FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

Wireless 802.11N DUAL BAND MINI PCI MODULE

Model: WM821-M-LS

Trade Name: Linksys

Issued to

Cisco-Linksys LLC
121 Theory Drive
Irvine, CA 92617(USA)

Issued by

Compliance Certification Services Inc.
No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,
Taoyuan Hsien, (338) Taiwan, R.O.C.
http://www.ccsemc.com.tw
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ACCREDITED
TESTING CERT #0024.01

TAF
Testing Laboratory
0363

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1. TEST RESULT CERTIFICATION

Applicant: Cisco-Linksys LLC
121 Theory Drive
Irvine, CA 92617(USA)

Equipment Under Test: Wireless 802.11N DUAL BAND MINI PCI MODULE

Trade Name: Linksys

Model: WM821-M-LS

Date of Test: October 3 ~ 26, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart E	No non-compliance noted
Deviation from Applicable Standard	
N/A	

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:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Amanda Wu
Section Manager
Compliance Certification Services Inc.

2. SUMMARY OF TEST RESULTS

THE EUT has been tested according to the following specifications:

Applied Standard: FCC Part 15, Subpart E			
Standard Paragraph	**Test Parameter**	**Result**	**Remark**
8.1 15.303 (c)	26dB Bandwidth	Pass	Meet the requirement of limit.
8.2 15.407 (a)	Maximum conducted output power	Pass	Meet the requirement of limit.
8.3 15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.
8.4 15.407 (a)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
8.5 15.407 (a)(6)	Peak Excursion	Pass	Meet the requirement of limit.
8.9 15.407 (h) & FCC 06-96	Dynamic Frequency Selection	Pass	Meet the requirement of limit.
8.10.1 15.407 (b)	Conducted Undesirable Emission	Pass	Meet the requirement of limit.
8.10.2.1 15.209(a)	Radiated Undesirable Emission (Above 1 GHz)	Pass	Dipole Antenna: Above 1 GHz: Minimum passing margin is -0.24dB at 8300.00 MHz PCB Antenna: Above 1 GHz: Minimum passing margin is -0.63 dB at 8300.00 MHz
8.10.2.4 15.209(a)	Radiated Undesirable Emission (Below 1 GHz)	Pass	Dipole Antenna: Below 1 GHz: Minimum passing margin is –7.54dB at 165.80 MHz PCB Antenna: Below 1 GHz: Minimum passing margin is –7.30dB at 165.80 MHz
8.11 15.207	Powerline Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -8.962dB at 0.198MHz.

3. EUT DESCRIPTION

Product	Wireless 802.11N DUAL BAND MINI PCI MODULE
Trade Name	Linksys
Model Number	WM821-M-LS
Model Discrepancy	N/A
Power Supply	Powered from host device.
Frequency Range	2.4GHz: 2400 ~ 2483.5MHz 5.0GHz: 5150 ~ 5250MHz, 5250 ~ 5350MHz, 5470 ~ 5725MHz, 5725 ~ 5850MHz
Number of Channels	IEEE 802.11a mode: 8 Channels for 5150 – 5350MHz draft 802.11n Standard-20 MHz Channel mode : 4 Channels draft 802.11n Wide-40 MHz Channel mode: 3 Channels IEEE 802.11a mode: 11channels for 5470 ~ 5725 MHz IEEE 802.11a mode: 5 Channels for 5725 - 5850 MHz draft 802.11n Standard-20 MHz Channel mode : 5 Channels draft 802.11n Wide-40 MHz Channel mode: 2 Channels IEEE 802.11b/g mode: 11 Channels draft 802.11n Standard-20 MHz Channel mode: 11 Channels draft 802.11n Wide-40 MHz Channel mode: 7 Channels
Modulation Technique	IEEE 802.11a: OFDM draft 802.11n Standard-20 MHz Channel mode: OFDM draft 802.11n Wide-40 MHz Channel mode: OFDM IEEE 802.11b mode: DSSS IEEE 802.11g mode: OFDM draft 802.11n Standard-20 MHz Channel mode: OFDM draft 802.11n Wide-40 MHz Channel mode: OFDM
Data Rate	IEEE 802.11a: DTS: 1, 2, 5.5, 11Mbps / UNII 6, 9, 12, 18, 24, 36, 48, 54 Mbps draft 802.11n Standard-20 MHz Channel mode: 6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps draft 802.11n Wide-40 MHz Channel mode: 13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps IEEE 802.11b mode: 1, 2, 5.5, 11 Mpbs IEEE 802.11g mode: 6, 9, 12, 18, 24, 36, 48, 54 Mpbs draft 802.11n Standard-20 MHz Channel mode: 6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps draft 802.11n Wide-40 MHz Channel mode: 13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps
Transmit Power	IEEE 802.11a mode for DTS: 16.41 dBm draft 802.11n Standard-20 MHz Channel mode: 17.53 dBm draft 802.11n Wide-40 MHz Channel mode: 17.38 dBm IEEE 802.11a mode for UNII (5150 ~ 5350MHz): 12.11 dBm draft 802.11n Standard-20 MHz Channel mode: 13.77 dBm draft 802.11n Wide-40 MHz Channel mode: 13.48 dBm IEEE 802.11a mode for UNII (5470 ~ 5725MHz): 13.08 dBm IEEE 802.11b mode: 20.99 dBm IEEE 802.11g mode: 17.88 dBm draft 802.11n Standard-20 MHz Channel mode: 21.94 dBm draft 802.11n Wide-40 MHz Channel mode: 23.11 dBm

Antenna Specification	Dipole Antenna / 2.4GHz: Gain: 1.8 dBi, 5.0GHz: 1.3 dB PCB Antenna / 2.4GHz: Gain: 1.8 dBi (excluding cable loss: 0.7 dB) for 25cm cable 1.8 dBi (excluding cable loss: 0.9 dB) for 30cm cable 1.8 dBi (excluding cable loss: 1.3dB) for 45cm cable 5.0GHz: Gain: 1.8 dBi (excluding cable loss: 1.1 dB) for 25cm cable 1.8 dBi (excluding cable loss: 1.3 dB) for 30cm cable 1.8 dBi (excluding cable loss: 2 dB) for 45cm cable
Antenna and cable	1. Dipole antenna + 18cm cable + 10cm cable 2. Dipole antenna + 20cm cable + 10cm cable 3. Dipole antenna + 10cm cable + 10cm cable + 10cm cable 4. Dipole antenna + 24cm cable + 31.5cm cable + 24cm cable 5. PCB antenna + 30cm cable + 25cm cable + 45cm cable

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: **Q87-WM821M**filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.*
3. *The frequency bands used in this EUT are listed as follows:*

Frequency Band (MHz)	2400 ~ 2483.5	5150 ~ 5250	5250 ~ 5350	5470 ~ 5725	5725 ~ 5850
802.11b	Yes				
802.11g	Yes				
802.11a		Yes	Yes	Yes	Yes
802.11n(20MHz)	Yes	Yes			Yes
802.11n(40MHz)	Yes	Yes			Yes

4. 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.

4.1 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.

4.2 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.

4.3 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.

4.4 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.

4.5 DESCRIPTION OF TEST MODES

The EUT (model: WM821-M-LS) had been tested under operating condition.

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

This EUT comes with 2 sets of antennae (Dipole antenna and PCB antenna) for sale.

- The Dipole antenna is with 5 different lengths of cables: 18cm and 10cm and 20cm and 24cm and 31.5cm and 24cm and 30cm.
- The PCB antenna is with 3 different lengths of cables: 30cm and 25cm and 45cm.

The EUT is a 2x3 configuration spatial MIMO (2Tx & 3Rx) without beam forming function but with cyclic delay diversity function that operate in double TX chains and triple RX chains. The 2x3 configuration is implemented with two outside TX & RX chains (Chain 1 and the middle RX chain (chain 0).

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

IEEE 802.11a mode:
Channel Low (5180MHz), Channel Mid (5260MHz) and Channel High (5320MHz) with 6Mbps data rate were chosen for full testing.

draft 802.11n Standard-20 MHz Channel mode:
Channel Low (5180MHz) with 6.5Mbps data rate were chosen for full testing.

draft 802.11n Wide-40 MHz Channel mode:
Channel Low (5190MHz) with 13.5Mbps data rate were chosen for full testing.

IEEE 802.11a mode:
Channel Low (5500MHz), Channel Mid (5600MHz) and Channel High (5700MHz) with 6Mbps data rate were chosen for full testing.

The following test modes were scanned during the preliminary test as per client request:
Mode 1: Dipole antenna + 18cm cable + 10cm cable

Mode 2: Dipole antenna + 20cm cable + 10cm cable

Mode 3: Dipole antenna + 10cm cable + 10cm cable + 10cm cable

Mode 4: Dipole antenna + 24cm cable + 31.5cm cable + 24cm cable

Mode 5: PCB antenna + 30cm cable + 25cm cable + 45cm cable

After the preliminary scan, the following test mode was found to produce the highest emission level.

Mode 2, 5

5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

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

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

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

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/30/2008

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	08/01/2008
Test Receiver	Rohde&Schwarz	ESCI	100064	11/13/2007
Switch Controller	TRC	Switch Controller	SC94050010	05/04/2008
4 Port Switch	TRC	4 Port Switch	SC94050020	05/04/2008
Horn-Antenna	TRC	HA-0502	06	06/05/2008
Horn-Antenna	TRC	HA-0801	04	06/20/2008
Horn-Antenna	TRC	HA-1201A	01	07/09/2008
Horn-Antenna	TRC	HA-1301A	01	07/17/2008
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/29/2008
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC: 965860 IC: IC 6106	09/25/2008
Test S/W	LABVIEW (V 6.1)			

Remark: *The measurement uncertainty is less than +/-2.0065dB (30MHz ~ 1GHz), +/-3.0958dB (Above 1GHz) 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	10/31/2007
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/12/2008
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	04/01/2008
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.*

Dynamic Frequency Selection				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Rohde&Schwarz	FSEK 30	100264	02/19/2008
Signal Generator	Agilent	E8267C	US42340162	12/05/2007

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

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

☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No. 11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

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

6.2 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.”

6.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	EN 55011, EN 55014-1/2, CISPR 11, CISPR 14-1/2, EN 55022, EN 55015, CISPR 22, CISPR 15, AS/NZS 3548, VCCI V3 (2001), CFR 47, FCC Part 15/18, CNS 13783-1, CNS 13439, CNS 13438, CNS 13803, CNS 14115, EN 55024, IEC 801-2, IEC 801-3, IEC 801-4, IEC/EN 61000-3-2, IEC/EN 61000-3-3, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 50081-1/ EN 61000-6-3, EN 50081-2/EN 61000-6-4, EN 50081-2/EN 61000-6-1: 2001	ACCREDITED TESTING CERT #0124.01
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, 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	TAF	EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	Testing Laboratory 0363
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 2324C-3, IC 2324C-5) / 3M Semi Anechoic Chamber (IC 6106)	IC 2324C-3 IC 2324C-5 IC 6106

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

7.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	ASUS	M5200AE	5BN0AG019631	PD9WM3B2100	N/A	AC I/P: Unshielded, 1.8m with a core DC O/P: Unshielded, 1.8m
2.	LCD Monitor	LG	L1740PQ	503KGXA2K858	BEJL17NU	Unshielded, 1.8m with 2 cores	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3.	USB Mouse	Dell	MO56UO	408031121	FCC DoC	Shielded, 1.8m	N/A
4.	USB Keyboard	Dell	Sk-8115	N/A	FCC DoC	Shielded, 1.8m	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.*

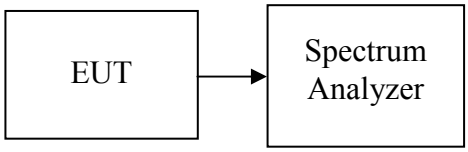
8. FCC PART 15 REQUIREMENTS

8.1 26 dB EMISSION BANDWIDTH

8.1.1 LIMIT

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



8.1.2 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 >26dB bandwidth, and Sweep = auto.
4. Mark the peak frequency and –26dB (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

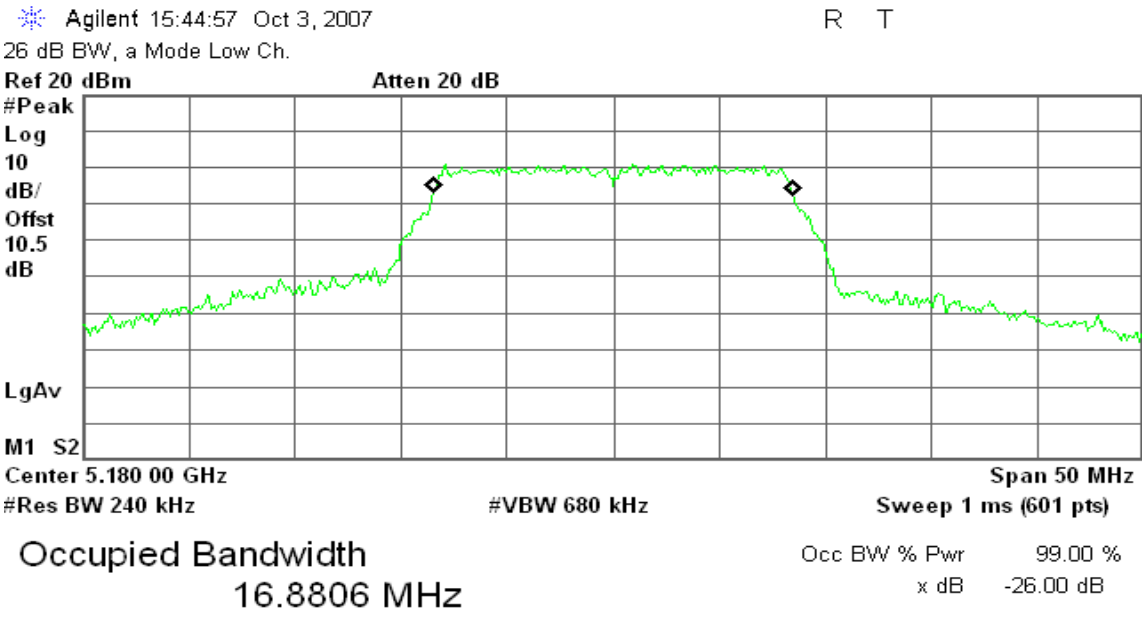
8.1.3 TEST RESULTS

No non-compliance noted

Test Data

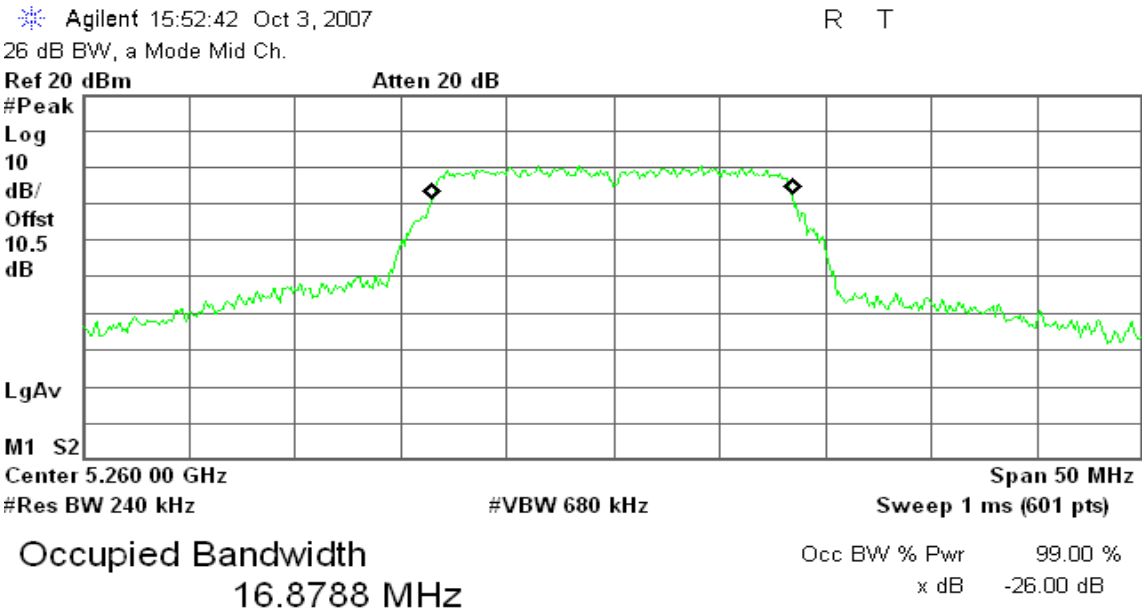
Test mode: IEEE 802.11a mode		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5180	20.241
Mid	5260	20.449
High	5320	20.472

26 dB Emission Bandwidth (CH Low)



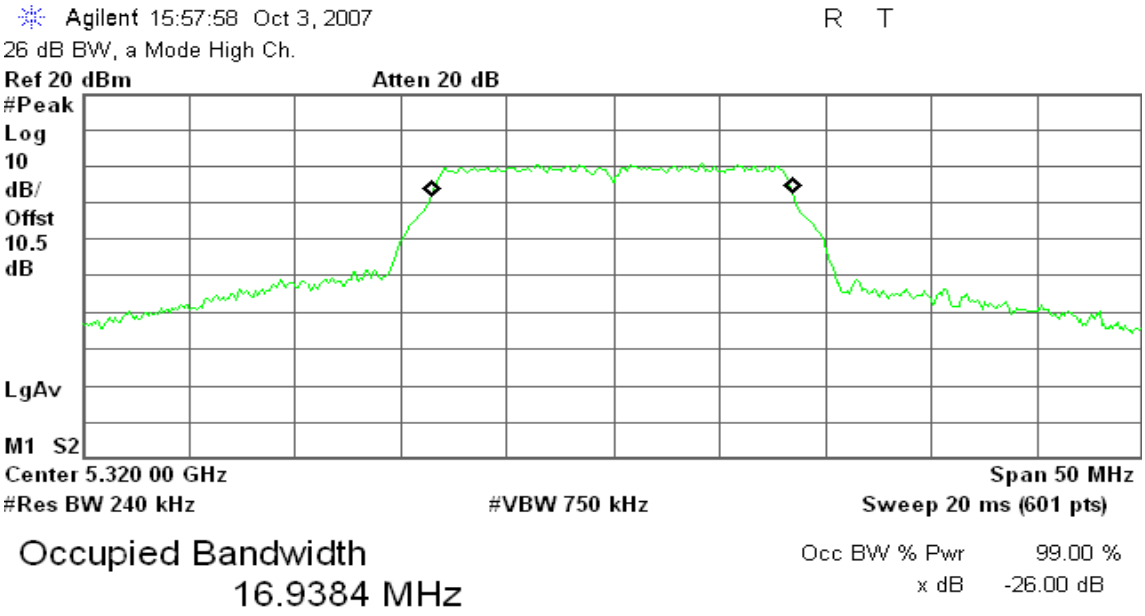
Transmit Freq Error	8.549 kHz
x dB Bandwidth	20.241 MHz

26 dB Emission Bandwidth (CH Mid)



Transmit Freq Error	-33.288 kHz
x dB Bandwidth	20.449 MHz

26 dB Emission Bandwidth (CH High)

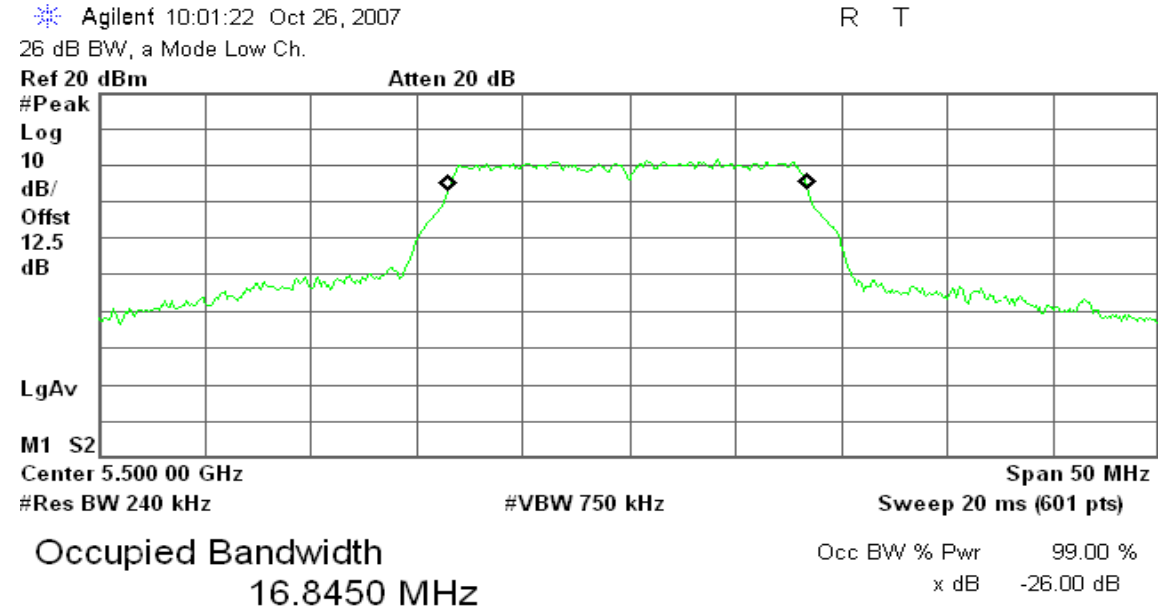


Transmit Freq Error	-42.961 kHz
x dB Bandwidth	20.472 MHz

Test Data

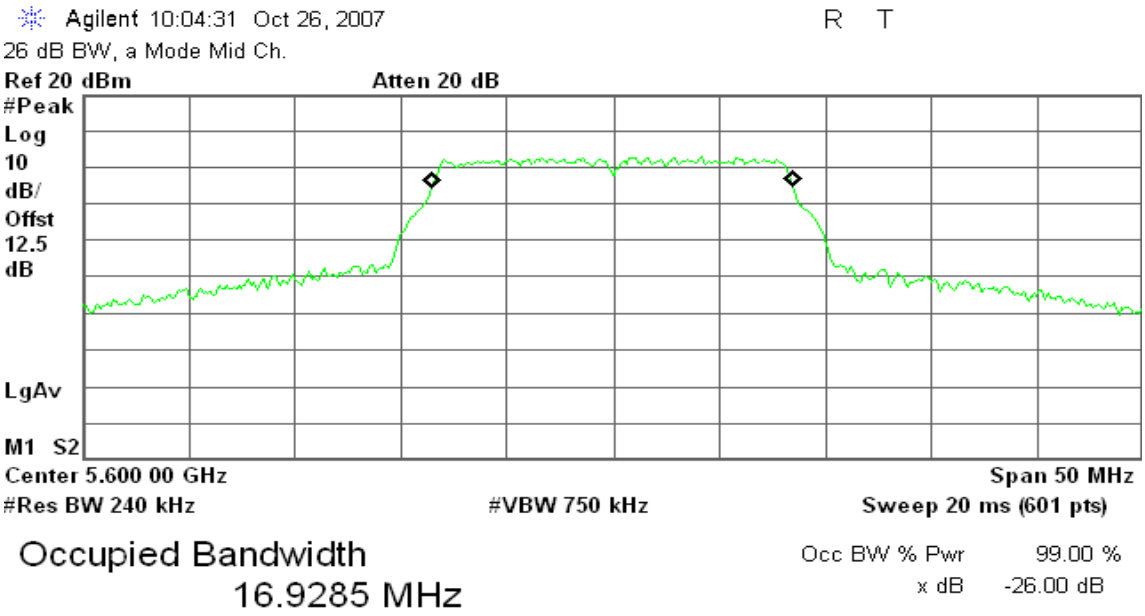
Test mode: IEEE 802.11a mode		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5500	20.436
Mid	5600	20.467
High	5700	20.483

26 dB Emission Bandwidth (CH Low)



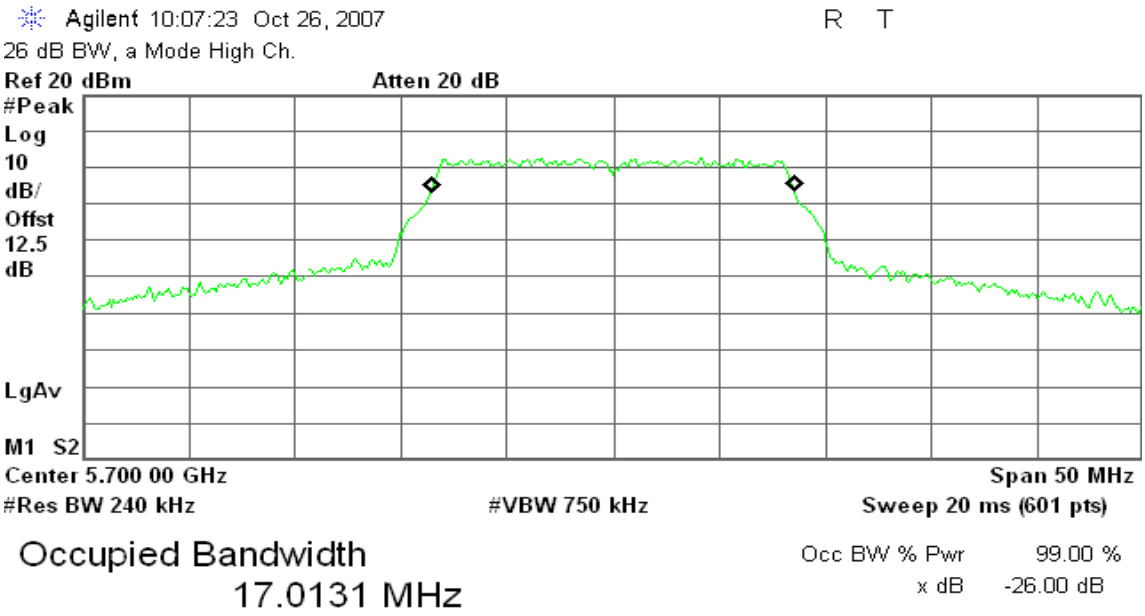
Transmit Freq Error	-51.411 kHz
x dB Bandwidth	20.436 MHz

26 dB Emission Bandwidth (CH Mid)



Transmit Freq Error	-23.070 kHz
x dB Bandwidth	20.467 MHz

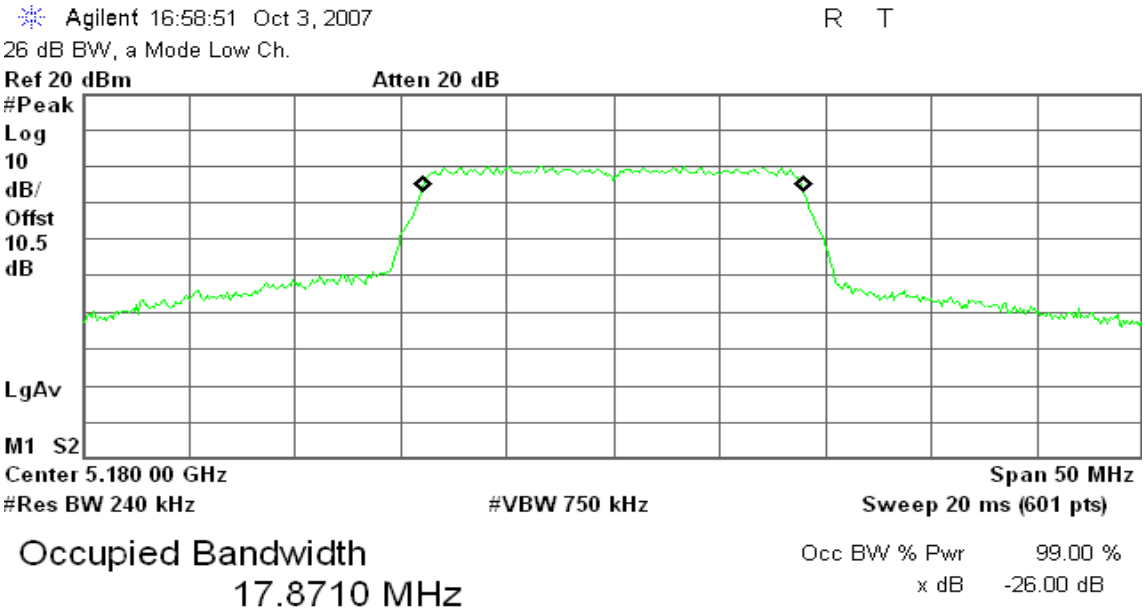
26 dB Emission Bandwidth (CH High)



Transmit Freq Error	-8.600 kHz
x dB Bandwidth	20.483 MHz

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5180	20.598

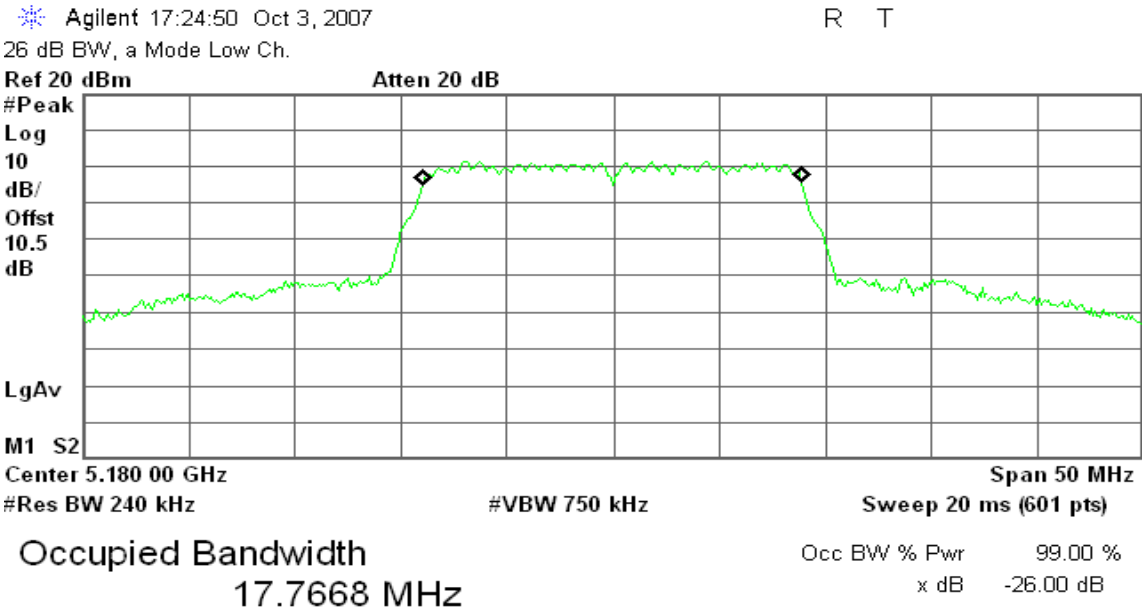
26 dB Emission Bandwidth (CH Low)



Transmit Freq Error	-21.044 kHz
x dB Bandwidth	20.598 MHz

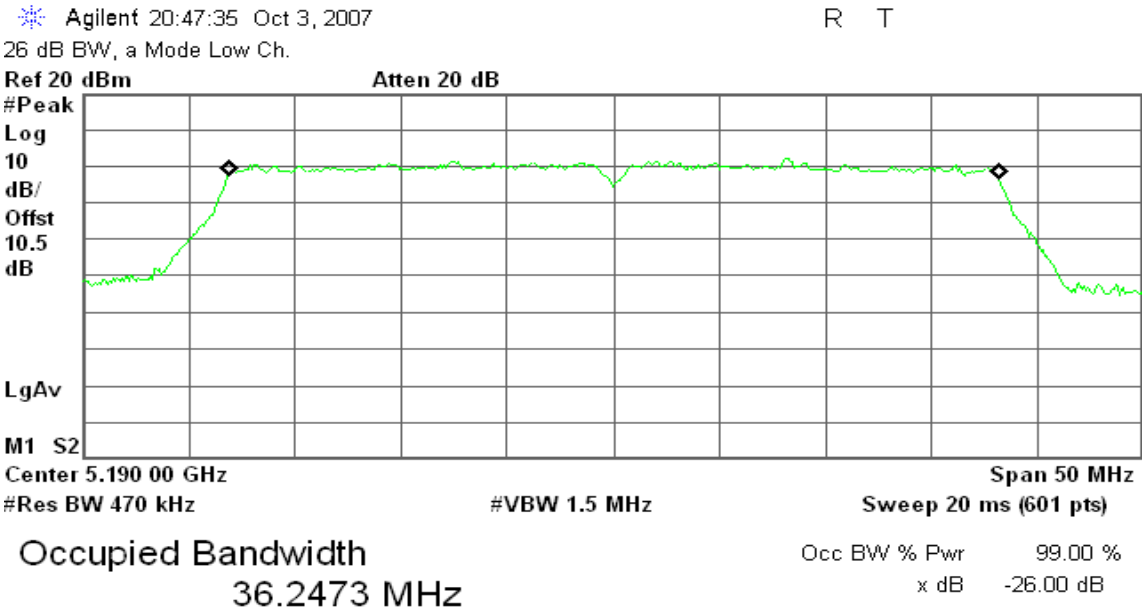
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5180	20.545

26 dB Emission Bandwidth (CH Low)



Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5190	40.937

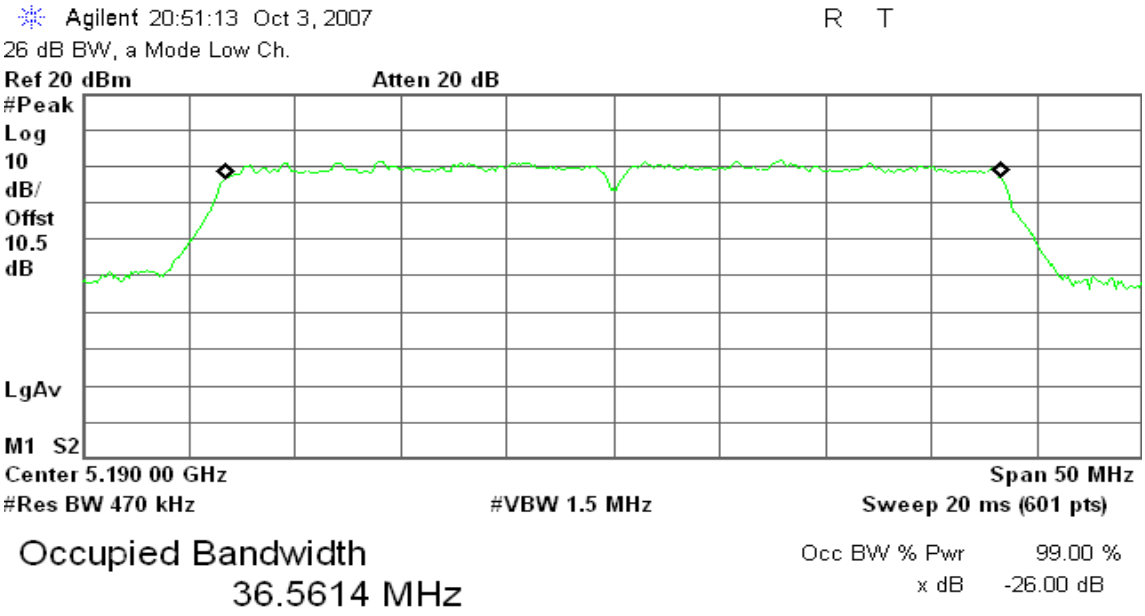
26 dB Emission Bandwidth (CH Low)



Transmit Freq Error	2.331 kHz
x dB Bandwidth	40.937 MHz

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1		
Channel	**Frequency (MHz)**	**Bandwidth (MHz)**
Low	5190	40.767

26 dB Emission Bandwidth (CH Low)



Transmit Freq Error	-3.523 kHz
x dB Bandwidth	40.767 MHz

8.2 MAXIMUM CONDUCTED OUTPUT POWER

8.2.1 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 dBm + 10log 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 dBm + 10log 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:

Specified Limit of the Peak Power

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	20.241	13.06	17.06	17.00
Mid	5260	20.449	13.11	24.11	24.00
High	5320	20.472	13.11	24.11	24.00

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	250 (mW) or 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	20.436	13.10	24.10	24.00
Mid	5600	20.467	13.11	24.11	24.00
High	5700	20.483	13.11	24.11	24.00

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	20.598	20.545	23.58	13.73	17.73	17.00

Test mode: draft 802.11n Wide-40 MHz Channel mode

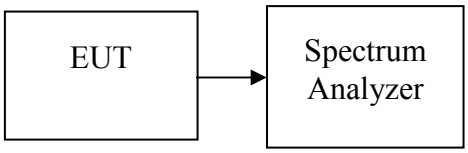
Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5190	40.937	40.767	43.86	16.42	20.42	17.00

Remark:

1. *Total 26dB Bandwidth (MHz) = 10*LOG(10^(Chain 0 (26dB Bandwidth) / 10)+10^(Chain 1 (26dB Bandwidth) /10))*
2. *Maximum antenna gain = 1.8dBi, therefore there is no reduction due to antenna gain.)*

Test Configuration

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



8.2.2 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.

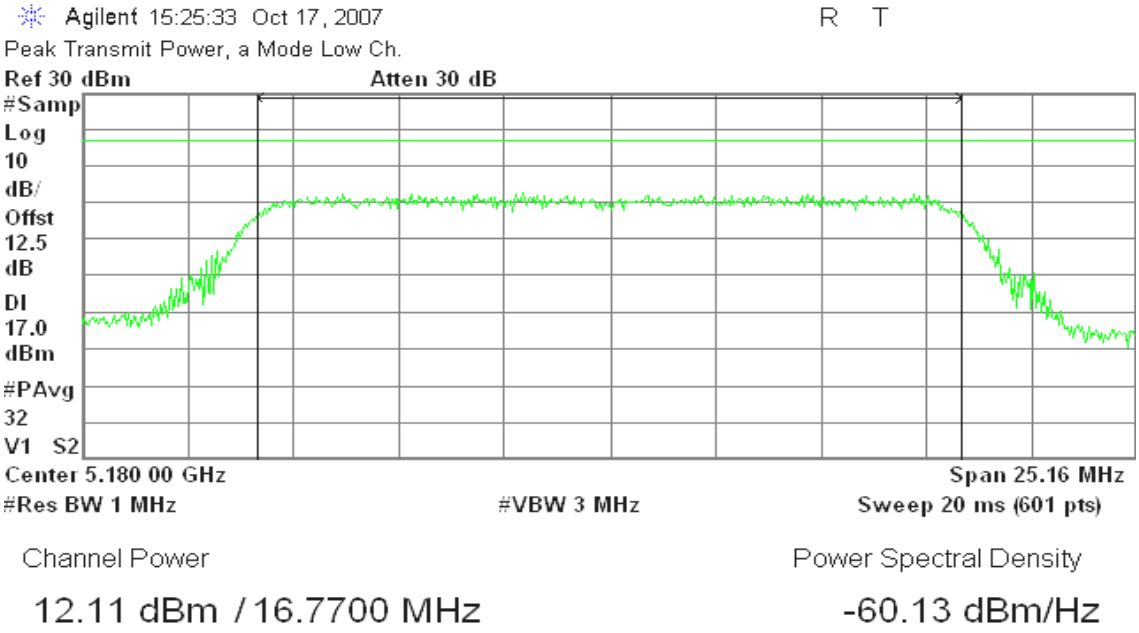
8.2.3 TEST RESULTS

No non-compliance noted

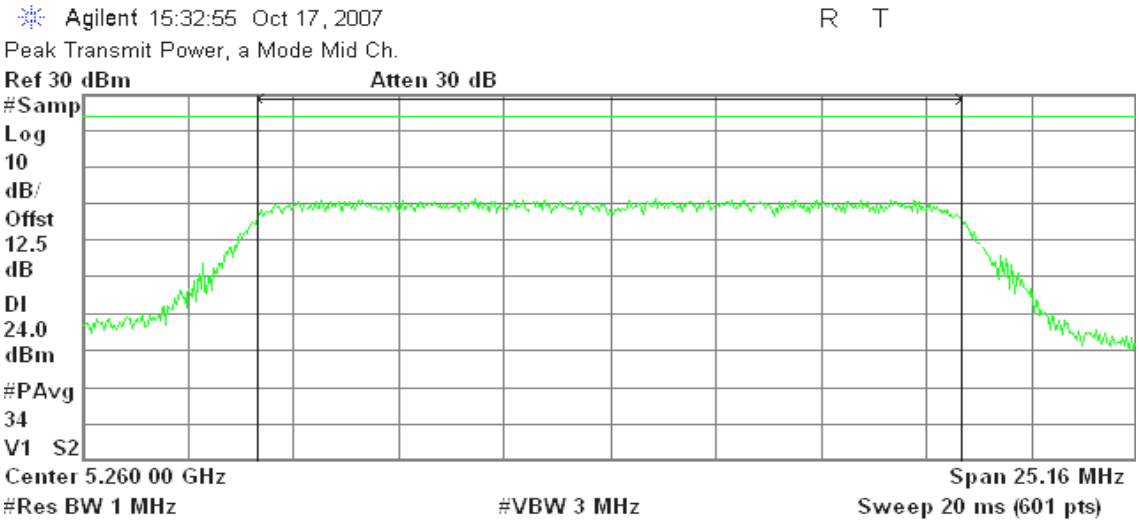
Test Data

Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**Maximum Conducted Output Power (dBm)**	**Limit (dBm)**
Low	5180	12.11	17.00
Mid	5260	11.35	24.00
High	5320	12.01	24.00

Maximum Conducted Output Power (CH Low)

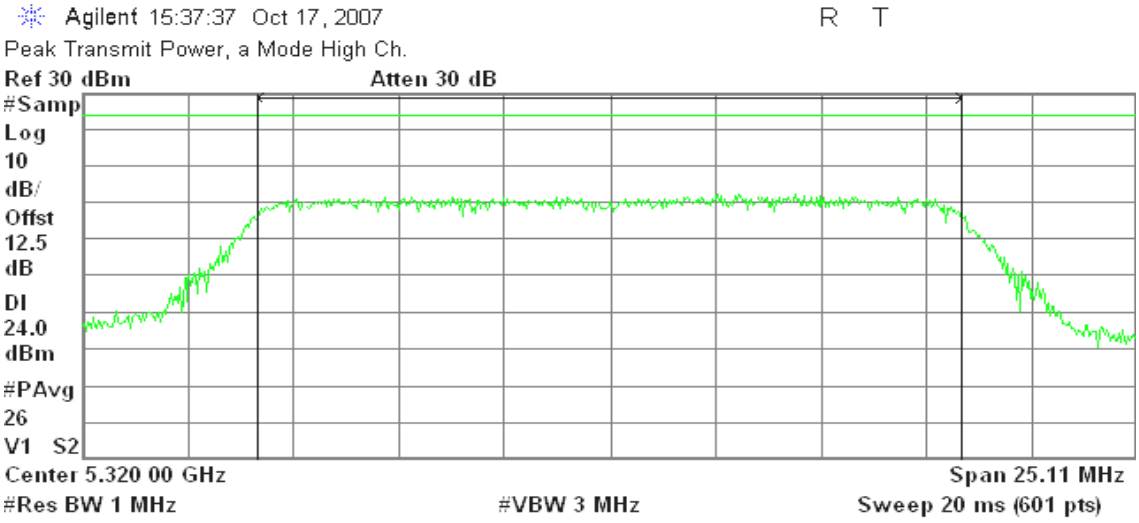


Maximum Conducted Output Power (CH Mid)



Channel Power	Power Spectral Density
11.35 dBm / 16.7700 MHz	-60.90 dBm/Hz

Maximum Conducted Output Power (CH High)

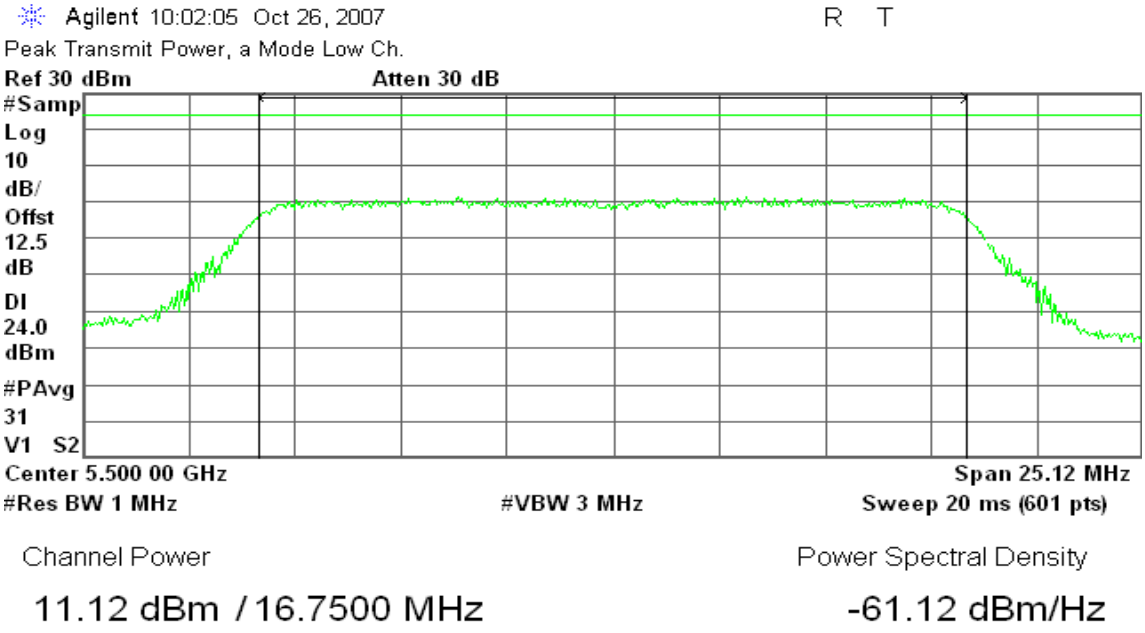


Channel Power	Power Spectral Density
12.01 dBm / 16.7400 MHz	-60.22 dBm/Hz

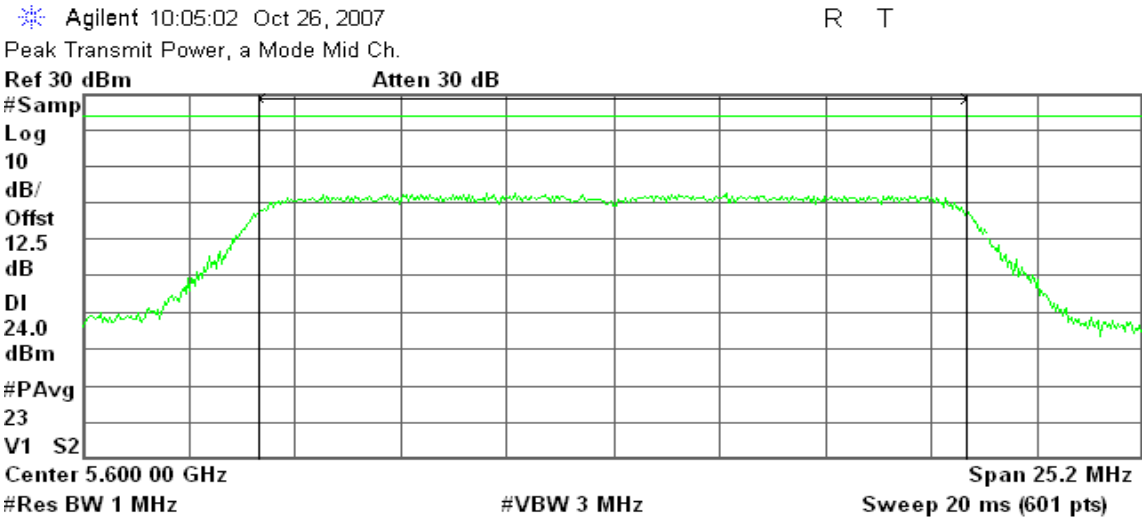
Test Data

Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**Maximum Conducted Output Power (dBm)**	**Limit (dBm)**
Low	5500	11.12	24.00
Mid	5600	13.08	24.00
High	5700	13.04	24.00

Maximum Conducted Output Power (CH Low)

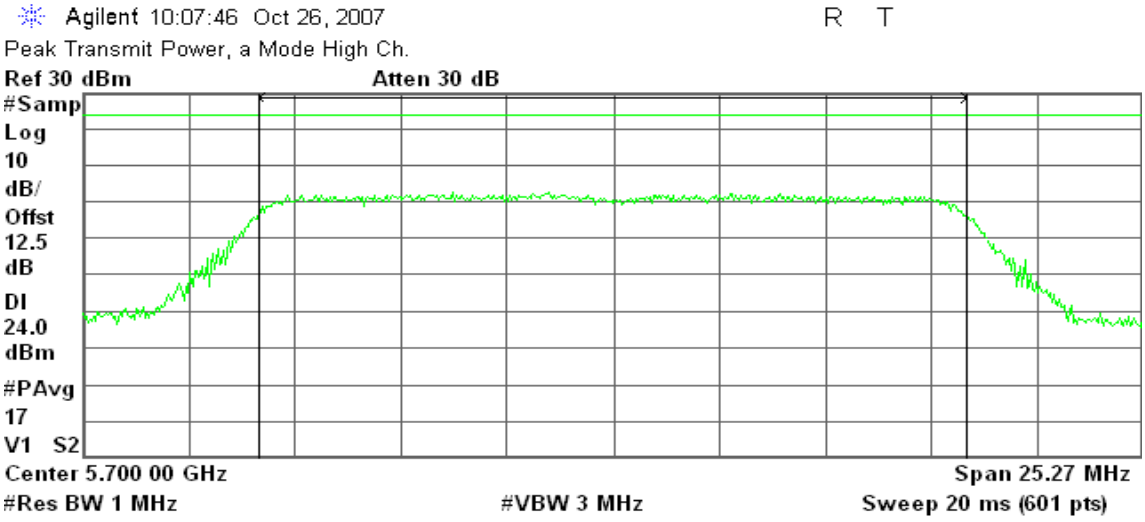


Maximum Conducted Output Power (CH Mid)



Channel Power	Power Spectral Density
13.08 dBm / 16.8000 MHz	-59.18 dBm/Hz

Maximum Conducted Output Power (CH High)



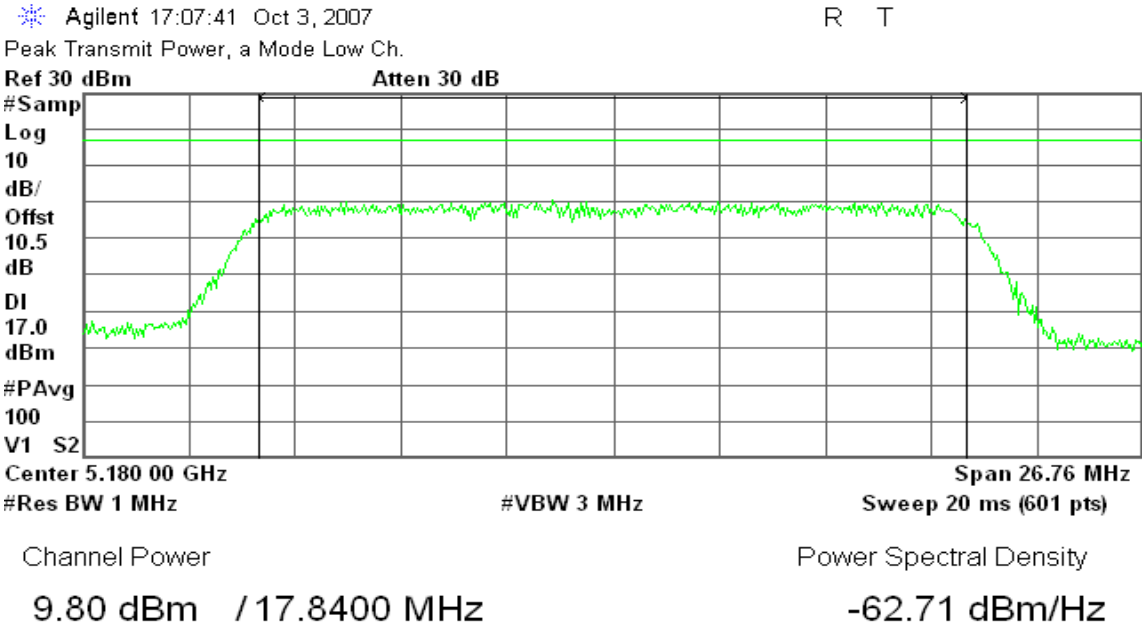
Channel Power	Power Spectral Density
13.04 dBm / 16.8500 MHz	-59.23 dBm/Hz

Test mode: draft 802.11n Standard-20 MHz Channel mode					
Channel	Frequency (MHz)	Chain 0 Maximum Conducted Output Power (dBm)	Chain 1 Maximum Conducted Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.80	11.55	13.77	17.00

Remark: *Total Maximum Conducted Output Power (dBm) = 10*LOG(10^(Chain 0 (Maximum Conducted Output Power) / 10)+10^(Chain 1 (Maximum Conducted Output Power) /10))*

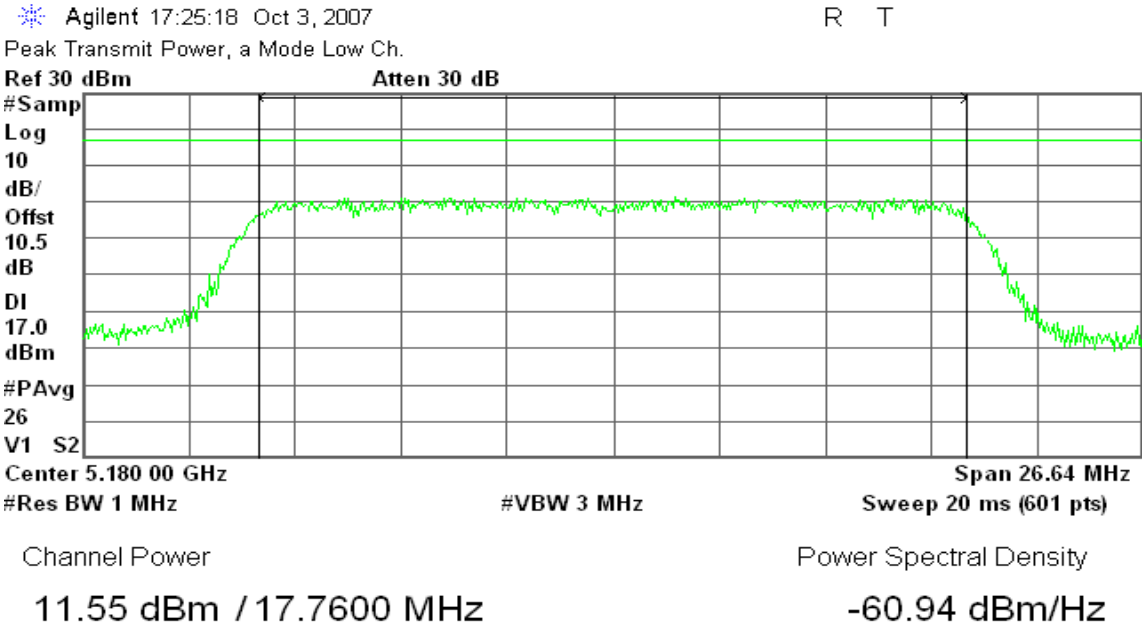
draft 802.11n Standard-20 MHz Channel mode / Chain 0:

Maximum Conducted Output Power (CH Low)



draft 802.11n Standard-20 MHz Channel mode / Chain 1:

Maximum Conducted Output Power (CH Low)

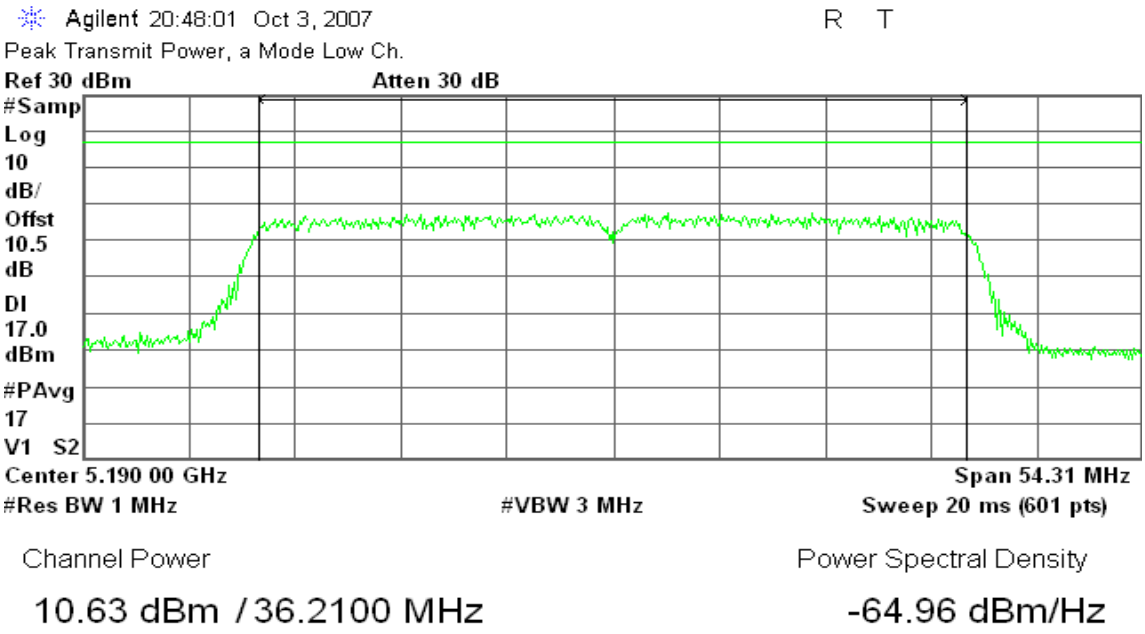


Test mode: draft 802.11n Wide-40 MHz Channel mode					
Channel	**Frequency (MHz)**	**Chain 0 Maximum Conducted Output Power (dBm)**	**Chain 1 Maximum Conducted Output Power (dBm)**	**Total Maximum Conducted Output Power (dBm)**	**Limit (dBm)**
Low	5190	10.63	10.31	13.48	17.00

Remark: *Total Maximum Conducted Output Power (dBm) = 10*LOG(10^(Chain 0 (Maximum Conducted Output Power) / 10)+10^(Chain 1 (Maximum Conducted Output Power) /10))*

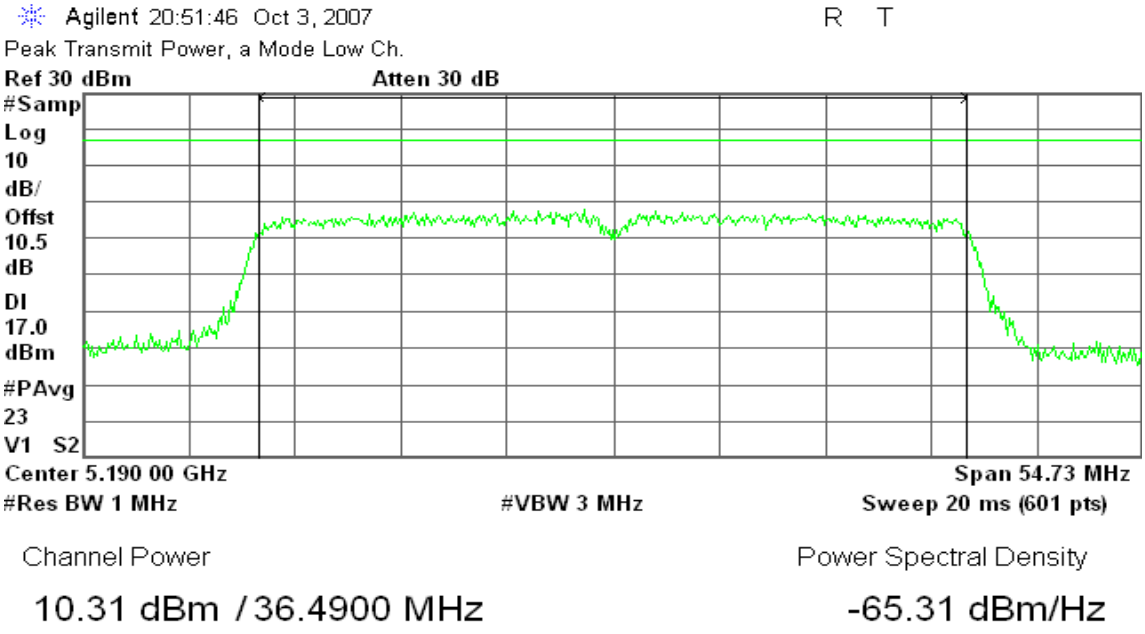
draft 802.11n Wide-40 MHz Channel mode / Chain 0

Maximum Conducted Output Power (CH Low)



draft 802.11n Wide-40 MHz Channel mode / Chain 1:

Maximum Conducted Output Power (CH Low)



8.3 BAND EDGES MEASUREMENT

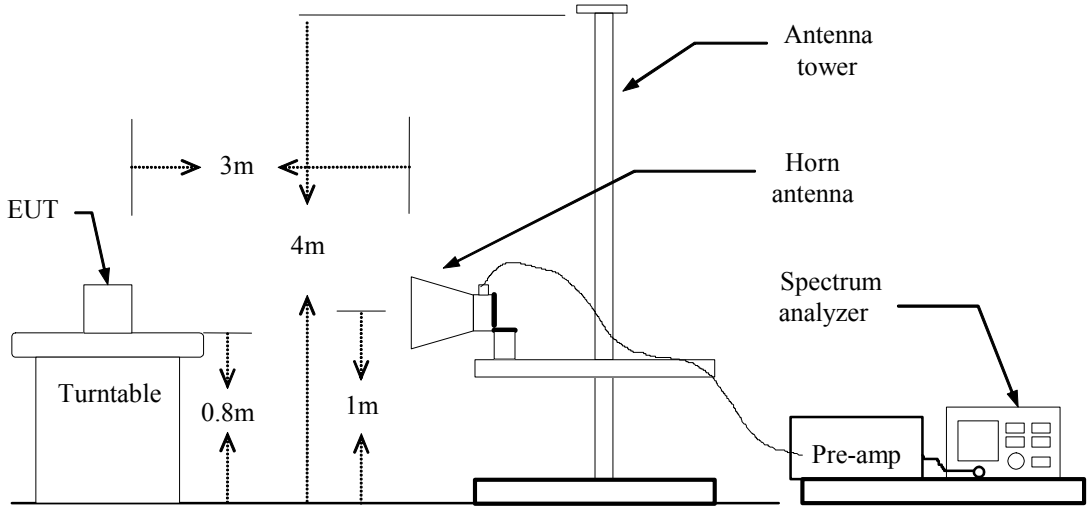
8.3.1 LIMIT

According to §15.407(b),

(1) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

Test Configuration



8.3.2 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.

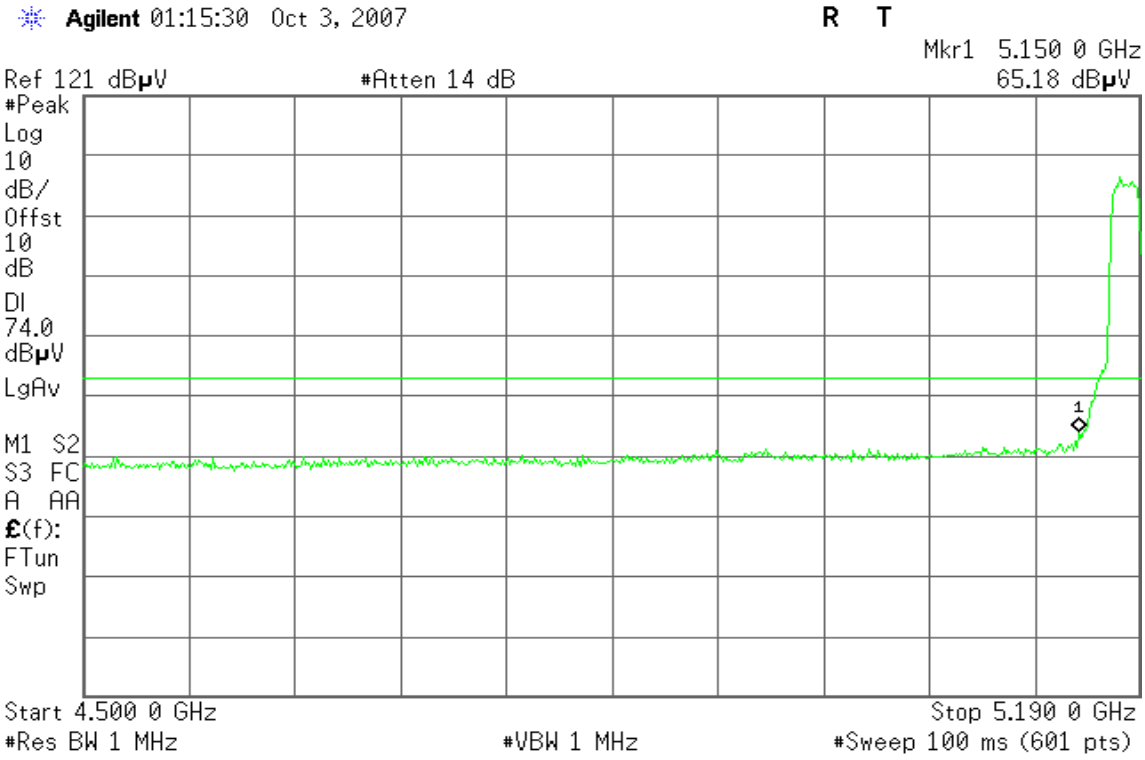
8.3.3 TEST RESULTS

Refer to attach spectrum analyzer data chart.

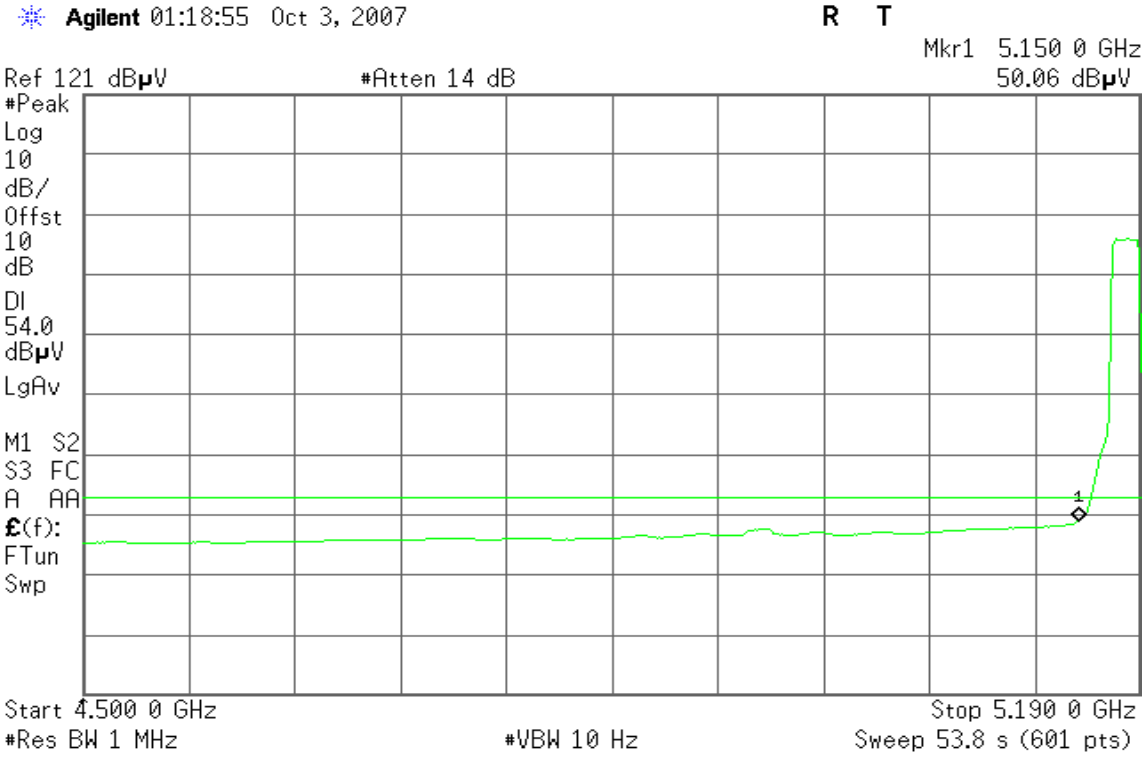
Mode 2

Band Edges (IEEE 802.11a mode / CH Low)

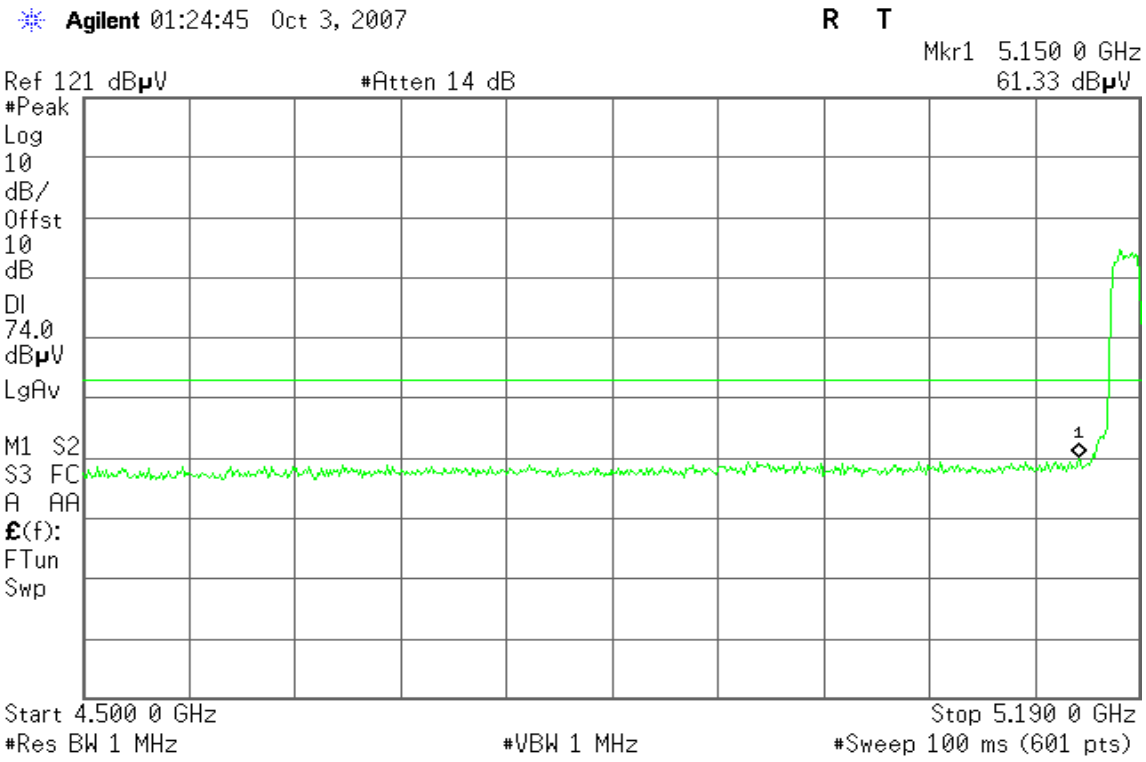
Detector mode: Peak **Polarity: Vertical**



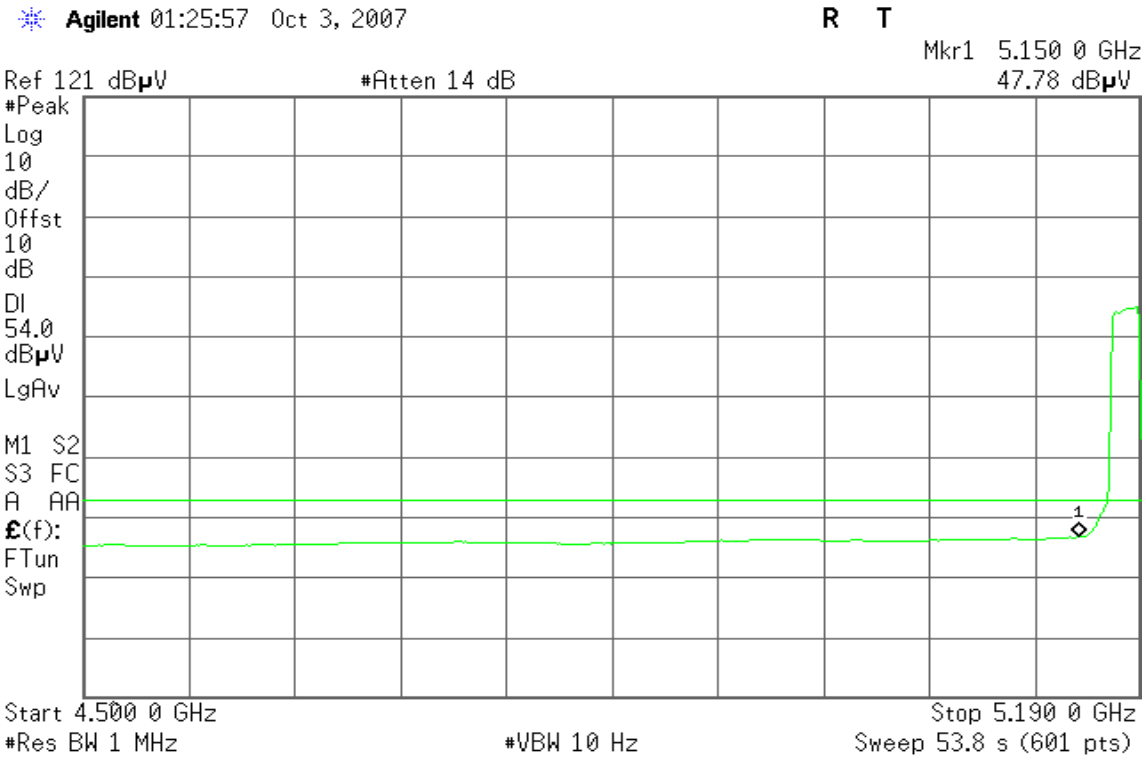
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

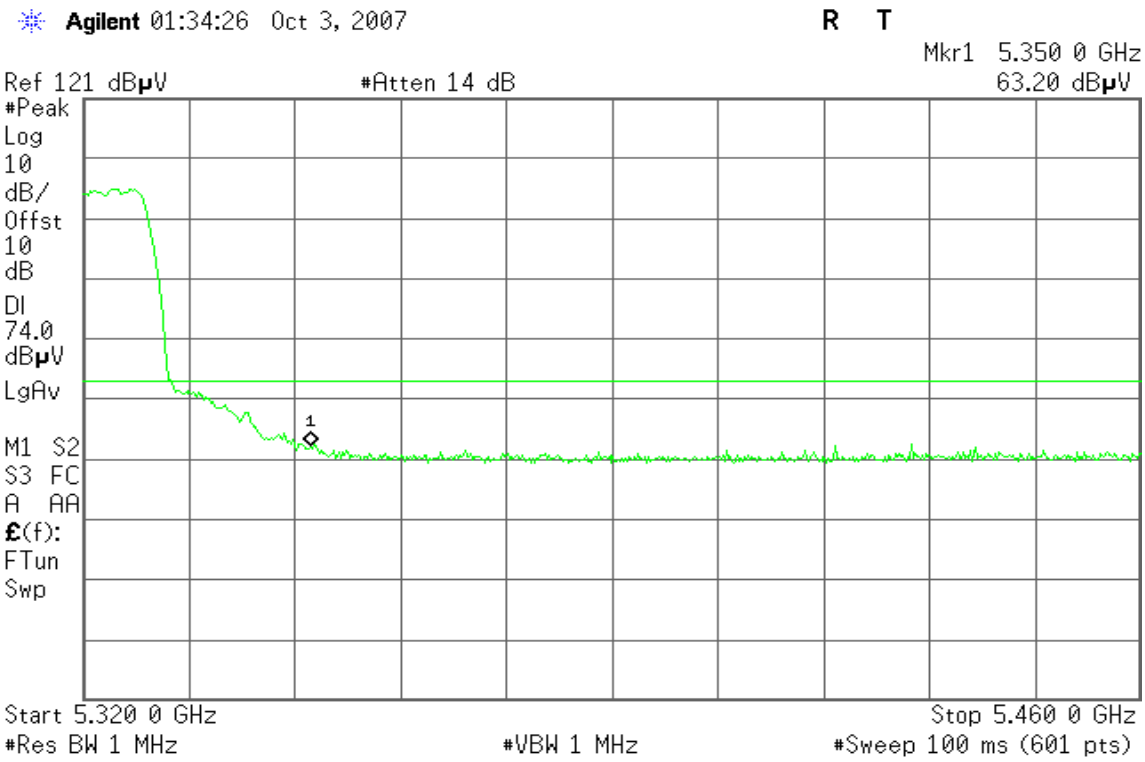


Detector mode: Average **Polarity: Horizontal**

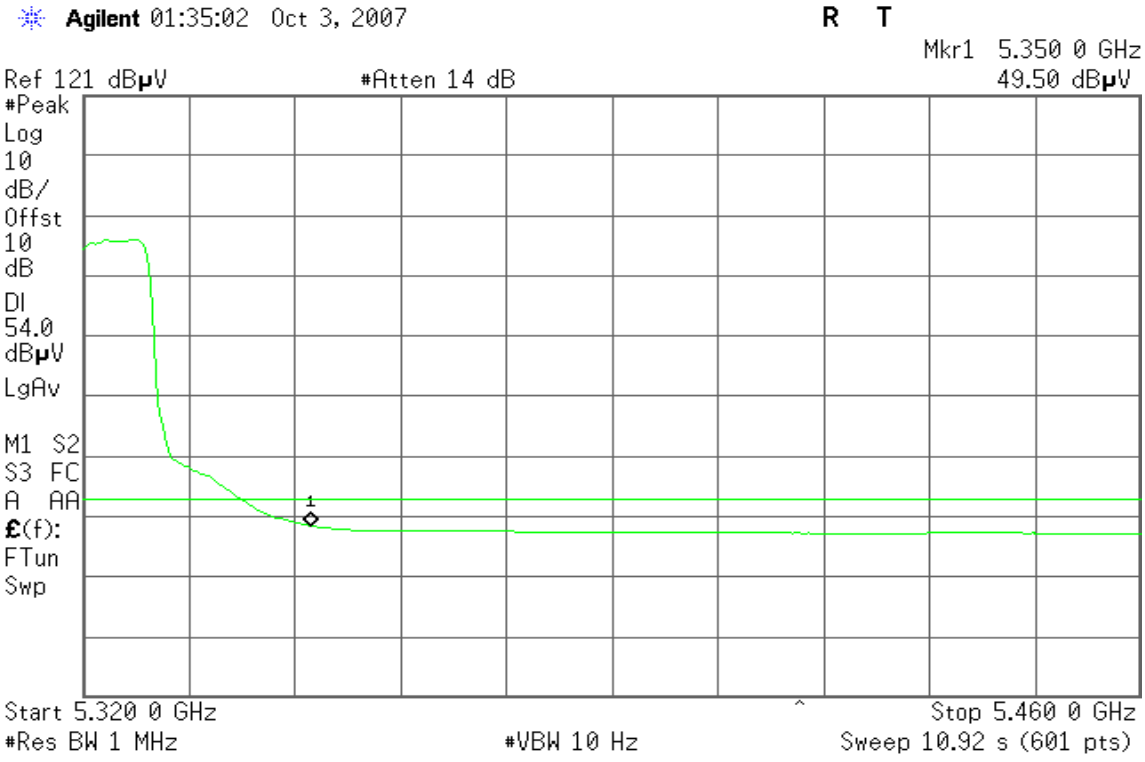


Band Edges (IEEE 802.11a mode / CH High)

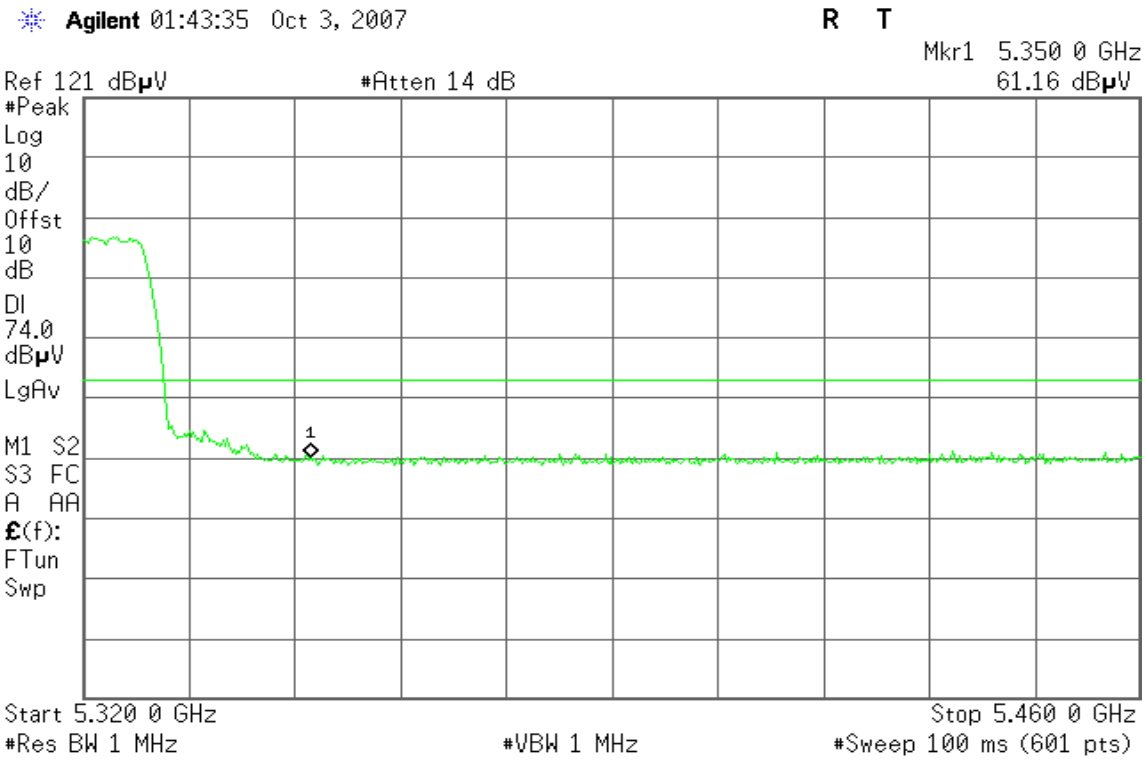
Detector mode: Peak Polarity: Vertical



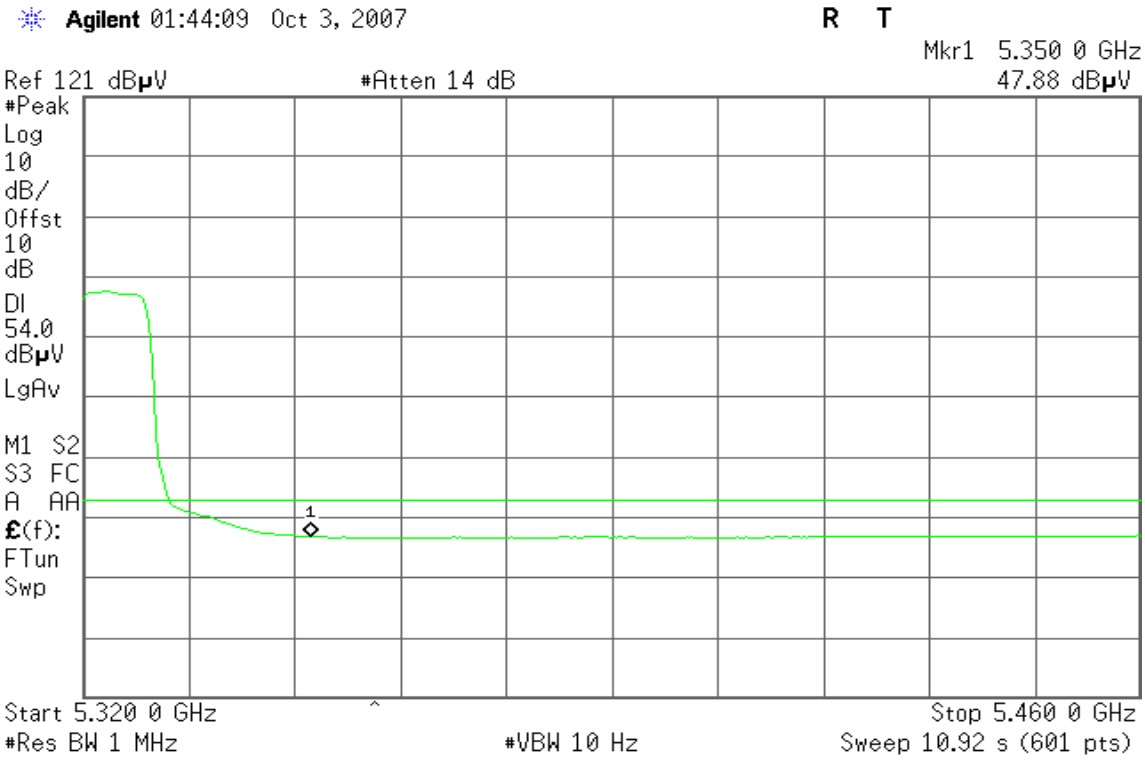
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

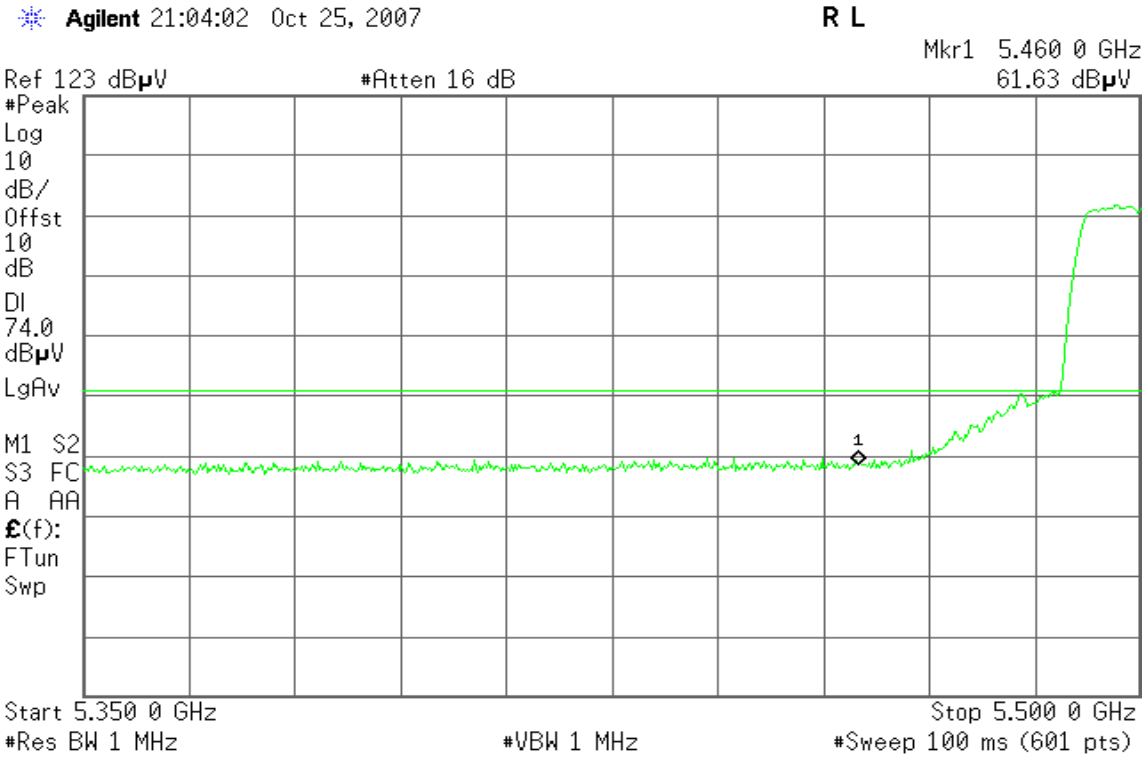


Detector mode: Average **Polarity: Horizontal**

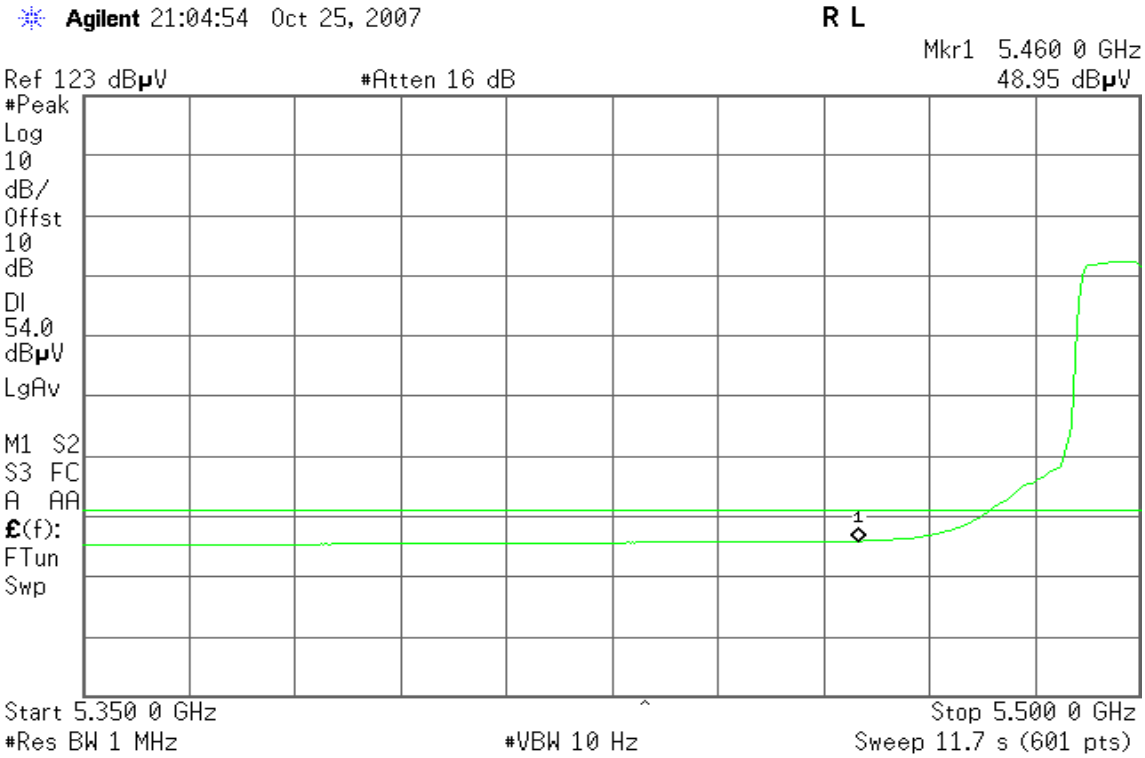


Band Edges (IEEE 802.11a mode / CH Low)

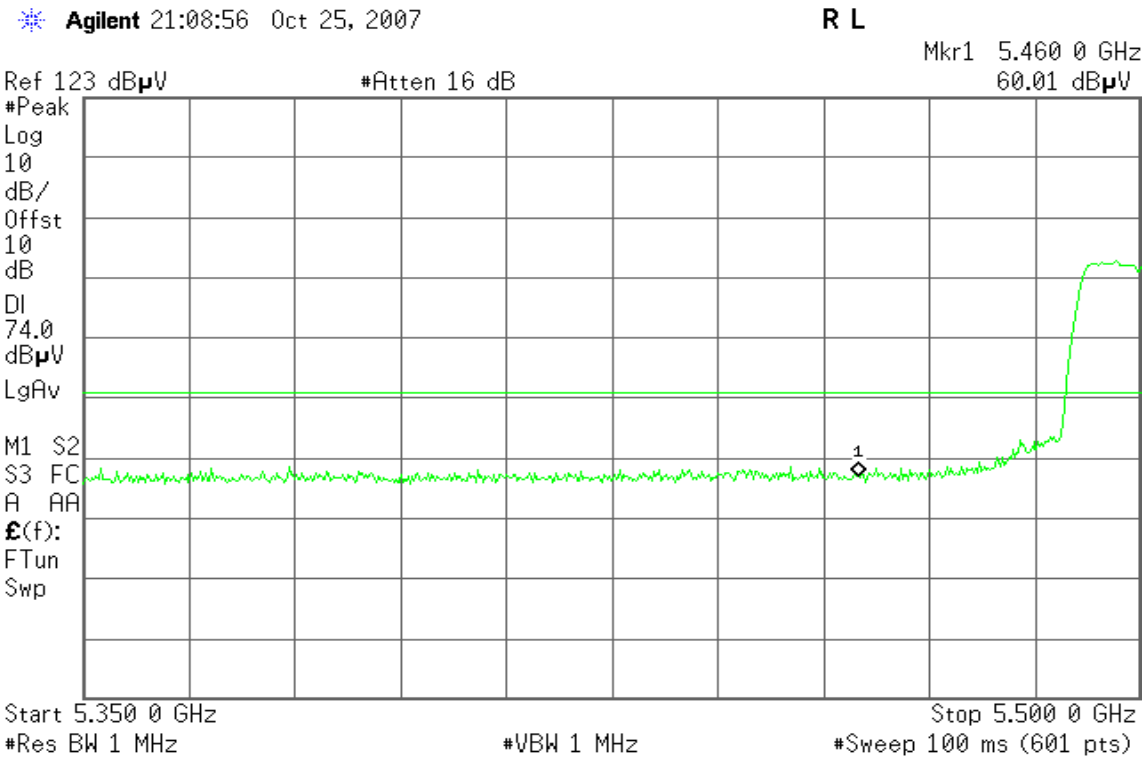
Detector mode: Peak **Polarity: Vertical**



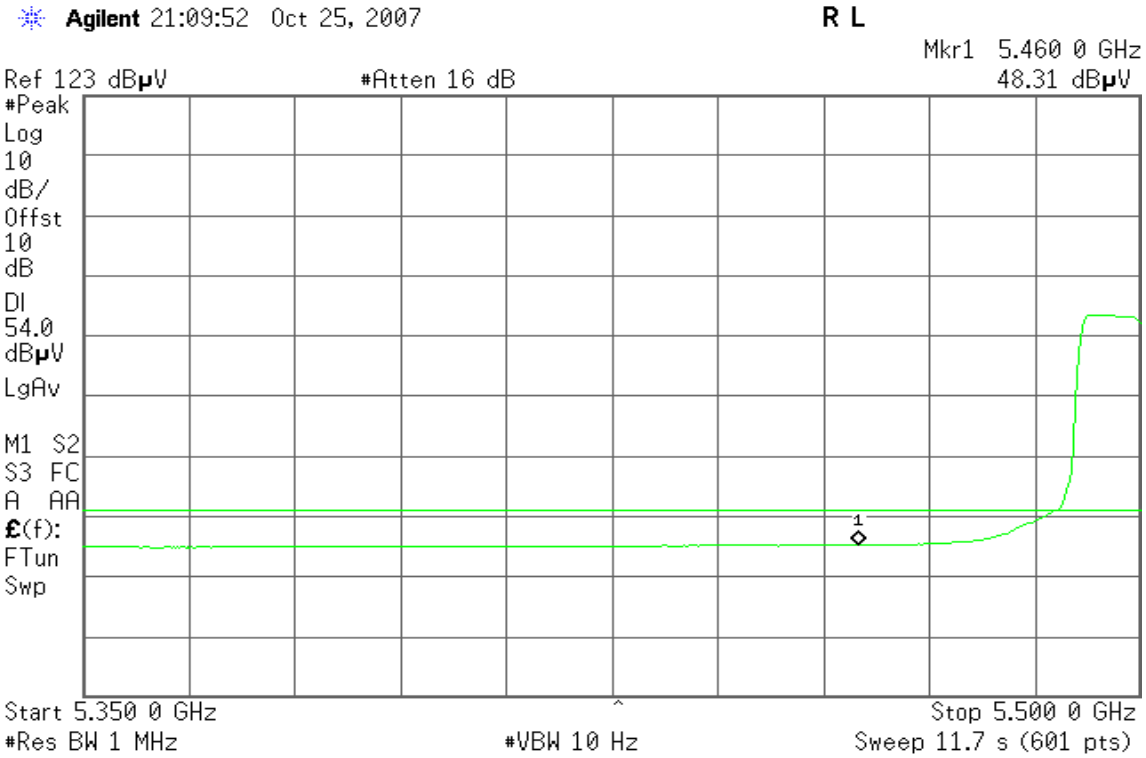
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

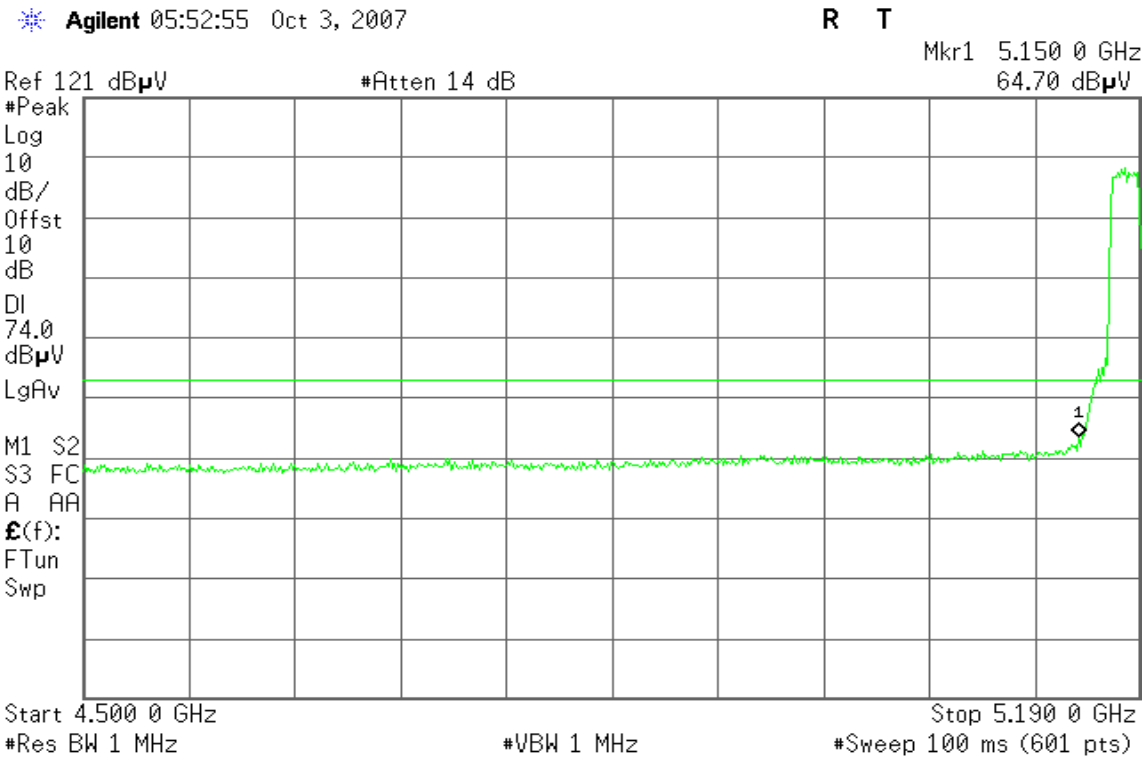


Detector mode: Average **Polarity: Horizontal**

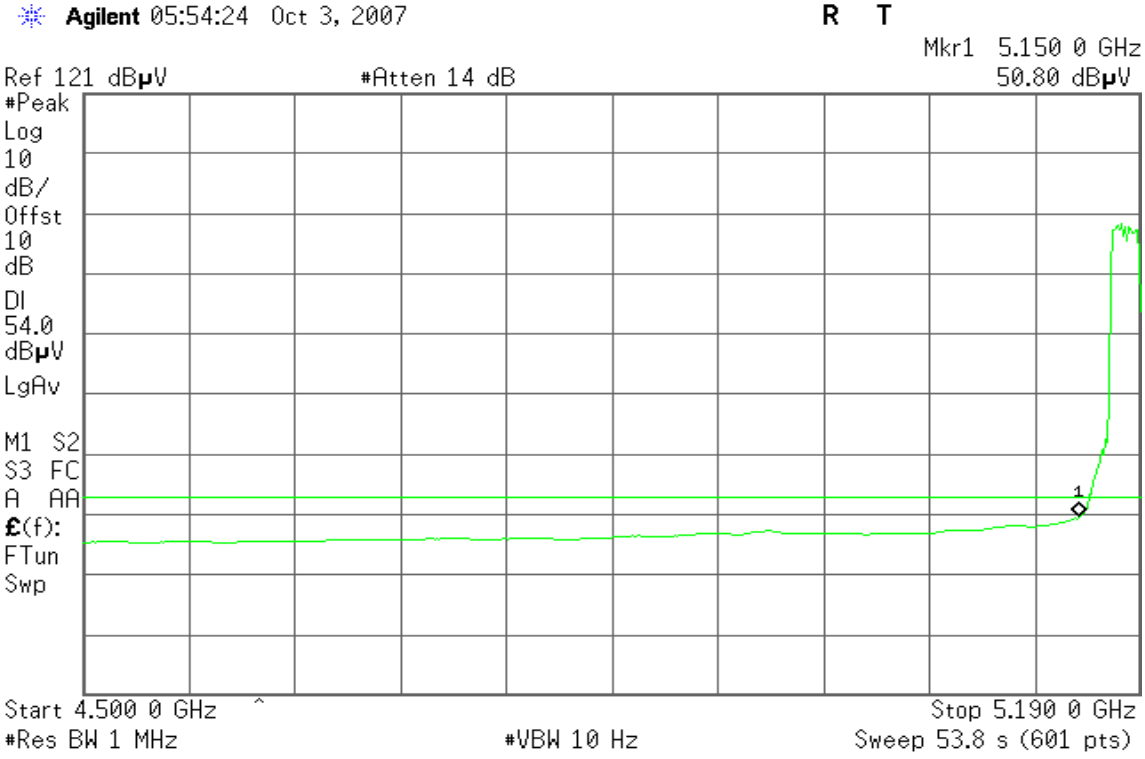


Band Edges (draft 802.11n Standard-20 MHz Channel mode / CH Low)

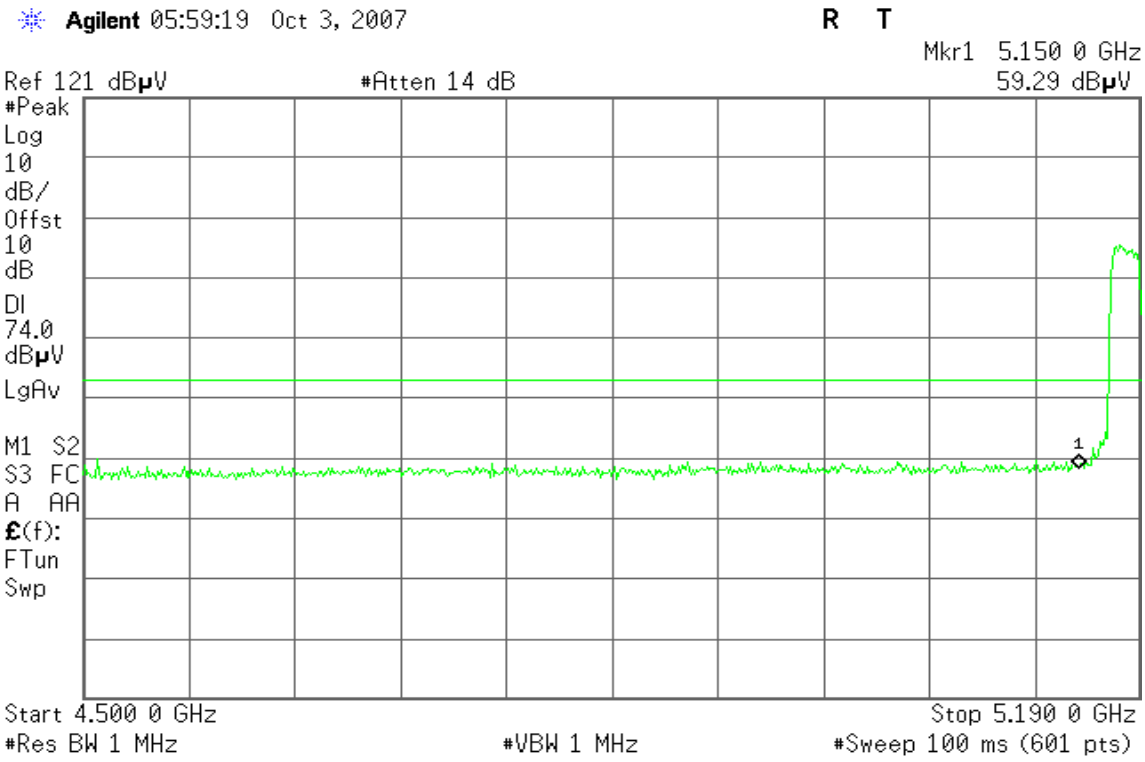
Detector mode: Peak **Polarity: Vertical**



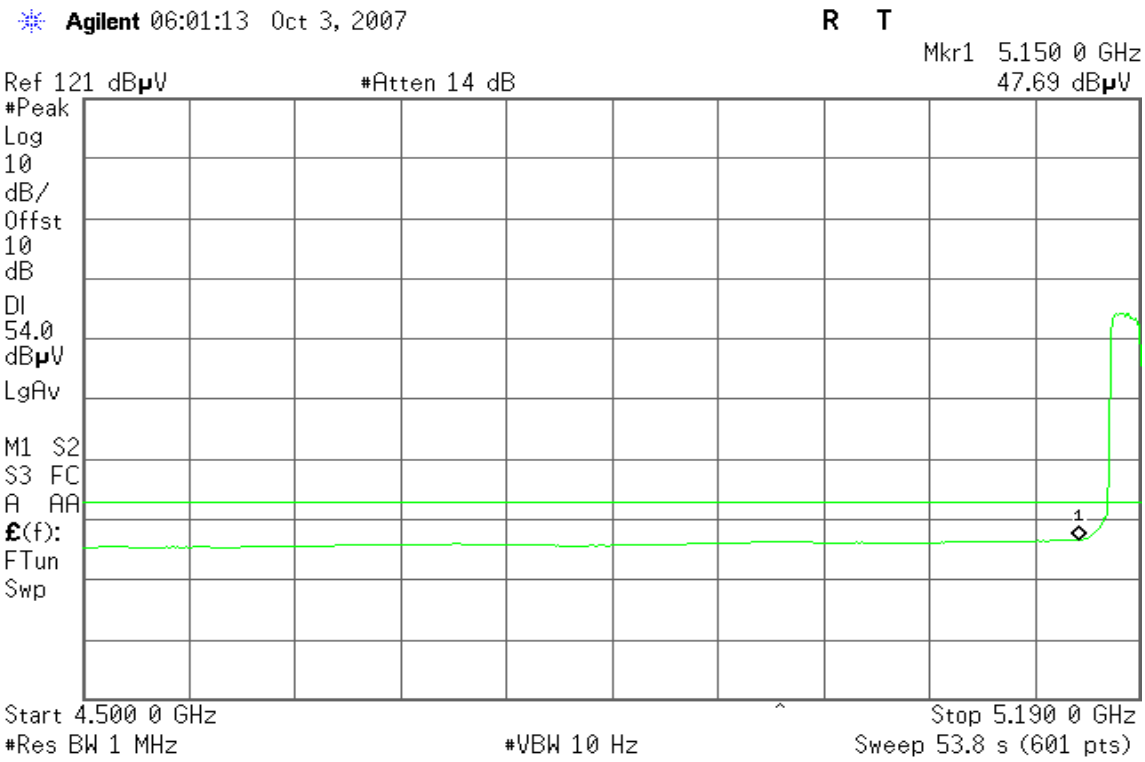
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

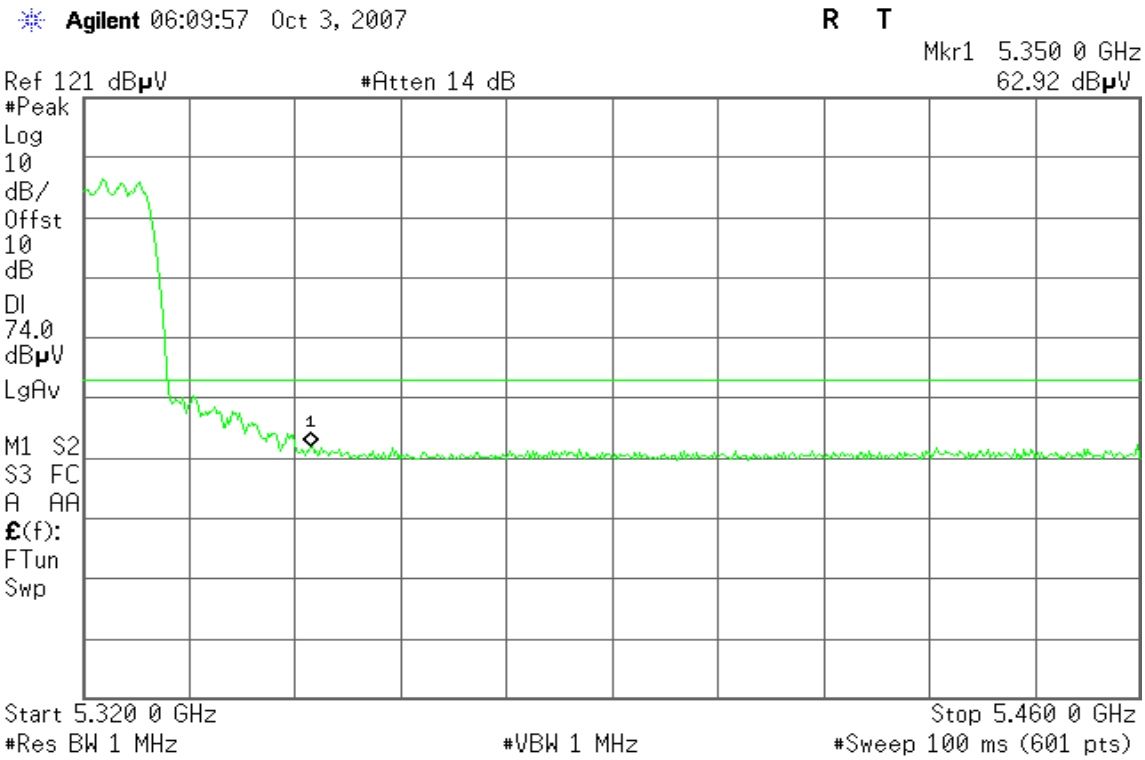


Detector mode: Average **Polarity: Horizontal**

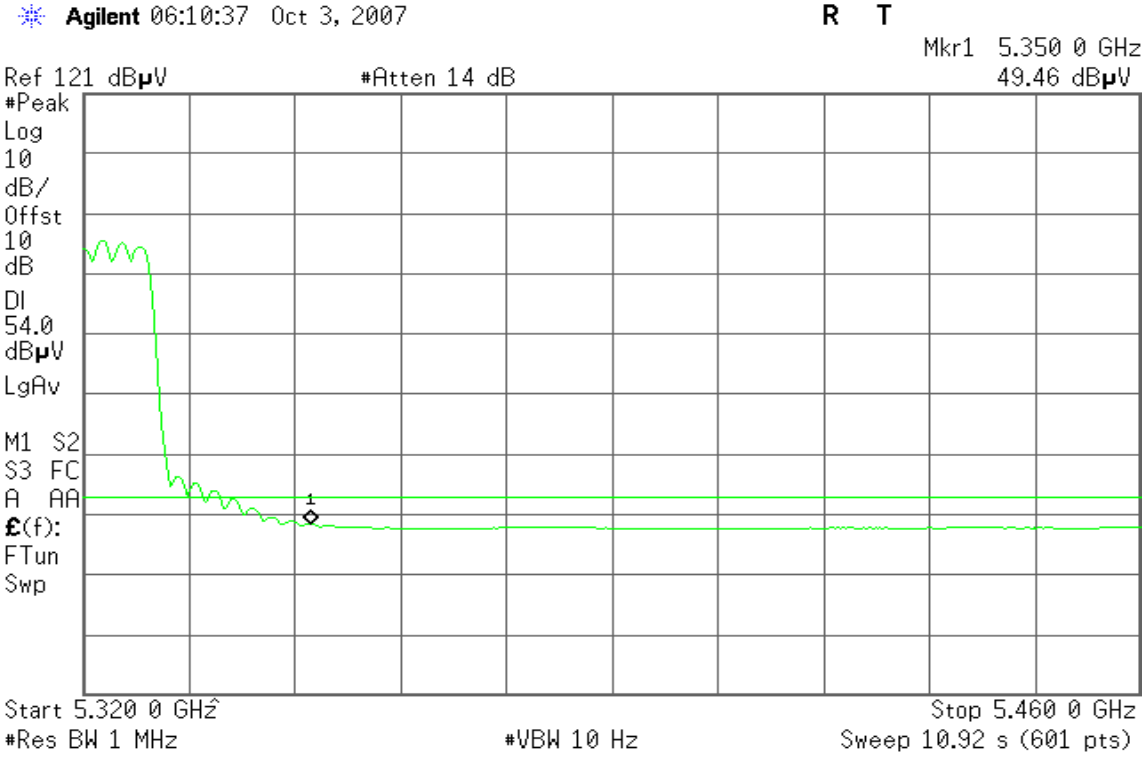


Band Edges (draft 802.11n Standard-20 MHz Channel mode / CH High)

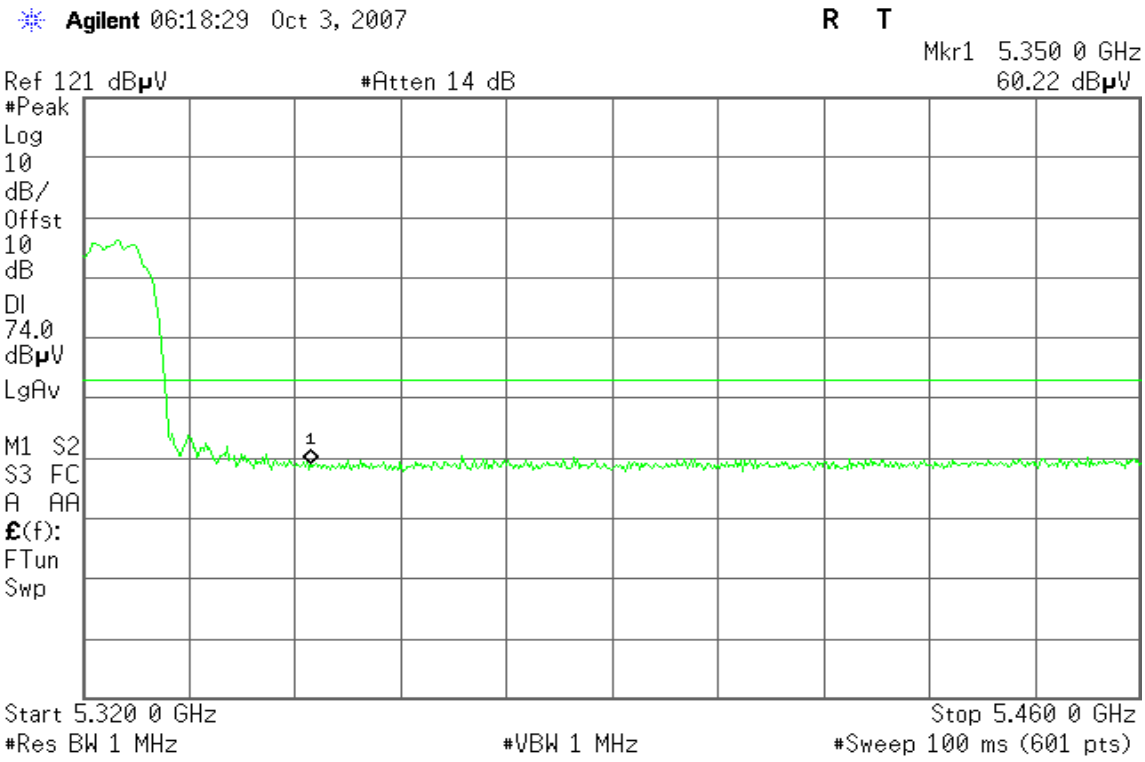
Detector mode: Peak **Polarity: Vertical**



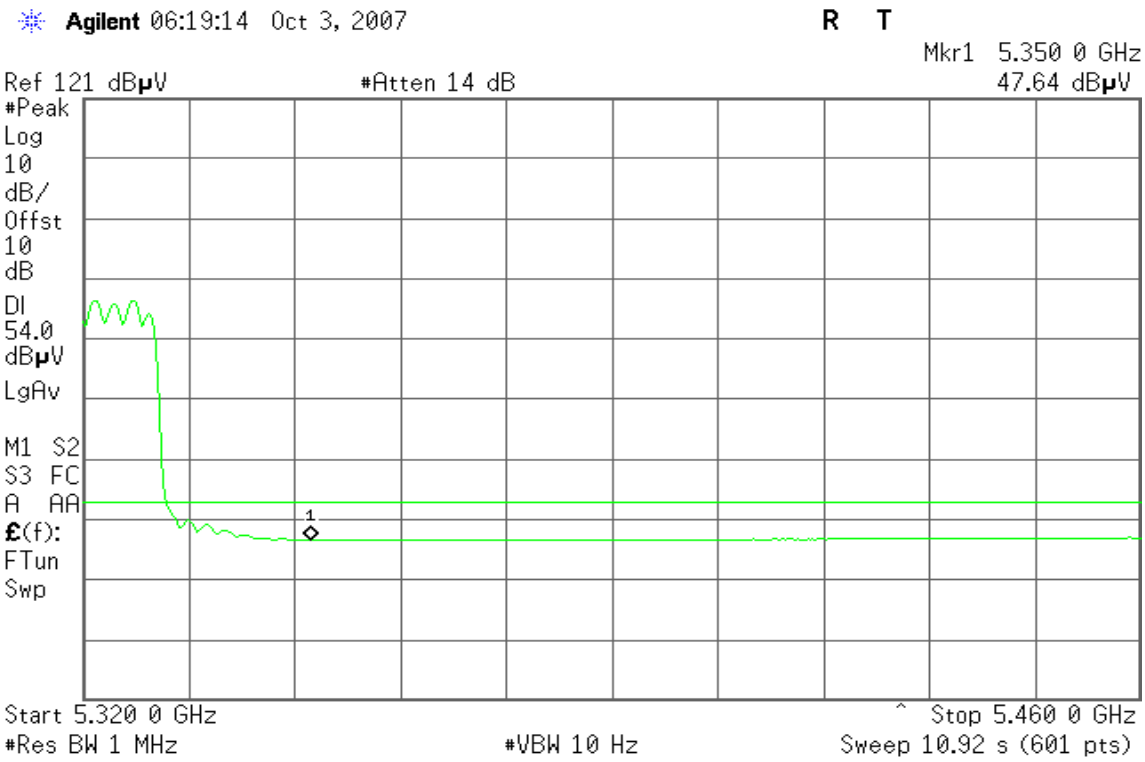
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

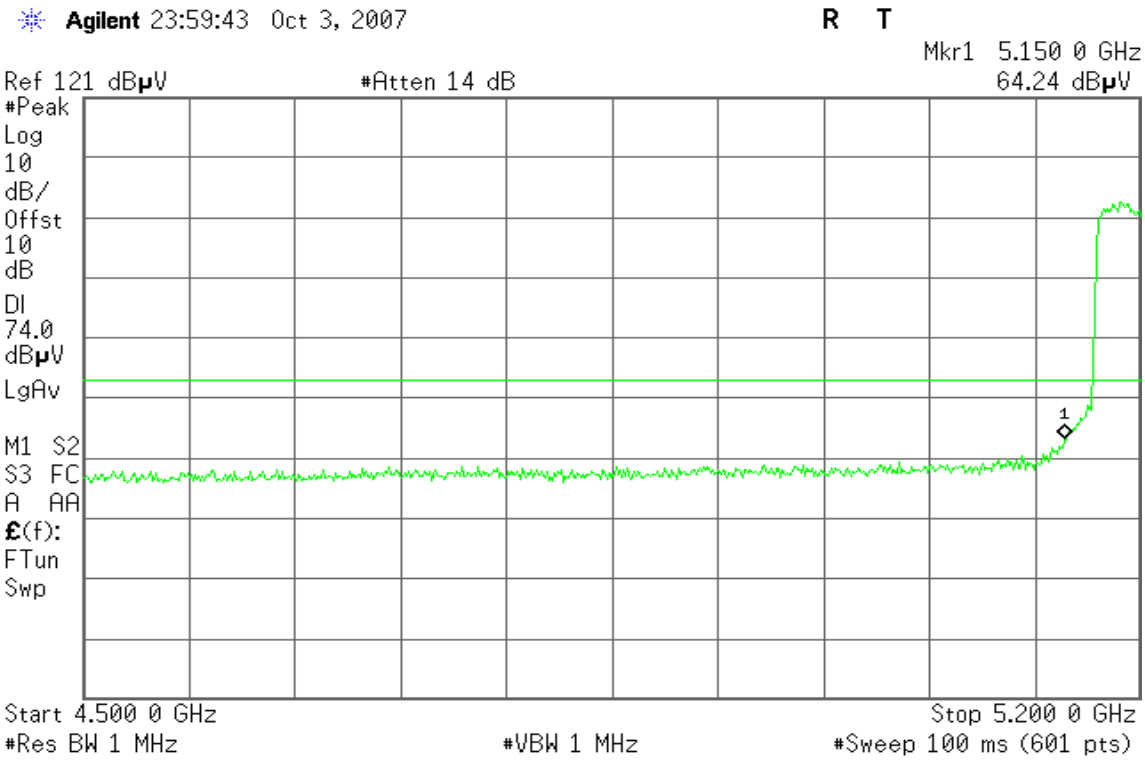


Detector mode: Average **Polarity: Horizontal**

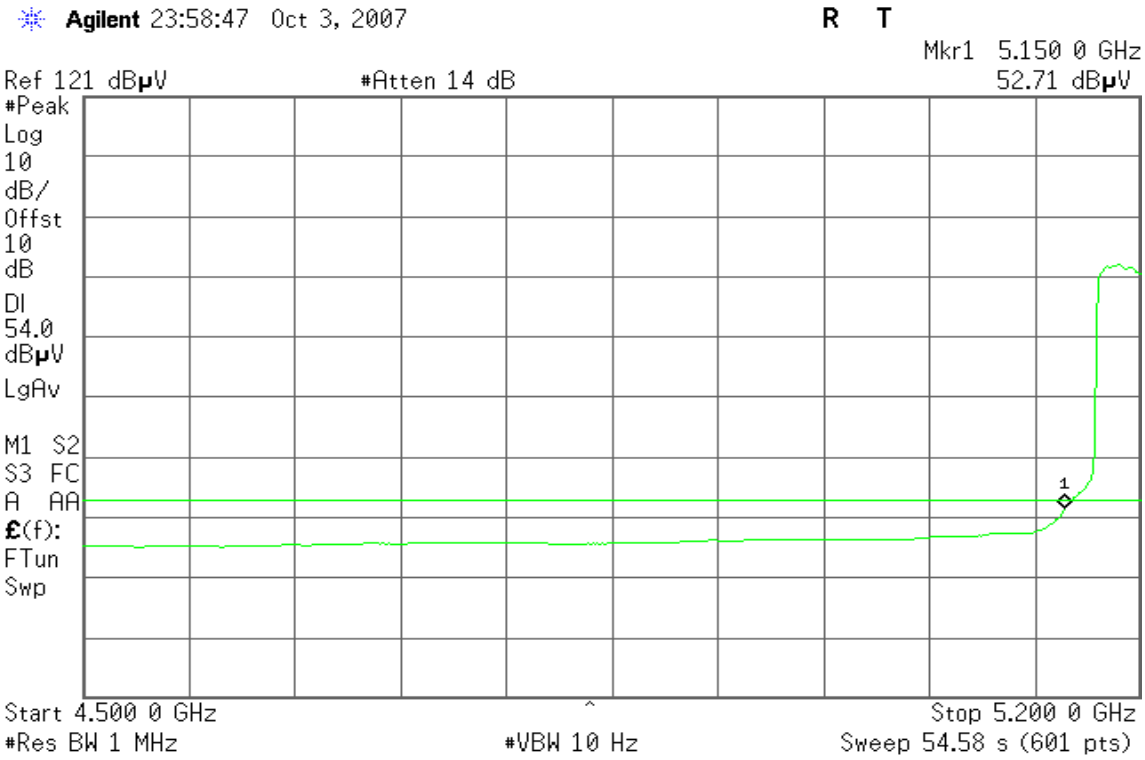


Band Edges (draft 802.11n Wide-40 MHz Channel mode / CH Low)

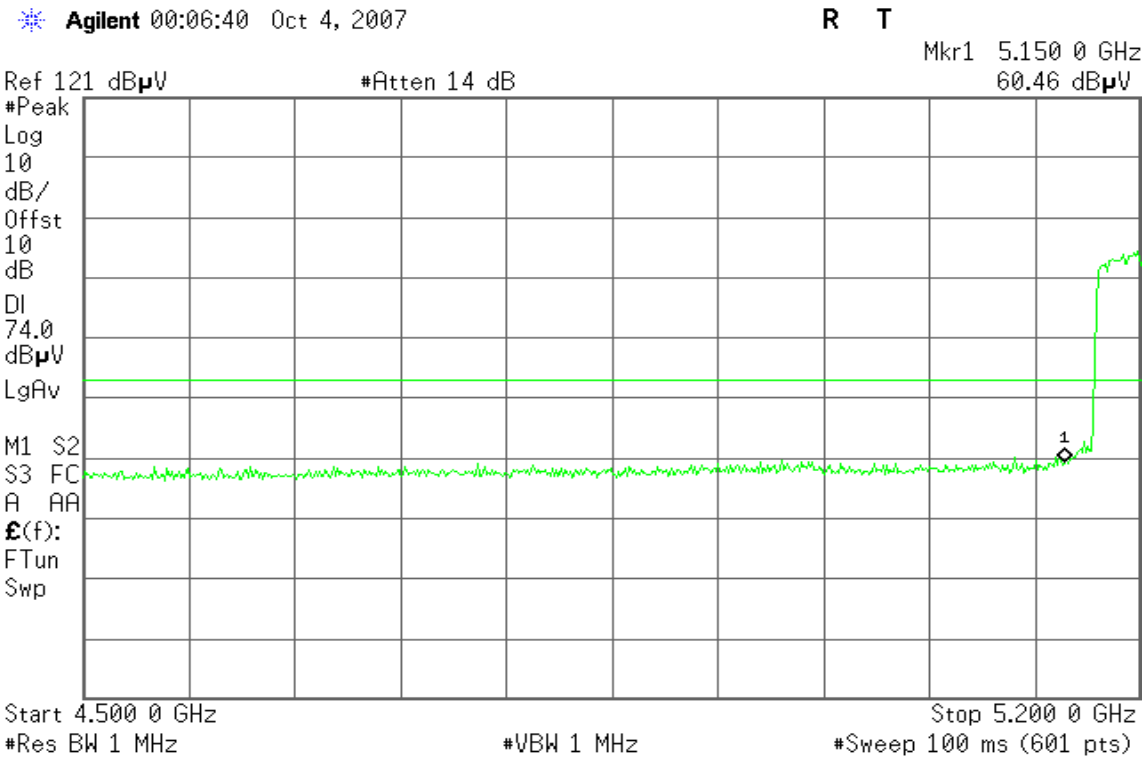
Detector mode: Peak **Polarity: Vertical**



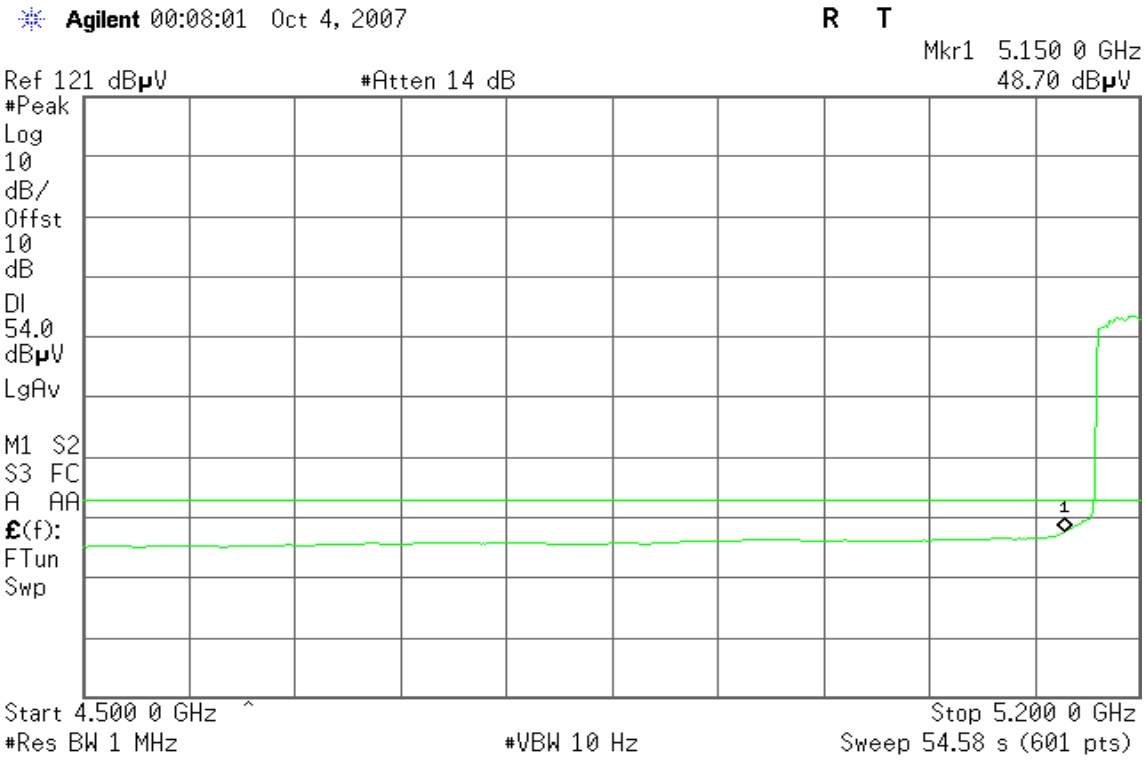
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

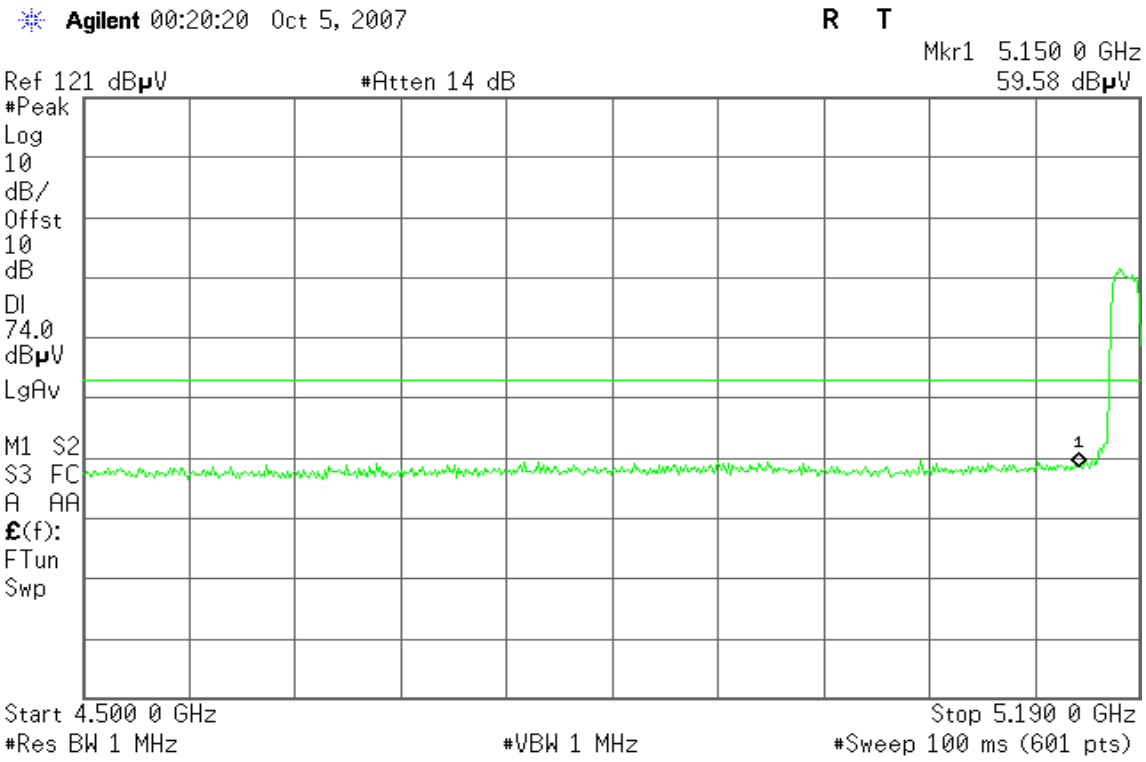


Detector mode: Average **Polarity: Horizontal**

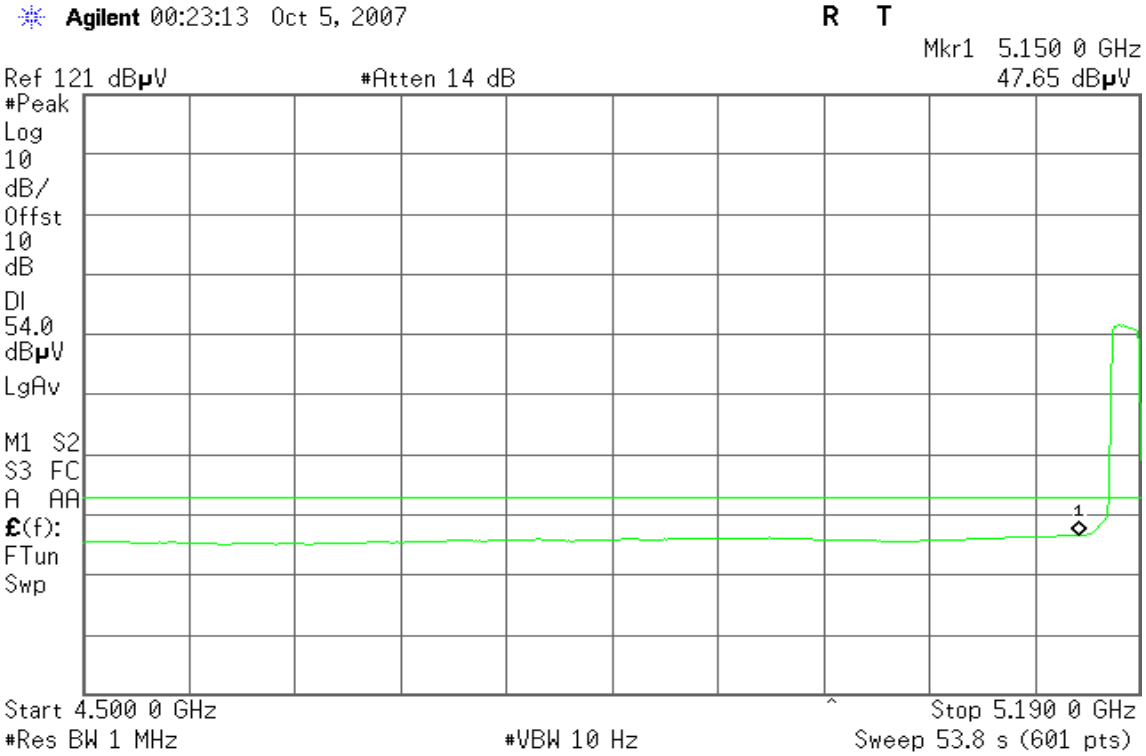


Mode 5
Band Edges (IEEE 802.11a mode / CH Low)

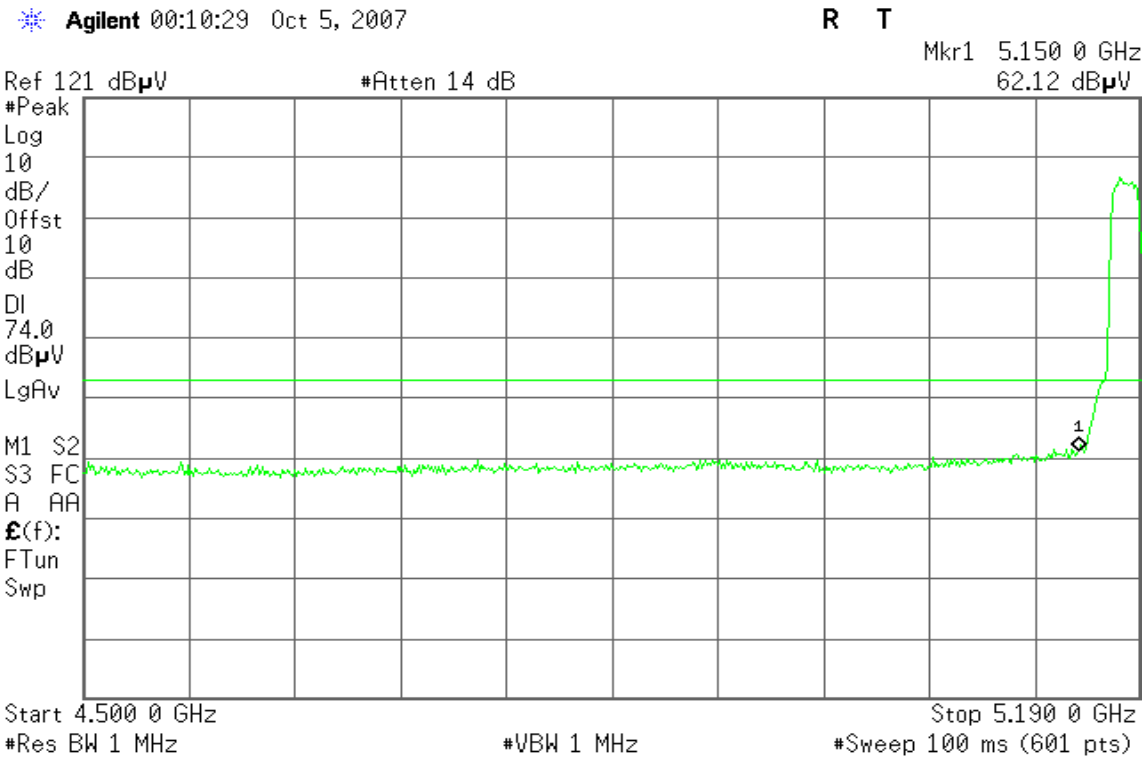
Detector mode: Peak **Polarity: Vertical**



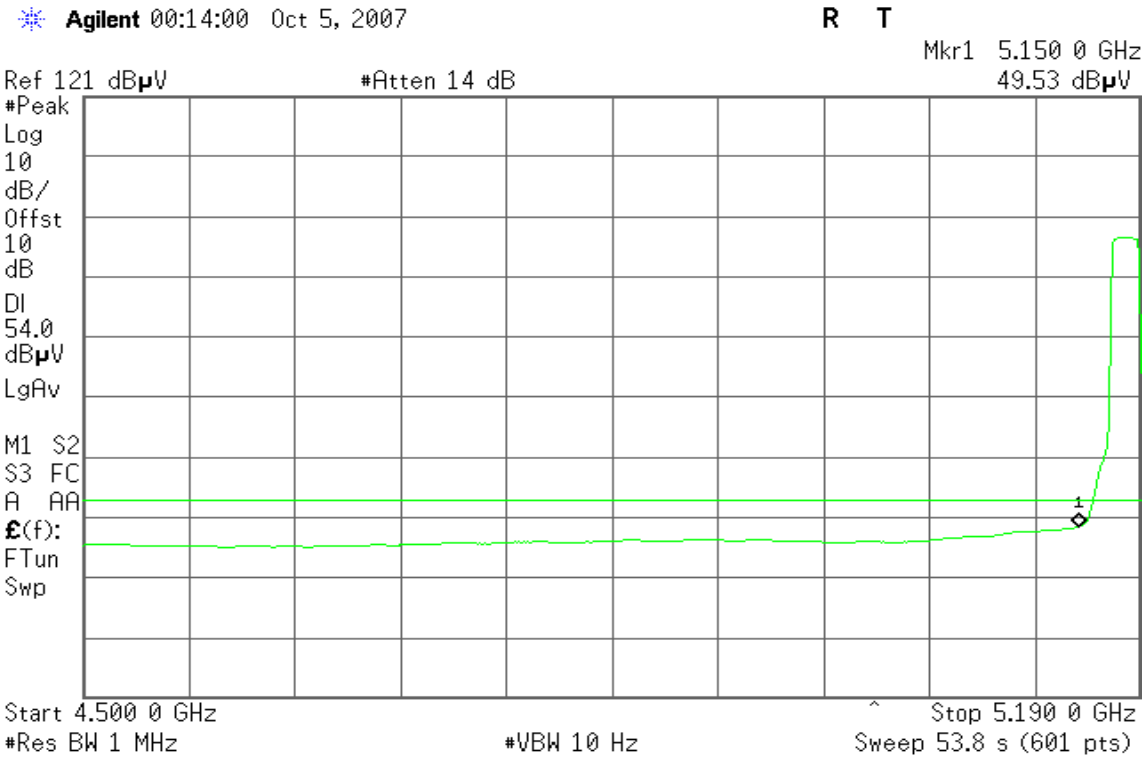
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

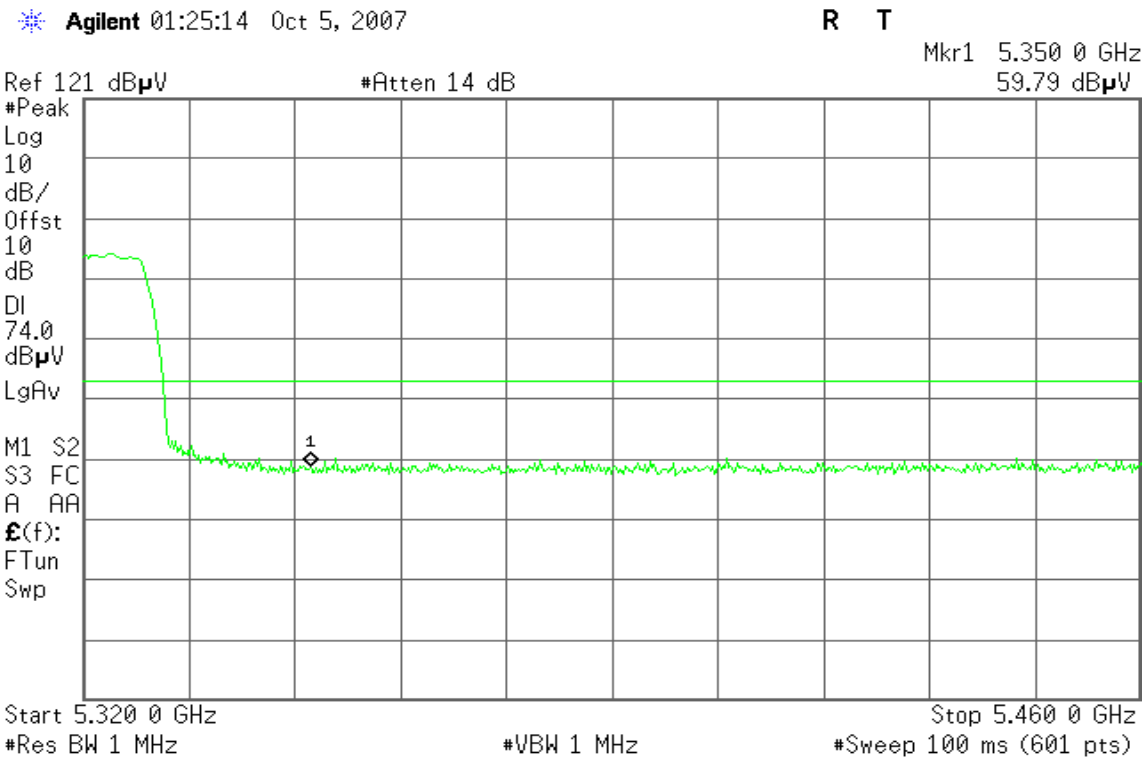


Detector mode: Average **Polarity: Horizontal**

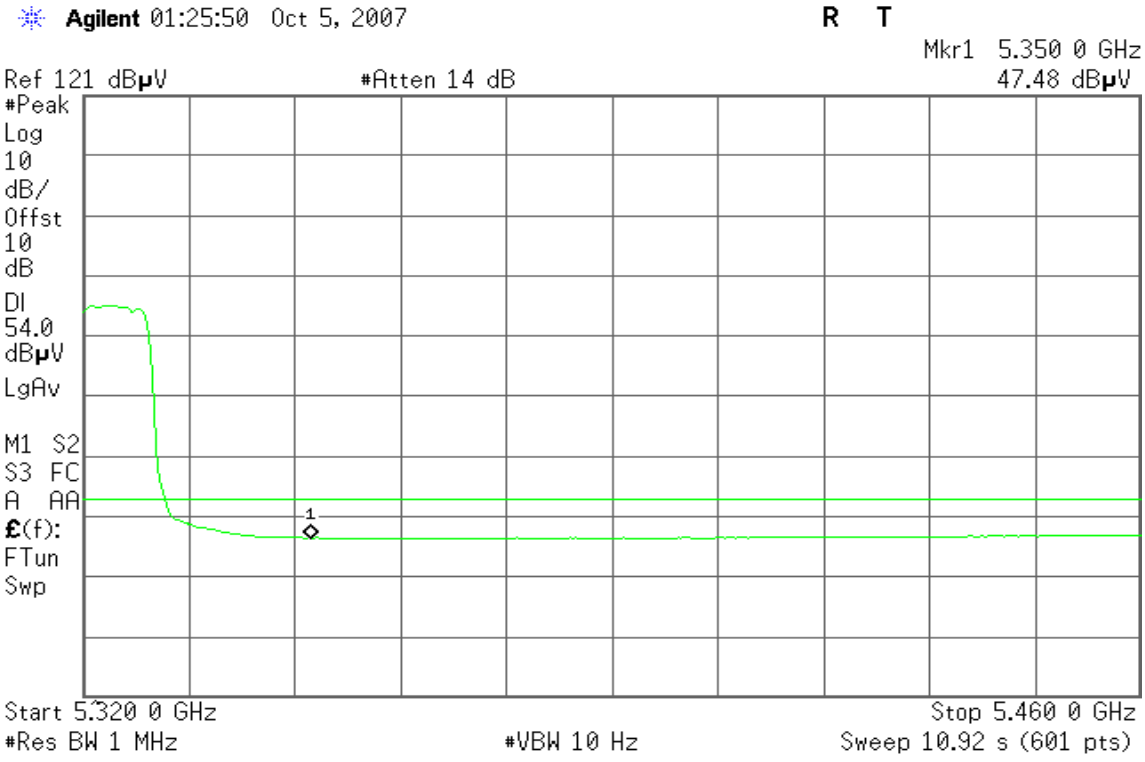


Band Edges (IEEE 802.11a mode / CH High)

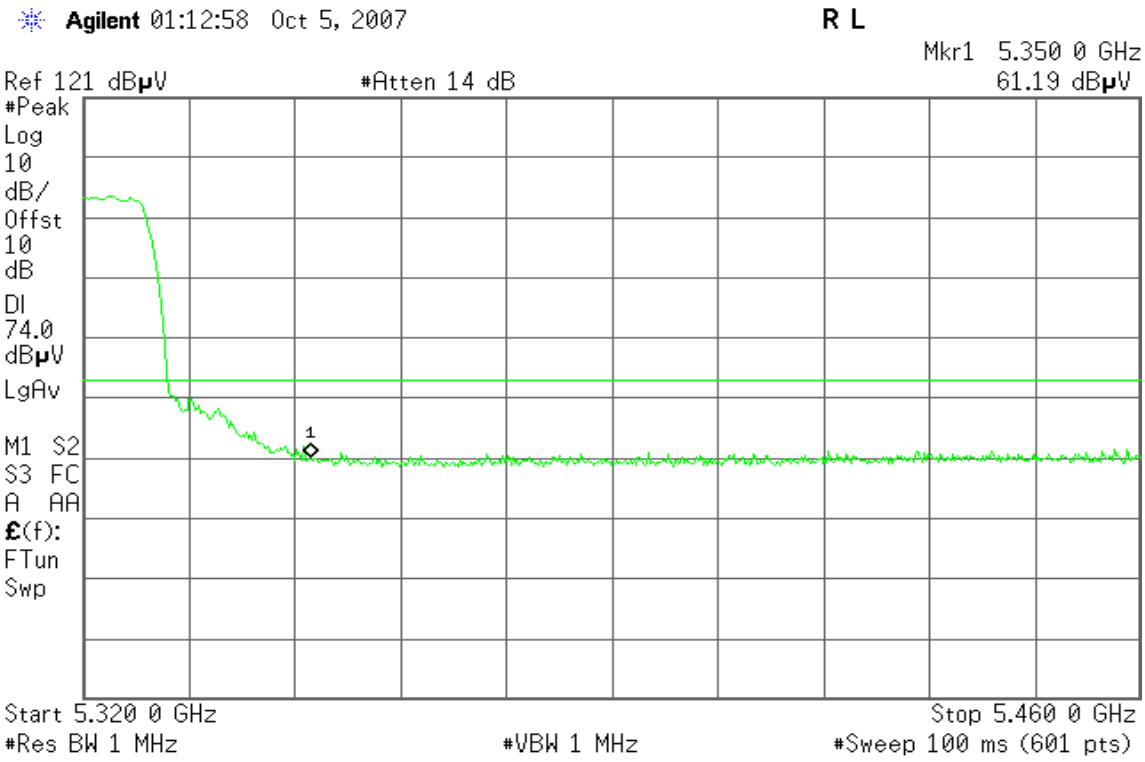
Detector mode: Peak **Polarity: Vertical**



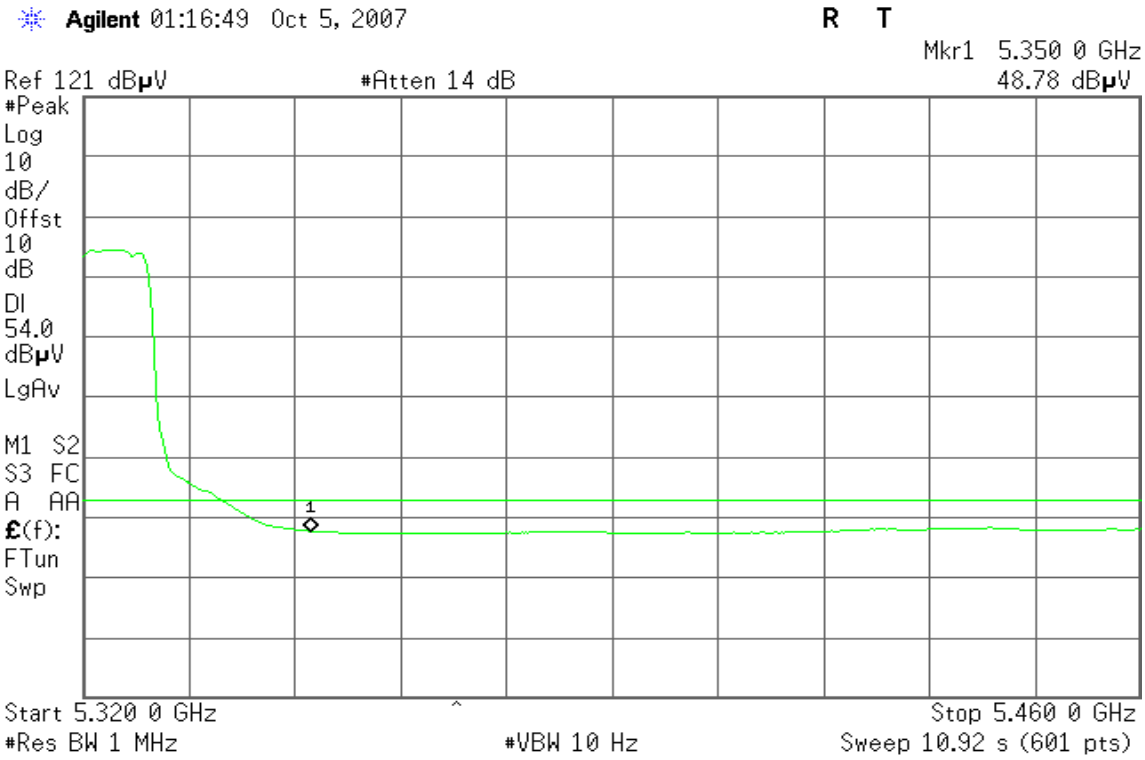
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

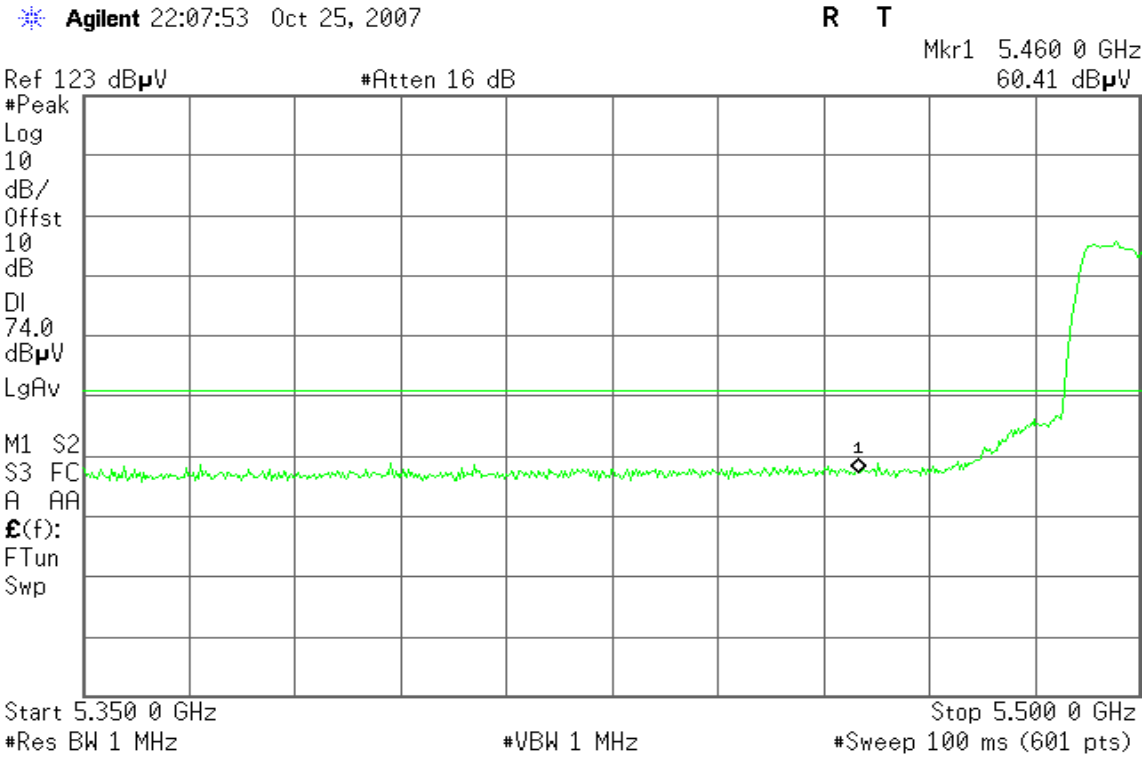


Detector mode: Average **Polarity: Horizontal**

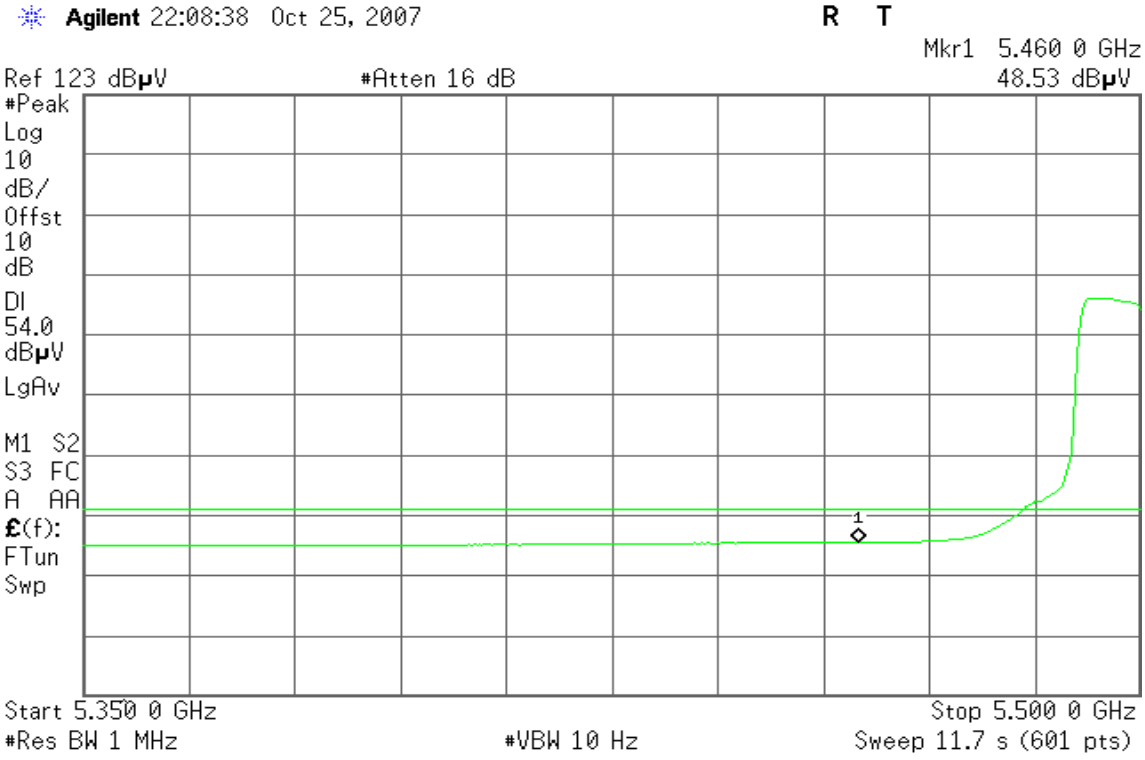


Band Edges (IEEE 802.11a mode / CH Low)

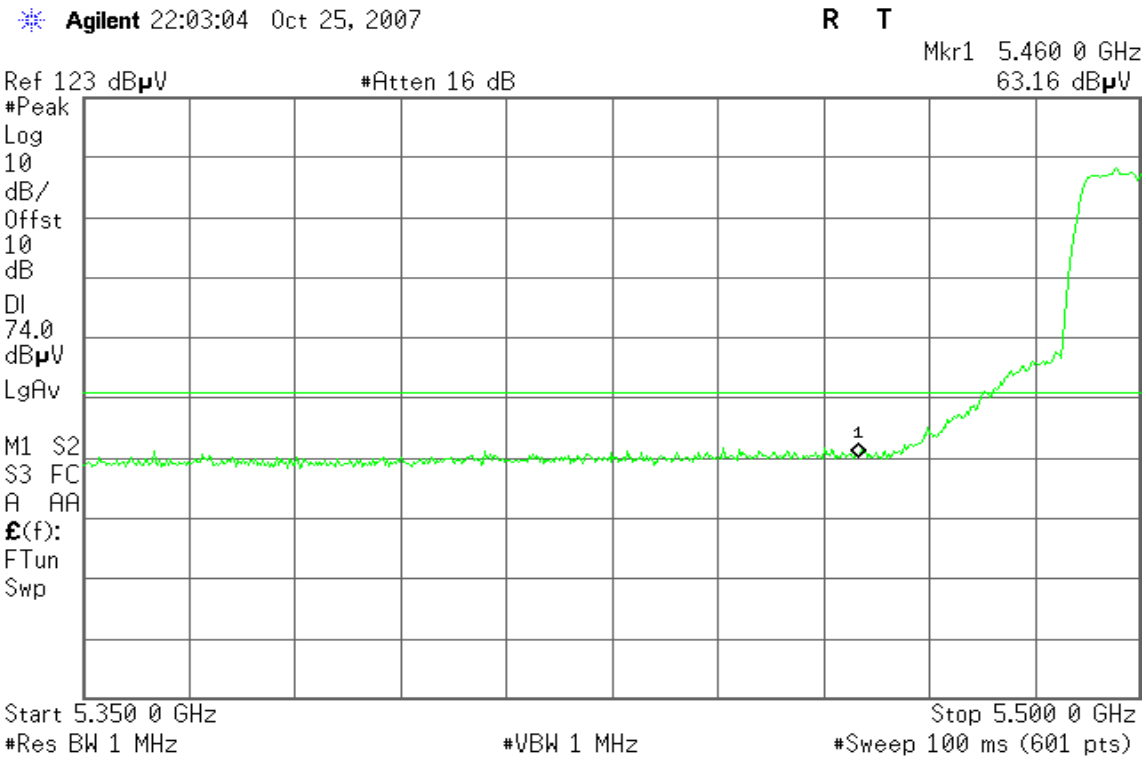
Detector mode: Peak Polarity: Vertical



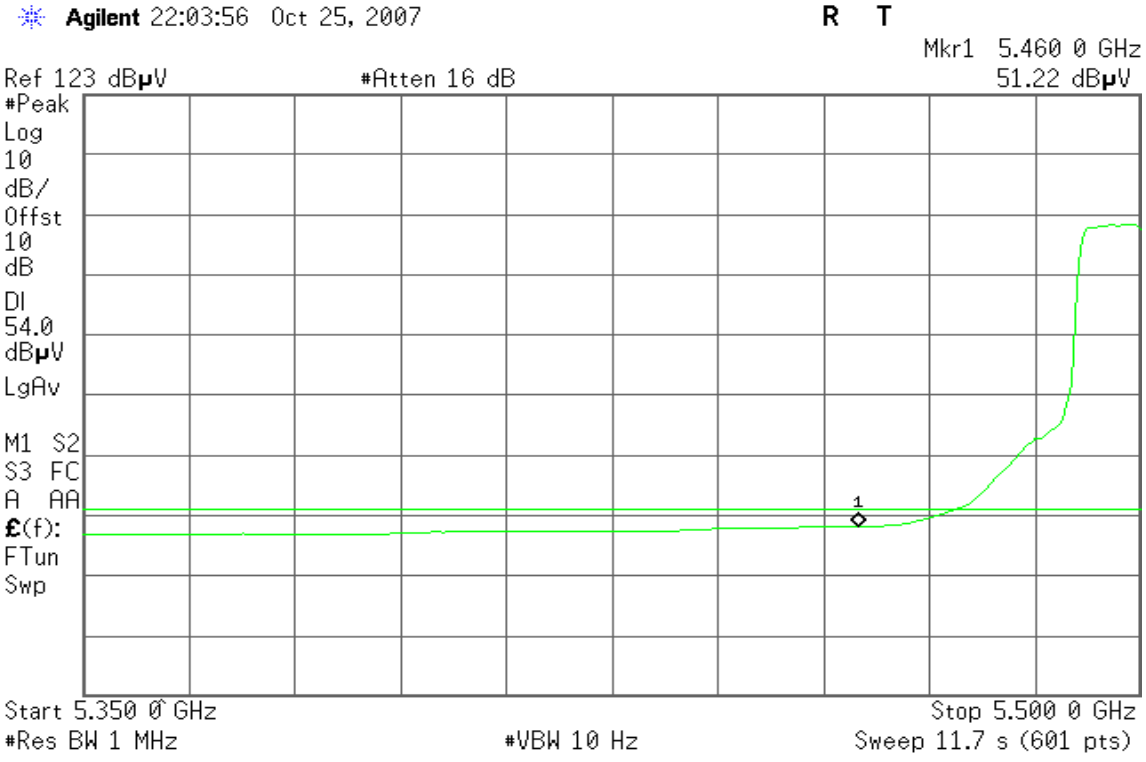
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

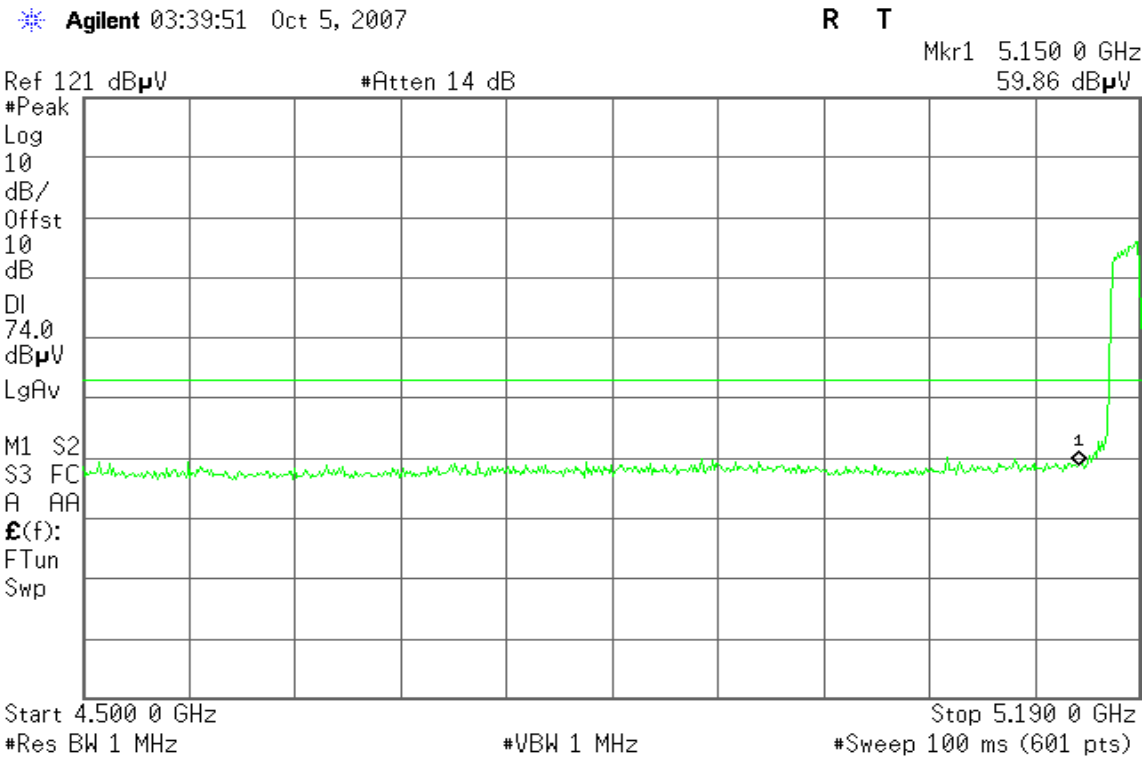


Detector mode: Average **Polarity: Horizontal**

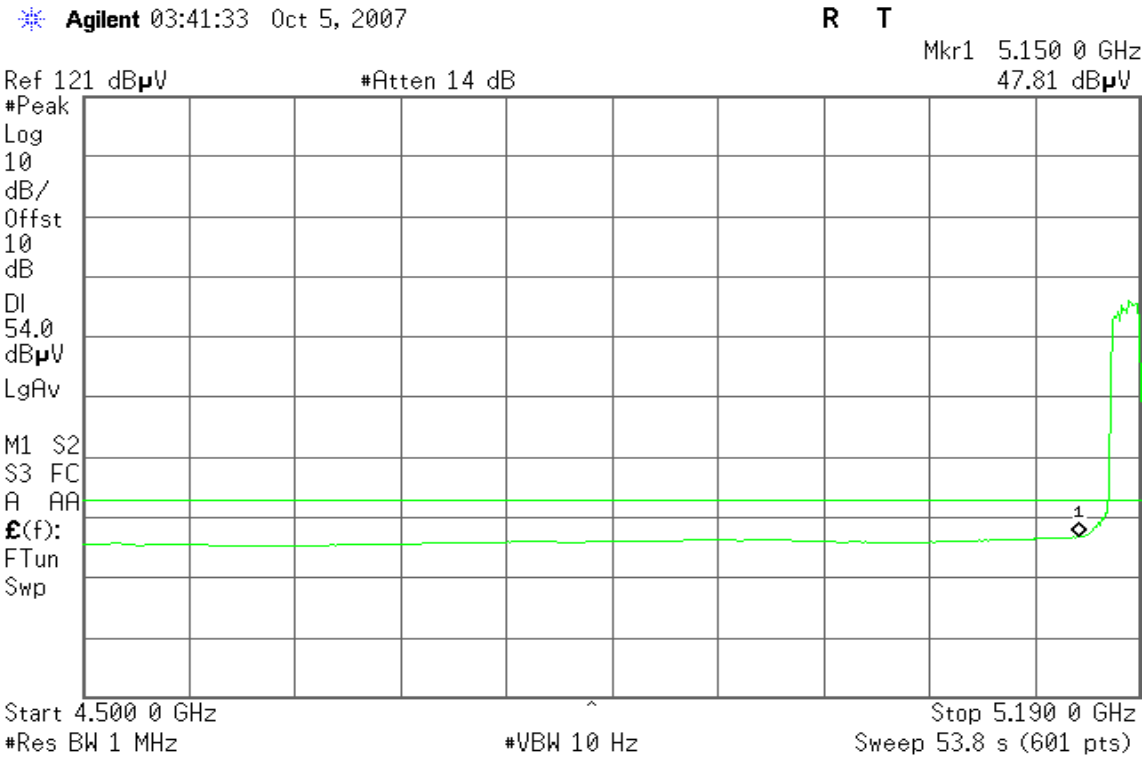


Band Edges (draft 802.11n Standard-20 MHz Channel mode / CH Low)

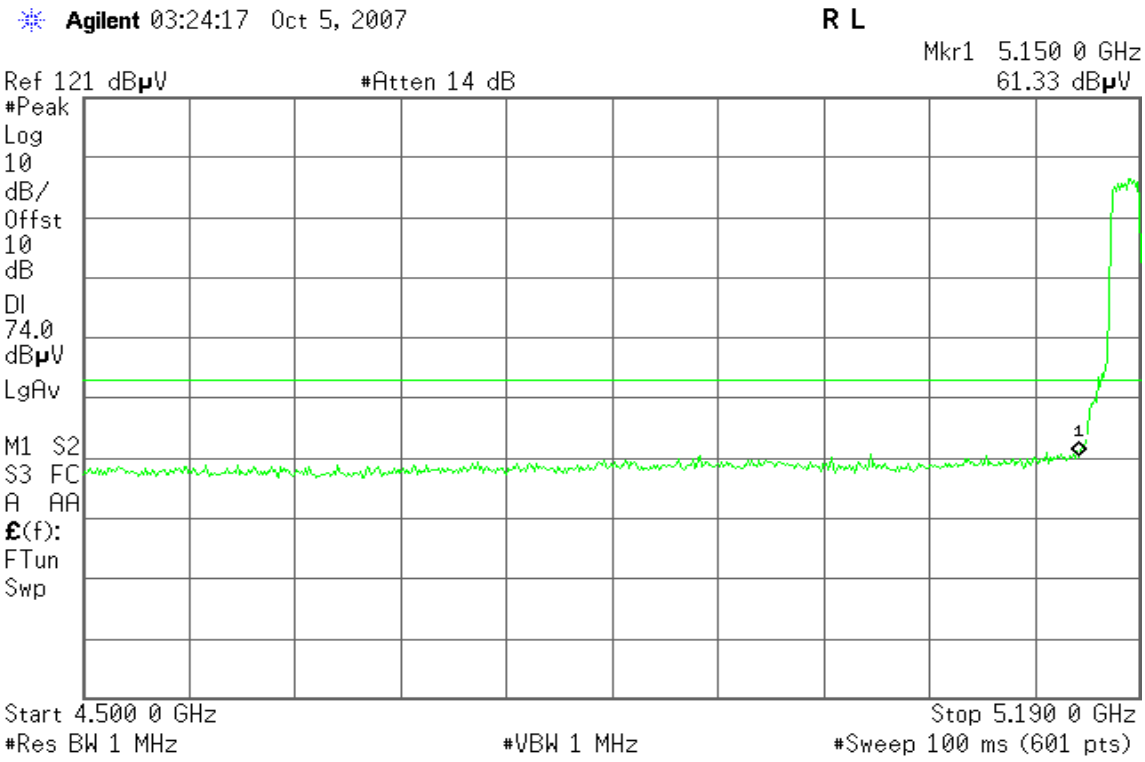
Detector mode: Peak **Polarity: Vertical**



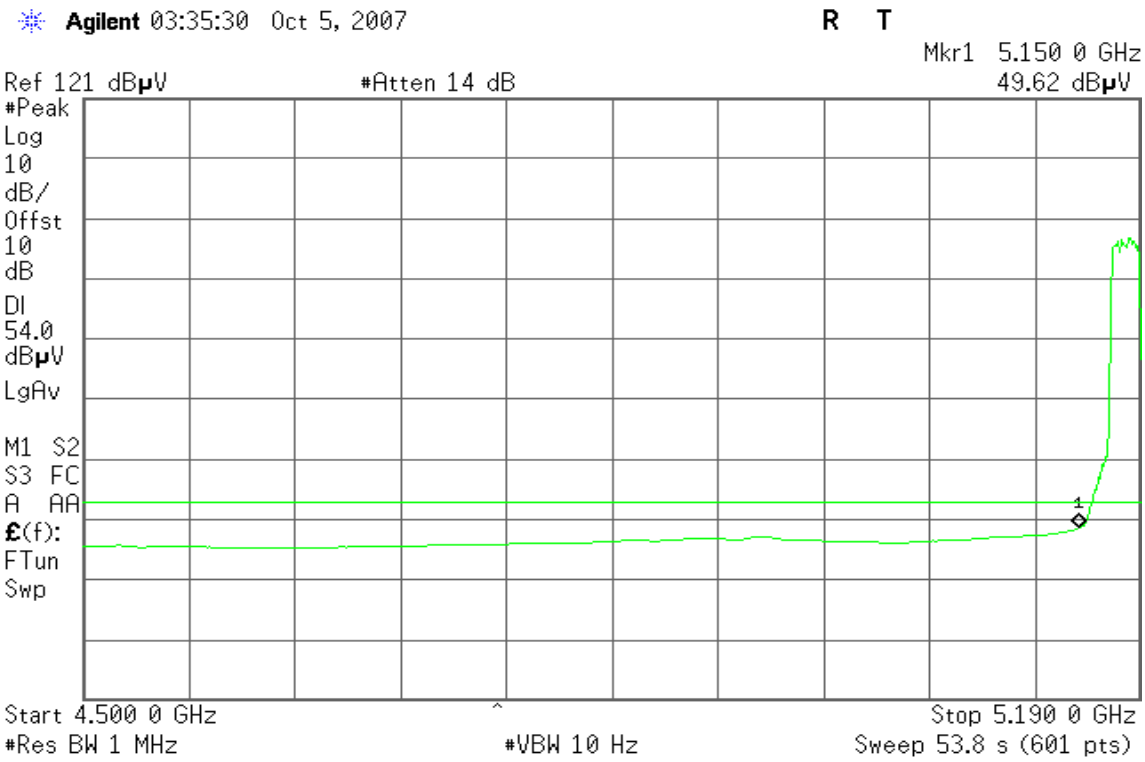
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

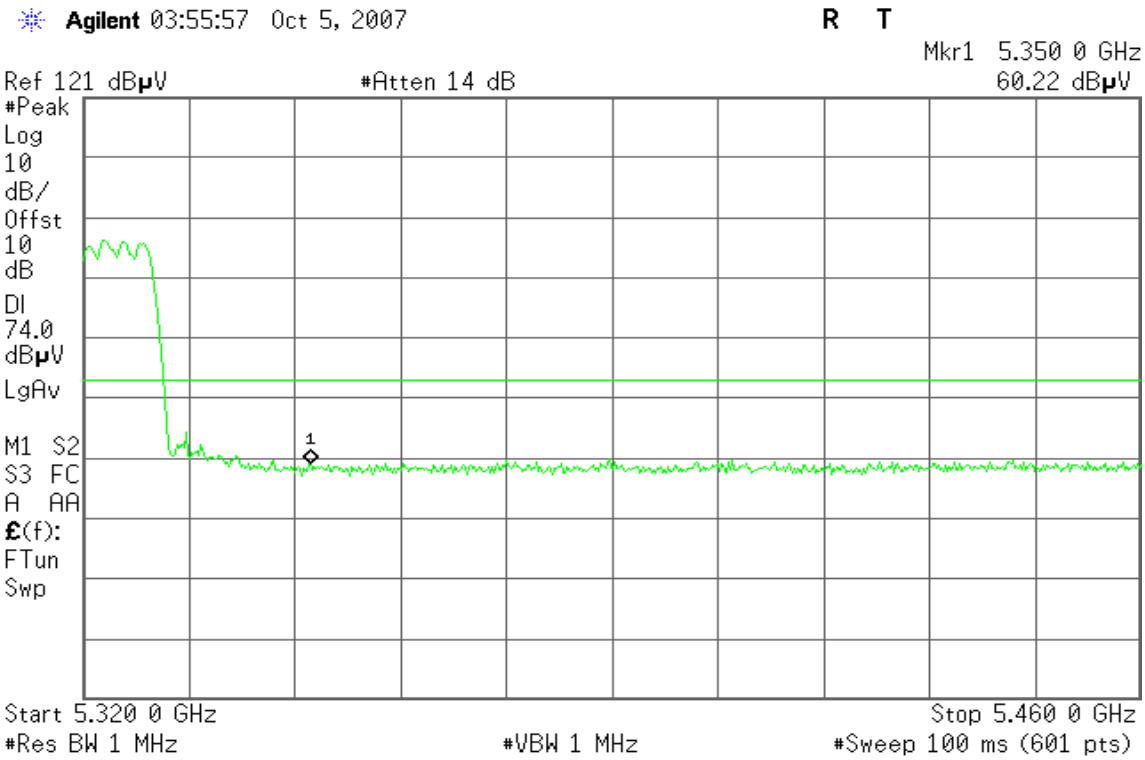


Detector mode: Average **Polarity: Horizontal**

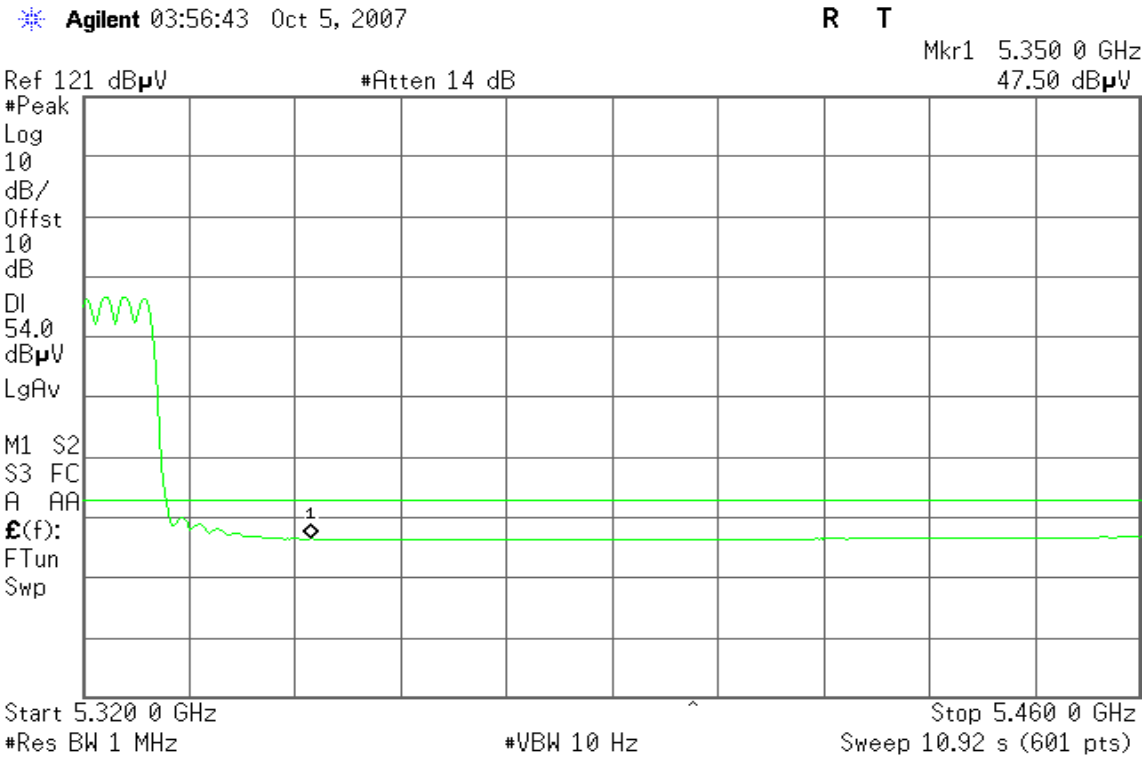


Band Edges (draft 802.11n Standard-20 MHz Channel mode / CH High)

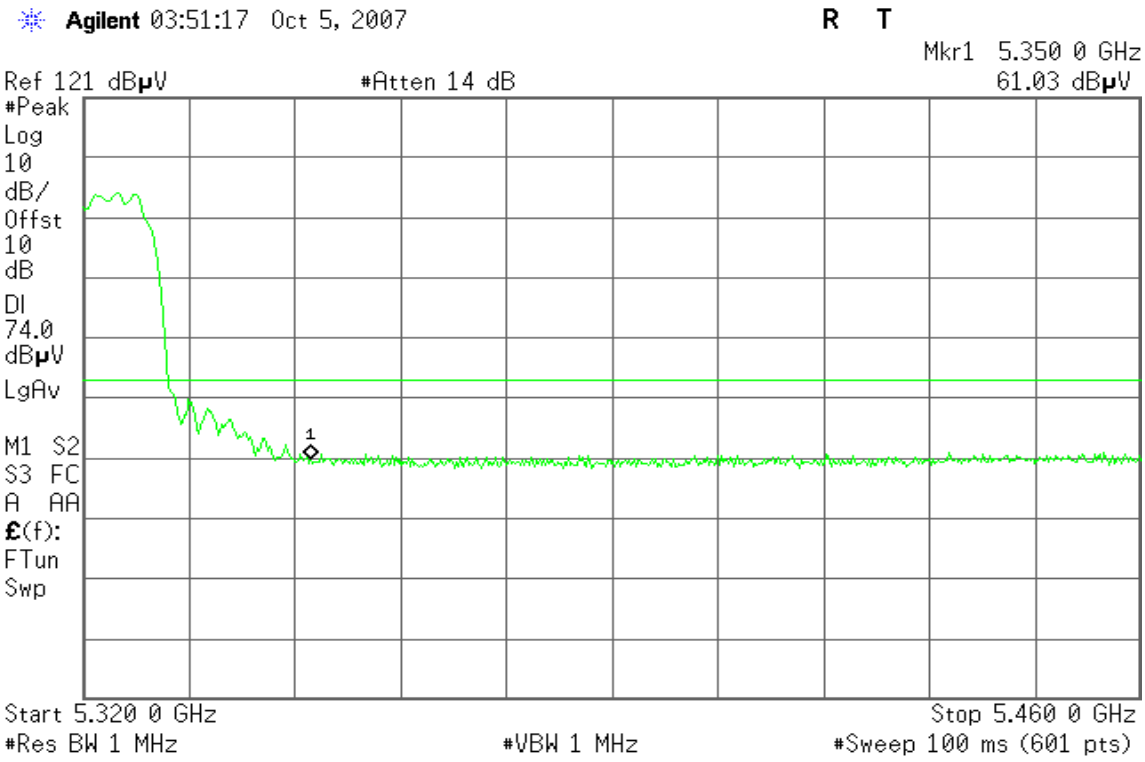
Detector mode: Peak **Polarity: Vertical**



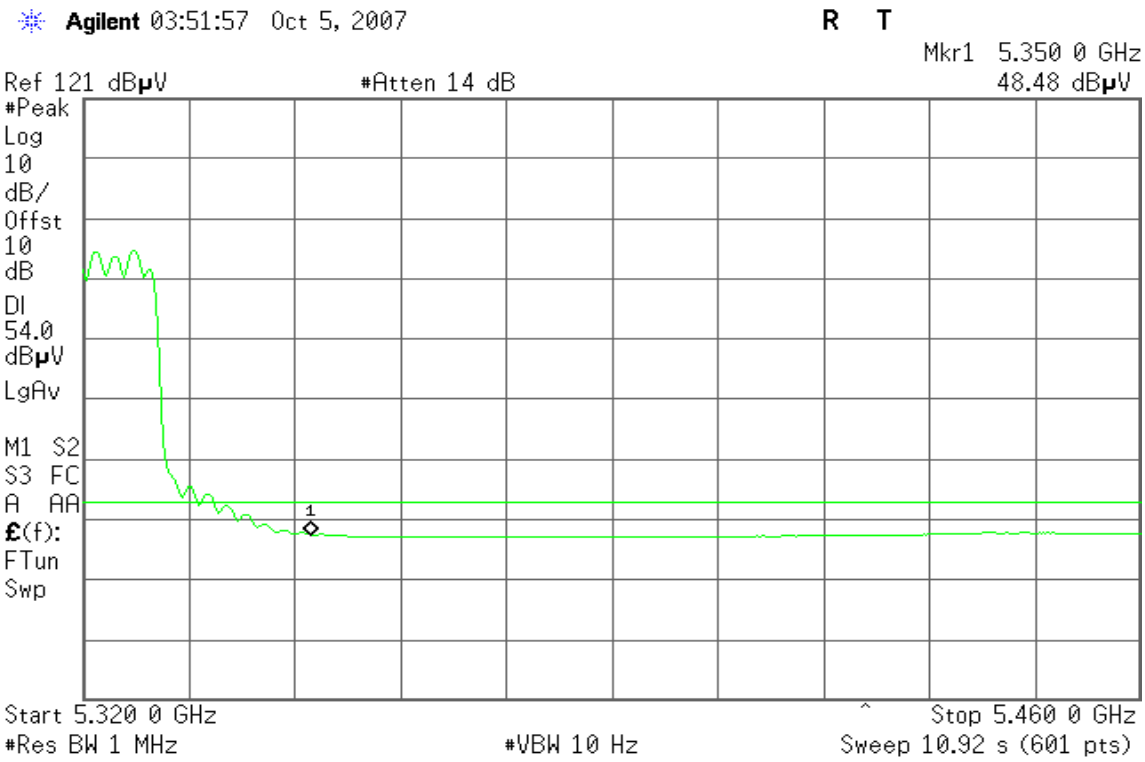
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

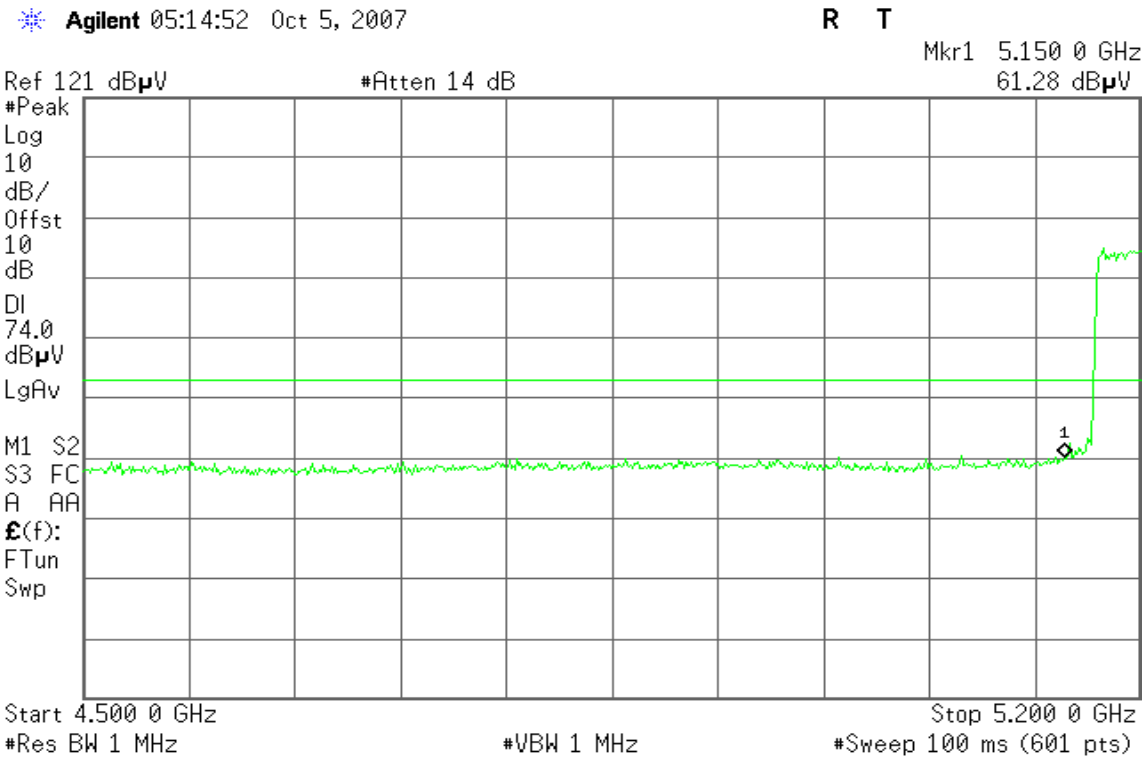


Detector mode: Average **Polarity: Horizontal**

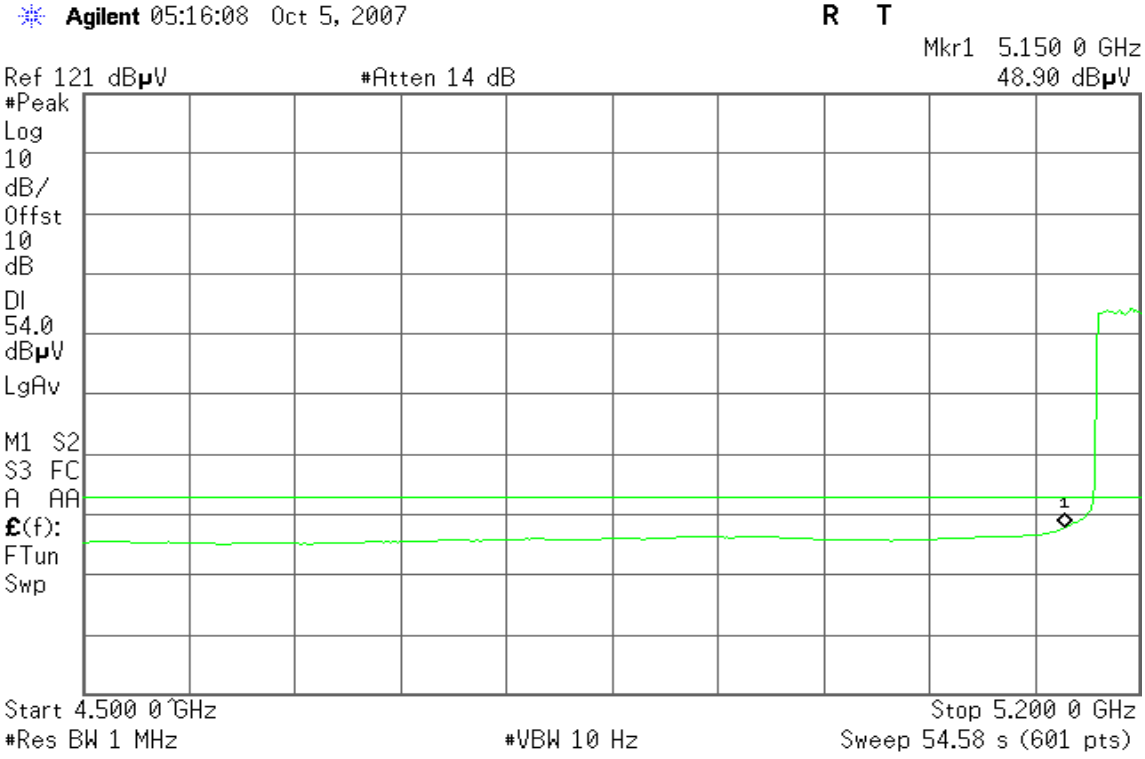


Band Edges (draft 802.11n Wide-40 MHz Channel mode / CH Low)

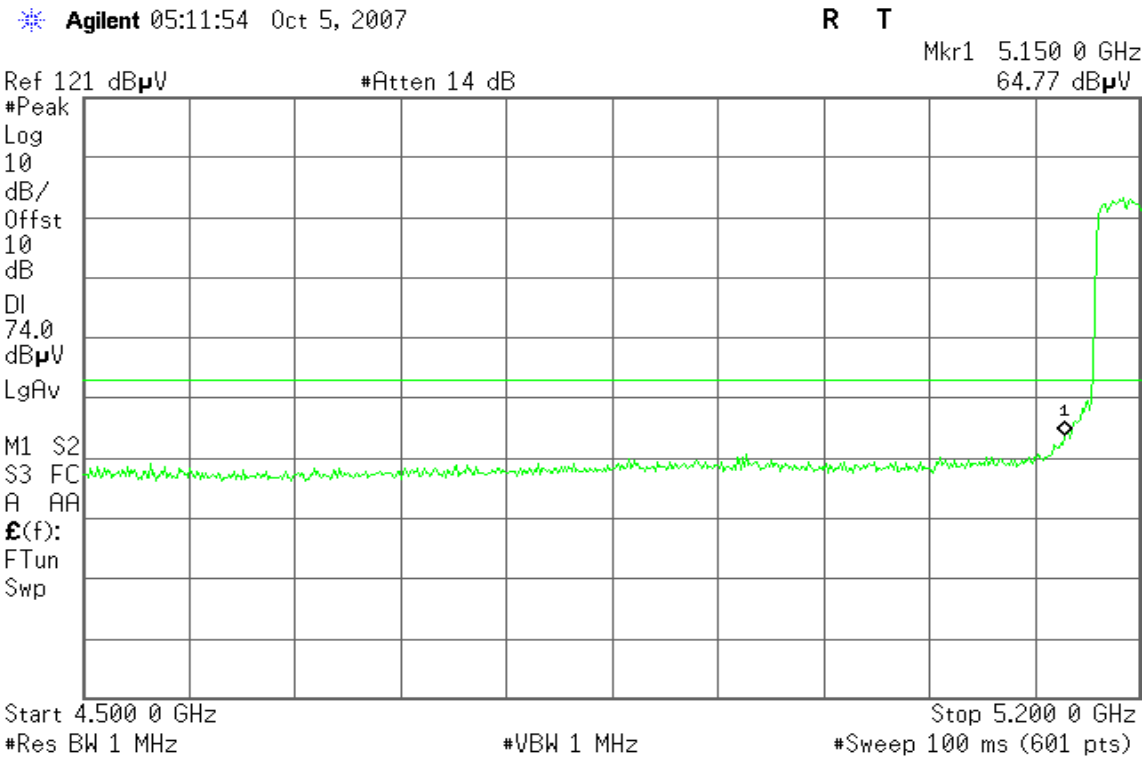
Detector mode: Peak **Polarity: Vertical**



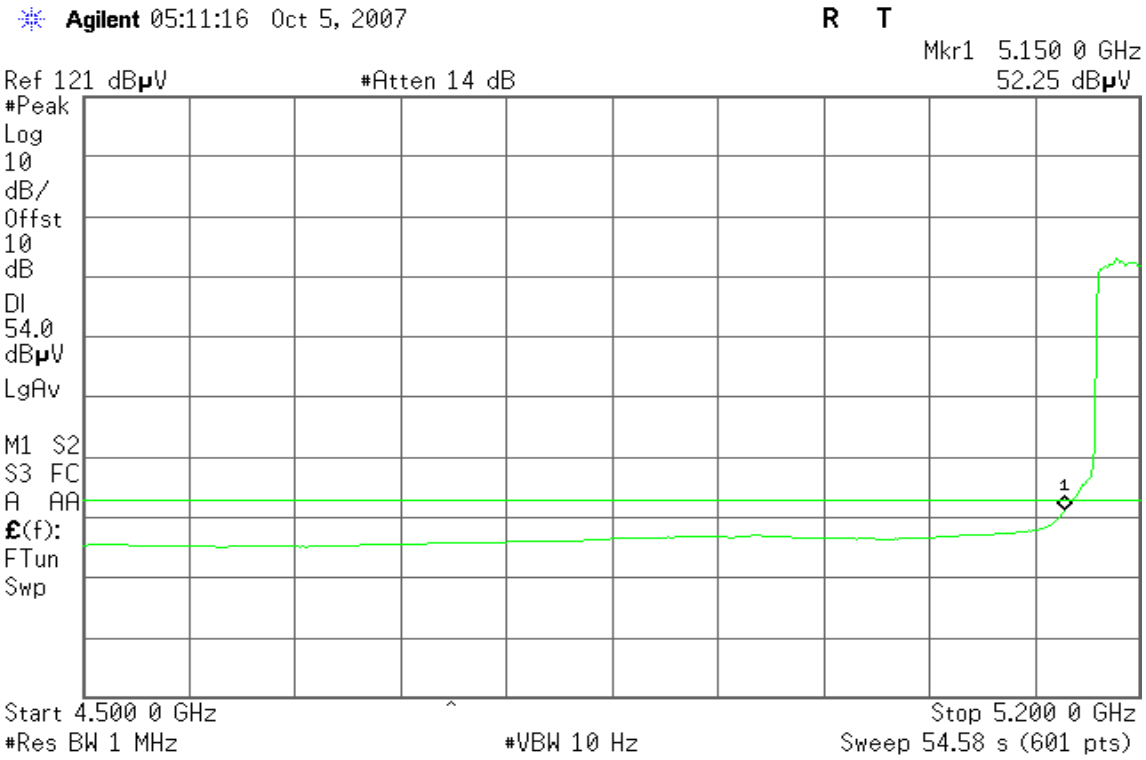
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



8.4 PEAK POWER SPECTRAL DENSITY

8.4.1 LIMIT

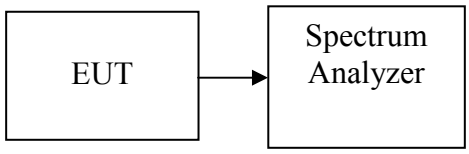
According to §15.407(a),

(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 and 5.47-5.725 GHz bands, 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



8.4.2 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 = Sweep= AUTO
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed

8.4.3 TEST RESULTS

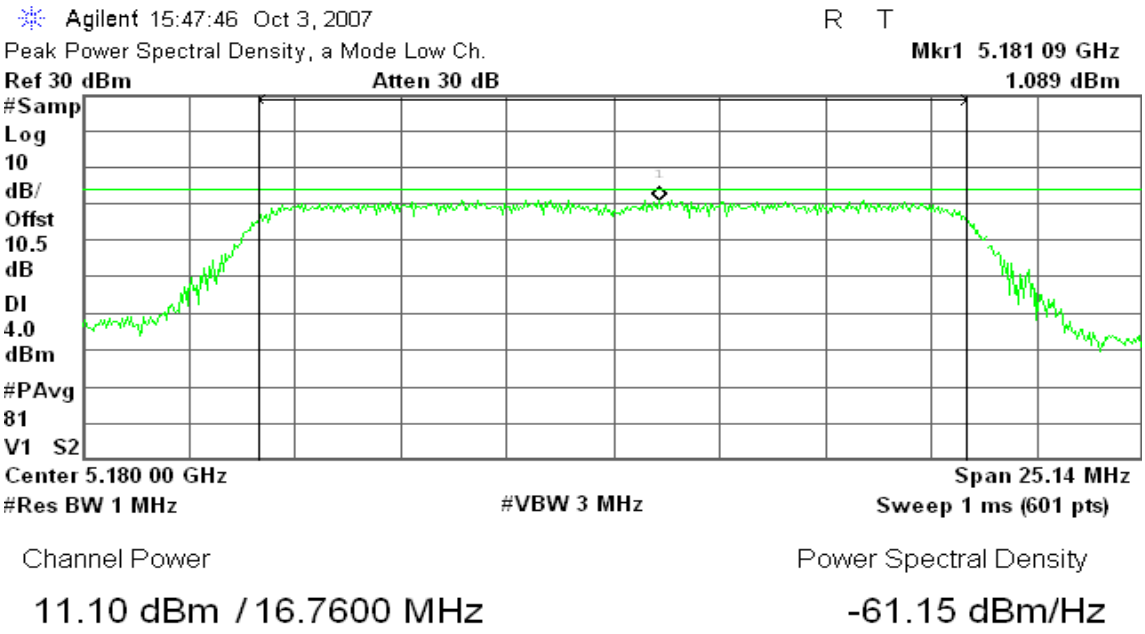
No non-compliance noted

Test Data

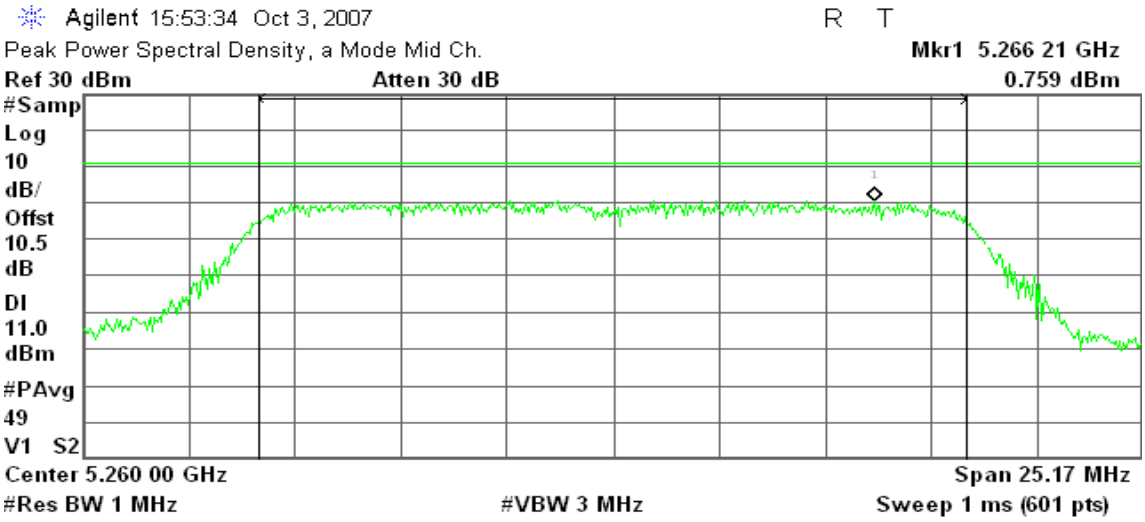
Test mode: IEEE 802.11a mode					
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5180	1.089	4.00	-2.911	PASS
Mid	5260	0.759	11.00	-10.241	PASS
High	5320	1.759	11.00	-9.241	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

PPSD (CH Low)

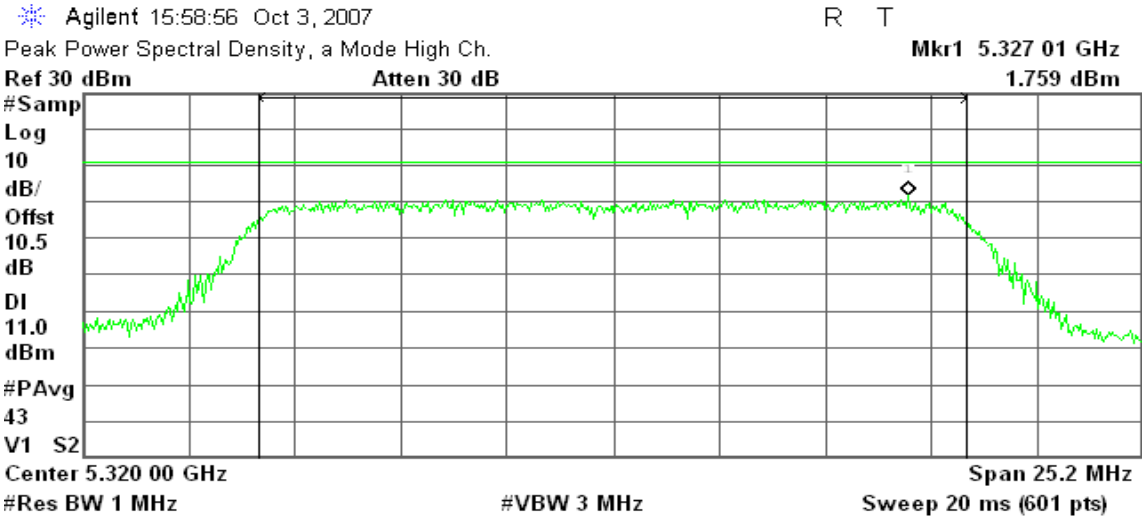


PPSD (CH Mid)



Channel Power	Power Spectral Density
10.46 dBm / 16.7800 MHz	-61.79 dBm/Hz

PPSD (CH High)



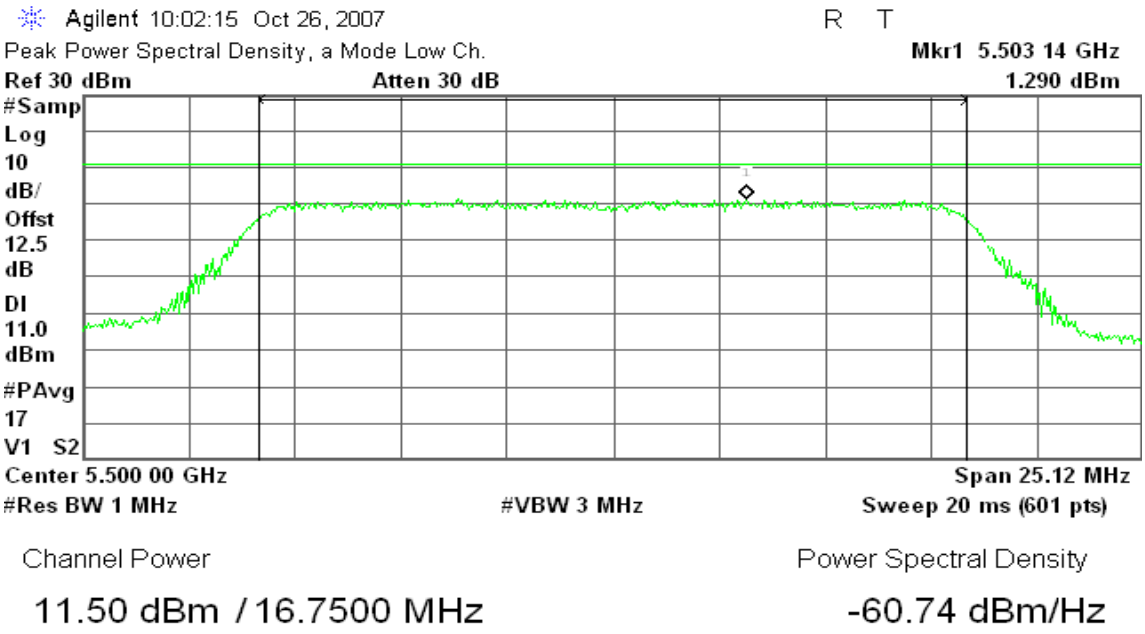
Channel Power	Power Spectral Density
10.83 dBm / 16.8000 MHz	-61.42 dBm/Hz

Test Data

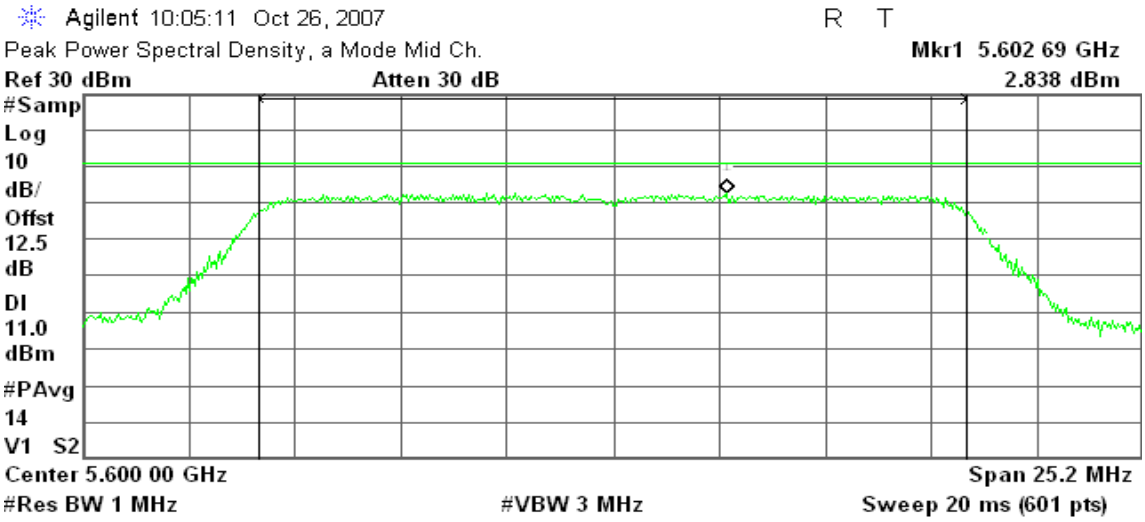
Test mode: IEEE 802.11a mode					
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5500	1.290	11.00	-9.710	PASS
Mid	5600	2.838	11.00	-8.162	PASS
High	5700	2.814	11.00	-8.186	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

PPSD (CH Low)

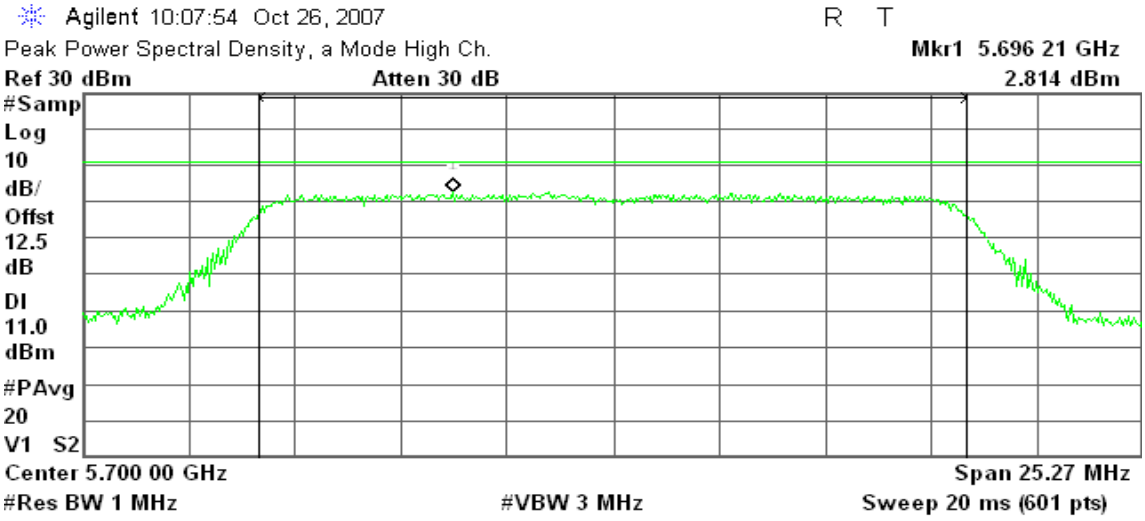


PPSD (CH Mid)



Channel Power	Power Spectral Density
13.35 dBm / 16.8000 MHz	-58.91 dBm/Hz

PPSD (CH High)



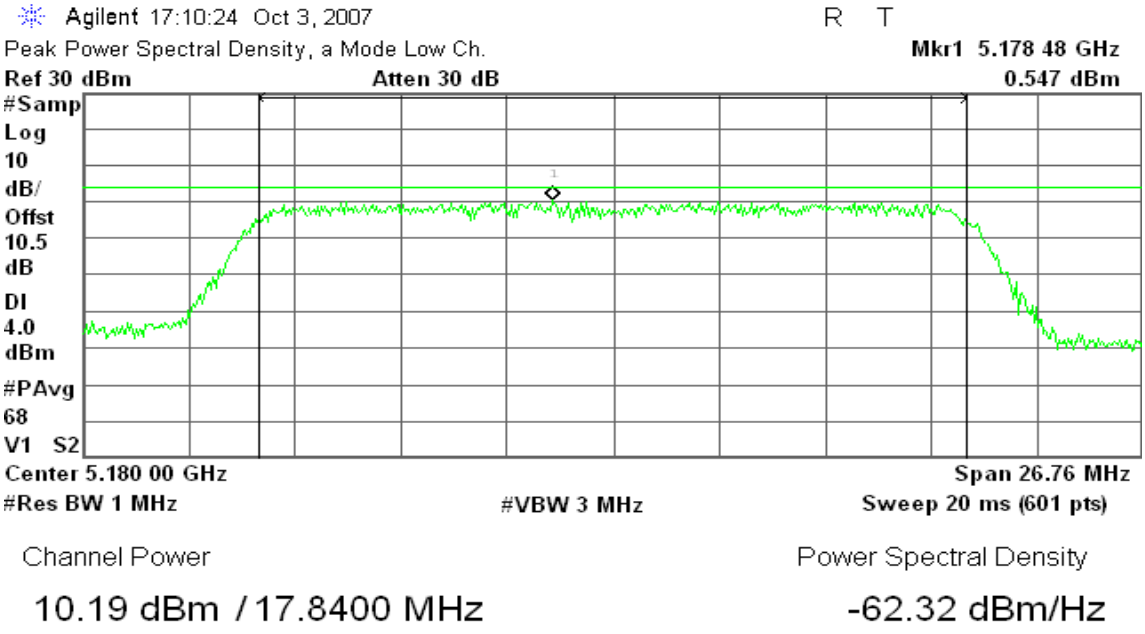
Channel Power	Power Spectral Density
12.90 dBm / 16.8500 MHz	-59.36 dBm/Hz

Test mode: draft 802.11n Standard-20 MHz Channel mode							
Channel	**Frequency (MHz)**	**Chain 0 PPSD (dBm)**	**Chain 1 PPSD (dBm)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5180	0.547	1.281	3.94	4.00	-0.06	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

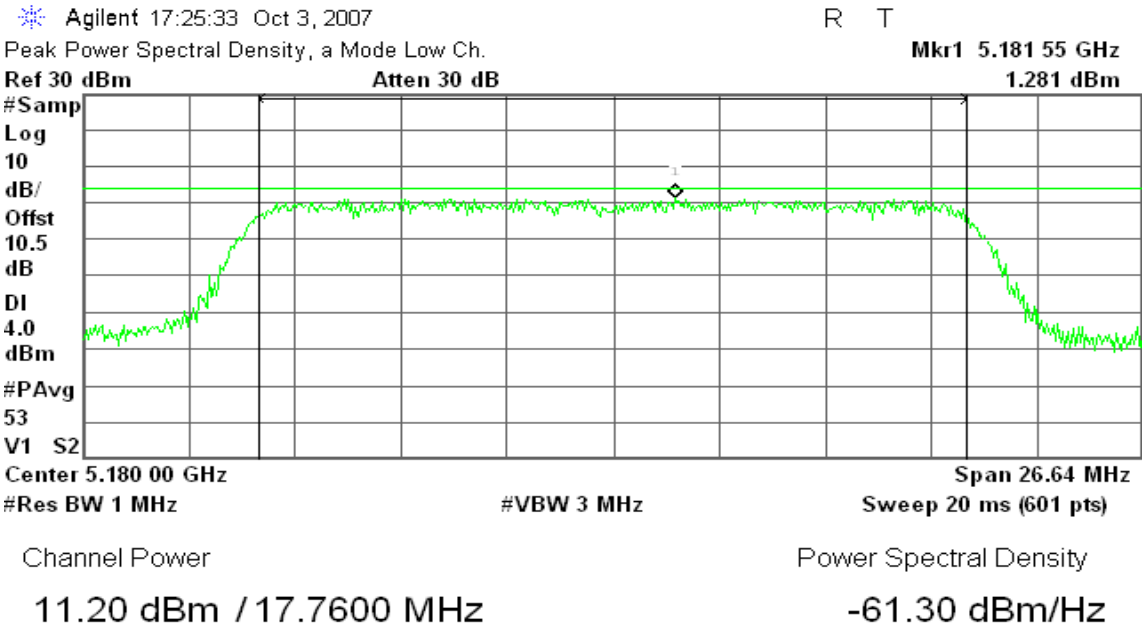
draft 802.11n Standard-20 MHz Channel mode / Chain 0:

PPSD (CH Low)



draft 802.11n Standard-20 MHz Channel mode / Chain 1:

PPSD (CH Low)



Channel Power

11.20 dBm / 17.7600 MHz

Power Spectral Density

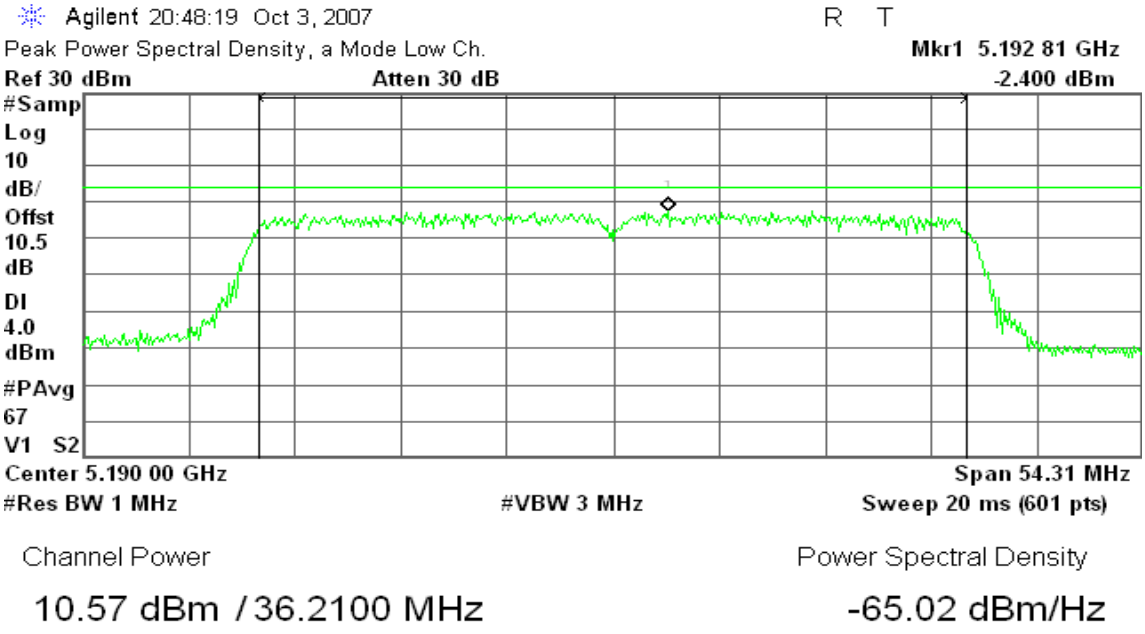
-61.30 dBm/Hz

Test mode: draft 802.11n Wide-40 MHz Channel mode							
Channel	**Frequency (MHz)**	**Chain 0 PPSD (dBm)**	**Chain 1 PPSD (dBm)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5190	-2.400	-2.048	0.79	4.00	-3.21	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

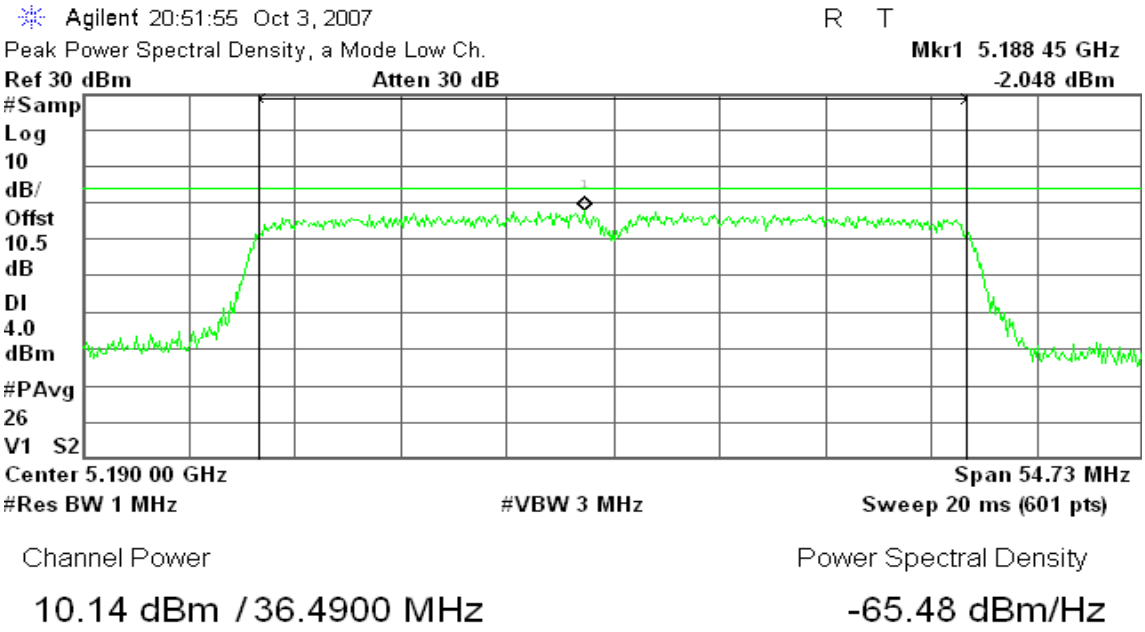
draft 802.11n Wide-40 MHz Channel mode / Chain 0:

PPSD (CH Low)



draft 802.11n Wide-40 MHz Channel mode / Chain 1:

PPSD (CH Low)

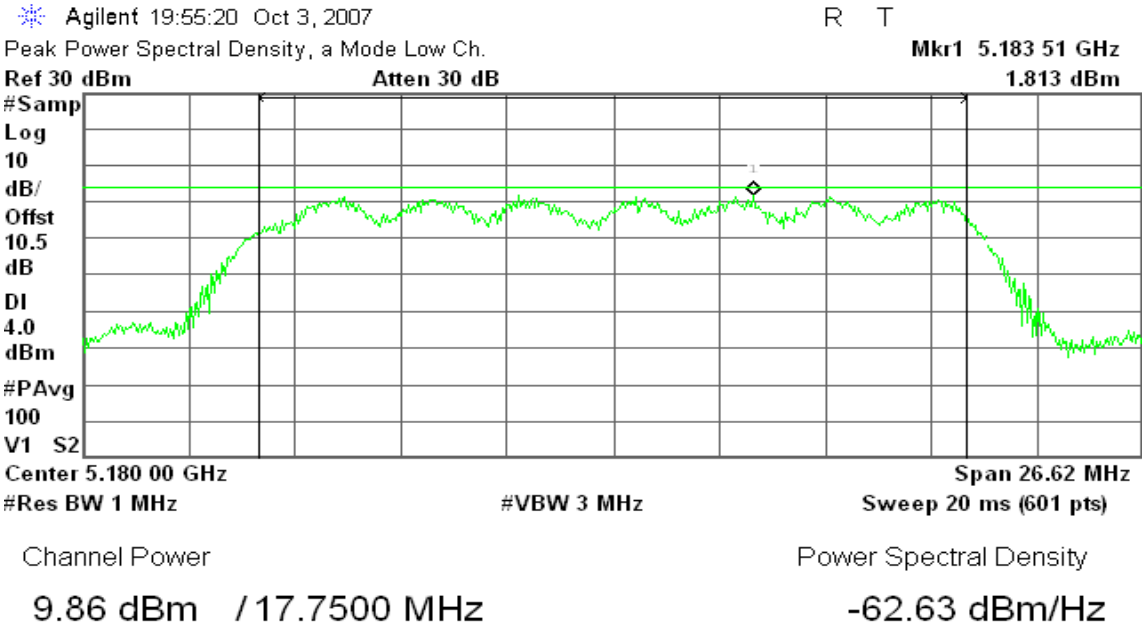


Channel Power	Power Spectral Density
10.14 dBm / 36.4900 MHz	-65.48 dBm/Hz

Test mode: draft 802.11n Standard-20 MHz Channel mode with combiner					
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5180	1.813	4.00	-2.187	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

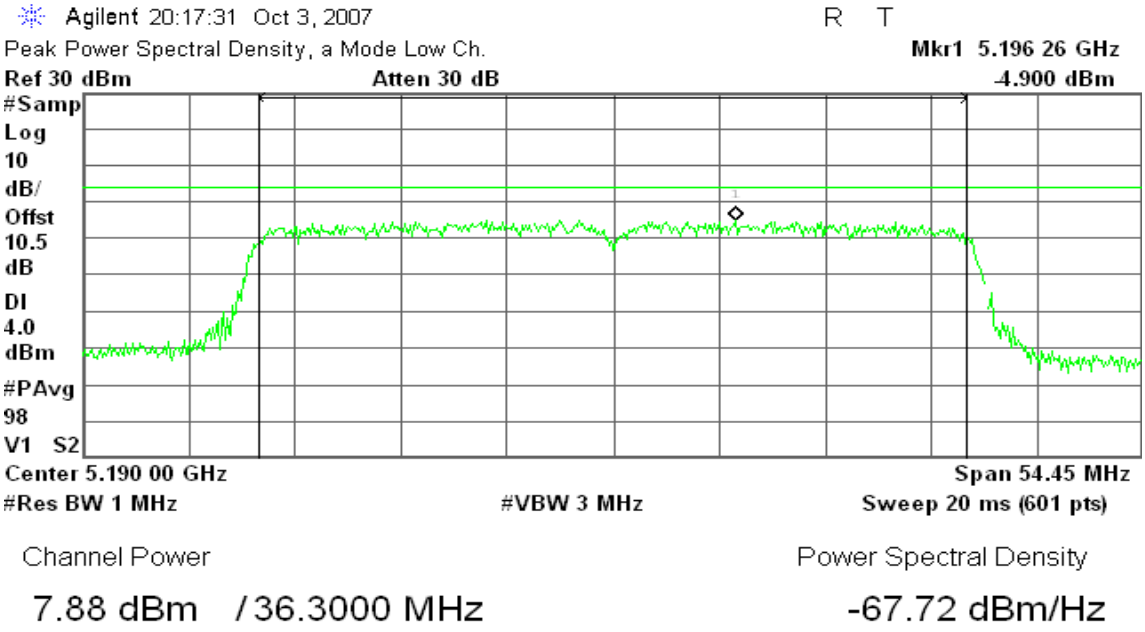
PPSD (CH Low)



Test mode: draft 802.11n Wide-40 MHz Channel mode with combiner					
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**	**Margin**	**Result**
Low	5190	-4.900	4.00	-8.900	PASS

Remark: *1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 (PPSD) / 10)+10^(Chain 1 (PPSD) /10))*
2. Maximum antenna gain =1.8dBi, therefore there is no reduction due to antenna gain.

PPSD (CH Low)

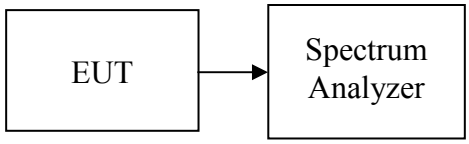


8.5 PEAK EXCURSION

8.5.1 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



8.5.2 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, Max. hold.
4. Delta Mark trace A Maximum frequency and trace B same frequency.
5. Repeat the above procedure until measurements for all frequencies were complete.

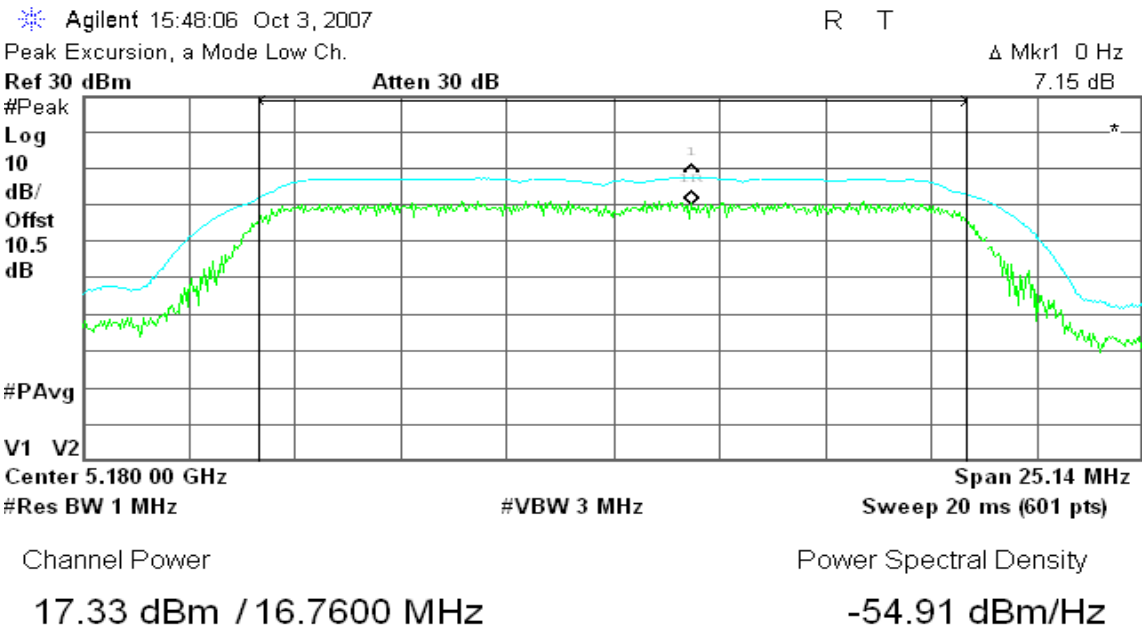
8.5.3 TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11amode					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5180	7.15	13.00	-5.85	PASS
Mid	5260	8.96	13.00	-4.04	PASS
High	5320	8.14	13.00	-4.86	PASS

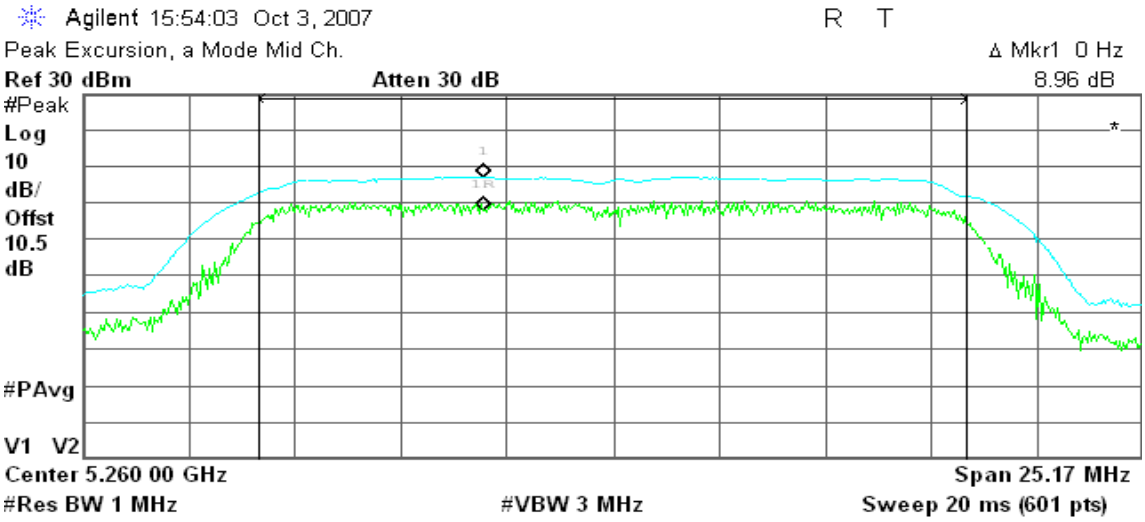
Peak Excursion (CH Low)



Channel Power
17.33 dBm / 16.7600 MHz

Power Spectral Density
-54.91 dBm/Hz

Peak Excursion (CH Mid)



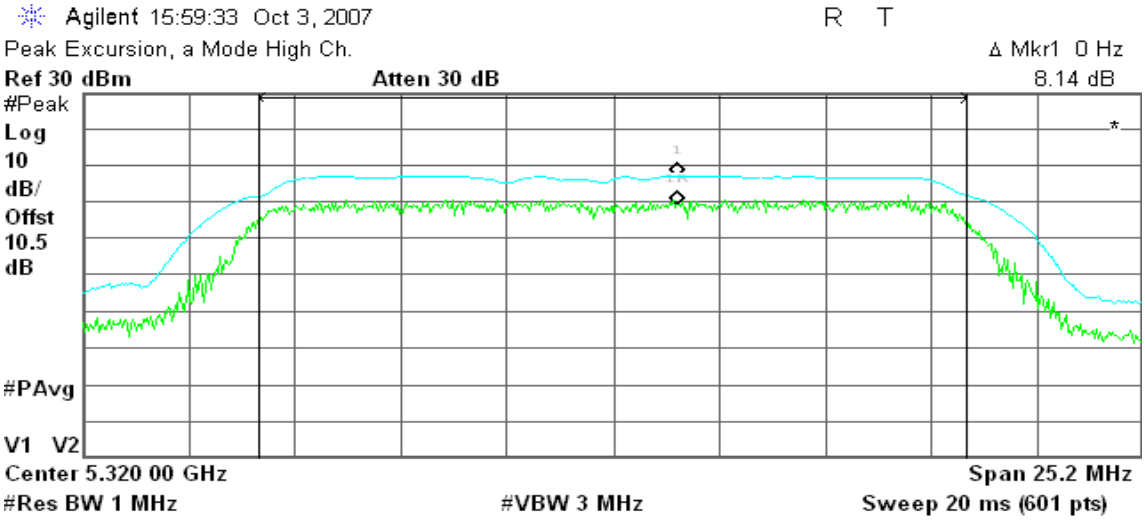
Channel Power

16.89 dBm / 16.7800 MHz

Power Spectral Density

-55.36 dBm/Hz

Peak Excursion (CH High)



Channel Power

17.16 dBm / 16.8000 MHz

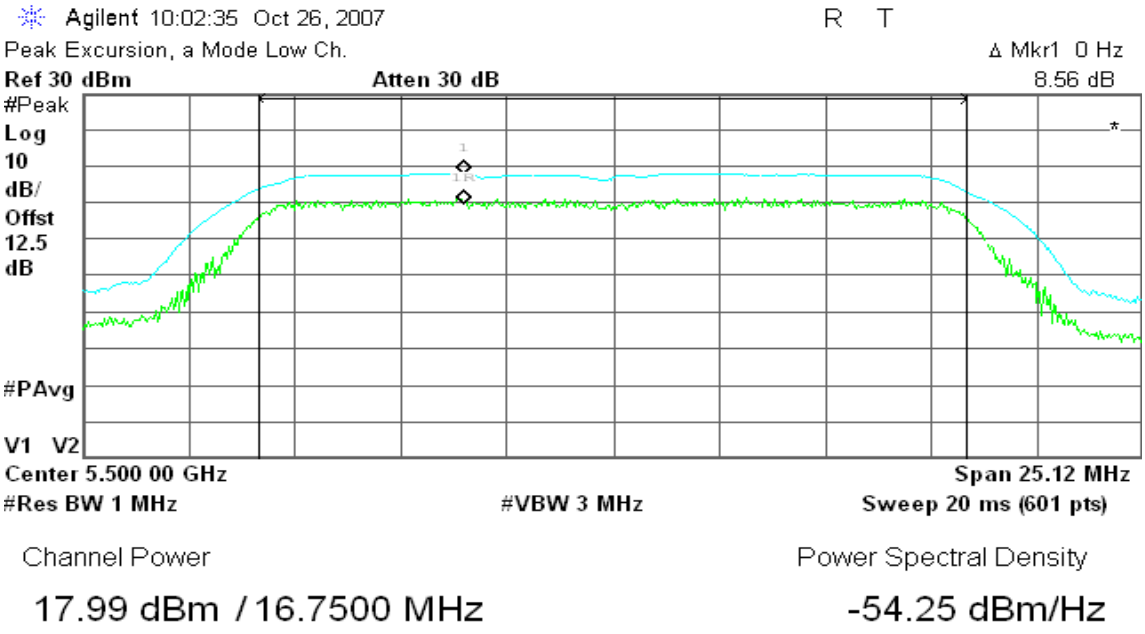
Power Spectral Density

-55.09 dBm/Hz

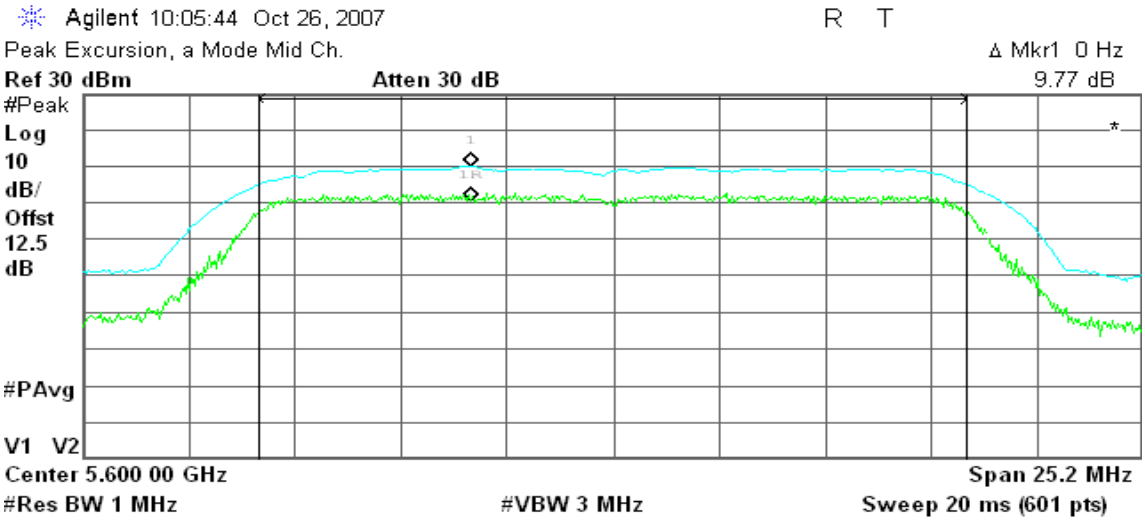
Test Data

Test mode: IEEE 802.11amode					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5500	8.56	13.00	-4.44	PASS
Mid	5600	9.77	13.00	-3.23	PASS
High	5700	9.08	13.00	-3.92	PASS

Peak Excursion (CH Low)



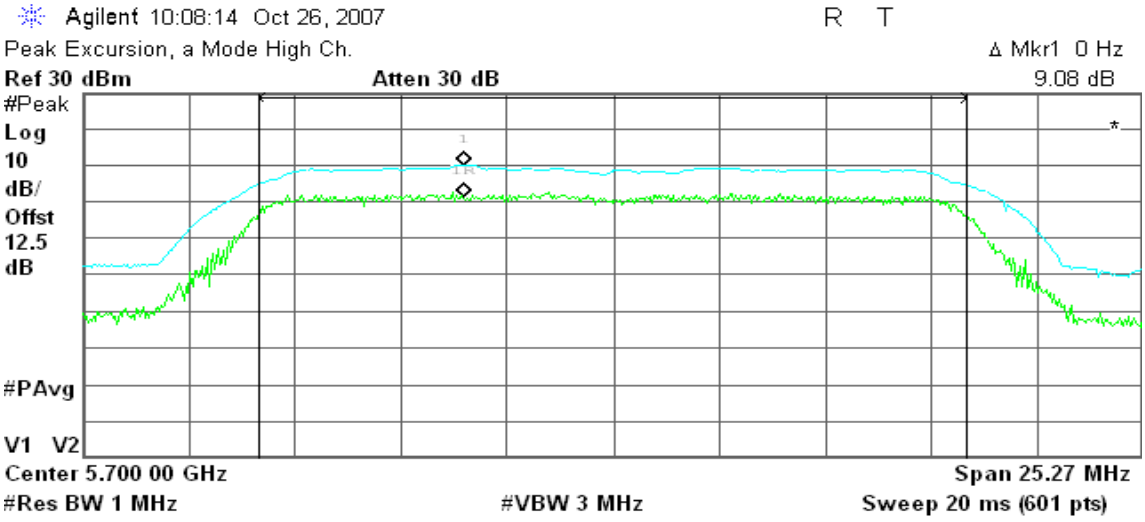
Peak Excursion (CH Mid)



Channel Power
19.50 dBm / 16.8000 MHz

Power Spectral Density
-52.75 dBm/Hz

Peak Excursion (CH High)

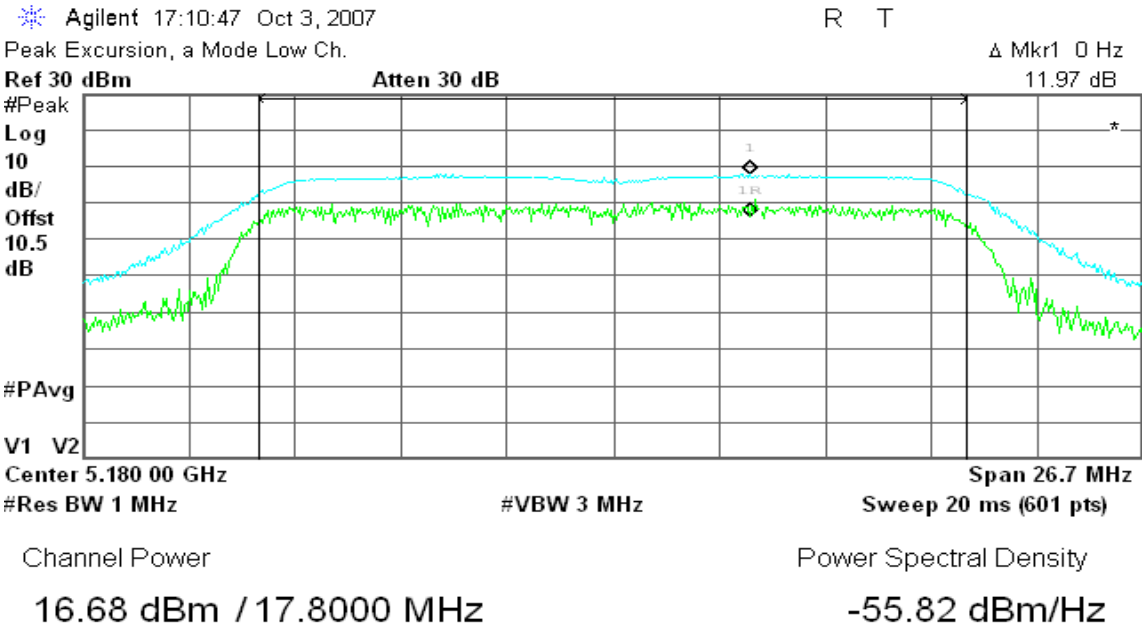


Channel Power
19.23 dBm / 16.8500 MHz

Power Spectral Density
-53.04 dBm/Hz

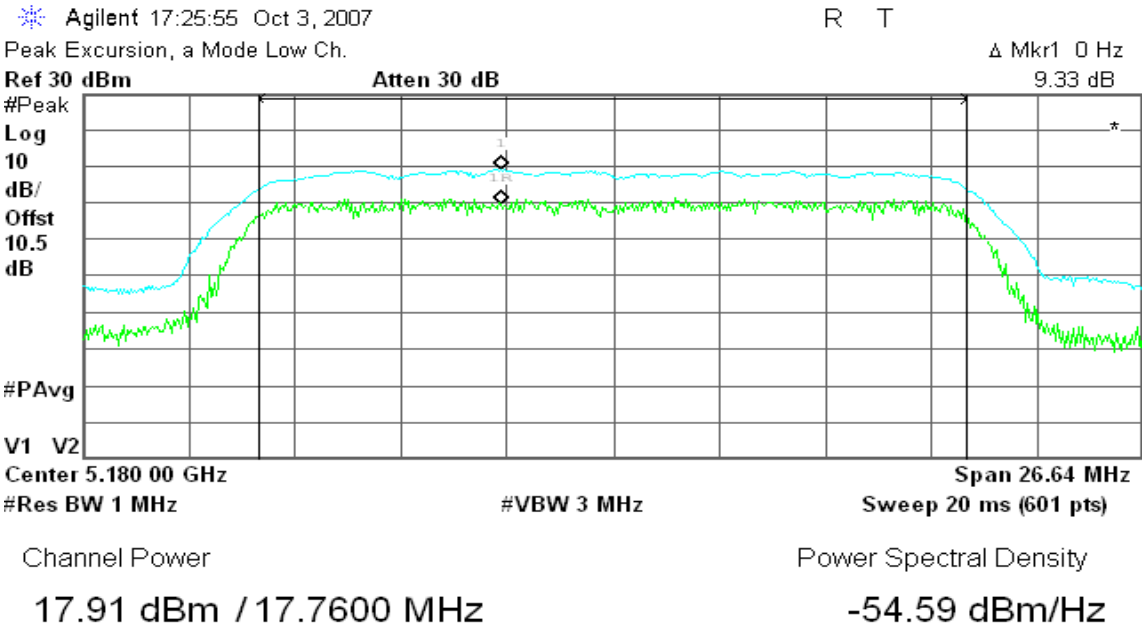
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5180	11.97	13.00	-1.03	PASS

Peak Excursion (CH Low)



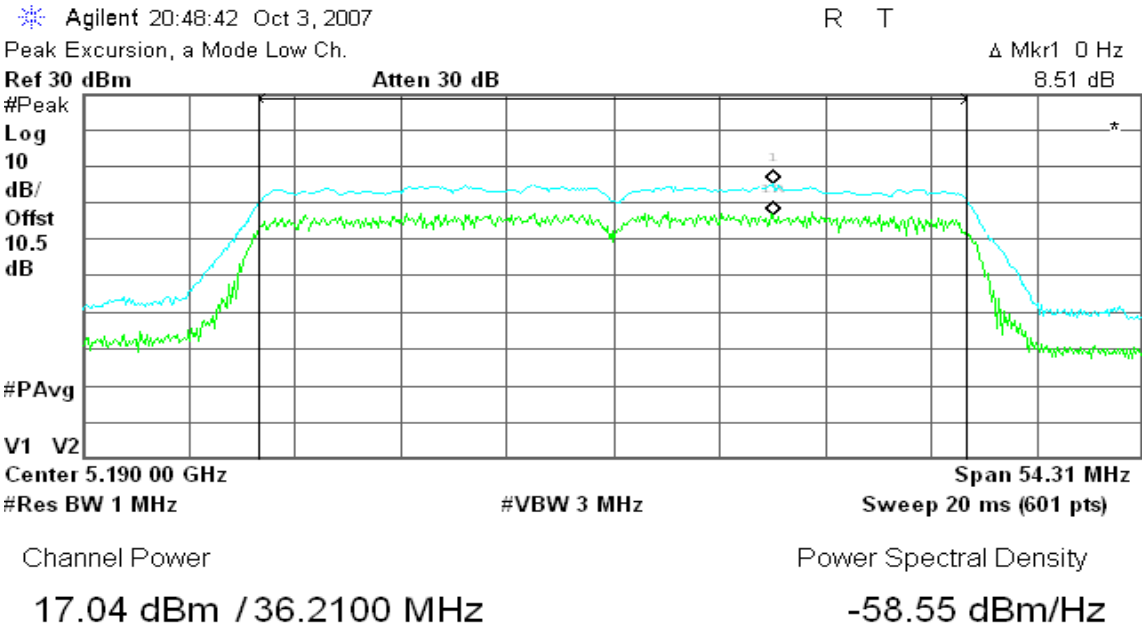
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5180	9.33	13.00	-3.67	PASS

Peak Excursion (CH Low)



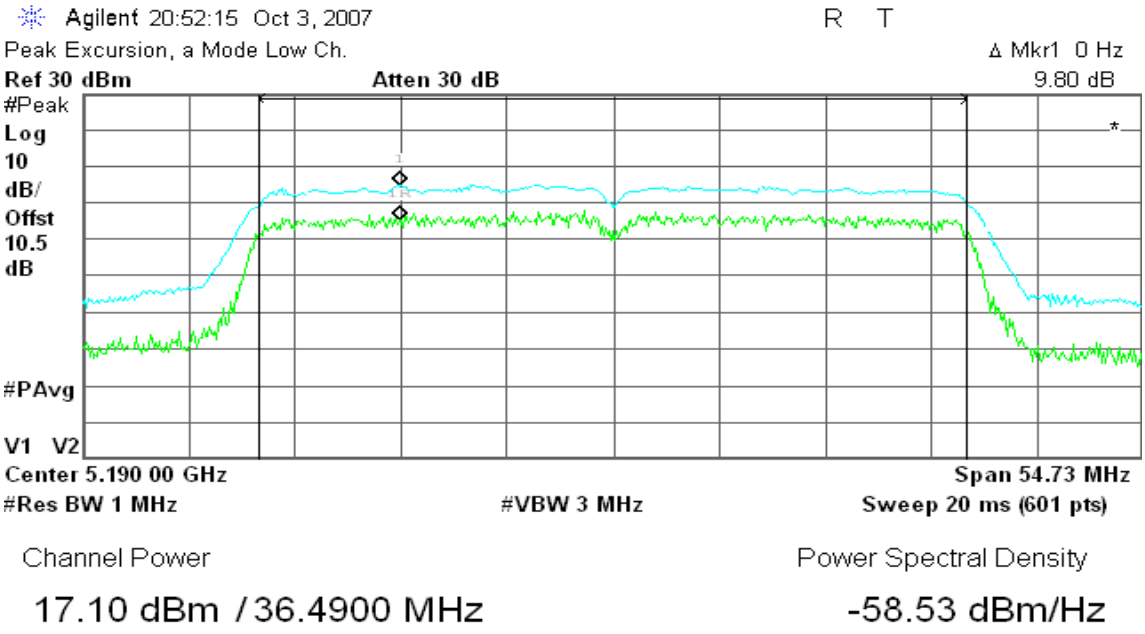
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5190	8.51	13.00	-4.49	PASS

Peak Excursion (CH Low)



Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1					
Channel	**Frequency (MHz)**	**Peak Excursion (dB)**	**Limit (dB)**	**Margin (dB)**	**Result**
Low	5190	9.80	13.00	-3.20	PASS

Peak Excursion (CH Low)



Channel Power
17.10 dBm / 36.4900 MHz

Power Spectral Density
-58.53 dBm/Hz

8.6 TRANSMISSION IN ABSENCE OF DATA

8.6.1 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.

8.6.2 TEST RESULTS

Please refer to the operational description for details.

Remark: *For the details, please refer to the operational description.*

8.7 FREQUENCY STABILITY

8.7.1 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 operational description.

8.7.2 TEST RESULTS

Please refer to the operational description 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.*

8.8 ANTENNA REQUIREMENT

8.8.1 LIMIT

According to FCC Part 15.407(d), any U-NII device that operates in the 5.15-5.25 GHz band shall use a transmitting antenna that is an integral part of the device.

8.8.2 TEST RESULTS

No non-compliance noted

The antenna connector is designed with a unique connector and replacement of it by the user is not considered. For details, refer to the EUT photos.

8.9 DYNAMIC FREQUENCY SELECTION

8.9.1 LIMIT

According to §15.407 (h) and FCC 06-96 appendix "compliance measurement procedures for unlicensed-national information infrastructure devices operating in the 5250-5350 MHz and 5470-5725 MHz bands incorporating dynamic frequency selection".

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client(with radar detection)
Non-Occupancy Period	Yes	Yes	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client(with radar detection)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes

Table 3: Interference Threshold values, Master or Client incorporating In-Service

Maximum Transmit Power	Value (see note)
>=200 Milliwatt	-64 dBm
< 200 Milliwatt	-62 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period

The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:

- For the Short pulse radar Test Signals this instant is the end of the Burst.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.
- For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Table 6 – Long Pulse Radar Test Signal

Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (µsec)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform	Pulse Width (µsec)	PRI (µsec)	Burst Length (ms)	Pulses Per Hop	Hopping Rate (kHz)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	300	9	0.33	70%	30

8.9.2 DESCRIPTION OF EUT

Overview Of EUT With Respect To §15.407 (H) Requirements

The firmware installed in the EUT during testing was:
Firmware Rev: 0.0.0

The EUT operates over the 5250-5350 MHz range as a Client Device that does not have radar detection capability.

The antenna assembly utilized with the EUT has a gain of 1.8 dBi.

The highest power level is 13.77 dBm EIRP in the 5150-5250 MHz band.

The EUT uses one transmitter connected to two 50-ohm coaxial antenna ports via a diversity switch. Only one antenna port is connected to the test system since the EUT has one antenna only.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic is generated by TFGEN 1.0 software from the Master to the Slave. Goal is to achieve 40 % ~ 60 %.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20 MHz.

The Master Device is a Cisco Aironet 802.11a/b/g Access Point, FCC ID: LDK102056.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –62 + 5 = -57dBm.

The calibrated conducted DFS Detection Threshold level is set to -62 dBm. The tested level is lower than the required level hence it provides margin to the limit.

Manufacturer's Statement Regarding Uniform Channel Spreading

The end product implements an automatic channel selection feature at startup such that operation commences on channels distributed across the entire set of allowed 5GHz channels. This feature will ensure uniform spreading is achieved while avoiding non-allowed channels due to prior radar events.

8.9.3 TEST AND MEASUREMENT SYSTEM

System Overview

The measurement system is based on a conducted test method.

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

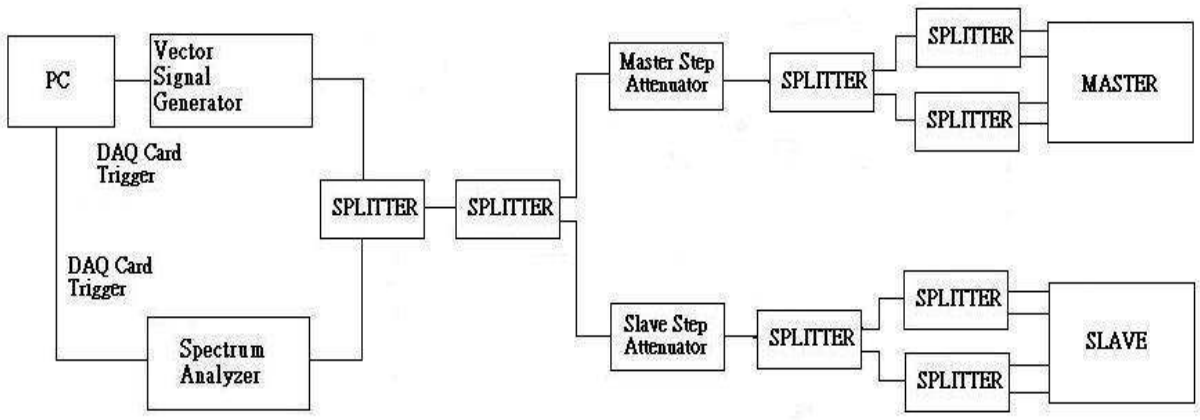
The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from FL to FH for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold. The time-domain resolution is 3 msec / bin with a 24 second sweep time, meeting the 22 second long pulse reporting criteria and allowing a minimum of 10 seconds after the end of the long pulse waveform.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), 50 ohm termination would be removed from the splitter so that connection can be established between splitter and the Master and/or Slave devices.

Conducted Method System Block Diagram



System Calibration

Connect the spectrum analyzer to the test system in place of the master device. Set the signal generator to CW mode. Adjust the amplitude of the signal generator to yield a measured level of –62 dBm on the spectrum analyzer.

Without changing any of the instrument settings, reconnect the spectrum analyzer to the Common port of the Spectrum Analyzer Combiner/Divider and connect a 50 ohm load to the Master Device port of the test system.

Measure the amplitude and calculate the difference from –62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference. Confirm that the signal is displayed at –62 dBm. Readjust the RBW and VBW to 3 MHz, set the span to 10 MHz, and confirm that the signal is still displayed at –62 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –62 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

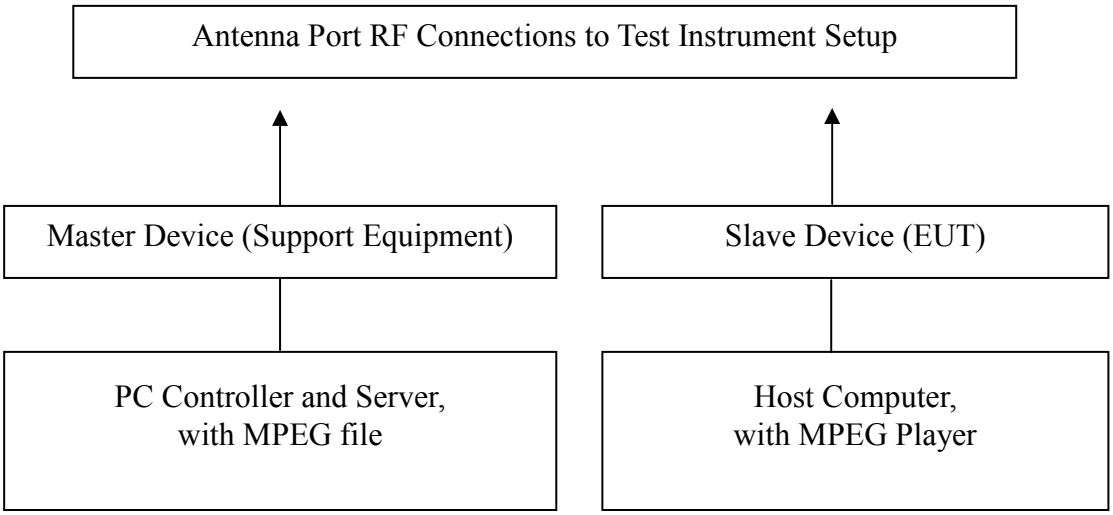
Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

Adjustment Of Displayed Traffic Level

Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. Confirm that the displayed traffic is from the Master Device. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

If a different setting of the Master Step Attenuator is required to meet the above conditions, perform a new System Calibration for the new Master Step Attenuator setting.

8.9.4 TEST SETUP



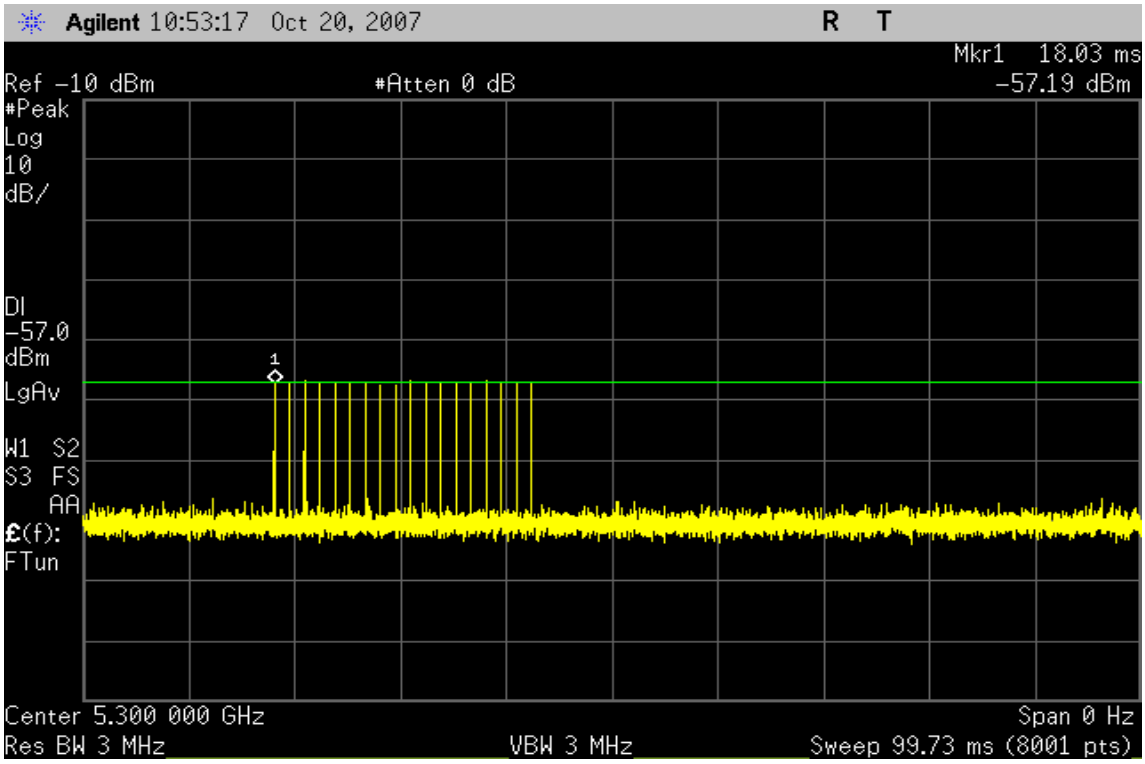
8.9.5 TEST RESULTS

No non-compliance noted

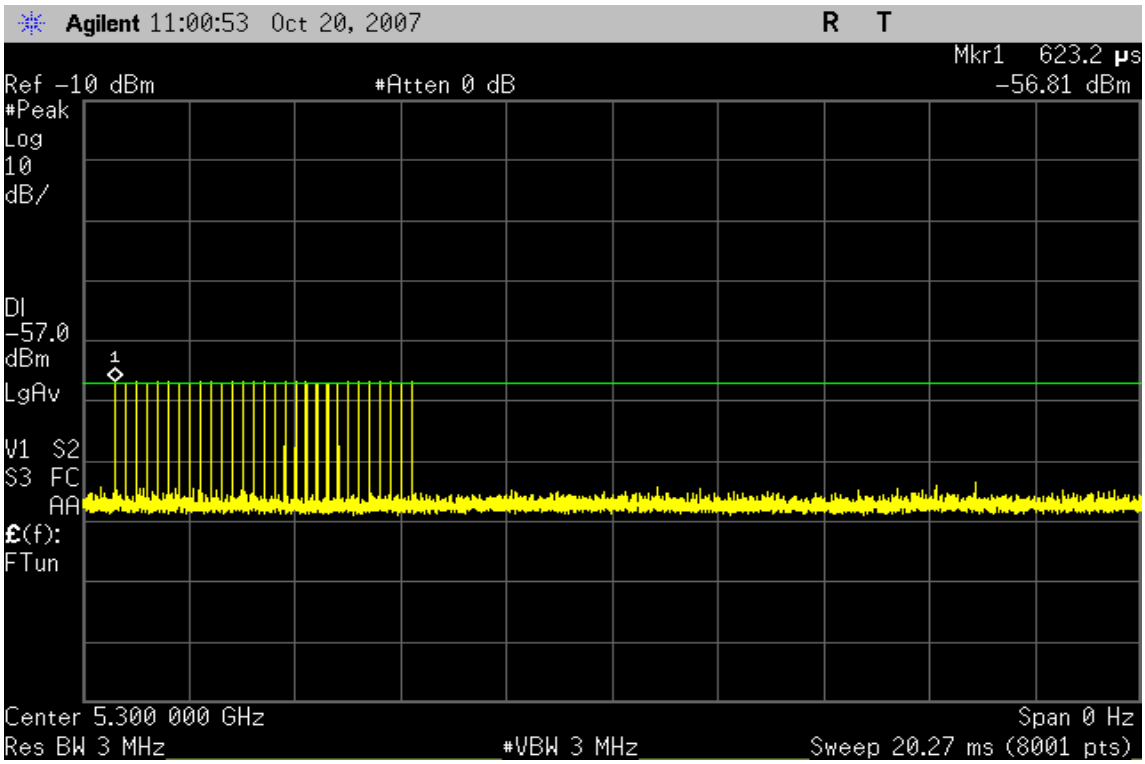
Test Plot

PLOTS OF RADAR WAVEFORMS

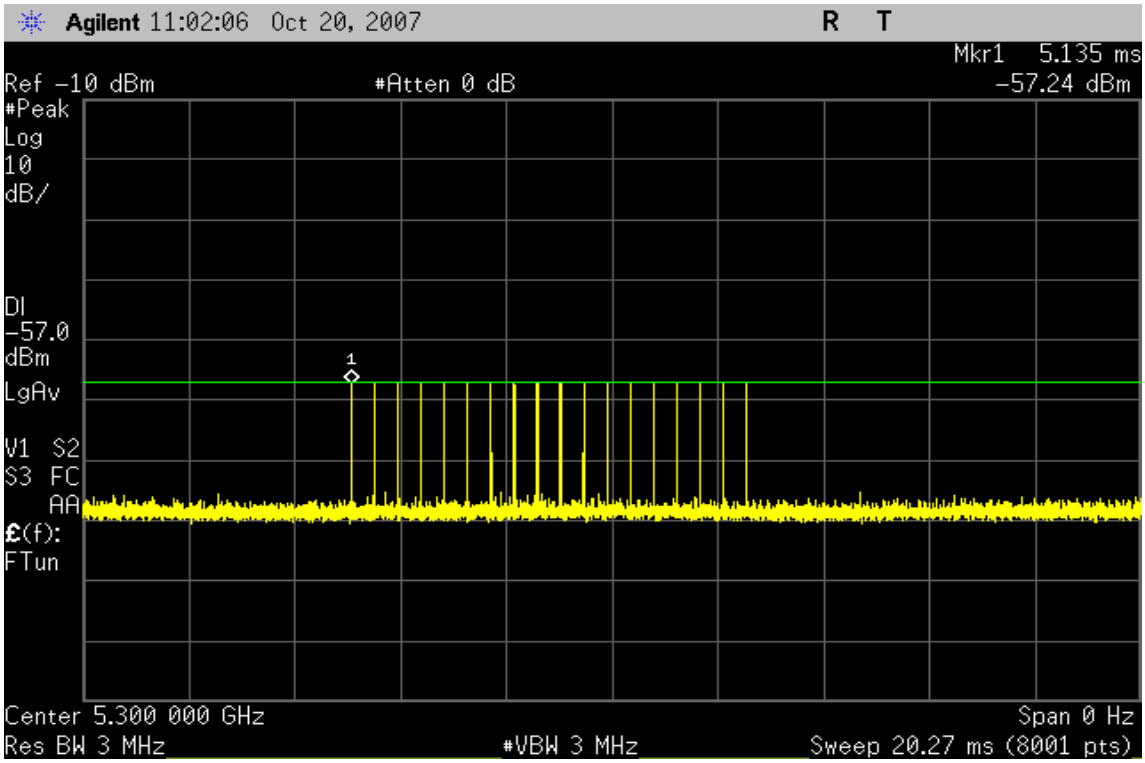
Sample of Short Pulse Radar Type 1



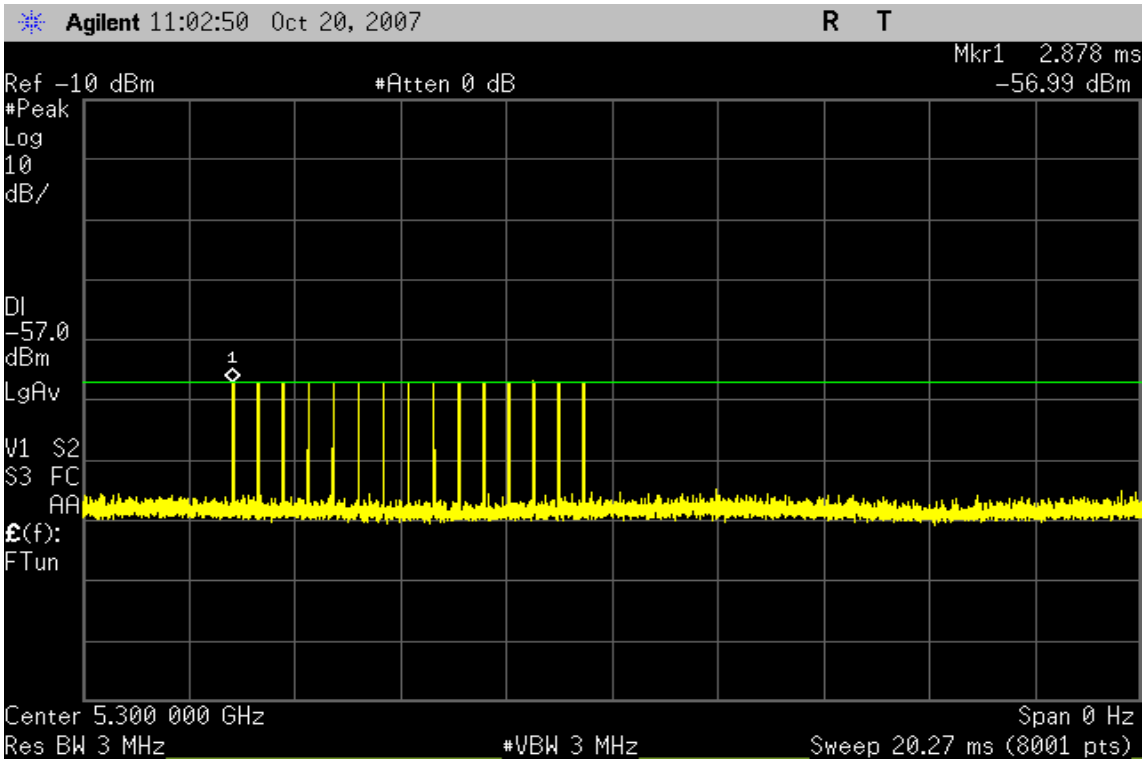
Sample of Short Pulse Radar Type 2



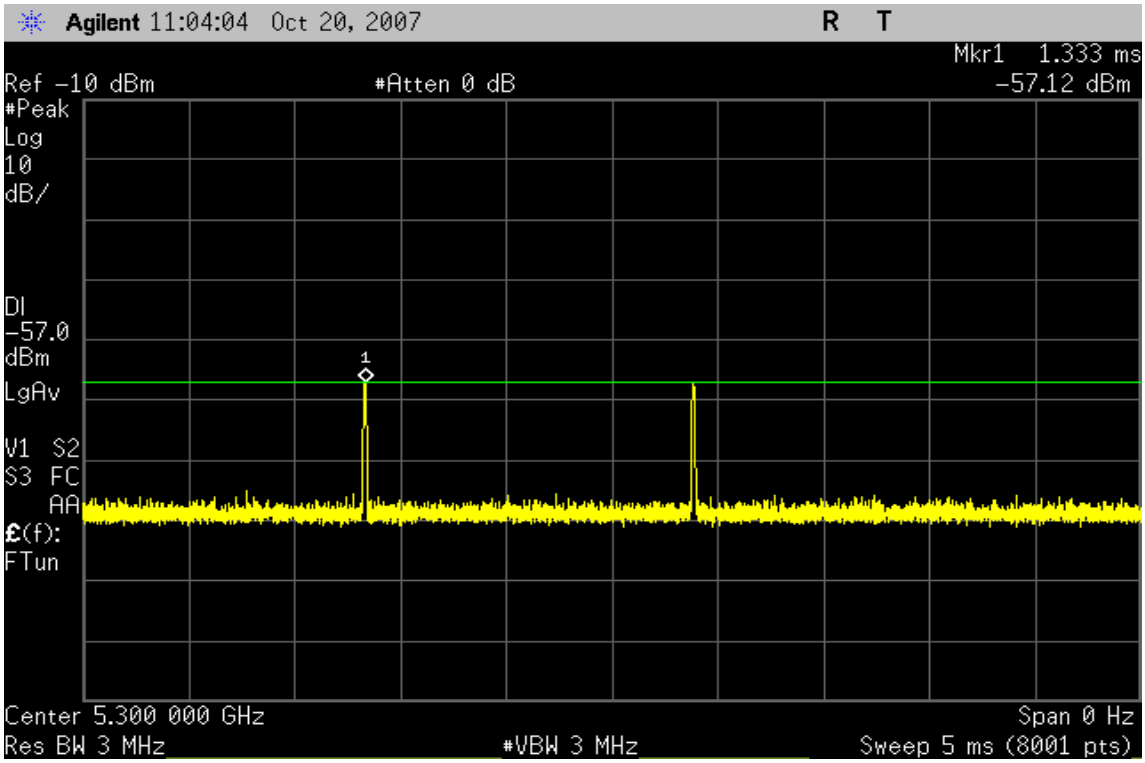
Sample of Short Pulse Radar Type 3



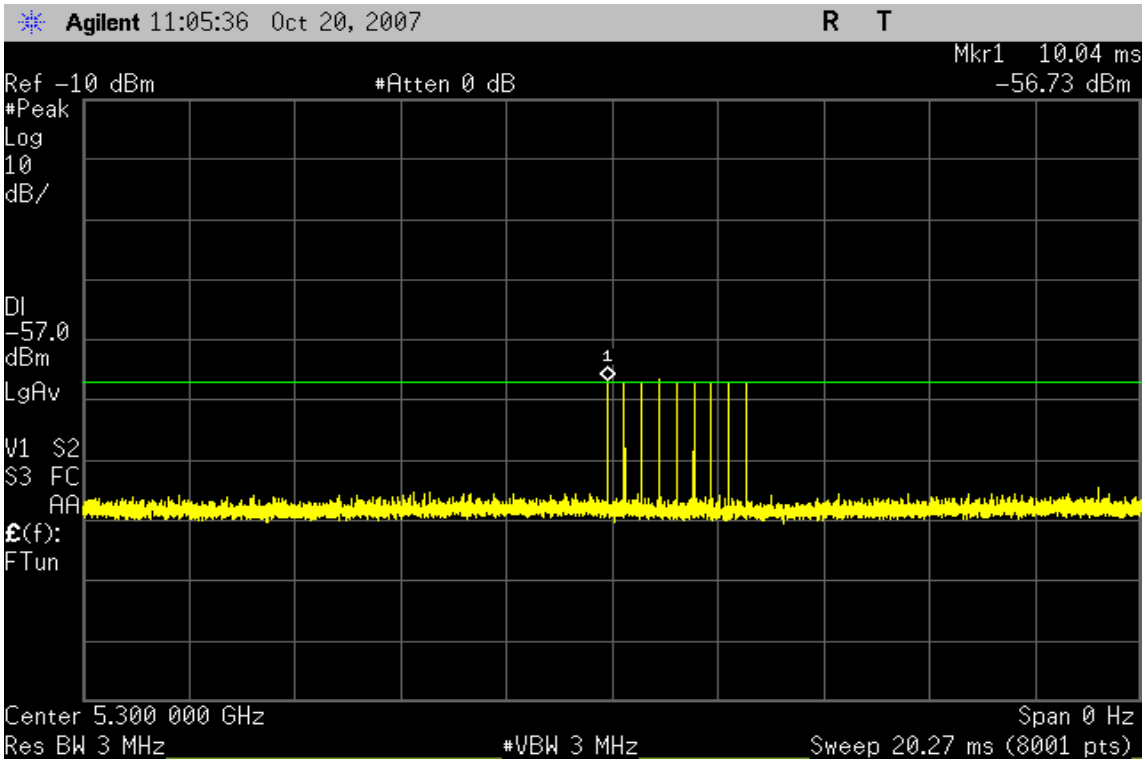
Sample of Short Pulse Radar Type 4



Sample of Long Pulse Radar Type 5



Sample of Frequency Hopping Radar Type 6



TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5300 MHz utilizing a conducted test method.

CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

GENERAL REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =

(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated

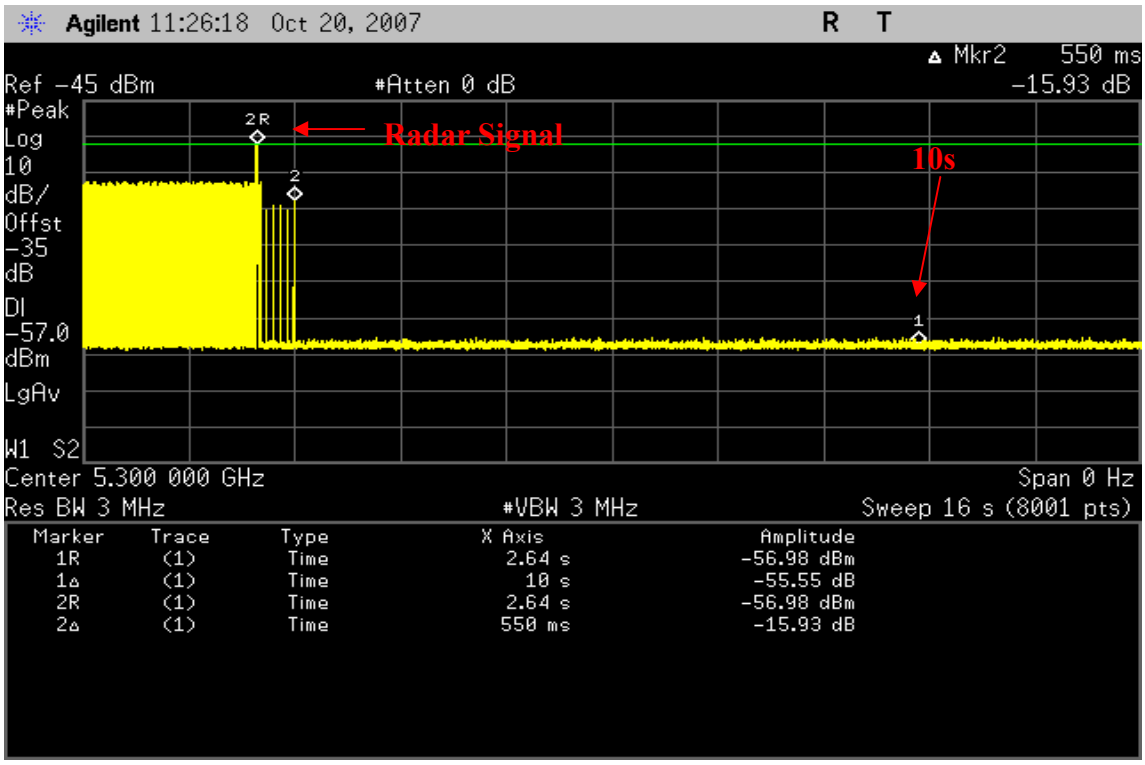
Begins at (Reference Marker + 200 msec) and

Ends no earlier than (Reference Marker + 10 sec).

Type 1 Channel Move Time Results

No non-compliance noted.

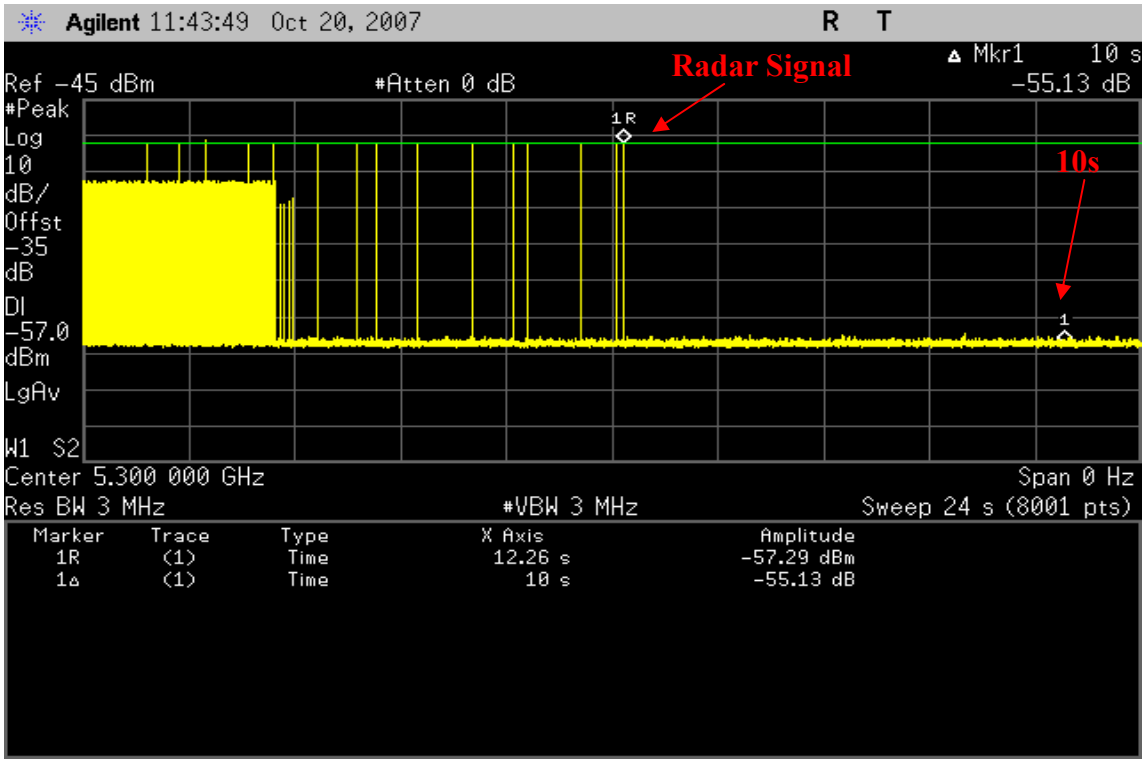
Channel Move Time (s)	Limit (s)
0.550	10



Type 5 Channel Move Time Results

No non-compliance noted.

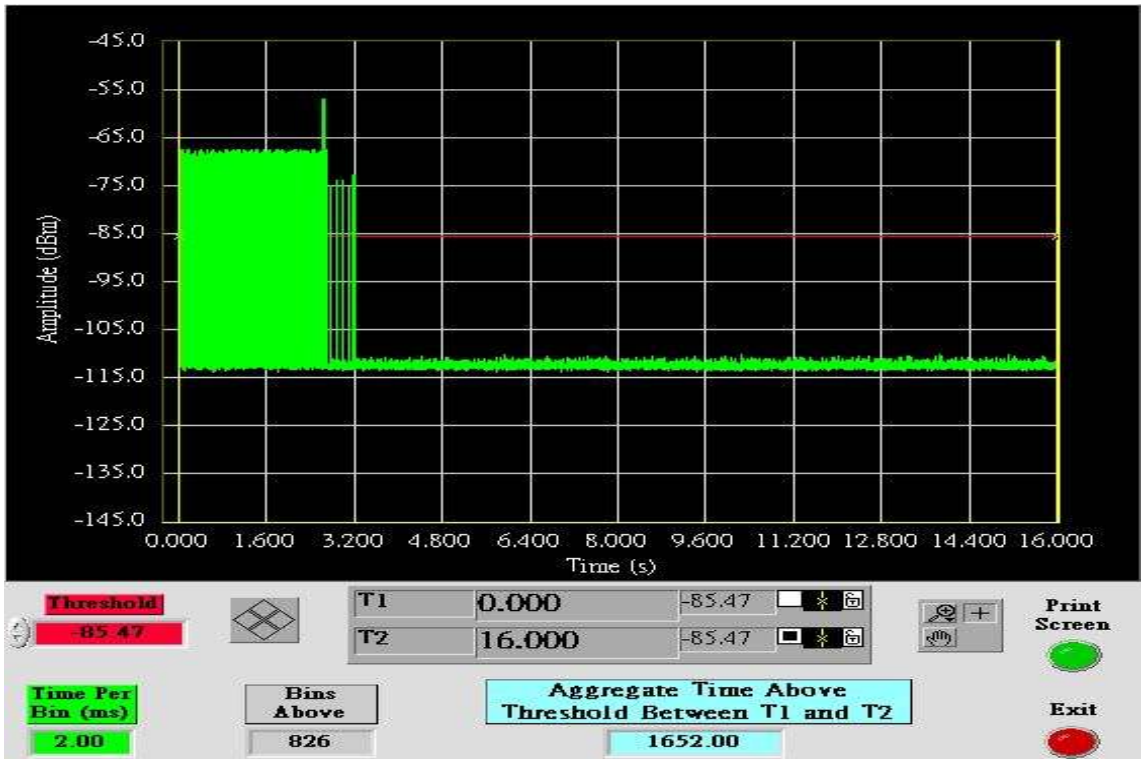
Channel Move Time (s)	Limit (s)
10	10

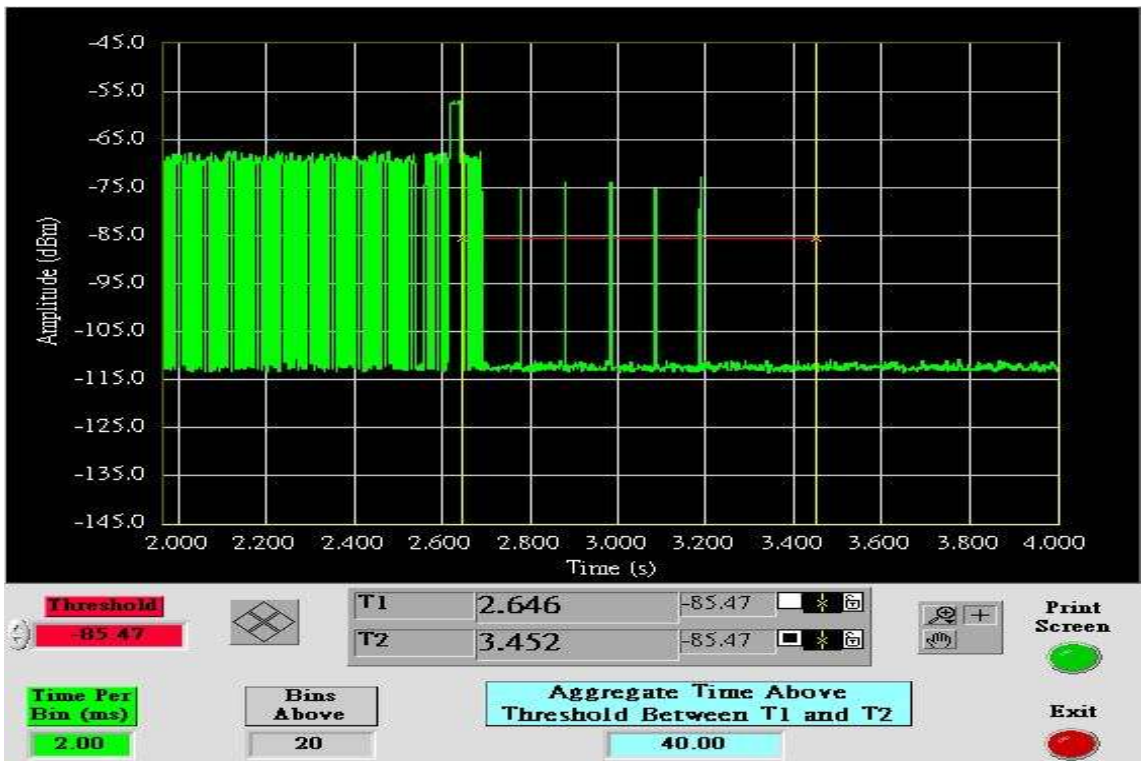


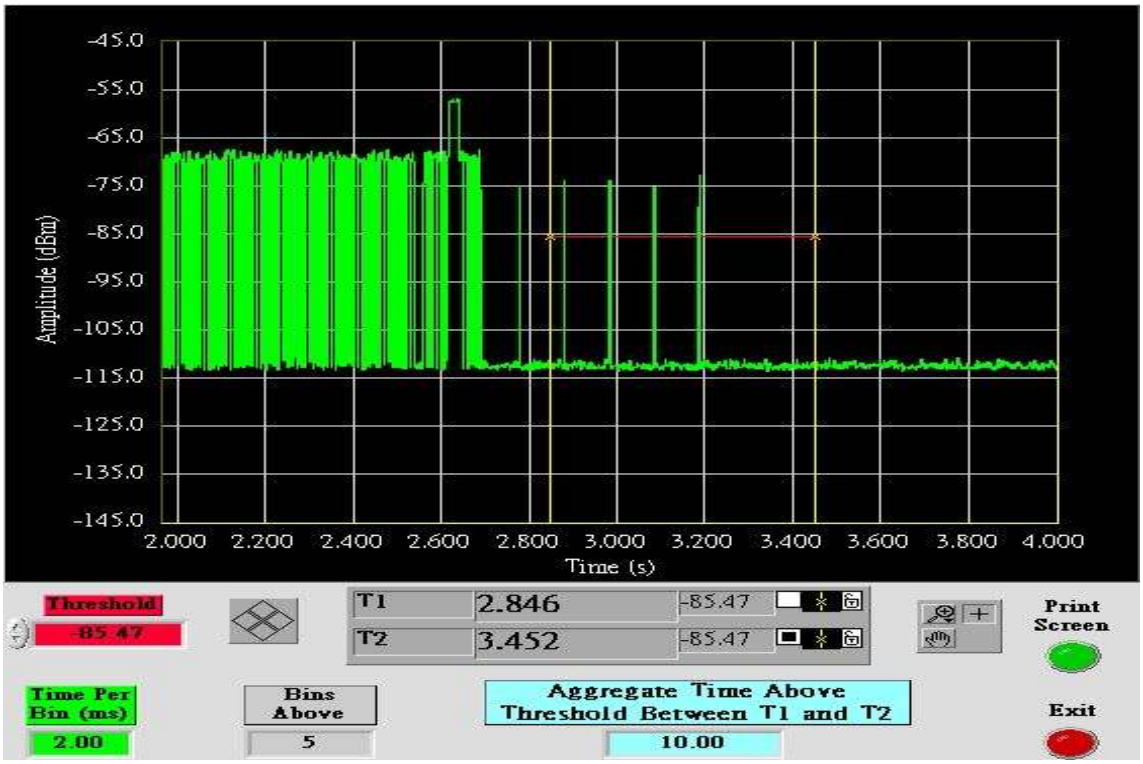
Type 1 Channel Closing Transmission Time Results

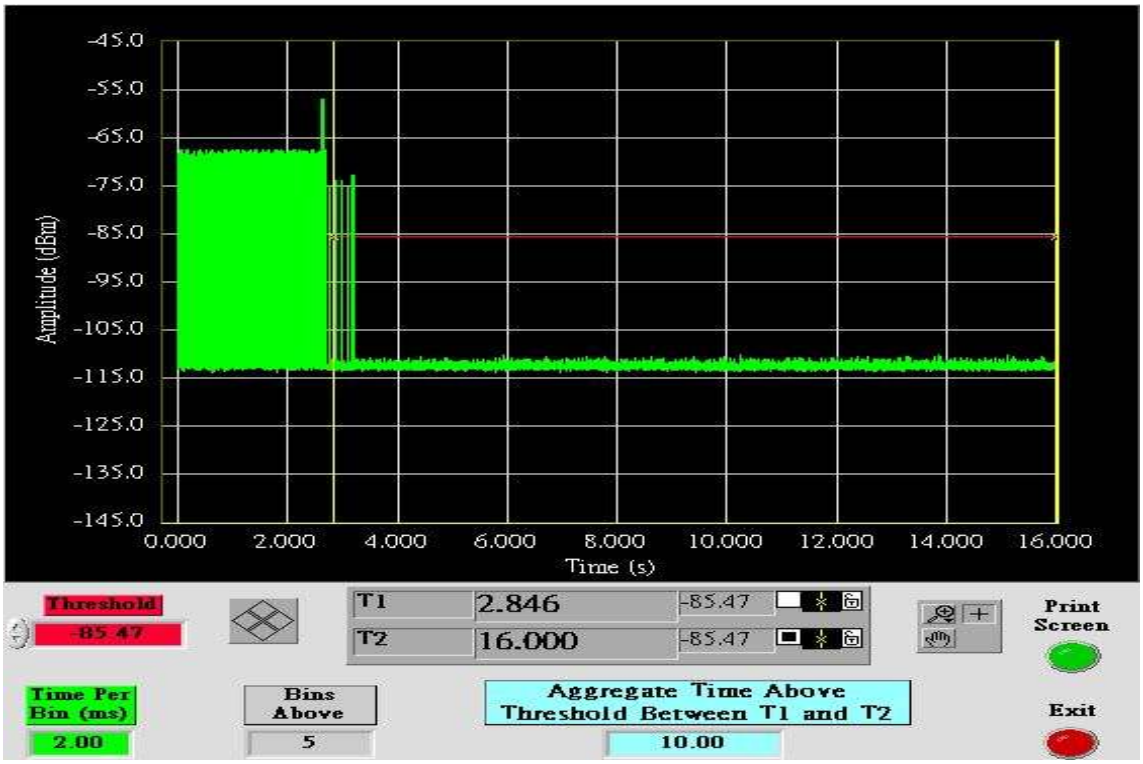
No non-compliance noted.

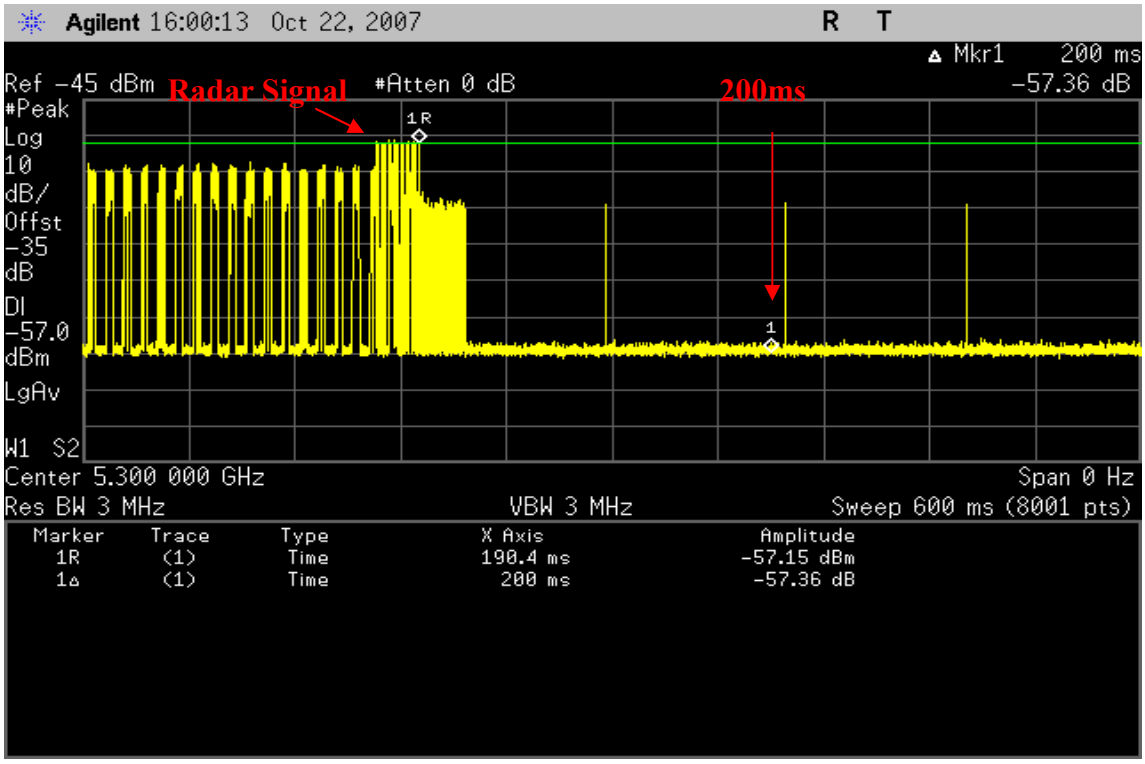
Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
2	60	-58






-45.0
-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
Amplitude (dBm)
2.000 2.200 2.400 2.600 2.800 3.000 3.200 3.400 3.600 3.800 4.000
Time (s)
Threshold
-85.47
T1 2.846 -85.47
T2 3.452 -85.47
Print Screen
Time Per Bin (ms)
2.00
Bins Above
5
Aggregate Time Above Threshold Between T1 and T2
10.00
Exit


-45.0
-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
Amplitude (dBm)
0.000 2.000 4.000 6.000 8.000 10.000 12.000 14.000 16.000
Time (s)
Threshold
-85.47
T1 2.846 -85.47
T2 16.000 -85.47
Print Screen
Time Per Bin (ms)
2.00
Bins Above
5
Aggregate Time Above Threshold Between T1 and T2
10.00
Exit



NON-OCCUPANCY PERIOD

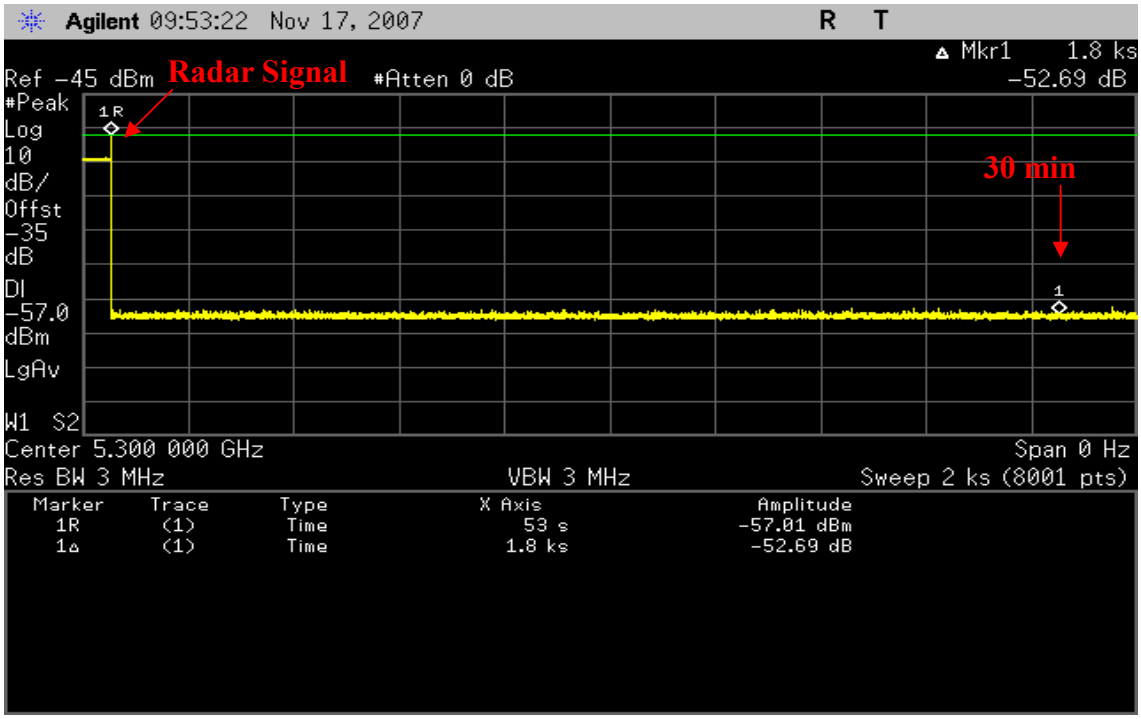
Test Procedure

Part 1: Non-associated test
Turn off the master device, monitoring the analyzer on the test mode frequency selected for testing, and powering up the client device for 30 min to make sure no beacons have been transmitted

Part 2: Associated test
Associate the client and master and stream the movie as specified for non-occupancy test, and then transmit Radar Bin1and monitor the test frequency to make sure no beacons have been transmitted for 30 min.
Note: If the client moves with the master, nothing should show up on the client non-occupancy test and the device is compliant. For devices that shut down (rather than moving channels), no beacons should appear.

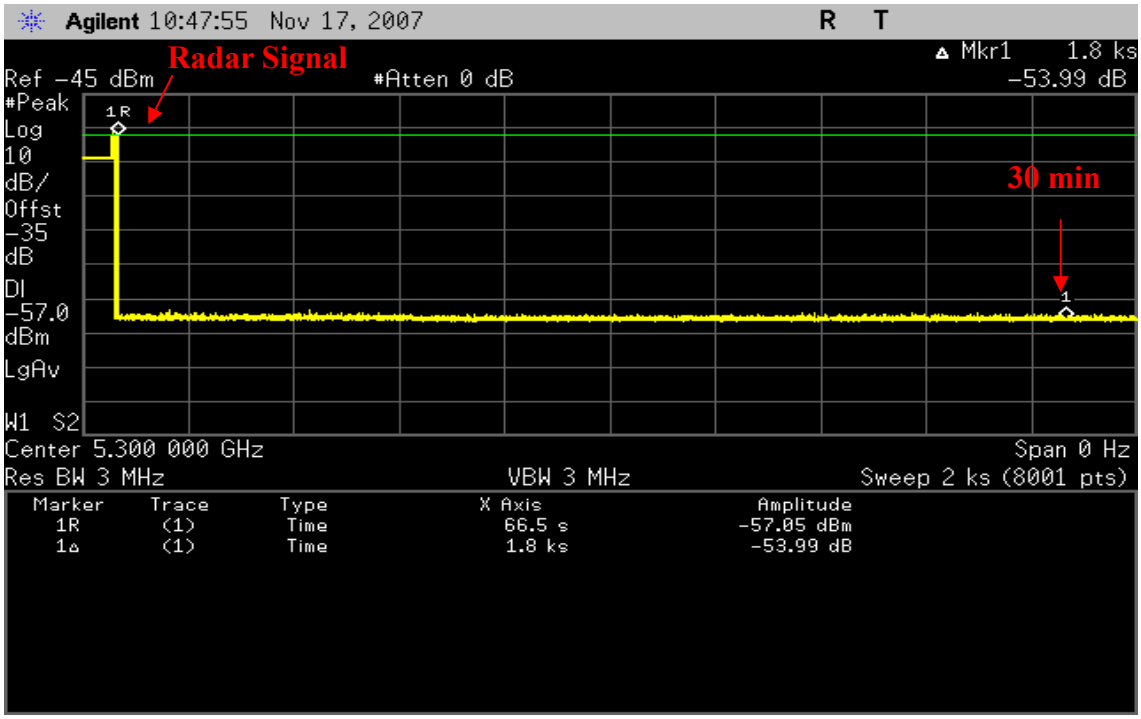
Type 1 Non-Occupancy Period Test Results

No non-compliance noted: No EUT transmissions were observed on the test channel during the 30 minute observation time.



Type 1 Non-Occupancy Period Test Results

No non-compliance noted: No EUT transmissions were observed on the test channel during the 30 minute observation time.



8.10 SPURIOUS EMISSIONS

8.10.1 CONDUCTED UNDESIRABLE EMISSION

8.10.1.1 LIMIT

According to 15.407(b),

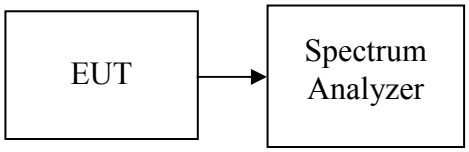
(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(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.

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

The provisions of §15.205 apply to intentional radiators operating under this section.

Test Configuration



8.10.1.2 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 detection 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.

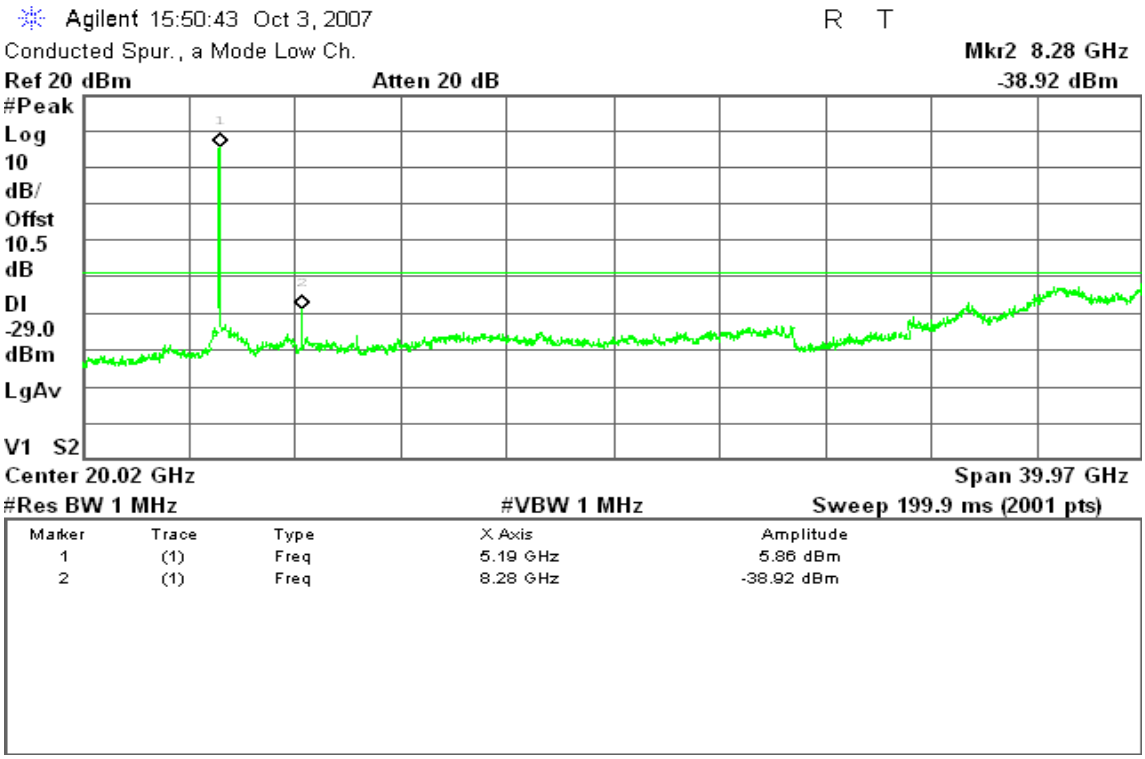
8.10.1.3 TEST RESULTS

No non-compliance noted

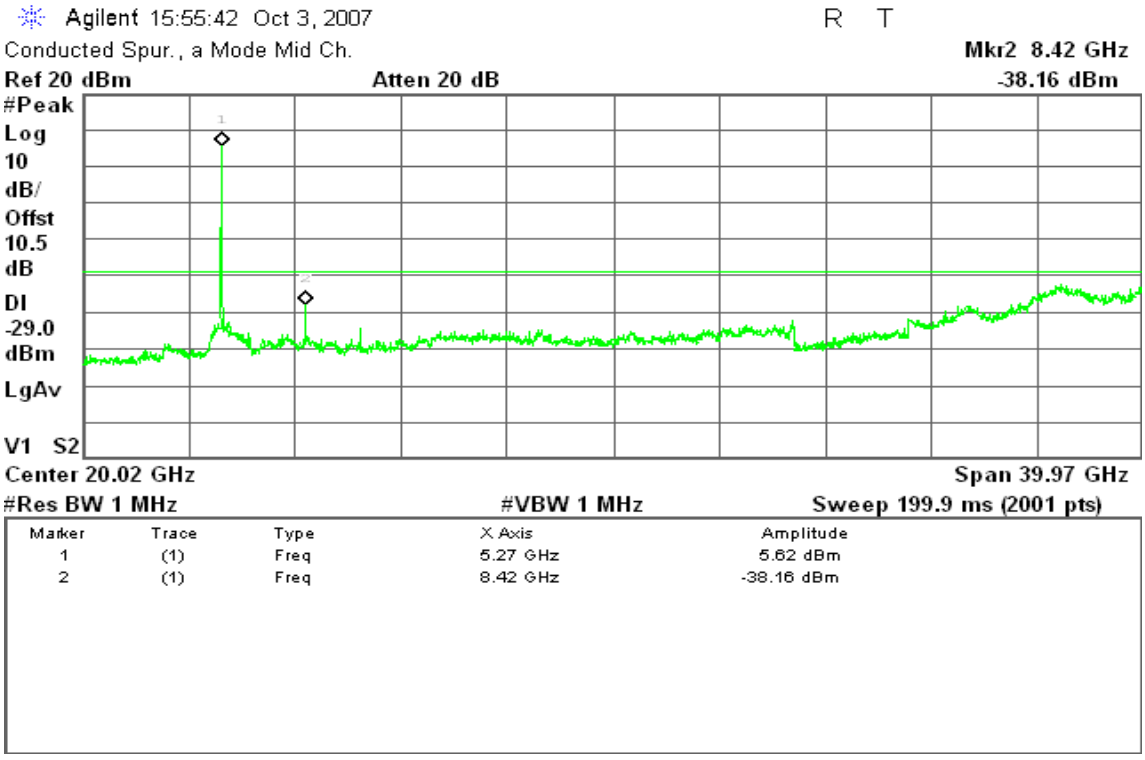
Test Plot

IEEE 802.11a mode:

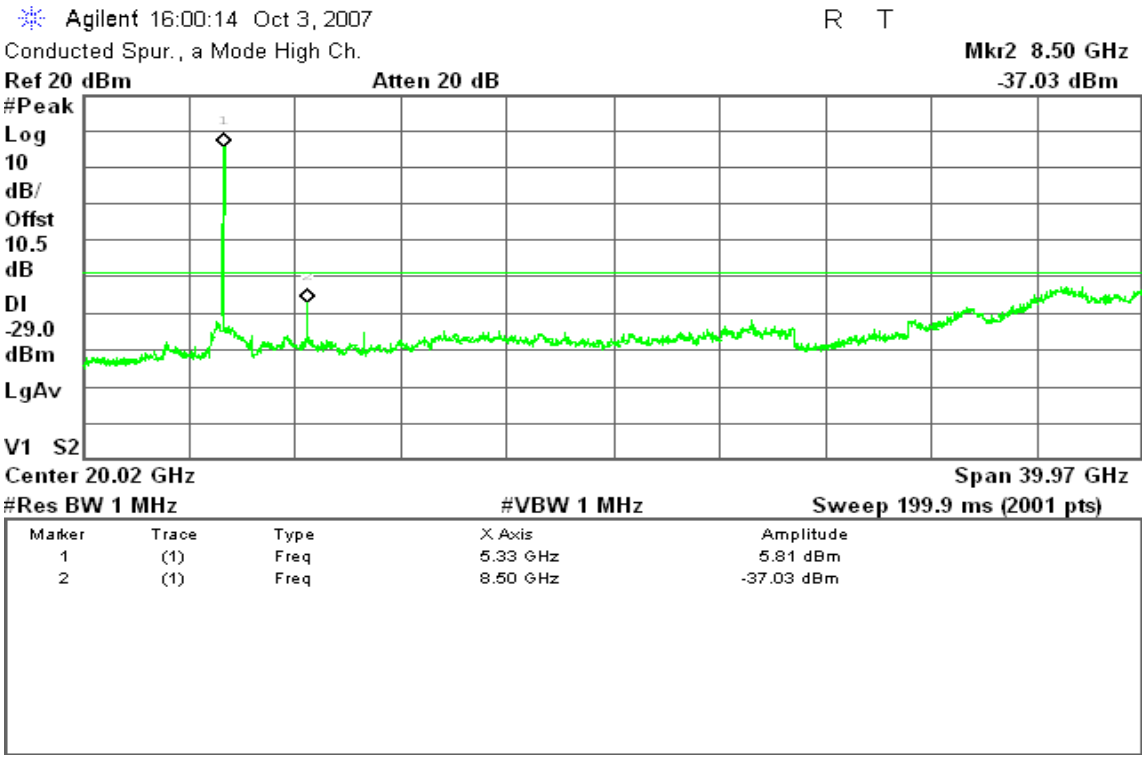
SPURIOUS EMISSIONS (CH Low)



SPURIOUS EMISSIONS (CH Mid)

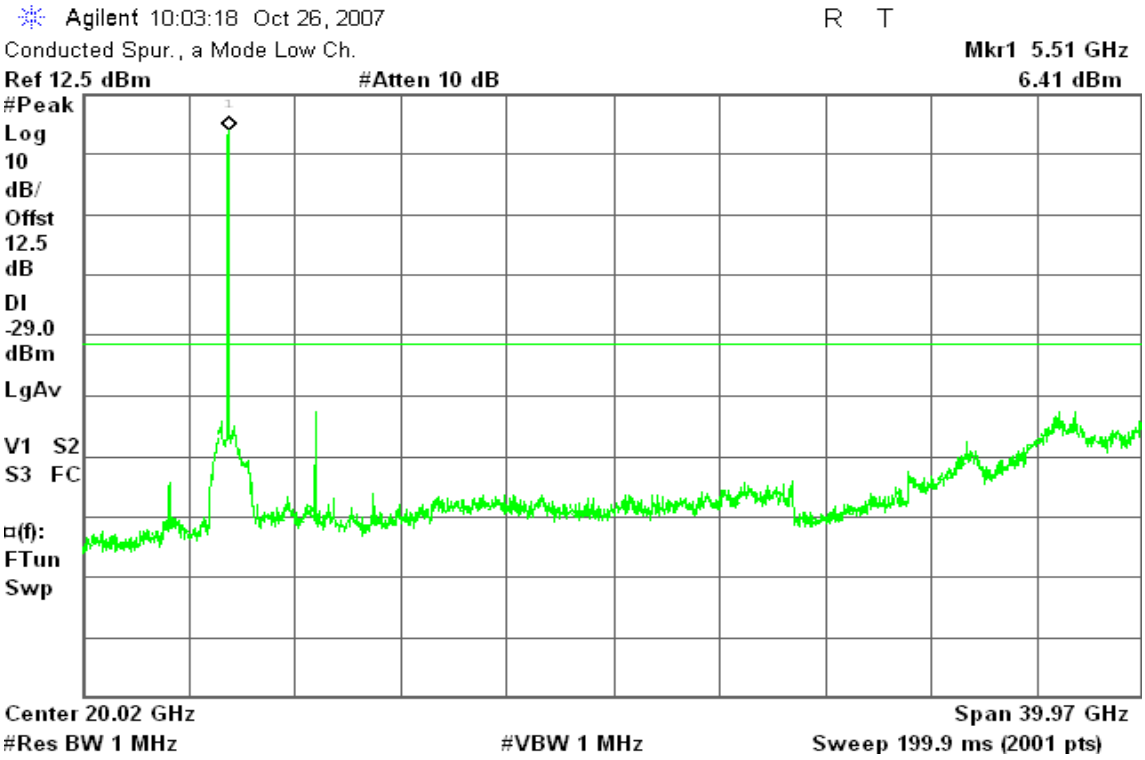


SPURIOUS EMISSIONS (CH High)

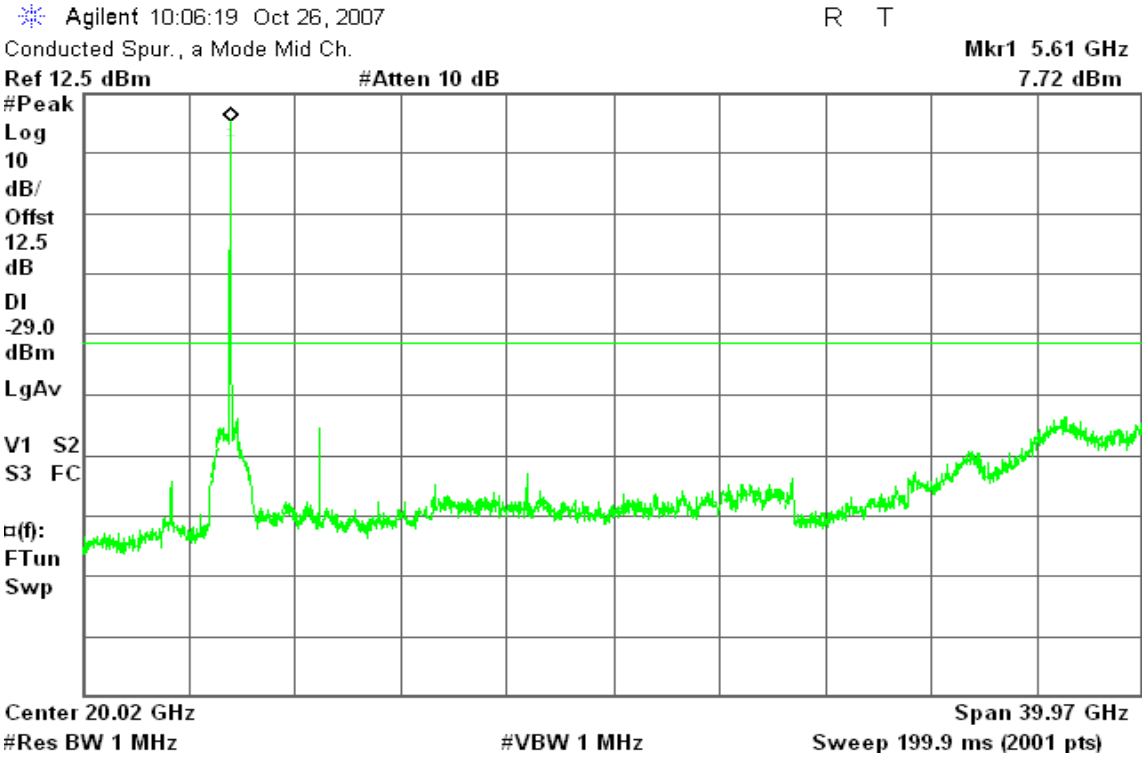


IEEE 802.11a mode:

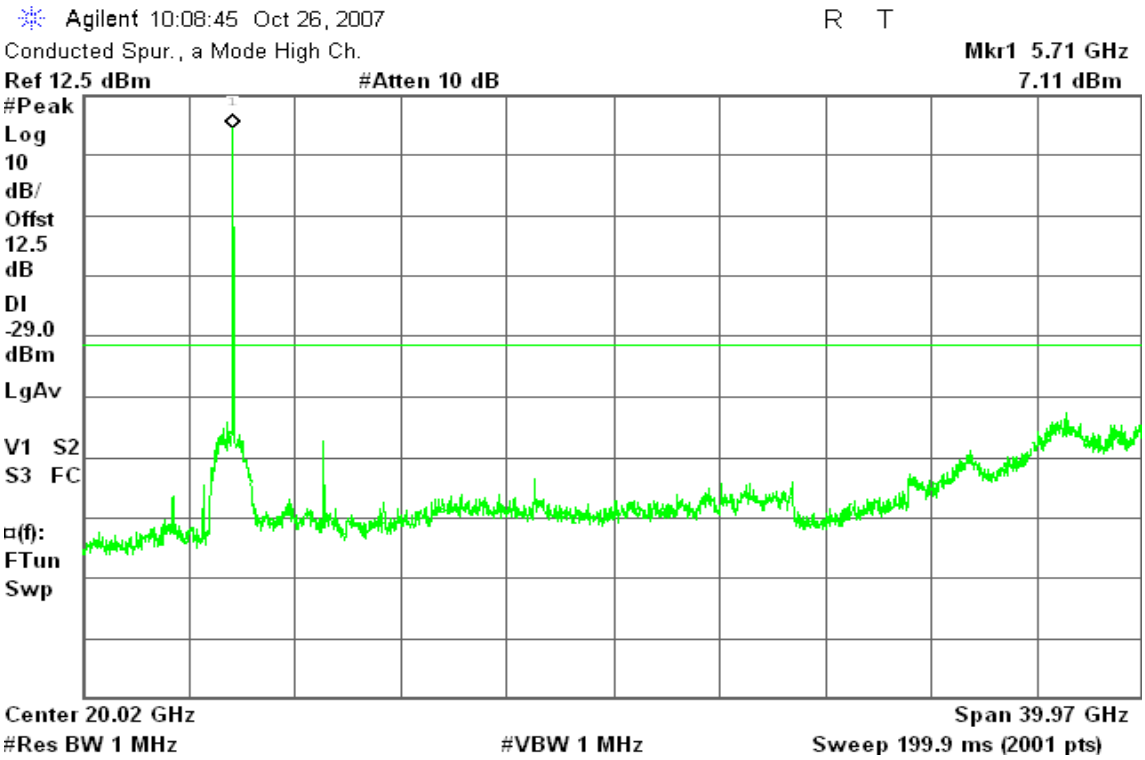
SPURIOUS EMISSIONS (CH Low)



SPURIOUS EMISSIONS (CH Mid)

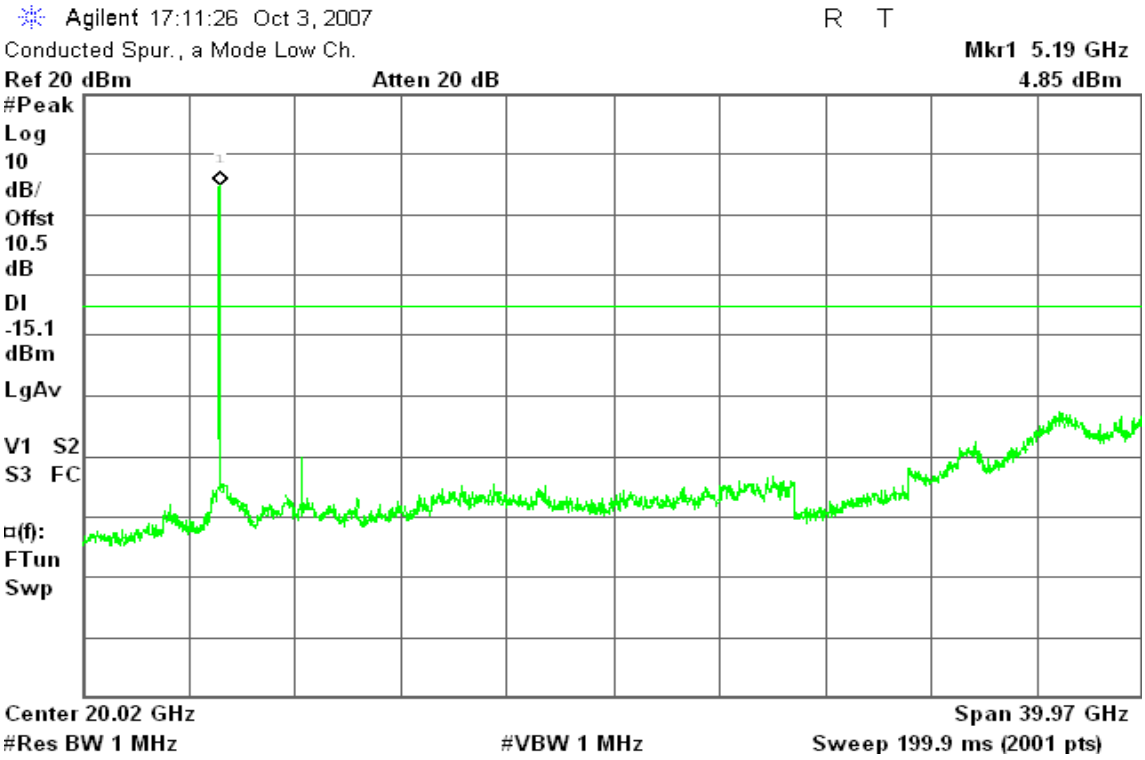


SPURIOUS EMISSIONS (CH High)

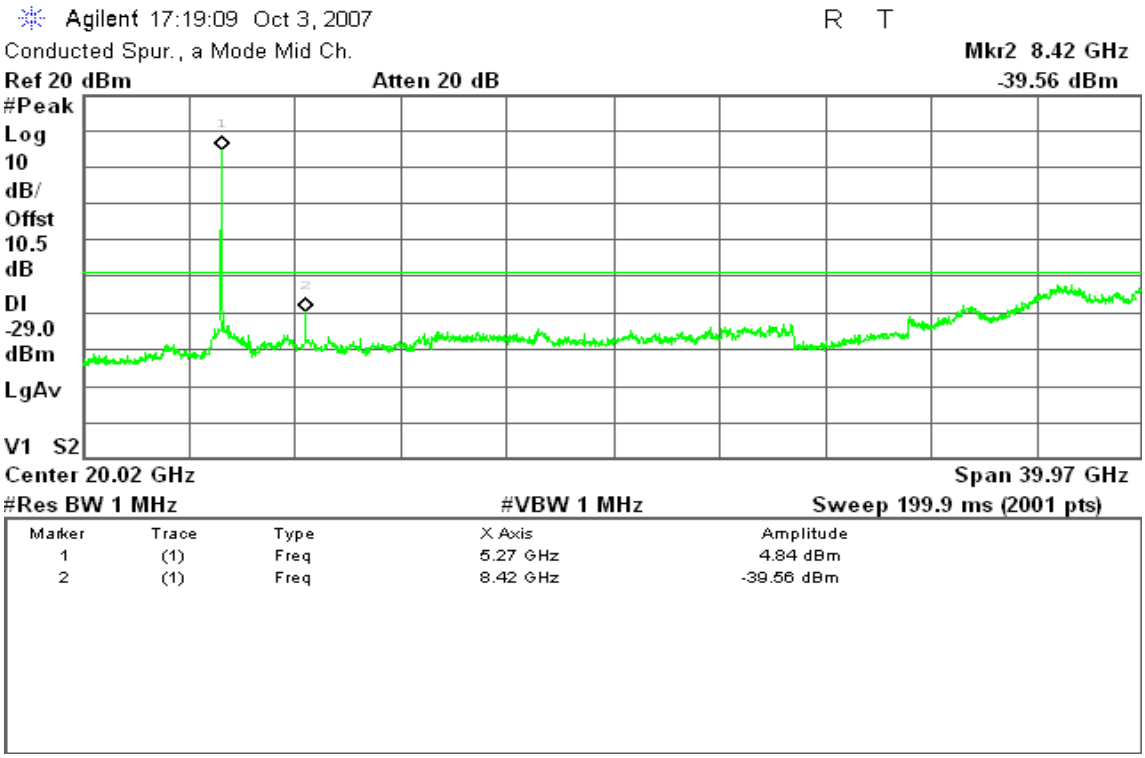


draft 802.11n Standard-20 MHz Channel mode / Chain 0:

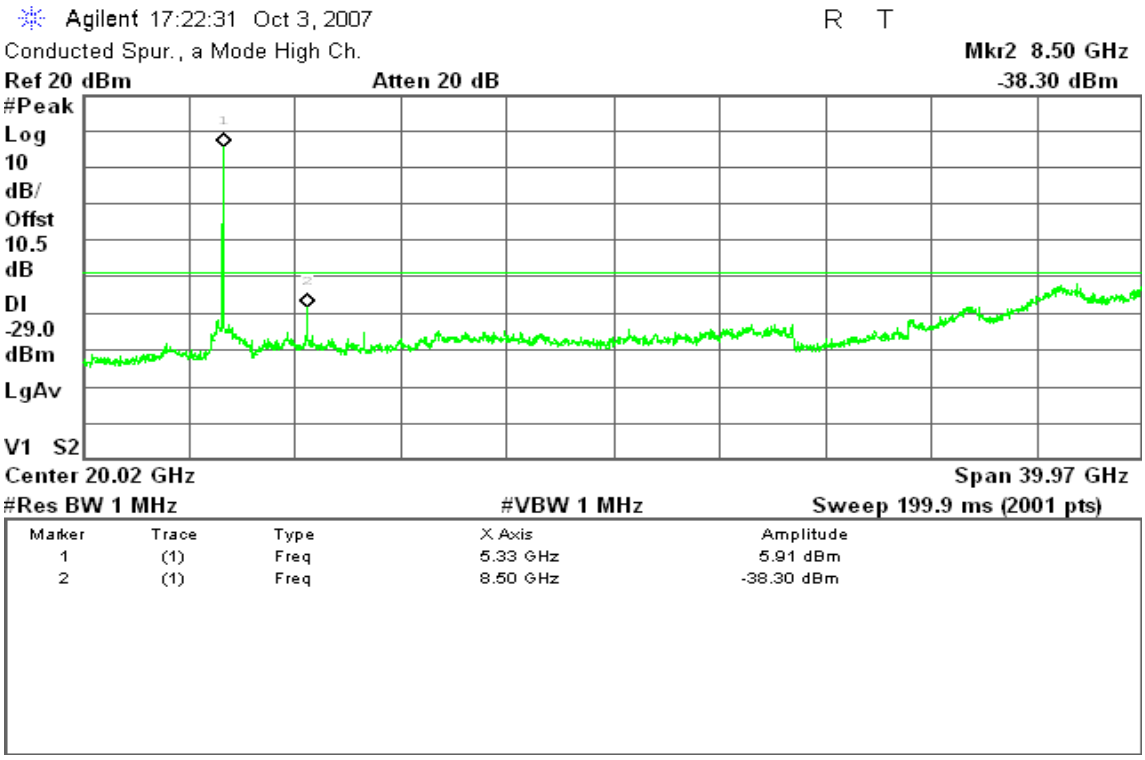
SPURIOUS EMISSIONS (CH Low)



SPURIOUS EMISSIONS (CH Mid)

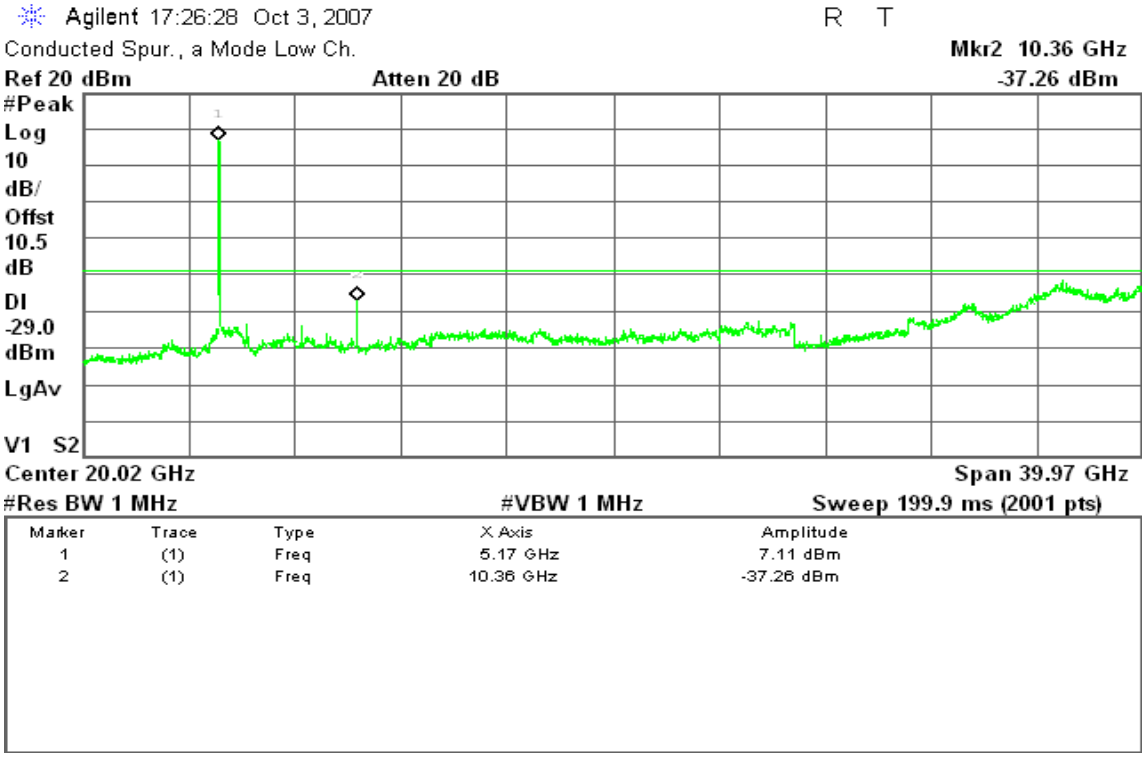


SPURIOUS EMISSIONS (CH High)

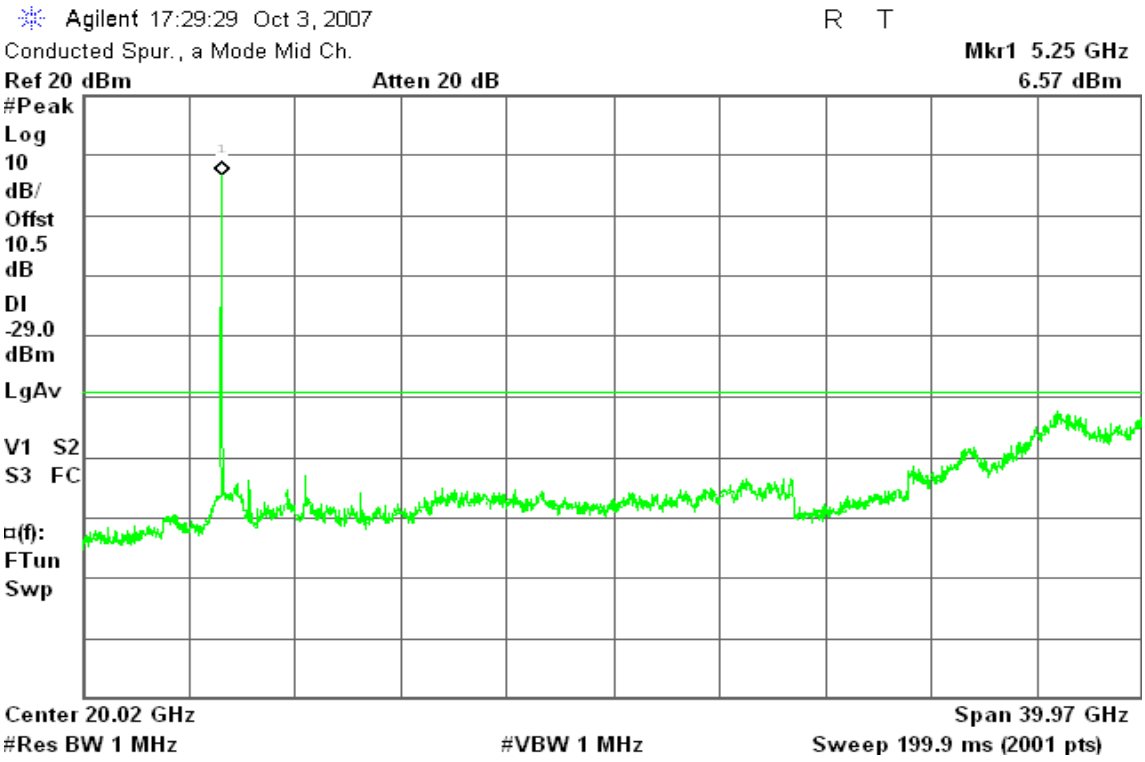


draft 802.11n Standard-20 MHz Channel mode / Chain 1:

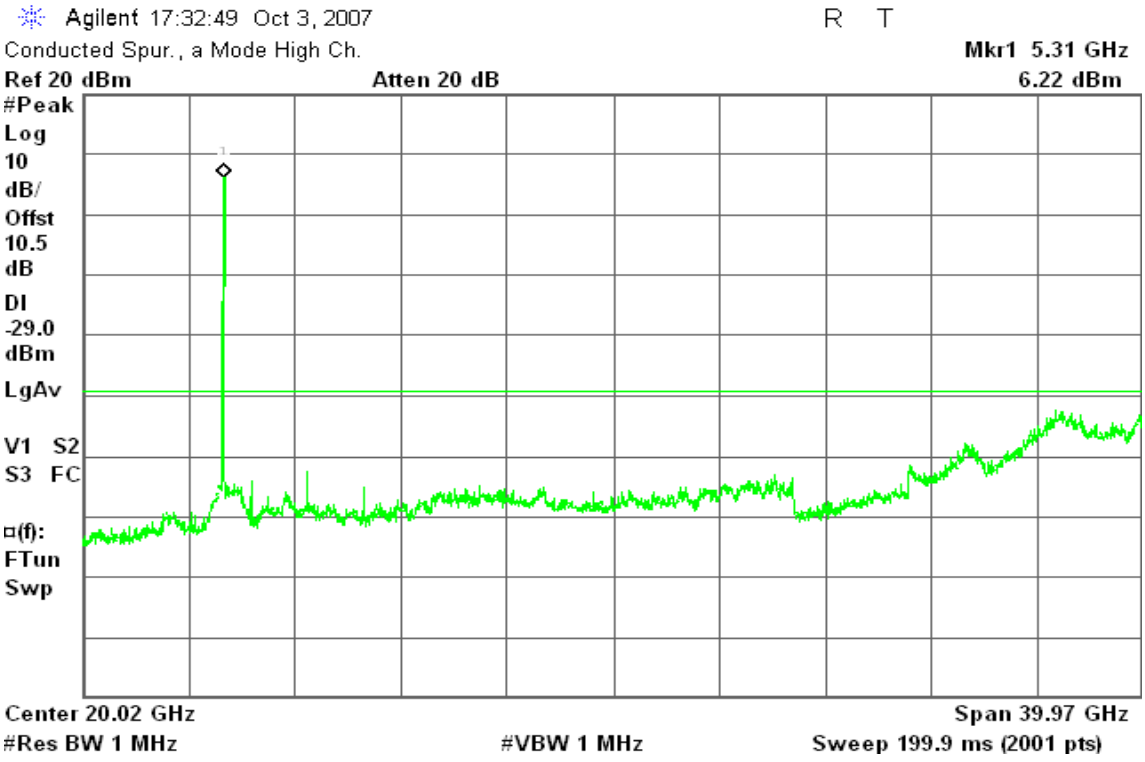
SPURIOUS EMISSIONS (CH Low)



SPURIOUS EMISSIONS (CH Mid)

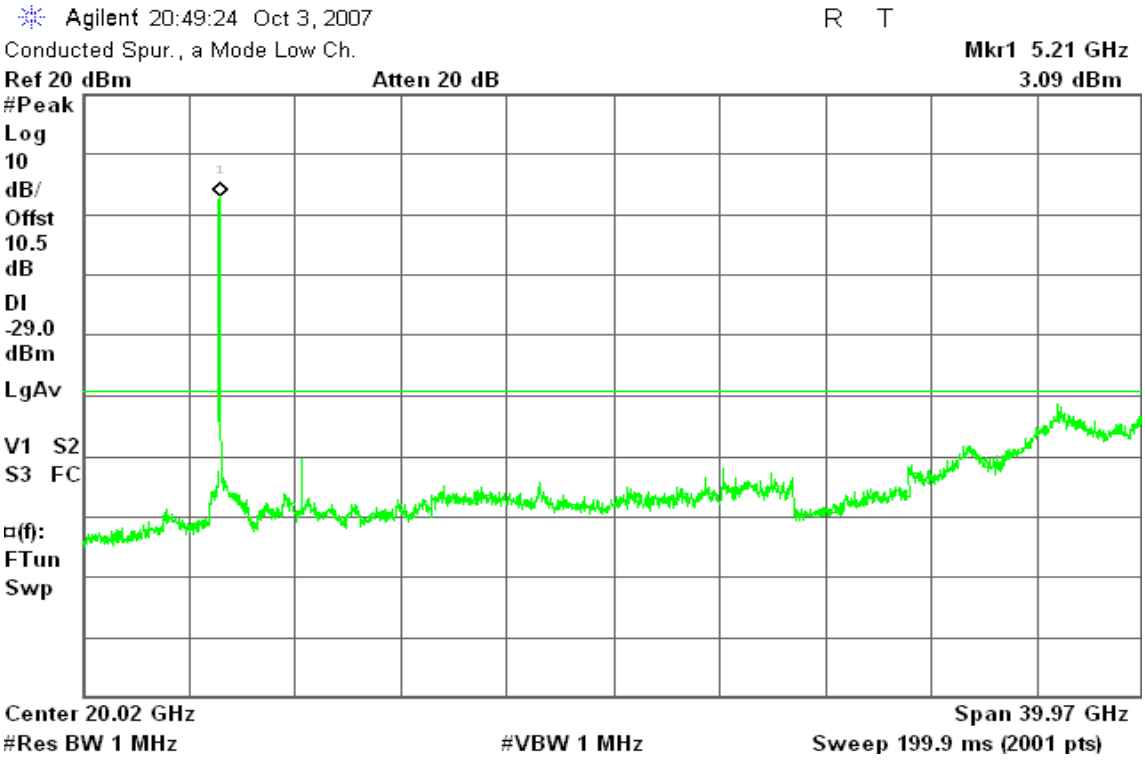


SPURIOUS EMISSIONS (CH High)



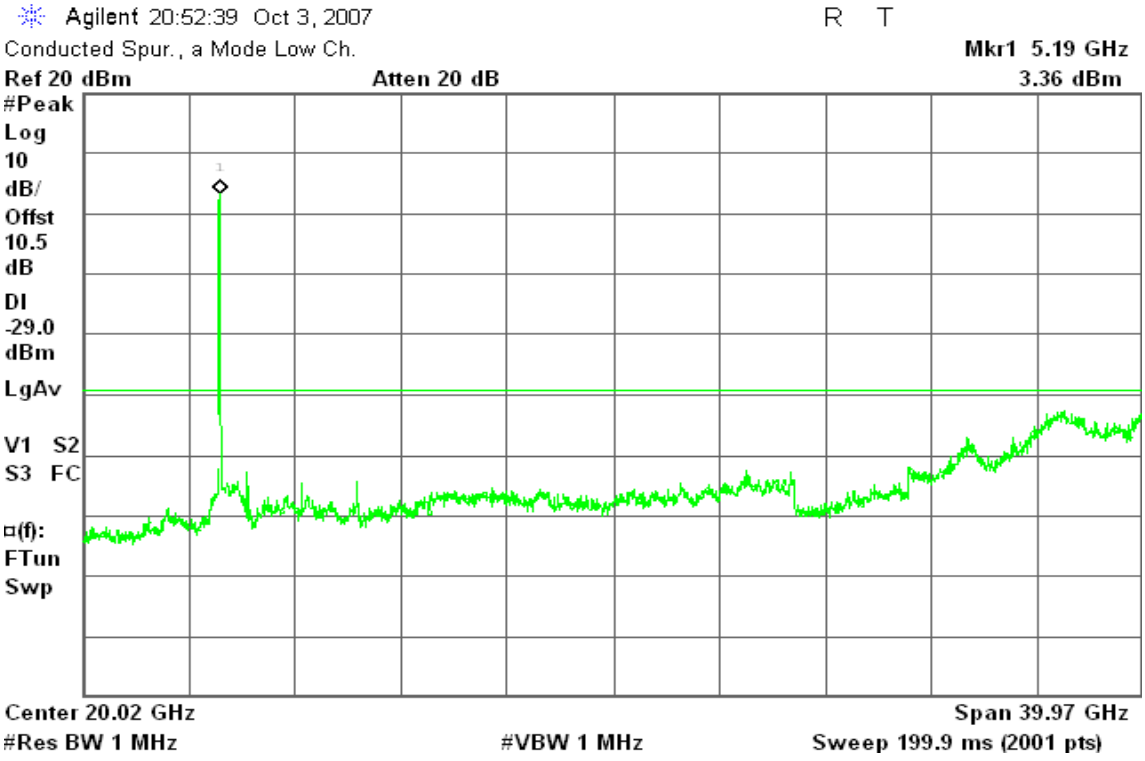
draft 802.11n Wide-40 MHz Channel mode / Chain 0:

SPURIOUS EMISSIONS (CH Low)



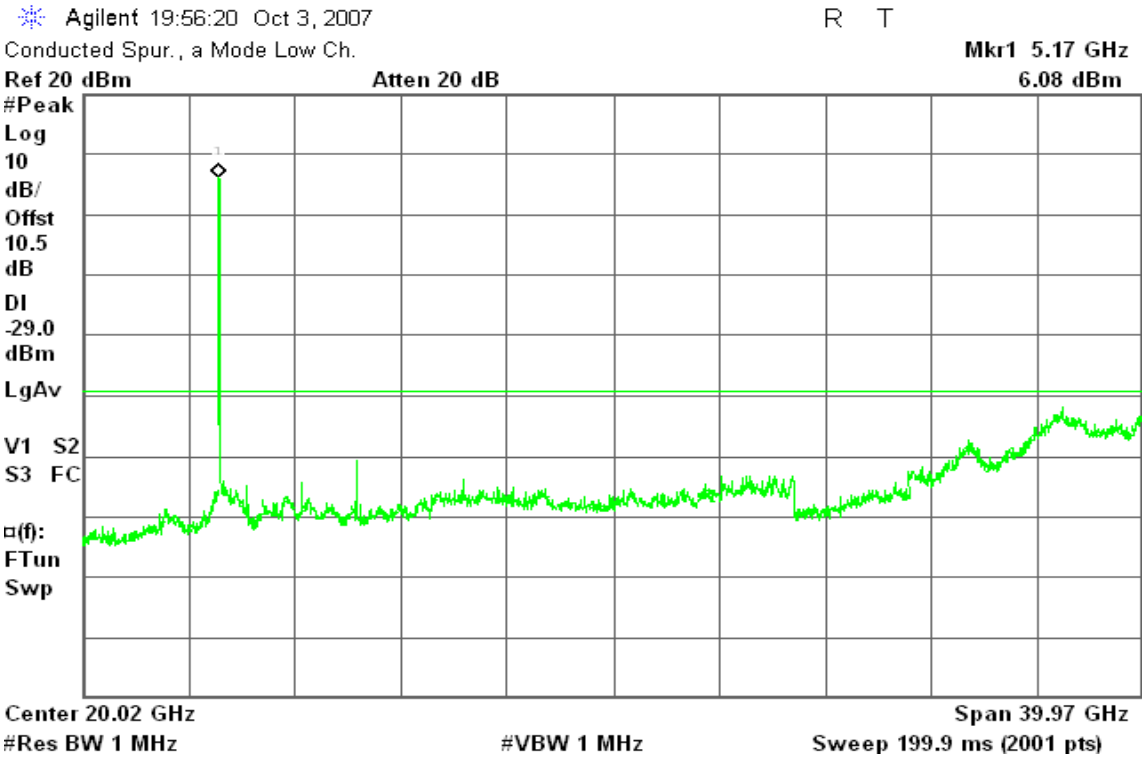
draft 802.11n Wide-40 MHz Channel mode / Chain 1:

SPURIOUS EMISSIONS (CH Low)



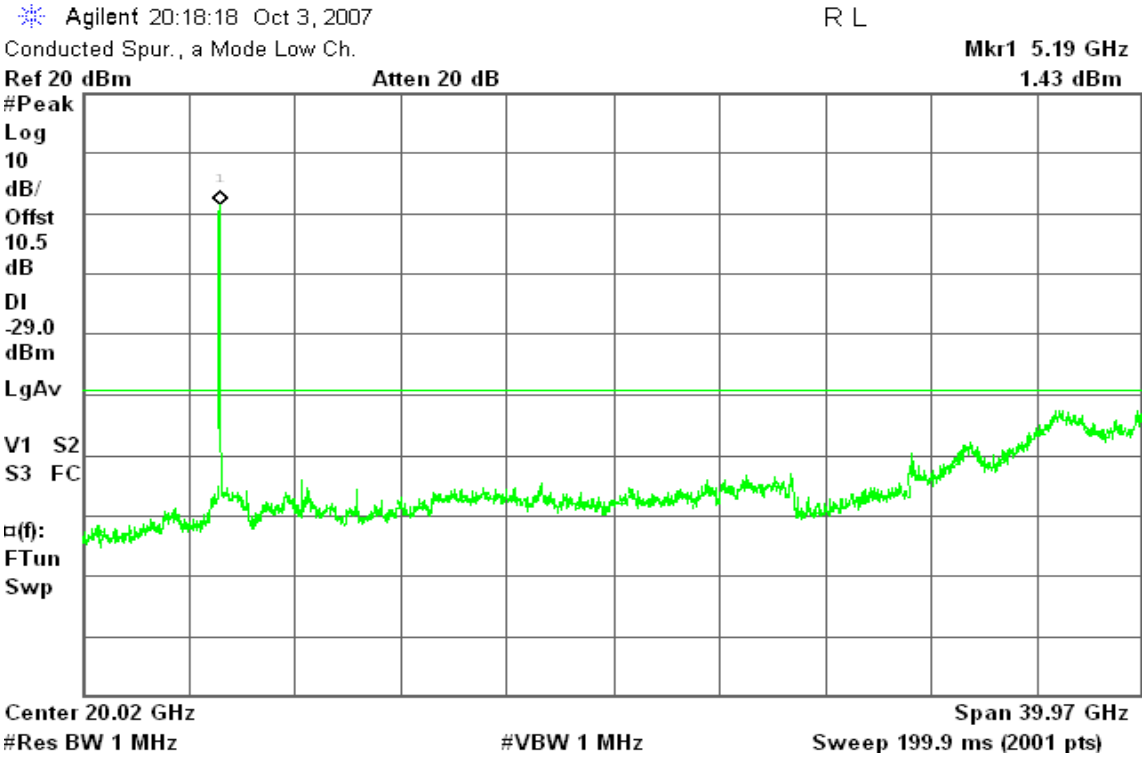
draft 802.11n Standard-20 MHz Channel mode with combiner:

SPURIOUS EMISSIONS (CH Low)



draft 802.11n Wide-40 MHz Channel mode with combiner:

SPURIOUS EMISSIONS (CH Low)



8.10.2 RADIATED UNDESIRABLE EMISSION

8.10.2.1 LIMIT - ABOVE 1 GHz

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

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
Above 960	500	3

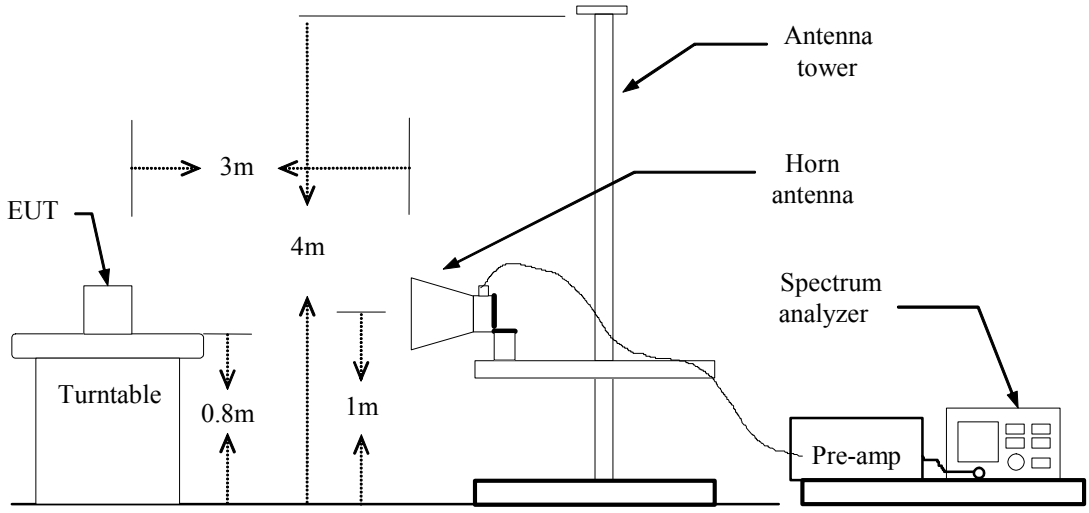
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
Above 960	500	54

Test Configuration

Above 1 GHz



8.10.2.2 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:

   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.

8.10.2.3 TEST RESULTS

No non-compliance noted

Above 1 GHz

Operation Mode: Tx / IEEE 802.11a mode / CH Low / 5180 MHz **Test Date:** October 3, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8283.33	V	50.56	45.79	7.83	58.39	53.62	74.00	54.00	-0.38	AVG
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Mid / 5260 MHz **Test Date:** October 3, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8416.67	V	49.89	42.30	8.84	58.73	51.14	74.00	54.00	-2.86	AVG
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH High / 5320 MHz **Test Date:** October 3, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Low / 5500MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8800.00	V	48.46	42.78	9.17	57.63	51.95	74.00	54.00	-2.05	AVG
N/A										
8800.00	H	42.60	---	9.17	51.77	---	74.00	54.00	-22.23	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Mid / 5600MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8966.67	V	43.70	---	9.01	52.71	---	74.00	54.00	-21.29	Peak
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH High / 5700 MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 2

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
9116.67	V	42.98	---	9.50	52.47	---	74.00	54.00	-21.53	Peak
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH Low	**Test Date:**	October 3, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	2		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8283.33	V	48.09	39.07	7.83	55.92	46.90	74.00	54.00	-7.10	AVG
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH Mid	**Test Date:**	October 3, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	2		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8416.67	V	48.51	39.57	8.84	57.35	48.41	74.00	54.00	-5.59	AVG
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH High	**Test Date:**	October 3, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	2		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Wide-40 MHz Channel mode / CH Low	**Test Date:**	October 4, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	2		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8300.00	V	50.57	45.80	7.96	58.53	53.76	74.00	54.00	-0.24	AVG
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Low / 5180MHz **Test Date:** October 4, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8283.33	V	46.95	45.33	7.83	54.79	53.16	74.00	54.00	-0.84	AVG
N/A										
8283.33	H	50.86	44.81	7.83	58.69	52.64	74.00	54.00	-1.36	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Mid / 5260MHz **Test Date:** October 5, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8416.67	V	49.56	42.67	8.84	58.40	51.51	74.00	54.00	-2.49	AVG
N/A										
8416.67	H	48.04	43.80	8.84	56.87	52.64	74.00	54.00	-1.36	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH High / 5320MHz **Test Date:** October 5, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Low / 5500MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8800.00	V	48.63	43.56	9.17	57.80	52.73	74.00	54.00	-1.27	AVG
N/A										
8800.00	H	49.78	43.37	9.17	58.95	52.54	74.00	54.00	-1.46	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH Mid / 5600MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
N/A										
8966.67	H	44.85	---	9.01	53.85	---	74.00	54.00	-20.15	Peak
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode: Tx / IEEE 802.11a mode / CH High / 5700MHz **Test Date:** October 25, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Test Mode 5

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
9116.67	V	46.11	41.87	9.50	55.61	51.37	74.00	54.00	-2.63	AVG
N/A										
9116.67	H	44.75	42.57	9.50	54.25	52.07	74.00	54.00	-1.93	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH Low	**Test Date:**	October 5, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	5		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8283.33	V	50.59	44.34	7.83	58.42	52.17	74.00	54.00	-1.83	AVG
N/A										
8283.33	H	53.54	44.34	7.83	61.37	52.17	74.00	54.00	-1.83	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) － Peak limit (dBuV/m) or Average Remark result (dBuV/m) － Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH Mid	**Test Date:**	October 5, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	5		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8416.67	V	49.61	43.79	8.84	58.45	52.63	74.00	54.00	-1.37	AVG
N/A										
8416.67	H	50.61	44.36	8.84	59.45	53.20	74.00	54.00	-0.80	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Standard-20 MHz Channel mode / CH High	**Test Date:**	October 5, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	5		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
N/A										
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / draft 802.11n Wide-40 MHz Channel mode / CH Low	**Test Date:**	October 5, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55 % RH	**Polarity:**	Ver. / Hor.
Test Mode	5		

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
8300.00	V	48.99	44.32	7.96	56.95	52.28	74.00	54.00	-1.72	AVG
N/A										
8300.00	H	53.99	45.41	7.96	61.95	53.37	74.00	54.00	-0.63	AVG
N/A										

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Peak Remark result (dBuV/m) – Peak limit (dBuV/m) or Average Remark result (dBuV/m) – Average limit (dBuV/m).*

8.10.2.4 LIMIT - BELOW 1 GHz

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

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.706	24000/F (kHz)	30
1.705 – 30.0	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3

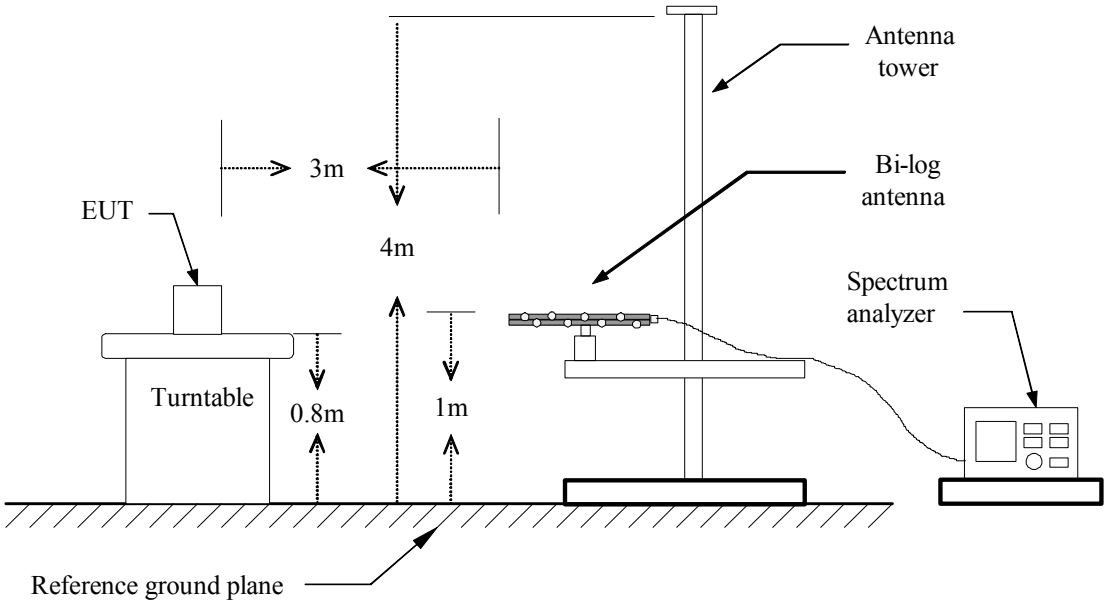
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

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

Test Configuration

Below 1 GHz



8.10.2.5 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
7. Repeat above procedures until the measurements for all frequencies are complete.

8.10.2.6 TEST RESULTS

No non-compliance noted

Below 1 GHz

Operation Mode: Mode 2 **Test Date:** October 9, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
38.08	V	40.72	-11.60	29.13	40.00	-10.87	Peak
99.52	V	44.26	-16.93	27.33	43.50	-16.17	Peak
165.80	V	50.50	-14.55	35.96	43.50	-7.54	Peak
298.37	V	42.29	-12.47	29.82	46.00	-16.18	Peak
479.43	V	37.78	-7.71	30.08	46.00	-15.92	Peak
912.70	V	34.19	-1.80	32.39	46.00	-13.61	Peak
165.80	H	47.81	-14.55	33.26	43.50	-10.24	Peak
232.08	H	45.96	-14.68	31.29	46.00	-14.71	Peak
299.98	H	47.67	-12.43	35.24	46.00	-10.76	Peak
479.43	H	42.71	-7.71	35.00	46.00	-11.00	Peak
566.73	H	38.88	-6.42	32.45	46.00	-13.55	Peak
912.70	H	37.69	-1.80	35.89	46.00	-10.11	Peak

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. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

Operation Mode: Mode 5 **Test Date:** October 9, 2007

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 55% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
36.47	V	40.35	-10.49	29.86	40.00	-10.14	Peak
99.52	V	43.84	-16.93	26.92	43.50	-16.58	Peak
165.80	V	50.75	-14.55	36.20	43.50	-7.30	Peak
232.08	V	43.84	-14.68	29.16	46.00	-16.84	Peak
299.98	V	42.40	-12.43	29.97	46.00	-16.03	Peak
566.73	V	35.88	-6.42	29.45	46.00	-16.55	Peak
165.80	H	44.37	-14.55	29.82	43.50	-13.68	Peak
232.08	H	46.57	-14.68	31.89	46.00	-14.11	Peak
299.98	H	47.53	-12.43	35.10	46.00	-10.90	Peak
400.22	H	42.88	-10.00	32.88	46.00	-13.12	Peak
765.58	H	37.82	-3.60	34.22	46.00	-11.78	Peak
912.70	H	37.39	-1.80	35.59	46.00	-10.41	Peak

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. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

8.11 POWERLINE CONDUCTED EMISSIONS

8.11.1 LIMIT

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

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

** Decreases with the logarithm of the frequency.*

TEST CONFIGURATION

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

8.11.2 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.

8.11.3 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:	Mode 2	**Test Date:**	October 15, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55% RH		

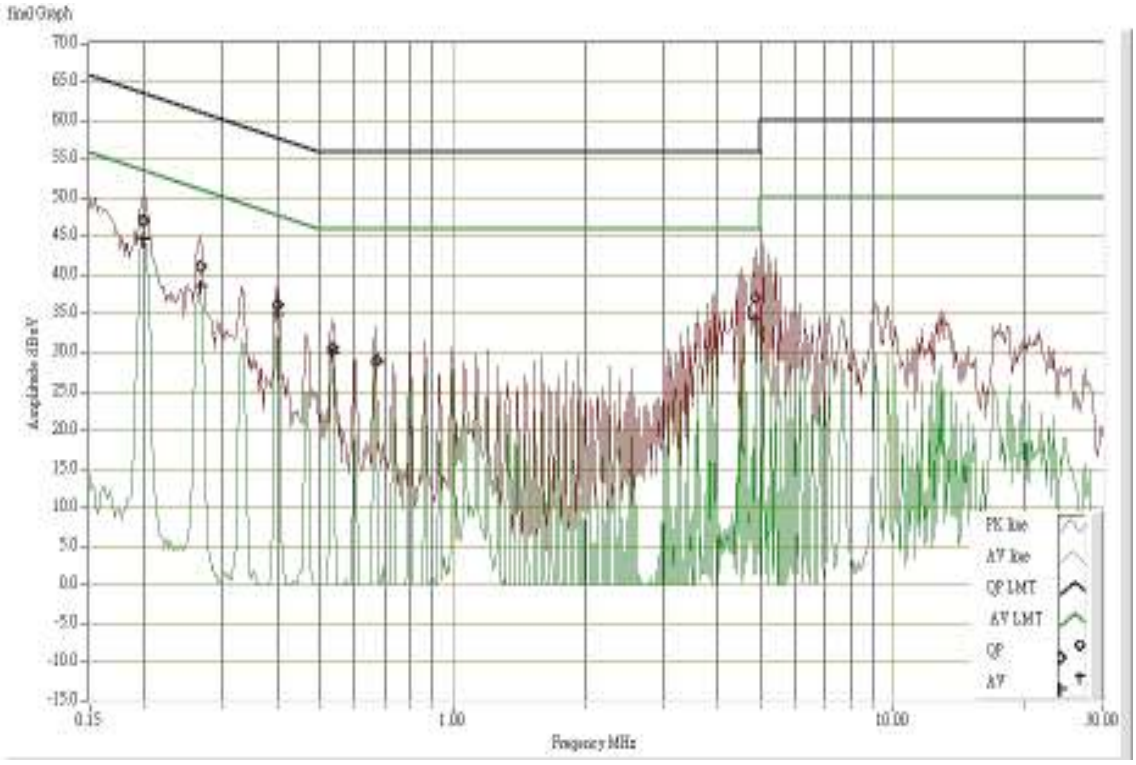
Freq. (MHz)	QP Reading (dBuV)	AV Reading. (dBuV)	Corr. Factor (dB)	QP Result (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Result (dBuV)	AV Limit (dBuV)	AV Margin (dB)	Note
0.198	47.140	44.620	0.112	47.252	63.694	-16.442	44.732	53.694	-8.962	L1
0.268	41.110	38.620	0.085	41.195	61.180	-19.985	38.705	51.180	-12.475	L1
0.400	36.120	34.950	0.037	36.157	57.853	-21.697	34.987	47.853	-12.867	L1
0.534	30.620	29.960	0.000	30.620	56.000	-25.380	29.960	46.000	-16.040	L1
0.670	28.940	28.570	0.000	28.940	56.000	-27.060	28.570	46.000	-17.430	L1
4.884	37.180	34.290	0.097	37.277	56.000	-18.723	34.387	46.000	-11.613	L1
0.199	46.500	43.690	0.111	46.611	63.659	-17.048	43.801	53.659	-9.858	L2
0.268	40.890	38.220	0.085	40.975	61.180	-20.205	38.305	51.180	-12.875	L2
0.403	34.710	32.810	0.036	34.746	57.791	-23.046	32.846	47.791	-14.946	L2
0.536	30.520	30.030	0.000	30.520	56.000	-25.480	30.030	46.000	-15.970	L2
0.670	28.760	28.440	0.000	28.760	56.000	-27.240	28.440	46.000	-17.560	L2
4.620	34.770	33.530	0.089	34.859	56.000	-21.141	33.619	46.000	-12.381	L2

Remark:

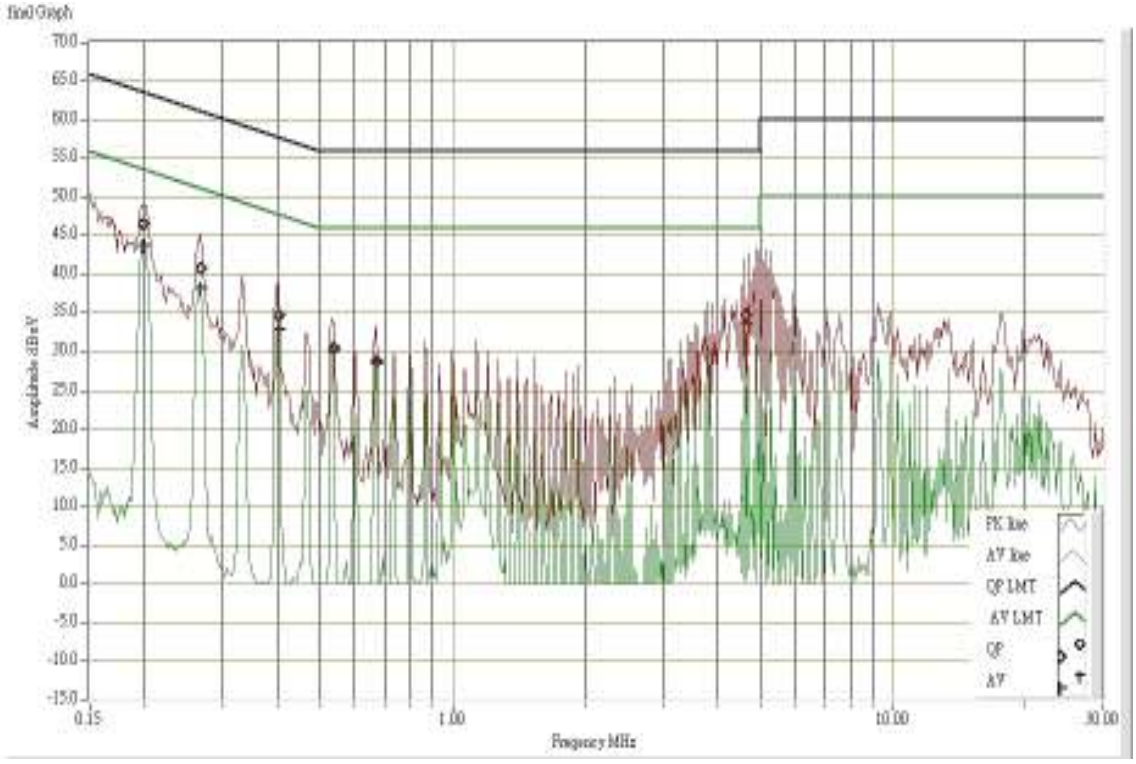
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)



Operation Mode:	Mode 5	**Test Date:**	October 15, 2007
Temperature:	25°C	**Tested by:**	Wolf Huang
Humidity:	55% RH		

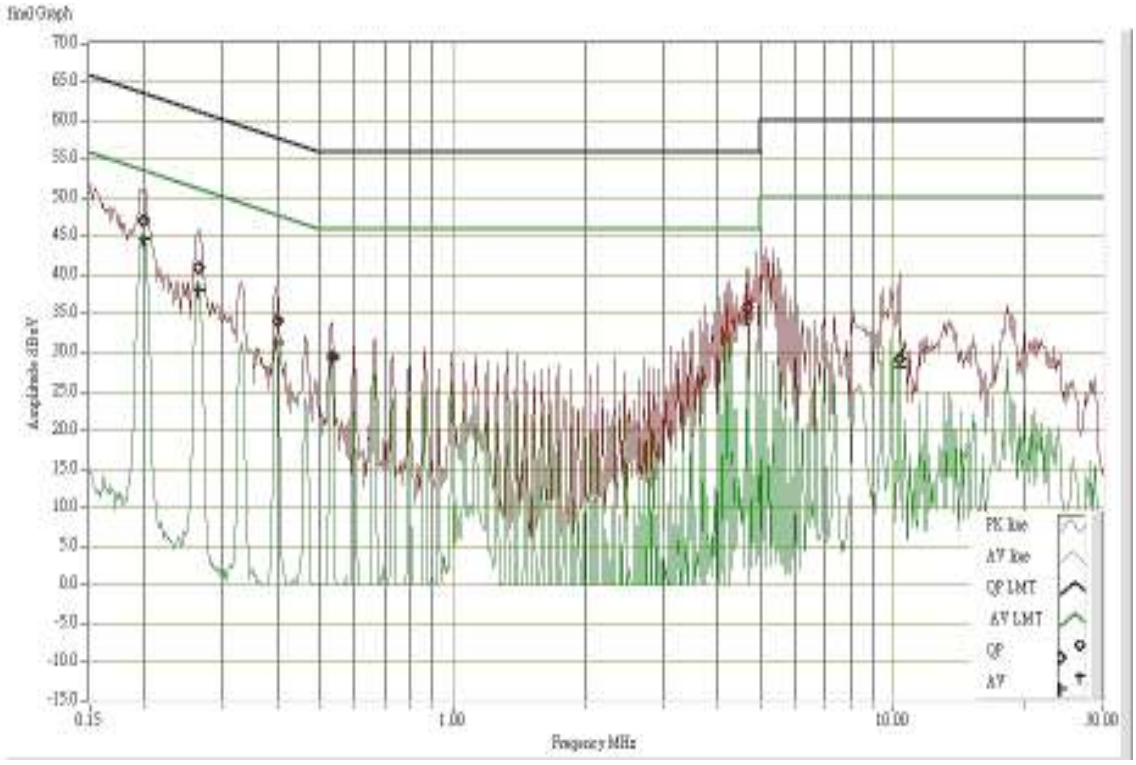
Freq. (MHz)	QP Reading (dBuV)	AV Reading. (dBuV)	Corr. Factor (dB)	QP Result (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Result (dBuV)	AV Limit (dBuV)	AV Margin (dB)	Note
0.198	47.100	44.620	0.112	47.212	63.694	-16.482	44.732	53.694	-8.962	L1
0.264	41.050	38.110	0.087	41.137	61.305	-20.168	38.197	51.305	-13.108	L1
0.400	34.170	31.210	0.037	34.207	57.853	-23.647	31.247	47.853	-16.607	L1
0.532	29.610	29.170	0.000	29.610	56.000	-26.390	29.170	46.000	-16.830	L1
4.667	35.850	34.550	0.090	35.940	56.000	-20.060	34.640	46.000	-11.360	L1
10.334	29.220	28.030	0.308	29.528	60.000	-30.472	28.338	50.000	-21.662	L1
0.200	46.540	43.880	0.110	46.650	63.611	-16.961	43.990	53.611	-9.621	L2
0.264	40.910	38.160	0.087	40.997	61.305	-20.308	38.247	51.305	-13.058	L2
0.400	34.670	32.310	0.037	34.707	57.853	-23.147	32.347	47.853	-15.507	L2
0.532	30.250	29.960	0.000	30.250	56.000	-25.750	29.960	46.000	-16.040	L2
0.666	29.810	29.490	0.000	29.810	56.000	-26.190	29.490	46.000	-16.510	L2
4.474	34.570	33.730	0.084	34.654	56.000	-21.346	33.814	46.000	-12.186	L2

Remark:

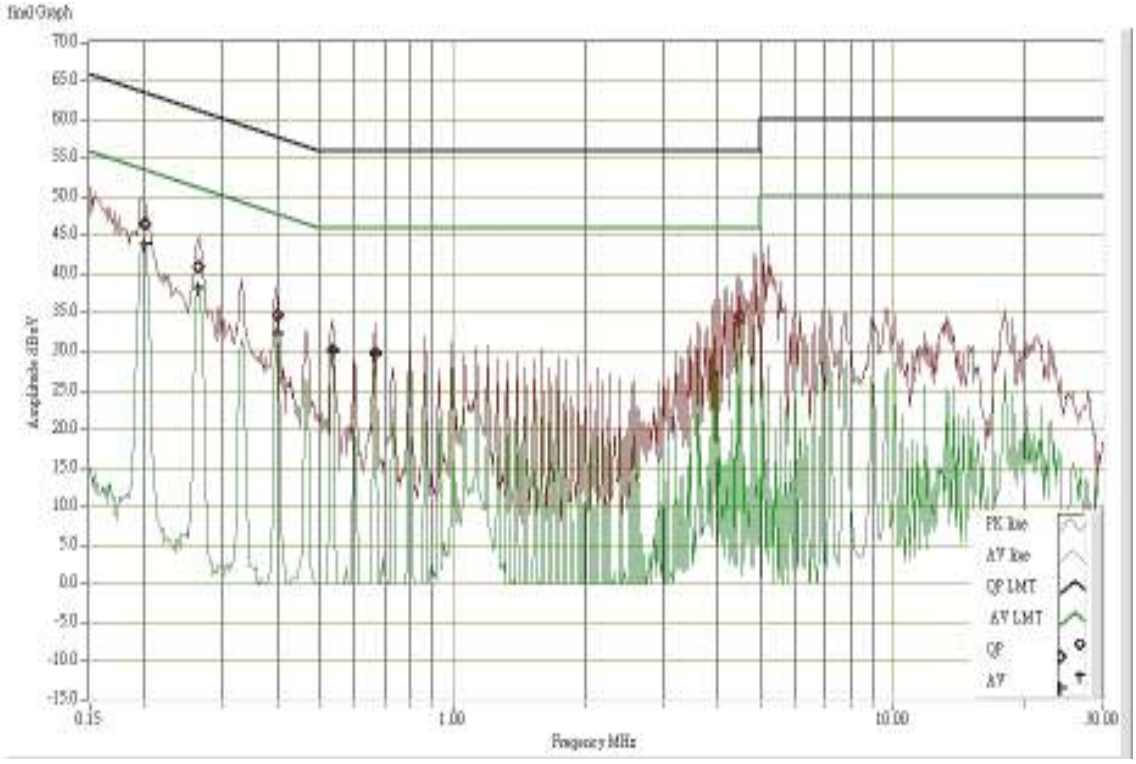
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz.*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)



9. APPENDIX I
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	Wireless 802.11N DUAL BAND MINI PCI MODULE
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☒ WLAN: 5.15GHz ~ 5.35GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☐ Bluetooth: 2.402 GHz ~ 2.482 GHz ☐ Others: _____
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others: _____
Exposure classification	General Population/Uncontrolled exposure *(S=1mW/cm^2)*
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	IEEE 802.11a mode: 12.11 dBm (16.26mW) draft 802.11n Standard-20 MHz Channel mode: 13.77 dBm (23.82mW) draft 802.11n Wide-40 MHz Channel mode: 13.48 dBm (22.28mW)
Antenna gain (Max)	Dipole Antenna: 1.3 dBi (Numeric gain: 1.35) PCB Antenna: 1.8 dBi (Numeric gain: 1.51)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A
Remark: *1. The maximum output power is 13.77dBm (23.82mW) at 5270MHz (with 1.51 numeric antenna gain.)* *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 and

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm²

Maximum Permissible Exposure

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

EUT output power = 23.82mW

Numeric Antenna gain = 1.51

→ Power density = 0.0072 mW / cm²

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

EUT Specification

EUT	Wireless 802.11N DUAL BAND MINI PCI MODULE
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.15GHz ~ 5.35GHz ☒ WLAN: 5.47GHz ~ 5.725GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☐ Bluetooth: 2.402 GHz ~ 2.482 GHz ☐ Others: _____
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others: _____
Exposure classification	General Population/Uncontrolled exposure *(S=1mW/cm^2)*
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	IEEE 802.11a mode: 13.08 dBm (20.32mW)
Antenna gain (Max)	Dipole Antenna: 1.3 dBi (Numeric gain: 1.35) PCB Antenna: 1.8 dBi (Numeric gain: 1.51)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A
Remark: *3. The maximum output power is 13.08dBm (20.32mW) at 5600MHz (with 1.51 numeric antenna gain.)* *4. 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 and

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm²

Maximum Permissible Exposure

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

EUT output power = 20.32mW

Numeric Antenna gain = 1.51

→ Power density = 0.0061 mW / cm²

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