



**FCC 47 CFR PART 15 SUBPART E**  
**CERTIFICATION TEST REPORT**  
**FOR**  
**TABLET DEVICE**

**MODEL NUMBERS: A1674, A1675**

**FCC ID: BCGA1674**  
**IC: 579C-A1674**

**REPORT NUMBER: 15U22428-E4V2**

**ISSUE DATE: FEBRUARY 09, 2016**

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**NVLAP LAB CODE 200065-0**

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u>          | <u>Revised By</u> |
|-------------|-------------------|---------------------------|-------------------|
| V1          | 02/03/2016        | Initial Issue             | C. Pang           |
| V2          | 02/09/2016        | Addressed TCB's Questions | J. Vang           |
|             |                   |                           |                   |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
1 INFINITE LOOP  
CUPERTINO, CA 95014, U.S.A.

**EUT DESCRIPTION:** TABLET DEVICE

**MODEL:** A1674, A1675

**SERIAL NUMBER:** RADIATED (DLXQL01CH0JF) & CONDUCTED (DLXQL00HH0J4)  
DFS (DLXQL01EH0JF)

**DATE TESTED:** NOVEMBER 04, 2015 – FEBRUARY 04, 2016

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart E | Pass         |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:

Tested By:



CHIN PANG  
SENIOR ENGINEER  
UL VERIFICATION SERVICES INC.

JOE VANG  
EMC LAB ENGINEER  
UL VERIFICATION SERVICES INC.

## 2. TEST METHODOLOGY

FCC: The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 905462 D02 v01r02/D03 v01r01/D06 v01, FCC KDB 789033 D02 v01r01, FCC KDB 644545 D03 v01, ANSI C63.10-2013.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 47173 Benicia Street               | 47266 Benicia Street                          |
|------------------------------------|---|
| <input type="checkbox"/> Chamber A | <input type="checkbox"/> Chamber D            |
| <input type="checkbox"/> Chamber B | <input checked="" type="checkbox"/> Chamber E |
| <input type="checkbox"/> Chamber C | <input type="checkbox"/> Chamber F            |
|                                    | <input type="checkbox"/> Chamber G            |
|                                    | <input type="checkbox"/> Chamber H            |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable} \\ &\text{Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | ± 3.52 dB   |
| Radiated Disturbance, 30 to 1000 MHz  | ± 4.94 dB   |
| Radiated Disturbance, 1 to 6 GHz      | ± 3.86 dB   |
| Radiated Disturbance, 6 to 18 GHz     | ± 4.23 dB   |
| Radiated Disturbance, 18 to 26 GHz    | ± 5.30 dB   |
| Radiated Disturbance, 26 to 40 GHz    | ± 5.23 dB   |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a tablet with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000 1xRTT/1xAdvanced/EVDO Rev.A/WCDMA/HSPA+/DC-HSDPA/LTE FDD & Carrier Aggregation/TDD/TD-SCDMA radio, IEEE 802.11a/b/g/n/ac radio, and Bluetooth radio. The rechargeable battery is not user accessible.

### 5.2. DESCRIPTION OF MODELS DIFFERENCES

Model tested: A1674. The Models A1674 & A1675 have one FCC ID: BCGA1674 and IC ID: 579C-A1674

Both Model A1674 and A1675 have identical PCB layout, design and functionality, except that A1674 supports second electronic-UICC based SIM or "soft SIM" ( called eSIM) beside the regular UICC based SIM and A1675 will come with eSIM removed.

RF and electromagnetic characteristic are independent of the eSIM element. Both models have exactly same technology and band support.

### 5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5.2GHz Band

| Frequency Range (MHz) | Mode                    | Output Power (dBm)                 | Output Power (mW) |
|-----------------------|-------------------------|------------------------------------|-------------------|
| 5180 - 5240           | 802.11a                 | Covered by 802.11n HT20 SISO       |                   |
|                       | 802.11n HT20 SISO       | 16.97                              | 49.77             |
|                       | 802.11a 2TX CDD         | Covered by 802.11n HT20 CDD 2TX    |                   |
|                       | 802.11n HT20 2TX CDD    | 18.95                              | 78.52             |
|                       | 802.11n HT20 2TX STBC   | 20.00                              | 100.00            |
|                       | 802.11n HT20 2TX SDM    | Covered by 802.11n HT20 2TX STBC   |                   |
| 5190 - 5230           | 802.11n HT40 SISO       | 16.99                              | 50.00             |
|                       | 802.11n HT40 2TX CDD    | 18.91                              | 77.80             |
|                       | 802.11n HT40 2TX STBC   | 19.97                              | 99.31             |
|                       | 802.11n HT40 2TX SDM    | Covered by 802.11n HT40 2TX STBC   |                   |
| 5210                  | 802.11ac VHT80 SISO     | 13.00                              | 19.95             |
|                       | 802.11ac VHT80 2TX CDD  | 15.00                              | 31.62             |
|                       | 802.11ac VHT80 2TX STBC | 14.93                              | 31.12             |
|                       | 802.11ac VHT80 2TX SDM  | Covered by 802.11ac VHT80 2TX STBC |                   |

**5.3GHz Band**

| Frequency Range (MHz) | Mode                    | Output Power (dBm)                 | Output Power (mW) |
|-----------------------|-------------------------|------------------------------------|-------------------|
| 5260 - 5320           | 802.11a                 | Covered by 802.11n HT20 SISO       |                   |
|                       | 802.11n HT20 SISO       | 17.50                              | 56.23             |
|                       | 802.11a 2TX CDD         | Covered by 802.11n HT20 2TX CDD    |                   |
|                       | 802.11n HT20 2TX CDD    | 18.92                              | 77.98             |
|                       | 802.11n HT20 2TX STBC   | 19.94                              | 98.63             |
|                       | 802.11n HT20 2TX SDM    | Covered by 802.11n HT20 2TX STBC   |                   |
| 5270 - 5310           | 802.11n HT40 SISO       | 17.43                              | 55.34             |
|                       | 802.11n HT40 2TX CDD    | 18.91                              | 77.80             |
|                       | 802.11n HT40 2TX STBC   | 19.91                              | 97.95             |
|                       | 802.11n HT40 2TX SDM    | Covered by 802.11n HT40 2TX STBC   |                   |
| 5290                  | 802.11ac VHT80 SISO     | 13.94                              | 24.77             |
|                       | 802.11ac VHT80 2TX CDD  | 15.43                              | 34.91             |
|                       | 802.11ac VHT80 2TX STBC | 15.39                              | 34.59             |
|                       | 802.11ac VHT80 2TX SDM  | Covered by 802.11ac VHT80 2TX STBC |                   |



**5.6GHz Band**

| Frequency Range (MHz) | Mode                    | Output Power (dBm)               | Output Power (mW) |
|-----------------------|-------------------------|----------------------------------|-------------------|
| 5500 - 5700           | 802.11a                 | Covered by 802.11n HT20 SISO     |                   |
| 5500 - 5700           | 802.11n HT20 SISO       | 16.47                            | 44.36             |
| 5720                  | 802.11ac VHT20 SISO     | 15.26                            | 33.57             |
| 5500 - 5700           | 802.11a 2TX CDD         | Covered by 802.11n HT20 CDD      |                   |
| 5500 - 5700           | 802.11n HT20 2TX CDD    | 18.41                            | 69.34             |
| 5720                  | 802.11ac VHT20 2TX CDD  | 17.23                            | 52.84             |
| 5500 - 5700           | 802.11n HT20 2TX STBC   | 19.24                            | 83.95             |
| 5720                  | 802.11ac VHT20 2TX STBC | 17.98                            | 62.81             |
| 5500 - 5700           | 802.11n HT20 2TX SDM    | Covered by 802.11n HT20 2TX STBC |                   |
| 5720                  | 802.11ac VHT20 2TX SDM  | Covered by 802.11n HT20 2TX STBC |                   |
| 5510 - 5670           | 802.11n HT40 SISO       | 16.50                            | 44.67             |
| 5710                  | 802.11ac VHT40 SISO     | 15.79                            | 37.93             |
| 5510 - 5670           | 802.11n HT40 2TX CDD    | 18.42                            | 69.50             |
| 5710                  | 802.11ac VHT40 2TX CDD  | 18.00                            | 63.10             |
| 5510 - 5670           | 802.11n HT40 2TX STBC   | 19.26                            | 84.33             |
| 5710                  | 802.11ac VHT40 2TX STBC | 18.79                            | 75.68             |
| 5510 - 5670           | 802.11n HT40 2TX SDM    | Covered by 802.11n HT40 2TX STBC |                   |
| 5710                  | 802.11ac VHT40 2TX SDM  | Covered by 802.11n HT40 2TX STBC |                   |
| 5530-5610             | 802.11ac VHT80 SISO     | 16.46                            | 44.26             |
| 5690                  | 802.11ac VHT80 SISO     | 16.40                            | 43.65             |
| 5530-5610             | 802.11ac VHT80 2TX CDD  | 19.15                            | 82.22             |
| 5690                  | 802.11ac VHT80 2TX CDD  | 19.00                            | 79.43             |
| 5530-5610             | 802.11ac VHT80 2TX STBC | Covered by 802.11n VHT80 2TX CDD |                   |
| 5690                  | 802.11ac VHT80 2TX STBC | Covered by 802.11n VHT80 2TX CDD |                   |
| 5530-5610             | 802.11ac VHT80 2TX SDM  | Covered by 802.11n VHT80 2TX CDD |                   |
| 5690                  | 802.11ac VHT80 2TX SDM  | Covered by 802.11n VHT80 2TX CDD |                   |

**5.8GHz Band**

| Frequency Range (MHz) | Mode                    | Output Power (dBm)               | Output Power (mW) |
|-----------------------|-------------------------|----------------------------------|-------------------|
| 5745 - 5825           | 802.11a                 | Covered by 802.11n HT20 SISO     |                   |
| 5745 - 5825           | 802.11n HT20 SISO       | 16.93                            | 49.32             |
| 5745 - 5825           | 802.11a 2TX CDD         | Covered by 802.11n HT20 2TX CDD  |                   |
| 5745 - 5825           | 802.11n HT20 2TX CDD    | 19.69                            | 93.11             |
| 5745 - 5825           | 802.11n HT20 2TX STBC   | Covered by 802.11n HT20 2TX CDD  |                   |
| 5746 - 5825           | 802.11n HT20 2TX SDM    | Covered by 802.11n HT20 2TX STBC |                   |
| 5755 - 5795           | 802.11n HT40 SISO       | 16.39                            | 43.55             |
| 5755 - 5795           | 802.11n HT40 2TX CDD    | 18.41                            | 69.34             |
| 5755 - 5795           | 802.11n HT40 2TX STBC   | Covered by 802.11n HT40 2TX CDD  |                   |
| 5756 - 5795           | 802.11n HT40 2TX SDM    | Covered by 802.11n HT40 2TX STBC |                   |
| 5775                  | 802.11ac VHT80 SISO     | 13.42                            | 21.98             |
| 5775                  | 802.11ac VHT80 2TX CDD  | 15.43                            | 34.91             |
| 5775                  | 802.11ac VHT80 2TX STBC | Covered by 802.11n VHT80 2TX CDD |                   |
| 5775                  | 802.11ac VHT80 2TX SDM  | Covered by 802.11n VHT80 2TX CDD |                   |

**5.4. DESCRIPTION OF AVAILABLE ANTENNAS**

| Frequency Band (GHz) | Antenna Gain (dBi) |           |
|----------------------|--------------------|-----------|
|                      | Antenna B          | Antenna A |
| 5.2                  | 3.04               | 2.30      |
| 5.3                  | 3.02               | 2.23      |
| 5.5                  | 2.83               | 4.03      |
| 5.8                  | 2.42               | 4.16      |

**5.5. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during testing was 13E31820k.

**5.6. WORST-CASE CONFIGURATION AND MODE**

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For SISO modes, there are two transmission antennas. The antenna used in any given time can be either ANTENNA B or ANTENNA A. Both antenna ports have the same power; output power and PSD measurement for SISO modes on both antennas are reported. For MIMO modes, both ANTENNA B and ANTENNA A used at the same time.

The fundamental of the EUT was investigated in three orthogonal orientations X (Flatbed), Y (Landscape), Z (Portrait), it was determined that (see table below) was worst-case orientations. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

| Frequency Band (GHz) | Mode     | Antenna Port      | Worst-case Orientation |
|----------------------|----------|-------------------|------------------------|
| 5.2-5.8              | 1TX SISO | Chain 0           | Z-Portrait             |
|                      |          | Chain 1           | Y-Landscape            |
|                      | 2TX MIMO | Chain 0 + Chain 1 | Y-Landscape            |

Worst-case data rates as provided by the client were:

- 802.11a mode: 6 Mbps
- 802.11n HT20 mode: MCS0
- 802.11n HT40 mode: MCS0
- 802.11ac VHT20 mode: MCS0
- 802.11ac VHT40 mode: MCS0
- 802.11ac VHT80 mode: MCS0

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

For simultaneous transmission of multiple channels from the same antenna in BT/BLE and WLAN 5 GHz bands. Baseline testing was performed on various configurations to determine the worst case on radiated emissions.

The following configurations were investigated on AC line conducted test.

| Configuration | Descriptions                               |
|---------------|--|
| 1             | EUT powered by AC/DC adapter via USB cable |
| 2             | EUT powered by host PC via USB cable       |

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |             |               |        |
|------------------------|--------------|-------------|---------------|--------|
| Description            | Manufacturer | Model       | Serial Number | FCC ID |
| Laptop                 | Apple        | MacBook Pro | 73043BDQAGU   | N/A    |
| Laptop AC/DC adapter   | Apple        | A1172       | MV7211FJAX4XA | N/A    |
| Earphone               | Apple        | NA          | NA            | N/A    |
| EUT AC/DC adapter      | Apple        | A1357       | W010A051      | N/A    |

### I/O CABLES (CONDUCTED TEST)

| I/O Cable List |         |                      |                |             |                  |                      |
|----------------|---------|----------------------|----------------|-------------|------------------|----------------------|
| Cable No       | Port    | # of identical ports | Connector Type | Cable Type  | Cable Length (m) | Remarks              |
| 1              | Antenna | 1                    | SMA            | Un-Shielded | 0.2              | To spectrum Analyzer |
| 2              | USB     | 1                    | USB            | Shielded    | 1                | N/A                  |
| 3              | AC      | 1                    | AC             | Un-shielded | 3                | N/A                  |

### I/O CABLES (RADIATED ABOVE 1 GHZ)

| I/O Cable List |      |                      |                |            |                  |         |
|----------------|------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| None Used      |      |                      |                |            |                  |         |

### I/O CABLES (RADIATED BELOW 1 GHZ)

| I/O Cable List |                 |                |                |             |                  |         |
|----------------|-----------------|----------------|----------------|-------------|------------------|---------|
| Cable No       | Port            | # of identical | Connector Type | Cable Type  | Cable Length (m) | Remarks |
| 1              | Headphones Jack | 1              | 3.5mm Audio    | Shielded    | 0.9              | N/A     |
| 2              | AC              | 1              | AC             | Un-shielded | 3                | N/A     |

### I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)

| I/O Cable List |                 |                |                |             |                  |         |
|----------------|-----------------|----------------|----------------|-------------|------------------|---------|
| Cable No       | Port            | # of identical | Connector Type | Cable Type  | Cable Length (m) | Remarks |
| 1              | Headphones Jack | 1              | 3.5mm Audio    | Shielded    | 0.9              | N/A     |
| 2              | AC              | 1              | AC             | Un-shielded | 3                | N/A     |

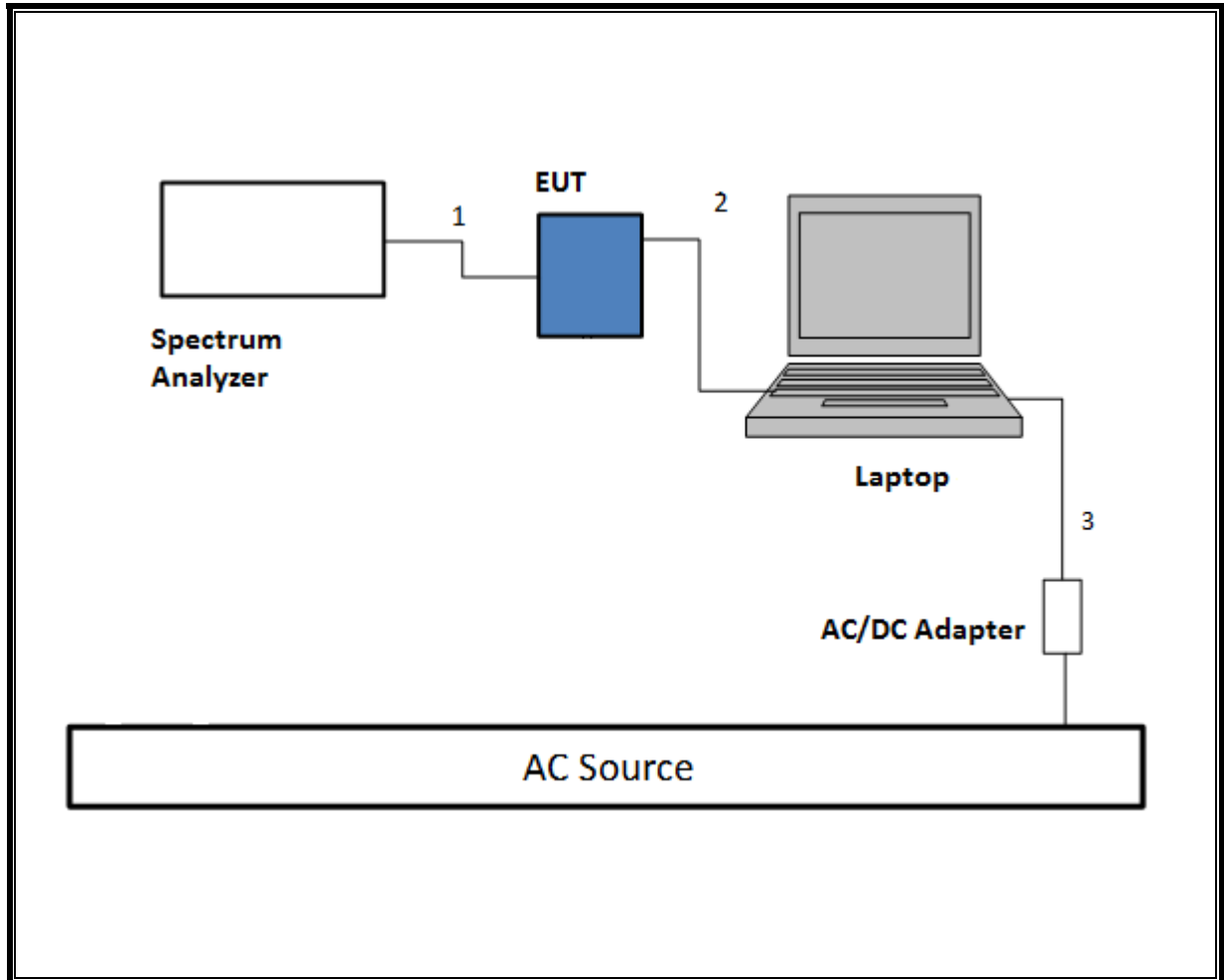
**I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)**

| <b>I/O Cable List</b> |                 |                       |                       |                   |                         |                |
|-----------------------|-----------------|-----------------------|-----------------------|-------------------|-------------------------|----------------|
| <b>Cable No</b>       | <b>Port</b>     | <b># of identical</b> | <b>Connector Type</b> | <b>Cable Type</b> | <b>Cable Length (m)</b> | <b>Remarks</b> |
| 1                     | Headphones Jack | 1                     | 3.5mm Audio           | Shielded          | 0.9                     | N/A            |
| 2                     | USB             | 1                     | USB                   | Shielded          | 1                       | N/A            |
| 3                     | AC              | 1                     | AC                    | Un-shielded       | 3                       | N/A            |

**TEST SETUP - CONDUCTED TESTS**

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

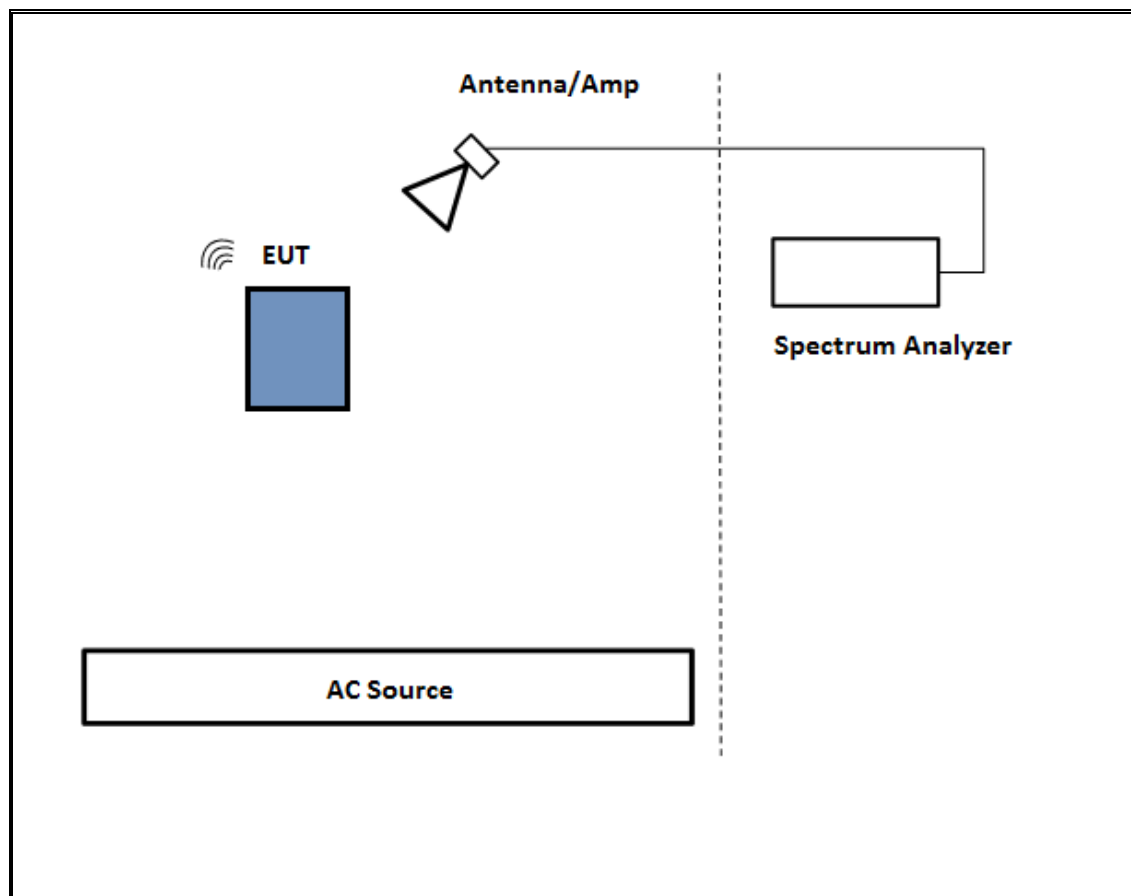
**SETUP DIAGRAM**



**TEST SETUP- RADIATED-ABOVE 1 GHZ**

The EUT was tested battery powered. Test software exercised the EUT.

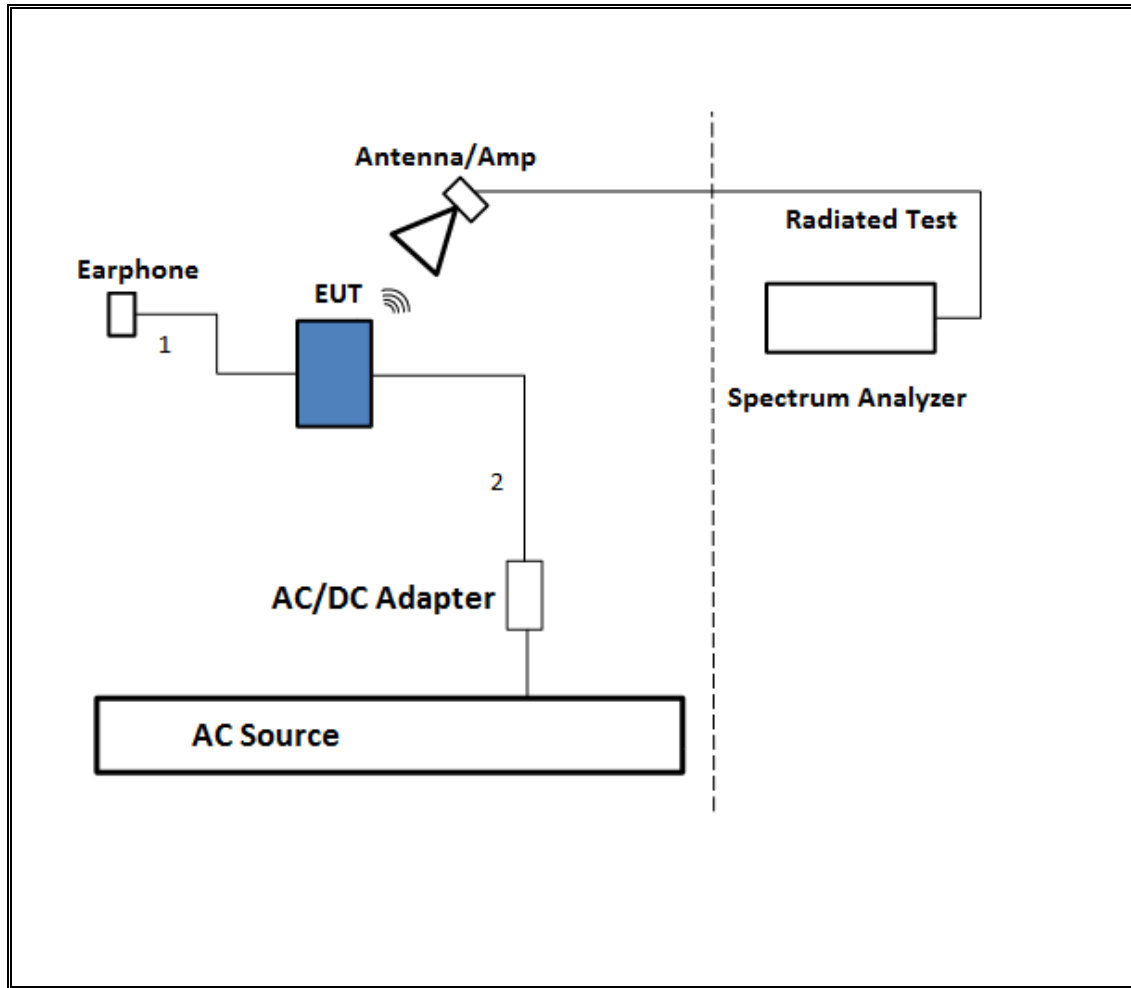
**SETUP DIAGRAM**



**TEST SETUP- BELOW 1GHz**

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

**SETUP DIAGRAM**

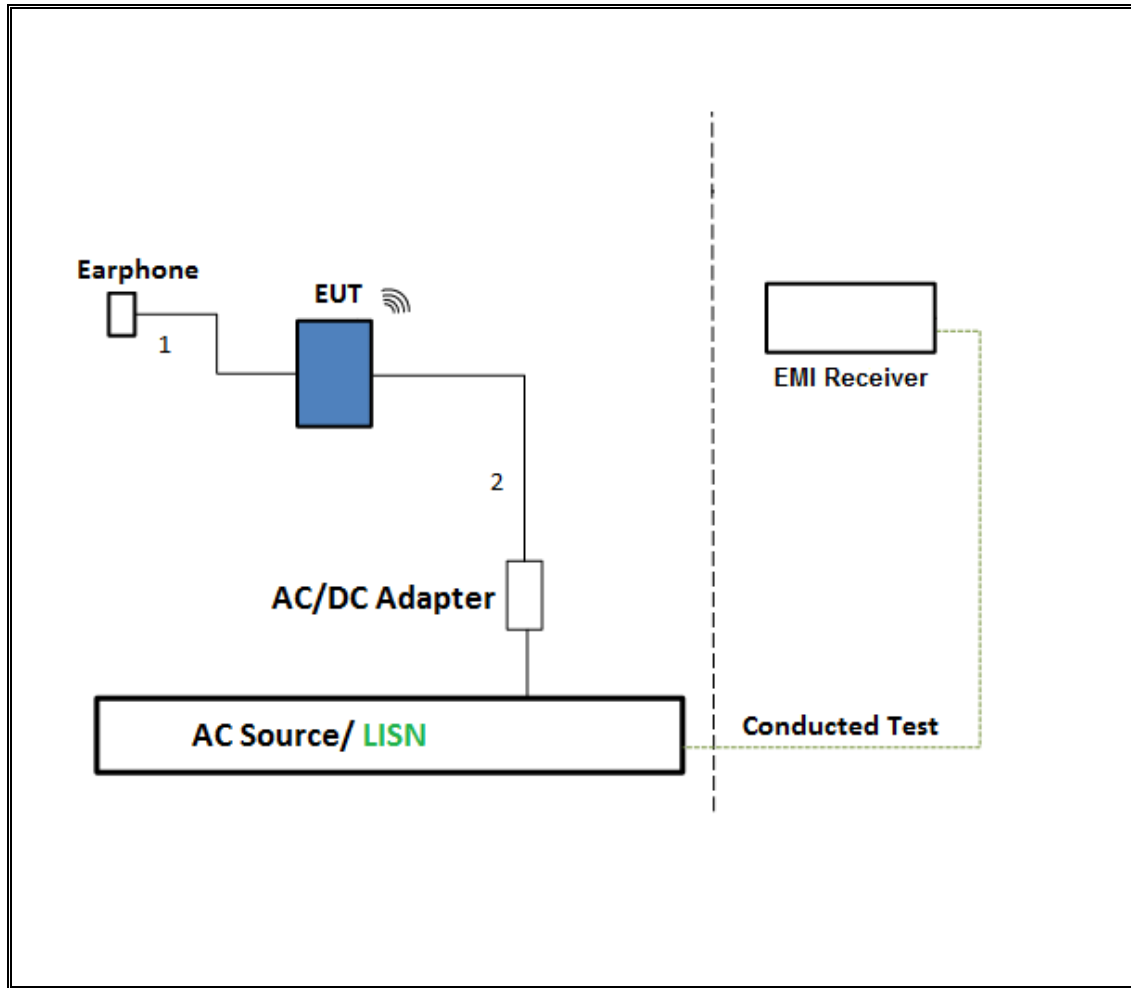




**TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER**

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

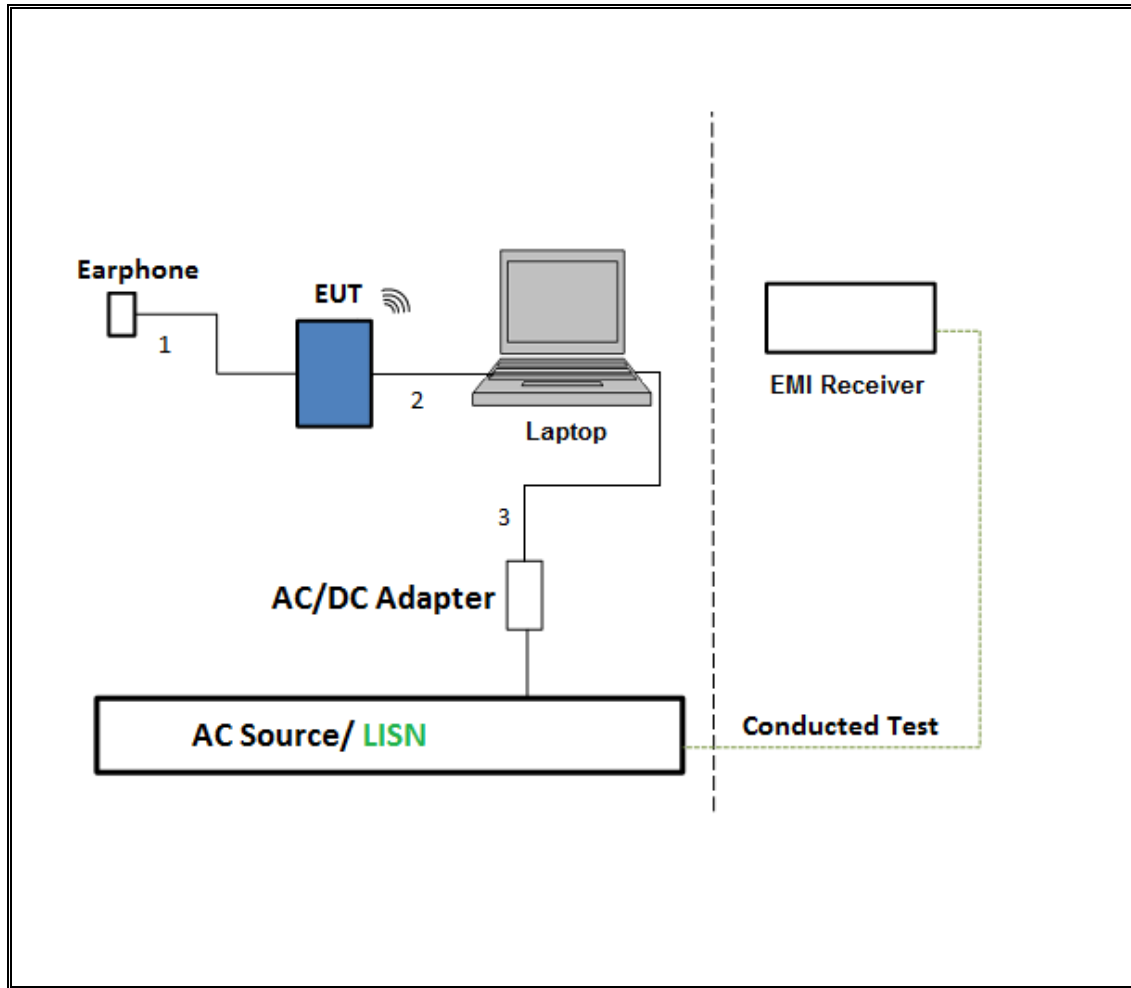
**SETUP DIAGRAM**



**TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION**

The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

**SETUP DIAGRAM**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List                                |                 |                        |                         |            |
|--|-----------------|------------------------|-------------------------|------------|
| Description  | Manufacturer    | Model                  | Cal Date                | Cal Due    |
| Antenna, Horn 1-18GHz                              | ETS Lindgren    | 3117                   | 2/10/2015               | 2/10/2016  |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz        | Sunol Sciences  | JB1                    | 9/25/2015               | 9/25/2016  |
| Amplifier, 1 - 18GHz                               | Miteq           | AFS42-00101800-25-S-42 | 8/12/2015               | 8/12/2016  |
| Amplifier, 1 - 18GHz                               | Miteq           | AMF-4D-01000800-30-29P | 8/12/2015               | 8/12/2016  |
| Amplifier, 10KHz to 1GHz, 32dB                     | Sonoma          | 310N                   | 6/9/2015                | 6/9/2016   |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent         | N9030A                 | 3/31/2015               | 3/31/2016  |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent         | N9030A                 | 11/19/2015              | 11/19/2016 |
| Power Meter, P-series single channel               | Agilent         | N1911A                 | 4/7/2015                | 4/7/2016   |
| Power Sensor, P - series, 50MHz to 18GHz, Wideband | Agilent         | N1921A                 | 2/27/2015               | 2/27/2016  |
| Antenna, Horn 18 to 26.5GHz                        | ARA             | MWH-1826               | 5/12/2015               | 5/12/2016  |
| Spectrum Analyzer, 40 GHz                          | Agilent         | 8564E                  | 8/14/2015               | 8/14/2016  |
| Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum       | Agilent         | 8449B                  | 6/29/2015               | 6/29/2016  |
| AC Line Conducted                                  |                 |                        |                         |            |
| EMI Test Receiver 9KHz-7GHz                        | Rohde & Schwarz | ECSI7                  | 08/07/15                | 08/07/16   |
| **LISN for Conducted Emissions CISPR-16            | FCC             | 50/250-25-2            | 01/16/15                | 01/16/16   |
| LISN for Conducted Emissions CISPR-16              | Fisher          | 50/250-2-01            | 09/16/15                | 09/16/16   |
| Power Cable, Line Conducted Emissions              | UL              | PG1                    | 7/28/2015               | 7/28/2016  |
| UL SOFTWARE  |                 |                        |                         |            |
| * Radiated Software                                | UL              | UL EMC                 | Ver 9.5, July 22, 2014  |            |
| * Conducted Software                               | UL              | UL EMC                 | Ver 2.2, March 31, 2015 |            |
| * AC Line Conducted Software                       | UL              | UL EMC                 | Ver 9.5, April 3, 2015  |            |

Note: \* indicates automation software version used in the compliance certification testing  
 \*\* testing is completed before equipment calibration expiration date.

## 7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

### 7.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

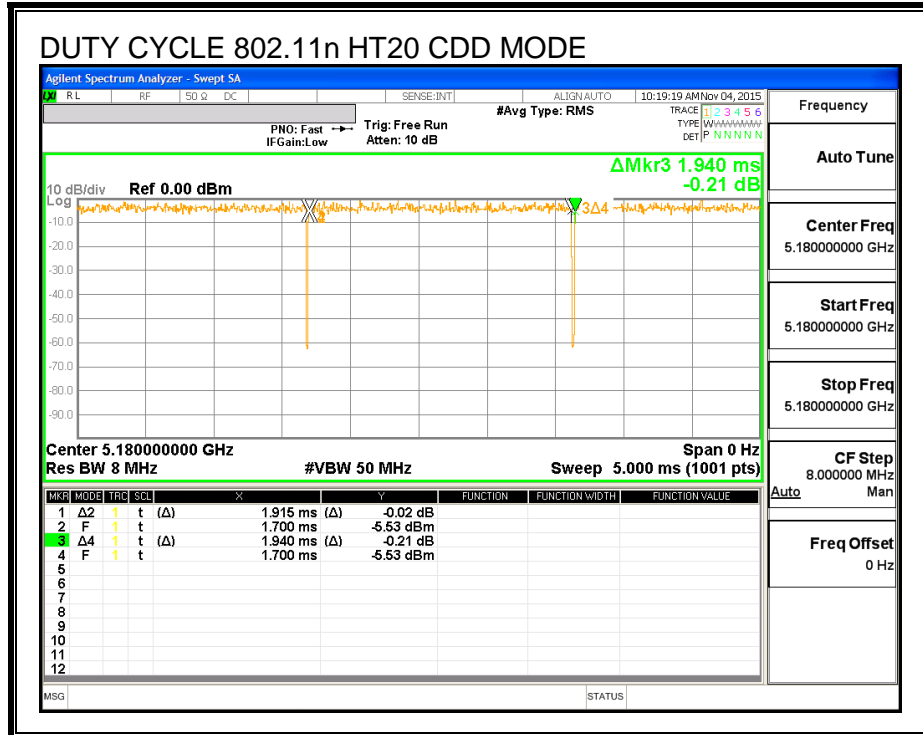
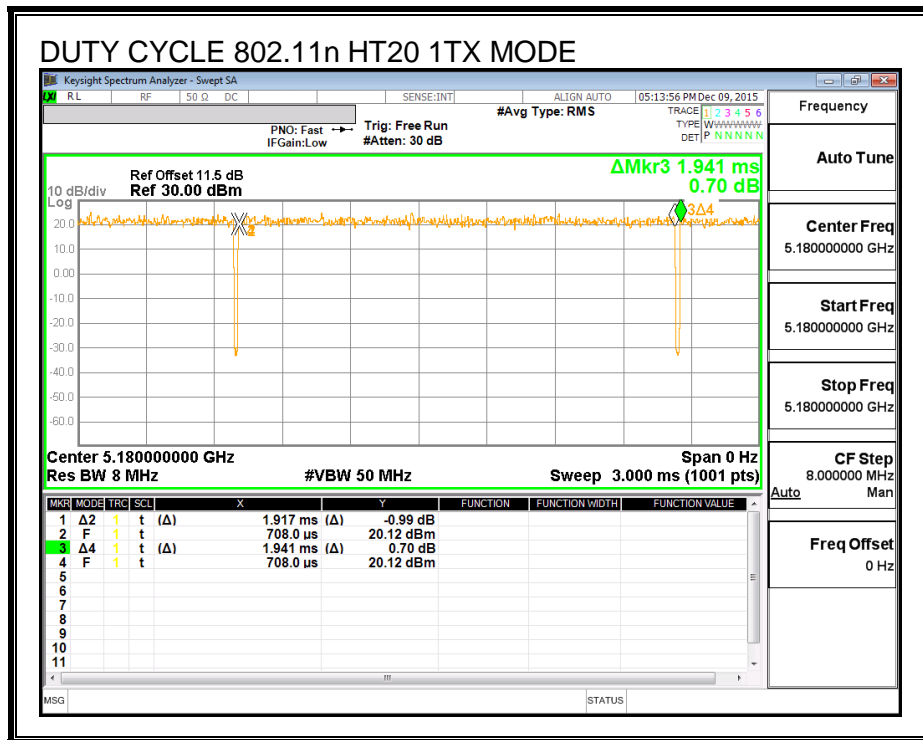
#### PROCEDURE

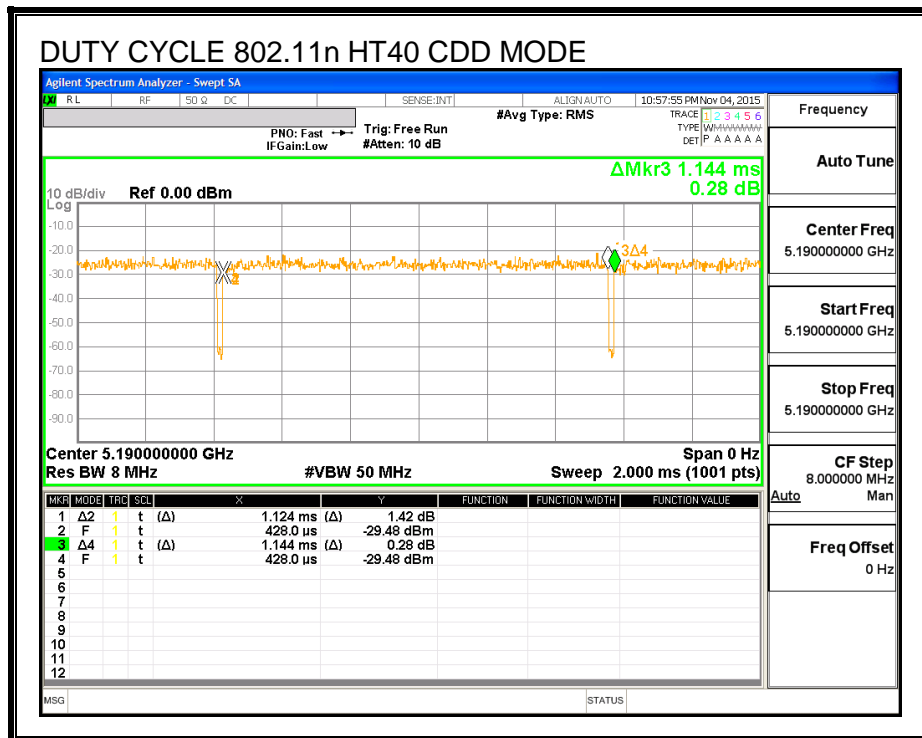
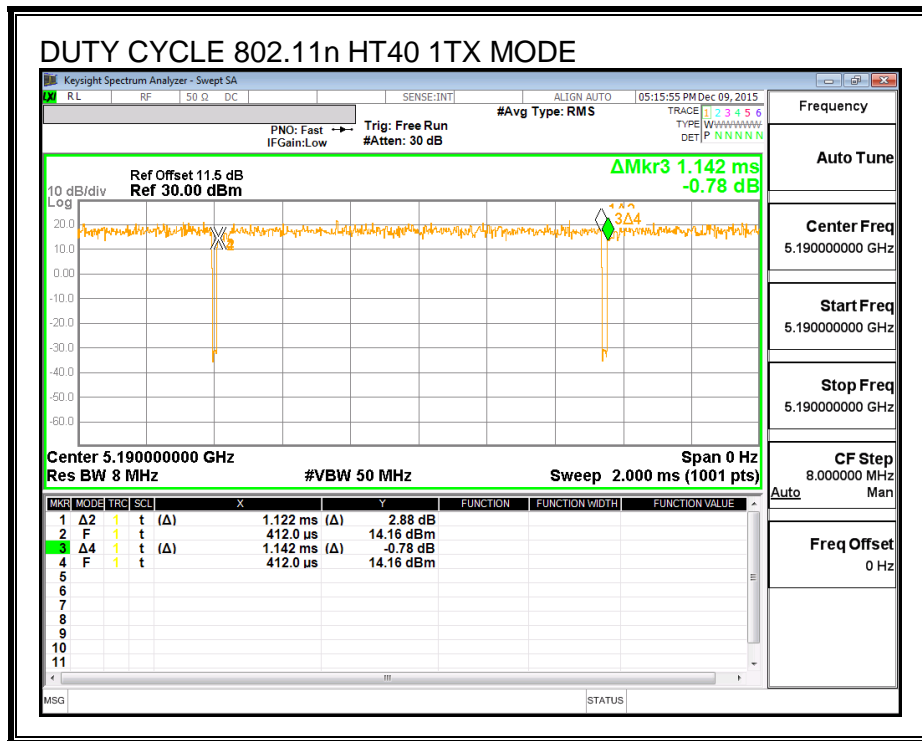
KDB 789033 Zero-Span Spectrum Analyzer Method.

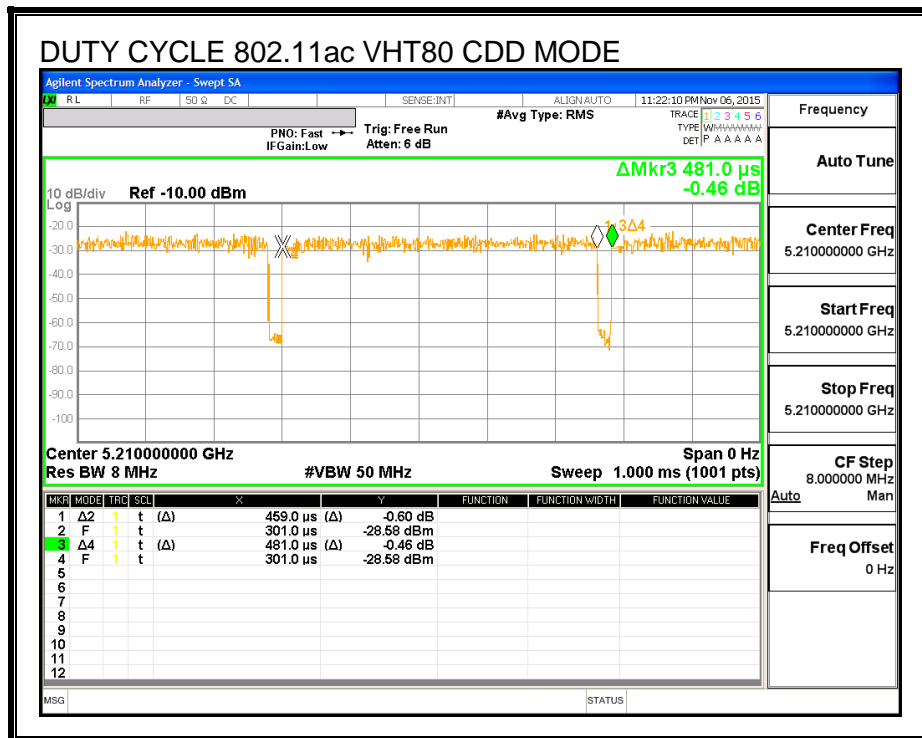
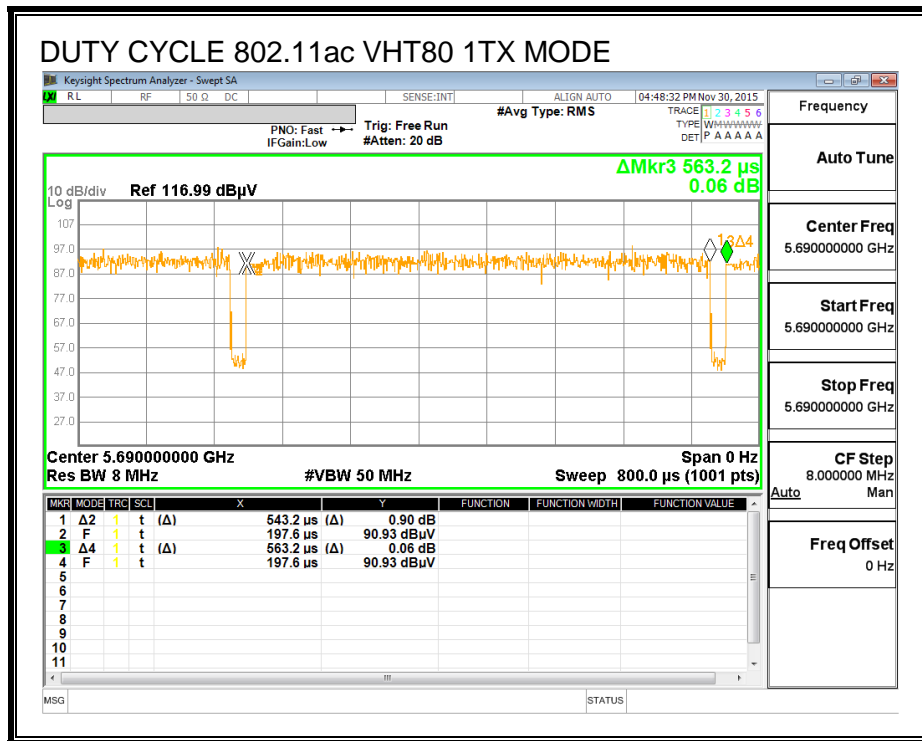
#### RESULTS

| Mode               | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|--------------------|------------------------|------------------|-----------------------------|----------------------|---|-----------------------------|
| 802.11n HT20 1TX   | 1.917                  | 1.941            | 0.988                       | 98.76%               | 0.00                                    | 0.010                       |
| 802.11n HT20 CDD   | 1.915                  | 1.940            | 0.987                       | 98.71%               | 0.00                                    | 0.010                       |
| 802.11n HT40 1TX   | 1.122                  | 1.142            | 0.982                       | 98.25%               | 0.00                                    | 0.010                       |
| 802.11n HT40 CDD   | 1.124                  | 1.144            | 0.983                       | 98.25%               | 0.00                                    | 0.010                       |
| 802.11ac VHT80 1TX | 0.543                  | 0.563            | 0.964                       | 96.45%               | 0.16                                    | 1.841                       |
| 802.11ac VHT80 CDD | 0.459                  | 0.481            | 0.954                       | 95.43%               | 0.20                                    | 2.179                       |

**DUTY CYCLE PLOTS**







## **7.2. MEASUREMENT METHODS**

26 dB Emission BW: KDB 789033 D02 v01r01, Section C.

99% Occupied BW: KDB 789033 D02 v01r01, Section D.

Conducted Output Power: KDB 789033 D02 v01r01, Section E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v01r01, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 v01r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01r01, Sections G.3, G.4, and G.5.



## 8. ANTENNA PORT TEST RESULTS

### 8.1. 802.11a SISO MODE IN THE 5.2 GHz BAND

**Note:** Covered by 802.11n HT20 SISO MODE IN THE 5.2 GHz BAND.

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## 8.2. 802.11n HT20 ANTENNA - B MODE IN THE 5.2 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

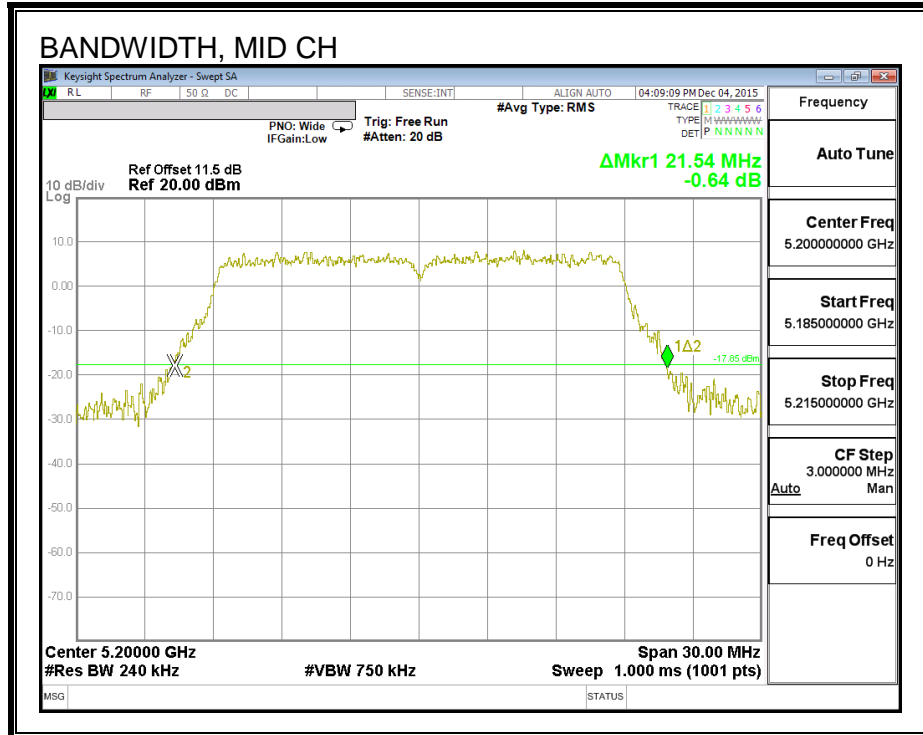
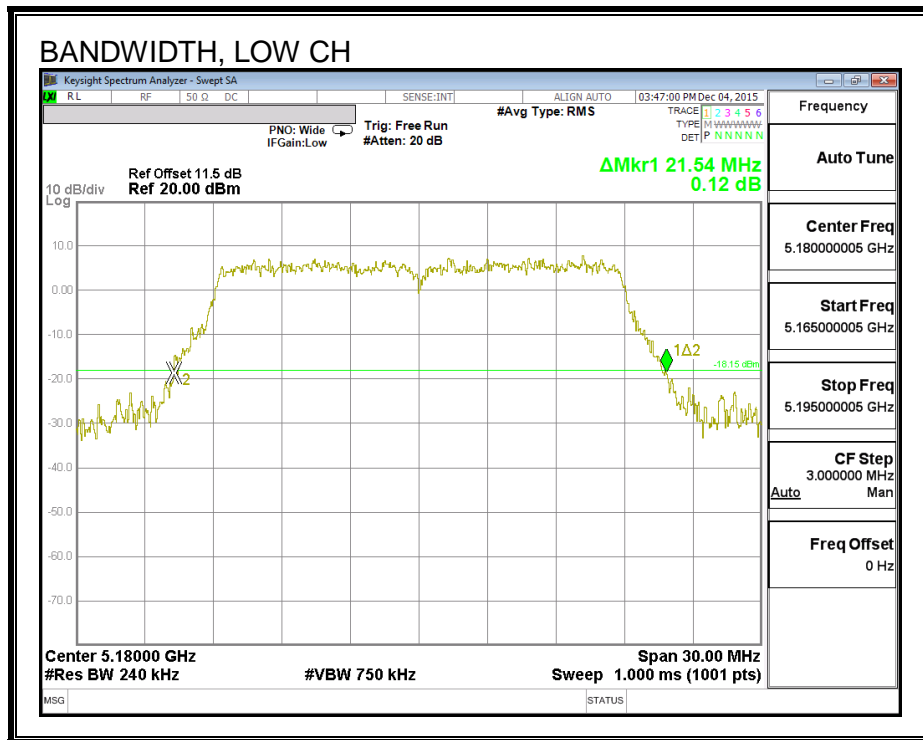
#### LIMITS

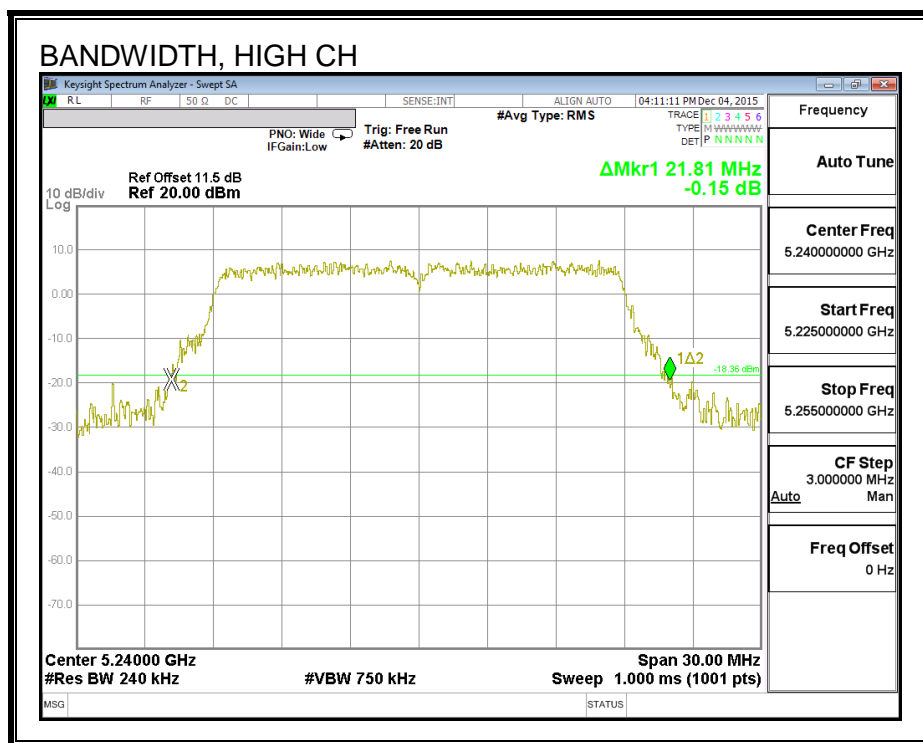
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 5180            | 21.54                 |
| Mid     | 5200            | 21.54                 |
| High    | 5240            | 21.81                 |

**26 dB BANDWIDTH**





### 8.2.2. 99% BANDWIDTH

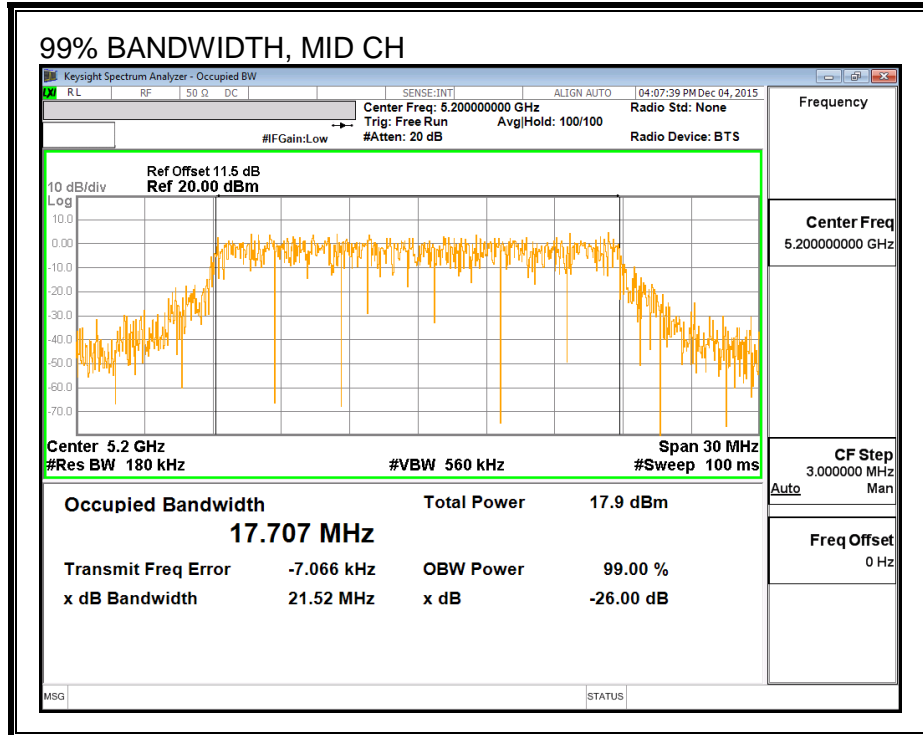
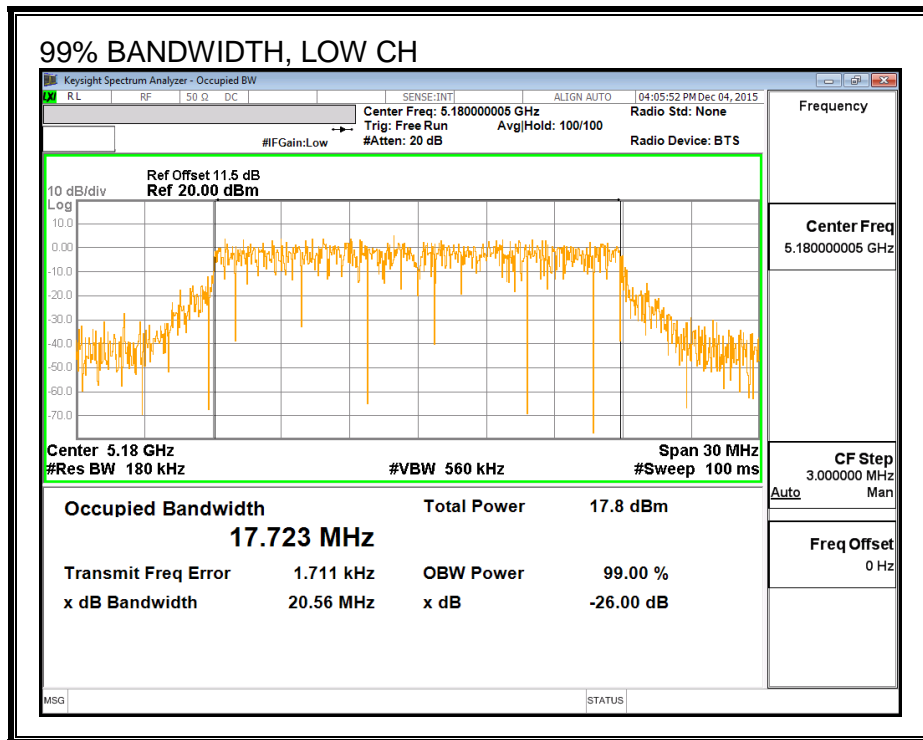
#### LIMITS

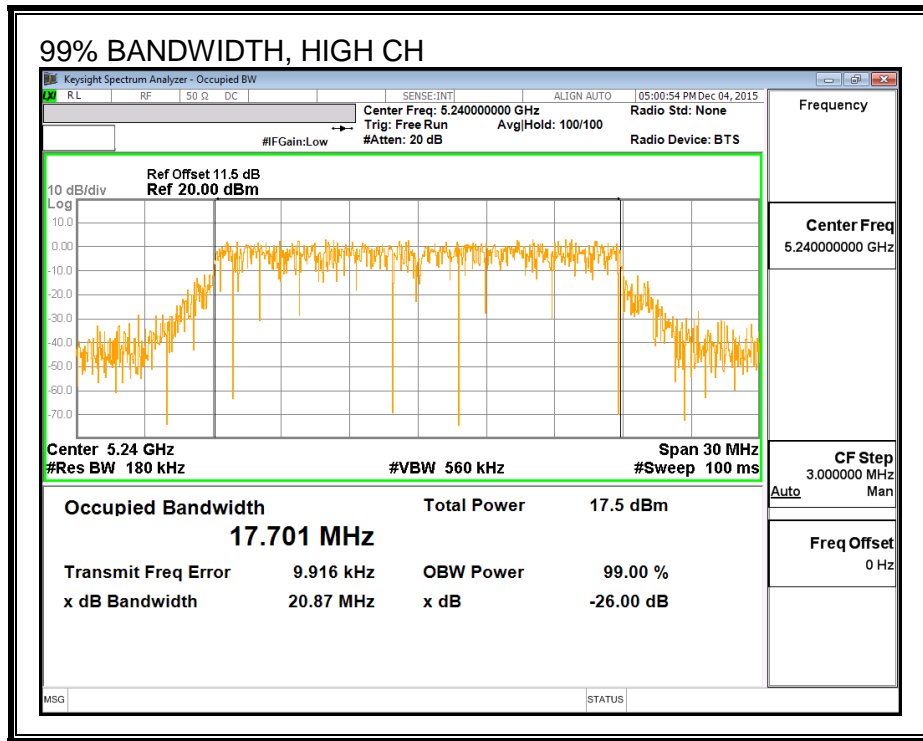
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>(MHz) |
|---------|--------------------|-----------------|
| Low     | 5180               | 17.723          |
| Mid     | 5200               | 17.707          |
| High    | 5240               | 17.701          |

**99% BANDWIDTH**





### 8.2.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency (MHz) | Power (dBm) |
|---------|-----------------|-------------|
| Low     | 5180            | 16.36       |
| Mid     | 5200            | 16.90       |
| High    | 5240            | 16.86       |



## 8.2.4. OUTPUT POWER AND PSD

### LIMITS

FCC §15.407 (a) (1)

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

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

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

**RESULTS**

**Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Directional<br>Gain<br>for PSD<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|---|---|-------------------------|-----------------------|
| Low     | 5180               | 3.04                                      | 3.04                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 3.04                                      | 3.04                                    | 24.00                   | 11.00                 |
| High    | 5240               | 3.04                                      | 3.04                                    | 24.00                   | 11.00                 |

|                           |      |   |
|---------------------------|------|---|
| <b>Duty Cycle CF (dB)</b> | 0.00 | <b>Included in Calculations of Corr'd PSD</b> |
|---------------------------|------|---|

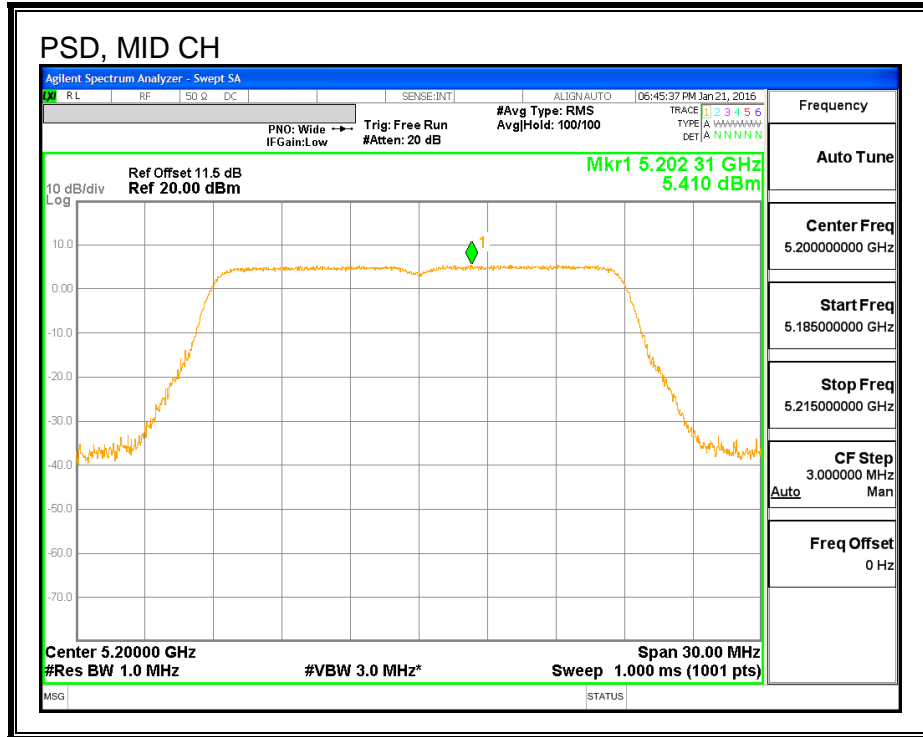
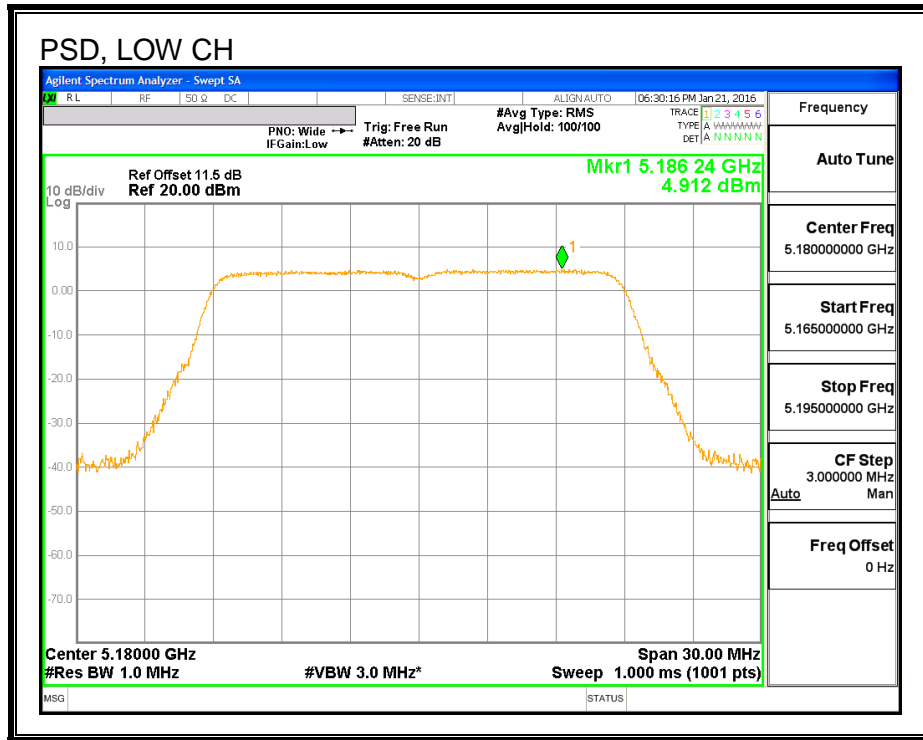
**Output Power Results**

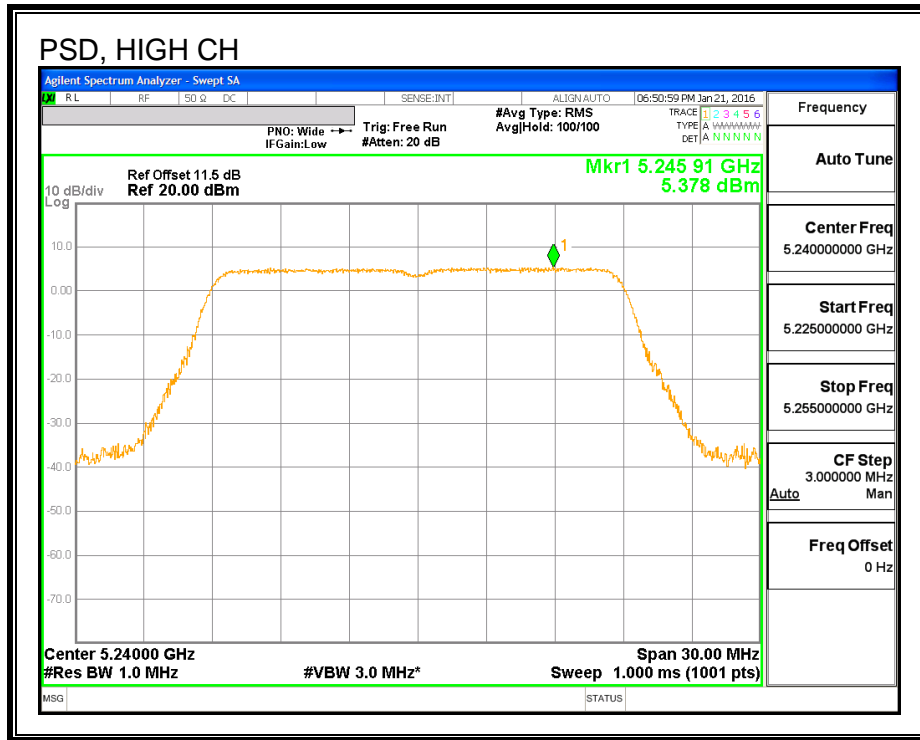
| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 16.36                               | 16.36                             | 24.00                   | -7.64                   |
| Mid     | 5200               | 16.90                               | 16.90                             | 24.00                   | -7.10                   |
| High    | 5240               | 16.86                               | 16.86                             | 24.00                   | -7.14                   |

**PSD Results**

| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 4.912                             | 4.91                            | 11.00                 | -6.09                 |
| Mid     | 5200               | 5.410                             | 5.41                            | 11.00                 | -5.59                 |
| High    | 5240               | 5.378                             | 5.38                            | 11.00                 | -5.62                 |

**PSD**





**8.3. 802.11n HT20 ANTENNA - A MODE IN THE 5.2 GHz BAND**

**8.3.1. 26 dB BANDWIDTH**

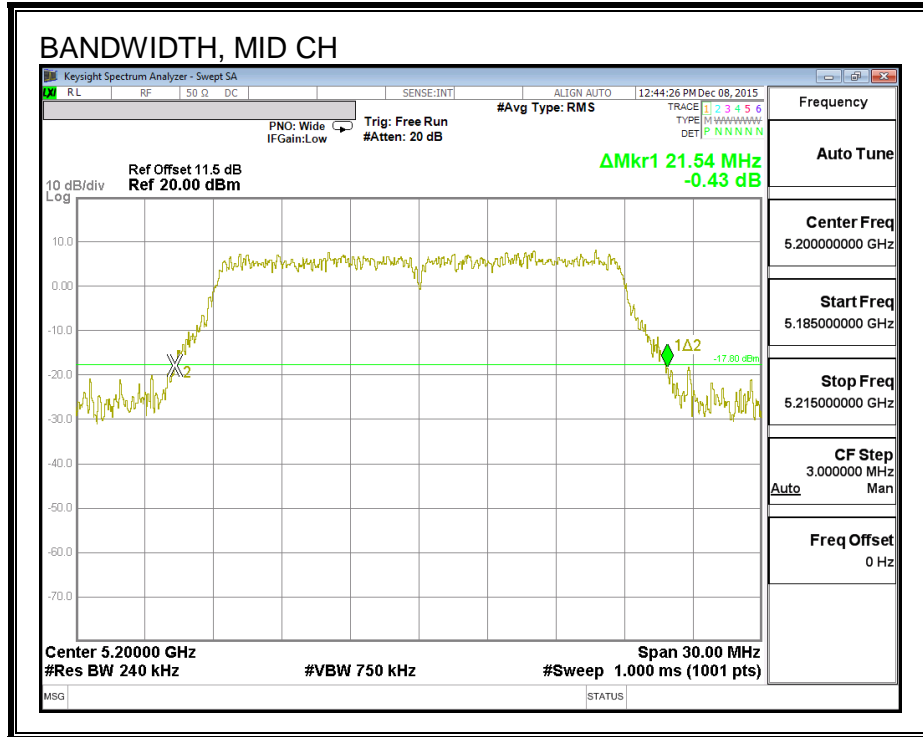
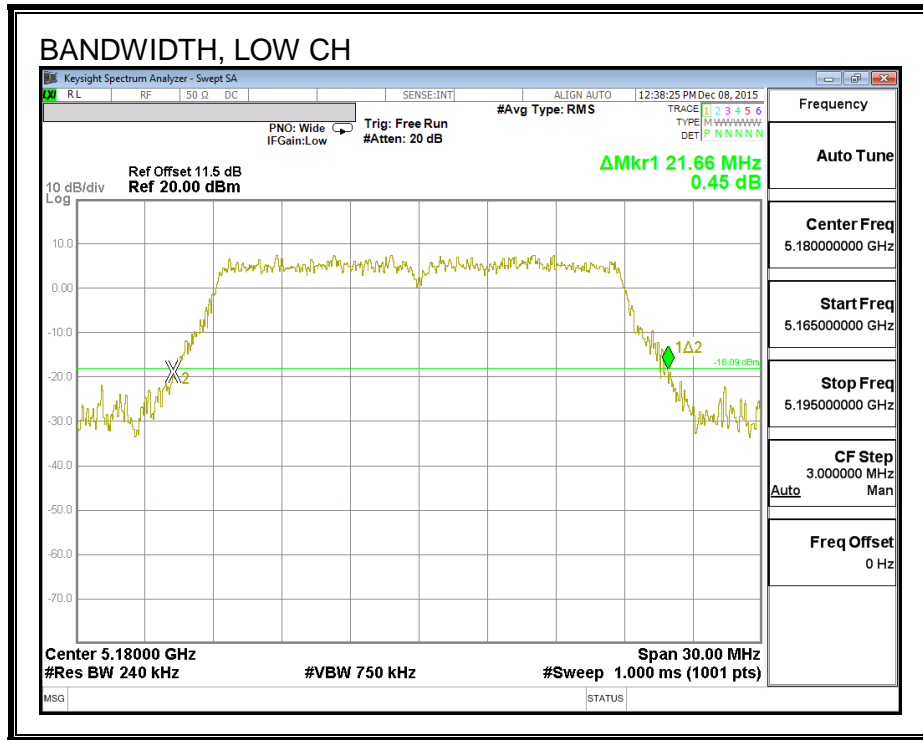
**LIMITS**

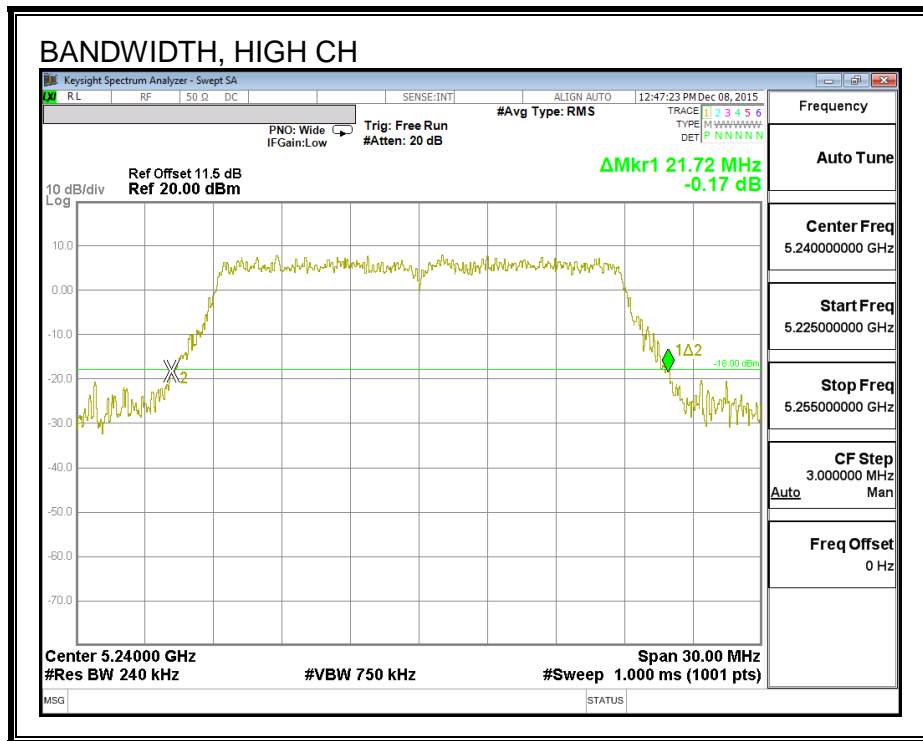
None; for reporting purposes only.

**RESULTS**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 5180            | 21.66                 |
| Mid     | 5200            | 21.54                 |
| High    | 5240            | 21.72                 |

**26 dB BANDWIDTH**





### 8.3.2. 99% BANDWIDTH

#### LIMITS

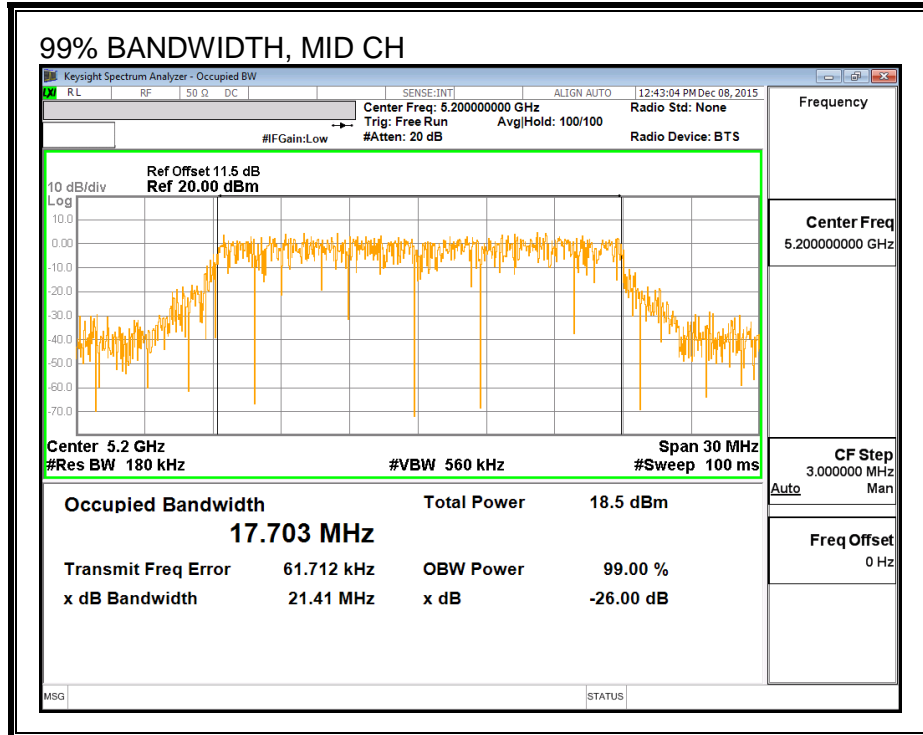
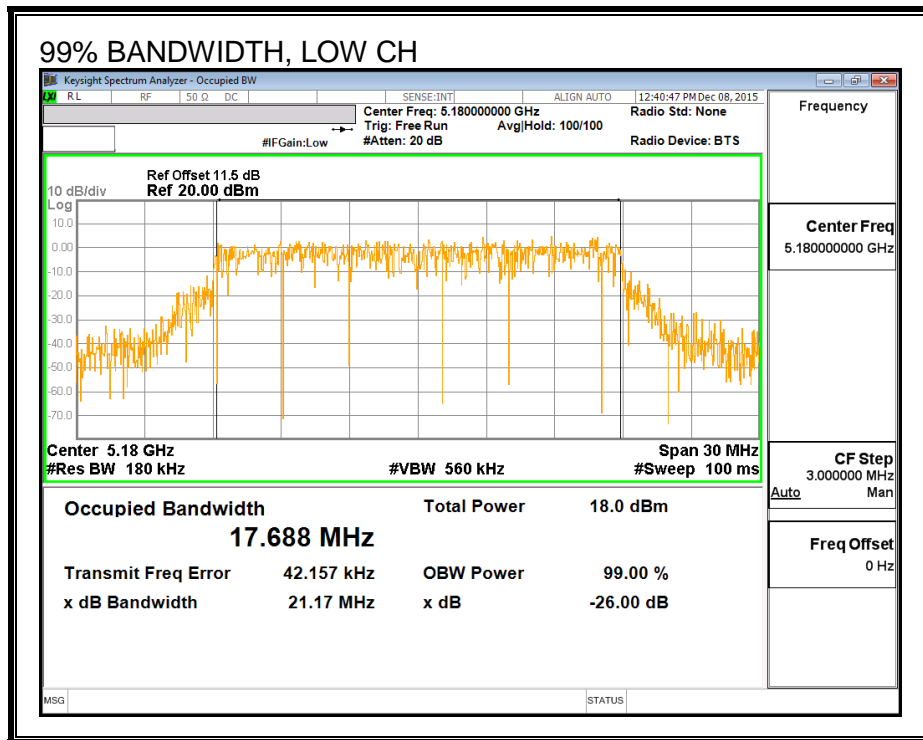
None; for reporting purposes only.

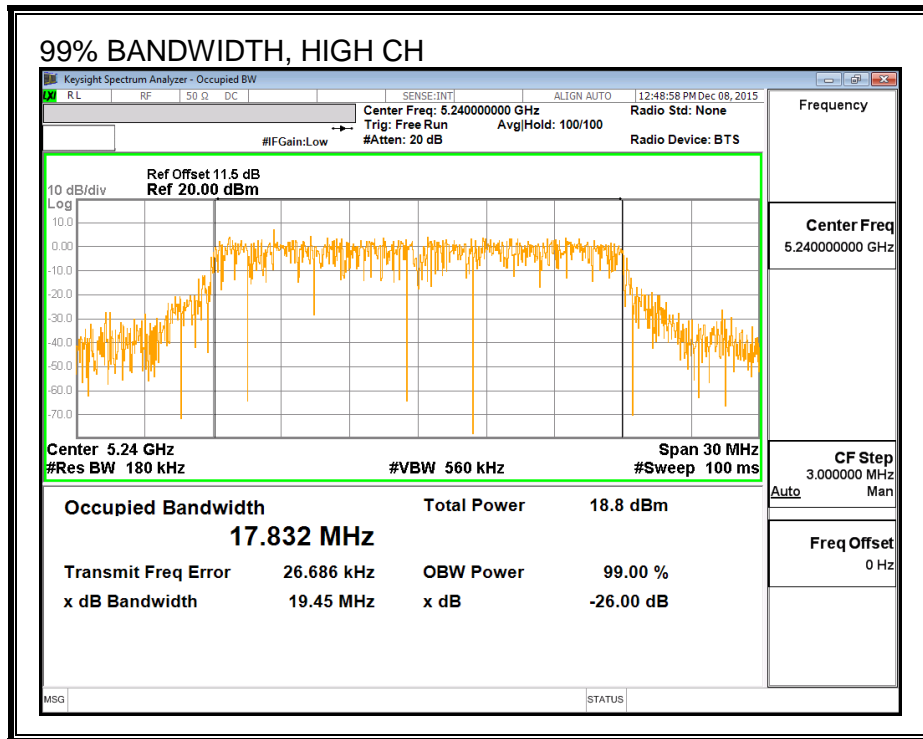
#### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>(MHz) |
|---------|--------------------|-----------------|
| Low     | 5180               | 17.688          |
| Mid     | 5200               | 17.703          |
| High    | 5240               | 17.832          |



**99% BANDWIDTH**





### 8.3.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency (MHz) | Power (dBm) |
|---------|-----------------|-------------|
| Low     | 5180            | 16.44       |
| Mid     | 5200            | 16.97       |
| High    | 5240            | 16.81       |

### 8.3.4. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

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

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

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

#### DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

**RESULTS**

**Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Directional<br>Gain<br>for PSD<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|---|---|-------------------------|-----------------------|
| Low     | 5180               | 2.30                                      | 2.30                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 2.30                                      | 2.30                                    | 24.00                   | 11.00                 |
| High    | 5240               | 2.30                                      | 2.30                                    | 24.00                   | 11.00                 |

|                           |      |   |
|---------------------------|------|---|
| <b>Duty Cycle CF (dB)</b> | 0.00 | <b>Included in Calculations of Corr'd PSD</b> |
|---------------------------|------|---|

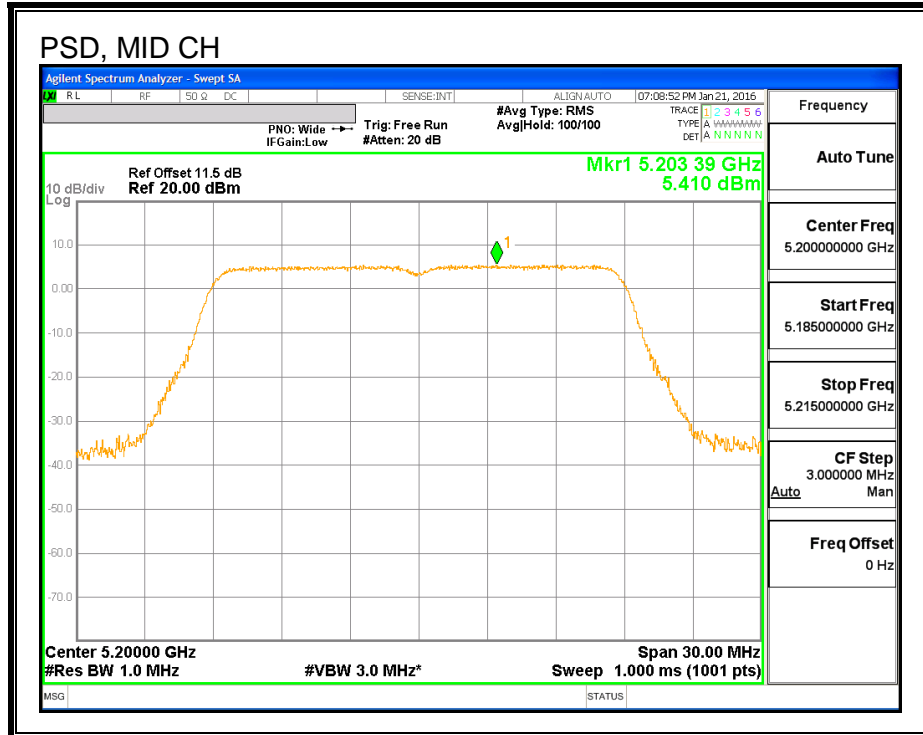
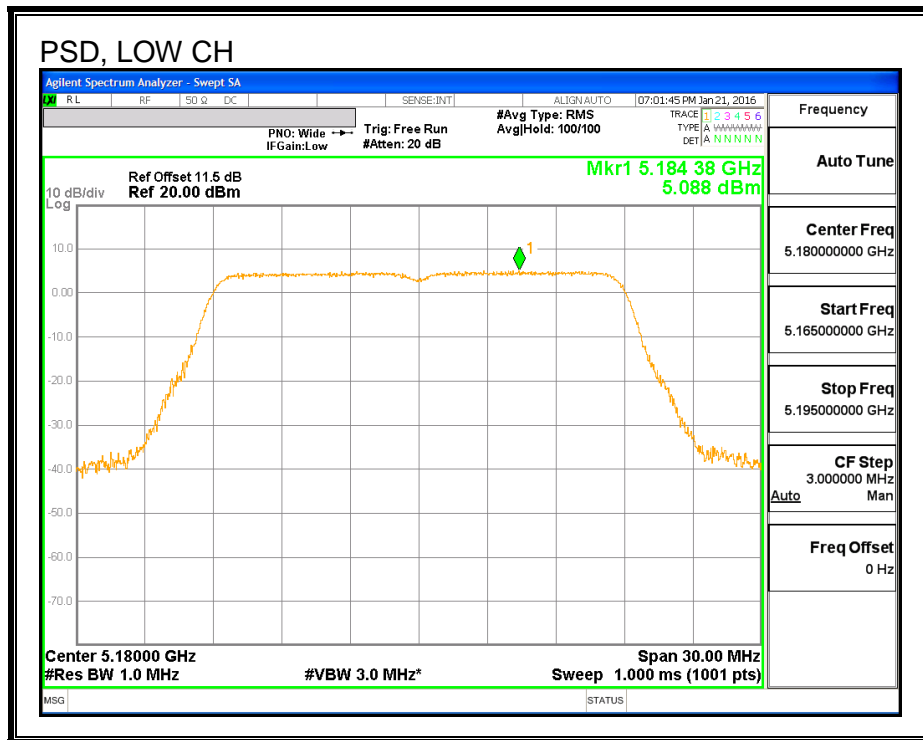
**Output Power Results**

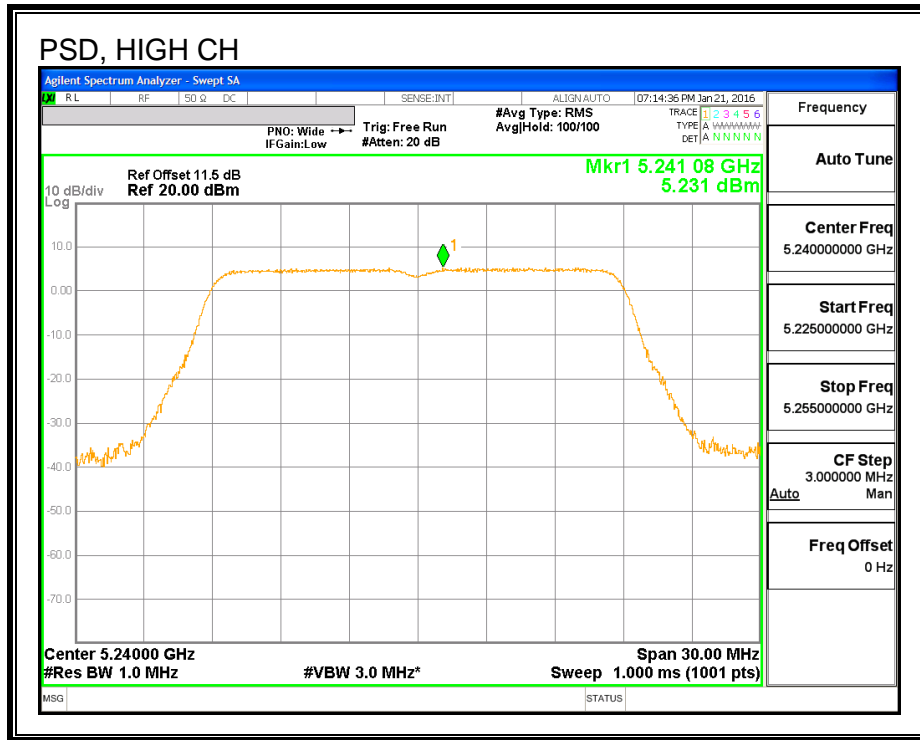
| Channel | Frequency<br>(MHz) | Antenna A<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 16.44                               | 16.44                             | 24.00                   | -7.56                   |
| Mid     | 5200               | 16.97                               | 16.97                             | 24.00                   | -7.03                   |
| High    | 5240               | 16.81                               | 16.81                             | 24.00                   | -7.19                   |

**PSD Results**

| Channel | Frequency<br>(MHz) | Antenna A<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 5.088                             | 5.09                            | 11.00                 | -5.91                 |
| Mid     | 5200               | 5.410                             | 5.41                            | 11.00                 | -5.59                 |
| High    | 5240               | 5.231                             | 5.23                            | 11.00                 | -5.77                 |

**PSD**





#### **8.4. 802.11a 2TX CDD MODE IN THE 5.2 GHz BAND**

**Note:** Covered by 802.11n HT20 2TX CDD MODE IN THE 5.2 GHz BAND.



## 8.5. 802.11n HT20 2TX CDD MODE IN THE 5.2 GHz BAND

### 8.5.1. 26 dB BANDWIDTH

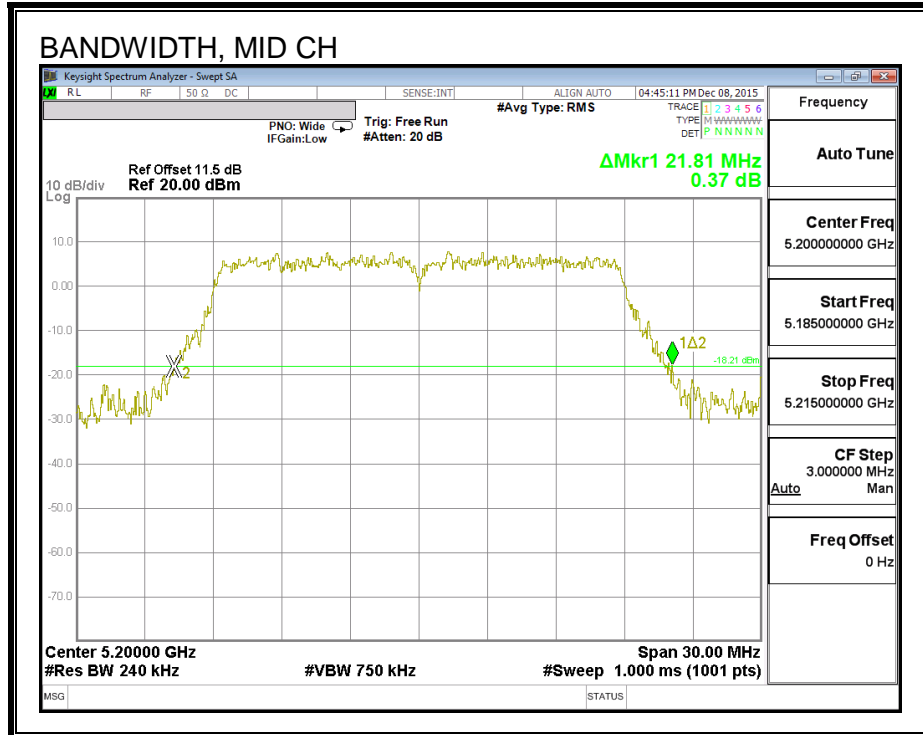
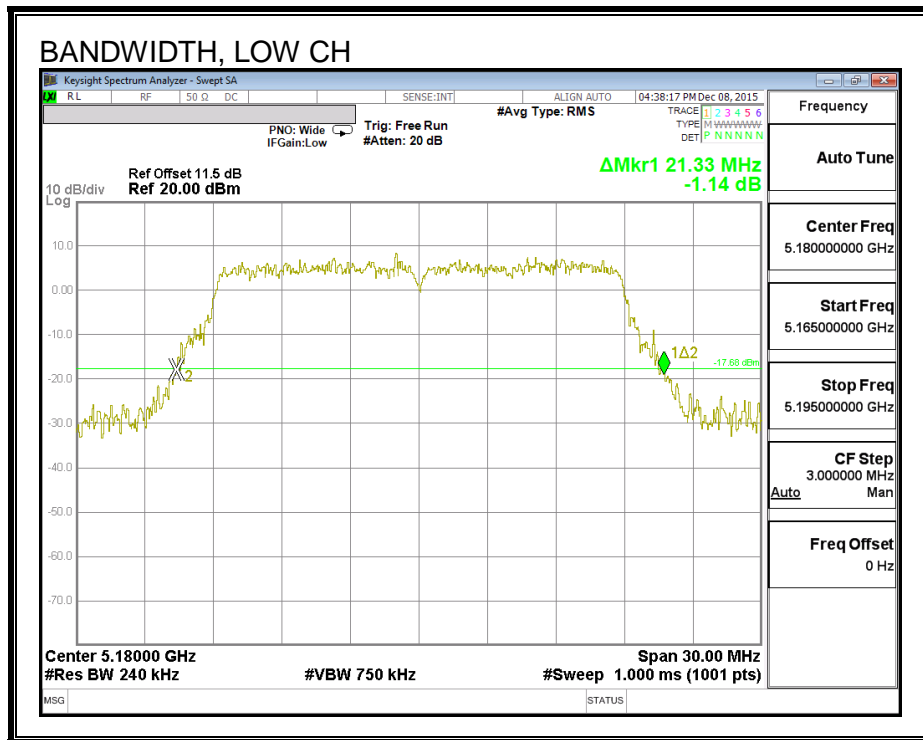
#### LIMITS

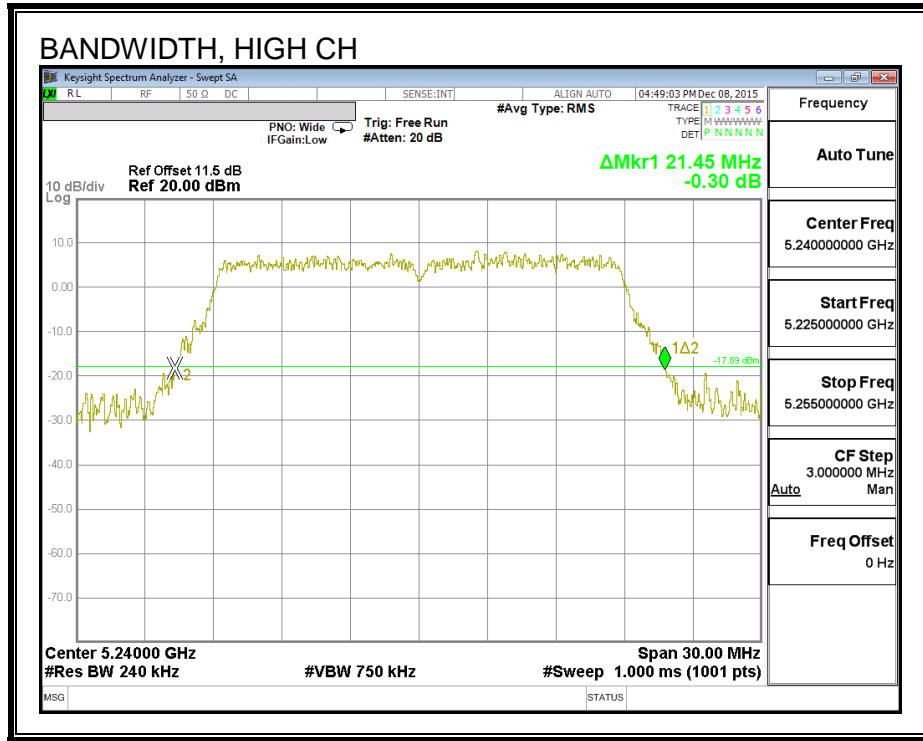
None; for reporting purposes only.

#### RESULTS

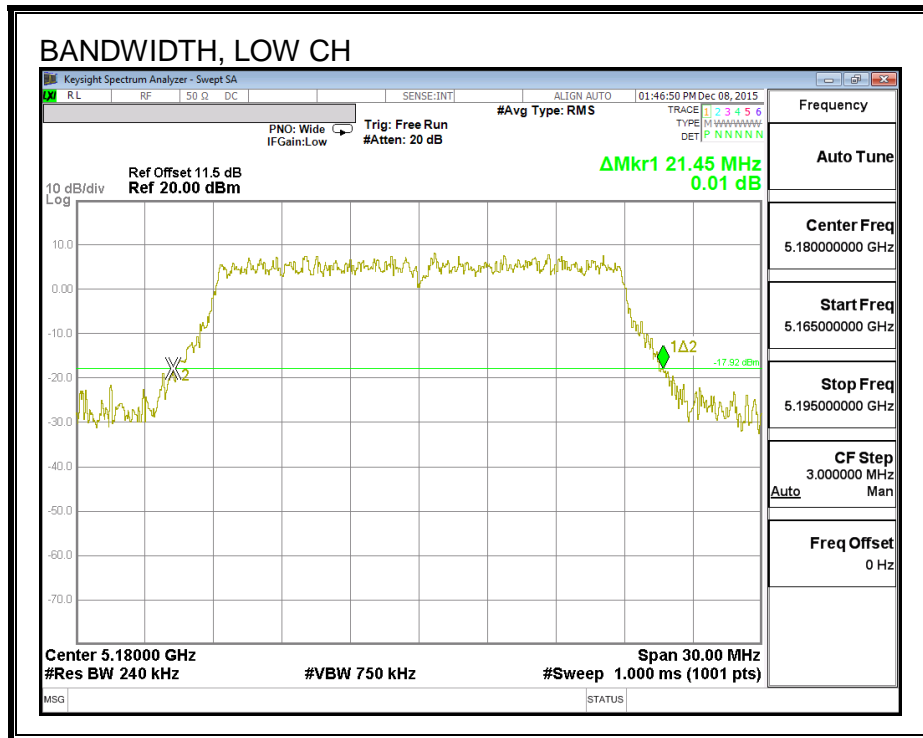
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Antenna B<br>(MHz) | 26 dB BW<br>Antenna A<br>(MHz) |
|---------|--------------------|--------------------------------|--------------------------------|
| Low     | 5180               | 21.33                          | 21.45                          |
| Mid     | 5200               | 21.81                          | 21.60                          |
| High    | 5240               | 21.45                          | 21.69                          |

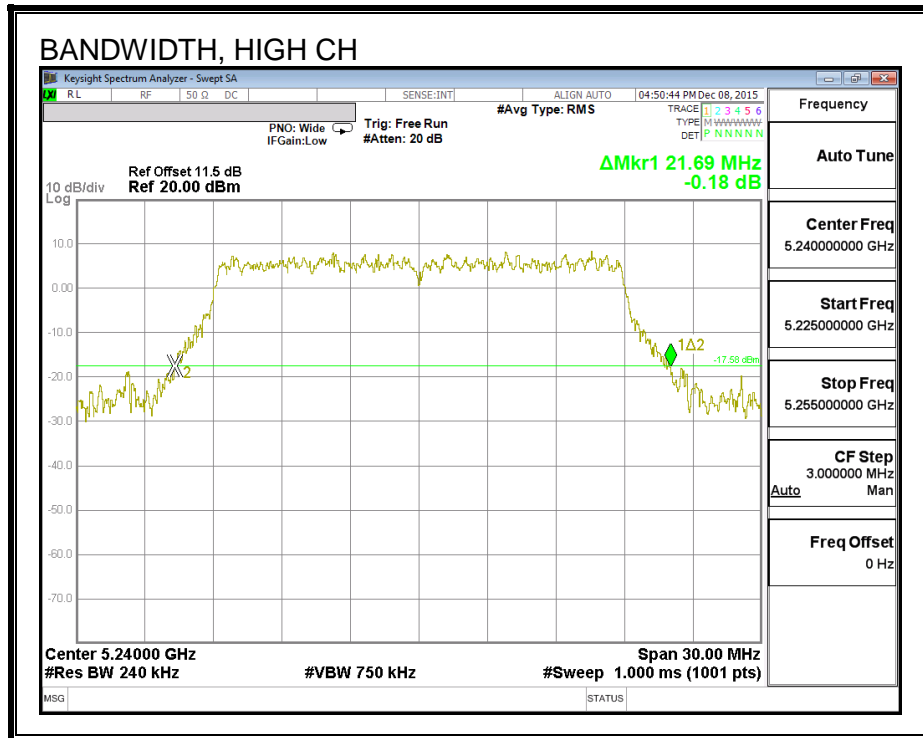
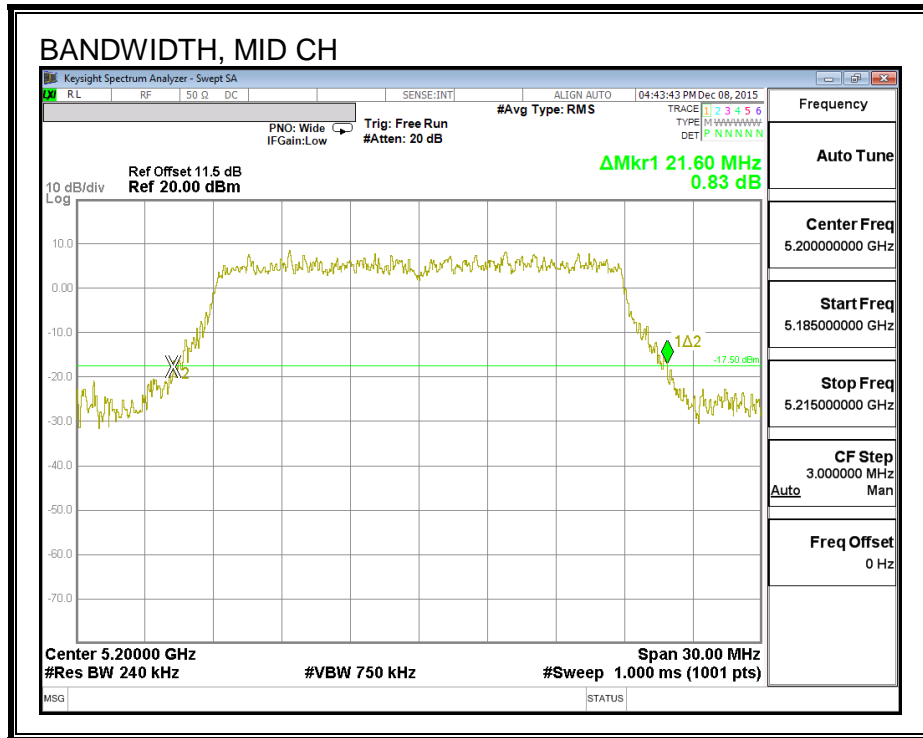
**26 DB BANDWIDTH, ANTENNA - B**





**26 DB BANDWIDTH, ANTENNA - A**





### 8.5.2. 99% BANDWIDTH

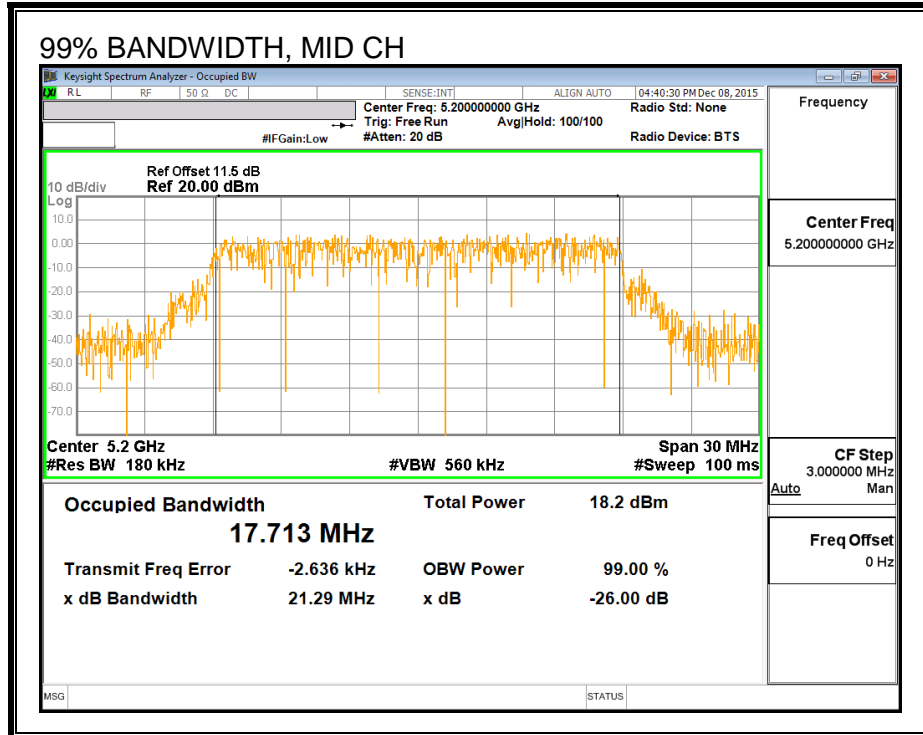
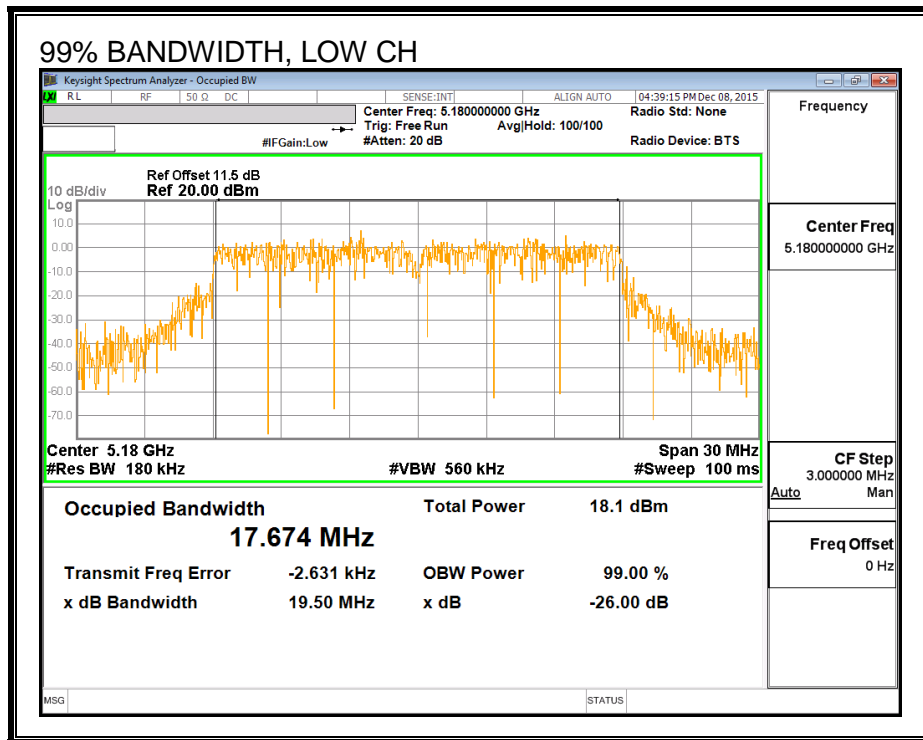
#### LIMITS

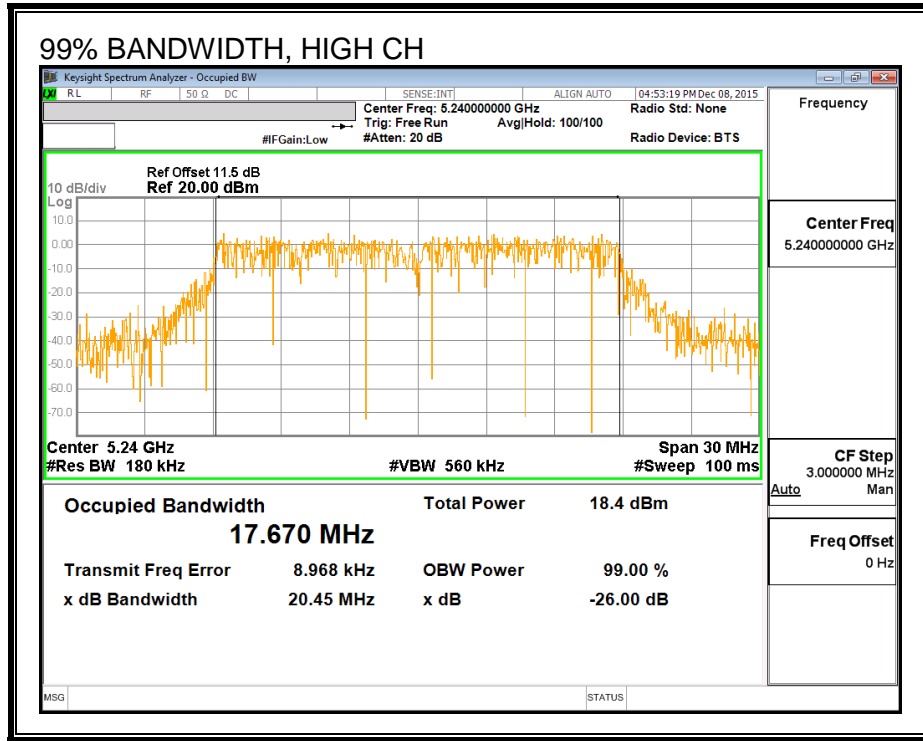
None; for reporting purposes only.

#### RESULTS

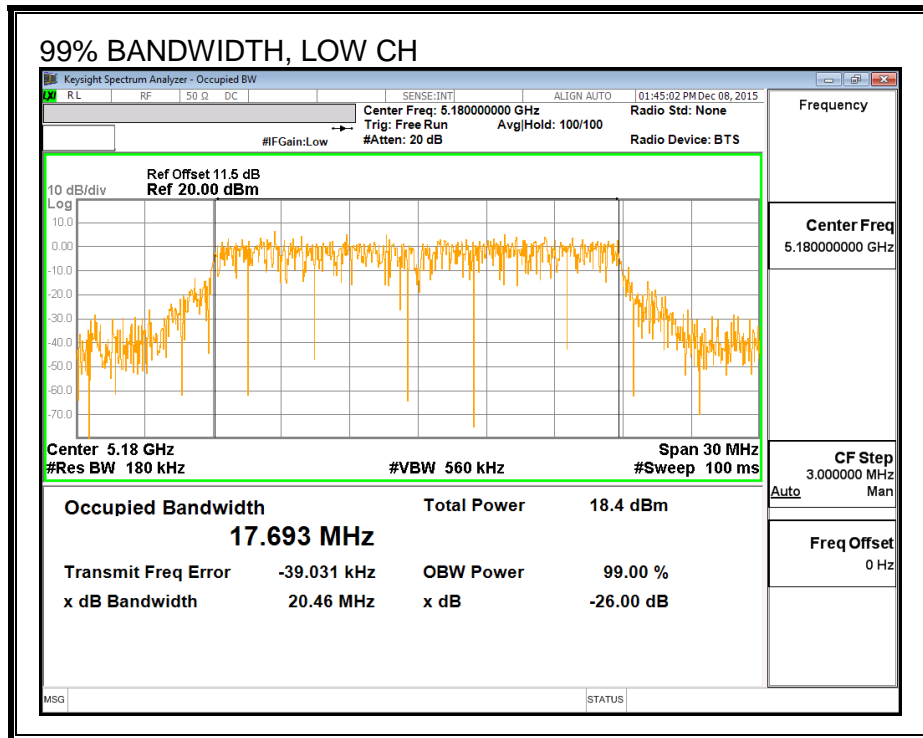
| Channel | Frequency<br>(MHz) | 99% BW<br>Antenna B<br>(MHz) | 99% BW<br>Antenna A<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 17.674                       | 17.693                       |
| Mid     | 5200               | 17.713                       | 17.732                       |
| High    | 5240               | 17.670                       | 17.690                       |

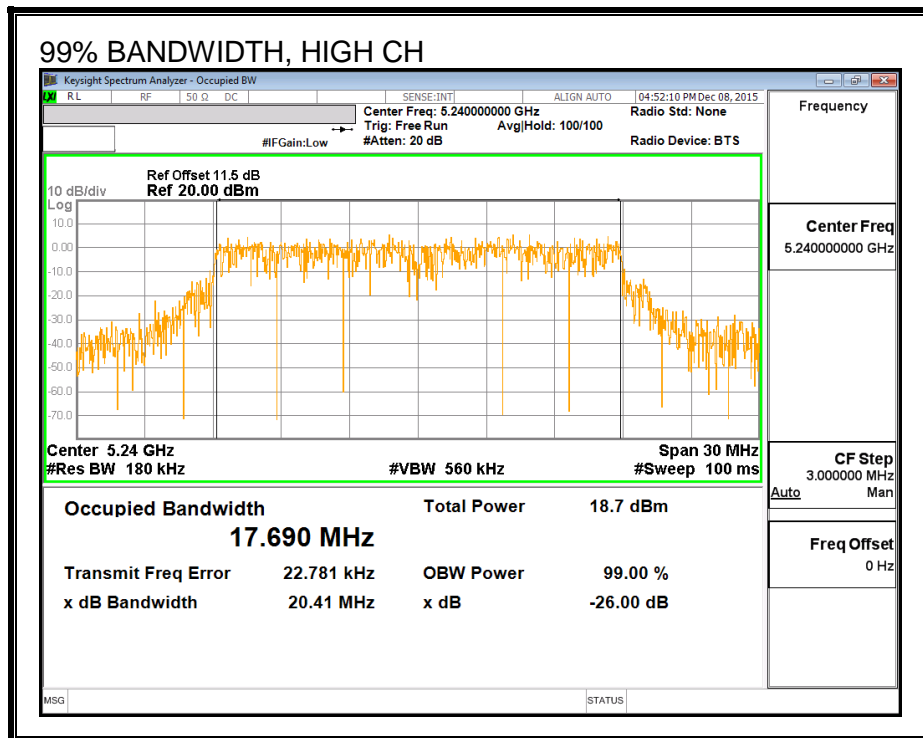
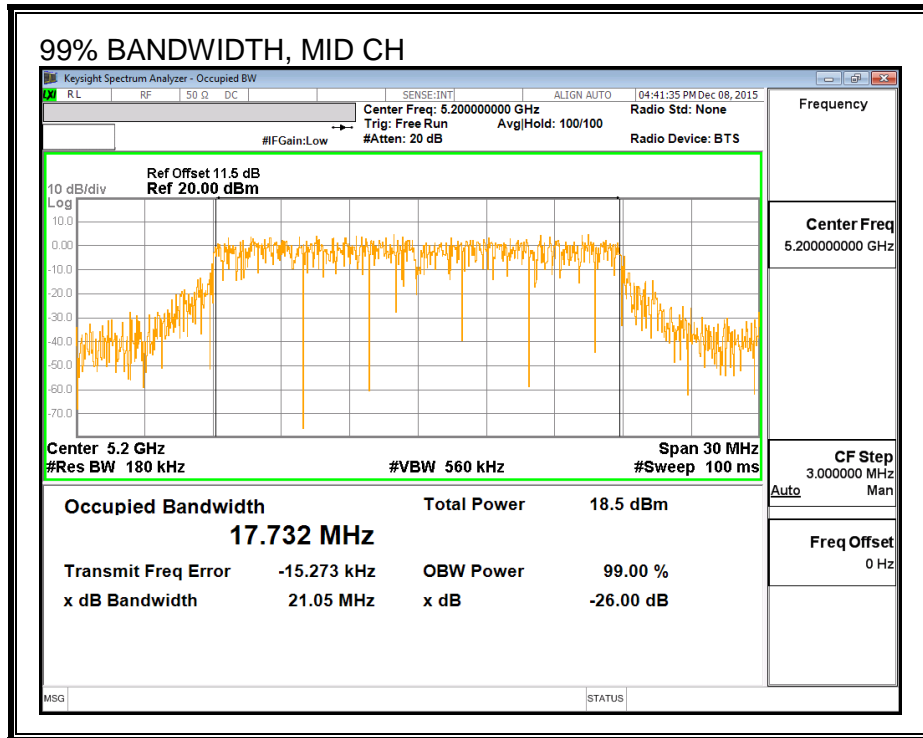
**99% BANDWIDTH, ANTENNA - B**





**99% BANDWIDTH, ANTENNA - A**







### 8.5.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Antenna B<br>Power<br>(dBm) | Antenna A<br>Power<br>(dBm) | Total<br>Power<br>(dBm) |
|---------|--------------------|-----------------------------|-----------------------------|-------------------------|
| Low     | 5180               | 14.46                       | 14.45                       | 17.47                   |
| Mid     | 5200               | 15.97                       | 15.82                       | 18.91                   |
| High    | 5240               | 15.95                       | 15.93                       | 18.95                   |

## 8.5.4. OUTPUT POWER AND PSD

### LIMITS

FCC §15.407 (a) (1)

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

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

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**DIRECTIONAL ANTENNA GAIN**

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

| <b>Antenna B</b>  | <b>Antenna A</b>  | <b>Uncorrelated Chains</b>    |
|-------------------|-------------------|-------------------------------|
| <b>Gain (dBi)</b> | <b>Gain (dBi)</b> | <b>Directional Gain (dBi)</b> |
| 3.04              | 2.30              | 2.69                          |

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

| <b>Antenna B</b>  | <b>Antenna A</b>  | <b>Correlated Chains</b>      |
|-------------------|-------------------|-------------------------------|
| <b>Gain (dBi)</b> | <b>Gain (dBi)</b> | <b>Directional Gain (dBi)</b> |
| 3.04              | 2.30              | 5.69                          |

**RESULTS**

**Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Directional<br>Gain<br>for PSD<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|---|---|-------------------------|-----------------------|
| Low     | 5180               | 2.69                                      | 5.69                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 2.69                                      | 5.69                                    | 24.00                   | 11.00                 |
| High    | 5240               | 2.65                                      | 5.69                                    | 24.00                   | 11.00                 |

|                           |      |   |
|---------------------------|------|---|
| <b>Duty Cycle CF (dB)</b> | 0.00 | <b>Included in Calculations of Corr'd PSD</b> |
|---------------------------|------|---|

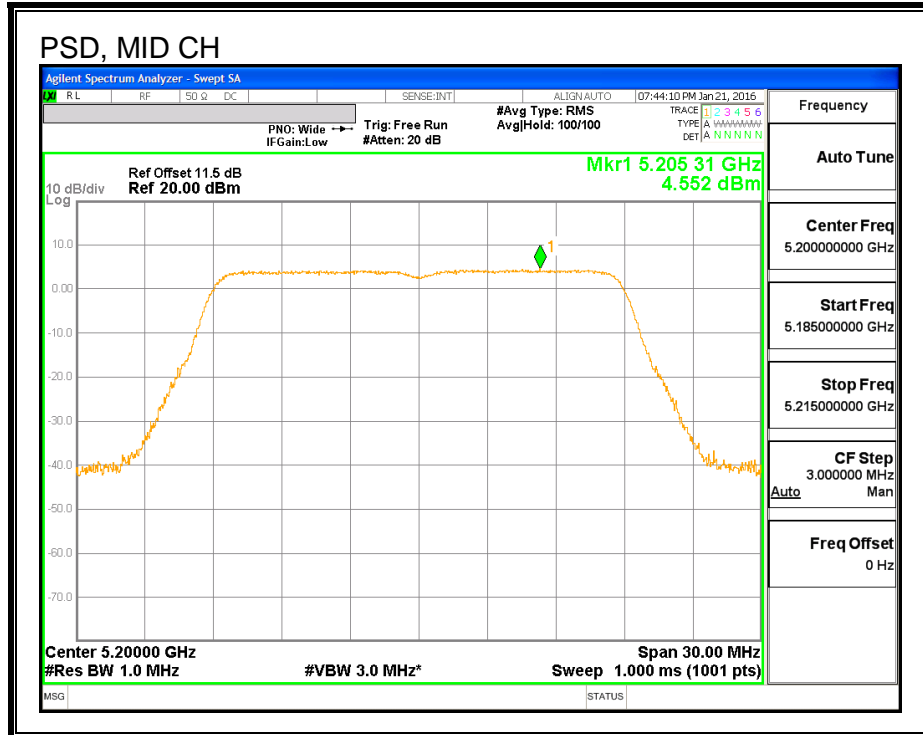
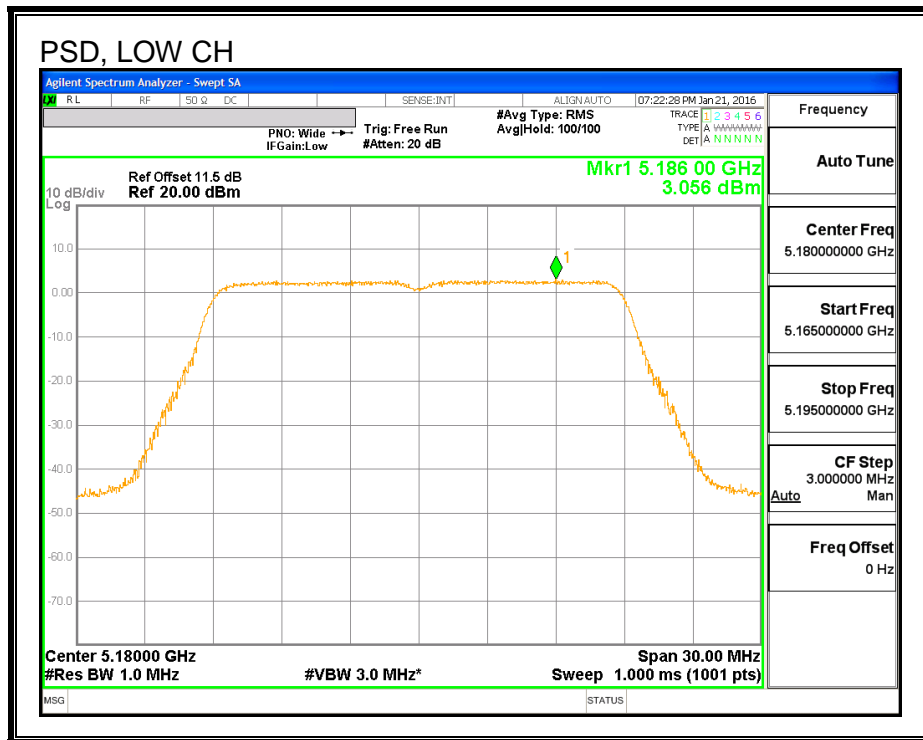
**Output Power Results**

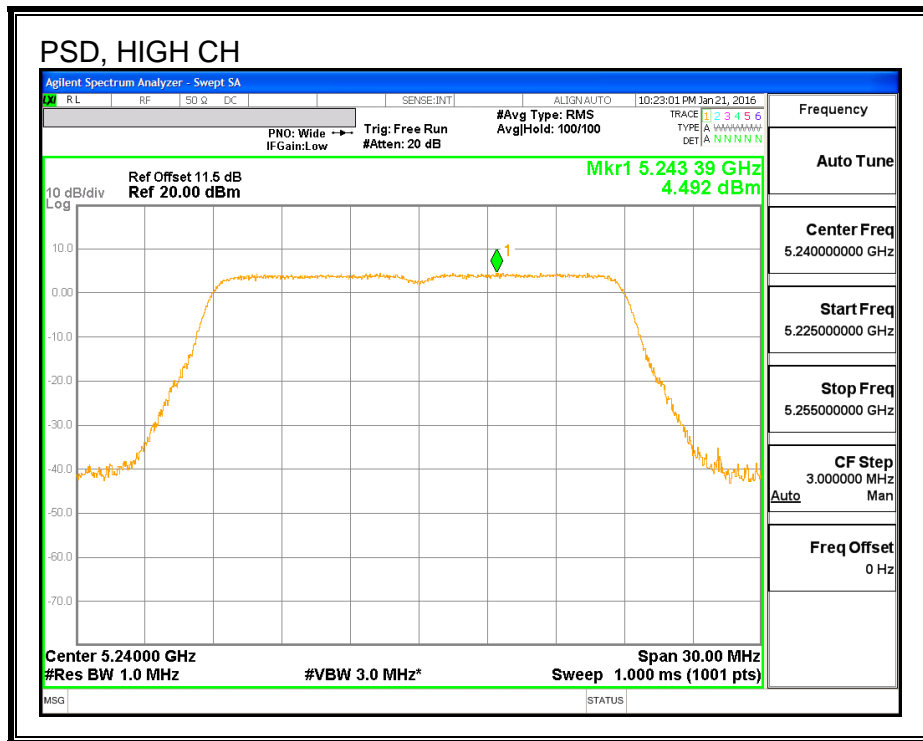
| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>Power<br>(dBm) | Antenna A<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 14.46                               | 14.45                               | 17.47                             | 24.00                   | -6.53                   |
| Mid     | 5200               | 15.97                               | 15.82                               | 18.91                             | 24.00                   | -5.09                   |
| High    | 5240               | 15.95                               | 15.93                               | 18.95                             | 24.00                   | -5.05                   |

**PSD Results**

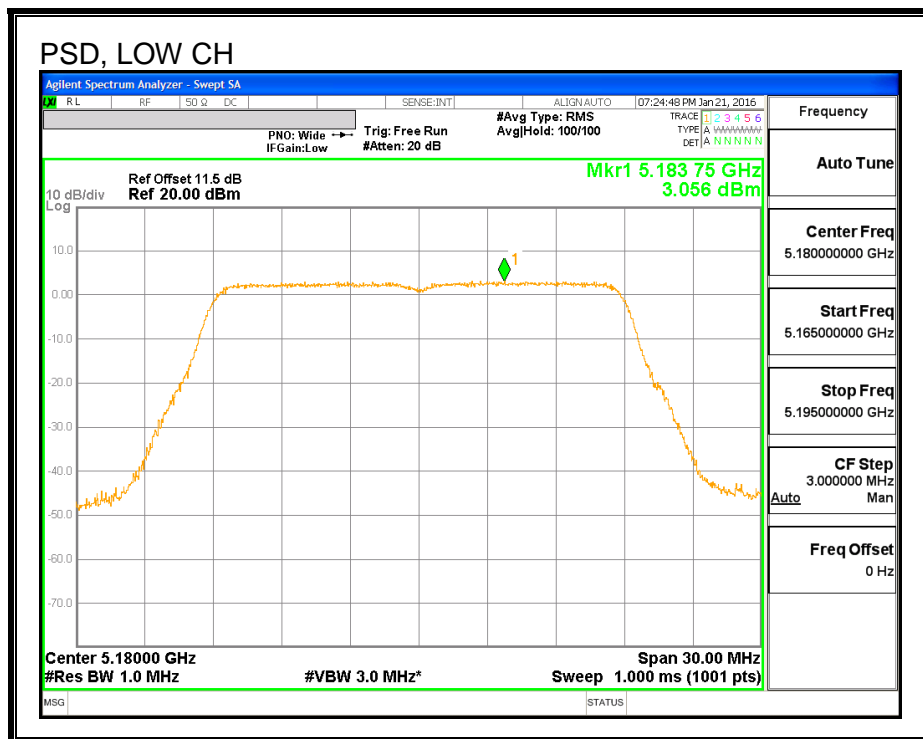
| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>PSD<br>(dBm) | Antenna A<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 3.056                             | 3.056                             | 6.07                            | 11.00                 | -4.93                 |
| Mid     | 5200               | 4.552                             | 4.283                             | 7.43                            | 11.00                 | -3.57                 |
| High    | 5240               | 4.492                             | 4.400                             | 7.46                            | 11.00                 | -3.54                 |

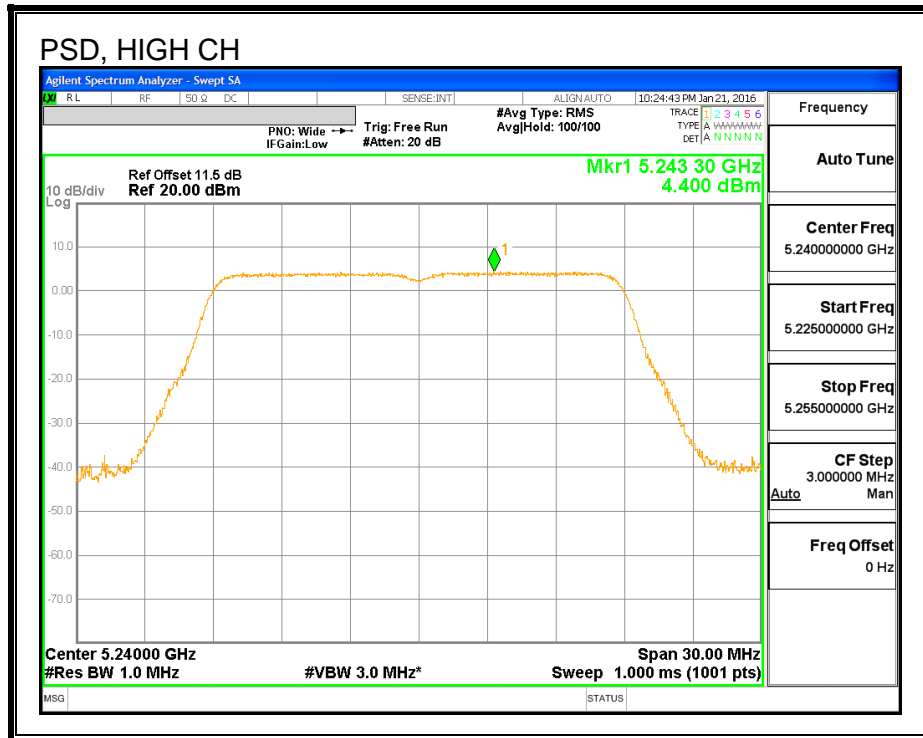
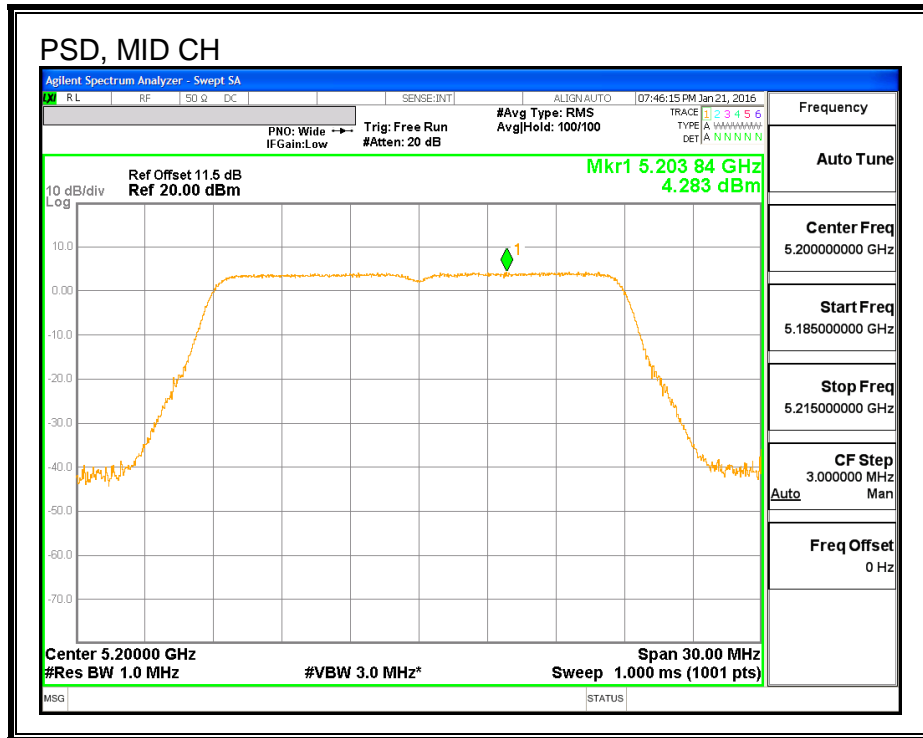
**PSD, ANTENNA - B**





**PSD, ANTENNA - A**





**8.6. 802.11n HT20 2TX STBC MODE IN THE 5.2 GHz BAND**

**8.6.1. 26 dB BANDWIDTH**

**LIMITS**

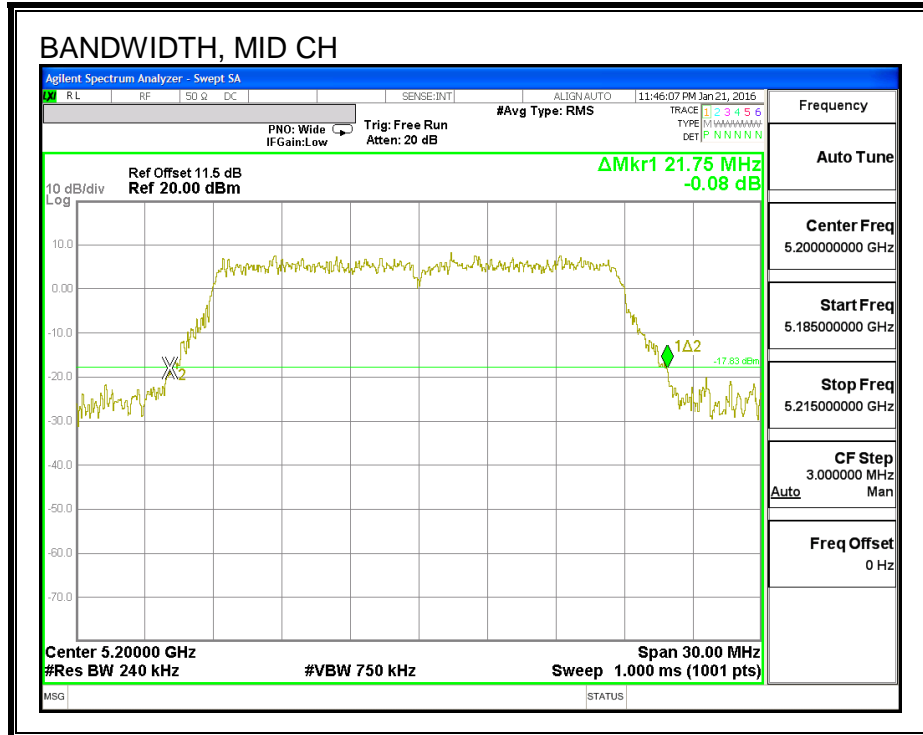
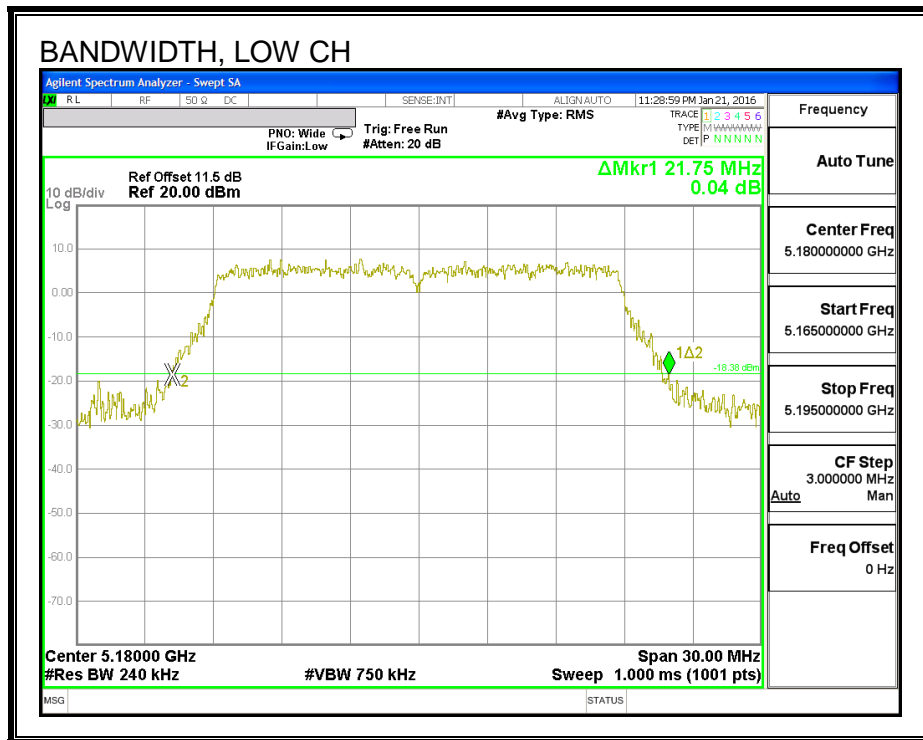
None; for reporting purposes only.

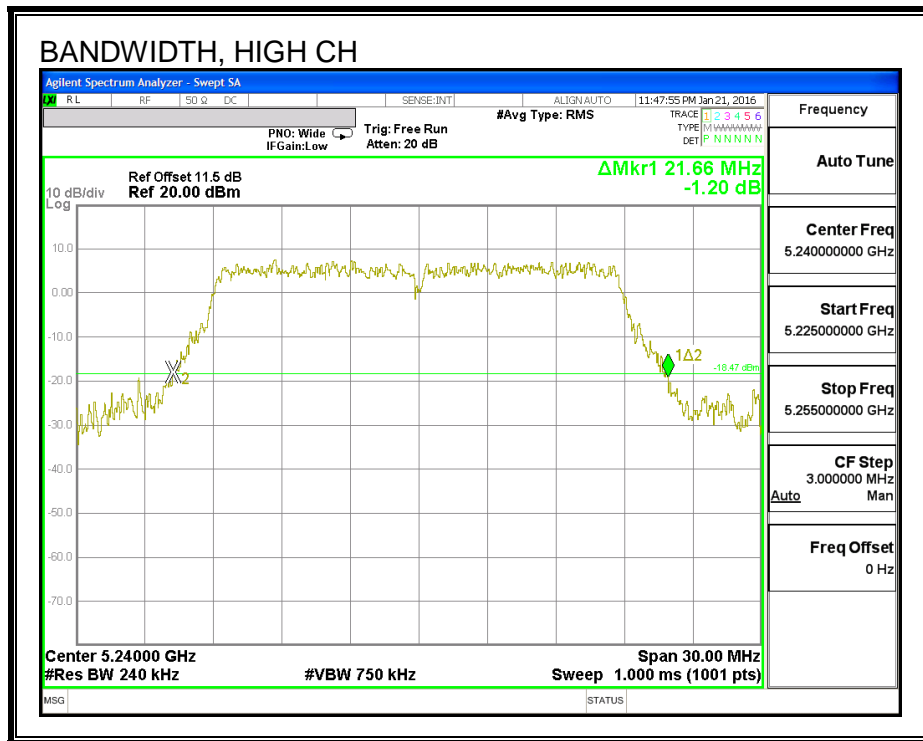
**RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Antenna B<br>(MHz) | 26 dB BW<br>Antenna A<br>(MHz) |
|---------|--------------------|--------------------------------|--------------------------------|
| Low     | 5180               | 21.75                          | 21.66                          |
| Mid     | 5200               | 21.75                          | 21.51                          |
| High    | 5240               | 21.66                          | 21.45                          |

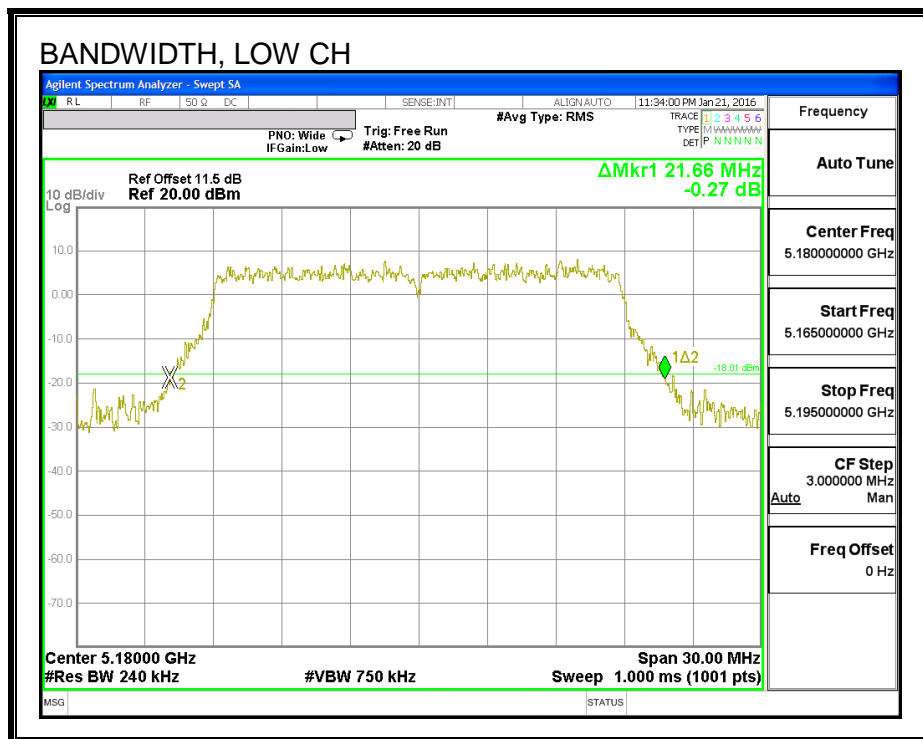


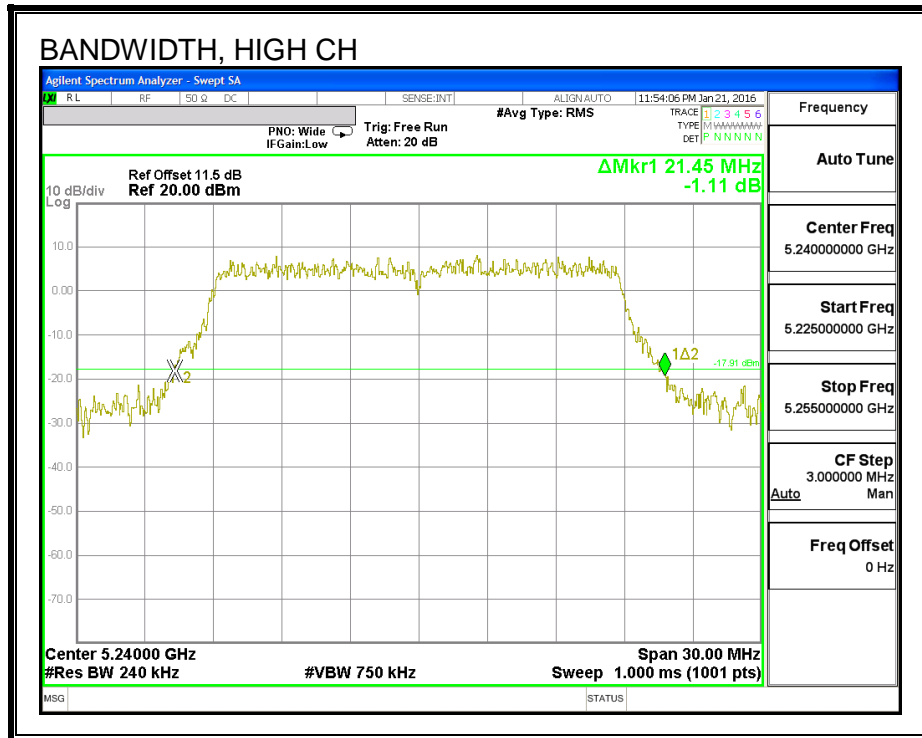
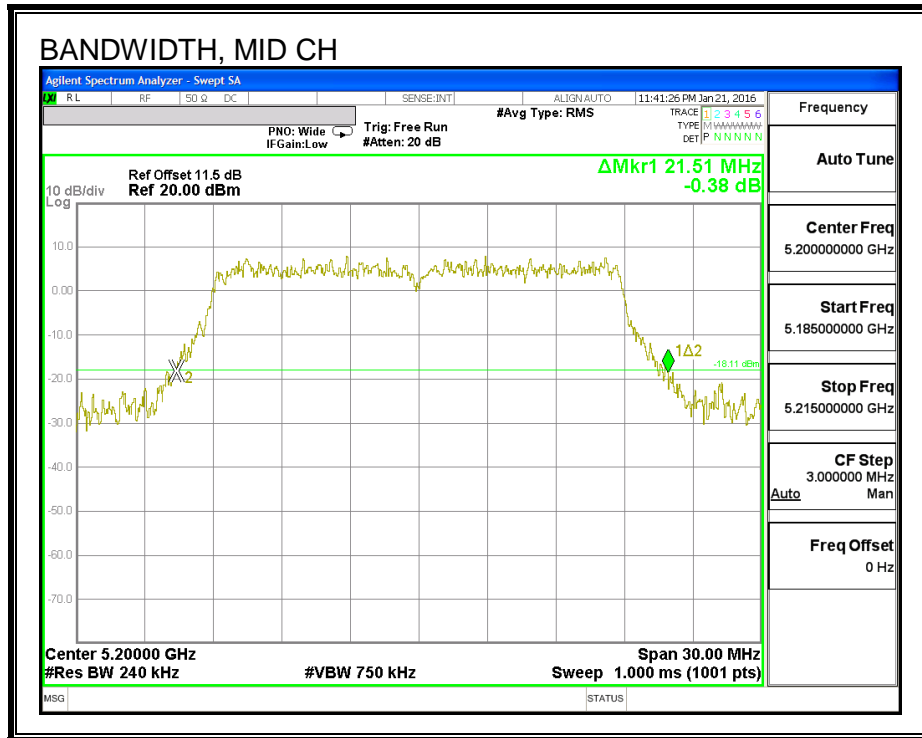
**26 DB BANDWIDTH, ANTENNA - B**





**26 DB BANDWIDTH, ANTENNA - A**





### 8.6.2. 99% BANDWIDTH

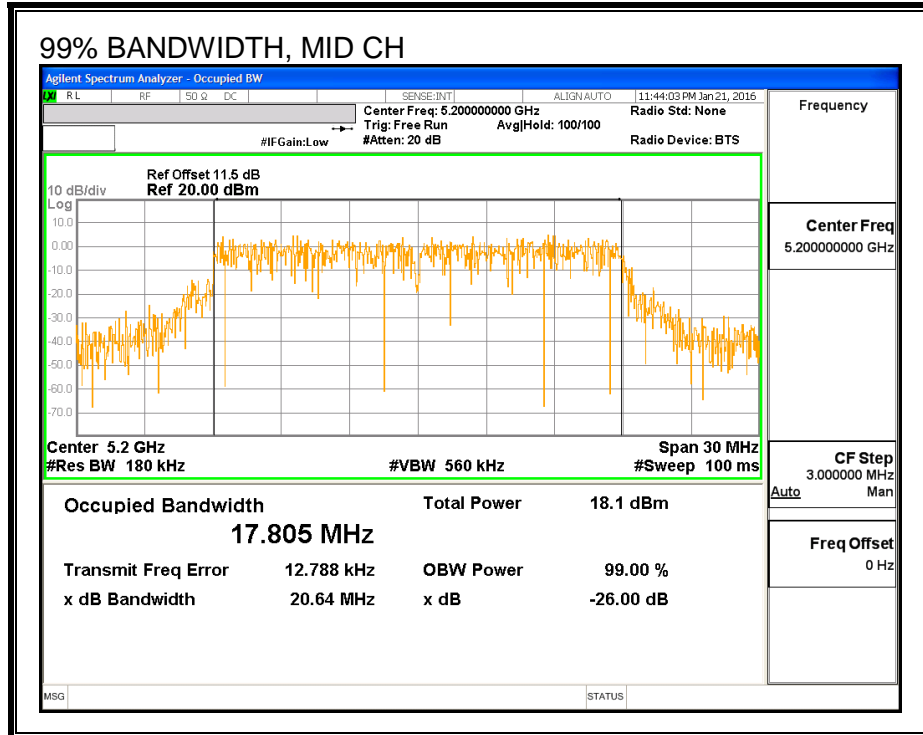
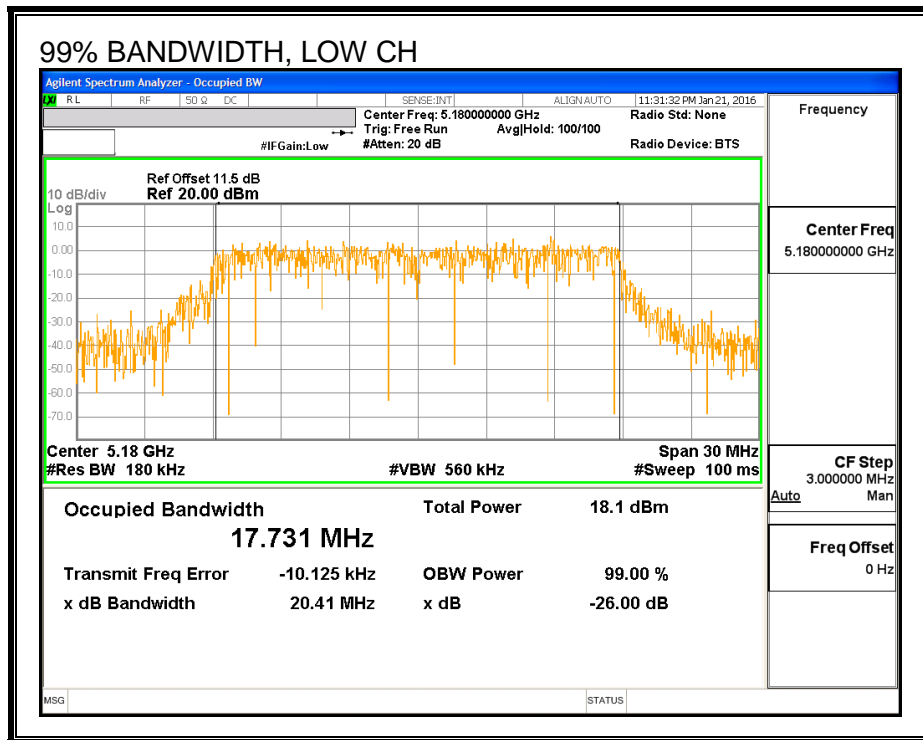
#### LIMITS

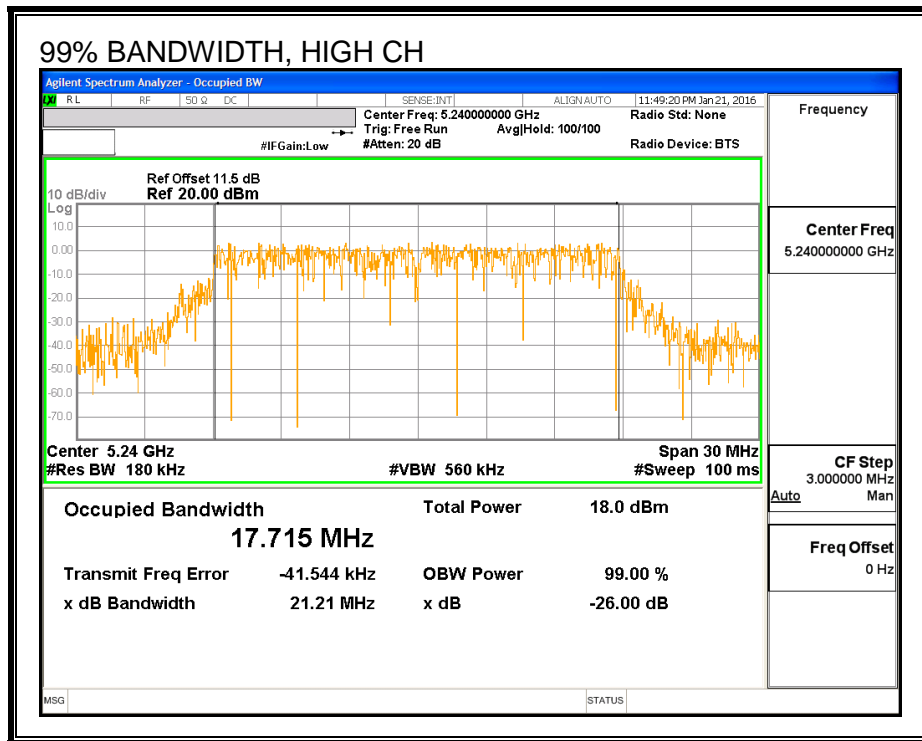
None; for reporting purposes only.

#### RESULTS

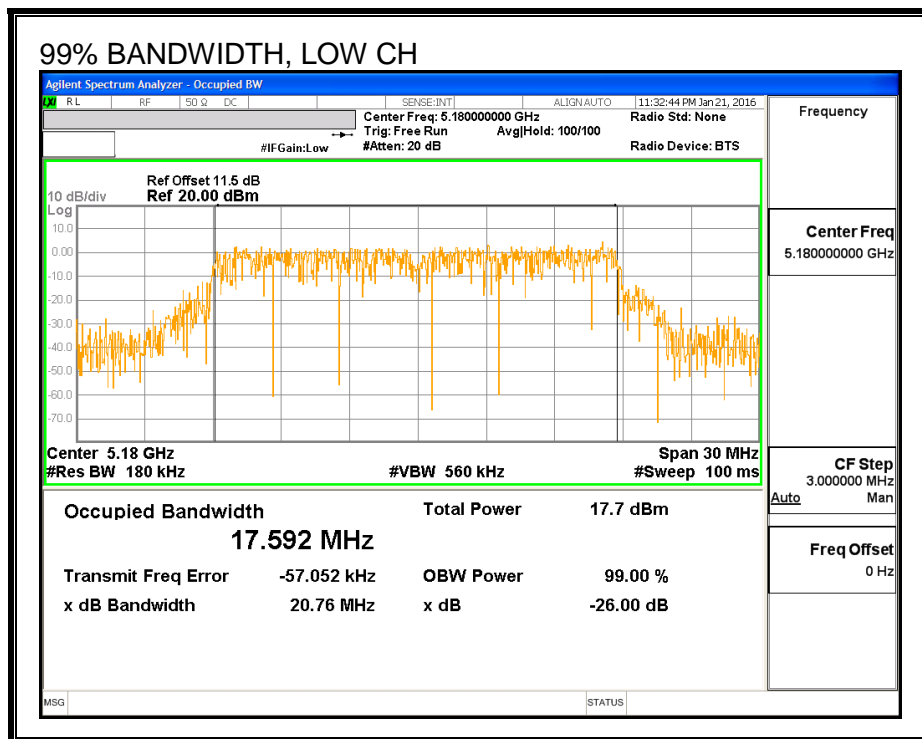
| Channel | Frequency<br>(MHz) | 99% BW<br>Antenna B<br>(MHz) | 99% BW<br>Antenna A<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 17.731                       | 17.592                       |
| Mid     | 5200               | 17.805                       | 17.691                       |
| High    | 5240               | 17.715                       | 17.744                       |

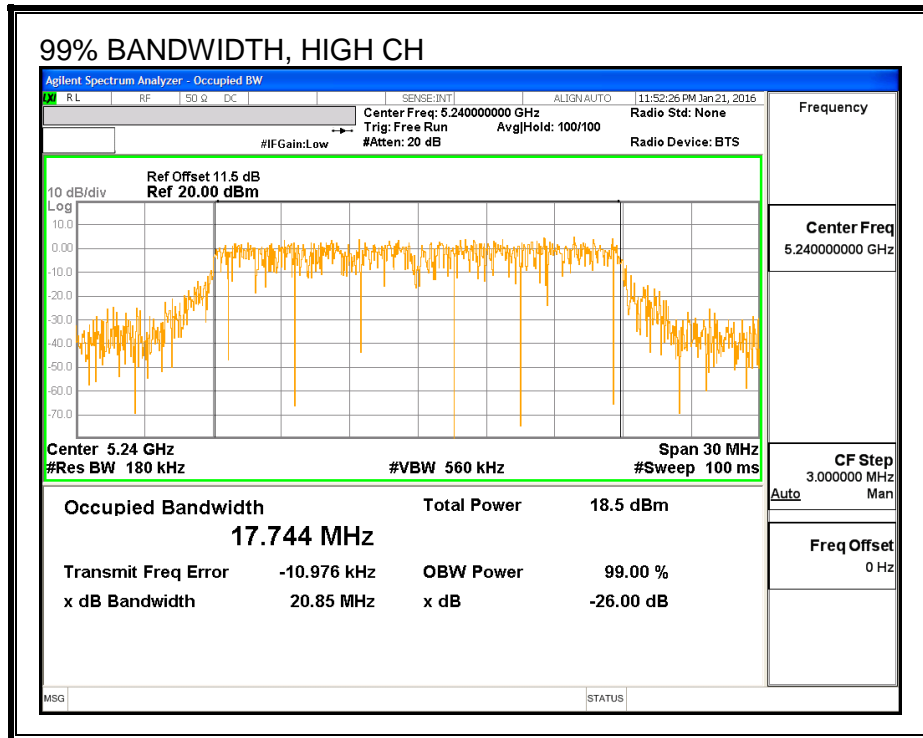
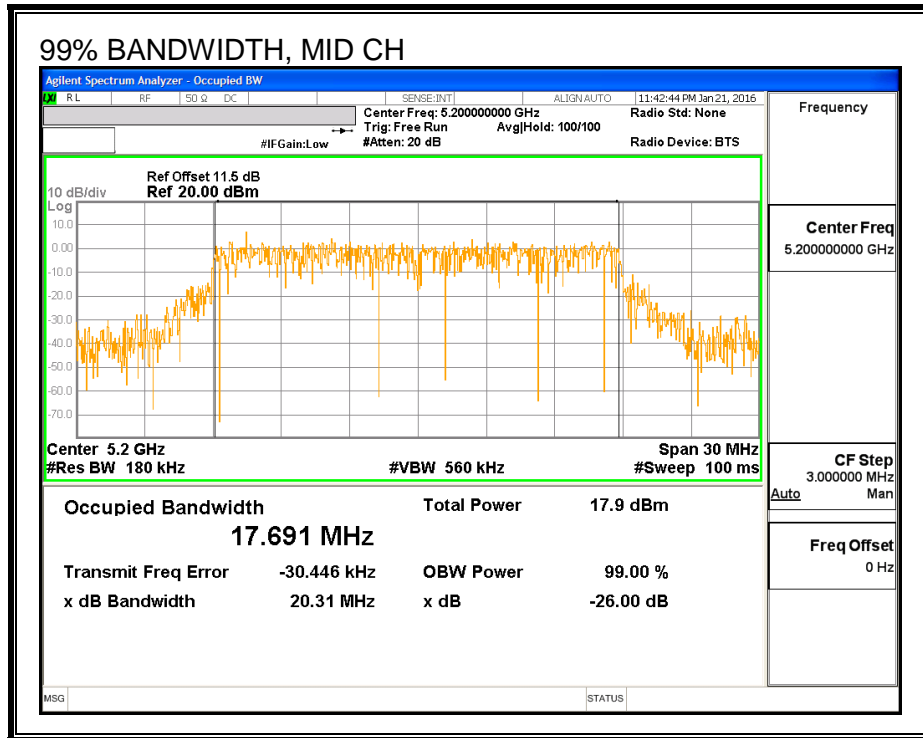
**99% BANDWIDTH, ANTENNA - B**





**99% BANDWIDTH, ANTENNA - A**





### 8.6.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Antenna<br>B<br>Power<br>(dBm) | Antenna<br>A<br>Power<br>(dBm) | Total<br>Power<br>(dBm) |
|---------|--------------------|--------------------------------|--------------------------------|-------------------------|
| Low     | 5180               | 14.38                          | 14.42                          | 17.41                   |
| Mid     | 5200               | 16.99                          | 16.97                          | 19.99                   |
| High    | 5240               | 16.98                          | 17.00                          | 20.00                   |



## 8.6.4. OUTPUT POWER AND PSD

### LIMITS

FCC §15.407 (a) (1)

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

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

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**DIRECTIONAL ANTENNA GAIN**

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

| <b>Antenna B</b>  | <b>Antenna A</b>  | <b>Uncorrelated Chains</b>    |
|-------------------|-------------------|-------------------------------|
| <b>Gain (dBi)</b> | <b>Gain (dBi)</b> | <b>Directional Gain (dBi)</b> |
| 3.04              | 2.30              | 2.69                          |

**RESULTS**

**Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Directional<br>Gain<br>for PSD<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|---|---|-------------------------|-----------------------|
| Low     | 5180               | 2.69                                      | 2.69                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 2.69                                      | 2.69                                    | 24.00                   | 11.00                 |
| High    | 5240               | 2.69                                      | 2.69                                    | 24.00                   | 11.00                 |

|                           |      |   |
|---------------------------|------|---|
| <b>Duty Cycle CF (dB)</b> | 0.00 | <b>Included in Calculations of Corr'd PSD</b> |
|---------------------------|------|---|

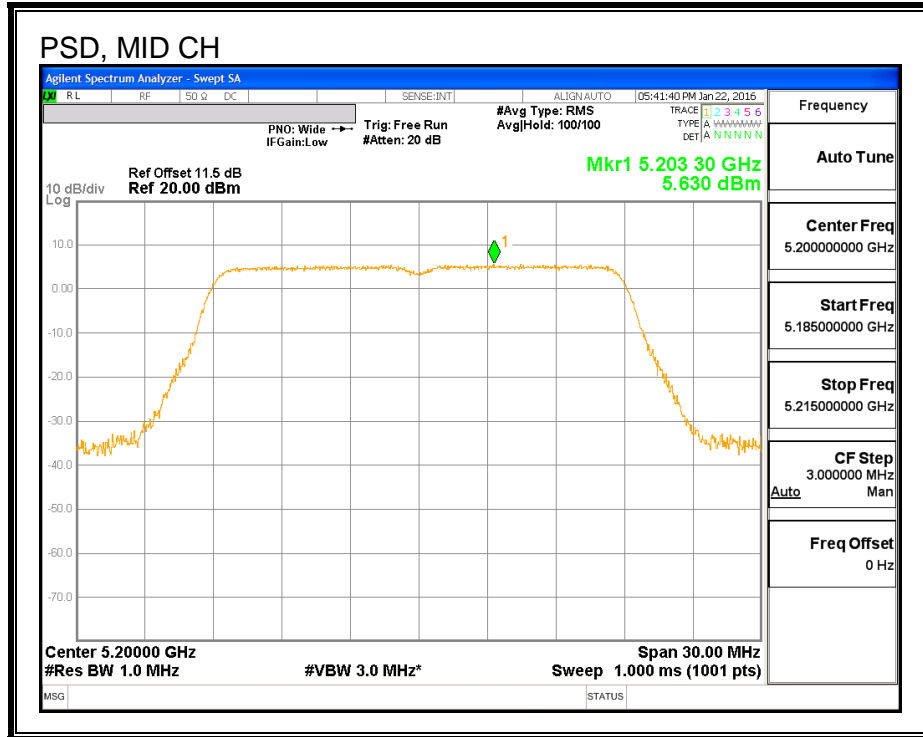
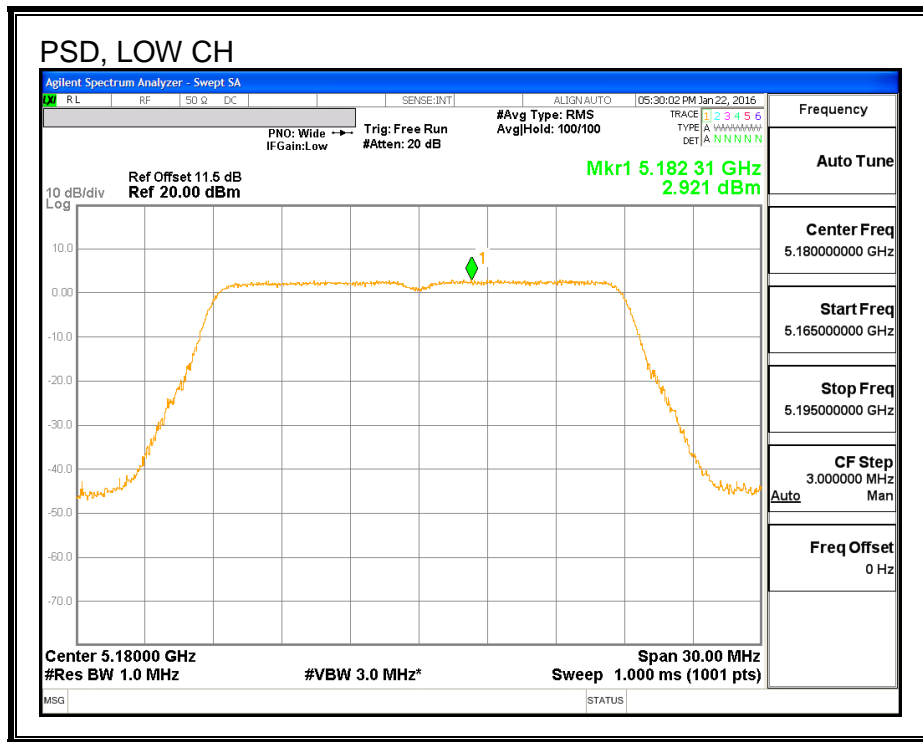
**Output Power Results**

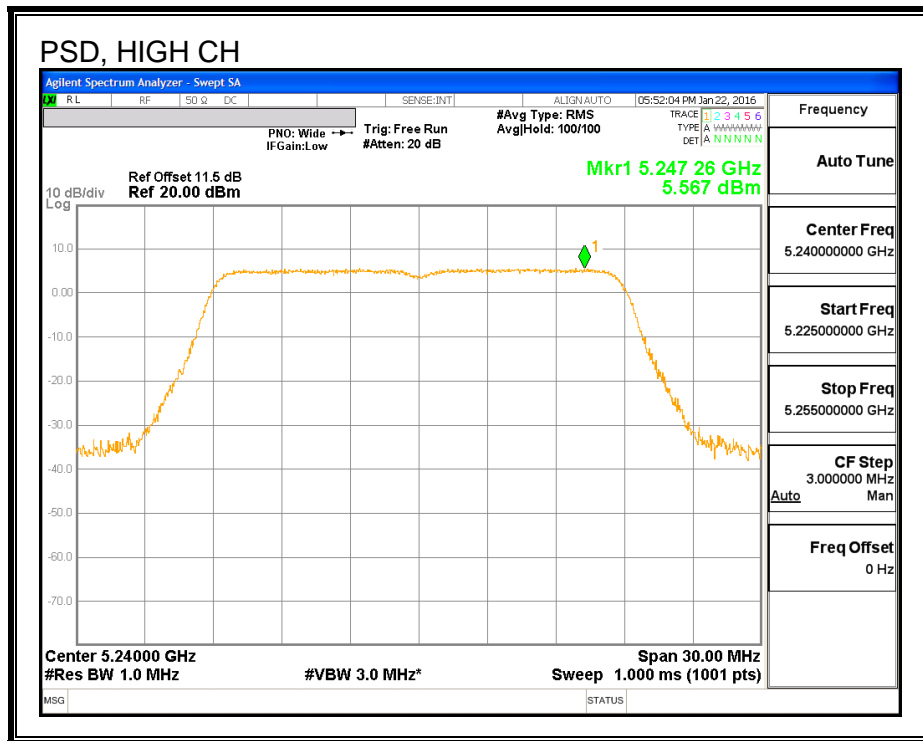
| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>Power<br>(dBm) | Antenna A<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 14.38                               | 14.42                               | 17.41                             | 24.00                   | -6.59                   |
| Mid     | 5200               | 16.99                               | 16.97                               | 19.99                             | 24.00                   | -4.01                   |
| High    | 5240               | 16.98                               | 17.00                               | 20.00                             | 24.00                   | -4.00                   |

**PSD Results**

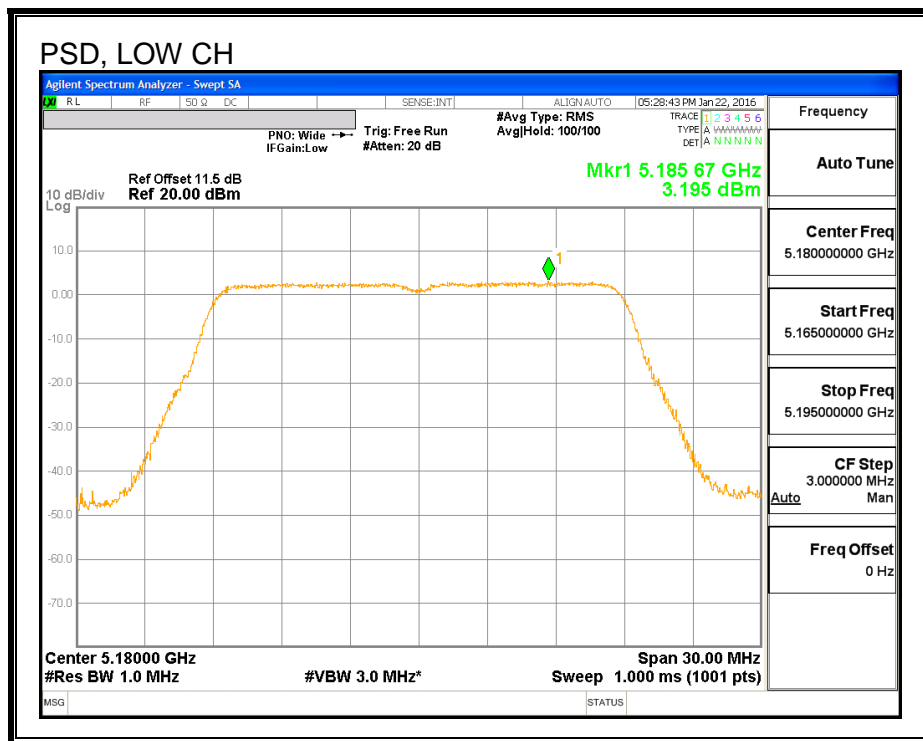
| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>PSD<br>(dBm) | Antenna A<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 2.921                             | 3.195                             | 6.07                            | 11.00                 | -4.93                 |
| Mid     | 5200               | 5.630                             | 5.551                             | 8.60                            | 11.00                 | -2.40                 |
| High    | 5240               | 5.567                             | 5.823                             | 8.71                            | 11.00                 | -2.29                 |

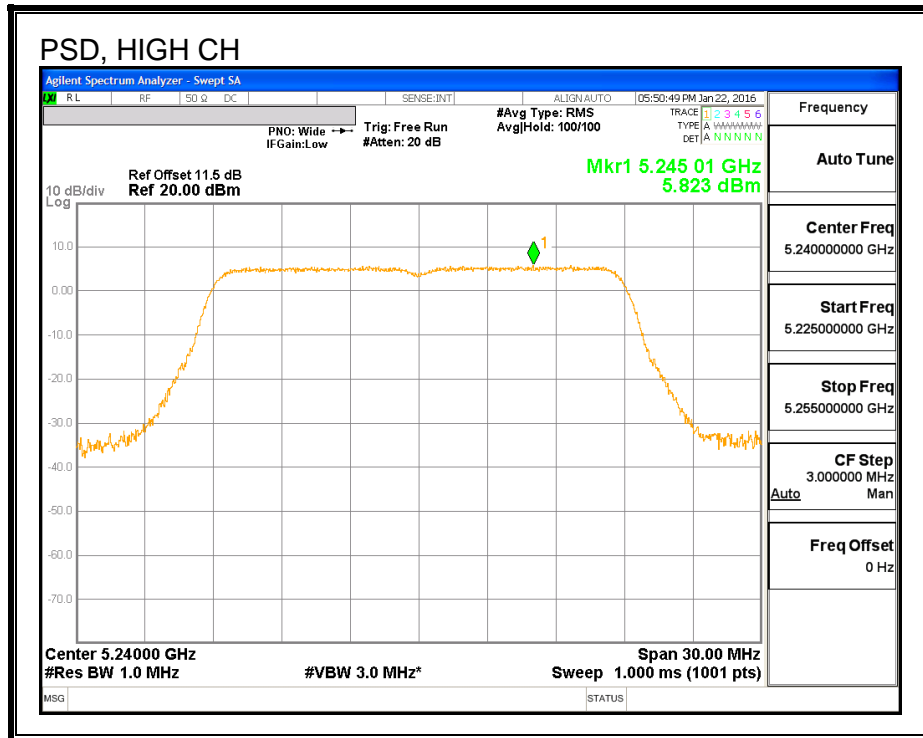
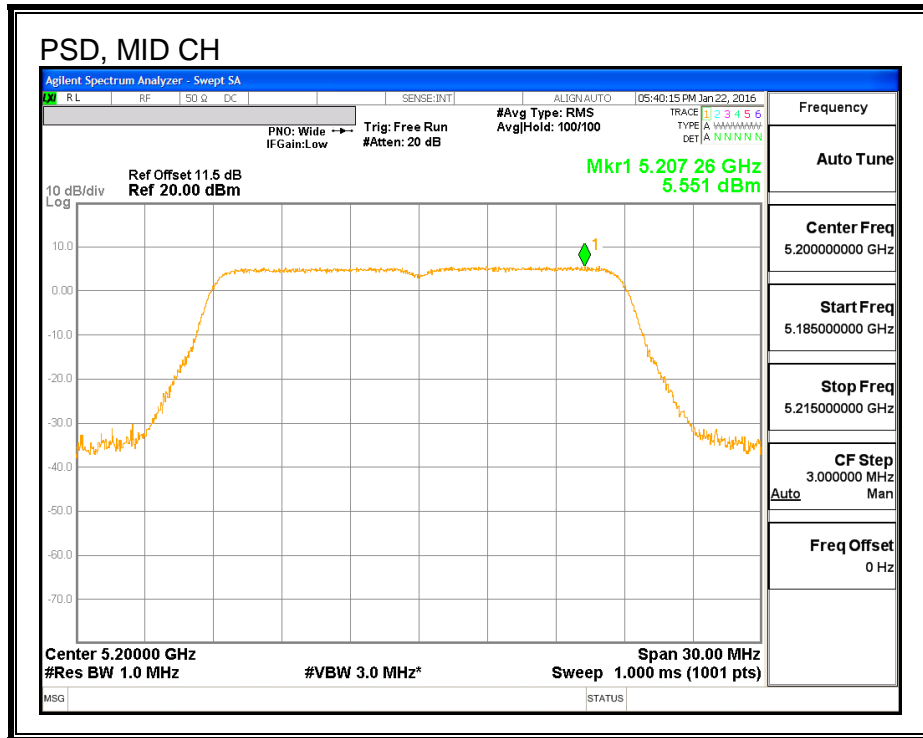
**PSD, ANTENNA - B**





### PSD, ANTENNA - A





## **8.7. 802.11n HT20 2TX SDM MODE IN THE 5.2 GHz BAND**

**Note:** Covered by 802.11n HT20 2Tx STBC MODE IN THE 5.2 GHz BAND

## 8.8. 802.11n HT40 ANTENNA - B MODE IN THE 5.2 GHz BAND

### 8.8.1. 26 dB BANDWIDTH

#### LIMITS

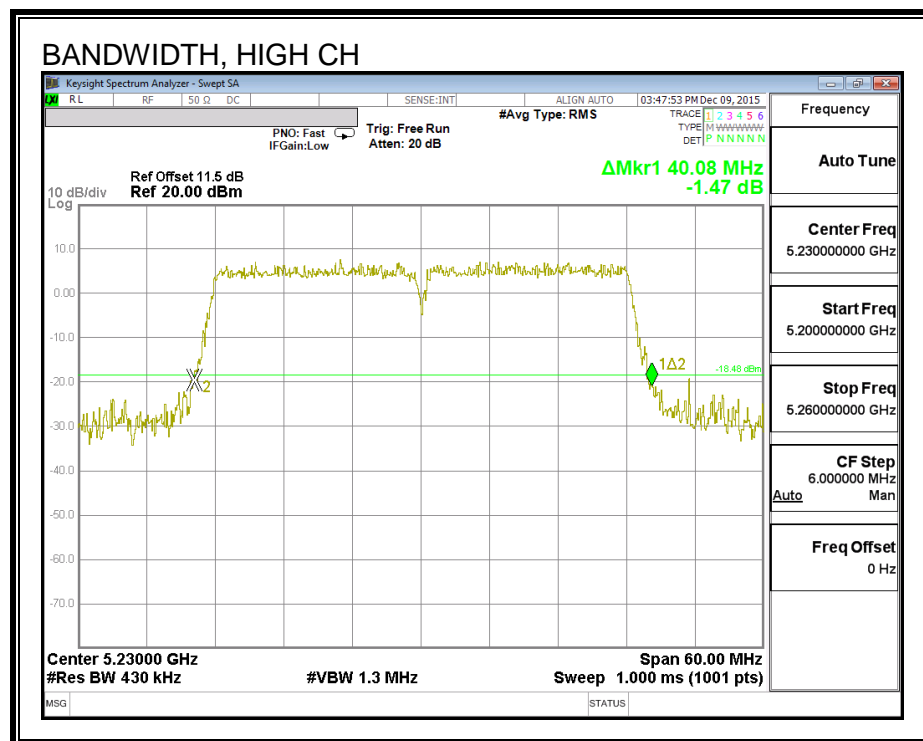
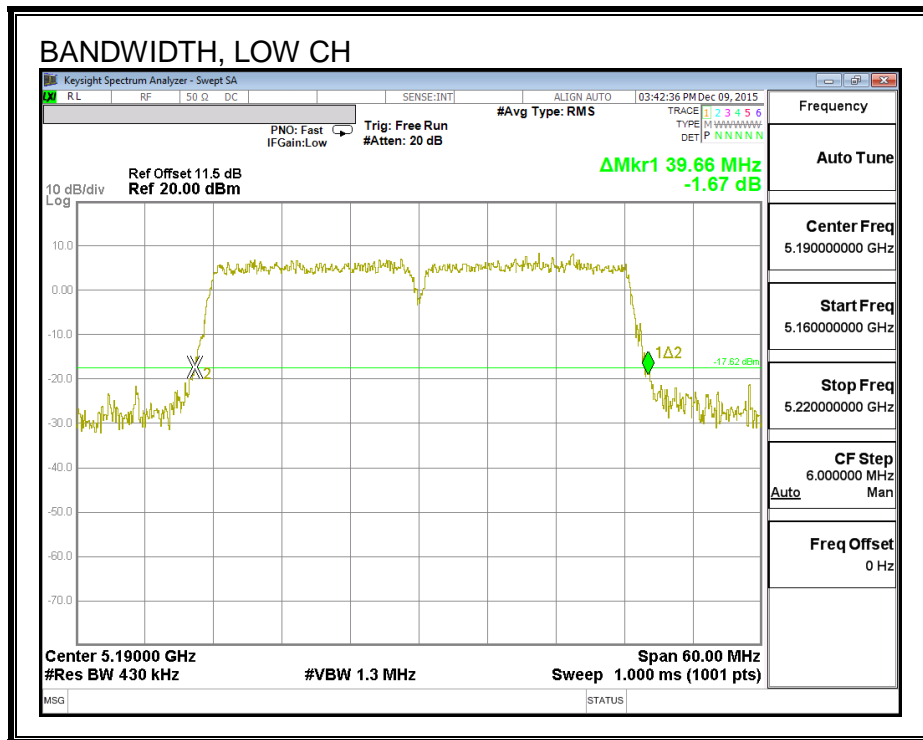
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 5190            | 39.66                 |
| High    | 5230            | 40.08                 |



**26 dB BANDWIDTH**



### 8.8.2. 99% BANDWIDTH

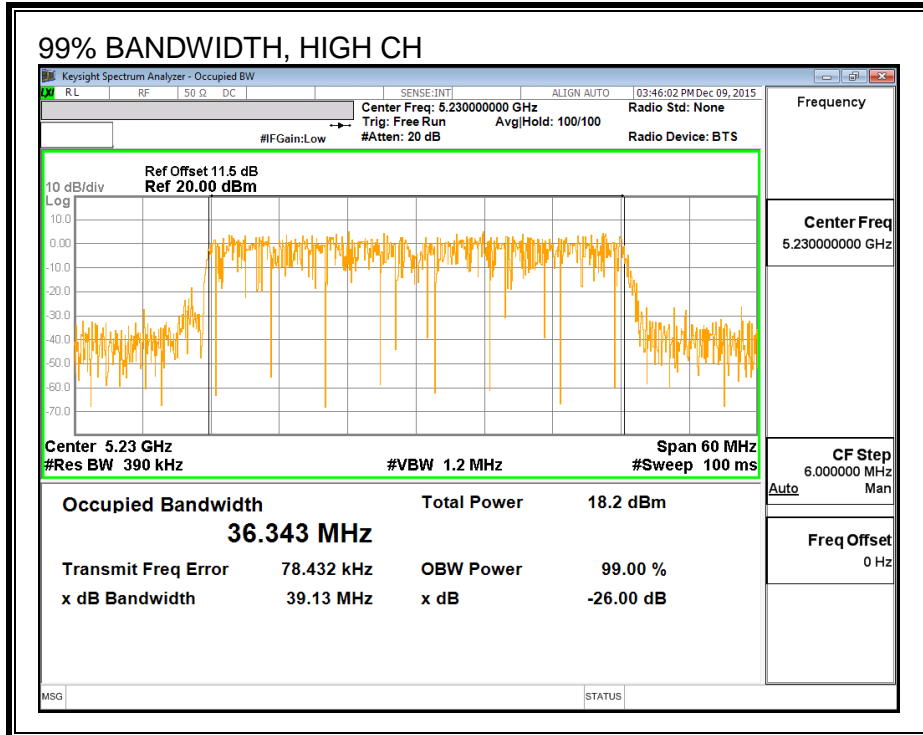
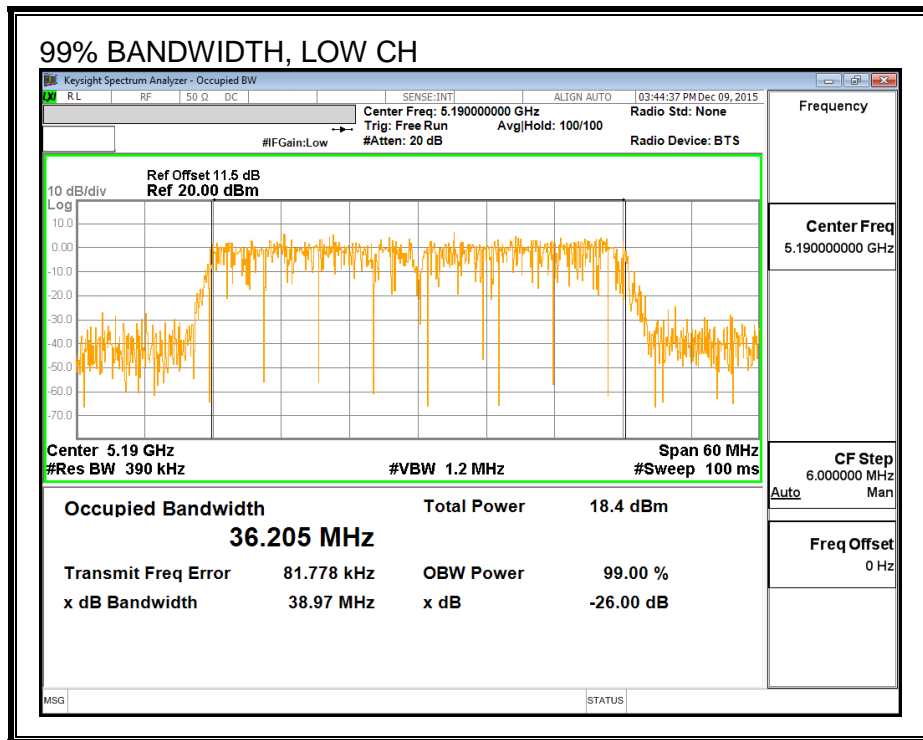
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 5190            | 36.205              |
| High    | 5230            | 36.343              |

**99% BANDWIDTH**



### 8.8.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency (MHz) | Power (dBm) |
|---------|-----------------|-------------|
| Low     | 5190            | 13.48       |
| High    | 5230            | 16.98       |

## 8.8.4. OUTPUT POWER AND PSD

### LIMITS

FCC §15.407 (a) (1)

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

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

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

**RESULTS**

**Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Directional<br>Gain<br>for PSD<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|---|---|-------------------------|-----------------------|
| Low     | 5190               | 3.04                                      | 3.04                                    | 24.00                   | 11.00                 |
| High    | 5230               | 3.04                                      | 3.04                                    | 24.00                   | 11.00                 |

|                           |      |   |
|---------------------------|------|---|
| <b>Duty Cycle CF (dB)</b> | 0.00 | <b>Included in Calculations of Corr'd PSD</b> |
|---------------------------|------|---|

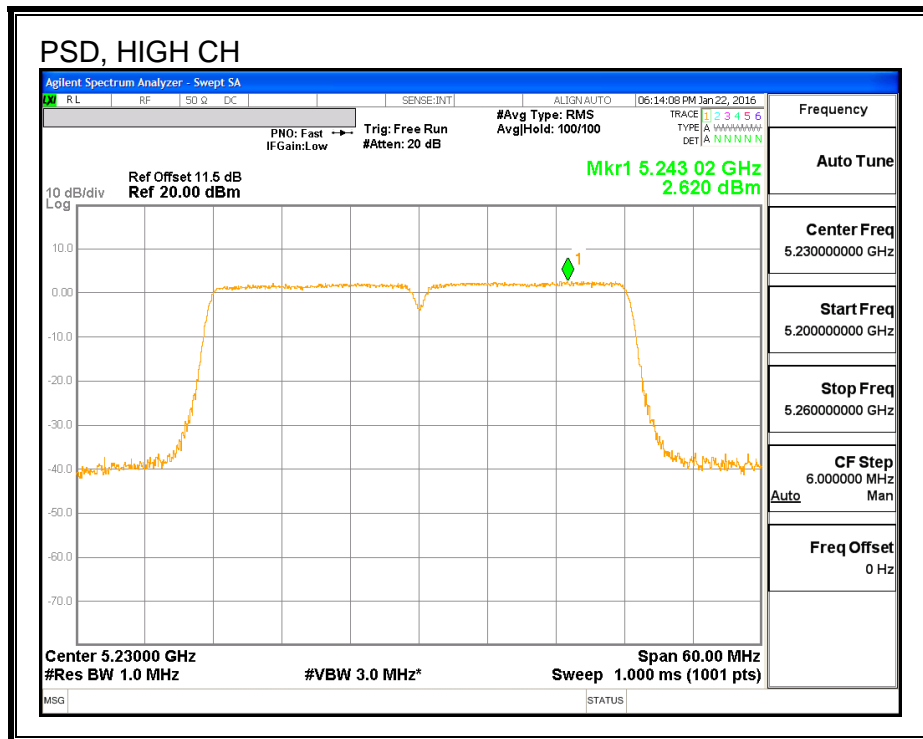
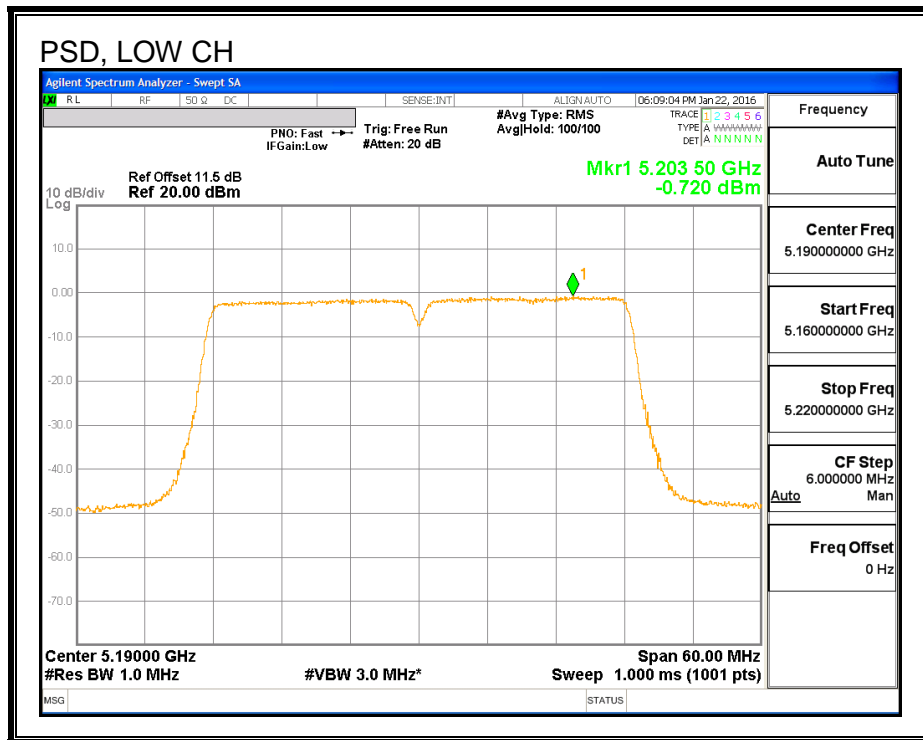
**Output Power Results**

| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5190               | 13.48                               | 13.48                             | 24.00                   | -10.52                  |
| High    | 5230               | 16.98                               | 16.98                             | 24.00                   | -7.02                   |

**PSD Results**

| Channel | Frequency<br>(MHz) | Antenna B<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5190               | -0.720                            | -0.720                          | 11.00                 | -11.72                |
| High    | 5230               | 2.620                             | 2.620                           | 11.00                 | -8.38                 |

**PSD**



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**8.9. 802.11n HT40 ANTENNA - A MODE IN THE 5.2 GHz BAND**

**8.9.1. 26 dB BANDWIDTH**

**LIMITS**

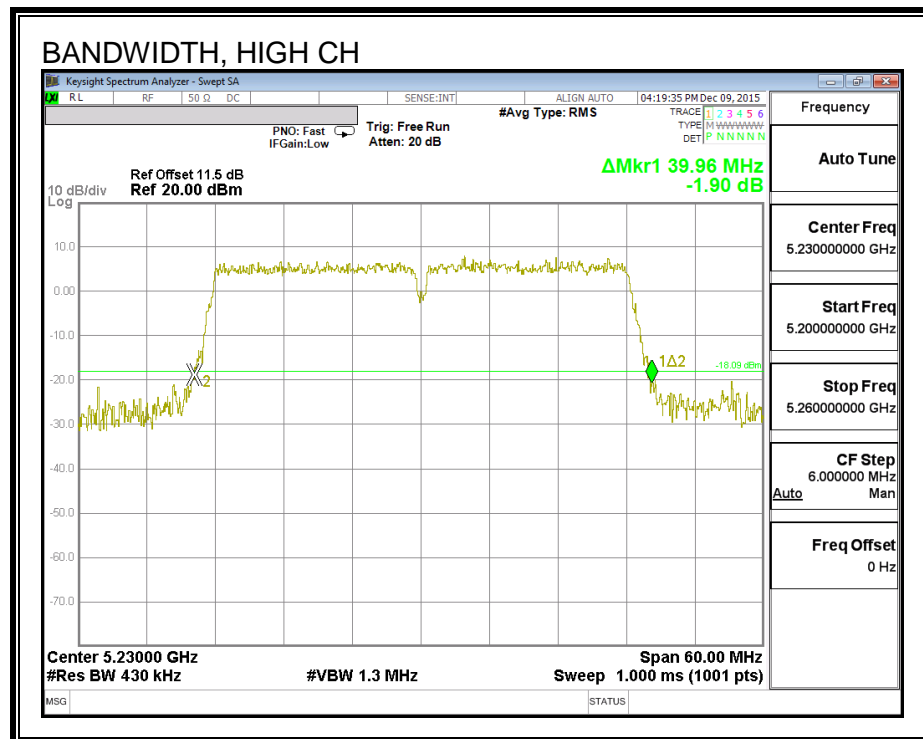
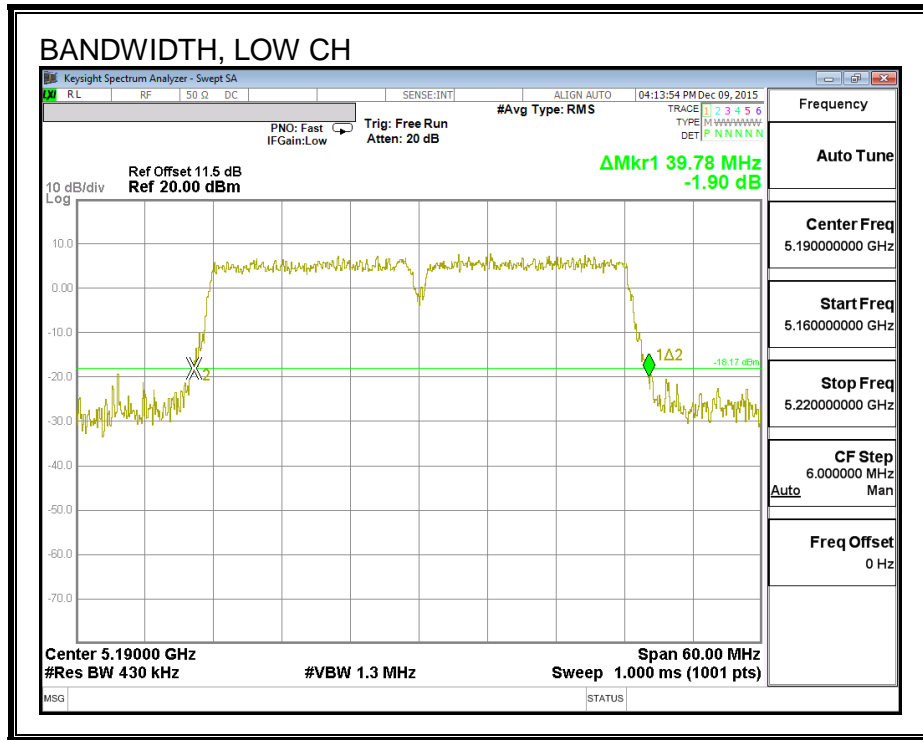
None; for reporting purposes only.

**RESULTS**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 5190            | 39.78                 |
| High    | 5230            | 39.96                 |



**26 dB BANDWIDTH**



### 8.9.2. 99% BANDWIDTH

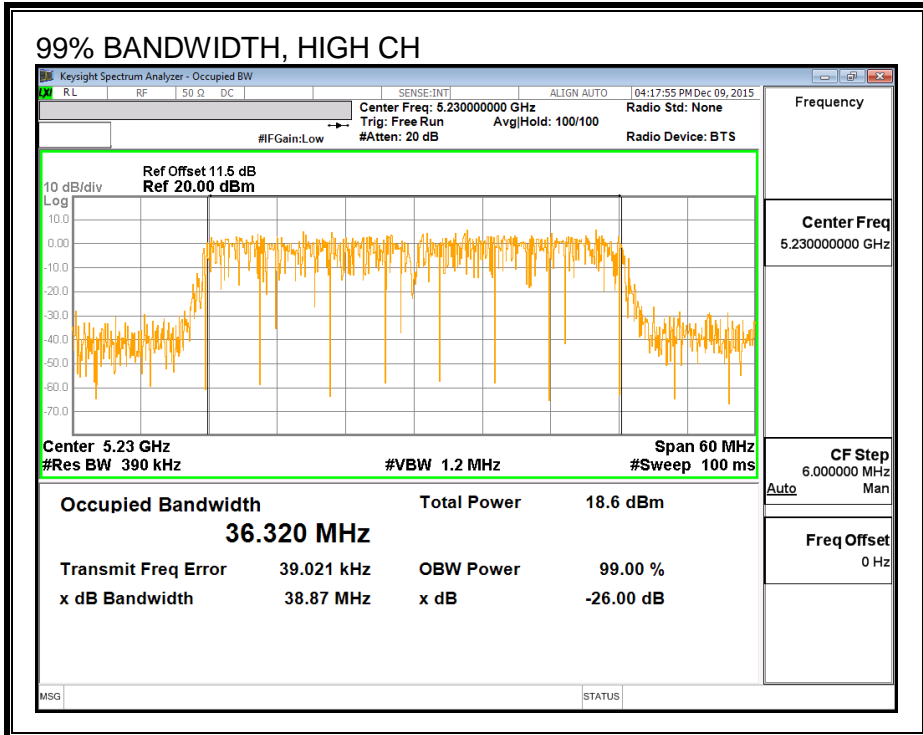
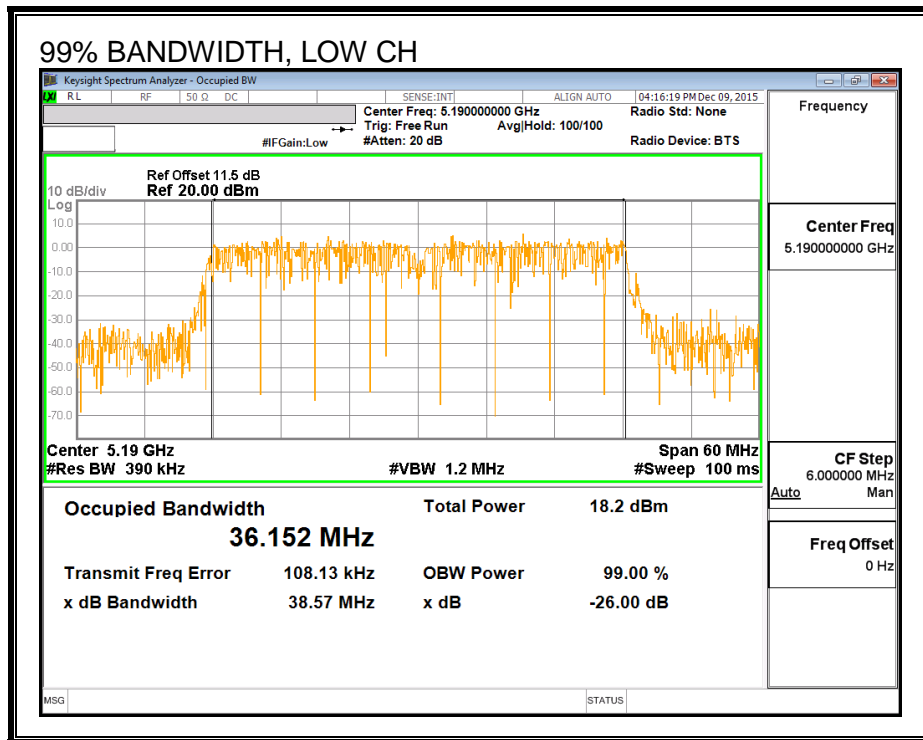
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5190               | 36.152                 |
| High    | 5230               | 36.320                 |

**99% BANDWIDTH**



### 8.9.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

#### RESULTS

| Channel | Frequency (MHz) | Power (dBm) |
|---------|-----------------|-------------|
| Low     | 5190            | 13.48       |
| High    | 5230            | 16.99       |