FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

11n/a/g/b Wi-Fi USB adapter

Model: GW-USFang300

Trade Name:

Issued to

PLANEX Communications Inc.
2F F NISSAY Ebisu Bldg. 3-16-3 Higashi, Shibuya-ku, Tokyo 150-0011, Japan

Issued by

Compliance Certification Services Inc.
No.11, Wu-Gong 6th Rd., Wugu Industrial Park,
New Taipei City 248, Taiwan (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com
Issued Date: September 22, 2011

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		September 22, 2011		Initial Issue	ALL	Sandy Lin

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Applicant: PLANEX Communications Inc.
2F F NlSSAY Ebisu Bldg. 3-16-3 Higashi, Shibuya-ku, Tokyo 150-0011, Japan

Equipment Under Test: 11n/a/g/b Wi-Fi USB adapter

Trade Name:

Model: GW-USFang300

Date of Test: August 23 ~ September 15, 2011

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

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

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

Approved by:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Gina Lo
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

<table>
<tr><td>Product</td><td>11n/a/g/b Wi-Fi USB adapter</td></tr>
<tr><td>Trade Name</td><td>  </td></tr>
<tr><td>Model Number</td><td>GW-USFang300</td></tr>
<tr><td>Model Discrepancy</td><td>N/A</td></tr>
<tr><td>Received Date</td><td>July 29, 2011</td></tr>
<tr><td>Power Supply</td><td>Power from host device</td></tr>
<tr><td>Operating Frequency Range & Number of Channels</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th></tr>
<tr><td rowspan="3">UNII Band I</td><td>IEEE 802.11a</td><td>5180 – 5240</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz mode</td><td>5180 – 5240</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz mode</td><td>5190 ~ 5230</td></tr>
</table>
</td></tr>
<tr><td>Transmit Power</td><td>IEEE 802.11a mode / 5180 ~ 5240MHz: 9.05 dBm
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz: 10.75 dBm
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz: 8.18 dBm</td></tr>
<tr><td>Modulation Technique</td><td>OFDM (QPSK, BPSK, 16-QAM, 64-QAM)</td></tr>
<tr><td>Transmit Data Rate</td><td>IEEE 802.11a mode: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11n HT 20 MHz mode: OFDM (6.50, 13.00, 19.50, 26.00, 39.00, 52.00, 58.50, 65.00, 78.00, 104.0, 117.0, 130.0, 156.0, 175.5, 195.0Mbps)
IEEE 802.11n HT 40 MHz mode: OFDM (13.50, 27.00, 40.50, 54.00, 81.00, 108.0, 121.5, 135.0, 162.0, 216.0, 243.0, 270.0, 324.0, 364.5, 405.0Mbps)</td></tr>
<tr><td>Antenna Specification</td><td>Omni Antenna / Gain: 4.27 dBi (Numeric gain: 2.67)
MIMO Mode:
Total ANT=
10*LOG(((10^(4.27/20)+10^(4.27/20))^2/2)
5.725~5.850 GHz: 7.28 dBi (Numeric gain: 5.35)</td></tr>
</table>

Operation Frequency

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)	
CHANNEL	**MHz**
36	5180
38	5190
40	5200
46	5230
48	5240

Remark:

1. *The sample selected for test was production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **SJ9GW-USFANG300** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.*

3. TEST METHODOLOGY

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

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

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

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

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

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

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

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

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

[2] Above 38.6

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

3.5 DESCRIPTION OF TEST MODES

The EUT (model: GW-USFang300) had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in triple TX chains and triple RX chains. The 2x2 configuration is implemented with three outside TX & RX chains (Chain 0 and Chain 1).

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

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

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (Y axis) and the worst case was recorded.

IEEE 802.11a mode / 5180 ~ 5240MHz:

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz:

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz:

Channel Low (5190MHz) and Channel High (5230MHz) with 13.5Mbps data rate were chosen for full testing.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

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

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/17/2012

Wugu 966 Chamber A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	11/03/2011
EMI Test Receiver	R&S	ESCI	100064	02/03/2012
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/12/2012
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/19/2011
Bilog Antenna	Sunol Sciences	JB3	A030105	10/06/2011
Horn Antenna	EMCO	3117	00055165	01/12/2012
Loop Antenna	EMCO	6502	8905/2356	06/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/26/2011
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room #1				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
L.I.S.N.	SCHWARZBECK	NNLK 8121	8121-308	Sep. 06, 2012
L.I.S.N.	Rohde & Schwarz	ESH 3-Z5	840062/021	Aug. 02, 2012
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL. 03, 2012
BNC COAXIAL CABLE	CCS	BNC50	11	OCT. 04, 2011
Test S/W	e-3 (5.04211c) R&S (2.27)			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 2.9000
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

***Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

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

☒ No.11, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

☒ No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
Tel: 886-6-580-2201 / Fax: 886-6-580-2202

Remark: The Conducted emissions test items was tested at Compliance Certification Services Inc. (Tainan Lab.) The test equipments were listed in page 10 and the test data, please refer page 83-84.

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

5.2 EQUIPMENT

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

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

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

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

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	IC 2324G-1 IC 2324G-2

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

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

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

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC	HP	dv6-1332TX	CNF9491GLJ	PD9112BNHU	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2	Notebook PC	IBM	T43	B463AOAGALT097	DoC	N/A	Unshielded, 1.6m
3	Wireless Pre-N Router (MIMO) (Remote)	BELKIN	F5D8230-4	N/A	SA3-AGN0901 AP0100	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark:

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

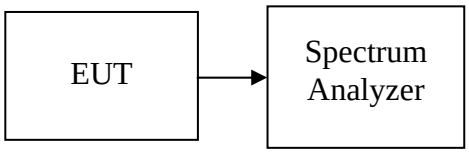
7. FCC PART 15 REQUIREMENTS

7.1 26 DB EMISSION BANDWIDTH

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



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.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5180	22.774
Mid	5220	22.629
High	5240	22.694

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5180	22.824
Mid	5220	22.739
High	5240	23.500

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5180	23.015
Mid	5220	22.952
High	5240	22.968

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5190	41.587
High	5230	41.627

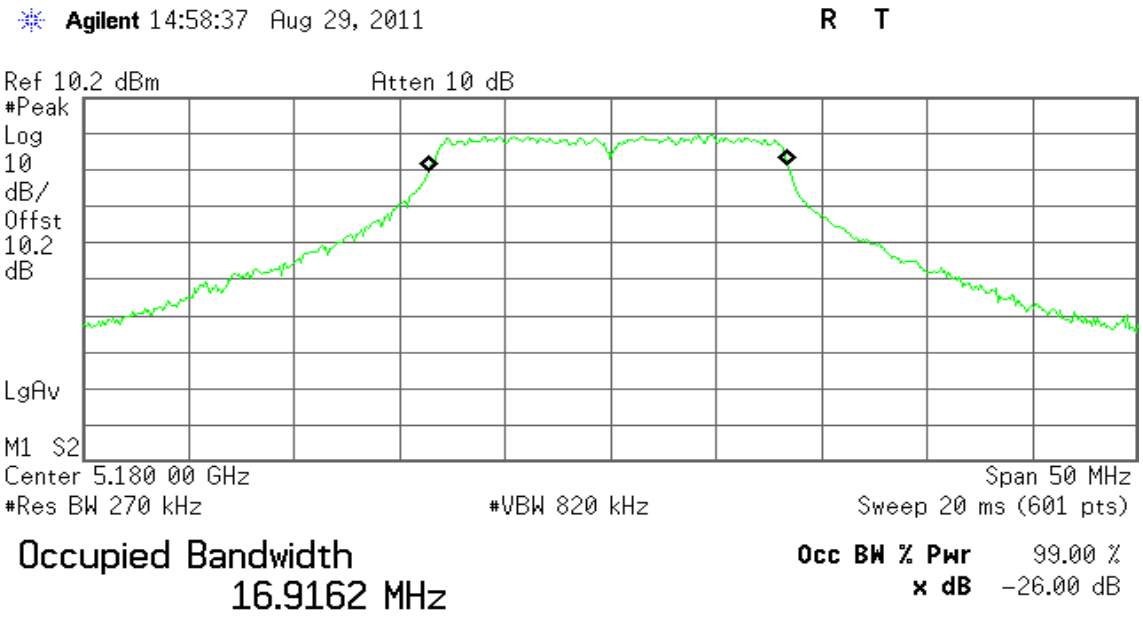
Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5190	41.189
High	5230	41.068

Test Plot

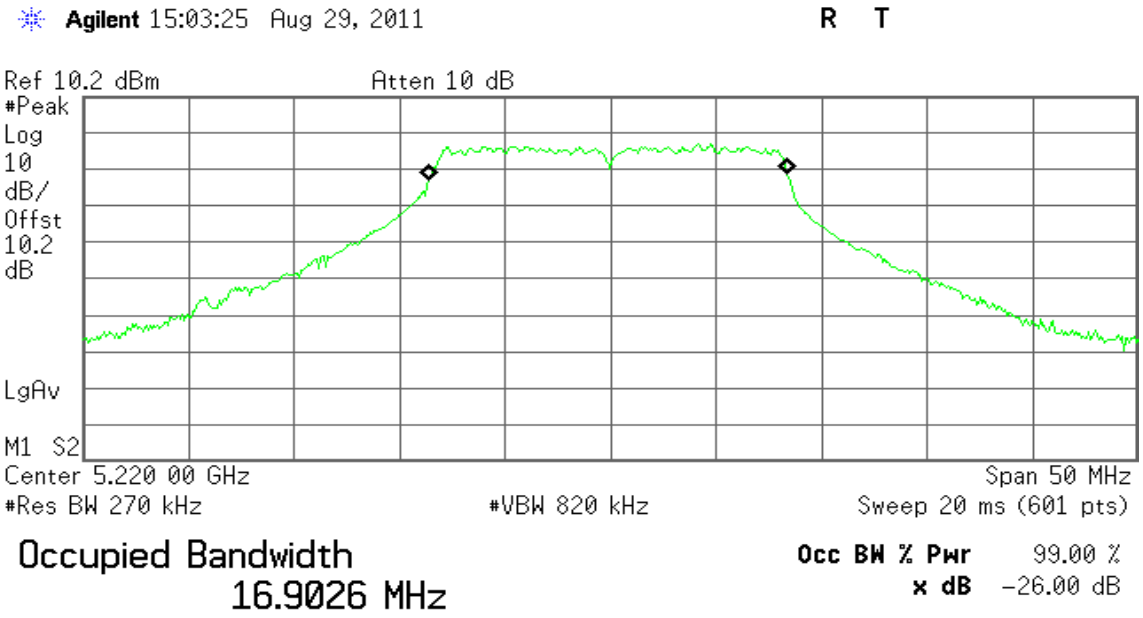
IEEE 802.11a mode / 5180 ~ 5240MHz

CH Low



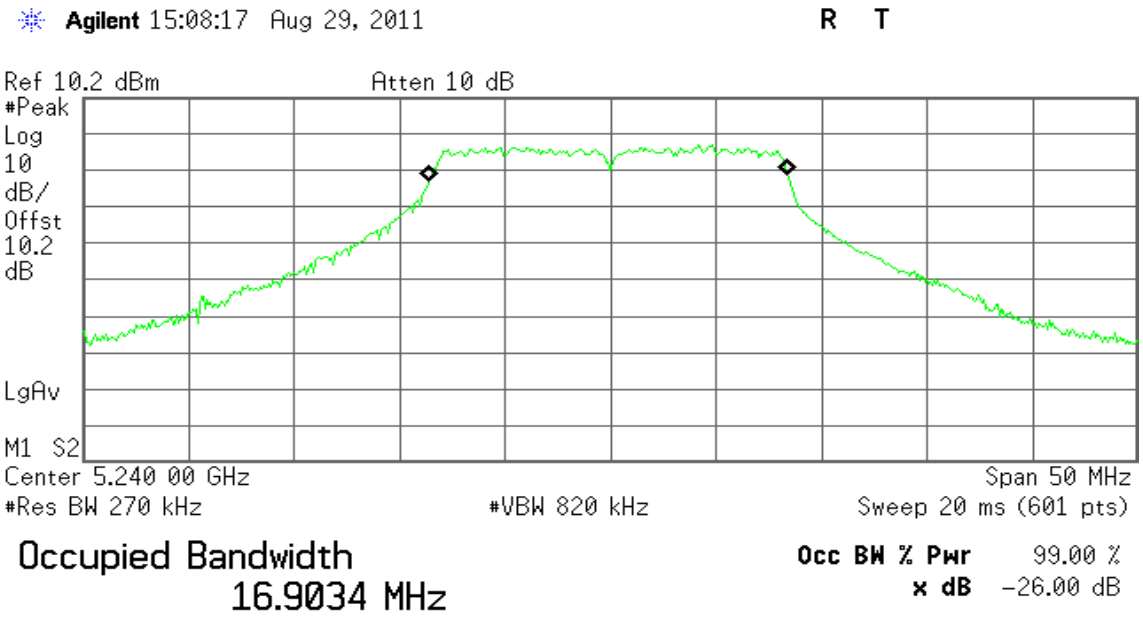
Transmit Freq Error	-128.976 kHz
x dB Bandwidth	22.774 MHz

CH Mid



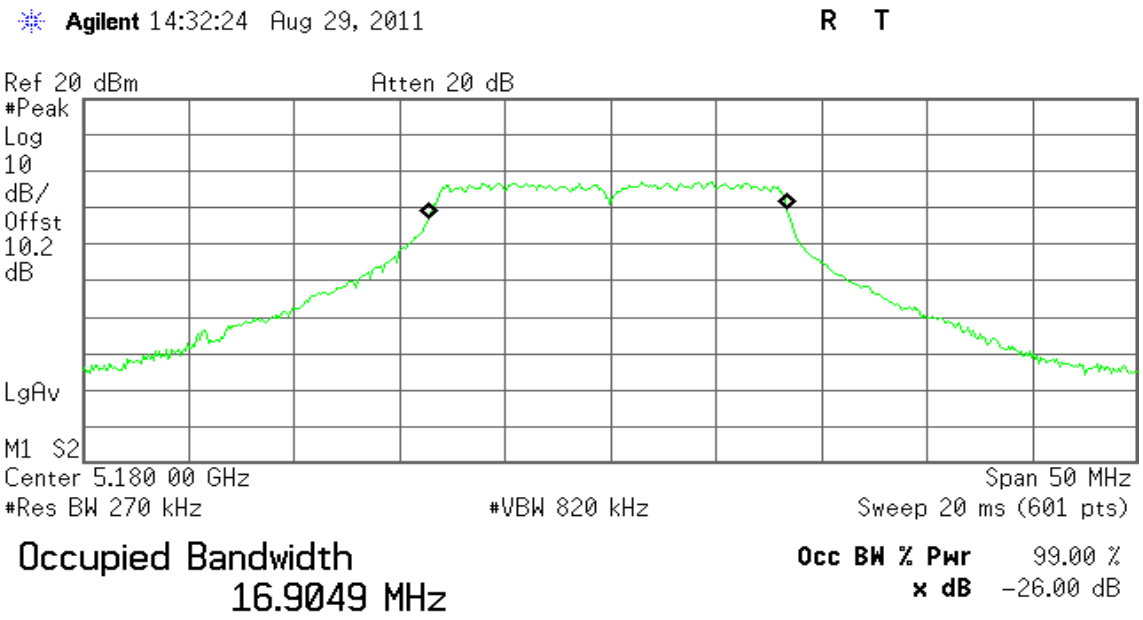
Transmit Freq Error	-134.179 kHz
x dB Bandwidth	22.629 MHz

CH High


Agilent 15:08:17 Aug 29, 2011
R T
Ref 10.2 dBm
Atten 10 dB
#Peak
Log
10
dB/
Offst
10.2
dB
LgAv
M1 S2
Center 5.240 00 GHz
Span 50 MHz
#Res BW 270 kHz
#VBW 820 kHz
Sweep 20 ms (601 pts)
Occupied Bandwidth
16.9034 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -122.160 kHz
x dB Bandwidth 22.694 MHz

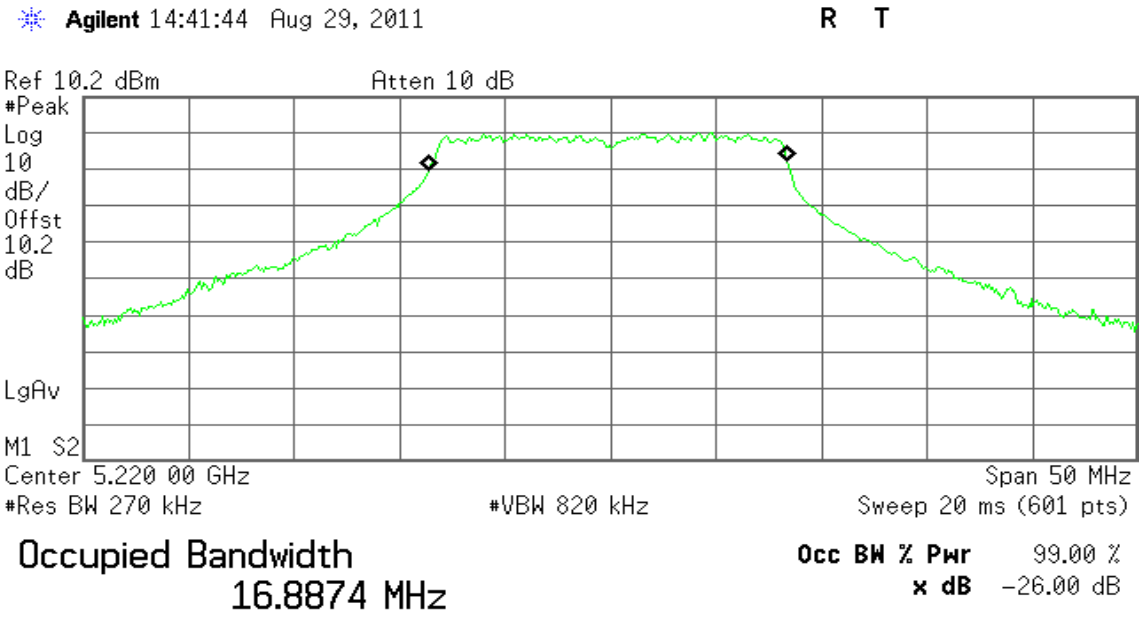
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

CH Low



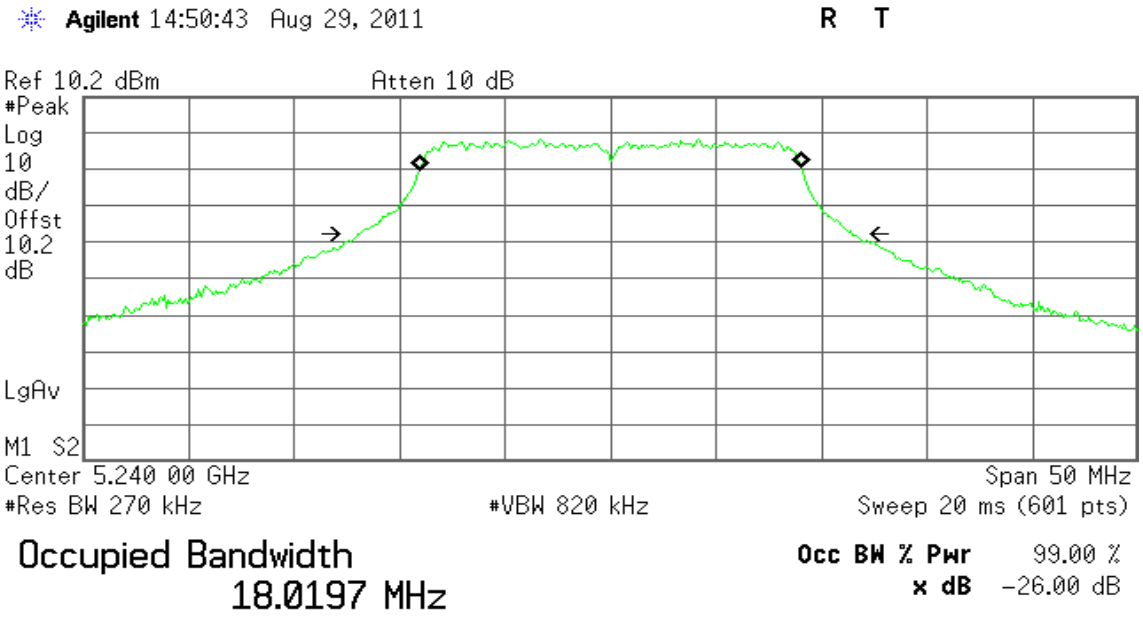
Transmit Freq Error -138.836 kHz
x dB Bandwidth 22.824 MHz

CH Mid



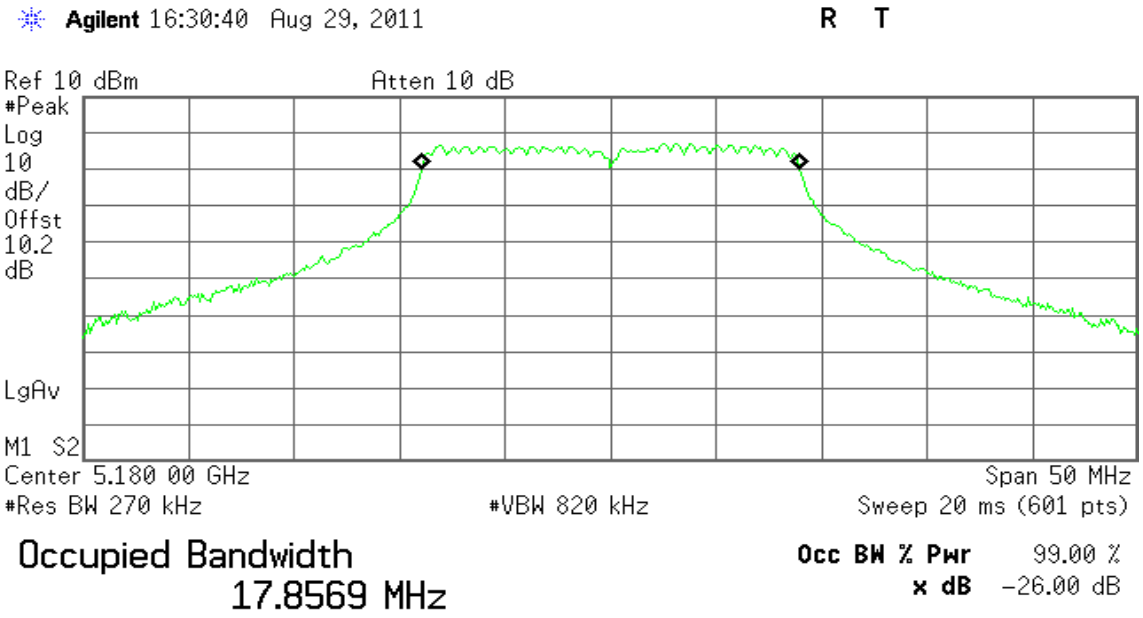
Transmit Freq Error -129.422 kHz
x dB Bandwidth 22.739 MHz

CH High


Agilent 14:50:43 Aug 29, 2011
R T
Ref 10.2 dBm
Atten 10 dB
#Peak
Log
10
dB/
Offst
10.2
dB
LgAv
M1 S2
Center 5.240 00 GHz
Span 50 MHz
#Res BW 270 kHz
#VBW 820 kHz
Sweep 20 ms (601 pts)
Occupied Bandwidth
18.0197 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -18.273 kHz
x dB Bandwidth 23.500 MHz

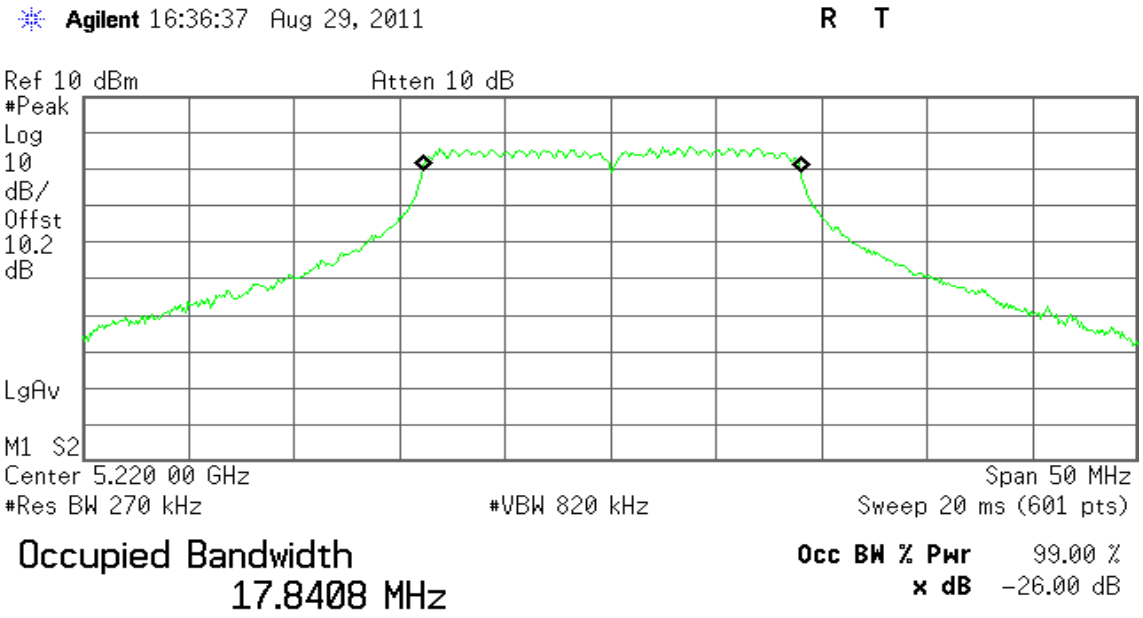
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

CH Low



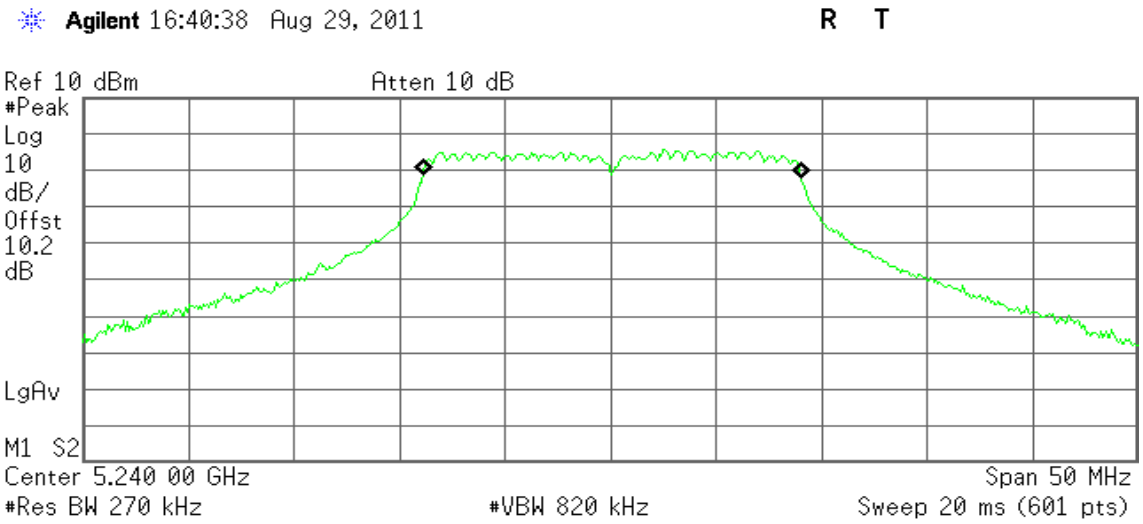
Transmit Freq Error	16.654 kHz
x dB Bandwidth	23.015 MHz

CH Mid



Transmit Freq Error	47.274 kHz
x dB Bandwidth	22.952 MHz

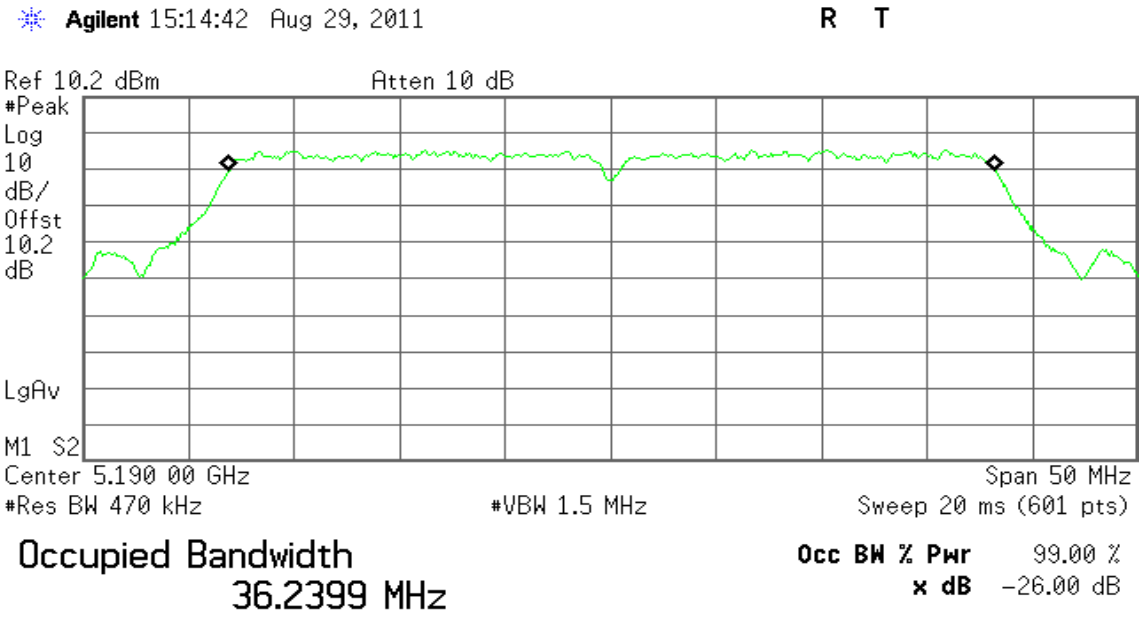
CH High



Transmit Freq Error	57.250 kHz
x dB Bandwidth	22.968 MHz

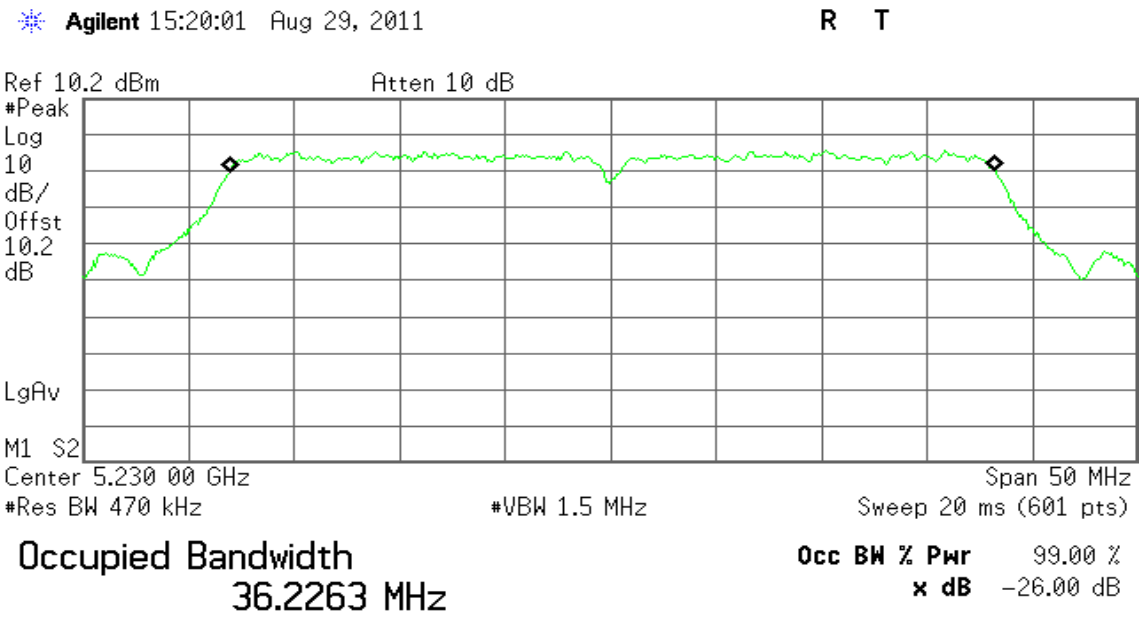
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low



Transmit Freq Error	64.828 kHz
x dB Bandwidth	41.587 MHz

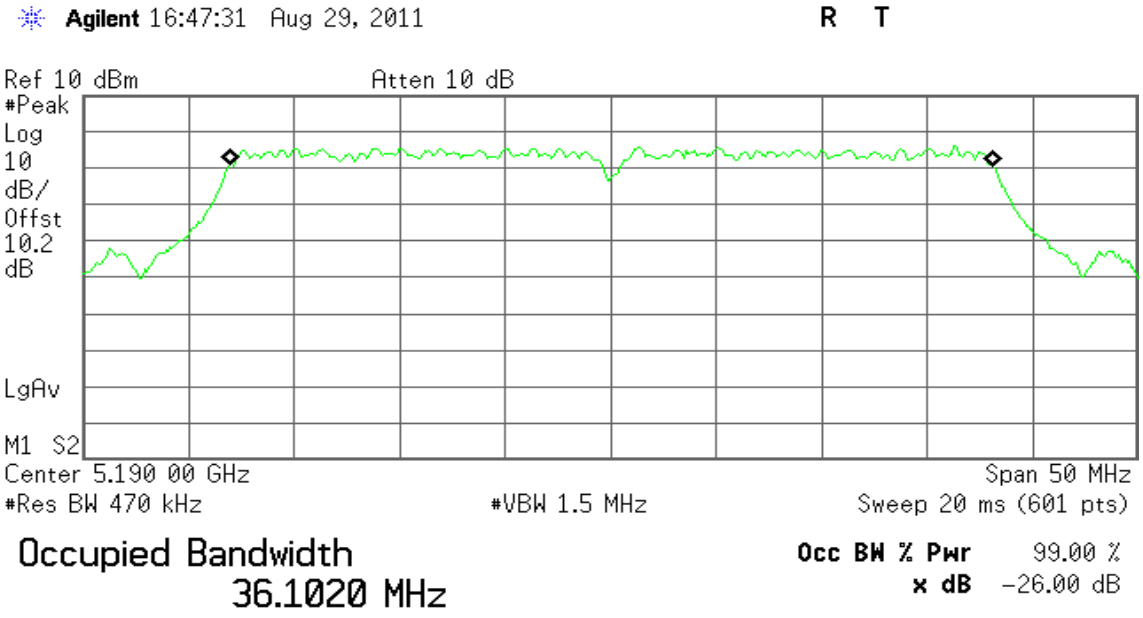
CH High



Transmit Freq Error	74.988 kHz
x dB Bandwidth	41.627 MHz

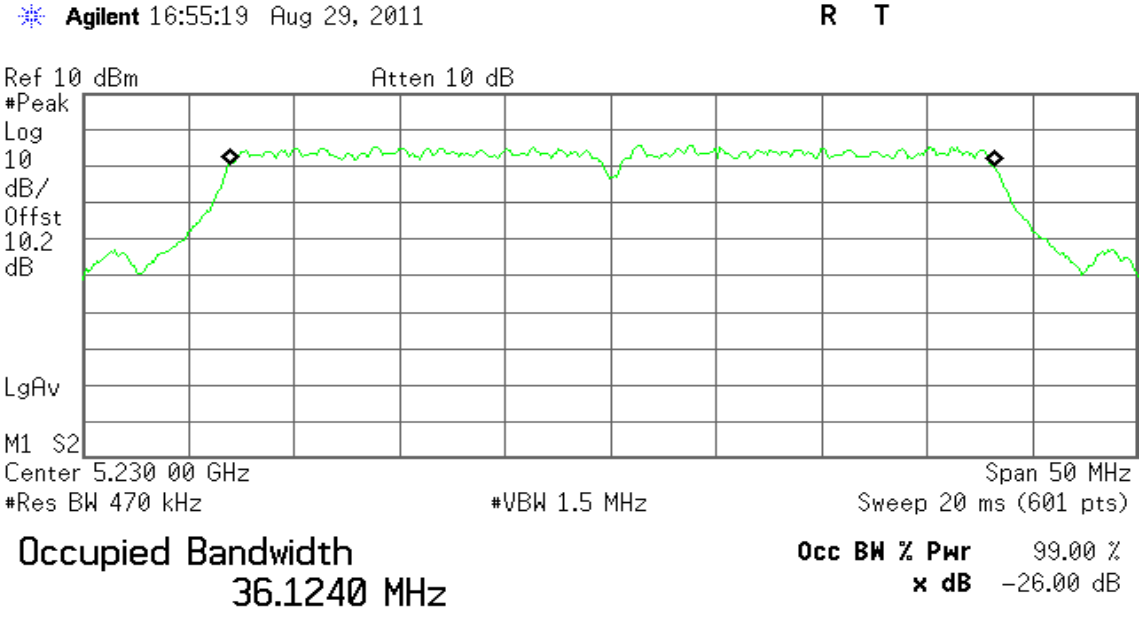
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low



Transmit Freq Error	33.321 kHz
x dB Bandwidth	41.189 MHz

CH High



Transmit Freq Error	68.895 kHz
x dB Bandwidth	41.068 MHz

7.2 PEAK POWER

LIMIT

According to §15.407(a),

(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 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 / 5180 ~ 5240MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	22.774	13.57	17.57	17.00
Mid	5220	22.629	13.55	17.55	17.00
High	5240	22.694	13.56	17.56	17.00

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

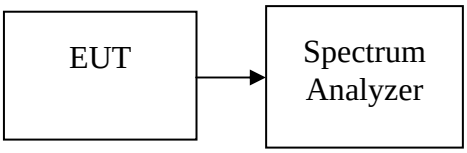
Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	22.824	23.015	13.62	17.62	17.00
Mid	5220	22.739	22.952	13.61	17.61	17.00
High	5240	23.500	22.968	13.71	17.71	17.00

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5190	41.587	41.189	16.19	20.19	17.00
High	5230	41.627	41.068	16.19	20.19	17.00

Test Configuration

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



TEST PROCEDURE

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

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

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

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.05	17.00
Mid	5220	6.31	17.00
High	5240	6.19	17.00

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	6.29	5.55	8.95	15.72
Mid	5220	9.41	4.98	10.75	15.72
High	5240	7.21	4.31	9.01	15.72

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5190	5.42	4.43	7.96	15.72
High	5230	5.85	4.36	8.18	15.72

Remark:

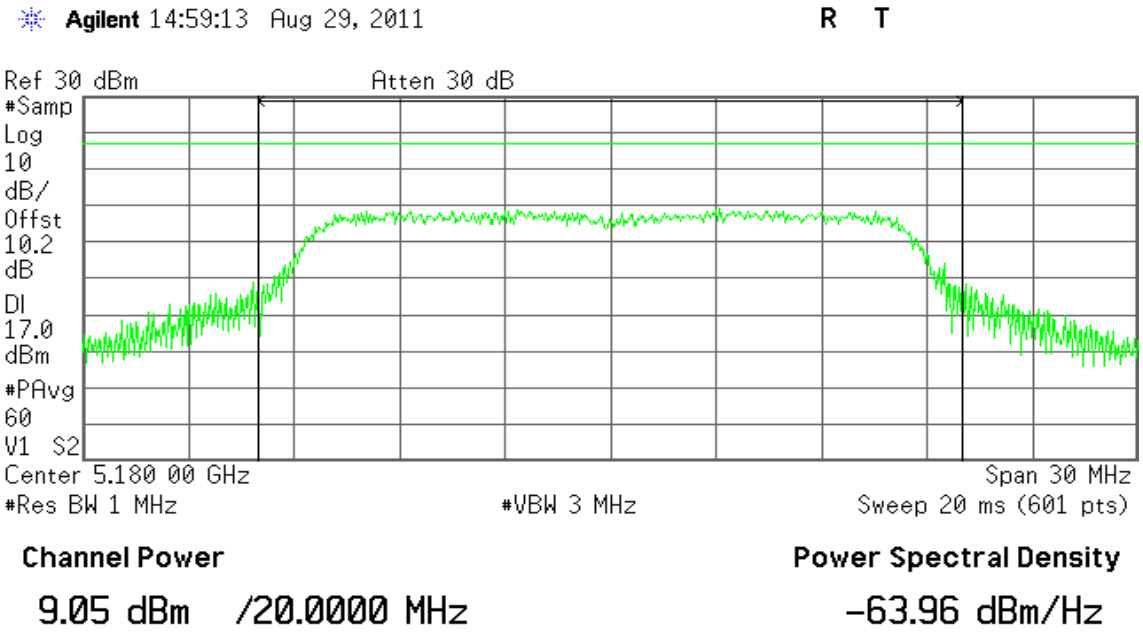
1. Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000) + Chain 1 (10^(Output Power /10)/1000)

2. The maximum antenna gain is 7.28dBi; therefore the reduction due to antenna gain is 1.28dBi, so the limit is 15.72dBm.

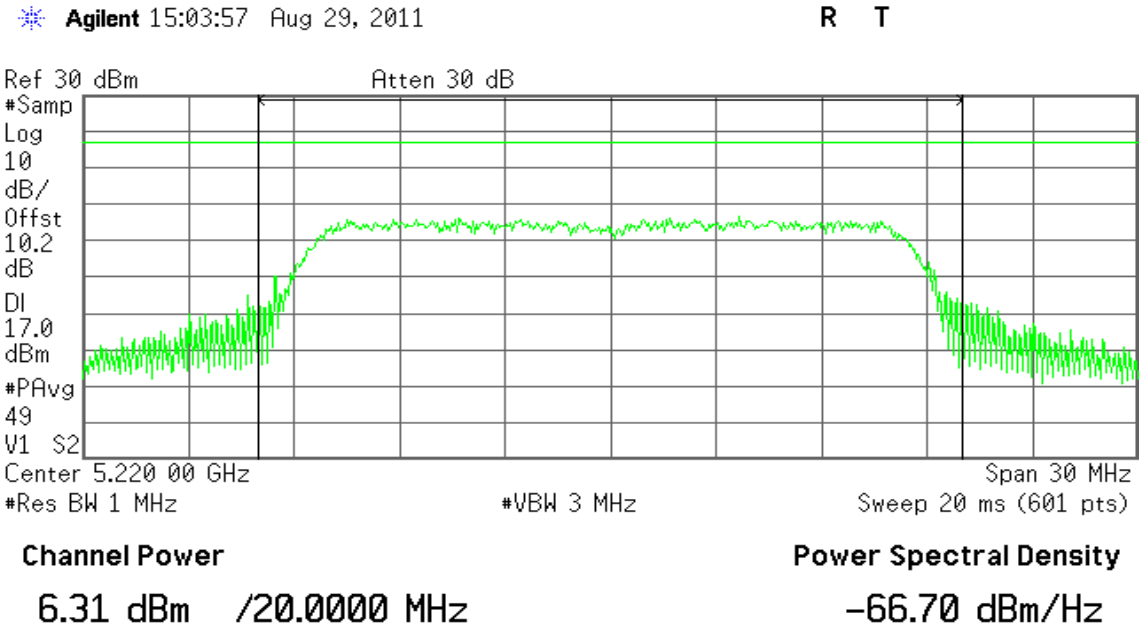
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

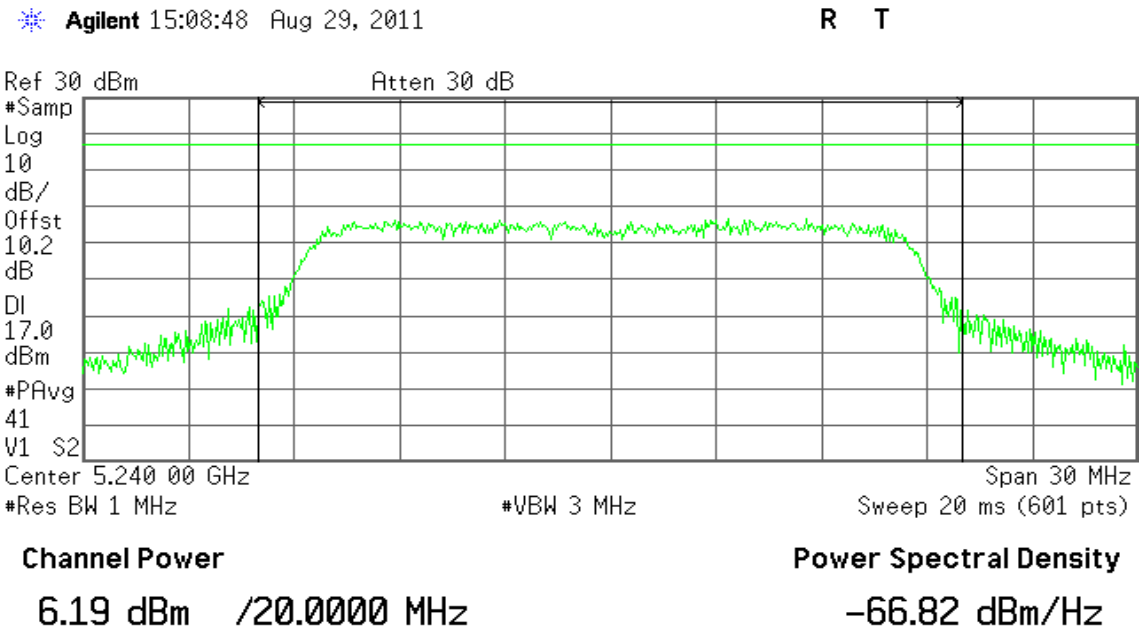
CH Low



CH Mid

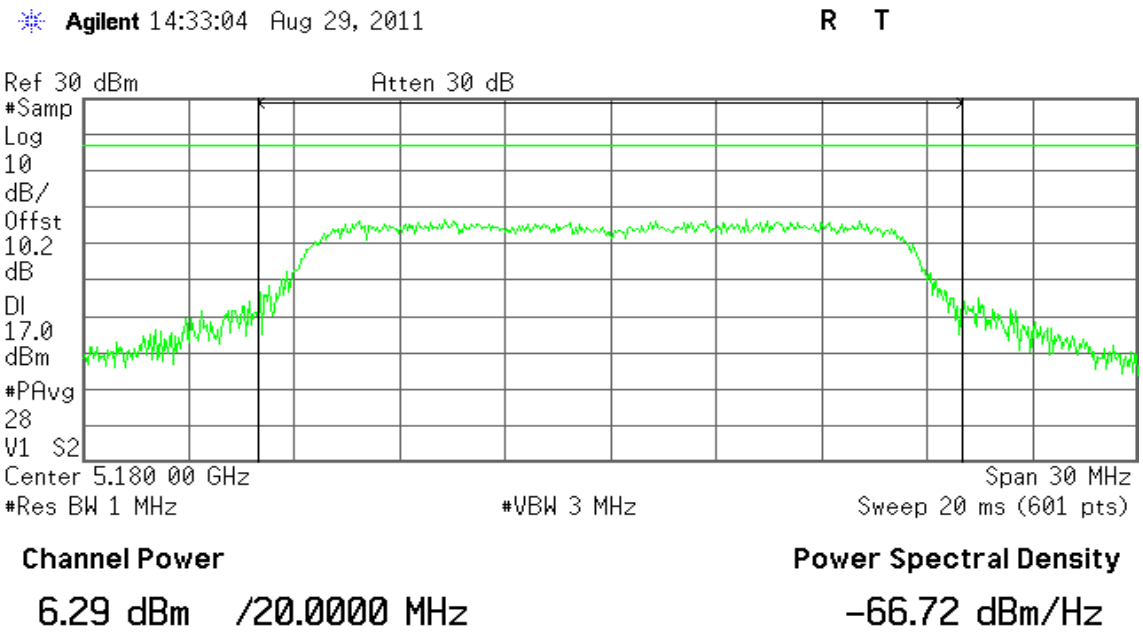


CH High

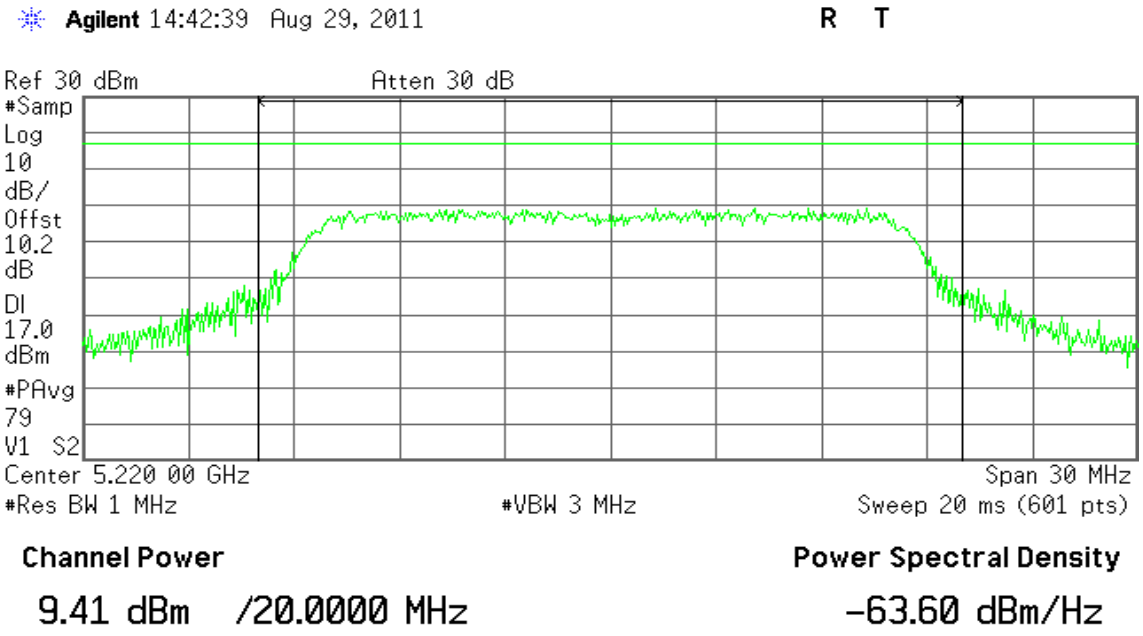

Agilent 15:08:48 Aug 29, 2011
R T
Ref 30 dBm
Atten 30 dB
#Samp
Log
10
dB/
Offst
10.2
dB
Dl
17.0
dBm
#PAvg
41
V1 S2
Center 5.240 00 GHz
Span 30 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 20 ms (601 pts)
Channel Power
6.19 dBm /20.0000 MHz
Power Spectral Density
-66.82 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

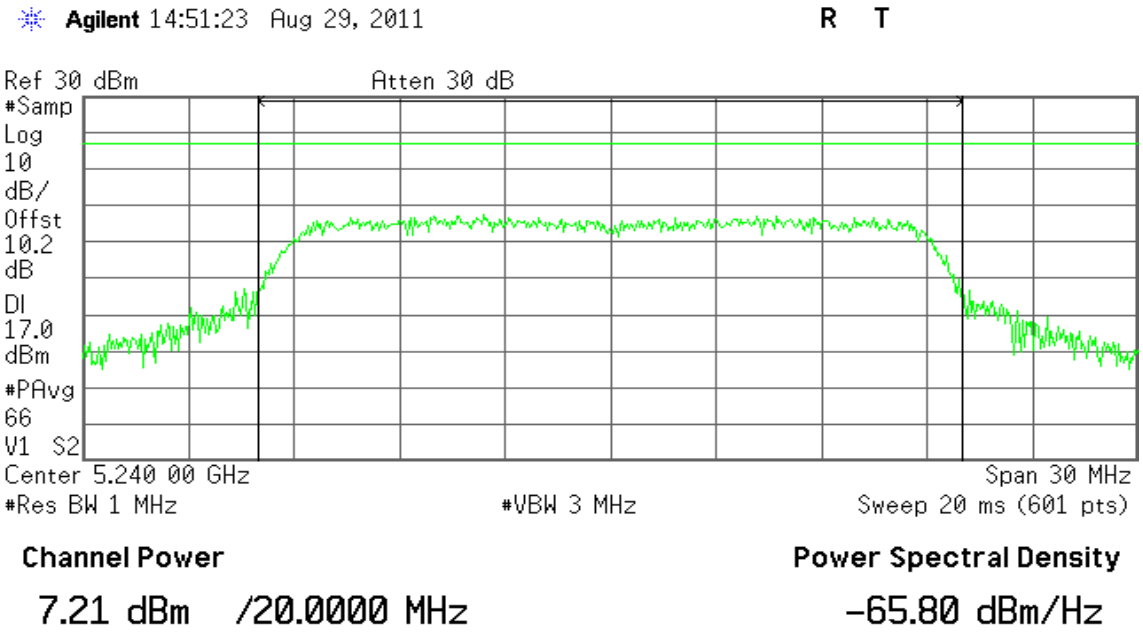
CH Low



CH Mid

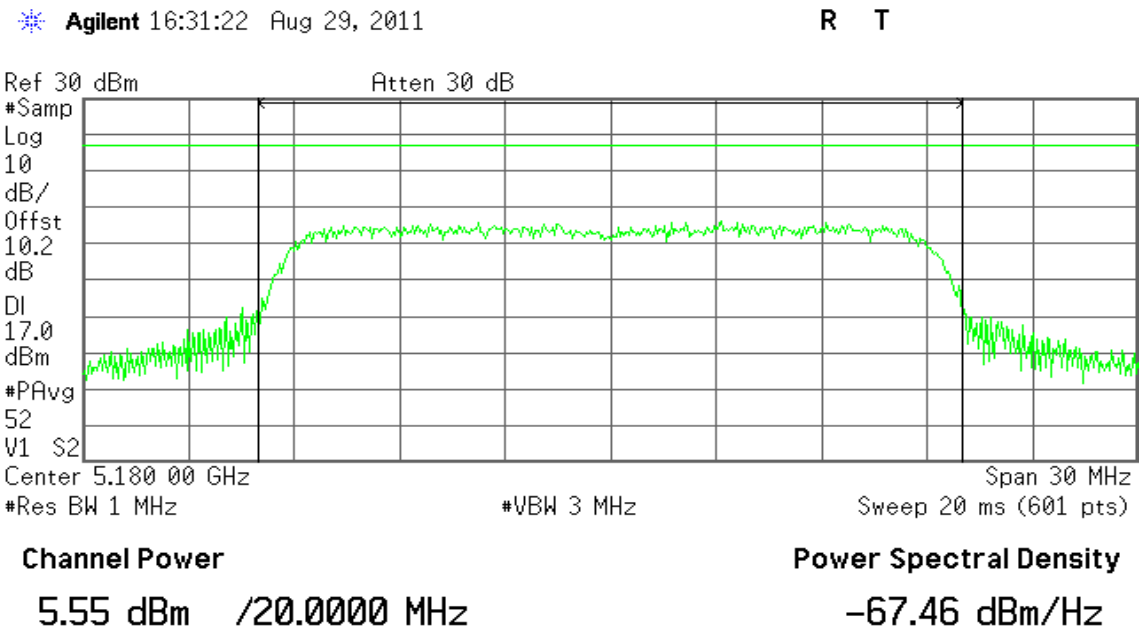


CH High

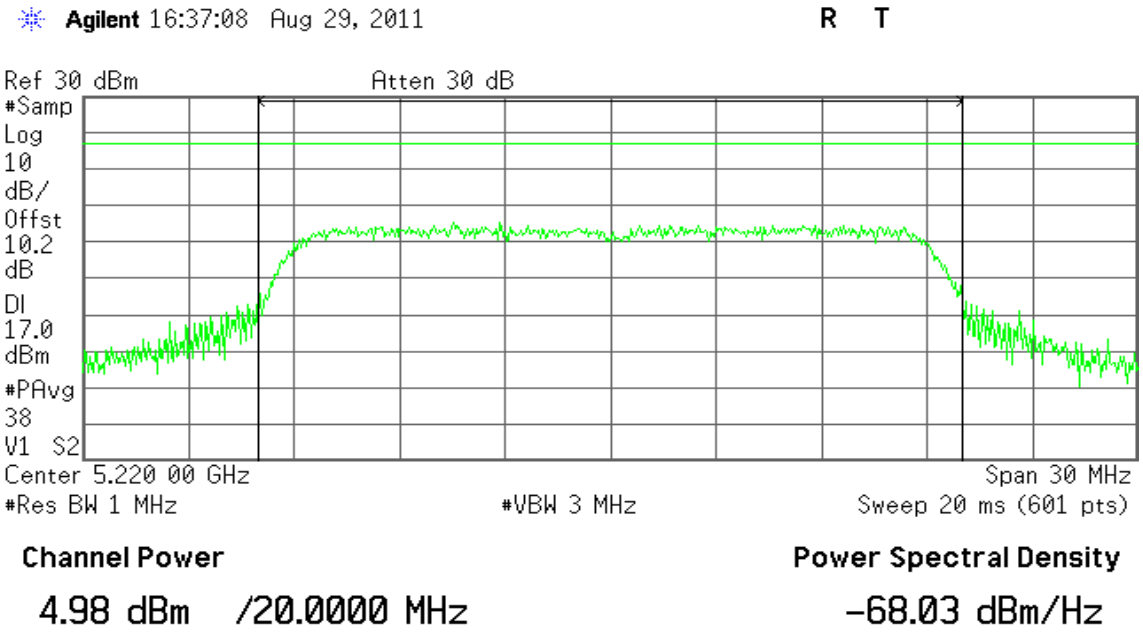

Agilent 14:51:23 Aug 29, 2011
R T
Ref 30 dBm
Atten 30 dB
#Samp
Log
10
dB/
Offst
10.2
dB
Dl
17.0
dBm
#PAvg
66
V1 S2
Center 5.240 00 GHz
Span 30 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 20 ms (601 pts)
Channel Power
7.21 dBm /20.0000 MHz
Power Spectral Density
-65.80 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

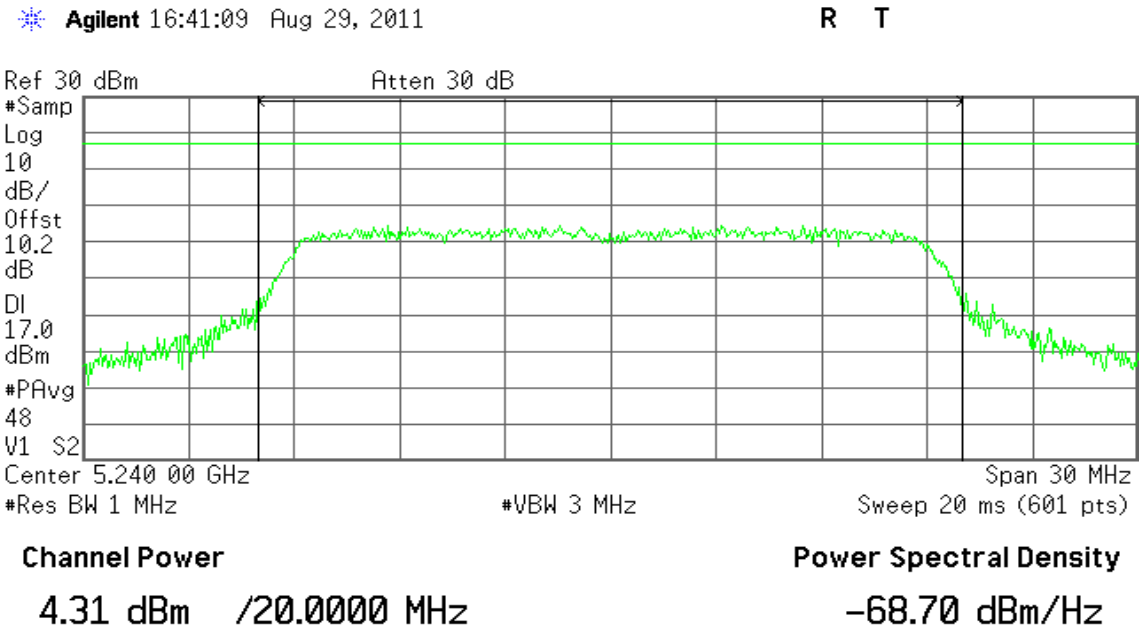
CH Low



CH Mid

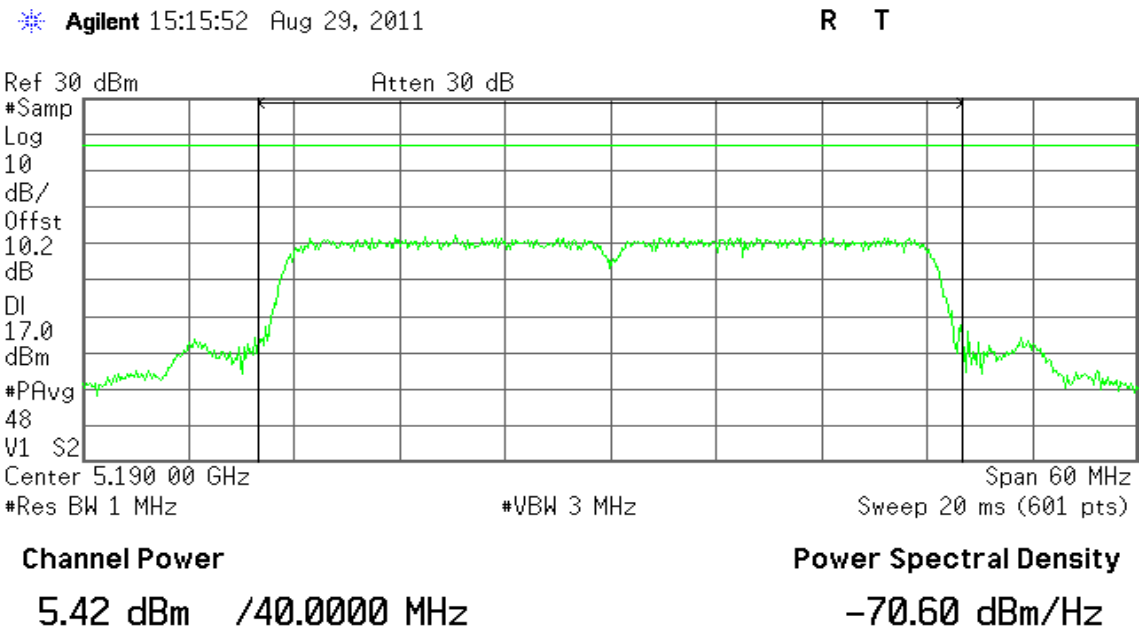


CH High

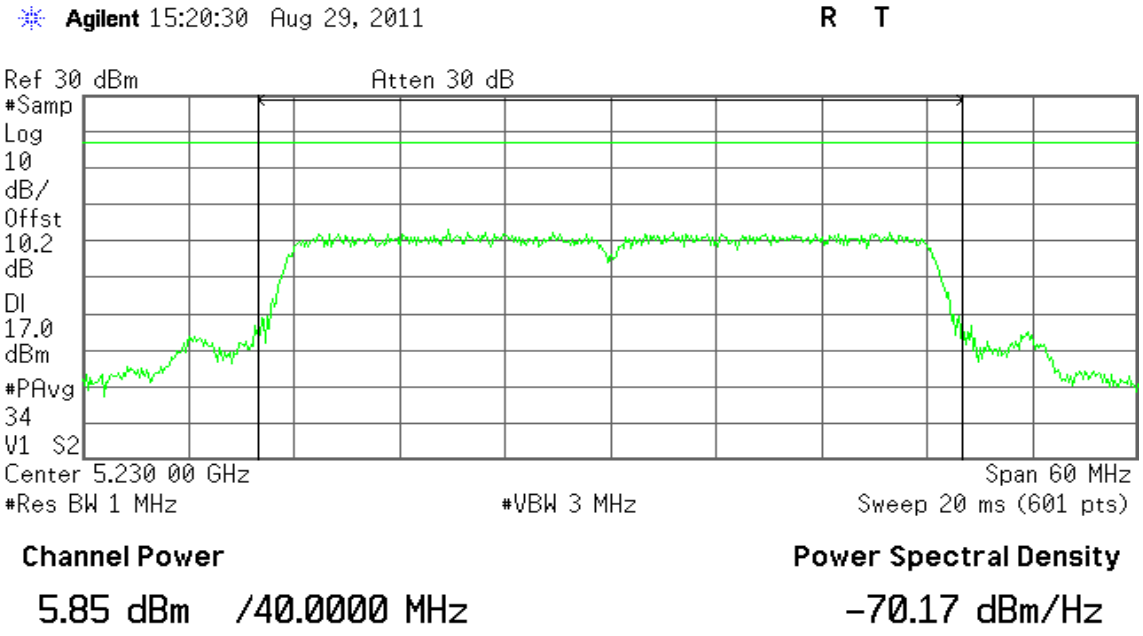

Agilent 16:41:09 Aug 29, 2011
R T
Ref 30 dBm
Atten 30 dB
#Samp
Log
10
dB/
Offst
10.2
dB
Dl
17.0
dBm
#PAvg
48
V1 S2
Center 5.240 00 GHz
Span 30 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 20 ms (601 pts)
Channel Power
4.31 dBm /20.0000 MHz
Power Spectral Density
-68.70 dBm/Hz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low

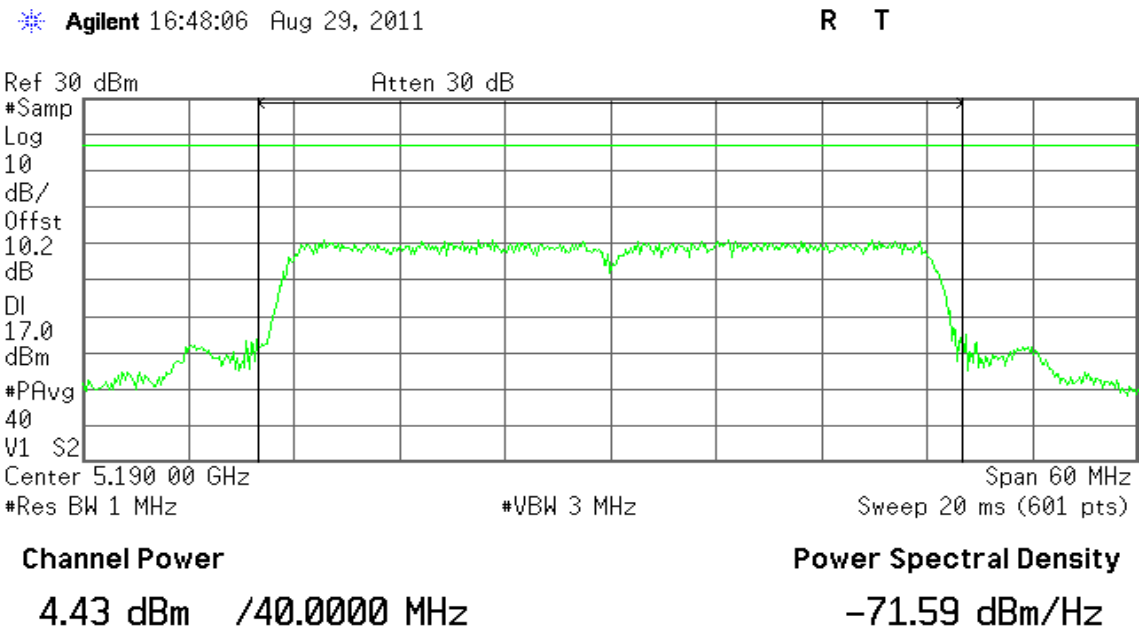


CH High

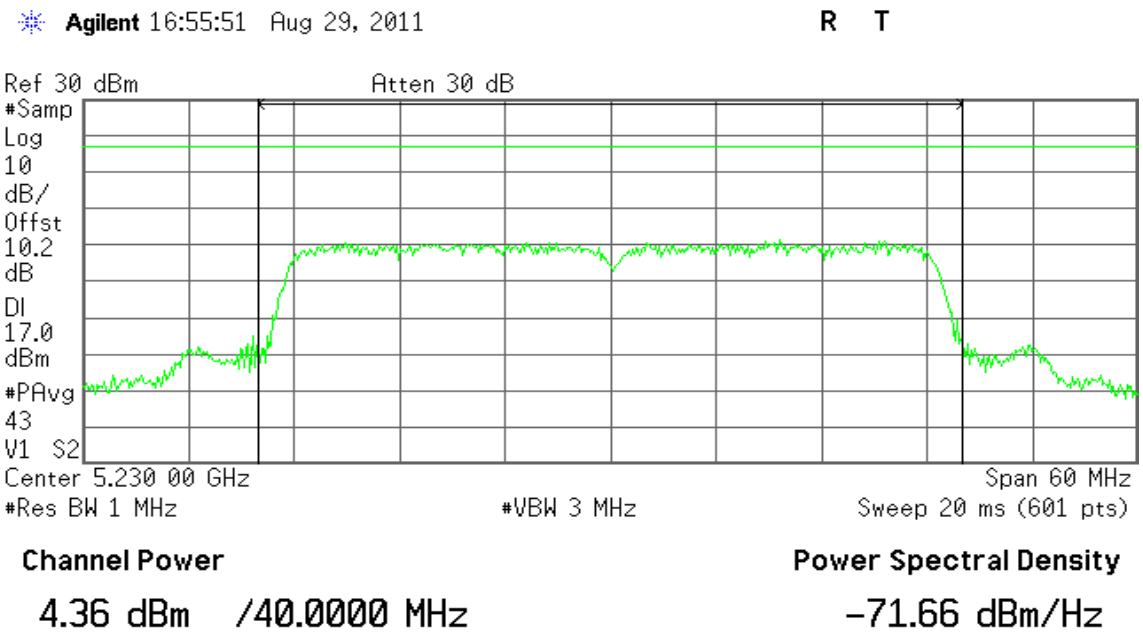


IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low



CH High

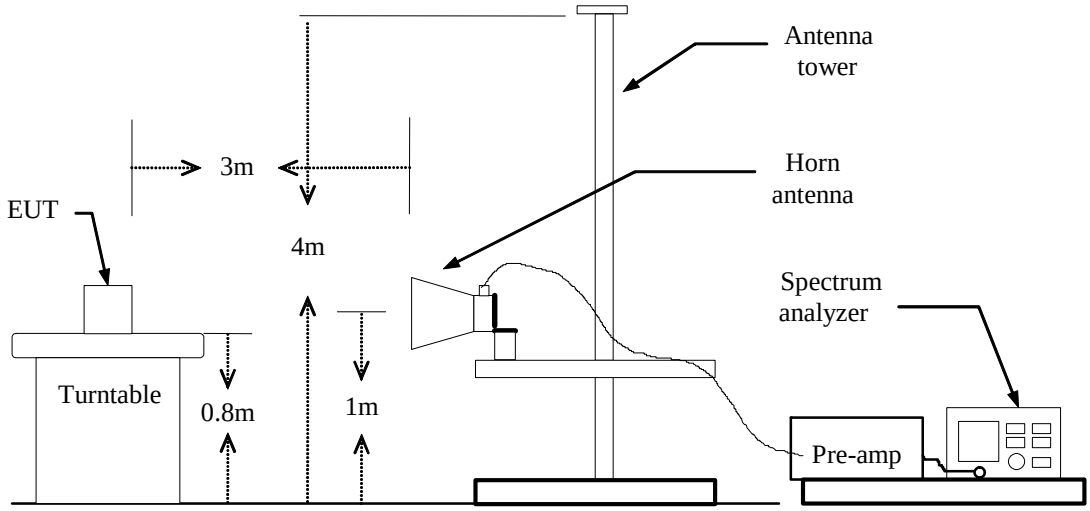


7.3 BAND EDGES MEASUREMENT

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



TEST PROCEDURE

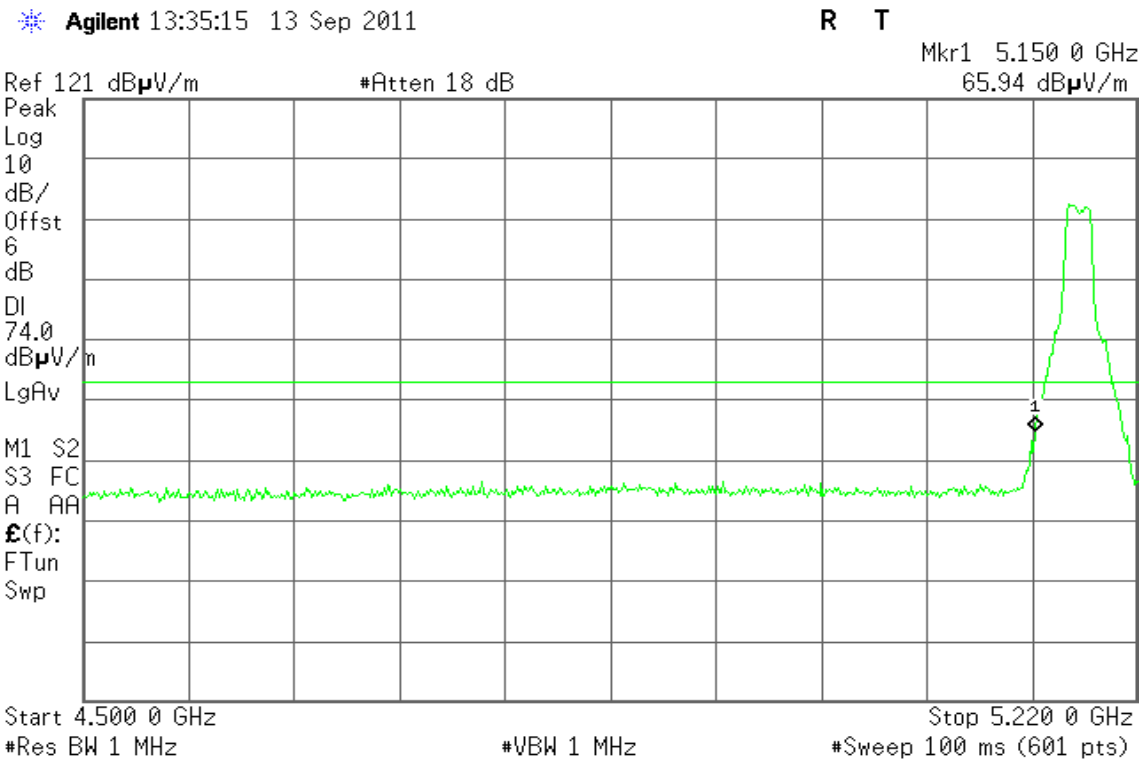
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

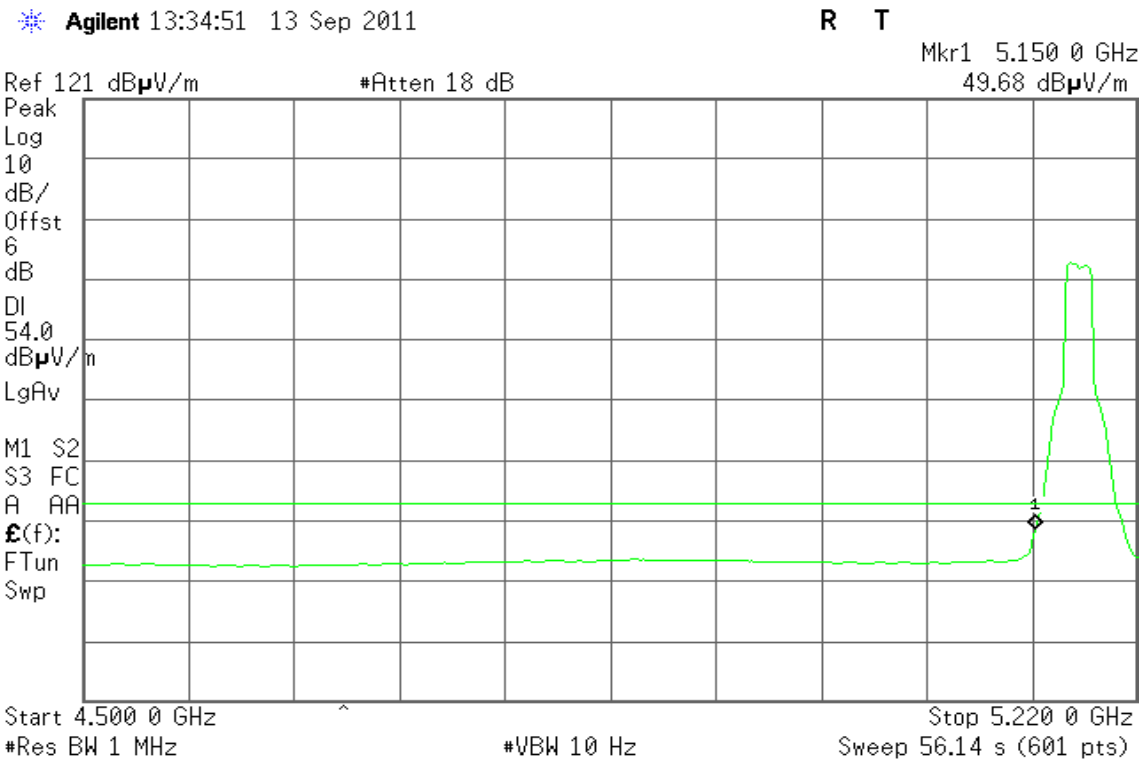
Refer to attach spectrum analyzer data chart.

Band Edges (IEEE 802.11a mode / 5180 MHz)

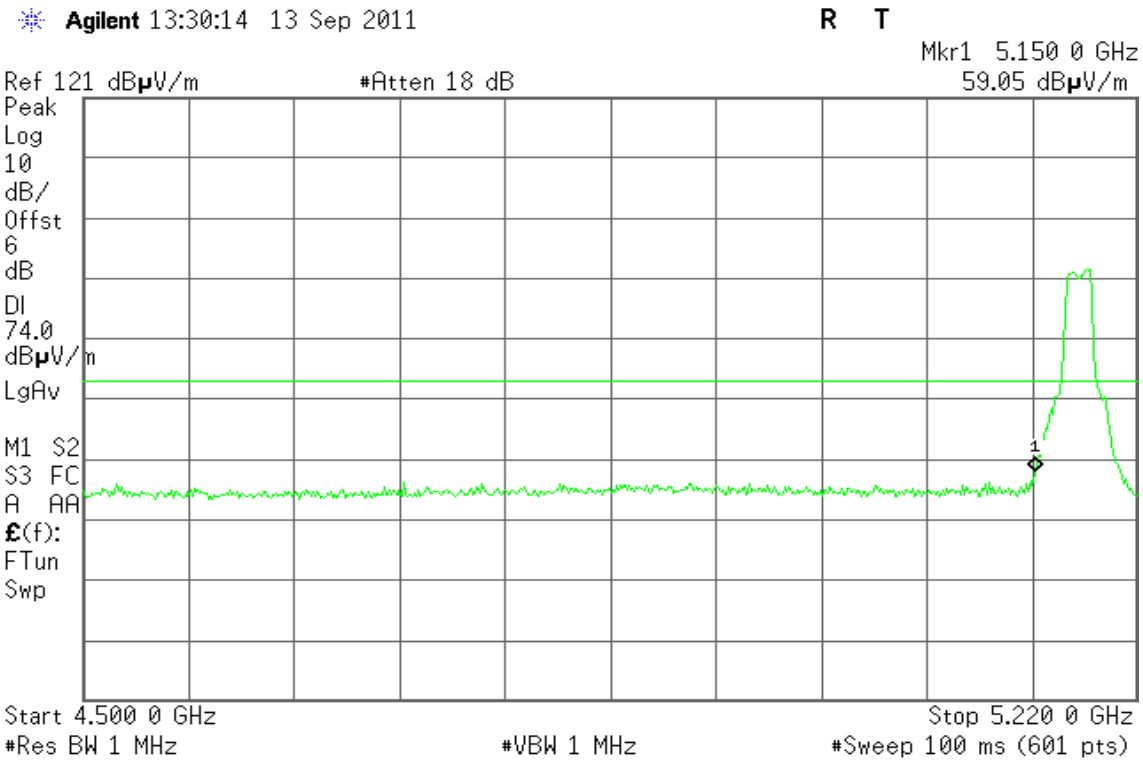
Detector mode: Peak **Polarity: Vertical**



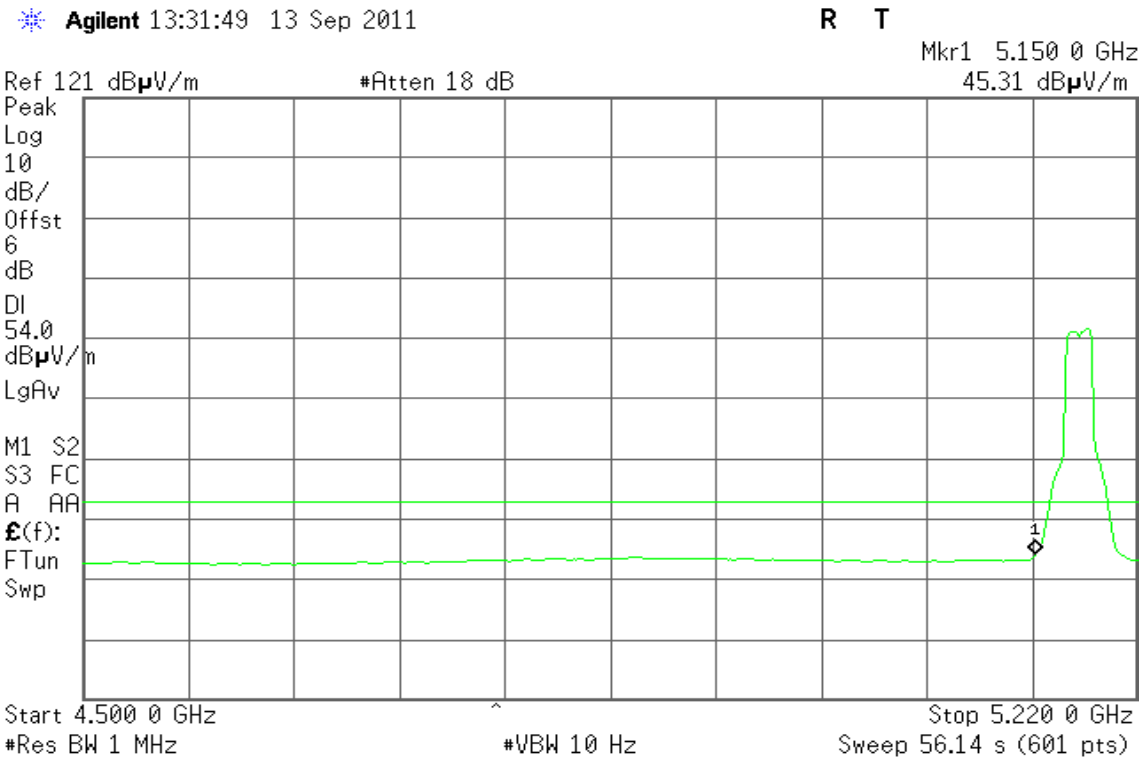
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

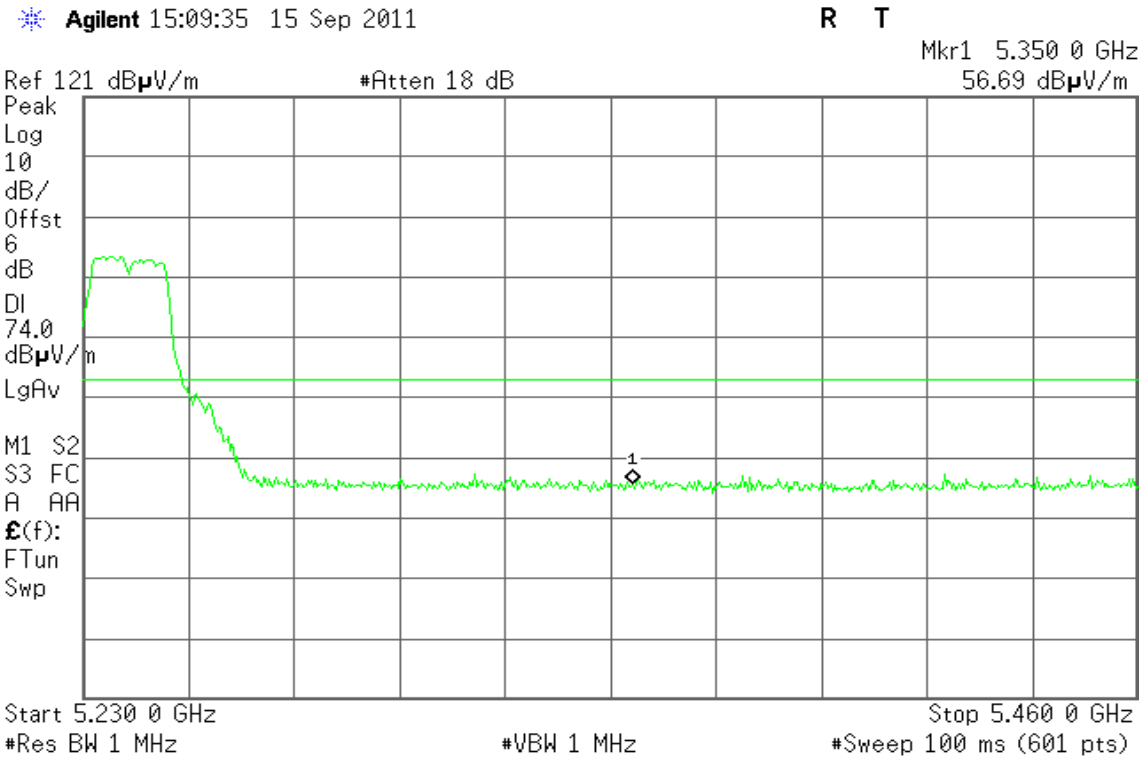


Detector mode: Average **Polarity: Horizontal**

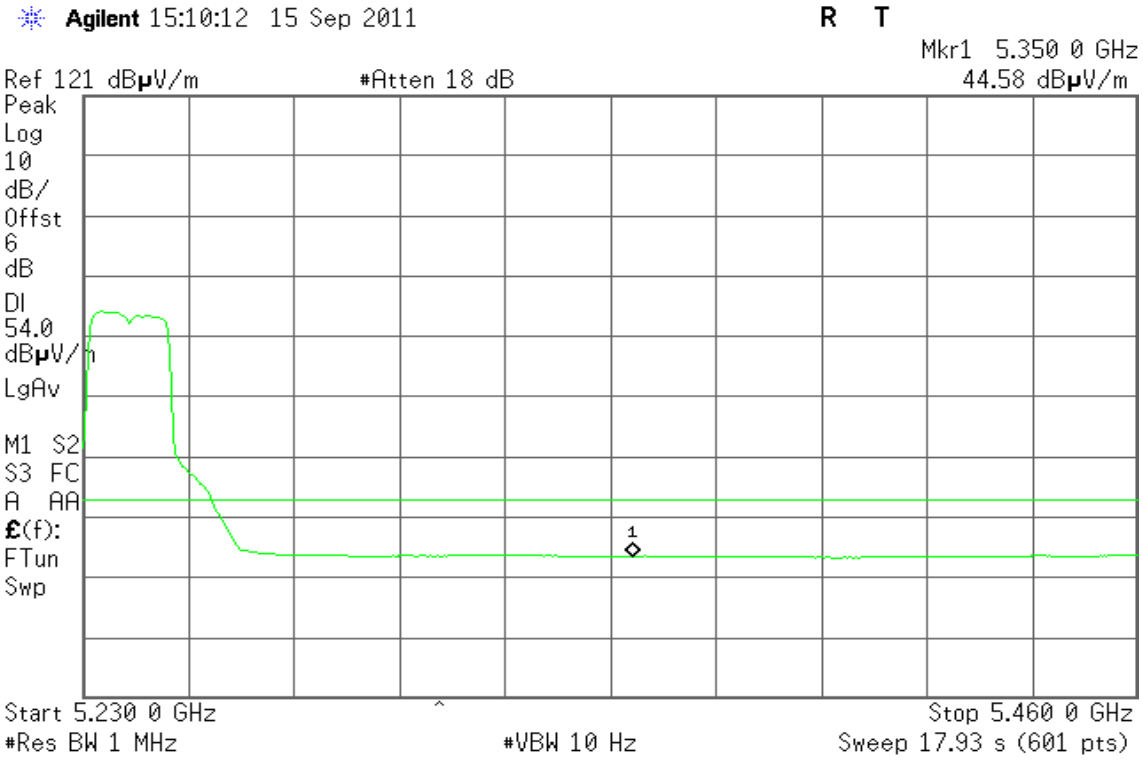


Band Edges (IEEE 802.11a mode / 5240 MHz)

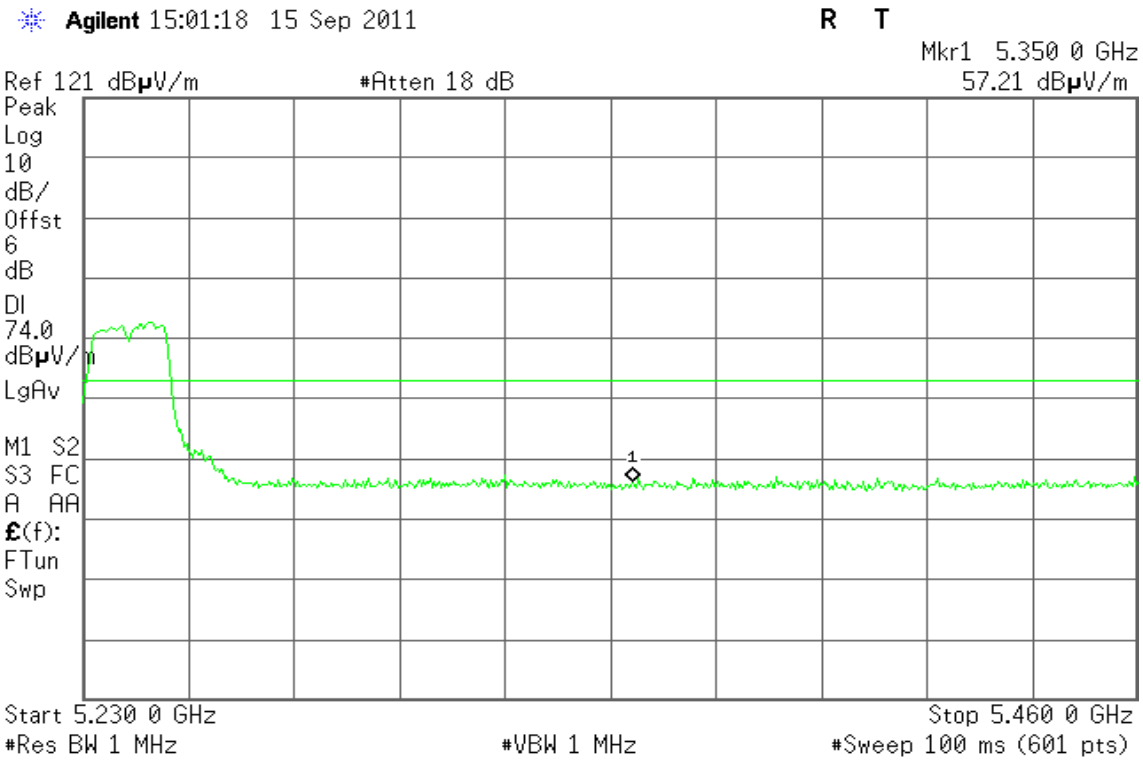
Detector mode: Peak **Polarity: Vertical**



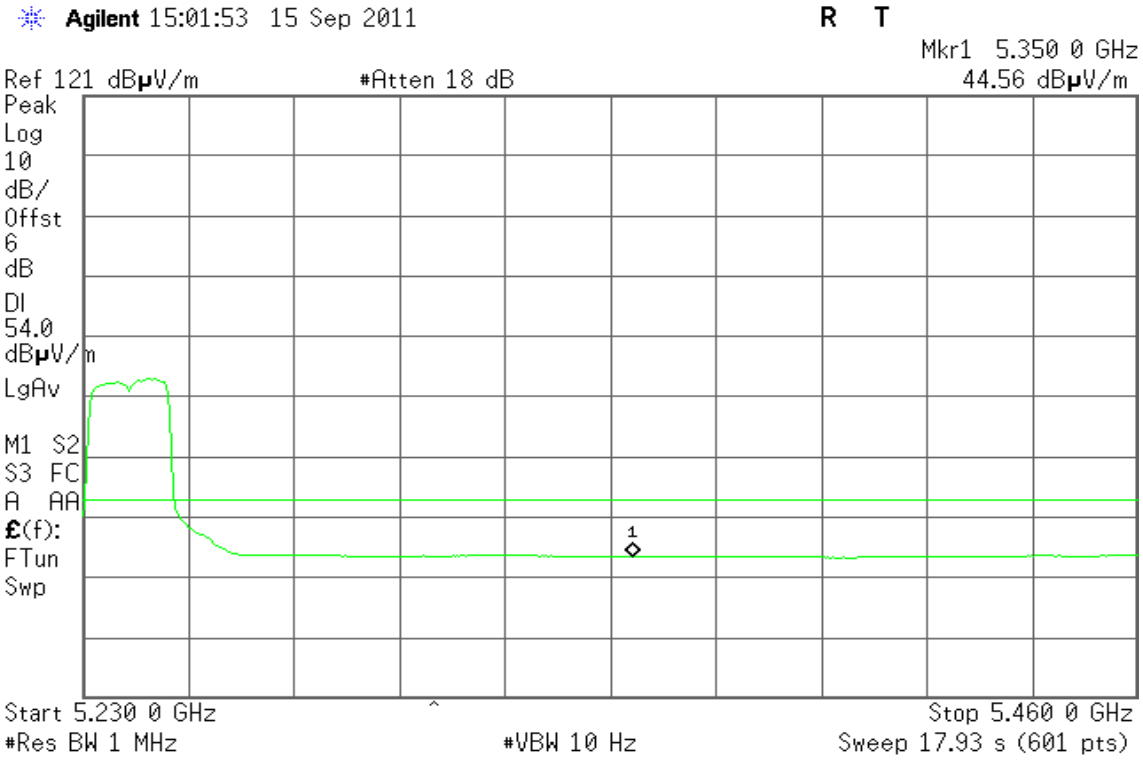
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

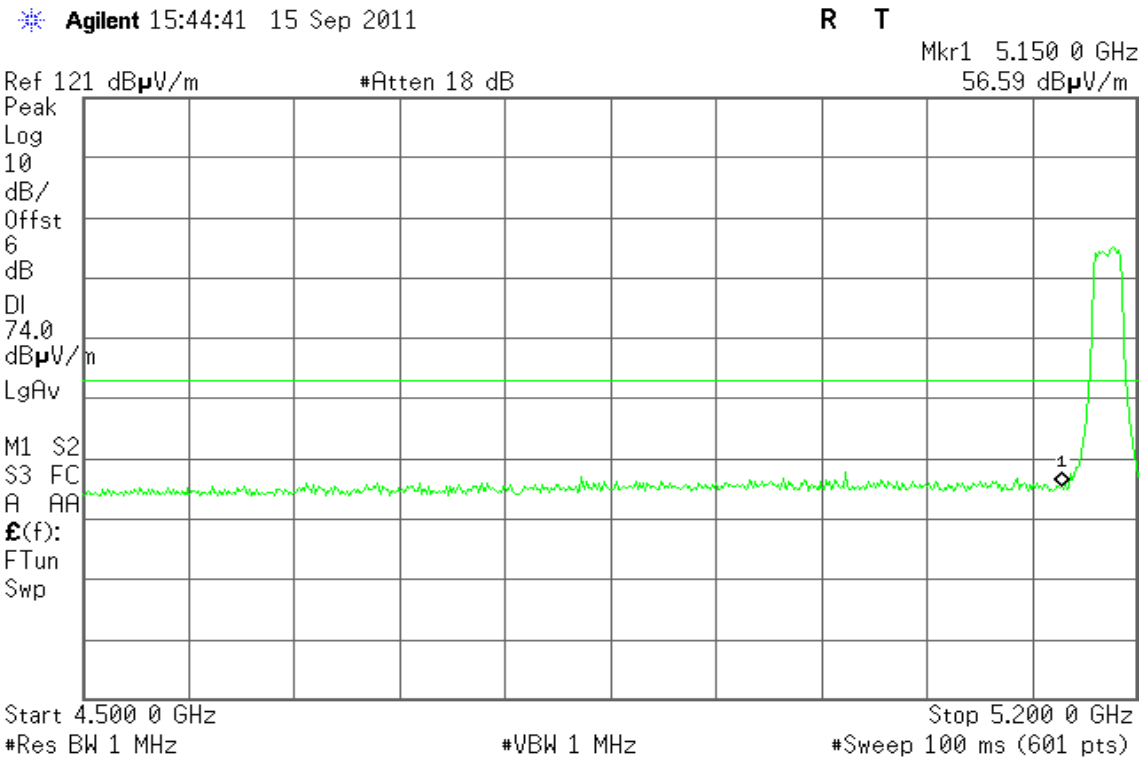


Detector mode: Average **Polarity: Horizontal**

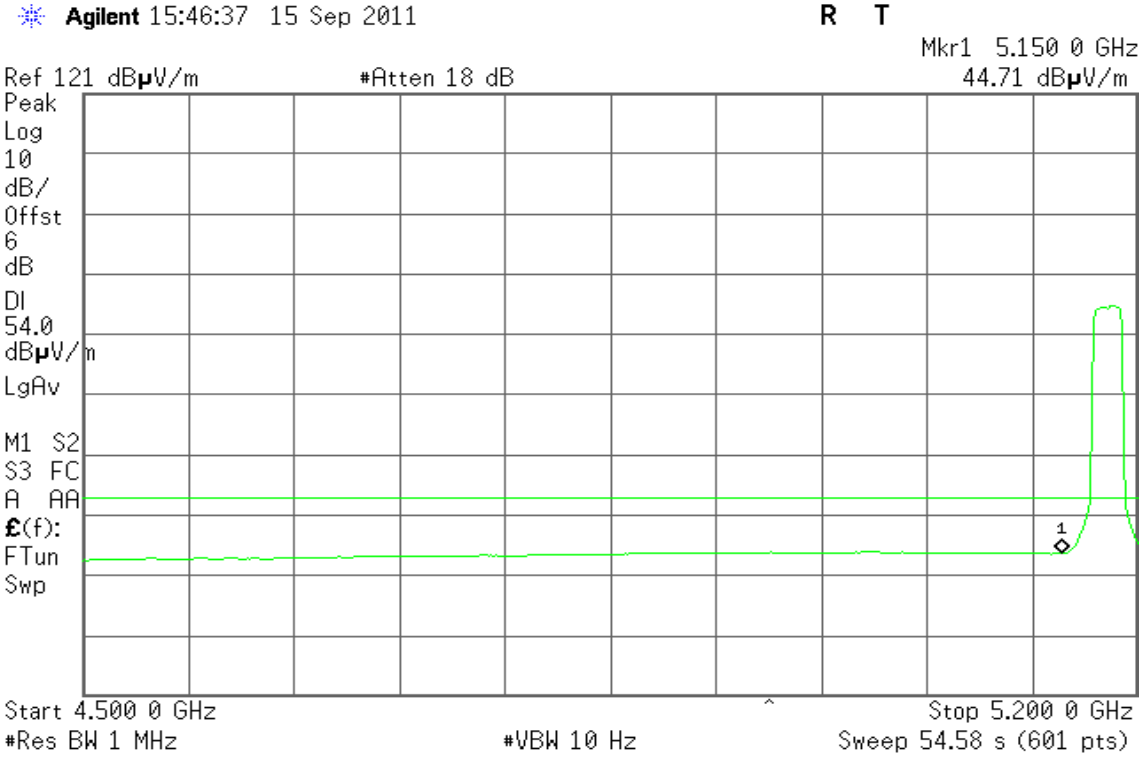


Band Edges (IEEE 802.11n HT 20 MHz mode / 5180 MHz)

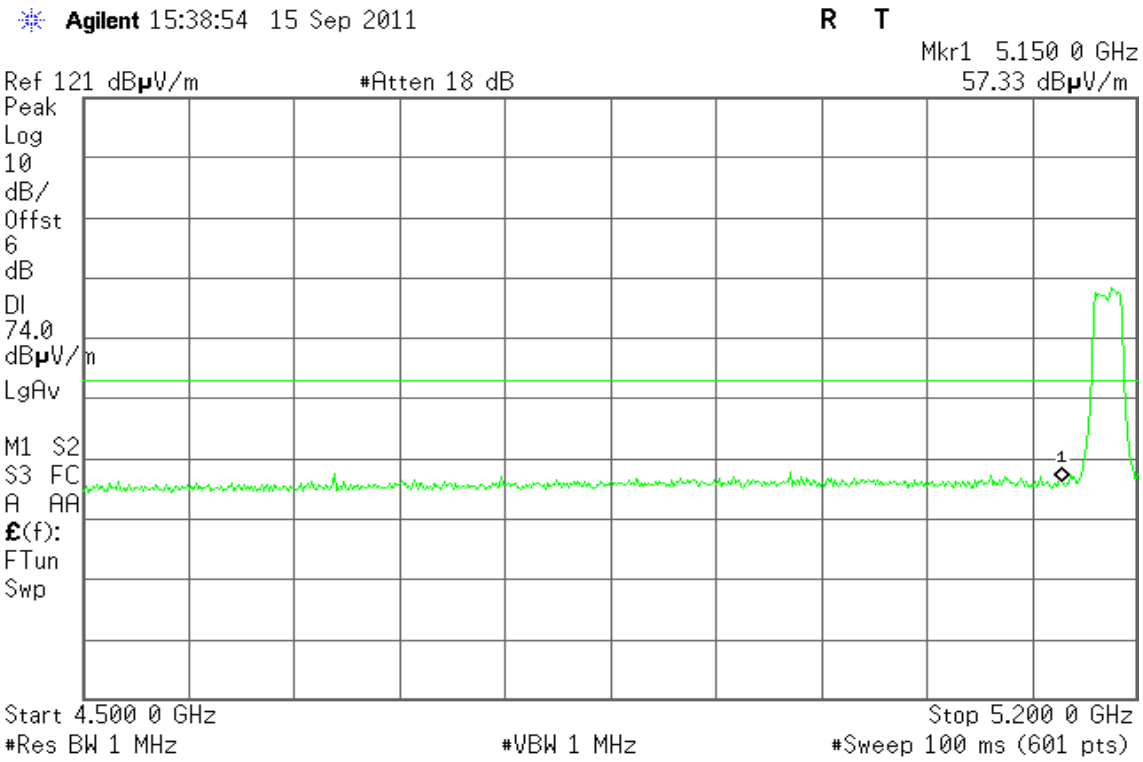
Detector mode: Peak **Polarity: Vertical**



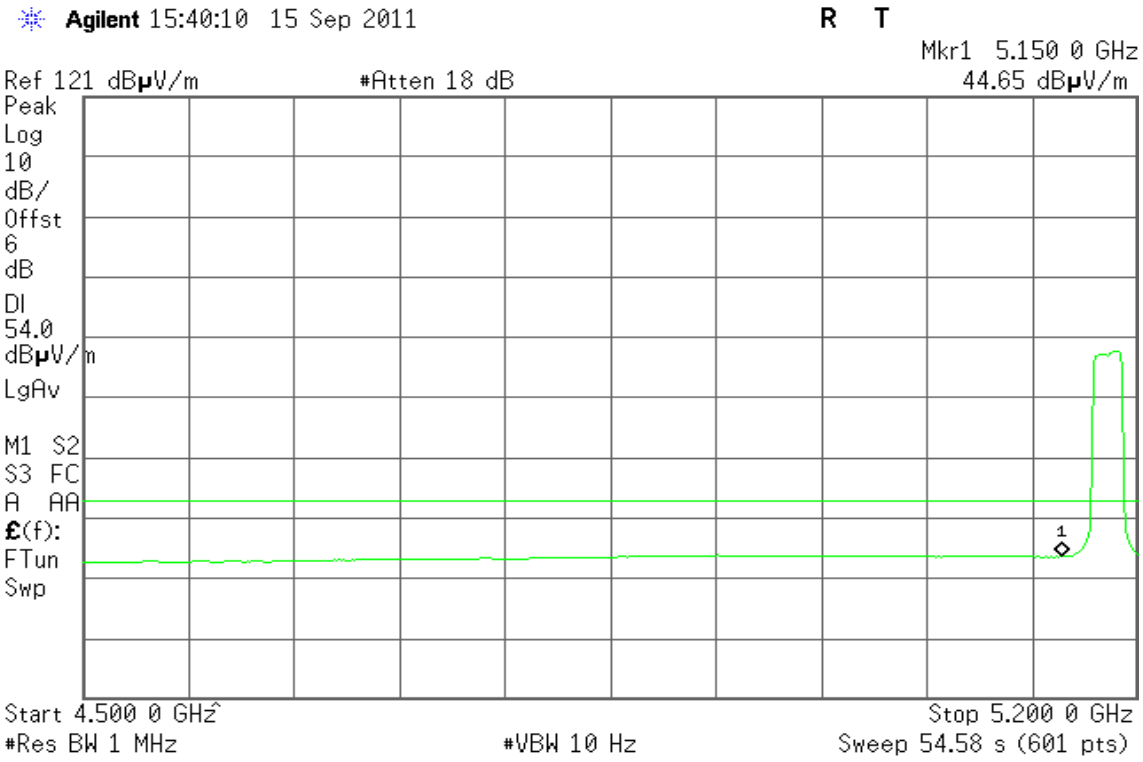
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

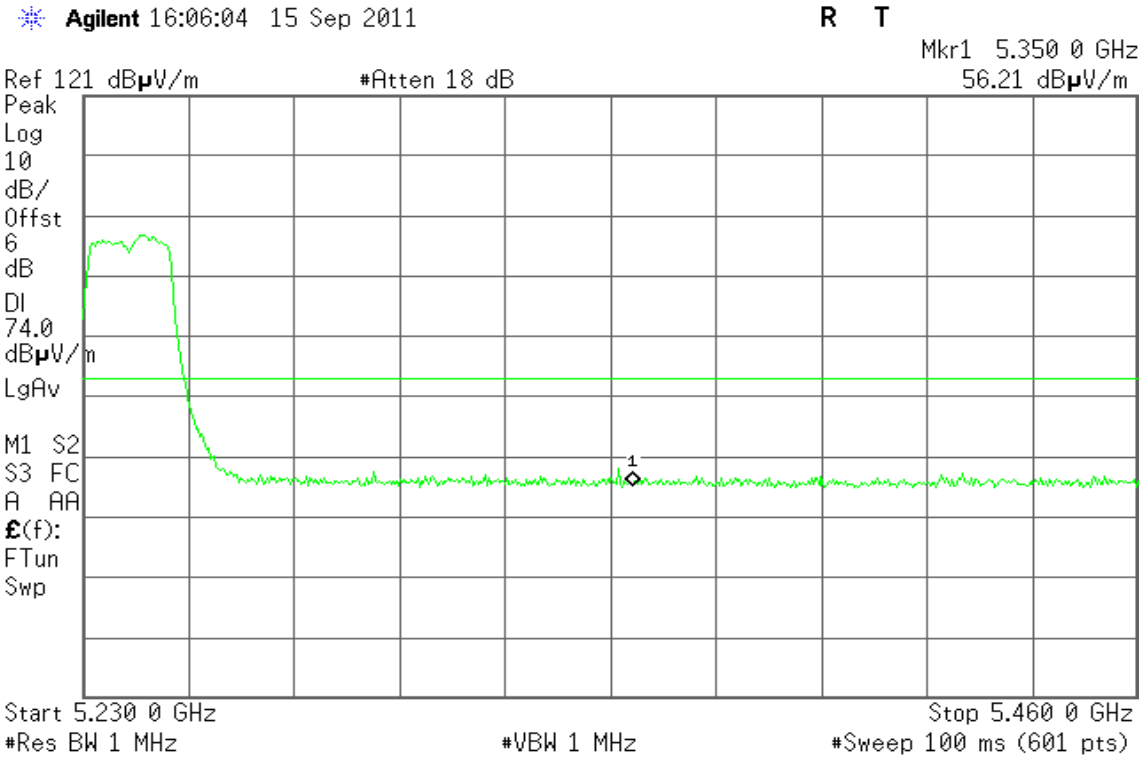


Detector mode: Average **Polarity: Horizontal**

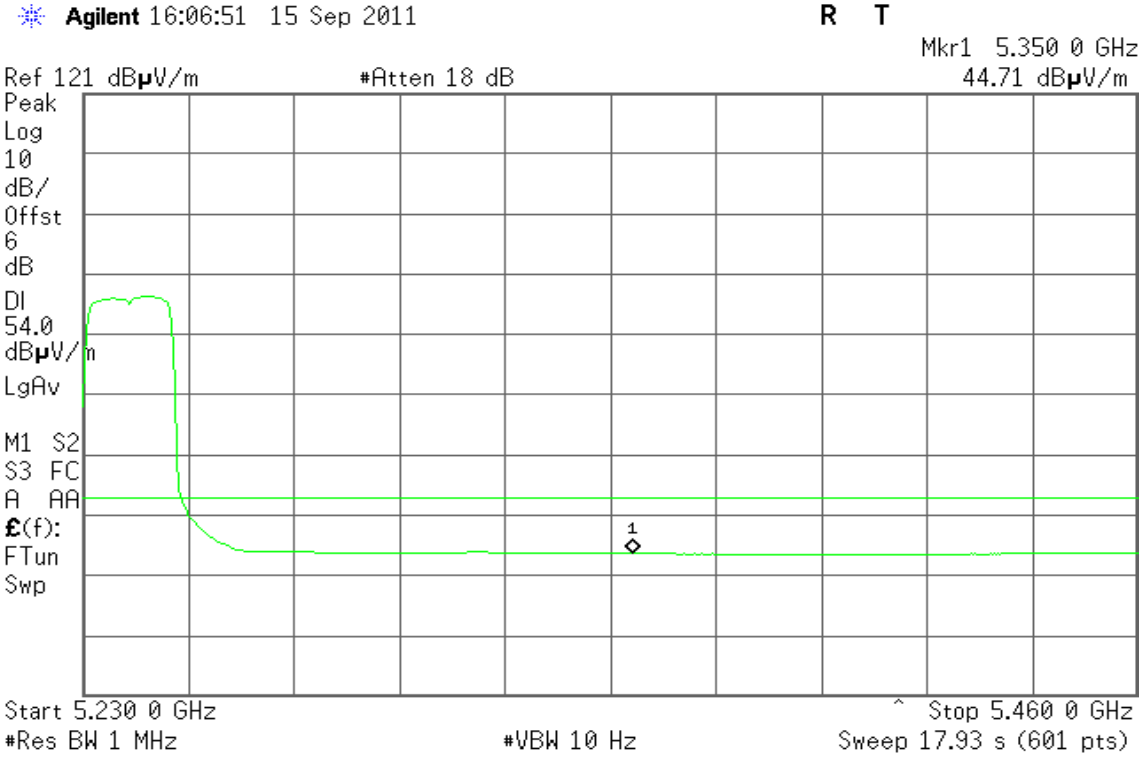


Band Edges (IEEE 802.11n HT 20 MHz mode / 5240 MHz)

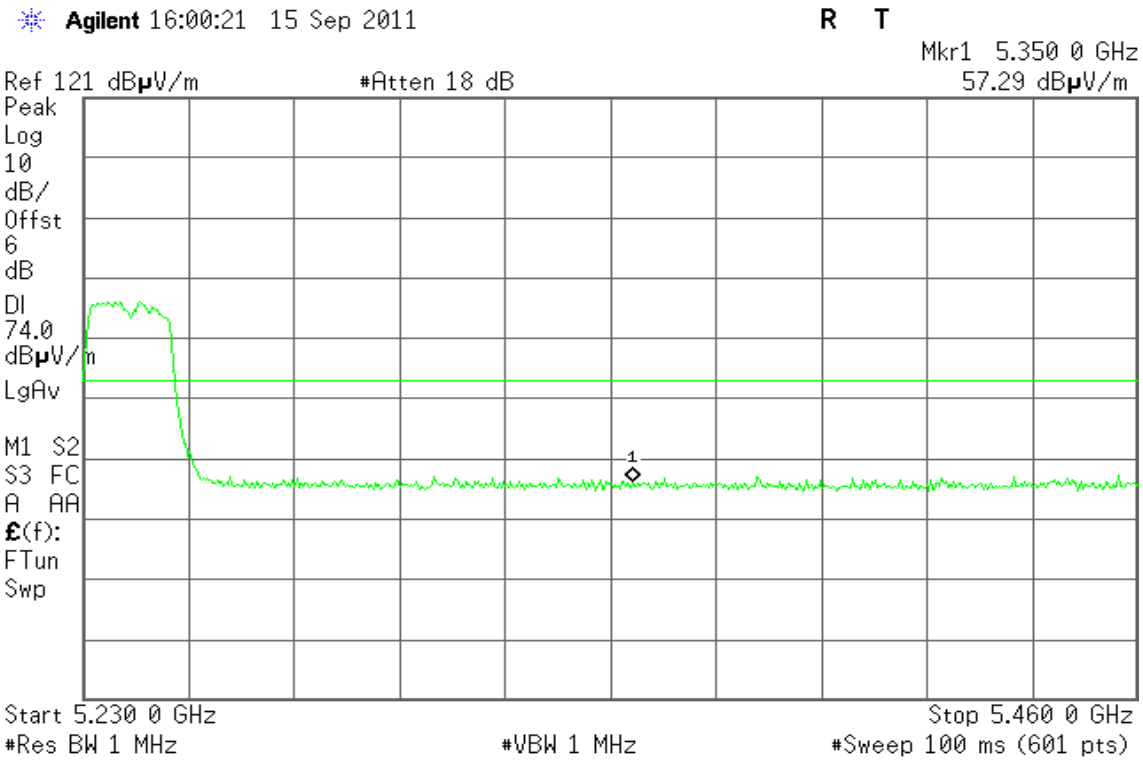
Detector mode: Peak **Polarity: Vertical**



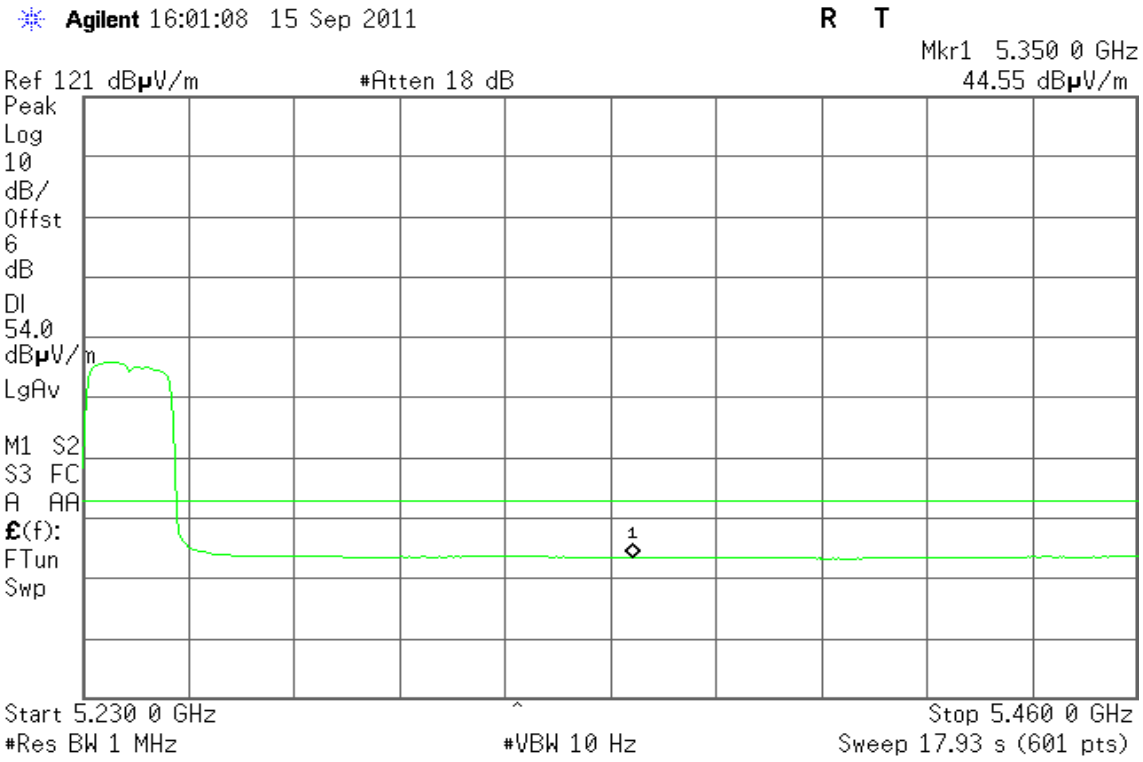
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

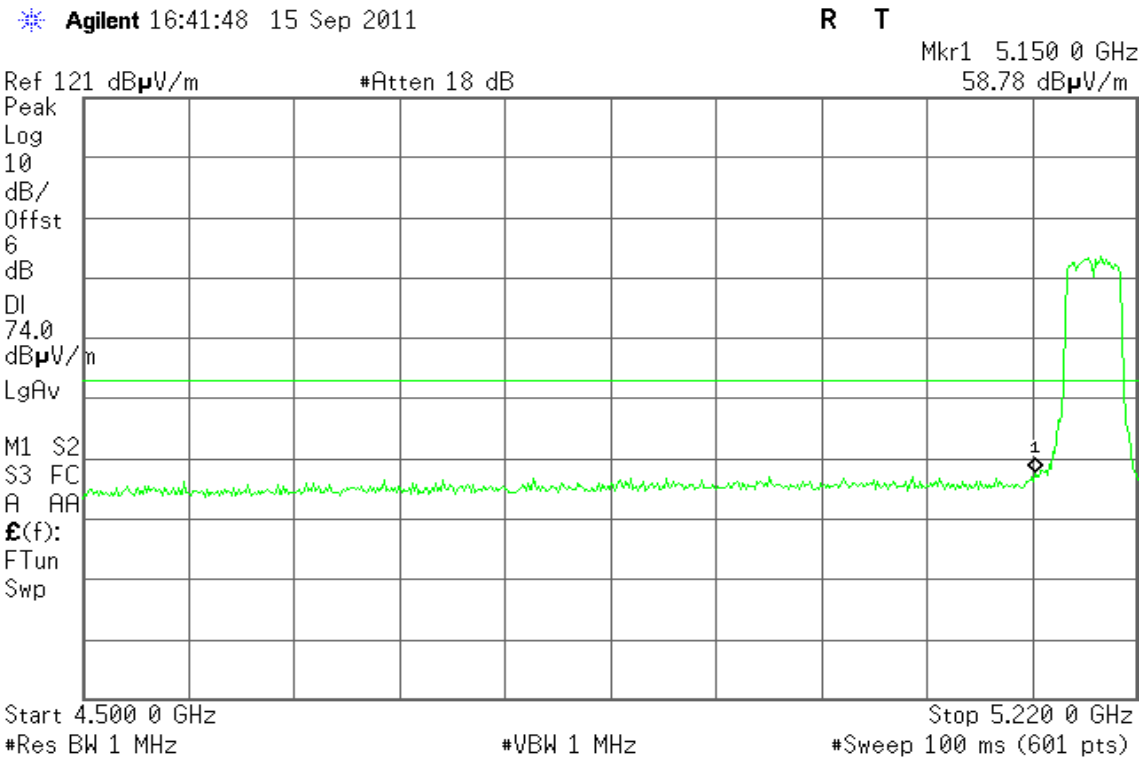


Detector mode: Average **Polarity: Horizontal**



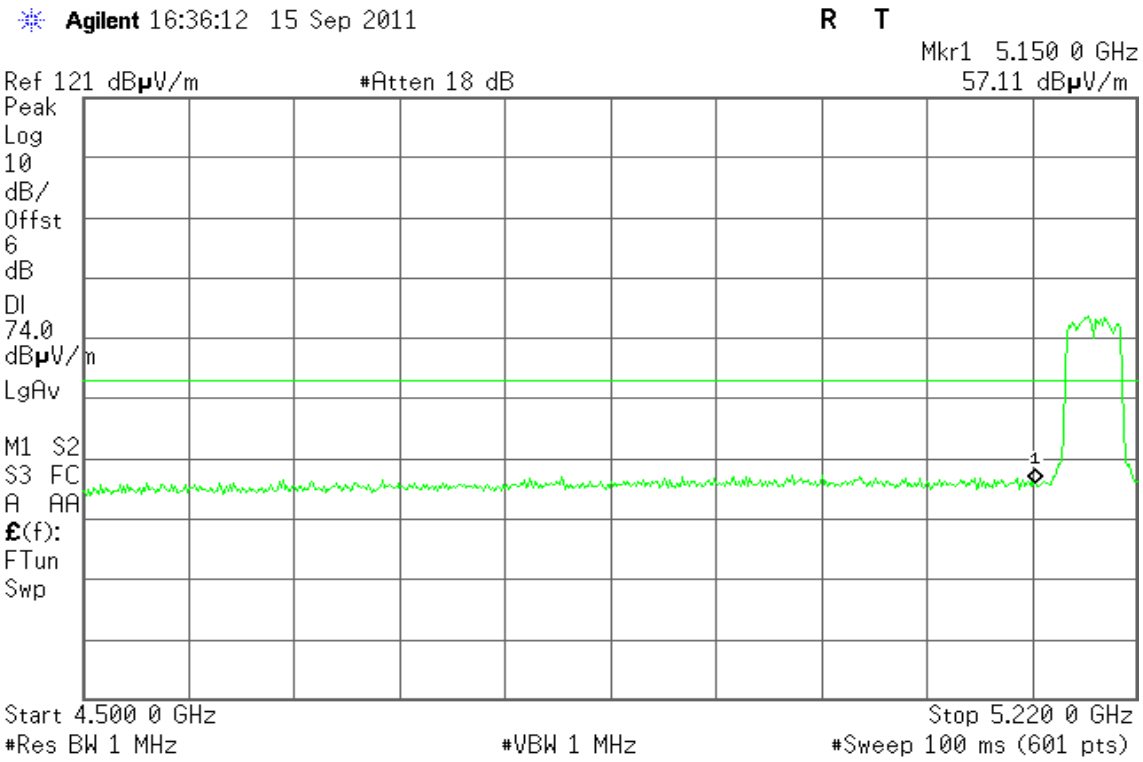
Band Edges (IEEE 802.11n HT 40 MHz mode / 5190 MHz)

Detector mode: Peak **Polarity: Vertical**

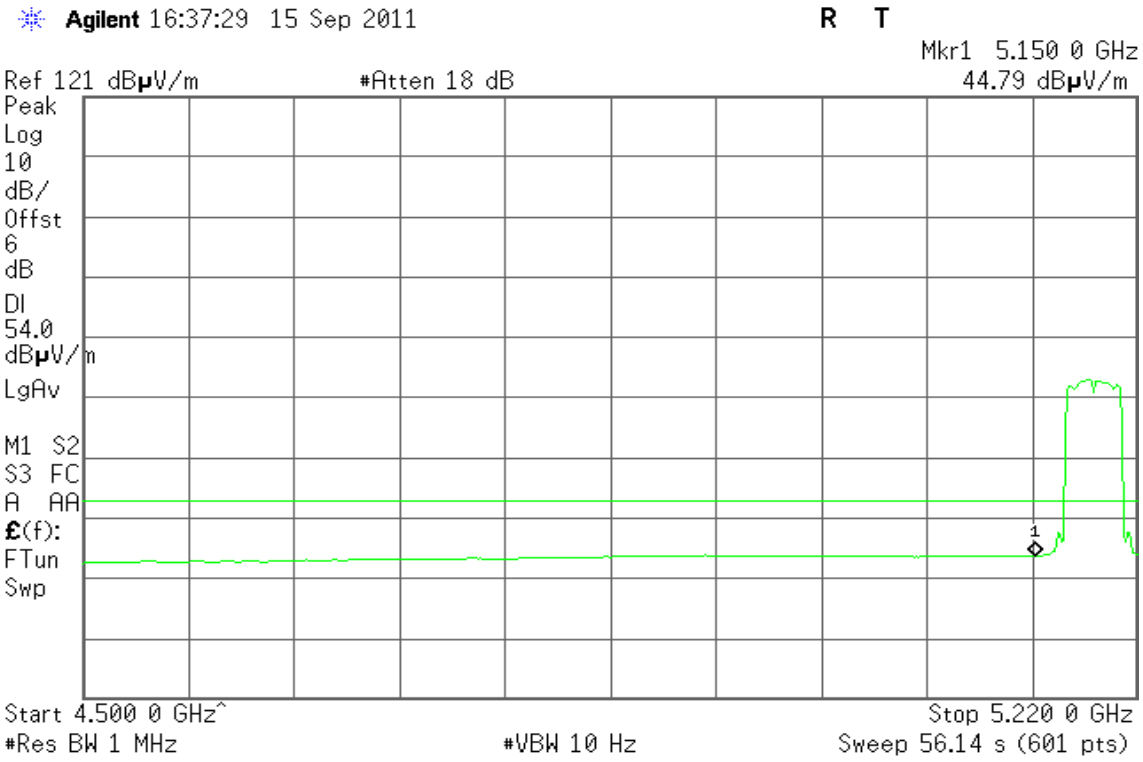


Detector mode: Average **Polarity: Vertical**

Detector mode: Peak **Polarity: Horizontal**

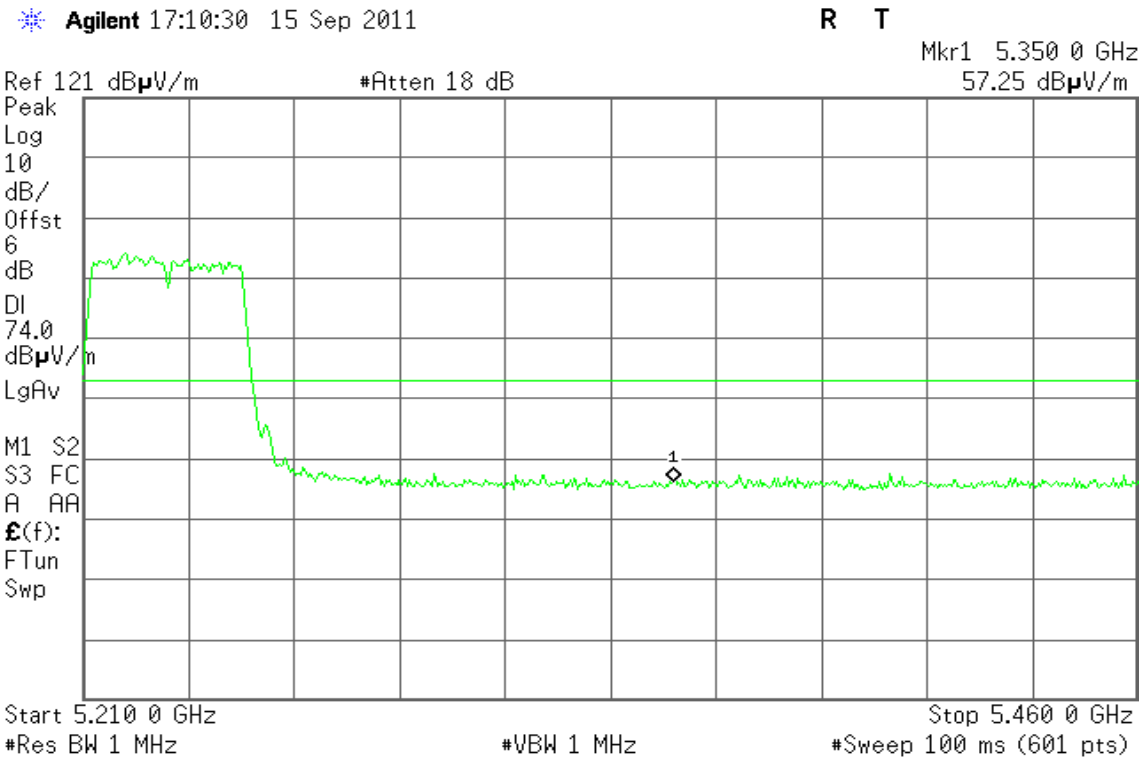


Detector mode: Average **Polarity: Horizontal**

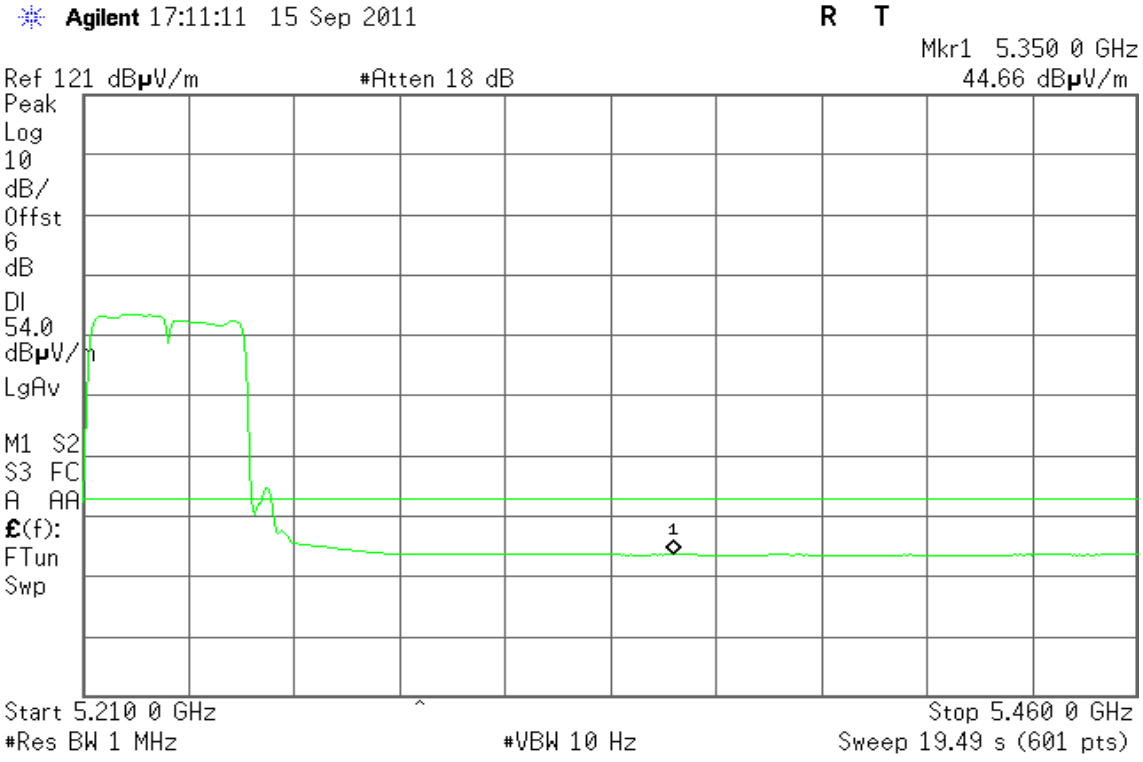


Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5230 MHz)

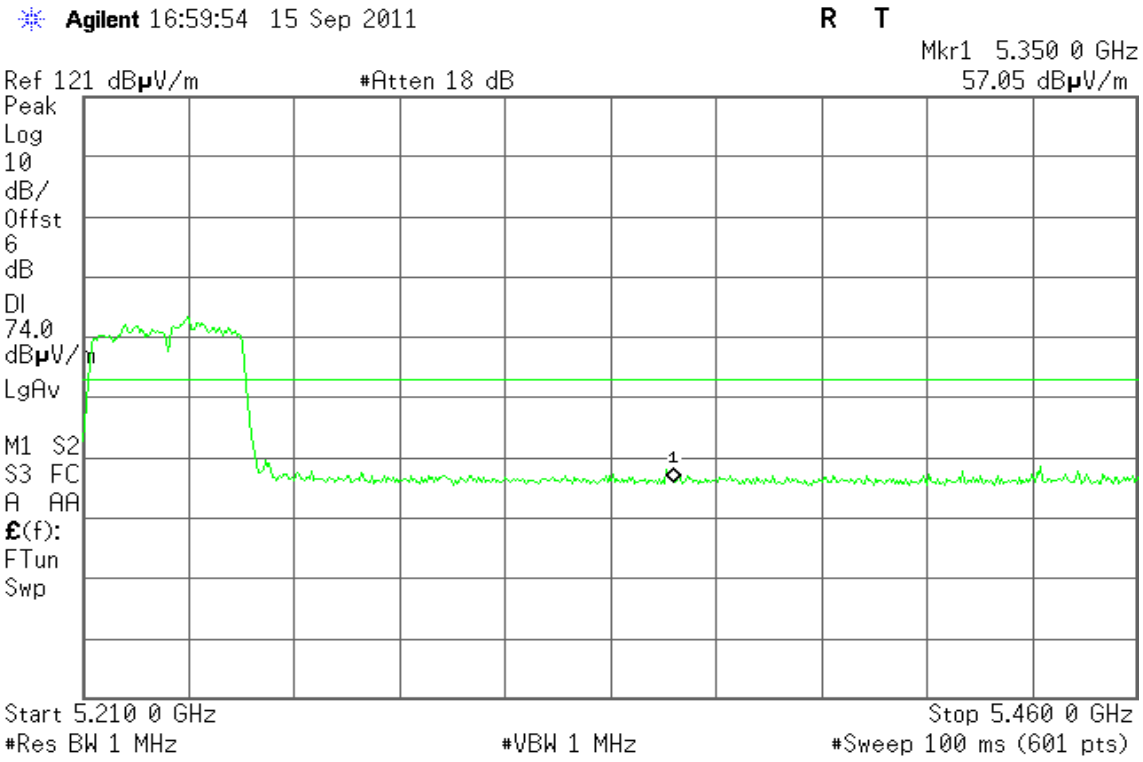
Detector mode: Peak **Polarity: Vertical**



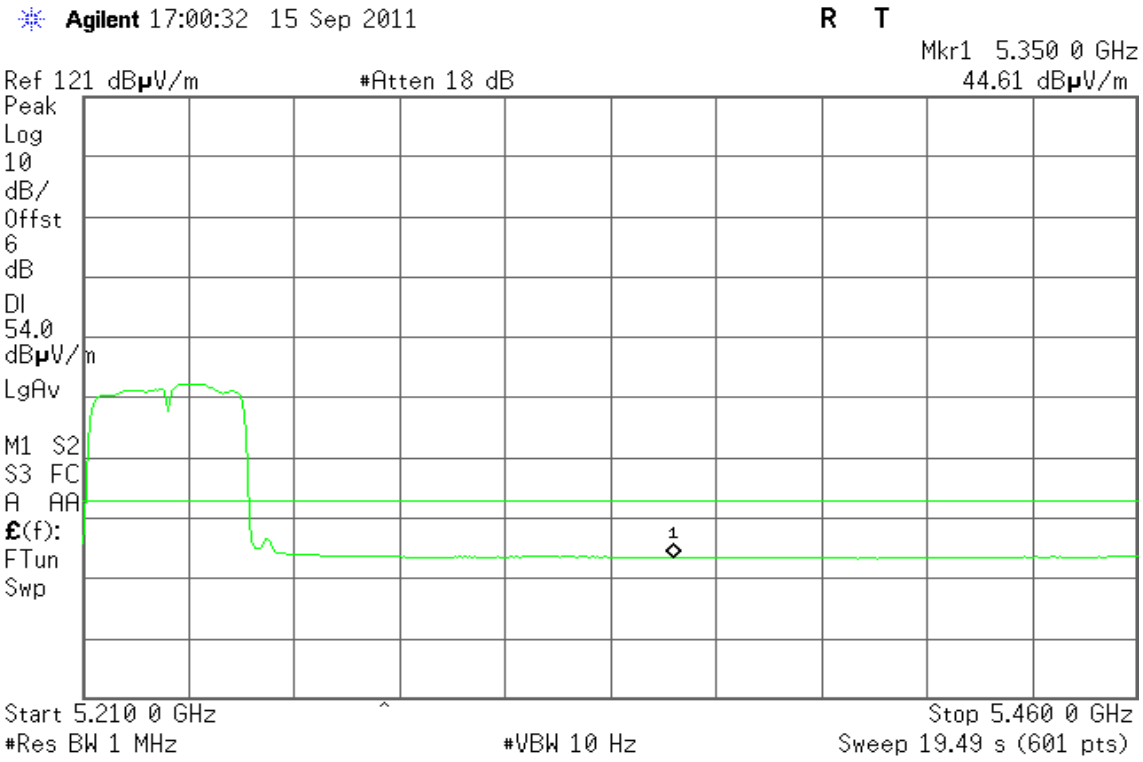
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



7.4 PEAK POWER SPECTRAL DENSITY

LIMIT

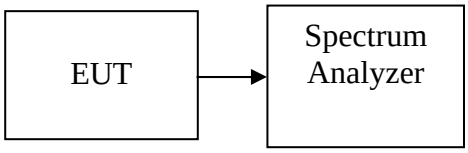
According to §15.407(a),

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

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

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

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 1MHz, VBW = 3MHz, Span = 30MHz, Sweep=20ms
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-0.776	4.00	-4.776	PASS
Mid	5220	-3.215	4.00	-7.215	PASS
High	5240	-3.416	4.00	-7.416	PASS

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-3.298	-3.727	-0.497	2.72	-4.497	PASS
Mid	5220	-10.180	-4.637	-3.568	2.72	-7.568	PASS
High	5240	-2.547	-5.397	-0.732	2.72	-4.732	PASS

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz

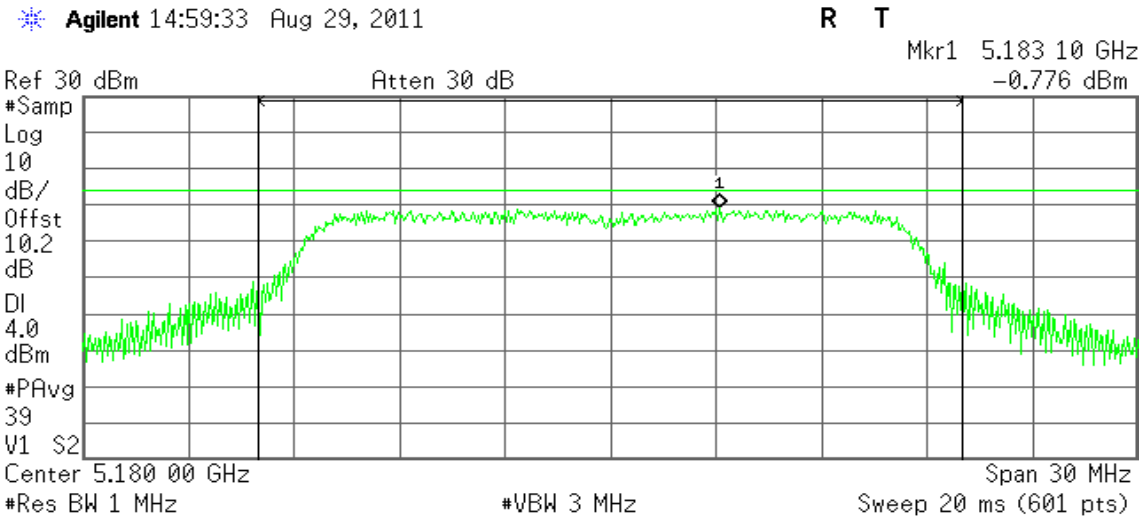
Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5190	-7.778	-8.752	-5.227	2.72	-9.227	PASS
High	5230	-6.920	-8.635	-4.683	2.72	-8.683	PASS

Remark:

*1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 PPSD / 10)+10^(Chain 1 PPSD /10)*
2. The maximum antenna gain is 7.28 dBi; therefore the reduction due to antenna gain is 1.28dBi, so the limit is 2.72 dBm.

Test Plot
IEEE 802.11a mode / 5180 ~ 5240MHz

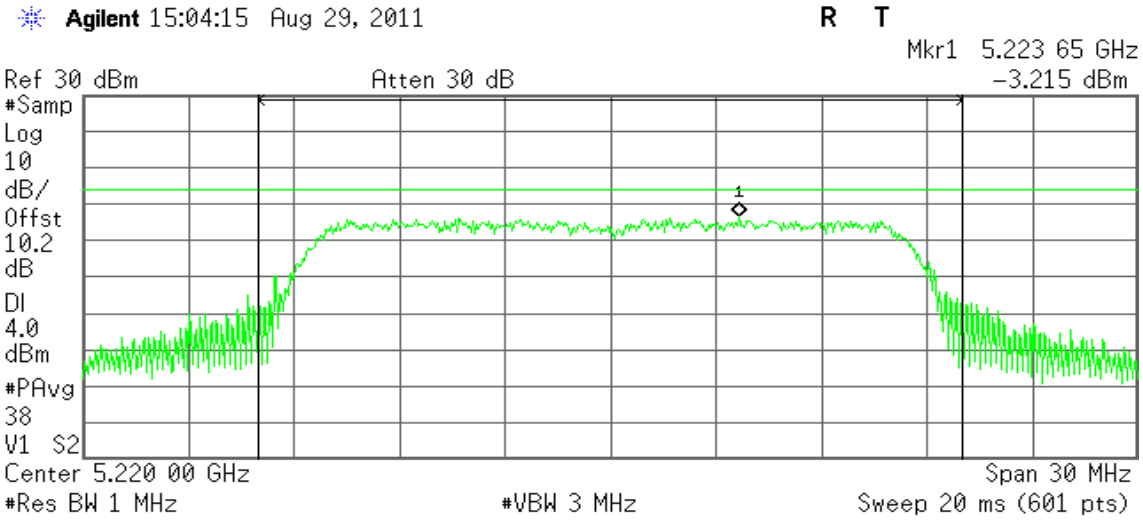
CH Low



Channel Power
8.61 dBm /20.0000 MHz

Power Spectral Density
-64.40 dBm/Hz

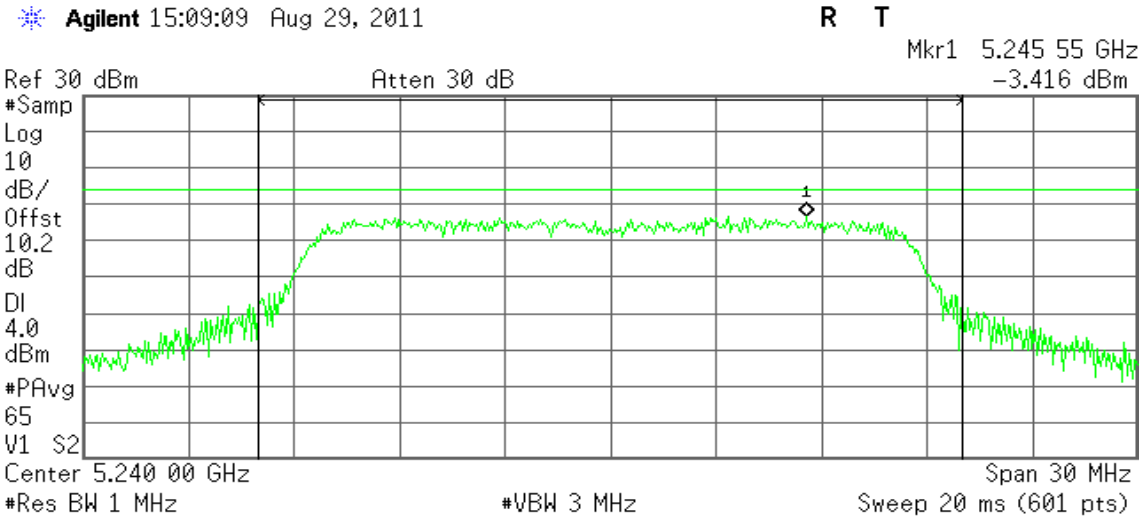
CH Mid



Channel Power
6.21 dBm /20.0000 MHz

Power Spectral Density
-66.80 dBm/Hz

CH High



Channel Power

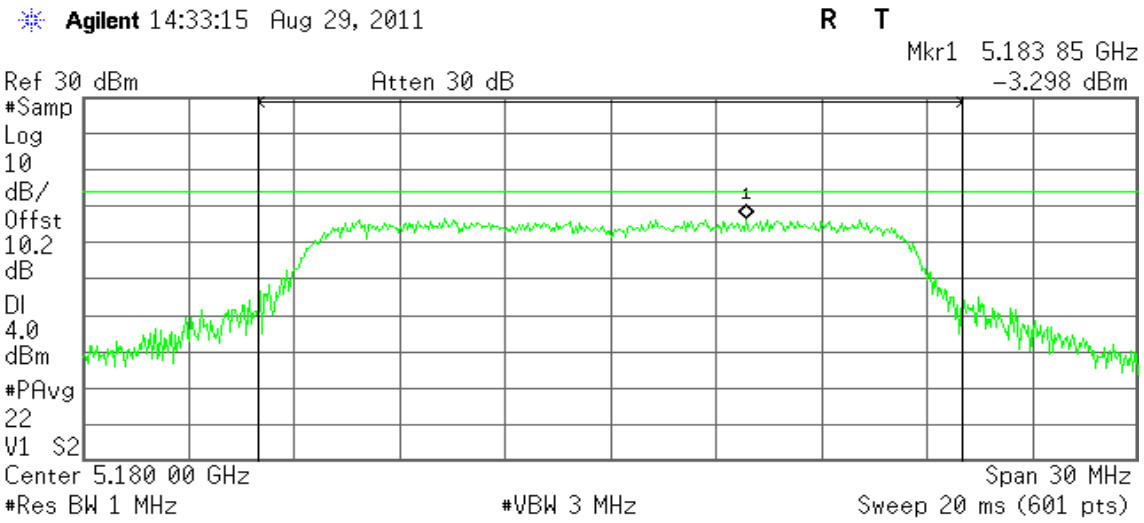
6.26 dBm /20.0000 MHz

Power Spectral Density

-66.75 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

CH Low



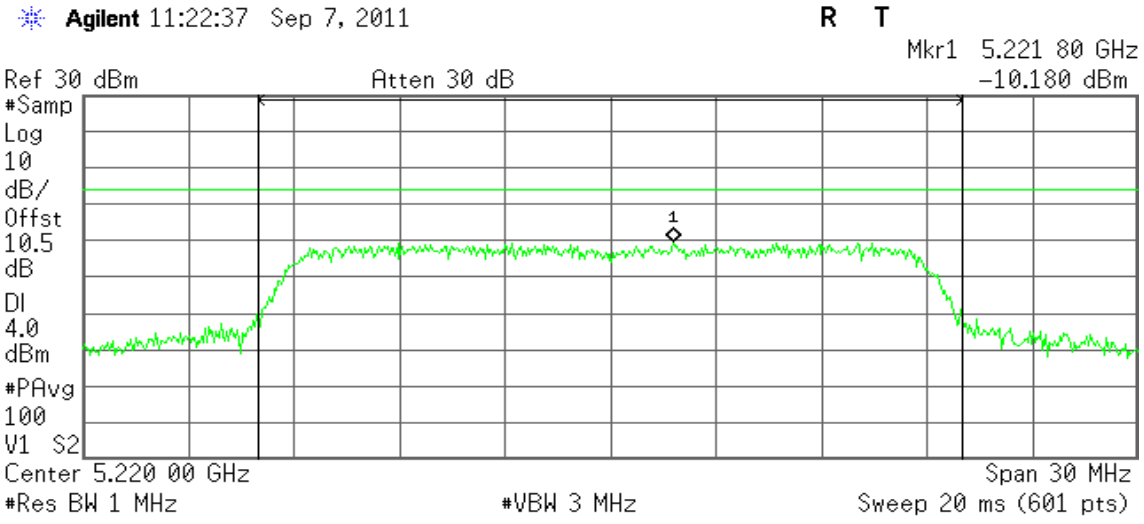
Channel Power

6.62 dBm /20.0000 MHz

Power Spectral Density

-66.39 dBm/Hz

CH Mid



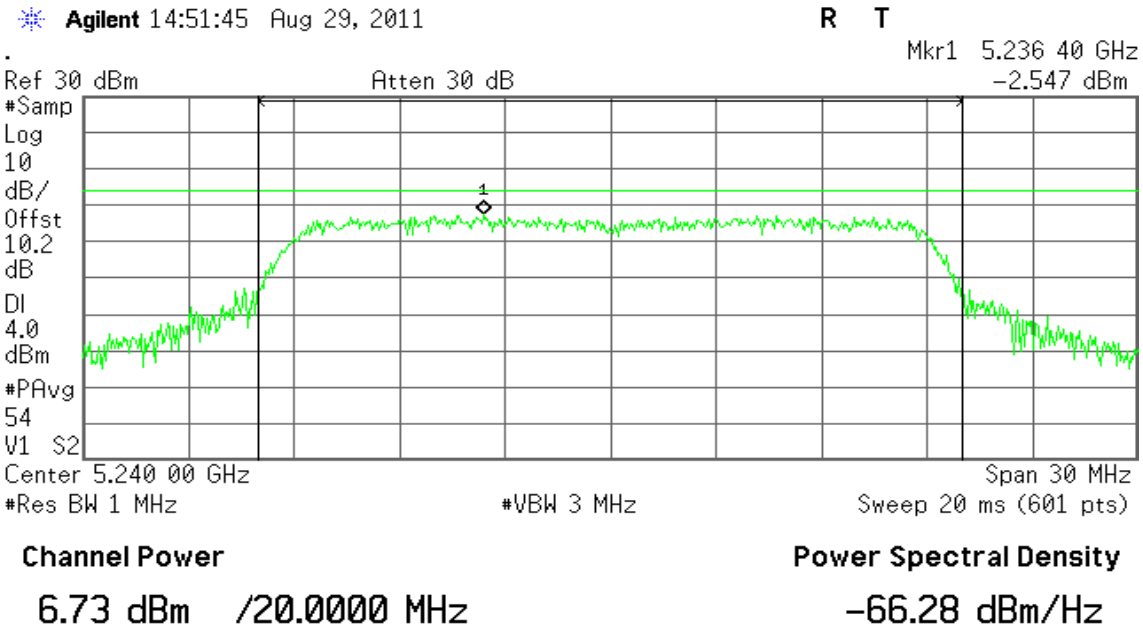
Channel Power

-0.67 dBm /20.0000 MHz

Power Spectral Density

-73.68 dBm/Hz

CH High



Channel Power

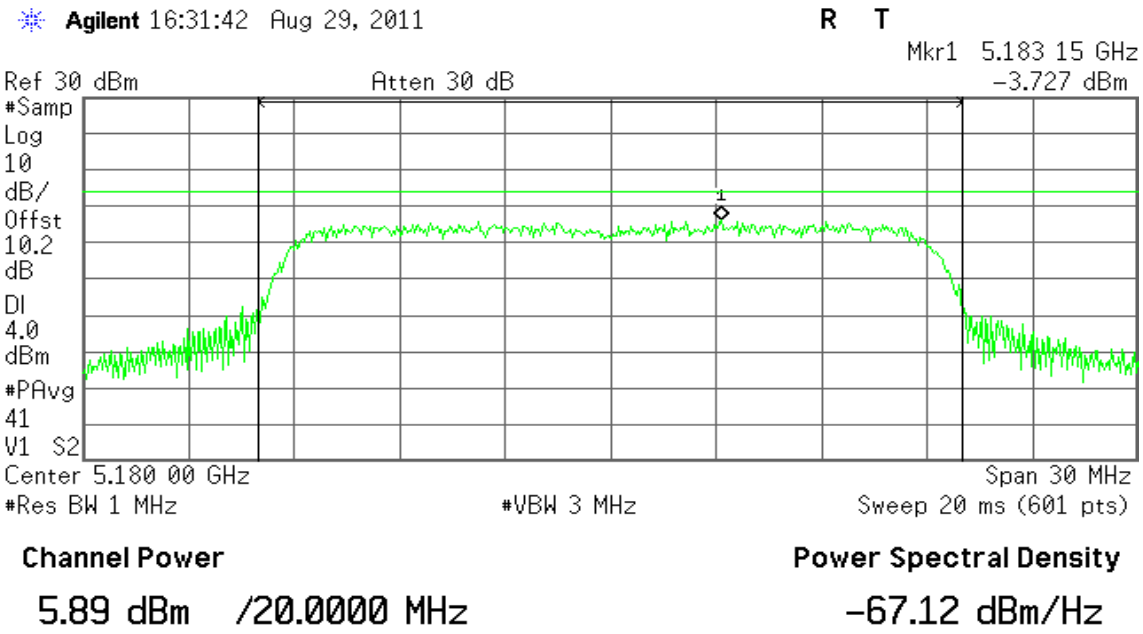
6.73 dBm /20.0000 MHz

Power Spectral Density

-66.28 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

CH Low



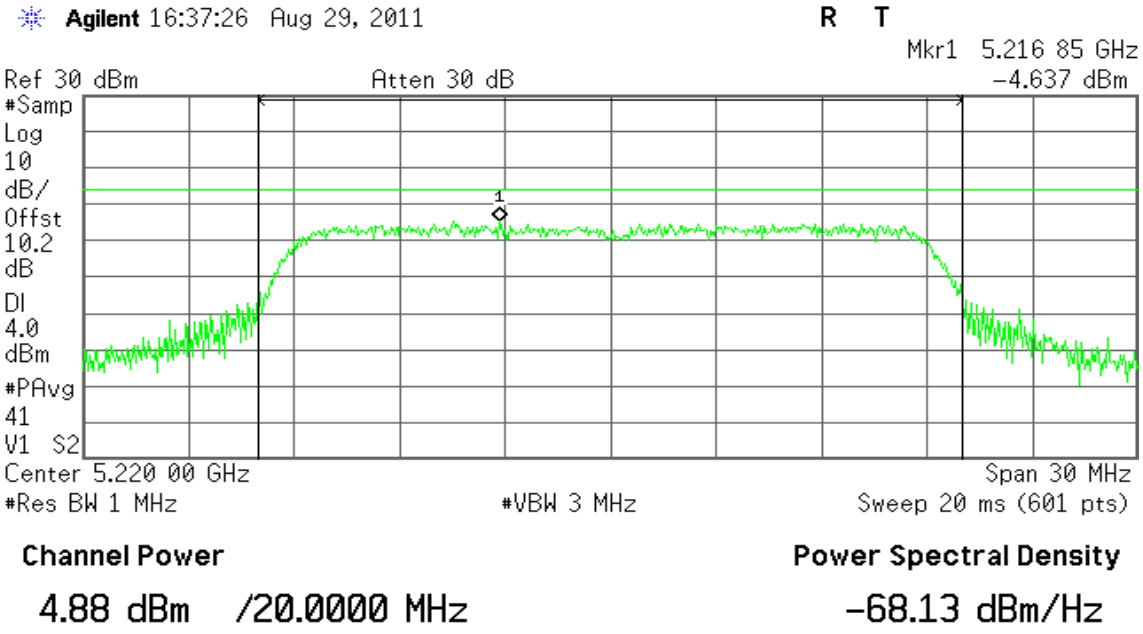
Channel Power

5.89 dBm /20.0000 MHz

Power Spectral Density

-67.12 dBm/Hz

CH Mid



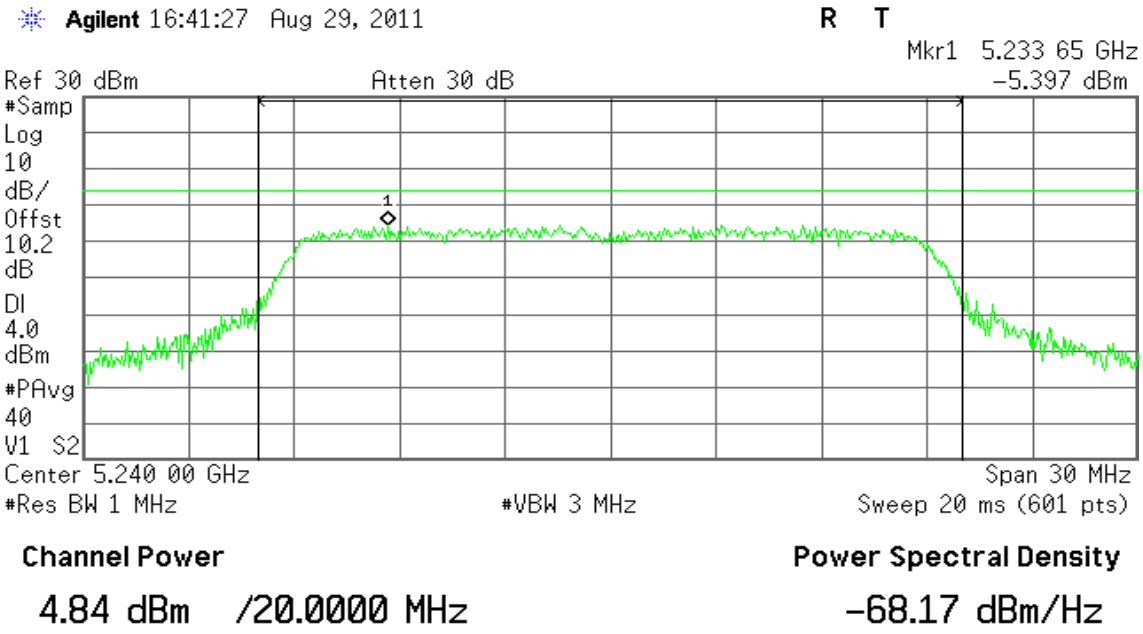
Channel Power

4.88 dBm /20.0000 MHz

Power Spectral Density

-68.13 dBm/Hz

CH High



Channel Power

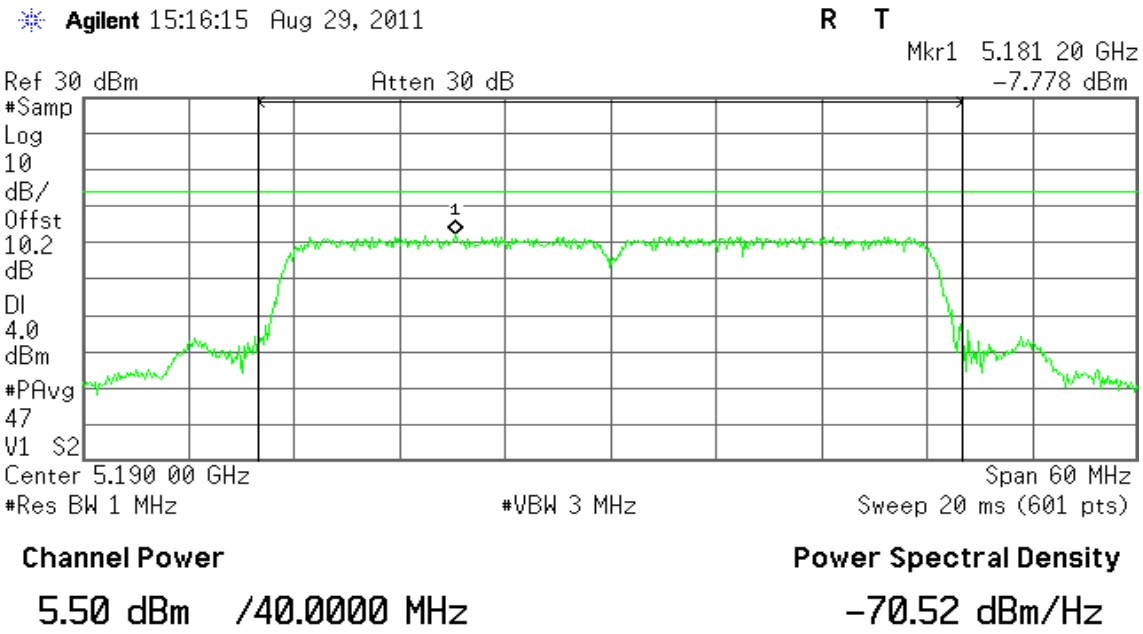
4.84 dBm /20.0000 MHz

Power Spectral Density

-68.17 dBm/Hz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low



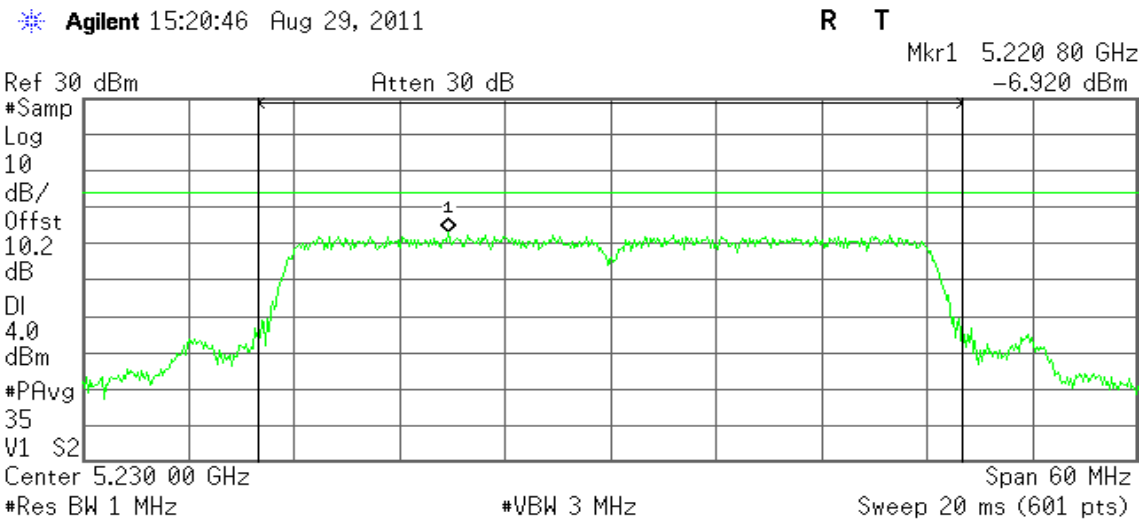
Channel Power

5.50 dBm /40.0000 MHz

Power Spectral Density

-70.52 dBm/Hz

CH High



Channel Power

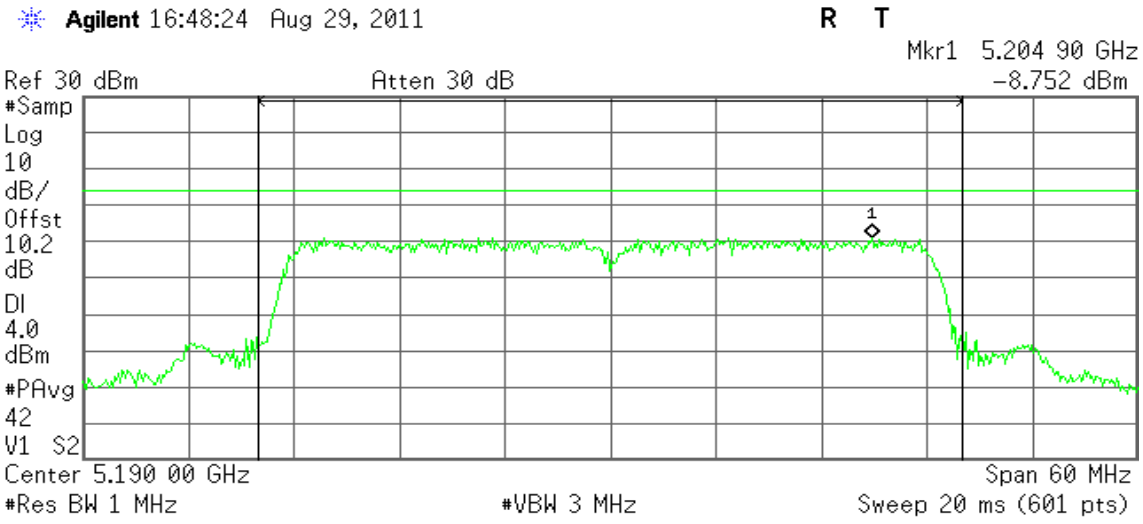
5.66 dBm /40.0000 MHz

Power Spectral Density

-70.36 dBm/Hz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low



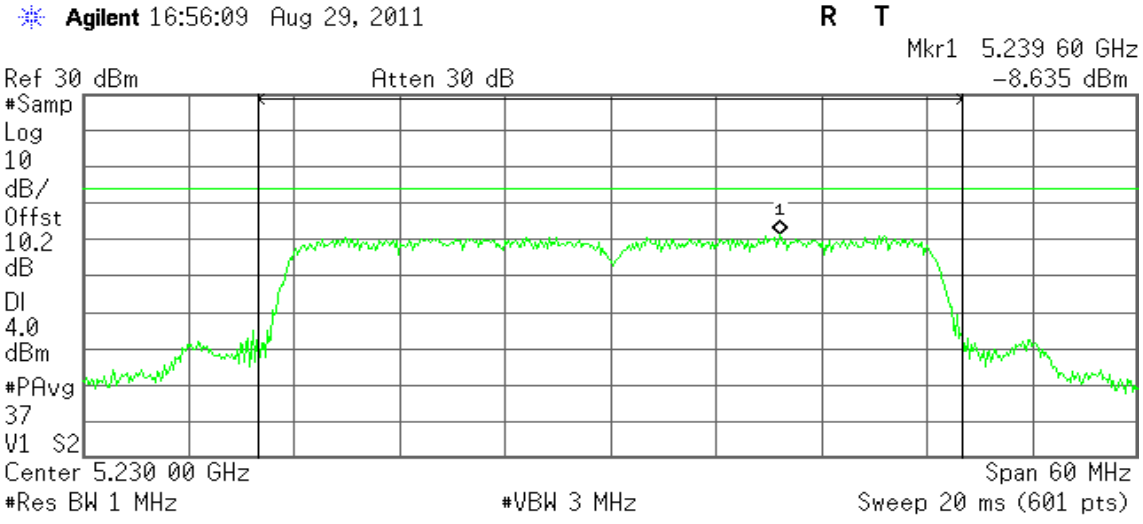
Channel Power

4.39 dBm /40.0000 MHz

Power Spectral Density

-71.63 dBm/Hz

CH High



Channel Power

4.19 dBm /40.0000 MHz

Power Spectral Density

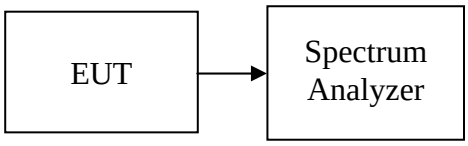
-71.83 dBm/Hz

7.5 PEAK EXCURSION

LIMIT

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

Test Configuration



TEST PROCEDURE

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

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW =1MHz, VBW = 3MHz, Span >26dB bandwidth, 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.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.10	13.00	-2.90
Mid	5220	7.16	13.00	-5.84
High	5240	9.41	13.00	-3.59

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.16	13.00	-4.84
Mid	5220	9.10	13.00	-3.90
High	5240	8.97	13.00	-4.03

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.19	13.00	-3.81
Mid	5220	8.99	13.00	-4.01
High	5240	9.62	13.00	-3.38

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	8.28	13.00	-4.72
High	5230	7.42	13.00	-5.58

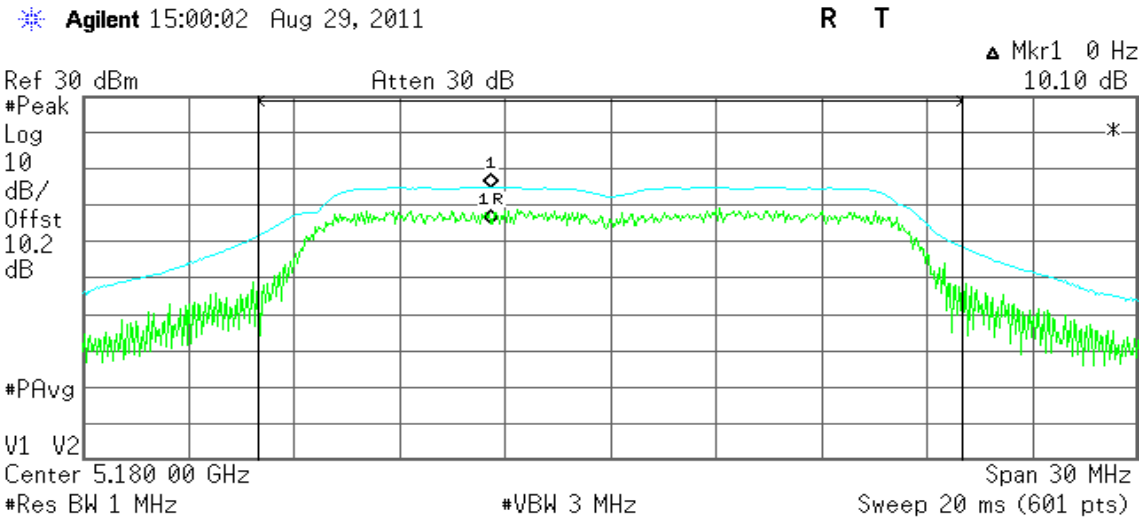
Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.25	13.00	-2.75
High	5230	10.11	13.00	-2.89

Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

CH Low



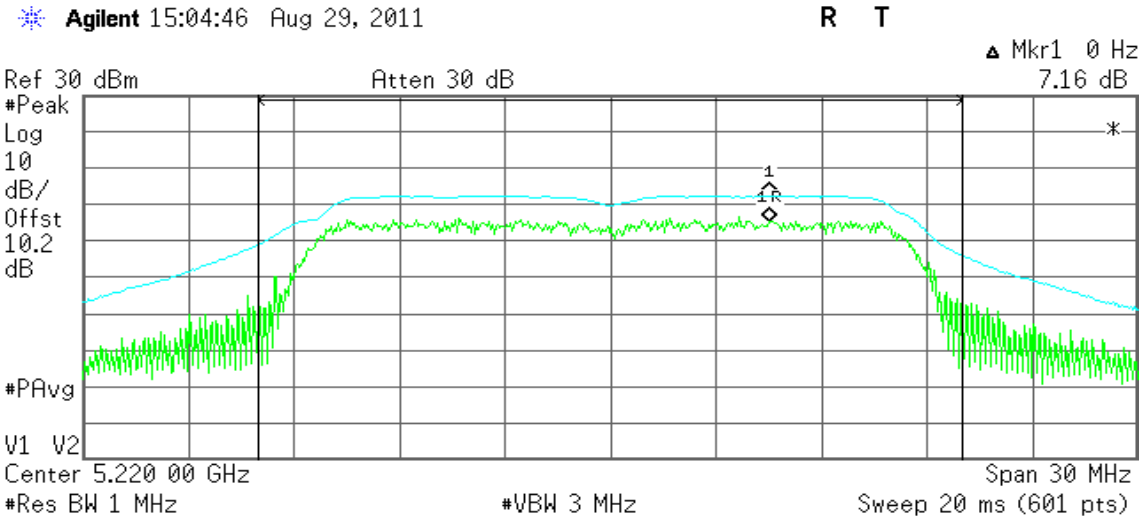
Channel Power

14.86 dBm /20.0000 MHz

Power Spectral Density

-58.16 dBm/Hz

CH Mid



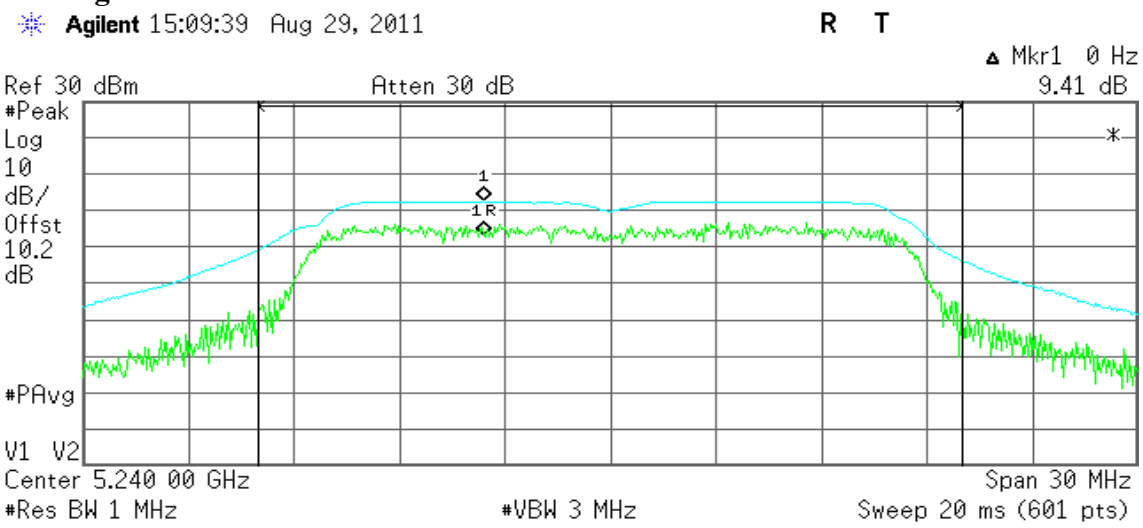
Channel Power

12.43 dBm /20.0000 MHz

Power Spectral Density

-60.58 dBm/Hz

CH High



Channel Power

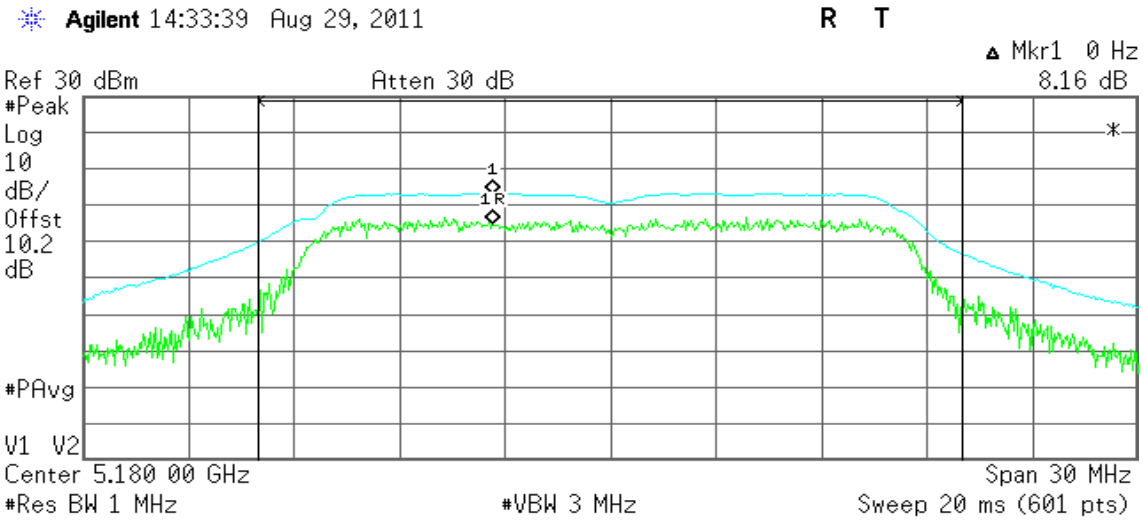
12.52 dBm /20.0000 MHz

Power Spectral Density

-60.49 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

CH Low



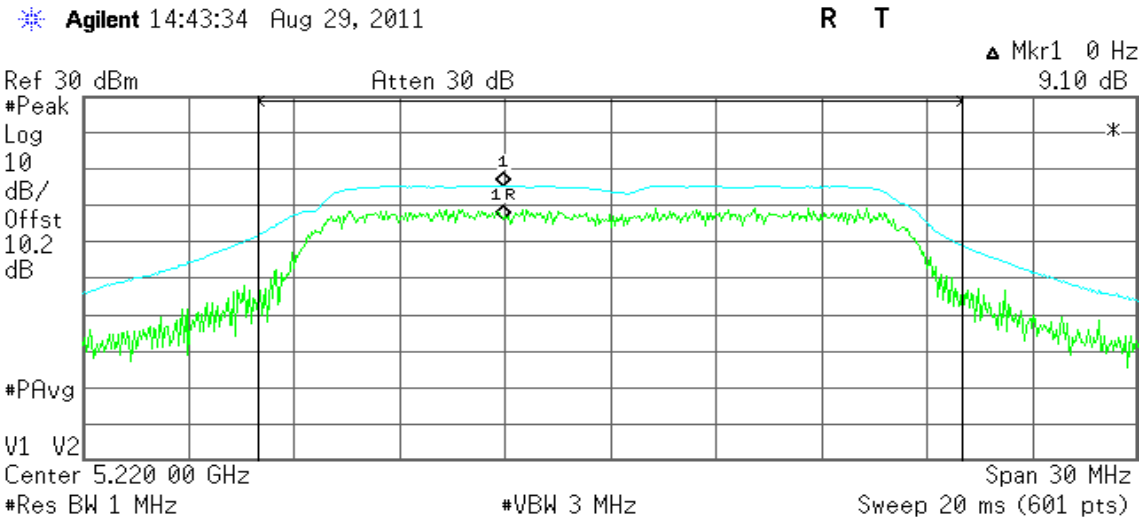
Channel Power

13.27 dBm /20.0000 MHz

Power Spectral Density

-59.74 dBm/Hz

CH Mid



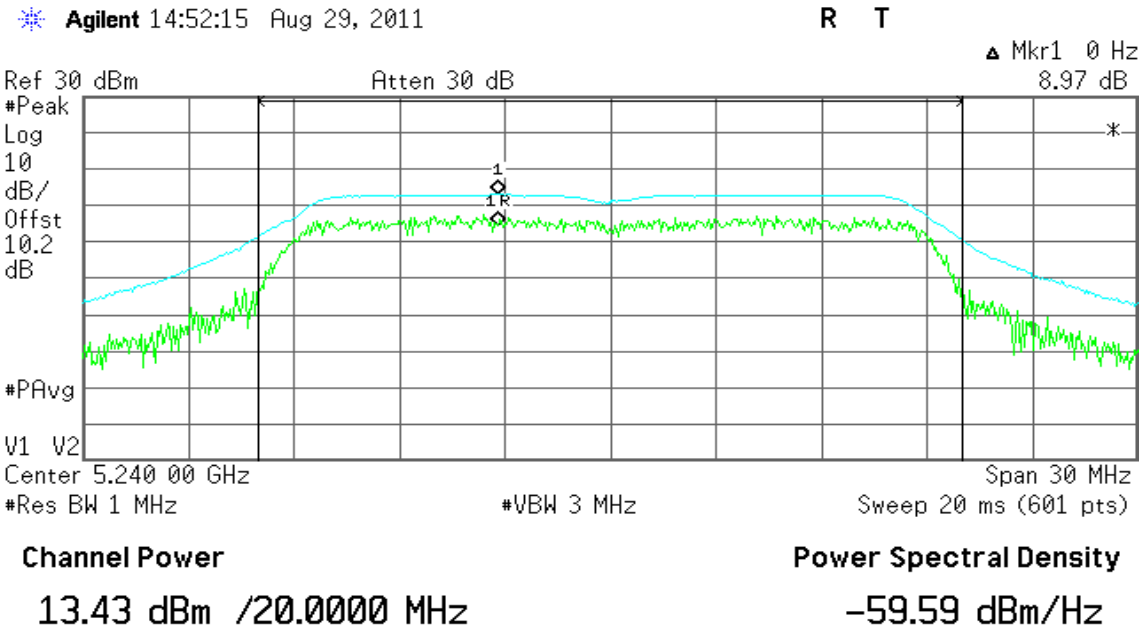
Channel Power

15.23 dBm /20.0000 MHz

Power Spectral Density

-57.78 dBm/Hz

CH High



Channel Power

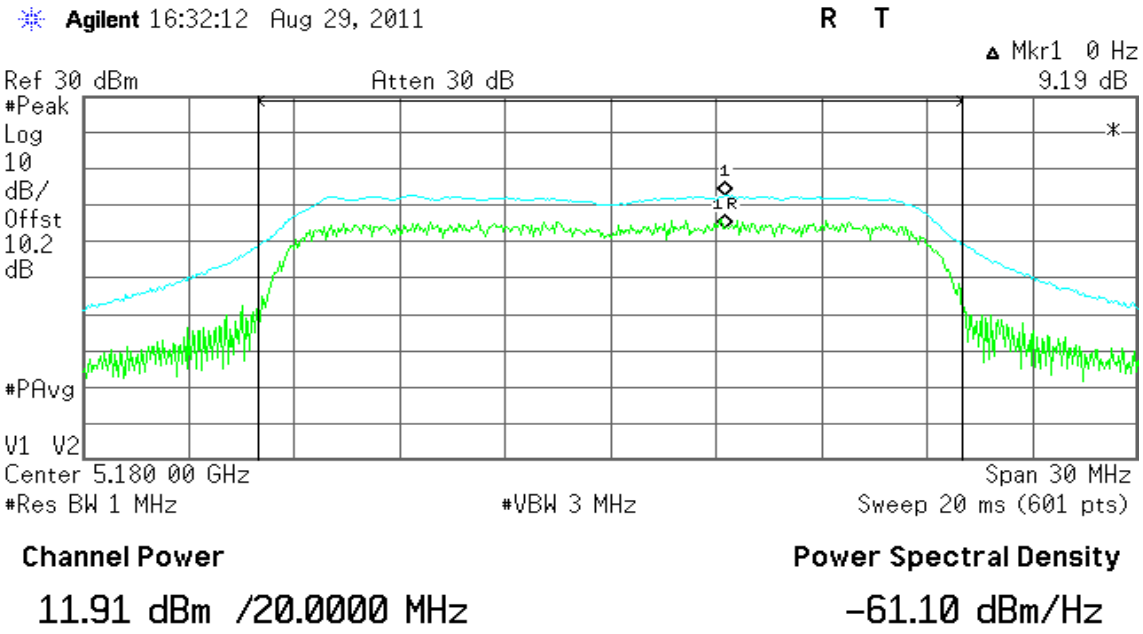
13.43 dBm /20.0000 MHz

Power Spectral Density

-59.59 dBm/Hz

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

CH Low



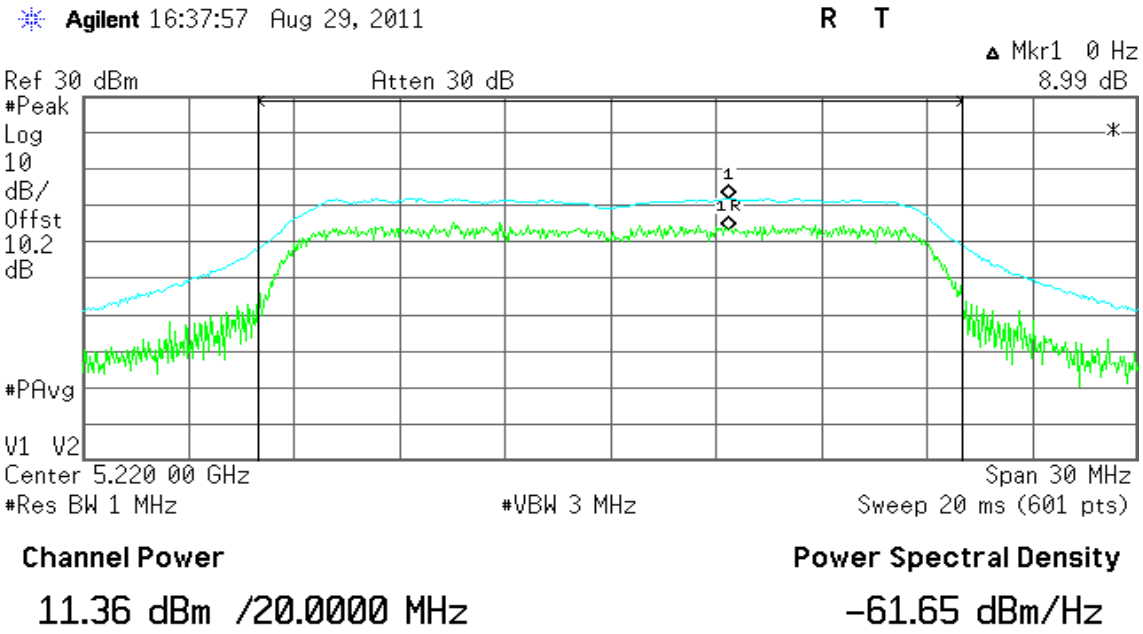
Channel Power

11.91 dBm /20.0000 MHz

Power Spectral Density

-61.10 dBm/Hz

CH Mid



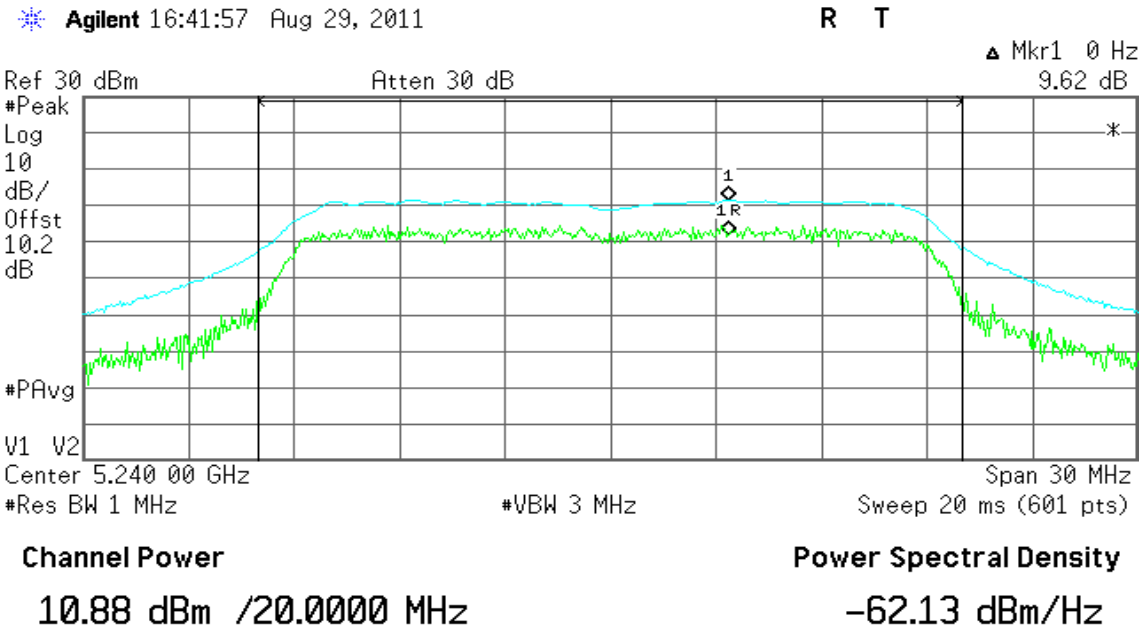
Channel Power

11.36 dBm /20.0000 MHz

Power Spectral Density

-61.65 dBm/Hz

CH High



Channel Power

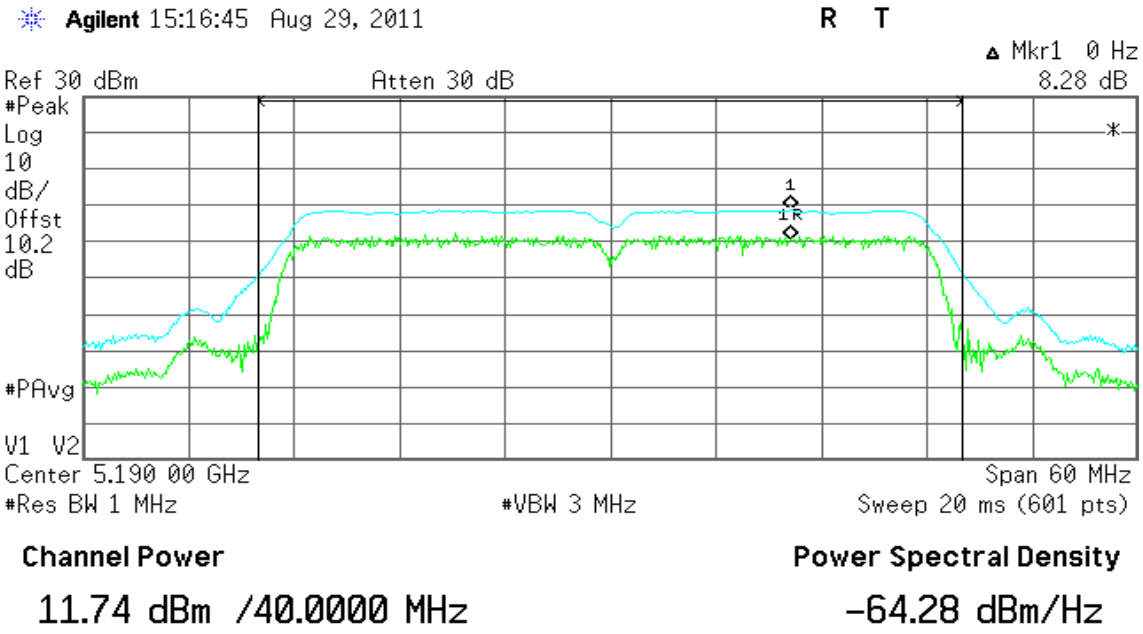
10.88 dBm /20.0000 MHz

Power Spectral Density

-62.13 dBm/Hz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low



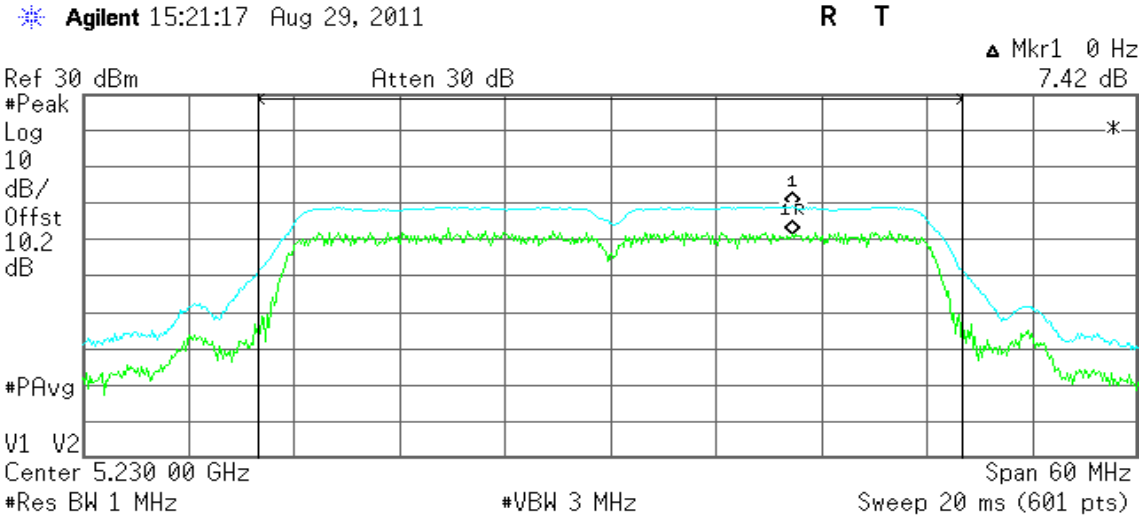
Channel Power

11.74 dBm /40.0000 MHz

Power Spectral Density

-64.28 dBm/Hz

CH High



Channel Power

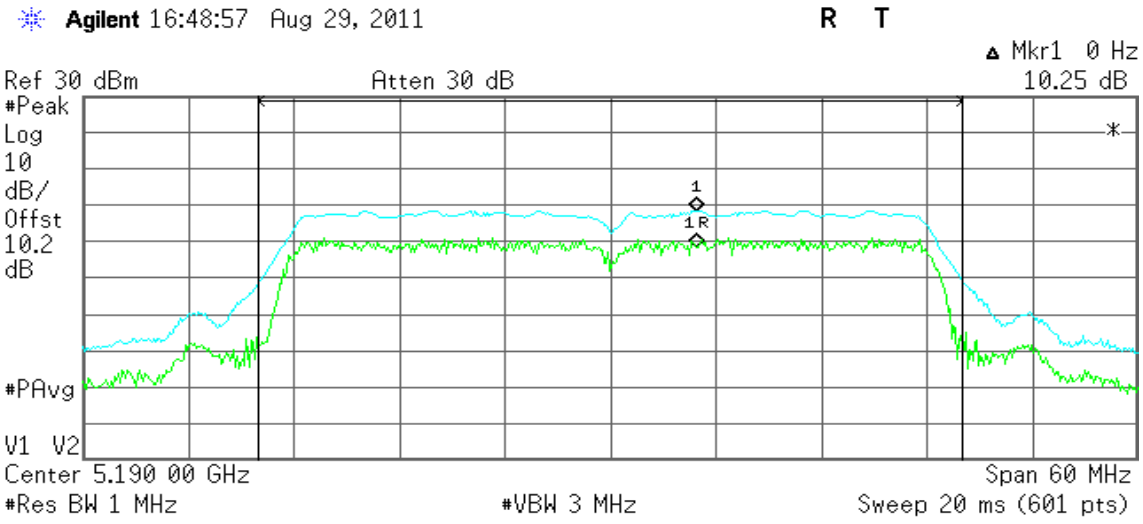
12.01 dBm /40.0000 MHz

Power Spectral Density

-64.01 dBm/Hz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low



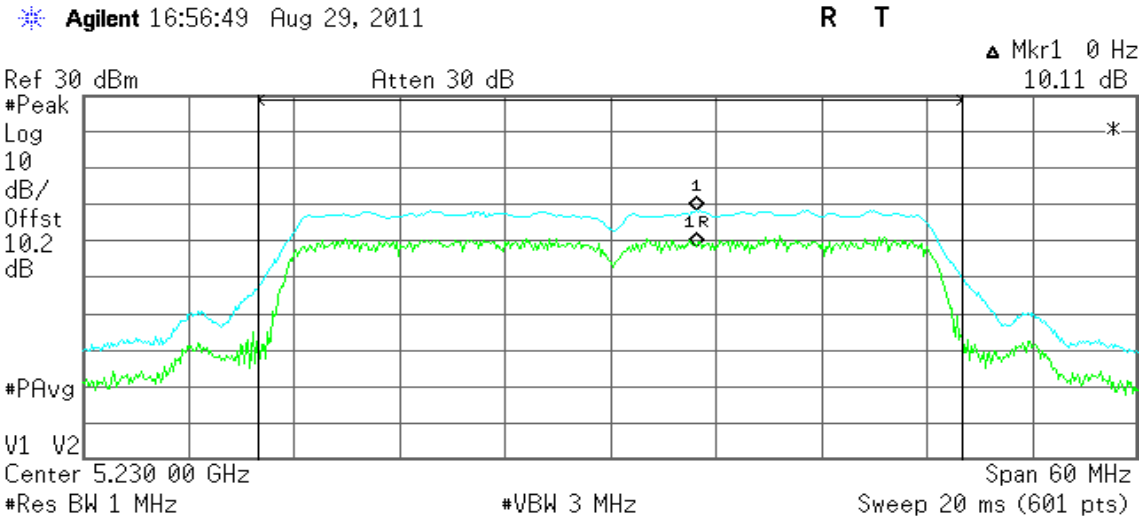
Channel Power

10.60 dBm /40.0000 MHz

Power Spectral Density

-65.42 dBm/Hz

CH High



Channel Power

10.41 dBm /40.0000 MHz

Power Spectral Density

-65.62 dBm/Hz

7.6 RADIATED UNDESIRABLE EMISSION

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

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

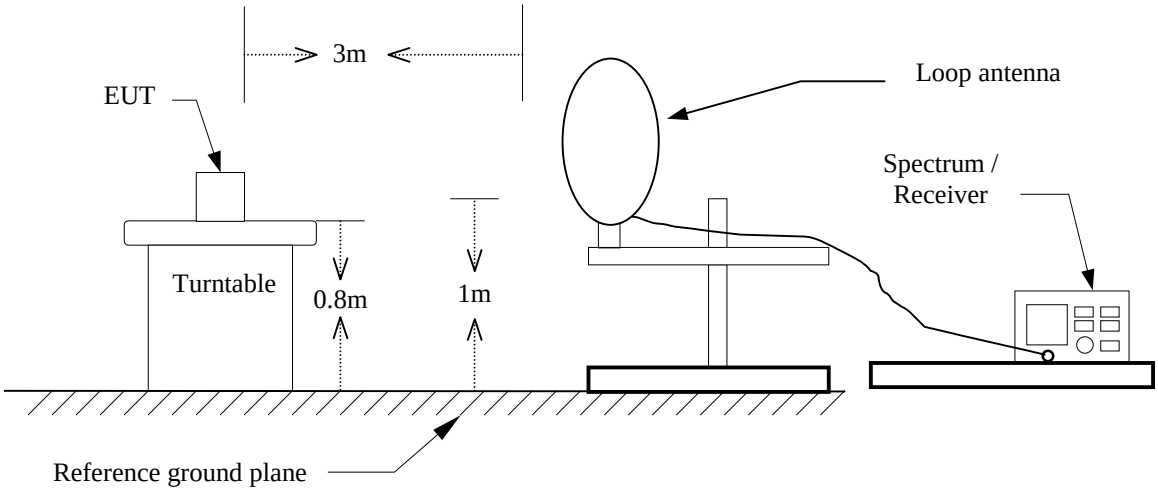
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

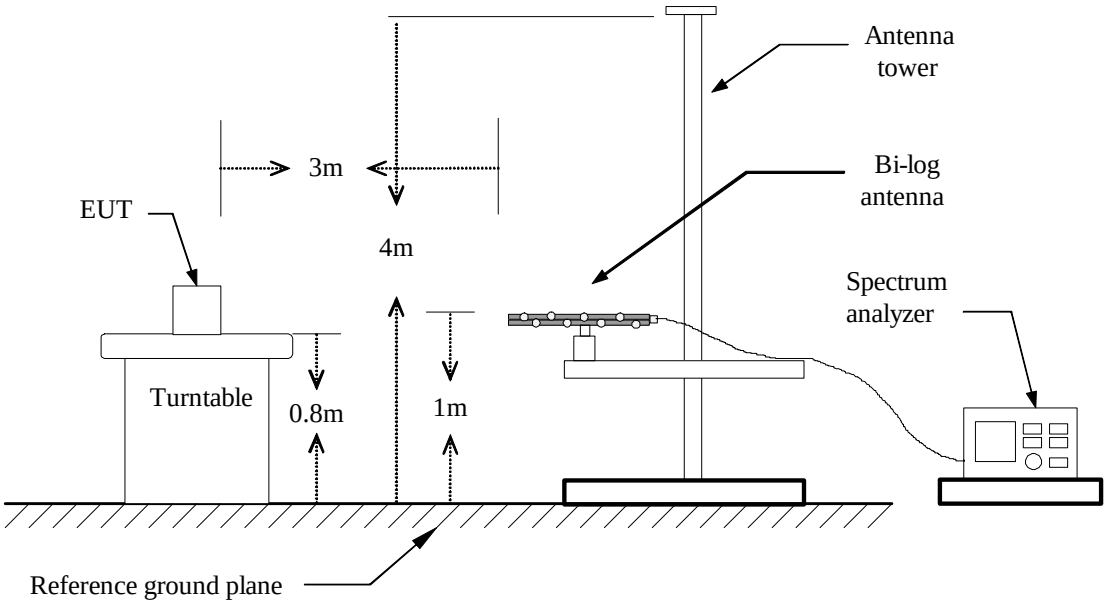
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

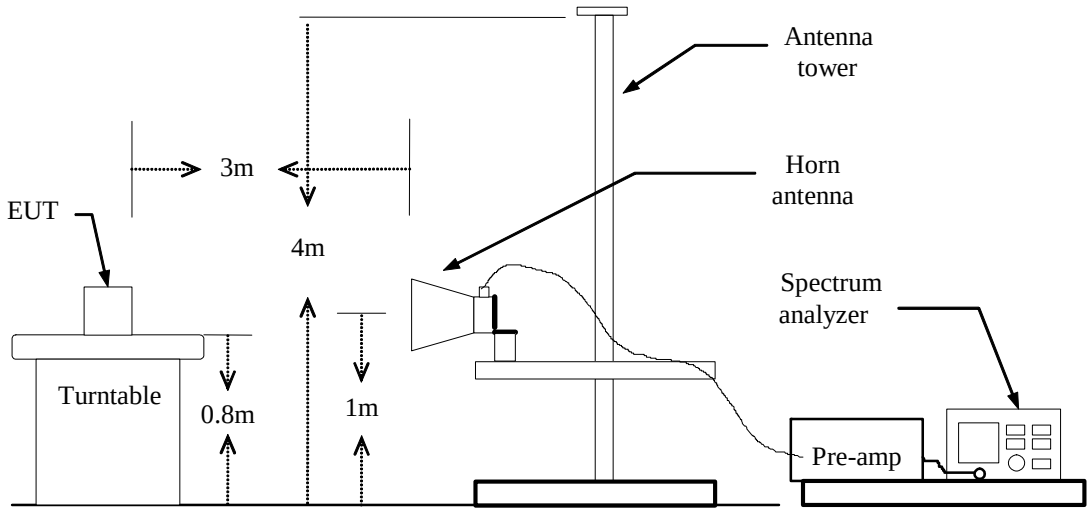
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz


Antenna
tower
3m
Horn
antenna
EUT
4m
Spectrum
analyzer
Turntable
0.8m
1m
Pre-amp

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

   RBW=100kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

Below 1 GHz

Operation Mode: Normal Link **Test Date:** September 15, 2011

Temperature: 25°C **Tested by:** Sehni Hu

Humidity: 50% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
60.72	45.22	-15.89	29.33	40.00	-10.67	Peak	V
96.28	44.30	-13.95	30.35	43.50	-13.15	Peak	V
120.53	35.83	-9.57	26.27	43.50	-17.23	Peak	V
157.72	39.87	-10.48	29.40	43.50	-14.10	Peak	V
432.55	31.74	-6.29	25.45	46.00	-20.55	Peak	V
689.60	27.04	-2.61	24.42	46.00	-21.58	Peak	V
65.57	37.28	-15.21	22.07	40.00	-17.93	Peak	H
157.72	35.31	-10.48	24.83	43.50	-18.67	Peak	H
240.17	40.27	-11.09	29.18	46.00	-16.82	Peak	H
277.35	37.73	-9.48	28.25	46.00	-17.75	Peak	H
384.05	33.50	-7.40	26.10	46.00	-19.90	Peak	H
720.32	31.89	-2.25	29.64	46.00	-16.36	Peak	H

Remark:

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

Above 1 GHz

Operation Mode:	Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Low	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
2108.33	55.90	---	-5.19	50.71	---	74.00	54.00	-3.29	Peak	V
10366.67	43.78	34.10	17.06	60.84	51.16	74.00	54.00	-2.84	AVG	V
N/A										
2003.33	55.58	---	-5.46	50.12	---	74.00	54.00	-3.88	Peak	H
10366.67	43.22	34.96	17.06	60.28	52.02	74.00	54.00	-1.98	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Mid	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1956.67	55.42	---	-5.91	49.51	---	74.00	54.00	-4.49	Peak	V
10433.33	51.10	35.72	17.38	68.48	53.10	74.00	54.00	-0.90	AVG	V
N/A										
1921.67	55.44	---	-6.27	49.18	---	74.00	54.00	-4.82	Peak	H
10433.33	48.52	35.98	17.38	65.90	53.36	74.00	54.00	-0.64	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11a mode / 5180 ~ 5240MHz /CH High	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1886.67	54.30	---	-6.62	47.68	---	74.00	54.00	-6.32	Peak	V
10483.33	44.91	35.16	17.62	62.53	52.78	74.00	54.00	-1.22	AVG	V
N/A										
1886.67	56.25	---	-6.62	49.63	---	74.00	54.00	-4.37	Peak	H
10483.33	50.53	35.70	17.62	68.15	53.32	74.00	54.00	-0.68	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / CH Low	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1991.67	55.12	---	-5.55	49.57	---	74.00	54.00	-4.43	Peak	V
10366.67	46.44	36.28	17.06	63.50	53.34	74.00	54.00	-0.66	AVG	V
N/A										
2341.67	54.95	---	-4.52	50.44	---	74.00	54.00	-3.56	Peak	H
10366.67	48.30	36.22	17.06	65.36	53.28	74.00	54.00	-0.72	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / CH Mid	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1991.67	54.37	---	-5.55	48.81	---	74.00	54.00	-5.19	Peak	V
10433.33	43.57	35.83	17.38	60.95	53.21	74.00	54.00	-0.79	AVG	V
N/A										
2015.00	55.36	---	-5.43	49.93	---	74.00	54.00	-4.07	Peak	H
10433.33	44.41	34.61	17.38	61.79	51.99	74.00	54.00	-2.01	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / CH High	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1770.00	55.60	---	-7.81	47.79	---	74.00	54.00	-6.21	Peak	V
10483.33	45.18	35.82	17.62	62.80	53.44	74.00	54.00	-0.56	AVG	V
N/A										
1770.00	56.10	---	-7.81	48.29	---	74.00	54.00	-5.71	AVG	H
10483.33	41.41	34.56	17.62	59.03	52.18	74.00	54.00	-1.82	Peak	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / CH Low	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1770.00	56.00	---	-7.81	48.19	---	74.00	54.00	-5.81	Peak	V
10383.33	49.85	35.71	17.14	66.99	52.85	74.00	54.00	-1.15	AVG	V
N/A										
1770.00	57.37	---	-7.81	49.56	---	74.00	54.00	-4.44	Peak	H
10383.33	40.66	31.30	17.14	57.80	48.44	74.00	54.00	-5.56	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	Tx / IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / CH High	**Test Date:**	September 15, 2011
Temperature:	25°C	**Tested by:**	Sehni Hu
Humidity:	50% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	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	Ant.Pol. (H/V)
1793.33	55.14	---	-7.57	47.57	---	74.00	54.00	-6.43	Peak	V
10466.67	49.89	35.83	17.54	67.43	53.37	74.00	54.00	-0.63	AVG	V
N/A										
1980.00	55.41	---	-5.67	49.74	---	74.00	54.00	-4.26	Peak	H
10466.67	39.02	30.60	17.54	56.56	48.14	74.00	54.00	-5.86	AVG	H
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) = Remark result (dBuV/m) – Average limit (dBuV/m).*

7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

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

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

** Decreases with the logarithm of the frequency.*

TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

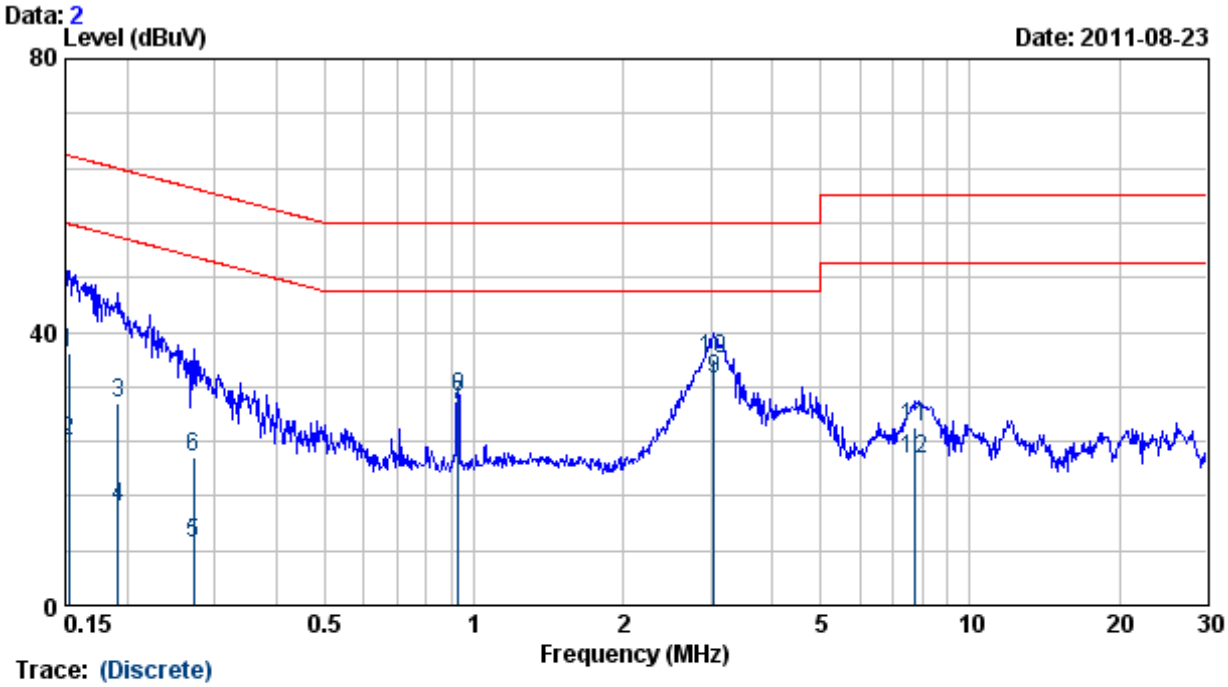
1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

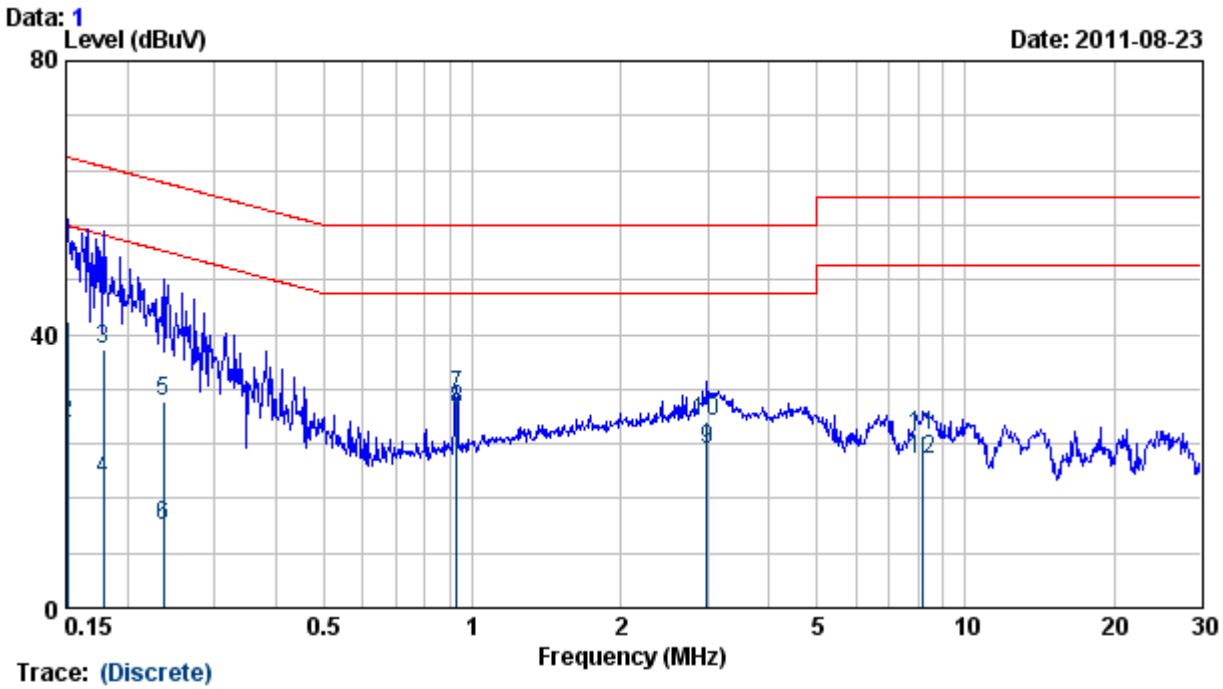
Operation Mode:	Normal Link	**Test Date:**	August 23, 2011
Temperature:	27°C	**Tested by:**	Shiang Su
Humidity:	62% RH	**Line:**	L1



Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.152	8.64	0.01	28.20	36.85	65.87	-29.02	QP
0.152	8.64	0.01	15.31	23.96	55.87	-31.91	AVERAGE
0.191	8.65	0.01	20.91	29.57	63.98	-34.41	QP
0.191	8.65	0.01	5.59	14.25	53.98	-39.73	AVERAGE
0.272	8.65	0.01	0.51	9.17	51.07	-41.90	AVERAGE
0.272	8.65	0.01	13.04	21.70	61.07	-39.37	QP
0.928	8.61	0.02	20.68	29.31	46.00	-16.69	AVERAGE
0.928	8.61	0.02	21.82	30.45	56.00	-25.55	QP
3.041	8.66	0.02	24.52	33.20	46.00	-12.80	AVERAGE
3.041	8.66	0.02	27.36	36.04	56.00	-19.96	QP
7.769	8.88	0.02	17.30	26.20	60.00	-33.80	QP
7.769	8.88	0.02	12.48	21.38	50.00	-28.62	AVERAGE

REMARK:
1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value

Operation Mode:	Normal Link	**Test Date:**	August 23, 2011
Temperature:	27°C	**Tested by:**	Shiang Su
Humidity:	62% RH	**Line:**	L2



Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.151	8.64	0.01	33.28	41.93	65.96	-24.03	QP
0.151	8.64	0.01	18.32	26.97	55.96	-28.99	AVERAGE
0.179	8.65	0.01	29.14	37.80	64.55	-26.75	QP
0.179	8.65	0.01	10.21	18.87	54.55	-35.68	AVERAGE
0.237	8.65	0.01	21.64	30.30	62.22	-31.92	QP
0.237	8.65	0.01	3.28	11.94	52.22	-40.28	AVERAGE
0.928	8.61	0.02	22.29	30.92	56.00	-25.08	QP
0.928	8.61	0.02	20.31	28.94	46.00	-17.06	AVERAGE
2.993	8.66	0.02	14.52	23.20	46.00	-22.80	AVERAGE
2.993	8.66	0.02	18.45	27.13	56.00	-28.87	QP
8.192	8.89	0.02	16.24	25.16	60.00	-34.84	QP
8.192	8.89	0.02	12.69	21.61	50.00	-28.39	AVERAGE

REMARK:

1. Correction Factor = Insertion loss + cable loss

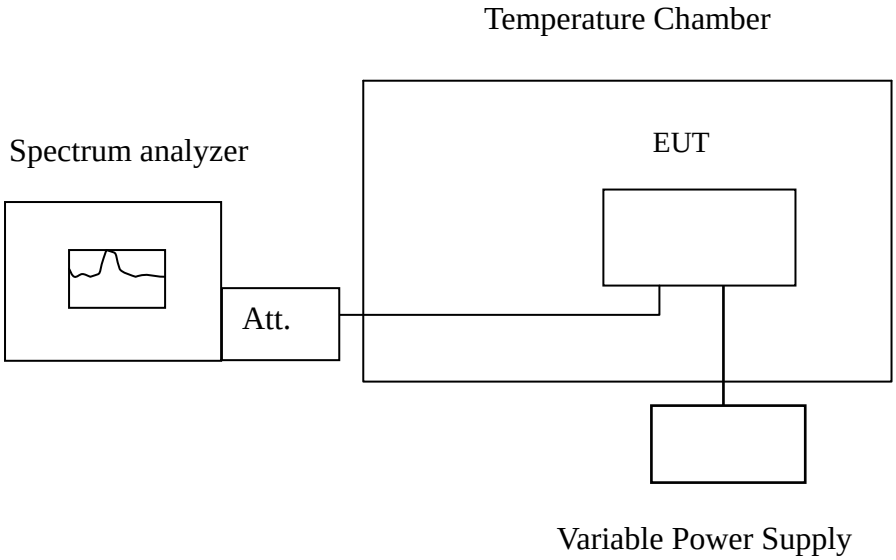
2. Margin value = Emission level – Limit value

7.8 FREQUENCY STABILITY

LIMIT

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

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

No non-compliance noted.

IEEE 802.11a mode / 5180 ~ 5240 MHz:

CH Low

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5180.018272	5150~5250	Pass
40	110	5180.005756	5150~5250	Pass
30	110	5179.972654	5150~5250	Pass
20	110	5179.997451	5150~5250	Pass
10	110	5180.005423	5150~5250	Pass
0	110	5179.989979	5150~5250	Pass
-10	110	5179.973593	5150~5250	Pass
-20	110	5179.997635	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5180.009198	5150~5250	Pass
	110	5180.004813	5150~5250	Pass
	121	5179.988172	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5240.011746	5150~5250	Pass
40	110	5239.976007	5150~5250	Pass
30	110	5240.007533	5150~5250	Pass
20	110	5240.018555	5150~5250	Pass
10	110	5239.987983	5150~5250	Pass
0	110	5240.003799	5150~5250	Pass
-10	110	5240.007527	5150~5250	Pass
-20	110	5240.006171	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5240.004015	5150~5250	Pass
	110	5239.993498	5150~5250	Pass
	121	5239.974037	5150~5250	Pass

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240 MHz:

CH Low

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5180.002170	5150~5250	Pass
40	110	5179.978175	5150~5250	Pass
30	110	5180.012058	5150~5250	Pass
20	110	5179.993505	5150~5250	Pass
10	110	5180.006301	5150~5250	Pass
0	110	5179.977786	5150~5250	Pass
-10	110	5180.003486	5150~5250	Pass
-20	110	5179.992359	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5179.999202	5150~5250	Pass
	110	5179.989649	5150~5250	Pass
	121	5180.016508	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5240.015362	5150~5250	Pass
40	110	5239.986997	5150~5250	Pass
30	110	5240.000638	5150~5250	Pass
20	110	5240.005963	5150~5250	Pass
10	110	5239.993340	5150~5250	Pass
0	110	5240.006325	5150~5250	Pass
-10	110	5240.014251	5150~5250	Pass
-20	110	5239.985887	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5239.971625	5150~5250	Pass
	110	5239.997967	5150~5250	Pass
	121	5239.995896	5150~5250	Pass

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230 MHz:

CH Low

Operating Frequency: 5190 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5189.991757	5150~5250	Pass
40	110	5189.985057	5150~5250	Pass
30	110	5189.997103	5150~5250	Pass
20	110	5189.997225	5150~5250	Pass
10	110	5190.020206	5150~5250	Pass
0	110	5189.970104	5150~5250	Pass
-10	110	5189.987391	5150~5250	Pass
-20	110	5189.984093	5150~5250	Pass

Operating Frequency: 5190 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5189.994257	5150~5250	Pass
	110	5189.970802	5150~5250	Pass
	121	5190.017047	5150~5250	Pass

CH High

Operating Frequency: 5230 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5229.986048	5150~5250	Pass
40	110	5229.996164	5150~5250	Pass
30	110	5230.019791	5150~5250	Pass
20	110	5230.020666	5150~5250	Pass
10	110	5229.997666	5150~5250	Pass
0	110	5229.993463	5150~5250	Pass
-10	110	5230.012620	5150~5250	Pass
-20	110	5229.982228	5150~5250	Pass

Operating Frequency: 5230 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5229.973358	5150~5250	Pass
	110	5230.003706	5150~5250	Pass
	121	5230.003156	5150~5250	Pass

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	11n/a/g/b Wi-Fi USB adapter
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☒ WLAN: 5.15GHz ~ 5.250GHz ☐ 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 / 5180 ~ 5240MHz: 9.05 dBm(8.04mW) IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz: 10.75 dBm(11.89 mW) IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz: 8.18 dBm(6.58 mW)
Antenna gain (Max)	Omni Antenna / Gain: 4.27 dBi (Numeric gain: 2.67) MIMO Mode: Total ANT= 10*LOG(((10^(4.27/20)+10^(4.27/20))^2/2) 5.725~5.850 GHz: 7.28 dBi (Numeric gain: 5.35)
Evaluation applied	☐ MPE Evaluation ☒ SAR Evaluation* ☐ N/A
Remark: *The maximum output power is 10.75dBm (11.89 mW) at 5220MHz (with 5.35 numeric antenna gain.)*	

Test results

No non-compliance noted.
Remark: Please refer to the separated SAR report.