FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

Cisco Small Business Telepresence

Model: CLX300

Trade Name: CISCO

Issued to

Cisco Systems Inc.
170 West Tasman Drive, San Jose, CA 95134,United States

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: March 8, 2012

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		March 8, 2012		Initial Issue	ALL	Angel Cheng

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION 4

2. EUT DESCRIPTION 5

3. TEST METHODOLOGY 7

3.1 EUT CONFIGURATION 7
3.2 EUT EXERCISE 7
3.3 GENERAL TEST PROCEDURES 7
3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS 8
3.5 DESCRIPTION OF TEST MODES 9

4. INSTRUMENT CALIBRATION 10

4.1 MEASURING INSTRUMENT CALIBRATION 10
4.2 MEASUREMENT EQUIPMENT USED 10
4.3 MEASUREMENT UNCERTAINTY 11

5. FACILITIES AND ACCREDITATIONS 12

5.1 FACILITIES 12
5.2 EQUIPMENT 12
5.3 LABORATORY ACCREDITATIONS AND LISTING 12
5.4 TABLE OF ACCREDITATIONS AND LISTINGS 13

6. SETUP OF EQUIPMENT UNDER TEST 14

6.1 SETUP CONFIGURATION OF EUT 14
6.2 SUPPORT EQUIPMENT 14

7. FCC PART 15 REQUIREMENTS 15

7.1 DUTY CYCLE 15
7.2 26 DB EMISSION BANDWIDTH 17
7.3 MAXIMUM CONDUCTED OUTPUT POWER 28
7.4 BAND EDGES MEASUREMENT 42
7.5 PEAK POWER SPECTRAL DENSITY 52
7.6 PEAK EXCURSION 64
7.7 RADIATED UNDESIRABLE EMISSION 75
7.8 CONDUCTED UNDESIRABLE EMISSION 98
7.9 POWERLINE CONDUCTED EMISSIONS 108
7.10 FREQUENCY STABILITY 111
7.11 DYNAMIC FREQUENCY SELECTION 124

APPENDIX I RADIO FREQUENCY EXPOSURE 149

APPENDIX 2 PHOTOGRAPHS OF TEST SETUP 152

APPENDIX 1 - PHOTOGRAPHS OF EUT

1. TEST RESULT CERTIFICATION

Applicant:	Cisco Systems Inc. 170 West Tasman Drive, San Jose, CA 95134,United States
Manufacturer:	Cisco Systems Inc. 170 West Tasman Drive, San Jose, CA 95134,United States
Equipment Under Test:	Cisco Small Business Telepresence
Trade Name:	CISCO
Model:	CLX300
Date of Test:	November 30, 2011 ~ March 8, 2012

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 and Industry Canada RSS-210 Issue 8.

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

Approved by:

Jason Lin

Jason Lin
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Gina Lo

Gina Lo
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

<table>
<tr><td>Product</td><td>Cisco Small Business Telepresence</td></tr>
<tr><td>Trade Name</td><td>CISCO</td></tr>
<tr><td>Model Number</td><td>CLX300</td></tr>
<tr><td>Model Discrepancy</td><td>N/A.</td></tr>
<tr><td>Received Date</td><td>February 1, 2012</td></tr>
<tr><td>Power Adapter</td><td>1. DVE / DSA-12PFA-05 FUS 050200
I/P: 100-240V, 50-60Hz, 0.5A
O/P: +5V, 2A
2. APD / WA-10J05FU
I/P: 100-240V, 50-60Hz, 0.3A MAX
O/P: 5V, 2A</td></tr>
<tr><td>HDMI Cable Manufacturer</td><td>LOROM INDUSTRIAL CO.,LTD. /
WANSHIH ELECTRONIC CO.,LTD.</td></tr>
<tr><td>HDMI Cable Model</td><td>72-4989-01(A096A1005) /
EH9HDM0001A</td></tr>
<tr><td>HDMI Cable Type</td><td>Shielded, 1.8m (Detachable)</td></tr>
<tr><td>Operating Frequency Range & Number of Channels</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th><th>Number of Channels</th></tr>
<tr><td rowspan="2">UNII Band I</td><td>IEEE 802.11a</td><td>5180 – 5240</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5180 – 5240</td><td>4 Channels</td></tr>
<tr><td rowspan="2">UNII Band II</td><td>IEEE 802.11a</td><td>5260 - 5320</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5260 - 5320</td><td>4 Channels</td></tr>
<tr><td rowspan="2">UNII Band III</td><td>IEEE 802.11a</td><td>5500 - 5700</td><td>11 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5500 – 5700</td><td>11 Channels</td></tr>
</table>
</td></tr>
<tr><td>Transmit Power</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th><th>Output Power (dBm)</th><th>Output Power (mw)</th></tr>
<tr><td rowspan="2">UNII Band I</td><td>IEEE 802.11a</td><td>5180 – 5240</td><td>10.04</td><td>10.0925</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5180 – 5240</td><td>9.84</td><td>9.6383</td></tr>
<tr><td rowspan="2">UNII Band II</td><td>IEEE 802.11a</td><td>5260 - 5320</td><td>9.82</td><td>9.5940</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5260 - 5320</td><td>10.33</td><td>10.7895</td></tr>
<tr><td rowspan="2">UNII Band III</td><td>IEEE 802.11a</td><td>5500 - 5700</td><td>11.14</td><td>13.0017</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5500 – 5700</td><td>10.45</td><td>11.0917</td></tr>
</table>
</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: OFDM (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)</td></tr>
<tr><td>Antenna Specification</td><td>Antenna Gain:
IEEE 802.11a: 4.61 dBi</td></tr>
<tr><td>Antenna Designation</td><td>PIFA Antenna</td></tr>
</table>

Operation Frequency:

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)	
CHANNEL	**MHz**
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

Remark: *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

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: 2003.

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: CLX300) comes with two types of power adapter (DVE & APD) for sale. After the preliminary test, the EUT with power adapter (Model: DVE) was found to emit the worst emissions and therefore had been tested under operating condition.

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

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

UNII Band I:

IEEE 802.11a for 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 for 5180 ~ 5240MHz:
Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with 6.5Mbps data rate were chosen for full testing.

UNII Band II:

IEEE 802.11a for 5260 ~ 5320MHz:
Channel Low (5260MHz), Channel Mid (5280MHz) and Channel High (5320MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz for 5260 ~ 5320MHz:
Channel Low (5260MHz), Channel Mid (5280MHz) and Channel High (5320MHz) with 6.5Mbps data rate were chosen for full testing.

UNII Band III:

IEEE 802.11a for 5500 ~ 5700MHz:
Channel Low (5500MHz), Channel Mid (5580MHz) and Channel High (5700MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz for 5500 ~ 5700MHz:
Channel Low (5500MHz), Channel Mid (5580MHz) and Channel High (5700MHz) with 6.5Mbps data rate were chosen for full testing.

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

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
Power Meter	Anritsu	ML2495A	1012009	04/27/2012
Power Sensor	Anritsu	MA2411B	0917072	04/27/2012

Wugu 966 Chamber A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510268	11/15/2012
EMI Test Receiver	R&S	ESCI	100064	02/16/2013
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/12/2013
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/20/2012
Bilog Antenna	Sunol Sciences	JB3	A030105	10/03/2012
Horn Antenna	EMCO	3117	00055165	01/11/2013
Horn Antenna	EMCO	3116	00026370	10/12/2012
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	12/25/2012
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	09/05/2012
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	12/13/2012
LISN	SCHWARZBECK	NSLK 8127	8127526	12/13/2012
BNC CABLE	EMCI	5Dr	BNC A6	12/07/2012
THERMO-HYGRO METER	TECPEL	DTM-303	NO.3	11/21/2012

Dynamic Frequency Selection				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Rohde&Schwarz	FSEK 30	100264	05/24/2012
Signal Generator	Agilent	E8267C	US42340162	08/08/2012

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2159
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., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

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

5.2 EQUIPMENT

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

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

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

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

5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, 2324G-2 for 3M Semi Anechoic Chamber B.

5.4 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 I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

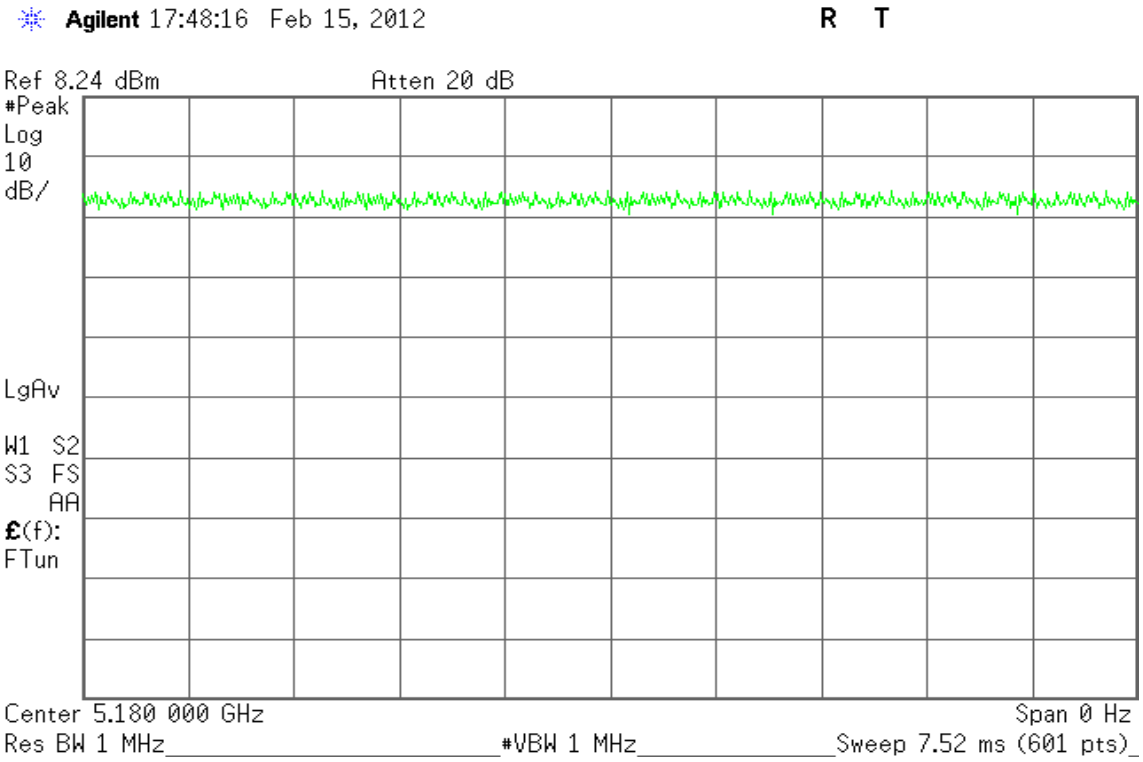
No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	DELL	PP19L	71G6Q1S	N/A	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2.	LCD Monitor	DELL	2407WFPb	CN-0YY528-46633-76I-1CDS	FCC DoC	Shielded, 1.8m with 2 cores	Unshielded, 1.8m
3	Cisco Access Point	AIR-AP1262N-A-K9	FTX1536K51Z	N/A	CISCO	N/A	N/A

Remark:

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

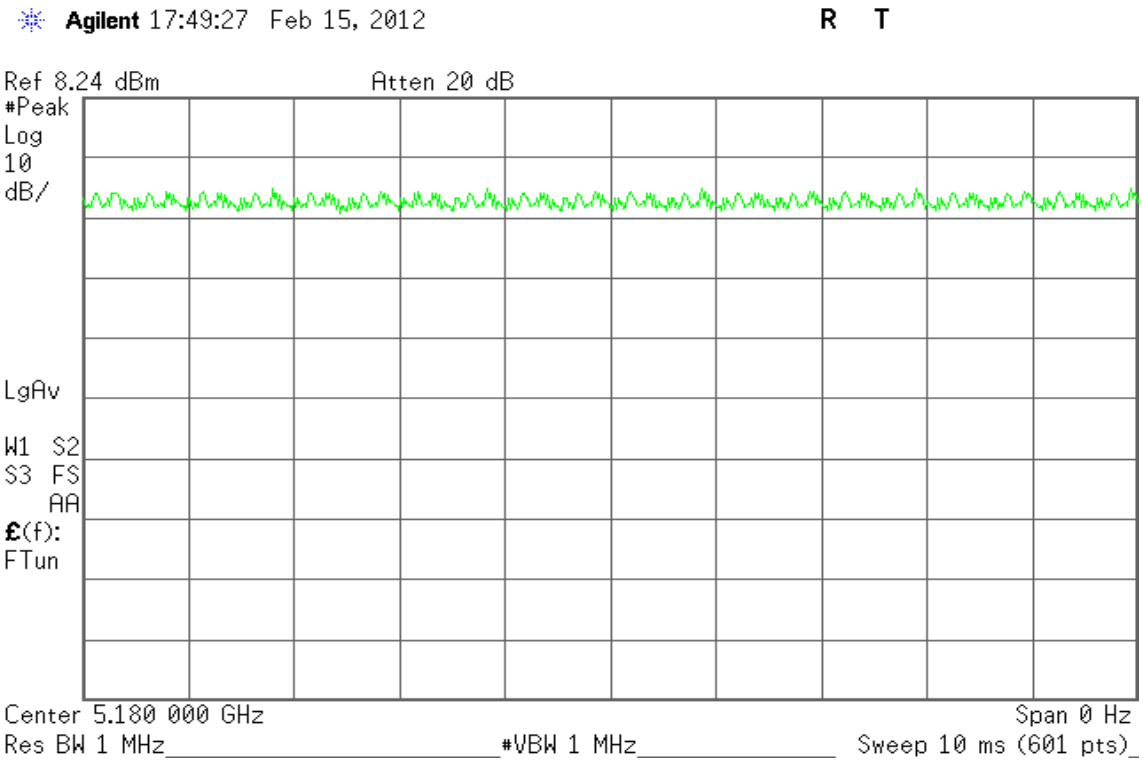
7. FCC PART 15 REQUIREMENTS

7.1 DUTY CYCLE



A mode duty cycle

Duty cycle > 99%



A20 mode duty cycle

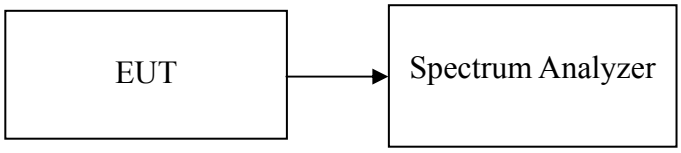
Duty cycle > 99%

7.2 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 (B) (MHz)
Low	5180	19.701
Mid	5220	19.719
High	5240	19.577

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

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	20.174
Mid	5220	20.249
High	5240	20.178

Test mode: IEEE 802.11a mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	19.655
Mid	5280	19.806
High	5320	19.414

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	20.159
Mid	5280	20.218
High	5320	20.093

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5500	19.918
Mid	5580	19.794
High	5700	19.824

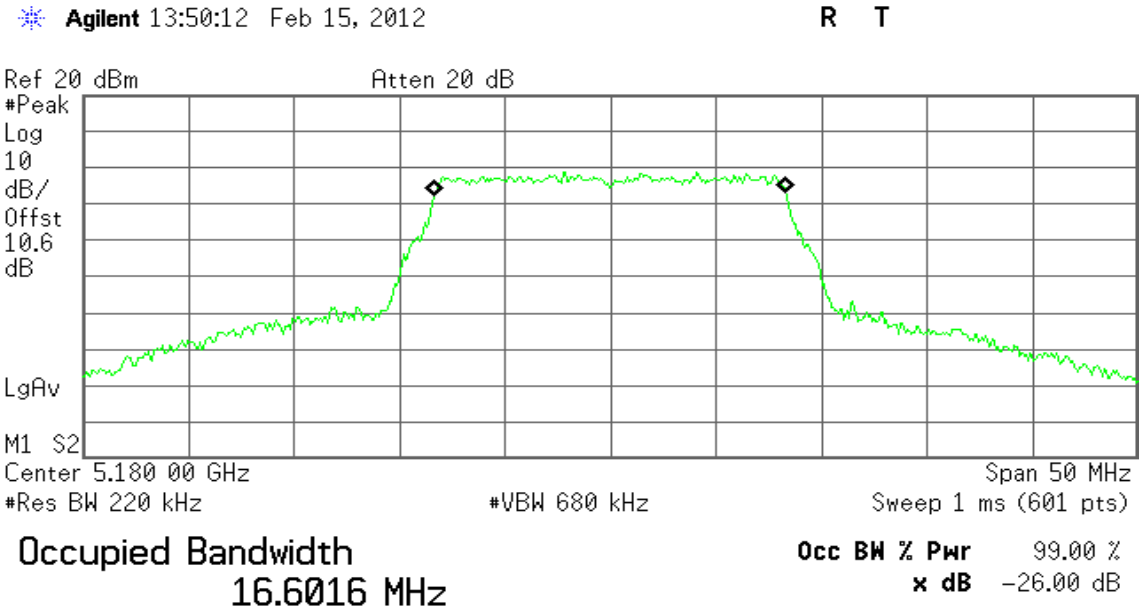
Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	5500	20.252
Mid	5580	20.094
High	5700	20.211

Test Plot

IEEE 802.11a for 5180 ~ 5240MHz

CH Low

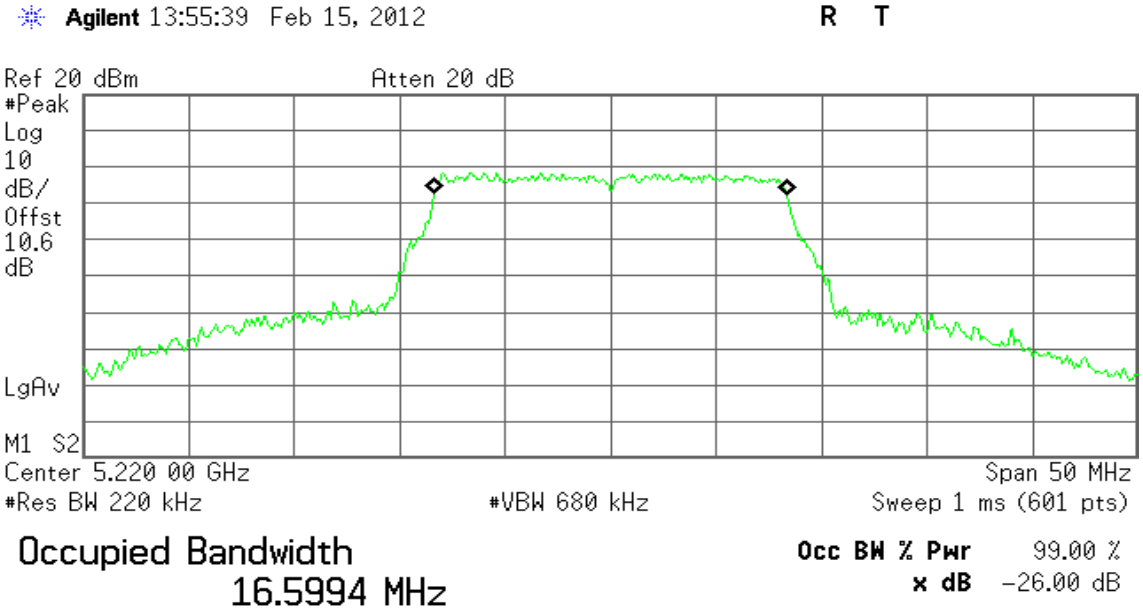


Occupied Bandwidth
16.6016 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -15.313 kHz
x dB Bandwidth 19.701 MHz

CH Mid

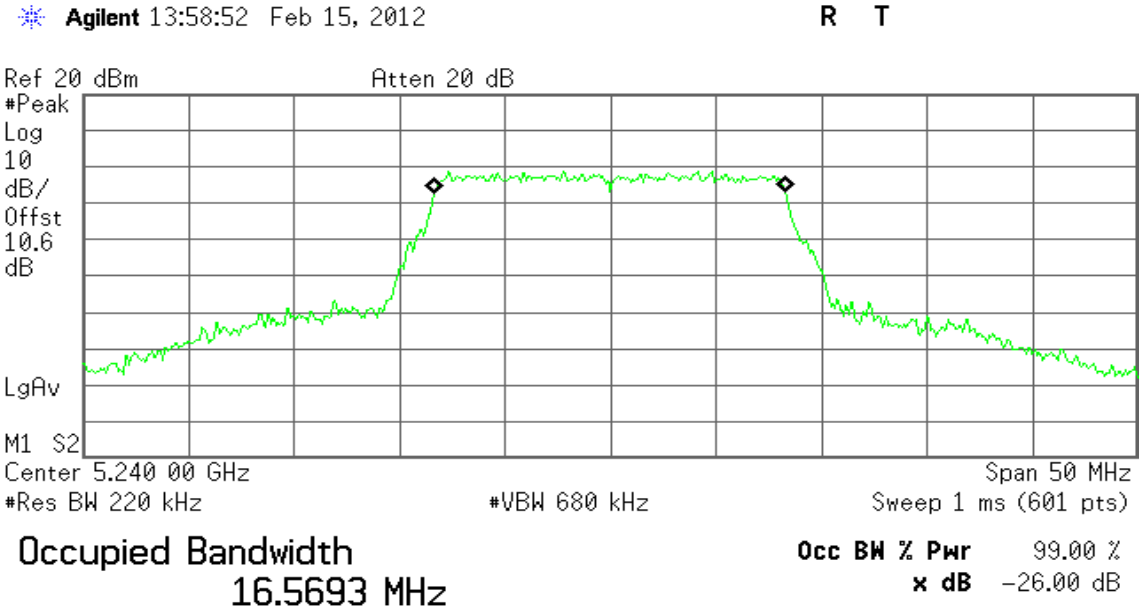


Occupied Bandwidth
16.5994 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 634.368 Hz
x dB Bandwidth 19.719 MHz

CH High



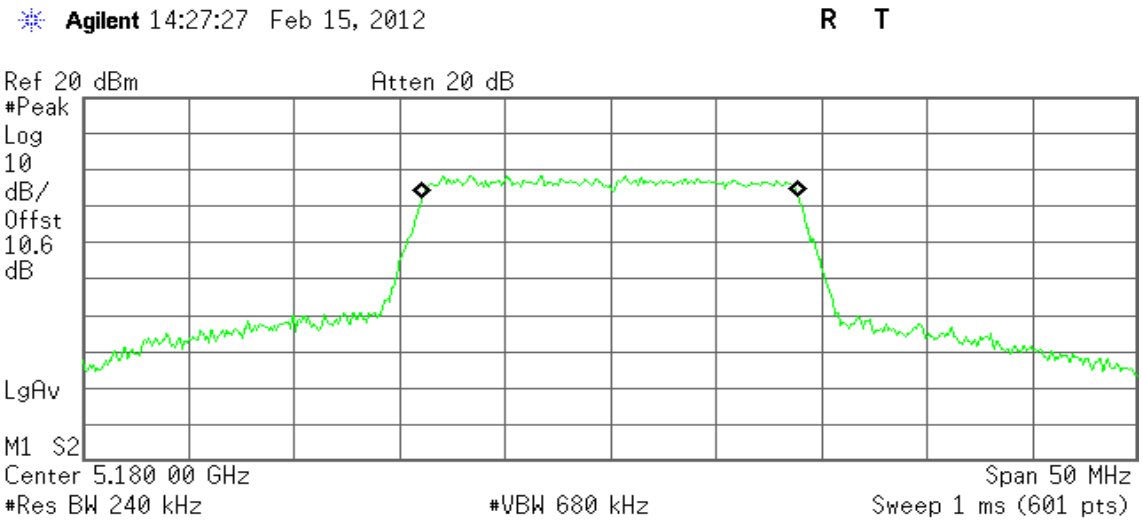
Occupied Bandwidth
16.5693 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -26.670 kHz
x dB Bandwidth 19.577 MHz

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

CH Low

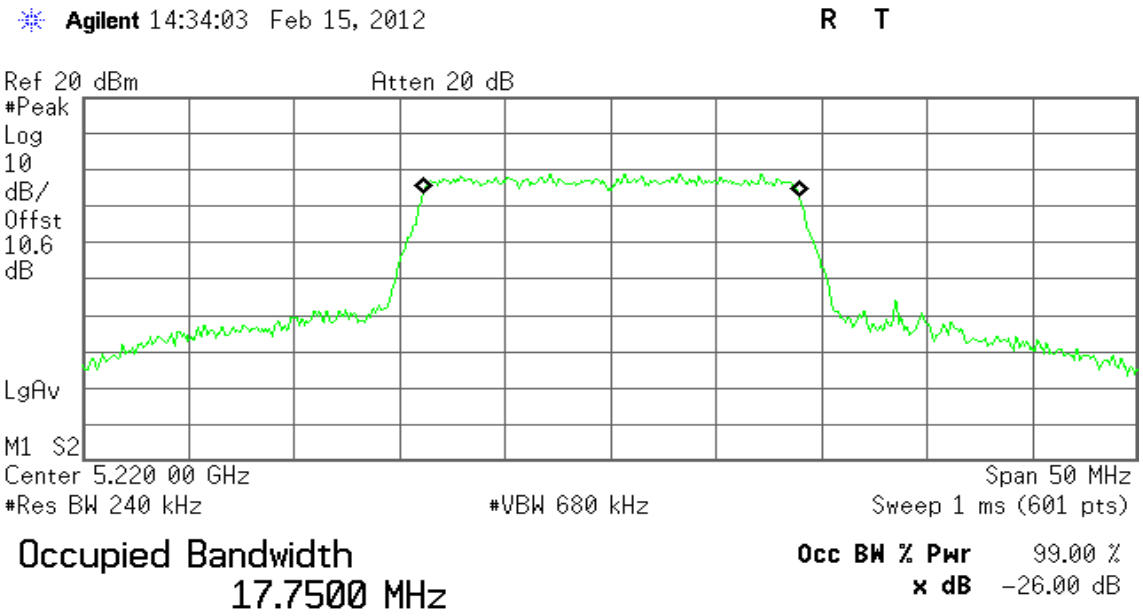


Occupied Bandwidth
17.7524 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

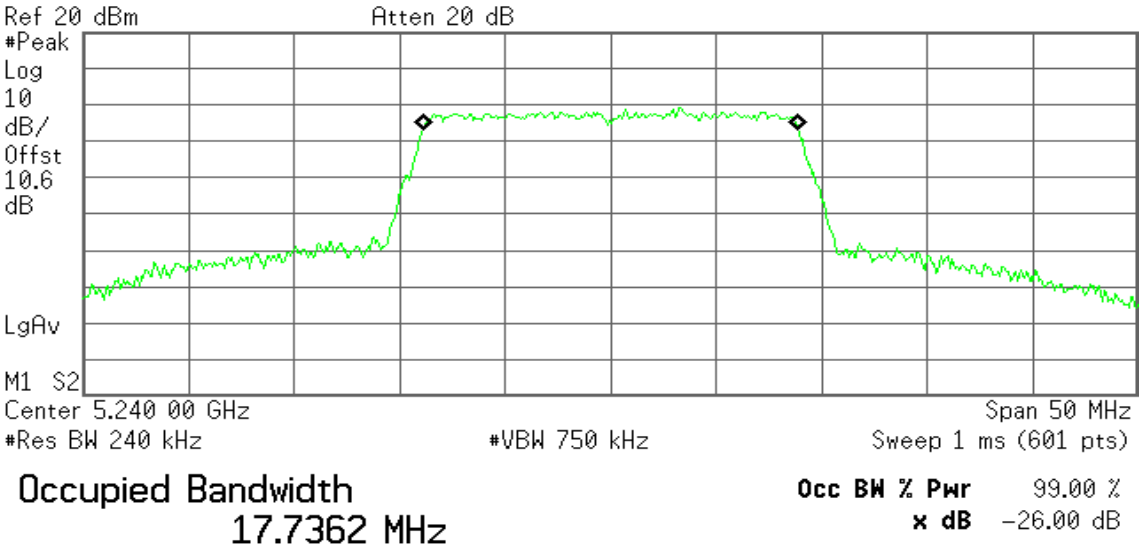
Transmit Freq Error -3.760 kHz
x dB Bandwidth 20.174 MHz

CH Mid



Transmit Freq Error	8.299 kHz
x dB Bandwidth	20.249 MHz

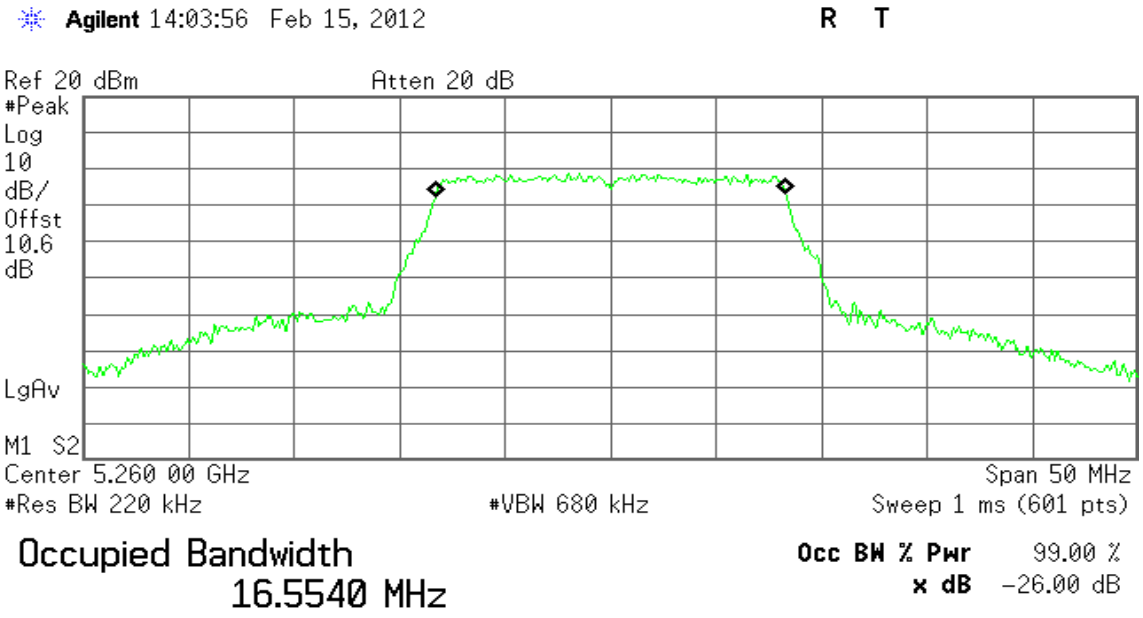
CH High



Transmit Freq Error	2.576 kHz
x dB Bandwidth	20.178 MHz

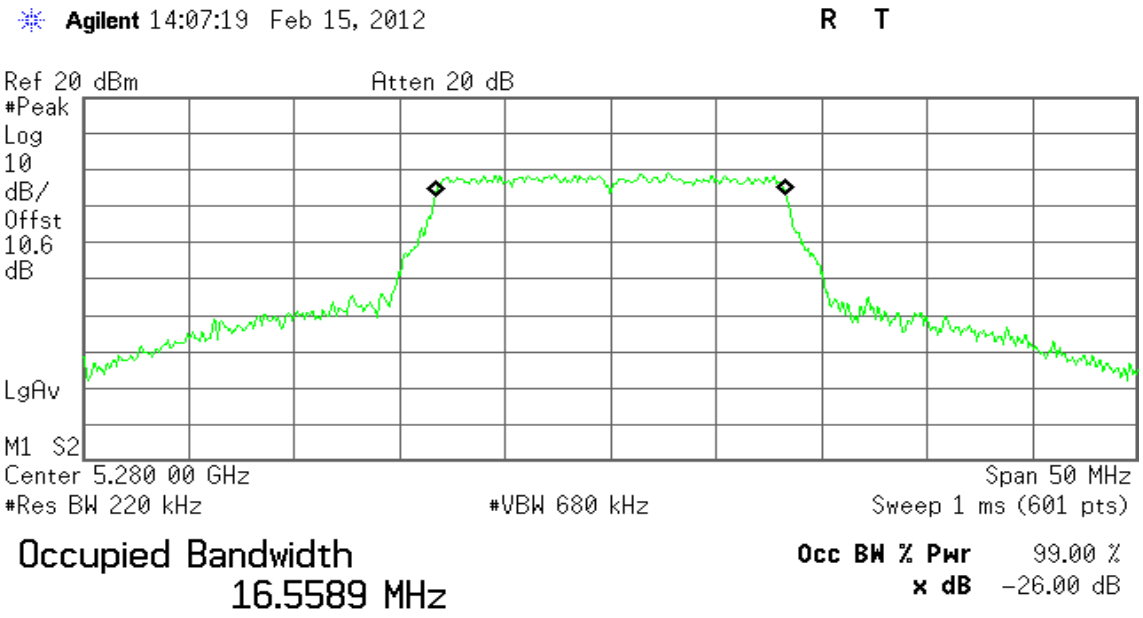
IEEE 802.11a mode / 5260 ~ 5320MHz

CH Low



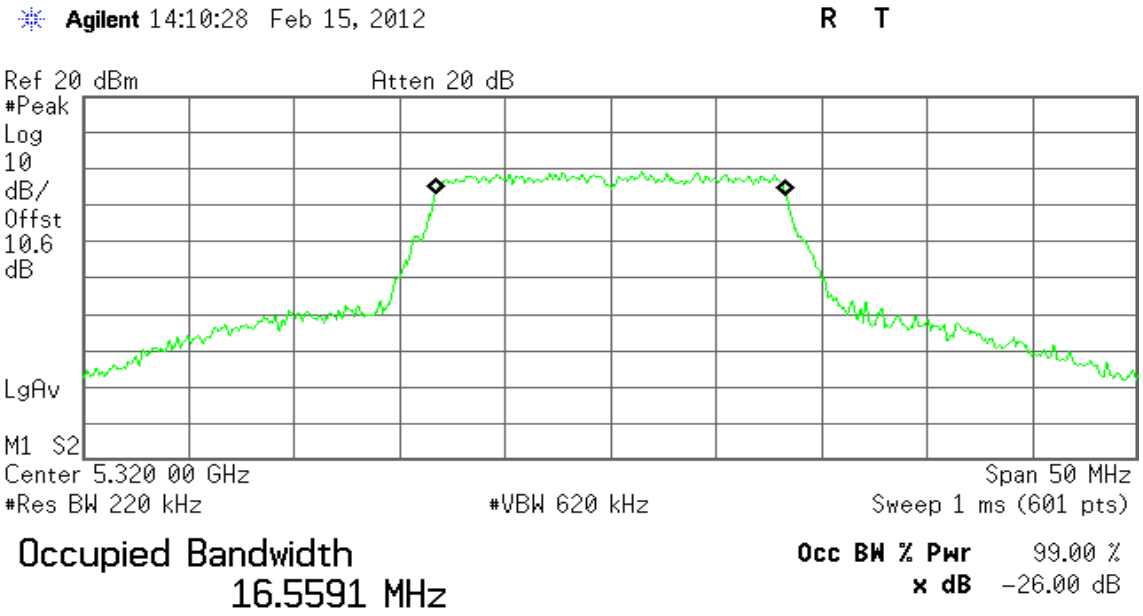
Transmit Freq Error	244.889 Hz
x dB Bandwidth	19.655 MHz

CH Mid



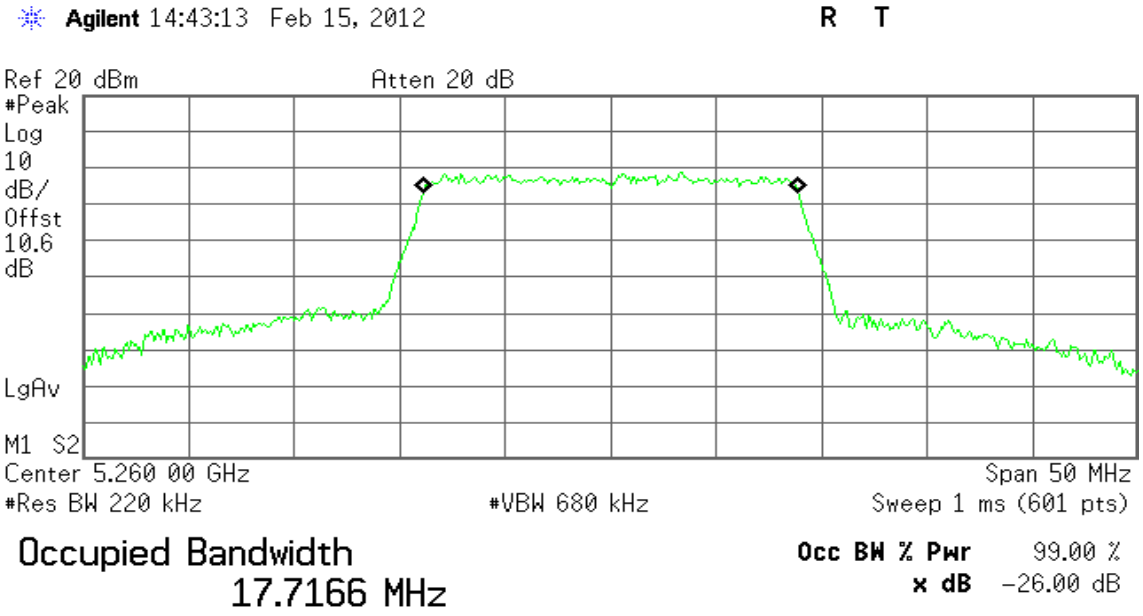
Transmit Freq Error	-4.870 kHz
x dB Bandwidth	19.806 MHz

CH High

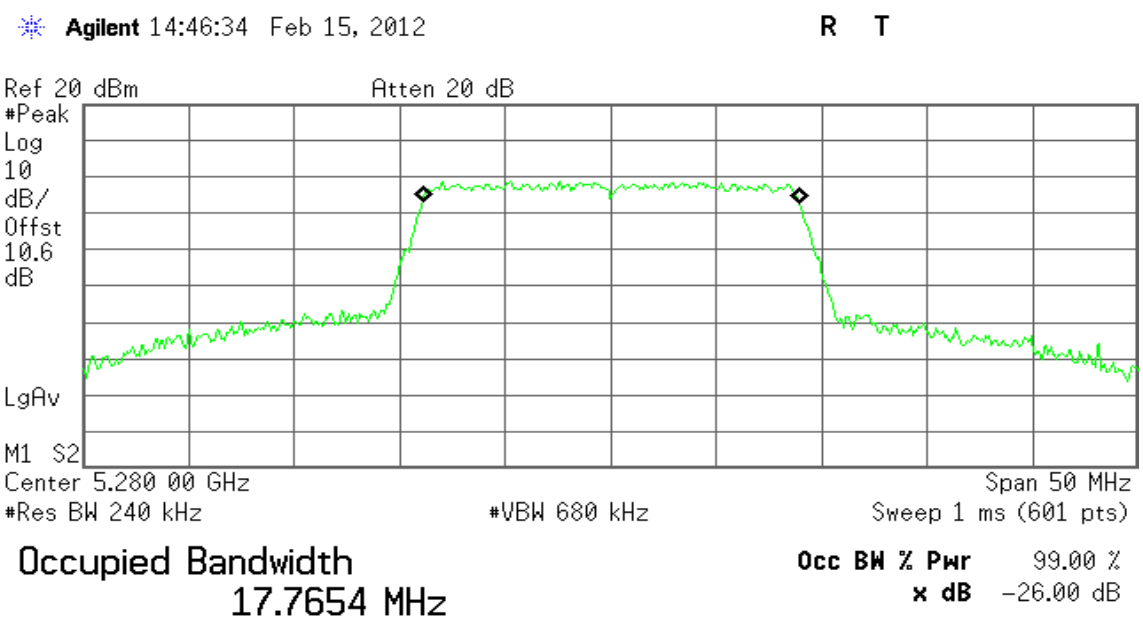


IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

CH Low

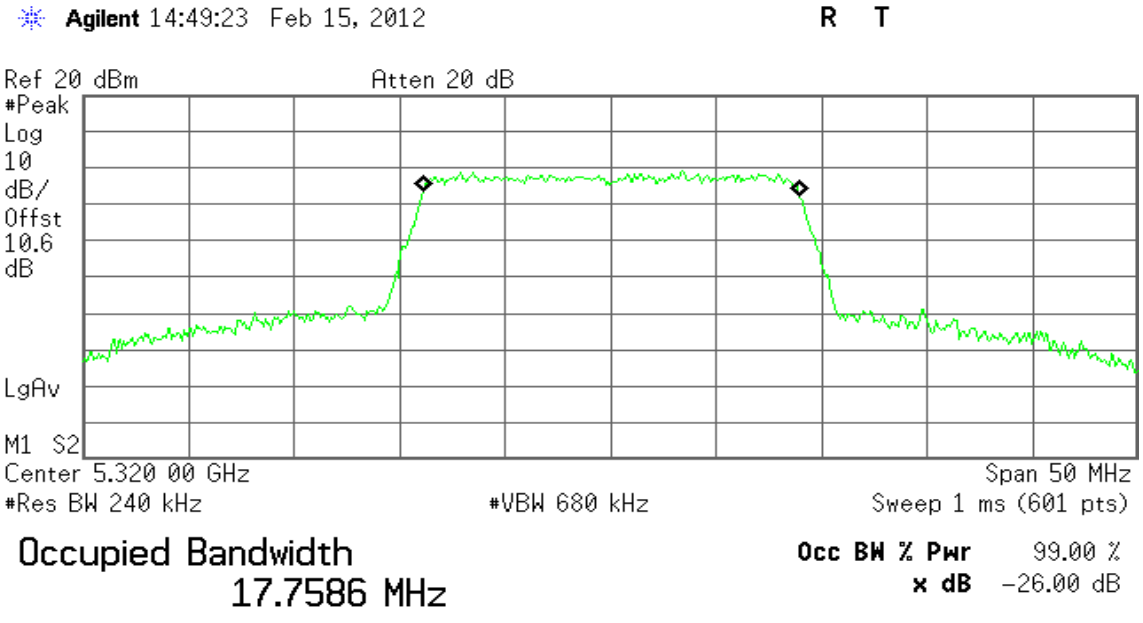


CH Mid



Transmit Freq Error	14.736 kHz
x dB Bandwidth	20.218 MHz

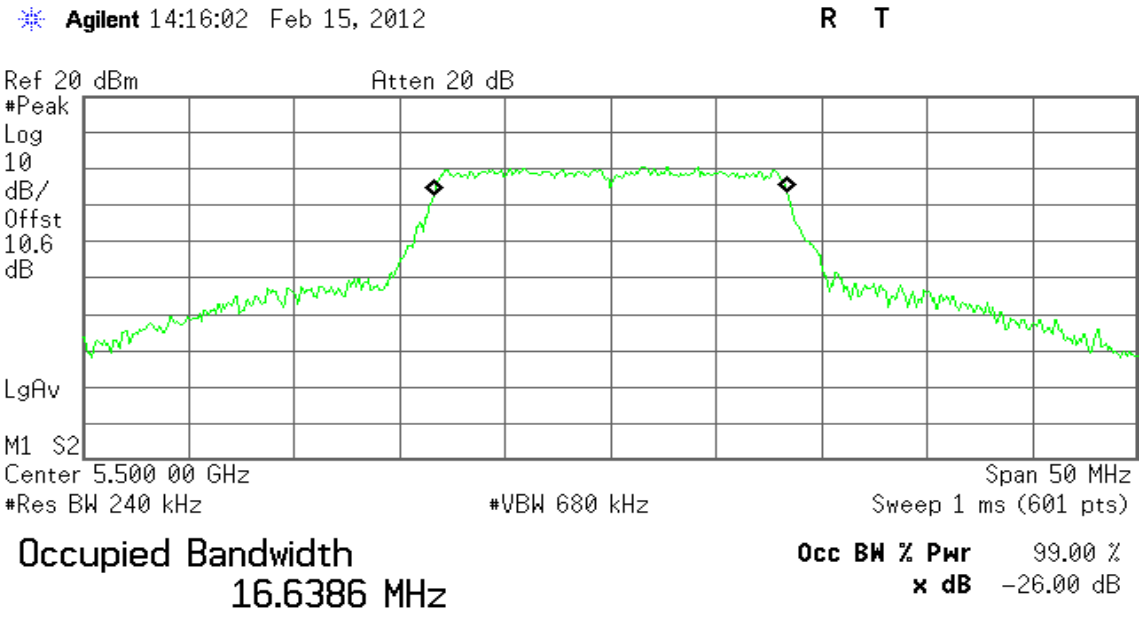
CH High



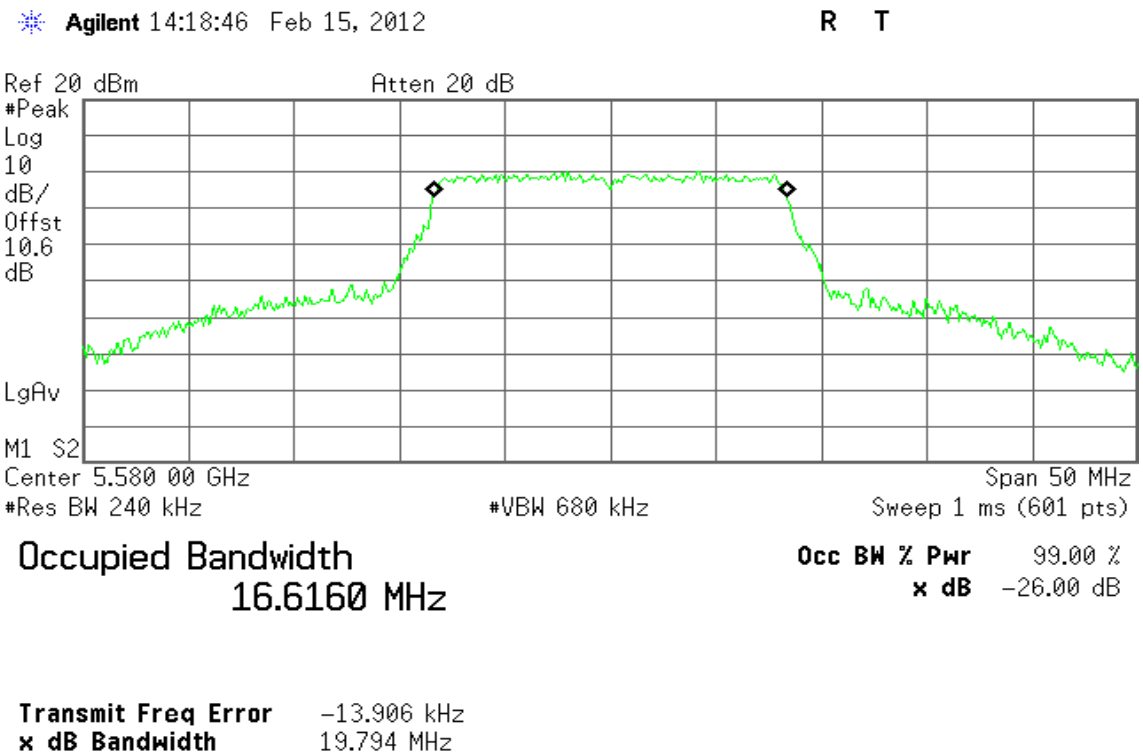
Transmit Freq Error	24.615 kHz
x dB Bandwidth	20.093 MHz

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

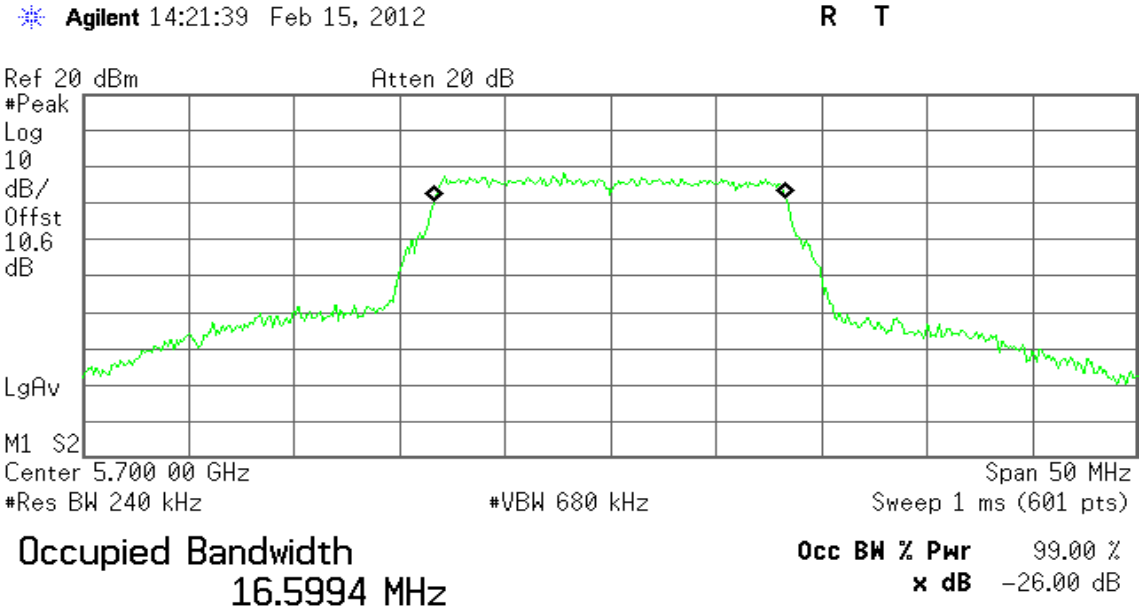
CH Low



CH Mid

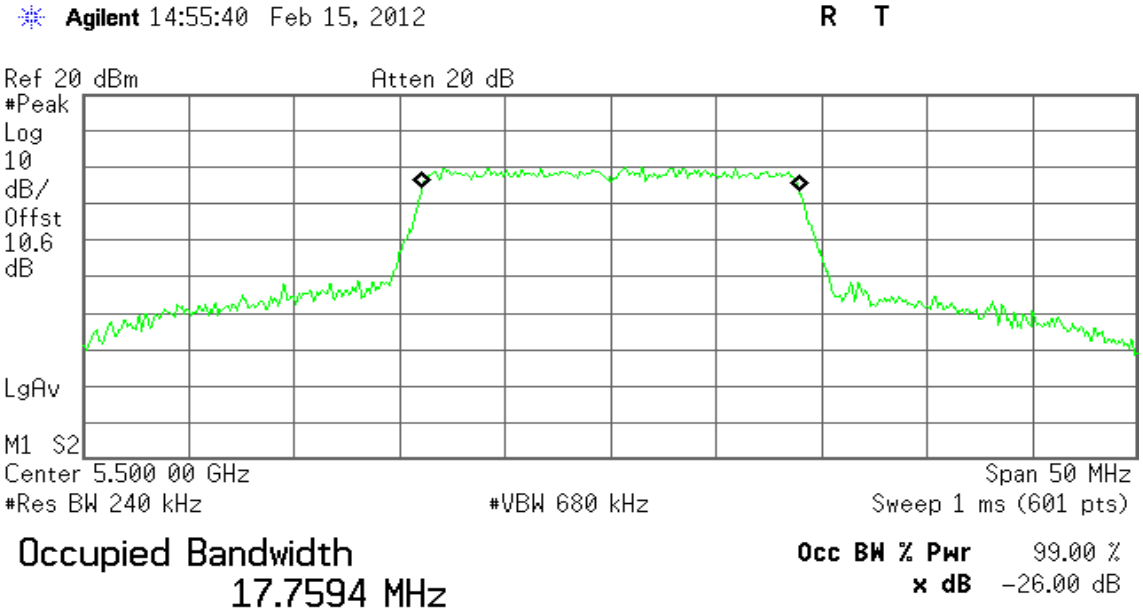


CH High

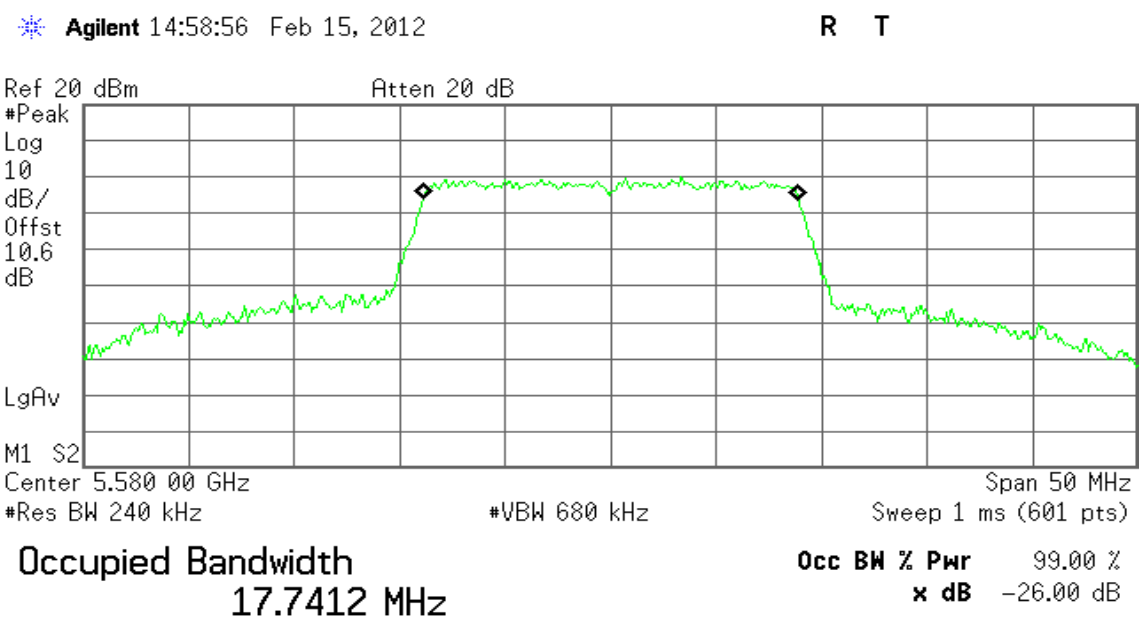


IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

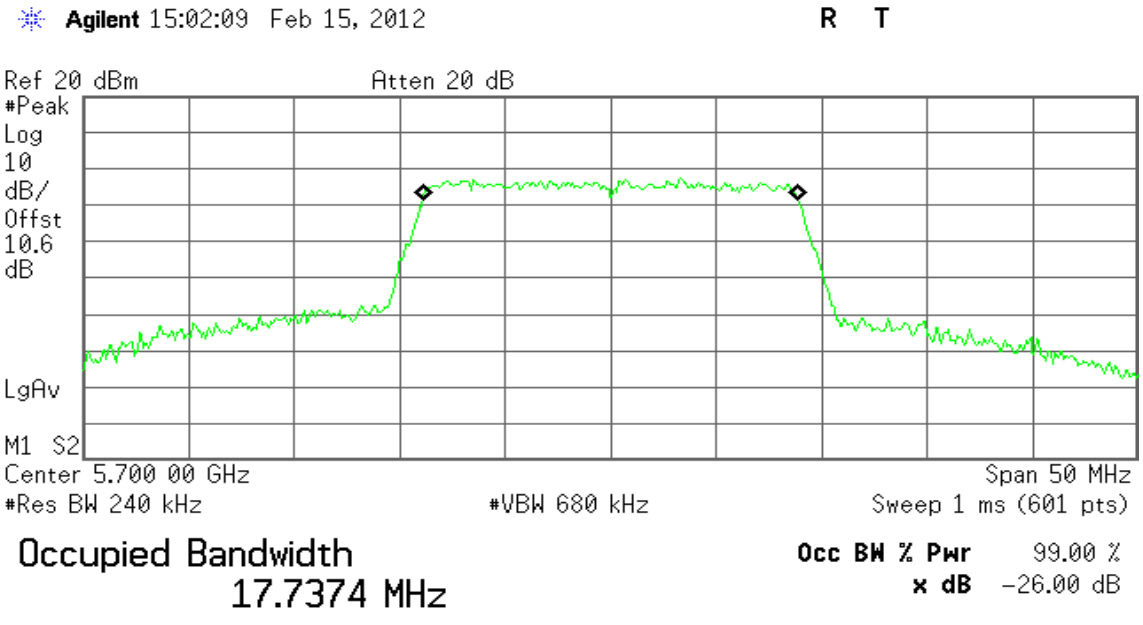
CH Low



CH Mid



CH High



7.3 MAXIMUM CONDUCTED OUTPUT 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.

For FCC

Specified Limit of the Peak Power

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

Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	19.701	12.94	16.94	17.00
Mid	5220	19.719	12.95	16.95	17.00
High	5240	19.577	12.92	16.92	17.00

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

Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	20.174	13.05	17.05	17.00
Mid	5220	20.249	13.06	17.06	17.00
High	5240	20.178	13.05	17.05	17.00

Test mode: IEEE 802.11a mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	19.655	12.93	23.93	24.00
Mid	5280	19.806	12.97	23.97	24.00
High	5320	19.414	12.88	23.88	24.00

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	20.159	13.04	24.04	24.00
Mid	5280	20.218	13.06	24.06	24.00
High	5320	20.093	13.03	24.03	24.00

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

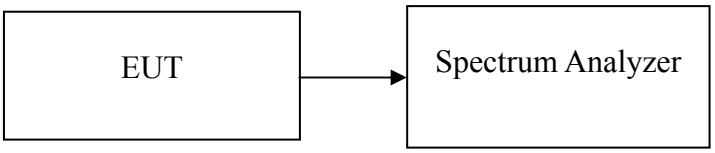
Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	19.918	12.99	23.99	24.00
Mid	5580	19.794	12.97	23.97	24.00
High	5700	19.824	12.97	23.97	24.00

Test mode: IEEE 802.11n HT 20 MHz Channel mode/ 5500 ~ 5700MHz

Channel	Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	Conducted 11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	20.252	13.06	24.06	24.00
Mid	5580	20.094	13.03	24.03	24.00
High	5700	20.211	13.06	24.06	24.00

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.

Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times

TEST RESULTS

No non-compliance noted

Test Data

For FCC

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

Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5180	9.14	9.18	16.945	PASS
Mid	5220	9.9	9.94	16.949	PASS
High	5240	10	10.04	16.917	PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5180	9.45	9.49	17.00	PASS
Mid	5220	9.8	9.84	17.00	PASS
High	5240	9.77	9.81	17.00	PASS

Test mode: IEEE 802.11a mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5260	9.4	9.44	23.93	PASS
Mid	5280	9.36	9.40	23.97	PASS
High	5320	9.78	9.82	23.88	PASS

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5260	9.38	9.42	24.00	PASS
Mid	5280	10.29	10.33	24.00	PASS
High	5320	9.51	9.55	24.00	PASS

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5500	11.1	11.14	23.99	PASS
Mid	5580	10.44	10.48	23.97	PASS
High	5700	7.86	7.90	23.97	PASS

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

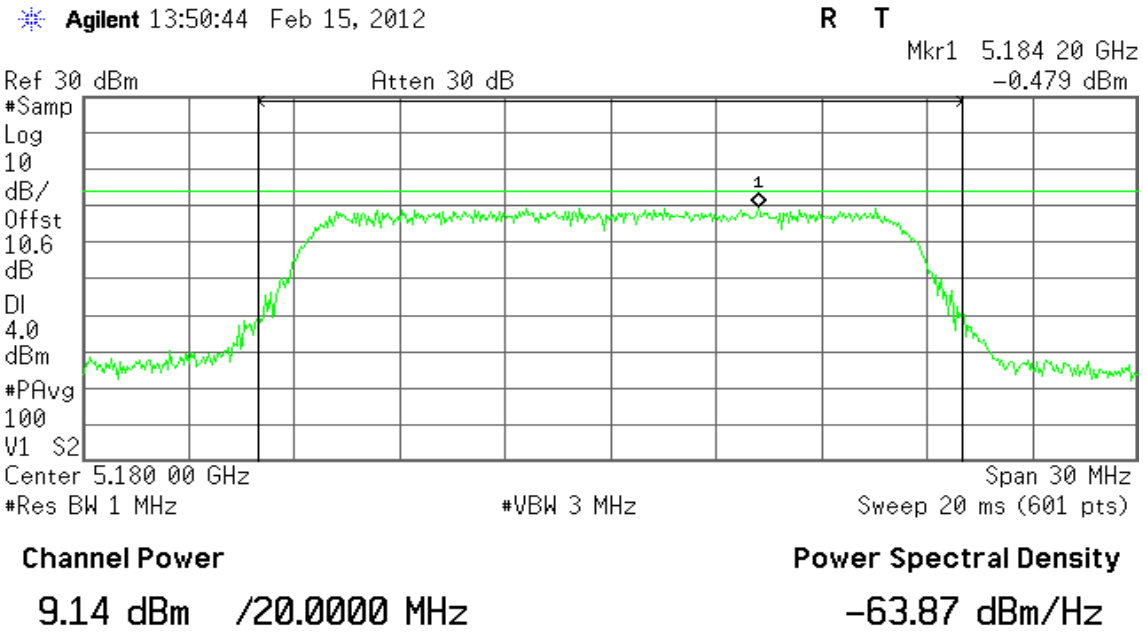
Channel	Frequency (MHz)	Output Power (dBm)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	5500	10.41	10.45	24.00	PASS
Mid	5580	10.09	10.13	24.00	PASS
High	5700	8.29	8.33	24.00	PASS

Remark: *1. Maximum Conducted Output Power=Conducted Output Power+10 log(1/x)*
2. 10 1og (1/x)=0.0436481, x=Duty cycle(0.99%)

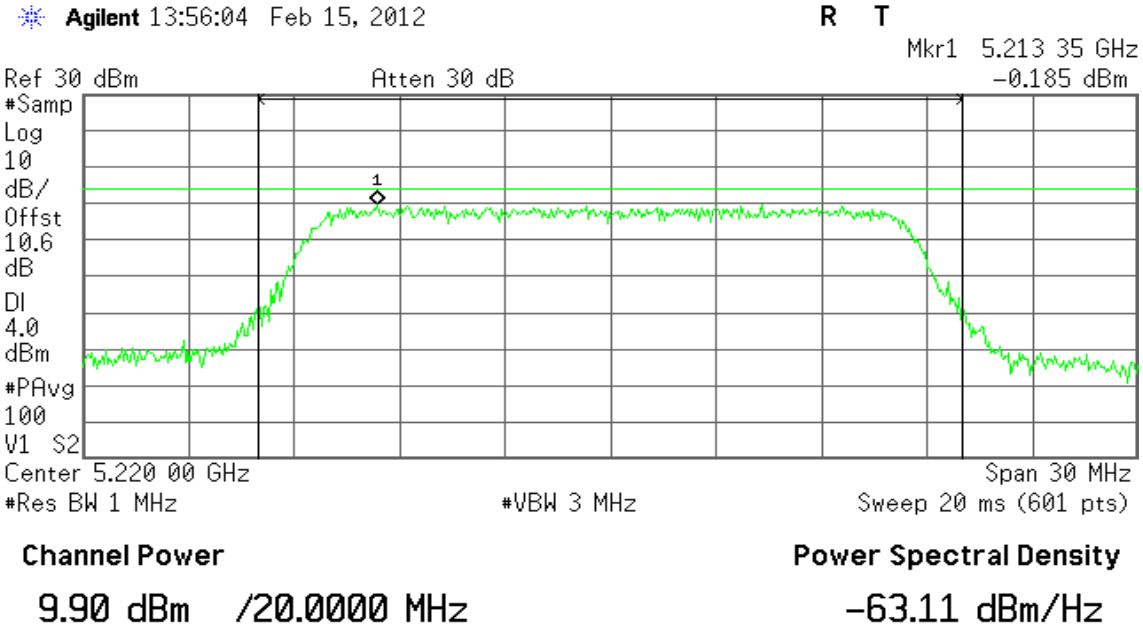
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

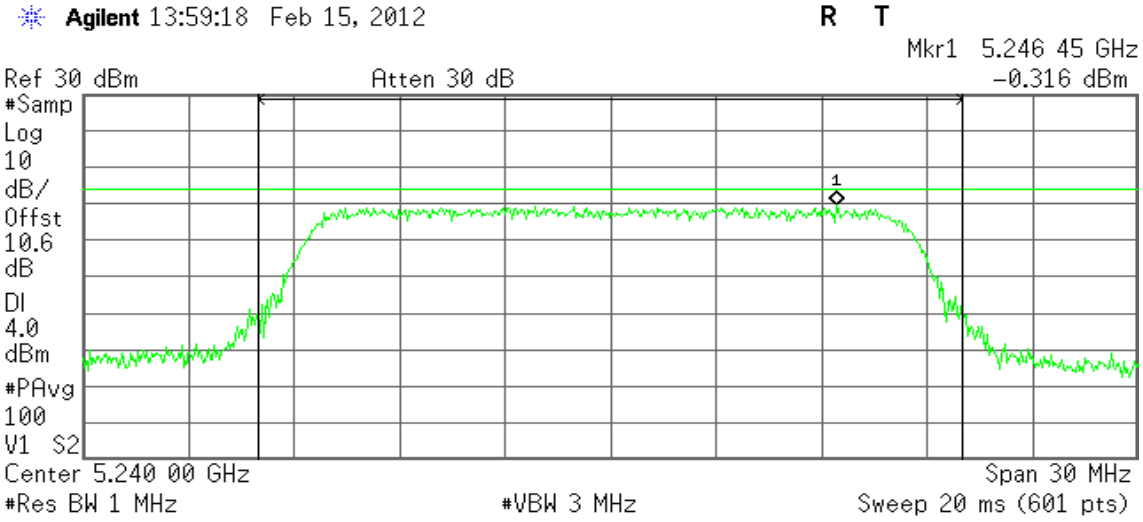
CH Low



CH Mid

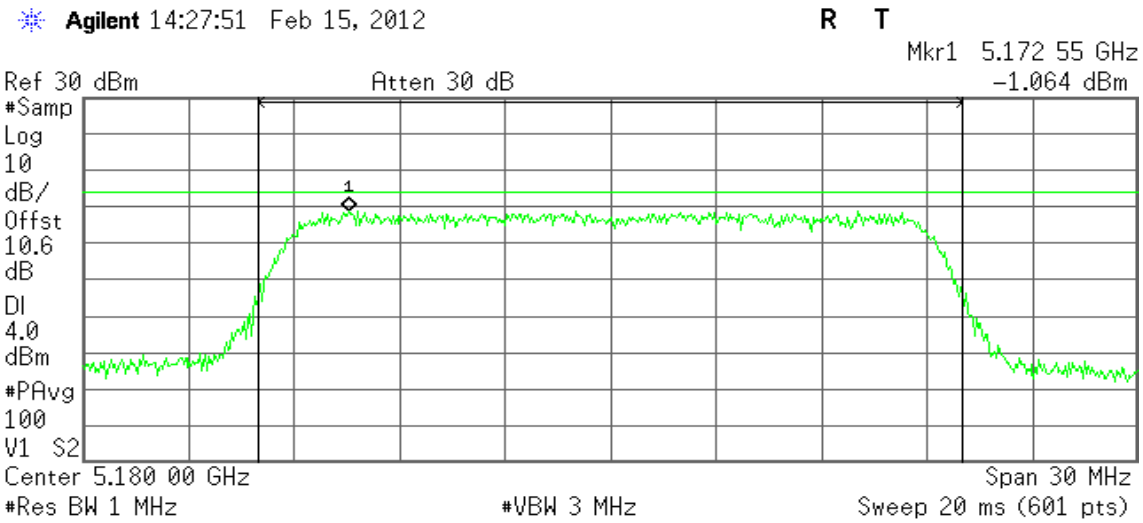


CH High

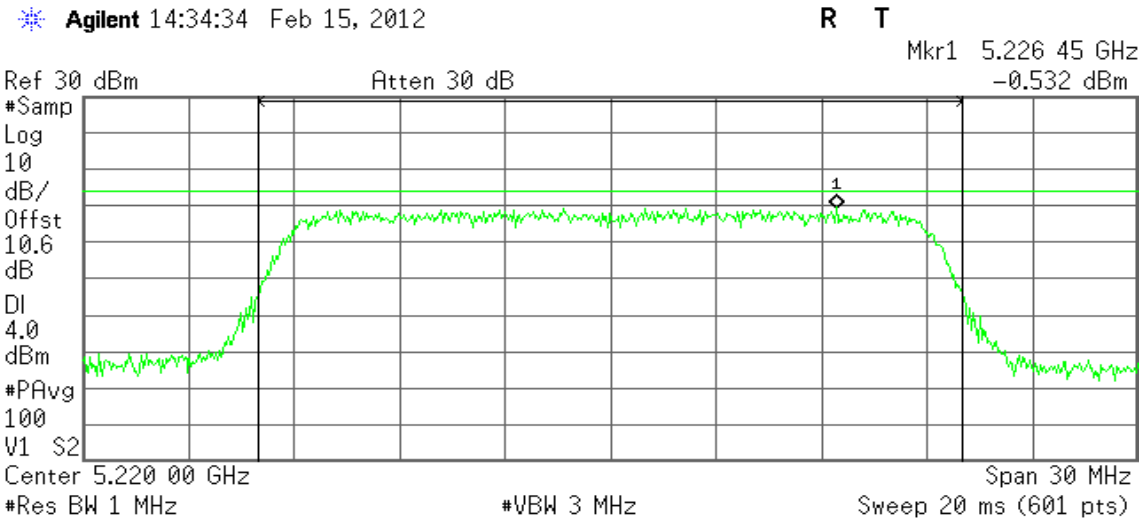


IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

CH Low



CH Mid



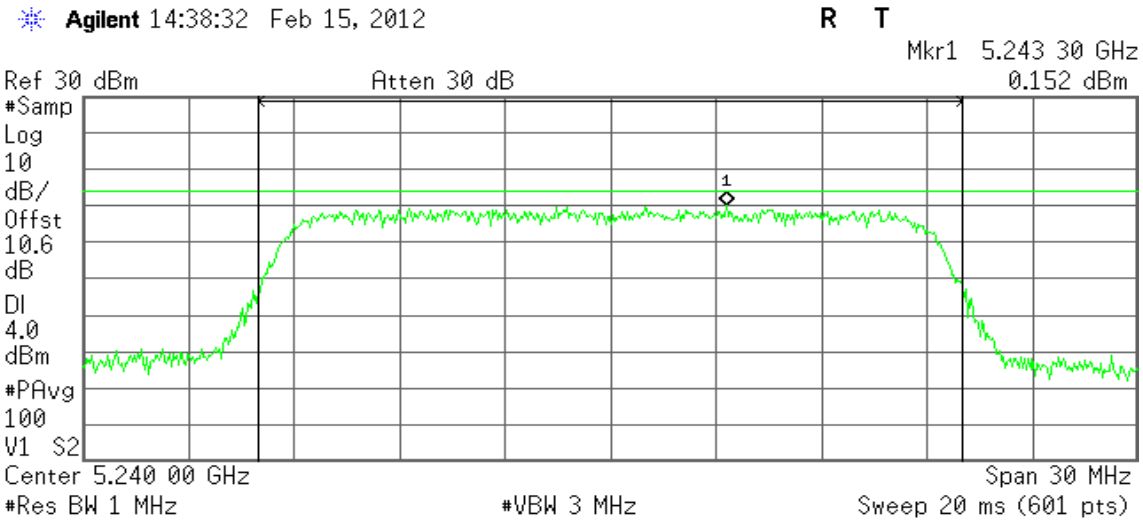
Channel Power

9.80 dBm /20.0000 MHz

Power Spectral Density

-63.21 dBm/Hz

CH High



Channel Power

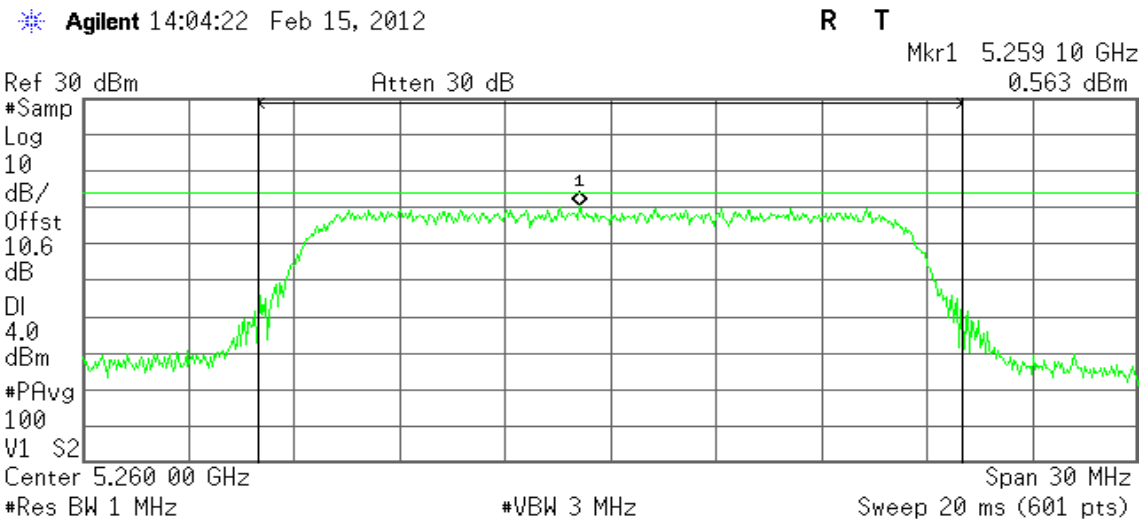
9.77 dBm /20.0000 MHz

Power Spectral Density

-63.25 dBm/Hz

IEEE 802.11a mode / 5260 ~ 5320MHz

CH Low



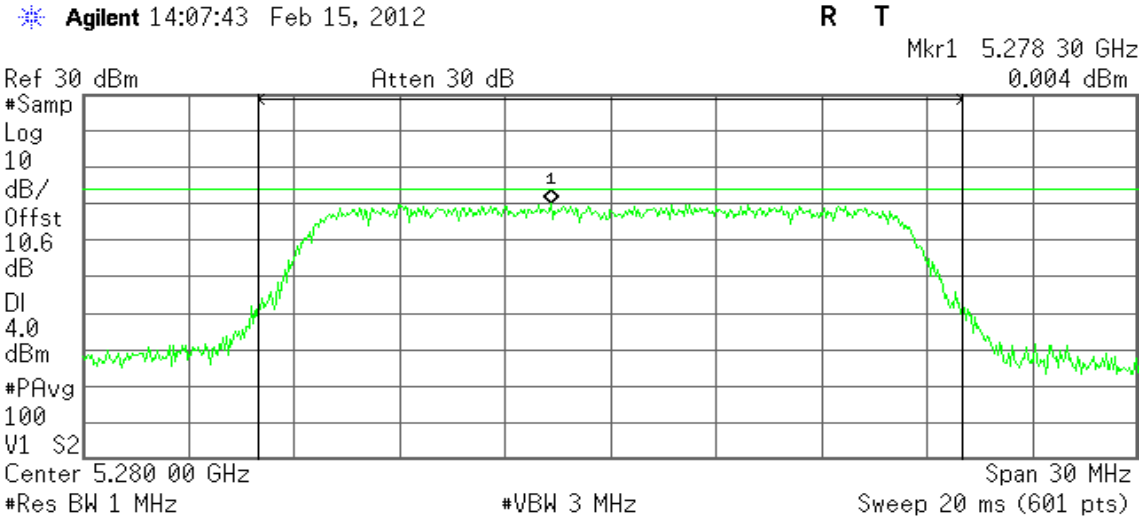
Channel Power

9.40 dBm /20.0000 MHz

Power Spectral Density

-63.61 dBm/Hz

CH Mid



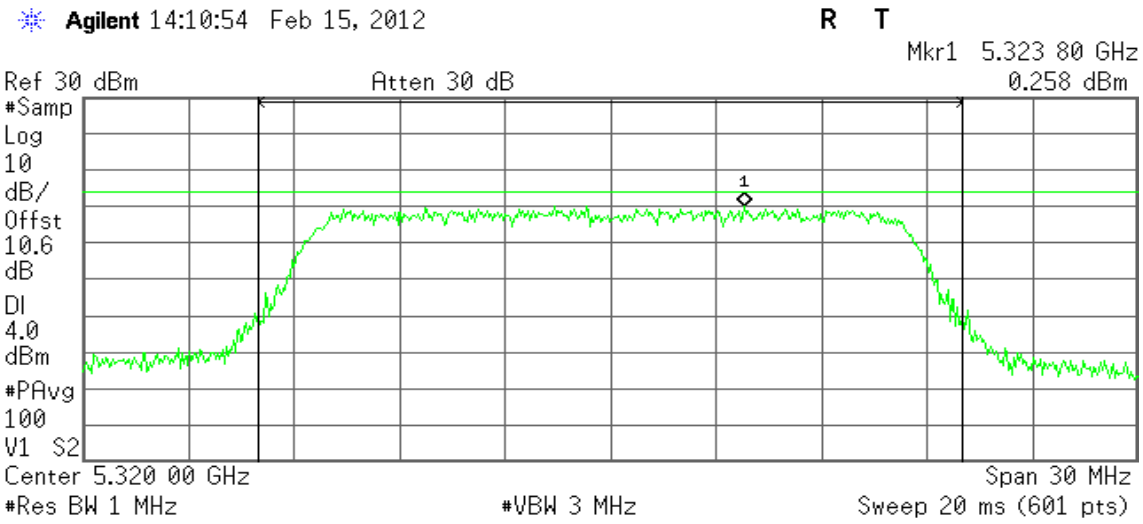
Channel Power

9.36 dBm /20.0000 MHz

Power Spectral Density

-63.65 dBm/Hz

CH High



Channel Power

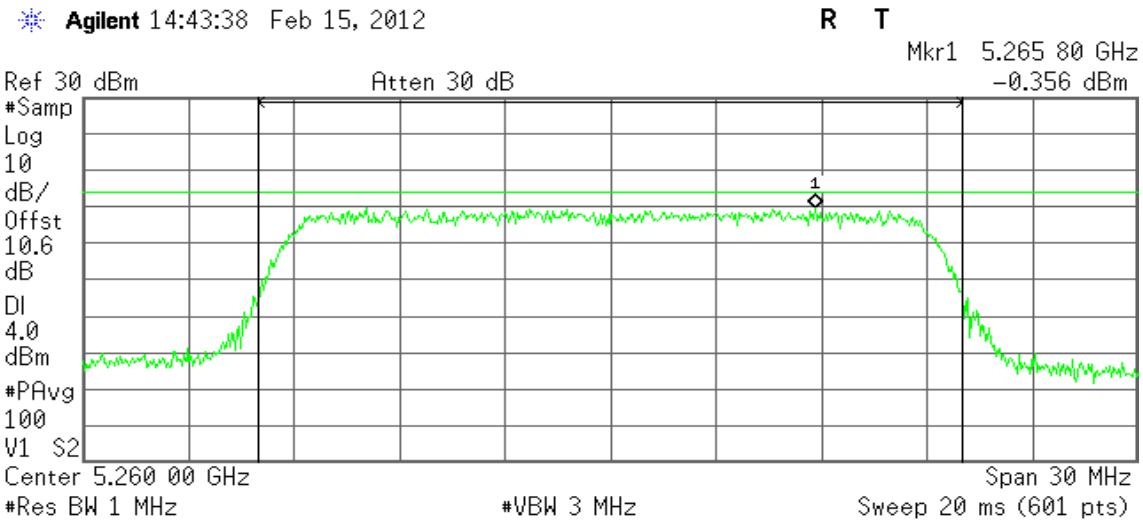
9.78 dBm /20.0000 MHz

Power Spectral Density

-63.23 dBm/Hz

IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

CH Low



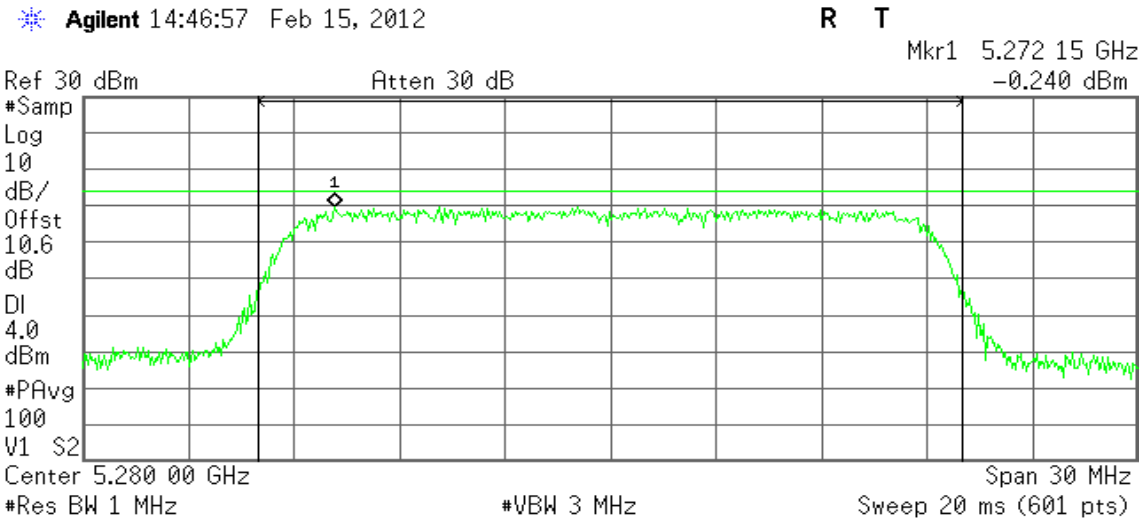
Channel Power

9.38 dBm /20.0000 MHz

Power Spectral Density

-63.63 dBm/Hz

CH Mid



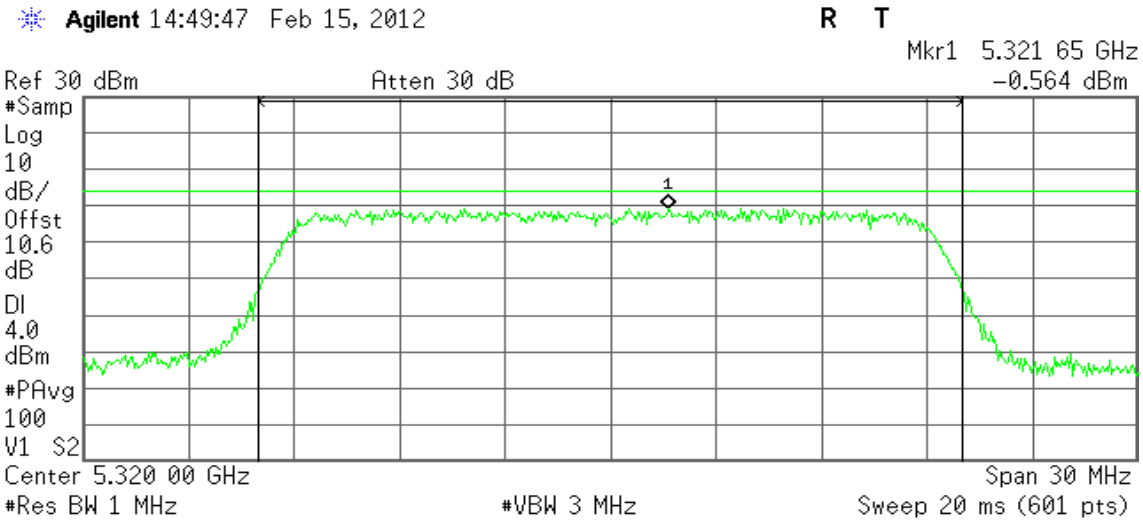
Channel Power

10.29 dBm /20.0000 MHz

Power Spectral Density

-62.72 dBm/Hz

CH High



Channel Power

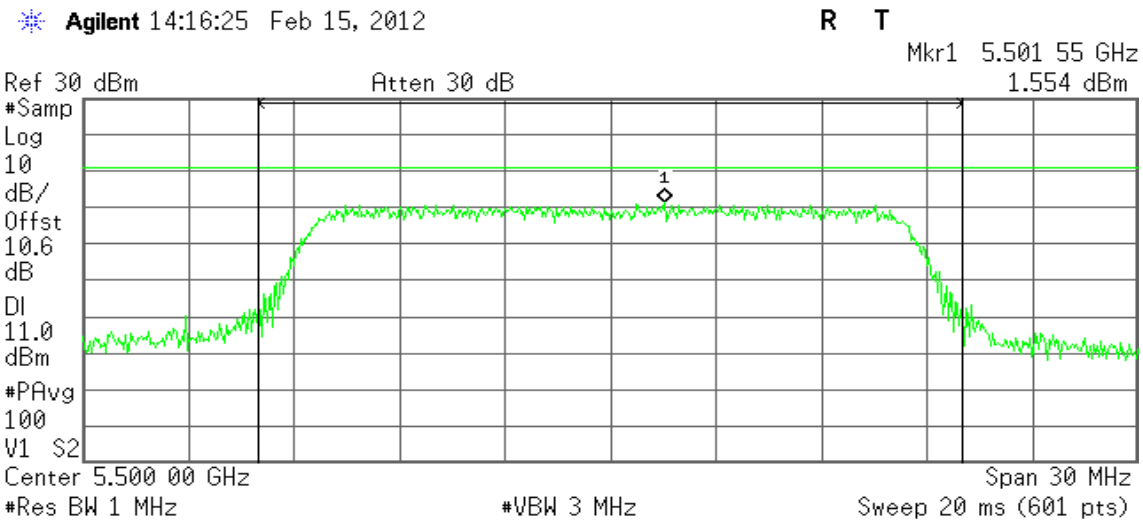
9.51 dBm /20.0000 MHz

Power Spectral Density

-63.50 dBm/Hz

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

CH Low



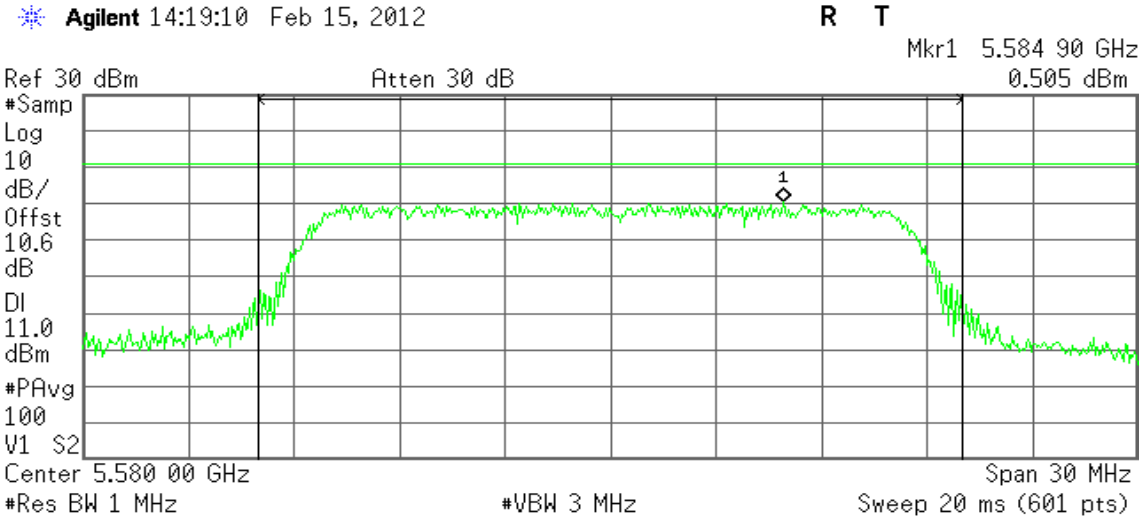
Channel Power

11.10 dBm /20.0000 MHz

Power Spectral Density

-61.91 dBm/Hz

CH Mid



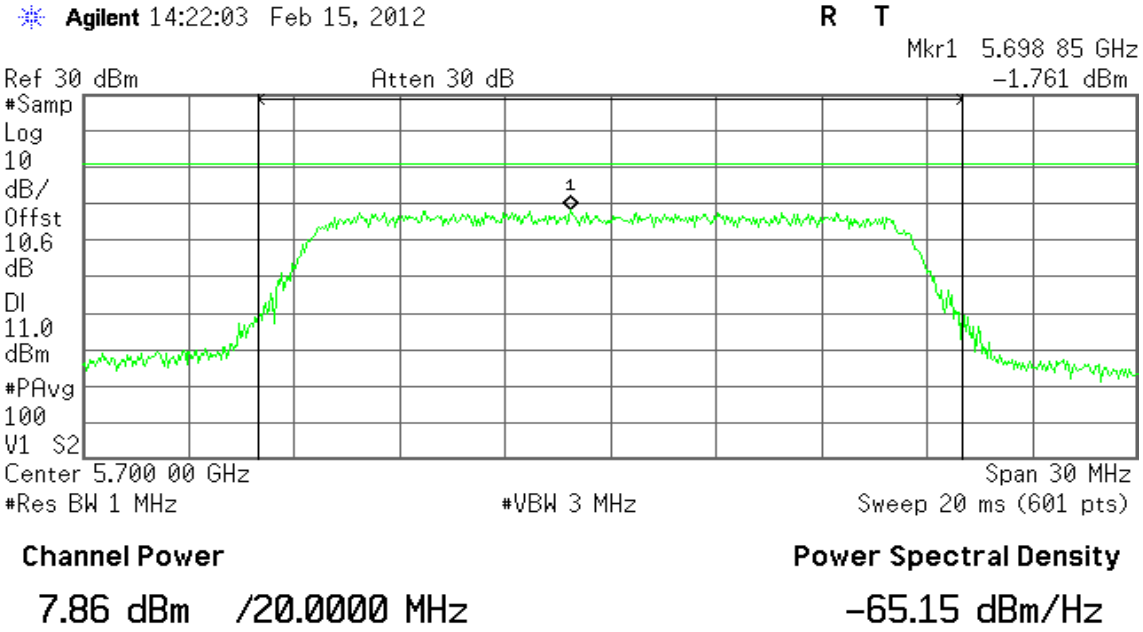
Channel Power

10.44 dBm /20.0000 MHz

Power Spectral Density

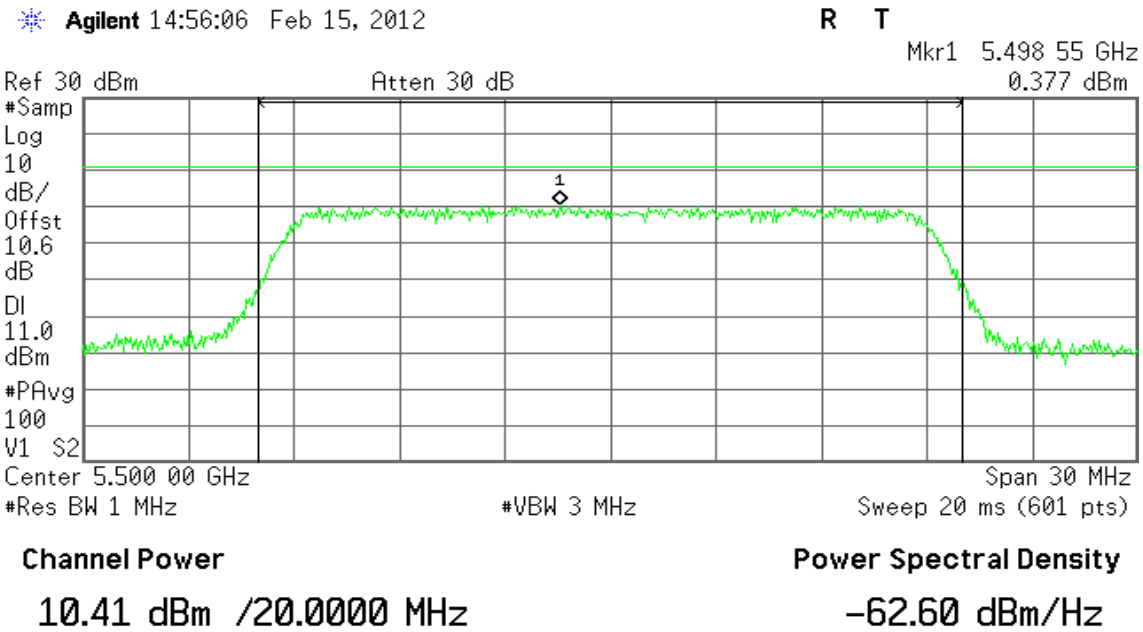
-62.57 dBm/Hz

CH High

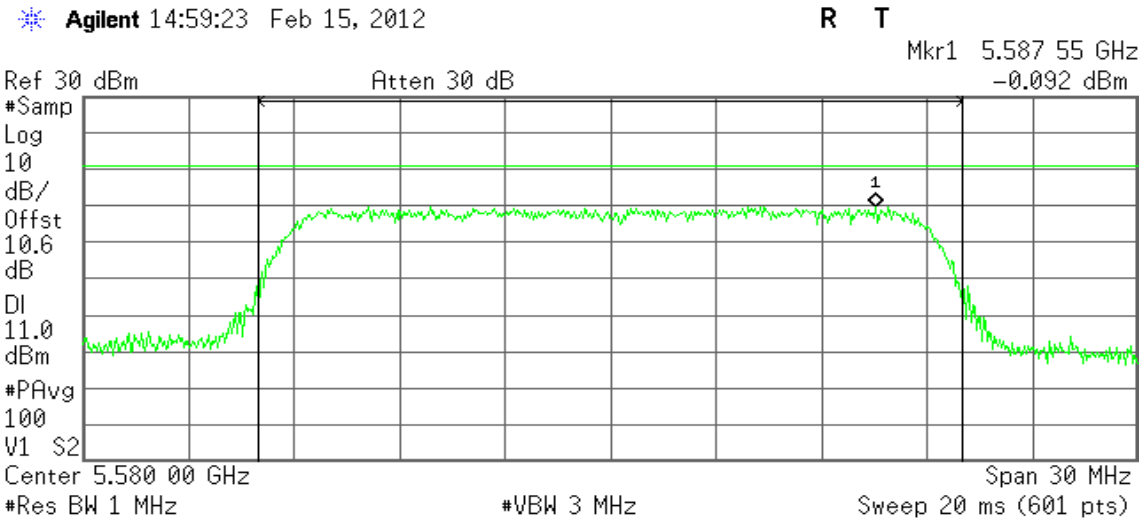


IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

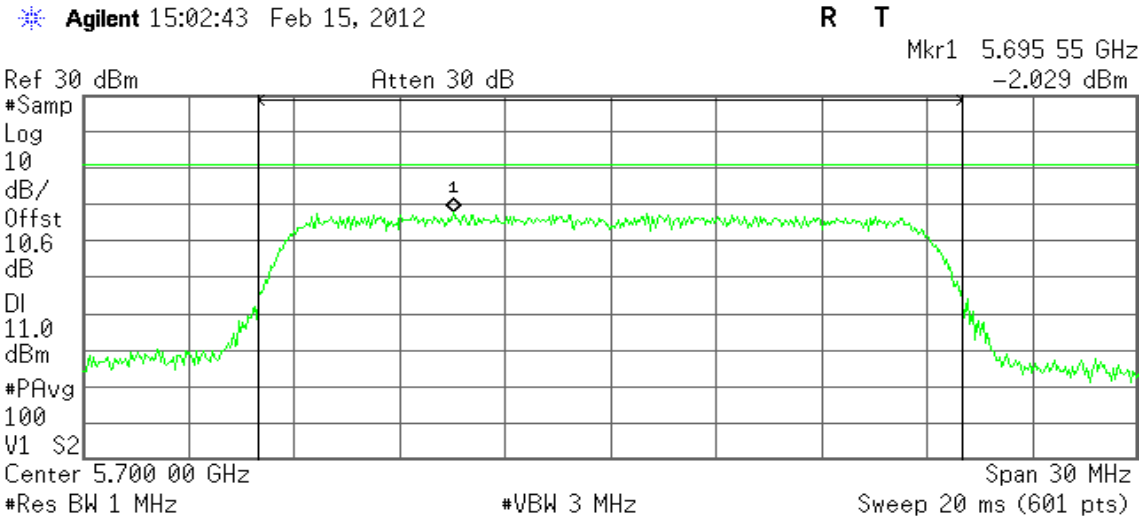
CH Low



CH Mid



CH High



7.4 BAND EDGES MEASUREMENT

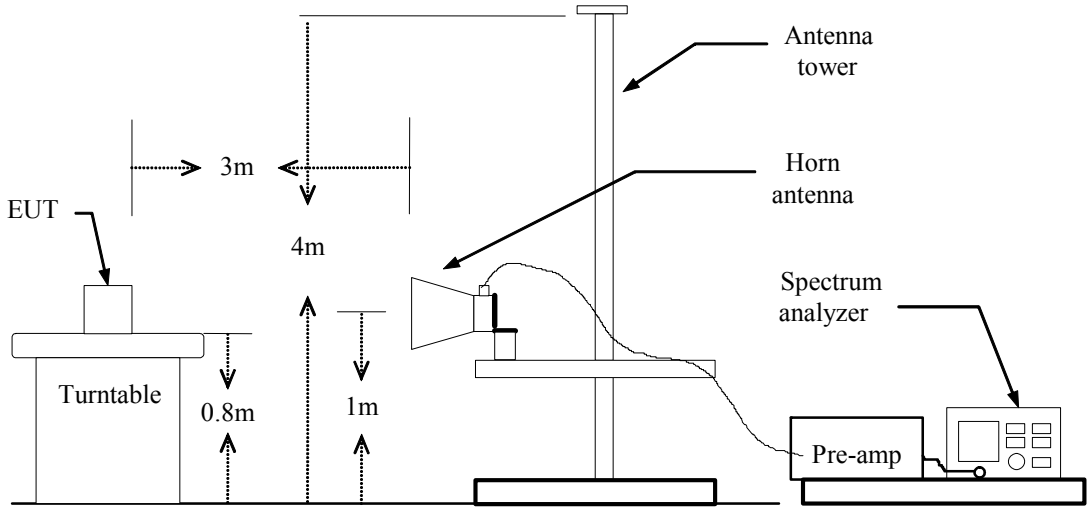
LIMIT

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=1MHz VBW=3MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz
   duty cycle ≥ 98 percent, set VBW ≤ RBW/100 but not less than 10 Hz.
   duty cycle < 98 percent, set VBW ≥ 1/*T*
   (c) / 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.

A mode duty cycle

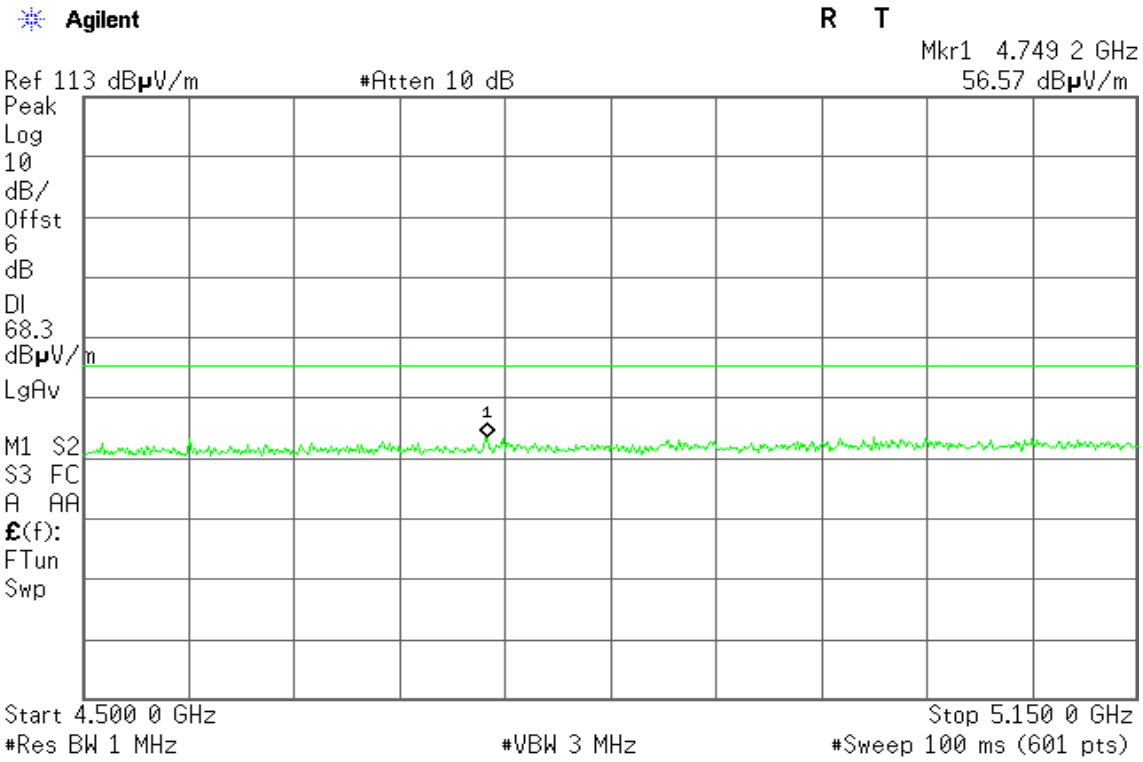
Duty cycle >98%
VBW=11Hz

A 20 Mode duty cycle

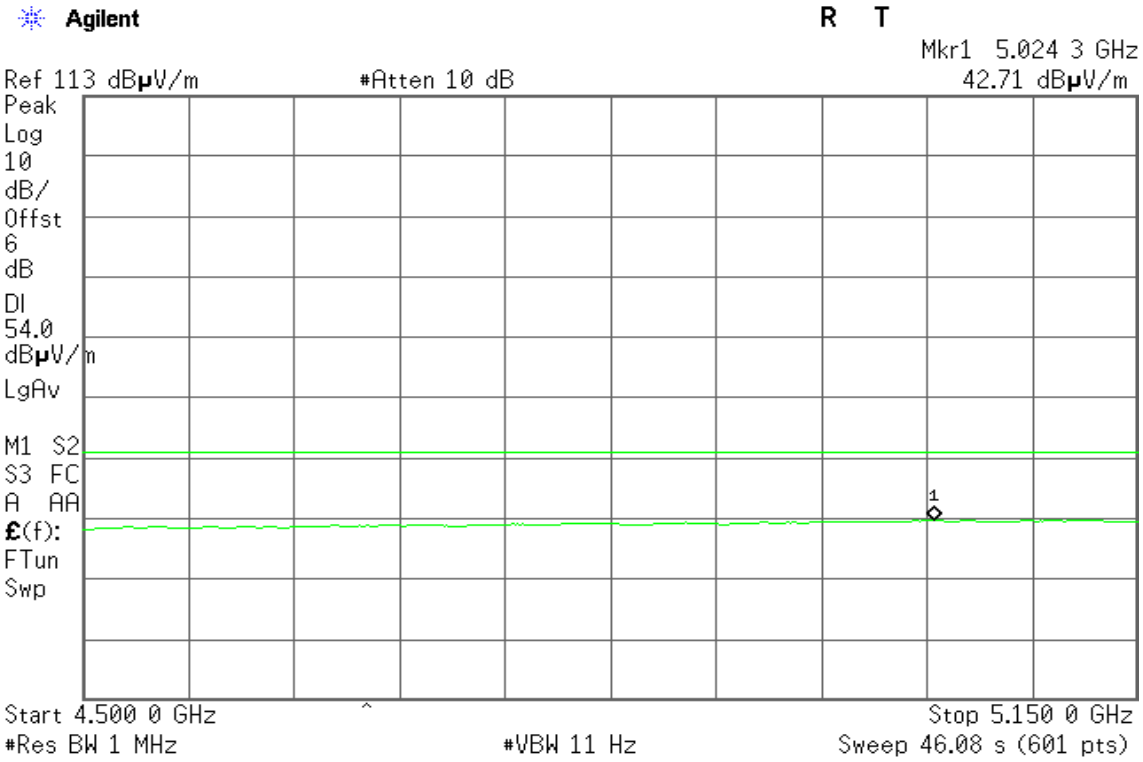
Duty cycle >98%
VBW=11Hz

Band Edges (IEEE 802.11a mode / 5180 MHz)

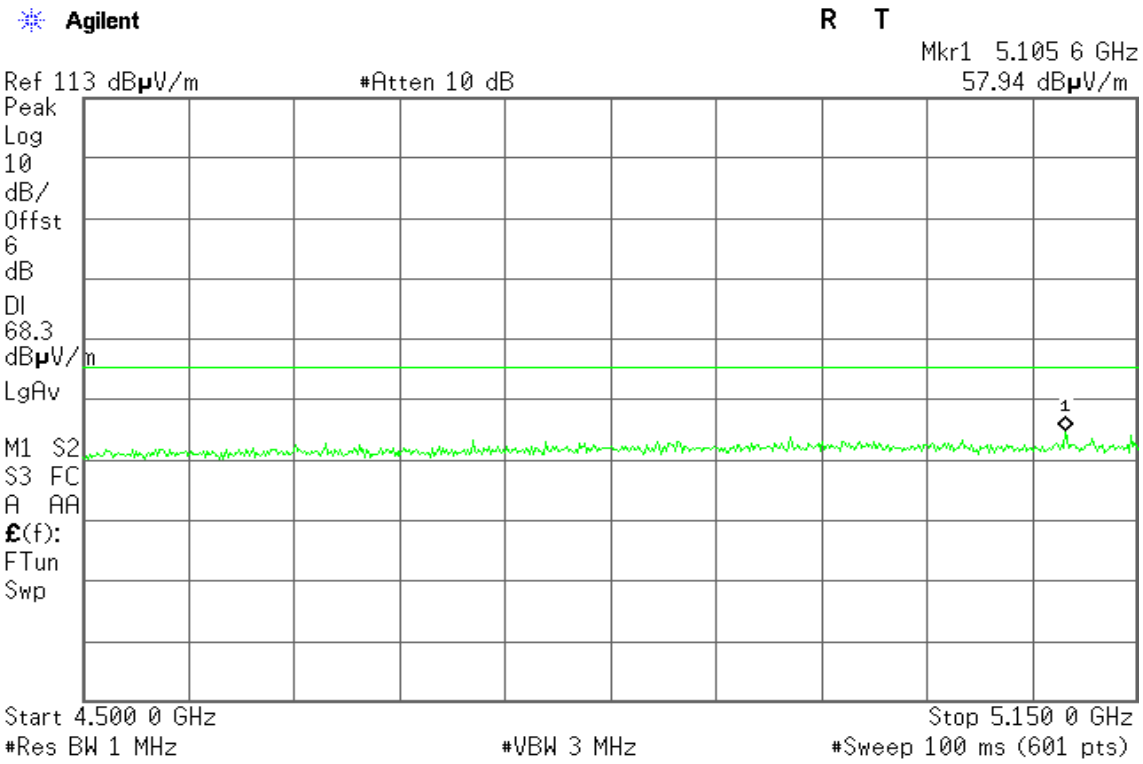
Detector mode: Peak **Polarity: Vertical**



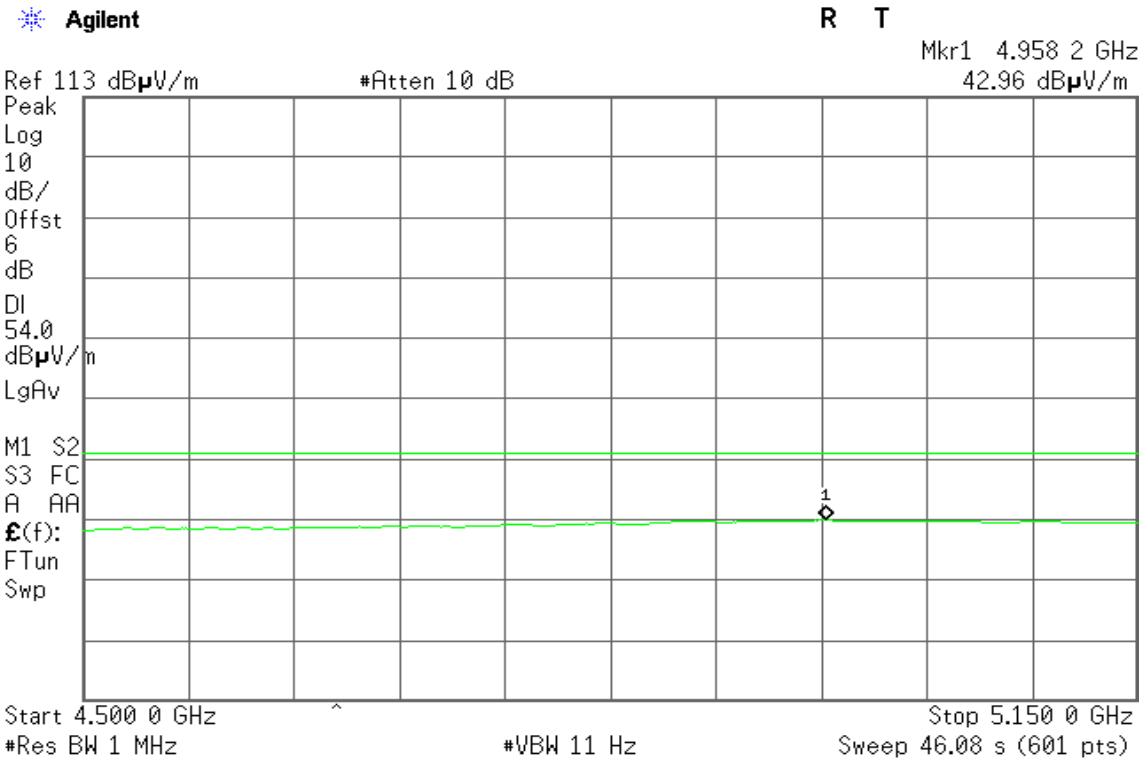
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

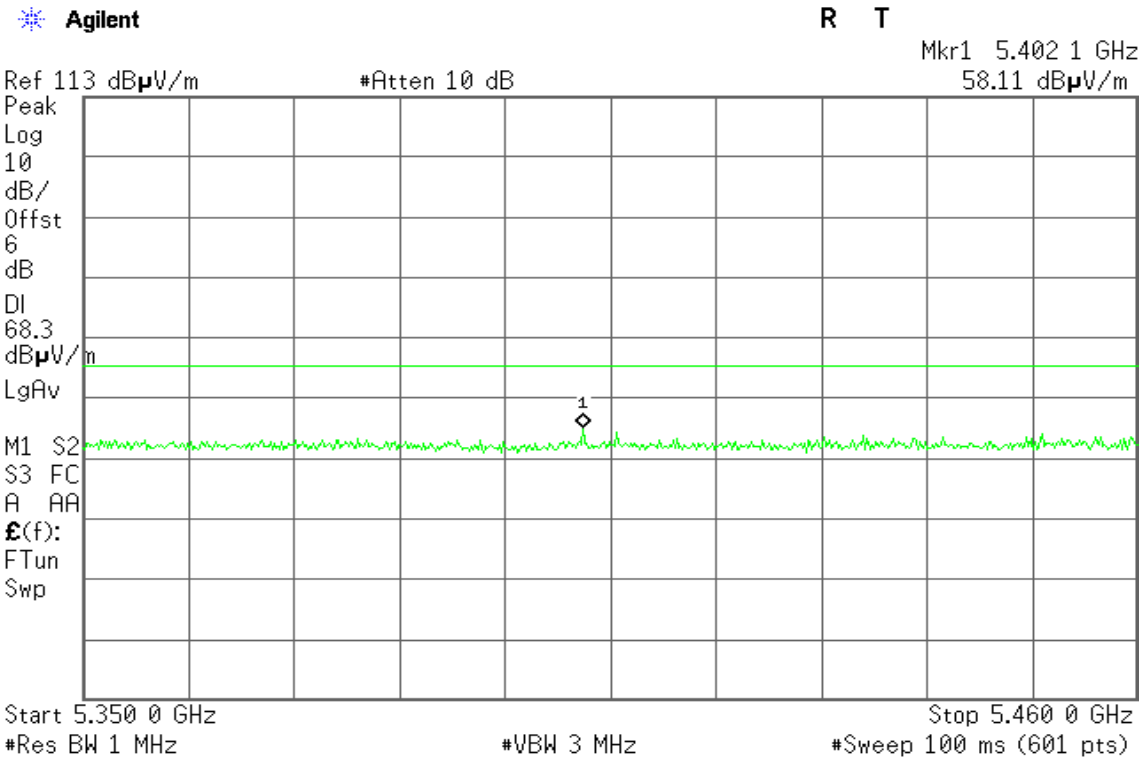


Detector mode: Average **Polarity: Horizontal**

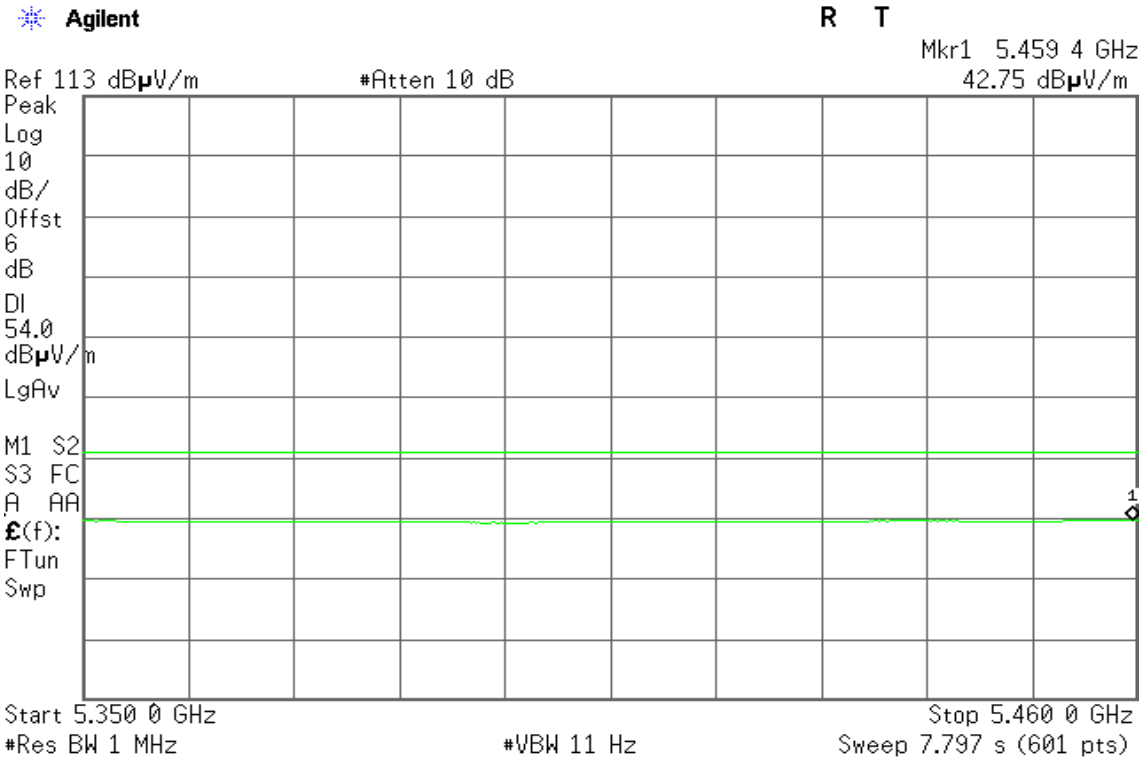


Band Edges (IEEE 802.11a mode / 5320 MHz)

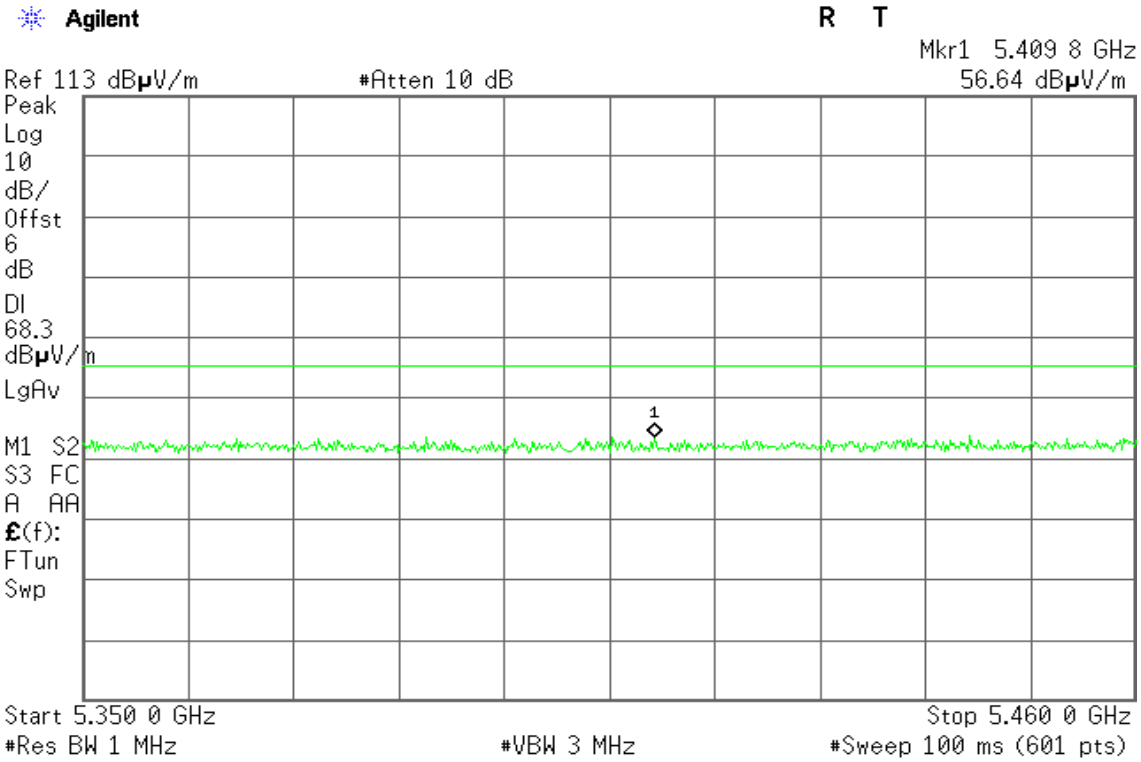
Detector mode: Peak **Polarity: Vertical**



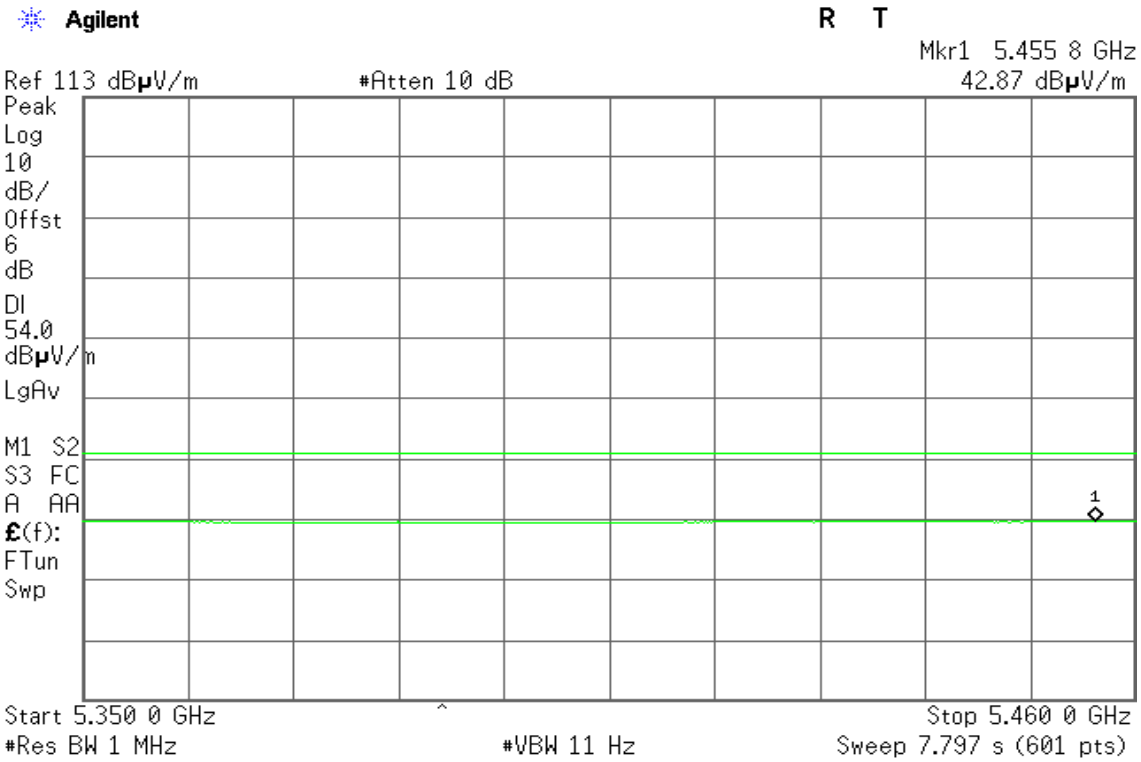
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

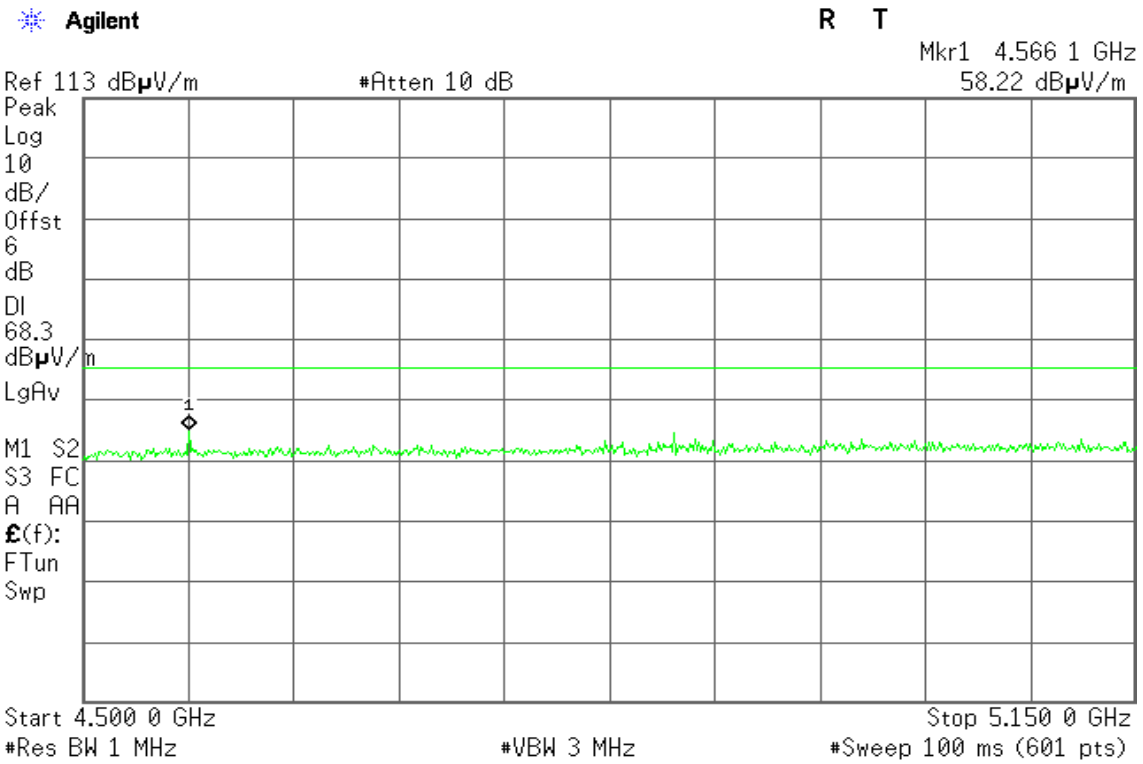


Detector mode: Average **Polarity: Horizontal**

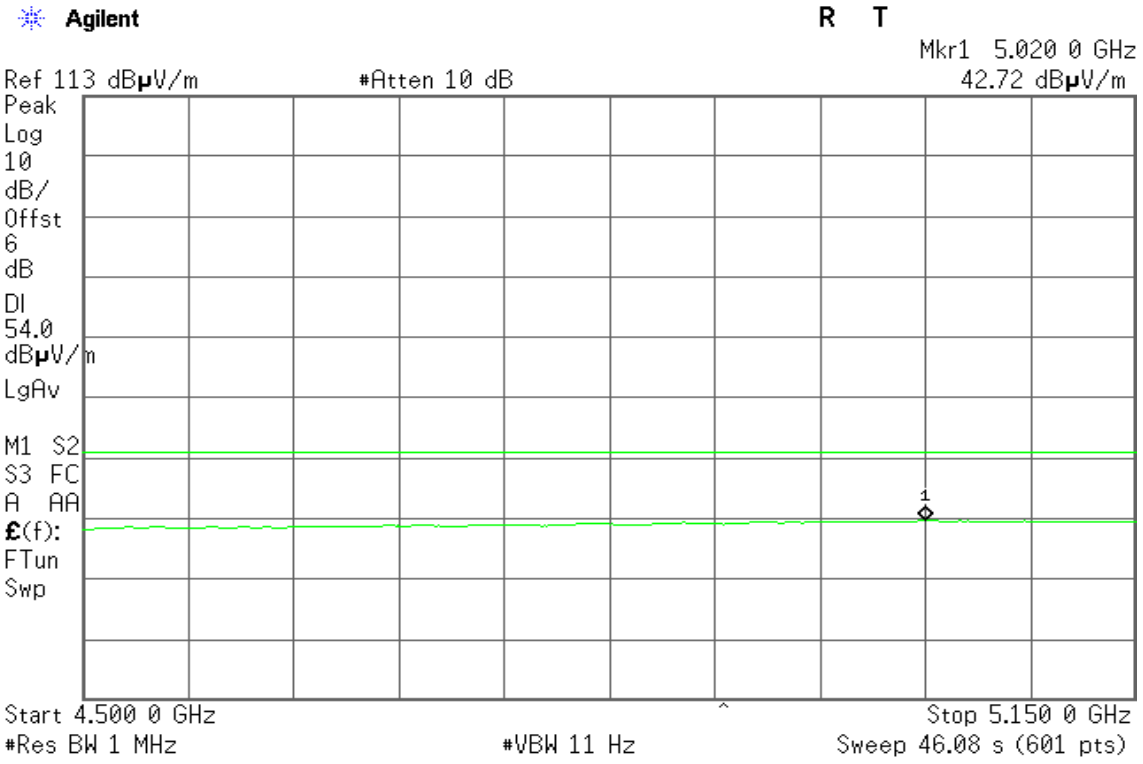


Band Edges (IEEE 802.11n HT 20 MHz Channel mode / 5180 MHz)

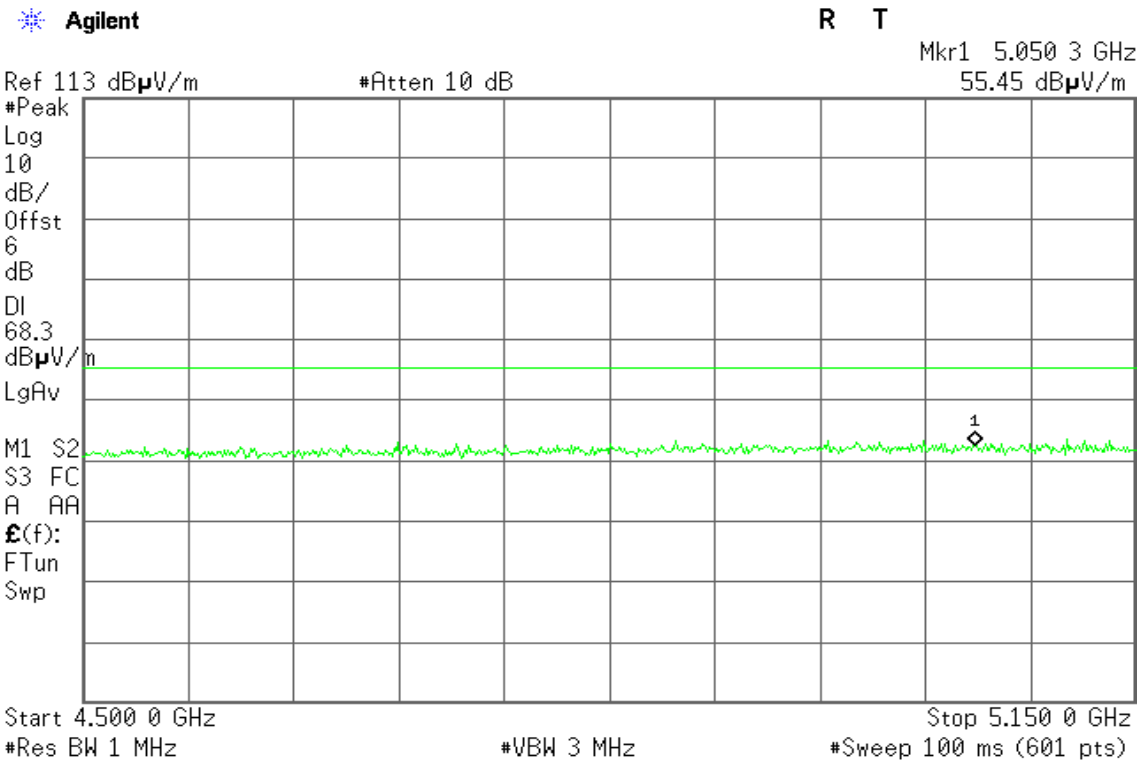
Detector mode: Peak **Polarity: Vertical**



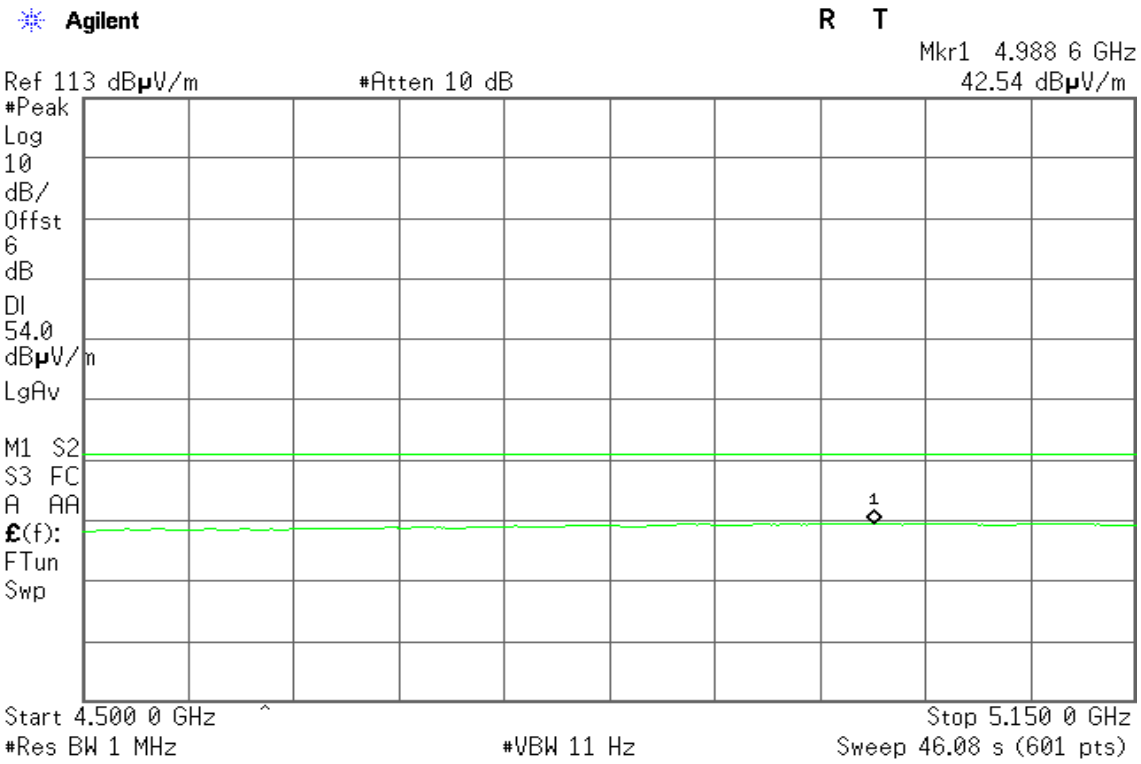
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

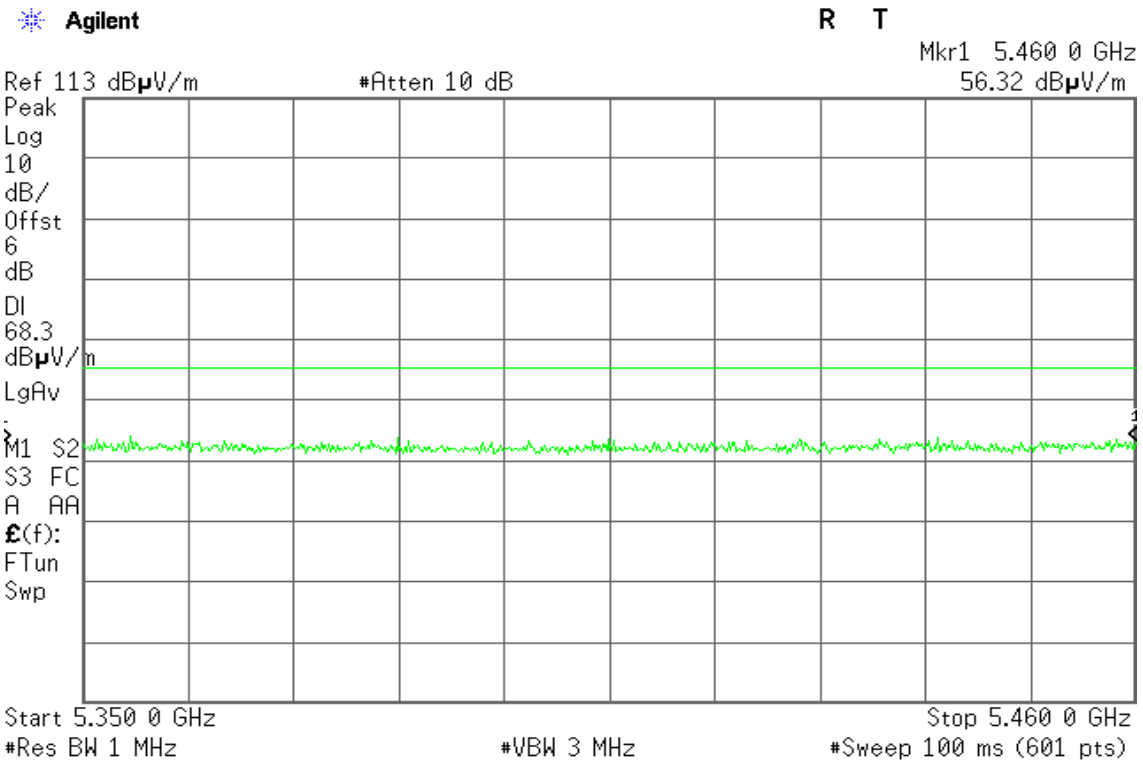


Detector mode: Average **Polarity: Horizontal**

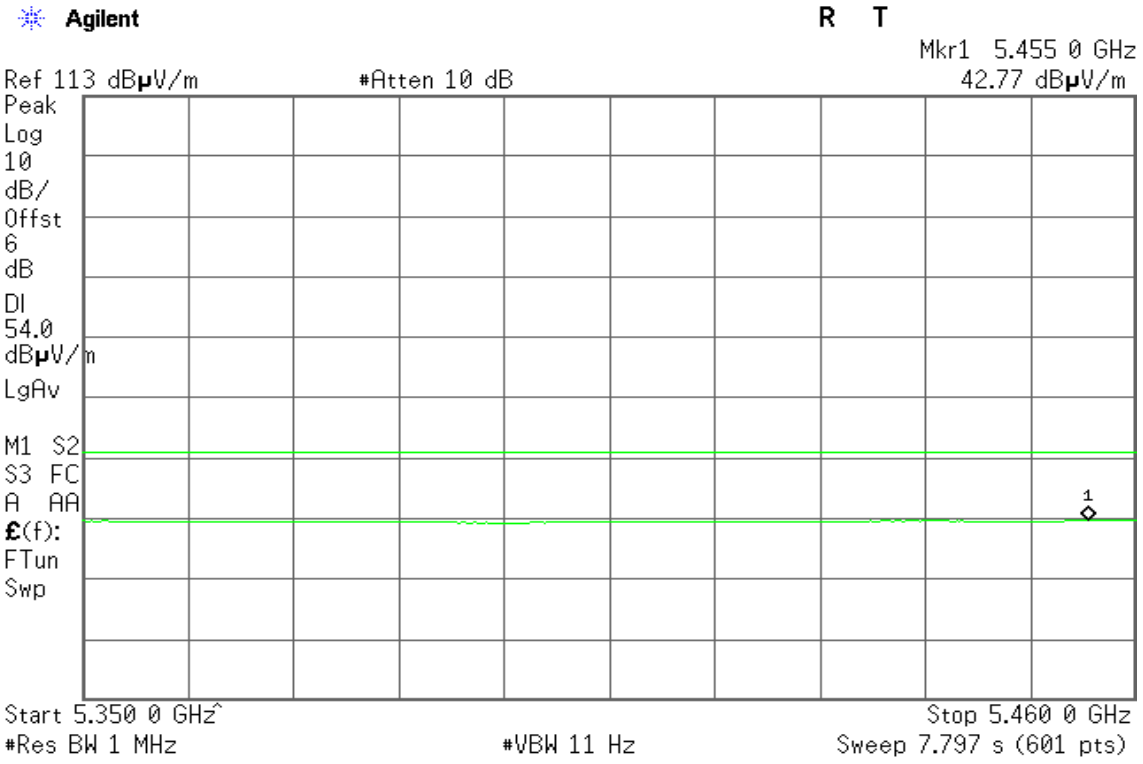


Band Edges (IEEE 802.11n HT 20 MHz Channel mode / 5320 MHz)

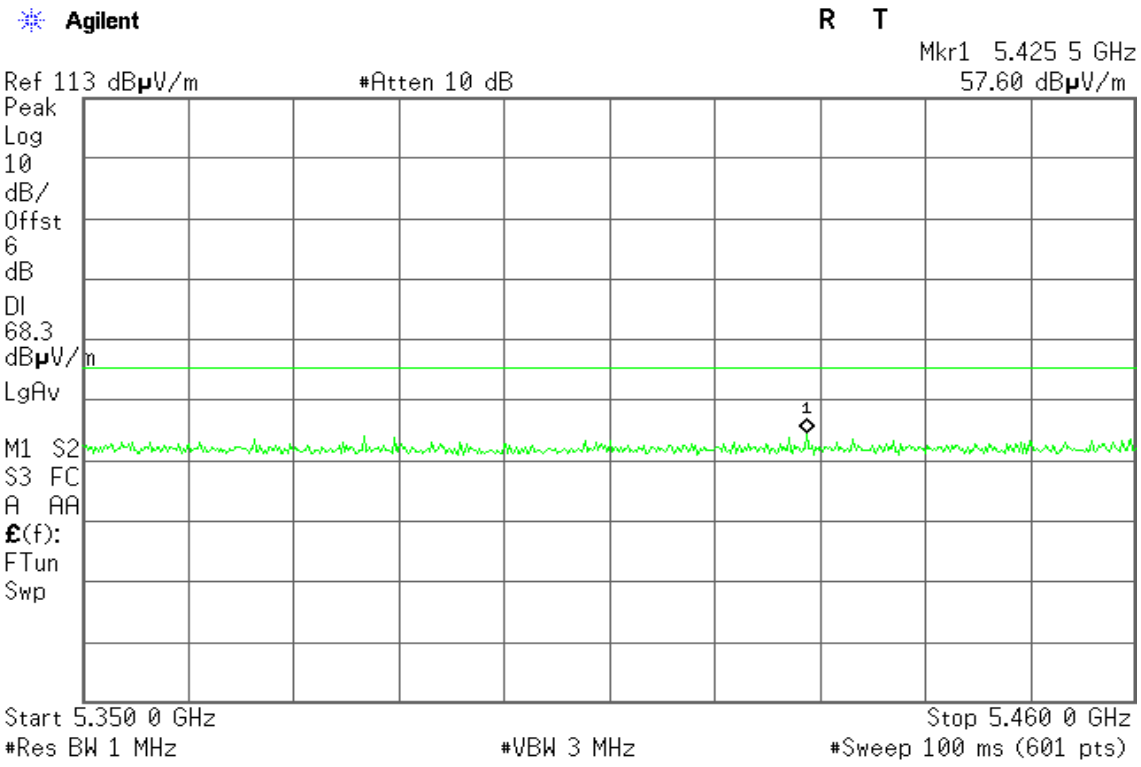
Detector mode: Peak **Polarity: Vertical**



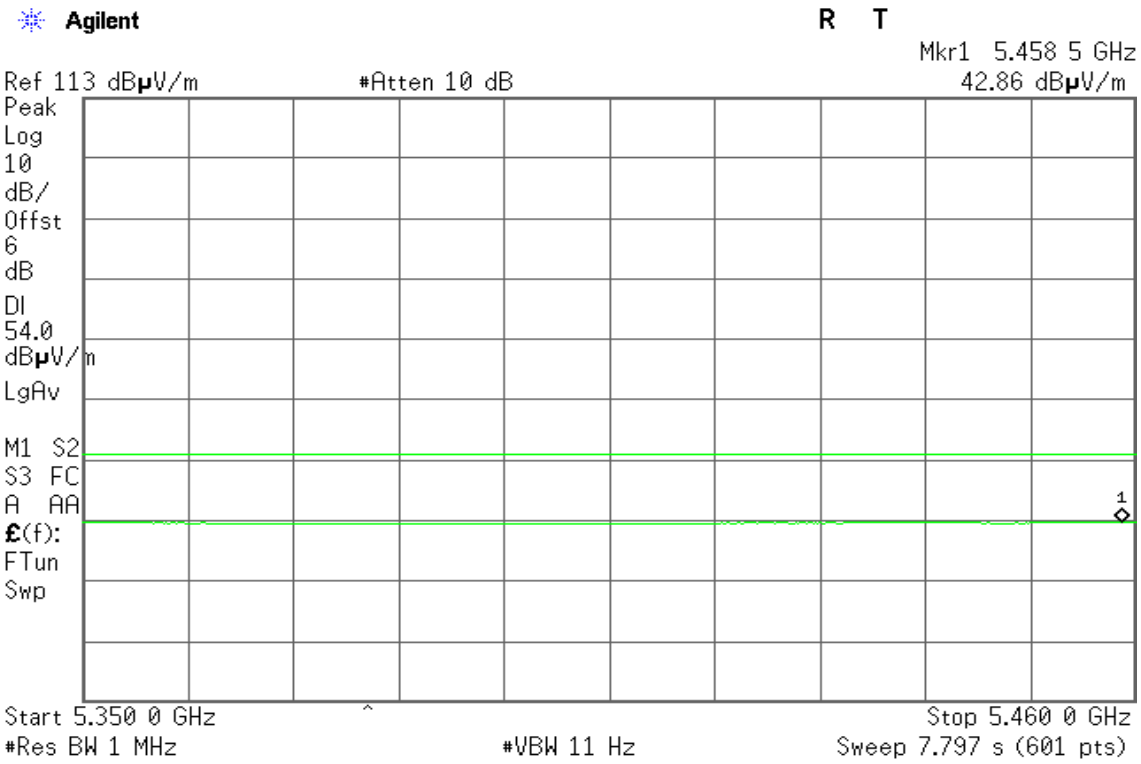
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

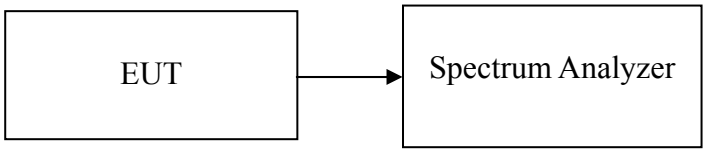
According to §15.407(a)

(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,and 5.47-5.725 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 = Sweep= AUTO
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed

   duty cycle ≥ 98 add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.

TEST RESULTS

No non-compliance noted

Test Data

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

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-0.48	-0.44	4.00	-4.44	PASS
Mid	5220	-0.19	-0.14	4.00	-4.14	PASS
High	5240	-0.32	-0.27	4.00	-4.27	PASS

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

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-1.06	-1.02	4.00	-5.02	PASS
Mid	5220	-0.53	-0.49	4.00	-4.49	PASS
High	5240	0.15	0.20	4.00	-3.80	PASS

Test mode: IEEE 802.11a mode/ 5260 ~ 5320MHz

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5260	0.56	0.61	11.00	-10.39	PASS
Mid	5280	0.00	0.05	11.00	-10.95	PASS
High	5320	0.26	0.30	11.00	-10.70	PASS

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5260	-0.36	-0.31	11.00	-11.31	PASS
Mid	5280	-0.24	-0.20	11.00	-11.20	PASS
High	5320	-0.56	-0.52	11.00	-11.52	PASS

Remark: *1. Maximum Conducted Output Power=Conducted Output Power+10 log(1/x)*
2. 10 1og (1/x)=0.0436481, x=Duty cycle(0.99%)

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5500	1.55	1.60	11.00	-9.40	PASS
Mid	5580	0.51	0.55	11.00	-10.45	PASS
High	5700	-1.76	-1.72	11.00	-12.72	PASS

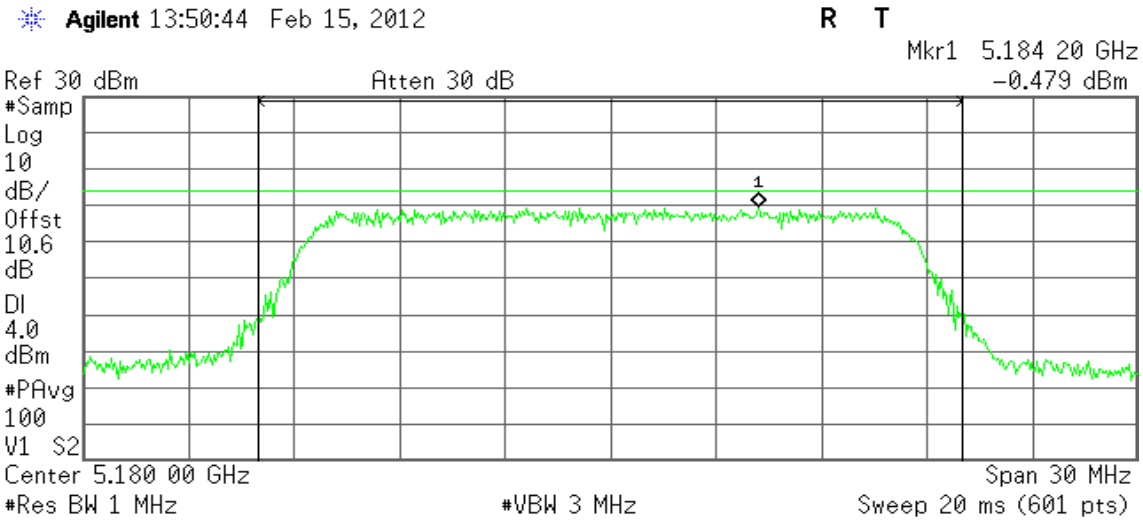
Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	PPSD (dBm)	MAX PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5500	0.38	0.42	11.00	-10.58	PASS
Mid	5580	-0.09	-0.05	11.00	-11.05	PASS
High	5700	-2.03	-1.99	11.00	-12.99	PASS

Remark: *1. Maximum Conducted Output Power=Conducted Output Power+10 log(1/x)*
2. 10 1og (1/x)=0.0436481, x=Duty cycle(0.99%)

Test Plot
IEEE 802.11a mode / 5180 ~ 5240MHz

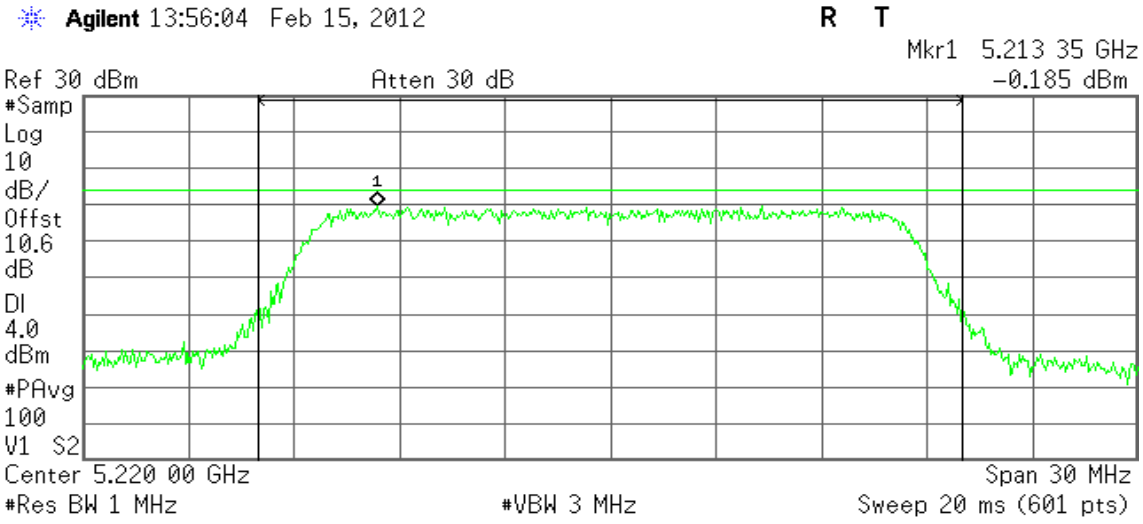
CH Low



Channel Power **Power Spectral Density**

9.14 dBm /20.0000 MHz -63.87 dBm/Hz

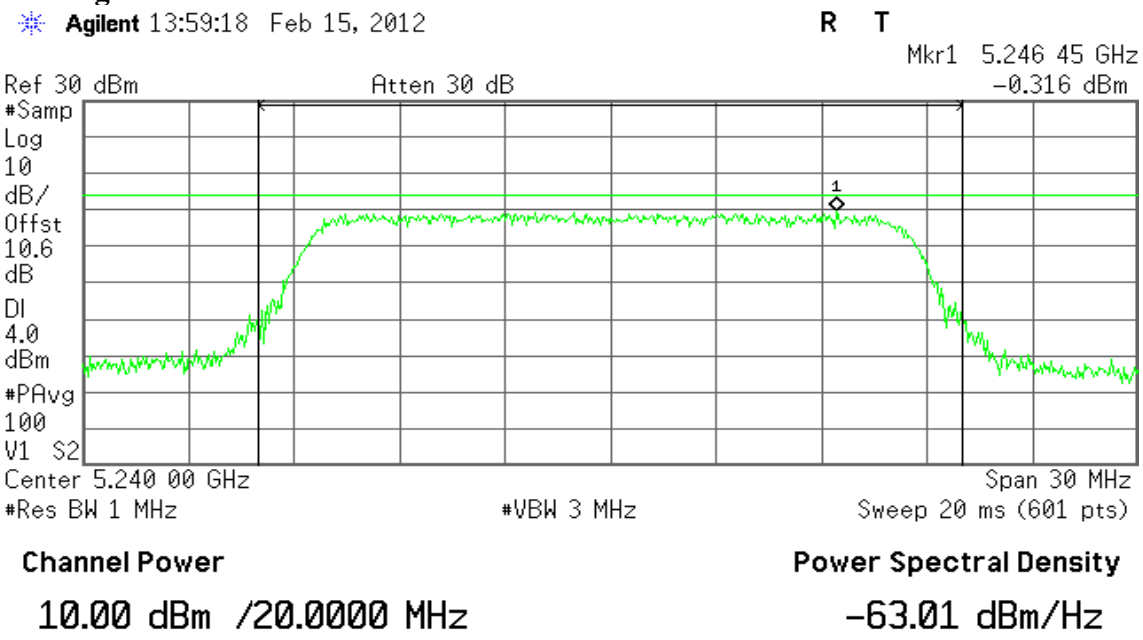
CH Mid



Channel Power **Power Spectral Density**

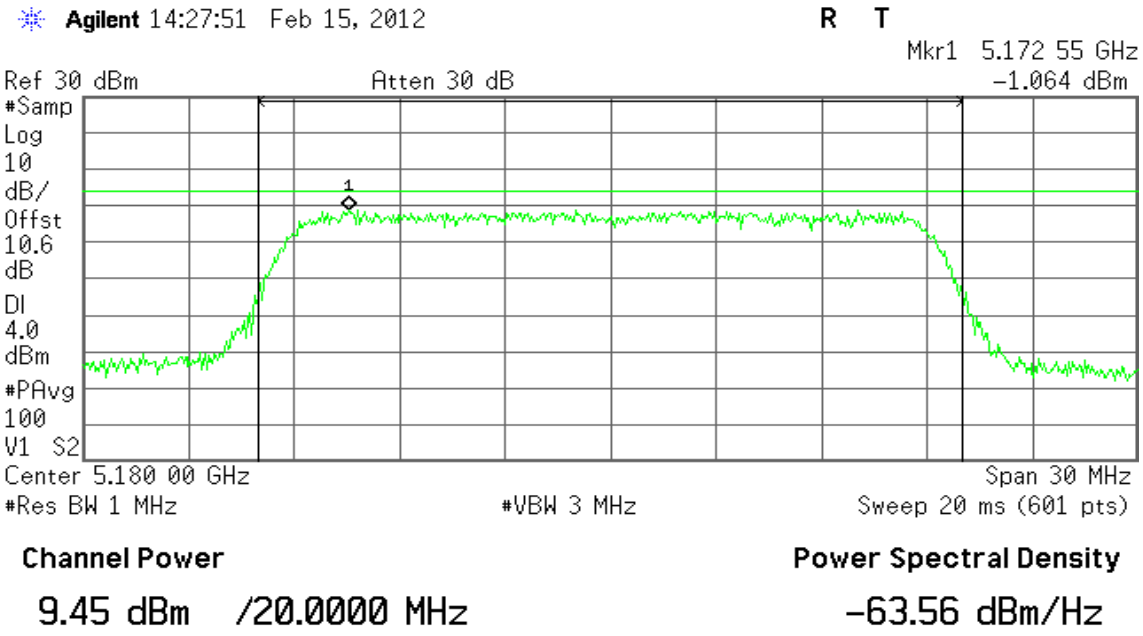
9.90 dBm /20.0000 MHz -63.11 dBm/Hz

CH High

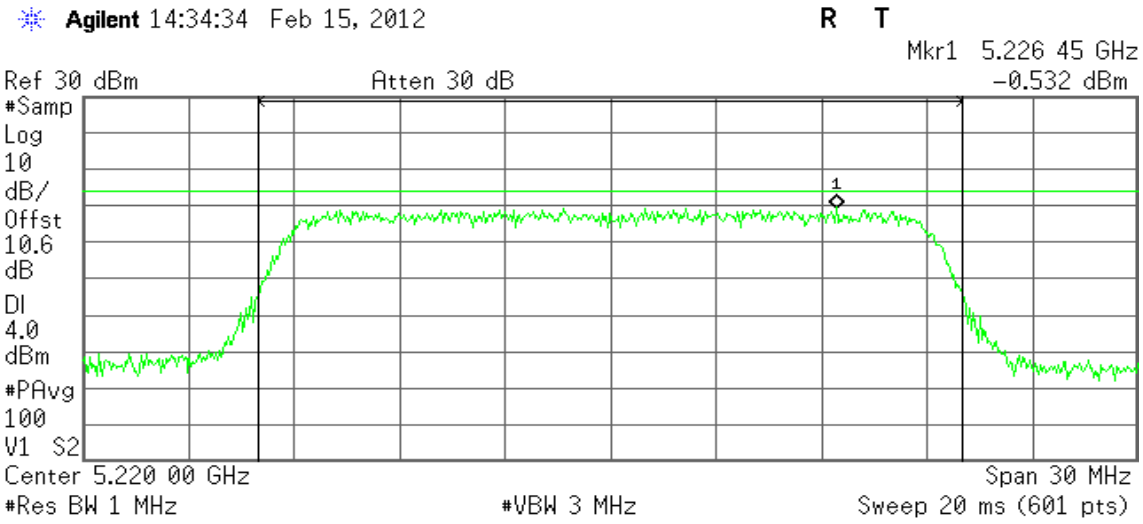


IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

CH Low



CH Mid



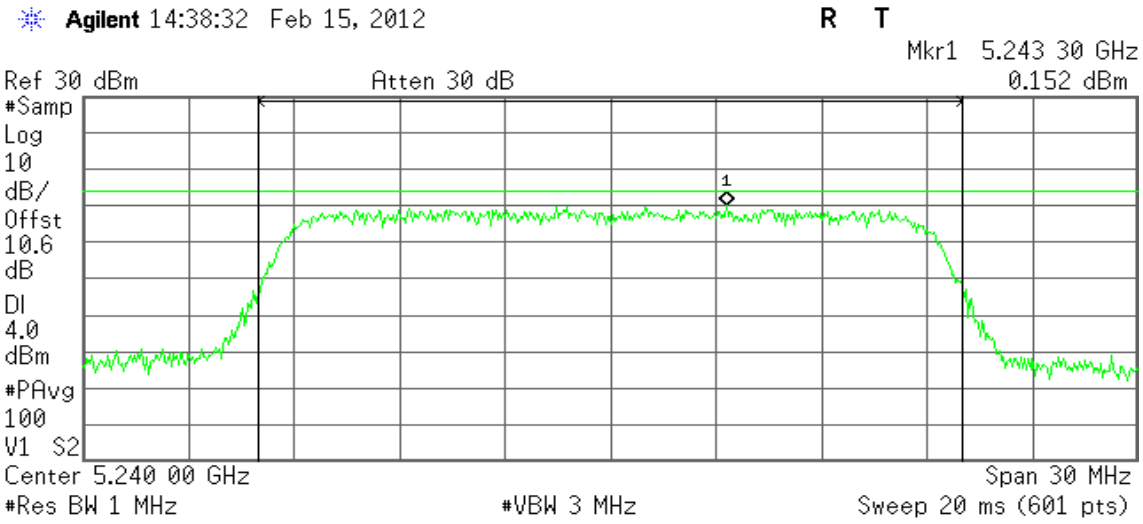
Channel Power

9.80 dBm /20.0000 MHz

Power Spectral Density

-63.21 dBm/Hz

CH High



Channel Power

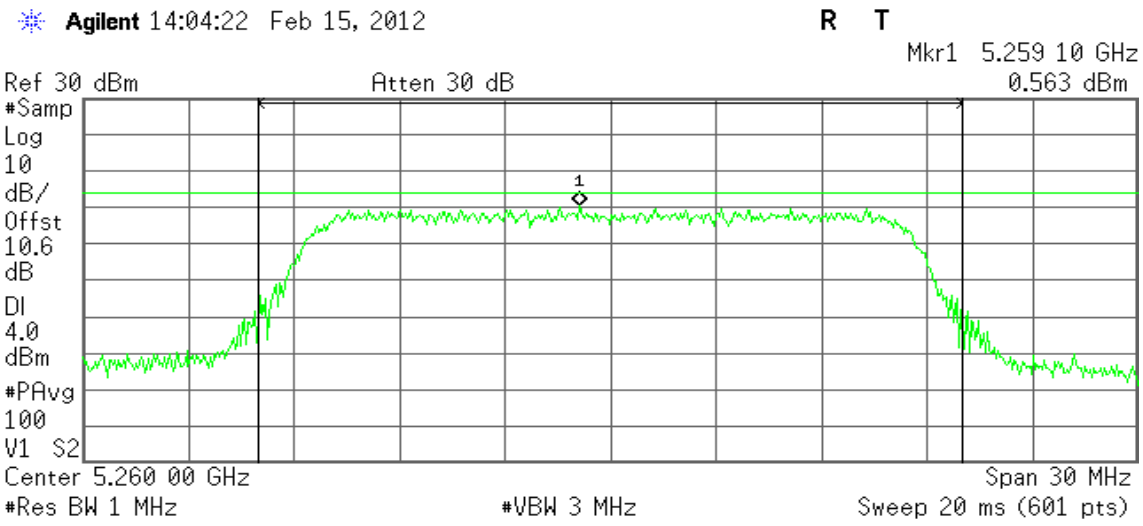
9.77 dBm /20.0000 MHz

Power Spectral Density

-63.25 dBm/Hz

IEEE 802.11a mode / 5260 ~ 5320MHz

CH Low



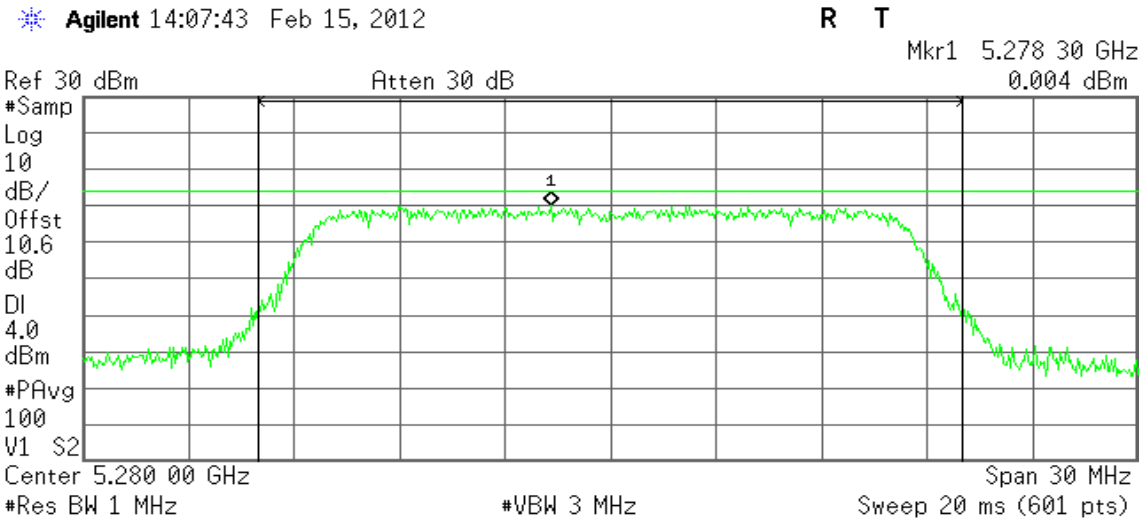
Channel Power

9.40 dBm /20.0000 MHz

Power Spectral Density

-63.61 dBm/Hz

CH Mid



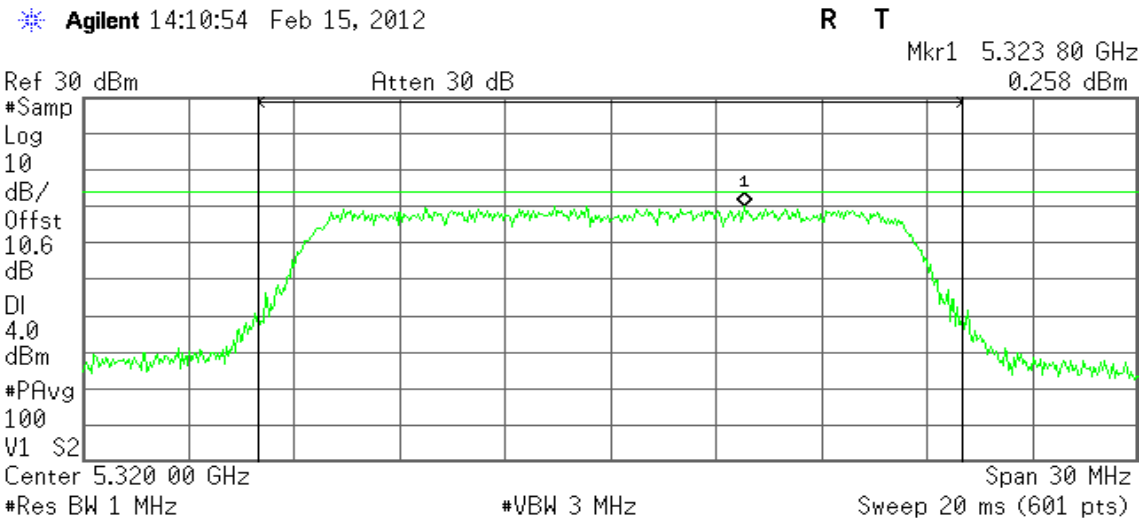
Channel Power

9.36 dBm /20.0000 MHz

Power Spectral Density

-63.65 dBm/Hz

CH High



Channel Power

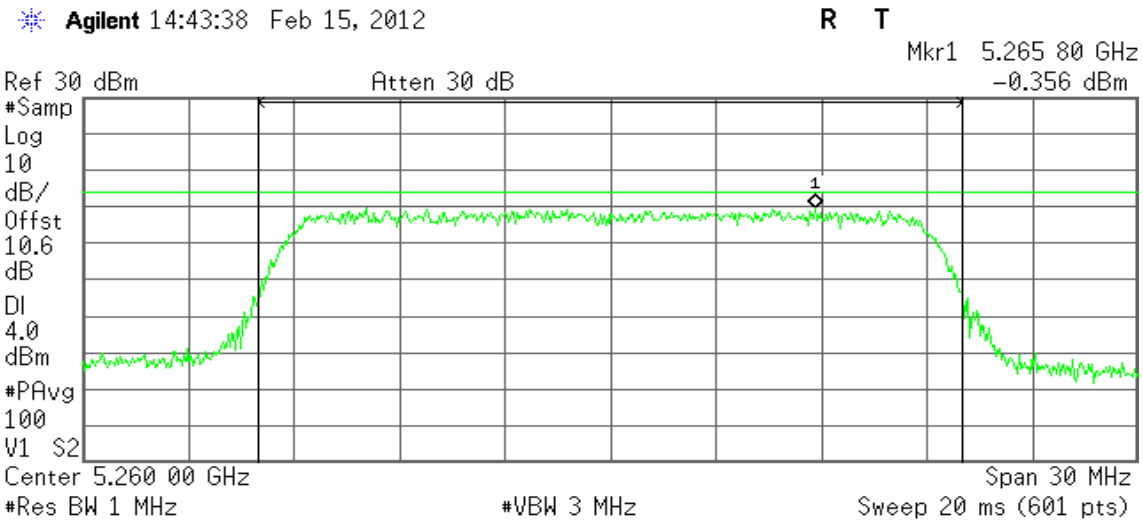
9.78 dBm /20.0000 MHz

Power Spectral Density

-63.23 dBm/Hz

IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

CH Low



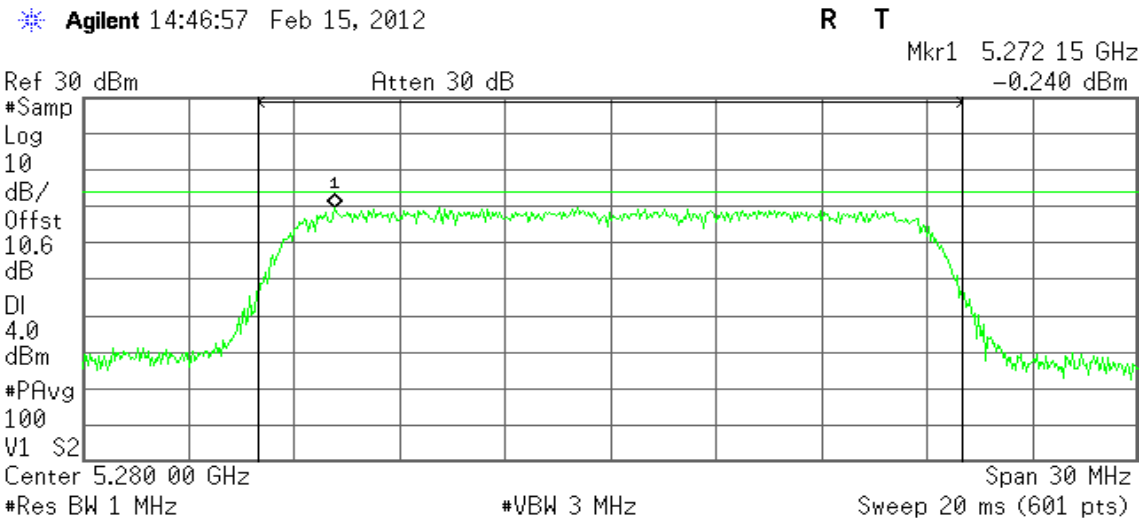
Channel Power

9.38 dBm /20.0000 MHz

Power Spectral Density

-63.63 dBm/Hz

CH Mid



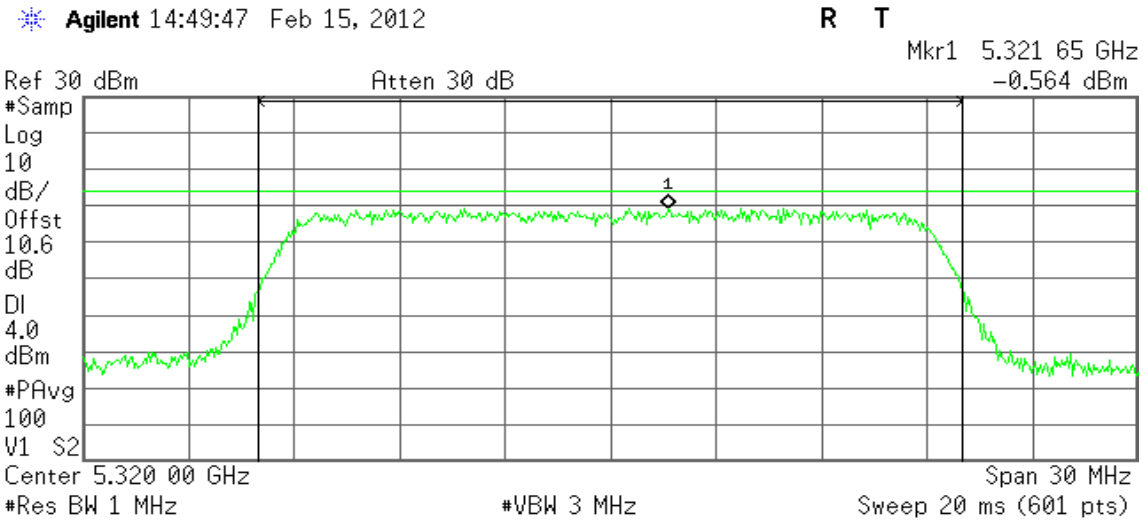
Channel Power

10.29 dBm /20.0000 MHz

Power Spectral Density

-62.72 dBm/Hz

CH High



Channel Power

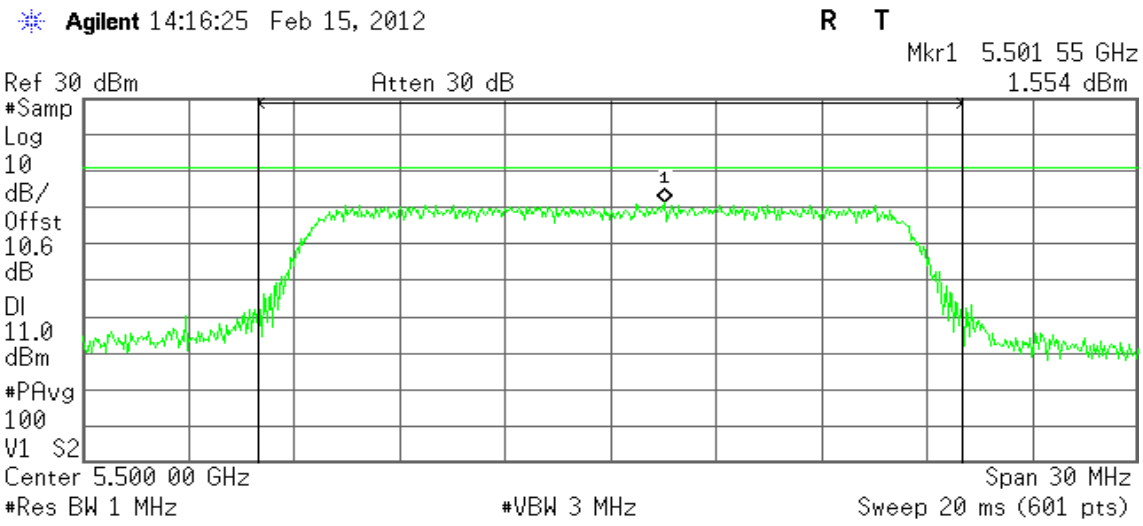
9.51 dBm /20.0000 MHz

Power Spectral Density

-63.50 dBm/Hz

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

CH Low



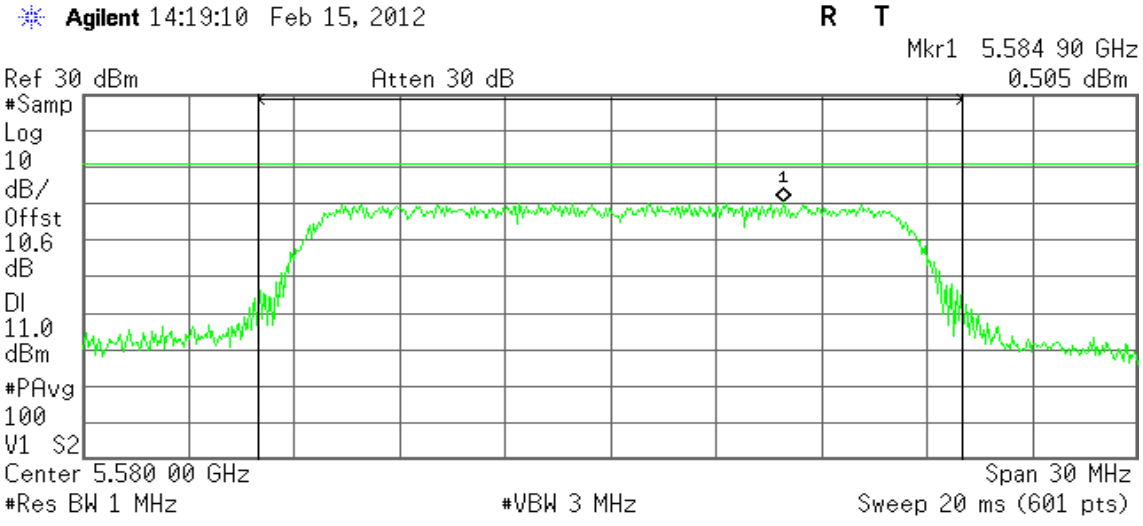
Channel Power

11.10 dBm /20.0000 MHz

Power Spectral Density

-61.91 dBm/Hz

CH Mid



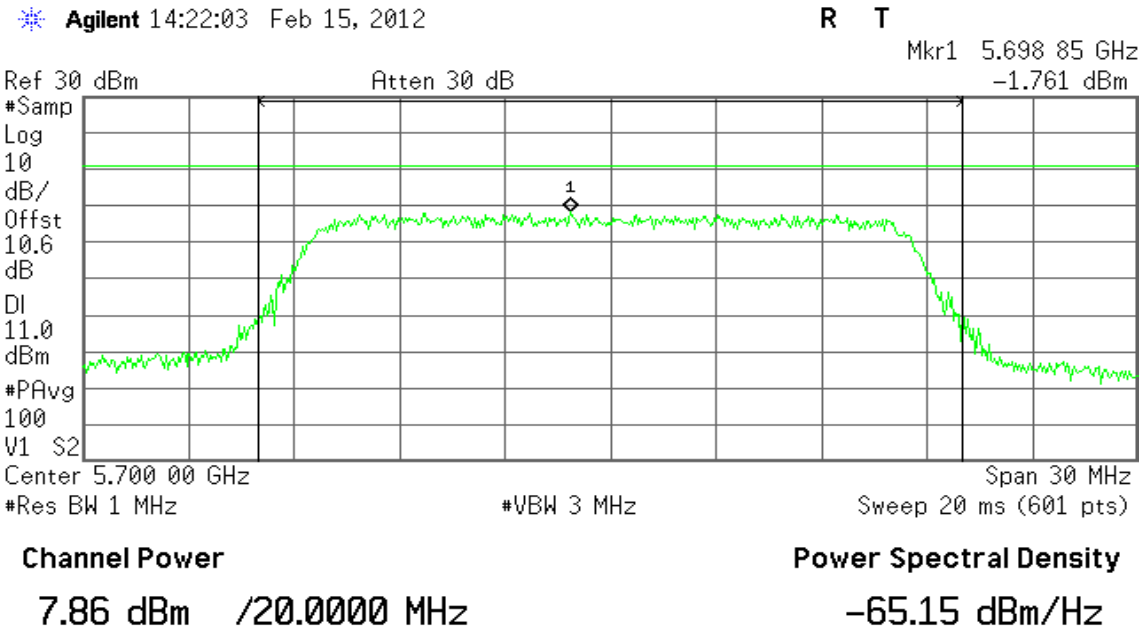
Channel Power

10.44 dBm /20.0000 MHz

Power Spectral Density

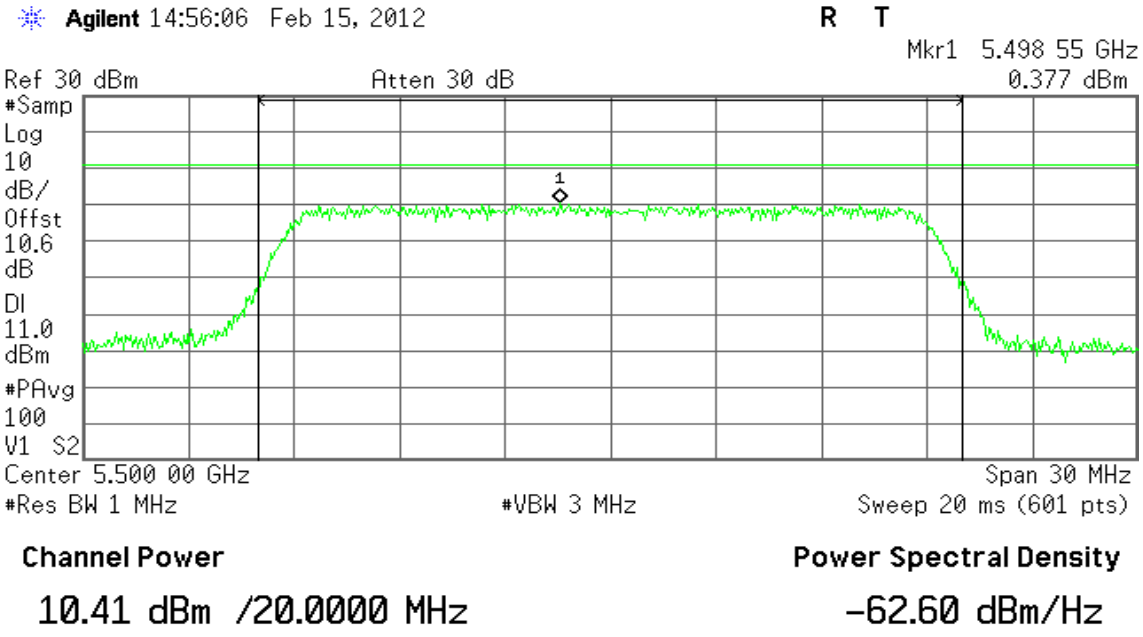
-62.57 dBm/Hz

CH High

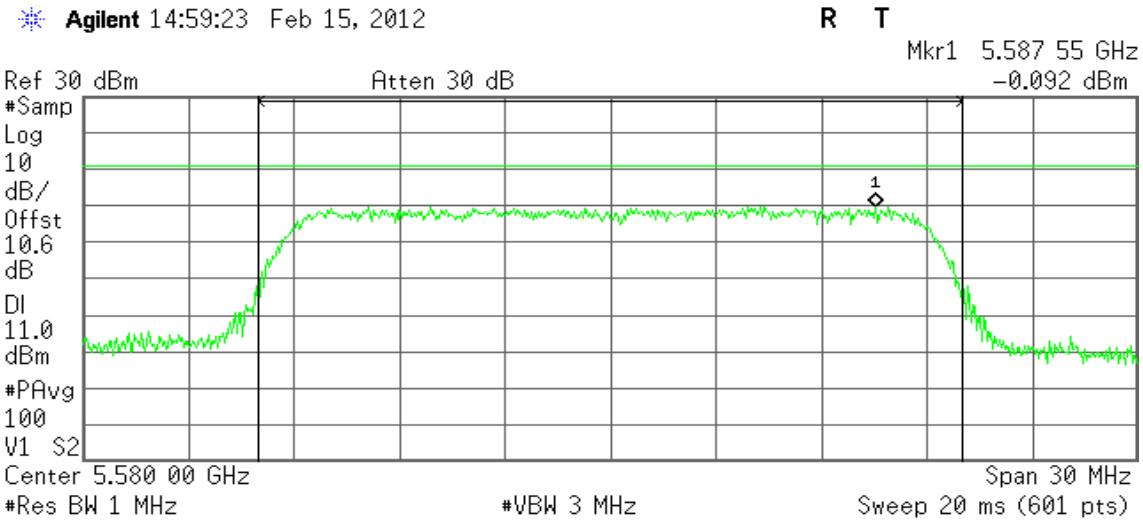


IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

CH Low



CH Mid



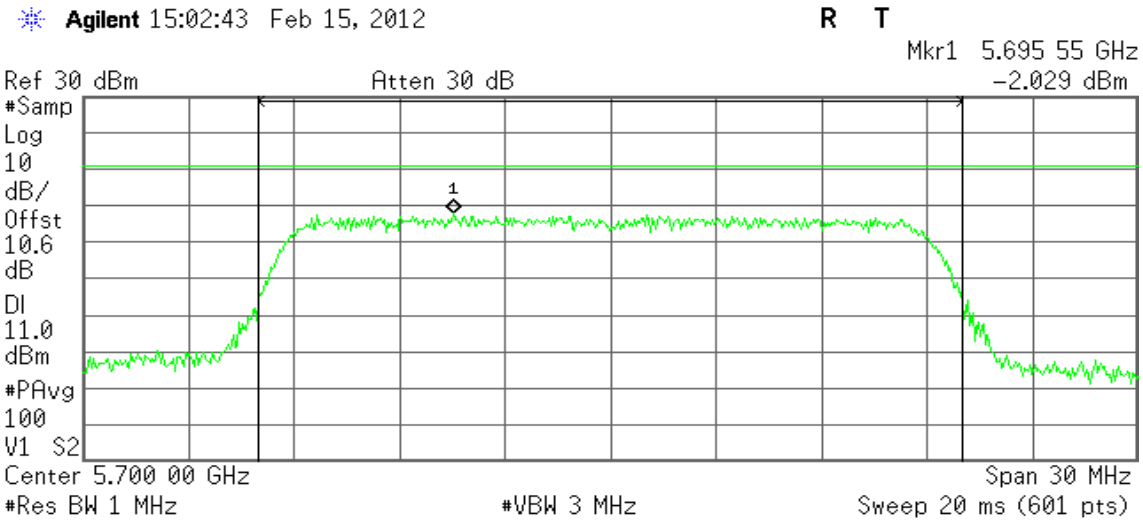
Channel Power

10.09 dBm /20.0000 MHz

Power Spectral Density

-62.92 dBm/Hz

CH High



Channel Power

8.29 dBm /20.0000 MHz

Power Spectral Density

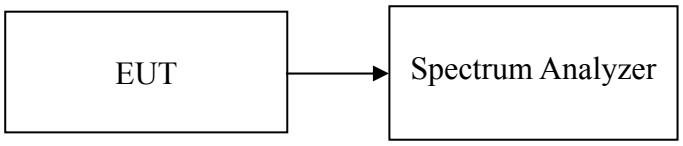
-64.72 dBm/Hz

7.6 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)	Result
Low	5180	6.57	13.00	-6.43	PASS
Mid	5220	8.24	13.00	-4.76	PASS
High	5240	8.40	13.00	-4.60	PASS

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

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
Low	5180	9.90	13.00	-3.10	PASS
Mid	5220	9.01	13.00	-3.99	PASS
High	5240	9.49	13.00	-3.51	PASS

Test mode: IEEE 802.11a mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
Low	5260	8.32	13.00	-4.68	PASS
Mid	5280	8.08	13.00	-4.92	PASS
High	5320	7.59	13.00	-5.41	PASS

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
Low	5260	9.03	13.00	-3.97	PASS
Mid	5280	7.87	13.00	-5.13	PASS
High	5320	10.01	13.00	-2.99	PASS

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
Low	5500	7.86	13.00	-5.14	PASS
Mid	5600	9.69	13.00	-3.31	PASS
High	5700	8.34	13.00	-4.66	PASS

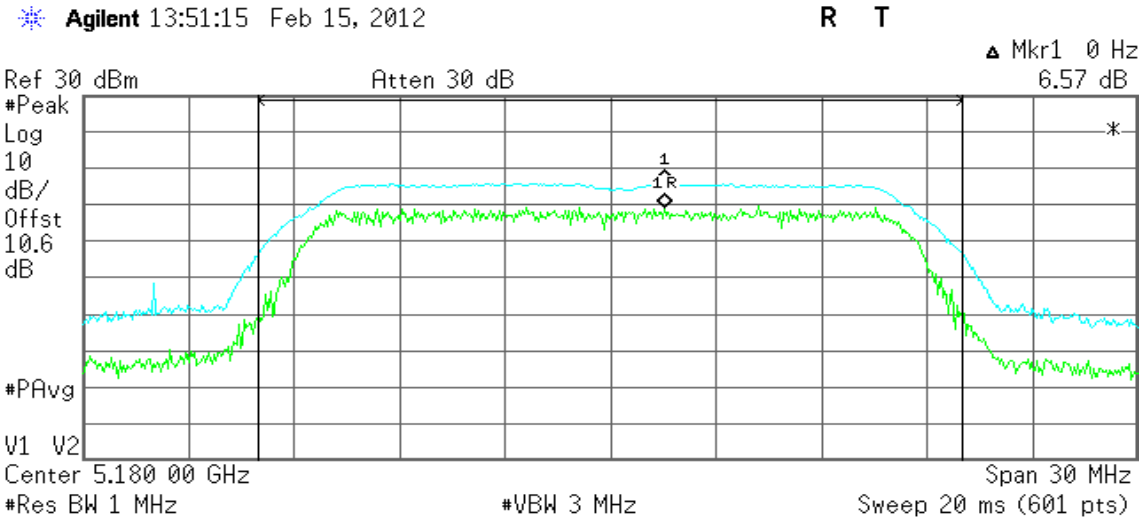
Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
Low	5500	8.55	13.00	-4.45	PASS
Mid	5600	9.43	13.00	-3.57	PASS
High	5700	8.19	13.00	-4.81	PASS

Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

CH Low



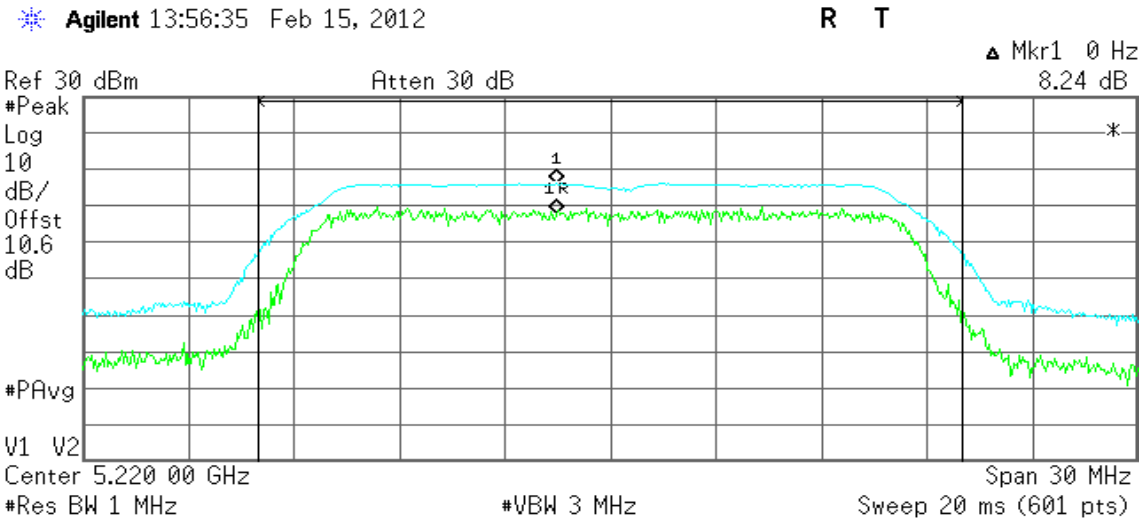
Channel Power

15.40 dBm /20.0000 MHz

Power Spectral Density

-57.61 dBm/Hz

CH Mid



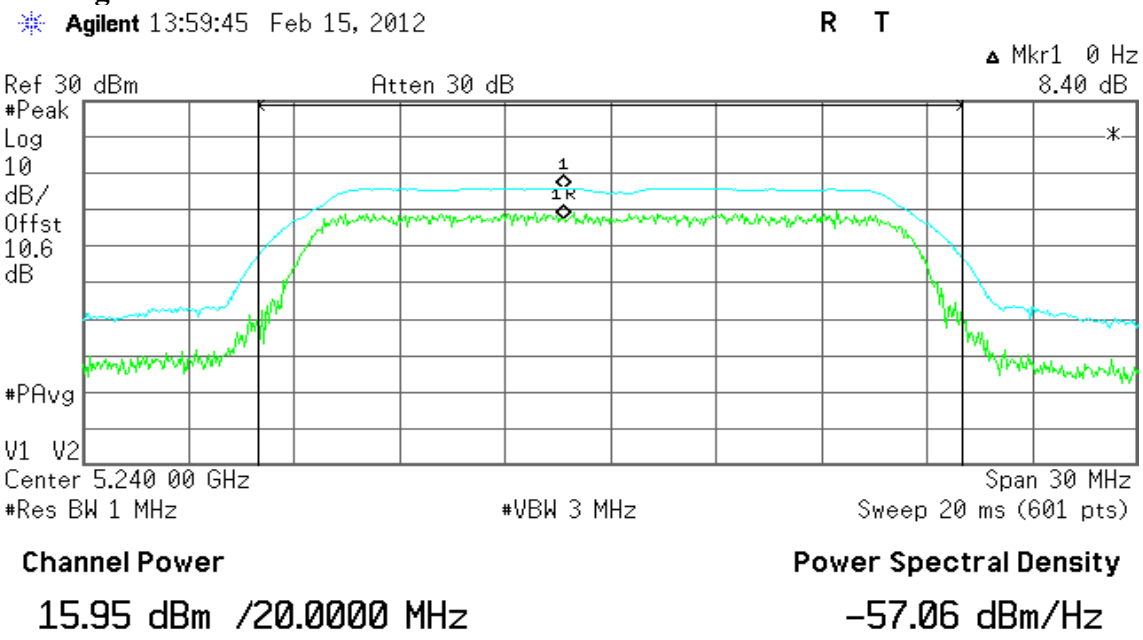
Channel Power

15.61 dBm /20.0000 MHz

Power Spectral Density

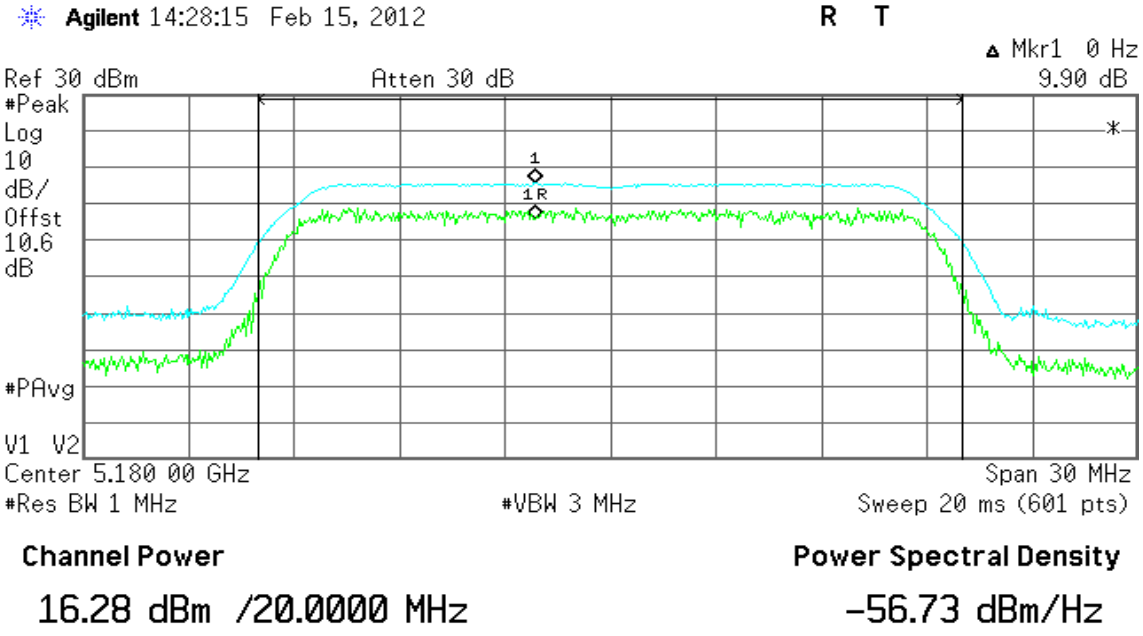
-57.40 dBm/Hz

CH High

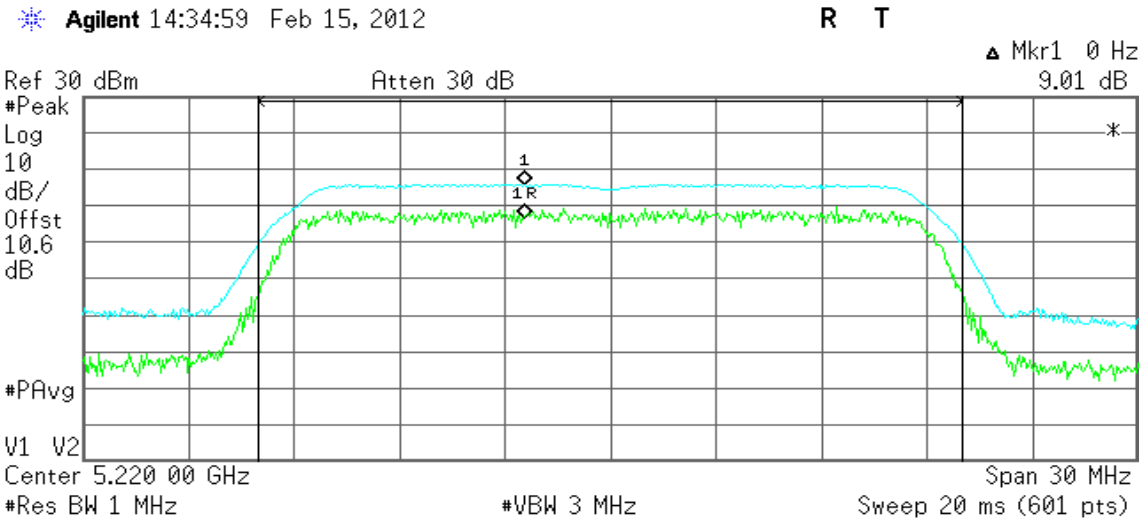


IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

CH Low



CH Mid



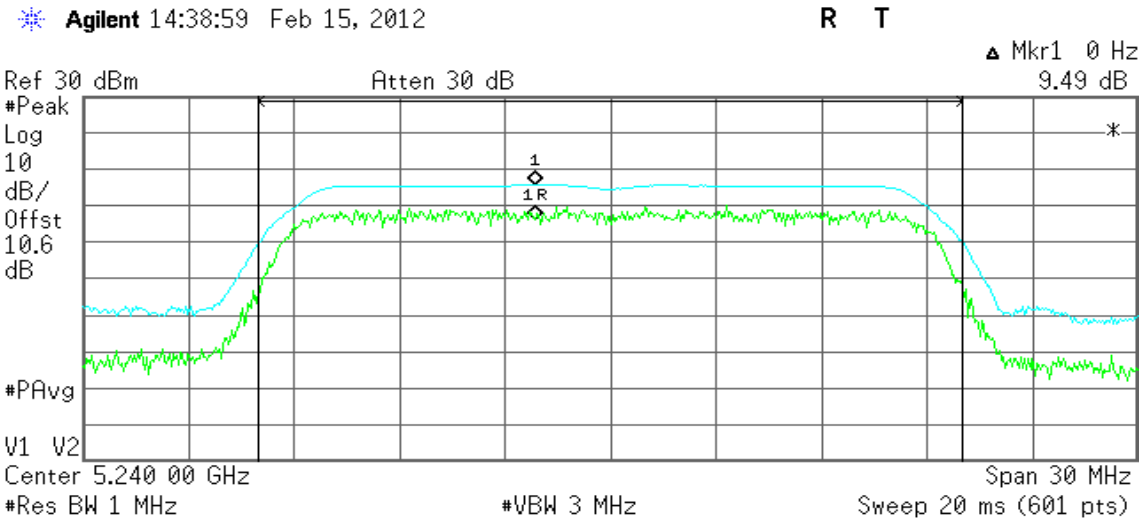
Channel Power

16.02 dBm /20.0000 MHz

Power Spectral Density

-56.99 dBm/Hz

CH High



Channel Power

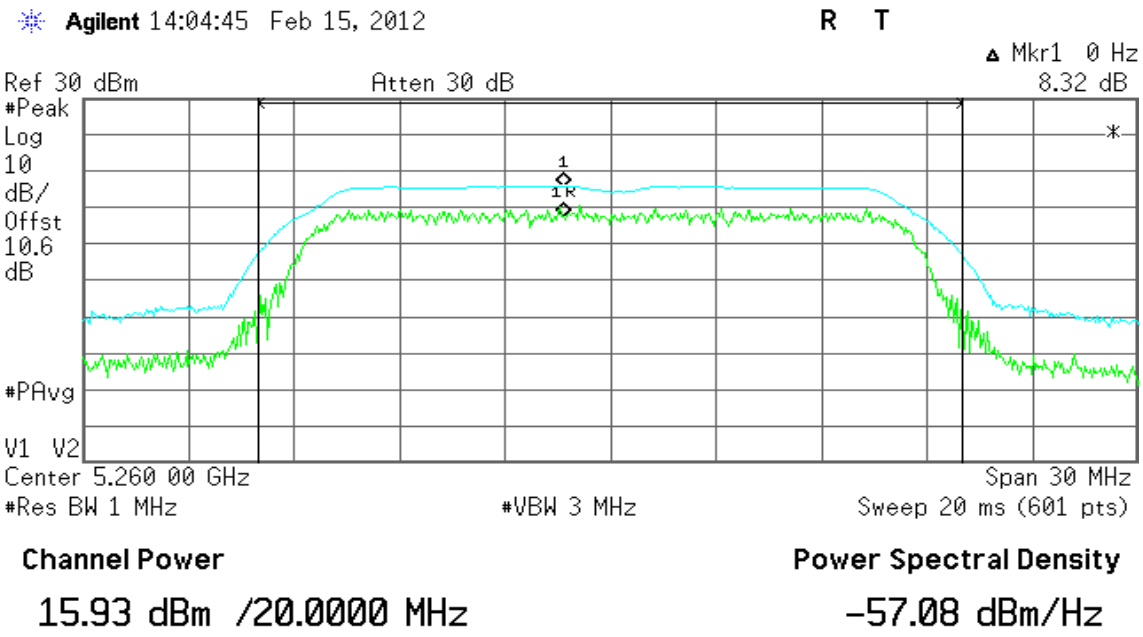
16.34 dBm /20.0000 MHz

Power Spectral Density

-56.67 dBm/Hz

IEEE 802.11a mode / 5260 ~ 5320MHz

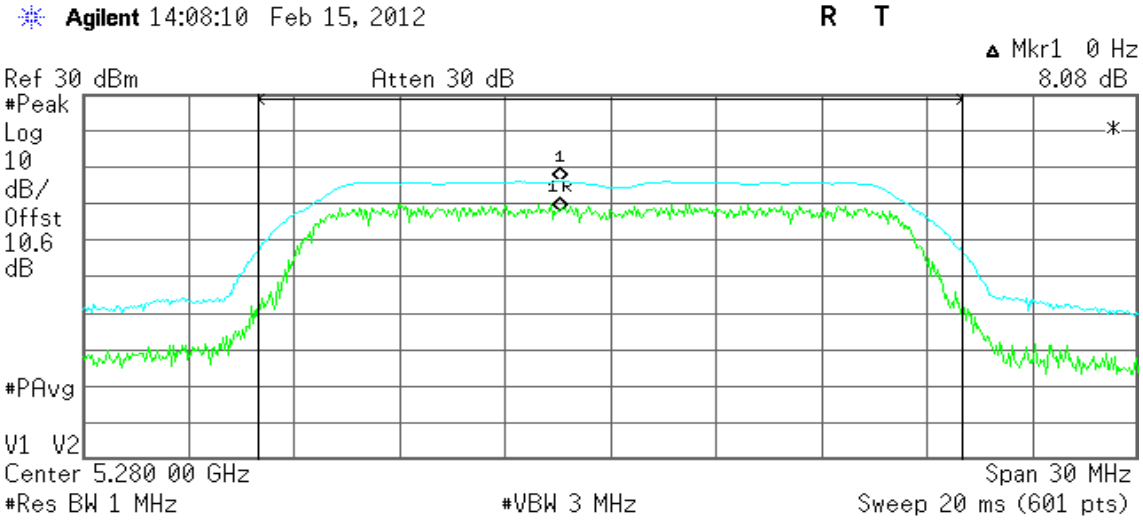
CH Low



Channel Power
15.93 dBm /20.0000 MHz

Power Spectral Density
-57.08 dBm/Hz

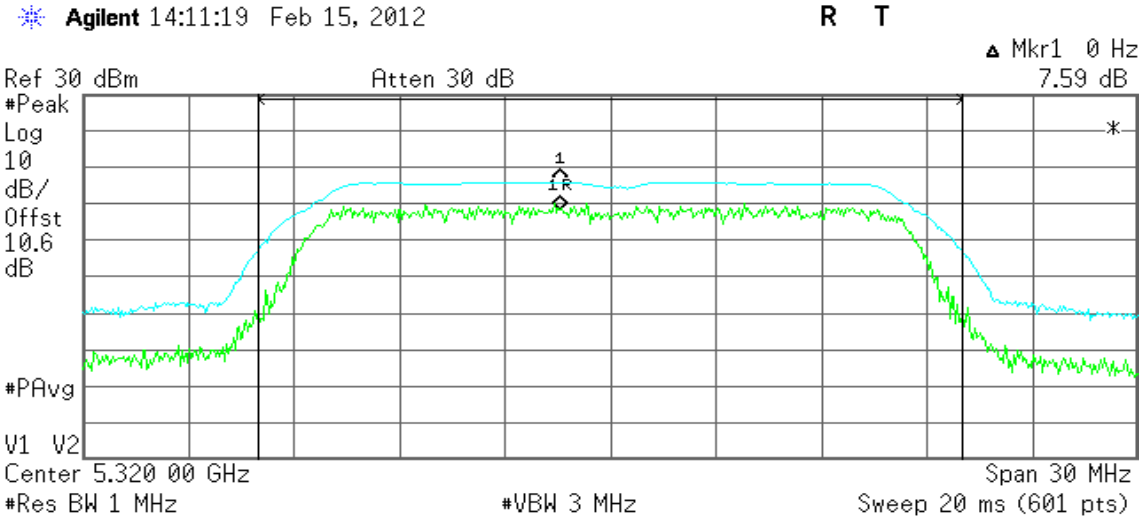
CH Mid



Channel Power
16.11 dBm /20.0000 MHz

Power Spectral Density
-56.90 dBm/Hz

CH High



Channel Power

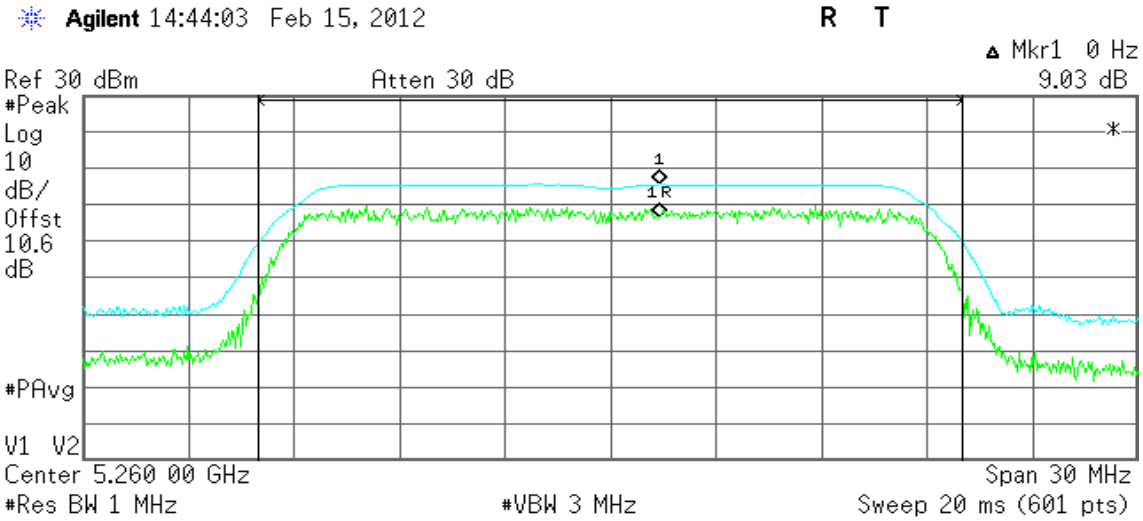
15.88 dBm /20.0000 MHz

Power Spectral Density

-57.13 dBm/Hz

IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

CH Low



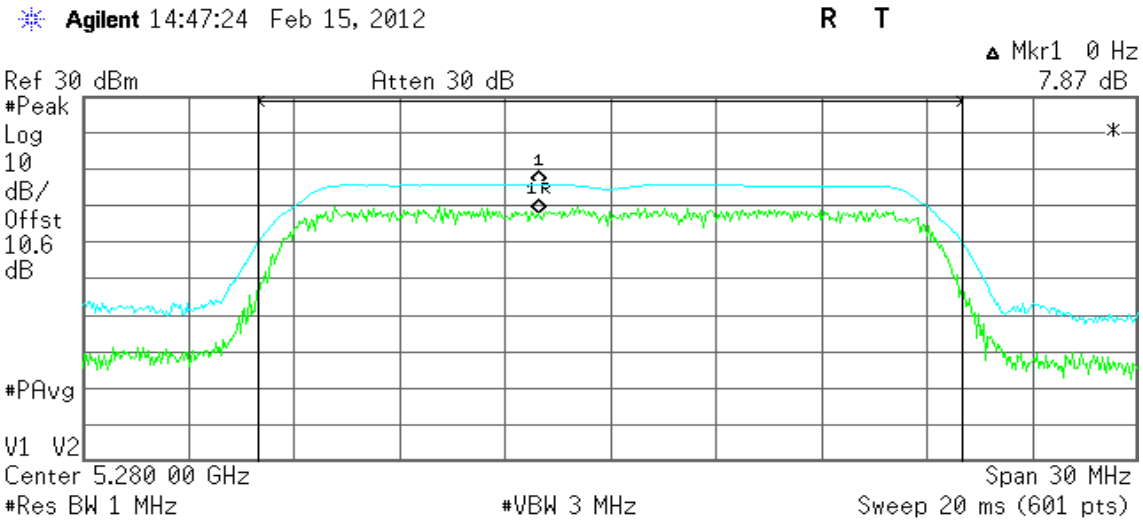
Channel Power

16.27 dBm /20.0000 MHz

Power Spectral Density

-56.74 dBm/Hz

CH Mid



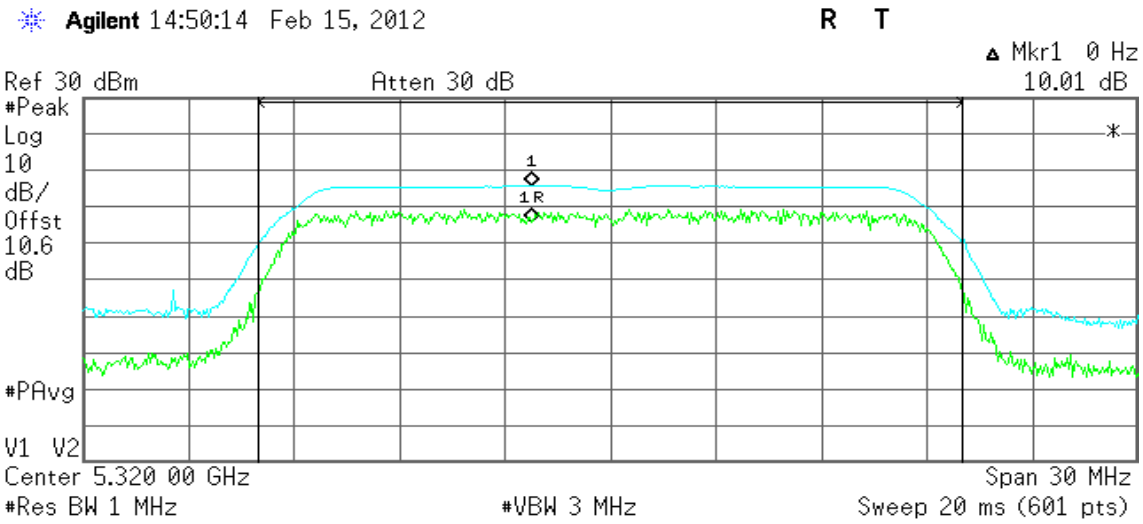
Channel Power

16.51 dBm /20.0000 MHz

Power Spectral Density

-56.50 dBm/Hz

CH High



Channel Power

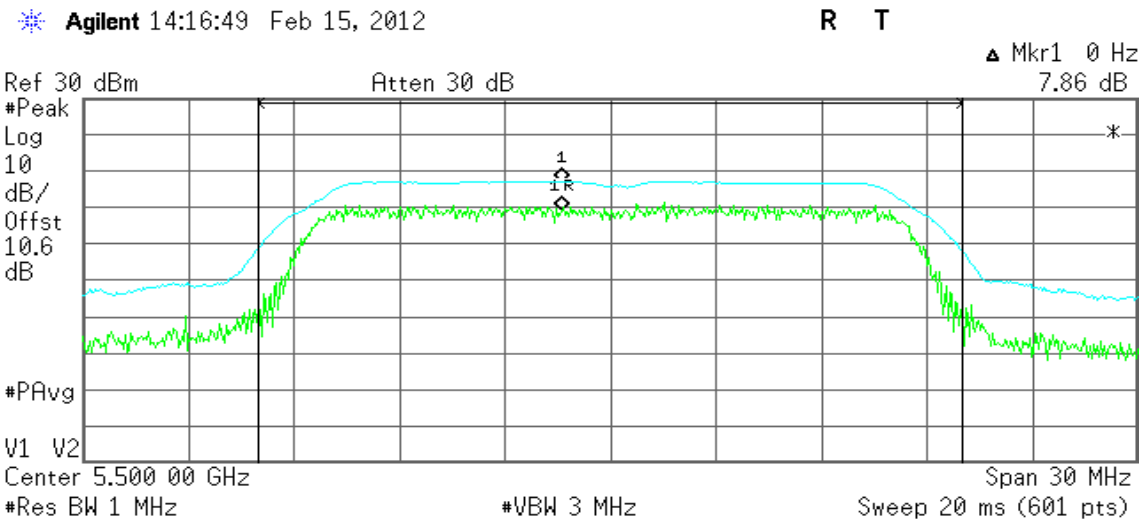
16.31 dBm /20.0000 MHz

Power Spectral Density

-56.70 dBm/Hz

Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

CH Low



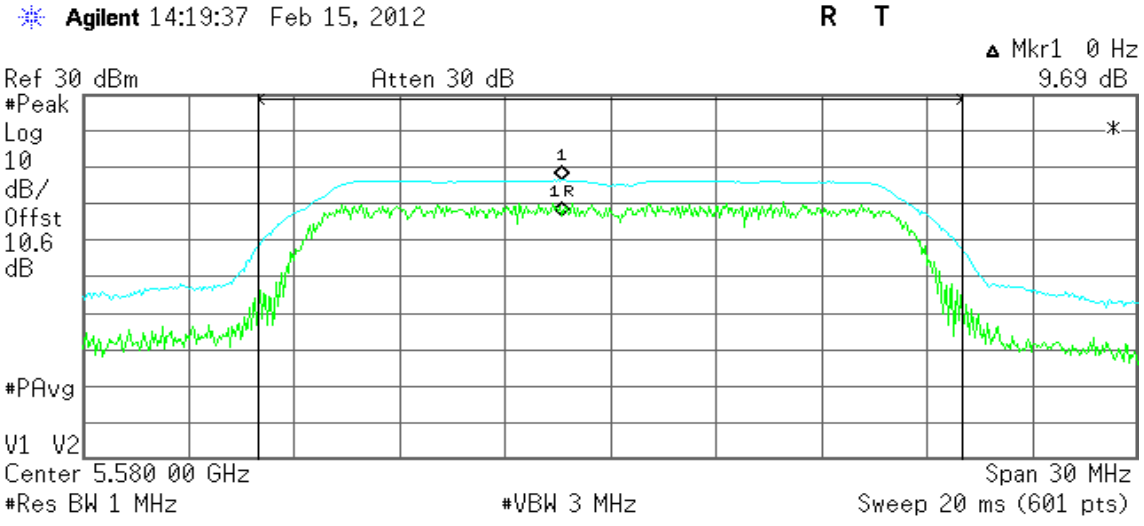
Channel Power

17.18 dBm /20.0000 MHz

Power Spectral Density

-55.83 dBm/Hz

CH Mid



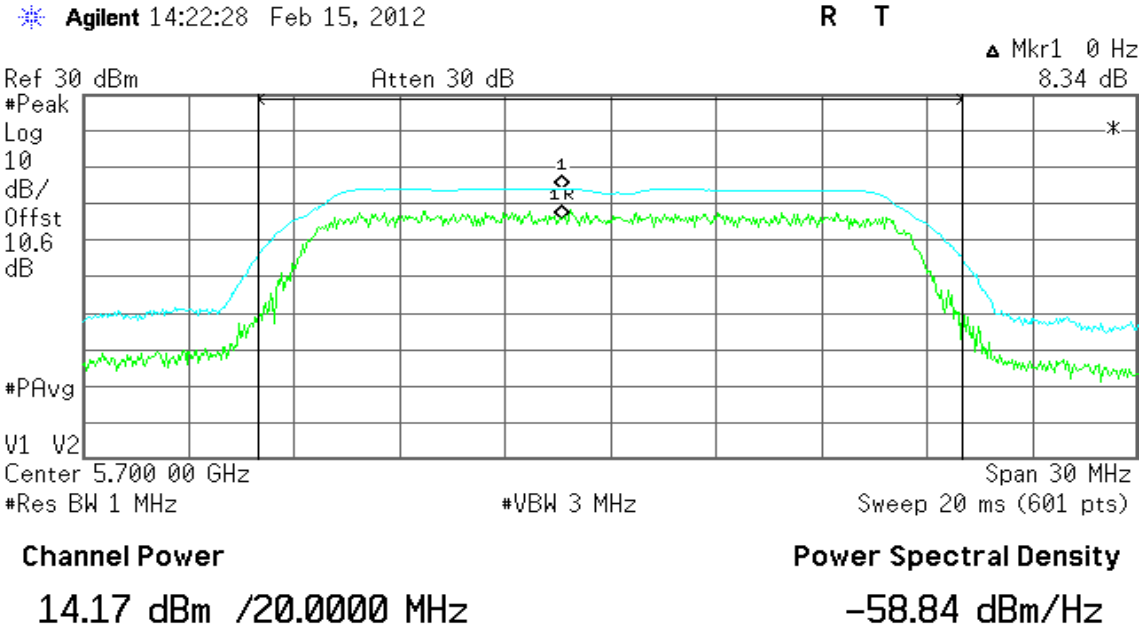
Channel Power

16.43 dBm /20.0000 MHz

Power Spectral Density

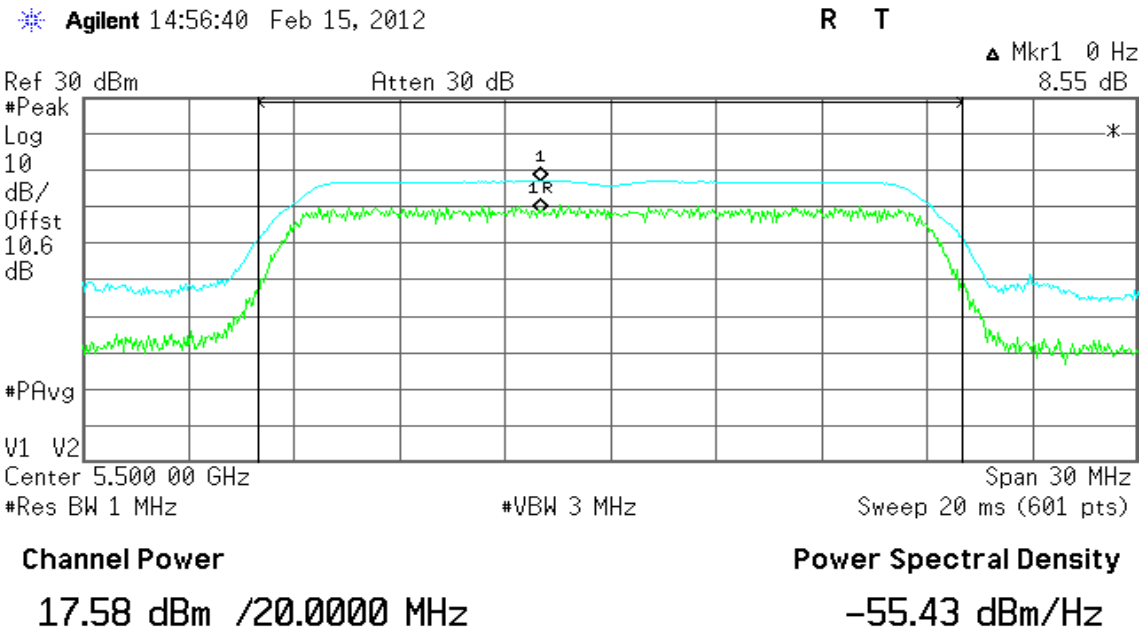
-56.58 dBm/Hz

CH High

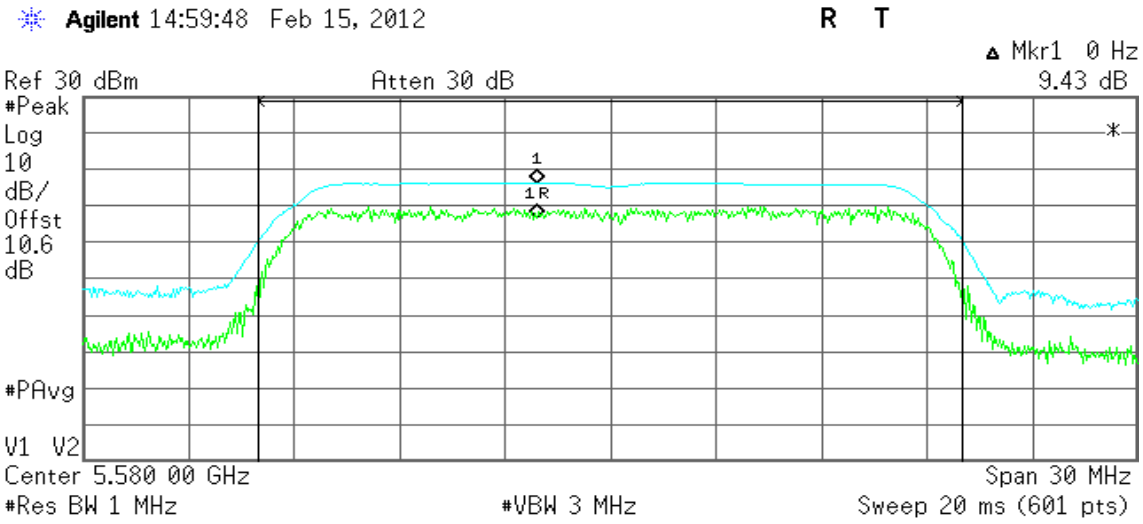


IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

CH Low



CH Mid



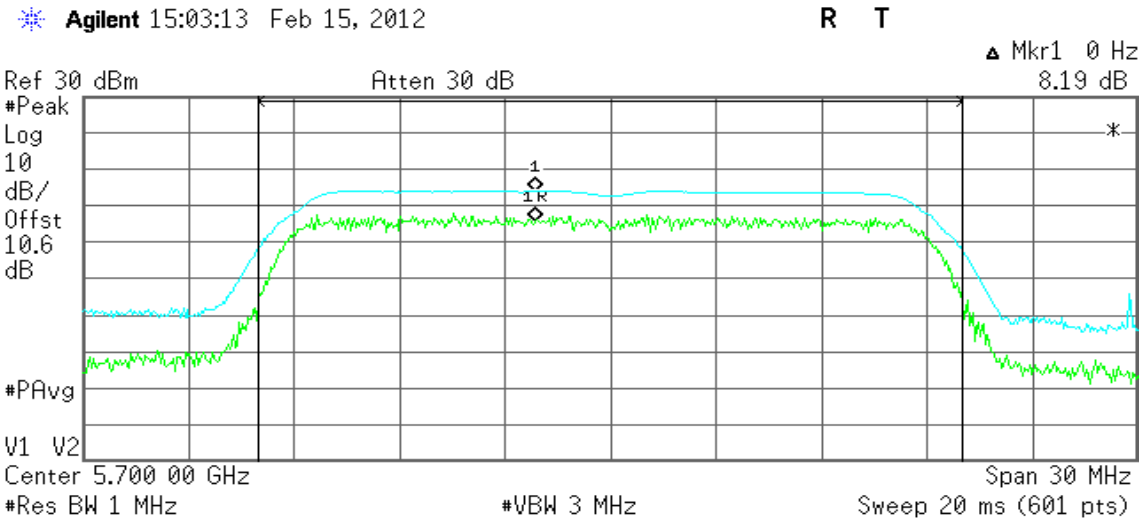
Channel Power

16.87 dBm /20.0000 MHz

Power Spectral Density

-56.14 dBm/Hz

CH High



Channel Power

14.56 dBm /20.0000 MHz

Power Spectral Density

-58.45 dBm/Hz

7.7 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

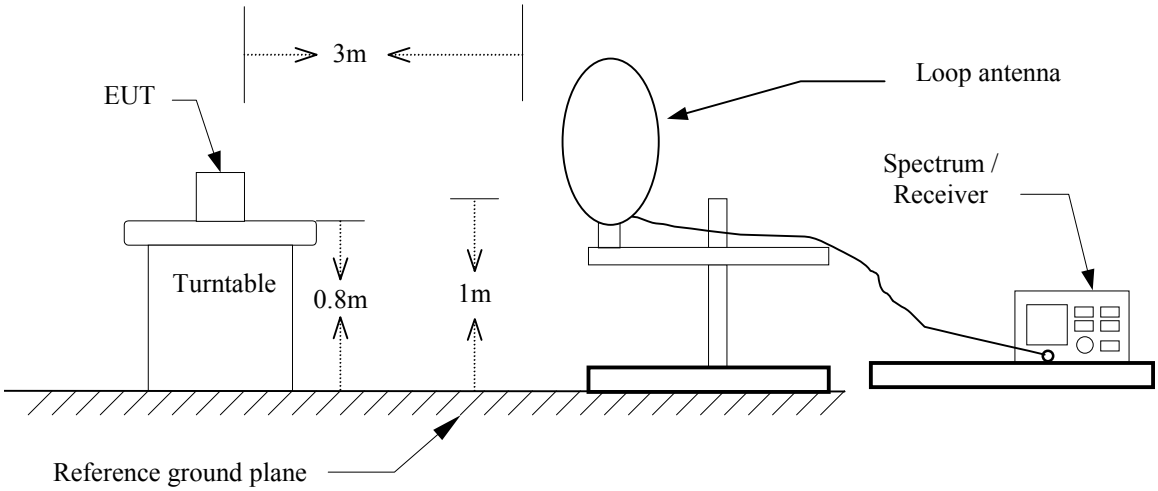
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

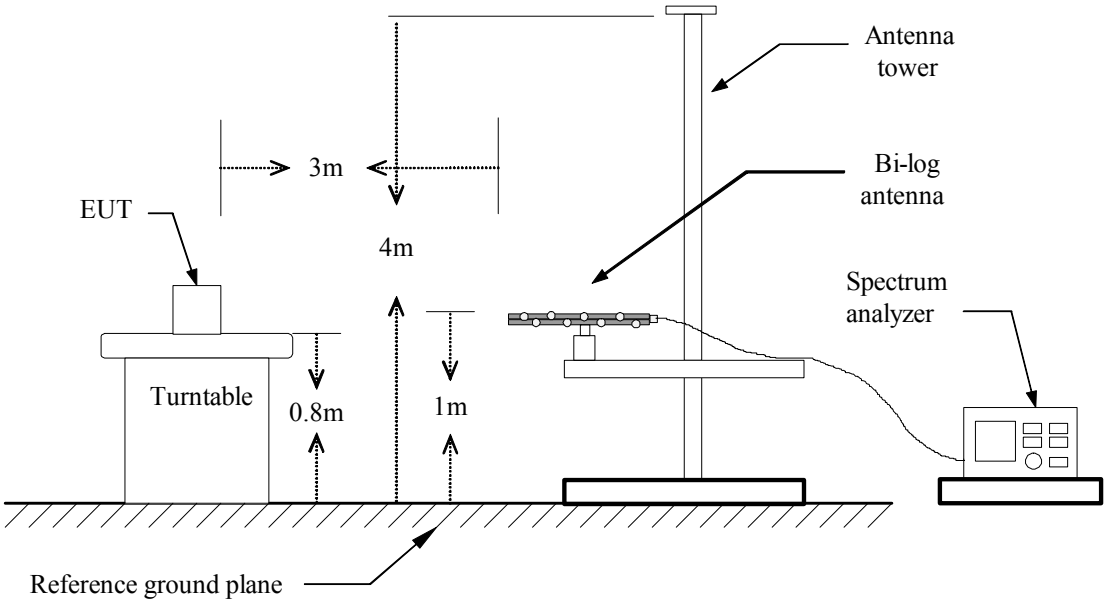
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

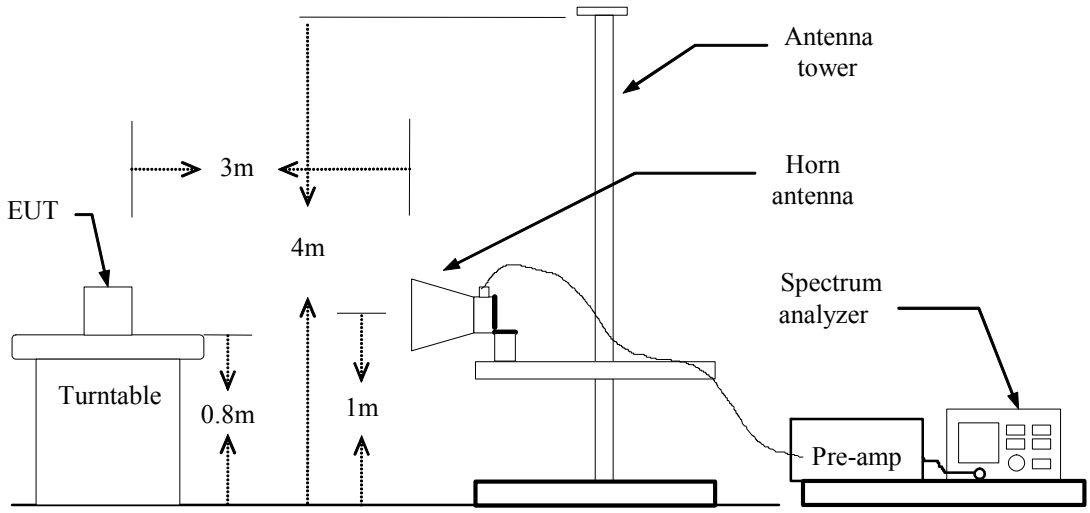
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz



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=1MHz, VBW=3MHz / Sweep=AUTO

   (b)AVERAGE: RBW=1MHz

   duty cycle ≥ 98 percent, set VBW ≤ RBW/100 but not less than 10 Hz.

   duty cycle < 98 percent, set VBW ≥ 1/*T*

   / Sweep=AUTO
7. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.
8. Repeat above procedures until the measurements for all frequencies are complete.

Below 30 MHz

Operation Mode: Normal Link **Test Date:** March 8, 2012

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
0.17	46.78	32.87	79.65	116.82	-37.17	Peak
0.21	45.66	31.54	77.19	113.99	-36.80	Peak
0.27	43.08	29.75	72.83	109.36	-36.53	Peak
0.36	40.34	28.22	68.56	103.29	-34.73	Peak
0.41	38.86	27.23	66.09	99.35	-33.27	Peak
0.46	37.28	26.32	63.61	95.77	-32.16	Peak
6.00	14.30	7.12	21.42	69.50	-48.08	Peak
9.44	10.60	6.32	16.92	69.50	-52.58	Peak
13.28	10.41	5.77	16.18	69.50	-53.32	Peak
17.46	7.51	5.47	12.98	69.50	-56.52	Peak
21.79	8.40	5.42	13.82	69.50	-55.68	Peak
27.93	9.32	6.10	15.41	69.50	-54.09	Peak

Remark:

1. *Radiated emissions measured in frequency range from 9kHz ~ 30MHz were made with an instrument using peak/quasi-peak detector mode.*
2. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
3. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *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).*

Below 1 GHz

Operation Mode: Normal Link **Test Date:** December 6, 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)
41.32	47.26	-12.67	34.59	40.00	-5.41	Peak	V
78.50	43.24	-16.75	26.48	40.00	-13.52	Peak	V
384.05	31.94	-9.58	22.35	46.00	-23.65	Peak	V
479.43	35.01	-8.27	26.74	46.00	-19.26	Peak	V
527.93	32.48	-7.69	24.80	46.00	-21.20	Peak	V
799.53	31.70	-3.88	27.82	46.00	-18.18	Peak	V
191.67	43.20	-12.69	30.50	43.50	-13.00	Peak	H
240.17	46.91	-13.10	33.81	46.00	-12.19	Peak	H
299.98	41.68	-10.82	30.86	46.00	-15.14	Peak	H
359.80	44.75	-9.99	34.76	46.00	-11.24	Peak	H
419.62	54.41	-9.03	45.38	46.00	-0.62	QP	H
799.53	40.07	-3.88	36.19	46.00	-9.81	Peak	H

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).*

Above 1 GHz

Operation Mode:	Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Low	**Test Date:**	November 30, 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)
1653.33	56.00	---	-8.99	47.00	---	68.30	54.00	-7.00	Peak	V
10350.00	41.18	31.36	16.98	58.16	48.34	68.30	54.00	-5.66	AVG	V
N/A										
1396.67	62.13	43.12	-10.66	51.47	32.46	68.30	54.00	-21.54	AVG	H
10366.67	41.40	30.74	17.06	58.46	47.80	68.30	54.00	-6.20	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:**	November 30, 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)
1863.33	55.48	---	-6.86	48.62	---	68.30	54.00	-5.38	Peak	V
10433.33	41.00	31.94	17.38	58.38	49.32	68.30	54.00	-4.68	AVG	V
N/A										
1396.67	65.11	43.12	-10.66	54.46	32.46	68.30	54.00	-21.54	AVG	H
10433.33	42.02	31.36	17.38	59.40	48.74	68.30	54.00	-5.26	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:** November 30, 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)
1921.67	54.87	---	-6.27	48.60	---	68.30	54.00	-5.40	Peak	V
10483.33	40.88	31.23	17.62	58.50	48.85	68.30	54.00	-5.15	AVG	V
N/A										
1396.67	64.48	43.31	-10.66	53.82	32.65	68.30	54.00	-21.35	AVG	H
10483.33	40.59	31.11	17.62	58.21	48.73	68.30	54.00	-5.27	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 / 5180 ~ 5240MHz / CH Low	**Test Date:**	November 30, 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	55.19	---	-7.57	47.62	---	68.30	54.00	-6.38	Peak	V
10350.00	39.53	31.11	16.98	56.51	48.09	68.30	54.00	-5.91	AVG	V
N/A										
1396.67	65.04	43.16	-10.66	54.39	32.50	68.30	54.00	-21.50	AVG	H
10350.00	40.82	31.22	16.98	57.80	48.20	68.30	54.00	-5.80	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 / 5180 ~ 5240MHz / CH Mid	**Test Date:**	November 30, 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)
2061.67	55.78	---	-5.31	50.47	---	68.30	54.00	-3.53	Peak	V
10433.33	39.52	31.14	17.38	56.90	48.52	68.30	54.00	-5.48	AVG	V
N/A										
1396.67	60.95	---	-10.66	50.29	---	68.30	54.00	-3.71	Peak	H
10433.33	40.04	31.16	17.38	57.42	48.54	68.30	54.00	-5.46	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 Channel mode / 5180 ~ 5240MHz / CH High **Test Date:** November 30, 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	55.38	---	-5.91	49.47	---	68.30	54.00	-4.53	Peak	V
10483.33	39.25	31.21	17.62	56.87	48.83	68.30	54.00	-5.17	AVG	V
N/A										
1396.67	64.81	43.21	-10.66	54.16	32.55	68.30	54.00	-21.45	AVG	H
10483.33	40.02	31.42	17.62	57.64	49.04	68.30	54.00	-4.96	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 / 5260 ~ 5320MHz / CH Low	**Test Date:**	November 30, 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)
2271.67	55.44	---	-4.76	50.68	---	68.30	54.00	-3.32	Peak	V
10516.67	39.22	31.01	17.72	56.94	48.73	68.30	54.00	-5.27	AVG	V
N/A										
1396.67	62.22	43.21	-10.66	51.56	32.55	68.30	54.00	-21.45	AVG	H
10516.67	38.31	31.21	17.72	56.03	48.93	68.30	54.00	-5.07	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 / 5260 ~ 5320MHz / CH Mid	**Test Date:**	November 30, 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)
2178.33	55.78	---	-5.01	50.77	---	68.30	54.00	-3.23	Peak	V
N/A										
1396.67	62.18	---	-10.66	51.52	---	68.30	54.00	-2.48	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 802.11a mode / 5260 ~ 5320MHz / CH High **Test Date:** November 30, 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	55.34	---	-5.91	49.43	---	68.30	54.00	-4.57	Peak	V
N/A										
1396.67	63.03	43.07	-10.66	52.37	32.41	68.30	54.00	-21.59	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 / 5260 ~ 5320MHz / CH Low	**Test Date:**	November 30, 2011
Temperature:	23°C	**Tested by:**	Sehni Hu
Humidity:	53% 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)
2131.67	55.15	---	-5.13	50.03	---	68.30	54.00	-3.97	Peak	V
N/A										
1396.67	63.06	43.26	-10.66	52.40	32.60	68.30	54.00	-21.4	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 / 5260 ~ 5320MHz / CH Mid	**Test Date:**	November 30, 2011
Temperature:	23°C	**Tested by:**	Sehni Hu
Humidity:	53% 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)
2015.00	53.76	---	-5.43	48.33	---	68.30	54.00	-5.67	Peak	V
N/A										
1396.67	64.74	43.22	-10.66	54.08	32.56	68.30	54.00	-21.44	AVG	H
10566.67	37.75	31.27	17.77	55.52	49.04	68.30	54.00	-4.96	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 / 5260 ~ 5320MHz / CH High **Test Date:** November 30, 2011

Temperature: 23°C **Tested by:** Sehni Hu

Humidity: 53% 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	55.53	---	-7.57	47.96	---	68.30	54.00	-6.04	Peak	V
N/A										
1396.67	61.08	---	-10.66	50.42	---	68.30	54.00	-3.58	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 802.11a mode / 5500 ~ 5700MHz / CH Low	**Test Date:**	November 30, 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)
1816.67	54.85	---	-7.33	47.52	---	68.30	54.00	-6.48	Peak	V
N/A										
1396.67	65.54	43.24	-10.66	54.89	32.58	68.30	54.00	-21.42	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 or as required by the applicant.*
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 / 5500 ~ 5700MHz /CH Mid	**Test Date:**	November 30, 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)
2038.33	55.38	---	-5.37	50.01	---	68.30	54.00	-3.99	Peak	V
N/A										
1396.67	63.00	43.29	-10.66	52.35	32.63	68.30	54.00	-21.37	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 or as required by the applicant.*
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 / 5500 ~ 5700MHz / CH High	**Test Date:**	November 30, 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	54.30	---	-5.55	48.74	---	68.30	54.00	-5.26	Peak	V
N/A										
1396.67	62.88	43.26	-10.66	52.23	32.60	68.30	54.00	-21.4	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 or as required by the applicant.*
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 Channel mode / 5500 ~ 5700MHz / CH Low	**Test Date:**	November 30, 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)
2691.67	55.15	---	-3.22	51.93	---	68.30	54.00	-2.07	Peak	V
N/A										
1396.67	61.96	43.24	-10.66	51.30	32.58	68.30	54.00	-21.42	AVG	H
11000.00	40.98	31.21	18.26	59.24	49.47	68.30	54.00	-4.53	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 or as required by the applicant.*
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 Channel mode / 5500 ~ 5700MHz / CH Mid	**Test Date:**	November 30, 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)
2190.00	54.87	---	-4.98	49.89	---	68.30	54.00	-4.11	Peak	V
N/A										
1396.67	65.11	43.32	-10.66	54.45	32.66	68.30	54.00	-21.34	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 or as required by the applicant.*
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 Channel mode / 5500 ~ 5700MHz / CH High	**Test Date:**	November 30, 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)
1501.67	57.40	---	-10.53	46.86	---	68.30	54.00	-7.14	Peak	V
N/A										
1396.67	62.13	---	-10.66	51.47	---	68.30	54.00	-2.53	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 or as required by the applicant.*
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).*

7.8 CONDUCTED UNDESIRABLE EMISSION

LIMIT

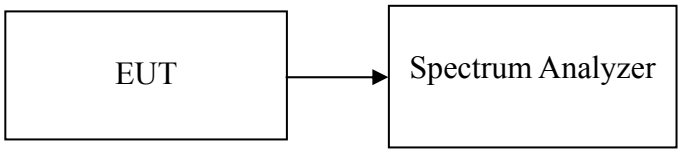
According to 15.407(b),

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

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

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

Test Configuration



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak 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.

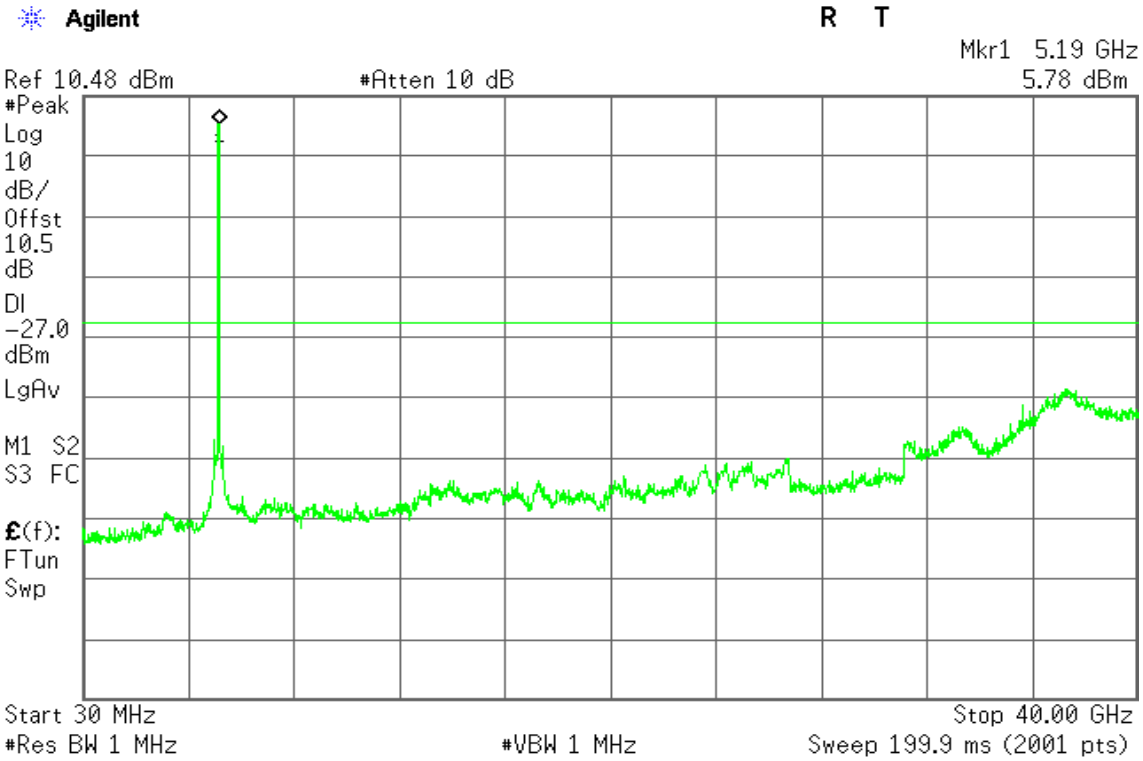
TEST RESULTS

No non-compliance noted

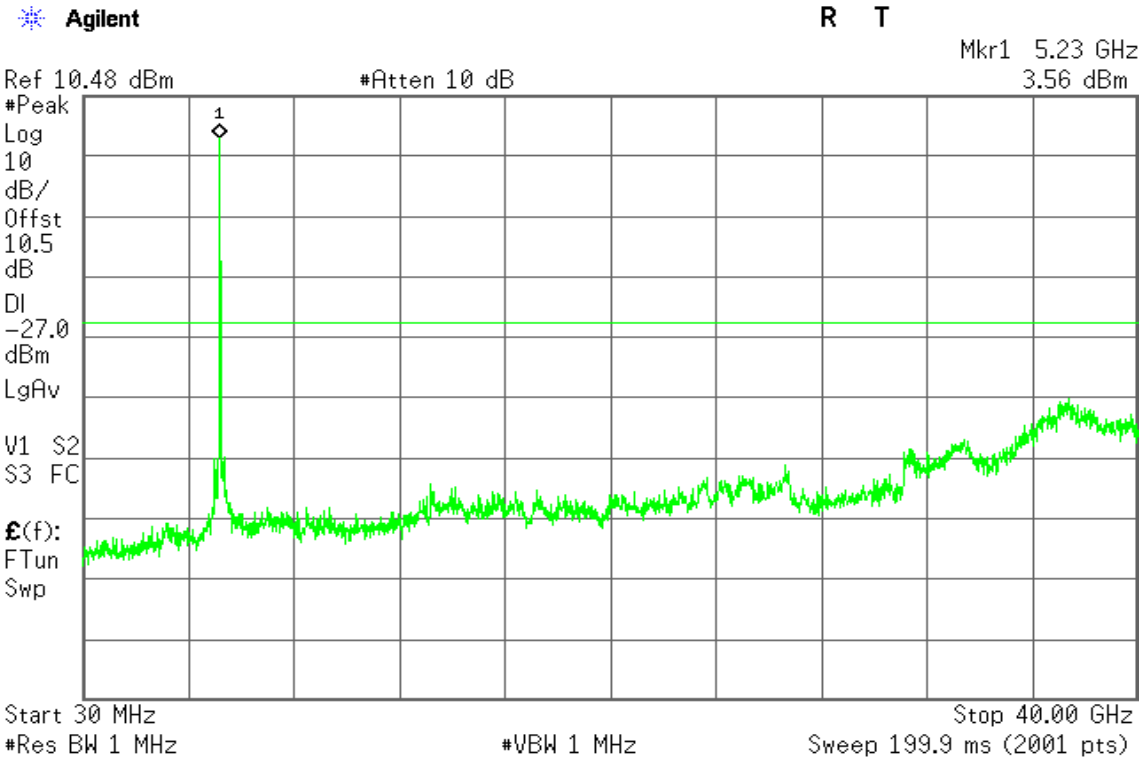
Test Plot

IEEE 802.11a (5180 ~ 5240MHz)

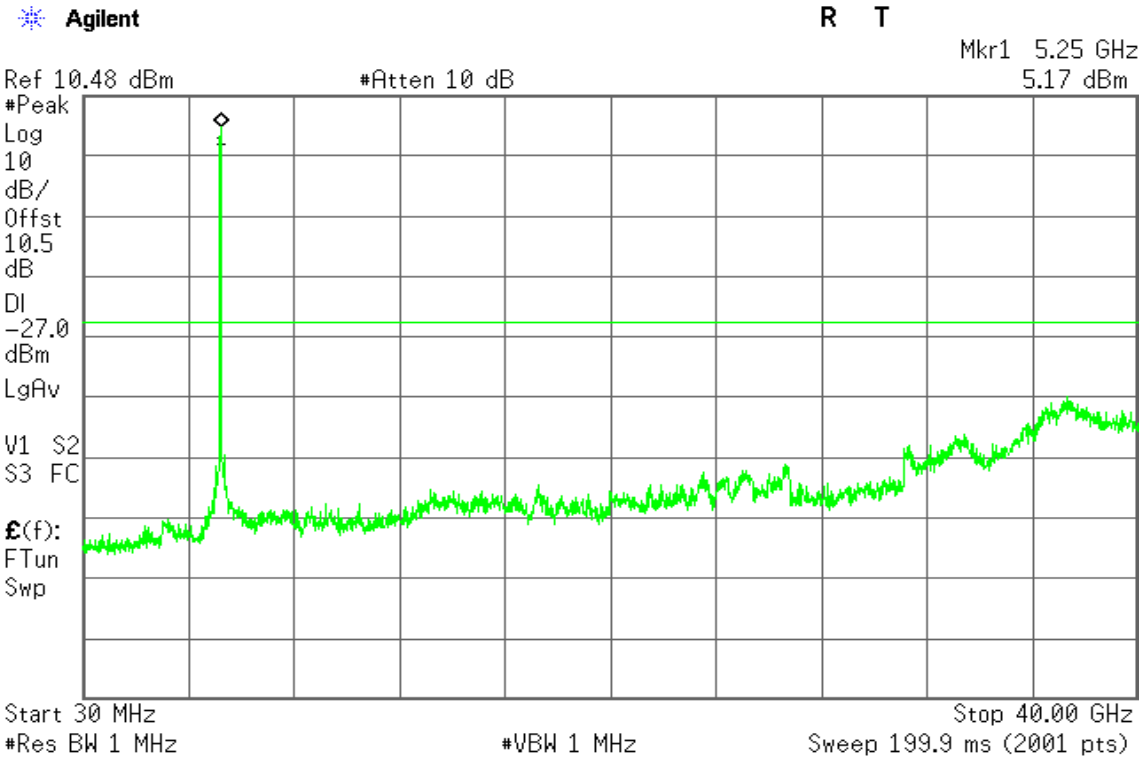
CH Low



CH Mid

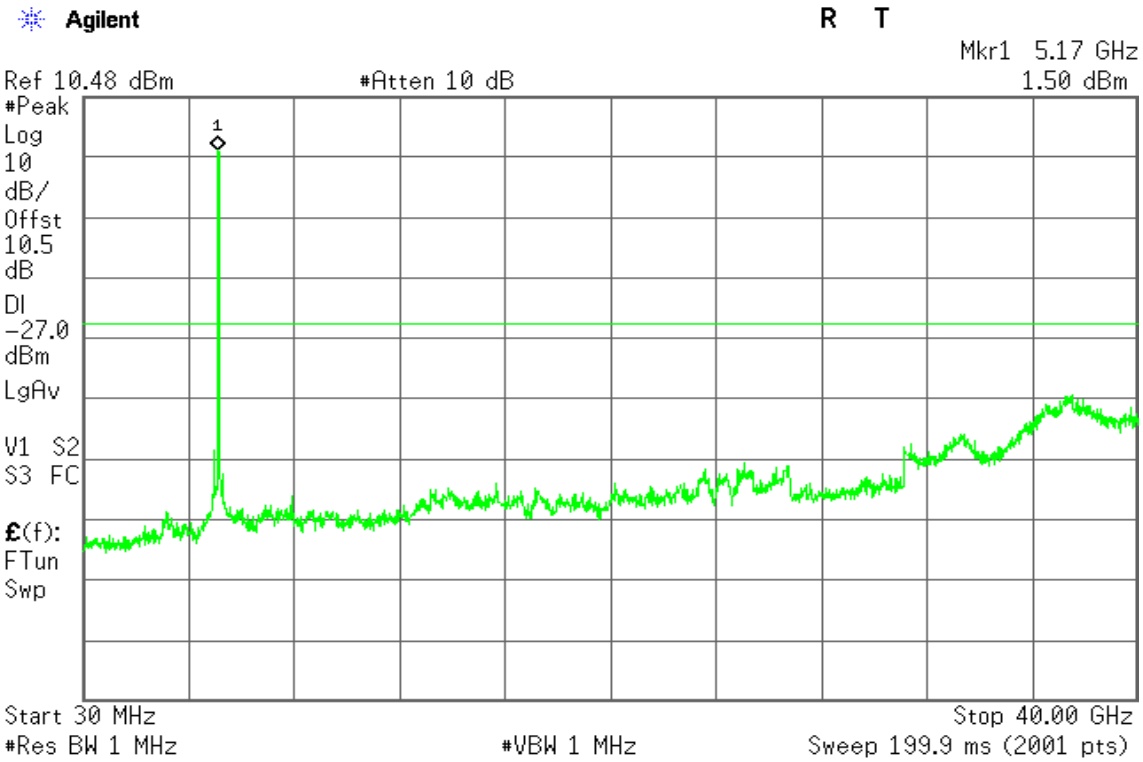


CH High

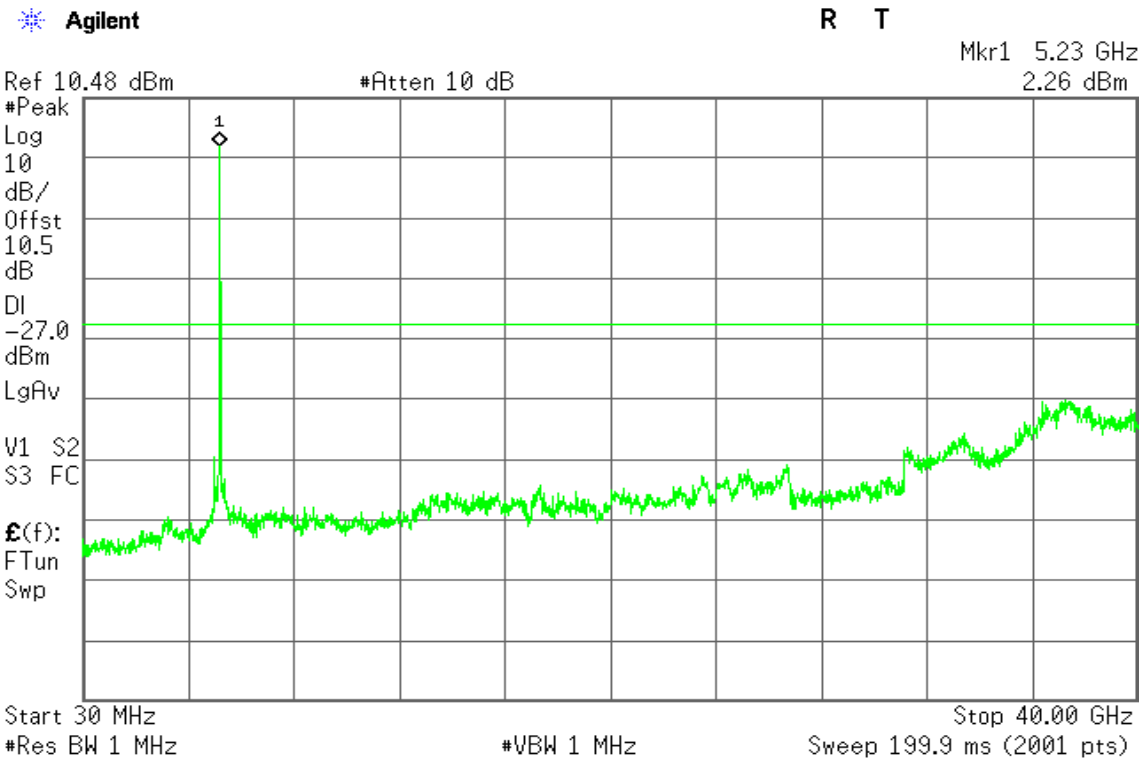


IEEE 802.11n HT 20 MHz (5180 ~ 5240MHz)

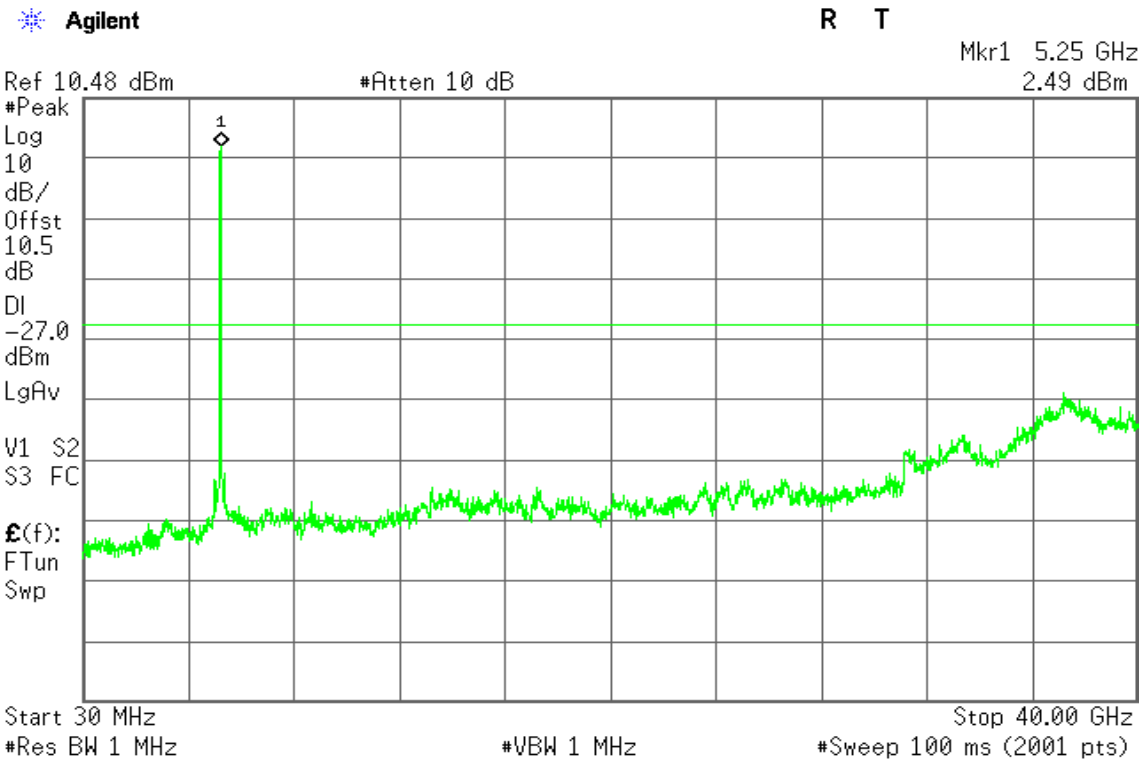
CH Low



CH Mid

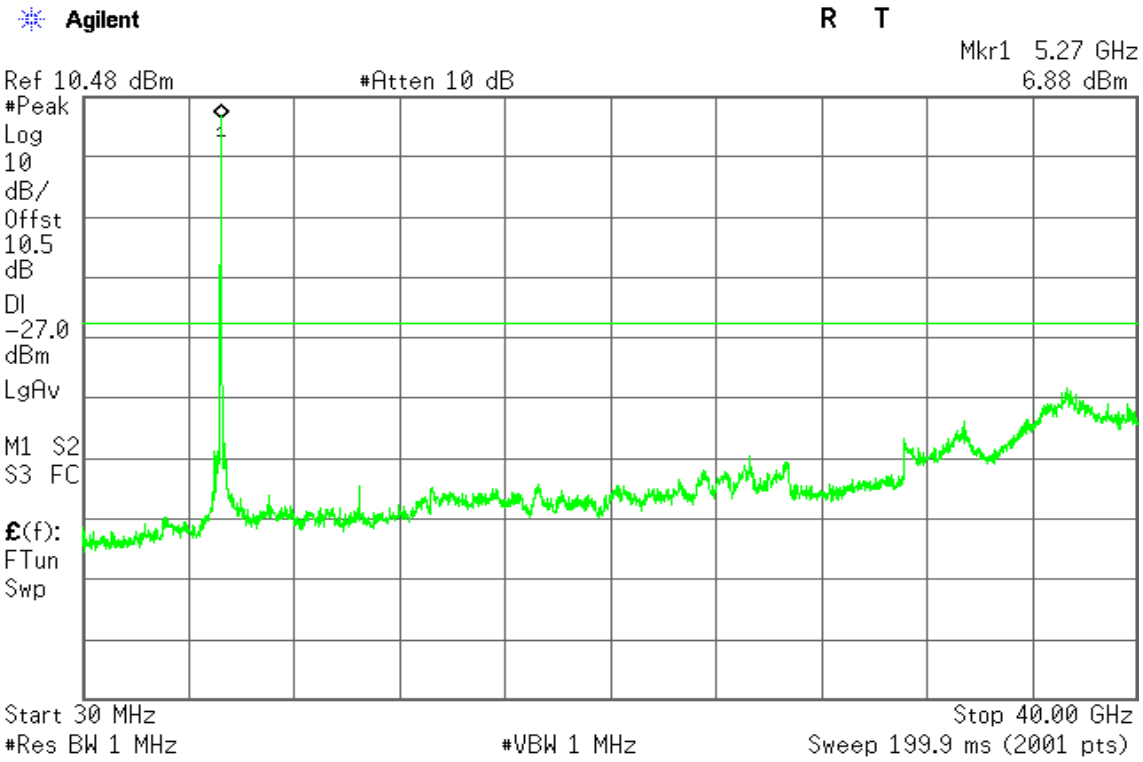


CH High

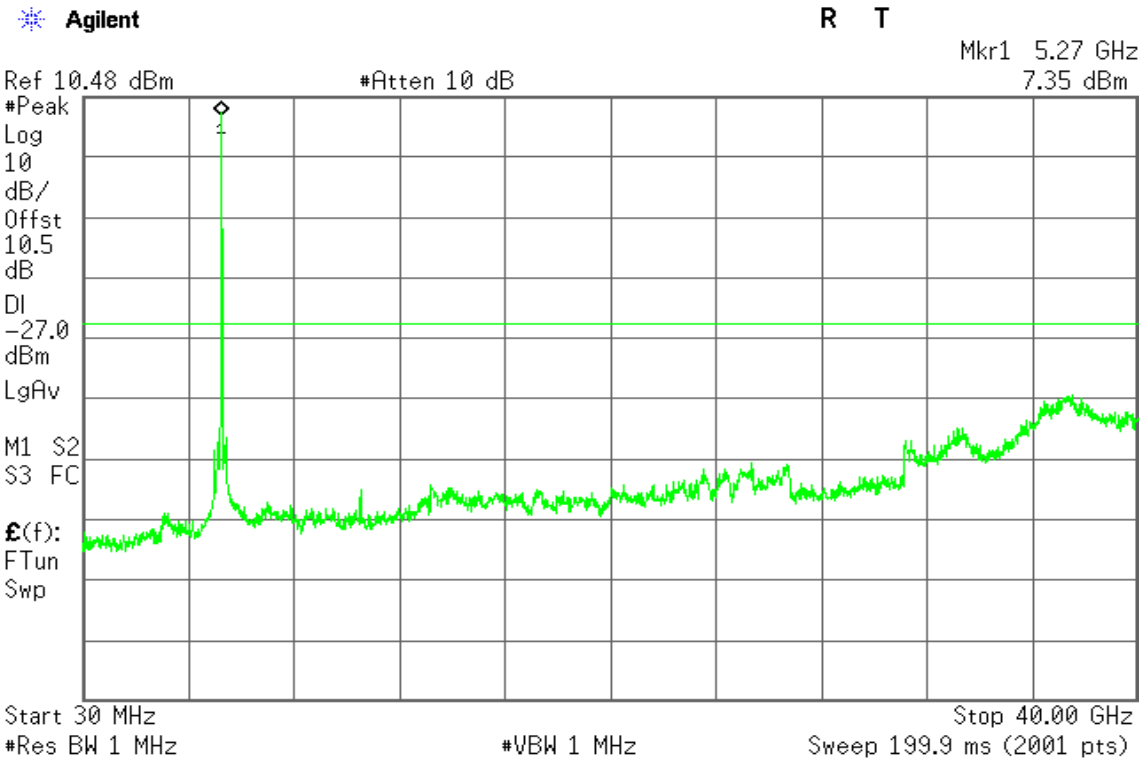


IEEE 802.11a mode / 5260 ~ 5320MHz

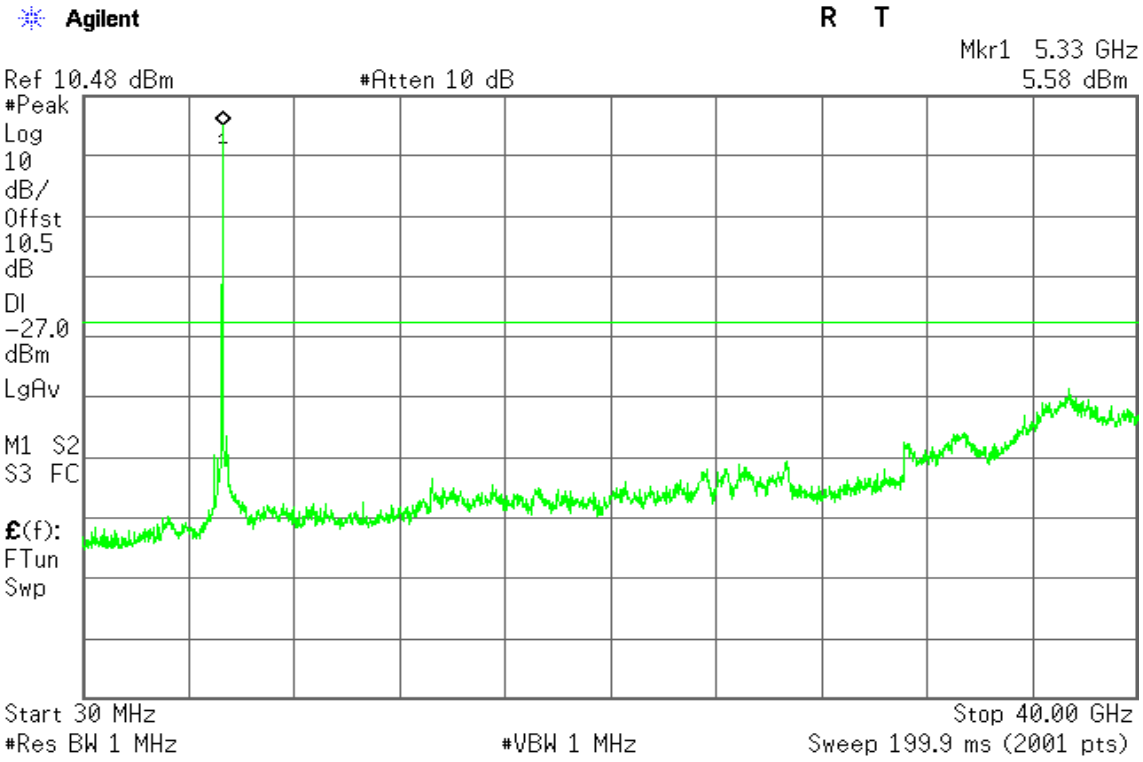
CH Low



CH Mid

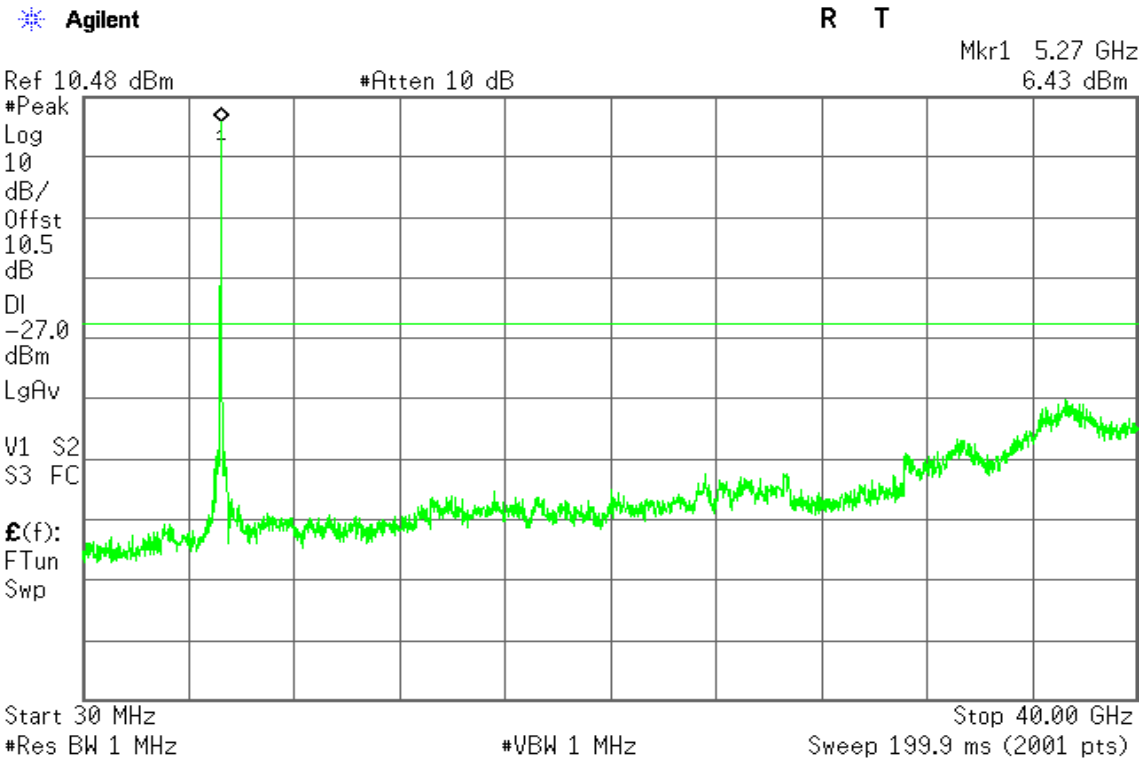


CH High

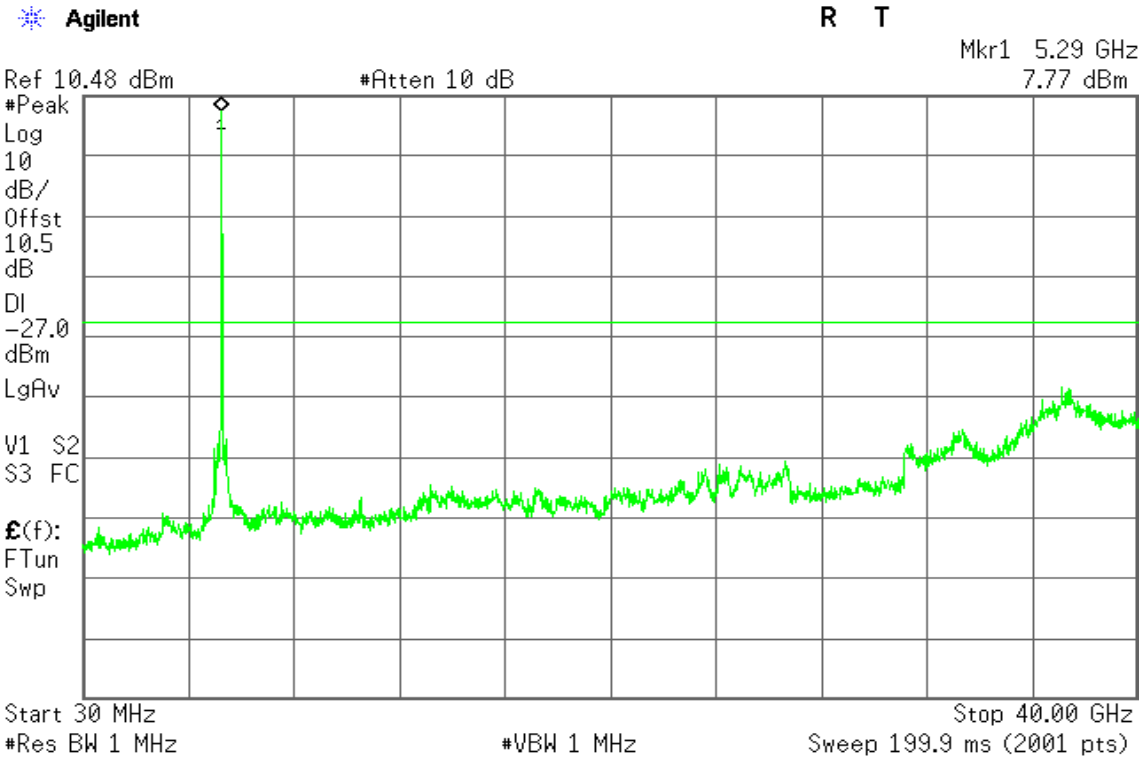


IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320MHz

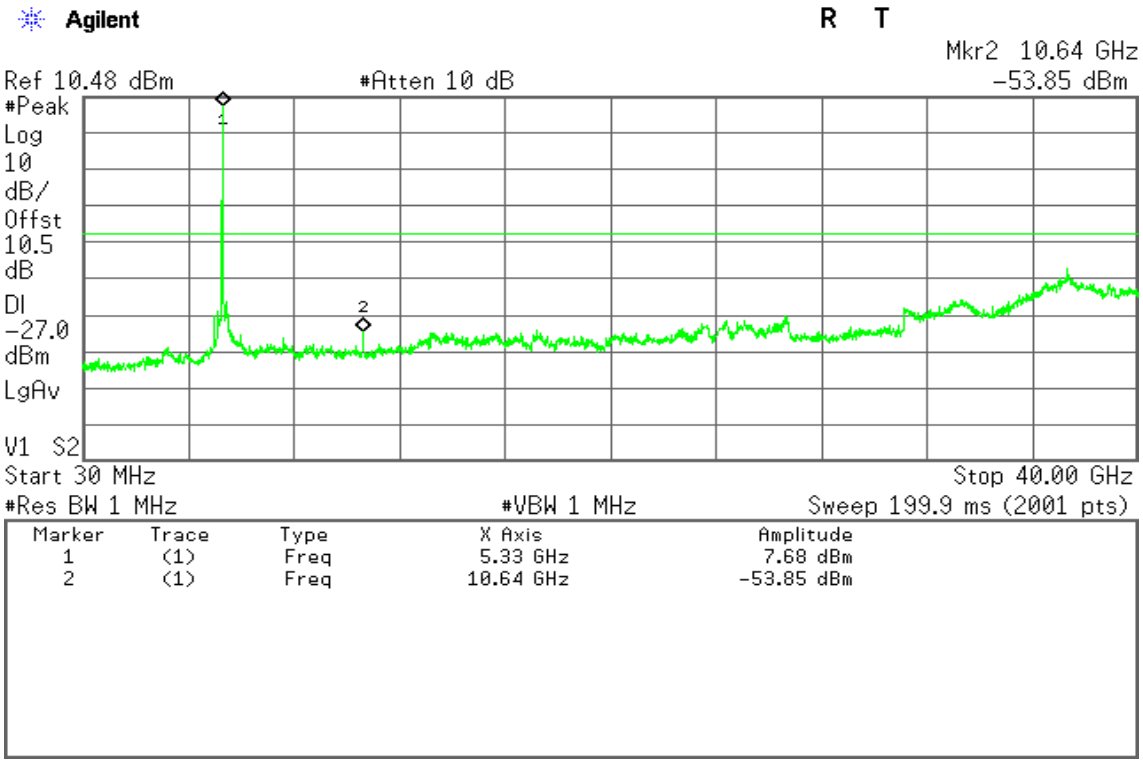
CH Low



CH Mid

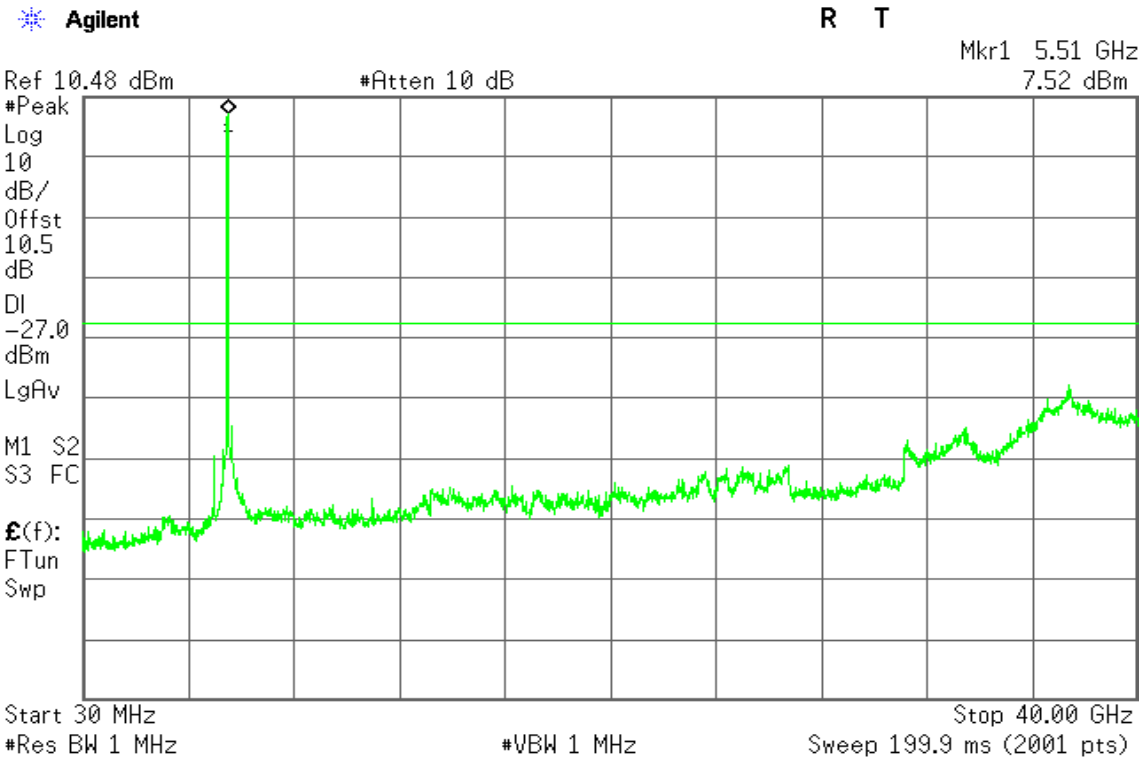


CH High

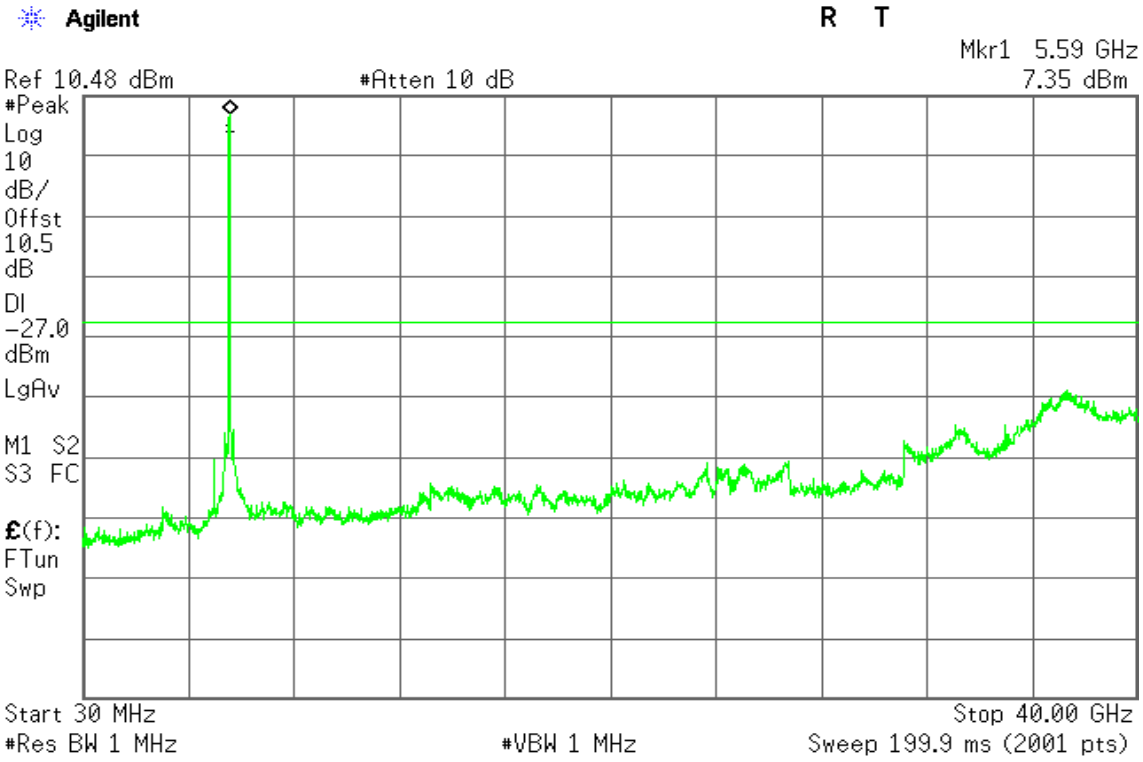


Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz

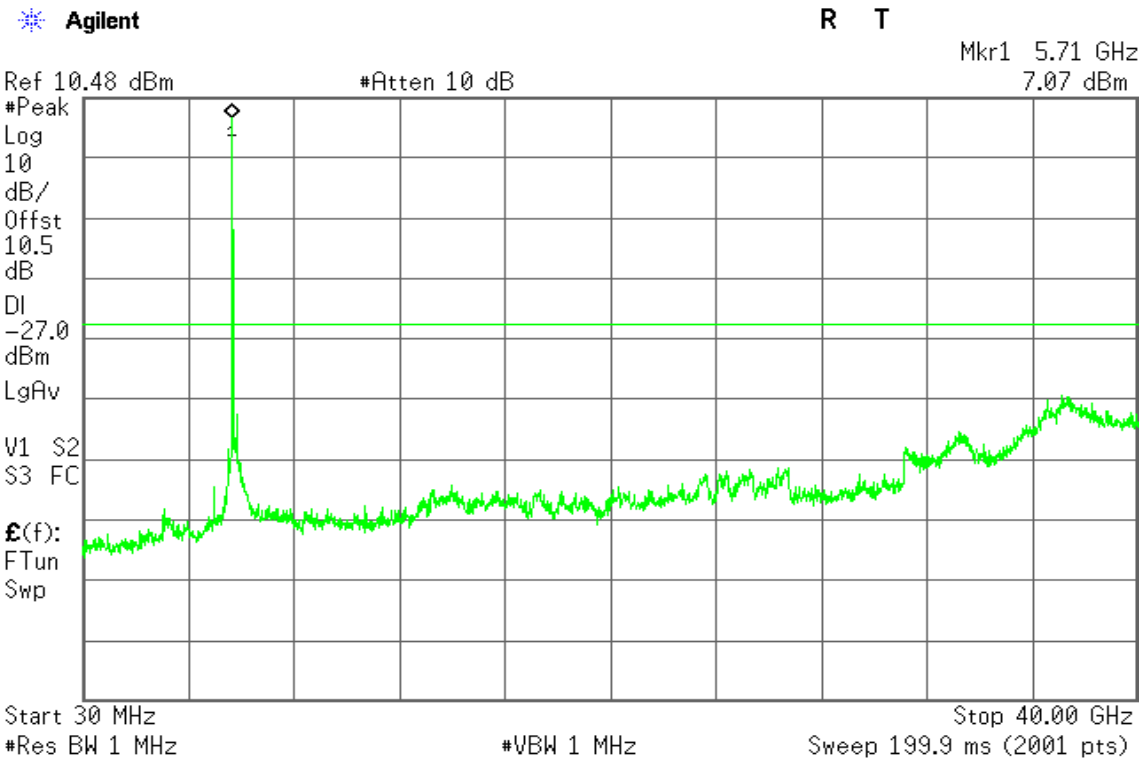
CH Low



CH Mid

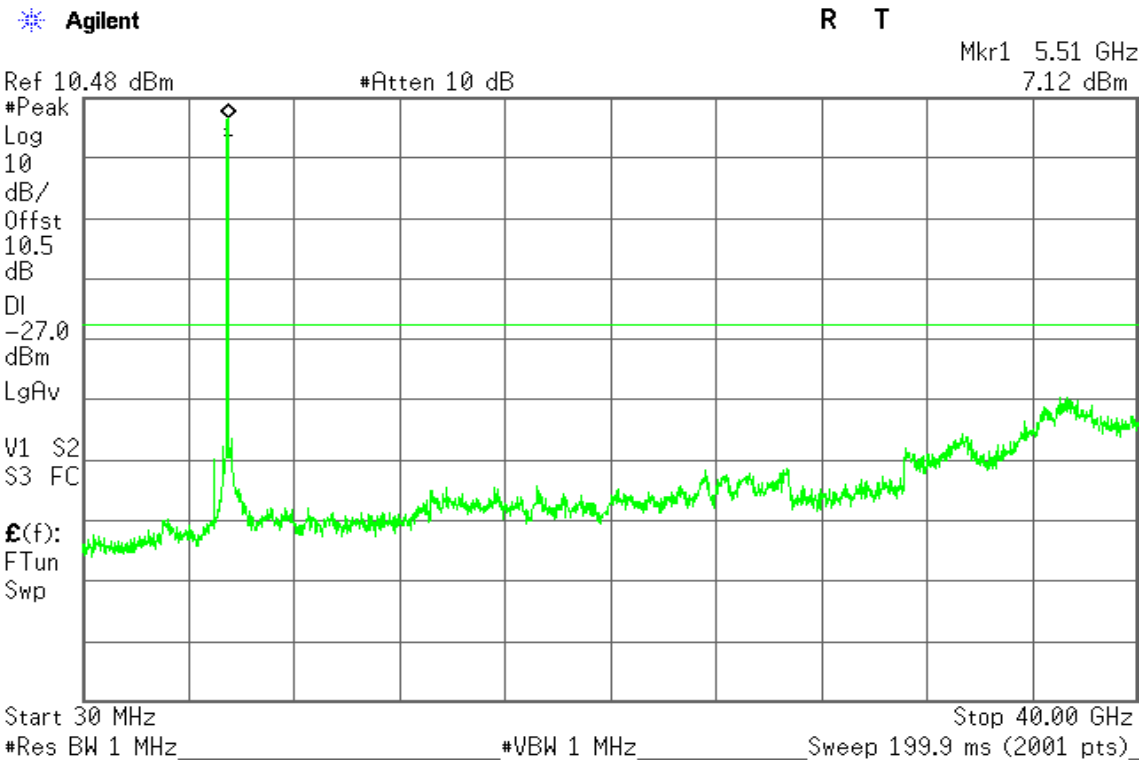


CH High

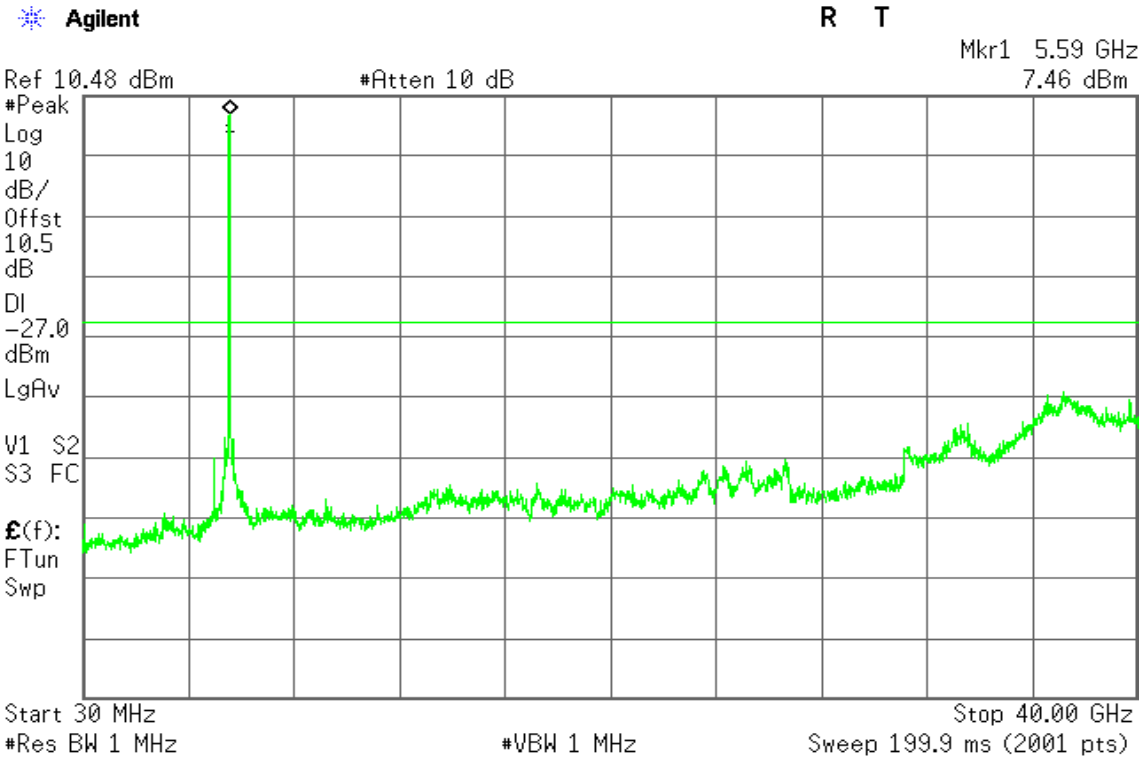


IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700MHz

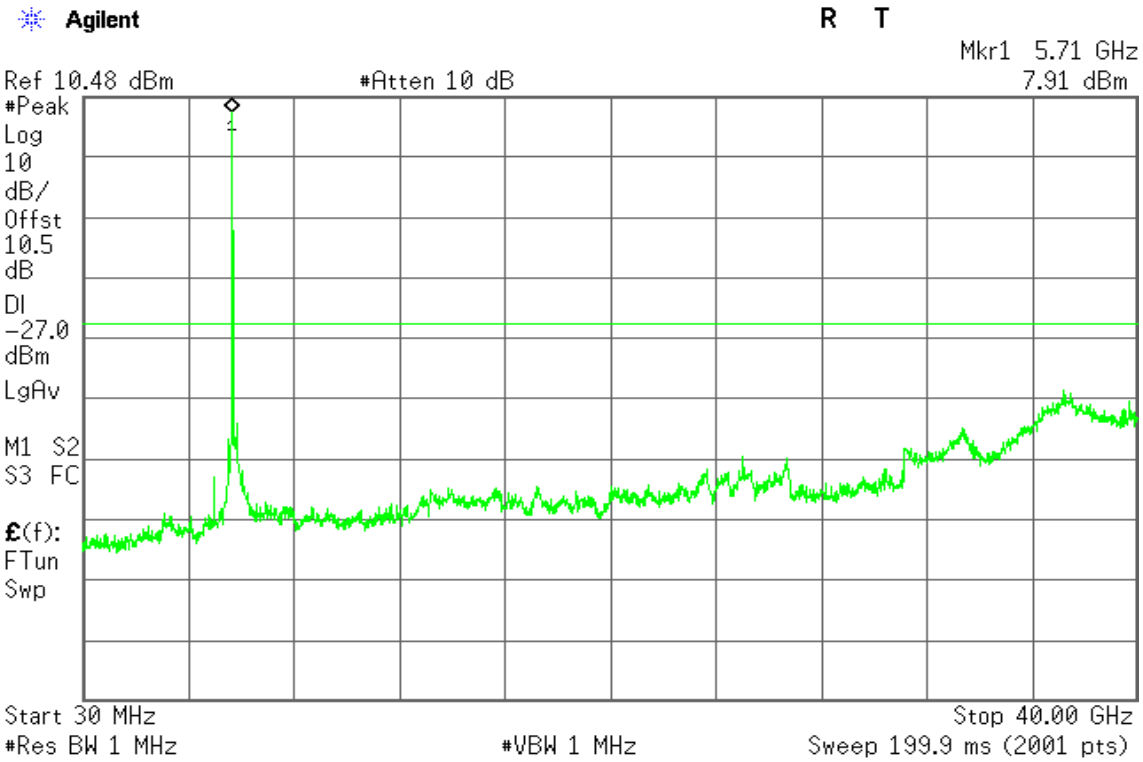
CH Low



CH Mid



CH High



7.9 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 II 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:**	February 16, 2012
Temperature:	26°C	**Tested by:**	Chester Tsai
Humidity:	60% RH		

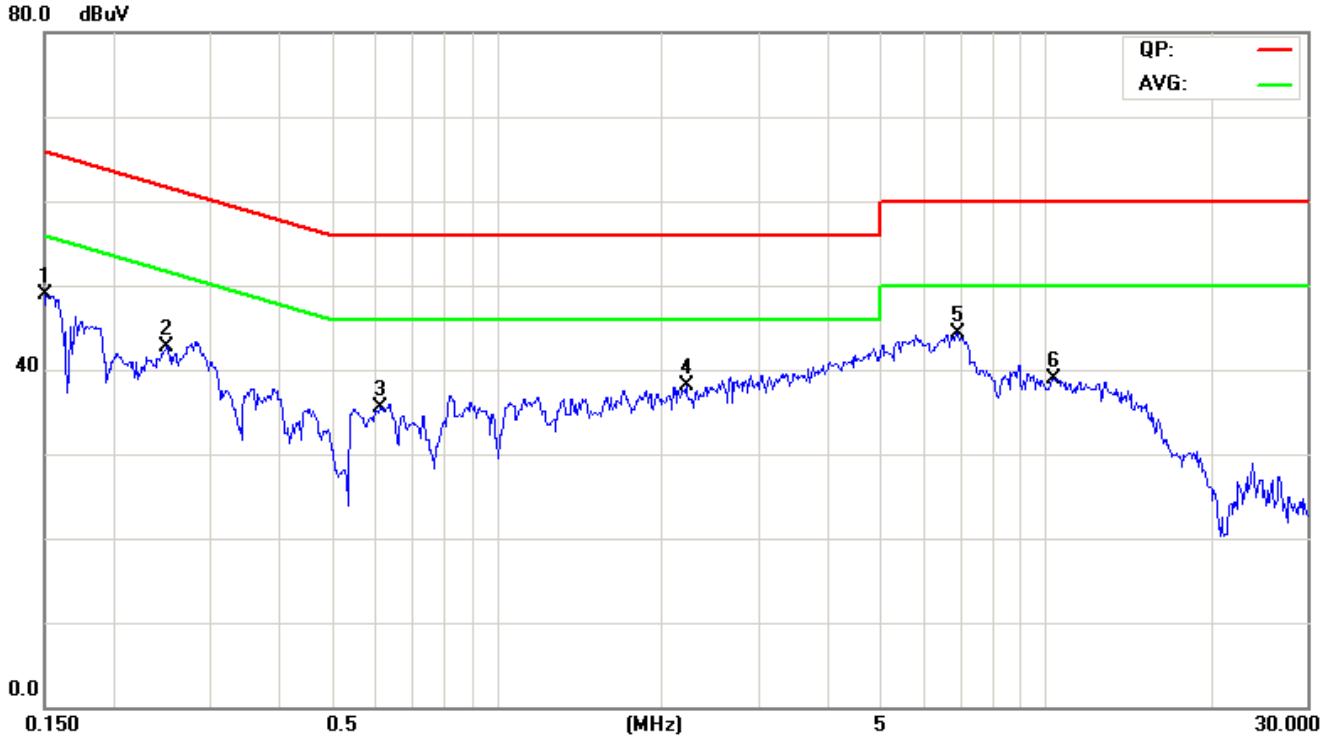
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1507	48.78	48.78	0.09	48.87	48.87	65.96	55.96	-17.09	-7.09	L1
0.2508	42.68	42.68	0.09	42.77	42.77	61.73	51.73	-18.96	-8.96	L1
0.6201	32.84	22.73	0.10	32.94	22.83	56.00	46.00	-23.06	-23.17	L1
2.2357	33.18	23.84	0.15	33.33	23.99	56.00	46.00	-22.67	-22.01	L1
6.8900	38.62	30.00	0.30	38.92	30.30	60.00	50.00	-21.08	-19.70	L1
10.3140	33.95	25.88	0.42	34.37	26.30	60.00	50.00	-25.63	-23.70	L1
0.1558	46.31	30.12	0.09	46.40	30.21	65.68	55.68	-19.28	-25.47	L2
0.3215	39.02	27.91	0.09	39.11	28.00	59.67	49.67	-20.56	-21.67	L2
1.1077	33.49	20.94	0.10	33.59	21.04	56.00	46.00	-22.41	-24.96	L2
4.2698	34.17	24.97	0.18	34.35	25.15	56.00	46.00	-21.65	-20.85	L2
5.9676	36.17	26.68	0.22	36.39	26.90	60.00	50.00	-23.61	-23.10	L2
24.0011	30.63	26.42	0.65	31.28	27.07	60.00	50.00	-28.72	-22.93	L2

Remark:

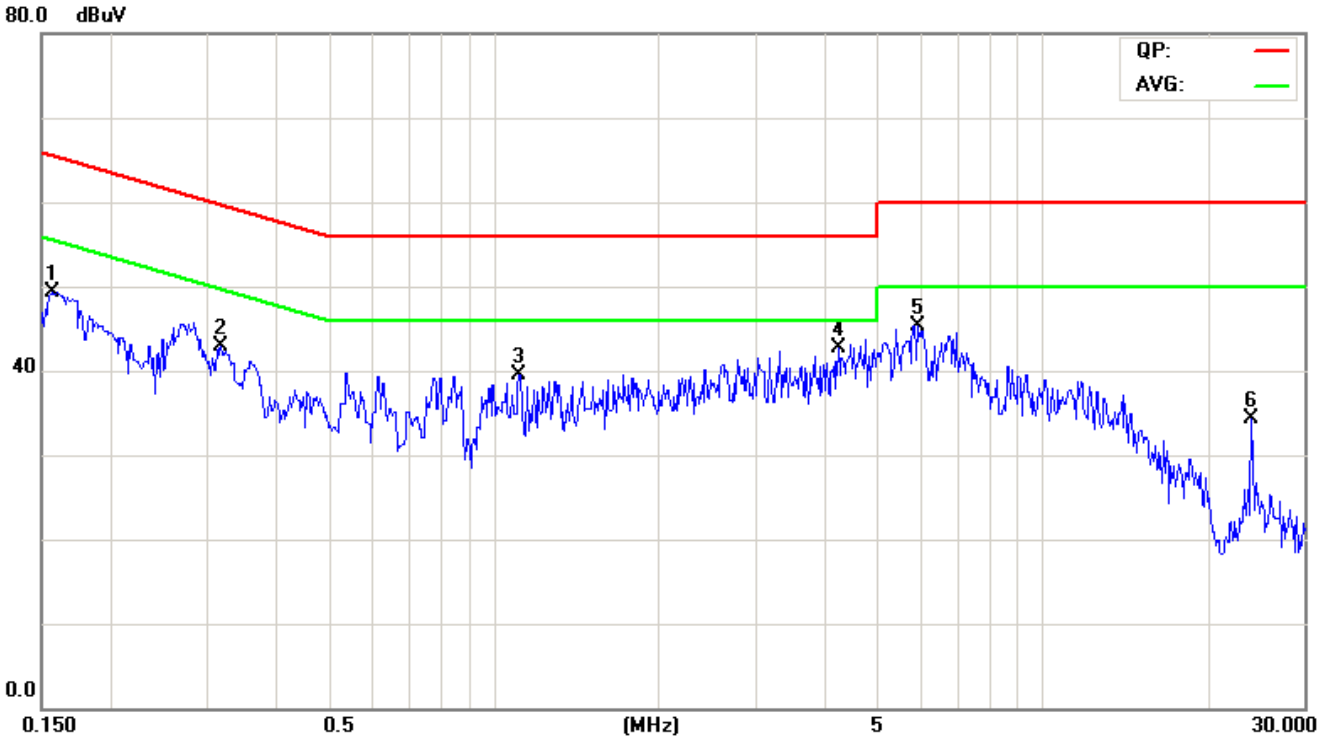
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 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)

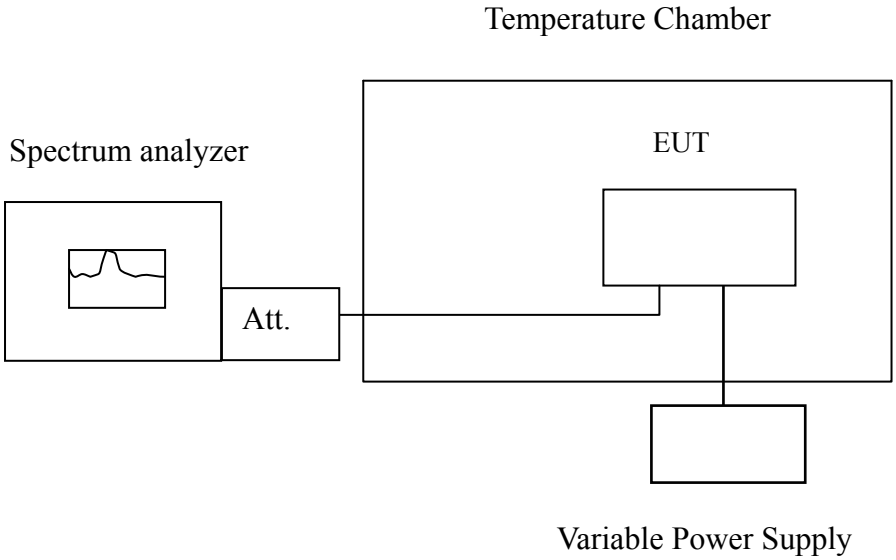


7.10 FREQUENCY STABILITY

LIMIT

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

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	5180.001202	5150~5250	Pass
40	110	5179.973357	5150~5250	Pass
30	110	5179.993079	5150~5250	Pass
20	110	5180.005383	5150~5250	Pass
10	110	5179.979495	5150~5250	Pass
0	110	5180.020371	5150~5250	Pass
-10	110	5179.976897	5150~5250	Pass
-20	110	5179.996777	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5180.016092	5150~5250	Pass
	110	5179.978065	5150~5250	Pass
	121	5179.980783	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5239.991058	5150~5250	Pass
40	110	5239.980515	5150~5250	Pass
30	110	5239.986816	5150~5250	Pass
20	110	5240.009889	5150~5250	Pass
10	110	5239.986490	5150~5250	Pass
0	110	5239.990107	5150~5250	Pass
-10	110	5240.005326	5150~5250	Pass
-20	110	5240.020865	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5239.975065	5150~5250	Pass
	110	5239.997755	5150~5250	Pass
	121	5239.985259	5150~5250	Pass

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

CH Low

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5179.997416	5150~5250	Pass
40	110	5179.979583	5150~5250	Pass
30	110	5179.979588	5150~5250	Pass
20	110	5179.998196	5150~5250	Pass
10	110	5180.003426	5150~5250	Pass
0	110	5179.982241	5150~5250	Pass
-10	110	5179.986851	5150~5250	Pass
-20	110	5179.990860	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5179.970218	5150~5250	Pass
	110	5180.014203	5150~5250	Pass
	121	5180.017003	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5240.007435	5150~5250	Pass
40	110	5239.974199	5150~5250	Pass
30	110	5239.994157	5150~5250	Pass
20	110	5240.015372	5150~5250	Pass
10	110	5239.998311	5150~5250	Pass
0	110	5240.014170	5150~5250	Pass
-10	110	5239.985436	5150~5250	Pass
-20	110	5239.999026	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5239.985865	5150~5250	Pass
	110	5240.00024	5150~5250	Pass
	121	5239.976755	5150~5250	Pass

IEEE 802.11a mode / 5260 ~ 5320 MHz:

CH Low

Operating Frequency: 5260 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	110	5260.020471	5250~5350	Pass
40	110	5259.991777	5250~5350	Pass
30	110	5260.001980	5250~5350	Pass
20	110	5260.008143	5250~5350	Pass
10	110	5260.004803	5250~5350	Pass
0	110	5259.970800	5250~5350	Pass
-10	110	5260.013748	5250~5350	Pass
-20	110	5259.980757	5250~5350	Pass

Operating Frequency: 5260 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
20	99	5259.984083	5250~5350	Pass
	110	5260.00651	5250~5350	Pass
	121	5260.010257	5250~5350	Pass

CH High

Operating Frequency: 5320 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5320.019298	5250~5350	Pass
40	110	5320.003374	5250~5350	Pass
30	110	5319.974695	5250~5350	Pass
20	110	5320.007362	5250~5350	Pass
10	110	5319.985279	5250~5350	Pass
0	110	5319.982286	5250~5350	Pass
-10	110	5319.974176	5250~5350	Pass
-20	110	5320.018723	5250~5350	Pass

Operating Frequency: 5320 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5319.987741	5250~5350	Pass
	110	5320.011381	5250~5350	Pass
	121	5320.002114	5250~5350	Pass

IEEE 802.11n HT 20 MHz Channel mode / 5260 ~ 5320 MHz:

CH Low

Operating Frequency: 5260 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5260.006767	5250~5350	Pass
40	110	5259.988355	5250~5350	Pass
30	110	5259.991982	5250~5350	Pass
20	110	5259.995440	5250~5350	Pass
10	110	5260.014623	5250~5350	Pass
0	110	5259.983867	5250~5350	Pass
-10	110	5259.994107	5250~5350	Pass
-20	110	5259.981503	5250~5350	Pass

Operating Frequency: 5260 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5260.0097	5250~5350	Pass
	110	5259.993322	5250~5350	Pass
	121	5259.978913	5250~5350	Pass

CH High

Operating Frequency: 5320 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5320.008093	5250~5350	Pass
40	110	5319.974507	5250~5350	Pass
30	110	5320.010987	5250~5350	Pass
20	110	5320.008051	5250~5350	Pass
10	110	5319.999249	5250~5350	Pass
0	110	5320.014166	5250~5350	Pass
-10	110	5319.974986	5250~5350	Pass
-20	110	5319.999356	5250~5350	Pass

Operating Frequency: 5320 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5319.970161	5250~5350	Pass
	110	5319.984009	5250~5350	Pass
	121	5319.987334	5250~5350	Pass

IEEE 802.11a mode / 5500 ~ 5700 MHz:

CH Low

Operating Frequency: 5500 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	110	5499.996332	5470~5725	Pass
40	110	5499.983679	5470~5725	Pass
30	110	5499.998090	5470~5725	Pass
20	110	5499.989402	5470~5725	Pass
10	110	5500.017784	5470~5725	Pass
0	110	5500.000742	5470~5725	Pass
-10	110	5499.973209	5470~5725	Pass
-20	110	5500.015160	5470~5725	Pass

Operating Frequency: 5500 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
20	99	5500.007989	5470~5725	Pass
	110	5499.974319	5470~5725	Pass
	121	5500.003808	5470~5725	Pass

CH High

Operating Frequency: 5700 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5699.995183	5470~5725	Pass
40	110	5699.980766	5470~5725	Pass
30	110	5699.974935	5470~5725	Pass
20	110	5700.014751	5470~5725	Pass
10	110	5699.979865	5470~5725	Pass
0	110	5699.992590	5470~5725	Pass
-10	110	5700.001667	5470~5725	Pass
-20	110	5699.977244	5470~5725	Pass

Operating Frequency: 5700 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5699.970011	5470~5725	Pass
	110	5700.012082	5470~5725	Pass
	121	5700.005732	5470~5725	Pass

IEEE 802.11n HT 20 MHz Channel mode / 5500 ~ 5700 MHz:

CH Low

Operating Frequency: 5500 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	110	5499.984976	5470~5725	Pass
40	110	5499.971681	5470~5725	Pass
30	110	5500.007799	5470~5725	Pass
20	110	5499.977233	5470~5725	Pass
10	110	5500.012248	5470~5725	Pass
0	110	5499.999387	5470~5725	Pass
-10	110	5499.991675	5470~5725	Pass
-20	110	5499.984289	5470~5725	Pass

Operating Frequency: 5500 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	99	5499.990697	5470~5725	Pass
	110	5500.009397	5470~5725	Pass
	121	5499.970732	5470~5725	Pass

CH High

Operating Frequency: 5700 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	110	5699.972288	5470~5725	Pass
40	110	5699.987482	5470~5725	Pass
30	110	5699.972719	5470~5725	Pass
20	110	5699.982575	5470~5725	Pass
10	110	5700.013833	5470~5725	Pass
0	110	5699.973165	5470~5725	Pass
-10	110	5700.002159	5470~5725	Pass
-20	110	5699.982367	5470~5725	Pass

Operating Frequency: 5700 MHz				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
20	99	5699.972476	5470~5725	Pass
	110	5699.991943	5470~5725	Pass
	121	5700.012427	5470~5725	Pass

7.11 DYNAMIC FREQUENCY SELECTION

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
U-NII Detection Bandwidth	Yes	Not required	Yes

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
U-NII Detection Bandwidth	Yes	Not required	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

DESCRIPTION OF EUT

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

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

The EUT uses one transmitters, each connected to a 50-ohm coaxial antenna port. Both antenna ports are connected to the test system via a power divider to perform conducted tests.

The EUT is a Slave Device without radar detection.

WLAN traffic is generated by streaming the video file TestFile.mp2 "6 ½ Magic Hours" from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

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 D AIR-AP1262N-A-K9, FCC ID: LDK102061 & LDK102062.

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 + 3.5 = -58.5dBm.

The calibrated conducted DFS Detection Threshold level is set to -58.5dBm. 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.

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.

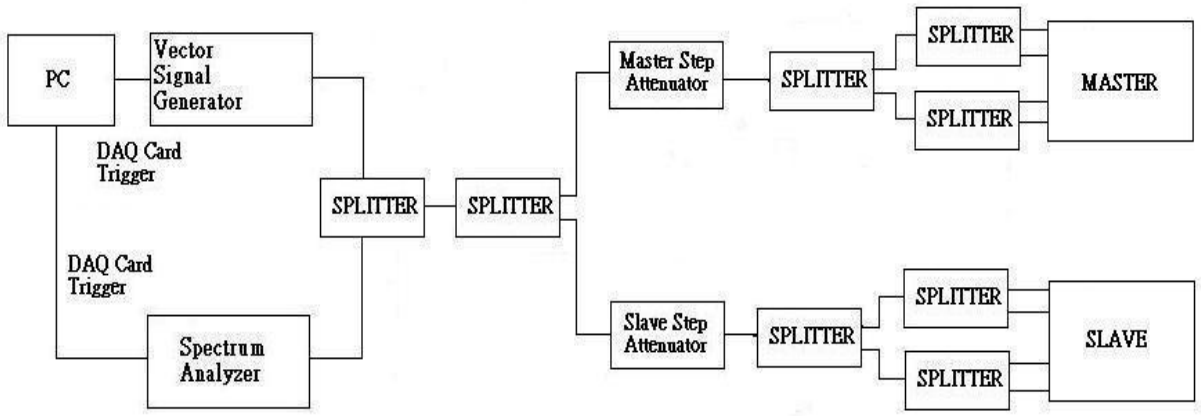
The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

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.

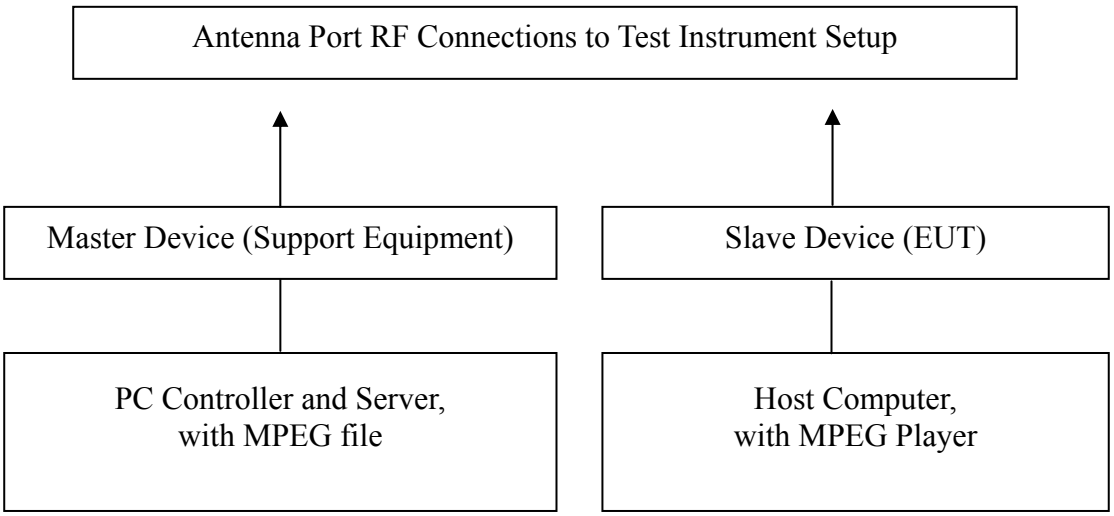
Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection 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. Use the test program iperf.exe 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.

Test Setup



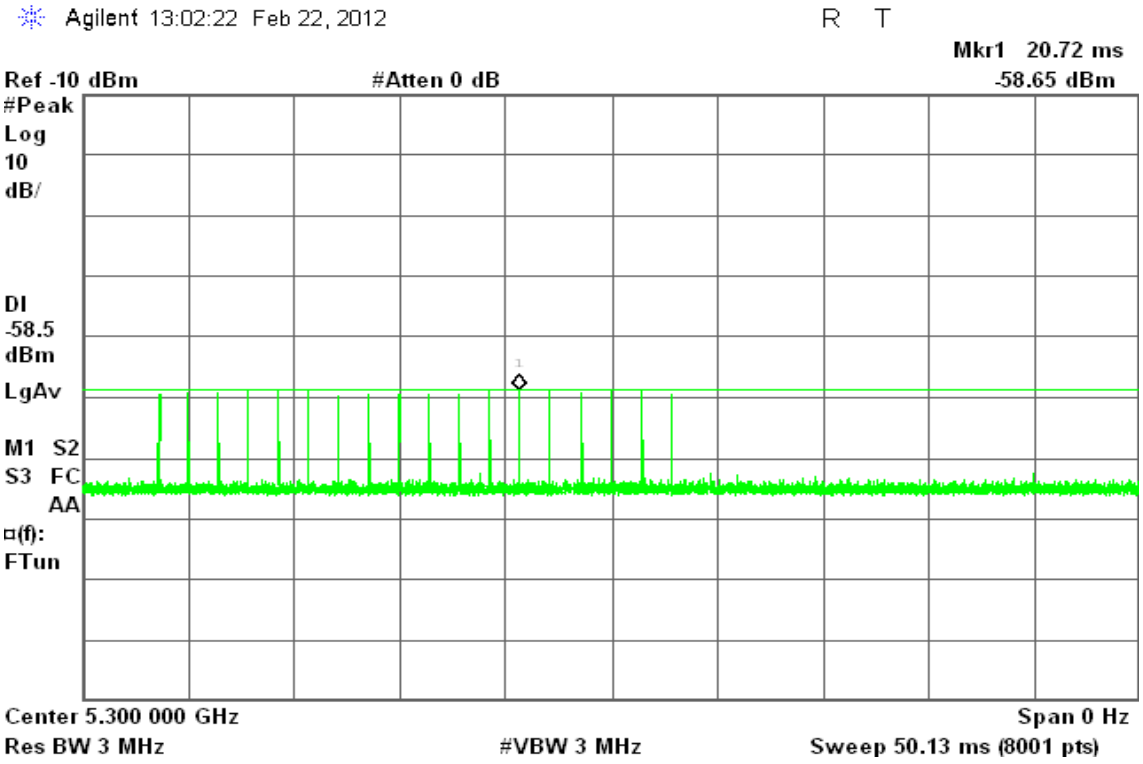
TEST RESULTS

No non-compliance noted

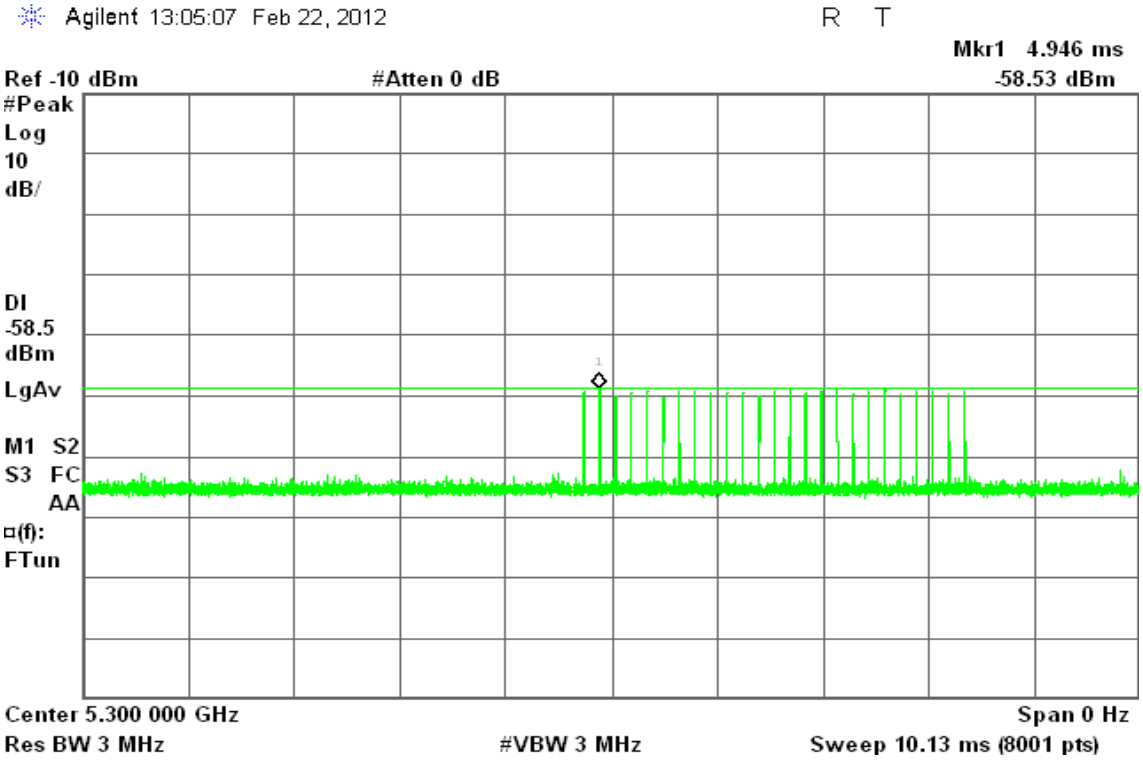
Test Plot

PLOTS OF RADAR WAVEFORMS

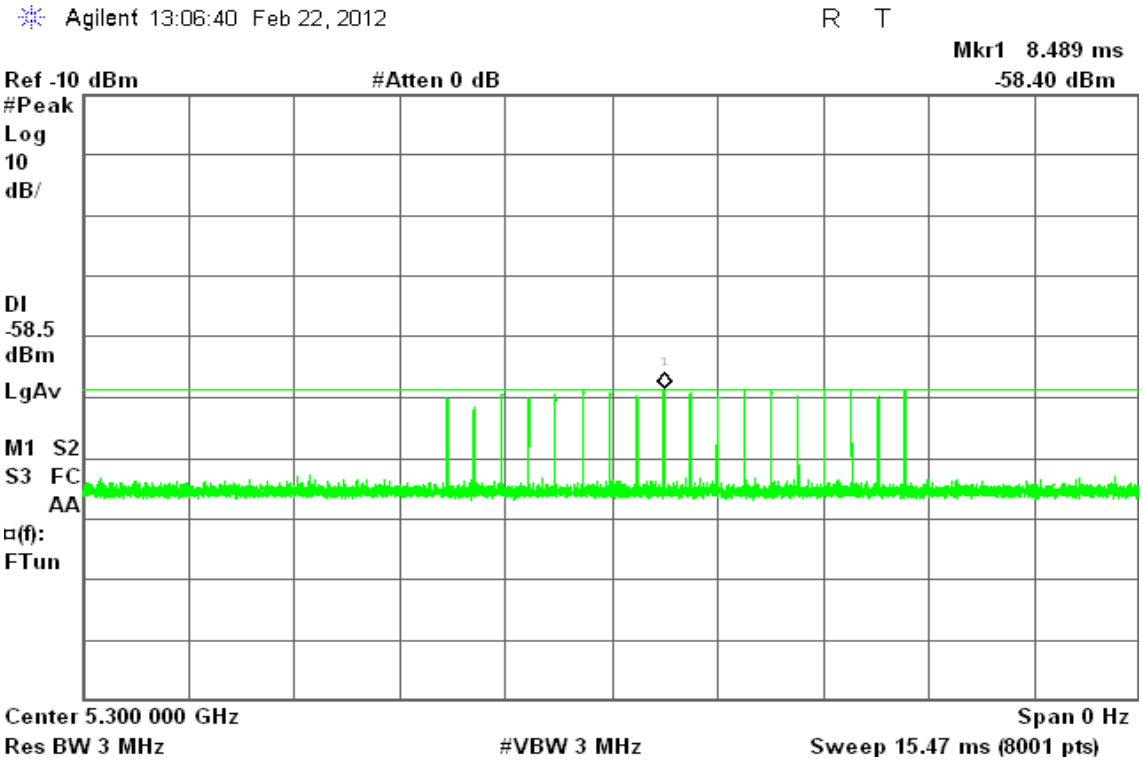
Sample of Short Pulse Radar Type 1



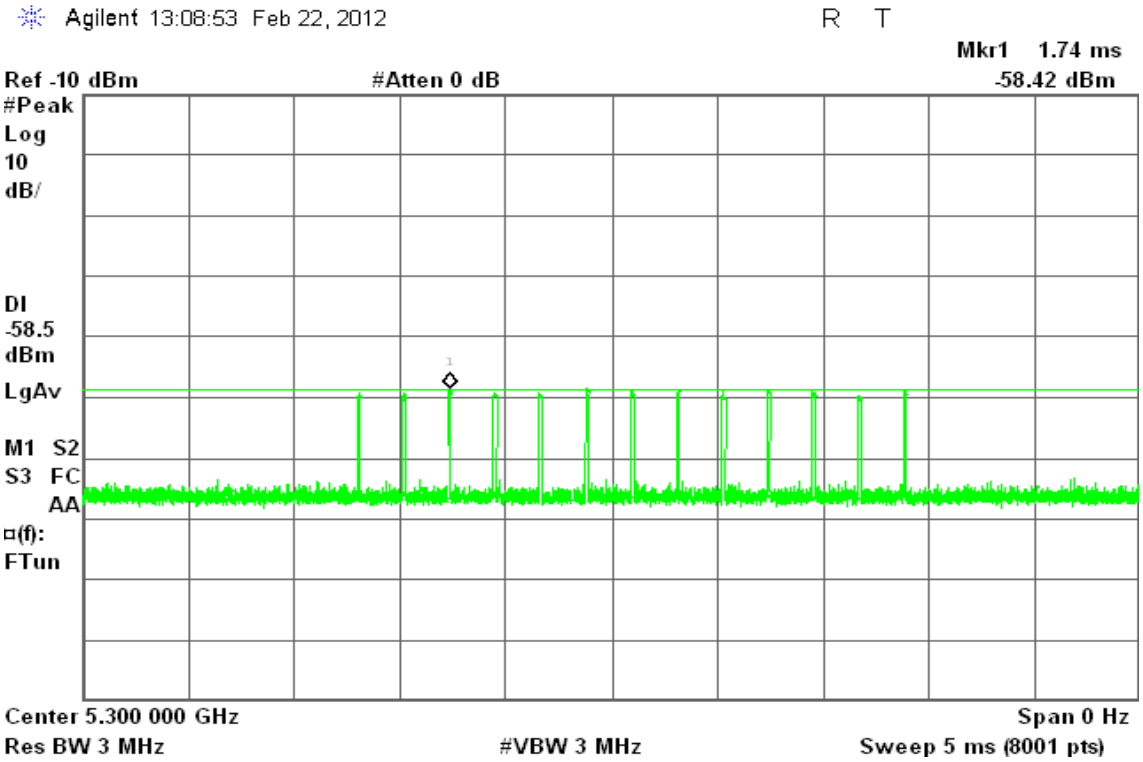
Sample of Short Pulse Radar Type 2



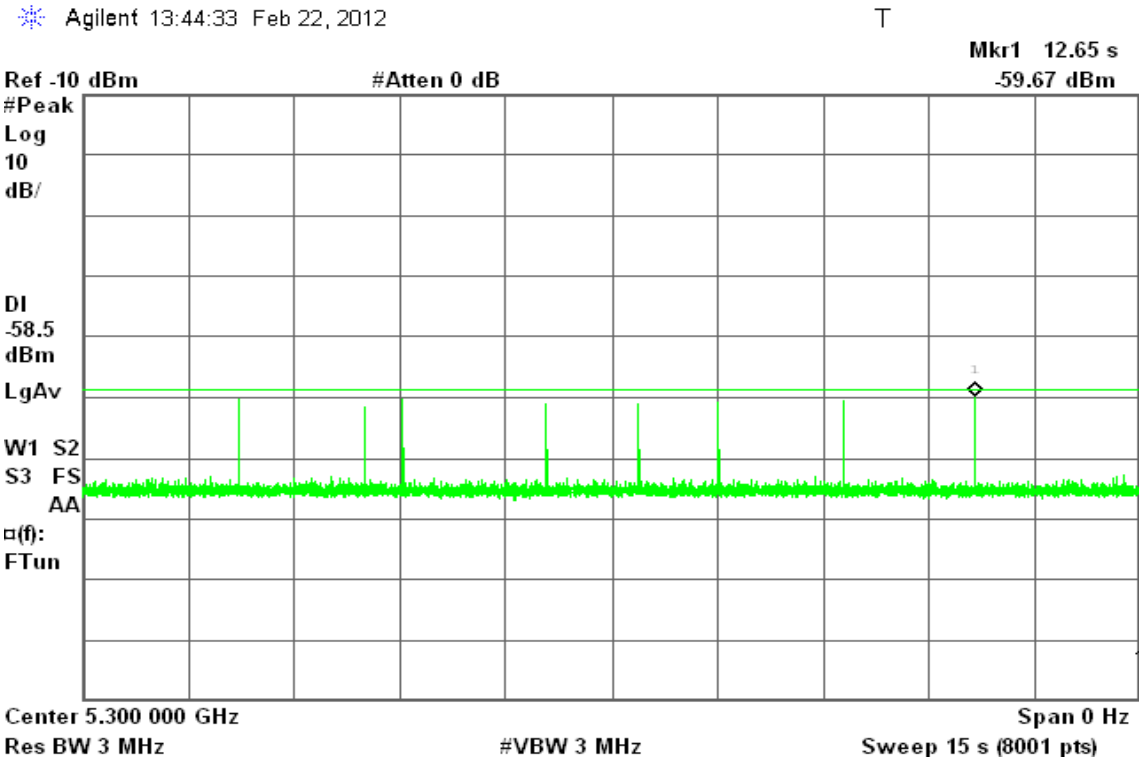
Sample of Short Pulse Radar Type 3



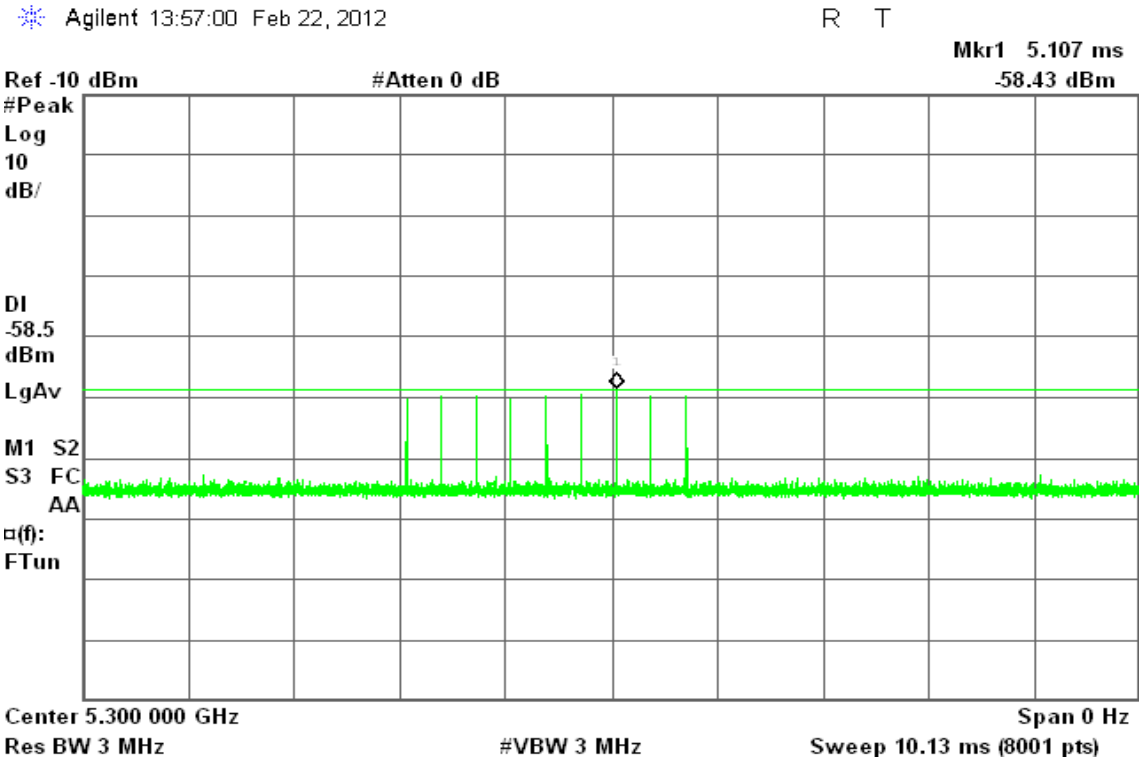
Sample of Short Pulse Radar Type 4



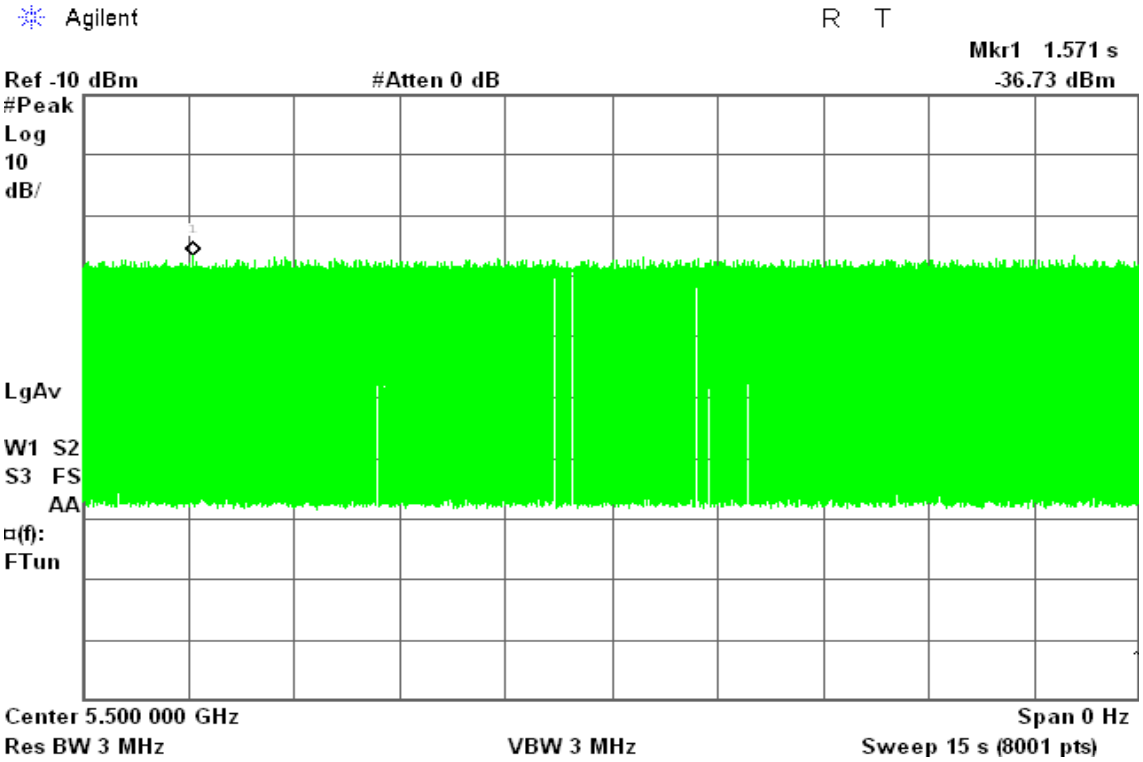
Sample of Long Pulse Radar Type 5



Sample of Frequency Hopping Radar Type 6



Plot of WLAN Traffic from Slave



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).

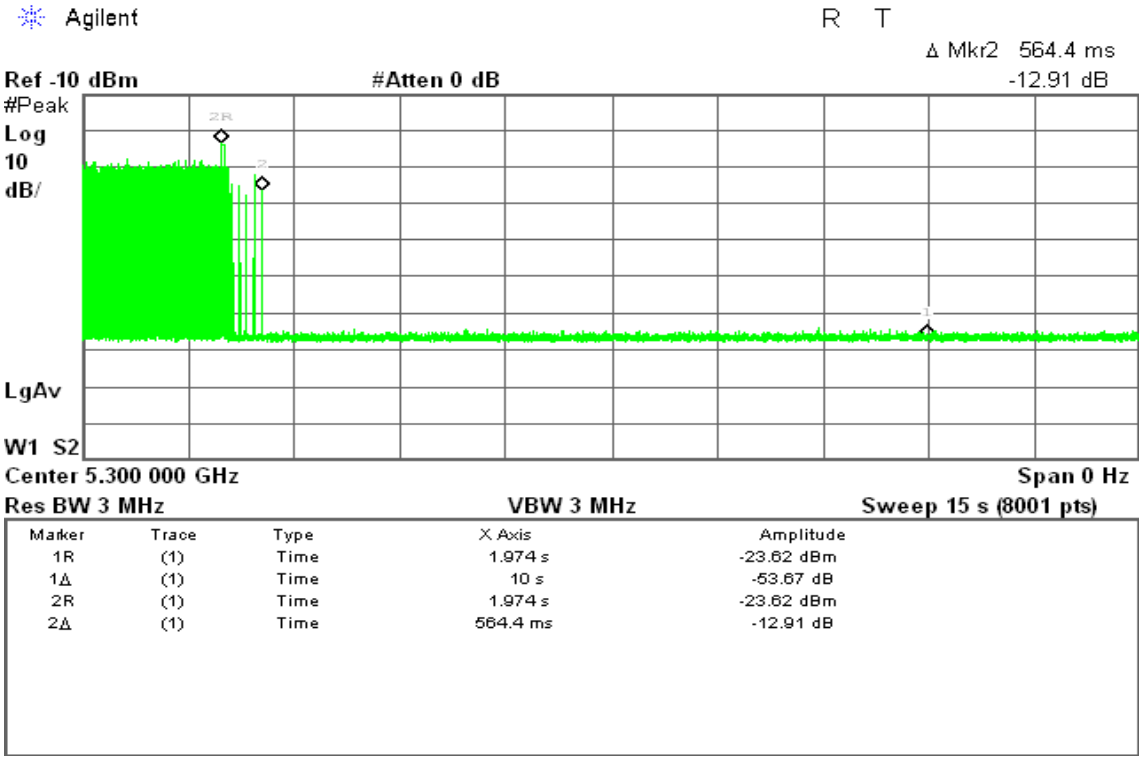
LOW BAND RESULTS

IEEE 802.11n HT 20 MHz Channel mode

Type 1 Channel Move Time Results

No non-compliance noted.

Channel Move Time (s)	Limit (s)
1.974	10



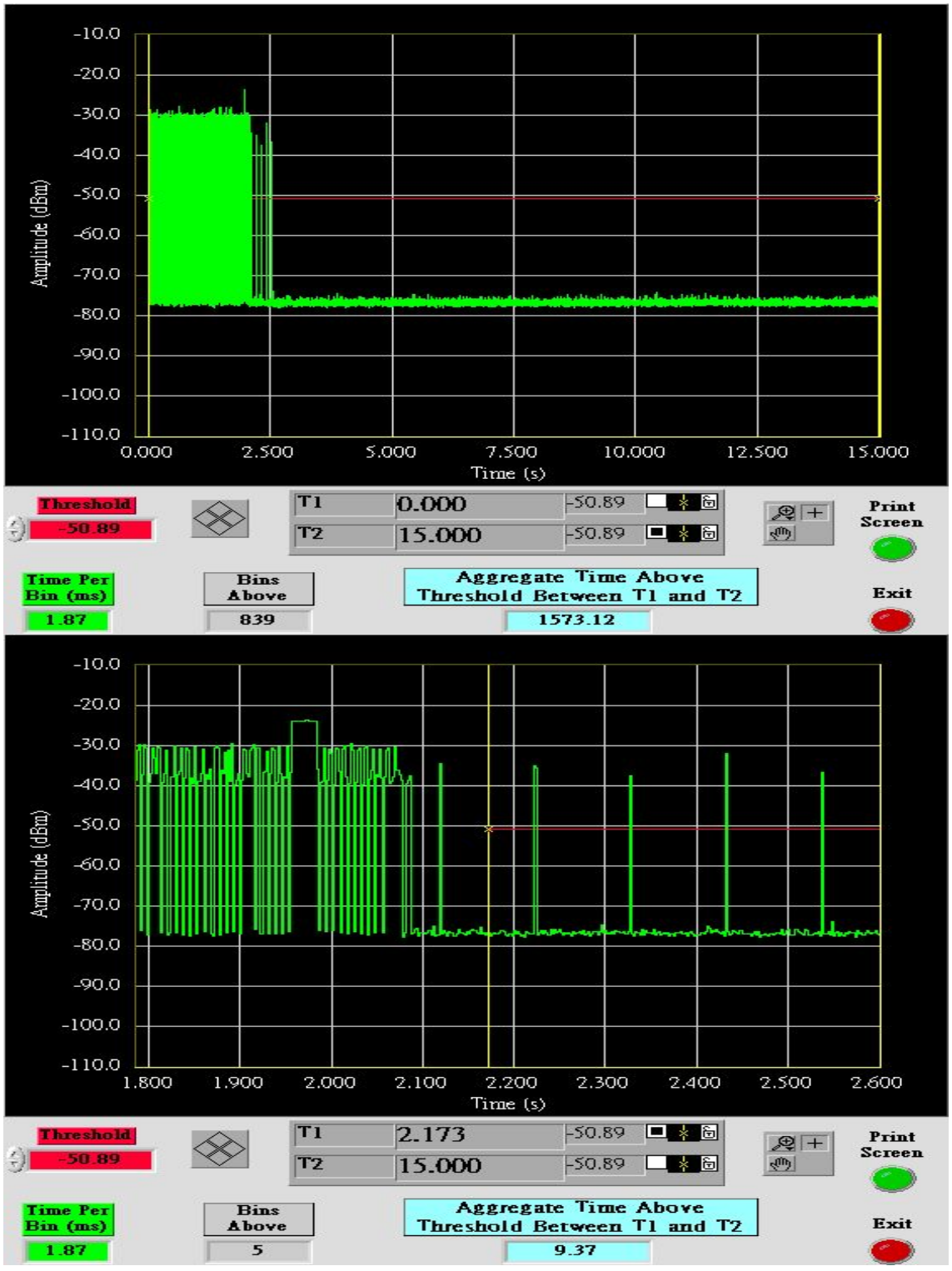
IEEE 802.11n HT 20 MHz Channel mode

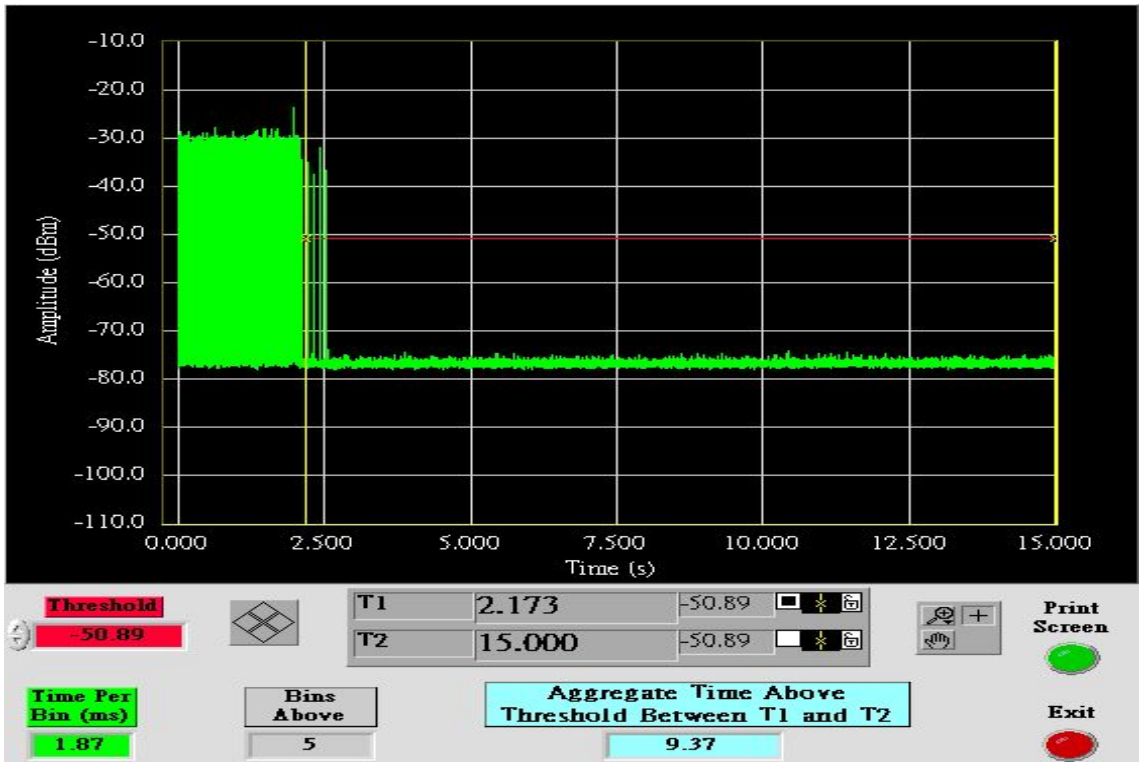
Type 1 Channel Closing Transmission Time Results

No non-compliance noted.

For R1

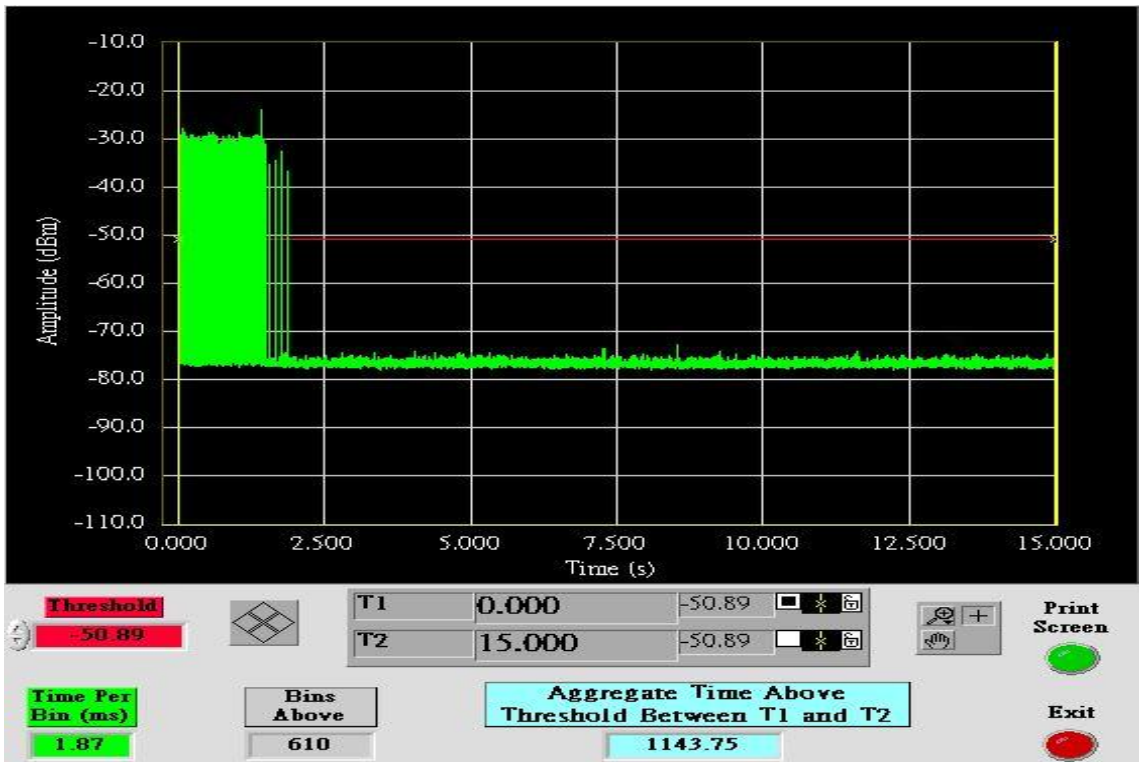
Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
9.37	60	-50.63

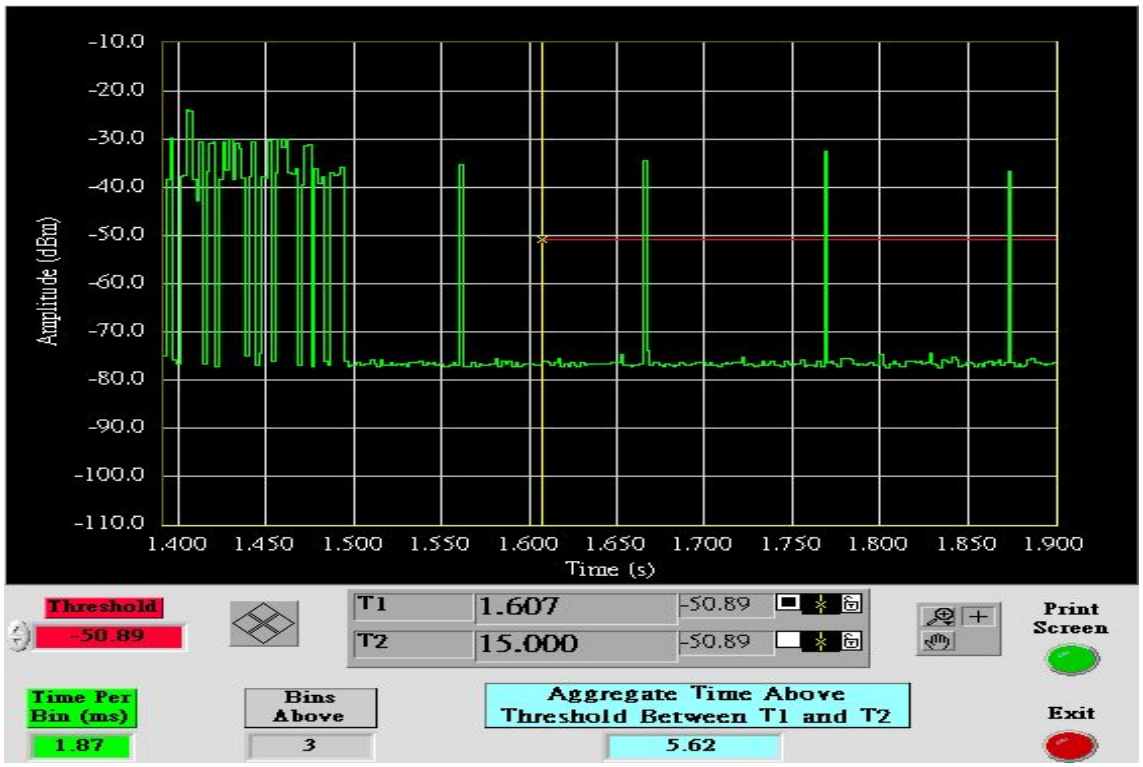


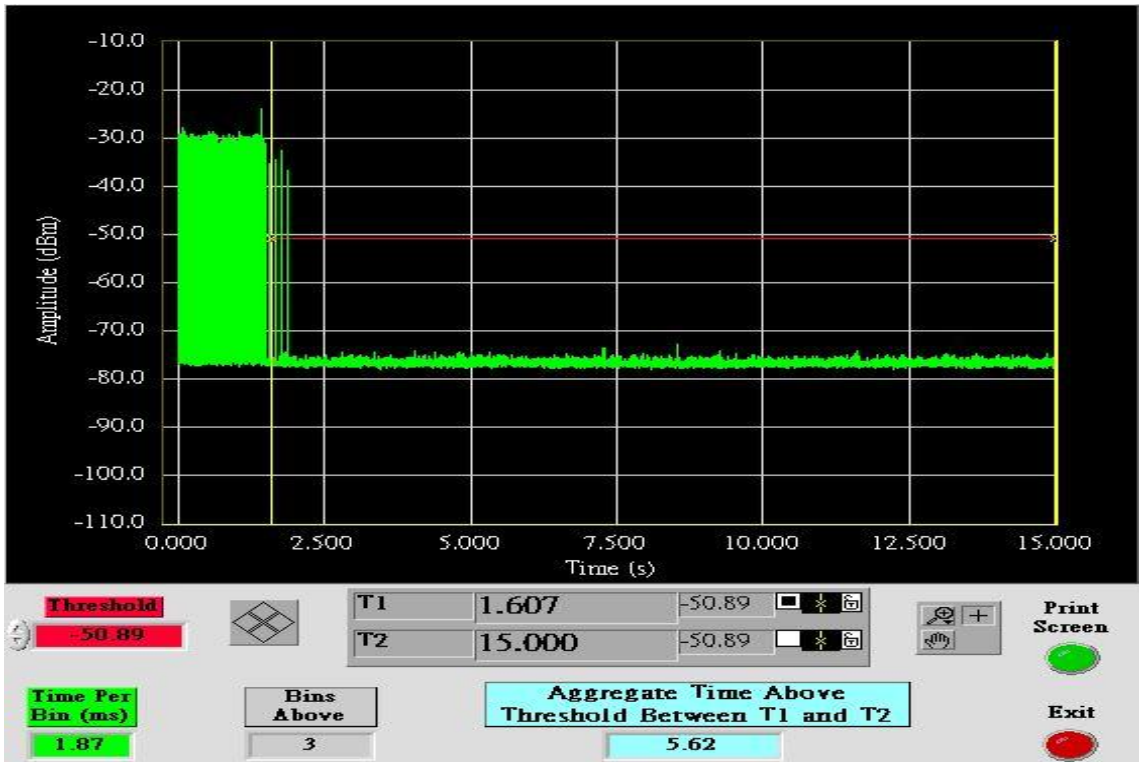

-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
Amplitude (dBm)
0.000
2.500
5.000
7.500
10.000
12.500
15.000
Time (s)
Threshold
-50.89
T1
2.173
-50.89
T2
15.000
-50.89
Print Screen
Exit
Time Per Bin (ms)
1.87
Bins Above
5
Aggregate Time Above Threshold Between T1 and T2
9.37

For R5

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
5.62	60	-54.38






-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
Amplitude (dBm)
0.000
2.500
5.000
7.500
10.000
12.500
15.000
Time (s)
Threshold
-50.89
T1
1.607
-50.89
T2
15.000
-50.89
Print Screen
Time Per Bin (ms)
1.87
Bins Above
3
Aggregate Time Above Threshold Between T1 and T2
5.62
Exit

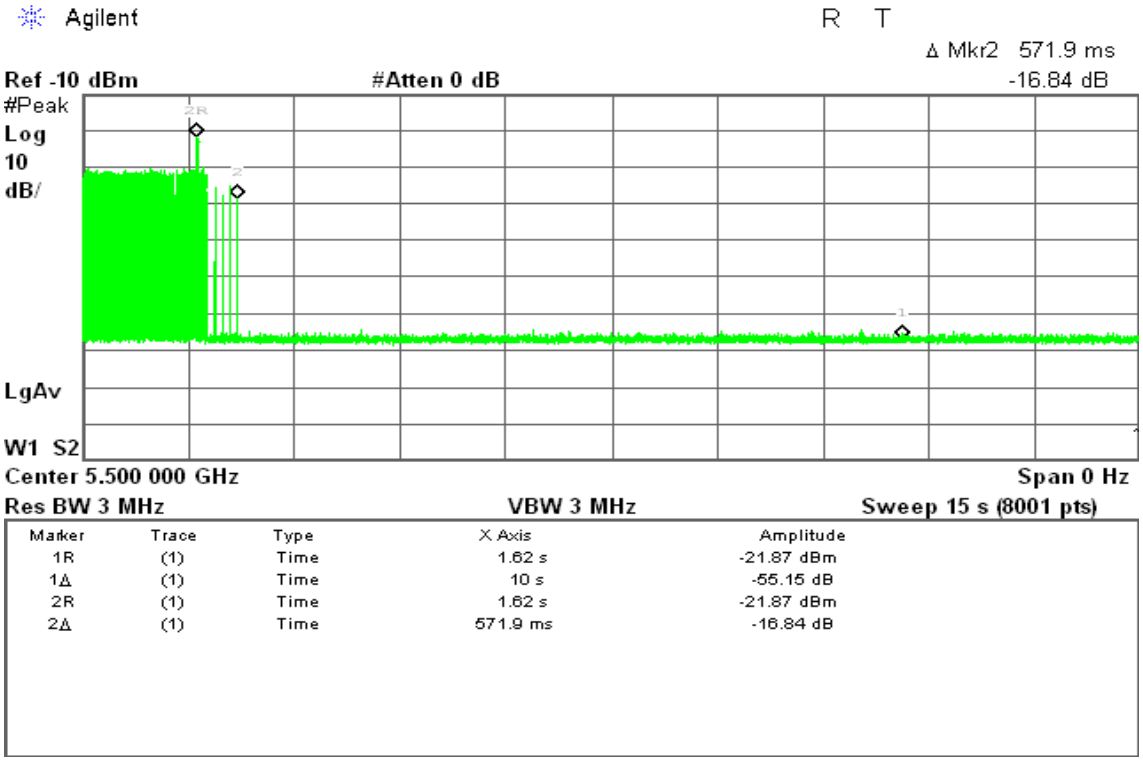
HIGH BAND RESULTS

IEEE 802.11n HT 20 MHz Channel mode

Type 1 Channel Move Time Results

No non-compliance noted.

Channel Move Time (s)	Limit (s)
1.62	10



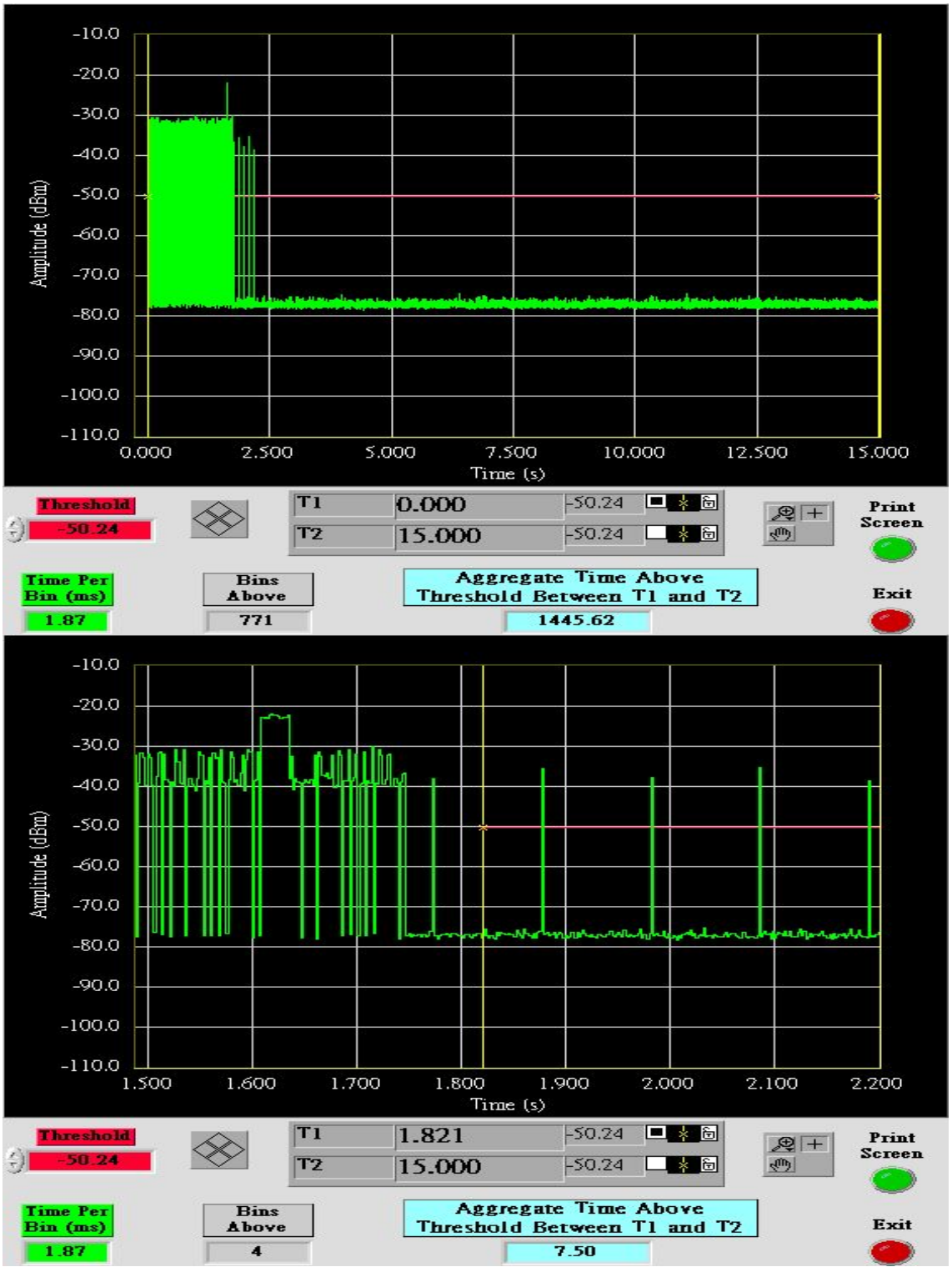
IEEE 802.11n HT 20 MHz Channel mode

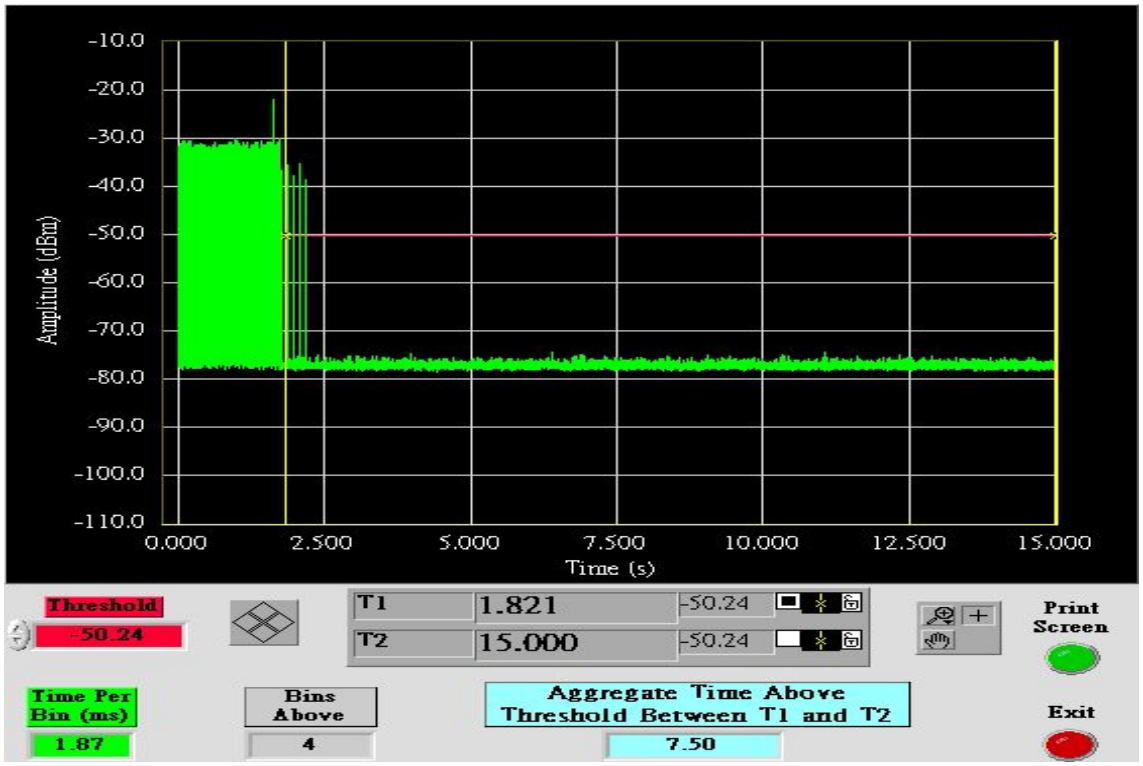
Type 1 Channel Closing Transmission Time Results

No non-compliance noted.

For R1

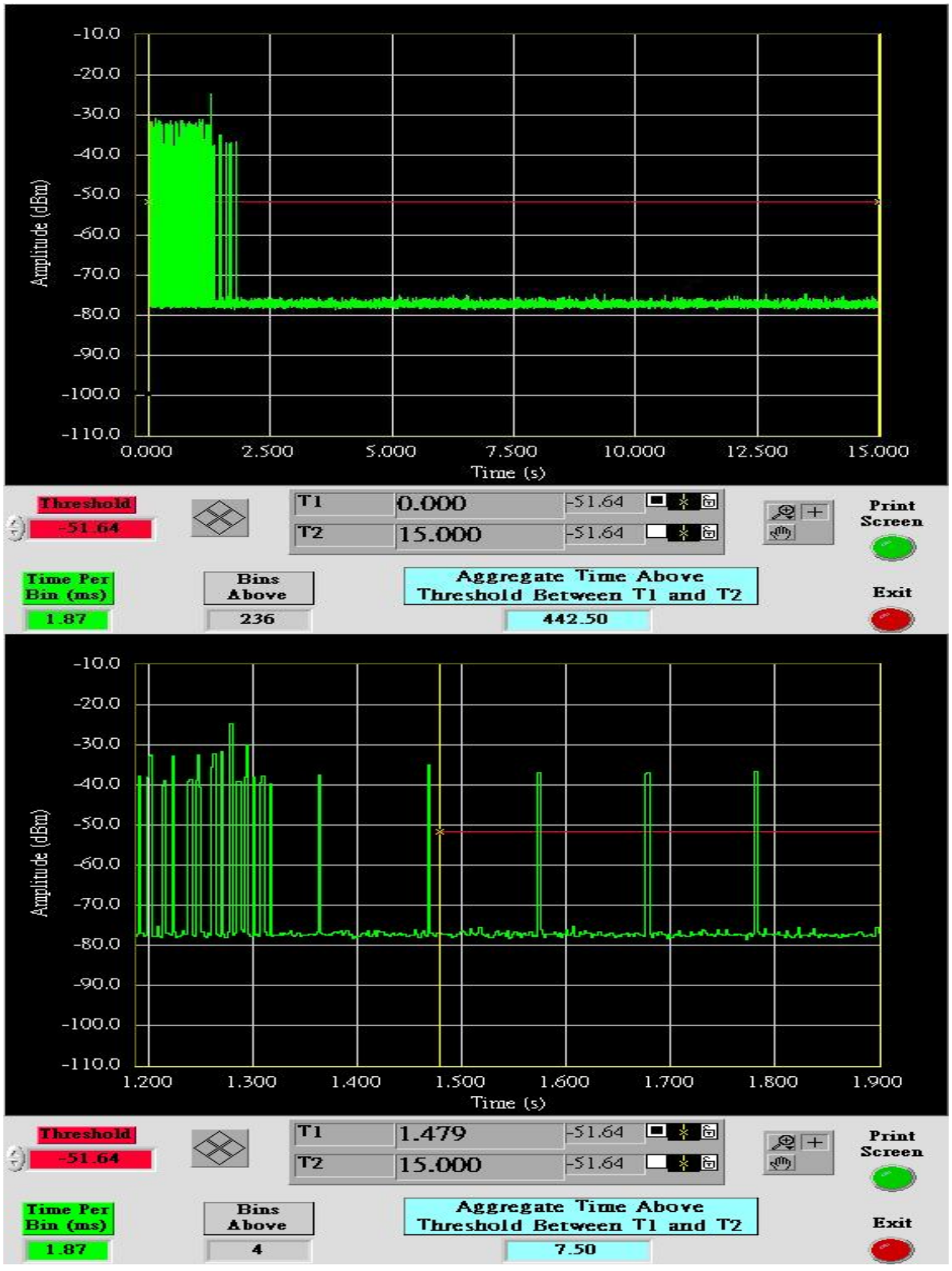
Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
7.50	60	-52.5

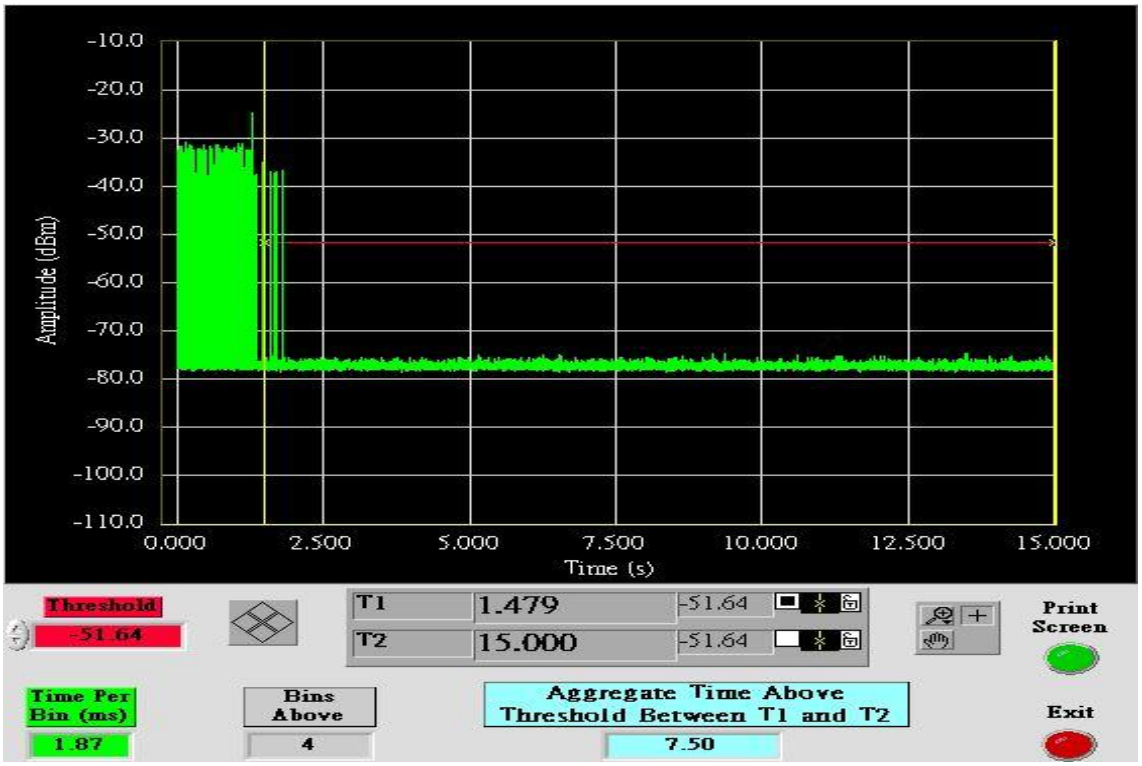



-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
Amplitude (dBm)
0.000
2.500
5.000
7.500
10.000
12.500
15.000
Time (s)
Threshold
-50.24
T1
1.821
-50.24
T2
15.000
-50.24
Print Screen
Time Per Bin (ms)
1.87
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
7.50
Exit

For R5

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
7.50	60	-52.5




-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
Amplitude (dBm)
0.000
2.500
5.000
7.500
10.000
12.500
15.000
Time (s)
Threshold
-51.64
T1
1.479
-51.64
T2
15.000
-51.64
Print Screen
Time Per Bin (ms)
1.87
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
7.50
Exit

NON-OCCUPANCY PERIOD

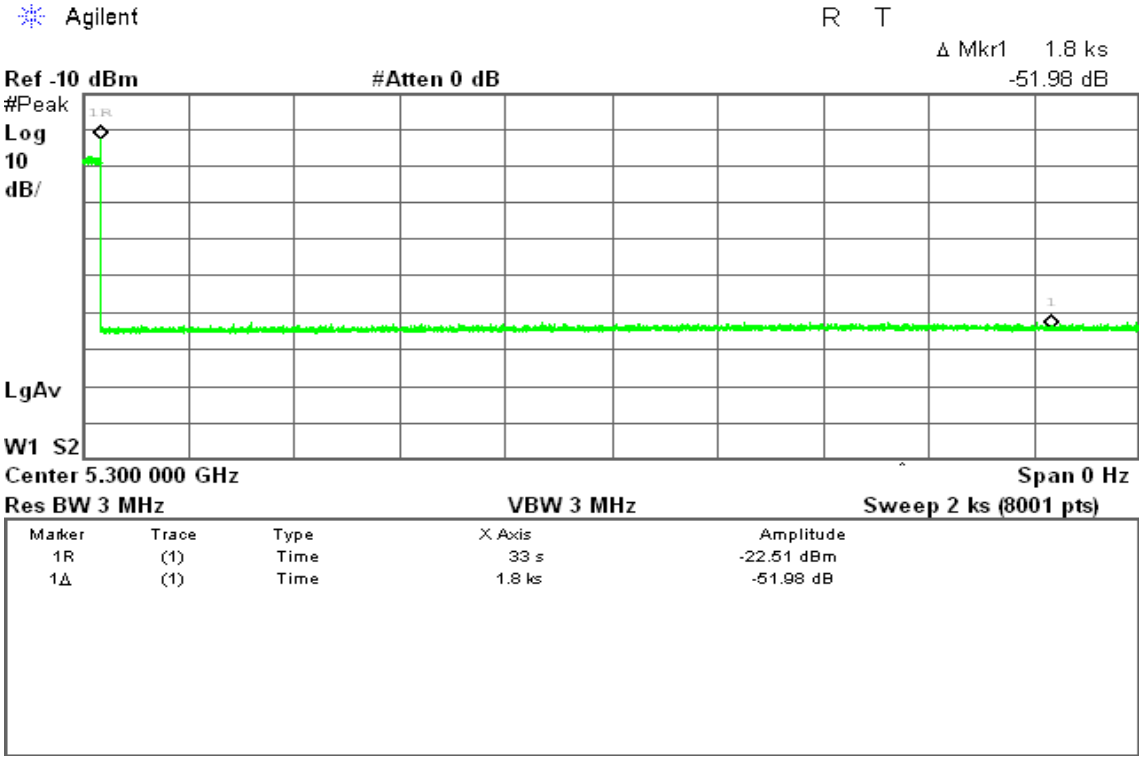
UNII Band II

IEEE 802.11n HT 20 MHz mode

Type 1 Non-Occupancy Period Test Results

No non-compliance noted.

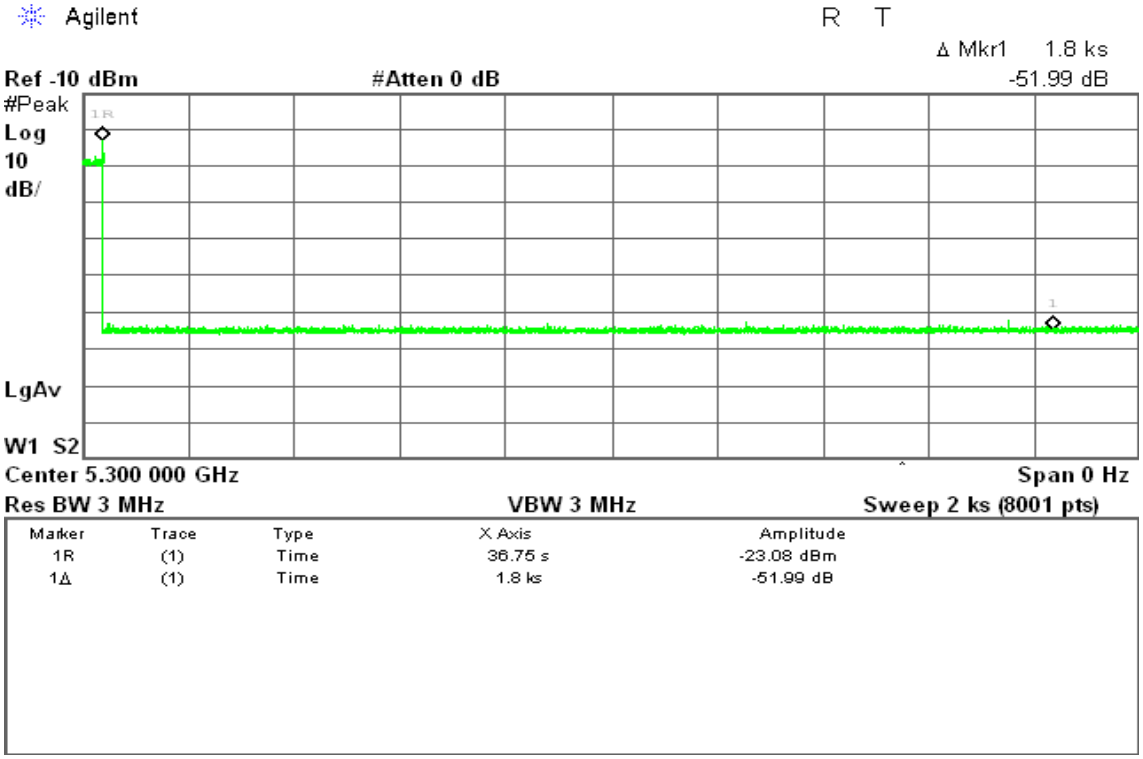
No EUT transmissions were observed on the test channel during the 30 minute observation time.



Type 5 Non-Occupancy Period Test Results

No non-compliance noted.

No EUT transmissions were observed on the test channel during the 30 minute observation time.



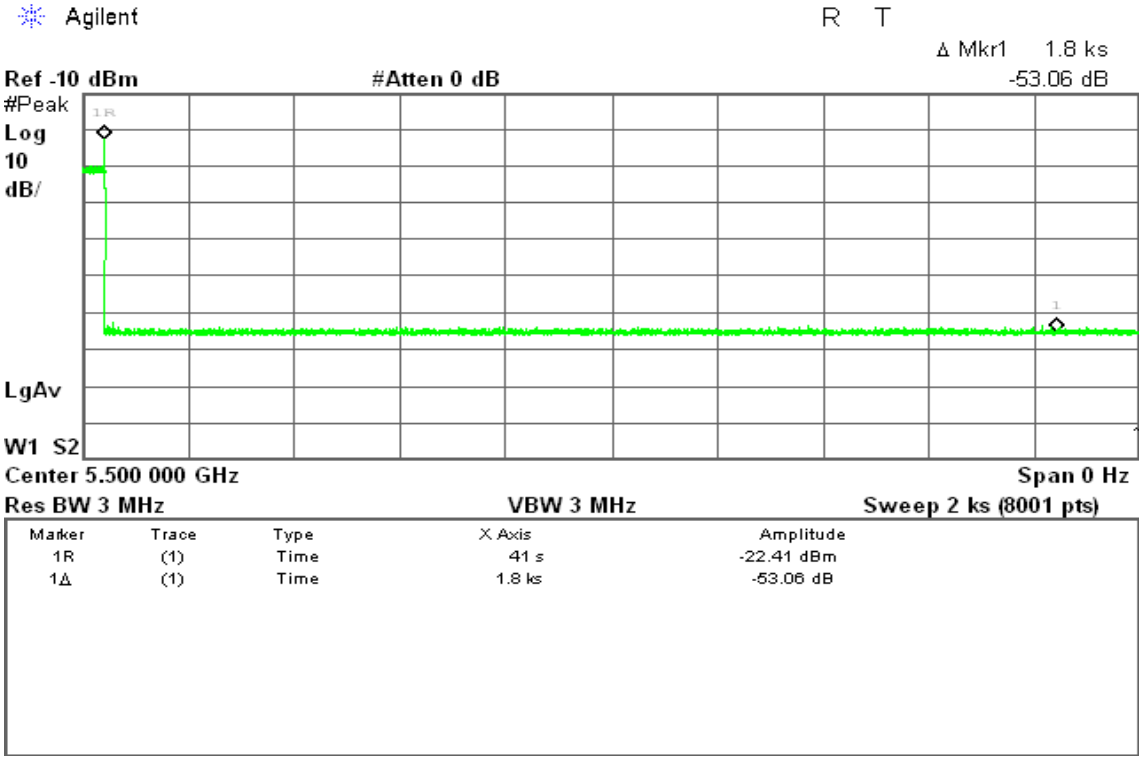
UNII Band III

IEEE 802.11n HT 20 MHz mode

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 5 Non-Occupancy Period Test Results

No non-compliance noted.

No EUT transmissions were observed on the test channel during the 30 minute observation time.