



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

IEEE 802.11b/g Wireless USB 2.0 Adapter

Model: NUB-362EXT, EUB-362EXT, NUB-362, EUB-362

Trade Name: SENAO

Issued to

**SENAO INTERNATIONAL CO., LTD.,
NO.16, GONGBA RD., LINKOU TOWNSHIP,
TAIPEI, TAIWAN, R.O.C.**

Issued by

**Compliance Certification Services Inc.
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1. TEST RESULT CERTIFICATION

Applicant: SENAO INTERNATIONAL CO., LTD.,
NO.16, GONGBA RD., LINKOU TOWNSHIP,
TAIPEI, TAIWAN, R.O.C.

Equipment Under Test: IEEE 802.11b/g Wireless USB 2.0 Adapter

Trade Name: SENAO

Model: NUB-362EXT, EUB-362EXT, NUB-362, EUB-362

Date of Test: August 4 ~ September 6, 2005

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:

Gavin Lim
Section Manager
Compliance Certification Services Inc.

Amanda Wu
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	IEEE 802.11b/g Wireless USB 2.0 Adapter
Trade Name	SENAO
Model Number	NUB-362EXT, EUB-362EXT, NUB-362, EUB-362
Model Discrepancy	All the above models are identical except that they come with four different models with two different external appearances for sale. External appearance 1: For NUB-362EXT, EUB-362EXT (with Dipole antenna 2.0 or 5.0 dBi) External appearance 2: For NUB-362, EUB-362 (with Dipole antenna 0.97 dBi) For further details, please refer to the EUT photos.
Power Supply	Powered from host device
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b Base mode: 21.12 dBm IEEE 802.11g Base mode: 18.84 dBm IEEE 802.11g Turbo mode: 22.67 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 Base mode: 11, 5.5, 2, 1 Mbps IEEE 802.11g Base mode: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps IEEE 802.11g Turbo mode: 108, 54, 48, 36, 24, 18, 12 Mbps
Number of Channels	11 Channels
Antenna Specification	Antenna Type / Gain Dipole Antenna / 0.97 dBi for NUB-362, EUB-362 Dipole Antenna / 2.00 dBi for NUB-362 EXT, EUB-362EXT Dipole Antenna / 5.00 dBi for NUB-362 EXT, EUB-362EXT

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: NI3-UB36005001 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

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

² Above 38.6

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



3.5 DESCRIPTION OF TEST MODES

The EUT comes with two different external appearances and two different antennas for sale. After the preliminary test, the EUT (model: NUB-362EXT) with 5.0 dBi external antenna was found to eliminate 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, which worst case was in normal link mode only.

IEEE802.11b Base mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 11Mbps data rate were chosen for full testing.

IEEE802.11g Base mode:

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

IEEE802.11g Turbo mode:

Channel Mid (2437MHz) with 12Mbps data rate was chosen for full testing.



4. 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.

4.1 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	01/10/2006
Spectrum Analyzer	R&S	FSP30	100112	08/03/2006

Open Area Test Site # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESVS20	838804/004	01/08/2006
Spectrum Analyzer	R&S	FSP30	100112	09/23/2006
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/10/2006
Pre-Amplifier	MITEC	AFS42-00102650	924206	N.C.R.
Pre-Amplifier	MITEC	AMF-6F-260400	945377	N.C.R.
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/05/2006
Horn Antenna	EMCO	3115	00022250	04/18/2006
Horn Antenna	EMCO	3116	2487	12/08/2005
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R.
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R.
Controller	EMCO	2090	9709-1256	N.C.R.
RF Switch	ANRITSU	MP59B	M53867	N.C.R.
Site NSA	C&C	N/A	N/A	09/06/2006

Remark: The measurement uncertainty is less than +/- 2.16dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER 9kHz-30MHz	ROHDE & SCHWARZ	ESHS30	828144/003	09/24/2006
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/11/2006
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	02/17/2006
Test S/W	LABVIEW (V 6.1)			

Remark: The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang, Taoyuan Hsien, Taiwan, R.O.C.

No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

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 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200600-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (Registration no: 93105 and 90471).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	 200600-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 93105, 90471
Japan	VCCI	4 3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	CNLA	EN 300 328-1/2, EN 300 220-1/2/3, EN 300 440-1/2, EN 61000-3-2, EN 61000-3-3, 47 CFR FCC Part 15 Subpart C/D/E, EN 55013, CNS 13439, EN 55014-1, CNS 13783-1, EN 55022, CNS 13438, CISPR 22, AS/NZS 3548, EN 61000-4-2/3/4/5/6/8/11, ENV 50204, IEEE Std 1528, FCC OET Bulletin, 65+Supplement C, EN50360, EN50361, EN50371, RSS102	 0 3 6 3 ILAC MRA
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	 IC 3991-3 IC 3991-4

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

* Australia: MRA of NVLAP AS/NZS 4771 &AS/NZS 4268.



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 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)	99PBTKB	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	Notebook PC	Sony	PCG-6GFP	J000WFF4	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3.	Wireless Router (Remote)	ASUS	WL-500g	471GA12838	MSQWL500G	N/A	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.

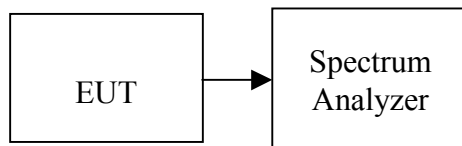
7. FCC PART 15.247 REQUIREMENTS

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 6 dB 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:

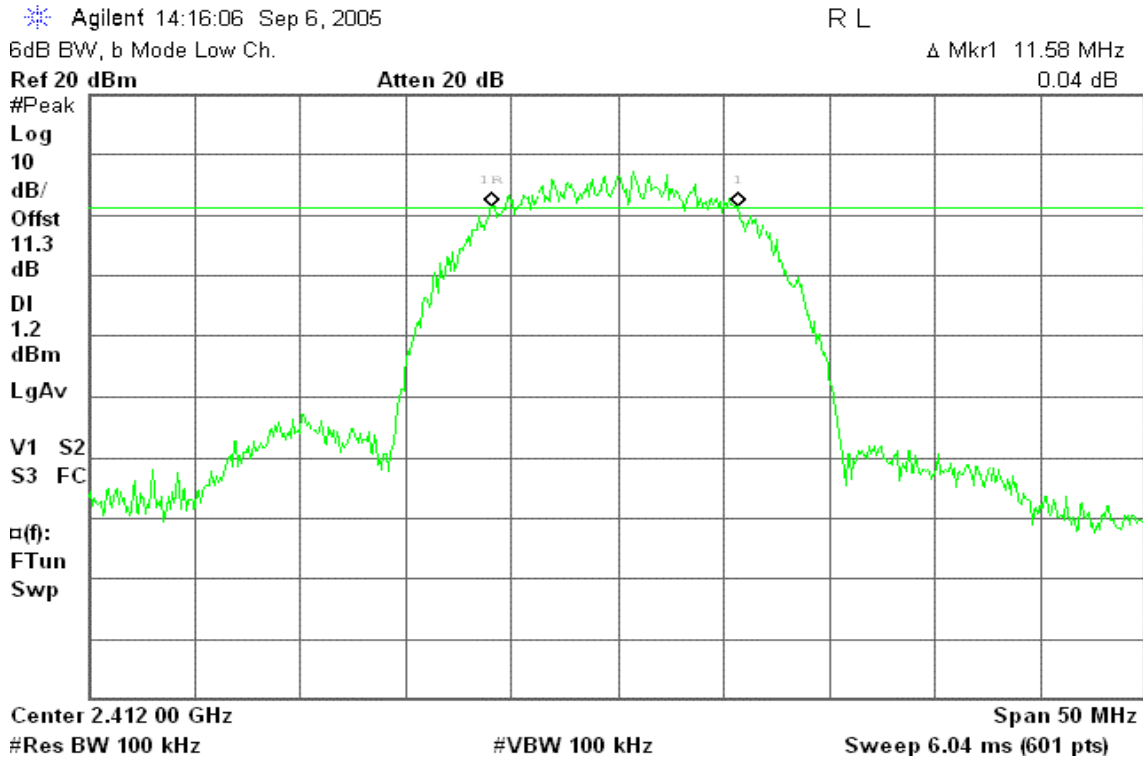
Test mode	Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
IEEE 802.11b Base mode	Low	2412	11580	>500	PASS
	Mid	2437	10750		PASS
	High	2462	11580		PASS
IEEE 802.11g Base mode	Low	2412	16580		PASS
	Mid	2437	16420		PASS
	High	2462	16500		PASS
IEEE 802.11g Turbo mode	Mid	2437	32670		PASS



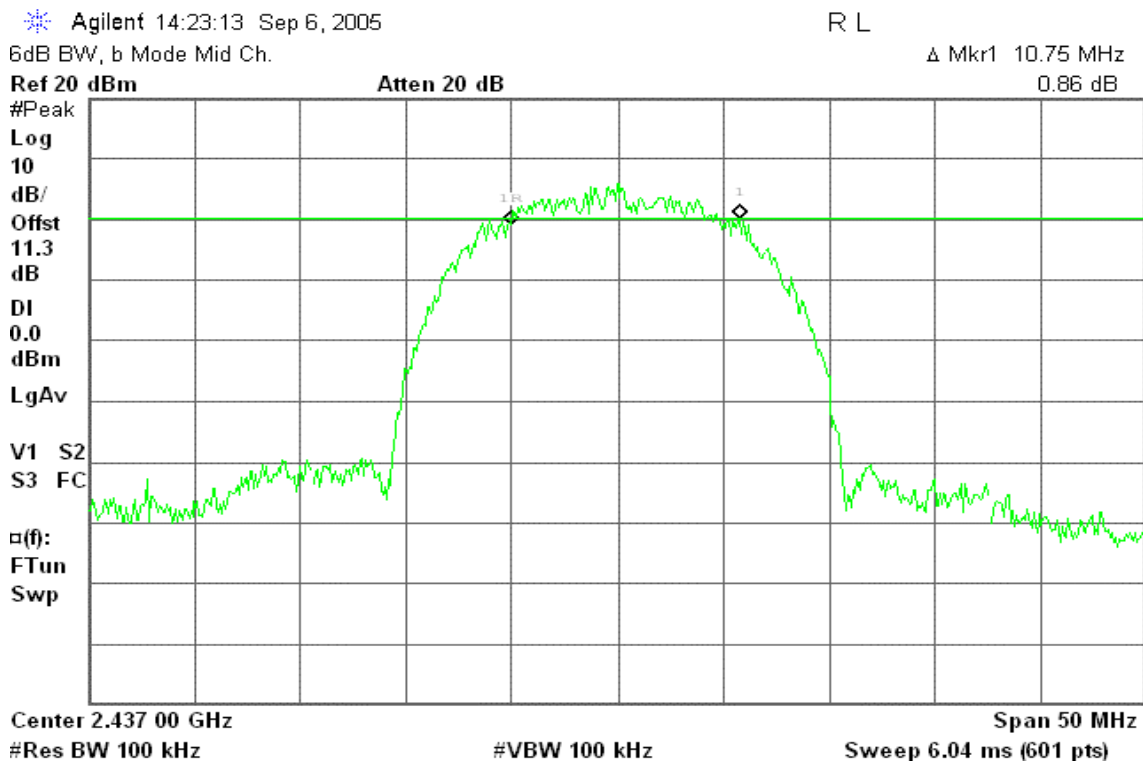
Test Plot

IEEE 802.11b Base mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)





6dB Bandwidth (CH High)

Agilent 14:36:34 Sep 6, 2005

R L

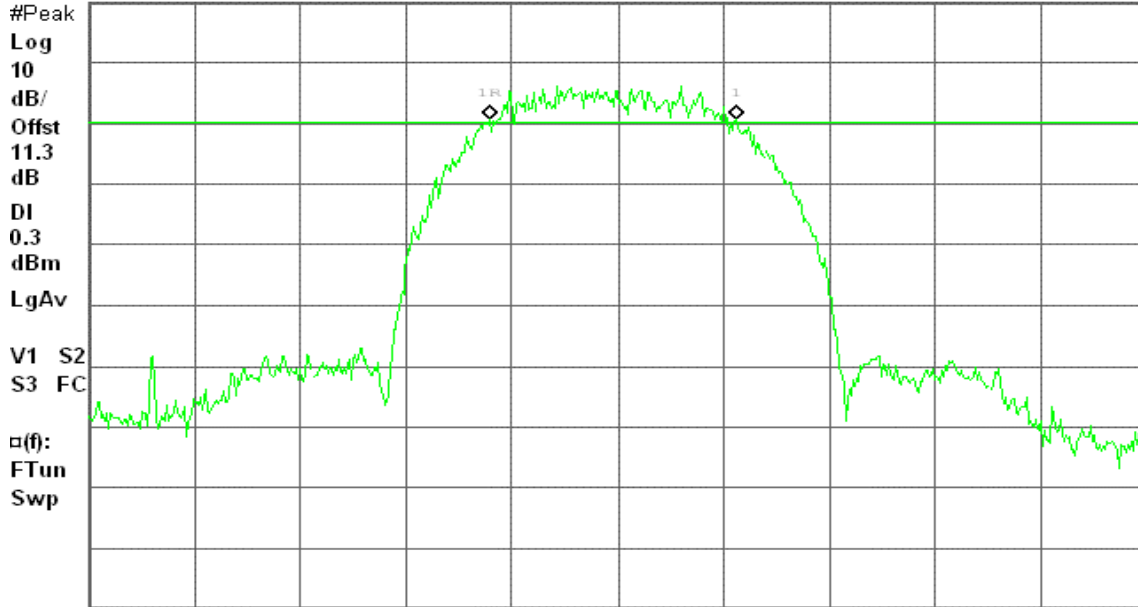
6dB BW, b Mode High Ch.

Δ Mkr1 11.58 MHz

Ref 20 dBm

Atten 20 dB

0.00 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 Base mode

6dB Bandwidth (CH Low)

Agilent 13:37:27 Sep 6, 2005

R L

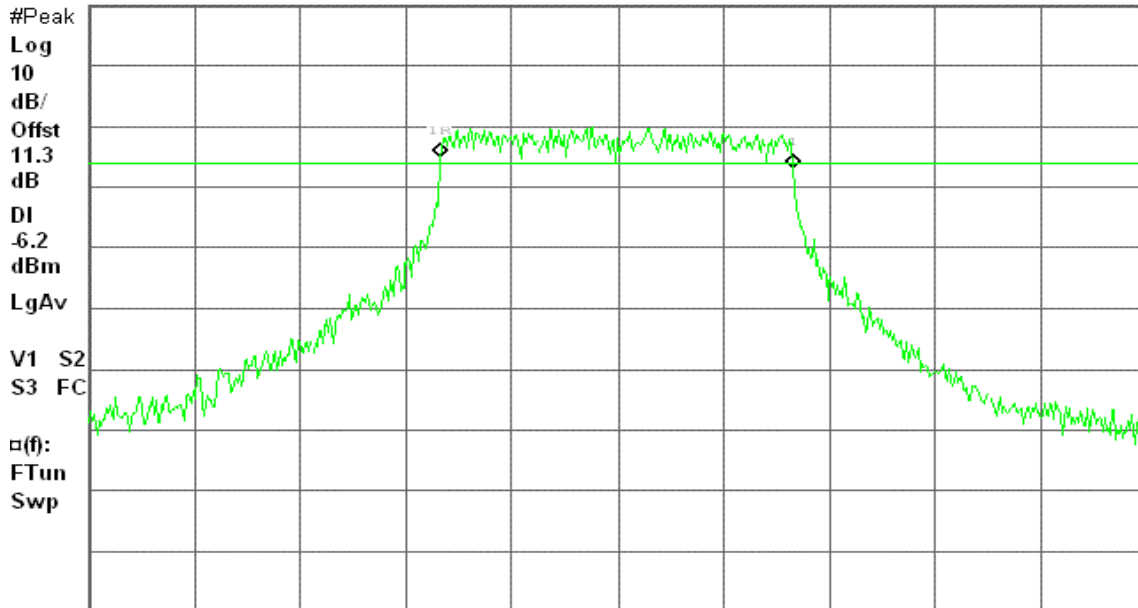
6dB BW, g Mode Low Ch.

Δ Mkr1 16.58 MHz

Ref 20 dBm

Atten 20 dB

-1.91 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 13:43:16 Sep 6, 2005

R L

6dB BW, g Mode Mid Ch.

Δ Mkr1 16.42 MHz

Ref 20 dBm

Atten 20 dB

0.43 dB

#Peak

Log

10

dB/

Offst

11.3

dB

DI

-3.5

dBm

LgAv

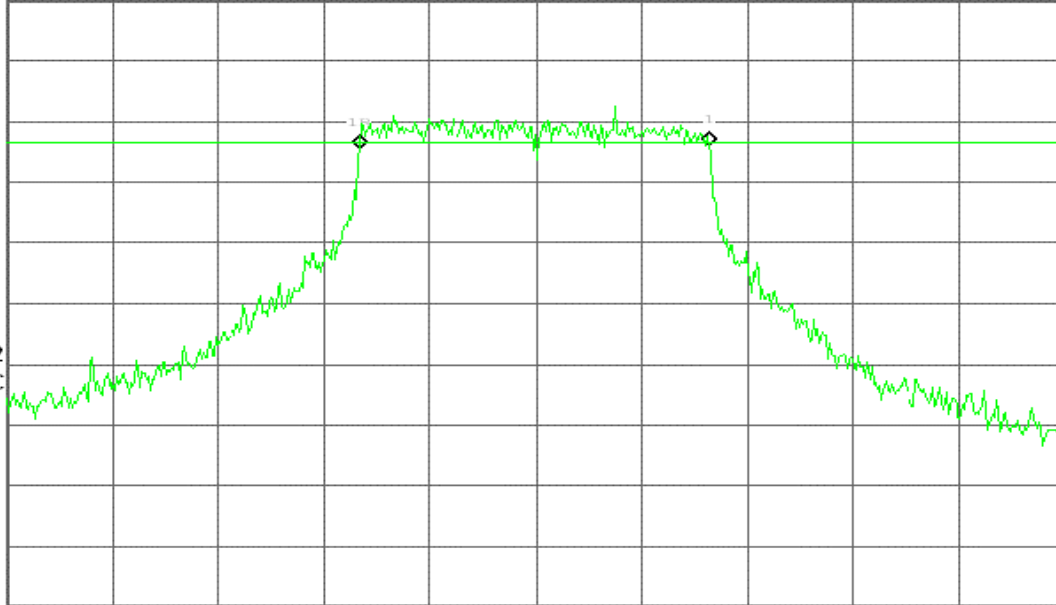
V1 S2

S3 FC

□(f):

FTun

Swp



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 13:49:45 Sep 6, 2005

R L

6dB BW, g Mode High Ch.

Δ Mkr1 16.50 MHz

Ref 20 dBm

Atten 20 dB

1.10 dB

#Peak

Log

10

dB/

Offst

11.3

dB

DI

-3.1

dBm

LgAv

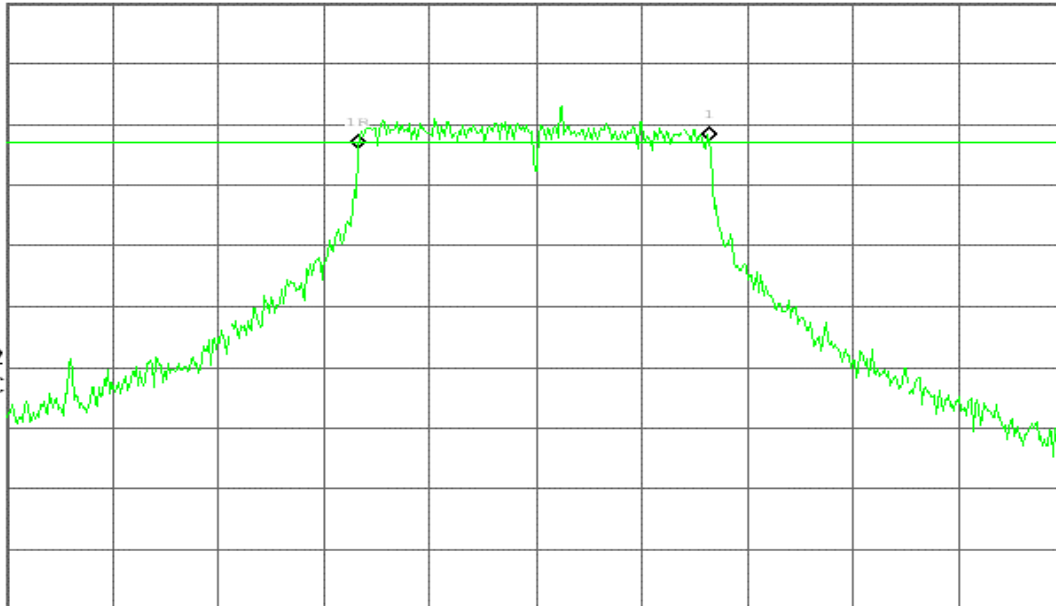
V1 S2

S3 FC

□(f):

FTun

Swp



Center 2.462 00 GHz

Span 50 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 6.04 ms (601 pts)



IEEE 802.11g Turbo mode

6dB Bandwidth (CH Mid)

Agilent 14:04:31 Sep 6, 2005

R L

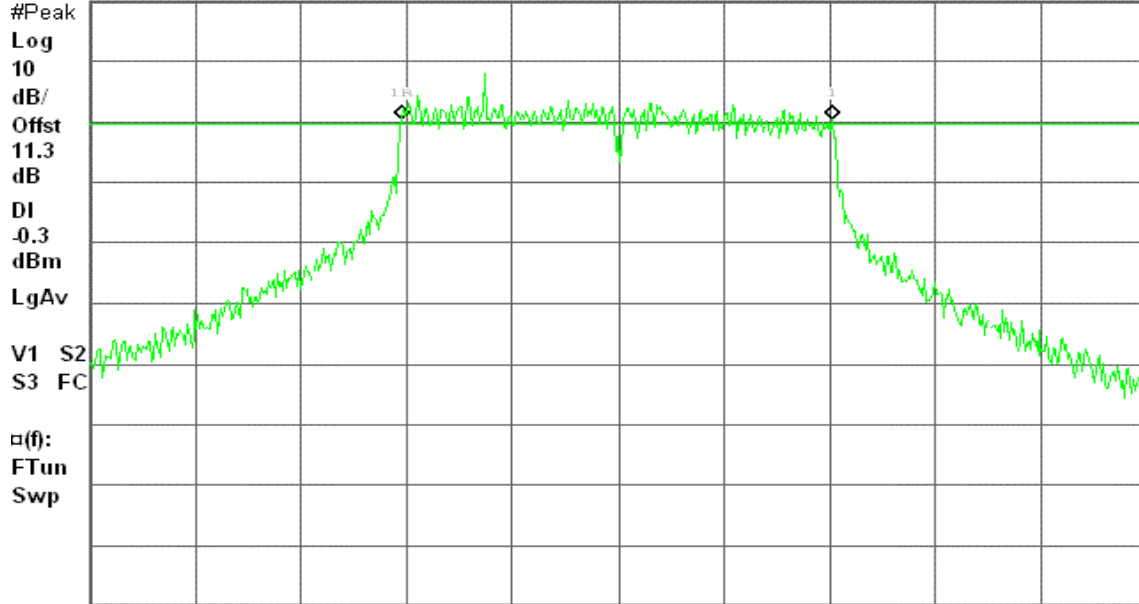
6dB BW, g turbo Mode Mid Ch.

Δ Mkr1 32.67 MHz

Ref 20 dBm

Atten 20 dB

-0.10 dB



Center 2.437 00 GHz

Span 80 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 9.68 ms (601 pts)



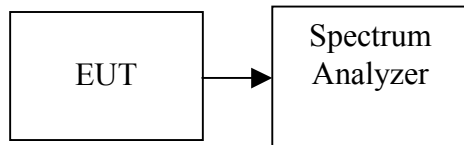
7.2 PEAK POWER

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 Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
IEEE 802.11b Base mode	Low	2412	21.12	0.1294	1	PASS
	Mid	2437	19.84	0.0964		PASS
	High	2462	20.87	0.1222		PASS
IEEE 802.11g Base mode	Low	2412	18.07	0.0641		PASS
	Mid	2437	18.52	0.0711		PASS
	High	2462	18.84	0.0766		PASS
IEEE 802.11g Turbo mode	Mid	2437	22.67	0.1849		PASS



Test Plot

IEEE 802.11b Base mode

Peak Power (CH Low)

Agilent 14:16:46 Sep 6, 2005

R L

Peak Output Power , b Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 22.99 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

21.12 dBm / 15.3250 MHz

-50.74 dBm/Hz

Peak Power (CH Mid)

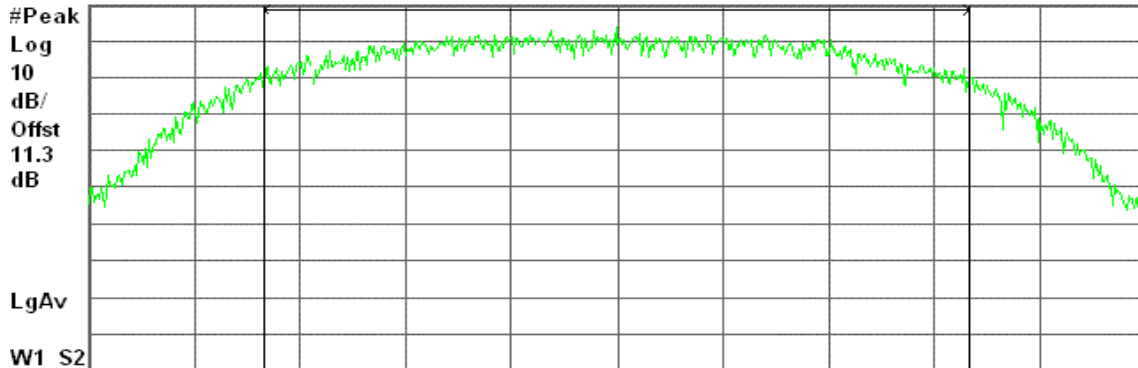
Agilent 14:24:24 Sep 6, 2005

R L

Peak Output Power (DTS), b Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 22.94 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

19.84 dBm / 15.2950 MHz

-52.00 dBm/Hz



Peak Power (CH High)

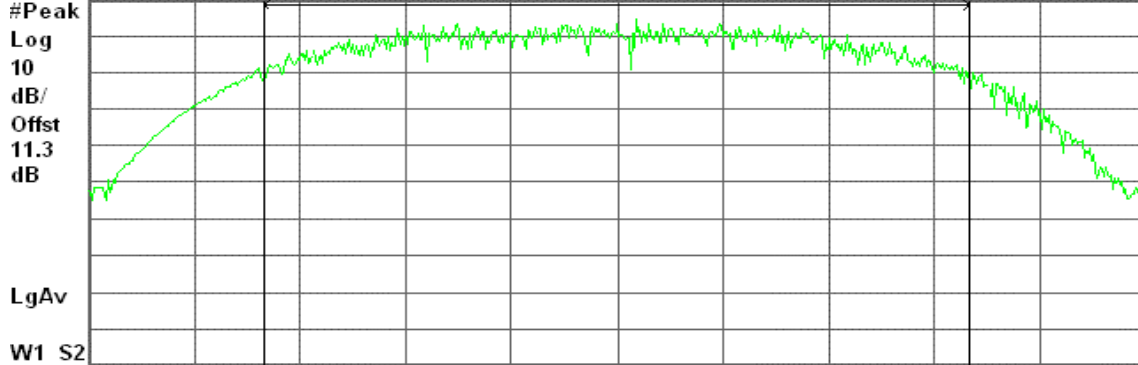
Agilent 14:37:16 Sep 6, 2005

R L

Peak Output Power , b Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 23.07 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

20.87 dBm / 15.3810 MHz

-51.00 dBm/Hz

IEEE 802.11g Base mode

Peak Power (CH Low)

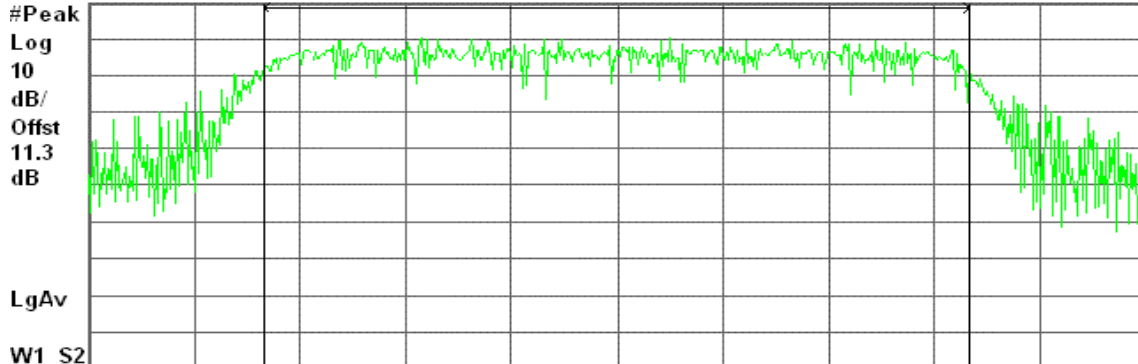
Agilent 13:38:25 Sep 6, 2005

R L

Peak Output Power (DTS), g Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 2.412 00 GHz

Span 25.04 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.07 dBm / 16.6930 MHz

-54.15 dBm/Hz



Peak Power (CH Mid)

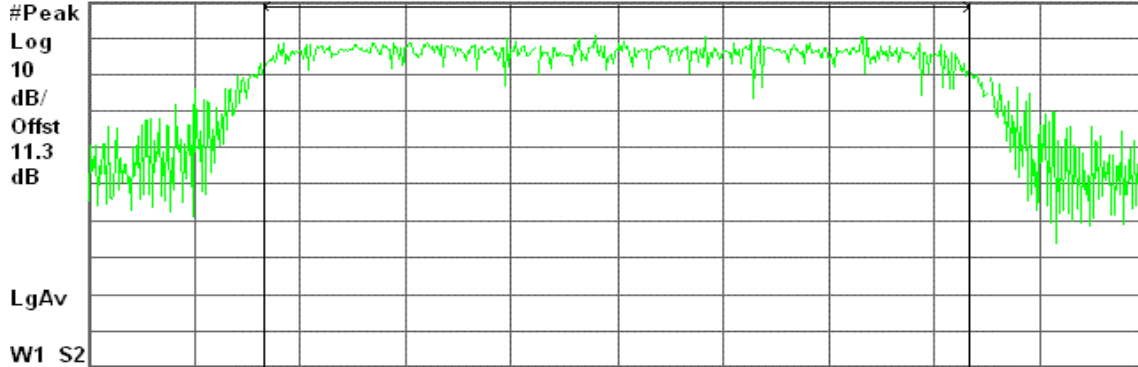
Agilent 13:44:01 Sep 6, 2005

R L

Peak Output Power (DTS), g Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.52 dBm / 16.7230 MHz

-53.71 dBm/Hz

Peak Power (CH High)

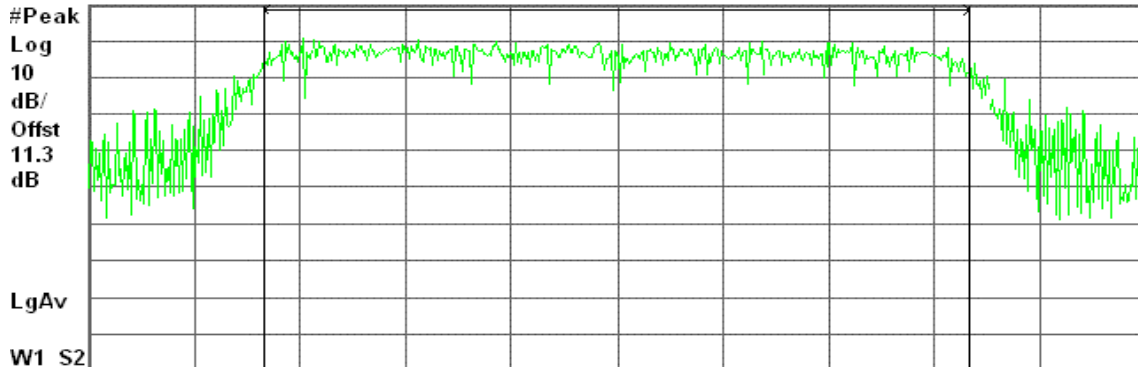
Agilent 13:50:49 Sep 6, 2005

R L

Peak Output Power (DTS), g Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 2.462 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.84 dBm / 16.7180 MHz

-53.39 dBm/Hz



IEEE 802.11g Turbo mode

Peak Power (CH Mid)

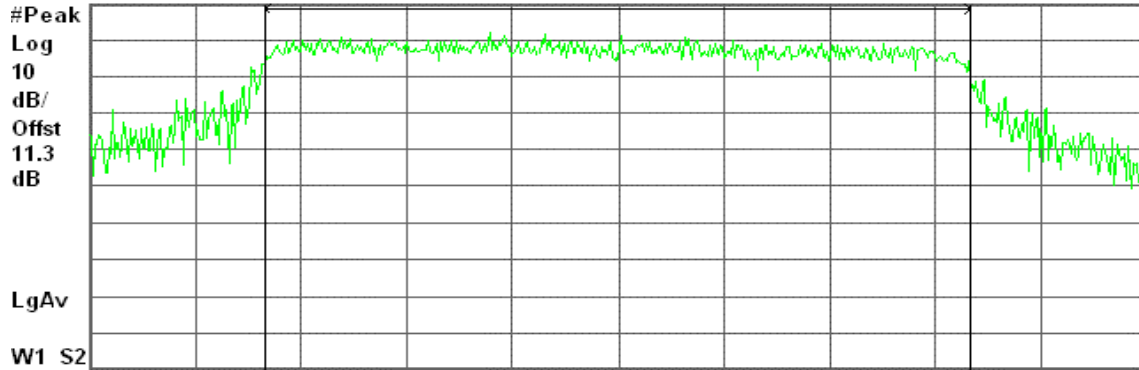
Agilent 14:05:17 Sep 6, 2005

R L

Peak Output Power (DTS), g turbo Mode Mid Ch

Ref 20 dBm

Atten 20 dB



Center 2.437 00 GHz

Span 50.16 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

22.67 dBm / 33.4410 MHz

-52.57 dBm/Hz

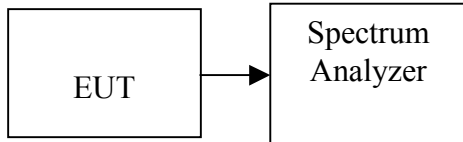


7.3 AVERAGE POWER

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	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
IEEE 802.11b Base mode	Low	2412	18.04	0.0637
	Mid	2437	16.45	0.0442
	High	2462	17.23	0.0528
IEEE 802.11g Base mode	Low	2412	14.83	0.0304
	Mid	2437	15.83	0.0383
	High	2462	15.65	0.0367
IEEE 802.11g Turbo mode	Mid	2437	19.42	0.0875



Test Plot

IEEE 802.11b Base mode

CH Low

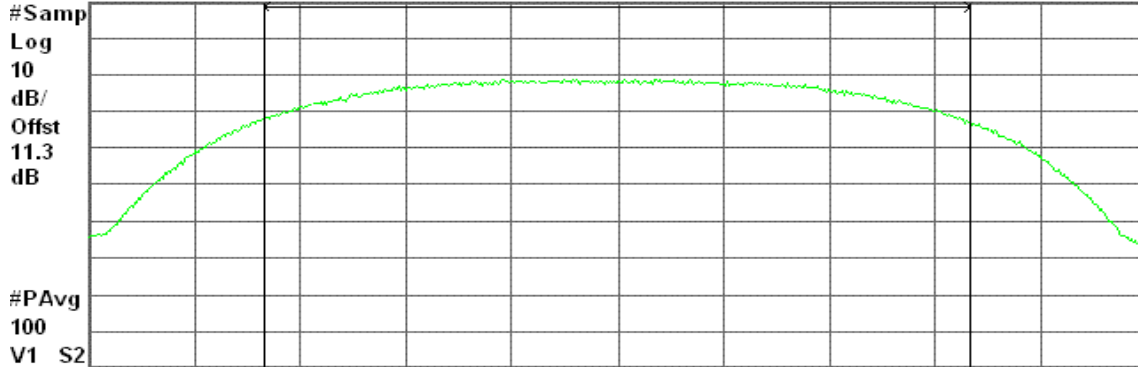
Agilent 14:18:50 Sep 6, 2005

R L

AVG Output Power , b Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 22.99 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

18.04 dBm / 15.3250 MHz

-53.81 dBm/Hz

CH Mid

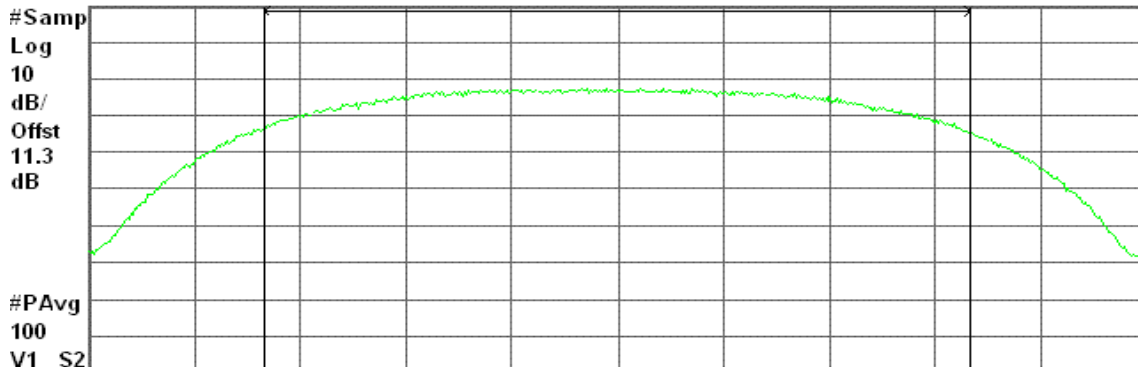
Agilent 14:29:29 Sep 6, 2005

R L

AVG Output Power , b Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 22.94 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

16.45 dBm / 15.2950 MHz

-55.40 dBm/Hz



CH High

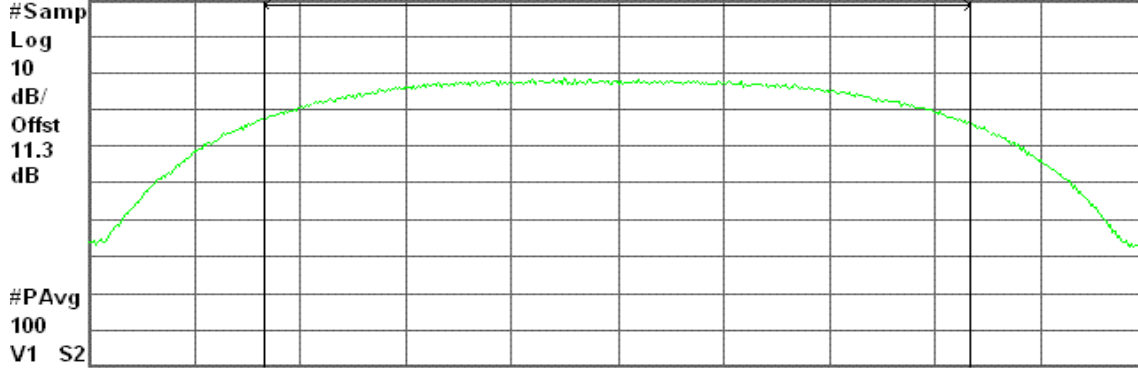
Agilent 14:37:48 Sep 6, 2005

R L

AVG Output Power , b Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 23.07 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

17.23 dBm / 15.3810 MHz

-54.64 dBm/Hz

IEEE 802.11g Base mode

CH Low

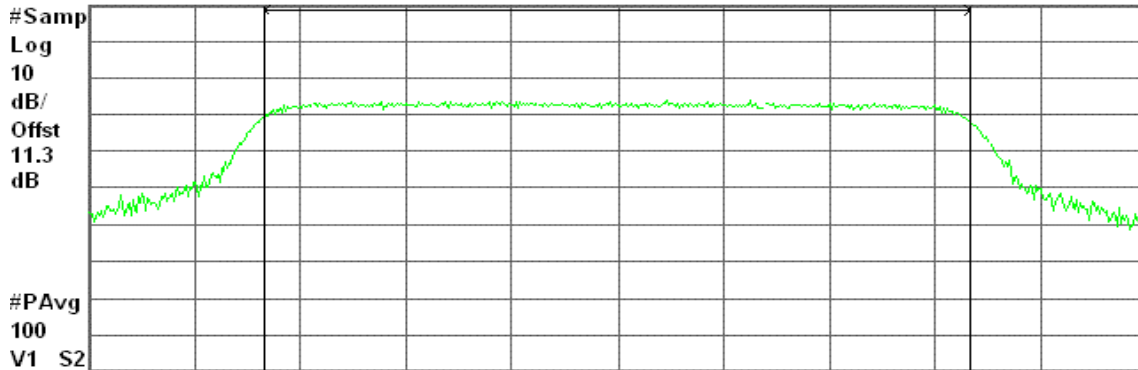
Agilent 13:38:54 Sep 6, 2005

R L

AVG Output Power , g Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 2.412 00 GHz

Span 25.04 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

14.83 dBm / 16.6930 MHz

-57.39 dBm/Hz



CH Mid

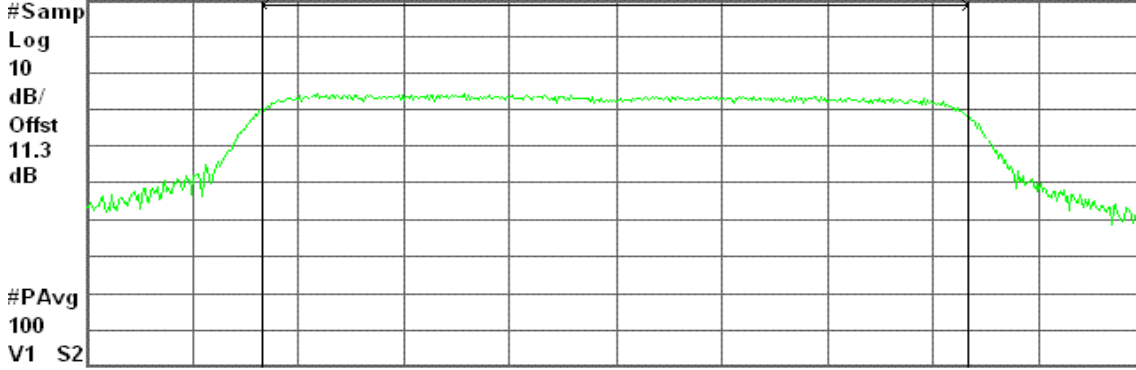
Agilent 13:44:29 Sep 6, 2005

R L

AVG Output Power , g Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

15.83 dBm / 16.7230 MHz

-56.40 dBm/Hz

CH High

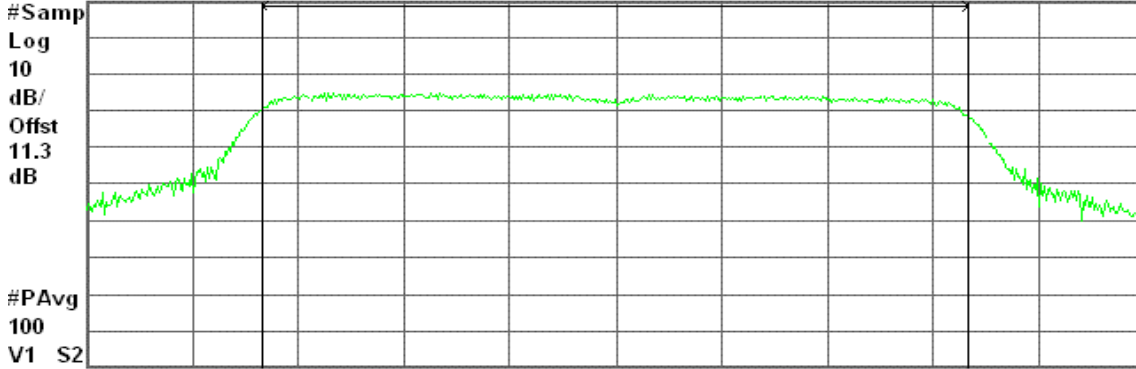
Agilent 13:51:18 Sep 6, 2005

R L

AVG Output Power , g Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 2.462 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

15.65 dBm / 16.7180 MHz

-56.58 dBm/Hz



IEEE 802.11g Turbo mode

CH Mid

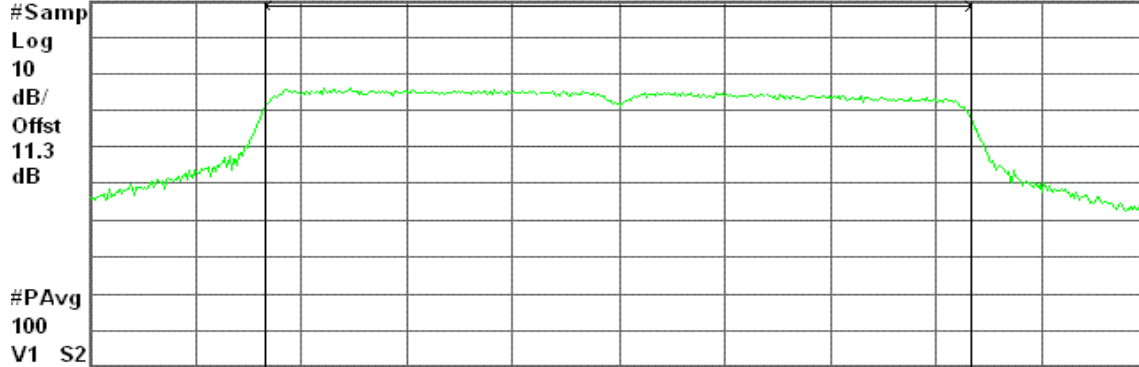
Agilent 14:05:48 Sep 6, 2005

R L

AVG Output Power , g turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 2.437 00 GHz

Span 50.16 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

19.42 dBm / 33.4410 MHz

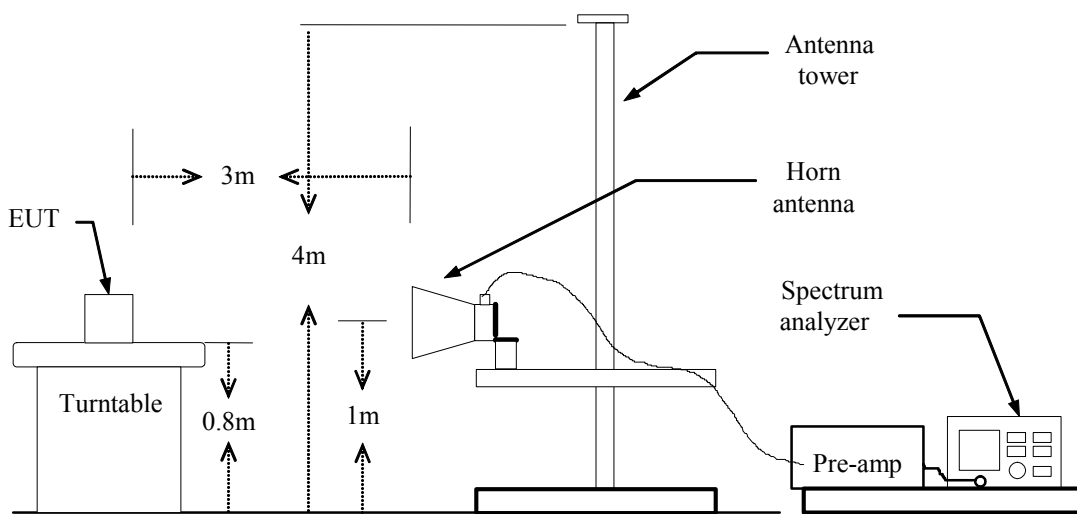
-55.82 dBm/Hz

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.



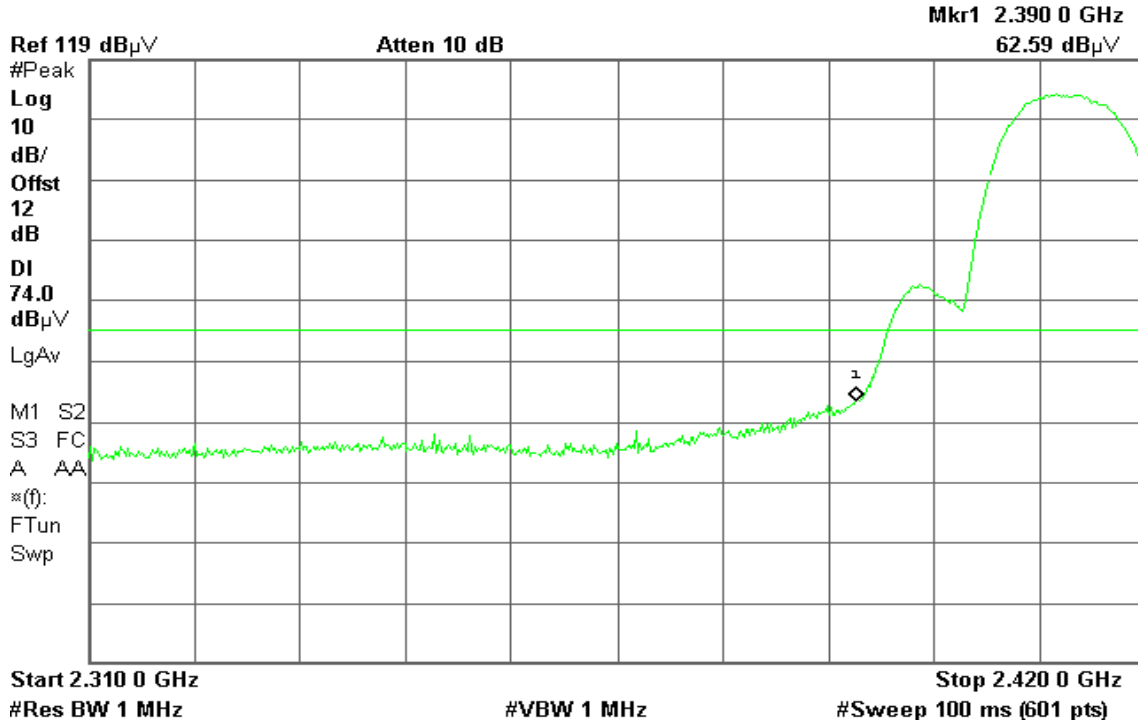
Band Edges (IEEE 802.11b Base mode / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 17:48:43 Sep 5, 2005

T

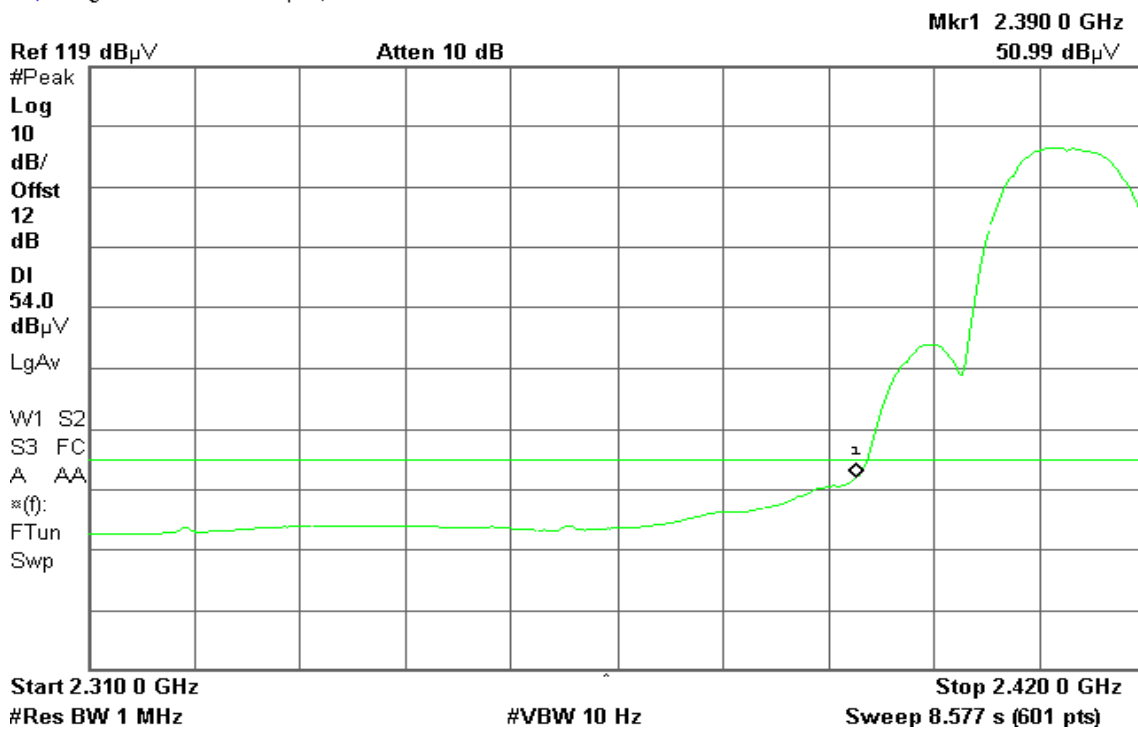


Detector mode: Average

Polarity: Vertical

Agilent 17:47:55 Sep 5, 2005

T



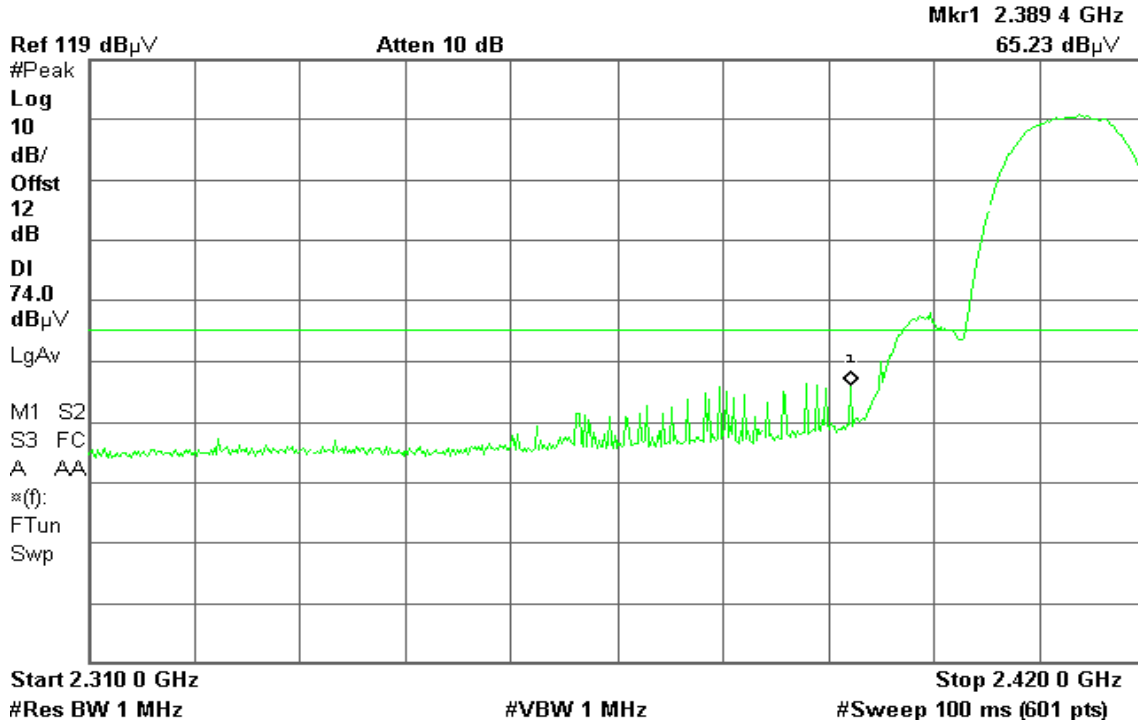


Detector mode: Peak

Polarity: Horizontal

Agilent 17:51:51 Sep 5, 2005

T

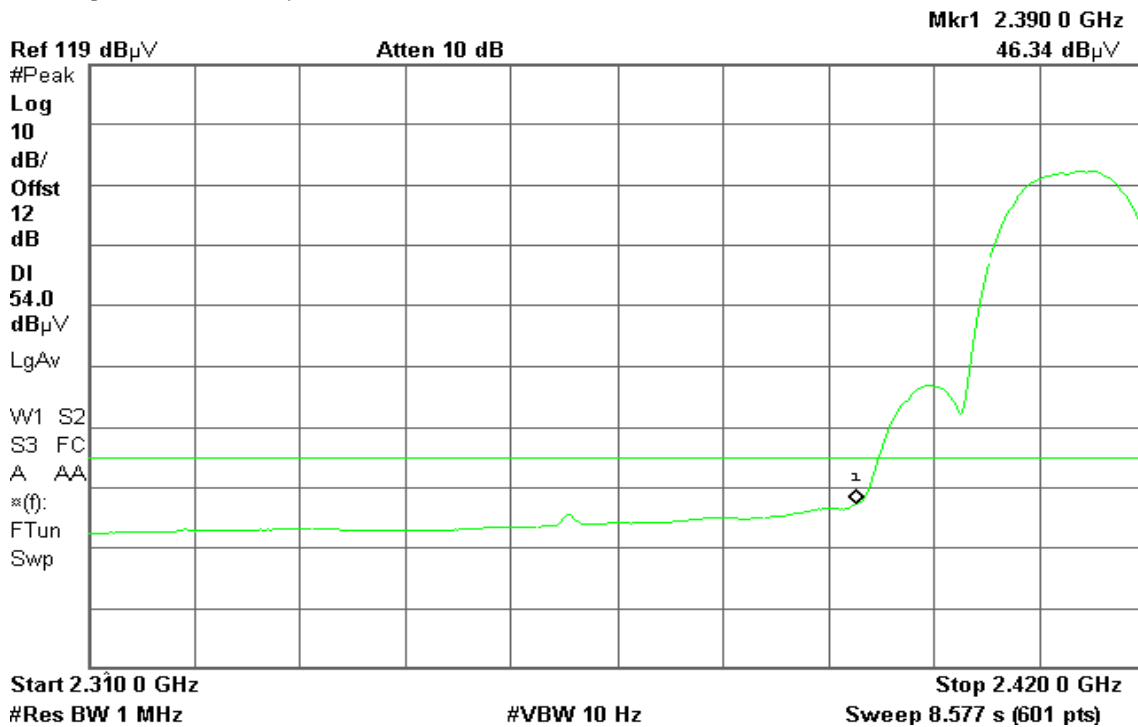


Detector mode: Average

Polarity: Horizontal

Agilent 17:51:13 Sep 5, 2005

T





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

Detector mode: Peak

Polarity: Vertical

Agilent 17:57:30 Sep 5, 2005

T

Mkr1 2.483 50 GHz
67.40 dB μ V



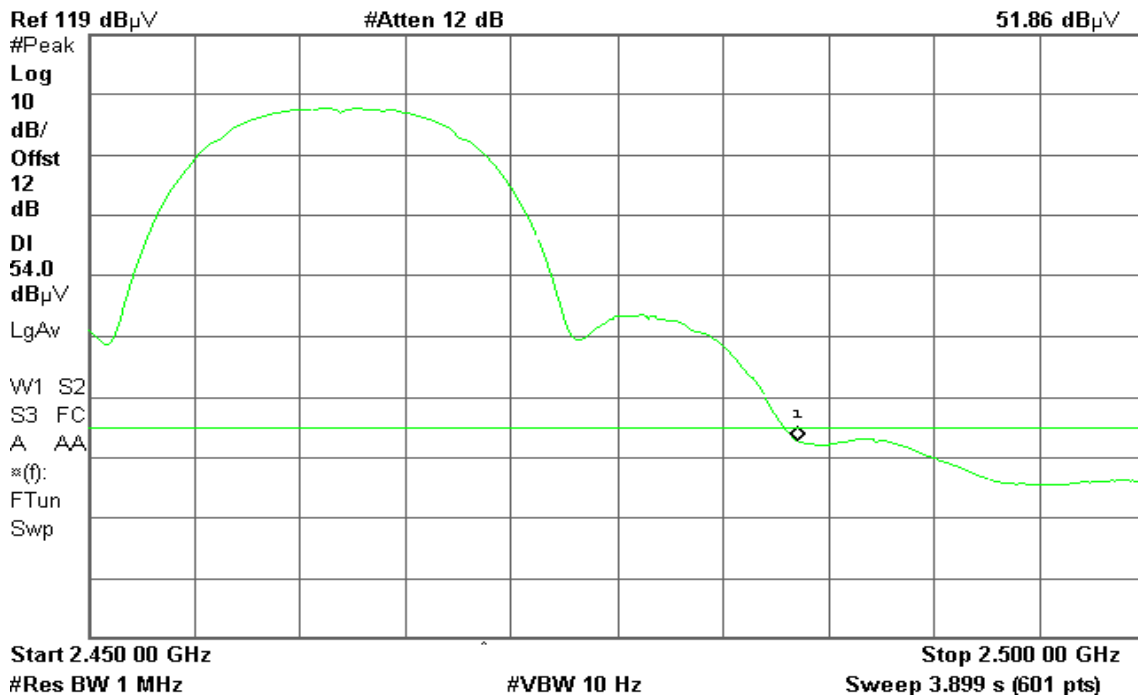
Detector mode: Average

Polarity: Vertical

Agilent 17:57:07 Sep 5, 2005

T

Mkr1 2.483 50 GHz
51.86 dB μ V





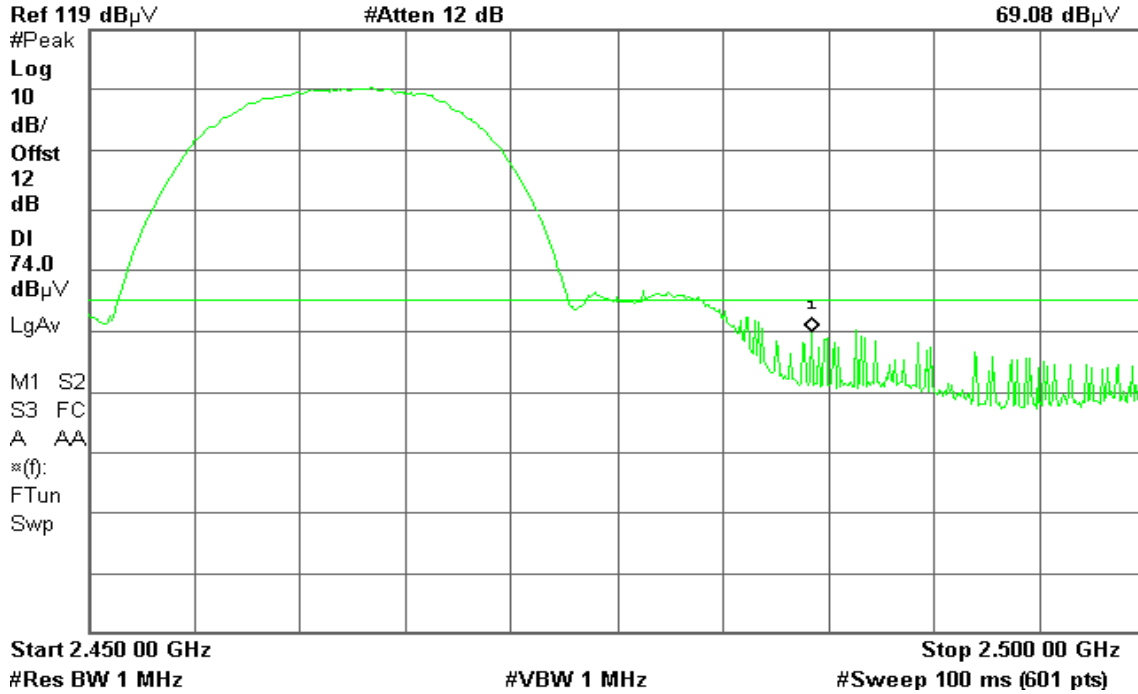
Detector mode: Peak

Polarity: Horizontal

Agilent 18:25:36 Sep 5, 2005

T

Mkr1 2.484 17 GHz
69.08 dBμV



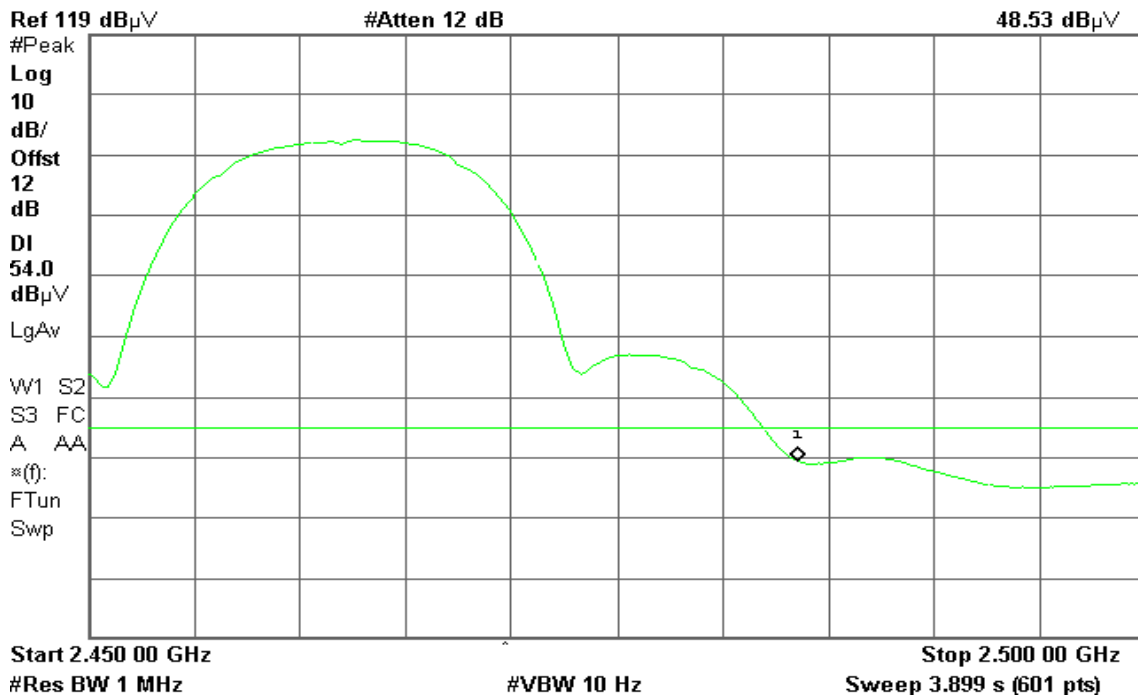
Detector mode: Average

Polarity: Horizontal

Agilent 18:24:13 Sep 5, 2005

T

Mkr1 2.483 50 GHz
48.53 dBμV





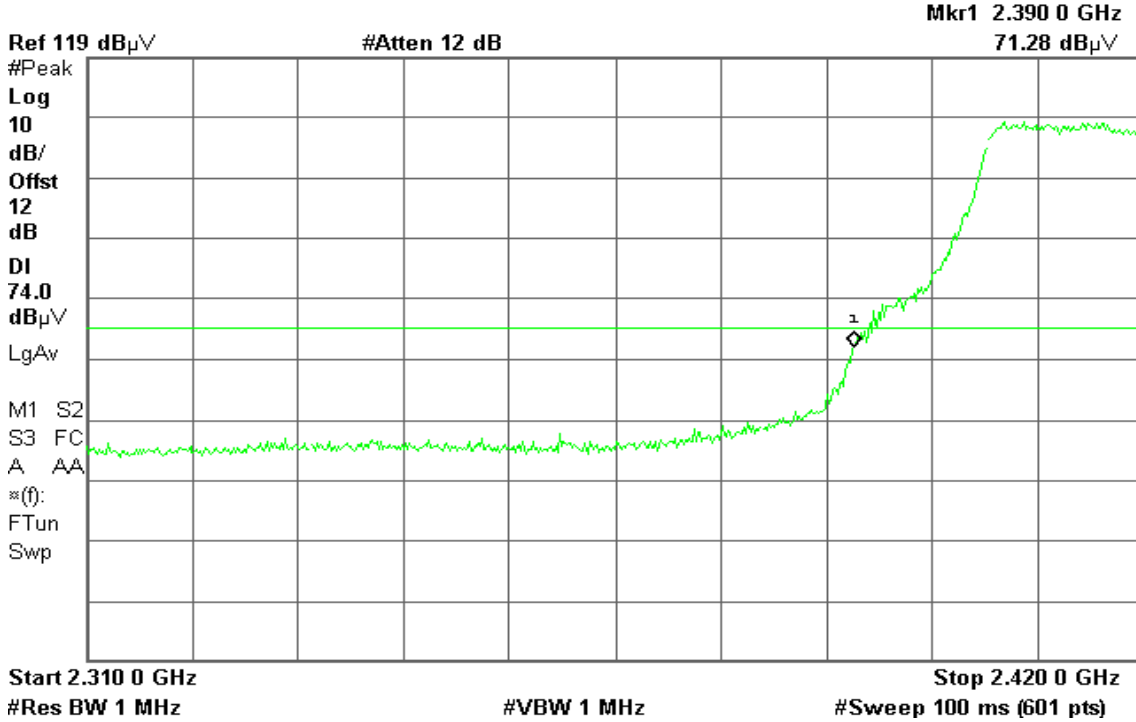
Band Edges (IEEE 802.11g Base mode / CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 18:32:37 Sep 5, 2005

T

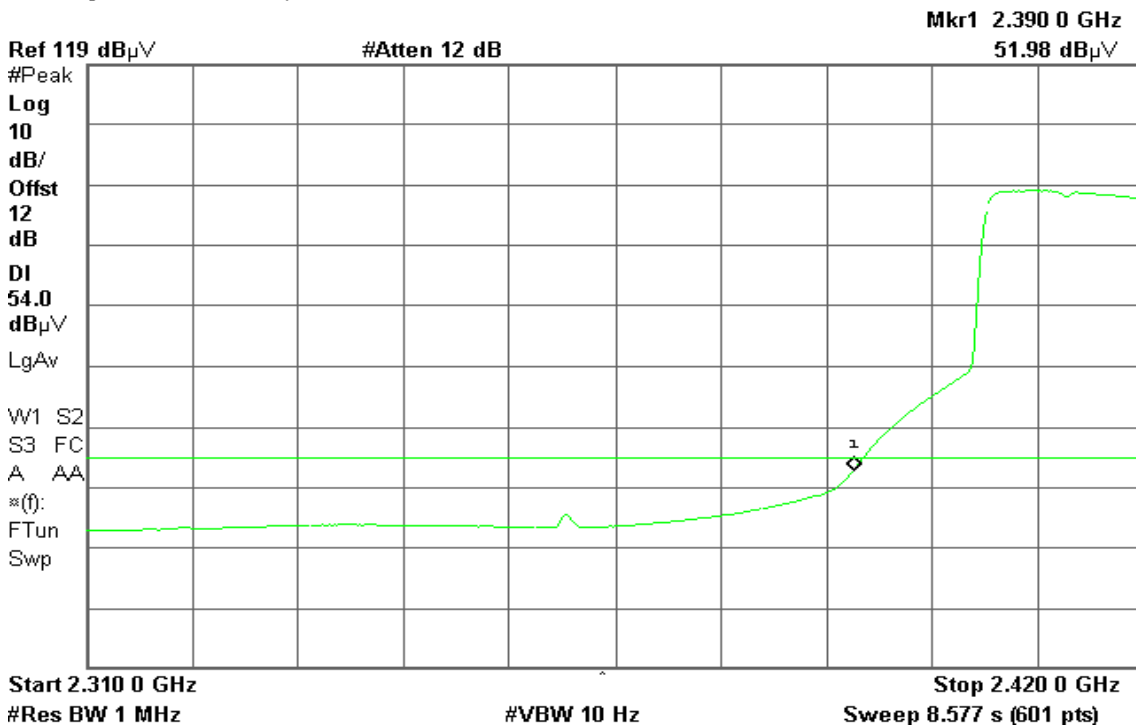


Detector mode: Average

Polarity: Vertical

Agilent 18:32:21 Sep 5, 2005

T



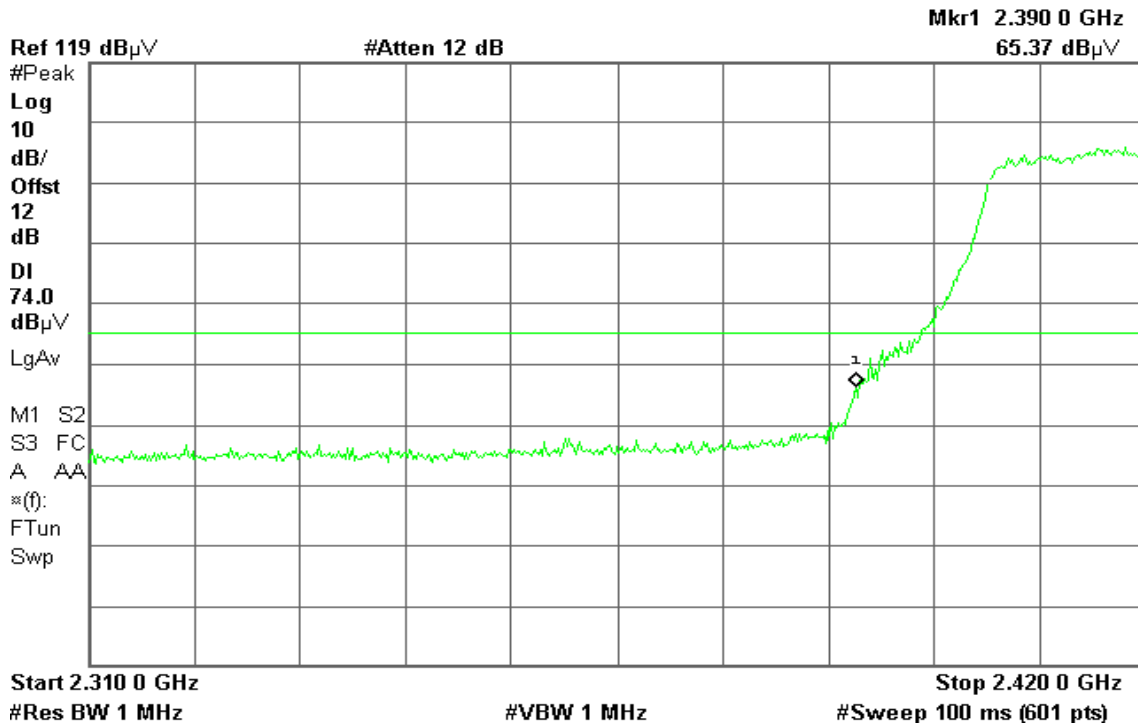


Detector mode: Peak

Polarity: Horizontal

Agilent 18:35:19 Sep 5, 2005

T

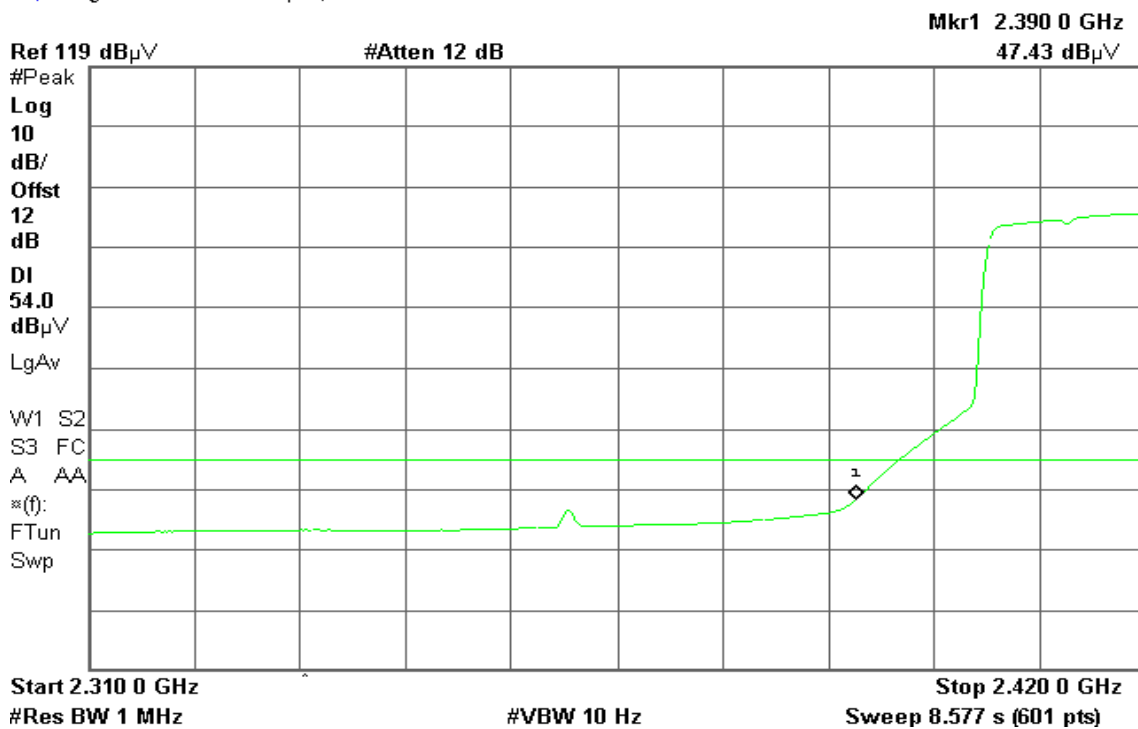


Detector mode: Average

Polarity: Horizontal

Agilent 18:35:05 Sep 5, 2005

T





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

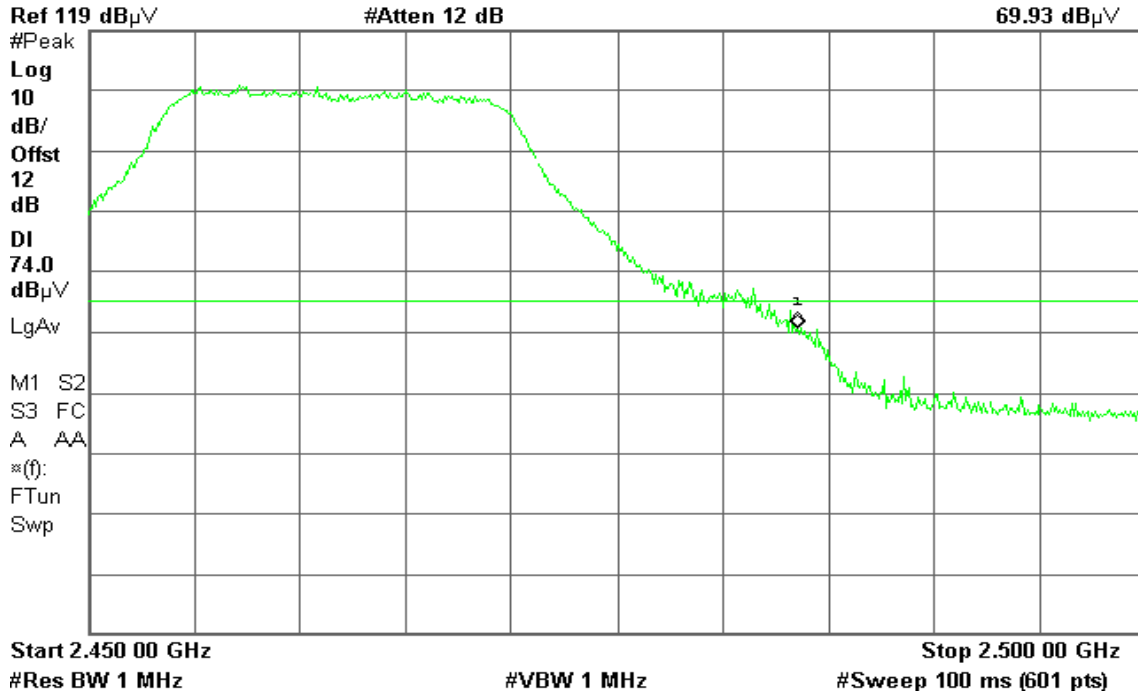
Detector mode: Peak

Polarity: Vertical

Agilent 18:40:00 Sep 5, 2005

T

Mkr1 2.483 50 GHz
69.93 dB μ V



Detector mode: Average

Polarity: Vertical

Agilent 18:39:41 Sep 5, 2005

T

Mkr1 2.483 50 GHz
50.65 dB μ V



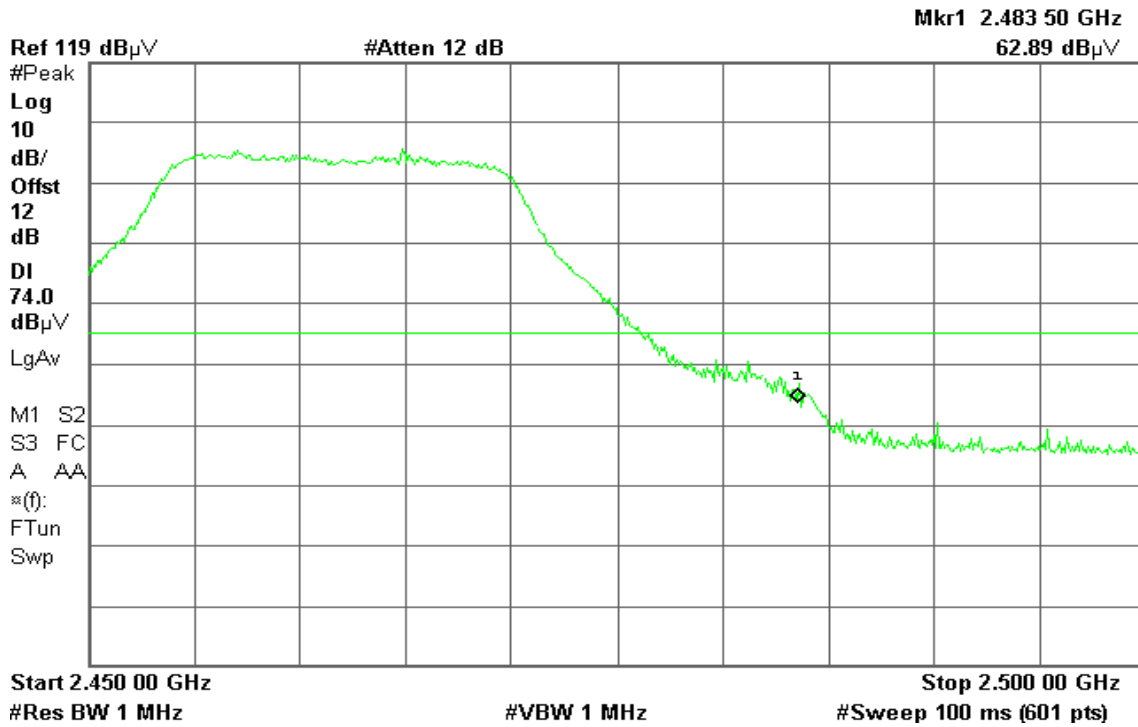


Detector mode: Peak

Polarity: Horizontal

Agilent 18:43:23 Sep 5, 2005

R L

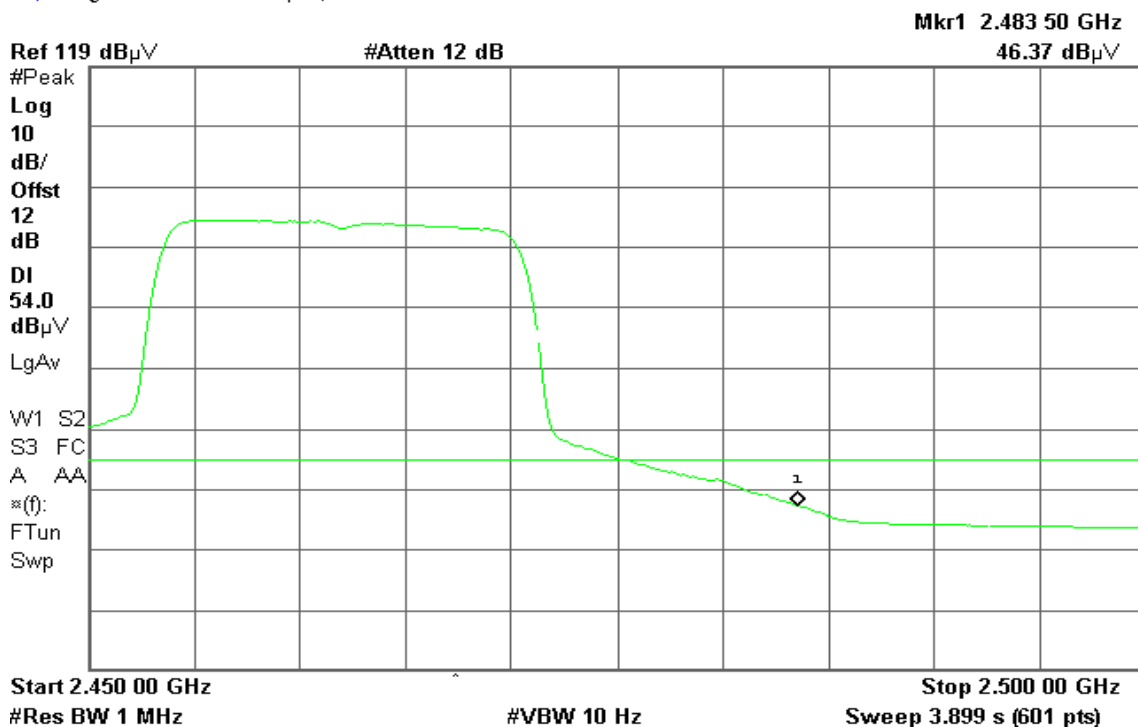


Detector mode: Average

Polarity: Horizontal

Agilent 18:42:42 Sep 5, 2005

T





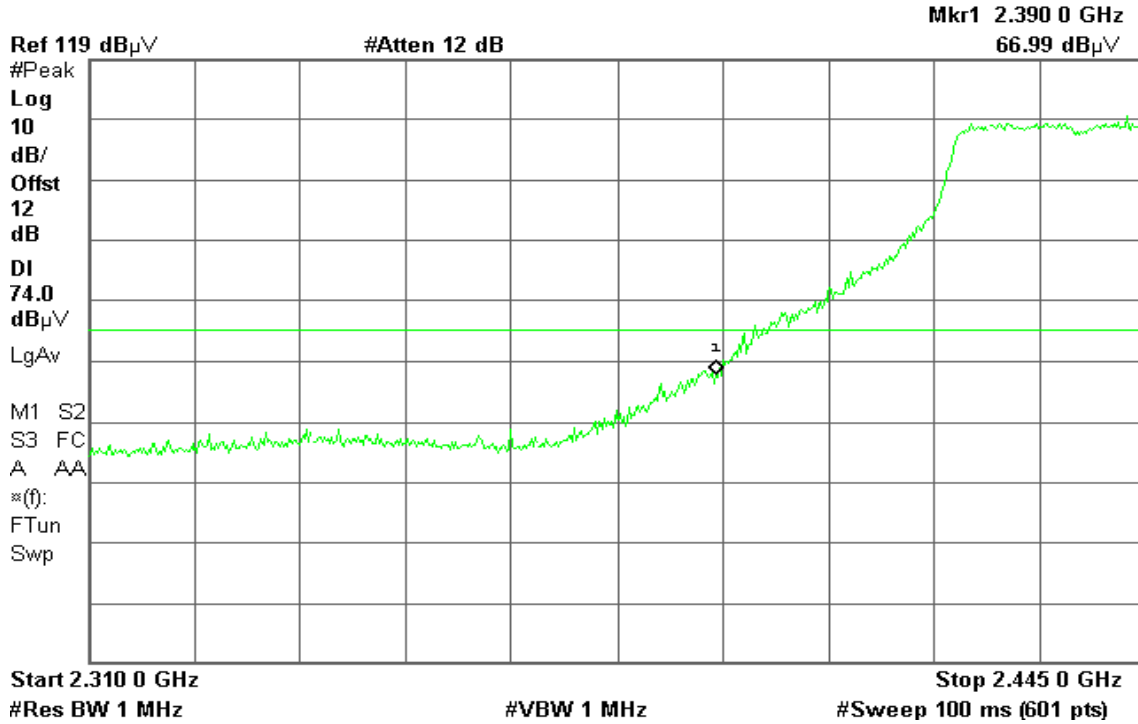
Band Edges (IEEE 802.11g Turbo mode / CH Mid)

Detector mode: Peak

Polarity: Vertical

Agilent 19:01:48 Sep 5, 2005

T

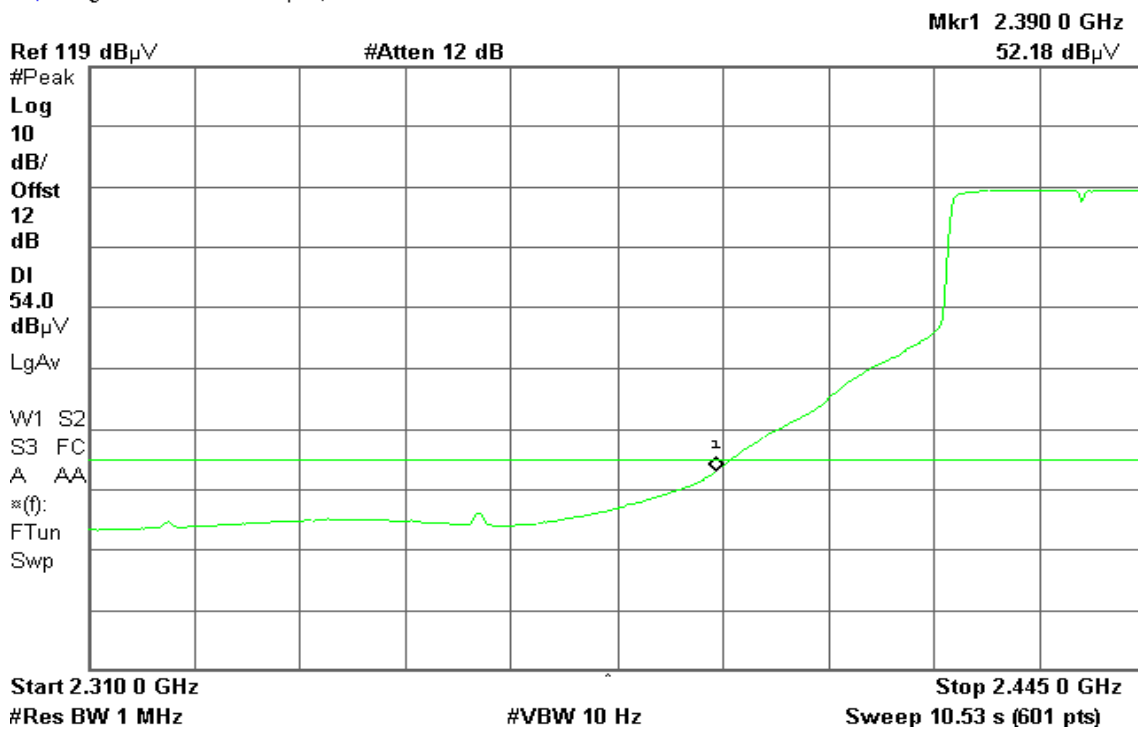


Detector mode: Average

Polarity: Vertical

Agilent 19:01:37 Sep 5, 2005

R L



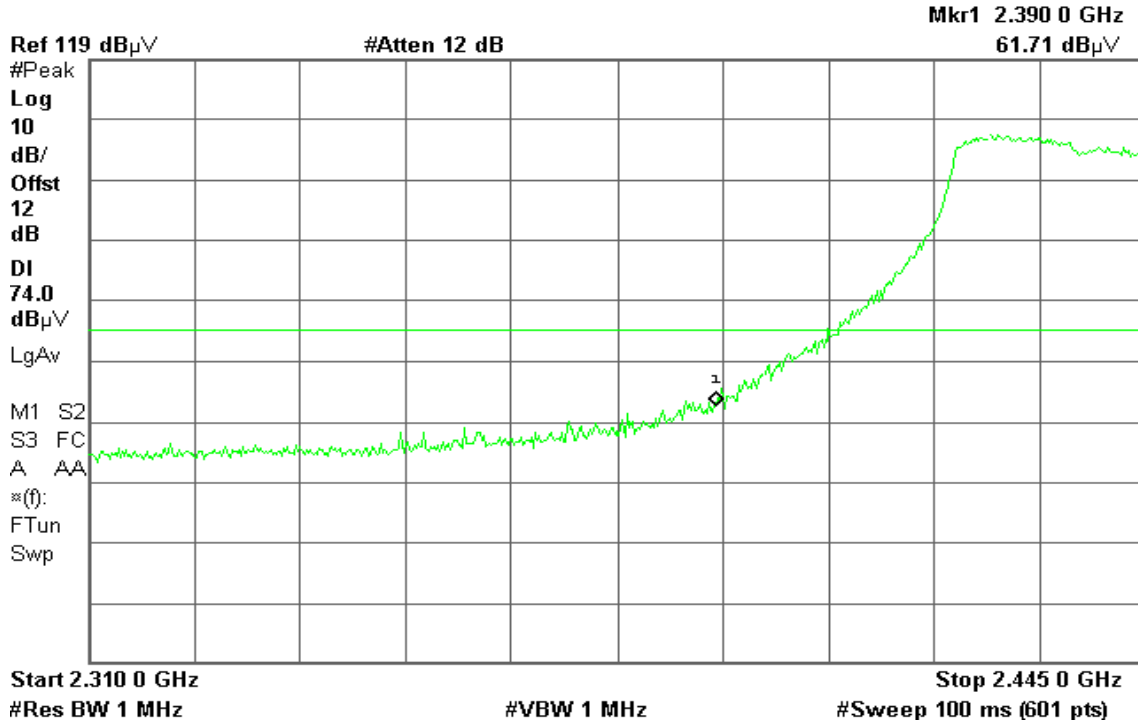


Detector mode: Peak

Polarity: Horizontal

Agilent 19:04:22 Sep 5, 2005

T

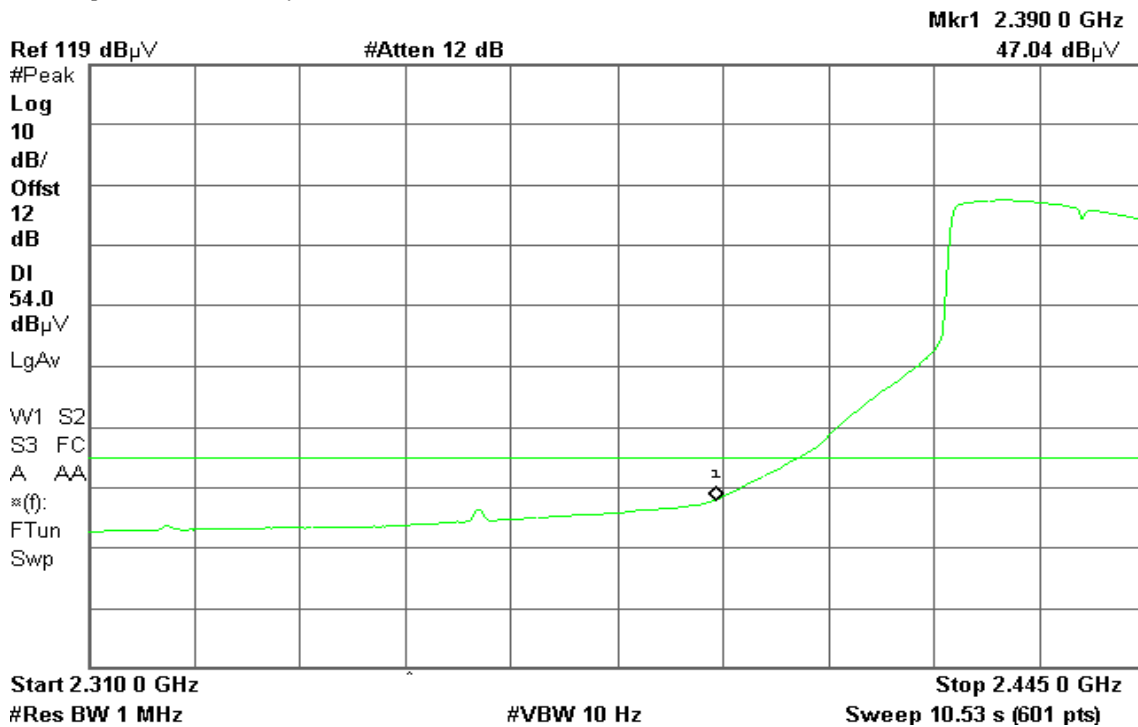


Detector mode: Average

Polarity: Horizontal

Agilent 19:04:08 Sep 5, 2005

T





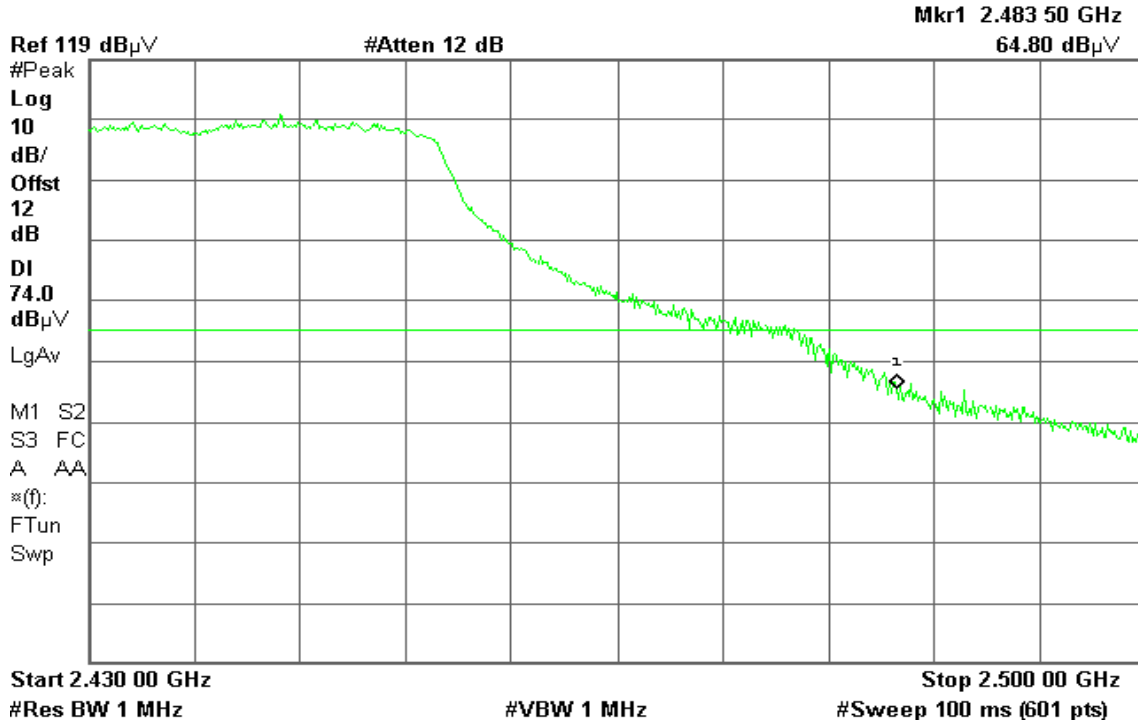
Band Edges (IEEE 802.11g Turbo mode / CH Mid)

Detector mode: Peak

Polarity: Vertical

Agilent 19:07:37 Sep 5, 2005

T

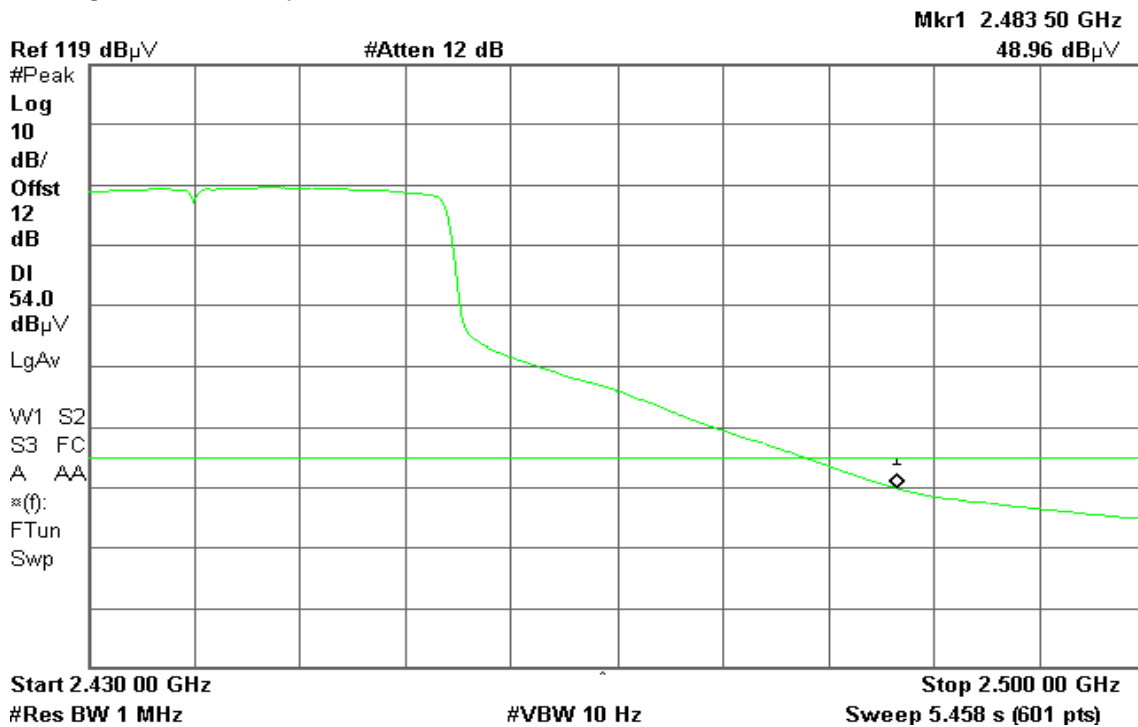


Detector mode: Average

Polarity: Vertical

Agilent 19:07:23 Sep 5, 2005

T





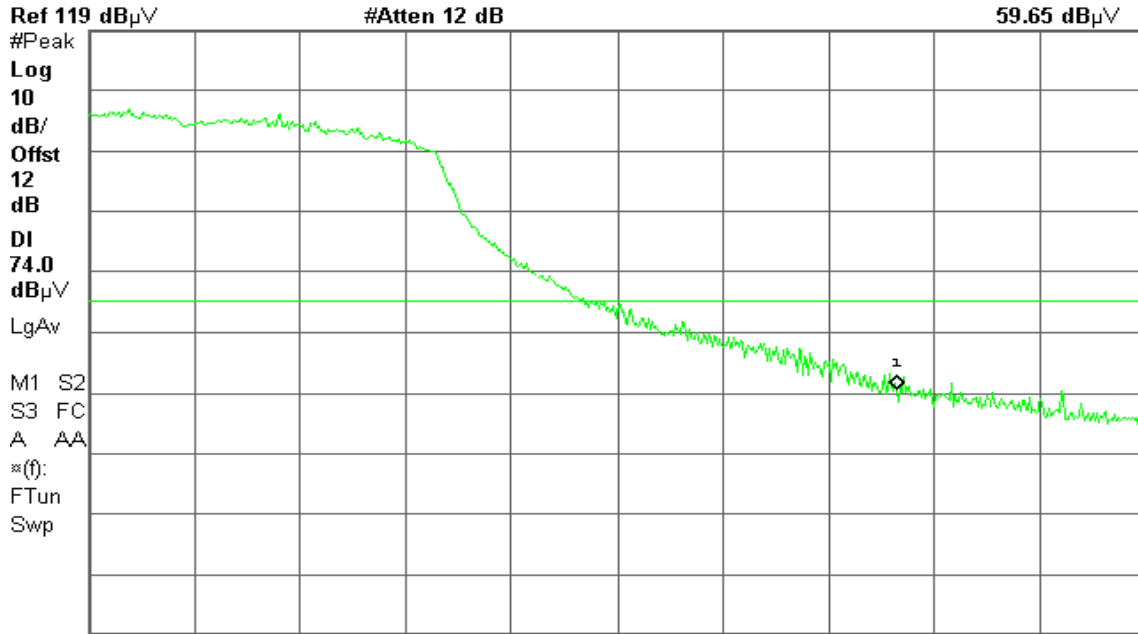
Detector mode: Peak

Polarity: Horizontal

Agilent 19:10:05 Sep 5, 2005

T

Mkr1 2.483 50 GHz
59.65 dBμV



Start 2.430 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

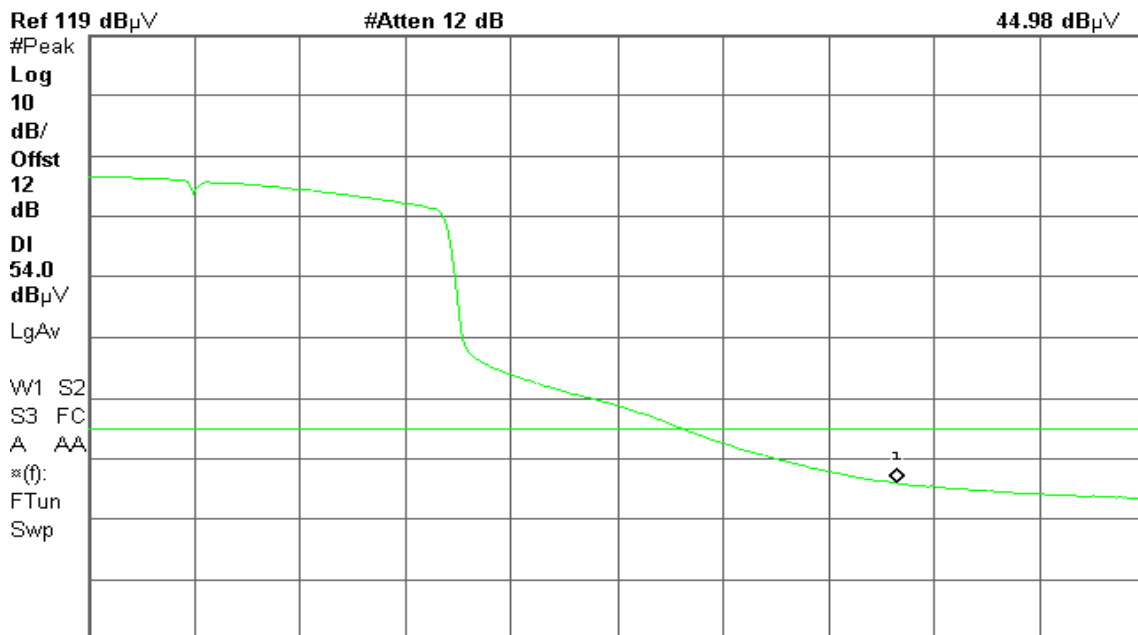
Detector mode: Average

Polarity: Horizontal

Agilent 19:09:49 Sep 5, 2005

R T

Mkr1 2.483 50 GHz
44.98 dBμV



Start 2.430 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 5.458 s (601 pts)

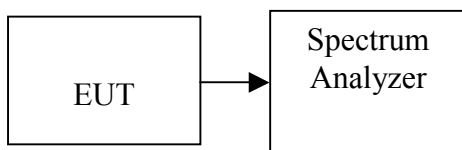


7.5 PEAK POWER SPECTRAL DENSITY

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 = 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

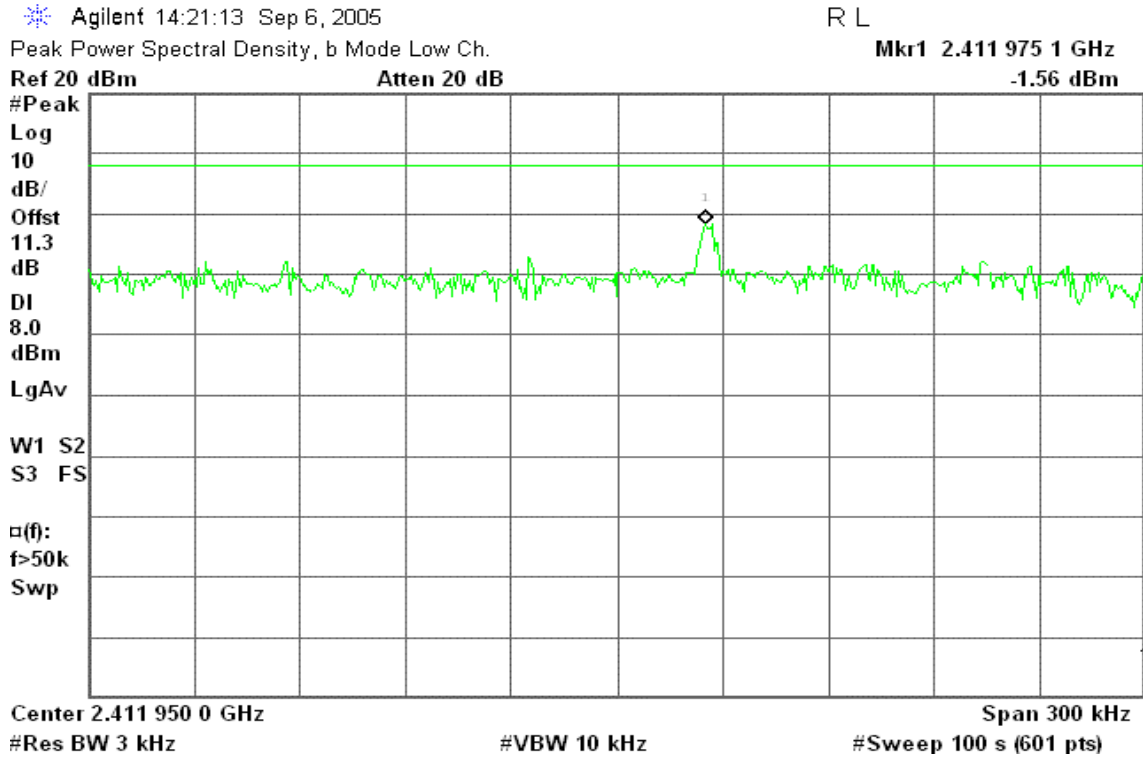
Test mode	Channel	Frequency	PPSD (dBm)	Limit (dBm)	Result
IEEE 802.11b Base mode	Low	2412	-1.56	8.00	PASS
	Mid	2437	-2.77		PASS
	High	2462	-6.62		PASS
IEEE 802.11g Base mode	Low	2412	-3.43		PASS
	Mid	2437	-4.17		PASS
	High	2462	-8.98		PASS
IEEE 802.11g Turbo mode	Mid	2437	-6.97		PASS



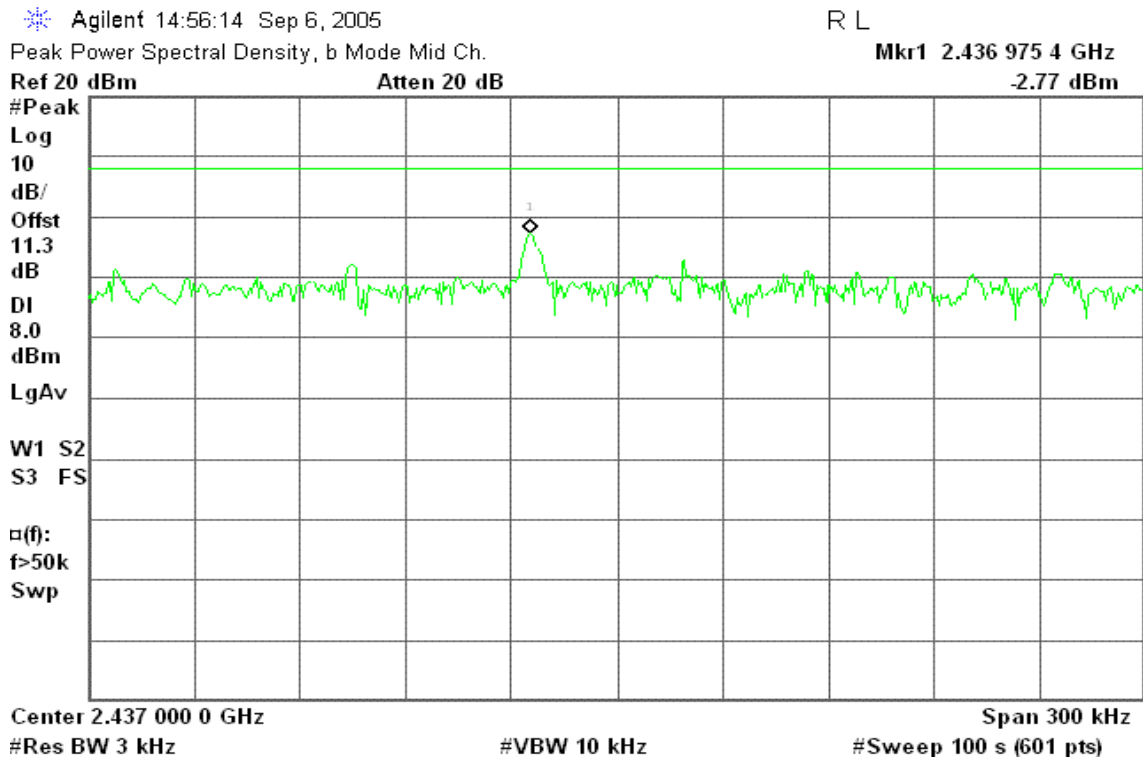
Test Plot

IEEE 802.11b Base mode

PPSD (CH Low)



PPSD (CH Mid)





PPSD (CH High)

Agilent 14:40:20 Sep 6, 2005

R L

Peak Power Spectral Density, b Mode High Ch.

Mkr1 2.461 415 9 GHz

Ref 20 dBm

Atten 20 dB

-6.62 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

8.0

dBm

LgAv

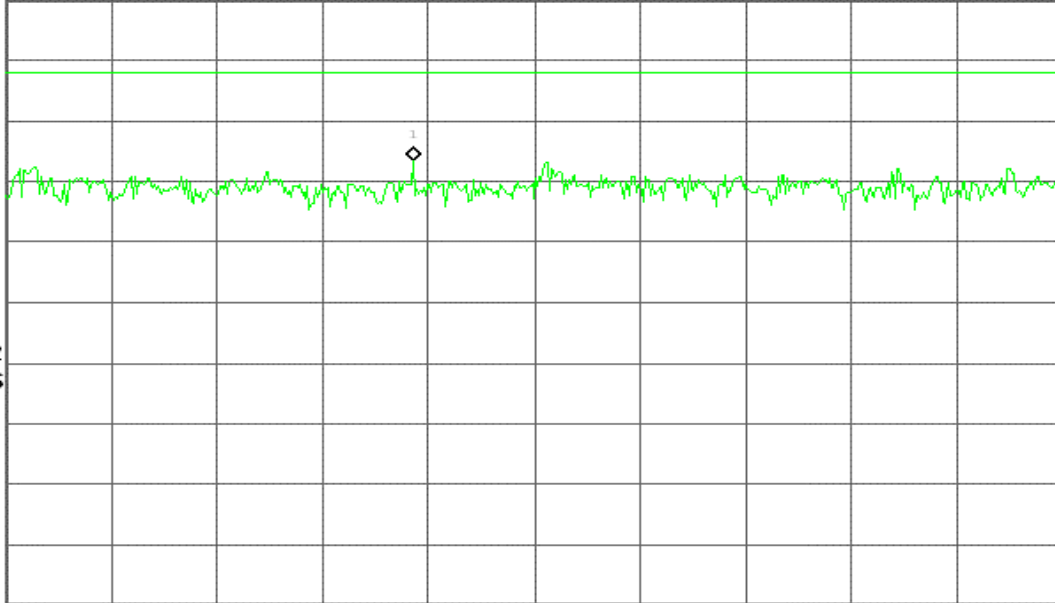
W1 S2

S3 FS

□(f):

f>50k

Swp



Center 2.461 450 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

IEEE 802.11g Base mode

PPSD (CH Low)

Agilent 13:41:18 Sep 6, 2005

R L

Peak Power Spectral Density, g Mode Low Ch.

Mkr1 2.411 975 9 GHz

Ref 20 dBm

Atten 20 dB

-3.43 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

8.0

dBm

LgAv

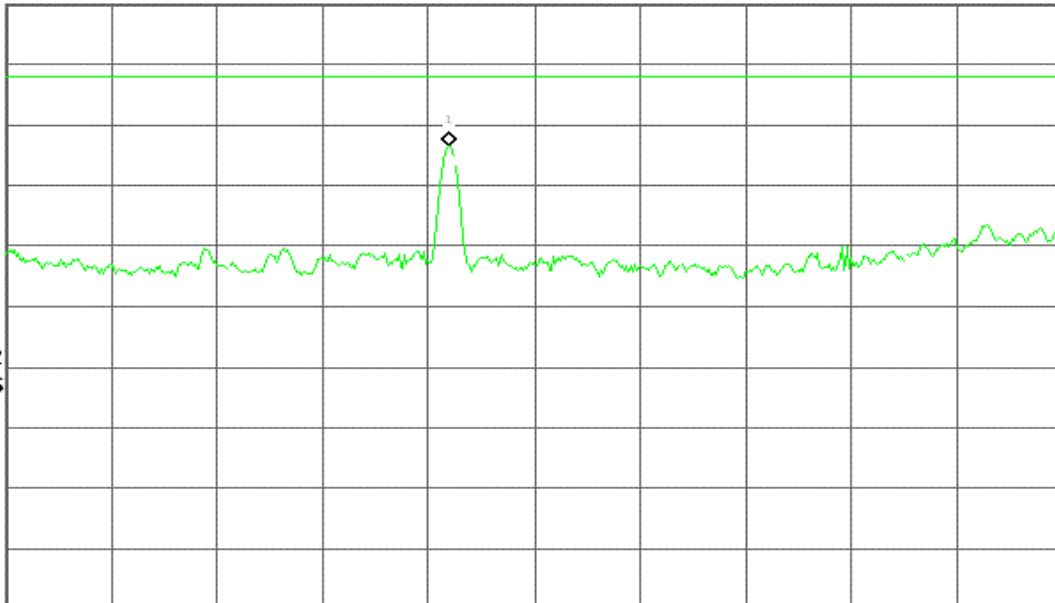
W1 S2

S3 FS

□(f):

f>50k

Swp



Center 2.412 000 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



PPSD (CH Mid)

Agilent 13:46:50 Sep 6, 2005

R L

Peak Power Spectral Density, g Mode Mid Ch.

Mkr1 2.436 975 4 GHz

Ref 20 dBm

Atten 20 dB

-4.17 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

8.0

dBm

LgAv

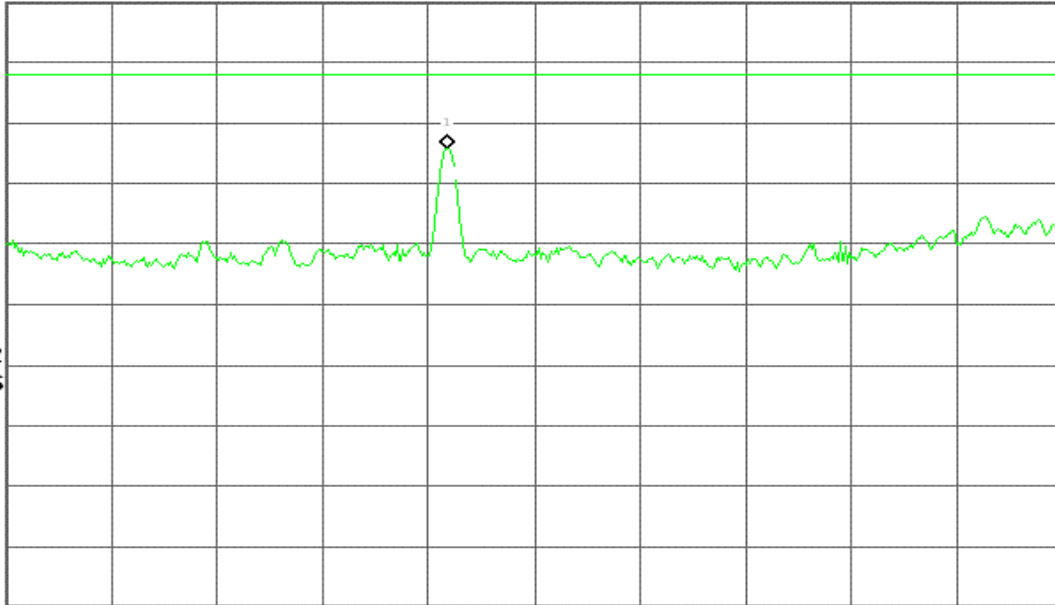
W1 S2

S3 FS

□(f):

f>50k

Swp



Center 2.437 000 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)

PPSD (CH High)

Agilent 13:53:43 Sep 6, 2005

R L

Peak Power Spectral Density, g Mode High Ch.

Mkr1 2.457 601 0 GHz

Ref 20 dBm

Atten 20 dB

-8.98 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

8.0

dBm

LgAv

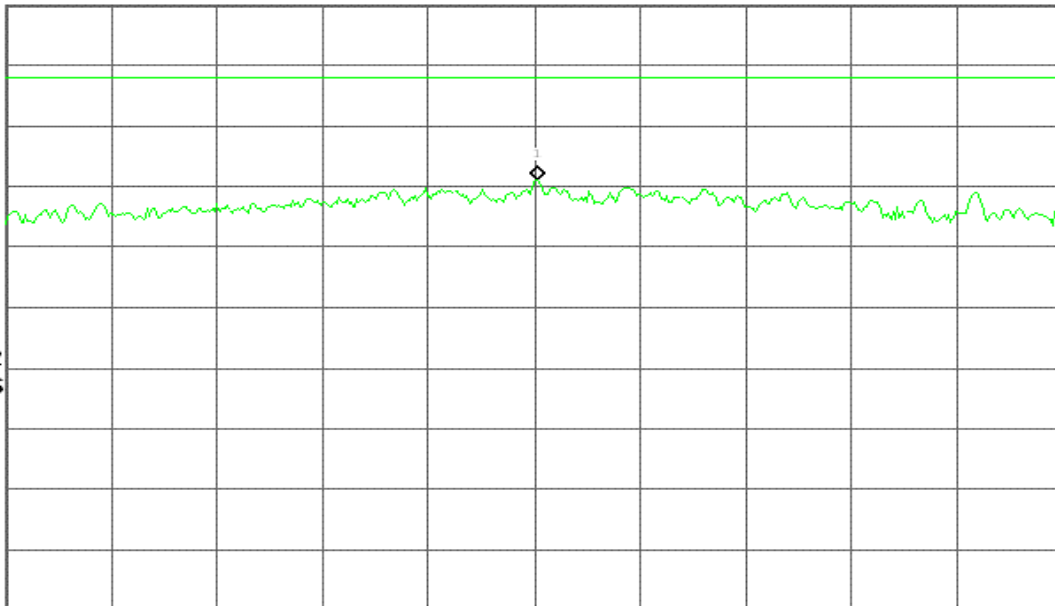
W1 S2

S3 FS

□(f):

f>50k

Swp



Center 2.457 600 0 GHz

Span 300 kHz

#Res BW 3 kHz

#VBW 10 kHz

#Sweep 100 s (601 pts)



IEEE 802.11g Turbo mode

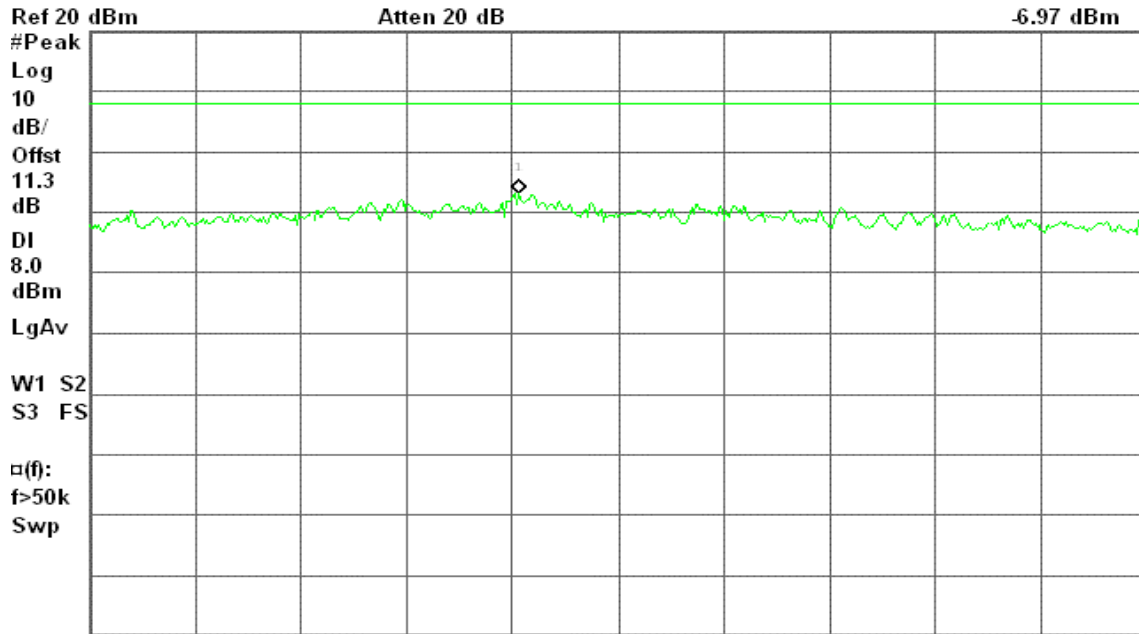
PPSD (CH Mid)

Agilent 14:08:25 Sep 6, 2005

R L

Mkr1 2.426 971 9 GHz

-6.97 dBm





7.6 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	IEEE 802.11b/g Wireless USB 2.0 Adapter
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 Base mode: 21.12 dBm (129.42mW) IEEE 802.11g Base mode: 18.84 dBm (76.56mW) IEEE 802.11g Turbo mode: 22.67 dBm (184.93mW)
Antenna gain (Max)	5.0 dBi (Numeric gain: 3.16)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation
Remark:	
1. The maximum output power is <u>22.67dBm (184.93mW) at 2437MHz (with 3.16 numeric antenna gain.)</u> 2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance. 3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm ² 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 = 184.93mW

Numeric Antenna gain = 3.16

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

Yields

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

Where $P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

→ Power density = 0.11629 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.)



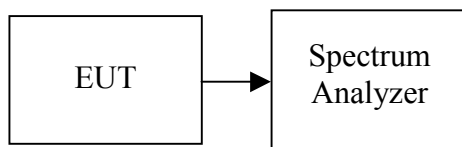
7.7 SPURIOUS EMISSIONS

7.7.1 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 300 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 Base mode

CH Low

Agilent 14:22:20 Sep 6, 2005

L

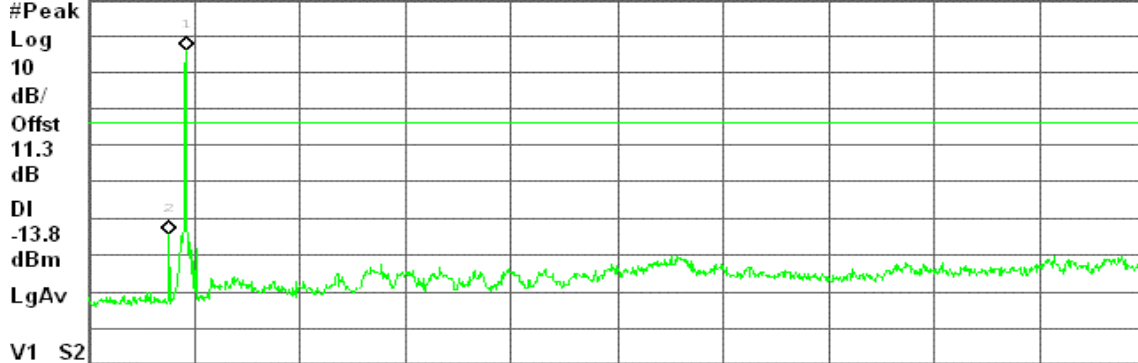
Spurious, b Mode Low Ch.

Mkr2 2.00 GHz

Ref 20 dBm

Atten 20 dB

-44.56 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42 GHz	6.19 dBm
2	(1)	Freq	2.00 GHz	-44.56 dBm

CH Mid

Agilent 14:35:45 Sep 6, 2005

L

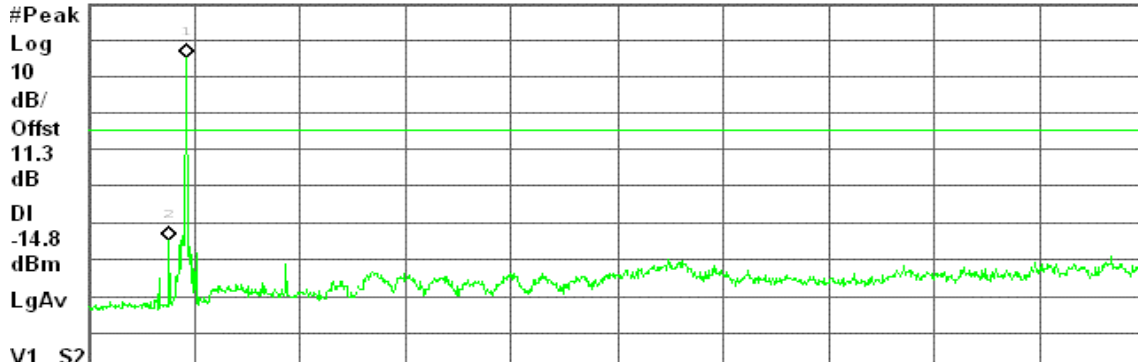
Spurious, b Mode Mid Ch.

Mkr2 2.00 GHz

Ref 20 dBm

Atten 20 dB

-44.84 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	5.22 dBm
2	(1)	Freq	2.00 GHz	-44.84 dBm



CH High

Agilent 14:41:47 Sep 6, 2005

L

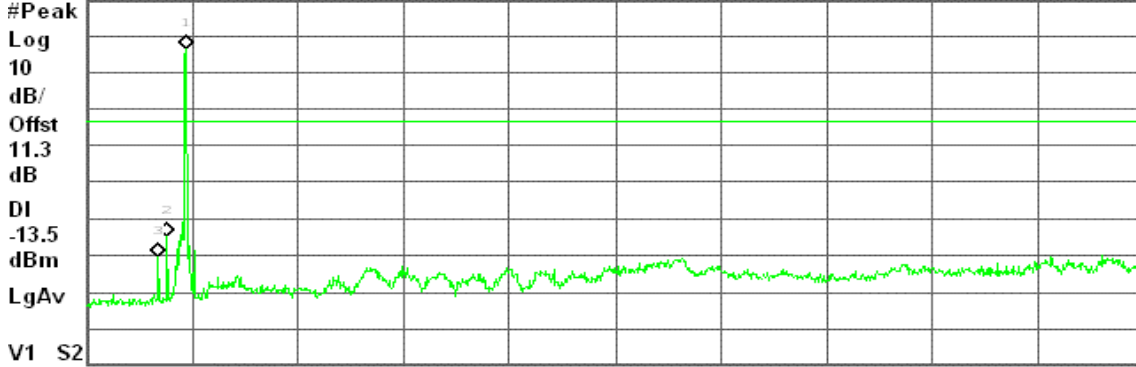
Spurious, b Mode High Ch.

Mkr3 1.80 GHz

Ref 20 dBm

Atten 20 dB

-50.48 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.47 GHz	6.52 dBm
2	(1)	Freq	2.00 GHz	-44.95 dBm
3	(1)	Freq	1.80 GHz	-50.48 dBm

IEEE 802.11g Base mode

CH Low

Agilent 13:42:28 Sep 6, 2005

L

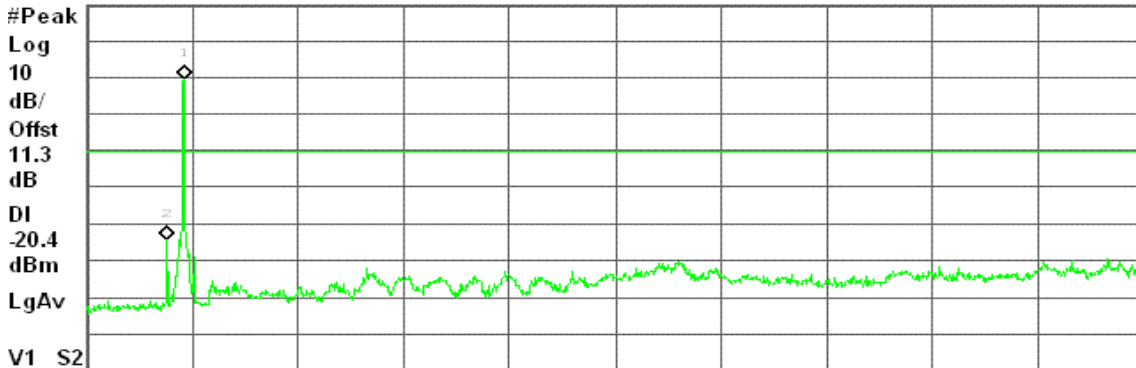
Spurious, g Mode Low Ch.

Mkr2 2.00 GHz

Ref 20 dBm

Atten 20 dB

44.44 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42 GHz	-0.37 dBm
2	(1)	Freq	2.00 GHz	-44.44 dBm



CH Mid

Agilent 13:49:07 Sep 6, 2005

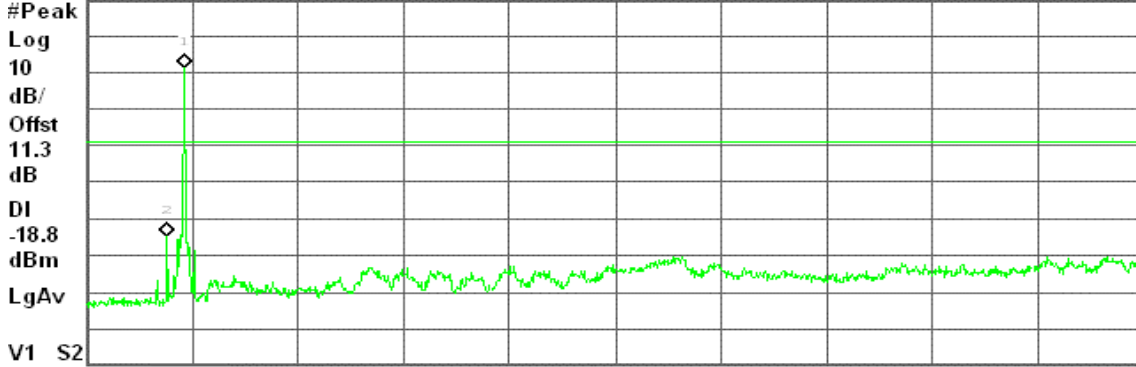
L

Spurious, g Mode Mid Ch.

Mkr2 2.00 GHz
-44.88 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.46 GHz	1.32 dBm
2	(1)	Freq	2.00 GHz	-44.88 dBm

CH High

Agilent 13:56:43 Sep 6, 2005

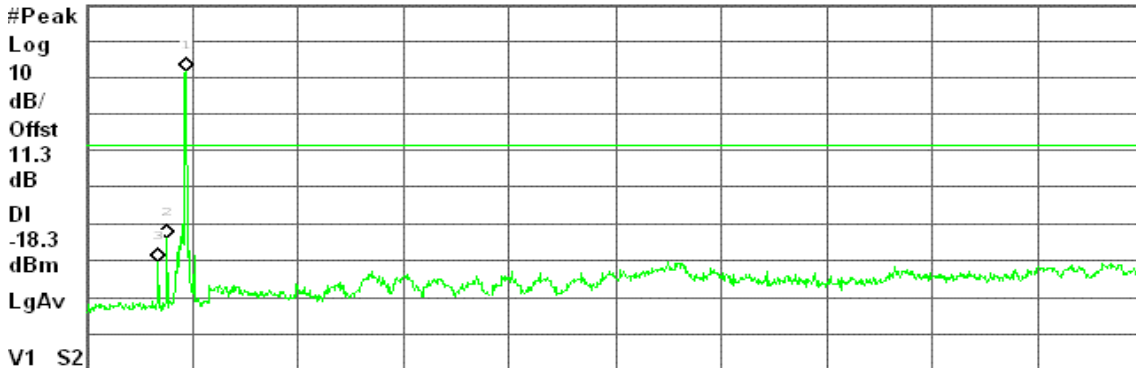
L

Spurious, g Mode High Ch.

Mkr3 1.80 GHz
-50.75 dBm

Ref 20 dBm

Atten 20 dB



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.47 GHz	1.67 dBm
2	(1)	Freq	2.00 GHz	-44.14 dBm
3	(1)	Freq	1.80 GHz	-50.75 dBm



IEEE 802.11g Turbo mode

CH Mid

Agilent 14:09:45 Sep 6, 2005

L

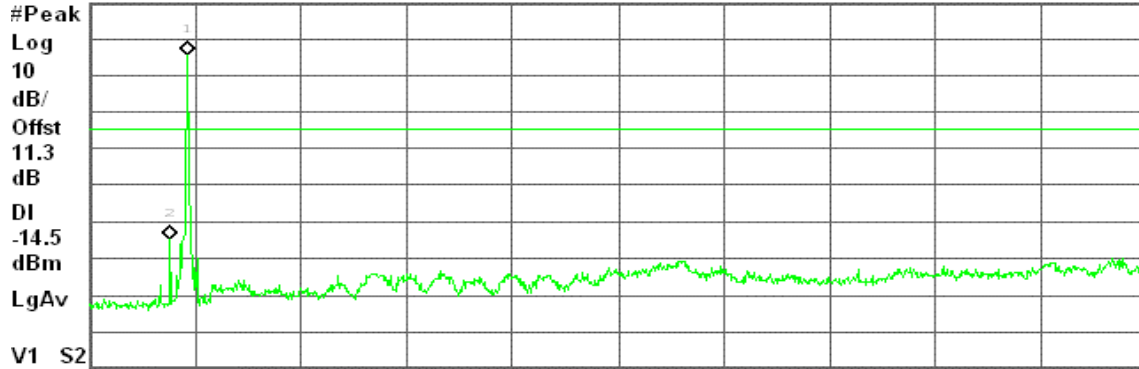
Spurious, g turbo Mode Mid Ch.

Mkr2 2.00 GHz

Ref 20 dBm

Atten 20 dB

-44.99 dBm



Center 13.02 GHz

Span 25.97 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 2.482 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	5.64 dBm
2	(1)	Freq	2.00 GHz	-44.99 dBm



7.7.2 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 (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

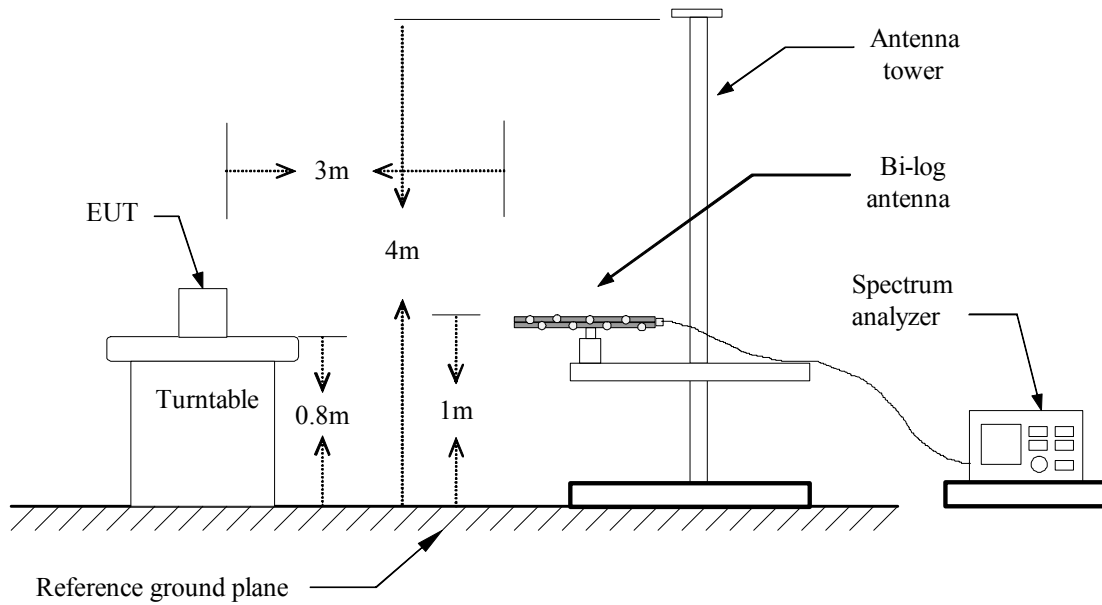
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

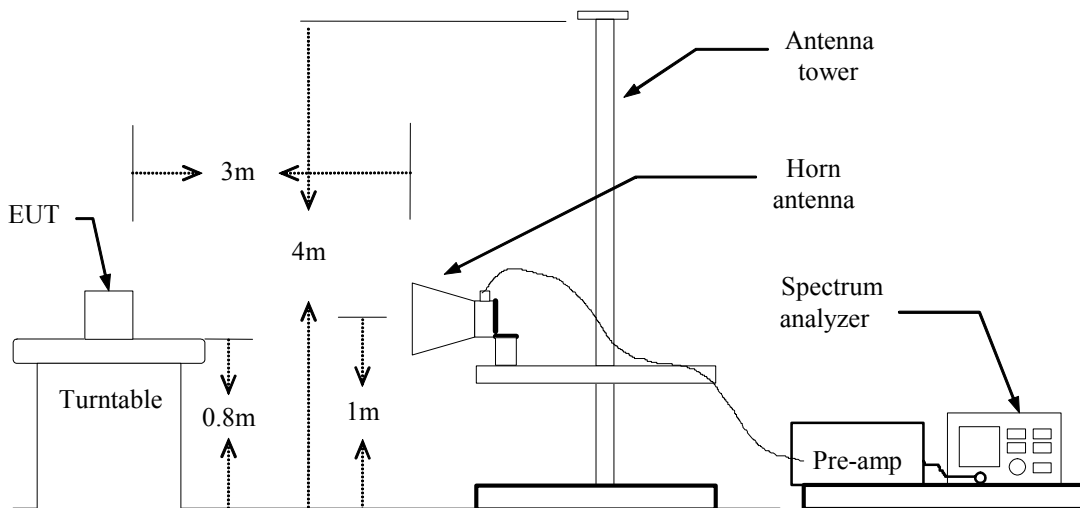
Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

Below 1 GHz



Above 1 GHz





TEST PROCEDURE

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



TEST RESULTS

Below 1 GHz

Operation Mode: Normal Link

Test Date: August 04, 2005

Temperature: 26°C

Tested by: Rex Lai

Humidity: 53% RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
201.45	V	Peak	18.70	11.80	30.50	43.50	-13.00
232.95	V	Peak	19.30	14.20	33.50	46.00	-12.50
288.30	V	Peak	17.40	15.30	32.70	46.00	-13.30
455.16	V	Peak	13.40	17.70	31.10	46.00	-14.90
566.00	V	Peak	12.20	22.30	34.50	46.00	-11.50
798.21	V	Peak	10.90	24.60	35.50	46.00	-10.50
127.20	H	Peak	20.20	9.80	30.00	43.50	-13.50
227.55	H	Peak	18.50	13.90	32.40	46.00	-13.60
287.85	H	Peak	13.50	15.30	28.80	46.00	-17.20
479.79	H	Peak	18.20	19.60	37.80	46.00	-8.20
576.50	H	Peak	13.50	22.40	35.90	46.00	-10.10
797.00	H	Peak	12.90	24.70	37.60	46.00	-8.40

Remark:

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/Quasi-peak detector mode.
3. 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.
4. The IF bandwidth of SPA between 30MHz and 1GHz was 100 kHz.



Above 1 GHz

Operation Mode: TX / IEEE 802.11b Base mode / CH Low **Test Date:** September 05, 2005

Temperature: 20°C **Tested by:** Jason Chang

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4823.00	V	52.47	41.48	0.35	52.82	41.83	74.00	54.00	-12.17	AVG
7234.00	V	56.71	46.99	3.33	60.04	50.32	74.00	54.00	-3.68	AVG
N/A										
4823.00	H	52.50	---	0.35	52.85	---	74.00	54.00	-1.15	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



Operation Mode: TX / IEEE 802.11b Base mode / CH Mid Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4880.00	V	54.24	41.82	0.40	54.64	42.22	74.00	54.00	-11.78	AVG
7300.00	V	56.03	46.68	3.45	59.48	50.13	74.00	54.00	-3.87	AVG
N/A										
4870.00	H	50.48	---	0.39	50.87	---	74.00	54.00	-3.13	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



Operation Mode: TX / IEEE 802.11b Base mode / CH High Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4923.00	V	56.11	44.55	0.44	56.55	44.55	74.00	54.00	-9.45	AVG
7383.00	V	57.18	48.62	3.59	60.77	52.21	74.00	54.00	-1.79	AVG
N/A										
4924.00	H	54.44	41.86	0.44	54.88	42.30	74.00	54.00	-11.70	AVG
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



Operation Mode: TX / IEEE 802.11g Base mode / CH Low Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4820.00	V	49.82	---	0.35	50.17	---	74.00	54.00	-3.83	Peak
7234.00	V	55.16	43.62	3.33	58.49	46.95	74.00	54.00	-7.05	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *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.*
3. *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.*
4. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
5. *Spectrum setting:*
 - a. *Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.*
 - b. *AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.*



Operation Mode: TX / IEEE 802.11g Base mode / CH Mid Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4880.00	V	50.40	---	0.40	50.80	---	74.00	54.00	-3.20	Peak
7307.00	V	55.97	43.73	3.45	59.42	47.18	74.00	54.00	-6.82	AVG
N/A										
7309.00	H	55.99	43.86	3.45	59.44	47.31	74.00	54.00	-6.69	AVG
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



Operation Mode: TX / IEEE 802.11g Base mode / CH High Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4920.00	V	50.60	---	0.44	51.04	---	74.00	54.00	-2.96	Peak
7383.00	V	52.33	43.65	3.59	58.72	47.24	74.00	54.00	-6.76	AVG
N/A										
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto



Operation Mode: TX / IEEE 802.11g Turbo mode / CH Mid Test Date: September 05, 2005

Temperature: 20°C Tested by: Jason Chang

Humidity: 60 % RH Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
4874.00	V	53.10	40.00	0.39	53.49	40.39	74.00	54.00	-13.61	AVG
7306.00	V	56.36	44.26	3.45	59.81	47.71	74.00	54.00	-6.29	AVG
N/A										
4880.00	H	51.49	---	0.40	51.89	---	74.00	54.00	-2.11	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. 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.
3. 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.
4. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
5. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



7.8 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

* 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:** September 8, 2005
Temperature: 25°C **Tested by:** Mark Chen
Humidity: 55% RH

Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.191	46.970	44.650	0.118	47.088	44.768	63.993	53.993	-16.905	-9.225	L1
0.512	40.760	41.020	0.100	40.860	41.120	56.000	46.000	-15.140	-4.880	L1
1.091	25.350	25.330	0.100	25.450	25.430	56.000	46.000	-30.550	-20.570	L1
2.941	29.110	29.050	0.100	29.210	29.150	56.000	46.000	-26.790	-16.850	L1
6.397	25.990	23.930	0.340	26.330	24.270	60.000	50.000	-33.670	-25.730	L1
21.308	26.210	24.300	1.200	27.410	25.500	60.000	50.000	-32.590	-24.500	L1
0.194	43.000	39.920	0.112	43.112	40.032	63.864	53.864	-20.752	-13.832	L2
0.254	38.180	36.150	0.100	38.280	36.250	61.625	51.625	-23.345	-15.375	L2
0.577	36.840	36.600	0.100	36.940	36.700	56.000	46.000	-19.060	-9.300	L2
2.600	16.440	8.720	0.100	16.540	8.820	56.000	46.000	-39.460	-37.180	L2
11.264	21.660	18.500	0.725	22.385	19.225	60.000	50.000	-37.615	-30.775	L2
27.497	25.330	21.780	1.300	26.630	23.080	60.000	50.000	-33.370	-26.920	L2

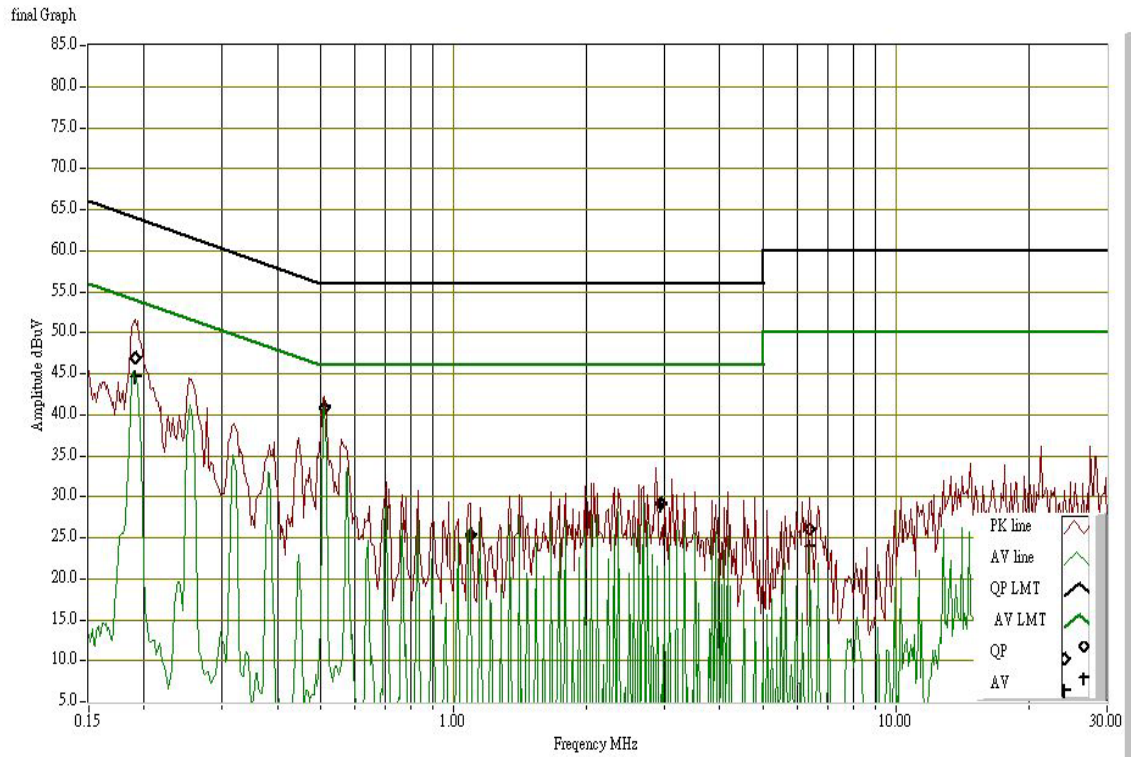
Remark:

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)



Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

