



## FCC 47 CFR PART 15 SUBPART C

### TEST REPORT

For

**802.11abg mini PCI**

**Model: JA25MPX**

**Trade Name: JJplus**

*Issued to*

**JJPlus Corporation**  
**11F, No, 780, Chung Cheng Rd.,**  
**Chung Ho City, Taipei 235, Taiwan**

*Issued by*

**Compliance Certification Services Inc.**  
**No. 11, Wu-Gong 6<sup>th</sup> Rd., Wugu Industrial Park,**  
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# 1. TEST RESULT CERTIFICATION

**Applicant:** JJPlus Corporation  
 11F, No, 780, Chung Cheng Rd.,  
 Chung Ho City, Taipei 235, Taiwan

**Equipment Under Test:** 802.11abg mini PCI

**Trade Name:** JJplus

**Model:** JA25MPX

**Date of Test:** March 19 ~ July 13, 2009

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:

Reviewed by:

*Rex Lai*

*Gina Lo*

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Rex Lai  
 Section Manager  
 Compliance Certification Services Inc.

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Gina Lo  
 Section Manager  
 Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	802.11abg mini PCI
<b>Trade Name</b>	JJplus
<b>Model Number</b>	JA25MPX
<b>Module Trade Name</b>	Atheros
<b>Module Model Number</b>	AR5414
<b>Power Supply</b>	DC 3.3V powered from host device
<b>Frequency Range</b>	IEEE 802.11a: 5725 ~ 5850MHz IEEE 802.11b/g: 2400 ~ 2483.5 MHz
<b>Operating frequency</b>	IEEE 802.11a: 5745~5825 MHz IEEE 802.11b/g: 2412~2462 MHz
<b>Transmit Power</b>	IEEE 802.11a: 29.45 dBm IEEE 802.11b: 24.18 dBm IEEE 802.11g: 29.45 dBm
<b>Modulation Technique</b>	IEEE 802.11a: OFDM (QPSK, BPSK, 16-QAM, 64-QAM) IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
<b>Number of Channels</b>	IEEE 802.11a: 5 Channels IEEE 802.11b/g: 11 Channels
<b>Antenna Specification</b>	IEEE 802.11a: 2 dBi IEEE 802.11b/g: 0 dBi
<b>Antenna Designation</b>	IEEE 802.11a/b/g: Dipole Antenna

**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: **W23-JA25MPN** 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: 2003 and FCC CFR 47 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: 2003 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: 2003.



### 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

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

<sup>2</sup> Above 38.6

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



### **3.5 DESCRIPTION OF TEST MODES**

The EUT (model: JA25MPX) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed. The worst case data rate is determined as the data rate with highest output power.

Test program 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 802.11a mode:

Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 54Mbps data rate were chosen for full testing.

IEEE 802.11b mode:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE 802.11g mode:

Channel Low(2412MHz), Channel Mid(2437MHz) and Channel High(2462MHz) with 54Mbps 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	01/23/2010
Peak Power Meter	ANRITSU & Wideband	ML2487A	6K00001783	05/13/2010
Wide Bandwidth Sensor	ANRITSU & Wideband	MAL2491A	030982	05/13/2010

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	09/10/2009
Test Receiver	Rohde&Schwarz	ESCI	100064	11/29/2009
Switch Controller	TRC	Switch Controller	SC94050010	05/02/2010
4 Port Switch	TRC	4 Port Switch	SC94050020	05/02/2010
Loop Antenna	EMCO	6502	8905/2356	05/28/2010
Horn-Antenna	TRC	HA-0502	06	06/03/2010
Horn-Antenna	TRC	HA-0801	04	06/17/2010
Horn-Antenna	TRC	HA-1201A	01	08/11/2009
Horn-Antenna	TRC	HA-1301A	01	08/11/2009
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/27/2010
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 MRA: TW1039 IC: 2324G-1/-2	10/17/2010 11/04/2010
Test S/W	LABVIEW (V 6.1)			

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver 9kHz-30MHz	Rohde & Schwarz	ESHS30	828144/003	11/18/2009
TWO-Line V-Network 9kHz-30MHz	Schaffner	NNB41	03/10013	06/10/2010
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	04/08/2010
Test S/W	LABVIEW (V 6.1)			





### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 2.81
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	+/-3.7046
3M Semi Anechoic Chamber / Above 1GHz	+/-3.0958

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



## 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	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

\* 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.	Notebook PC	IBM	2672 (X31)	9985H9M	WLAN: ANO20030400LEG Bluetooth: ANO20020100MTN	N/A:	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	LCD Monitor	LG	L17NP-4	503KGXA2K858	BEJL17NU	VGA Cable Shielded, 1.8m with 2 cores	Unshielded, 1.8m
3.	USB 2.0 External HDD	TeraSyS	F12-U	A0100214-2Bq0039	FCC DoC	Shielded, 1.8m	N/A
4.	USB Mouse	Logitech	M-UE58	LZA10752880	FCC DoC	Shielded, 1.8m	N/A
5.	Test Kit	N/A	N/A	N/A	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.

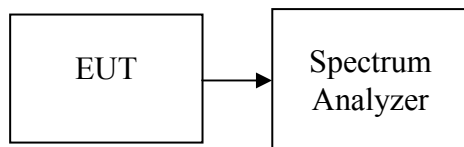
## 7. FCC PART 15.247 REQUIREMENTS

### 7.1 6dB BANDWIDTH

#### LIMIT

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

#### Test Configuration



#### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = RBW, Span = mode: 50MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### TEST RESULTS

*No non-compliance noted*



**Test Data**

**IEEE 802.11b**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	10920	>500	PASS
Mid	2437	10170		PASS
High	2462	11250		PASS

**IEEE 802.11g**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16500	>500	PASS
Mid	2437	16330		PASS
High	2462	16420		PASS

**IEEE 802.11a**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	5745	16170	>500	PASS
Mid	5785	15920		PASS
High	5825	16000		PASS



### Test Plot

### IEEE 802.11b mode

### CH Low

Agilent 10:31:37 Jul 10, 2009

R T

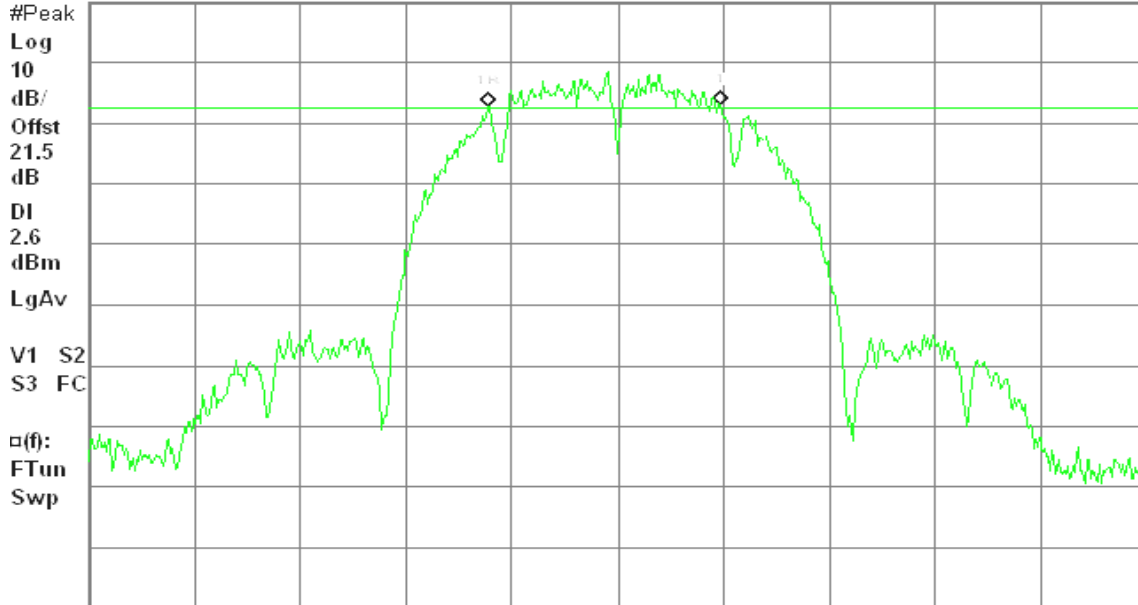
6dB BW, b Mode Low Ch.

Δ Mkr1 10.92 MHz

Ref 20 dBm

Atten 10 dB

0.21 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

### CH Mid

Agilent 10:57:29 Jul 10, 2009

R T

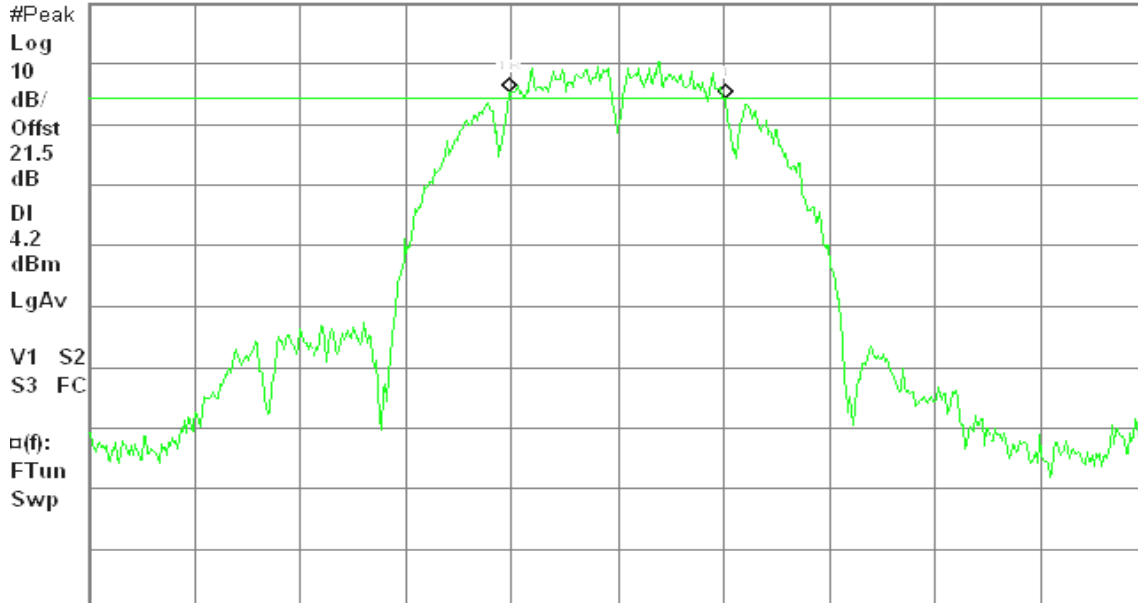
6dB BW, b Mode Mid Ch.

Δ Mkr1 10.17 MHz

Ref 20 dBm

Atten 10 dB

-1.18 dB



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



### CH High

Agilent 11:01:33 Jul 10, 2009

R T

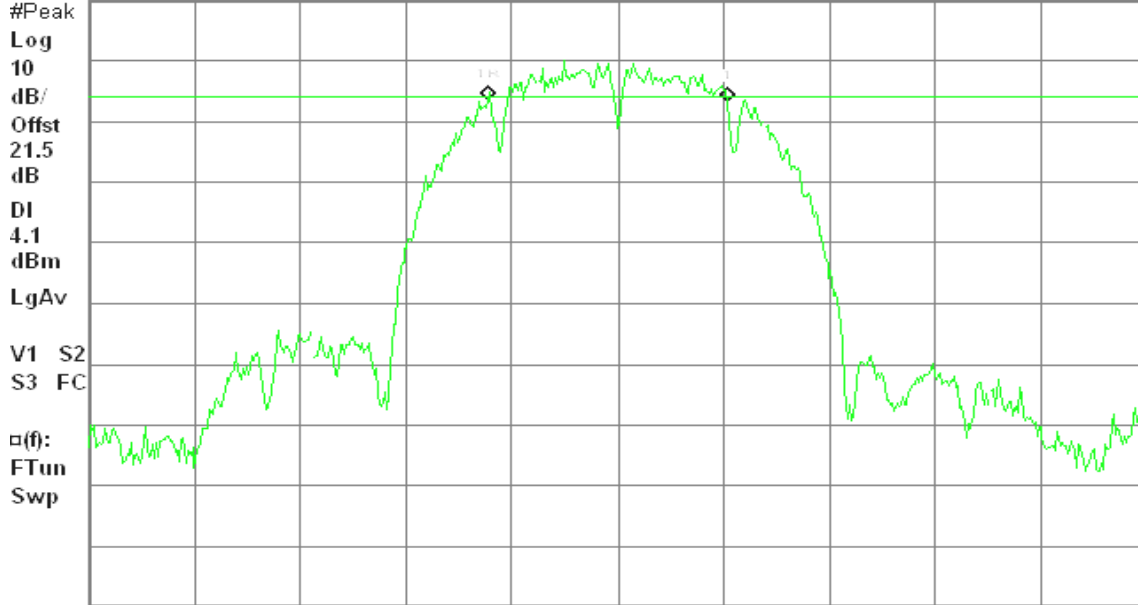
6dB BW, b Mode High Ch.

Δ Mkr1 11.25 MHz

Ref 20 dBm

Atten 10 dB

-0.50 dB



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

### IEEE 802.11g mode

### CH Low

Agilent 11:22:11 Jul 10, 2009

R T

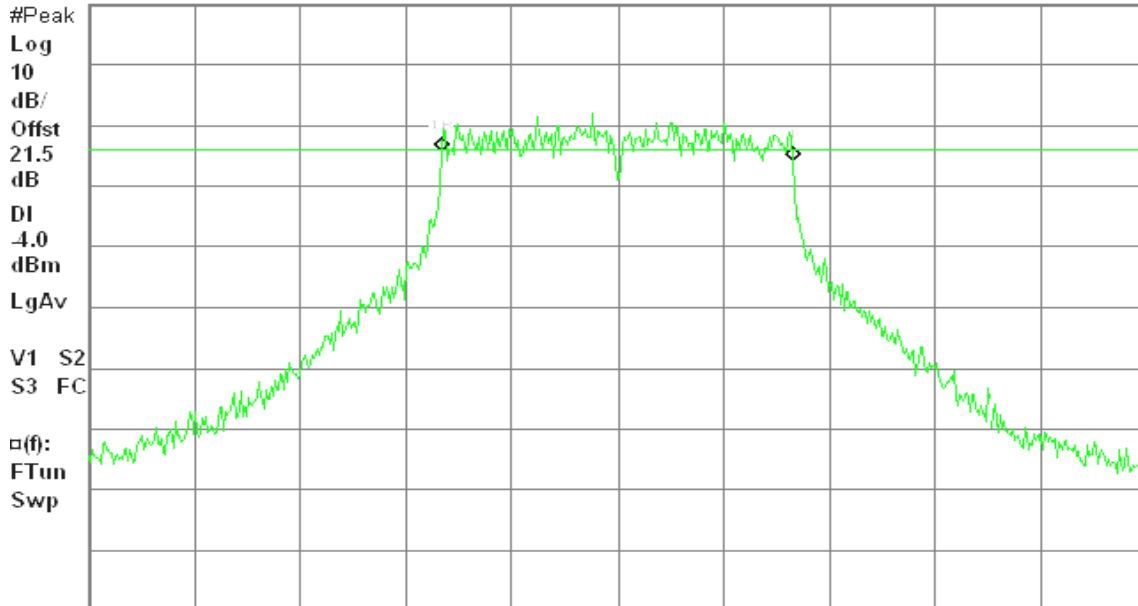
6dB BW, g Mode Low Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 10 dB

-1.62 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)





### CH Mid

Agilent 11:17:26 Jul 10, 2009

R T

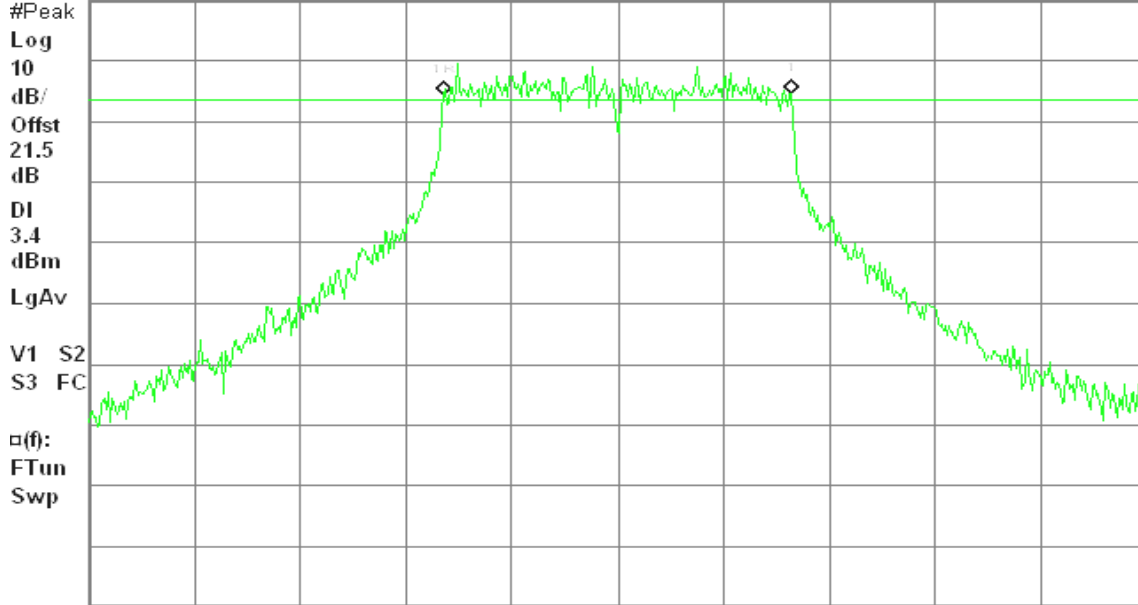
6dB BW, g Mode Mid Ch.

Δ Mkr1 16.33 MHz

Ref 20 dBm

Atten 10 dB

0.45 dB



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

### CH High

Agilent 11:13:27 Jul 10, 2009

R T

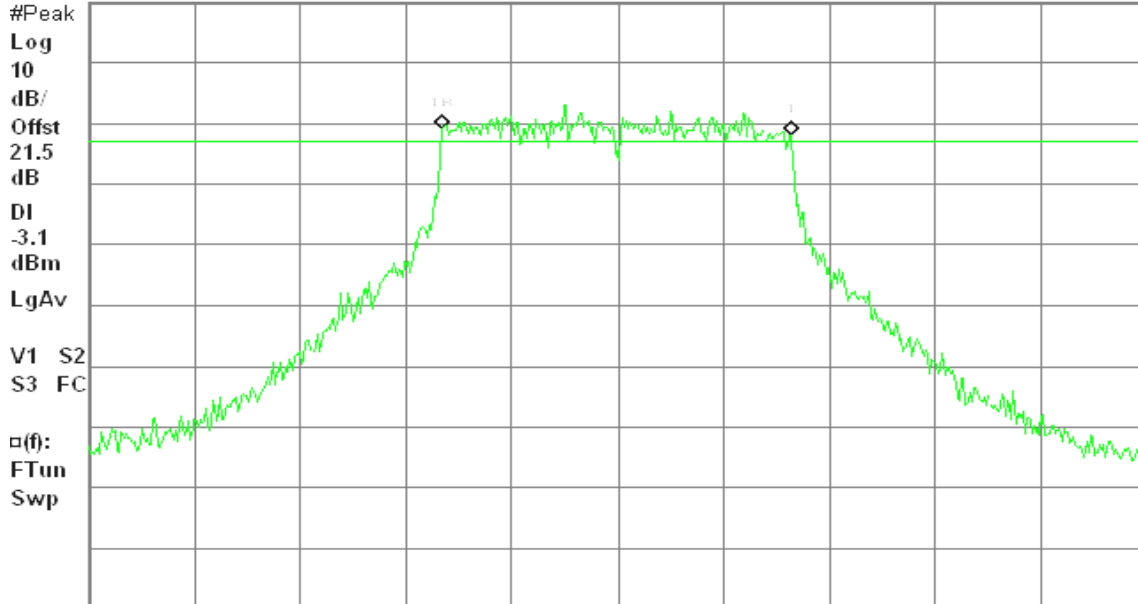
6dB BW, g Mode High Ch.

Δ Mkr1 16.42 MHz

Ref 20 dBm

Atten 10 dB

-1.15 dB



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



### IEEE 802.11a mode

#### CH Low

Agilent 11:40:12 Jul 10, 2009

R T

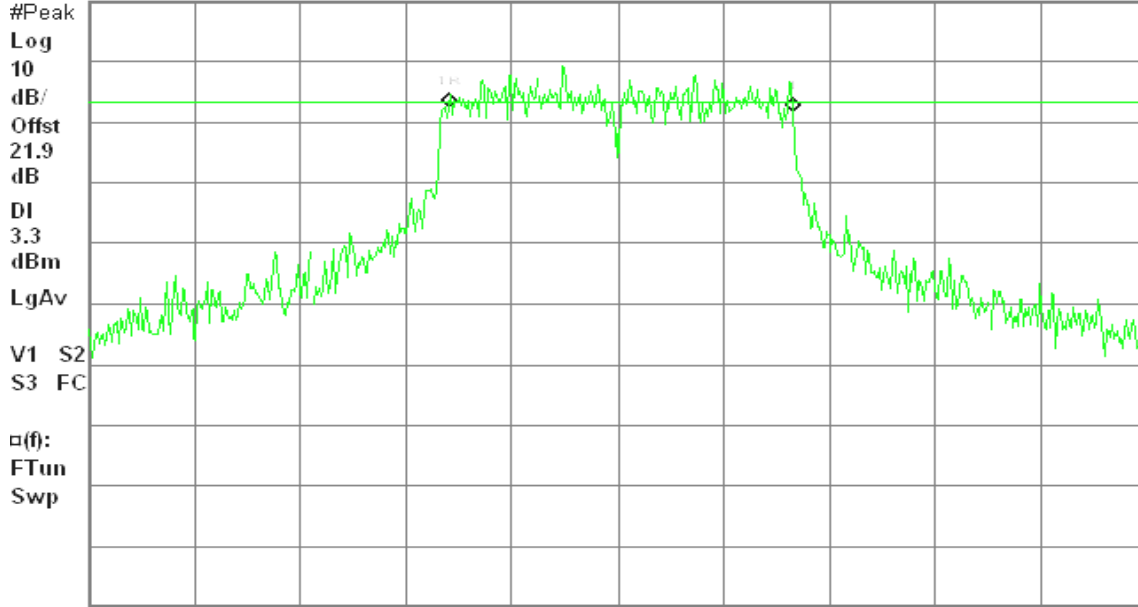
6dB BW, a Mode Low Ch.

Δ Mkr1 16.17 MHz

Ref 20 dBm

Atten 10 dB

-0.76 dB



Center 5.745 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

#### CH Mid

Agilent 11:44:18 Jul 10, 2009

R T

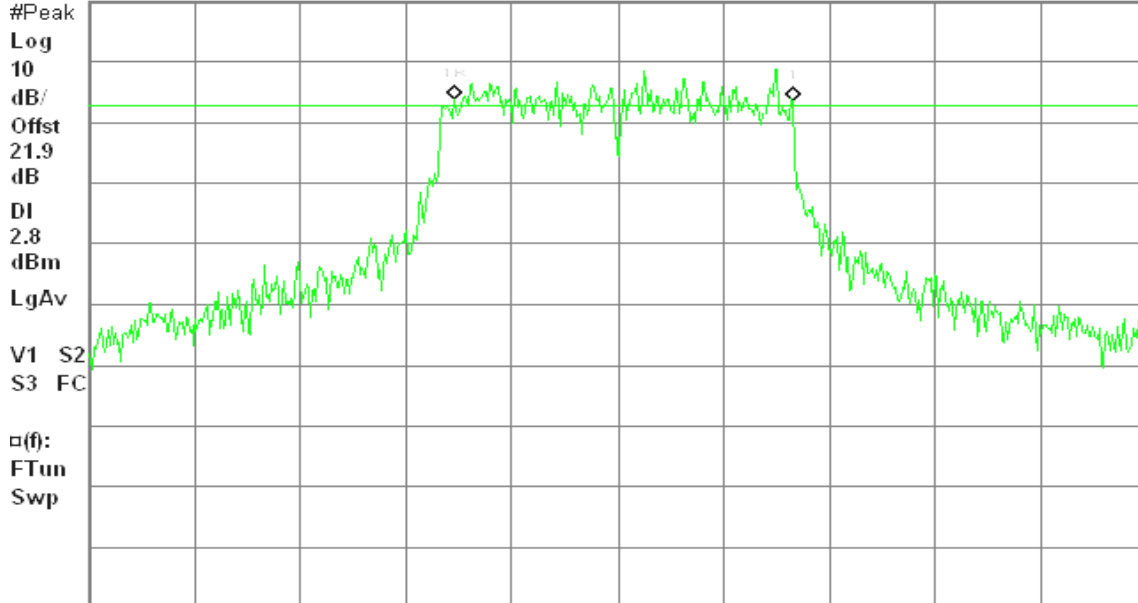
6dB BW, a Mode Mid Ch.

Δ Mkr1 15.92 MHz

Ref 20 dBm

Atten 10 dB

-0.47 dB



Center 5.785 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



### CH High

Agilent 11:48:22 Jul 10, 2009

R T

6dB BW, a Mode High Ch.

$\Delta$  Mkr1 16.00 MHz

Ref 20 dBm

Atten 10 dB

-0.47 dB

#Peak

Log

10

dB/

Offst

21.9

dB

Dl

3.2

dBm

LgAv

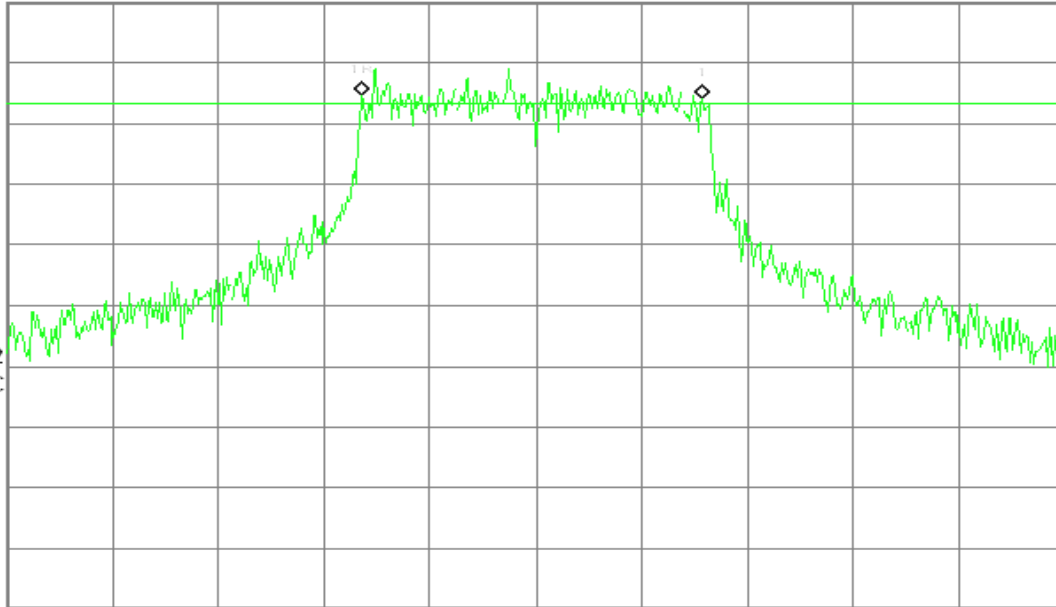
V1 S2

S3 FC

$\square(f)$ :

FTun

Swp



Center 5.825 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

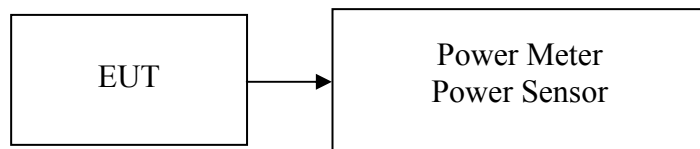
## 7.2 PEAK POWER

### LIMIT

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

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted.*



**Test Data**

**IEEE 802.11b**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	21.82	0.1521	1	PASS
Mid	2437	24.18	0.2618		PASS
High	2462	24.16	0.2606		PASS

**IEEE 802.11g**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	23.60	0.2291	1	PASS
Mid	2437	29.45	0.8810		PASS
High	2462	25.62	0.3648		PASS

**IEEE 802.11a**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	5745	29.13	0.8185	1	PASS
Mid	5785	29.30	0.8511		PASS
High	5825	29.45	0.8810		PASS

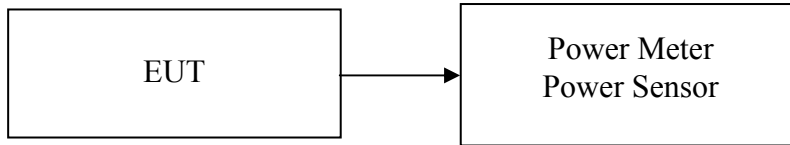


### 7.3 AVERAGE POWER

#### LIMIT

None; for reporting purposes only.

#### Test Configuration



#### TEST PROCEDURE

The transmitter output is connected to the Power Meter The Power Meter is set to the average power detection.

#### TEST RESULTS

*No non-compliance noted.*



**Test Data**

**Test mode: IEEE 802.11b**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	19.53	0.0897
Mid	2437	21.88	0.1542
High	2462	21.79	0.1510

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.13	0.0259
Mid	2437	21.01	0.1262
High	2462	16.27	0.0424

**Test mode: IEEE 802.11a**

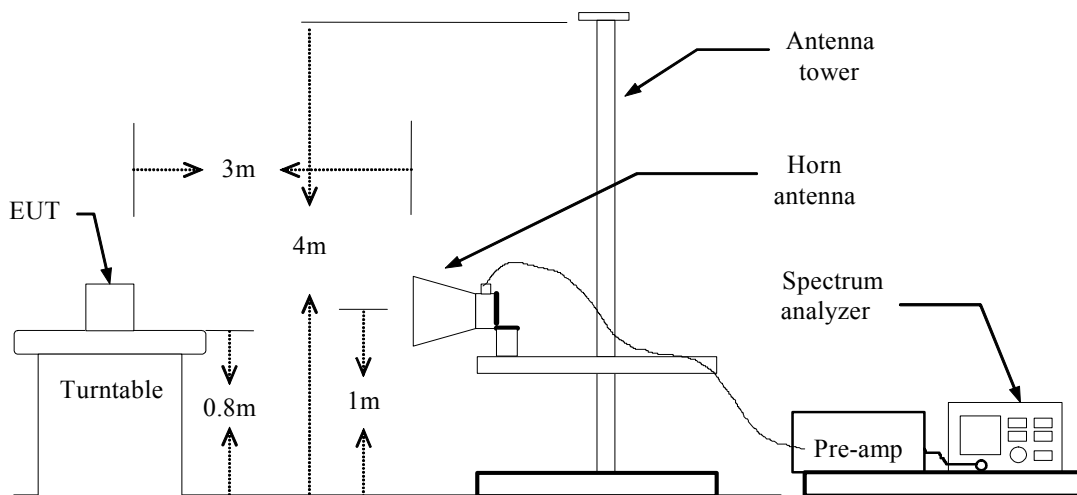
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	21.56	0.1432
Mid	5785	21.64	0.1459
High	5825	21.87	0.1538

## 7.4 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.





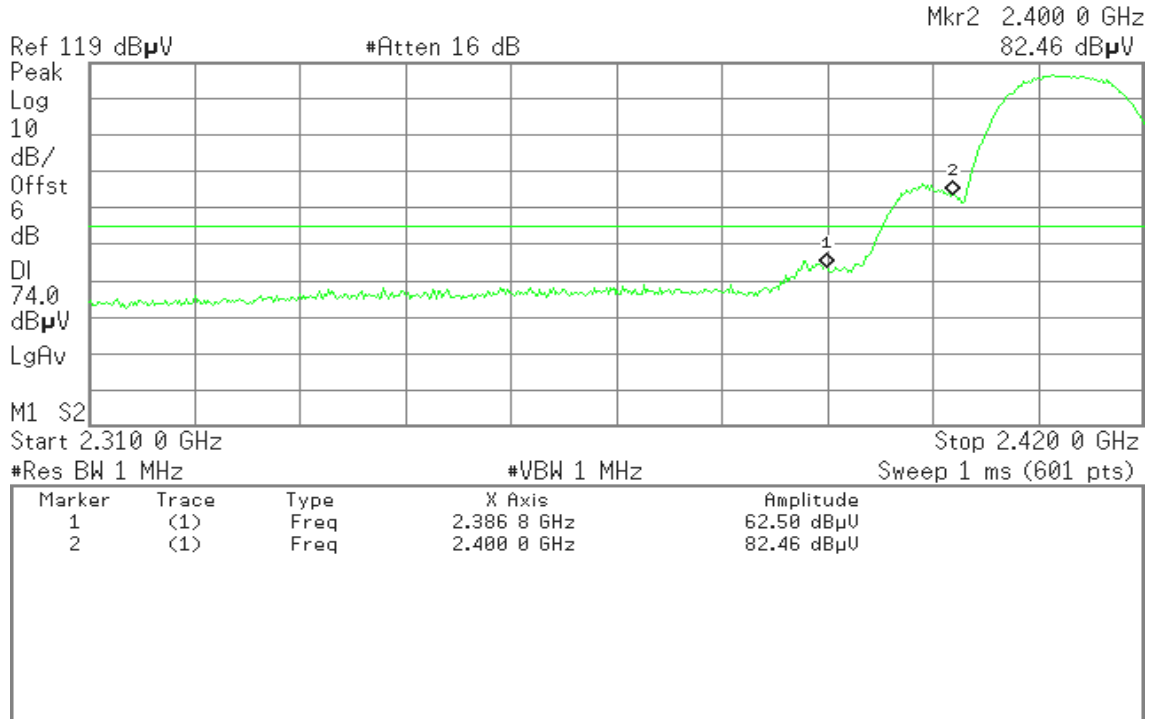
### Band Edges (IEEE 802.11b mode / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent

R T

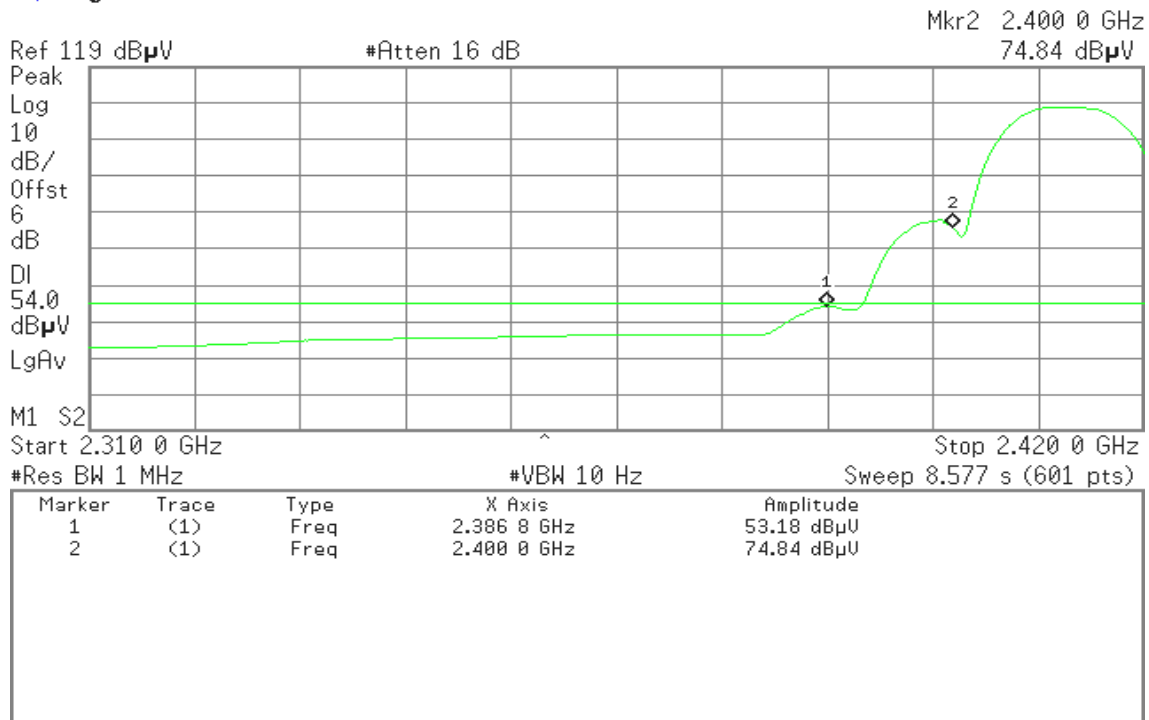


Detector mode: Average

Polarity: Vertical

Agilent

R T



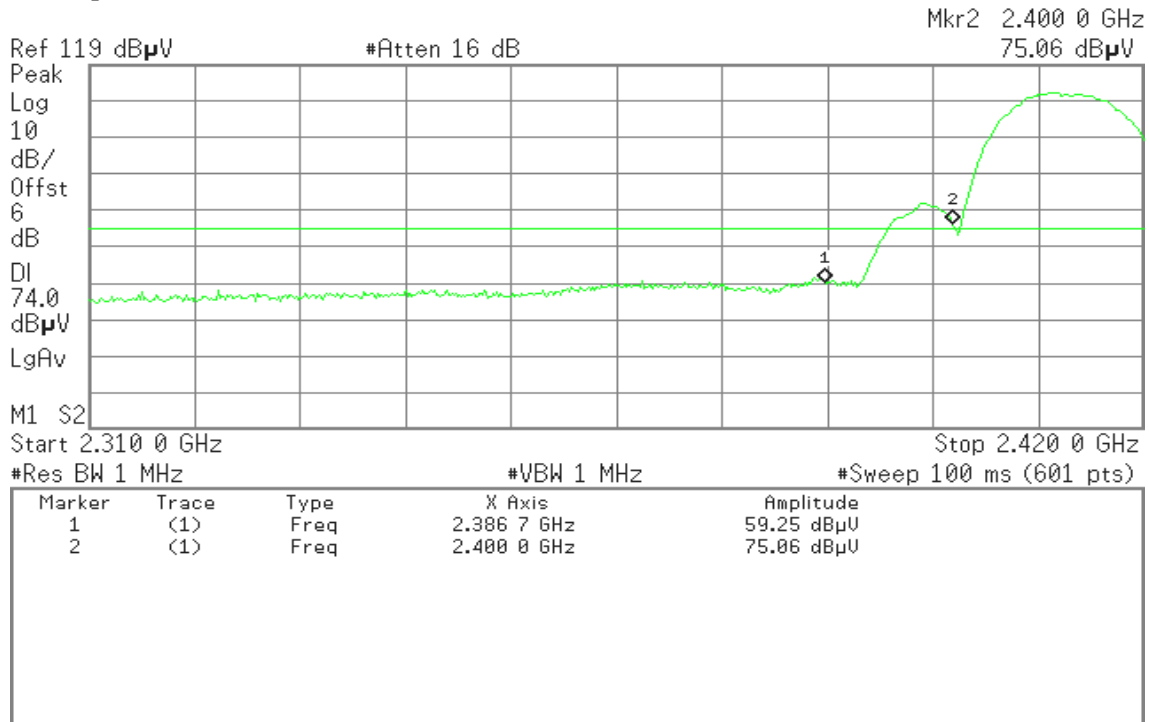


Detector mode: Peak

Polarity: Horizontal

Agilent

T

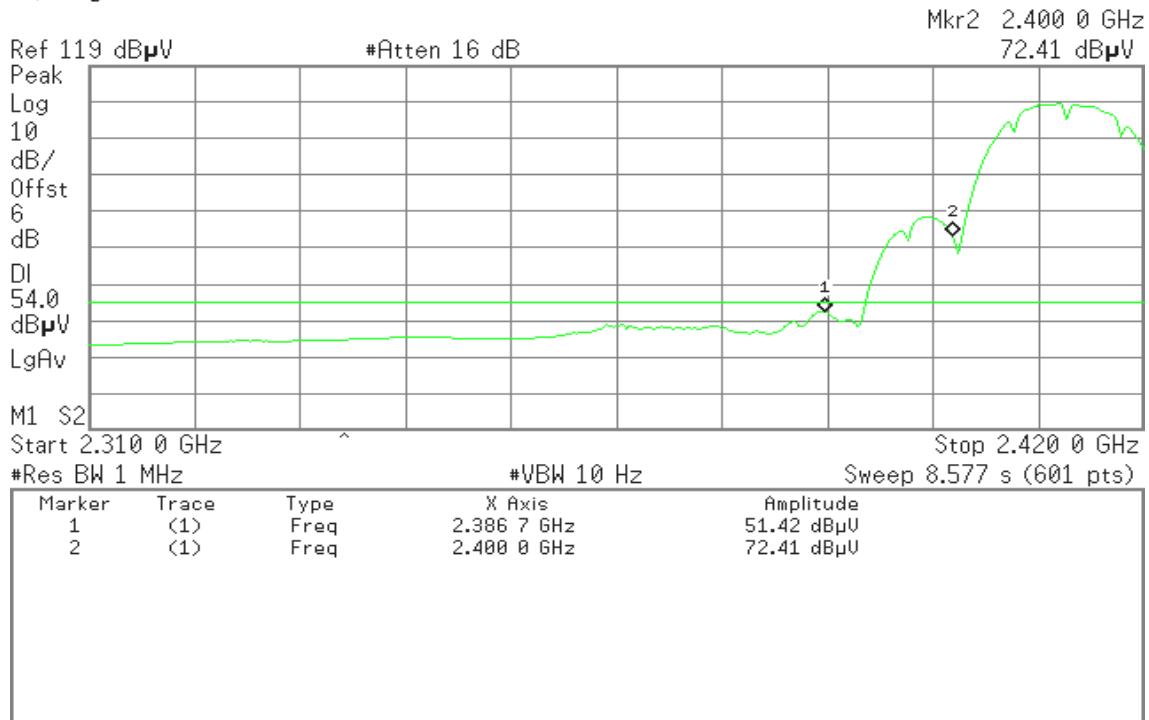


Detector mode: Average

Polarity: Horizontal

Agilent

T





### Band Edges (IEEE 802.11b mode / CH High)

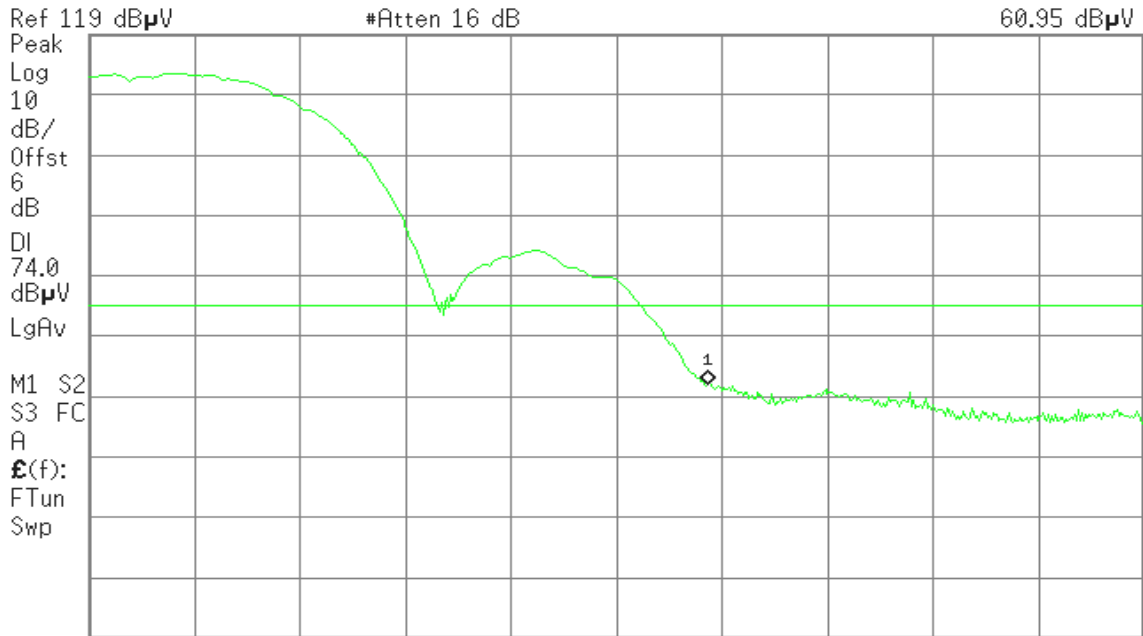
Detector mode: Peak

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
60.95 dB $\mu$ V



Start 2.460 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

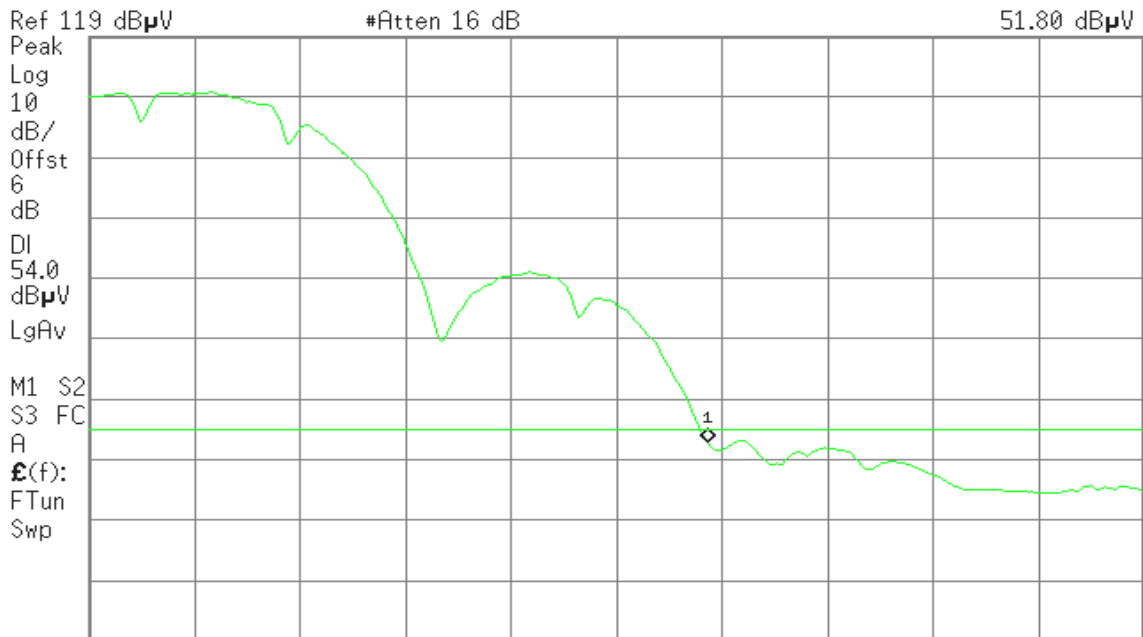
Detector mode: Average

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
51.80 dB $\mu$ V



Start 2.460 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)



Detector mode: Peak

Polarity: Horizontal

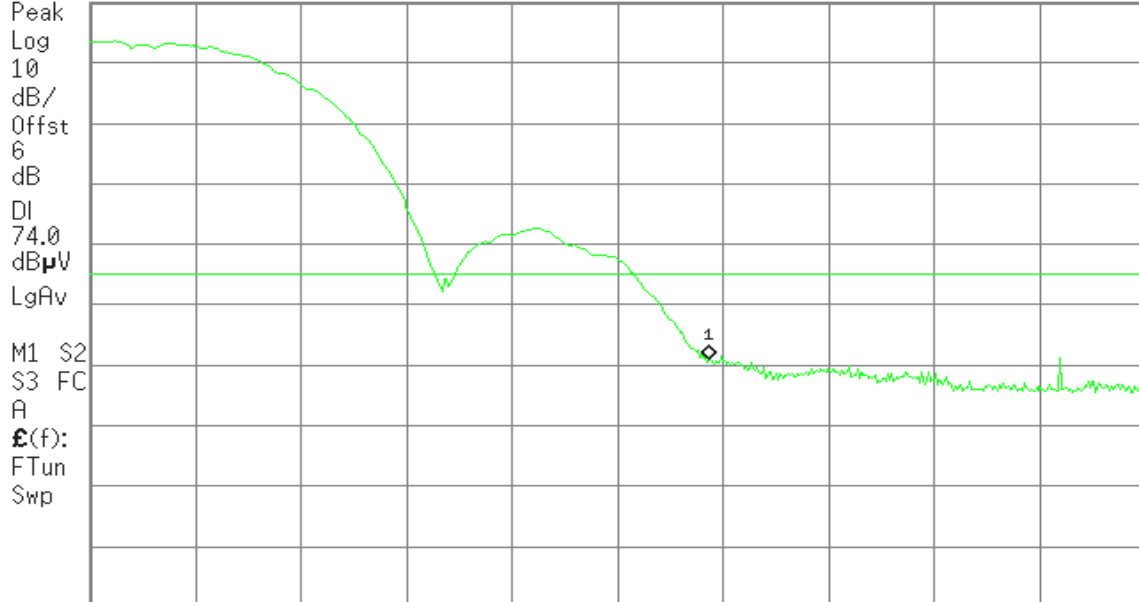
Agilent

T

Mkr1 2.483 50 GHz  
59.92 dBμV

Ref 119 dBμV

#Atten 16 dB



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

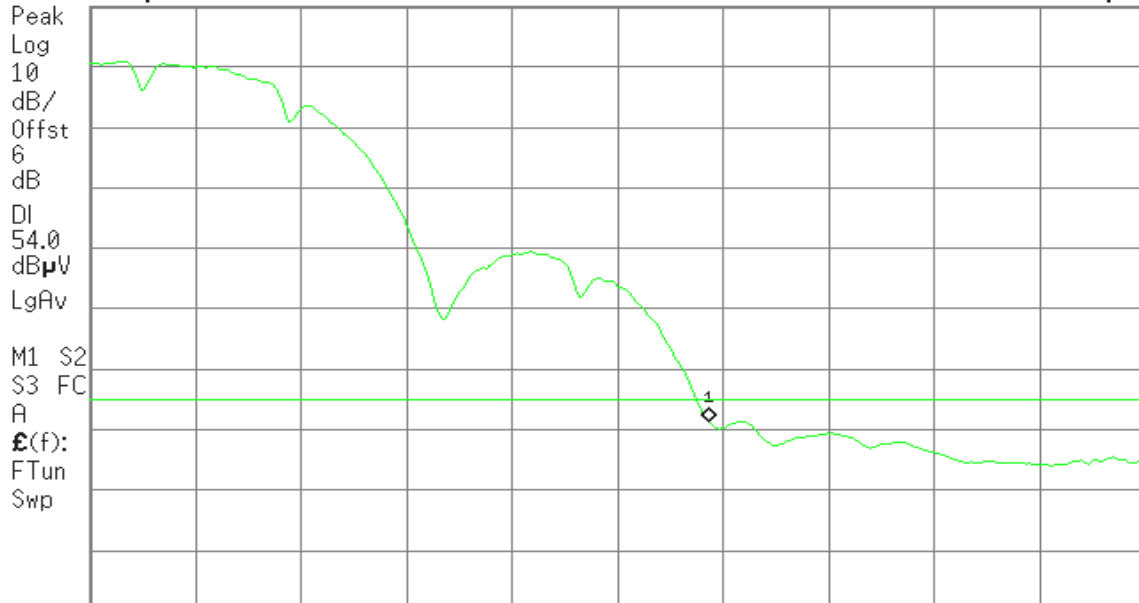
Agilent

T

Mkr1 2.483 50 GHz  
50.25 dBμV

Ref 119 dBμV

#Atten 16 dB



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.119 s (601 pts)



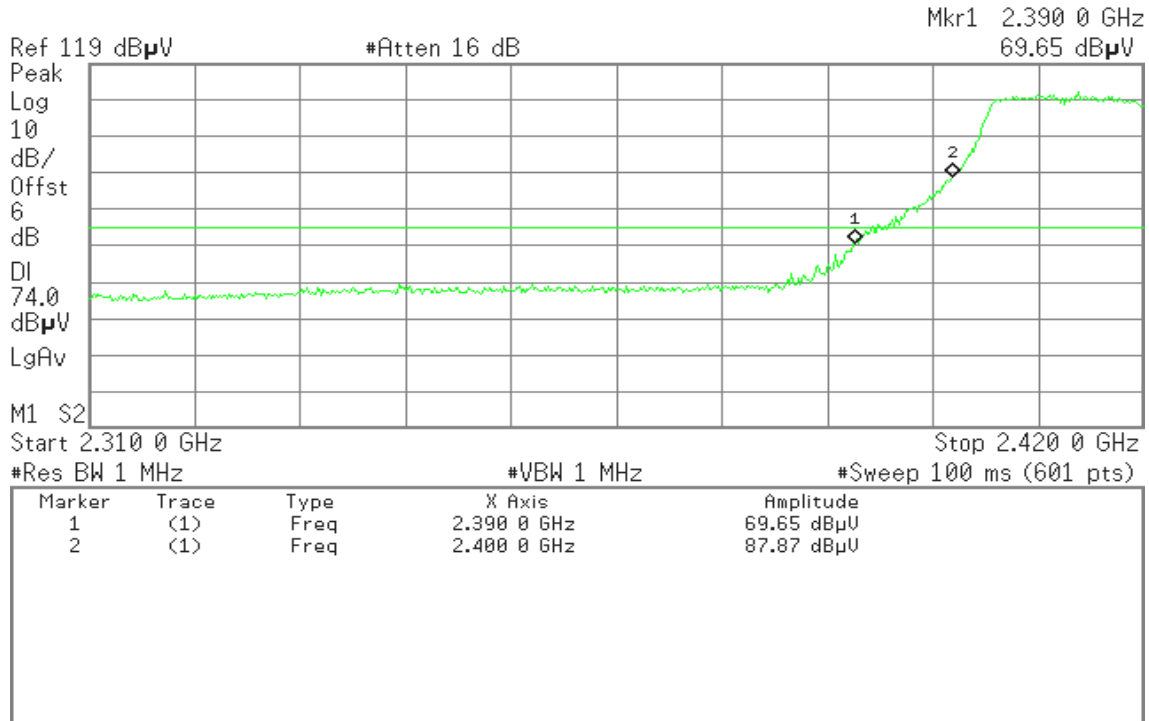
### Band Edges (IEEE 802.11g mode / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent

T

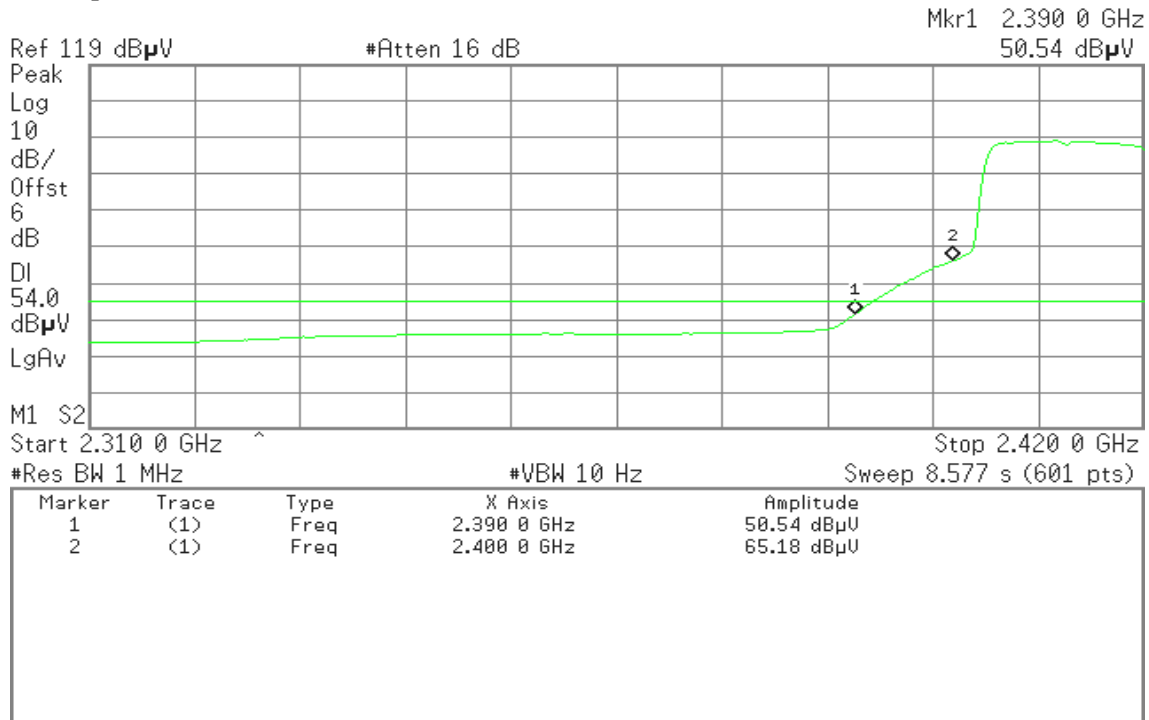


Detector mode: Average

Polarity: Vertical

Agilent

T



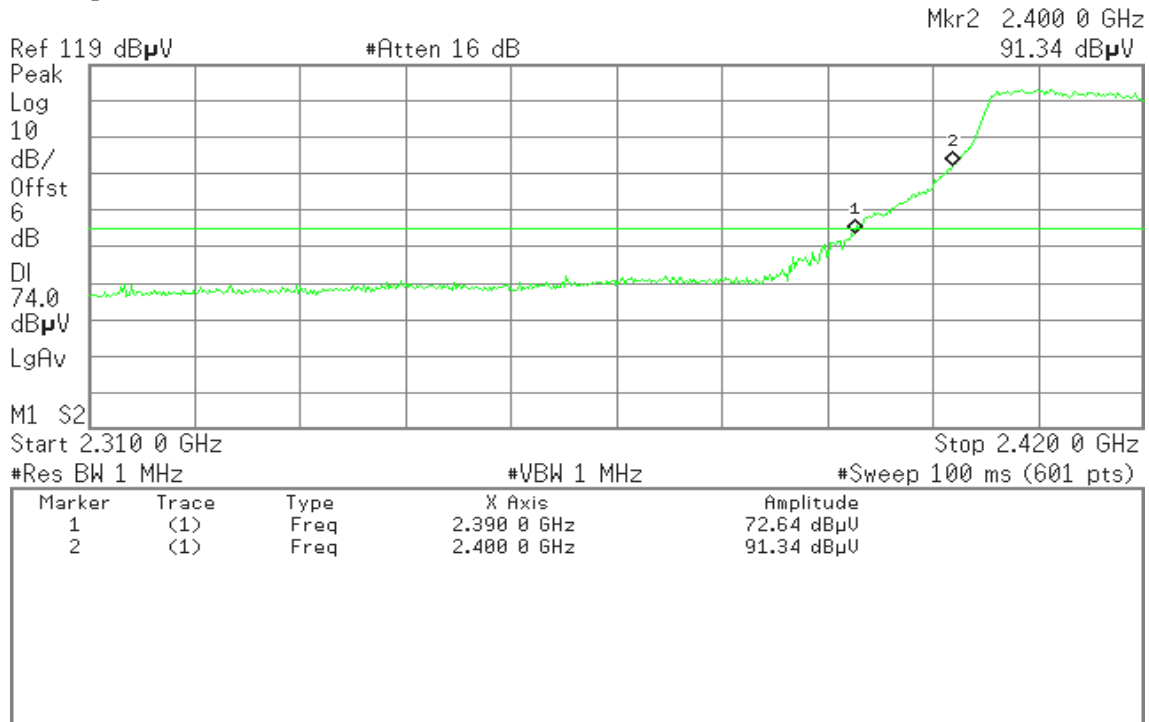


Detector mode: Peak

Polarity: Horizontal

Agilent

T

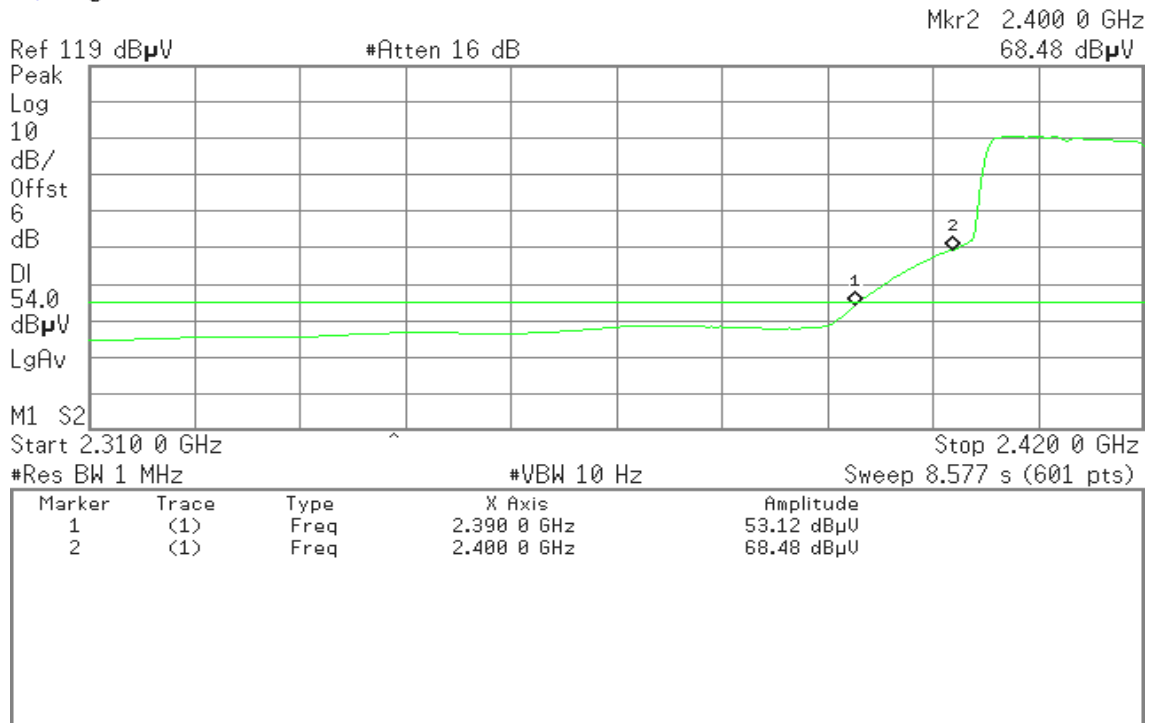


Detector mode: Average

Polarity: Horizontal

Agilent

T





### Band Edges (IEEE 802.11g mode / CH High)

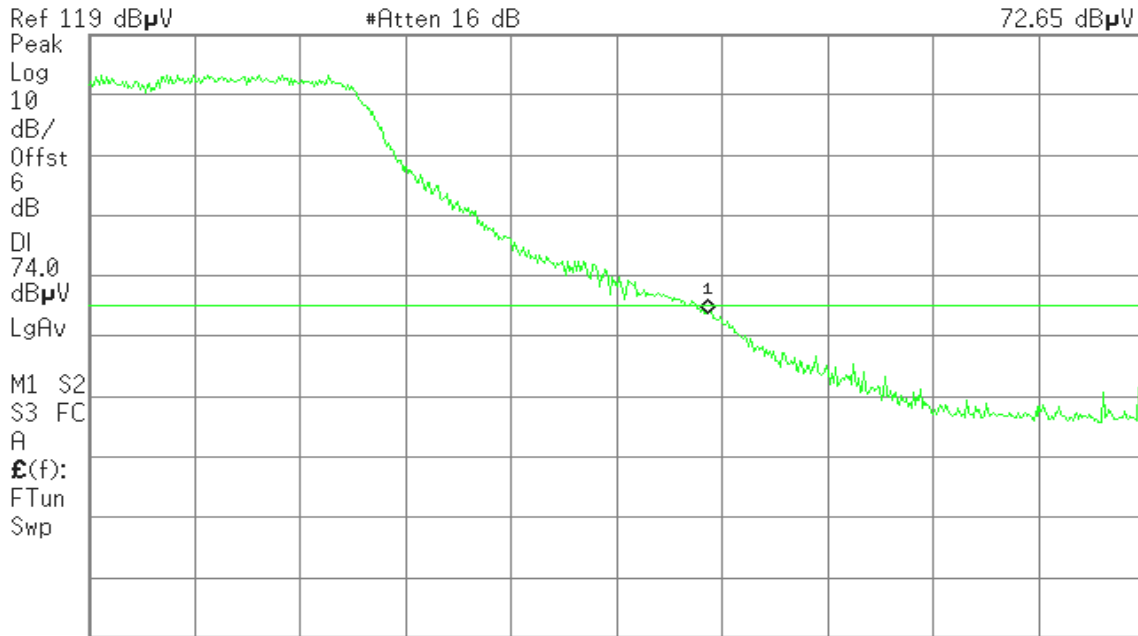
Detector mode: Peak

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
72.65 dB $\mu$ V



Start 2.460 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

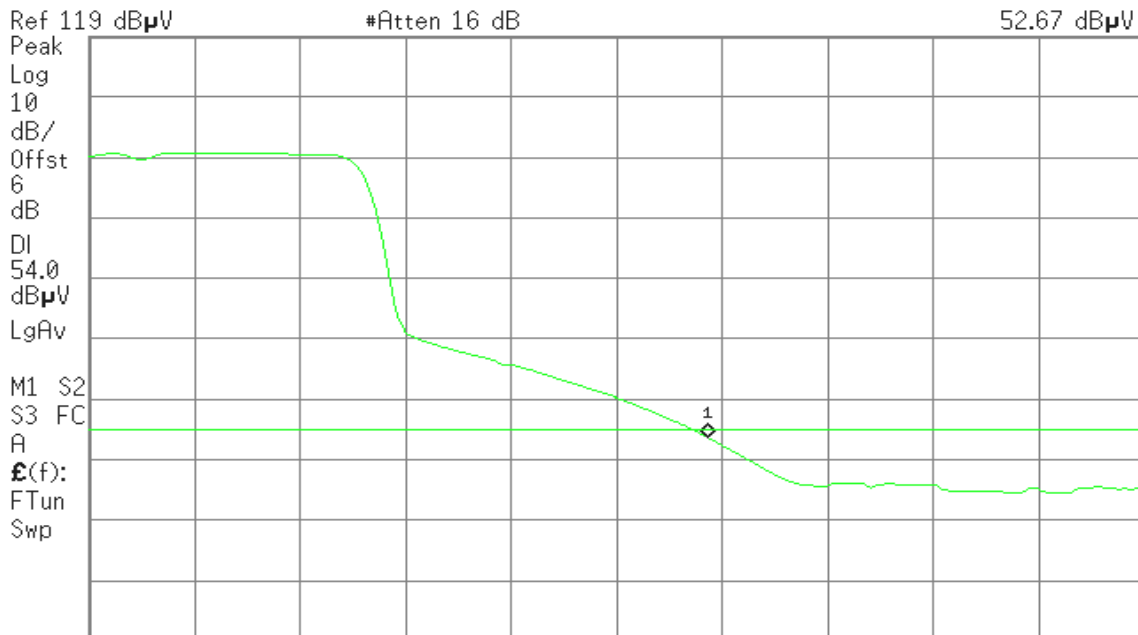
Detector mode: Average

Polarity: Vertical

Agilent

T

Mkr1 2.483 50 GHz  
52.67 dB $\mu$ V



Start 2.460 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)



Detector mode: Peak

Polarity: Horizontal

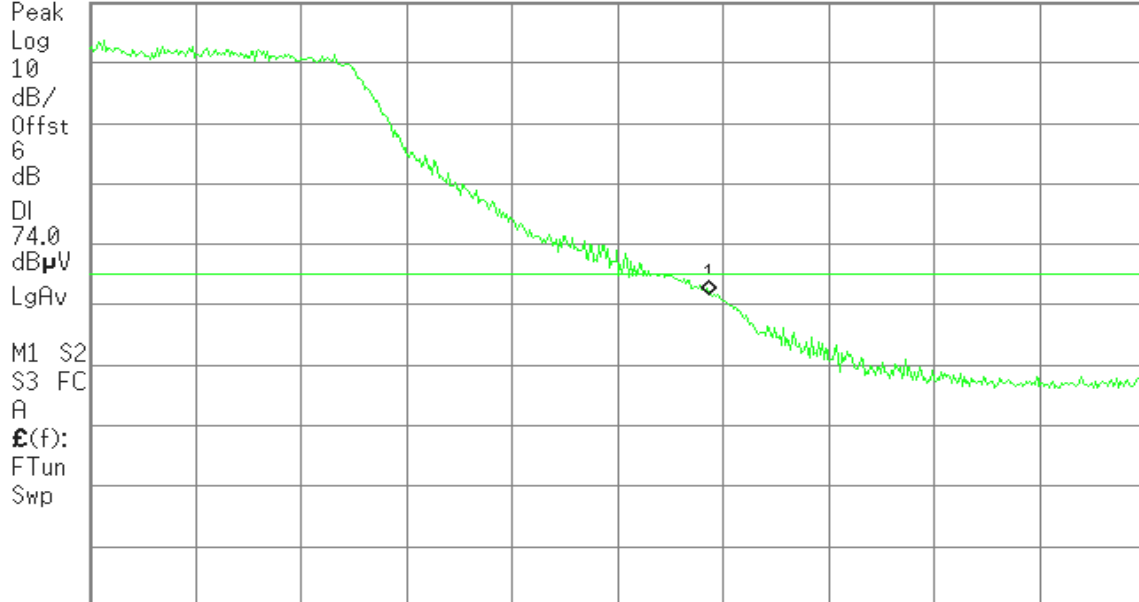
Agilent

T

Mkr1 2.483 50 GHz  
70.64 dBμV

Ref 119 dBμV

#Atten 16 dB



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

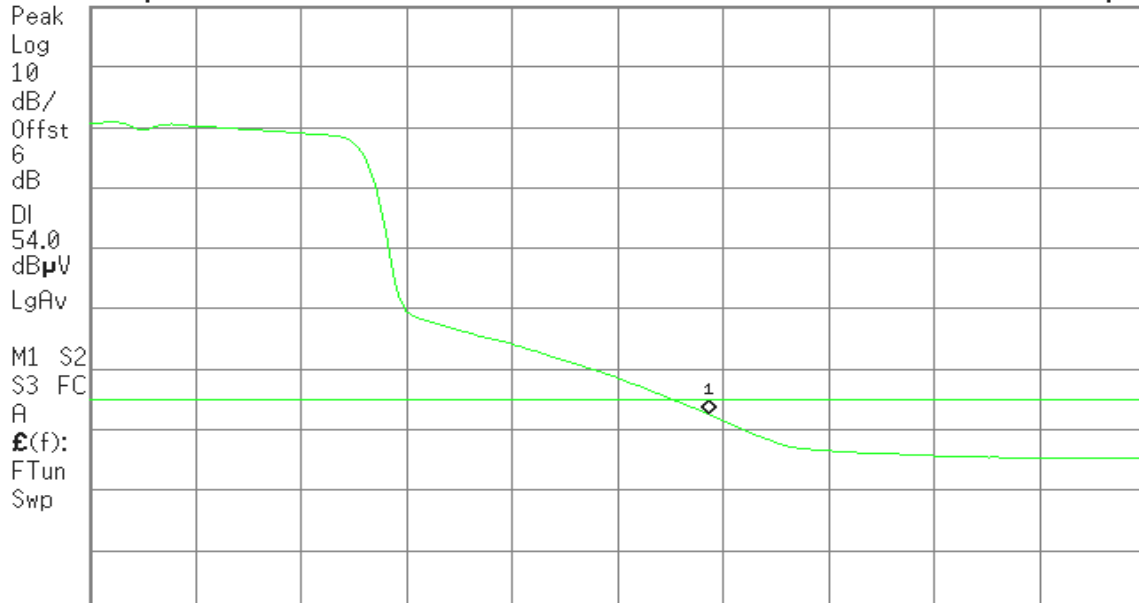
Agilent

T

Mkr1 2.483 50 GHz  
51.55 dBμV

Ref 119 dBμV

#Atten 16 dB



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.119 s (601 pts)

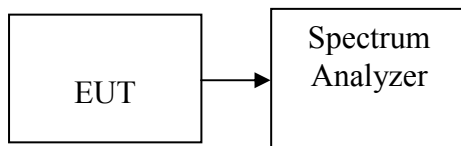


## 7.5 PEAK POWER SPECTRAL DENSITY

### LIMIT

1. According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.  
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s.
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

### TEST RESULTS

*No non-compliance noted*



**Test Data**

**IEEE 802.11b**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-3.63	8.00	PASS
Mid	2437	-2.45		PASS
High	2462	-1.69		PASS

**IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.00	8.00	PASS
Mid	2437	-2.39		PASS
High	2462	-8.78		PASS

**IEEE 802.11a**

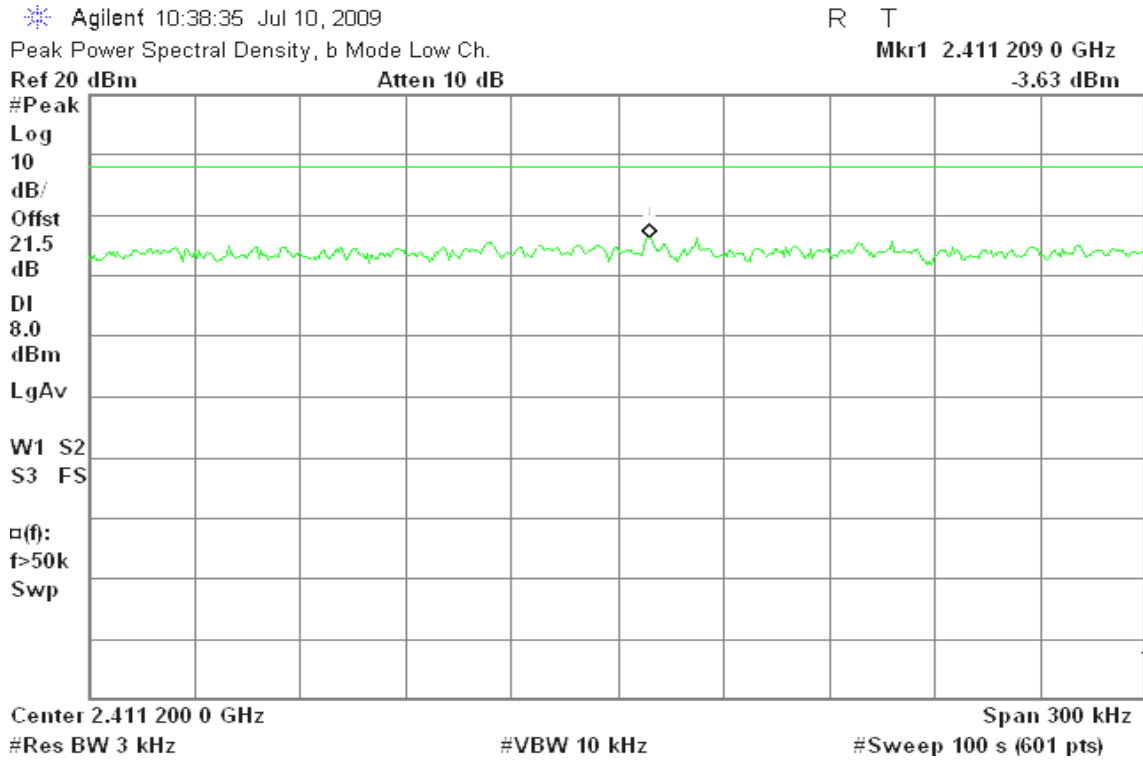
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	5745	-4.52	8.00	PASS
Mid	5785	-2.42		PASS
High	5825	-3.80		PASS



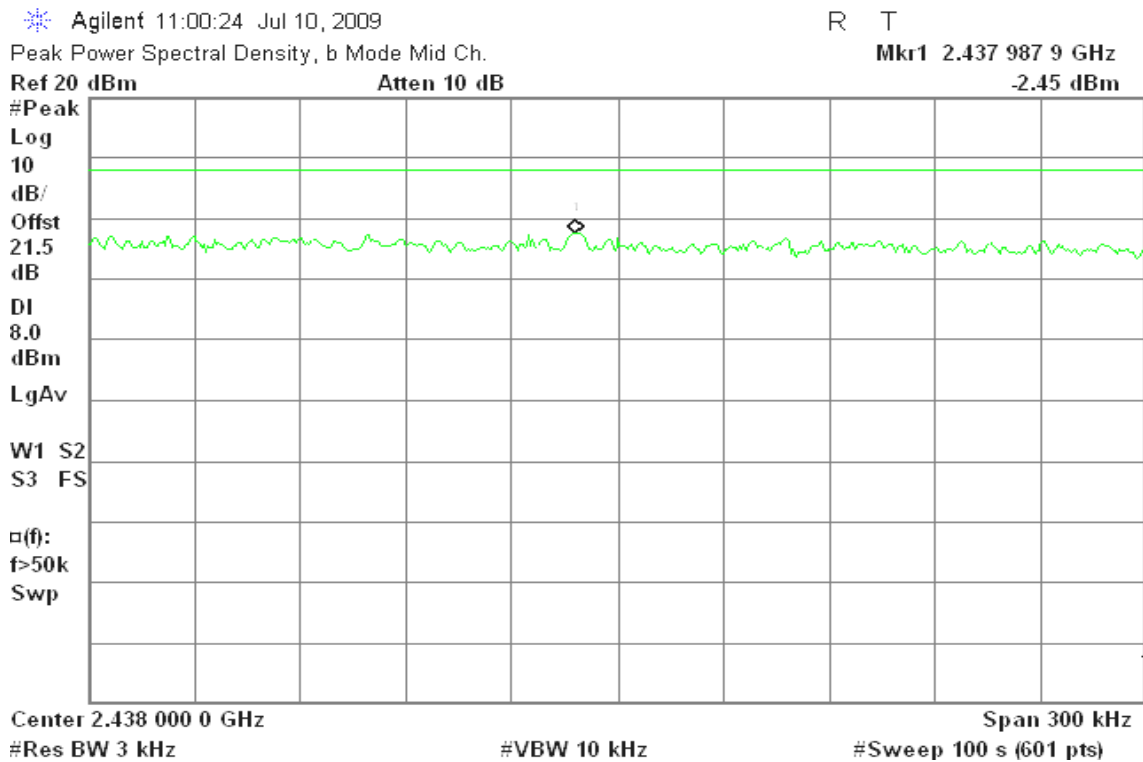
### Test Plot

### IEEE 802.11b mode

### CH Low



### CH Mid





### CH High

Agilent 11:04:43 Jul 10, 2009

R T

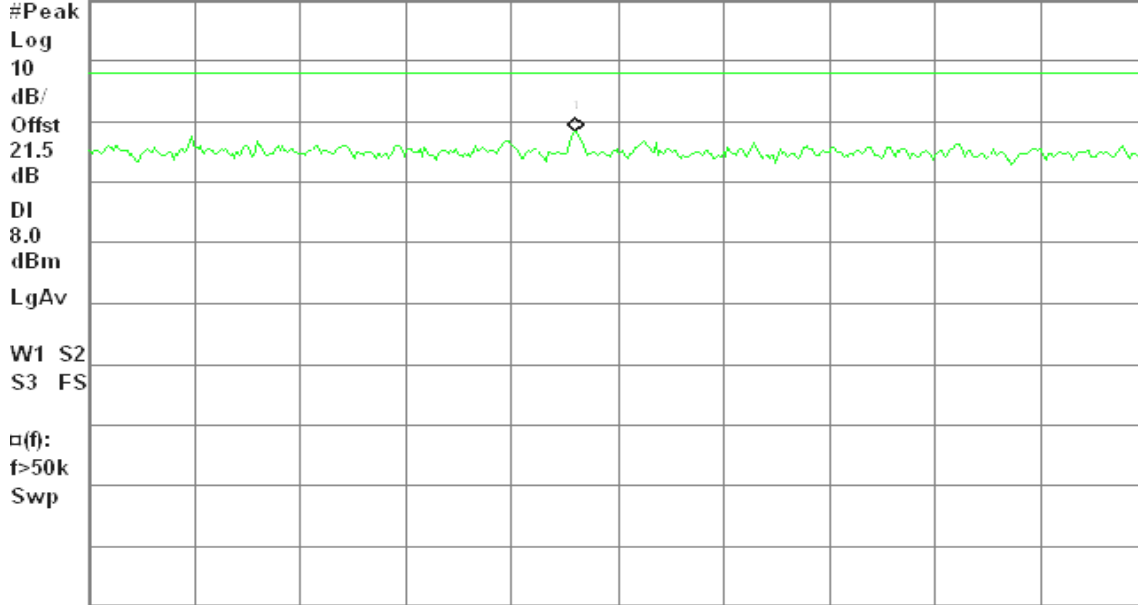
Peak Power Spectral Density, b Mode High Ch.

Mkr1 2.459 488 0 GHz

Ref 20 dBm

Atten 10 dB

-1.69 dBm



Center 2.459 500 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### IEEE 802.11g mode

### CH Low

Agilent 11:25:37 Jul 10, 2009

R T

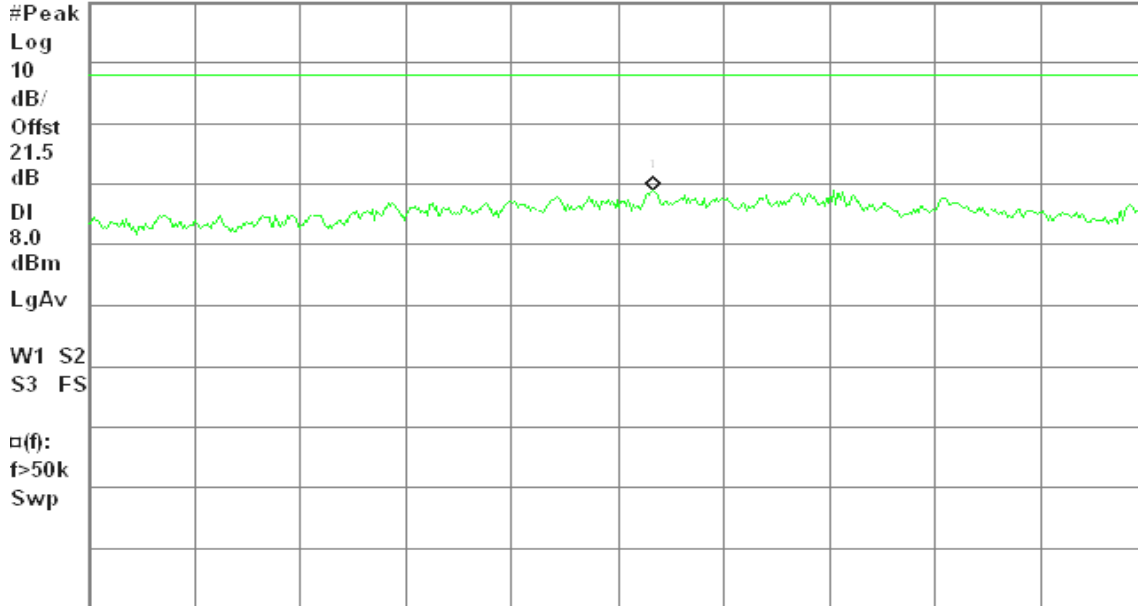
Peak Power Spectral Density, g Mode Low Ch.

Mkr1 2.410 410 0 GHz

Ref 20 dBm

Atten 10 dB

-11.00 dBm



Center 2.410 400 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### CH Mid

Agilent 11:20:22 Jul 10, 2009

R T

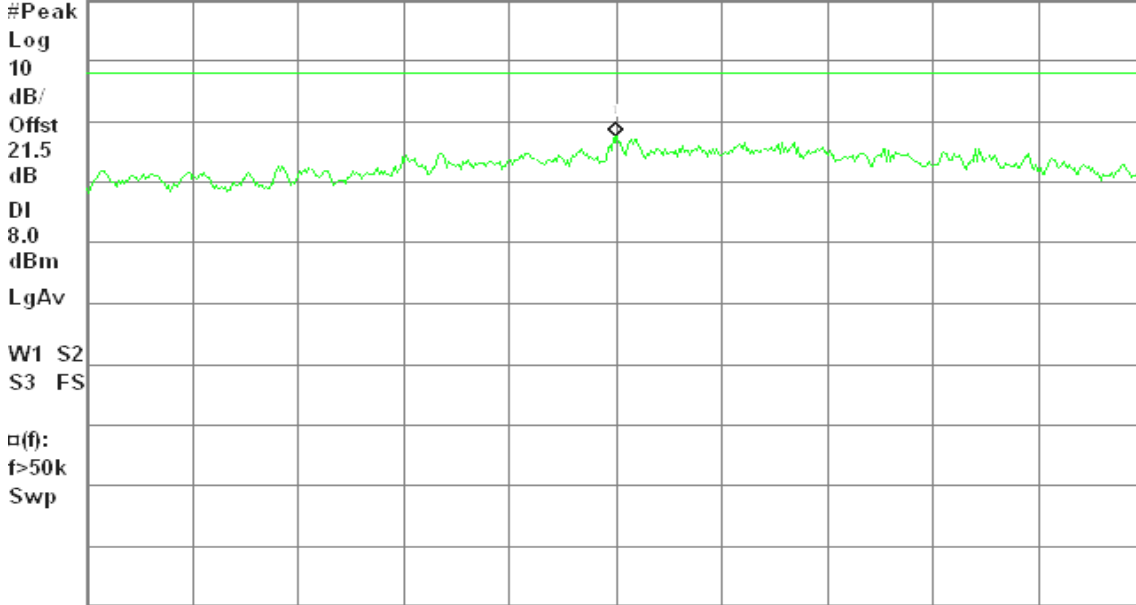
Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.430 699 5 GHz

Ref 20 dBm

Atten 10 dB

-2.39 dBm



Center 2.430 700 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

### CH High

Agilent 11:16:19 Jul 10, 2009

R T

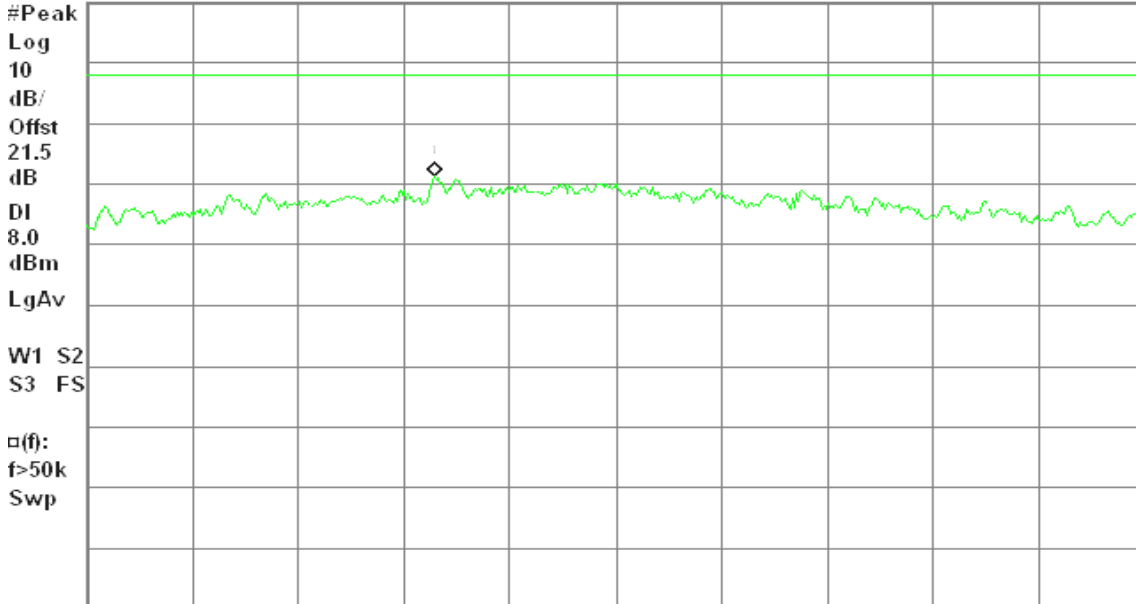
Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.455 698 7 GHz

Ref 20 dBm

Atten 10 dB

-8.78 dBm



Center 2.455 750 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### IEEE 802.11a mode

#### CH Low

Agilent 11:42:57 Jul 10, 2009

R T

Peak Power Spectral Density, a Mode Low Ch.

Mkr1 5.751 859 0 GHz

Ref 20 dBm

Atten 10 dB

-4.52 dBm



Center 5.751 859 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

#### CH Mid

Agilent 11:46:56 Jul 10, 2009

R T

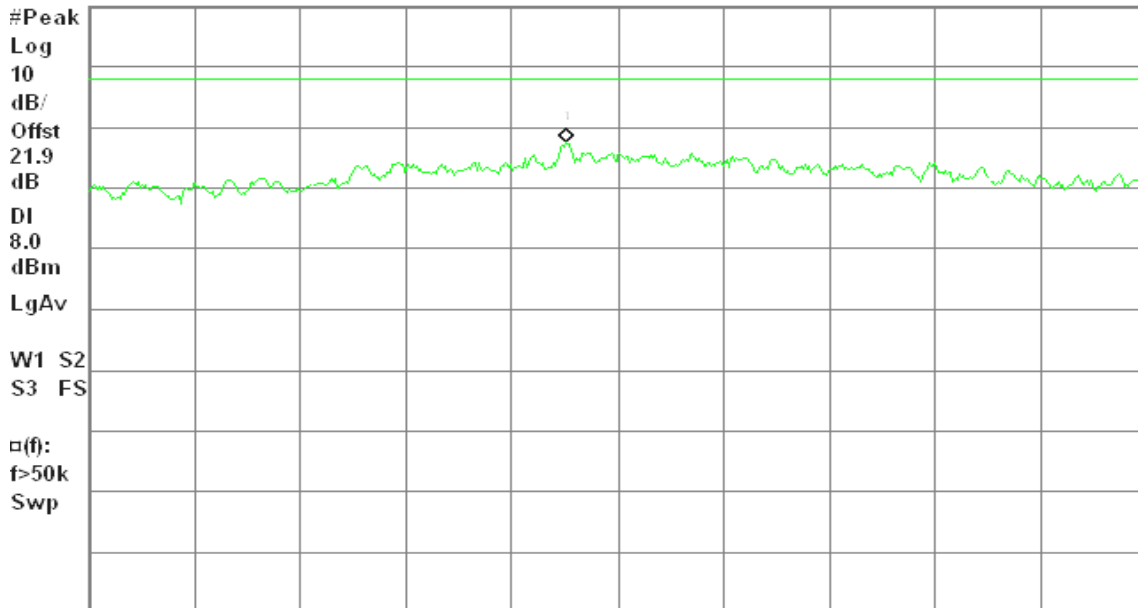
Peak Power Spectral Density, a Mode Mid Ch.

Mkr1 5.778 685 4 GHz

Ref 20 dBm

Atten 10 dB

-2.42 dBm



Center 5.778 700 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



### CH High

Agilent 11:51:35 Jul 10, 2009

R T

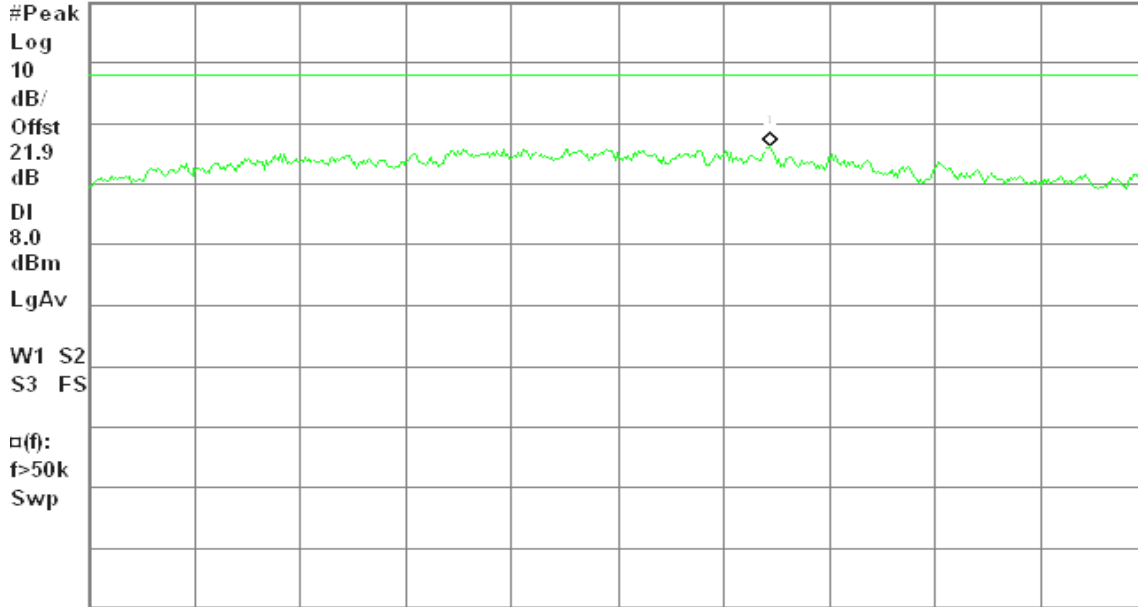
Peak Power Spectral Density, a Mode High Ch.

Mkr1 5.826 293 1 GHz

Ref 20 dBm

Atten 10 dB

-3.80 dBm



Center 5.826 250 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

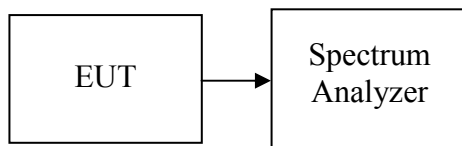
## 7.6 SPURIOUS EMISSIONS

### 7.6.1 CONDUCTED 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

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 13GHz to 26GHz range for IEEE 802.11b/g, 20GHz to 40GHz range for IEEE 802.11a with the transmitter set to the lowest, middle, and highest channels.

#### TEST RESULTS

*No non-compliance noted.*





### Test Plot

#### IEEE 802.11b / CH Low

13GHz ~ 26GHz

Agilent 10:39:53 Jul 10, 2009

R T

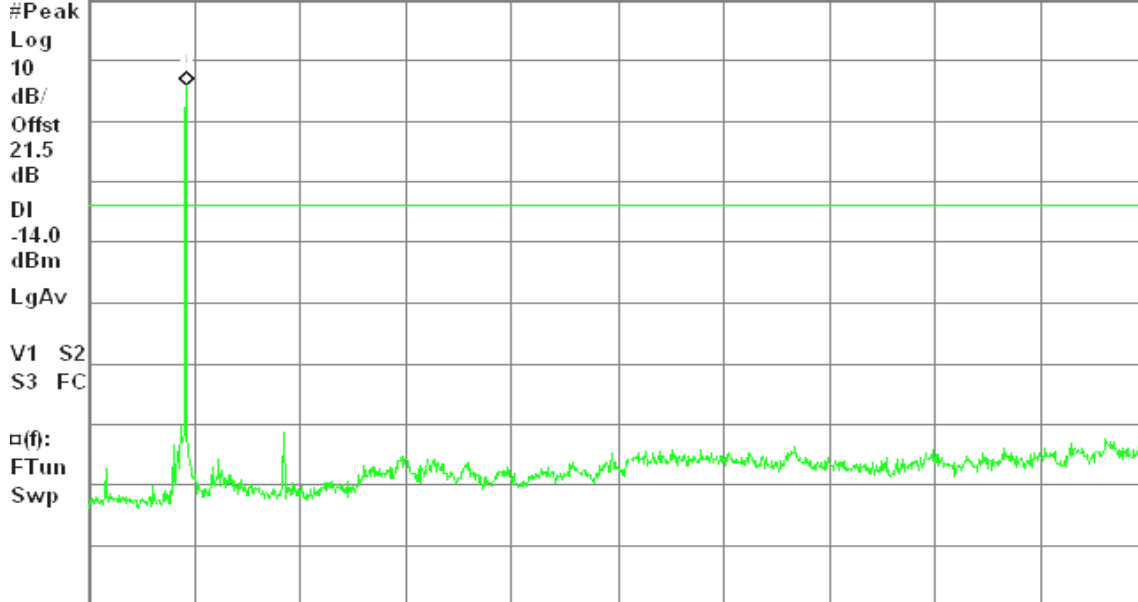
Spurious, b Mode Low Ch.

Mkr1 2.42 GHz

Ref 20 dBm

Atten 10 dB

5.96 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

#### IEEE 802.11b / CH Mid

13GHz ~ 26GHz

Agilent 11:01:07 Jul 10, 2009

R L

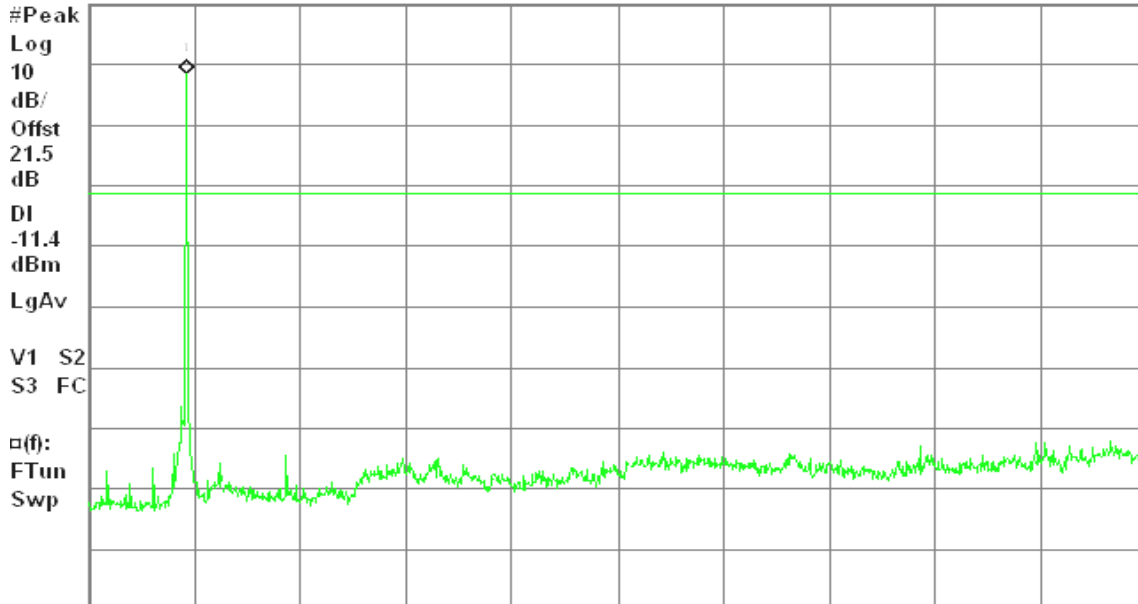
Spurious, b Mode Mid Ch.

Mkr1 2.45 GHz

Ref 20 dBm

Atten 10 dB

8.62 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



### IEEE 802.11b / CH High

#### 13GHz ~ 26GHz

Agilent 11:05:36 Jul 10, 2009

R L

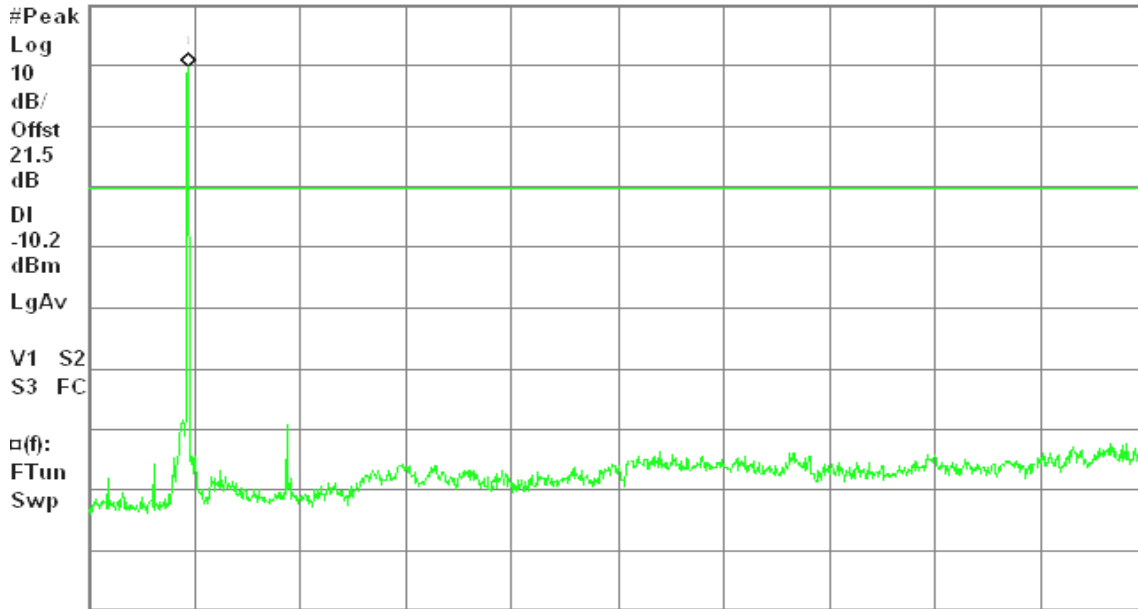
Spurious, b Mode High Ch.

Mkr1 2.47 GHz

Ref 20 dBm

Atten 10 dB

9.81 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

### IEEE 802.11g / CH Low

#### 13GHz ~ 26GHz

Agilent 11:26:24 Jul 10, 2009

R T

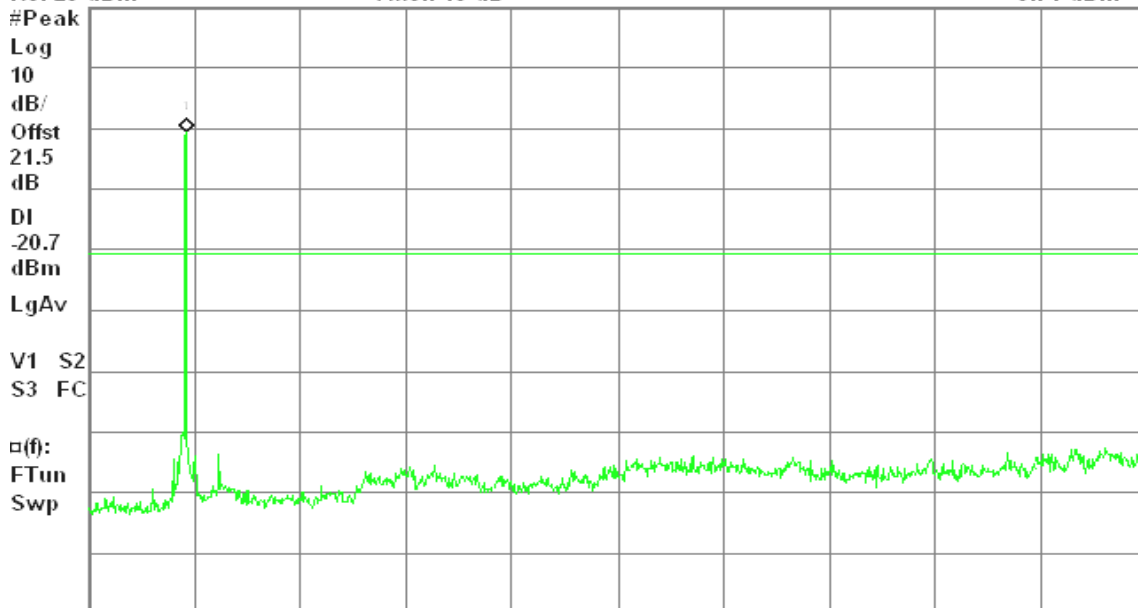
Spurious, g Mode Low Ch.

Mkr1 2.42 GHz

Ref 20 dBm

Atten 10 dB

-0.74 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



### IEEE 802.11g / CH Mid

#### 13GHz ~ 26GHz

Agilent 11:21:47 Jul 10, 2009

R T

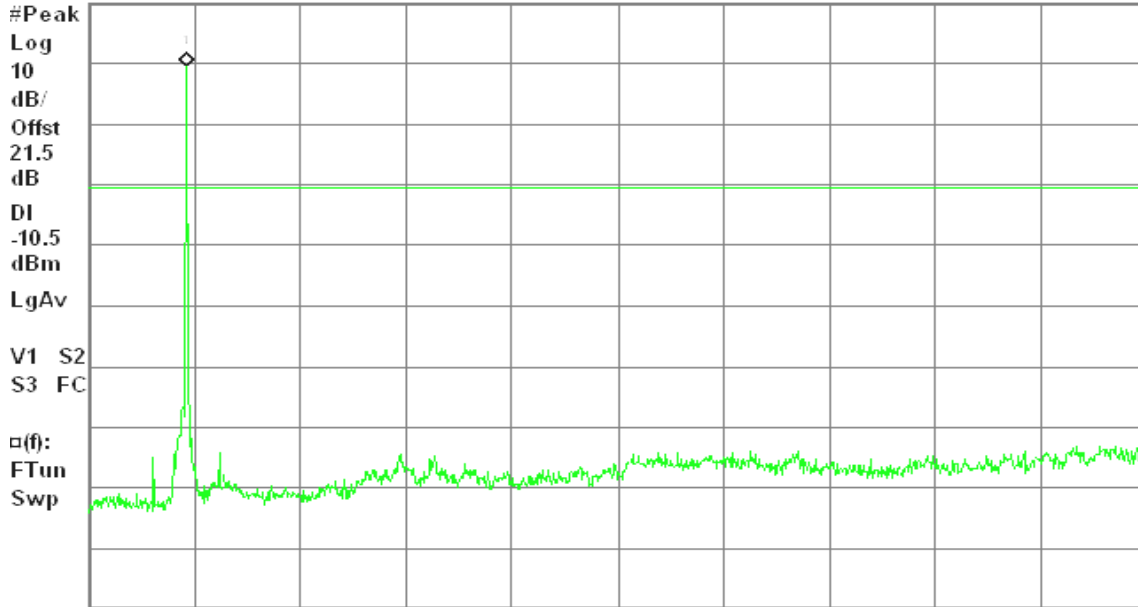
Spurious, g Mode Mid Ch.

Mkr1 2.45 GHz

Ref 20 dBm

Atten 10 dB

9.53 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

### IEEE 802.11g / CH High

#### 13GHz ~ 26GHz

Agilent 11:16:59 Jul 10, 2009

R L

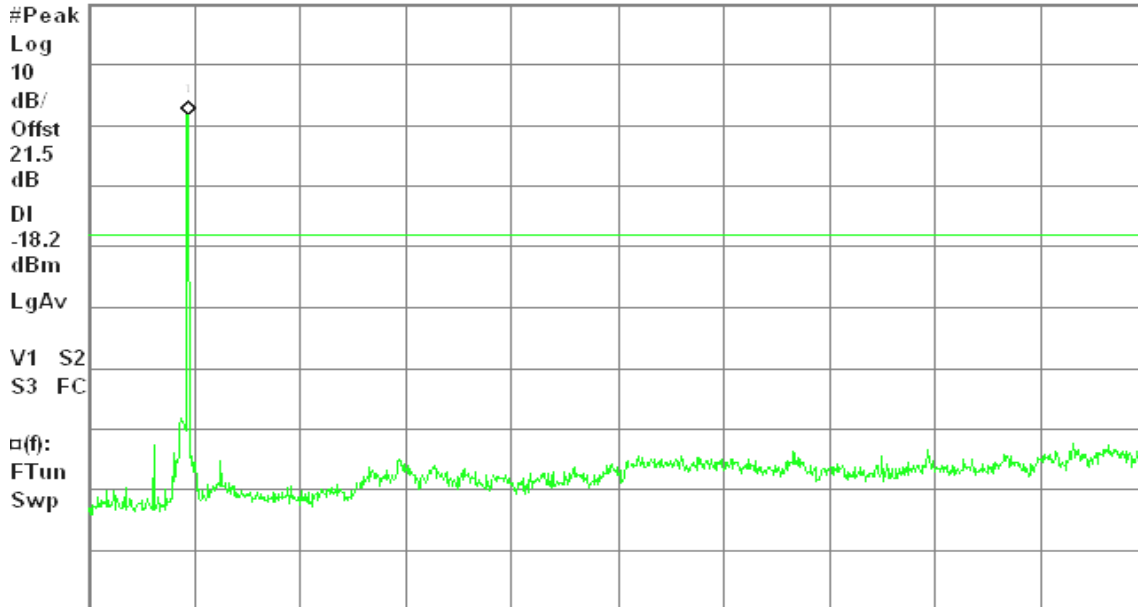
Spurious, g Mode High Ch.

Mkr1 2.47 GHz

Ref 20 dBm

Atten 10 dB

1.76 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



### IEEE 802.11a / CH Low

#### 20GHz ~ 40GHz

Agilent 11:43:47 Jul 10, 2009

R T

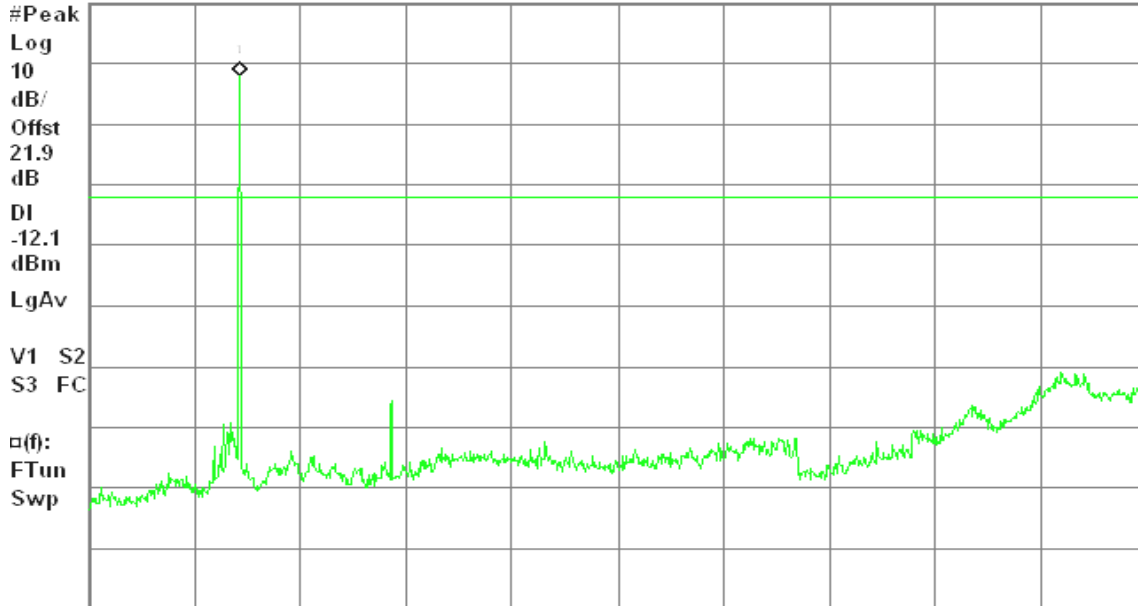
Spurious, a Mode Low Ch.

Mkr1 5.75 GHz

Ref 20 dBm

Atten 10 dB

7.91 dBm



Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)

### IEEE 802.11a / CH Mid

#### 20GHz ~ 40GHz

Agilent 11:47:44 Jul 10, 2009

R T

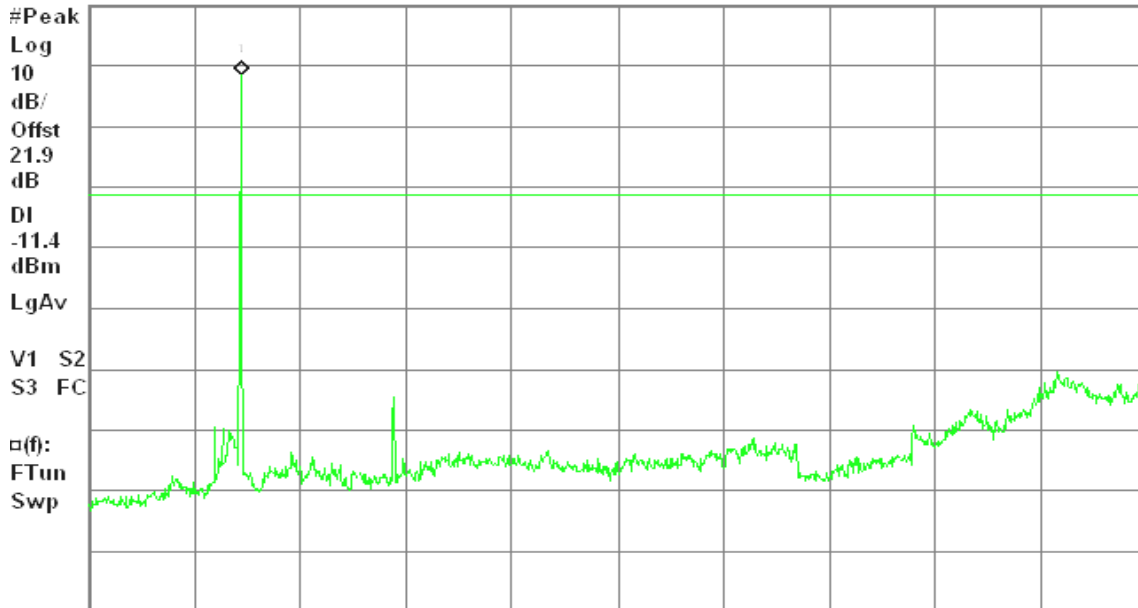
Spurious, a Mode Mid Ch.

Mkr1 5.79 GHz

Ref 20 dBm

Atten 10 dB

8.57 dBm



Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)



### IEEE 802.11a / CH High

### 20GHz ~ 40GHz

Agilent 11:52:26 Jul 10, 2009

R T

Spurious, a Mode High Ch.

Mkr1 5.83 GHz

Ref 20 dBm

Atten 10 dB

6.79 dBm

#Peak

Log

10

dB/

Offst

21.9

dB

DI

-13.2

dBm

LgAv

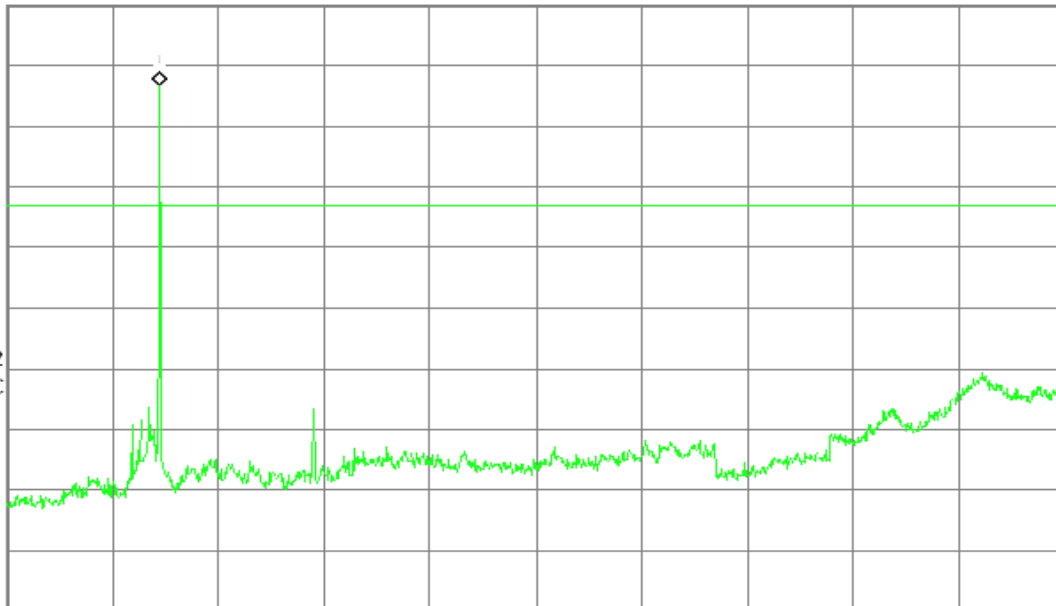
V1 S2

S3 FC

□(f):

FTun

Swp



Center 20.02 GHz

Span 39.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 4.819 s (1001 pts)



## 7.6.2 Radiated Emissions

### LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

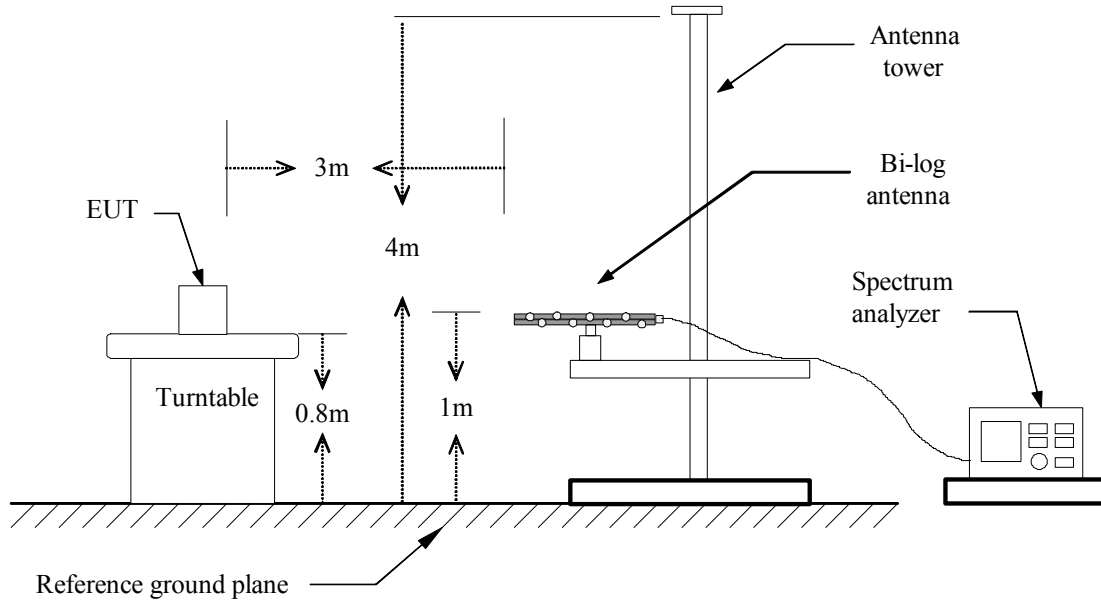
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections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

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

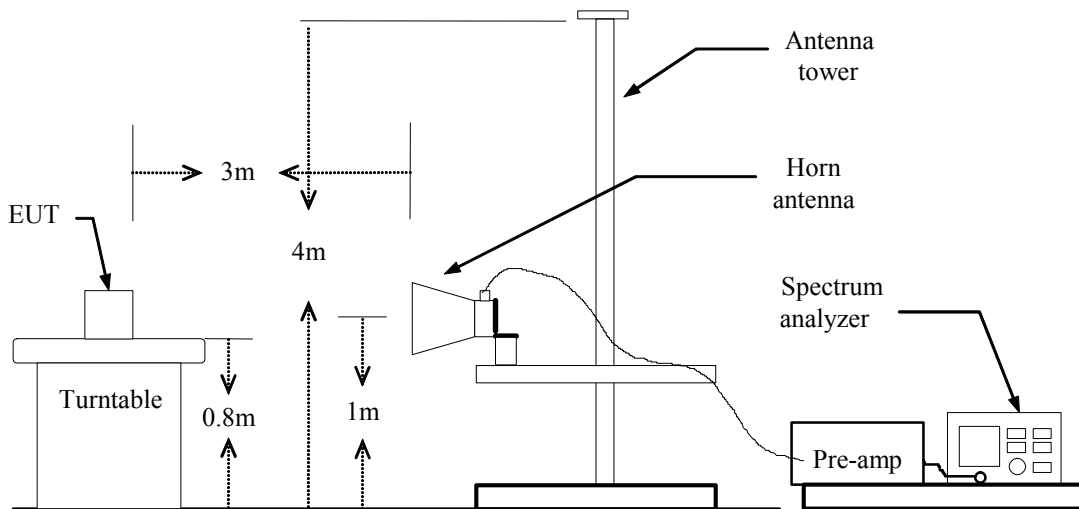
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### 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.



**Below 1 GHz****Operation Mode:** Normal Link**Test Date:** March 19, 2009**Temperature:** 25°C**Tested by:** Nan Tsai**Humidity:** 50% 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
133.47	V	39.09	-9.01	30.08	43.50	-13.42	Peak
162.57	V	40.62	-10.50	30.12	43.50	-13.38	Peak
296.75	V	36.30	-8.53	27.77	46.00	-18.23	Peak
455.18	V	39.85	-5.54	34.31	46.00	-11.69	Peak
665.35	V	43.55	-2.21	41.34	46.00	-4.66	Peak
930.48	V	36.00	1.51	37.52	46.00	-8.48	Peak
199.75	H	42.91	-9.03	33.88	43.50	-9.62	Peak
269.27	H	42.62	-9.08	33.54	46.00	-12.46	Peak
299.98	H	45.60	-8.46	37.13	46.00	-8.87	Peak
700.92	H	32.65	-2.00	30.65	46.00	-15.35	Peak
801.15	H	32.02	0.21	32.24	46.00	-13.76	Peak
933.72	H	35.57	1.61	37.18	46.00	-8.82	Peak

**Remark:**

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured 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:** Tx / IEEE 802.11b mode / CH Low**Test Date:** July 9, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% 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
2283.33	V	58.95	46.74	-1.78	57.17	44.96	74.00	54.00	-9.04	AVG
4825.00	V	53.21	48.37	1.04	54.25	49.41	74.00	54.00	-4.59	AVG
7241.67	V	50.86	45.62	4.07	54.93	49.69	74.00	54.00	-4.31	AVG
N/A										
1300.00	H	56.43	---	-7.40	49.02	---	74.00	54.00	-4.98	Peak
4825.00	H	53.03	47.08	1.04	54.07	48.12	74.00	54.00	-5.88	AVG
7233.33	H	50.19	42.45	4.07	54.26	46.52	74.00	54.00	-7.48	AVG
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:** Tx / IEEE 802.11b mode / CH Mid**Test Date:** July 9, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% 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
2356.67	V	62.25	48.71	-1.66	60.59	47.05	74.00	54.00	-6.95	AVG
4875.00	V	53.51	51.80	1.02	54.53	52.82	74.00	54.00	-1.18	AVG
7308.33	V	50.31	44.61	4.03	54.34	48.64	74.00	54.00	-5.36	AVG
N/A										
2330.00	H	62.17	49.67	-1.70	60.46	47.97	74.00	54.00	-6.03	AVG
3083.33	H	49.65	---	-0.34	49.31	---	74.00	54.00	-4.69	Peak
4875.00	H	53.53	49.50	1.02	54.55	50.52	74.00	54.00	-3.48	AVG
7308.33	H	50.03	43.04	4.03	54.06	47.07	74.00	54.00	-6.93	AVG
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:** Tx / IEEE 802.11b mode / CH High**Test Date:** July 9, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% 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
2320.00	V	62.78	50.33	-1.72	61.06	48.61	74.00	54.00	-5.39	AVG
4925.00	V	54.60	51.55	1.01	55.61	52.56	74.00	54.00	-1.44	AVG
7383.33	V	50.85	39.51	3.98	54.83	43.49	74.00	54.00	-10.51	AVG
N/A										
2353.33	H	62.27	50.31	-1.66	60.60	48.65	74.00	54.00	-5.35	AVG
4925.00	H	53.82	47.23	1.01	54.83	48.24	74.00	54.00	-5.76	AVG
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: Tx / IEEE 802.11g mode / CH Low

Test Date: July 9, 2009

Temperature: 23°C

Tested by: Mimic Yang

Humidity: 53% 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
1230.00	V	55.96	---	-7.53	48.42	---	74.00	54.00	-5.58	Peak
N/A										
2296.67	H	60.17	49.39	-1.76	58.41	47.63	74.00	54.00	-6.37	AVG
2353.33	H	62.11	49.46	-1.66	60.45	47.80	74.00	54.00	-6.20	AVG
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:** Tx / IEEE 802.11g mode / CH Mid**Test Date:** July 9, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% 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
2340.00	V	64.08	51.09	-1.69	62.40	49.40	74.00	54.00	-4.60	AVG
4875.00	V	53.08	39.35	1.02	54.10	40.37	74.00	54.00	-13.63	AVG
7308.33	V	52.67	41.54	4.03	56.70	45.57	74.00	54.00	-8.43	AVG
N/A										
2326.67	H	63.18	52.50	-1.71	61.47	50.79	74.00	54.00	-3.21	AVG
4875.00	H	49.77	---	1.02	50.79	---	74.00	54.00	-3.21	Peak
7308.33	H	50.62	40.20	4.03	54.64	44.23	74.00	54.00	-9.77	AVG
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: Tx / IEEE 802.11g mode / CH High

Test Date: July 9, 2009

Temperature: 23°C

Tested by: Mimic Yang

Humidity: 53% 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
2353.33	V	61.90	50.29	-1.66	60.24	48.63	74.00	54.00	-5.37	AVG
N/A										
2363.33	H	61.43	48.78	-1.65	59.78	47.13	74.00	54.00	-6.87	AVG
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: Tx / IEEE 802.11a mode / CH Low

Test Date: July 9, 2009

Temperature: 23°C

Tested by: Mimic Yang

Humidity: 53% 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
1113.33	V	53.85	---	-7.75	46.10	---	74.00	54.00	-7.90	Peak
1996.67	V	50.41	---	-2.28	48.13	---	74.00	54.00	-5.87	Peak
N/A										
1996.67	H	52.17	---	-2.28	49.89	---	74.00	54.00	-4.11	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: Tx / IEEE 802.11a mode / CH Mid

Test Date: July 9, 2009

Temperature: 23°C

Tested by: Mimic Yang

Humidity: 53% 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
1993.33	V	50.58	---	-2.31	48.26	---	74.00	54.00	-5.74	Peak
11566.67	V	46.83	38.50	14.19	61.01	52.69	74.00	54.00	-1.31	AVG
N/A										
1990.00	H	51.83	---	-2.35	49.49	---	74.00	54.00	-4.51	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:** Tx / IEEE 802.11a mode / CH High**Test Date:** July 9, 2009**Temperature:** 23°C**Tested by:** Mimic Yang**Humidity:** 53% 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
1996.67	V	50.71	---	-2.28	48.43	---	74.00	54.00	-5.57	Peak
5533.33	V	58.96	47.07	1.62	60.58	48.69	74.00	54.00	-5.31	AVG
11650.00	V	45.20	35.57	14.35	59.55	49.92	74.00	54.00	-4.08	AVG
N/A										
2000.00	H	51.73	---	-2.25	49.48	---	74.00	54.00	-4.52	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).



## 7.7 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  $\mu$ 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 $\mu$ 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

\* Decreases with the logarithm of the frequency.

### Test Configuration

See test photographs attached in Appendix 1 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:** July 13, 2009  
**Temperature:** 22°C                                      **Tested by:** Ryan Chen  
**Humidity:** 45% RH

Freq. (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
0.1950	41.21	33.11	0.09	41.30	33.20	63.82	53.82	-22.52	-20.62	L1
0.2950	40.72	26.12	0.08	40.80	26.20	60.38	50.38	-19.58	-24.18	L1
0.3350	40.82	19.72	0.08	40.90	19.80	59.33	49.33	-18.43	-29.53	L1
0.4600	35.24	20.94	0.06	35.30	21.00	56.69	46.69	-21.39	-25.69	L1
7.1550	26.91	20.11	0.09	27.00	20.20	60.00	50.00	-33.00	-29.80	L1
13.9500	29.72	24.22	0.28	30.00	24.50	60.00	50.00	-30.00	-25.50	L1
0.2000	41.90	35.70	0.10	42.00	35.80	63.61	53.61	-21.61	-17.81	L2
0.3100	45.31	30.51	0.09	45.40	30.60	59.97	49.97	-14.57	-19.37	L2
0.3900	38.81	28.11	0.09	38.90	28.20	58.06	48.06	-19.16	-19.86	L2
0.4900	36.52	23.52	0.08	36.60	23.60	56.17	46.17	-19.57	-22.57	L2
0.5750	35.32	22.62	0.08	35.40	22.70	56.00	46.00	-20.60	-23.30	L2
13.6800	31.30	25.70	0.20	31.50	25.90	60.00	50.00	-28.50	-24.10	L2

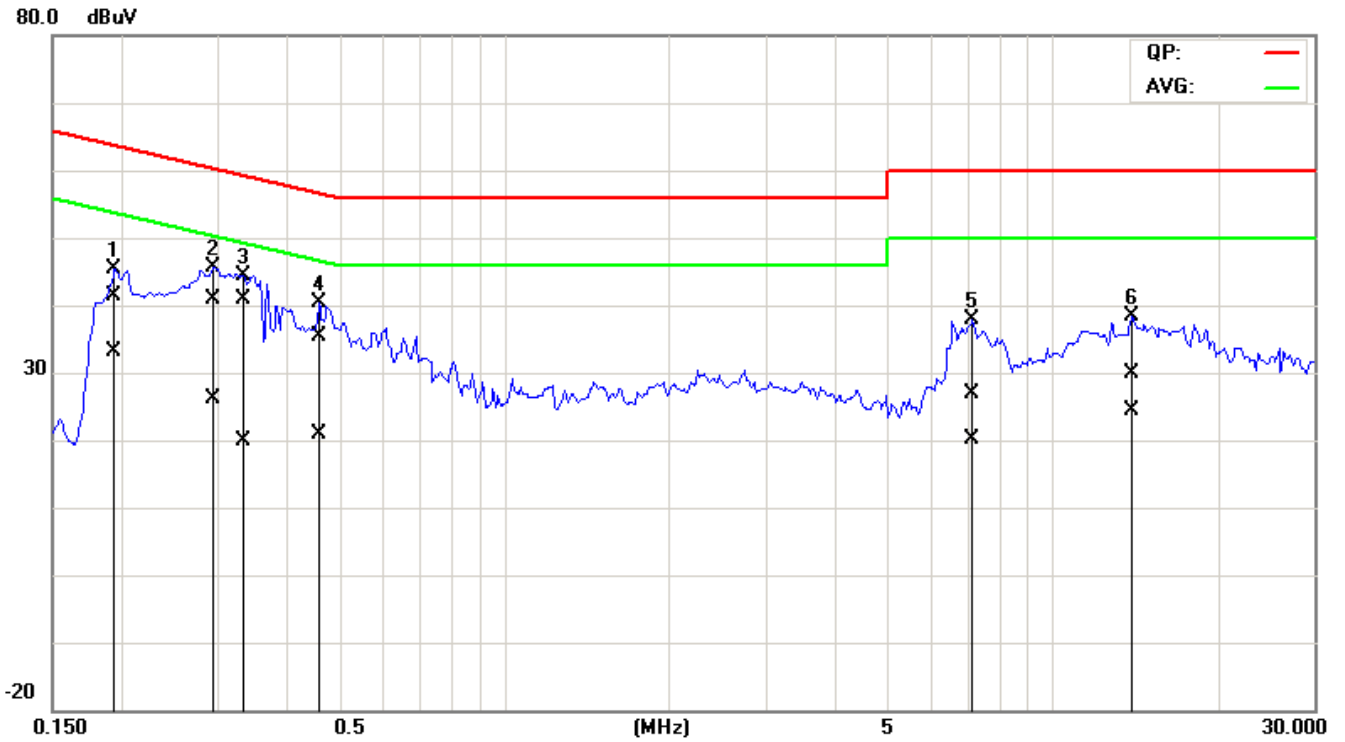
### **Remark:**

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)

