



**FCC 47 CFR PART 15 SUBPART C  
(Class II Permissive Change)**

**TEST REPORT**

**For**

**802.11b/g Mini PCI Card**

**Model: WLL3090**

**Trade Name: Askey**

*Issued to*

**ASKEY COMPUTER CORP.  
10F, No. 119, CHIENKANG RD.,  
CHUNG-HO, TAIPEI, TAIWAN, R.O.C.**

*Issued by*

**Compliance Certification Services Inc.  
No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,  
Taoyuan Hsien, (338) Taiwan, R.O.C.  
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## TABLE OF CONTENTS

<b>1. TEST RESULT CERTIFICATION.....</b>	<b>3</b>
<b>2. EUT DESCRIPTION .....</b>	<b>4</b>
<b>3. TEST METHODOLOGY .....</b>	<b>5</b>
3.1 EUT CONFIGURATION .....	5
3.2 EUT EXERCISE.....	5
3.3 GENERAL TEST PROCEDURES.....	5
3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS.....	6
3.5 DESCRIPTION OF TEST MODES .....	6
<b>4. INSTRUMENT CALIBRATION.....</b>	<b>7</b>
4.1 MEASURING INSTRUMENT CALIBRATION.....	7
4.2 MEASUREMENT EQUIPMENT USED.....	7
<b>5. FACILITIES AND ACCREDITATIONS .....</b>	<b>8</b>
5.1 FACILITIES .....	8
5.2 EQUIPMENT.....	8
5.3 LABORATORY ACCREDITATIONS AND LISTING.....	8
5.4 TABLE OF ACCREDITATIONS AND LISTINGS.....	9
<b>6. SETUP OF EQUIPMENT UNDER TEST .....</b>	<b>10</b>
6.1 SETUP CONFIGURATION OF EUT.....	10
6.2 SUPPORT EQUIPMENT .....	10
6.3 BAND EDGES MEASUREMENT .....	11
6.4 RADIO FREQUENCY EXPOSURE .....	20
6.5 SPURIOUS EMISSIONS .....	22
<b>APPENDIX 1 PHOTOGRAPHS OF TEST SETUP .....</b>	<b>32</b>



## 1. TEST RESULT CERTIFICATION

**Applicant:** ASKEY COMPUTER CORP.  
10F, No.119, CHIENKANG RD.,  
CHUNG-HO, TAIPEI, TAIWAN, R.O.C.

**Equipment Under Test:** 802.11b/g Mini PCI Card

**Trade Name:** Askey

**Model:** WLL3090

**Date of Test:** July 1 ~ November 14, 2005

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

### We hereby certify that:

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

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

Approved by:

Gavin Lim  
Section Manager  
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	802.11b/g Mini PCI Card			
<b>Trade Name</b>	Askey			
<b>Model Number</b>	WLL3090			
<b>Model Discrepancy</b>	N/A			
<b>Power Supply</b>	Powered from host device			
<b>Frequency Range</b>	2412 ~ 2462 MHz			
<b>Transmit Power</b>	IEEE 802.11b: 22.78 dBm IEEE 802.11g: 22.96 dBm			
<b>Modulation Technique</b>	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)			
<b>Antenna Specification</b>	Old Antenna: Omni Antenna / Gain: 2 dBi PIFA Antenna / Gain: 0.85 dBi New Antenna:			
	<b>No.</b>	<b>Antenna Name</b>	<b>Type</b>	<b>Peak Gain</b>
	1	MITAC-8050 QMA-L	PIFA	0.94 dBi
	2	<b>MITAC-8066</b>	<b>PIFA</b>	<b>3.39 dBi</b>
	3	MITAC-8317	PIFA	2.94 dBi
	4	MITAC-8889C	PIFA	3.39 dBi
	5	MITAC-ARES(421685500009)	PIFA	2.64 dBi
	6	MITAC-COUGAR	PIFA	2.76 dBi
	7	MITAC-DRAGON	PIFA	0.79 dBi
	8	MITAC-HOOK	PIFA	2.04 dBi
	9	MITAC-RHEA A	PIFA	2.94 dBi
	10	MITAC-RHEA C	PIFA	2.94 dBi
	11	MITAC-ZEUS	PIFA	1.86 dBi
	12	MITAC-8366	PIFA	2.29 dBi
<b>Transmit Data Rate</b>	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps			
<b>Number of Channels</b>	11 Channels			
<b>Class II Permissive Change</b>	1. Add twelve Antennas, detail please refers to antenna spec. 2. Disabling Turbo mode function.			

### 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: H8N-WLL3090 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

#### **3.1 EUT CONFIGURATION**

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

#### **3.2 EUT EXERCISE**

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

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

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

##### **Conducted Emissions**

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

##### **Radiated Emissions**

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

### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

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

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

<sup>2</sup> Above 38.6

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

### 3.5 DESCRIPTION OF TEST MODES

There are 12 sources of antennas listed on this report. After verified, the worst data in the test report is antenna Name: MITAC-8066.

The EUT (model: WLL3090) with 3.39 dBi PIFA antenna (antenna Name: MITAC-8066) 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.

IEEE802.11b: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 11Mbps data rate were chosen for full testing.

IEEE802.11g: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

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

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

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

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/10/2006

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	07/25/2006
Test Receiver	Rohde&Schwarz	ESCI	100064	06/28/2006
Switch Controller	TRC	Switch Controller	SC94050010	05/05/2006
4 Port Switch	TRC	4 Port Switch	SC94050020	05/05/2006
Horn-Antenna	TRC	HA-0502	06	06/02/2006
Horn-Antenna	TRC	HA-0801	04	05/05/2006
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/09/2006
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R
Site NSA	CCS	N/A	FCC: 965860 IC: IC 6106	09/26/2008
Test S/W	LABVIEW (V 6.1)			

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

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER 9kHz-30MHz	ROHDE & SCHWARZ	ESHS30	828144/003	09/24/2006
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/11/2006
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	02/17/2006
Test S/W	LABVIEW (V 6.1)			

**Remark:** The measurement uncertainty is less than  $\pm 2.81\text{dB}$ , 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.







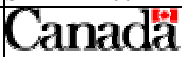
All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### **5.3 LABORATORY ACCREDITATIONS AND LISTING**

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



## 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	 200600-0
USA	FCC	3/10 meter Open Area Test Sites (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements	 93105, 90471 965860
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	CNLA	EN 300 328-1/2, EN 300 220-1/2/3, EN 300 440-1/2, EN 61000-3-2, EN 61000-3-3, 47 CFR FCC Part 15 Subpart C/D/E, EN 55013, CNS 13439, EN 55014-1, CNS 13783-1, EN 55022, CNS 13438, CISPR 22, AS/NZS 3548, EN 61000-4-2/3/4/5/6/8/11, ENV 50204, IEEE Std 1528, FCC OET Bulletin, 65+Supplement C, EN50360, EN50361, EN50371, RSS102	 0 3 6 3 ILAC MRA
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	3/10 meter Open Area Test Sites (IC 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1	 IC 3991-3 IC 3991-4 IC 6106

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

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



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

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

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	Sony	VGN-S44TP	28198080 8100339	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Intelligent Wireless Broadband Router (Remote)	PLANEX	BLW-04SAG	40DDA0421	N/A	N/A	N/A

**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.

## 6.3 BAND EDGES MEASUREMENT

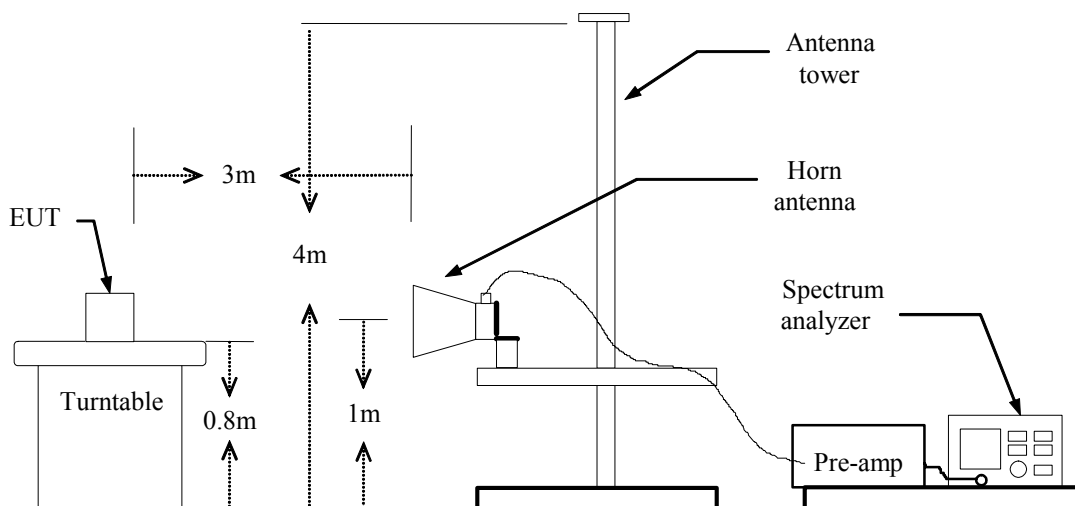
### LIMIT

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)).

### 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.

### 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.

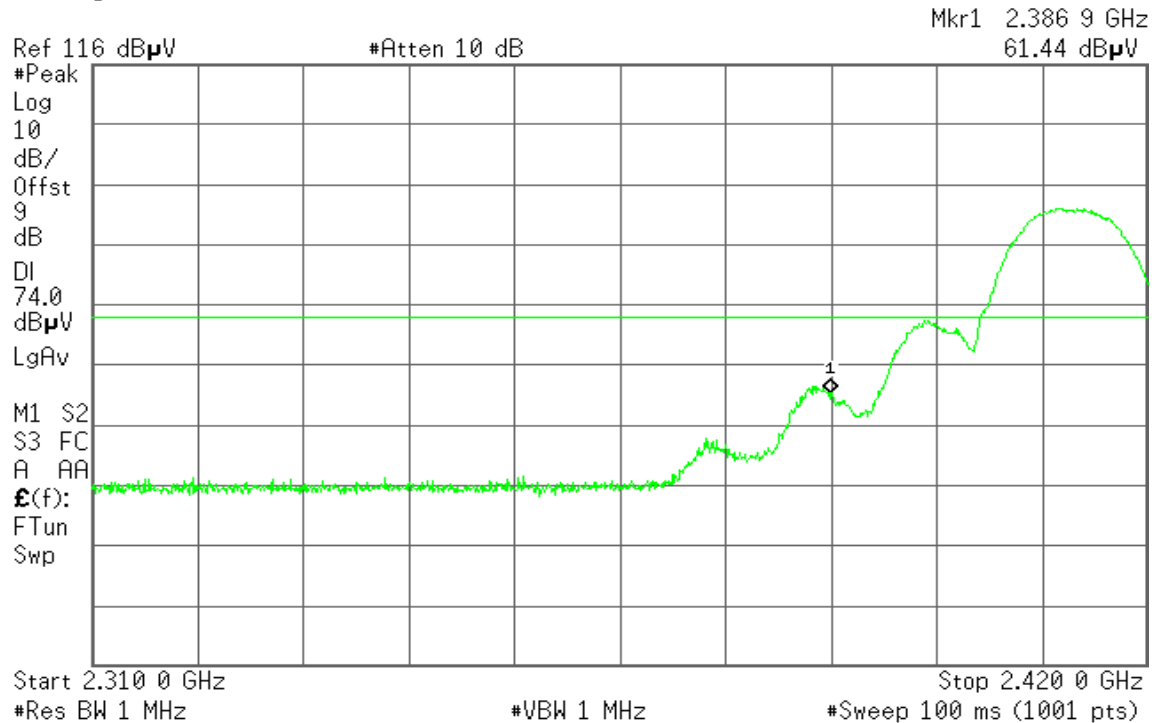
### TEST RESULTS

Refer to attach spectrum analyzer data chart.

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

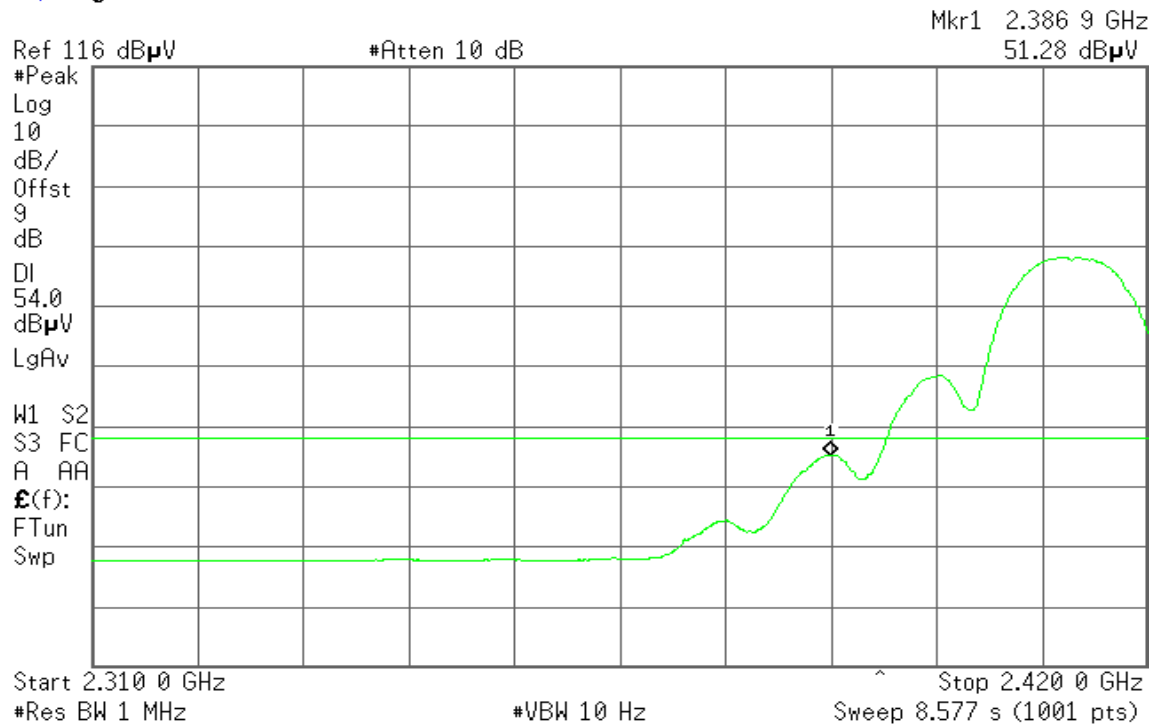
\* Agilent 14:51:17 Nov 7, 2005

T

**Detector mode: Average****Polarity: Vertical**

\* Agilent 14:50:57 Nov 7, 2005

T



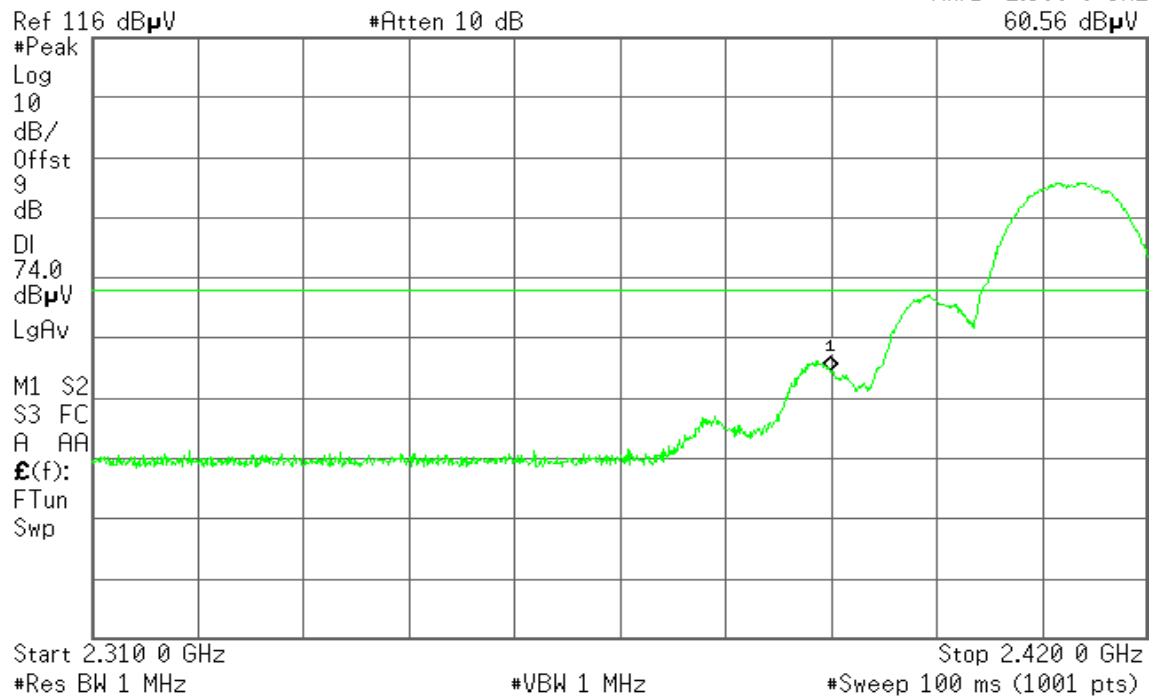


**Detector mode: Peak**

**Polarity: Horizontal**

Agilent 14:47:28 Nov 7, 2005

T

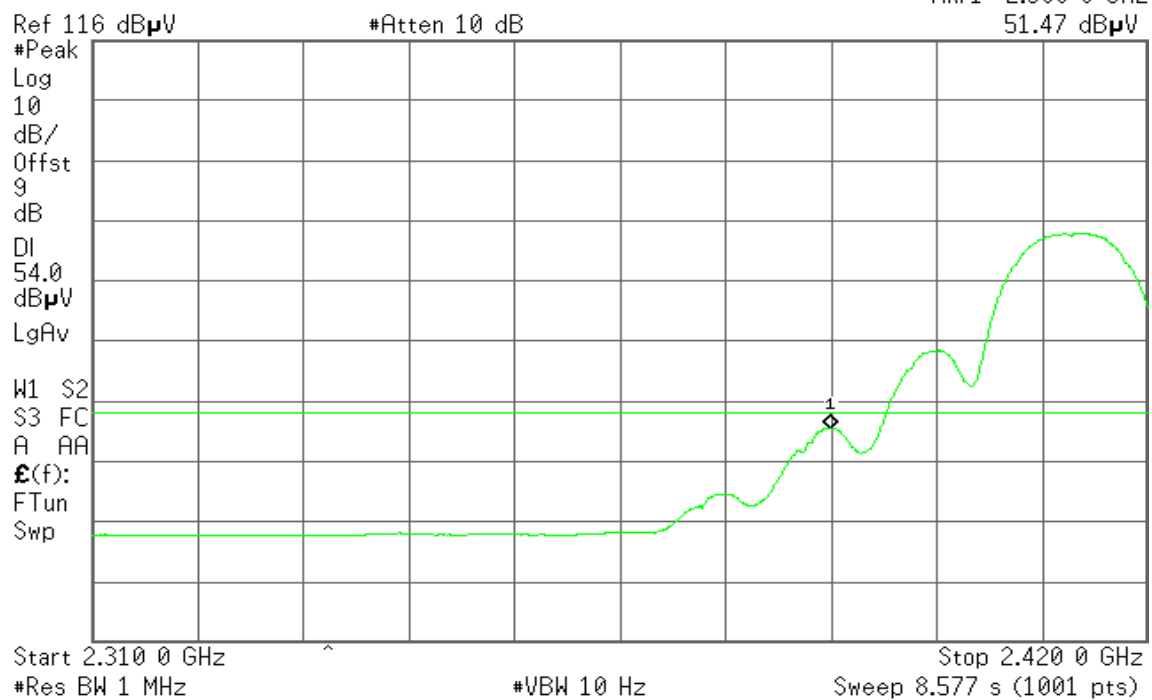


**Detector mode: Average**

**Polarity: Horizontal**

Agilent 14:47:06 Nov 7, 2005

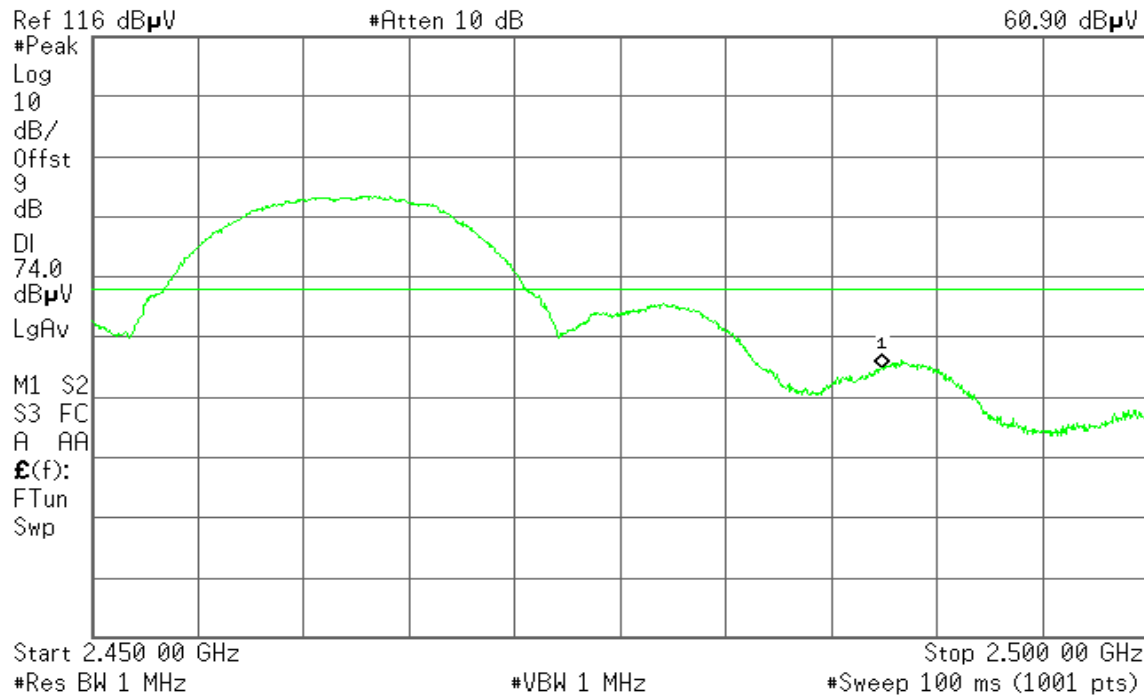
R T



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

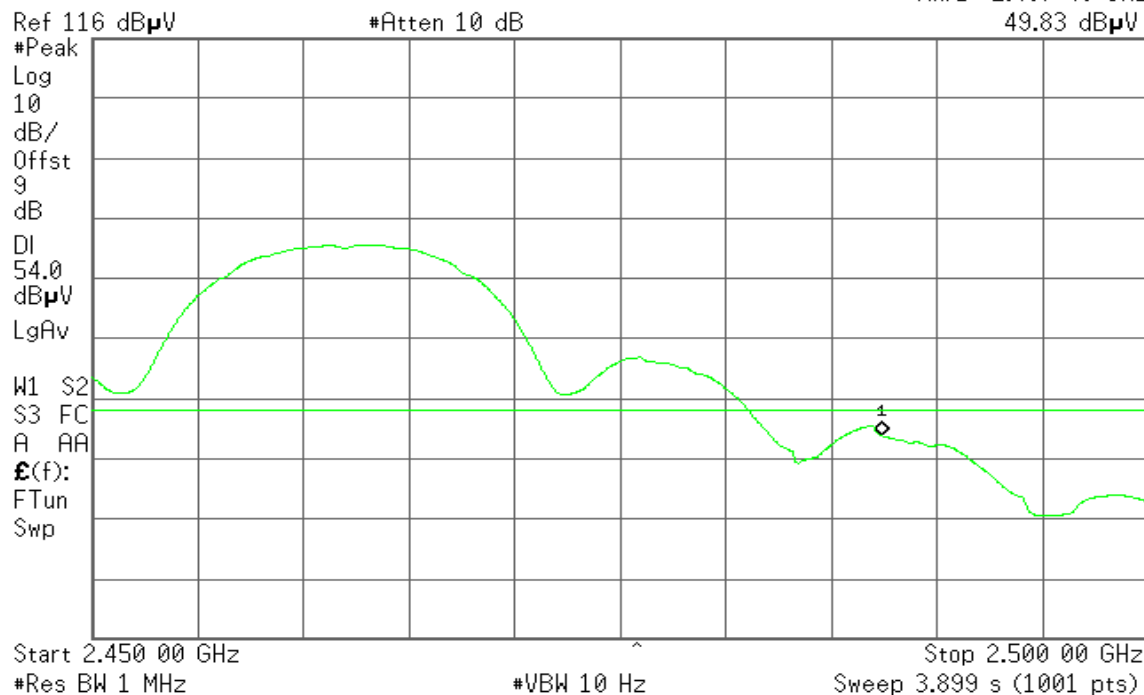
\* Agilent 14:55:36 Nov 7, 2005

T

Mkr1 2.487 40 GHz  
60.90 dB $\mu$ V**Detector mode: Average****Polarity: Vertical**

\* Agilent 14:55:20 Nov 7, 2005

T

Mkr1 2.487 40 GHz  
49.83 dB $\mu$ V



## Detector mode: Peak

## Polarity: Horizontal

\* Agilent 14:59:21 Nov 7, 2005

T

Mkr1 2.487 40 GHz  
62.65 dB $\mu$ VRef 116 dB $\mu$ V

#Atten 10 dB

#Peak

Log

10

dB/

Offst

9

dB

DI

74.0

dB $\mu$ V

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (1001 pts)

## Detector mode: Average

## Polarity: Horizontal

\* Agilent 14:58:53 Nov 7, 2005

R T

Mkr1 2.487 40 GHz  
51.52 dB $\mu$ VRef 116 dB $\mu$ V

#Atten 10 dB

#Peak

Log

10

dB/

Offst

9

dB

DI

54.0

dB $\mu$ V

LgAv

W1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.450 00 GHz ^

#Res BW 1 MHz

#VBW 10 Hz

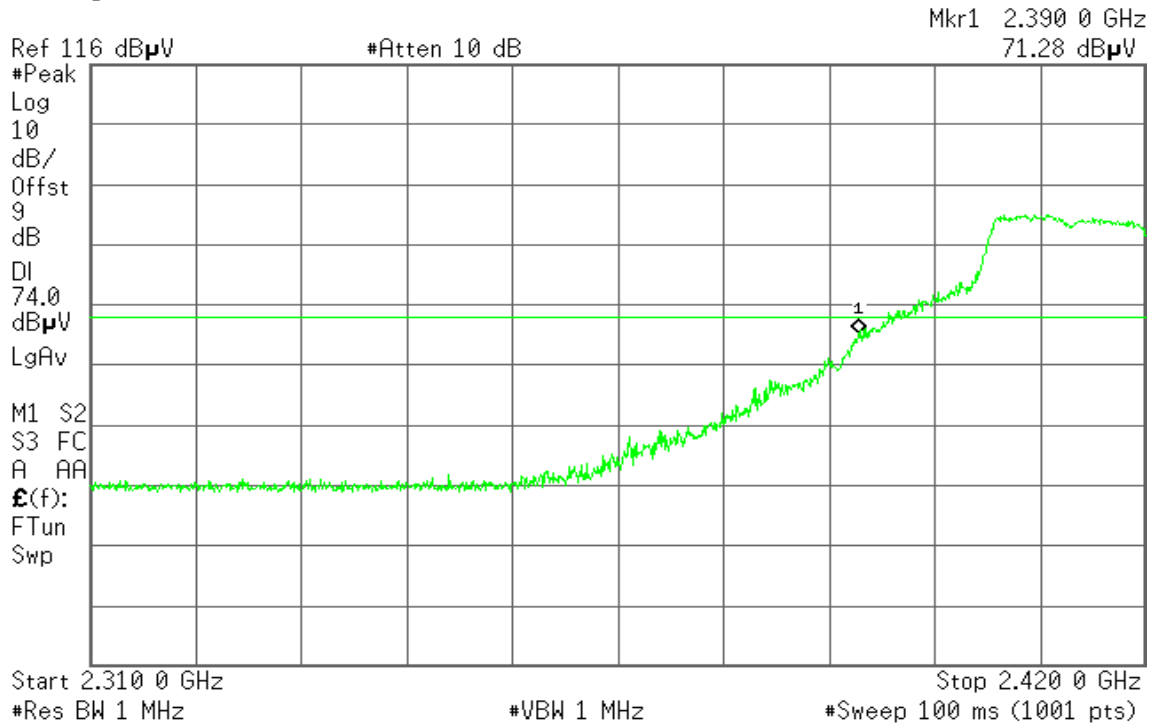
Stop 2.500 00 GHz

Sweep 3.899 s (1001 pts)

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

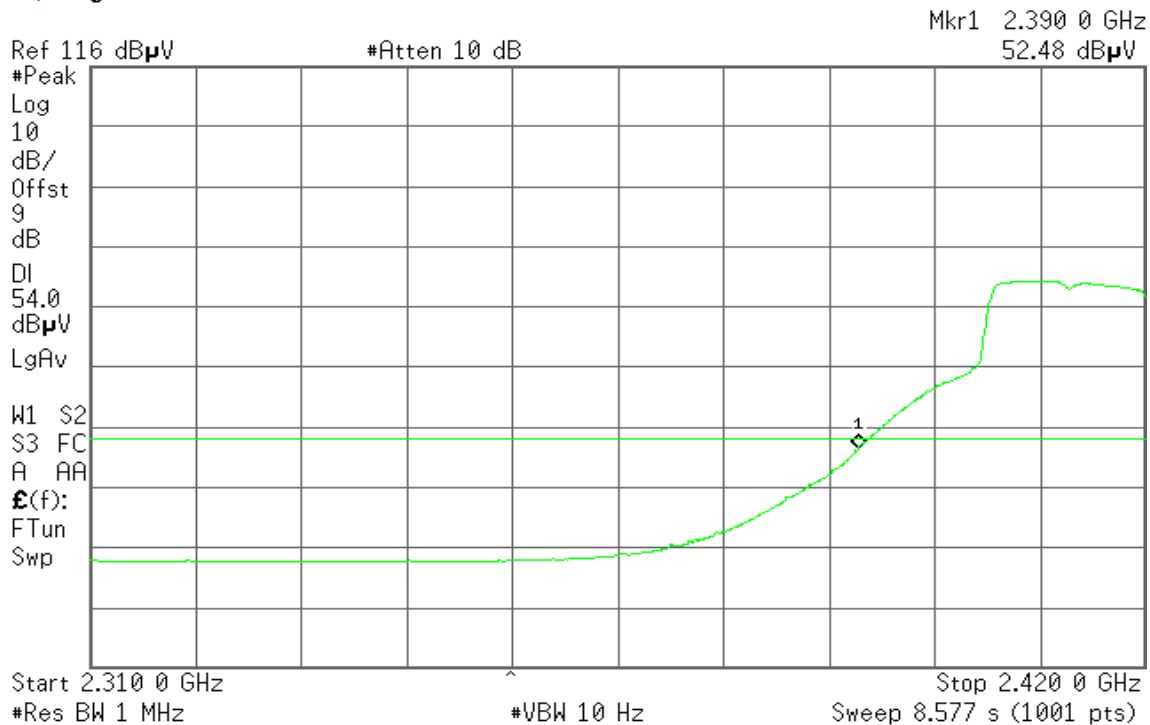
\* Agilent 15:18:35 Nov 7, 2005

T

**Detector mode: Average****Polarity: Vertical**

\* Agilent 15:17:58 Nov 7, 2005

T





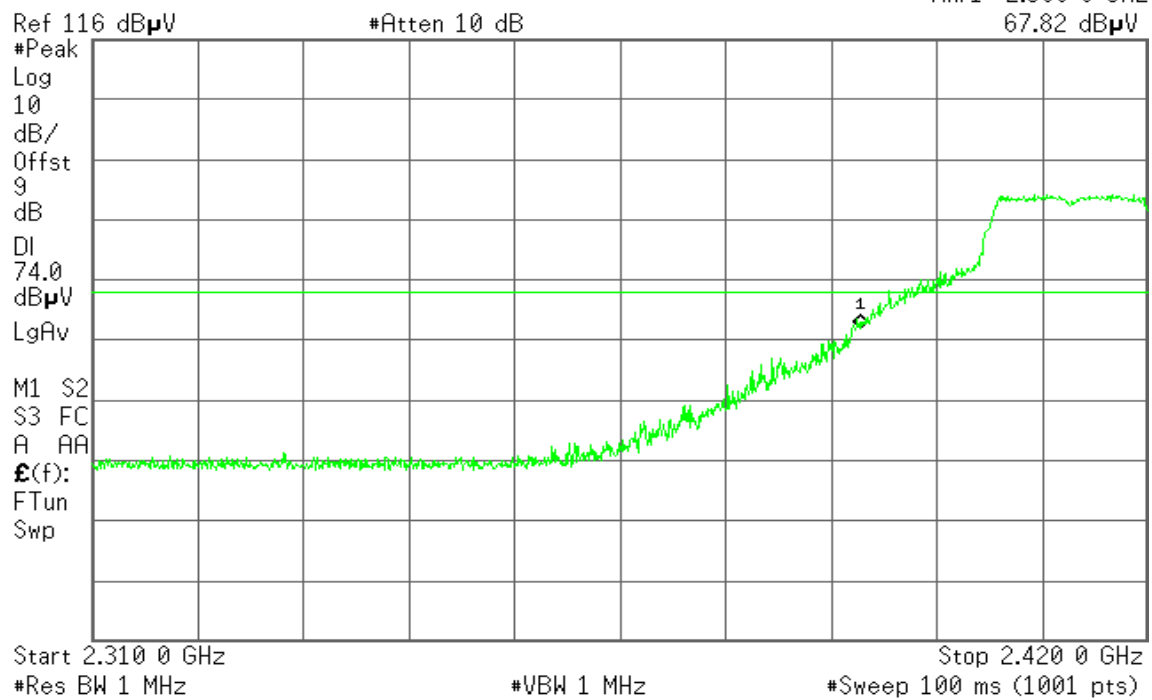


Detector mode: Peak

Polarity: Horizontal

\* Agilent 15:11:34 Nov 7, 2005

T

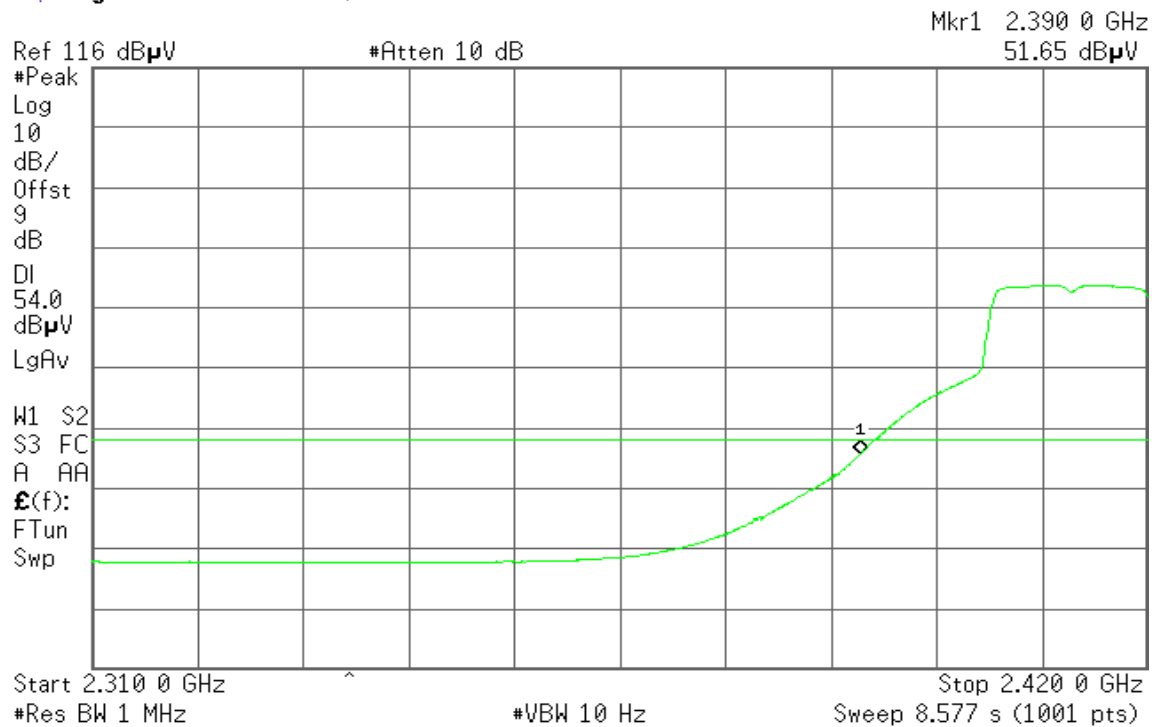


Detector mode: Average

Polarity: Horizontal

\* Agilent 15:11:19 Nov 7, 2005

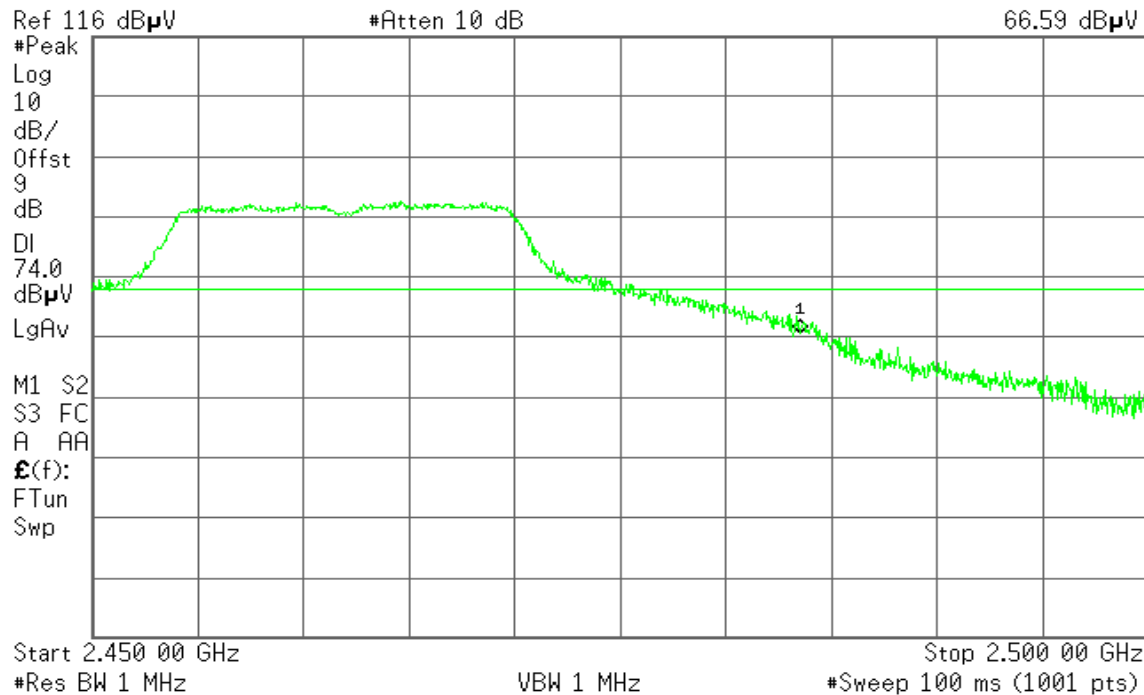
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**Band Edges (IEEE 802.11g mode / CH High)****Detector mode: Peak****Polarity: Vertical**

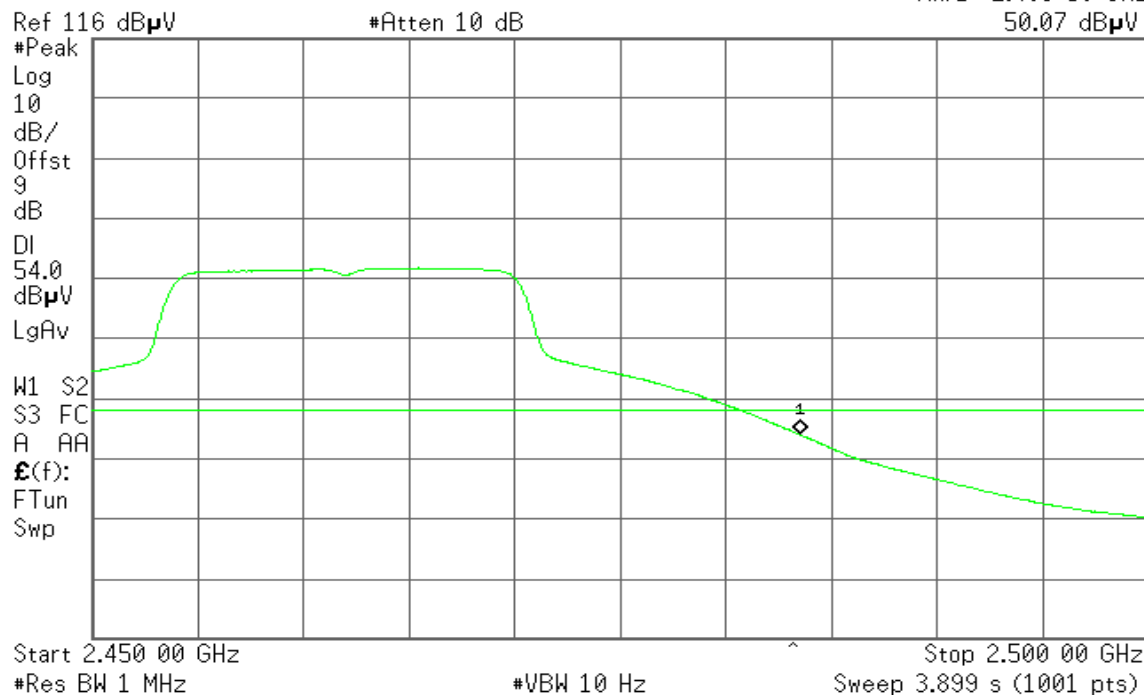
\* Agilent 15:06:02 Nov 7, 2005

R T

Mkr1 2.483 50 GHz  
66.59 dB $\mu$ V**Detector mode: Average****Polarity: Vertical**

\* Agilent 15:05:43 Nov 7, 2005

T

Mkr1 2.483 50 GHz  
50.07 dB $\mu$ V



## Detector mode: Peak

## Polarity: Horizontal

\* Agilent 15:03:16 Nov 7, 2005

T

Mkr1 2.483 50 GHz  
68.34 dB $\mu$ VRef 116 dB $\mu$ V

#Atten 10 dB

#Peak

Log

10

dB/

Offst

9

dB

DI

74.0

dB $\mu$ V

LgAv

M1 S2

S3 FC

A AA

£(f):

FTun

Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (1001 pts)

## Detector mode: Average

## Polarity: Horizontal

\* Agilent 15:03:00 Nov 7, 2005

T

Mkr1 2.483 50 GHz  
51.04 dB $\mu$ VRef 116 dB $\mu$ V

#Atten 10 dB

#Peak

Log

10

dB/

Offst

9

dB

DI

54.0

dB $\mu$ V

LgAv

W1 S2

S3 FC

A AA

£(f):

FTun

Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 3.899 s (1001 pts)



## 6.4 RADIO FREQUENCY EXPOSURE

### LIMIT

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 §15.247(i) and §1.1307(b)(1) of this chapter.

### EUT Specification

<b>EUT</b>	802.11b/g Mini PCI Card
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure ( $S = 5\text{mW/cm}^2$ ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S = 1\text{mW/cm}^2$ )
<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: 22.78 dBm (189.67mW) IEEE 802.11g: 22.96 dBm (197.70mW)
<b>Antenna gain (Max)</b>	3.39 dBi (Numeric gain: 2.18)
<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 22.96dBm (197.70mW) (with 2.18 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  $1.0\text{ mW/cm}^2$  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:

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

Changing to units of mW and cm, using:

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

$$d \text{ (cm)} = d \text{ (m)} / 100$$

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 = 197.70mW

Numeric Antenna gain = 2.18

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>

$$\rightarrow \text{Power density} = 0.0858 \text{ mW} / \text{cm}^2$$

(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.)



## 6.5 SPURIOUS EMISSIONS

### 6.5.1 Radiated Emissions

#### LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

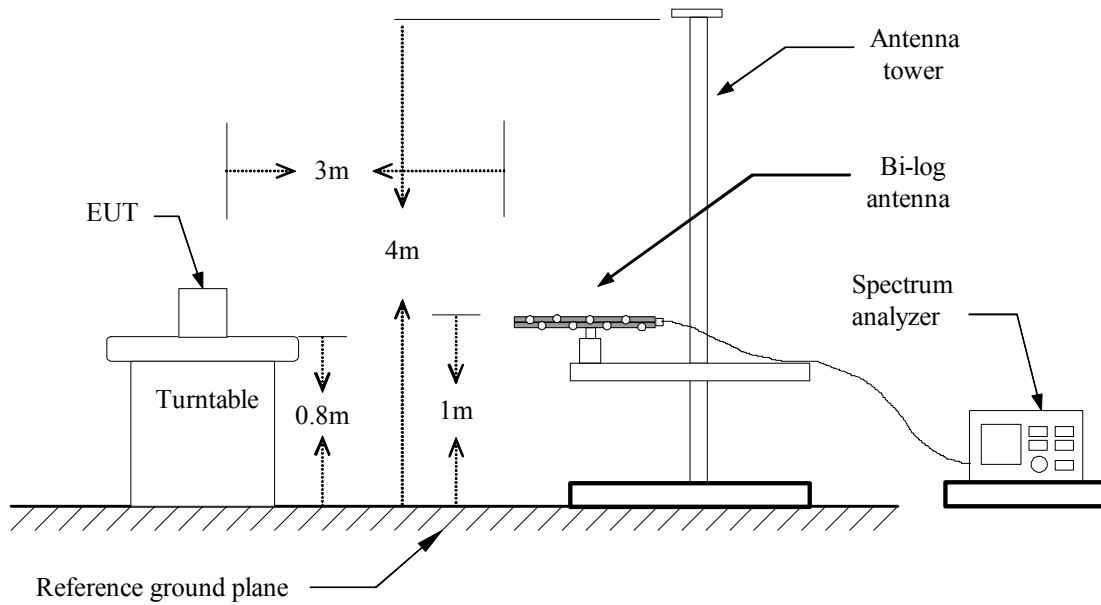
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections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

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

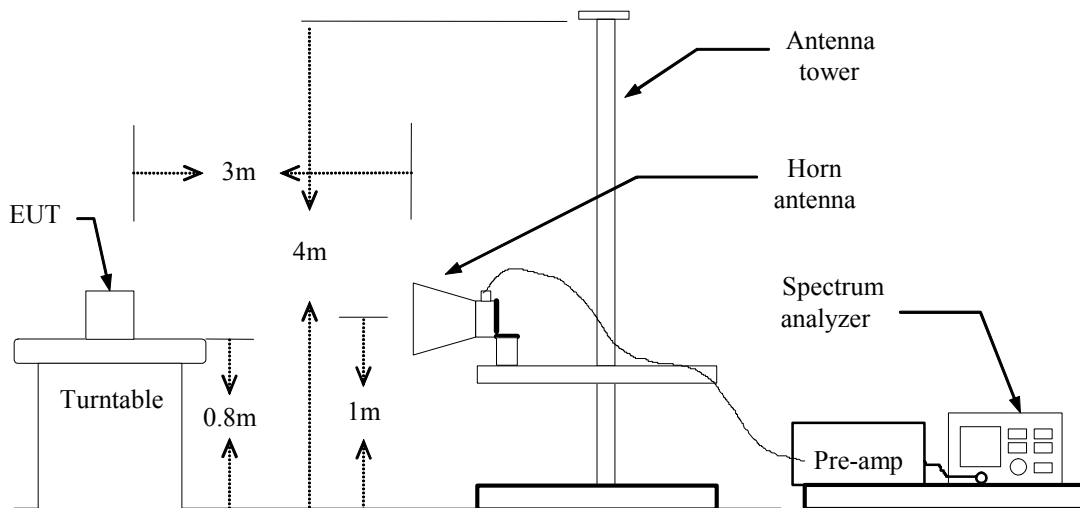
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

## **Test Configuration**

### **Below 1 GHz**



### **Above 1 GHz**





## **TEST PROCEDURE**

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





## TEST RESULTS

### Below 1 GHz

**Operation Mode:** Normal Link**Test Date:** November 14, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
34.85	V	51.97	---	-16.52	35.45	---	40.00	-4.55	Peak
165.80	V	55.95	---	-20.27	35.68	---	43.50	-7.82	Peak
498.03	V	47.35	---	-12.73	34.62	---	46.00	-11.38	Peak
565.93	V	45.85	---	-11.49	34.36	---	46.00	-11.64	Peak
619.27	V	47.19	---	-10.64	36.55	---	46.00	-9.45	Peak
861.77	V	43.62	---	-7.49	36.13	---	46.00	-9.87	Peak
168.23	H	61.62	---	-20.45	41.17	---	43.50	-2.33	Peak
233.70	H	56.14	---	-20.16	35.98	---	46.00	-10.02	Peak
432.55	H	49.45	---	-14.26	35.19	---	46.00	-10.81	Peak
498.03	H	48.31	---	-12.73	35.58	---	46.00	-10.42	Peak
565.93	H	47.32	---	-11.49	35.83	---	46.00	-10.17	Peak
764.77	H	50.29	---	-8.75	41.54	---	46.00	-4.46	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
3215.00	V	44.38	---	-3.71	40.67	---	74.00	54.00	-13.33	Peak
4825.00	V	61.82	51.21	0.64	62.46	51.85	74.00	54.00	-2.15	Average
7235.00	V	45.66	---	6.27	51.93	---	74.00	54.00	-2.07	Peak
9650.00	V	84.22	---	-34.53	49.69	---	74.00	54.00	-4.31	Peak
12060.00	V	70.70	---	-34.26	36.45	---	74.00	54.00	-17.55	Peak
14470.00	V	78.53	---	-33.34	45.18	---	74.00	54.00	-8.82	Peak
3215.00	H	48.84	---	-3.71	45.13	---	74.00	54.00	-8.87	Peak
4825.00	H	57.76	46.32	0.64	58.40	46.96	74.00	54.00	-7.04	Average
7235.00	H	44.44	---	6.27	50.71	---	74.00	54.00	-3.29	Peak
9650.00	H	82.25	---	-34.53	47.73	---	74.00	54.00	-6.27	Peak
12060.00	H	66.44	---	-34.26	32.18	---	74.00	54.00	-21.82	Peak
14470.00	H	80.84	---	-33.34	47.50	---	74.00	54.00	-6.50	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
3250.00	V	41.91	---	-3.72	38.19	---	74.00	54.00	-15.81	Peak
4875.00	V	61.28	51.79	0.81	62.09	52.60	74.00	54.00	-1.40	Average
7310.00	V	45.39	---	5.87	51.26	---	74.00	54.00	-2.74	Peak
9750.00	V	88.93	87.02	-34.26	54.67	52.76	74.00	54.00	-1.24	Average
12180.00	V	63.12	---	-34.17	28.95	---	74.00	54.00	-25.05	Peak
14620.00	V	74.12	---	-32.83	41.29	---	74.00	54.00	-12.71	Peak
3250.00	H	44.47	---	-3.72	40.75	---	74.00	54.00	-13.25	Peak
4875.00	H	60.37	47.83	0.81	61.18	48.64	74.00	54.00	-5.36	Average
7315.00	H	45.28	---	5.84	51.13	---	74.00	54.00	-2.87	Peak
9750.00	H	87.79	85.89	-34.26	53.53	51.63	74.00	54.00	-2.37	Average
12180.00	H	64.06	---	-34.17	29.89	---	74.00	54.00	-24.11	Peak
14620.00	H	78.82	---	-32.83	45.99	---	74.00	54.00	-8.01	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
4925.00	V	62.00	50.85	0.99	63.00	51.84	74.00	54.00	-2.16	Average
7385.00	V	47.12	---	5.47	52.59	---	74.00	54.00	-1.41	Peak
9850.00	V	87.08	87.61	-33.99	53.10	50.62	74.00	54.00	-3.38	Average
12310.00	V	62.37	---	-34.07	28.30	---	74.00	54.00	-25.70	Peak
14770.00	V	82.57	---	-32.23	50.34	---	74.00	54.00	-3.66	Peak
N/A										
3285.00	H	42.70	---	-3.73	38.97	---	74.00	54.00	-15.03	Peak
4925.00	H	60.77	46.26	0.99	61.77	47.25	74.00	54.00	-6.75	Average
7385.00	H	48.16	---	5.47	53.63	---	74.00	54.00	-0.37	Peak
9850.00	H	83.15	---	-33.99	49.17	---	74.00	54.00	-4.83	Peak
12310.00	H	64.63	---	-34.07	30.56	---	74.00	54.00	-23.44	Peak
14770.00	H	83.93	---	-32.23	51.70	---	74.00	54.00	-2.30	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
3215.00	V	48.33	---	-3.71	44.62	---	74.00	54.00	-9.38	Peak
4825.00	V	50.28	---	0.64	50.92	---	74.00	54.00	-3.08	Peak
7230.00	V	42.12	---	6.30	48.42	---	74.00	54.00	-5.58	Peak
9650.00	V	67.77	---	-34.53	33.24	---	74.00	54.00	-20.76	Peak
12060.00	V	59.61	---	-34.26	25.36	---	74.00	54.00	-28.64	Peak
14470.00	V	65.35	---	-33.34	32.01	---	74.00	54.00	-21.99	Peak
3215.00	H	50.84	---	-3.71	47.12	---	74.00	54.00	-6.88	Peak
4830.00	H	46.01	---	0.65	46.66	---	74.00	54.00	-7.34	Peak
7230.00	H	40.48	---	6.30	46.78	---	74.00	54.00	-7.22	Peak
9650.00	H	63.54	---	-34.53	29.01	---	74.00	54.00	-24.99	Peak
14470.00	H	68.37	---	-33.34	35.03	---	74.00	54.00	-18.97	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
3250.00	V	42.70	---	-3.72	38.98	---	74.00	54.00	-15.02	Peak
4870.00	V	54.70	49.26	0.80	55.50	50.06	74.00	54.00	-3.94	Average
7305.00	V	44.11	---	5.90	50.01	---	74.00	54.00	-3.99	Peak
9740.00	V	77.07	---	-34.28	42.78	---	74.00	54.00	-11.22	Peak
12180.00	V	58.16	---	-34.17	24.00	---	74.00	54.00	-30.00	Peak
14620.00	V	67.87	---	-32.83	35.04	---	74.00	54.00	-18.96	Peak
3250.00	H	48.75	---	-3.72	45.03	---	74.00	54.00	-8.97	Peak
4870.00	H	50.68	---	0.80	51.47	---	74.00	54.00	-2.53	Peak
7315.00	H	43.80	---	5.84	49.65	---	74.00	54.00	-4.35	Peak
9750.00	H	76.26	---	-34.26	42.00	---	74.00	54.00	-12.00	Peak
12180.00	H	57.69	---	-34.17	23.52	---	74.00	54.00	-30.48	Peak
14620.00	H	71.50	---	-32.83	38.67	---	74.00	54.00	-15.33	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.
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:** November 12, 2005**Temperature:** 25°C**Tested by:** Ryan Chen**Humidity:** 58 % 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
3280.00	V	44.59	---	-3.73	40.87	---	74.00	54.00	-13.13	Peak
4925.00	V	52.77	46.38	0.99	53.76	47.37	74.00	54.00	-6.63	Average
7385.00	V	42.32	---	5.47	47.79	---	74.00	54.00	-6.21	Peak
9850.00	V	74.17	---	-33.99	40.18	---	74.00	54.00	-13.82	Peak
12310.00	V	56.90	---	-34.07	22.83	---	74.00	54.00	-31.17	Peak
14760.00	V	67.71	---	-32.27	35.44	---	74.00	54.00	-18.56	Peak
3285.00	H	47.05	---	-3.73	43.32	---	74.00	54.00	-10.68	Peak
4925.00	H	49.94	---	0.99	50.93	---	74.00	54.00	-3.07	Peak
7385.00	H	45.17	---	5.47	50.64	---	74.00	54.00	-3.36	Peak
9840.00	H	69.14	---	-34.01	35.13	---	74.00	54.00	-18.87	Peak
12320.00	H	59.58	---	-34.06	25.51	---	74.00	54.00	-28.49	Peak
14770.00	H	69.72	---	-32.23	37.49	---	74.00	54.00	-16.51	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.
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).