



FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

802.11a/b/g AP

Model: SS-200-AT

Trade Name: AirTight Networks

Issued to

AirTight Networks, Inc
339N. Bernardo Avenue, Suite 200 Mountain View,
CA 94043

Issued by

Compliance Certification Services Inc.
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1. TEST RESULT CERTIFICATION

Applicant: AirTight Networks, Inc
339N. Bernardo Avenue, Suite 200 Mountain View,
CA 94043

Equipment Under Test: 802.11a/b/g AP

Trade Name: AirTight Networks

Model: SS-200-AT

Date of Test: September 14 ~ October 7, 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	802.11a/b/g AP
Trade Name	AirTight Networks
Model Number	SS-200-AT
Model Discrepancy	N/A
Power Supply	DELTA / ADP-15KB I/P: 100-240V, 0.5A, 50-60Hz O/P: 5.1V, 3.0A
Frequency Range	Base mode: 5.15 ~ 5.35 GHz Turbo mode: 5.210 GHz / 5.250 GHz / 5.290 GHz
Transmit Power	Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz Base mode: 12.88 dBm Turbo mode: 12.00 dBm Omnidirectional antenna / 6.0 dBi for 5 GHz Base mode: 9.86 dBm Turbo mode: 11.60 dBm
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	The EUT comes with two different antennas for 5GHz: Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz Omnidirectional antenna / 6.0 dBi for 5 GHz For detail descriptions, please refer to antenna specification and external photos.

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: TORSS-200-AT 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: SS-200-AT) comes with two different antennas for 5 GHz.

The EUT with antenna as below had been tested under operating condition.

1. Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz
2. Omnidirectional antenna / 6.0 dBi for 5 GHz

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
Spectrum Analyzer	R&S	FSP30	100112	08/03/2006

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	07/25/2006
Test Receiver	Rohde&Schwarz	ESCI	100064	06/28/2006
Switch Controller	TRC	Switch Controller	SC94050010	05/05/2006
4 Port Switch	TRC	4 Port Switch	SC94050020	05/05/2006
Horn-Antenna	TRC	HA-0502	06	06/02/2006
Horn-Antenna	TRC	HA-0801	04	05/05/2006
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/09/2006
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R
Site NSA	CCS	N/A	965860	09/26/2008
Test S/W	LABVIEW (V 6.1)			

Remark: The measurement uncertainty is less than +/- 2.0065dB, 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. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

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

☒ No. No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

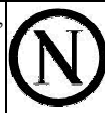
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 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 (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements	 93105, 90471 965860
Japan	VCCI	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	3/10 meter Open Area Test Sites (IC 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1	 IC 3991-3 IC 3991-4 IC 6106

* 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 (Remote)	IBM	2672(X31)	99PBTKB	FCC DoC	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

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.

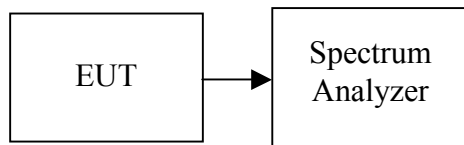


7. FCC PART 15 REQUIREMENTS

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.
3. Set the spectrum analyzer as $RBW = 1\%EBW$, $VBW = RBW$, $Span = 50MHz / 100MHz$ (Turbo Mode), and Sweep = auto.
Or Set the spectrum analyzer as $RBW > 1\%EBW$, $VBW > RBW$, $Span > 26dB$ bandwidth (Base Mode) / $> 26dB$ bandwidth (Turbo Mode), and Sweep = auto.
4. Mark the peak frequency and $-26dB$ (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

**TEST RESULTS**

No non-compliance noted

Test Data**Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz**

Channel	Frequency (MHz)		Bandwidth (B) (MHz)
Low	Base mode	5180	24.226
Mid		5260	23.268
High		5320	24.206
Low	Turbo mode	5210	49.032
Mid		5250	50.095
High		5290	50.025

Omnidirectional antenna / 6.0 dBi for 5 GHz

Channel	Frequency (MHz)		Bandwidth (B) (MHz)
Low	Base mode	5180	23.884
Mid		5260	23.880
High		5320	24.097
Low	Turbo mode	5210	49.032
Mid		5250	48.643
High		5290	46.688



Test Plot

Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz

IEEE 802.11a Base mode

CH Low

Agilent 17:28:18 Oct 3, 2005

R L

26 dB BW, a Mode Low Ch.

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

11

dB

LgAv

M1 S2

Center 5.180 00 GHz

#Res BW 270 kHz

#VBW 820 kHz

Span 50 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.9928 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

18.087 kHz

x dB Bandwidth

24.226 MHz

CH Mid

Agilent 17:37:30 Oct 3, 2005

R L

26 dB BW, a Mode Mid Ch.

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

11

dB

LgAv

M1 S2

Center 5.260 00 GHz

#Res BW 240 kHz

#VBW 750 kHz

Span 50 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.8987 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-12.368 kHz

x dB Bandwidth

23.268 MHz

**CH High**

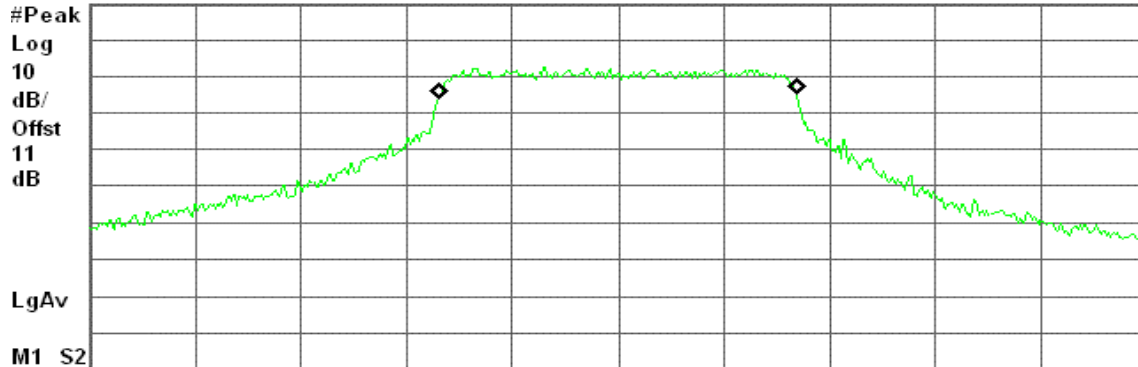
* Agilent 17:43:38 Oct 3, 2005

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 240 kHz

#VBW 750 kHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

16.8418 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-3.639 kHz

x dB Bandwidth

24.206 MHz

IEEE 802.11a Turbo mode**CH Low**

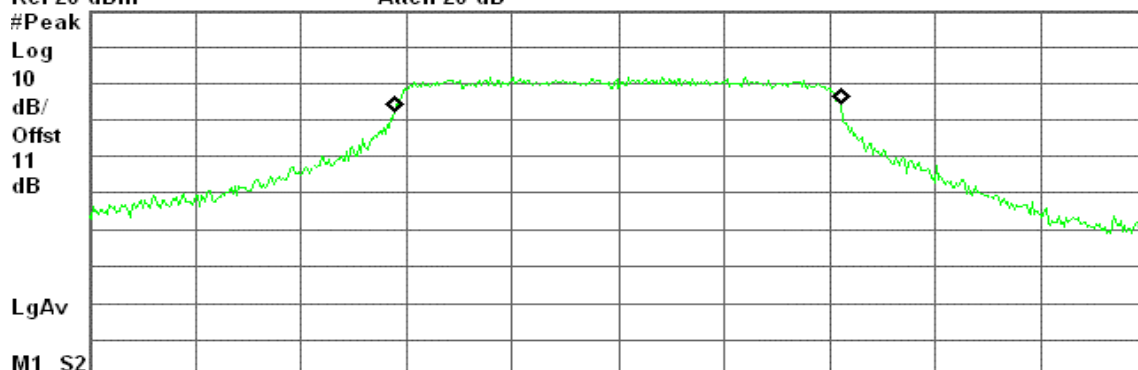
* Agilent 18:27:54 Oct 3, 2005

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 510 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

33.8090 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-36.394 kHz

x dB Bandwidth

49.032 MHz



CH Mid

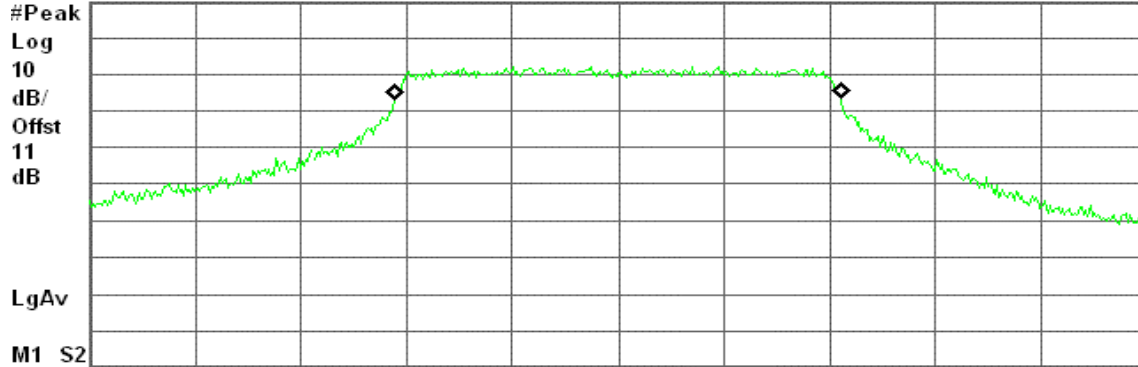
Agilent 18:32:49 Oct 3, 2005

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 510 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

33.8330 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -28.977 kHz

x dB Bandwidth 50.095 MHz

CH High

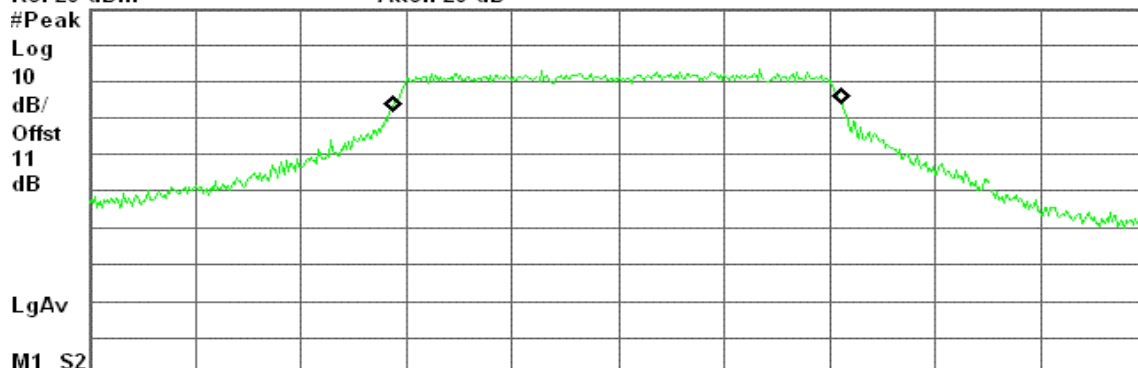
Agilent 18:36:40 Oct 3, 2005

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

34.1241 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -62.104 kHz

x dB Bandwidth 50.025 MHz

**Omnidirectional antenna / 6.0 dBi for 5 GHz****IEEE 802.11a Base mode****CH Low**

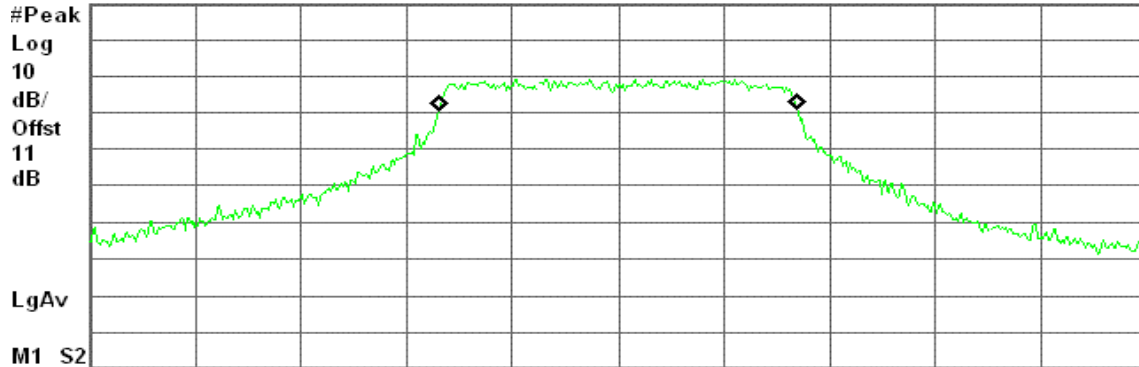
* Agilent 19:04:46 Oct 3, 2005

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**16.8680 MHz**Occ BW % Pwr 99.00 %
x dB -26.00 dBTransmit Freq Error 14.976 kHz
x dB Bandwidth 23.884 MHz**CH Mid**

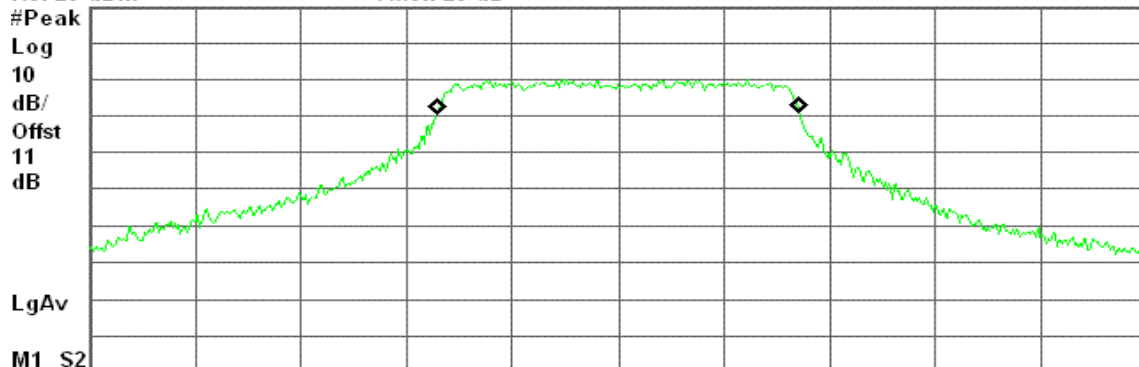
* Agilent 19:08:22 Oct 3, 2005

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**17.0374 MHz**Occ BW % Pwr 99.00 %
x dB -26.00 dBTransmit Freq Error -7.705 kHz
x dB Bandwidth 23.880 MHz

**CH High**

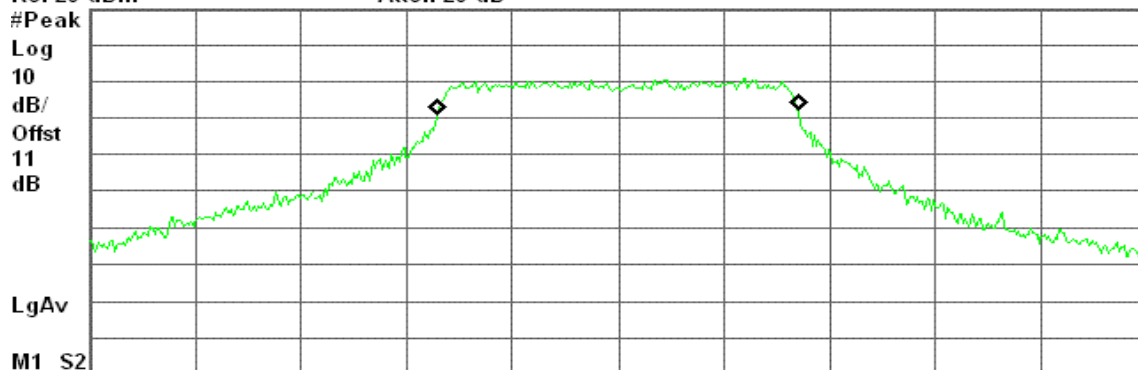
* Agilent 19:11:23 Oct 3, 2005

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

16.9588 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-2.222 kHz

x dB Bandwidth

24.097 MHz

IEEE 802.11a Turbo mode**CH Low**

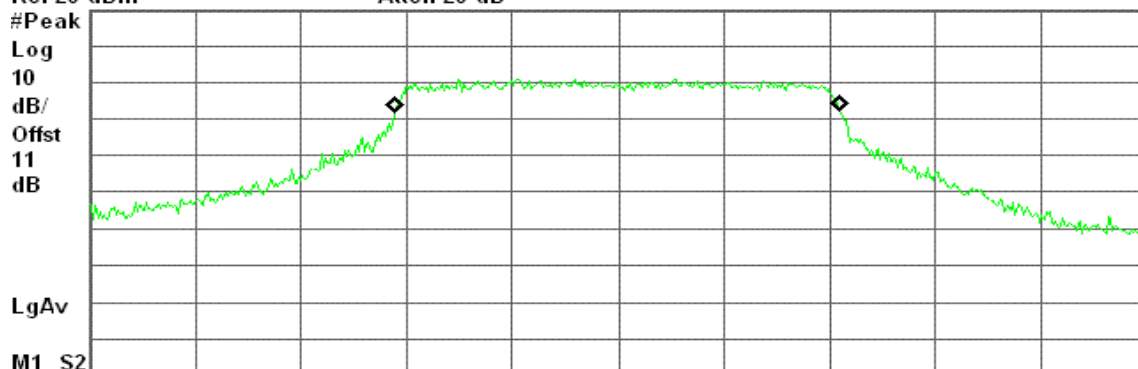
* Agilent 19:00:18 Oct 3, 2005

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 510 kHz

#VBW 1.6 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

33.7870 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-35.089 kHz

x dB Bandwidth

49.032 MHz



CH Mid

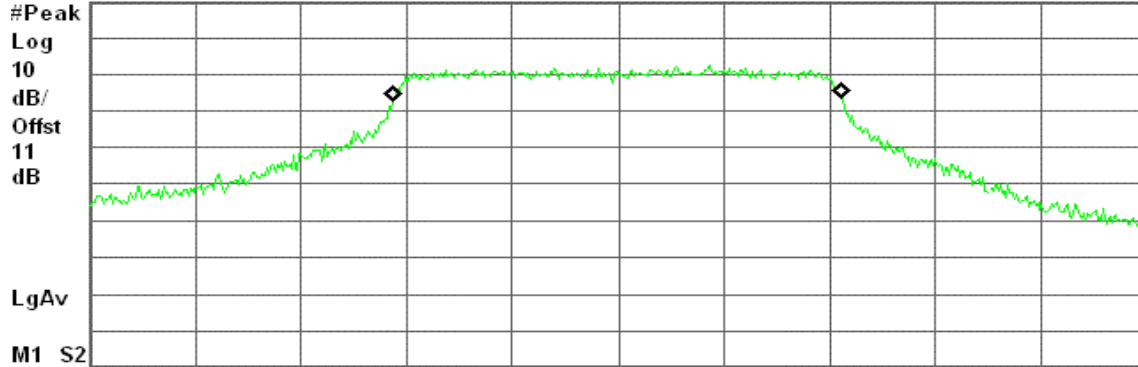
Agilent 18:54:33 Oct 3, 2005

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

34.0553 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-29.495 kHz

x dB Bandwidth

48.643 MHz

CH High

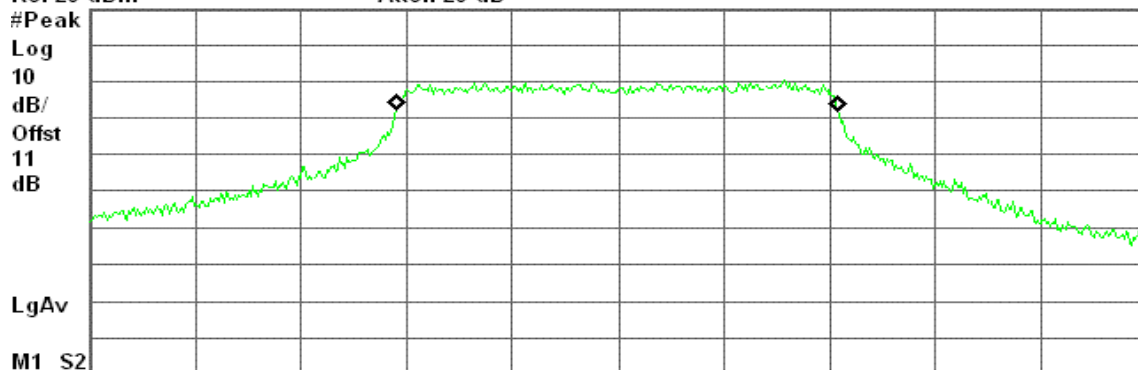
Agilent 18:49:42 Oct 3, 2005

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 430 kHz

#VBW 1.3 MHz

Sweep 1 ms (601 pts)

Occupied Bandwidth

33.5430 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error

-49.755 kHz

x dB Bandwidth

46.688 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:

Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz

Frequency (MHz)		26 dB Bandwidth (B) (MHz)	10 Log B (dB)	Limit 4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Base mode	5180	24.226	13.84	17.84	17
	5260	23.268	13.67	24.67	24
	5320	24.206	13.84	24.84	24
Turbo mode	5210	49.032	16.90	20.90	17
	5250	50.095	17.00	21.00	17
	5290	50.025	16.99	27.99	24

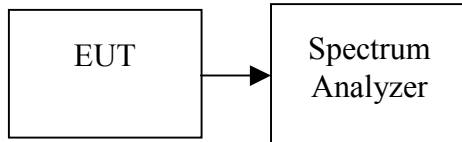
Omnidirectional antenna / 6.0 dBi for 5 GHz

Frequency (MHz)		26 dB Bandwidth (B) (MHz)	10 Log B (dB)	Limit 4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Base mode	5180	23.884	13.78	17.78	17
	5260	23.880	13.78	24.78	24
	5320	24.097	13.82	24.82	24
Turbo mode	5210	49.032	16.90	20.90	17
	5250	48.643	16.87	20.87	17
	5290	46.688	16.69	27.69	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****Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz**

Channel	Frequency (MHz)		Output Power (dBm)	Limit (dBm)
Low	Base mode	5180	10.28	17
Mid		5260	12.09	24
High		5320	12.88	24
Low	Turbo mode	5210	11.84	17
Mid		5250	11.90	17
High		5290	12.00	24

Omnidirectional antenna / 6.0 dBi for 5 GHz

Channel	Frequency (MHz)		Output Power (dBm)	Limit (dBm)
Low	Base mode	5180	9.44	17
Mid		5260	9.86	24
High		5320	9.77	24
Low	Turbo mode	5210	11.60	17
Mid		5250	10.65	17
High		5290	11.23	24



Test Plot

Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz

IEEE 802.11a Base mode

CH Low

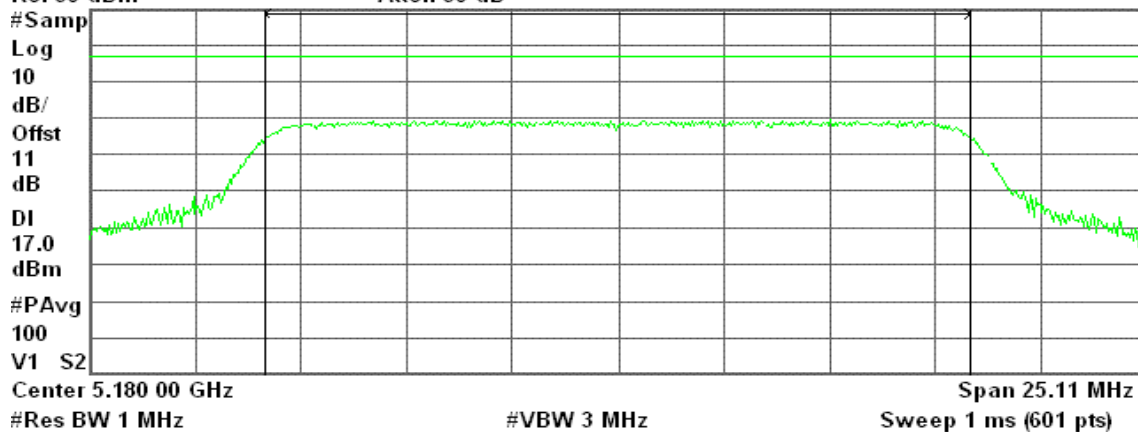
Agilent 17:29:50 Oct 3, 2005

R L

Peak Transmit Power, a Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

10.28 dBm / 16.7431 MHz

-61.96 dBm/Hz

CH Mid

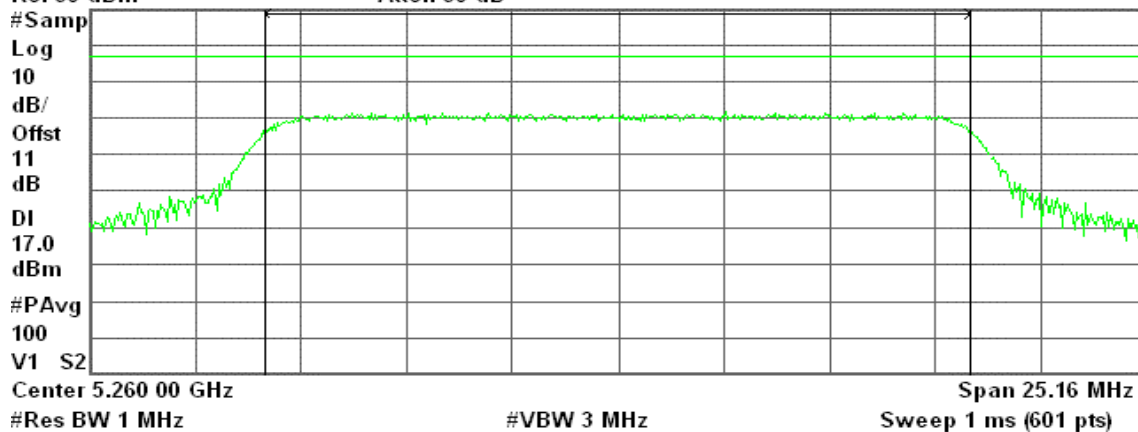
Agilent 17:38:24 Oct 3, 2005

R L

Peak Transmit Power, a Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

12.09 dBm / 16.7758 MHz

-60.16 dBm/Hz



CH High

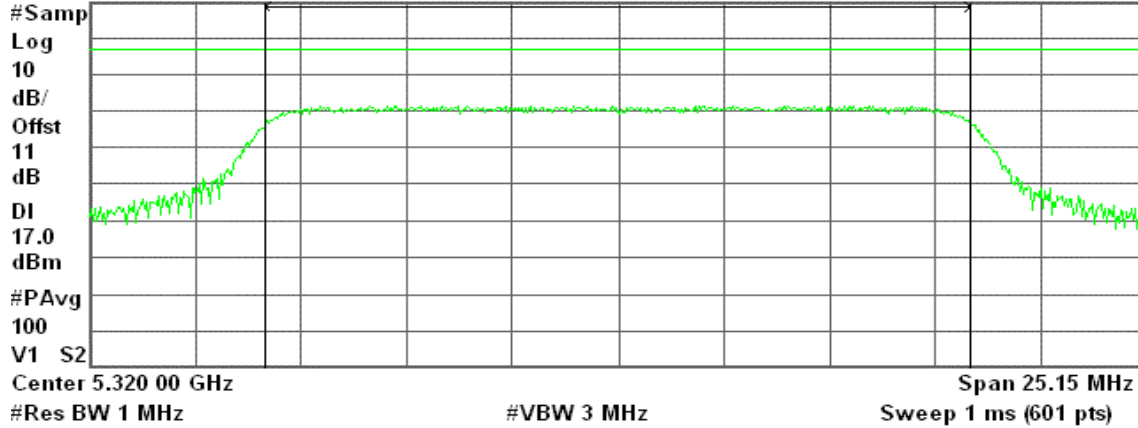
Agilent 17:44:26 Oct 3, 2005

R L

Peak Transmit Power, a Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

12.88 dBm / 16.7670 MHz

-59.37 dBm/Hz

IEEE 802.11a Turbo mode

CH Low

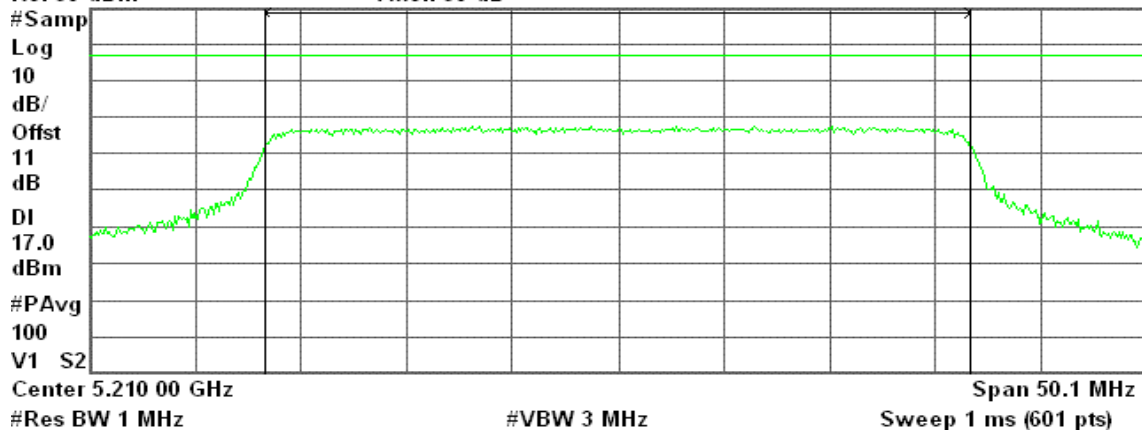
Agilent 18:28:41 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

11.84 dBm / 33.4000 MHz

-63.39 dBm/Hz



CH Mid

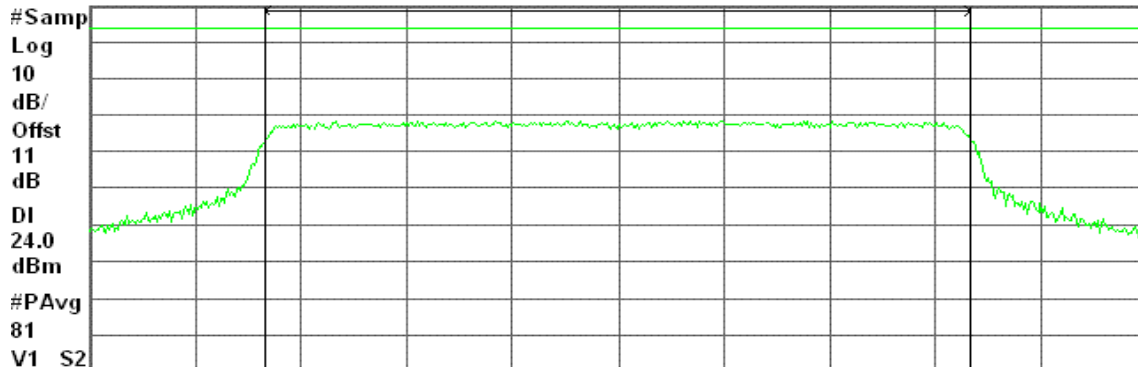
Agilent 18:33:27 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

11.90 dBm / 33.3200 MHz

Power Spectral Density

-63.32 dBm/Hz

CH High

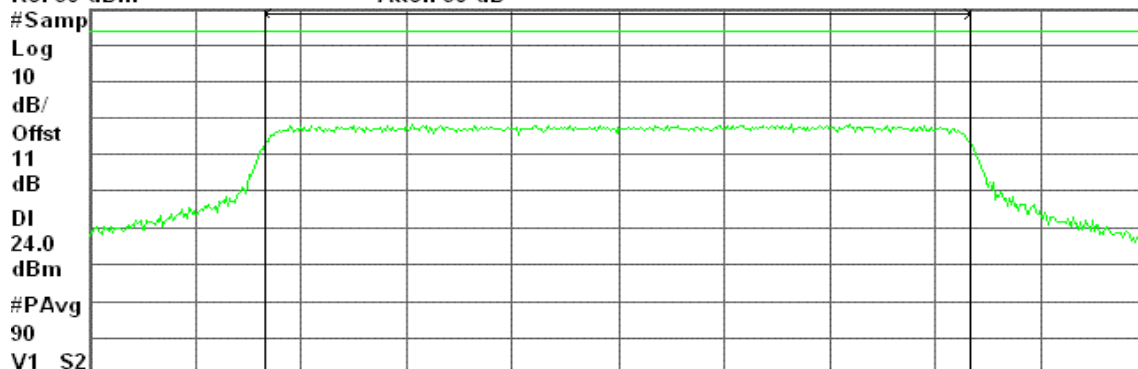
Agilent 18:37:08 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

12.00 dBm / 33.3300 MHz

Power Spectral Density

-63.23 dBm/Hz



Omnidirectional antenna / 6.0 dBi for 5 GHz

IEEE 802.11a Base mode

CH Low

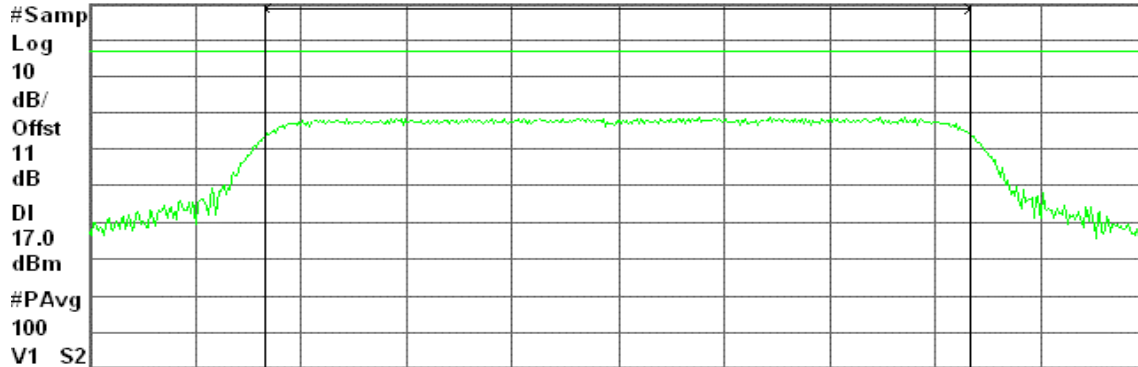
Agilent 19:05:25 Oct 3, 2005

R L

Peak Transmit Power, a Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Center 5.180 00 GHz

Span 25.14 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

9.44 dBm / 16.7600 MHz

-62.81 dBm/Hz

CH Mid

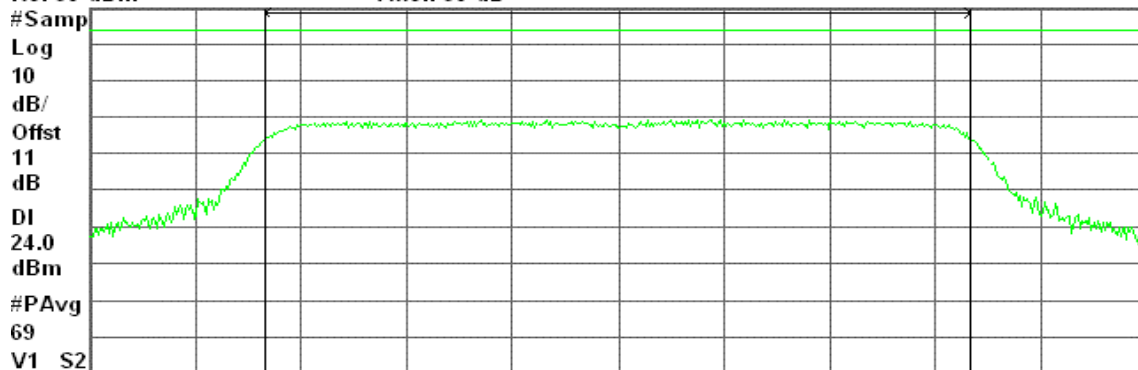
Agilent 19:08:51 Oct 3, 2005

R L

Peak Transmit Power, a Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 5.260 00 GHz

Span 25.17 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

9.86 dBm / 16.7800 MHz

-62.39 dBm/Hz



CH High

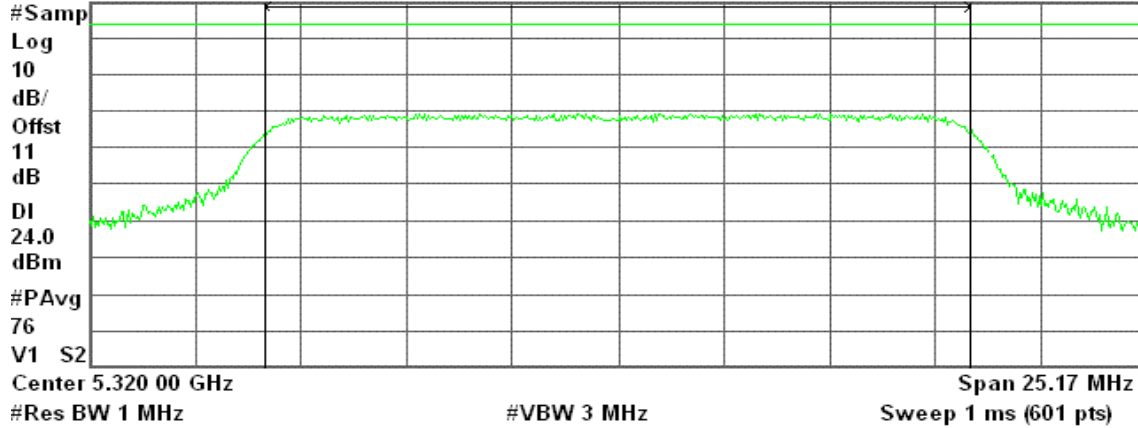
Agilent 19:11:49 Oct 3, 2005

R L

Peak Transmit Power, a Mode High Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

9.77 dBm / 16.7800 MHz

-62.47 dBm/Hz

IEEE 802.11a Turbo mode

CH Low

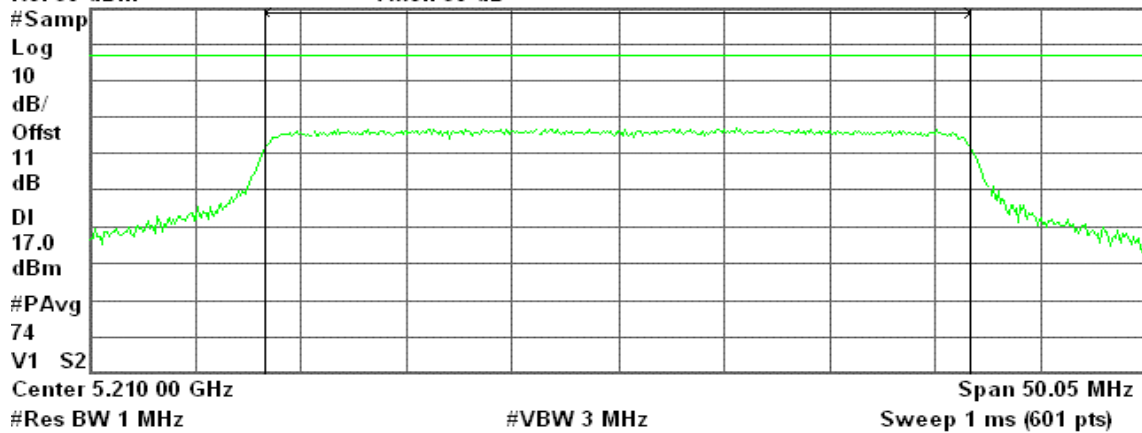
Agilent 19:00:47 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode Low Ch.

Ref 30 dBm

Atten 30 dB



Channel Power

Power Spectral Density

11.60 dBm / 33.3700 MHz

-63.63 dBm/Hz



CH Mid

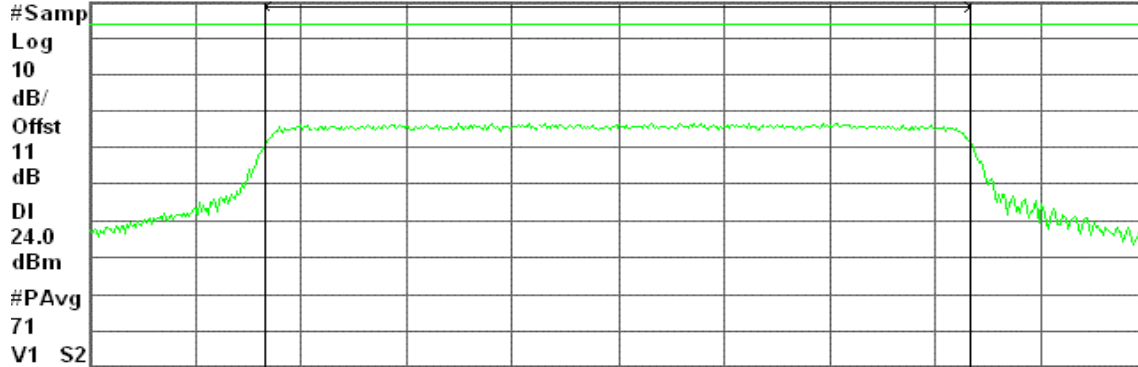
Agilent 18:55:03 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode Mid Ch.

Ref 30 dBm

Atten 30 dB



Center 5.250 00 GHz

Span 50.09 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

10.65 dBm / 33.3900 MHz

-64.59 dBm/Hz

CH High

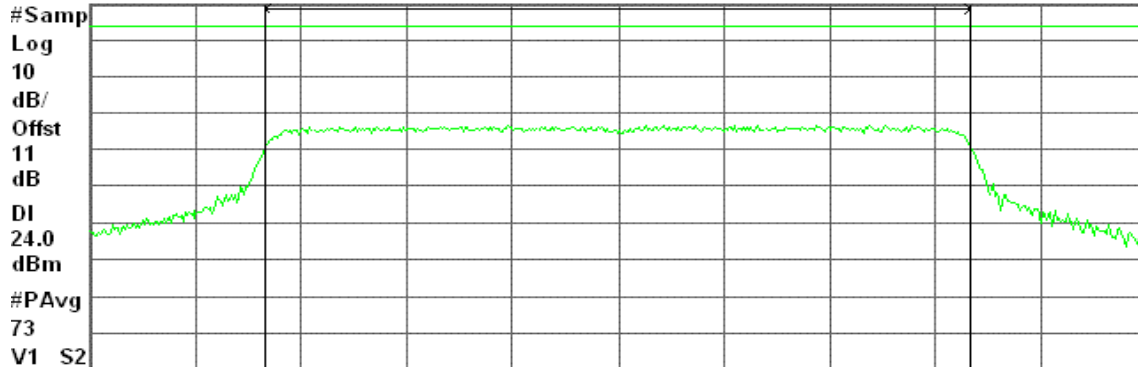
Agilent 18:50:16 Oct 3, 2005

R L

Peak Transmit Power, a turbo Mode High Ch.

Ref 30 dBm

Atten 30 dB



Center 5.290 00 GHz

Span 50.23 MHz

#Res BW 1 MHz

#VBW 3 MHz

Sweep 1 ms (601 pts)

Channel Power

Power Spectral Density

11.23 dBm / 33.4900 MHz

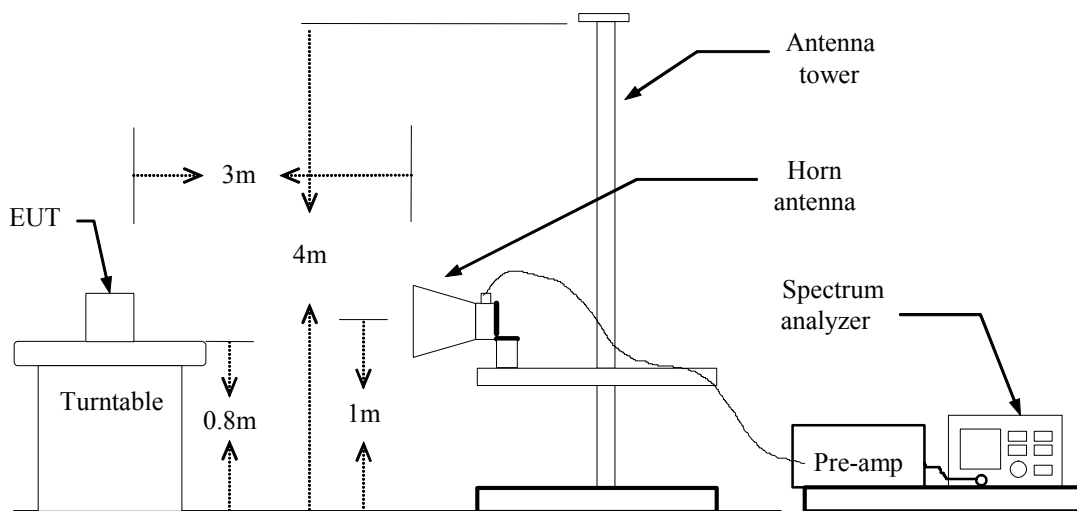
-64.02 dBm/Hz

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

Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz

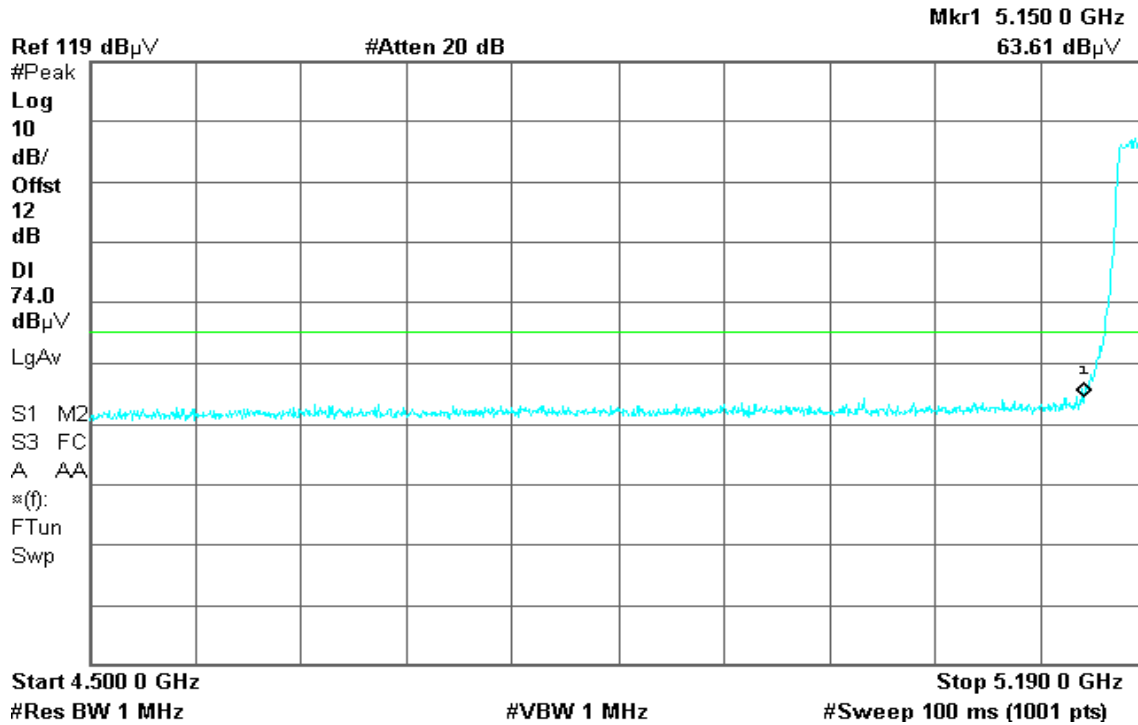
IEEE 802.11a Base mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 14:59:13 Sep 14, 2005

T

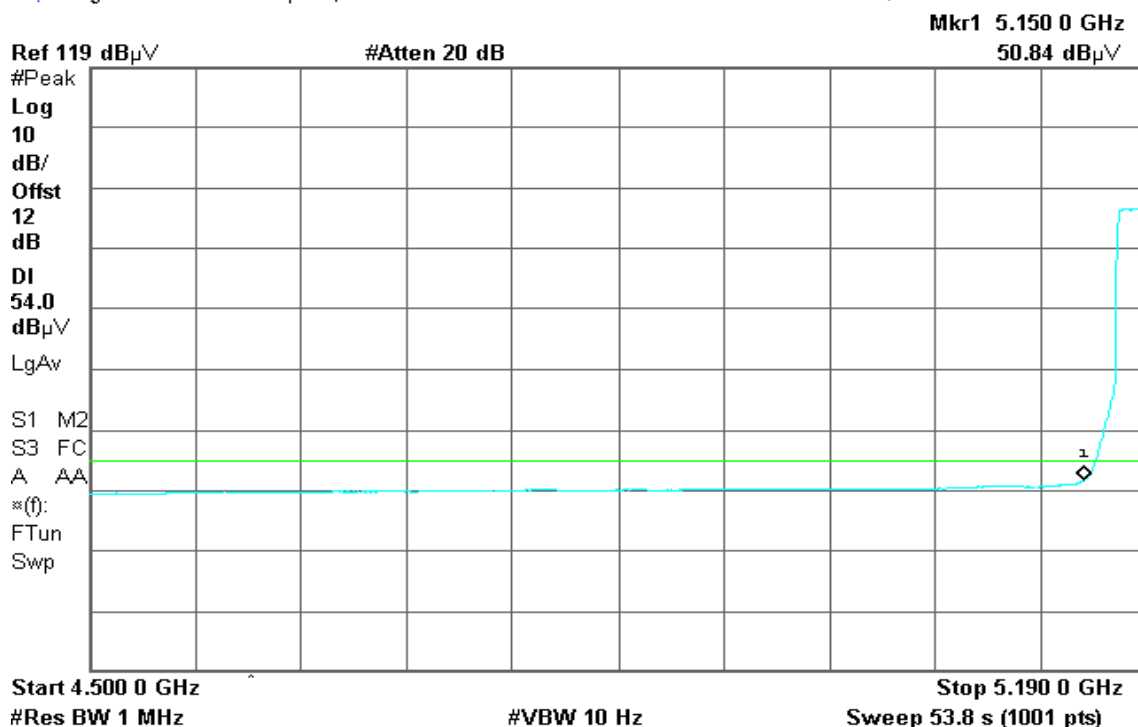


Detector mode: Average

Polarity: Vertical

Agilent 15:00:52 Sep 14, 2005

T



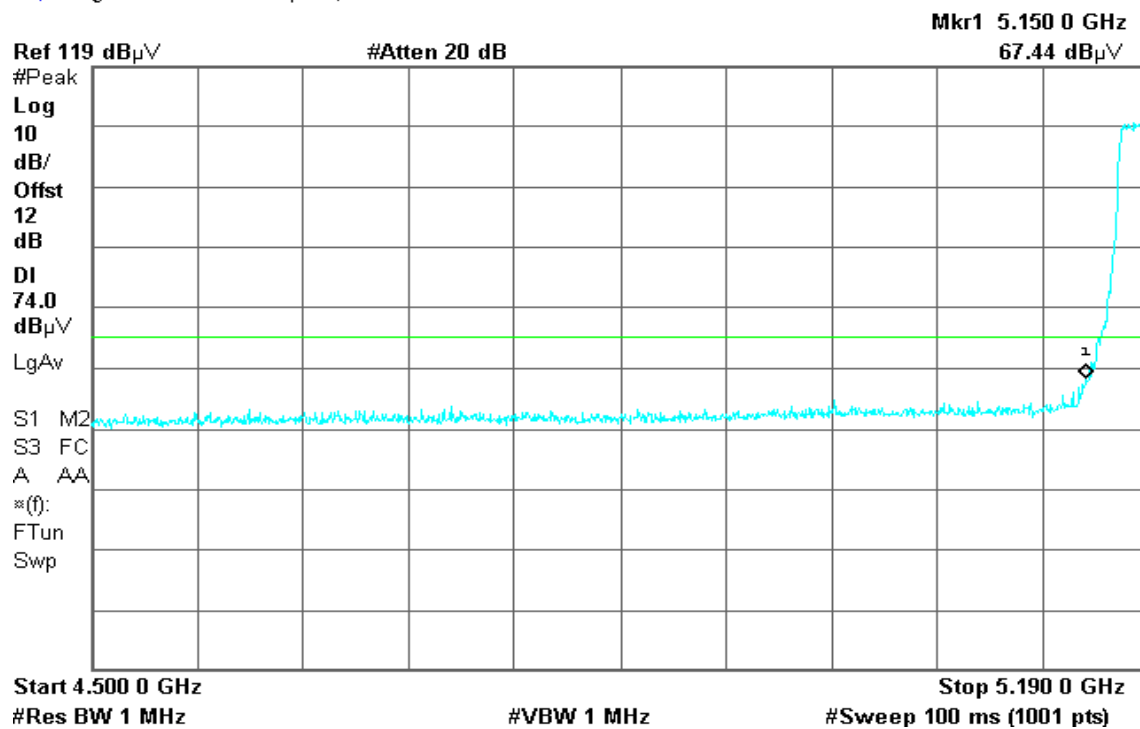


Detector mode: Peak

Polarity: Horizontal

Agilent 15:06:00 Sep 14, 2005

T

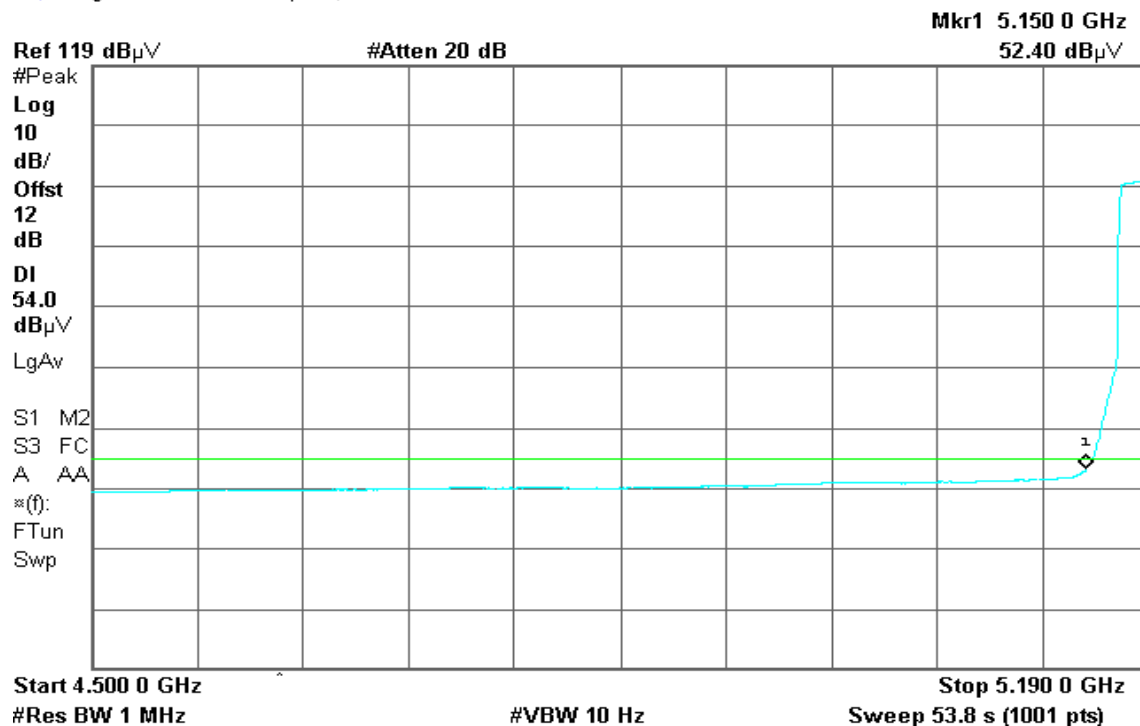


Detector mode: Average

Polarity: Horizontal

Agilent 15:05:22 Sep 14, 2005

T





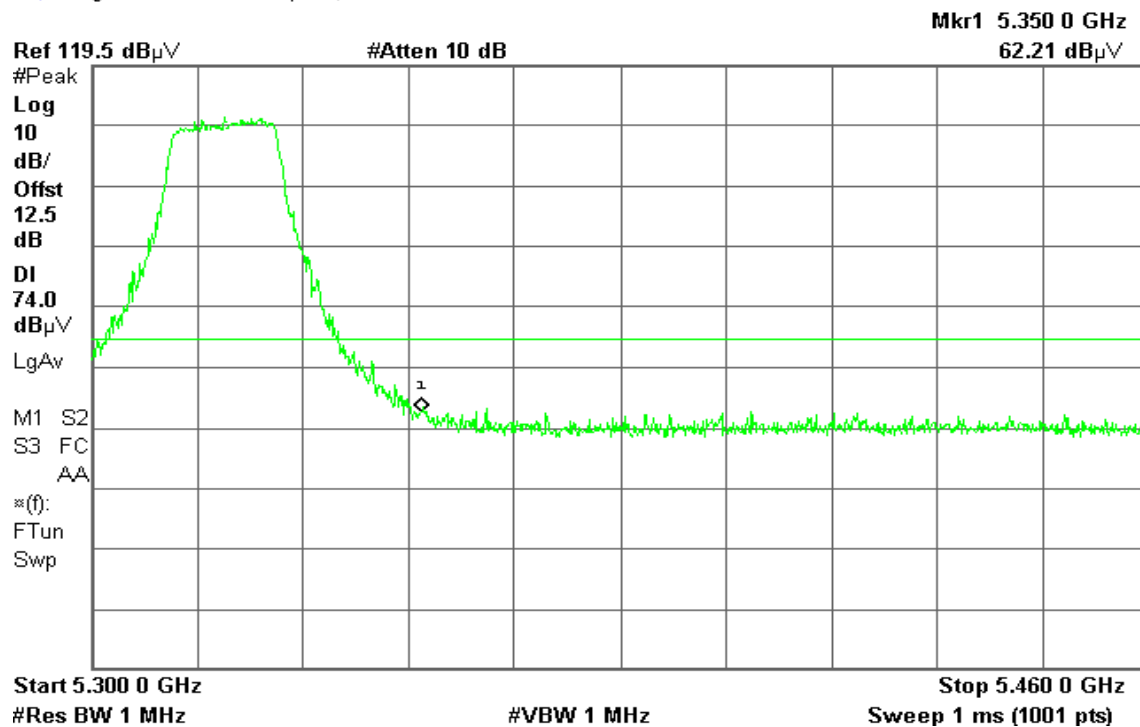
IEEE 802.11a Base mode / CH High

Detector mode: Peak

Polarity: Vertical

Agilent 16:14:50 Sep 17, 2005

T

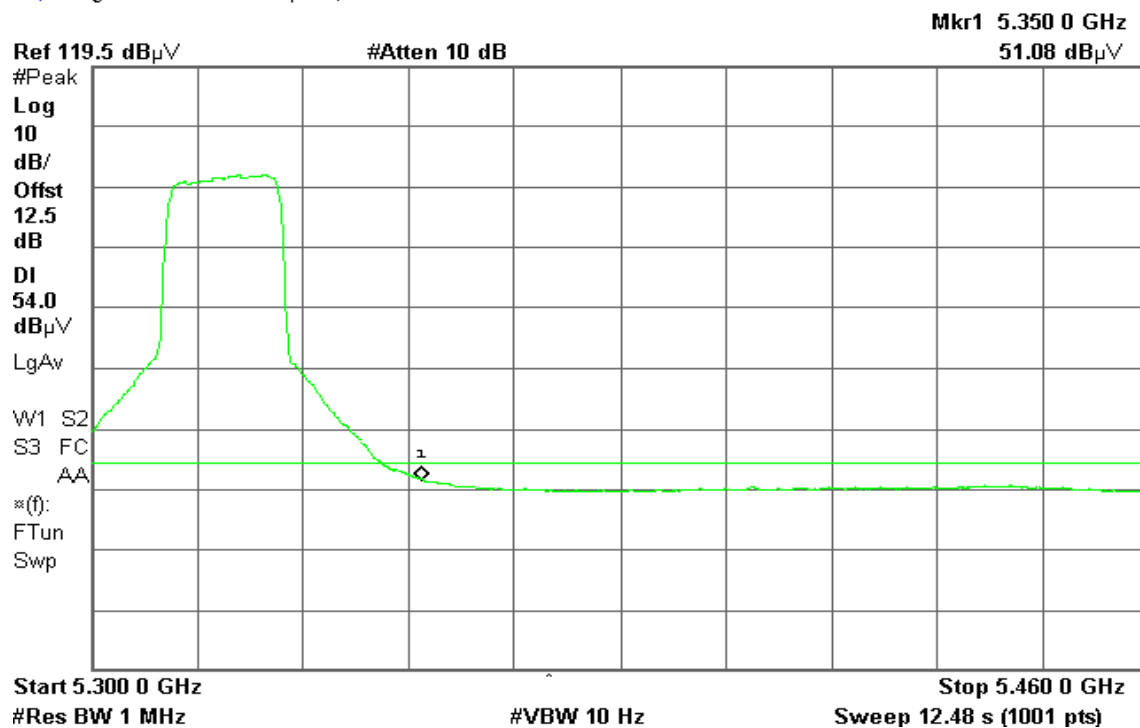


Detector mode: Average

Polarity: Vertical

Agilent 16:13:05 Sep 17, 2005

T



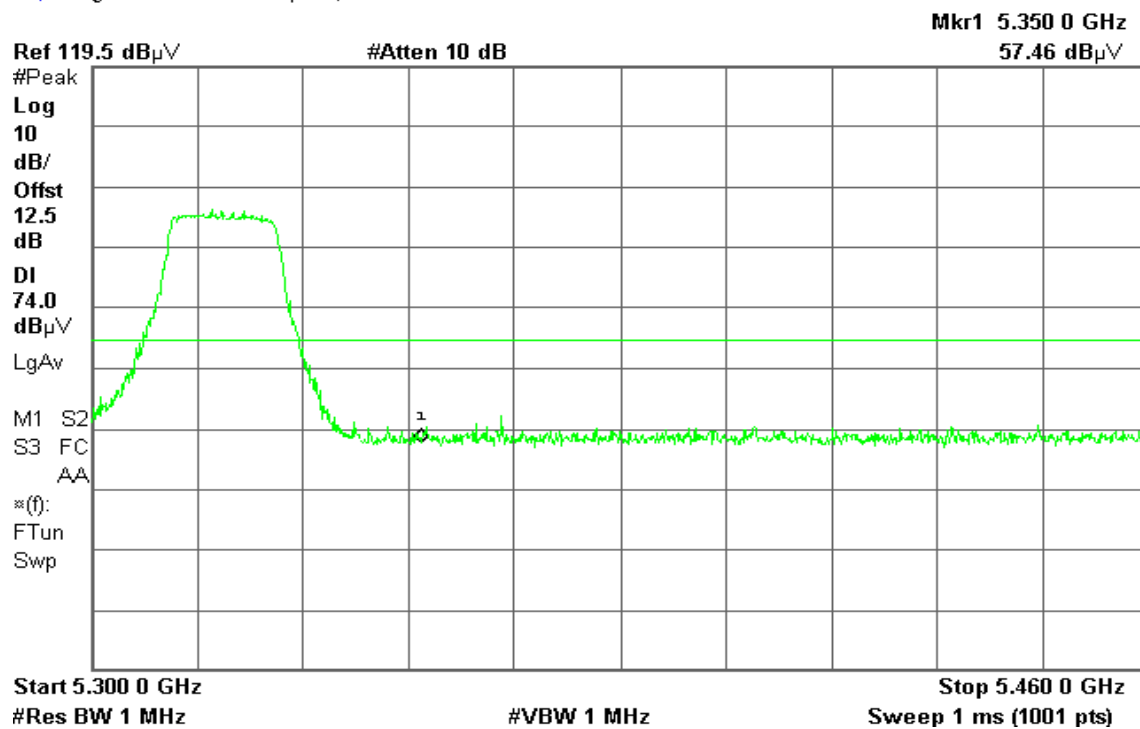


Detector mode: Peak

Polarity: Horizontal

Agilent 16:27:40 Sep 17, 2005

T

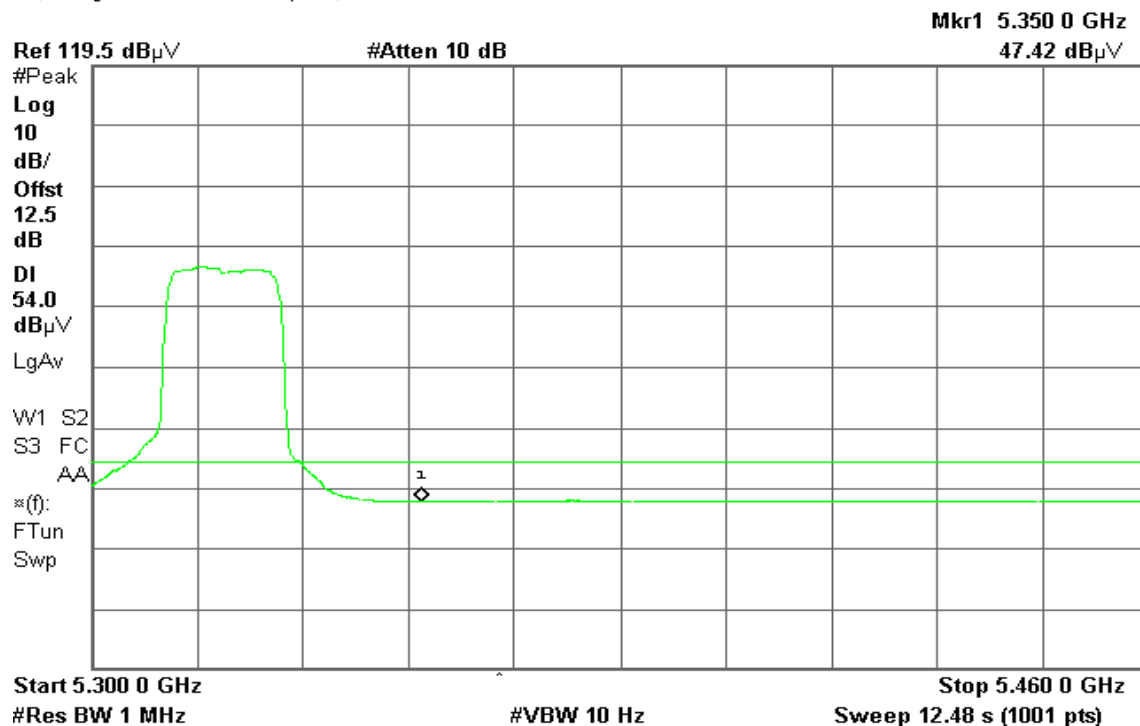


Detector mode: Average

Polarity: Horizontal

Agilent 16:26:28 Sep 17, 2005

T





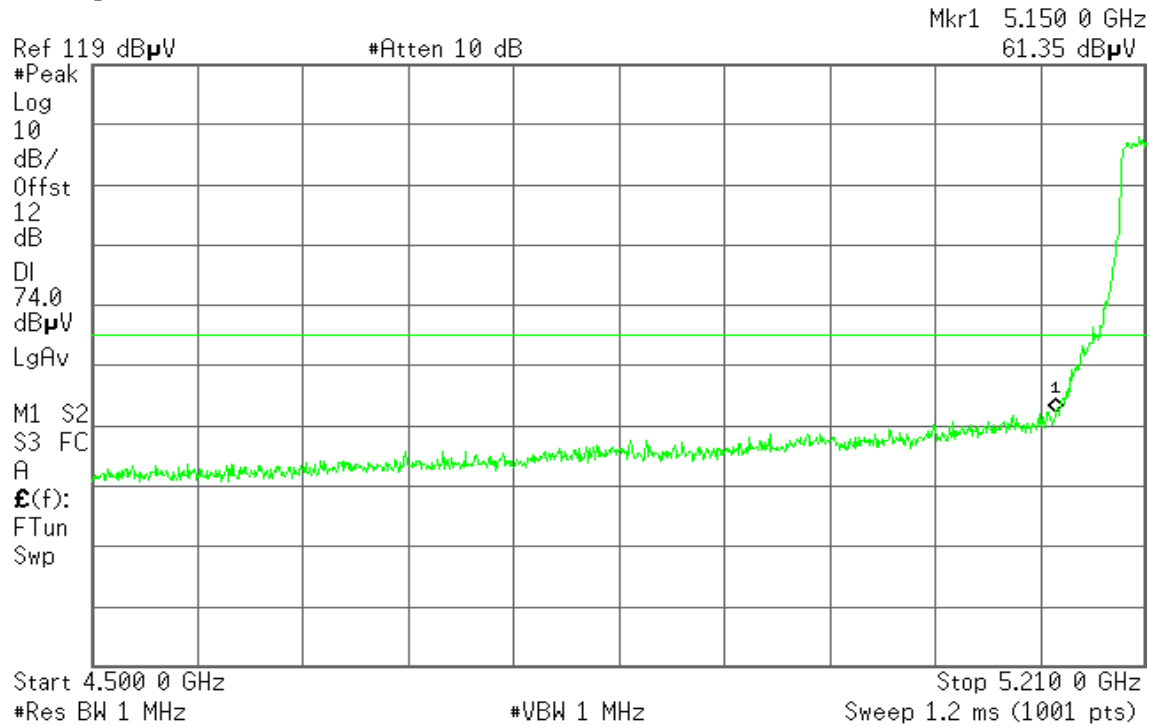
IEEE 802.11a Turbo mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 20:40:45 Oct 6, 2005

T

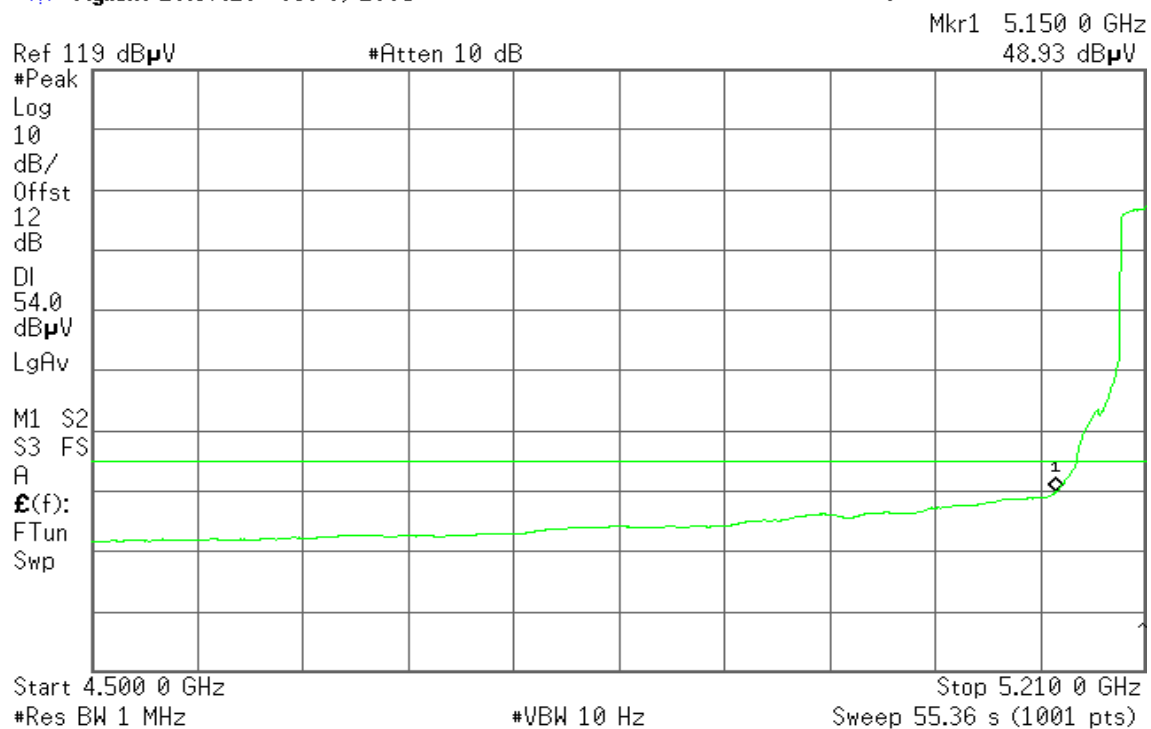


Detector mode: Average

Polarity: Vertical

Agilent 20:37:28 Oct 6, 2005

T

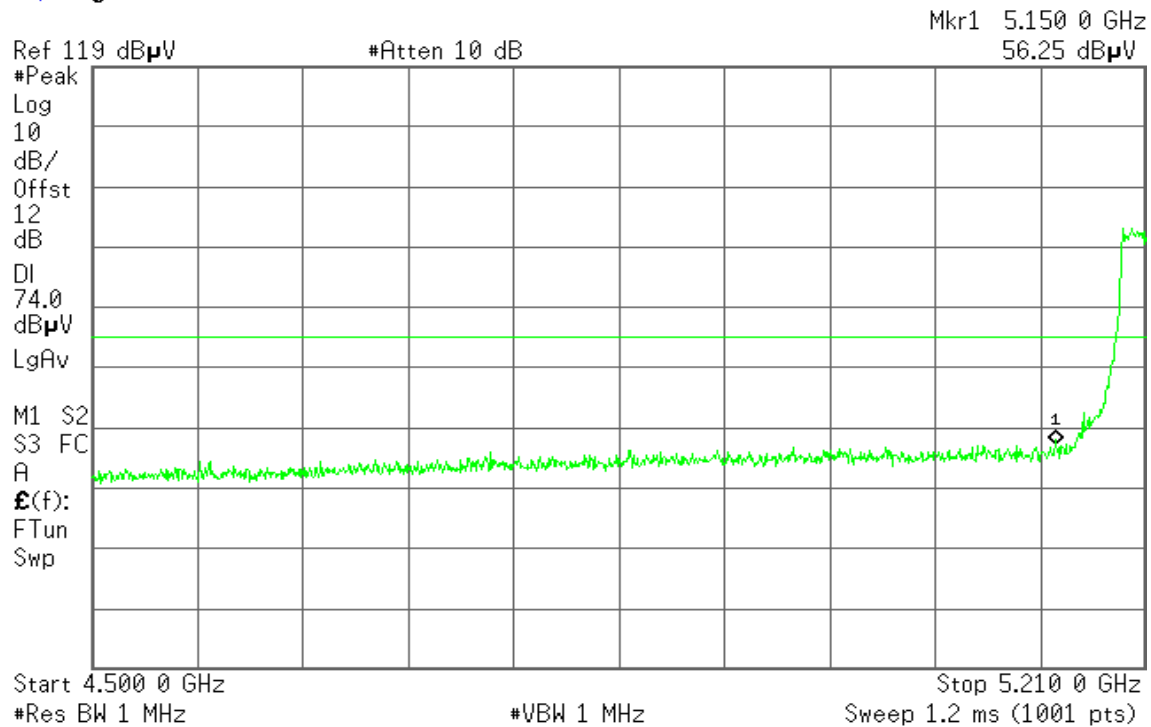




Detector mode: Peak

Polarity: Horizontal

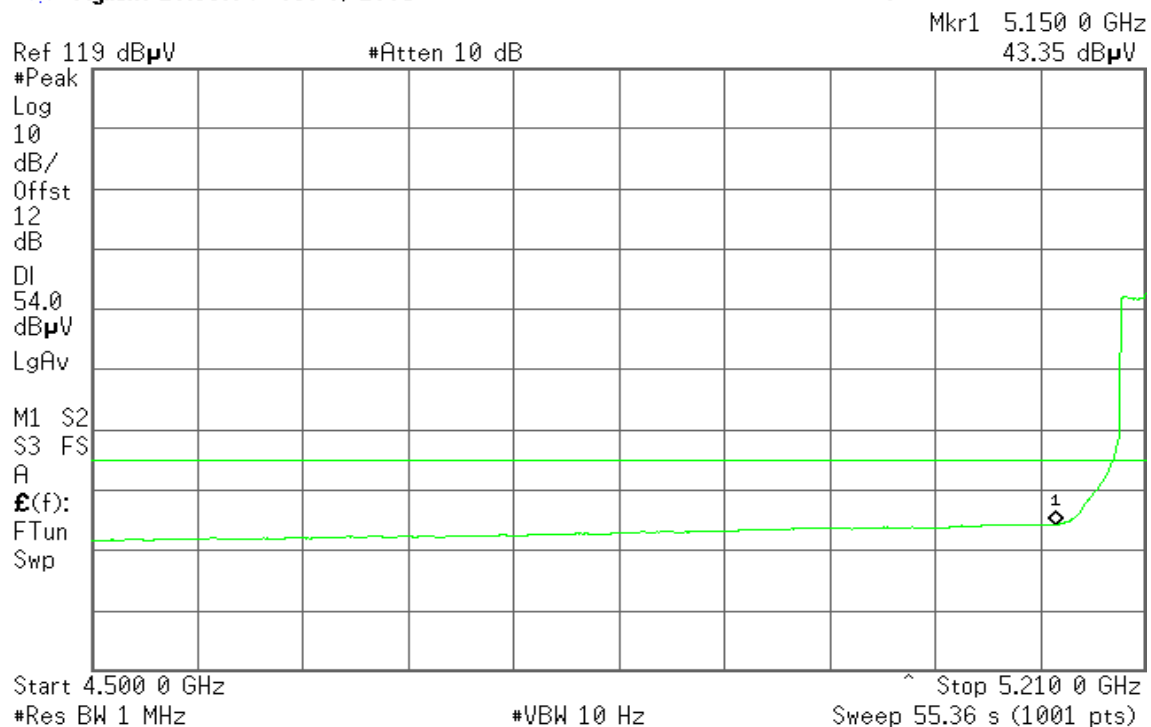
Agilent 20:10:02 Oct 6, 2005



Detector mode: Average

Polarity: Horizontal

Agilent 20:33:04 Oct 6, 2005





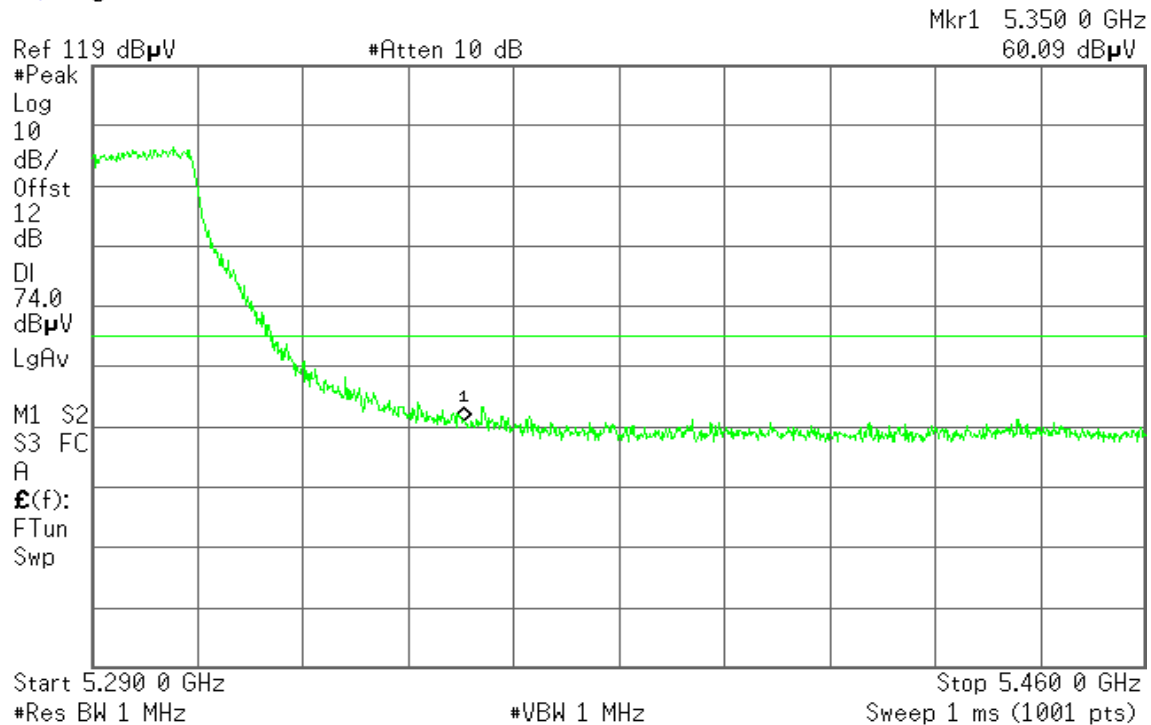
IEEE 802.11a Turbo mode / CH High

Detector mode: Peak

Polarity: Vertical

Agilent 20:22:39 Oct 6, 2005

T

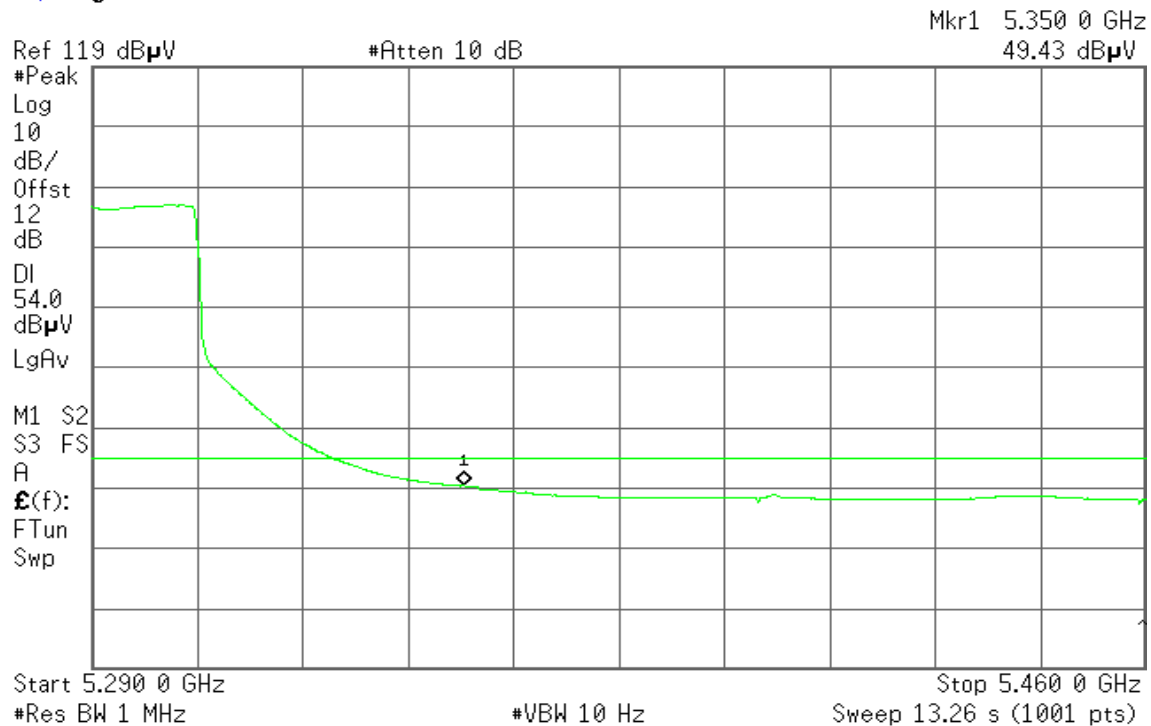


Detector mode: Average

Polarity: Vertical

Agilent 20:23:35 Oct 6, 2005

T





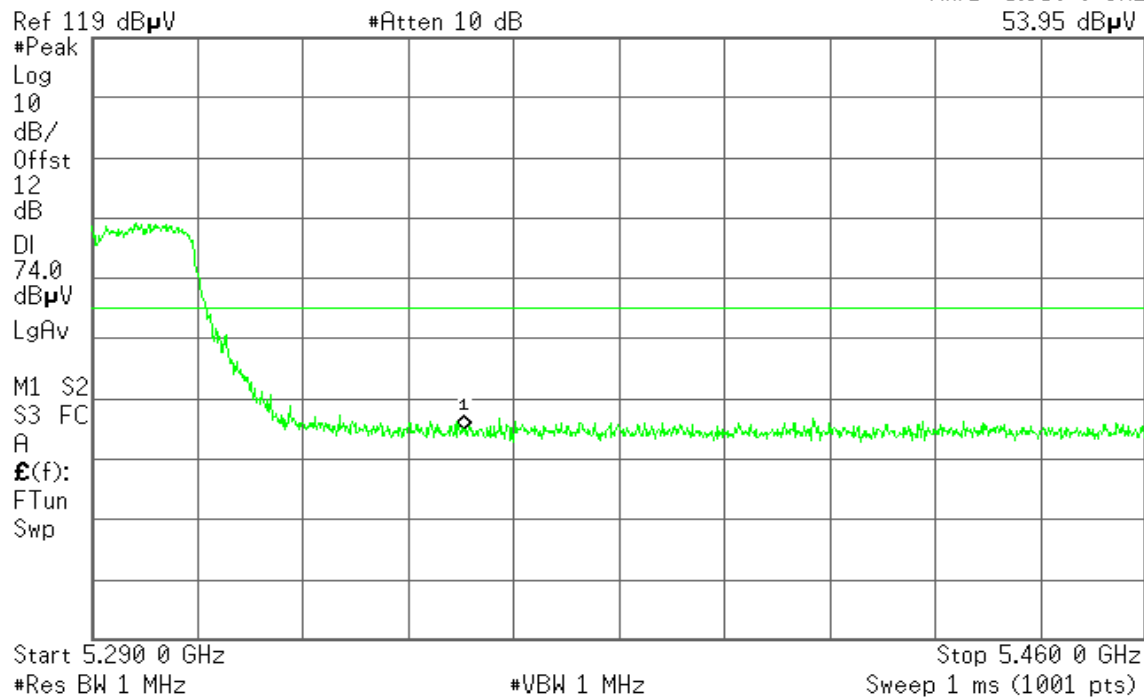
Detector mode: Peak

Polarity: Horizontal

Agilent 20:27:33 Oct 6, 2005

T

Mkr1 5.350 0 GHz
53.95 dBμV



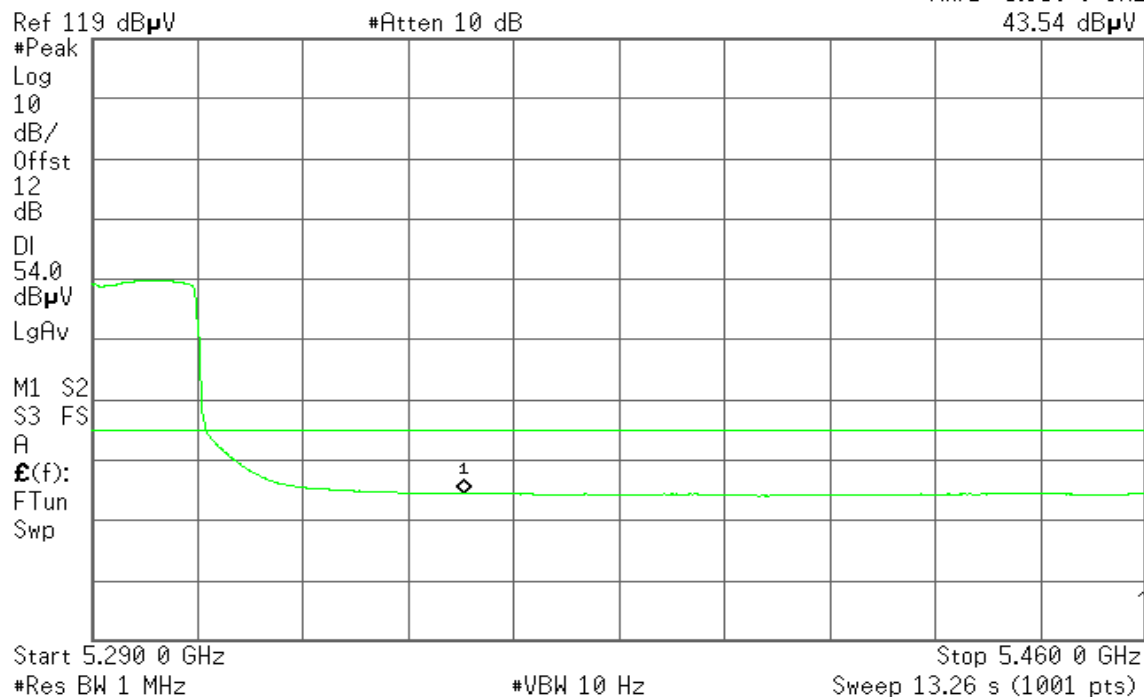
Detector mode: Average

Polarity: Horizontal

Agilent 20:28:16 Oct 6, 2005

T

Mkr1 5.350 0 GHz
43.54 dBμV





Omnidirectional antenna / 6.0 dBi for 5 GHz

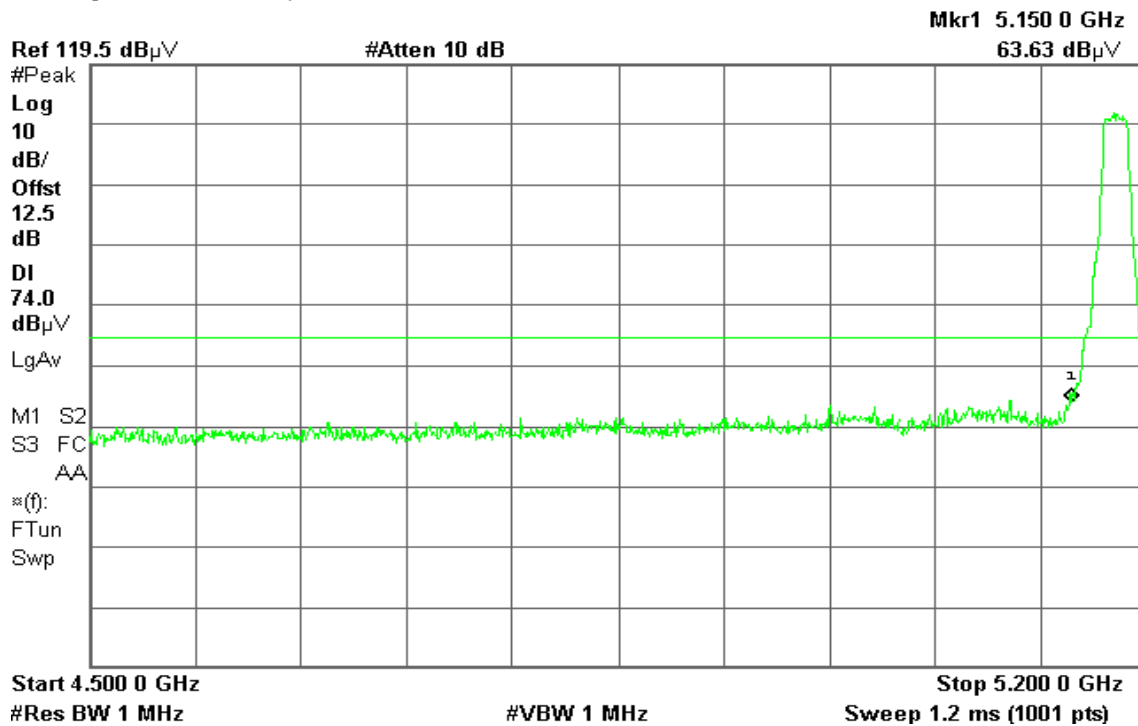
IEEE 802.11a Base mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 16:09:35 Sep 17, 2005

R L

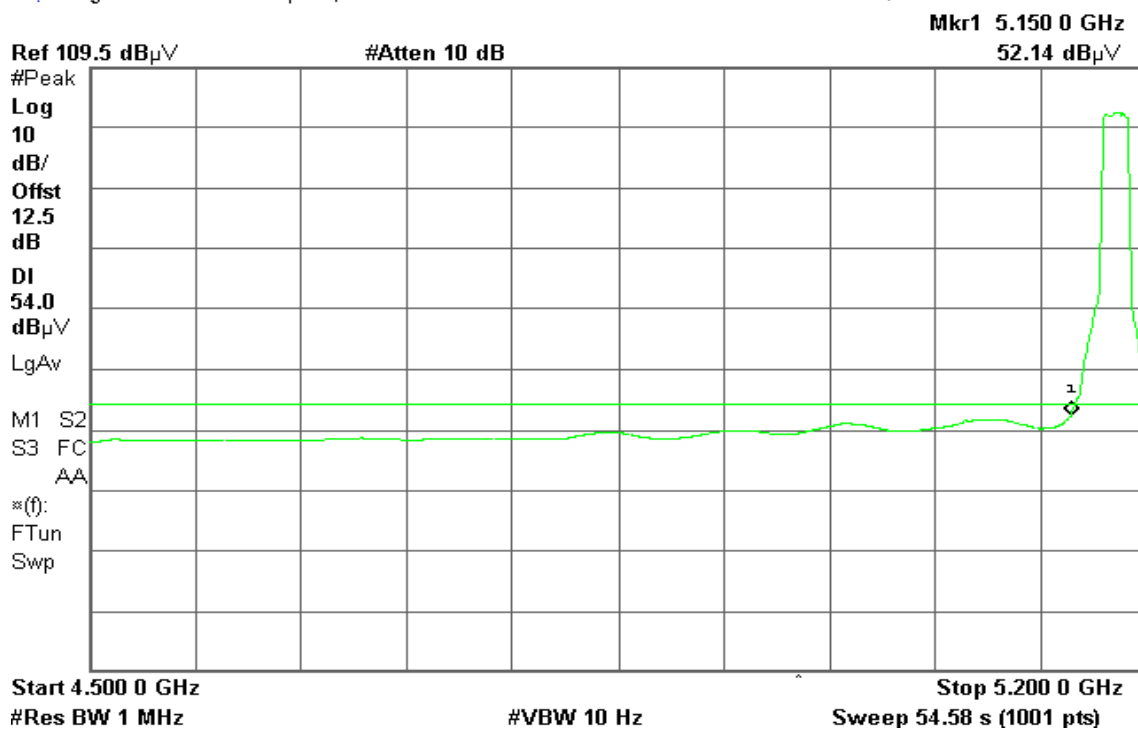


Detector mode: Average

Polarity: Vertical

Agilent 16:08:46 Sep 17, 2005

T

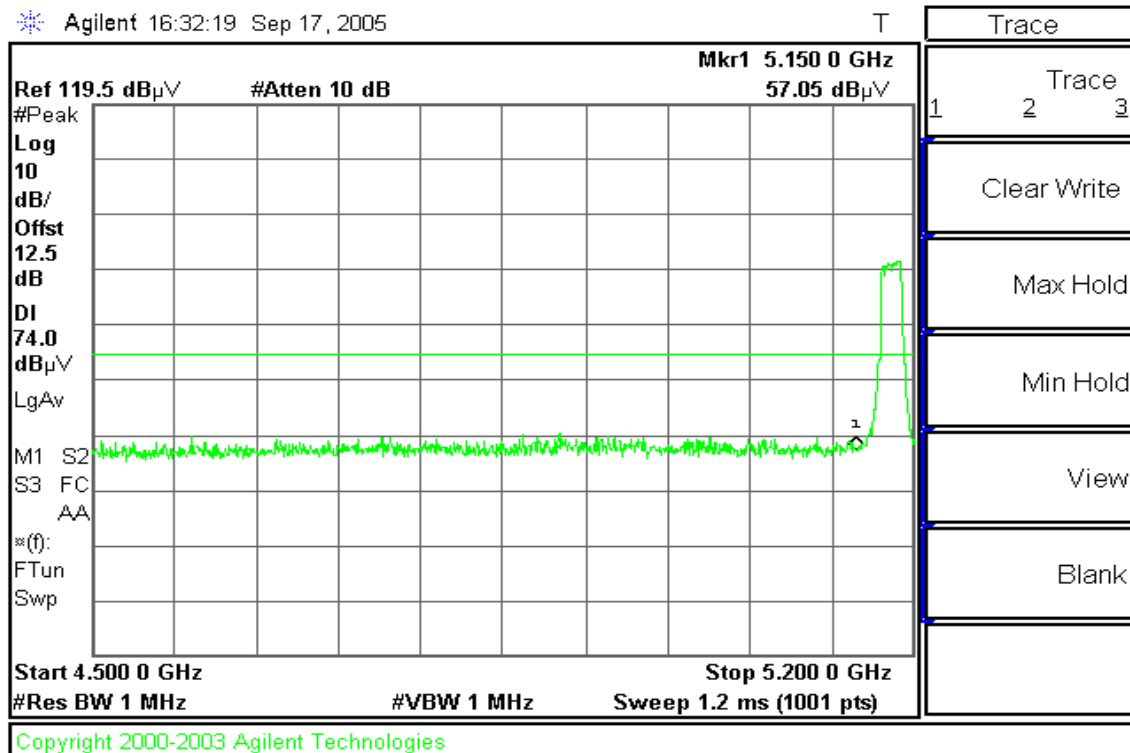




Detector mode: Peak

Polarity: Horizontal

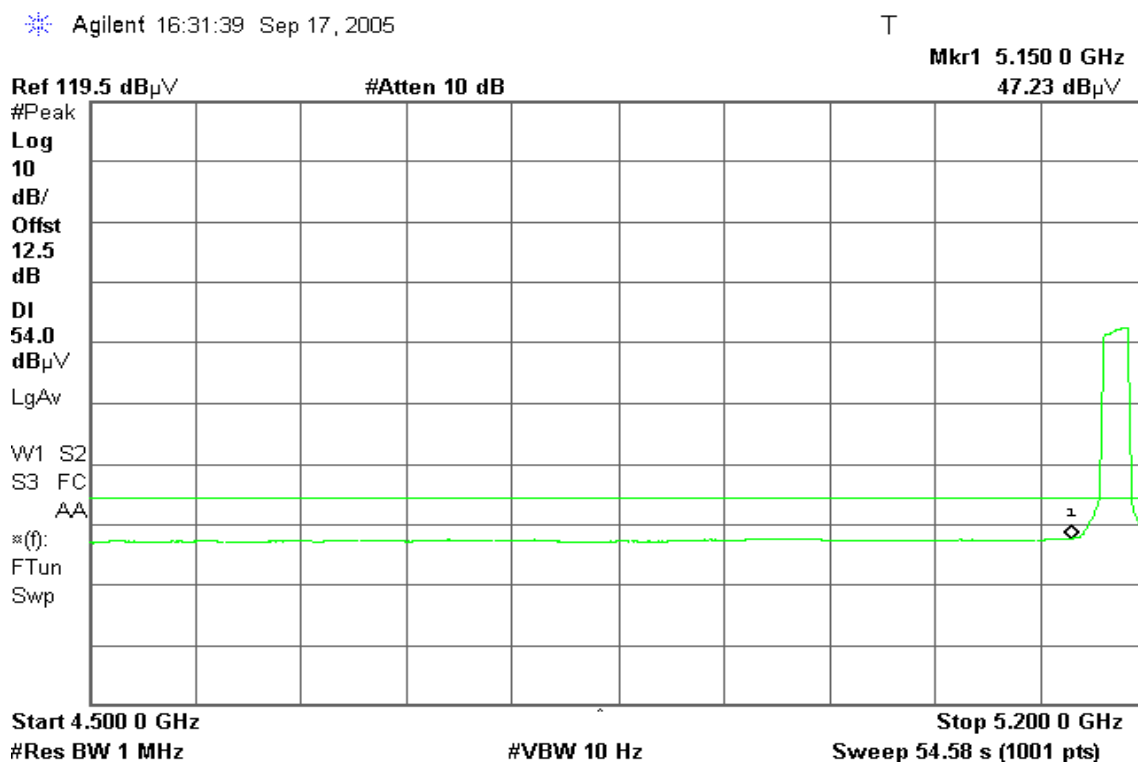
Agilent 16:32:19 Sep 17, 2005



Detector mode: Average

Polarity: Horizontal

Agilent 16:31:39 Sep 17, 2005





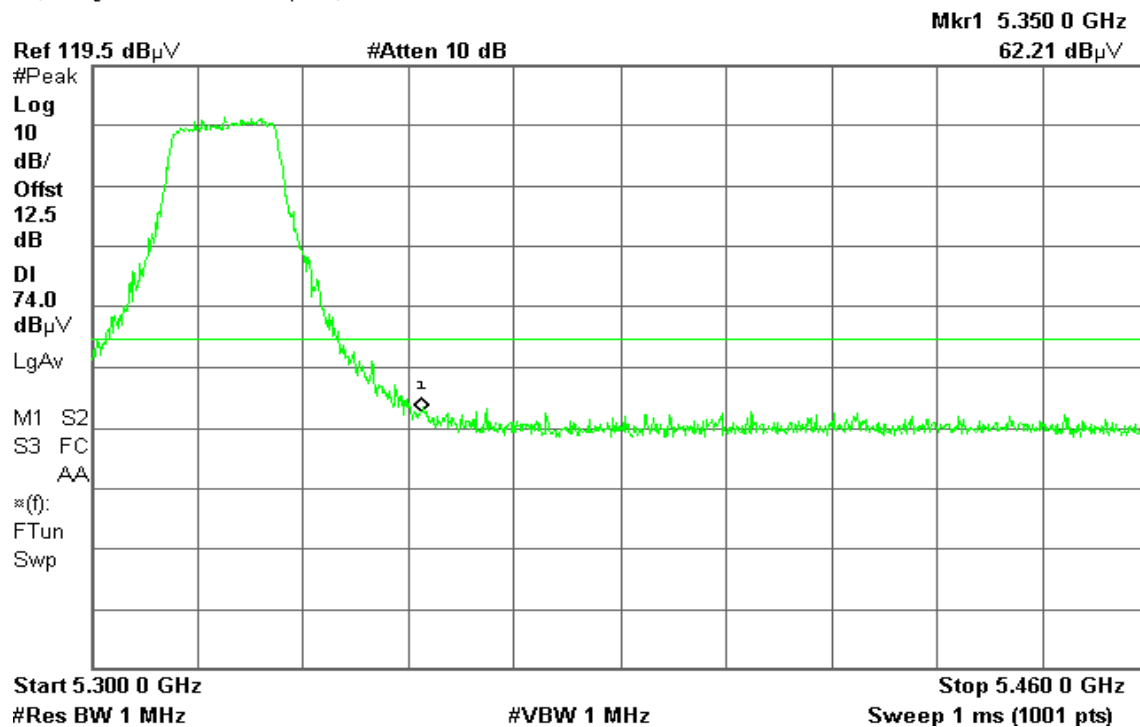
IEEE 802.11a Base mode / CH High

Detector mode: Peak

Polarity: Vertical

Agilent 16:14:50 Sep 17, 2005

T

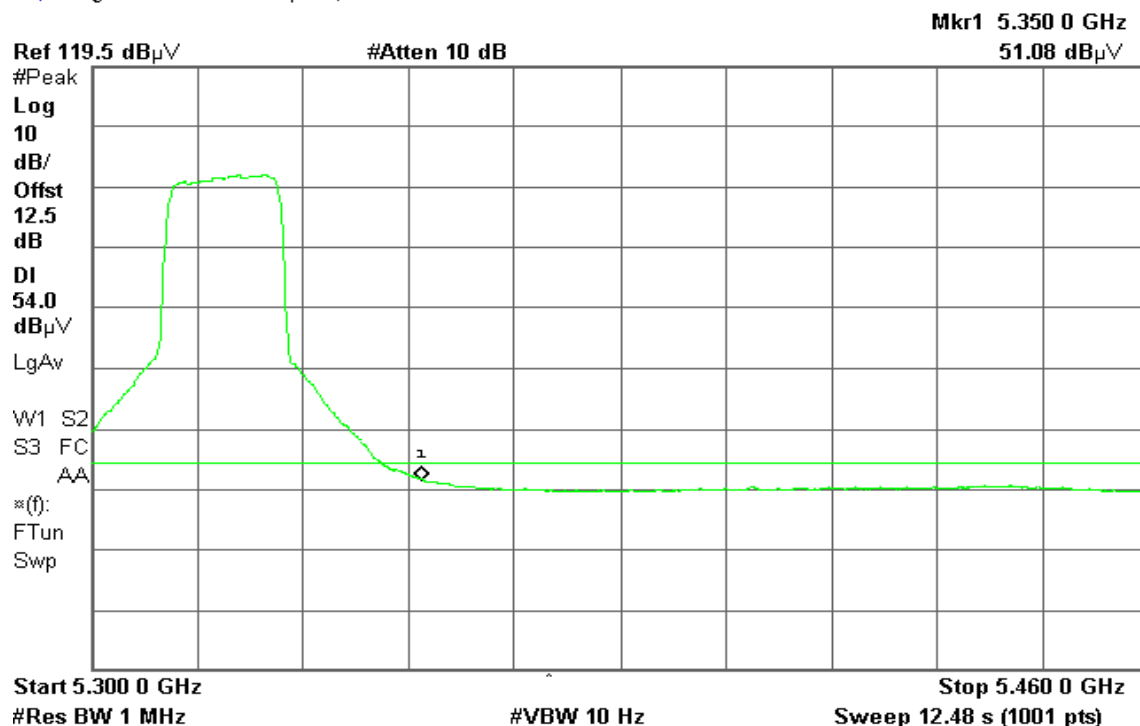


Detector mode: Average

Polarity: Vertical

Agilent 16:13:05 Sep 17, 2005

T



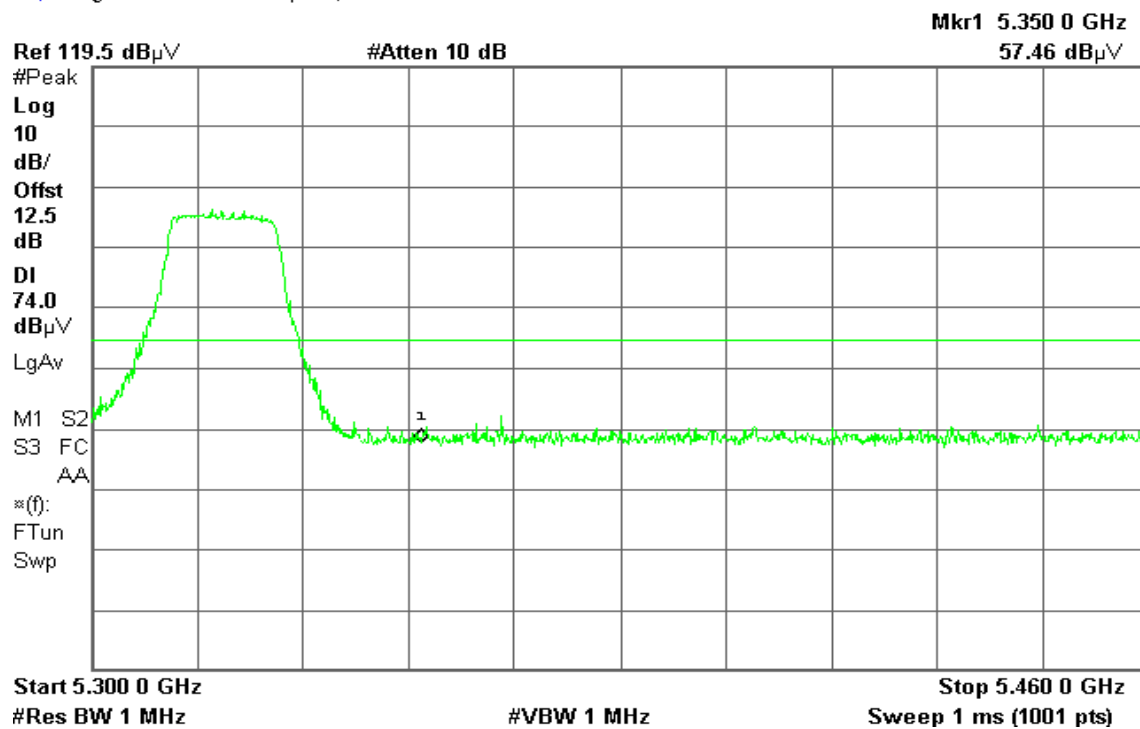


Detector mode: Peak

Polarity: Horizontal

Agilent 16:27:40 Sep 17, 2005

T

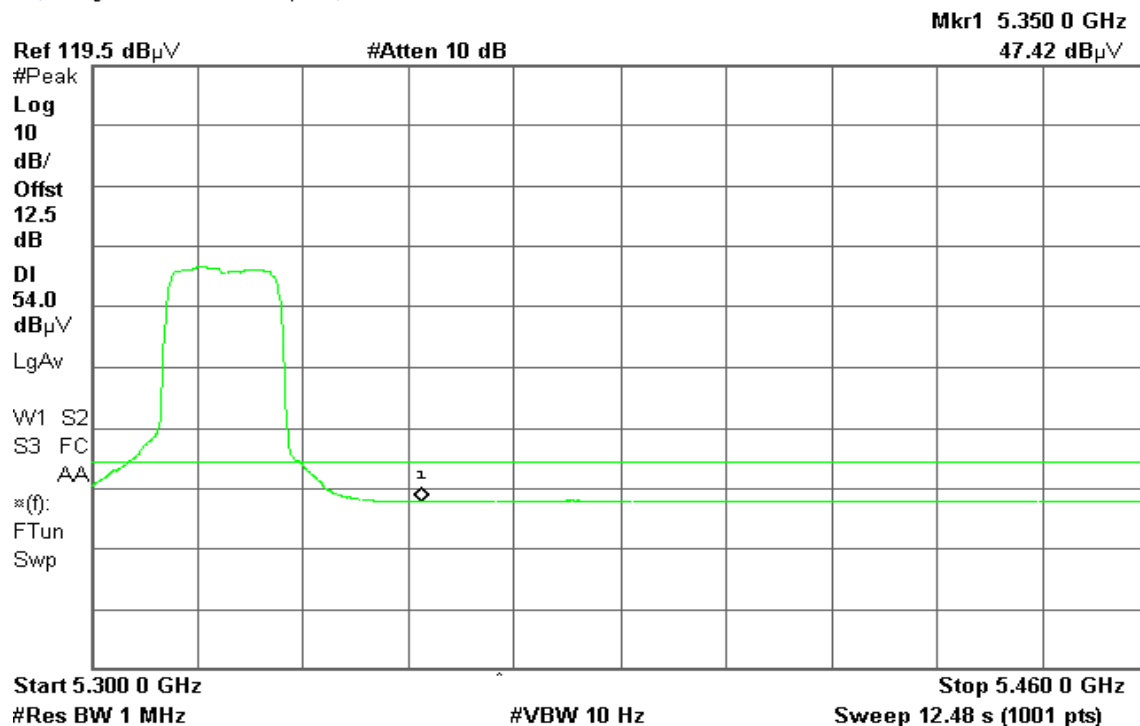


Detector mode: Average

Polarity: Horizontal

Agilent 16:26:28 Sep 17, 2005

T





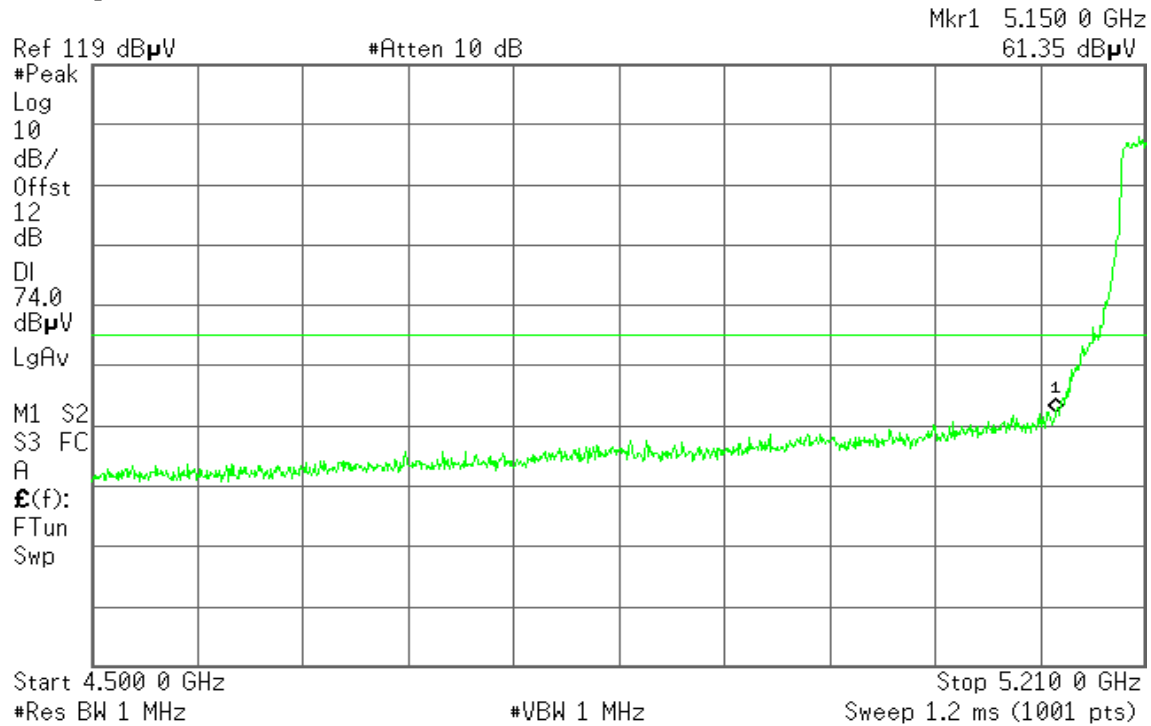
IEEE 802.11a Turbo mode / CH Low

Detector mode: Peak

Polarity: Vertical

Agilent 20:40:45 Oct 6, 2005

T

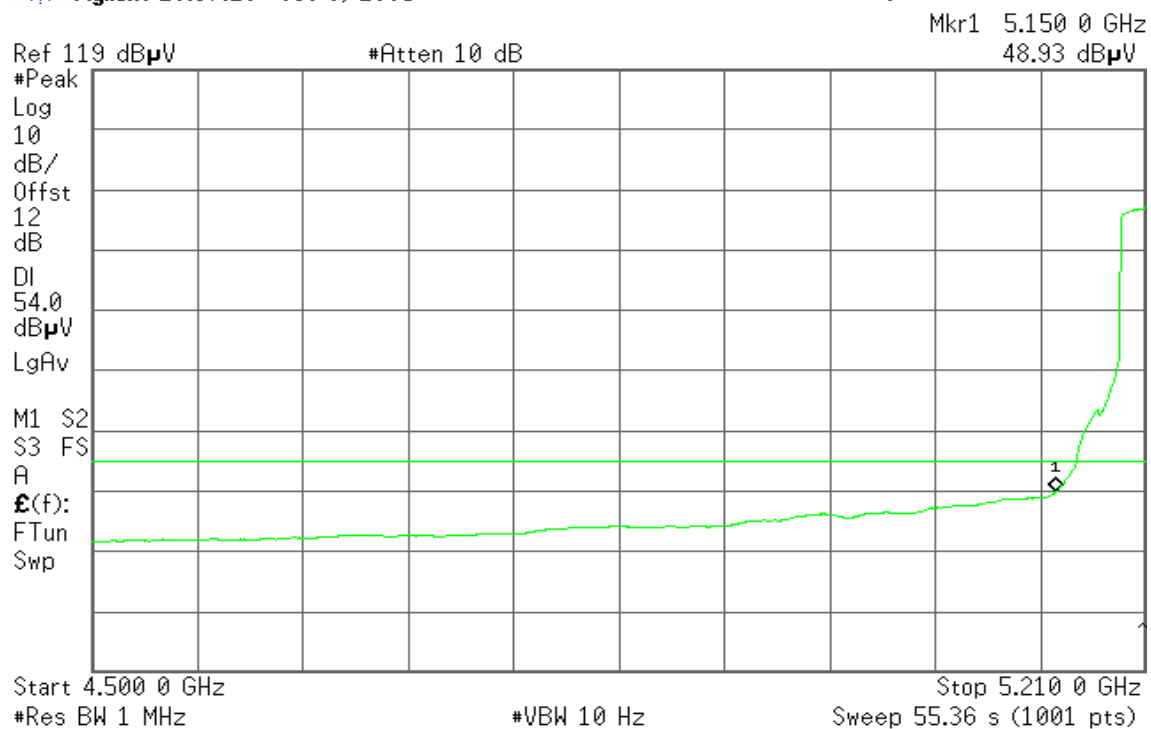


Detector mode: Average

Polarity: Vertical

Agilent 20:37:28 Oct 6, 2005

T

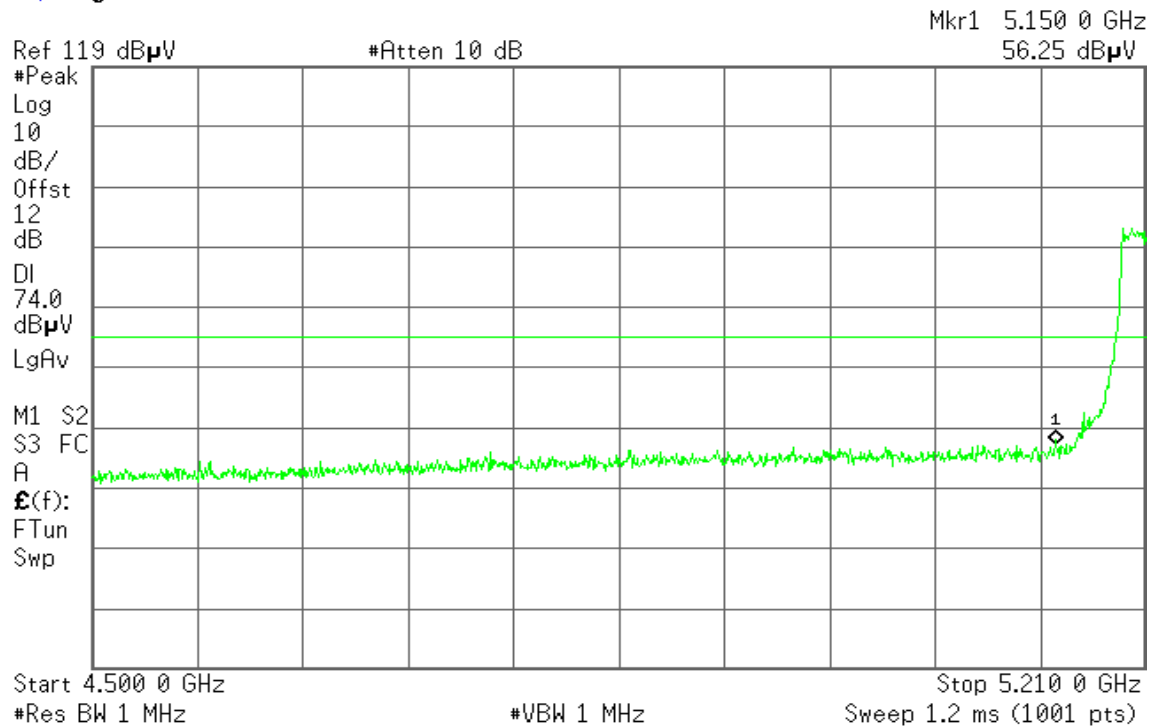




Detector mode: Peak

Polarity: Horizontal

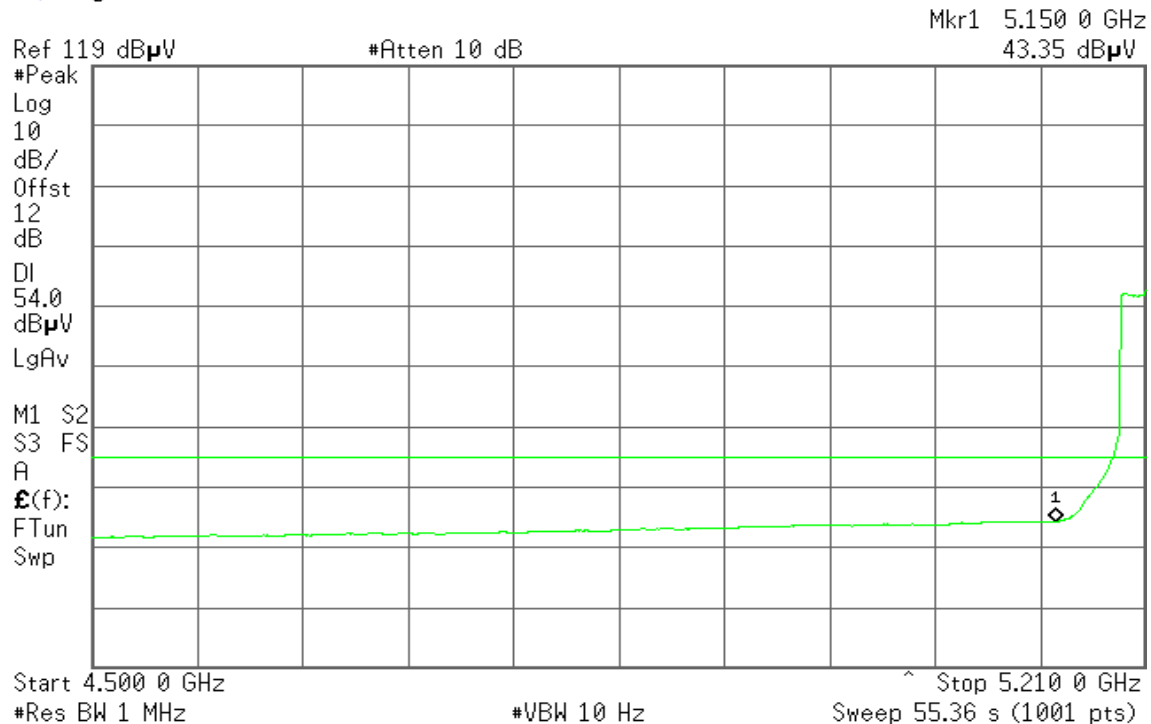
Agilent 20:10:02 Oct 6, 2005



Detector mode: Average

Polarity: Horizontal

Agilent 20:33:04 Oct 6, 2005





IEEE 802.11a Turbo mode / CH High

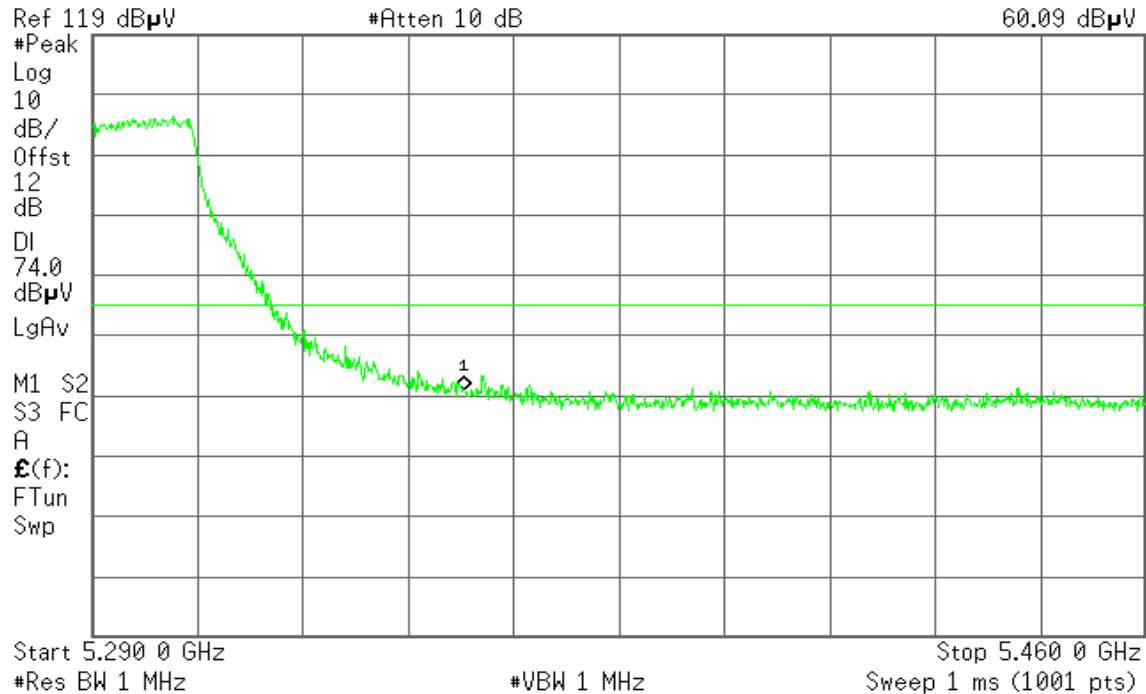
Detector mode: Peak

Polarity: Vertical

Agilent 20:22:39 Oct 6, 2005

T

Mkr1 5.350 0 GHz
60.09 dB μ V



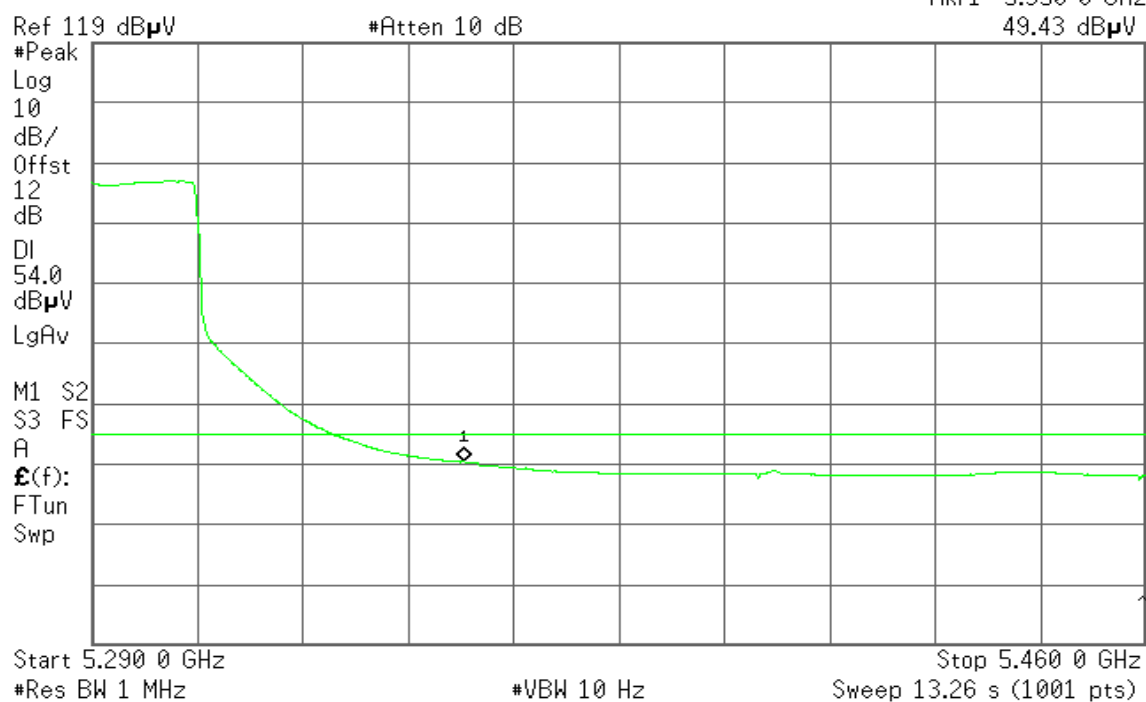
Detector mode: Average

Polarity: Vertical

Agilent 20:23:35 Oct 6, 2005

T

Mkr1 5.350 0 GHz
49.43 dB μ V





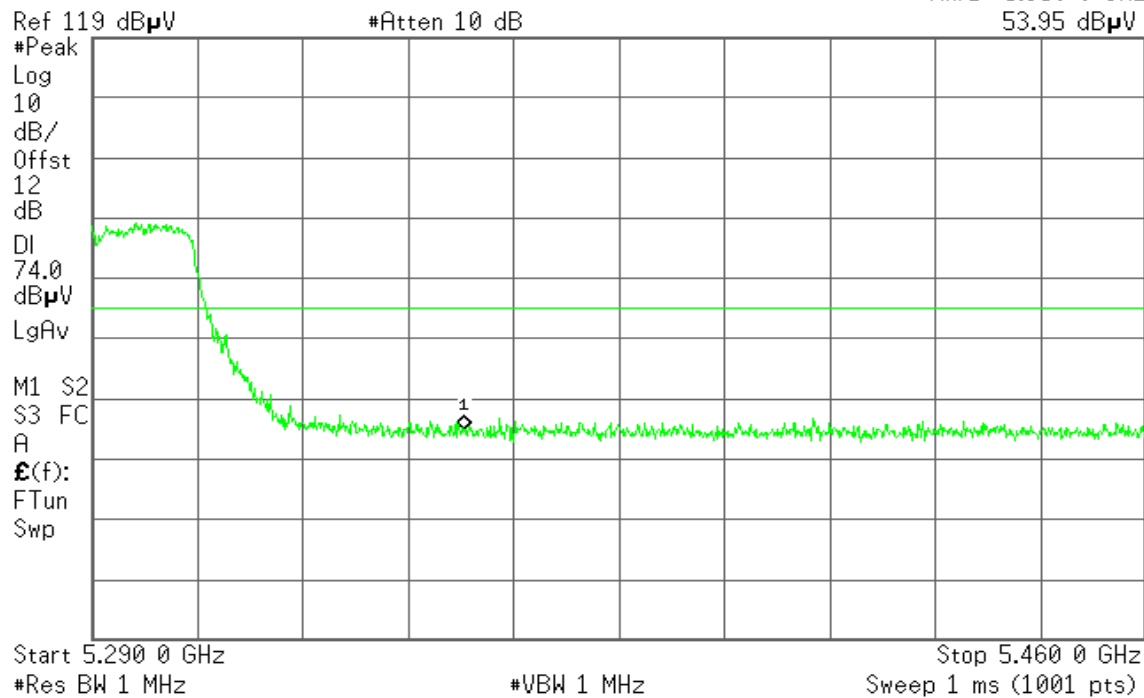
Detector mode: Peak

Polarity: Horizontal

Agilent 20:27:33 Oct 6, 2005

T

Mkr1 5.350 0 GHz
53.95 dB μ V



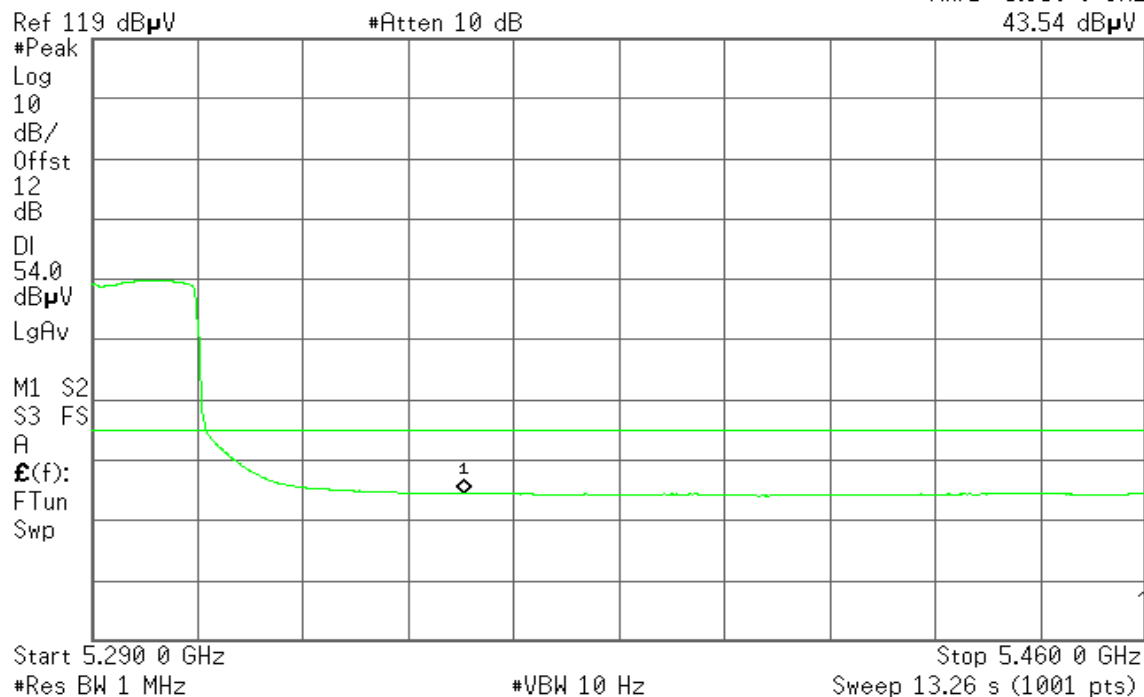
Detector mode: Average

Polarity: Horizontal

Agilent 20:28:16 Oct 6, 2005

T

Mkr1 5.350 0 GHz
43.54 dB μ V





7.4 PEAK POWER SPECTRAL DENSITY

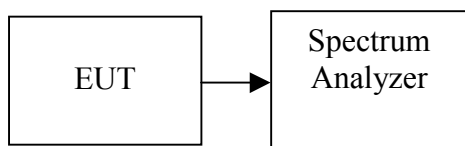
LIMIT

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.
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 = 1MHz, VBW = 3MHz, Span = Base mode 25 MHz / Turbo mode 50MHz, Sweep=Auto.
4. Record the max. reading.

Repeat the above procedure until the measurements for all frequencies are completed.

**TEST RESULTS***No non-compliance noted***Test Data****Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz**

Channel	Frequency (MHz)		PPSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	Base mode	5180	-0.385	4	-4.385	PASS
Mid		5260	1.857	11	-9.143	PASS
High		5320	1.524	11	-9.476	PASS
Low	Turbo mode	5210	-2.263	4	-6.263	PASS
Mid		5250	-1.401	4	-5.401	PASS
High		5290	-1.591	11	-12.591	PASS

Omnidirectional antenna / 6.0 dBi for 5 GHz

Channel	Frequency (MHz)		PPSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	Base mode	5180	-1.225	4	-5.225	PASS
Mid		5260	-0.550	11	-11.550	PASS
High		5320	-0.729	11	-11.729	PASS
Low	Turbo mode	5210	-3.047	4	-7.047	PASS
Mid		5250	-3.216	4	-7.216	PASS
High		5290	-3.305	11	-14.305	PASS

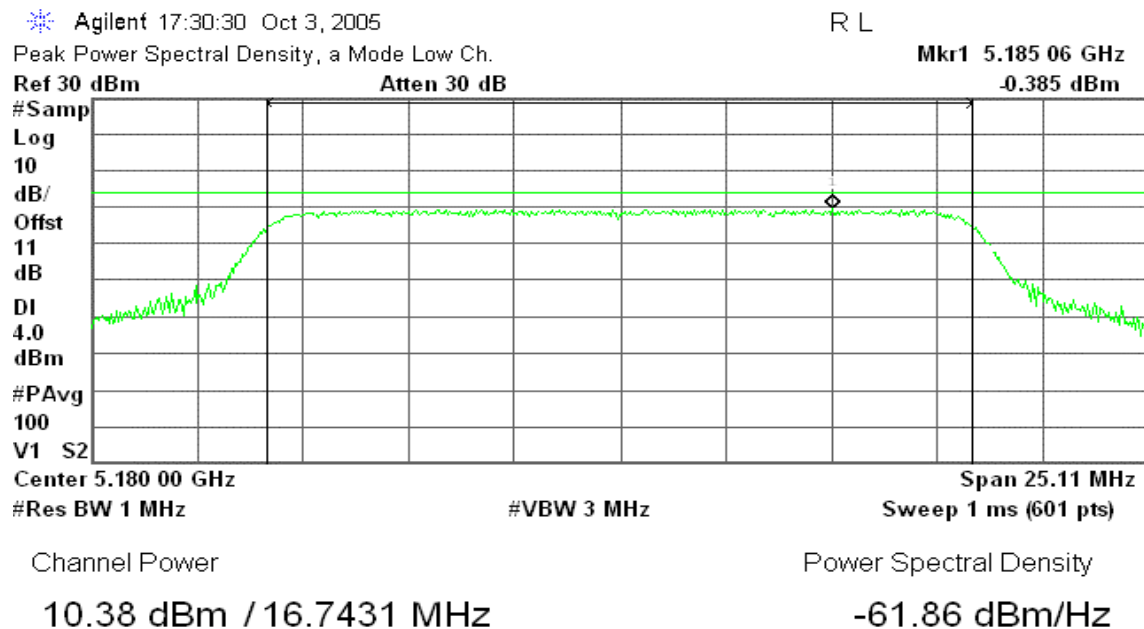


Test Plot

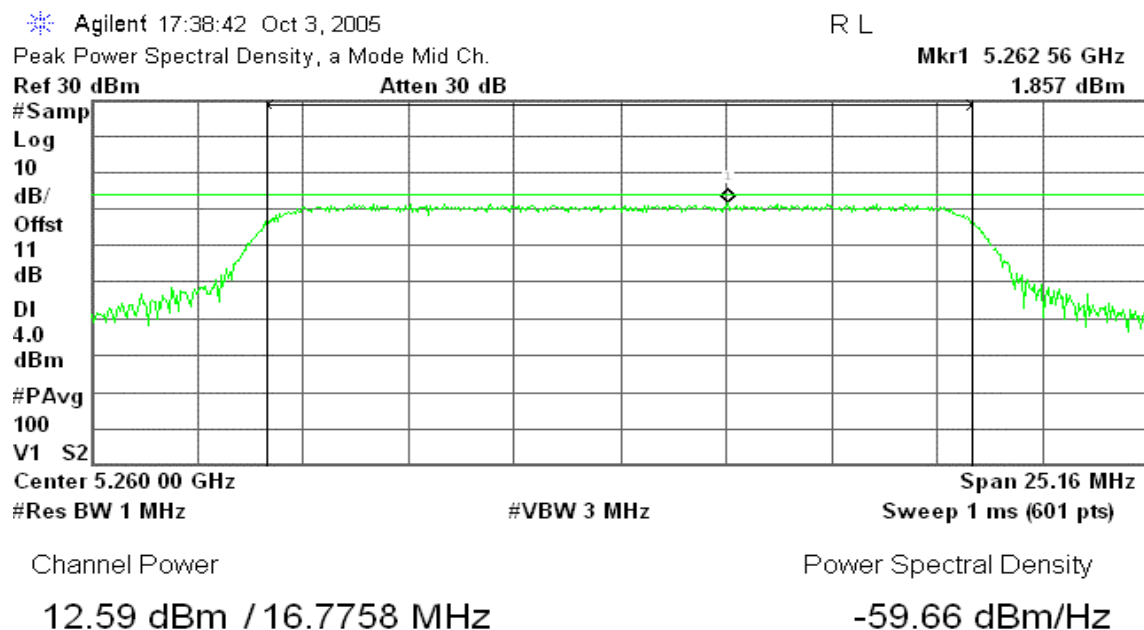
Omnidirectional Panel antenna / 3.0 dBi for 2.4 GHz and 5 GHz

IEEE 802.11a Base mode

CH Low



CH Mid





CH High

Agilent 17:45:01 Oct 3, 2005

R L

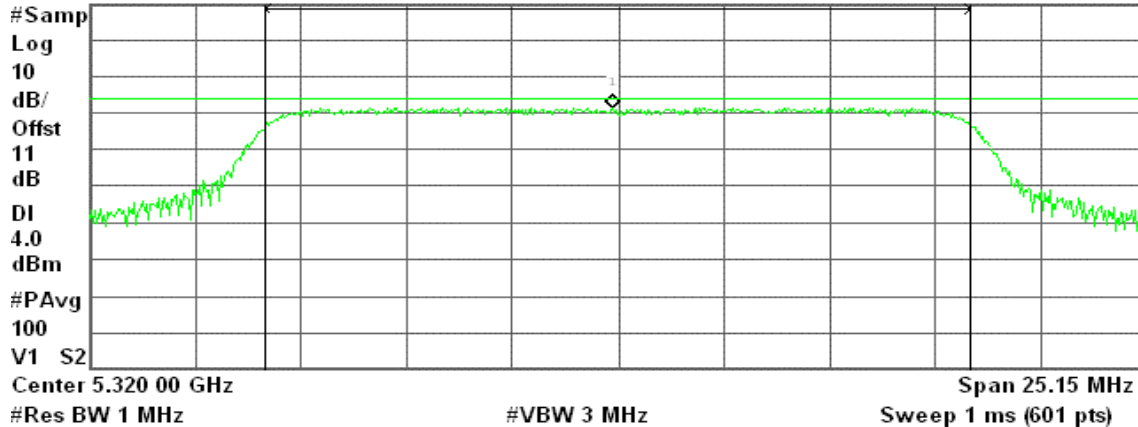
Peak Power Spectral Density, a Mode High Ch.

Mkr1 5.319 83 GHz

Ref 30 dBm

Atten 30 dB

1.524 dBm



Channel Power

Power Spectral Density

12.71 dBm / 16.7670 MHz

-59.53 dBm/Hz

IEEE 802.11a Turbo mode

CH Low

Agilent 18:28:57 Oct 3, 2005

R L

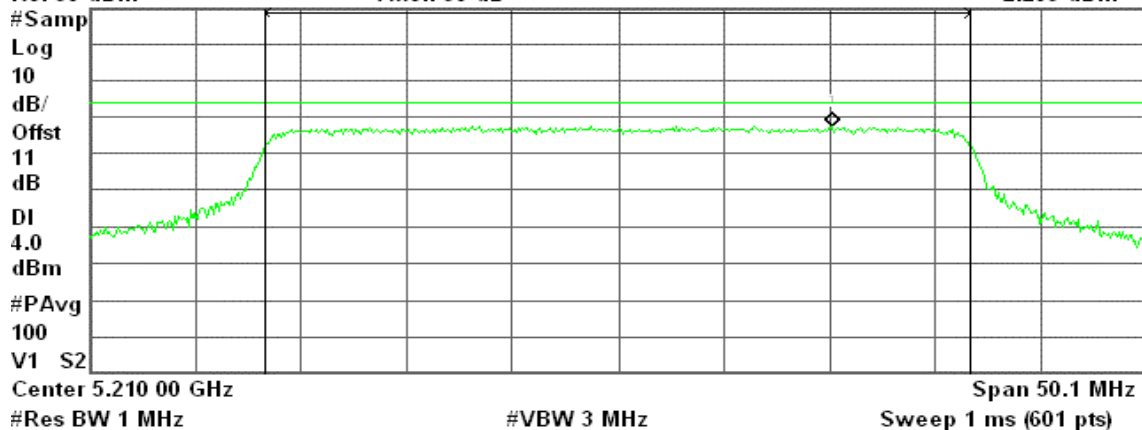
Peak Transmit Power, a turbo Mode Low Ch.

Mkr1 5.220 19 GHz

Ref 30 dBm

Atten 30 dB

-2.263 dBm



Channel Power

Power Spectral Density

11.99 dBm / 33.4000 MHz

-63.24 dBm/Hz



CH Mid

Agilent 18:33:42 Oct 3, 2005

R L

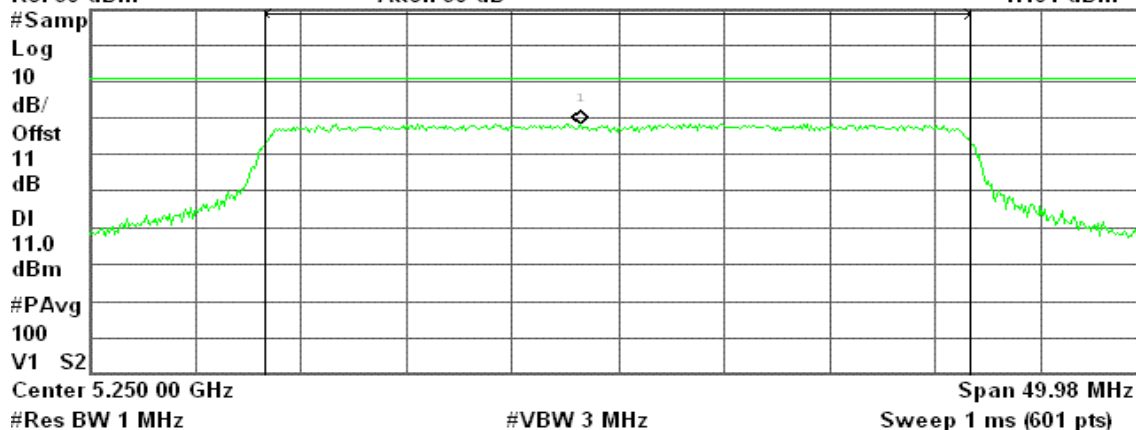
Peak Transmit Power, a turbo Mode Mid Ch.

Mkr1 5.248 17 GHz

Ref 30 dBm

Atten 30 dB

-1.401 dBm



Channel Power

Power Spectral Density

12.05 dBm / 33.3200 MHz

-63.18 dBm/Hz

CH High

Agilent 18:45:18 Oct 3, 2005

R L

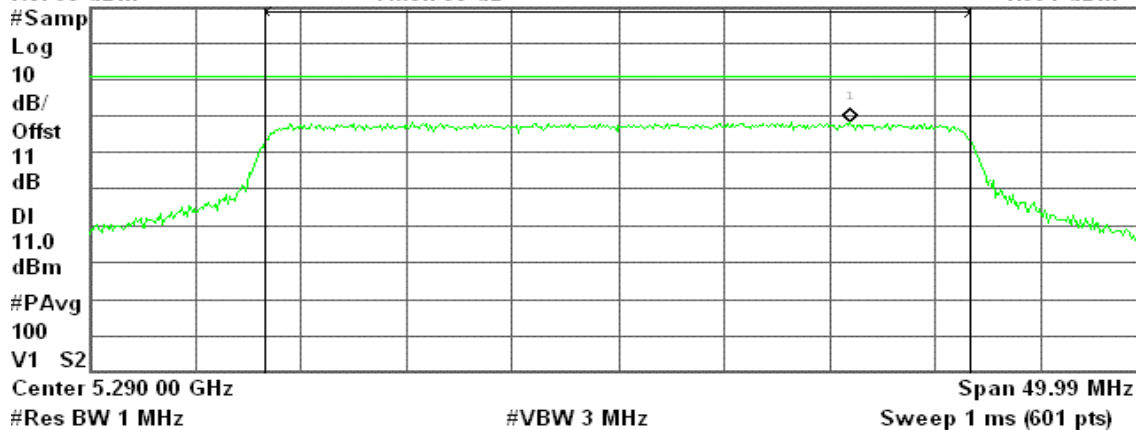
Peak Transmit Power, a turbo Mode High Ch.

Mkr1 5.301 00 GHz

Ref 30 dBm

Atten 30 dB

-1.591 dBm



Channel Power

Power Spectral Density

12.31 dBm / 33.3300 MHz

-62.92 dBm/Hz