



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**108M WIRELESS PCI ADAPTER**

**Model: TL-WN650G / TL-WN651G, NPI-3601, EPI-3601**

**Trade Name: TP-LINK, Senao, EnGenius**

*Prepared for*

**TP-LINK TECHNOLOGIES CO., LTD.  
BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL PARK, XILI,  
NANSHAN DISTRICT, SHENZHEN, P.R.C.**

*Prepared by*

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# 1. TEST RESULT CERTIFICATION

**Applicant:** TP-LINK TECHNOLOGIES CO., LTD.  
 BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL  
 PARK, XILI, NANSHAN DISTRICT, SHENZHEN, P.R.C.

**Equipment Under Test:** 108M WIRELESS PCI ADAPTER

**Trade Name:** TP-LINK, Senao, EnGenius

**Model:** TL-WN650G / TL-WN651G, NPI-3601, EPI-3601

**Date of Test:** June 13-30, 2006

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

### We hereby certify that:

The above equipment was tested by Compliance Certification Services (Shenzhen) 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 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:

\_\_\_\_\_  
 Clinton Kao / EMC Manager  
 COMPLIANCE CERTIFICATION  
 SERVICES (SHENZHEN) INC.

Tested By: Henry Ding

Reviewed By:

\_\_\_\_\_  
 Eric Wong / Assistant manager  
 COMPLIANCE CERTIFICATION  
 SERVICES (SHENZHEN) INC.



## 2. EUT DESCRIPTION

<b>Product</b>	108M WIRELESS PCI ADAPTER
<b>Trade Name</b>	TP-LINK, Senao, EnGenius
<b>Model Number</b>	TL-WN650G / TL-WN651G, NPI-3601, EPI-3601
<b>Model Discrepancy</b>	TL-WN650G is fixed antenna, TL-WN651G, NPI-3601 and EPI-3601 is detachable antenna. Others are the same.
<b>EUT Power Rating</b>	Powered from PC
<b>Frequency Range</b>	802.11b mode: 2412 ~ 2462 MHz 802.11g mode: 2412 ~ 2462 MHz
<b>Transmit Power</b>	802.11b mode: 16.71 dBm 802.11g mode: 16.90 dBm (Turbo mode: 15.71 dBm)
<b>Modulation Technique</b>	802.11b: DSSS (CCK; DQPSK; DBPSK) 802.11g: OFDM
<b>Transmit Data Rate</b>	802.11b: 11Mbps(CCK) with fall back rates of 5.5, 2, and 1Mbps 802.11g: 108Mbps with fall back rates of 54/48/36/24/18/12/9/6 Mbps (OFDM)
<b>Number of Channels</b>	11 Channels
<b>Antenna Specification</b>	Dipole antenna Gain: 1.8 dBi (Max)

*Note: This submittal(s) (test report) 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 turntable, 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.

### 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 has been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

IEEE802.11b: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 11Mbps highest data rate (worst case) are chosen for the final testing.

IEEE802.11g: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 6Mbps data rate (the worst case) are chosen for the final testing.



#### **4. 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.



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

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

No. 5, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China

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: 200577-0 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.





## 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	Equipment	Model	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	USB KEYBOARD	KU9985	2D41500055B	DoC	DELL	Shielded 1.00M	N/A
2	USB MOUSE	M-BE58	N/A	DoC	ZHESHEN	N/A	N/A
3	21" MONITOR	VP201b	VLCDS26064-2W	DoC	ViewSonic	Shielded 1.80M	Shielded 1.80M
4	PC	DX200	CNG50401CW	DoC	HP	N/A	Shielded 1.80M

**Notes:**

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 PEAK POWER

#### LIMIT

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

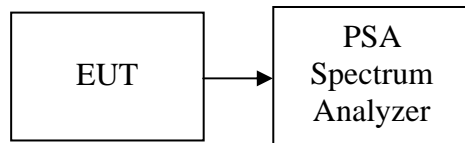
1. For systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007

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

#### 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)	Factor (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	14.19	250	16.69	0.04667	1	PASS
Md	2437	13.31	250	15.81	0.03811		PASS
Hgh	2462	14.21	250	16.71	0.04688		PASS

Test mode: IEEE 802.11g

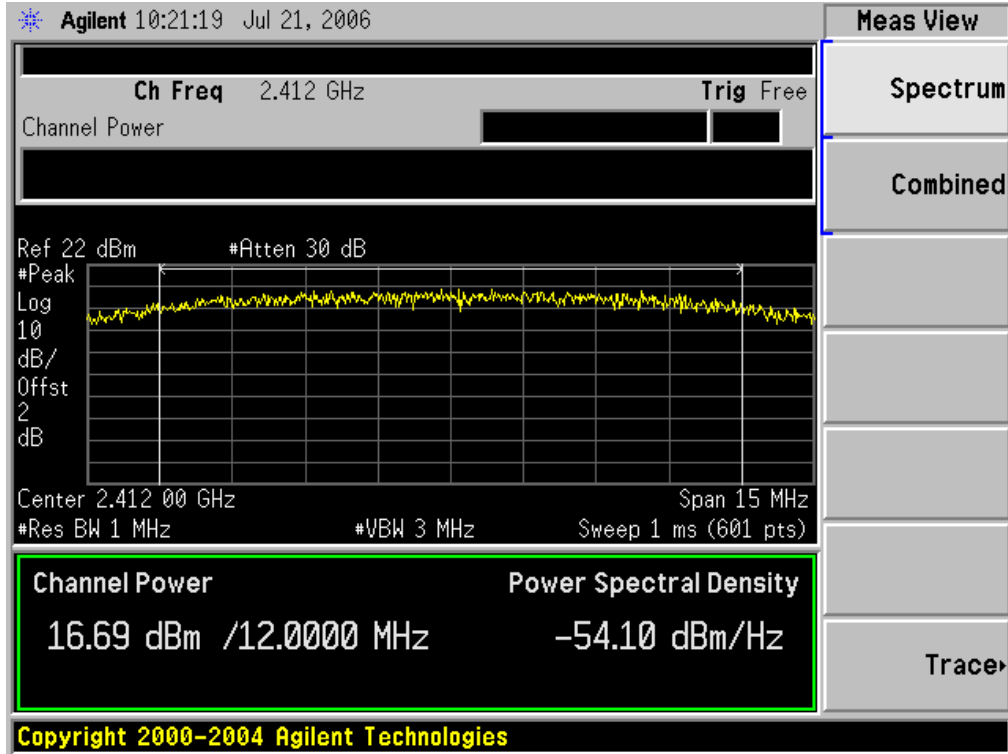
Channel	Frequency (MHz)	Output Power (dBm)	Factor (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	14.31	250	16.81	0.04797	1	PASS
Md	2437	13.58	250	16.08	0.04055		PASS
Hgh	2462	14.40	250	16.90	0.04898		PASS
Turbo	2437	13.21	250	15.71	0.03724		PASS



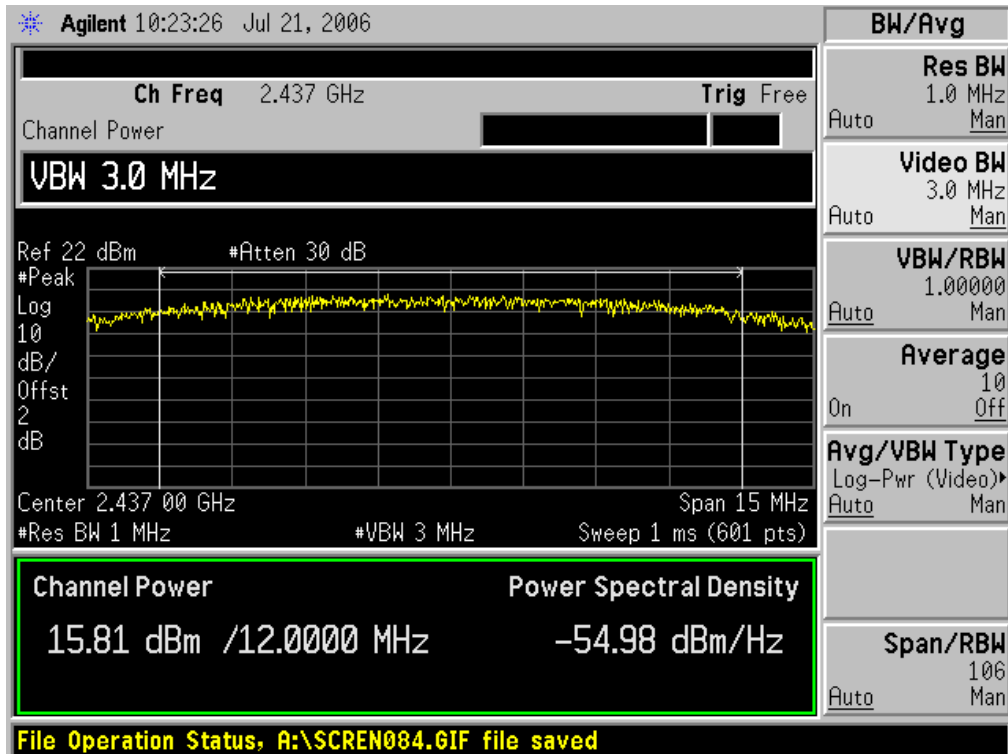
**Test Plot**

**802.11b mode**

**Peak power (CH Low)**

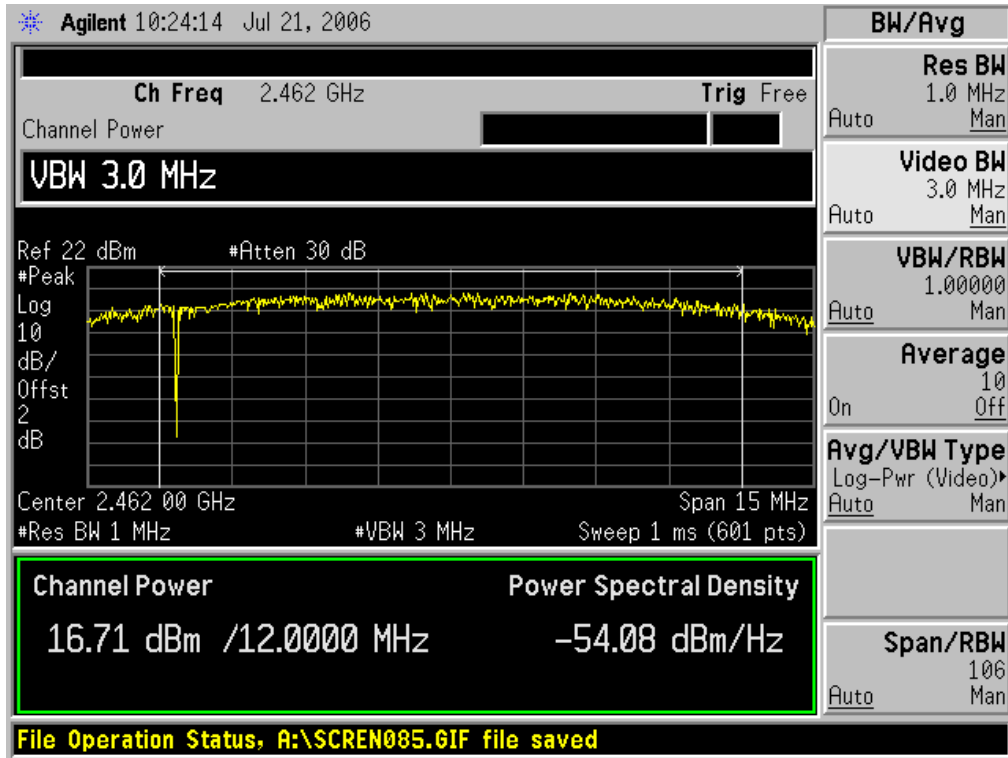


**Peak power (CH Mid)**





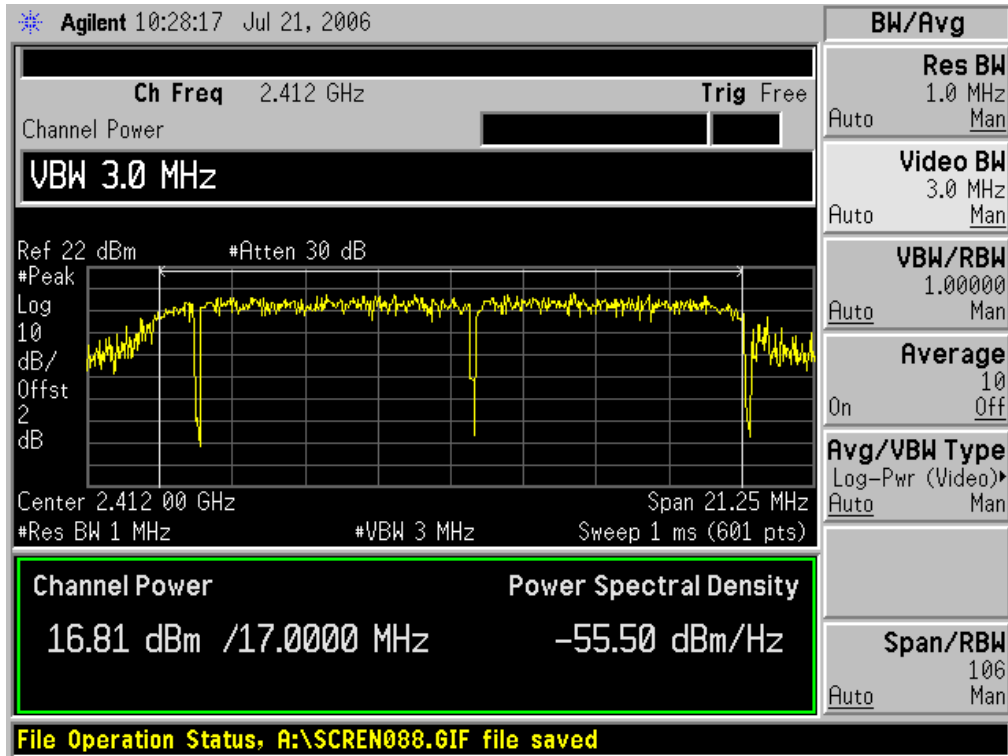
### Peak power (CH High)



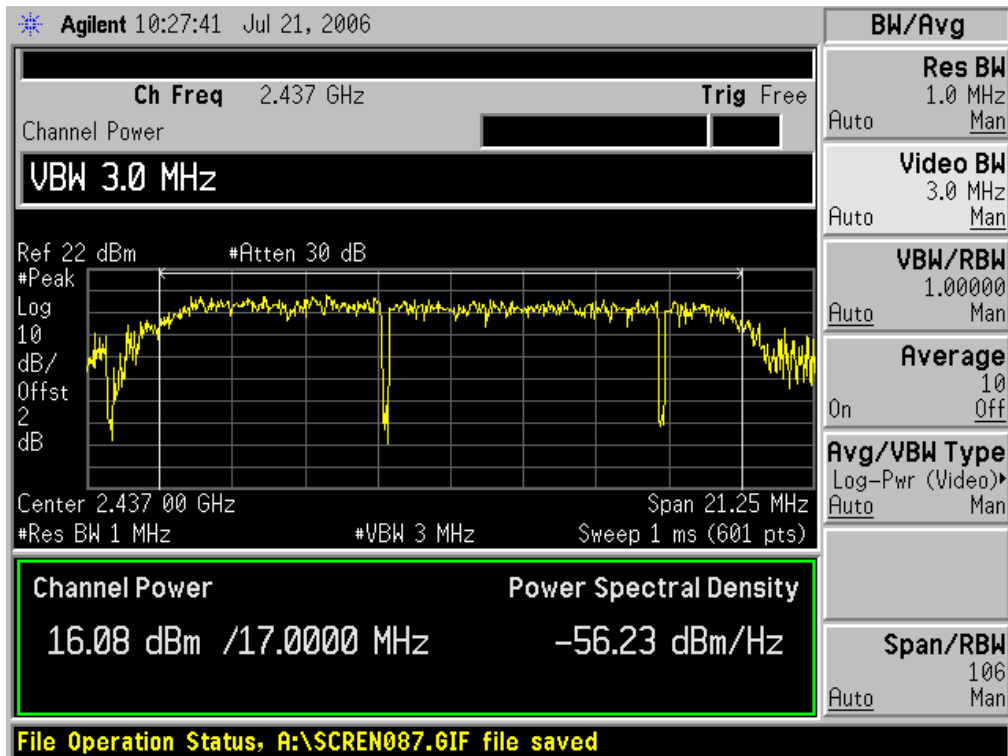


### 802.11g mode

#### Peak power (CH Low)

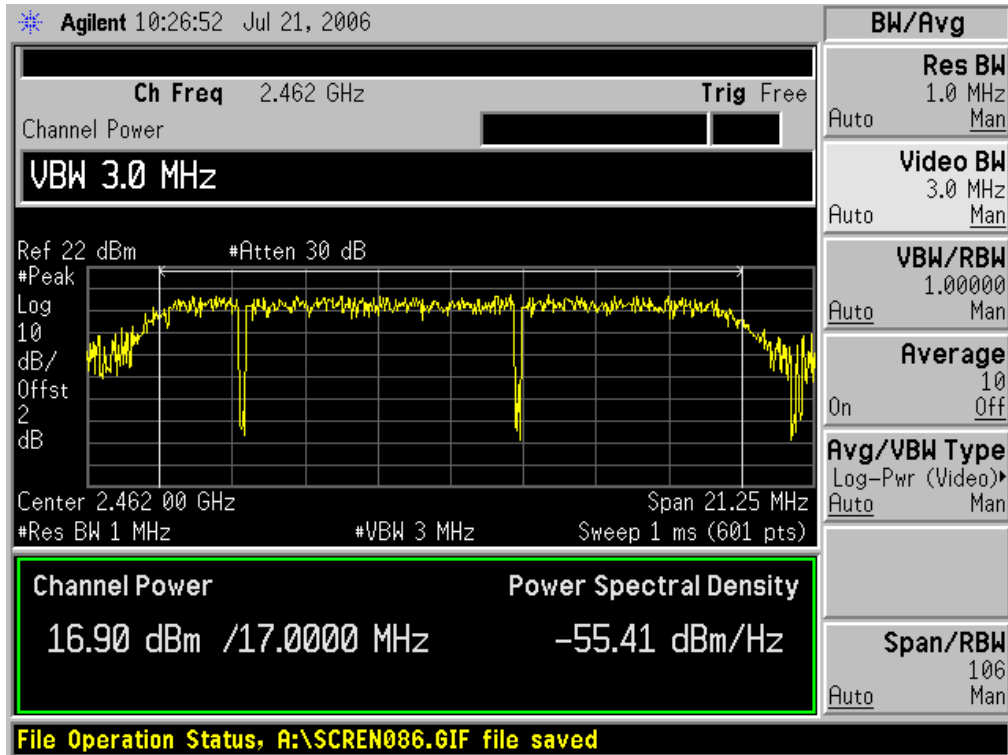


#### Peak power (CH Mid)

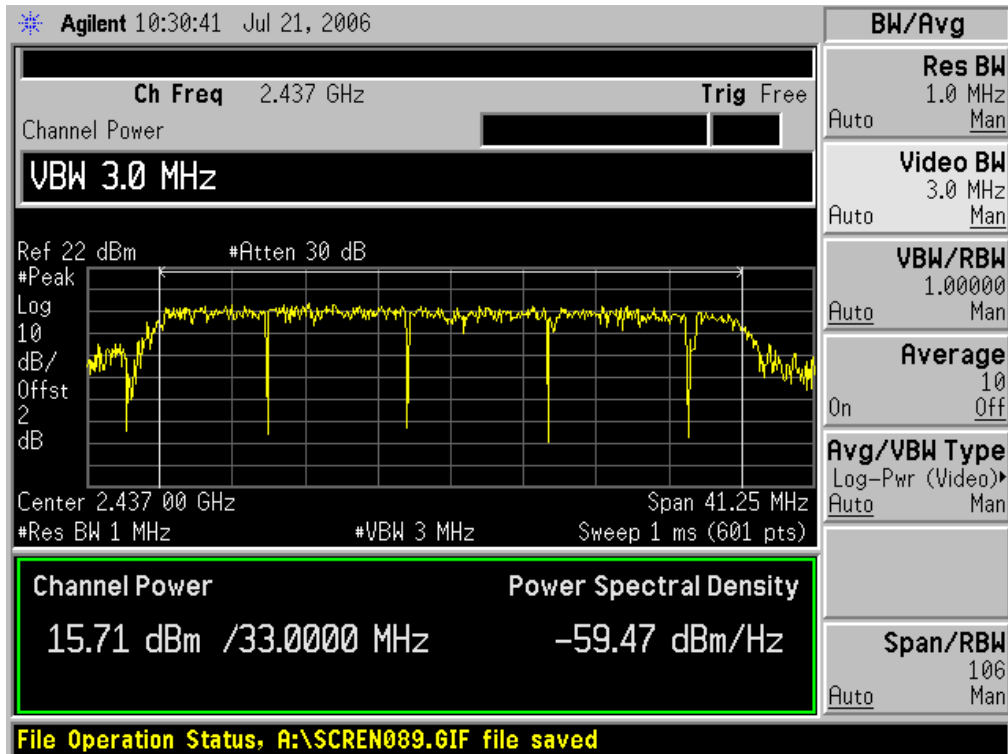




### Peak power (CH High)



### Peak power (Turbo)



## 7.2 BAND EDGES MEASUREMENT

### LIMIT

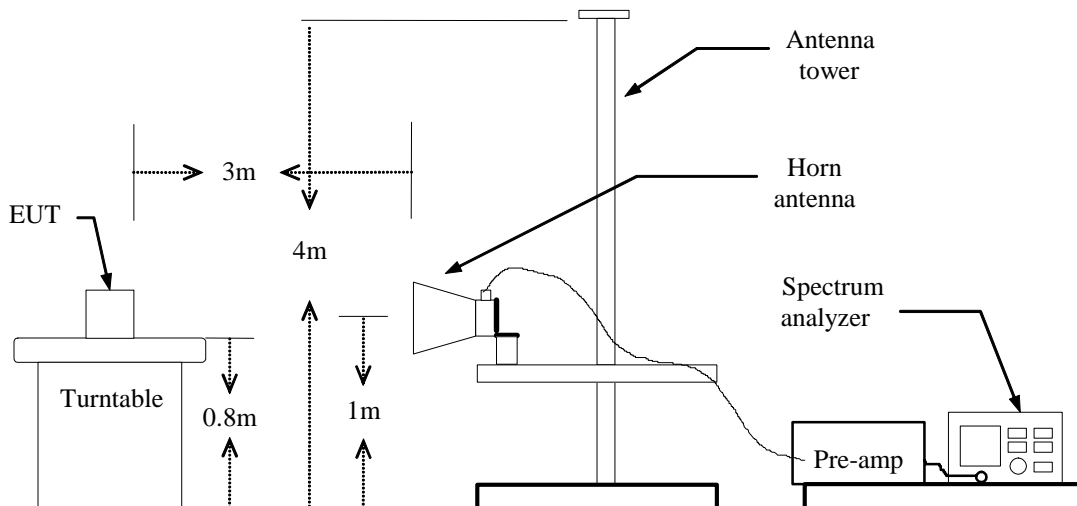
According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. 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).

### MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007

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

### 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.

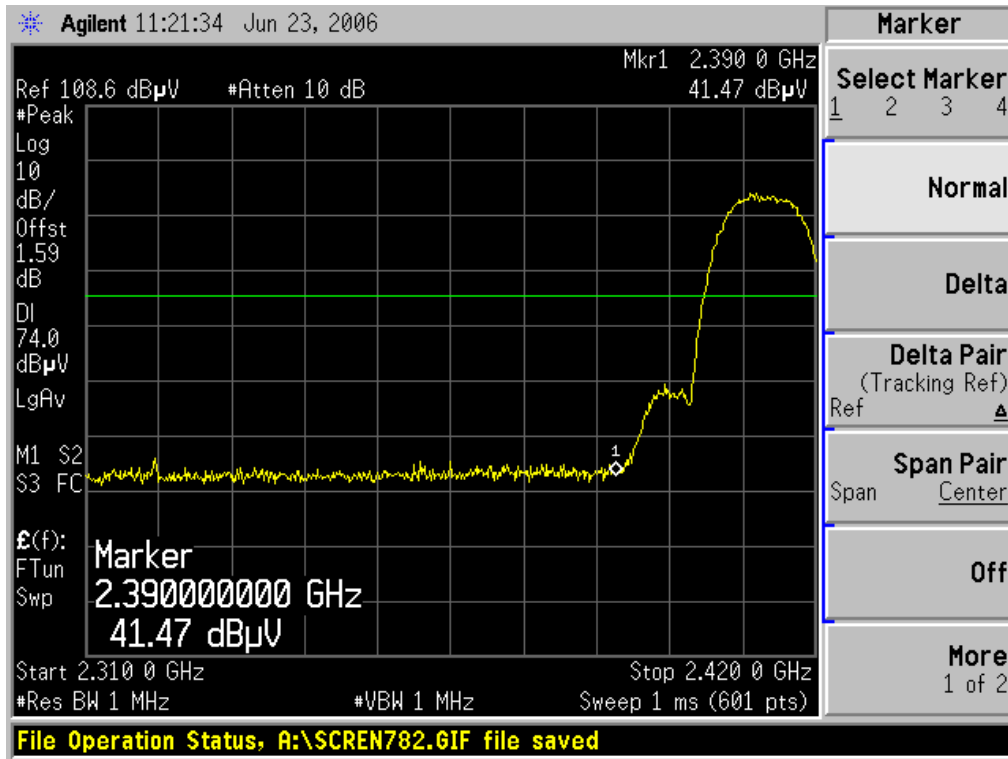




Band Edges (802.11b / CH Low)

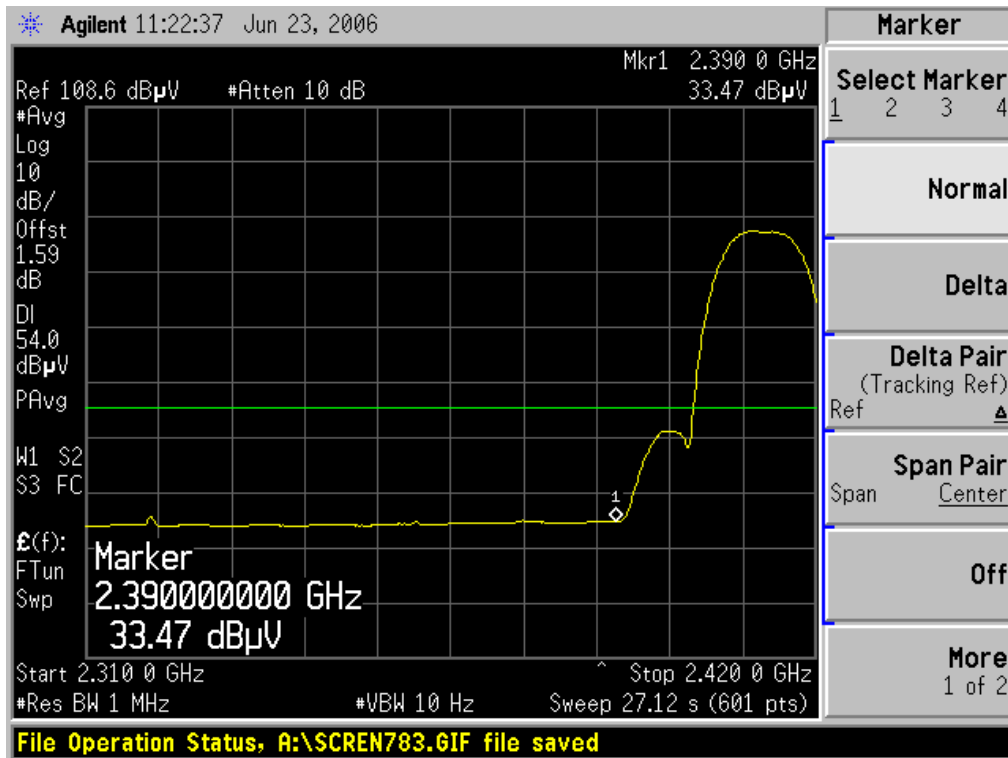
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

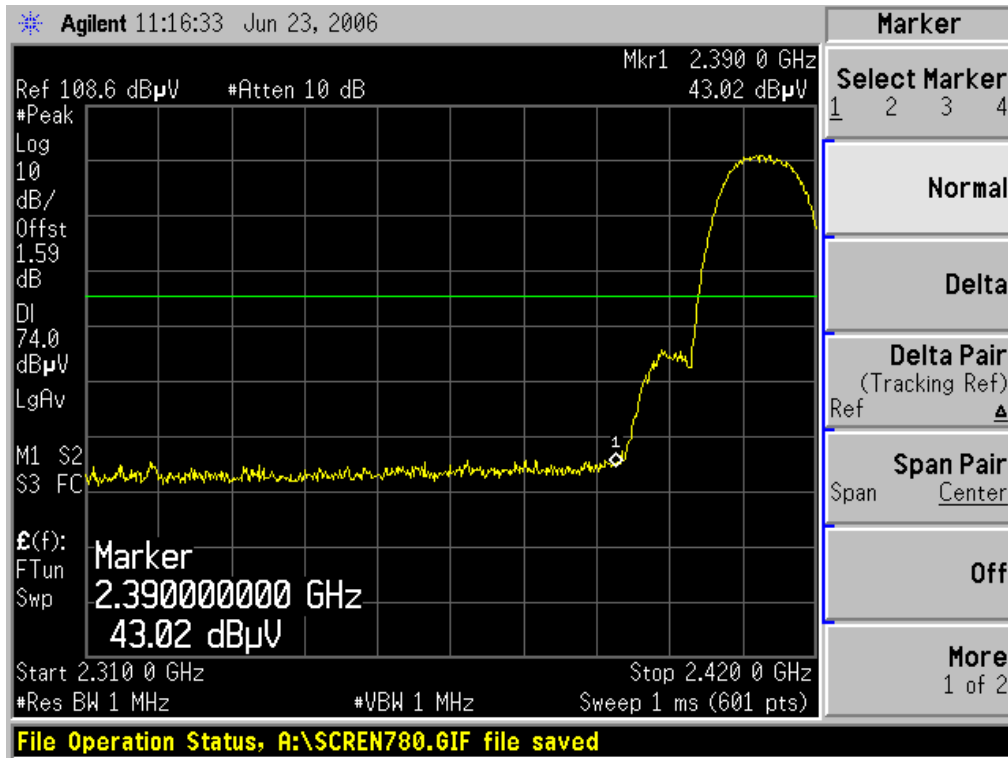
Polarity: Vertical





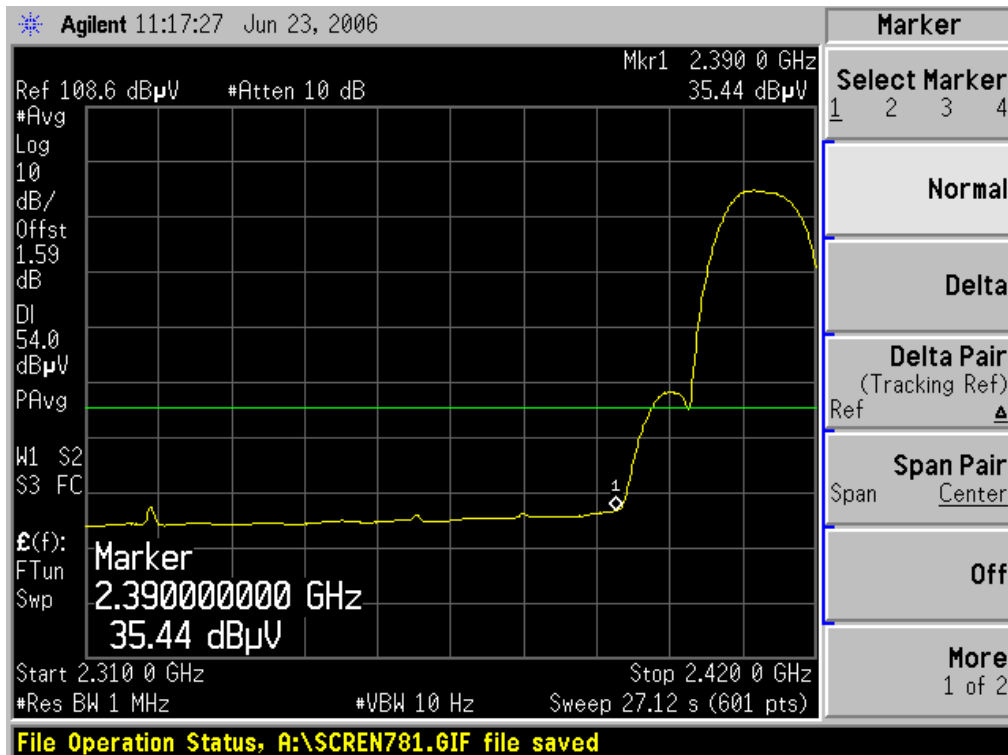
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

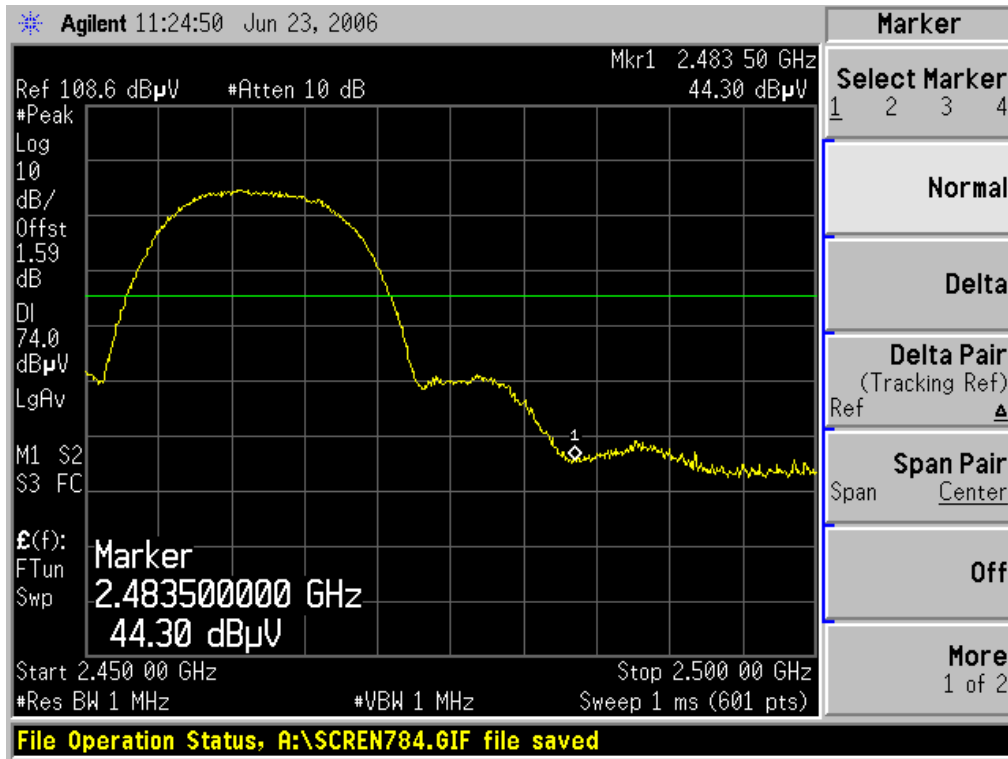




Band Edges (802.11b / CH High)

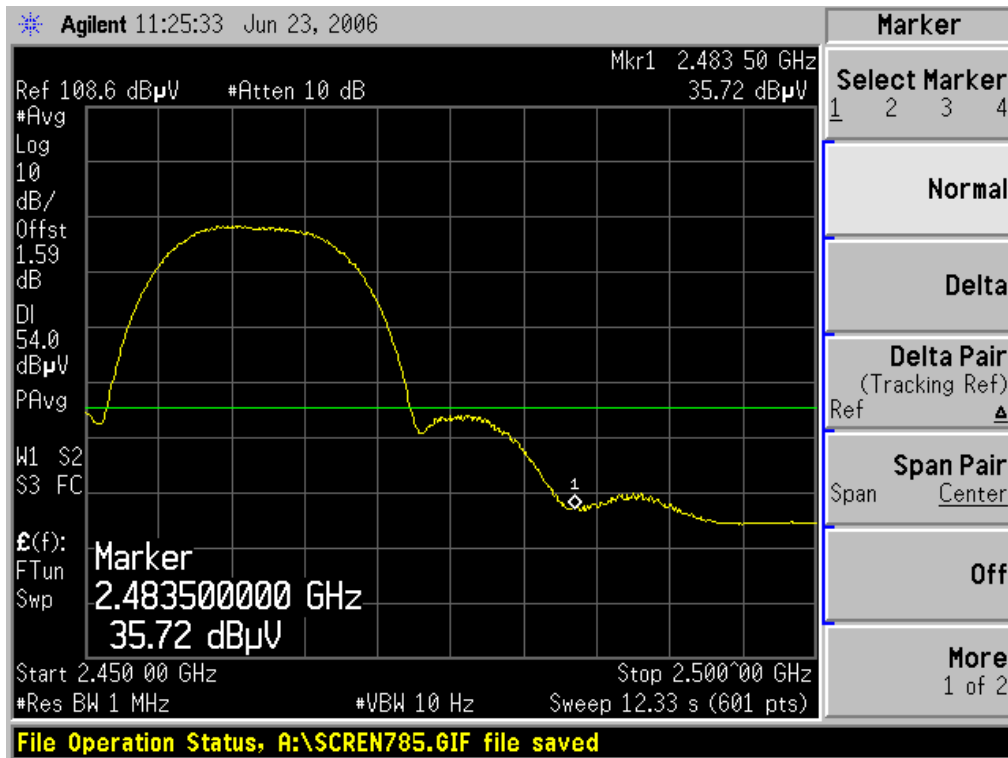
Detector mode: Peak

Polarity: Vertical



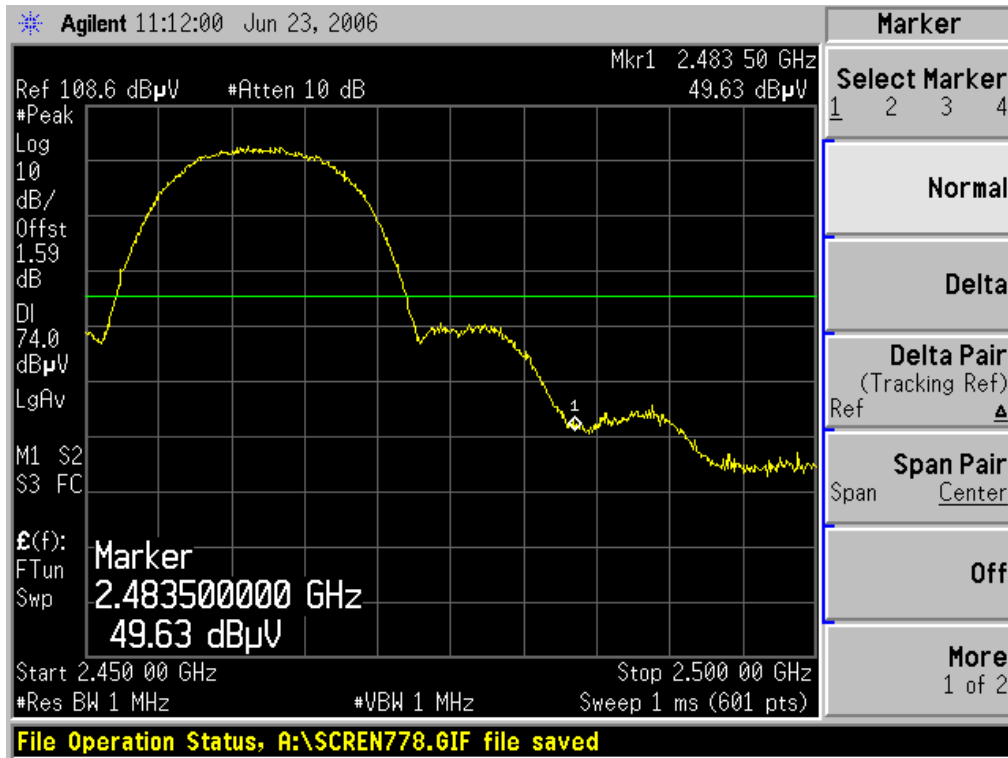
Detector mode: Average

Polarity: Vertical



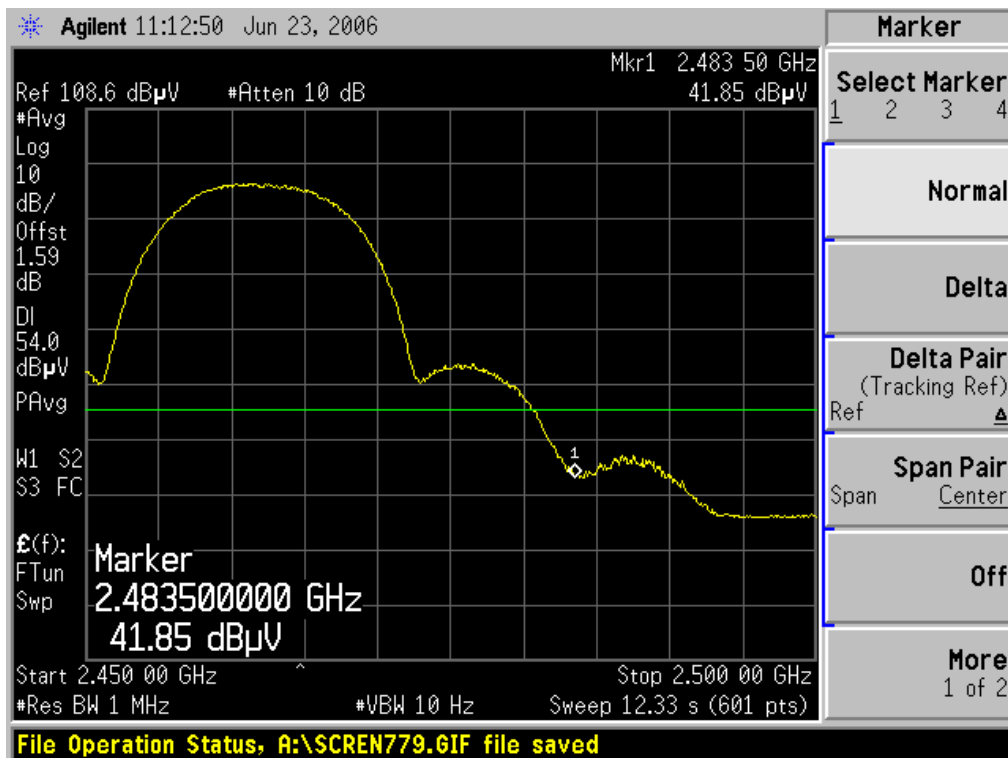
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

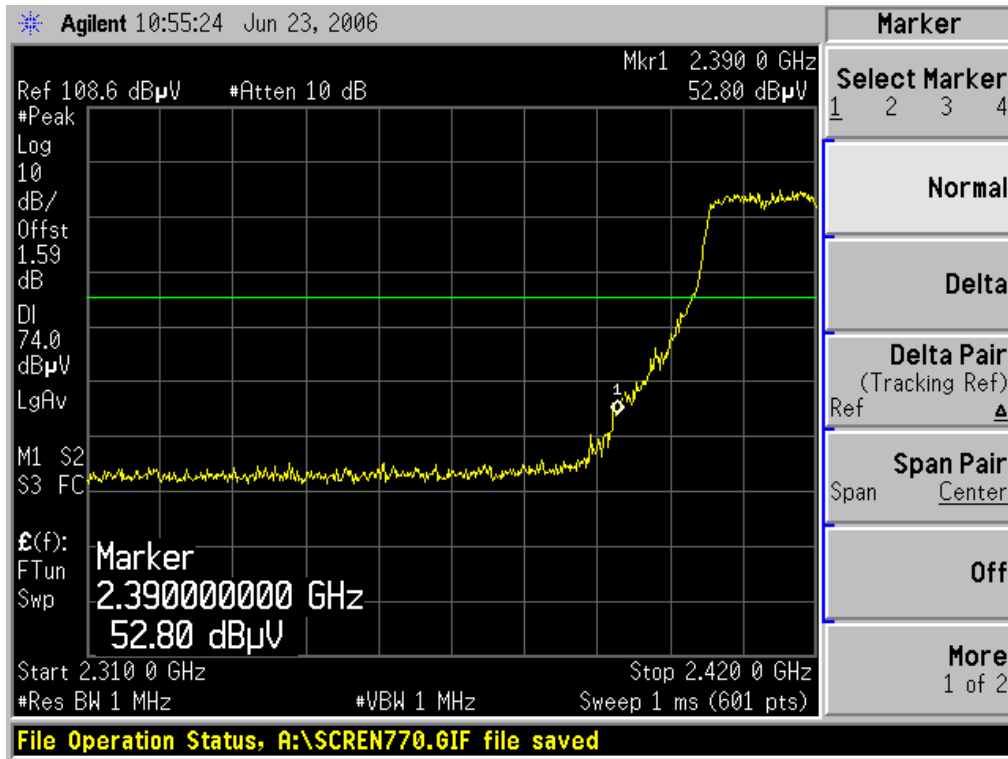




### Band Edges (802.11g / CH Low)

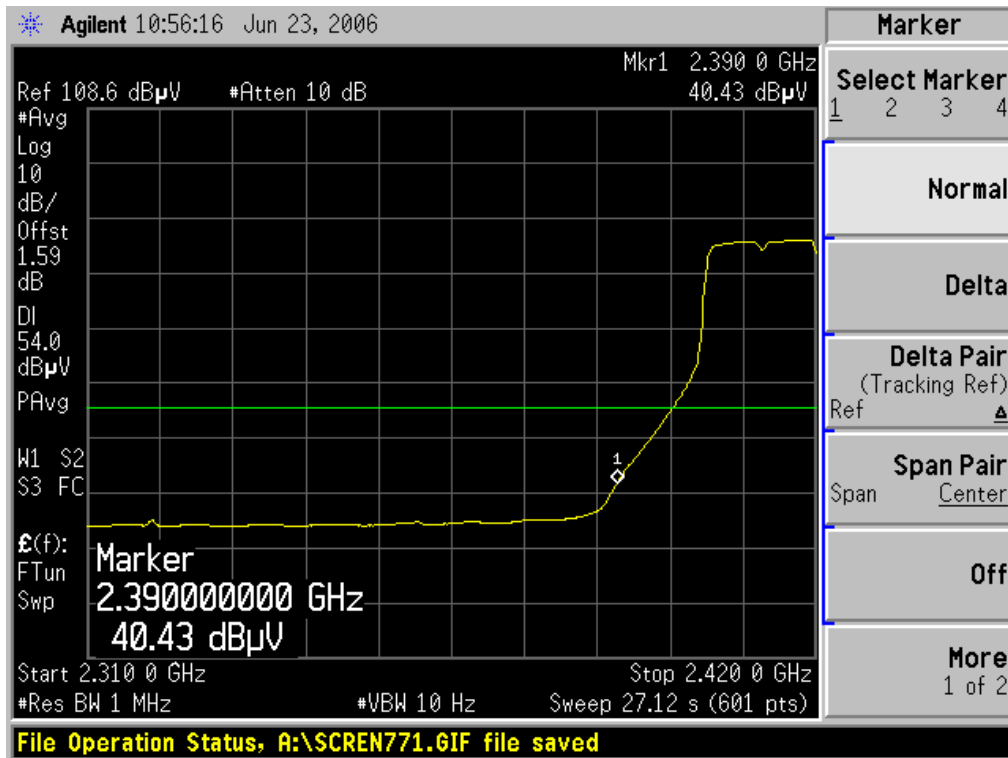
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

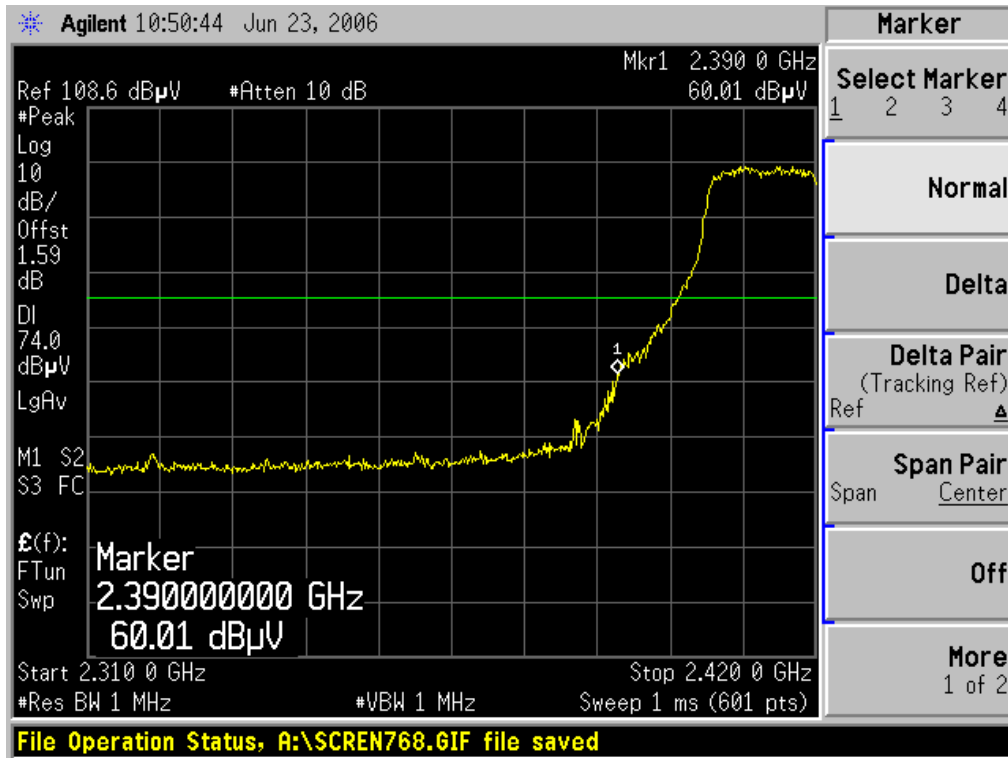
Polarity: Vertical





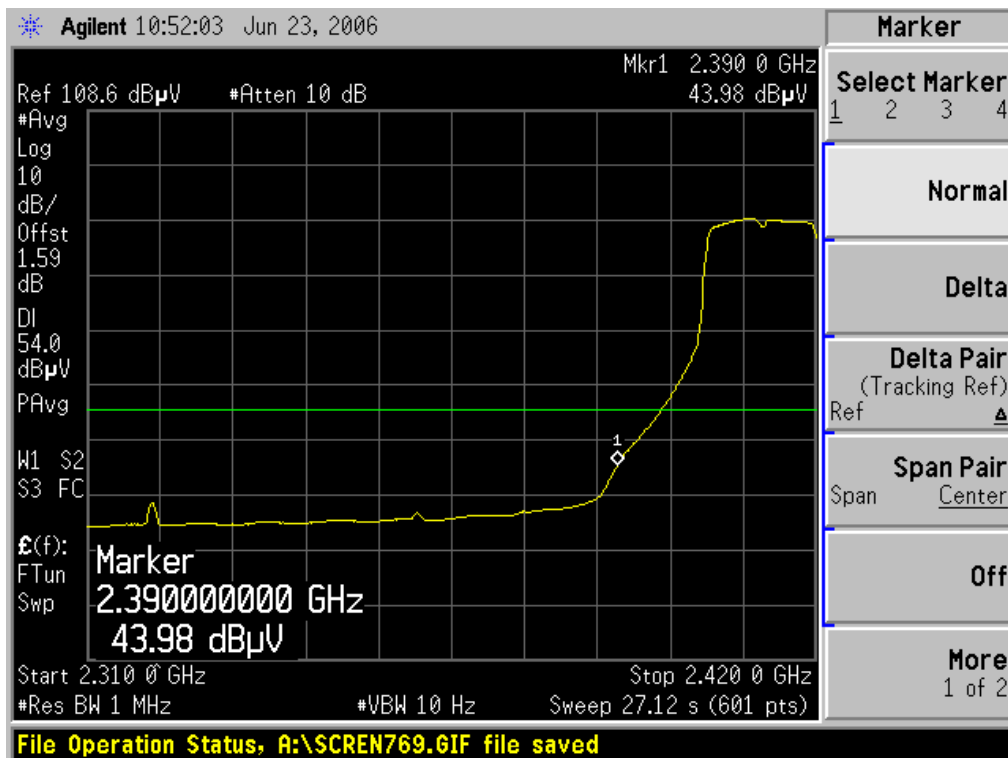
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

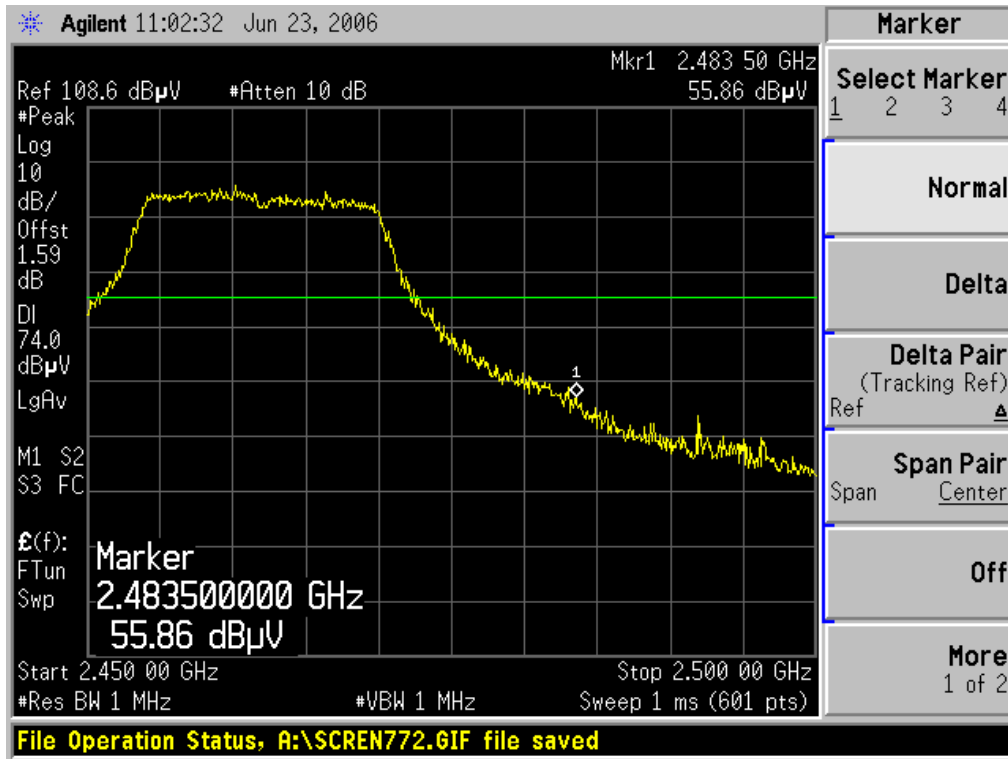




Band Edges (802.11g / CH High)

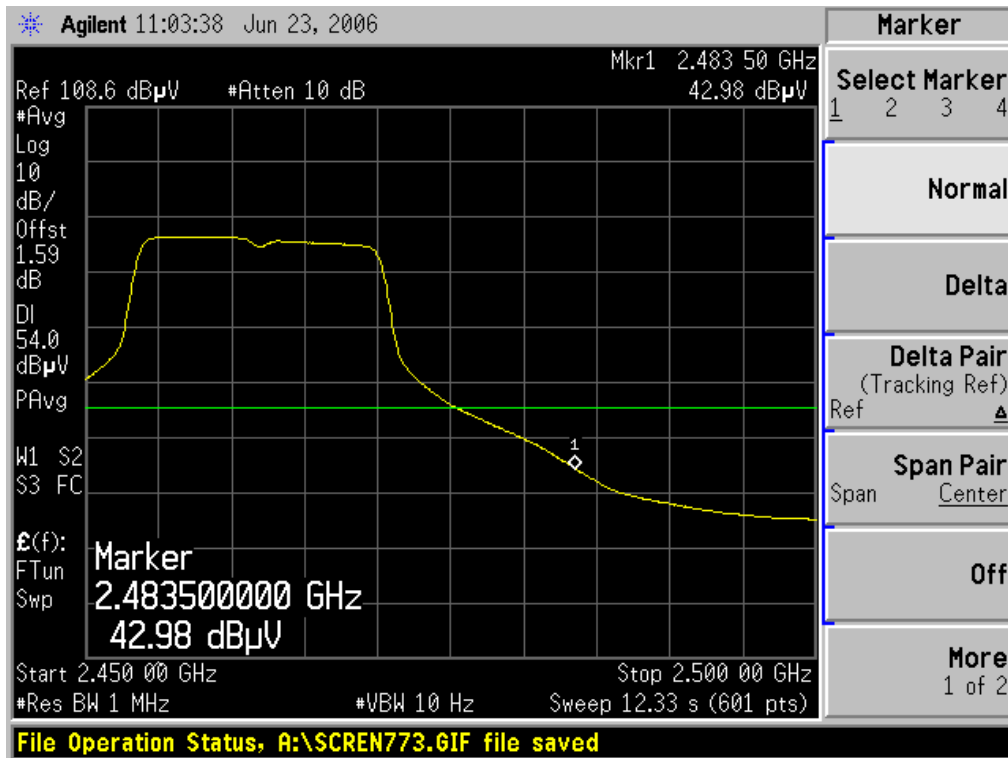
Detector mode: Peak

Polarity: Vertical



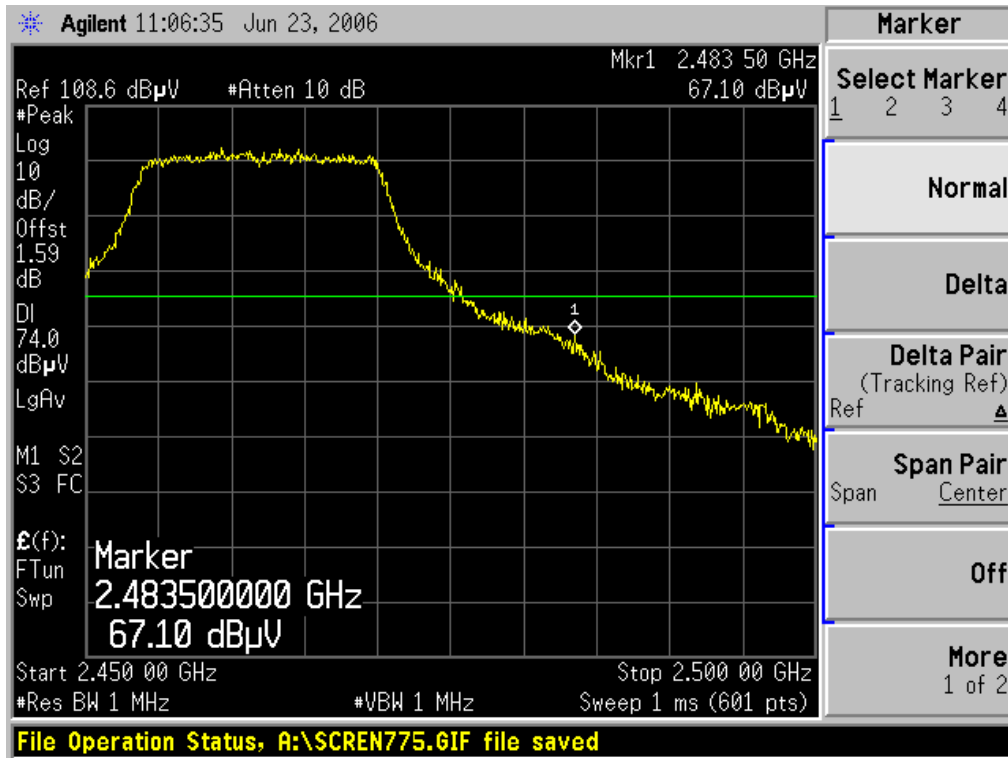
Detector mode: Average

Polarity: Vertical



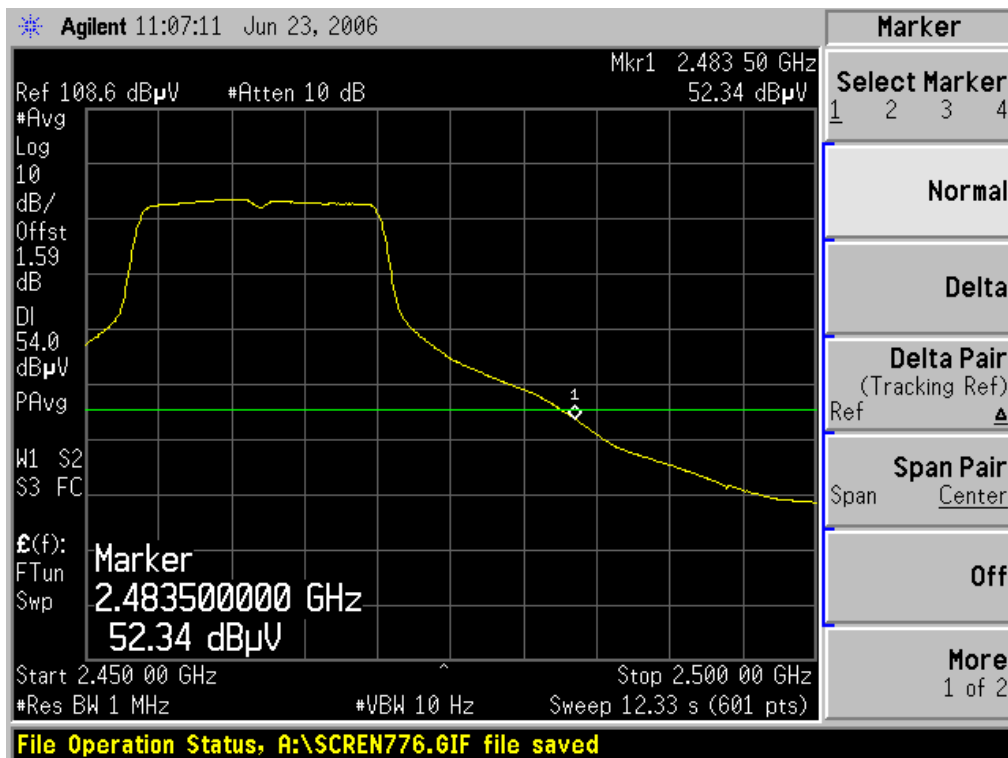
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal







### 7.3 SPURIOUS EMISSIONS

#### 7.3.1 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

*Note: 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 (Hz)	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

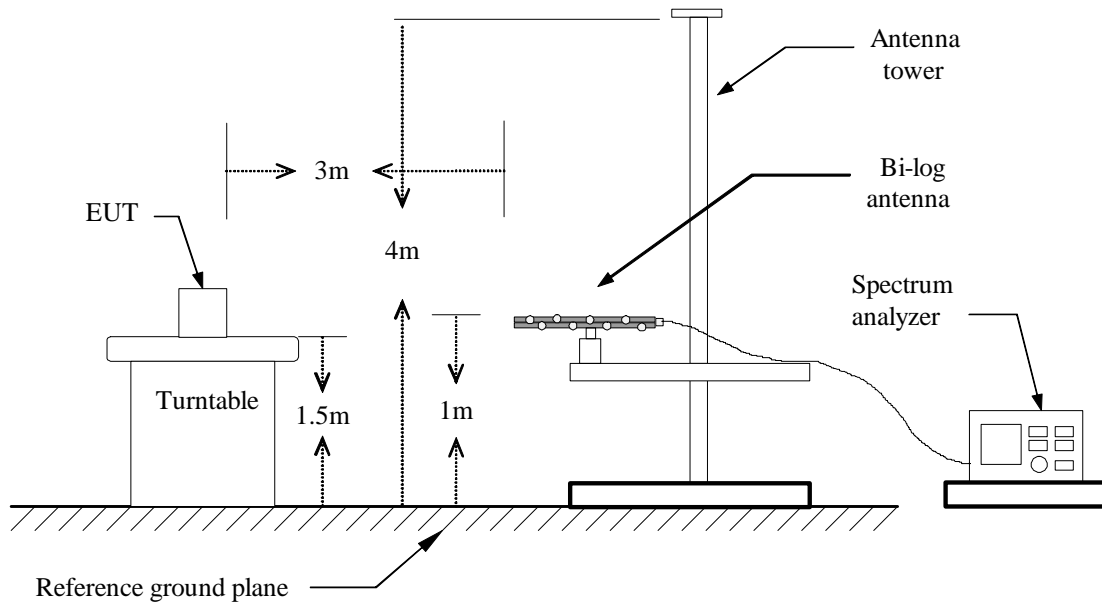
## MEASUREMENT EQUIPMENT USED

966 RF CHAMBER 2				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007
EMI Test Receiver	R&S	ESCI	1166.595K03	01/13/2007
Pre-Amplifier	MITEQ	N/A	AFS42-00102650-42-10P-42	02/14/2007
Bi-log Antenna	SCHWAZBECK	CBL6143	5082	06/09/2007
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	CT	N/A	N/A	N.C.R
Controller	CT	N/A	N/A	N.C.R
RF Comm. Test set	HP	8920B	US36142090	N.C.R
Site NSA	C&C	N/A	N/A	09/06/2007
Horn Antenna	TRC	N/A	N/A	03/04/2007

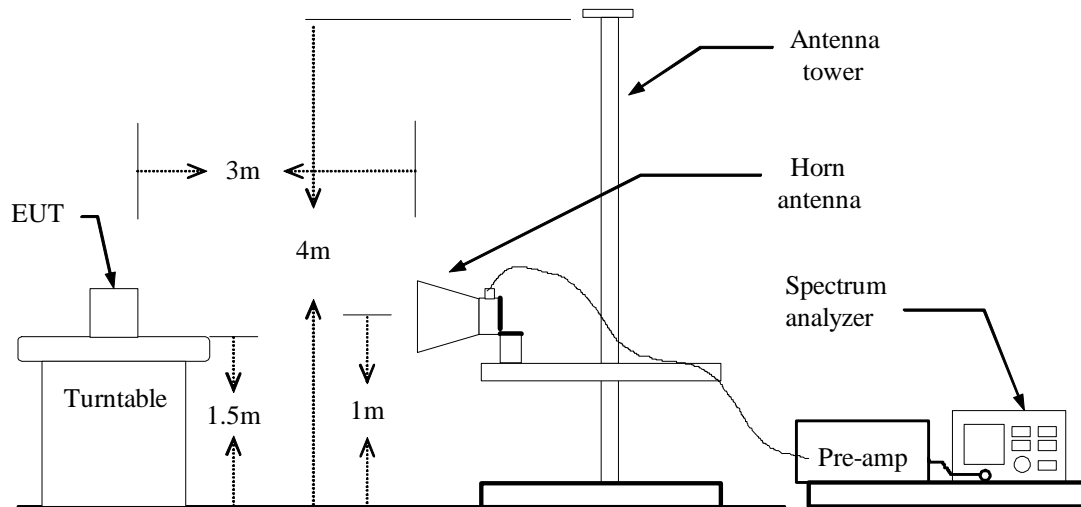
**Remark:** Each piece of equipment is scheduled for calibration once a year.

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

**TEST RESULTS****Below 1 GHz****Operation Mode:** TX / IEEE 802.11b / CH Low**Test Date:** June 27, 2006**Temperature:** 20°C**Tested by:** Henry**Humidity:** 70 % RH**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
124.950	V	Peak	45.29	-7.34	37.95	43.50	-5.55
176.250	V	Peak	52.20	-11.02	41.18	43.50	-2.32
232.950	V	Peak	54.87	-14.05	40.82	46.00	-5.18
444.666	V	Peak	43.69	-2.68	41.01	46.00	-4.99
479.666	V	Peak	41.40	1.17	42.57	46.00	-3.43
616.166	V	Peak	39.49	0.25	39.74	46.00	-6.26
78.600	H	Peak	43.83	-7.83	36.00	40.00	-4.00
177.150	H	Peak	49.48	-10.53	38.95	43.50	-4.55
266.250	H	Peak	51.24	-8.95	42.29	46.00	-3.71
456.333	H	Peak	40.26	1.08	41.34	46.00	-4.66
500.666	H	Peak	39.62	0.57	40.19	46.00	-5.81
798.166	H	Peak	40.39	-4.19	36.20	46.00	-9.80

**Notes:**

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Operation Mode: TX / IEEE 802.11b / CH Mid

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit 3m (dBUV/m)	Safe Margin (dB)
212.250	V	Peak	52.58	-12.27	40.31	43.50	-3.19
232.950	V	Peak	54.87	-14.05	40.82	46.00	-5.18
251.850	V	Peak	45.59	-6.83	38.76	46.00	-7.24
444.666	V	Peak	43.69	-2.68	41.01	46.00	-4.99
479.666	V	Peak	41.40	1.17	42.57	46.00	-3.43
616.166	V	Peak	39.49	0.25	39.74	46.00	-6.26
67.800	H	Peak	38.51	-1.96	36.55	40.00	-3.45
156.000	H	Peak	48.34	-9.72	38.62	43.50	-4.88
278.850	H	Peak	48.49	-7.81	40.68	46.00	-5.32
431.833	H	Peak	43.78	-7.14	36.64	46.00	-9.36
598.666	H	Peak	45.21	-9.19	36.02	46.00	-9.98
665.166	H	Peak	44.46	-7.91	36.55	46.00	-9.45

Notes:

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Operation Mode: TX / IEEE 802.11b / CH High

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit 3m (dBUV/m)	Safe Margin (dB)
212.250	V	Peak	52.58	-12.27	40.31	43.50	-3.19
232.950	V	Peak	54.87	-14.05	40.82	46.00	-5.18
251.850	V	Peak	45.59	-6.83	38.76	46.00	-7.24
433.000	V	Peak	45.98	-3.85	42.13	46.00	-3.87
499.500	V	Peak	42.76	0.19	42.95	46.00	-3.05
583.500	V	Peak	41.33	2.10	43.43	46.00	-2.57
62.400	H	Peak	38.48	-2.03	36.45	40.00	-3.55
169.950	H	Peak	48.90	-9.14	39.76	43.50	-3.74
251.850	H	Peak	49.93	-6.33	43.60	46.00	-2.40
431.833	H	Peak	43.78	-7.14	36.64	46.00	-9.36
598.666	H	Peak	45.21	-9.19	36.02	46.00	-9.98
665.166	H	Peak	44.46	-7.91	36.55	46.00	-9.45

Notes:

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Operation Mode: TX / IEEE 802.11g / CH Low

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
213.150	V	Peak	51.36	-12.59	38.77	43.50	-4.73
252.300	V	Peak	43.75	-6.91	36.84	46.00	-9.16
299.550	V	Peak	52.43	-14.15	38.28	46.00	-7.72
443.500	V	Peak	44.34	-2.80	41.54	46.00	-4.46
500.666	V	Peak	42.00	0.17	42.17	46.00	-3.83
529.833	V	Peak	40.94	1.39	42.33	46.00	-3.67
65.100	H	Peak	36.25	-0.20	36.05	40.00	-3.95
162.750	H	Peak	47.87	-7.61	40.26	43.50	-3.24
279.750	H	Peak	50.69	-7.11	43.58	46.00	-2.42
339.666	H	Peak	48.23	-6.66	41.57	46.00	-4.43
392.166	H	Peak	48.75	-7.71	41.04	46.00	-4.96
730.500	H	Peak	40.50	-4.52	35.98	46.00	-10.02

Notes:

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Operation Mode: TX / IEEE 802.11g / CH Mid

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
213.150	V	Peak	51.36	-12.59	38.77	43.50	-4.73
252.300	V	Peak	43.75	-6.91	36.84	46.00	-9.16
299.550	V	Peak	52.43	-14.15	38.28	46.00	-7.72
486.666	V	Peak	39.57	2.53	42.10	46.00	-3.90
529.833	V	Peak	40.94	1.39	42.33	46.00	-3.67
566.000	V	Peak	40.17	1.07	41.24	46.00	-4.76
66.900	H	Peak	37.65	-1.37	36.28	40.00	-3.72
189.750	H	Peak	48.05	-8.87	39.18	43.50	-4.32
259.500	H	Peak	51.27	-7.71	43.56	46.00	-2.44
339.666	H	Peak	48.23	-6.66	41.57	46.00	-4.43
392.166	H	Peak	48.75	-7.71	41.04	46.00	-4.96
730.500	H	Peak	40.50	-4.52	35.98	46.00	-10.02

Notes:

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.





Operation Mode: TX / IEEE 802.11g / CH High

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit 3m (dBUV/m)	Safe Margin (dB)
85.800	V	Peak	45.74	-7.82	37.92	40.00	-2.08
186.150	V	Peak	47.14	-8.79	38.35	43.50	-5.15
246.000	V	Peak	44.46	-7.85	36.61	46.00	-9.39
486.666	V	Peak	39.57	2.53	42.10	46.00	-3.90
529.833	V	Peak	40.94	1.39	42.33	46.00	-3.67
566.000	V	Peak	40.17	1.07	41.24	46.00	-4.76
66.900	H	Peak	37.65	-1.37	36.28	40.00	-3.72
189.750	H	Peak	48.05	-8.87	39.18	43.50	-4.32
259.500	H	Peak	51.27	-7.71	43.56	46.00	-2.44
433.000	H	Peak	47.04	-7.07	39.97	46.00	-6.03
500.666	H	Peak	39.31	0.57	39.88	46.00	-6.12
799.333	H	Peak	40.76	-4.13	36.63	46.00	-9.37

Notes:

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Operation Mode:** TX / IEEE 802.11g / Turbo**Test Date:** June 30, 2006**Temperature:** 20°C**Tested by:** Henry**Humidity:** 70 % RH**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
219.000	V	Peak	58.81	-15.52	43.29	46.00	-2.71
266.250	V	Peak	50.96	-13.45	37.51	46.00	-8.49
364.166	V	Peak	53.96	-12.50	41.46	46.00	-4.54
420.166	V	Peak	43.86	-2.64	41.22	46.00	-4.78
515.833	V	Peak	40.99	1.39	42.38	46.00	-3.62
549.666	V	Peak	39.29	1.40	40.69	46.00	-5.31
269.400	H	Peak	51.70	-9.24	42.46	46.00	-3.54
289.650	H	Peak	52.01	-8.92	43.09	46.00	-2.91
405.000	H	Peak	50.68	-8.09	42.59	46.00	-3.41
443.500	H	Peak	46.88	-5.91	40.97	46.00	-5.03
499.500	H	Peak	40.71	0.70	41.41	46.00	-4.59
695.500	H	Peak	46.49	-5.08	41.41	46.00	-4.59

**Notes:**

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. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



**Above 1 GHz**

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

**Test Date:** June 27, 2006

**Temperature:** 23°C

**Tested by:** Henry

**Humidity:** 56 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1200.00	V	47.58	---	-2.10	45.48	---	74.00	54.00	-8.52	Peak
1596.66	V	45.16	---	-0.91	44.25	---	74.00	54.00	-9.75	Peak
4983.33	V	43.24	---	7.77	51.01	---	74.00	54.00	-2.99	Peak
N/A										
1713.33	H	50.18	---	-0.78	49.40	---	74.00	54.00	-4.60	Peak
1730.00	H	51.67	---	-0.76	50.91	---	74.00	54.00	-3.09	Peak
4925.00	H	41.36	---	7.18	48.54	---	74.00	54.00	-5.46	Peak
N/A										

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.



Operation Mode: TX / IEEE 802.11b / CH Mid

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1200.00	V	47.62	---	-2.10	45.52	---	74.00	54.00	-8.48	Peak
1396.66	V	47.61	---	-2.54	45.07	---	74.00	54.00	-8.93	Peak
4983.33	V	43.24	---	7.77	51.01	---	74.00	54.00	-2.99	Peak
N/A										
1396.66	H	45.65	---	-2.54	43.11	---	74.00	54.00	-10.89	Peak
1600.00	H	44.08	---	-0.88	43.20	---	74.00	54.00	-10.80	Peak
4975.00	H	41.70	---	7.69	49.39	---	74.00	54.00	-4.61	Peak
N/A										

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.



Operation Mode: TX / IEEE 802.11b / CH High

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1200.00	V	47.55	---	-2.10	45.45	---	74.00	54.00	-8.55	Peak
1593.33	V	46.08	---	-0.94	45.14	---	74.00	54.00	-8.86	Peak
4983.33	V	43.24	---	7.77	51.01	---	74.00	54.00	-2.99	Peak
N/A										
1400.00	H	44.85	---	-2.55	42.30	---	74.00	54.00	-11.70	Peak
1600.00	H	44.27	---	-0.88	43.39	---	74.00	54.00	-10.61	Peak
5000.00	H	41.37	---	7.94	49.31	---	74.00	54.00	-4.69	Peak
N/A										

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.



Operation Mode: TX / IEEE 802.11g / CH Low

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1200.00	V	47.37	---	-2.10	45.27	---	74.00	54.00	-8.73	Peak
1596.66	V	46.02	---	-0.91	45.11	---	74.00	54.00	-8.89	Peak
4866.66	V	42.94	---	6.59	49.53	---	74.00	54.00	-4.47	Peak
N/A										
1593.33	H	43.47	---	-0.94	42.53	---	74.00	54.00	-11.47	Peak
1793.33	H	43.62	---	-0.71	42.91	---	74.00	54.00	-11.09	Peak
4891.66	H	41.99	---	6.84	48.83	---	74.00	54.00	-5.17	Peak
N/A										

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.



**Operation Mode:** TX / IEEE 802.11g / CH Mid

**Test Date:** June 27, 2006

**Temperature:** 20°C

**Tested by:** Henry

**Humidity:** 70 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1196.66	V	47.87	---	-2.10	45.77	---	74.00	54.00	-8.23	Peak
1596.66	V	47.00	---	-0.91	46.09	---	74.00	54.00	-7.91	Peak
4925.00	V	42.75	---	7.18	49.93	---	74.00	54.00	-4.07	Peak
N/A										
1396.66	H	48.65	---	-2.54	46.11	---	74.00	54.00	-7.89	Peak
1596.66	H	43.66	---	-0.91	42.75	---	74.00	54.00	-11.25	Peak
4941.66	H	41.15	---	7.35	48.50	---	74.00	54.00	-5.50	Peak
N/A										

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.



Operation Mode: TX / IEEE 802.11g / CH High

Test Date: June 27, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1200.00	V	47.39	---	-2.10	45.29	---	74.00	54.00	-8.71	Peak
1600.00	V	46.31	---	-0.88	45.43	---	74.00	54.00	-8.57	Peak
4925.00	V	42.75	---	7.18	49.93	---	74.00	54.00	-4.07	Peak
N/A										
1596.66	H	43.98	---	-0.91	43.07	---	74.00	54.00	-10.93	Peak
1796.66	H	42.59	---	-0.70	41.89	---	74.00	54.00	-12.11	Peak
4983.33	H	41.40	---	7.77	49.17	---	74.00	54.00	-4.83	Peak
N/A										

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.





Operation Mode: TX / IEEE 802.11g / Turbo

Test Date: June 30, 2006

Temperature: 20°C

Tested by: Henry

Humidity: 70 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1863.33	V	37.23	---	-0.38	36.85	---	74.00	54.00	-17.15	Peak
2063.33	V	37.12	---	0.34	37.46	---	74.00	54.00	-16.54	Peak
4966.66	V	36.37	---	7.60	43.97	---	74.00	54.00	-10.03	Peak
N/A										
1686.66	H	37.50	---	-0.80	36.70	---	74.00	54.00	-17.30	Peak
1943.33	H	36.56	---	0.02	36.58	---	74.00	54.00	-17.42	Peak
4941.66	H	36.12	---	7.35	43.47	---	74.00	54.00	-10.53	Peak
N/A										

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
  - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.

# APPENDIX 1

## PHOTOGRPHS OF TEST SETUP

### RADIATED EMISSION TEST

