



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**2.4G Outdoor Device**

**Model: ZW-2000-IA**

**Trade Name: Zinwell**

*Issued to*

**ZINWELL CORPORATION**

**No. 2, Wen-Hua Road, Hsinchu Industrial Park Hsinchu Hsien 303,  
Taiwan, R.O.C.**

*Issued by*

**Compliance Certification Services Inc.**

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# 1. TEST RESULT CERTIFICATION

**Applicant:** ZINWELL CORPORATION  
 No. 2, Wen-Hua Road, Hsinchu Industrial Park Hsinchu Hsien 303,  
 Taiwan, R.O.C.

**Equipment Under Test:** 2.4G OutDoor Device

**Trade Name:** Zinwell

**Model:** ZW-2000-IA

**Date of Test:** July 4 ~ August 22, 2006

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:*

*Reviewed by:*

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Gavin Lim  
 Section Manager  
 Compliance Certification Services Inc.

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Amanda Wu  
 Section Manager  
 Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	2.4G OutDoor Device
<b>Trade Name</b>	Zinwell
<b>Model Number</b>	ZW-2000-IA
<b>Model Discrepancy</b>	N/A
<b>Power Supply</b>	Power Adapter: Model: SA06L48-V I/P: DC 100-240V 0.6A 50~60Hz O/P: AC 48V 0.4A
<b>Frequency Range</b>	2412 ~ 2462 MHz
<b>Transmit Power</b>	IEEE 802.11b: 21.27 dBm (133.97 mW) IEEE 802.11g: 21.04 dBm (127.06 mW)
<b>Modulation Technique</b>	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 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 12, 9, 6 Mbps
<b>Number of Channels</b>	11 Channels
<b>Antenna Specification</b>	Panel Antenna: Gain: 14 dBi Dipole Antenna: Gain: 12 dBi, 9dBi

**Remark:**

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **RIW-ZW-2000-22** 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 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 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 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.



### 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<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**

The EUT (model: ZW-2000-IA) comes with two different antennas (internal panel antenna or external dipole antenna) for sale.

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

The antennas used for radiated emissions above 1GHz are internal panel antenna and external 12dBi dipole antenna.

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.

IEEE802.11b mode:

Channel Low, Channel Mid and Channel High with 11Mbps data rate were chosen for full testing.

IEEE802.11g mode:

Channel Low, Channel Mid and Channel High 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 stand-up position (Z 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	01/18/2007
Spectrum Analyzer	R&S	FSEK30	10026	03/22/2007

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	07/25/2007
Test Receiver	Rohde&Schwarz	ESCI	100064	11/05/2006
Switch Controller	TRC	Switch Controller	SC94050010	05/05/2007
4 Port Switch	TRC	4 Port Switch	SC94050020	05/05/2007
Horn-Antenna	TRC	HA-0502	06	06/02/2007
Horn-Antenna	TRC	HA-0801	04	05/05/2007
Horn-Antenna	TRC	HA-1201A	01	07/04/2007
Horn-Antenna	TRC	HA-1301A	01	07/04/2007
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/09/2007
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: 965860 IC: IC 6106	09/26/2008
Test S/W	LABVIEW (V 6.1)			

*Remark: The measurement uncertainty is less than +/-2.0065dB (30MHz ~ 1GHz), +/-3.0958dB (Above 1GHz) which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER 9kHz-30MHz	ROHDE & SCHWARZ	ESHS30	828144/003	09/27/2006
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/12/2007
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	03/20/2007
Test S/W	LABVIEW (V 6.1)			

*Remark: The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*





## 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 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	A2LA	EN 55011, EN 55014-1/2, CISPR 11, CISPR 14-1/2, EN 55022, EN 55015, CISPR 22, CISPR 15, AS/NZS 3548, VCCI V3 (2001), CFR 47, FCC Part 15/18, CNS 13783-1, CNS 13439, CNS 13438, CNS 13803, CNS 14115, EN 55024, IEC 801-2, IEC 801-3, IEC 801-4, IEC/EN 61000-3-2, EIC/EN 61000-3-3, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 50081-1/ EN 61000-6-3, EN 50081-2/EN 61000-6-4, EN 50081-2/EN 61000-6-1: 2001	 0824-01
USA	FCC	3/10 meter Open Area Test Sites (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements	 93105, 90471 965860
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	TAF	EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	3/10 meter Open Area Test Sites (IC 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1	 IC 3991-3 IC 3991-4 IC 6106

\* 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 II for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC (Remote)	IBM	2672 (X31)	99PBTKB	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	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)	IBM	2672 (X31)	9985H9M	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	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.



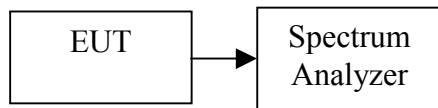
## 7. FCC PART 15.247 REQUIREMENTS

### 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 = 100 kHz, VBW = RBW, Span = 50 MHz, 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

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	10500	>500	PASS
Mid	2437	8920		PASS
High	2462	9250		PASS

##### Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Low	2412	16333	>500	PASS
Mid	2437	16167		PASS
High	2462	16083		PASS

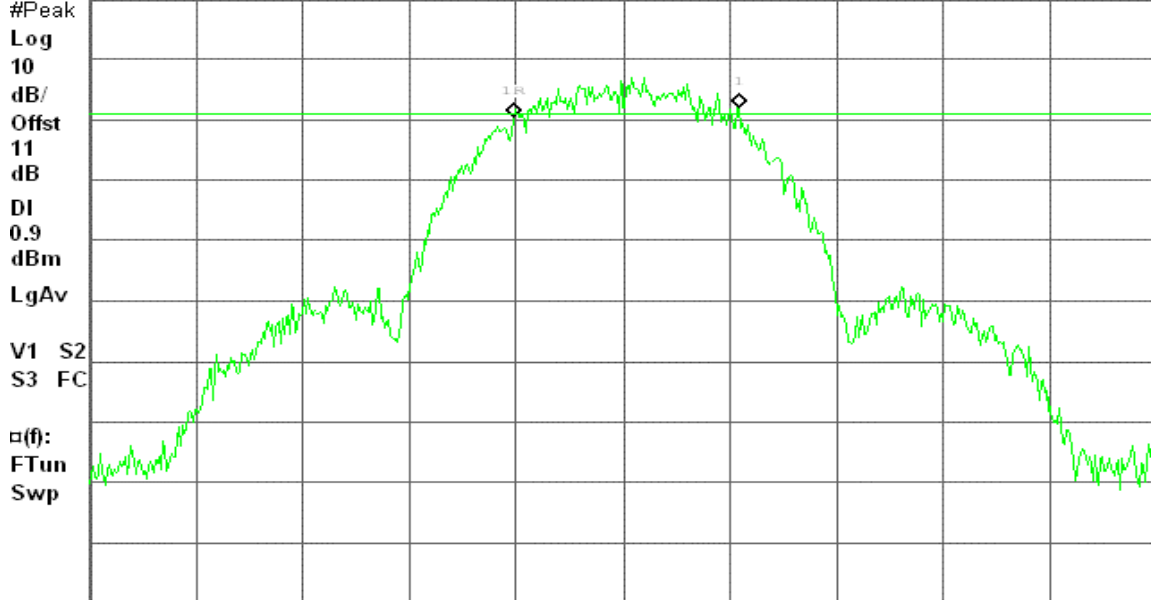


Test Plot

IEEE 802.11b

6dB Bandwidth (CH Low)

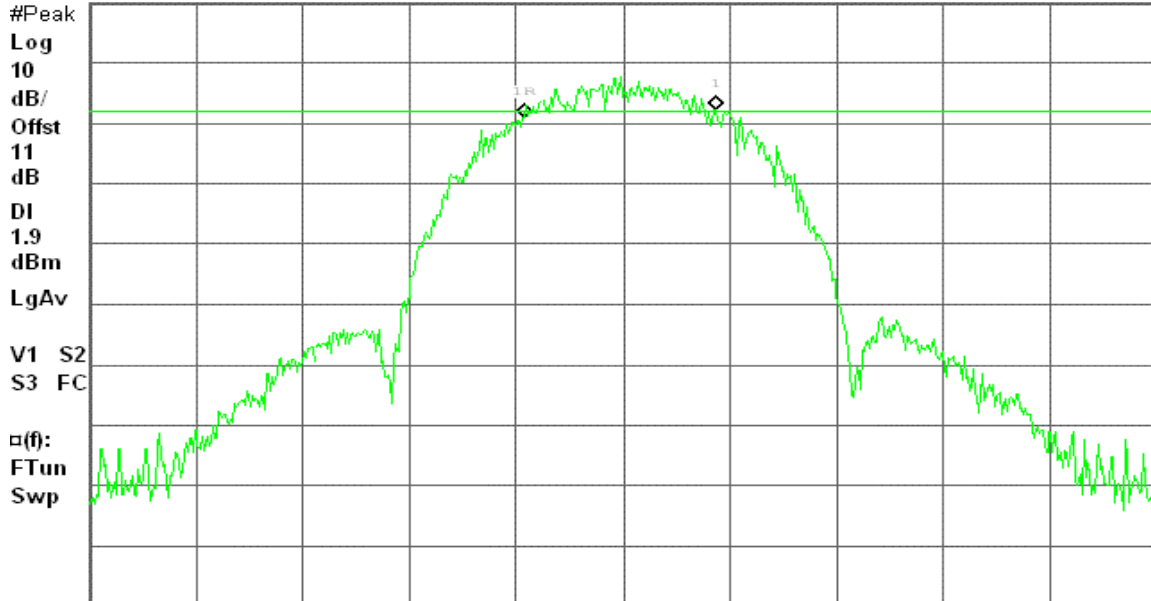
Agilent 19:28:41 Aug 22, 2006 R L
6dB BW, b Mode Low Ch.
Ref 20 dBm Atten 20 dB
#Peak 1.61 dB



Center 2.412 00 GHz Span 50 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 6.04 ms (601 pts)

6dB Bandwidth (CH Mid)

Agilent 19:42:08 Aug 22, 2006 R L
6dB BW, b Mode Mid Ch.
Ref 20 dBm Atten 20 dB
#Peak 1.32 dB



Center 2.437 00 GHz Span 50 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 6.04 ms (601 pts)



### 6dB Bandwidth (CH High)

Agilent 19:47:46 Aug 22, 2006

R L

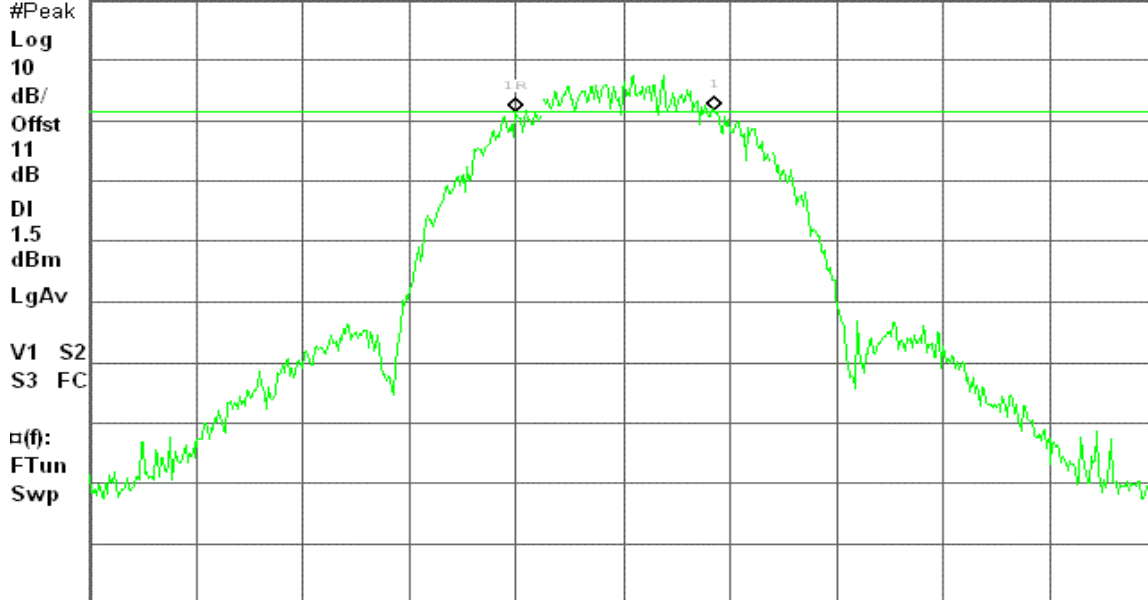
6dB BW, b Mode High Ch.

Δ Mkr1 9.25 MHz

Ref 20 dBm

Atten 20 dB

0.07 dB



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

### IEEE 802.11g

### 6dB Bandwidth (CH Low)

Agilent 20:02:28 Aug 22, 2006

R L

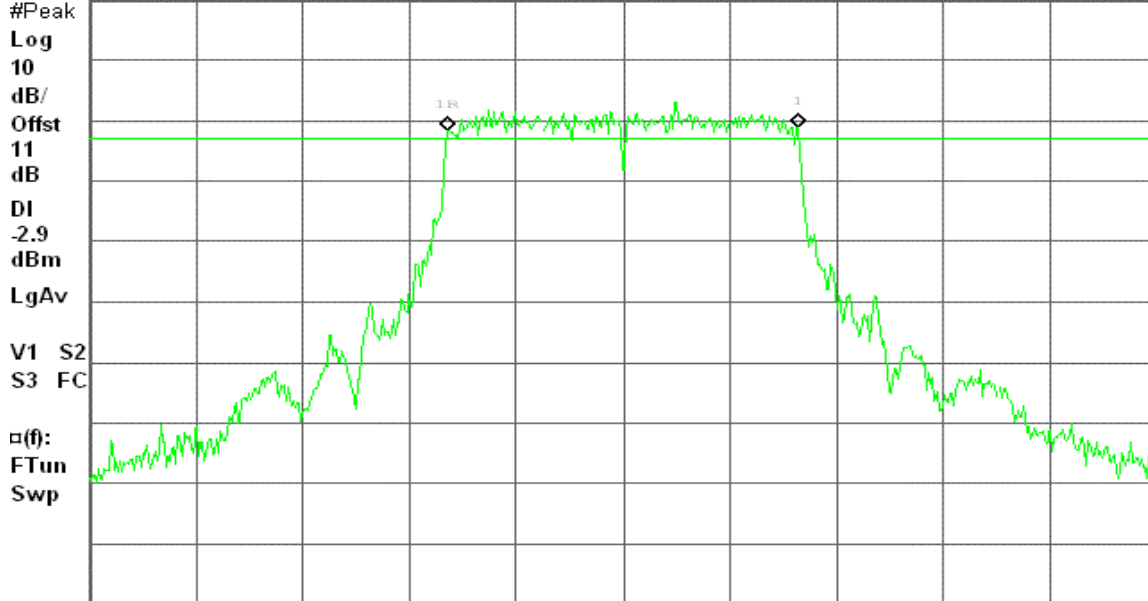
6dB BW, g Mode Low Ch.

Δ Mkr1 16.33 MHz

Ref 20 dBm

Atten 20 dB

0.44 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



### 6dB Bandwidth (CH Mid)

Agilent 20:08:32 Aug 22, 2006

R T

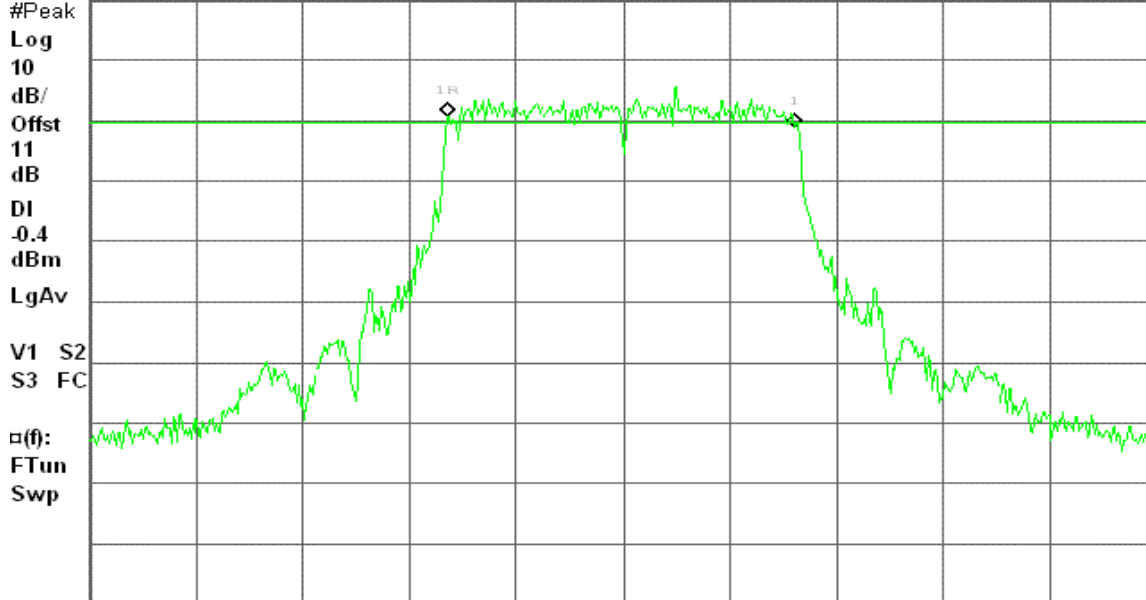
6dB BW, g Mode Mid Ch.

Δ Mkr1 16.17 MHz

Ref 20 dBm

Atten 20 dB

-1.83 dB



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

### 6dB Bandwidth (CH High)

Agilent 20:18:45 Aug 22, 2006

R L

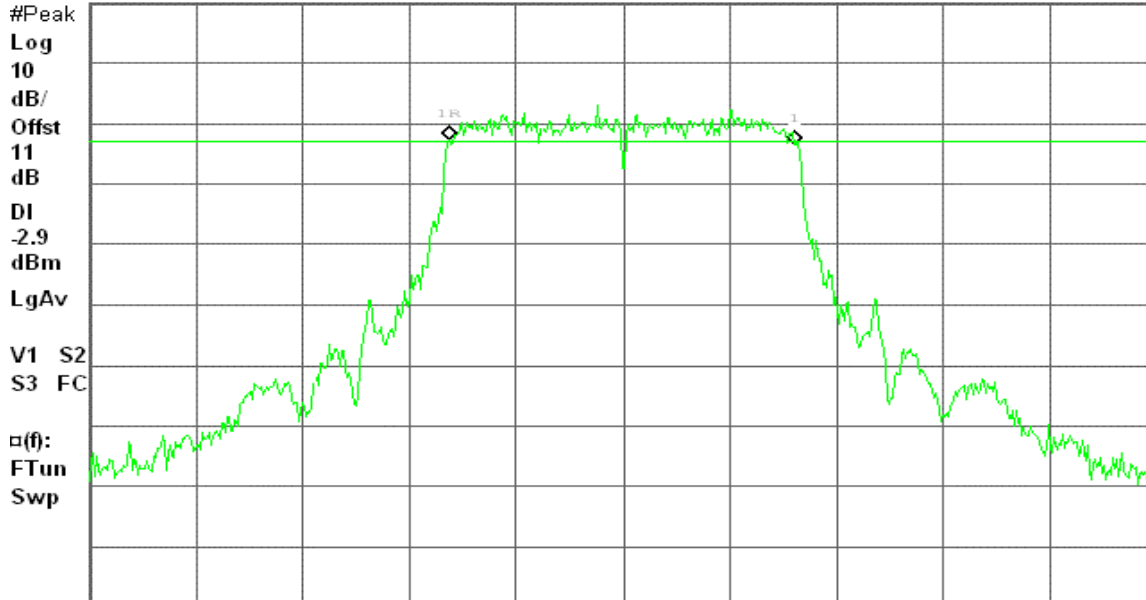
6dB BW, g Mode High Ch.

Δ Mkr1 16.08 MHz

Ref 20 dBm

Atten 20 dB

-0.72 dB



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



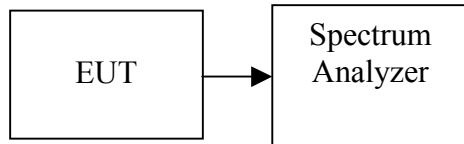
## 7.2 PEAK POWER

### 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

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

### TEST RESULTS

*No non-compliance noted*

#### Test Data

##### Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	21.02	0.126	0.158	PASS
Mid	2437	21.27	0.134		PASS
High	2462	20.69	0.117		PASS

##### Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	19.97	0.099	0.158	PASS
Mid	2437	21.04	0.127		PASS
High	2462	19.59	0.091		PASS

*Remark: The maximum antenna gain is 14 dBi; therefore the reduction due to antenna gain is 8 dB, so the limit is 22 dBm.*





**Test Plot**

**IEEE 802.11b**

**Peak Power (CH Low)**

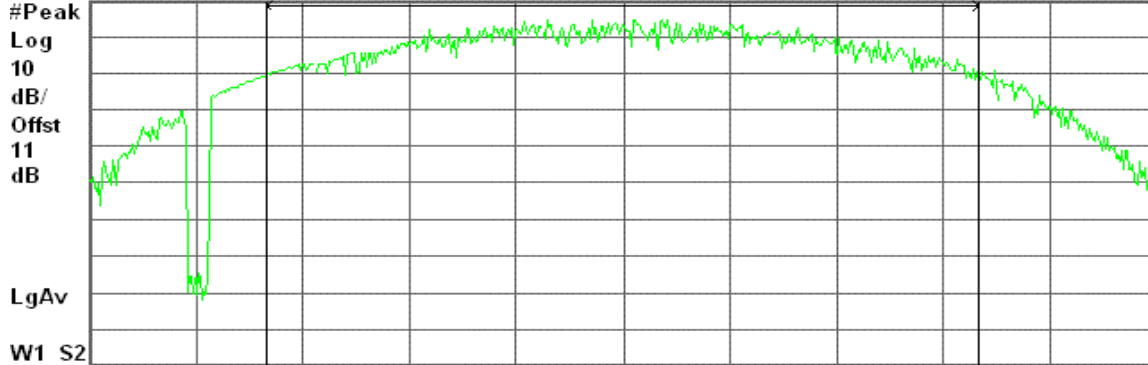
Agilent 19:36:58 Aug 22, 2006

R L

Peak Output Power, b Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 22.05 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

21.02 dBm / 14.7010 MHz

-50.65 dBm/Hz

**Peak Power (CH Mid)**

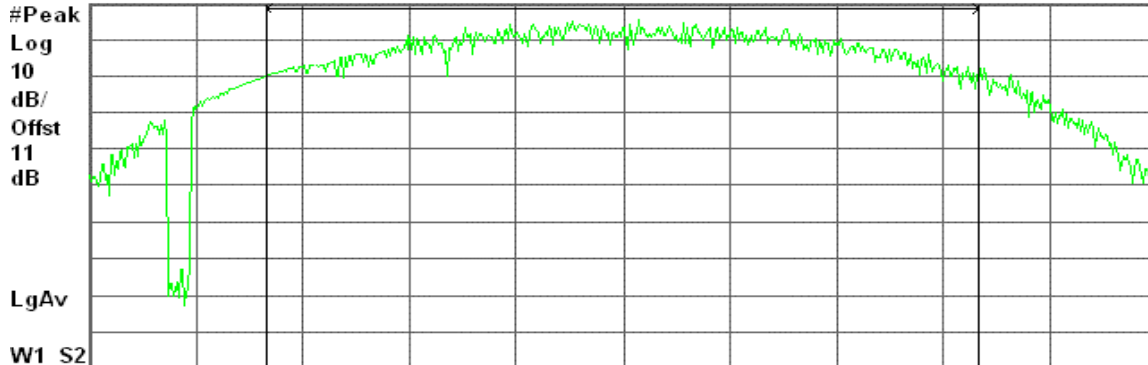
Agilent 19:43:03 Aug 22, 2006

R L

Peak Output Power, b Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 21.86 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

21.27 dBm / 14.5710 MHz

-50.37 dBm/Hz



### Peak Power (CH High)

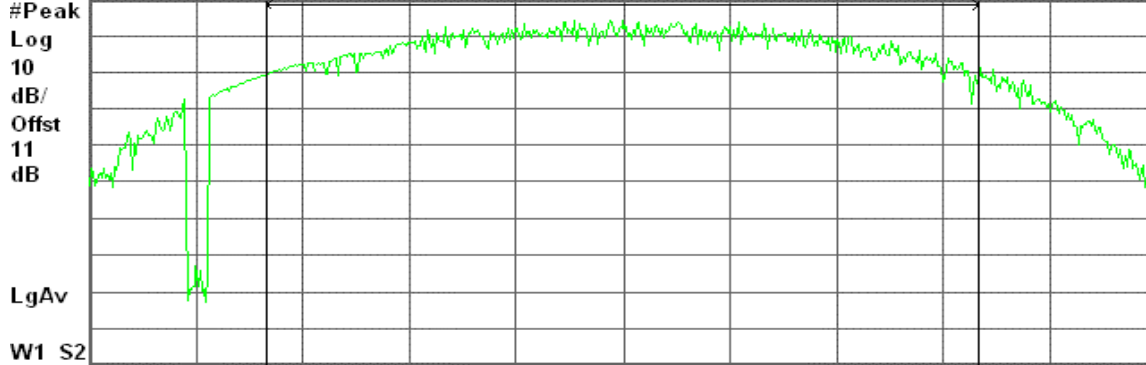
Agilent 19:50:45 Aug 22, 2006

R L

Peak Output Power, b Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 21.82 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

20.69 dBm / 14.5450 MHz

-50.93 dBm/Hz

### IEEE 802.11g

#### Peak Power (CH Low)

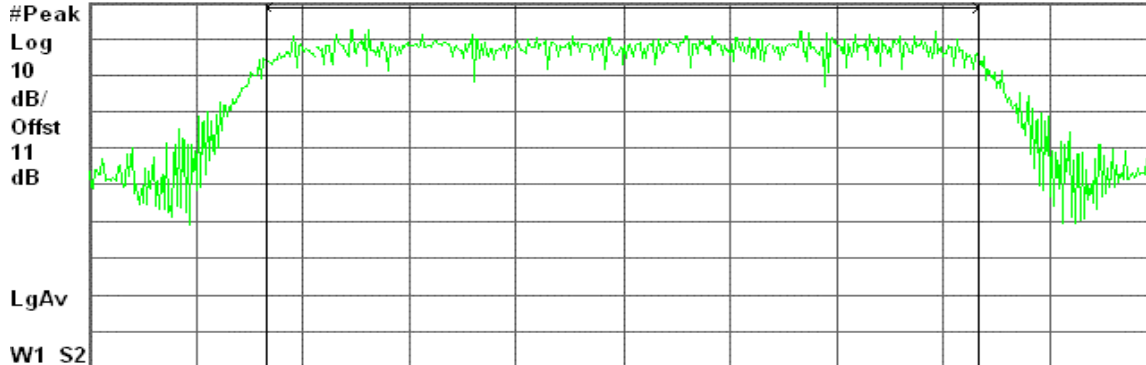
Agilent 20:03:24 Aug 22, 2006

R L

Peak Output Power, g Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 24.57 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

19.97 dBm / 16.3830 MHz

-52.17 dBm/Hz



### Peak Power (CH Mid)

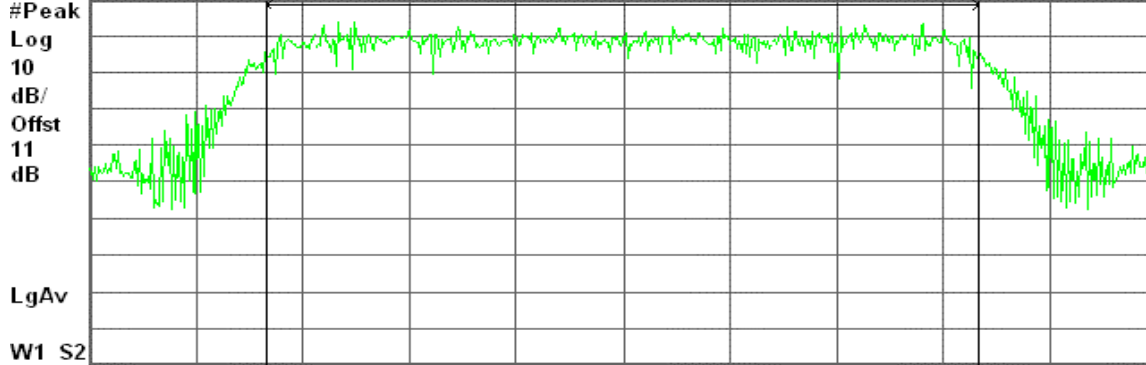
Agilent 20:12:08 Aug 22, 2006

R L

Peak Output Power, g Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 24.55 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

21.04 dBm / 16.3640 MHz

-51.10 dBm/Hz

### Peak Power (CH High)

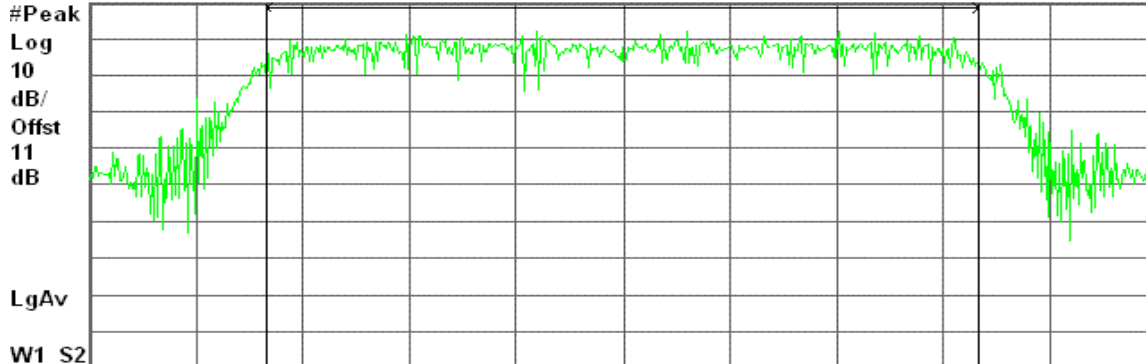
Agilent 20:20:00 Aug 22, 2006

R L

Peak Output Power, g Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 24.64 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

19.59 dBm / 16.4240 MHz

-52.57 dBm/Hz

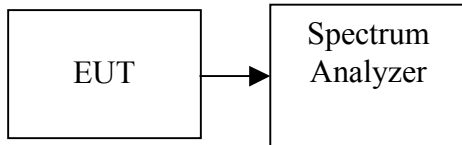


### 7.3 AVERAGE POWER

#### 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 mode

Channel	Frequency (MHz)	Output Power (dBm)
Low	2412	17.95
Mid	2437	17.96
High	2462	17.60

##### Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)
Low	2412	16.62
Mid	2437	17.43
High	2462	16.34



**Test Plot**

**IEEE 802.11b**

**CH Low**

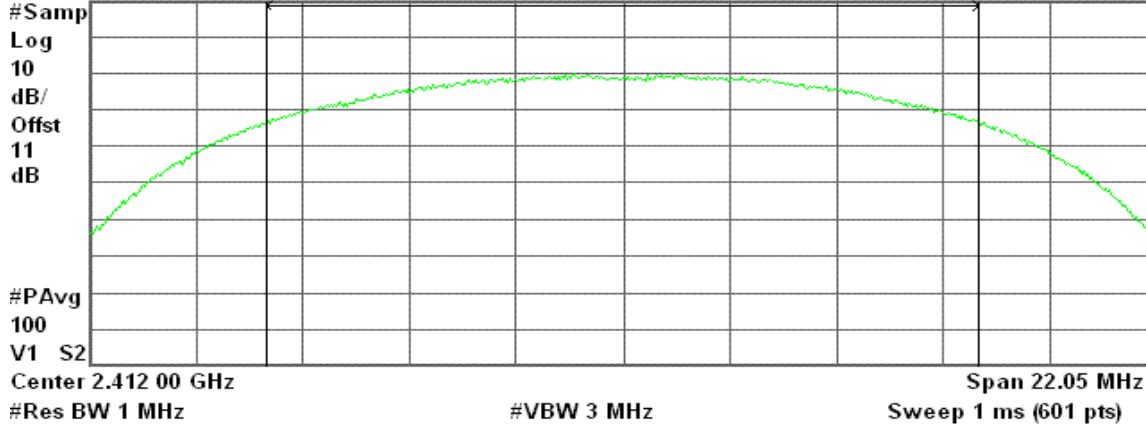
Agilent 19:37:33 Aug 22, 2006

R L

Avg Output Power, b Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

17.95 dBm / 14.7010 MHz

-53.72 dBm/Hz

**CH Mid**

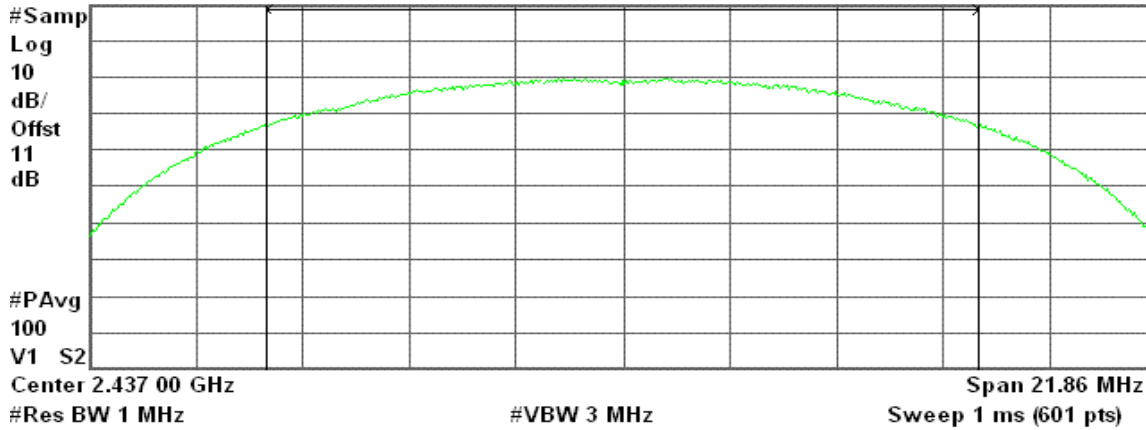
Agilent 19:43:36 Aug 22, 2006

R L

Avg Output Power, b Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

17.96 dBm / 14.5710 MHz

-53.67 dBm/Hz



### CH High

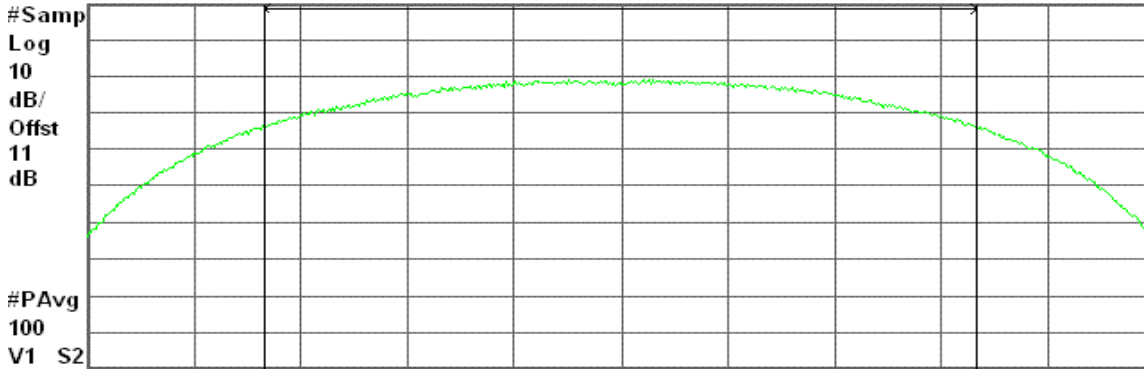
Agilent 19:51:33 Aug 22, 2006

R L

Avg Output Power, b Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 21.82 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

17.60 dBm / 14.5450 MHz

-54.02 dBm/Hz

### IEEE 802.11g

#### CH Low

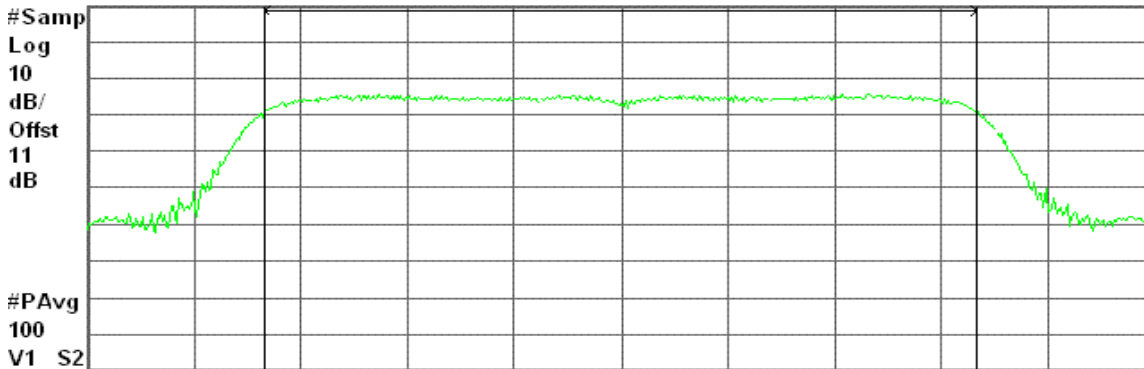
Agilent 20:04:00 Aug 22, 2006

R L

Avg Output Power, g Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 24.57 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

16.62 dBm / 16.3830 MHz

-55.53 dBm/Hz



### CH Mid

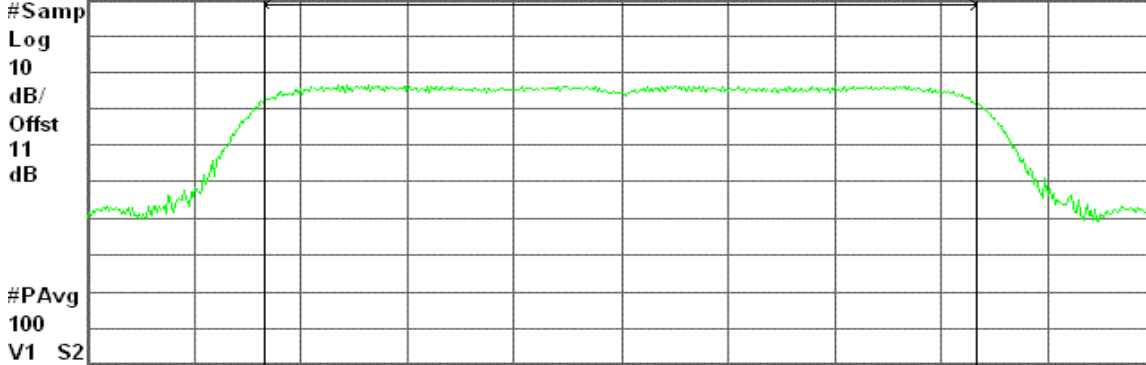
Agilent 20:12:46 Aug 22, 2006

R L

Avg Output Power, g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

17.43 dBm / 16.3640 MHz

Power Spectral Density

-54.70 dBm/Hz

### CH High

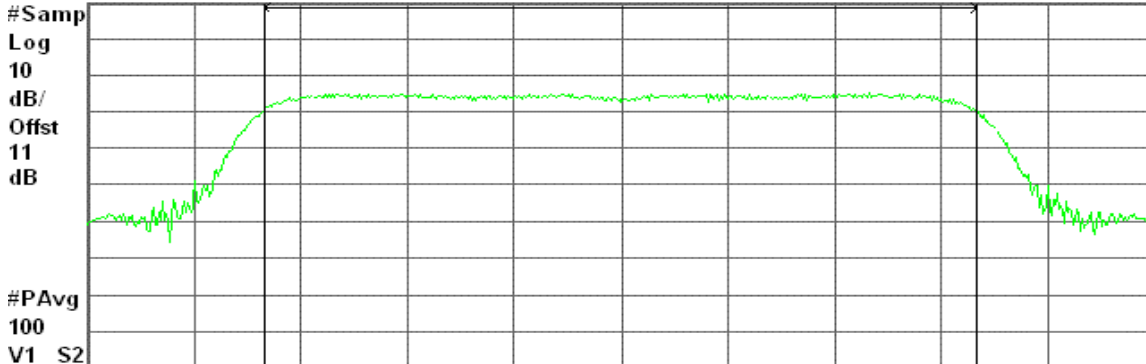
Agilent 20:20:43 Aug 22, 2006

R L

Avg Output Power, g Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

16.34 dBm / 16.4240 MHz

Power Spectral Density

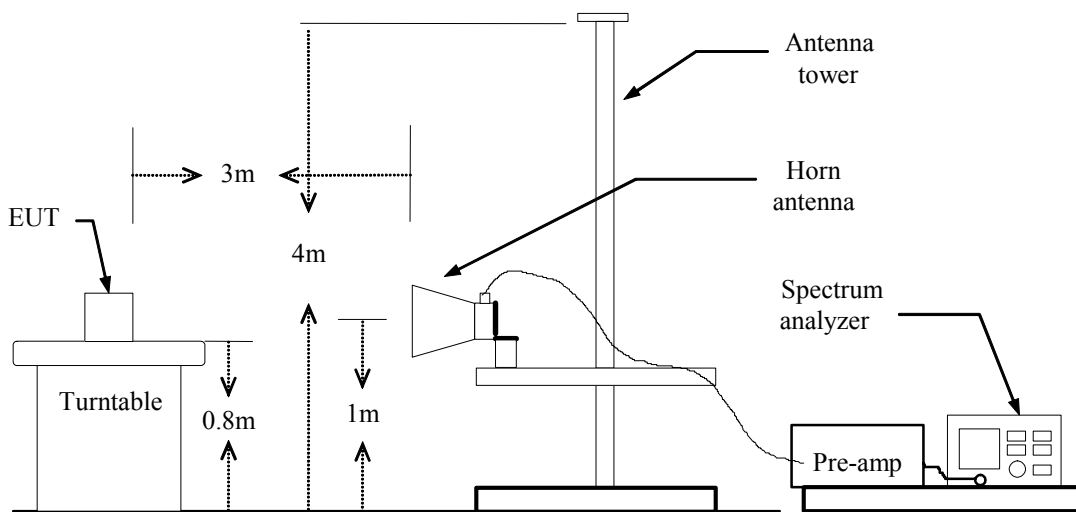
-55.81 dBm/Hz

## 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.





External Antenna: Dipole Antenna

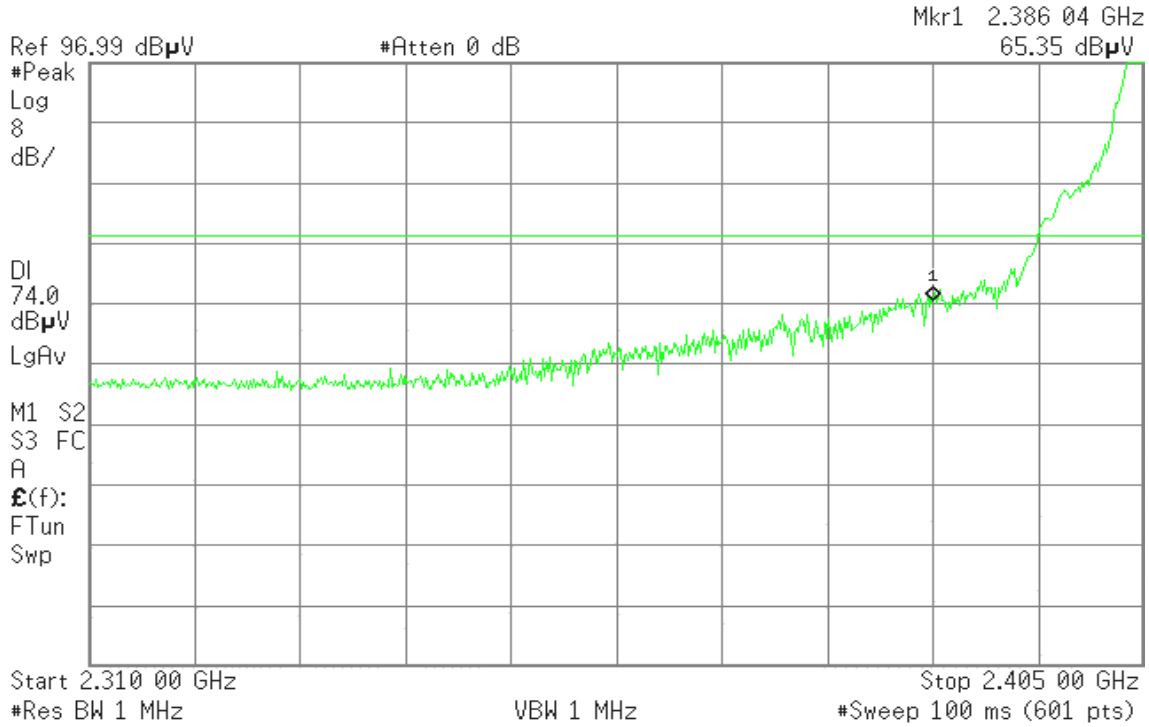
Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 15:48:25 Jul 4, 2006

T

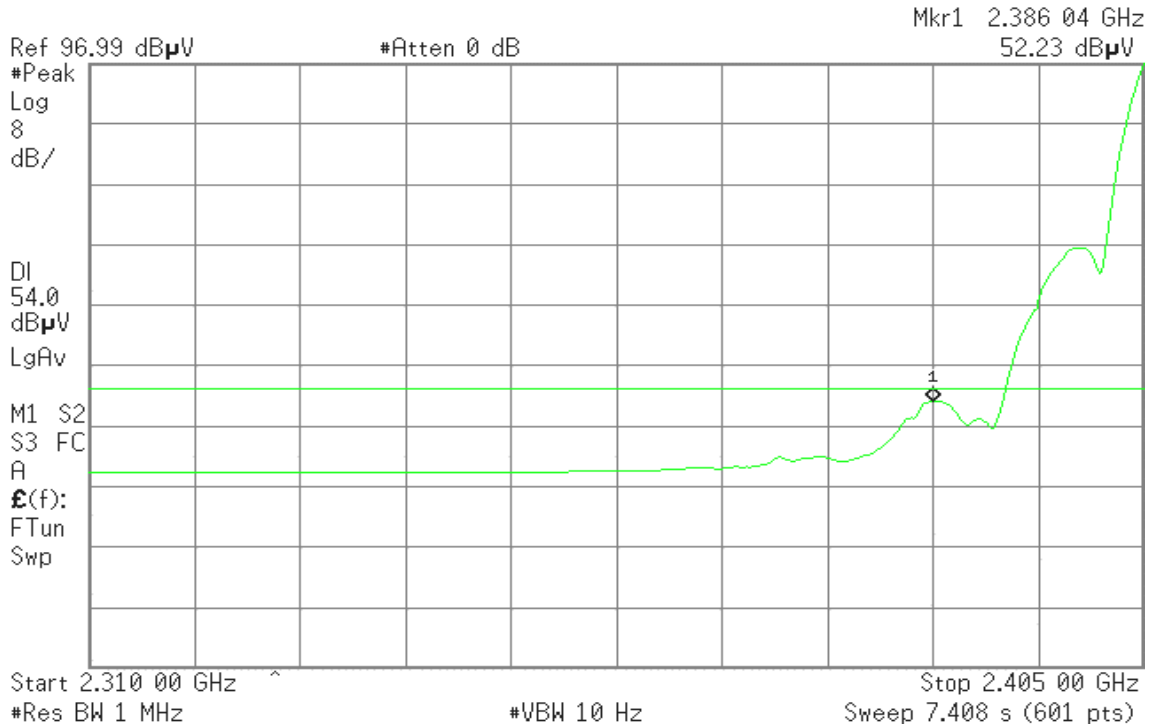


Detector mode: Average

Polarity: Vertical

Agilent 15:47:46 Jul 4, 2006

R T





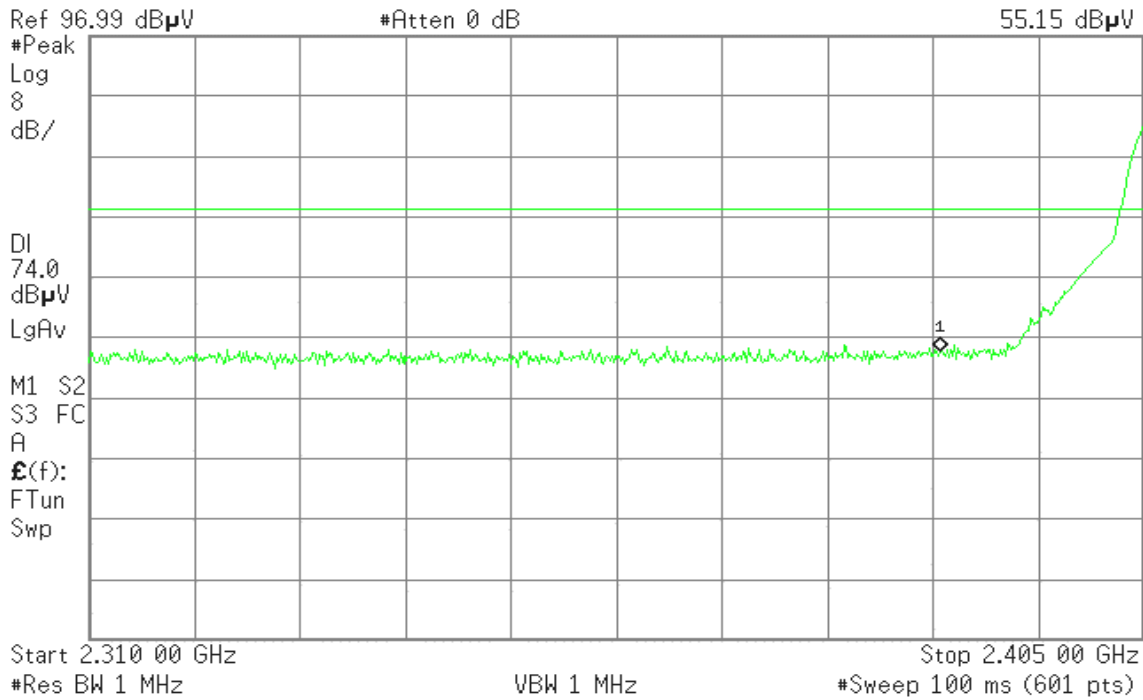
Detector mode: Peak

Polarity: Horizontal

Agilent 15:54:52 Jul 4, 2006

T

Mkr1 2.386 68 GHz  
55.15 dBμV



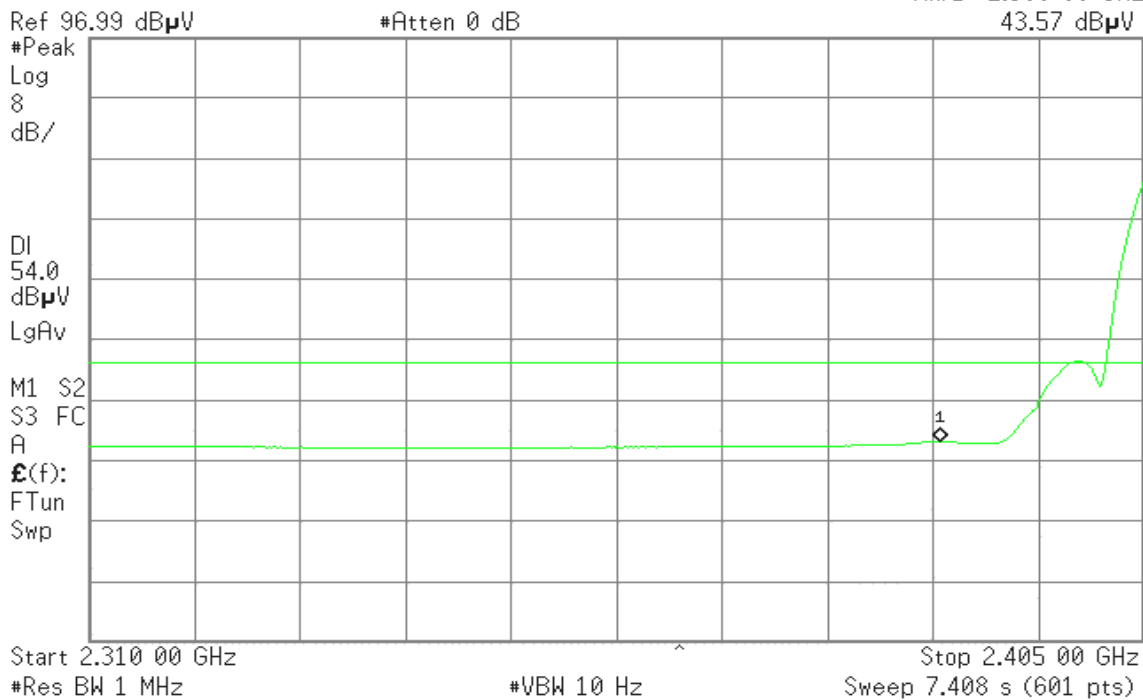
Detector mode: Average

Polarity: Horizontal

Agilent 15:54:32 Jul 4, 2006

T

Mkr1 2.386 68 GHz  
43.57 dBμV





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

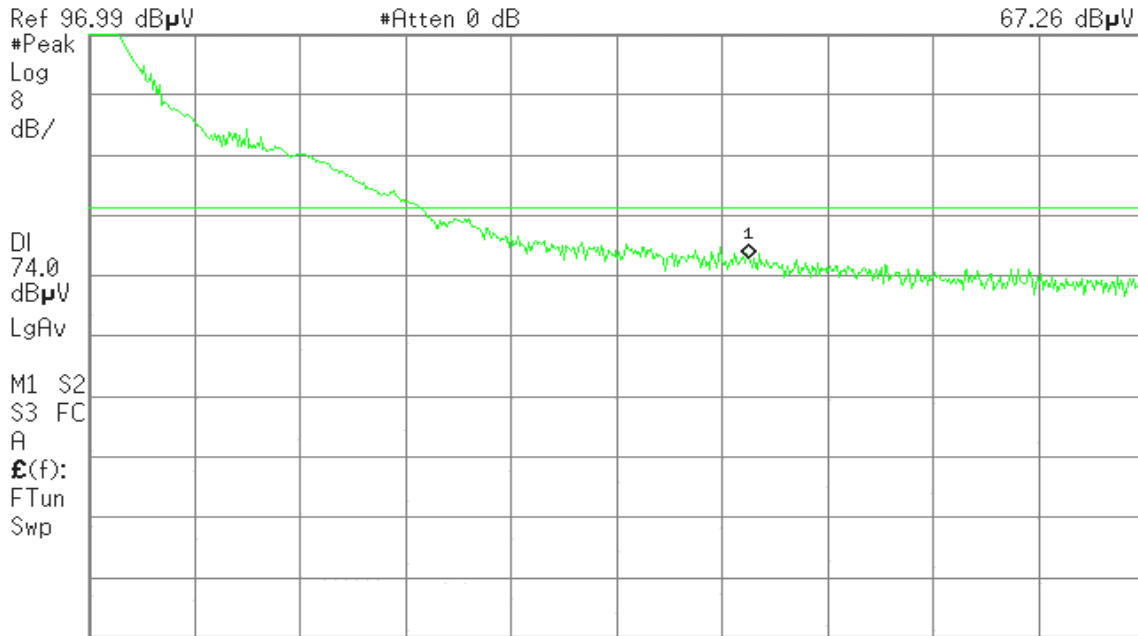
Detector mode: Peak

Polarity: Vertical

Agilent 16:20:12 Jul 4, 2006

T

Mkr1 2.488 75 GHz  
67.26 dBμV



Start 2.470 00 GHz

#Res BW 1 MHz

VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

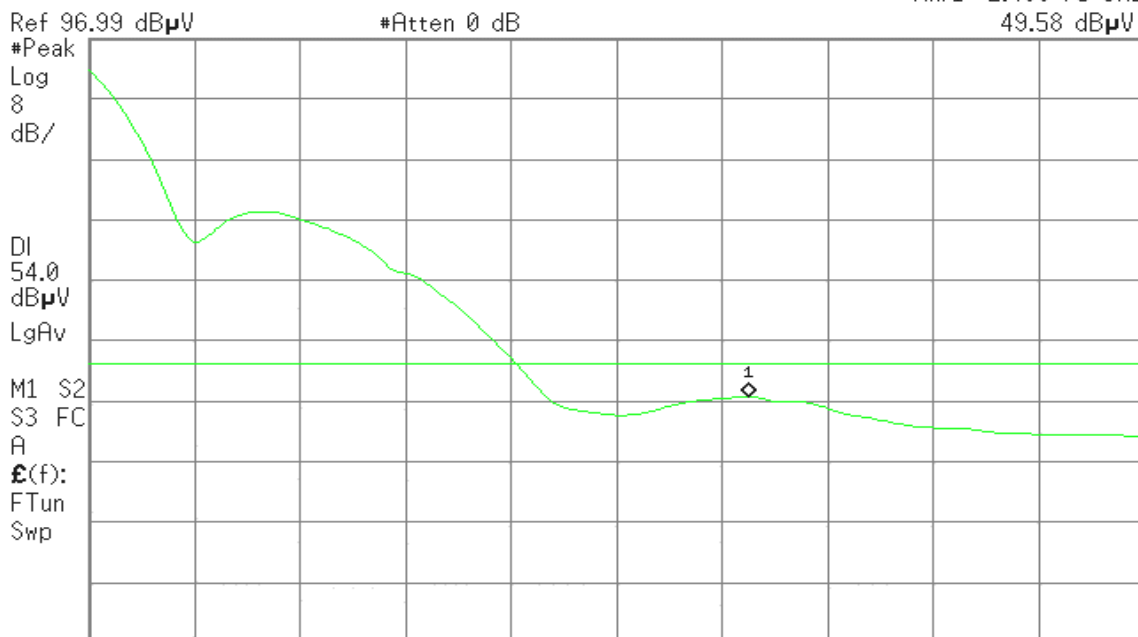
Detector mode: Average

Polarity: Vertical

Agilent 16:08:55 Jul 4, 2006

T

Mkr1 2.488 75 GHz  
49.58 dBμV



Start 2.470 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 2.339 s (601 pts)



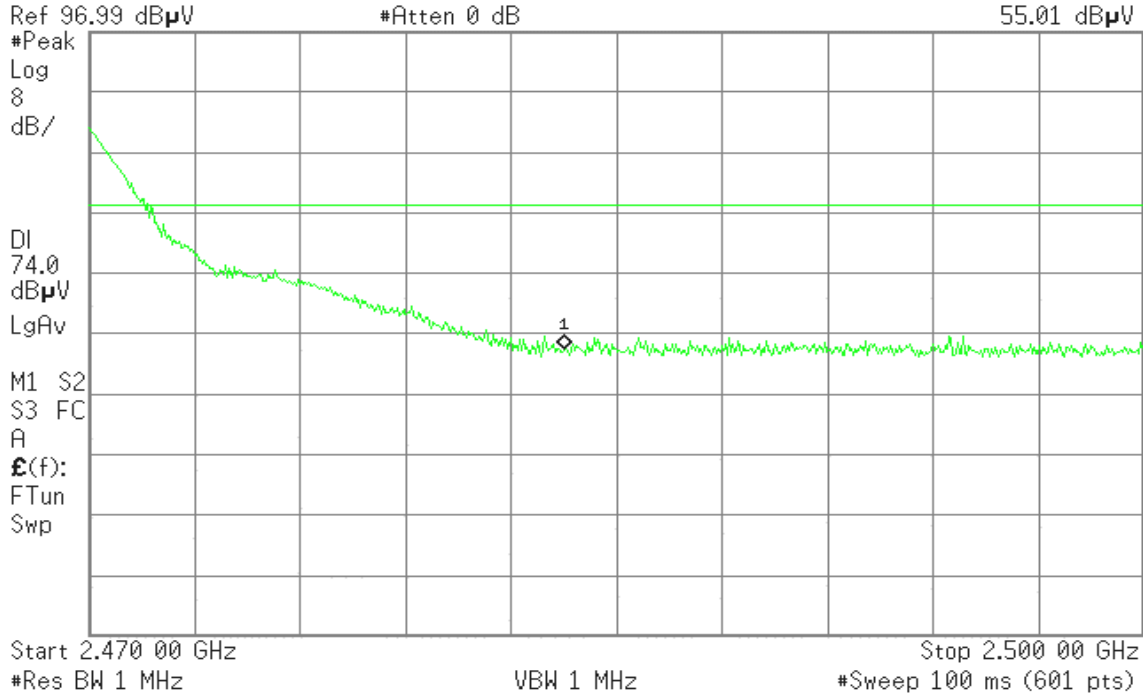
Detector mode: Peak

Polarity: Horizontal

Agilent 16:12:24 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
55.01 dBμV



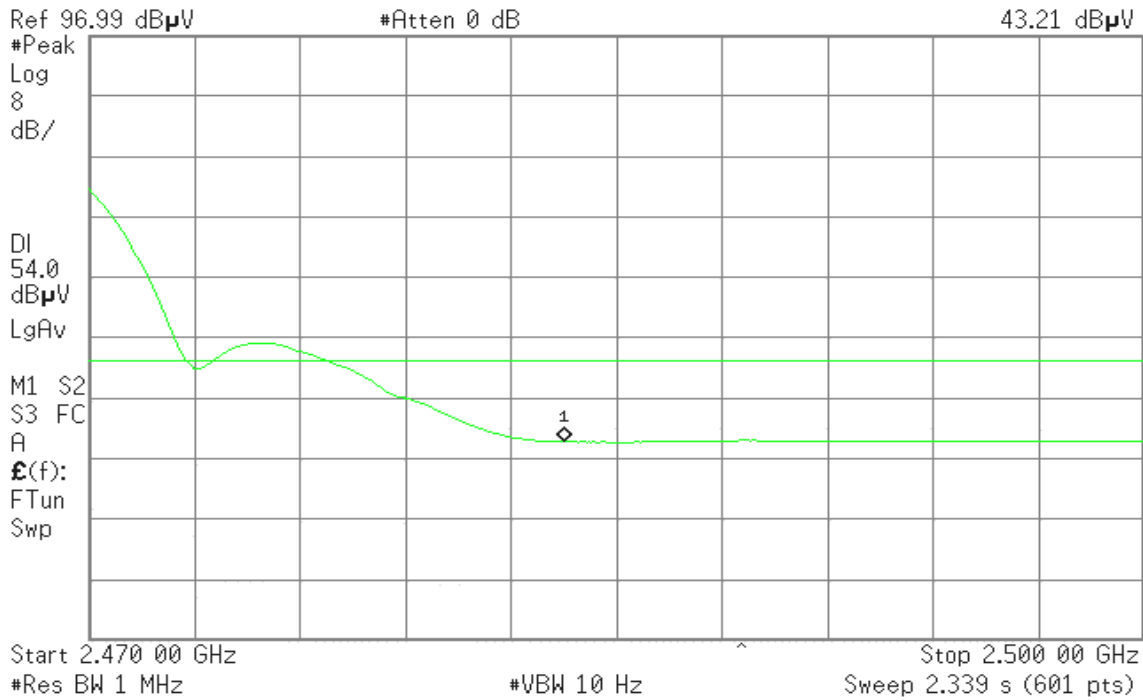
Detector mode: Average

Polarity: Horizontal

Agilent 16:12:04 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
43.21 dBμV





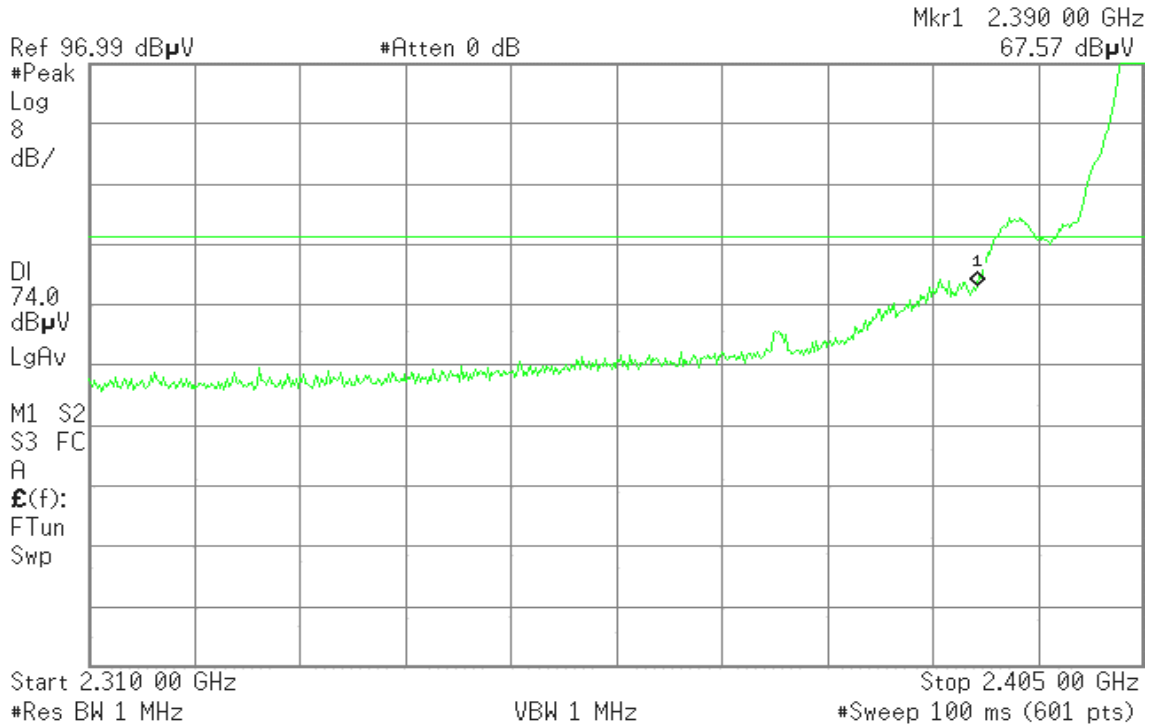
### Band Edges (IEEE 802.11g / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 16:37:21 Jul 4, 2006

T

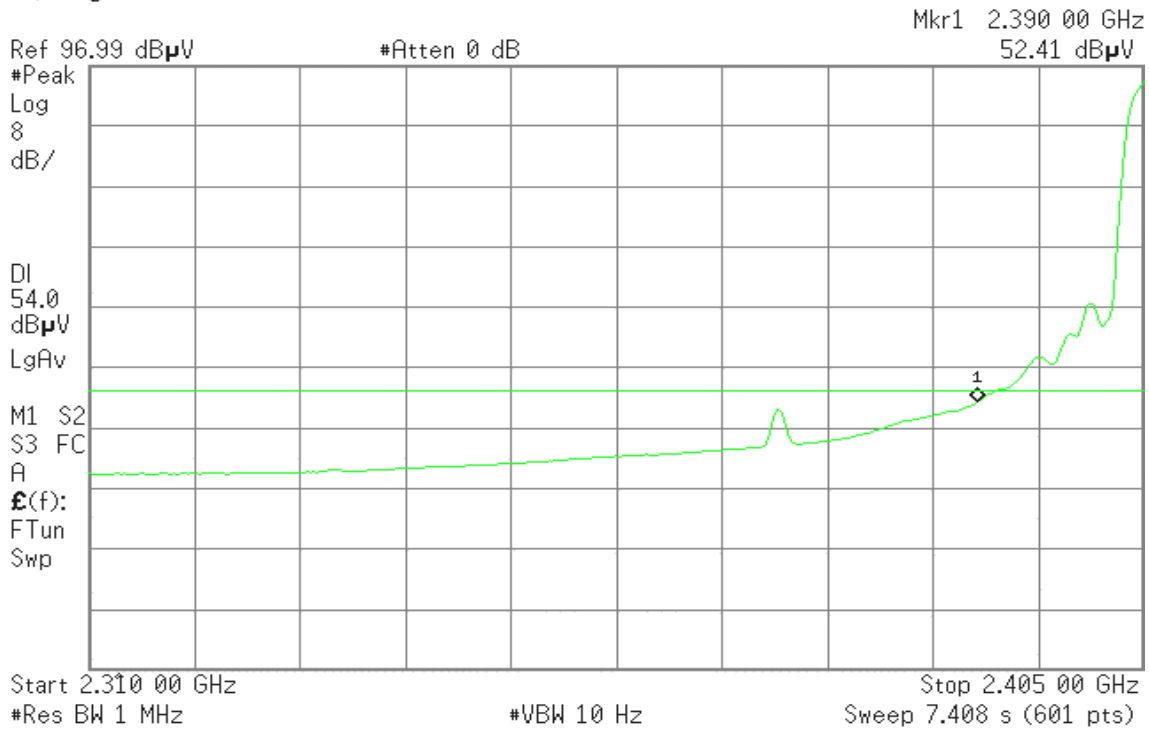


Detector mode: Average

Polarity: Vertical

Agilent 16:36:48 Jul 4, 2006

T





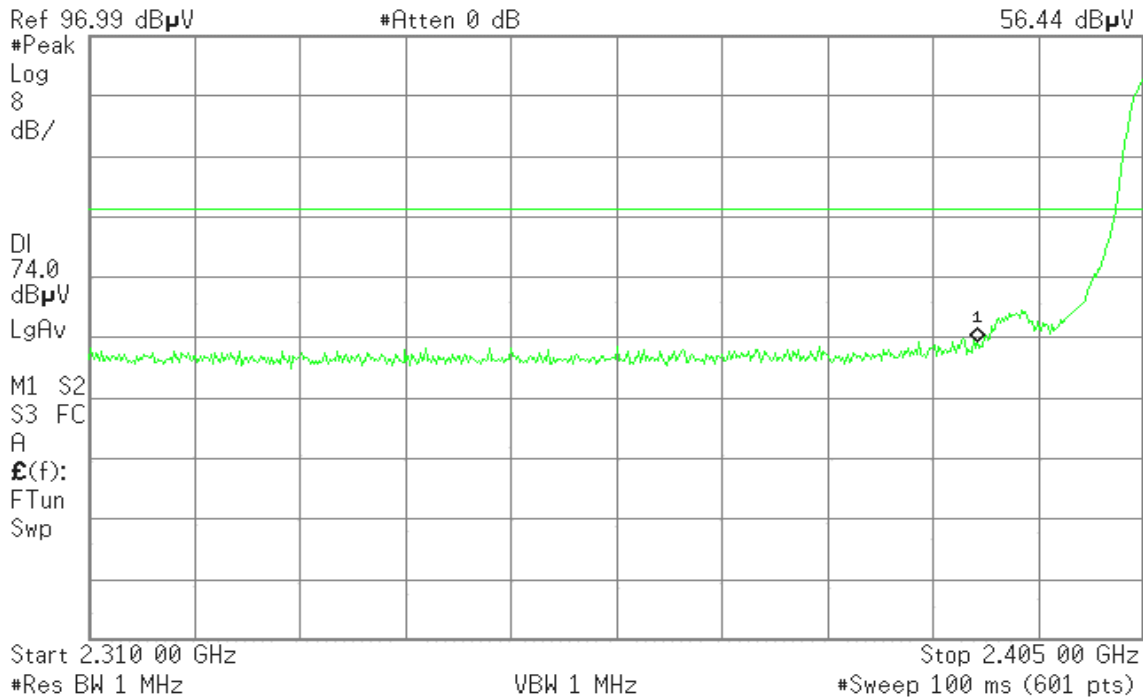
Detector mode: Peak

Polarity: Horizontal

Agilent 16:39:18 Jul 4, 2006

T

Mkr1 2.390 00 GHz  
56.44 dBμV



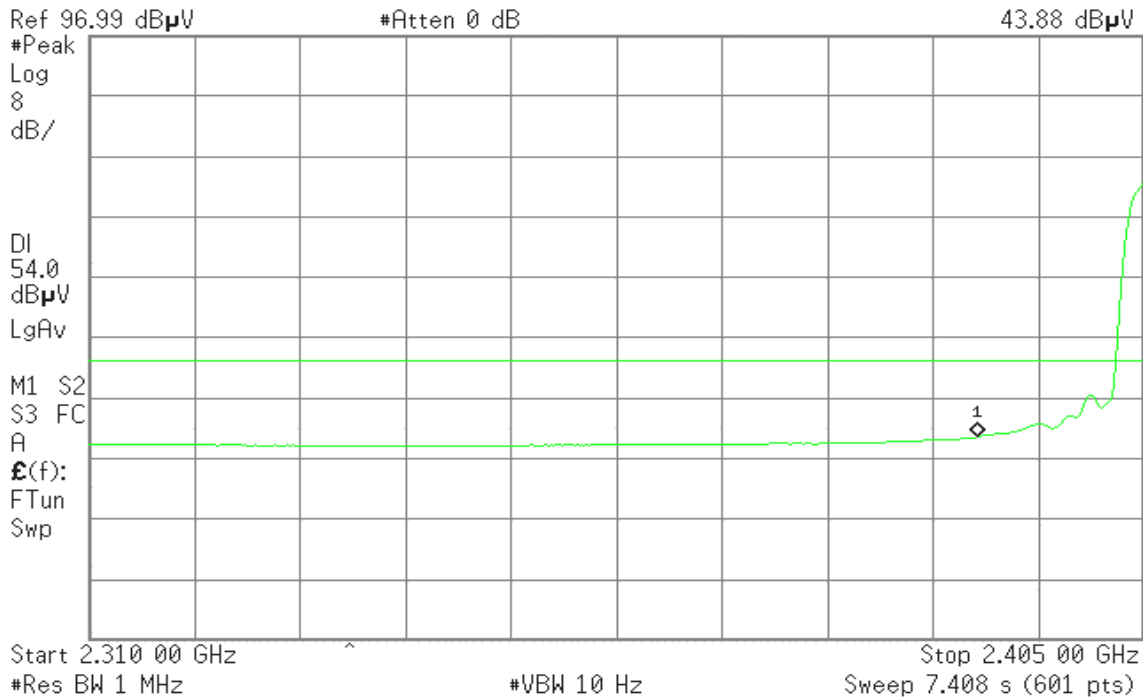
Detector mode: Average

Polarity: Horizontal

Agilent 16:39:01 Jul 4, 2006

T

Mkr1 2.390 00 GHz  
43.88 dBμV





### Band Edges (IEEE 802.11g / CH High)

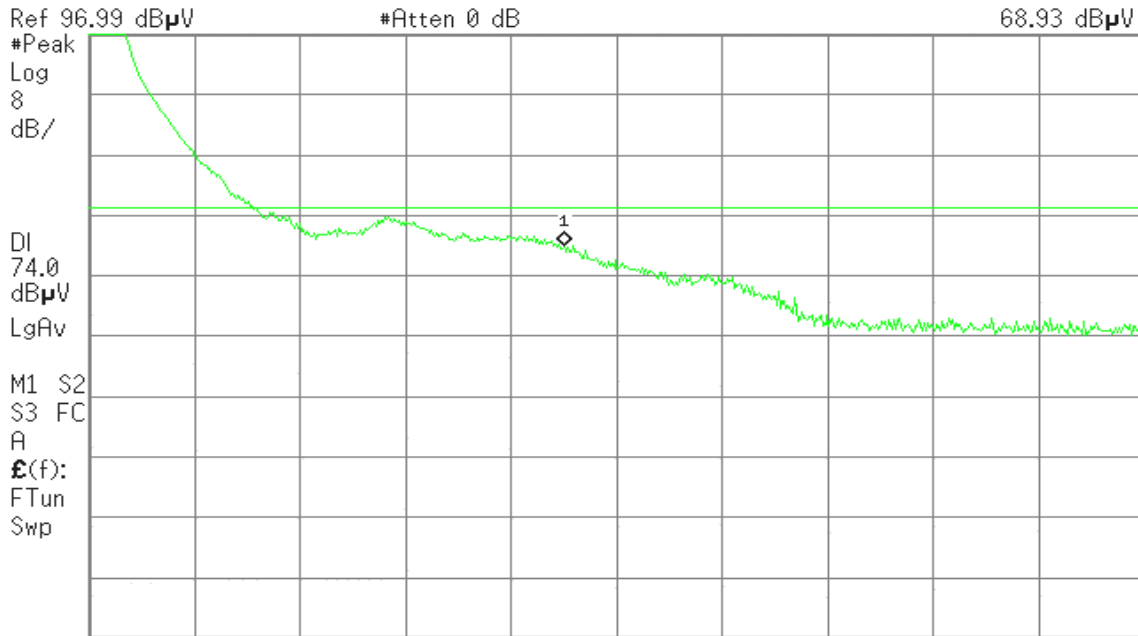
Detector mode: Peak

Polarity: Vertical

Agilent 16:30:41 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
68.93 dB $\mu$ V



Start 2.470 00 GHz

#Res BW 1 MHz

VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

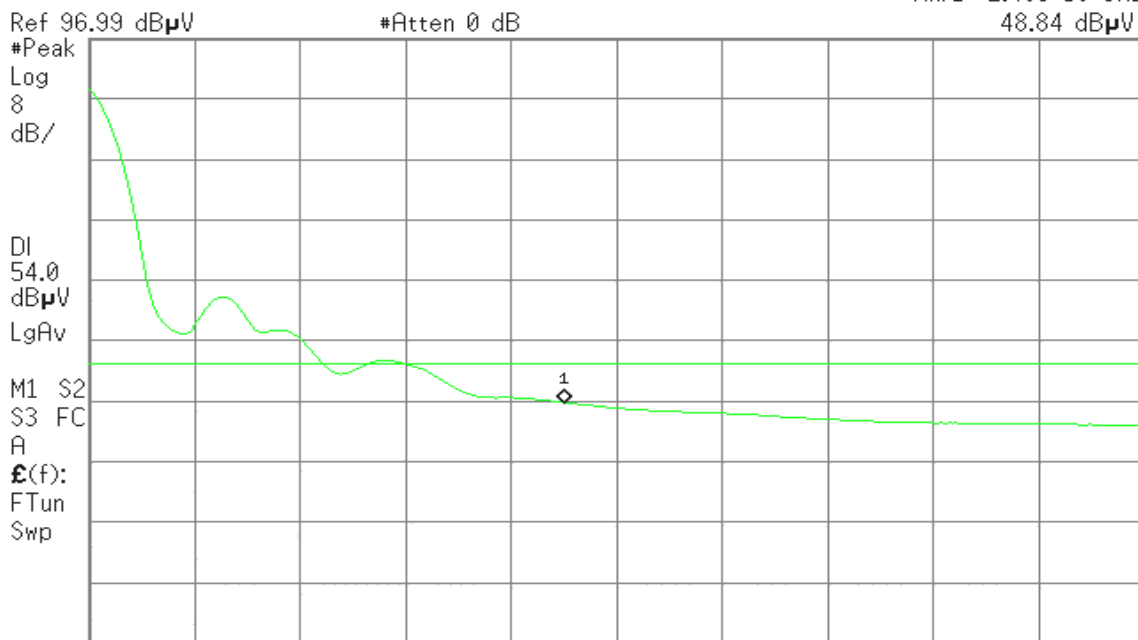
Detector mode: Average

Polarity: Vertical

Agilent 16:31:07 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
48.84 dB $\mu$ V



Start 2.470 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 2.339 s (601 pts)



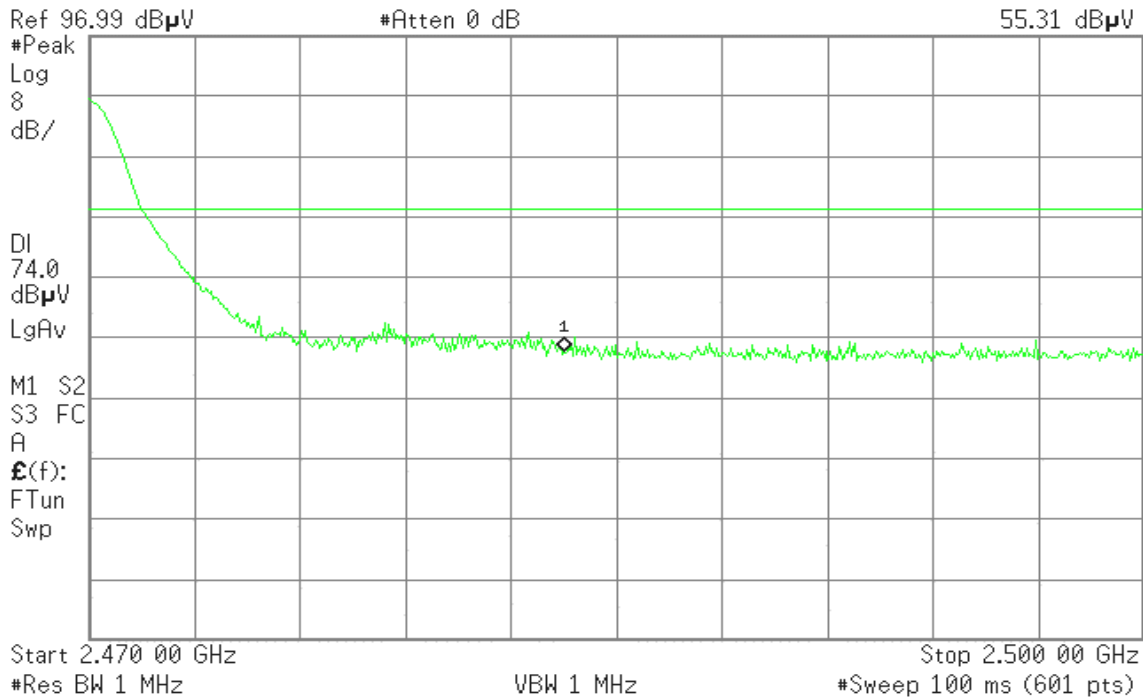
Detector mode: Peak

Polarity: Horizontal

Agilent 16:33:00 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
55.31 dBμV



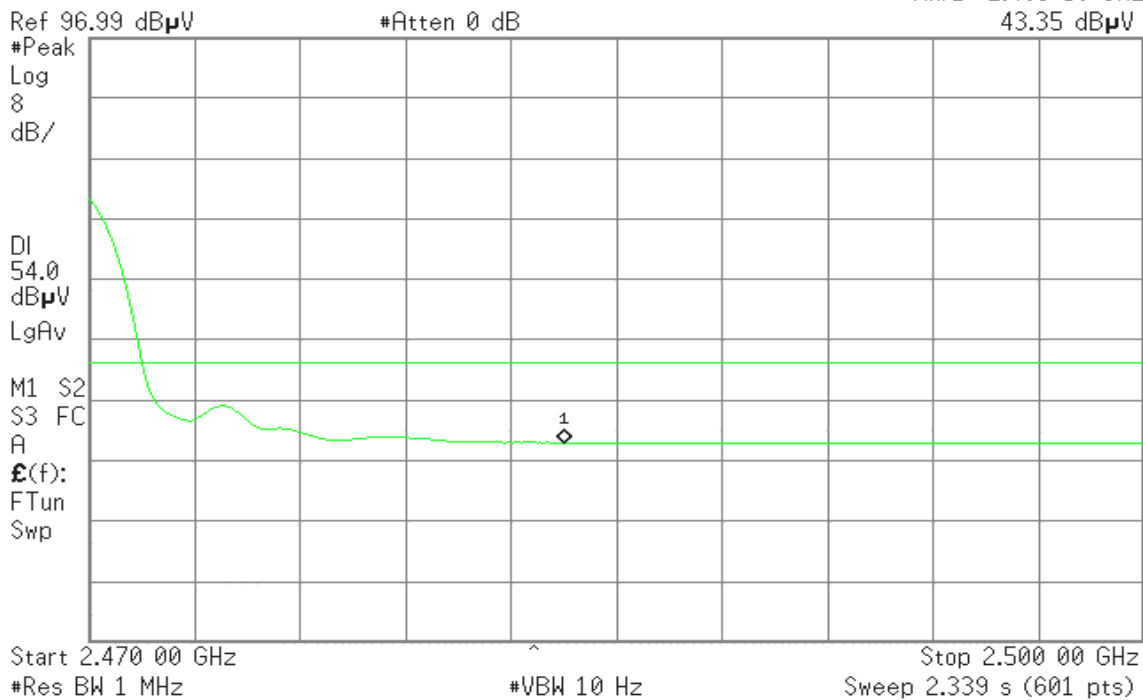
Detector mode: Average

Polarity: Horizontal

Agilent 16:32:42 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
43.35 dBμV







Internal Antenna: Panel Antenna

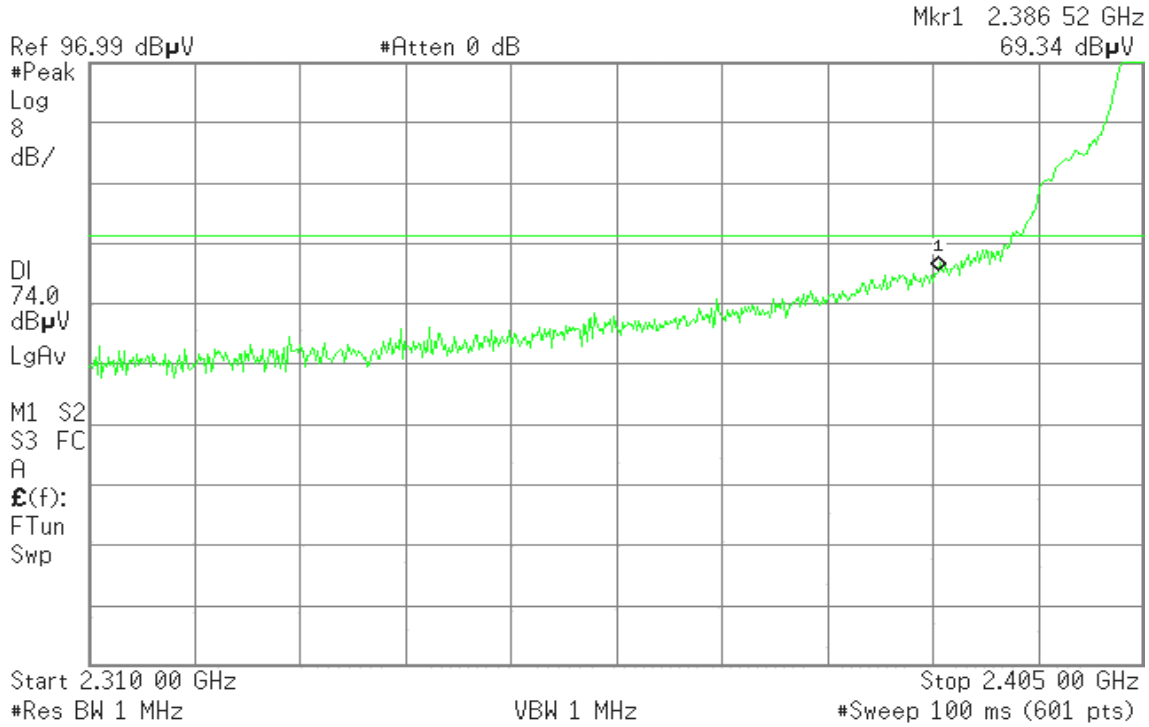
Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 10:33:50 Jul 4, 2006

T

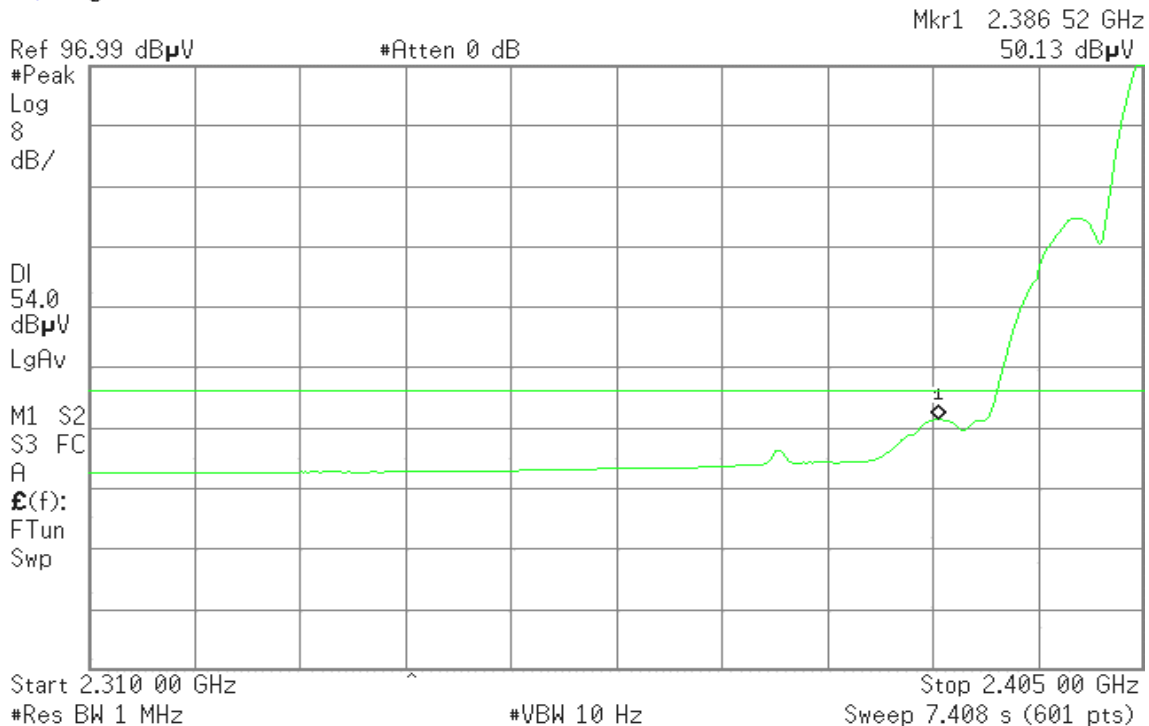


Detector mode: Average

Polarity: Vertical

Agilent 10:33:30 Jul 4, 2006

T





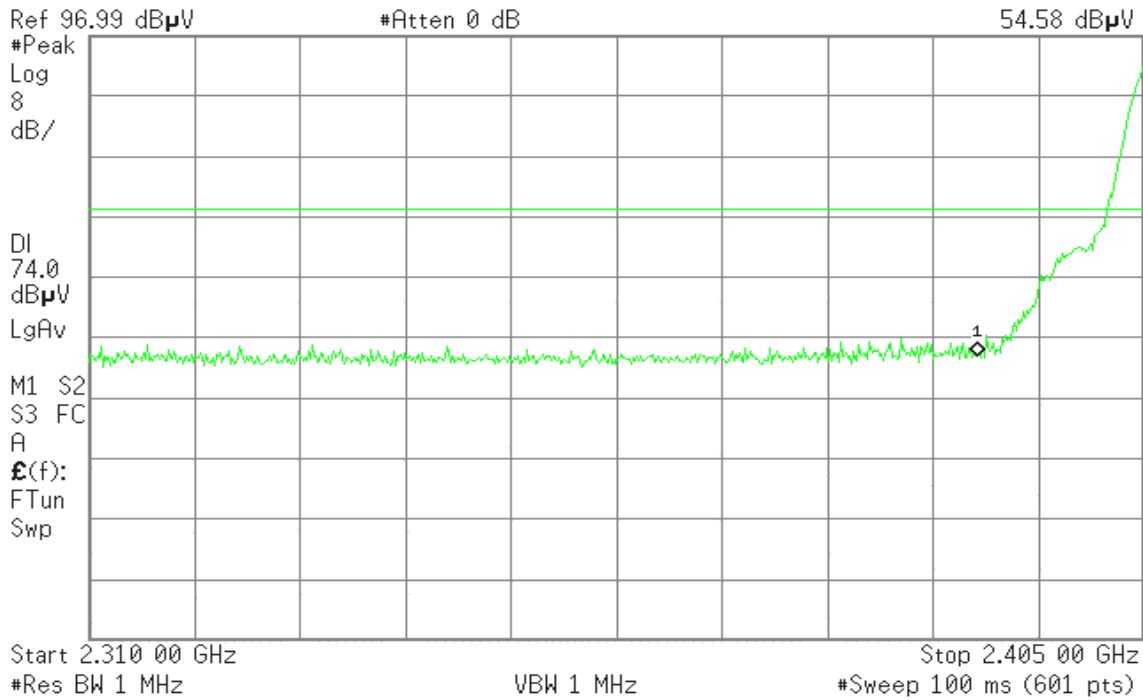
**Detector mode: Peak**

**Polarity: Horizontal**

Agilent 10:37:29 Jul 4, 2006

T

Mkr1 2.390 00 GHz  
54.58 dBμV



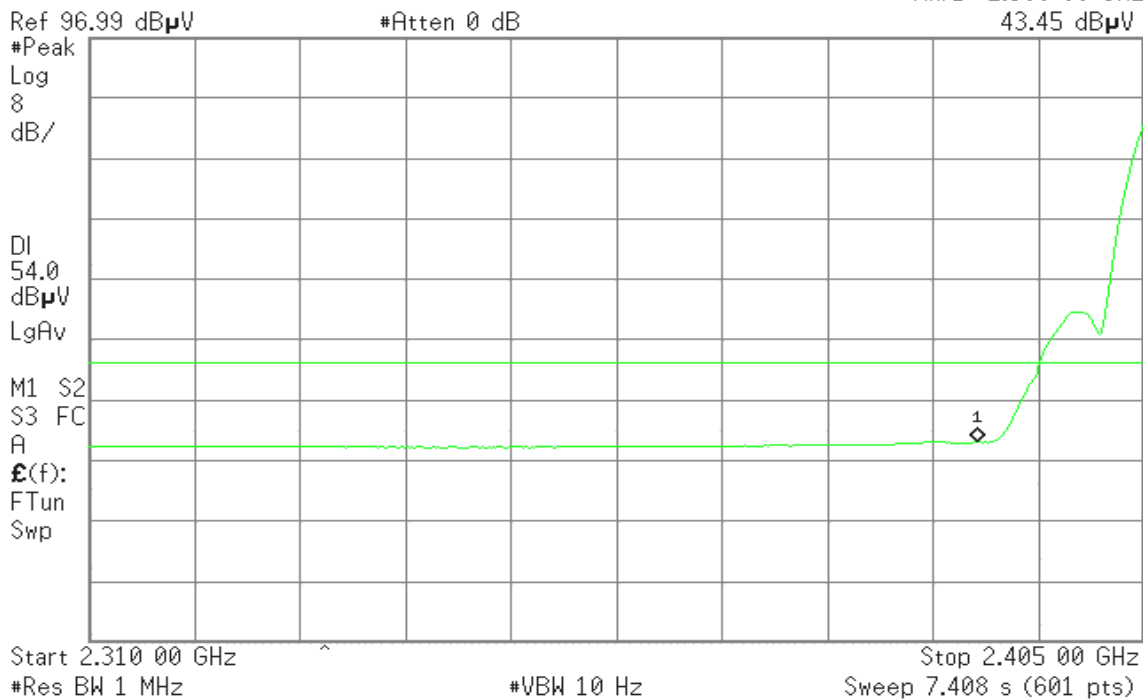
**Detector mode: Average**

**Polarity: Horizontal**

Agilent 10:37:08 Jul 4, 2006

T

Mkr1 2.390 00 GHz  
43.45 dBμV





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

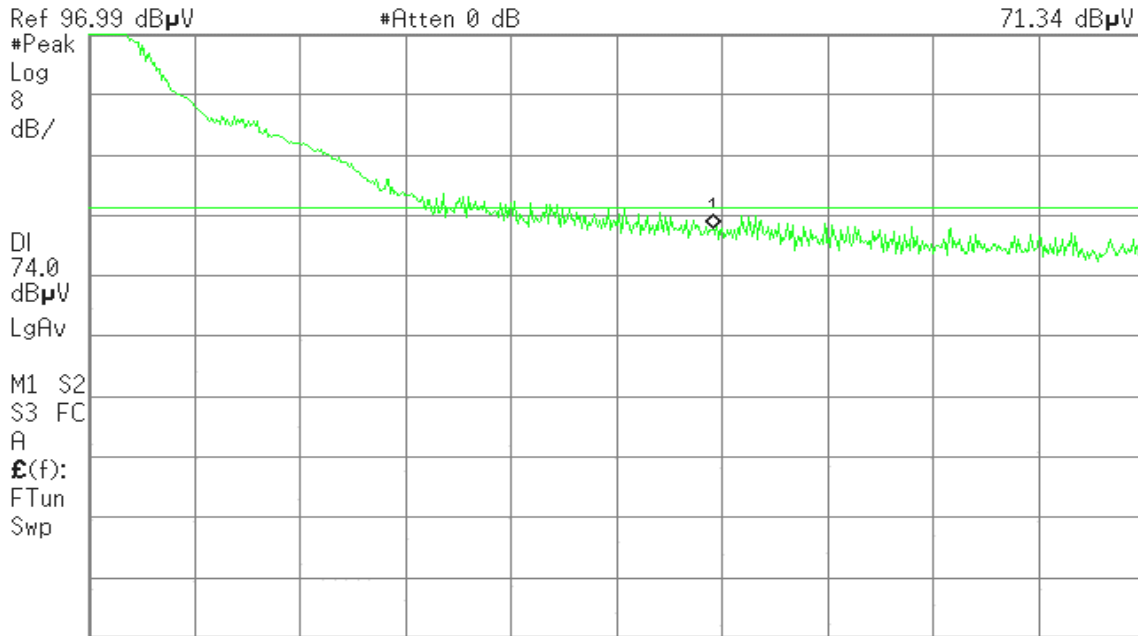
Detector mode: Peak

Polarity: Vertical

Agilent 10:47:34 Jul 4, 2006

T

Mkr1 2.487 75 GHz  
71.34 dB $\mu$ V



Start 2.470 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz VBW 1 MHz #Sweep 100 ms (601 pts)

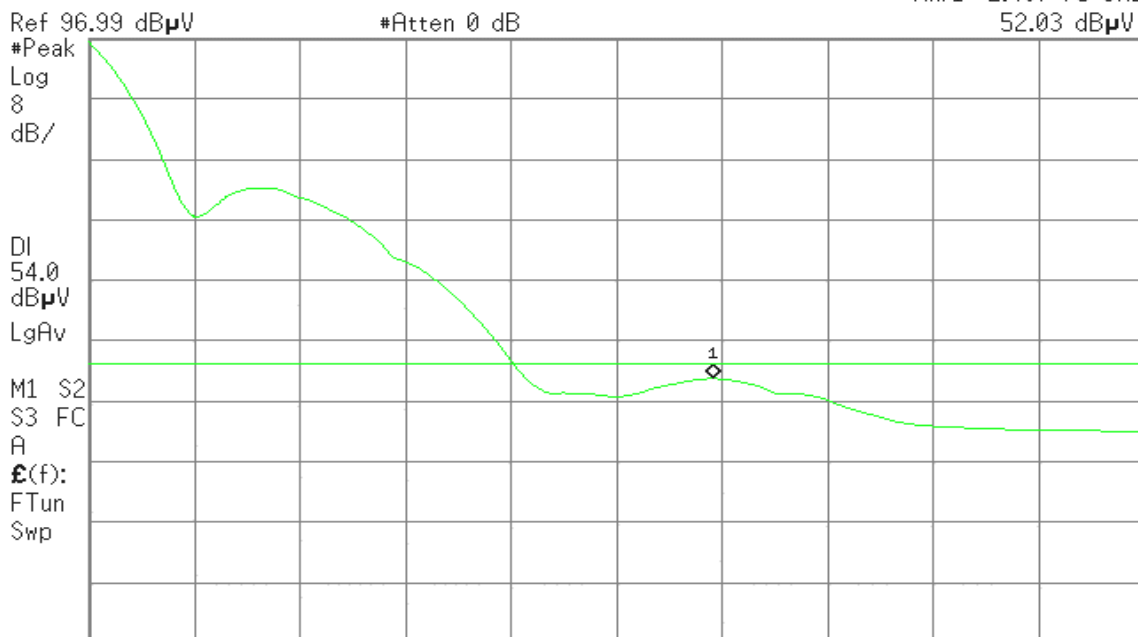
Detector mode: Average

Polarity: Vertical

Agilent 10:44:30 Jul 4, 2006

R T

Mkr1 2.487 75 GHz  
52.03 dB $\mu$ V



Start 2.470 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 2.339 s (601 pts)



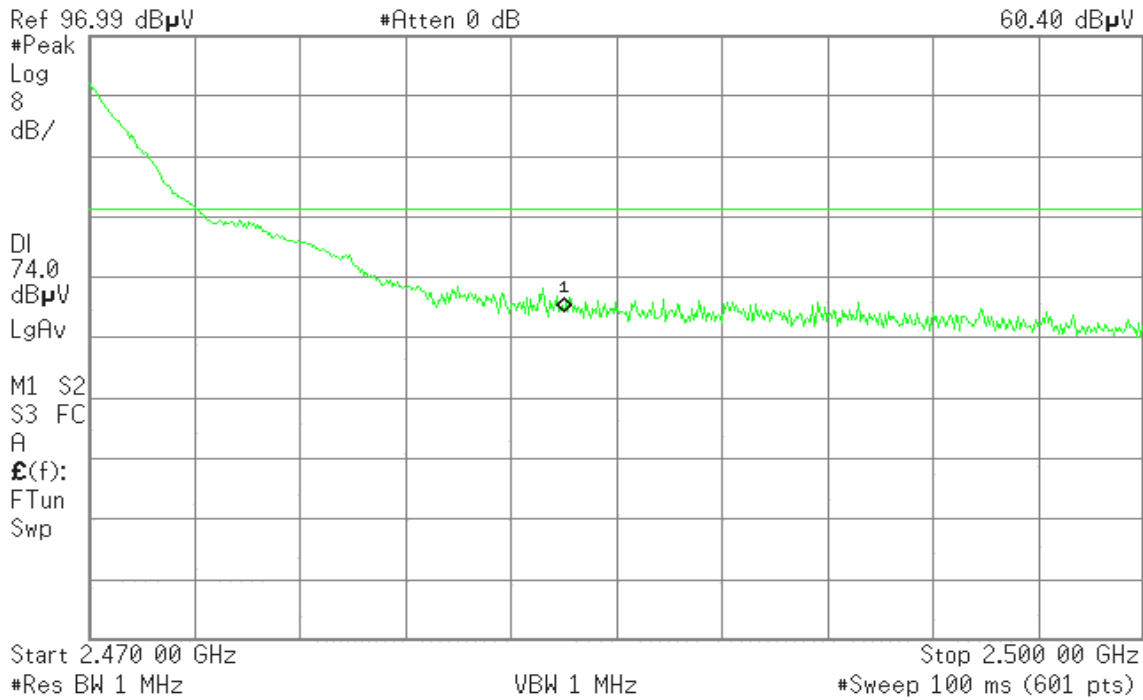
Detector mode: Peak

Polarity: Horizontal

Agilent 10:50:31 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
60.40 dBμV



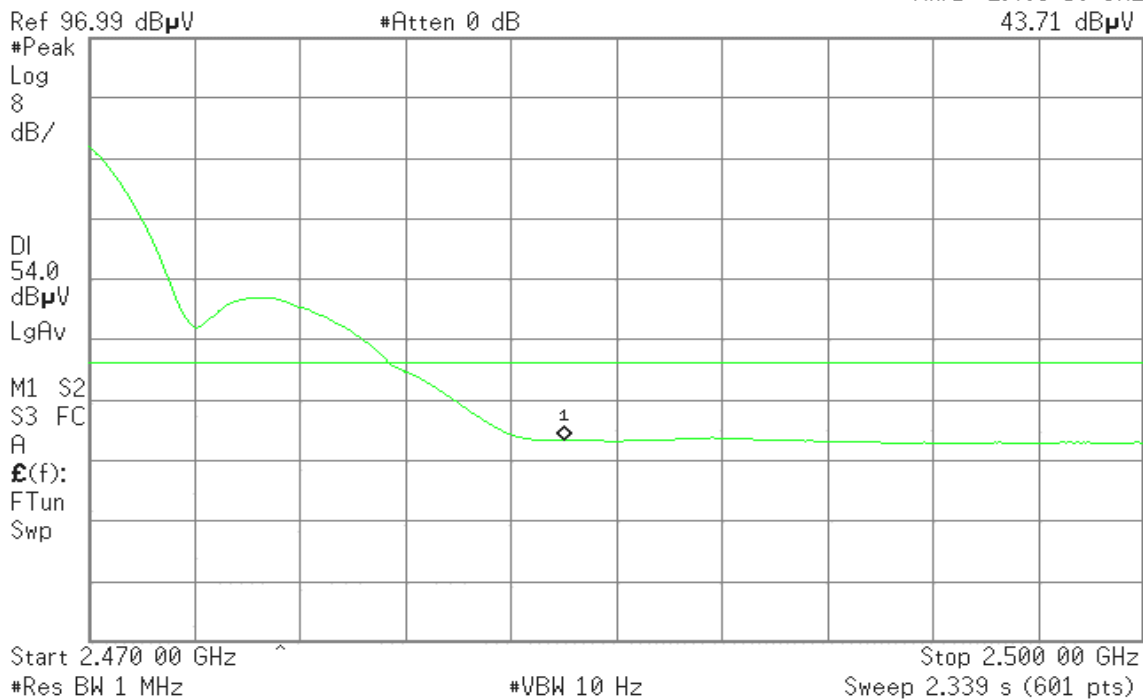
Detector mode: Average

Polarity: Horizontal

Agilent 10:49:20 Jul 4, 2006

T

Mkr1 2.483 50 GHz  
43.71 dBμV





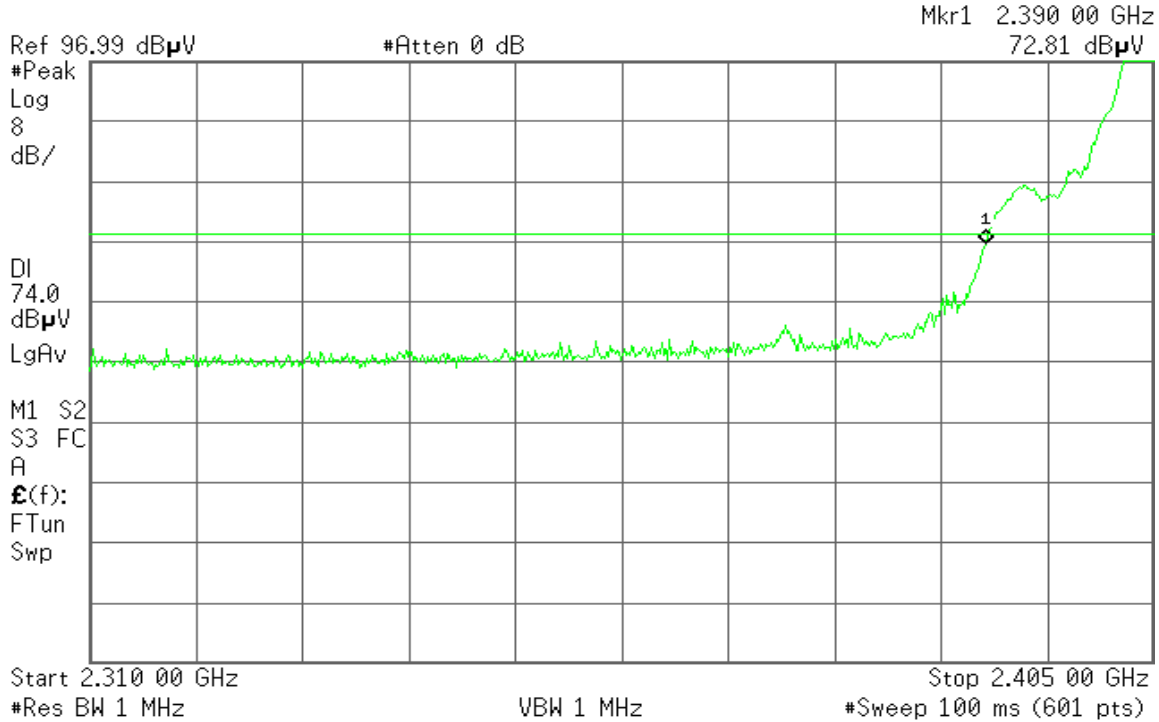
### Band Edges (IEEE 802.11g / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 20:10:26 Aug 17, 2006

T

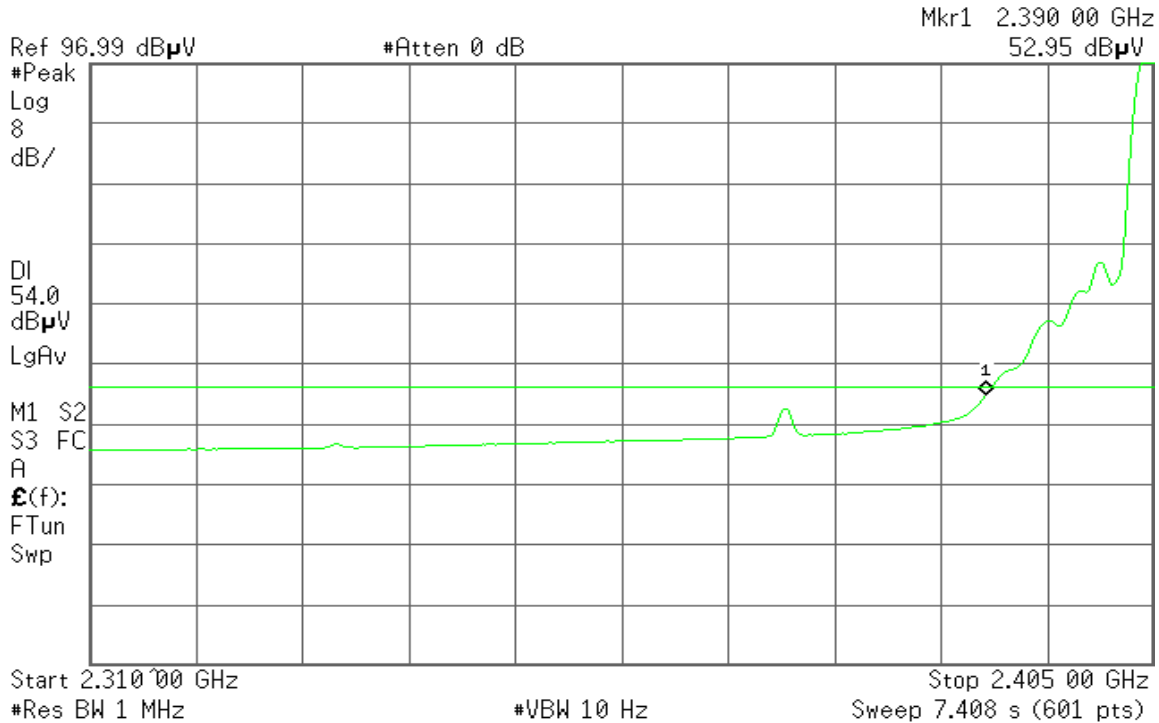


Detector mode: Average

Polarity: Vertical

Agilent 20:09:35 Aug 17, 2006

T



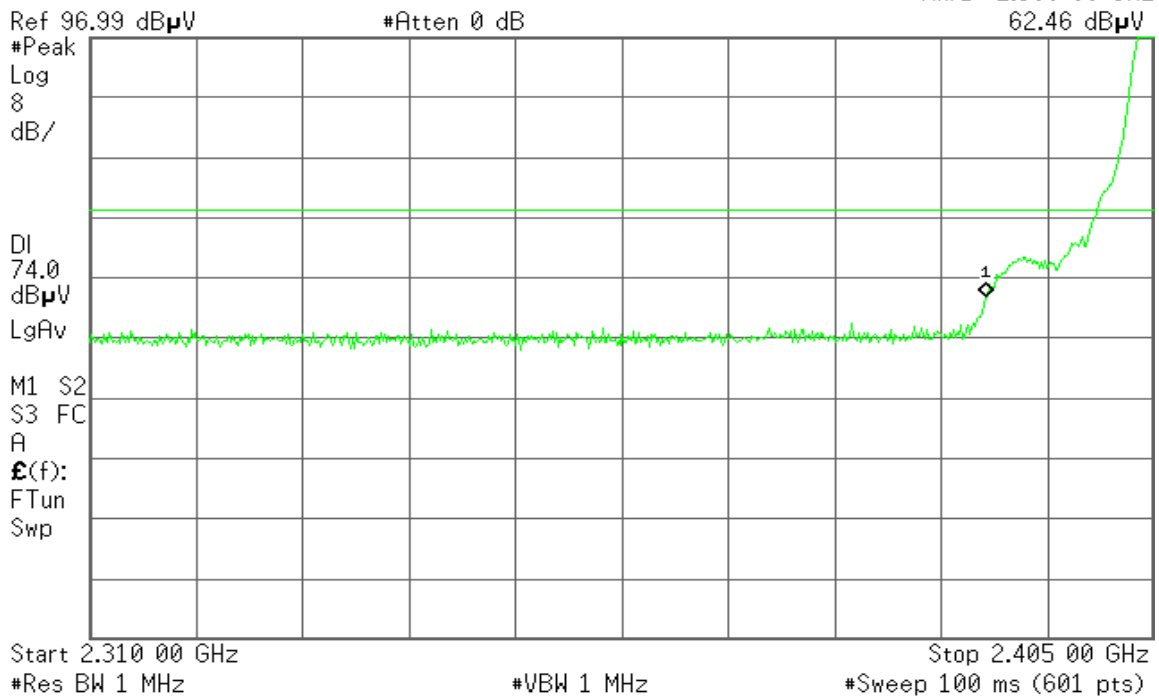


Detector mode: Peak

Polarity: Horizontal

Agilent 20:12:51 Aug 17, 2006

T

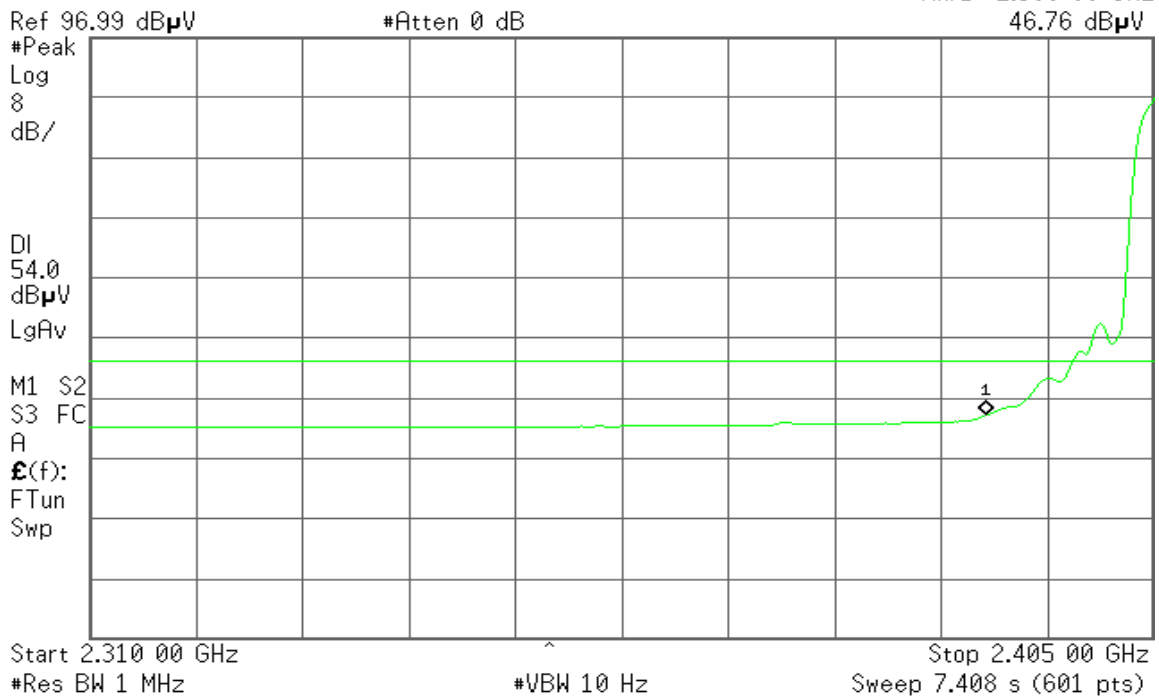


Detector mode: Average

Polarity: Horizontal

Agilent 20:12:28 Aug 17, 2006

T





### Band Edges (IEEE 802.11g / CH High)

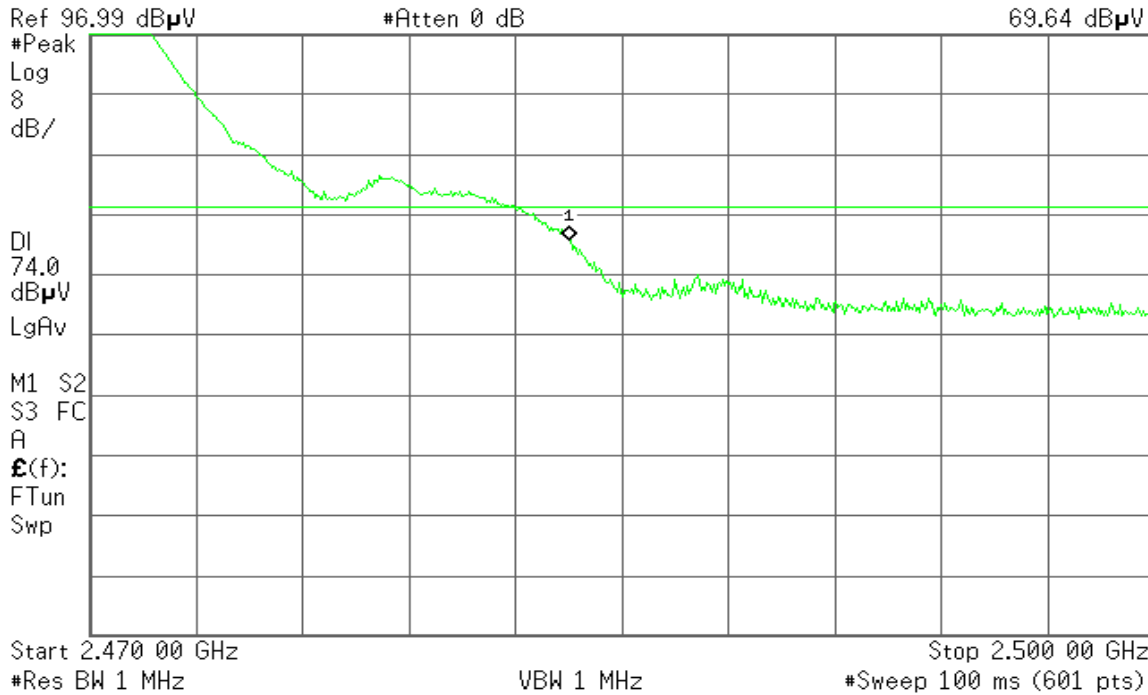
Detector mode: Peak

Polarity: Vertical

Agilent 21:01:11 Aug 17, 2006

R T

Mkr1 2.483 50 GHz  
69.64 dBμV



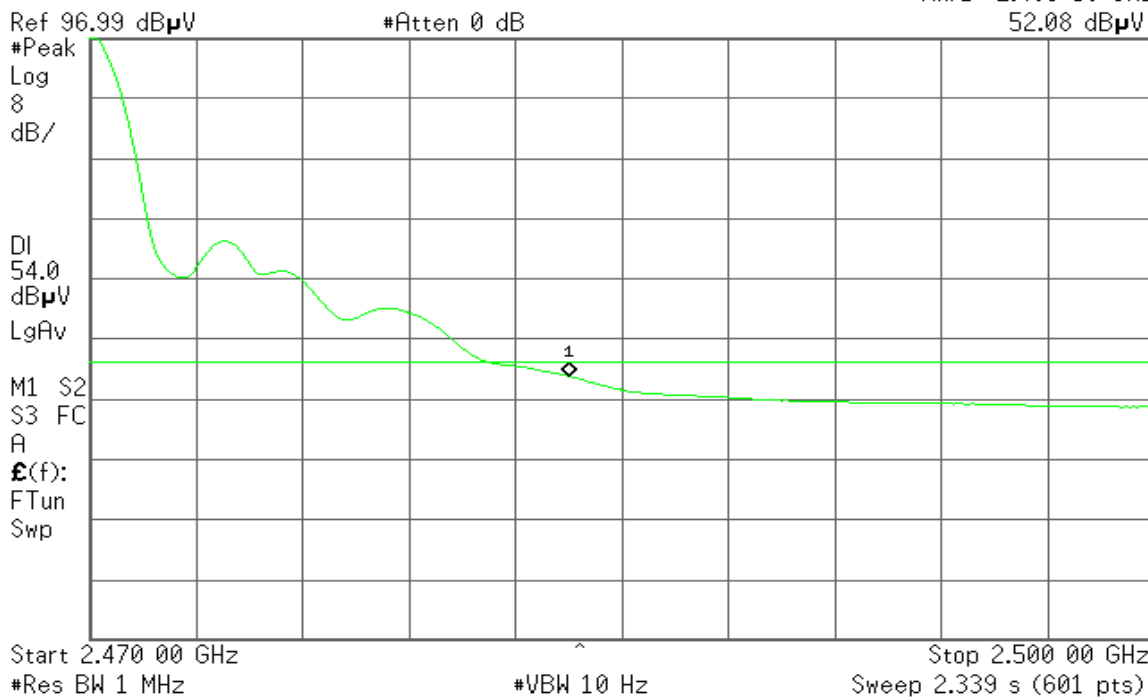
Detector mode: Average

Polarity: Vertical

Agilent 21:00:52 Aug 17, 2006

T

Mkr1 2.483 50 GHz  
52.08 dBμV





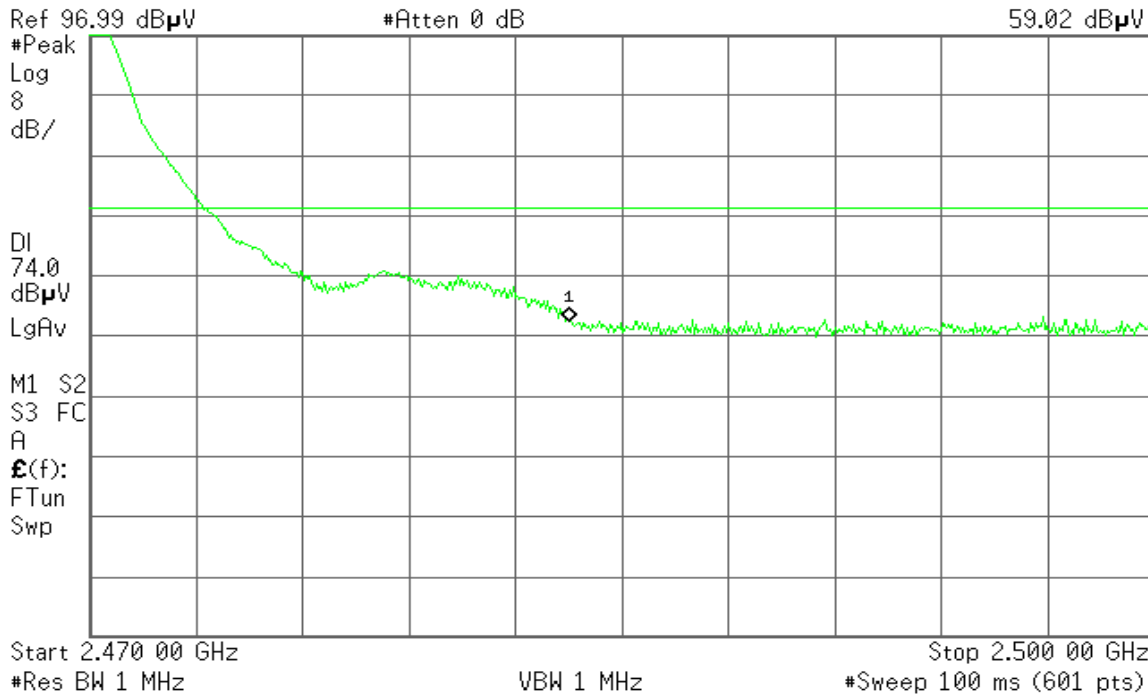
Detector mode: Peak

Polarity: Horizontal

Agilent 21:02:44 Aug 17, 2006

T

Mkr1 2.483 50 GHz  
59.02 dBμV



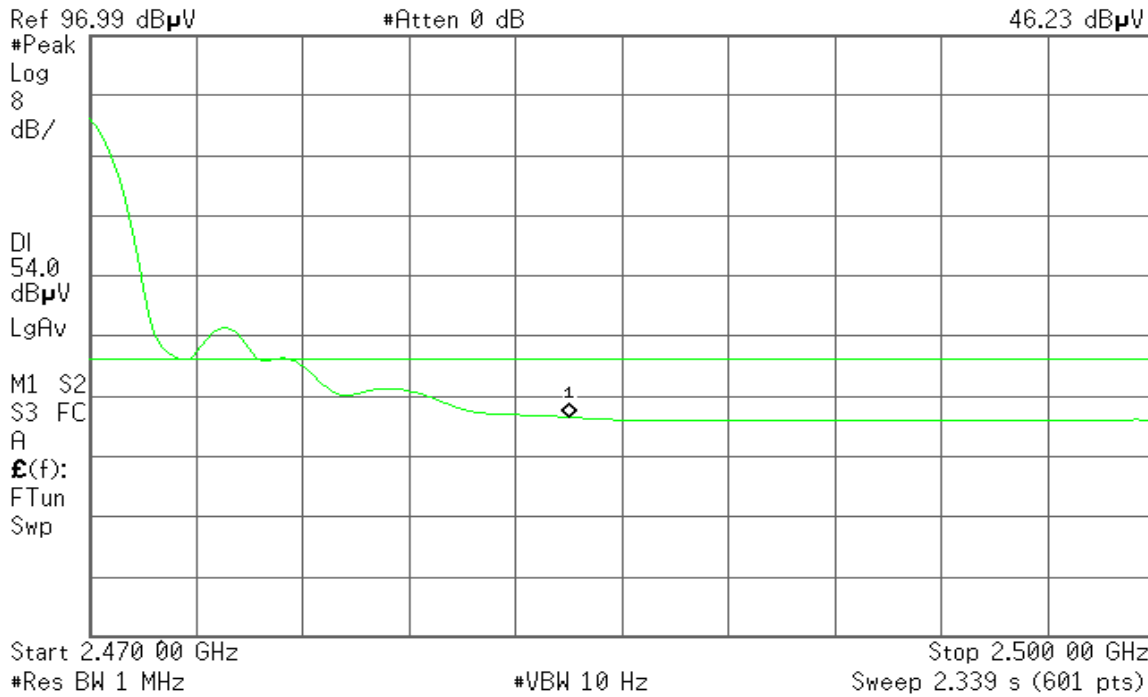
Detector mode: Average

Polarity: Horizontal

Agilent 21:02:15 Aug 17, 2006

R T

Mkr1 2.483 50 GHz  
46.23 dBμV



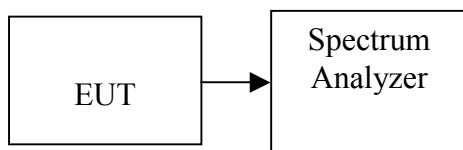


## 7.5 PEAK POWER SPECTRAL DENSITY

### 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 = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
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	-5.21	0	PASS
Mid	2437	-5.29		PASS
High	2462	-5.88		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-9.61	0	PASS
Mid	2437	-9.10		PASS
High	2462	-9.95		PASS

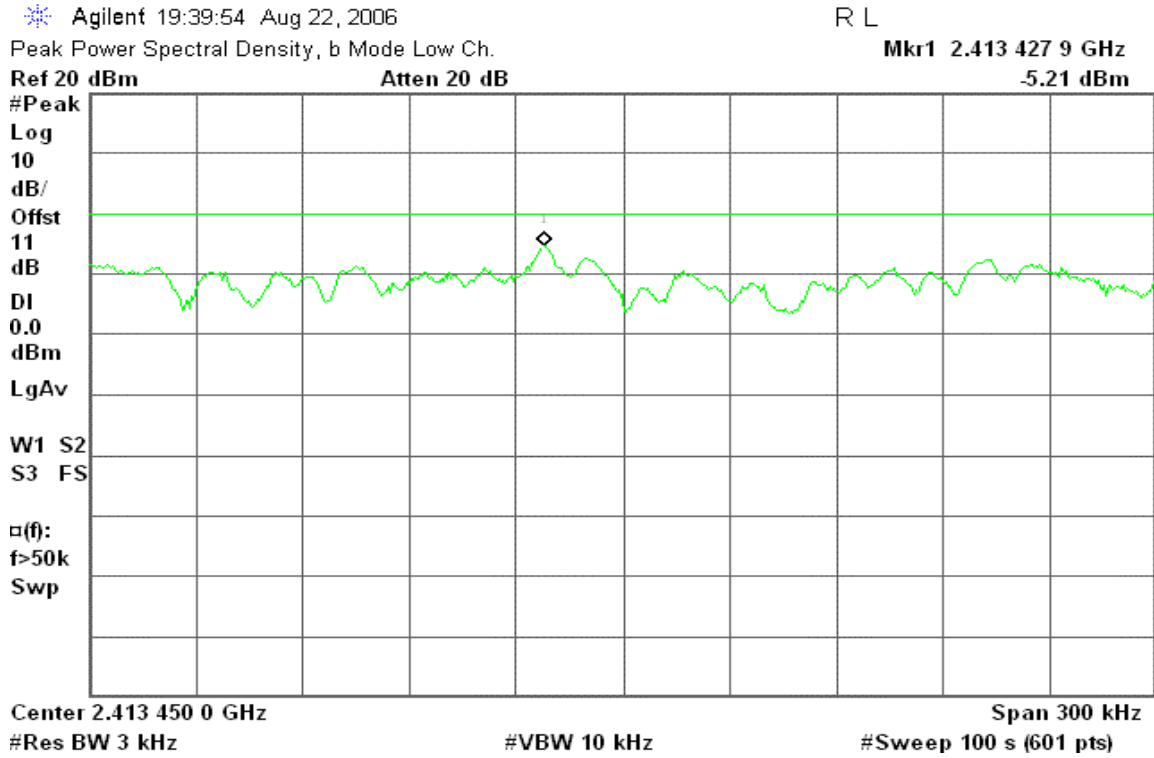
*Remark: The maximum antenna gain is 14 dBi; therefore the reduction due to antenna gain is 8 dB, so the limit is 0 dBm.*



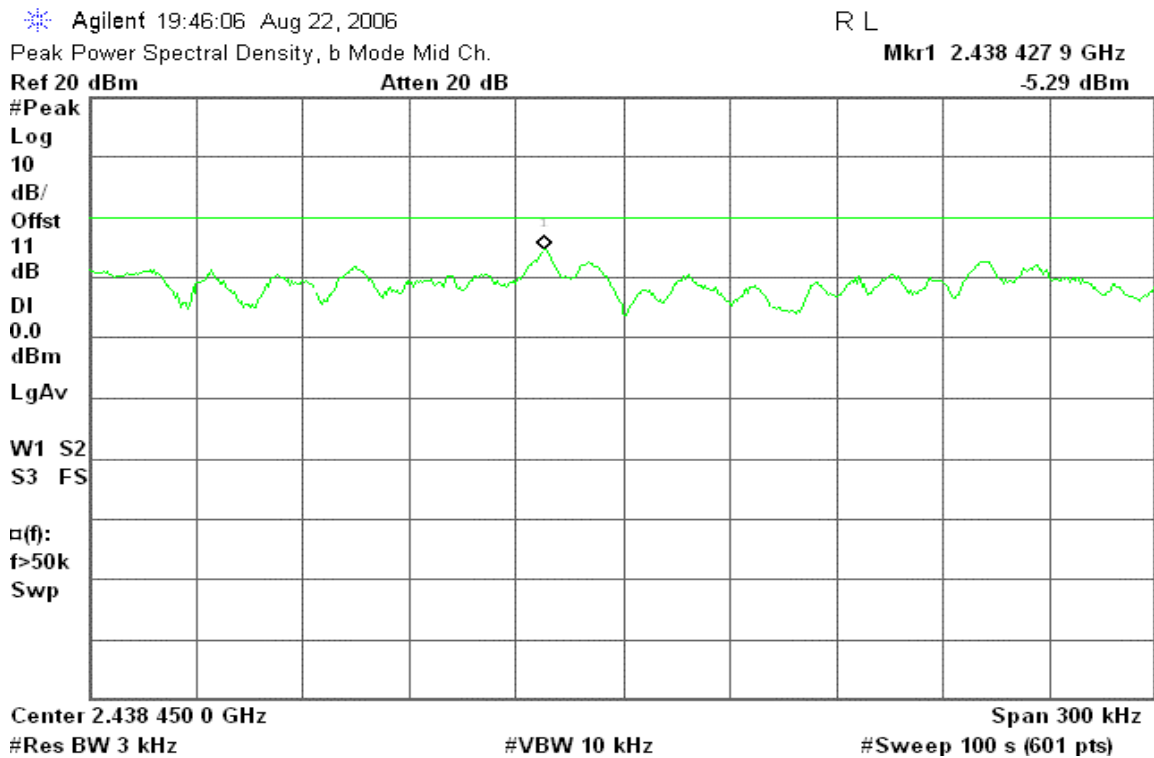
**Test Plot**

**IEEE 802.11b**

**PPSD (CH Low)**



**PPSD (CH Mid)**





### PPSD (CH High)

Agilent 19:59:58 Aug 22, 2006

Peak Power Spectral Density, b Mode High Ch.

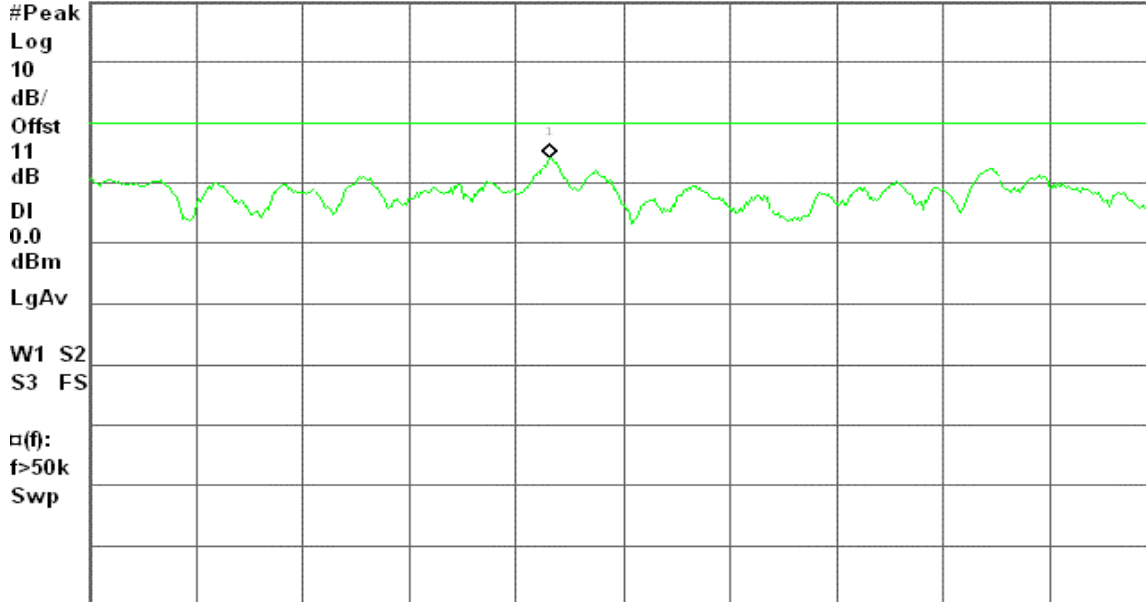
L

Mkr1 2.463 429 4 GHz

Ref 20 dBm

Atten 20 dB

-5.88 dBm



Center 2.463 450 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### IEEE 802.11g

### PPSD (CH Low)

Agilent 20:06:20 Aug 22, 2006

Peak Power Spectral Density, g Mode Low Ch.

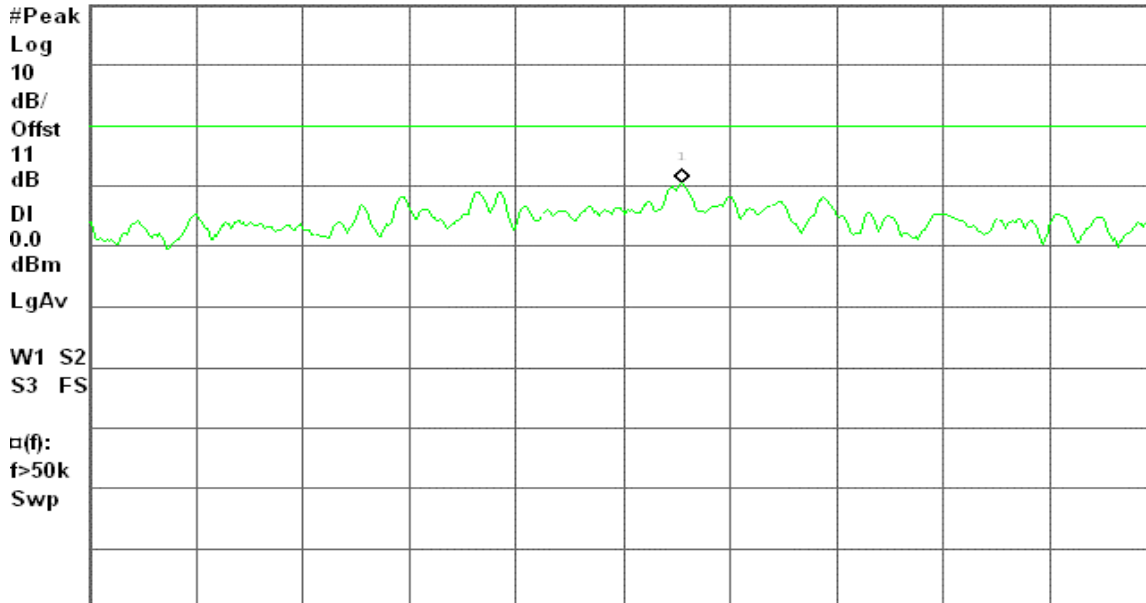
R L

Mkr1 2.418 266 6 GHz

Ref 20 dBm

Atten 20 dB

-9.61 dBm



Center 2.418 250 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### PPSD (CH Mid)

Agilent 20:16:57 Aug 22, 2006

R L

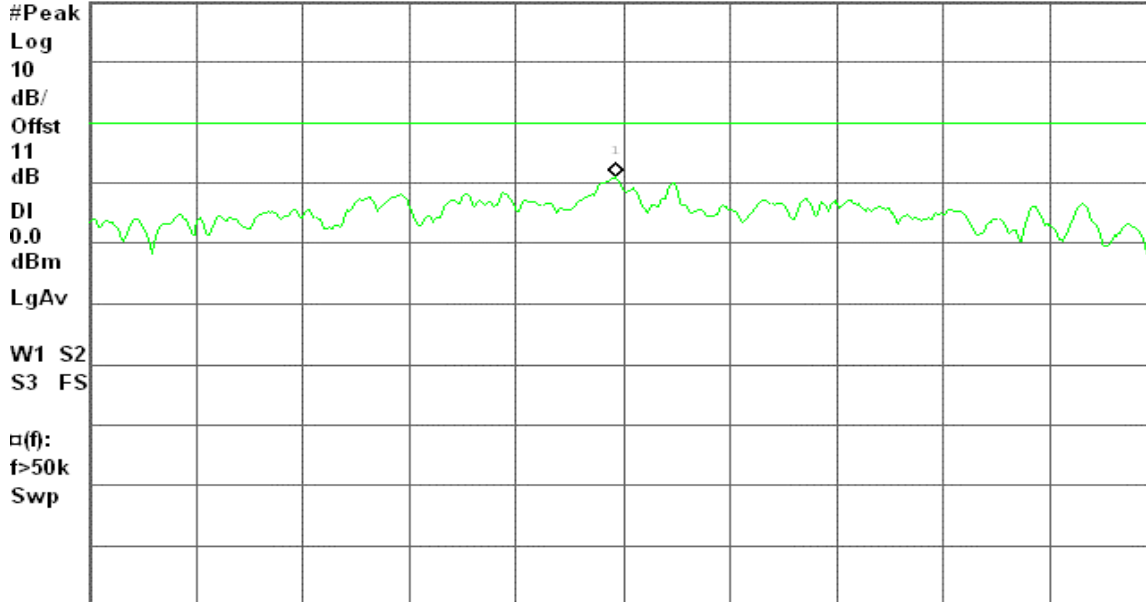
Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.441 997 5 GHz

Ref 20 dBm

Atten 20 dB

-8.98 dBm



Center 2.442 000 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### PPSD (CH High)

Agilent 20:28:02 Aug 22, 2006

R L

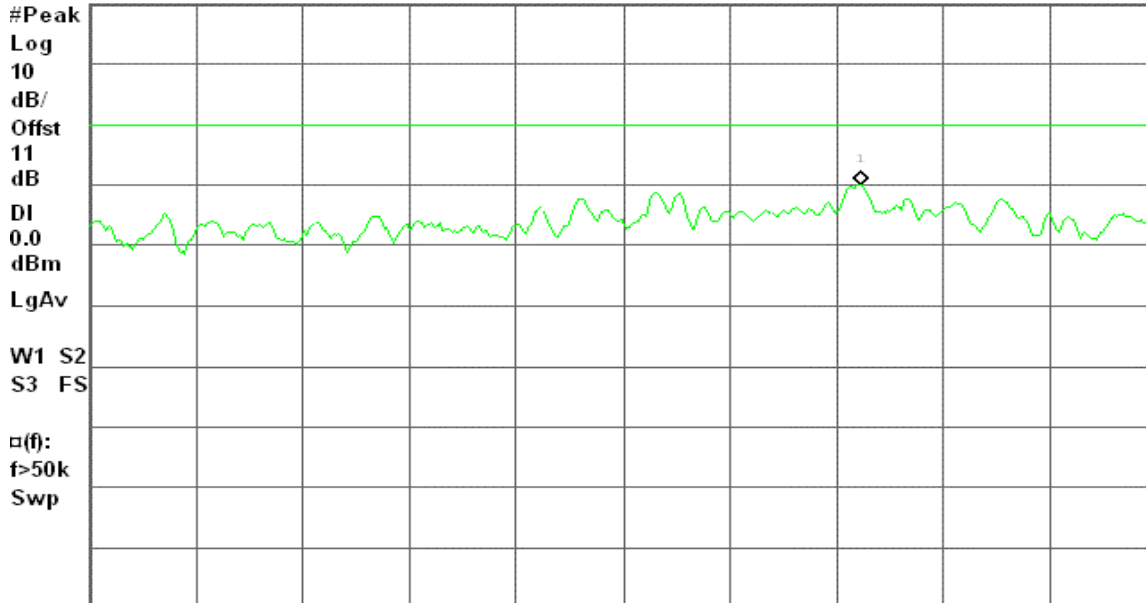
Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.468 267 1 GHz

Ref 20 dBm

Atten 20 dB

-9.95 dBm



Center 2.468 200 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



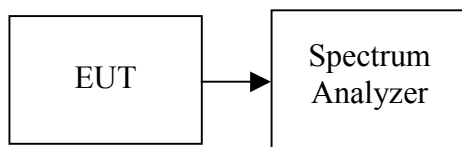
## 7.6 SPURIOUS EMISSIONS

### 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 with the transmitter set to the lowest, middle, and highest channels.

#### TEST RESULTS

*No non-compliance noted*



**Test Plot**

**IEEE 802.11b**

**CH Low**

Agilent 19:35:26 Aug 22, 2006

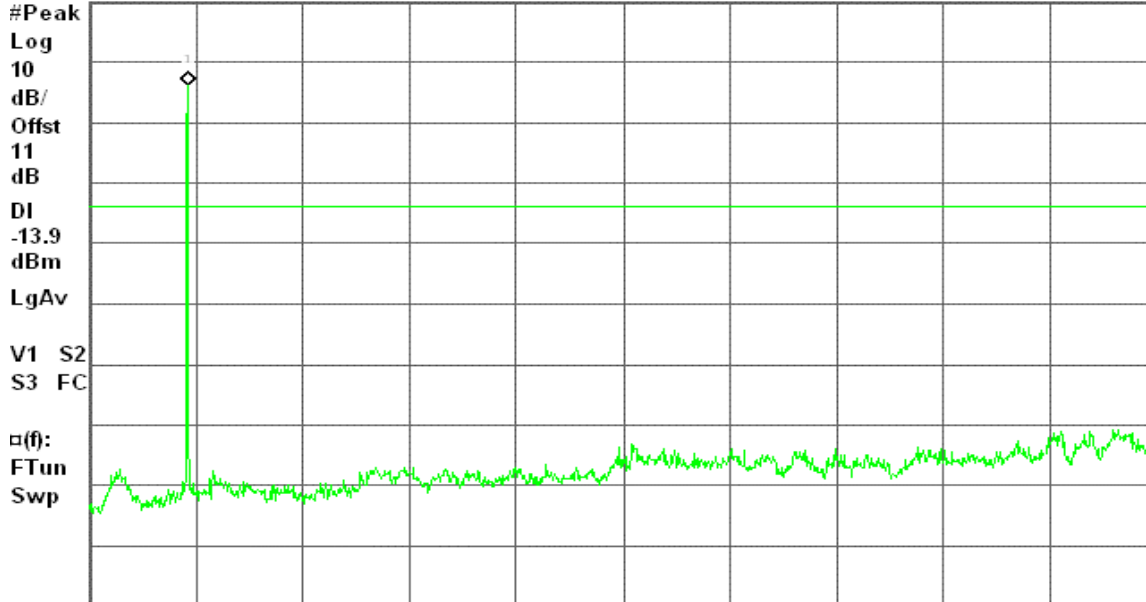
L

Spurious, b Mode Low Ch.

Mkr1 2.42 GHz  
6.12 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz  
#Res BW 100 kHz

#VBW 100 kHz

Span 25.97 GHz  
Sweep 3.131 s (1001 pts)

**CH Mid**

Agilent 19:47:03 Aug 22, 2006

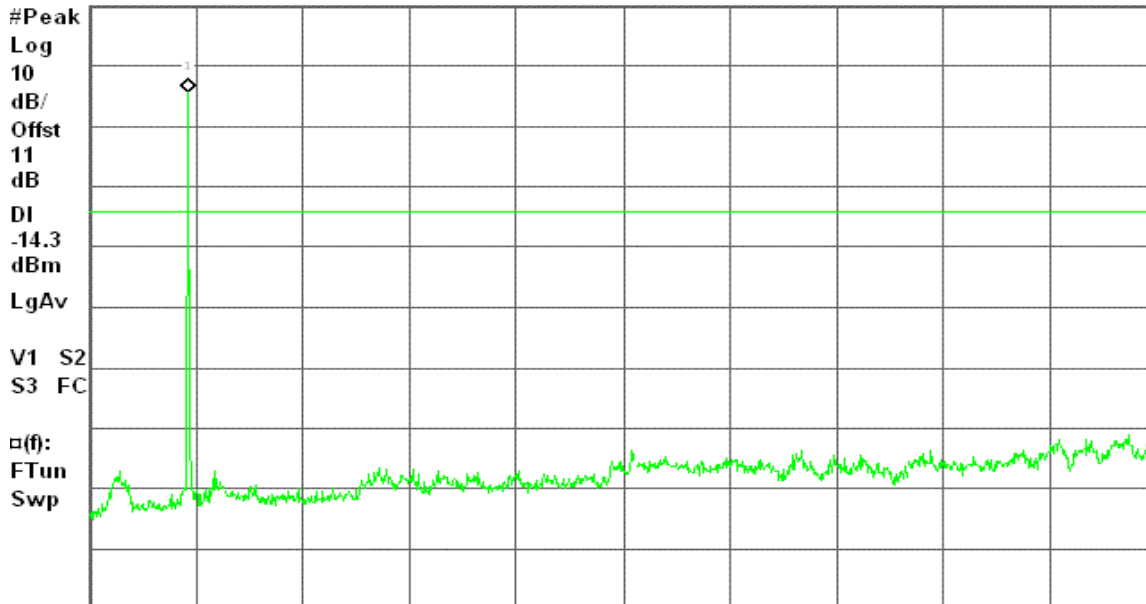
R L

Spurious, b Mode Mid Ch.

Mkr1 2.45 GHz  
5.72 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz  
#Res BW 100 kHz

#VBW 100 kHz

Span 25.97 GHz  
Sweep 3.131 s (1001 pts)



### CH High

Agilent 19:55:12 Aug 22, 2006

L

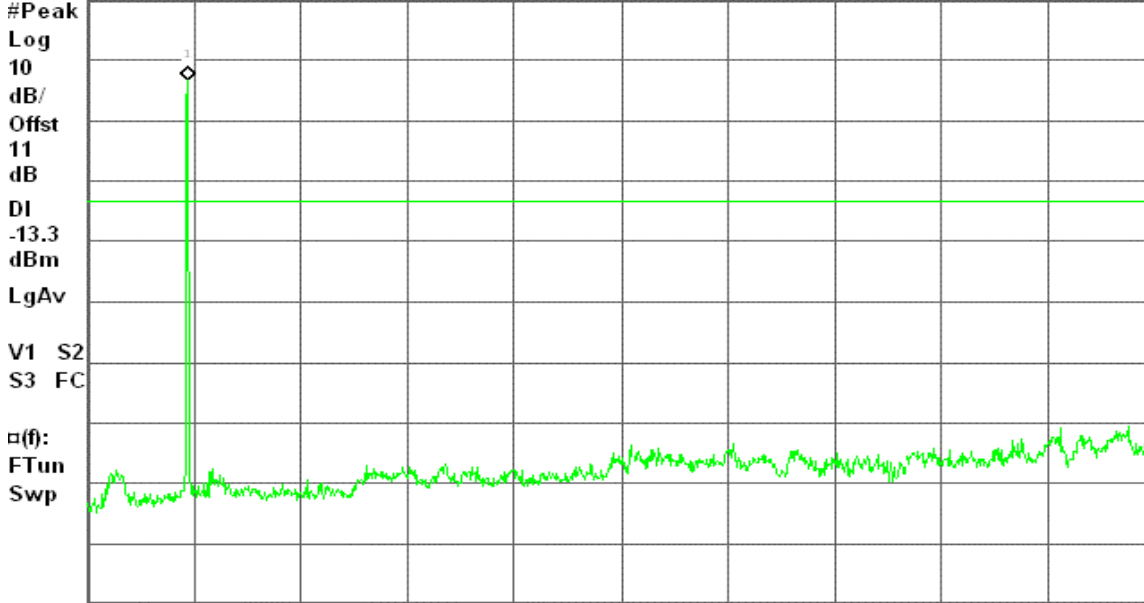
Spurious, b Mode High Ch.

Mkr1 2.47 GHz

Ref 20 dBm

Atten 20 dB

6.66 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

### IEEE 802.11g

#### CH Low

Agilent 20:07:24 Aug 22, 2006

L

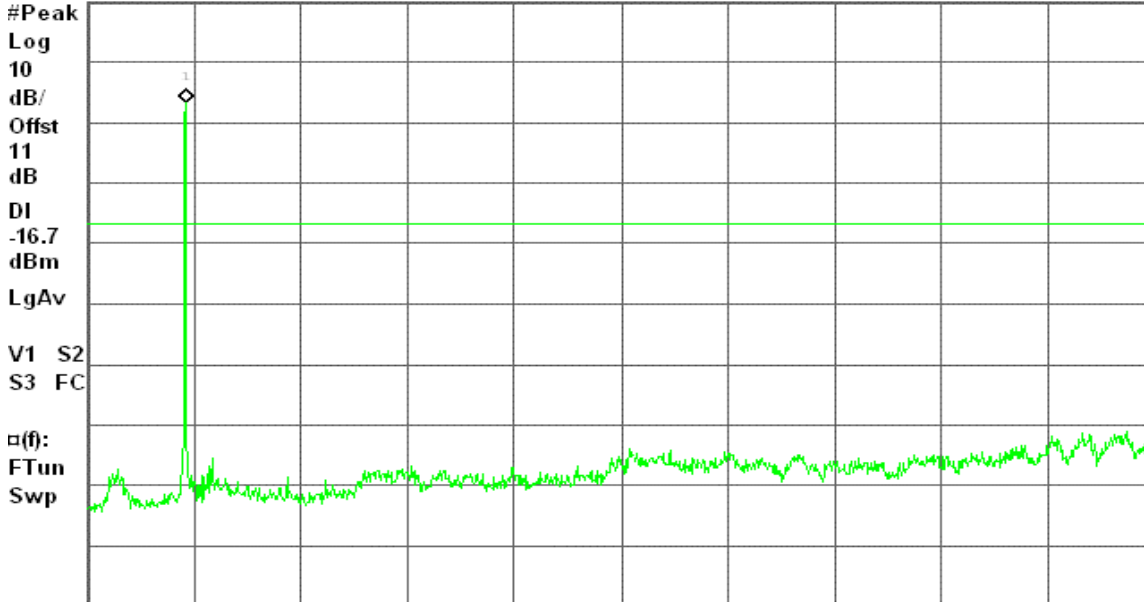
Spurious, g Mode Low Ch.

Mkr1 2.42 GHz

Ref 20 dBm

Atten 20 dB

3.28 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)





### CH Mid

Agilent 20:17:49 Aug 22, 2006

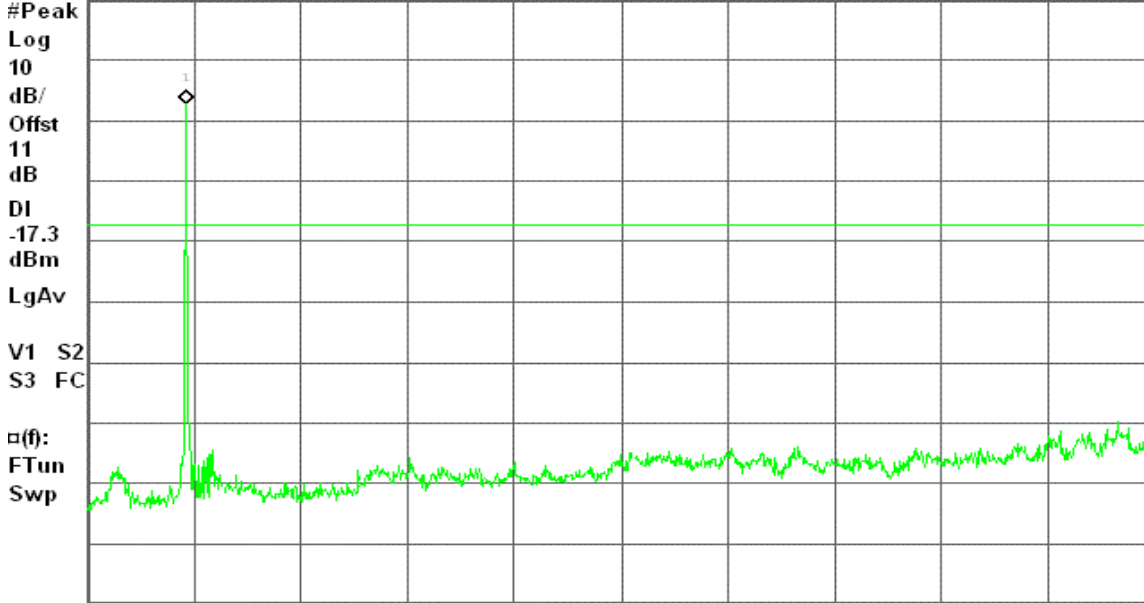
L

Spurious, g Mode Mid Ch.

Mkr1 2.45 GHz  
2.66 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

### CH High

Agilent 20:28:56 Aug 22, 2006

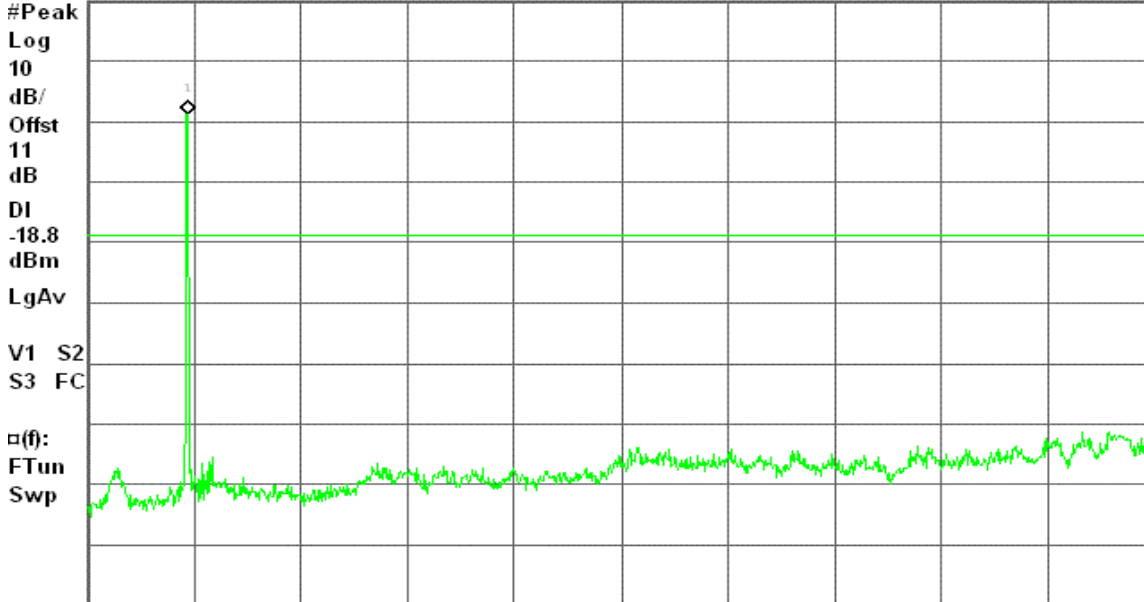
L

Spurious, g Mode High Ch.

Mkr1 2.47 GHz  
1.19 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



## 7.6.2 RADIATED EMISSIONS

### LIMIT

1. According to §15.209(a), 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 ( $\mu\text{V/m}$ )	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

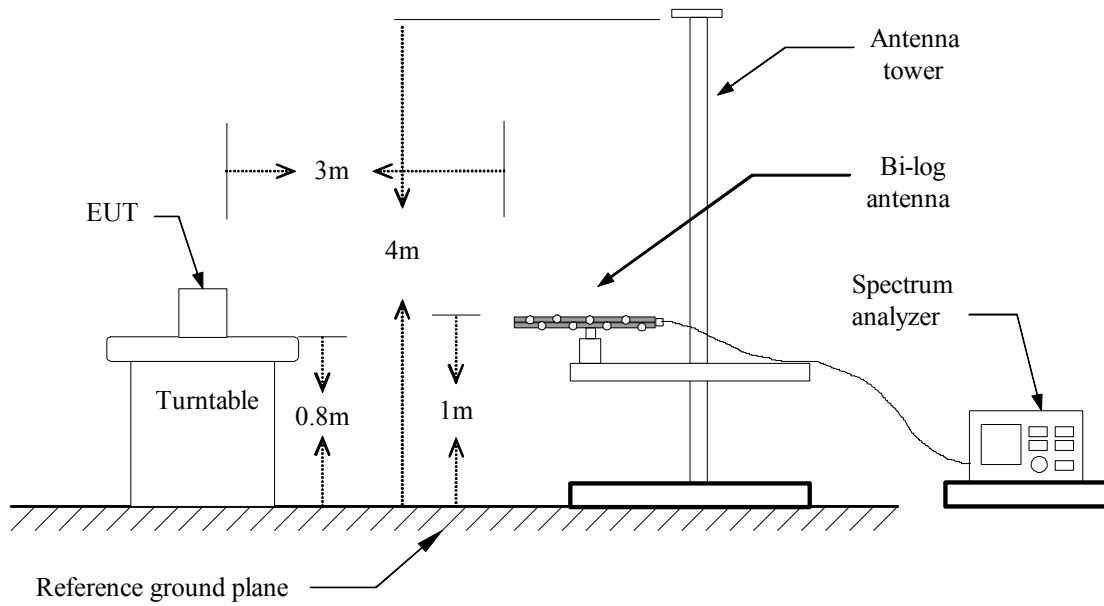
*Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

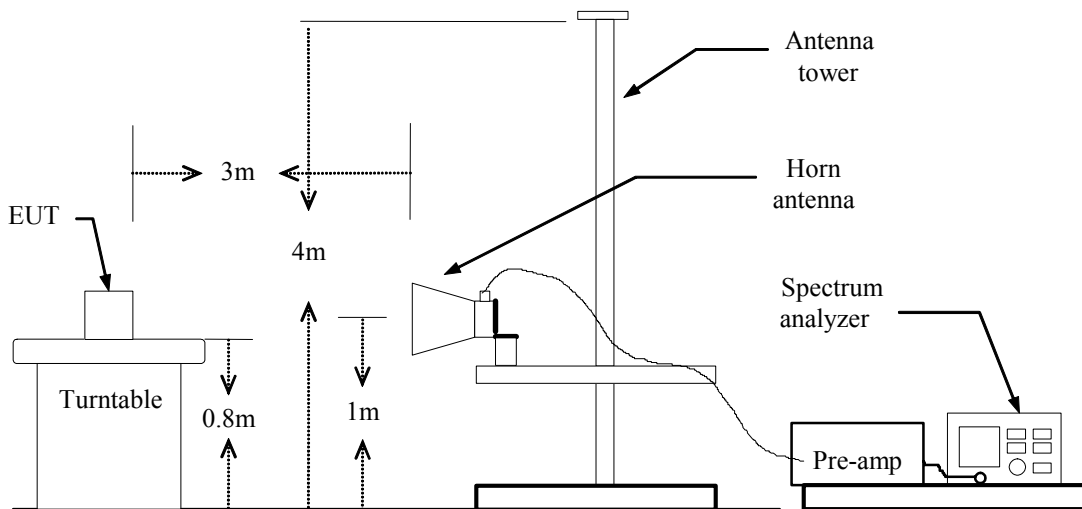
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### 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.

**TEST RESULTS****Below 1GHz****Operation Mode:** Normal Link**Test Date:** July 11, 2006**Temperature:** 25°C**Tested by:** Bruce Chen**Humidity:** 55% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
47.78	V	56.51	-17.04	39.47	40.00	-0.53	QP
78.50	V	53.89	-18.45	35.44	40.00	-4.56	QP
359.80	V	50.55	-10.15	40.39	46.00	-5.61	Peak
487.52	V	39.73	-7.43	32.30	46.00	-13.70	QP
498.83	V	33.40	-7.13	26.27	46.00	-19.73	QP
597.45	V	45.84	-5.43	40.40	46.00	-5.60	Peak
107.60	H	52.17	-13.85	38.32	43.50	-5.18	Peak
379.20	H	49.07	-9.71	39.36	46.00	-6.64	Peak
485.90	H	48.05	-7.47	40.58	46.00	-5.42	Peak
511.77	H	47.41	-6.83	40.58	46.00	-5.42	Peak
540.87	H	46.91	-6.15	40.76	46.00	-5.24	Peak
755.88	H	41.80	-2.91	38.89	46.00	-7.11	Peak

**Remark:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz 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).



**External Antenna: Dipole Antenna**

**Above 1 GHz**

**Operation Mode:** TX / IEEE 802.11b / CH Low

**Test Date:** July 4, 2006

**Temperature:** 23°C

**Tested by:** James Yu

**Humidity:** 48 % 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
1326.67	V	21.49	---	27.55	49.04	---	74.00	54.00	-4.96	Peak
4825.00	V	47.63	---	0.39	48.02	---	74.00	54.00	-5.98	Peak
N/A										
1353.33	H	20.81	---	27.55	48.37	---	74.00	54.00	-5.63	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH Mid

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1330.00	V	21.30	---	27.55	48.85	---	74.00	54.00	-5.15	Peak
4875.00	V	61.20	48.29	0.38	61.58	48.67	74.00	54.00	-5.33	AVG
7308.33	V	46.15	---	4.49	50.64	---	74.00	54.00	-3.36	Peak
N/A										
1313.33	H	20.88	---	27.55	48.42	---	74.00	54.00	-5.58	Peak
4875.00	H	46.40	---	0.38	46.78	---	74.00	54.00	-7.22	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH High

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1330.00	V	20.34	---	27.55	47.89	---	74.00	54.00	-6.11	Peak
4925.00	V	61.63	46.61	0.38	62.01	46.99	74.00	54.00	-7.01	AVG
7383.33	V	58.82	35.48	4.39	63.21	39.87	74.00	54.00	-14.13	AVG
N/A										
1350.00	H	21.34	---	27.55	48.89	---	74.00	54.00	-5.11	Peak
4925.00	H	46.98	---	0.38	47.36	---	74.00	54.00	-6.64	Peak
7383.33	H	43.78	---	4.39	48.18	---	74.00	54.00	-5.82	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).





Operation Mode: TX / IEEE 802.11g / CH Low

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1293.33	V	22.15	---	27.54	49.70	---	74.00	54.00	-4.30	Peak
4825.00	V	44.48	---	0.39	44.87	---	74.00	54.00	-9.13	Peak
N/A										
1293.33	H	20.35	---	27.54	47.89	---	74.00	54.00	-6.11	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11g / CH Mid

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1306.67	V	20.67	---	27.55	48.21	---	74.00	54.00	-5.79	Peak
3083.33	V	44.91	---	-2.31	42.60	---	74.00	54.00	-11.40	Peak
N/A										
1306.67	H	20.28	---	27.55	47.83	---	74.00	54.00	-6.17	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11g / CH High

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1303.33	V	21.19	---	27.54	48.74	---	74.00	54.00	-5.26	Peak
N/A										
1303.33	H	21.42	---	27.54	48.96	---	74.00	54.00	-5.04	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Internal Antenna: Panel Antenna**

**Above 1 GHz**

**Operation Mode:** TX / IEEE 802.11b / CH Low

**Test Date:** July 4, 2006

**Temperature:** 23°C

**Tested by:** James Yu

**Humidity:** 48 % 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
1320.00	V	19.66	---	27.55	47.21	---	74.00	54.00	-6.79	Peak
3041.67	V	48.30	---	-2.40	45.91	---	74.00	54.00	-8.09	Peak
3083.33	V	44.63	---	-2.31	42.32	---	74.00	54.00	-11.68	Peak
4825.00	V	45.17	---	0.39	45.56	---	74.00	54.00	-8.44	Peak
N/A										
1320.00	H	19.82	---	27.55	47.37	---	74.00	54.00	-6.63	Peak
3041.67	H	46.52	---	-2.40	44.12	---	74.00	54.00	-9.88	Peak
3083.33	H	45.55	---	-2.31	43.24	---	74.00	54.00	-10.76	Peak
4825.00	H	45.57	---	0.39	45.96	---	74.00	54.00	-8.04	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH Mid

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1346.67	V	19.92	---	27.55	47.48	---	74.00	54.00	-6.52	Peak
3041.67	V	48.25	---	-2.40	45.86	---	74.00	54.00	-8.14	Peak
3083.33	V	45.85	---	-2.31	43.54	---	74.00	54.00	-10.46	Peak
N/A										
1346.67	H	19.32	---	27.55	46.87	---	74.00	54.00	-7.13	Peak
3041.67	H	46.96	---	-2.40	44.56	---	74.00	54.00	-9.44	Peak
3083.33	H	46.08	---	-2.31	43.76	---	74.00	54.00	-10.24	Peak
4875.00	H	50.28	---	0.38	50.67	---	74.00	54.00	-3.33	Peak
7308.33	H	44.72	---	4.49	49.21	---	74.00	54.00	-4.79	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH High

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1303.33	V	19.65	---	27.54	47.20	---	74.00	54.00	-6.80	Peak
3041.67	V	48.49	---	-2.40	46.10	---	74.00	54.00	-7.90	Peak
3083.33	V	45.45	---	-2.31	43.14	---	74.00	54.00	-10.86	Peak
3175.00	V	43.87	---	-2.13	41.75	---	74.00	54.00	-12.25	Peak
N/A										
1303.33	H	20.44	---	27.54	47.98	---	74.00	54.00	-6.02	Peak
3041.67	H	47.56	---	-2.40	45.16	---	74.00	54.00	-8.84	Peak
3083.33	H	46.02	---	-2.31	43.71	---	74.00	54.00	-10.29	Peak
4925.00	H	48.40	---	0.38	48.77	---	74.00	54.00	-5.23	Peak
7383.33	H	43.77	---	4.39	48.16	---	74.00	54.00	-5.84	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11g / CH Low

Test Date: August 22, 2006

Temperature: 22°C

Tested by: James Yu

Humidity: 50 % 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
3041.67	V	52.05	---	-7.28	44.78	---	74.00	54.00	-9.22	Peak
3083.33	V	43.76	---	-7.23	36.54	---	74.00	54.00	-17.46	Peak
3441.67	V	42.76	---	-6.78	35.98	---	74.00	54.00	-18.02	Peak
N/A										
1266.67	H	19.74	---	30.80	50.54	---	74.00	54.00	-3.46	Peak
3041.67	H	51.05	---	-7.28	43.77	---	74.00	54.00	-10.23	Peak
3083.33	H	43.93	---	-7.23	36.70	---	74.00	54.00	-17.30	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11g / CH Mid

Test Date: August 22, 2006

Temperature: 22°C

Tested by: James Yu

Humidity: 50 % 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
1243.33	V	20.21	---	30.80	51.01	---	74.00	54.00	-2.99	Peak
3041.67	V	51.59	---	-7.28	44.32	---	74.00	54.00	-9.68	Peak
3083.33	V	42.70	---	-7.23	35.47	---	74.00	54.00	-18.53	Peak
N/A										
1273.33	H	19.58	---	30.80	50.38	---	74.00	54.00	-3.62	Peak
3041.67	H	51.65	---	-7.28	44.37	---	74.00	54.00	-9.63	Peak
3116.67	H	43.38	---	-7.19	36.20	---	74.00	54.00	-17.80	Peak
3166.67	H	43.19	---	-7.12	36.07	---	74.00	54.00	-17.93	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).





Operation Mode: TX / IEEE 802.11g / CH High

Test Date: July 4, 2006

Temperature: 23°C

Tested by: James Yu

Humidity: 48 % 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
1203.33	V	19.32	---	30.80	50.12	---	74.00	54.00	-3.88	Peak
3000.00	V	46.76	---	-7.33	39.43	---	74.00	54.00	-14.57	Peak
3041.67	V	53.53	---	-7.28	46.25	---	74.00	54.00	-7.75	Peak
3908.33	V	42.95	---	-6.33	36.63	---	74.00	54.00	-17.37	Peak
N/A										
1266.67	H	19.63	---	30.80	50.43	---	74.00	54.00	-3.57	Peak
3041.67	H	53.35	---	-7.28	46.07	---	74.00	54.00	-7.93	Peak
3083.33	H	43.46	---	-7.23	36.23	---	74.00	54.00	-17.77	Peak
3116.67	H	43.84	---	-7.19	36.65	---	74.00	54.00	-17.35	Peak
3925.00	H	42.95	---	-6.31	36.63	---	74.00	54.00	-17.37	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. 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:** July 7, 2006  
**Temperature:** 25°C                                      **Tested by:** Eric Cheng  
**Humidity:** 55% 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
0.284	42.260	38.580	0.100	42.360	38.680	60.698	50.698	-18.338	-12.018	L1
0.423	44.460	43.090	0.100	44.560	43.190	57.389	47.389	-12.829	-4.199	L1
0.563	42.740	39.030	0.100	42.840	39.130	56.000	46.000	-13.160	-6.870	L1
1.135	42.920	38.630	0.100	43.020	38.730	56.000	46.000	-12.980	-7.270	L1
1.488	41.150	36.070	0.100	41.250	36.170	56.000	46.000	-14.750	-9.830	L1
16.378	24.760	22.380	0.910	25.670	23.290	60.000	50.000	-34.330	-26.710	L1
0.281	44.220	39.790	0.100	44.320	39.890	60.786	50.786	-16.466	-10.896	L2
0.423	46.140	43.160	0.100	46.240	43.260	57.389	47.389	-11.149	-4.129	L2
0.496	45.130	44.030	0.100	45.230	44.130	56.067	46.067	-10.837	-1.937	L2
1.488	42.000	39.860	0.100	42.100	39.960	56.000	46.000	-13.900	-6.040	L2
5.455	29.530	27.400	0.245	29.775	27.645	60.000	50.000	-30.225	-22.355	L2
16.777	26.680	24.460	0.942	27.622	25.402	60.000	50.000	-32.378	-24.598	L2

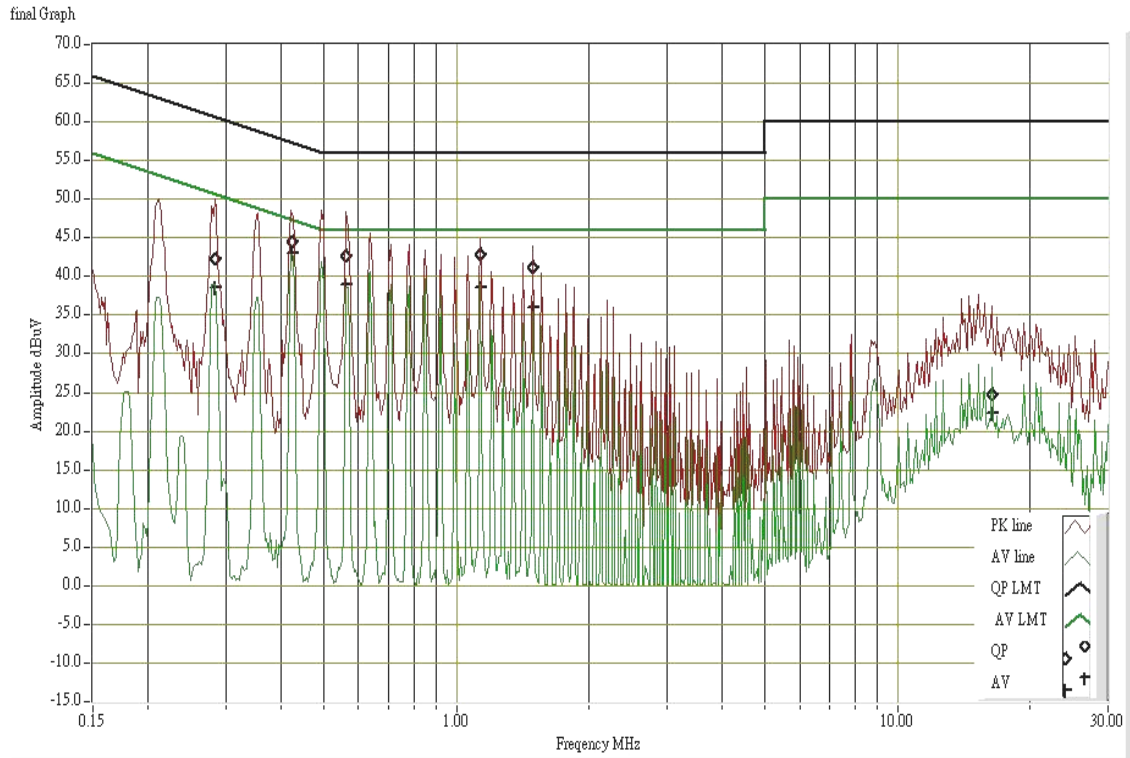
***Remark:***

- 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 and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;*
- 4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

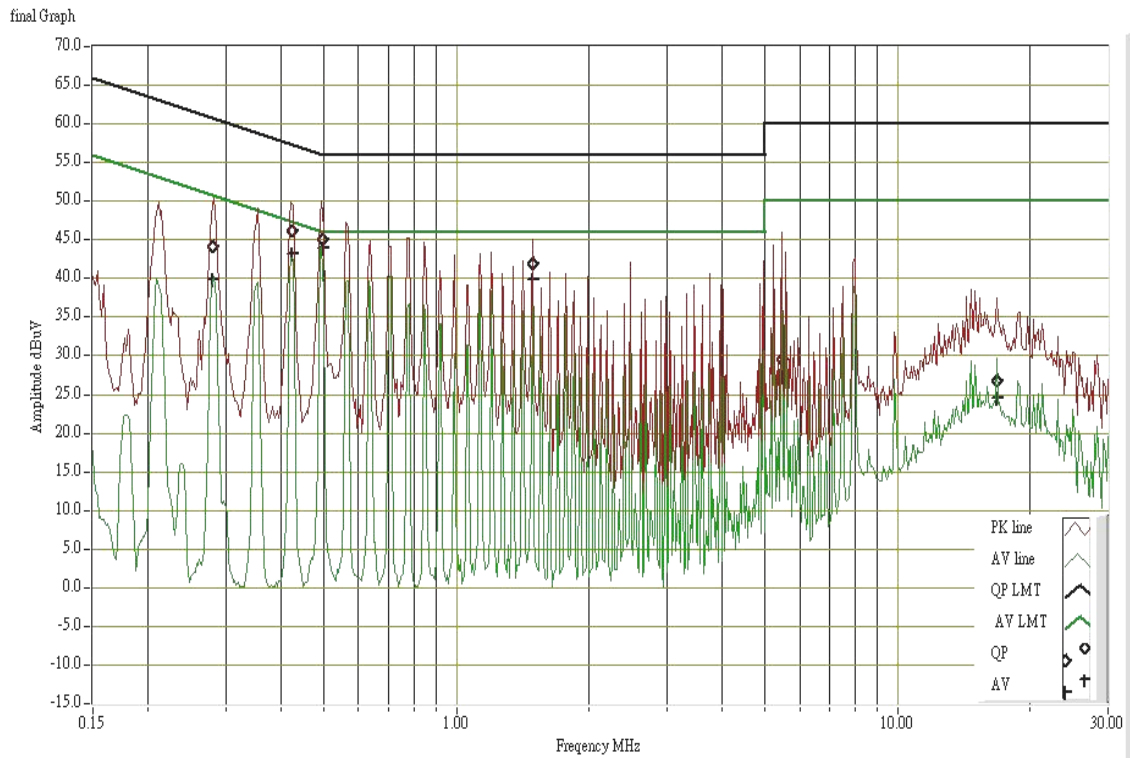


### Test Plots

#### Conducted emissions (Line 1)



#### Conducted emissions (Line 2)





# APPENDIX I RADIO FREQUENCY EXPOSURE

## LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

## EUT Specification

<b>EUT</b>	2.4G OutDoor Device
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	IEEE 802.11b: 21.27 dBm (133.97 mW) IEEE 802.11g: 21.04 dBm (127.06 mW)
<b>Antenna gain (Max)</b>	14 dBi (Numeric gain: 25.11)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

### Remark:

1. The maximum output power is 21.27dBm (133.97mW) at 2437MHz (with 25.11 numeric antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.

## TEST RESULTS

No non-compliance noted.



**Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{3770}$

Where  $E =$  Field strength in Volts / meter

$P =$  Power in Watts

$G =$  Numeric antenna gain

$d =$  Distance in meters

$S =$  Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d =$  Distance in cm

$P =$  Power in mW

$G =$  Numeric antenna gain

$S =$  Power density in mW / cm<sup>2</sup>

**Maximum Permissible Exposure**

EUT output power = 133.97mW

Numeric Antenna gain = 25.11

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where  $P =$  Power in mW

$G =$  Numeric antenna gain

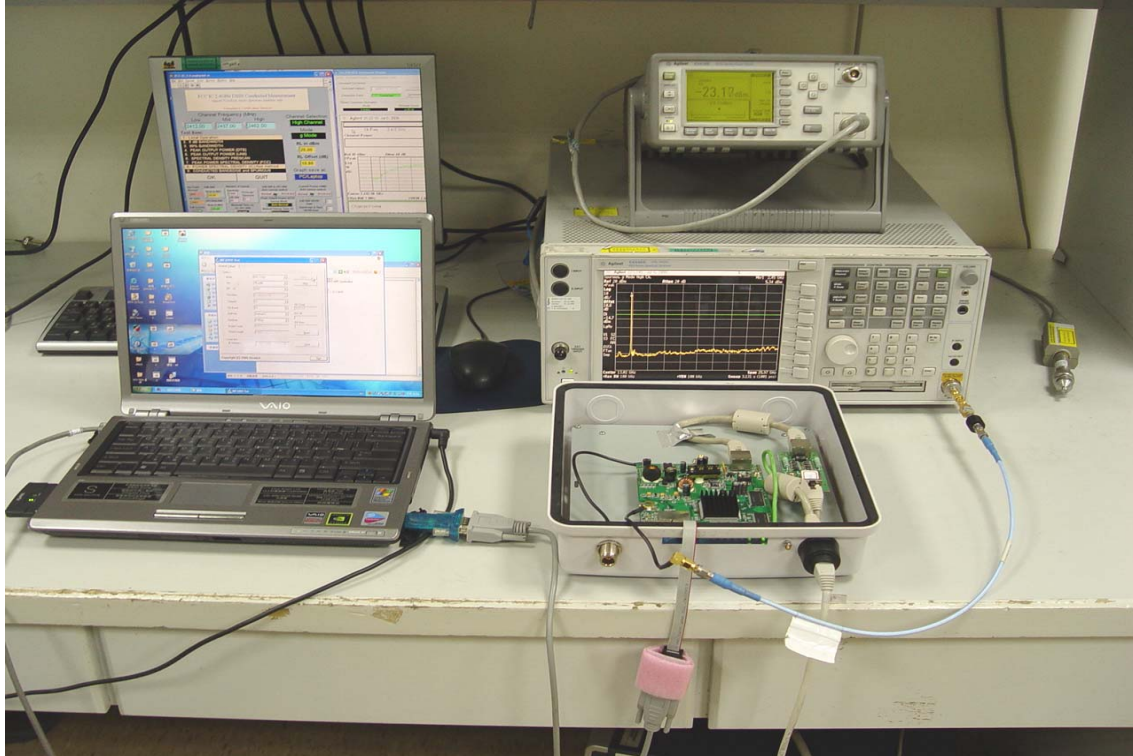
$S =$  Power density in mW / cm<sup>2</sup>

→ Power density = 0.6694 mW / cm<sup>2</sup>

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.)

## APPENDIX II PHOTOGRAPHS OF TEST SETUP

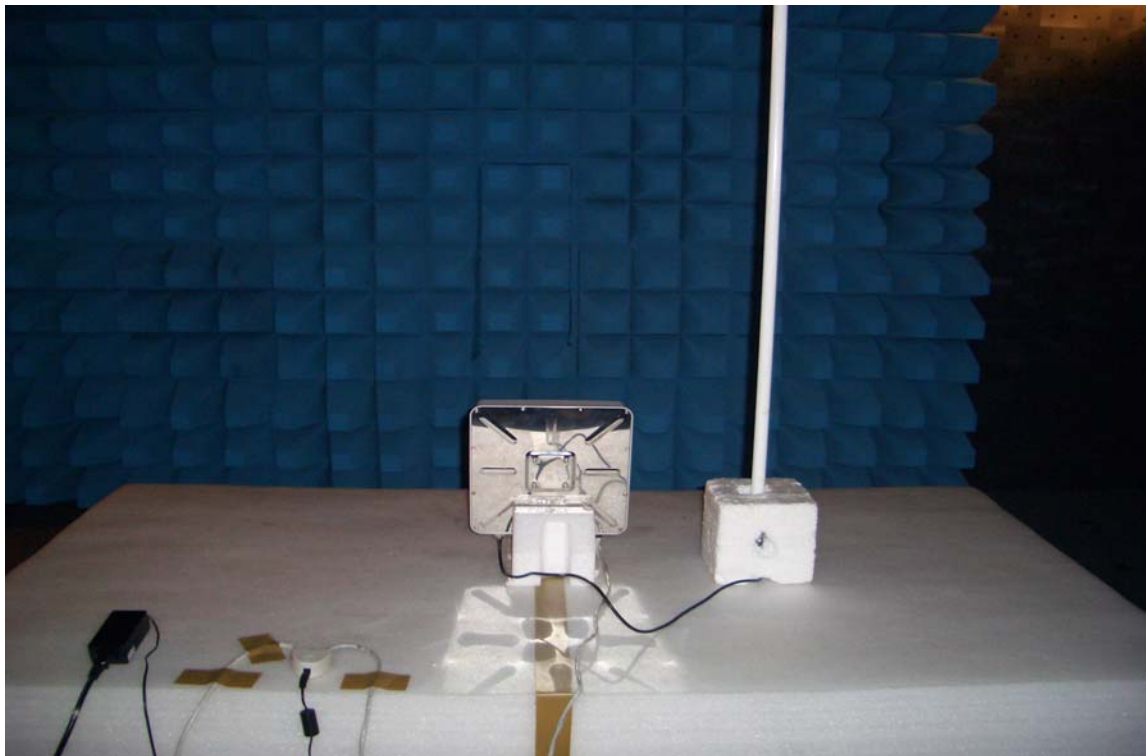
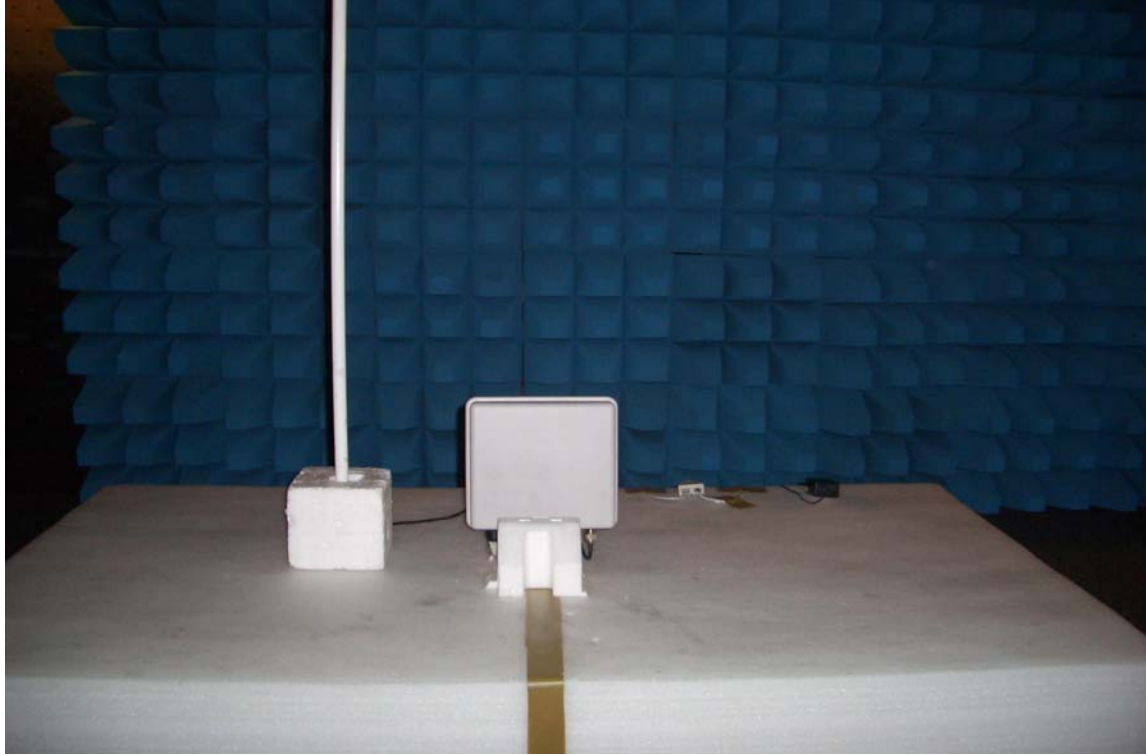
### Conducted Emissions Setup Photos





## Radiated Emissions Setup Photos

### Dipole Antenna







### Powerline Conducted Emissions Setup Photos

