



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

TEST REPORT

For

802.11a/b/g Wireless MiniPCI Card

Model: WCM6002

Trade Name: AboCom

Issued to

**AboCom Systems, Inc
No.77, Yu-Yih Rd., Chu-Nan,
Miao-Lih County 35059, 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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1. TEST RESULT CERTIFICATION

Applicant: AboCom Systems, Inc
No.77, Yu-Yih Rd., Chu-Nan,
Miao-Lih County 35059, Taiwan R.O.C.

Equipment Under Test: 802.11a/b/g Wireless MiniPCI Card

Trade Name: AboCom

Model: WCM6002

Date of Test: December 1 ~ 11, 2007

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted
Deviation from Applicable Standard	
None	

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:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	802.11a/b/g Wireless MiniPCI Card
Trade Name	AboCom
Model Number	WCM6002
Model Discrepancy	N/A
Power Adapter	Powered from host device
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b: 18.53 dBm IEEE 802.11g: 18.80 dBm
Modulation Technique	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	IEEE 802.11b Mode: 11, 5.5, 2, 1 Mbps IEEE 802.11g Mode: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1Mbps
Number of Channels	11 Channels
Antenna Specification	Gain: 5 dBi / 2 dBi
Antenna Designation	Dipole Antenna
Class II Permissive Change	The major change filed under this application is: 1. Add two Dipole Antenna of Gain: 5 dBi and 2 dBi. 2. Disable in 802.11a mode, Band: 5150~5350MHz & 5725~5850MHz. This was upgrade by software / firmware change without hardware changes.

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **MQ4WCM6002** 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
¹ 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	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² 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: WCM6002) comes with two antennas. (AC0101075R00 with Gain: 2dBi and AC0104158R00 with 5dBi) for sale. After the preliminary test, the antenna with model number AC0104158R00 with 5dBi was found to emit the worst emissions and therefore 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 and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE 802.11b mode:

Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 11Mbps data rate were chosen for the final testing.

IEEE 802.11b mode:

Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 54Mbps data rate were chosen for the final 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	01/29/2009
Spectrum Analyzer	R&S	FSEK30	10026	03/20/2009

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	08/01/2008
Test Receiver	Rohde&Schwarz	ESCI	100064	11/03/2008
Switch Controller	TRC	Switch Controller	SC94050010	05/04/2008
4 Port Switch	TRC	4 Port Switch	SC94050020	05/04/2008
Horn-Antenna	TRC	HA-0502	06	06/05/2008
Horn-Antenna	TRC	HA-0801	04	05/04/2008
Horn-Antenna	TRC	HA-1201A	01	07/09/2008
Horn-Antenna	TRC	HA-1301A	01	07/17/2008
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/07/2009
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	09/25/2008
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	10/30/2008
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/13/2008
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	03/18/2009
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.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






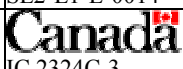
Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

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, IEC/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	 ACCREDITED TESTING CERT #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	VCCI R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	TAF	EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	 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 2324C-3, IC 2324C-5) / 3M Semi Anechoic Chamber (IC 6106)	 IC 2324C-3 IC 2324C-5 IC 6106

* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

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

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	LCD Monitor	Viewsonic	VE710b	P10043601269	FCC DoC	Shielded, 1.8m with 2 cores	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Notebook PC	ASUS	M5200AE	5BN0AG019631	PD9WM3B2100	N/A	AC I/P: Unshielded, 1.8m with a core DC O/P: Unshielded, 1.8m
3.	USB Mouse	DELL	M-UV69a	323617-001	FCC DoC	Shielded, 1.8m	N/A
4.	USB 2.0 External HDD	TeraSyS	F12-U	A0100214-43b0012	FCC DoC	Shielded, 1.8m	N/A
5.	Multimedia Earphone	Labtec	Axis-301	N/A	FCC DoC	Unshielded, 1.8m*2	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.

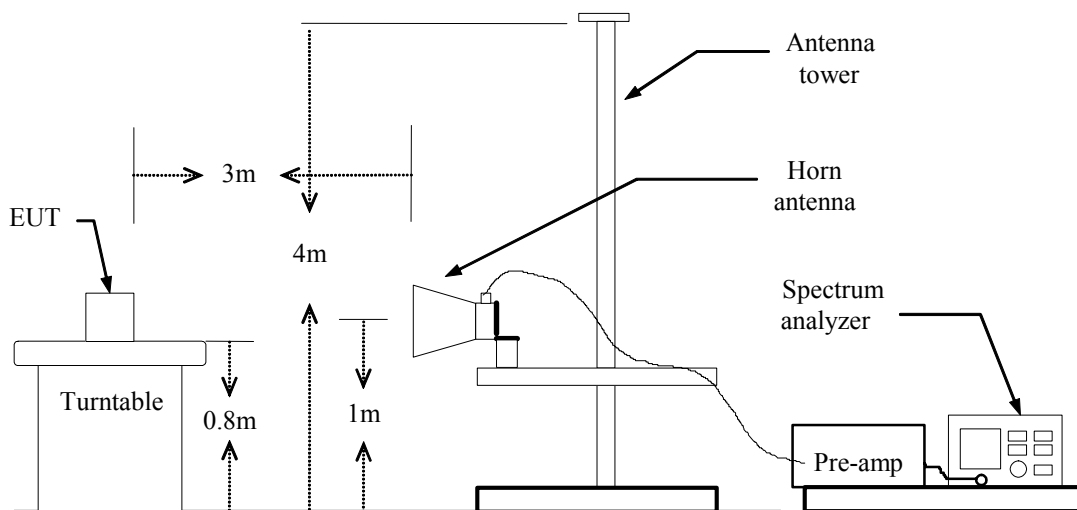
7. FCC PART 15.247 REQUIREMENTS

7.1 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)

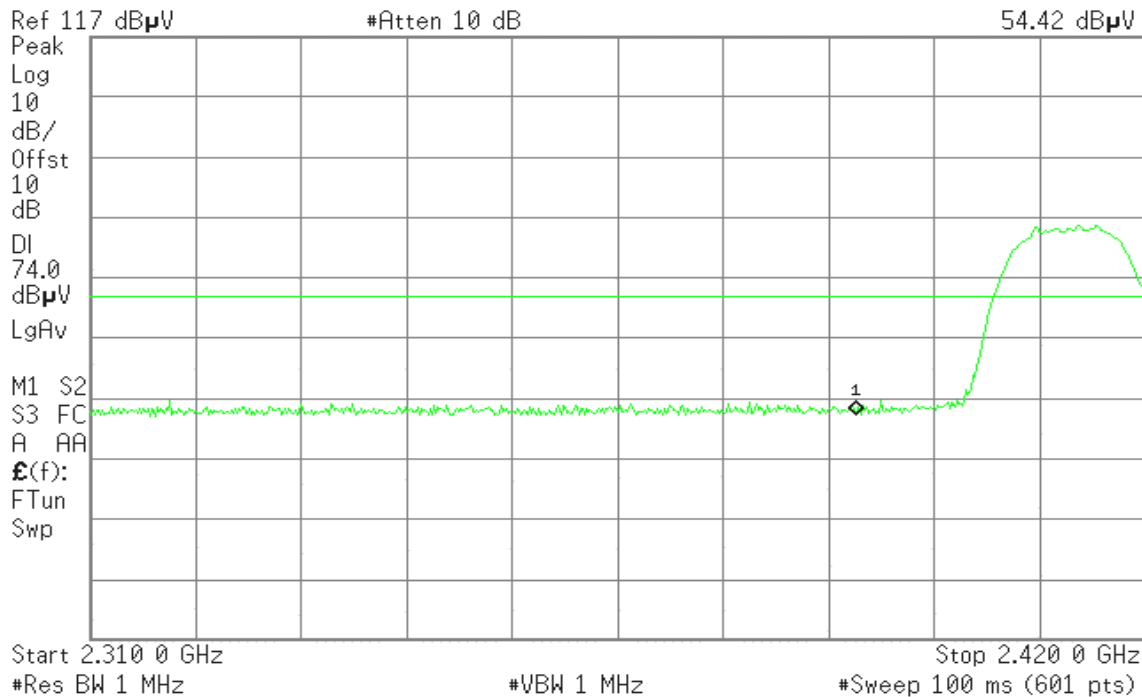
Detector mode: Peak

Polarity: Vertical

Agilent 15:57:05 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
54.42 dB μ V



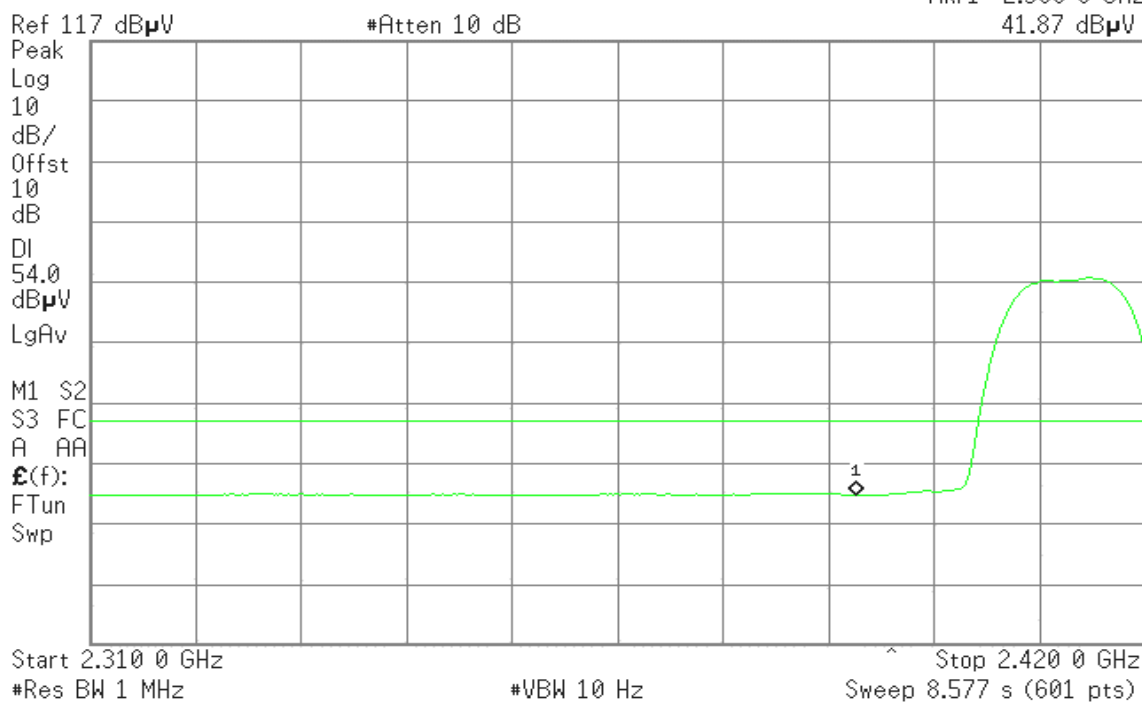
Detector mode: Average

Polarity: Vertical

Agilent 15:57:47 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
41.87 dB μ V





Detector mode: Peak

Polarity: Horizontal

Agilent 15:51:20 Dec 1, 2007

R T

Mkr1 2.390 0 GHz
53.22 dB μ V

Ref 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

74.0

dB μ V

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$:

FTun

Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.420 0 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent 15:52:04 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
41.84 dB μ V

Ref 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

54.0

dB μ V

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$:

FTun

Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.420 0 GHz

Sweep 8.577 s (601 pts)



Band Edges (IEEE 802.11b / CH High)

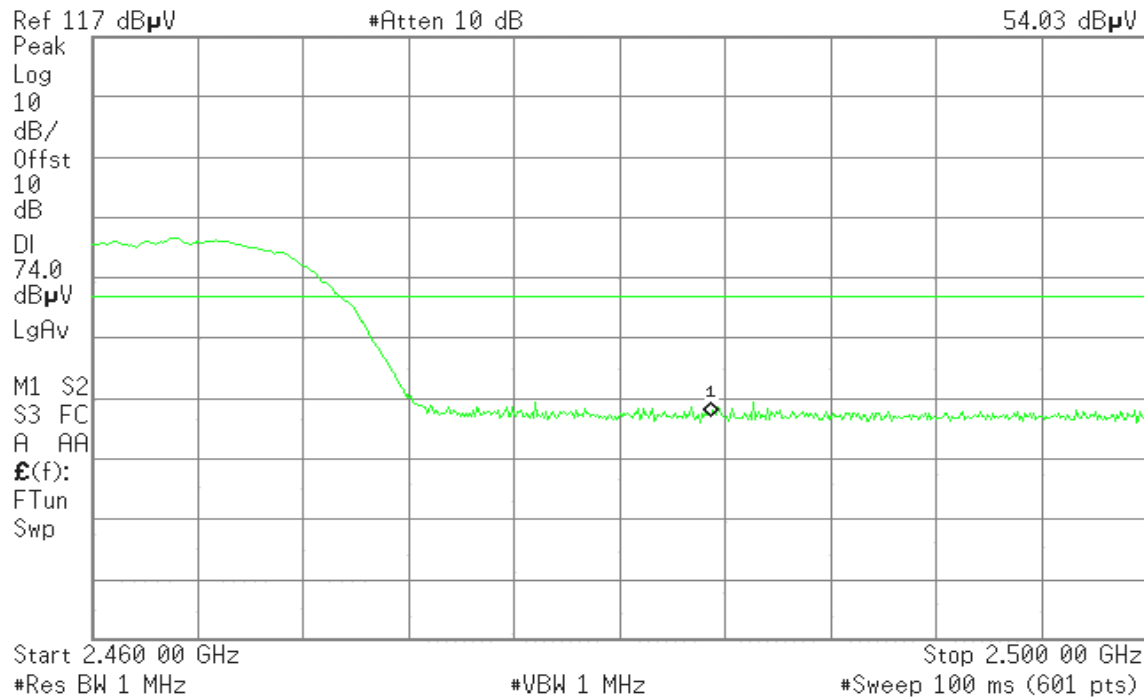
Detector mode: Peak

Polarity: Vertical

Agilent 15:41:24 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
54.03 dBμV



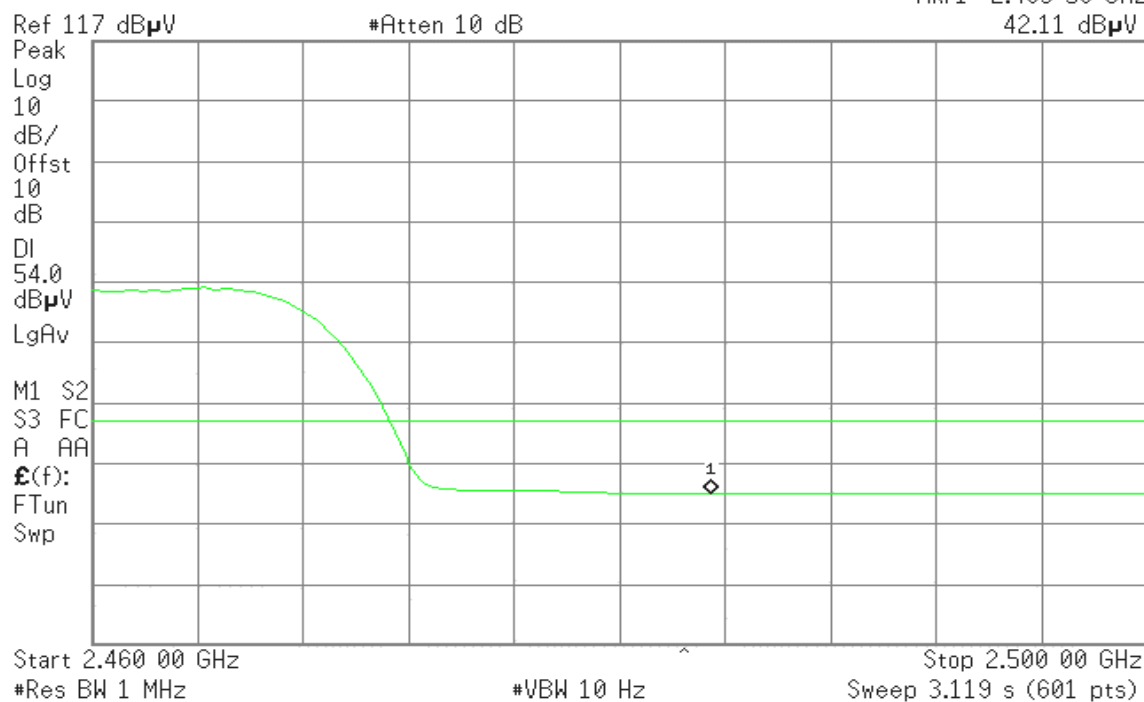
Detector mode: Average

Polarity: Vertical

Agilent 15:41:55 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
42.11 dBμV





Detector mode: Peak

Polarity: Horizontal

* Agilent 15:46:51 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
53.68 dB μ VRef 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

74.0

dB μ V

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

* Agilent 15:47:36 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
42.07 dB μ VRef 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

54.0

dB μ V

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 3.119 s (601 pts)

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

* Agilent 16:09:06 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
54.09 dB μ VRef 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

74.0

dB μ V

LgAv

M1 S2

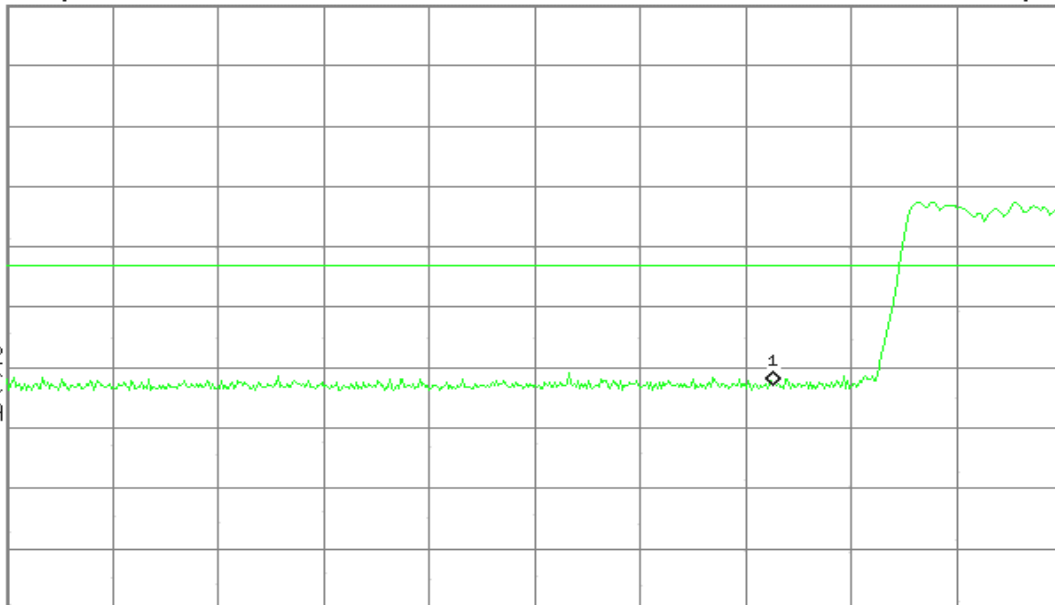
S3 FC

A AA

 $\mathcal{E}(f)$:

FTun

Swp



Center 2.365 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Span 110 MHz
#Sweep 100 ms (601 pts)**Detector mode: Average****Polarity: Vertical**

* Agilent 16:09:37 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
41.90 dB μ VRef 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

54.0

dB μ V

LgAv

M1 S2

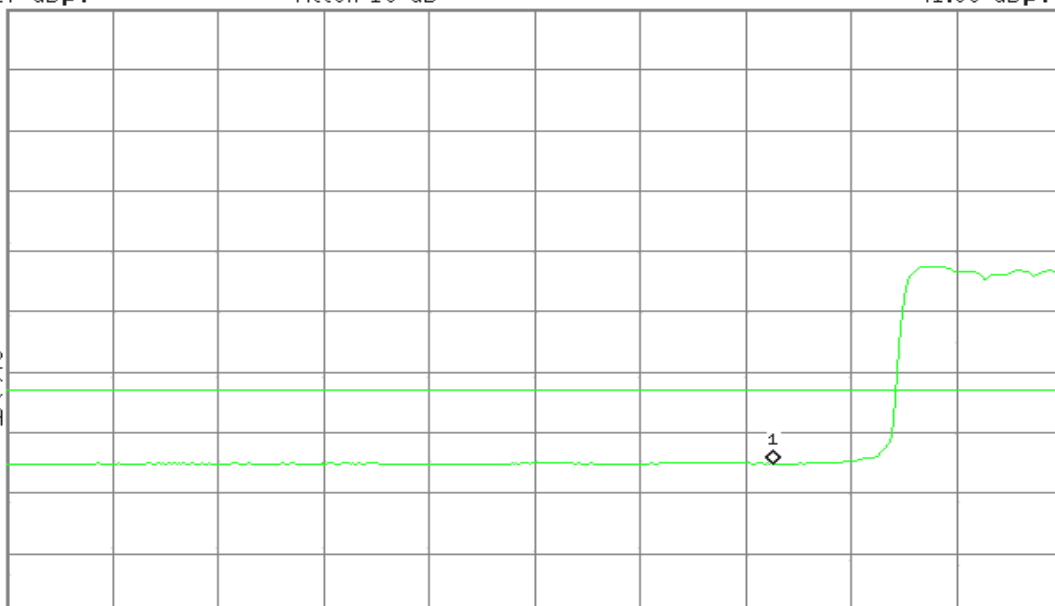
S3 FC

A AA

 $\mathcal{E}(f)$:

FTun

Swp



Center 2.365 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

Span 110 MHz
Sweep 8.577 s (601 pts)



Detector mode: Peak

Polarity: Horizontal

* Agilent 16:12:58 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
54.09 dB μ VRef 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

74.0

dB μ V

LgAv

M1 S2

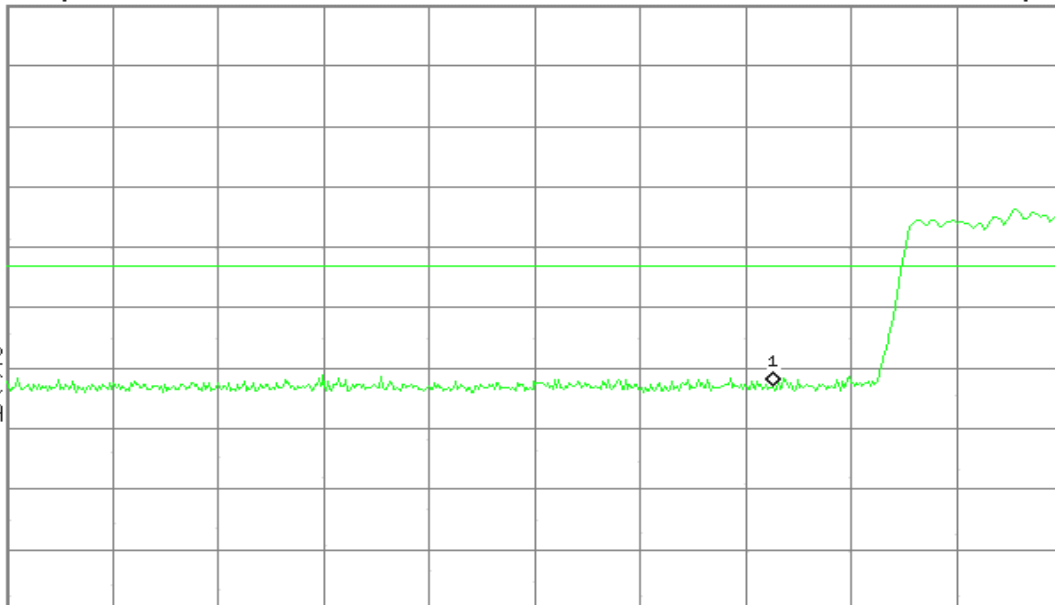
S3 FC

A AA

E(f):

FTun

Swp



Center 2.365 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Span 110 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

* Agilent 16:19:11 Dec 1, 2007

R L

Mkr1 2.390 0 GHz
41.95 dB μ VRef 117 dB μ V

#Atten 10 dB

#Peak

Log

10

dB/

Offst

10

dB

DI

54.0

dB μ V

LgAv

M1 S2

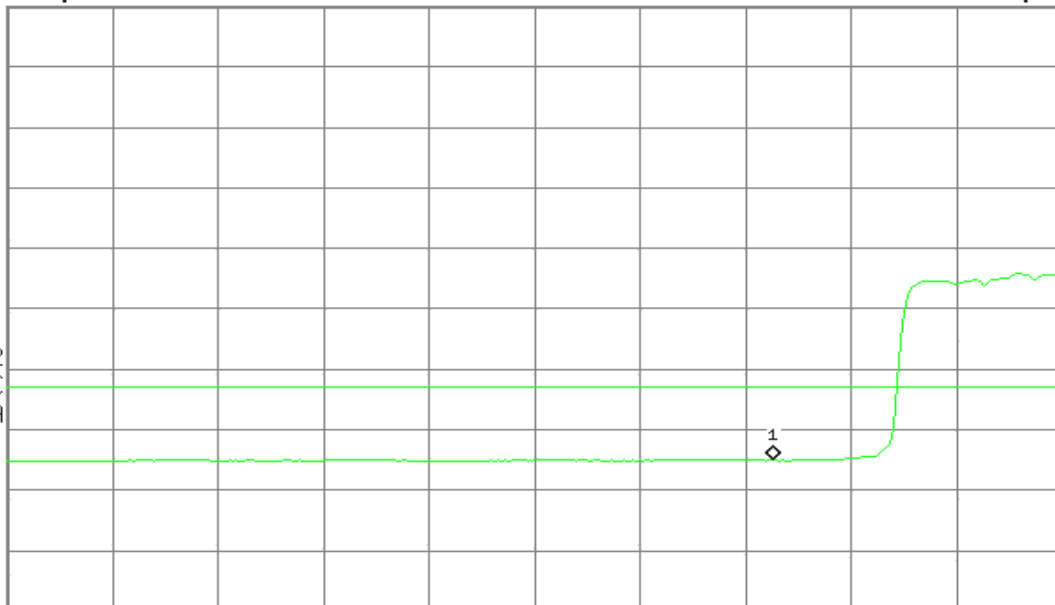
S3 FC

A AA

E(f):

FTun

Swp



Start 2.310 0 GHz

Res BW 1 MHz

#VBW 10 Hz

Stop 2.420 0 GHz

Sweep 8.577 s (601 pts)



Band Edges (IEEE 802.11g / CH High)

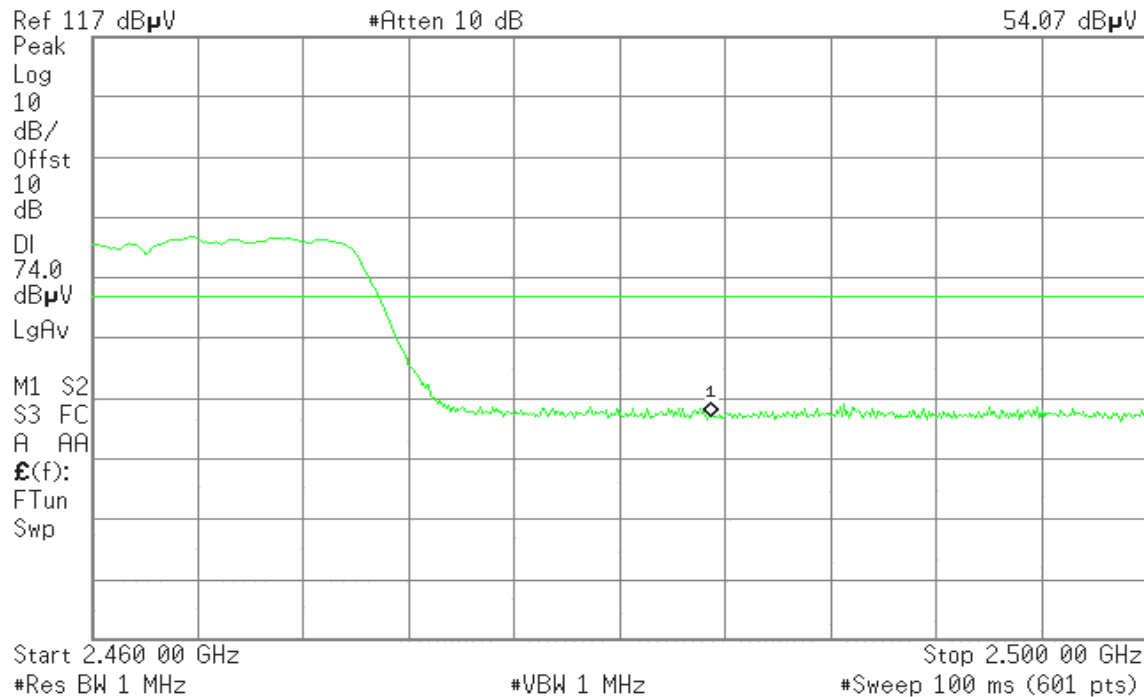
Detector mode: Peak

Polarity: Vertical

Agilent 15:38:18 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
54.07 dBμV



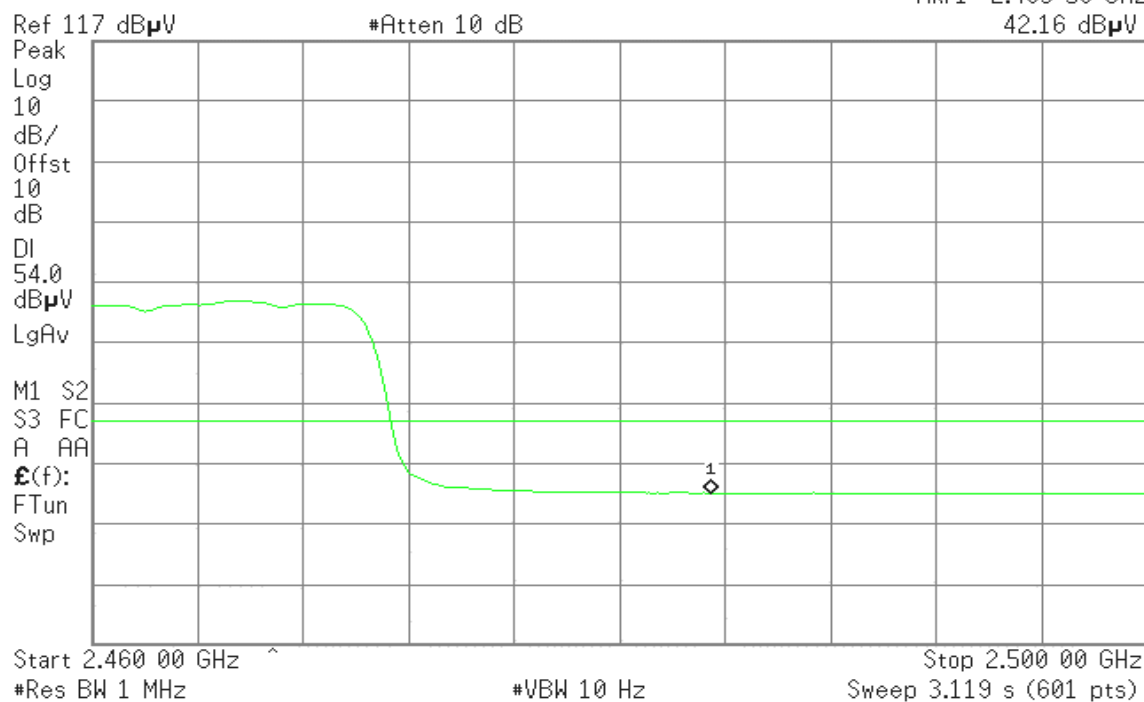
Detector mode: Average

Polarity: Vertical

Agilent 15:38:56 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
42.16 dBμV





Detector mode: Peak

Polarity: Horizontal

* Agilent 15:32:42 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
55.47 dB μ V

Ref 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

74.0

dB μ V

LgAv

M1 S2

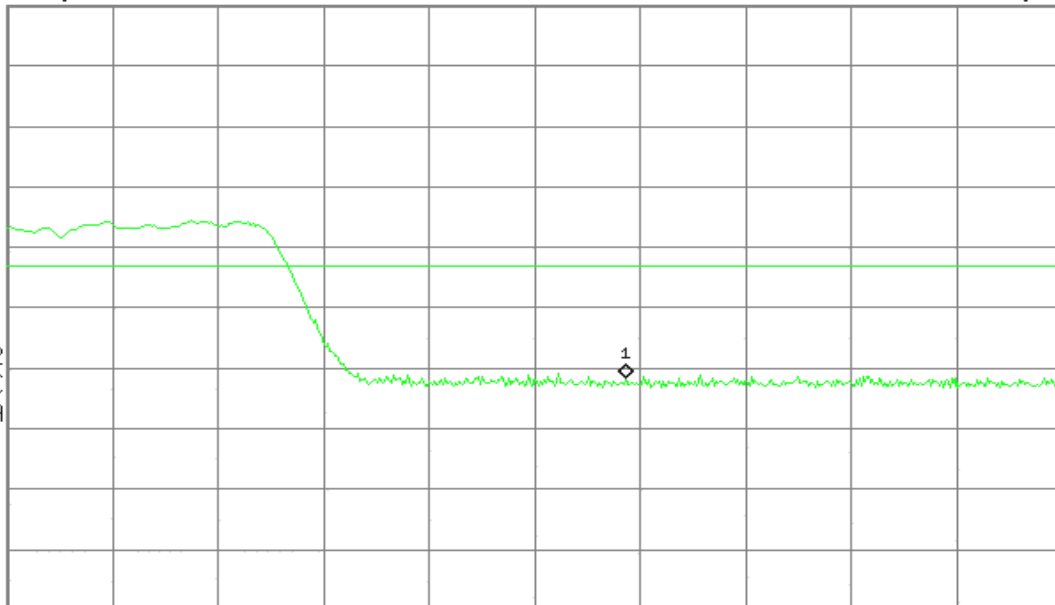
S3 FC

A AA

$\mathcal{E}(f)$:

FTun

Swp



Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

* Agilent 15:33:29 Dec 1, 2007

R L

Mkr1 2.483 50 GHz
42.23 dB μ V

Ref 117 dB μ V

#Atten 10 dB

Peak

Log

10

dB/

Offst

10

dB

DI

54.0

dB μ V

LgAv

M1 S2

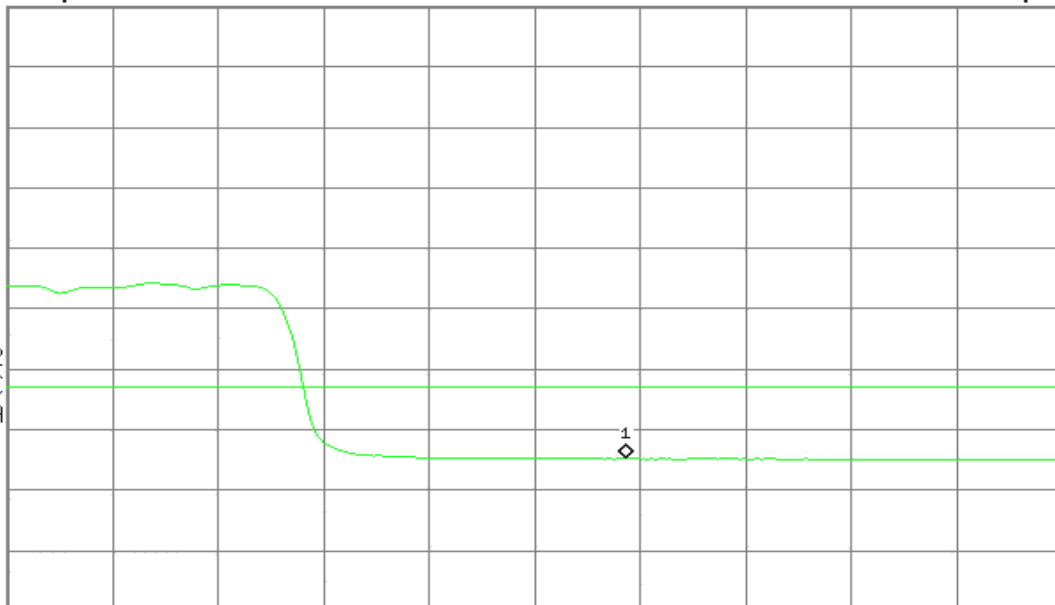
S3 FC

A AA

$\mathcal{E}(f)$:

FTun

Swp



Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 3.119 s (601 pts)



7.2 SPURIOUS EMISSIONS

7.2.1 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

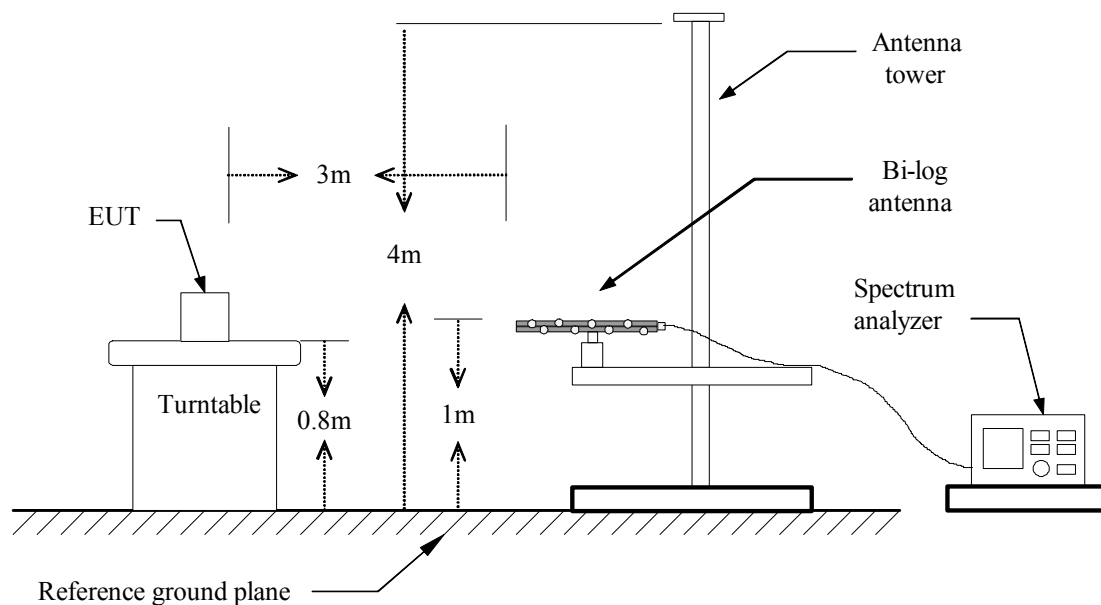
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

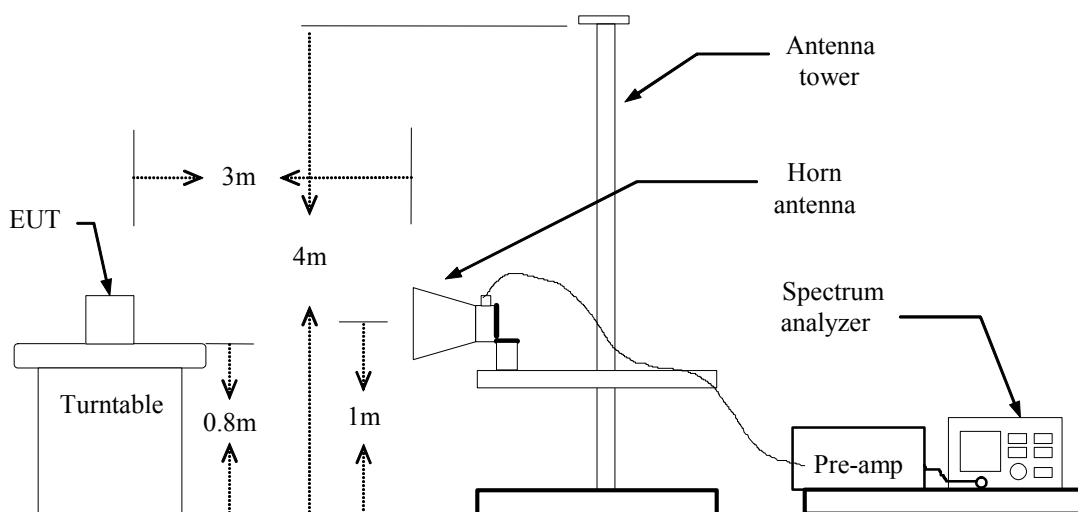
Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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

No non-compliance noted.

**Below 1 GHz****Operation Mode:** Normal Link**Test Date:** December 11, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
122.15	V	52.87	-12.95	39.92	43.50	-3.58	Peak
165.80	V	52.71	-14.55	38.16	43.50	-5.34	Peak
206.22	V	54.36	-14.57	39.78	43.50	-3.72	Peak
304.83	V	44.87	-12.17	32.71	46.00	-13.29	Peak
429.32	V	44.95	-9.01	35.94	46.00	-10.06	Peak
666.97	V	38.15	-4.89	33.25	46.00	-12.75	Peak
141.55	H	51.53	-13.73	37.80	43.50	-5.70	Peak
207.83	H	50.63	-14.90	35.73	43.50	-7.77	Peak
257.95	H	52.31	-14.10	38.21	46.00	-7.79	Peak
384.05	H	48.83	-10.08	38.76	46.00	-7.24	Peak
662.12	H	39.87	-4.99	34.88	46.00	-11.12	Peak
827.02	H	38.76	-2.53	36.23	46.00	-9.77	Peak

Remark:

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

**Above 1 GHz****Operation Mode:** IEEE 802.11b / TX / CH Low**Test Date:** December 1, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1130.00	V	55.51	---	-10.58	44.93	---	74.00	54.00	-9.07	Peak
1913.33	V	51.19	---	-5.87	45.32	---	74.00	54.00	-8.68	Peak
6433.33	V	47.65	---	2.87	50.51	---	74.00	54.00	-3.49	Peak
N/A										
1130.00	H	55.47	---	-10.58	44.89	---	74.00	54.00	-9.11	Peak
1913.33	H	50.76	---	-5.87	44.90	---	74.00	54.00	-9.10	Peak
6433.33	H	47.50	---	2.87	50.36	---	74.00	54.00	-3.64	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:** IEEE 802.11b / TX / CH Mid**Test Date:** December 1, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1146.67	V	56.35	---	-10.55	45.80	---	74.00	54.00	-8.20	Peak
1913.33	V	50.57	---	-5.87	44.70	---	74.00	54.00	-9.30	Peak
6500.00	V	47.36	---	2.99	50.35	---	74.00	54.00	-3.65	Peak
N/A										
1146.67	H	54.89	---	-10.55	44.34	---	74.00	54.00	-9.66	Peak
1836.67	H	56.39	---	-6.63	49.76	---	74.00	54.00	-4.24	Peak
4875.00	H	44.43	---	0.60	45.03	---	74.00	54.00	-8.97	Peak
6500.00	H	48.55	---	2.99	51.54	---	74.00	54.00	-2.46	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:** IEEE 802.11b / TX / CH High**Test Date:** December 1, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1146.67	V	55.09	---	-10.55	44.54	---	74.00	54.00	-9.46	Peak
1913.33	V	50.36	---	-5.87	44.50	---	74.00	54.00	-9.50	Peak
4925.00	V	43.80	---	0.65	44.46	---	74.00	54.00	-9.54	Peak
6566.67	V	45.39	---	3.12	48.51	---	74.00	54.00	-5.49	Peak
N/A										
1146.67	H	53.93	---	-10.55	43.38	---	74.00	54.00	-10.62	Peak
1830.00	H	55.44	---	-6.69	48.75	---	74.00	54.00	-5.25	Peak
4925.00	H	44.88	---	0.65	45.53	---	74.00	54.00	-8.47	Peak
6566.67	H	47.40	---	3.12	50.53	---	74.00	54.00	-3.47	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:** IEEE 802.11g / TX / CH Low**Test Date:** December 1, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1146.67	V	55.05	---	-10.55	44.50	---	74.00	54.00	-9.50	Peak
1840.00	V	51.90	---	-6.60	45.30	---	74.00	54.00	-8.70	Peak
6433.33	V	48.39	---	2.87	51.26	---	74.00	54.00	-2.74	Peak
N/A										
1146.67	H	54.39	---	-10.55	43.83	---	74.00	54.00	-10.17	Peak
1833.33	H	54.15	---	-6.66	47.49	---	74.00	54.00	-6.51	Peak
6433.33	H	47.24	---	2.87	50.11	---	74.00	54.00	-3.89	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: IEEE 802.11g / TX / CH Mid

Test Date: December 1, 2007

Temperature: 25°C

Tested by: Ivan Tsai

Humidity: 55 % RH

Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1146.67	V	55.52	---	-10.55	44.96	---	74.00	54.00	-9.04	Peak
1913.33	V	51.33	---	-5.87	45.46	---	74.00	54.00	-8.54	Peak
6500.00	V	46.94	---	2.99	49.93	---	74.00	54.00	-4.07	Peak
N/A										
1130.00	H	55.44	---	-10.58	44.86	---	74.00	54.00	-9.14	Peak
1836.67	H	58.40	---	-6.63	51.78	---	74.00	54.00	-2.22	Peak
6500.00	H	48.47	---	2.99	51.46	---	74.00	54.00	-2.54	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:** IEEE 802.11g / TX / CH High**Test Date:** December 1, 2007**Temperature:** 25°C**Tested by:** Ivan Tsai**Humidity:** 55 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1146.67	V	55.35	---	-10.55	44.80	---	74.00	54.00	-9.20	Peak
1830.00	V	52.95	---	-6.69	46.25	---	74.00	54.00	-7.75	Peak
6566.67	V	44.74	---	3.12	47.86	---	74.00	54.00	-6.14	Peak
N/A										
1130.00	H	55.65	---	-10.58	45.07	---	74.00	54.00	-8.93	Peak
1530.00	H	51.07	---	-9.68	41.39	---	74.00	54.00	-12.61	Peak
1836.67	H	53.12	---	-6.63	46.49	---	74.00	54.00	-7.51	Peak
6566.67	H	46.55	---	3.12	49.67	---	74.00	54.00	-4.33	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser; with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



7.3 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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

Test Configuration

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

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

**TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Operation Mode: Normal Link **Test Date:** December 7, 2007
Temperature: 26°C **Tested by:** Ivan Tsai
Humidity: 45% RH

Frequency (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
0.2050	50.39	44.09	0.11	50.50	44.20	63.41	53.41	-12.91	-9.21	L1
0.4100	42.77	41.07	0.03	42.80	41.10	57.65	47.65	-14.85	-6.55	L1
0.5450	41.50	40.20	0.00	41.50	40.20	56.00	46.00	-14.50	-5.80	L1
1.5050	41.99	39.39	0.01	42.00	39.40	56.00	46.00	-14.00	-6.60	L1
3.6250	46.94	41.44	0.06	47.00	41.50	56.00	46.00	-9.00	-4.50	L1
16.4850	47.86	32.76	0.44	48.30	33.20	60.00	50.00	-11.70	-16.80	L1
0.2700	44.02	40.12	0.08	44.10	40.20	61.12	51.12	-17.02	-10.92	L2
0.4100	42.07	40.67	0.03	42.10	40.70	57.65	47.65	-15.55	-6.95	L2
0.5450	41.00	39.60	0.00	41.00	39.60	56.00	46.00	-15.00	-6.40	L2
1.0250	41.40	38.50	0.00	41.40	38.50	56.00	46.00	-14.60	-7.50	L2
3.7000	45.24	37.74	0.06	45.30	37.80	56.00	46.00	-10.70	-8.20	L2
16.5300	49.16	47.26	0.44	49.60	47.70	60.00	50.00	-10.40	-2.30	L2

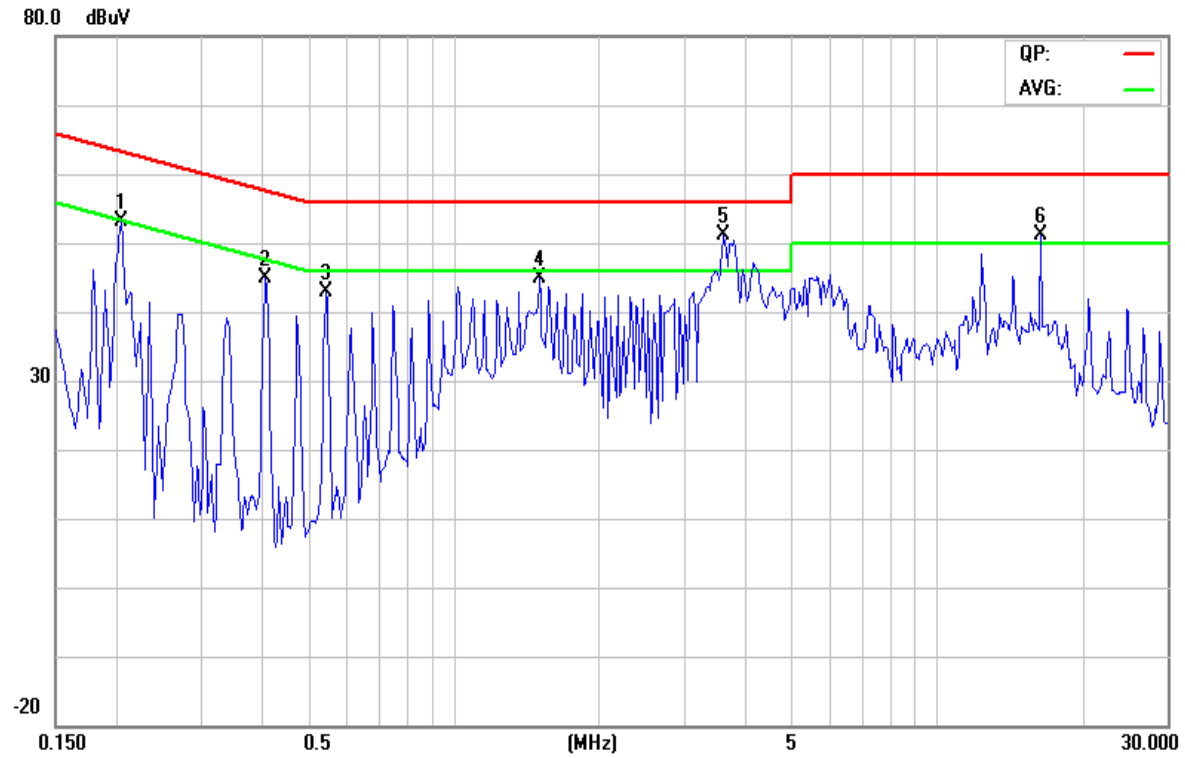
Remark:

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)

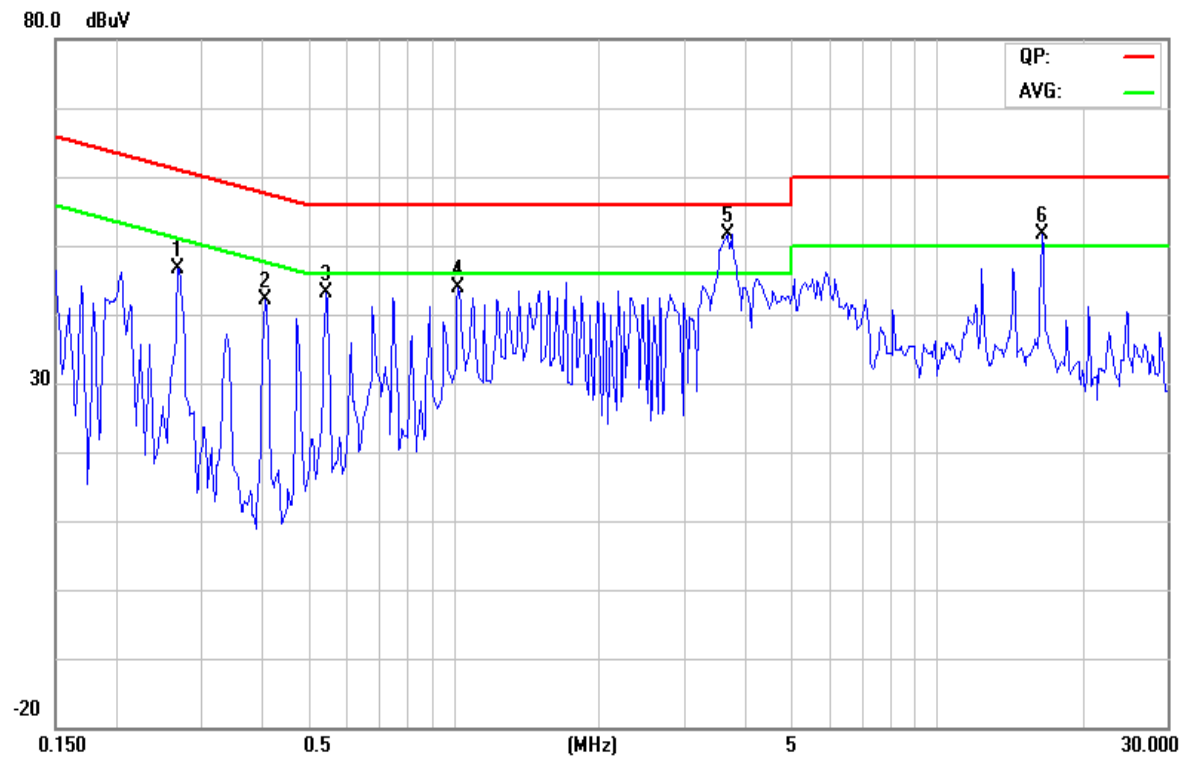


Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)





APPENDIX I

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

EUT	802.11a/b/g Wireless MiniPCI Card
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Bluetooth: <u>2.402GHz ~ 2.480 GHz</u>
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<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
Max. output power	IEEE 802.11b: 18.53 dBm (71.29mW) IEEE 802.11g: 18.80 dBm (75.86mW)
Antenna gain (Max)	5 dBi (Numeric gain: 3.16)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

1. The maximum output power is 18.80dBm (75.86mW) at 2437MHz (with 3.16 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/cm² 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:

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

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

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 / cm²

Maximum Permissible Exposure

EUT output power = 75.86mW

Numeric Antenna gain = 3.16

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 / cm²

$$\rightarrow \text{Power density} = 0.0477 \text{ mW / cm}^2$$

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)