



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Home Monitoring Gateway

Model: 7502AG

Trade Name: WESTELL

Issued to

Westell, Inc.

750 N. Commons Drive Aurora, IL 60504, USA

Issued by

Compliance Certification Services Inc.

No. 11, Wu-Gong 6th Rd., Wugu Industrial Park,

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1. TEST RESULT CERTIFICATION

Applicant: Westell, Inc.
750 N. Commons Drive Aurora, IL 60504, USA

Equipment Under Test: Home Monitoring Gateway

Trade Name: WESTELL

Model: 7502AG

Date of Test: October 17 ~ November 19, 2008

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

We hereby certify that:

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

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

Approved by:

Reviewed by:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Amanda Wu
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	Home Monitoring Gateway
Trade Name	WESTELL
Model Number	7502AG
Model Discrepancy	N/A
Power Adapter	1. DVE / DSA-15P-12US 120120 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1 A 2. LEADER / MU12-2120100-A1 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1 A 3. LEADER / MT12-Y120100-A1 I/P: 120V, 60Hz, 0.3A O/P: 12V, 1 A
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b: 15.45 dBm IEEE 802.11g: 13.37 dBm
Modulation Technique	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps
Number of Channels	11 Channels
Antenna Specification	Gain: 3.29 dBi
Antenna Designation	PIFA 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: **CH87502AGXX-00** 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 Part 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
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

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

² Above 38.6

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



3.5 DESCRIPTION OF TEST MODES

The EUT (model: 7502AG) comes with three types of power adapter (DSA-15P-12US 120120 & MU12-2120100-A1 & MT12-Y120100-A1) for sale. After the preliminary test, the EUT with power adapter (Model: DSA-15P-12US 120120) was found to emit the worst emissions and therefore had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE802.11b mode:

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

IEEE802.11g mode:

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



4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

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

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

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

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	02/24/2009

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	11/30/2008
Switch Controller	TRC	Switch Controller	SC94050010	05/03/2009
4 Port Switch	TRC	4 Port Switch	SC94050020	05/03/2009
Horn-Antenna	TRC	HA-0502	06	06/04/2009
Horn-Antenna	TRC	HA-0801	04	06/19/2009
Horn-Antenna	TRC	HA-1201A	01	08/10/2009
Horn-Antenna	TRC	HA-1301A	01	08/11/2009
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/28/2009
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC MRA: TW1039 IC: 2324G-1/-2	10/17/2010 11/04/2010
Test S/W	LABVIEW (V 6.1)			

Conducted Emissions Test Site # B				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESHS10	843743/015	03/31/2009
LISN (EUT)	FCC	FCC-LISN-50-32-2	08009	06/09/2009
LISN	EMCO	3825/2	1382	01/06/2009
BNC CABLE	MIYAZAKI	5D-FB	BNC B1	07/11/2009
Pulse Limiter	R&S	ESH3-Z2	100374	08/22/2009
THERMO-HYGRO METER	TOP	HA-202	9303-3	01/29/2009



4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 3.45
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	+/-3.7046
3M Semi Anechoic Chamber / 1GHz Above	+/-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, Chungshen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

Remark: The powerline conducted emissions test items was tested at Compliance Certification Services Inc. (Hsintien Lab.) The test equipments were listed in page 8 and the test data, please refer page 54-55.

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: 2003 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	 Testing Laboratory 1309
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	DELL	PP05L	7T390 A03	E2K5HCKT	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	USB to Comport Cable	N/A	N/A	N/A	N/A	Shielded, 0.4m	N/A
3.	Test Kit	N/A	N/A	N/A	N/A	N/A	N/A
4.	PS/2 Mouse	DELL	M071KC	443029438	FCC DOC	Shielded, 1.8m	N/A
5.	PS/2 Keyboard	DELL	SK-8110	N/A	FCC DOC	Shielded, 1.8m	N/A
6.	Printer	HP	LaserJet 1015	N/A	FCC DOC	Shielded, 1.8m	Unshielded, 1.8m
7.	Monitor	SAMAUNG	710V	GS17H9NXA05858E	FCC DOC	Shielded, 1.8m with two cores	Unshielded, 1.8m
8.	Dongle	Sercomm	N/A	N/A	FCC DOC	N/A	N/A
9.	Dongle	Sercomm	N/A	N/A	FCC DOC	N/A	N/A
10.	Host PC	HP	xw4400	N/A	FCC DOC	Unshielded, 1.1m	Unshielded, 1.8m
11.	Modem	ACEEX	1414	N/A	FCC DOC	Shielded, 1.8m	Unshielded, 1.8m
12.	Server PC (Remote)	HP	xw4400	N/A	FCC DOC	Unshielded, 20m	Unshielded, 1.8m

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.



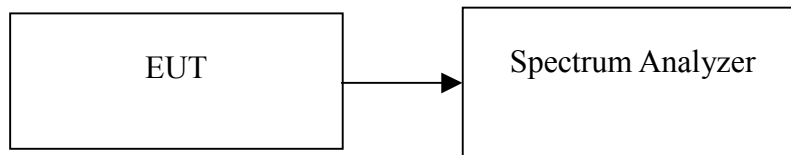
7. FCC PART 15.247 REQUIREMENTS

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 = 100 kHz, VBW = RBW, Span = 50 MHz, 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

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	9.92	>500	PASS
Mid	2437	9.67		PASS
High	2462	9.83		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.50	>500	PASS
Mid	2437	16.42		PASS
High	2462	16.17		PASS



Test Plot

IEEE 802.11b

6dB Bandwidth (CH Low)

Agilent 14:38:3 Oct 22, 2008

R T

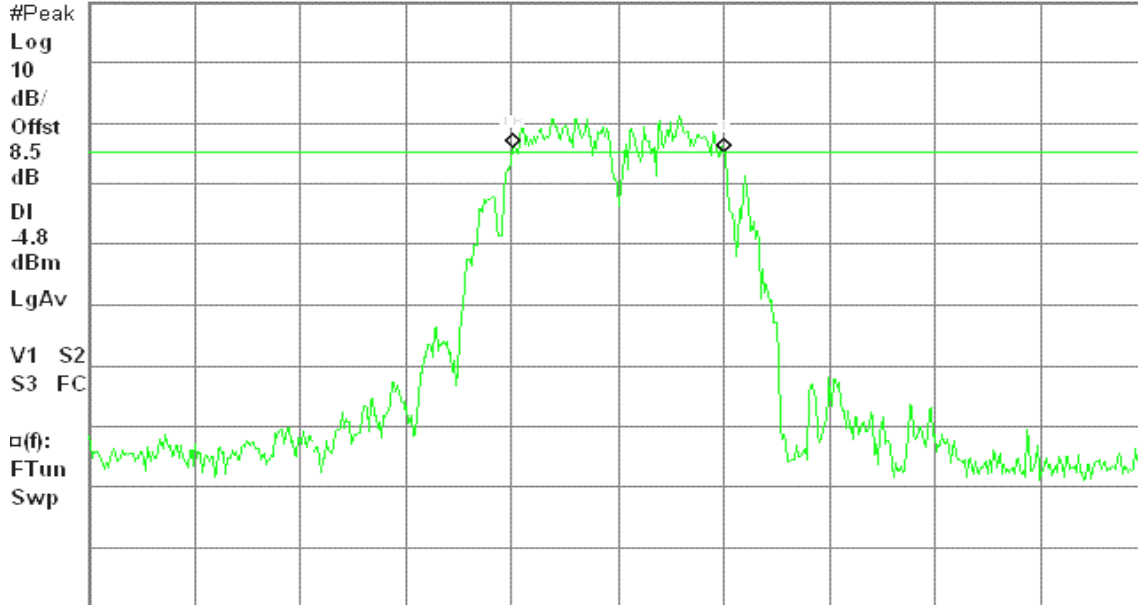
6dB BW, b Mode Low Ch.

Δ Mkr1 9.92 MHz

Ref 20 dBm

Atten 30 dB

-0.75 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

6dB Bandwidth (CH Mid)

Agilent 14:49:16 Oct 22, 2008

R T

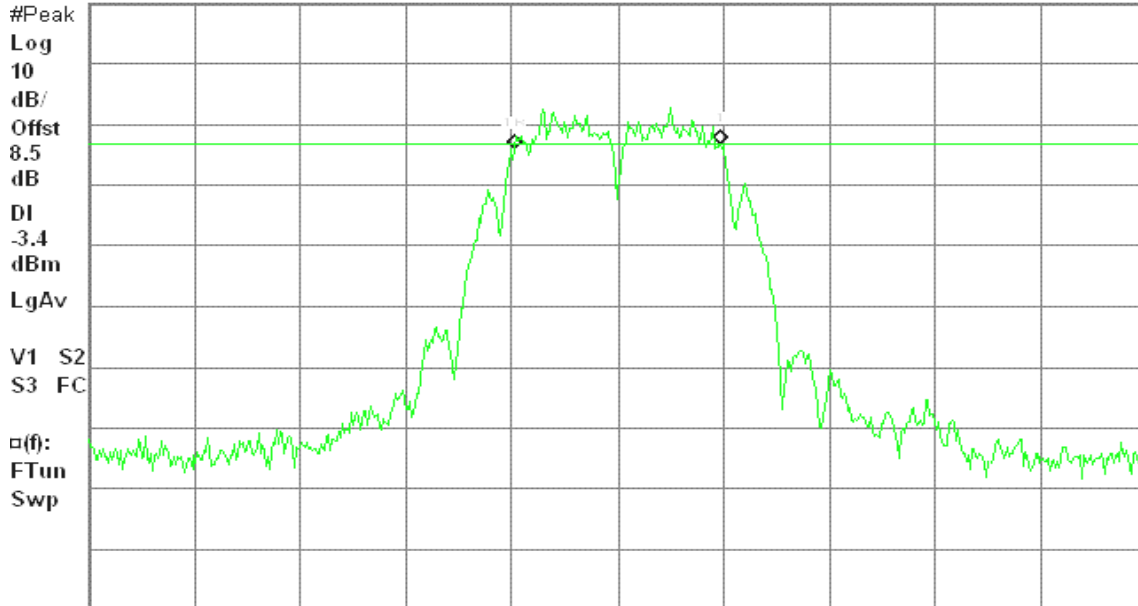
6dB BW, b Mode Mid Ch.

Δ Mkr1 9.67 MHz

Ref 20 dBm

Atten 30 dB

0.81 dB



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



6dB Bandwidth (CH High)

Agilent 14:55: Oct 22, 2008

R T

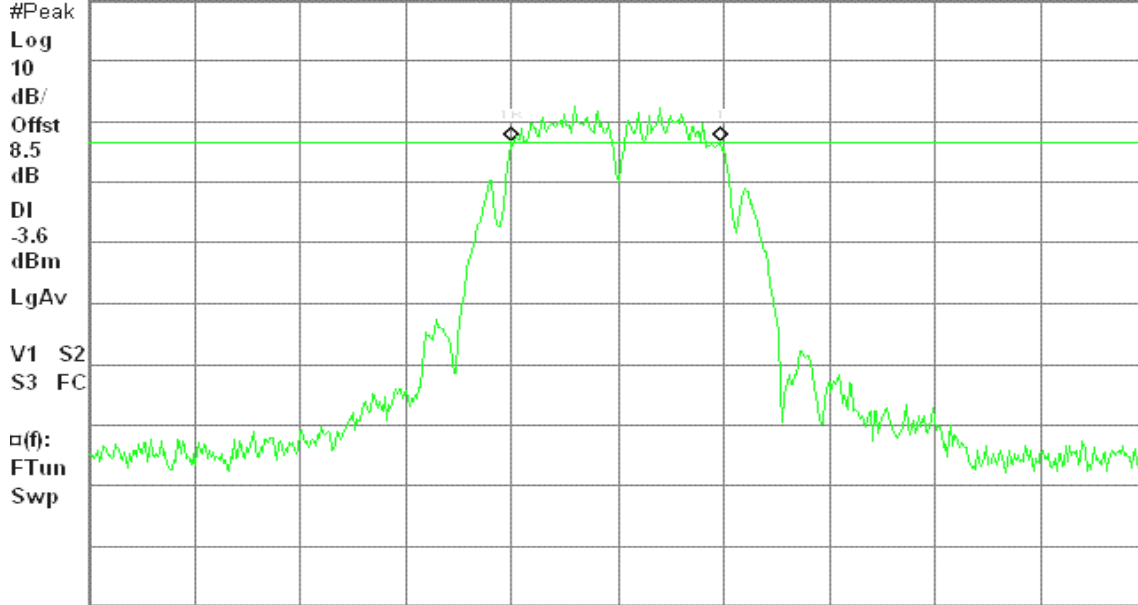
6dB BW, b Mode High Ch.

Δ Mkr1 9.83 MHz

Ref 20 dBm

Atten 30 dB

0.01 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

6dB Bandwidth (CH Low)

Agilent 15:04:40 Oct 22, 2008

R T

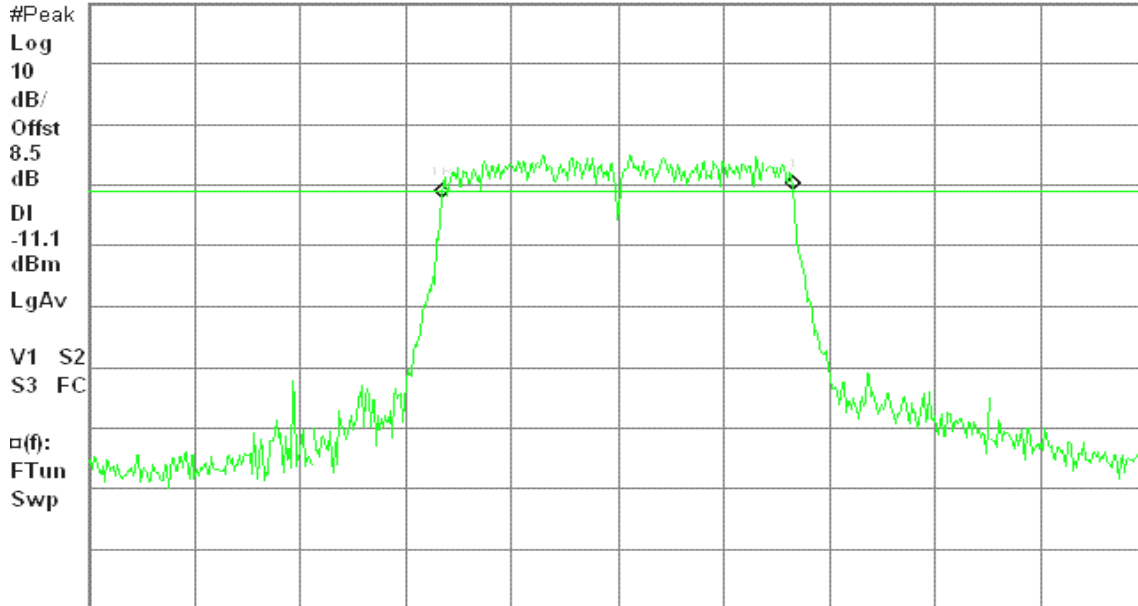
6dB BW, g Mode Low Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 30 dB

1.27 dB



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



6dB Bandwidth (CH Mid)

Agilent 15:23:55 Oct 22, 2008

R T

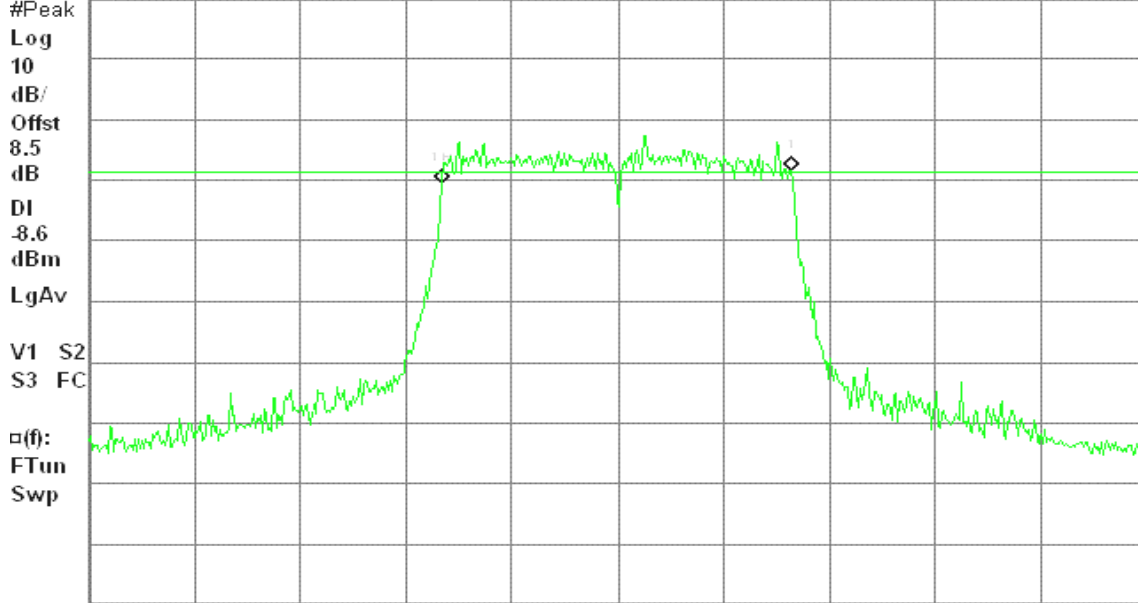
6dB BW, g Mode Mid Ch.

Δ Mkr1 16.42 MHz

Ref 20 dBm

Atten 30 dB

2.21 dB



Center 2.437 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)

6dB Bandwidth (CH High)

Agilent 15:49:47 Oct 22, 2008

R T

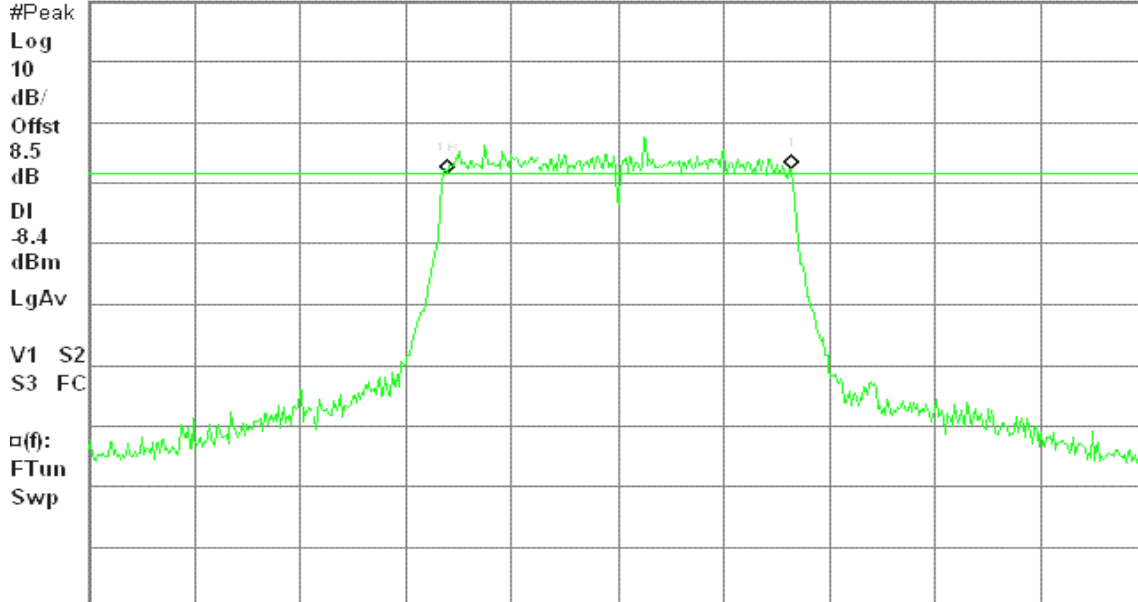
6dB BW, g Mode High Ch.

Δ Mkr1 16.17 MHz

Ref 20 dBm

Atten 30 dB

0.80 dB



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



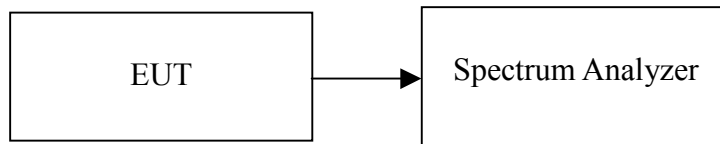
7.2 PEAK POWER

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

1. Peak power is measured using the spectrum analyzer's internal channel power integration function.
2. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

TEST RESULTS

No non-compliance noted



Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	15.45	0.0351	1.00	PASS
Mid	2437	15.26	0.0336		PASS
High	2462	14.96	0.0313		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	13.37	0.0217	1.00	PASS
Mid	2437	13.06	0.0202		PASS
High	2462	12.94	0.0197		PASS



Test Plot

IEEE 802.11b

Peak Power (CH Low)

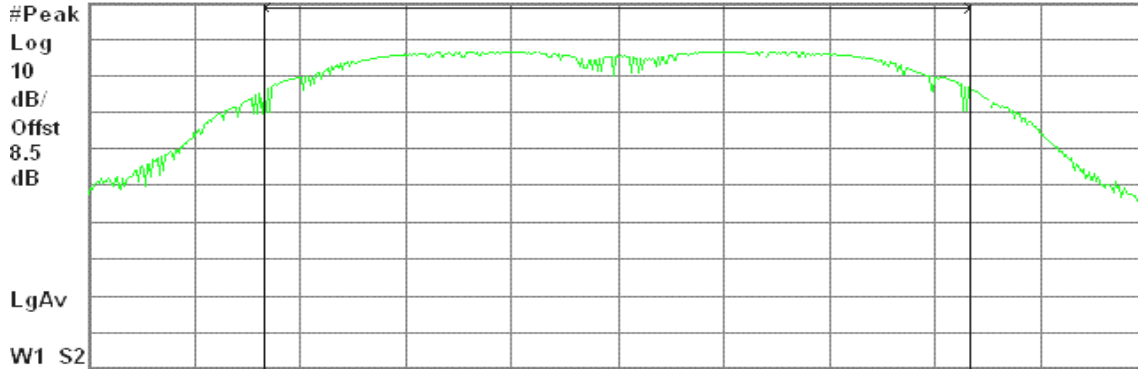
Agilent 14:40:10 Oct 22, 2008

R T

Peak Output Power , b Mode Low Ch.

Ref 20 dBm

Atten 30 dB



Channel Power

15.45 dBm / 11.8970 MHz

Power Spectral Density

-55.31 dBm/Hz

Peak Power (CH Mid)

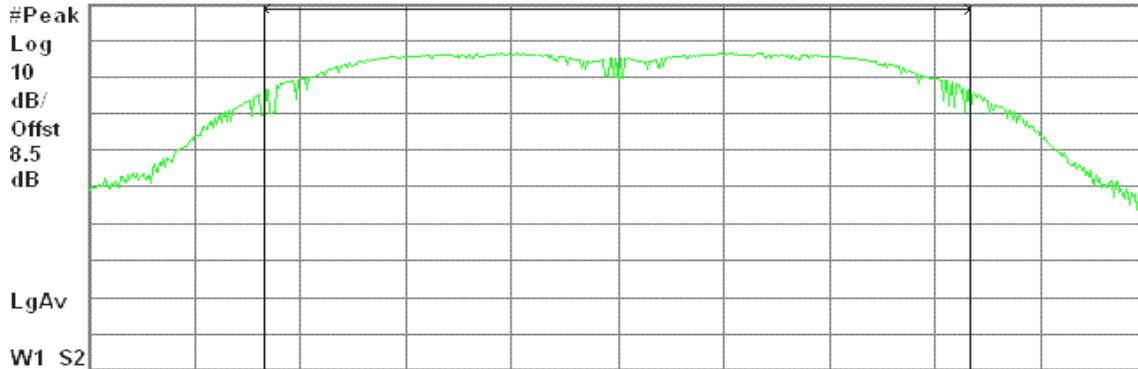
Agilent 14:49:51 Oct 22, 2008

R T

Peak Output Power , b Mode Mid Ch.

Ref 20 dBm

Atten 30 dB



Channel Power

15.26 dBm / 11.8920 MHz

Power Spectral Density

-55.49 dBm/Hz



Peak Power (CH High)

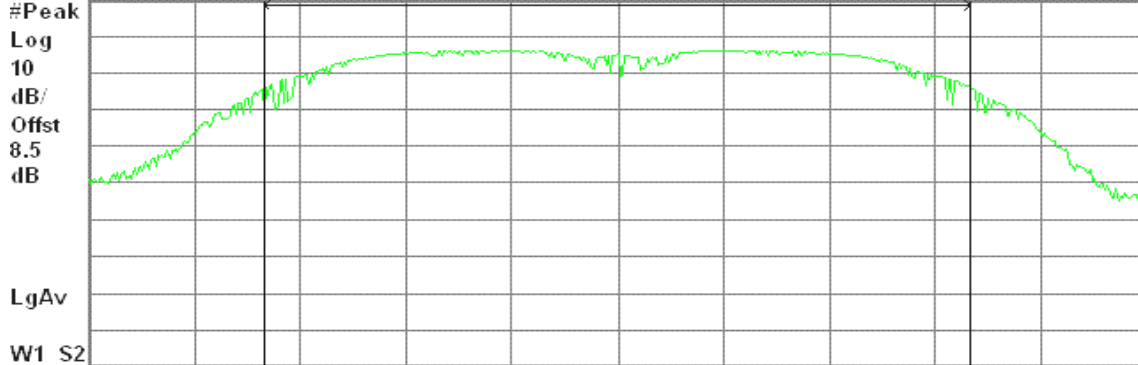
Agilent 14:56:14 Oct 22, 2008

R T

Peak Output Power , b Mode High Ch.

Ref 20 dBm

Atten 30 dB



Channel Power

14.96 dBm / 11.8750 MHz

Power Spectral Density

-55.79 dBm/Hz

IEEE 802.11g

Peak Power (CH Low)

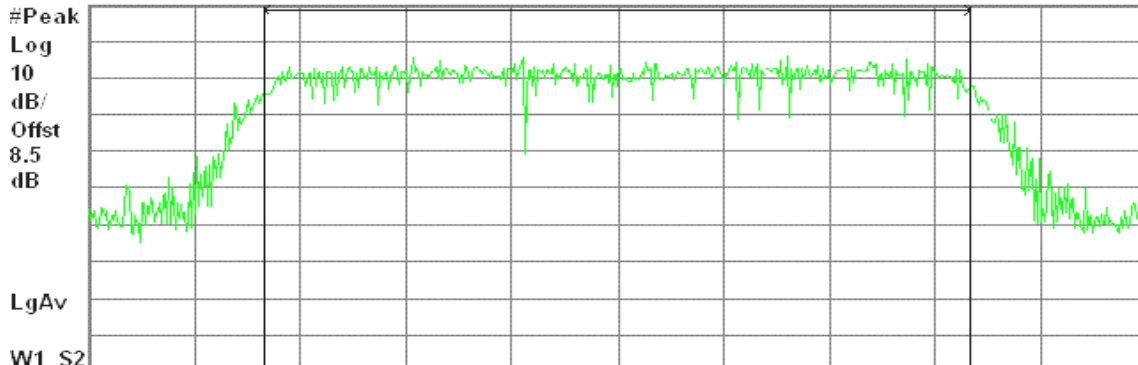
Agilent 15:05:50 Oct 22, 2008

R L

Peak Output Power , g Mode Low Ch.

Ref 20 dBm

Atten 30 dB



Channel Power

13.37 dBm / 16.6690 MHz

Power Spectral Density

-58.85 dBm/Hz



Peak Power (CH Mid)

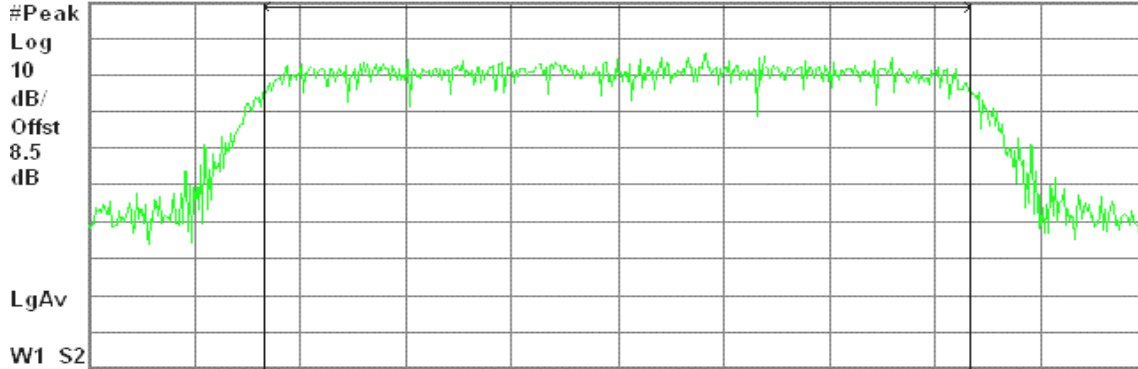
Agilent 15:24:46 Oct 22, 2008

R T

Peak Output Power, g Mode Mid Ch.

Ref 20 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.1 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

13.06 dBm / 16.7350 MHz

-59.17 dBm/Hz

Peak Power (CH High)

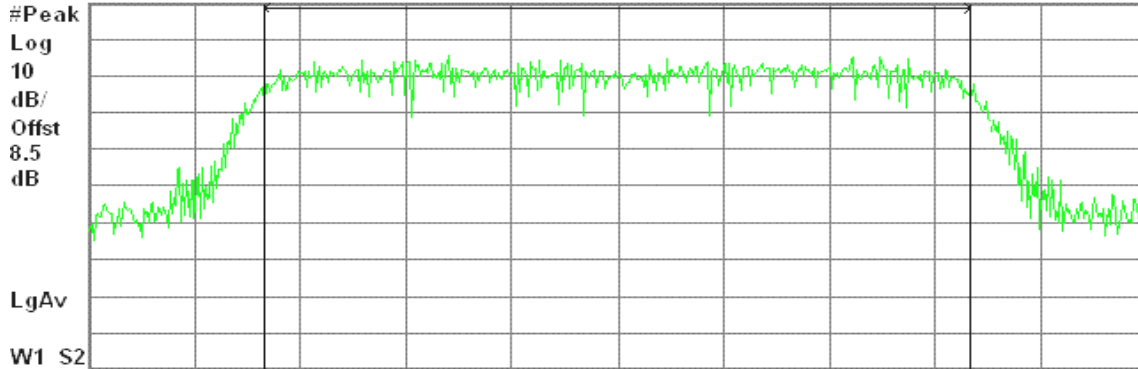
Agilent 15:51:19 Oct 22, 2008

R T

Peak Output Power, g Mode High Ch.

Ref 20 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 25.12 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

12.94 dBm / 16.7490 MHz

-59.30 dBm/Hz

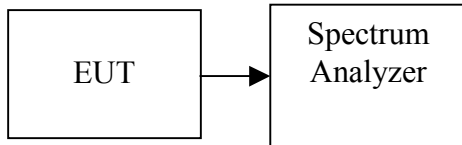


7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer 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)
Low	2412	12.72
Mid	2437	12.57
High	2462	12.36

Test mode: IEEE 802.11g

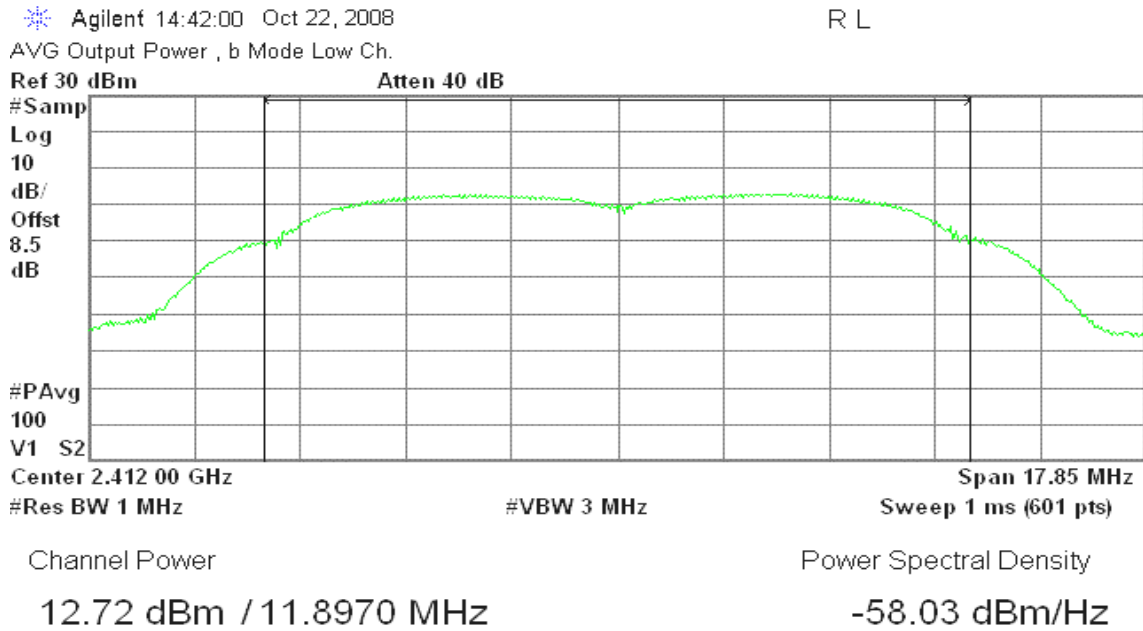
Channel	Frequency (MHz)	Output Power (dBm)
Low	2412	9.78
Mid	2437	9.86
High	2462	9.60



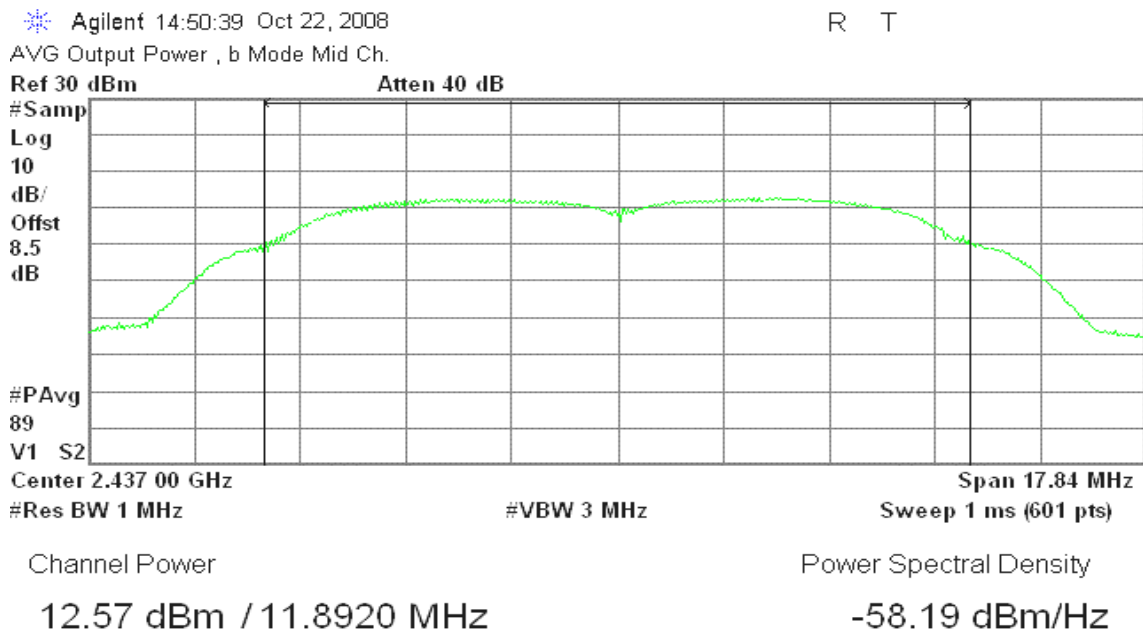
Test Plot

IEEE 802.11b

CH Low



CH Mid





CH High

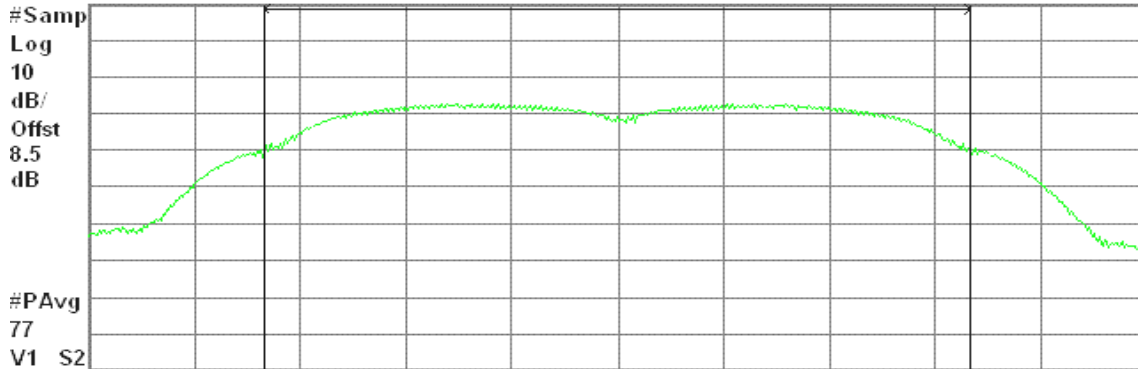
Agilent 14:57:11 Oct 22, 2008

R T

AVG Output Power , b Mode High Ch.

Ref 30 dBm

Atten 40 dB



Center 2.462 00 GHz

Span 17.81 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

12.36 dBm / 11.8750 MHz

-58.39 dBm/Hz

IEEE 802.11g

CH Low

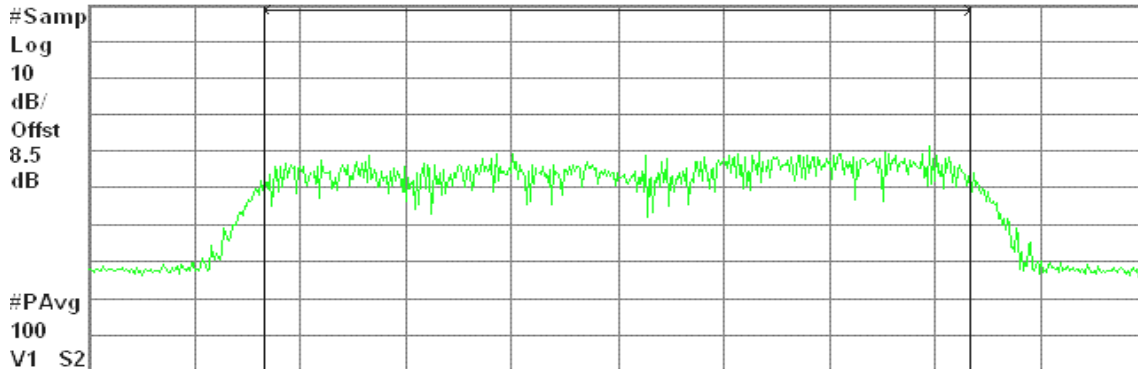
Agilent 15:07:20 Oct 22, 2008

R T

AVG Output Power , g Mode Low Ch.

Ref 30 dBm

Atten 40 dB



Center 2.412 00 GHz

Span 25 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

9.78 dBm / 16.6690 MHz

-62.44 dBm/Hz



CH Mid

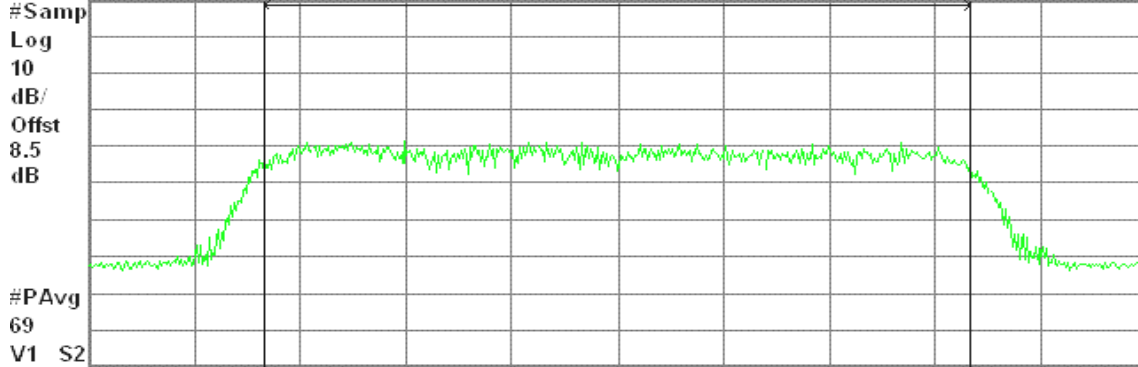
Agilent 15:41:54 Oct 22, 2008

R T

AVG Output Power , g Mode Mid Ch.

Ref 30 dBm

Atten 40 dB



Center 2.437 00 GHz

Span 25.1 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

9.86 dBm / 16.7350 MHz

-62.37 dBm/Hz

CH High

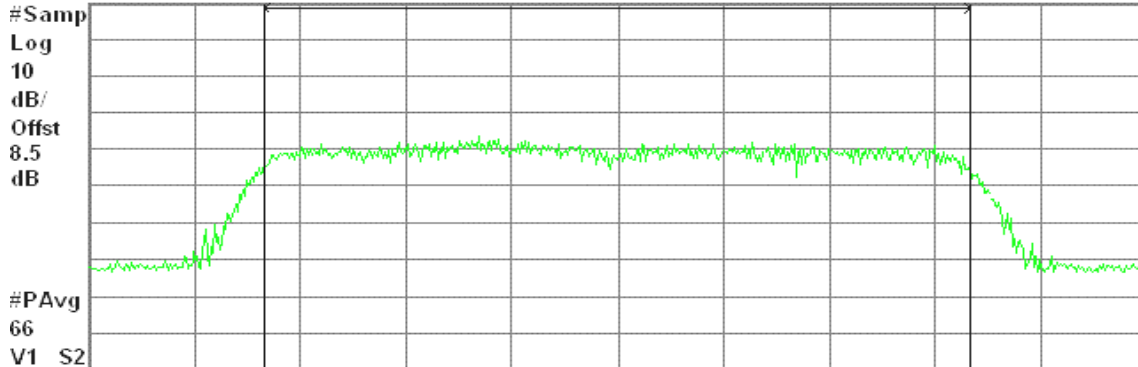
Agilent 15:51:59 Oct 22, 2008

R T

AVG Output Power , g Mode High Ch.

Ref 30 dBm

Atten 40 dB



Center 2.462 00 GHz

Span 25.12 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

9.60 dBm / 16.7490 MHz

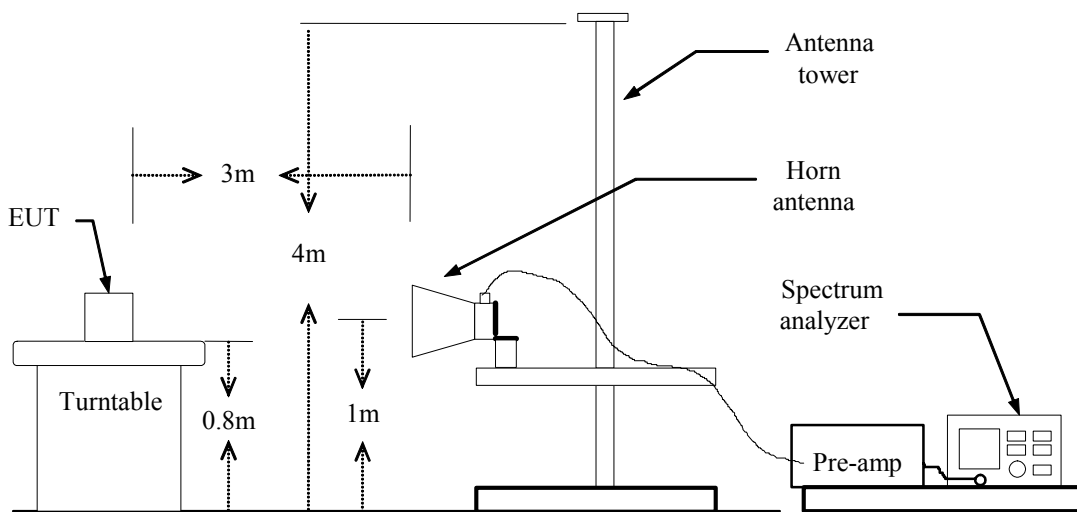
-62.64 dBm/Hz

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.



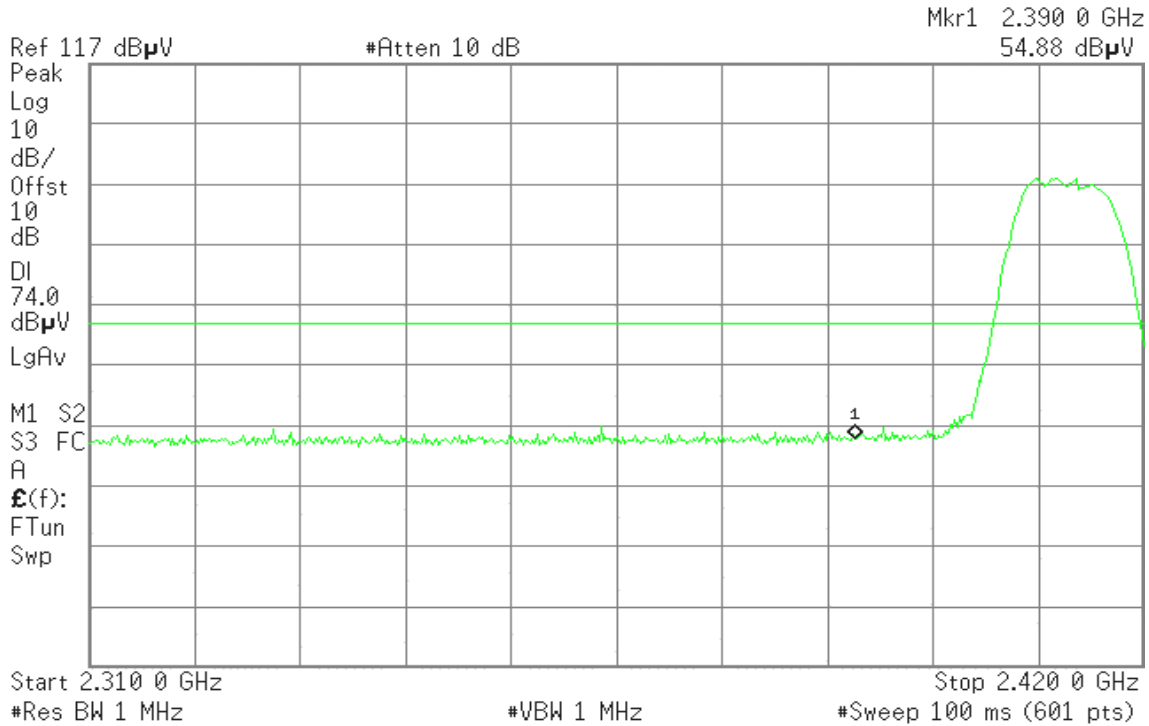
Band Edges (IEEE 802.11b / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 15:51:44 Oct 17, 2008

T

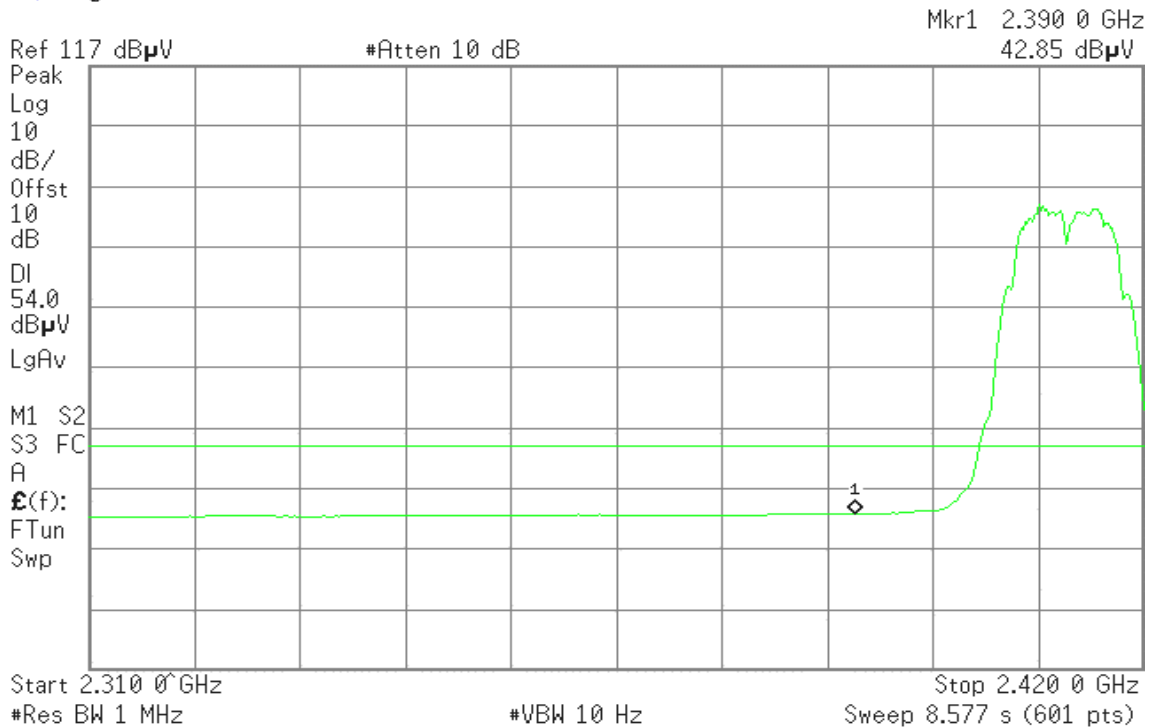


Detector mode: Average

Polarity: Vertical

Agilent 15:52:09 Oct 17, 2008

T





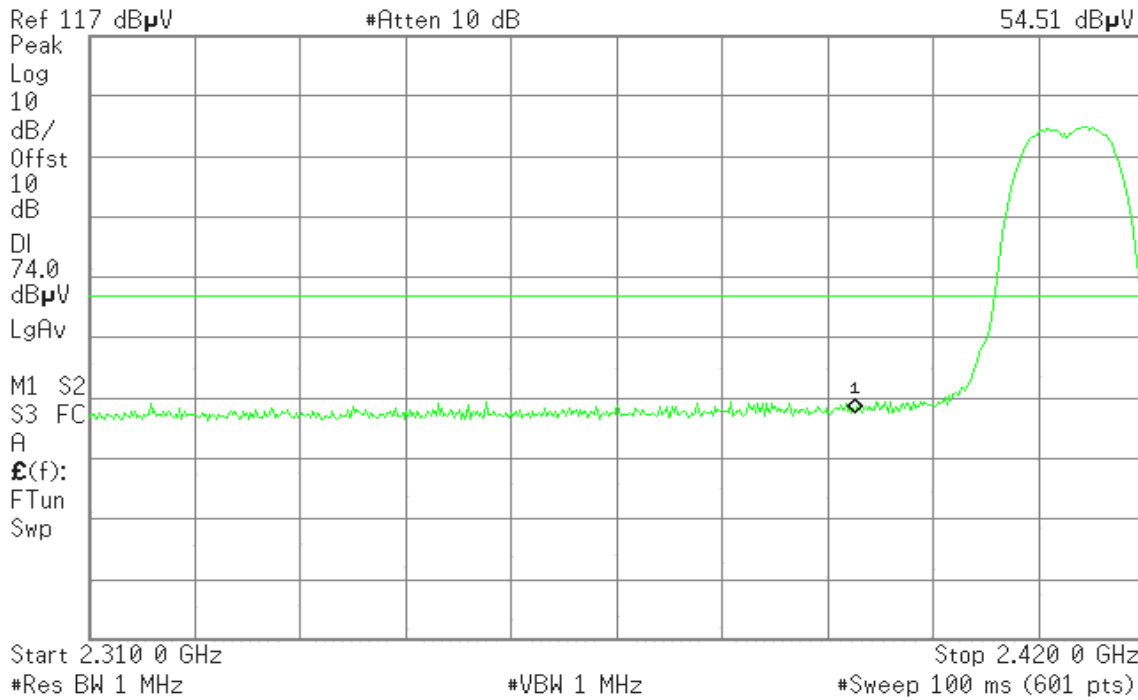
Detector mode: Peak

Polarity: Horizontal

Agilent 15:53:20 Oct 17, 2008

T

Mkr1 2.390 0 GHz
54.51 dBµV



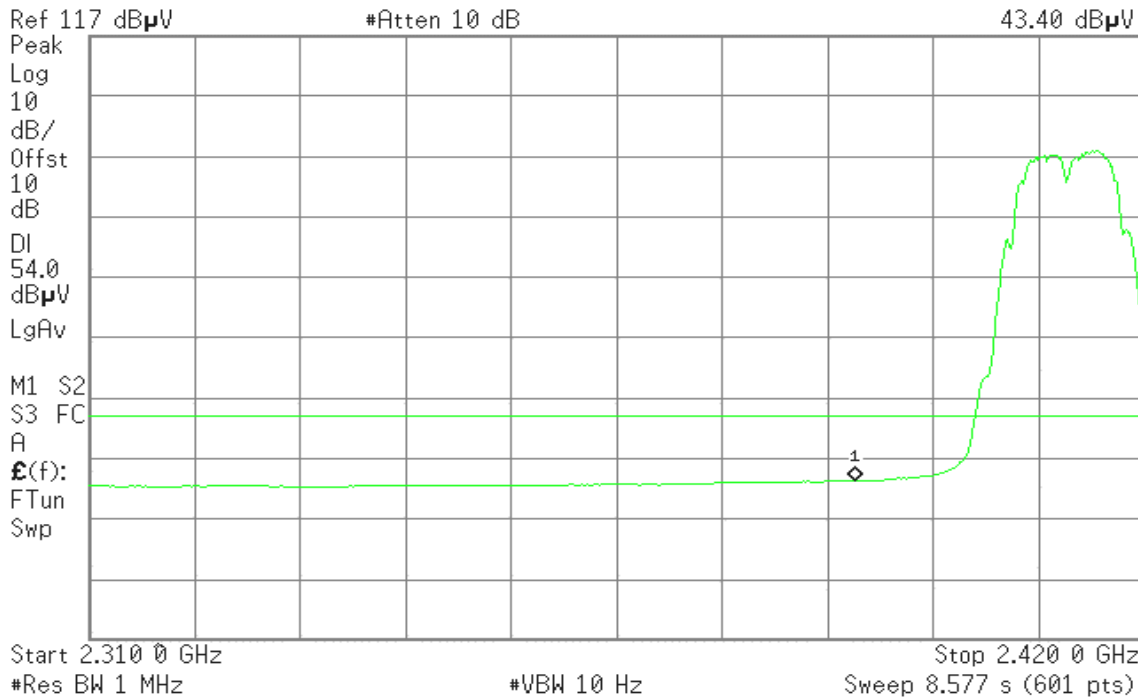
Detector mode: Average

Polarity: Horizontal

Agilent 15:53:04 Oct 17, 2008

T

Mkr1 2.390 0 GHz
43.40 dBµV





Band Edges (IEEE 802.11b / CH High)

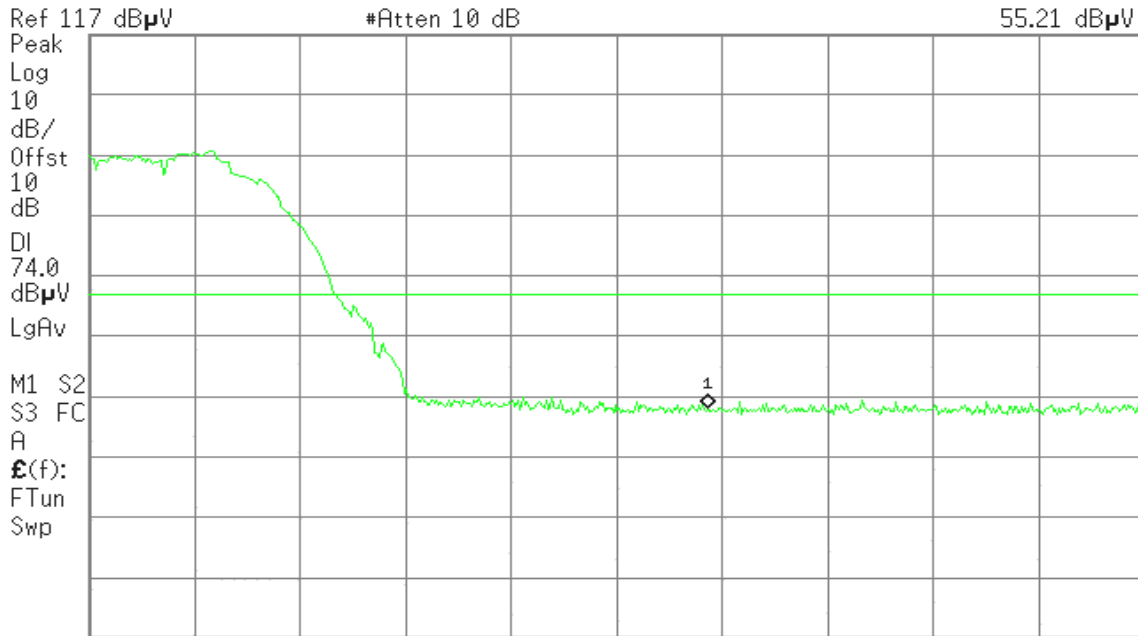
Detector mode: Peak

Polarity: Vertical

Agilent 15:37:42 Oct 17, 2008

R T

Mkr1 2.483 50 GHz
55.21 dB μ V



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

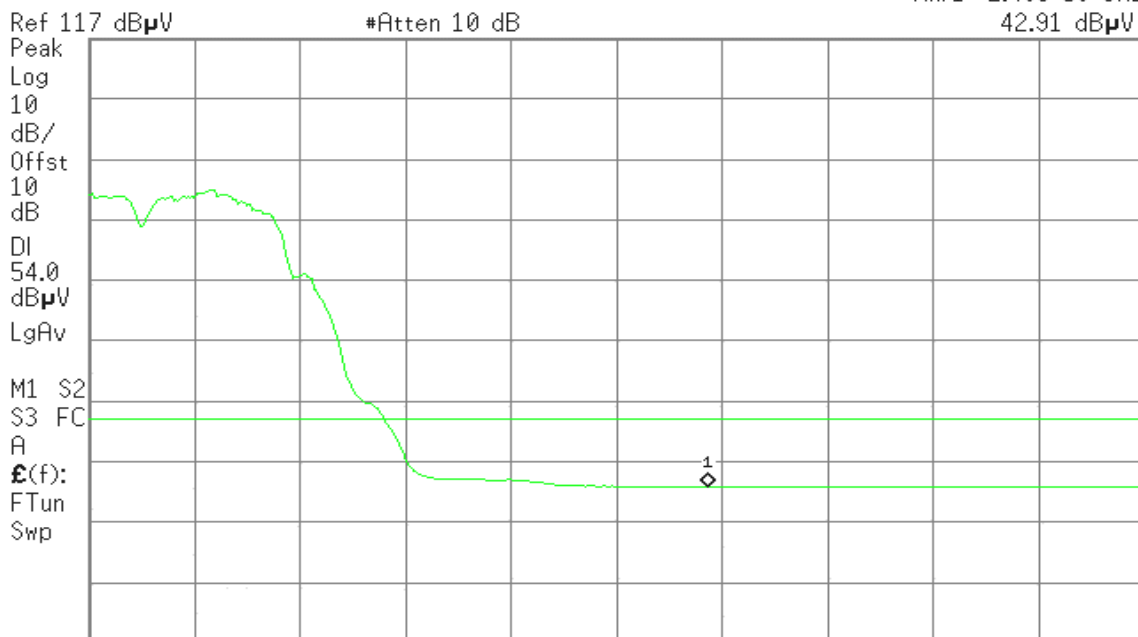
Detector mode: Average

Polarity: Vertical

Agilent 15:37:57 Oct 17, 2008

R T

Mkr1 2.483 50 GHz
42.91 dB μ V



Start 2.460 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 3.119 s (601 pts)



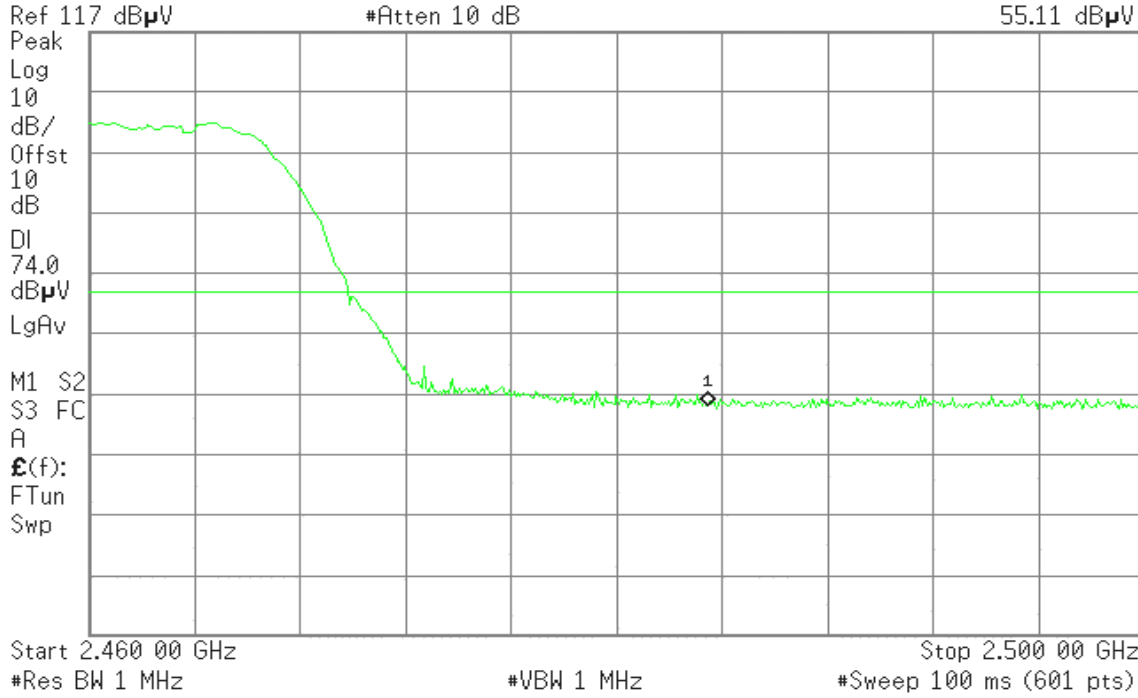
Detector mode: Peak

Polarity: Horizontal

Agilent 15:39:48 Oct 17, 2008

R T

Mkr1 2.483 50 GHz
55.11 dBμV



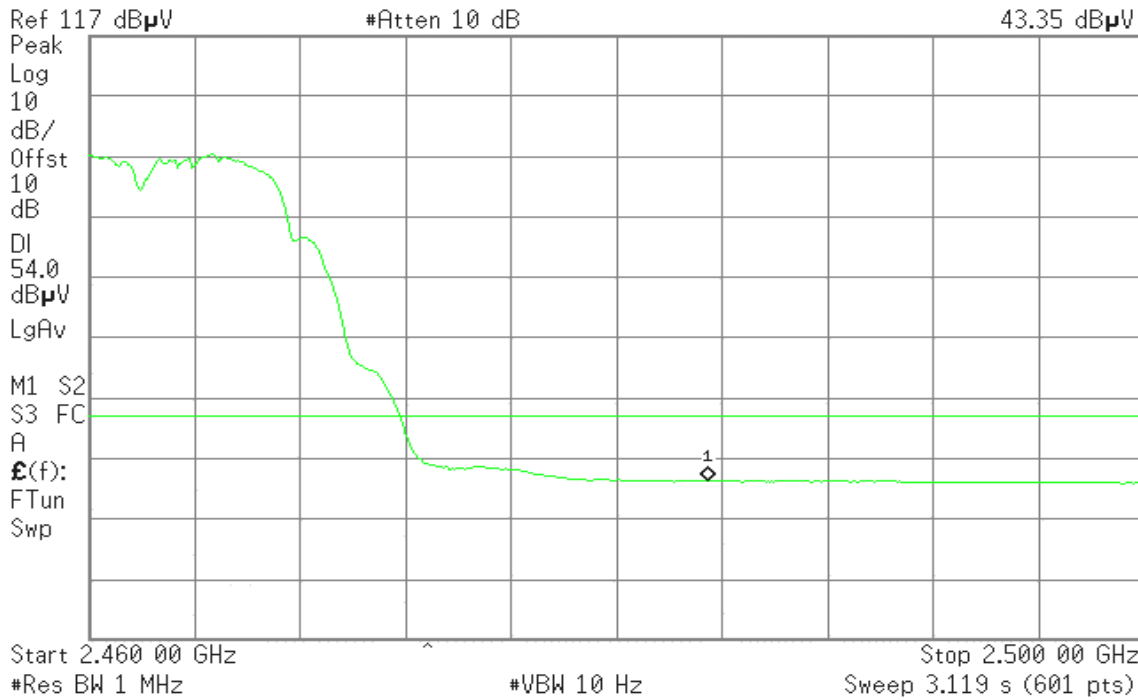
Detector mode: Average

Polarity: Horizontal

Agilent 15:40:03 Oct 17, 2008

R T

Mkr1 2.483 50 GHz
43.35 dBμV





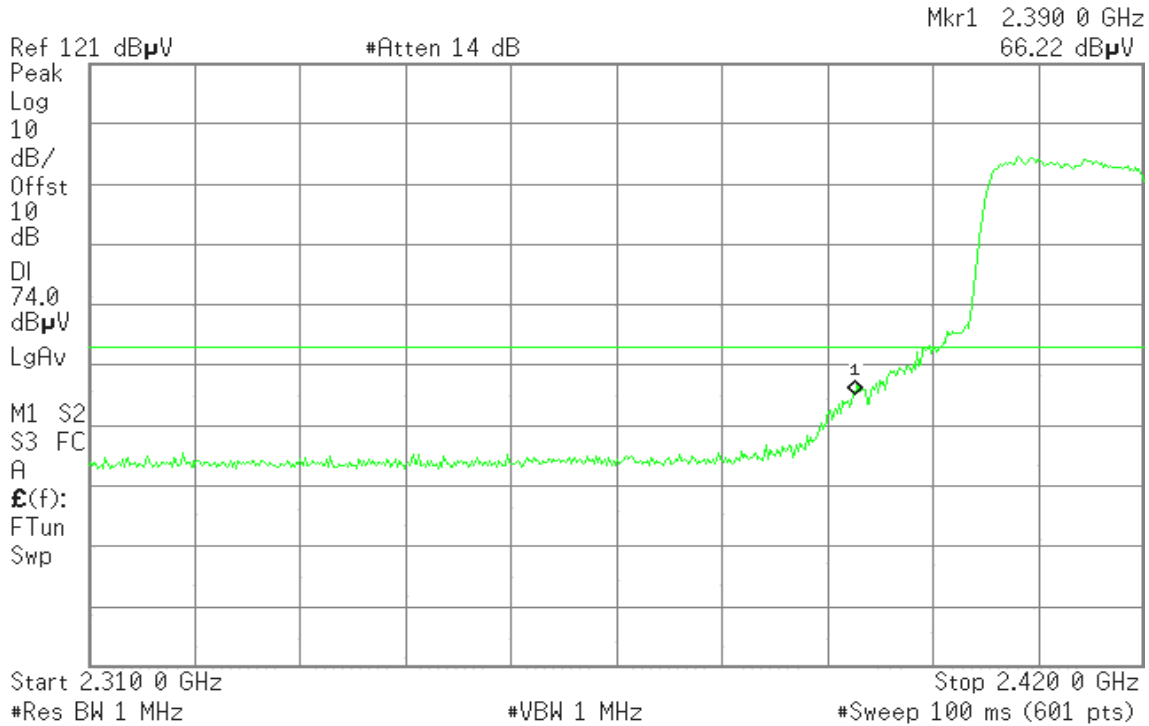
Band Edges (IEEE 802.11g / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 16:09:06 Oct 17, 2008

T

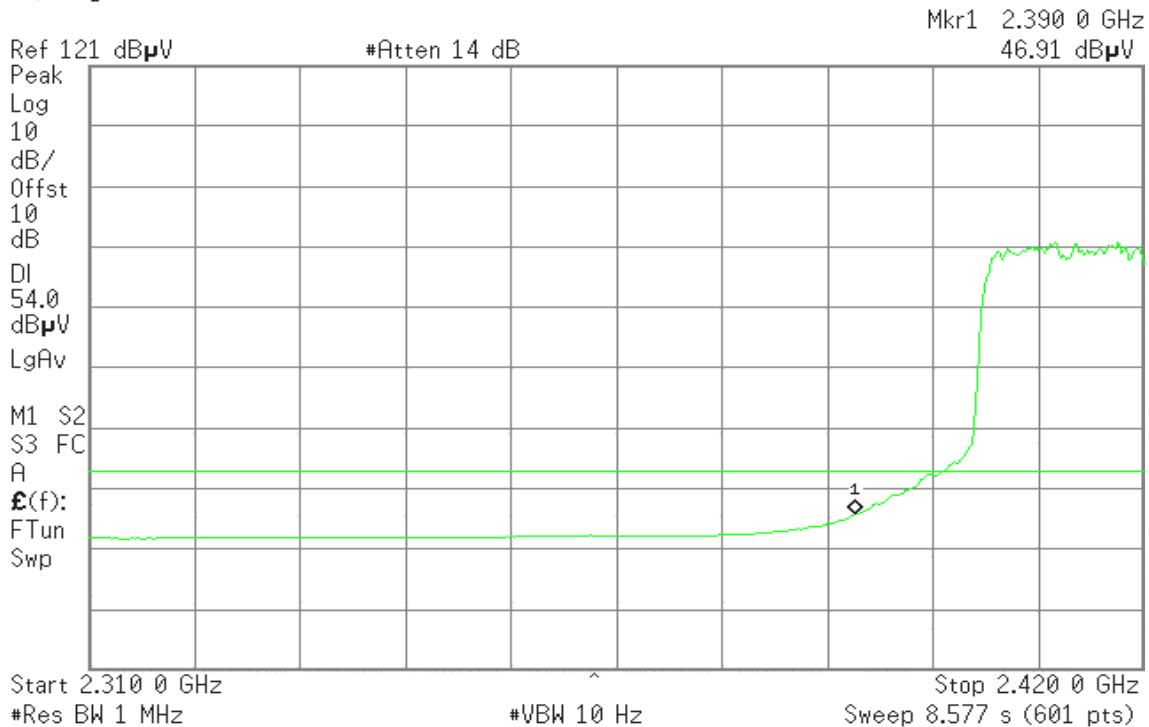


Detector mode: Average

Polarity: Vertical

Agilent 16:09:36 Oct 17, 2008

T





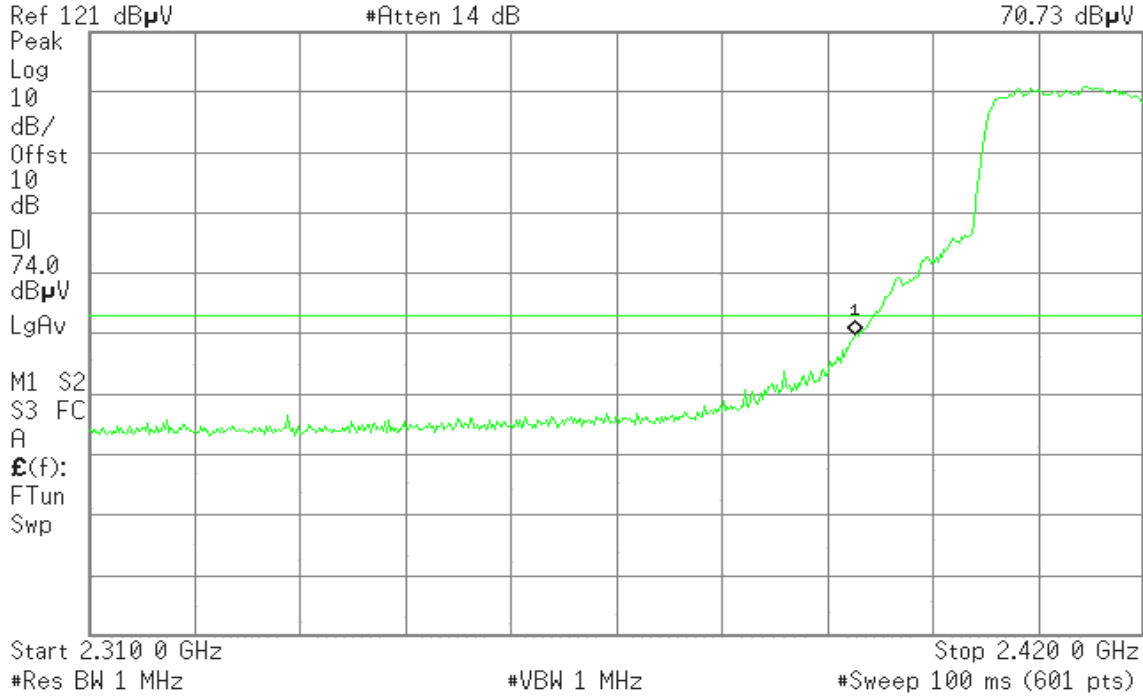
Detector mode: Peak

Polarity: Horizontal

Agilent 16:08:25 Oct 17, 2008

T

Mkr1 2.390 0 GHz
70.73 dBμV



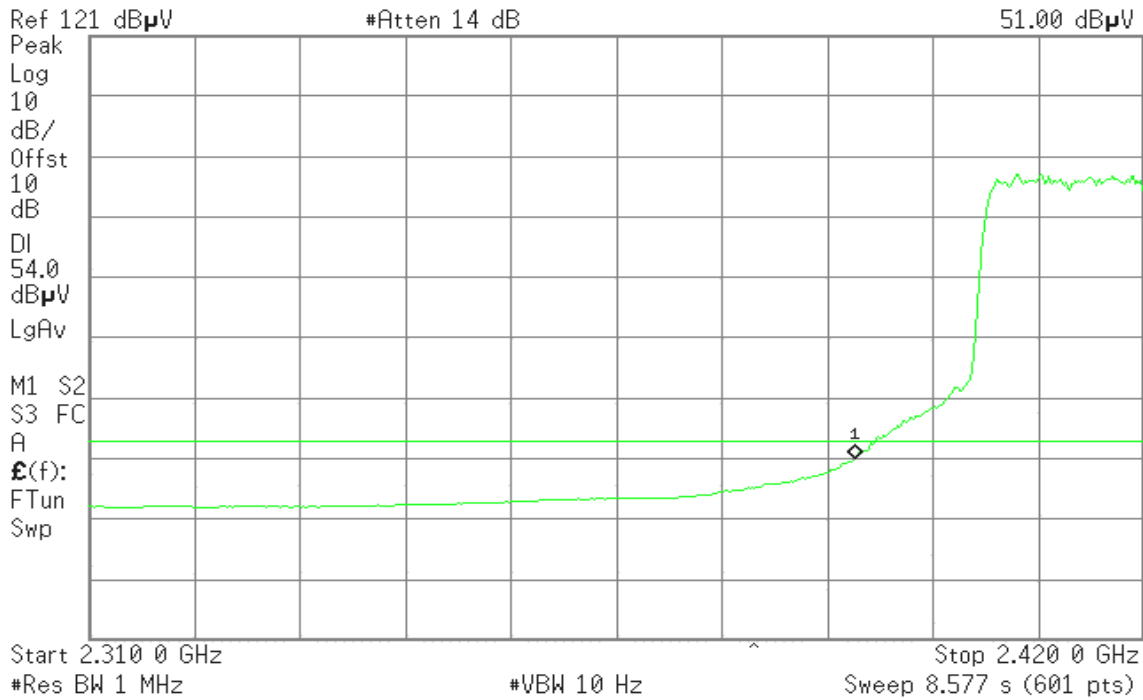
Detector mode: Average

Polarity: Horizontal

Agilent 16:08:04 Oct 17, 2008

T

Mkr1 2.390 0 GHz
51.00 dBμV





Band Edges (IEEE 802.11g / CH High)

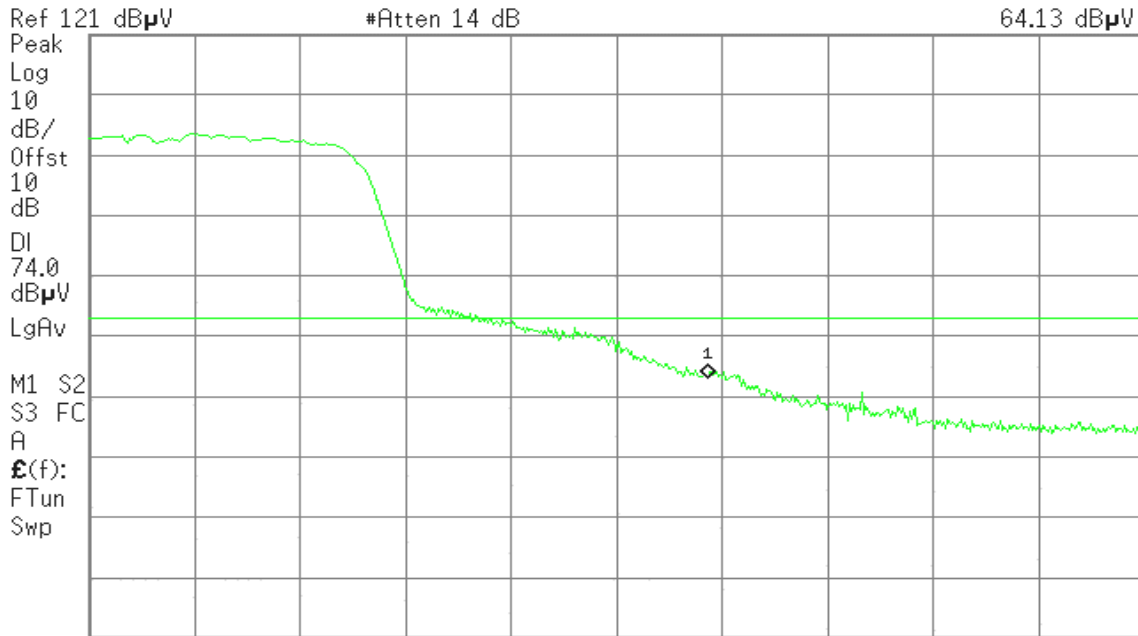
Detector mode: Peak

Polarity: Vertical

Agilent 16:55:39 Oct 17, 2008

T

Mkr1 2.483 50 GHz
64.13 dB μ V



Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

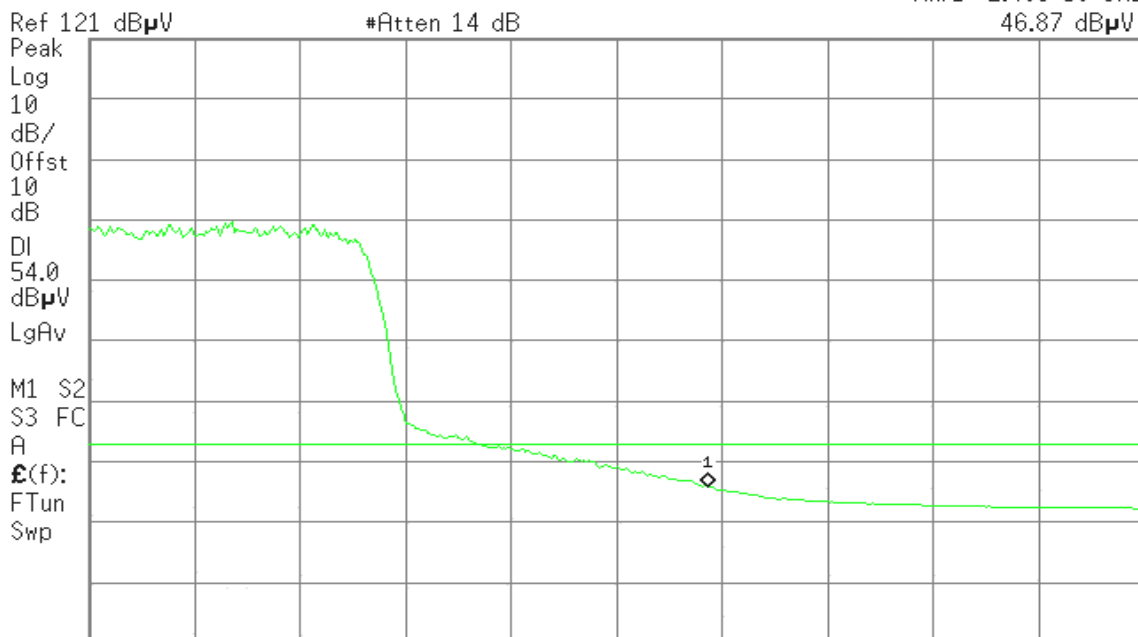
Detector mode: Average

Polarity: Vertical

Agilent 16:55:51 Oct 17, 2008

T

Mkr1 2.483 50 GHz
46.87 dB μ V



Start 2.460 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 3.119 s (601 pts)



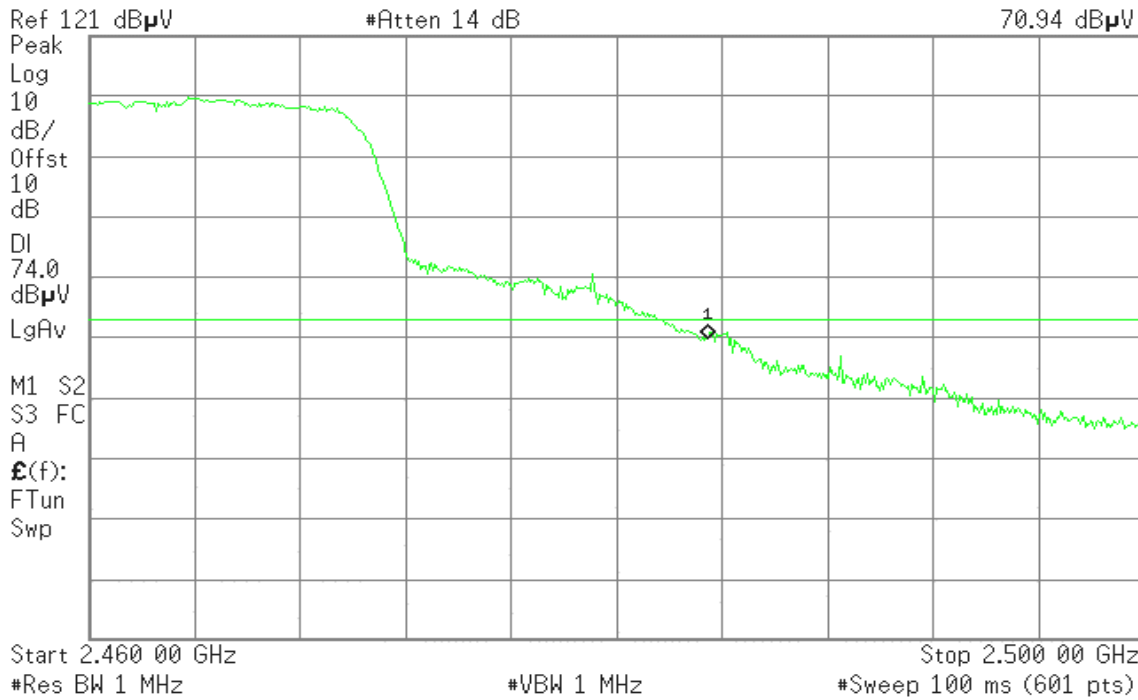
Detector mode: Peak

Polarity: Horizontal

Agilent 16:54:39 Oct 17, 2008

T

Mkr1 2.483 50 GHz
70.94 dBμV



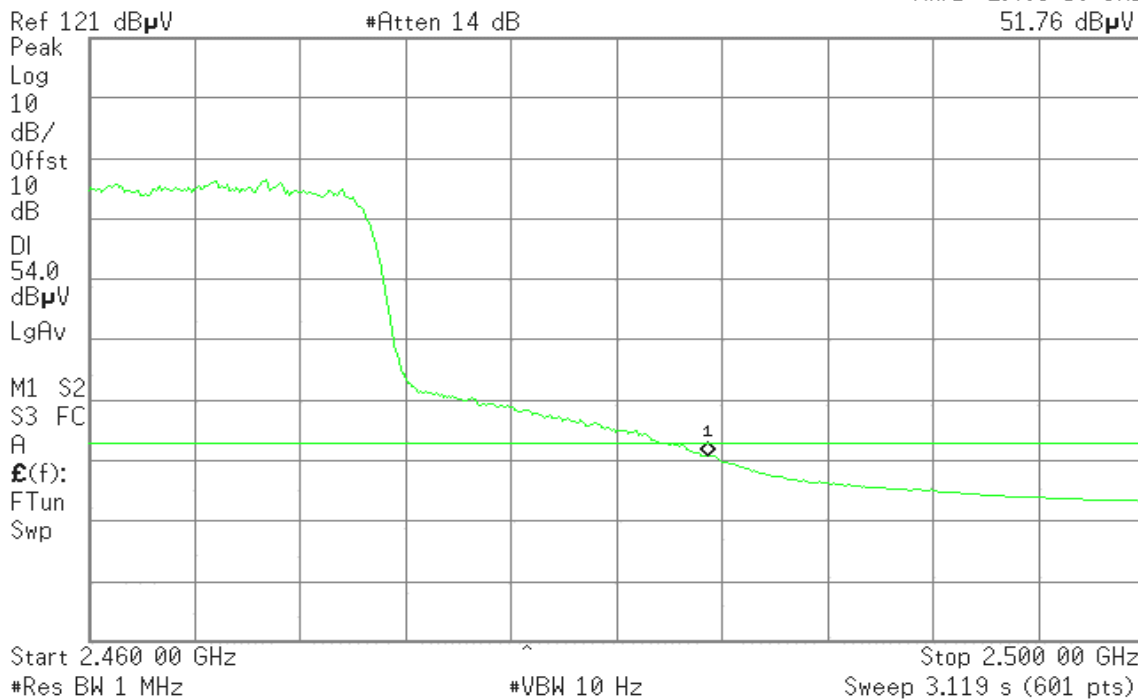
Detector mode: Average

Polarity: Horizontal

Agilent 16:54:19 Oct 17, 2008

T

Mkr1 2.483 50 GHz
51.76 dBμV



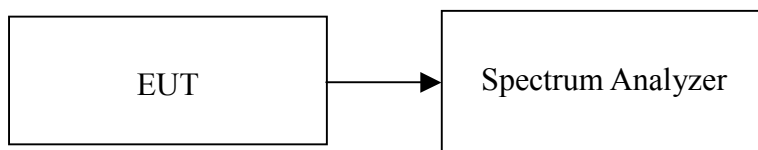


7.5 PEAK POWER SPECTRAL DENSITY

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 = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
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

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-8.80	8.00	PASS
Mid	2437	-9.86		PASS
High	2462	-9.47		PASS

Test mode: IEEE 802.11g

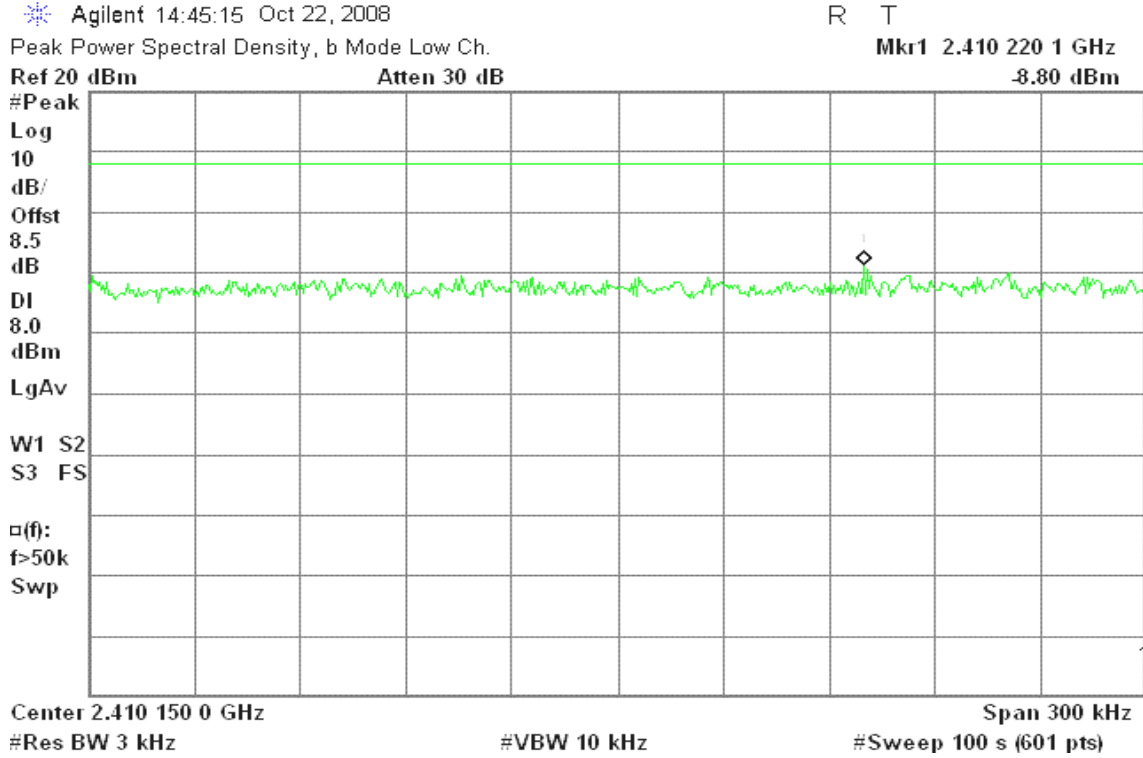
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-15.83	8.00	PASS
Mid	2437	-16.70		PASS
High	2462	-16.56		PASS



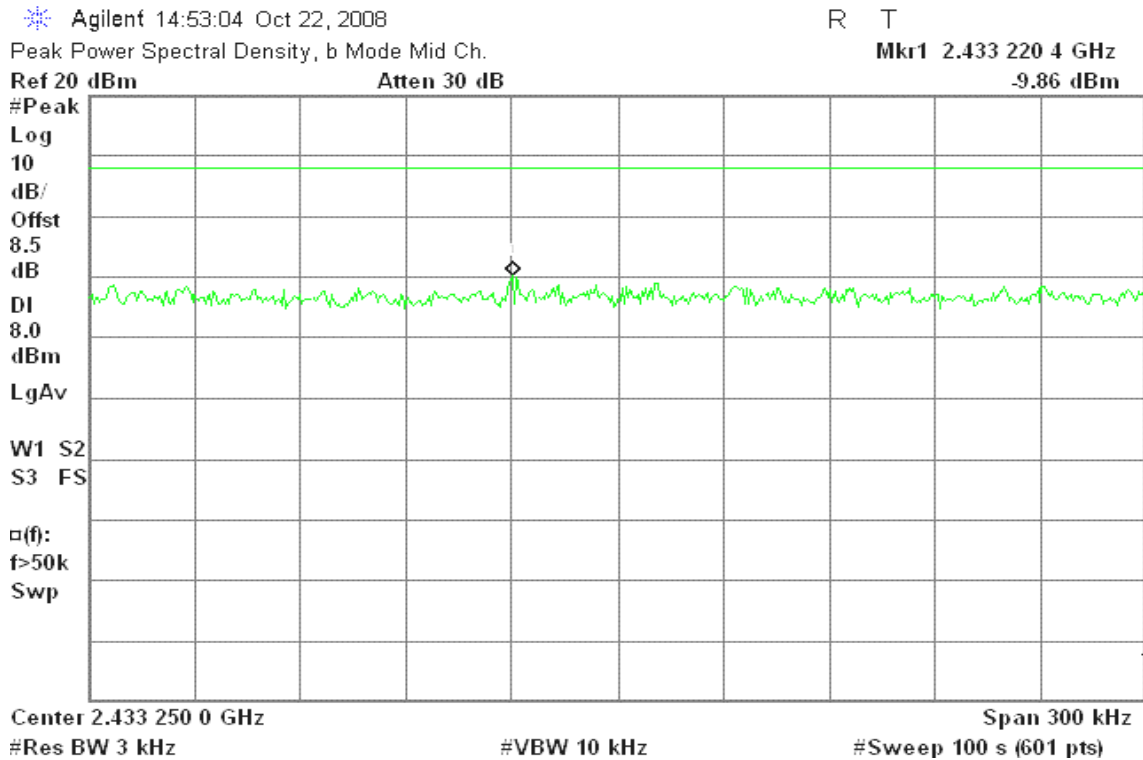
Test Plot

IEEE 802.11b

PPSD (CH Low)



PPSD (CH Mid)





PPSD (CH High)

Agilent 15:02:24 Oct 22, 2008

R T

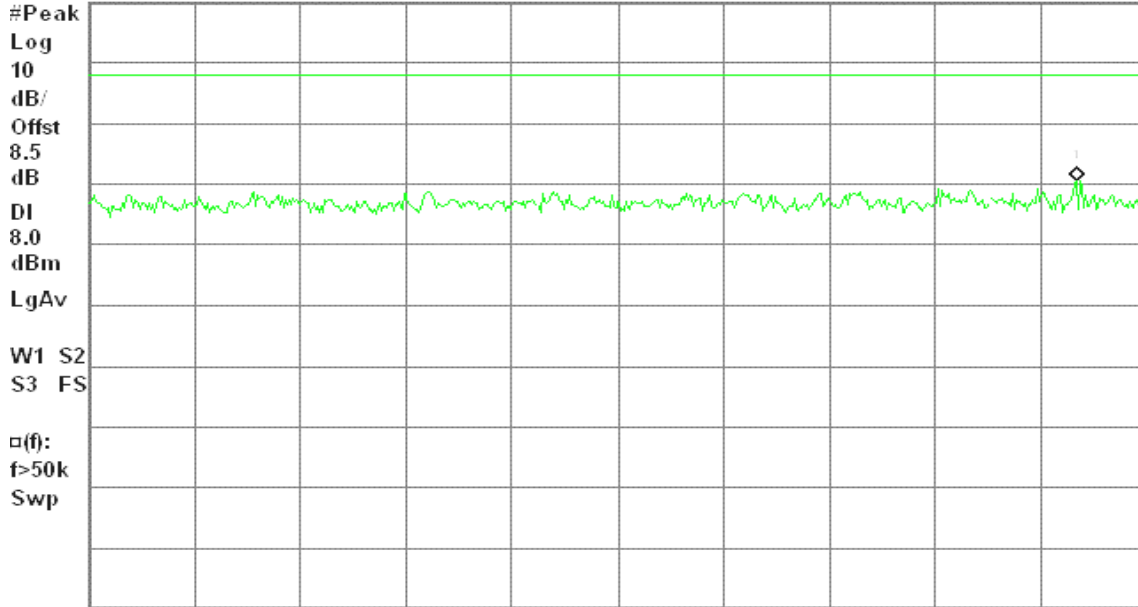
Peak Power Spectral Density, b Mode High Ch.

Mkr1 2.463 781 5 GHz

Ref 20 dBm

Atten 30 dB

-9.47 dBm



Center 2.463 650 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

IEEE 802.11g

PPSD (CH Low)

Agilent 15:09:36 Oct 22, 2008

R T

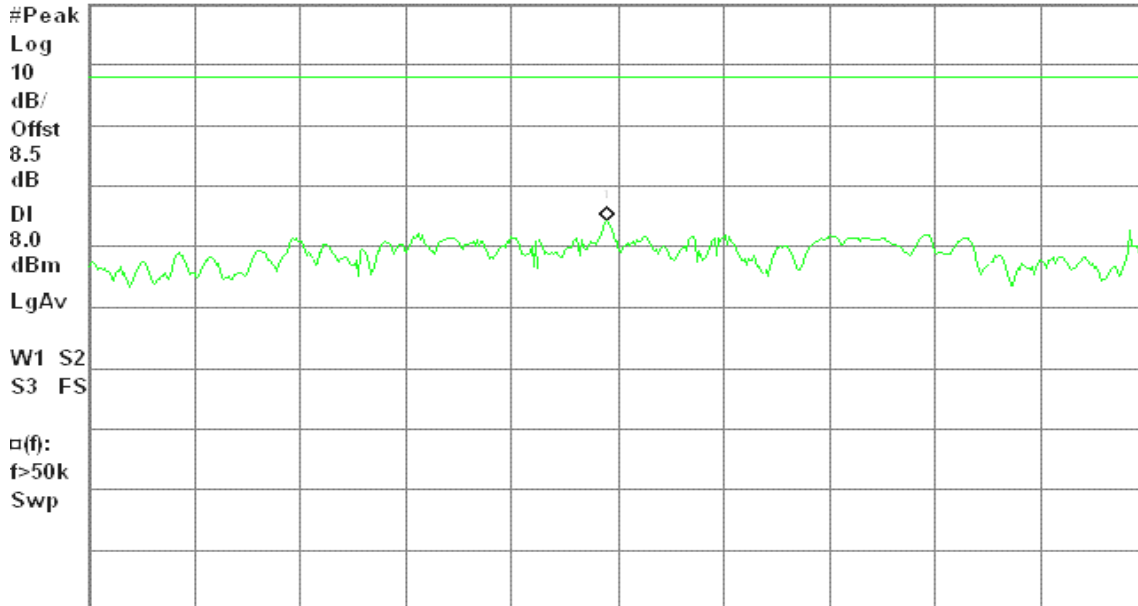
Peak Power Spectral Density, g Mode Low Ch.

Mkr1 2.413 546 5 GHz

Ref 20 dBm

Atten 30 dB

-15.83 dBm



Center 2.413 550 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



PPSD (CH Mid)

Agilent 15:44:06 Oct 22, 2008

R T

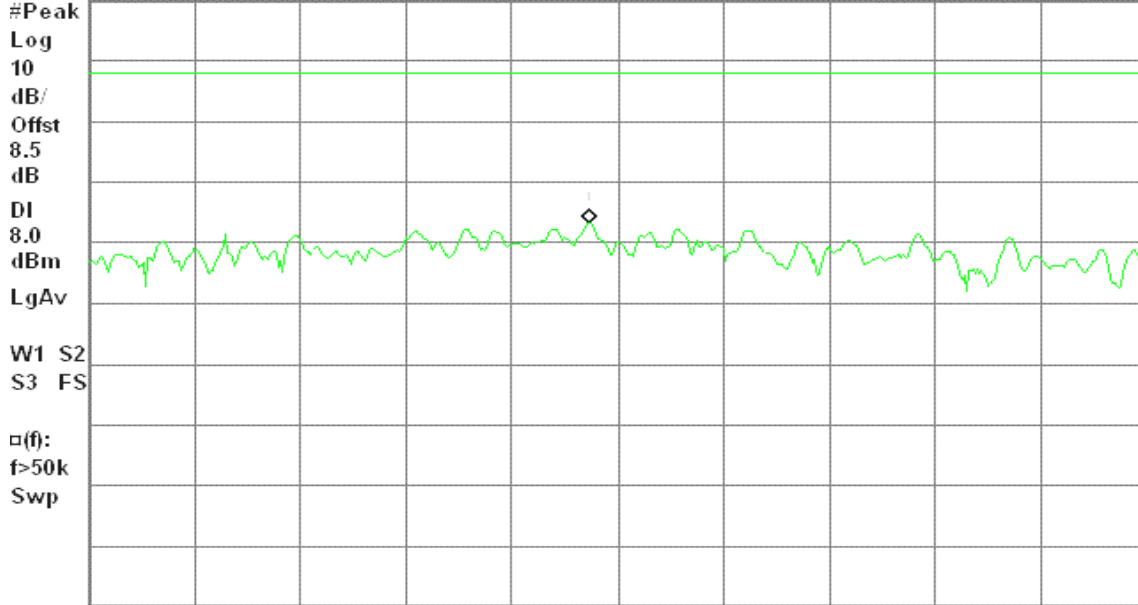
Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.441 691 5 GHz

Ref 20 dBm

Atten 30 dB

-16.70 dBm



Center 2.441 700 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

PPSD (CH High)

Agilent 15:54:15 Oct 22, 2008

R T

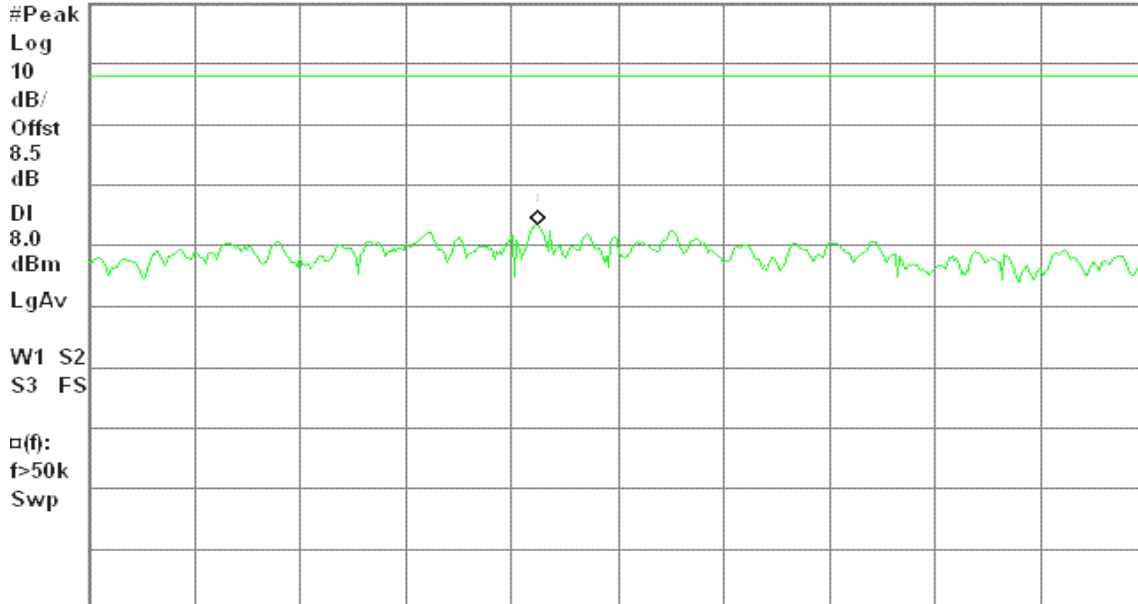
Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.460 127 4 GHz

Ref 20 dBm

Atten 30 dB

-16.56 dBm



Center 2.460 150 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



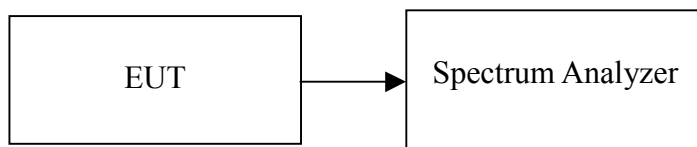
7.6 SPURIOUS EMISSIONS

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 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted



Test Plot

IEEE 802.11b

CH Low

Agilent 14:46:31 Oct 22, 2008

R T

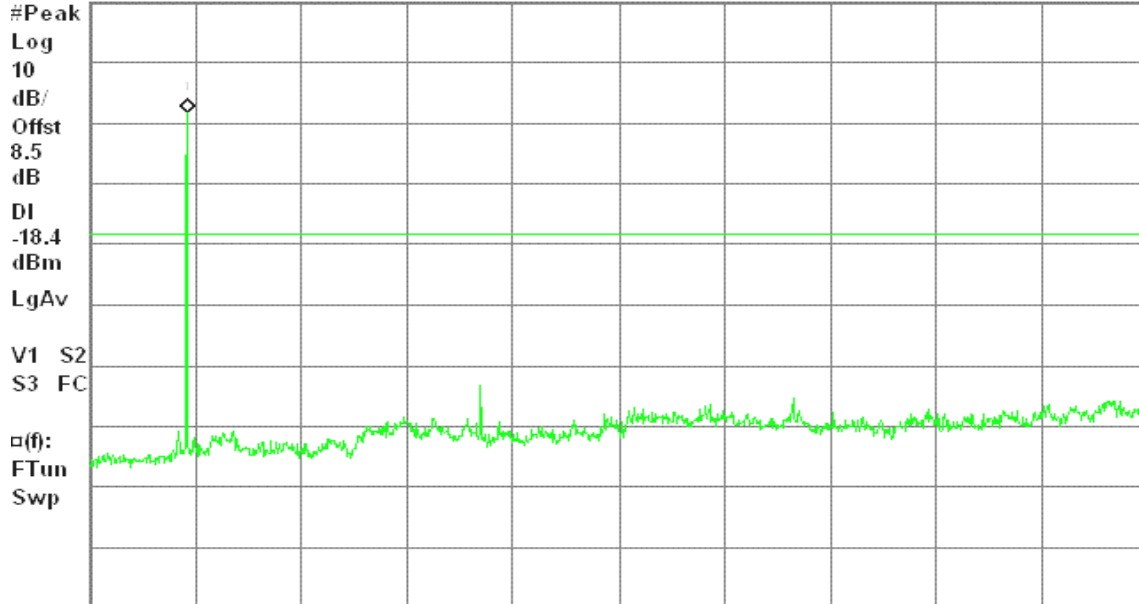
Spurious, b Mode Low Ch.

Mkr1 2.42 GHz

Ref 20 dBm

Atten 30 dB

1.60 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

CH Mid

Agilent 14:53:45 Oct 22, 2008

R T

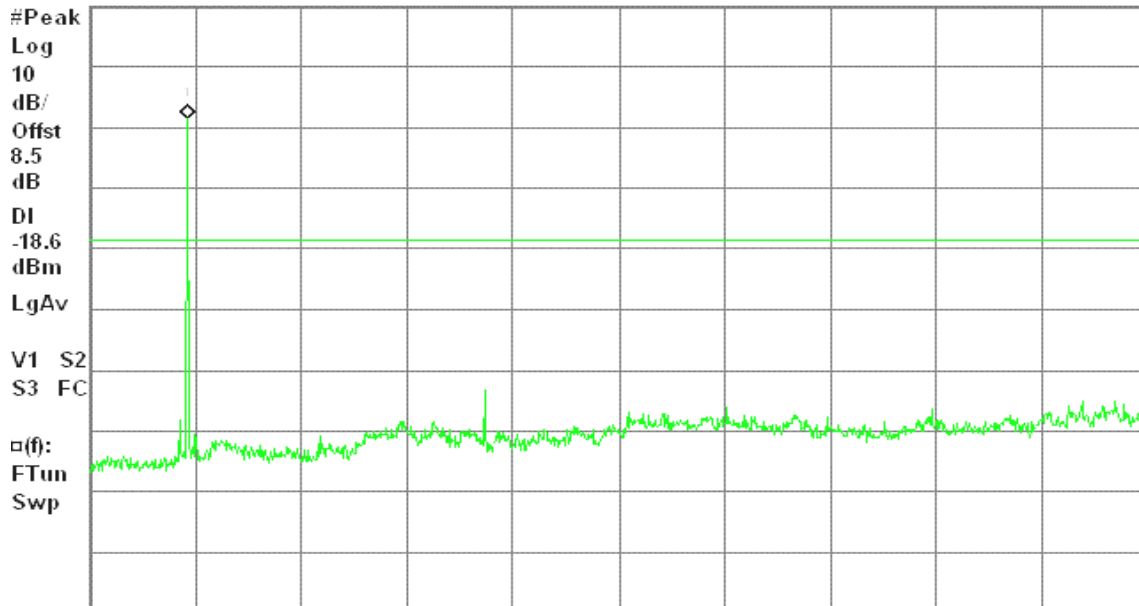
Spurious, b Mode Mid Ch.

Mkr1 2.45 GHz

Ref 20 dBm

Atten 30 dB

1.35 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



CH High

Agilent 15:03:06 Oct 22, 2008

R T

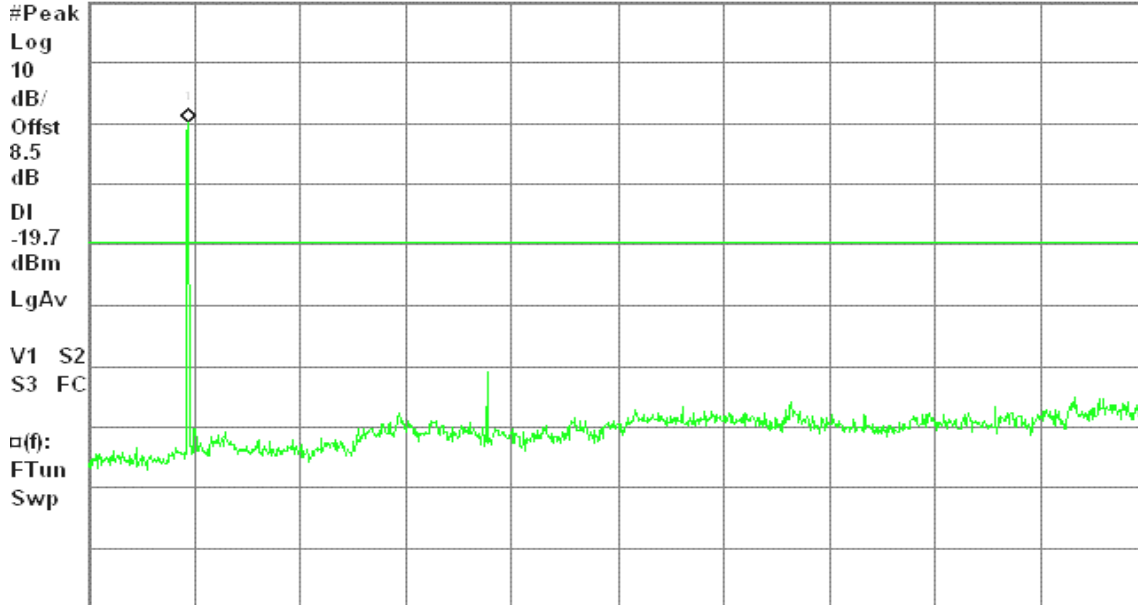
Spurious, b Mode High Ch.

Mkr1 2.47 GHz

Ref 20 dBm

Atten 30 dB

0.27 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

Agilent 15:10:57 Oct 22, 2008

R T

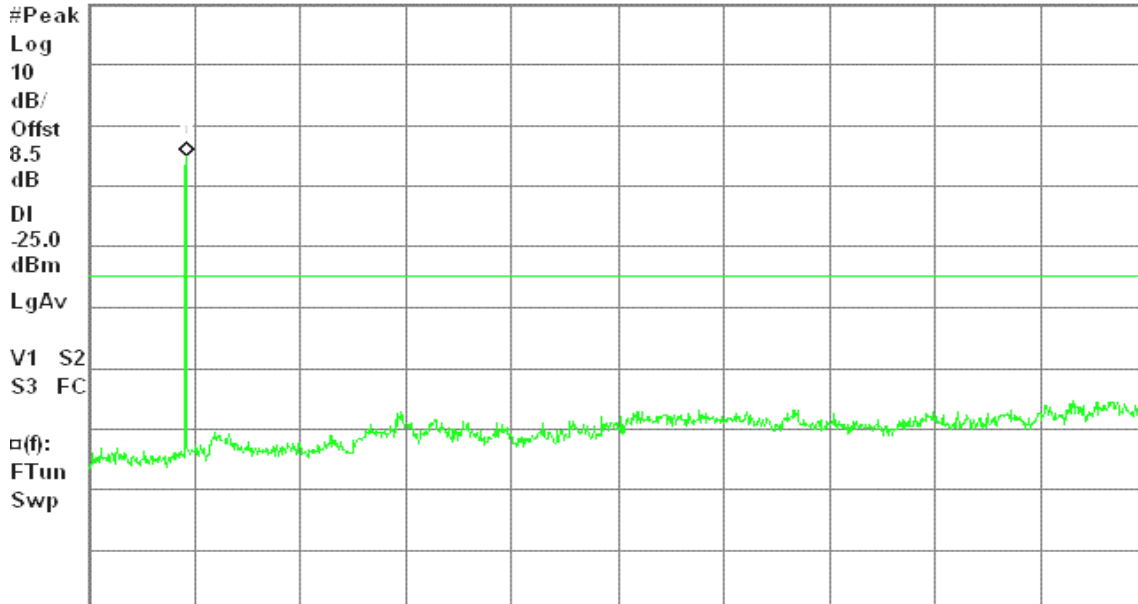
Spurious, g Mode Low Ch.

Mkr1 2.42 GHz

Ref 20 dBm

Atten 30 dB

-5.02 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



CH Mid

Agilent 15:47:09 Oct 22, 2008

R T

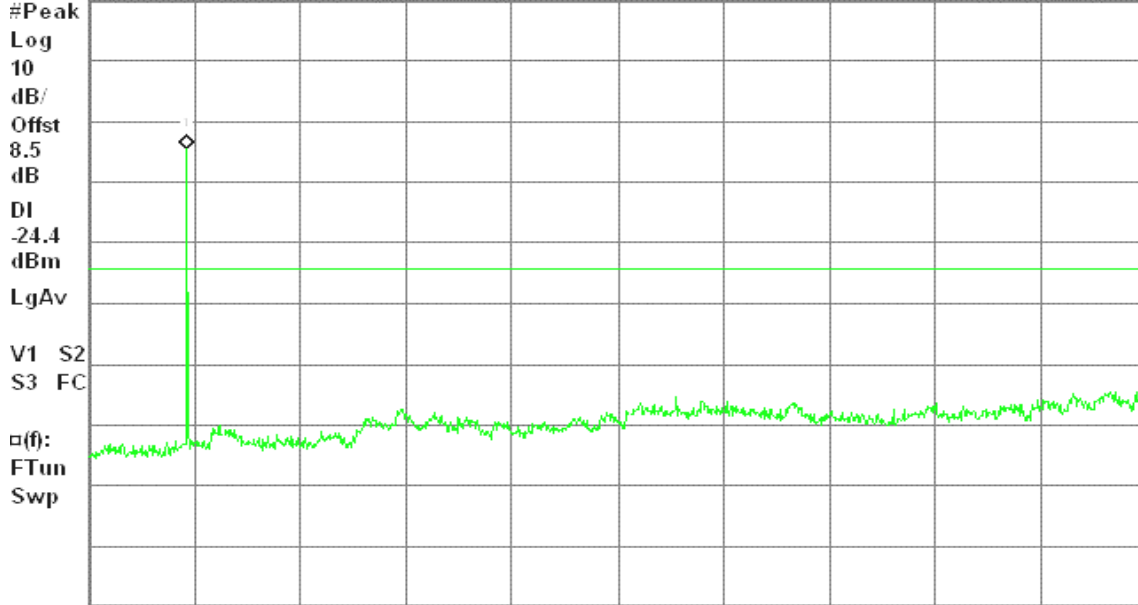
Spurious, g Mode Mid Ch.

Mkr1 2.45 GHz

Ref 20 dBm

Atten 30 dB

-4.43 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)

CH High

Agilent 15:56:55 Oct 22, 2008

R T

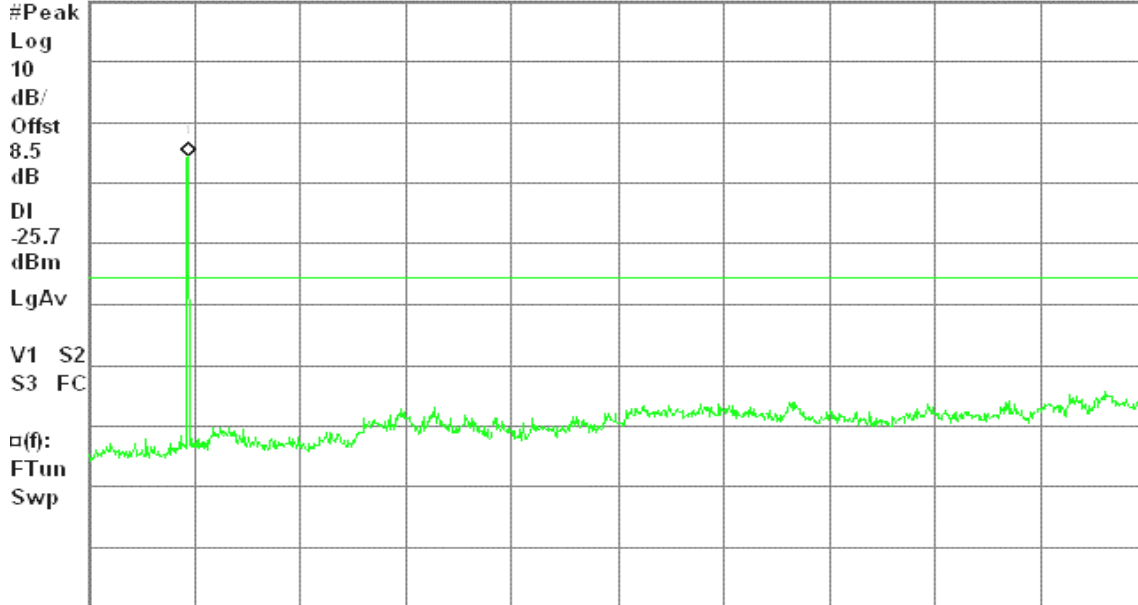
Spurious, g Mode High Ch.

Mkr1 2.47 GHz

Ref 20 dBm

Atten 30 dB

-5.69 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 3.131 s (1001 pts)



7.6.2 RADIATED EMISSIONS

LIMIT

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

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

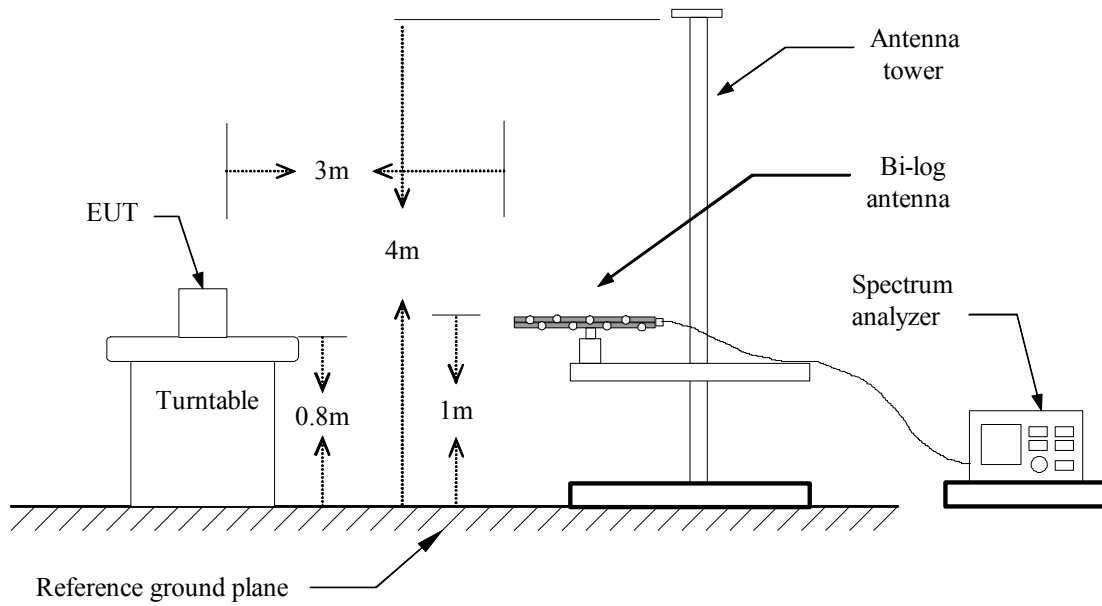
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

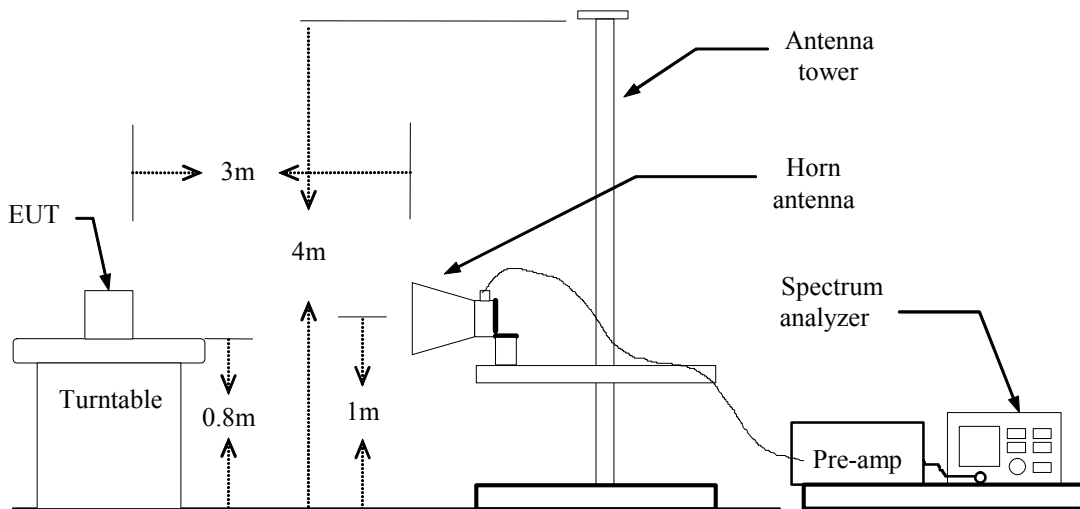
Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

Below 1 GHz



Above 1 GHz





TEST PROCEDURE

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

**Below 1GHz****Operation Mode:** Normal Link**Test Date:** November 11, 2008**Temperature:** 22°C**Tested by:** Ryan Chen**Humidity:** 51% 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
36.4667	V	38.91	-9.23	29.68	40.00	-10.32	Peak
240.1667	V	41.29	-11.23	30.06	46.00	-15.94	Peak
359.8000	V	33.70	-7.17	26.53	46.00	-19.47	Peak
479.4333	V	42.05	-5.18	36.87	46.00	-9.13	Peak
720.3167	V	36.66	-1.21	35.45	46.00	-10.55	Peak
959.5833	V	34.01	1.46	35.47	46.00	-10.53	Peak
125.3833	H	36.11	-10.06	26.05	43.50	-17.45	Peak
240.1667	H	40.27	-11.23	29.04	46.00	-16.96	Peak
479.4333	H	42.80	-5.18	37.62	46.00	-8.38	Peak
600.6833	H	35.74	-2.63	33.11	46.00	-12.89	Peak
720.3167	H	41.58	-1.21	40.37	46.00	-5.63	Peak
959.5833	H	39.10	1.46	40.56	46.00	-5.44	Peak

Remark:

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).



Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1053.33	V	67.33	50.13	-9.42	57.91	40.71	74.00	54.00	-13.29	AVG
4825.00	V	56.33	51.73	0.35	56.68	52.08	74.00	54.00	-1.92	AVG
7241.67	V	53.79	35.93	2.96	56.75	38.89	74.00	54.00	-15.11	AVG
N/A										
1053.33	H	65.45	47.26	-9.42	56.03	37.84	74.00	54.00	-16.16	AVG
3216.67	H	50.44	---	-0.91	49.54	---	74.00	54.00	-4.46	Peak
4825.00	H	55.42	51.93	0.35	55.77	52.28	74.00	54.00	-1.72	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 / CH Mid

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1043.33	V	65.66	46.46	-9.44	56.22	37.02	74.00	54.00	-16.98	AVG
4875.00	V	51.27	---	0.24	51.51	---	74.00	54.00	-2.49	Peak
N/A										
1043.33	H	66.22	46.78	-9.44	56.78	37.34	74.00	54.00	-16.66	AVG
3250.00	H	50.19	---	-0.85	49.35	---	74.00	54.00	-4.65	Peak
4875.00	H	55.83	51.08	0.24	56.07	51.32	74.00	54.00	-2.68	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 / CH High

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1030.00	V	69.11	46.13	-9.47	59.64	36.66	74.00	54.00	-17.34	AVG
4925.00	V	54.74	46.73	0.13	54.87	46.86	74.00	54.00	-7.14	AVG
N/A										
1043.33	H	69.35	47.13	-9.44	59.91	37.69	74.00	54.00	-16.31	AVG
3758.33	H	49.28	---	0.22	49.51	---	74.00	54.00	-4.49	Peak
4925.00	H	52.80	51.99	0.13	53.93	52.12	74.00	54.00	-1.88	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 / CH Low

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1046.67	V	65.86	46.75	-9.43	56.43	37.32	74.00	54.00	-16.68	AVG
4825.00	V	56.28	41.66	0.35	56.63	42.01	74.00	54.00	-11.99	AVG
7241.67	V	60.87	41.10	2.96	63.83	44.06	74.00	54.00	-9.94	AVG
N/A										
1056.67	H	66.86	46.56	-9.41	57.45	37.15	74.00	54.00	-16.85	AVG
4833.33	H	61.15	46.86	0.33	61.48	47.19	74.00	54.00	-6.81	AVG
7233.33	H	63.59	40.38	2.96	66.55	43.34	74.00	54.00	-10.66	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 / CH Mid

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1043.33	V	67.62	47.54	-9.44	58.18	38.10	74.00	54.00	-15.90	AVG
4866.67	V	57.01	42.51	0.26	57.27	42.77	74.00	54.00	-11.23	AVG
7308.33	V	63.16	40.64	2.95	66.11	43.59	74.00	54.00	-10.41	AVG
N/A										
1050.00	H	70.04	47.05	-9.42	60.62	37.63	74.00	54.00	-16.37	AVG
4875.00	H	59.40	44.21	0.24	59.64	44.45	74.00	54.00	-9.55	AVG
7308.33	H	60.34	39.68	2.95	63.29	42.63	74.00	54.00	-11.37	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 / CH High

Test Date: October 17, 2008

Temperature: 23°C

Tested by: Mimic Young

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
1046.67	V	65.70	47.53	-9.43	56.27	38.10	74.00	54.00	-15.90	AVG
4916.67	V	58.35	43.55	0.15	58.50	43.70	74.00	54.00	-10.30	AVG
7391.67	V	63.03	39.48	2.93	65.96	42.41	74.00	54.00	-11.59	AVG
N/A										
1026.67	H	68.44	48.00	-9.48	58.96	38.52	74.00	54.00	-15.48	AVG
1056.67	H	66.80	47.51	-9.41	57.39	38.10	74.00	54.00	-15.90	AVG
4925.00	H	60.55	45.10	0.13	60.68	45.23	74.00	54.00	-8.77	AVG
7383.33	H	62.12	39.42	2.93	65.05	42.35	74.00	54.00	-11.65	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).



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 μH/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 (dBμV)	
	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 I 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:** November 19, 2008
Temperature: 22°C **Tested by:** Willy Shu
Humidity: 60% 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
0.155	46.59	7.41	10.84	57.43	18.25	65.74	55.74	-8.31	-37.49	L1
0.187	44.96	19.15	10.59	55.55	29.74	64.15	54.15	-8.60	-24.41	L1
0.194	44.26	20.90	10.54	54.80	31.44	63.84	53.84	-9.50	-22.41	L1
0.360	29.71	---	10.21	39.92	---	58.74	---	-18.82	---	L1
1.980	29.49	---	10.08	39.57	---	56.00	---	-16.43	---	L1
5.362	30.87	---	10.13	41.00	---	60.00	---	-19.00	---	L1
0.258	39.31	---	10.40	49.71	---	61.51	---	-11.80	---	L2
0.387	30.96	---	10.17	41.13	---	58.12	---	-16.99	---	L2
0.894	26.13	---	10.06	36.19	---	56.00	---	-19.81	---	L2
1.276	26.12	---	10.06	36.18	---	56.00	---	-19.82	---	L2
2.044	28.04	---	10.08	38.12	---	56.00	---	-17.88	---	L2
2.309	26.90	---	10.09	36.99	---	56.00	---	-19.01	---	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 and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)
5. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

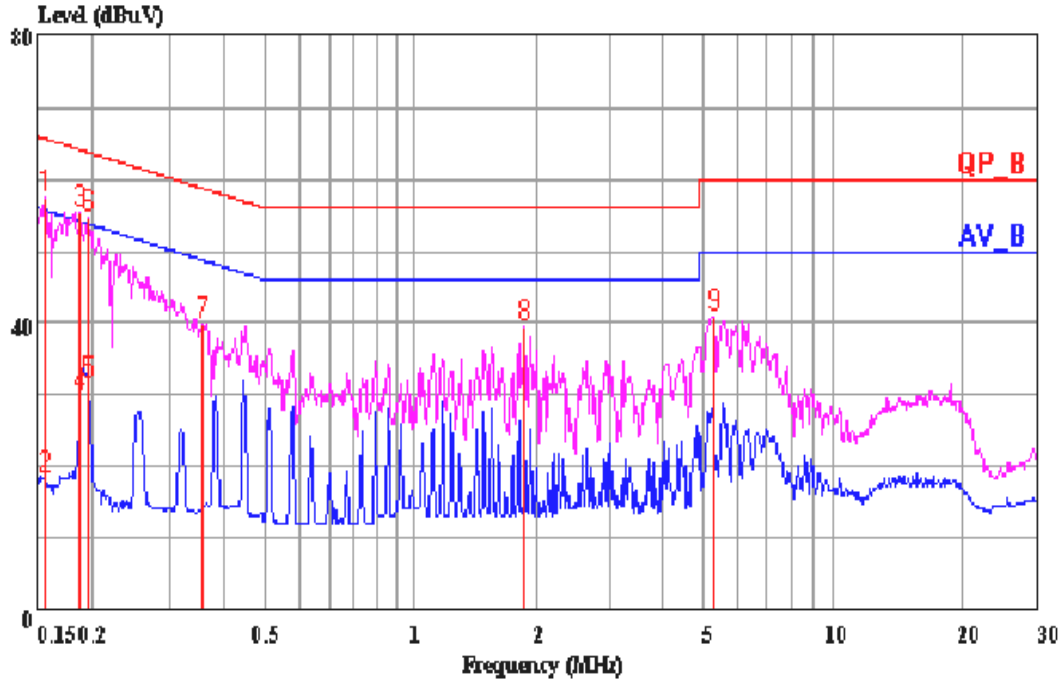


Test Plots

Conducted emissions (Line 1)

Data#: 52 File#: 20081016中研CB.EMI

Date: 2008-11-19 Time: 16:36:55

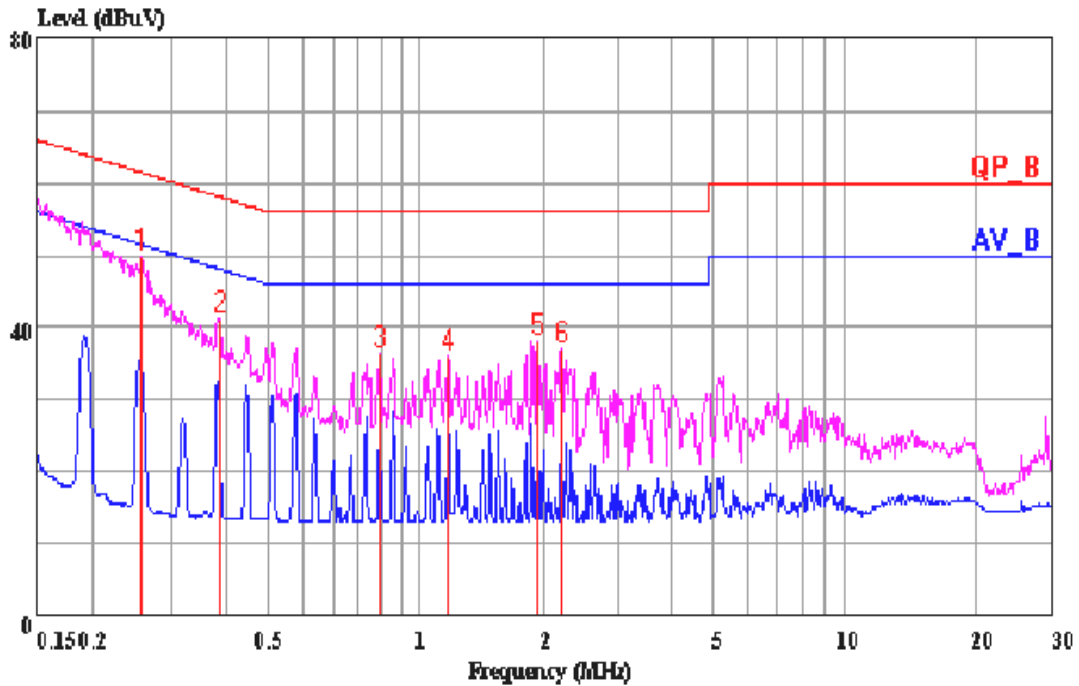


(CCS Conduction B)

Conducted emissions (Line 2)

Data#: 47 File#: 20081016中研CB.EMI

Date: 2008-11-19 Time: 16:28:17



(CCS Conduction B)



APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	Home Monitoring Gateway
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	IEEE 802.11b: 15.45 dBm (35.08mW) IEEE 802.11g: 13.37 dBm (21.73mW)
Antenna gain (Max)	3.29 dBi (Numeric gain: 2.13)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Remark:

- The maximum output power is 15.45dBm (35.08mW) at 2412MHz (with 2.13 numeric antenna gain.)
- DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
- For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.

TEST RESULTS

No non-compliance noted.



Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where $E =$ Field strength in Volts / meter

$P =$ Power in Watts

$G =$ Numeric antenna gain

$d =$ Distance in meters

$S =$ Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of mW and cm, using:

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

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

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where $d =$ Distance in cm

$P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

Maximum Permissible Exposure

EUT output power = 35.08mW

Numeric Antenna gain = 2.13

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where $P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

→ Power density = 0.0149 mW / cm²

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