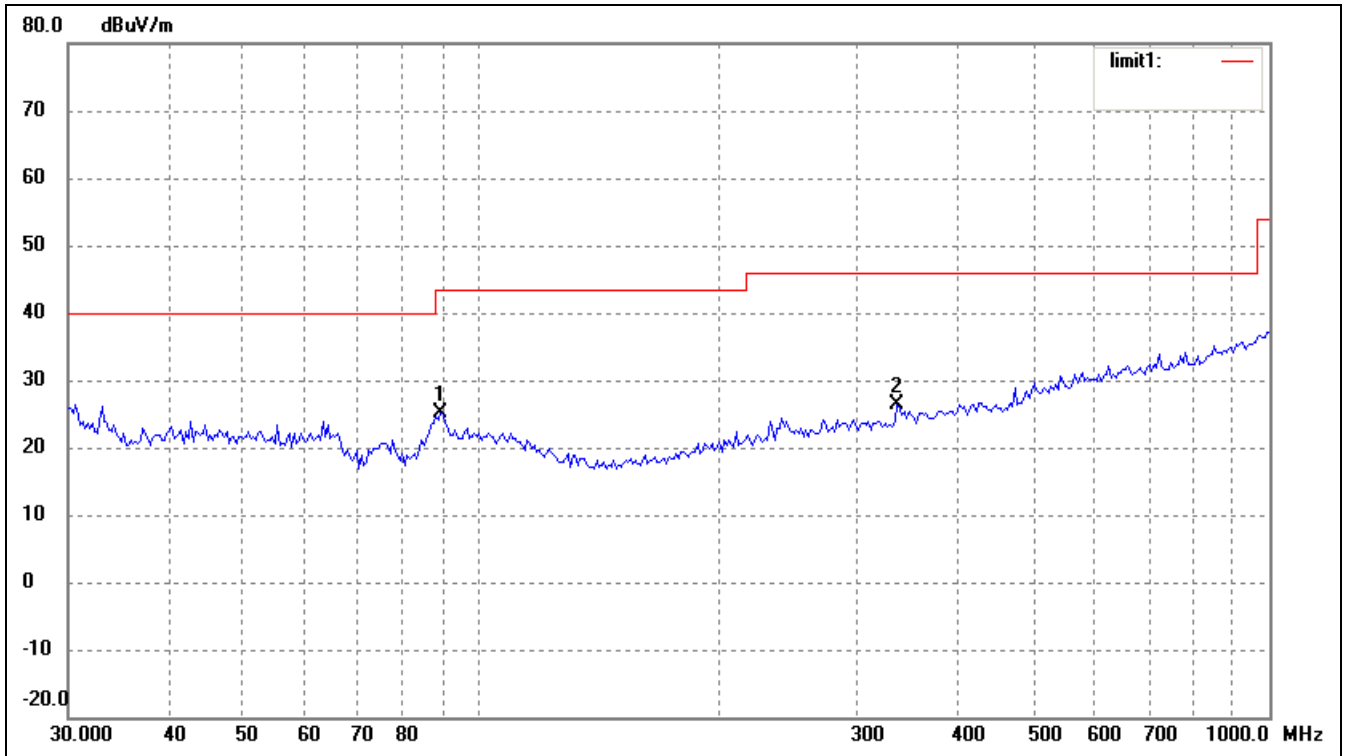
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	240.8304	22.69	7.46	30.15	46.00	-15.85	280	100	peak
2	337.2155	21.18	9.18	30.36	46.00	-15.64	72	200	peak

Vertical



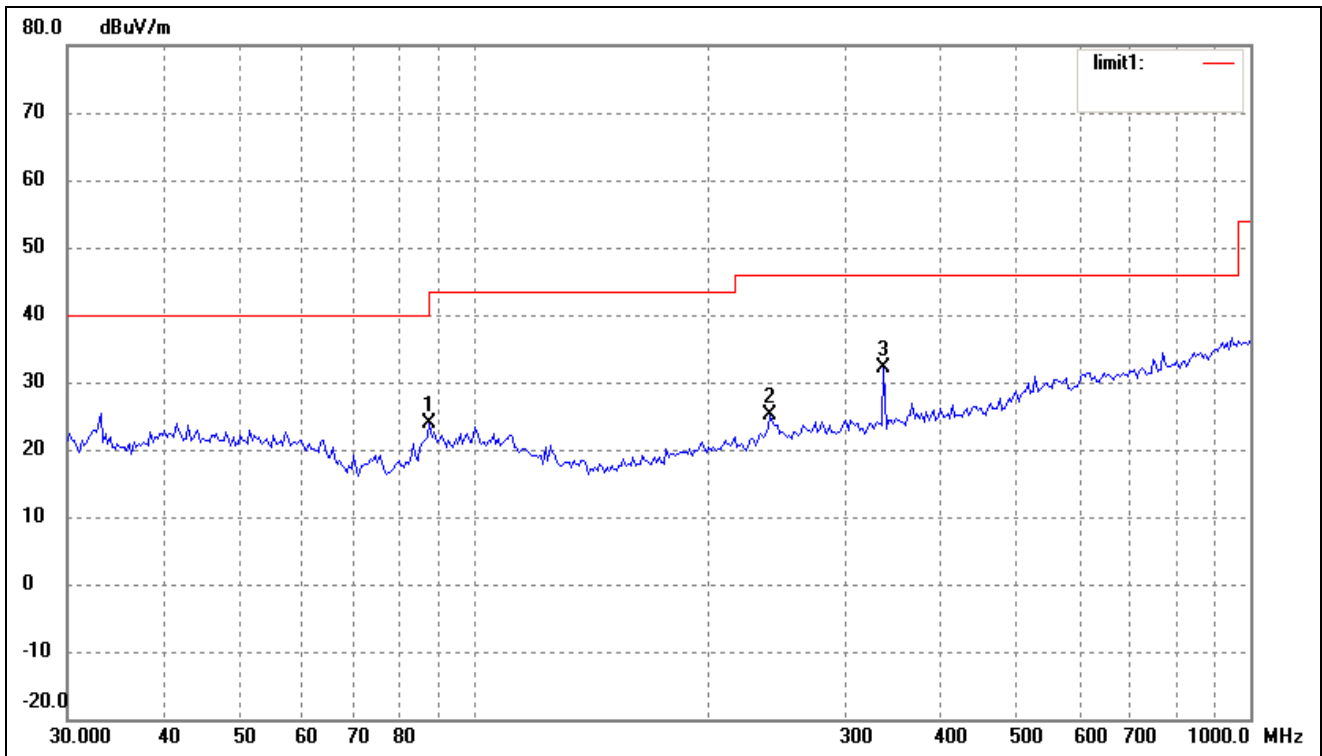
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	88.9639	18.88	6.20	25.08	43.50	-18.42	213	100	peak
2	337.2155	17.19	9.18	26.37	46.00	-19.63	220	100	peak

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11g) High Channel

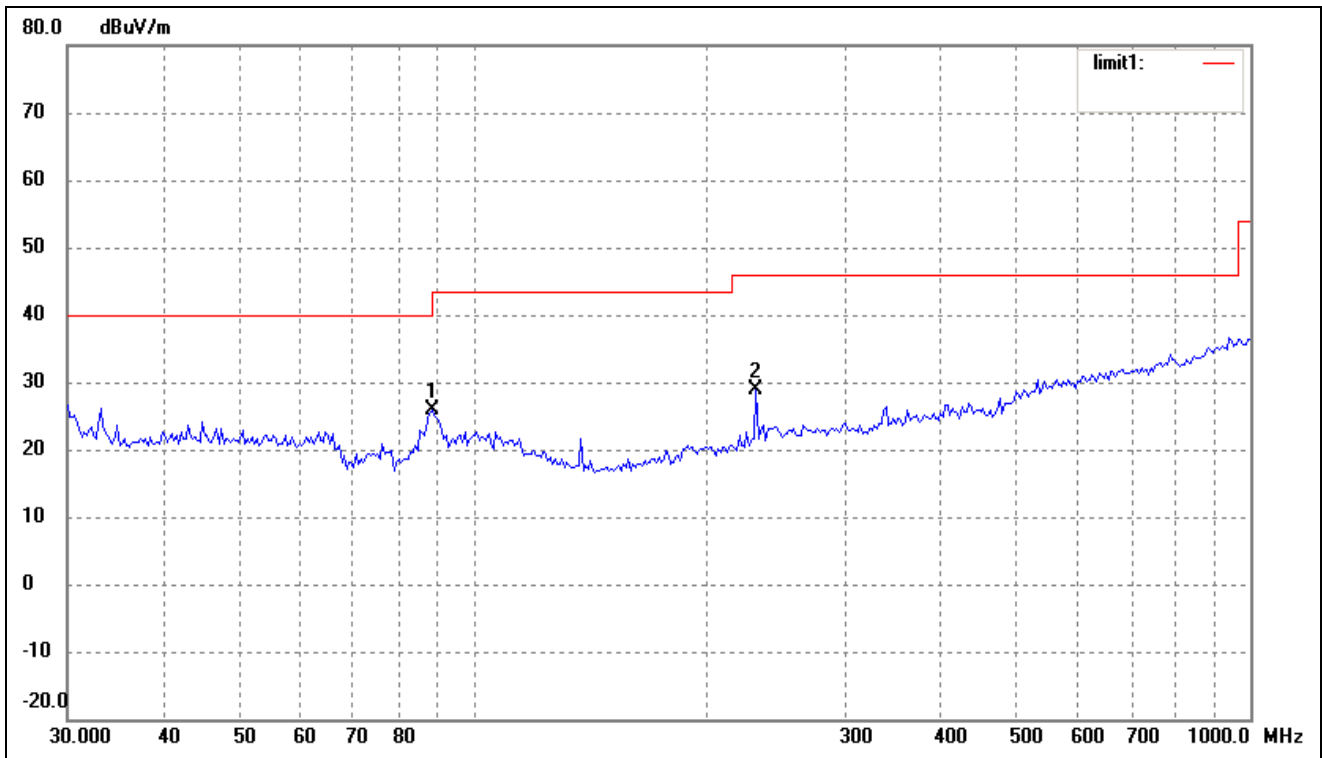
Comment:

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	87.7248	18.11	5.81	23.92	40.00	-16.08	164	100	peak
2	240.8304	17.58	7.46	25.04	46.00	-20.96	179	200	peak
3	337.2155	22.96	9.18	32.14	46.00	-13.86	201	100	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	88.3421	19.88	6.00	25.88	43.50	-17.62	130	100	peak
2	230.9068	21.93	6.94	28.87	46.00	-17.13	128	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	53.0	37	V	34.1	5.2	33.0	59.3	74	-14.7
4824.0	PK	52.3	264	H	34.1	5.2	33.0	58.6	74	-15.4
7236.0	PK	50.1	58	V	37.4	6.1	33.5	60.1	74	-13.9
7236.0	PK	49.6	114	H	37.4	6.1	33.5	59.6	74	-14.4
4824.0	AV	44.9	170	V	34.1	5.2	33.0	51.2	54	-2.8
4824.0	AV	44.1	290	H	34.1	5.2	33.0	50.4	54	-3.6
7236.0	AV	41.9	47	V	37.4	6.1	33.5	51.9	54	-2.1
7236.0	AV	40.6	236	H	37.4	6.1	33.5	50.6	54	-3.4
Middle Channel (1G to 25GHz)										
4874.0	PK	51.5	45	V	34.1	5.2	33.0	57.8	74	-16.2
4874.0	PK	52.8	267	H	34.1	5.2	33.0	59.1	74	-14.9
7311.0	PK	50.6	45	V	37.4	6.1	33.5	60.6	74	-13.4
7311.0	PK	49.0	180	H	37.4	6.1	33.5	59.0	74	-15.0
4874.0	AV	43.9	70	V	34.1	5.2	33.0	50.2	54	-3.8
4874.0	AV	43.5	90	H	34.1	5.2	33.0	49.8	54	-4.2
7311.0	AV	41.5	160	V	37.4	6.1	33.5	51.5	54	-2.5
7311.0	AV	40.7	45	H	37.4	6.1	33.5	50.7	54	-3.3
High Channel (1G to 25GHz)										
4924.0	PK	51.3	270	V	34.1	5.2	33.0	57.6	74	-16.4
4924.0	PK	53.0	45	H	34.1	5.2	33.0	59.3	74	-14.7
7386.0	PK	51.4	278	V	37.4	6.1	33.5	61.4	74	-12.6
7386.0	PK	49.6	64	H	37.4	6.1	33.5	59.6	74	-14.4
4924.0	AV	43.3	90	V	34.1	5.2	33.0	49.6	54	-4.4
4924.0	AV	44.3	270	H	34.1	5.2	33.0	50.6	54	-3.4
7386.0	AV	41.4	310	V	37.4	6.1	33.5	51.4	54	-2.6
7386.0	AV	38.9	228	H	37.4	6.1	33.5	48.9	54	-5.1

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	53.2	190	V	34.1	5.2	33.0	59.5	74	-14.5
4824.0	PK	51.1	220	H	34.1	5.2	33.0	57.4	74	-16.6
7236.0	PK	50.4	180	V	37.4	6.1	33.5	60.4	74	-13.6
7236.0	PK	48.7	236	H	37.4	6.1	33.5	58.7	74	-15.3
4824.0	AV	43.2	170	V	34.1	5.2	33.0	49.5	54	-4.5
4824.0	AV	41.3	268	H	34.1	5.2	33.0	47.6	54	-6.4
7236.0	AV	41.2	45	V	37.4	6.1	33.5	51.2	54	-2.8
7236.0	AV	40.8	60	H	37.4	6.1	33.5	50.8	54	-3.2
Middle Channel (1G to 25GHz)										
4874.0	PK	52.3	220	V	34.1	5.2	33.0	58.6	74	-15.4
4874.0	PK	51.2	180	H	34.1	5.2	33.0	57.5	74	-16.5
7311.0	PK	50.6	236	V	37.4	6.1	33.5	60.6	74	-13.4
7311.0	PK	47.4	180	H	37.4	6.1	33.5	57.4	74	-16.6
4874.0	AV	42.3	270	V	34.1	5.2	33.0	48.6	54	-5.4
4874.0	AV	43.4	90	H	34.1	5.2	33.0	49.7	54	-4.3
7311.0	AV	40.5	60	V	37.4	6.1	33.5	50.5	54	-3.5
7311.0	AV	39.3	45	H	37.4	6.1	33.5	49.3	54	-4.7
High Channel (1G to 25GHz)										
4924.0	PK	53.6	270	V	34.1	5.2	33.0	59.9	74	-14.1
4924.0	PK	51.2	245	H	34.1	5.2	33.0	57.5	74	-16.5
7386.0	PK	51.2	180	V	37.4	6.1	33.5	61.2	74	-12.8
7386.0	PK	48.7	90	H	37.4	6.1	33.5	58.7	74	-15.3
4924.0	AV	43.9	60	V	34.1	5.2	33.0	50.2	54	-3.8
4924.0	AV	43.2	270	H	34.1	5.2	33.0	49.5	54	-4.5
7386.0	AV	41.7	60	V	37.4	6.1	33.5	51.7	54	-2.3
7386.0	AV	40.1	160	H	37.4	6.1	33.5	50.1	54	-3.9

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.

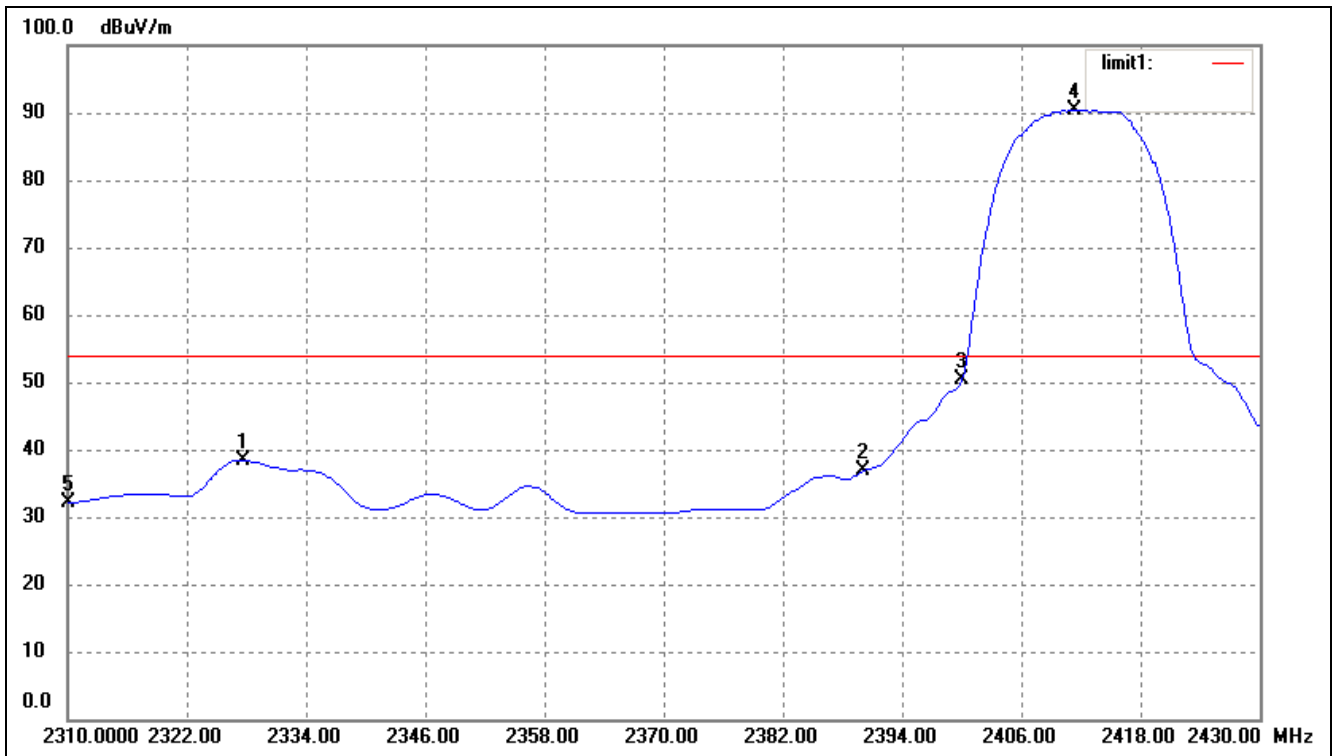
9.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.5 Summary of Test Results/Plots

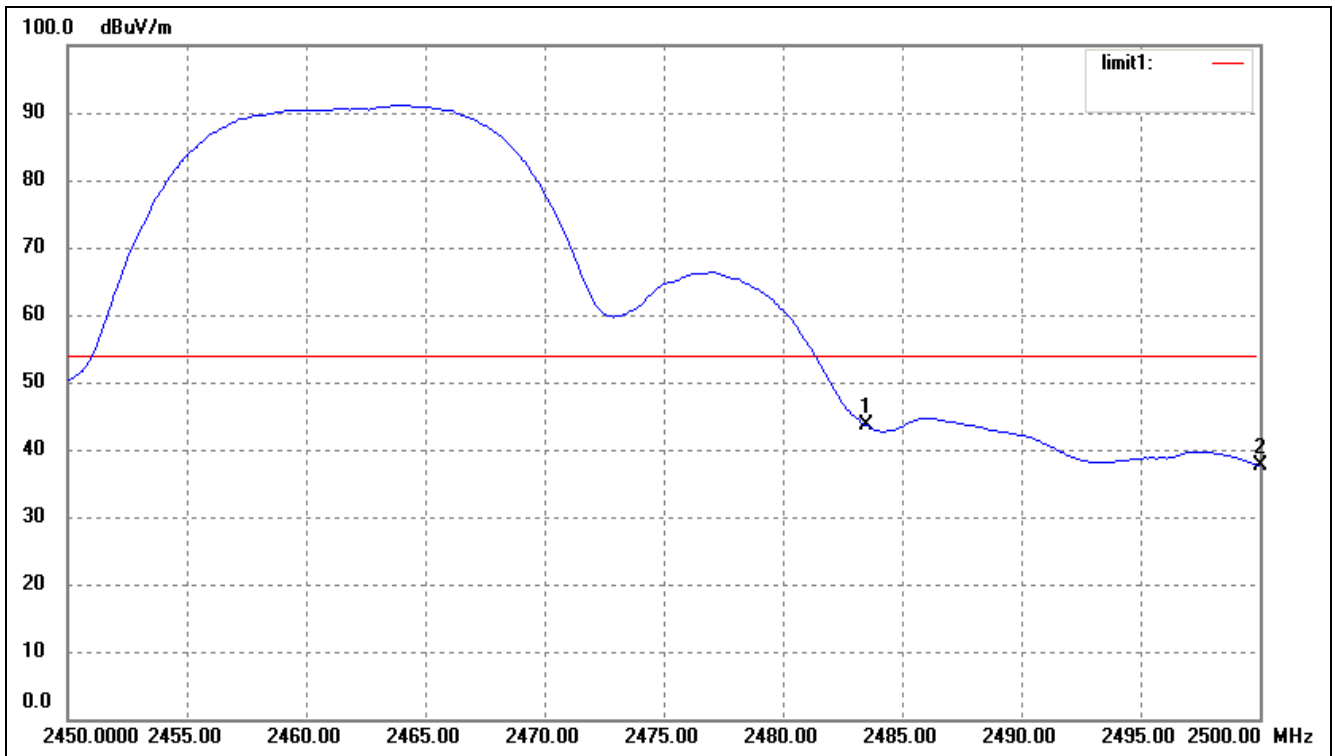
Test mode	Frequency MHz	Limit dBuV /dB	Result
802.11b	2310.00	<54dBuV	Pass
	2327.615	<54dBuV	Pass
	2390.00	<54dBuV	Pass
	2400.00	>20dB ATT	Pass
	2483.50	<54dBuV	Pass
	2500.00	<54dBuV	Pass
802.11g	2310.00	<54dBuV	Pass
	2325.258	<54dBuV	Pass
	2390.00	<54dBuV	Pass
	2400.00	>20dB ATT	Pass
	2483.50	<54dBuV	Pass
	2500.00	<54dBuV	Pass

For 802.11b
Lowest Bandedge



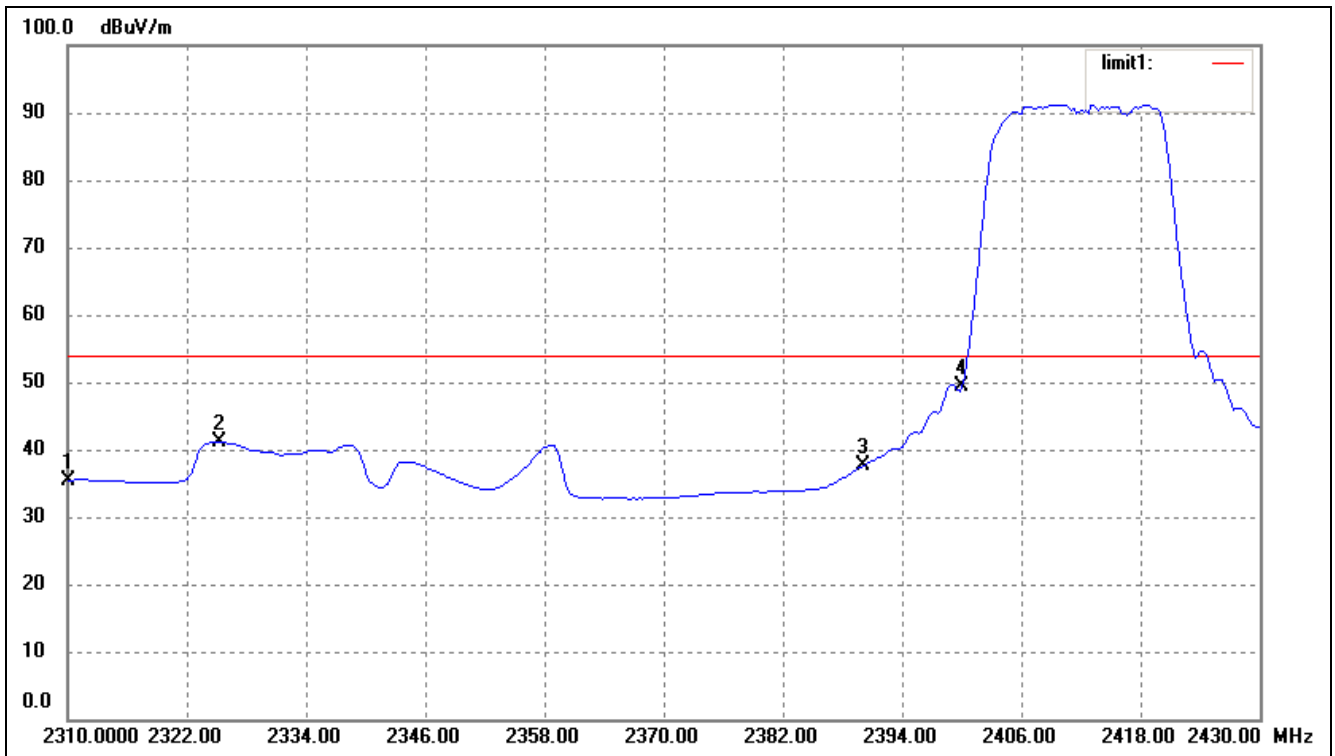
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2327.615	43.03	-4.61	38.42	54.00	-15.58	245	100	Ave
	2327.615	53.37	-4.61	48.76	74.00	-25.24	245	100	Peak
2	2390.000	41.34	-4.46	36.88	54.00	-17.12	178	100	Ave
	2390.000	52.02	-4.46	47.56	74.00	-26.44	178	100	Peak
3	2400.000	54.71	-4.43	50.28	/	/	360	200	Ave
4	2411.366	43.03	-4.40	90.45	/	/	169	100	Ave
5	2310.000	36.66	-4.65	32.01	54.00	-21.99	168	100	Ave
	2310.000	47.20	-4.65	42.55	74.00	-31.45	168	100	Peak

For 802.11b
Highest Bandedge



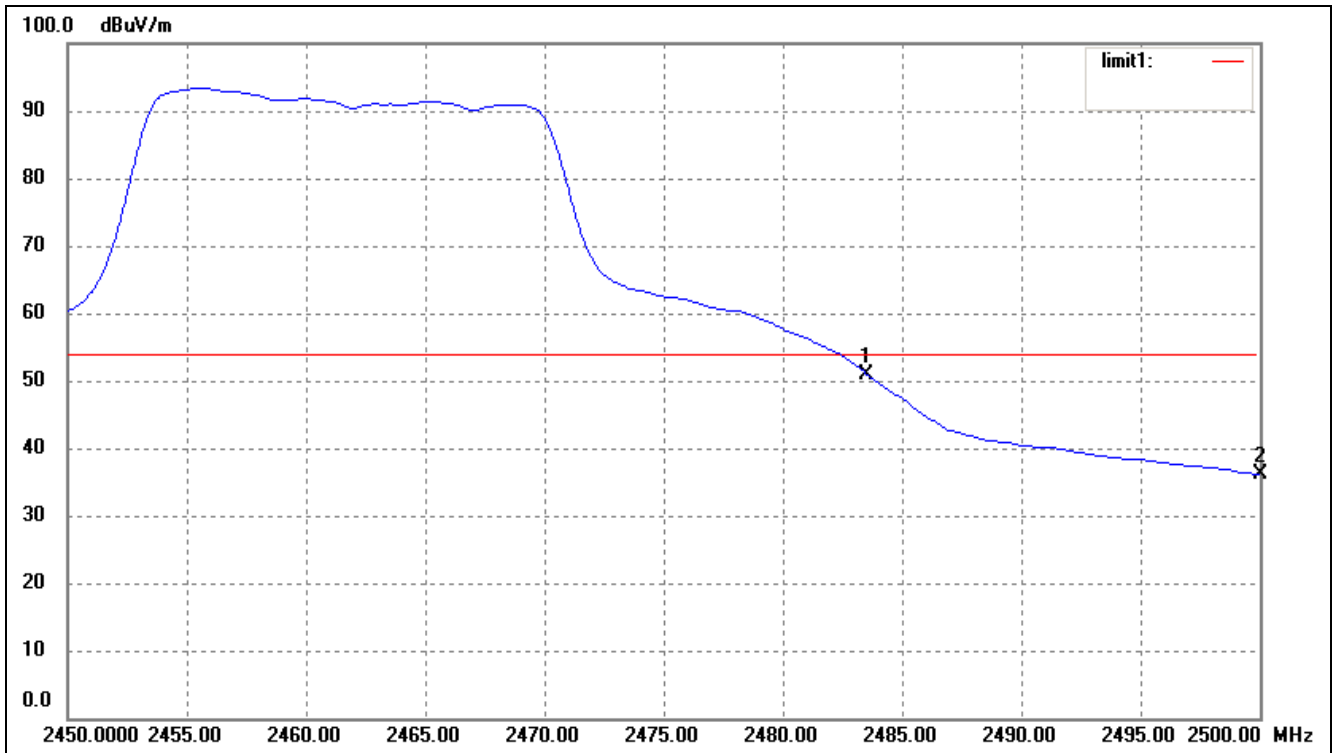
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2483.500	47.74	-4.23	43.51	54.00	-10.49	236	100	Ave
	2483.500	57.17	-4.23	52.94	74.00	-21.06	236	100	Peak
2	2500.000	41.89	-4.18	37.71	54.00	-16.29	197	100	Ave
	2500.000	52.85	-4.18	48.67	74.00	-25.33	197	100	Peak

For 802.11g
 Lowest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2310.000	39.99	-4.65	35.34	54.00	-18.66	274	100	Ave
	2310.000	51.43	-4.65	46.78	74.00	-27.22	274	100	Peak
2	2325.258	45.85	-4.62	41.23	54.00	-12.77	182	200	Ave
	2325.258	56.96	-4.62	52.34	74.00	-21.66	182	200	Peak
3	2390.000	42.03	-4.46	37.57	54.00	-16.43	224	100	Ave
	2390.000	53.59	-4.46	49.13	74.00	-24.87	224	100	Peak
4	2400.000	53.82	-4.43	49.39	/	/	167	100	Ave
5	2413.321	95.61	-4.40	91.21	/	/	175	100	Ave

Highest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2483.500	55.19	-4.23	50.96	54.00	-3.04	267	100	Ave
	2483.500	66.74	-4.23	62.51	74.00	-11.49	267	100	Peak
2	2500.000	40.32	-4.18	36.14	54.00	-17.86	280	100	Ave
	2500.000	52.07	-4.18	47.89	74.00	-26.11	280	100	Peak

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