



FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

IEEE 802.11a/b/g Wireless USB 2.0 Adapter

Model: NUB-862, EUB-862

Trade Name: SENAO

Issued to

**SENAO INTERNATIONAL CO., LTD.,
No.500, Fusing 3 RD., Hwa-Ya Technical Park, Kuei-Shan Hsiang,
Taoyuan County 333, Taiwan, R.O.C.**

Issued by

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

Applicant: SENAO INTERNATIONAL CO., LTD.,
No.500, Fusing 3 RD., Hwa-Ya Technical Park, Kuei-Shan Hsiang,
Taoyuan County 333, Taiwan, R.O.C.

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

Trade Name: SENAO

Model: NUB-862, EUB-862

Date of Test: August 03 ~ 23, 2005

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart E	No non-compliance noted

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. 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 conducted and radiated emission limits of FCC Rules Part 15.407.

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

Approved by:

Gavin Lim
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	IEEE 802.11a/b/g Wireless USB 2.0 Adapter
Trade Name	SENAO
Model Number	NUB-862, EUB-862
Model Discrepancy	All the specification and layout are identical except they come with different model numbers for marking purpose.
Power Supply	Powered from host device
Frequency Range	Base mode: 5.18 ~ 5.32 GHz Turbo mode: 5.210 GHz / 5.250 GHz / 5.290 GHz
Transmit Power	Base mode: 14.06 dBm Turbo mode: 14.38dBm
Modulation Technique	OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	108, 54, 48, 36, 24, 18, 12, 9, 6 Mbps
Number of Channels	Base mode: 8 Channels Turbo mode: 3 Channels
Antenna Specification	Antenna Type: Printed Antenna Antenna Gain: -1.14dBi

Operation Frequency:

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)	
CHANNEL	MHz
1	5180
2	5200
3	5220
4	5240
5	5260
6	5280
7	5300
8	5320

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-UB86005001 filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.



3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4. Radiated testing was performed at an antenna to EUT distance 3 meters.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

3.2 EUT EXERCISE

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

Radiated Emissions

The EUT is placed on the turntable, which is 0.8 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. 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 (model: NUB-862) 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.

Base mode:

Channel Low (5180MHz), Channel Mid (5260MHz) and Channel High (5320MHz) with 6Mbps data rate were chosen for full testing.

Turbo mode:

Channel Low (5210MHz), Channel Mid (5250MHz) and Channel High (5290MHz) with 12Mbps data rate were 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

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.







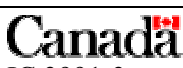
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

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	 0363 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.	Intelligent Wireless Broadband Router	PLANEX	BLW-04SAG	40DDA0421	N/A	N/A	N/A

Remark:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



7. FCC PART 15 REQUIREMENTS

7.1 26 dB EMISSION BANDWIDTH

According to §15.303(c), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

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.
Set the spectrum analyzer as RBW > 1%EBW, VBW > RBW, Span >26dB bandwidth (Base Mode) / >26dB bandwidth (Turbo Mode), and Sweep = auto.
3. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat until all the rest channels were investigated.

TEST RESULTS

No non-compliance noted

Test Data

Channel	Frequency (MHz)		Bandwidth (B) (MHz)
Low	Base mode	5180	24.090
Mid		5260	23.758
High		5320	24.224
Low	Turbo mode	5210	47.998
Mid		5250	49.553
High		5290	48.741



Test Plot

IEEE 802.11a Base mode

CH Low

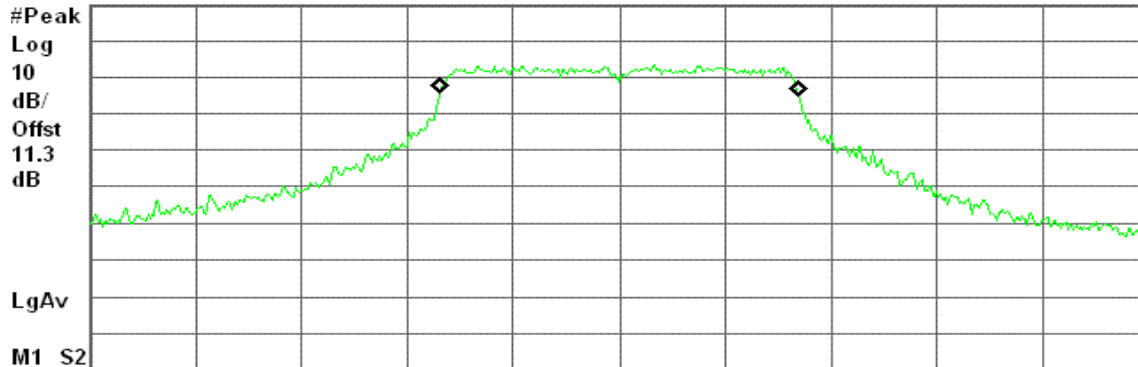
Agilent 22:37:43 Jul 11, 2005

R L

26 dB BW, a Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 5.180 00 GHz

Span 50 MHz

#Res BW 240 kHz

#VBW 750 kHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.8101 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error

6.390 kHz

x dB Bandwidth

24.090 MHz

CH Mid

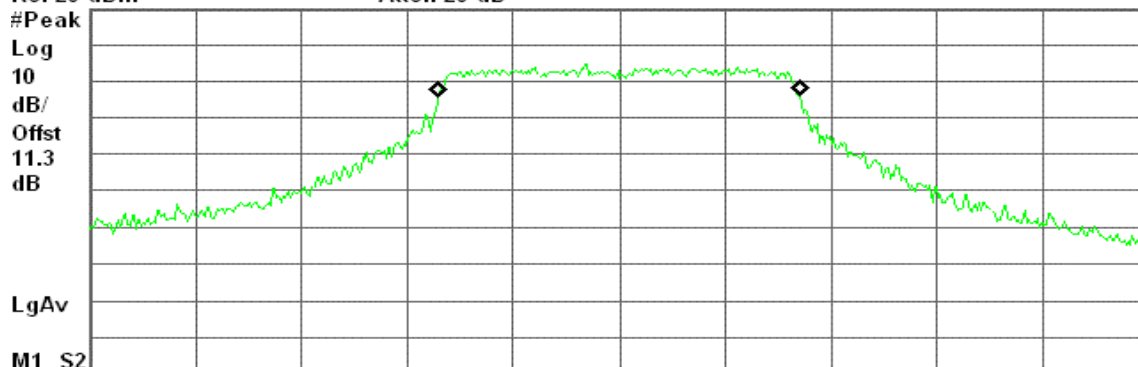
Agilent 22:44:20 Jul 11, 2005

R L

26 dB BW, a Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 5.260 00 GHz

Span 50 MHz

#Res BW 270 kHz

#VBW 820 kHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.9606 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error

21.014 kHz

x dB Bandwidth

23.758 MHz

**CH High**

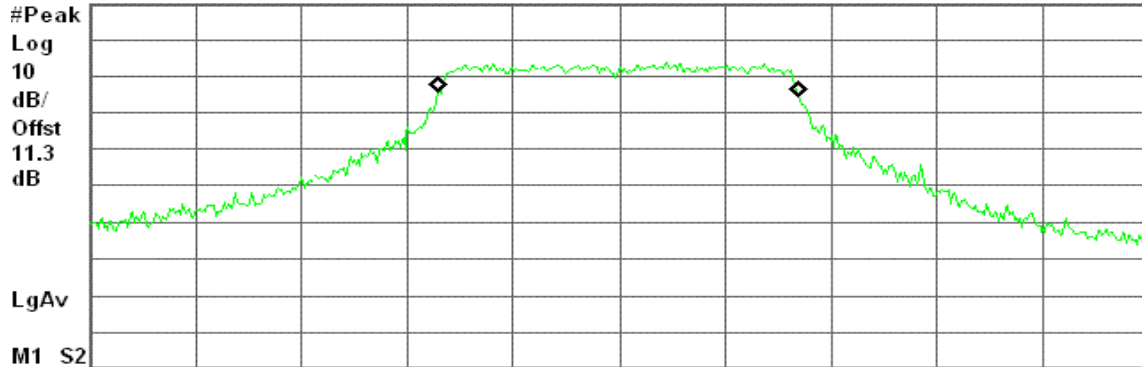
* Agilent 22:49:36 Jul 11, 2005

R L

26 dB BW, a Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 5.320 00 GHz

Span 50 MHz

#Res BW 270 kHz

#VBW 750 kHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.9716 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -28.755 kHz

x dB Bandwidth 24.224 MHz

IEEE 802.11a Turbo mode**CH Low**

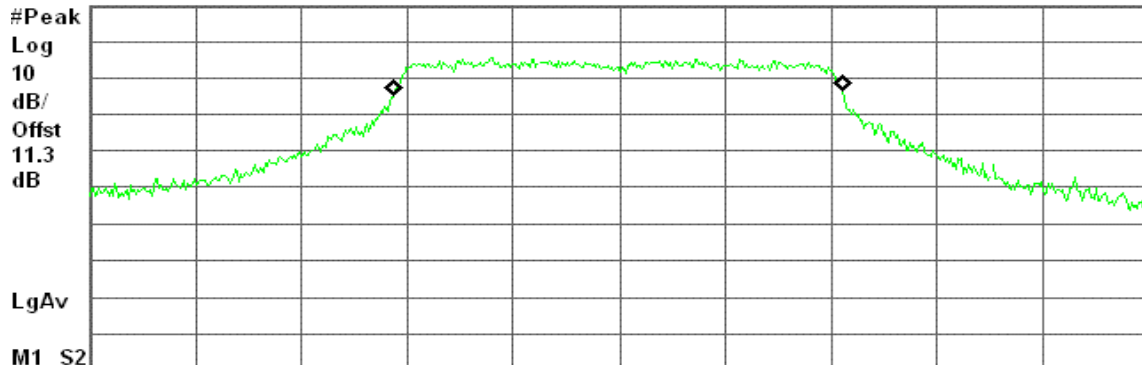
* Agilent 23:05:46 Jul 11, 2005

R L

26 dB BW, a turbo Mode Low Ch.

Ref 20 dBm

Atten 20 dB



Center 5.210 00 GHz

Span 80 MHz

#Res BW 560 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

33.9345 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -71.799 kHz

x dB Bandwidth 47.998 MHz



CH Mid

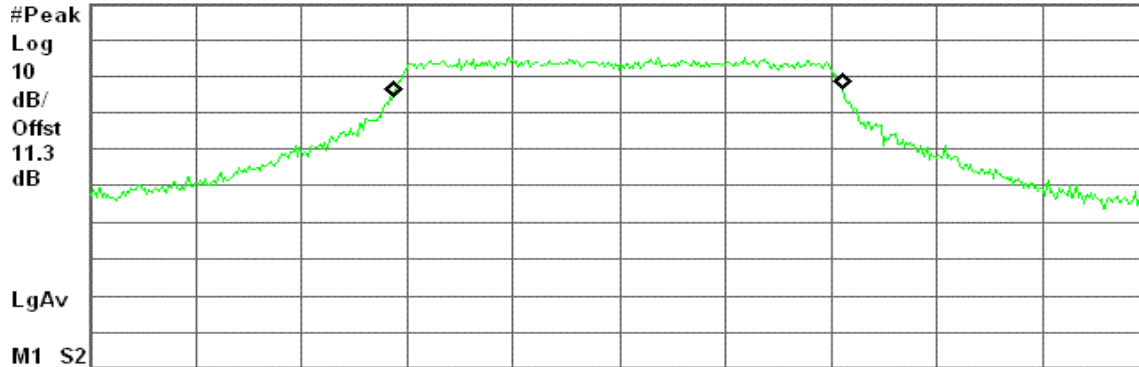
Agilent 23:13:44 Jul 11, 2005

R L

26 dB BW, a turbo Mode Mid Ch.

Ref 20 dBm

Atten 20 dB



Center 5.250 00 GHz

Span 80 MHz

#Res BW 560 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

34.0807 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-75.053 kHz

x dB Bandwidth

49.553 MHz

CH High

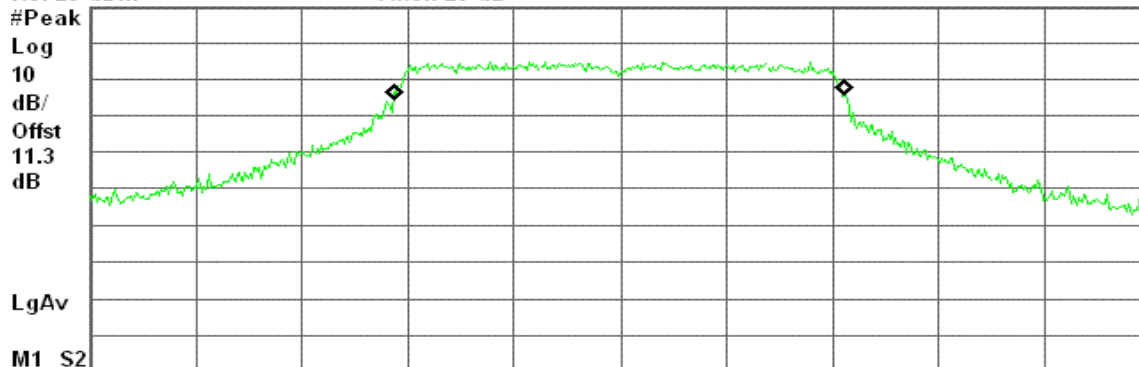
Agilent 22:55:11 Jul 11, 2005

R L

26 dB BW, a turbo Mode High Ch.

Ref 20 dBm

Atten 20 dB



Center 5.290 00 GHz

Span 80 MHz

#Res BW 560 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

34.0330 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-105.937 kHz

x dB Bandwidth

48.741 MHz



7.2 PEAK POWER

LIMIT

According to §15.407(a),

- (1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.
- (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.

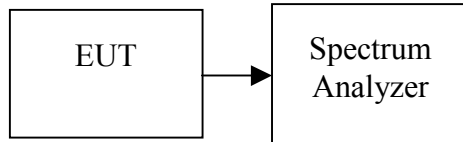
If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

The peak power shall not exceed the limit as follow:

Frequency (MHz)		10 Log B (dB)	Limit 4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Base mode	5180	13.82	17.82	17
	5260	13.76	24.76	24
	5320	13.84	24.84	24
Turbo mode	5210	16.81	20.81	17
	5250	16.95	20.95	17
	5290	16.88	27.88	24

**Test Configuration**

The EUT was connected to a spectrum analyzer through a 50 Ω RF cable.

**TEST PROCEDURE**

Set span to encompass the entire emission bandwidth (EBW) of the signal.

Set RBW = 1 MHz / Set VBW = 3 MHz.

Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to “free run”. Trace average 100 traces in power averaging mode. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer’s band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

TEST RESULTS

No non-compliance noted

Test Data

Channel	Frequency (MHz)		Output Power (dBm)	Limit (dBm)
Low	Base mode	5180	13.38	17.00
Mid		5260	14.06	24.00
High		5320	13.53	24.00
Low	Turbo mode	5210	14.33	17.00
Mid		5250	14.38	17.00
High		5290	13.90	24.00



Test Plot

IEEE 802.11a Base mode

CH Low

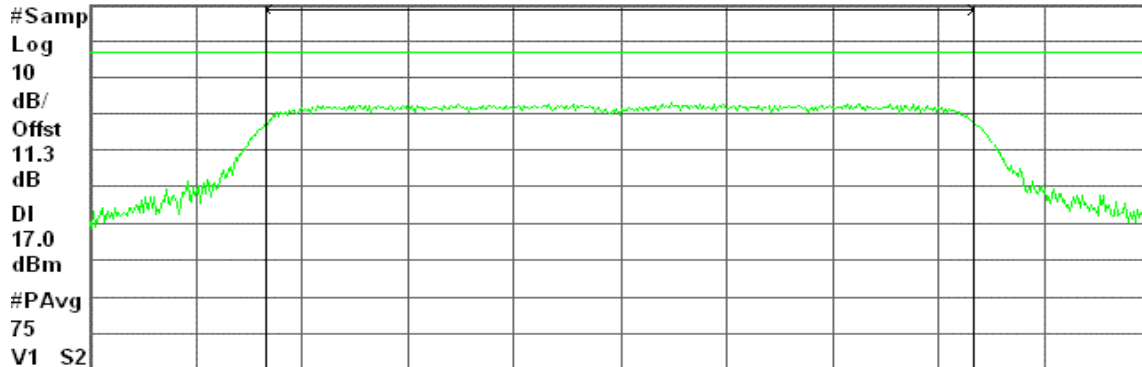
Agilent 22:38:19 Jul 11, 2005

R L

Peak Transmit Power, a Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 5.180 00 GHz

Span 25.17 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

13.38 dBm / 16.7800 MHz

-58.87 dBm/Hz

CH Mid

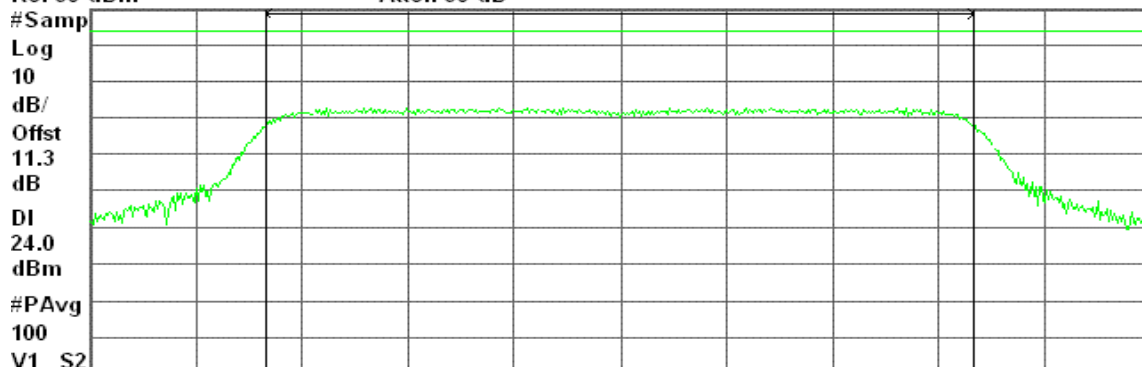
Agilent 22:44:57 Jul 11, 2005

R L

Peak Transmit Power, a Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 5.260 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

14.06 dBm / 16.7200 MHz

-58.17 dBm/Hz



CH High

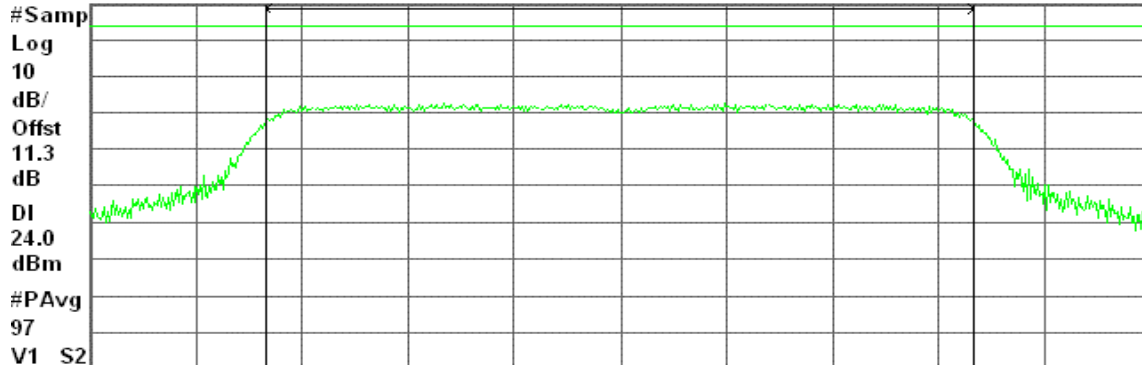
Agilent 22:50:09 Jul 11, 2005

R L

Peak Transmit Power, a Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

13.53 dBm / 16.7600 MHz

Power Spectral Density

-58.71 dBm/Hz

IEEE 802.11a Turbo mode

CH Low

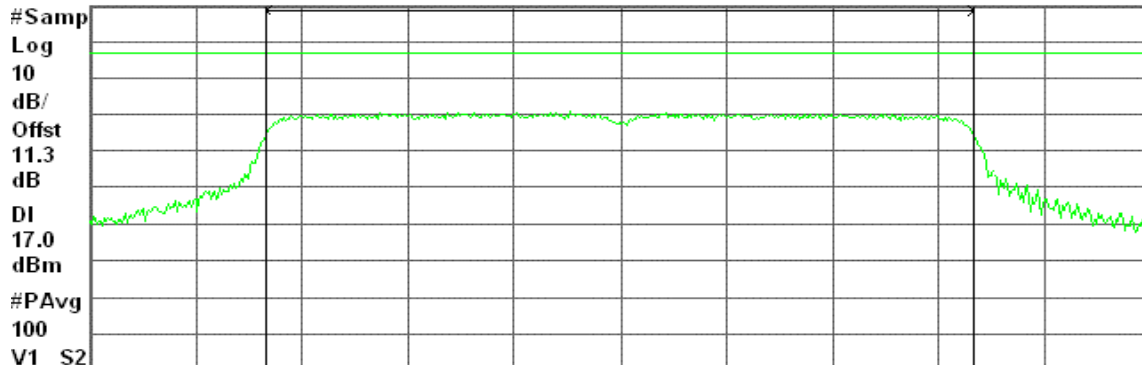
Agilent 23:06:34 Jul 11, 2005

R L

Peak Transmit Power, a turbo Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

14.33 dBm / 33.4600 MHz

Power Spectral Density

-60.91 dBm/Hz



CH Mid

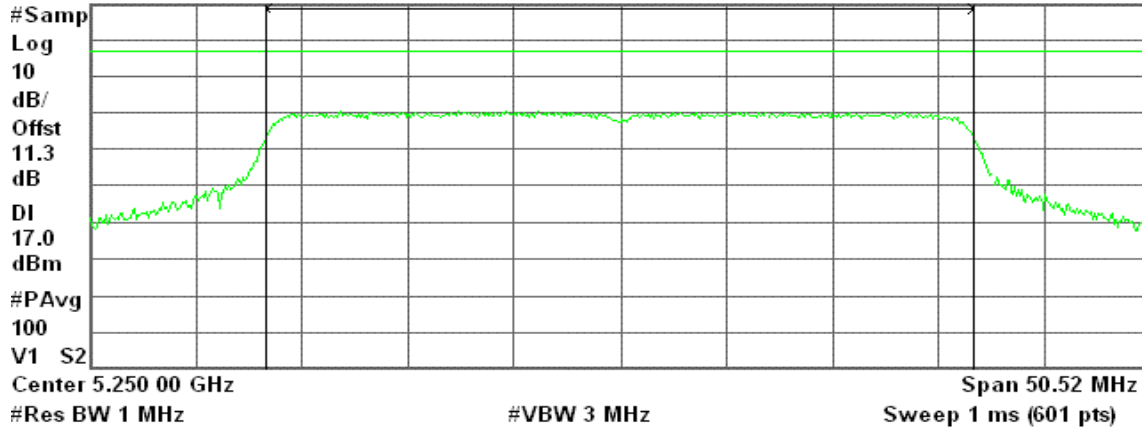
Agilent 23:14:29 Jul 11, 2005

R L

Peak Transmit Power, a turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

14.38 dBm / 33.6800 MHz

Power Spectral Density

-60.89 dBm/Hz

CH High

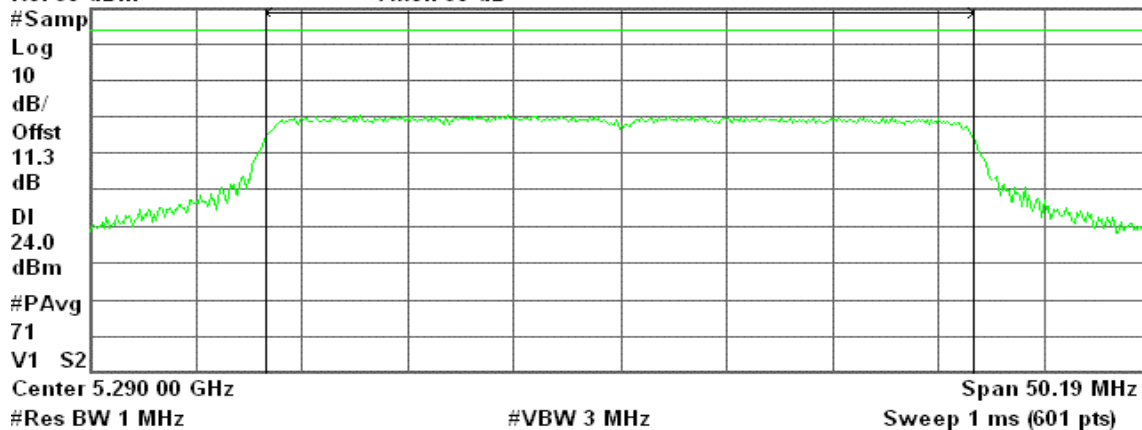
Agilent 22:55:52 Jul 11, 2005

R L

Peak Transmit Power, a turbo Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

13.90 dBm / 33.4600 MHz

Power Spectral Density

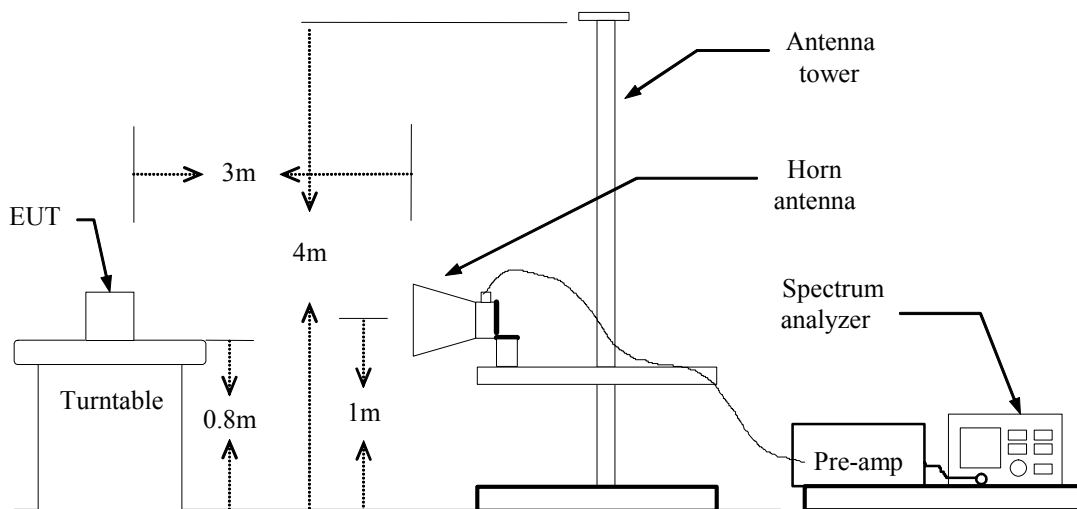
-61.35 dBm/Hz

7.3 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.



Test Plot

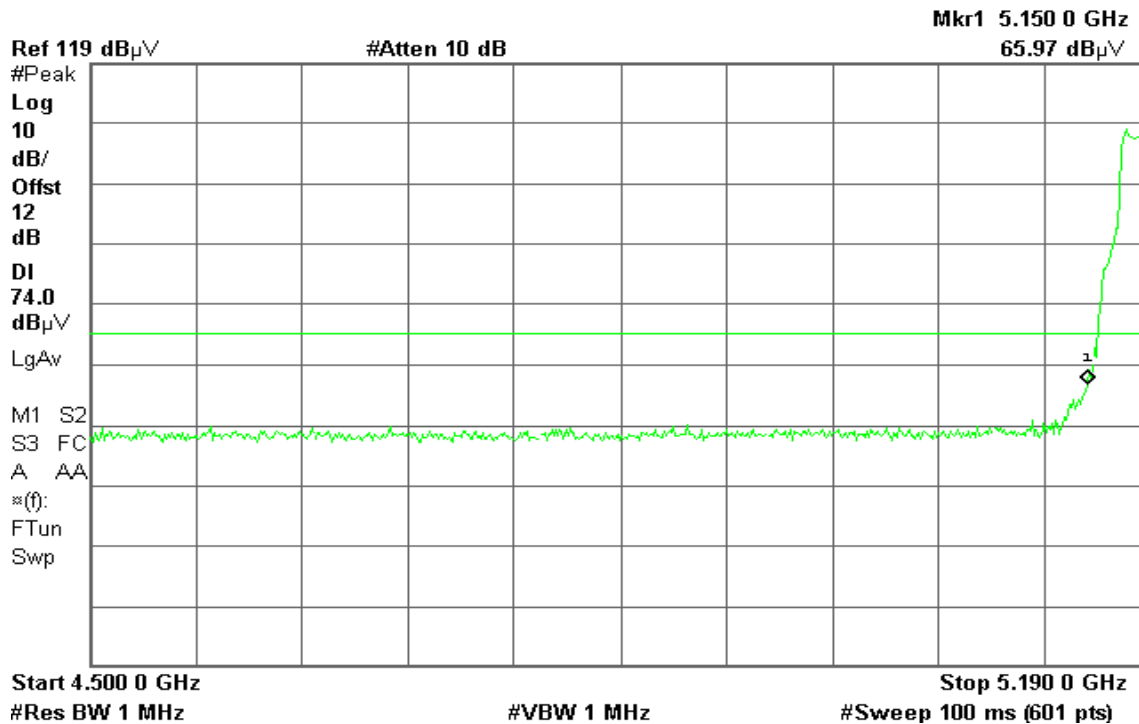
IEEE 802.11a Base mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 13:36:27 Aug 2, 2005

T

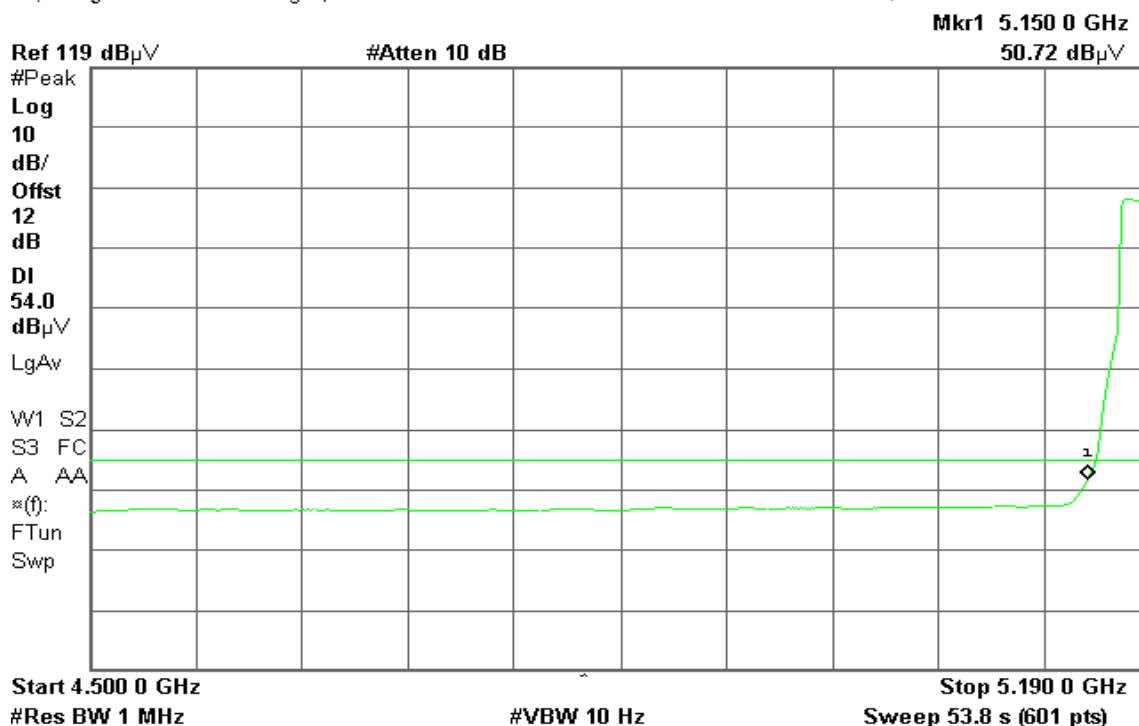


Detector mode: Average

Polarity: Vertical

Agilent 13:36:10 Aug 2, 2005

T



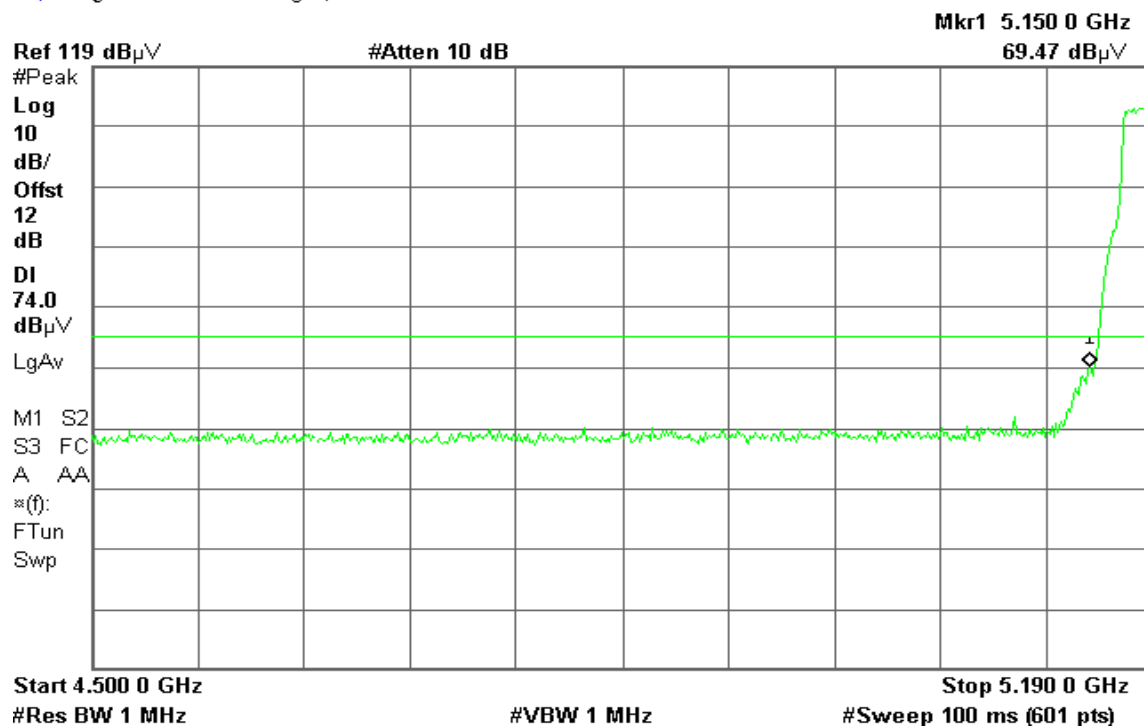


Detector mode: Peak

Polarity: Horizontal

Agilent 13:44:17 Aug 2, 2005

T

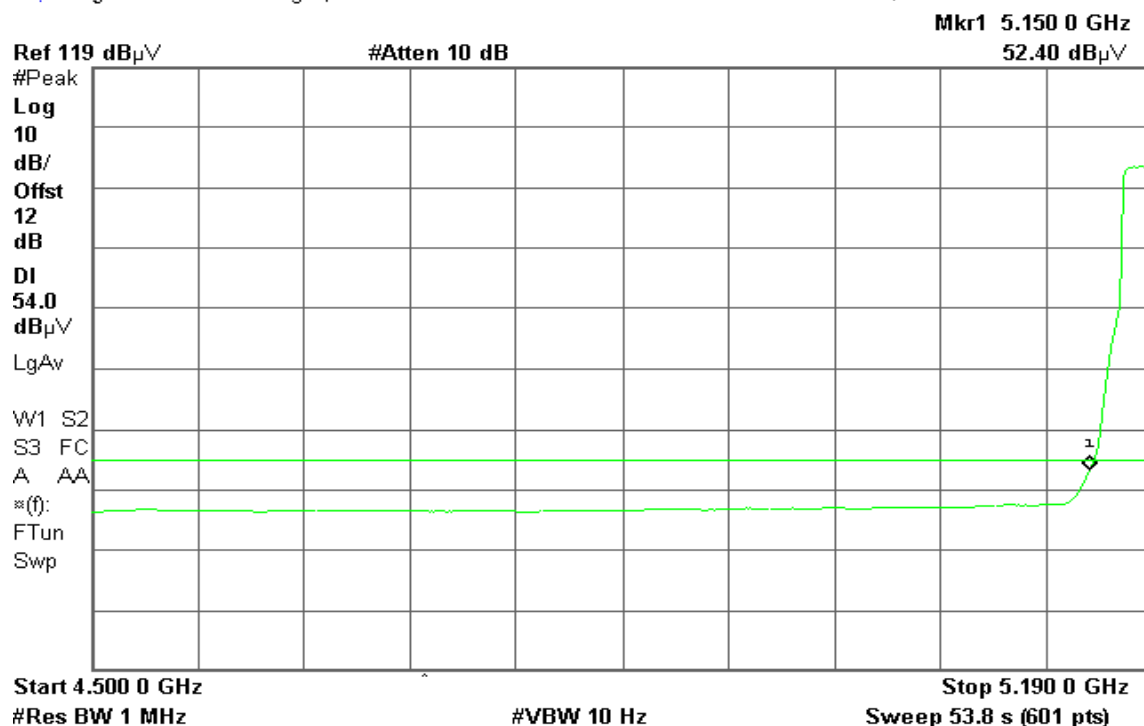


Detector mode: Average

Polarity: Horizontal

Agilent 13:43:57 Aug 2, 2005

T





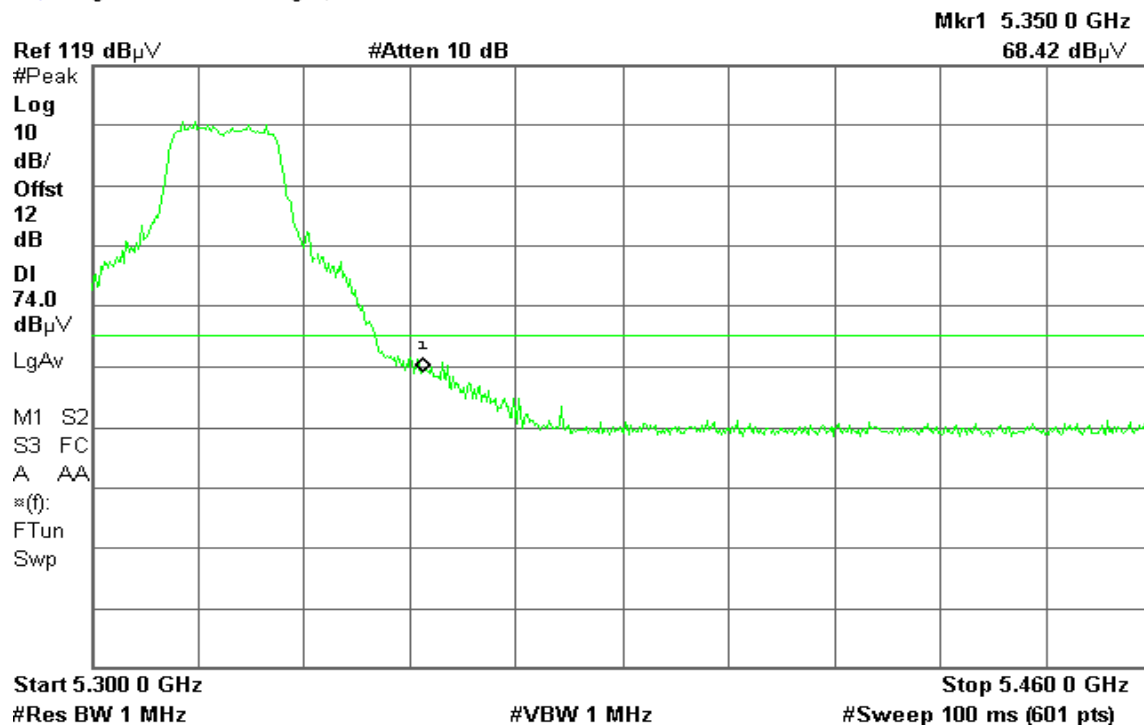
IEEE 802.11a Base mode / CH High

Detector mode: Peak

Polarity: Vertical

Agilent 13:49:17 Aug 2, 2005

T

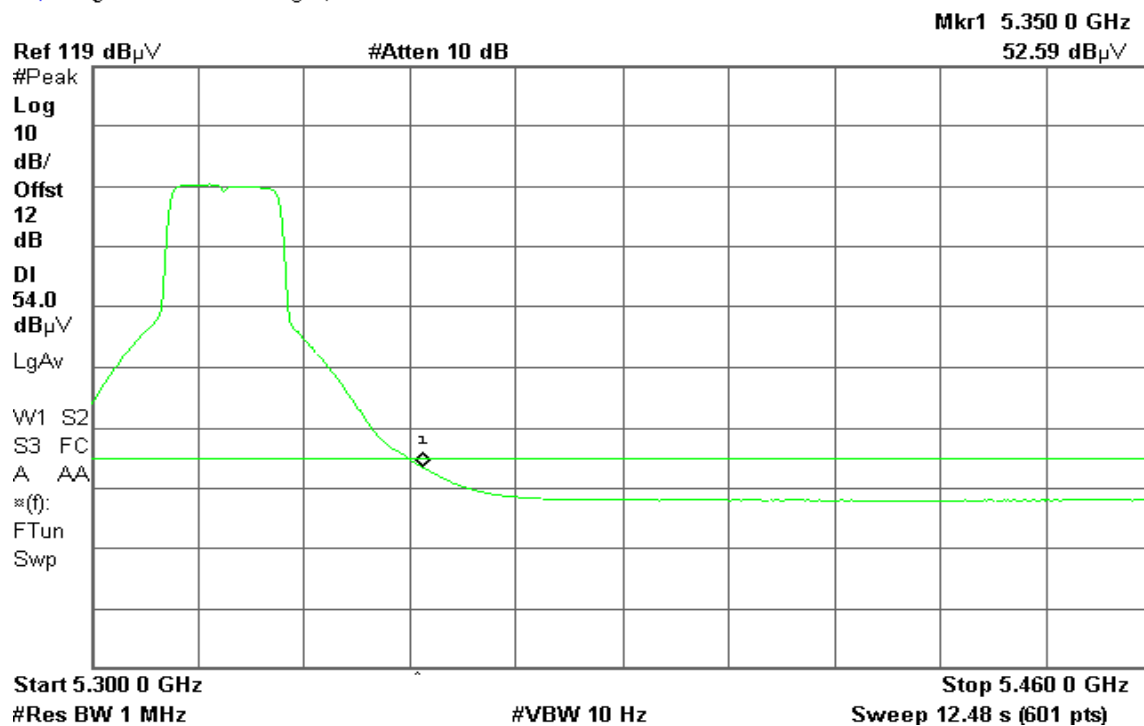


Detector mode: Average

Polarity: Vertical

Agilent 13:49:02 Aug 2, 2005

T



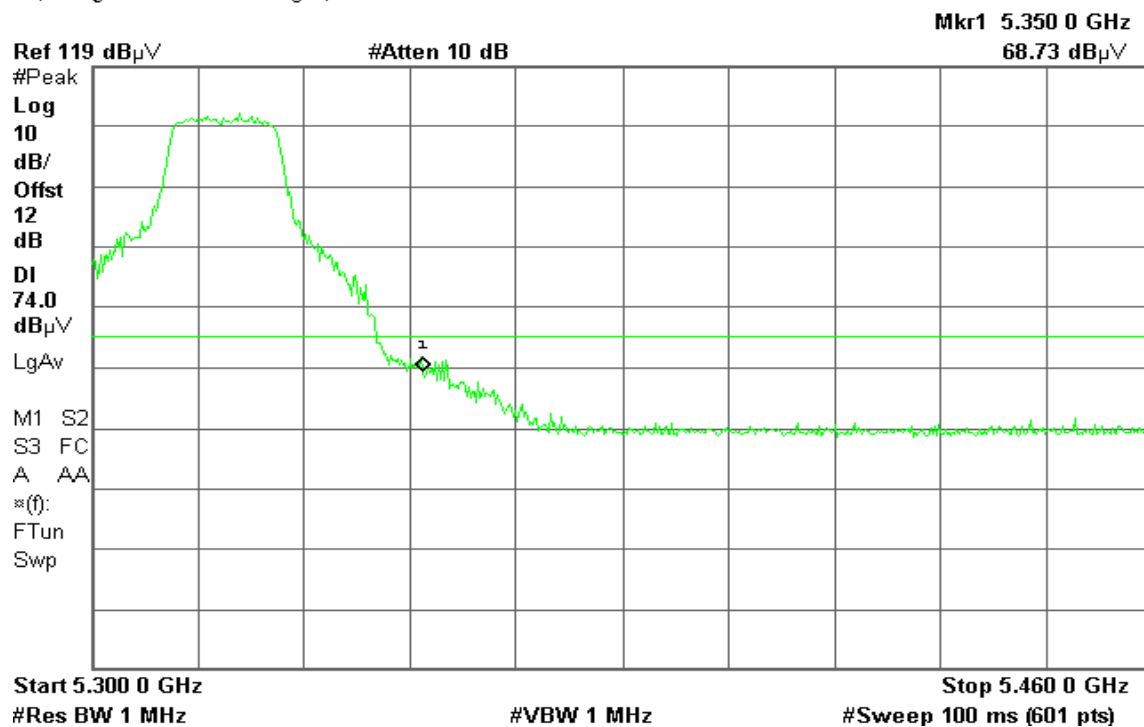


Detector mode: Peak

Polarity: Horizontal

Agilent 13:51:57 Aug 2, 2005

T

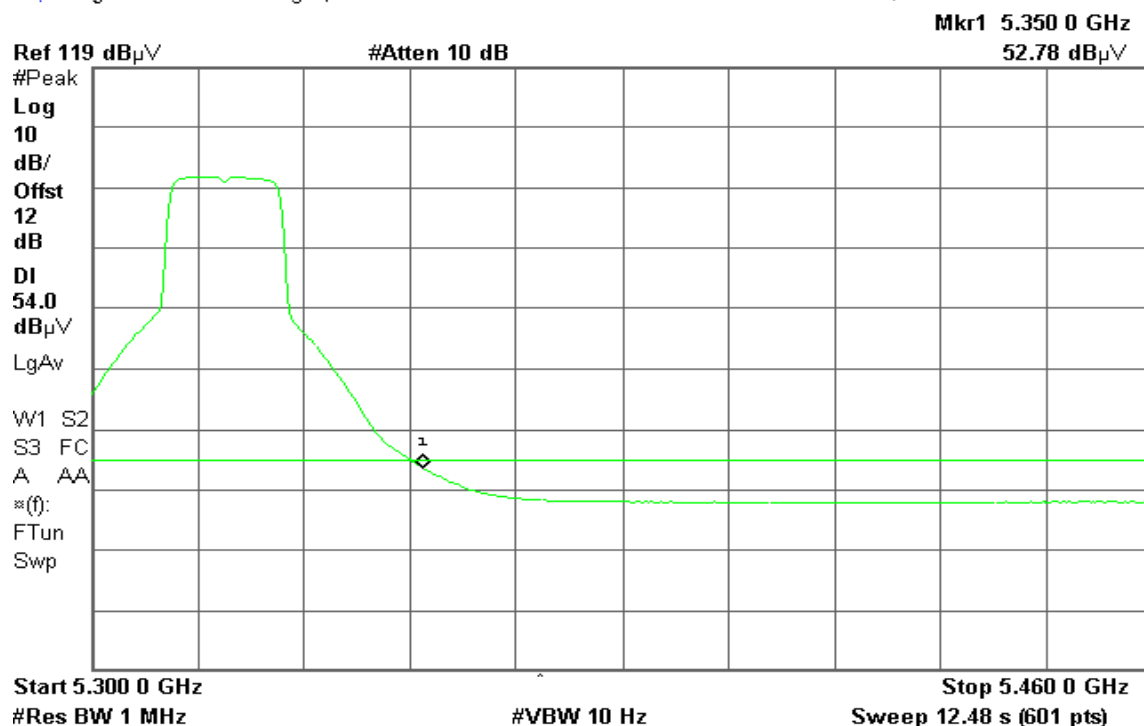


Detector mode: Average

Polarity: Horizontal

Agilent 13:51:40 Aug 2, 2005

T





IEEE 802.11a Turbo mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 10:43:04 Aug 23, 2005

R L

Mkr1 5.150 0 GHz

61.68 dB μ V

Ref 119 dB μ V

Atten 10 dB

#Peak

Log

10

dB/

Offst

12

dB

DI

74.0

dB μ V

LgAv

M1 S2

S3 FC

A AA

*(f):

FTun

Swp

Start 4.500 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 5.220 0 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Vertical

Agilent 10:42:27 Aug 23, 2005

T

Mkr1 5.150 0 GHz

48.48 dB μ V

Ref 119 dB μ V

Atten 10 dB

#Peak

Log

10

dB/

Offst

12

dB

DI

54.0

dB μ V

LgAv

W1 S2

S3 FC

A AA

*(f):

FTun

Swp

Start 4.500 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 5.220 0 GHz

Sweep 56.14 s (601 pts)

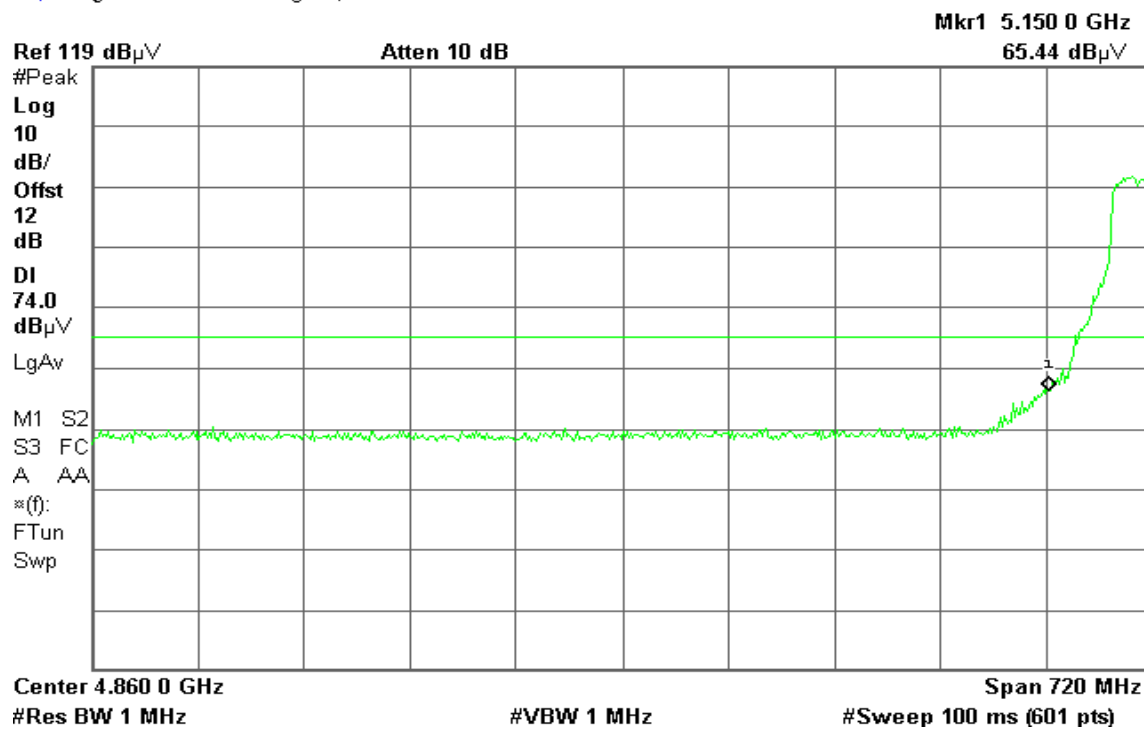


Detector mode: Peak

Polarity: Horizontal

✱ Agilent 10:49:19 Aug 23, 2005

R L

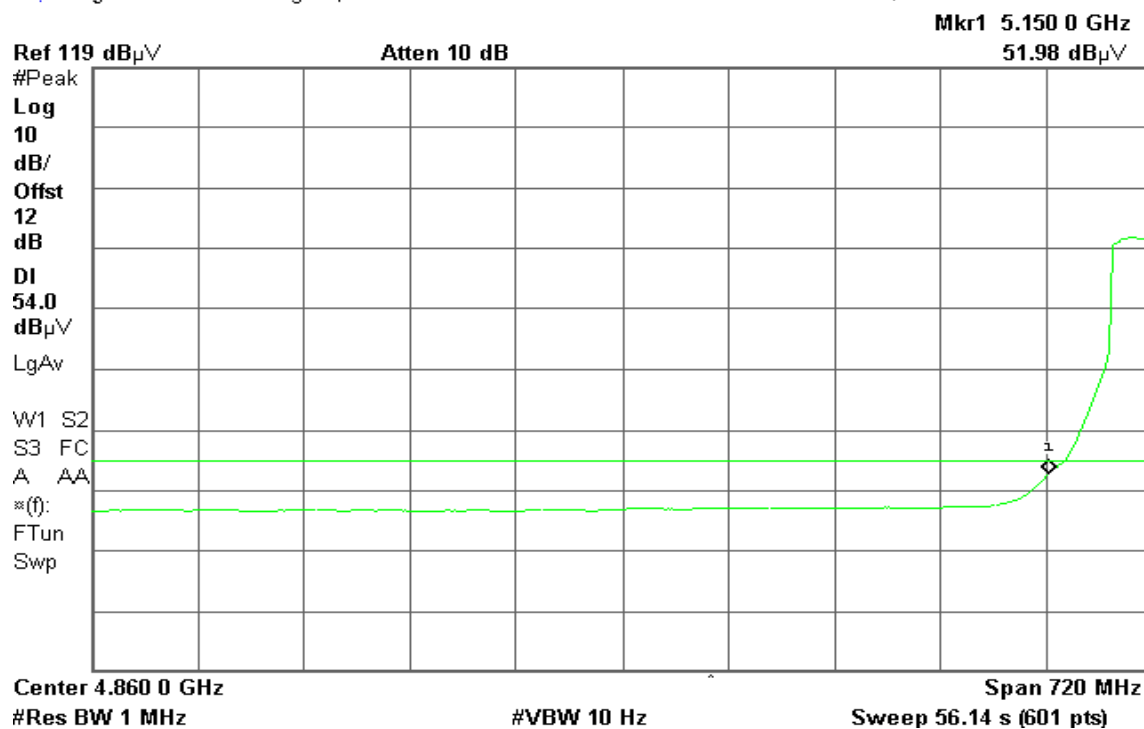


Detector mode: Average

Polarity: Horizontal

✱ Agilent 10:48:32 Aug 23, 2005

T





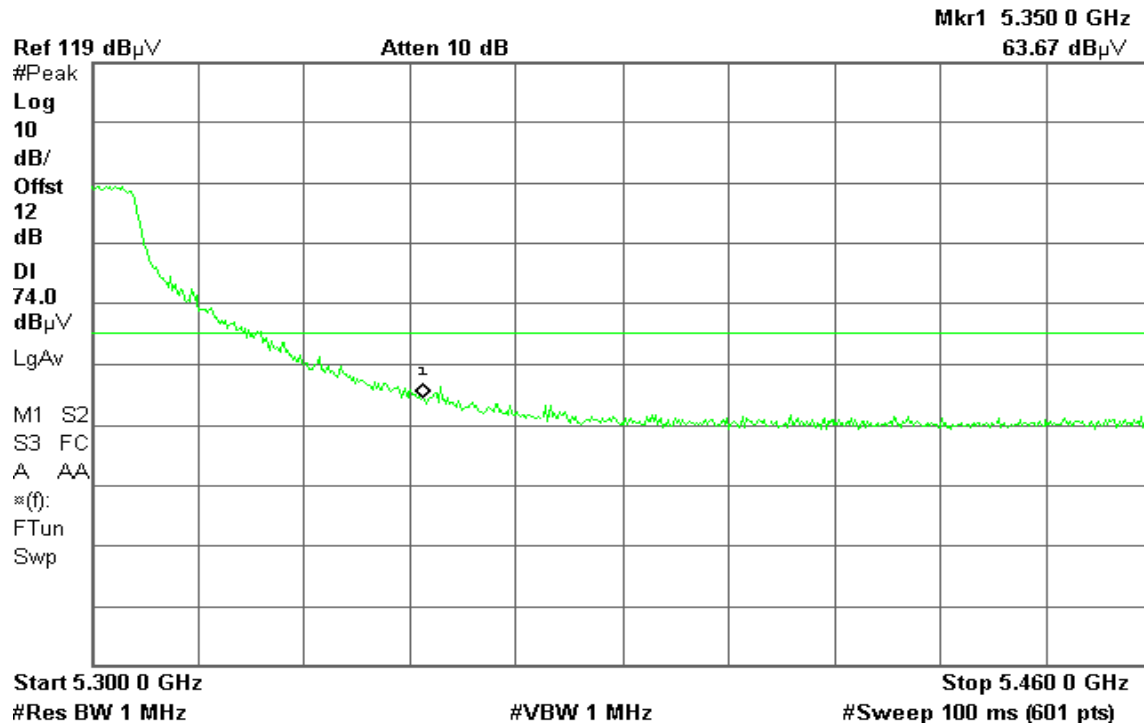
IEEE 802.11a Turbo mode / CH High

Detector mode: Peak

Polarity: Vertical

Agilent 10:12:11 Aug 23, 2005

T

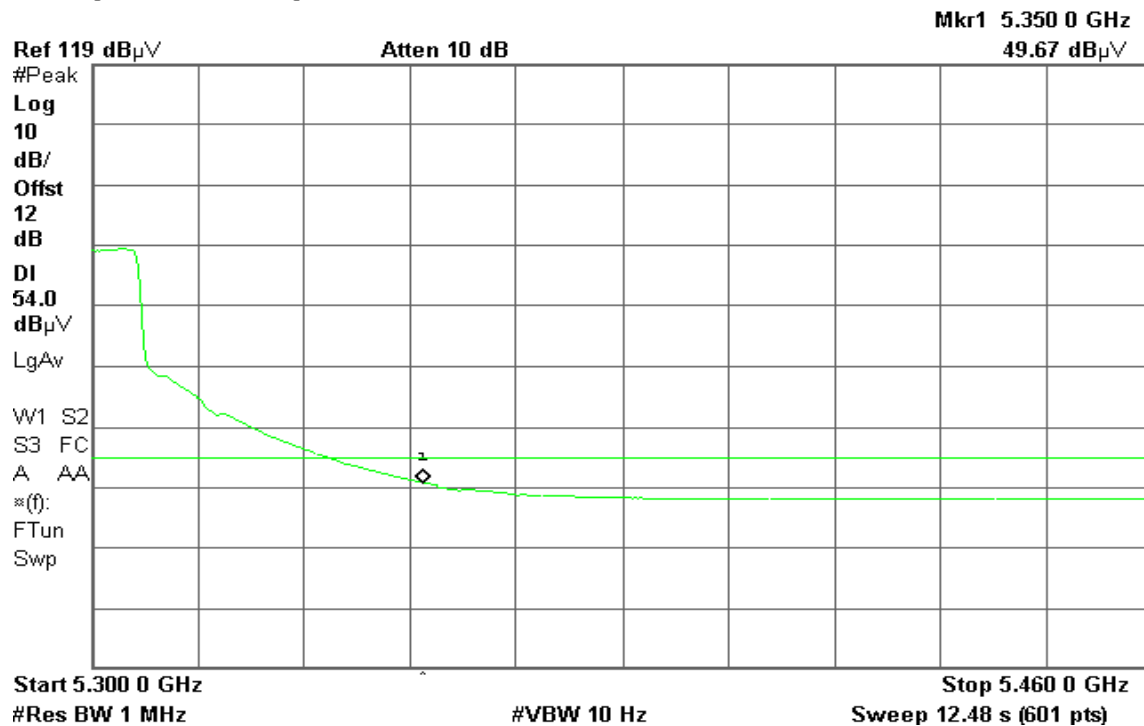


Detector mode: Average

Polarity: Vertical

Agilent 10:11:12 Aug 23, 2005

R T



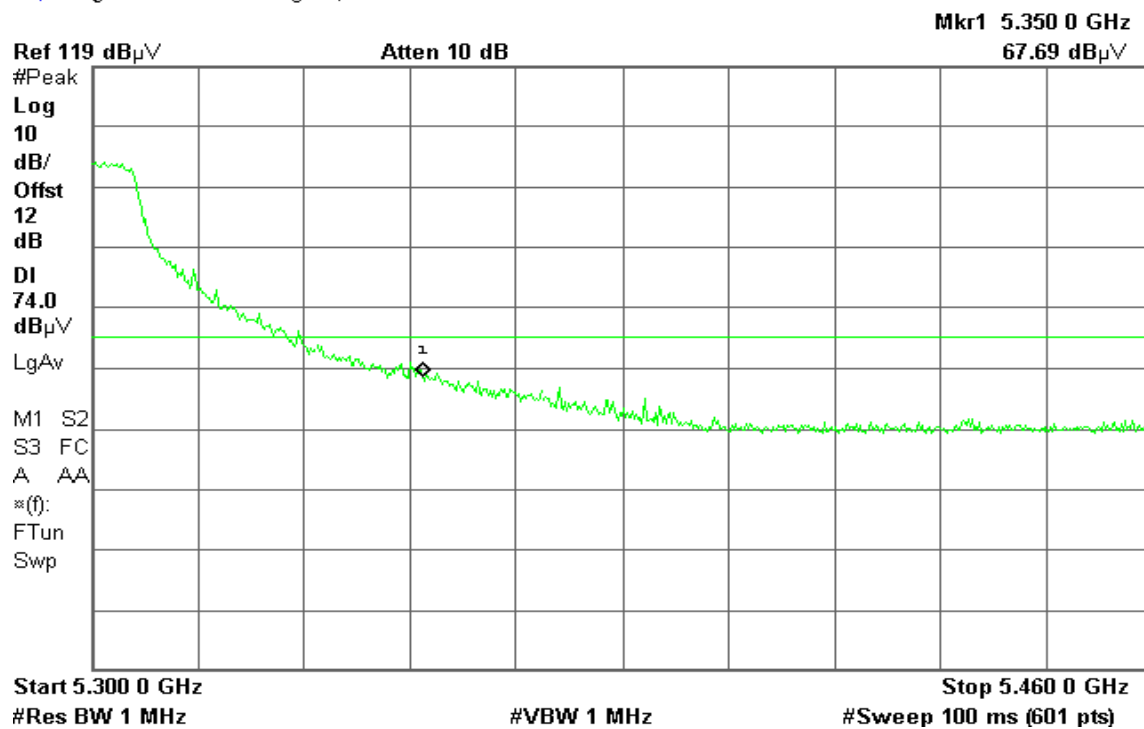


Detector mode: Peak

Polarity: Horizontal

Agilent 10:18:58 Aug 23, 2005

T

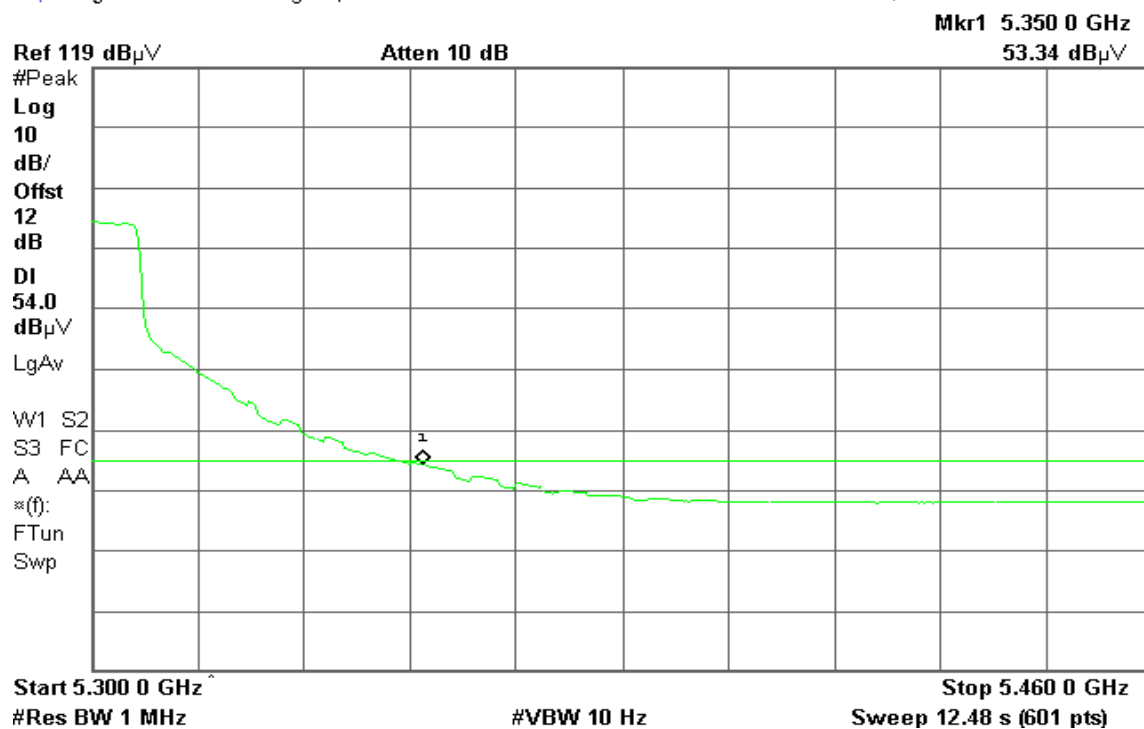


Detector mode: Average

Polarity: Horizontal

Agilent 10:17:40 Aug 23, 2005

T





7.4 PEAK POWER SPECTRAL DENSITY

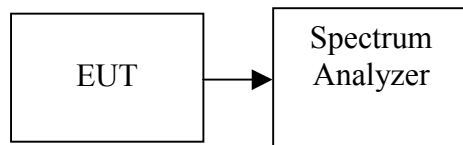
LIMIT

According to §15.407(a),

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4dBm in any 1MHz band.
- (2) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11dBm in any 1MHz band.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

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 = 1MHz, VBW = 3MHz, Span = 25/50MHz, Sweep=Auto.
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**

Channel	Frequency (MHz)		PPSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	Base mode	5180	2.98	4.00	-1.02	PASS
Mid		5260	2.87	11.00	-8.13	PASS
High		5320	2.82	11.00	-8.18	PASS
Low	Turbo mode	5210	0.81	4.00	-3.19	PASS
Mid		5250	0.58	4.00	-3.42	PASS
High		5290	0.60	11.0	-10.4	PASS



Test Plot

IEEE 802.11a Base mode

CH Low

Agilent 22:38:40 Jul 11, 2005

R L

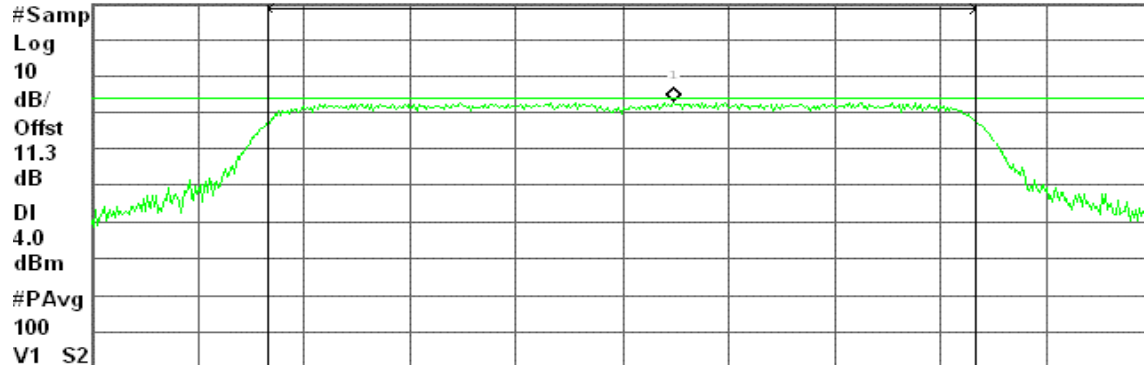
Peak Power Spectral Density, a Mode Low Ch.

Mkr1 5.181 22 GHz

Ref 30 dBm

Atten 30 dB

2.983 dBm



Center 5.180 00 GHz

Span 25.17 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

13.93 dBm / 16.7800 MHz

-58.32 dBm/Hz

CH Mid

Agilent 22:45:07 Jul 11, 2005

R L

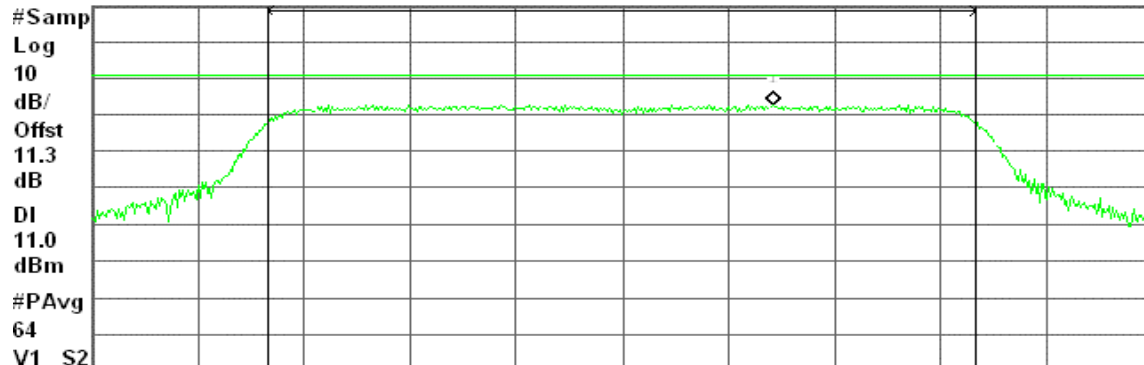
Peak Power Spectral Density, a Mode Mid Ch.

Mkr1 5.263 55 GHz

Ref 30 dBm

Atten 30 dB

2.870 dBm



Center 5.260 00 GHz

Span 25.08 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

13.69 dBm / 16.7200 MHz

-58.54 dBm/Hz

**CH High**

* Agilent 22:50:20 Jul 11, 2005

R L

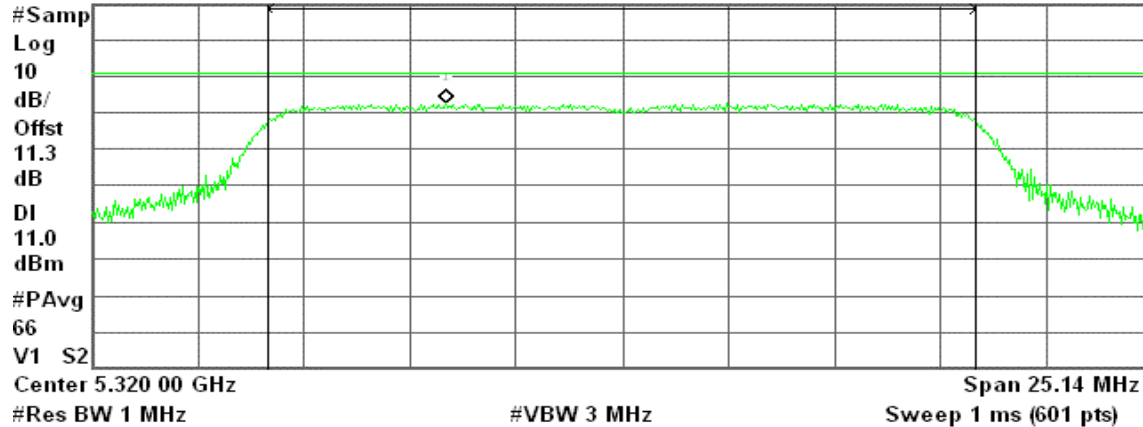
Peak Power Spectral Density, a Mode High Ch.

Mkr1 5.315 85 GHz

Ref 30 dBm

Atten 30 dB

2.815 dBm



Channel Power

Power Spectral Density

13.18 dBm / 16.7600 MHz

-59.07 dBm/Hz

IEEE 802.11a Turbo mode**CH Low**

* Agilent 23:06:58 Jul 11, 2005

R L

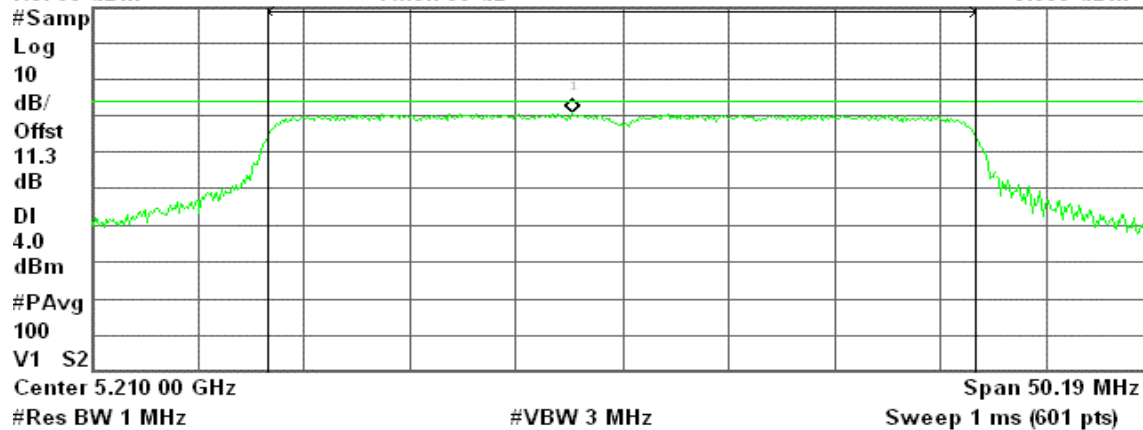
Peak Transmit Power, a turbo Mode Low Ch.

Mkr1 5.207 66 GHz

Ref 30 dBm

Atten 30 dB

0.806 dBm



Channel Power

Power Spectral Density

15.01 dBm / 33.4600 MHz

-60.24 dBm/Hz



CH Mid

Agilent 23:14:47 Jul 11, 2005

R L

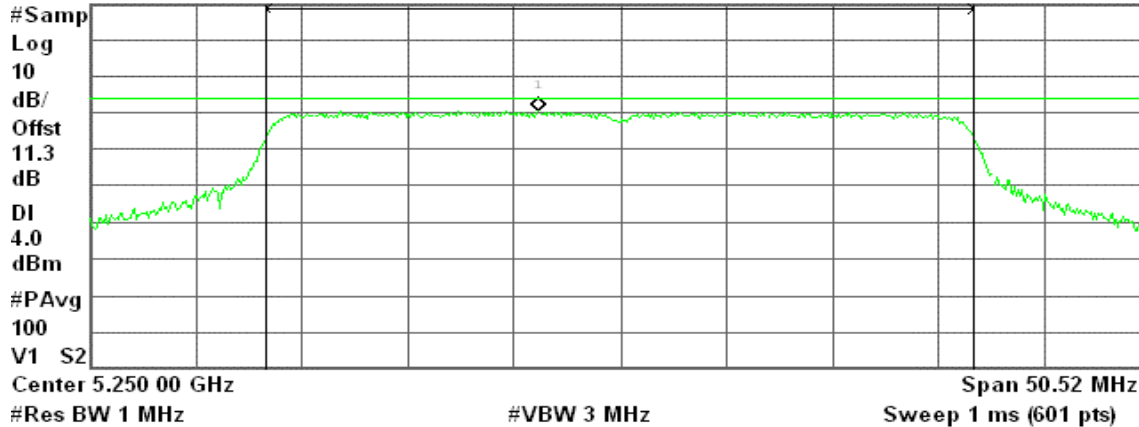
Peak Transmit Power, a turbo Mode Mid Ch.

Mkr1 5.246 13 GHz

Ref 30 dBm

Atten 30 dB

0.578 dBm



Channel Power

Power Spectral Density

12.68 dBm / 33.6800 MHz

-62.59 dBm/Hz

CH High

Agilent 22:56:09 Jul 11, 2005

R L

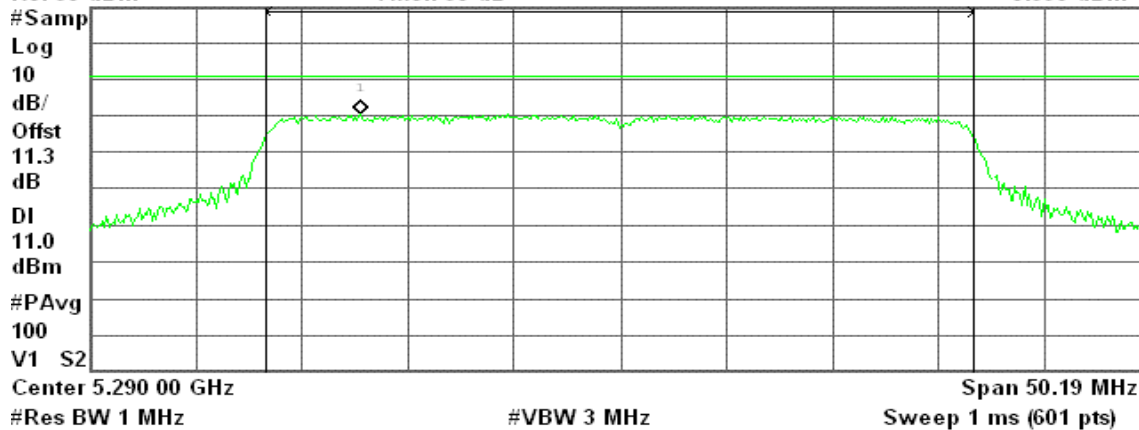
Peak Transmit Power, a turbo Mode High Ch.

Mkr1 5.277 70 GHz

Ref 30 dBm

Atten 30 dB

0.596 dBm



Channel Power

Power Spectral Density

14.14 dBm / 33.4600 MHz

-61.10 dBm/Hz

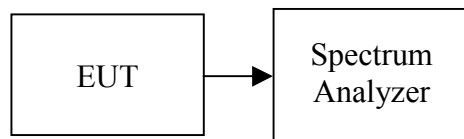


7.5 PEAK EXCURSION

LIMIT

According to §15.407(a)(6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Configuration



TEST PROCEDURE

The test is performed in accordance with <FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices> – Part 15, Subpart E, August 2002.

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW = 1MHz, VBW = 3MHz, Span >26dB bandwidth (Base Mode) / >26dB bandwidth (Turbo Mode), Max. hold.
4. Trace B, Set RBW = 1MHz, VBW = 3kHz, Span >26dB bandwidth (Base Mode) / >26dB bandwidth (Turbo Mode), Max. hold.
5. Delta Mark trace A Maximum frequency and trace B same frequency.
6. Repeat the above procedure until measurements for all frequencies were complete.

**TEST RESULTS***No non-compliance noted***Test Data**

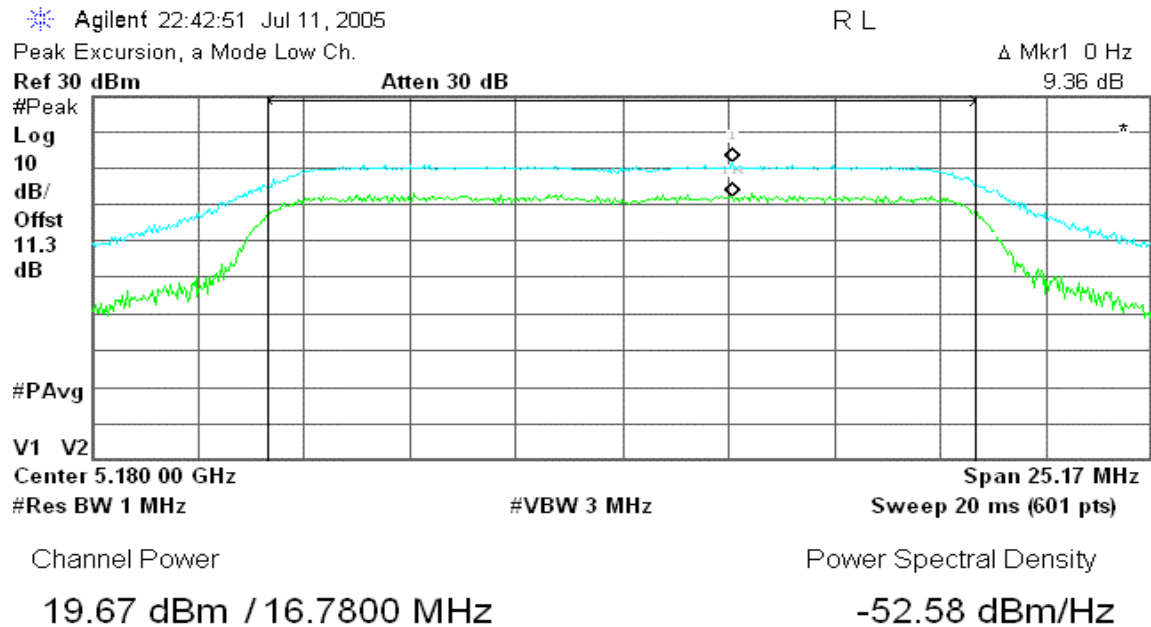
Channel	Frequency (MHz)		Peak Excursion (dB)	Limit (dBm)	Margin (dB)	Result
Low	Base mode	5180	9.36	13.00	-3.64	PASS
Mid		5260	10.59	13.00	-2.41	PASS
High		5320	9.77	13.00	-3.23	PASS
Low	Turbo mode	5210	9.16	13.00	-3.84	PASS
Mid		5250	8.61	13.00	-4.39	PASS
High		5290	8.54	13.00	-4.46	PASS



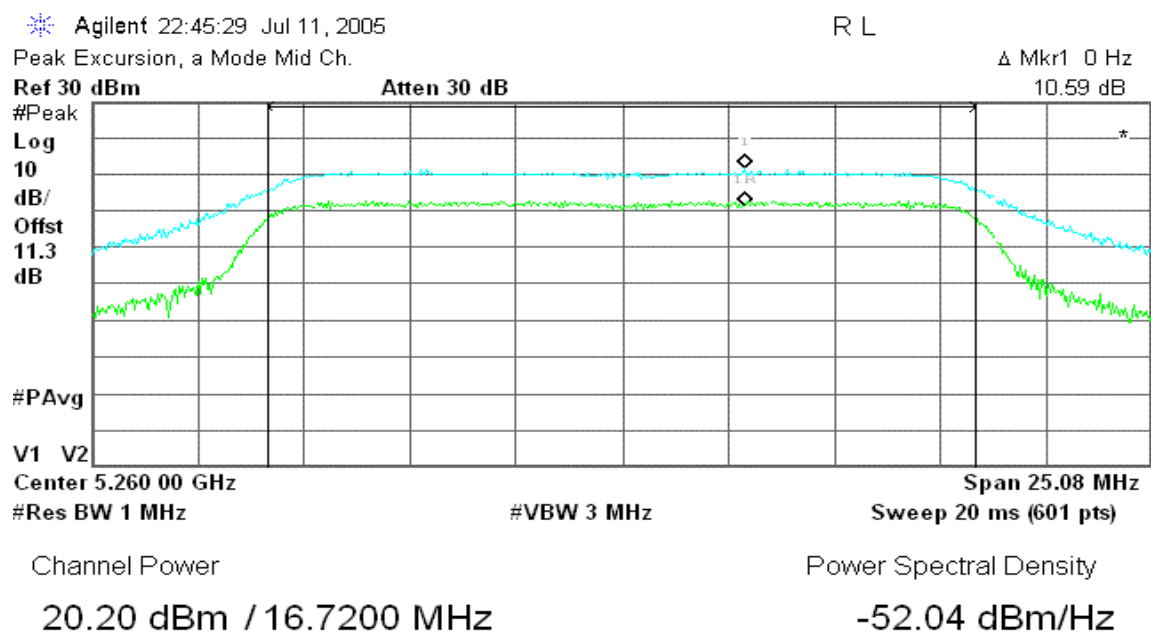
Test Plot

IEEE 802.11a Base mode

CH Low



CH Mid



**CH High**

* Agilent 22:50:50 Jul 11, 2005

R L

Peak Excursion, a Mode High Ch.

 Δ Mkr1 0 Hz

Ref 30 dBm

Atten 30 dB

9.77 dB

#Peak

Log

10

dB/

Offst

11.3

dB

#PAvg

V1 V2

Center 5.320 00 GHz

Span 25.14 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 20 ms (601 pts)

Channel Power

Power Spectral Density

19.73 dBm / 16.7600 MHz

-52.52 dBm/Hz

IEEE 802.11a Turbo mode**CH Low**

* Agilent 23:07:26 Jul 11, 2005

R L

Peak Excursion, a turbo Mode Low Ch.

 Δ Mkr1 0 Hz

Ref 30 dBm

Atten 30 dB

9.16 dB

#Peak

Log

10

dB/

Offst

11.3

dB

#PAvg

V1 V2

Center 5.210 00 GHz

Span 50.19 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 20 ms (601 pts)

Channel Power

Power Spectral Density

19.93 dBm / 33.4600 MHz

-55.32 dBm/Hz



CH Mid

Agilent 23:15:12 Jul 11, 2005

R L

Peak Excursion, a turbo Mode Mid Ch.

Δ Mkr1 0 Hz

Ref 30 dBm

Atten 30 dB

8.61 dB

#Peak

Log

10

dB/

Offst

11.3

dB

#PAvg

V1 V2

Center 5.250 00 GHz

Span 50.52 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 20 ms (601 pts)

Channel Power

Power Spectral Density

19.39 dBm / 33.6800 MHz

-55.88 dBm/Hz

CH High

Agilent 22:56:30 Jul 11, 2005

R L

Peak Excursion, a turbo Mode High Ch.

Δ Mkr1 0 Hz

Ref 30 dBm

Atten 30 dB

8.54 dB

#Peak

Log

10

dB/

Offst

11.3

dB

#PAvg

V1 V2

Center 5.290 00 GHz

Span 50.19 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 20 ms (601 pts)

Channel Power

Power Spectral Density

19.68 dBm / 33.4600 MHz

-55.56 dBm/Hz



7.6 RADIATED UNDESIRABLE EMISSION

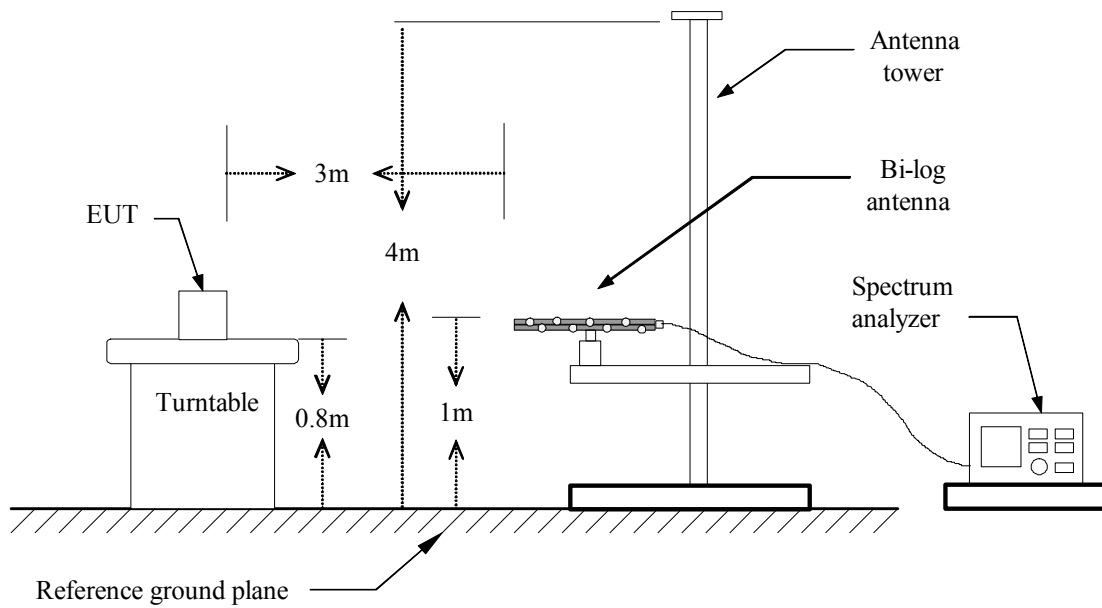
LIMIT

According to 15.407(b),

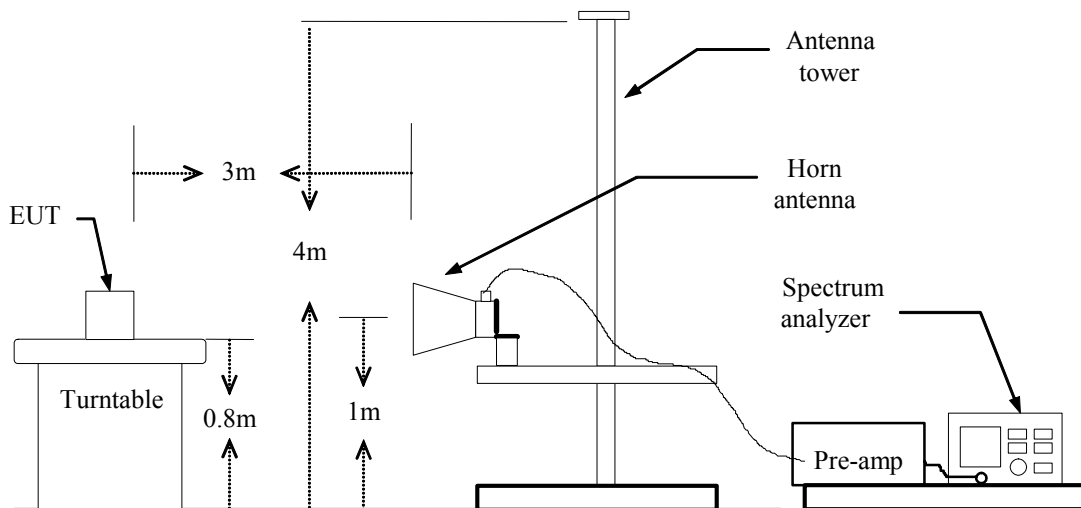
- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

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	PK	18.70	11.80	30.50	43.50	-13.00
232.95	V	PK	19.30	14.20	33.50	46.00	-12.50
288.30	V	PK	17.40	15.30	32.70	46.00	-13.30
455.16	V	PK	13.40	17.70	31.10	46.00	-14.90
566.00	V	PK	12.20	22.30	34.50	46.00	-11.50
798.21	V	PK	10.90	24.60	35.50	46.00	-10.50
127.20	H	PK	20.20	9.80	30.00	43.50	-13.50
227.55	H	PK	18.50	13.90	32.40	46.00	-13.60
287.85	H	PK	13.50	15.30	28.80	46.00	-17.20
479.79	H	PK	18.20	19.60	37.80	46.00	-8.20
576.50	H	PK	13.50	22.40	35.90	46.00	-10.10
797.00	H	PK	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 802.11a Base mode / CH Low**Test Date:** August 16, 2005**Temperature:** 28°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)				
10370.00	V	50.65	37.94	10.10	60.75	48.04	74.00	54.00	-5.96	AVG
N/A										
10360.00	H	43.85	34.20	10.08	53.93	44.28	74.00	54.00	-9.72	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 802.11a Base mode / CH Mid**Test Date:** August 16, 2005**Temperature:** 28°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)				
10520.00	V	50.84	38.85	10.41	61.25	49.26	74.00	54.00	-4.74	AVG
N/A										
10520.00	H	43.49	35.20	10.41	53.90	45.61	74.00	54.00	-8.39	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 802.11a Base mode / CH High **Test Date:** August 16, 2005**Temperature:** 28°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)				
10640.00	V	54.05	42.18	10.71	64.76	52.89	74.00	54.00	-1.11	AVG
N/A										
10640.00	H	44.87	35.76	10.71	55.58	46.47	74.00	54.00	-7.53	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 802.11a Turbo mode / CH Low **Test Date:** August 16, 2005**Temperature:** 28°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)				
10420.00	V	53.69	41.13	10.20	63.89	51.33	74.00	54.00	-2.67	AVG
N/A										
10420.00	H	50.37	37.15	10.20	60.57	47.35	74.00	54.00	-6.65	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 802.11a Turbo mode / CH Mid **Test Date:** August 16, 2005**Temperature:** 28°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)				
10502.00	V	55.18	42.64	10.36	65.54	53.00	74.00	54.00	-1.00	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, 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 802.11a Turbo mode / CH High **Test Date:** August 16, 2005**Temperature:** 28°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)				
10580.00	V	56.04	42.57	10.56	66.60	53.13	74.00	54.00	-0.87	AVG
N/A										
10580.00	H	46.71	34.11	10.56	57.27	44.67	74.00	54.00	-9.33	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.



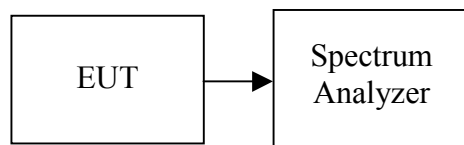
7.7 CONDUCTED UNDESIRABLE EMISSION

LIMIT

According to 15.407(b),

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

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 1 MHz. The video bandwidth is set to 1 MHz. Peak detector measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted

**Test Plot****IEEE 802.11a Base mode****CH Low****30MHz ~ 40GHz**

* Agilent 22:48:08 Jul 11, 2005

R T

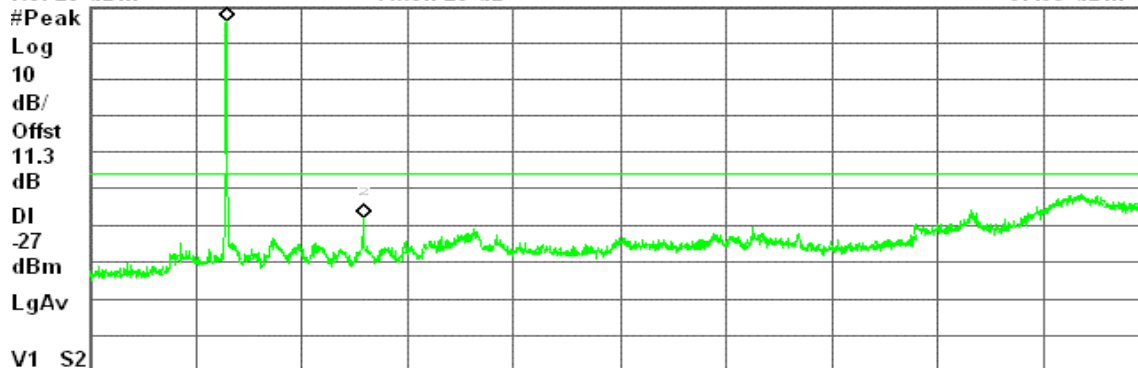
Conducted Spur., a Mode Low Ch.

Mkr2 10.36 GHz

Ref 20 dBm

Atten 20 dB

-37.99 dBm



Center 20.02 GHz

Span 39.97 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 100 ms (2001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.19 GHz	16.01 dBm
2	(1)	Freq	10.36 GHz	-37.99 dBm

CH Mid**30MHz ~ 40GHz**

* Agilent 22:46:29 Jul 11, 2005

L

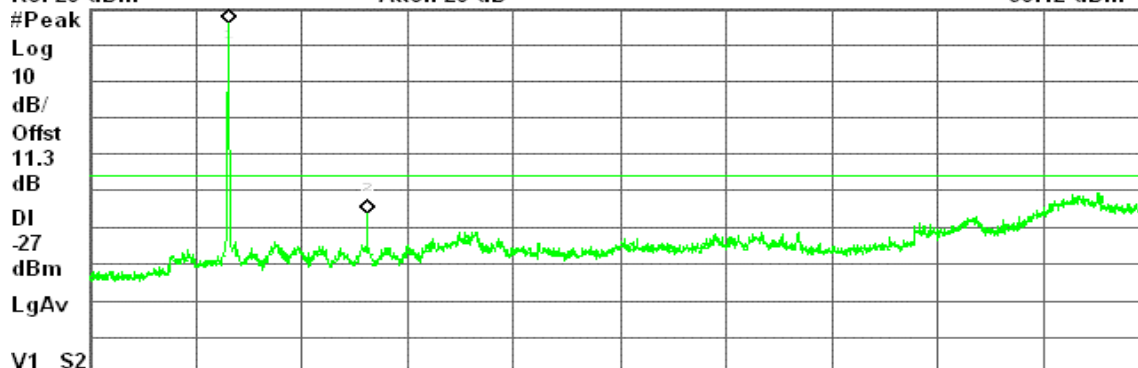
Conducted Spur., a Mode Mid Ch.

Mkr2 10.52 GHz

Ref 20 dBm

Atten 20 dB

-36.12 dBm



Center 20.02 GHz

Span 39.97 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 100 ms (2001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.27 GHz	16.06 dBm
2	(1)	Freq	10.52 GHz	-36.12 dBm

**CH High****30MHz ~ 40GHz**

* Agilent 22:51:37 Jul 11, 2005

R L

Conducted Spur., a Mode High Ch.

Mkr2 10.64 GHz

Ref 20 dBm

Atten 20 dB

-39.06 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

-27

dBm

LgAv

V1 S2

Center 20.02 GHz

Span 39.97 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 100 ms (2001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.33 GHz	15.67 dBm
2	(1)	Freq	10.64 GHz	-39.06 dBm

IEEE 802.11a Turbo mode**CH Low****30MHz ~ 40GHz**

* Agilent 23:08:54 Jul 11, 2005

R L

Conducted Spur., a turbo Mode Low Ch.

Mkr2 10.42 GHz

Ref 20 dBm

Atten 20 dB

-38.74 dBm

#Peak

Log

10

dB/

Offst

11.3

dB

DI

-27

dBm

LgAv

V1 S2

Center 20.02 GHz

Span 39.97 GHz

#Res BW 1 MHz

#VBW 1 MHz

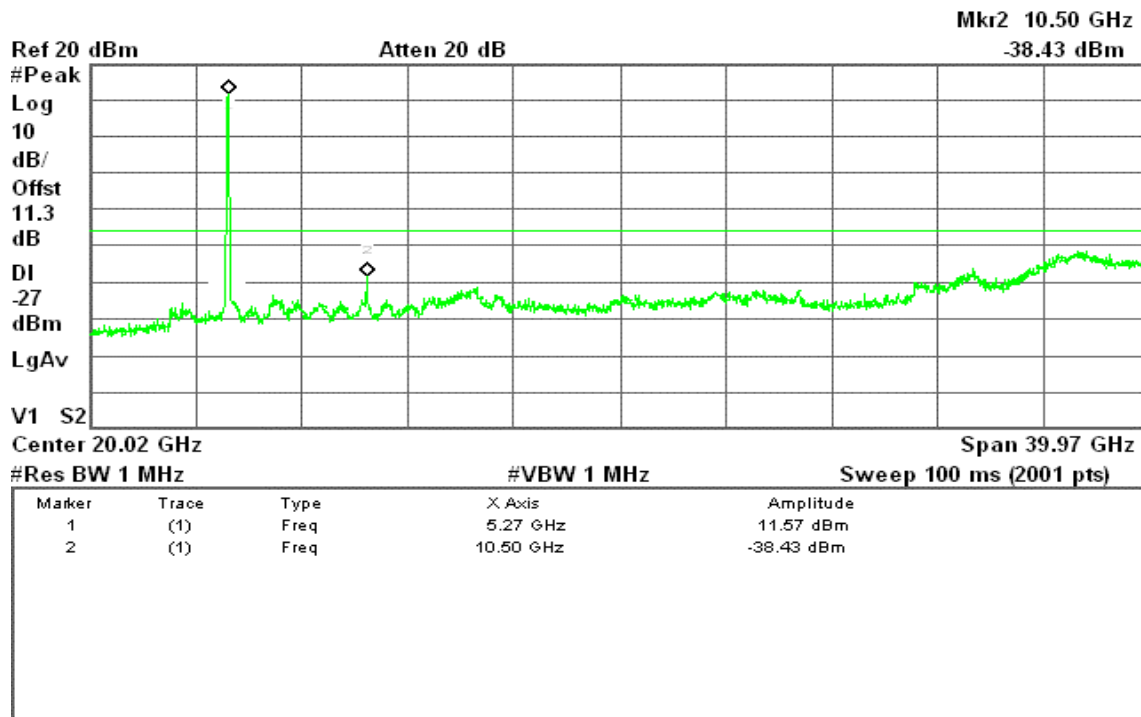
Sweep 100 ms (2001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.21 GHz	11.43 dBm
2	(1)	Freq	10.42 GHz	-38.74 dBm

**CH Mid****30MHz ~ 40GHz**

* Agilent 23:16:18 Jul 11, 2005

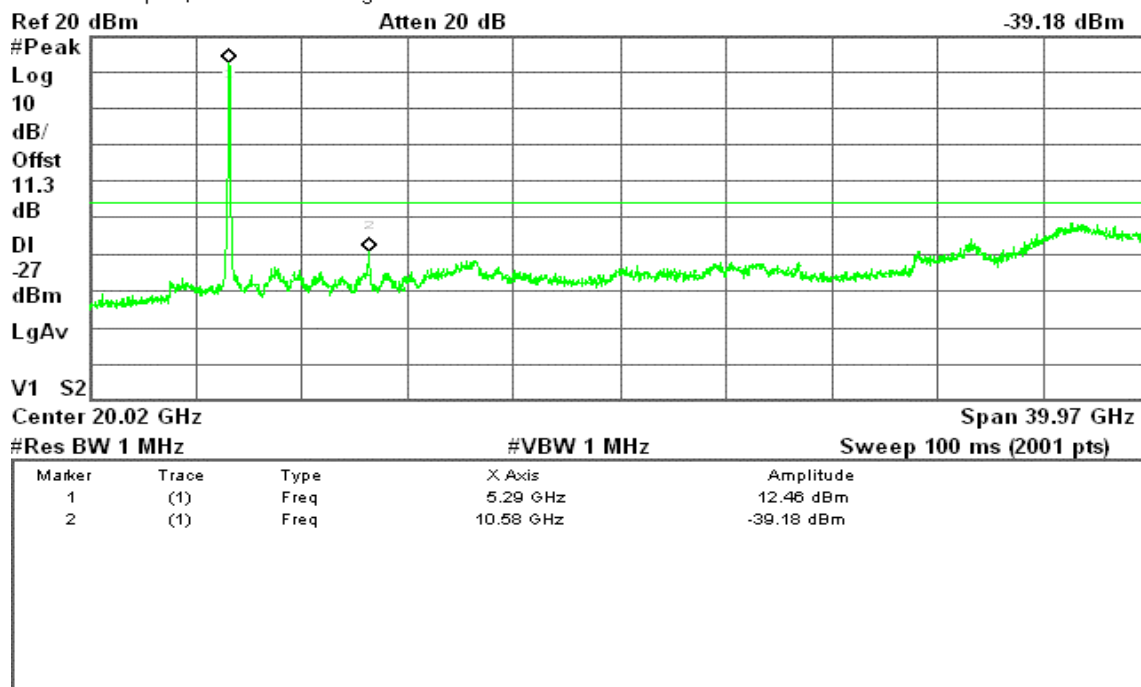
L

**CH High****30MHz ~ 40GHz**

* Agilent 22:57:11 Jul 11, 2005

L

Conducted Spur., a turbo Mode High Ch.





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:** August 03, 2005
Temperature: 25°C **Tested by:** Jason Chang
Humidity: 55% RH

Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.194	48.110	44.510	0.112	48.222	44.622	63.864	53.864	-15.642	-9.242	L1
0.454	31.140	27.100	0.100	31.240	27.200	56.802	46.802	-25.562	-19.602	L1
0.774	25.760	25.810	0.100	25.860	25.910	56.000	46.000	-30.140	-20.090	L1
1.091	27.170	27.560	0.100	27.270	27.660	56.000	46.000	-28.730	-18.340	L1
2.953	29.390	29.690	0.100	29.490	29.790	56.000	46.000	-26.510	-16.210	L1
11.264	30.470	24.710	0.725	31.195	25.435	60.000	50.000	-28.805	-24.565	L1
0.191	43.730	41.380	0.118	43.848	41.498	63.993	53.993	-20.145	-12.495	L2
0.450	36.510	36.370	0.100	36.610	36.470	56.875	46.875	-20.265	-10.405	L2
0.832	29.080	29.430	0.100	29.180	29.530	56.000	46.000	-26.820	-16.470	L2
1.732	29.910	30.270	0.100	30.010	30.370	56.000	46.000	-25.990	-15.630	L2
6.099	25.630	22.890	0.310	25.940	23.200	60.000	50.000	-34.060	-26.800	L2
14.769	24.840	22.040	0.795	25.635	22.835	60.000	50.000	-34.365	-27.165	L2

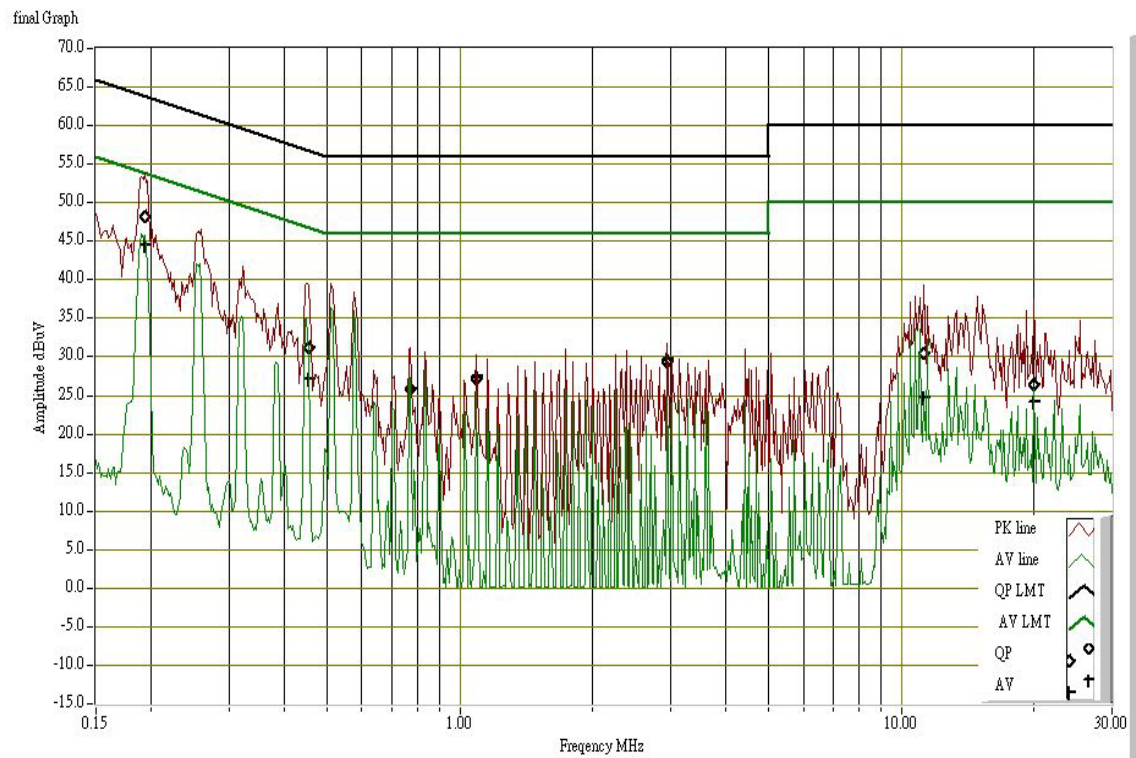
Remark:

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 10kHz; 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)

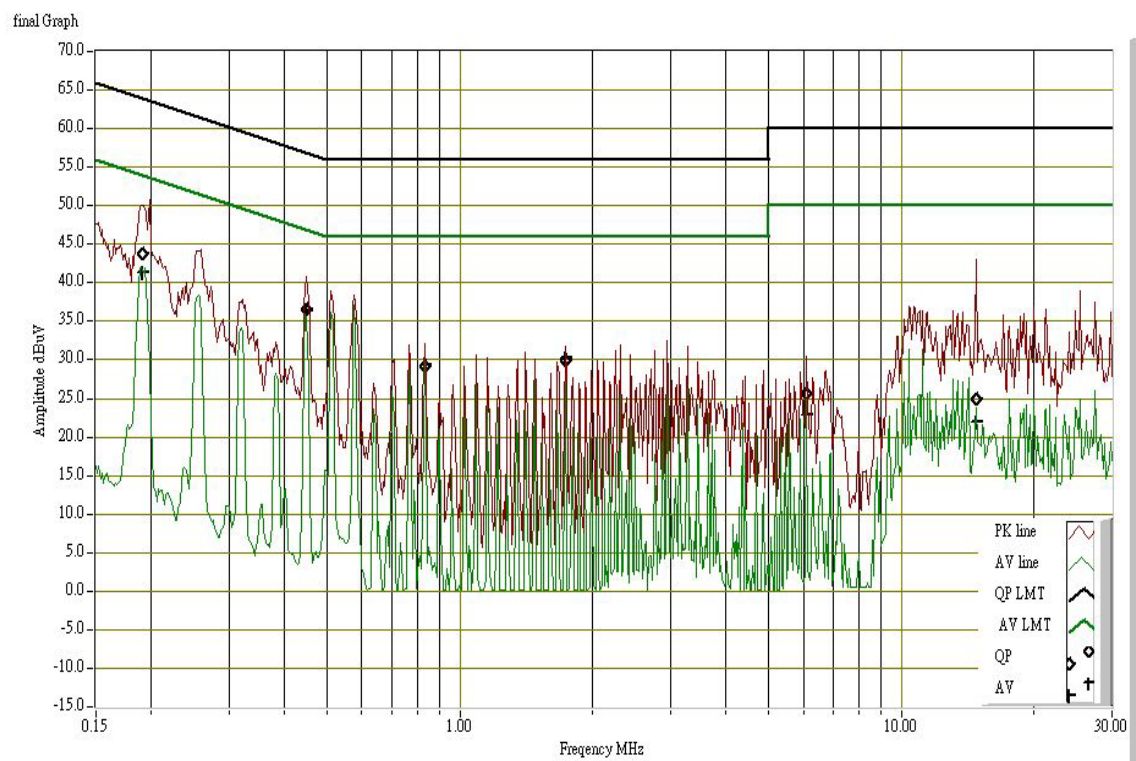


Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)





7.9 TRANSMISSION IN ABSENCE OF DATA

LIMIT

According to §15.319(f), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Applicants shall include in their application for equipment authorization a description of how this requirement is met.

TEST RESULTS

No non-compliance noted

Remark: *For the details, please refer to the theory of the operation.*

7.10 FREQUENCY STABILITY

LIMIT

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

TEST RESULTS

Please refer to the user's manual for further details.

Remark: *An examination of the band-edge plots shows that the emission will stay within the authorized band over the entire temperature range.*



APPENDIX II

RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

EUT Specification

EUT	IEEE 802.11a/b/g Wireless USB 2.0 Adapter
Frequency band (Operating)	<input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.15GHz ~ 5.35GHz <input type="checkbox"/> WLAN: 5.725GHz ~ 5.850GHz <input type="checkbox"/> Bluetooth: 2.402 GHz ~ 2.482 GHz <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	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	Base mode: 14.06 dBm (25.47mW) Turbo mode: 14.38 dBm (27.42mW)
Antenna gain (Max)	-1.14 dBi (Numeric gain: 0.77)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
Remark: 1. The maximum output power is <u>14.38dBm (27.42mW)</u> at <u>5250MHz</u> (with <u>0.77 numeric antenna gain.</u>) 2. 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:

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

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 = 27.42mW

Numeric antenna gain = 0.77 (Numeric gain)

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

$$\rightarrow \text{Power density} = 0.0042 \text{ mW / cm}^2$$

(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.)