



## FCC 47 CFR PART 15 SUBPART C

### TEST REPORT

For

**IEEE802.11 b/g Outdoor AP/Bridge  
(Support IEEE802.11a Client Backhaul)**

#### Trade Name / Model

4ipnet / OWL800

4ipnet /OWL2000

4ipnet / HSG800

4ipnet / OWL80x where x is 0,1,2,3,4,5,6,7,8,9

4ipnet / OWL200x where x is 0,1,2,3,4,5,6,7,8,9

USC / A80x where x is 0,1,2,3,4,5,6,7,8,9

USC / A800G

USC / A800L

USC / W1180

Cipherium / A80x where x is 0,1,2,3,4,5,6,7,8,9

Cipherium / A800G

Cipherium / A800L

Cipherium / W1180

*Issued to*

**4IPNET, INC.  
38129 Cambridge Court Fremont,  
CA 94536, USA**

*Issued by*

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## 1. TEST RESULT CERTIFICATION

**Applicant:** 4IPNET, INC.  
38129 Cambridge Court Fremont,  
CA 94536, USA

**Equipment Under Test:** IEEE802.11 b/g Outdoor AP/Bridge  
(Support IEEE802.11a Client Backhaul)

**Trade Name / Model:** 4ipnet / OWL800  
4ipnet / OWL2000  
4ipnet / HSG800  
4ipnet / OWL80x where x is 0,1,2,3,4,5,6,7,8,9  
4ipnet / OWL200x where x is 0,1,2,3,4,5,6,7,8,9  
USC / A80x where x is 0,1,2,3,4,5,6,7,8,9  
USC / A800G  
USC / A800L  
USC / W1180  
Cipherium / A80x where x is 0,1,2,3,4,5,6,7,8,9  
Cipherium / A800G  
Cipherium / A800L  
Cipherium / W1180

**Date of Test:** February 17 ~ May 8, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

*Approved by:*

Rex Lai  
Section Manager  
Compliance Certification Services Inc.

*Reviewed by:*

Gina Lo  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	IEEE802.11 b/g Outdoor AP/Bridge (Support IEEE802.11a Client Backhaul)
<b>Trade Name / Model</b>	4ipnet / OWL800 4ipnet / OWL2000 4ipnet / HSG800 4ipnet / OWL80x where x is 0,1,2,3,4,5,6,7,8,9 4ipnet / OWL200x where x is 0,1,2,3,4,5,6,7,8,9 USC / A80x where x is 0,1,2,3,4,5,6,7,8,9 USC / A800G USC / A800L USC / W1180 Cipherium / A80x where x is 0,1,2,3,4,5,6,7,8,9 Cipherium / A800G Cipherium / A800L Cipherium / W1180
<b>Model Discrepancy</b>	All the specification and layout are identical except they come with different model numbers and trade name for marketing purposes.
<b>Power Supply</b>	Model: F919I-4810 IP: 100-240VAC, 2A, 50-60Hz OP: 48V, 1.0A
<b>AC Power Cord Type</b>	Unshielded, 1.8m (Detachable) at POE.
<b>Frequency Range</b>	IEEE 802.11a: 5.745~5.825 GHz IEEE 802.11b/g: 2.412~2.462 GHz
<b>Transmit Power</b>	IEEE 802.11a: 19.92 dBm IEEE 802.11b: 15.41 dBm IEEE 802.11g: 18.69 dBm
<b>Modulation Technique</b>	IEEE 802.11a: OFDM (QPSK, BPSK, 16-QAM, 64-QAM) IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
<b>Transmit Data Rate</b>	IEEE 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps
<b>Number of Channels</b>	IEEE 802.11a: 5 Channels IEEE 802.11b/g: 11 Channels
<b>Antenna Specification</b>	Antenna Type: Dipole Antenna Antenna Gain: IEEE 802.11a: 3.43dBi IEEE 802.11b/g: 2.44dBi

**Remark:**

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **VZ9090001** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47, 15.207, 15.209 and 15.247.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003.

### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



### **3.5 DESCRIPTION OF TEST MODES**

Software used to control the EUT for staying in continuous transmitting mode was programmed.

The worst case data rate is determined as the data rate with highest output power.

The EUT (model: OWL800) comes with two identical module (A & B) and two PoE for sale.

Module A is 802.11a function, and module B is 802.11 b/g functions.

The two PoE cannot work simultaneously.

Module A comes with two antennas, antenna 1 is TX & RX function, antenna 2 is RX function.

Module B comes with two antennas, antenna 3 is TX & RX function, antenna 4 is RX function.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE802.11b:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE802.11g:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE802.11a:

Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 6Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year.*

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	02/23/2010

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	09/10/2009
Test Receiver	Rohde&Schwarz	ESCI	100064	11/30/2009
Switch Controller	TRC	Switch Controller	SC94050010	05/02/2010
4 Port Switch	TRC	4 Port Switch	SC94050020	05/02/2010
Loop Antenna	EMCO	6502	8905/2356	05/30/2009
Horn-Antenna	TRC	HA-0502	06	06/04/2009
Horn-Antenna	TRC	HA-0801	04	06/18/2009
Horn-Antenna	TRC	HA-1201A	01	10/15/2009
Horn-Antenna	TRC	HA-1301A	01	10/15/2009
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/27/2010
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC MRA: TW1039 IC: 2324G-1/-2	10/17/2010 11/04/2010
Test S/W	LABVIEW (V 6.1)			

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver 9kHz-30MHz	Rohde & Schwarz	ESHS30	828144/003	11/25/2009
TWO-Line V-Network 9kHz-30MHz	Schaffner	NNB41	03/10013	06/11/2009
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	04/08/2010
Test S/W	LABVIEW (V 6.1)			



### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 2.81
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	+/-3.7046
3M Semi Anechoic Chamber / 1GHz Above	+/-3.0958

*Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4: 2003 and CISPR Publication 22.

### **5.2 EQUIPMENT**

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

**5.3 TABLE OF ACCREDITATIONS AND LISTINGS**

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	 Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1& IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

*\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Model	Series No.	FCC ID	Brand	Data Cable	Power Cord
1.	Notebook PC	2672 (X31)	9985H9M	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	IBM	LAN Cable: Unshielded, 10m Line Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Notebook PC (Remote)	PP05L	7T390 A03	E2K5HCKT	DELL	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3	Notebook PC (Remote)	PP19L	GK102 A00	QDS-BRCM1021	DELL	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
4	Notebook PC (Remote)	2672 (X31)	99PBTKB	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	IBM	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
5	Notebook PC (Remote)	M5200AE	5BN0AG019631	PD9WM3B2100	ASUS	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

#### **Remark:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

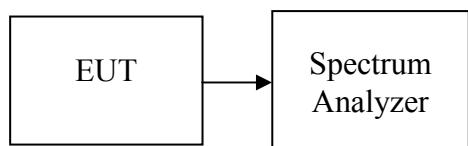
## 7. FCC PART 15.247 REQUIREMENTS

### 7.1 6dB BANDWIDTH

#### LIMIT

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 6dB bandwidth shall be at least 500 kHz.

#### Test Configuration



#### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = RBW, Span = 50MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### TEST RESULTS

*No non-compliance noted*



## Test Data

### Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	11080	>500	PASS
Mid	2437	10080		PASS
High	2462	10170		PASS

### Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16500	>500	PASS
Mid	2437	16500		PASS
High	2462	16420		PASS

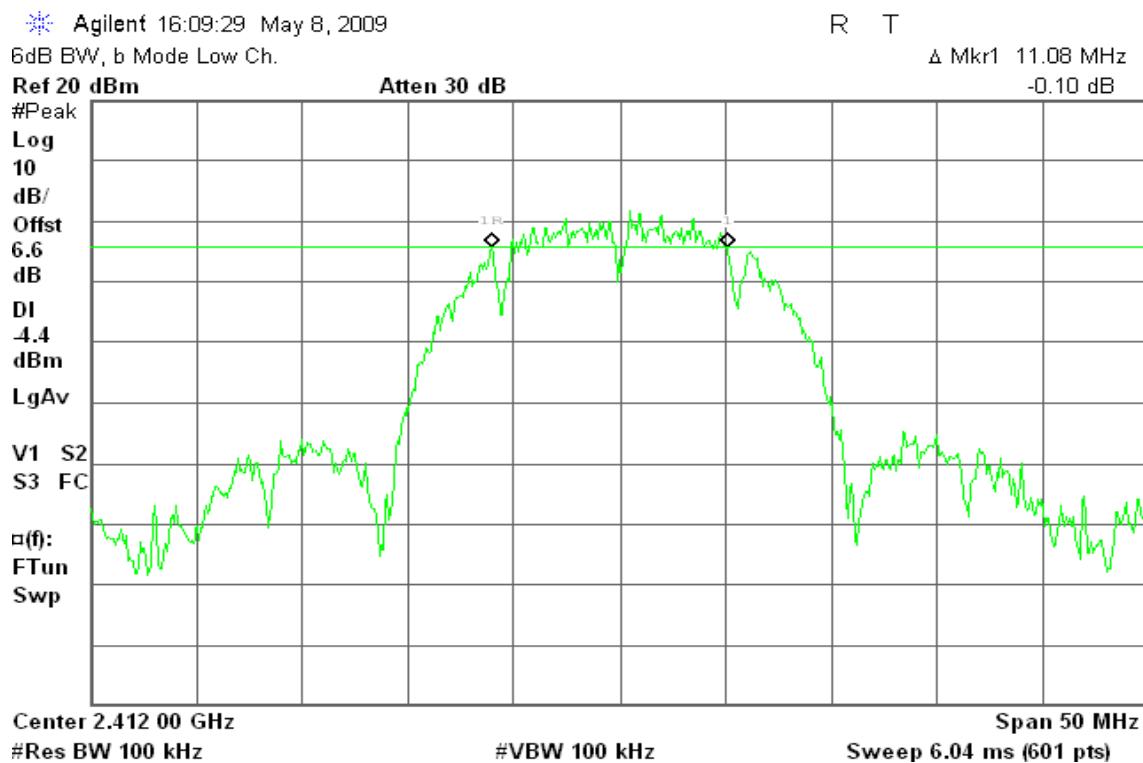
### Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	5745	16500	>500	PASS
Mid	5785	16500		PASS
High	5825	16420		PASS

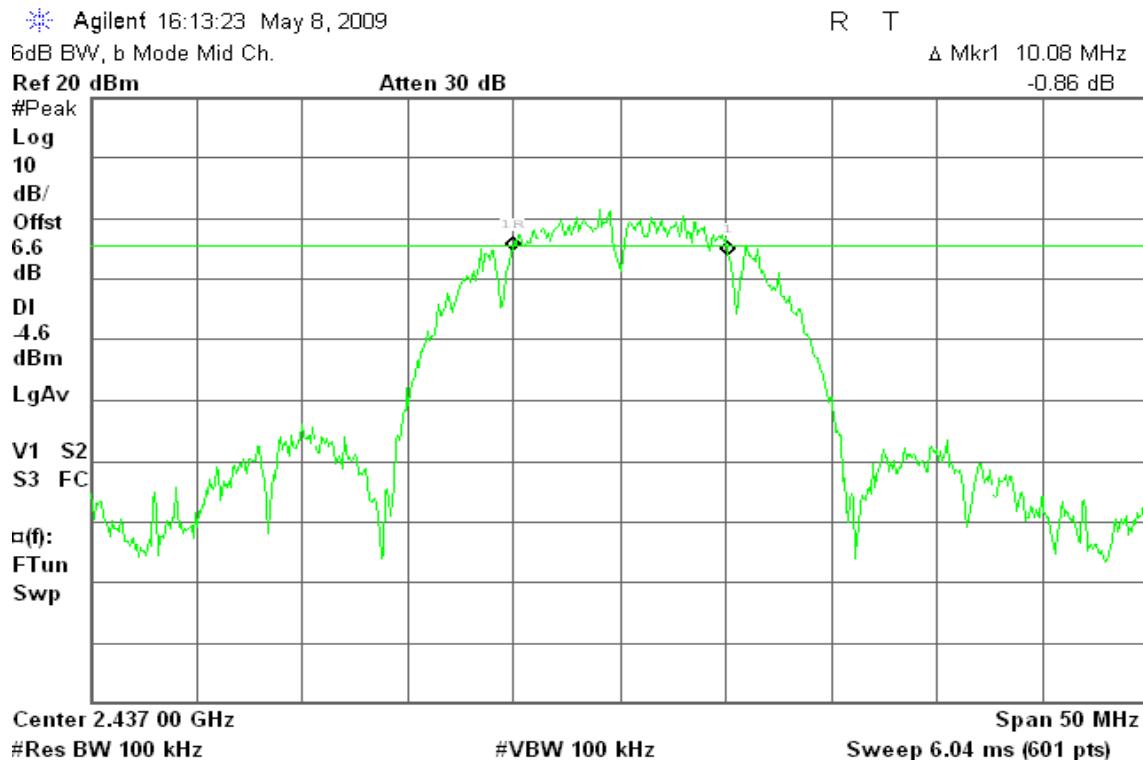
## Test Plot

### IEEE 802.11b

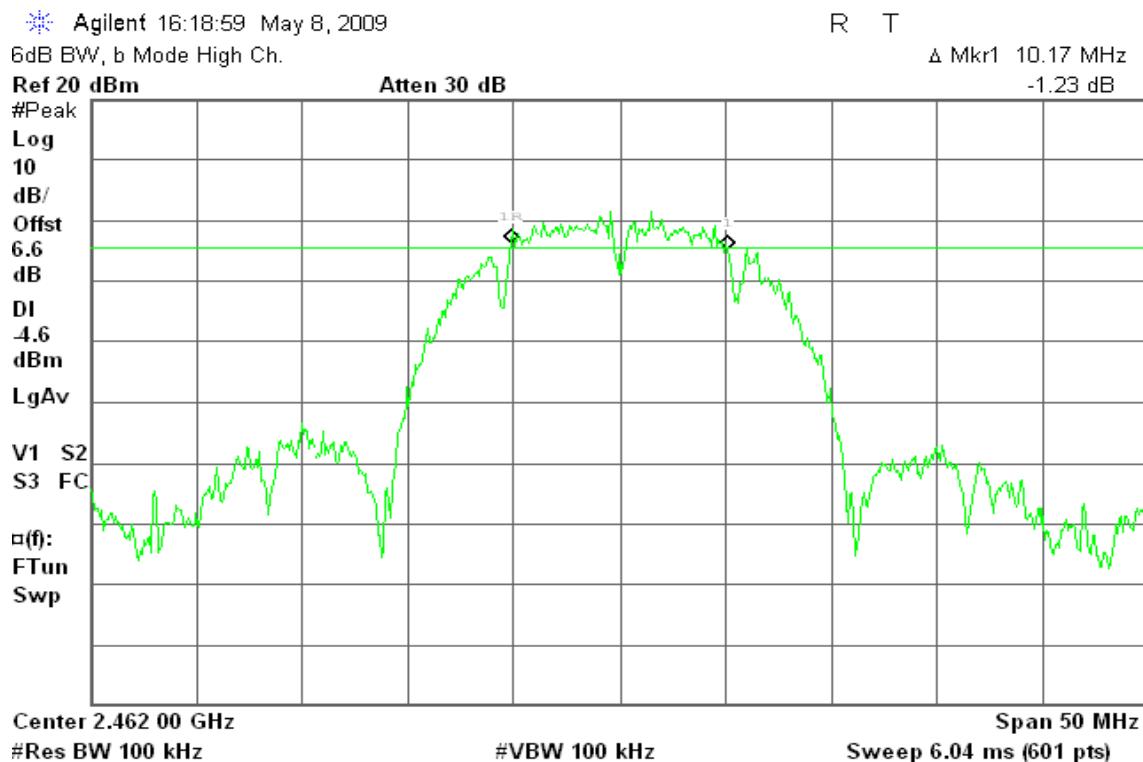
#### CH Low



#### CH Mid

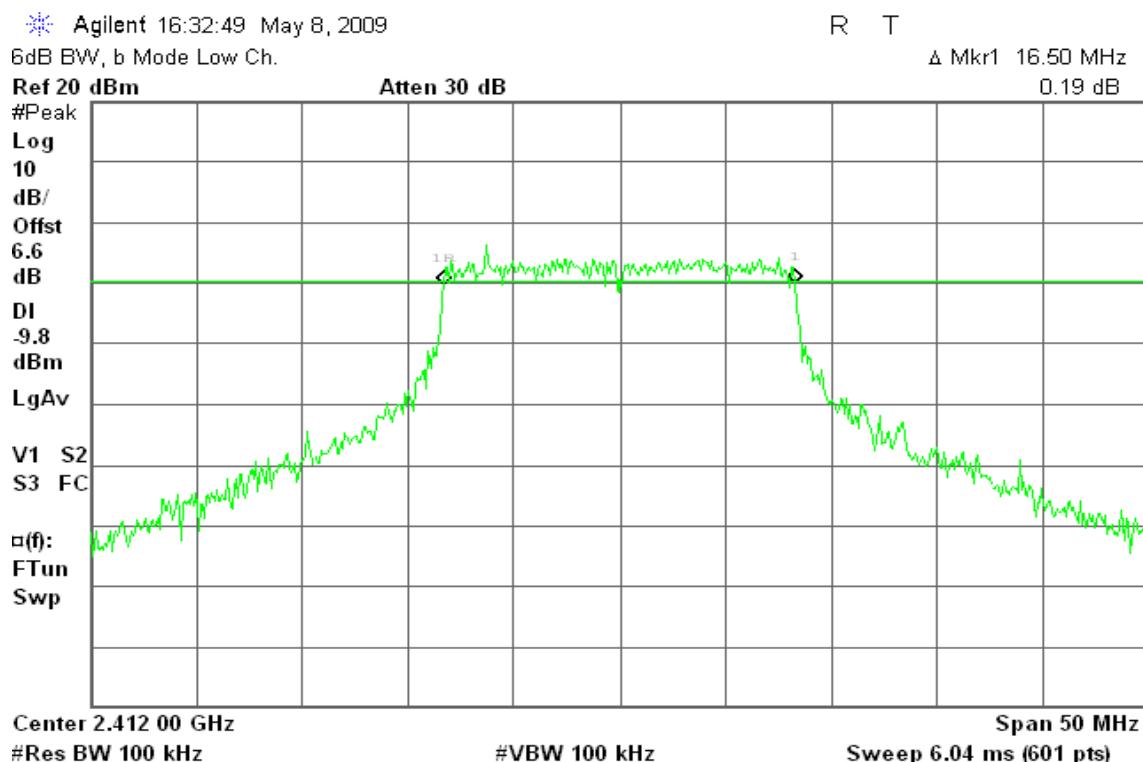


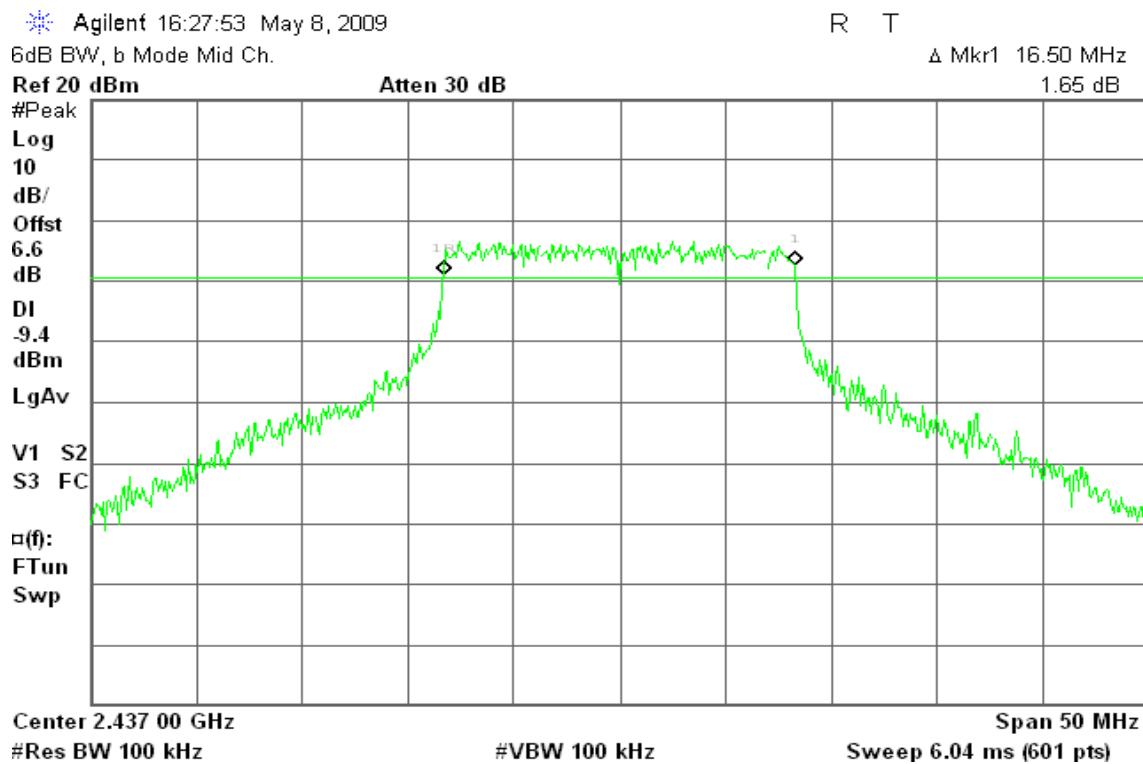
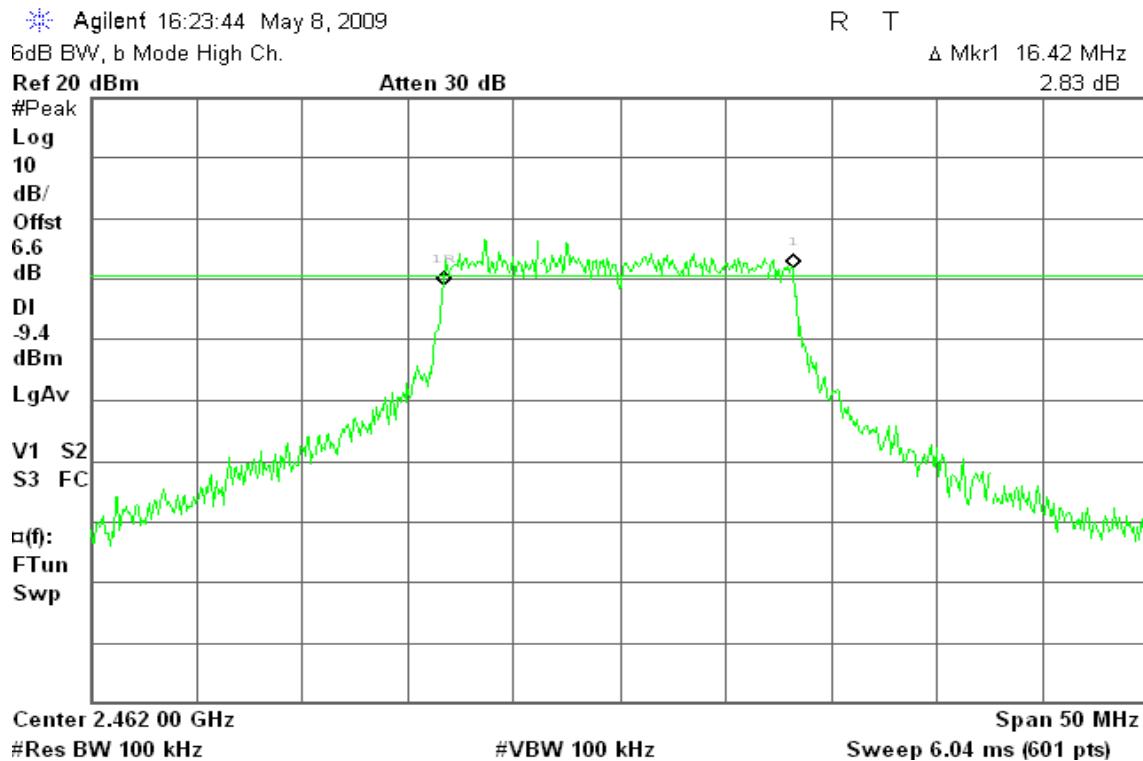
## CH High

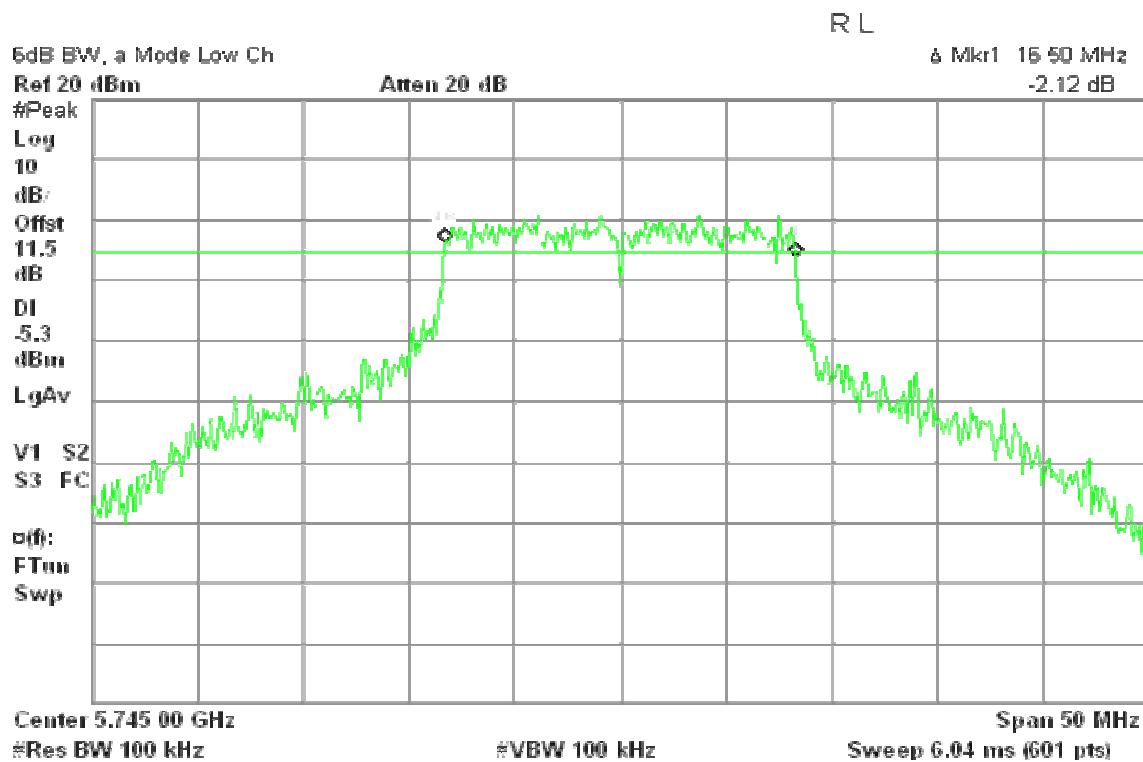
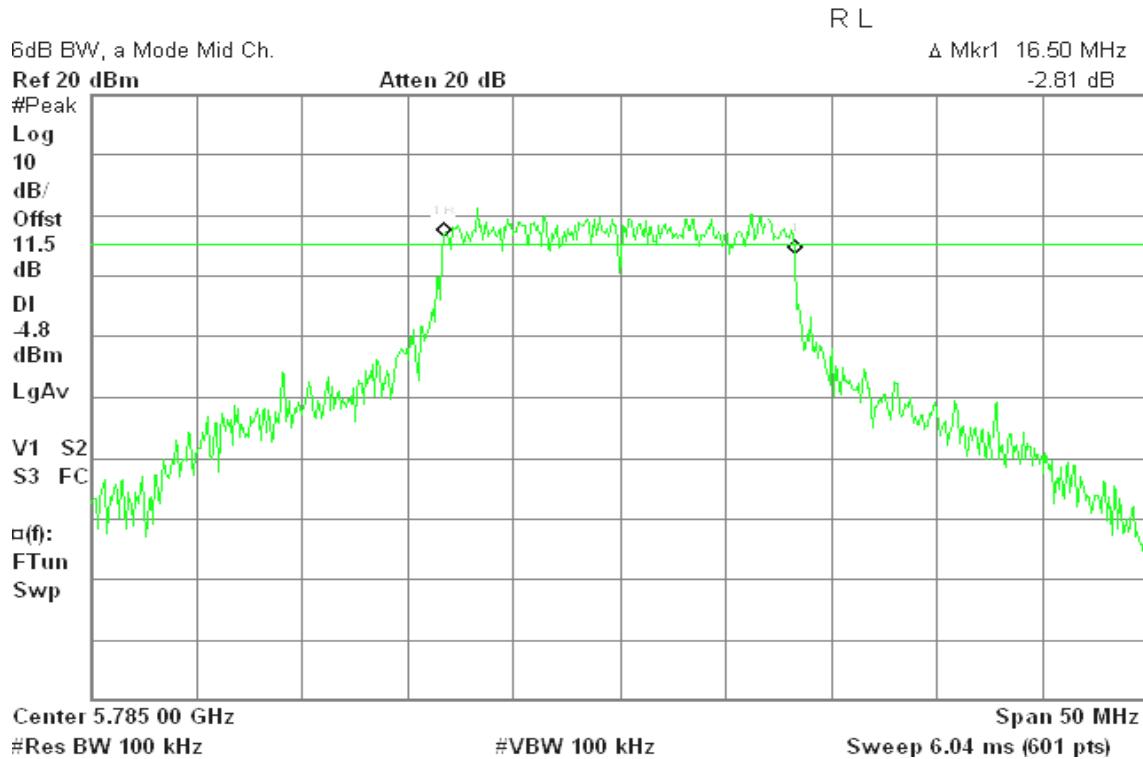


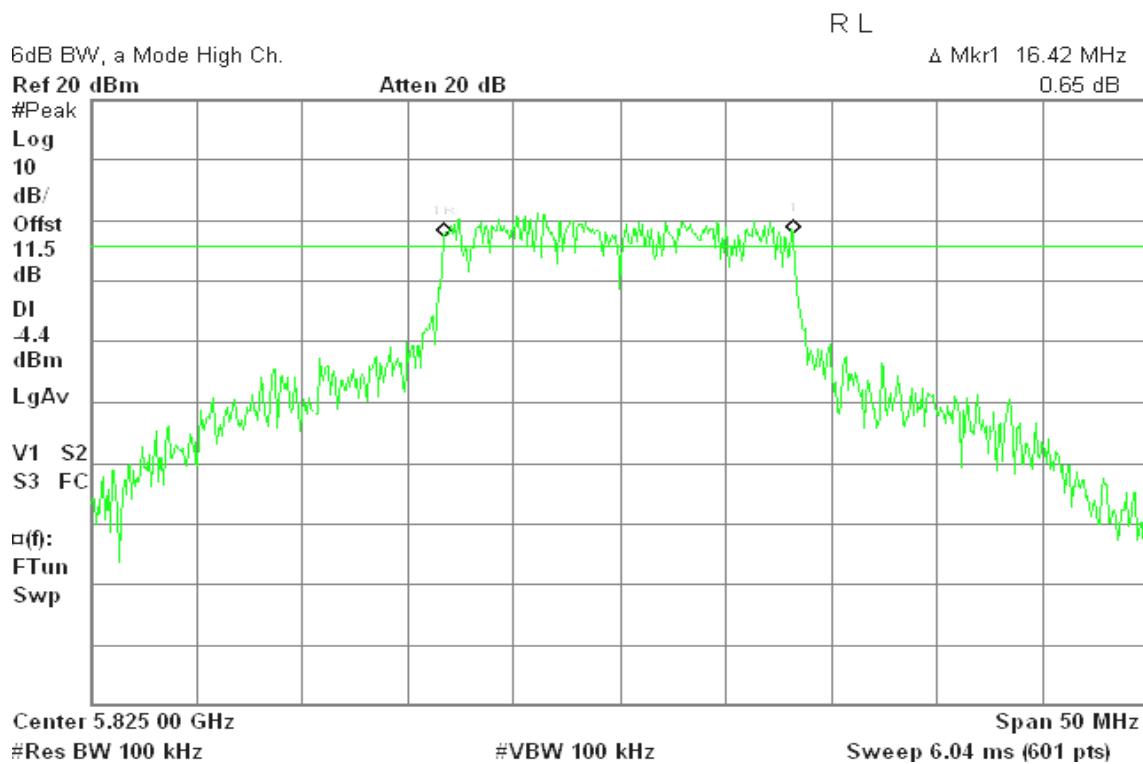
## IEEE 802.11g

### CH Low



**CH Mid****CH High**

**IEEE 802.11a****CH Low****CH Mid**

**CH High**

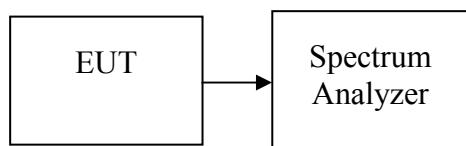
## 7.2 PEAK POWER

### LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Test Configuration



### TEST PROCEDURE

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz.
3. 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/ich.
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 or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

### TEST RESULTS

*No non-compliance noted.*

**Test Data****Test Data****Test mode: IEEE 802.11b**

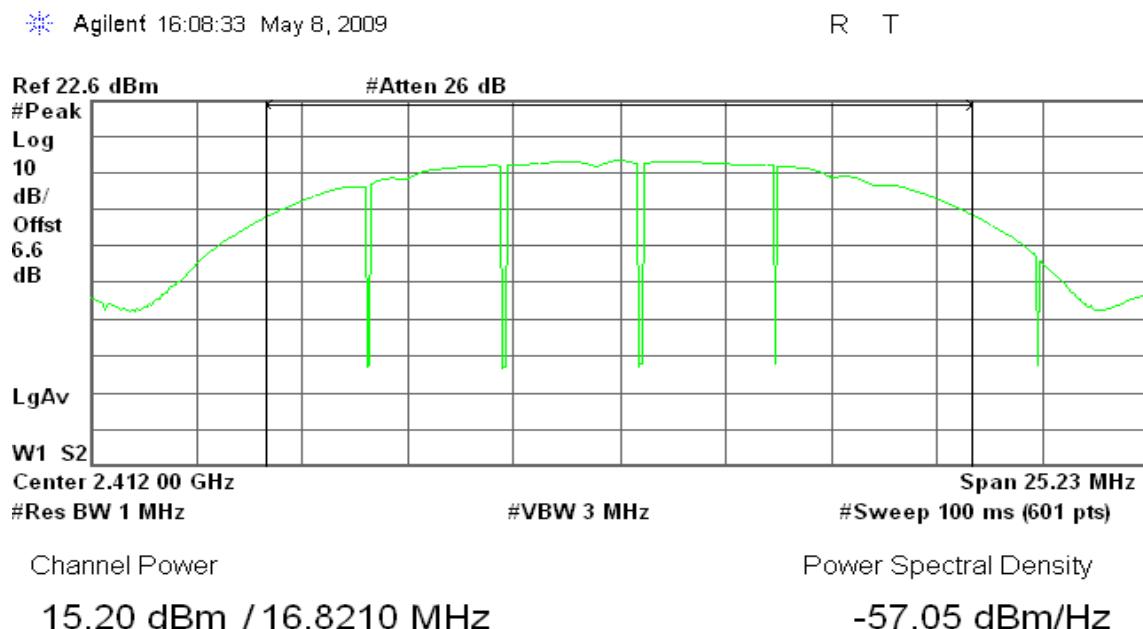
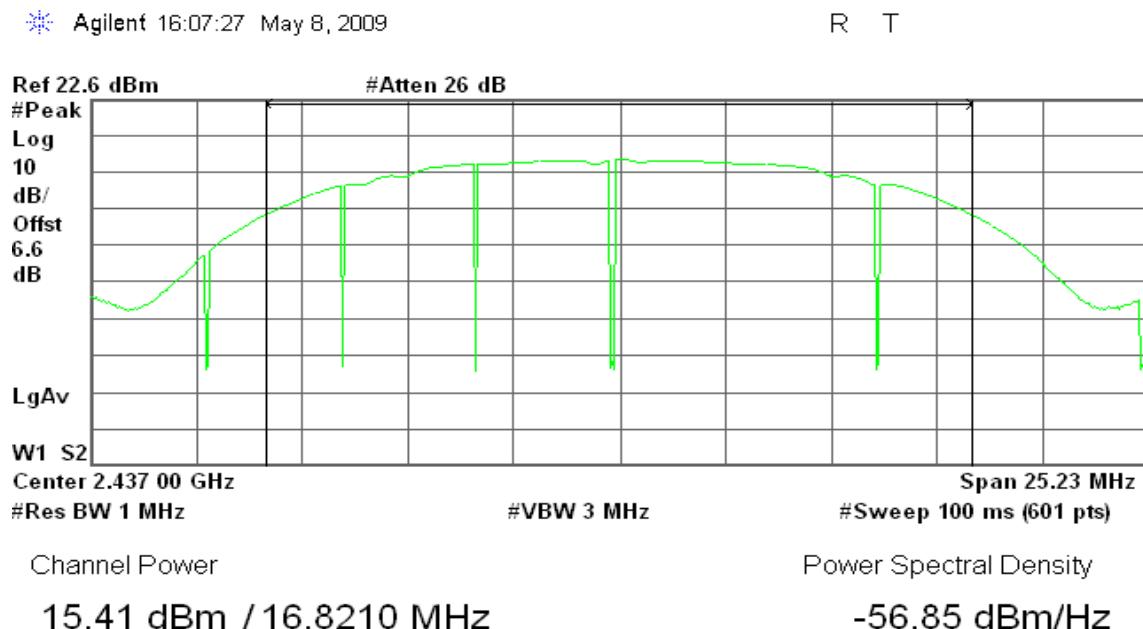
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	15.20	0.0331	1	PASS
Mid	2437	15.41	0.0348		PASS
High	2462	15.39	0.0346		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.06	0.0508	1	PASS
Mid	2437	18.69	0.0740		PASS
High	2462	16.91	0.0491		PASS

**Test mode: IEEE 802.11a**

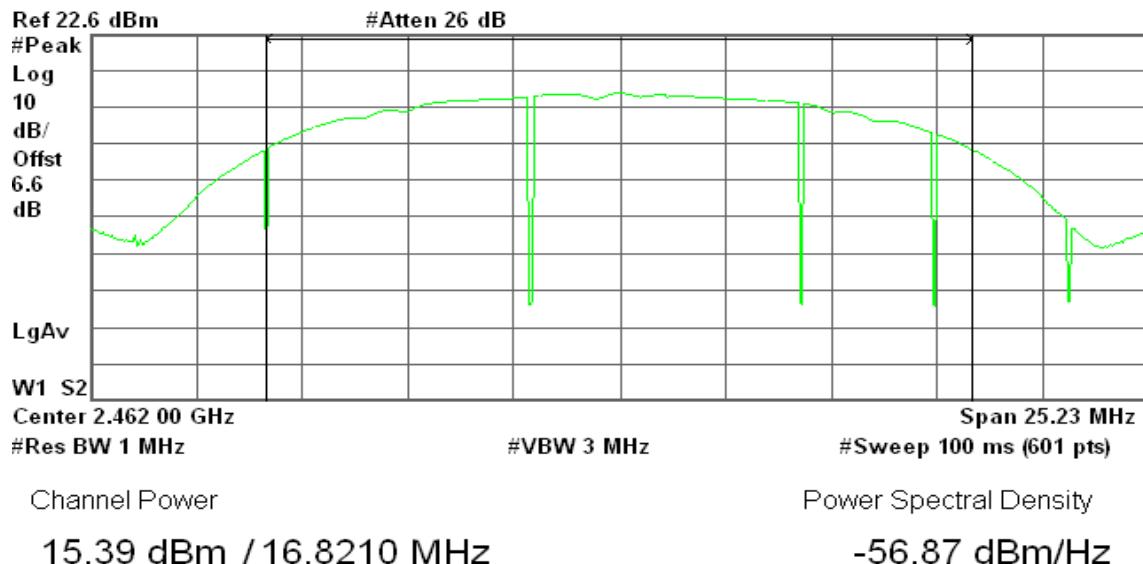
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5745	19.21	0.08337	1	PASS
Mid	5785	19.26	0.08433		PASS
High	5825	19.92	0.09817		PASS

**Test Plot****IEEE 802.11b****CH Low****CH Mid**

**CH High**

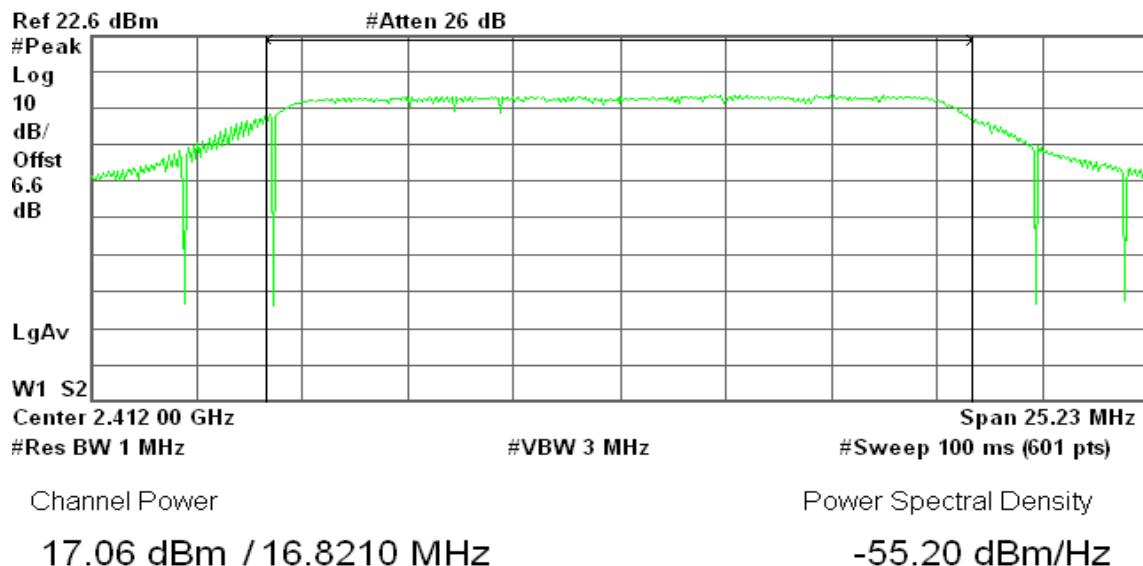
Agilent 16:07:06 May 8, 2009

R T

**IEEE 802.11g****CH Low**

Agilent 16:04:23 May 8, 2009

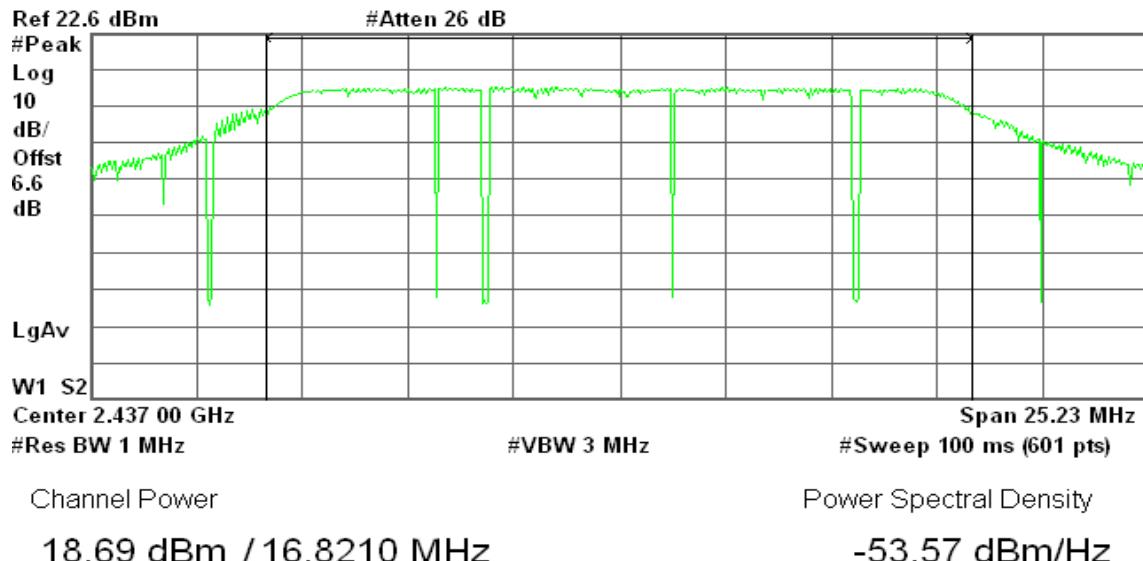
R T



**CH Mid**

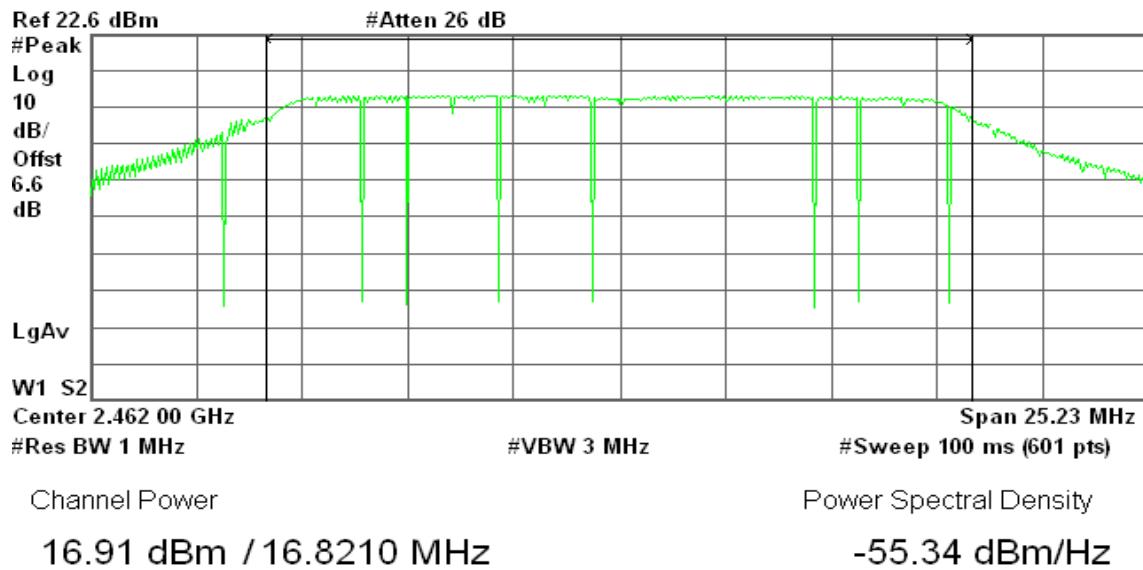
Agilent 16:05:37 May 8, 2009

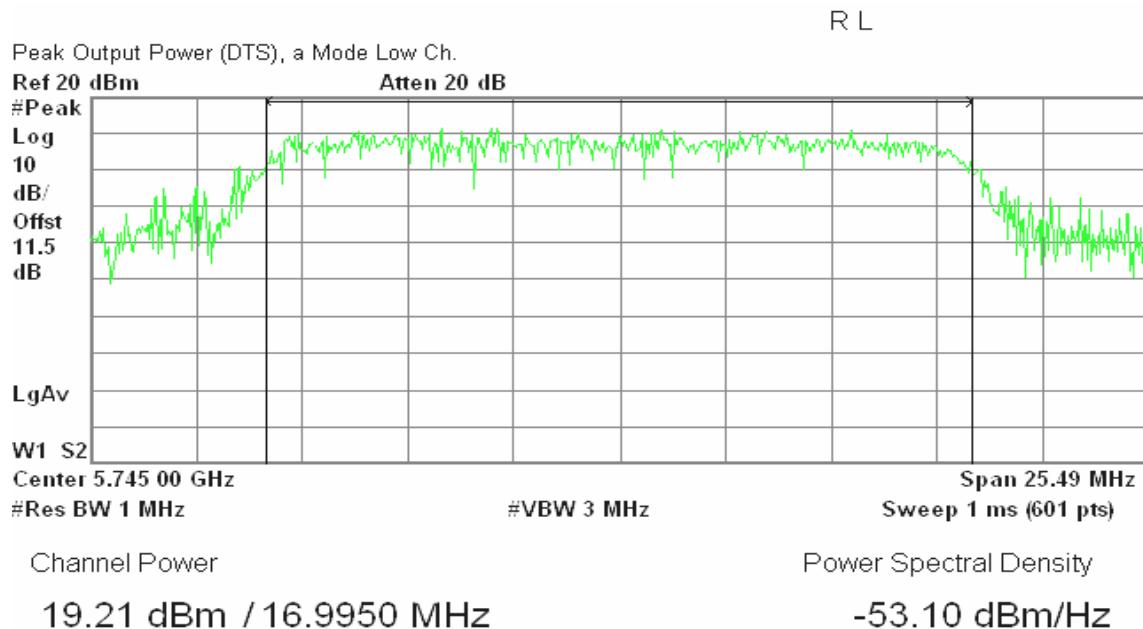
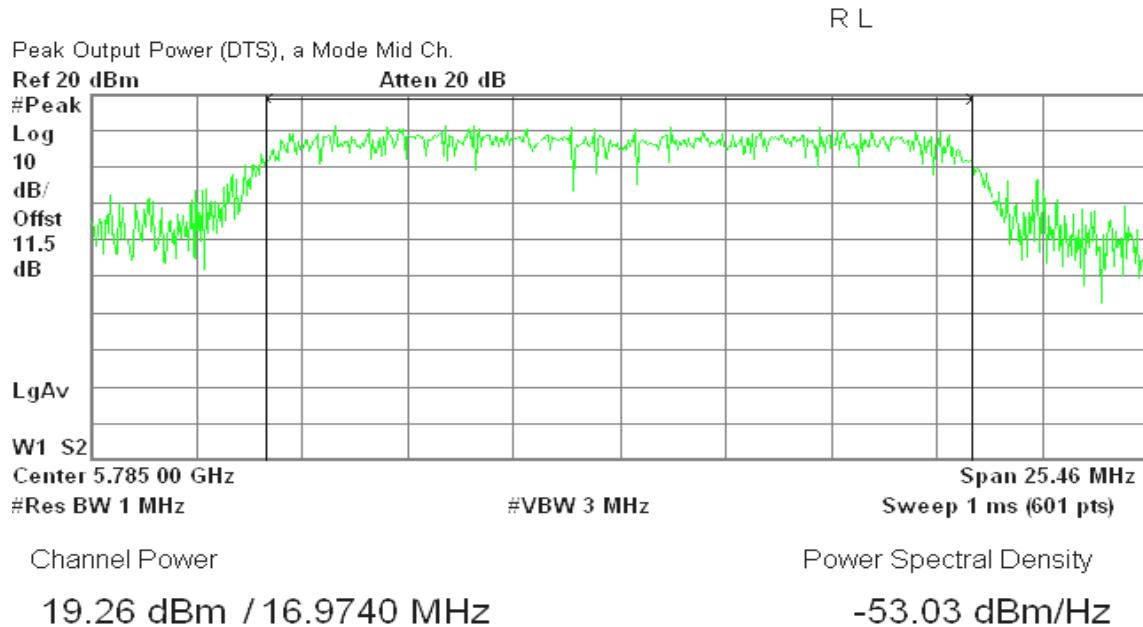
R T

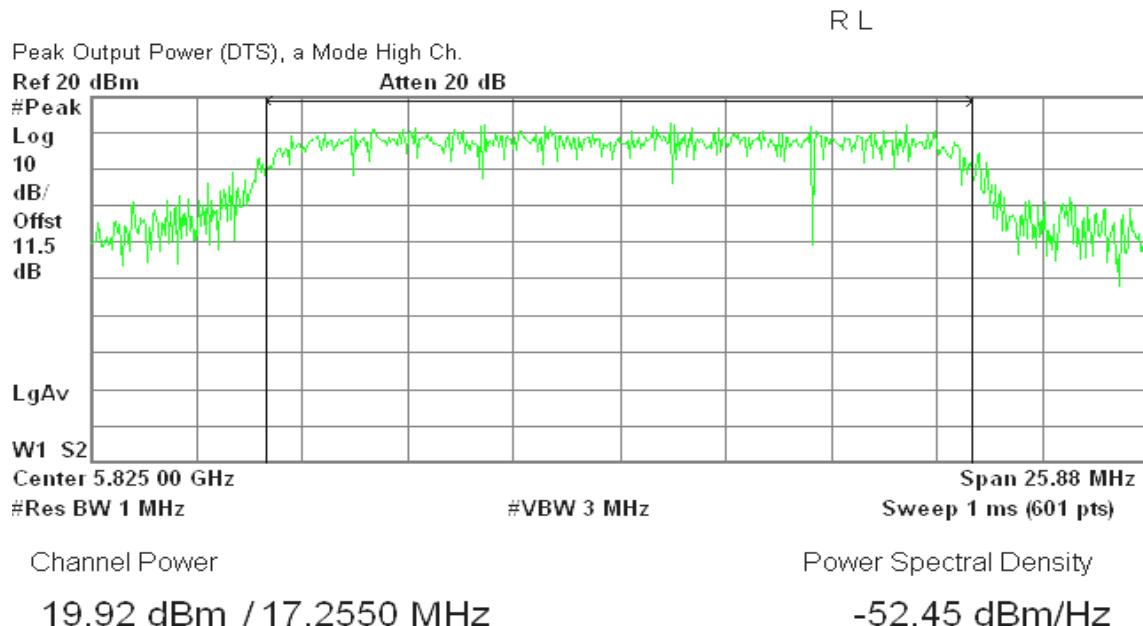
**CH High**

Agilent 16:06:02 May 8, 2009

R T



**IEEE 802.11a****CH Low****CH Mid**

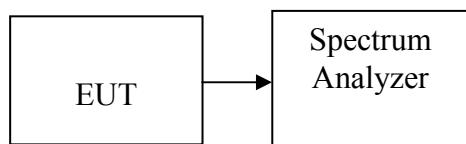
**CH High**

## 7.3 AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the average power detection.

### TEST RESULTS

*No non-compliance noted.*

**Test Data****Test mode: IEEE 802.11b**

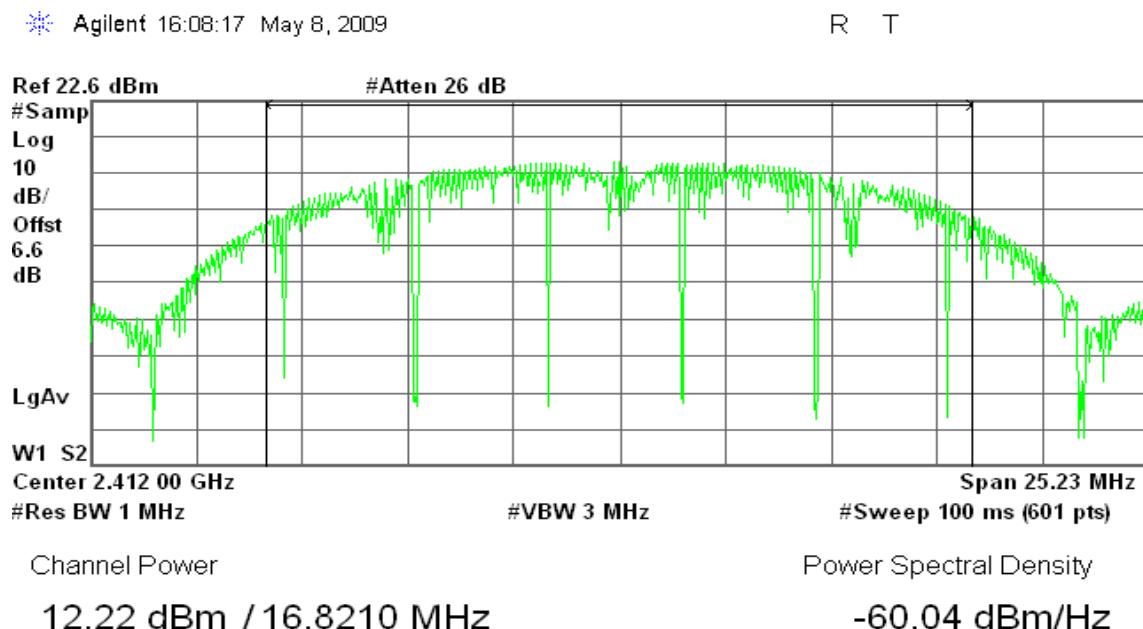
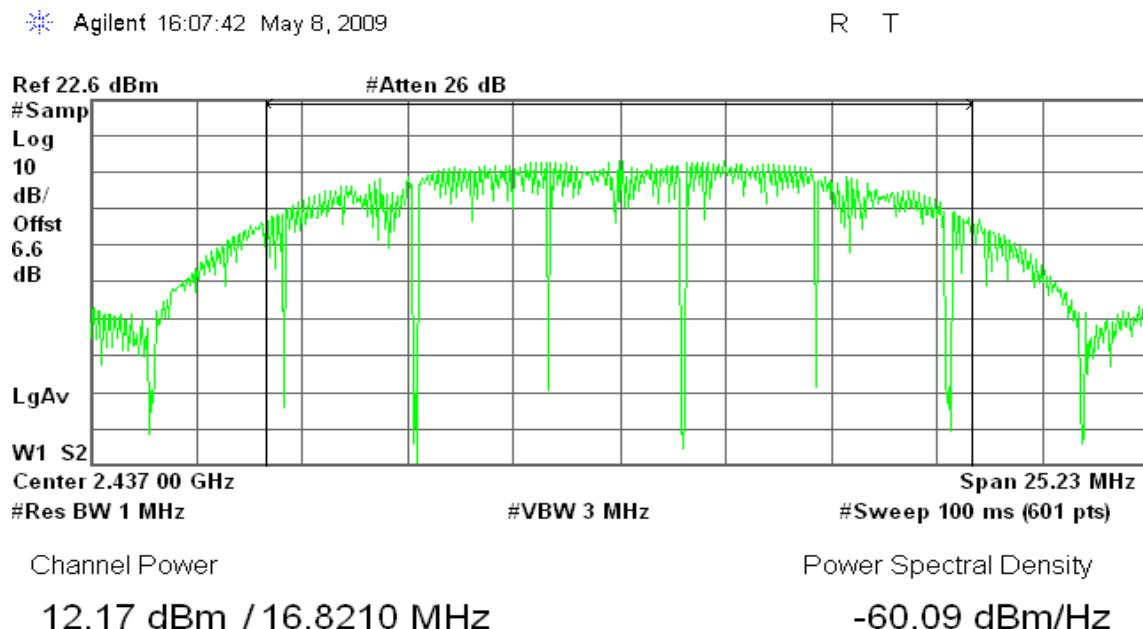
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	12.22	0.0167
Mid	2437	12.17	0.0165
High	2462	12.33	0.0171

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	8.94	17.06
Mid	2437	11.22	18.69
High	2462	9.24	16.91

**Test mode: IEEE 802.11a**

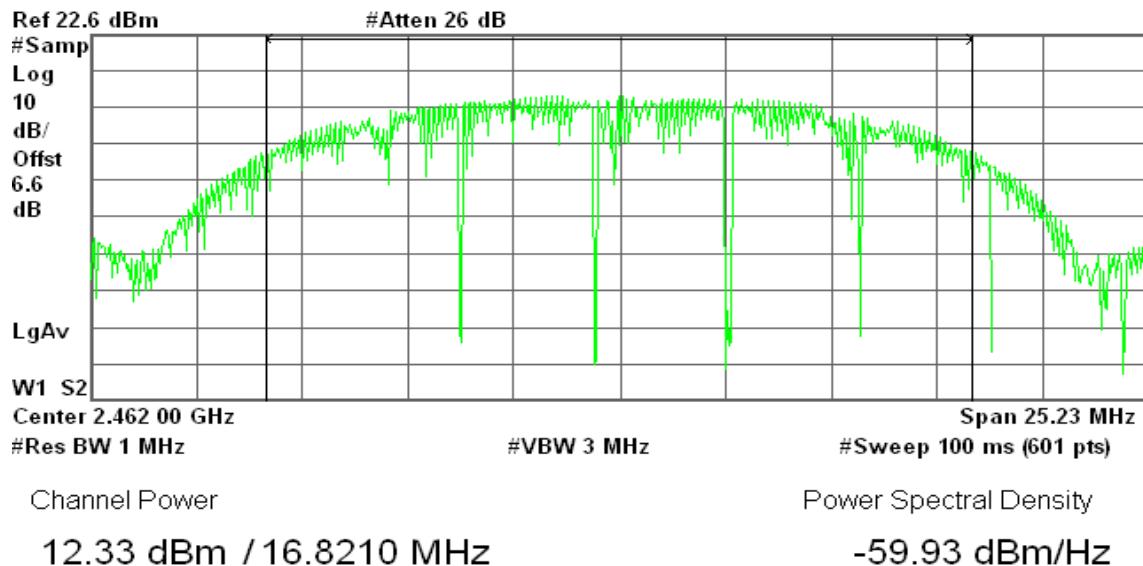
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	15.40	0.03467
Mid	5785	15.22	0.03327
High	5825	16.15	0.04121

**Test Plot****IEEE 802.11b****CH Low****CH Mid**

## CH High

Agilent 16:06:51 May 8, 2009

R T

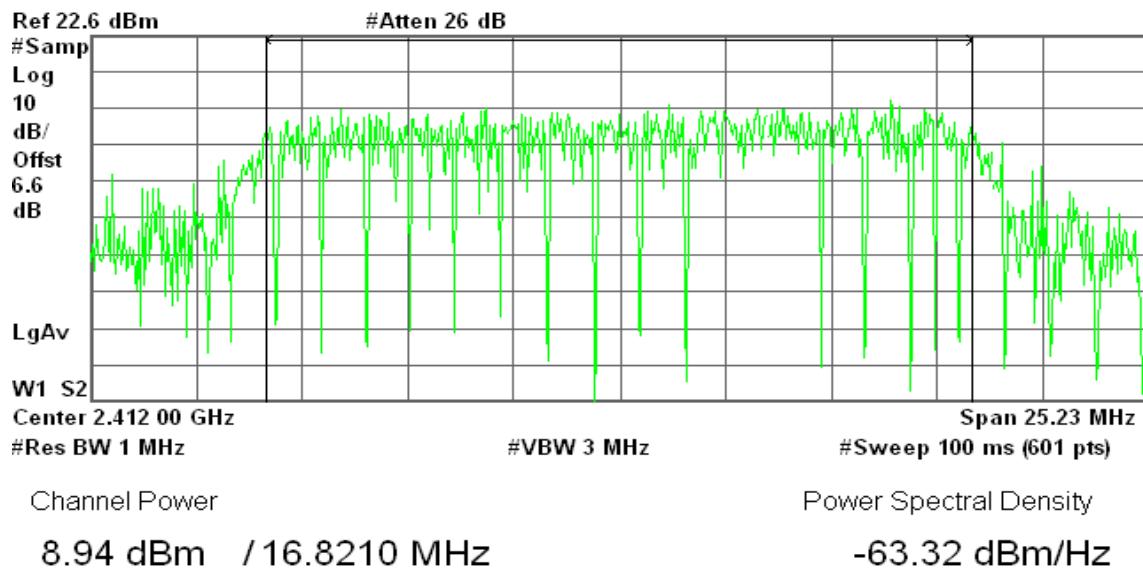


## IEEE 802.11g

CH Low

\* Agilent 16:04:47 May 8, 2009

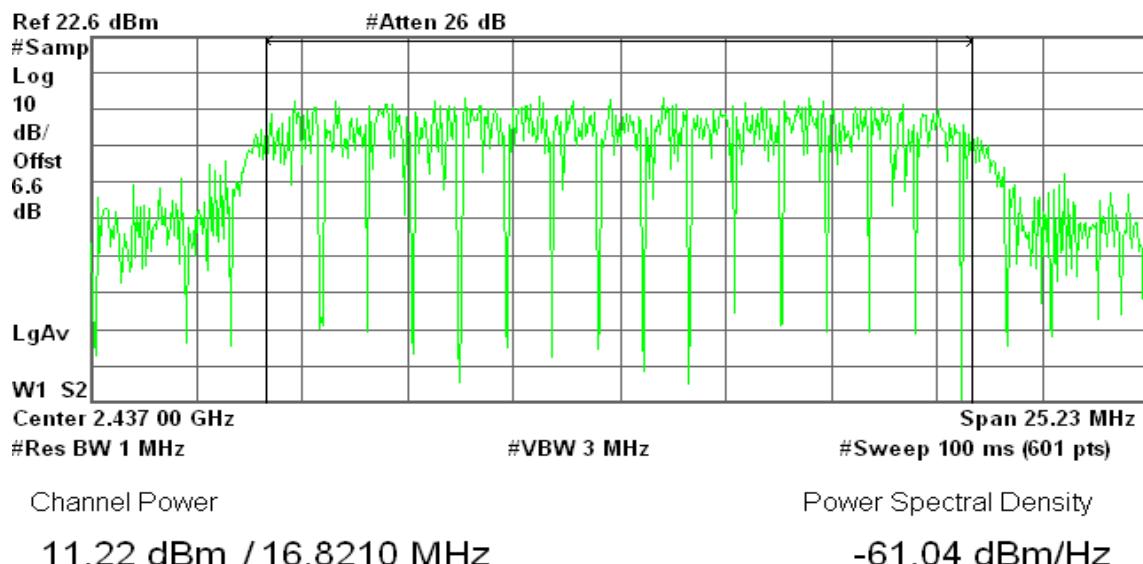
R T



**CH Mid**

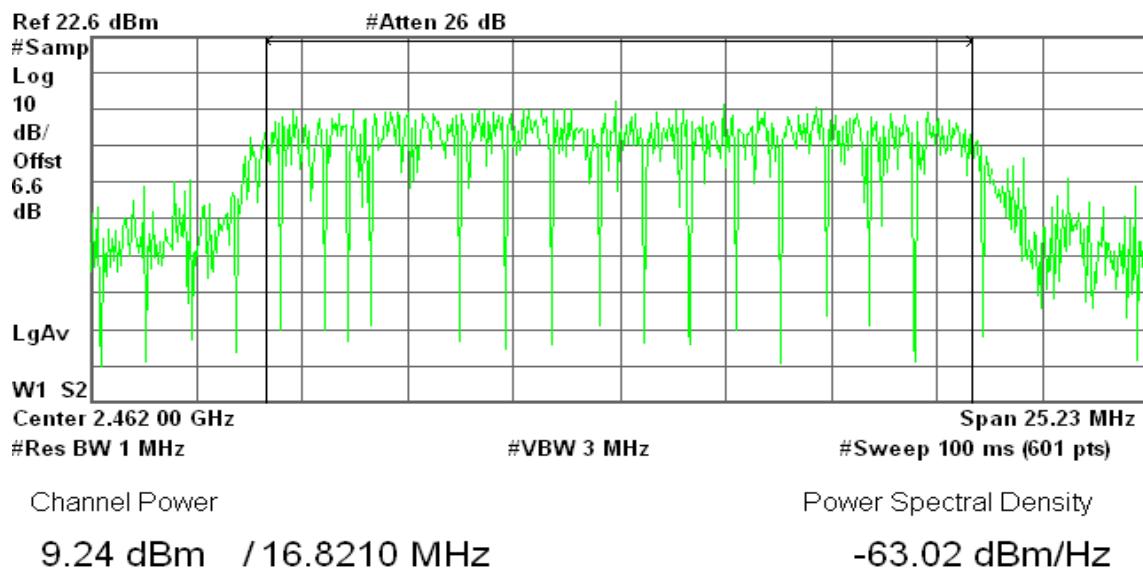
Agilent 16:05:19 May 8, 2009

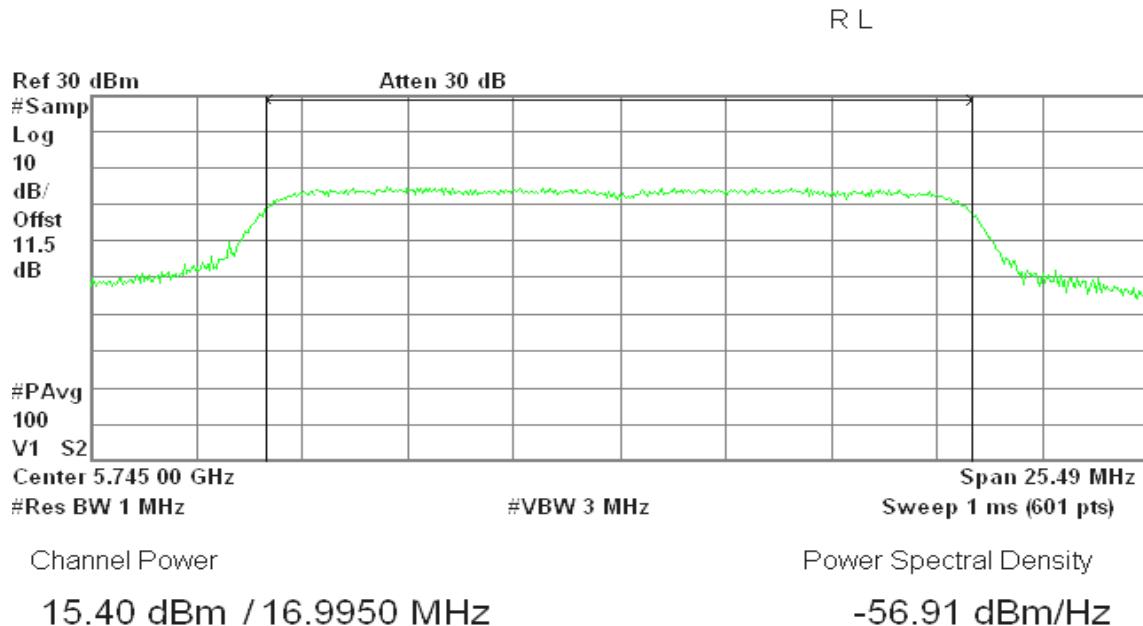
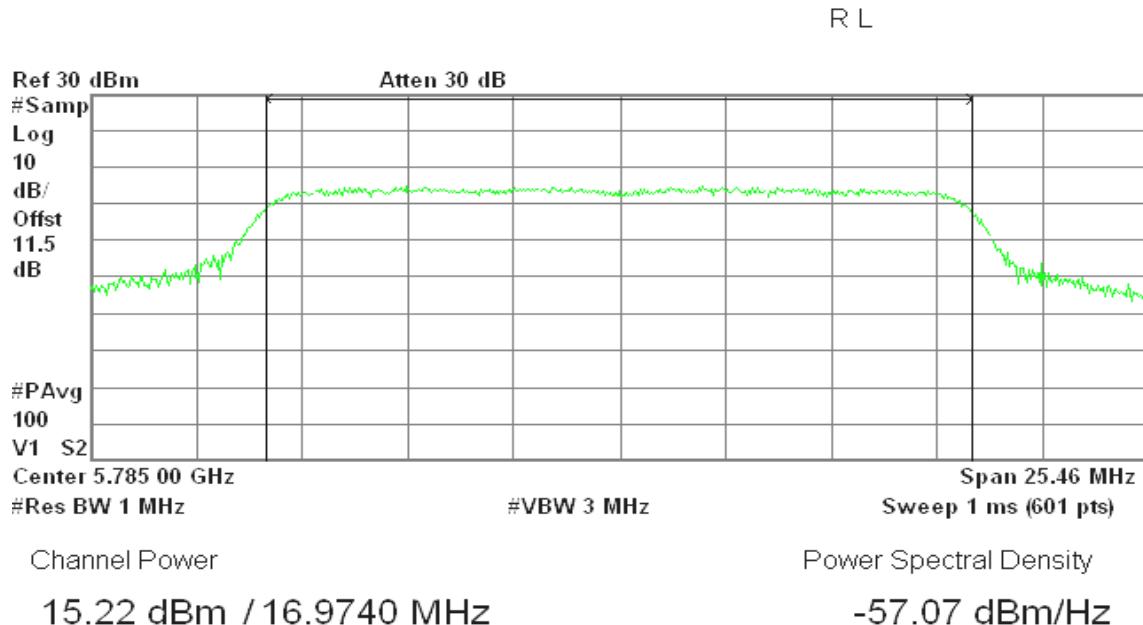
R T

**CH High**

Agilent 16:06:23 May 8, 2009

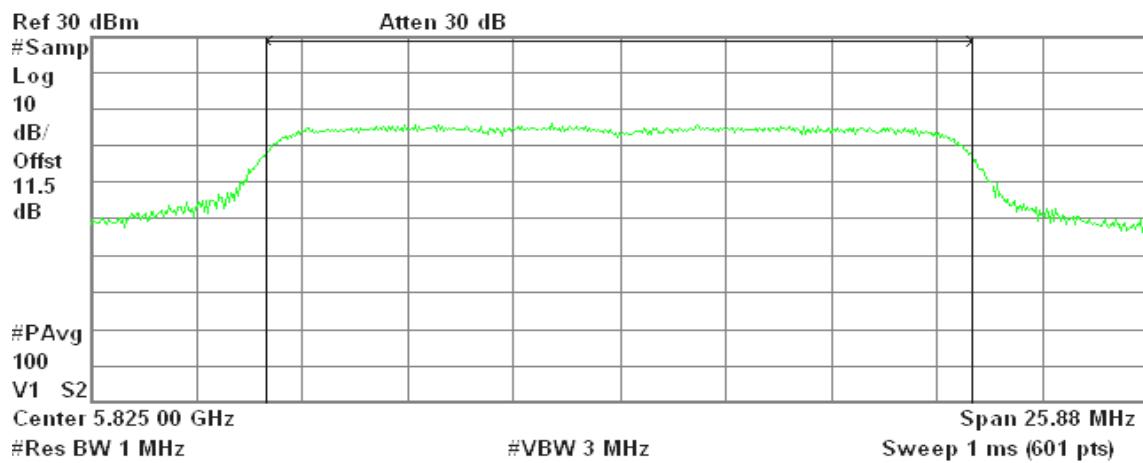
R T



**IEEE 802.11a****CH Low****CH Mid**

**CH High**

R T

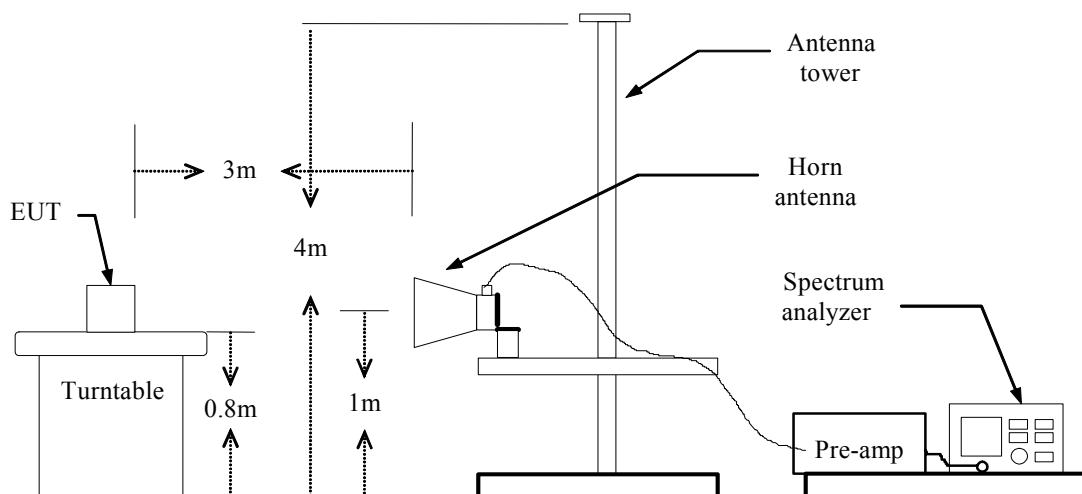


## 7.4 BAND EDGES MEASUREMENT

### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### Test Configuration



### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### TEST RESULTS

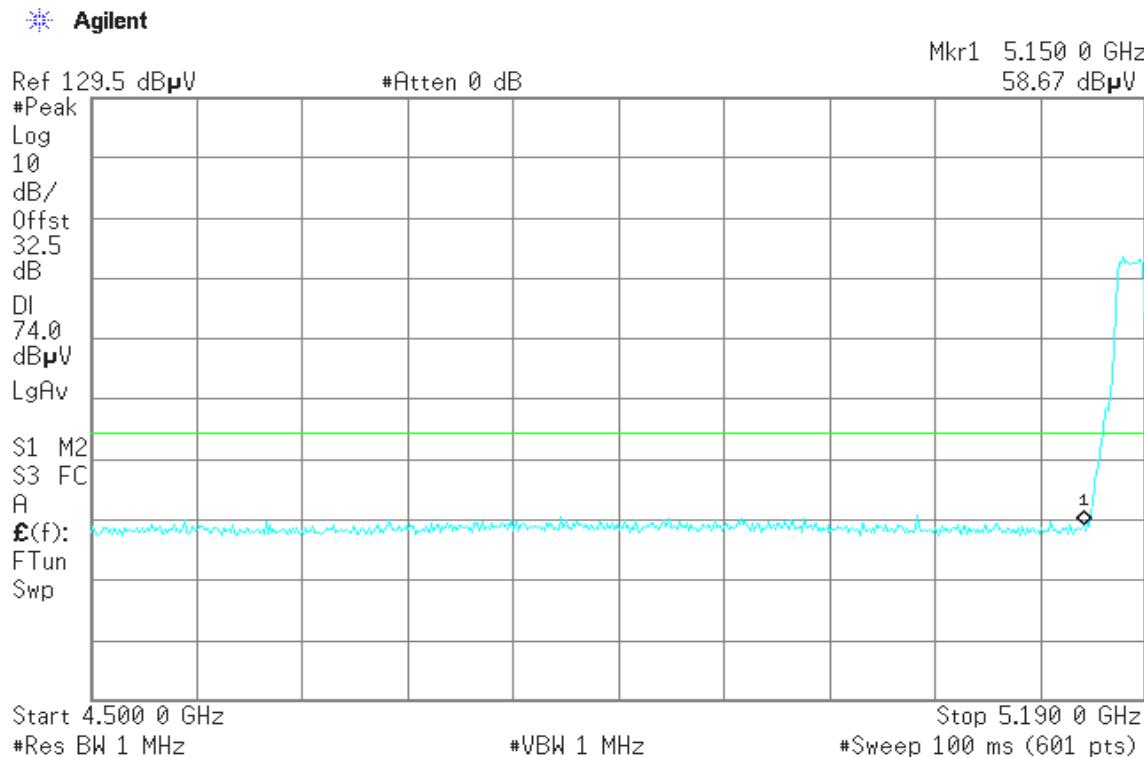
Refer to attach spectrum analyzer data chart.

## Module A

### Band Edges (IEEE 802.11a / CH Low)

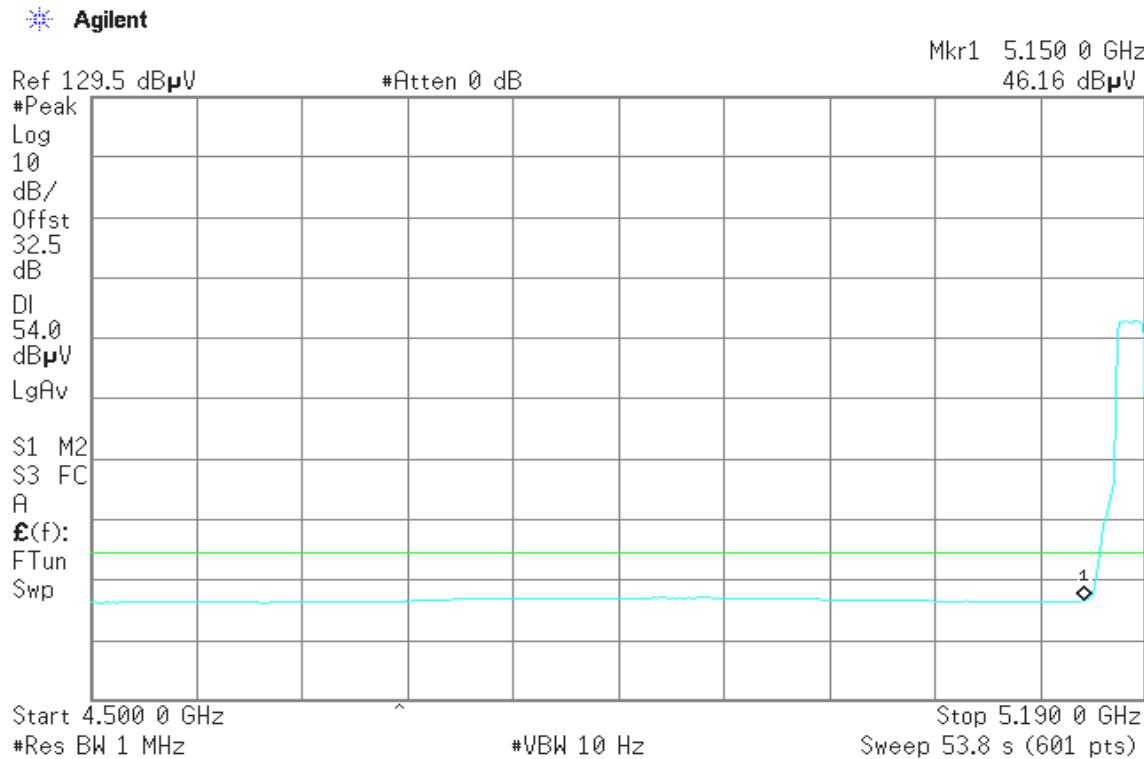
Detector mode: Peak

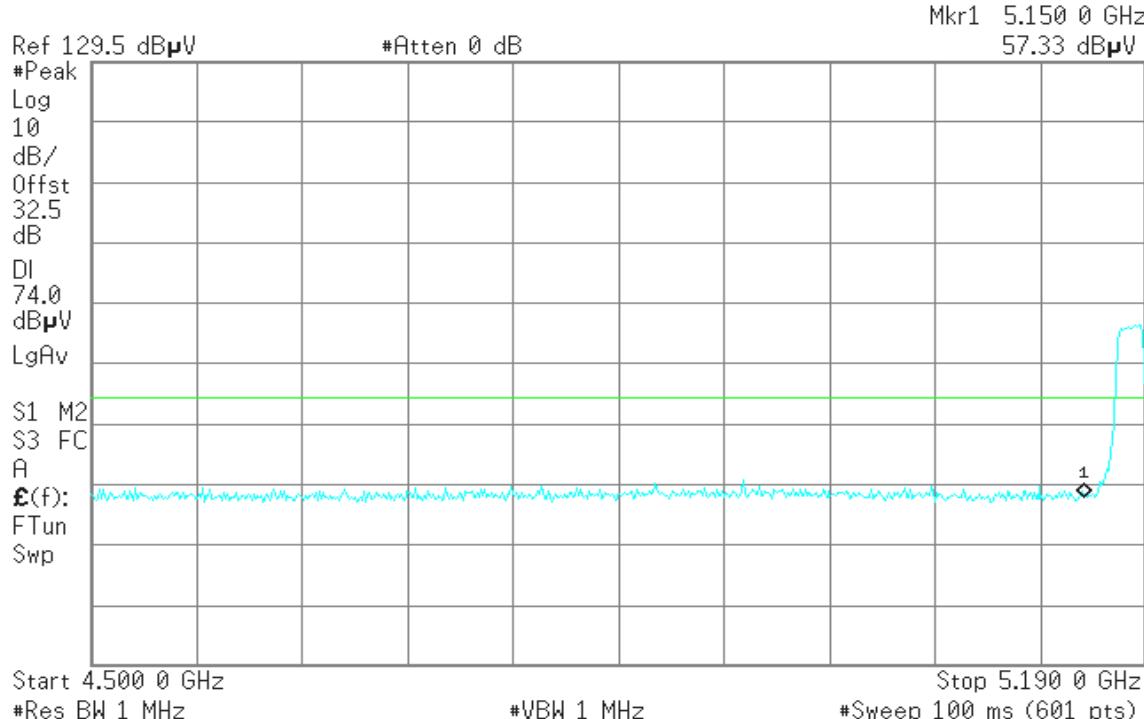
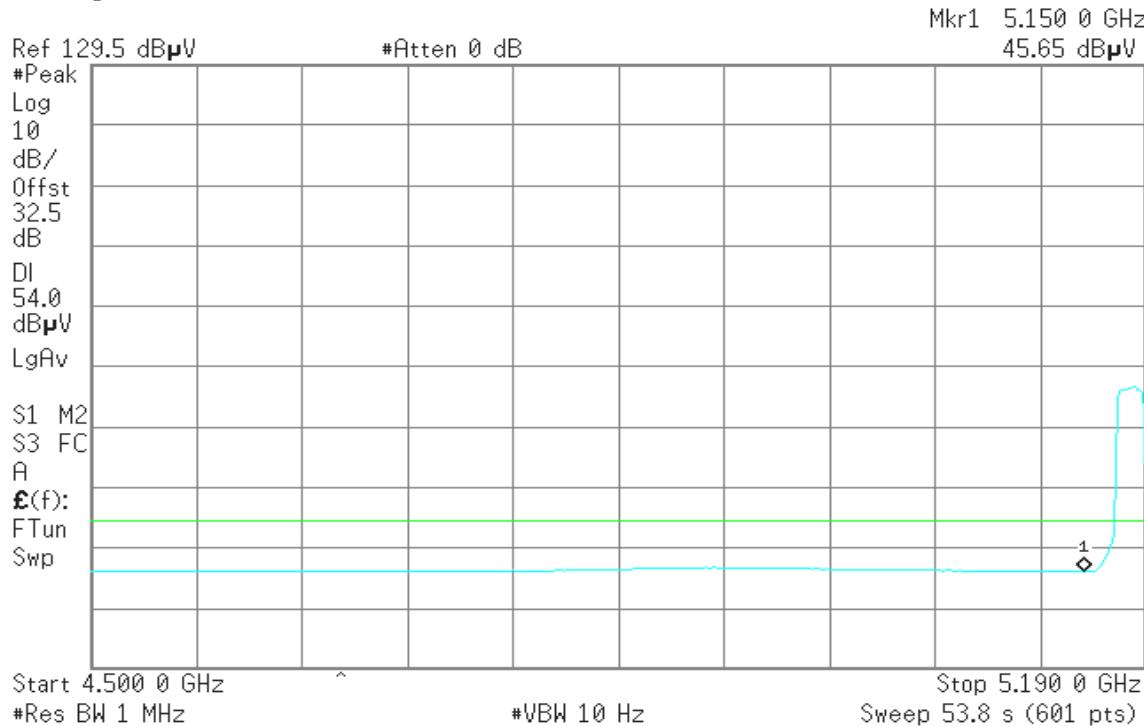
Polarity: Vertical

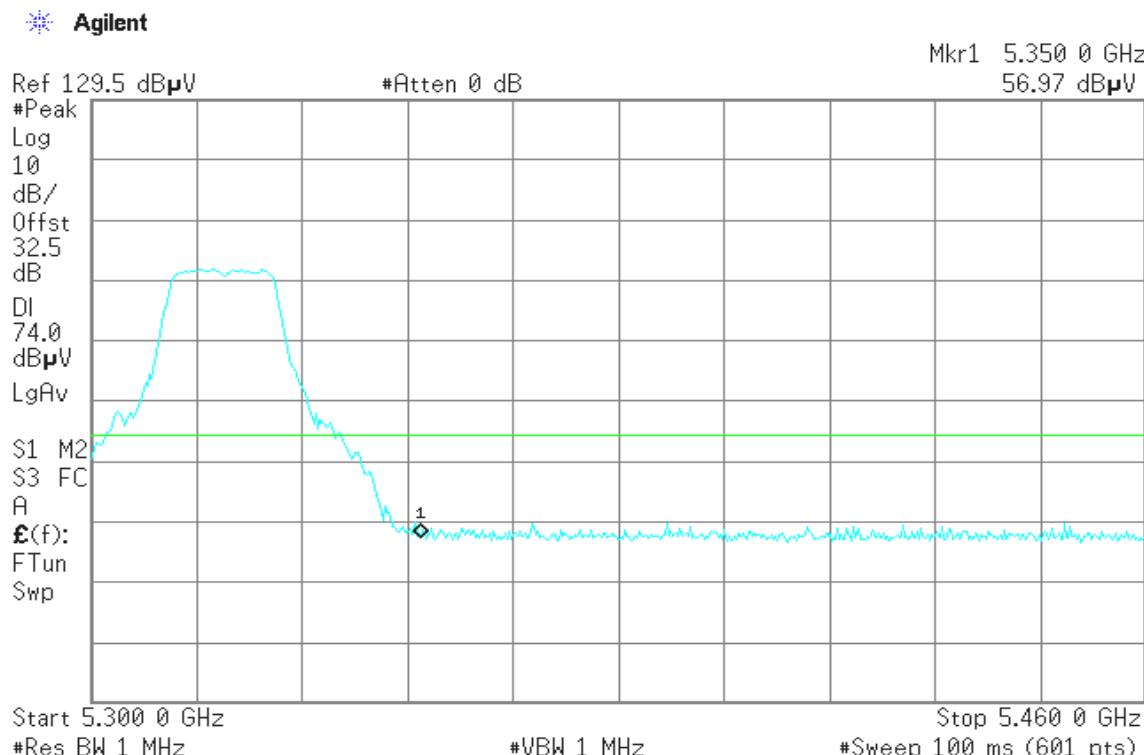
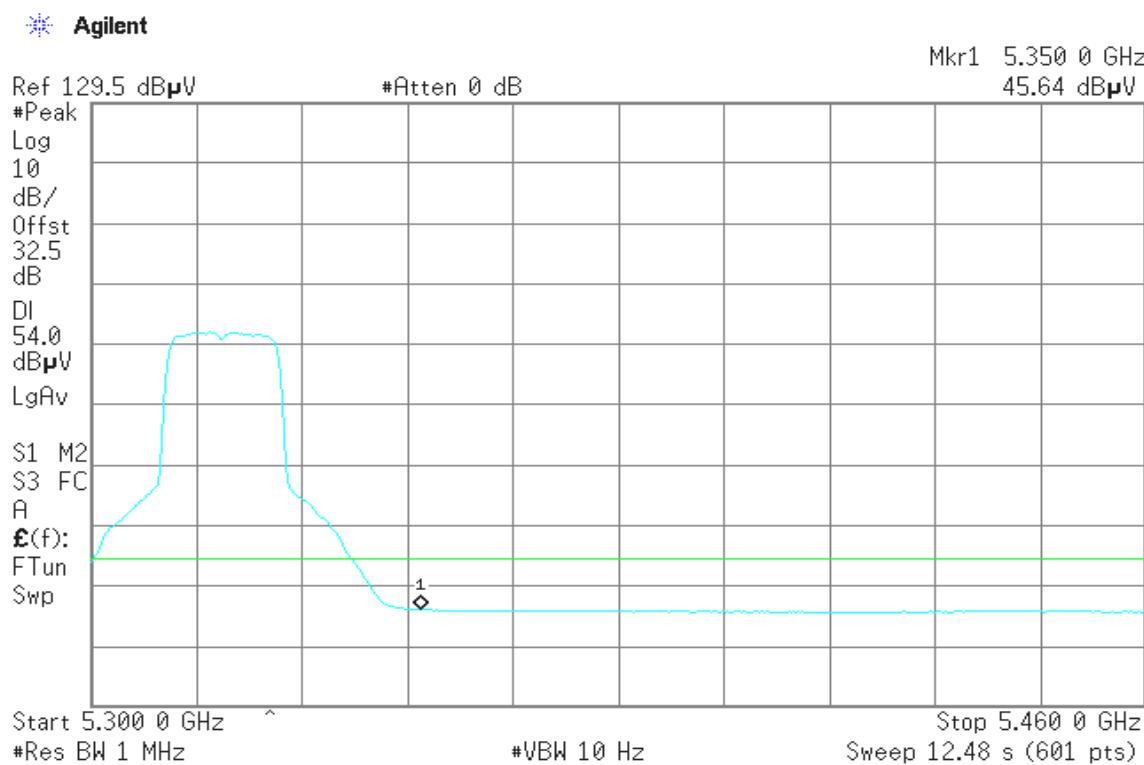


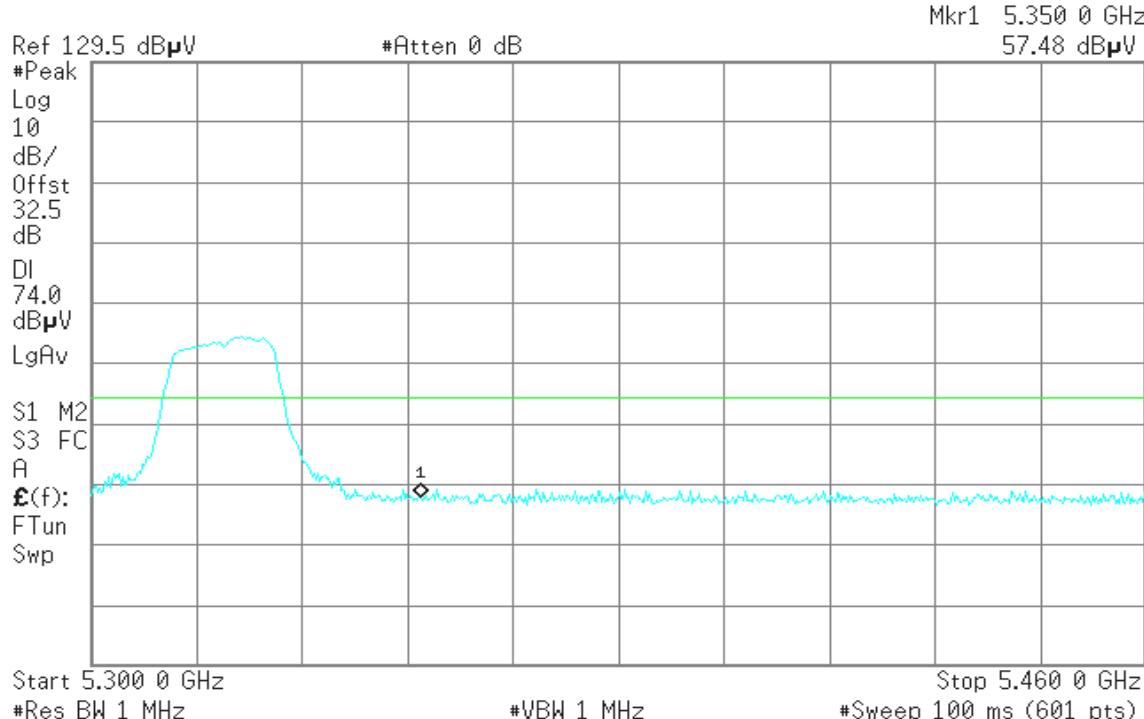
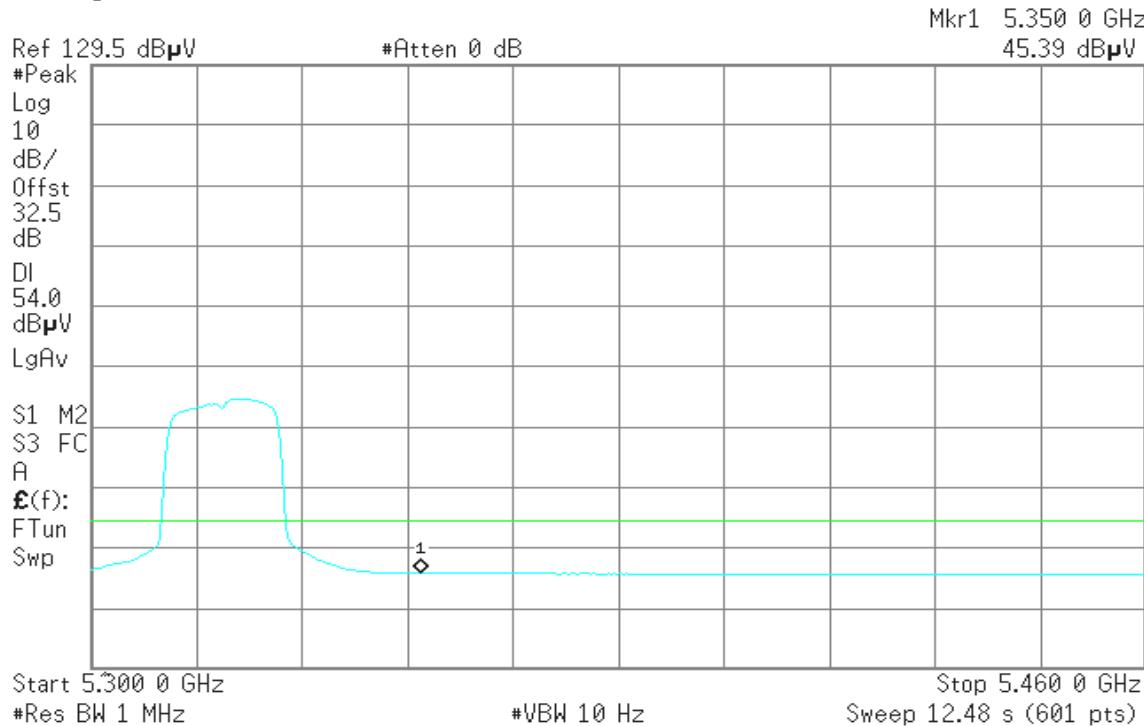
Detector mode: Average

Polarity: Vertical



**Detector mode: Peak****Polarity: Horizontal****Agilent****Detector mode: Average****Polarity: Horizontal****Agilent**

**Band Edges (IEEE 802.11a / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

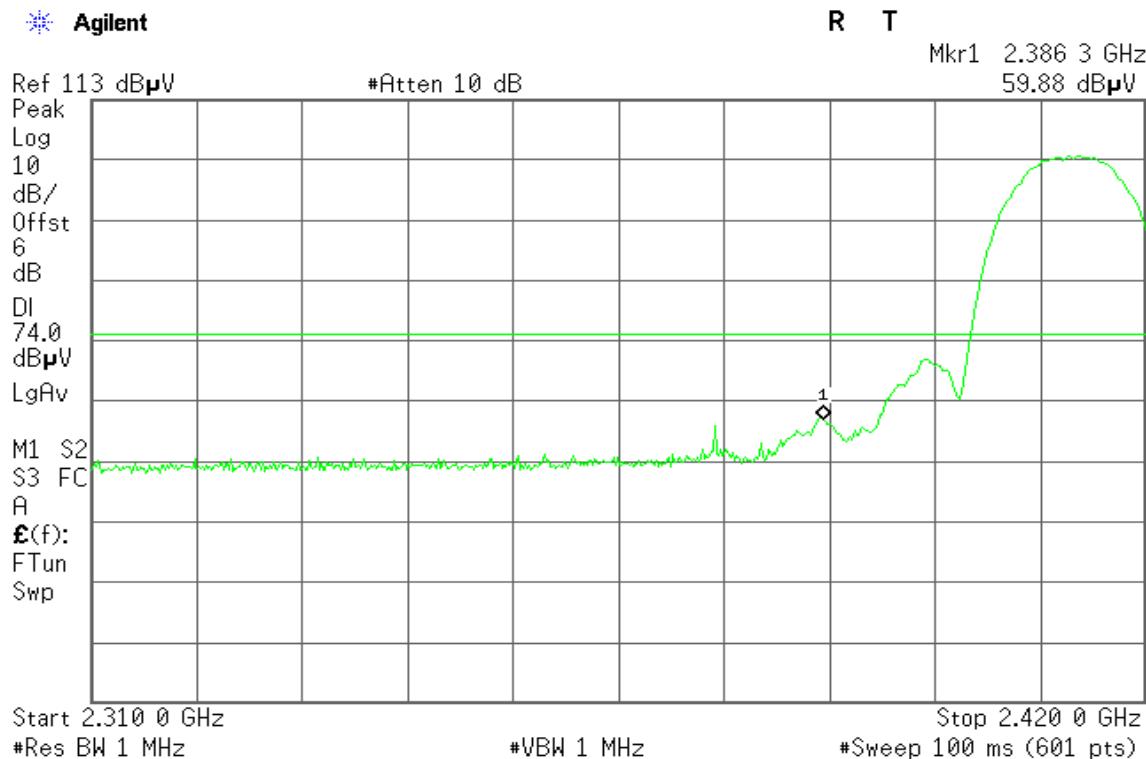
**Detector mode: Peak****Polarity: Horizontal****Agilent****Detector mode: Average****Polarity: Horizontal****Agilent**

## Module B

### Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak

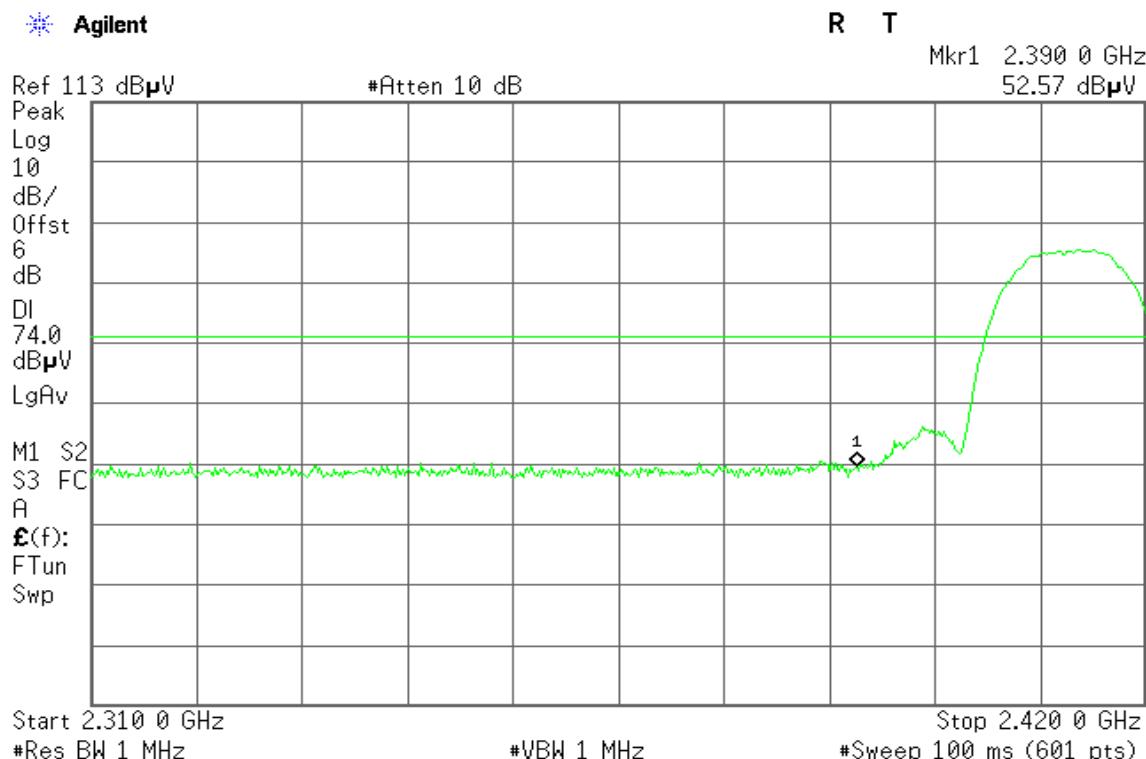
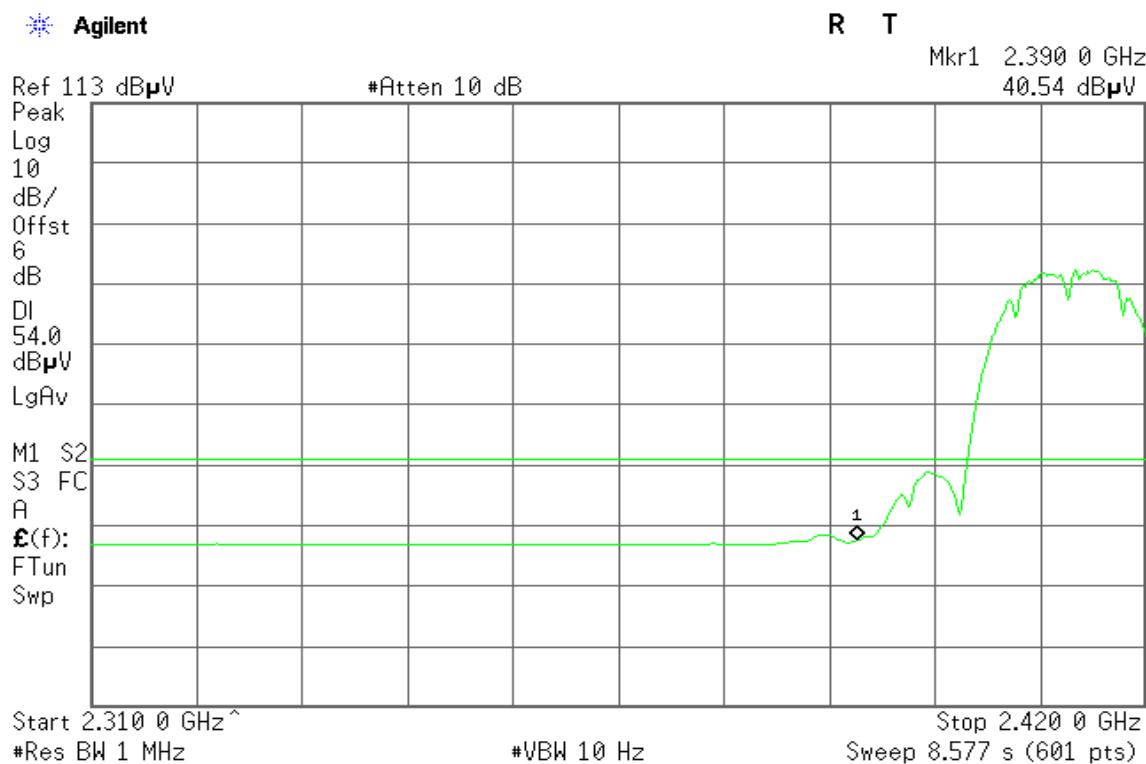
Polarity: Vertical

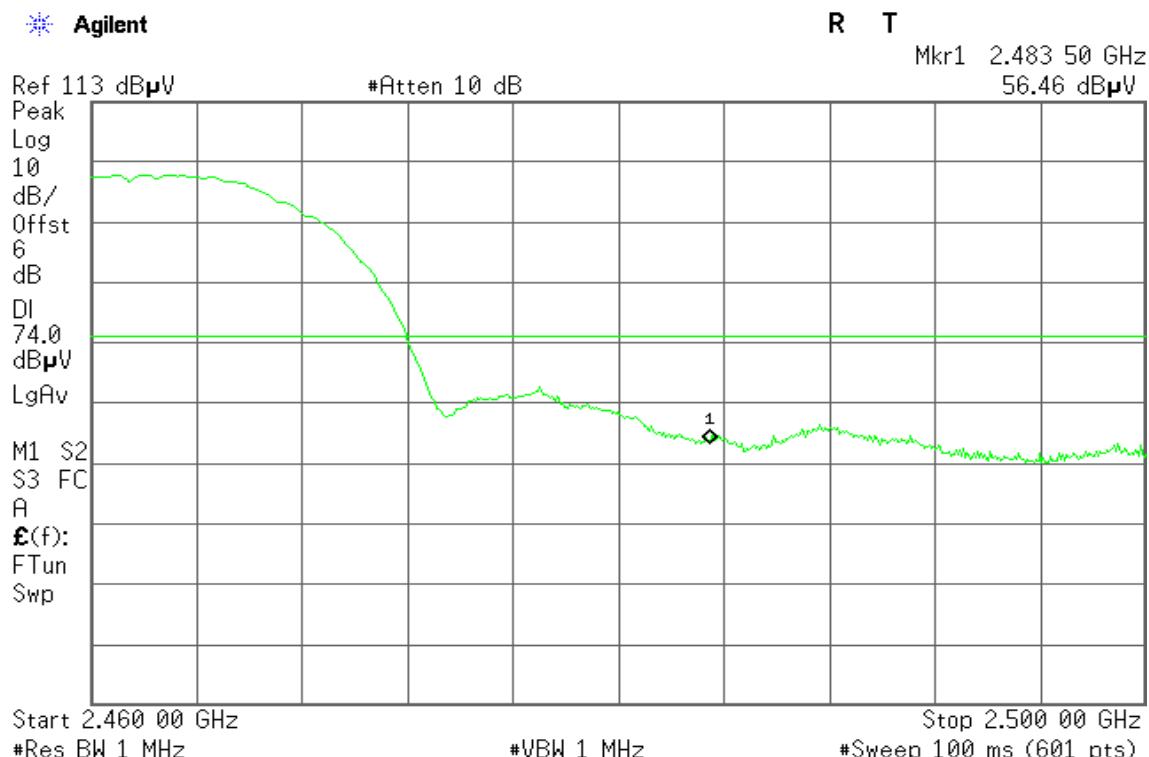
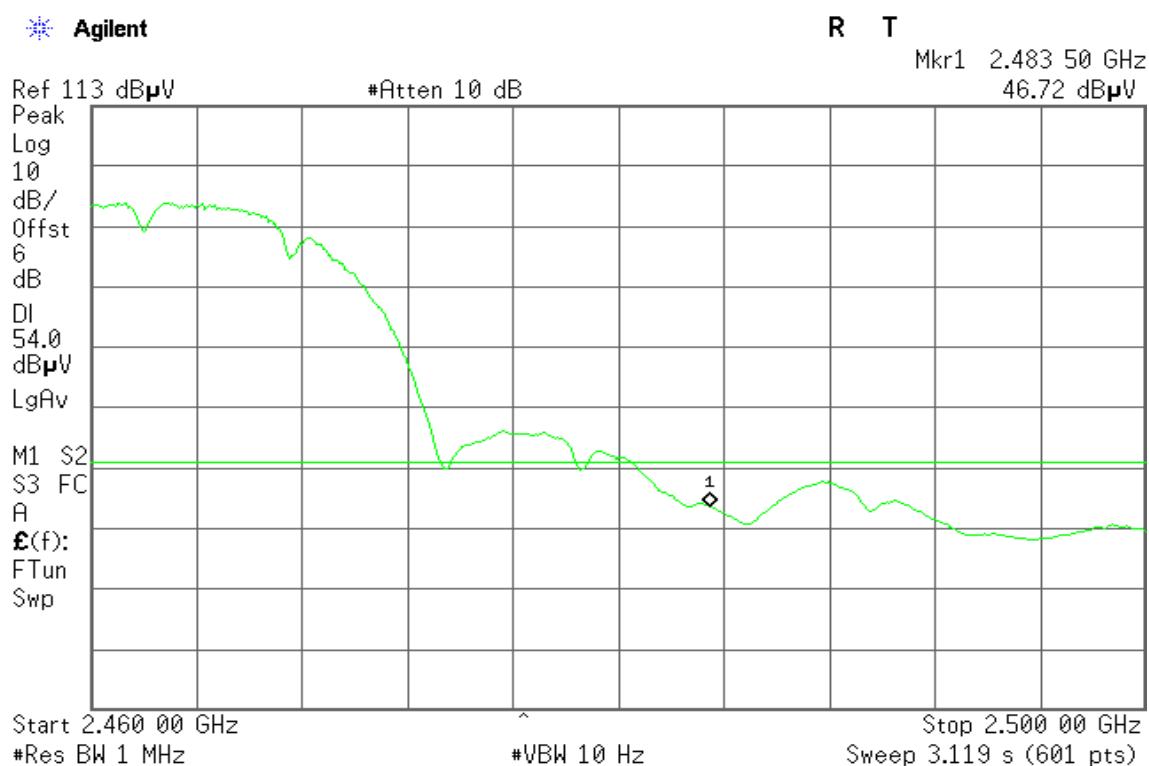


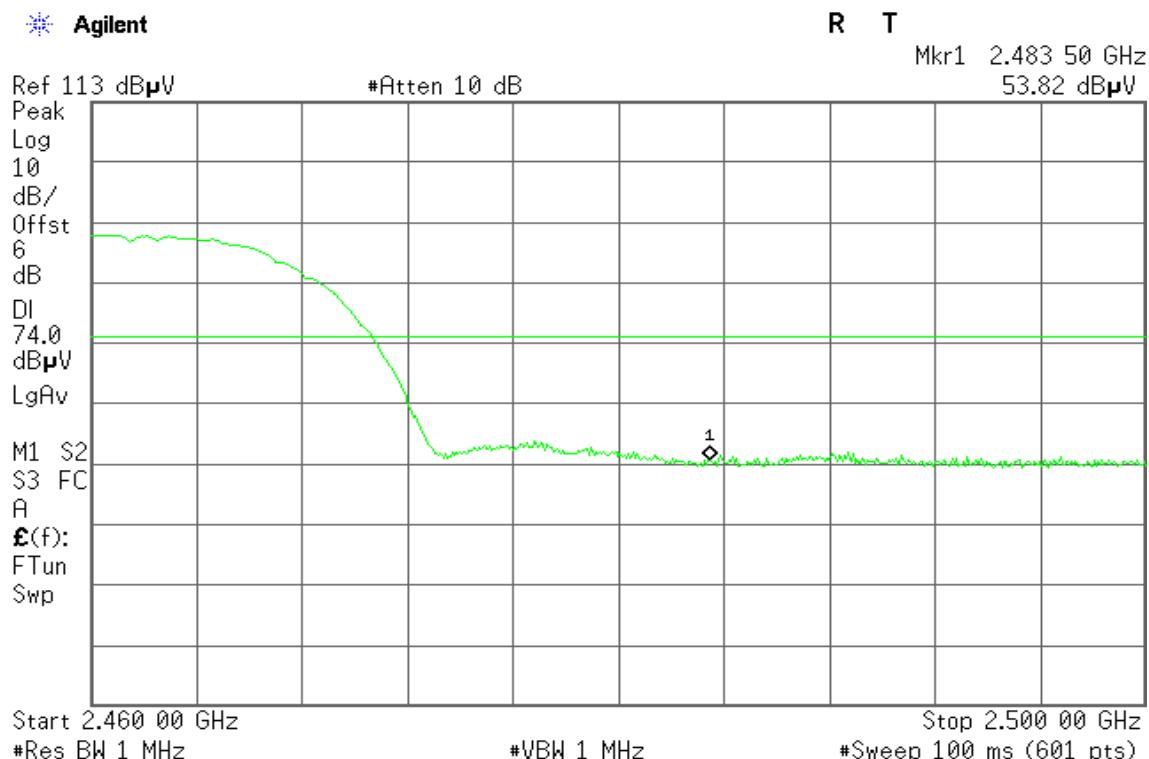
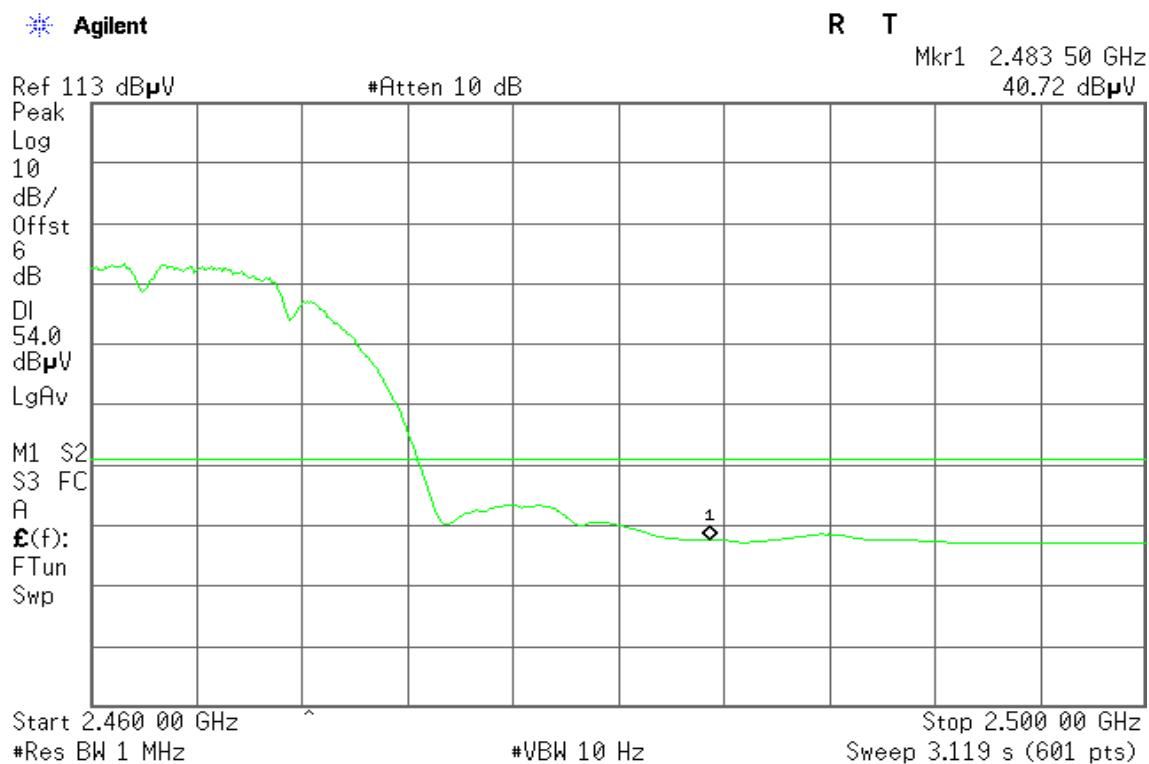
Detector mode: Average

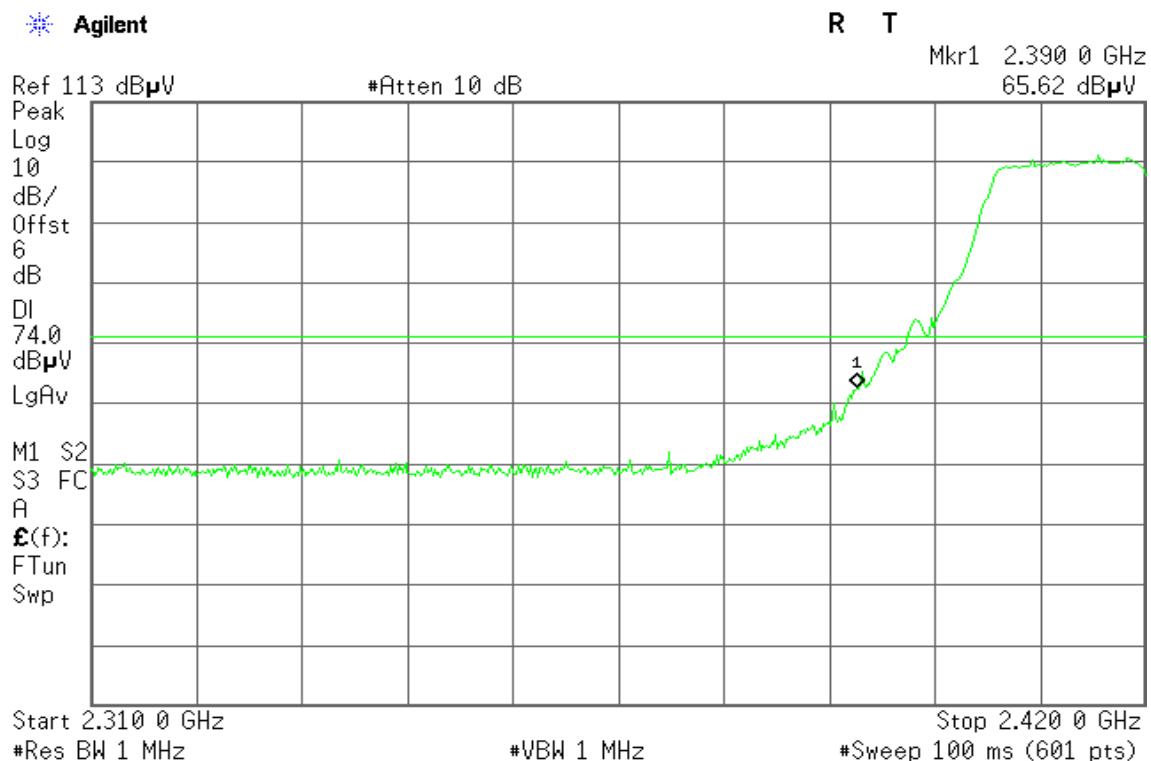
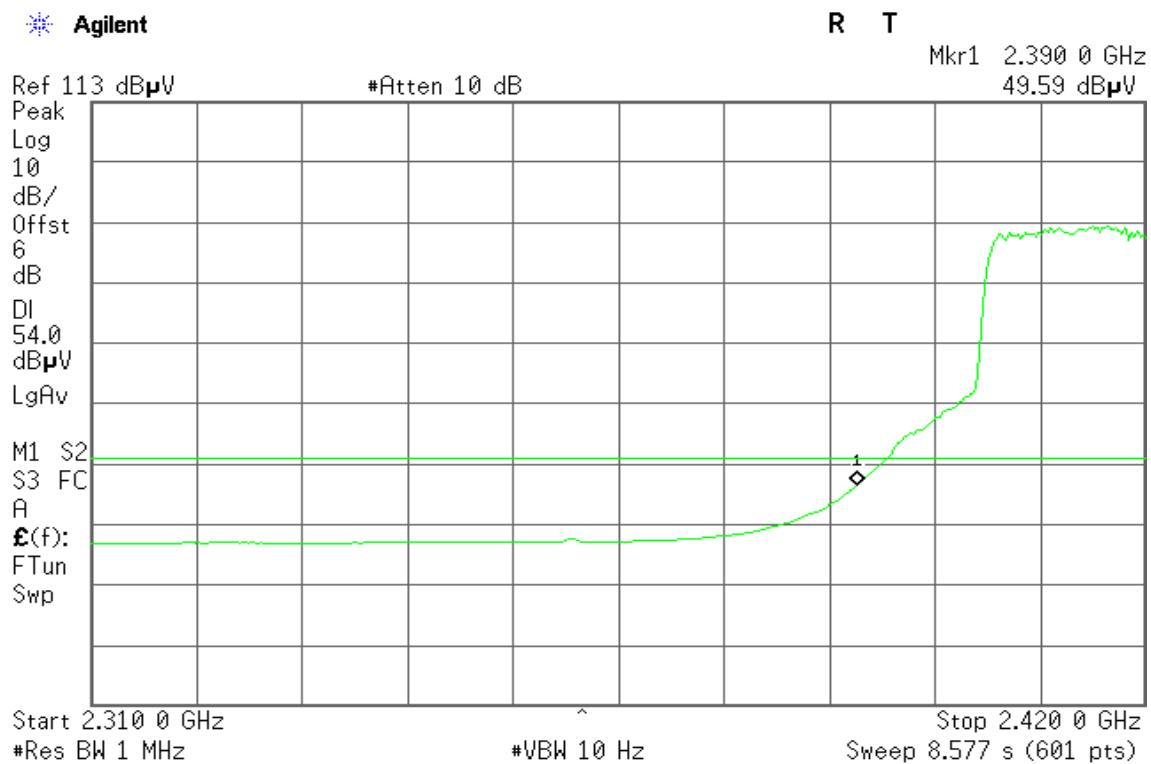
Polarity: Vertical

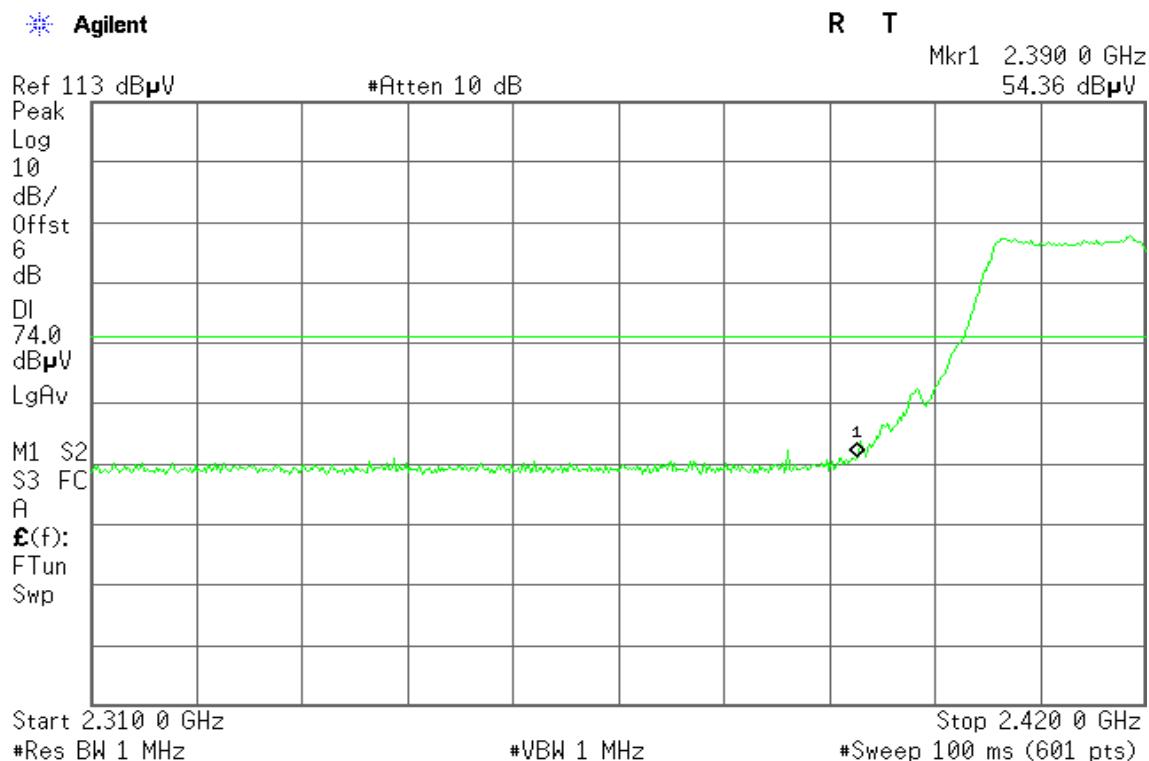
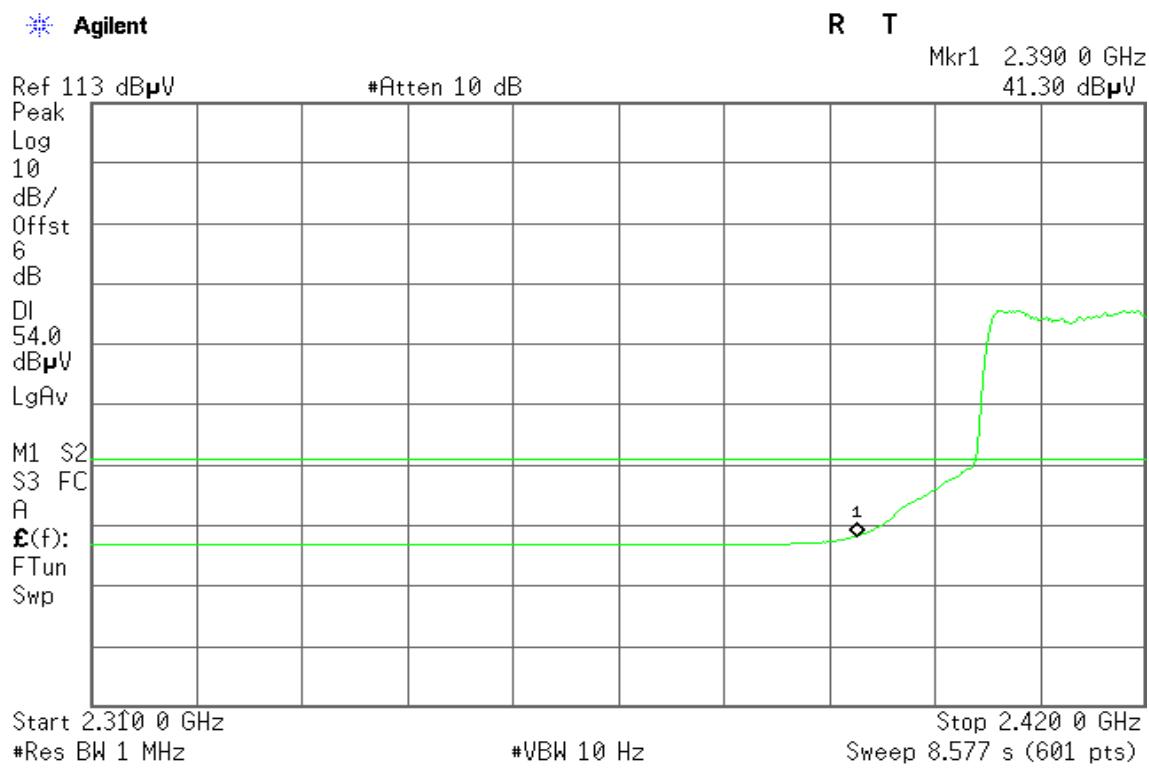


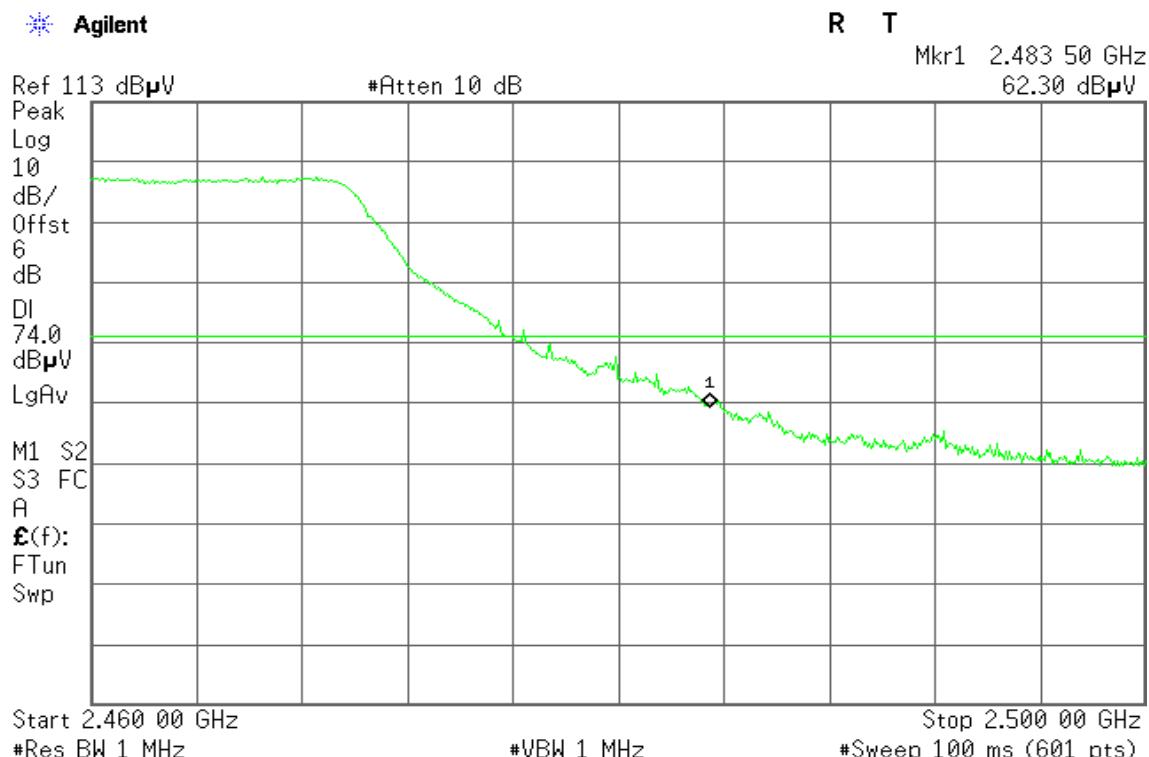
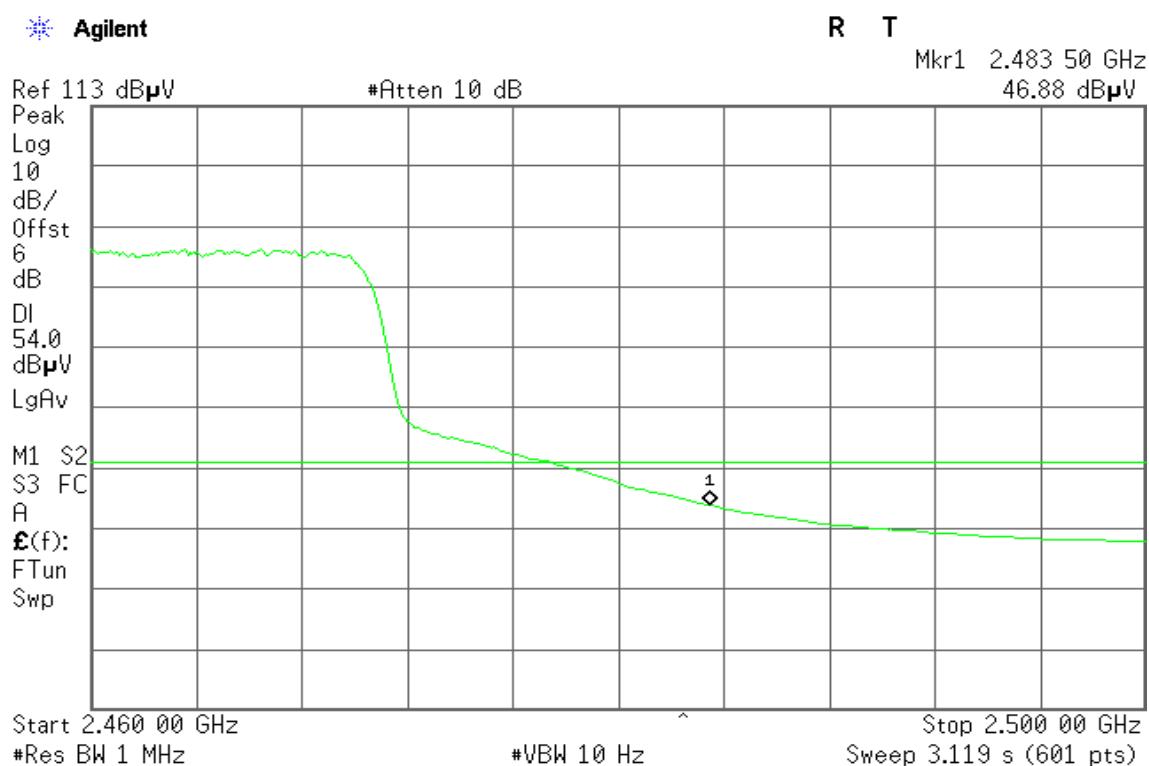
**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

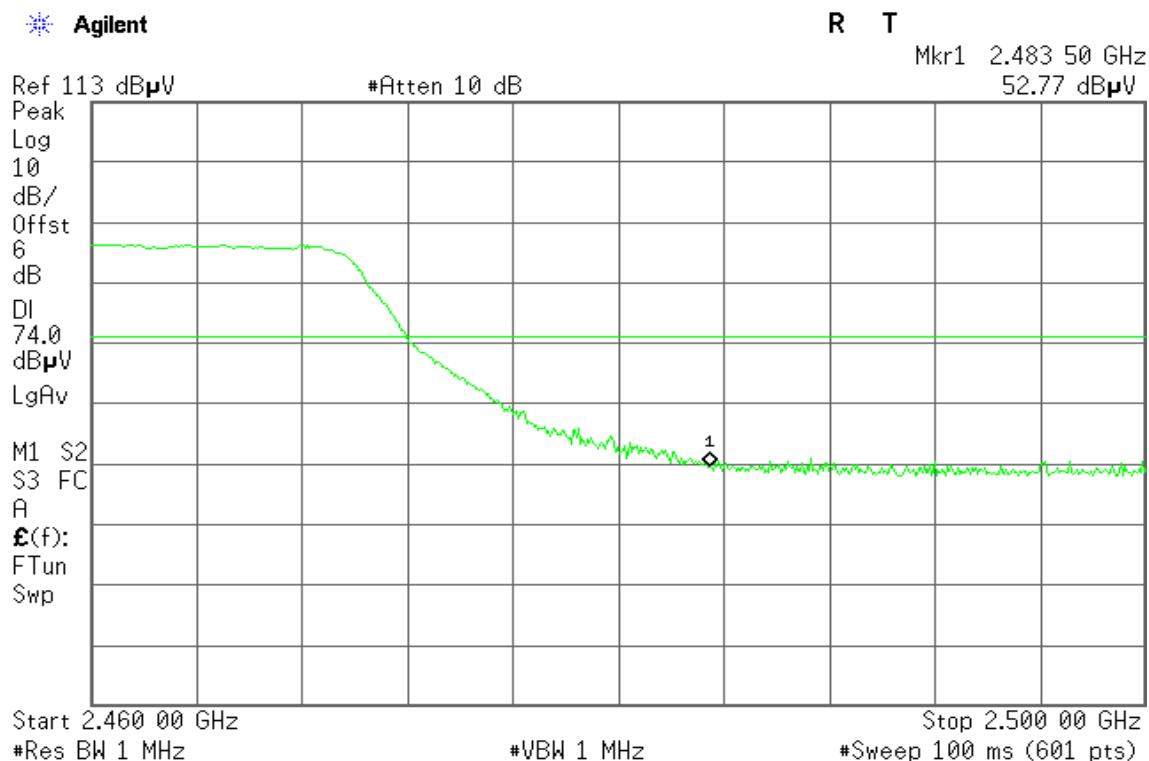
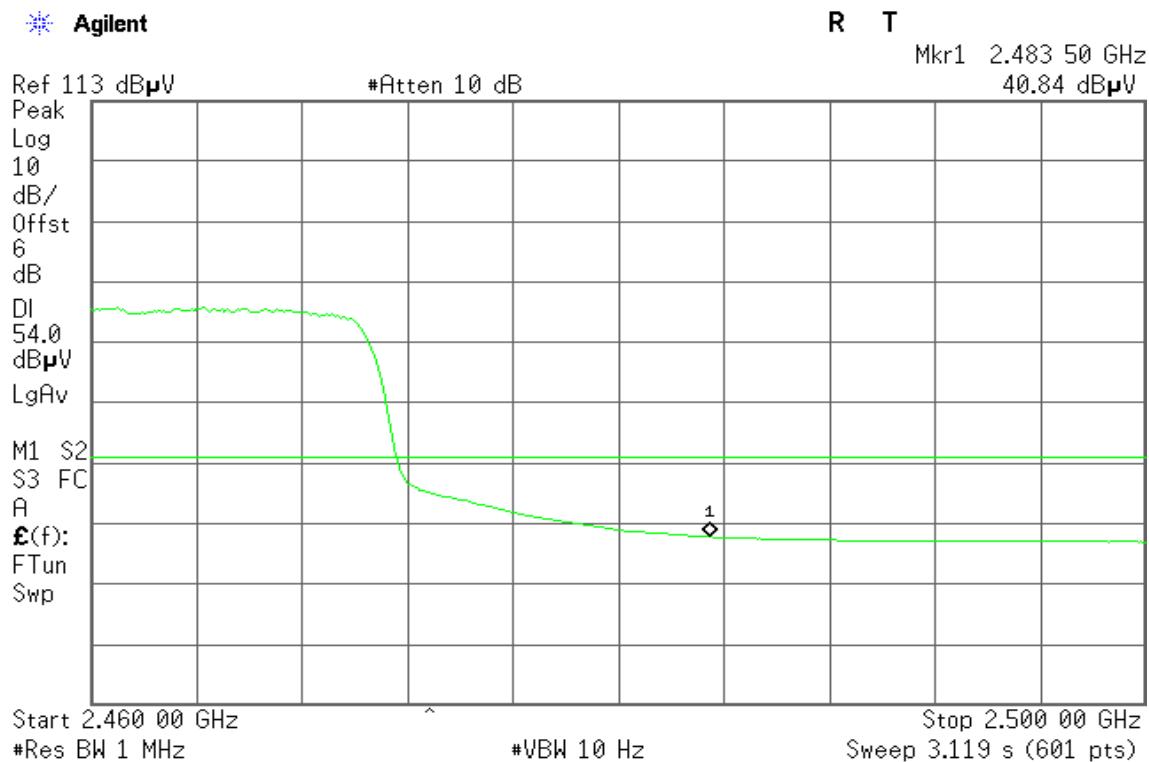
**Band Edges (IEEE 802.11b / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

**Band Edges (IEEE 802.11g / CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

**Band Edges (IEEE 802.11g / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

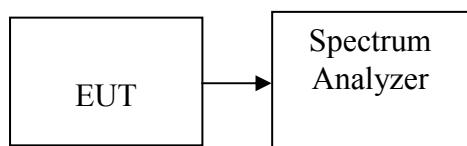
**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

## 7.5 PEAK POWER SPECTRAL DENSITY

### LIMIT

1. According to §15.247(e), 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.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode. 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 = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s.
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

### TEST RESULTS

*No non-compliance noted*

**Test Data****Test mode: IEEE 802.11b**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-4.36	8.00	PASS
Mid	2437	-8.22		PASS
High	2462	-3.84		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-12.34	8.00	PASS
Mid	2437	-10.31		PASS
High	2462	-12.17		PASS

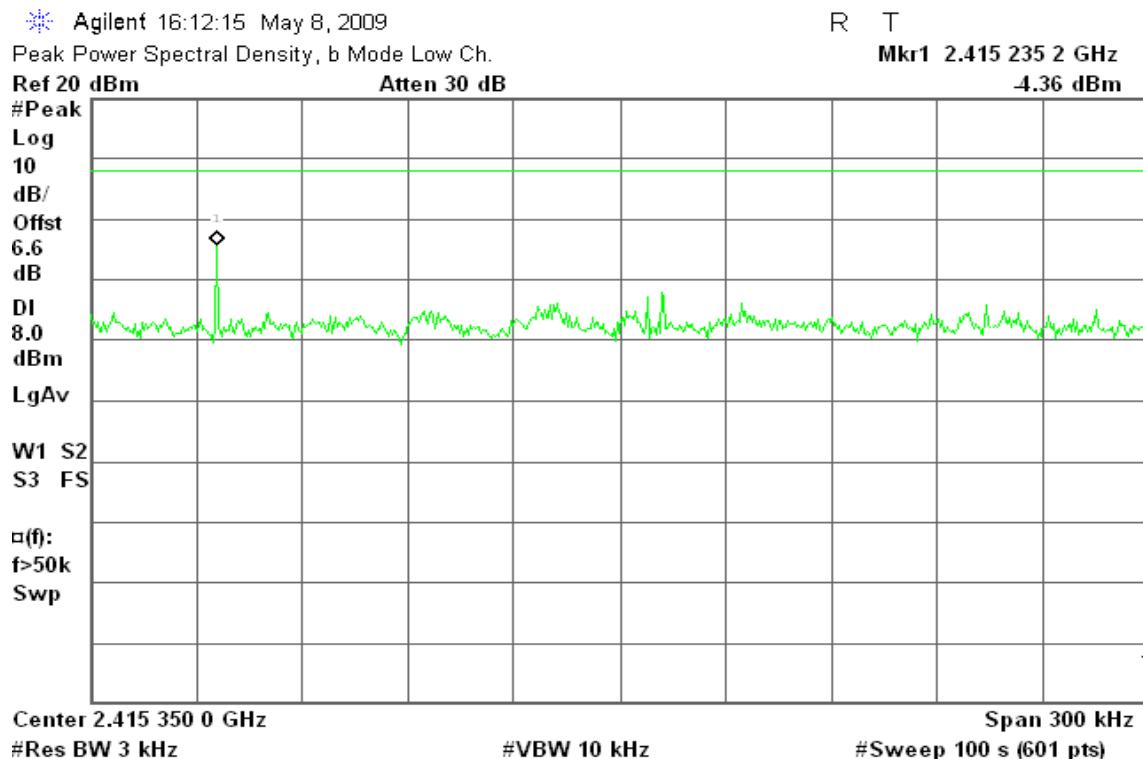
**Test mode: IEEE 802.11a**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	5745	-11.98	8.00	PASS
Mid	5785	-11.39		PASS
High	5825	-9.14		PASS

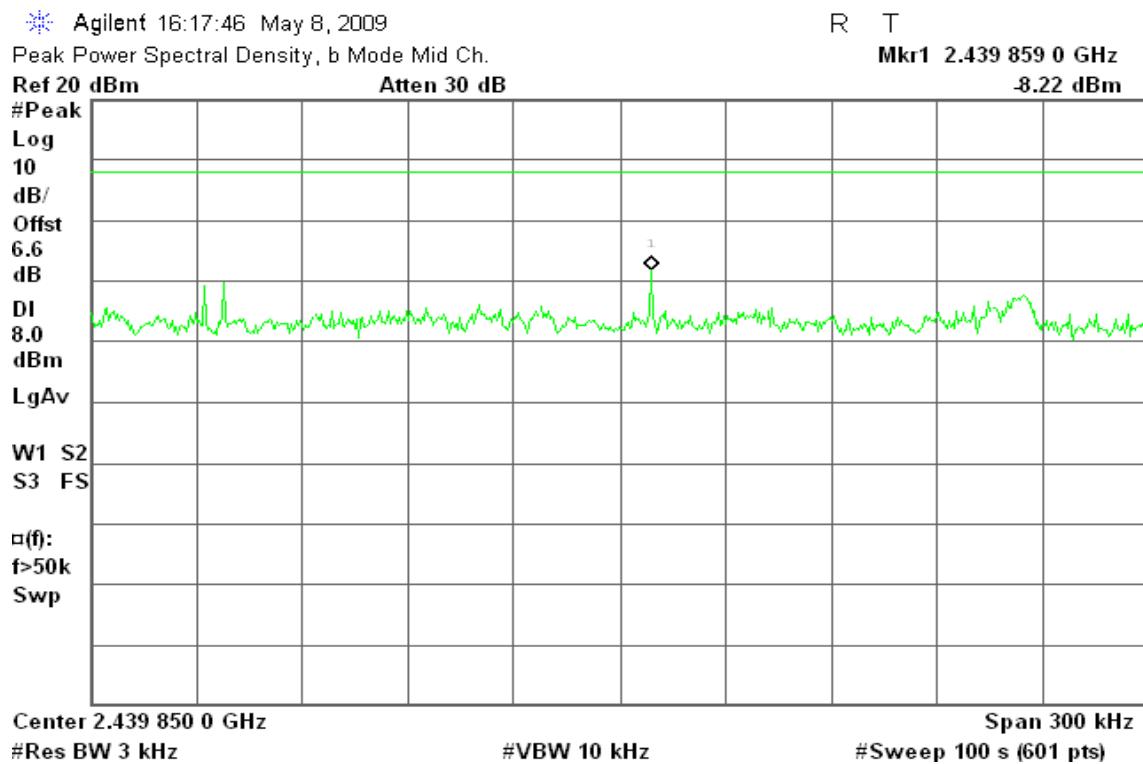
## Test Plot

### IEEE 802.11b

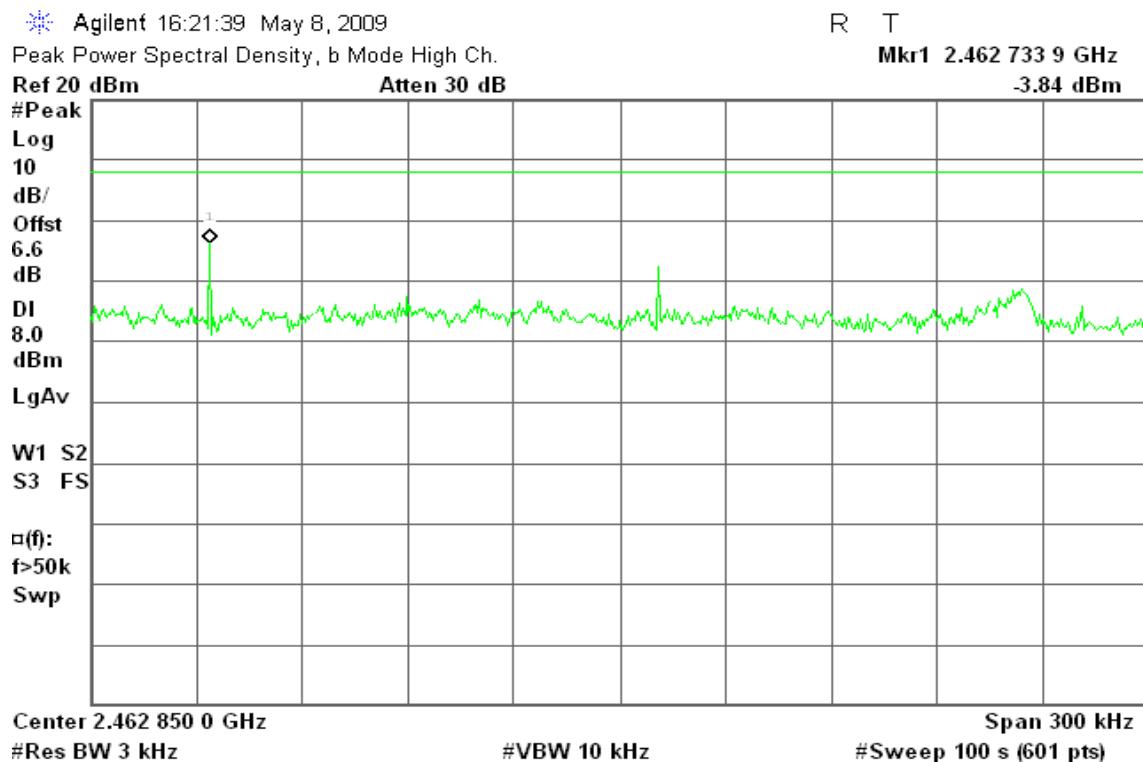
#### CH Low



#### CH Mid

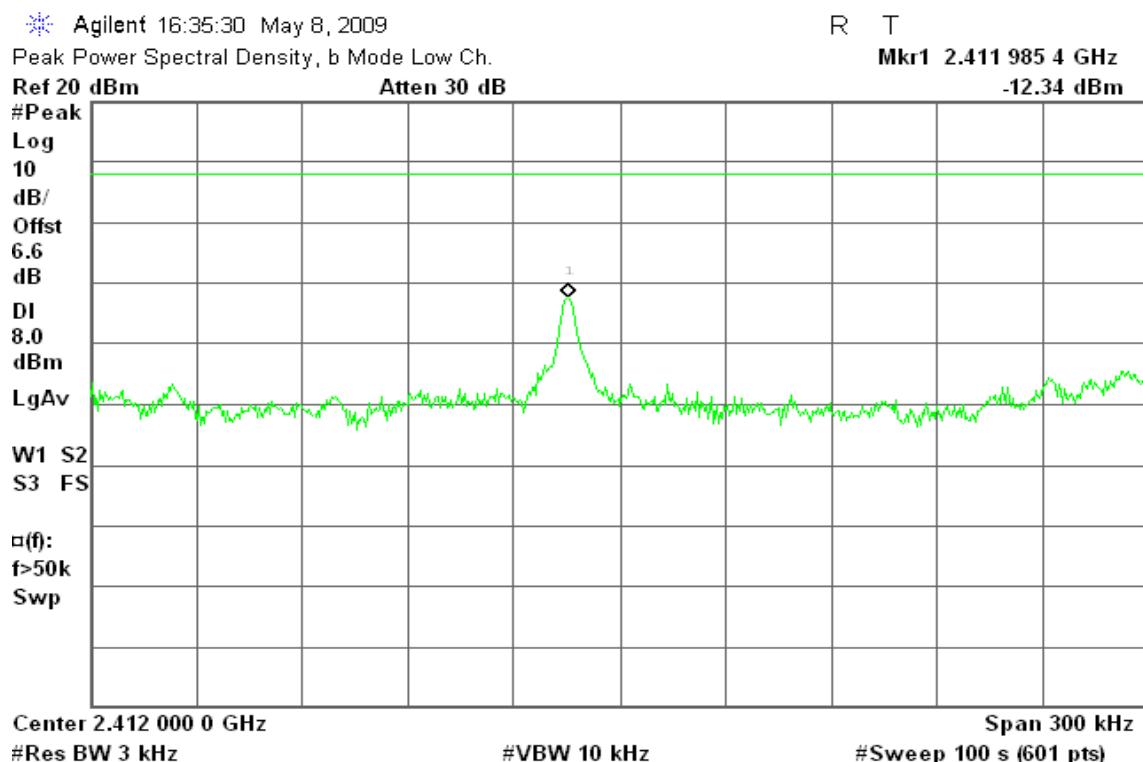


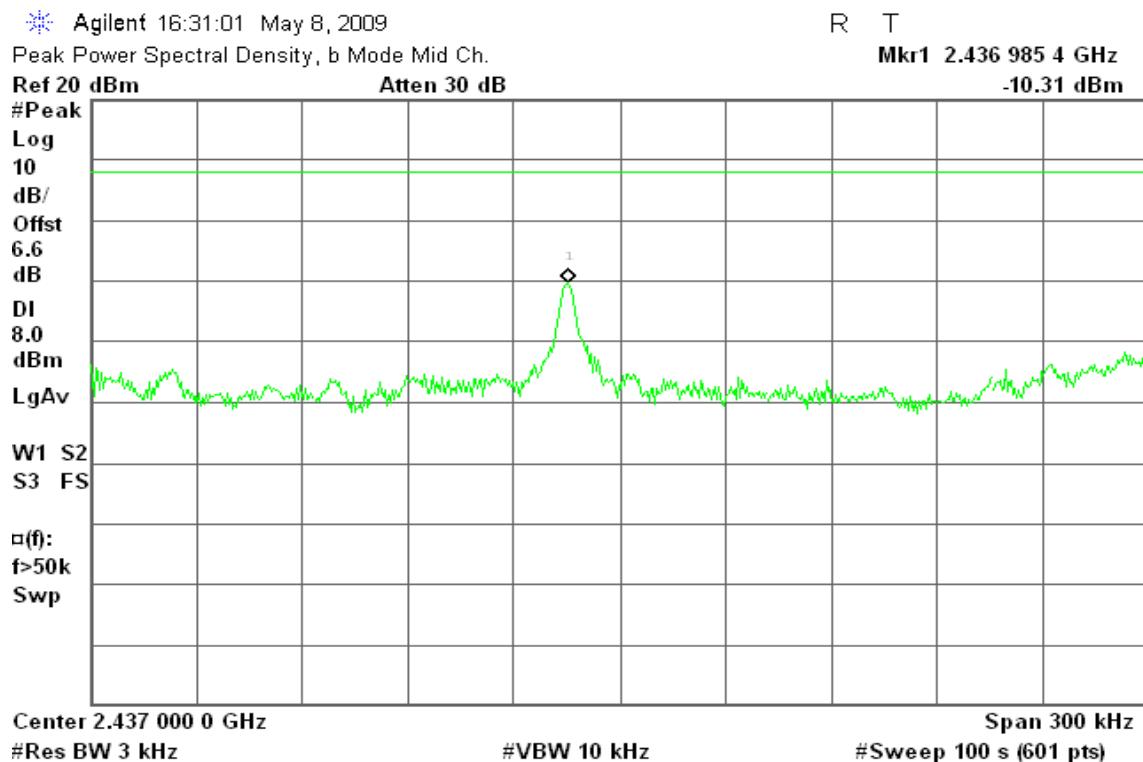
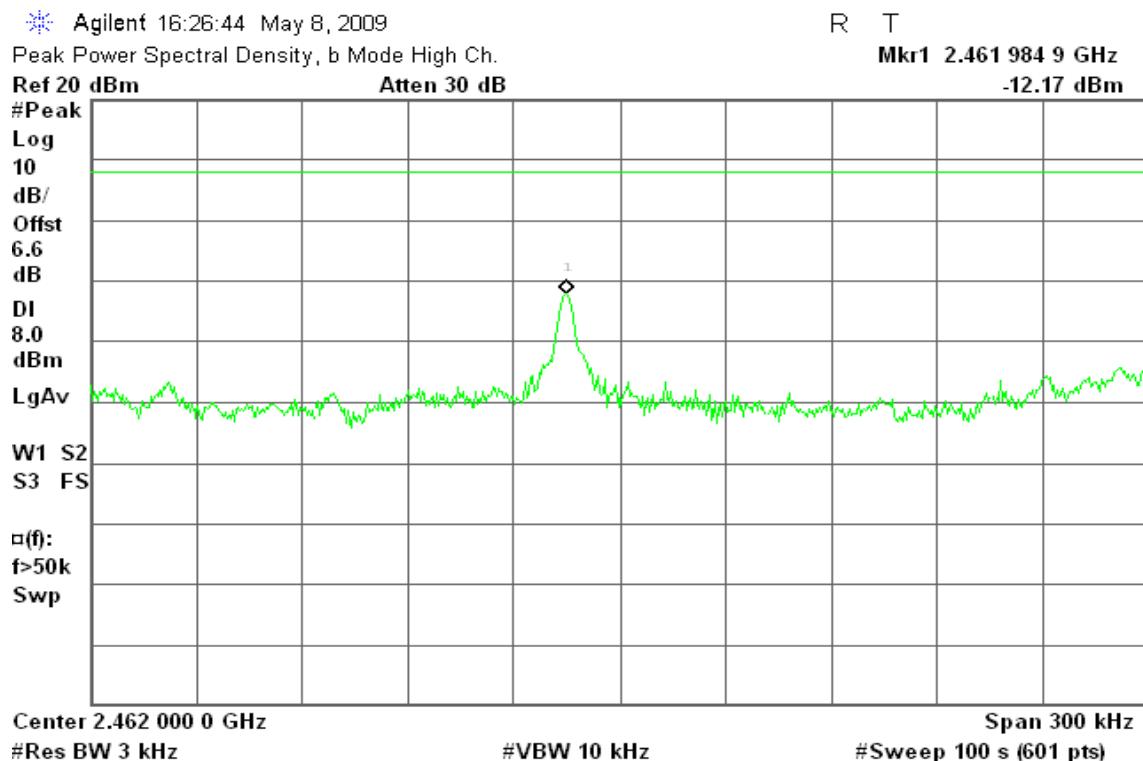
## CH High

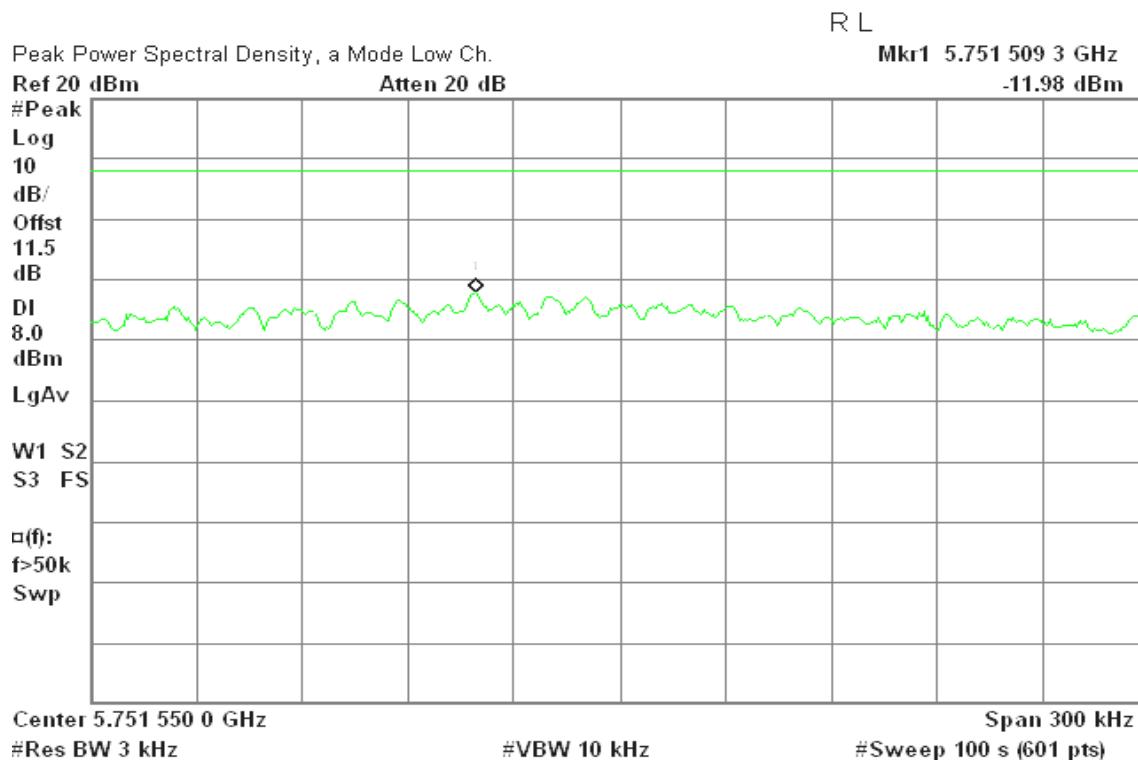
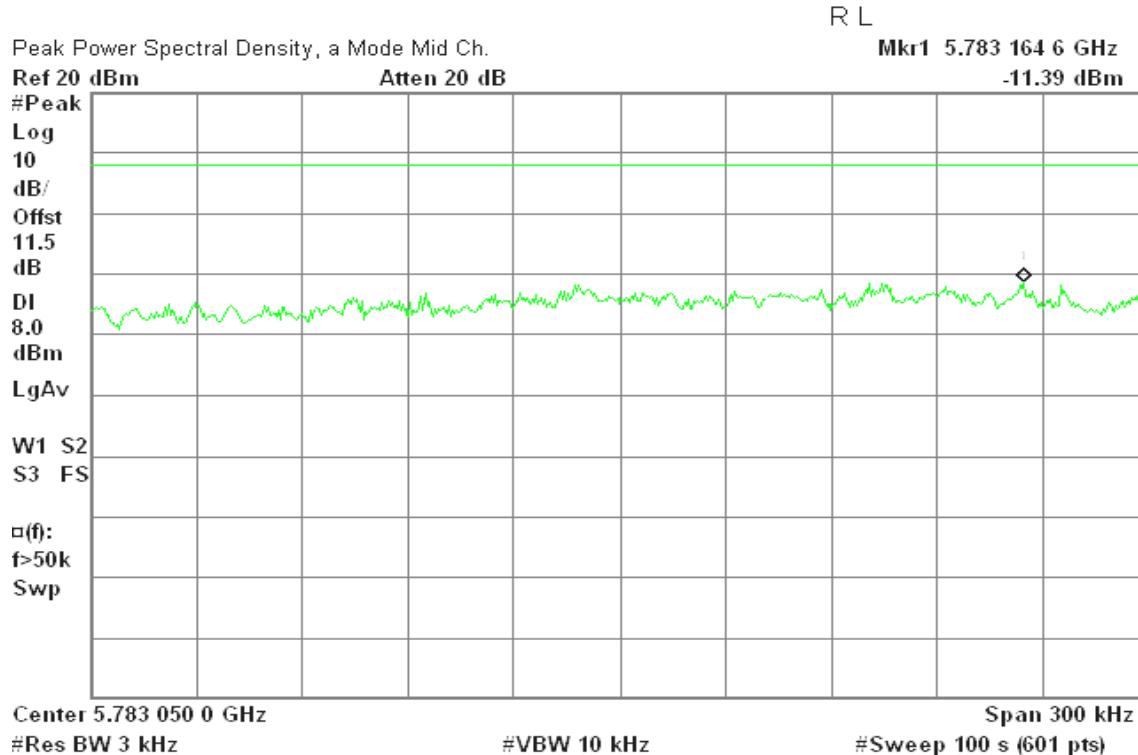


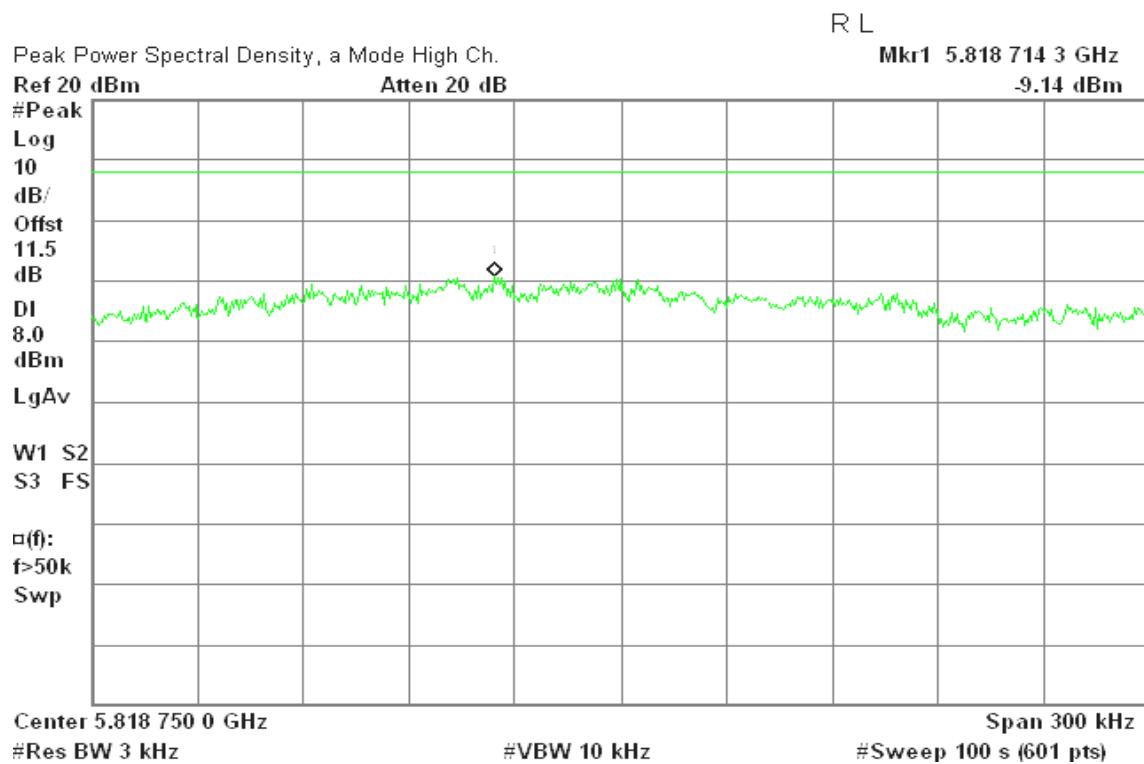
## IEEE 802.11g

### CH Low



**CH Mid****CH High**

**IEEE 802.11a****CH Low****CH Mid**

**CH High**

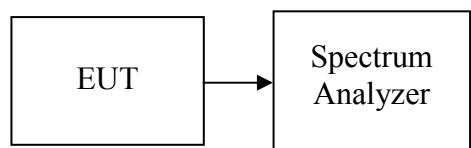
## 7.6 SPURIOUS EMISSIONS

### 7.6.1 CONDUCTED MEASUREMENT

#### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

#### Test Configuration



#### TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

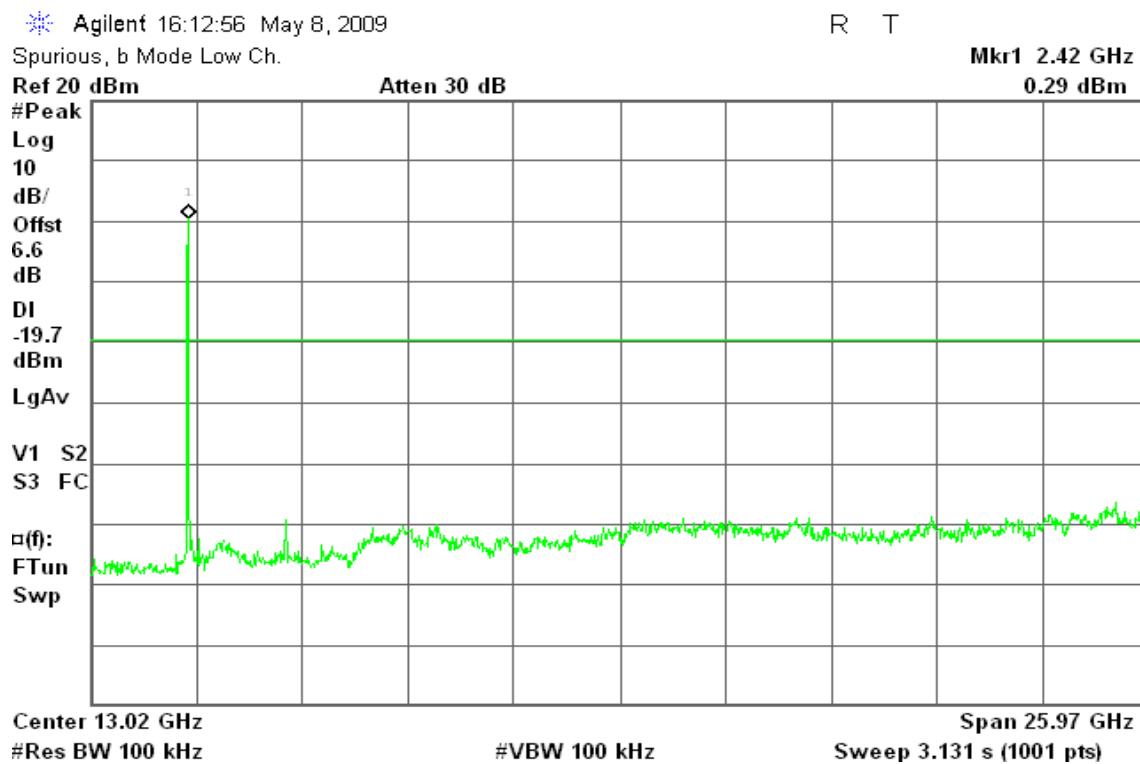
Measurements are made over the 30MHz to 26GHz range for IEEE 802.11b/g, 30MHz to 40GHz range for IEEE 802.11a with the transmitter set to the lowest, middle, and highest channels.

#### TEST RESULTS

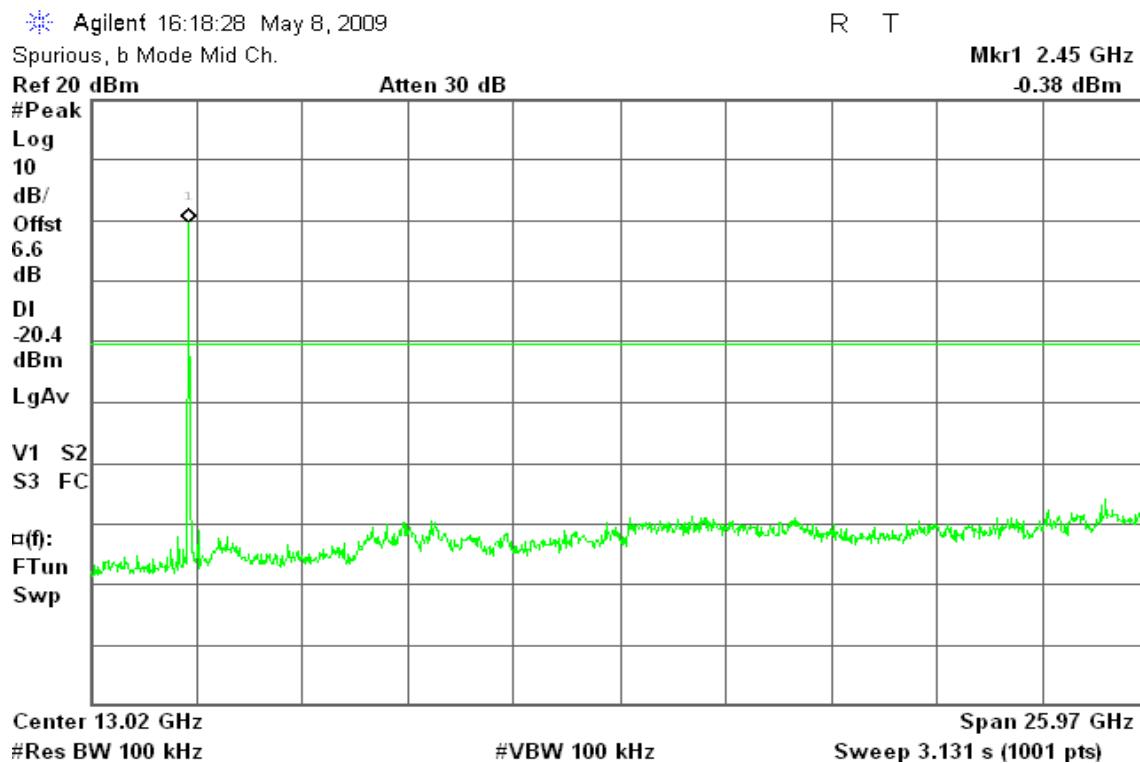
*No non-compliance noted.*

## Test Plot

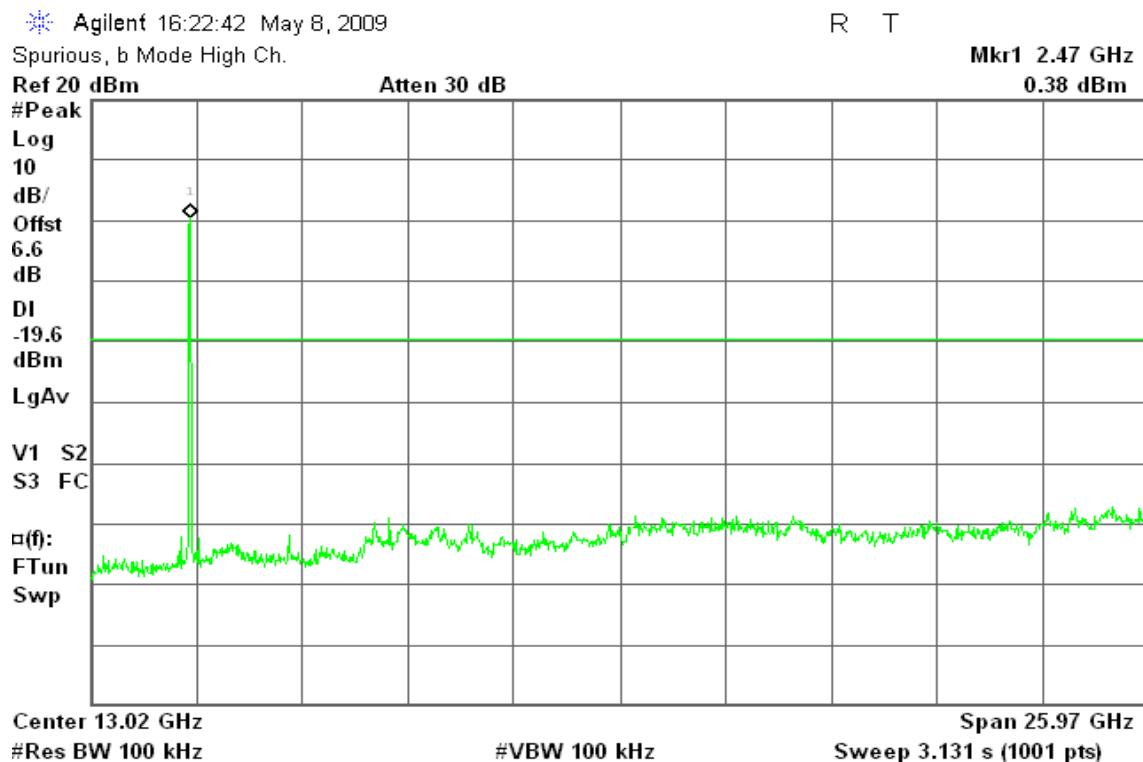
### IEEE 802.11b / CH Low



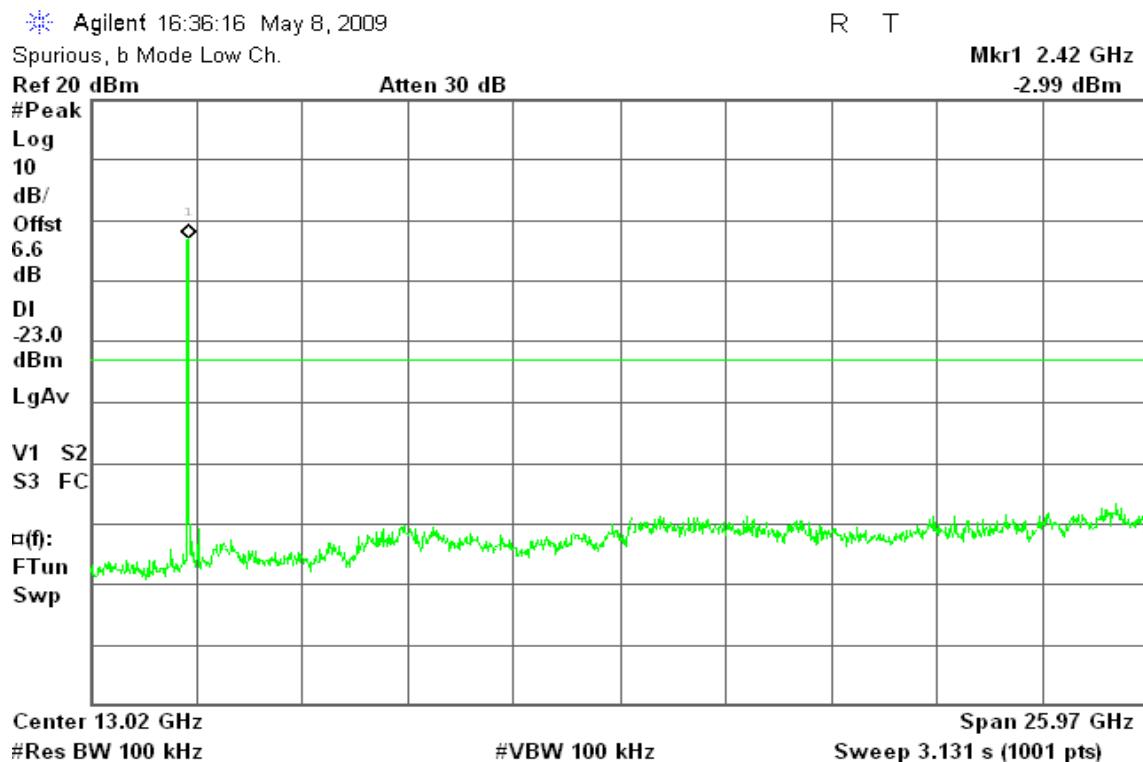
### IEEE 802.11b / CH Mid



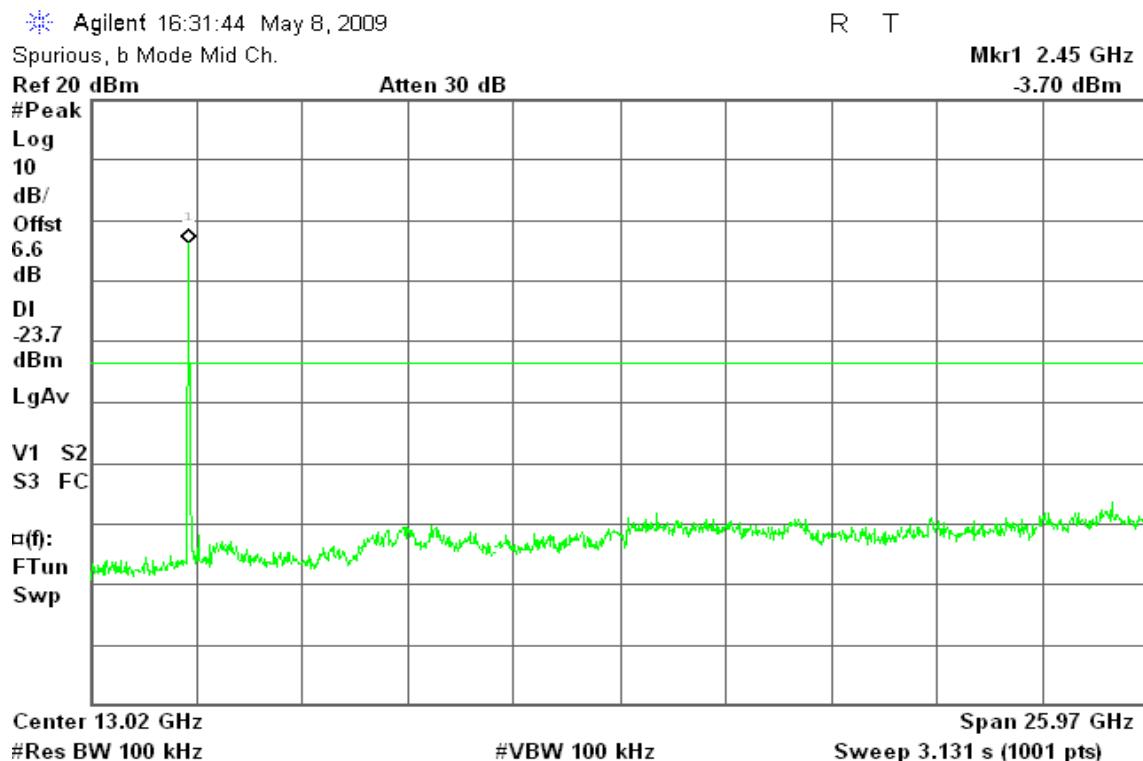
### IEEE 802.11b / CH High



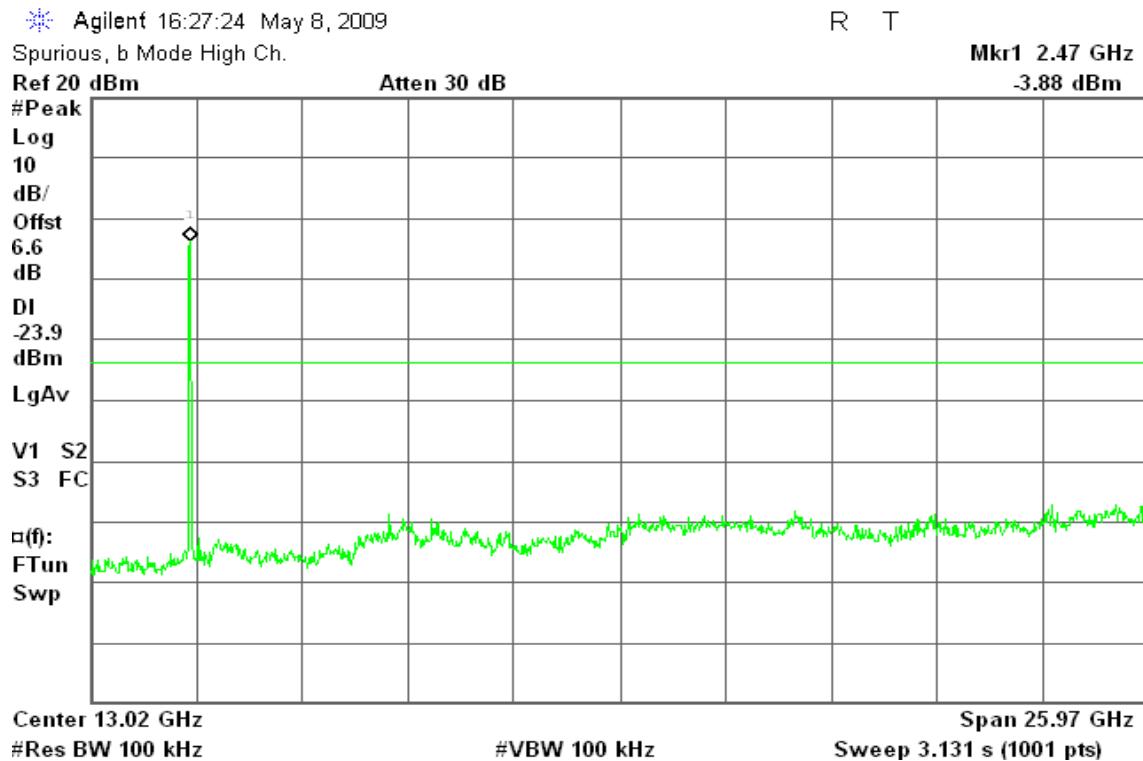
### IEEE 802.11g / CH Low



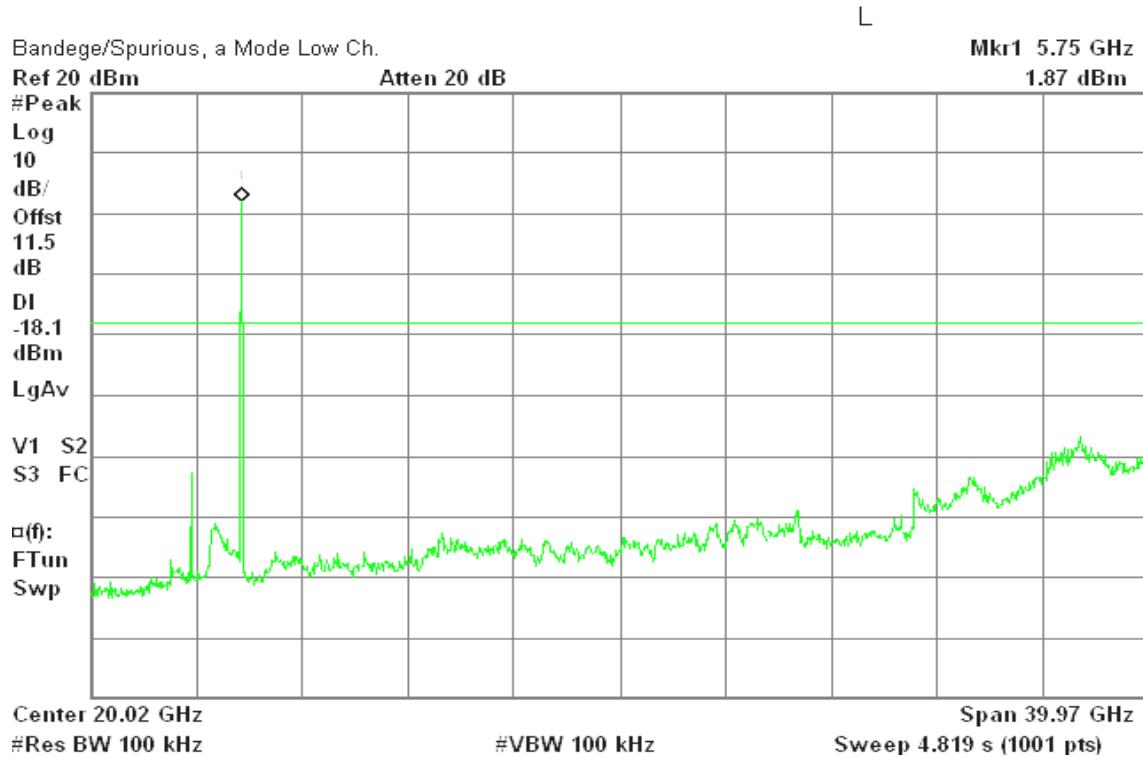
### IEEE 802.11g / CH Mid



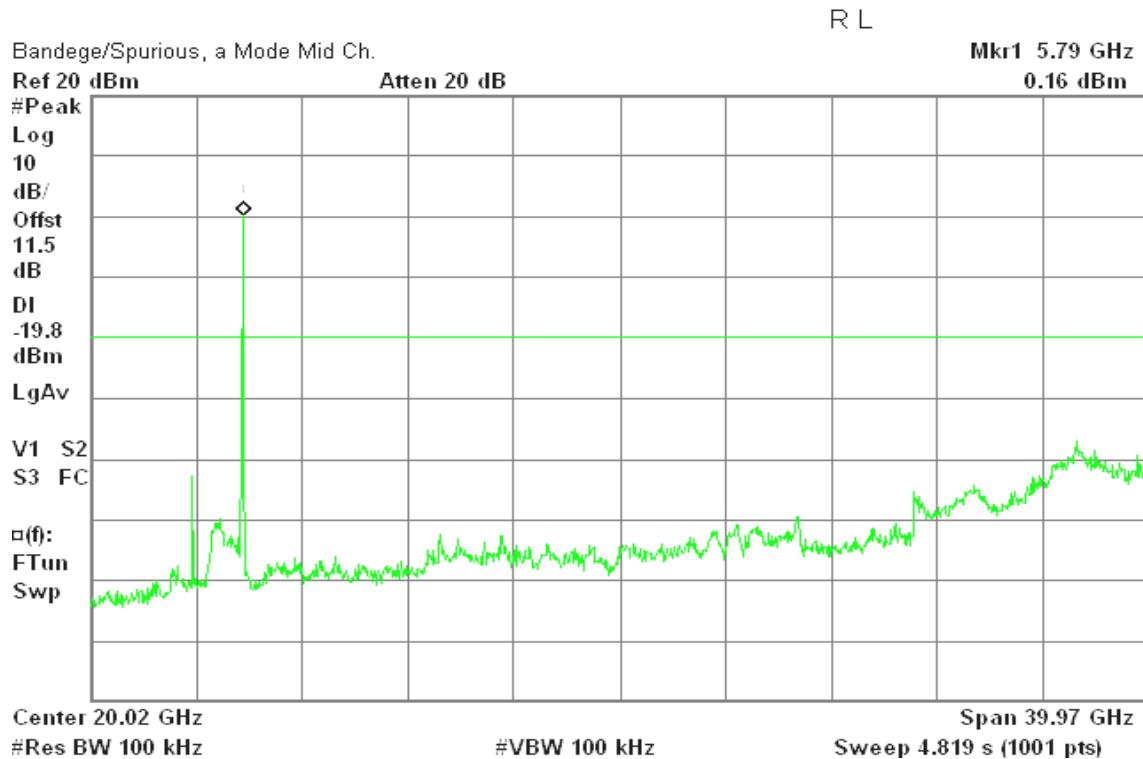
### IEEE 802.11g / CH High

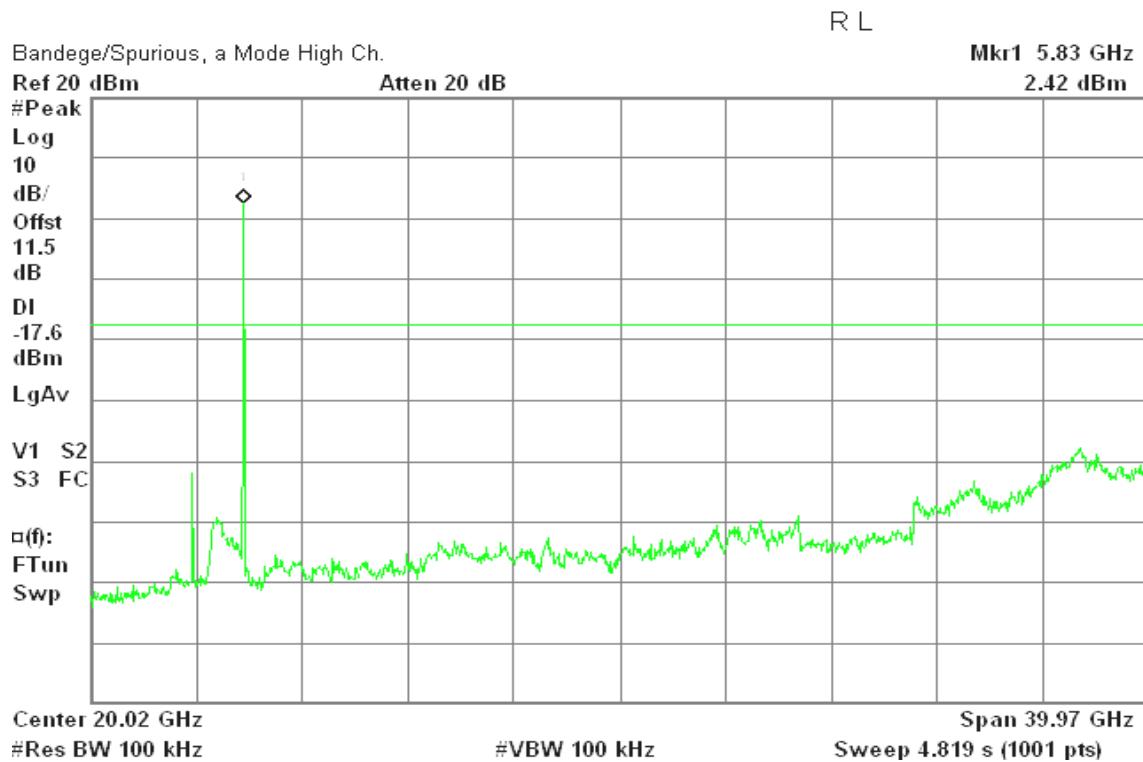


### IEEE 802.11a / CH Low



### IEEE 802.11a / CH Mid



IEEE 802.11a / CH High



## 7.6.2 Radiated Emissions

### LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu$ V/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

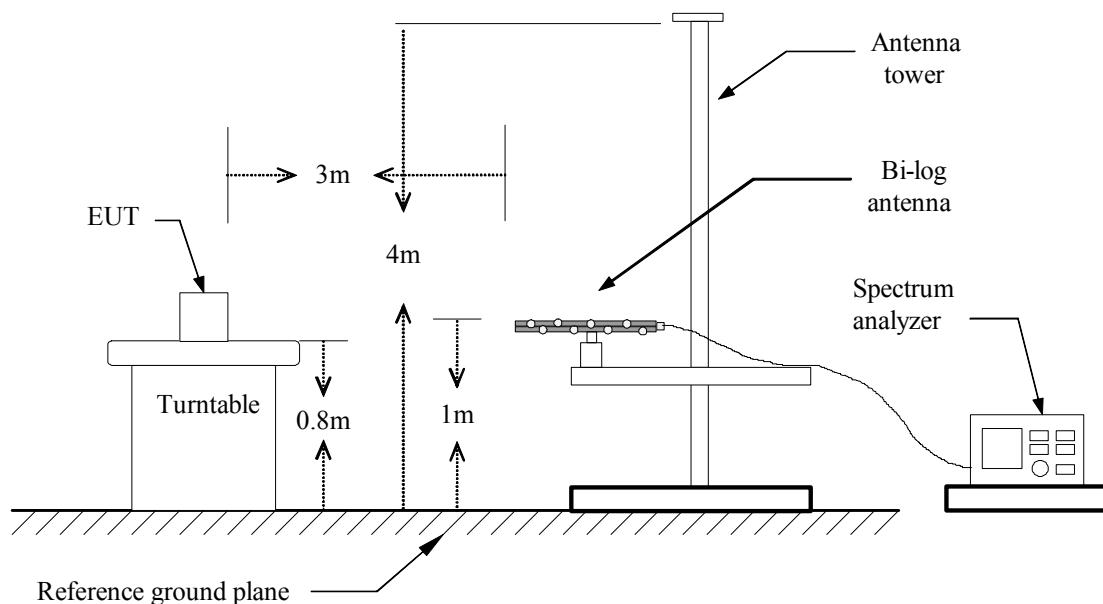
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the above emission table, the tighter limit applies at the band edges.

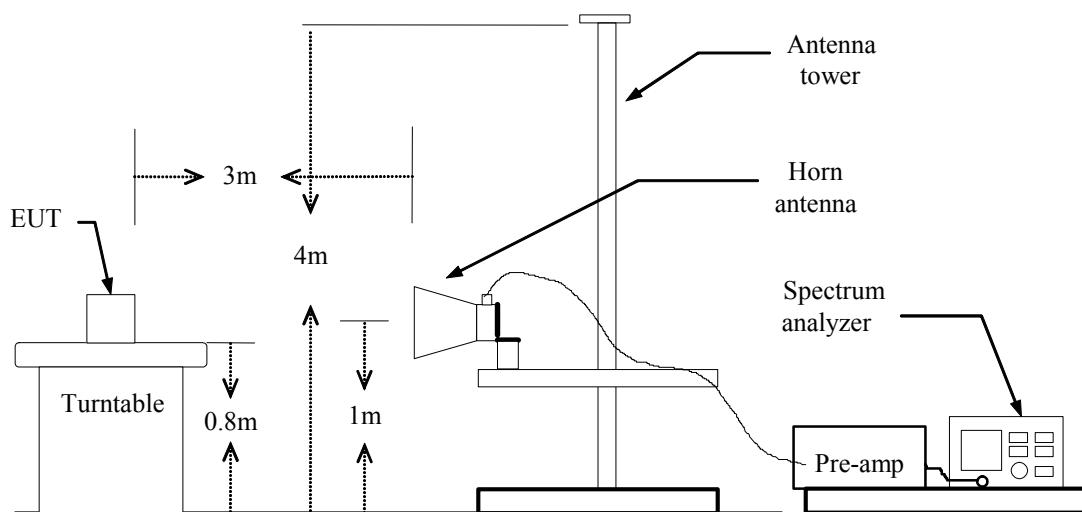
Frequency (MHz)	Field Strength ( $\mu$ V/m at 3-meter)	Field Strength (dB $\mu$ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

## Test Configuration

### Below 1 GHz



### Above 1 GHz





## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

**Below 1 GHz****Operation Mode:** Normal Link**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/QP)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)
51.02	V	QP	52.56	-13.69	38.87	40.00	-1.13
133.47	V	QP	50.98	-9.01	41.97	43.50	-1.53
156.10	V	QP	52.60	-10.15	42.45	43.50	-1.05
555.42	V	QP	46.14	-2.82	43.32	46.00	-2.68
578.05	V	Peak	44.14	-2.68	41.47	46.00	-4.53
666.97	V	QP	46.06	-2.20	43.86	46.00	-2.14
156.10	H	QP	52.00	-10.15	41.85	43.50	-1.65
175.50	H	QP	53.56	-10.94	42.62	43.50	-0.88
199.75	H	QP	51.48	-9.03	42.45	43.50	-1.05
225.62	H	QP	53.65	-10.09	43.56	46.00	-2.44
592.60	H	Peak	45.05	-2.58	42.47	46.00	-3.53
799.53	H	QP	43.02	0.21	43.23	46.00	-2.77

***Remark:***

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).

**Above 1 GHz****Operation Mode:** Tx / IEEE 802.11b / CH Low**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1570.00	V	55.06	---	-6.36	48.70	---	74.00	54.00	-5.30	Peak
7233.33	V	52.32	47.08	4.07	56.39	51.15	74.00	54.00	-2.85	AVG
N/A										
1400.00	H	55.13	---	-7.22	47.91	---	74.00	54.00	-6.09	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11b / CH Mid**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1383.33	V	55.36	---	-7.25	48.12	---	74.00	54.00	-5.88	Peak
7308.33	V	50.76	41.14	4.03	54.79	45.17	74.00	54.00	-8.83	AVG
N/A										
1313.33	H	55.81	---	-7.38	48.44	---	74.00	54.00	-5.56	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11b / CH High**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	56.16	---	-7.04	49.12	---	74.00	54.00	-4.88	Peak
7383.33	V	50.51	43.77	3.98	54.49	47.75	74.00	54.00	-6.25	AVG
N/A										
1526.67	H	55.53	---	-6.78	48.76	---	74.00	54.00	-5.24	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11g / CH Low**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1536.67	V	55.06	---	-6.68	48.38	---	74.00	54.00	-5.62	Peak
N/A										
1473.33	H	55.00	---	-7.08	47.92	---	74.00	54.00	-6.08	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11g / CH Mid**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1510.00	V	54.85	---	-6.93	47.92	---	74.00	54.00	-6.08	Peak
7308.33	V	50.89	36.89	4.03	54.92	40.92	74.00	54.00	-13.08	AVG
N/A										
1503.33	H	54.95	---	-7.00	47.95	---	74.00	54.00	-6.05	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11g / CH High**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1563.33	V	55.15	---	-6.42	48.72	---	74.00	54.00	-5.28	Peak
N/A										
1400.00	H	56.55	---	-7.22	49.33	---	74.00	54.00	-4.67	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11a / CH Low**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1070.00	V	47.79	---	-13.55	34.24	---	74.00	54.00	-19.76	Peak
3835.00	V	60.45	57.30	-6.40	54.05	50.90	74.00	54.00	-3.10	AVG
5736.67	V	47.48	---	-3.50	43.98	---	74.00	54.00	-10.02	Peak
N/A										
1070.00	H	48.33	---	-13.55	34.78	---	74.00	54.00	-19.22	Peak
1490.00	H	47.40	---	-12.35	35.04	---	74.00	54.00	-18.96	Peak
3835.00	H	49.41	---	-6.40	43.01	---	74.00	54.00	-10.99	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11a / CH Mid**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1070.00	V	46.89	---	-13.55	33.34	---	74.00	54.00	-20.66	Peak
3858.33	V	60.05	56.80	-6.37	53.68	50.43	74.00	54.00	-3.57	AVG
N/A										
3858.33	H	46.98	---	-6.37	40.60	---	74.00	54.00	-13.40	Peak
5795.00	H	44.93	---	-3.30	41.63	---	74.00	54.00	-12.37	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** Tx / IEEE 802.11a / CH High**Test Date:** May 7, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1070.00	V	46.70	---	-13.55	33.15	---	74.00	54.00	-20.85	Peak
3881.67	V	63.36	60.24	-6.35	57.01	53.89	74.00	54.00	-0.11	AVG
5830.00	V	45.37	---	-3.18	42.19	---	74.00	54.00	-11.81	Peak
N/A										
3881.67	H	51.35	---	-6.35	45.00	---	74.00	54.00	-9.00	Peak
5818.33	H	43.66	---	-3.22	40.44	---	74.00	54.00	-13.56	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



## 7.7 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

\* Decreases with the logarithm of the frequency.

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.



## **TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

### **Test Data**

**Operation Mode:** Normal Link      **Test Date:** February 17, 2009  
**Temperature:** 22°C      **Tested by:** Jerry Lin  
**Humidity:** 45%RH

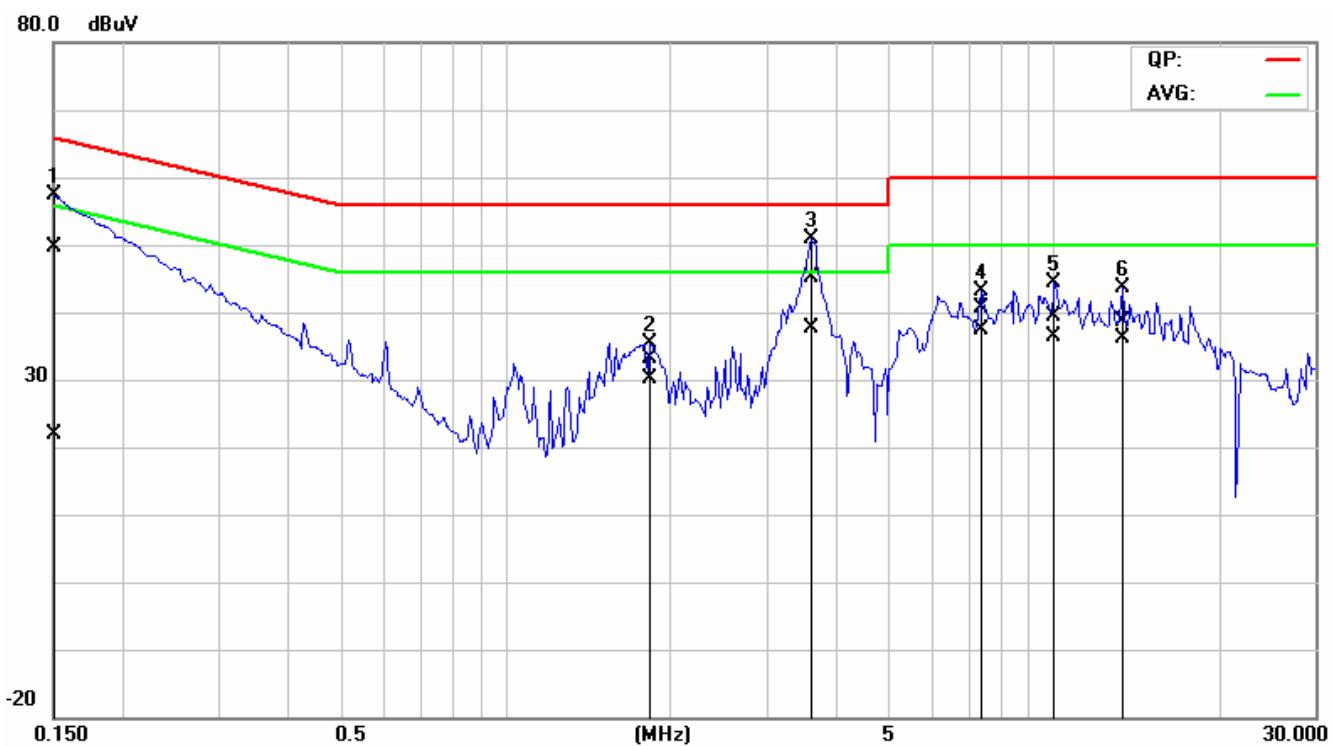
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1500	49.40	21.80	0.20	49.60	22.00	66.00	56.00	-16.40	-34.00	L1
1.8350	33.07	30.17	0.03	33.10	30.20	56.00	46.00	-22.90	-15.80	L1
3.6150	44.96	37.56	0.14	45.10	37.70	56.00	46.00	-10.90	-8.30	L1
7.3700	40.21	36.91	0.39	40.60	37.30	60.00	50.00	-19.40	-12.70	L1
10.0600	38.83	35.93	0.57	39.40	36.50	60.00	50.00	-20.60	-13.50	L1
13.3550	37.98	35.48	0.62	38.60	36.10	60.00	50.00	-21.40	-13.90	L1
0.1500	49.50	21.60	0.20	49.70	21.80	66.00	56.00	-16.30	-34.20	L2
1.1250	30.37	28.67	0.03	30.40	28.70	56.00	46.00	-25.60	-17.30	L2
1.7900	32.67	29.47	0.03	32.70	29.50	56.00	46.00	-23.30	-16.50	L2
3.6000	45.16	37.36	0.14	45.30	37.50	56.00	46.00	-10.70	-8.50	L2
6.7600	43.04	40.74	0.36	43.40	41.10	60.00	50.00	-16.60	-8.90	L2
13.3550	38.37	35.17	0.63	39.00	35.80	60.00	50.00	-21.00	-14.20	L2

### ***Remark:***

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz.
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

## Test Plots

### *Conducted emissions (Line 1)*



### *Conducted emissions (Line 2)*

