

EMC TEST REPORT

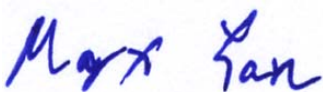
Report No. : EME-060654/01
Model No. : G-620H, 401545
Issued Date : Jul. 25, 2007

Applicant : ZyXEL Communications Corporation
No. 6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
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Project Engineer



Marx Yan

Reviewed By



Kevin Chen



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Summary of Tests

**802.11g Wireless High Power Mini-PCI Card-Model: G-620H
FCC ID: I88G620H**

Test	Reference	Results
Radiated Spurious Emission test	15.205, 15.209	Pass
Emission on the Band Edge test	15.247(d)	Pass



1. General information

1.1 Identification of the EUT

Applicant : ZyXEL Communications Corporation
Product : 802.11g Wireless High Power Mini-PCI Card
Model No. : G-620H
FCC ID. : I88G620H
Frequency Range : 2412MHz ~ 2462MHz
Channel Number : 11 channels
Frequency of Each Channel : 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation : DSSS, OFDM
Rated Power : 3.3Vdc
Power Cord : N/A
Sample Received : Jul. 17, 2007
Test Date(s) : Jul. 18, 2007

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The EUT is an 802.11g Wireless High Power Mini-PCI Card, and was defined as information technology equipment.

The model 401545 is identical to model G-620H (EUT), the different model number for different brand serves as marketing strategy.

The EUT meets special requirements for full modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

Since the EUT has changed antenna, the test item must be re-tested Radiated Spurious Emission and Emission on the Band Edge by engineering judgment.

This certification issued Report No. EME-070654/01 has to be deemed as attachment of certification with original Report No. EME-070654

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



1.3 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 : 1.8dBi max
- Antenna Type : Dipole antenna
- Connector Type : SMC Plug Reverse

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Notebook PC	Toshiba	PS240T-00UHY	920435010J	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205, §15.207, §15.209, §15.247 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

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

Plug the EUT into Notebook PC via USB interface, then turn on the Notebook PC power and run the test program “ZD121EVLTOOL” under windows OS, which provide by manufacturer.

The EUT was transmitted continuously during the test.

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

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/16/2008
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	08/06/2007
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/22/2008
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/31/2007
Horn Antenna	SCHWARZBECK	1GHz~18GHz	BBHA 9120 D	EC371	12/22/2007
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/07/2008
Bilog Antenna	SCHWARZBECK	25MHz~2GHz	VULB 9168	EC347	12/23/2007
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	02/10/2008
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/ MA2491A	EC396	11/09/2007
Controller	HDGmbH	N/A	CM 100	EP346	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP347	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/12/2008

Note: 1. The above equipments are within the valid calibration period.

2. The test antennas (receiving antenna) are calibration per 3 years.

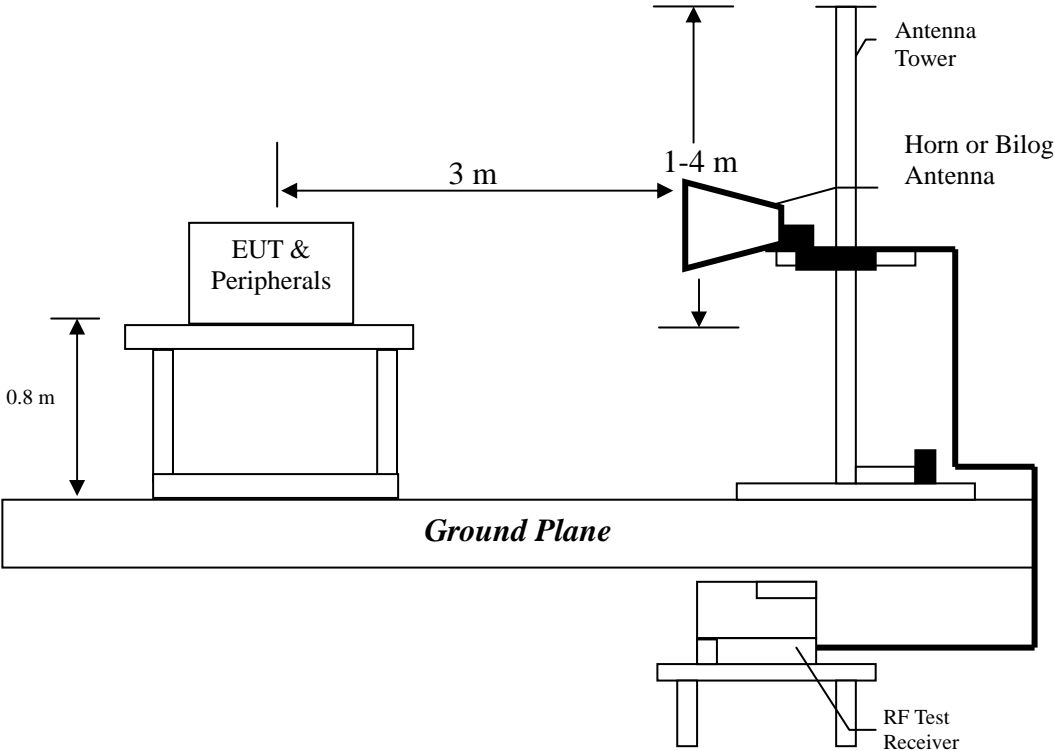
3. Radiated Emission test

3.1 Operating environment

Temperature: 23
Relative Humidity: 56 %
Atmospheric Pressure: 1023 hPa

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz 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 meter reading using inverse scaling with distance.

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

3.3 Emission limits

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 (dB μ V/m@3m)
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

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is 4.98 dB.



3.4 Radiated spurious emission test data

The radiated spurious emissions at

Frequency(MHz)	Margin
165.800	-2.05
365.620	-3.22

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

3.4.1 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. Channel 1, 6, 11 were verified. The worst case occurred at 802.11b Tx channel 1.

EUT : G-620H
 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	28.59	35.97	43.50	-7.54
V	165.800	QP	15.70	20.42	36.12	43.50	-7.38
V	364.650	QP	15.06	20.17	35.23	46.00	-10.77
V	399.570	QP	16.40	14.35	30.75	46.00	-15.25
V	566.410	QP	19.53	11.22	30.75	46.00	-15.25
V	599.390	QP	20.71	14.91	35.62	46.00	-10.38
H	165.800	QP	13.84	27.62	41.46	43.50	-2.05
H	298.690	QP	14.17	21.59	35.76	46.00	-10.25
H	365.620	QP	15.48	27.30	42.78	46.00	-3.22
H	399.570	QP	16.74	23.55	40.29	46.00	-5.71
H	599.390	QP	20.84	13.49	34.33	46.00	-11.68
H	799.210	QP	23.52	12.55	36.07	46.00	-9.93

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



3.4.2 Measurement results: frequency above 1GHz

EUT : G-620H
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	36.07	37.77	47.66	49.36	54	-4.64

Remark:

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

Noise floor level is :

For PK:
 1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:
 1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV



EUT : G-620H
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	36.07	37.77	46.39	48.09	54	-5.91
9750.00	PK	V	34.28	48.31	39.79	53.82	54	-0.18
8010.00	PK	H	36.75	46.12	43.61	52.98	54	-1.02

Remark:

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

Noise floor level is:

For PK:
 1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:
 1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV

EUT : G-620H
Test Condition : 802.11b Tx at channel 11

No spurious emission was found above the spectrum analyzer's noise floor

Noise floor level is:

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV



EUT : G-620H
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	36.07	37.77	44.72	46.42	54	-7.58

Remark:

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

Noise floor level is :

For PK:
 1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:
 1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV



EUT : G-620H
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	36.07	37.77	46.55	48.25	54	-5.75
7320.00	PK	V	36.18	43.97	45.06	52.85	54	-1.15
9750.00	PK	V	34.28	48.31	39.96	53.99	54	-0.01

Remark:

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

Noise floor level is:

For PK:
 1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:
 1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV

EUT : G-620H

Test Condition : 802.11g Tx at channel 11

No spurious emission was found above the spectrum analyzer's noise floor

Noise floor level is:

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV



4. Emission on the band edge

In any 100kHz bandwidth outside the frequency band 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.

4.1 Operating environment

Temperature: 23
Relative Humidity: 55 %
Atmospheric Pressure 1023 hPa

4.2 Test setup & procedure

The output of EUT was connected to spectrum analyzer via a 50ohm cable.

The setting of spectrum analyzer is:

Peak: RBW = 100kHz ; VBW = 100kHz
Average: RBW = 1MHz ; VBW = 10Hz



4.3 Test Result

Test Mode: 802.11b operating mode

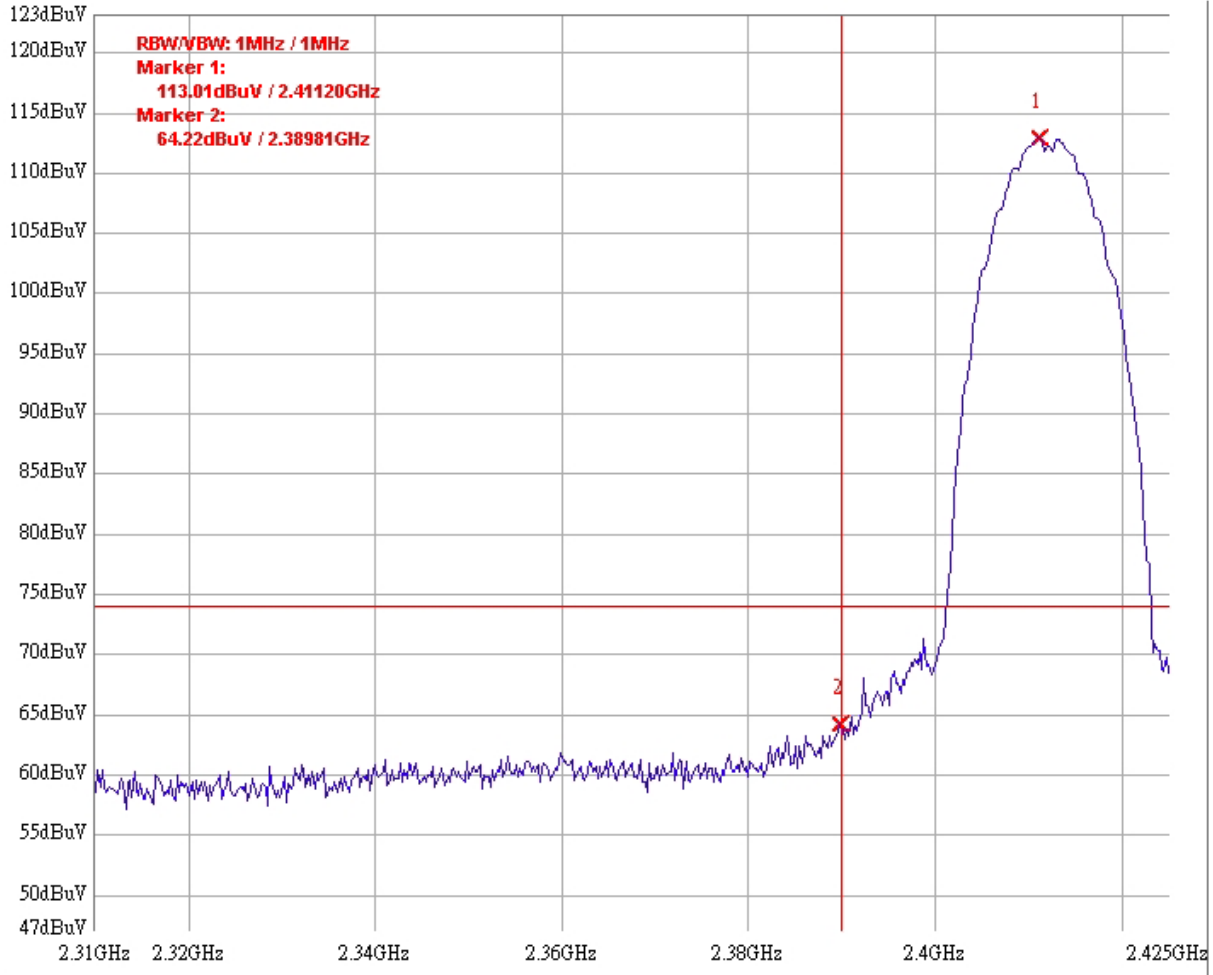
Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	64.22	74	-9.78
		AV	52.74	54	-1.26
11 (highest)	2483.5-2500	PK	63.52	74	-10.48
		AV	52.06	54	-1.94

Test Mode: 802.11g operating 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	68.66	74	-5.34
		AV	53.72	54	-0.28
11 (highest)	2483.5-2500	PK	65.75	74	-8.25
		AV	53.11	54	-0.89

4.3.1 Radiated Method

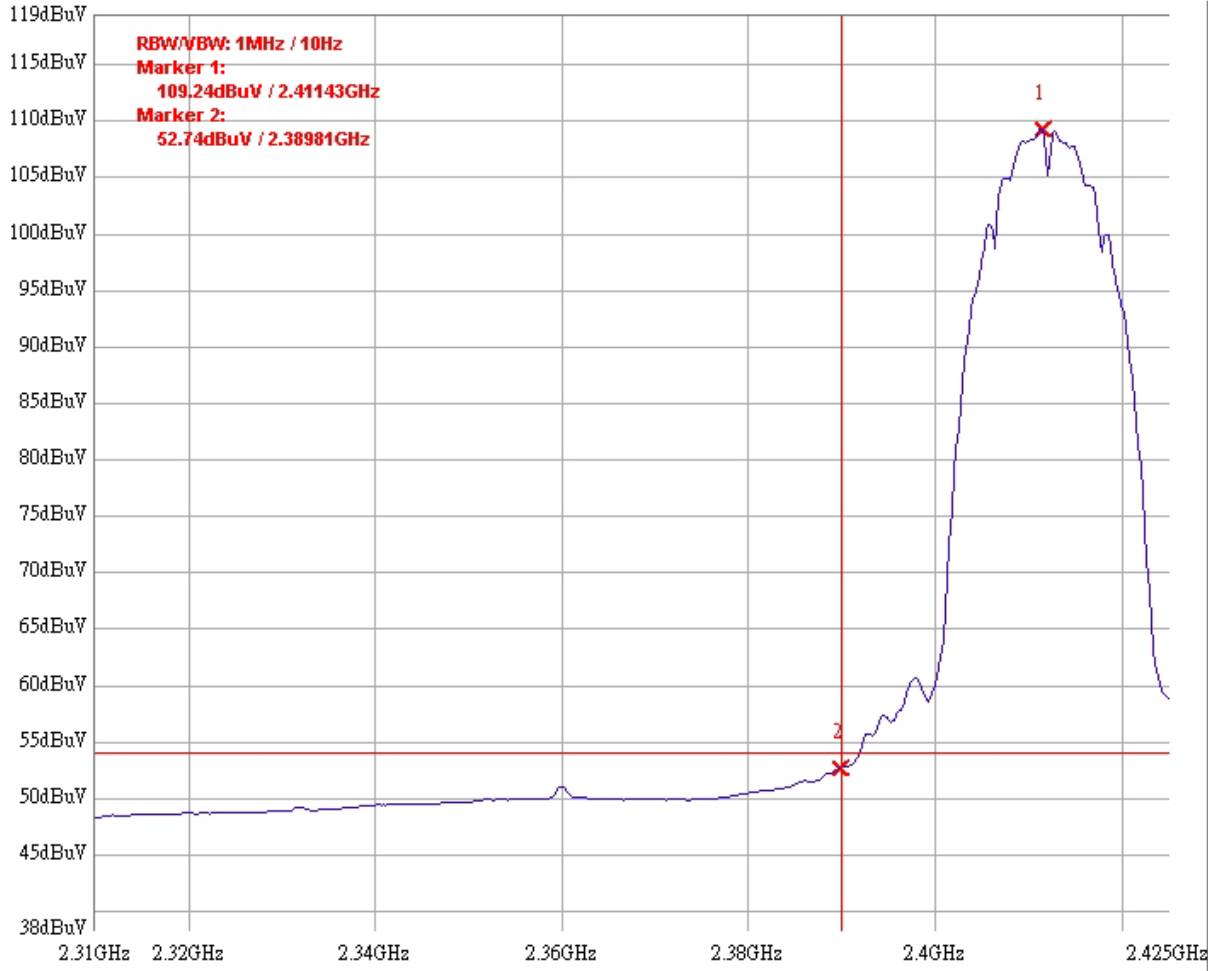
802.11b mode CH1 PK



band-edge
11b ch1
PK



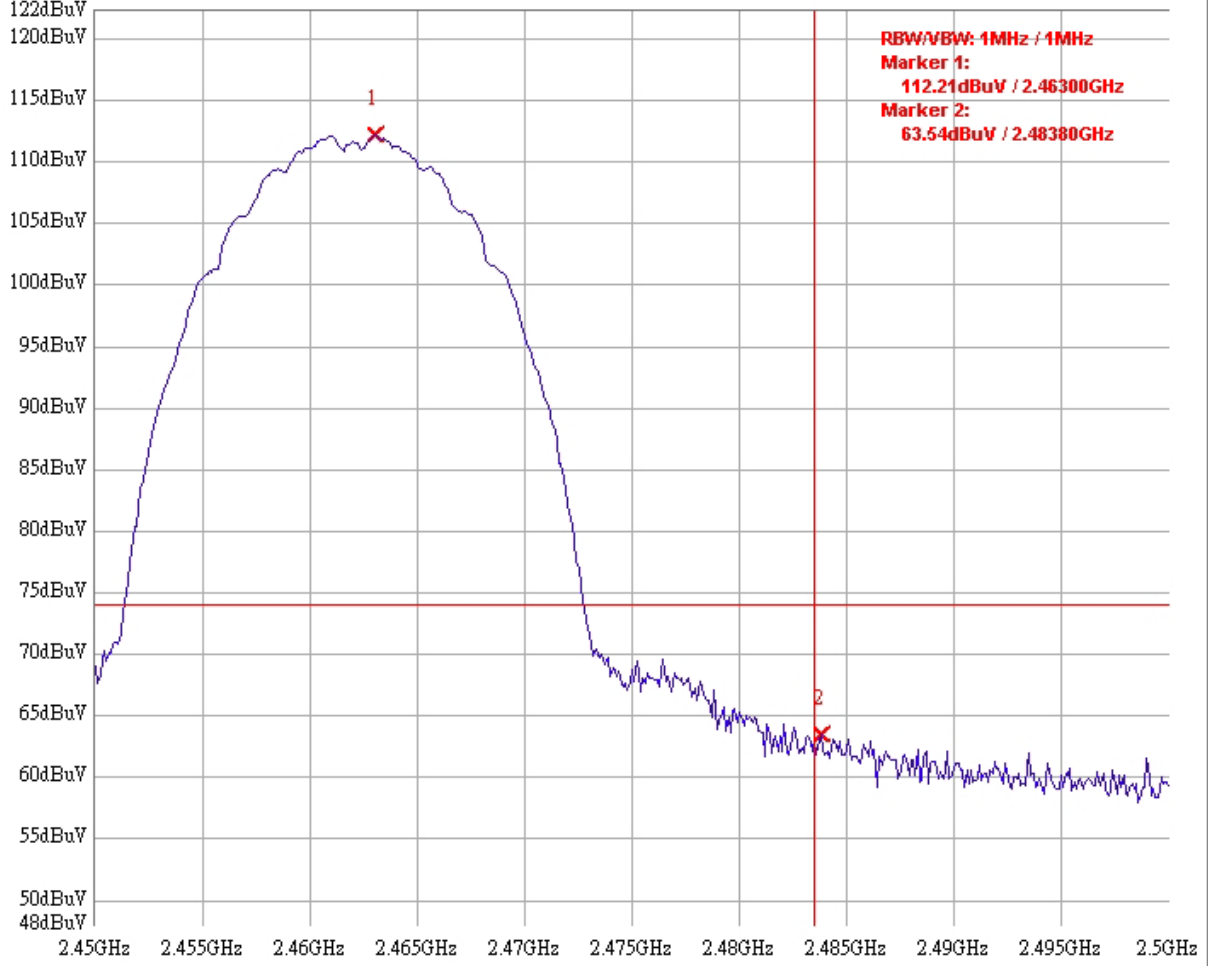
802.11b mode CH1 AV



band-edge
11b ch1
AV



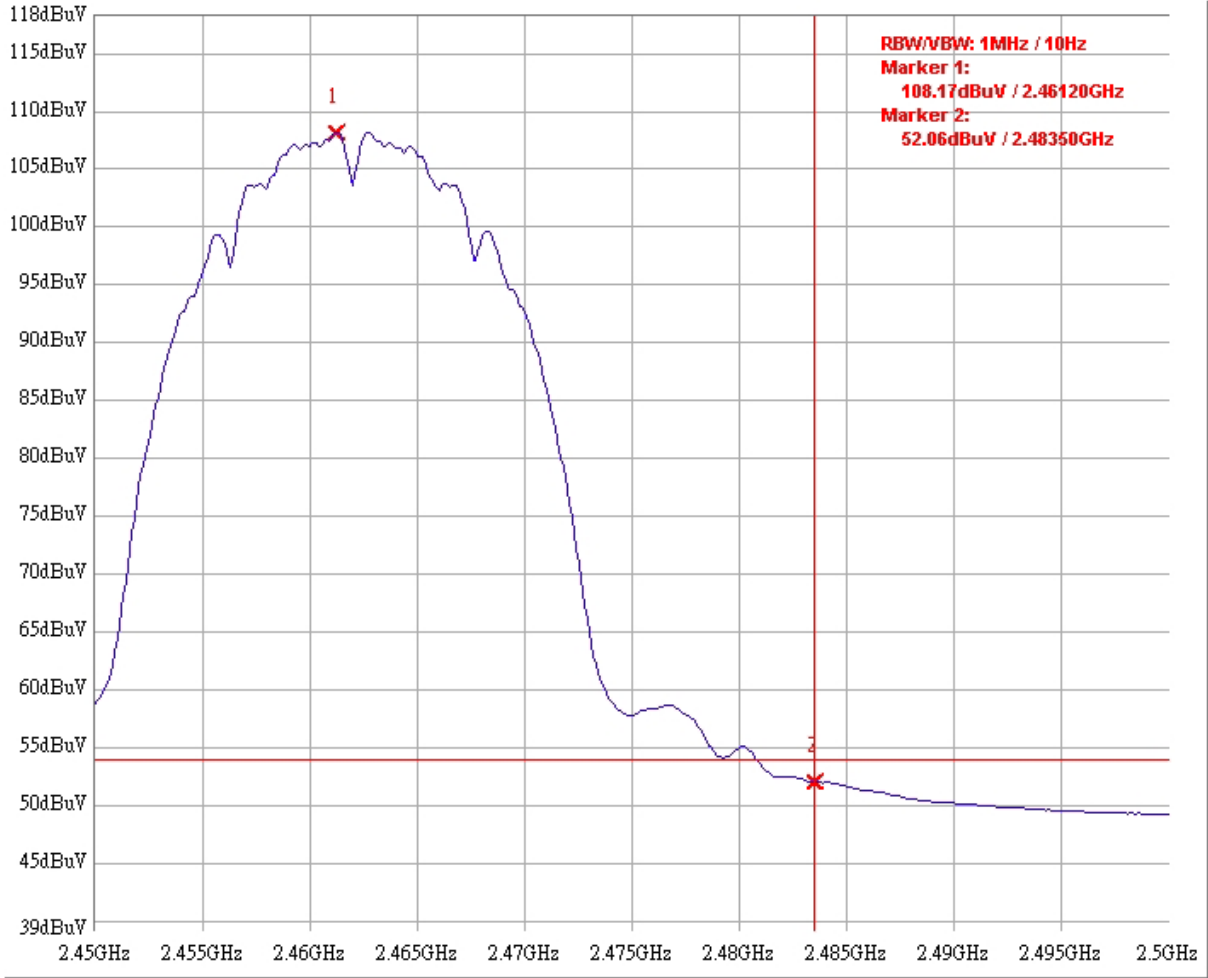
802.11b mode CH11 PK



band-edge
11b ch11
PK



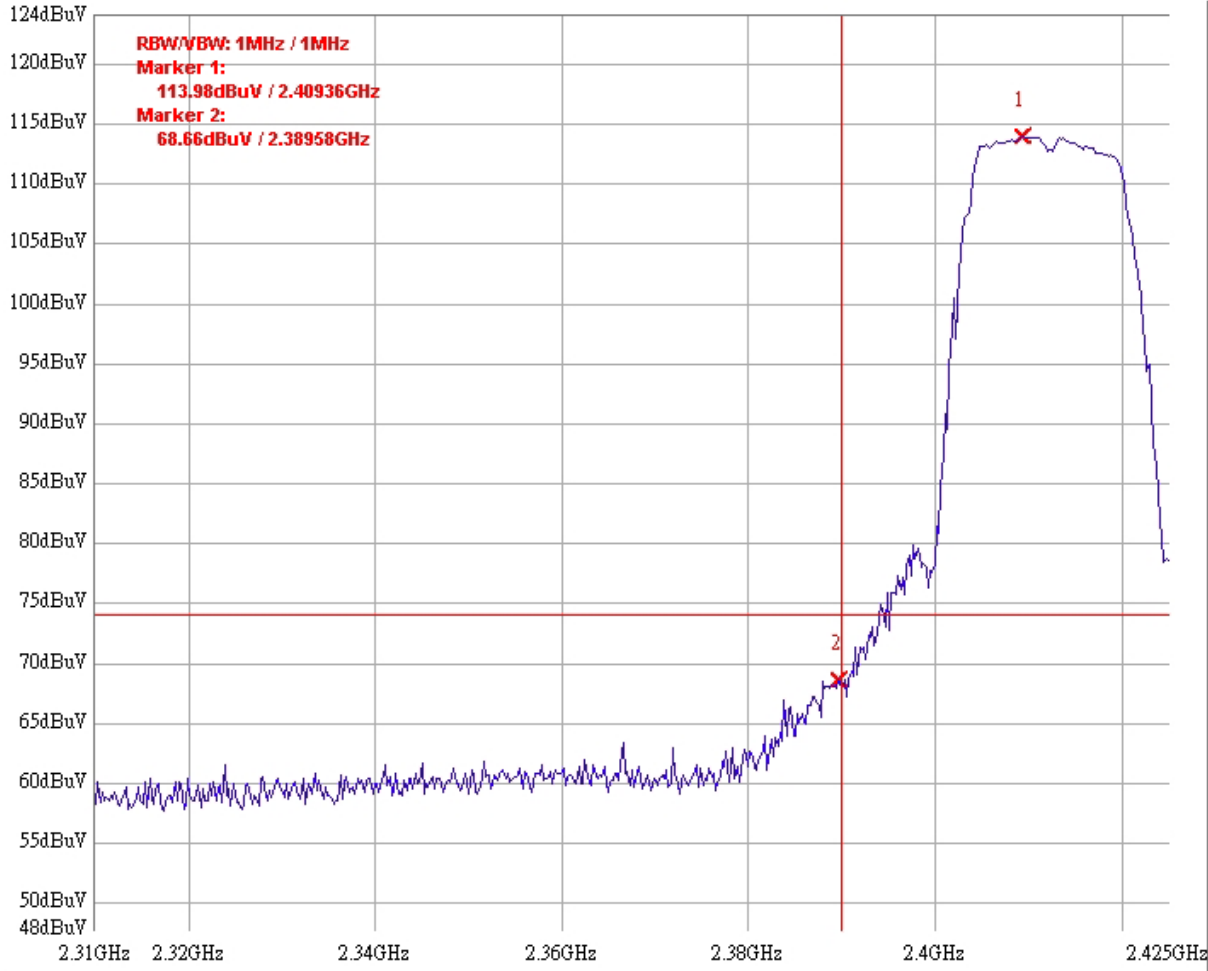
802.11b mode CH11 AV



band-edge
11b ch11
AV



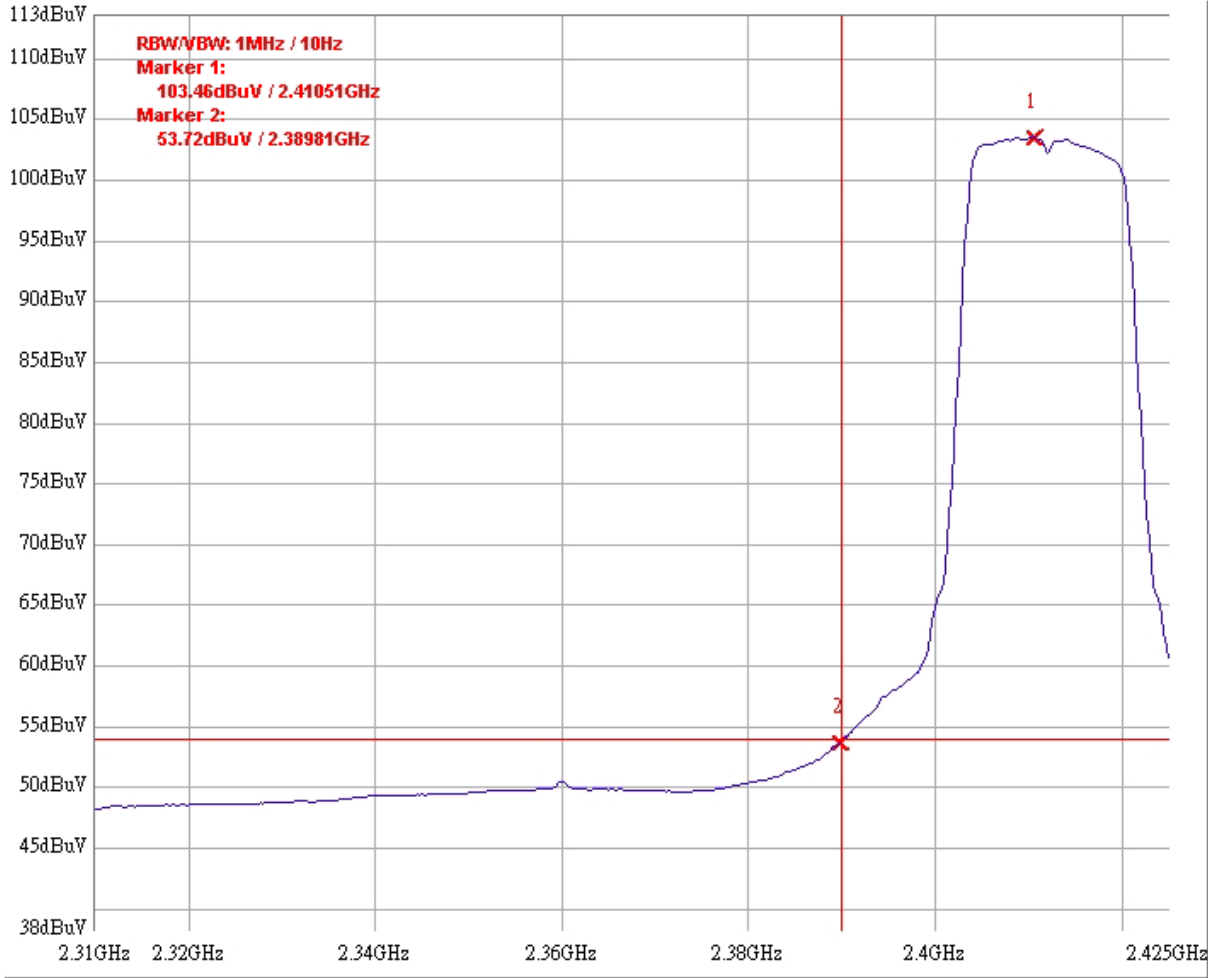
802.11g mode CH1 PK



band-edge
11g ch1
PK



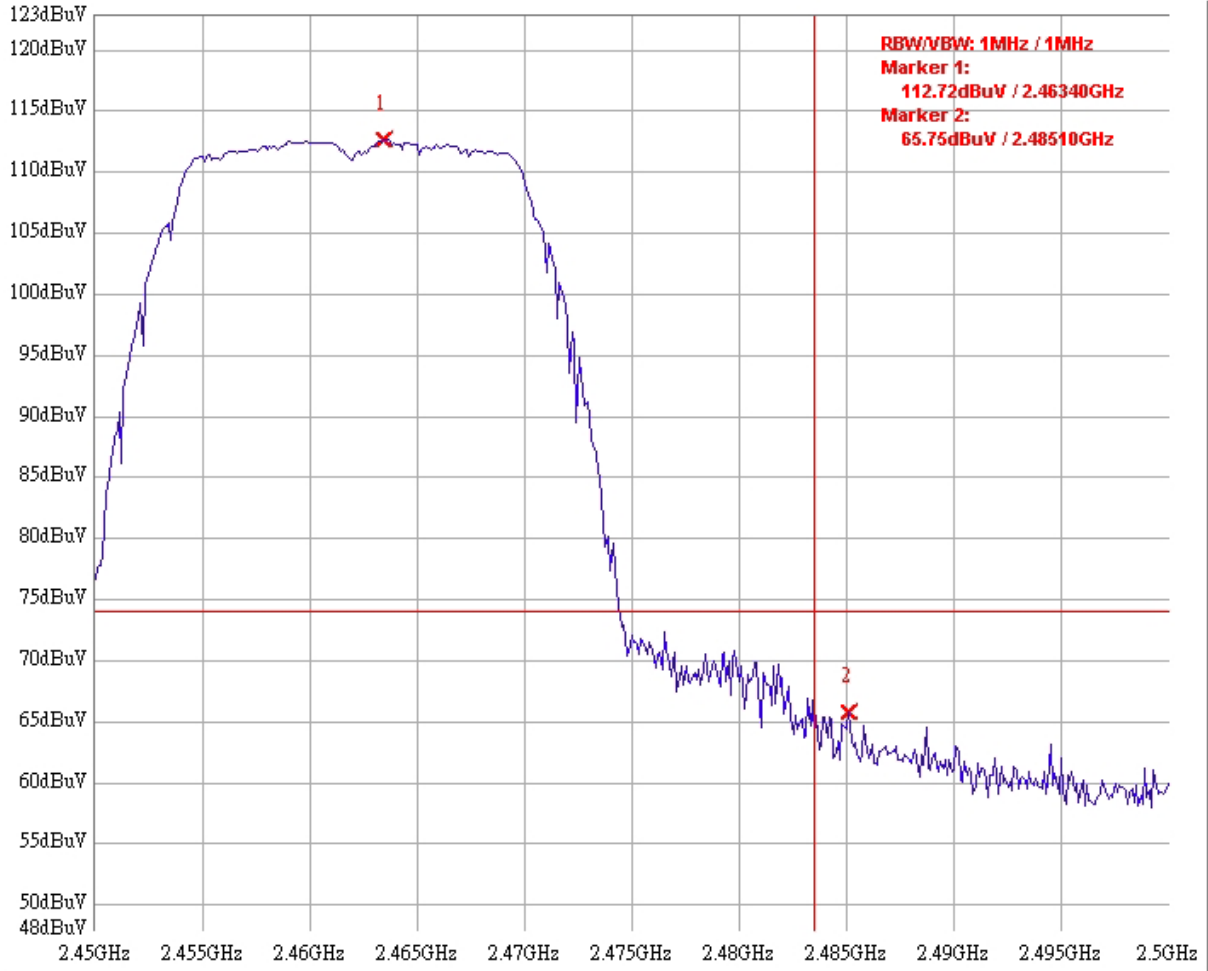
802.11g mode CH1 AV



band-edge
11g ch1
AV



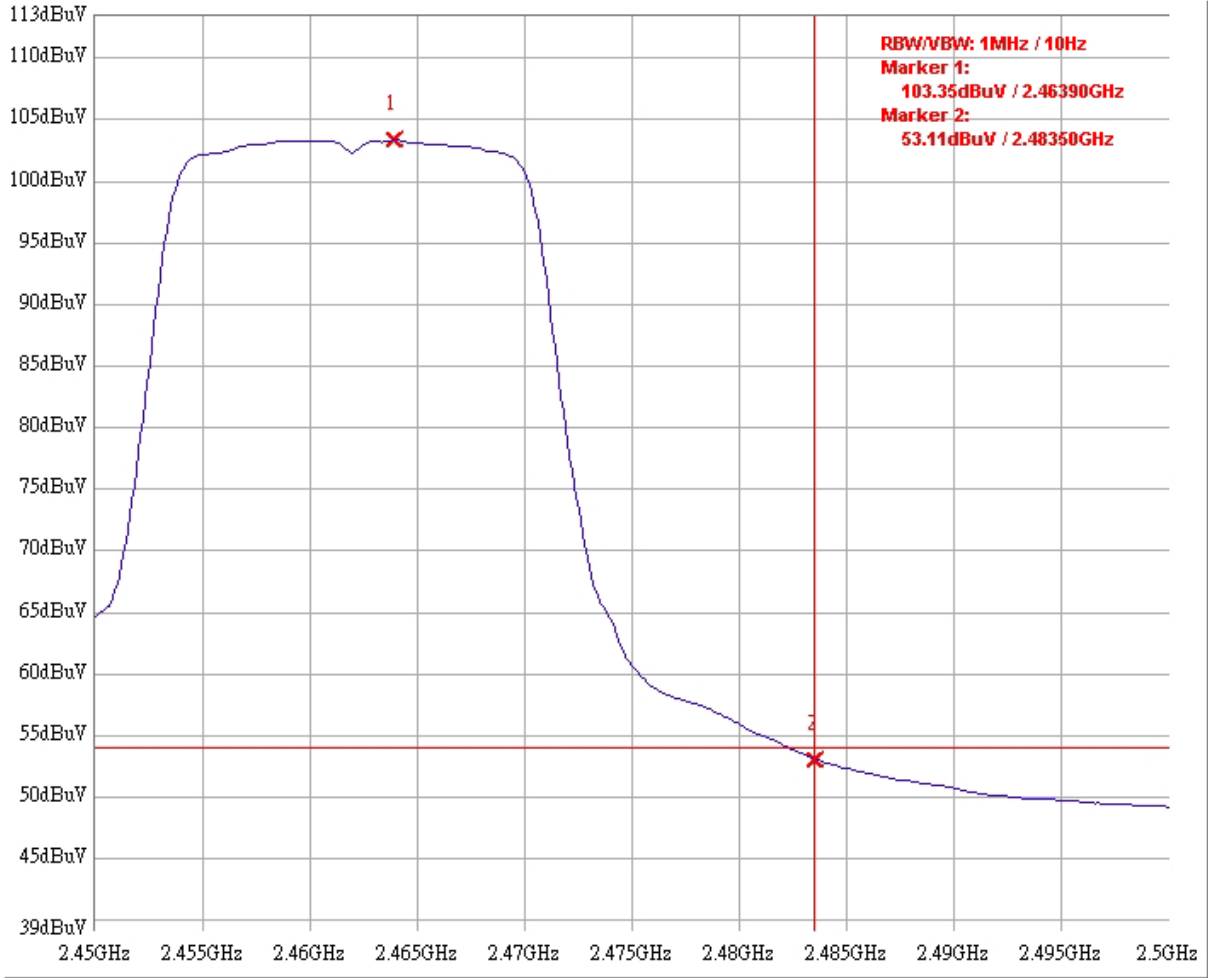
802.11g mode CH11 PK



band-edge
11g ch11
PK



802.11g mode CH11 AV



band-edge
11g ch11
AV