



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**802.11g (super G) CARDBUS CARD**

**Model: WCB-321A**

**Trade Name: U-MEDIA**

*Issued to*

**U-MEDIA Communications, Inc.**

**9F, No. 1, Jin-Shan 7th St.,  
Hsinchu 300, Taiwan, R.O.C.**

*Issued by*

**Compliance Certification Services Inc.**

**No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,  
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### 1. TEST RESULT CERTIFICATION

**Applicant:** U-MEDIA Communications, Inc.  
 9F, No. 1, Jin-Shan 7th St.,  
 Hsinchu 300, Taiwan, R.O.C.

**Equipment Under Test:** 802.11g (super G) CARDBUS CARD

**Trade Name:** U-MEDIA

**Model:** WCB-321A

**Date of Test:** December 17, 2005

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:

\_\_\_\_\_  
 Gavin Lim  
 Section Manager  
 Compliance Certification Services Inc.

\_\_\_\_\_  
 Amanda Wu  
 Section Manager  
 Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	802.11g (super G) CARDBUS CARD
<b>Trade Name</b>	U-MEDIA
<b>Model Number</b>	WCB-321A
<b>Model Discrepancy</b>	N/A
<b>Power Supply</b>	Powered from host device.
<b>Frequency Range</b>	2412 ~ 2462 MHz
<b>Transmit Power</b>	IEEE 802.11b: 18.98 dBm IEEE 802.11g: 18.94 dBm
<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, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps
<b>Number of Channels</b>	11 Channels
<b>Antenna Specification</b>	Left: PCB Antenna / Gain: 3.74 dBi Center Omni PCB Antenna / Gain: 1.69 dBi Right: PCB Antenna / Gain: 1.51 dBi

**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: **SI5WCB321A** 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: WCB-321A) had been tested under operating condition.

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

The field strength of spurious emission was measured in the following mode.

Mode 1: Middle omni antenna mode only.

Mode 2: Middle omni antenna mode plus left antenna mode, controlled by software through U4 switch.

Mode 3: Middle omni antenna mode plus right antenna mode, controlled by software through U7 switch.

The worst emission was found in mode 2 and the worst case was recorded.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, 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 (Base mode):

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

IEEE802.11g Turbo mode: Channel Mid (2437MHz) with 12Mbps data rate was chosen for full testing.



## 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	01/10/2006

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	07/25/2006
Test Receiver	Rohde&Schwarz	ESCI	100064	06/28/2006
Switch Controller	TRC	Switch Controller	SC94050010	05/05/2006
4 Port Switch	TRC	4 Port Switch	SC94050020	05/05/2006
Horn-Antenna	TRC	HA-0502	06	06/02/2006
Horn-Antenna	TRC	HA-0801	04	05/05/2006
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/09/2006
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	09/24/2006
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/11/2006
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	02/17/2006
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.





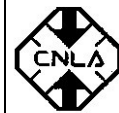


All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200600-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (Registration no: 93105 and 90471).



### 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	 200600-0
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 300 328-2, 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	CNLA	EN 300 328-1/2, EN 300 220-1/2/3, EN 300 440-1/2, EN 61000-3-2, EN 61000-3-3, 47 CFR FCC Part 15 Subpart C/D/E, EN 55013, CNS 13439, EN 55014-1, CNS 13783-1, EN 55022, CNS 13438, CISPR 22, AS/NZS 3548, EN 61000-4-2/3/4/5/6/8/11, ENV 50204, IEEE Std 1528, FCC OET Bulletin, 65+Supplement C, EN50360, EN50361, EN50371, RSS102	 0 3 6 3 ILAC MRA
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 NVLAP or any agency of the US Government.

\* Australia: MRA of NVLAP AS/NZS 4771 & AS/NZS 4268.



## 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	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	SONY	VGN-S44TP	28198080 8100339	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Super a/g 108Mbps Wireless Lan Router (Remote)	PLANEX	BLW-04SAG	40DDA0421	SJ9-BLW54SAG	N/A	Unshielded, 1.8m

**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.



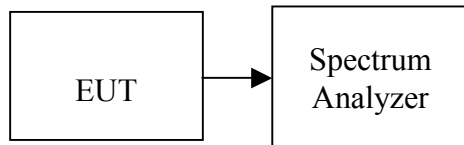
## 7. FCC PART 15.247 REQUIREMENTS

### 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**

Mode	Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Base Mode	Low	2412	11670	>500	PASS
	Mid	2437	11170		PASS
	High	2462	12000		PASS

**Test mode: IEEE 802.11g**

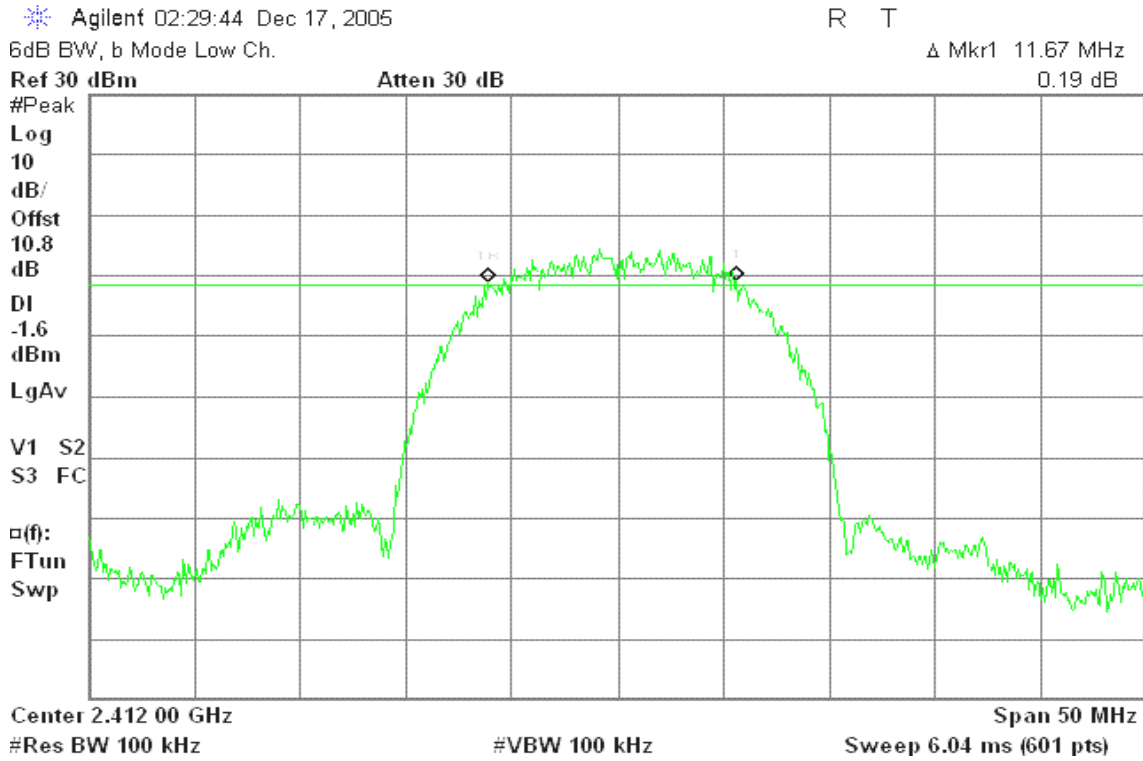
Mode	Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
Base Mode	Low	2412	16500	>500	PASS
	Mid	2437	16420		PASS
	High	2462	15500		PASS
Turbo Mode	Turbo	2437	32920		PASS



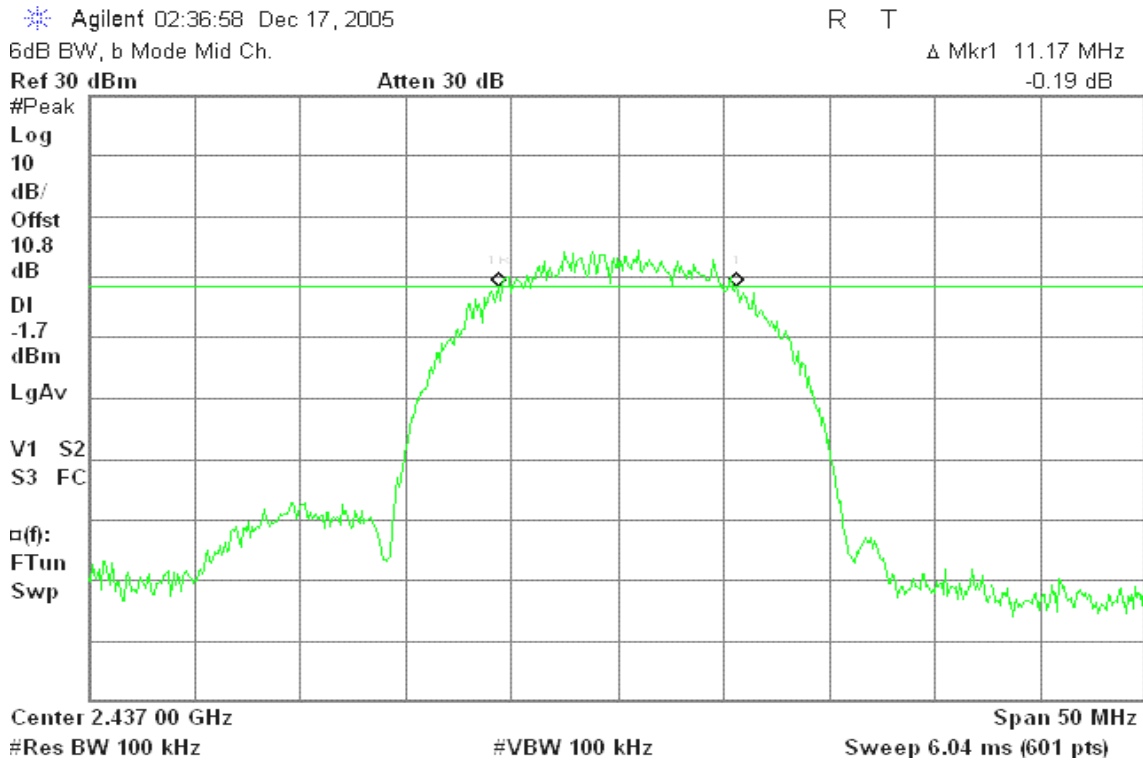
**Test Plot**

**IEEE 802.11b**

**6dB Bandwidth (CH Low)**



**6dB Bandwidth (CH Mid)**





### 6dB Bandwidth (CH High)

Agilent 02:49:03 Dec 17, 2005

R T

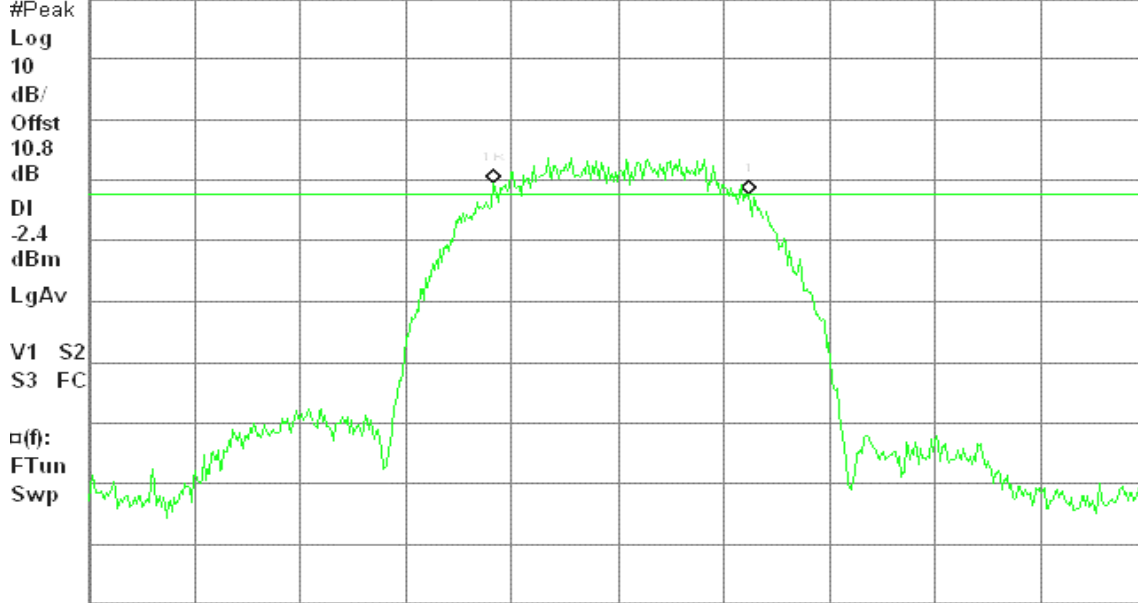
6dB BW, b Mode High Ch.

Δ Mkr1 12.00 MHz

Ref 30 dBm

Atten 30 dB

-1.70 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 18:48:00 Dec 17, 2005

R T

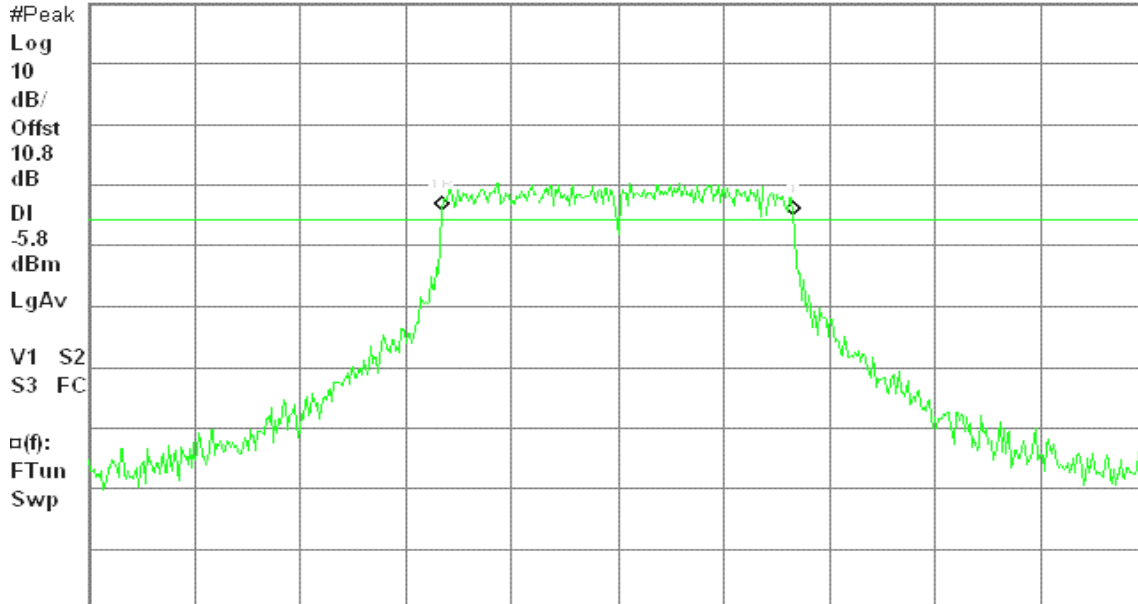
6dB BW, g Mode Low Ch.

Δ Mkr1 16.50 MHz

Ref 30 dBm

Atten 30 dB

-0.59 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 18:40:32 Dec 17, 2005

R T

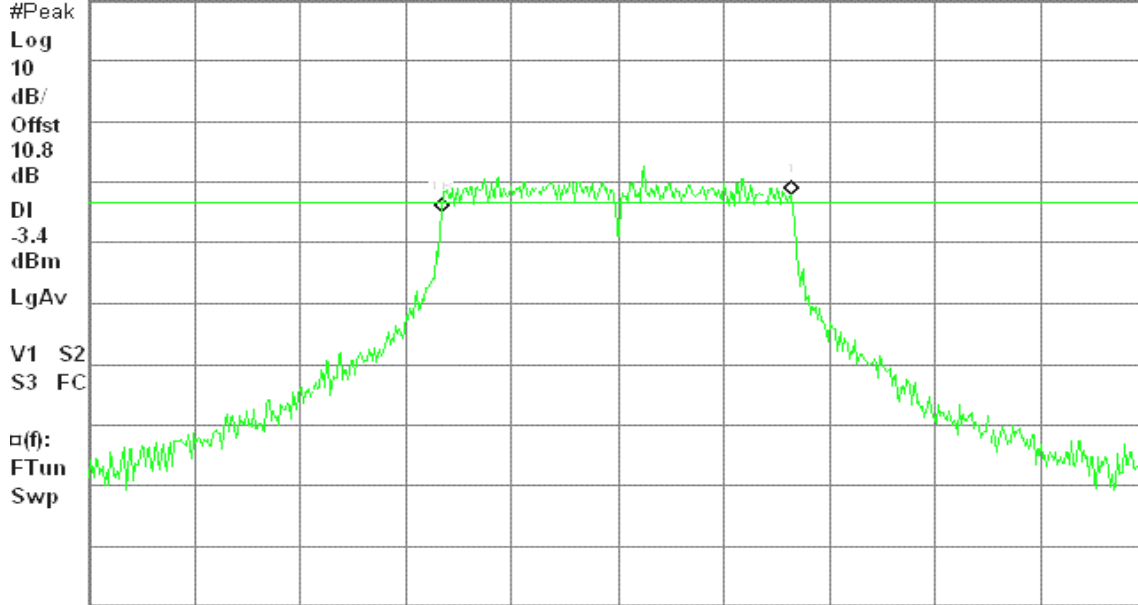
6dB BW, g Mode Mid Ch.

$\Delta$  Mkr1 16.42 MHz

Ref 30 dBm

Atten 30 dB

3.02 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 18:28:17 Dec 17, 2005

R T

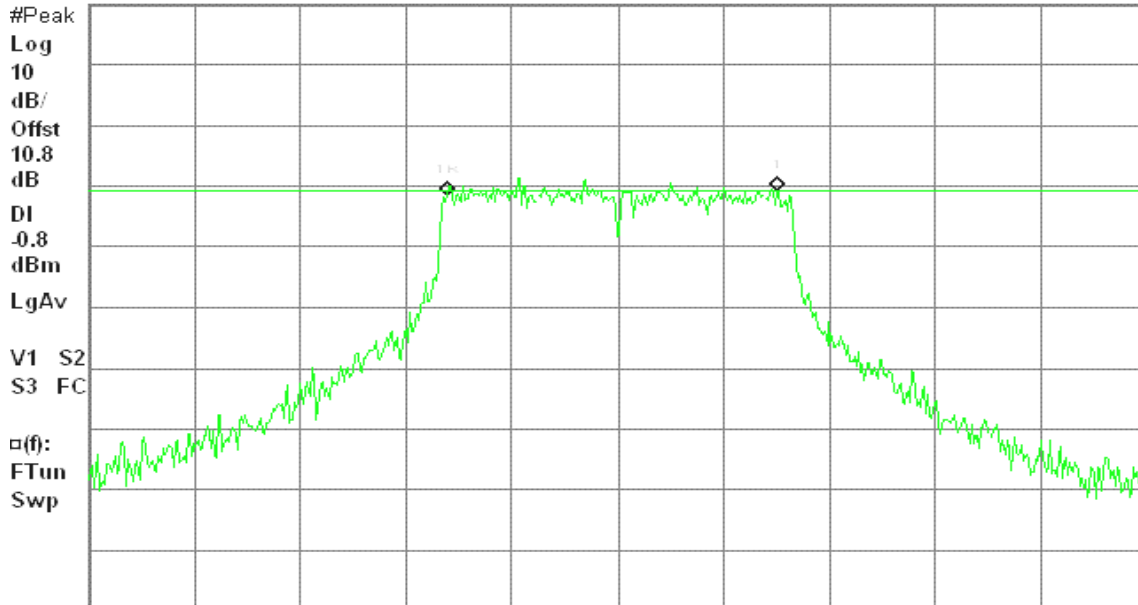
6dB BW, g Mode High Ch.

$\Delta$  Mkr1 15.50 MHz

Ref 30 dBm

Atten 30 dB

0.83 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 Turbo Mode

### 6dB Bandwidth (CH Mid)

Agilent 18:59:31 Dec 17, 2005

R T

6dB BW, g turbo Mode Mid Ch.

Δ Mkr1 32.92 MHz

Ref 30 dBm

Atten 30 dB

0.53 dB

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-6.9

dBm

LgAv

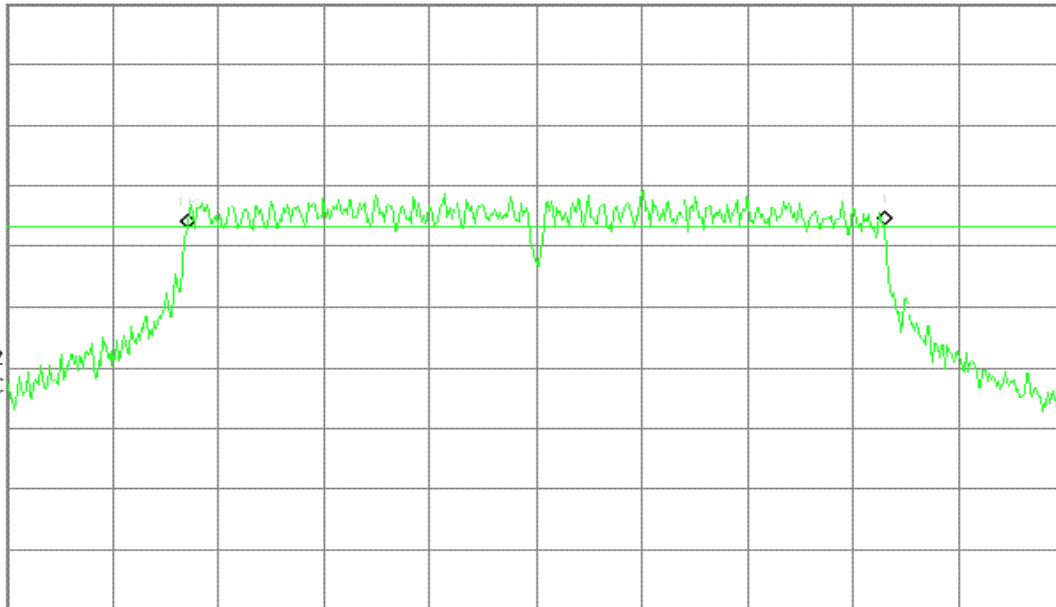
V1 S2

S3 FC

□(f):

FTun

Swp



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

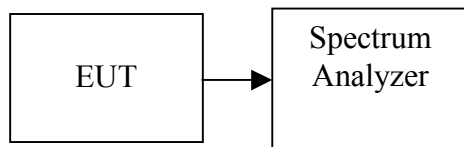
## 7.2 PEAK POWER

### 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

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Base Mode	Low	2412	18.91	0.07780	1.00	PASS
	Mid	2437	18.98	0.07907		PASS
	High	2462	18.87	0.07709		PASS

##### Test mode: IEEE 802.11g

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Base Mode	Low	2412	18.79	0.07568	1.00	PASS
	Mid	2437	18.94	0.07834		PASS
	High	2462	18.91	0.07780		PASS
Turbo Mode	Turbo	2437	18.79	0.07568		PASS





**Test Plot**

**IEEE 802.11b**

**Peak Power (CH Low)**

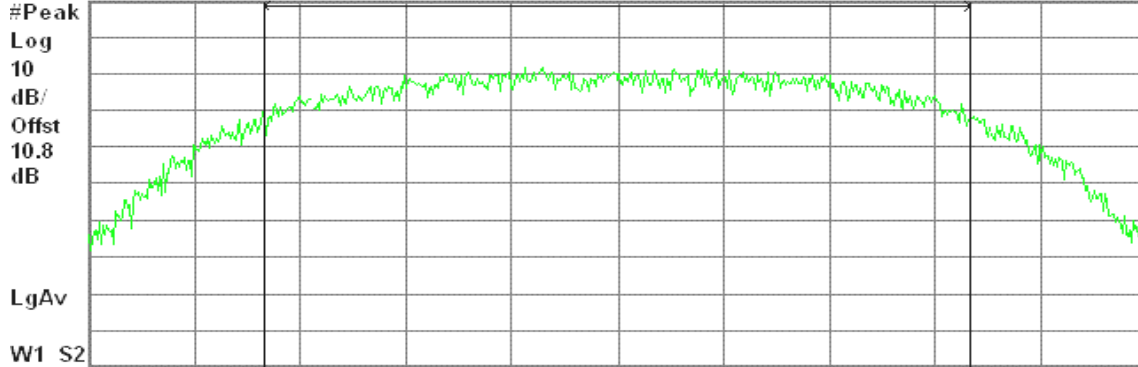
Agilent 02:30:48 Dec 17, 2005

R T

Peak Output Power, b Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 22.85 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.91 dBm / 15.2320 MHz

-52.92 dBm/Hz

**Peak Power (CH Mid)**

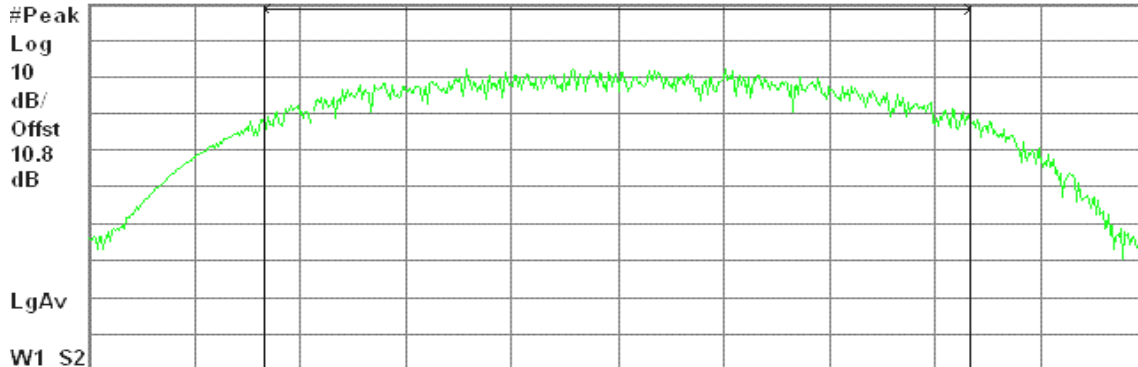
Agilent 02:39:07 Dec 17, 2005

R T

Peak Output Power, b Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 23.13 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.98 dBm / 15.4180 MHz

-52.90 dBm/Hz



### Peak Power (CH High)

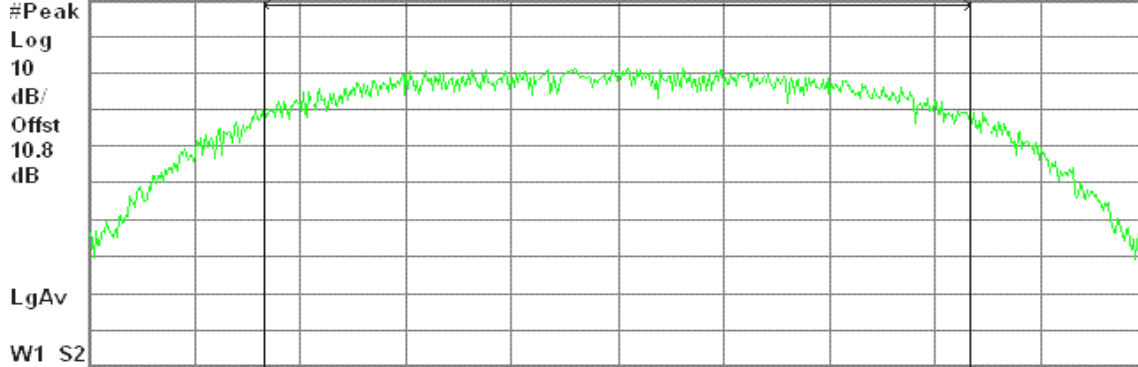
Agilent 02:49:59 Dec 17, 2005

R L

Peak Output Power , b Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

18.87 dBm / 15.3090 MHz

Power Spectral Density

-52.98 dBm/Hz

### IEEE 802.11g

#### Peak Power (CH Low)

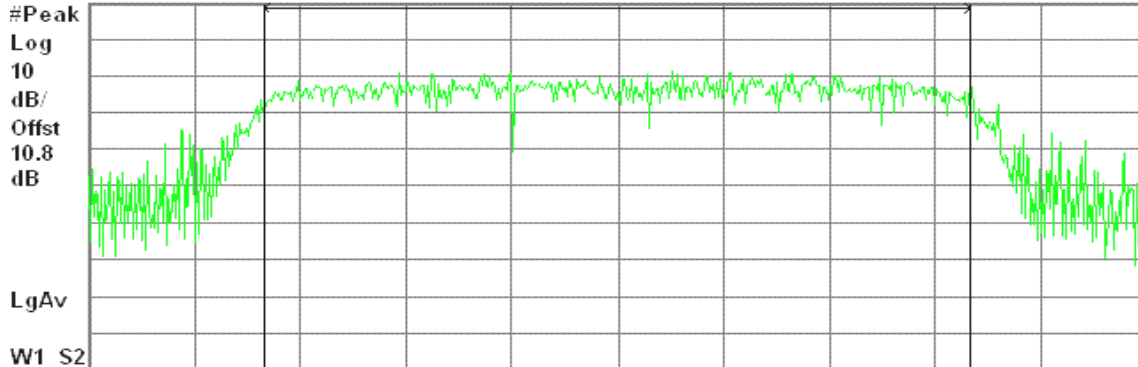
Agilent 18:49:26 Dec 17, 2005

R T

Peak Output Power , g Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

18.79 dBm / 16.6720 MHz

Power Spectral Density

-53.43 dBm/Hz



### Peak Power (CH Mid)

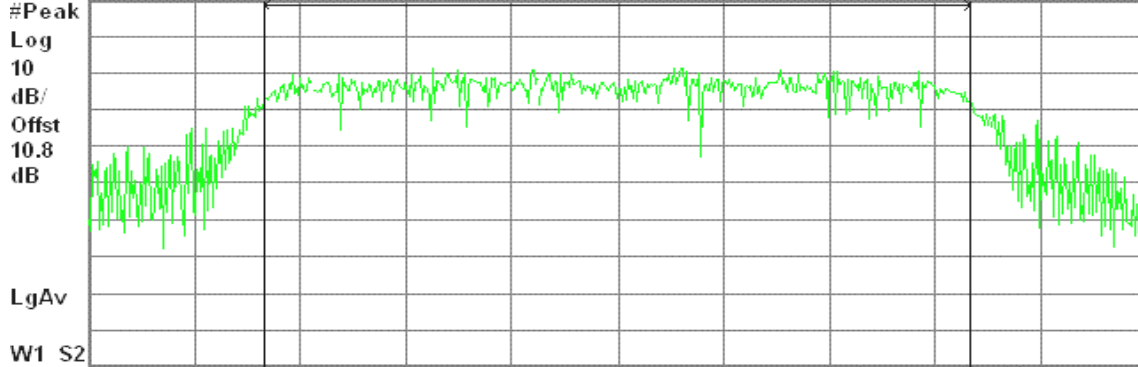
Agilent 18:43:01 Dec 17, 2005

R T

Peak Output Power , g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.94 dBm / 16.7220 MHz

-53.29 dBm/Hz

### Peak Power (CH High)

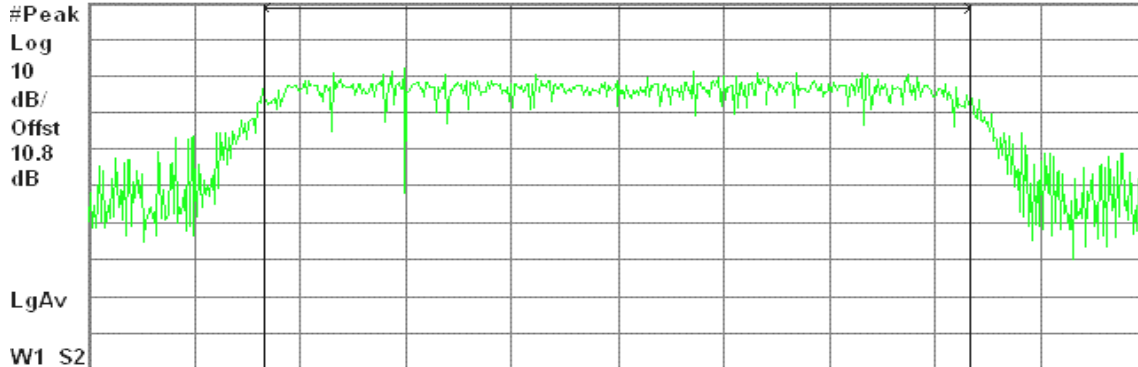
Agilent 18:30:58 Dec 17, 2005

R T

Peak Output Power , g Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 25.05 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.91 dBm / 16.7010 MHz

-53.31 dBm/Hz



### IEEE 802.11g Turbo Mode

#### Peak Power (CH Mid)

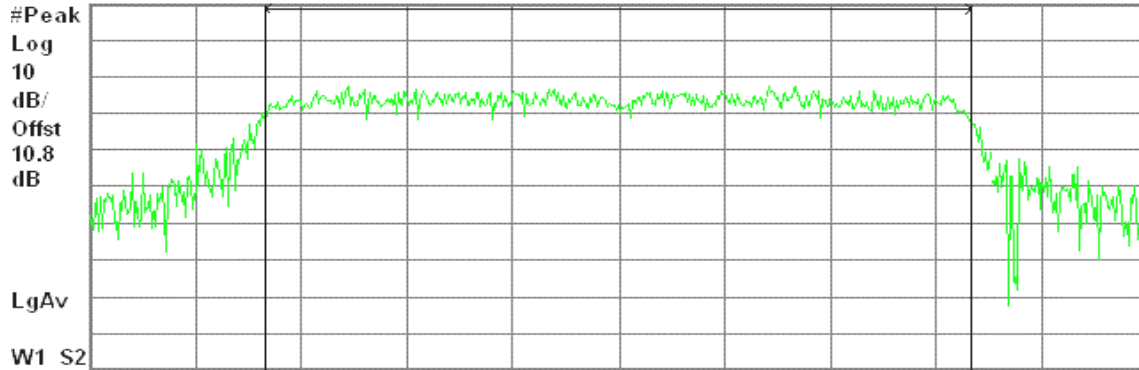
Agilent 19:00:55 Dec 17, 2005

R T

Peak Output Power, g turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 49.73 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.79 dBm / 33.1560 MHz

-56.41 dBm/Hz

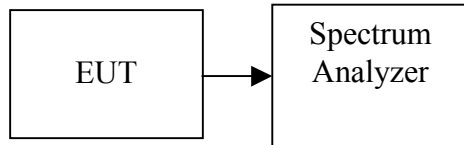


### 7.3 AVERAGE POWER

#### 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

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Base Mode	Low	2412	15.91	0.03899
	Mid	2437	15.98	0.03963
	High	2462	15.78	0.03784

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

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Base Mode	Low	2412	14.99	0.03155
	Mid	2437	15.95	0.03936
	High	2462	15.94	0.03926
Turbo Mode	Turbo	2437	14.85	0.03055



**Test Plot**

**IEEE 802.11b**

**CH Low**

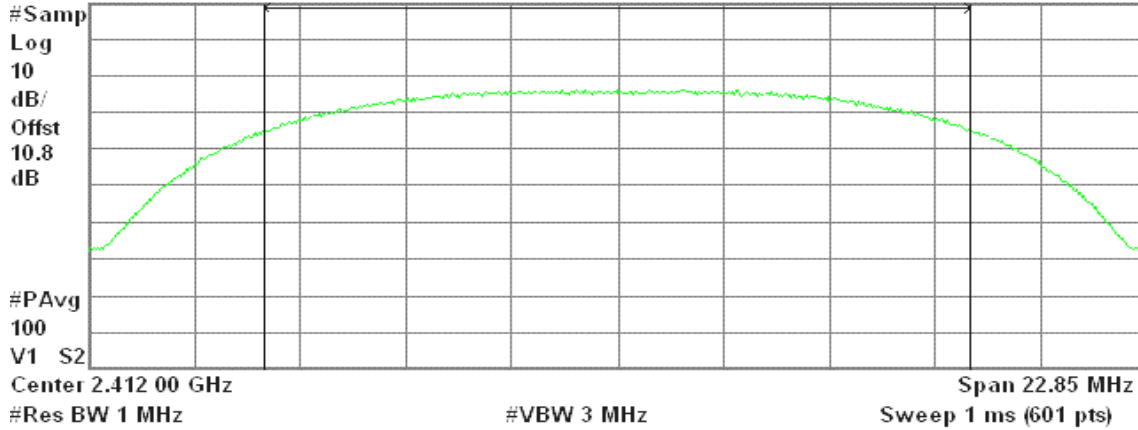
Agilent 02:31:27 Dec 17, 2005

R T

AV Output Power, b Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

15.91 dBm / 15.2320 MHz

-55.84 dBm/Hz

**CH Mid**

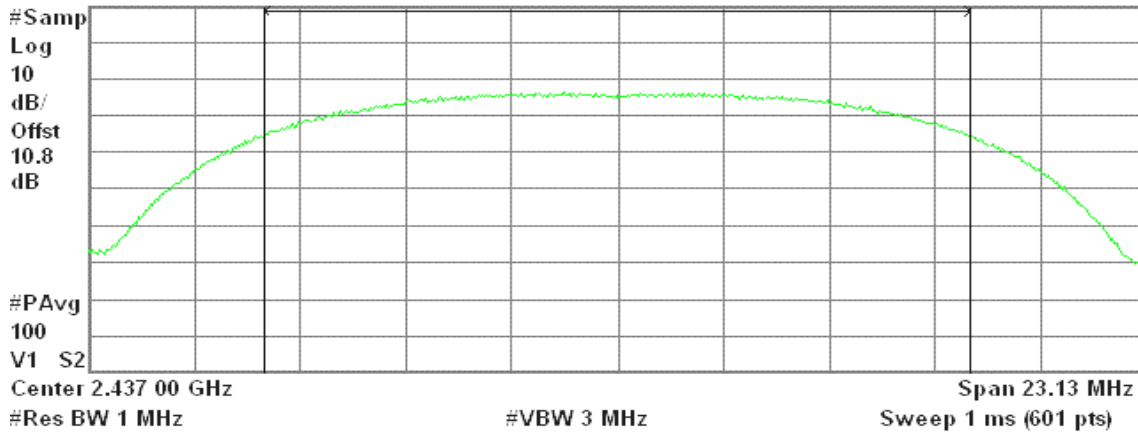
Agilent 02:40:02 Dec 17, 2005

R T

AV Output Power , b Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

15.98 dBm / 15.4180 MHz

-55.90 dBm/Hz



**CH High**

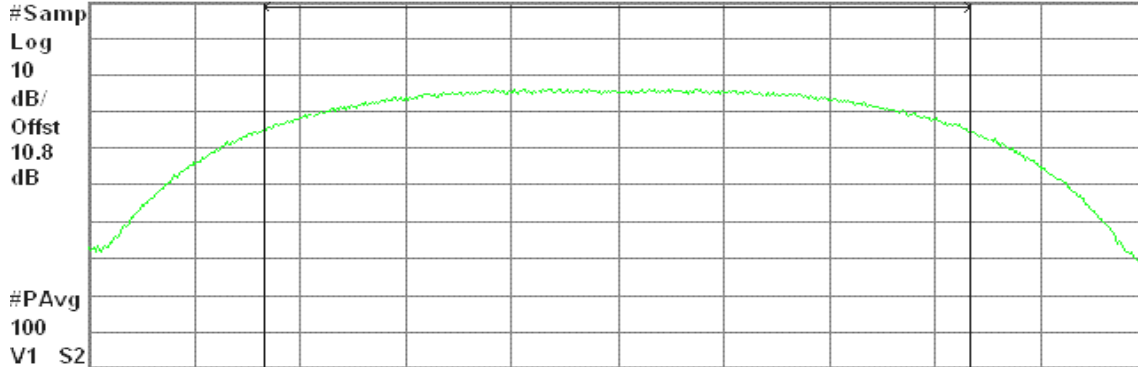
Agilent 02:50:41 Dec 17, 2005

R T

AV Output Power , b Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

15.78 dBm / 15.3090 MHz

-56.07 dBm/Hz

**IEEE 802.11g**

**CH Low**

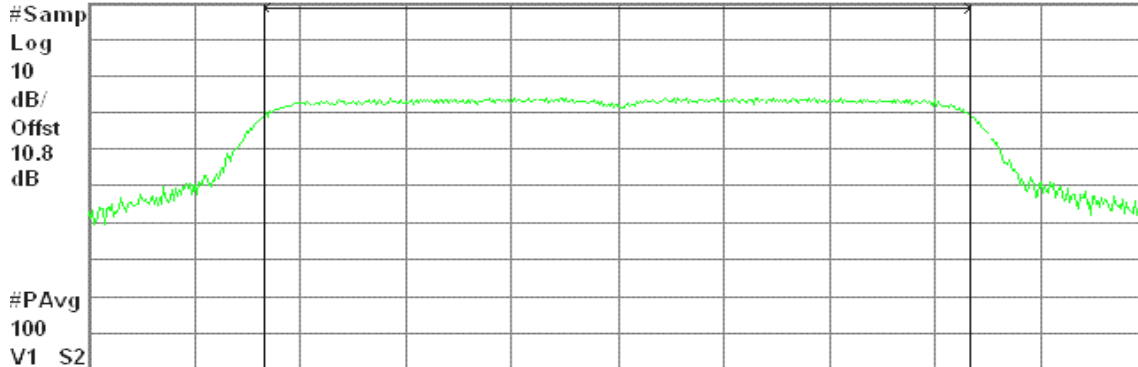
Agilent 18:50:04 Dec 17, 2005

R T

AV Output Power, g Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

14.99 dBm / 16.6720 MHz

-57.23 dBm/Hz



### CH Mid

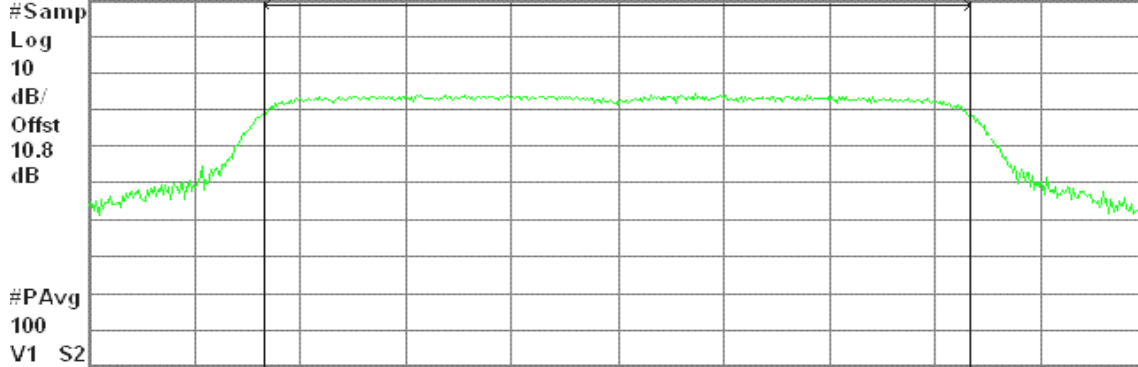
Agilent 18:44:06 Dec 17, 2005

R T

AV Output Power , g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

15.95 dBm / 16.7220 MHz

-56.29 dBm/Hz

### CH High

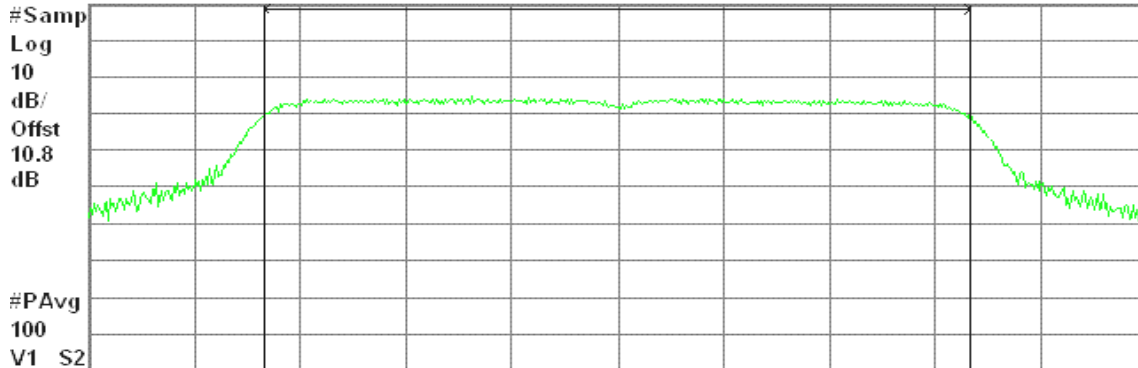
Agilent 18:31:37 Dec 17, 2005

R T

AV Output Power , g Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 25.05 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

15.94 dBm / 16.7010 MHz

-56.29 dBm/Hz





**IEEE 802.11g Turbo mode**

**CH Mid**

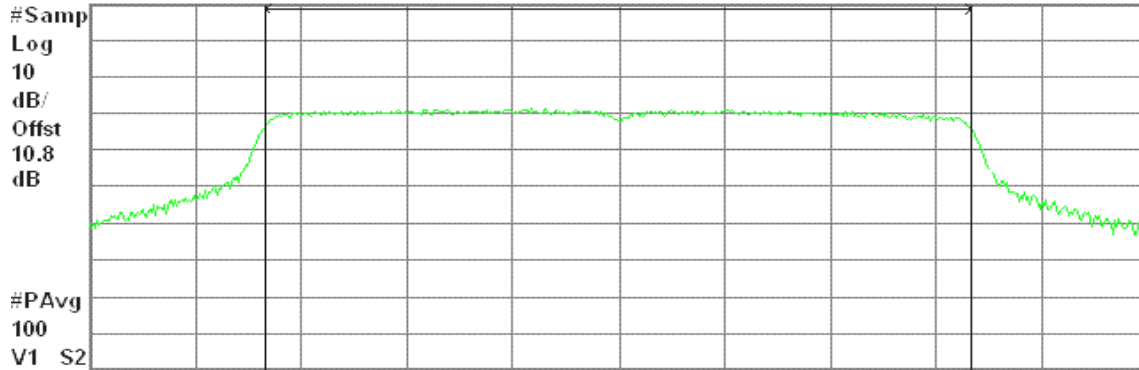
Agilent 19:01:25 Dec 17, 2005

R T

AV Output Power , g turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 49.73 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

14.85 dBm / 33.1560 MHz

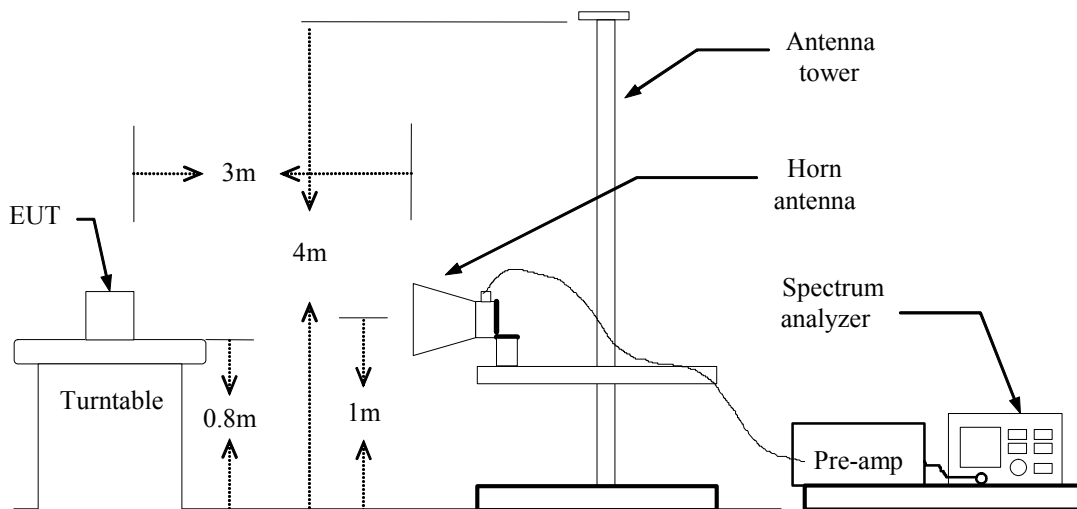
-60.36 dBm/Hz

## 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.



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

Detector mode: Peak

Polarity: Vertical

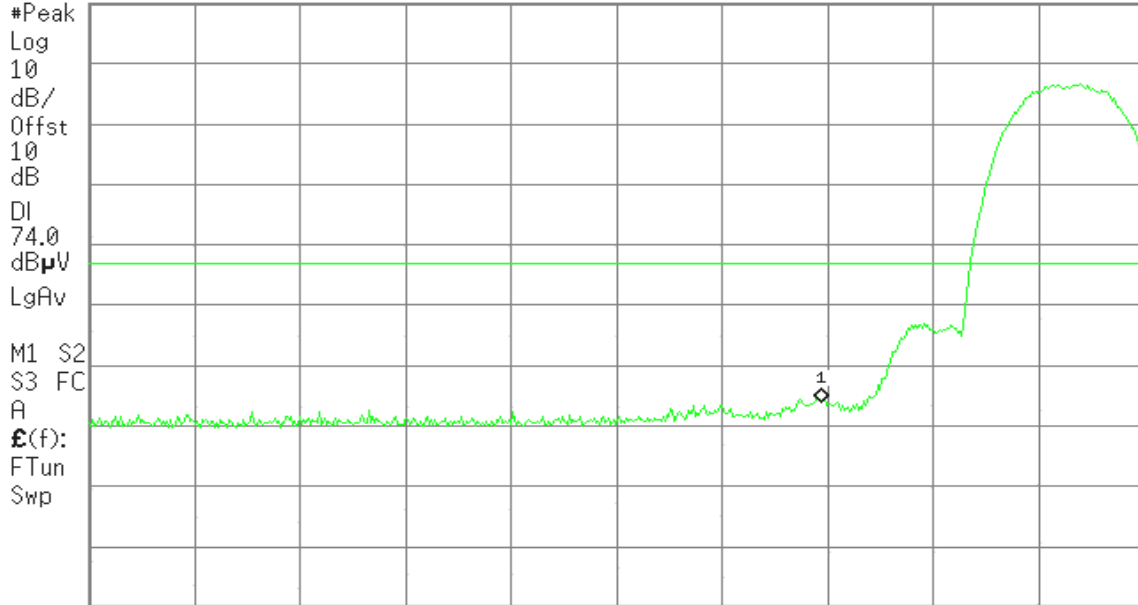
Agilent

R T

Mkr1 2.386 3 GHz  
51.05 dBμV

Ref 117 dBμV

Atten 10 dB



Start 2.310 0 GHz

Res BW 1 MHz

VBW 1 MHz

Stop 2.420 0 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Vertical

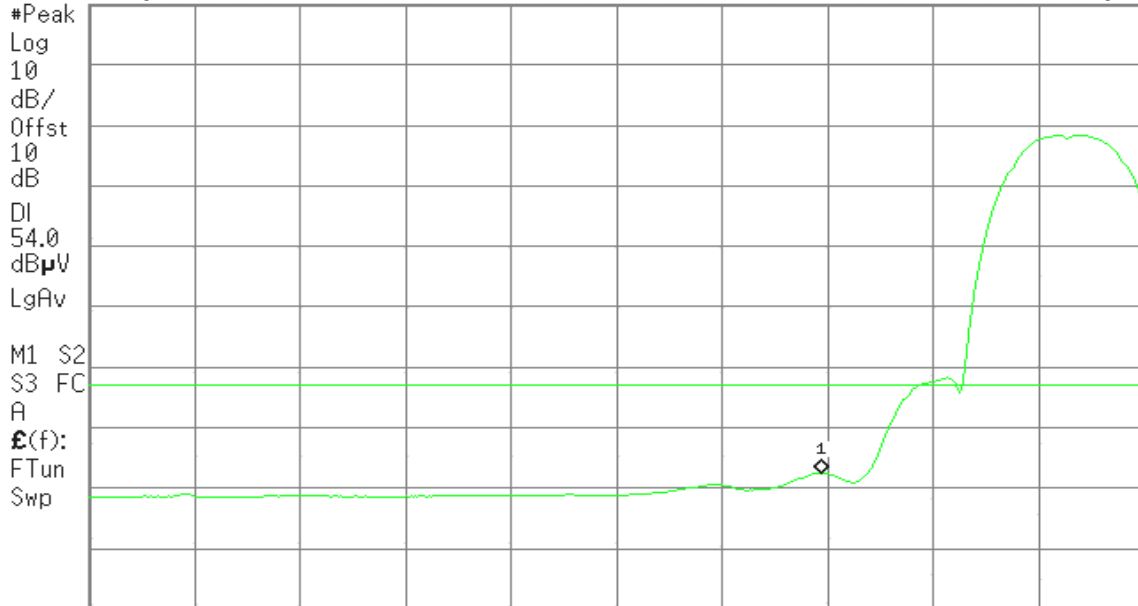
Agilent

R T

Mkr1 2.386 3 GHz  
39.39 dBμV

Ref 117 dBμV

Atten 10 dB



Start 2.310 0 GHz

Res BW 1 MHz

#VBW 10 Hz

Stop 2.420 0 GHz

Sweep 8.577 s (601 pts)



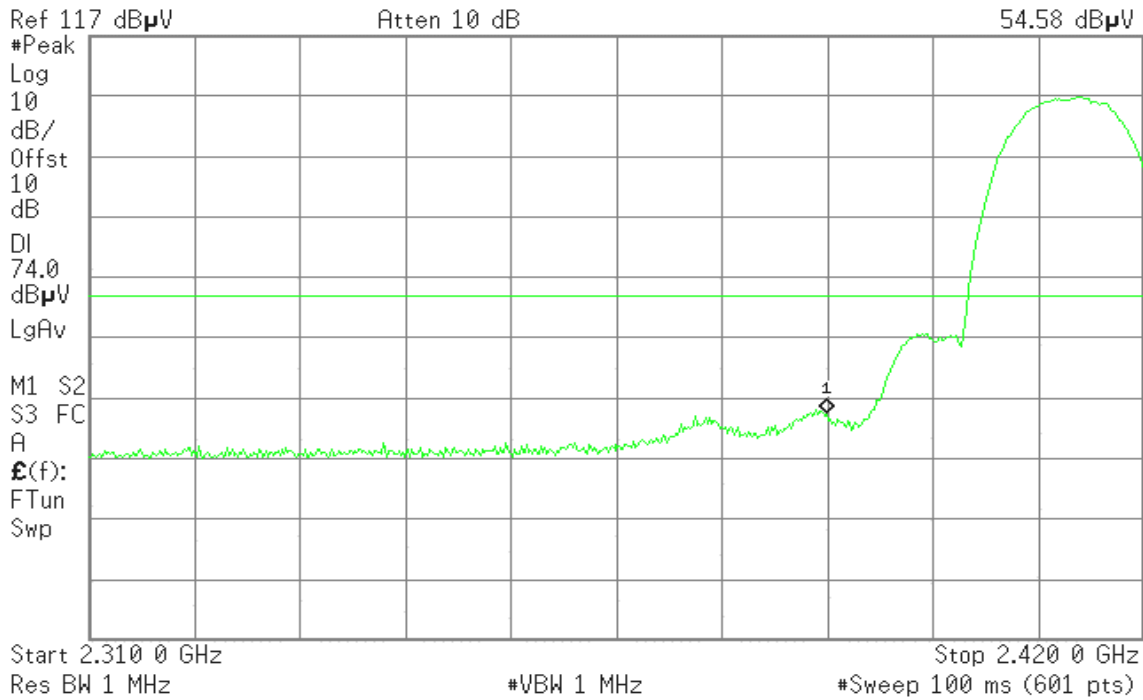
Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.387 1 GHz  
54.58 dBμV



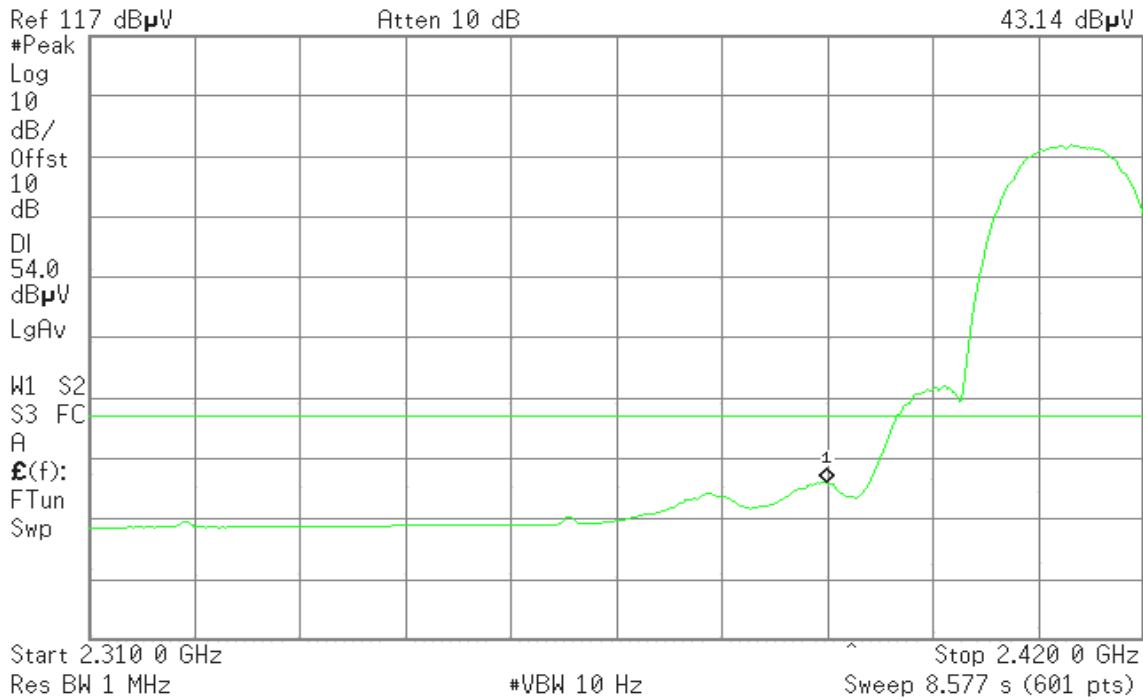
Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.387 1 GHz  
43.14 dBμV





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

Detector mode: Peak

Polarity: Vertical

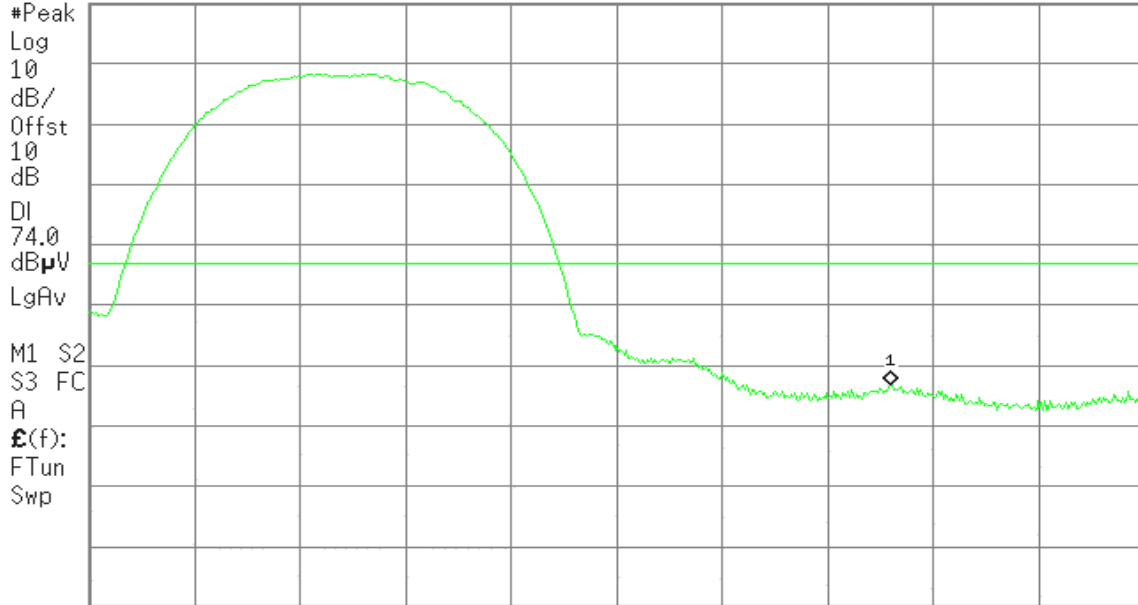
Agilent

R T

Mkr1 2.488 00 GHz  
53.68 dBμV

Ref 117 dBμV

Atten 10 dB



Center 2.475 00 GHz

Span 50 MHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Vertical

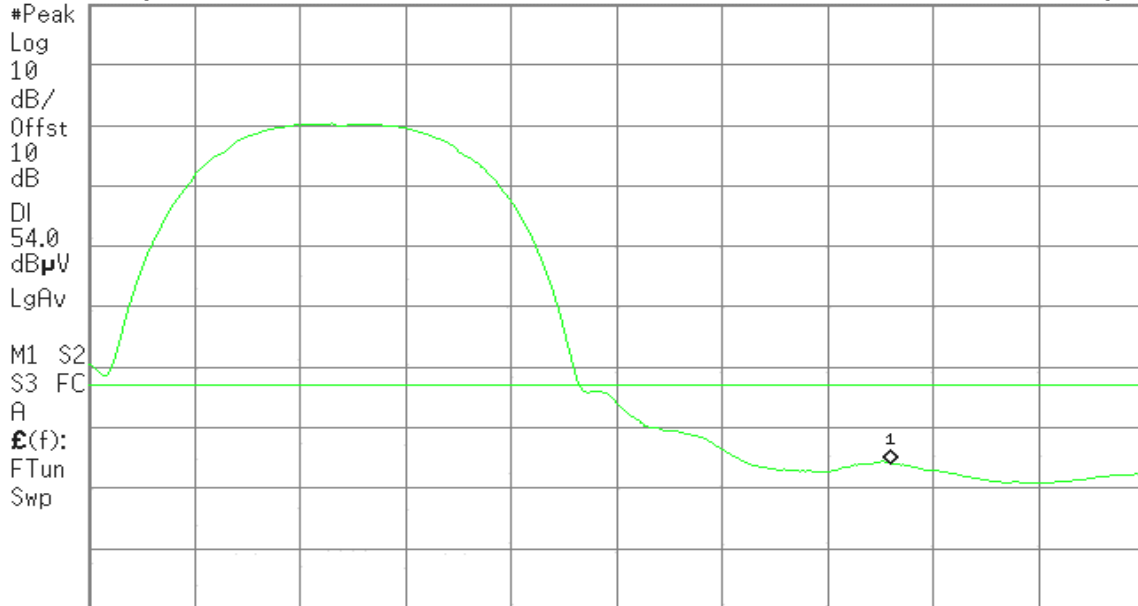
Agilent

R T

Mkr1 2.488 00 GHz  
41.13 dBμV

Ref 117 dBμV

Atten 10 dB



Center 2.475 00 GHz

Span 50 MHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.899 s (601 pts)

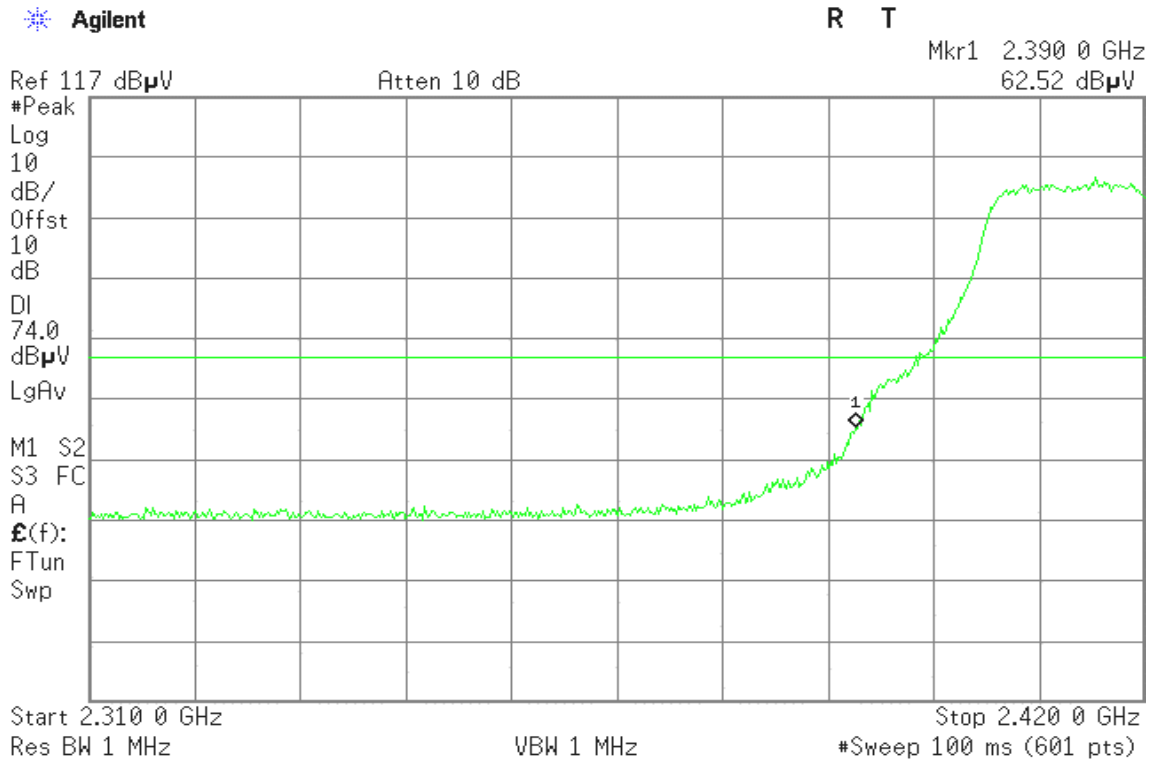




### Band Edges (IEEE 802.11g / CH Low)

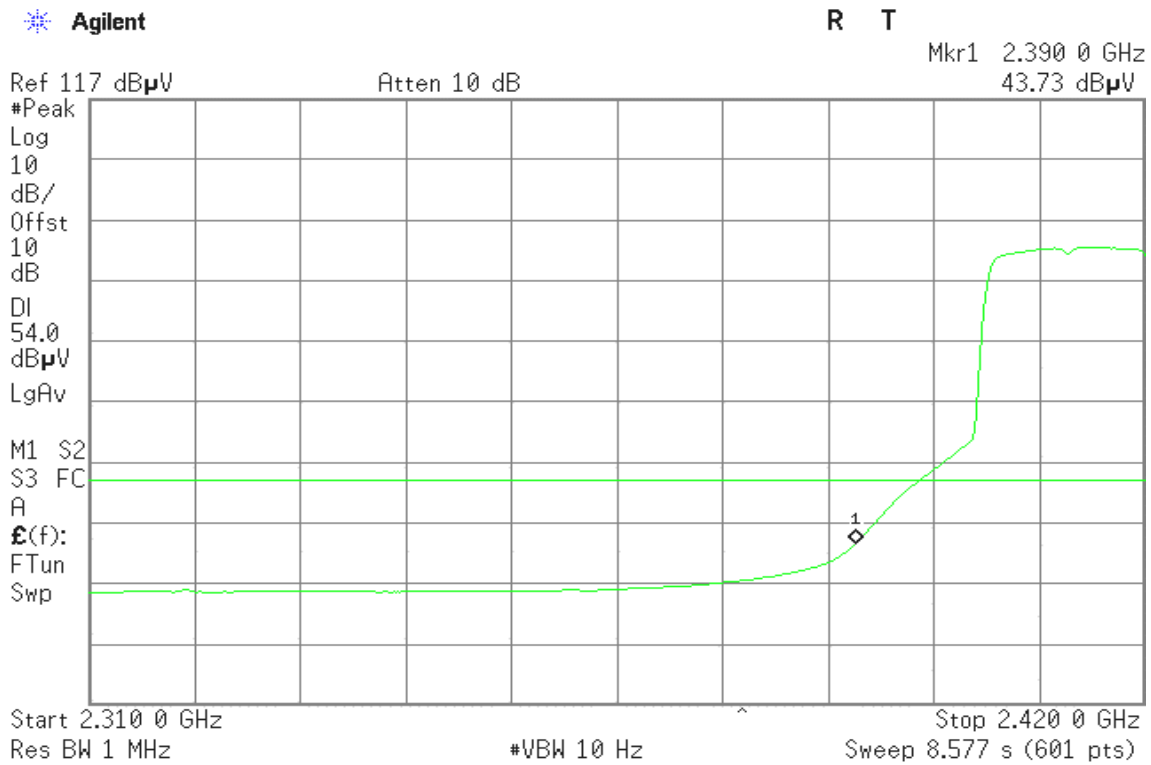
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





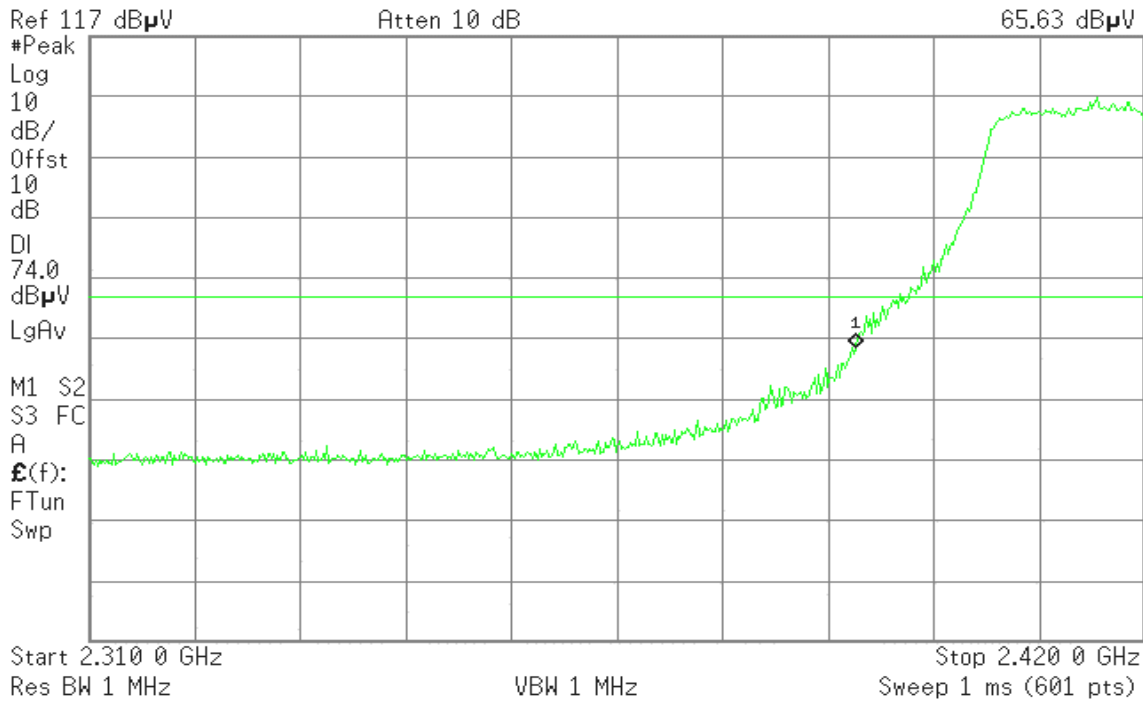
Detector mode: Peak

Polarity: Horizontal

Agilent

R L

Mkr1 2.390 0 GHz  
65.63 dBμV



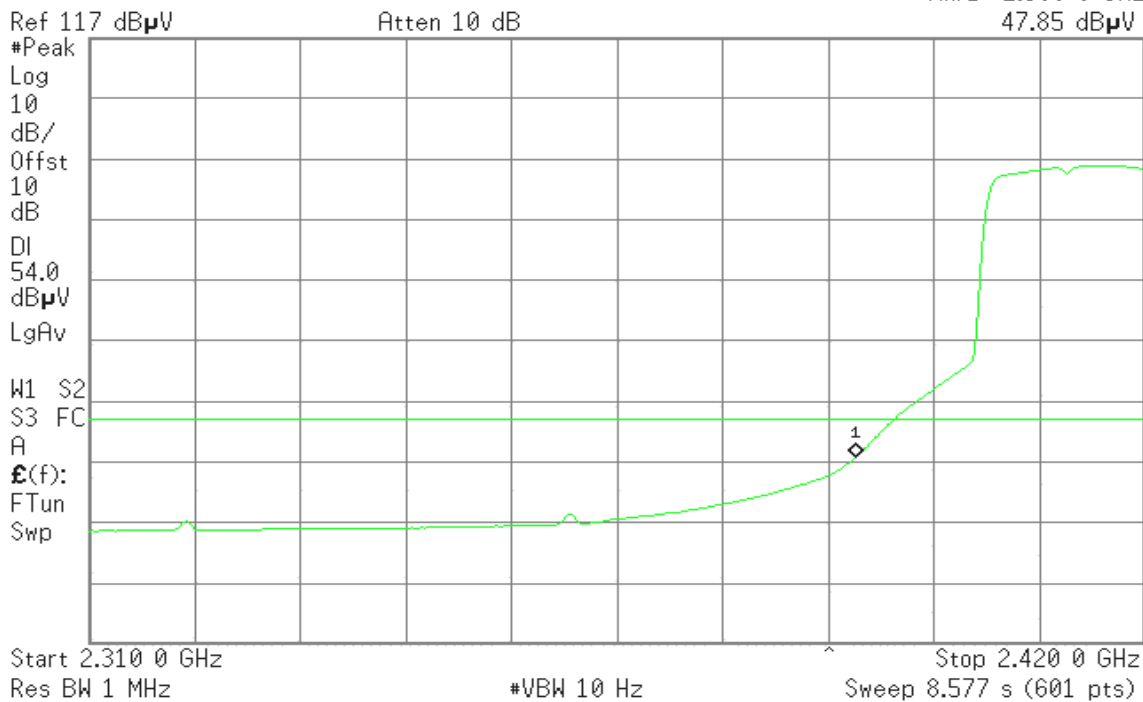
Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 0 GHz  
47.85 dBμV







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

Detector mode: Peak

Polarity: Vertical

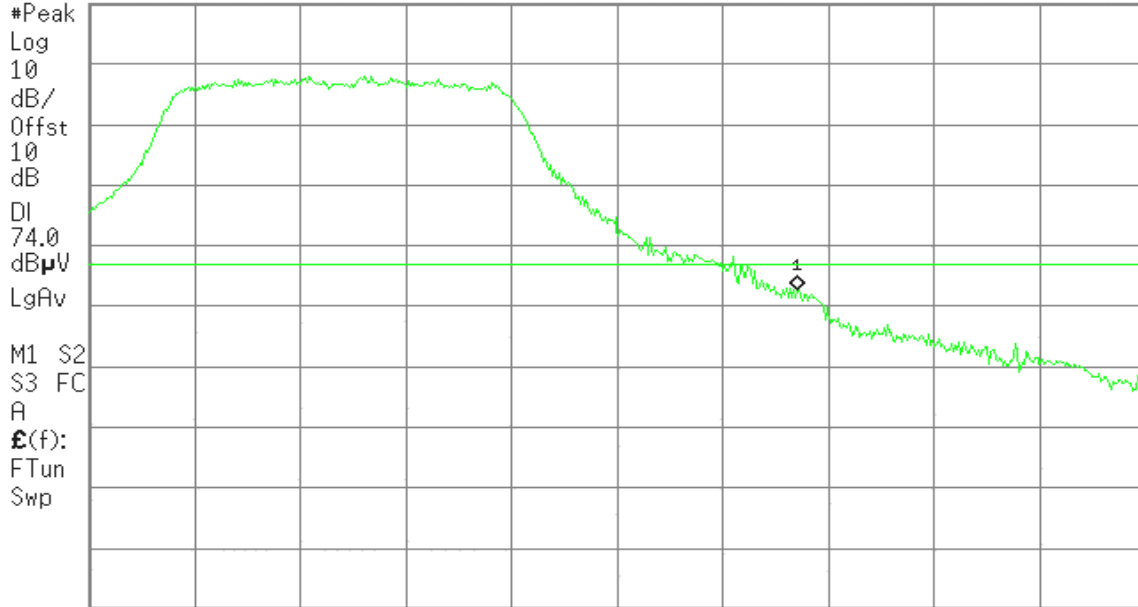
Agilent

R T

Mkr1 2.483 50 GHz  
69.67 dB $\mu$ V

Ref 117 dB $\mu$ V

Atten 10 dB



Start 2.450 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Vertical

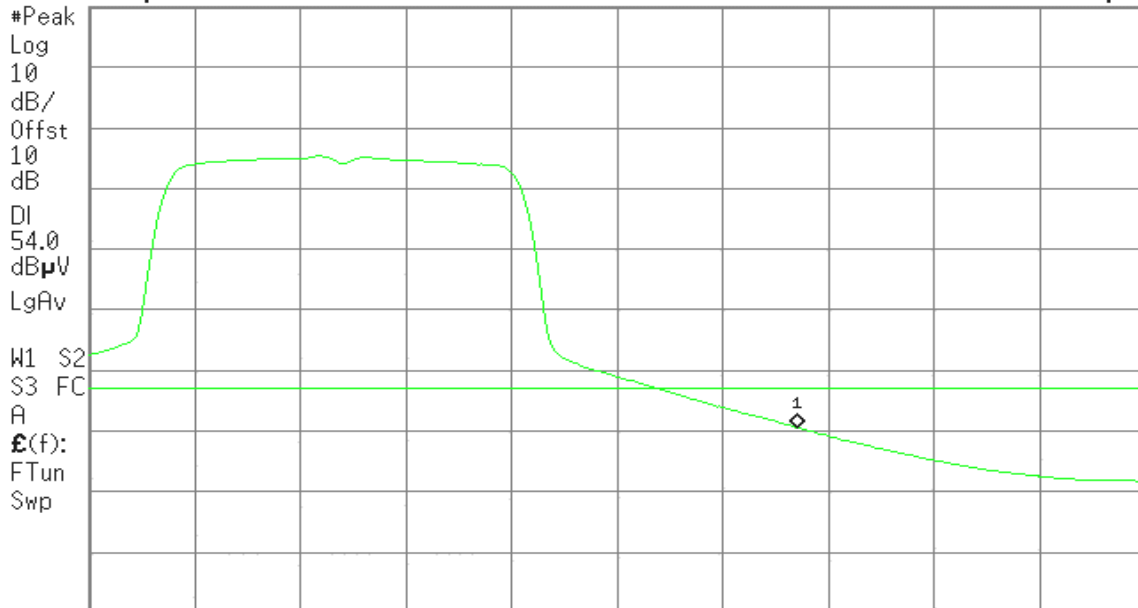
Agilent

R T

Mkr1 2.483 50 GHz  
47.62 dB $\mu$ V

Ref 117 dB $\mu$ V

Atten 10 dB



Start 2.450 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.899 s (601 pts)



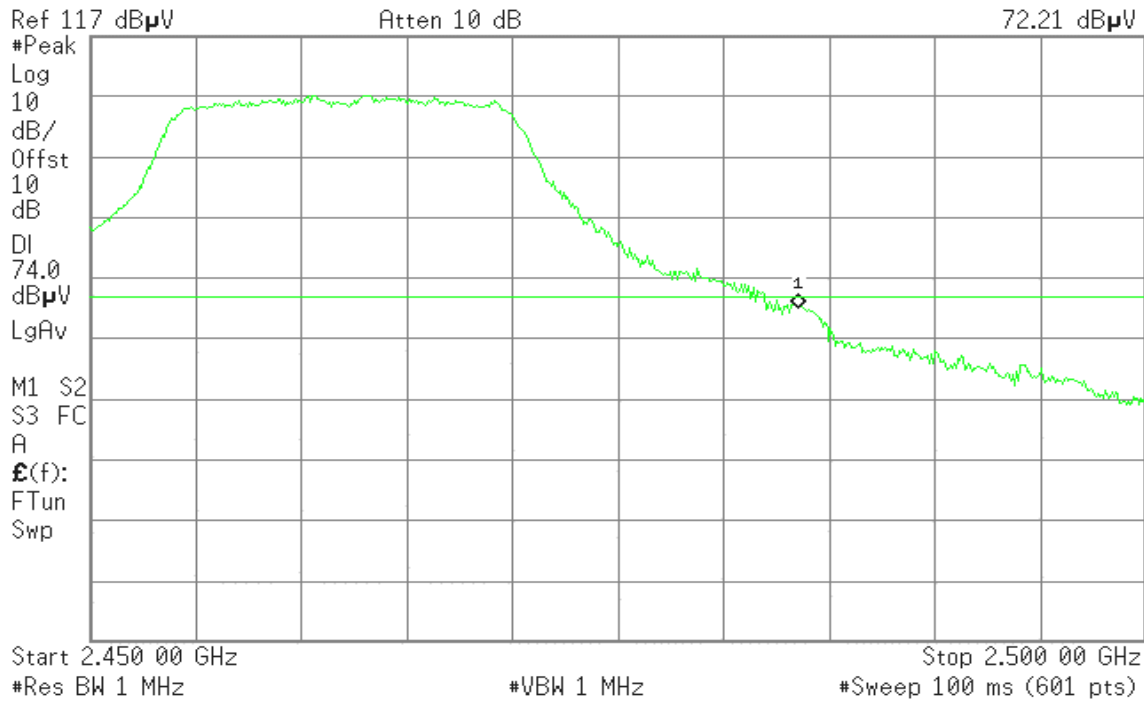
Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
72.21 dBµV



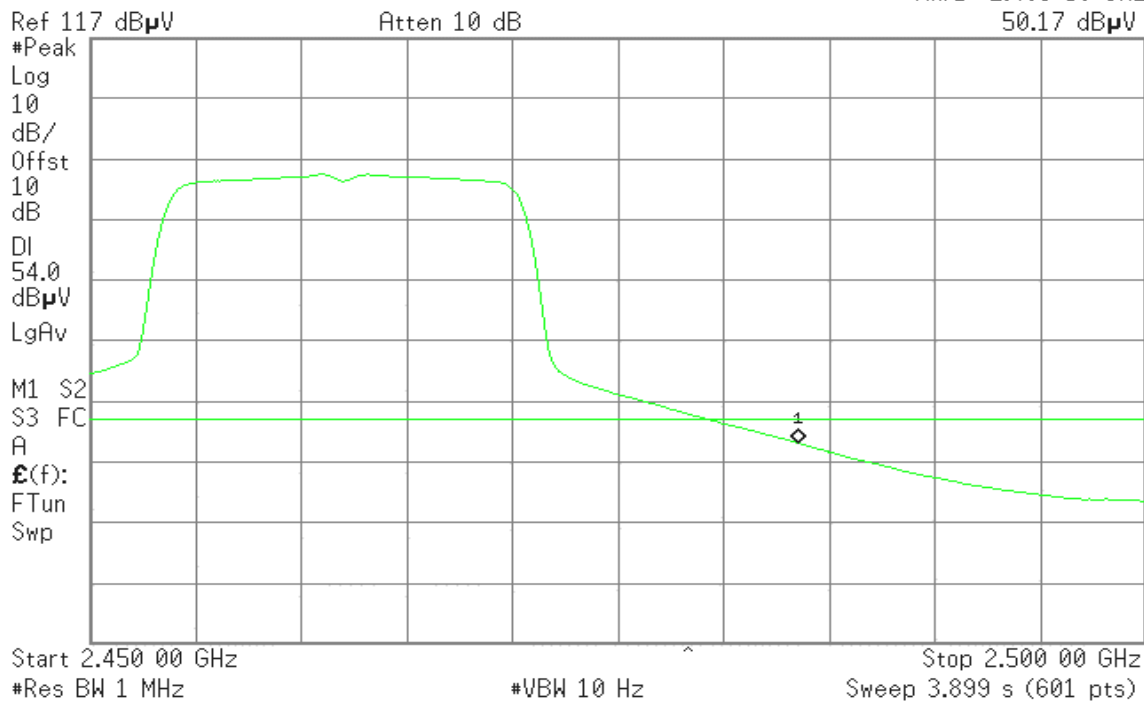
Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
50.17 dBµV





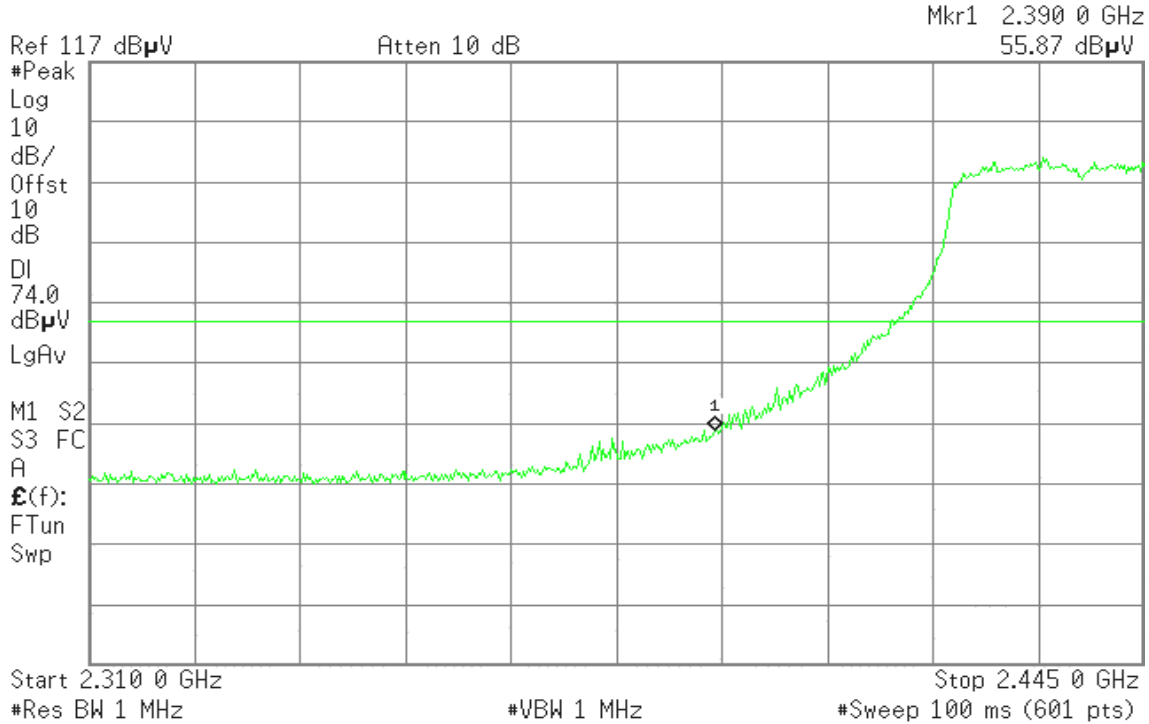
### Band Edges (IEEE 802.11g Turbo Mode / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent

R T

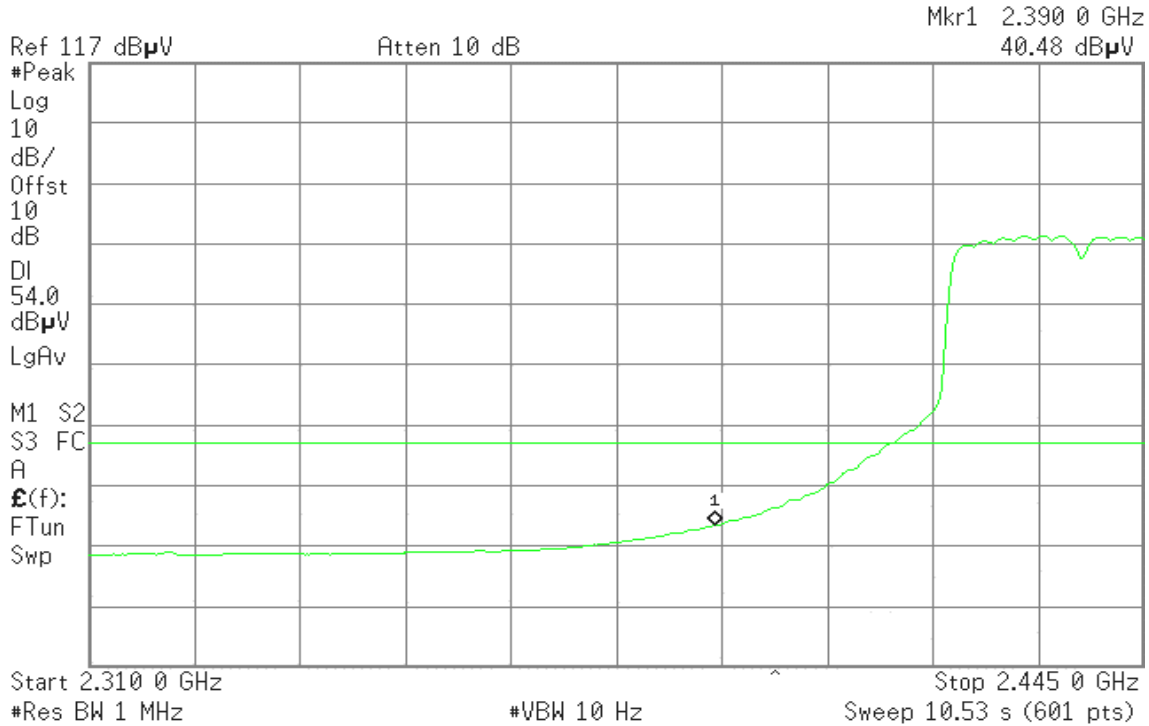


Detector mode: Average

Polarity: Vertical

Agilent

R T





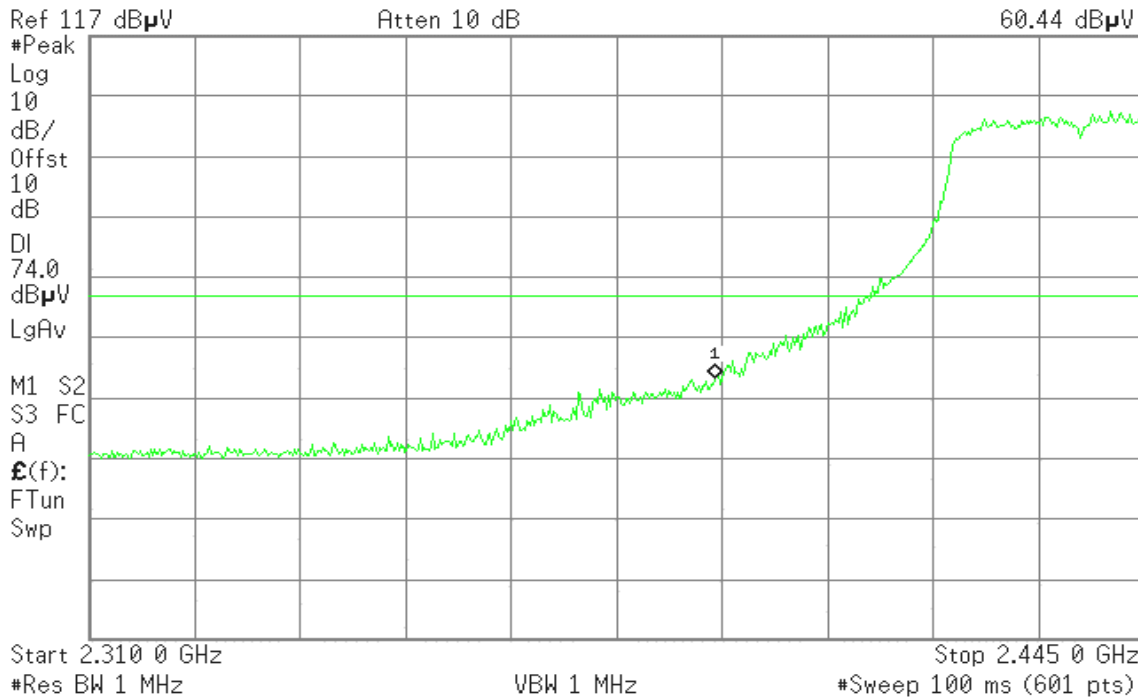
Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 0 GHz  
60.44 dBµV



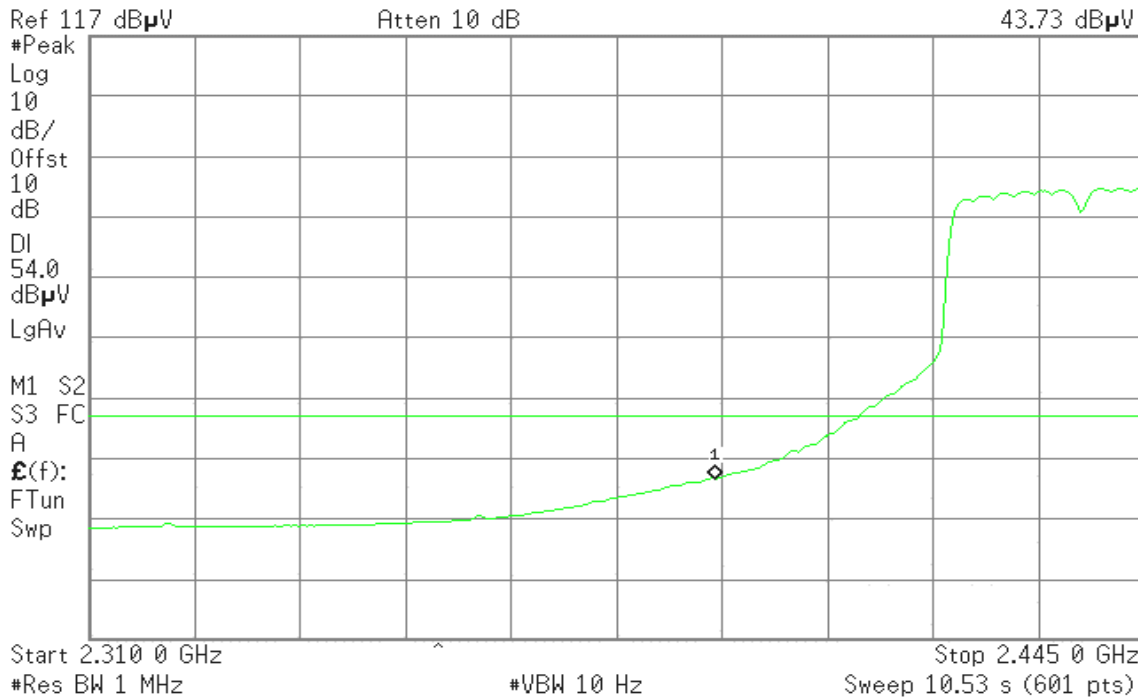
Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 0 GHz  
43.73 dBµV





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

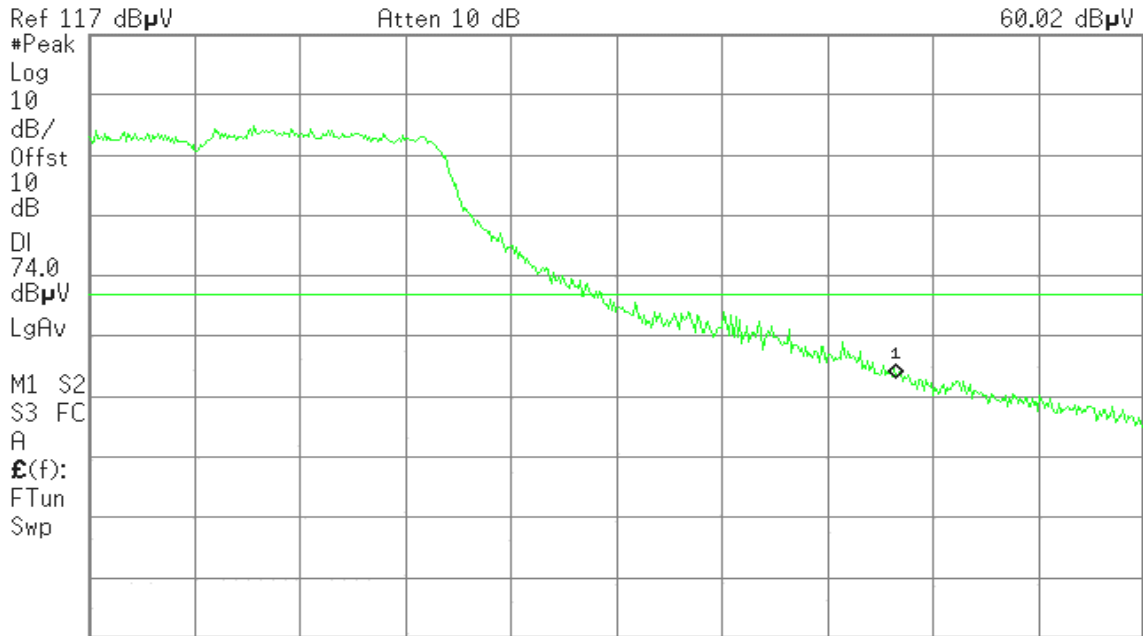
Detector mode: Peak

Polarity: Vertical

Agilent

R T

Mkr1 2.483 50 GHz  
60.02 dBµV



Start 2.430 00 GHz #Res BW 1 MHz #VBW 1 MHz Stop 2.500 00 GHz #Sweep 100 ms (601 pts)

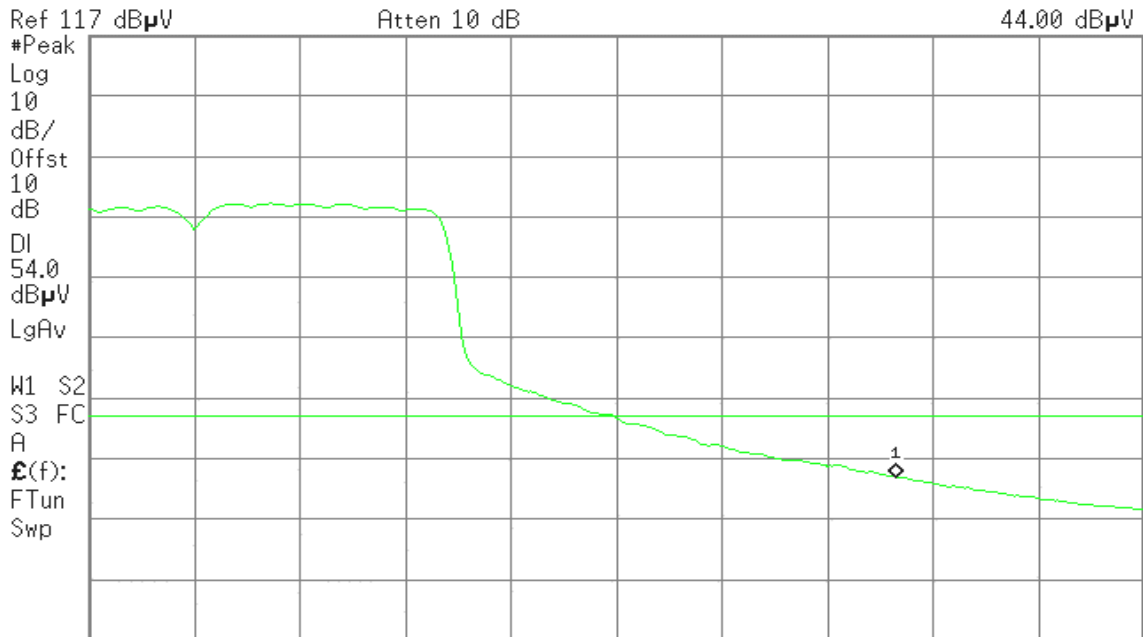
Detector mode: Average

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
44.00 dBµV



Start 2.430 00 GHz #Res BW 1 MHz #VBW 10 Hz Stop 2.500 00 GHz Sweep 5.458 s (601 pts)



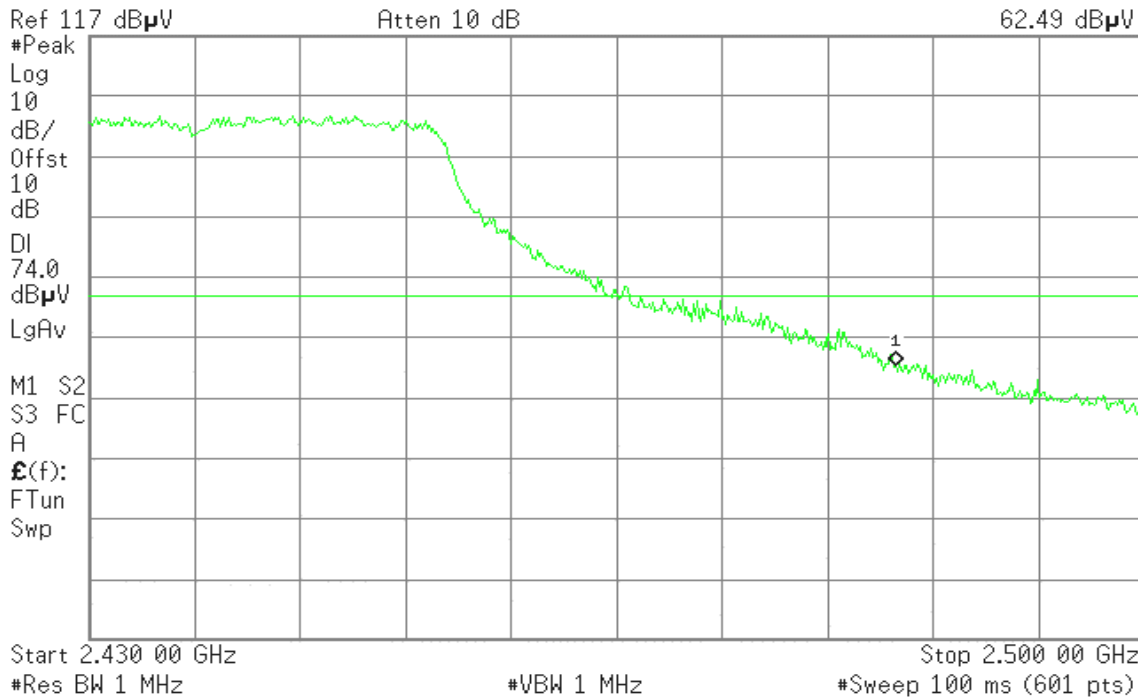
Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
62.49 dBµV



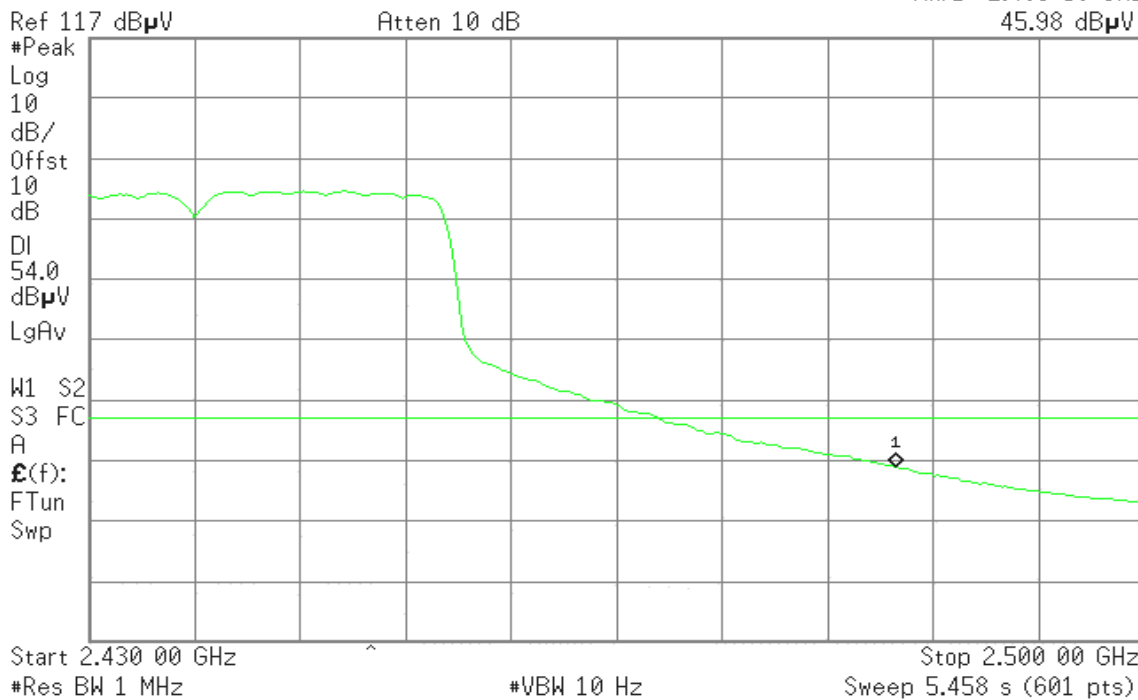
Detector mode: Average

Polarity: Horizontal

Agilent

T

Mkr1 2.483 50 GHz  
45.98 dBµV



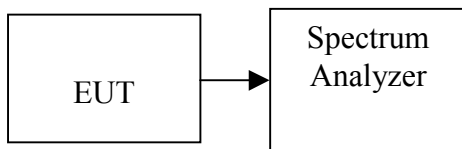


## 7.5 PEAK POWER SPECTRAL DENSITY

### 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**

Mode	Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Base Mode	Low	2412	-8.65	8.00	PASS
	Mid	2437	-8.93		PASS
	High	2462	-9.10		PASS

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

Mode	Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Base Mode	Low	2412	-9.46	8.00	PASS
	Mid	2437	-10.04		PASS
	High	2462	-8.28		PASS
Turbo Mode	Turbo	2437	-9.33		PASS

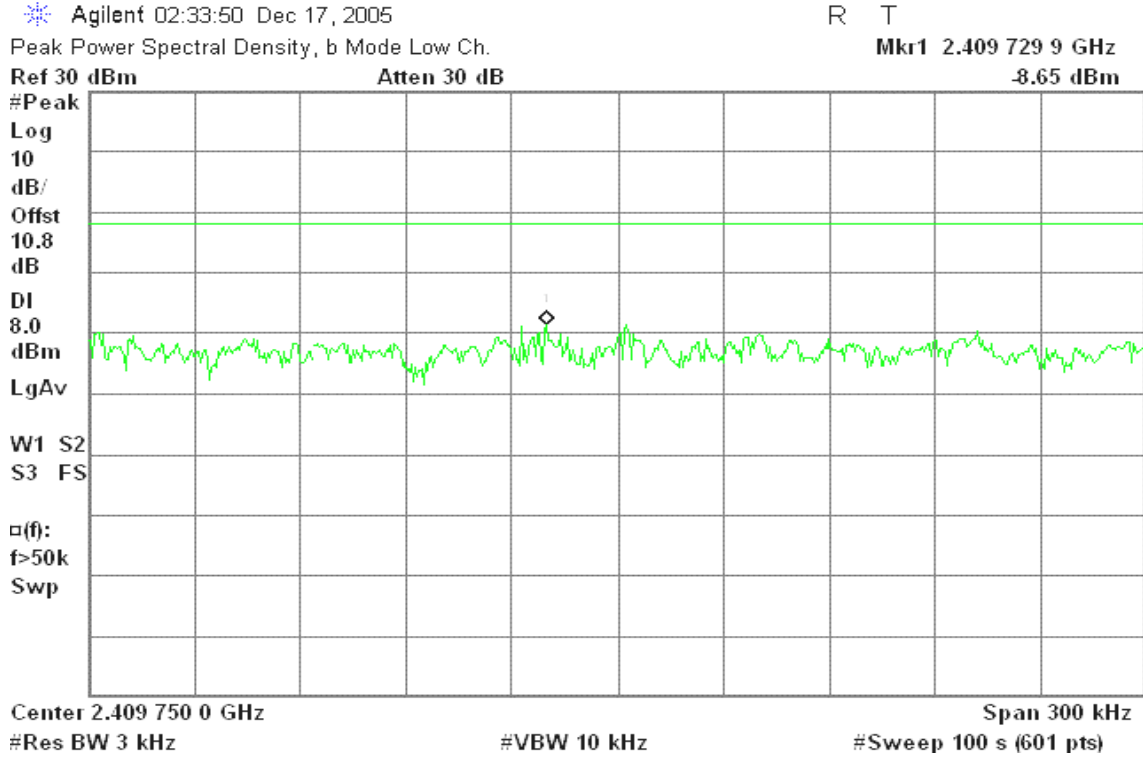




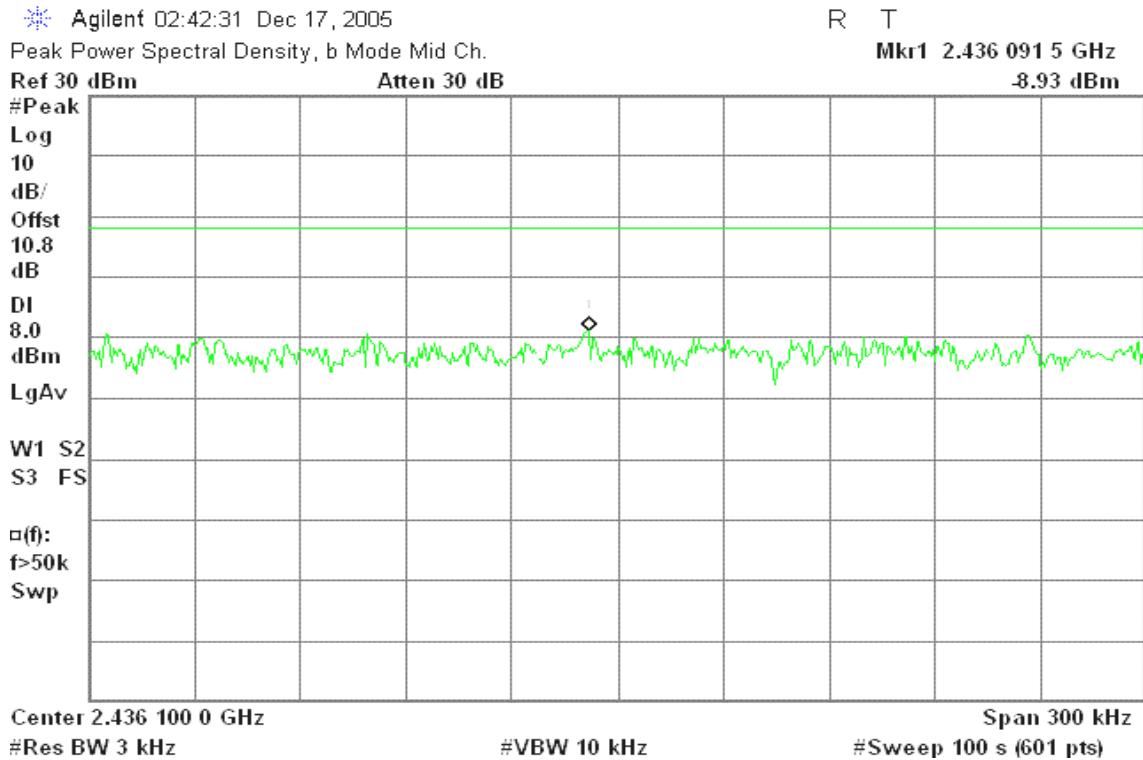
Test Plot

IEEE 802.11b

PPSD (CH Low)



PPSD (CH Mid)





### PPSD (CH High)

Agilent 02:53:40 Dec 17, 2005

R T

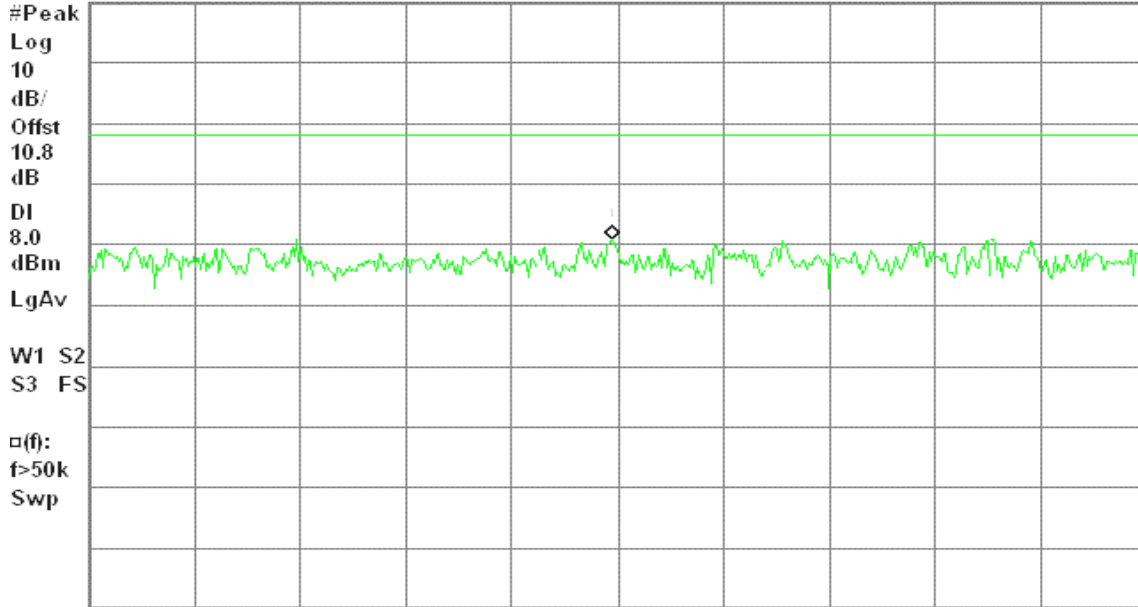
Peak Power Spectral Density, b Mode High Ch.

Mkr1 2.462 598 0 GHz

Ref 30 dBm

Atten 30 dB

-9.10 dBm



Center 2.462 600 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### IEEE 802.11g

### PPSD (CH Low)

Agilent 18:52:22 Dec 17, 2005

R T

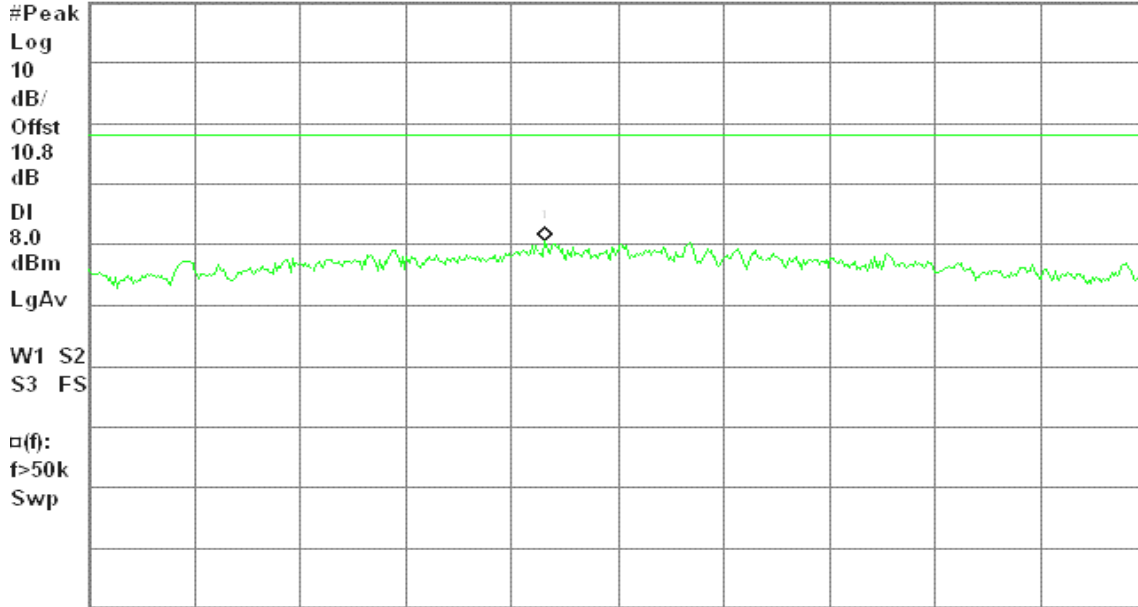
Peak Power Spectral Density, g Mode Low Ch.

Mkr1 2.410 729 4 GHz

Ref 30 dBm

Atten 30 dB

-9.46 dBm



Center 2.410 750 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### PPSD (CH Mid)

Agilent 18:46:21 Dec 17, 2005

R T

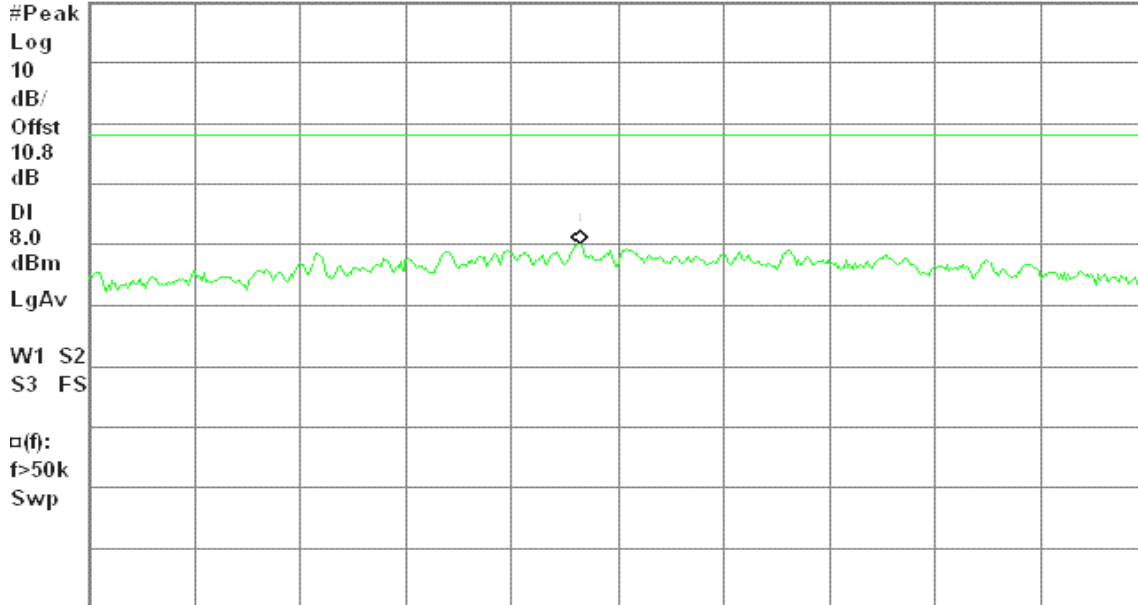
Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.431 039 0 GHz

Ref 30 dBm

Atten 30 dB

-10.04 dBm



Center 2.431 050 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### PPSD (CH High)

Agilent 18:37:07 Dec 17, 2005

R T

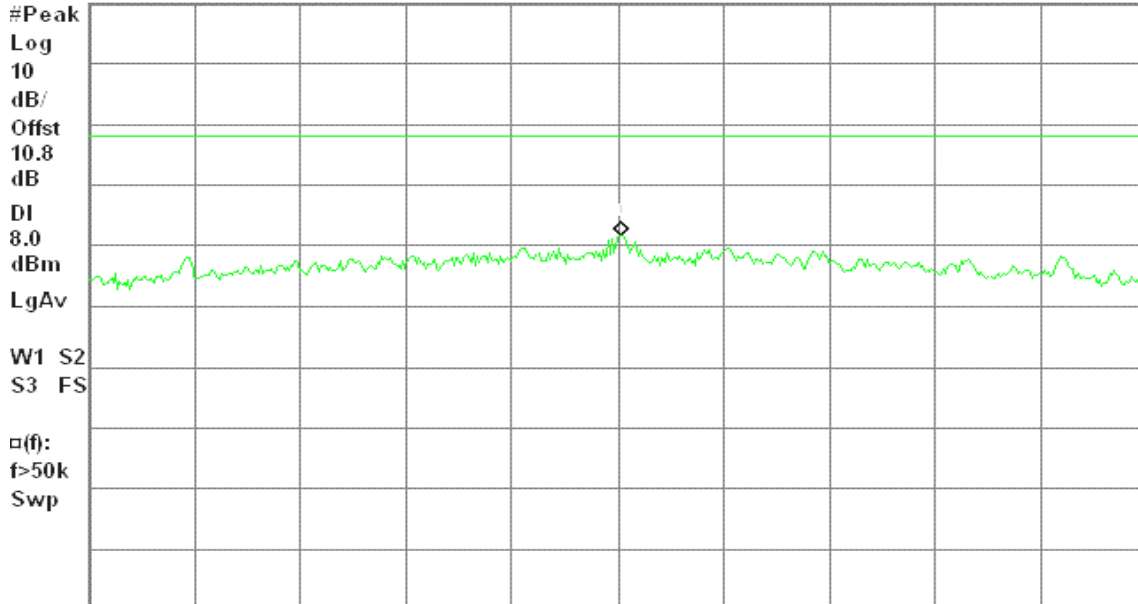
Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.457 001 0 GHz

Ref 30 dBm

Atten 30 dB

-8.28 dBm



Center 2.457 000 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



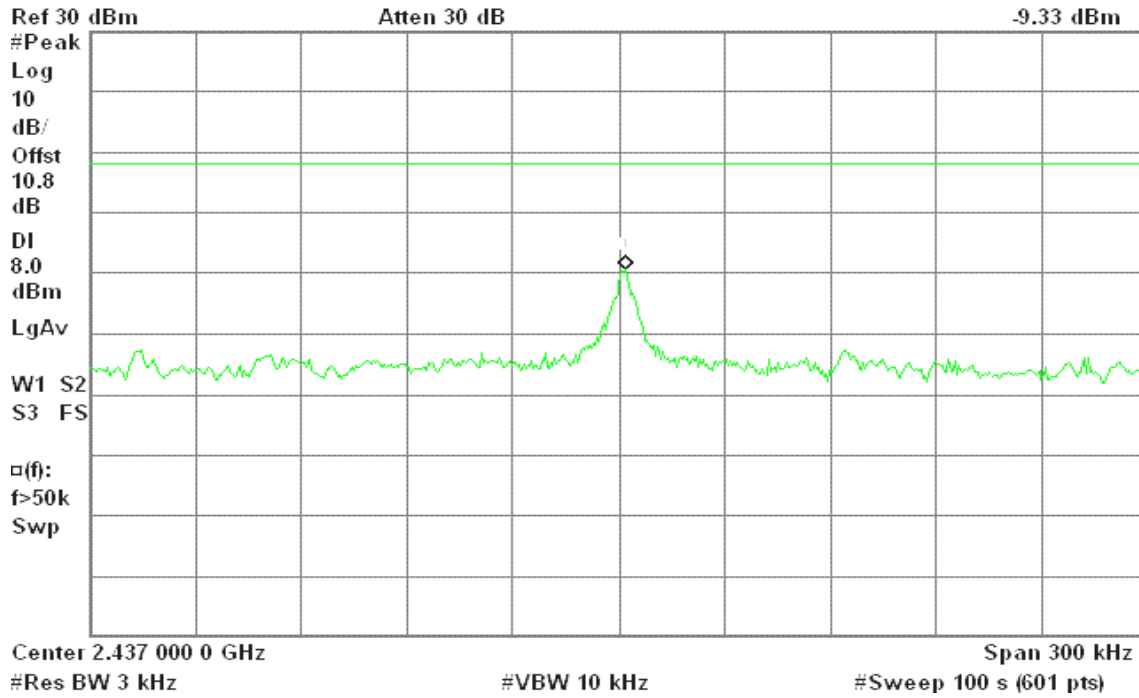
### IEEE 802.11g Turbo Mode

### PPSD (CH Mid)

Agilent 19:07:12 Dec 17, 2005

R T

Mkr1 2.437 002 0 GHz  
-9.33 dBm



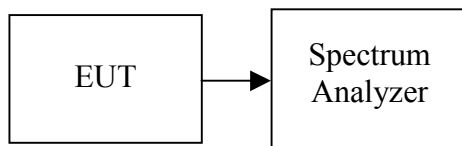
## 7.6 SPURIOUS EMISSIONS

### 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 300 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 02:35:18 Dec 17, 2005

R T

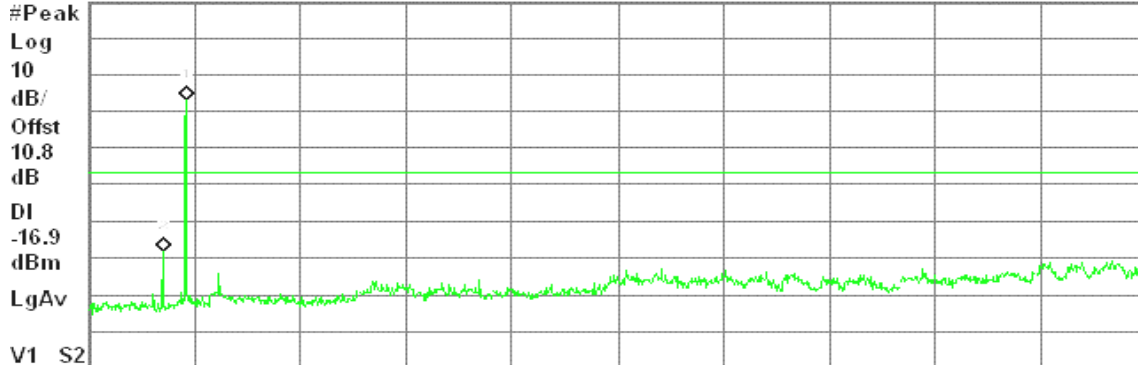
Spurious, b Mode Low Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-38.51 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42 GHz	3.13 dBm
2	(1)	Freq	1.85 GHz	-38.51 dBm

**CH Mid**

Agilent 02:44:43 Dec 17, 2005

L

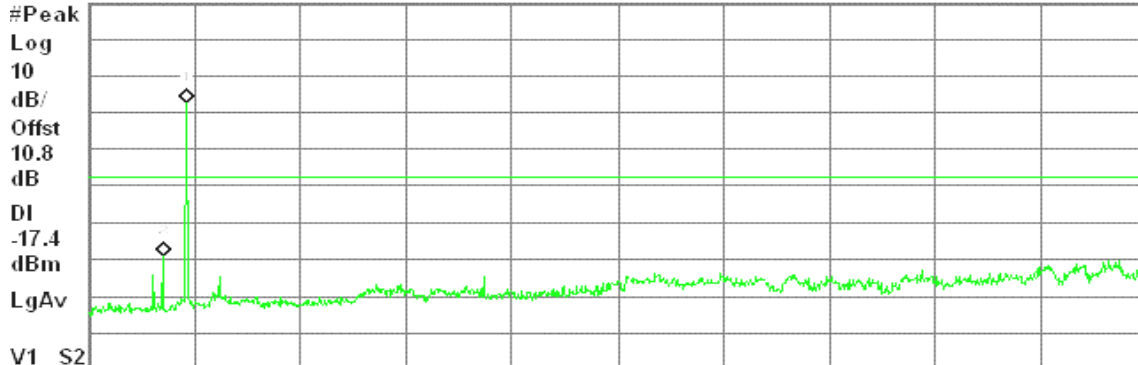
Spurious, b Mode Mid Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-39.21 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.46 GHz	2.59 dBm
2	(1)	Freq	1.85 GHz	-39.21 dBm



### CH High

Agilent 02:55:03 Dec 17, 2005

R T

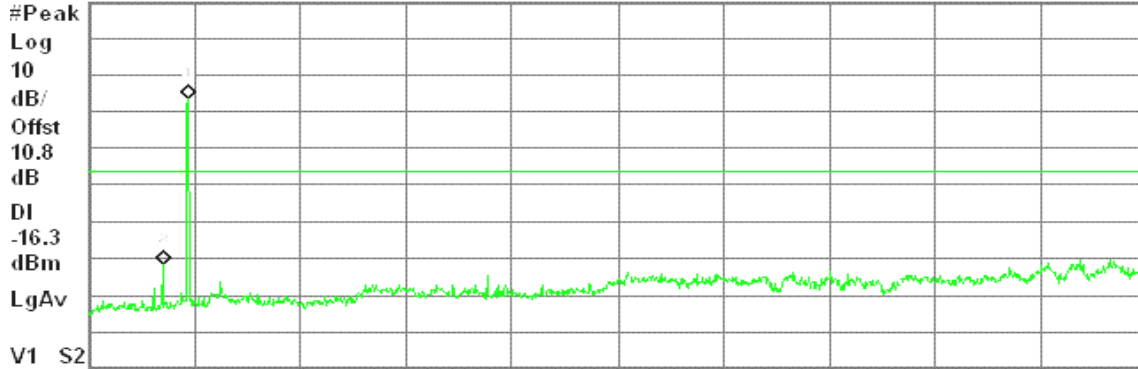
Spurious, b Mode High Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-41.82 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.47 GHz	3.69 dBm
2	(1)	Freq	1.85 GHz	-41.82 dBm

### IEEE 802.11g

#### CH Low

Agilent 18:53:29 Dec 17, 2005

R T

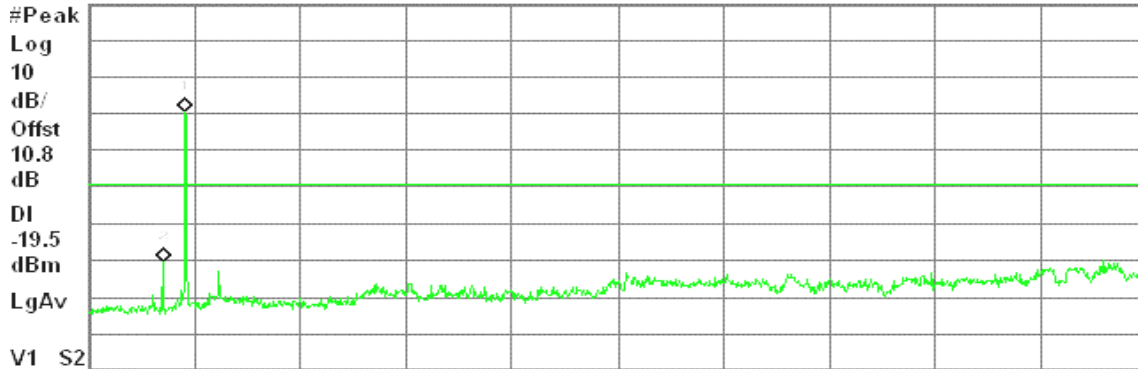
Spurious, g Mode Low Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-40.59 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.39 GHz	0.51 dBm
2	(1)	Freq	1.85 GHz	-40.59 dBm



### CH Mid

Agilent 18:47:22 Dec 17, 2005

R T

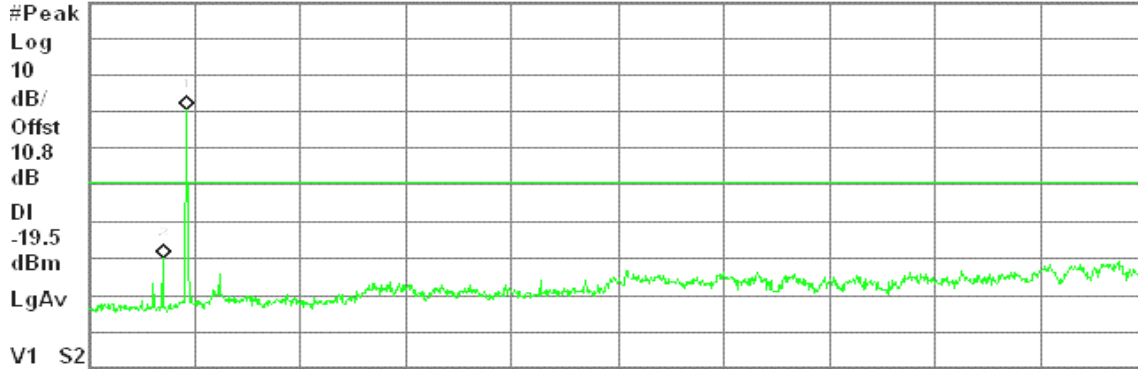
Spurious, g Mode Mid Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-39.99 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	0.49 dBm
2	(1)	Freq	1.85 GHz	-39.99 dBm

### CH High

Agilent 18:38:53 Dec 17, 2005

R T

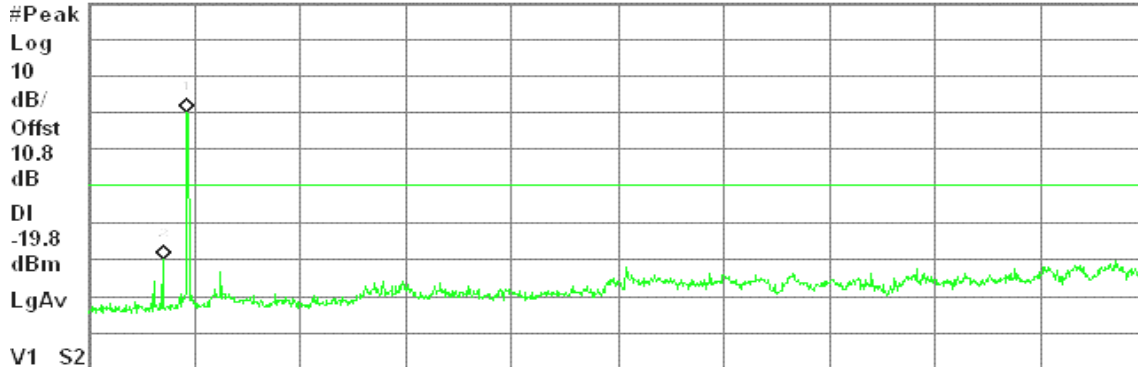
Spurious, g Mode High Ch.

Mkr2 1.85 GHz

Ref 30 dBm

Atten 30 dB

-40.28 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	0.24 dBm
2	(1)	Freq	1.85 GHz	-40.28 dBm





### IEEE 802.11g Turbo Mode

#### CH Mid

Agilent 19:12:28 Dec 17, 2005

L

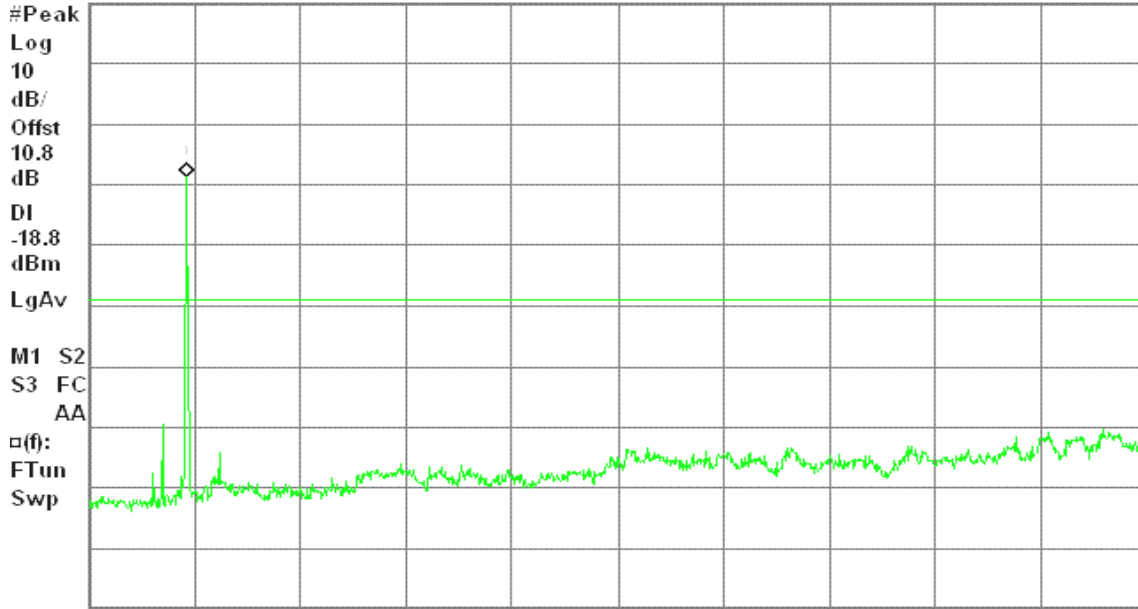
Spurious, g turbo Mode Mid Ch.

Mkr1 2.45 GHz

Ref 30 dBm

Atten 30 dB

1.19 dBm



Start 30 MHz  
#Res BW 100 kHz

#VBW 100 kHz

Stop 26.00 GHz  
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

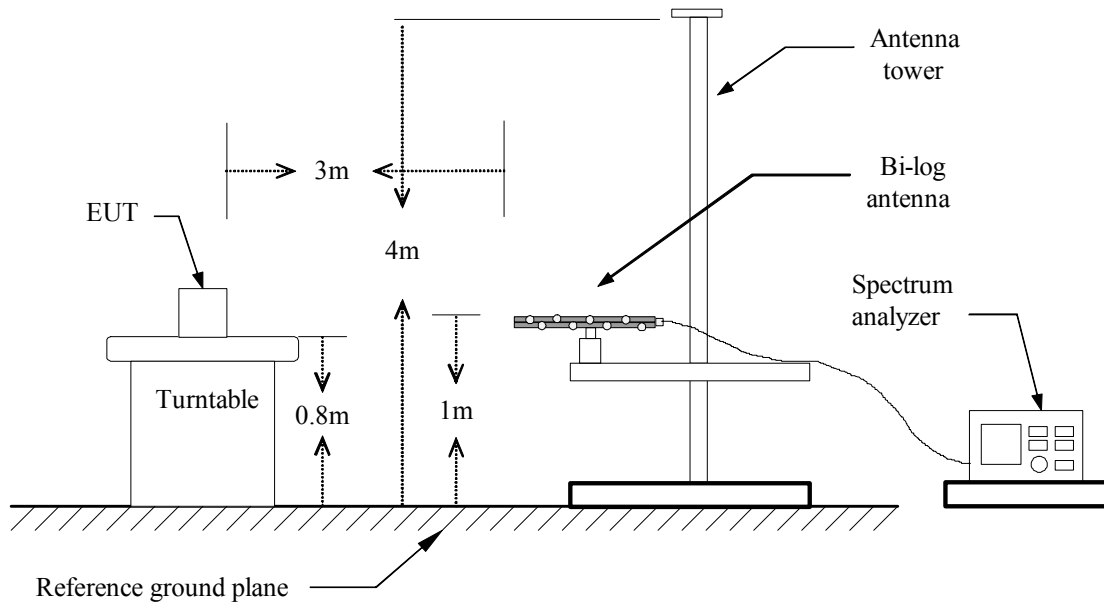
*Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

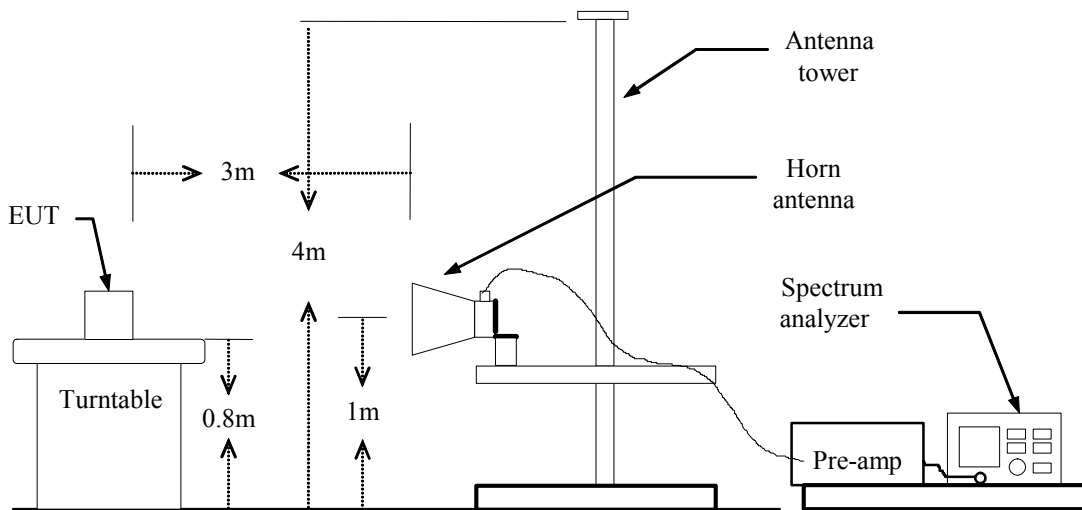
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### 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**

**Operation Mode:** Normal Link

**Test Date:** December 17, 2005

**Temperature:** 24°C

**Tested by:** Ryan Chen

**Humidity:** 55% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (QP) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (QP) (dBuV/m)	Limit (QP) (dBuV/m)	Margin (dB)	Remark
165.80	V	53.18	---	-20.81	32.37	---	43.50	-11.13	Peak
430.93	V	48.74	---	-15.20	33.54	---	46.00	-12.46	Peak
500.45	V	51.12	---	-13.43	37.69	---	46.00	-8.31	Peak
578.05	V	50.14	---	-12.36	37.78	---	46.00	-8.22	Peak
862.58	V	42.61	---	-8.60	34.00	---	46.00	-12.00	Peak
917.55	V	45.26	---	-7.91	37.35	---	46.00	-8.65	Peak
165.80	H	55.26	---	-20.81	34.45	---	43.50	-9.05	Peak
233.70	H	58.91	---	-20.78	38.13	---	46.00	-7.87	Peak
298.37	H	56.09	---	-18.54	37.55	---	46.00	-8.45	Peak
430.93	H	53.16	---	-15.20	37.96	---	46.00	-8.04	Peak
584.52	H	51.89	---	-12.32	39.57	---	46.00	-6.43	Peak
862.58	H	47.16	---	-8.60	38.56	---	46.00	-7.44	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. 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) – Quasi-peak limit (dBuV/m).



**Above 1 GHz**

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

**Test Date:** December 17, 2005

**Temperature:** 24°C

**Tested by:** Alex Cheng

**Humidity:** 55 % 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
1490.00	V	54.54	---	-7.02	47.52	---	74.00	54.00	-6.48	Peak
3718.33	V	43.73	---	-2.91	40.82	---	74.00	54.00	-13.18	Peak
4826.67	V	47.85	36.43	0.64	48.49	37.07	74.00	54.00	-16.93	Average
5655.00	V	43.60	---	2.25	45.85	---	74.00	54.00	-8.15	Peak
7031.67	V	42.04	---	7.35	49.40	---	74.00	54.00	-4.60	Peak
7241.67	V	48.70	43.58	6.23	54.94	49.81	74.00	54.00	-4.19	Average
1606.67	H	51.89	---	-6.83	45.07	---	74.00	54.00	-8.93	Peak
3216.67	H	45.32	---	-3.71	41.60	---	74.00	54.00	-12.40	Peak
4826.67	H	44.09	---	0.64	44.73	---	74.00	54.00	-9.27	Peak
5246.67	H	43.87	---	1.77	45.63	---	74.00	54.00	-8.37	Peak
7241.67	H	47.98	38.94	6.23	54.22	45.17	74.00	54.00	-8.83	Average
9650.00	H	77.14	73.36	-24.72	52.42	48.64	74.00	54.00	-5.36	Average

**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: December 17, 2005

Temperature: 24°C

Tested by: Alex Cheng

Humidity: 55 % 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
1338.33	V	47.80	---	-6.94	40.86	---	74.00	54.00	-13.14	Peak
2610.00	V	45.12	---	-4.61	40.50	---	74.00	54.00	-13.50	Peak
4873.33	V	46.76	---	0.81	47.57	---	74.00	54.00	-6.43	Peak
7311.67	V	48.67	41.80	5.86	54.53	47.66	74.00	54.00	-6.34	Average
9750.00	V	73.44	---	-24.77	48.67	---	74.00	54.00	-5.33	Peak
12183.33	V	71.30	---	-22.88	48.41	---	74.00	54.00	-5.59	Peak
1326.67	H	50.24	---	-6.94	43.30	---	74.00	54.00	-10.70	Peak
1630.00	H	50.56	---	-6.78	43.78	---	74.00	54.00	-10.22	Peak
2656.67	H	46.25	---	-4.50	41.75	---	74.00	54.00	-12.25	Peak
4873.33	H	45.95	---	0.81	46.76	---	74.00	54.00	-7.24	Peak
7311.67	H	48.63	39.67	5.86	54.49	45.53	74.00	54.00	-8.47	Average
9750.00	H	69.41	---	-24.77	44.64	---	74.00	54.00	-9.36	Peak

**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: December 17, 2005

Temperature: 24°C

Tested by: Alex Cheng

Humidity: 55 % 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
1245.00	V	50.82	---	-6.90	43.92	---	74.00	54.00	-10.08	Peak
1478.33	V	51.92	---	-7.01	44.91	---	74.00	54.00	-9.09	Peak
4920.00	V	44.65	---	0.98	45.62	---	74.00	54.00	-8.38	Peak
7381.67	V	47.42	40.06	5.49	52.91	45.55	74.00	54.00	-8.45	Average
9850.00	V	76.16	---	-24.81	51.35	---	74.00	---	-2.65	Peak
N/A										
1326.67	H	51.78	---	-6.94	44.84	---	74.00	54.00	-9.16	Peak
1490.00	H	52.59	---	-7.02	45.58	---	74.00	54.00	-8.42	Peak
1641.67	H	53.44	---	-6.76	46.68	---	74.00	54.00	-7.32	Peak
7381.67	H	48.03	37.04	5.49	53.52	42.53	74.00	54.00	-11.47	Average
9850.00	H	69.79	---	-24.81	44.98	---	74.00	54.00	-9.02	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: December 17, 2005

Temperature: 24°C

Tested by: Alex Cheng

Humidity: 55 % 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	48.69	---	-6.94	41.75	---	74.00	54.00	-12.25	Peak
2575.00	V	45.47	---	-4.70	40.77	---	74.00	54.00	-13.23	Peak
4826.67	V	47.26	---	0.64	47.91	---	74.00	54.00	-6.09	Peak
7241.67	V	51.24	45.57	6.23	57.48	51.80	74.00	54.00	-2.20	Average
9650.00	V	69.94	---	-24.72	45.22	---	74.00	54.00	-8.78	Peak
12066.67	V	76.61	67.17	-23.05	53.56	44.12	74.00	54.00	-9.88	Average
1326.67	H	51.56	---	-6.94	44.62	---	74.00	54.00	-9.38	Peak
1478.33	H	53.40	---	-7.01	46.39	---	74.00	54.00	-7.61	Peak
1606.67	H	50.71	---	-6.83	43.89	---	74.00	54.00	-10.11	Peak
7241.67	H	49.51	36.66	6.23	55.74	42.89	74.00	54.00	-11.11	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: December 17, 2005

Temperature: 24°C

Tested by: Alex Cheng

Humidity: 55 % 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
1233.33	V	48.49	---	-6.89	41.60	---	74.00	54.00	-12.40	Peak
1478.33	V	54.26	---	-7.01	47.25	---	74.00	54.00	-6.75	Peak
4873.33	V	44.98	---	0.81	45.79	---	74.00	54.00	-8.21	Peak
7311.67	V	51.28	39.36	5.86	57.14	45.22	74.00	54.00	-8.78	Average
N/A										
1326.67	H	49.25	---	-6.94	42.32	---	74.00	54.00	-11.68	Peak
1630.00	H	54.17	---	-6.78	47.39	---	74.00	54.00	-6.61	Peak
4873.33	H	44.64	---	0.81	45.45	---	74.00	54.00	-8.55	Peak
7311.67	H	49.79	38.31	5.86	55.65	44.17	74.00	54.00	-9.83	Average
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: December 17, 2005

Temperature: 24°C

Tested by: Alex Cheng

Humidity: 55 % 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
1081.67	V	48.97	---	-6.82	42.15	---	74.00	54.00	-11.85	Peak
1326.67	V	49.05	---	-6.94	42.11	---	74.00	54.00	-11.89	Peak
1641.67	V	47.78	---	-6.76	41.02	---	74.00	54.00	-12.98	Peak
2656.67	V	45.92	---	-4.50	41.42	---	74.00	54.00	-12.58	Peak
7393.33	V	48.57	36.01	5.43	54.00	41.44	74.00	54.00	-12.56	Average
N/A										
1326.67	H	51.66	---	-6.94	44.72	---	74.00	54.00	-9.28	Peak
1641.67	H	54.04	---	-6.76	47.28	---	74.00	54.00	-6.72	Peak
3286.67	H	45.82	---	-3.73	42.09	---	74.00	54.00	-11.91	Peak
7381.67	H	49.33	35.44	5.49	54.82	40.93	74.00	54.00	-13.07	Average
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 Turbo Mode/ CH Mid Test Date: December 17, 2005

Temperature: 24°C Tested by: Alex Cheng

Humidity: 55 % 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
1245.00	V	48.98	---	-6.90	42.08	---	74.00	54.00	-11.92	Peak
4068.33	V	44.60	---	-1.62	42.98	---	74.00	54.00	-11.02	Peak
7311.67	V	47.04	36.41	5.86	52.90	42.27	74.00	54.00	-11.73	Average
N/A										
1256.67	H	49.17	---	-6.90	42.27	---	74.00	54.00	-11.73	Peak
1326.67	H	50.46	---	-6.94	43.52	---	74.00	54.00	-10.48	Peak
1630.00	H	53.31	---	-6.78	46.53	---	74.00	54.00	-7.47	Peak
7311.67	H	46.19	35.32	5.86	52.05	41.18	74.00	54.00	-12.82	Average
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 μH/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 (dBμV)	
	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:** December 17,2005  
**Temperature:** 25°C                                      **Tested by:** Ryan Chen  
**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
0.203	44.100	44.110	0.100	44.200	44.210	63.487	53.487	-19.287	-9.277	L1
0.473	29.310	26.800	0.100	29.410	26.900	56.461	46.461	-27.051	-19.561	L1
1.488	27.620	25.960	0.100	27.720	26.060	56.000	46.000	-28.280	-19.940	L1
5.412	18.760	12.150	0.241	19.001	12.391	60.000	50.000	-40.999	-37.609	L1
7.039	19.650	13.740	0.404	20.054	14.144	60.000	50.000	-39.946	-35.856	L1
8.869	22.200	16.420	0.587	22.787	17.007	60.000	50.000	-37.213	-32.993	L1
0.205	36.590	35.390	0.100	36.690	35.490	63.405	53.405	-26.715	-17.915	L2
0.406	29.510	28.160	0.100	29.610	28.260	57.730	47.730	-28.120	-19.470	L2
0.953	21.350	16.060	0.100	21.450	16.160	56.000	46.000	-34.550	-29.840	L2
3.328	25.090	20.160	0.100	25.190	20.260	56.000	46.000	-30.810	-25.740	L2
5.159	24.410	19.700	0.216	24.626	19.916	60.000	50.000	-35.374	-30.084	L2
7.808	22.080	16.130	0.481	22.561	16.611	60.000	50.000	-37.439	-33.389	L2

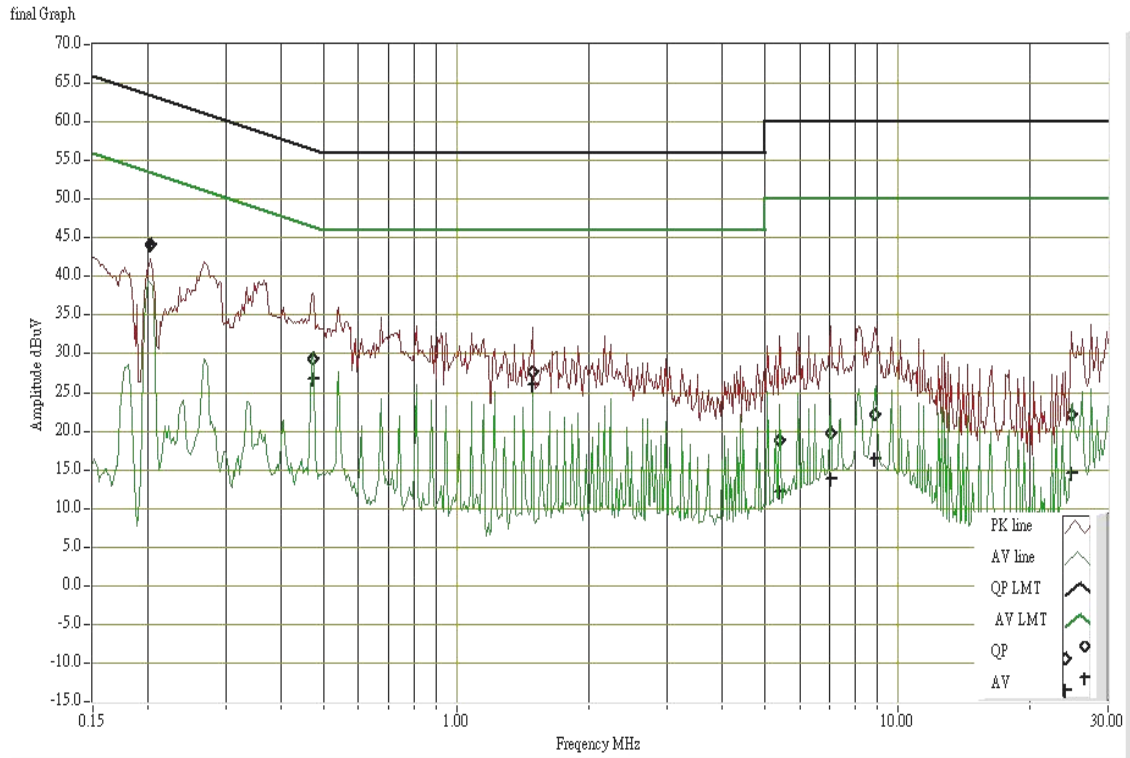
#### Remark:

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)

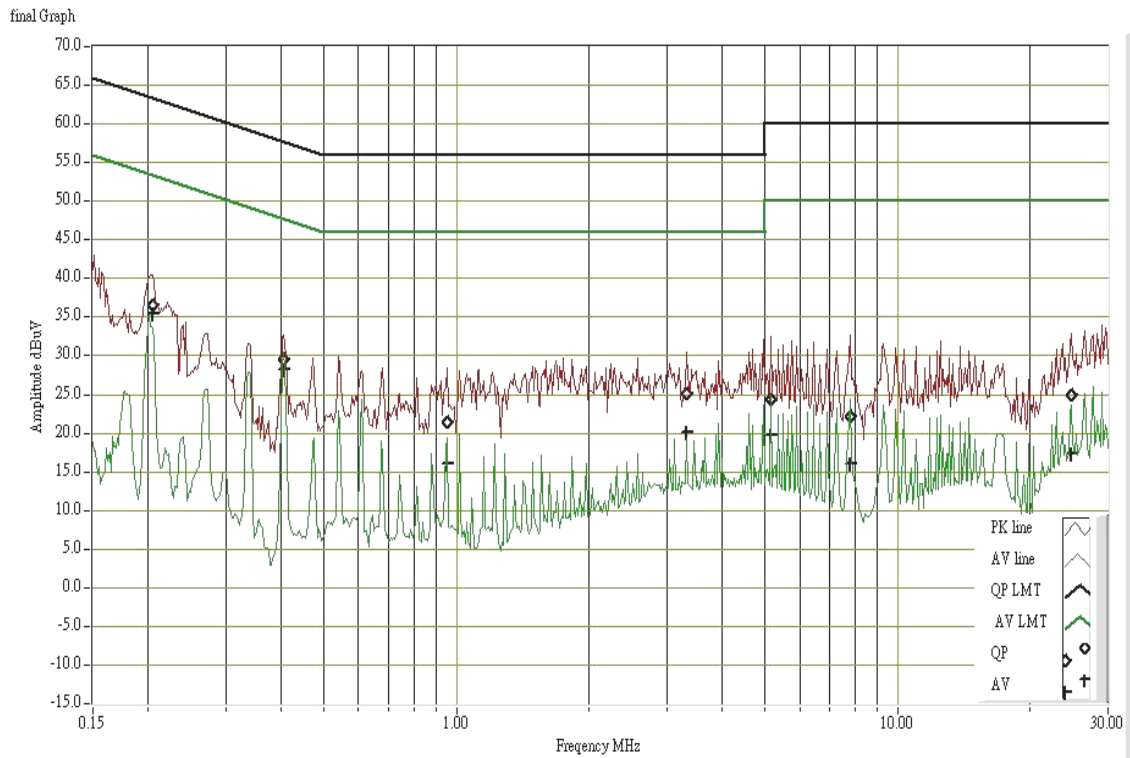


### Test Plots

#### Conducted emissions (Line 1)



#### Conducted emissions (Line 2)





## APPENDIX 1 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>	802.11g (super G) CARDBUS CARD
<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 checked="" type="checkbox"/> Portable (<20cm separation) <input 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 type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	IEEE 802.11b: 18.98 dBm (79.068mW) IEEE 802.11g: 18.94 dBm (78.342mW)
<b>Antenna gain (Max)</b>	3.74 dBi (Numeric gain: 2.366)
<b>Evaluation applied</b>	<input type="checkbox"/> MPE Evaluation <input checked="" type="checkbox"/> SAR Evaluation* <input type="checkbox"/> N/A

### **Remark:**

1. The maximum output power is 18.98dBm (79.068mW) at 2437MHz (with 2.366 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.

**Remark:** Please refer to the separated SAR report.