



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**IEEE 802.11a/b/g Wireless Mini-PCI Adapter**

**Model: NMP-8602(FCC)PLUS, EMP-8602(FCC)PLUS**

**Trade Name: SENAO**

*Issued to*

**SENAO INTERNATIONAL CO., LTD.  
No.500, Fusing 3 RD., Hwa-Ya Technical Park,  
Kuei-Shan Hsiang, Taoyuan County 333, Taiwan, R.O.C.**

*Issued by*



**Compliance Certification Services Inc.  
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# 1. TEST RESULT CERTIFICATION

**Applicant:** SENAO INTERNATIONAL CO., LTD.  
 No.500, Fusing 3 RD., Hwa-Ya Technical Park,  
 Kuei-Shan Hsiang, Taoyuan County 333, Taiwan, R.O.C.

**Equipment Under Test:** IEEE 802.11a/b/g Wireless Mini-PCI Adapter

**Trade Name:** SENAO

**Model:** NMP-8602(FCC)PLUS, EMP-8602(FCC)PLUS

**Date of Test:** November 21, 2005 ~ January 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>	IEEE 802.11a/b/g Wireless Mini-PCI Adapter
<b>Trade Name</b>	SENAO
<b>Model Number</b>	NMP-8602(FCC)PLUS, EMP-8602(FCC)PLUS
<b>Model Discrepancy</b>	All the specification and layout are identical except they come with different model numbers for marketing purpose.
<b>Power Supply</b>	Powered from host device.
<b>Frequency Range</b>	IEEE 802.11a: 5.745~5.825 GHz IEEE 802.11b/g: 2.412~2.462 GHz
<b>Transmit Power</b>	IEEE 802.11a: 22.70 dBm IEEE 802.11b: 25.26 dBm IEEE 802.11g: 26.26 dBm
<b>Modulation Technique</b>	IEEE 802.11a: OFDM (QPSK, BPSK, 16-QAM, 64-QAM) IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
<b>Transmit Data Rate</b>	IEEE 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 9, 6Mbps
<b>Number of Channels</b>	IEEE 802.11a: 5 Channels IEEE 802.11b/g: 11 Channels
<b>Antenna Specification</b>	Antenna Type: Dipole Antenna Antenna Gain: IEEE 802.11a: 1.5dBi IEEE 802.11b/g: 2dBi

**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: NI3-MP86005001 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

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

<sup>2</sup> Above 38.6

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



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

The EUT (model: NMP-8602(FCC)PLUS) had been tested under operating condition.

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

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.

IEEE802.11a mode:

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

IEEE802.11b mode:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 11Mbps data rate were chosen for full testing.

IEEE802.11g mode:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 6Mbps data rate were 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	01/10/2007

Open Area Test Site # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESVS20	838804/004	01/08/2007
Spectrum Analyzer	R&S	FSP30	100112	09/23/2006
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/10/2007
Pre-Amplifier	MITEC	AFS42-00102650	924206	N.C.R.
Pre-Amplifier	MITEC	AMF-6F-260400	945377	N.C.R.
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/05/2006
Horn Antenna	EMCO	3115	00022250	04/18/2006
Horn Antenna	EMCO	3116	2487	12/08/2006
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R.
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R.
Controller	EMCO	2090	9709-1256	N.C.R.
RF Switch	ANRITSU	MP59B	M53867	N.C.R.
Site NSA	C&C	N/A	N/A	09/06/2006
Test S/W	HTBasic (M026C)			

*Remark: The measurement uncertainty is less than +/- 2.16dB, 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. 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 300 328-2, 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	TAF	EN 300 328-1, EN 300 328-2, 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	 Testing Laboratory 0363
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 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	IBM	2672(X31)	99PBTKB	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	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.

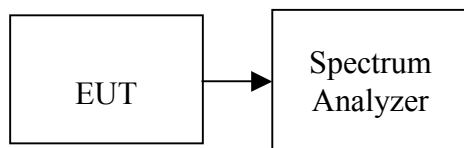
## 7. FCC PART 15.247 REQUIREMENTS

### 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 = 100kHz, VBW = RBW, Span = 50MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.



**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11b**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	11080	>500	PASS
Mid	2437	10000		PASS
High	2462	10000		PASS

**Test mode: IEEE 802.11g**

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

**Test mode: IEEE 802.11a**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	5745	16500	>500	PASS
Mid	5785	16500		PASS
High	5825	16580		PASS



**Test Plot**

**IEEE 802.11b**

**CH Low**

Agilent 10:36:53 Jan 22, 2006

R L

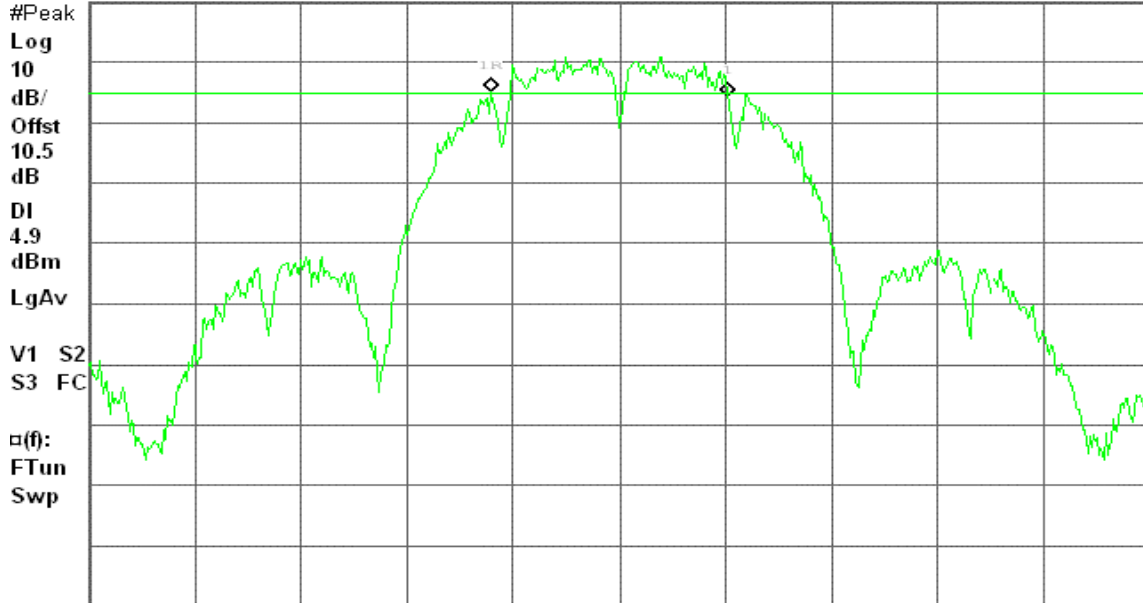
6dB BW, b Mode Low Ch.

Δ Mkr1 11.08 MHz

Ref 20 dBm

Atten 20 dB

-0.76 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

**CH Mid**

Agilent 10:45:06 Jan 22, 2006

R L

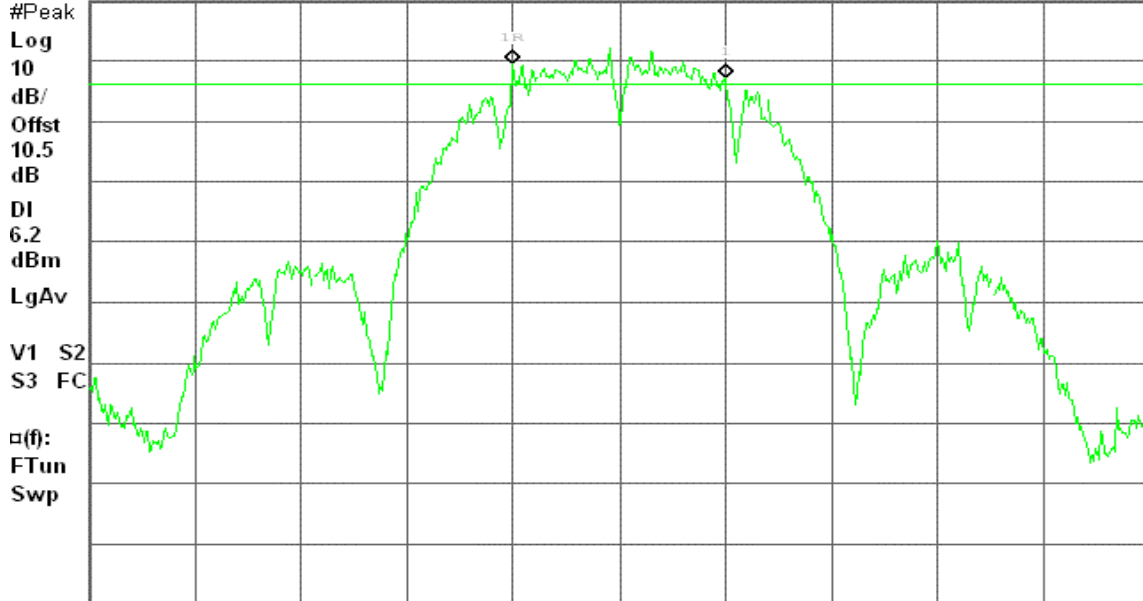
6dB BW, b Mode Mid Ch.

Δ Mkr1 10.00 MHz

Ref 20 dBm

Atten 20 dB

-2.49 dB



Center 2.437 00 GHz

Span 50 MHz

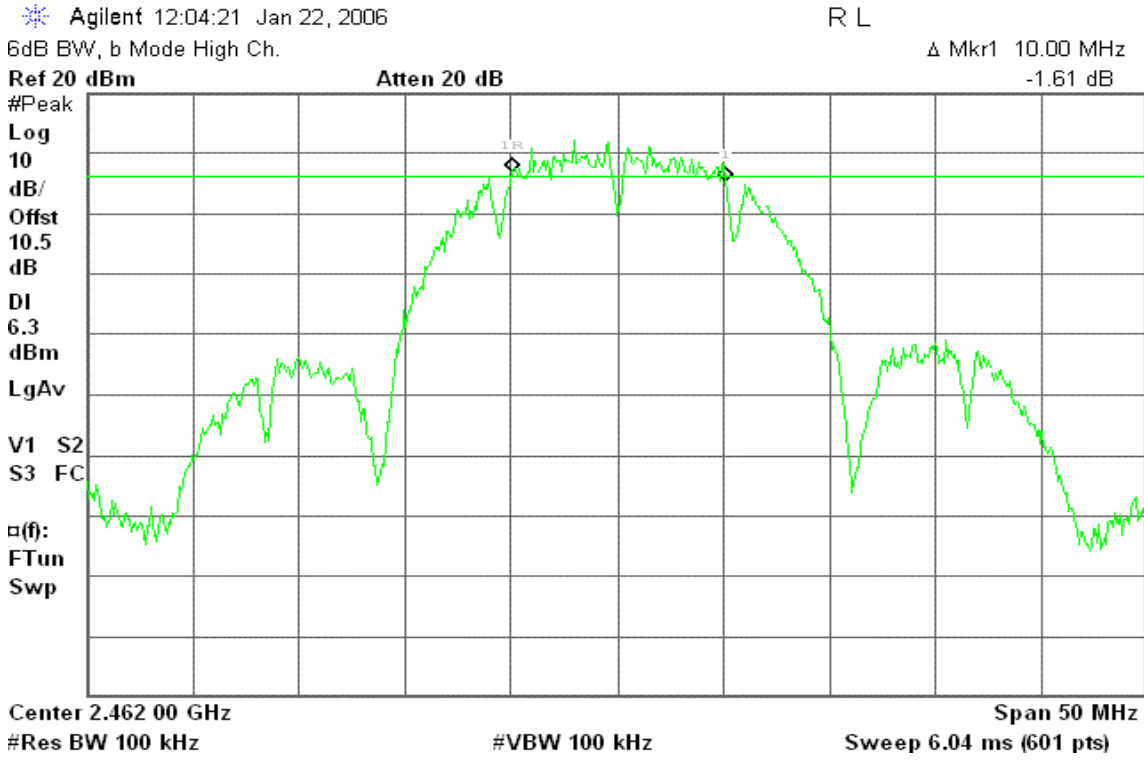
#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

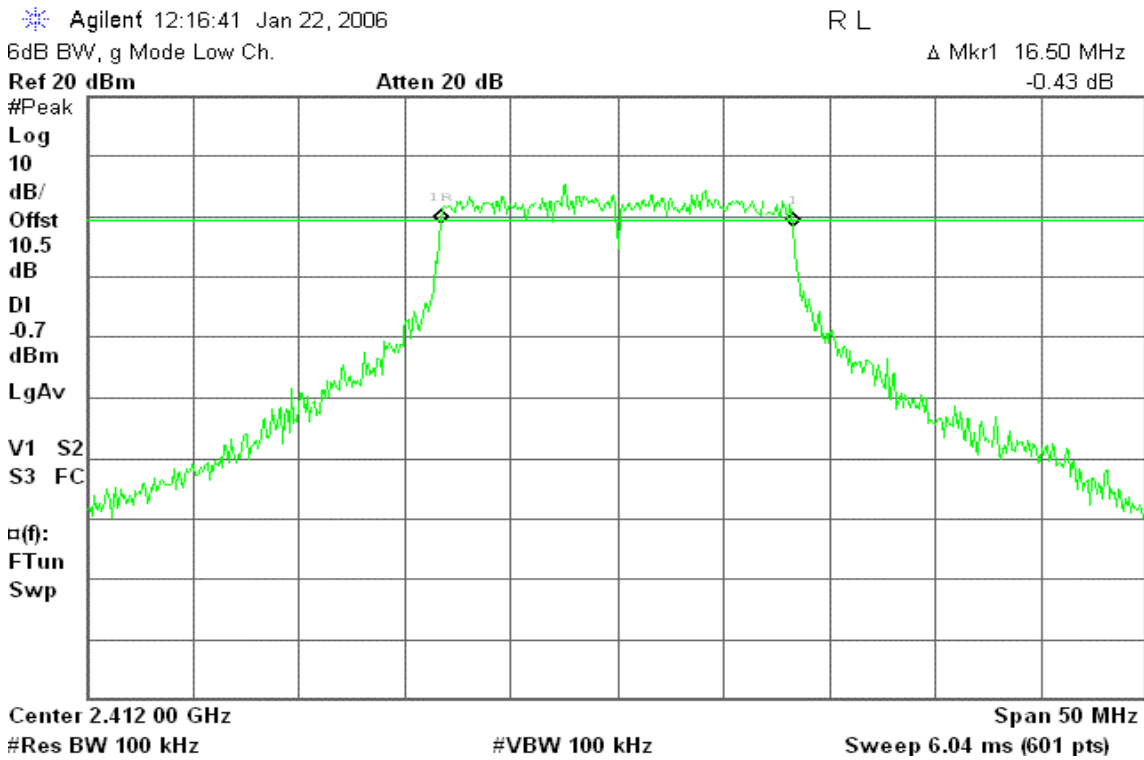


**CH High**



**IEEE 802.11g**

**CH Low**





### CH Mid

Agilent 12:24:47 Jan 22, 2006

R L

6dB BW, g Mode Mid Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 20 dB

-1.30 dB

#Peak

Log

10

dB/

Offst

10.5

dB

DI

4.4

dBm

LgAv

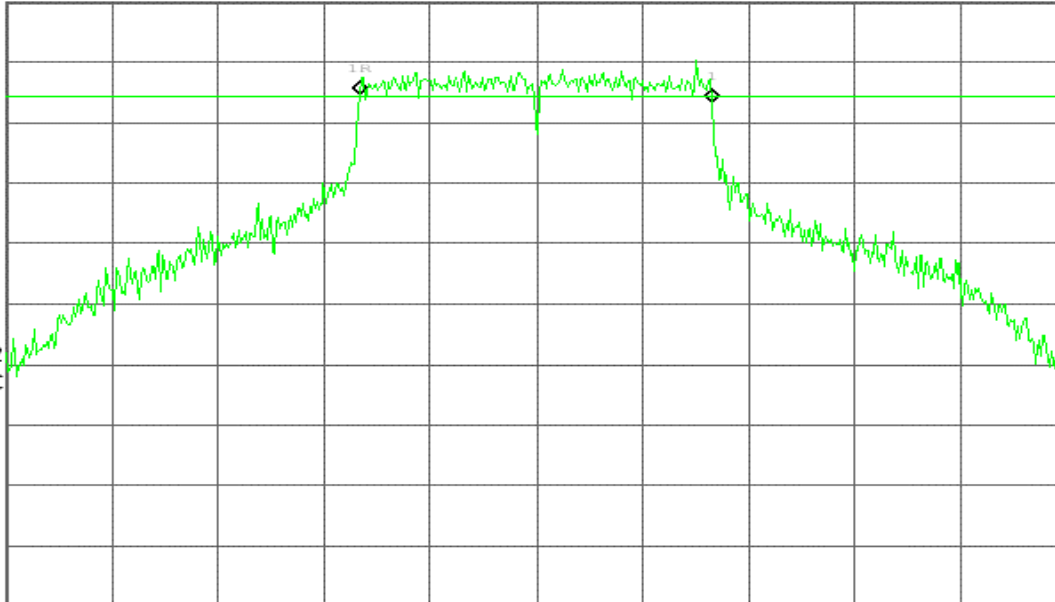
V1 S2

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)

### CH High

Agilent 12:33:39 Jan 22, 2006

R L

6dB BW, g Mode High Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 20 dB

-0.74 dB

#Peak

Log

10

dB/

Offst

10.5

dB

DI

-3.1

dBm

LgAv

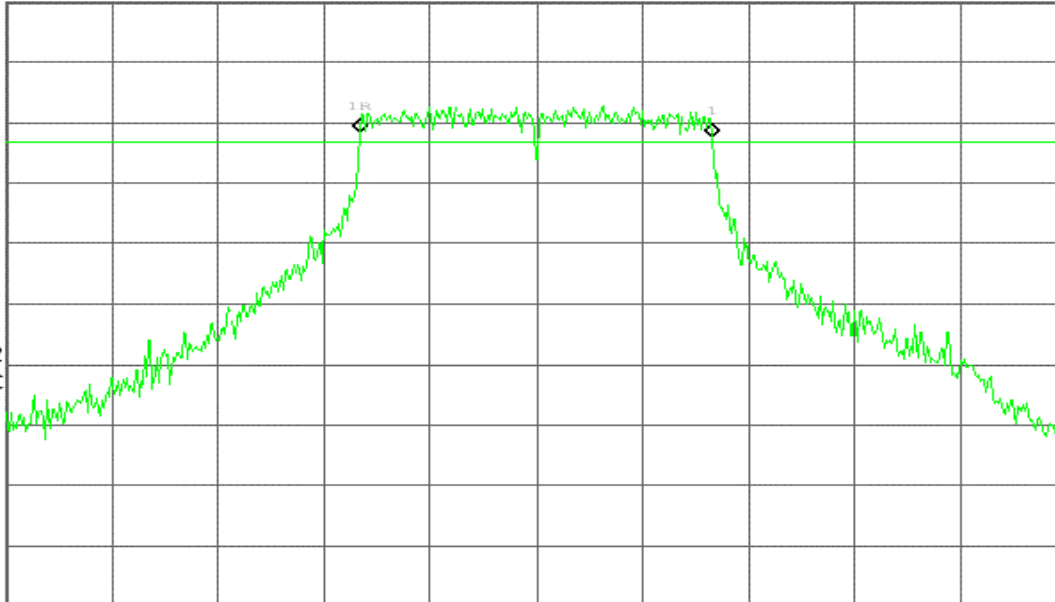
V1 S2

S3 FC

□(f):

FTun

Swp



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)





**IEEE 802.11a**

**CH Low**

Agilent 12:43:34 Jan 22, 2006

R L

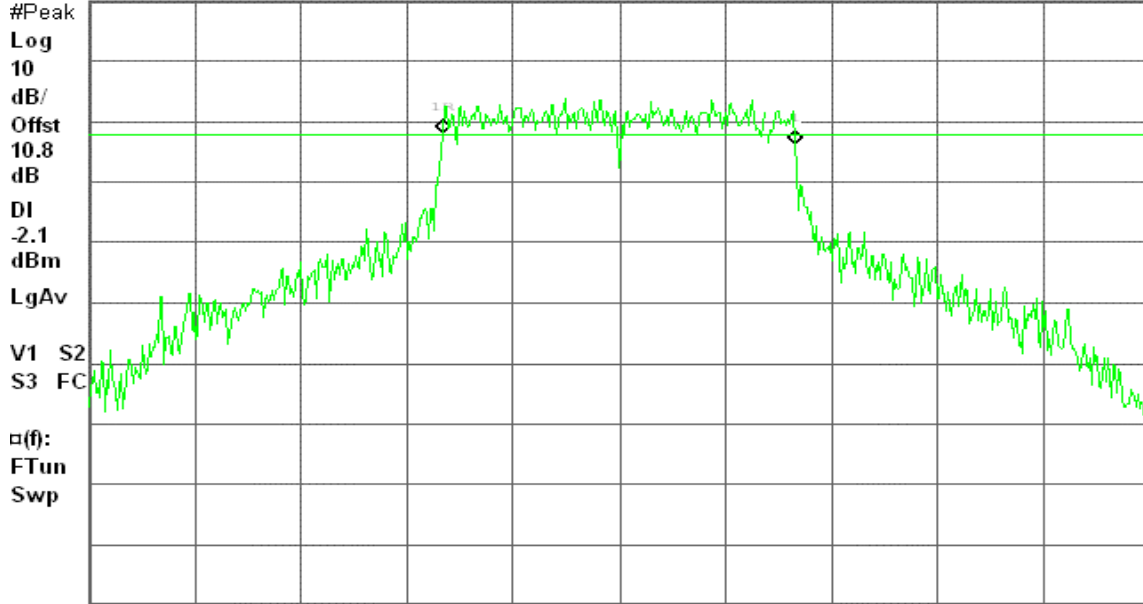
6dB BW, a Mode Low Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 20 dB

-1.88 dB



Center 5.745 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

**CH Mid**

Agilent 12:49:23 Jan 22, 2006

R L

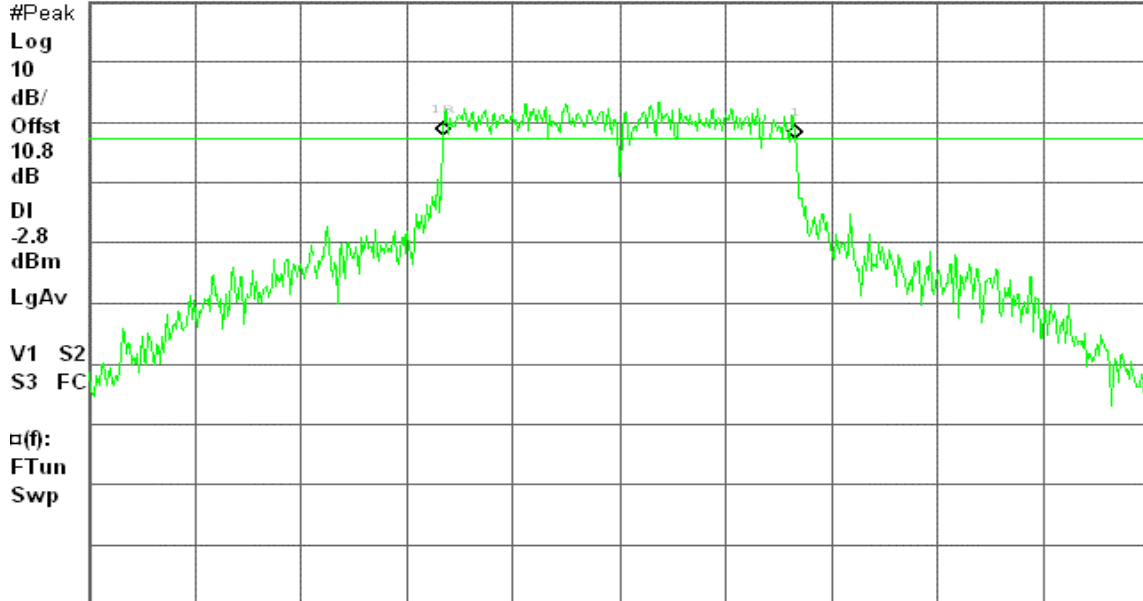
6dB BW, a Mode Mid Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 20 dB

-0.36 dB



Center 5.785 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



### CH High

Agilent 12:56:37 Jan 22, 2006

R L

6dB BW, a Mode High Ch.

Δ Mkr1 16.58 MHz

Ref 20 dBm

Atten 20 dB

2.67 dB

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-1.6

dBm

LgAv

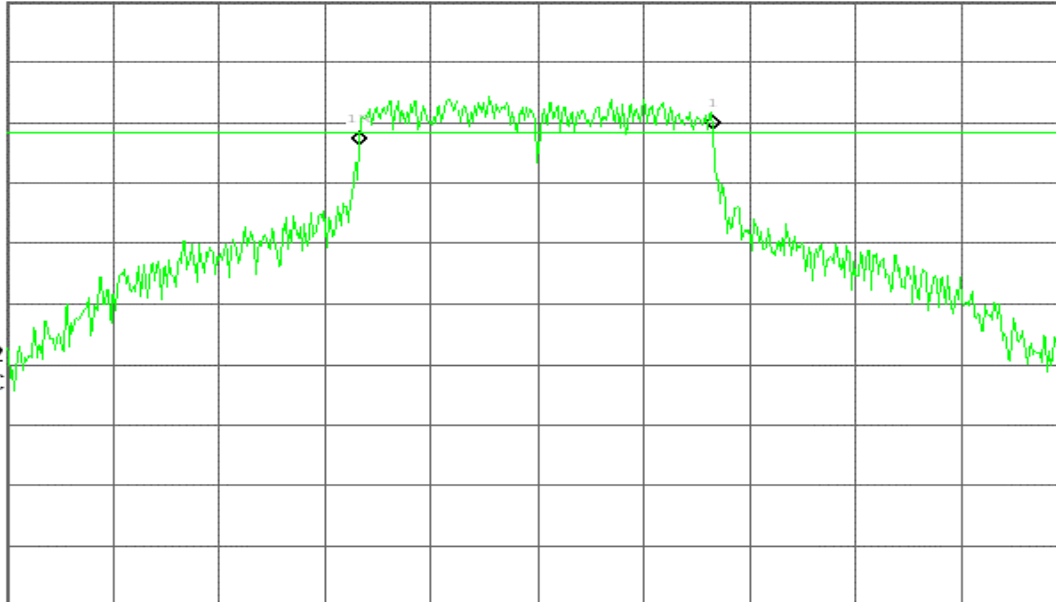
V1 S2

S3 FC

α(f):

FTun

Swp



Center 5.825 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

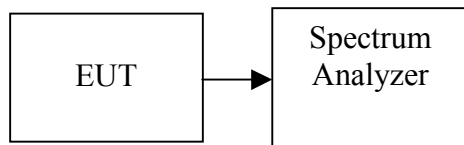
## 7.2 PEAK POWER

### 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	25.18	0.32961	1	PASS
Mid	2437	25.26	0.33574		PASS
High	2462	25.17	0.32885		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	22.57	0.18072	1	PASS
Mid	2437	26.26	0.42267		PASS
High	2462	21.42	0.13868		PASS

**Test mode: IEEE 802.11a**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5745	22.21	0.16634	1	PASS
Mid	5785	22.02	0.15922		PASS
High	5825	22.70	0.18621		PASS



**Test Plot**

**IEEE 802.11b**

**CH Low**

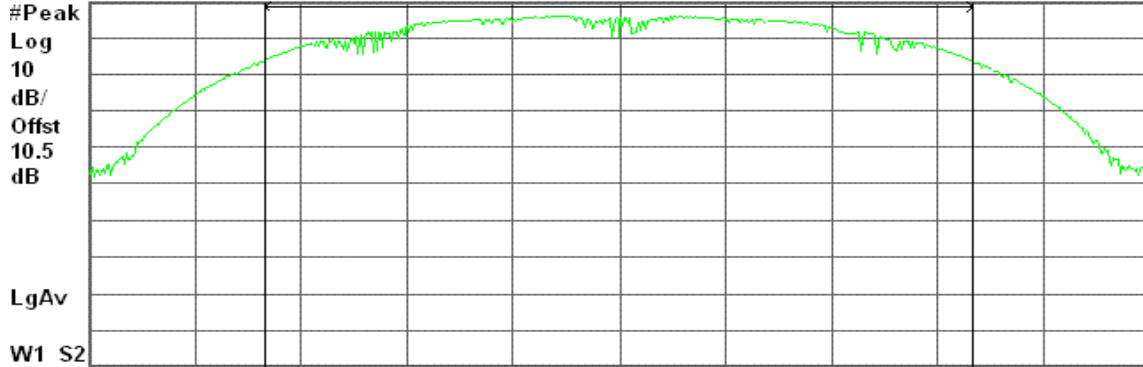
Agilent 10:37:37 Jan 22, 2006

R L

Peak Output Power, b Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 23.62 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

25.18 dBm / 15.7480 MHz

-46.79 dBm/Hz

**CH Mid**

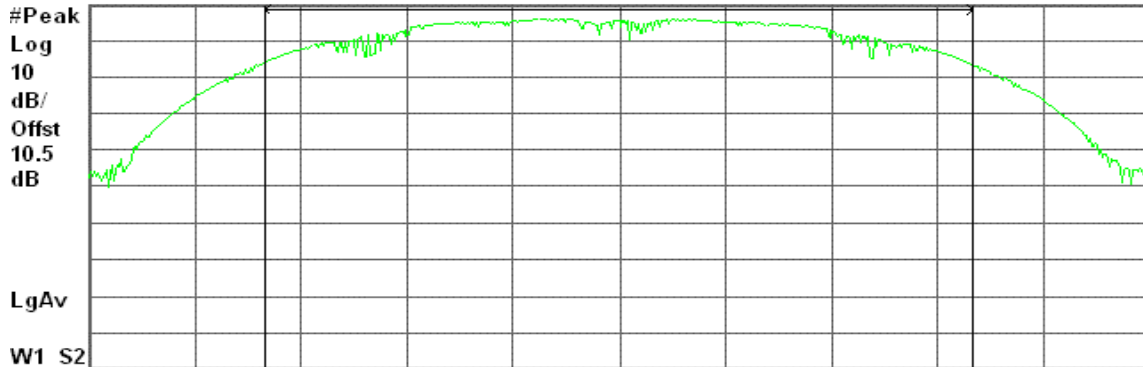
Agilent 10:45:47 Jan 22, 2006

T

Peak Output Power, b Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 23.66 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

25.26 dBm / 15.7760 MHz

-46.72 dBm/Hz



### CH High

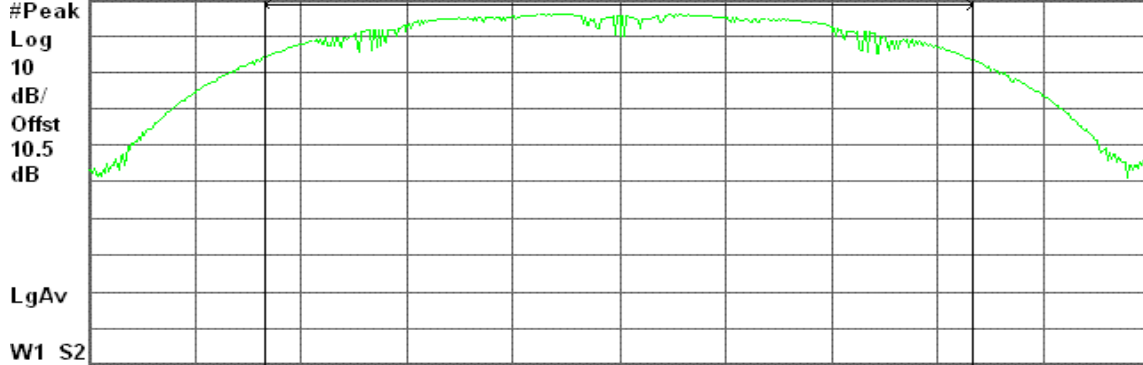
Agilent 12:04:57 Jan 22, 2006

R L

Peak Output Power, b Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 23.64 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

25.17 dBm / 15.7610 MHz

-46.80 dBm/Hz

### IEEE 802.11g

#### CH Low

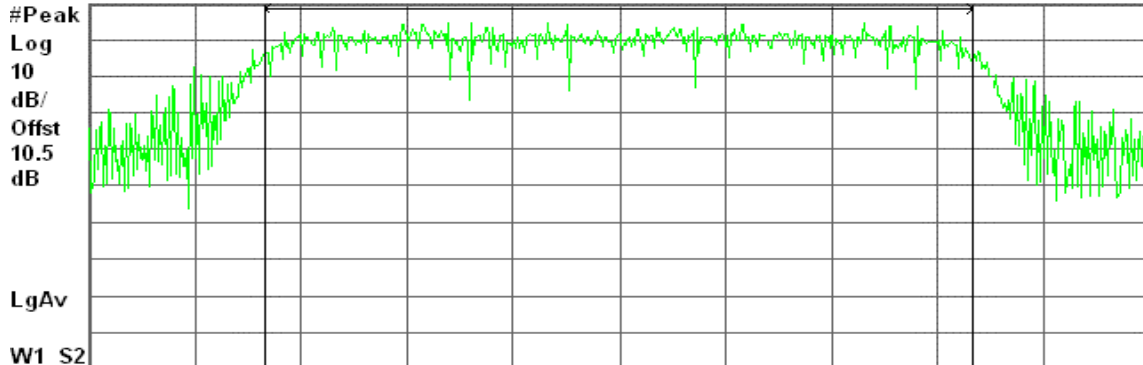
Agilent 12:17:25 Jan 22, 2006

R L

Peak Output Power (DTS), g Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 25.04 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.57 dBm / 16.6940 MHz

-49.66 dBm/Hz



**CH Mid**

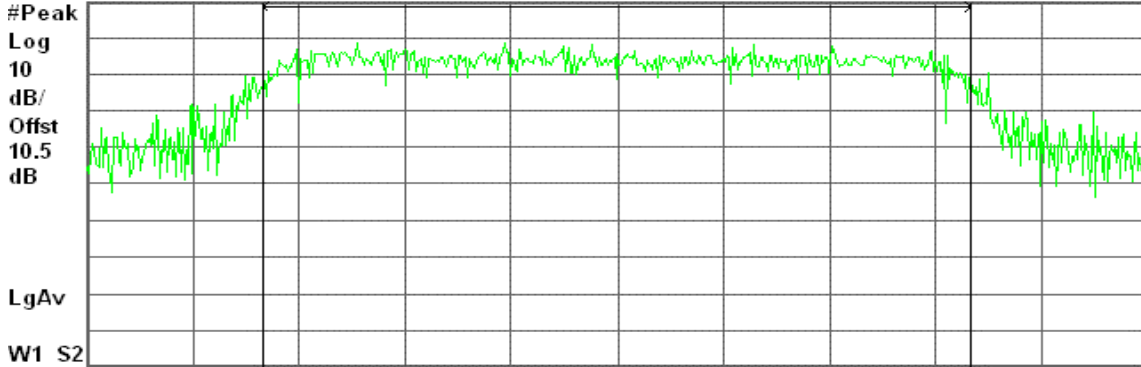
Agilent 12:27:03 Jan 22, 2006

R L

Peak Output Power (DTS), g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.62 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

26.26 dBm / 17.0820 MHz

-46.06 dBm/Hz

**CH High**

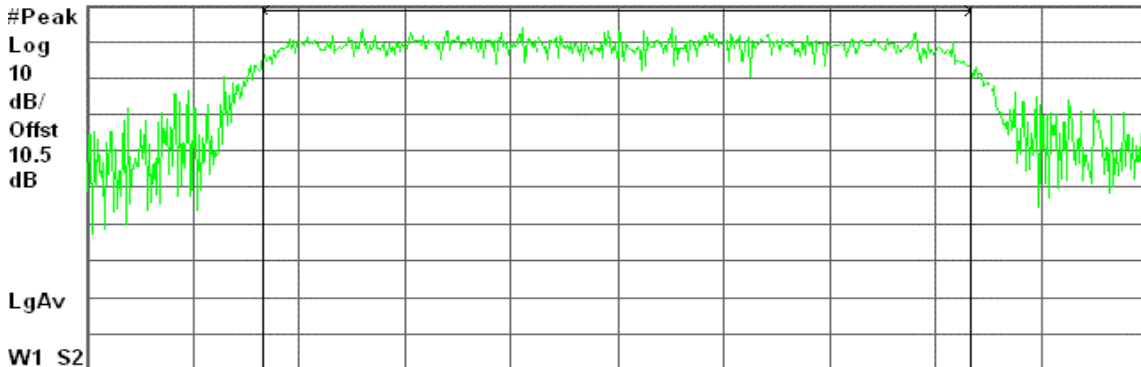
Agilent 12:34:22 Jan 22, 2006

R L

Peak Output Power, g Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 25.18 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

21.42 dBm / 16.7890 MHz

-50.83 dBm/Hz



**IEEE 802.11a**

**CH Low**

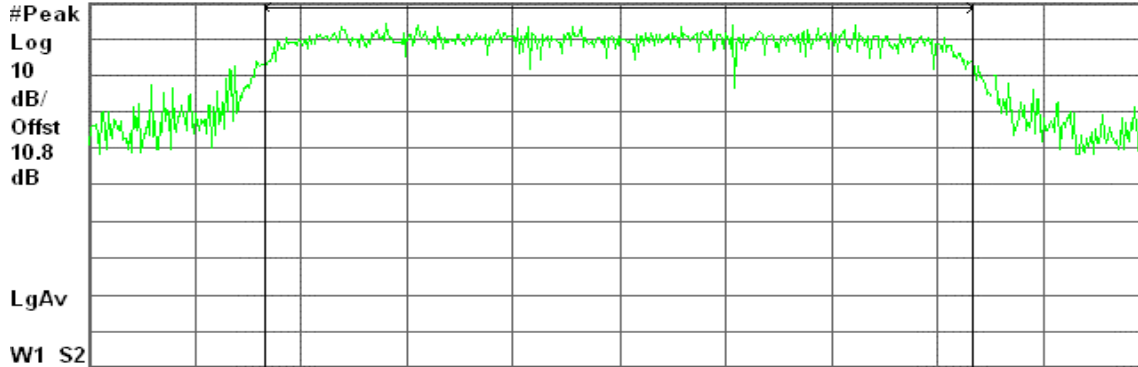
Agilent 12:44:11 Jan 22, 2006

R L

Peak Output Power, a Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 5.745 00 GHz

Span 25.61 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.21 dBm / 17.0730 MHz

-50.11 dBm/Hz

**CH Mid**

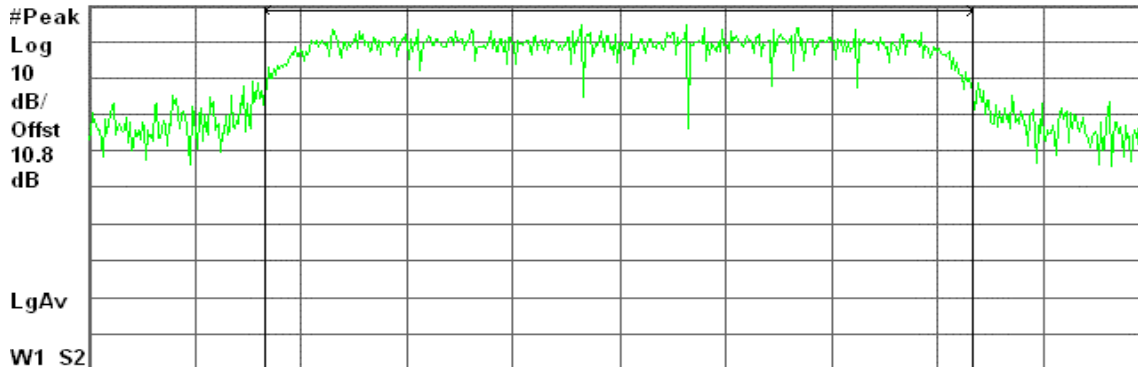
Agilent 12:50:02 Jan 22, 2006

R L

Peak Output Power, a Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 5.785 00 GHz

Span 26.85 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.02 dBm / 17.9010 MHz

-50.51 dBm/Hz





**CH High**

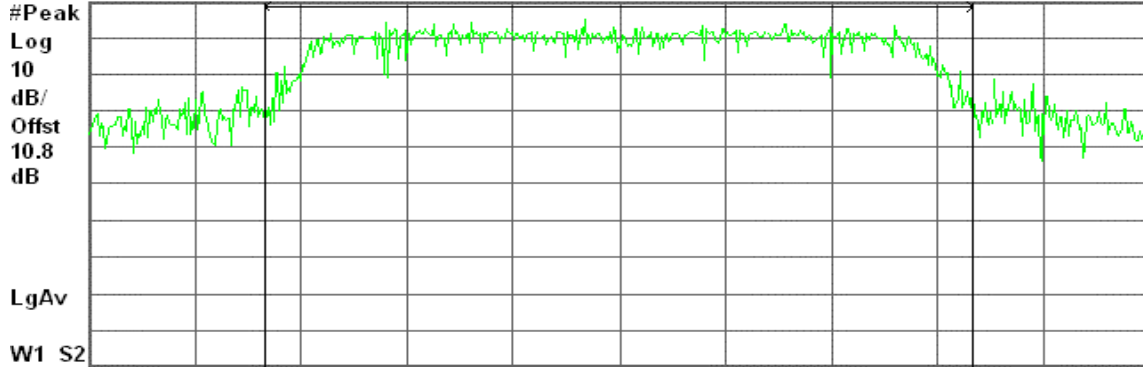
Agilent 12:57:15 Jan 22, 2006

R L

Peak Output Power (DTS), a Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 5.825 00 GHz

Span 29.13 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.70 dBm / 19.4180 MHz

-50.18 dBm/Hz

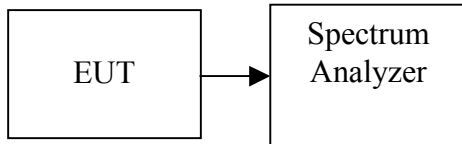


## **7.3 AVERAGE POWER**

### **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**

<b>Channel</b>	<b>Frequency (M H z)</b>	<b>Output Power (d B m)</b>
Low	2412	23.05
Mid	2437	22.63
High	2462	22.54

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

<b>Channel</b>	<b>Frequency (M H z)</b>	<b>Output Power (d B m)</b>
Low	2412	18.73
Mid	2437	22.94
High	2462	17.27

#### **Test mode: IEEE 802.11a**

<b>Channel</b>	<b>Frequency (M H z)</b>	<b>Output Power (d B m)</b>
Low	5745	18.92
Mid	5785	18.21
High	5825	19.22



**Test Plot**

**IEEE 802.11b**

**CH Low**

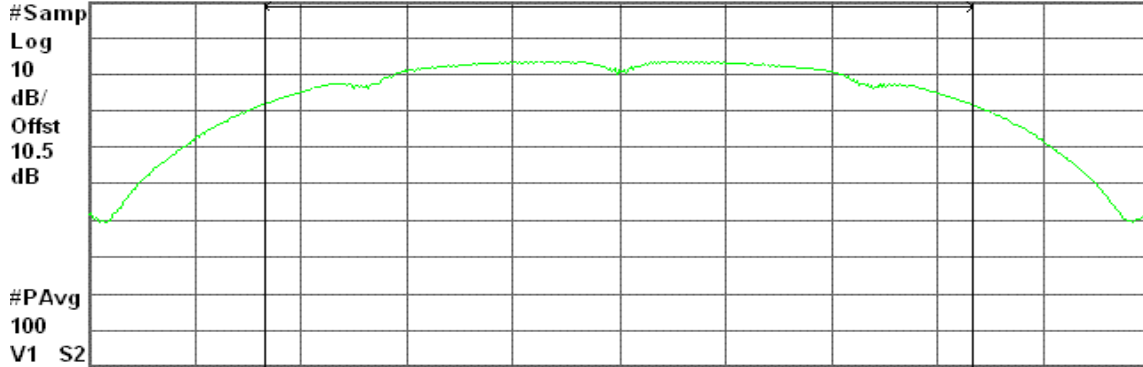
Agilent 10:38:23 Jan 22, 2006

R L

AVG Output Power, b Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 23.62 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

23.05 dBm / 15.7480 MHz

-48.93 dBm/Hz

**CH Mid**

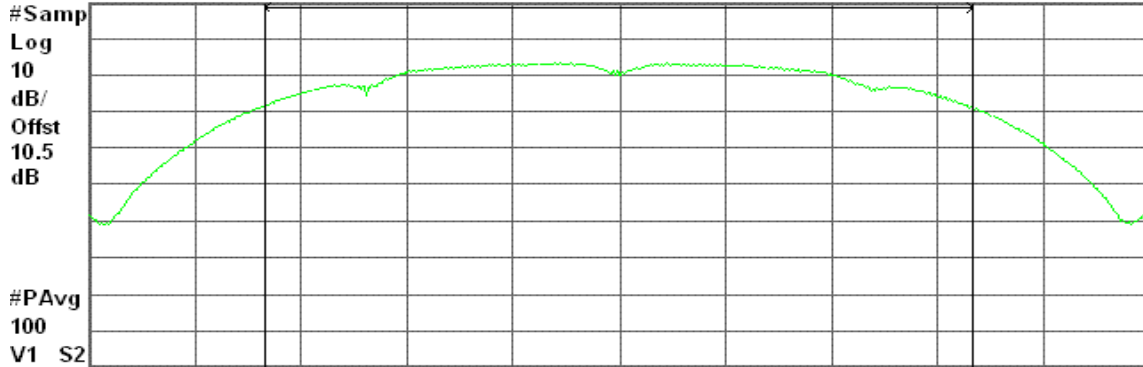
Agilent 10:46:16 Jan 22, 2006

R L

AVG Output Power, b Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 23.66 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.63 dBm / 15.7760 MHz

-49.35 dBm/Hz



### CH High

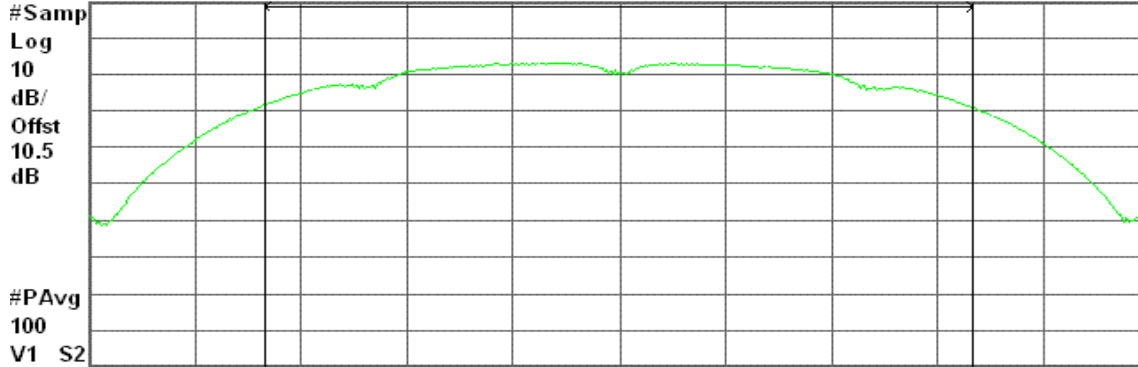
Agilent 12:05:23 Jan 22, 2006

R L

AVG Output Power, b Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 23.64 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.54 dBm / 15.7610 MHz

-49.44 dBm/Hz

### IEEE 802.11g

#### CH Low

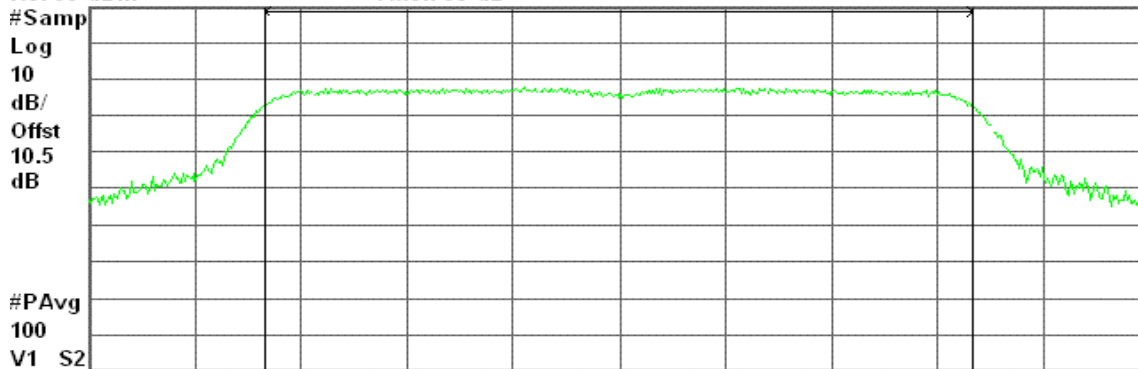
Agilent 12:17:55 Jan 22, 2006

R L

AVG Output Power, g Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 25.04 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.73 dBm / 16.6940 MHz

-53.50 dBm/Hz



### CH Mid

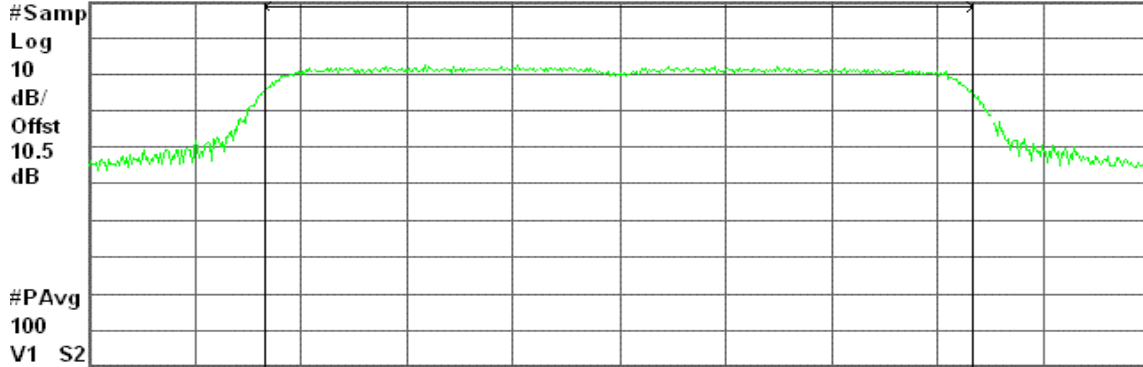
Agilent 12:27:54 Jan 22, 2006

R L

AVG Output Power, g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.62 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.94 dBm / 17.0820 MHz

-49.38 dBm/Hz

### CH High

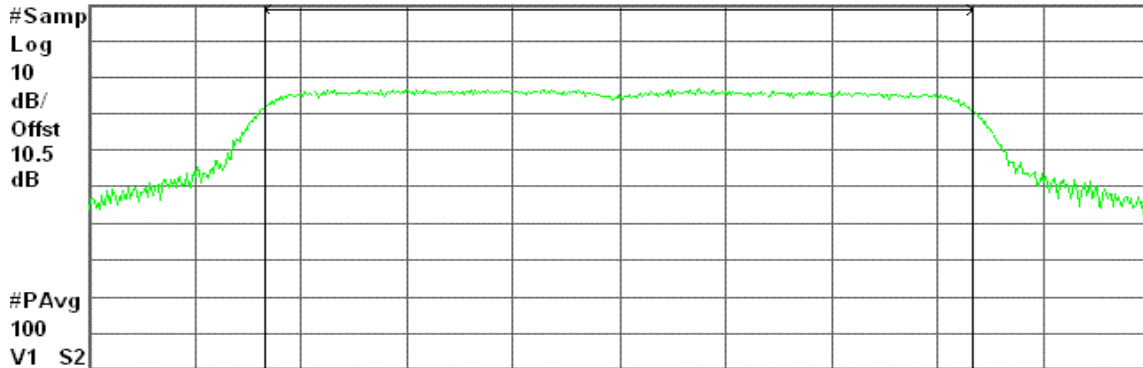
Agilent 12:34:53 Jan 22, 2006

R L

AVG Output Power, g Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 25.18 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

17.27 dBm / 16.7890 MHz

-54.98 dBm/Hz



**IEEE 802.11a**

**CH Low**

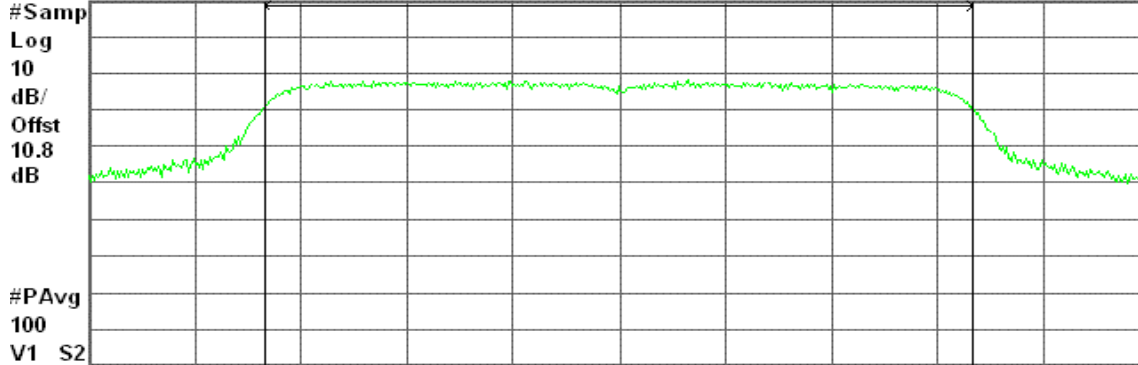
Agilent 12:44:38 Jan 22, 2006

R L

AVG Output Power, a Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 5.745 00 GHz

Span 25.61 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.92 dBm / 17.0730 MHz

-53.41 dBm/Hz

**CH Mid**

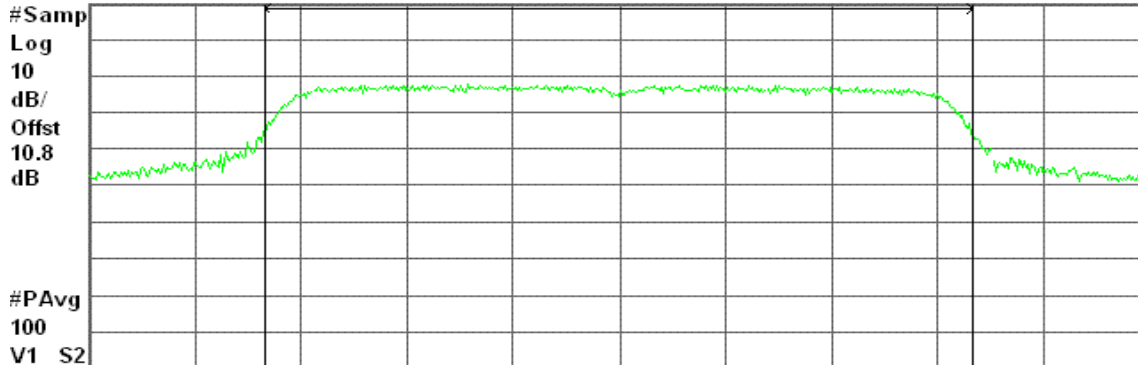
Agilent 12:50:28 Jan 22, 2006

R L

AVG Output Power, a Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 5.785 00 GHz

Span 26.85 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.21 dBm / 17.9010 MHz

-54.32 dBm/Hz



**CH High**

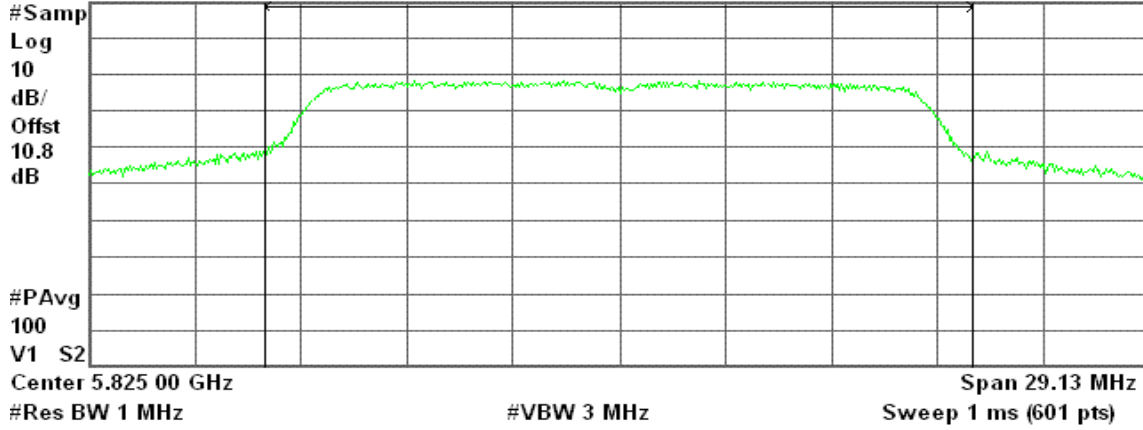
Agilent 12:57:42 Jan 22, 2006

R L

AVG Output Power, a Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

19.22 dBm / 19.4180 MHz

-53.67 dBm/Hz

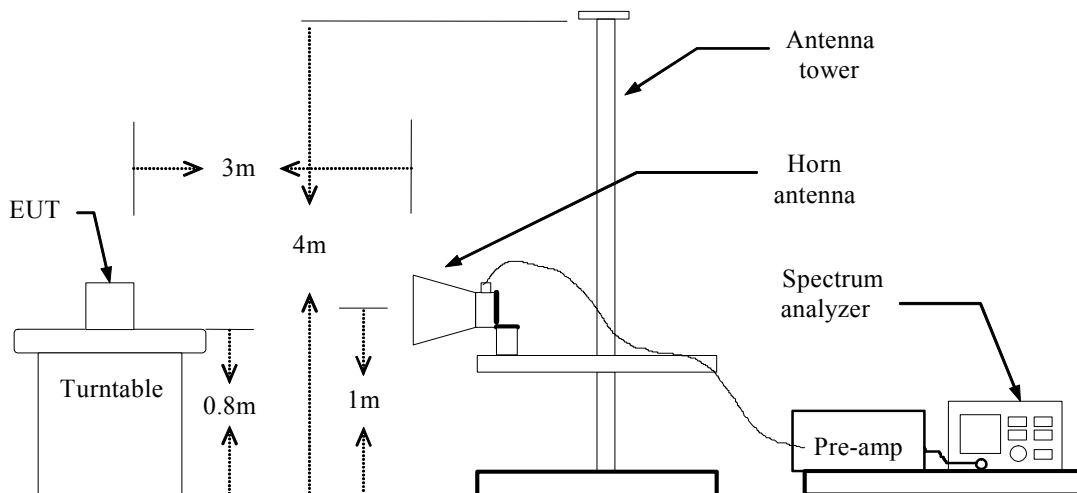


## 7.4 BAND EDGES MEASUREMENT

### 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.



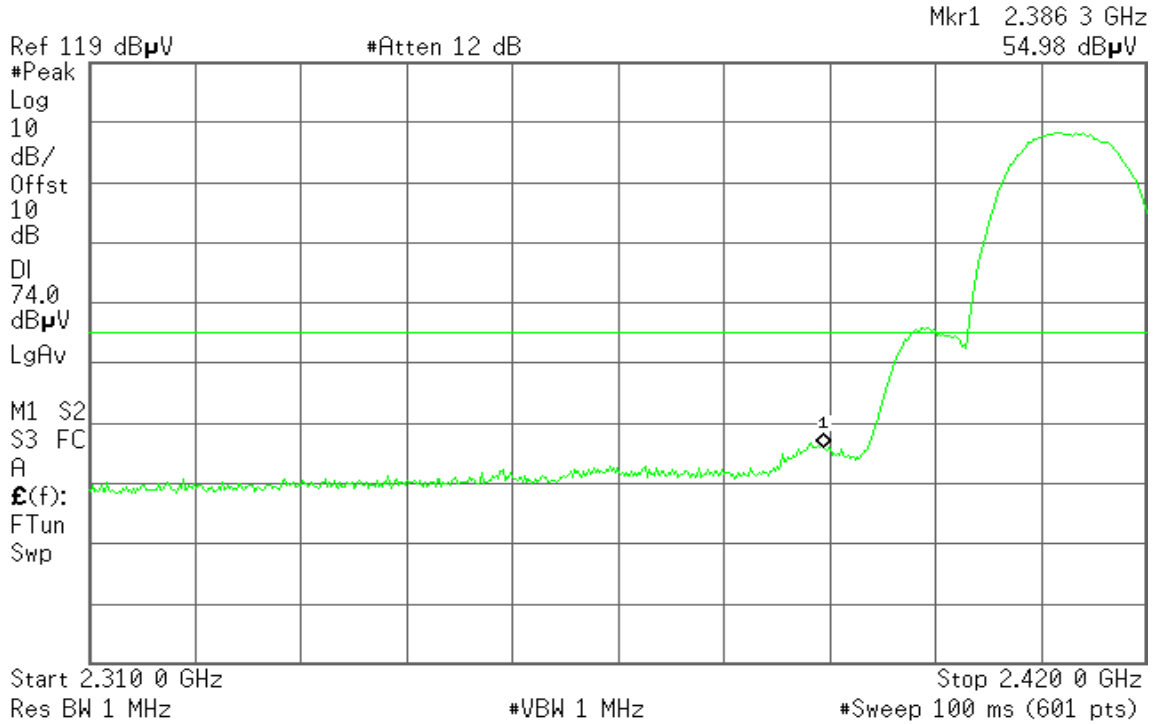
### Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent

T

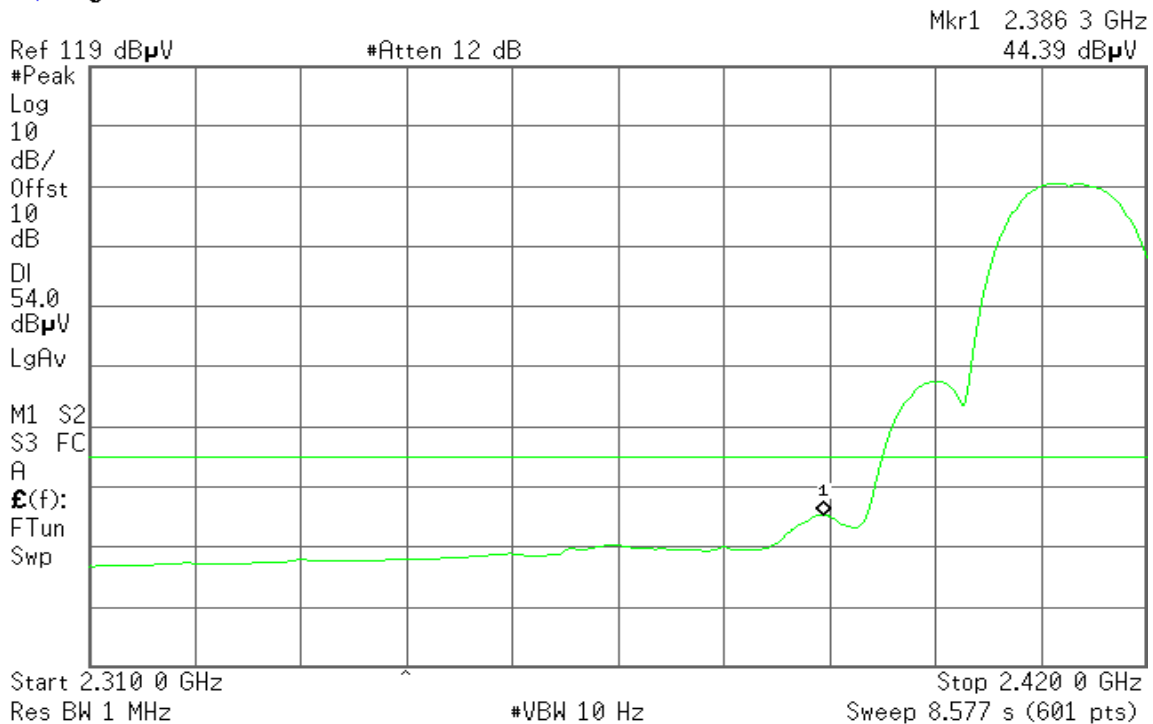


Detector mode: Average

Polarity: Vertical

Agilent

R T



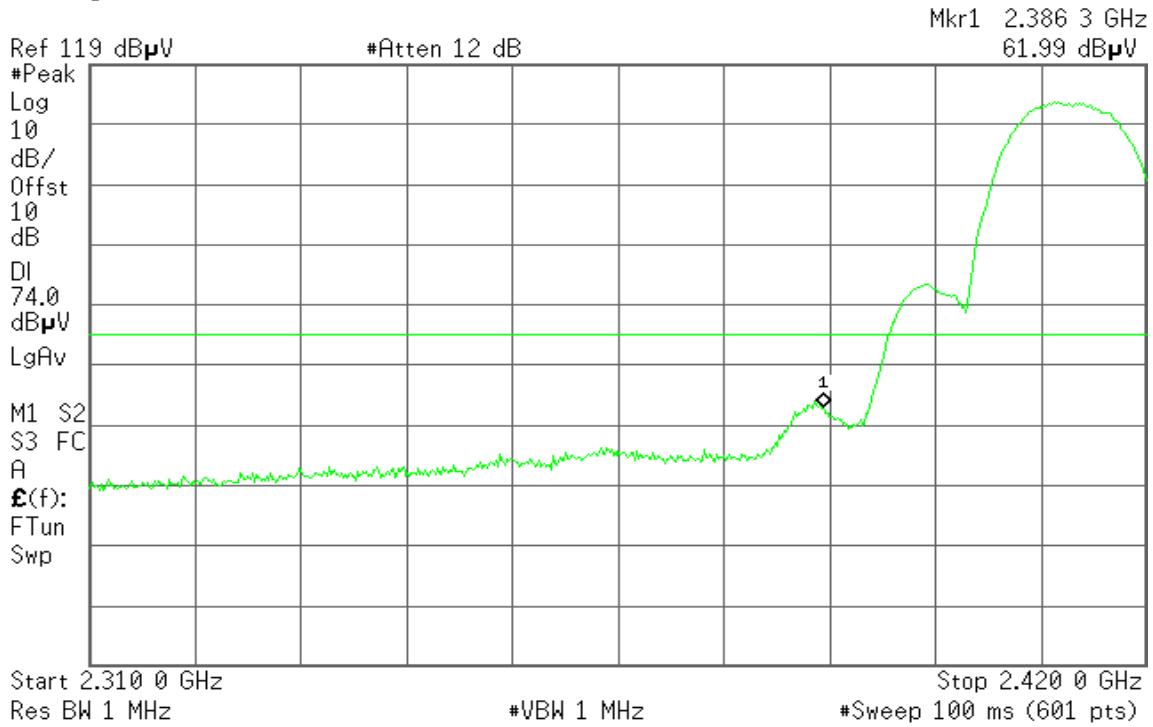


Detector mode: Peak

Polarity: Horizontal

Agilent

T

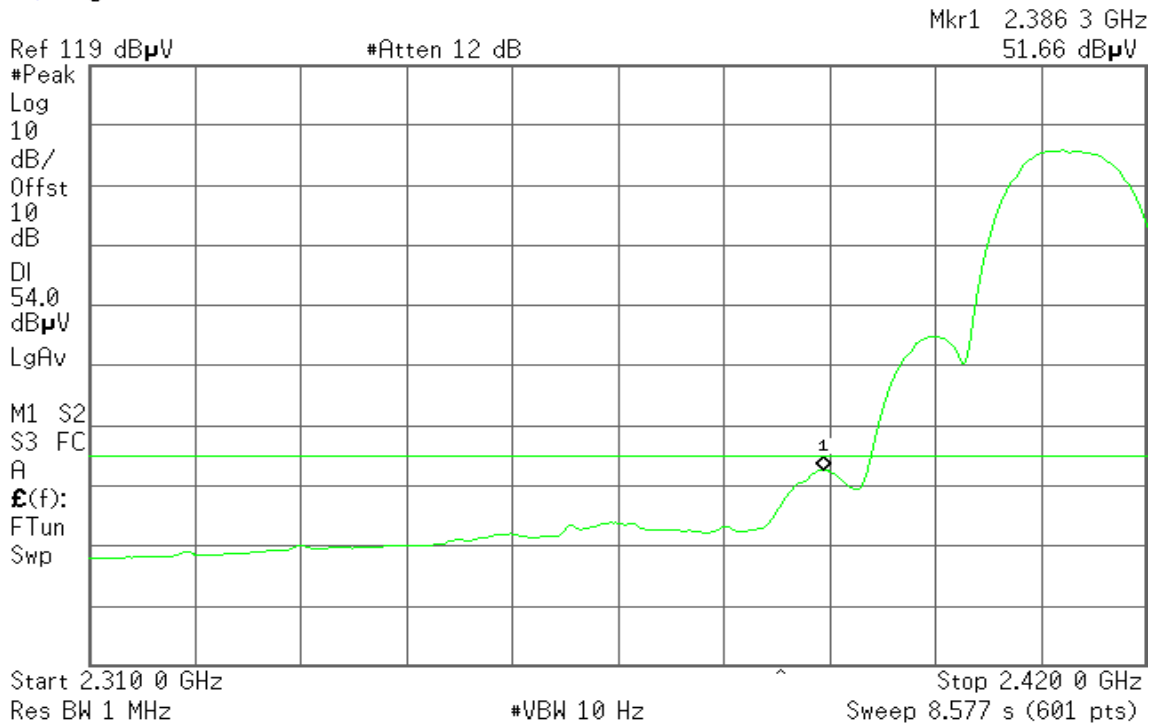


Detector mode: Average

Polarity: Horizontal

Agilent

T





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

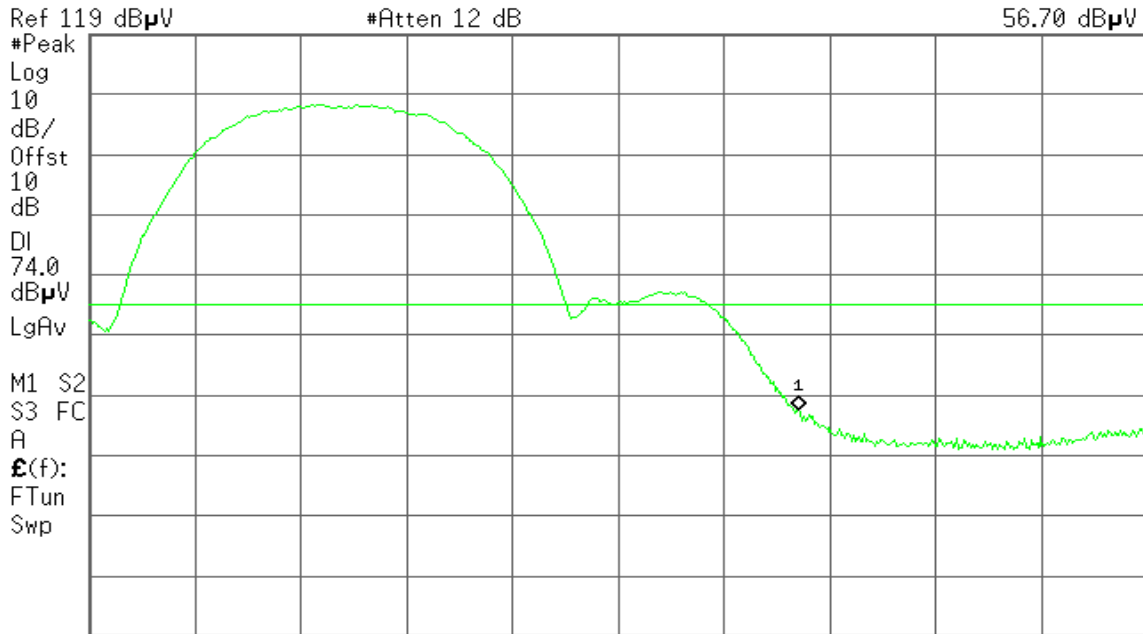
Detector mode: Peak

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
56.70 dBμV



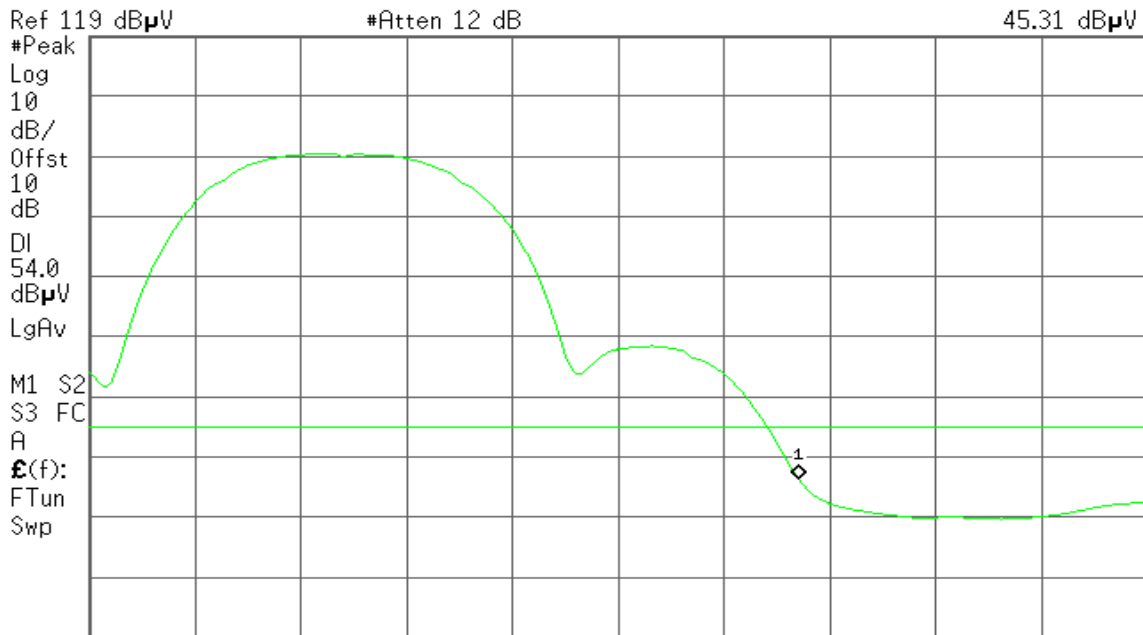
Detector mode: Average

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
45.31 dBμV





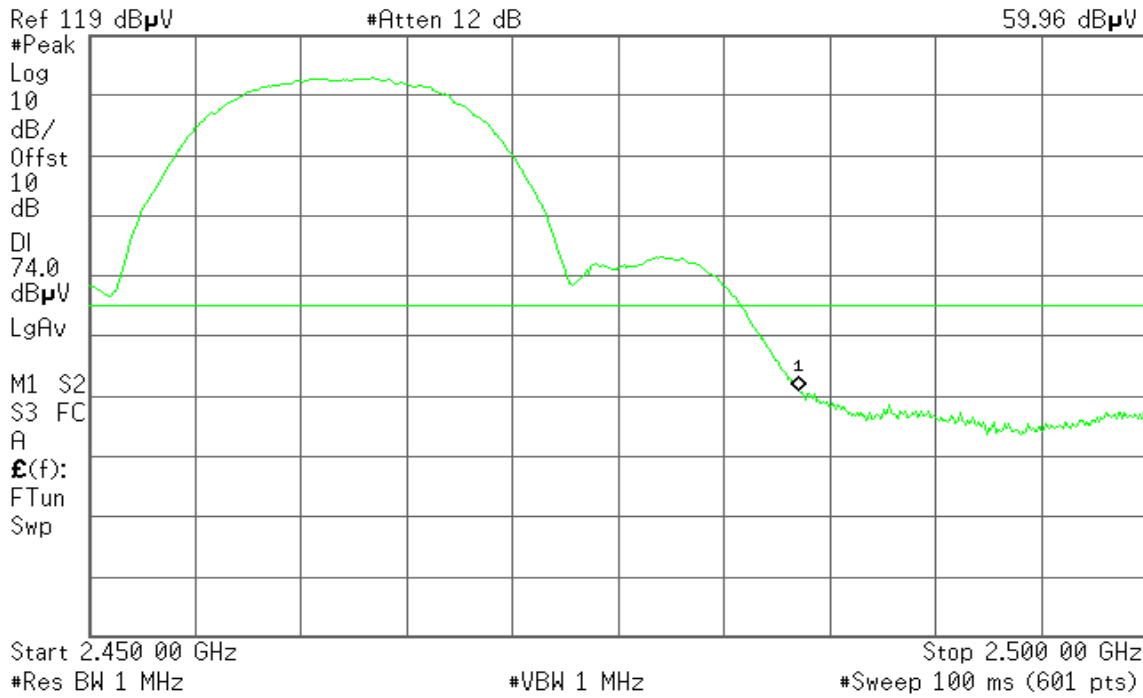
Detector mode: Peak

Polarity: Horizontal

Agilent

T

Mkr1 2.483 50 GHz  
59.96 dBµV



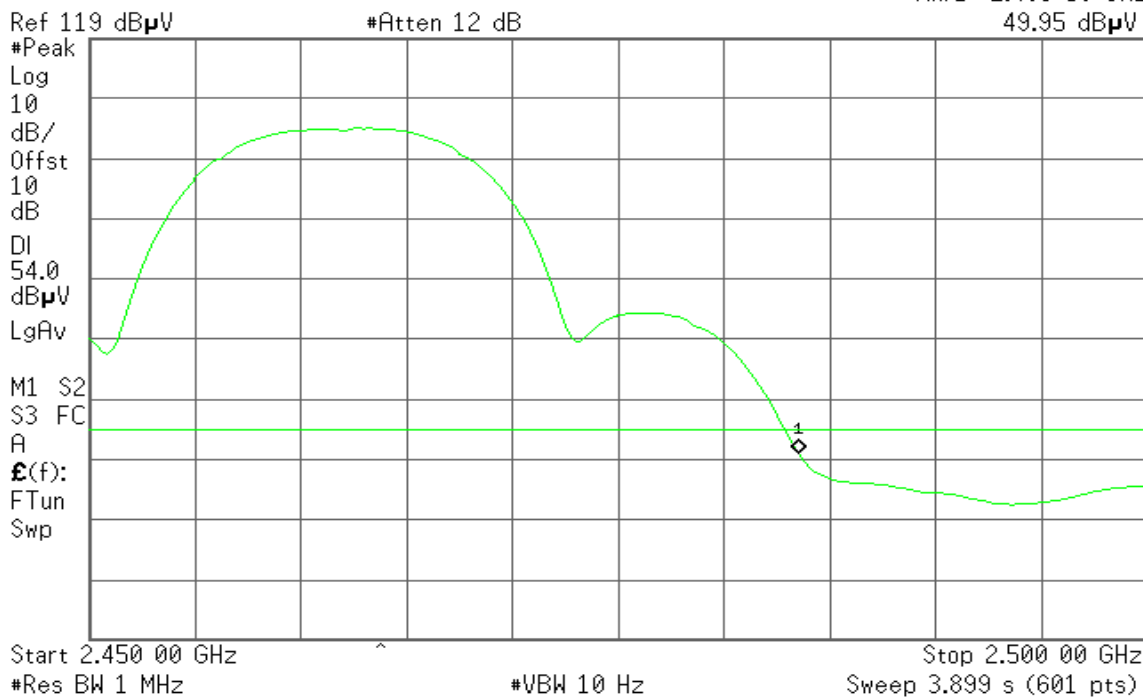
Detector mode: Average

Polarity: Horizontal

Agilent

T

Mkr1 2.483 50 GHz  
49.95 dBµV





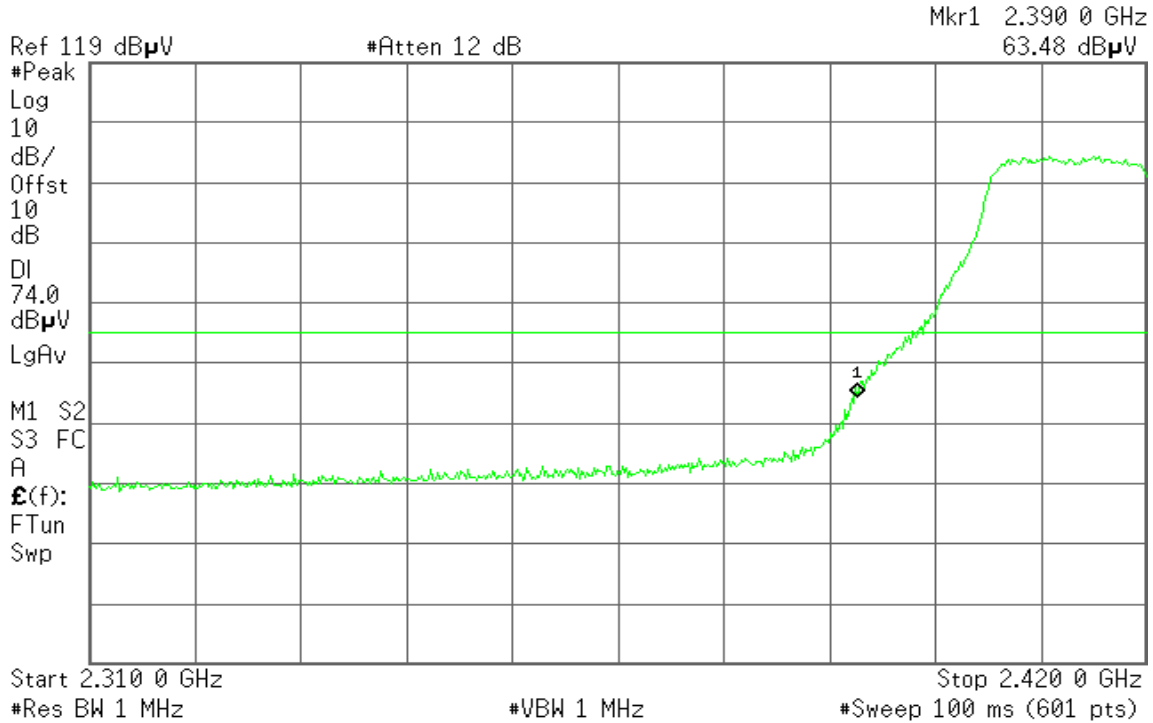
### Band Edges (IEEE 802.11g / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent

R T

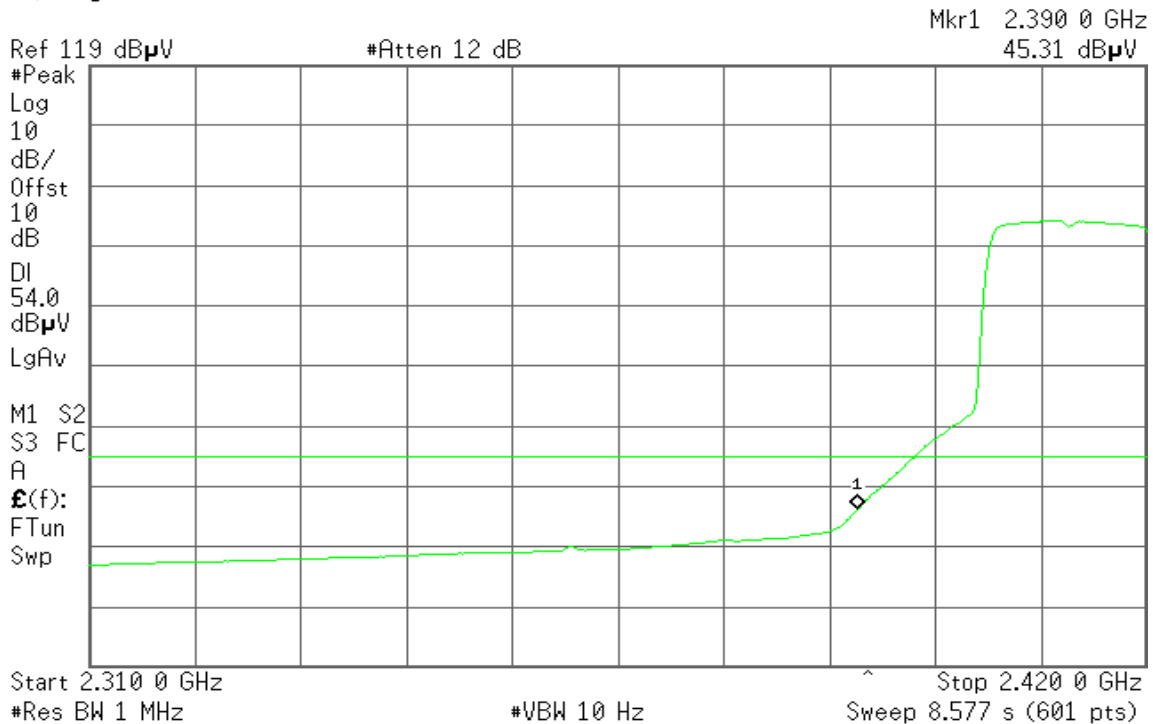


Detector mode: Average

Polarity: Vertical

Agilent

T



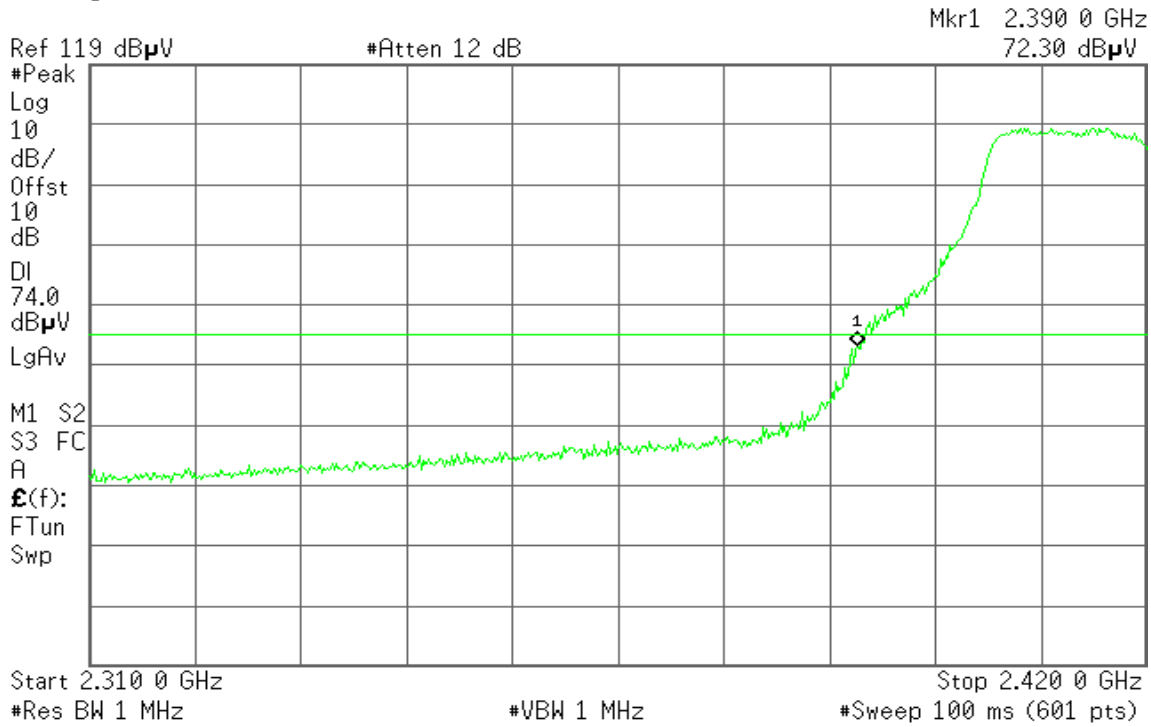


Detector mode: Peak

Polarity: Horizontal

Agilent

T

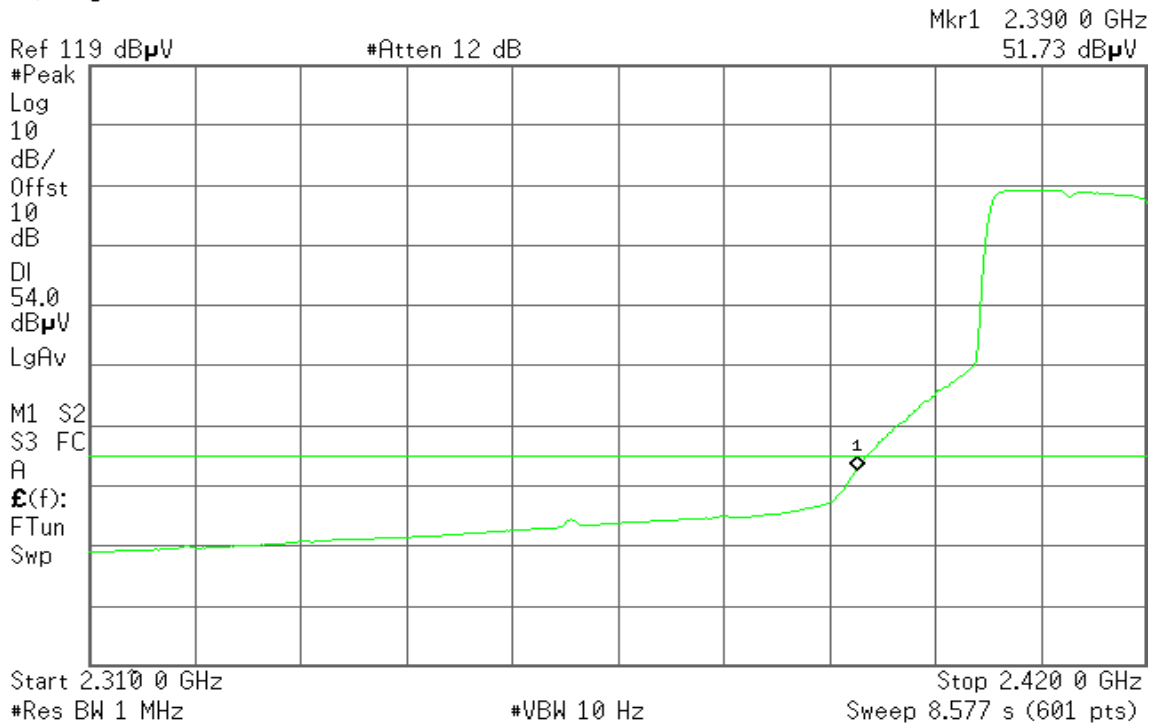


Detector mode: Average

Polarity: Horizontal

Agilent

T





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

Detector mode: Peak

Polarity: Vertical

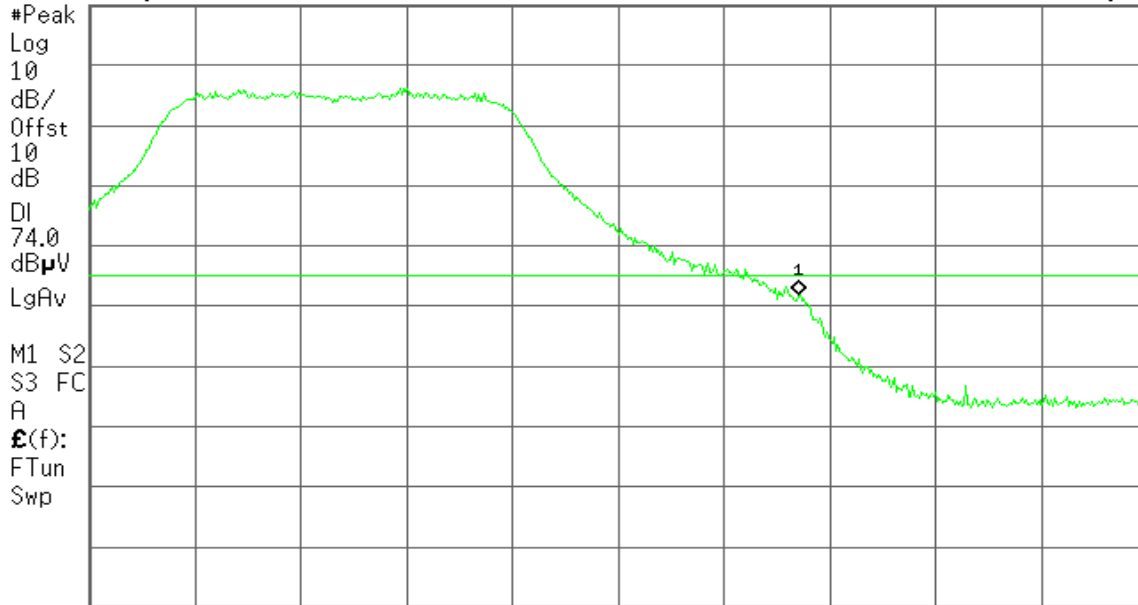
Agilent

T

Mkr1 2.483 50 GHz  
70.94 dB $\mu$ V

Ref 119 dB $\mu$ V

#Atten 12 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

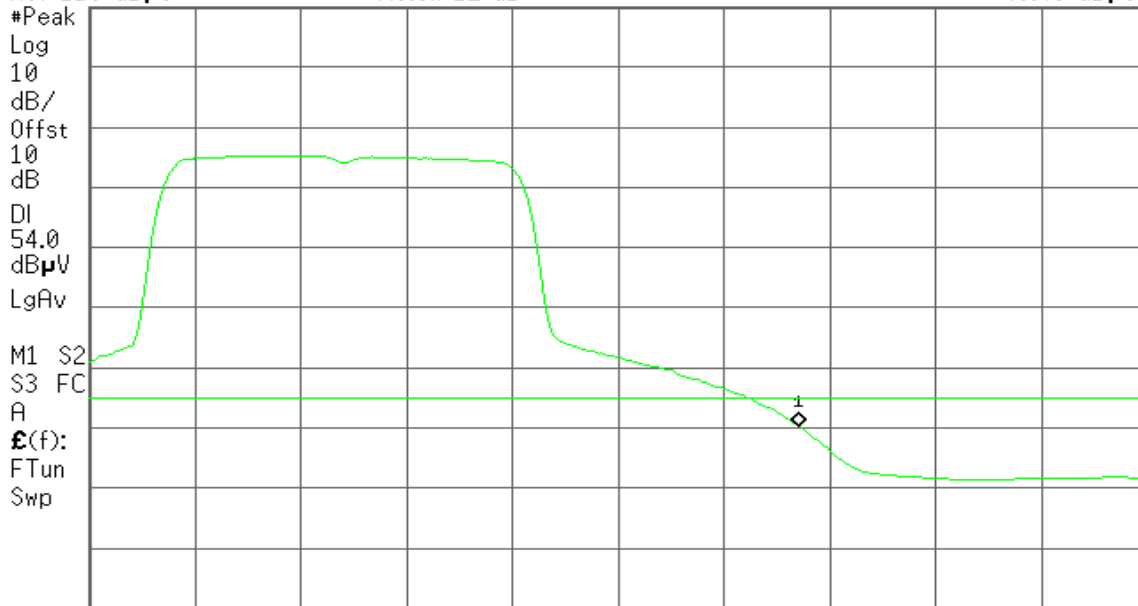
Agilent

T

Mkr1 2.483 50 GHz  
49.40 dB $\mu$ V

Ref 119 dB $\mu$ V

#Atten 12 dB



Start 2.450 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.899 s (601 pts)





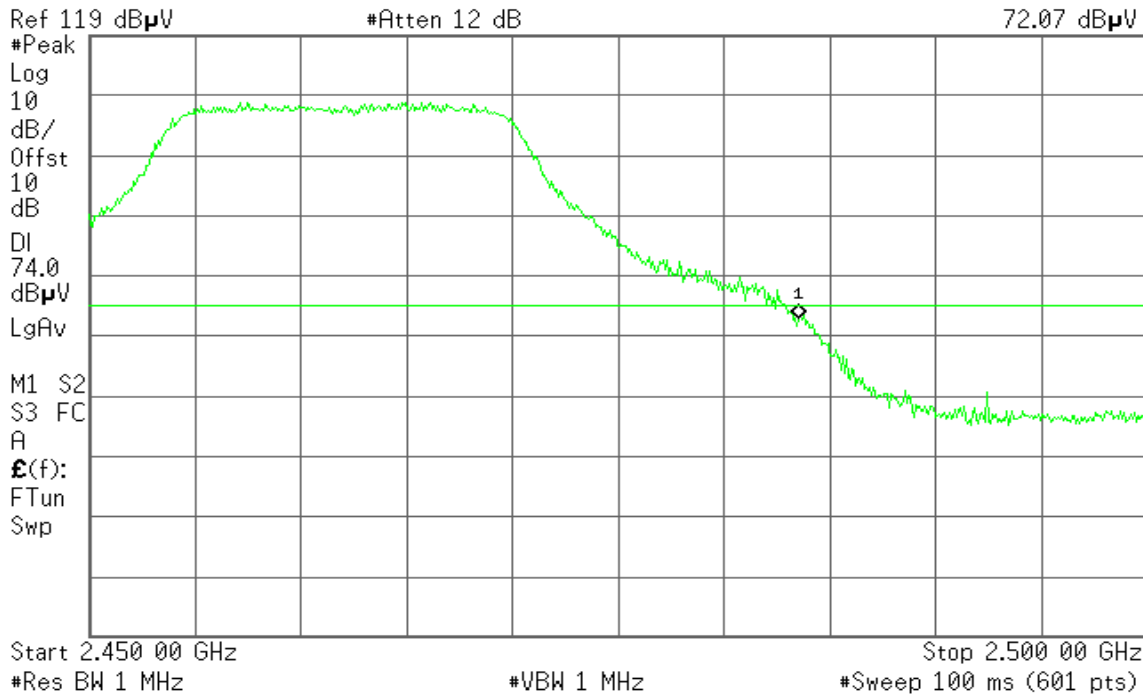
Detector mode: Peak

Polarity: Horizontal

Agilent

T

Mkr1 2.483 50 GHz  
72.07 dBµV



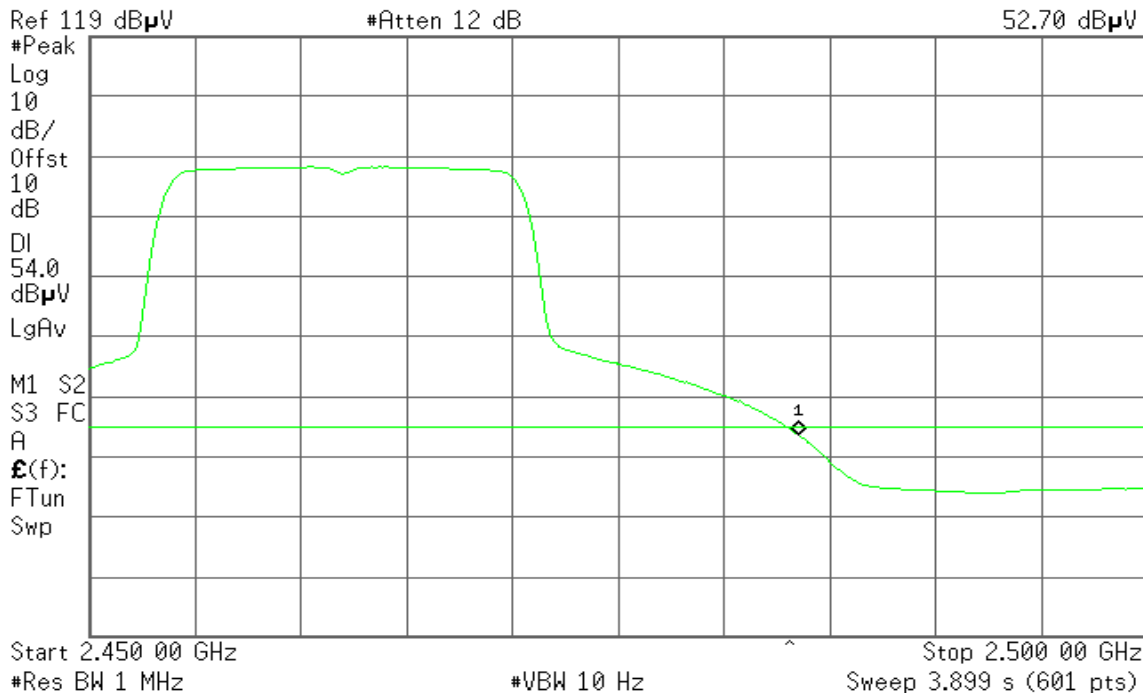
Detector mode: Average

Polarity: Horizontal

Agilent

T

Mkr1 2.483 50 GHz  
52.70 dBµV

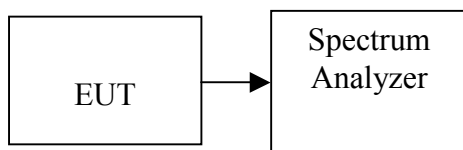


## 7.5 PEAK POWER SPECTRAL DENSITY

### 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 = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s.
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.



**TEST RESULTS**

*No non-compliance noted*

**Test Data**

**Test mode: IEEE 802.11b**

Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	0.18	8.00	PASS
Mid	2437	-0.50		PASS
High	2462	-0.12		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-5.90	8.00	PASS
Mid	2437	-1.62		PASS
High	2462	-7.34		PASS

**Test mode: IEEE 802.11a**

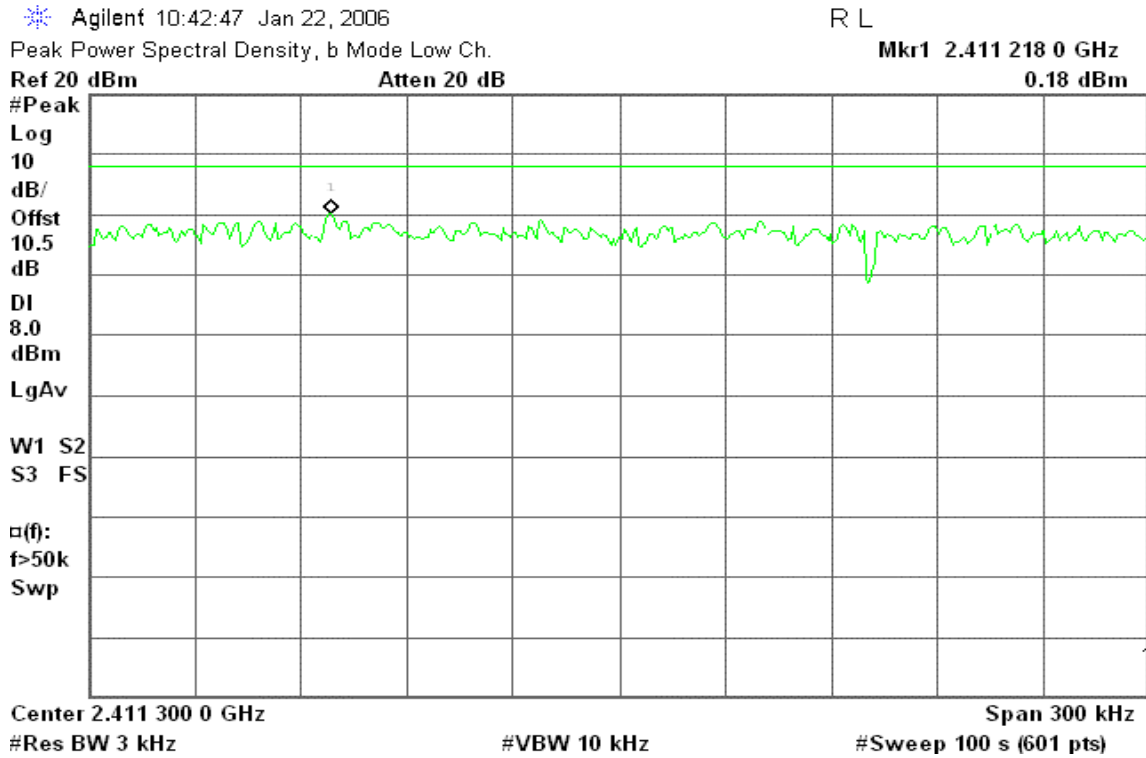
Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
Low	5745	-6.44	8.00	PASS
Mid	5785	-6.61		PASS
High	5825	-6.02		PASS



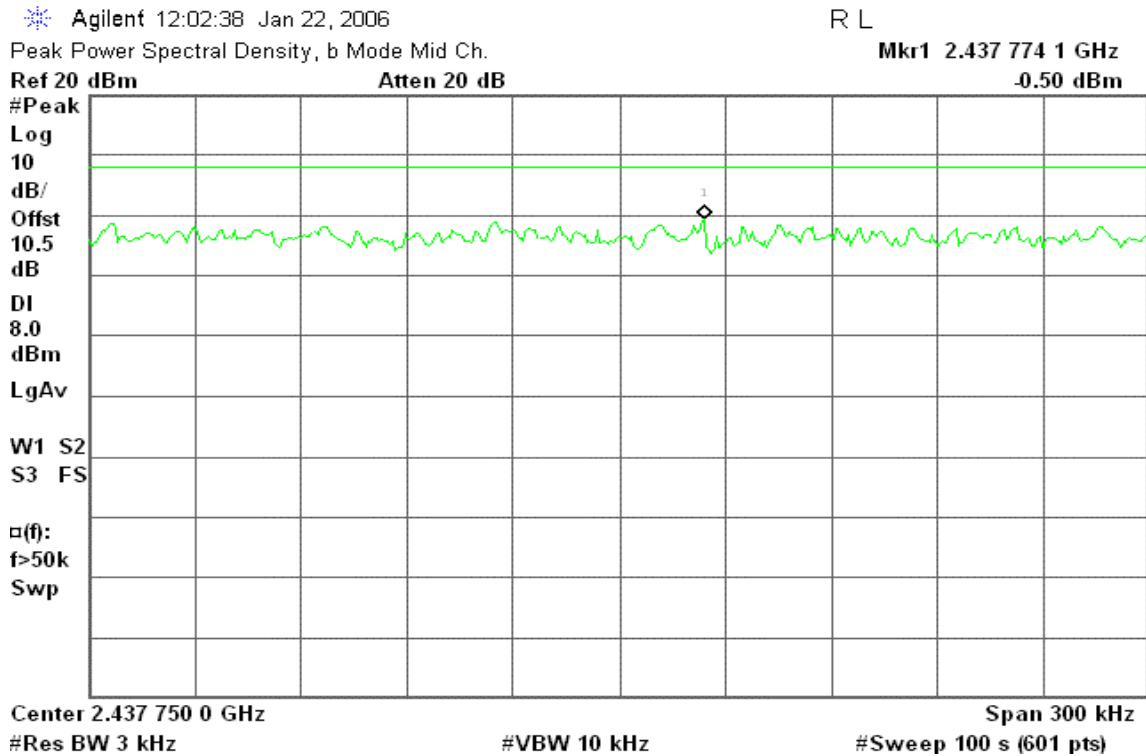
**Test Plot**

**IEEE 802.11b**

**CH Low**



**CH Mid**





**CH High**

Agilent 12:11:24 Jan 22, 2006

R L

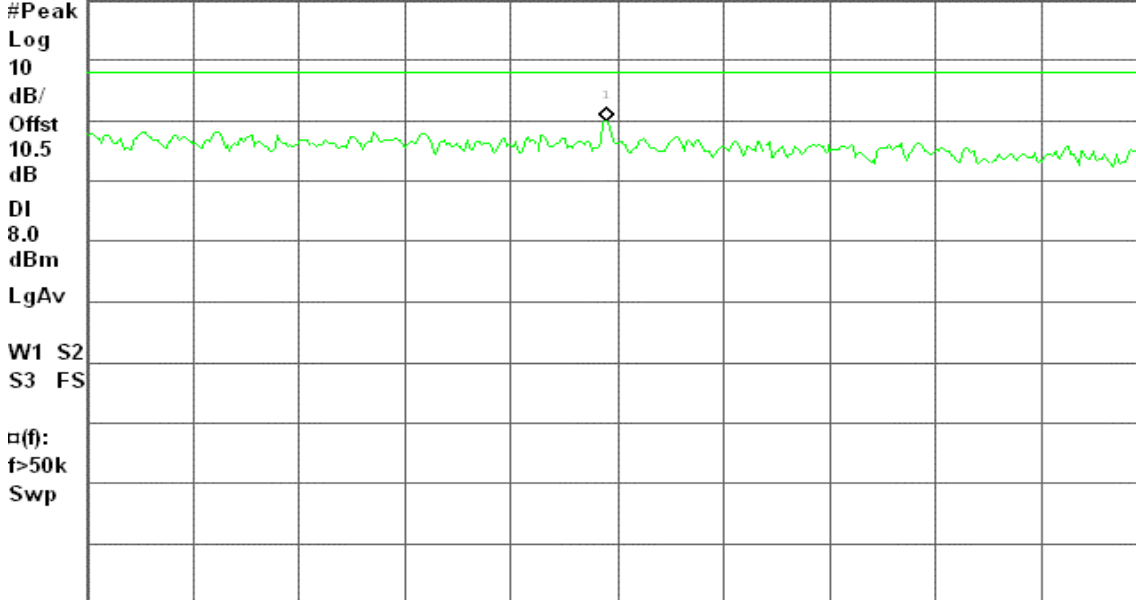
Peak Power Spectral Density, b Mode High Ch.

Mkr1 2.461 496 5 GHz

Ref 20 dBm

Atten 20 dB

-0.12 dBm



Center 2.461 500 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

**IEEE 802.11g**

**CH Low**

Agilent 12:22:08 Jan 22, 2006

R L

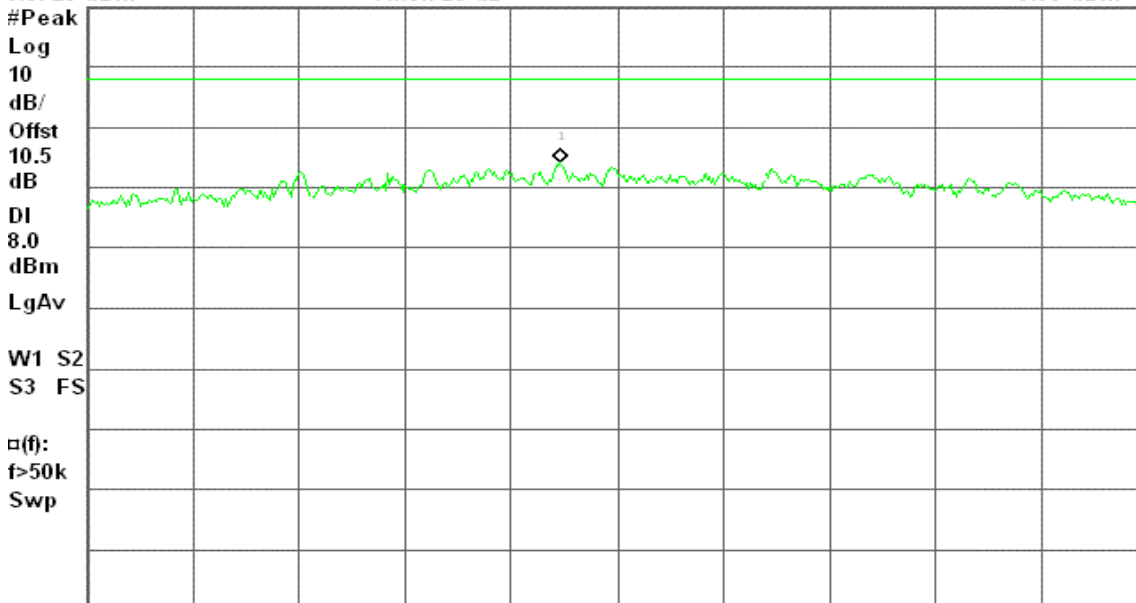
Peak Power Spectral Density, g Mode Low Ch.

Mkr1 2.406 033 9 GHz

Ref 20 dBm

Atten 20 dB

-5.90 dBm



Center 2.406 050 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### CH Mid

Agilent 12:32:02 Jan 22, 2006

R L

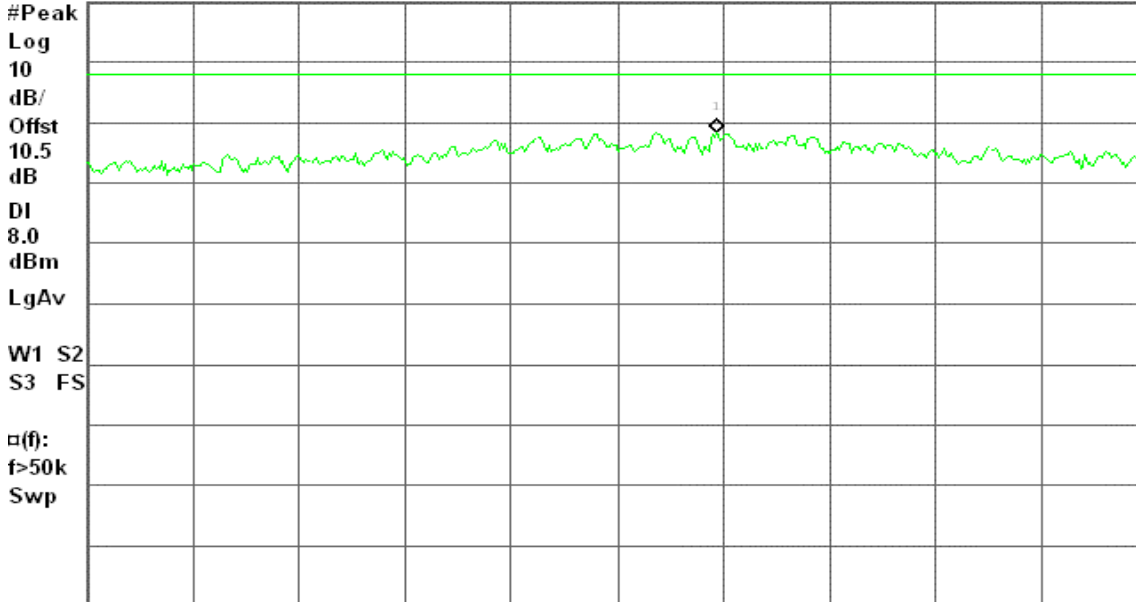
Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.437 628 1 GHz

Ref 20 dBm

Atten 20 dB

-1.62 dBm



Center 2.437 600 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### CH High

Agilent 12:39:10 Jan 22, 2006

R L

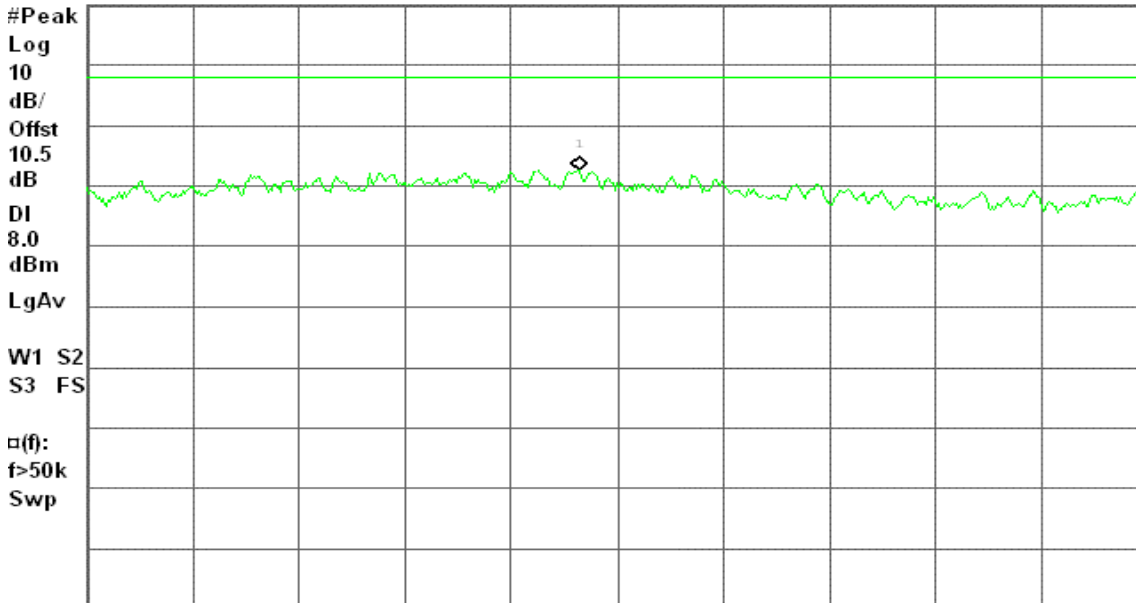
Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.458 589 0 GHz

Ref 20 dBm

Atten 20 dB

-7.34 dBm



Center 2.458 600 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



**IEEE 802.11a**

**CH Low**

Agilent 12:46:52 Jan 22, 2006

R L

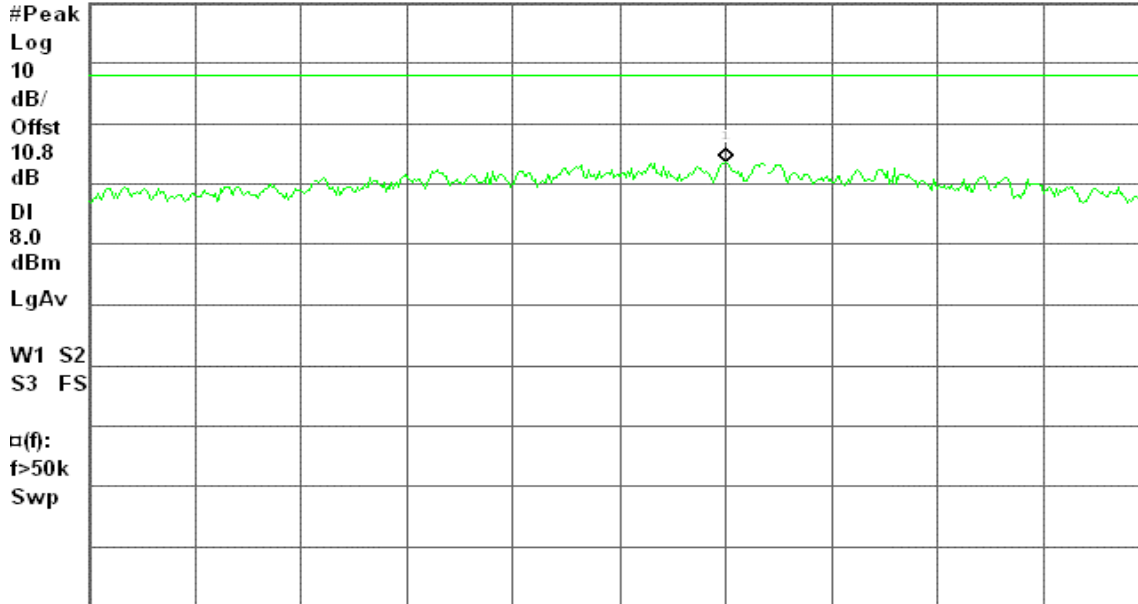
Peak Power Spectral Density, a Mode Low Ch.

Mkr1 5.741 580 1 GHz

Ref 20 dBm

Atten 20 dB

-6.44 dBm



Center 5.741 550 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

**CH Mid**

Agilent 12:54:56 Jan 22, 2006

R L

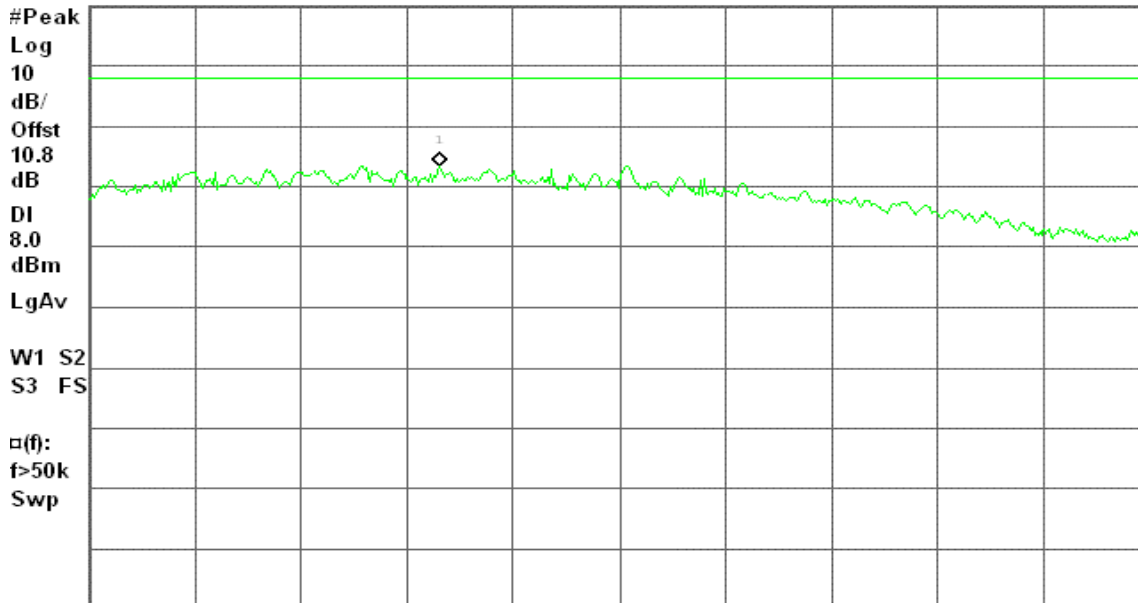
Peak Power Spectral Density, a Mode Mid Ch.

Mkr1 5.784 699 2 GHz

Ref 20 dBm

Atten 20 dB

-6.61 dBm



Center 5.784 750 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



**CH High**

Agilent 13:01:49 Jan 22, 2006

R L

Peak Power Spectral Density, a Mode High Ch.

Mkr1 5.824 378 4 GHz

Ref 20 dBm

Atten 20 dB

-6.02 dBm

#Peak

Log

10

dB/

Offst

10.8

dB

DI

8.0

dBm

LgAv

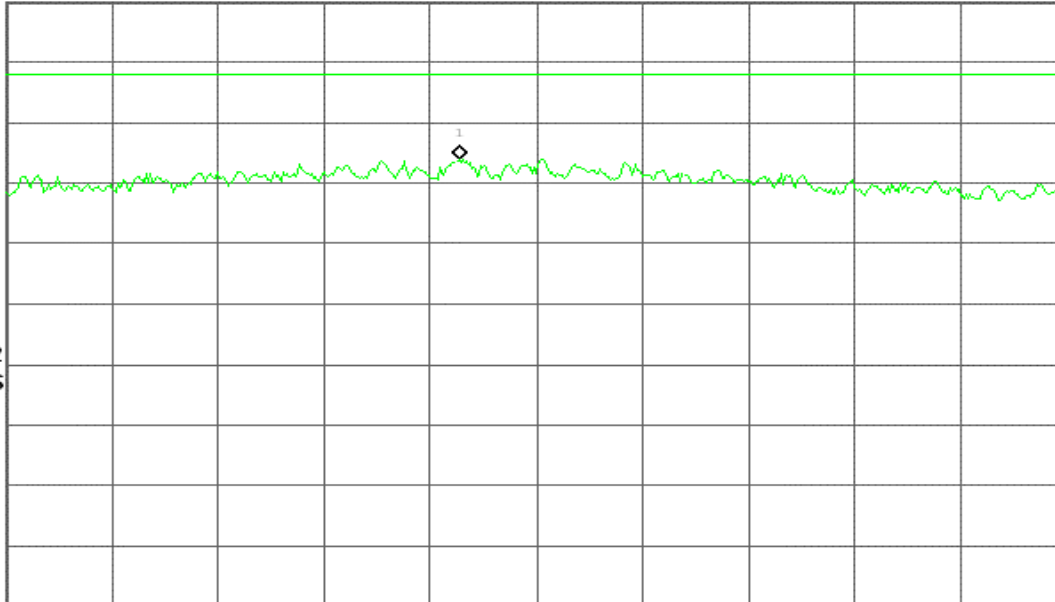
W1 S2

S3 FS

□(f):

f>50k

Swp



Center 5.824 400 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)





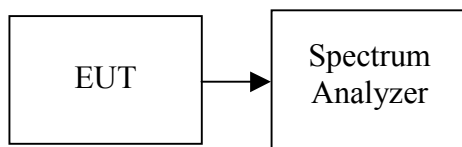
## 7.6 SPURIOUS EMISSIONS

### 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 for IEEE802.11b/g, 30MHz to 40GHz range for IEEE802.11a with the transmitter set to the lowest, middle, and highest channels.

#### TEST RESULTS

*No non-compliance noted.*



Test Plot

IEEE 802.11b / CH Low

30MHz ~ 26GHz

Agilent 10:44:03 Jan 22, 2006

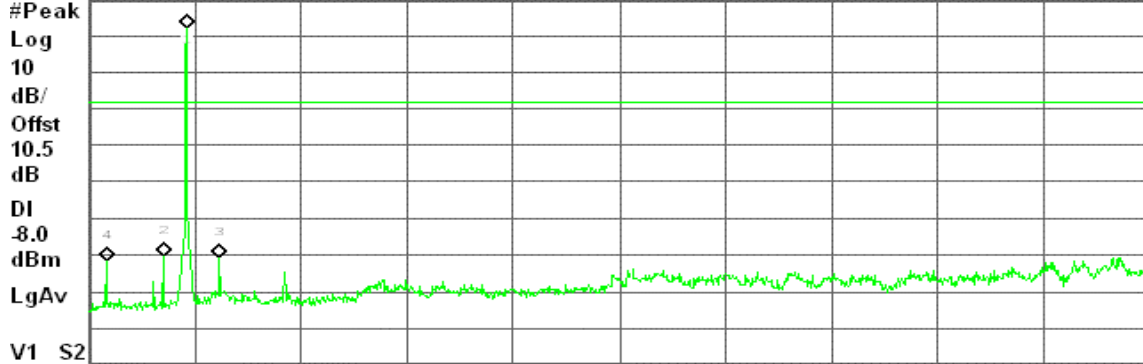
L

Spurious, b Mode Low Ch.

Mkr4 450 MHz  
-52.03 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)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42 GHz	12.02 dBm
2	(1)	Freq	1.85 GHz	-50.62 dBm
3	(1)	Freq	3.22 GHz	-50.94 dBm
4	(1)	Freq	450 MHz	-52.03 dBm

IEEE 802.11b / CH Mid

30MHz ~ 26GHz

Agilent 12:03:52 Jan 22, 2006

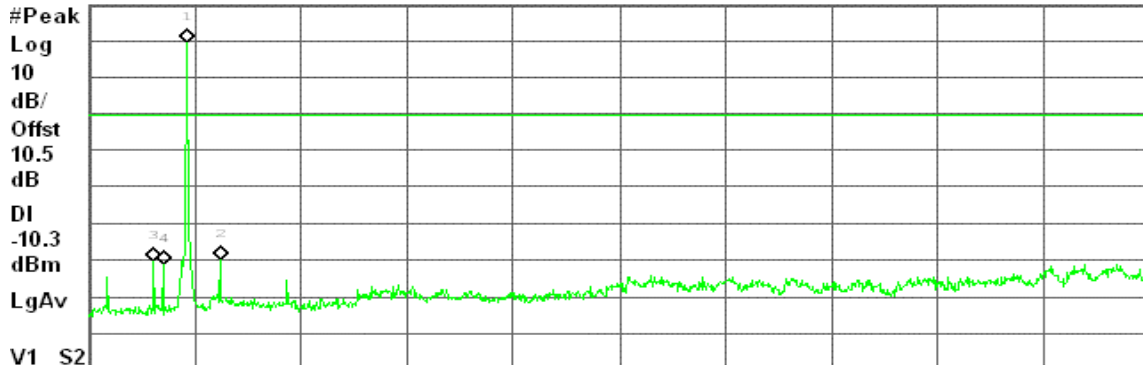
L

Spurious, b Mode Mid Ch.

Mkr4 1.85 GHz  
-51.48 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)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	9.68 dBm
2	(1)	Freq	3.25 GHz	-50.25 dBm
3	(1)	Freq	1.81 GHz	-50.51 dBm
4	(1)	Freq	1.85 GHz	-51.48 dBm



**IEEE 802.11b / CH High**

**30MHz ~ 26GHz**

Agilent 12:12:45 Jan 22, 2006

L

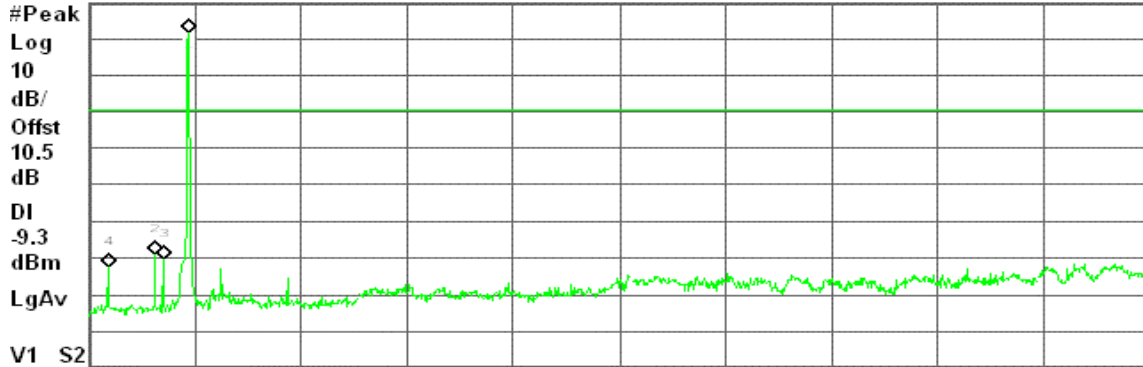
Spurious, b Mode High Ch.

Mkr4 500 MHz

Ref 20 dBm

Atten 20 dB

-52.78 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	11.70 dBm
2	(1)	Freq	1.64 GHz	-49.17 dBm
3	(1)	Freq	1.85 GHz	-50.59 dBm
4	(1)	Freq	500 MHz	-52.78 dBm

**IEEE 802.11g / CH Low**

**30MHz ~ 26GHz**

Agilent 12:24:08 Jan 22, 2006

L

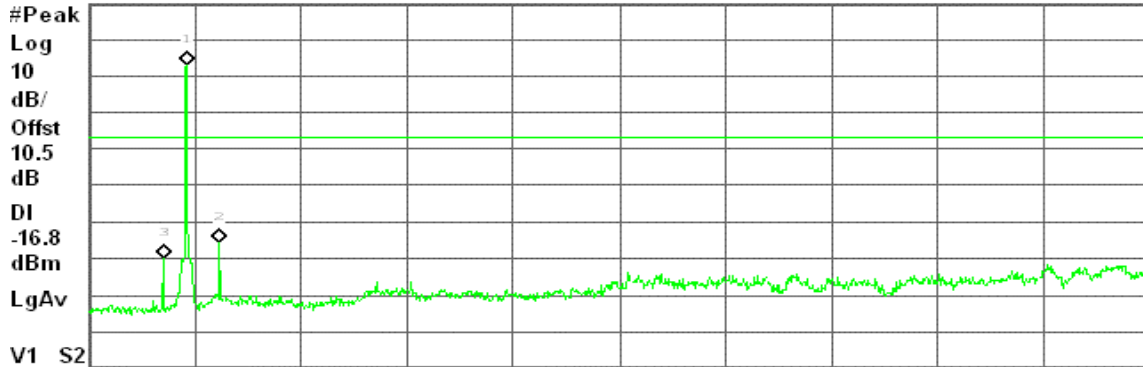
Spurious, g Mode Low Ch.

Mkr3 1.85 GHz

Ref 20 dBm

Atten 20 dB

-50.12 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	3.23 dBm
2	(1)	Freq	3.22 GHz	-45.92 dBm
3	(1)	Freq	1.85 GHz	-50.12 dBm



IEEE 802.11g / CH Mid

30MHz ~ 26GHz

Agilent 12:33:03 Jan 22, 2006

L

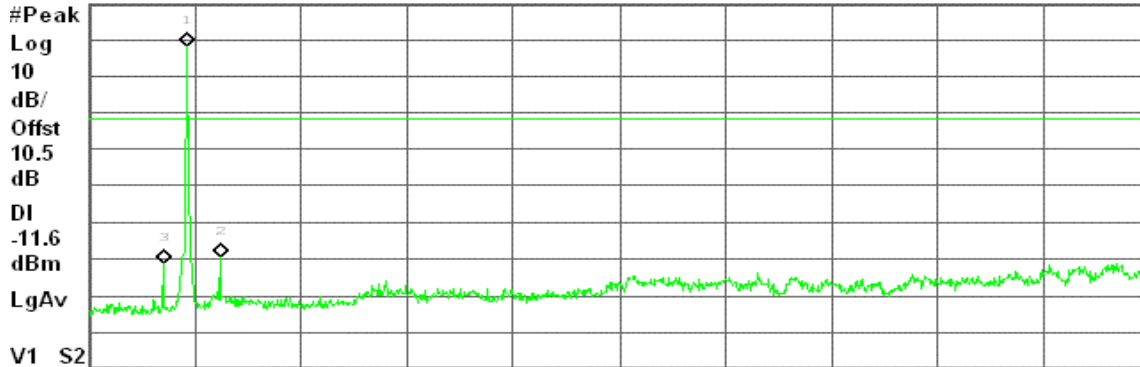
Spurious, g Mode Mid Ch.

Mkr3 1.85 GHz

Ref 20 dBm

Atten 20 dB

-51.60 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	8.37 dBm
2	(1)	Freq	3.25 GHz	-49.64 dBm
3	(1)	Freq	1.85 GHz	-51.60 dBm

IEEE 802.11g / CH High

30MHz ~ 26GHz

Agilent 12:40:15 Jan 22, 2006

L

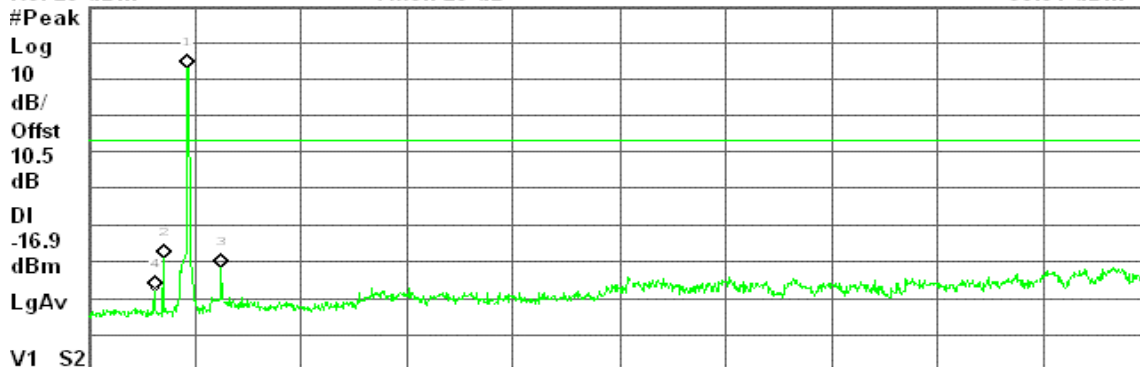
Spurious, g Mode High Ch.

Mkr4 1.64 GHz

Ref 20 dBm

Atten 20 dB

-58.01 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	3.13 dBm
2	(1)	Freq	1.85 GHz	-49.13 dBm
3	(1)	Freq	3.28 GHz	-51.89 dBm
4	(1)	Freq	1.64 GHz	-58.01 dBm



**IEEE 802.11a / CH Low**

**30MHz ~ 40GHz**

Agilent 12:48:42 Jan 22, 2006

L

Spurious, a Mode Low Ch.

Mkr4 4.47 GHz

Ref 20 dBm

Atten 20 dB

-55.66 dBm

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-16.5

dBm

LgAv

V1 S2

Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.75 GHz	3.54 dBm
2	(1)	Freq	5.11 GHz	-44.10 dBm
3	(1)	Freq	4.79 GHz	-46.45 dBm
4	(1)	Freq	4.47 GHz	-55.66 dBm

**IEEE 802.11a / CH Mid**

**30MHz ~ 40GHz**

Agilent 12:56:01 Jan 22, 2006

L

Spurious, a Mode Mid Ch.

Mkr3 3.87 GHz

Ref 20 dBm

Atten 20 dB

-55.43 dBm

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-15.7

dBm

LgAv

V1 S2

Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.79 GHz	4.26 dBm
2	(1)	Freq	5.11 GHz	-43.46 dBm
3	(1)	Freq	3.87 GHz	-55.43 dBm



**IEEE 802.11a / CH High**

**30MHz ~ 40GHz**

Agilent 13:03:24 Jan 22, 2006

L

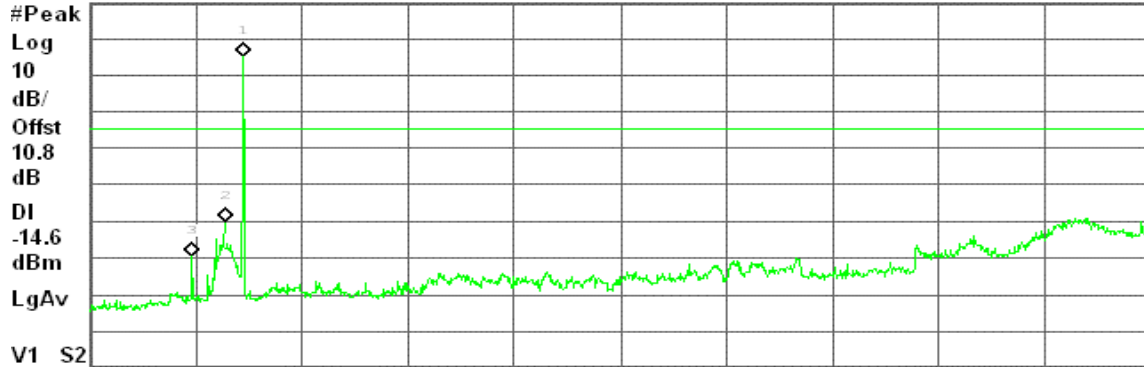
Spurious, a Mode High Ch.

Mkr3 3.87 GHz

Ref 20 dBm

Atten 20 dB

-49.67 dBm



Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.83 GHz	5.39 dBm
2	(1)	Freq	5.11 GHz	-40.24 dBm
3	(1)	Freq	3.87 GHz	-49.67 dBm



### 7.6.2 Radiated Emissions

#### LIMIT

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

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

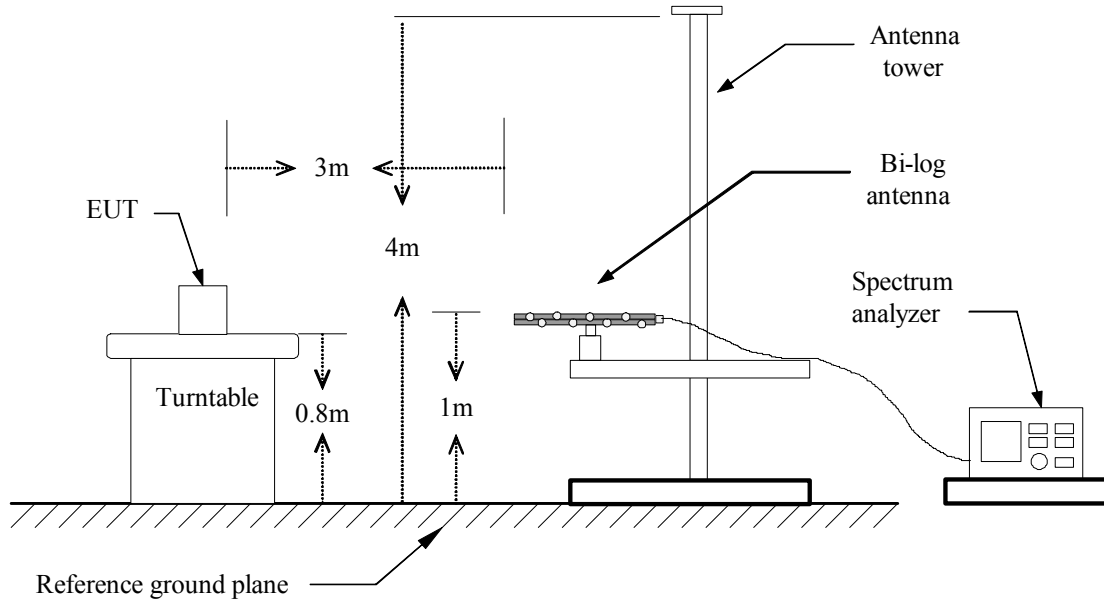
*Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

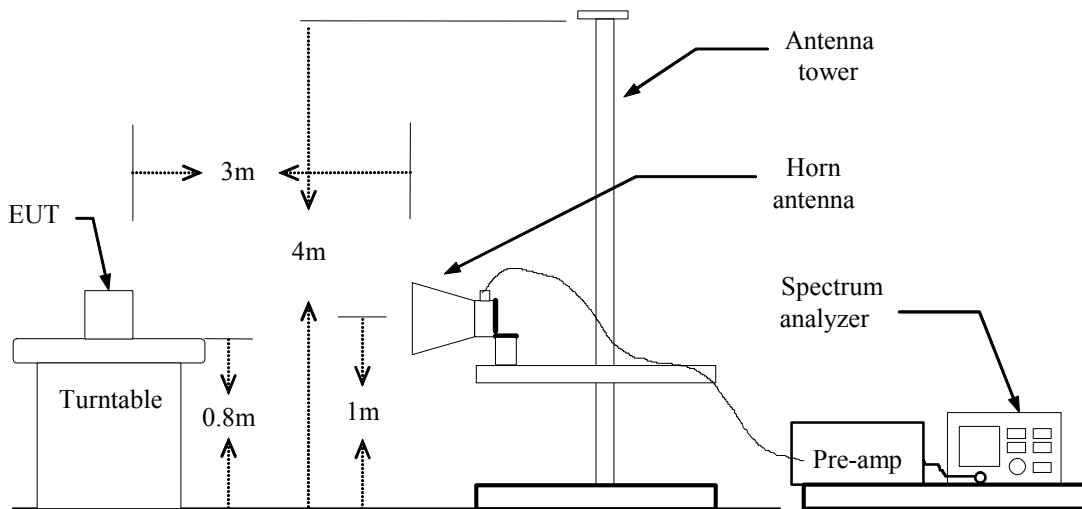
Frequency (MHz)	Field Strength ( $\mu$ V/m at 3-meter)	Field Strength (dB $\mu$ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### Test Configuration

#### Below 1 GHz



#### Above 1 GHz







## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:  
Below 1GHz:  
RBW=100kHz / VBW=300kHz / Sweep=AUTO  
Above 1GHz:  
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

**TEST RESULTS****Below 1 GHz****Operation Mode:** Normal Link**Test Date:** March 10, 2006**Temperature:** 26°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
136.42	V	21.37	---	9.88	31.25	---	43.50	-12.25	Peak
265.79	V	19.70	---	14.25	33.95	---	46.00	-12.05	Peak
366.41	V	14.76	---	16.73	31.49	---	46.00	-14.51	Peak
554.67	V	12.12	---	20.42	32.54	---	46.00	-13.46	Peak
643.10	V	8.81	---	21.68	30.49	---	46.00	-15.51	Peak
806.46	V	8.35	---	23.54	31.89	---	46.00	-14.11	Peak
145.46	H	23.81	---	9.68	33.49	---	43.50	-10.01	Peak
274.94	H	21.82	---	14.42	36.24	---	46.00	-9.76	Peak
349.15	H	20.75	---	16.36	37.11	---	46.00	-8.89	Peak
455.97	H	17.72	---	18.22	35.94	---	46.00	-10.06	Peak
598.16	H	11.25	---	21.31	32.56	---	46.00	-13.44	Peak
715.38	H	12.89	---	22.33	35.22	---	46.00	-10.78	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:** January 18, 2006

**Temperature:** 23°C

**Tested by:** Eric Cheng

**Humidity:** 60% 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
1066.67	V	52.04	---	-6.81	45.23	---	74.00	54.00	-8.77	Peak
1203.33	V	54.49	---	-6.88	47.62	---	74.00	54.00	-6.38	Peak
3216.67	V	48.32	---	-3.71	44.60	---	74.00	54.00	-9.40	Peak
4825.00	V	53.05	38.54	0.64	53.69	39.18	74.00	54.00	-14.82	Average
7233.33	V	55.47	45.89	6.28	61.75	52.17	74.00	54.00	-1.83	Average
14466.67	V	69.18	---	-21.62	47.56	---	74.00	54.00	-6.44	Peak
1066.67	H	51.67	---	-6.81	44.86	---	74.00	54.00	-9.14	Peak
3216.67	H	51.58	---	-3.71	47.87	---	74.00	54.00	-6.13	Peak
4825.00	H	51.63	36.99	0.64	52.27	37.63	74.00	54.00	-16.37	Average
7233.33	H	49.82	39.22	6.28	56.10	45.50	74.00	54.00	-8.50	Average
9650.00	H	67.55	---	-24.72	42.83	---	74.00	54.00	-11.17	Peak
14466.67	H	64.39	---	-21.62	42.77	---	74.00	54.00	-11.23	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 Mid**Test Date:** January 18, 2006**Temperature:** 23°C**Tested by:** Eric Cheng**Humidity:** 60% 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
1063.33	V	52.31	---	-6.81	45.50	---	74.00	54.00	-8.50	Peak
1200.00	V	52.60	---	-6.88	45.73	---	74.00	54.00	-8.27	Peak
3250.00	V	49.39	---	-3.72	45.67	---	74.00	54.00	-8.33	Peak
4875.00	V	46.71	---	0.81	47.52	---	74.00	54.00	-6.48	Peak
7308.33	V	54.74	45.33	5.88	60.62	51.21	74.00	54.00	-2.79	Average
14616.67	V	66.86	---	-20.48	46.39	---	74.00	54.00	-7.61	Peak
1196.67	H	52.47	---	-6.87	45.59	---	74.00	54.00	-8.41	Peak
3250.00	H	51.71	---	-3.72	47.99	---	74.00	54.00	-6.01	Peak
4875.00	H	46.81	---	0.81	47.63	---	74.00	54.00	-6.37	Peak
7308.33	H	49.80	39.51	5.88	55.68	45.39	74.00	54.00	-8.61	Average
9750.00	H	66.64	---	-24.77	41.87	---	74.00	54.00	-12.13	Peak
14616.67	H	64.44	---	-20.48	43.97	---	74.00	54.00	-10.03	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:** January 18, 2006**Temperature:** 23°C**Tested by:** Eric Cheng**Humidity:** 60% 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
1196.67	V	53.70	---	-6.87	46.82	---	74.00	54.00	-7.18	Peak
1640.00	V	52.34	---	-6.77	45.58	---	74.00	54.00	-8.42	Peak
4925.00	V	47.02	---	0.99	48.01	---	74.00	54.00	-5.99	Peak
7383.33	V	55.16	45.77	5.48	60.64	51.25	74.00	54.00	-2.75	Average
9850.00	V	70.56	---	-24.81	45.75	---	74.00	54.00	-8.25	Peak
14766.67	V	65.07	---	-19.13	45.94	---	74.00	54.00	-8.06	Peak
1066.67	H	51.08	---	-6.81	44.27	---	74.00	54.00	-9.73	Peak
3283.33	H	51.33	---	-3.73	47.60	---	74.00	54.00	-6.40	Peak
4925.00	H	47.82	---	0.99	48.81	---	74.00	54.00	-5.19	Peak
7383.33	H	50.75	40.45	5.48	56.23	45.93	74.00	54.00	-8.07	Average
9850.00	H	69.58	---	-24.81	44.77	---	74.00	54.00	-9.23	Peak
14766.67	H	61.81	---	-19.13	42.68	---	74.00	54.00	-11.32	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 802.11g / CH Low**Test Date:** January 18, 2006**Temperature:** 23°C**Tested by:** Eric Cheng**Humidity:** 60% 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
1063.33	V	51.90	---	-6.81	45.09	---	74.00	54.00	-8.91	Peak
1203.33	V	54.48	---	-6.88	47.61	---	74.00	54.00	-6.39	Peak
1330.00	V	50.90	---	-6.94	43.96	---	74.00	54.00	-10.04	Peak
3216.67	V	49.76	---	-3.71	46.04	---	74.00	54.00	-7.96	Peak
4825.00	V	44.46	---	0.64	45.10	---	74.00	54.00	-8.90	Peak
7233.33	V	61.05	45.45	6.28	67.33	51.73	74.00	54.00	-2.27	Average
1066.67	H	50.93	---	-6.81	44.11	---	74.00	54.00	-9.89	Peak
3216.67	H	52.44	---	-3.71	48.73	---	74.00	54.00	-5.27	Peak
4825.00	H	44.47	---	0.64	45.10	---	74.00	54.00	-8.90	Peak
7233.33	H	55.96	41.11	6.28	62.24	47.39	74.00	54.00	-6.61	Average
14466.67	H	59.65	---	-21.62	38.04	---	74.00	54.00	-15.96	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:** January 18, 2006**Temperature:** 23°C**Tested by:** Eric Cheng**Humidity:** 60% 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
1063.33	V	50.36	---	-6.81	43.55	---	74.00	54.00	-10.45	Peak
1200.00	V	53.80	---	-6.88	46.92	---	74.00	54.00	-7.08	Peak
1463.33	V	51.57	---	-7.00	44.57	---	74.00	54.00	-9.43	Peak
3250.00	V	48.97	---	-3.72	45.25	---	74.00	54.00	-8.75	Peak
4875.00	V	43.09	---	0.81	43.90	---	74.00	54.00	-10.10	Peak
7308.33	V	63.18	46.72	5.88	69.06	52.60	74.00	54.00	-1.40	Average
1066.67	H	50.80	---	-6.81	43.99	---	74.00	54.00	-10.01	Peak
3250.00	H	51.97	---	-3.72	48.25	---	74.00	54.00	-5.75	Peak
4875.00	H	43.36	---	0.81	44.18	---	74.00	54.00	-9.82	Peak
7308.33	H	56.98	40.34	5.88	62.86	46.22	74.00	54.00	-7.78	Average
9750.00	H	63.21	---	-24.77	38.45	---	74.00	54.00	-15.55	Peak
14633.33	H	59.86	---	-20.33	39.53	---	74.00	54.00	-14.47	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 802.11g / CH High**Test Date:** January 18, 2006**Temperature:** 23°C**Tested by:** Eric Cheng**Humidity:** 60% 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
1066.67	V	51.19	---	-6.81	44.38	---	74.00	54.00	-9.62	Peak
3283.33	V	48.70	---	-3.73	44.98	---	74.00	54.00	-9.02	Peak
4925.00	V	42.62	---	0.99	43.61	---	74.00	54.00	-10.39	Peak
7383.33	V	62.82	47.17	5.48	68.30	52.65	74.00	54.00	-1.35	Average
9850.00	V	65.65	---	-24.81	40.83	---	74.00	54.00	-13.17	Peak
14766.67	V	59.87	---	-19.13	40.74	---	74.00	54.00	-13.26	Peak
1066.67	H	51.90	---	-6.81	45.09	---	74.00	54.00	-8.91	Peak
3283.33	H	51.44	---	-3.73	47.71	---	74.00	54.00	-6.29	Peak
4925.00	H	42.83	---	0.99	43.82	---	74.00	54.00	-10.18	Peak
7383.33	H	55.71	40.91	5.48	61.19	46.39	74.00	54.00	-7.61	Average
9850.00	H	65.45	---	-24.81	40.64	---	74.00	54.00	-13.36	Peak
14766.67	H	59.67	---	-19.13	40.54	---	74.00	54.00	-13.46	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 802.11a / CH Low

Test Date: January 18, 2006

Temperature: 24°C

Tested by: Eric Cheng

Humidity: 60% 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
3835.00	V	51.44	---	-2.44	48.99	---	74.00	54.00	-5.01	Peak
11483.33	V	85.92	72.10	-24.88	61.04	47.22	74.00	54.00	-6.78	Average
N/A										
3835.00	H	52.74	---	-2.44	50.30	---	74.00	54.00	-3.70	Peak
11483.33	H	86.74	73.67	-24.88	61.86	48.79	74.00	54.00	-5.21	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 802.11a / CH Mid

Test Date: January 18, 2006

Temperature: 24°C

Tested by: Eric Cheng

Humidity: 60% 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
1151.67	V	50.32	---	-6.85	43.46	---	74.00	54.00	-10.54	Peak
3858.33	V	51.51	---	-2.35	49.16	---	74.00	54.00	-4.84	Peak
11566.67	V	87.80	74.43	-24.72	63.08	49.71	74.00	54.00	-4.29	Average
N/A										
3858.33	H	52.74	---	-2.35	50.39	---	74.00	54.00	-3.61	Peak
11566.67	H	87.64	74.73	-24.72	62.92	50.01	74.00	54.00	-3.99	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 802.11a / CH High

Test Date: January 18, 2006

Temperature: 24°C

Tested by: Eric Cheng

Humidity: 60% 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
1198.33	V	52.56	---	-6.88	45.69	---	74.00	54.00	-8.31	Peak
3881.67	V	52.67	---	-2.26	50.41	---	74.00	54.00	-3.59	Peak
11650.00	V	87.33	73.59	-24.42	62.91	49.17	74.00	54.00	-4.83	Average
N/A										
3881.67	H	53.01	---	-2.26	50.75	---	74.00	54.00	-3.25	Peak
11650.00	H	87.99	74.12	-24.42	63.57	49.70	74.00	54.00	-4.30	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:** November 23, 2005  
**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
0.191	47.820	43.570	0.118	47.938	43.688	63.993	53.993	-16.055	-10.305	L1
0.252	39.210	35.030	0.100	39.310	35.130	61.691	51.691	-22.381	-16.561	L1
0.317	32.840	30.250	0.100	32.940	30.350	59.785	49.785	-26.845	-19.435	L1
0.443	30.770	29.730	0.100	30.870	29.830	57.005	47.005	-26.135	-17.175	L1
0.572	29.500	29.100	0.100	29.600	29.200	56.000	46.000	-26.400	-16.800	L1
15.248	26.030	22.560	0.820	26.850	23.380	60.000	50.000	-33.150	-26.620	L1
0.189	45.790	41.610	0.122	45.912	41.732	64.080	54.080	-18.168	-12.348	L2
0.254	36.410	33.200	0.100	36.510	33.300	61.625	51.625	-25.115	-18.325	L2
0.381	28.190	24.330	0.100	28.290	24.430	58.258	48.258	-29.968	-23.828	L2
0.440	30.000	29.000	0.100	30.100	29.100	57.062	47.062	-26.962	-17.962	L2
0.568	29.220	29.270	0.100	29.320	29.370	56.000	46.000	-26.680	-16.630	L2
15.006	24.800	21.130	0.800	25.600	21.930	60.000	50.000	-34.400	-28.070	L2

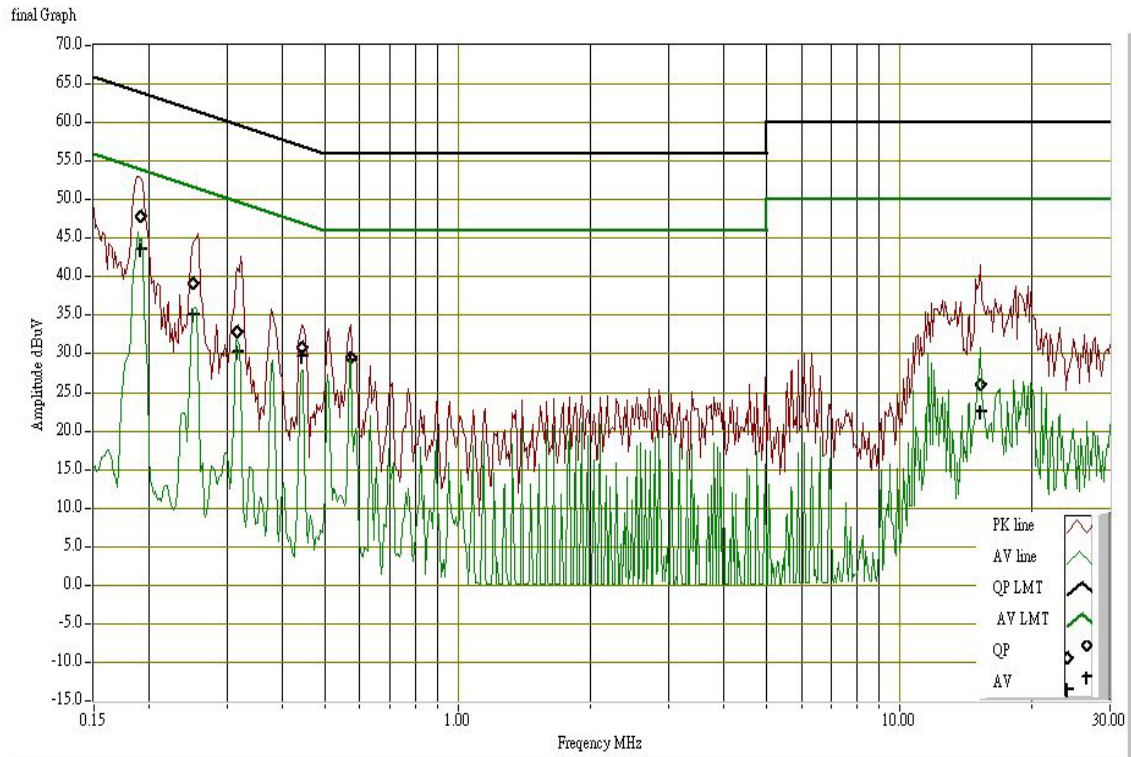
#### Remark:

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

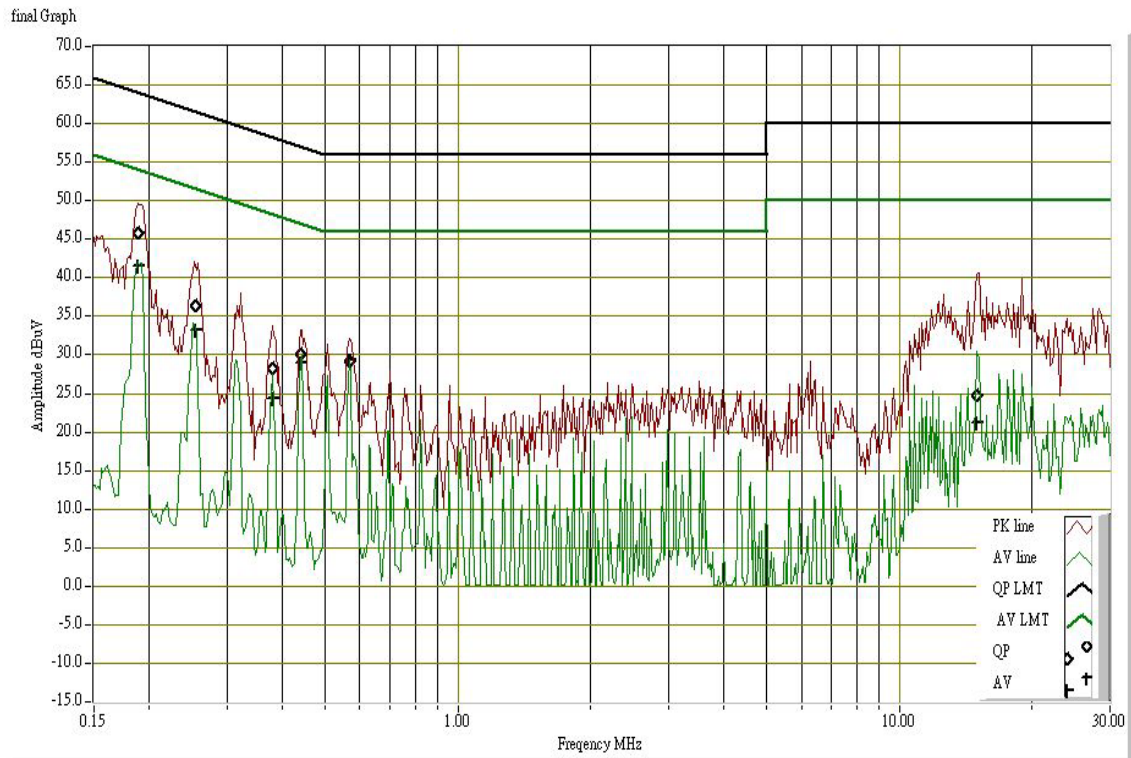


### Test Plots

#### Conducted emissions (Line 1)



#### Conducted emissions (Line 2)





## 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

#### EUT Specification

<b>EUT</b>	IEEE 802.11a/b/g Wireless Mini-PCI Adapter
<b>Frequency band (Operating)</b>	<input type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480GHz <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
<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: 25.26 dBm (335.74mW) IEEE 802.11g: 26.26 dBm (422.67mW)
<b>Antenna gain (Max)</b>	IEEE 802.11b/g: 2dBi (Numeric gain: 1.58)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

#### **Remark:**

1. The maximum output power is 26.26dBm (422.674mW) at 2437MHz (with 1.58 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 = 422.67mW

Numeric antenna gain = 1.58

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 = 0.1329 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.





**EUT Specification**

<b>EUT</b>	IEEE 802.11a/b/g Wireless Mini-PCI Adapter
<b>Frequency band (Operating)</b>	<input type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480GHz <input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
<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 802.11a: 22.70 dBm (186.21mW)
<b>Antenna gain (Max)</b>	IEEE 802.11a: 1.5dBi (Numeric gain: 1.413)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

**Remark:**

- The maximum output power is 22.70dBm (186.21mW) at 5800Hz (with 1.413 numeric antenna gain.)*
- DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.*
- 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 = 186.21mW

Numeric antenna gain = 1.413

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 = 0.0524 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.