FCC 47 CFR PART 15 SUBPART E

for

Pocket Projector
Model: PPX4935
Brand: PHILIPS
Test Report Number:
C160106Z03-RP1-4
Issued Date: February 20, 2016

Issued for

X-GEM SAS
9, rue de la Négresse 64200 BIARRITZ – FRANCE

Issued by:

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	February 20, 2016	Initial Issue	ALL	Amzula Chen

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1. TEST CERTIFICATION

Product	Pocket Projector
Model	PPX4935
Brand	PHILIPS
Tested	January 6~February 20, 2016
Applicant	**X-GEM SAS** 9, rue de la Négresse 64200 BIARRITZ – FRANCE
Manufacturer	**X-GEM SAS** 9, rue de la Négresse 64200 BIARRITZ – FRANCE

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

We hereby certify that:

Compliance Certification Services (Shenzhen) 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 C63.10: 2013** 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、FCC 14-30.

The TEST RESULTS of this report relate only to the tested sample identified in this report.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Services (Shenzhen) Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Services (Shenzhen) Inc.

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2. EUT DESCRIPTION

Product	Pocket Projector
Model Number	PPX4935
Brand	PHILIPS
Model Discrepancy	N/A
Serial Number	C160106Z03-RP1-4
Received Date	January 6, 2016
Power Supply	DC19V supplied by the adapter or DC7.4V supplied by the Battery
Adapter Manufacturer /Model No.	Huntkey / HKA04519024-XA INPUT: 100-240VAC, 50/60Hz, 1.2A OUTPUT : 19VDC, 2.37 A DC Cable: Unshielded, 1.80m
Battery Manufacturer /Model No.	Fujian Unlted/BT-E004 2000mAh/7.4V/14.8Wh
Frequency Range	UNII Band I: IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz; IEEE 802.11n HT40: 5190MHz ~ 5230MHz UNII Band II IEEE 802.11a, 802.11n HT20 : 5260MHz ~ 5320MHz IEEE 802.11n HT40: 5270MHz ~ 5310MHz UNII Band III IEEE 802.11a, 802.11n HT20 : 5500MHz ~ 5700MHz IEEE 802.11n HT40: 5510MHz ~ 5670MHz UNII Band IV IEEE 802.11a, 802.11n HT20 : 5745MHz ~ 5825MHz IEEE 802.11n HT40: 5755MHz ~ 5795MHz
Transmit Power	UNII Band I: IEEE 802.11a: 12.40dBm IEEE 802.11n HT 20 MHz mode: 11.70dBm IEEE 802.11n HT 40 MHz mode: 11.90dBm UNII Band II IEEE 802.11a: 12.10dBm IEEE 802.11n HT 20 MHz mode: 11.60dBm IEEE 802.11n HT 40 MHz mode: 11.70dBm UNII Band III IEEE 802.11a: 10.80dBm IEEE 802.11n HT 20 MHz mode: 9.80dBm IEEE 802.11n HT 40 MHz mode: 10.90dBm UNII Band IV IEEE 802.11a: 10.80dBm IEEE 802.11n HT 20 MHz mode: 10.30dBm IEEE 802.11n HT 40 MHz mode: 10.80dBm
Modulation Technique	OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps IEEE802.11n HT20MHz: 6.5,13,19.5,26,39,52,58.8,65Mbps IEEE802.11n HT40MHz: 13.5,27,40.5,54,81,108,121.5,135Mbps
Number of Channels	UNII Band I: IEEE 802.11a, 802.11n HT20 : 4 Channels

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	IEEE 802.11n HT40 : 2 Channels UNII Band II IEEE 802.11a, 802.11n HT20 : 4 Channels IEEE 802.11n HT40: 2 Channels UNII Band III IEEE 802.11a, 802.11n HT20 : 11 Channels IEEE 802.11n HT 40 MHz mode: 5 Channels UNII Band IV IEEE 802.11a, 802.11n HT20 : 5 Channels IEEE 802.11n HT 40 MHz mode: 2 Channels
Antenna Specification	FPC Antenna with 3.9dBi gain (Max)
Channels Spacing	IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40: 40MHz
Temperature Range	+5°C ~ +35°C
Hardware Version	V1.08b
Software Version	8967C

Note: *1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

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Operation Frequency:

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)	
CHANNEL	**MHz**
36	5180
38	5190
40	5200
44	5220
46	5230
48	5240
52	5260
54	5270
56	5280
60	5300
62	5310
64	5320
100	5500
102	5510
104	5520
108	5540
110	5550
112	5560
116	5580
132	5660
134	5670
136	5680
140	5700
149	5745
151	5755
153	5765
155	5775
159	5795
161	5805
165	5825

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **2AGG8PPX4935** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules and FCC 14-30.

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3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 Radiated testing was performed at an antenna to EUT distance 3 meters.
The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.407 and FCC 14-30.
Radio testing was performed according to KDB DA 02-2138、KDB 789033 D02、KDB 905462 D06；

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 C63.10, 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 (below 1GHz) or1.5m (above 1GHz) 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 C63.10.

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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.

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3.5 DESCRIPTION OF TEST MODES

The EUT is a 1x1 configuration spatial 1 (1TX & 1RX) without beam forming function.

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

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: HDMI IN	☒
Radiated Emission	Mode 1: TX	☒

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 (5200MHz) 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 (5200MHz) and Channel High (5240MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz Channel for 5190 ~ 5230MHz:
Channel Low (5190MHz) and Channel High (5230MHz) with 13.5Mbps data rate were chosen for full testing.

UNII Band II:

IEEE 802.11a for 5260 ~ 5320MHz:
Channel Low (5260MHz), Channel Mid (5300MHz) 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 (5300MHz) and Channel High (5320MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz Channel for 5270~ 5310MHz:
Channel Low (5270MHz) and Channel High (5310MHz) with 13.5Mbps data rate were chosen for full testing.

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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.

IEEE 802.11n HT 40 MHz Channel for 5510~ 5670MHz:
Channel Low (5510MHz) and Channel High (5670MHz) with 13.5Mbps data rate were chosen for full testing.

UNII Band IV:

IEEE 802.11a for 5745 ~ 5825MHz:
Channel Low (5745MHz), Channel Mid (5785MHz) and Channel High (5825MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz for 5745 ~ 5825MHz:
Channel Low (5745MHz), Channel Mid (5785MHz) and Channel High (5825MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz Channel for 5755~ 5795MHz:
Channel Low (5755MHz) and Channel High (5795MHz) with 13.5Mbps data rate were chosen for full testing.

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4. SETUP OF EQUIPMENT UNDER TEST

4.1 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	N/A						

Note:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.2 CONFIGURATION OF SYSTEM UNDER TEST

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

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5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at
No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.10, ANSI C63.7 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 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	**A2LA**
China	**CNAS**

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	**FCC**
Japan	**VCCI(C-4815, R-4320, T-2317, G-10624)**
Canada	**INDUSTRY CANADA**

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccssz.com

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5.4 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
RF frequency	+/-1 * 10-5
RF power conducted	+/- 1,5 dB
RF power radiated	+/- 6 dB
Spurious emissions, conducted	+/- 3 dB
Spurious emissions, radiated	+/- 6 dB
Humidity	+/- 5 %
Temperature	+/- 1°C
Time	+/-10 %

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

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6. FCC PART 15 REQUIREMENTS

6.1 26dB EMISSION BANDWIDTH

6.1.1 LIMIT

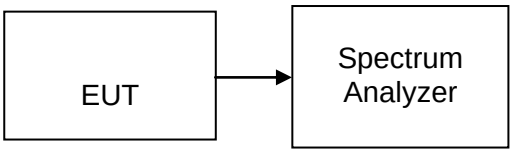
According to §15.303(c), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated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

6.1.2 MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	E4446A	US44300399	02/28/2015	02/27/2016

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

6.1.3 TEST CONFIGURATION



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

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6.1.5TEST RESULTS

No non-compliance noted

Test Data

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5180	18.432
Mid	5200	18.545
High	5240	18.150

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5260	18.358
Mid	5300	18.417
High	5320	18.393

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5500	18.502
Mid	5580	18.111
High	5700	18.250

Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5745	18.351
Mid	5785	18.368
High	5825	18.316

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5180	18.776
Mid	5200	18.683
High	5240	18.679

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5260	18.761
Mid	5300	18.794
High	5320	18.707

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5500	18.707
Mid	5580	18.534
High	5700	18.755

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5745	18.856
Mid	5785	18.751
High	5825	18.849

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5190	38.074
High	5230	37.890

Test mode: IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5270	37.836
High	5310	37.703

Test mode: IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5510	38.080
Mid	5550	37.890
High	5670	38.024

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5755	38.128
High	5795	37.784

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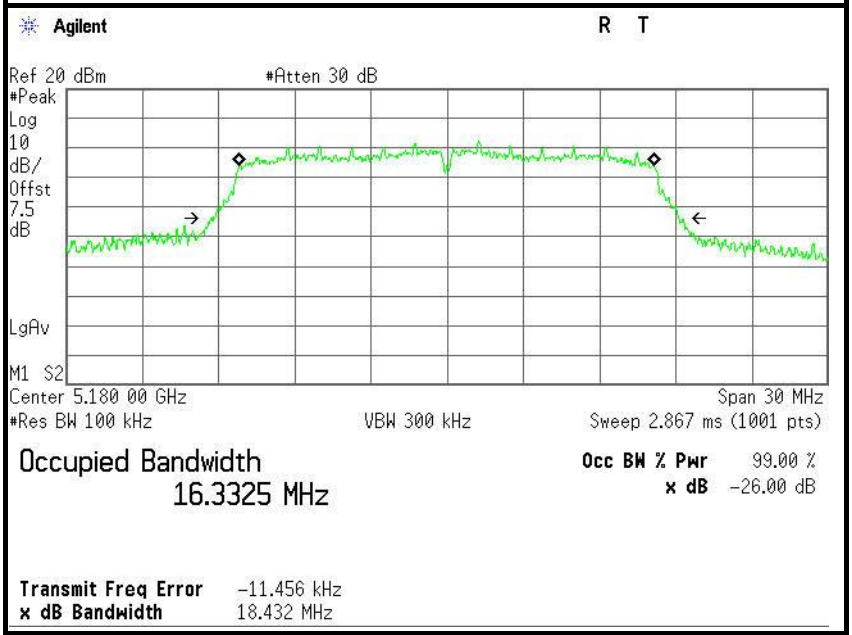
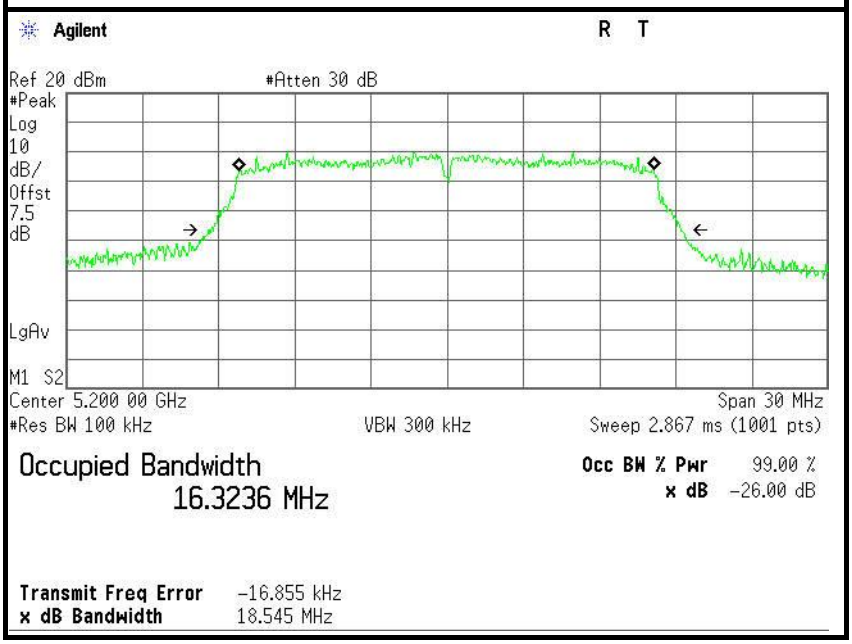
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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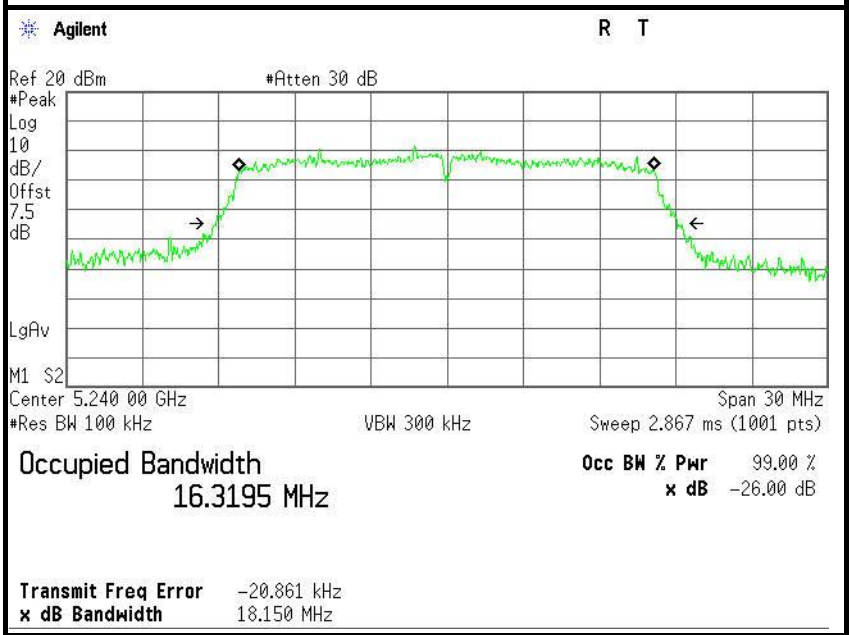
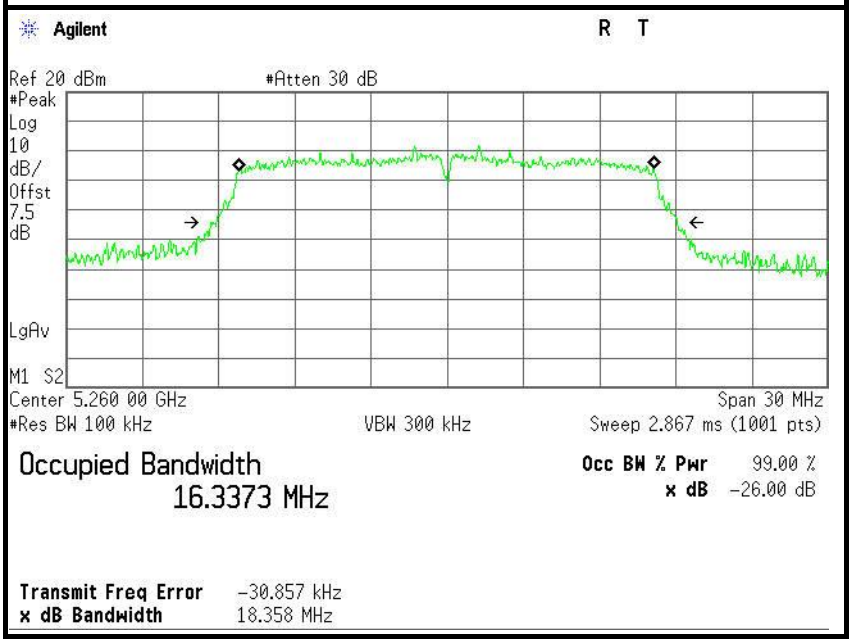
26dB Bandwidth (CH High)



IEEE 802.11a mode / 5260~ 5320MHz

26dB Bandwidth (CH Low)



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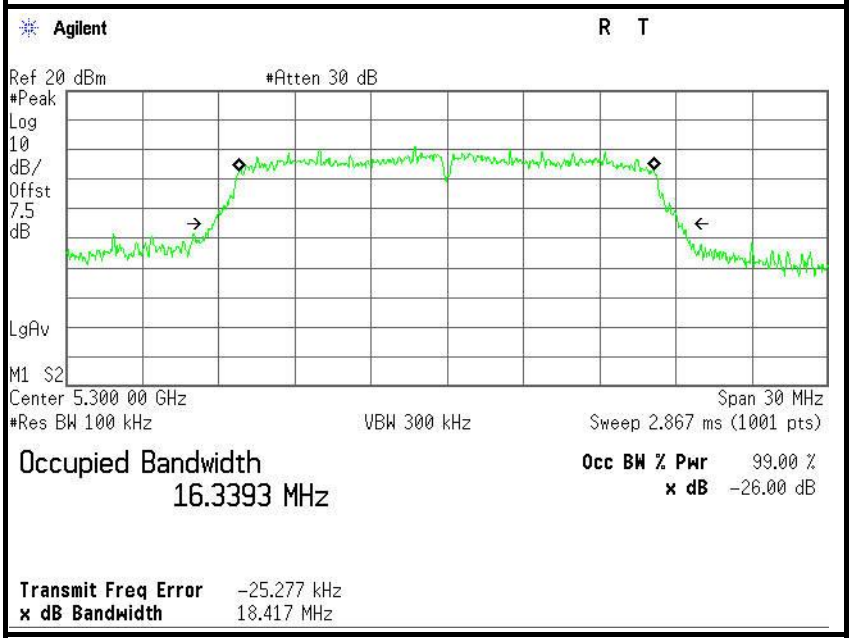
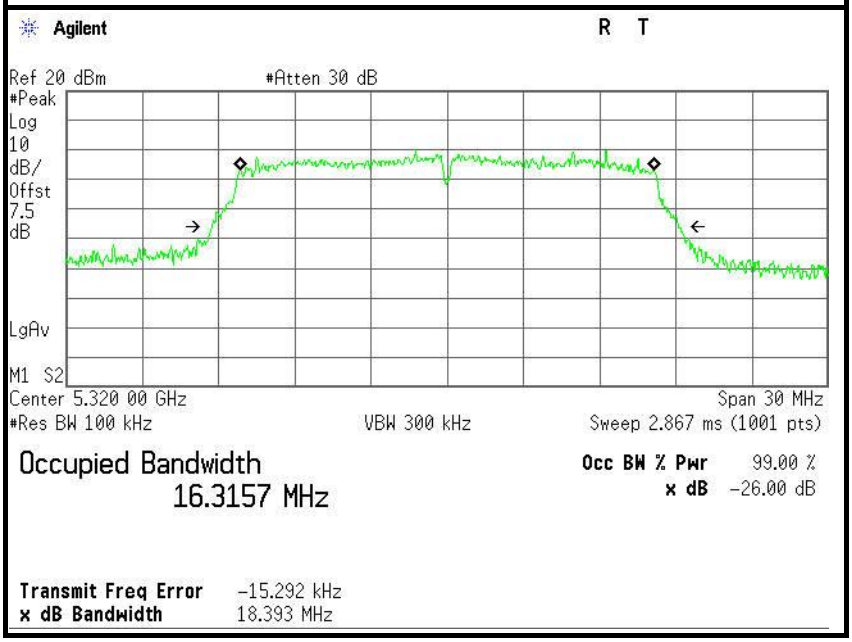
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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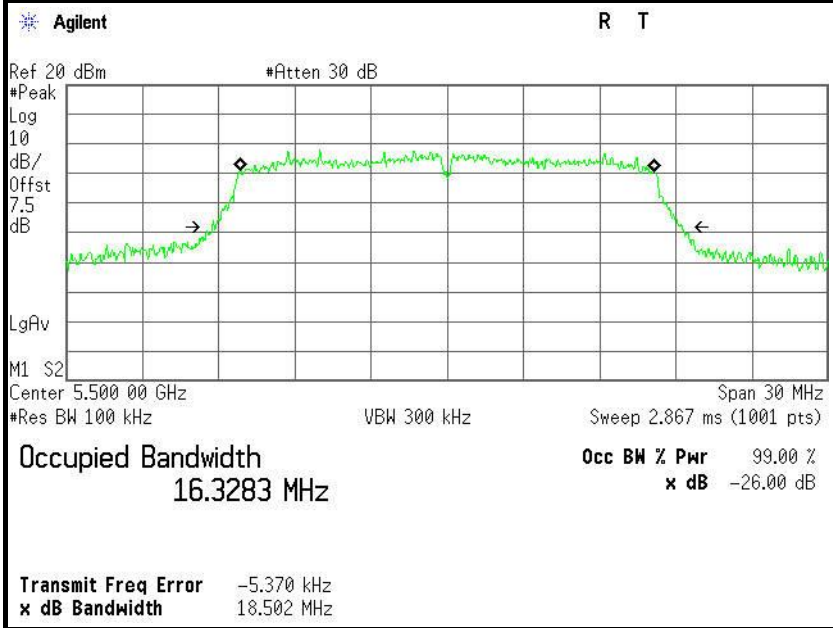
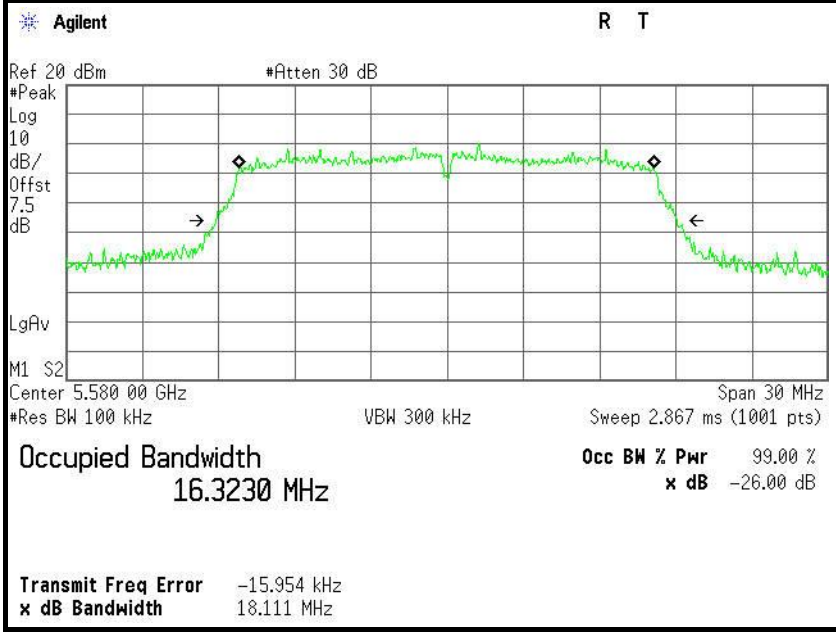
IEEE 802.11a mode / 5500 ~ 5700MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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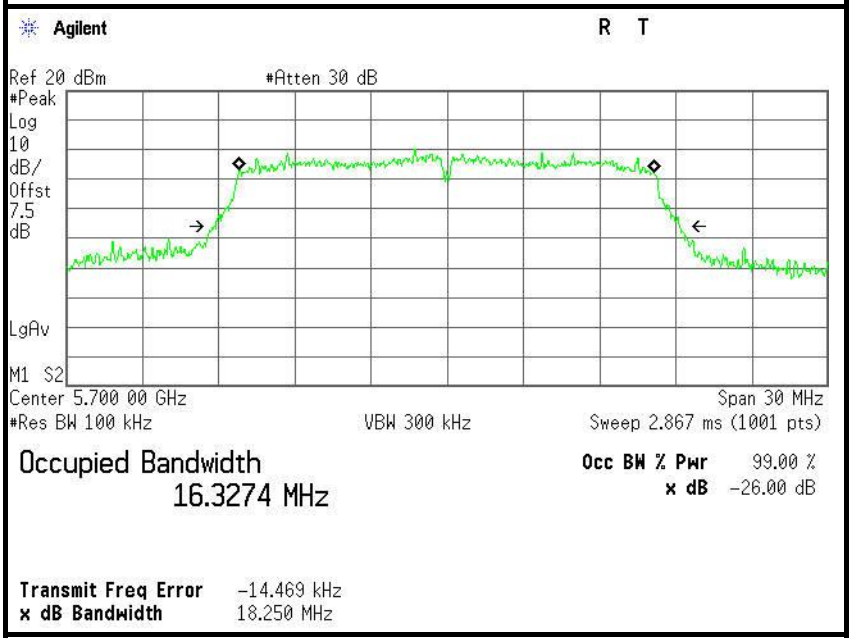
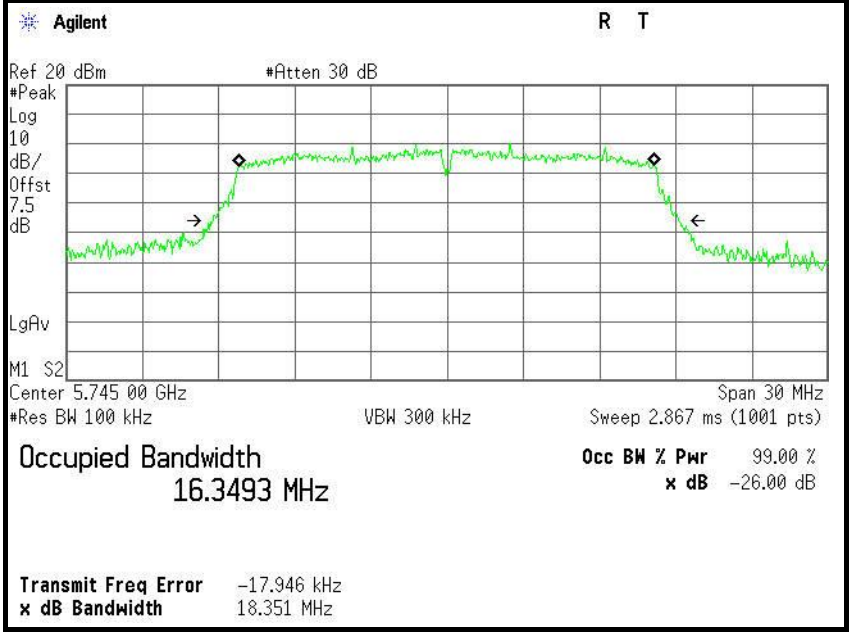
26dB Bandwidth (CH High)



IEEE 802.11a mode / 5745 ~ 5825MHz

26dB Bandwidth (CH Low)



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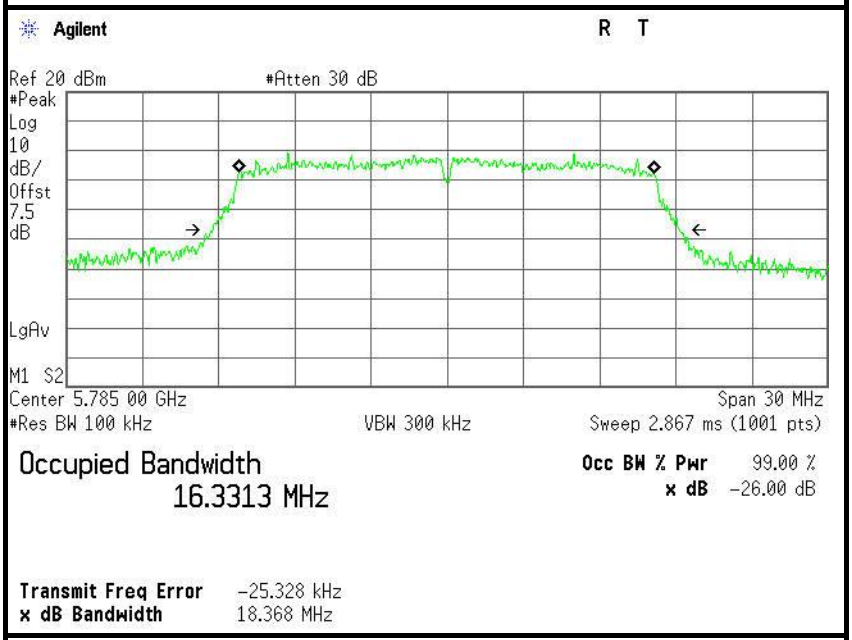
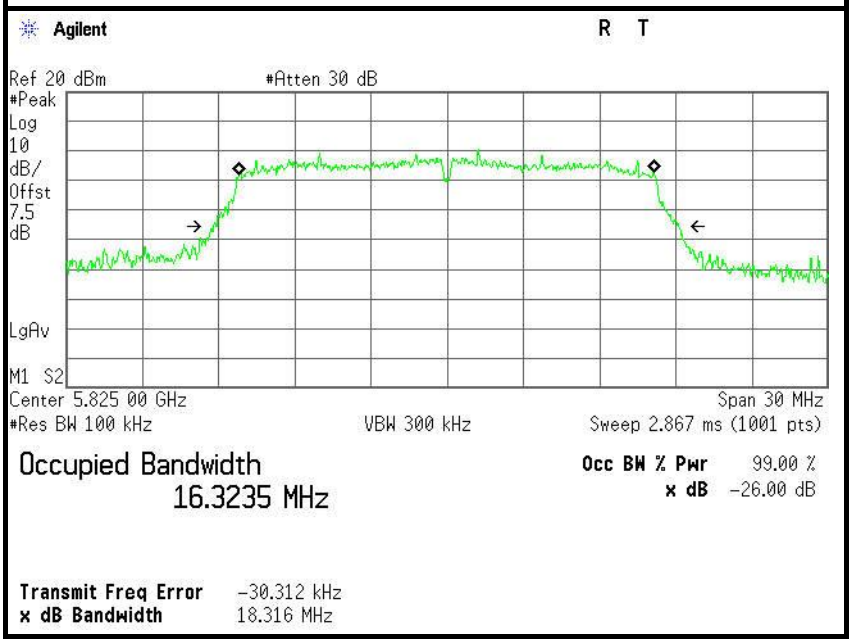
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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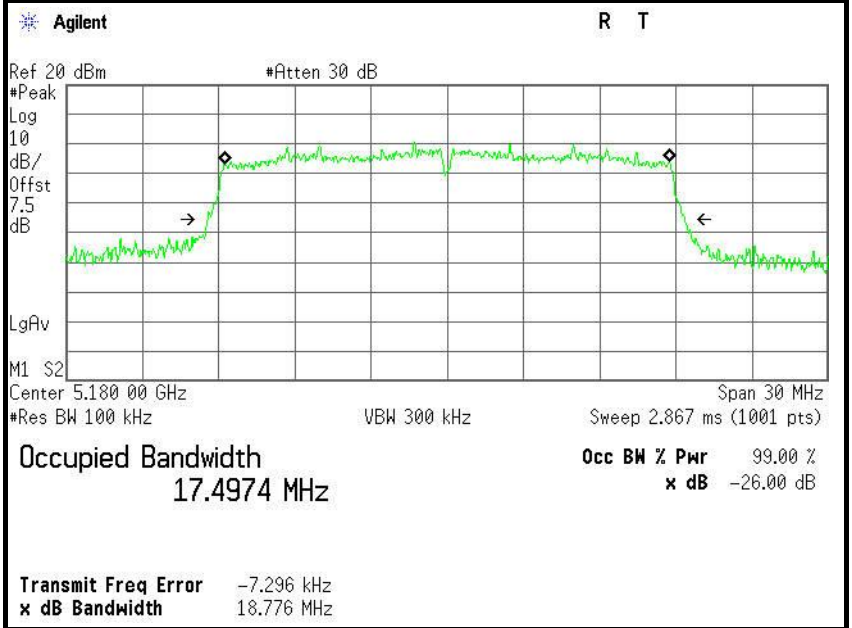
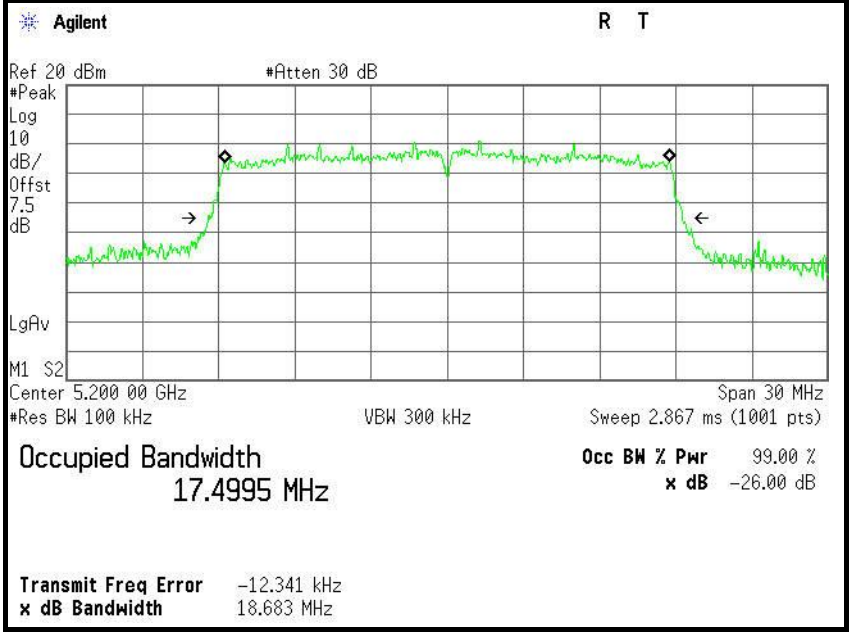
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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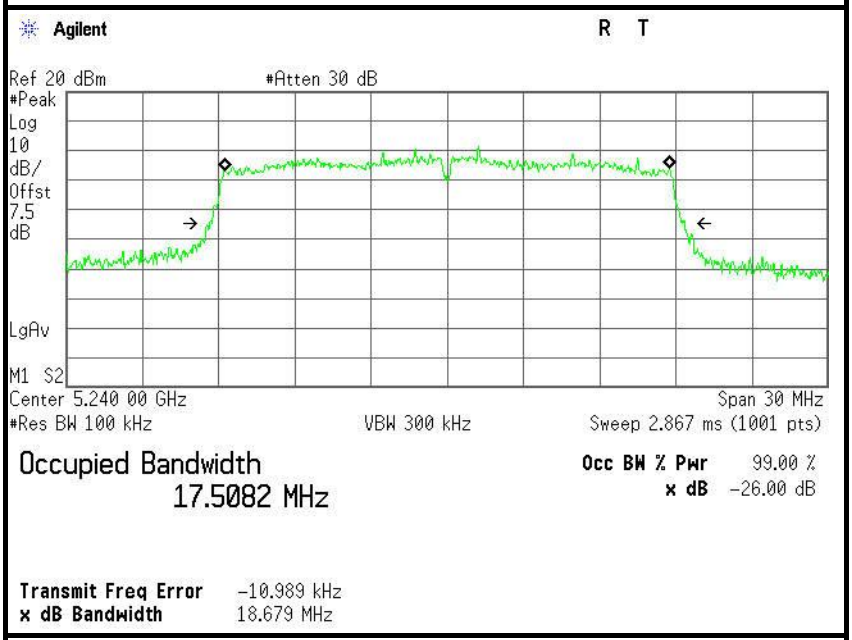
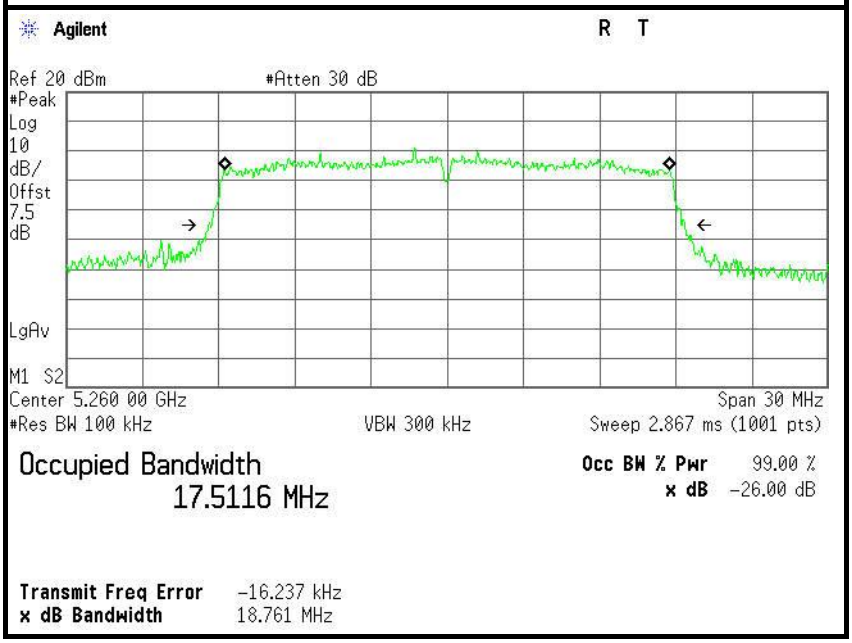
26dB Bandwidth (CH High)



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

26dB Bandwidth (CH Low)



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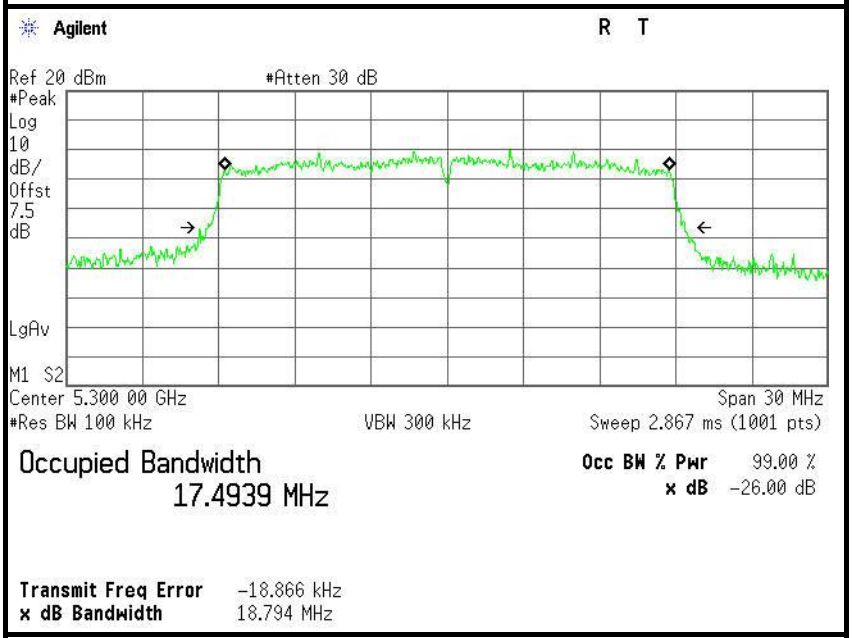
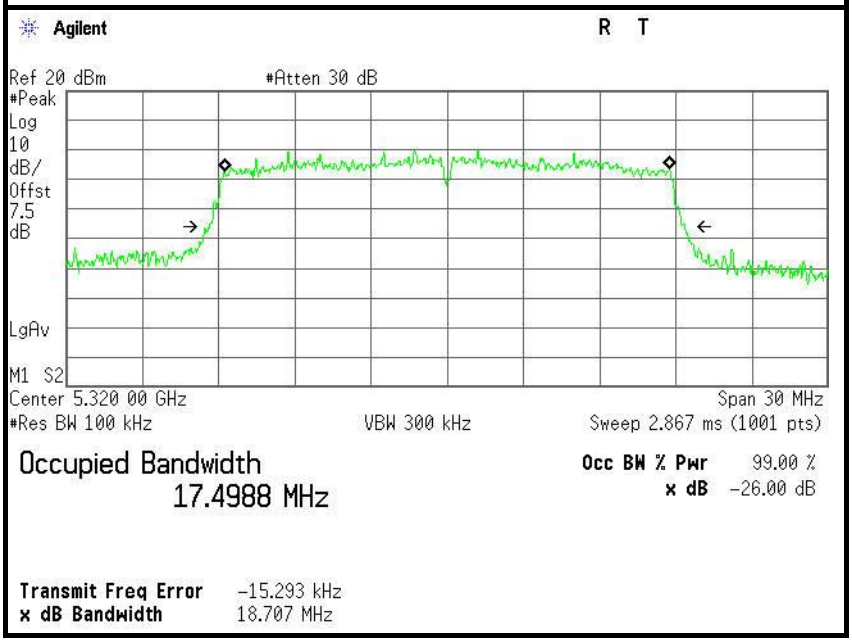
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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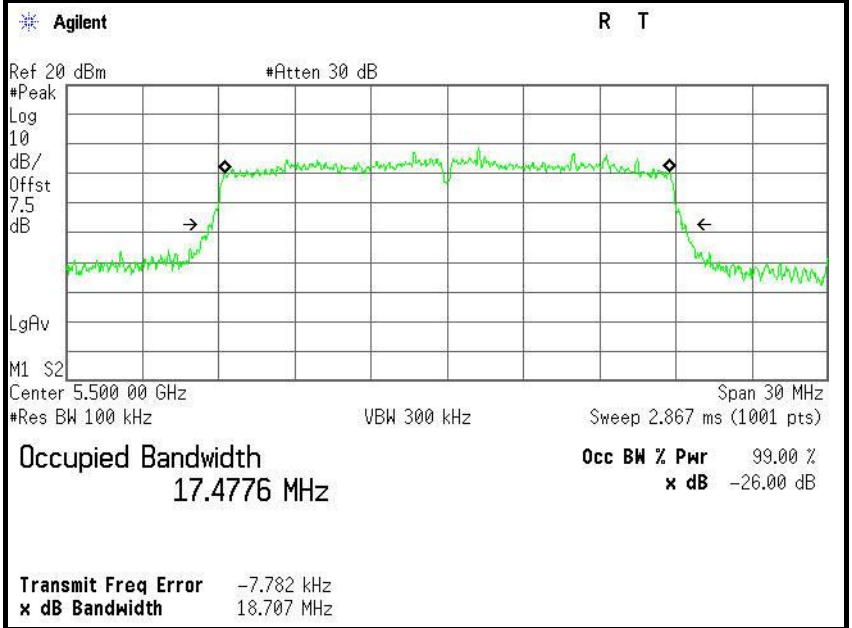
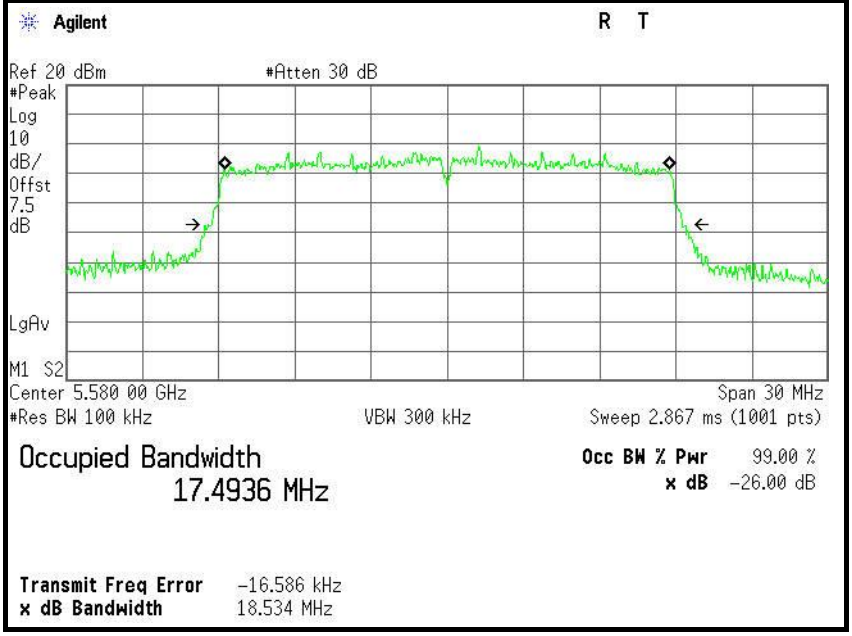
IEEE 802.11n HT 20 MHz mode / 5500 ~ 5700MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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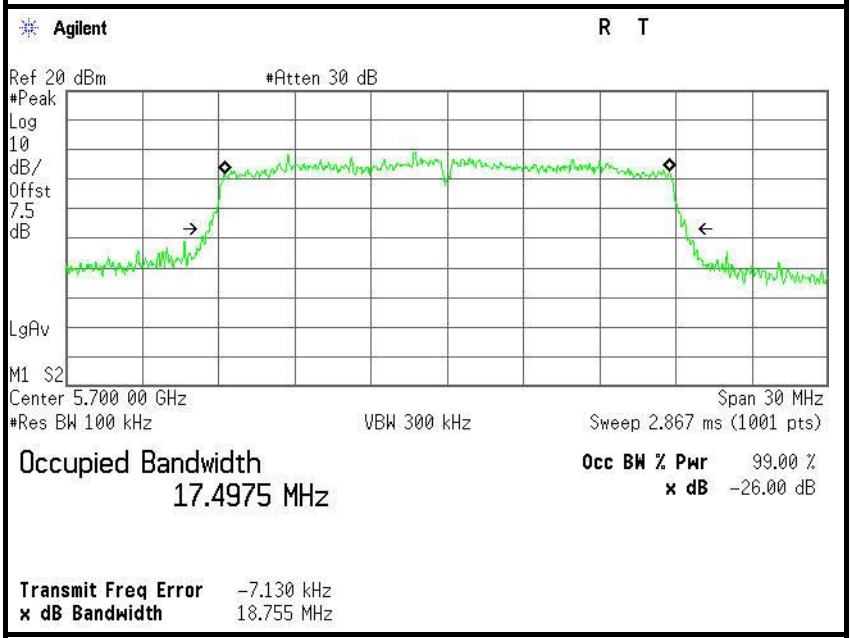
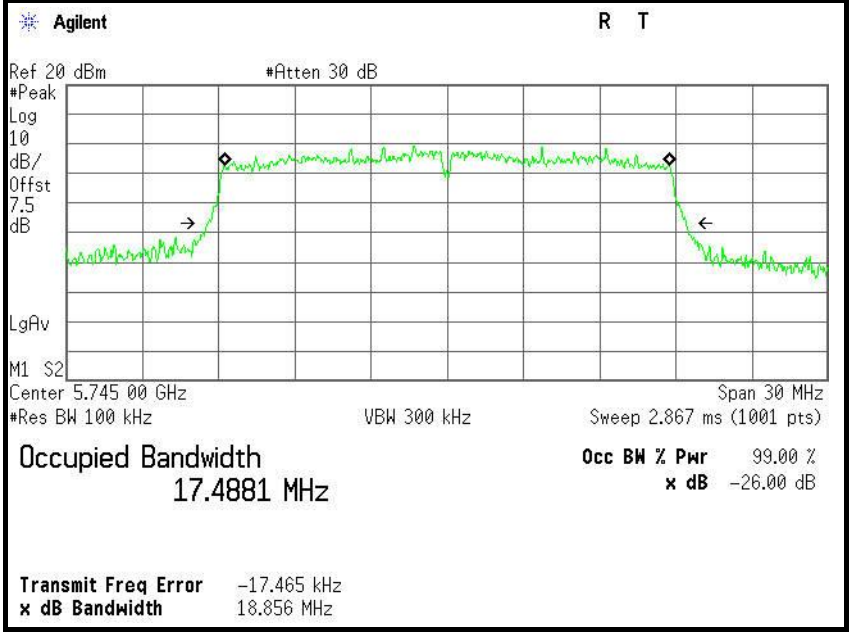
26dB Bandwidth (CH High)



IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

26dB Bandwidth (CH Low)



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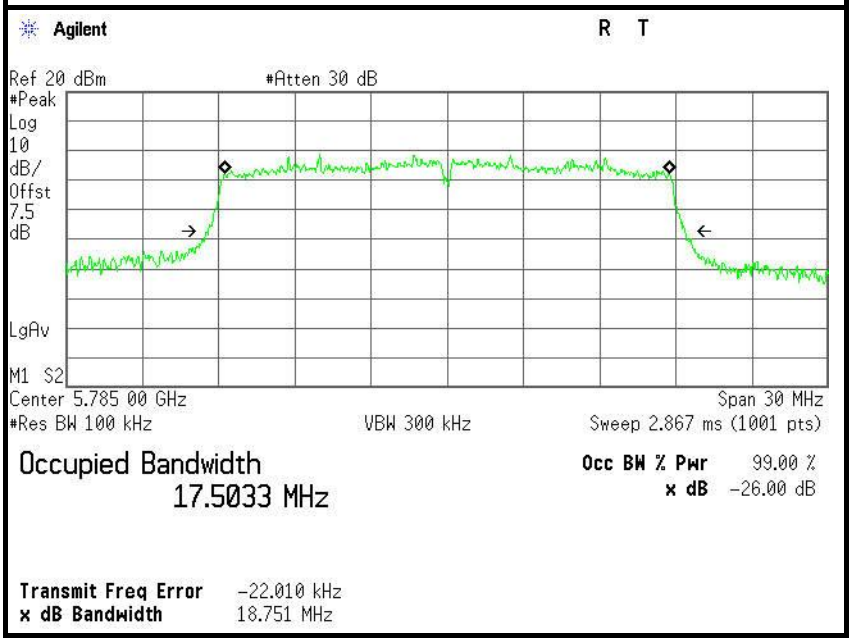
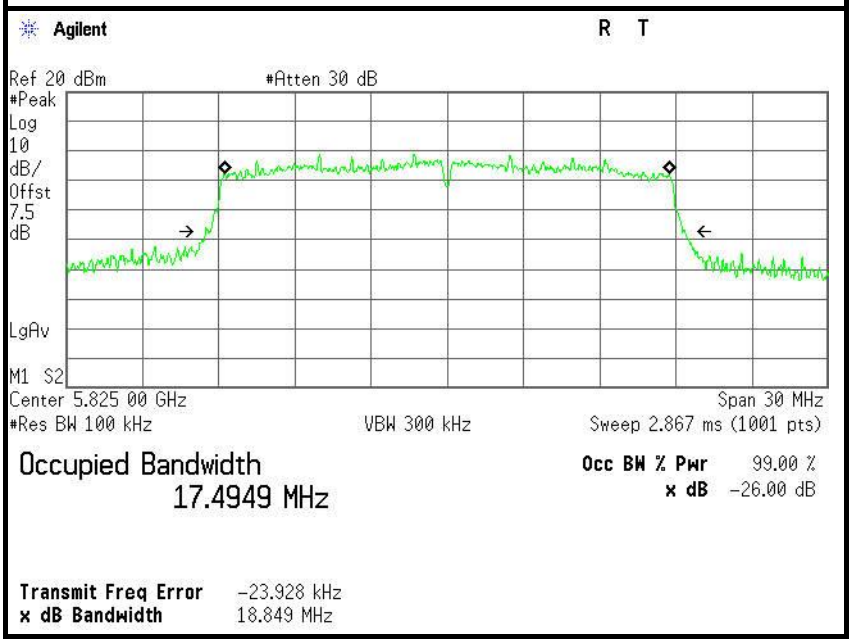
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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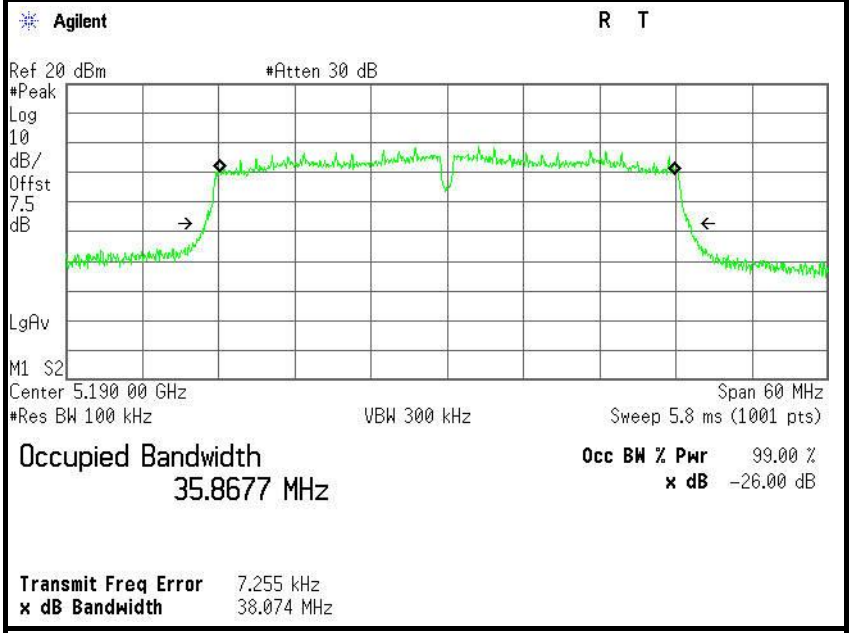
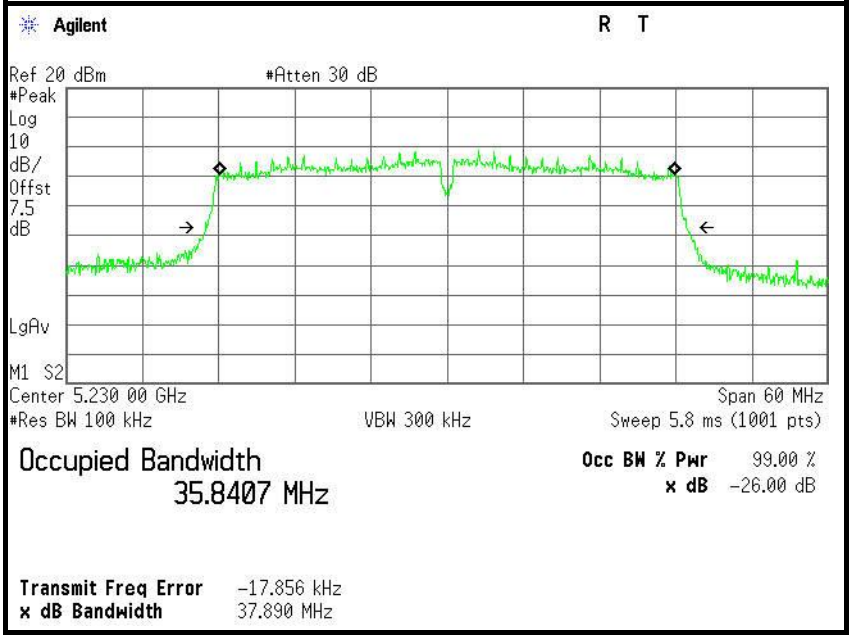
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH High)



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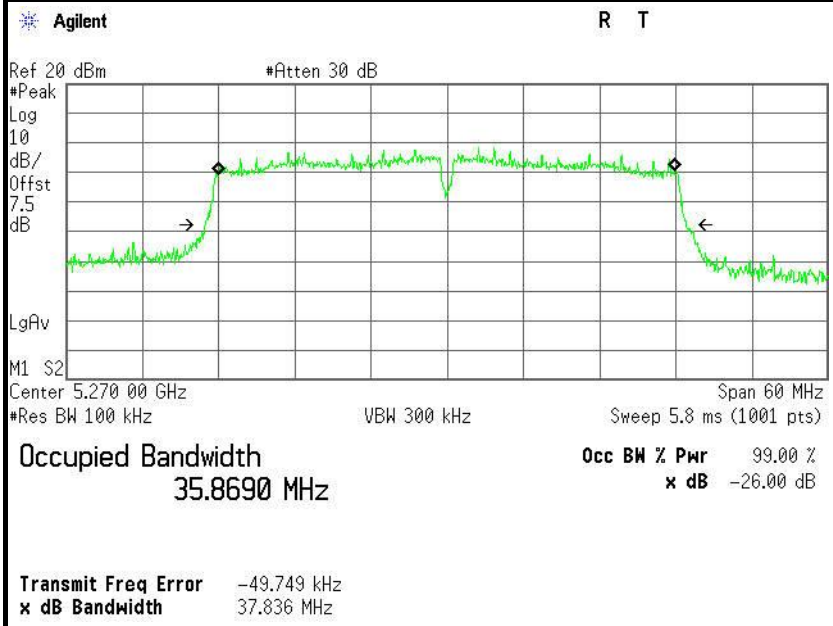
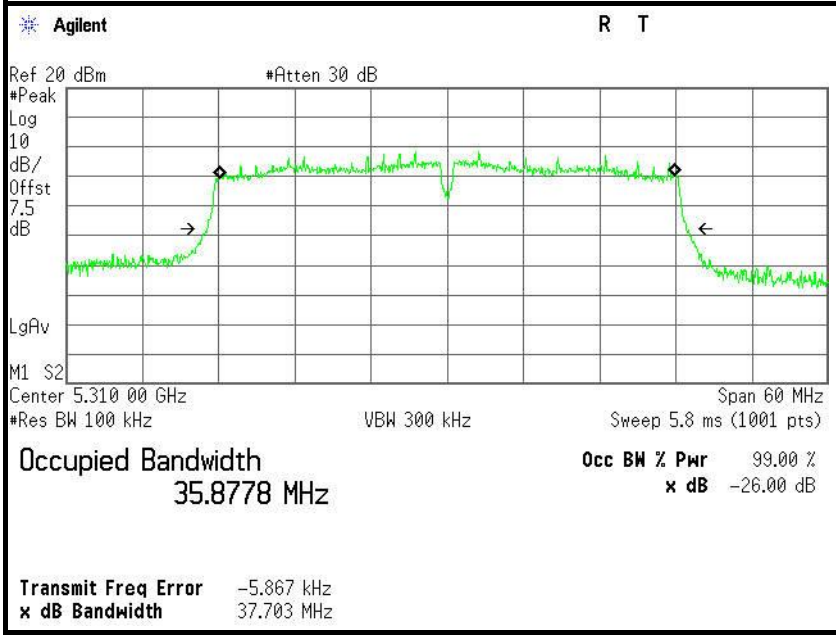
IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH High)



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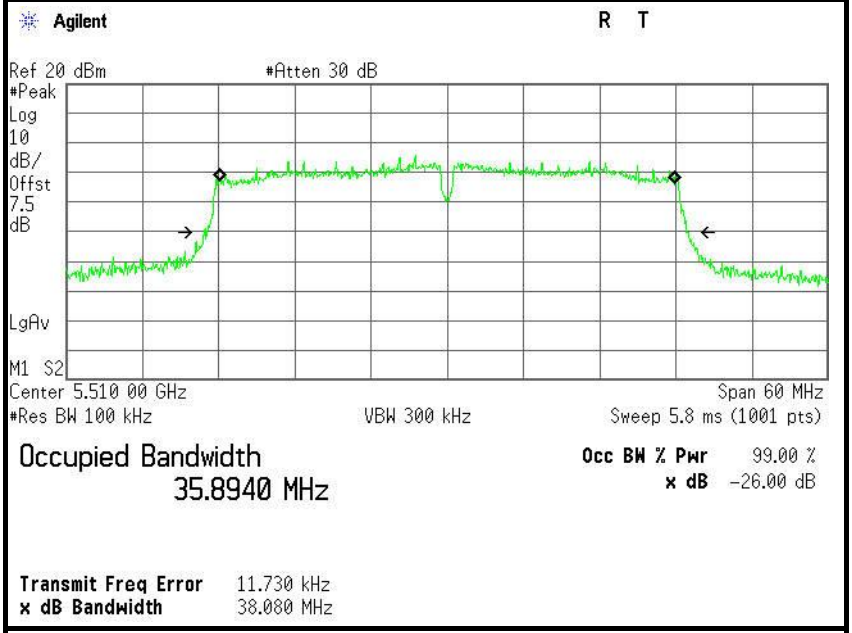
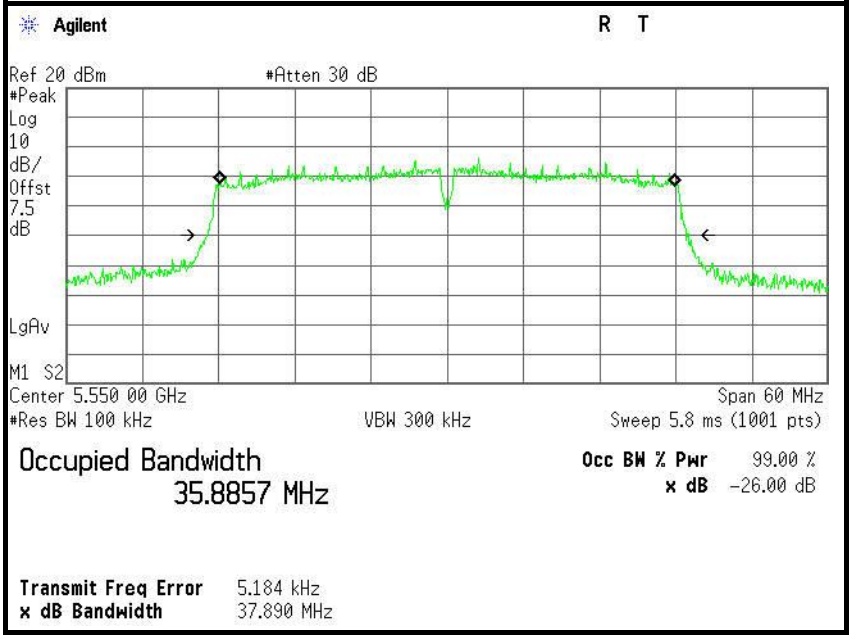
IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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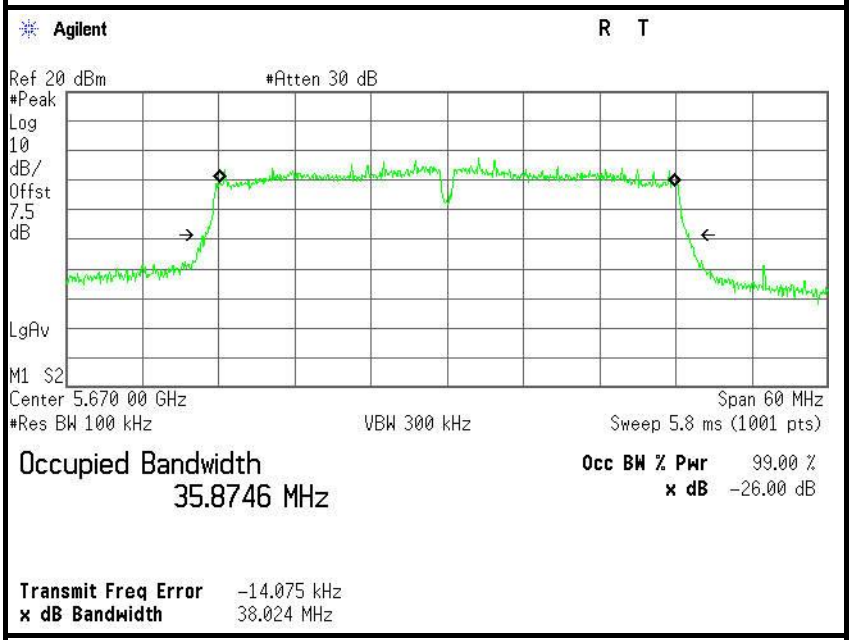
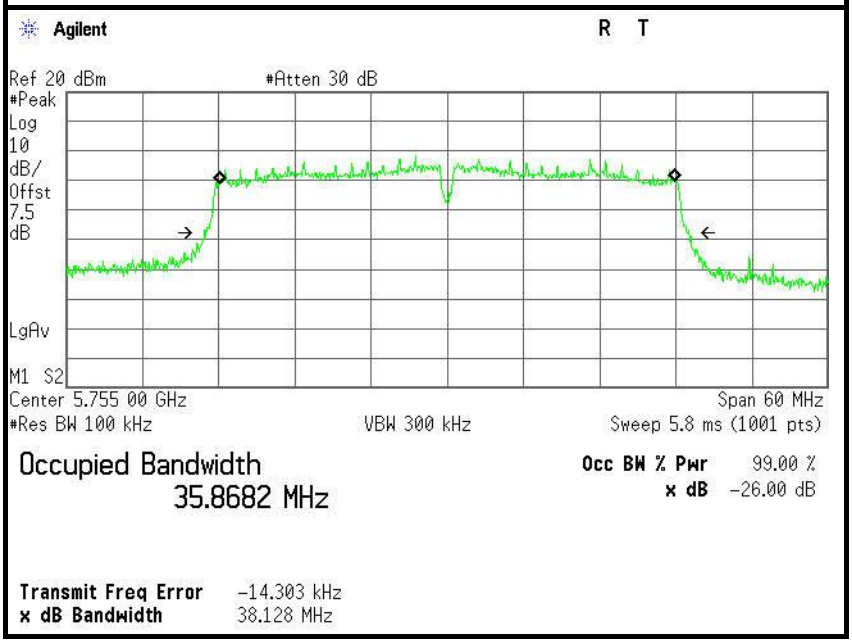
26dB Bandwidth (CH High)



IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

26dB Bandwidth (CH Low)



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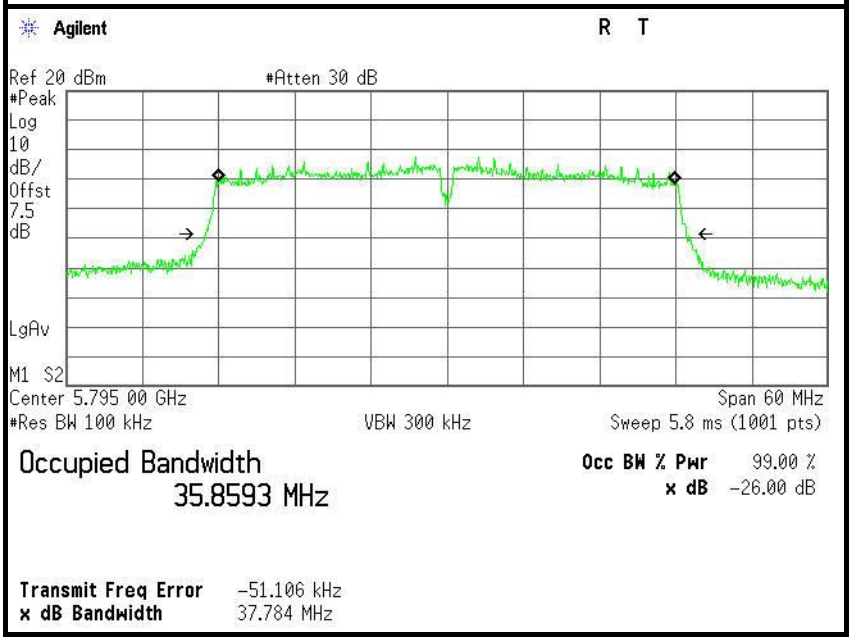
26dB Bandwidth (CH High)



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6.2 6dB BANDWIDTH MEASUREMENT

6.2.1 LIMITS

According to §15.407(e), Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

6.2.2 TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	E4446A	US44300399	02/28/2015	02/27/2016	10/24/2015

6.2.3 TEST PROCEDURES (please refer to measurement standard)

8.1 Option 1:

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW) ≥ 3 x RBW.

c) Detector = Peak.

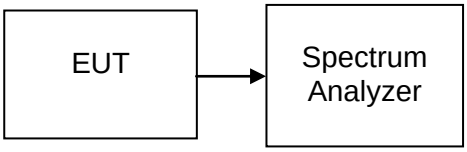
d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.2.4 TEST SETUP



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6.2.5 TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
Low	5745	15.137	>500	PASS
Mid	5785	15.073		PASS
High	5825	15.364		PASS

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
Low	5745	13.877	>500	PASS
Mid	5785	16.896		PASS
High	5825	14.186		PASS

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
Low	5755	35.164	>500	PASS
High	5795	35.154		PASS

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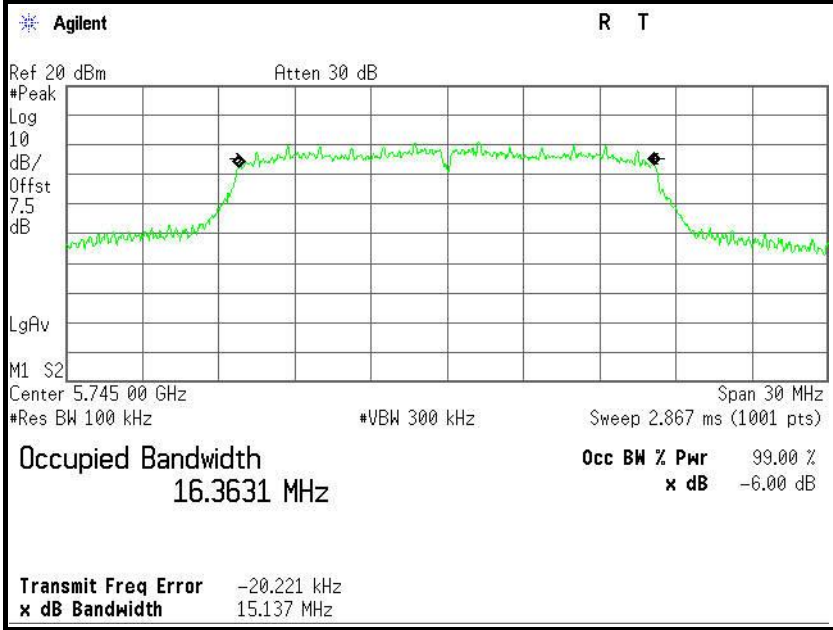
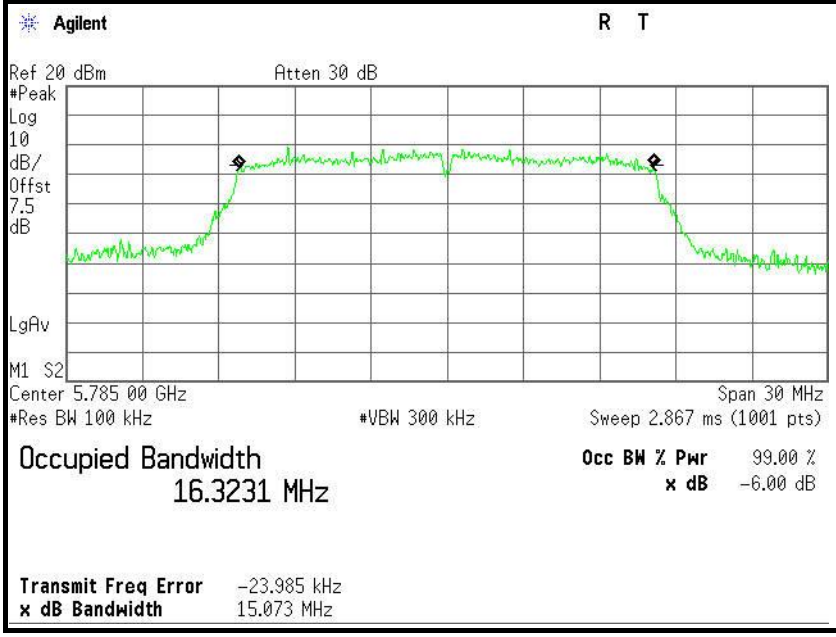
IEEE 802.11a mode / 5745 ~ 5825MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



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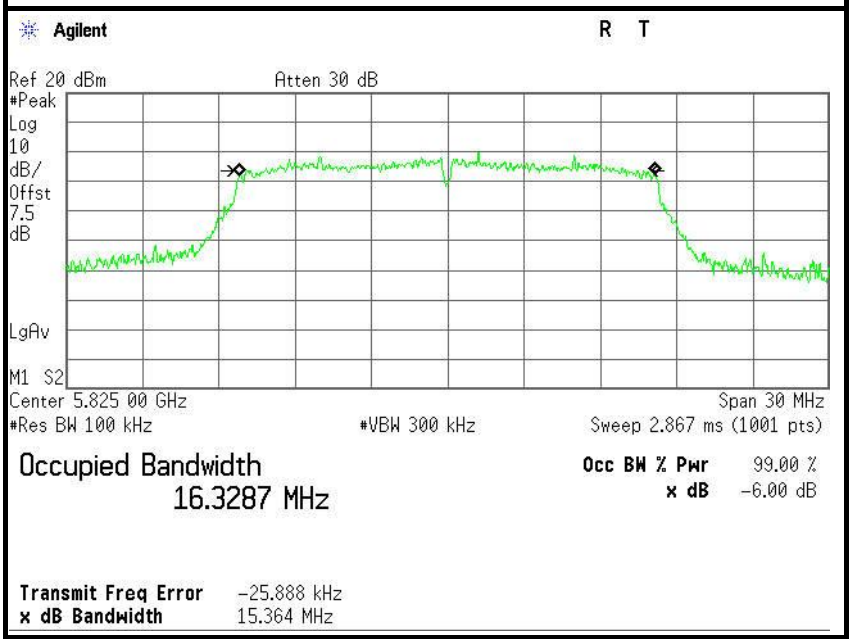
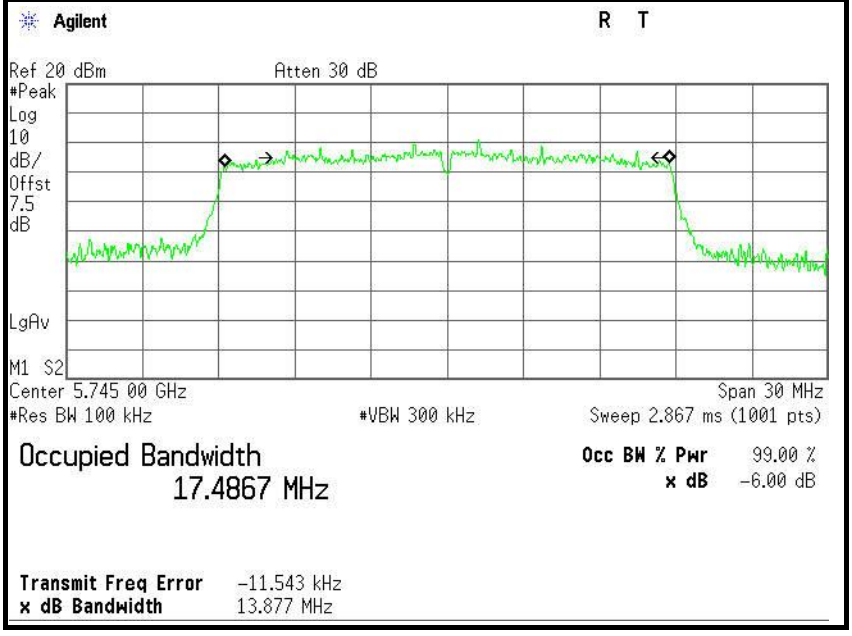
6dB Bandwidth (CH High)



IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

6dB Bandwidth (CH Low)



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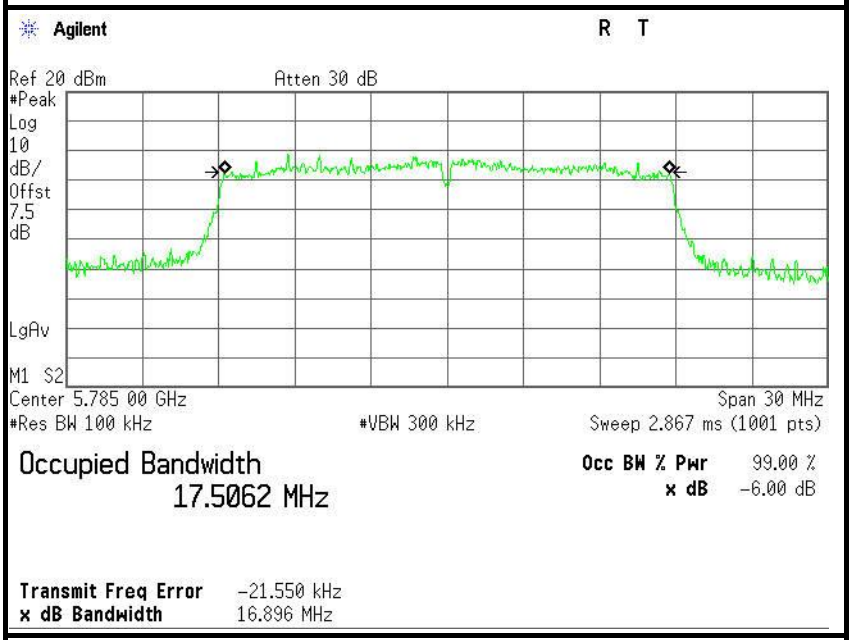
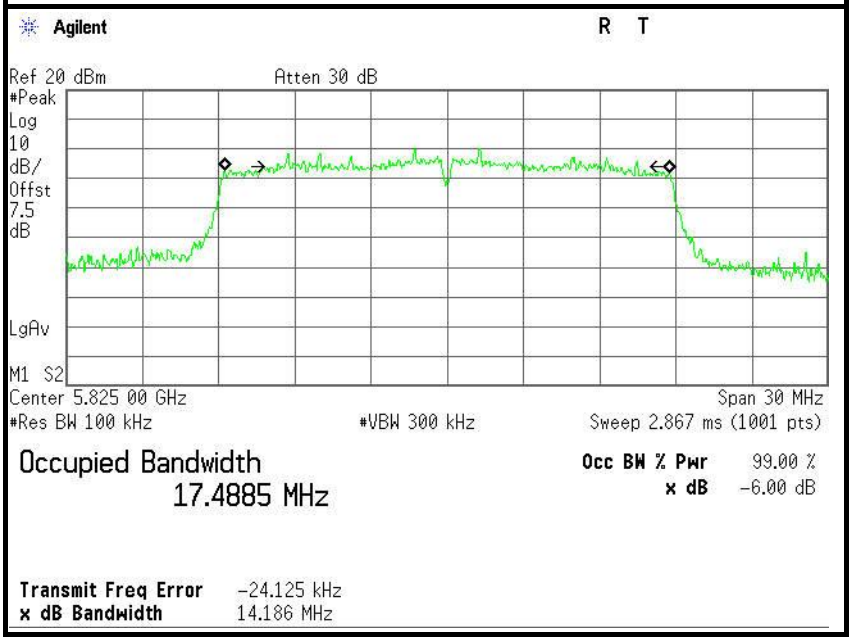
6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



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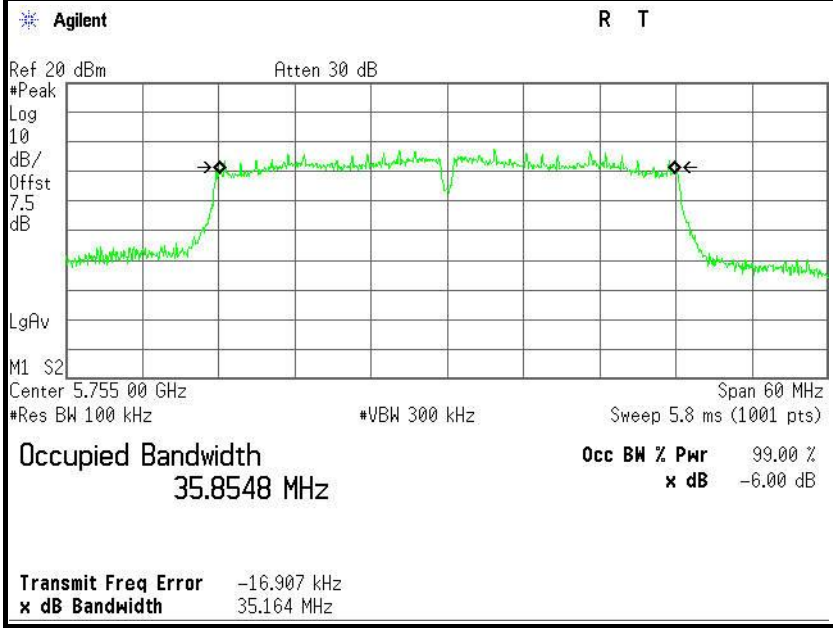
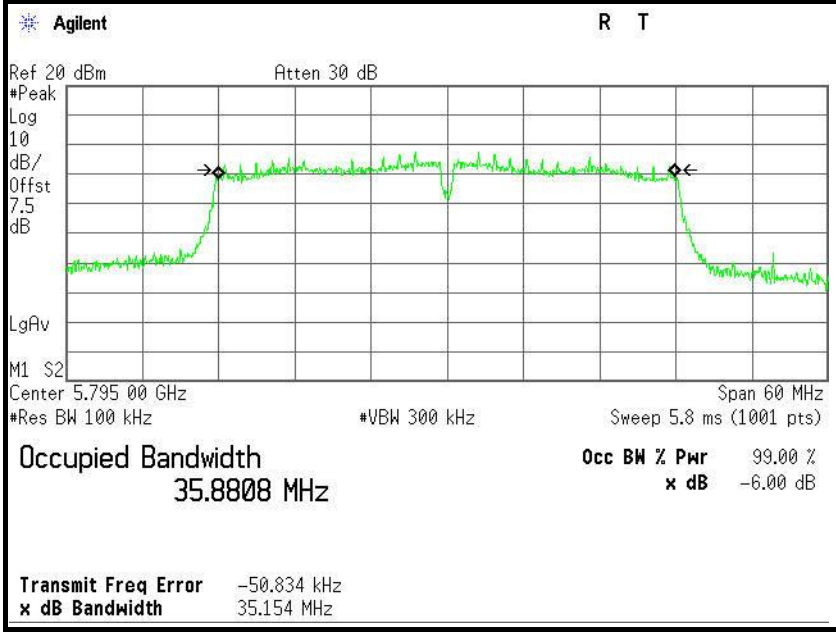
IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH High)



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6.3 ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the OFDM mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6 dBi	

TEST RESULTS

IEEE 802.11a mode

T_{nom}	V_{nom}	Lowest channel 5180MHz	Highest channel 5320MHz
Conducted power [dBm] Measured with OFDM modulation		9.47	8.47
Radiated power [dBm] Measured with OFDM modulation		2.66	1.64
Gain [dBi] Calculated		-6.81	-6.83
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)	

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6.4 PEAK POWER

6.4.1 LIMIT

According to §15.407(a)& FCC R&O FCC 14 - 30,

(1) (i) For an outdoor access point operating in the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(2) (ii) For an indoor access point operating in the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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.

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Specified Limit of the Peak Power

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

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	18.358	12.64	23.64	23.64
Mid	5300	18.417	12.65	23.65	23.65
High	5320	18.393	12.65	23.65	23.65

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

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	18.502	12.67	23.67	23.67
Mid	5580	18.111	12.58	23.58	23.58
High	5700	18.250	12.61	23.61	23.61

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

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	18.761	12.73	23.73	23.73
Mid	5300	18.794	12.74	23.74	23.74
High	5320	18.707	12.72	23.72	23.72

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

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	18.707	12.72	23.72	23.72
Mid	5580	18.534	12.68	23.68	23.68
High	5700	18.755	12.73	23.73	23.73

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IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5270	37.836	15.78	26.78	24.00
High	5310	37.703	15.76	26.76	24.00

IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5510	38.080	15.81	26.81	24.00
Mid	5550	37.890	15.79	26.79	24.00
High	5670	38.024	15.80	26.80	24.00

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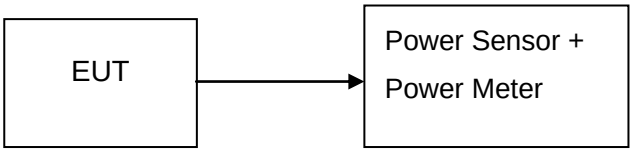
6.4.2 MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Meter	Anritsu	ML2495A	1204003	02/28/2015	02/27/2016
Power Sensor	Anritsu	MA2411B	1126150	02/28/2015	02/27/2016

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

6.4.3 TEST CONFIGURATIONS

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



6.4.4 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.

6.4.5 TEST RESULTS

No non-compliance noted

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6.4.6 TEST DATA

IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5180	12.40	0.01738	30.00	PASS
Mid	5200	12.30	0.01698		PASS
High	5240	12.20	0.01660		PASS

IEEE 802.11a mode / 5260~ 5320MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5260	12.10	0.01622	23.65	PASS
Mid	5300	11.90	0.01549		PASS
High	5320	11.70	0.01479		PASS

IEEE 802.11a mode / 5500 ~ 5700MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5500	9.70	0.00933	23.67	PASS
Mid	5580	10.10	0.01023		PASS
High	5700	10.80	0.01202		PASS

IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5745	10.80	0.01202	30.00	PASS
Mid	5785	10.30	0.01072		PASS
High	5825	10.10	0.01023		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5180	11.70	0.01479	30.00	PASS
Mid	5200	11.50	0.01413		PASS
High	5240	11.50	0.01413		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5260	11.60	0.01445	23.74	PASS
Mid	5300	11.40	0.01380		PASS
High	5320	11.20	0.01318		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5500	9.00	0.00794	23.73	PASS
Mid	5580	9.30	0.00851		PASS
High	5700	9.80	0.00955		PASS

IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5745	10.30	0.01072	30.00	PASS
Mid	5785	9.60	0.00912		PASS
High	5825	9.30	0.00851		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5190	11.90	0.01549	30.00	PASS
High	5230	11.80	0.01514		PASS

IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5270	11.70	0.01479	24.00	PASS
High	5310	11.50	0.01413		PASS

IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5510	9.40	0.00871	24.00	PASS
Mid	5550	9.90	0.00977		PASS
High	5670	10.90	0.01230		PASS

IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5755	10.80	0.01202	30.00	PASS
High	5795	10.50	0.01122		PASS

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6.5 BAND EDGES MEASUREMENT

6.5.1 LIMIT

According to §15.407(b)

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

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

6.5.2 MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site 966(2)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
EMI TEST RECEIVER	Agilent	N9038A	US44300399	02/28/2015	02/27/2016
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/28/2015	02/27/2016
Amplifier	MITEQ	AM-1604-3000	1123808	03/18/2015	03/18/2016
High Noise Amplifier	Agilent	8449B	3008A01838	02/28/2015	02/27/2016
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2015	02/27/2016
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/28/2015	02/27/2016
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2015	02/27/2016
Loop Antenna	COM-POWER	AL-130	121044	09/25/2015	09/24/2016
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/28/2015	02/27/2016
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The FCC Site Registration number is 101879.

3. N.C.R = No Calibration Required.

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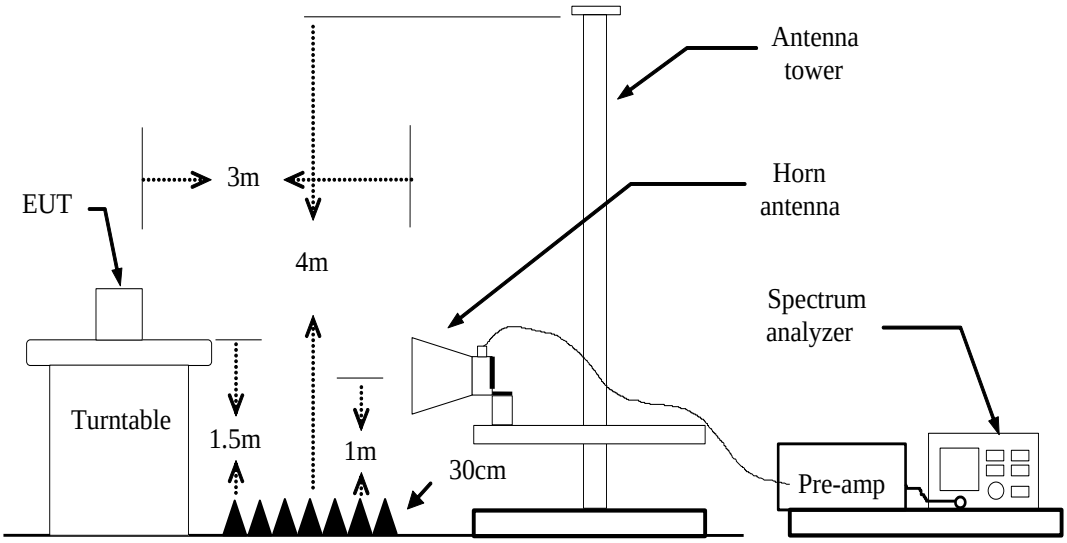
6.5.3 TEST CONFIGURATION



6.5.4 TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m 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=1 / VBW=3MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO / Detector=Peak
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

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6.5.5 TEST RESULT

IEEE 802.11a mode / 5500 ~ 5700MHz

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 18.502MHz, CH High: 18.250MHz
4. Frequency Range: 5490.7490MHz, 5709.1250MHz

IEEE 802.11a mode / 5745 ~ 5825MHz

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 18.351MHz, CH High: 18.316MHz
4. Frequency Range: 5735.8245MHz, 5834.1580MHz

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

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 18.707MHz, CH High: 18.755MHz
4. Frequency Range: 5490.6465MHz, 5709.3775MHz

IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 18.856MHz, CH High: 18.849MHz
4. Frequency Range: 5735.5720MHz, 5834.4245MHz

IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz

1. Operating Frequency: 5510-5670MHz
2. CH Low: 5510MHz, CH High: 5670MHz
3. 26dB bandwidth: CH Low: 38.080MHz, CH High: 38.024MHz
4. Frequency Range: 5490.9600MHz, 5689.0120MHz

IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

1. Operating Frequency: 5755-5795MHz
2. CH Low: 5755MHz, CH High: 5795MHz
3. 26dB bandwidth: CH Low: 38.128MHz, CH High: 37.784MHz
4. Frequency Range: 5735.9360MHz, 5813.8920MHz

Because the mentioned conditions, the test is not applicable.

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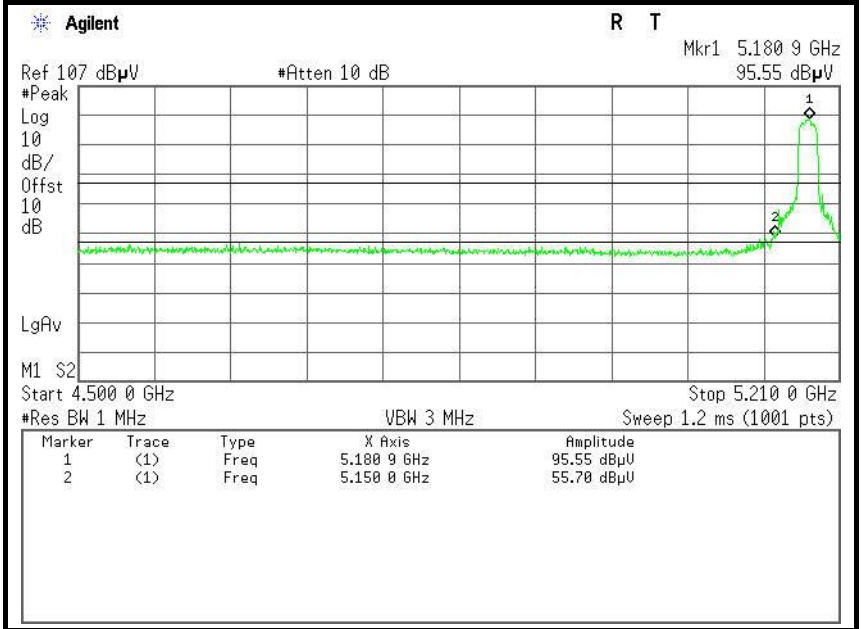
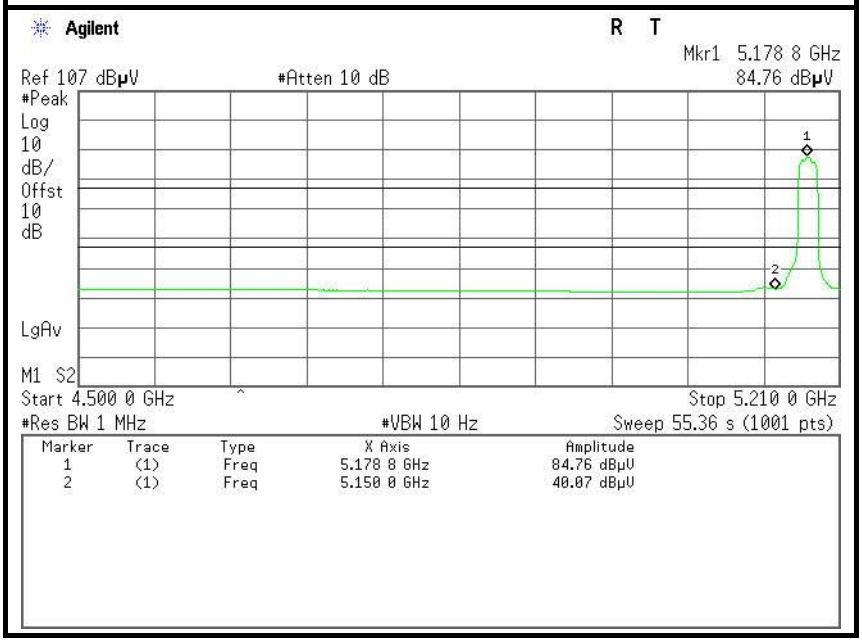
Test Plot

IEEE 802.11a mode / 5180MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	49.10	-6.60	55.70	74.00	-18.30	Peak	Vertical
2	5150.0000	33.47	-6.60	40.07	54.00	-13.93	Average	Vertical

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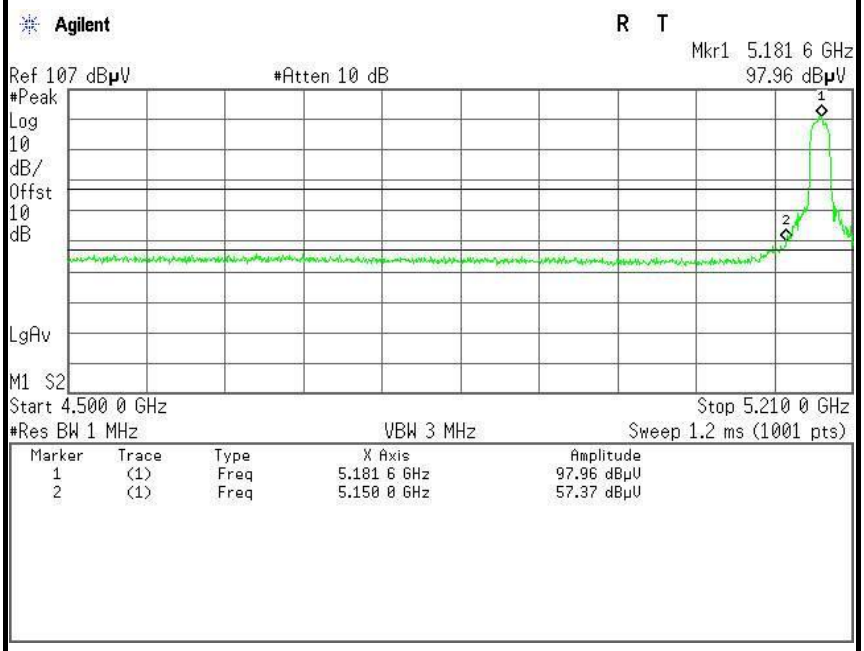
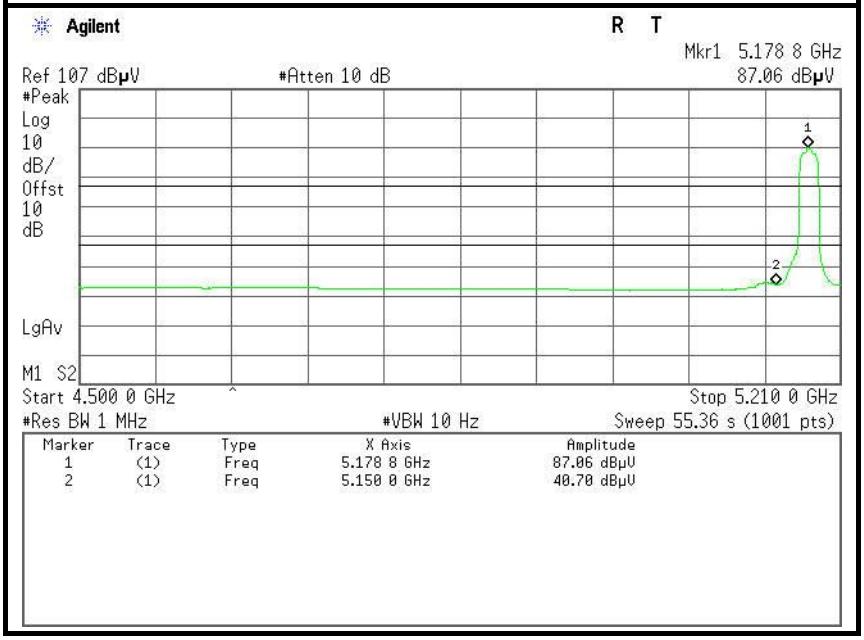
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	50.77	-6.60	57.37	74.00	-16.63	Peak	Horizontal
2	5150.0000	34.10	-6.60	40.70	54.00	-13.30	Average	Horizontal

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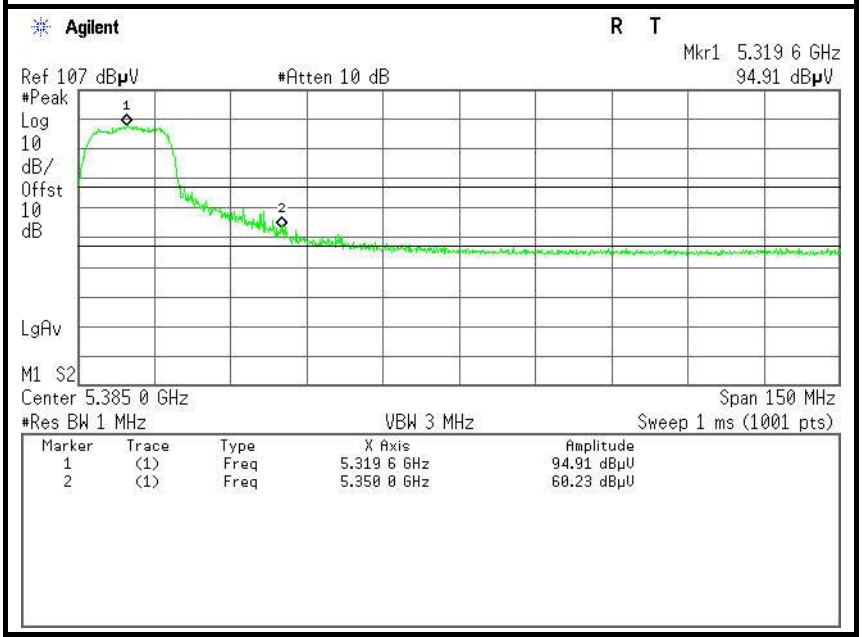
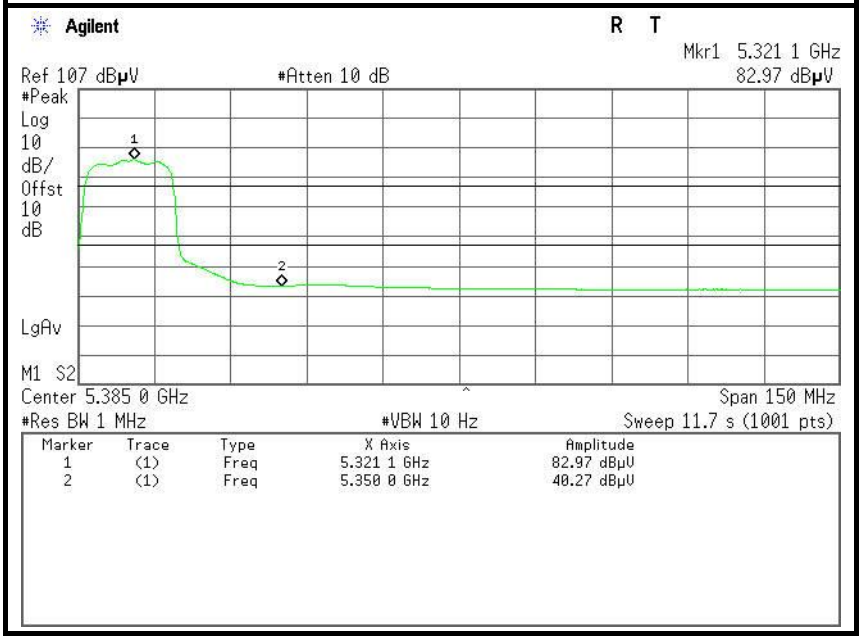
IEEE 802.11a mode / 5320MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	53.63	-6.60	60.23	74.00	-13.77	Peak	Vertical
2	5350.0000	33.67	-6.60	40.27	54.00	-13.73	Average	Vertical

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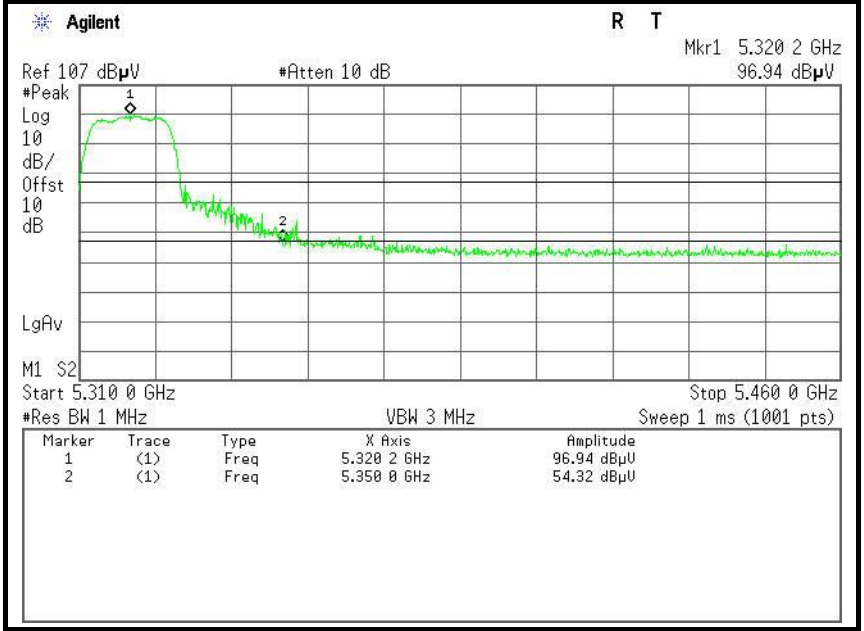
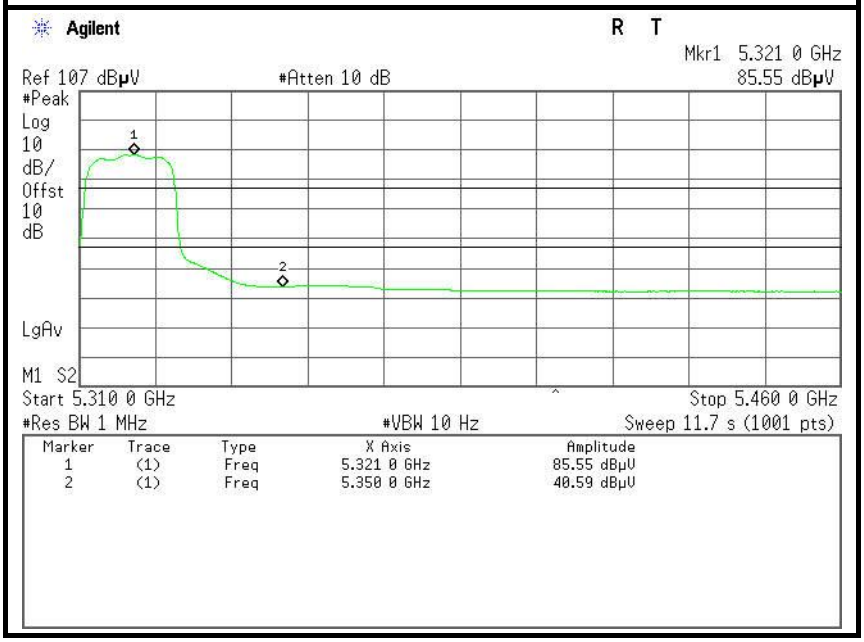
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	47.72	-6.60	54.32	74.00	-19.68	Peak	Horizontal
2	5350.0000	33.99	-6.60	40.59	54.00	-13.41	Average	Horizontal

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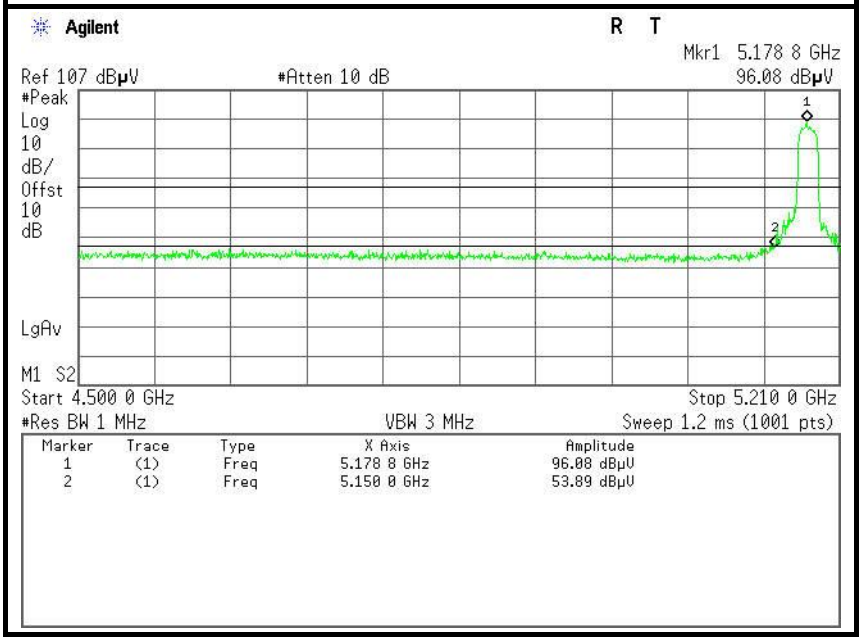
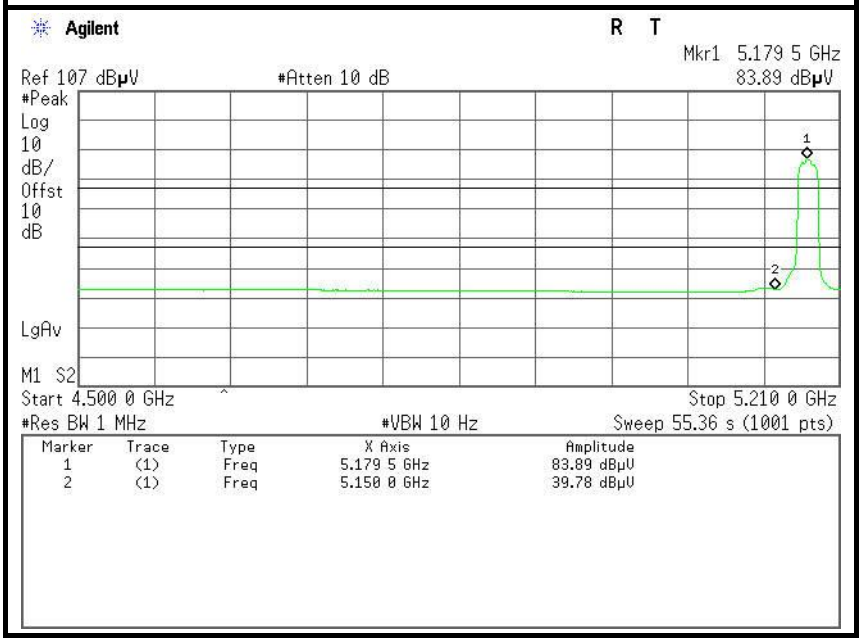
IEEE 802.11n HT 20 MHz mode / 5180 MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	47.29	-6.60	53.89	74.00	-20.11	Peak	Vertical
2	5150.0000	33.18	-6.60	39.78	54.00	-14.22	Average	Vertical

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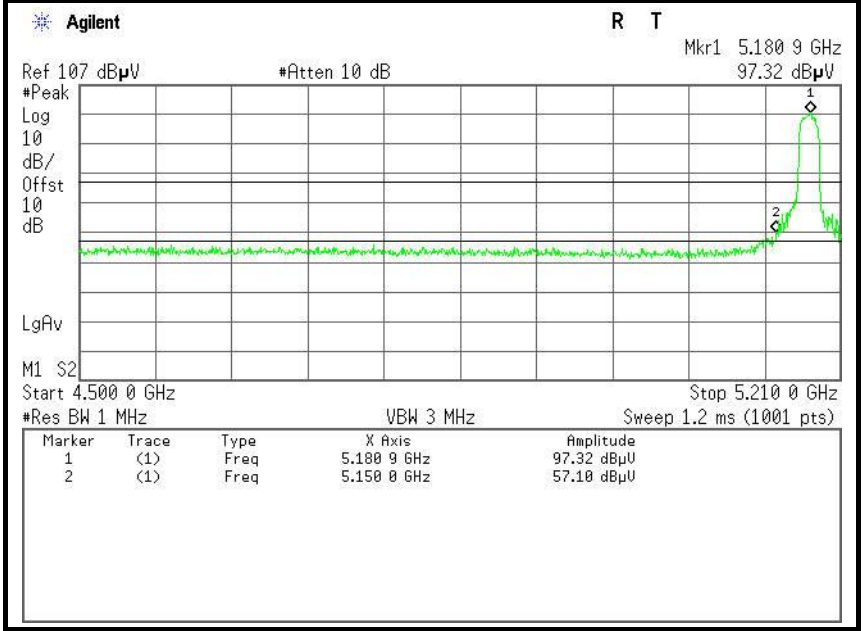
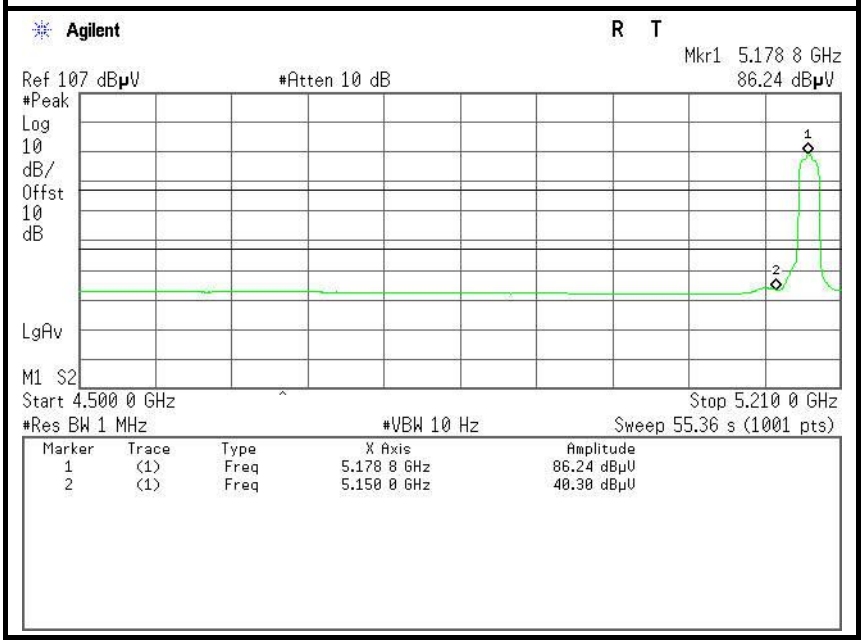
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	50.50	-6.60	57.10	74.00	-16.90	Peak	Horizontal
2	5150.0000	33.70	-6.60	40.30	54.00	-13.70	Average	Horizontal

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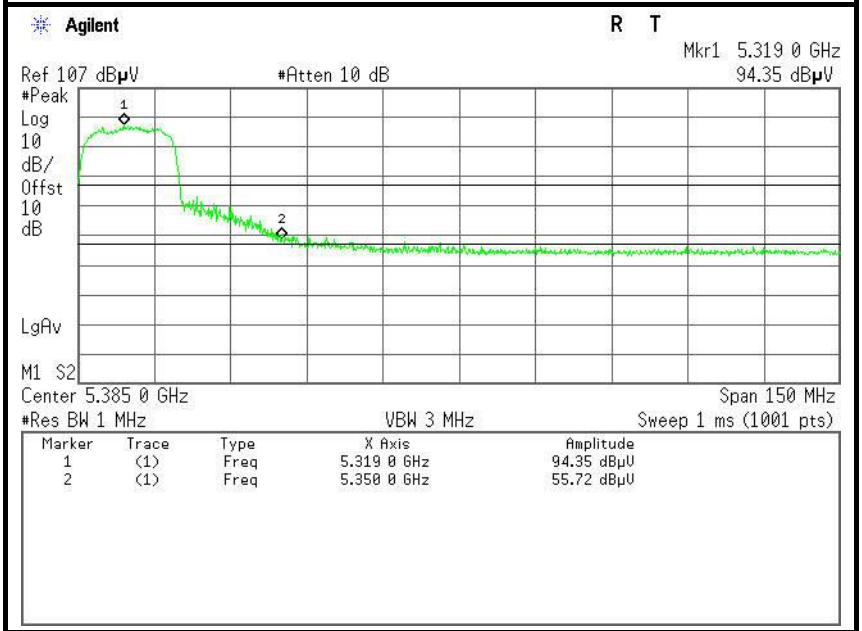
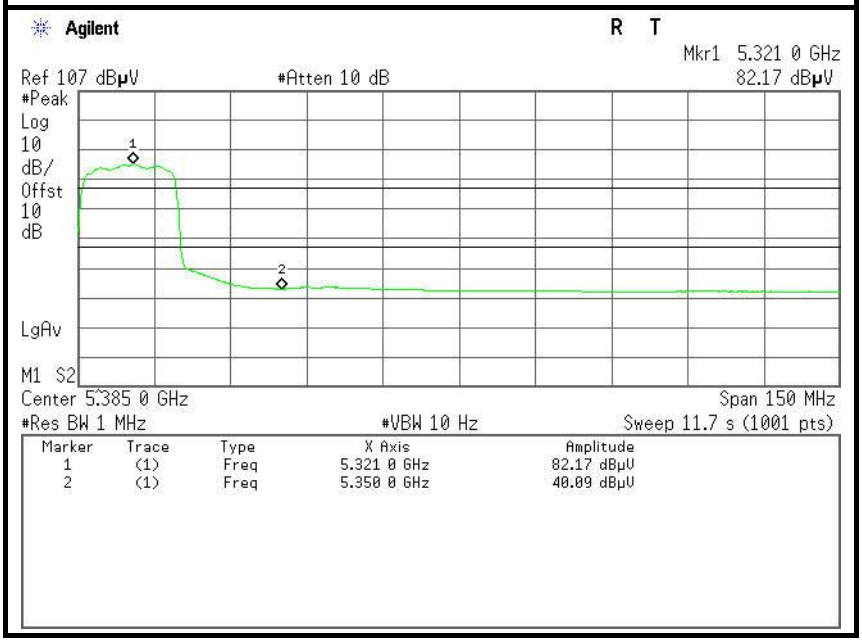
IEEE 802.11n HT 20 MHz mode / 5320 MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	49.12	-6.60	55.72	74.00	-18.28	Peak	Vertical
2	5350.0000	33.49	-6.60	40.09	54.00	-13.91	Average	Vertical

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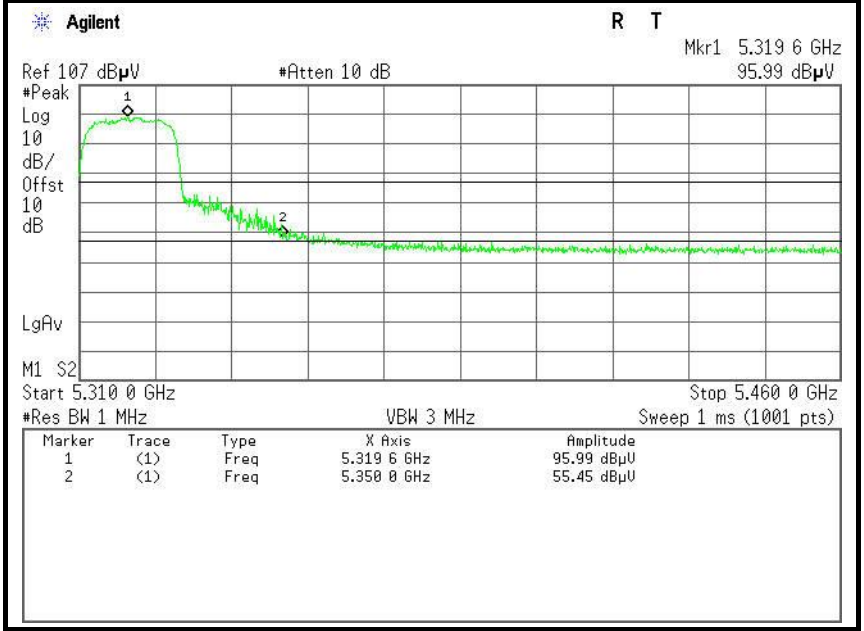
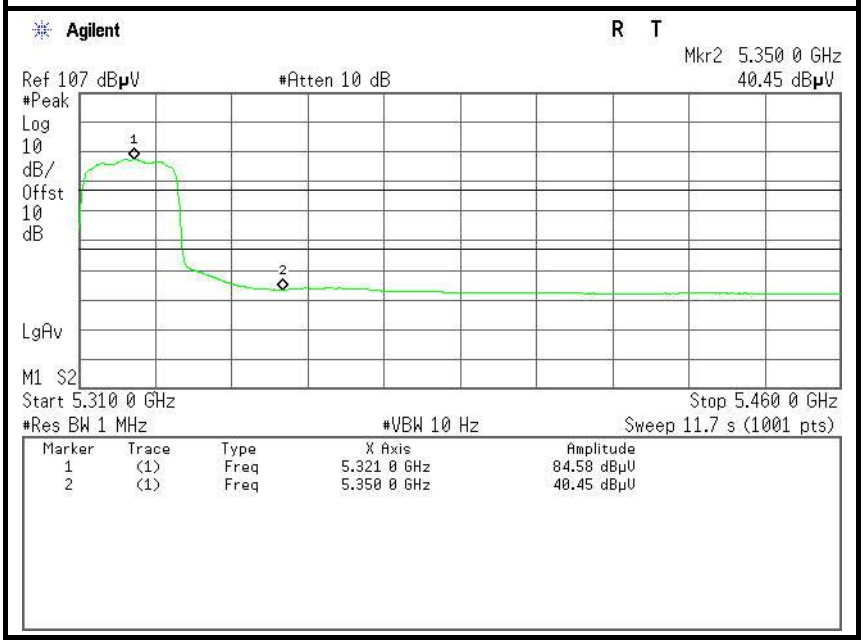
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	48.85	-6.60	55.45	74.00	-18.55	Peak	Horizontal
2	5350.0000	33.85	-6.60	40.45	54.00	-13.55	Average	Horizontal

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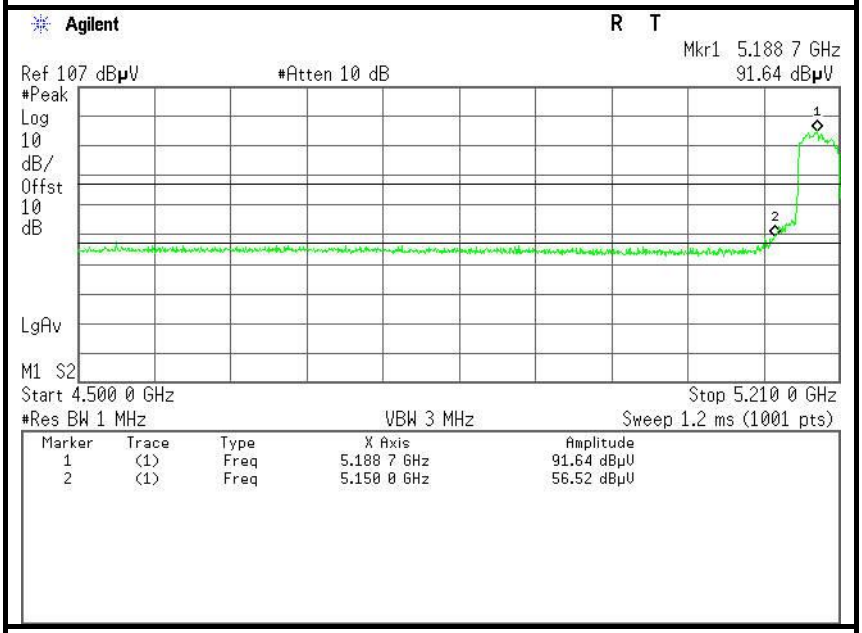
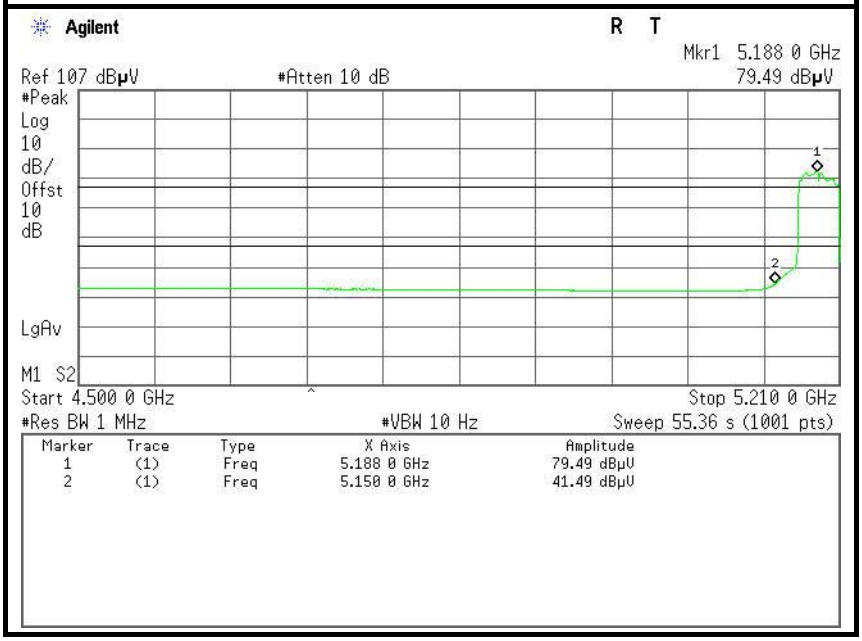
IEEE 802.11n HT 40 MHz mode / 5190 MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	49.92	-6.60	56.52	74.00	-17.48	Peak	Vertical
2	5150.0000	34.89	-6.60	41.49	54.00	-12.51	Average	Vertical

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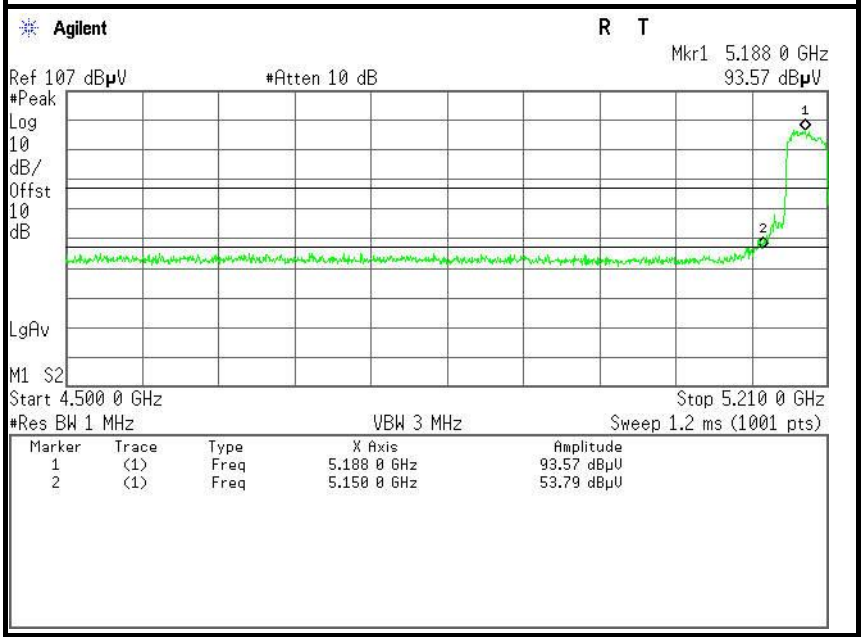
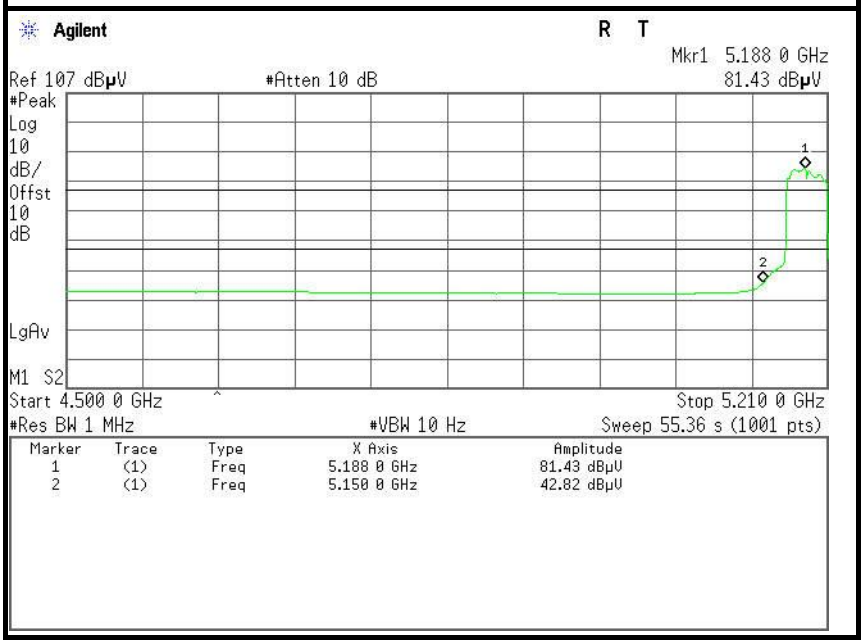
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	47.19	-6.60	53.79	74.00	-20.21	Peak	Horizontal
2	5150.0000	36.22	-6.60	42.82	54.00	-11.18	Average	Horizontal

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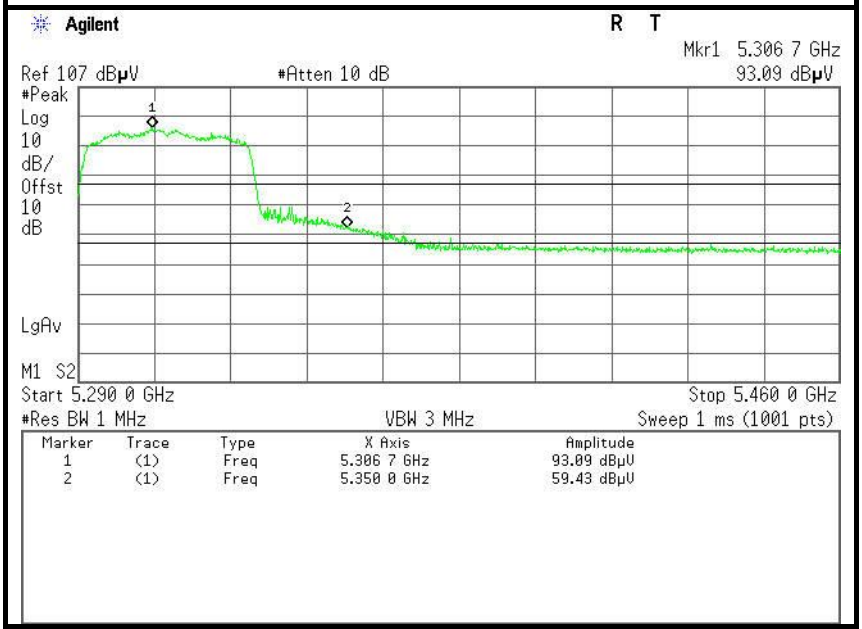
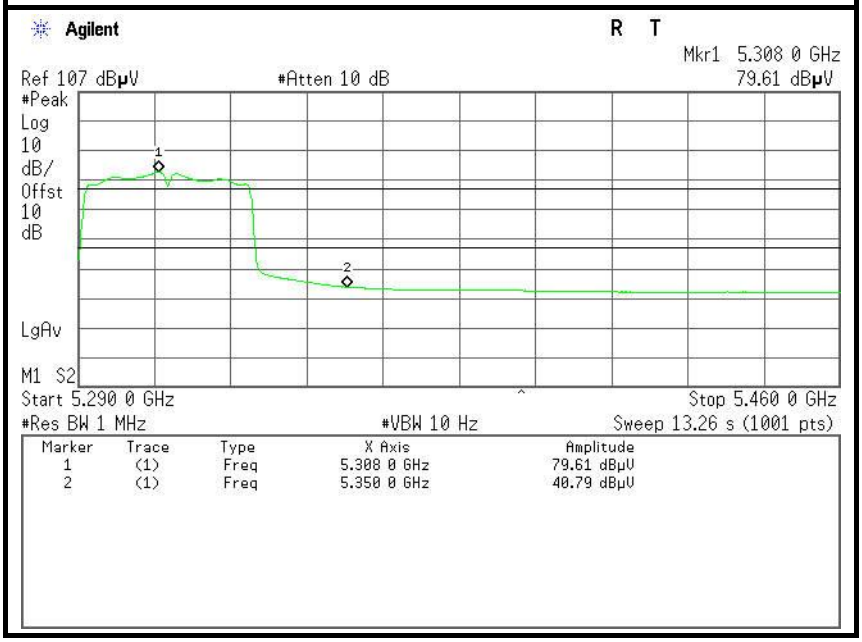
IEEE 802.11n HT 40 MHz mode / 5310 MHz

Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	52.83	-6.60	59.43	74.00	-14.57	Peak	Vertical
2	5350.0000	34.19	-6.60	40.79	54.00	-13.21	Average	Vertical

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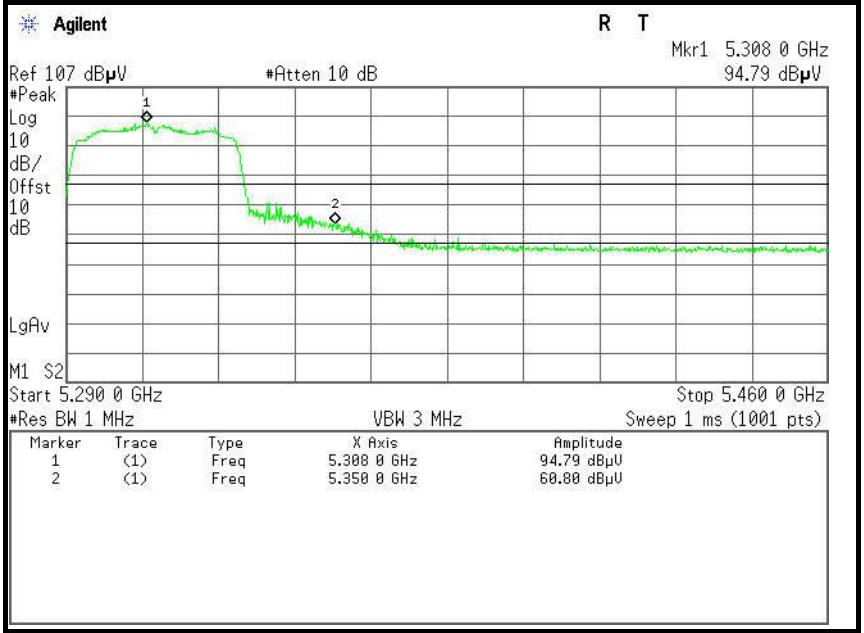
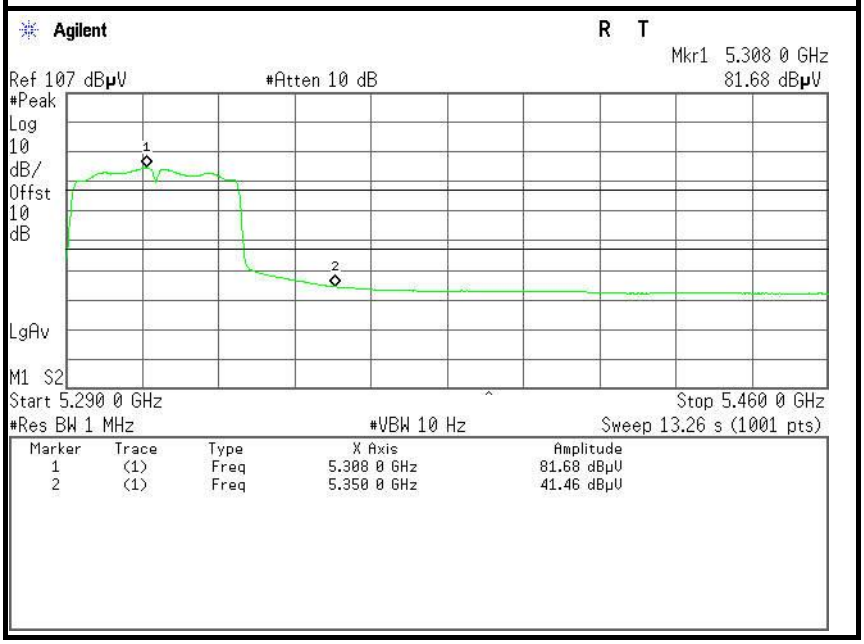
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	54.20	-6.60	60.80	74.00	-13.20	Peak	Horizontal
2	5350.0000	34.86	-6.60	41.46	54.00	-12.54	Average	Horizontal

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