EMC
TEST REPORT

Report No. : **EME-061171/02**
Model No. : **GLM-100**
Issued Date : **Mar. 18, 2009**

Applicant: **Alpha Networks Inc.**
No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan

Test Method/ Standard: **47 CFR FCC Part 15.247 & ANSI C63.4 2003**

Test By: **Intertek Testing Services Taiwan Ltd.**
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1. Summary of Test Data

Test/Requirement Description	Applicable Rule	Result
Maximum Output Power	15.247(b)	Pass
Radiated Spurious Emission	15.247(d), 15.205, 15.209	Pass
Emission on the Band Edge	15.247(d)	Pass

2. General Information

Identification of the EUT

Applicant:	Alpha Networks Inc.
Product:	Wireless Mini PCI Adapter
Model No.:	GLM-100
FCC ID.:	RRKGLM100
Frequency Range:	2412MHz ~ 2462MHz
Channel Number:	11 channels for 2412MHz ~ 2462MHz
Rated Power:	DC 3.3 V from Notebook PC
Power Cord:	N/A
Data Cable:	N/A
Sample Received:	Mar. 09, 2009
Test Date(s):	Mar. 13, 2009
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

Description of EUT

The EUT is a Wireless Mini PCI Adapter, and was defined as information technology equipment.

Modification (02) to test report No. EME-061171 (Verification No.: EME-061171)
The original Test Report Ref. No. EME-061171, dated Nov. 9, 2006 was modified on Mar. 17, 2009 to include the following changes and/or additions, which were considered technical modifications:

Add a PIFA antenna, gain 2 dBi (Model No.: IFF-A005MPLJ-508(SSP-80446-S3))

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain	: 2 dBi
Antenna Type	: PIFA antenna
Connector Type	: U.FL

Operation mode

The EUT was supplied with DC 3.3 V from Notebook PC and it was running in operating mode.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power was found at 1 Mbps data rate for 802.11b mode and 6 Mbps data rate for 802.11g mode. The final tests were executed under these conditions and recorded in this report individually.

3. Maximum Output Power

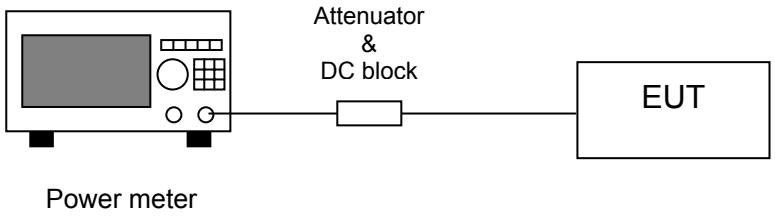
Name of Test	Maximum output power
Base Standard	FCC 15.247(b)

Measurement Uncertainty: ±2dB (k=2)
Test Result: Complies
Measurement Data: See Table below

Method of Measurement:
Reference FCC document: KDB558074
The peak power at antenna terminals is measured using a Wideband Peak Power Meter which the video bandwidth can be up to 20MHz. Power output is measured with the maximum rated input level.

Note: 1. The above equipments are within the valid calibration period.
2. The video bandwidth of the power meter and sensor can be up to 20 MHz

Test Diagram:



Note 1: The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

Note 2: §15.247 (b) (4) 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.

Table 3. Maximum output power

Mode	Channel	Frequency (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit
					(dBm)	(mW)	(W)
802.11b	1	2412	2	14.12	16.11	40.83	1
	6	2437	2	13.52	15.42	34.83	1
	11	2462	2	13.03	15.01	31.70	1
802.11g	1	2412	2	17.06	19.06	80.54	1
	6	2437	2	15.91	17.85	60.95	1
	11	2462	2	15.92	17.90	61.66	1

4. Radiated Spurious Emission

Name of Test	Radiated Spurious Emission
Base Standard	FCC 15.247(d), 15.209, 15.205

Test Result: Complies

Measurement Data: See Tables below

Method of Measurement:

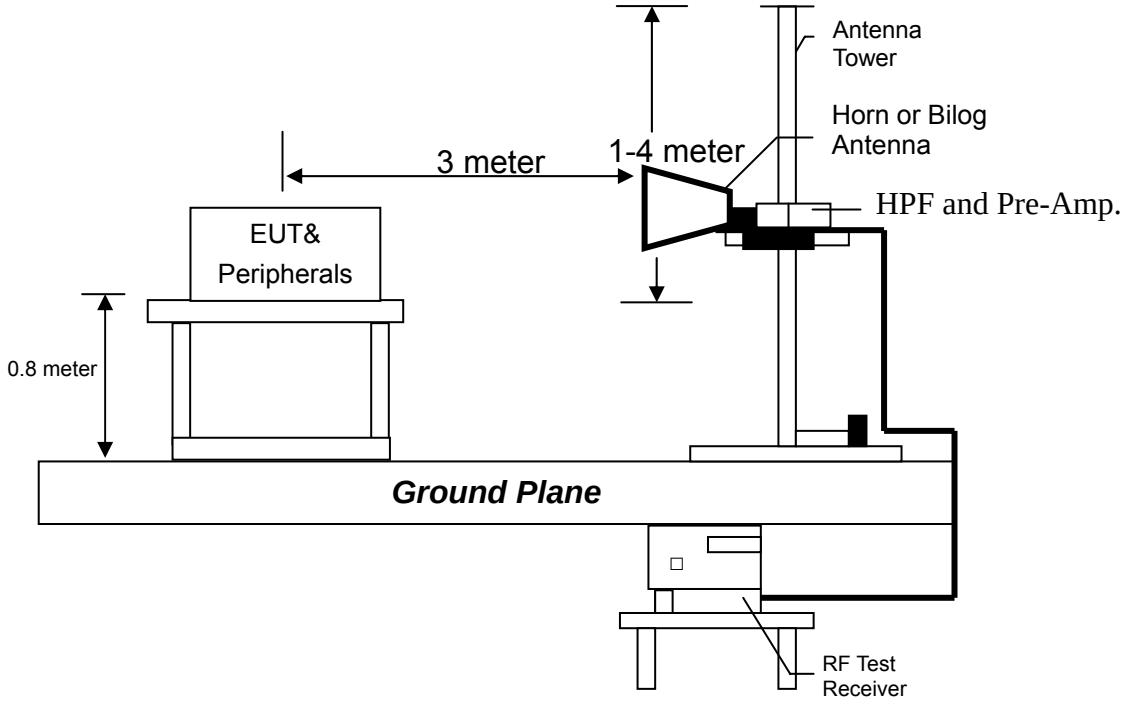
Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were invested cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter. The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meters reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

Test Diagram:



Emission Limit:

The spurious Emission shall test through the 10th harmonic. 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).

Frequency (MHz)	Limits (dBμV/m@ 3 meter)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Note: (1) The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

(2) The EUT operating at 2.4 GHz ISM band. Frequency Range scanned from 30 MHz to 25 GHz.

Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11b and 802.11g continuously transmitting mode. The worst case occurred at 802.11b Tx channel 1.

EUT : GLM-100
Worst Case : 802.11b Tx at channel 1

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	98.870	QP	7.38	24.45	31.82	43.50	-11.68
V	198.780	QP	12.00	19.44	31.44	43.50	-12.06
V	320.030	QP	14.10	10.32	24.42	46.00	-21.58
V	339.430	QP	14.98	12.35	27.33	46.00	-18.67
V	431.580	QP	17.64	10.63	28.27	46.00	-17.73
V	565.440	QP	19.53	11.41	30.94	46.00	-15.06
H	132.820	QP	12.32	21.82	34.14	43.50	-9.36
H	320.030	QP	14.32	21.42	35.73	46.00	-10.27
H	359.800	QP	15.48	15.12	30.59	46.00	-15.41
H	450.010	QP	18.16	12.89	31.05	46.00	-14.95
H	530.520	QP	19.65	10.20	29.85	46.00	-16.15
H	565.440	QP	19.72	10.43	30.15	46.00	-15.85

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

Measurement results: frequency above 1GHz

EUT : GLM-100
Test Condition : 802.11b Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824.00	PK	V	35.10	38.54	41.13	44.57	54	-9.43
4824.00	PK	H	35.10	38.54	43.89	47.33	54	-6.67

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : GLM-100
Test Condition : 802.11b Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.10	38.54	44.49	47.93	54	-6.07
4874.00	PK	H	35.10	38.54	47.37	50.81	54	-3.19

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : GLM-100
Test Condition : 802.11b Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924.00	PK	V	35.10	38.54	45.26	48.70	54	-5.30
4924.00	PK	H	35.10	38.54	45.04	48.48	54	-5.52

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : GLM-100
Test Condition : 802.11g Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824.00	PK	V	35.10	38.54	38.52	41.96	54	-12.04
4824.00	PK	H	35.10	38.54	37.37	40.81	54	-13.19

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : GLM-100
Test Condition : 802.11g Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.10	38.54	39.39	42.83	54	-11.17
4874.00	PK	H	35.10	38.54	38.11	41.55	54	-12.45

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : GLM-100
Test Condition : 802.11g Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924.00	PK	V	35.10	38.54	37.98	41.42	54	-12.58
4924.00	PK	H	35.10	38.54	38.46	41.90	54	-12.10

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

5. Emission on Band Edge

Name of Test	Emission Band Edge
Base Standard	FCC 15.247(d)

Test Result: Complies

Measurement Data: See Tables & plots below

Method of Measurement:

Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were invested cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report.

Note: The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

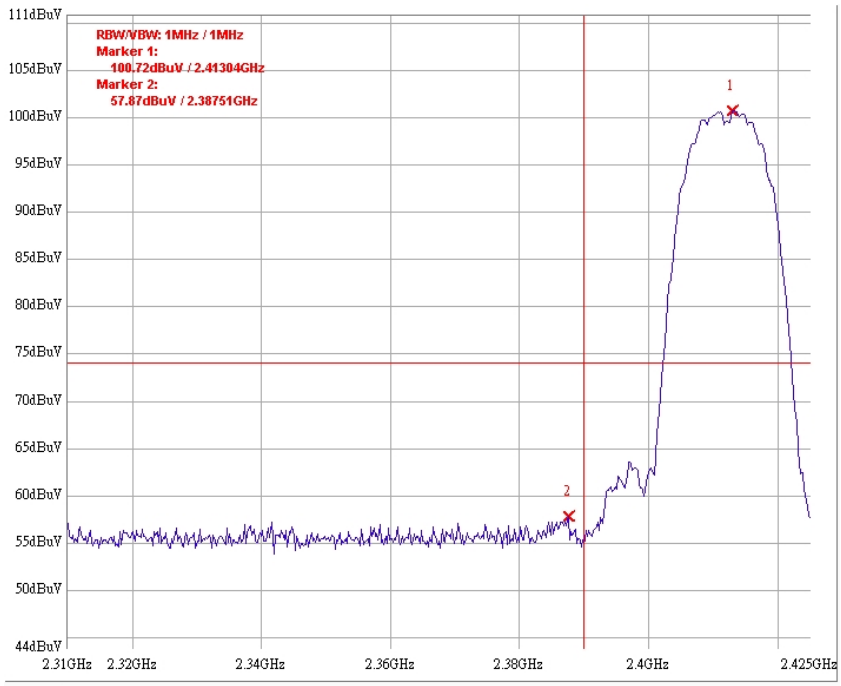
Test Mode: 802.11b mode

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	57.87	74	-16.13
		AV	47.38	54	-6.62
11 (highest)	2483.5-2500	PK	58.28	74	-15.72
		AV	46.78	54	-7.22

Test Mode: 802.11g mode

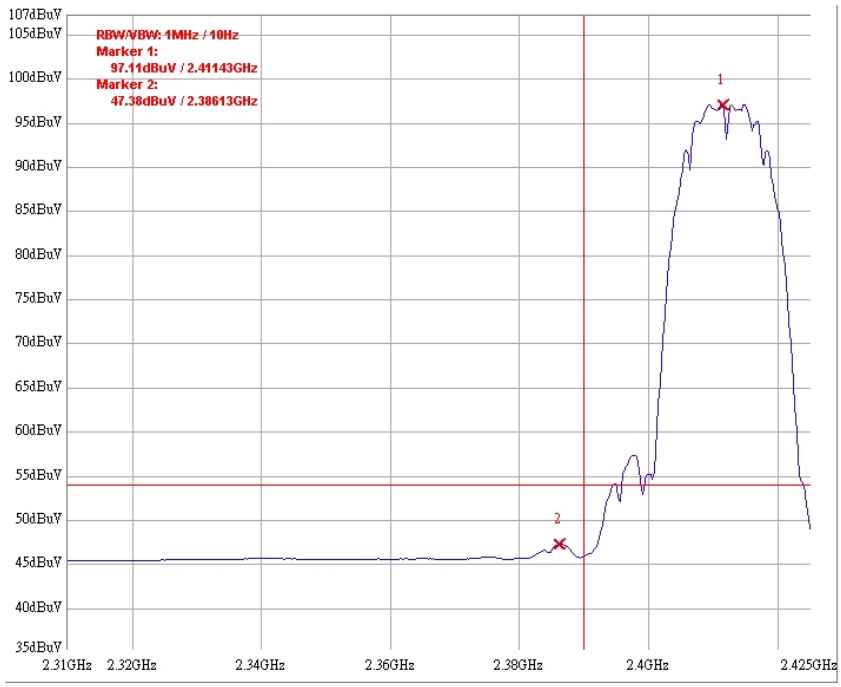
Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	57.62	74	-16.38
		AV	45.83	54	-8.17
11 (highest)	2483.5-2500	PK	57.59	74	-16.41
		AV	46.13	54	-7.87

Band edge @ 802.11b mode channel 1 PK



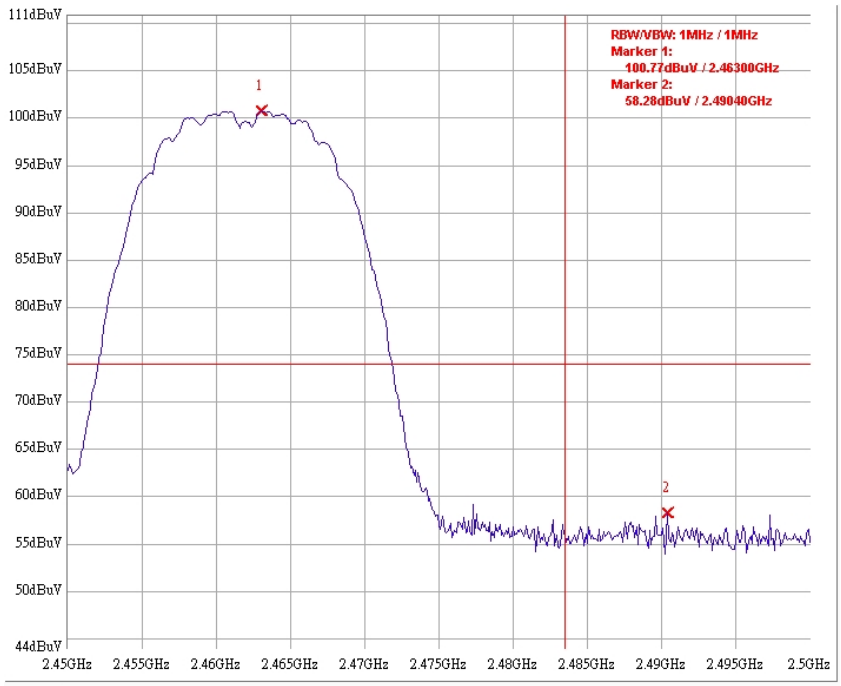
Band-edge
11b ch1
PK
sweep time:5ms

Band edge @ 802.11b mode channel 1 AV

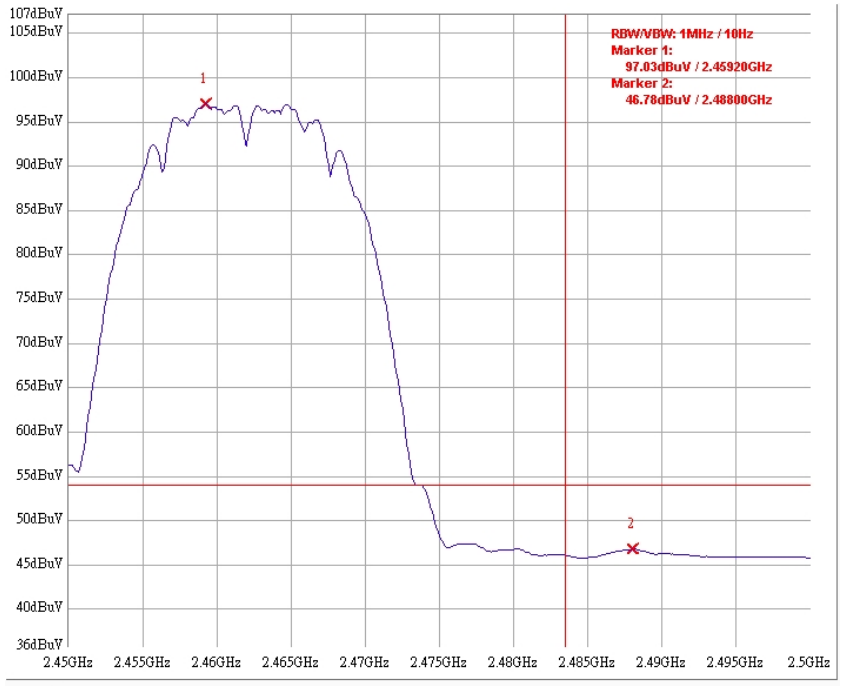


Band-edge
11b ch1
AV
sweep time:29S

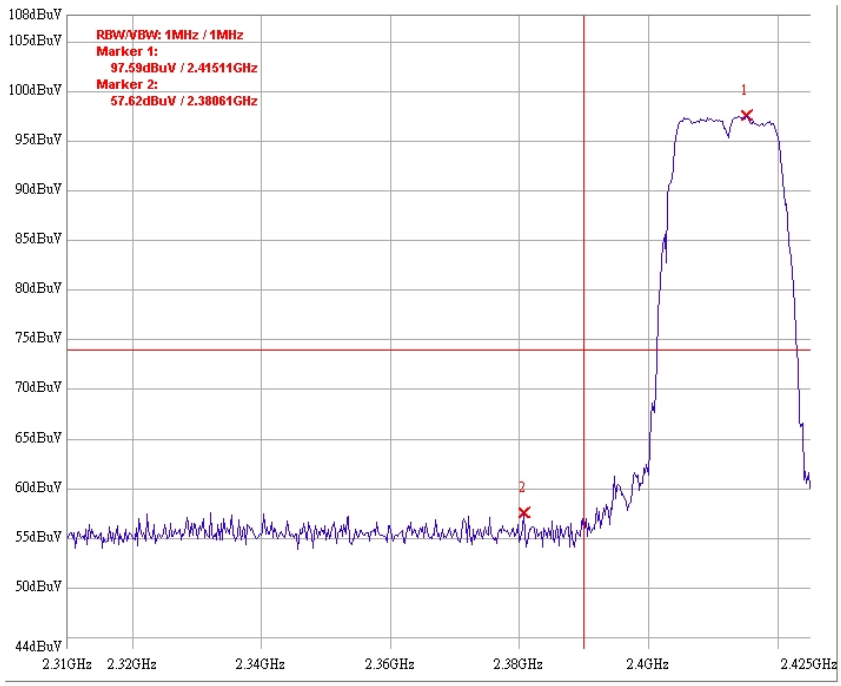
Band edge @ 802.11b mode channel 11 PK



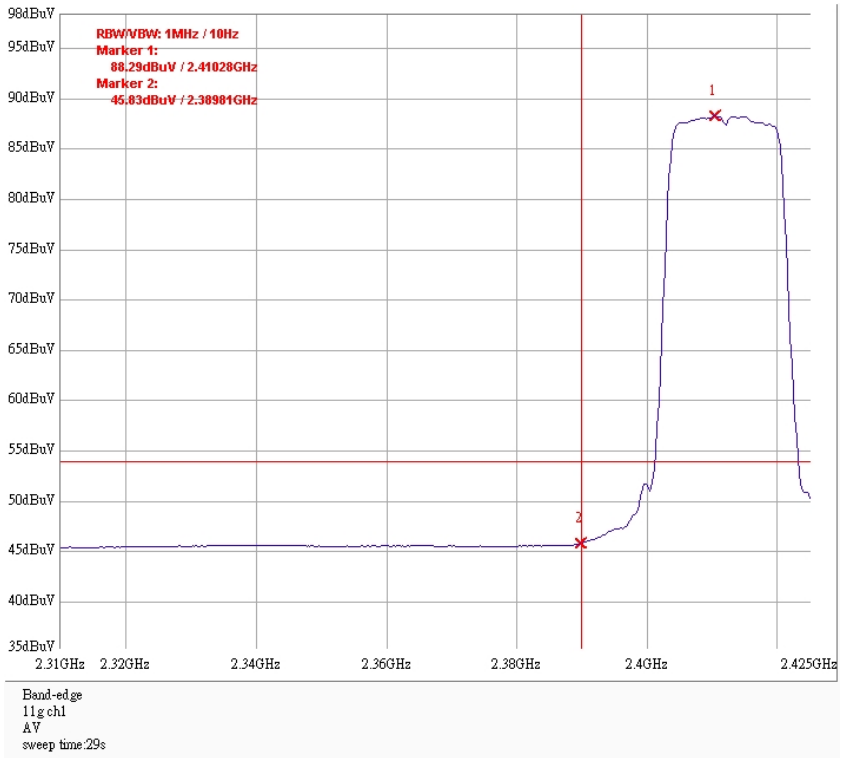
Band edge @ 802.11b mode channel 11 AV



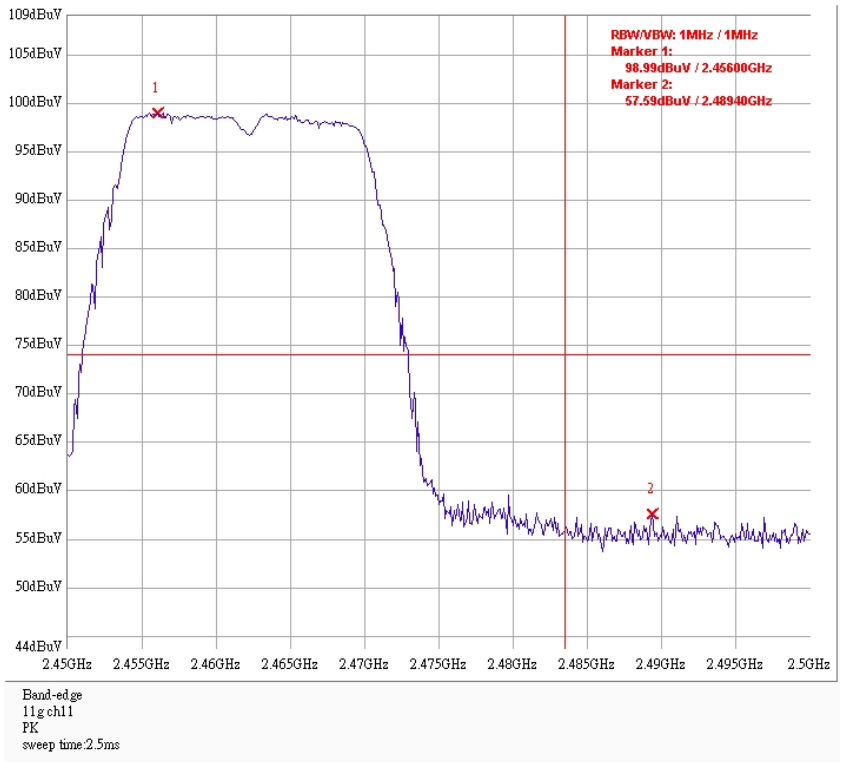
Band edge @ 802.11g mode channel 1 PK



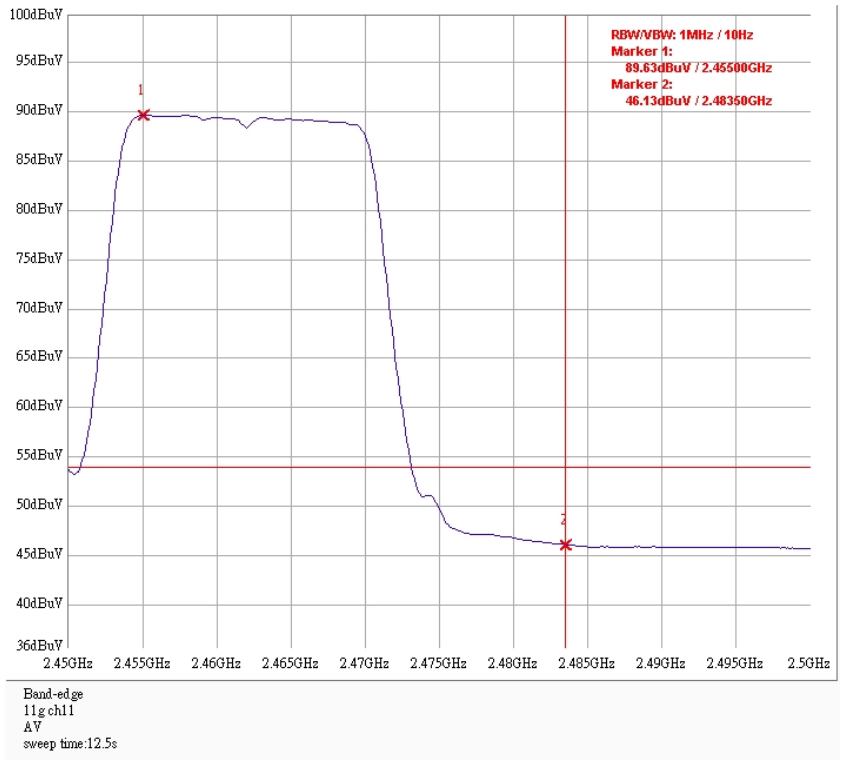
Band edge @ 802.11g mode channel 1 AV



Band edge @ 802.11g mode channel 11 PK



Band edge @ 802.11g mode channel 11 AV



Appendix A: Test Equipment List

Equipment	Brand	Model No.
EMI Test Receiver	Rohde & Schwarz	ESCS 30
Spectrum Analyzer	Rohde & Schwarz	FSP 30
Spectrum Analyzer	Rohde & Schwarz	FSEK 30
Signal Generator	Rohde & Schwarz	SMR27
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Horn Antenna	SCHWARZBECK	BBHA 9170
Bilog Antenna	SCHWARZBECK	VULB 9168
Pre-Amplifier	MITEQ	919981
Pre-Amplifier	MITEQ	828825
Controller	HDGmbH	CM 100
Antenna Tower	HDGmbH	MA 2400
LISN	Rohde & Schwarz	ESH3-Z5
Wideband Peak Power Meter/ Sensor	Anritsu	ML2487A/ MA2491A

Note: 1. The above equipments are within the valid calibration period.
2. The test antennas (receiving antenna) are calibration per 3 years.

Measurement Uncertainty:

Measurement uncertainty was calculated in accordance with NAMAS NIS 81.

Parameter	Uncertainty
Radiated Emission	±4.98 dB
Conducted Emission	±2.6 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.