FCC 47 CFR PART 15 SUBPART E

for

STB-4000

Model: STB-4000

Brand: N/A

Test Report Number:
C151228Z02-RP1-4

Issued Date: January 14, 2016

Issued for

Exceptional Innovation, Inc

480 Olde Worthington Rd. Suite 350 Westerville, Ohio 43082

Issued by:

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 14, 2016	Initial Issue	ALL	Nancy Fu

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1. TEST CERTIFICATION

Product	STB-4000
Model	STB-4000
Brand	N/A
Tested	December 28, 2015~ January 14, 2016
Applicant	**Exceptional Innovation, Inc** 480 Olde Worthington Rd. Suite 350 Westerville, Ohio 43082
Manufacturer	**Exceptional Innovation, Inc** 480 Olde Worthington Rd. Suite 350 Westerville, Ohio 43082

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	STB-4000
Model Number	STB-4000
Brand	N/A
Model Discrepancy	N/A
Serial Number	C151228Z02-RP1-4
Received Date	December 28, 2015
Power Supply	DC5V supplied by the Adapter
Adapter Manufacturer /Model No.	ShenZhen SOY Technology Co., Ltd/ SUN-0500300 I/P: 100-240Vac, 50/60Hz, 0.6A Max O/P: 5Vdc, 3.0A DC Output Cable: Unshielded, 1.50m (with a core)
Frequency Range	UNII Band I: IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz; IEEE 802.11n HT40: 5190MHz ~ 5230MHz IEEE 802.11ac 80: 5210MHz UNII Band II IEEE 802.11a, 802.11n HT20 : 5260MHz ~ 5320MHz IEEE 802.11n HT40: 5270MHz ~ 5310MHz IEEE 802.11ac 80: 5290MHz UNII Band IV IEEE 802.11a, 802.11n HT20 : 5745MHz ~ 5825MHz IEEE 802.11n HT40: 5755MHz ~ 5795MHz IEEE 802.11ac 80: 5775MHz
Transmit Power	UNII Band I: IEEE 802.11a: 13.67dBm IEEE 802.11n HT 20 MHz mode: 15.88dBm IEEE 802.11n HT 40 MHz mode: 15.66dBm IEEE 802.11ac 80: 15.08dBm UNII Band II IEEE 802.11a: 13.67dBm IEEE 802.11n HT 20 MHz mode: 15.49dBm IEEE 802.11n HT 40 MHz mode: 15.49dBm IEEE 802.11ac 80: 14.95dBm UNII Band IV IEEE 802.11a: 13.67dBm IEEE 802.11n HT 20 MHz mode: 17.07dBm IEEE 802.11n HT 40 MHz mode: 15.51dBm IEEE 802.11ac 80: 15.41dBm
Modulation Technique	OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Number of Channels	UNII Band I: IEEE 802.11a, 802.11n HT20 : 4 Channels IEEE 802.11n HT40 : 2 Channels IEEE 802.11ac 80: 1 Channel UNII Band II IEEE 802.11a, 802.11n HT20 : 4 Channels IEEE 802.11n HT40: 2 Channels IEEE 802.11ac 80: 1 Channel

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	UNII Band IV IEEE 802.11a, 802.11n HT20 : 5 Channels IEEE 802.11n HT 40 MHz mode: 2 Channels IEEE 802.11ac 80: 1 Channel
Antenna Specification	Dipole Antenna with 3.0dBi gain (Max)
Channels Spacing	IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40: 40MHz IEEE 802.11ac 80: 80MHz
Temperature Range	0°C ~ +40°C
Hardware Version	V2
Software Version	M8

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
42	5210
44	5220
46	5230
48	5240
52	5260
54	5270
56	5280
58	5290
60	5300
62	5310
64	5320
149	5745
151	5755
153	5765
155	5775
157	5785
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: 2AG4R-7C28EA 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) /1.5m (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 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:** Adapter + Play Video (AC120V/60Hz)	☒
	Mode 2: Adapter + Play Video (AC240V/50Hz)	☐
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.

IEEE 802.11ac 80 Channel for 5210MHz:
Channel Low (5210MHz) with 13.5Mbps data rate were chosen for full testing.

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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.

IEEE 802.11ac 80 Channel for 5290MHz:
Channel Low (5290MHz) 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.

IEEE 802.11ac 80 Channel for 5775MHz:
Channel Low (5775MHz) 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	TV	TLM19V68	N/A	DOC	Hisense	N/A	Unshielded 1.50m
2	Mouse	WB365PA#AB2	2HTJMB10117 8-317	DOC	DELL	Shielded 1.45m	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-3478, R-3135, T-652, 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

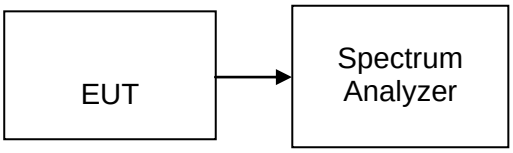
According to §15.303(c), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated 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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6.1.5 TEST RESULTS

No non-compliance noted

Test Data

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5180	21.648
Mid	5200	21.677
High	5240	21.399

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5260	21.707
Mid	5300	21.626
High	5320	21.443

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5745	27.949
Mid	5785	26.347
High	5825	25.787

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5180	21.908
Mid	5200	22.373
High	5240	24.254

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5260	25.561
Mid	5300	22.212
High	5320	25.883

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5745	29.922
Mid	5785	28.742
High	5825	28.320

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5190	39.841
High	5230	39.809

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5270	47.378
High	5310	39.627

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
Low	5755	58.898
High	5795	58.651

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Test mode: IEEE 802.11ac 80 mode / 5210MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
	5210	80.800

Test mode: IEEE 802.11ac 80 mode / 5290MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
	5290	80.582

Test mode: IEEE 802.11ac 80 mode / 5775MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)
	5775	103.512

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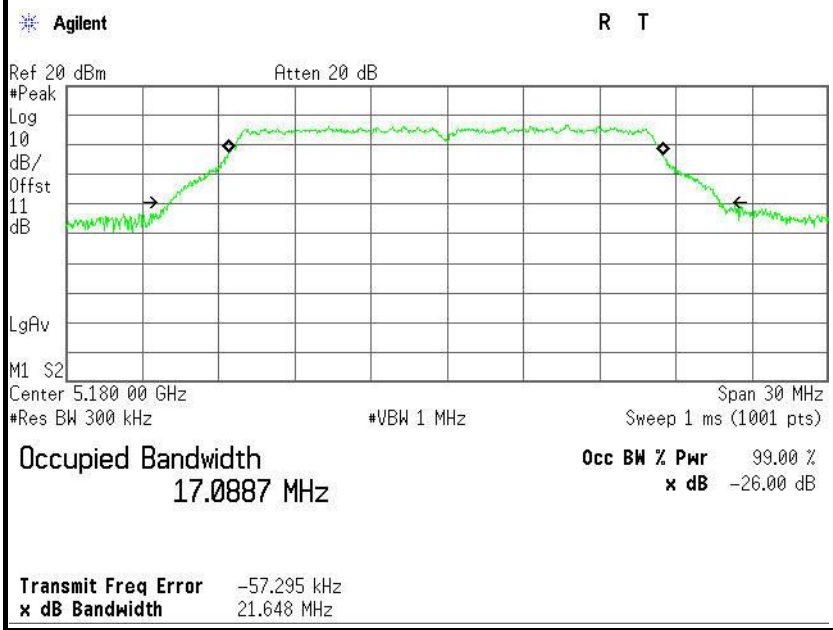
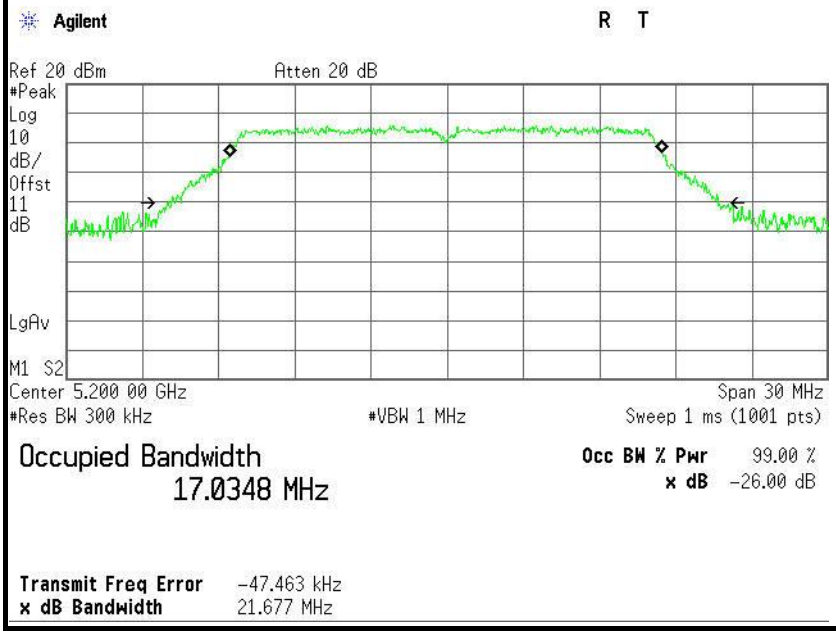
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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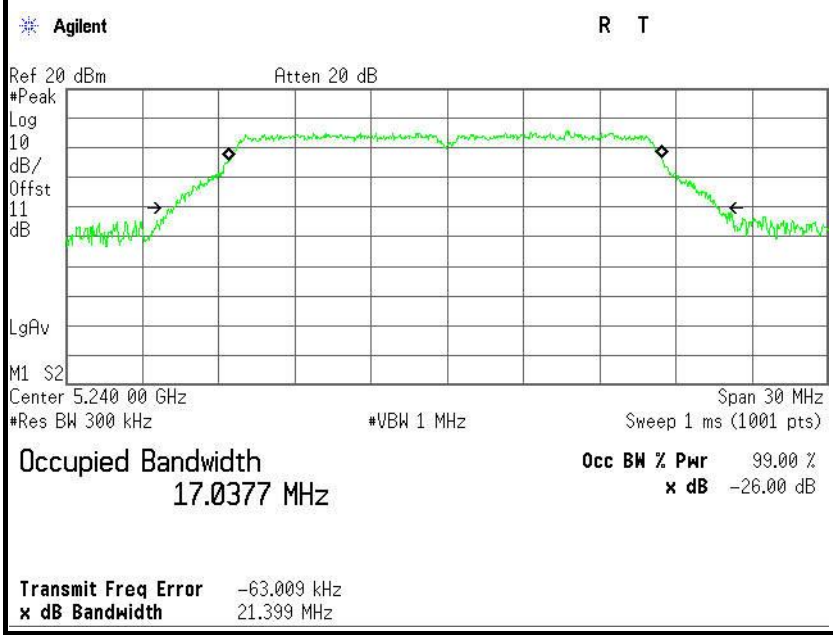
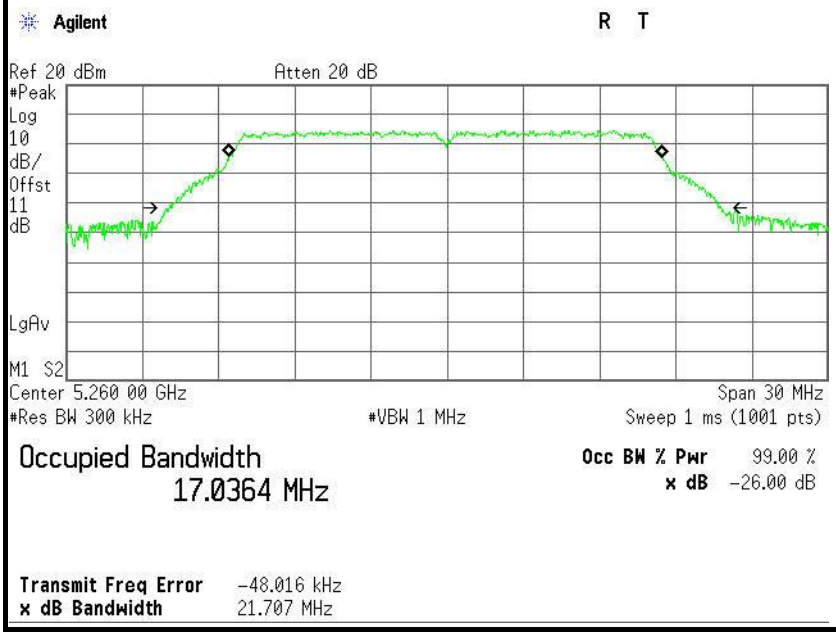
26dB Bandwidth (CH High)



IEEE 802.11a mode / 5260~ 5320MHz

26dB Bandwidth (CH Low)



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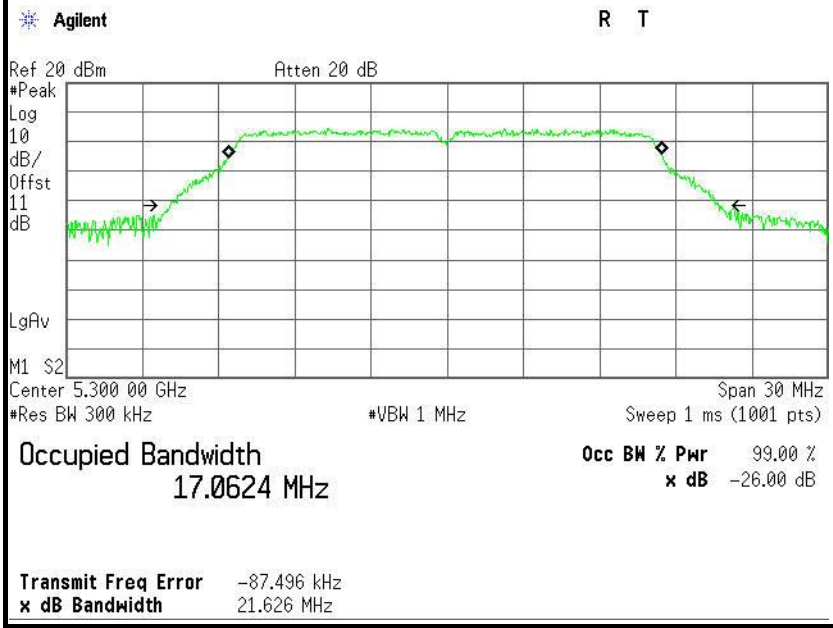
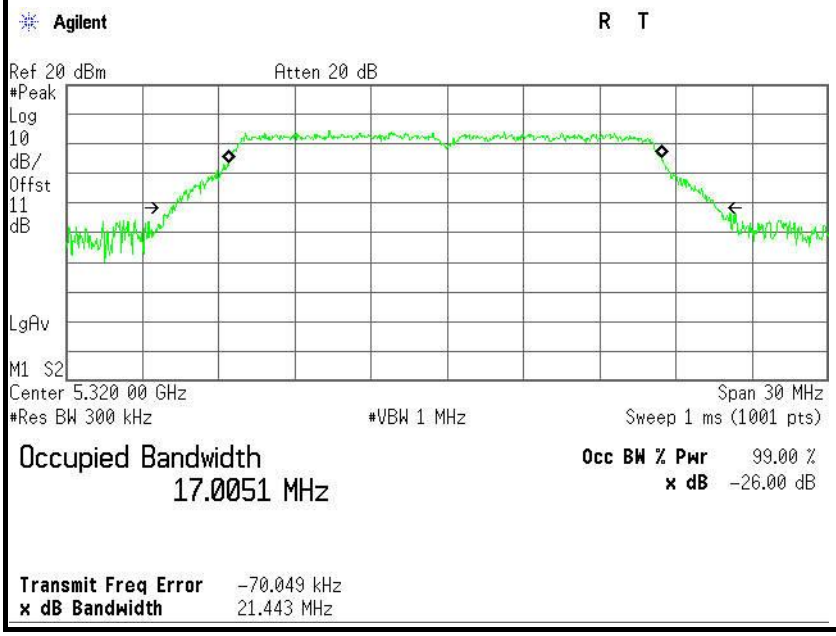
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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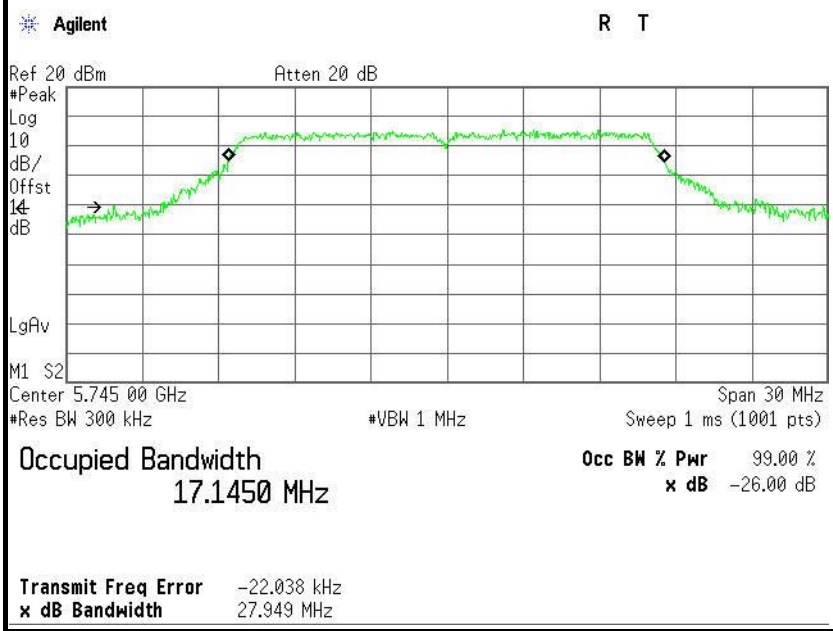
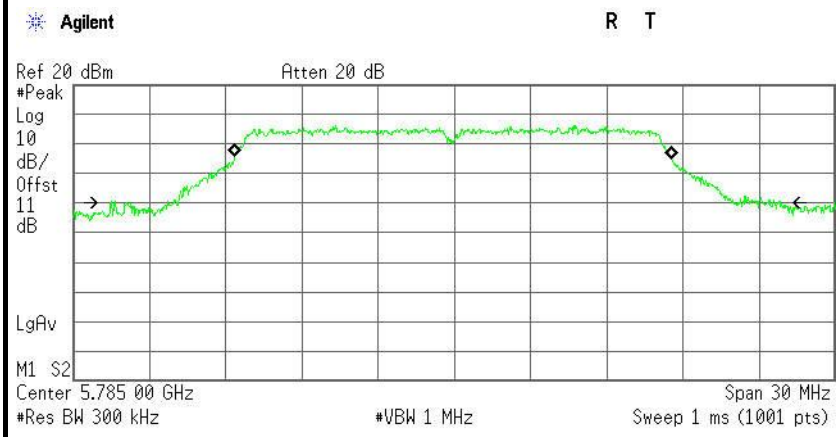
IEEE 802.11a mode / 5745 ~ 5825MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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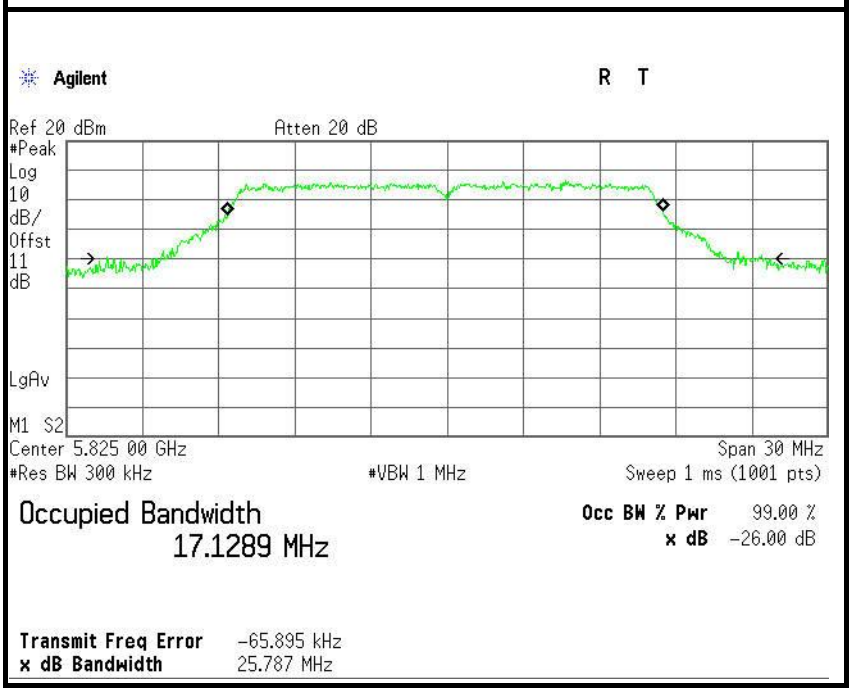
26dB Bandwidth (CH High)



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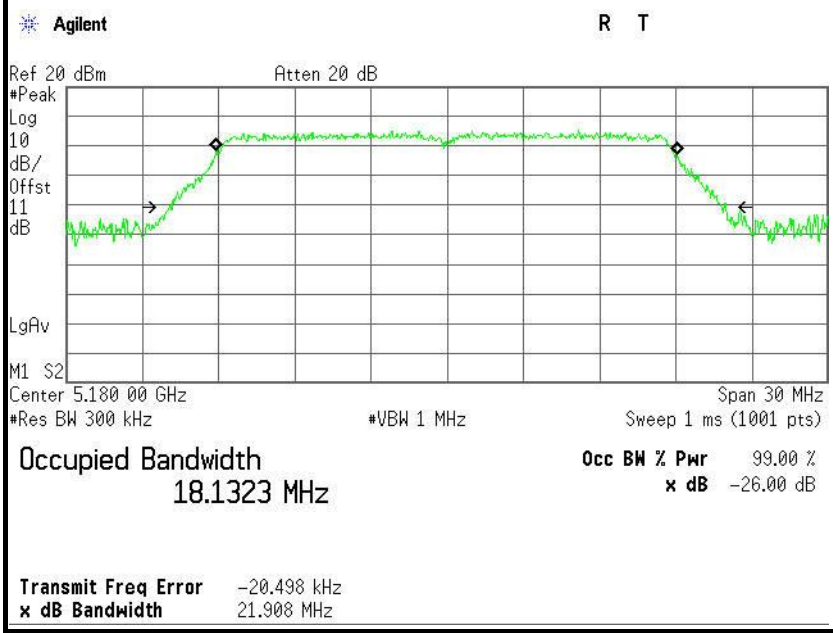
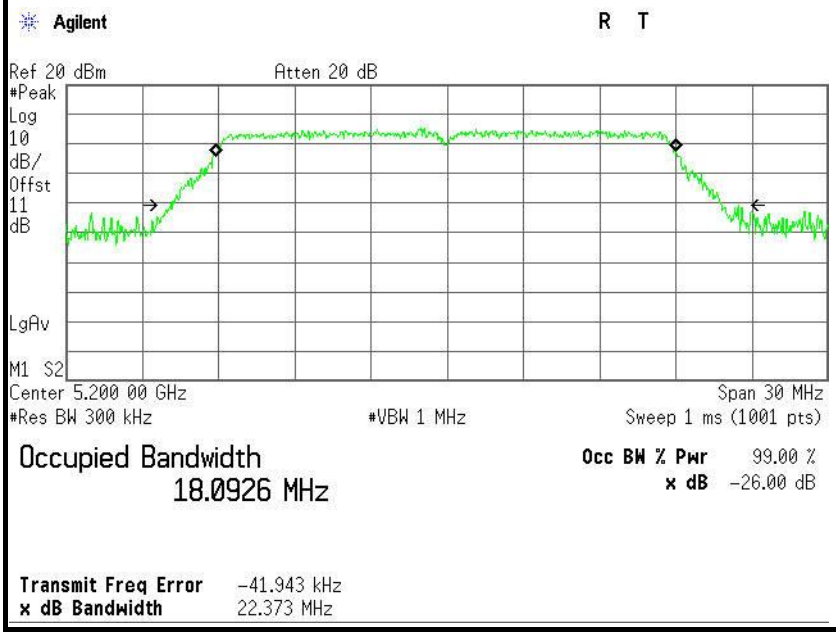
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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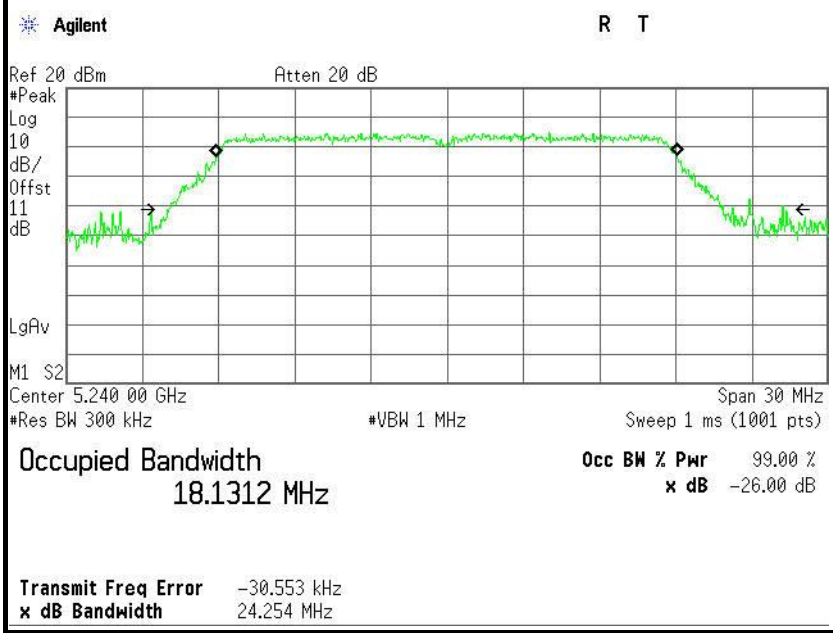
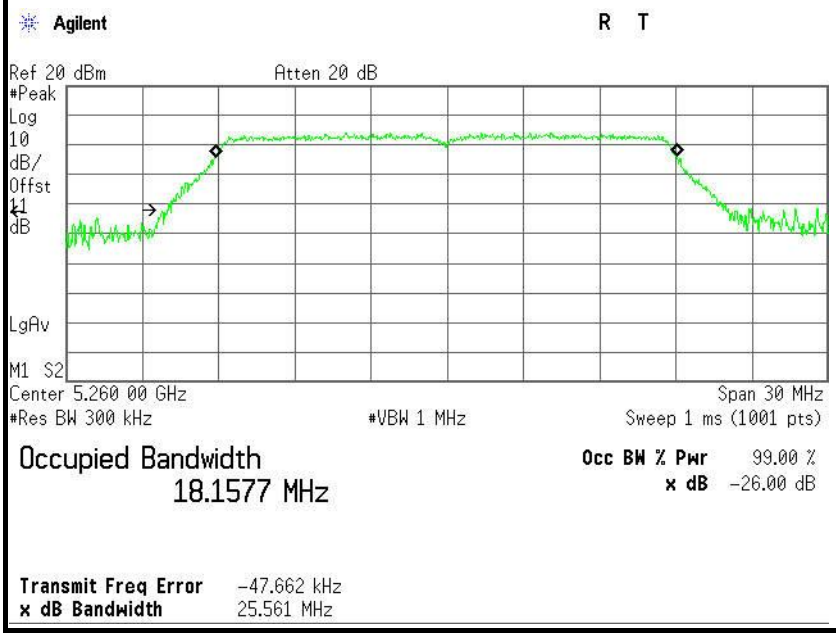
26dB Bandwidth (CH High)



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

26dB Bandwidth (CH Low)



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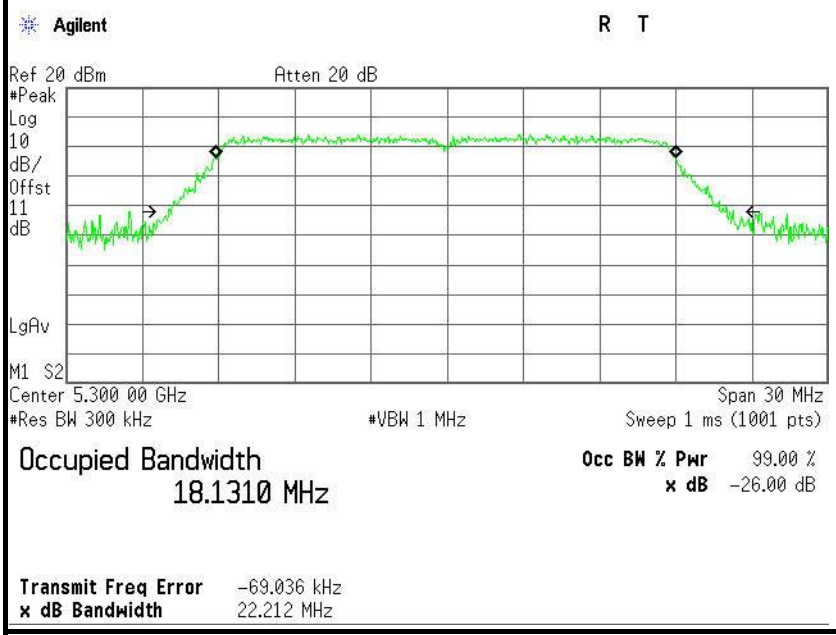
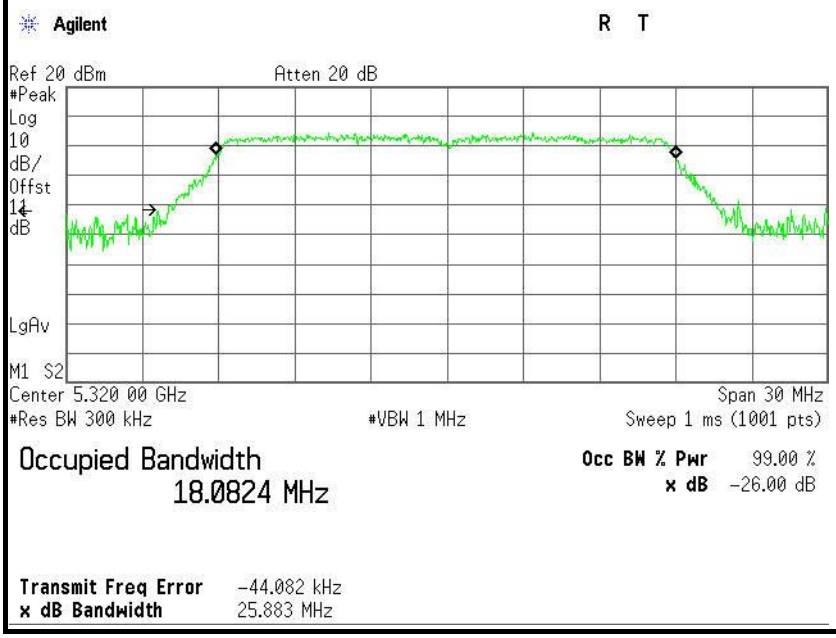
26dB Bandwidth (CH Mid)



26dB Bandwidth (CH High)



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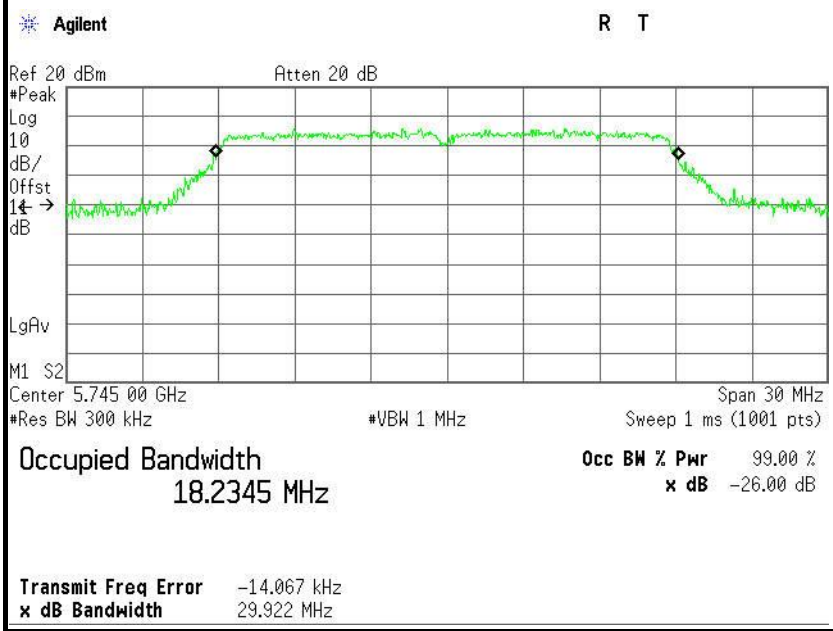
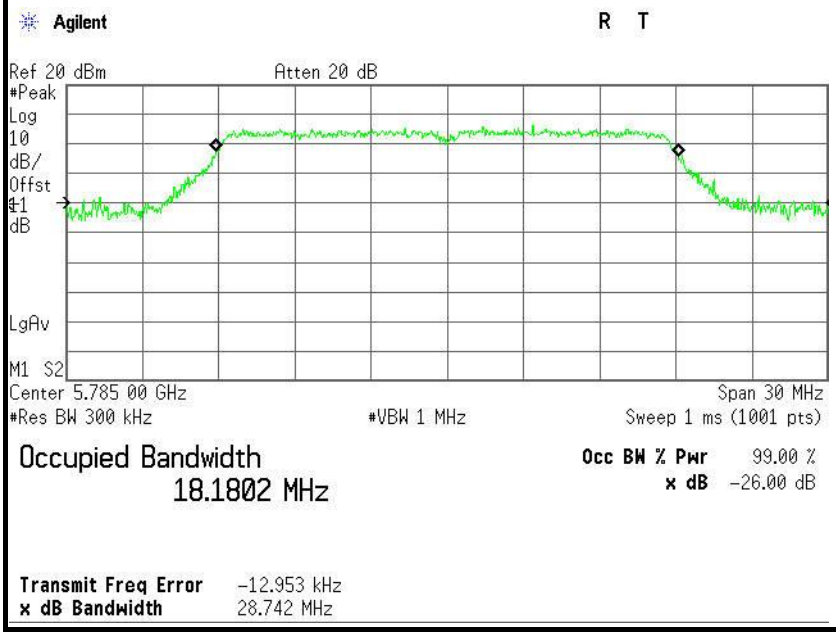
IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH Mid)



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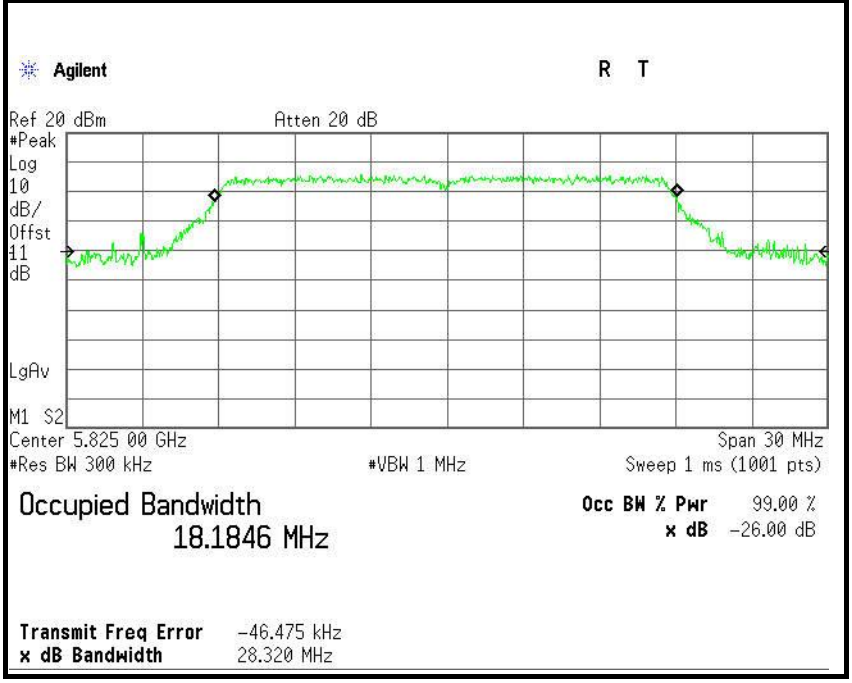
26dB Bandwidth (CH High)



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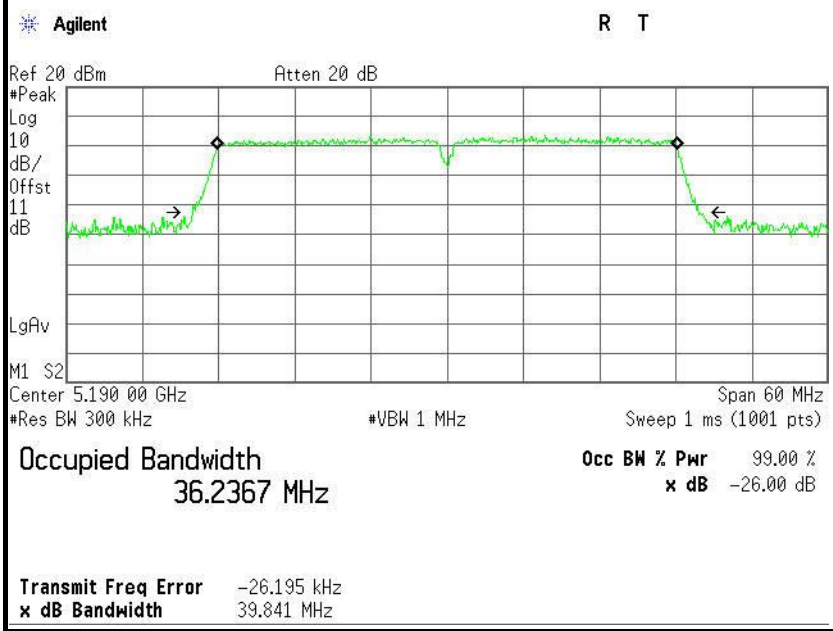
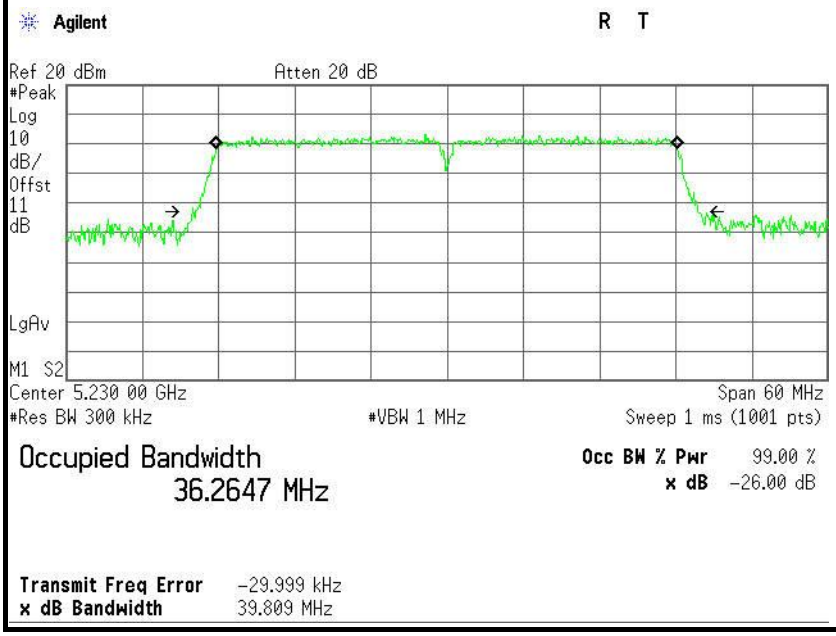
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH High)



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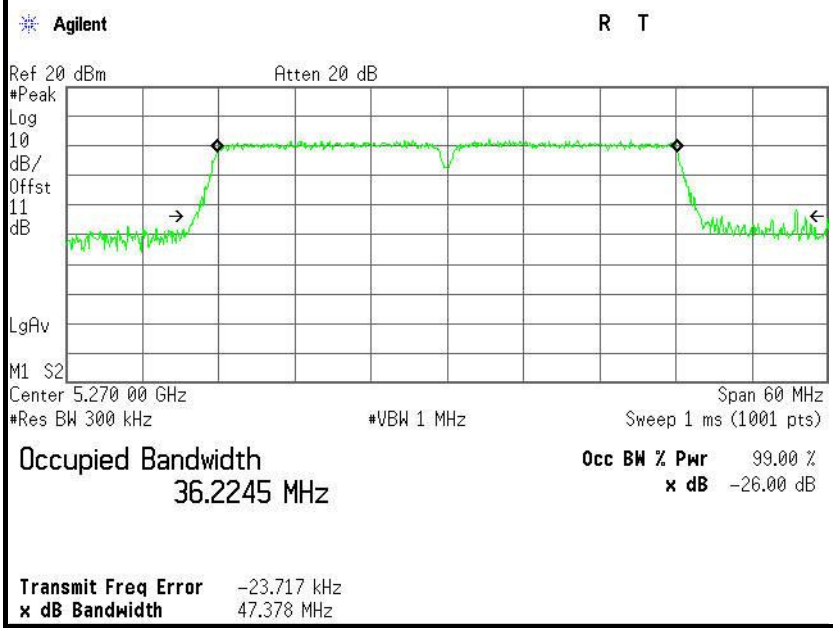
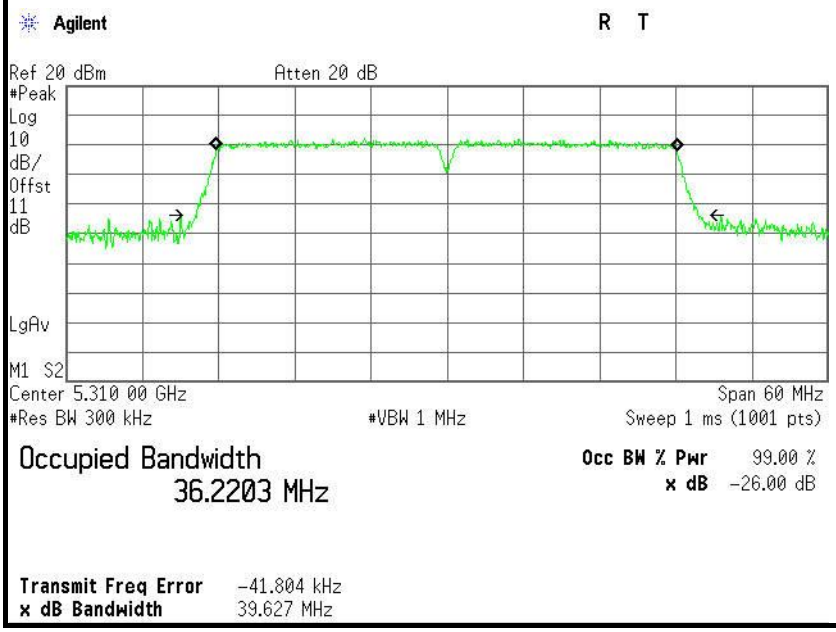
IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH High)



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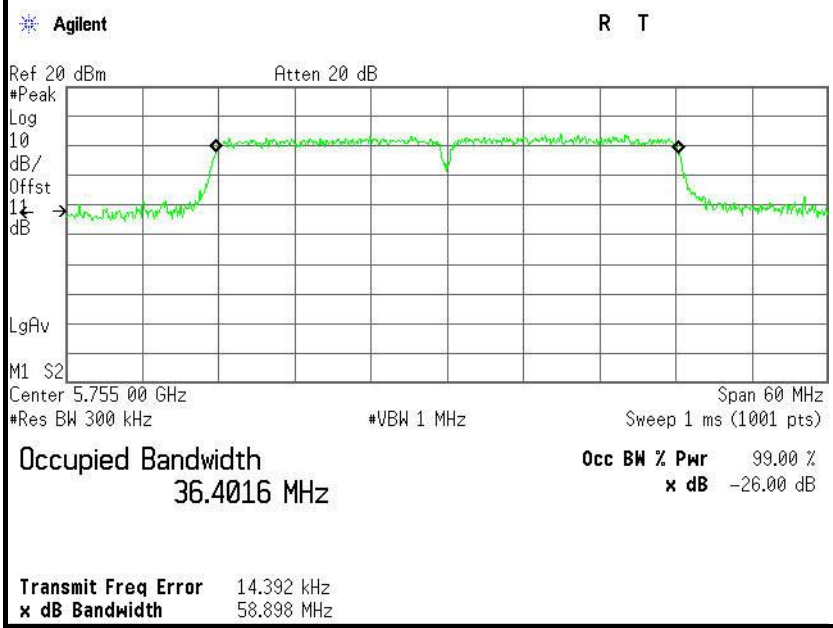
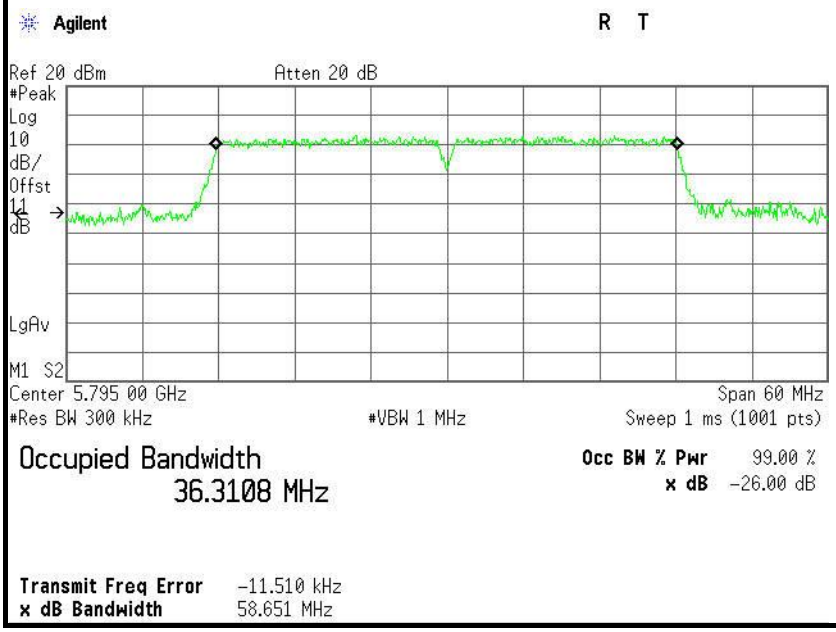
IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

26dB Bandwidth (CH Low)



26dB Bandwidth (CH High)



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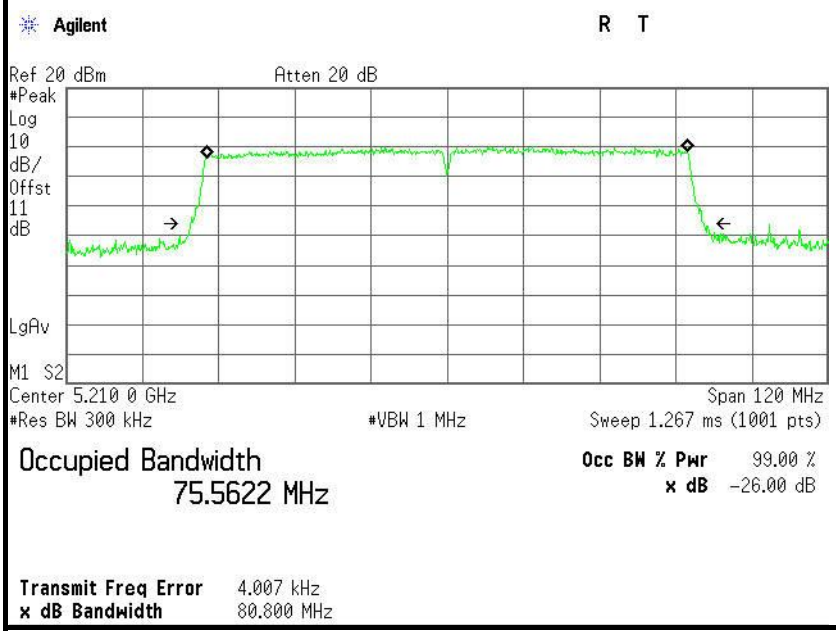
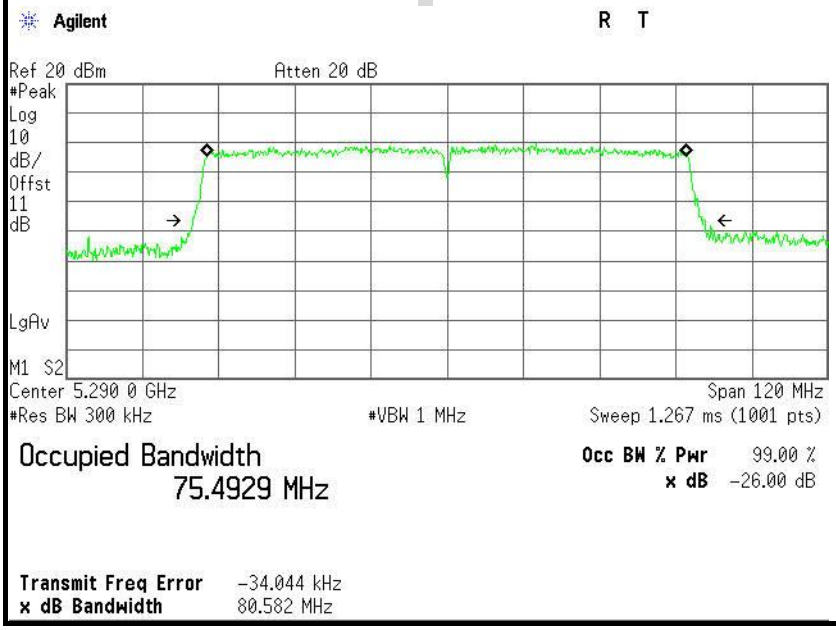
IEEE 802.11ac 80 mode / 5210MHz

26dB Bandwidth



IEEE 802.11ac 80 mode / 5290MHz

26dB Bandwidth



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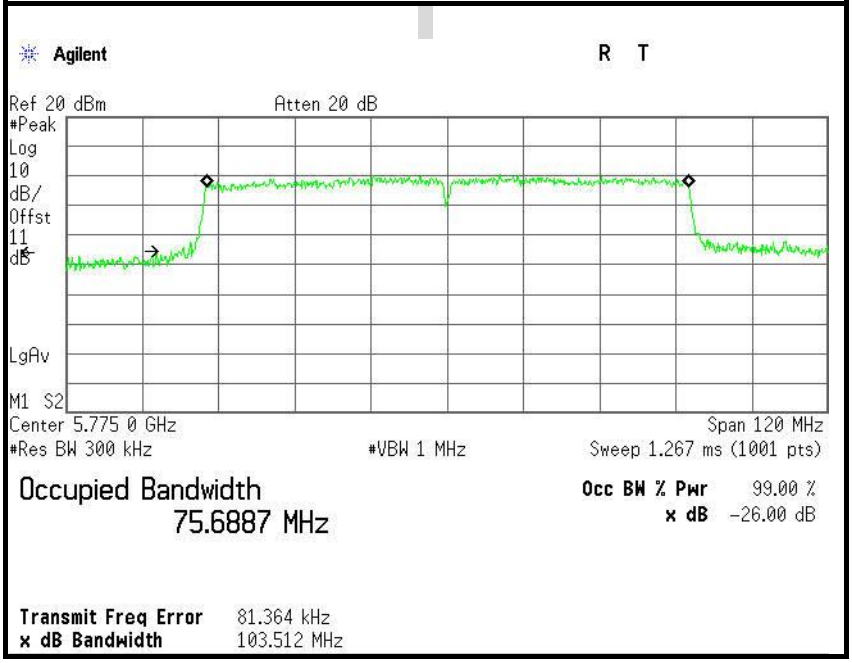
IEEE 802.11ac 80 mode / 5775MHz

26dB Bandwidth



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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	Agilent	E4446A	US44300399	02/28/2015	02/27/2016

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.

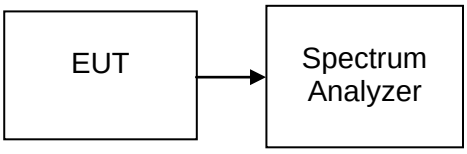
d) Trace mode = max hold.

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	16.379	>500	PASS
Mid	5785	16.388		PASS
High	5825	16.402		PASS

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
Low	5745	17.575	>500	PASS
Mid	5785	17.564		PASS
High	5825	17.596		PASS

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

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
Low	5755	36.192	>500	PASS
High	5795	36.252		PASS

Test mode: IEEE 802.11ac 80 mode / 5775MHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	Limit (kHz)	Test Result
	5775	75.233	>500	PASS

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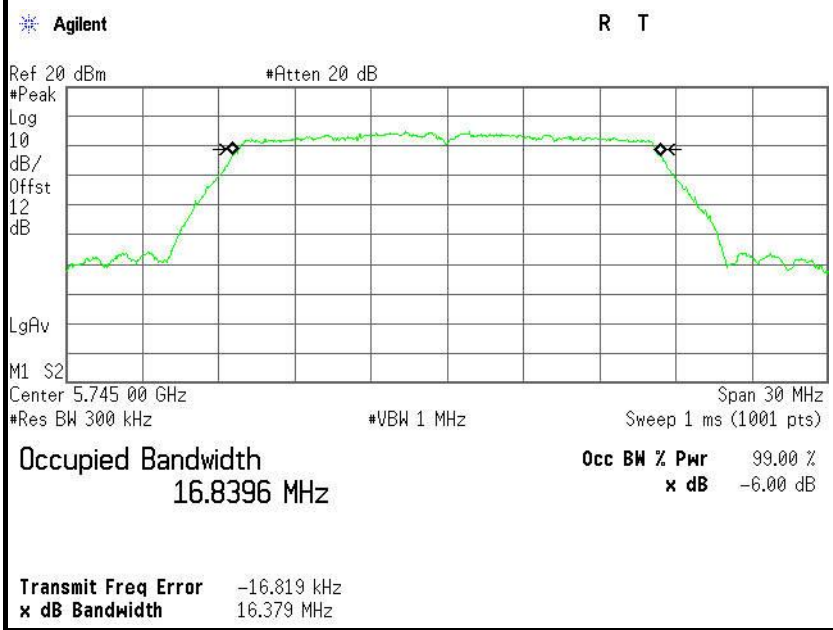
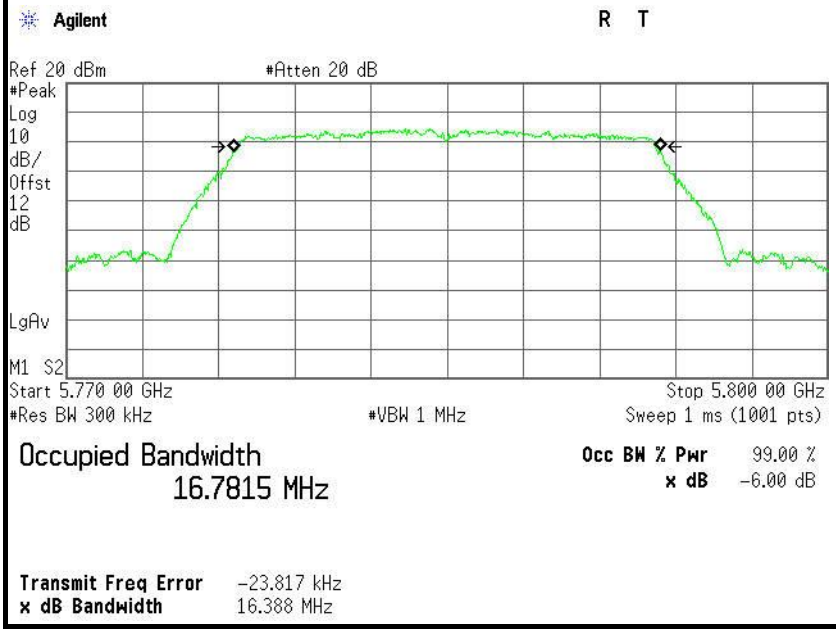
IEEE 802.11a mode / 5745 ~ 5825MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



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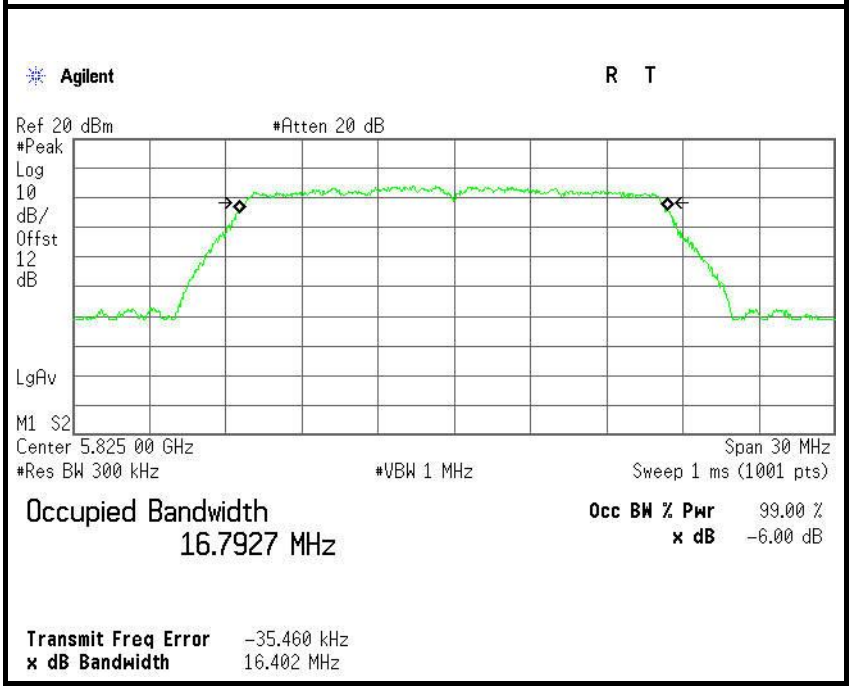
6dB Bandwidth (CH High)



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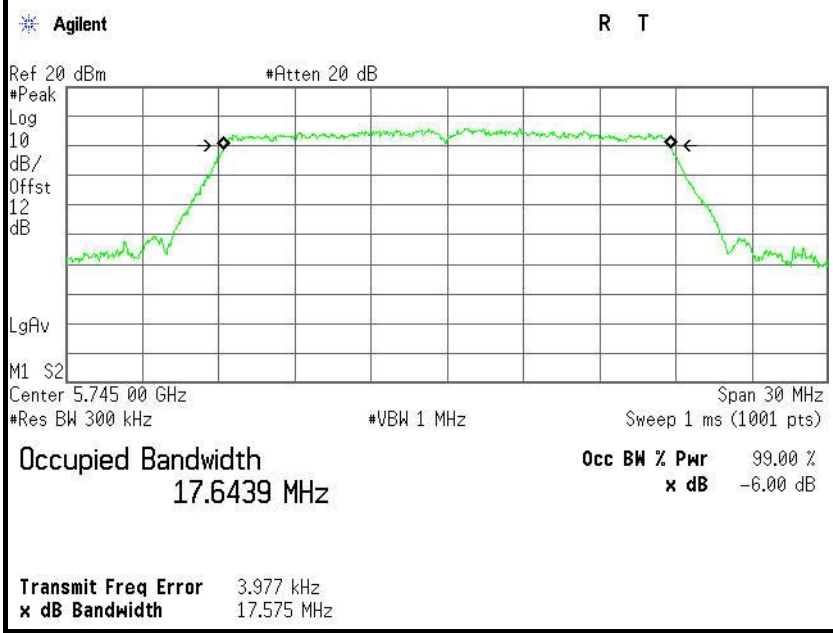
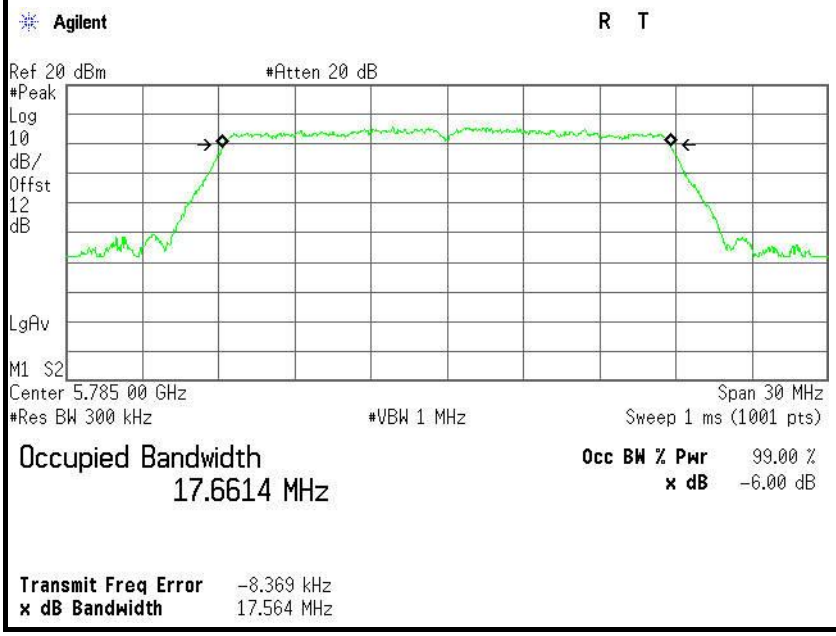
IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



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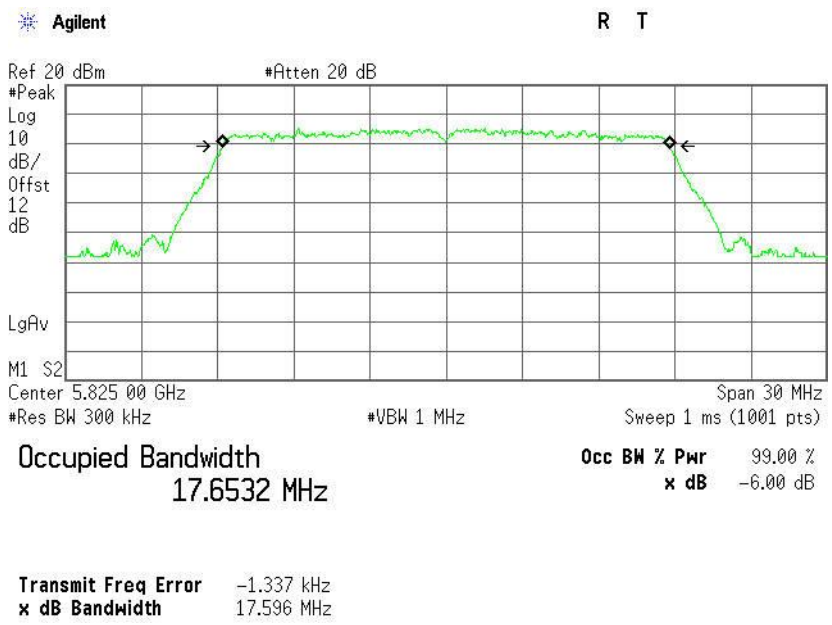
6dB Bandwidth (CH High)



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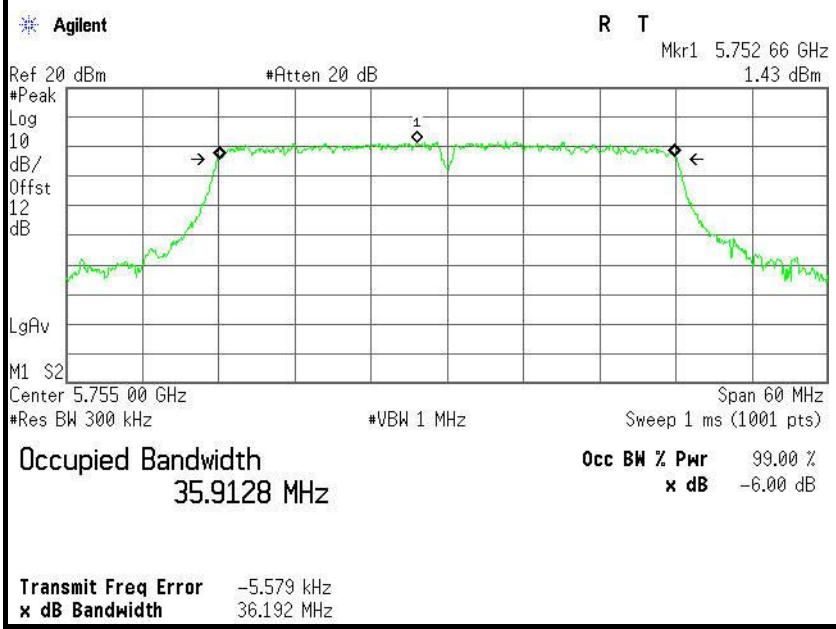
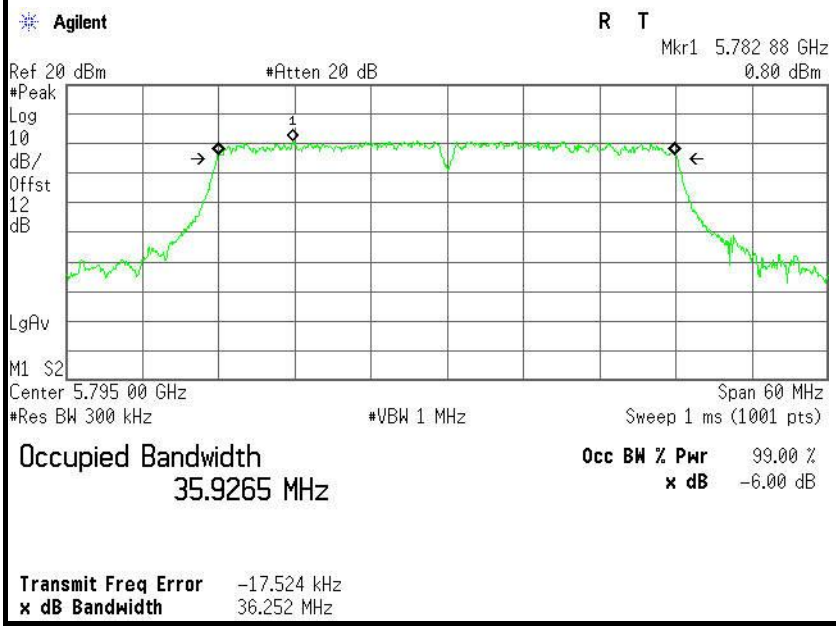
IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH High)



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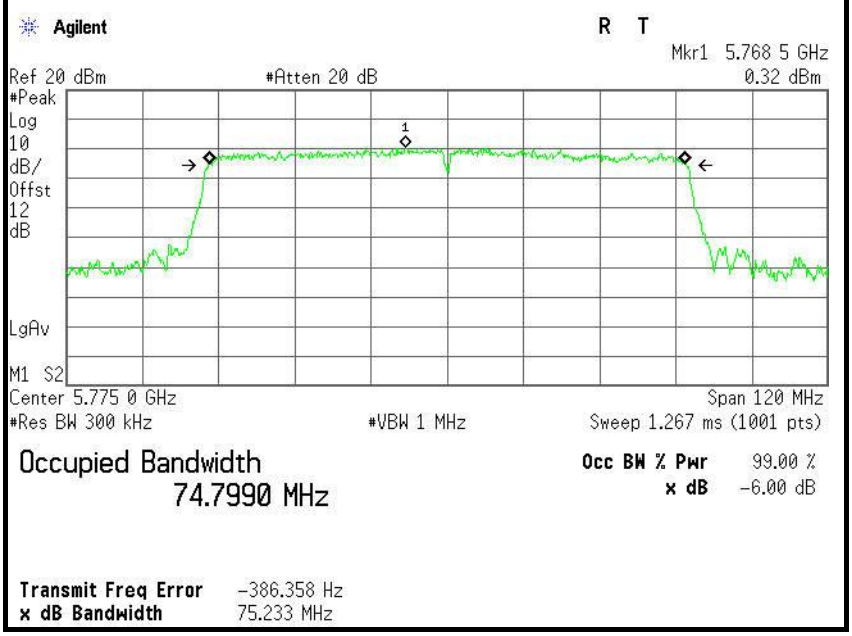
IEEE 802.11ac 80 MHz mode / 5775MHz

6dB Bandwidth



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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		9.27	5.60
Radiated power [dBm] Measured with OFDM modulation		12.16	8.03
Gain [dBi] Calculated		2.89	2.43
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	21.707	13.37	24.37	24.00
Mid	5300	21.626	13.35	24.35	24.00
High	5320	21.443	13.31	24.31	24.00

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	25.561	14.08	25.08	24.00
Mid	5300	22.212	13.47	24.47	24.00
High	5320	25.883	14.13	25.13	24.00

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	47.378	16.76	27.76	24.00
High	5310	39.627	15.98	26.98	24.00

IEEE 802.11ac 80 mode / 5290MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10*Log(B) (dB)	11 + 10*Log(B) (dBm)	Maximum Conducted Output Power Limit (dBm)
	5290	80.582	19.06	30.06	24.00

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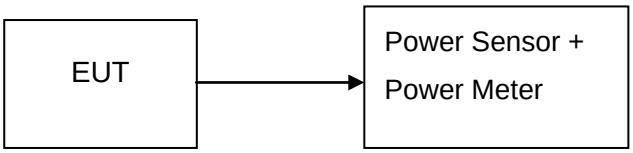
6.4.2 MEASUREMENT EQUIPMENT USED

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	11.97	0.01574	30.00	PASS
Mid	5200	11.56	0.01432		PASS
High	5240	10.63	0.01156		PASS

IEEE 802.11a mode / 5260~ 5320MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5260	8.32	0.00679	24.00	PASS
Mid	5300	7.64	0.00581		PASS
High	5320	7.77	0.00598		PASS

IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5745	12.03	0.01596	30.00	PASS
Mid	5785	12.21	0.01663		PASS
High	5825	12.48	0.01770		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	10.82	0.01208	30.00	PASS
Mid	5200	11.43	0.01390		PASS
High	5240	10.76	0.01191		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5260	8.25	0.00668	24.00	PASS
Mid	5300	7.71	0.00590		PASS
High	5320	7.41	0.00551		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5745	11.64	0.01459	30.00	PASS
Mid	5785	12.68	0.01854		PASS
High	5825	12.54	0.01795		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	6.71	0.00469	30.00	PASS
High	5230	7.76	0.00597		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5270	8.43	0.00697	24.00	PASS
High	5310	7.81	0.00604		PASS

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

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	5755	8.32	0.00679	30.00	PASS
High	5795	7.43	0.00553		PASS

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IEEE 802.11ac 80 mode / 5210MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
	5210	10.55	0.01135	30.00	PASS

IEEE 802.11ac 80 mode / 5290MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
	5290	7.48	0.00560	24.00	PASS

IEEE 802.11ac 80 mode / 5775MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
	5775	12.63	0.01832	30.00	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**
PSA Series Spectrum Analyzer	Agilent	E4446A	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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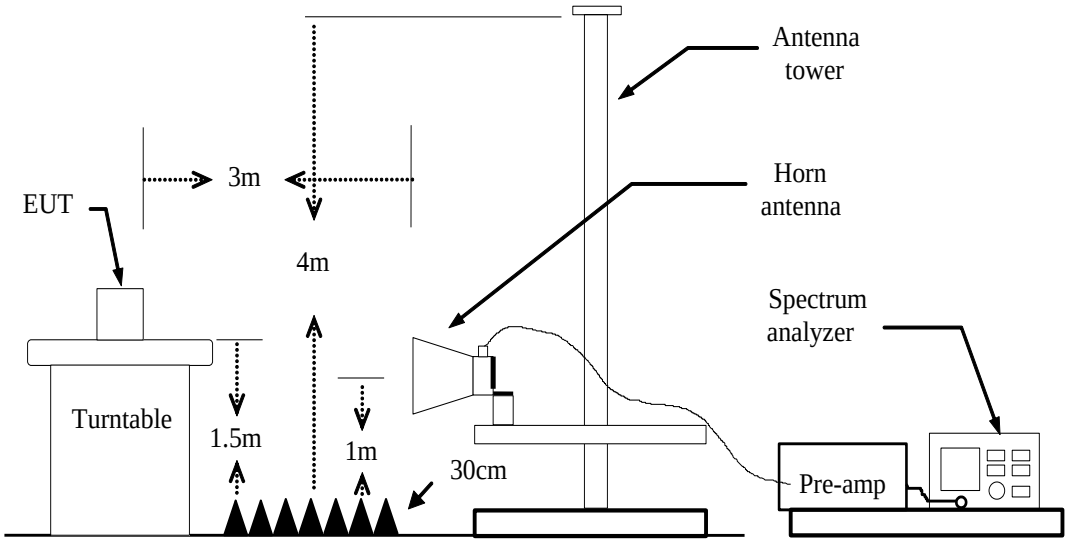
6.5.3 TEST CONFIGURATION



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=750Hz / 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 / 5745 ~ 5825MHz

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 27.949MHz, CH High: 25.787MHz
4. Frequency Range: 5731.0255MHz, 5837.8935MHz

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: 29.922MHz, CH High: 28.320MHz
4. Frequency Range: 5730.0390MHz, 5839.1600MHz

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: 58.898MHz, CH High: 58.651MHz
4. Frequency Range: 5725.5510MHz, 5824.3255MHz

IEEE 802.11ac 80 mode / 5775MHz

1. Operating Frequency: 5775MHz
2. CH: 5775MHz
3. 26dB bandwidth: CH: 103.512MHz
4. Frequency Range: 5723.2440MHz, 5826.7560MHz

Because the mentioned conditions, the test is not applicable.

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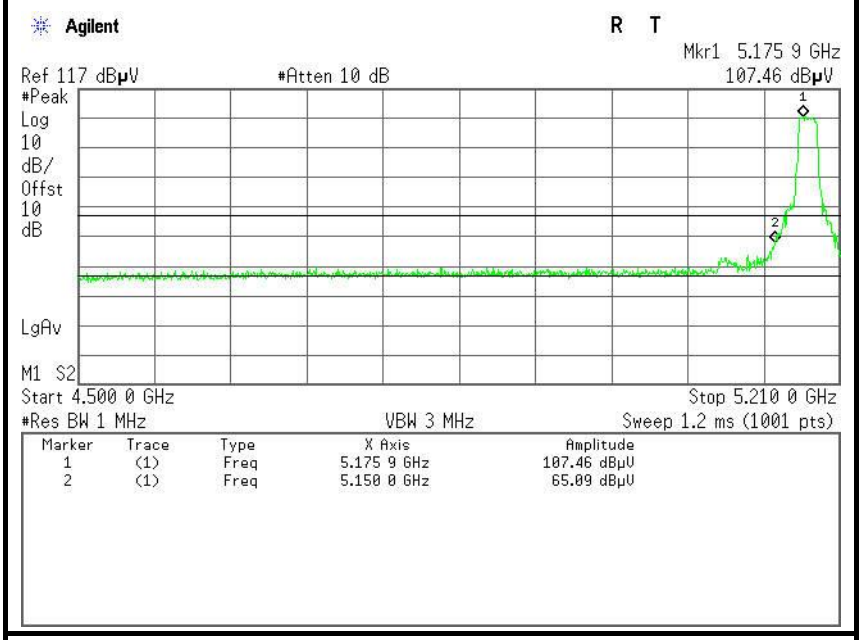
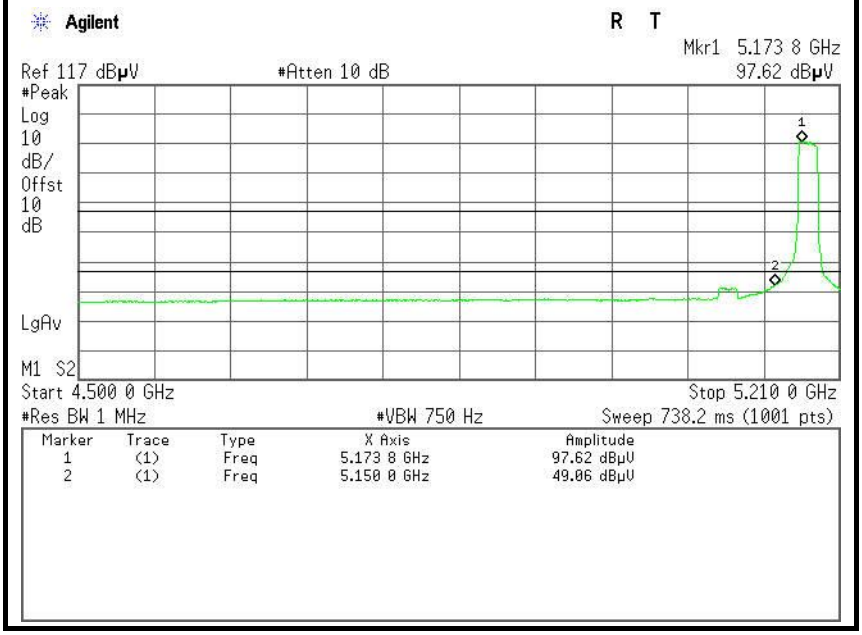
Test Plot

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	58.49	-6.60	65.09	74.00	-8.91	Peak	Vertical
2	5150.0000	42.46	-6.60	49.06	54.00	-4.94	Average	Vertical

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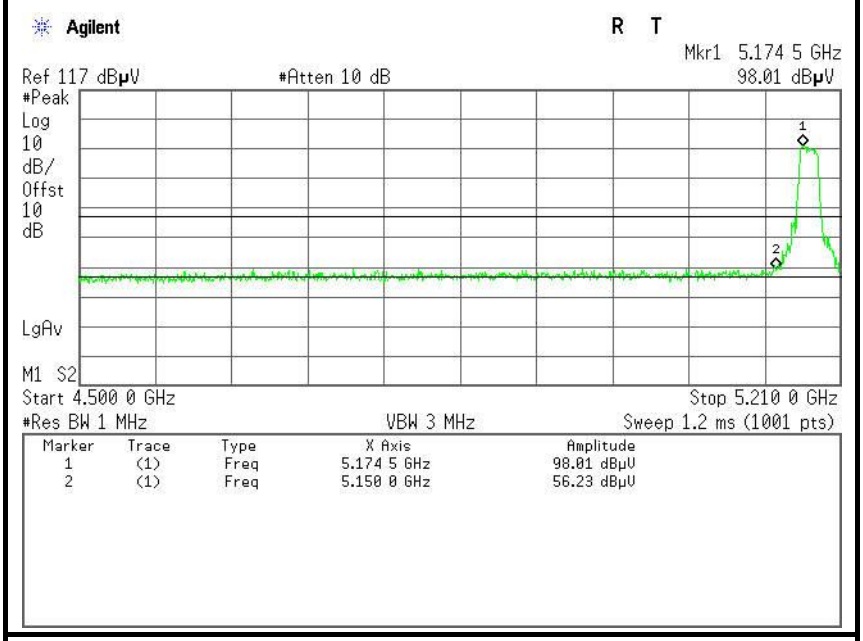
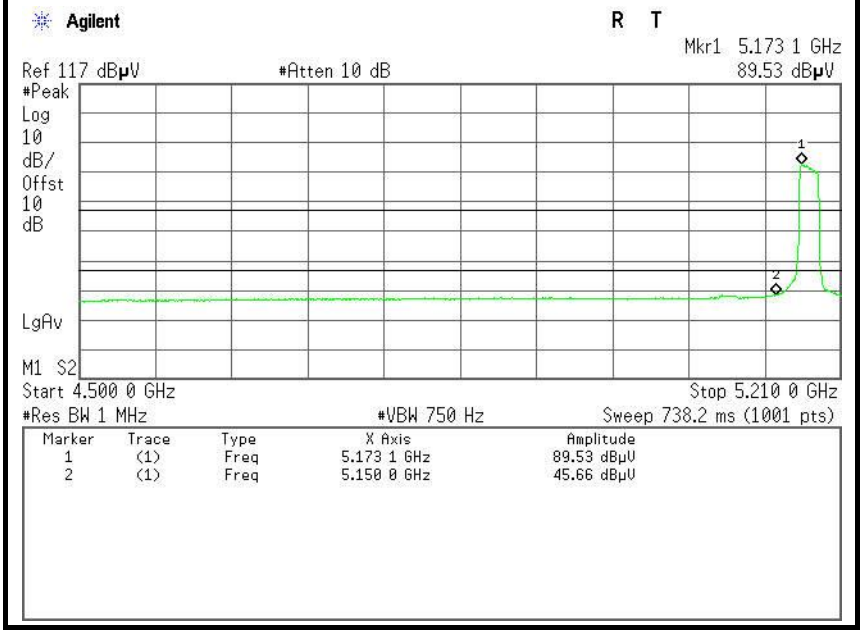
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	49.63	-6.60	56.23	74.00	-17.77	Peak	Horizontal
2	5150.0000	39.06	-6.60	45.66	54.00	-8.34	Average	Horizontal

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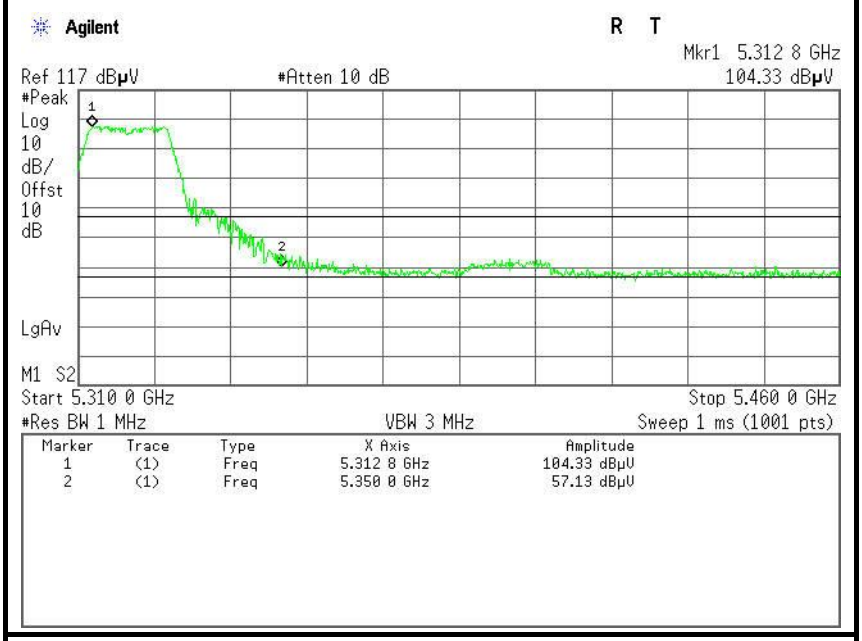
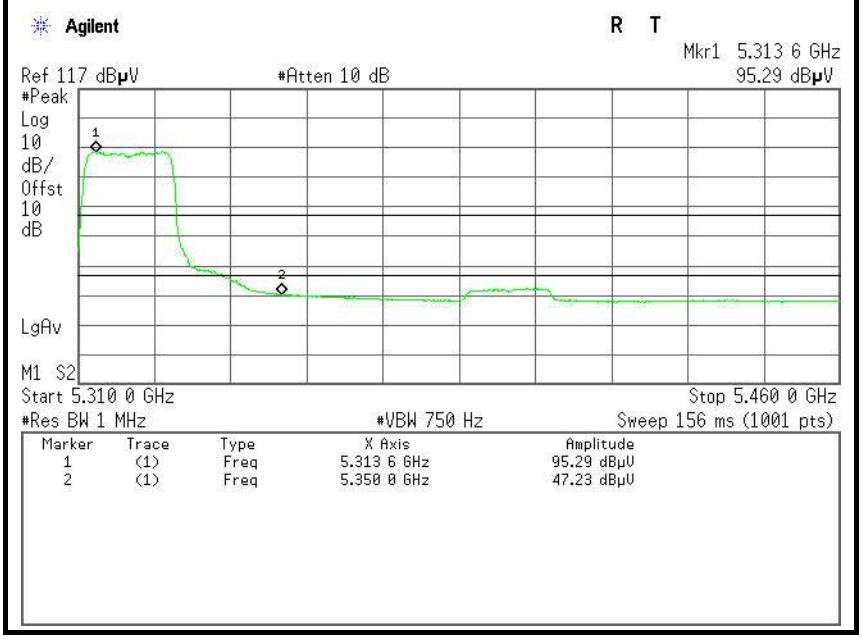
IEEE 802.11a mode / 5320MHz

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	50.53	-6.60	57.13	74.00	-16.87	Peak	Vertical
2	5350.0000	40.63	-6.60	47.23	54.00	-6.77	Average	Vertical

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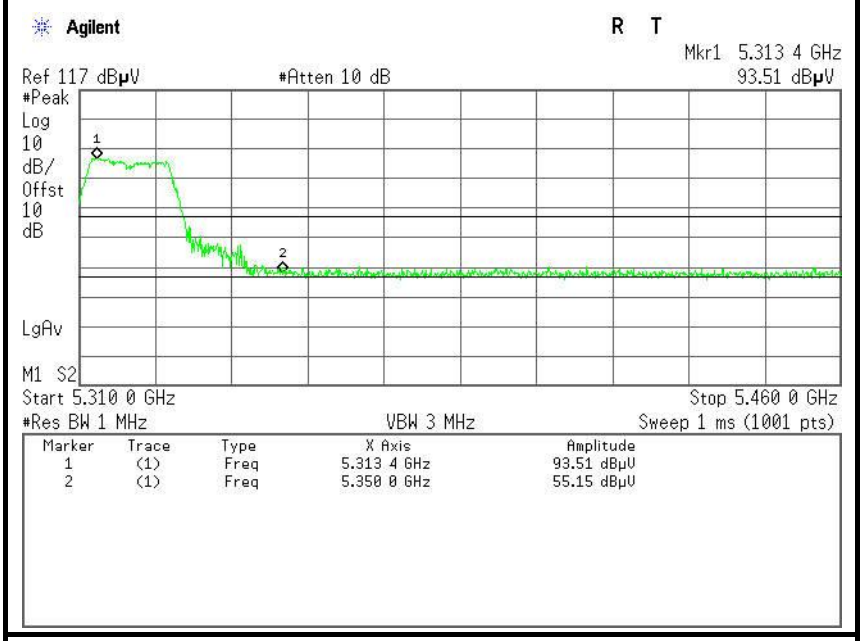
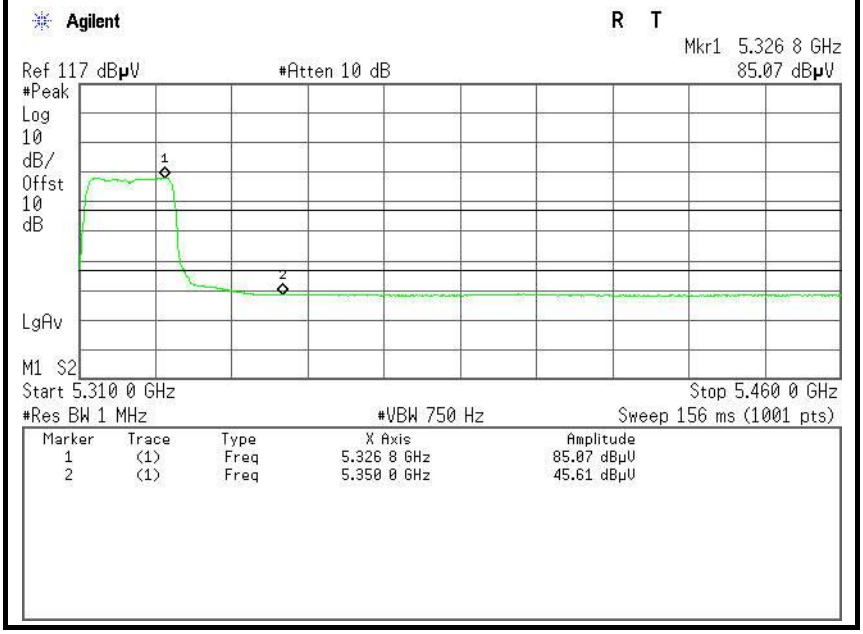
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	48.55	-6.60	55.15	74.00	-18.85	Peak	Horizontal
2	5350.0000	39.01	-6.60	45.61	54.00	-8.39	Average	Horizontal

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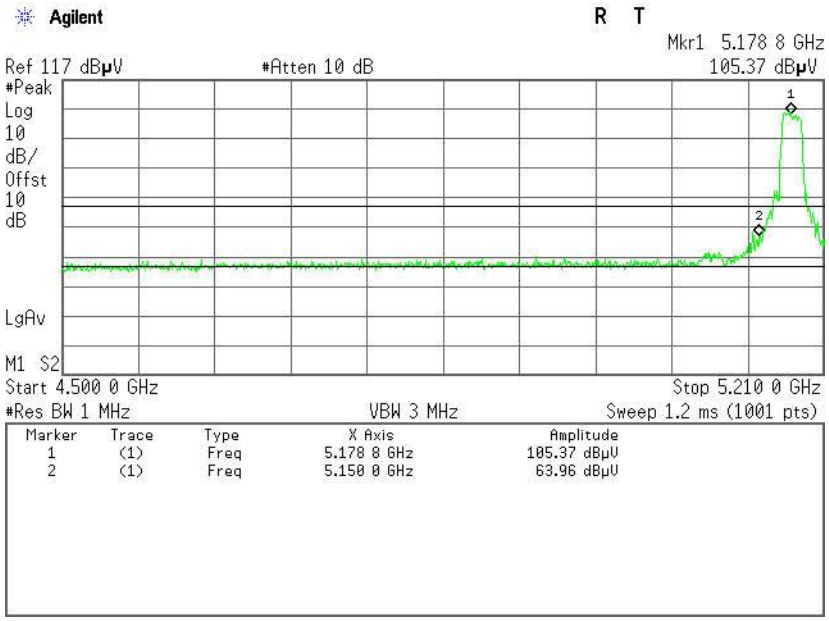
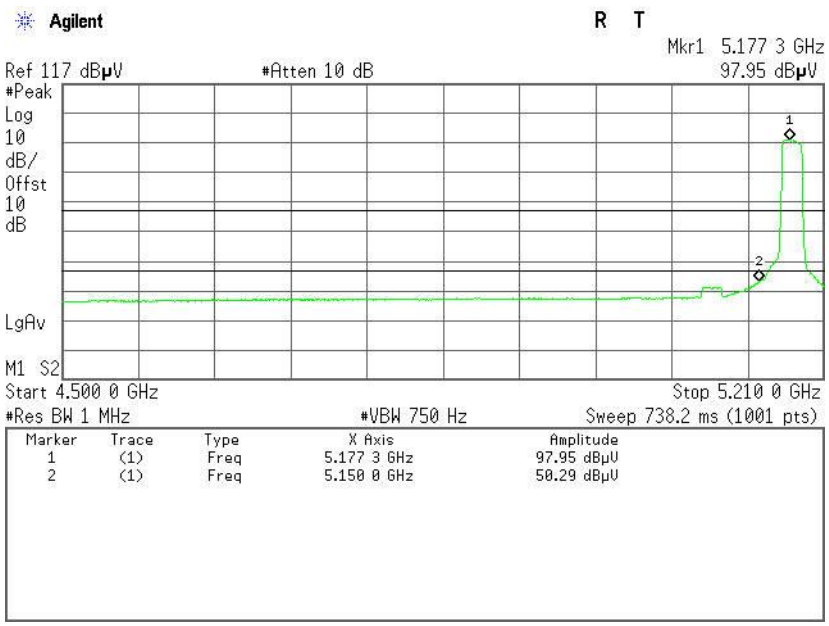
IEEE 802.11n HT 20 MHz mode / 5180 MHz

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	57.36	-6.60	63.96	74.00	-10.04	Peak	Vertical
2	5150.0000	43.69	-6.60	50.29	54.00	-3.71	Average	Vertical

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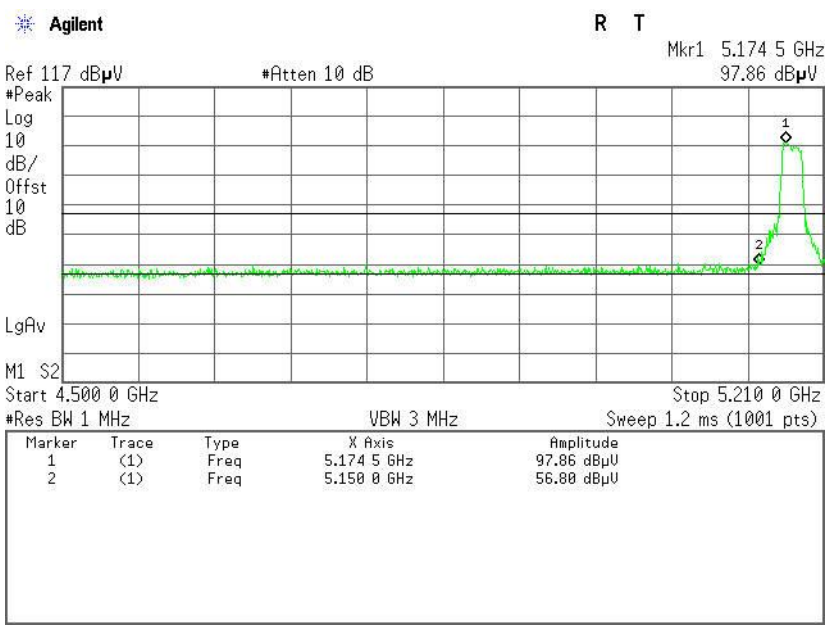
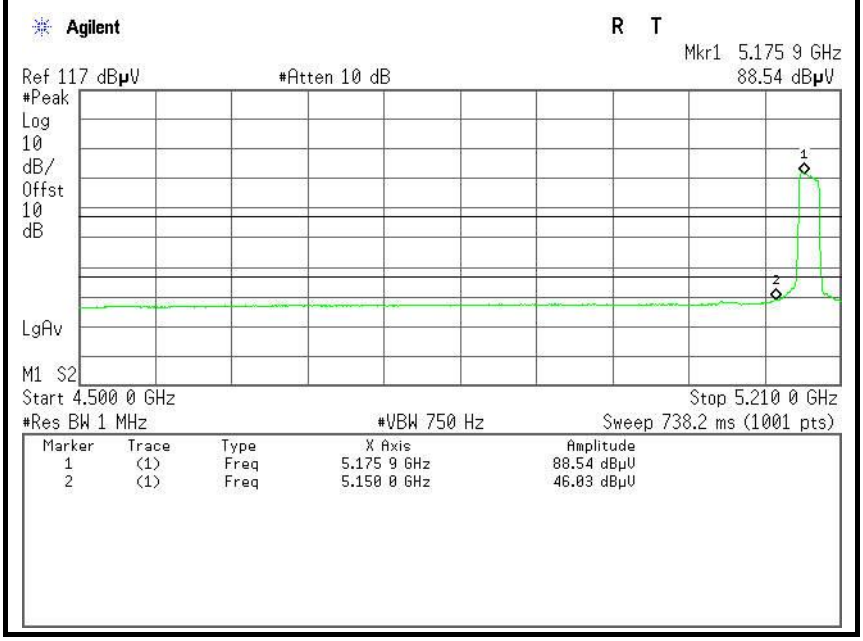
Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	50.20	-6.60	56.80	74.00	-17.20	Peak	Horizontal
2	5150.0000	39.43	-6.60	46.03	54.00	-7.97	Average	Horizontal

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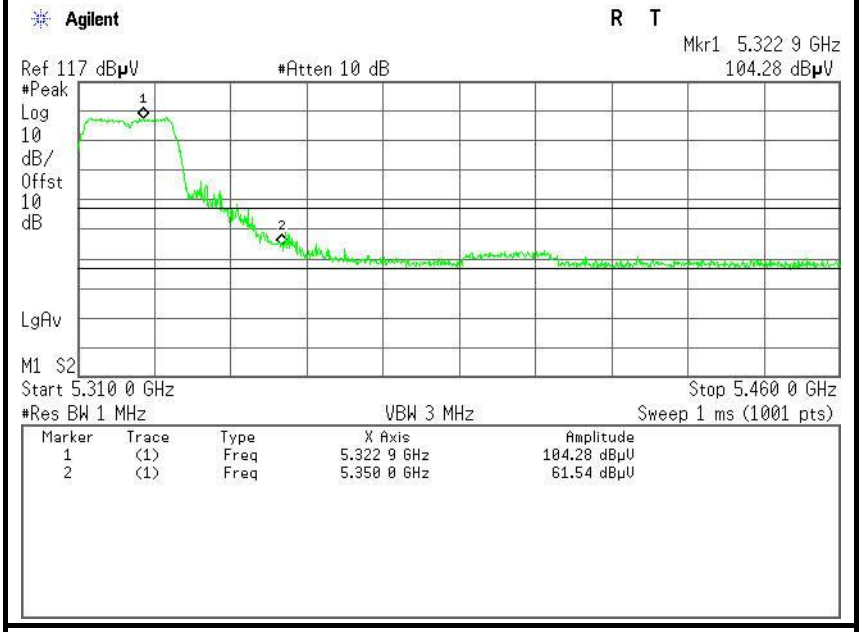
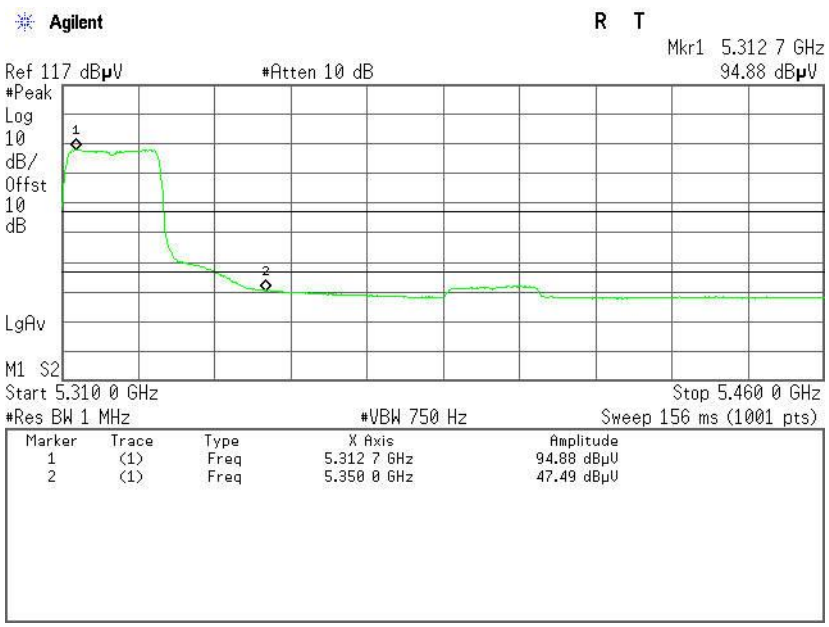
IEEE 802.11n HT 20 MHz mode / 5320 MHz

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	54.94	-6.60	61.54	74.00	-12.46	Peak	Vertical
2	5350.0000	40.89	-6.60	47.49	54.00	-6.51	Average	Vertical

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