# FCC 47 CFR PART 15 SUBPART E
# (Class II Permissive Change)

# TEST REPORT

## For

## Wireless-N Selectable-Band Access Point with PoE

## Model: WAP321

## Trade Name: Cisco

*Issued to*

**Sercomm Corporation**
**8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.**

*Issued by*

**Compliance Certification Services Inc.**
**No.11, Wu-Gong 6th Rd., Wugu Industrial Park,**
**New Taipei City 248, Taiwan (R.O.C.)**
**http://www.ccsrf.com**
**service@ccsrf.com**
**Issued Date: July 23, 2015**

Testing Laboratory
1309

## Revision History

| Rev. | | Issue Date | | Revisions | Effect Page | Revised By |
|---|---|---|---|---|---|---|
| 00 | | January 17, 2012 | | Initial Issue | ALL | Angel Cheng |
| 01 | | July 23, 2015 | | Rev. (01) | ALL | Doris Chu |

*Rev. (01)*
*1. Applicant updates standard.*
*2. Other information, please refer to the T111028201 and this test report.*
*3. Update report in accordance with FCC new rule.*
*4. Test data is same as the previous data.*

# TABLE OF CONTENTS

**1. TEST RESULT CERTIFICATION ..... 4**

**2. EUT DESCRIPTION ..... 5**

**3. TEST METHODOLOGY ..... 6**

3.1 EUT CONFIGURATION ..... 6
3.2 EUT EXERCISE ..... 6
3.3 GENERAL TEST PROCEDURES ..... 6
3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS ..... 7
3.5 DESCRIPTION OF TEST MODES ..... 8

**4. INSTRUMENT CALIBRATION ..... 9**

4.1 MEASURING INSTRUMENT CALIBRATION ..... 9
4.2 MEASUREMENT EQUIPMENT USED ..... 9
4.3 MEASUREMENT UNCERTAINTY ..... 10

**5. FACILITIES AND ACCREDITATIONS ..... 11**

5.1 FACILITIES ..... 11
5.2 EQUIPMENT ..... 11
5.3 TABLE OF ACCREDITATIONS AND LISTINGS ..... 12

**6. SETUP OF EQUIPMENT UNDER TEST ..... 13**

6.1 SETUP CONFIGURATION OF EUT ..... 13
6.2 SUPPORT EQUIPMENT ..... 13

**7. FCC PART 15 REQUIREMENTS ..... 14**

7.1 26 DB EMISSION BANDWIDTH ..... 14
7.2 MAXIMUM CONDUCTED OUTPUT POWER ..... 38
7.3 BAND EDGES MEASUREMENT ..... 41
7.4 PEAK POWER SPECTRAL DENSITY ..... 57
7.5 RADIATED UNDESIRABLE EMISSION ..... 80
7.6 POWERLINE CONDUCTED EMISSIONS ..... 103
7.7 FREQUENCY STABILITY ..... 106

**APPENDIX I PHOTOGRAPHS OF TEST SETUP ..... 113**

# 1. TEST RESULT CERTIFICATION

**Applicant:** Sercomm Corporation
8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.

**Equipment Under Test:** Wireless-N Selectable-Band Access Point with PoE

**Trade Name:** Cisco

**Model:** WAP321

**Date of Test:** July 12, 2015

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

## We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

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

*Approved by:*

Miller Lee
Manager
Compliance Certification Services Inc.

*Reviewed by:*

Angel Cheng
Section Manager
Compliance Certification Services Inc.

# 2. EUT DESCRIPTION

<table>
<tr><td>Product</td><td>Wireless-N Selectable-Band Access Point with PoE</td></tr>
<tr><td>Trade Name</td><td>Cisco</td></tr>
<tr><td>Model Number</td><td>WAP321</td></tr>
<tr><td>Model Discrepancy</td><td>N/A</td></tr>
<tr><td>Received Date</td><td>June 22, 2015</td></tr>
<tr><td>Power Adapter</td><td>1. Sunny/ SYS1381-121-W2C<br>I/P: 100-240V~, 0.5A MAX, 50-60Hz<br>O/P: 12V, 1.0A<br>2. LEADER / MU12-G120100-A2<br>I/P: 100-240V~, 50-60Hz, 0.5A<br>O/P: 12V, 1A<br>3. Sunny/ SYS1381-1212-W2<br>I/P: 100-240V~, 0.5A MAX, 50-60Hz<br>O/P: 12V, 1.0A<br>4. LEADER / MU12-G120100-A1<br>I/P: 100-240V~, 50-60Hz, 0.5A<br>O/P: 12V, 1A</td></tr>
<tr><td>Operating Frequency Range & Number of Channels</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th><th>Number of Channels</th></tr>
<tr><td rowspan="3">UNII Band I</td><td>IEEE 802.11a</td><td>5180 – 5240</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5180 – 5240</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz</td><td>5190 ~ 5230</td><td>2 Channels</td></tr>
</table>
</td></tr>
<tr><td>Transmit Power</td><td>IEEE 802.11a mode: 13.41 dBm<br>Mode 1:<br>IEEE 802.11n HT 20 MHz Mode : 12.56 dBm<br>IEEE 802.11n HT 40 MHz Mode: 12.35 dBm<br>Mode 2:<br>IEEE 802.11n HT 20 MHz Mode : 13.23 dBm<br>IEEE 802.11n HT 40 MHz Mode: 13.27 dBm<br>Mode 3:<br>IEEE 802.11n HT 20 MHz Mode: 12.35 dBm<br>IEEE 802.11n HT 40 MHz Mode: 12.76 dBm</td></tr>
<tr><td>Modulation Technique</td><td>OFDM (QPSK, BPSK, 16-QAM, 64-QAM)</td></tr>
<tr><td>Transmit Data Rate</td><td>IEEE 802.11a mode: 54, 48, 36, 24, 18, 12, 9, 6 Mbps<br>IEEE 802.11n HT 20 mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps)<br>IEEE 802.11n HT 40 mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)</td></tr>
<tr><td>Antenna Specification</td><td>Antenna 1 (chain 0): 4.32 dBi<br>Antenna 2 (chain 1): 4.67 dBi<br>Antenna 3 (chain 2): 3.96 dBi</td></tr>
<tr><td>Antenna Designation</td><td>PIFA Antenna</td></tr>
</table>

***Remark:***

1. *The sample selected for test was production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **P27-WAP321** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.*

# 3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2009 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: 2009, FCC CFR 47 Part 15.207, 15.209, 15.407 and KDB 789033 D02 General UNII Test Procedures New Rules v01.

## 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 ANSI C63.10: 2009, 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 1.5 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2009.

## 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

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

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

[2] Above 38.6

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

## 3.5 DESCRIPTION OF TEST MODES

The EUT (model: WAP321) comes with four types of power adapter (SYS1381-121-W2C, MU12-G120100-A2, SYS1381-1212-W2, MU12-G120100-A1) for sale. After the preliminary test, the EUT with power adapter (Model: MU12-G120100-A1) was found to emit the worst emissions and therefore had been tested under operating condition.

The EUT comes with three modes: mode 1 & mode 2 & mode 3.
"Mode 1" antenna 1 (chain 0), antenna 2 (chain 1)
"Mode 2" antenna 2 (chain 1), antenna 3 (chain 2)
"Mode 3" antenna 1 (chain 0), antenna 3 (chain 2)

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

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

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

**IEEE 802.11a mode / 5180 ~ 5240MHz:**
During the preliminary test, Chain 0, Chain 1,Chain 2 with IEEE 802.11a mode were pre-tested and found that Chain 1 emits the highest output power.
Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with chain 1 at 6Mbps data rate were chosen for full testing.

**IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz:**
During the preliminary test, MCS0 : Chain 0,Chain 1,Chain 2 and MCS8 : Chain 0+Chain 1,Chain 1 +Chain 2,Chain 0 + chain 2 with IEEE 802.11n HT 20 MHz were pre-tested and found that Chain 0+Chain 1,Chain 1 +Chain 2,Chain 0 + chain 2 emits the highest output power.
Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with chain 0 + chain 1 and chain 1 + chain 2 and chain 0 + chain 2 at MCS 8 data rate were chosen for full testing.

**IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz:**
During the preliminary test, MCS0 : Chain 0,Chain 1,Chain 2 and MCS8 : Chain 0+Chain 1,Chain 1 +Chain 2,Chain 0 + chain 2 with IEEE 802.11n HT 40 MHz were pre-tested and found that Chain 0+Chain 1,Chain 1 +Chain 2,Chain 0 + chain 2 emits the highest output power.
Channel Low (5190MHz) and Channel High (5230MHz) with chain 0 + chain 1 and chain 1 + chain 2 and chain 0 + chain 2 at MCS 8 data rate were chosen for full testing.

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

# 4. INSTRUMENT CALIBRATION

## 4.1 MEASURING INSTRUMENT CALIBRATION

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

## 4.2 MEASUREMENT EQUIPMENT USED

**Equipment Used for Emissions Measurement**

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

| Conducted Emissions Test Site | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 11/23/2015 |
| Thermostatic/Hrgrosatic Chamber | TAICHY | MHG-150LF | 930619 | 10/07/2015 |
| AC Power Source | EXTECH | 6205 | 1140845 | N.C.R |
| DC Power Supply | ABM | 8301HD | D011531 | N.C.R |
| Power Meter | Anritsu | ML2495A | 1012009 | 06/07/2016 |
| Power Sensor | Anritsu | MA2411A | 0917072 | 06/08/2016 |
| Spectrum Analyzer | ROHDE&SCHWARZ | FSV40 | 101073 | 07/08/2016 |

| Wugu 966 Chamber A | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | US42510268 | 09/18/2015 |
| EMI Test Receiver | R&S | ESCI | 100064 | 06/04/2016 |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 08/19/2015 |
| Horn Antenna | EMCO | 3117 | 00055165 | 01/26/2016 |
| Horn Antenna | EMCO | 3116 | 26370 | 12/25/2015 |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R |
| Pre-Amplifier | MITEQ | 1652-3000 | 1490939 | 08/09/2016 |
| Pre-Amplifier | EMC | EMC 01265 | 4035 | 06/04/2016 |
| Pre-Amplifier | MITEQ | AMF-6F-260400-40-8P | 985646 | 12/25/2015 |
| Coaxial Cable | Huber+Suhner | 102 | 29212/2 | 12/25/2015 |
| Coaxial Cable | Huber+Suhner | 102 | 29406/2 | 12/25/2015 |
| Test S/W | EZ-EMC (CCS-3A1RE) | | | |

| Conducted Emission room # B | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| TEST RECEIVER | R&S | ESCI | 100234 | 06/09/2016 |
| LISN (EUT) | FCC | FCC-LISN-50-32-2 | 08009 | 03/23/2016 |
| LISN | SCHWARZBECK | NSLK 8127 | 8127382 | 12/30/2015 |
| BNC CABLE | MIYAZAKI | 5D-FB | BNC B3 | 08/04/2015 |
| Pulse Limiter | R&S | ESH3-Z2 | 100374 | 01/05/2016 |
| THERMO-HYGRO METER | WISEWIND | 201A | 1006 | 05/19/2016 |
| Test S/W | CCS-3A1-CE | | | |

## 4.3 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|---|
| Powerline Conducted Emission | +/-1.1089 |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.0138 |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 3.9483 |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 2.5975 |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 2.6112 |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 2.7389 |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 2.9683 |

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

# 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

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

☒ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

***Remark**: The powerline conducted emissions test items was tested at Compliance Certification Services Inc. (Sindian Lab.) The test equipments were listed in page 10 and the test data, please refer page 104-105.*

☒ No.11, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

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

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2009 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, ridged waveguide, horn and/or Loop. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

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

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

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

## 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---|---|---|---|
| USA | FCC | 3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements | FCC MRA: TW1039 |
| Taiwan | TAF | LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-247, RSS-310<br>IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2,<br>ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328,<br>ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893,<br>ETSI EN 301 489-1/3/7/17<br>FCC OET Bulletin 65 + Supplement C,<br>EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385,<br>EN 50392, IEC 62209, CNS 14958-1, CNS 14959<br>FCC Method –47 CFR Part 15 Subpart B<br>IEC / EN 61000-3-2, IEC / EN 61000-3-3,<br>IEC / EN 61000-4-2/3/4/5/6/8/11 | Testing Laboratory 1309 |
| Canada | Industry Canada | 3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform | IC 2324G-1<br>IC 2324G-2 |

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

# 6. SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT

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

## 6.2 SUPPORT EQUIPMENT

| No. | Equipment | Model No. | Serial No. | FCC ID | Brand Name | Data Cable | Power Cord |
|---|---|---|---|---|---|---|---|
| 1 | USB Mouse | M-UAE96 | F93A90A5BU90L20 | FCC DOC | HP | Shielded, 1.8m | N/A |
| 2 | USB Keyboard | KU-0316 | BC3870FVBWH079 | FCC DOC | HP | Shielded, 1.8m | N/A |
| 3 | Printer | Deskjet D2360 | TH73C1492F | FCC DOC | HP | Shielded, 1.8m | Unshielded, 1.8m |
| 4 | Monitor | 933SN+ | CM19HVKSB00002 | FCC DOC | SAMSUNG | Shielded, 1.8m with two cores | Unshielded, 1.8m |
| 5 | Host PC | T3500 | 8X36VBX | FCC DOC | DELL | Unshielded, 1.5m | Unshielded, 1.8m |
| 6 | Modem | AL-56ERM | 0MERM04A0224 | FCC DOC | GALILEO | Shielded, 1.0m | Unshielded, 1.8m |
| 7 | Server PC | xw4400 | N/A | FCC DOC | HP | N/A | Unshielded, 1.8m |
| 8. | Notebook PC | dv6-1332TX | CNF9491GM9 | PD9112BNHU | HP | N/A | AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core |

***Remark:***

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

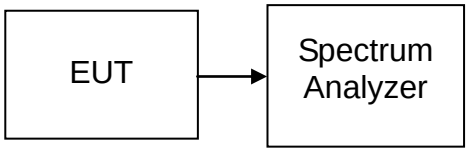
# 7. FCC PART 15 REQUIREMENTS

## 7.1 26 DB EMISSION BANDWIDTH

### LIMIT

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

### Test Configuration




### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW > 1%EBW, VBW > RBW, Span >26dB bandwidth, and Sweep = auto.
4. Mark the peak frequency and –26dB (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

# TEST RESULTS

*No non-compliance noted*

## Test Data

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 20.795 |
| Mid | 5220 | 21.036 |
| High | 5240 | 22.939 |

### Mode 1

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 21.444 |
| Mid | 5220 | 21.377 |
| High | 5240 | 21.205 |

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 20.855 |
| Mid | 5220 | 21.040 |
| High | 5240 | 20.994 |

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.751 |
| High | 5230 | 40.628 |

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.294 |
| High | 5230 | 40.235 |

## Mode 2

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 21.363 |
| Mid | 5220 | 21.322 |
| High | 5240 | 21.279 |

### Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 20.820 |
| Mid | 5220 | 20.900 |
| High | 5240 | 20.783 |

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.390 |
| High | 5230 | 40.832 |

### Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 2

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.352 |
| High | 5230 | 40.137 |

## Mode 3

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 21.364 |
| Mid | 5220 | 21.380 |
| High | 5240 | 21.321 |

### Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 20.890 |
| Mid | 5220 | 20.849 |
| High | 5240 | 20.982 |

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

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.968 |
| High | 5230 | 40.938 |

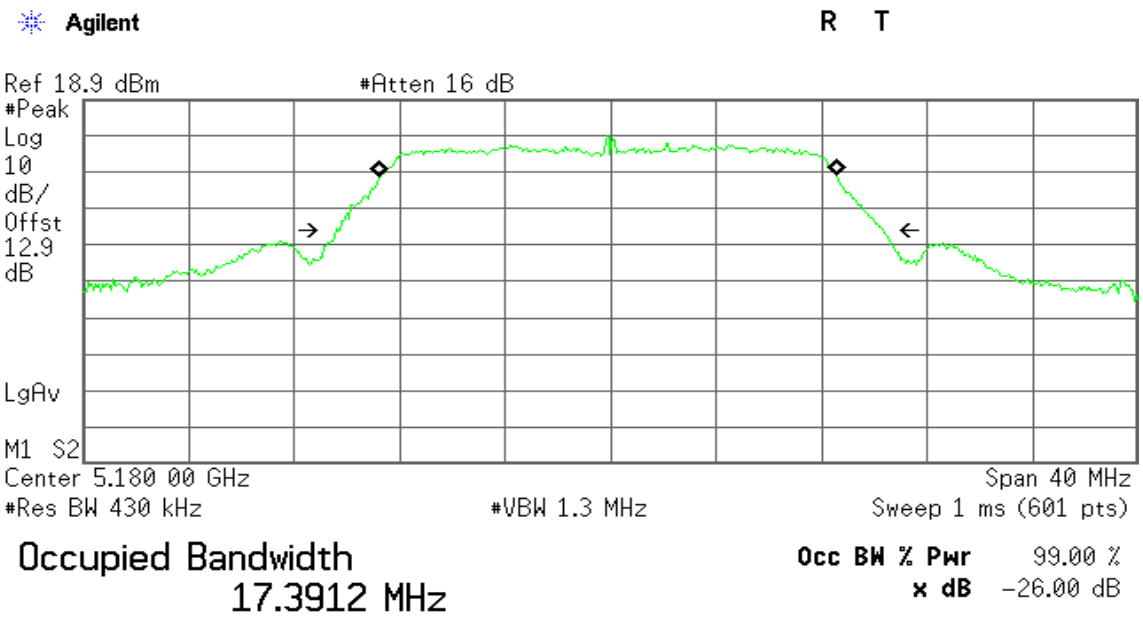
### Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 2

| Channel | Frequency (MHz) | 26db Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.155 |
| High | 5230 | 40.251 |

## Test Plot

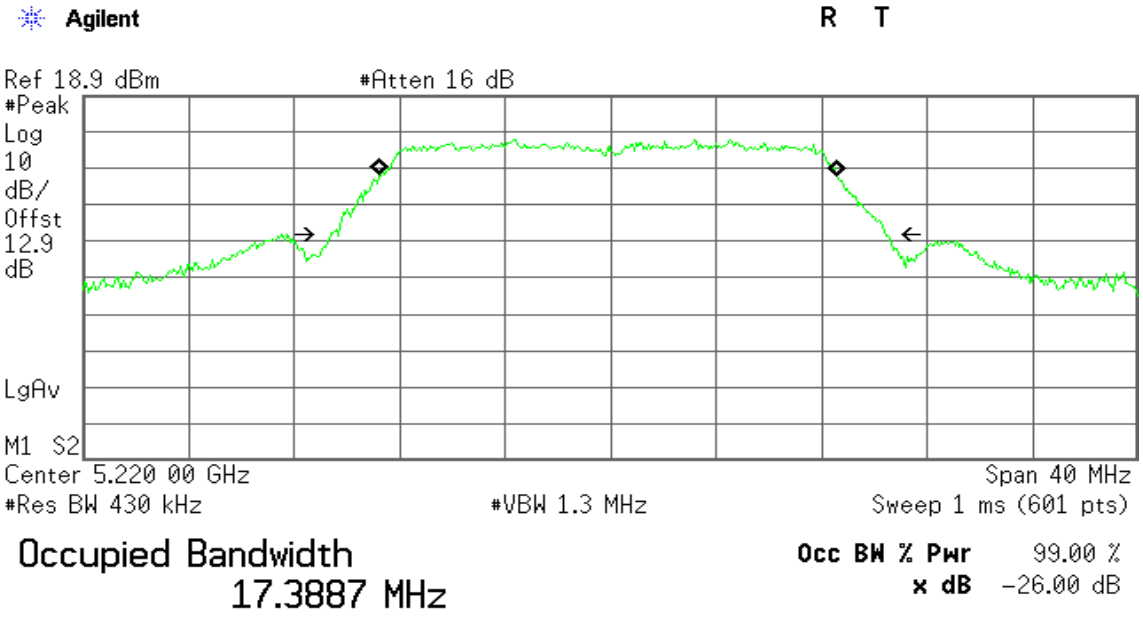
## IEEE 802.11a mode / 5180 ~ 5240MHz

### CH Low



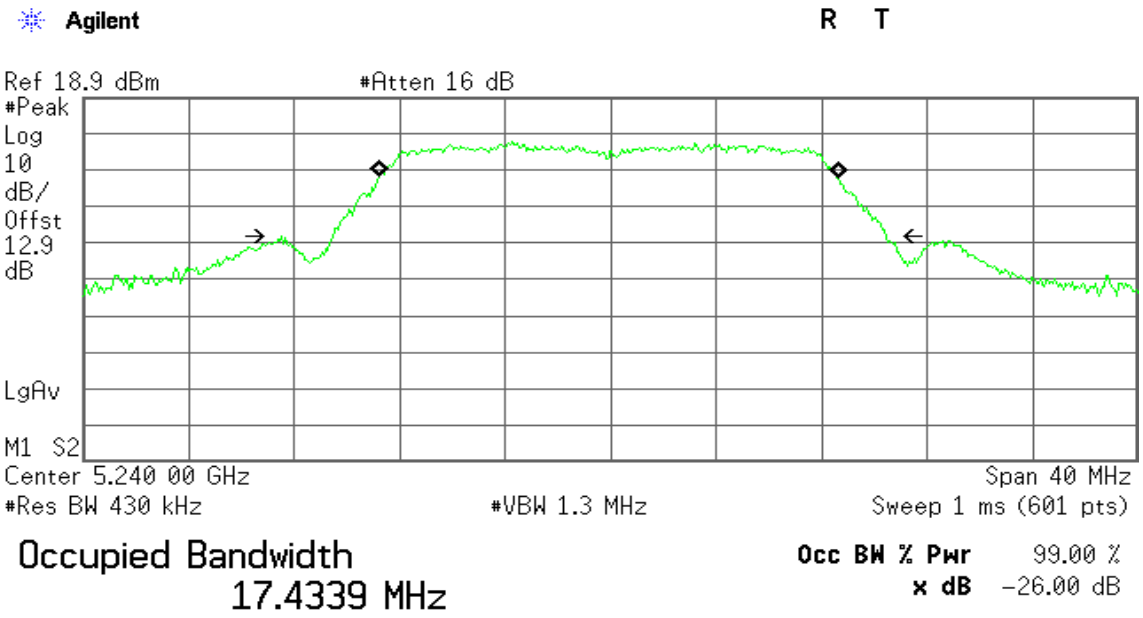

| | |
|---|---|
| **Transmit Freq Error** | -81.219 kHz |
| **x dB Bandwidth** | 20.795 MHz |

### CH Mid




| | |
|---|---|
| **Transmit Freq Error** | -98.914 kHz |
| **x dB Bandwidth** | 21.036 MHz |

## CH High




Occupied Bandwidth
17.4339 MHz

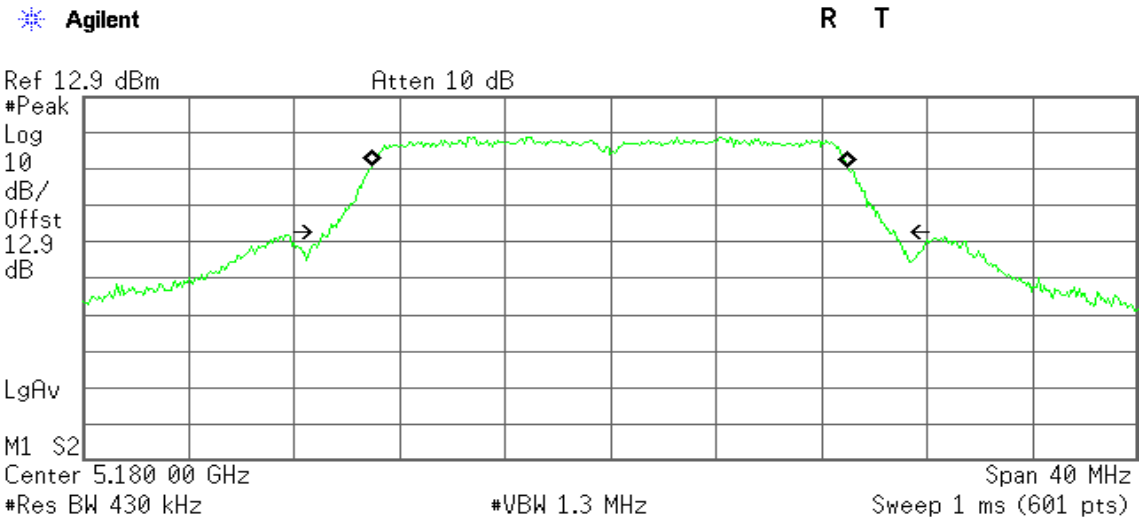
**Occ BW % Pwr** 99.00 %
**x dB** -26.00 dB

**Transmit Freq Error** -79.356 kHz
**x dB Bandwidth** 22.939 MHz

## Mode 1

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

### CH Low

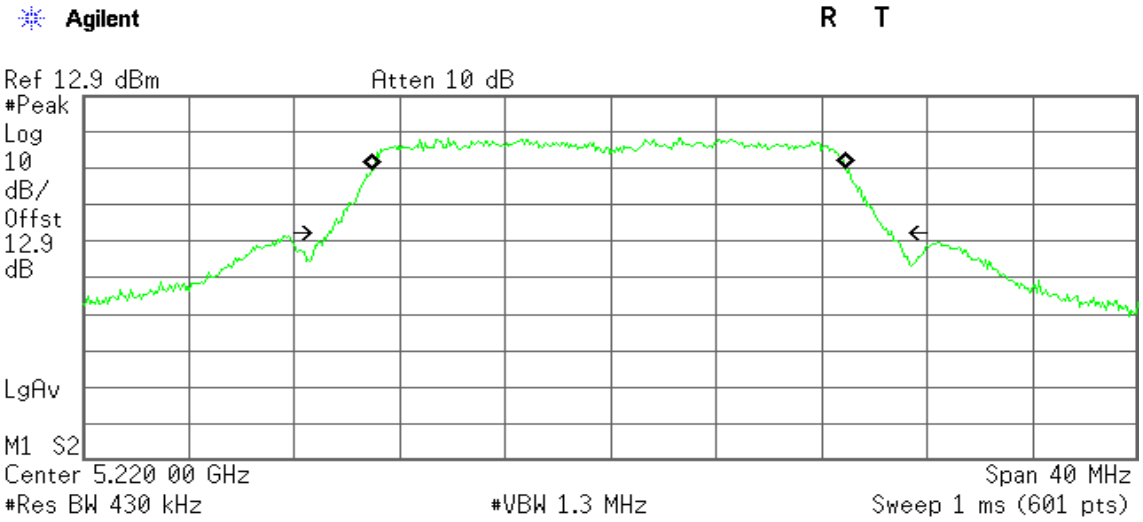



Occupied Bandwidth
18.0666 MHz

**Occ BW % Pwr** 99.00 %
**x dB** -26.00 dB

**Transmit Freq Error** -17.753 kHz
**x dB Bandwidth** 21.444 MHz

### CH Mid

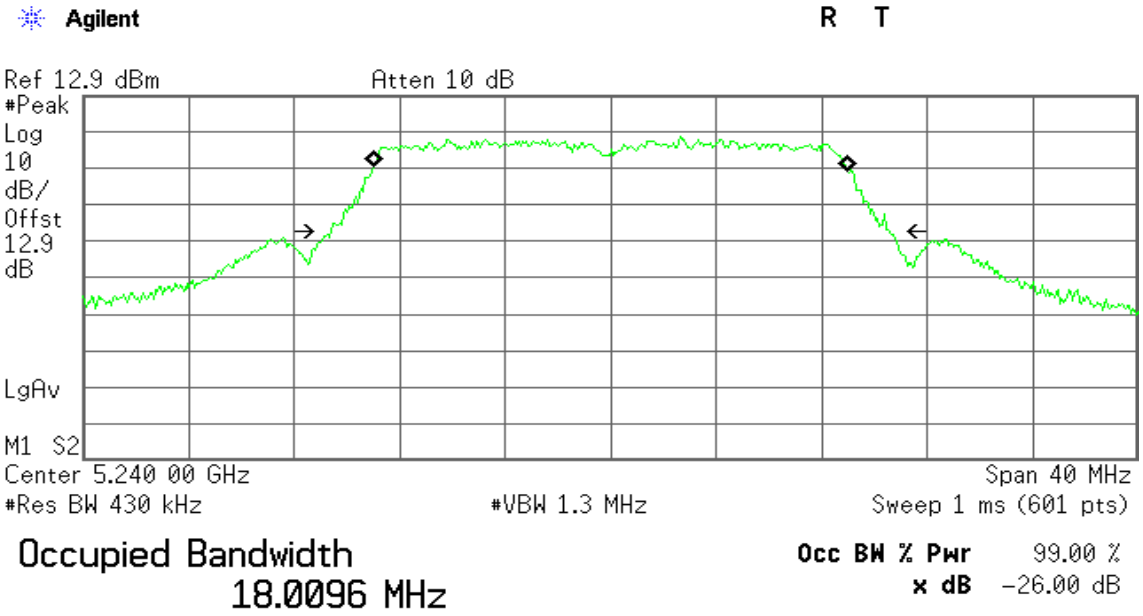



Occupied Bandwidth
17.9760 MHz

**Occ BW % Pwr** 99.00 %
**x dB** -26.00 dB

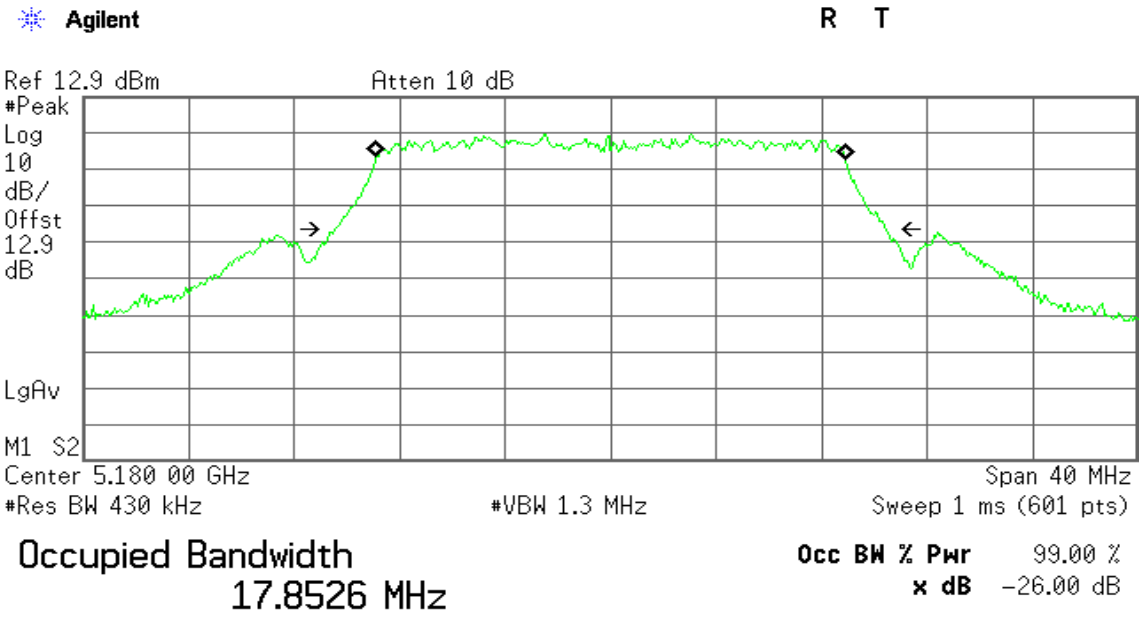
**Transmit Freq Error** -52.556 kHz
**x dB Bandwidth** 21.377 MHz

## CH High


Agilent
R T
Ref 12.9 dBm
Atten 10 dB
#Peak
Log
10
dB/
Offst
12.9
dB
LgAv
M1 S2
Center 5.240 00 GHz
Span 40 MHz
#Res BW 430 kHz
#VBW 1.3 MHz
Sweep 1 ms (601 pts)
Occupied Bandwidth
18.0096 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -1.427 kHz
x dB Bandwidth 21.205 MHz

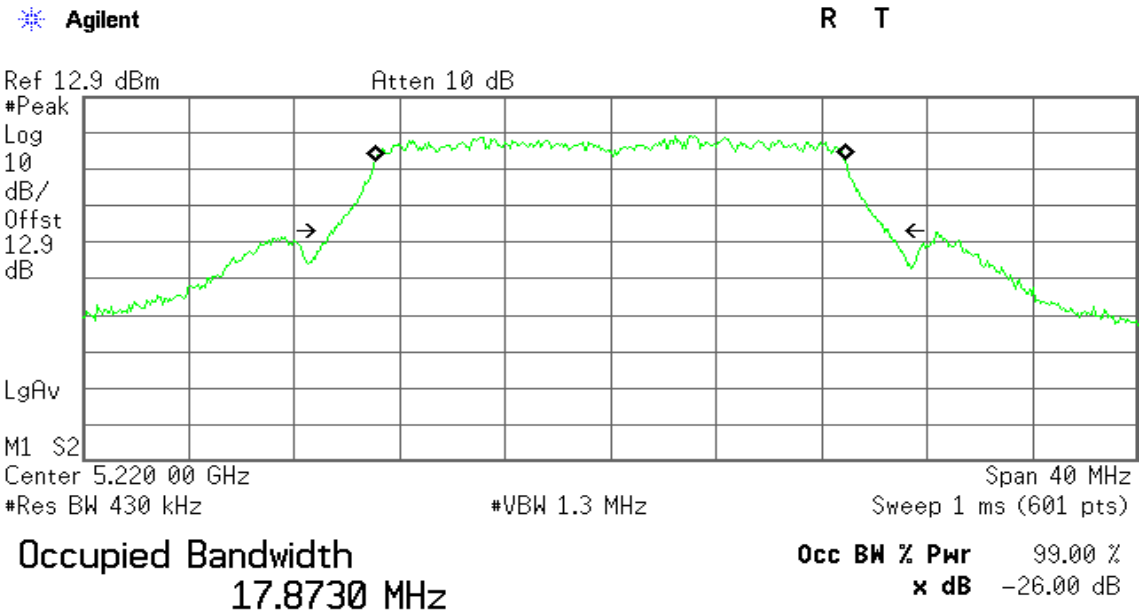
## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

### CH Low



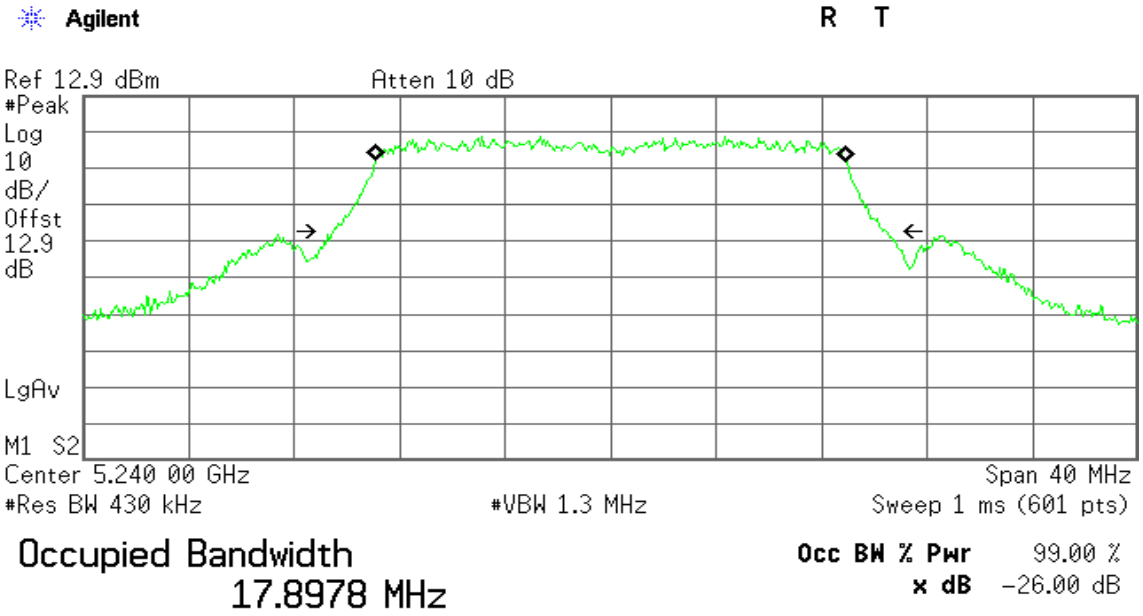

**Transmit Freq Error** −4.380 kHz
**x dB Bandwidth** 20.855 MHz

### CH Mid




**Transmit Freq Error** −21.067 kHz
**x dB Bandwidth** 21.040 MHz

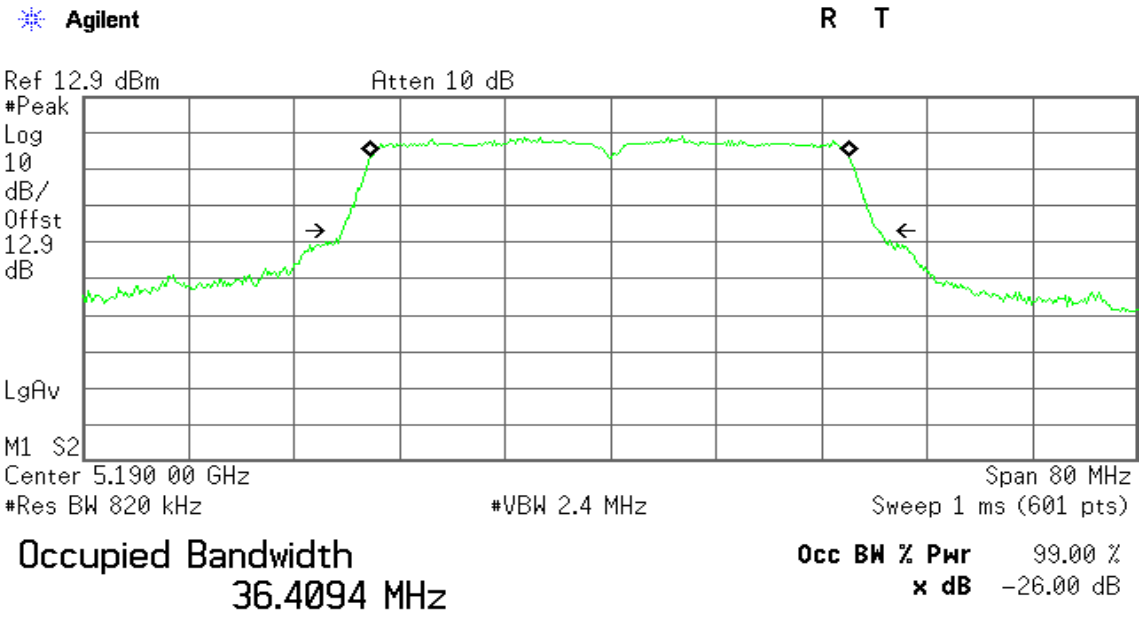
## CH High




| | |
|---|---|
| **Transmit Freq Error** | 3.573 kHz |
| **x dB Bandwidth** | 20.994 MHz |

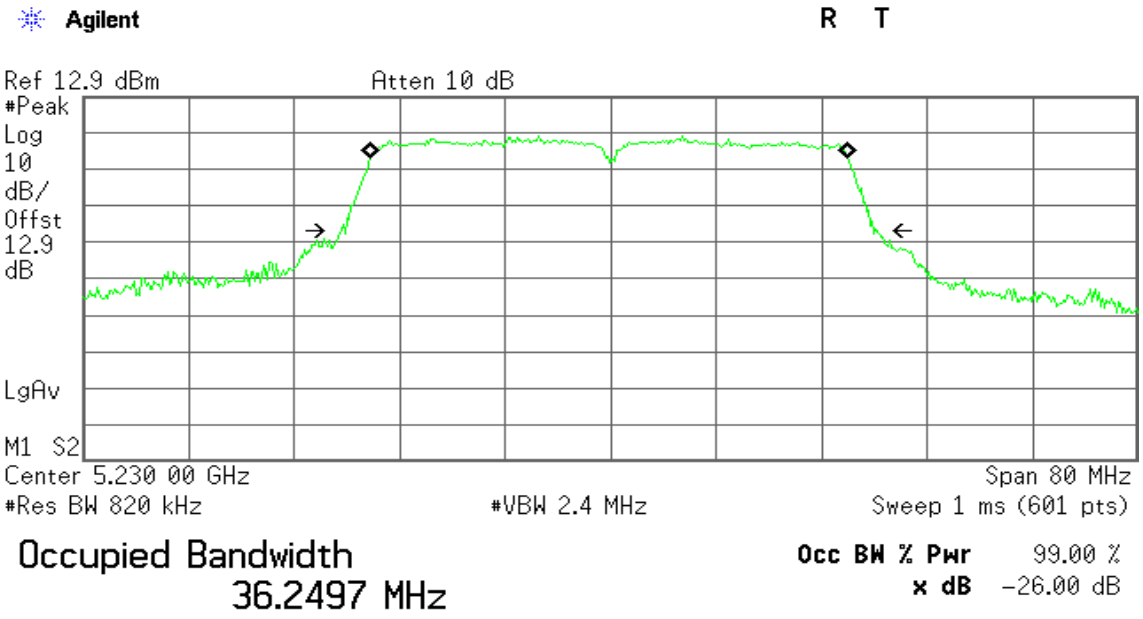
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

### CH Low




**Transmit Freq Error** -45.722 kHz
**x dB Bandwidth** 40.751 MHz

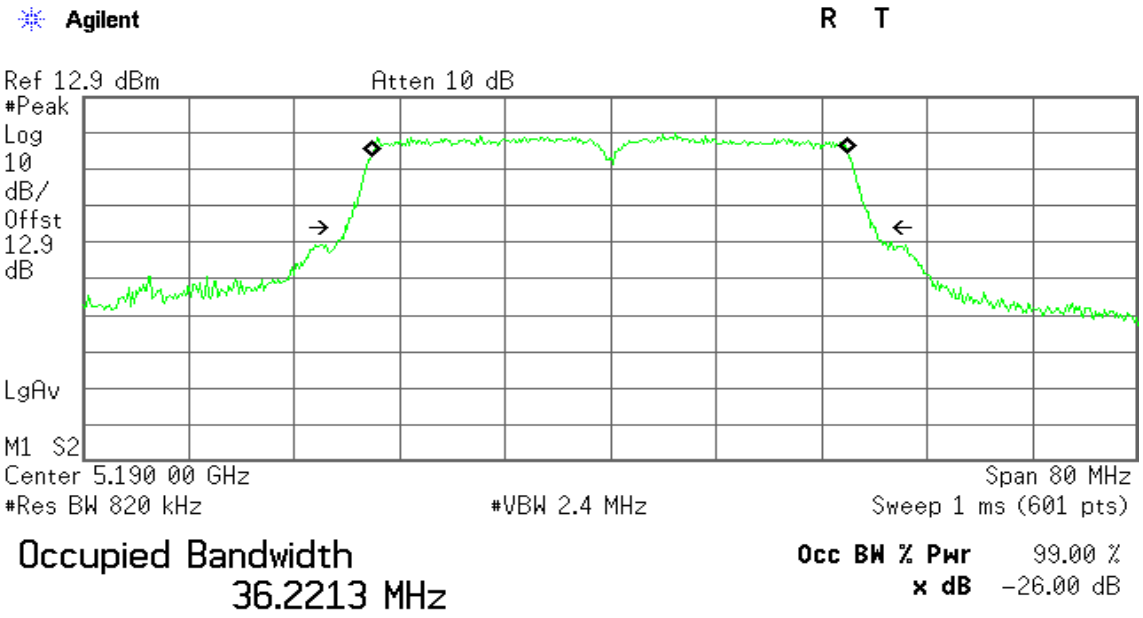
### CH High




**Transmit Freq Error** -98.432 kHz
**x dB Bandwidth** 40.628 MHz

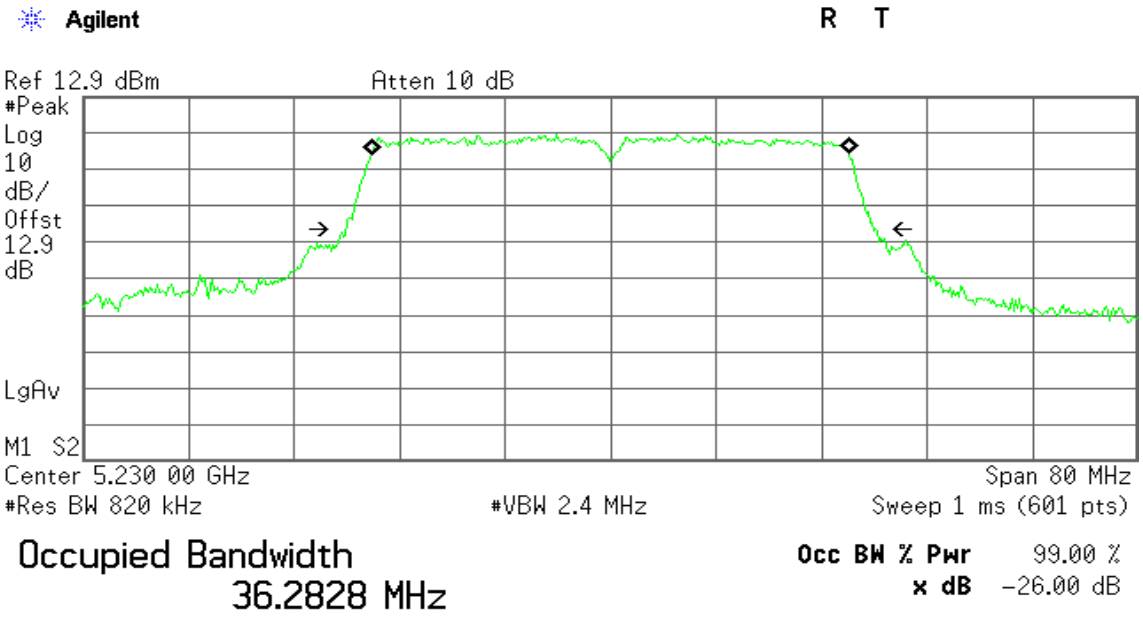
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

### CH Low




**Transmit Freq Error** -58.194 kHz
**x dB Bandwidth** 40.294 MHz

### CH High

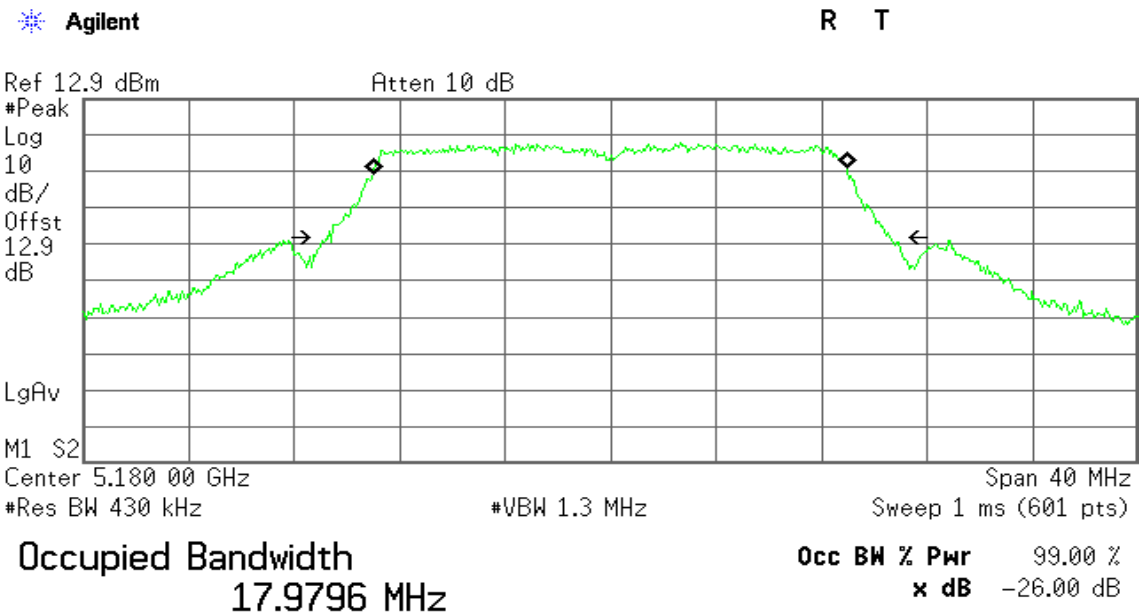



**Transmit Freq Error** -39.627 kHz
**x dB Bandwidth** 40.235 MHz

## Mode 2

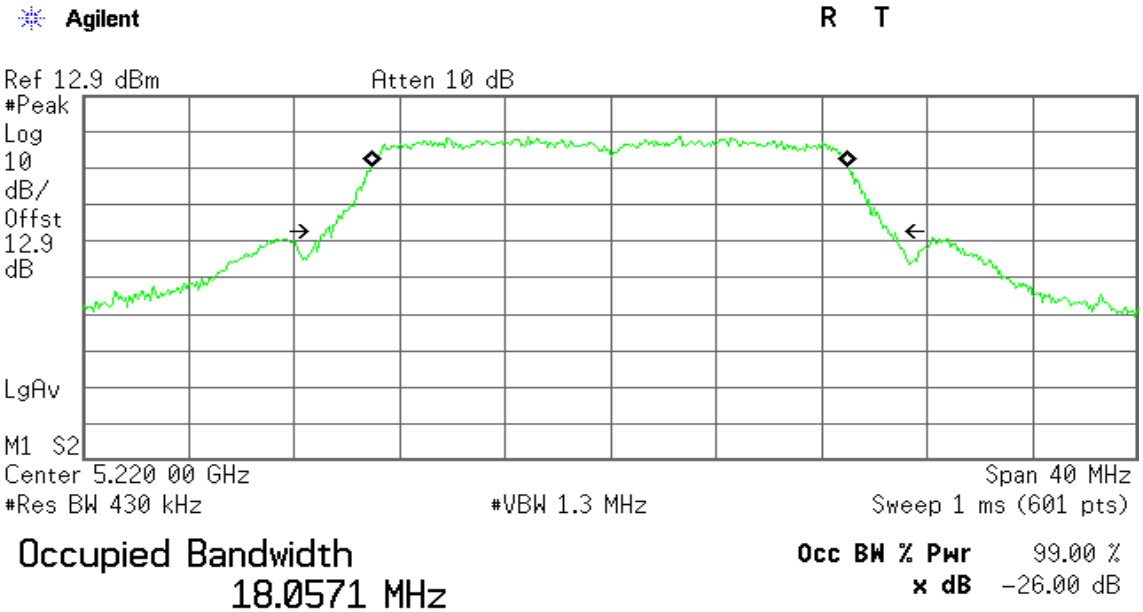
## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

### CH Low



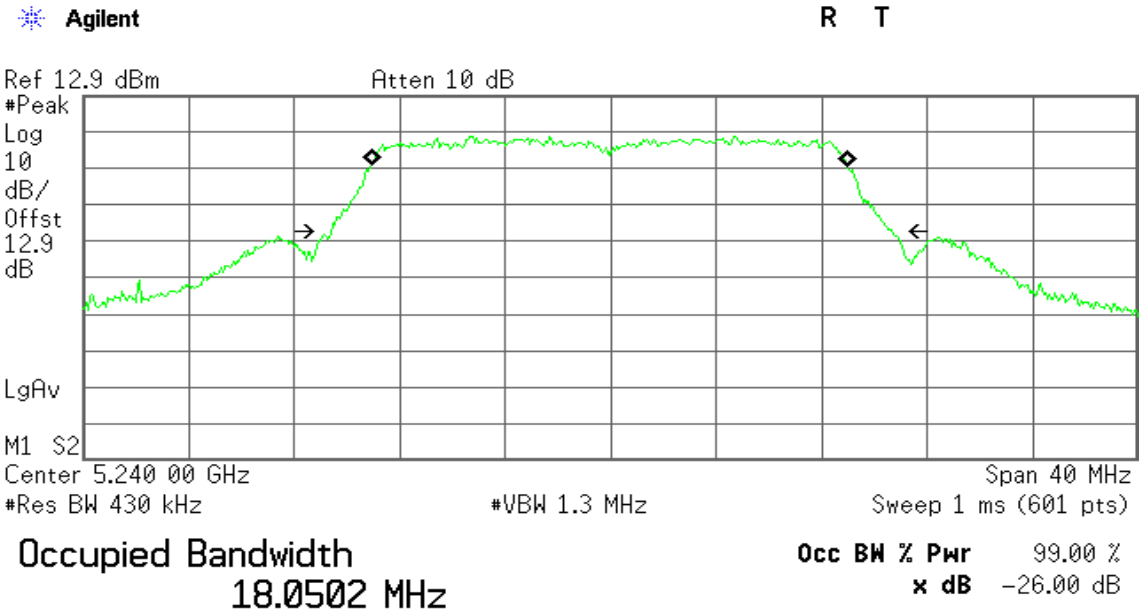

| | |
|---|---|
| **Transmit Freq Error** | -18.289 kHz |
| **x dB Bandwidth** | 21.363 MHz |

### CH Mid



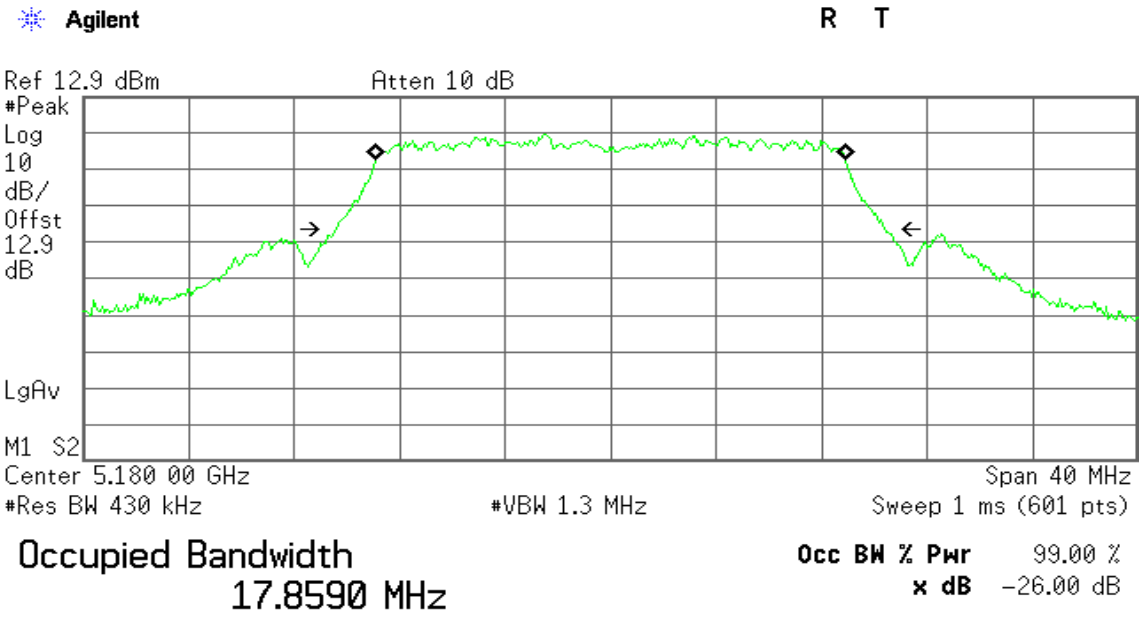

| | |
|---|---|
| **Transmit Freq Error** | -28.530 kHz |
| **x dB Bandwidth** | 21.322 MHz |

## CH High


Agilent
R T
Ref 12.9 dBm
Atten 10 dB
#Peak
Log
10
dB/
Offst
12.9
dB
LgAv
M1 S2
Center 5.240 00 GHz
Span 40 MHz
#Res BW 430 kHz
#VBW 1.3 MHz
Sweep 1 ms (601 pts)
Occupied Bandwidth
18.0502 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -48.196 kHz
x dB Bandwidth 21.279 MHz

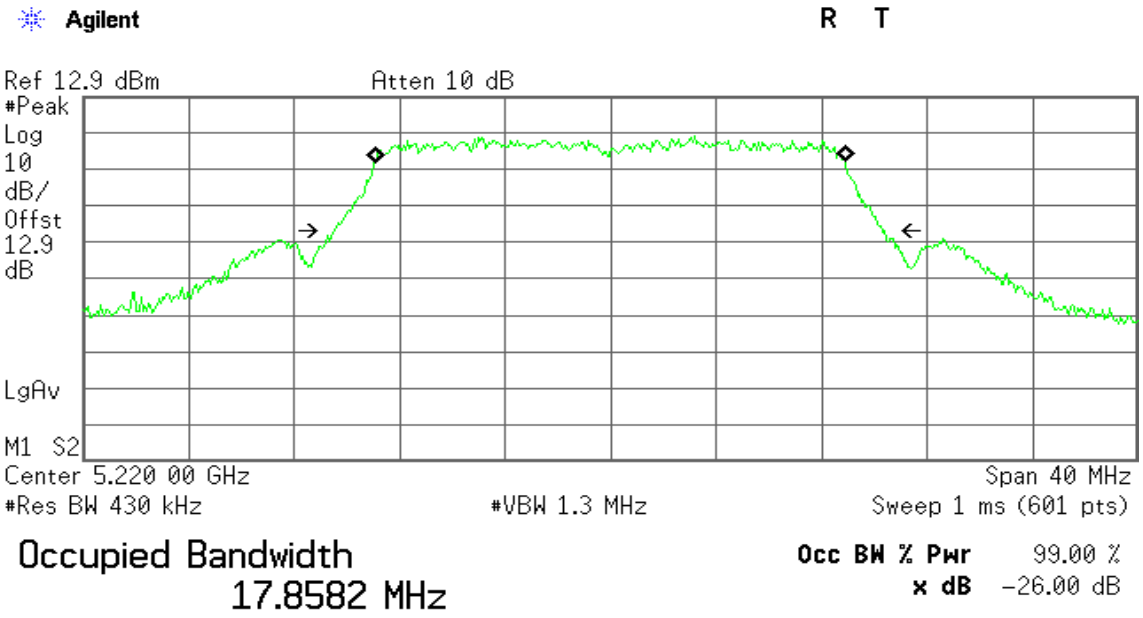
## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

### CH Low



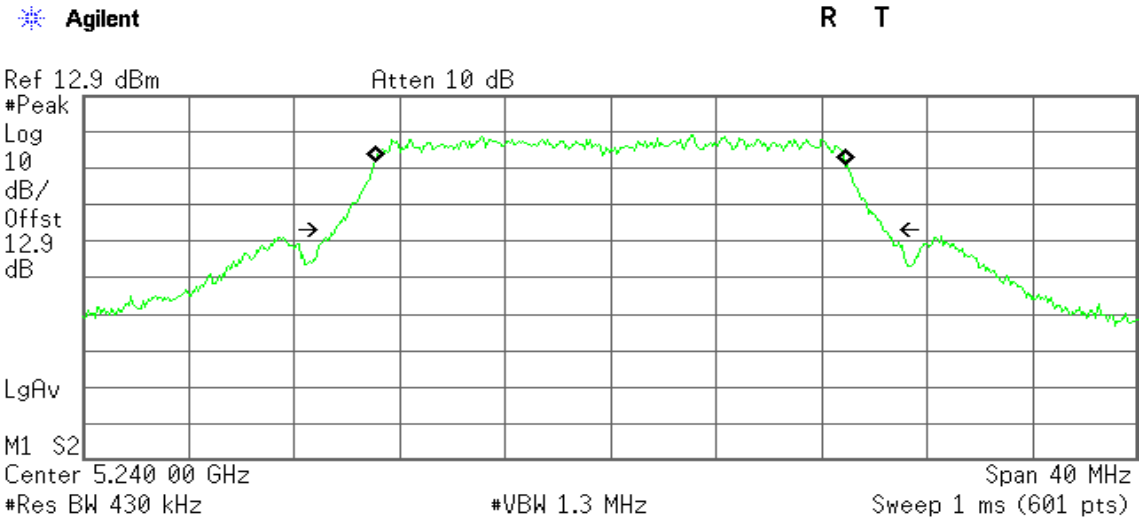

**Transmit Freq Error** -2.817 kHz
**x dB Bandwidth** 20.820 MHz

### CH Mid




**Transmit Freq Error** -27.013 kHz
**x dB Bandwidth** 20.900 MHz

## CH High



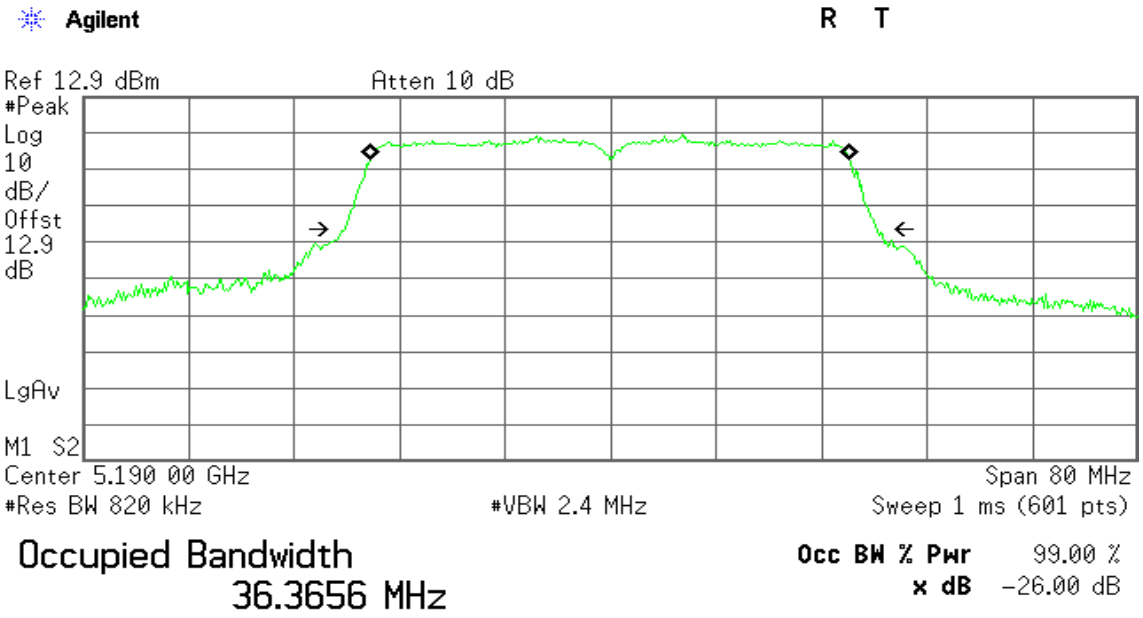

Occupied Bandwidth
17.8710 MHz

**Occ BW % Pwr** 99.00 %
**x dB** -26.00 dB

**Transmit Freq Error** -4.630 kHz
**x dB Bandwidth** 20.783 MHz

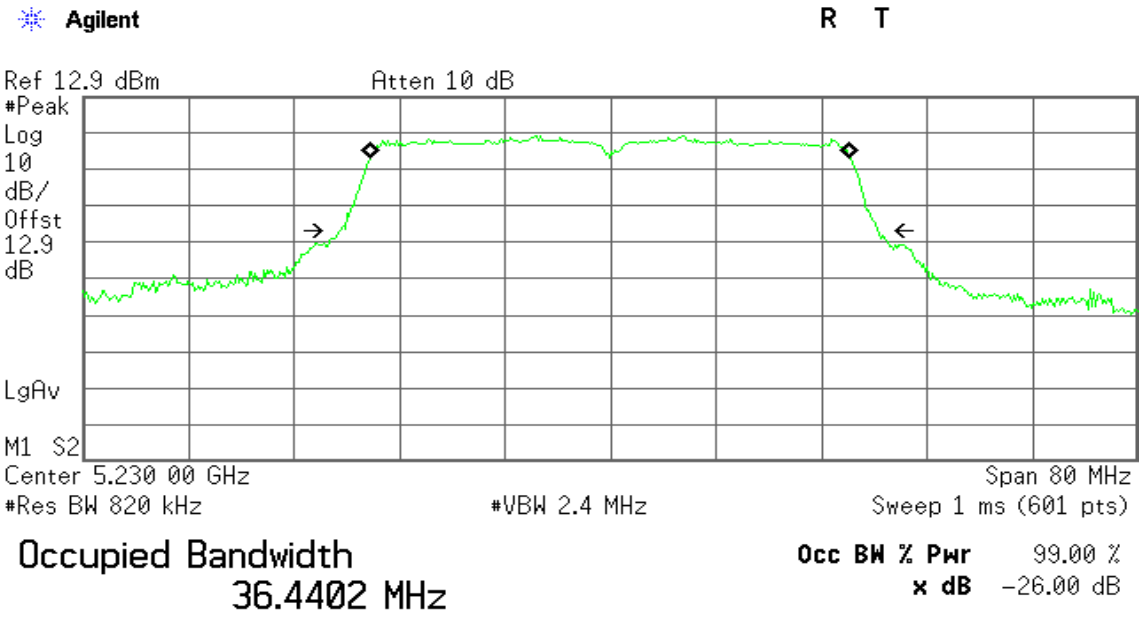
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

### CH Low




**Transmit Freq Error** -53.215 kHz
**x dB Bandwidth** 40.390 MHz

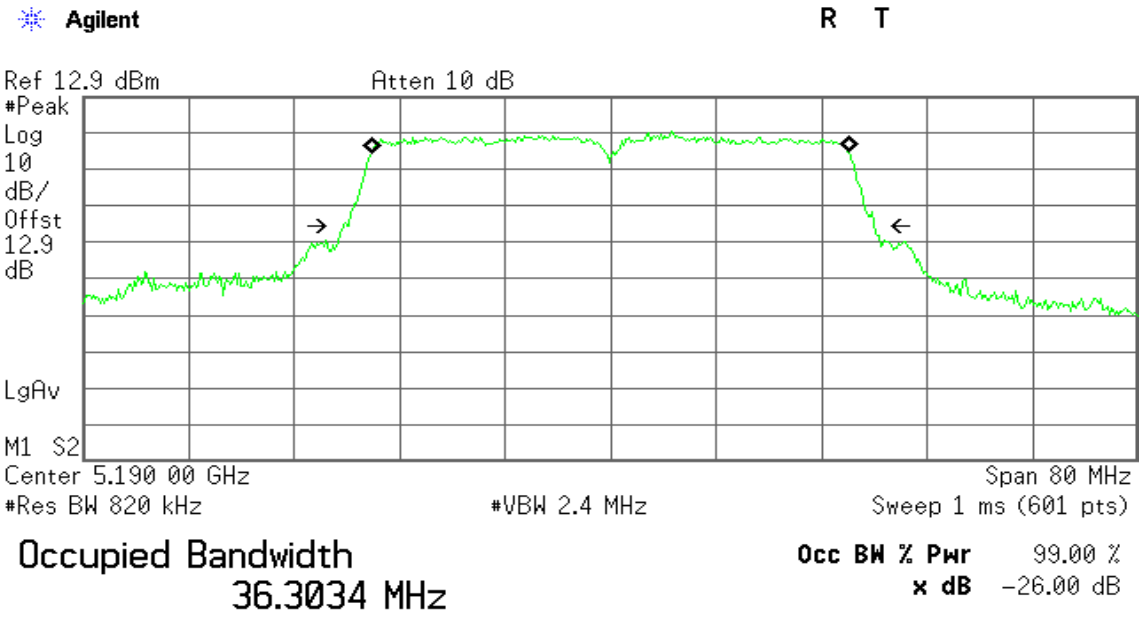
### CH High




**Transmit Freq Error** -21.533 kHz
**x dB Bandwidth** 40.832 MHz

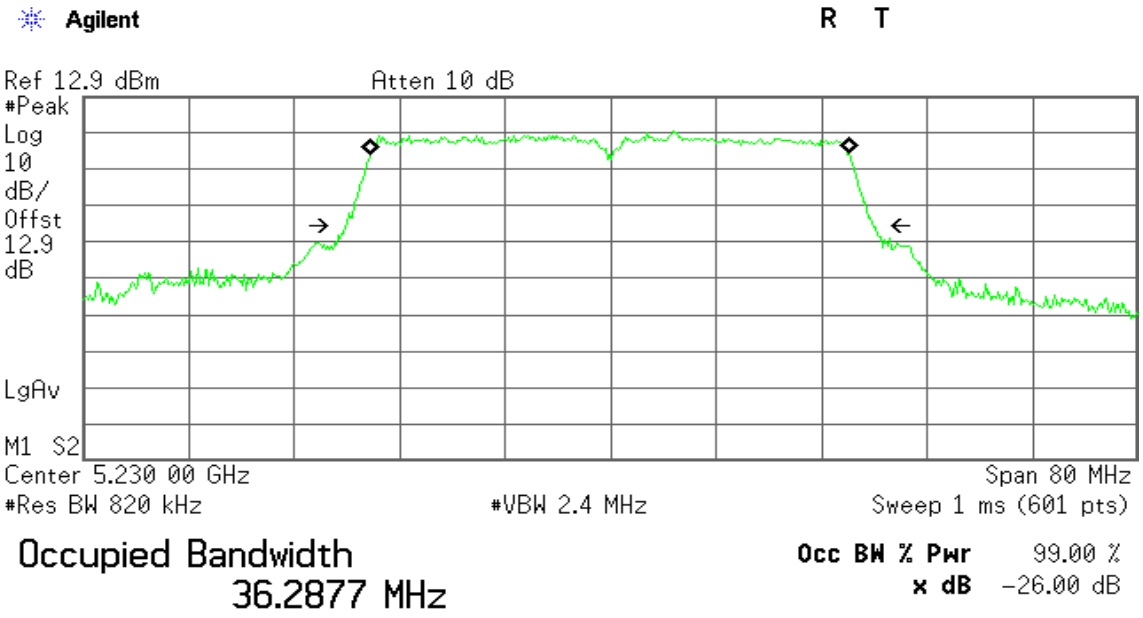
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 2

### CH Low




**Transmit Freq Error** -34.447 kHz
**x dB Bandwidth** 40.352 MHz

### CH High

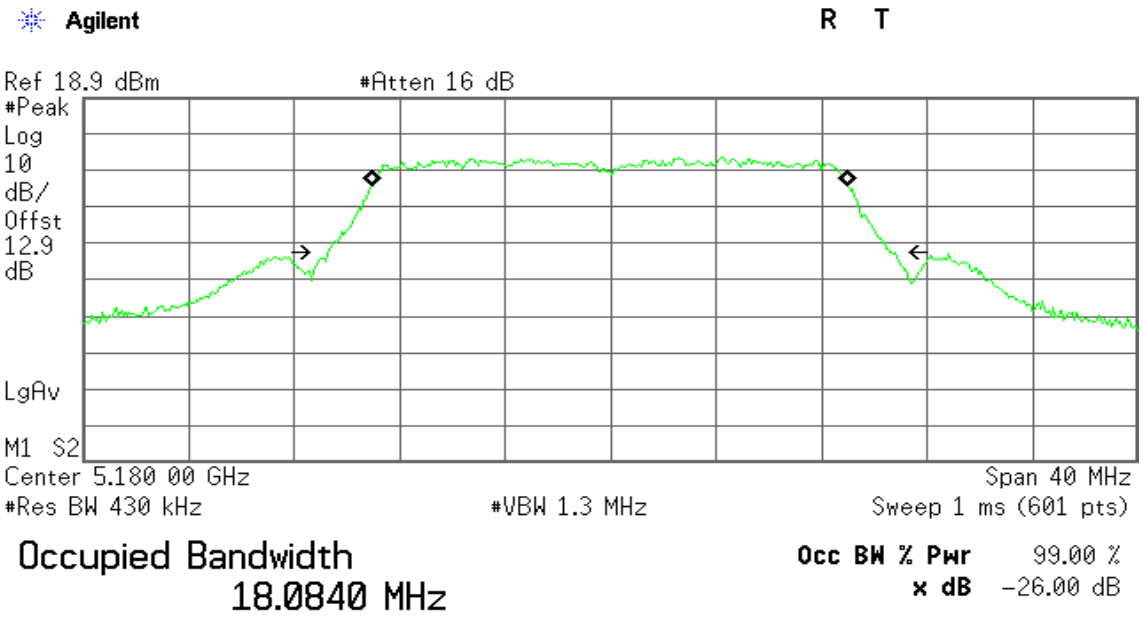



**Transmit Freq Error** -63.798 kHz
**x dB Bandwidth** 40.137 MHz

## Mode 3

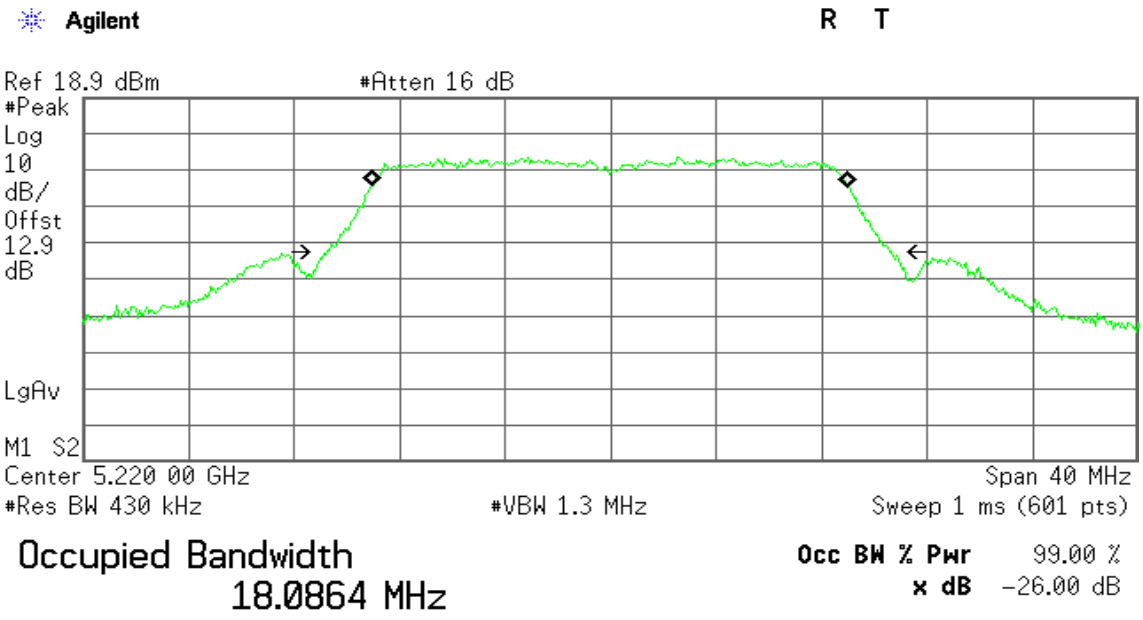
## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

### CH Low



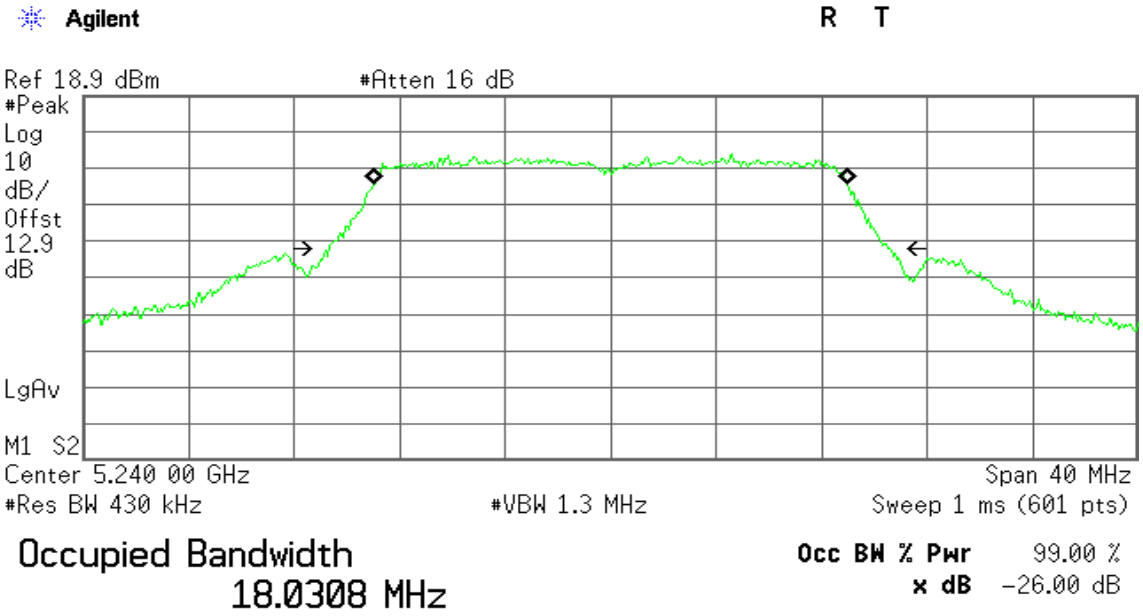

**Transmit Freq Error** −10.076 kHz
**x dB Bandwidth** 21.364 MHz

### CH Mid




**Transmit Freq Error** −36.030 kHz
**x dB Bandwidth** 21.380 MHz

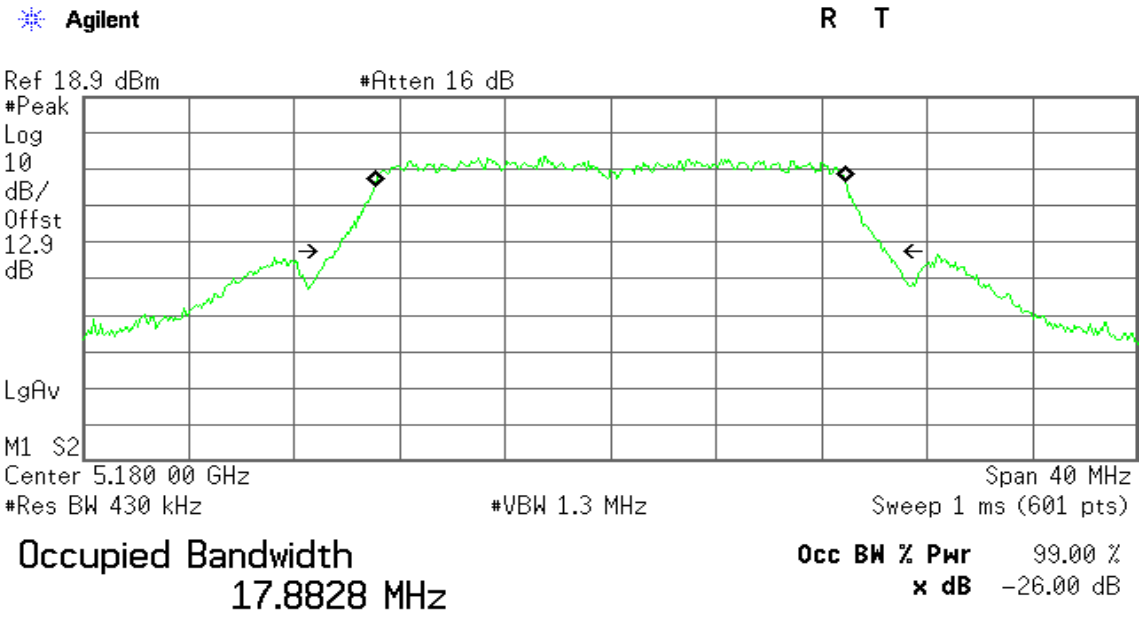
## CH High




**Transmit Freq Error** -12.319 kHz
**x dB Bandwidth** 21.321 MHz

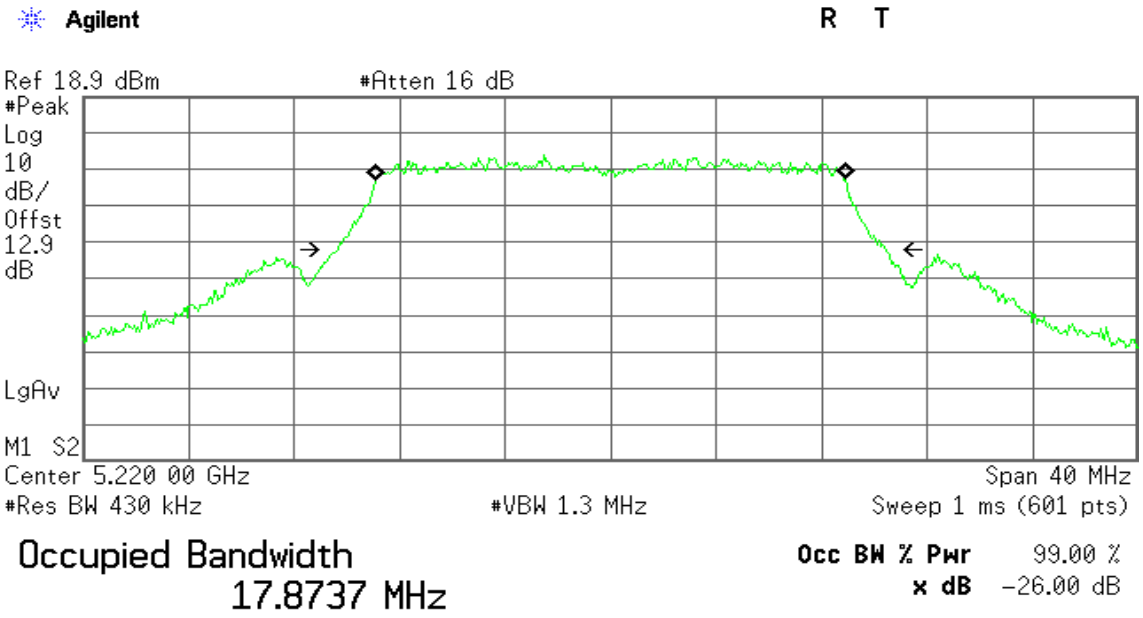
## IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

### CH Low



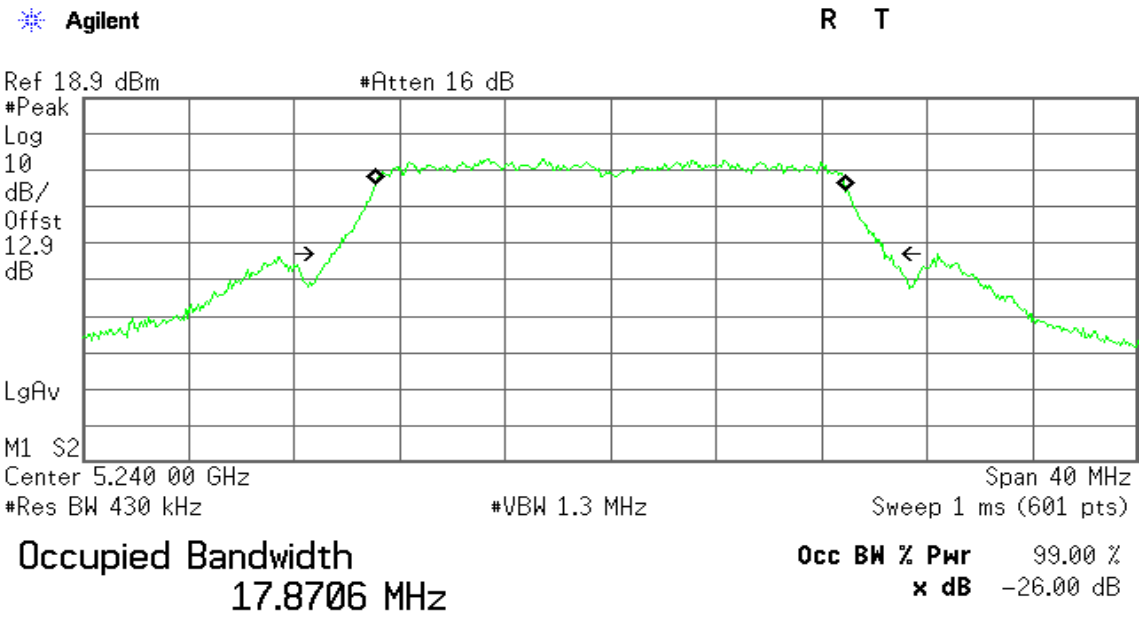

**Transmit Freq Error** -7.949 kHz
**x dB Bandwidth** 20.890 MHz

### CH Mid




**Transmit Freq Error** -9.906 kHz
**x dB Bandwidth** 20.849 MHz

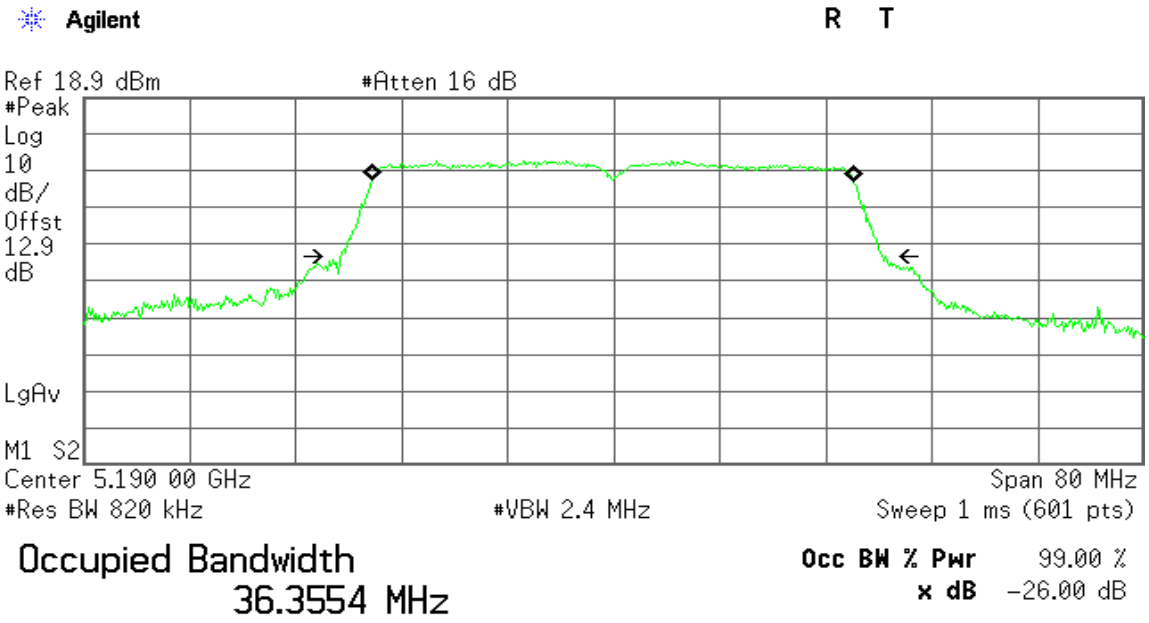
## CH High




| | |
|---|---|
| **Transmit Freq Error** | -15.430 kHz |
| **x dB Bandwidth** | 20.982 MHz |

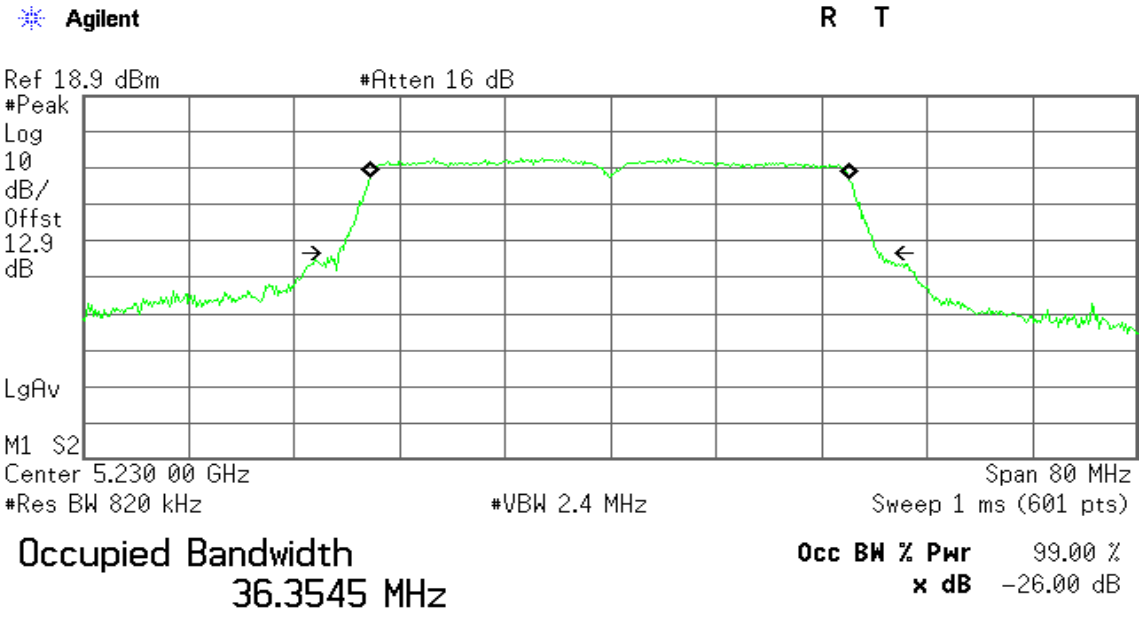
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

### CH Low




| | |
|---|---|
| **Transmit Freq Error** | -78.516 kHz |
| **x dB Bandwidth** | 40.968 MHz |

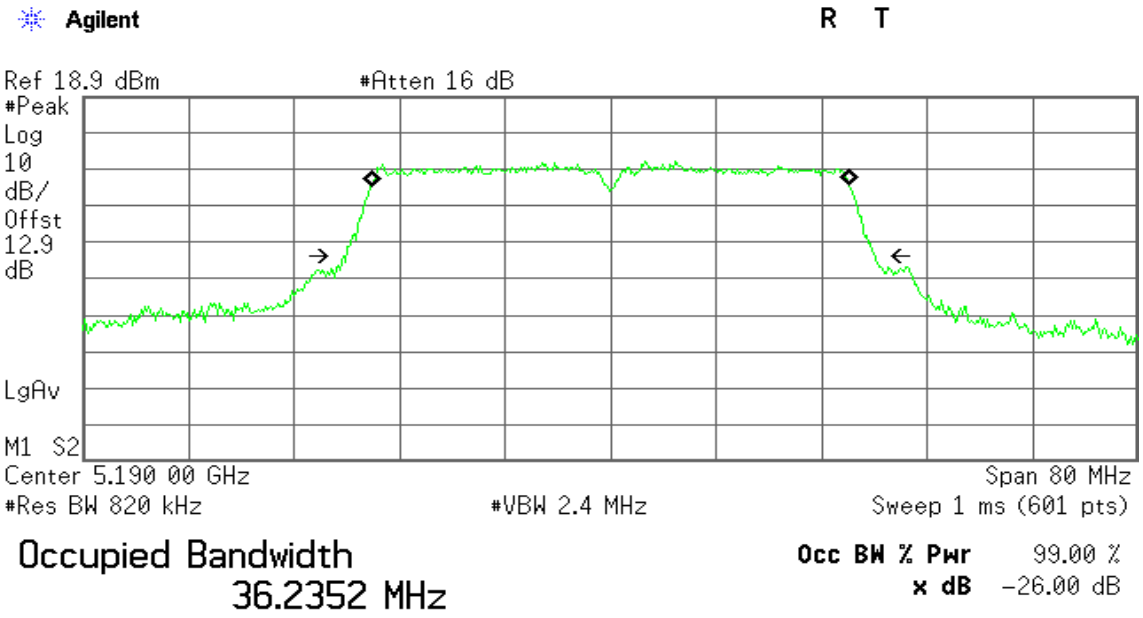
### CH High




| | |
|---|---|
| **Transmit Freq Error** | -78.516 kHz |
| **x dB Bandwidth** | 40.938 MHz |

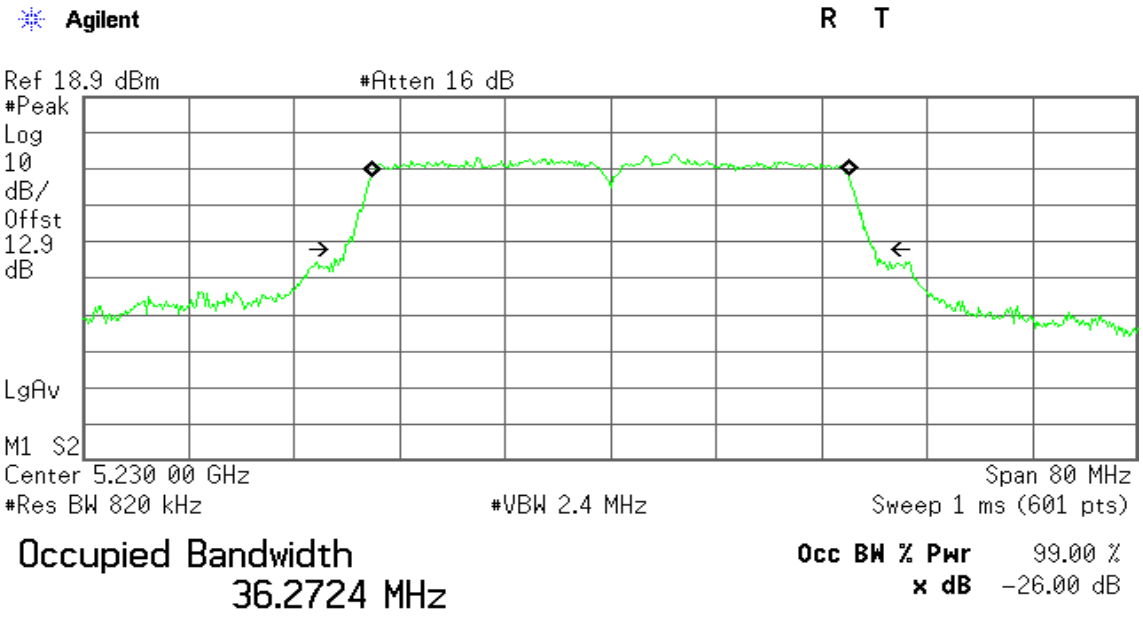
## IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 2

### CH Low




**Transmit Freq Error** -19.864 kHz
**x dB Bandwidth** 40.155 MHz

### CH High




**Transmit Freq Error** -56.247 kHz
**x dB Bandwidth** 40.251 MHz

## 7.2 MAXIMUM CONDUCTED OUTPUT POWER

### LIMIT

**According to §15.407(a),**

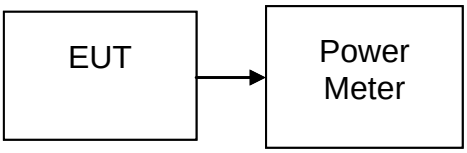
(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW, where B is the 26 dB emission bandwidth in MHz.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW, where B is the 26 dB emission bandwidth in MHz.

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

**Specified Limit of the Maximum Output PowerTest Configuration**

*The EUT was connected to a Power Meter through a 50Ω RF cable.*




### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the avg power detection. The EUT is configured to transmit continuously.

### TEST RESULTS

*No non-compliance noted*

## Test Data

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

| Channel | Frequency (MHz) | Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|
| Low | 5180 | 13.17 | 30.00 |
| Mid | 5220 | ***13.41** | 30.00 |
| High | 5240 | 13.36 | 30.00 |

### Mode 1

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

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5180 | 9.42 | 9.34 | 12.39 | 28.06 |
| Mid | 5220 | 9.67 | 9.39 | 12.54 | 28.06 |
| High | 5240 | 9.85 | 9.22 | ***12.56** | 28.06 |

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

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5190 | 8.54 | 9.78 | 12.22 | 28.06 |
| High | 5230 | 9.05 | 9.61 | ***12.35** | 28.06 |

***Remark:***
*1. Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000) + Chain 1 (10^(Output Power /10)/1000))*
*2. The maximum antenna gain is 7.94dBi; therefore the reduction due to antenna gain is 1.94dBi, so the limit is 28.06dBm.*

## Mode 2

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

| Channel | Frequency (MHz) | Chain 1 Output Power (dBm) | Chain 2 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5180 | 9.64 | 10.66 | 13.19 | 28.13 |
| Mid | 5220 | 9.30 | 10.98 | ***13.23** | 28.13 |
| High | 5240 | 9.27 | 10.48 | 12.93 | 28.13 |

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

| Channel | Frequency (MHz) | Chain 1 Output Power (dBm) | Chain 2 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5190 | 8.88 | 10.96 | 13.06 | 28.13 |
| High | 5230 | 8.95 | 11.26 | ***13.27** | 28.13 |

***Remark:***
*1. Total Output Power (w) = Chain 1 (10^(Output Power /10)/1000) + Chain 2 (10^(Output Power /10)/1000)*
*2. The maximum antenna gain is 7.87dBi; therefore the reduction due to antenna gain is 1.87dBi, so the limit is 28.13dBm.*

## Mode 3

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

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 2 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5180 | 9.07 | 9.16 | 12.12 | 28.18 |
| Mid | 5220 | 9.16 | 9.17 | 12.17 | 28.18 |
| High | 5240 | 9.25 | 9.44 | ***12.35** | 28.18 |

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

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 2 Output Power (dBm) | Total Maximum Conducted Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5190 | 9.02 | 10.04 | 12.57 | 28.18 |
| High | 5230 | 9.07 | 10.33 | ***12.76** | 28.18 |

***Remark:***
*1. Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000) + Chain 2 (10^(Output Power /10)/1000)*
*2. The maximum antenna gain is 7.82dBi; therefore the reduction due to antenna gain is 1.82dBi, so the limit is 28.18dBm.*

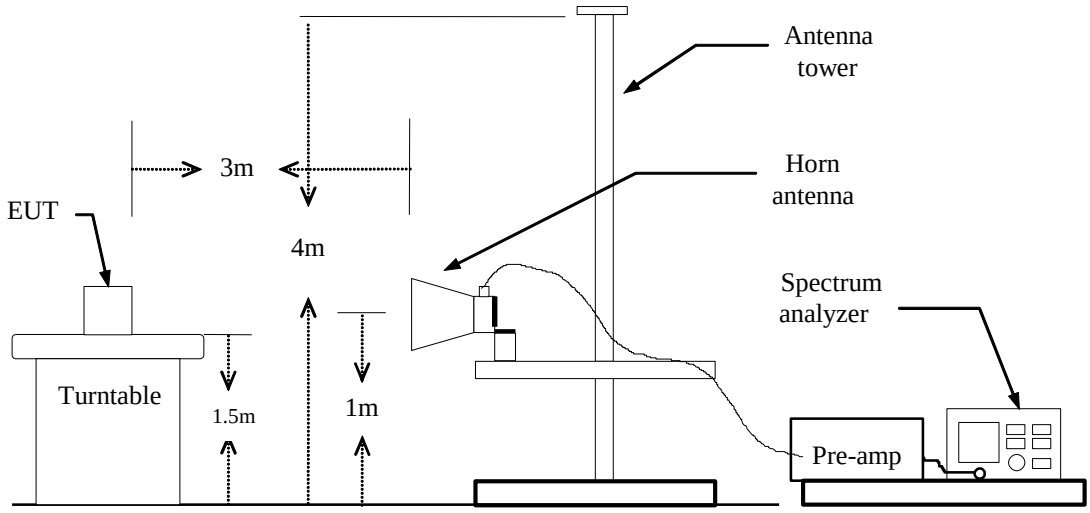
# 7.3 BAND EDGES MEASUREMENT

## LIMIT

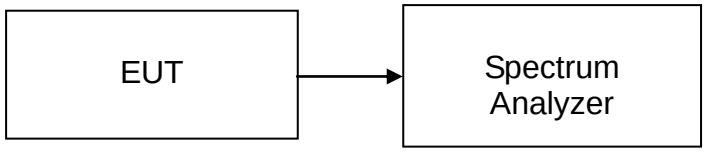
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### Test Configuration

**For Radiated**




**For Conducted**



# TEST PROCEDURE

**For Radiated**

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=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
   if duty cycle≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   **IEEE 802.11a mode:** = 95%, VBW=510Hz
   **IEEE 802.11n HT 20 MHz mode:** = 92%, VBW=1.1KHz
   **IEEE 802.11n HT 40 MHz mode:** = 85%, VBW=2.2KHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

**For Conducted**

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

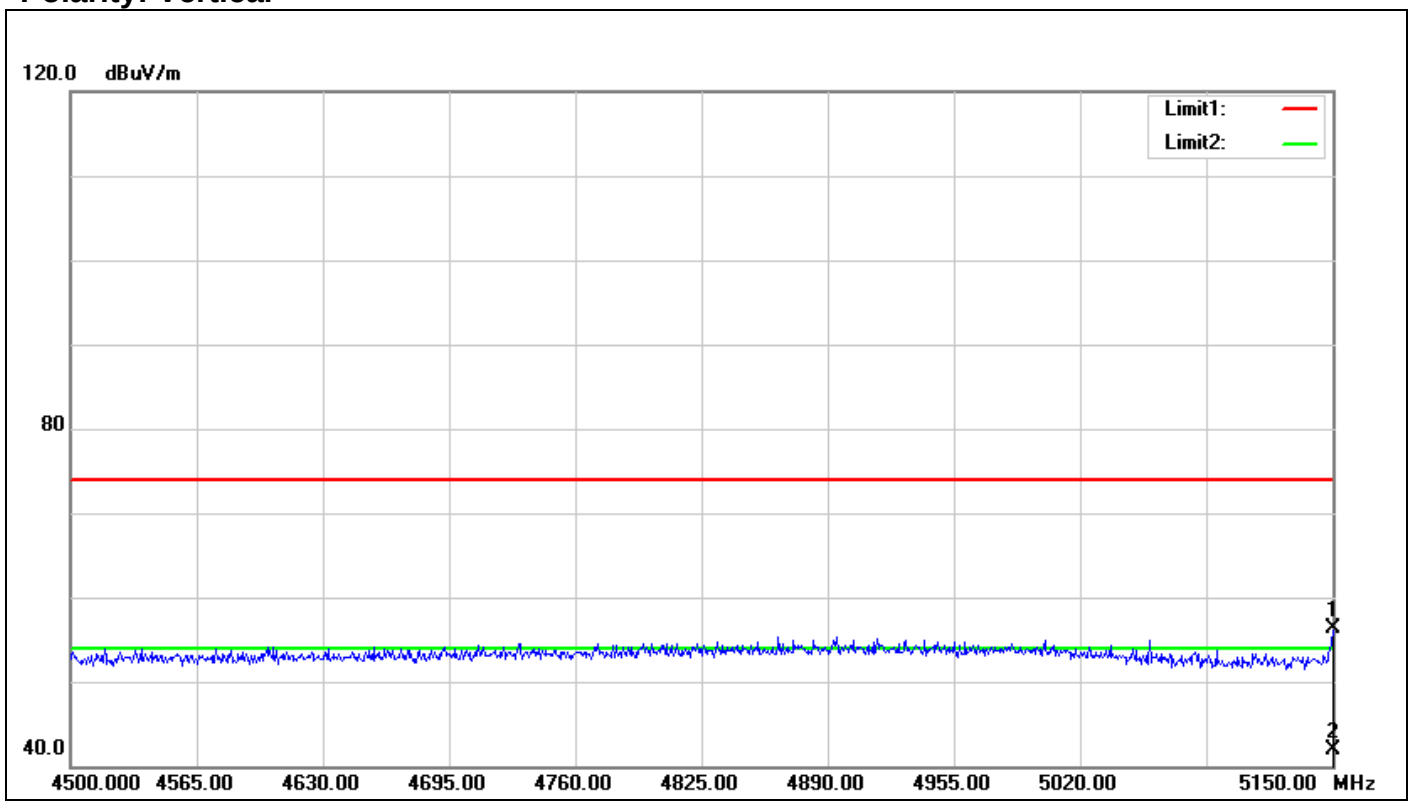
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

# TEST RESULTS

Refer to attach spectrum analyzer data chart.

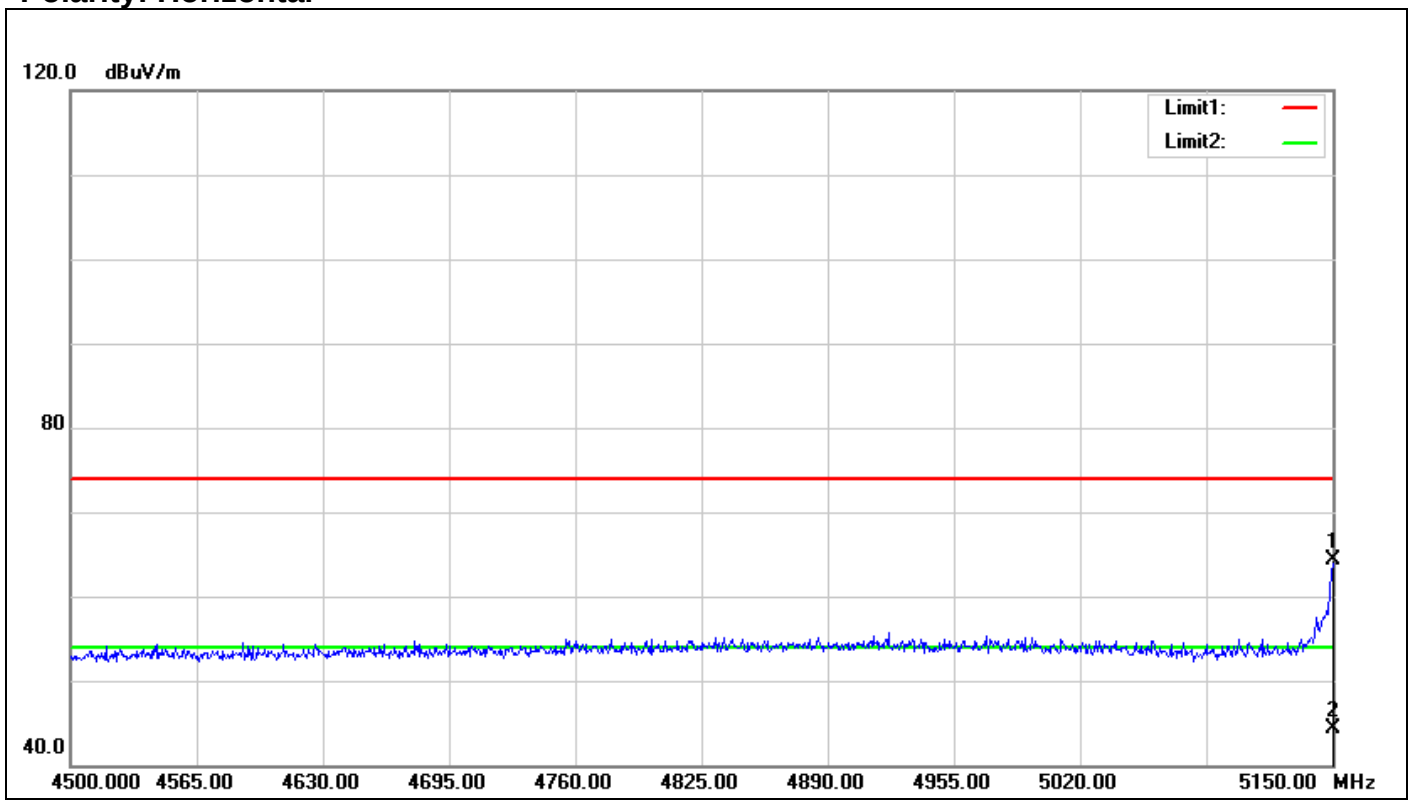
## Band Edges (IEEE 802.11a mode / 5180 MHz)

## Polarity: Vertical




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5150.000 | 53.30 | 3.04 | 56.34 | 74.00 | -17.66 | 100 | 284 | peak |
| 2 | 5150.000 | 38.95 | 3.04 | 41.99 | 54.00 | -12.01 | 100 | 284 | AVG |

## Polarity: Horizontal

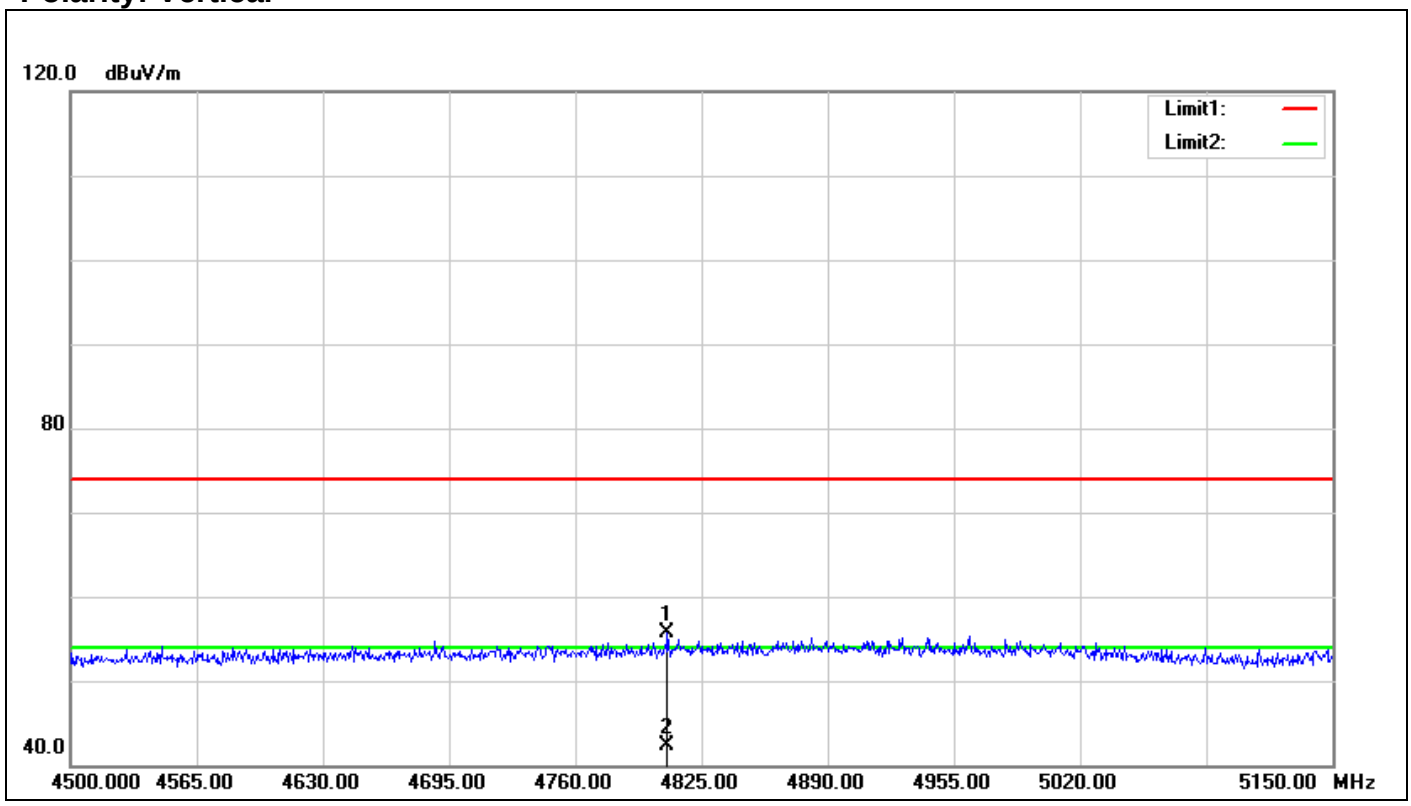



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5150.000 | 61.16 | 3.04 | 64.20 | 74.00 | -9.80 | 100 | 215 | peak |
| 2 | 5150.000 | 41.30 | 3.04 | 44.34 | 54.00 | -9.66 | 100 | 215 | AVG |

## For Mode 1

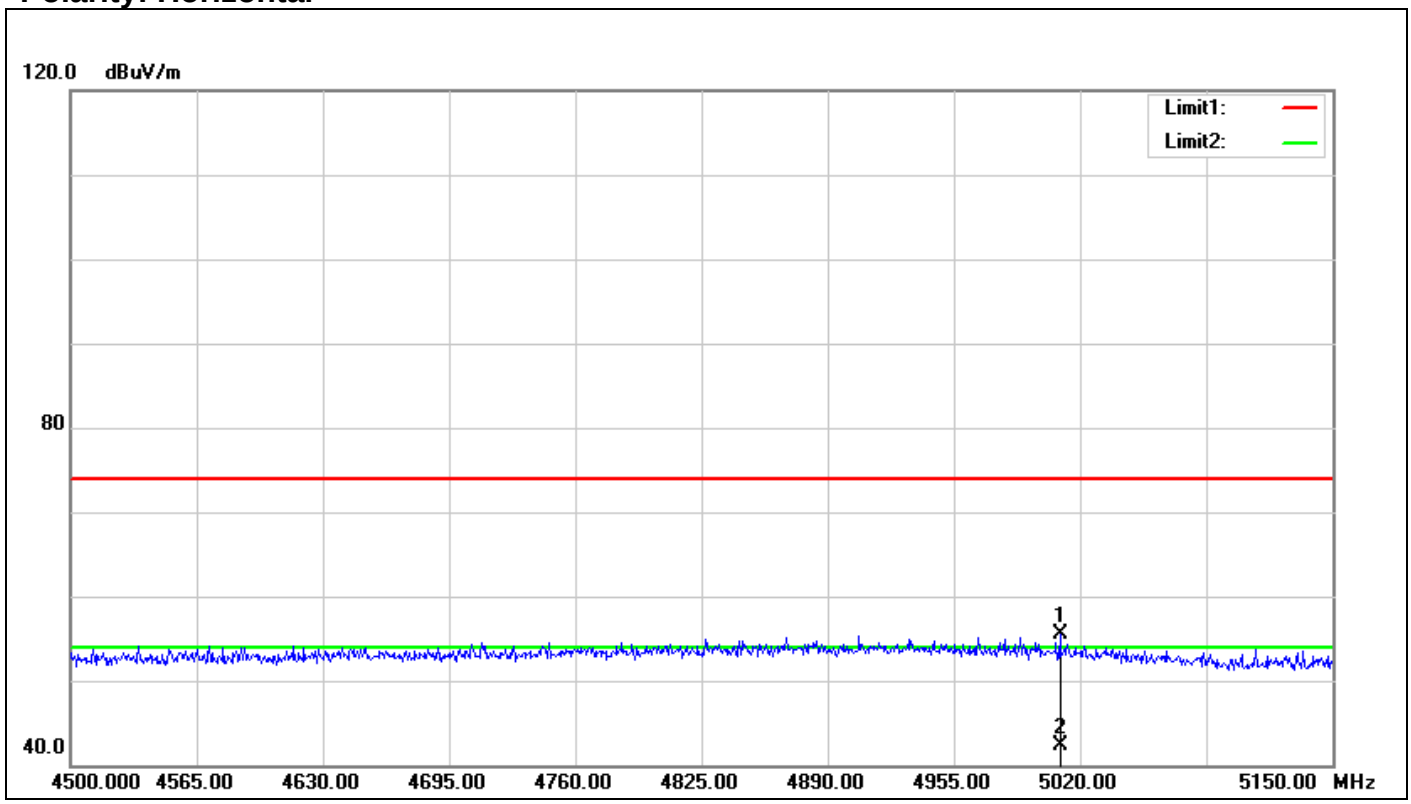
### Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)

### Polarity: Vertical




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4807.450 | 51.57 | 4.04 | 55.61 | 74.00 | -18.39 | 100 | 191 | peak |
| 2 | 4807.450 | 38.28 | 4.04 | 42.32 | 54.00 | -11.68 | 100 | 191 | AVG |

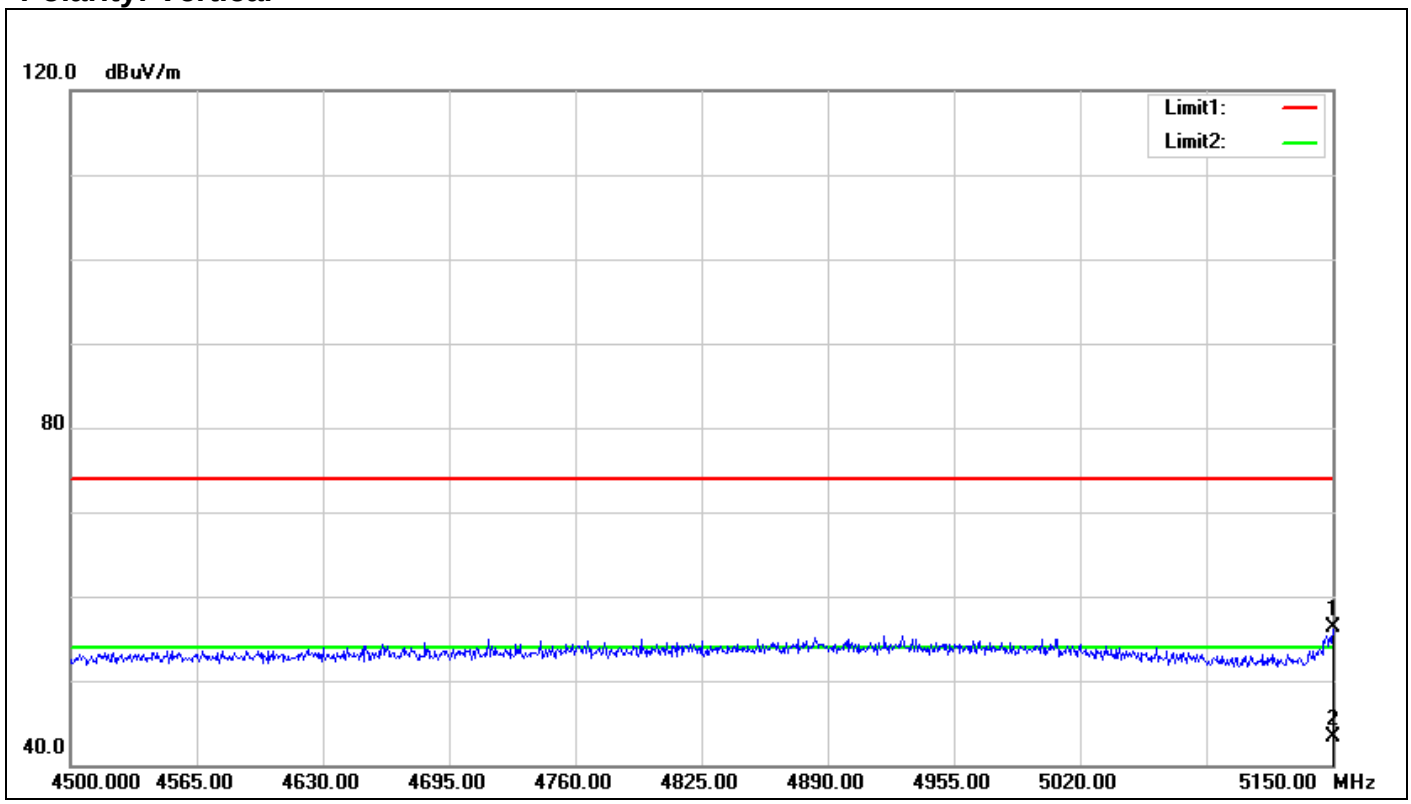
## Polarity: Horizontal




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5009.600 | 51.70 | 3.84 | 55.54 | 74.00 | -18.46 | 100 | 234 | peak |
| 2 | 5009.600 | 38.56 | 3.84 | 42.40 | 54.00 | -11.60 | 100 | 234 | AVG |

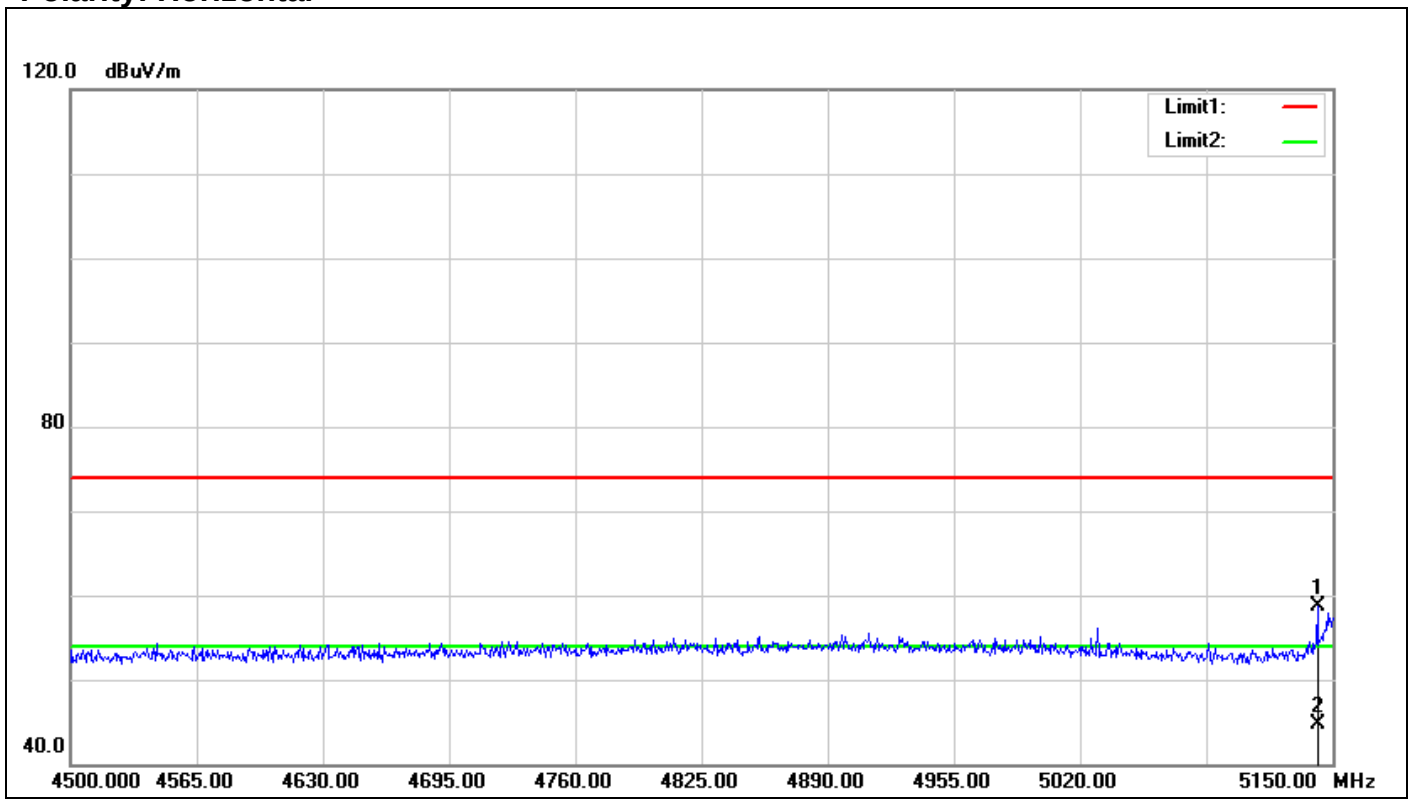
**Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5150.000 | 53.21 | 3.04 | 56.25 | 74.00 | -17.75 | 100 | 248 | peak |
| 2 | 5150.000 | 40.28 | 3.04 | 43.32 | 54.00 | -10.68 | 100 | 248 | AVG |

**Polarity: Horizontal**

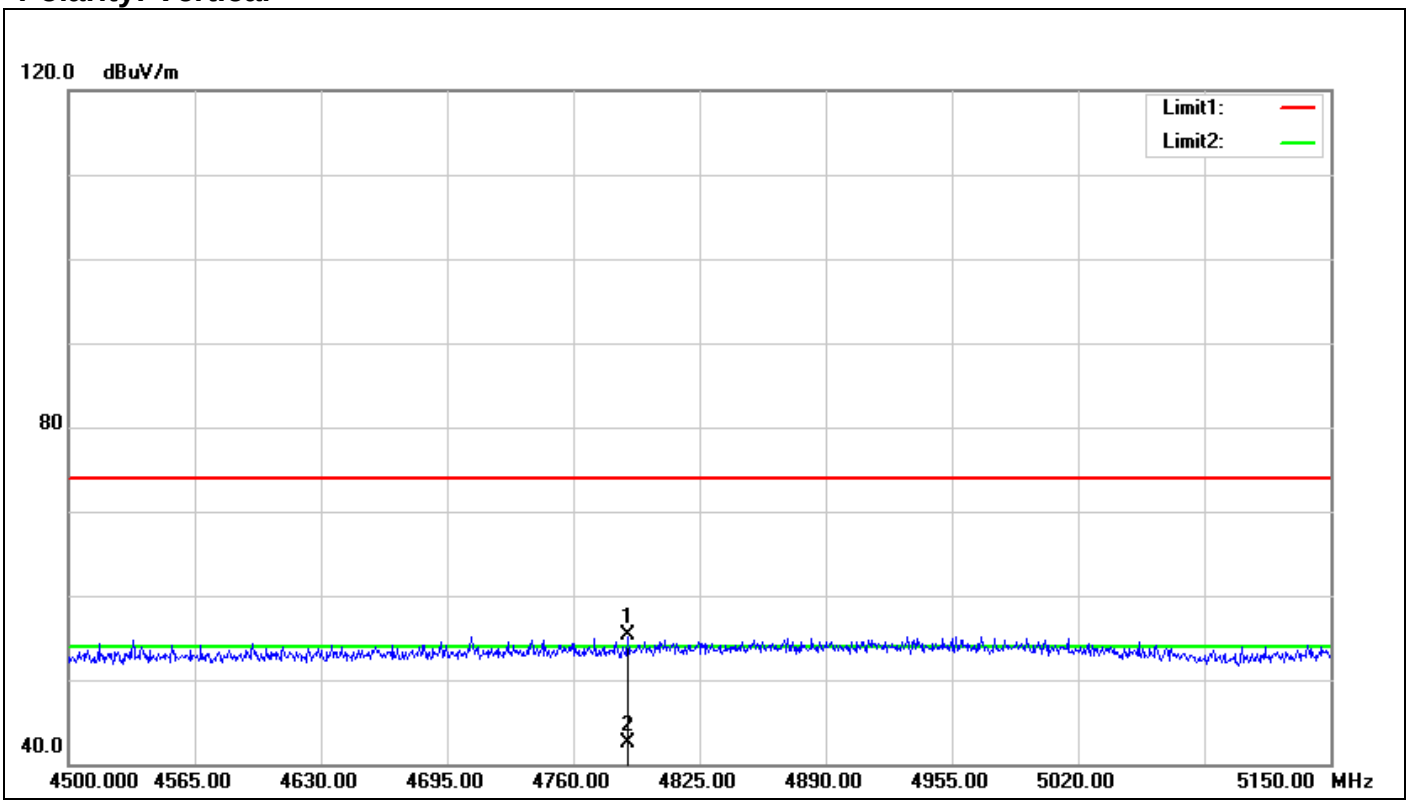



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5142.200 | 55.66 | 2.99 | 58.65 | 74.00 | -15.35 | 100 | 359 | peak |
| 2 | 5142.200 | 41.75 | 2.99 | 44.74 | 54.00 | -9.26 | 100 | 359 | AVG |

**For Mode 2**

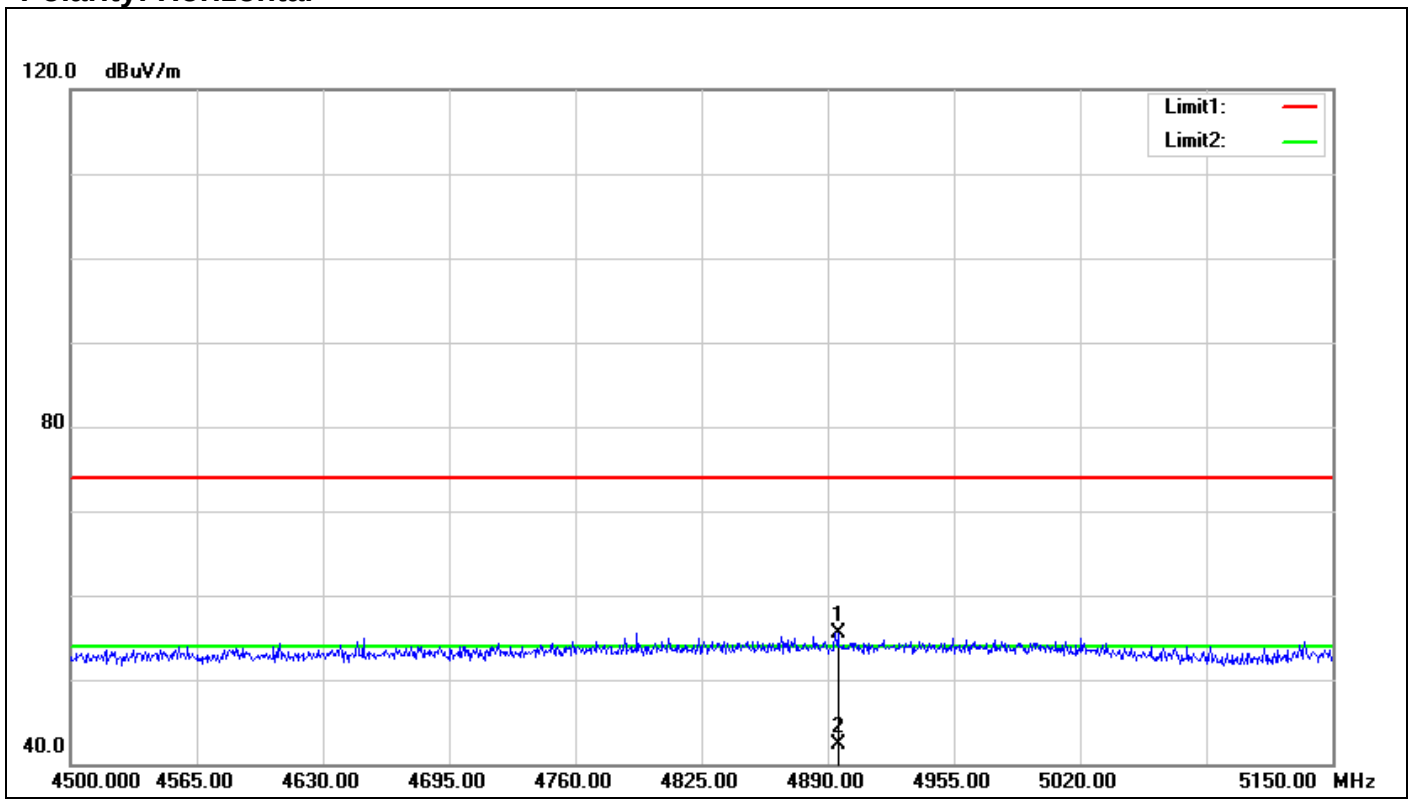
**Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4787.950 | 51.20 | 4.00 | 55.20 | 74.00 | -18.80 | 100 | 46 | peak |
| 2 | 4787.950 | 38.52 | 4.00 | 42.52 | 54.00 | -11.48 | 100 | 46 | AVG |

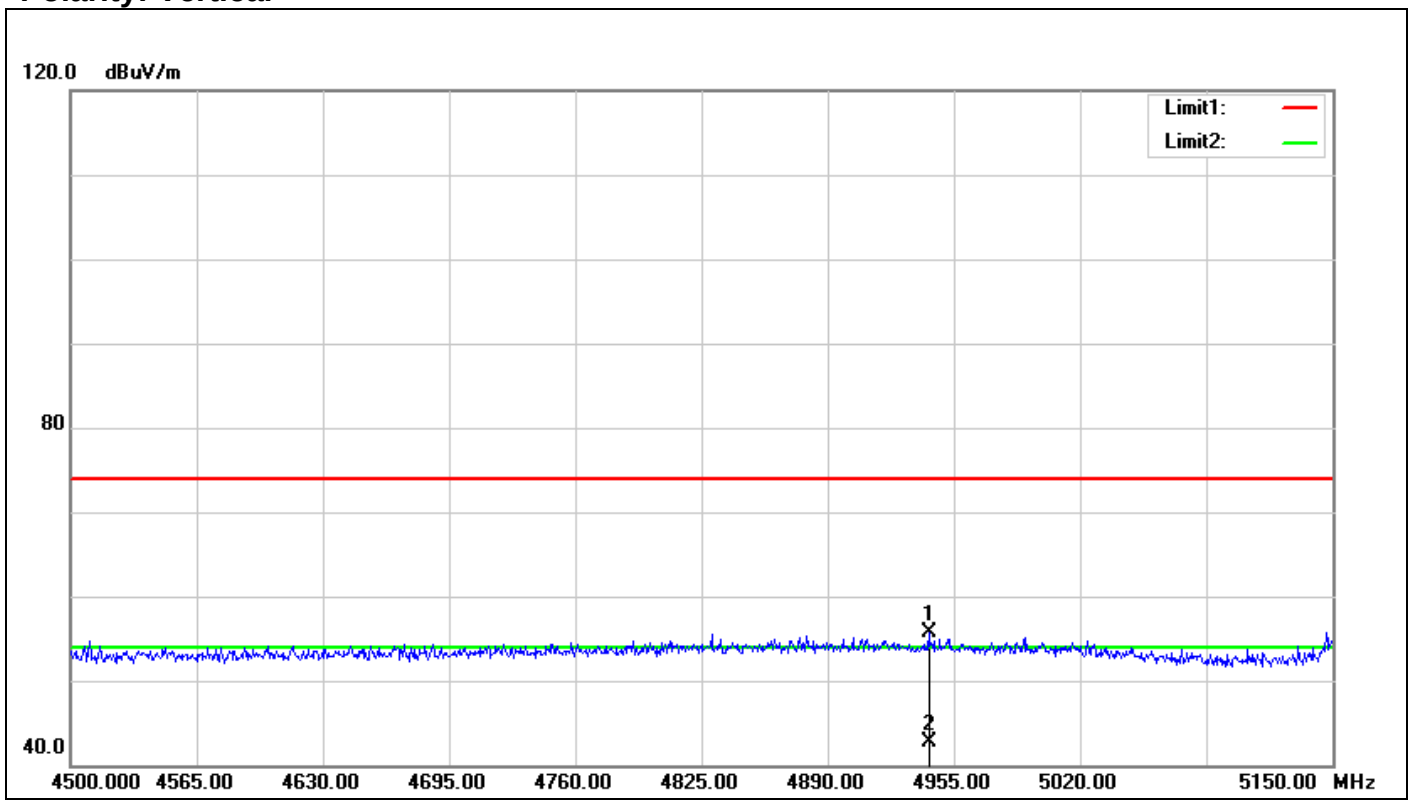
## Polarity: Horizontal




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4895.200 | 51.67 | 3.89 | 55.56 | 74.00 | -18.44 | 100 | 13 | peak |
| 2 | 4895.200 | 38.45 | 3.89 | 42.34 | 54.00 | -11.66 | 100 | 13 | AVG |

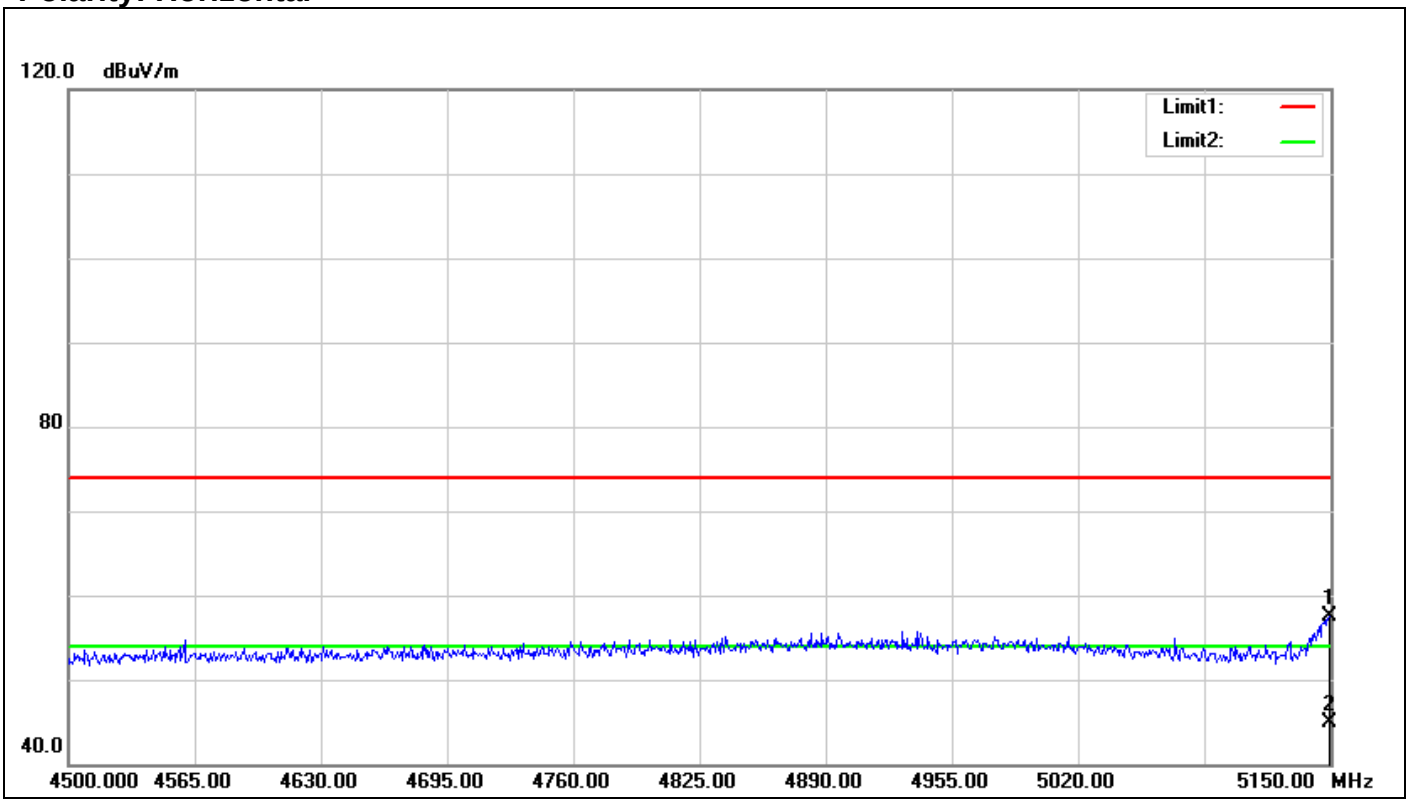
**Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4942.000 | 51.88 | 3.91 | 55.79 | 74.00 | -18.21 | 100 | 45 | peak |
| 2 | 4942.000 | 38.80 | 3.91 | 42.71 | 54.00 | -11.29 | 100 | 45 | AVG |

## Polarity: Horizontal

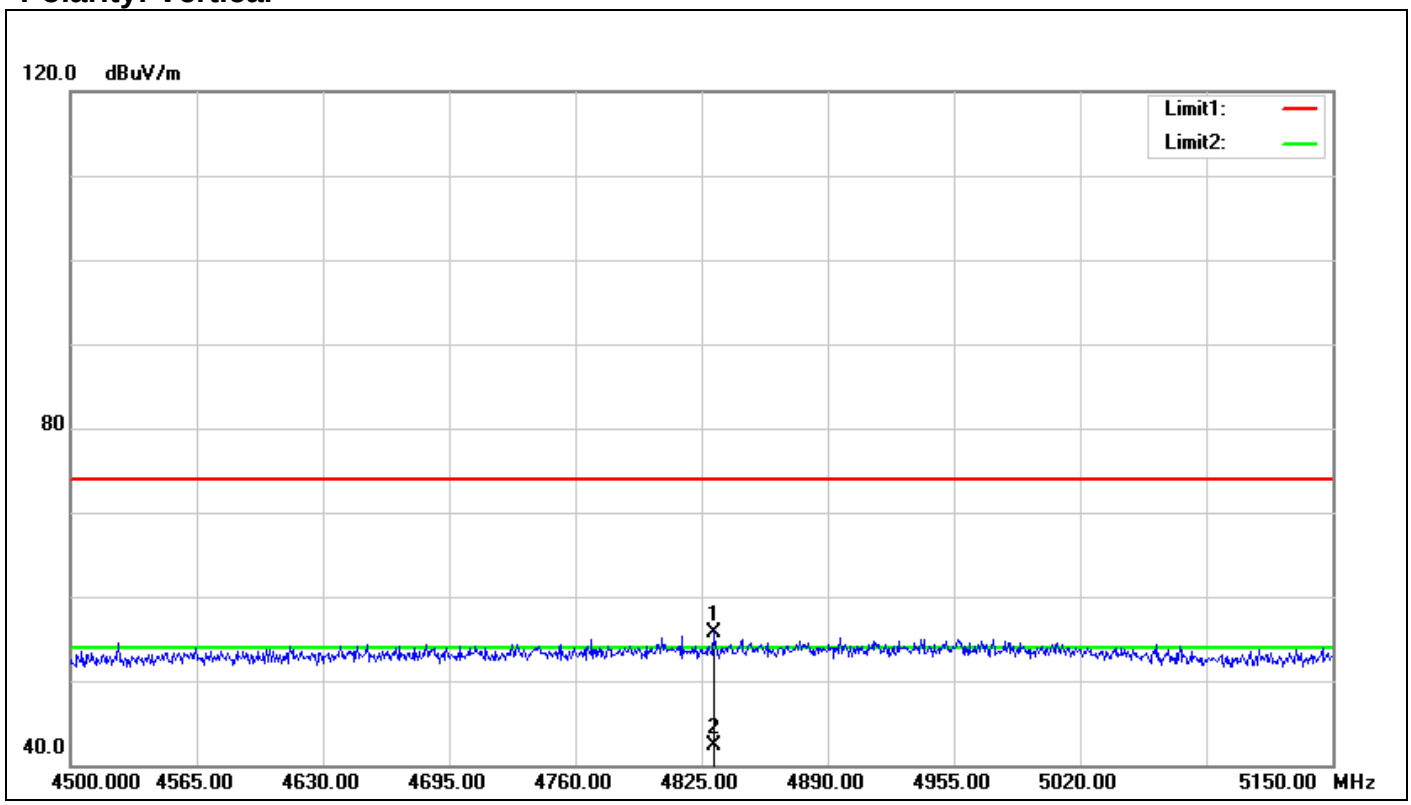



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5149.350 | 54.37 | 3.04 | 57.41 | 74.00 | -16.59 | 100 | 359 | peak |
| 2 | 5149.350 | 41.80 | 3.04 | 44.84 | 54.00 | -9.16 | 100 | 359 | AVG |

## For Mode 3

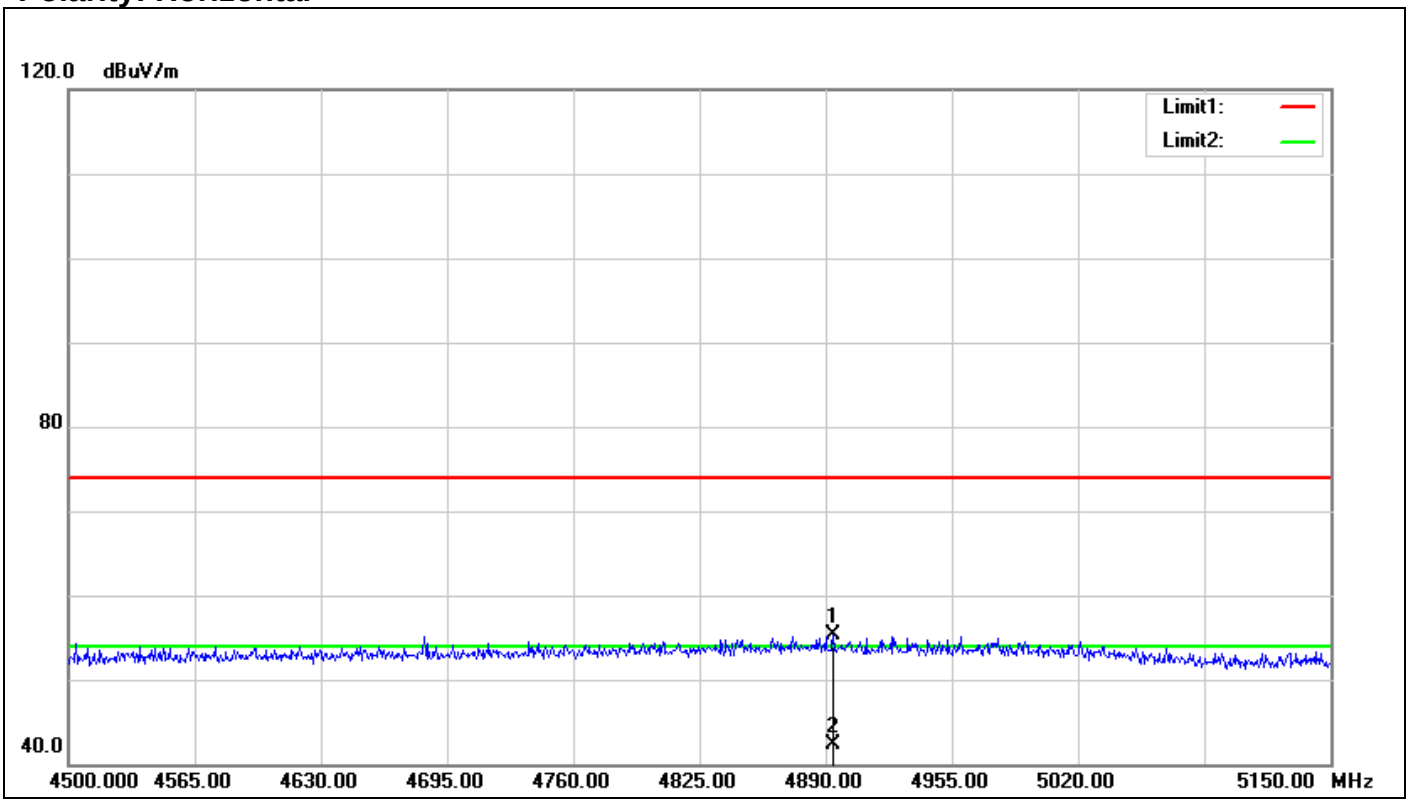
### Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)

### Polarity: Vertical




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4831.500 | 51.80 | 4.00 | 55.80 | 74.00 | -18.20 | 100 | 137 | peak |
| 2 | 4831.500 | 38.34 | 4.00 | 42.34 | 54.00 | -11.66 | 100 | 137 | AVG |

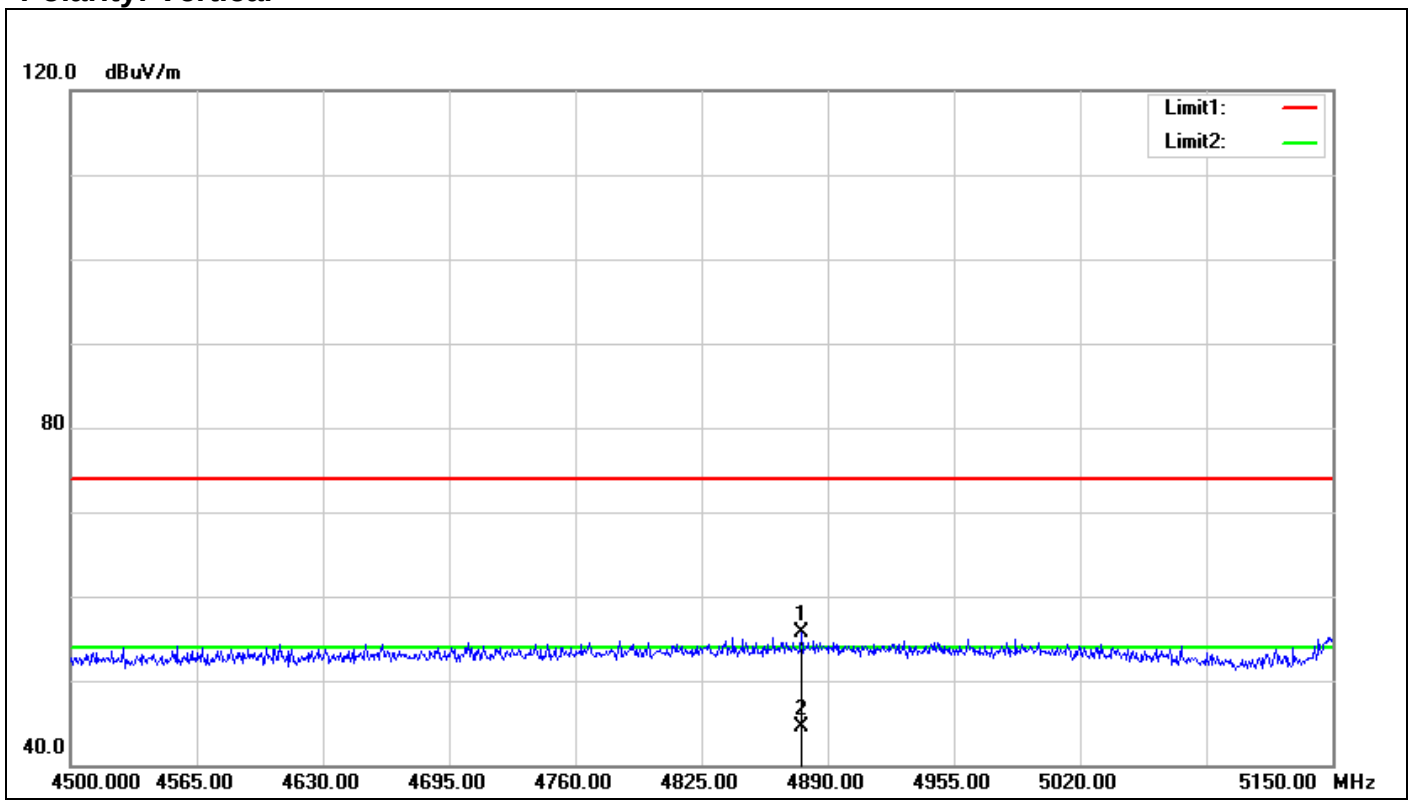
## Polarity: Horizontal




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4893.900 | 51.34 | 3.89 | 55.23 | 74.00 | -18.77 | 100 | 359 | peak |
| 2 | 4893.900 | 38.31 | 3.89 | 42.20 | 54.00 | -11.80 | 100 | 359 | AVG |

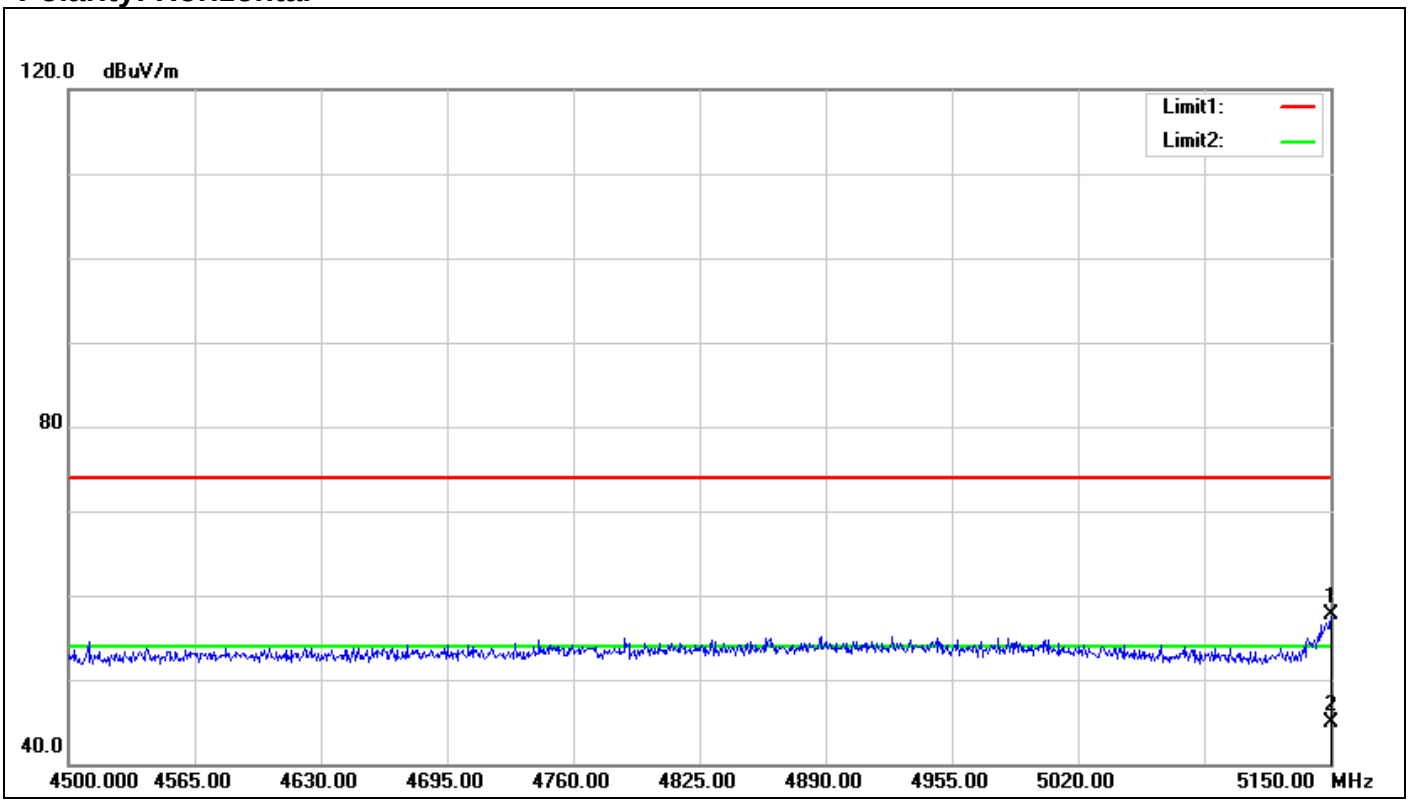
**Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)**

**Polarity: Vertical**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 4876.350 | 51.72 | 3.92 | 55.64 | 74.00 | -18.36 | 100 | 124 | peak |
| 2 | 4876.350 | 40.55 | 3.92 | 44.47 | 54.00 | -9.53 | 100 | 124 | AVG |

## Polarity: Horizontal




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | ( ° ) | |
| 1 | 5150.000 | 54.72 | 3.04 | 57.76 | 74.00 | -16.24 | 100 | 282 | peak |
| 2 | 5150.000 | 41.78 | 3.04 | 44.82 | 54.00 | -9.18 | 100 | 282 | AVG |

# 7.4 PEAK POWER SPECTRAL DENSITY

## LIMIT

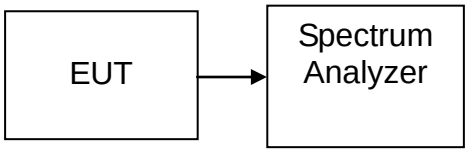
According to §15.407(a),

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

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

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

**Test Configuration**




## TEST PROCEDURE

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

## TEST RESULTS

*No non-compliance noted*

## Test Data

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

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|
| Low | 5180 | -3.08 | 17.00 | -20.08 | PASS |
| Mid | 5220 | -2.78 | 17.00 | -19.78 | PASS |
| High | 5240 | -2.56 | 17.00 | -19.56 | PASS |

### Mode 1

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

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5180 | -7.82 | -1.97 | -0.97 | 15.06 | -16.03 | PASS |
| Mid | 5220 | -6.57 | -2.23 | -0.87 | 15.06 | -15.93 | PASS |
| High | 5240 | -6.46 | -2.28 | -0.88 | 15.06 | -15.94 | PASS |

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

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5190 | -5.54 | -5.64 | -2.58 | 15.06 | -17.64 | PASS |
| High | 5230 | -5.65 | -5.52 | -2.57 | 15.06 | -17.63 | PASS |

***Remark:***

*1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 PPSD / 10)+10^(Chain 1 PPSD /10)*
*2. The maximum antenna gain is 7.94dBi; therefore the reduction due to antenna gain is 1.94dBi, so the limit is 15.06dBm.*

## Mode 2

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

| Channel | Frequency (MHz) | Chain 1 PPSD (dBm) | Chain 2 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5180 | -2.46 | -2.76 | 0.40 | 15.13 | -14.73 | PASS |
| Mid | 5220 | -2.89 | -3.30 | -0.08 | 15.13 | -15.21 | PASS |
| High | 5240 | -2.86 | -3.89 | -0.33 | 15.13 | -15.46 | PASS |

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

| Channel | Frequency (MHz) | Chain 1 PPSD (dBm) | Chain 2 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5190 | -5.91 | -5.50 | -2.69 | 15.13 | -17.82 | PASS |
| High | 5230 | -5.63 | -5.49 | -2.55 | 15.13 | -17.68 | PASS |

***Remark:***

*1. Total PPSD (dBm) = 10^(Chain 1 PPSD /10)+10^(Chain 2 PPSD /10))*
*2. The maximum antenna gain is 7.87dBi; therefore the reduction due to antenna gain is 1.87dBi, so the limit is 15.13dBm.*

## Mode 3

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

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 2 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5180 | -8.03 | -4.26 | -2.74 | 15.18 | -17.92 | PASS |
| Mid | 5220 | -7.78 | -4.54 | -2.85 | 15.18 | -18.03 | PASS |
| High | 5240 | -7.44 | -4.60 | -2.78 | 15.18 | -17.96 | PASS |

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

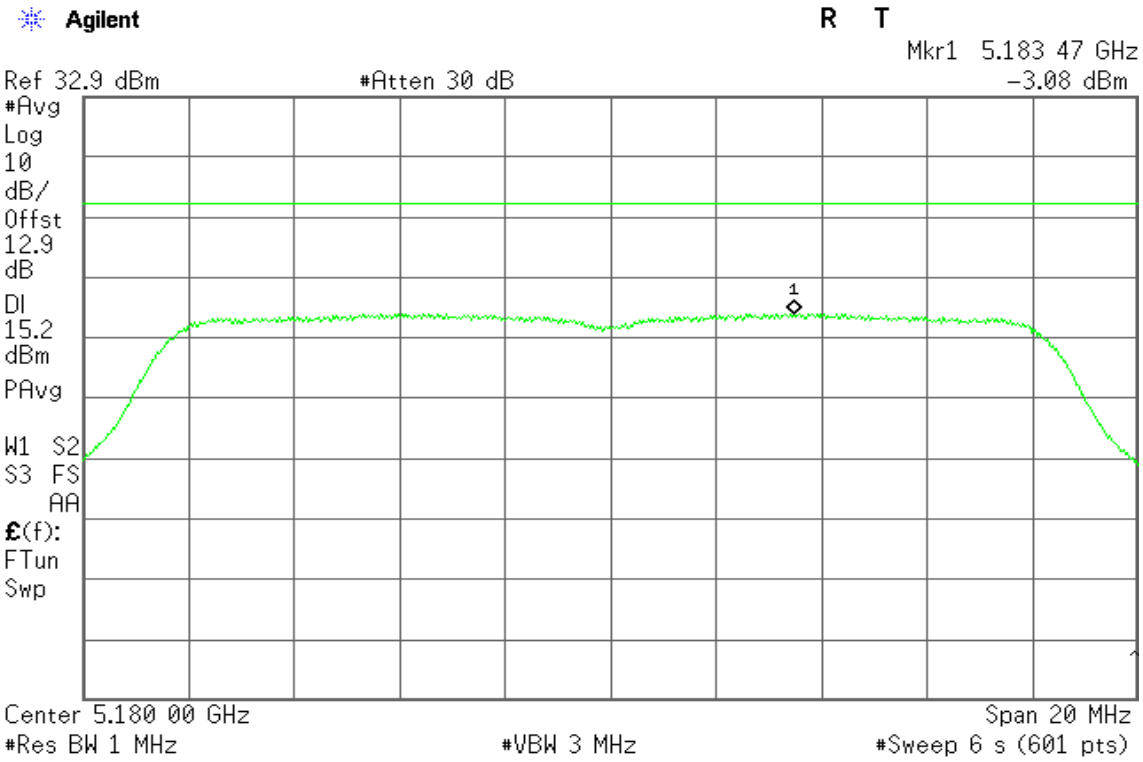
| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 2 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Margin | Result |
|---|---|---|---|---|---|---|---|
| Low | 5190 | -6.67 | -5.37 | -2.96 | 15.18 | -18.14 | PASS |
| High | 5230 | -8.10 | -4.35 | -2.82 | 15.18 | -18.00 | PASS |

***Remark:***

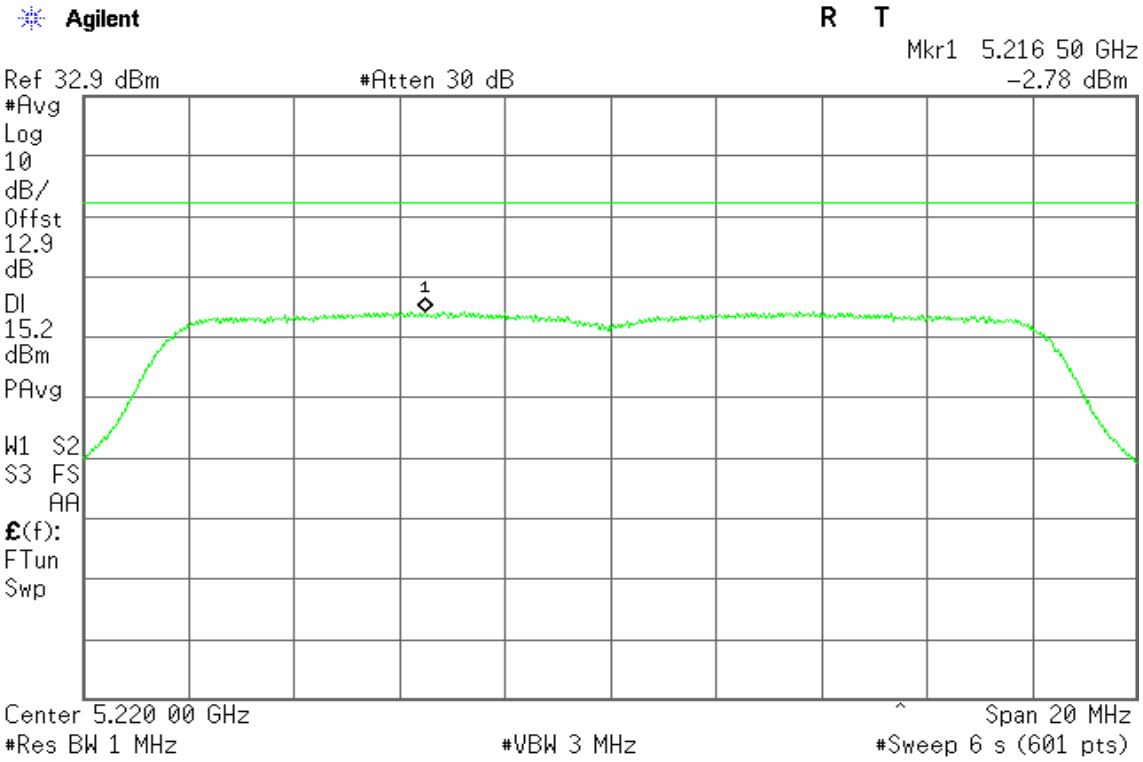
*1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 PPSD / 10) +10^(Chain 2 PPSD /10))*
*2. The maximum antenna gain is 7.82dBi; therefore the reduction due to antenna gain is 1.82dBi, so the limit is 15.18dBm.*

## Test Plot
## IEEE 802.11a mode / 5180 ~ 5240MHz

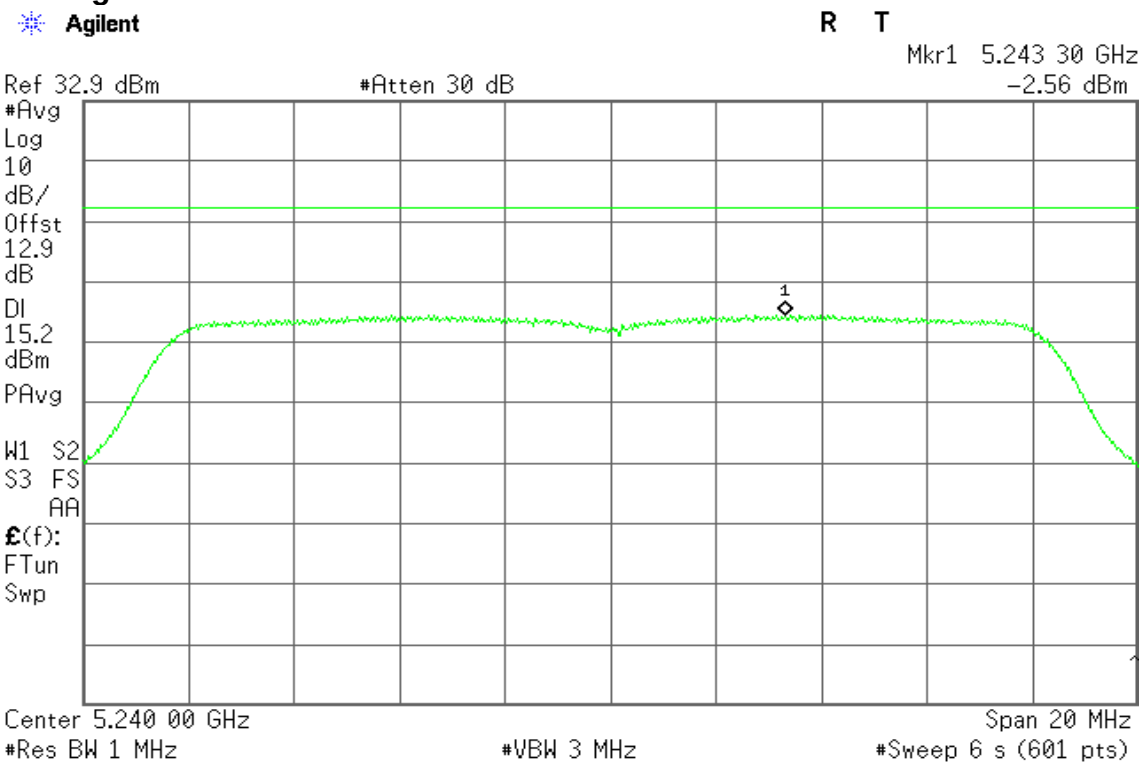
### CH Low




### CH Mid



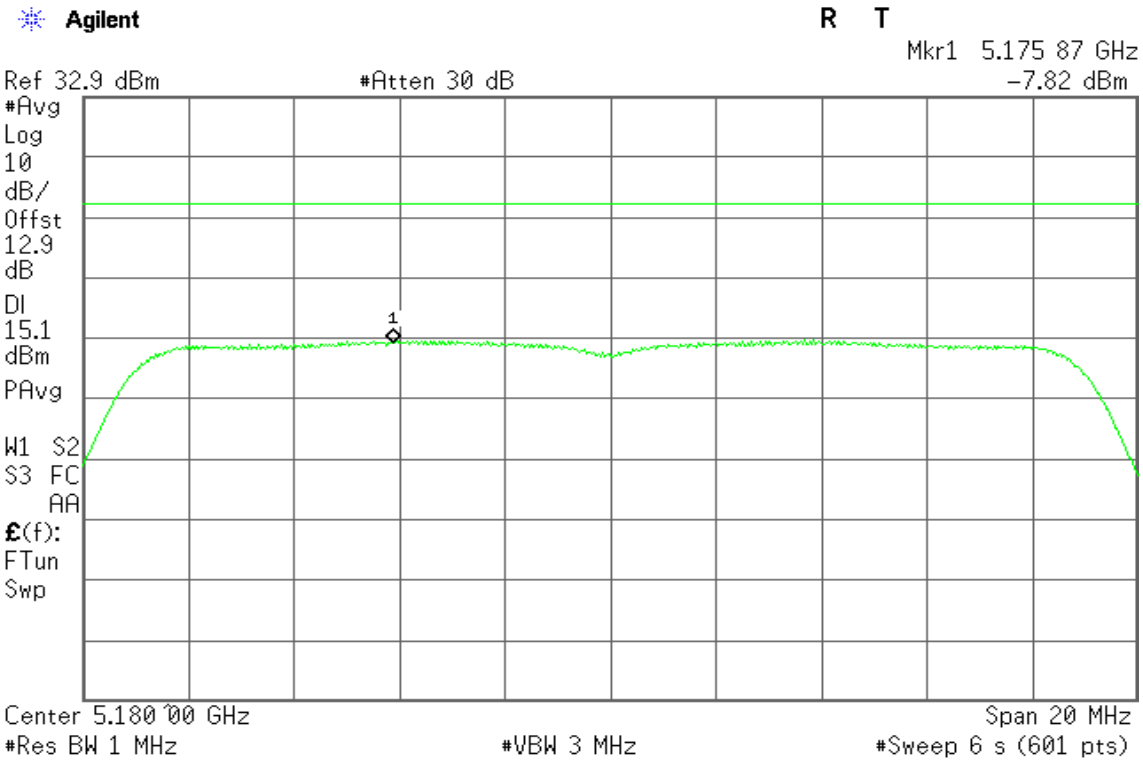
## CH High


Agilent
R T
Mkr1 5.243 30 GHz
-2.56 dBm
Ref 32.9 dBm
#Atten 30 dB
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.2
dBm
PAvg
W1 S2
S3 FS
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

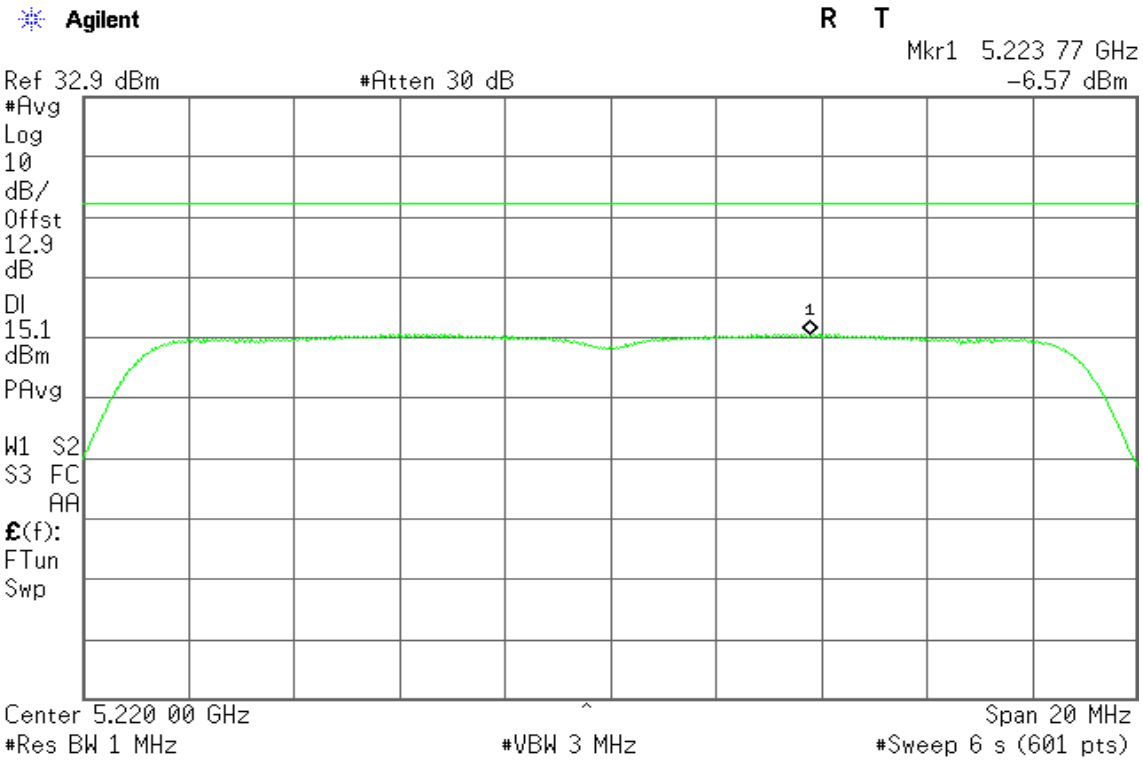
## Mode 1

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

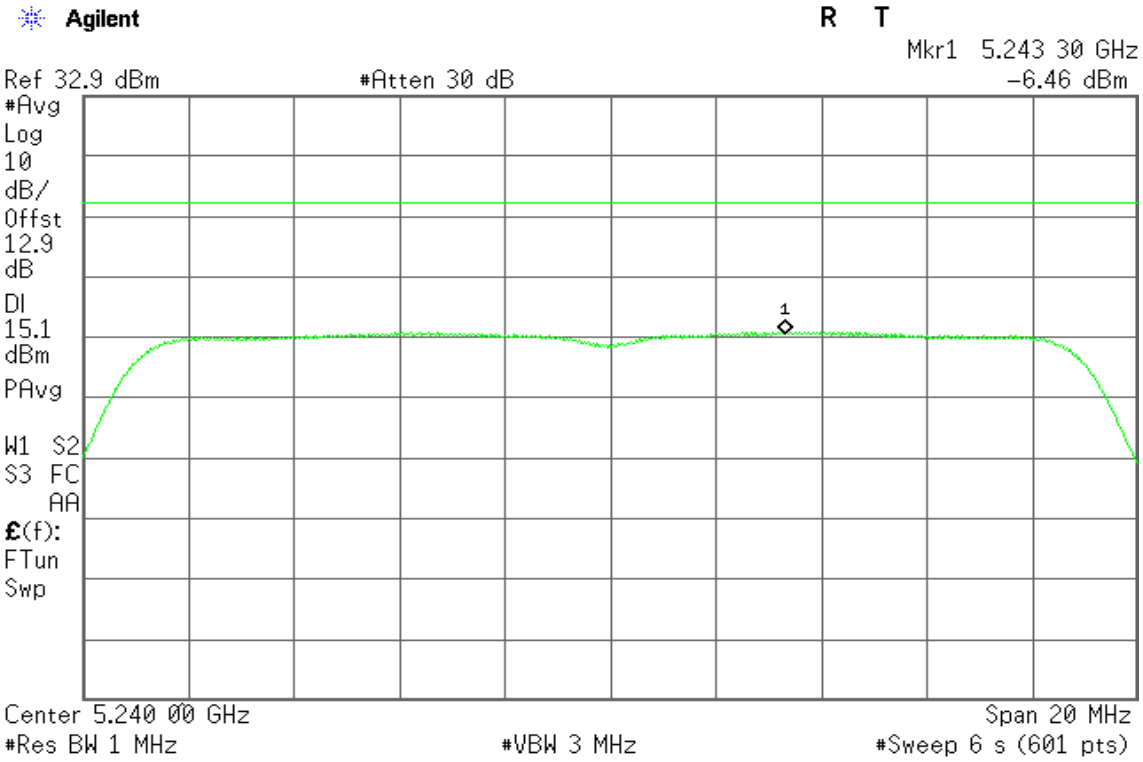
### CH Low




### CH Mid

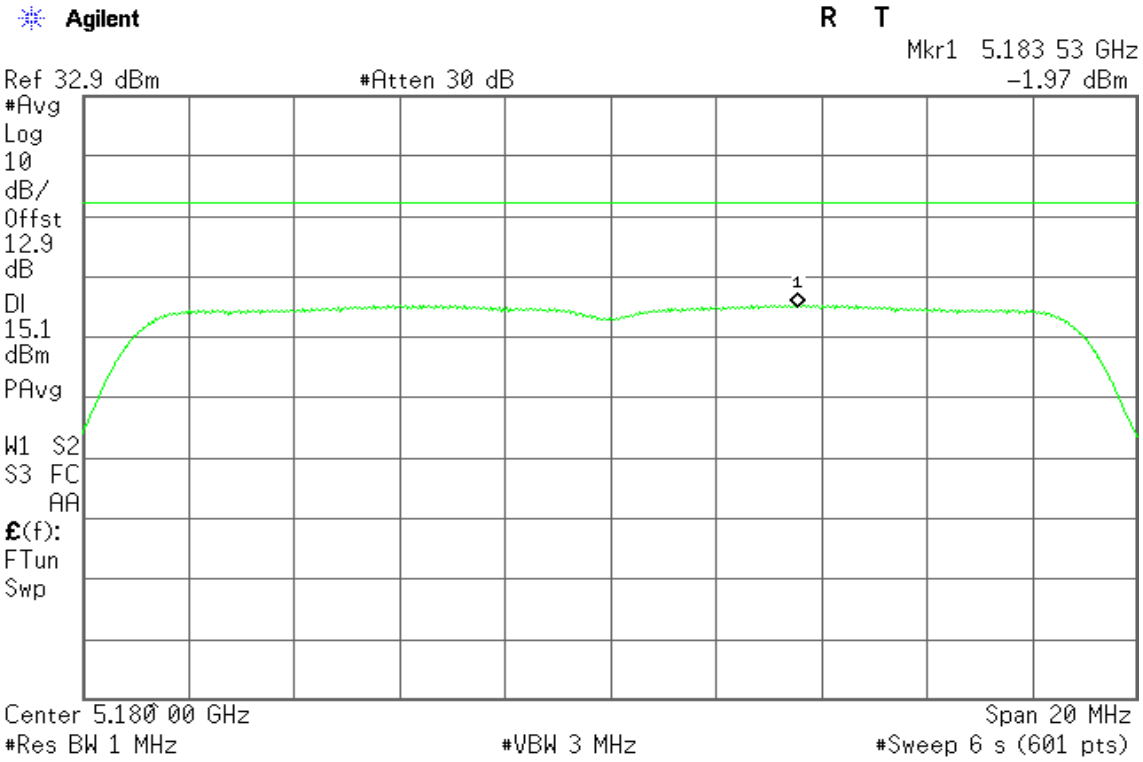


## CH High

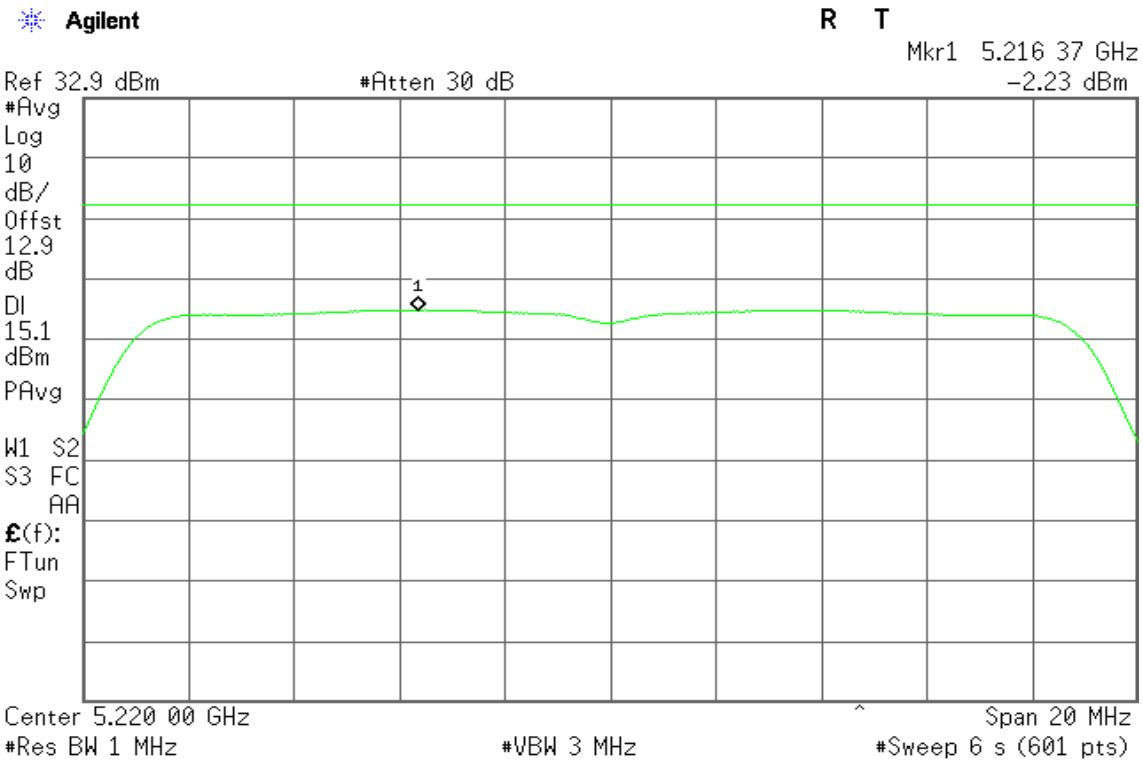

Agilent
R T
Mkr1 5.243 30 GHz
Ref 32.9 dBm
#Atten 30 dB
-6.46 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.1
dBm
PAvg
W1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

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

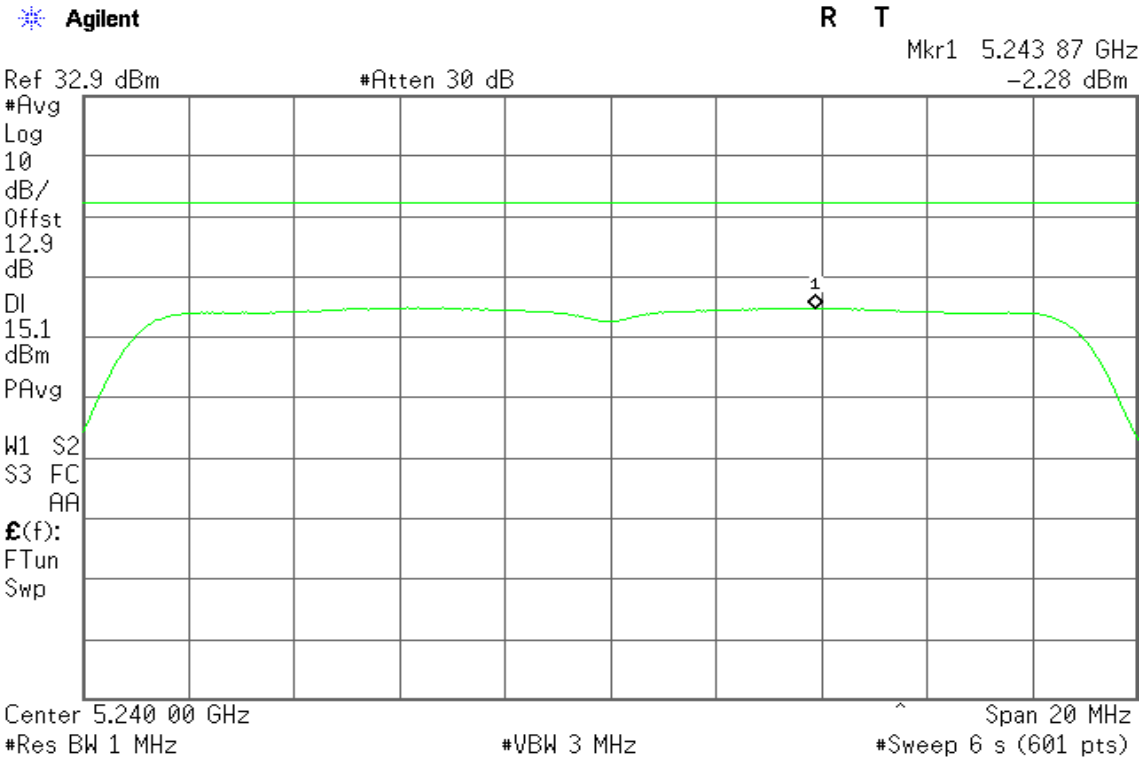
### CH Low




### CH Mid

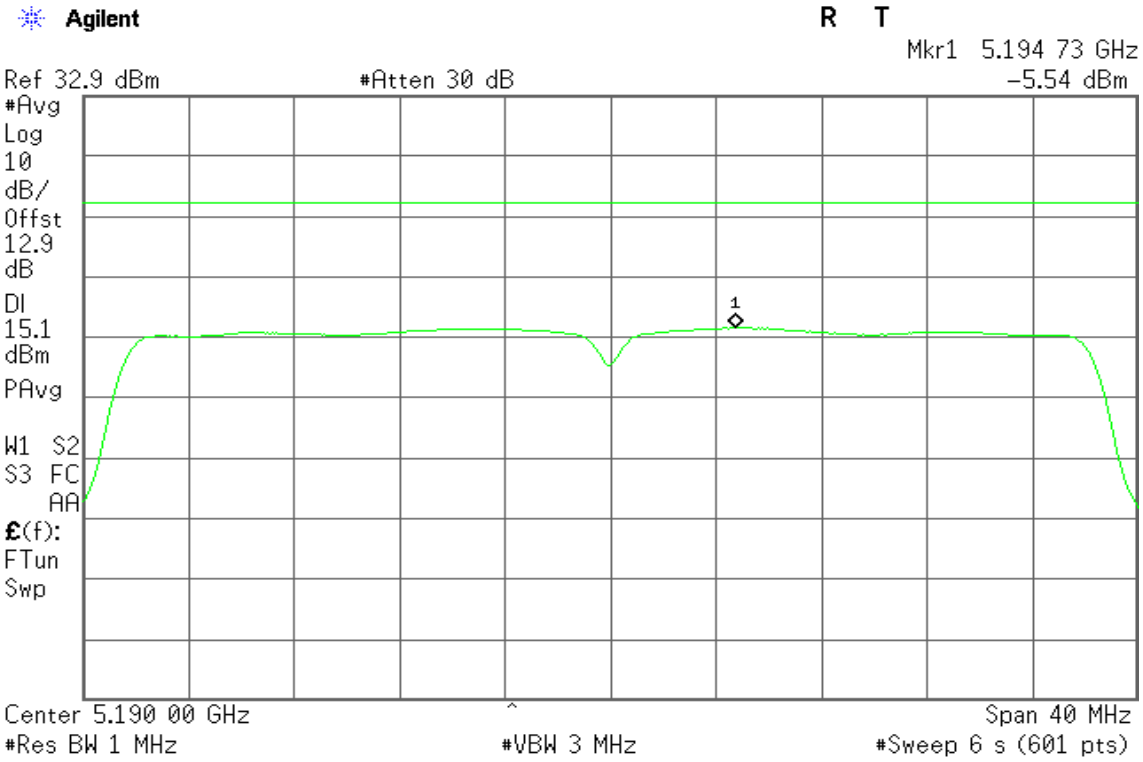


## CH High

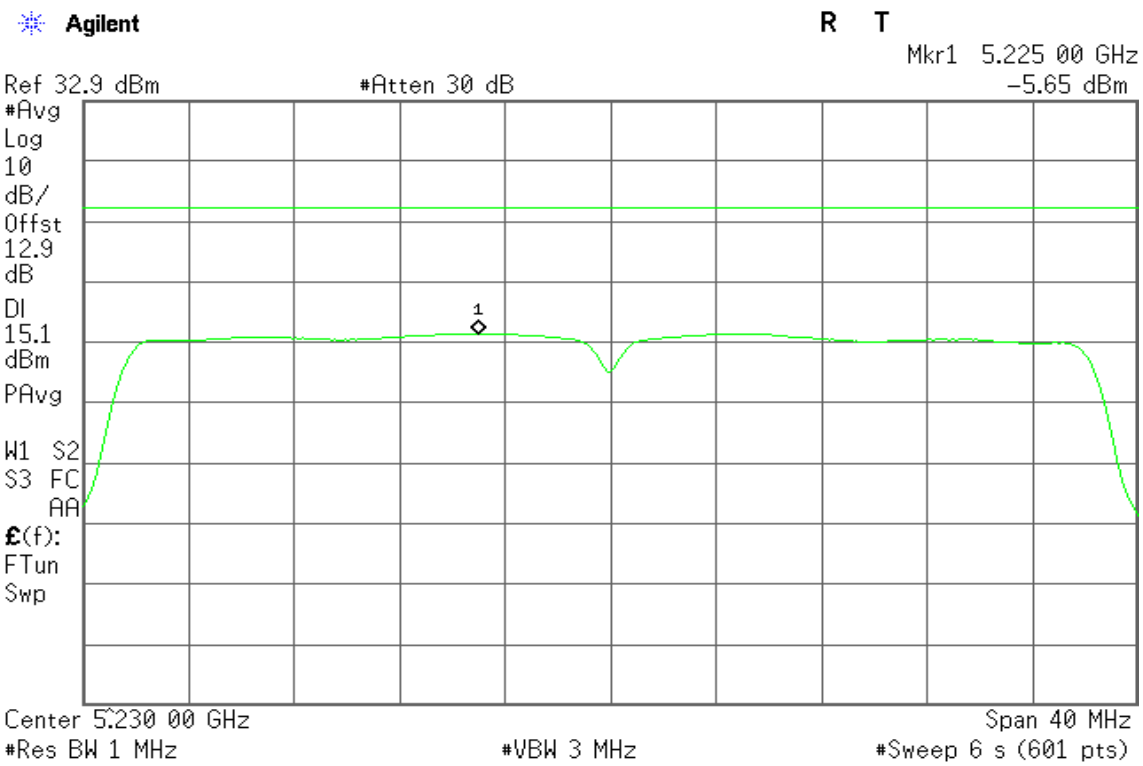

Agilent
R T
Mkr1 5.243 87 GHz
Ref 32.9 dBm
#Atten 30 dB
-2.28 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.1
dBm
PAvg
W1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

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

### CH Low

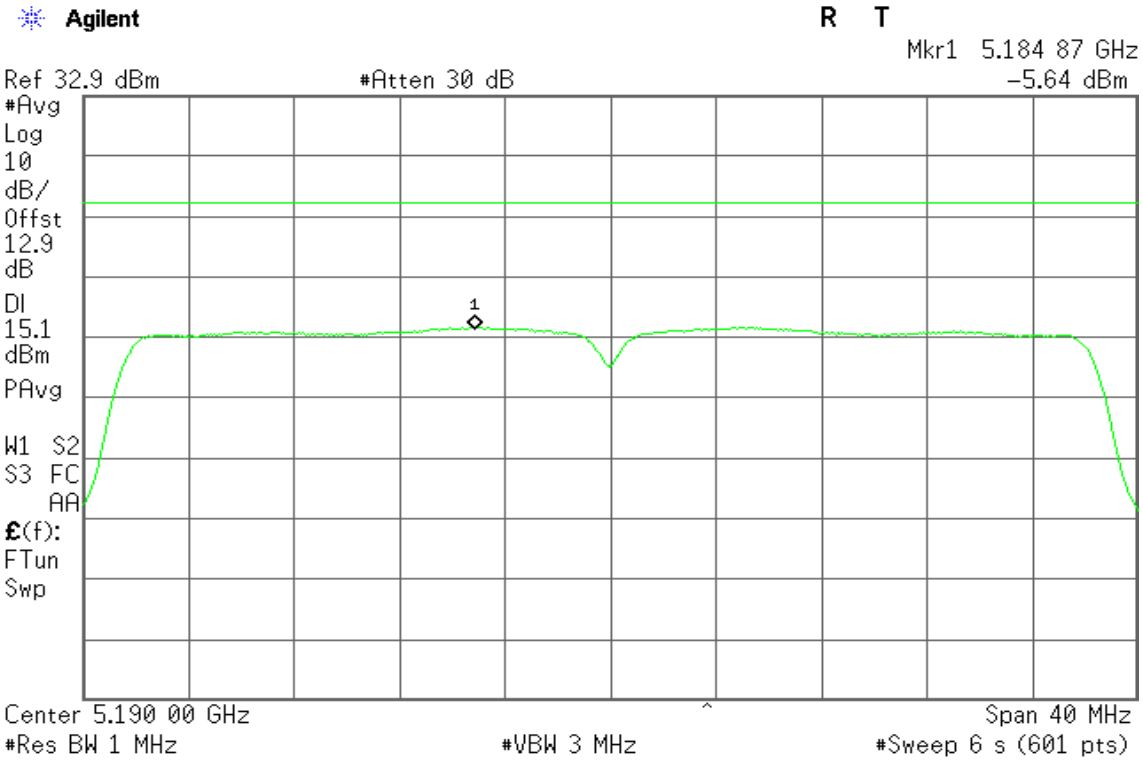



### CH High

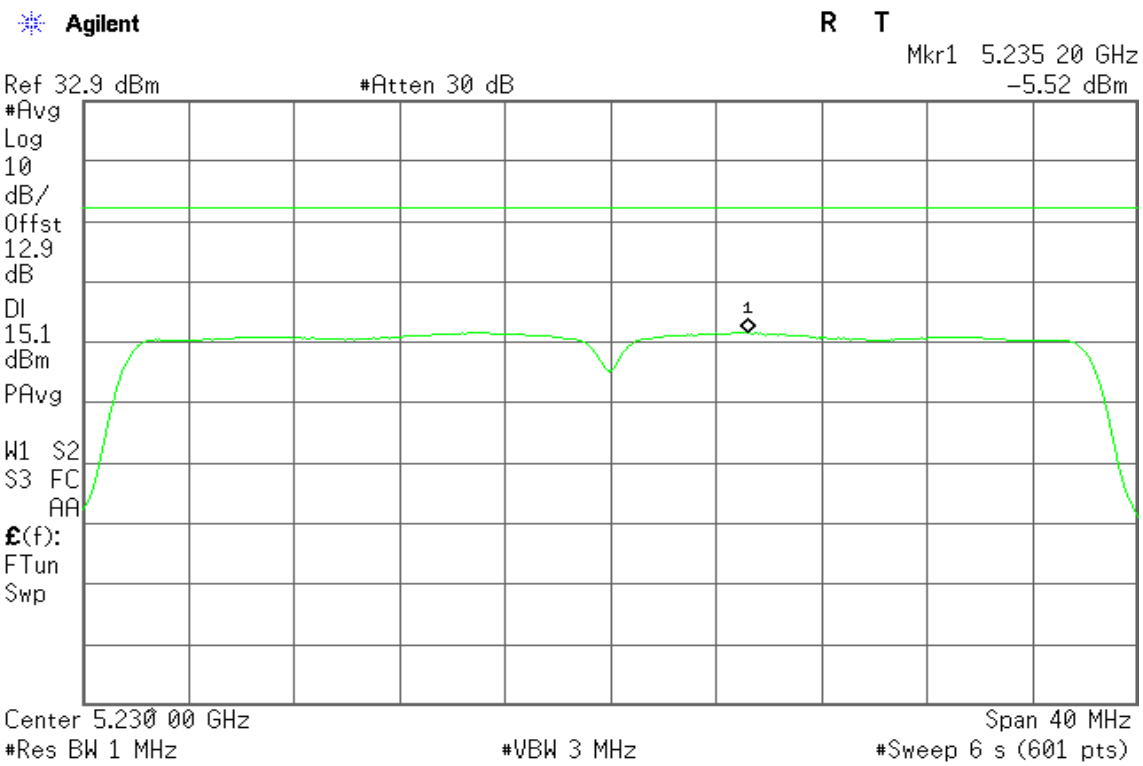


## IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 1

### CH Low



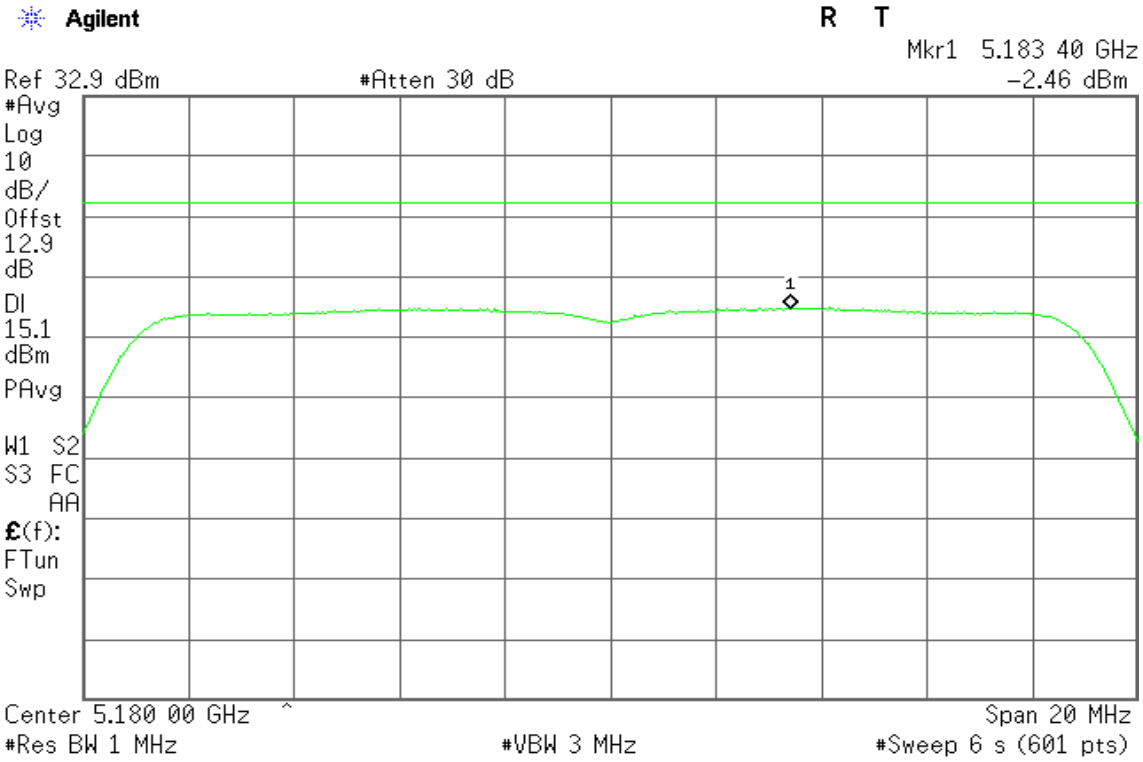

### CH High



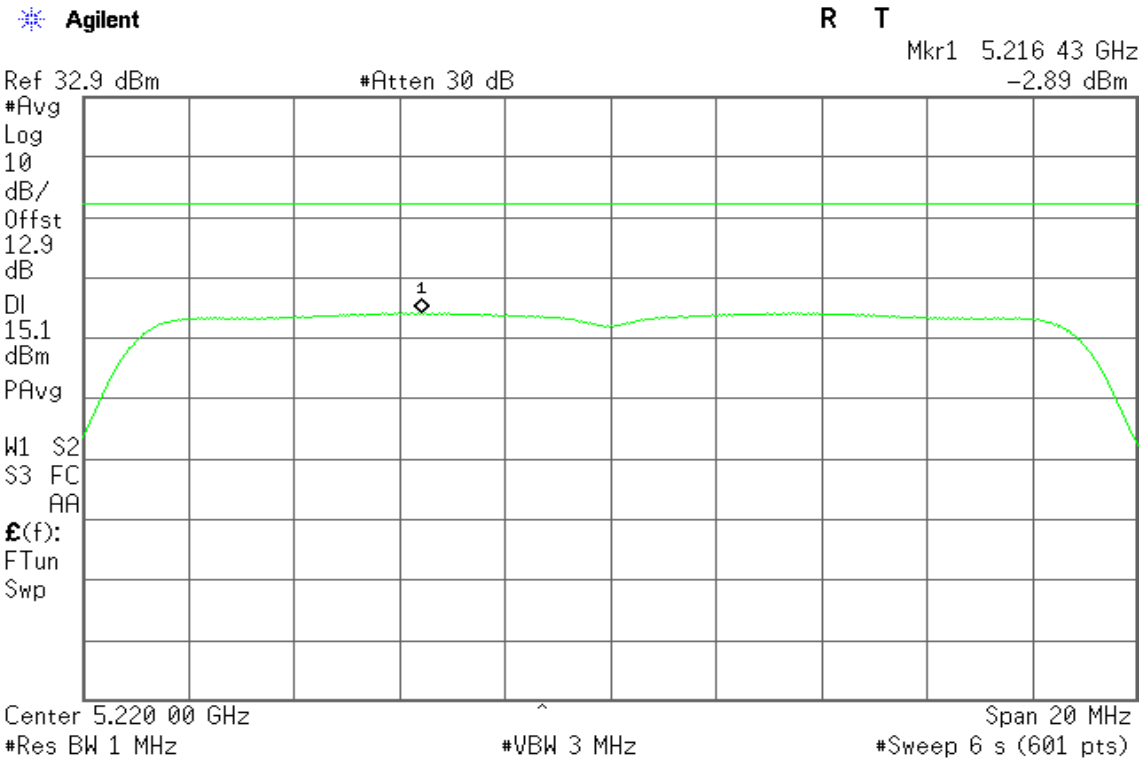
## Mode 2

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

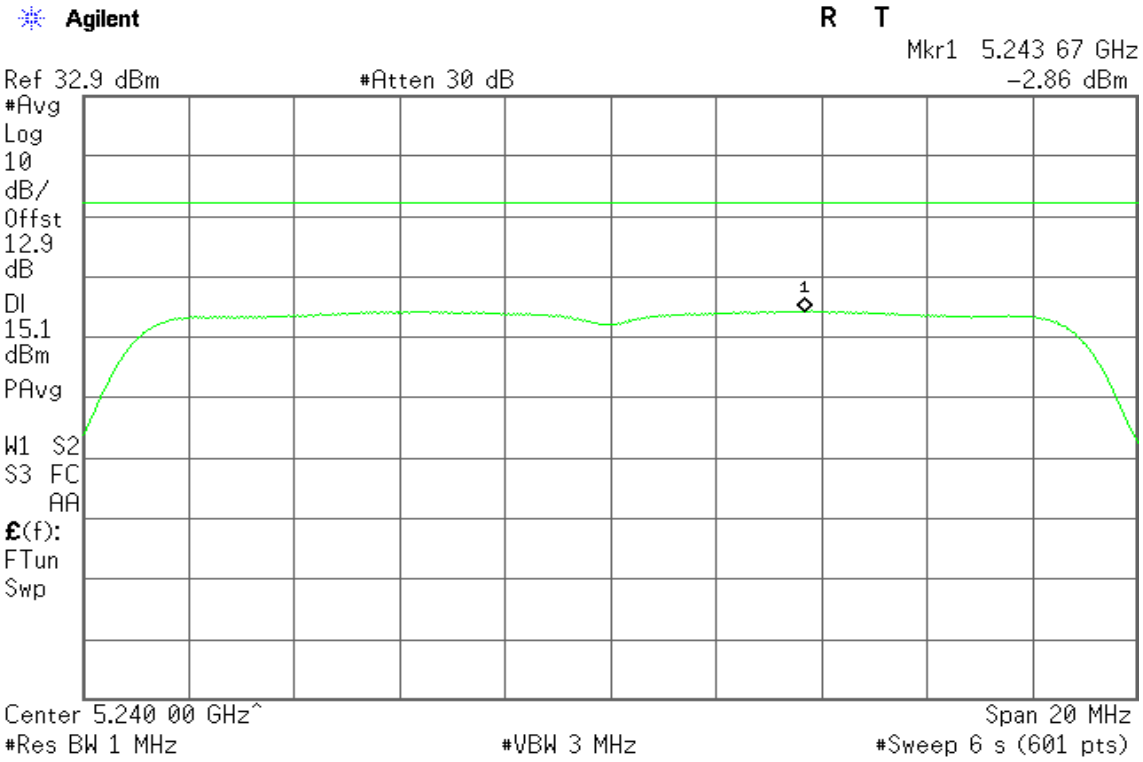
### CH Low




### CH Mid

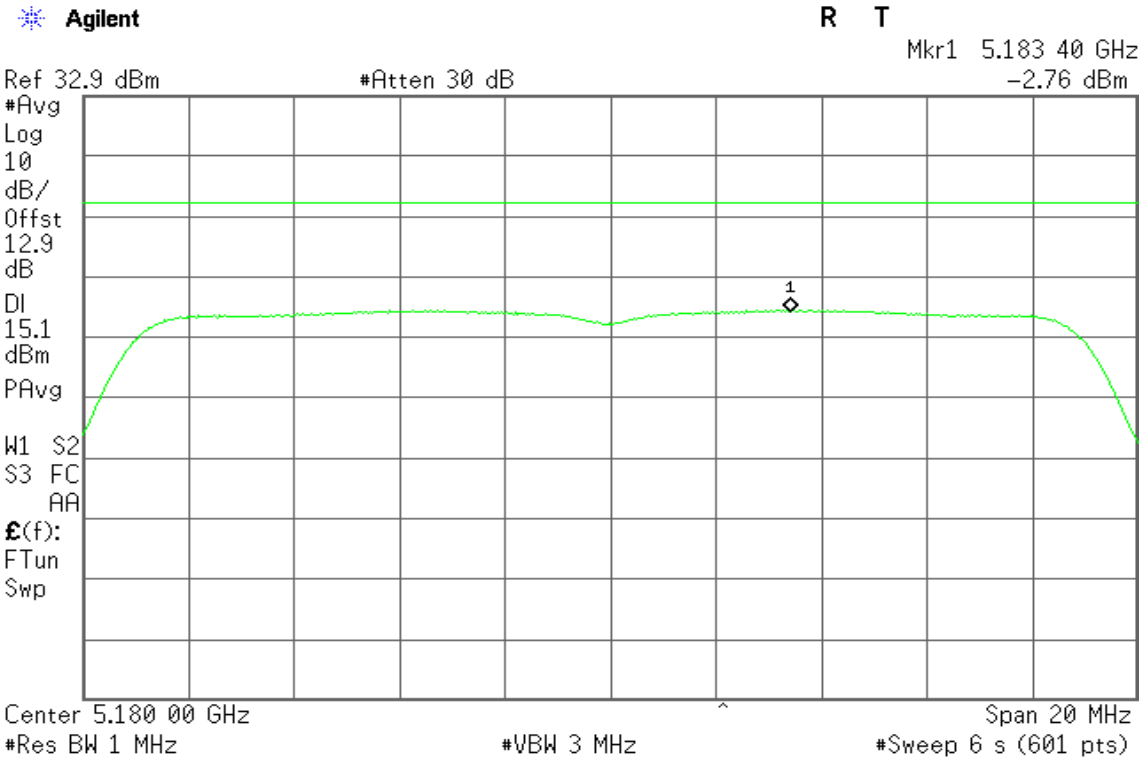


## CH High

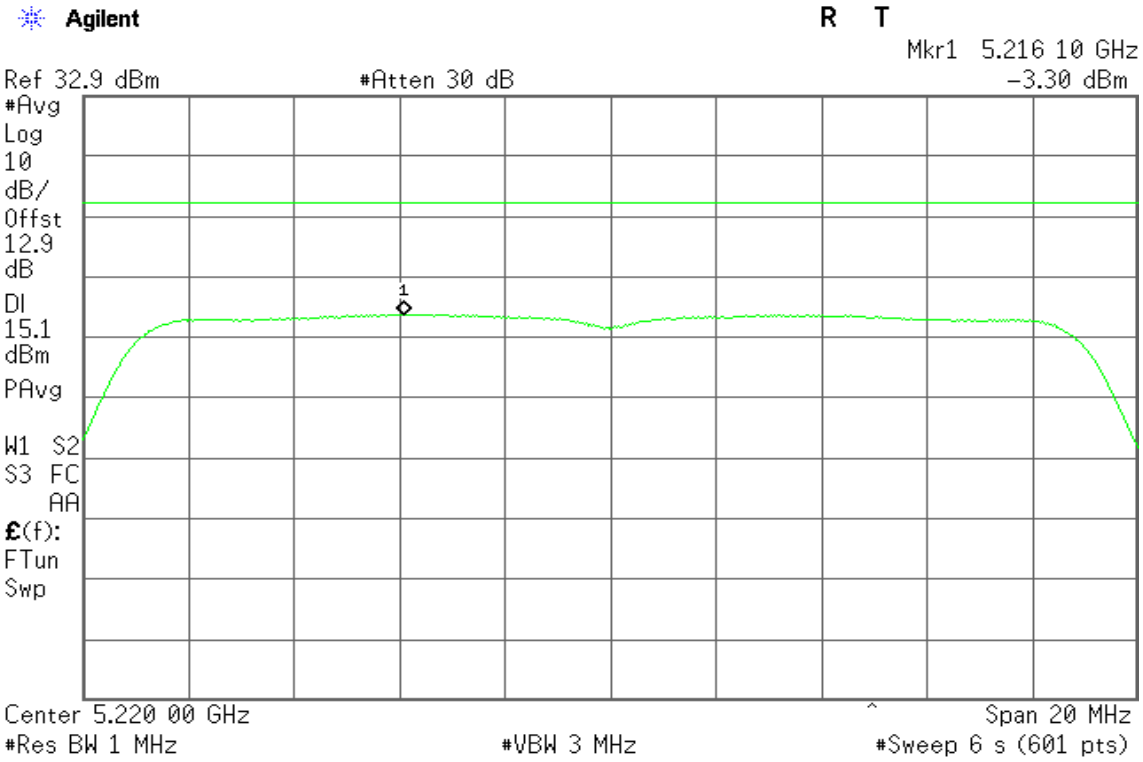

Agilent
R T
Mkr1 5.243 67 GHz
Ref 32.9 dBm
#Atten 30 dB
-2.86 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.1
dBm
PAvg
W1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz^
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

## IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 2

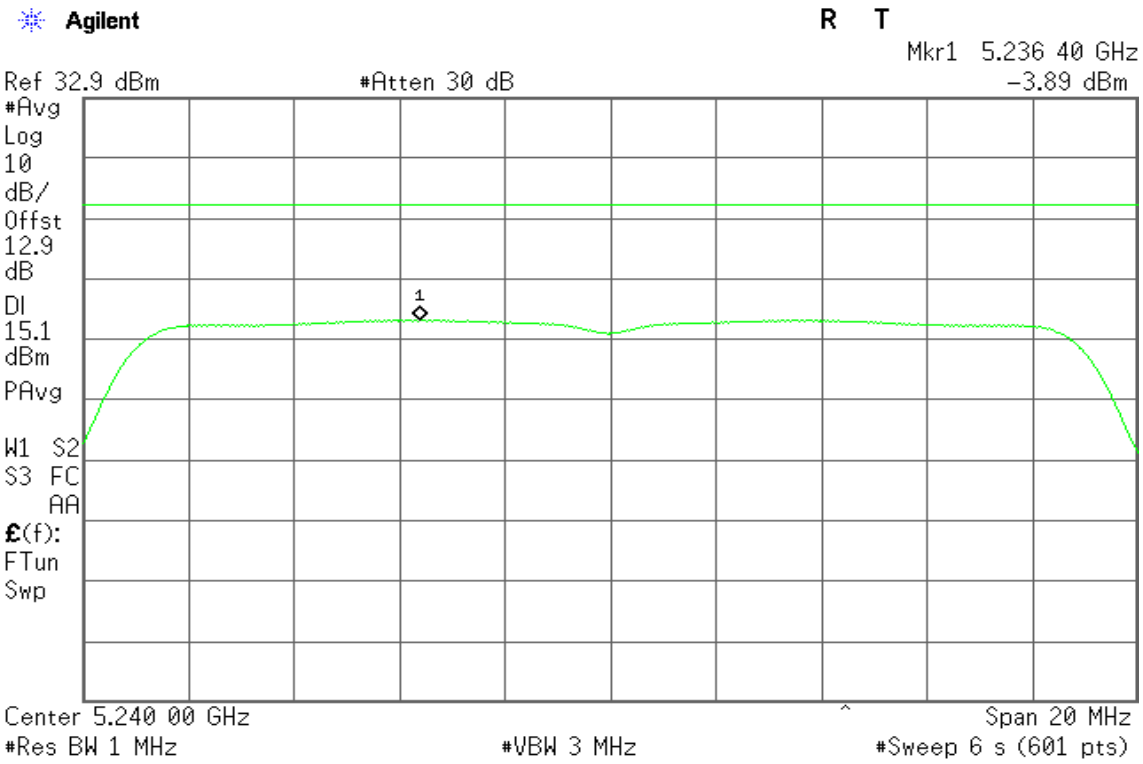
### CH Low




### CH Mid

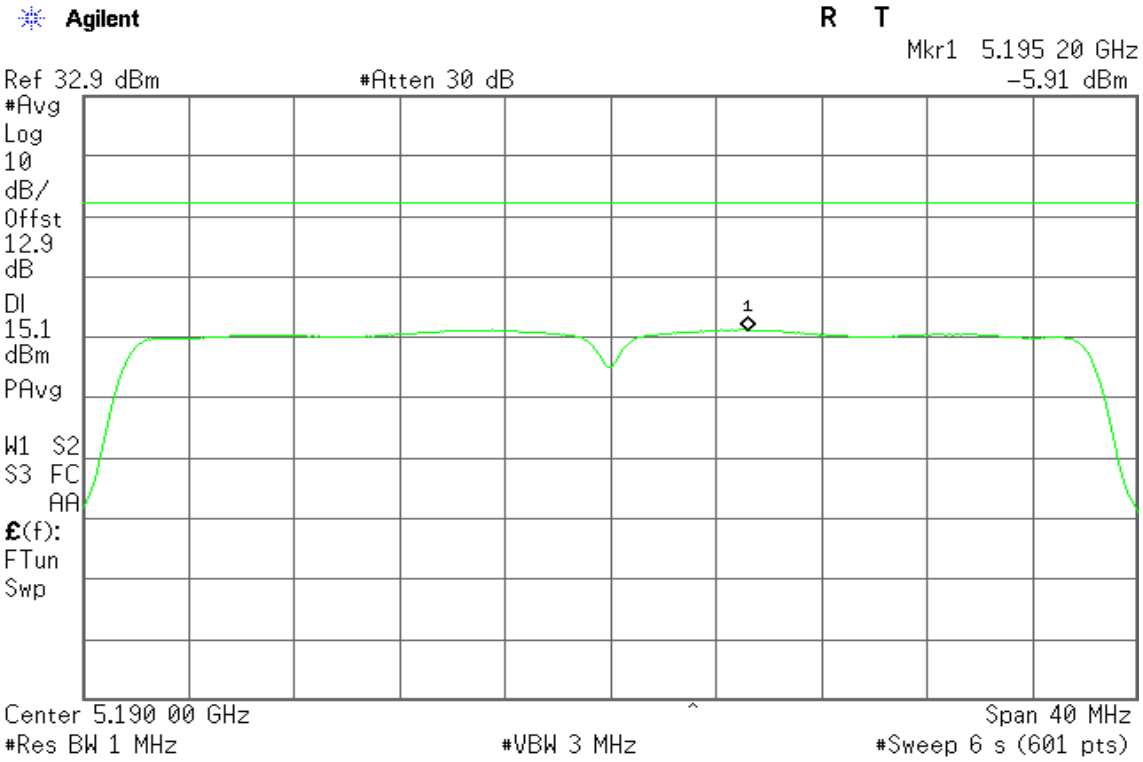


## CH High

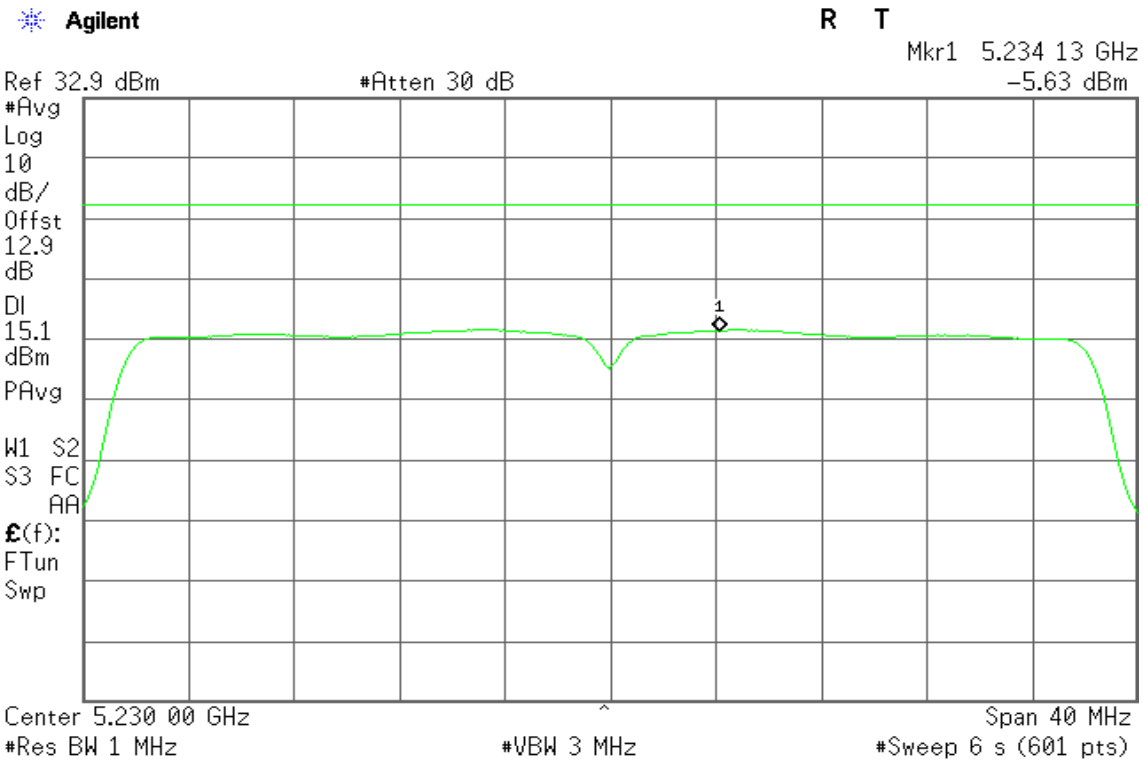

Agilent
R T
Mkr1 5.236 40 GHz
Ref 32.9 dBm
#Atten 30 dB
-3.89 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.1
dBm
PAvg
W1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

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

### CH Low

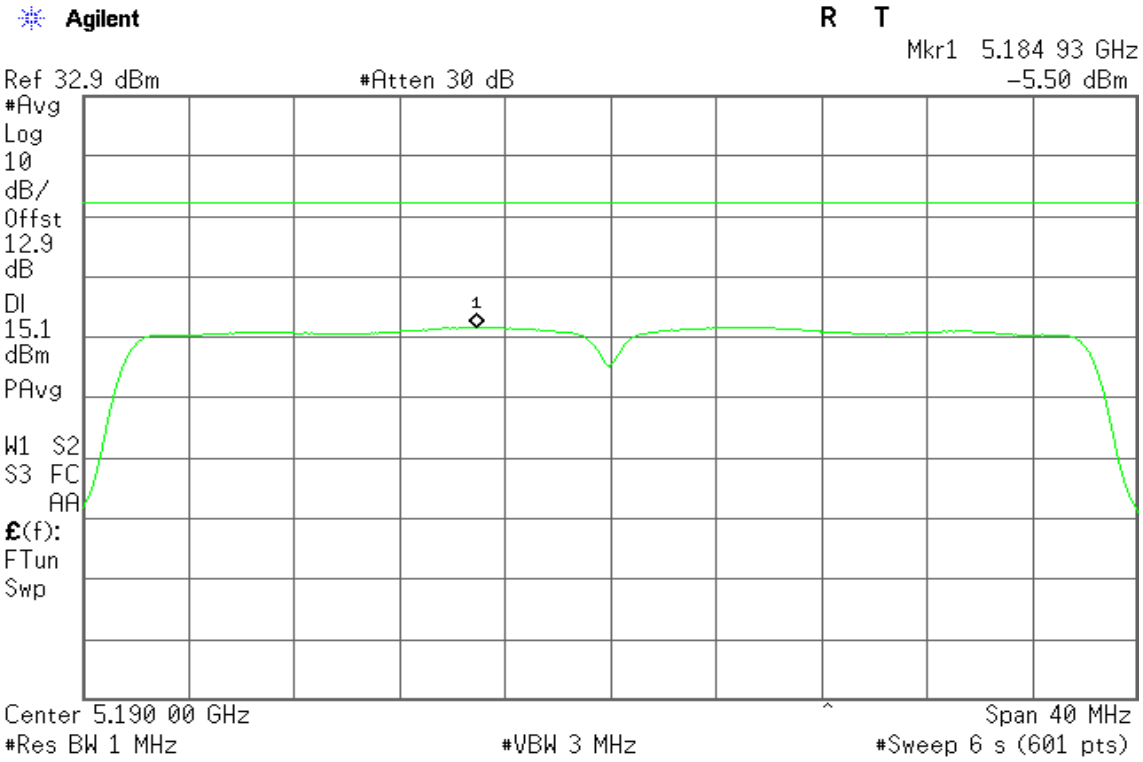



### CH High

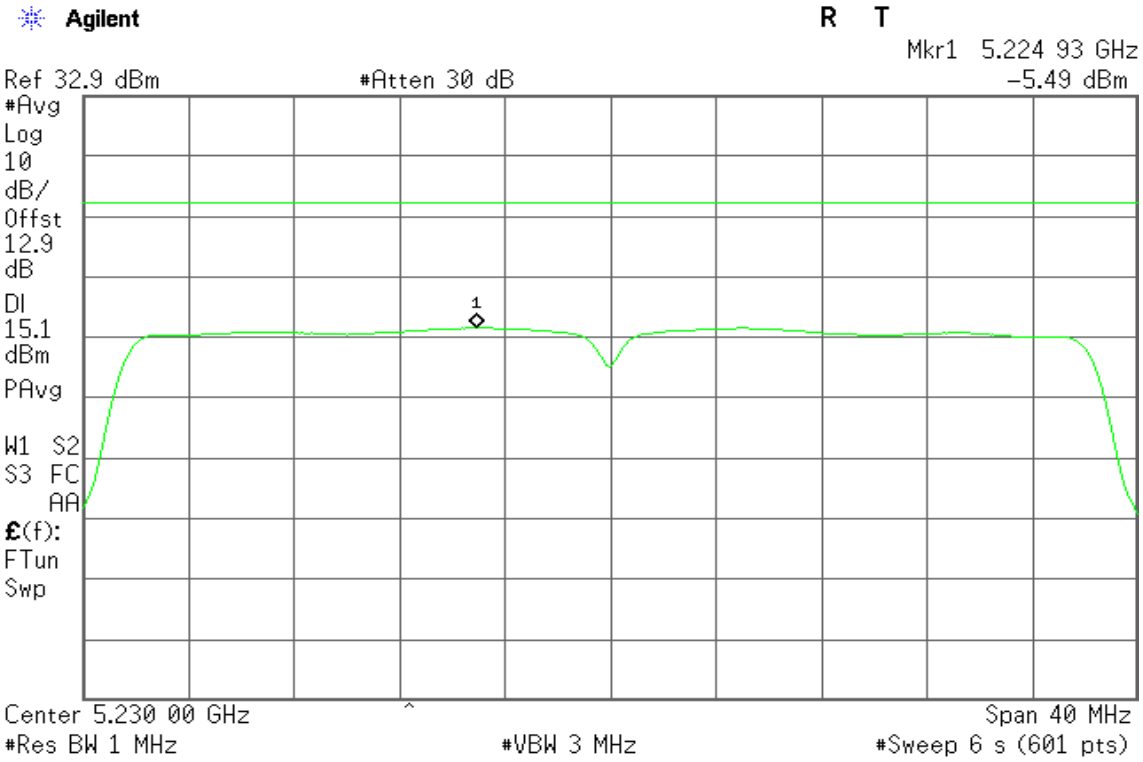


## IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 2

### CH Low



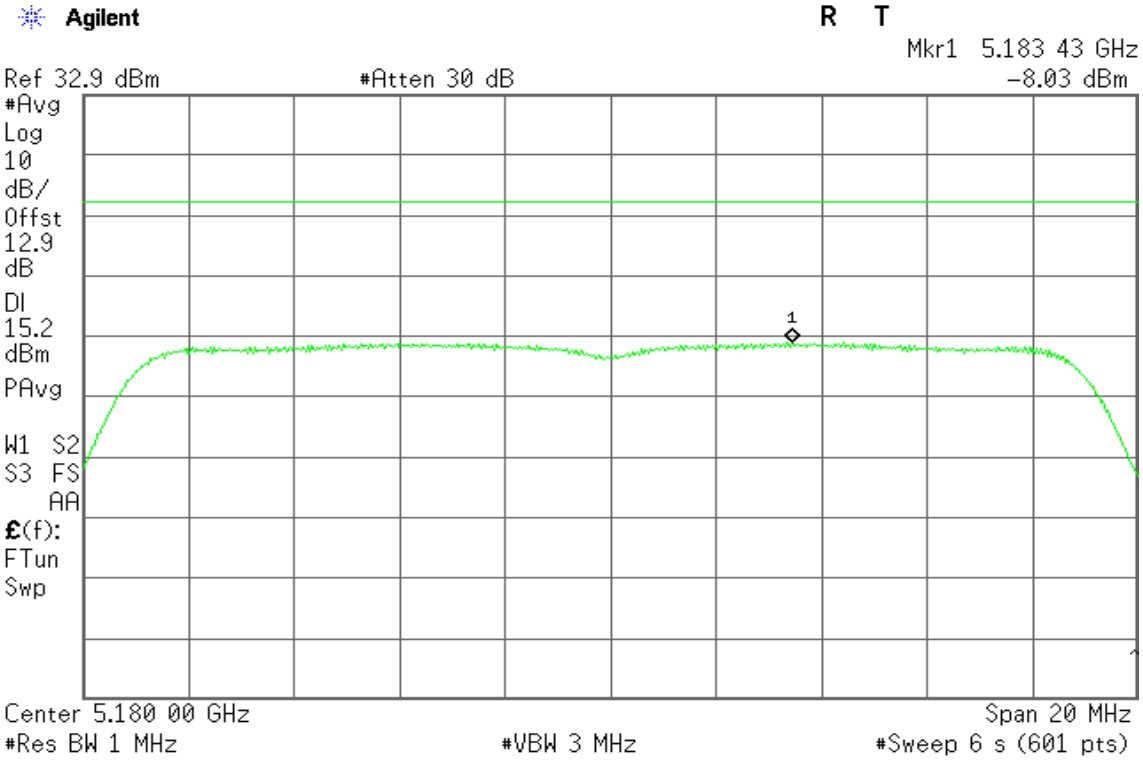

### CH High



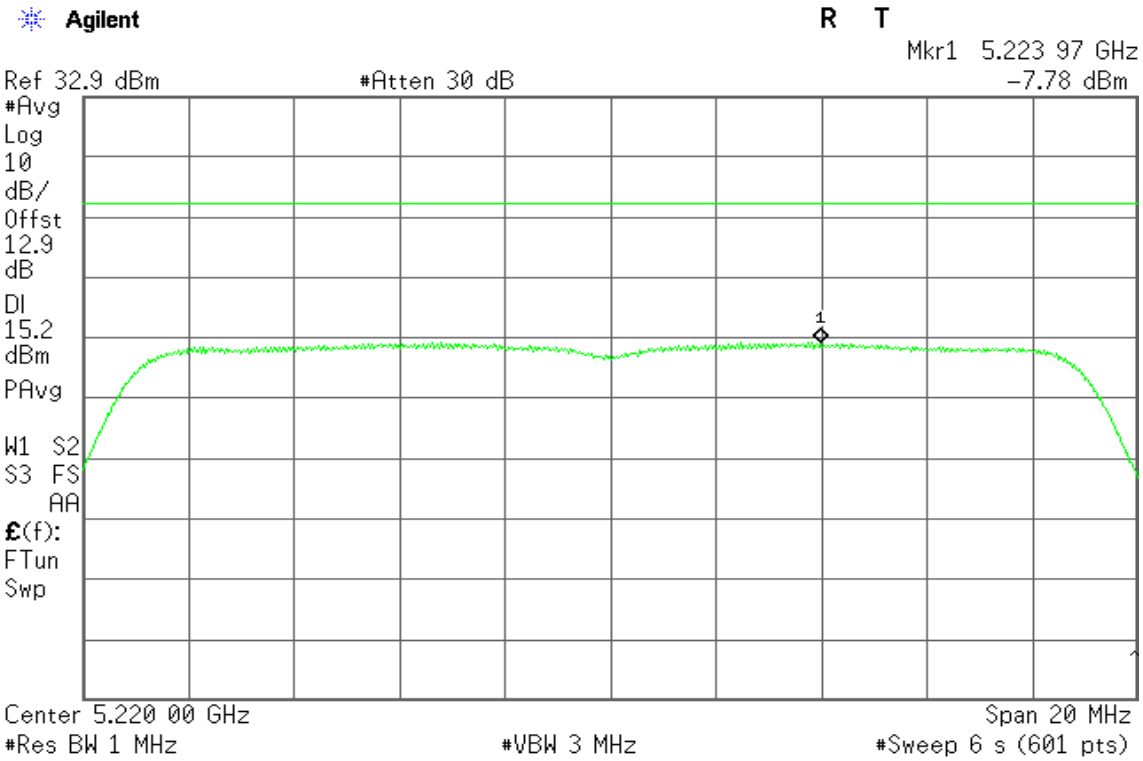
## Mode 3

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

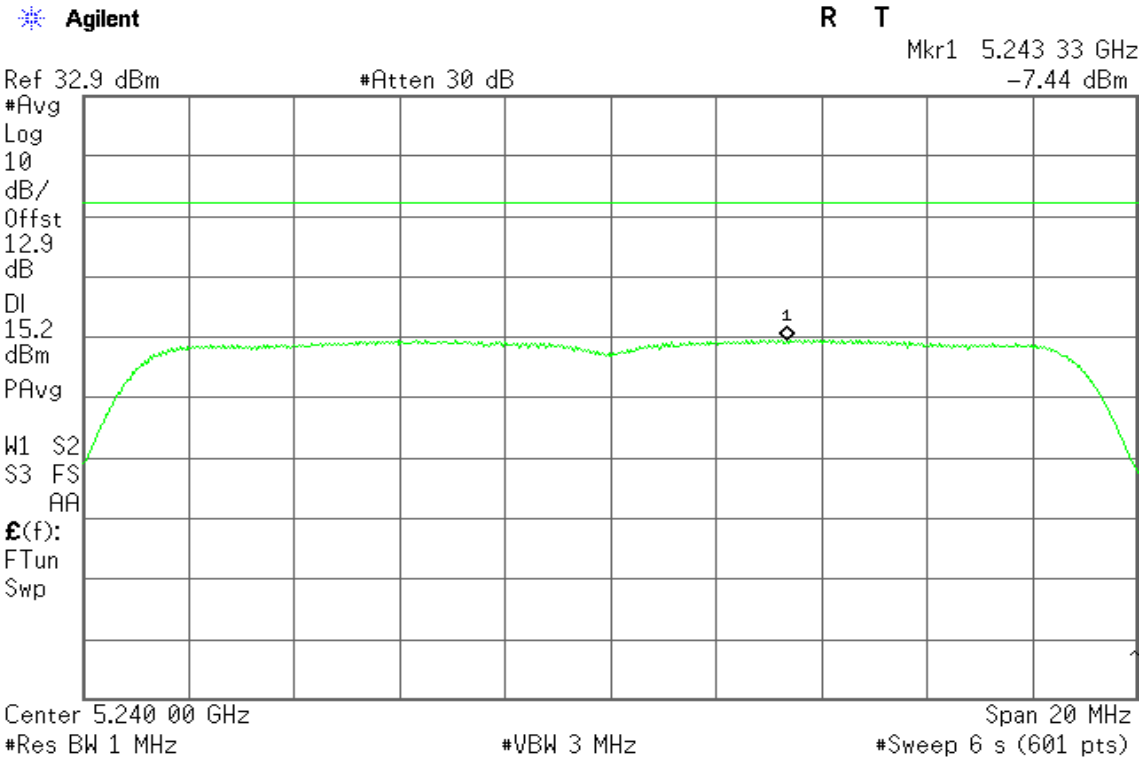
### CH Low




### CH Mid

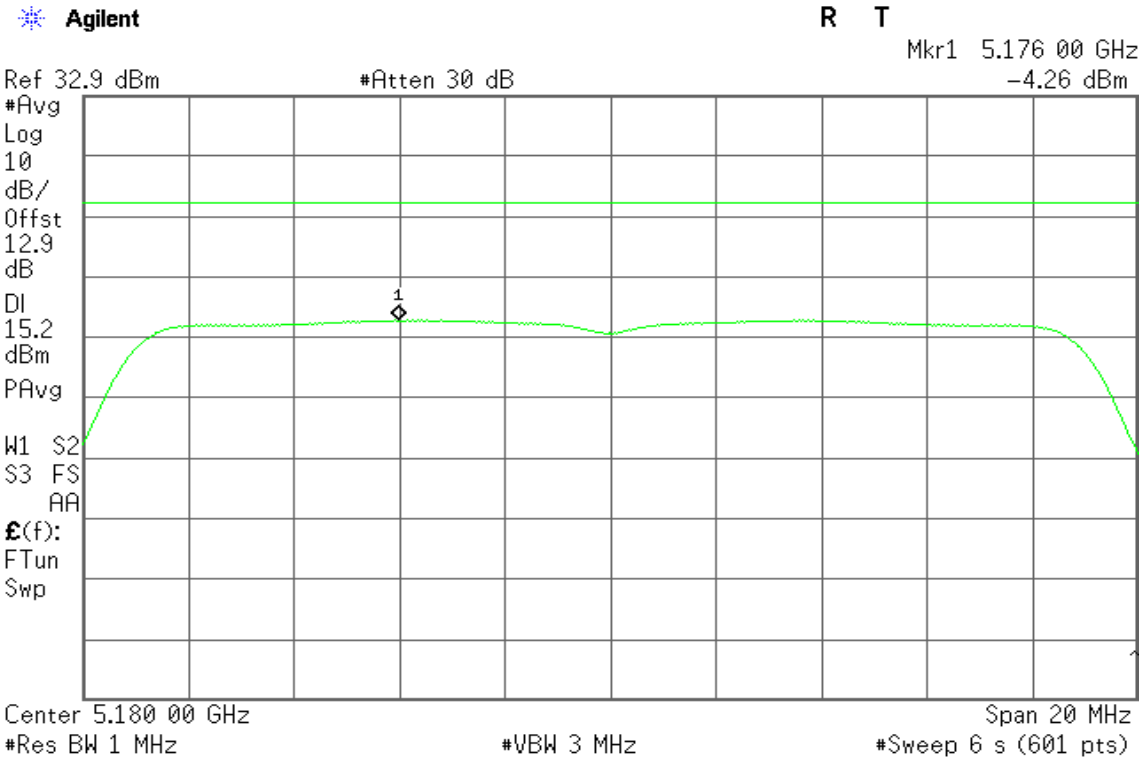


## CH High

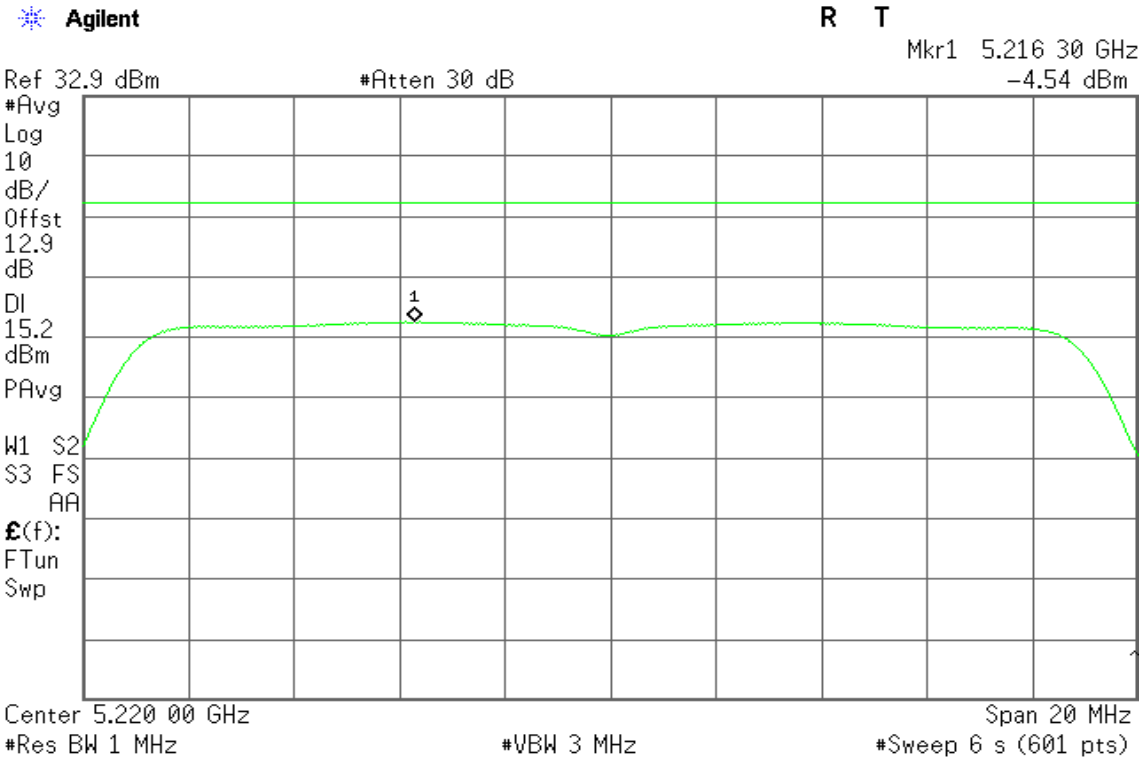

Agilent
R T
Mkr1 5.243 33 GHz
Ref 32.9 dBm
#Atten 30 dB
-7.44 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.2
dBm
PAvg
W1 S2
S3 FS
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

## IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 2

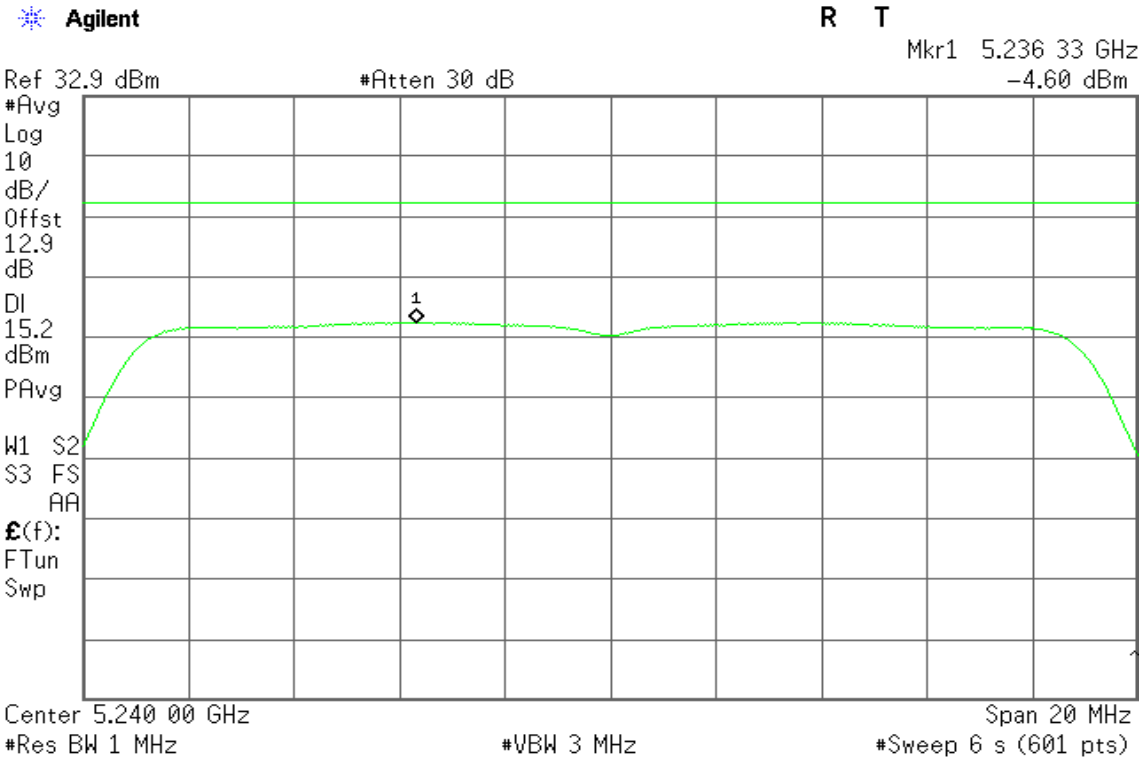
### CH Low




### CH Mid

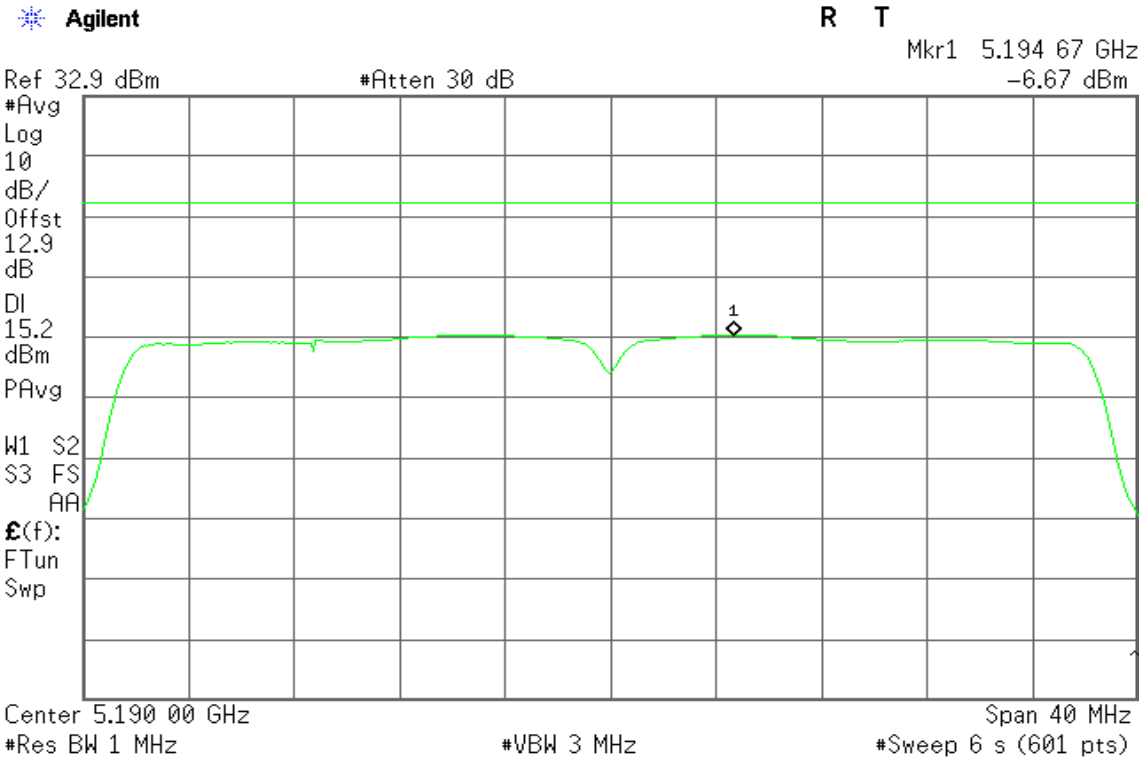


## CH High

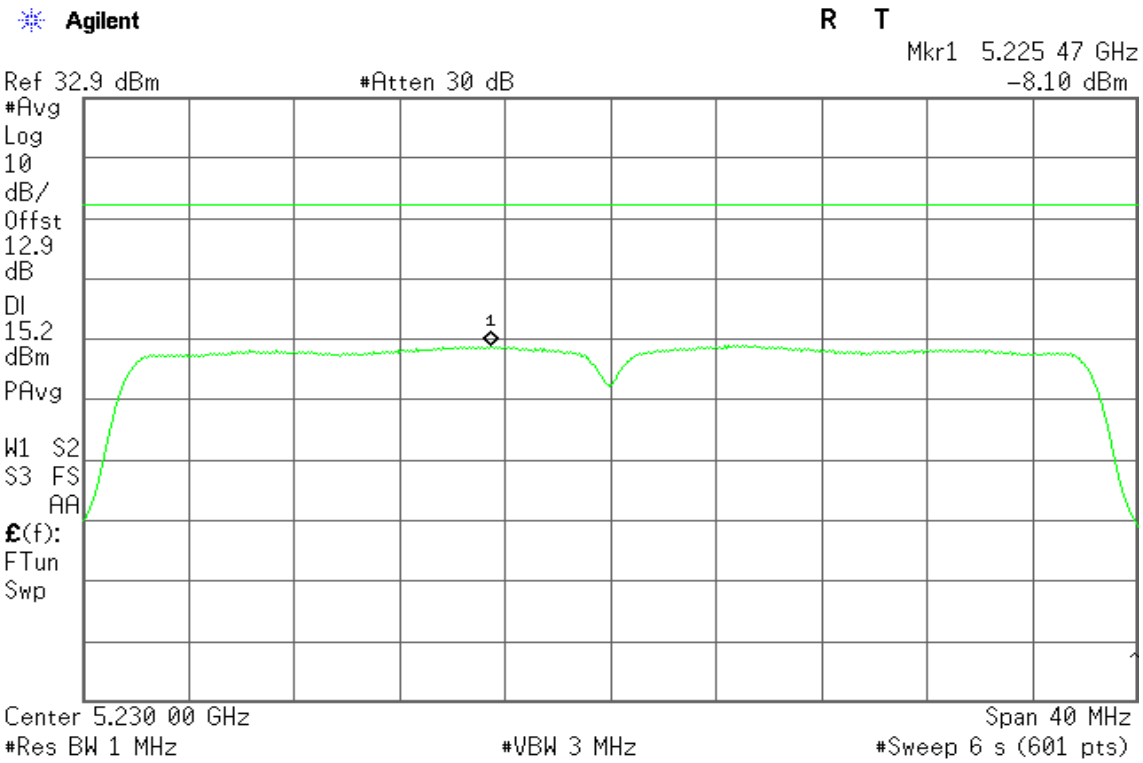

Agilent
R T
Mkr1 5.236 33 GHz
Ref 32.9 dBm
#Atten 30 dB
-4.60 dBm
#Avg
Log
10
dB/
Offst
12.9
dB
Dl
15.2
dBm
PAvg
W1 S2
S3 FS
AA
£(f):
FTun
Swp
1
Center 5.240 00 GHz
Span 20 MHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 6 s (601 pts)

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

### CH Low

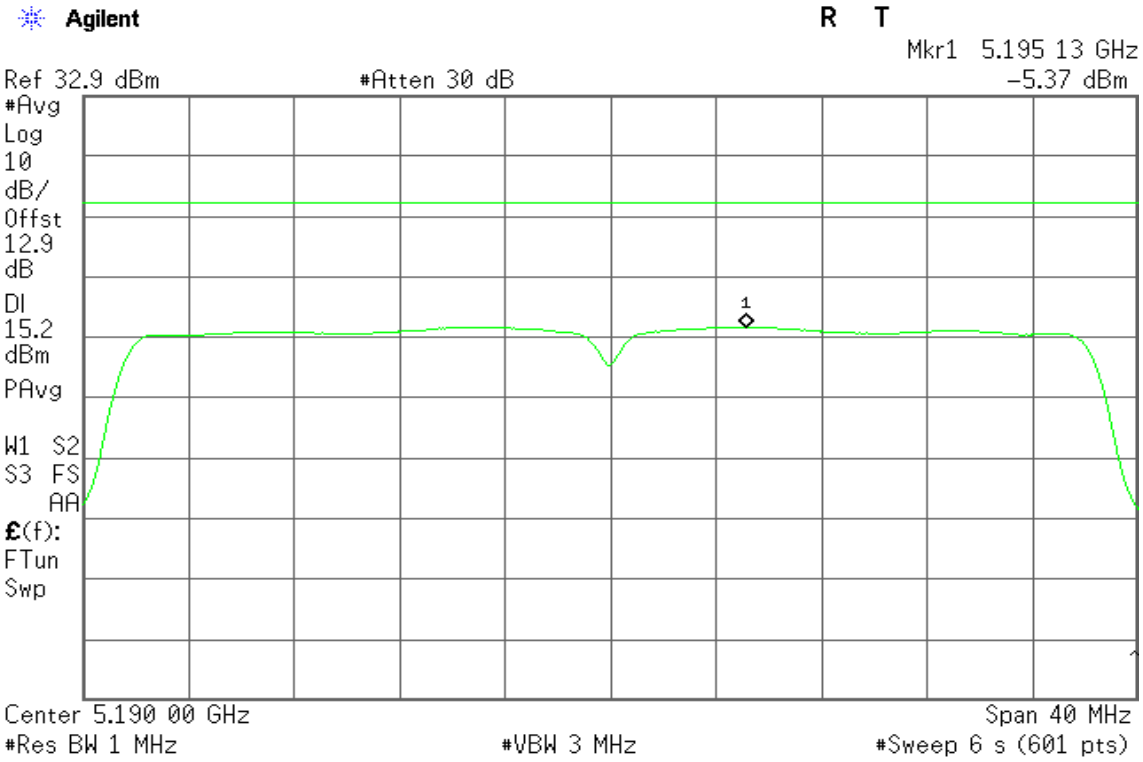



### CH High

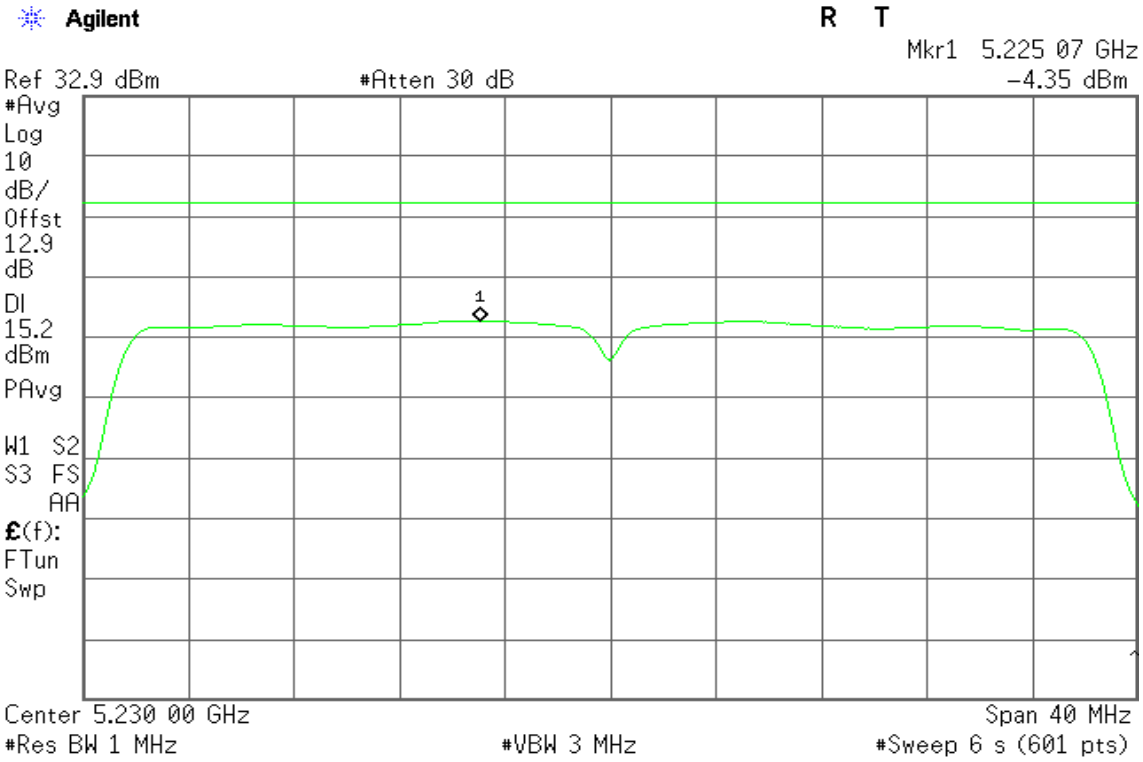


## IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 2

### CH Low




### CH High



## 7.5 RADIATED UNDESIRABLE EMISSION

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

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

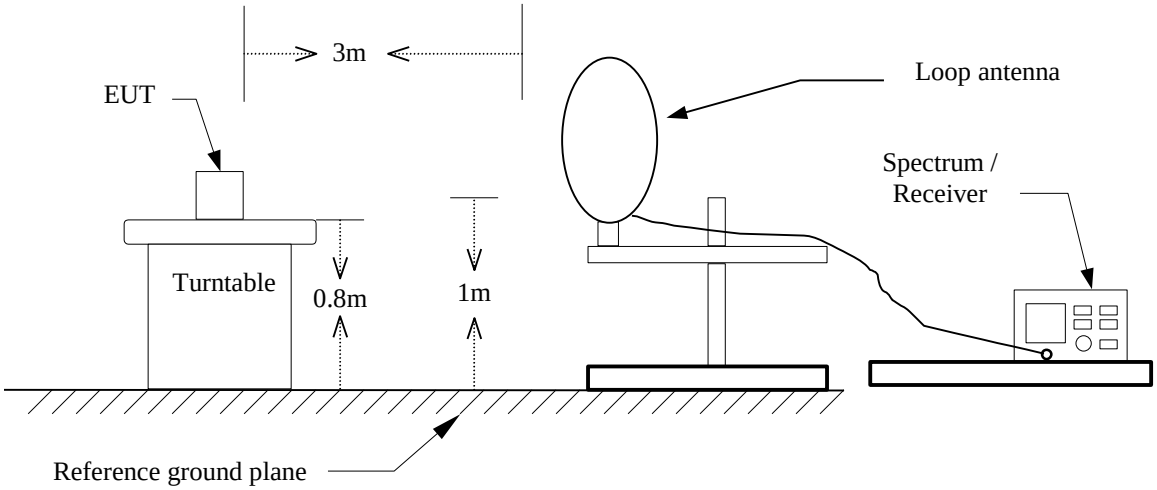
***Remark:*** *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections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

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

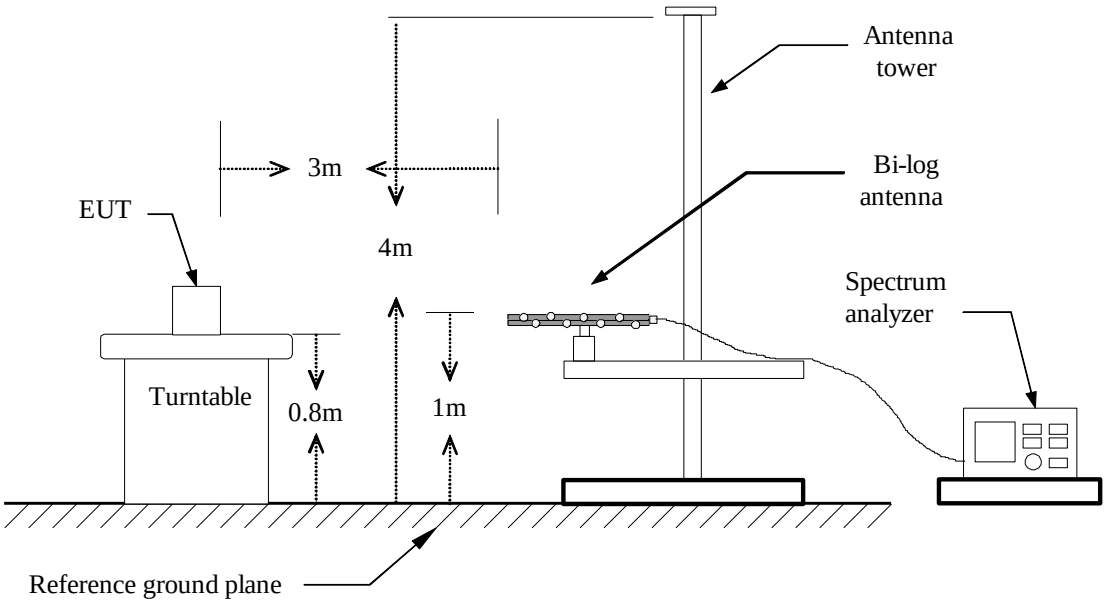
| Frequency (MHz) | Field Strength (μV/m at 3-meter) | Field Strength (dBμV/m at 3-meter) |
|---|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

## Test Configuration

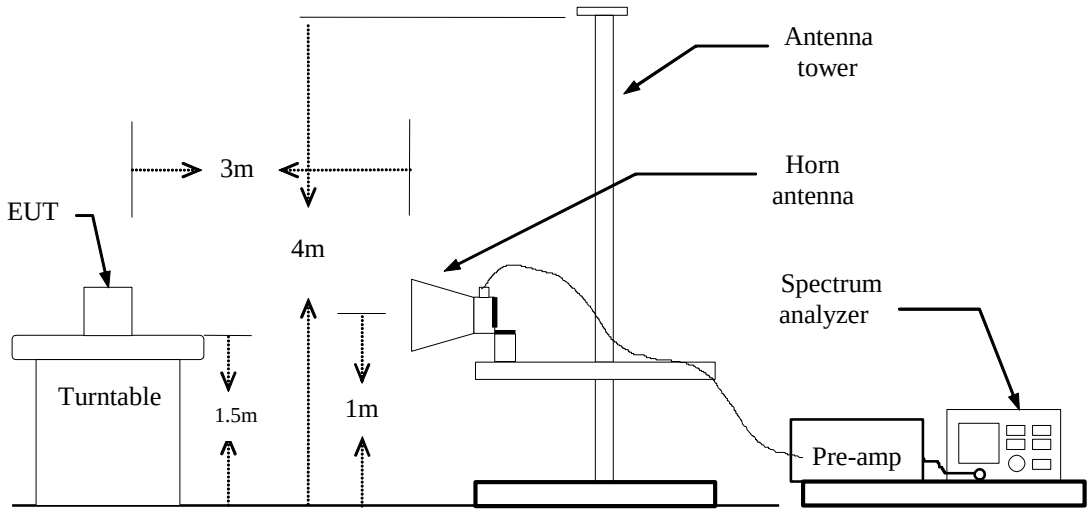
### 9kHz ~ 30MHz




### 30MHz ~ 1GHz



## Above 1 GHz


Antenna
tower
3m
Horn
antenna
EUT
4m
Spectrum
analyzer
Turntable
1.5m
1m
Pre-amp

## TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

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

   Above 1GHz:

   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
   if duty cycle≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   **IEEE 802.11a mode:** = 95%, VBW=510Hz
   **IEEE 802.11n HT 20 MHz mode:** = 92%, VBW=1.1KHz
   **IEEE 802.11n HT 40 MHz mode:** = 85%, VBW=2.2KHz
7. Repeat above procedures until the measurements for all frequencies are complete.

## Below 1 GHz

**Operation Mode:** Normal Link
**Test Date:** July 12, 2015
**Temperature:** 27°C
**Tested by:** Jason Lu
**Humidity:** 53% RH
**Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (Peak/QP) (dBuV) | Correction Factor (dB/m) | Result (Peak/QP) (dBuV/m) | Limit (Peak/QP) (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 228.8500 | 53.94 | -18.83 | 35.11 | 46.00 | -10.89 | peak | V |
| 256.3333 | 48.07 | -17.94 | 30.13 | 46.00 | -15.87 | peak | V |
| 419.6167 | 47.34 | -13.49 | 33.85 | 46.00 | -12.15 | peak | V |
| 539.2500 | 42.98 | -11.18 | 31.80 | 46.00 | -14.20 | peak | V |
| 597.4500 | 39.26 | -10.53 | 28.73 | 46.00 | -17.27 | peak | V |
| 767.2000 | 38.75 | -7.71 | 31.04 | 46.00 | -14.96 | peak | V |
| | | | | | | | |
| 228.8500 | 58.81 | -18.83 | 39.98 | 46.00 | -6.02 | Peak | H |
| 259.5667 | 55.16 | -17.71 | 37.45 | 46.00 | -8.55 | Peak | H |
| 419.6167 | 44.02 | -13.49 | 30.53 | 46.00 | -15.47 | Peak | H |
| 618.4667 | 41.60 | -10.07 | 31.53 | 46.00 | -14.47 | Peak | H |
| 689.6000 | 38.37 | -8.90 | 29.47 | 46.00 | -16.53 | Peak | H |
| 768.8167 | 43.23 | -7.69 | 35.54 | 46.00 | -10.46 | Peak | H |

***Remark:***

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

## Above 1 GHz

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 2386.000 | 54.79 | -3.81 | 50.98 | 74.00 | -23.02 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3289.000 | 52.35 | -1.42 | 50.93 | 74.00 | -23.07 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Mid | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3527.000 | 51.58 | -0.79 | 50.79 | 74.00 | -23.21 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3198.000 | 52.04 | -1.63 | 50.41 | 74.00 | -23.59 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 4262.000 | 49.66 | 2.22 | 51.88 | 74.00 | -22.12 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 4031.000 | 50.43 | 1.35 | 51.78 | 74.00 | -22.22 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

## For Mode 1

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 2393.000 | 52.48 | -3.75 | 48.73 | 74.00 | -25.27 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 1938.000 | 55.67 | -5.21 | 50.46 | 74.00 | -23.54 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3863.000 | 50.95 | 0.64 | 51.59 | 74.00 | -22.41 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 4227.000 | 49.55 | 2.09 | 51.64 | 74.00 | -22.36 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3891.000 | 50.80 | 0.76 | 51.56 | 74.00 | -22.44 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 4031.000 | 50.05 | 1.35 | 51.40 | 74.00 | -22.60 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3268.000 | 51.86 | -1.47 | 50.39 | 74.00 | -23.61 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3317.000 | 51.62 | -1.35 | 50.27 | 74.00 | -23.73 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3863.000 | 50.45 | 0.64 | 51.09 | 74.00 | -22.91 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3912.000 | 49.58 | 0.85 | 50.43 | 74.00 | -23.57 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

## For Mode 2

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 2400.000 | 54.34 | -3.69 | 50.65 | 74.00 | -23.35 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3604.000 | 51.71 | -0.46 | 51.25 | 74.00 | -22.75 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3226.000 | 51.87 | -1.57 | 50.30 | 74.00 | -23.70 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3793.000 | 50.78 | 0.34 | 51.12 | 74.00 | -22.88 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 2386.000 | 52.75 | -3.81 | 48.94 | 74.00 | -25.06 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 2400.000 | 54.52 | -3.69 | 50.83 | 74.00 | -23.17 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 4017.000 | 49.88 | 1.29 | 51.17 | 74.00 | -22.83 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3324.000 | 51.44 | -1.33 | 50.11 | 74.00 | -23.89 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3331.000 | 51.87 | -1.32 | 50.55 | 74.00 | -23.45 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3352.000 | 51.58 | -1.27 | 50.31 | 74.00 | -23.69 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

## For Mode 3

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3191.000 | 51.94 | -1.65 | 50.29 | 74.00 | -23.71 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3205.000 | 51.73 | -1.62 | 50.11 | 74.00 | -23.89 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3275.000 | 52.73 | -1.45 | 51.28 | 74.00 | -22.72 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3275.000 | 51.98 | -1.45 | 50.53 | 74.00 | -23.47 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3191.000 | 52.60 | -1.65 | 50.95 | 74.00 | -23.05 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3275.000 | 52.20 | -1.45 | 50.75 | 74.00 | -23.25 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3387.000 | 51.50 | -1.18 | 50.32 | 74.00 | -23.68 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3261.000 | 51.84 | -1.48 | 50.36 | 74.00 | -23.64 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High | **Test Date:** | July 12, 2015 |
| **Temperature:** | 27°C | **Tested by:** | Jason Lu |
| **Humidity:** | 53% RH | **Polarity:** | Ver. / Hor. |

| Frequency (MHz) | Reading (dBuV) | Correction (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Pol. (H/V) |
|---|---|---|---|---|---|---|---|
| 3310.000 | 51.38 | -1.37 | 50.01 | 74.00 | -23.99 | peak | V |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 3359.000 | 51.77 | -1.25 | 50.52 | 74.00 | -23.48 | peak | H |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

***Remark:***

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

## 7.6 POWERLINE CONDUCTED EMISSIONS

### LIMIT

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

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

** Decreases with the logarithm of the frequency.*

### TEST CONFIGURATION

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

## TEST PROCEDURE

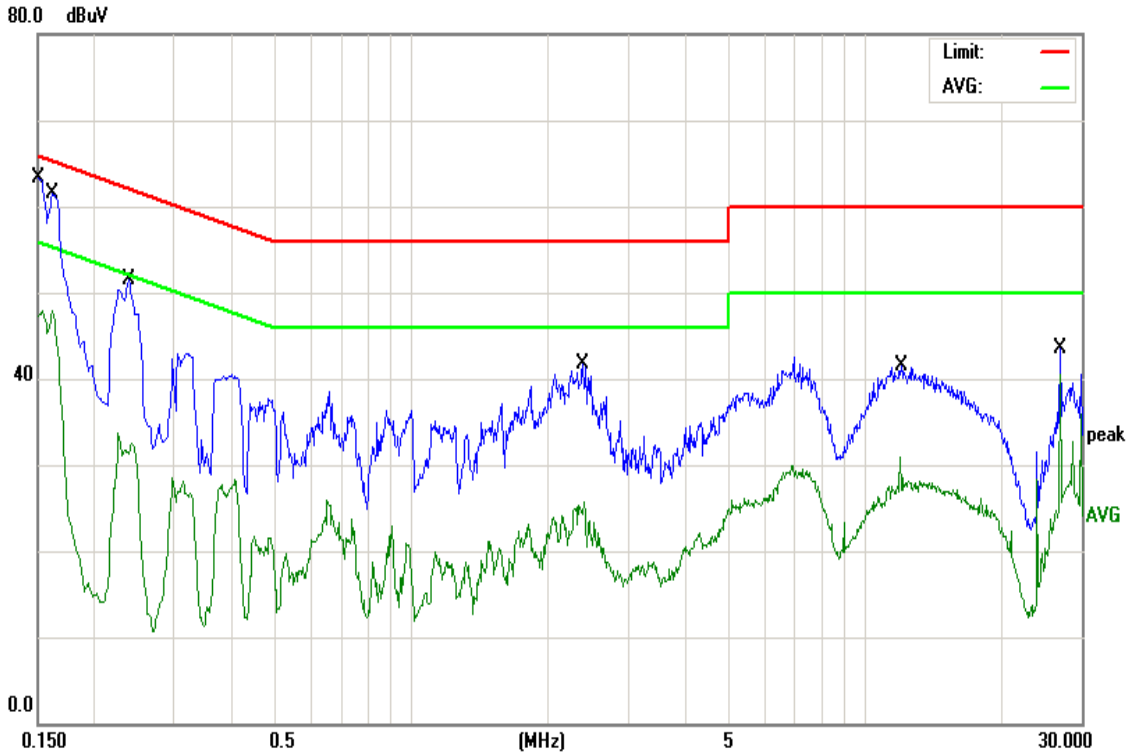
1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## TEST RESULTS

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

## Test Data

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal Link | **Test Date:** | July 14, 2015 |
| **Temperature:** | 24°C | **Tested by:** | Frank Liao |
| **Humidity:** | 60% RH | **Line** | L1 |

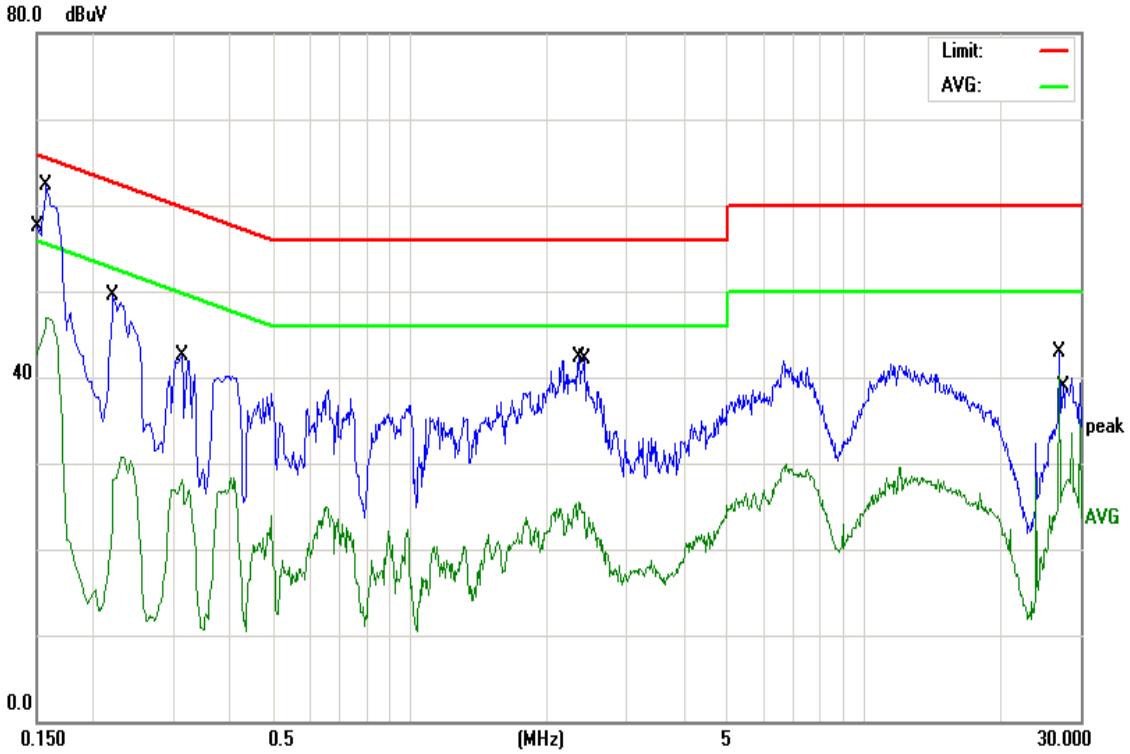



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 47.87 | 10.26 | 58.13 | 65.99 | -7.86 | QP |
| 2 | 0.1500 | 36.96 | 10.26 | 47.22 | 55.99 | -8.77 | AVG |
| 3 | 0.1620 | 36.29 | 10.23 | 46.52 | 65.36 | -18.84 | QP |
| 4 | 0.1620 | 14.62 | 10.23 | 24.85 | 55.36 | -30.51 | AVG |
| 5 | 0.2380 | 21.76 | 10.12 | 31.88 | 62.16 | -30.28 | QP |
| 6 | 0.2380 | 3.11 | 10.12 | 13.23 | 52.16 | -38.93 | AVG |
| 7 | 2.3900 | 27.55 | 10.03 | 37.58 | 56.00 | -18.42 | QP |
| 8 | 2.3900 | 15.24 | 10.03 | 25.27 | 46.00 | -20.73 | AVG |
| 9 | 12.0580 | 20.21 | 10.21 | 30.42 | 60.00 | -29.58 | QP |
| 10 | 12.0580 | 16.97 | 10.21 | 27.18 | 50.00 | -22.82 | AVG |
| 11 | 26.9340 | 30.21 | 10.56 | 40.77 | 60.00 | -19.23 | QP |
| 12 | 26.9340 | 15.48 | 10.56 | 26.04 | 50.00 | -23.96 | AVG |

***Remark:***

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

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal Link | **Test Date:** | July 14, 2015 |
| **Temperature:** | 24°C | **Tested by:** | Frank Liao |
| **Humidity:** | 60% RH | **Line** | L2 |




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 47.44 | 10.09 | 57.53 | 65.99 | -8.46 | QP |
| 2 | 0.1500 | 32.59 | 10.09 | 42.68 | 55.99 | -13.31 | AVG |
| 3 | 0.1580 | 42.18 | 10.07 | 52.25 | 65.56 | -13.31 | QP |
| 4 | 0.1580 | 36.76 | 10.07 | 46.83 | 55.56 | -8.73 | AVG |
| 5 | 0.2220 | 30.56 | 10.00 | 40.56 | 62.74 | -22.18 | QP |
| 6 | 0.2220 | 18.11 | 10.00 | 28.11 | 52.74 | -24.63 | AVG |
| 7 | 0.3140 | 32.60 | 9.94 | 42.54 | 59.86 | -17.32 | QP |
| 8 | 0.3140 | 18.11 | 9.94 | 28.05 | 49.86 | -21.81 | AVG |
| 9 | 2.3580 | 32.36 | 9.94 | 42.30 | 56.00 | -13.70 | QP |
| 10 | 2.3900 | 14.33 | 9.94 | 24.27 | 46.00 | -21.73 | AVG |
| 11 | 26.9340 | 32.42 | 10.50 | 42.92 | 60.00 | -17.08 | QP |
| 12 | 27.3780 | 15.96 | 10.50 | 26.46 | 50.00 | -23.54 | AVG |

***Remark:***

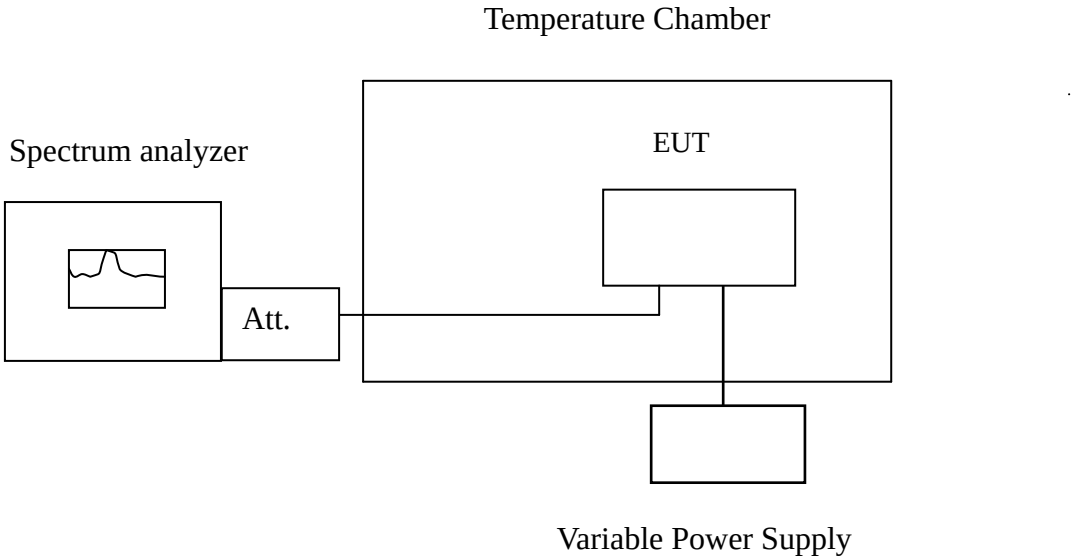
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between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

# 7.7 FREQUENCY STABILITY

## LIMIT

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

### Test Configuration




***Remark:*** *Measurement setup for testing on Antenna connector*

## TEST PROCEDURE

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

## TEST RESULTS

*No non-compliance noted.*

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

**CH Low**

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5180.008069 | 5150~5250 | Pass |
| 40 | 120 | 5179.979388 | 5150~5250 | Pass |
| 30 | 120 | 5179.999456 | 5150~5250 | Pass |
| 20 | 120 | 5180.018443 | 5150~5250 | Pass |
| 10 | 120 | 5180.010820 | 5150~5250 | Pass |
| 0 | 120 | 5180.002534 | 5150~5250 | Pass |
| -10 | 120 | 5180.018997 | 5150~5250 | Pass |
| -20 | 120 | 5179.971479 | 5150~5250 | Pass |

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5180.009737 | 5150~5250 | Pass |
| | 120 | 5179.975147 | 5150~5250 | Pass |
| | 132 | 5179.985548 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5240.017597 | 5150~5250 | Pass |
| 40 | 120 | 5239.989365 | 5150~5250 | Pass |
| 30 | 120 | 5240.005376 | 5150~5250 | Pass |
| 20 | 120 | 5239.975195 | 5150~5250 | Pass |
| 10 | 120 | 5240.008279 | 5150~5250 | Pass |
| 0 | 120 | 5239.985528 | 5150~5250 | Pass |
| -10 | 120 | 5240.002413 | 5150~5250 | Pass |
| -20 | 120 | 5239.981400 | 5150~5250 | Pass |

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5239.997143 | 5150~5250 | Pass |
| | 120 | 5239.983163 | 5150~5250 | Pass |
| | 132 | 5240.015898 | 5150~5250 | Pass |

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

## CH Low

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5179.999227 | 5150~5250 | Pass |
| 40 | 120 | 5180.008547 | 5150~5250 | Pass |
| 30 | 120 | 5179.996451 | 5150~5250 | Pass |
| 20 | 120 | 5180.018148 | 5150~5250 | Pass |
| 10 | 120 | 5180.015381 | 5150~5250 | Pass |
| 0 | 120 | 5179.992953 | 5150~5250 | Pass |
| -10 | 120 | 5179.981694 | 5150~5250 | Pass |
| -20 | 120 | 5179.979523 | 5150~5250 | Pass |

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5180.005194 | 5150~5250 | Pass |
| | 120 | 5179.987306 | 5150~5250 | Pass |
| | 132 | 5179.99221 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5239.999173 | 5150~5250 | Pass |
| 40 | 120 | 5239.975561 | 5150~5250 | Pass |
| 30 | 120 | 5240.006332 | 5150~5250 | Pass |
| 20 | 120 | 5240.011244 | 5150~5250 | Pass |
| 10 | 120 | 5240.016157 | 5150~5250 | Pass |
| 0 | 120 | 5240.010347 | 5150~5250 | Pass |
| -10 | 120 | 5239.976576 | 5150~5250 | Pass |
| -20 | 120 | 5239.985276 | 5150~5250 | Pass |

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5239.975275 | 5150~5250 | Pass |
| | 120 | 5239.978235 | 5150~5250 | Pass |
| | 132 | 5240.010857 | 5150~5250 | Pass |

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

## CH Low

| Operating Frequency: 5190 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5189.976894 | 5150~5250 | Pass |
| 40 | 120 | 5189.976695 | 5150~5250 | Pass |
| 30 | 120 | 5190.000180 | 5150~5250 | Pass |
| 20 | 120 | 5190.005424 | 5150~5250 | Pass |
| 10 | 120 | 5189.989693 | 5150~5250 | Pass |
| 0 | 120 | 5190.004222 | 5150~5250 | Pass |
| -10 | 120 | 5190.020994 | 5150~5250 | Pass |
| -20 | 120 | 5189.975604 | 5150~5250 | Pass |

| Operating Frequency: 5190 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5190.008673 | 5150~5250 | Pass |
| | 120 | 5189.986866 | 5150~5250 | Pass |
| | 132 | 5189.986508 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5230 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 120 | 5229.971337 | 5150~5250 | Pass |
| 40 | 120 | 5229.987898 | 5150~5250 | Pass |
| 30 | 120 | 5229.988175 | 5150~5250 | Pass |
| 20 | 120 | 5229.995861 | 5150~5250 | Pass |
| 10 | 120 | 5230.014015 | 5150~5250 | Pass |
| 0 | 120 | 5229.971852 | 5150~5250 | Pass |
| -10 | 120 | 5230.005806 | 5150~5250 | Pass |
| -20 | 120 | 5229.998456 | 5150~5250 | Pass |

| Operating Frequency: 5230 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 108 | 5229.991501 | 5150~5250 | Pass |
| | 120 | 5230.011001 | 5150~5250 | Pass |
| | 132 | 5229.998871 | 5150~5250 | Pass |