



**FCC 47 CFR PART 15 SUBPART E**

**CERTIFICATION TEST REPORT**

**FOR**

**PORTABLE COMPUTER**

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** PORTABLE COMPUTER

**MODEL:** A1534

**SERIAL NUMBER:** C02N900UG17D (Conducted), C02N900KG17D (Radiated)

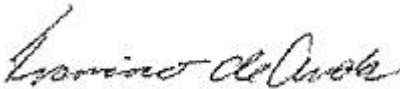
**DATE TESTED:** SEPTEMBER 22, 2014 – OCTOBER 20, 2014

| 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:



FRANCISCO DE ANDA  
PROJECT LEAD  
UL Verification Services Inc.

Tested By:



TOM CHEN  
EMC ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

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 905462 D02 and D03, FCC KDB 789033 D02, ANSI C63.10-2009.

## 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 checked="" type="checkbox"/> Chamber D |
| <input type="checkbox"/> Chamber B | <input checked="" type="checkbox"/> Chamber E |
| <input type="checkbox"/> Chamber C | <input checked="" 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:

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

### 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 | $\pm 3.52$ dB |
| Radiated Disturbance, 30 to 1000 MHz  | $\pm 4.94$ dB |
| Radiated Disturbance, 1 to 6 GHz      | $\pm 3.86$ dB |
| Radiated Disturbance, 6 to 18 GHz     | $\pm 4.23$ dB |
| Radiated Disturbance, 18 to 26 GHz    | $\pm 5.30$ dB |
| Radiated Disturbance, 26 to 40 GHz    | $\pm 5.23$ dB |

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

Laptop Device with Bluetooth and WLAN Radios (AC 80 MHZ Beam-Forming)

### 5.2. 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) | Covered Modes                                  |
|-----------------------|-------------------------|--------------------|-------------------|------------------------------------------------|
| 5180 - 5240           | 802.11a 1TX             | 17.98              | 62.81             | 802.11n HT20 1TX<br>802.11ac VHT20 1TX         |
| 5180 - 5240           | 802.11n HT20 2TX CDD    | 18.96              | 78.70             | 802.11a 2TX CDD<br>802.11ac VHT20 2TX CDD      |
| 5180 - 5240           | 802.11n HT20 2TX STBC   | 20.00              | 100.00            | 802.11n HT20 2TX SDM<br>802.11ac VHT20 2TX SDM |
| 5180 - 5240           | 802.11ac VHT20 2TX BF   | 19.08              | 80.91             | 802.11a 2TX BF<br>802.11n HT20 2TX BF          |
| 5190 - 5230           | 802.11n HT40 1TX        | 17.84              | 60.81             | 802.11ac VHT40 1TX                             |
| 5190 - 5230           | 802.11n HT40 2TX CDD    | 20.90              | 123.03            | 802.11ac VHT40 2TX CDD                         |
| 5190 - 5230           | 802.11n HT40 2TX STBC   | 20.88              | 122.46            | 802.11n HT40 2TX SDM<br>802.11ac VHT40 2TX SDM |
| 5190 - 5230           | 802.11ac VHT40 2TX BF   | 21.02              | 126.47            |                                                |
| 5210                  | 802.11ac VHT80 1TX      | 12.97              | 19.82             |                                                |
| 5210                  | 802.11ac VHT80 2TX CDD  | 14.99              | 31.55             |                                                |
| 5210                  | 802.11ac VHT80 2TX STBC | 14.99              | 31.55             | 802.11ac VHT80 2TX SDM                         |
| 5210                  | 802.11ac VHT80 2TX BF   | 15.03              | 31.84             |                                                |

Note: "Covered Modes" are test reduction modes. The output powers on the "Covered Modes" are equal to or less than the mode referenced.

**5.3GHz Band**

| Frequency Range (MHz) | Mode                    | Output Power (dBm) | Output Power (mW) | Covered Modes                                  |
|-----------------------|-------------------------|--------------------|-------------------|------------------------------------------------|
| 5260 - 5320           | 802.11a 1TX             | 17.98              | 62.81             | 802.11n HT20 1TX<br>802.11ac VHT20 1TX         |
| 5260 - 5320           | 802.11n HT20 2TX CDD    | 18.99              | 79.25             | 802.11a 2TX CDD<br>802.11ac VHT20 2TX CDD      |
| 5260 - 5320           | 802.11n HT20 2TX STBC   | 19.98              | 99.54             | 802.11n HT20 2TX SDM<br>802.11ac VHT20 2TX SDM |
| 5260 - 5320           | 802.11n HT20 2TX BF     | 19.11              | 81.47             | 802.11a 2TX BF<br>802.11n HT20 2TX BF          |
| 5270 - 5310           | 802.11n HT40 1TX        | 17.91              | 61.80             | 802.11ac VHT40 1TX                             |
| 5270 - 5310           | 802.11n HT40 2TX CDD    | 20.82              | 120.78            | 802.11ac VHT40 2TX CDD                         |
| 5270 - 5310           | 802.11n HT40 2TX STBC   | 20.74              | 118.58            | 802.11n HT40 2TX SDM<br>802.11ac VHT40 2TX SDM |
| 5270 - 5310           | 802.11n VH40 2TX BF     | 20.94              | 124.17            |                                                |
| 5290                  | 802.11ac VHT80 1TX      | 11.98              | 15.78             |                                                |
| 5290                  | 802.11ac VHT80 2TX CDD  | 12.47              | 17.66             |                                                |
| 5290                  | 802.11ac VHT80 2TX STBC | 12.46              | 17.62             | 802.11ac VHT80 2TX SDM                         |
| 5290                  | 802.11ac VHT80 2TX BF   | 12.51              | 17.82             |                                                |

Note: "Covered Modes" are test reduction modes. The output powers on the "Covered Modes" are equal to or less than the mode referenced.

5.6GHz Band

| Frequency Range (MHz) | Mode                    | Output Power (dBm) | Output Power (mW) | Covered Modes                                    |
|-----------------------|-------------------------|--------------------|-------------------|--------------------------------------------------|
| 5500 - 5700           | 802.11a 1TX             | 17.96              | 62.52             | 802.11n HT20 1TX<br>802.11n VHT20 1TX            |
| 5720                  | 802.11a 1TX             | 17.50              | 56.23             |                                                  |
| 5500 - 5700           | 802.11n HT20 2TX CDD    | 17.33              | 54.08             | 802.11a 2TX CDD<br>802.11ac VHT20 2TX CDD        |
| 5720                  | 802.11n HT20 2TX CDD    | 17.50              | 56.23             | 802.11a 2TX CDD<br>802.11ac VHT20 2TX CDD        |
| 5500 - 5700           | 802.11n HT20 2TX STBC   | 19.98              | 99.54             | 802.11n HT20 2TX SDM<br>802.11ac VHT20 2TX SDM   |
| 5720                  | 802.11n HT20 2TX STBC   | 19.50              | 89.13             | 802.11n HT20 2TX SDM<br>802.11ac VHT20 2TX SDM   |
| 5500 - 5700           | 802.11n VHT20 2TX BF    | 17.45              | 55.59             | 802.11a 2TX BF<br>802.11n HT20 2TX BF            |
| 5720                  | 802.11n VHT20 2TX BF    | 17.62              | 57.81             | 802.11a 2TX BF<br>802.11n HT20 2TX BF            |
| 5510 - 5670           | 802.11n HT40 1TX        | 17.98              | 62.81             | 802.11ac VHT40 1TX                               |
| 5710                  | 802.11n HT40 1TX        | 18.00              | 63.10             | 802.11ac VHT40 1TX                               |
| 5510 - 5670           | 802.11n HT40 2TX CDD    | 19.97              | 99.31             | 802.11ac VHT40 2TX CDD                           |
| 5710                  | 802.11n HT40 2TX CDD    | 20.00              | 100.00            | 802.11ac VHT40 2TX CDD                           |
| 5510 - 5670           | 802.11n HT40 2TX STBC   | 20.88              | 122.46            | 802.11n HT40 2TX SDM<br>802.11ac VHT40 2TX SDM   |
| 5710                  | 802.11n HT40 2TX STBC   | 19.99              | 99.77             | 802.11n HT40 2TX SDM<br>802.11ac VHT40 2TX SDM   |
| 5510 - 5670           | 802.11n HT40 2TX BF     | 20.09              | 102.09            |                                                  |
| 5710                  | 802.11n VHT40 2TX BF    | 20.12              | 102.80            |                                                  |
| 5530-5610             | 802.11ac VHT80 1TX      | 17.96              | 62.52             |                                                  |
| 5690                  | 802.11ac VHT80 1TX      | 18.00              | 63.10             |                                                  |
| 5530-5610             | 802.11ac VHT80 2TX CDD  | 20.98              | 125.31            |                                                  |
| 5690                  | 802.11ac VHT80 2TX CDD  | 21.00              | 125.89            |                                                  |
| 5530-5610             | 802.11ac VHT80 2TX STBC | 20.96              | 124.74            | 802.11ac VHT80 2TX SDM<br>802.11ac VHT80 2TX SDM |
| 5690                  | 802.11ac VHT80 2TX STBC | 21.00              | 125.89            |                                                  |
| 5530-5610             | 802.11ac VHT80 2TX BF   | 20.26              | 106.17            |                                                  |
| 5690                  | 802.11ac VHT80 2TX BF   | 20.00              | 100.00            |                                                  |

Note: "Covered Modes" are test reduction modes. The output powers on the "Covered Modes" are equal to or less than the mode referenced.

**5.8GHz Band**

| Frequency Range (MHz) | Mode                    | Output Power (dBm) | Output Power (mW) | Covered Modes                                  |
|-----------------------|-------------------------|--------------------|-------------------|------------------------------------------------|
| 5745 - 5825           | 802.11a 1TX             | 18.00              | 63.10             | 802.11n HT20 1TX<br>802.11ac VHT20 1TX         |
| 5745 - 5825           | 802.11n HT20 2TX CDD    | 20.94              | 124.17            | 802.11a 2TX CDD<br>802.11ac VHT20 2TX CDD      |
| 5745 - 5825           | 802.11n HT20 2TX STBC   | 20.79              | 119.95            | 802.11n HT20 2TX SDM<br>802.11ac VHT20 2TX SDM |
| 5745 - 5825           | 802.11ac VHT20 2TX BF   | 21.06              | 127.64            | 802.11a 2TX BF<br>802.11n HT20 2TX BF          |
| 5755 - 5795           | 802.11n HT40 1TX        | 17.99              | 62.95             | 802.11ac VHT40 1TX                             |
| 5755 - 5795           | 802.11n HT40 2TX CDD    | 19.93              | 98.40             | 802.11ac VHT40 2TX CDD                         |
| 5755 - 5795           | 802.11n HT40 2TX STBC   | 19.94              | 98.63             | 802.11n HT40 2TX SDM<br>802.11ac VHT40 2TX SDM |
| 5755 - 5795           | 802.11ac VHT40 2TX BF   | 20.05              | 101.16            |                                                |
| 5775                  | 802.11ac VHT80 1TX      | 15.49              | 35.40             |                                                |
| 5775                  | 802.11ac VHT80 2TX CDD  | 16.50              | 44.67             |                                                |
| 5775                  | 802.11ac VHT80 2TX STBC | 16.50              | 44.67             | 802.11ac VHT80 2TX SDM                         |
| 5775                  | 802.11ac VHT80 2TX BF   | 16.54              | 45.08             |                                                |

Note: "Covered Modes" are test reduction modes. The output powers on the "Covered Modes" are equal to or less than the mode referenced.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted-F antenna (IFA), with a maximum gain as below table:

| Frequency Band (GHz) | Antenna Gain (dBi) |         |
|----------------------|--------------------|---------|
|                      | Chain 0            | Chain 1 |
| 5.15 - 5.25          | 3.11               | 2.90    |
| 5.25 - 5.35          | 3.05               | 3.33    |
| 5.50 - 5.70          | 5.00               | 4.57    |
| 5.725 -5.85          | 4.78               | 5.26    |

### 5.4. SOFTWARE AND FIRMWARE

The WLAN firmware installed in the EUT during testing was 7.15.147

The test utility software used during testing was 7.15 RC147

### 5.5. 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 1Tx modes, both chains have the same power; output power and PSD measurement for 1Tx modes are reported only for the port with higher antenna gain.

All radiated testing was performed with the EUT in normal use orientation.

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

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

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |       |                   |        |
|------------------------|--------------|-------|-------------------|--------|
| Description            | Manufacturer | Model | Serial Number     | FCC ID |
| AC/ DC Adapter         | Apple Inc.   | A1540 | C4H433700AZFPWW1E | N/A    |
| Earphone               | Apple Inc.   | N/A   | N/A               | N/A    |

### I/O CABLES

| Cable No | Port    | # of identical ports | Connector Type | Cable Type  | Cable Length (m) | Remarks              |
|----------|---------|----------------------|----------------|-------------|------------------|----------------------|
| 1        | Antenna | 2                    | SMA            | Un-Shielded | 0.2              | To Spectrum Analyzer |
| 2        | DC      | 1                    | Lightning      | Un-Shielded | 2                |                      |

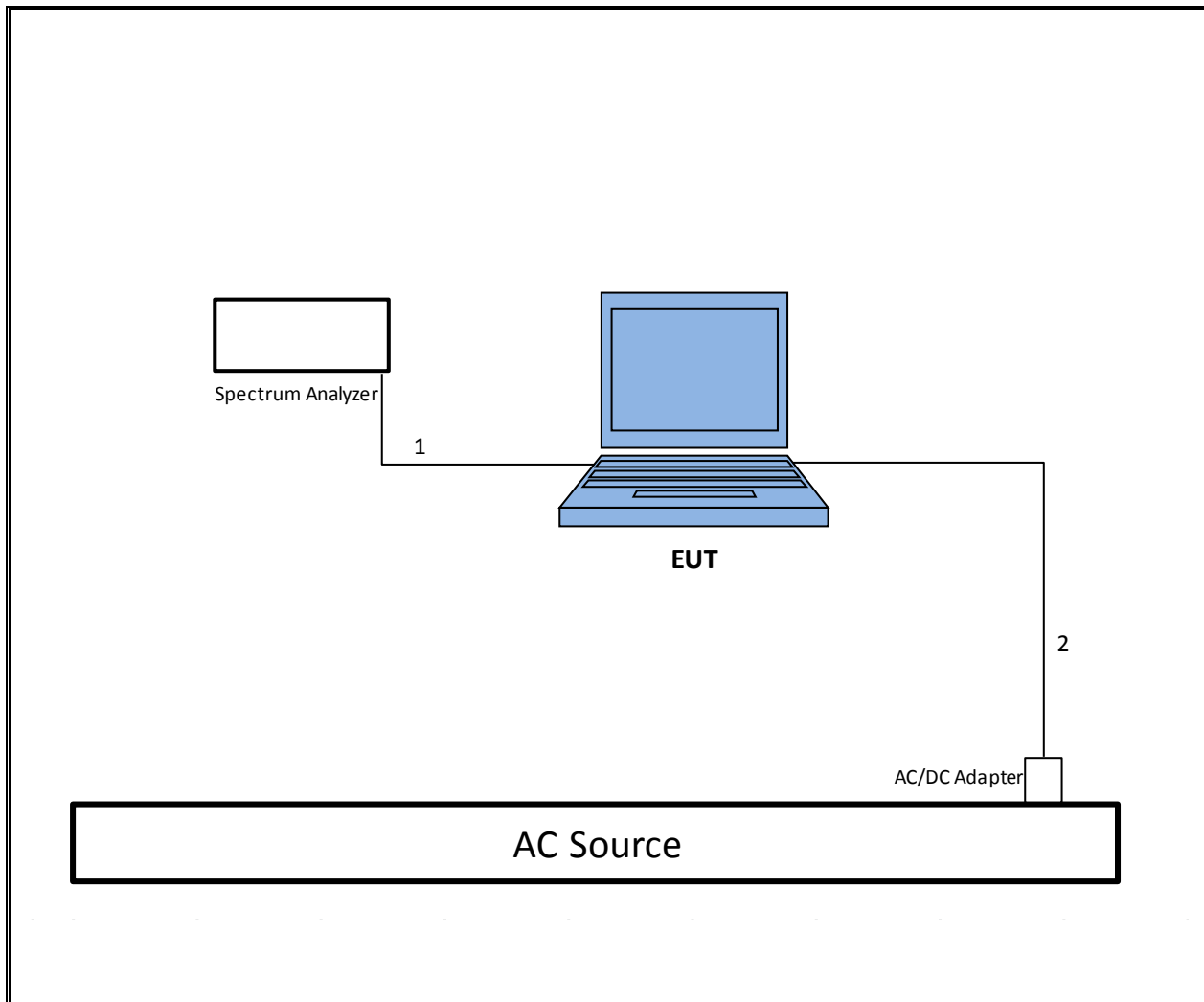
### I/O CABLES (RADIATED AND AC POWER CONDUCTED TEST)

| I/O Cable List |       |                      |                |             |                  |         |
|----------------|-------|----------------------|----------------|-------------|------------------|---------|
| Cable No       | Port  | # of identical ports | Connector Type | Cable Type  | Cable Length (m) | Remarks |
| 2              | DC    | 1                    | Lightning      | Un-Shielded | 2                | NA      |
| 3              | Audio | 1                    | Jack           | Un-Shielded | 0.5              | NA      |

**TEST SETUP- (CONDUCTED TEST)**

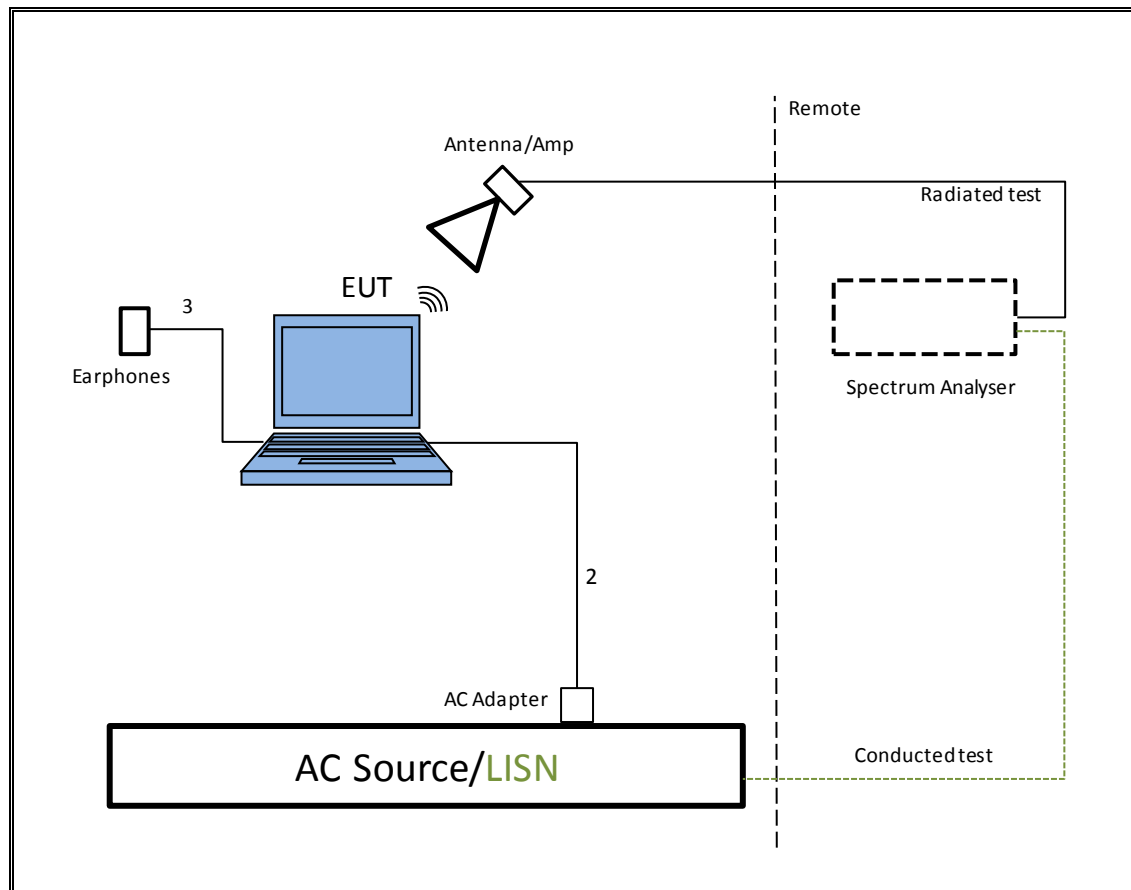
The EUT was tested connected to spectrum analyzer via antenna port. Test software exercised the EUT.

**SETUP DIAGRAM**



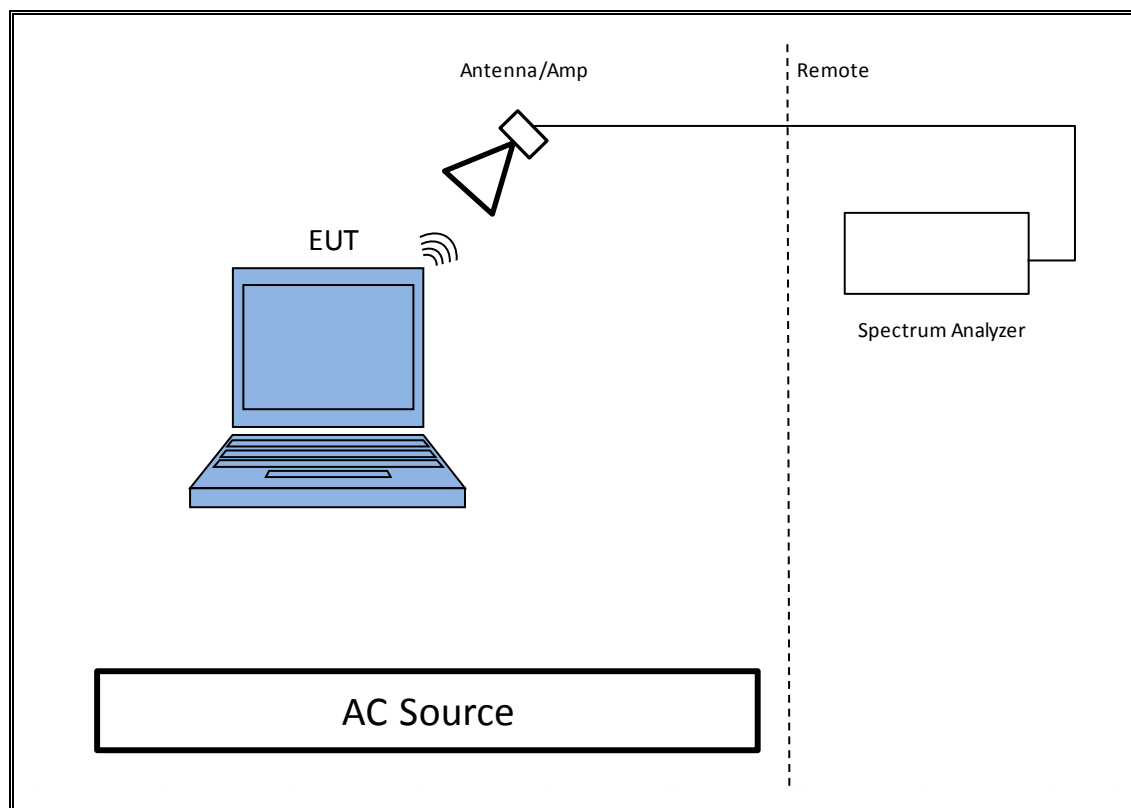
**TEST SETUP- RADIATED Below 1 GHz & AC LINE CONDUCTED TESTS**

The EUT's test software exercised the radio card.



**TEST SETUP- RADIATED ABOVE 1 GHz**

The EUT's test software exercised the radio card.



## 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                  | T Number | Cal Due  |
| PXA Signal Analyzer              | Agilent        | N9030A                 | T342     | 06/25/15 |
| PXA Signal Analyzer              | Agilent        | N9030A                 | T341     | 02/12/15 |
| Power Meter                      | Agilent        | N1911A                 | T382     | 04/09/15 |
| Antenna, Horn 1-18GHz            | ETS Lindgren   | 3117                   | T862     | 04/14/15 |
| Antenna, Horn 1-18GHz            | ETS Lindgren   | 3117                   | T120     | 03/26/15 |
| Antenna, Hybrid 30MHz to 2GHz    | Sunol Sciences | JB3                    | T899     | 05/14/15 |
| Antenna, Hybrid 30MHz to 2GHz    | Sunol Sciences | JB1                    | T122     | 04/22/15 |
| PXA Signal Analyzer 3Hz to 44GHz | Agilent        | N9030A                 | T905     | 05/17/15 |
| Amplifier, 10KHz to 1GHz         | Sonoma         | 310N                   | T834     | 06/05/15 |
| Amplifier, 10KHz to 1GHz         | Sonoma         | 310N                   | T173     | 12/30/14 |
| Amplifier, 1 to 18GHz            | Miteq          | AFS42-00101            | T491     | 06/05/15 |
| Amplifier, 1 to 18GHz            | Miteq          | AFS42-00101800-25-S-42 | T742     | 01/20/15 |
| PXA Signal Analyzer 3Hz to 44GHz | Agilent        | N9030A                 | T341     | 02/12/15 |
| Antenna, Horn 1-18GHz            | ETS Lindgren   | 3117                   | T120     | 03/20/15 |
| Antenna, Hybrid 30MHz to 2GHz    | Sunol Sciences | JB1                    | T122     | 04/22/15 |
| Amplifier, 1 to 18GHz            | Miteq          | AFS42-00101            | T742     | 01/20/15 |
| Amplifier, 10KHz to 1GHz         | Sonoma         | 310N                   | T173     | 12/30/14 |
| EMI Test Receiver, 9 kHz-7 GHz   | R & S          | ESCI 7                 | T284     | 09/16/15 |
| LISN, 30 MHz                     | FCC            | LISN-50/250-25-2       | T24      | 01/17/15 |
| Amplifier, 1 to 26.5 Ghz         | Agilent        | 8449B                  | T404     | 03/25/15 |
| Antenna Horn 18 to 26.5 Ghz      | ARA            | MWH-1826/B             | T89      | 11/26/14 |

---

## 7. MEASUREMENT METHODS

26 dB Emission BW: KDB 789033 D01 v01r03, Section C.

99% Occupied BW: KDB 789033 D01 v01r03, Section D.

Conducted Output Power: KDB 789033 D01 v01r03, Section E.3.a (Method PM).

Power Spectral Density: KDB 789033 D01 v01r03, Section F.

Peak Excursion: KDB 789033 D01 v01r03, Section G.

Unwanted emissions in restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, H.5, and H.6.

Unwanted emissions in non-restricted bands: KDB 789033 D01 v01r03, Sections H.3, H.4, and H.5.

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

### 8.1. ON TIME AND DUTY CYCLE RESULTS

#### LIMITS

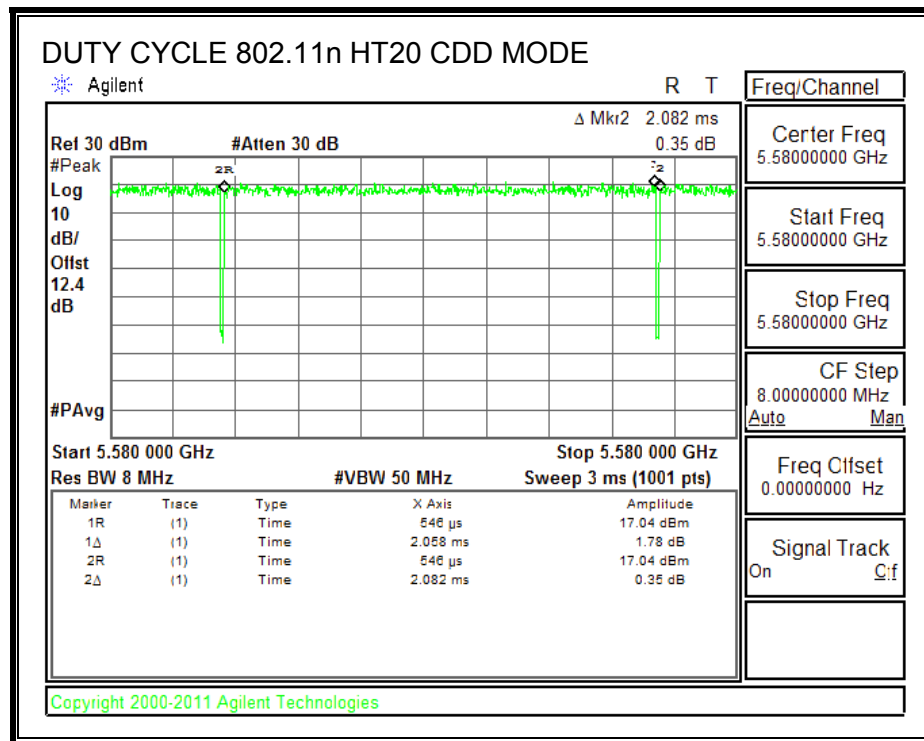
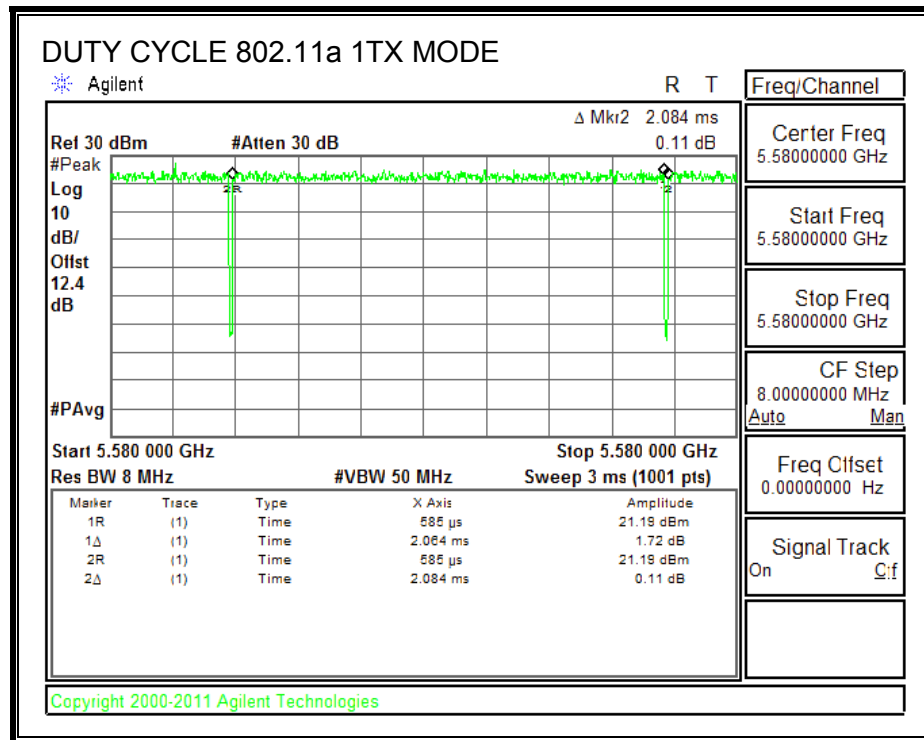
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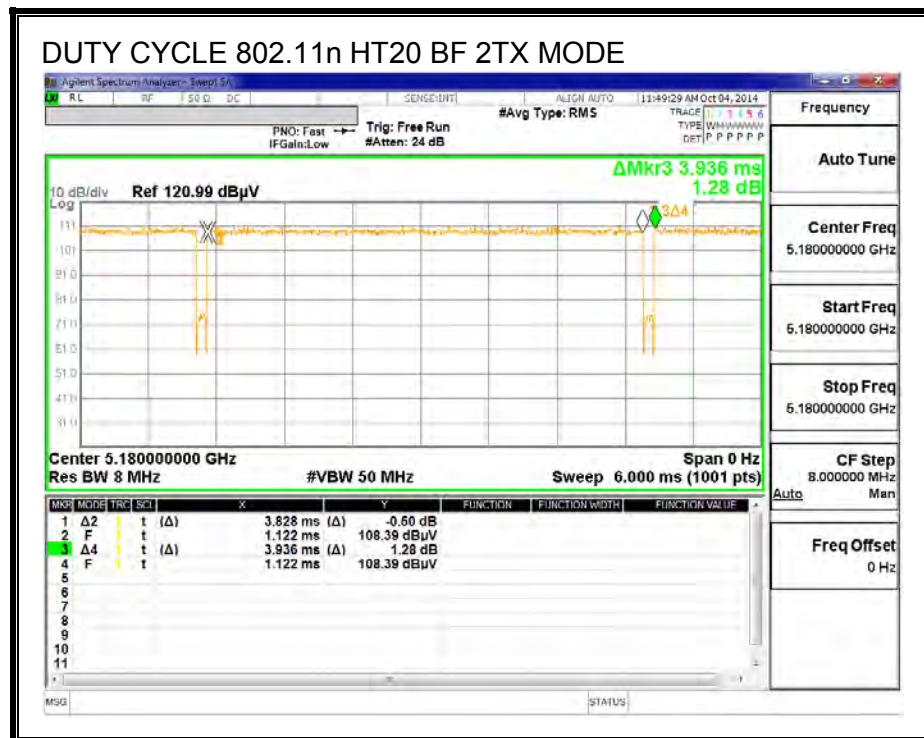
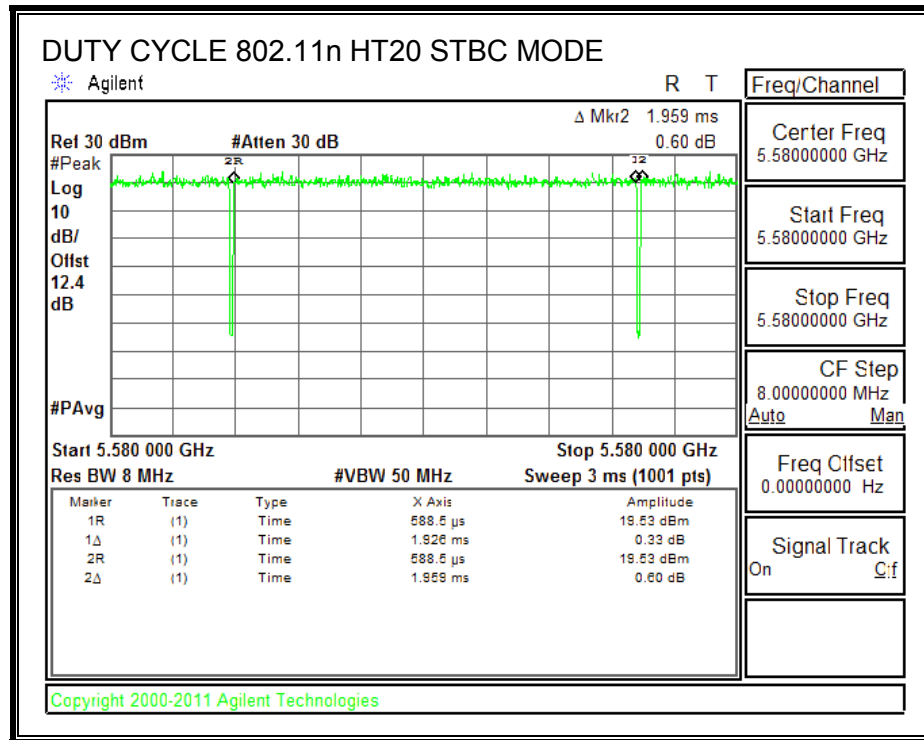
#### PROCEDURE

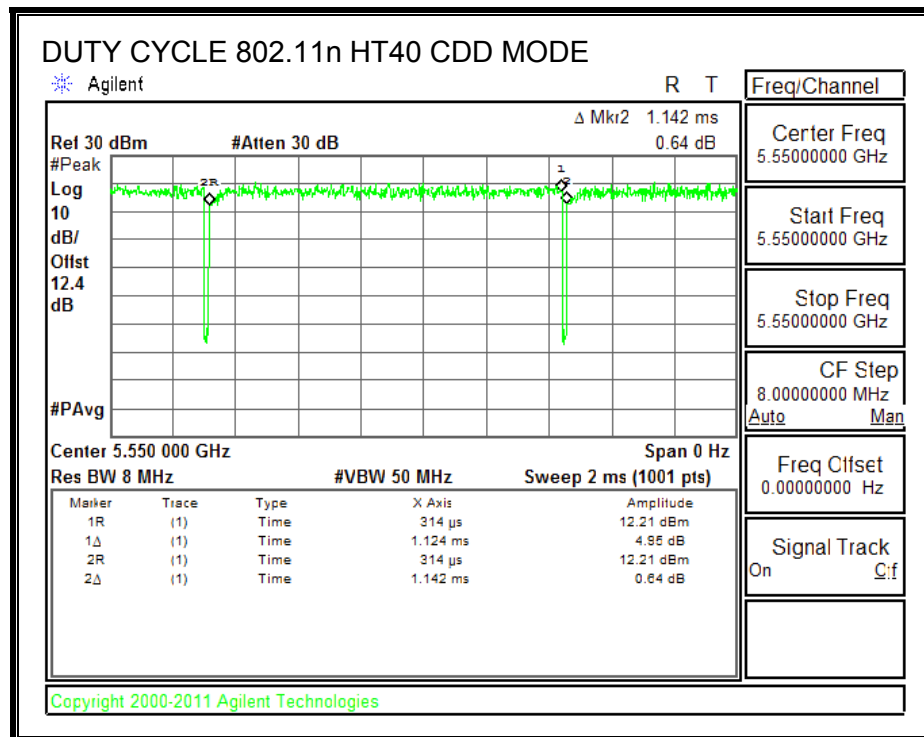
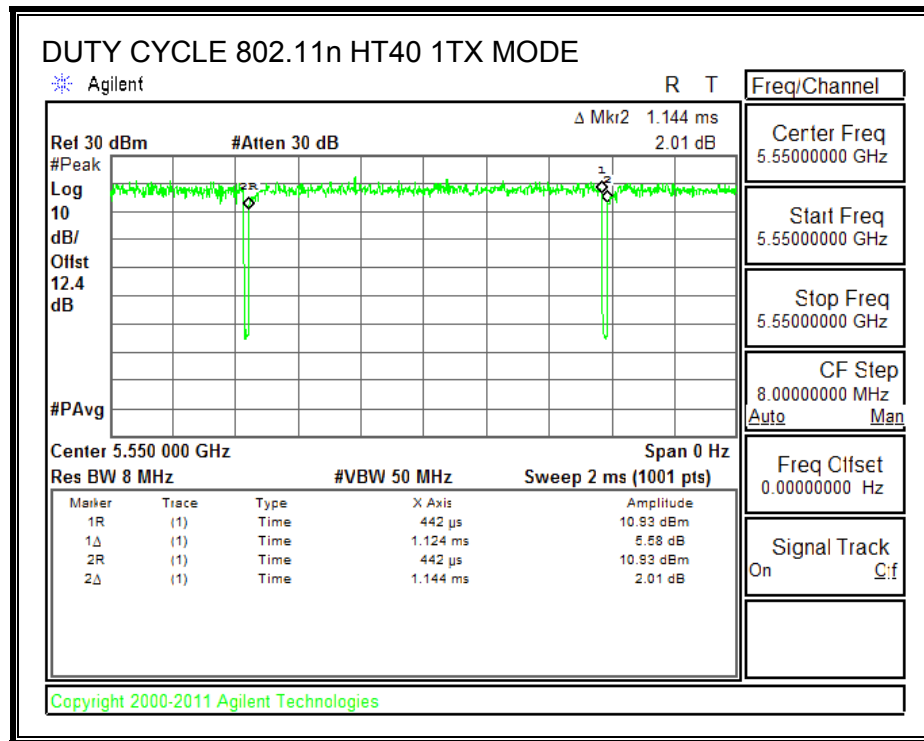
KDB 789033 Zero-Span Spectrum Analyzer Method.

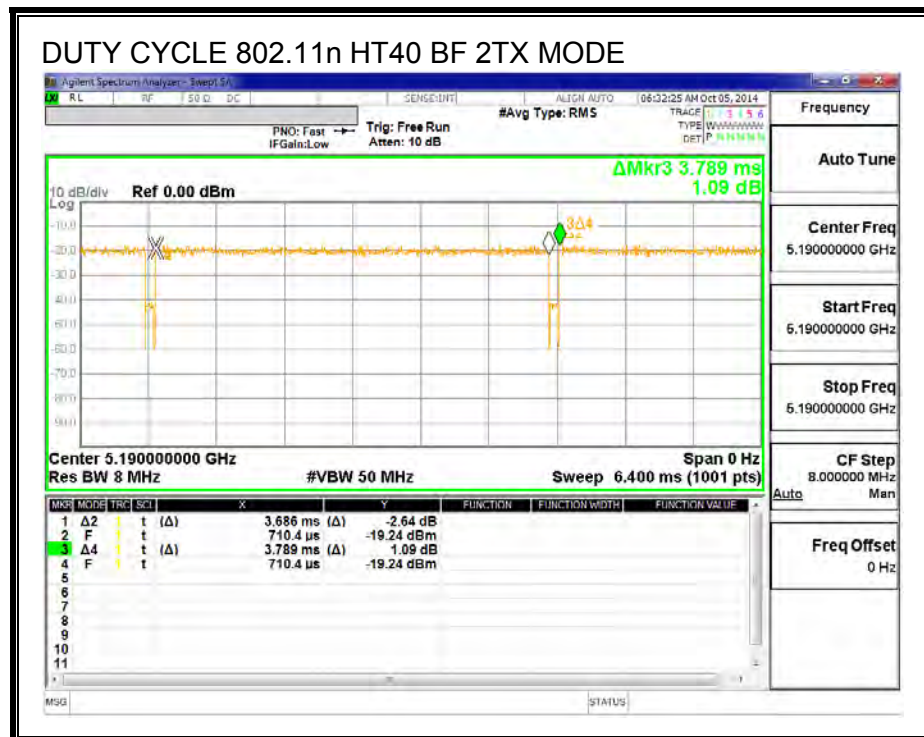
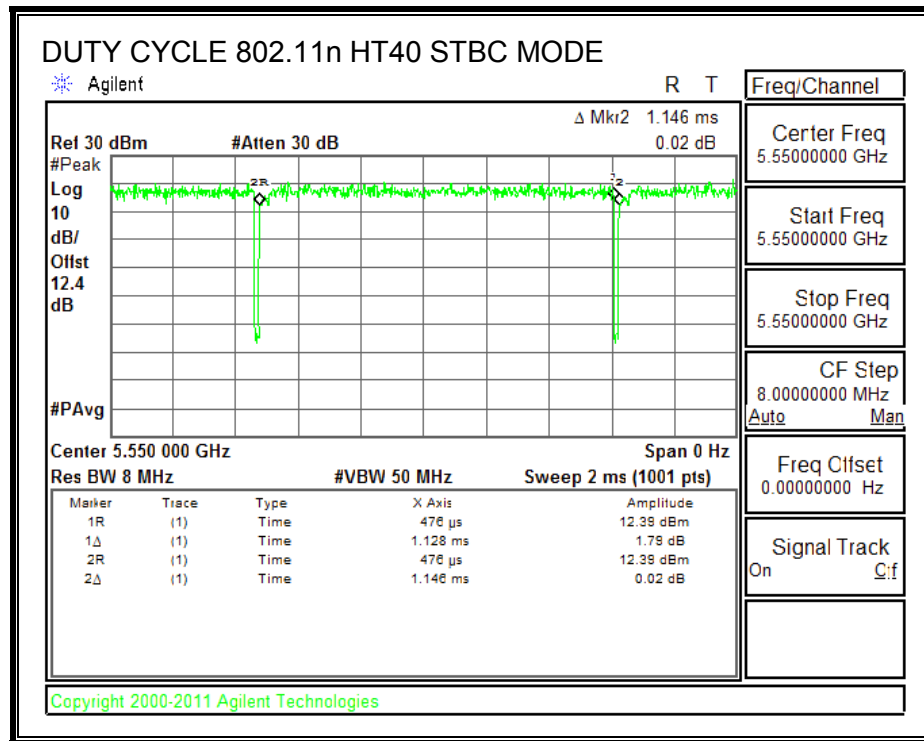
| Mode                    | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|-------------------------|------------------------|------------------|-----------------------------|----------------------|-----------------------------------------|-----------------------------|
| 802.11a 1TX             | 2.064                  | 2.084            | 0.990                       | 99.04%               | 0.00                                    | 0.010                       |
| 802.11n HT20 CDD        | 2.058                  | 2.082            | 0.988                       | 98.85%               | 0.00                                    | 0.010                       |
| 802.11n HT20 STBC       | 1.926                  | 1.959            | 0.983                       | 98.32%               | 0.00                                    | 0.010                       |
| 802.11n HT20 TXBF 2TX   | 3.828                  | 3.936            | 0.973                       | 97.26%               | 0.12                                    | 0.261                       |
| 802.11n HT40 1TX        | 1.124                  | 1.144            | 0.983                       | 98.25%               | 0.00                                    | 0.010                       |
| 802.11n HT40 CDD        | 1.124                  | 1.142            | 0.984                       | 98.42%               | 0.00                                    | 0.010                       |
| 802.11n HT40 STBC       | 1.128                  | 1.146            | 0.984                       | 98.43%               | 0.00                                    | 0.010                       |
| 802.11n HT40 TXBF 2TX   | 3.686                  | 3.789            | 0.973                       | 97.28%               | 0.12                                    | 0.271                       |
| 802.11ac VHT80 1TX      | 0.458                  | 0.482            | 0.950                       | 95.02%               | 0.22                                    | 2.183                       |
| 802.11ac VHT80 CDD      | 0.459                  | 0.483            | 0.950                       | 95.03%               | 0.22                                    | 2.179                       |
| 802.11ac VHT80 STBC     | 0.467                  | 0.491            | 0.951                       | 95.11%               | 0.22                                    | 2.141                       |
| 802.11ac VHT80 TXBF 2TX | 5.050                  | 5.360            | 0.942                       | 94.22%               | 0.26                                    | 0.198                       |

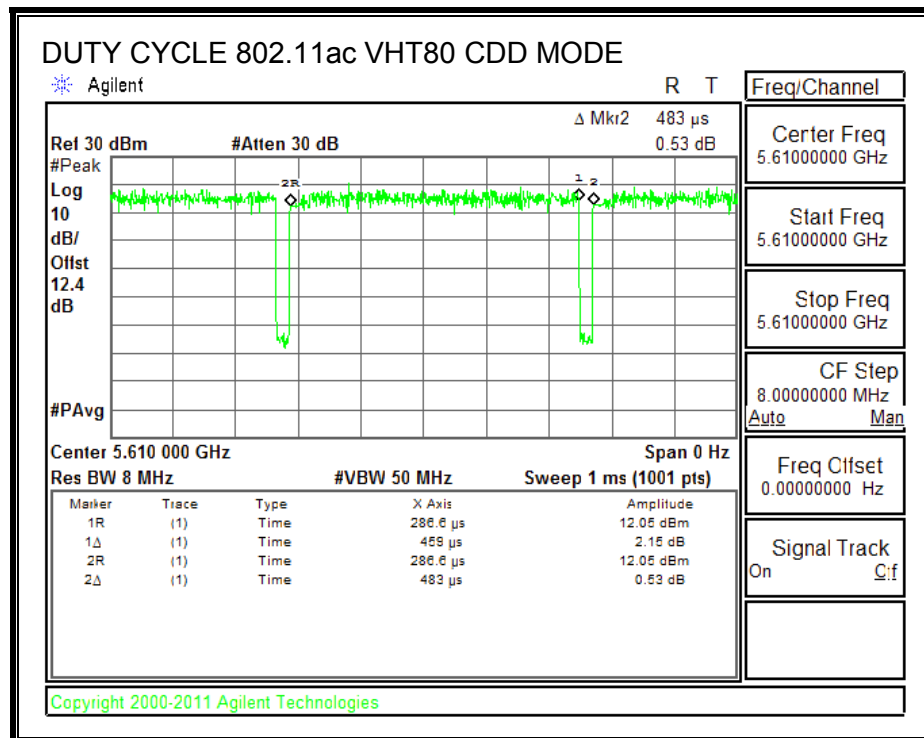
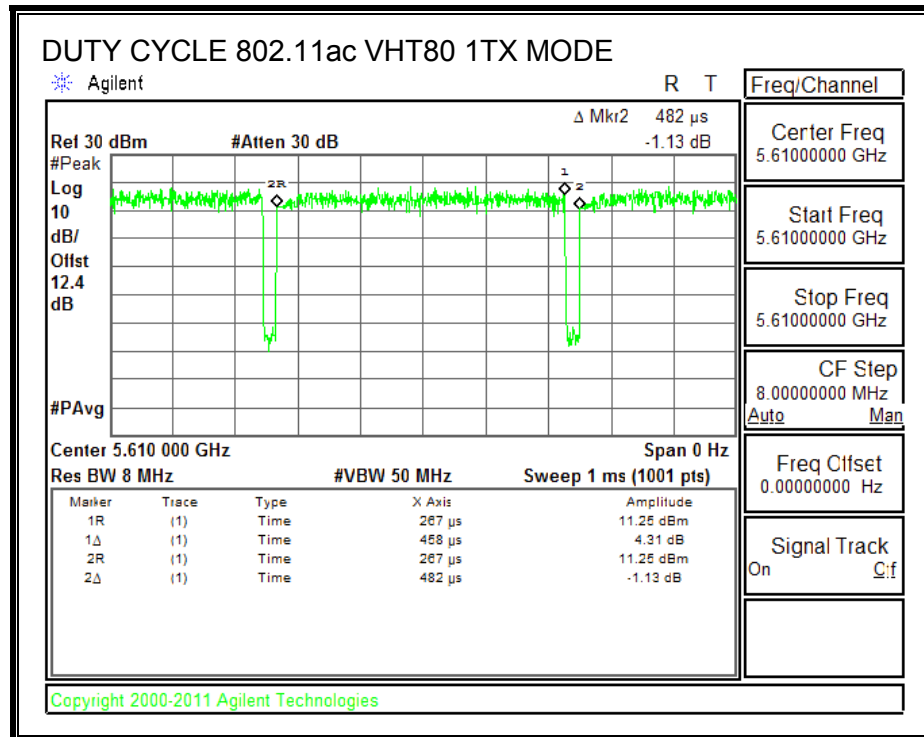
## 8.2. DUTY CYCLE PLOTS

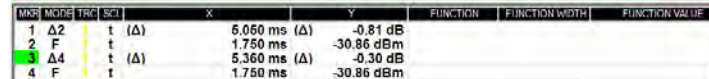
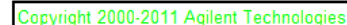












## 9. ANTENNA PORT TEST RESULTS

### 9.1. 802.11a 1TX MODE IN THE 5.2 GHz BAND

#### 9.1.1. 26 dB BANDWIDTH

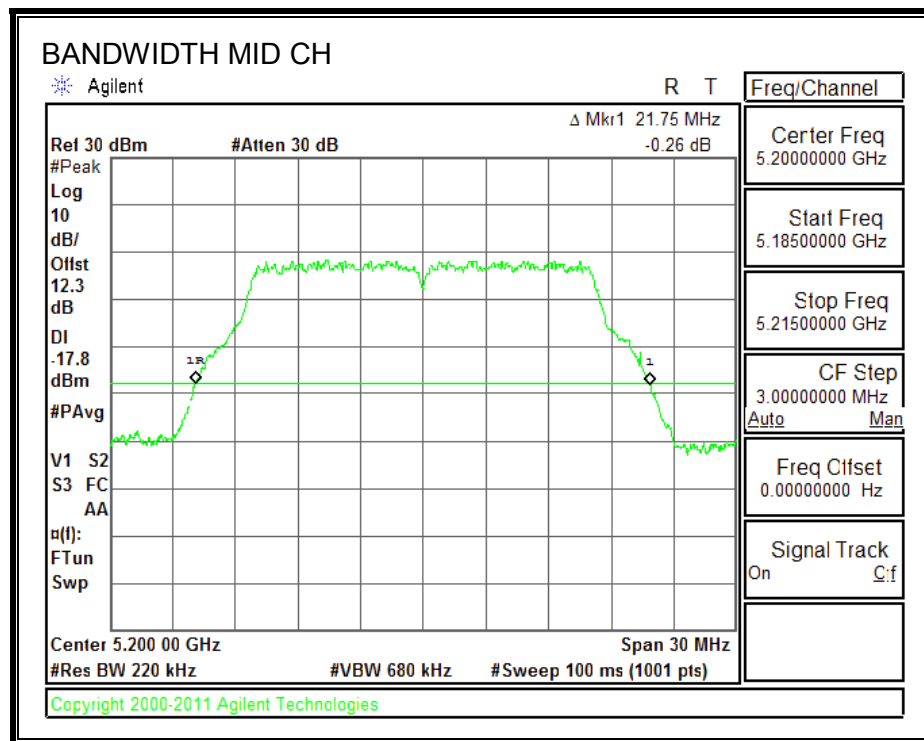
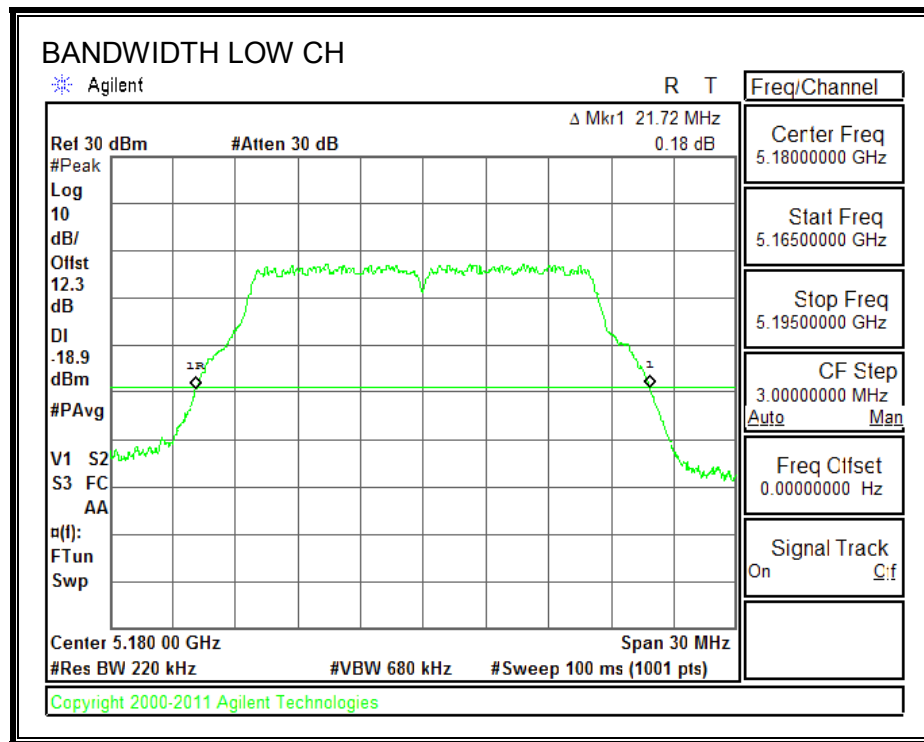
##### LIMITS

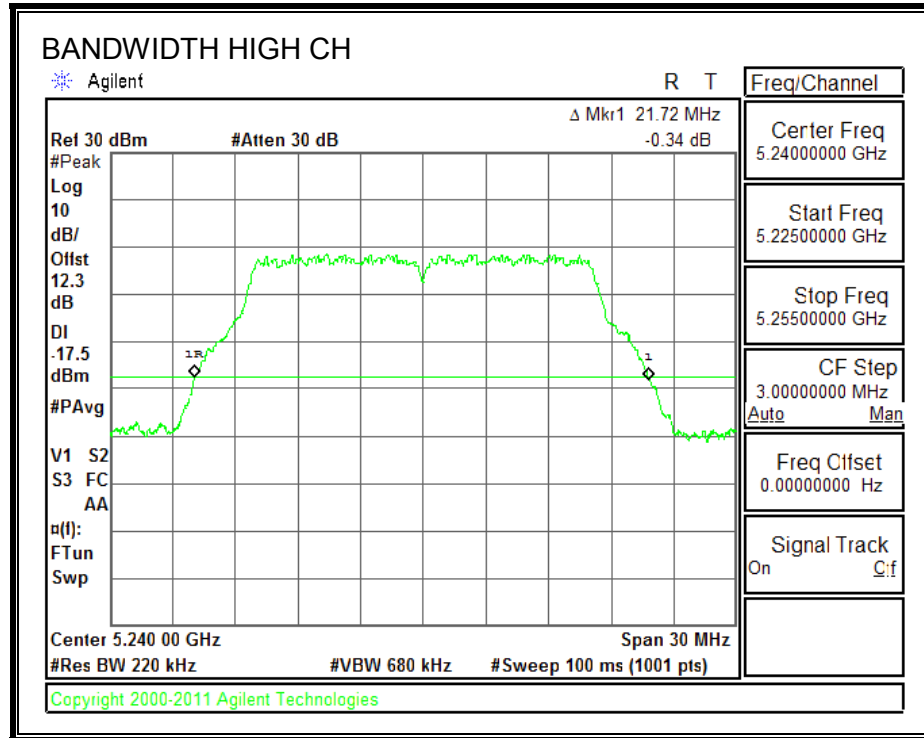
None; for reporting purposes only.

##### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5180               | 21.72                    |
| Mid     | 5200               | 21.75                    |
| High    | 5240               | 21.72                    |

**26 dB BANDWIDTH**





### 9.1.2. 99% BANDWIDTH

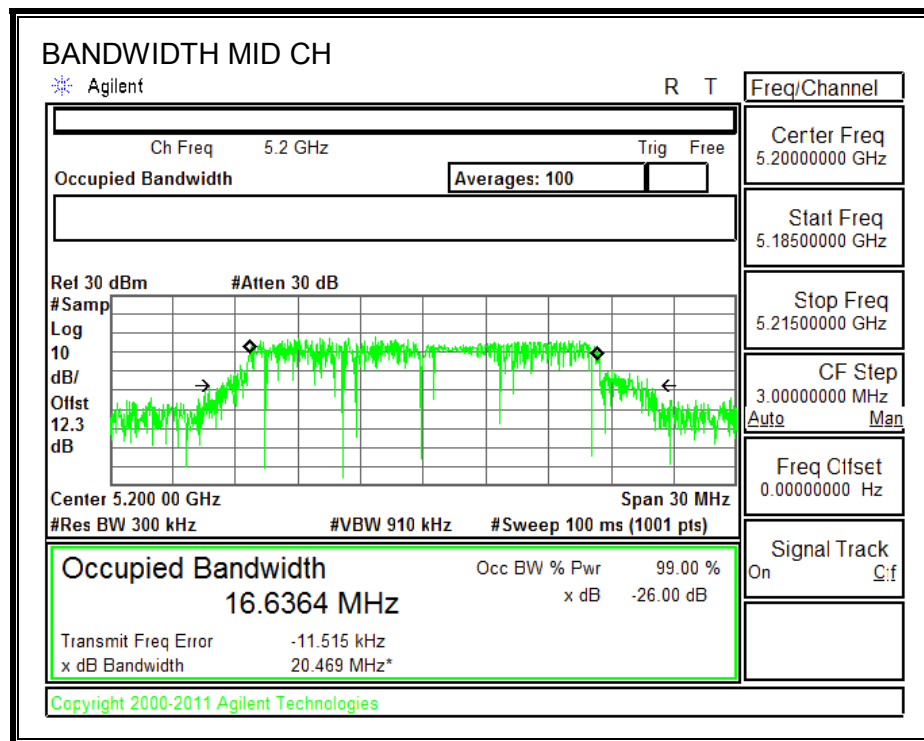
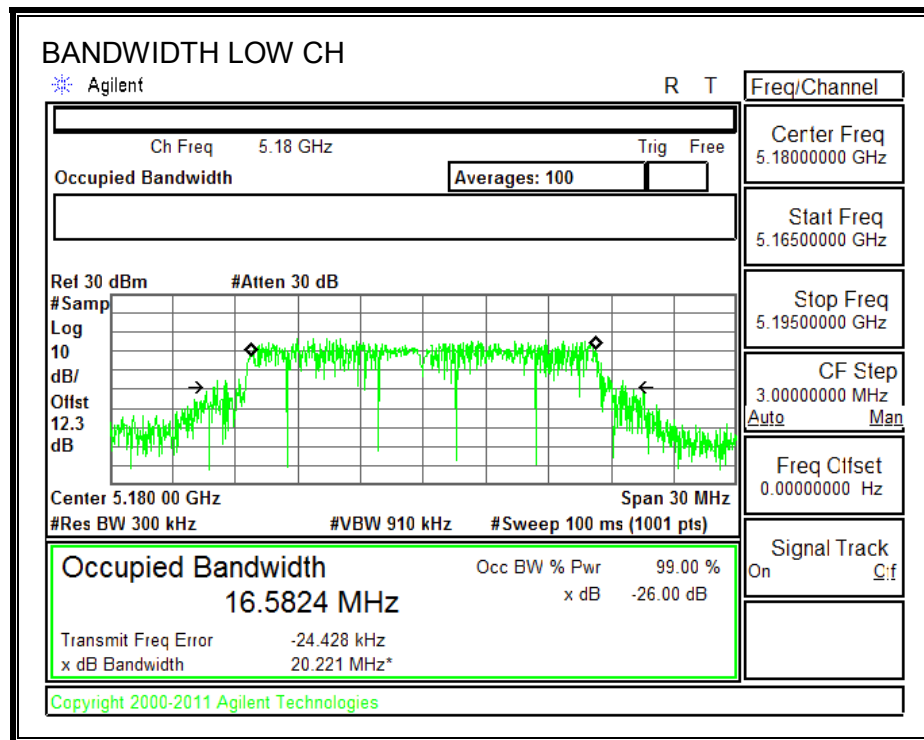
#### LIMITS

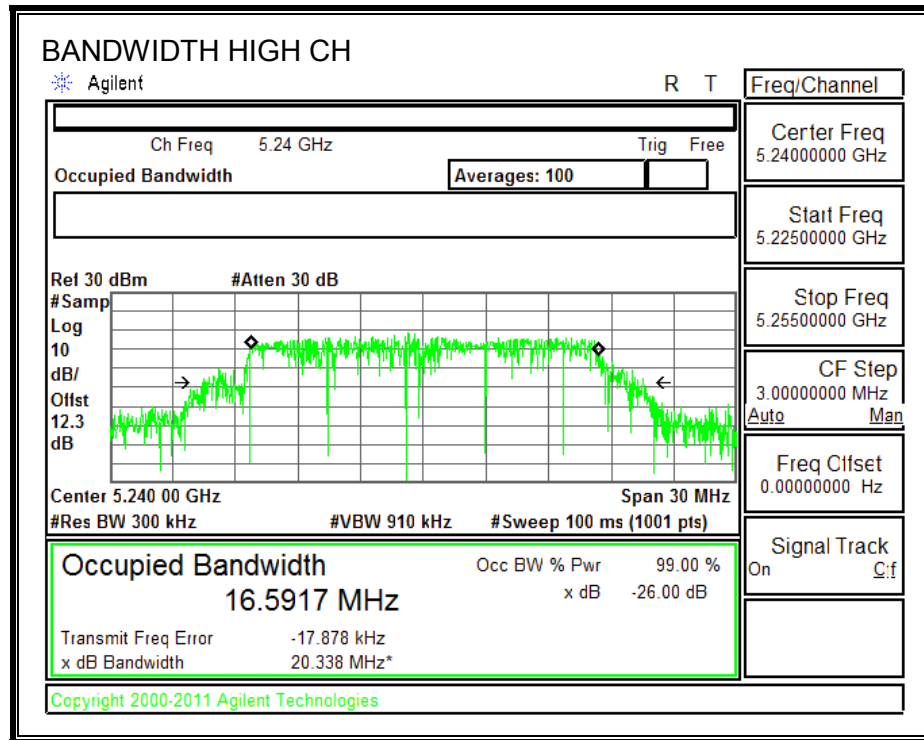
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5180               | 16.5824                |
| Mid     | 5200               | 16.6364                |
| High    | 5240               | 16.5917                |

**99% BANDWIDTH**





### 9.1.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.11                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 2.90                     |

## 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               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |
| High    | 5240               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

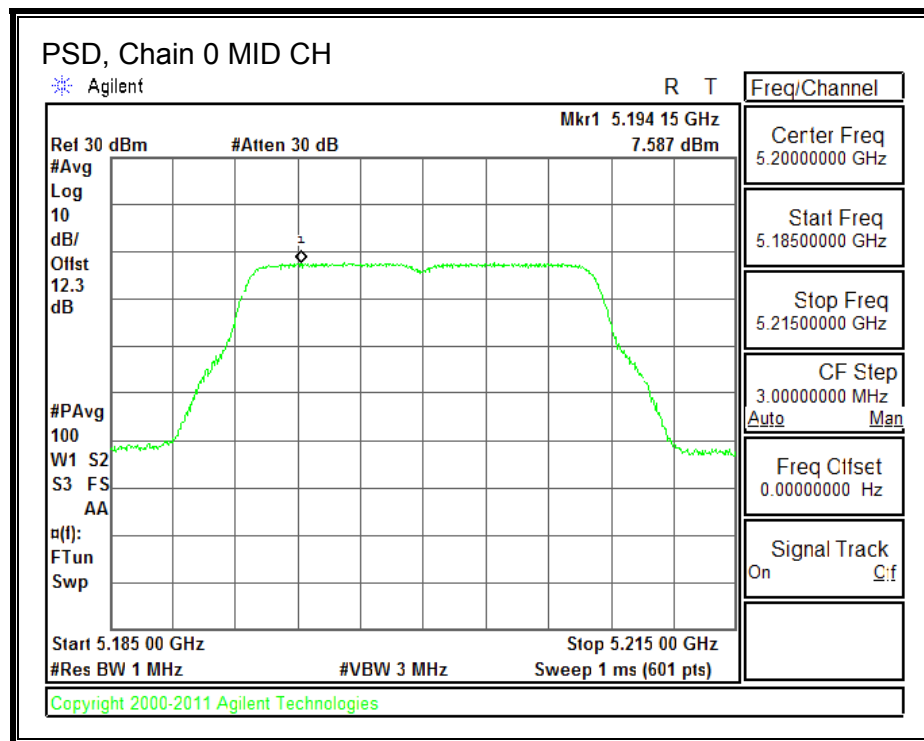
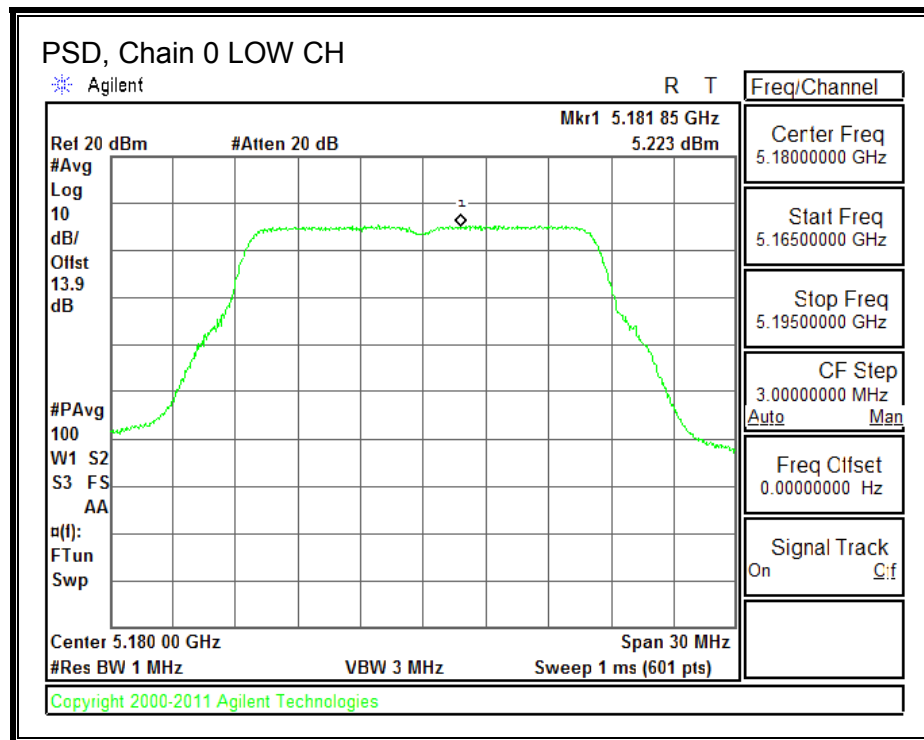
### Output Power Results

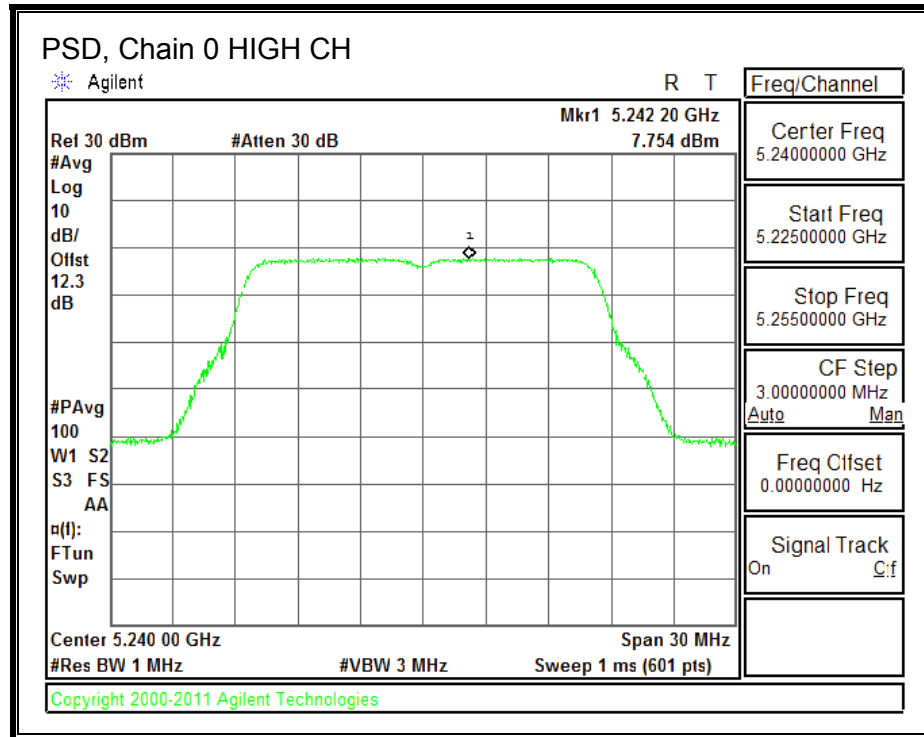
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 16.50                             | 16.50                             | 24.00                   | -7.50                   |
| Mid     | 5200               | 17.98                             | 17.98                             | 24.00                   | -6.02                   |
| High    | 5240               | 17.97                             | 17.97                             | 24.00                   | -6.03                   |

### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<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               | 5.22                            | 5.22                            | 11.00                 | -5.78                 |
| Mid     | 5200               | 7.59                            | 7.59                            | 11.00                 | -3.41                 |
| High    | 5240               | 7.75                            | 7.75                            | 11.00                 | -3.25                 |

**PSD, Chain 0**





## 9.2. 802.11n HT20 2TX CDD MODE IN THE 5.2 GHz BAND

### 9.2.1. 26 dB BANDWIDTH

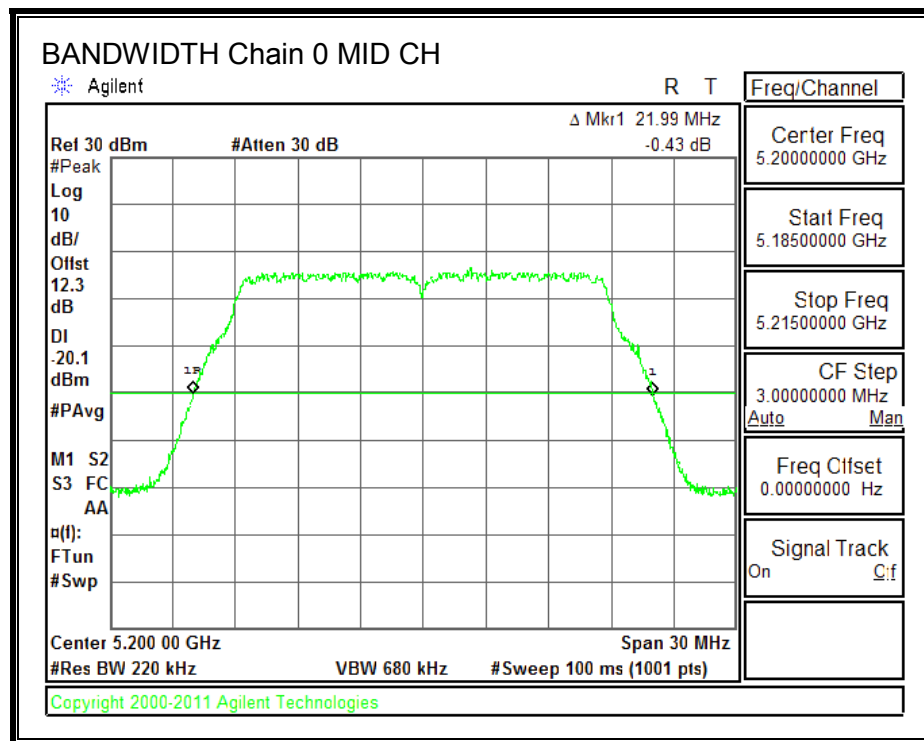
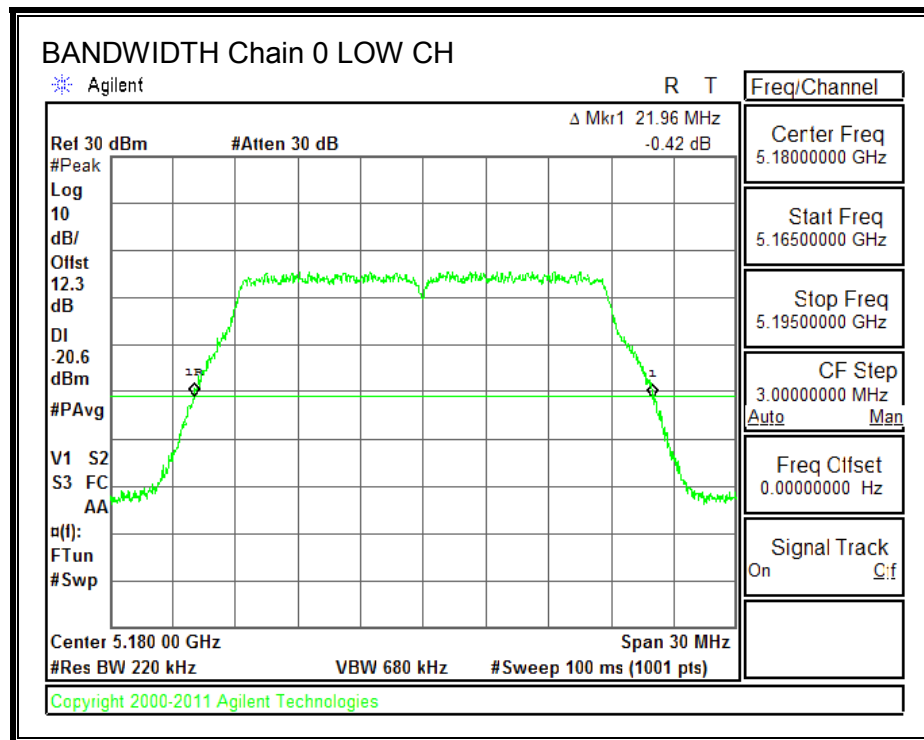
#### LIMITS

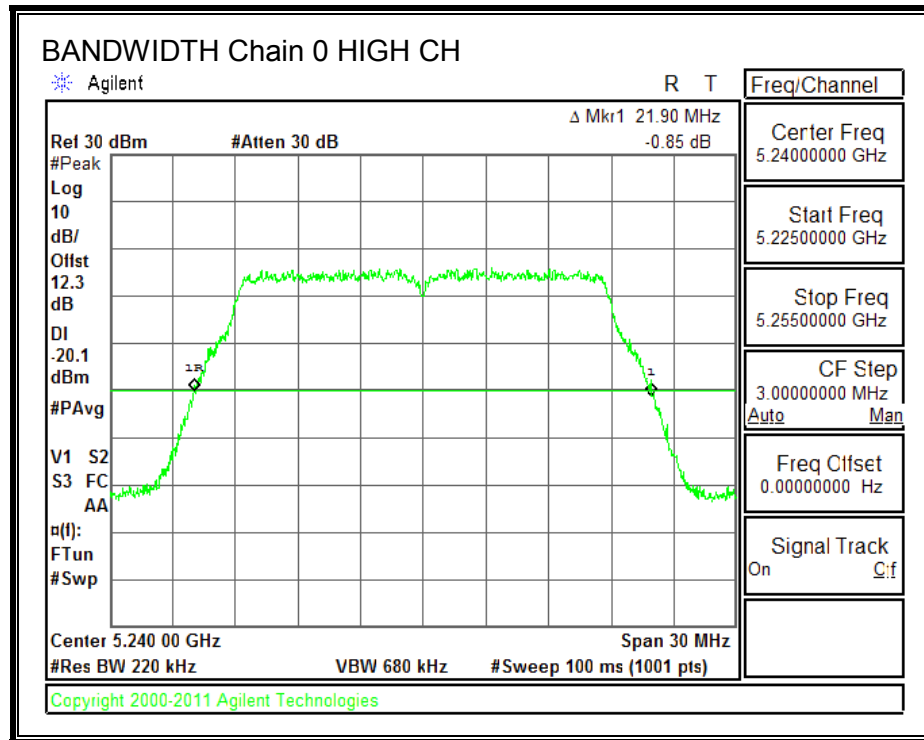
None; for reporting purposes only.

#### RESULTS

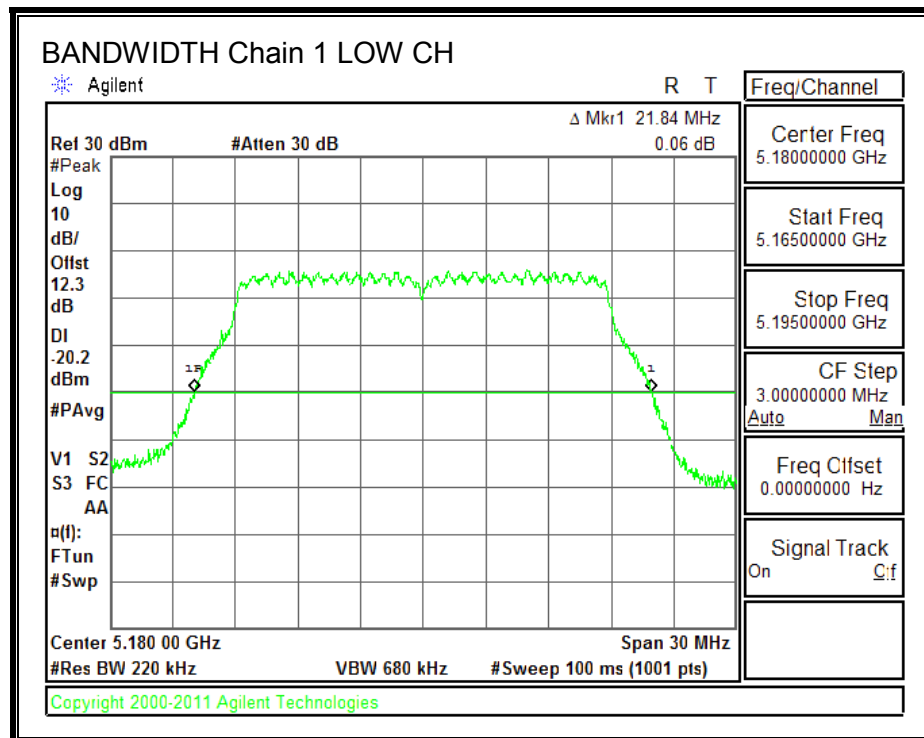
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 21.96                        | 21.84                        |
| Mid     | 5200               | 21.99                        | 21.81                        |
| High    | 5240               | 21.90                        | 21.78                        |

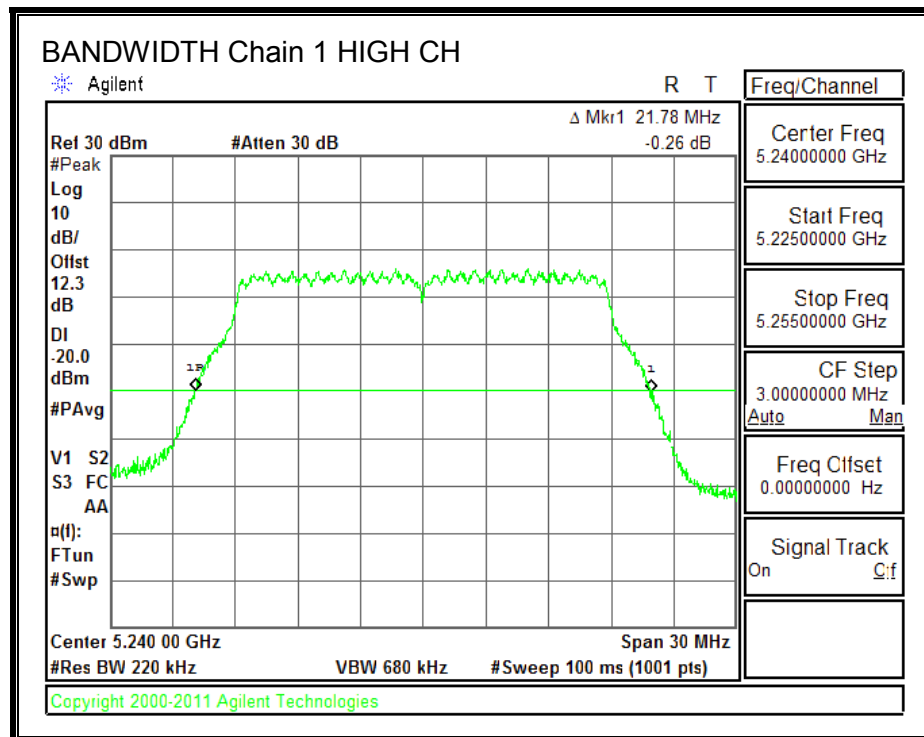
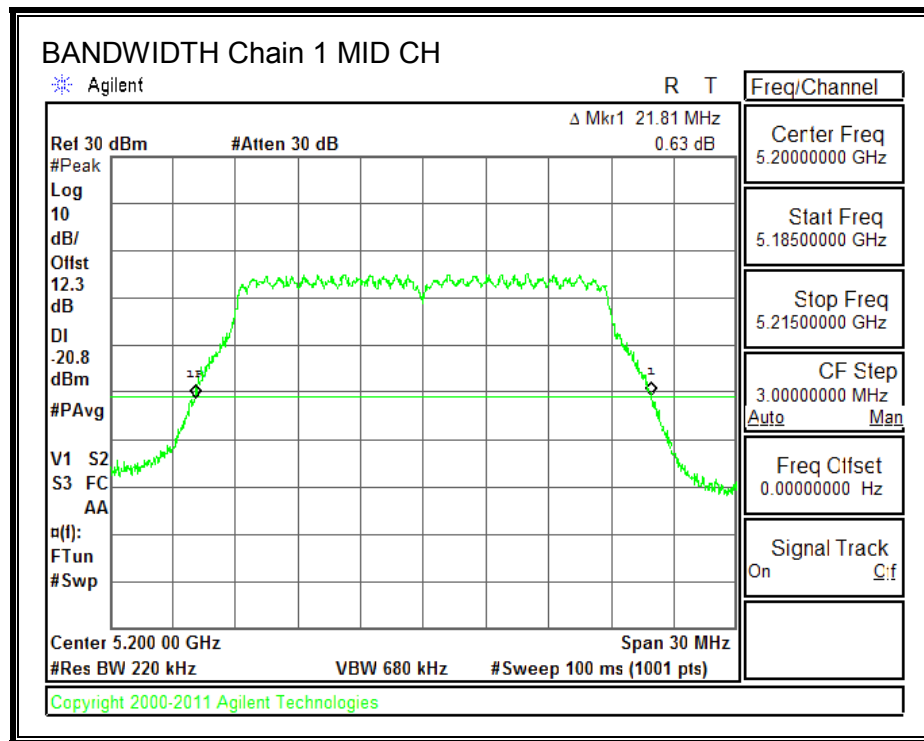
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





## 9.2.2. 99% BANDWIDTH

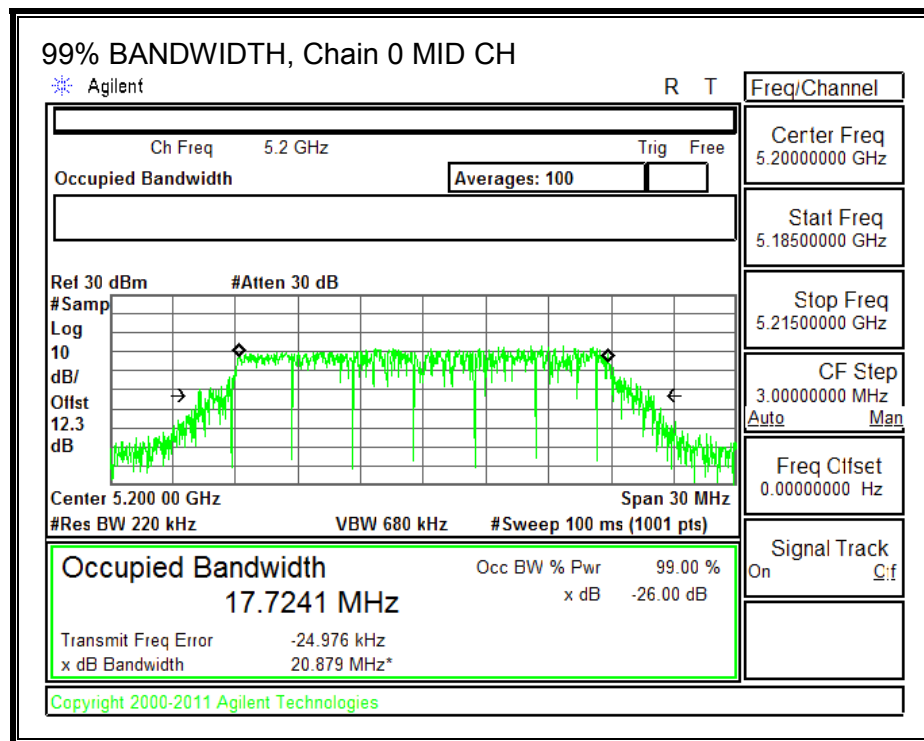
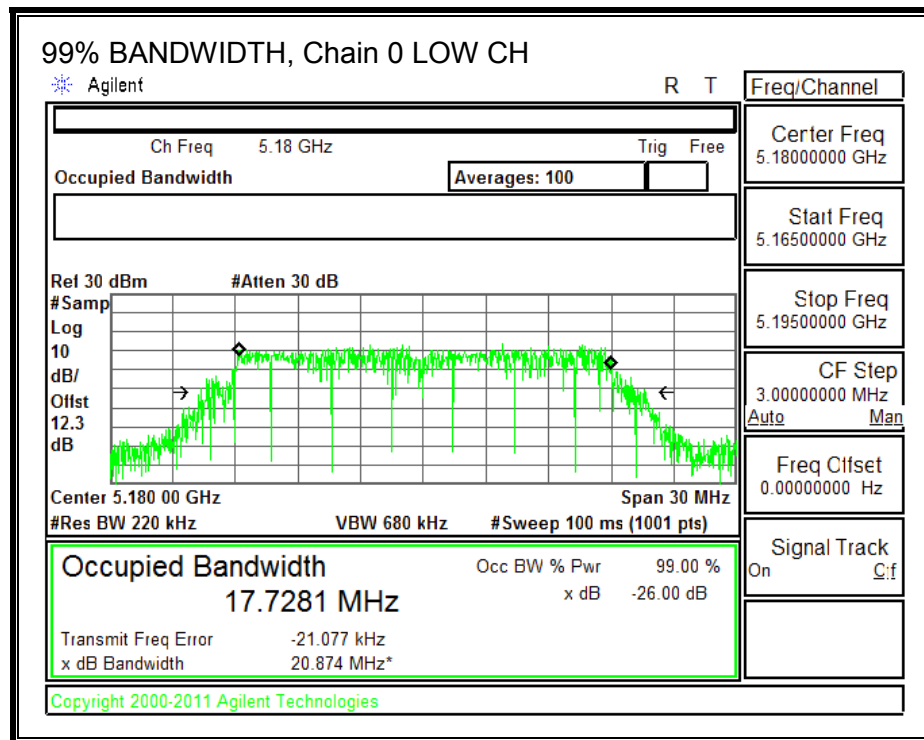
### LIMITS

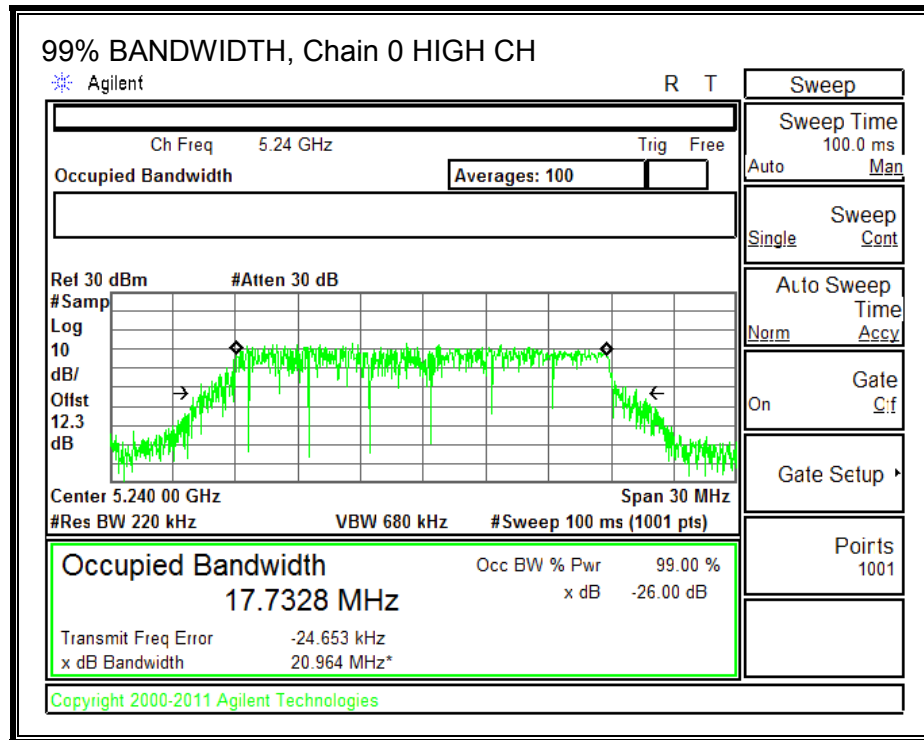
None; for reporting purposes only.

### RESULTS

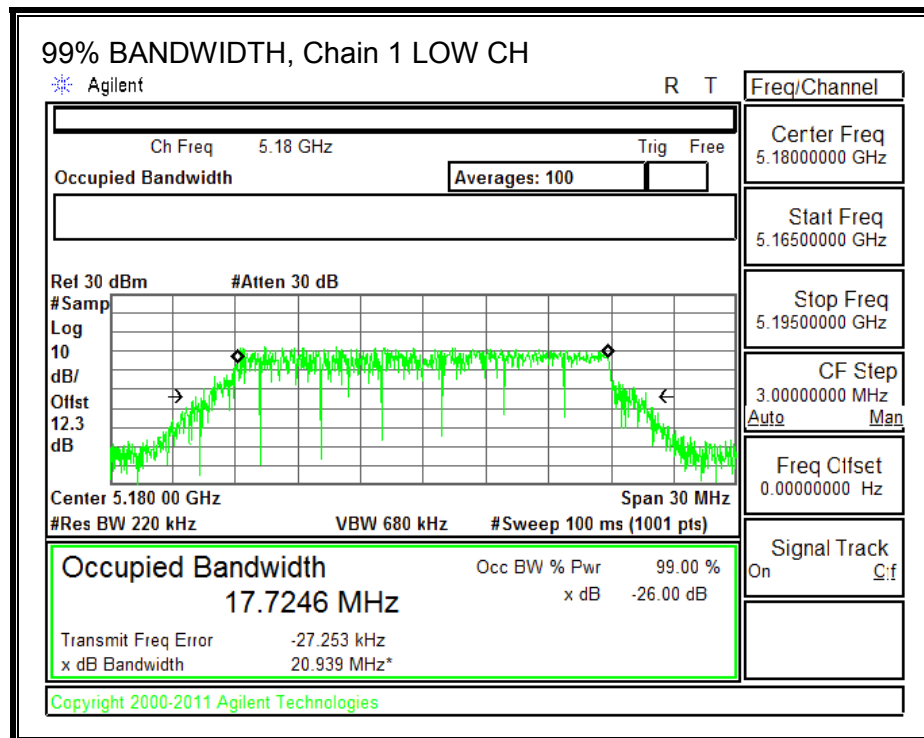
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.7281                    | 17.7246                    |
| Mid     | 5200               | 17.7241                    | 17.7269                    |
| High    | 5240               | 17.7328                    | 17.7332                    |

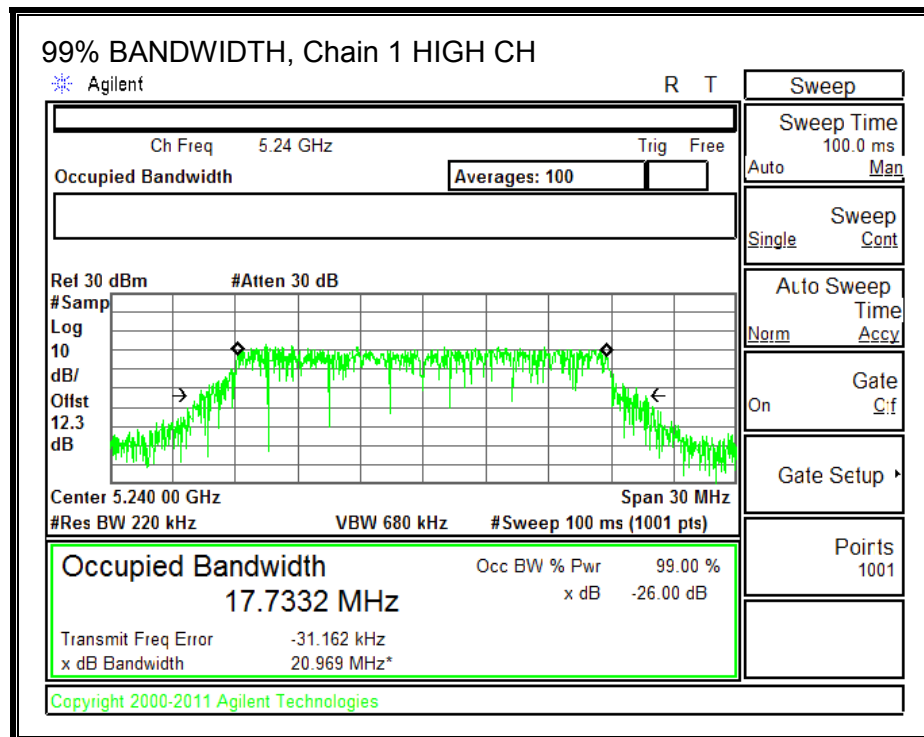
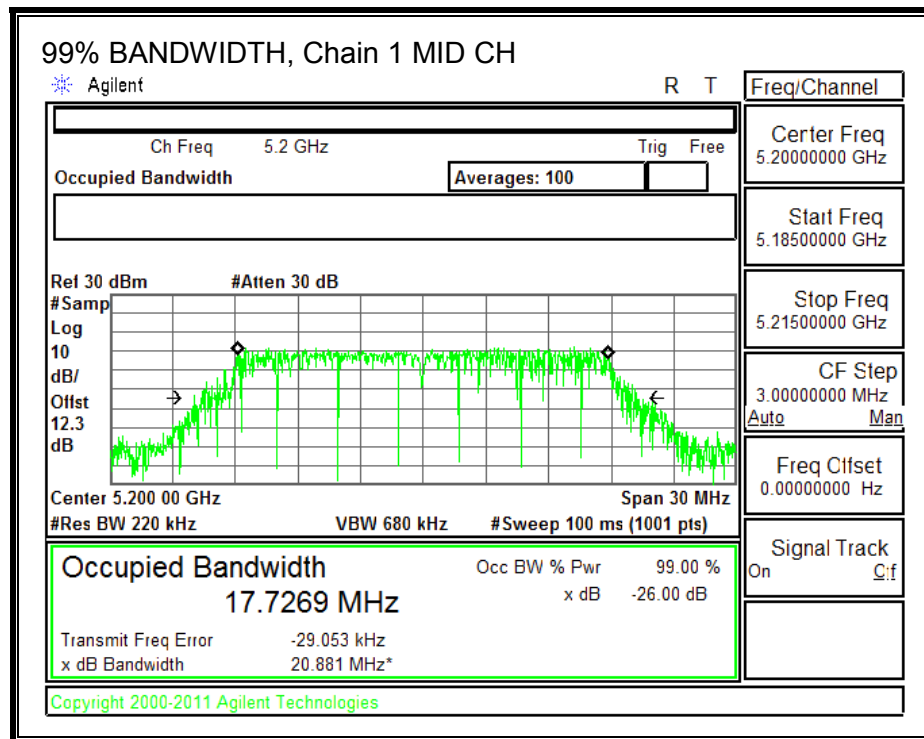
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 9.2.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## 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               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |
| Mid     | 5200               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |
| High    | 5240               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

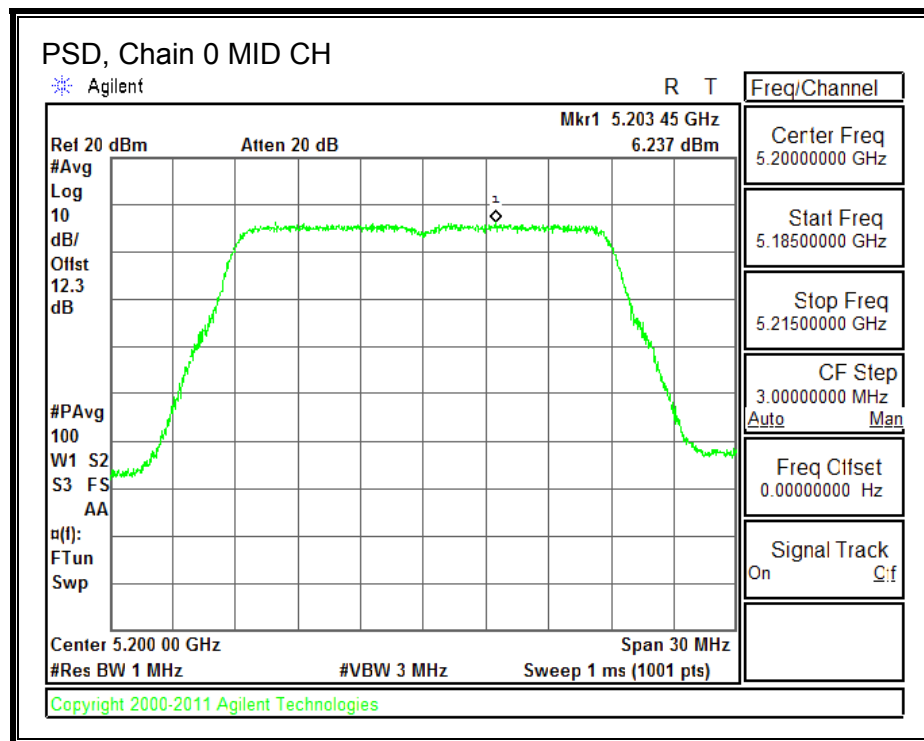
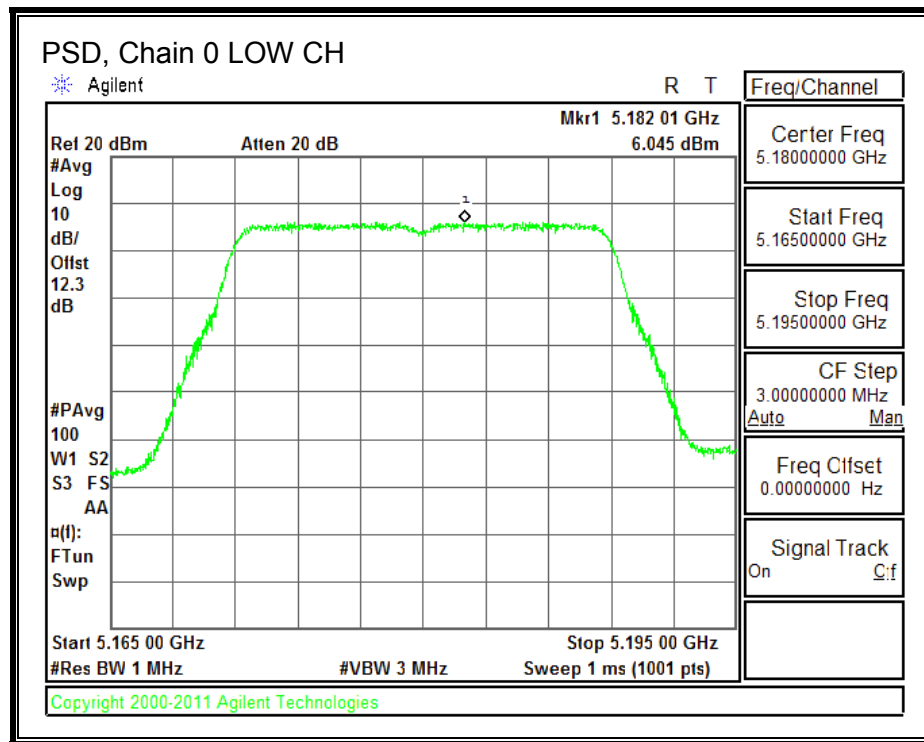
### Output Power Results

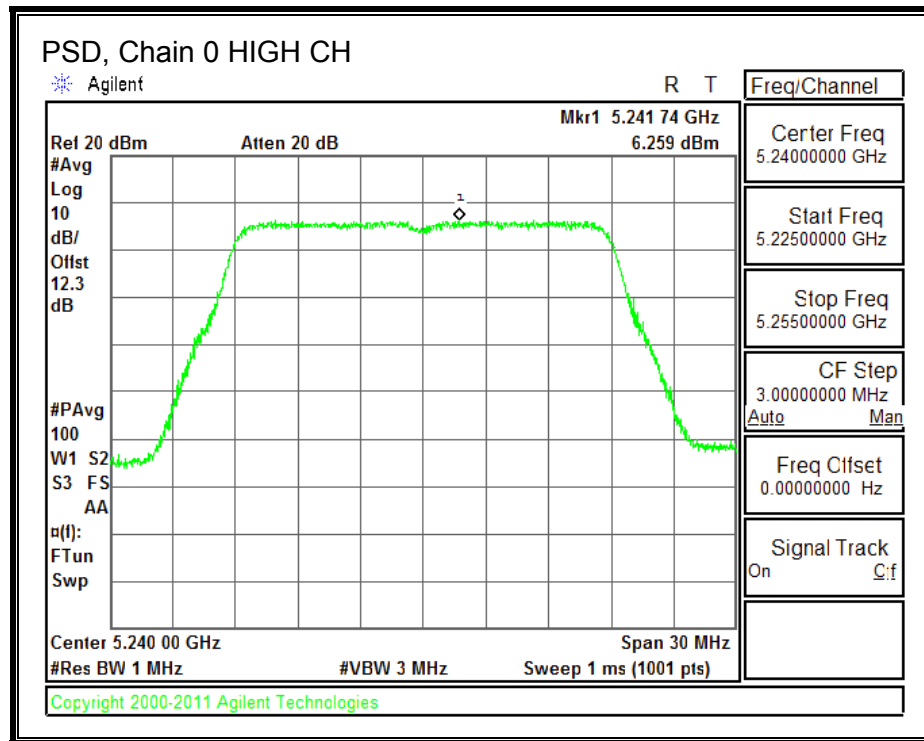
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 15.97                             | 15.92                             | 18.96                             | 24.00                   | -5.04                   |
| Mid     | 5200               | 15.95                             | 15.88                             | 18.93                             | 24.00                   | -5.07                   |
| High    | 5240               | 15.99                             | 15.89                             | 18.95                             | 24.00                   | -5.05                   |

### PSD Results

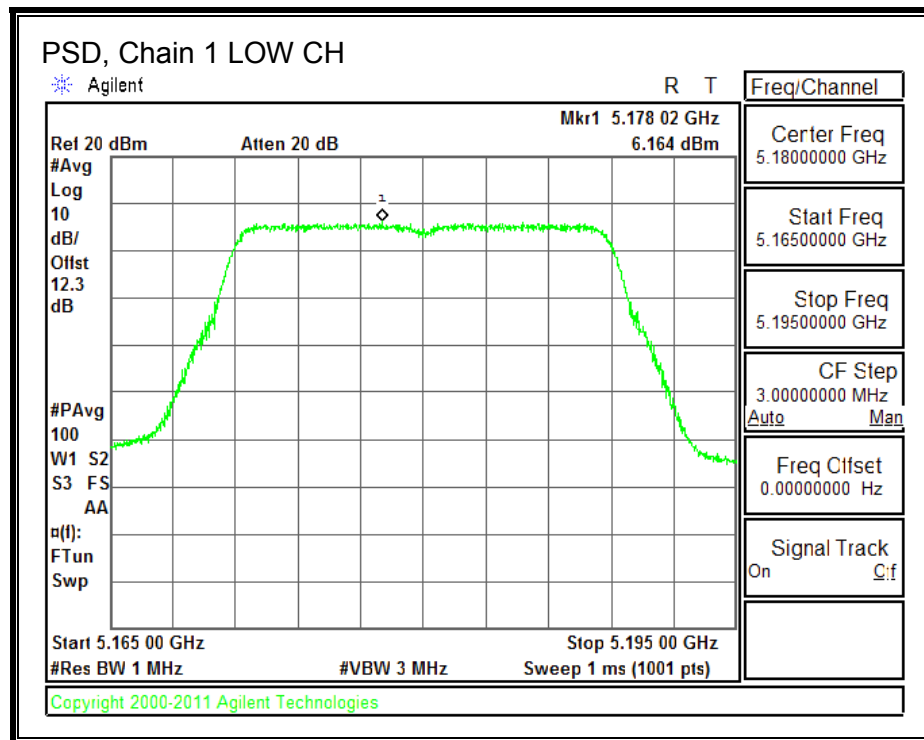
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 6.05                            | 6.16                            | 9.12                            | 10.98                 | -1.86                 |
| Mid     | 5200               | 6.24                            | 5.96                            | 9.11                            | 10.98                 | -1.87                 |
| High    | 5240               | 6.26                            | 6.05                            | 9.16                            | 10.98                 | -1.82                 |

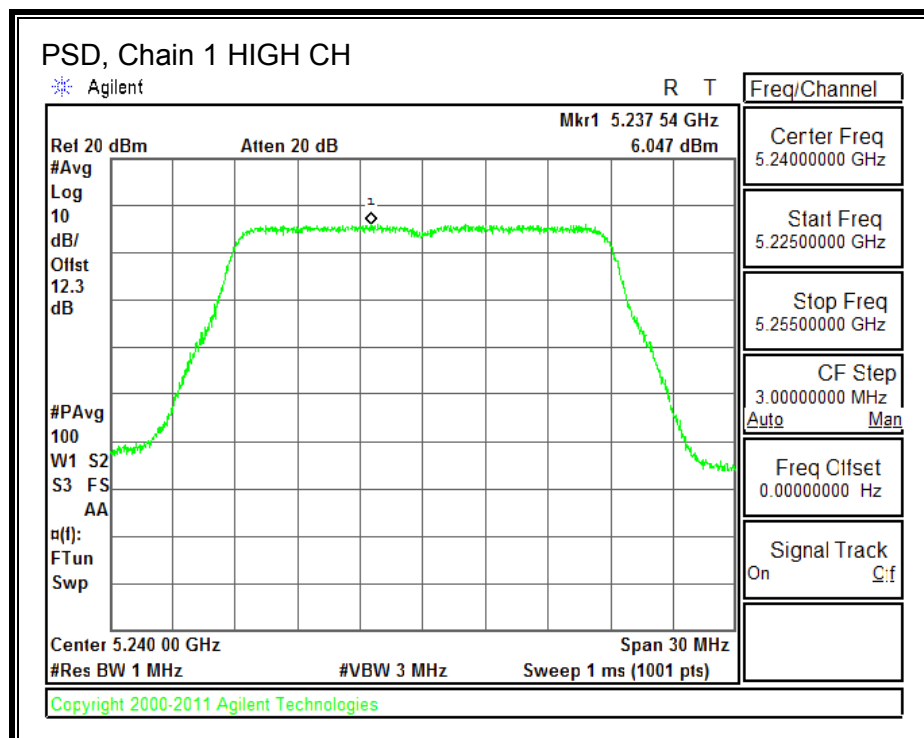
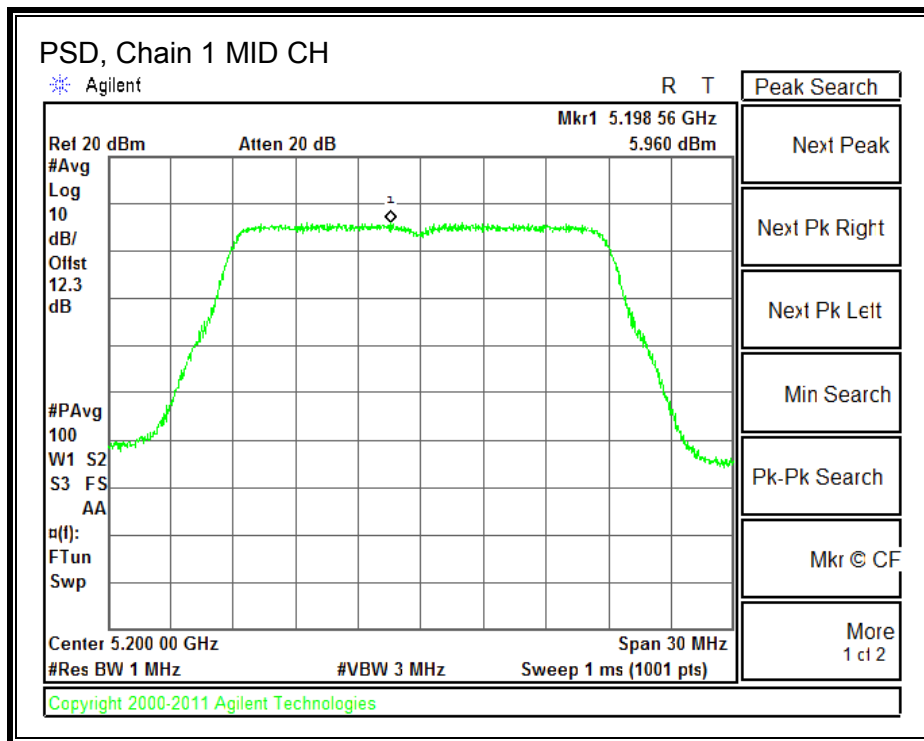
**PSD, Chain 0**





**PSD, Chain 1**





### 9.3. 802.11n HT20 2TX STBC MODE IN THE 5.2 GHz BAND

#### 9.3.1. 26 dB BANDWIDTH

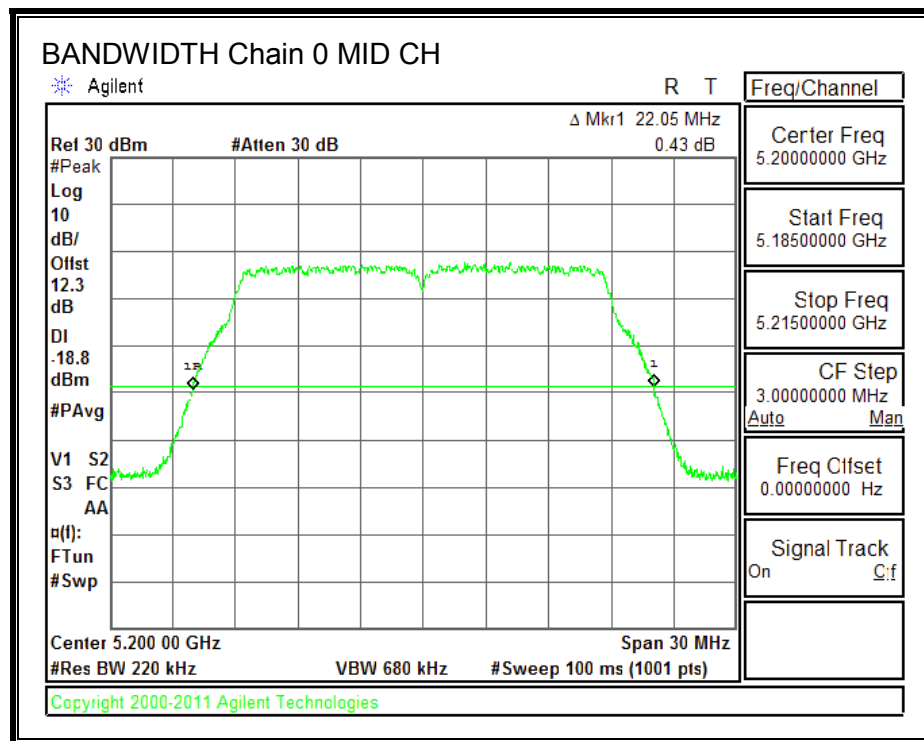
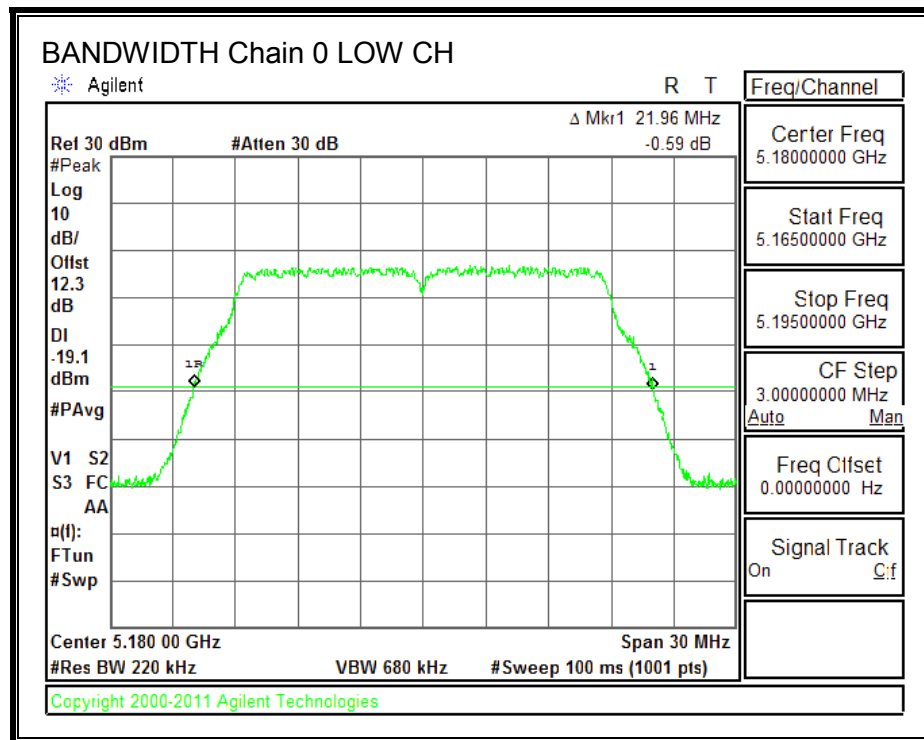
##### LIMITS

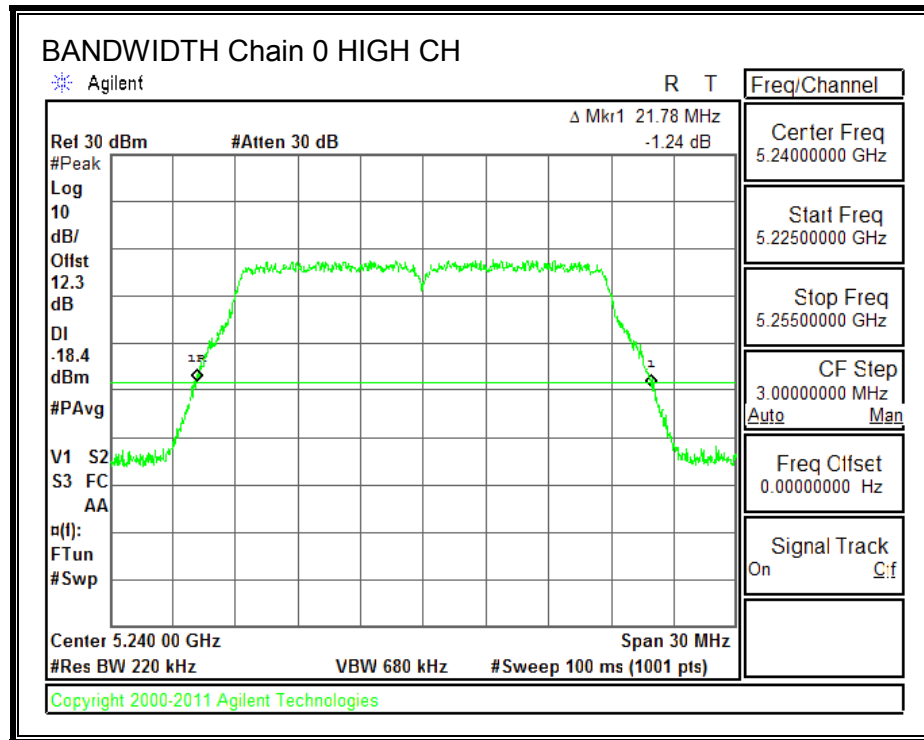
None; for reporting purposes only.

##### RESULTS

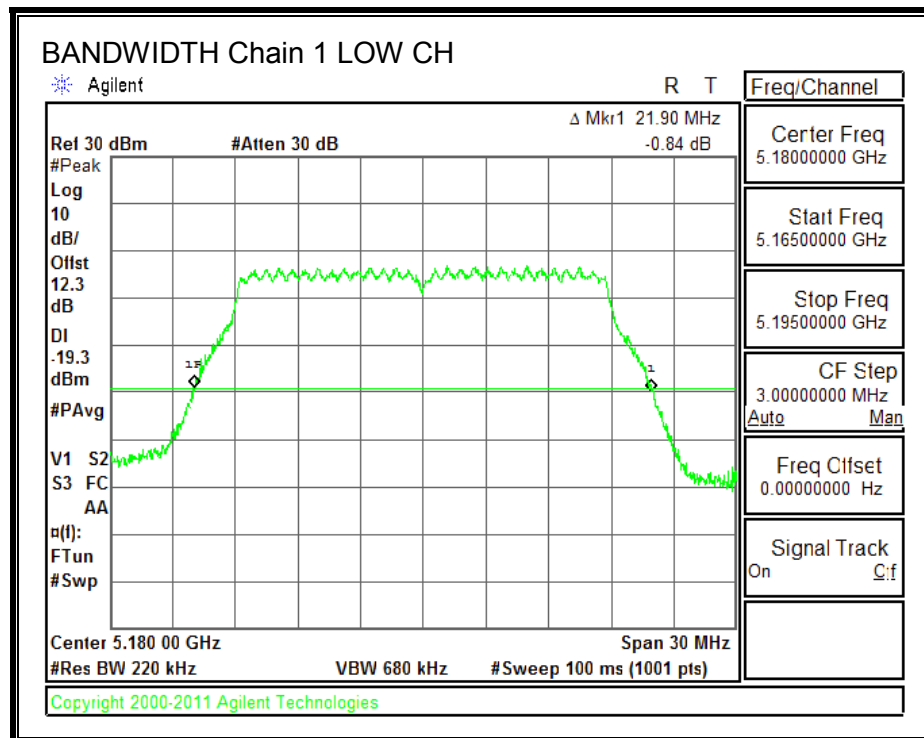
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 21.96                        | 21.90                        |
| Mid     | 5200               | 22.05                        | 21.72                        |
| High    | 5240               | 21.78                        | 21.78                        |

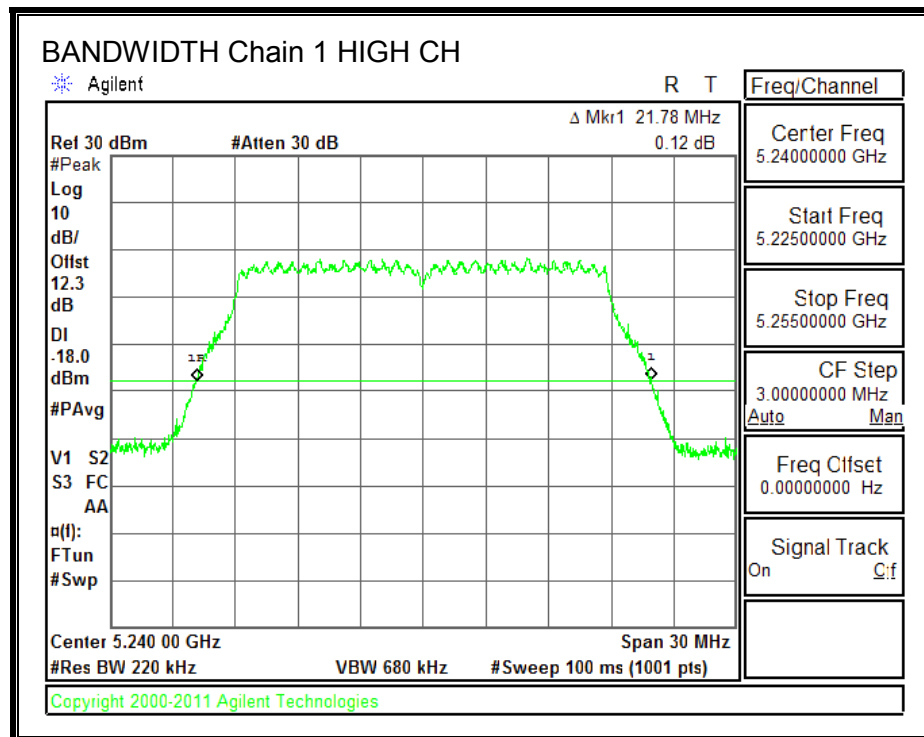
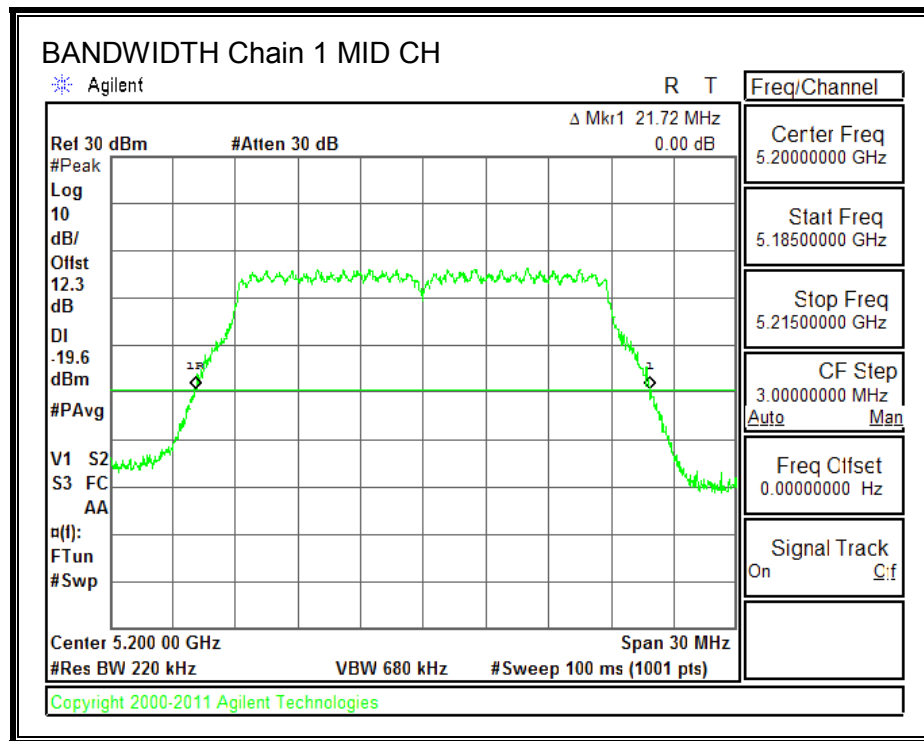
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





### 9.3.2. 99% BANDWIDTH

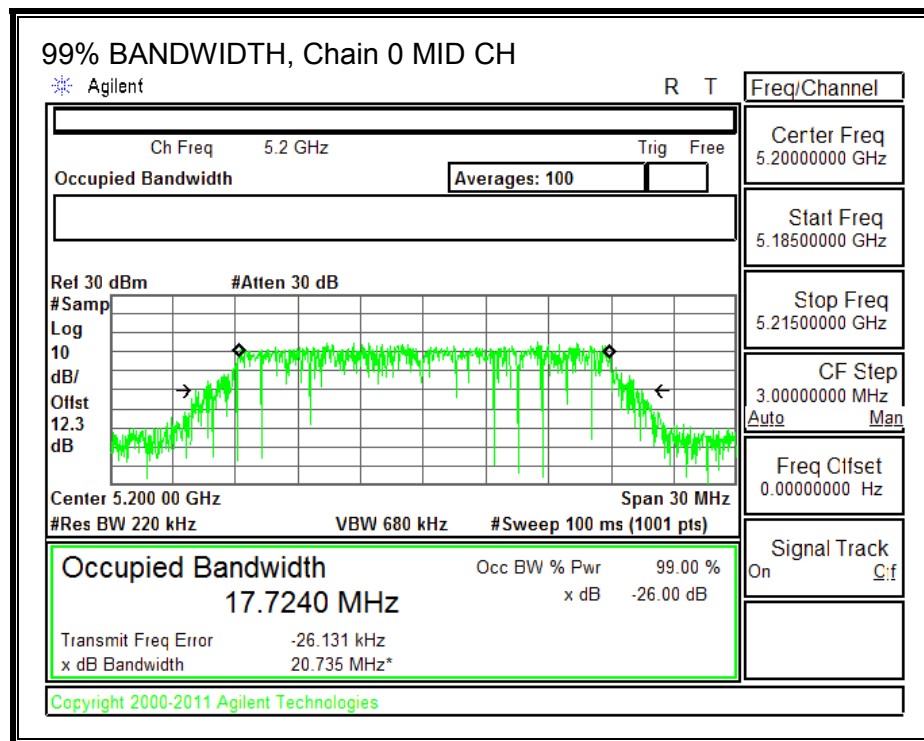
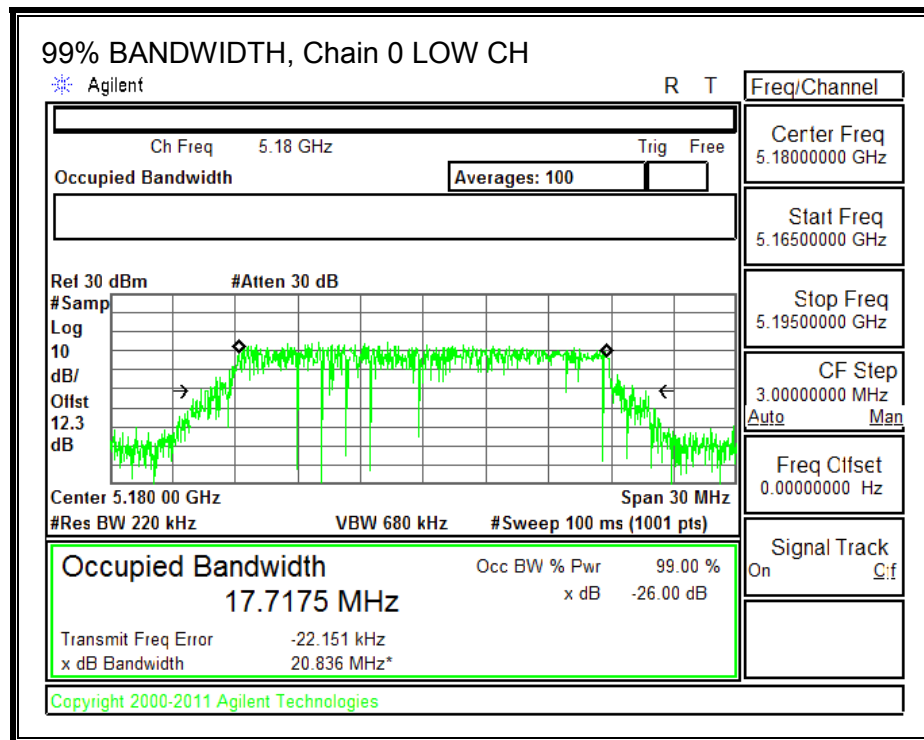
#### LIMITS

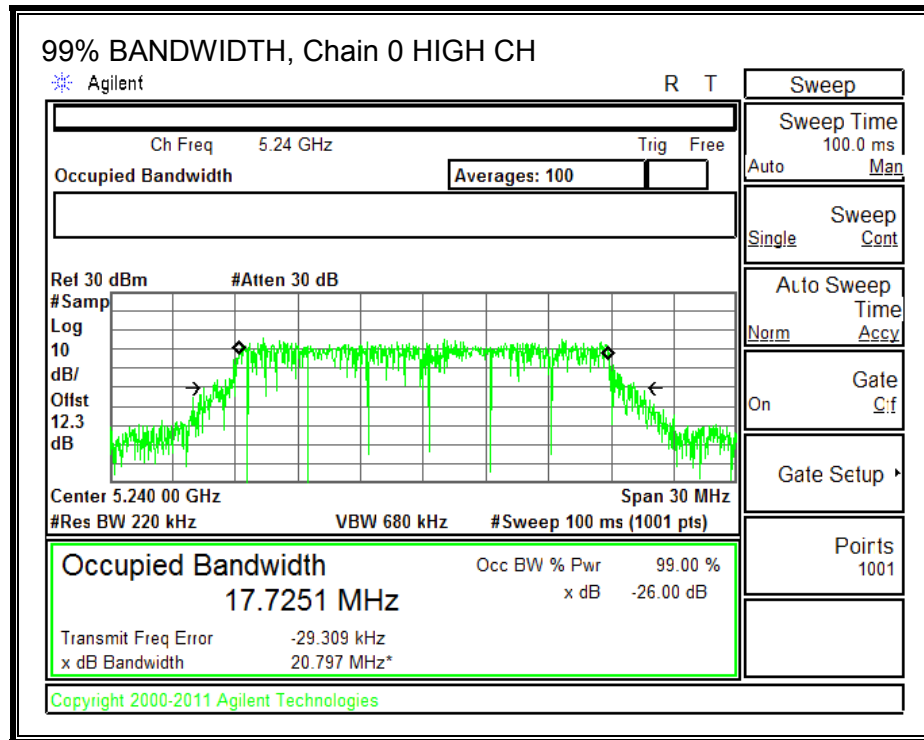
None; for reporting purposes only.

#### RESULTS

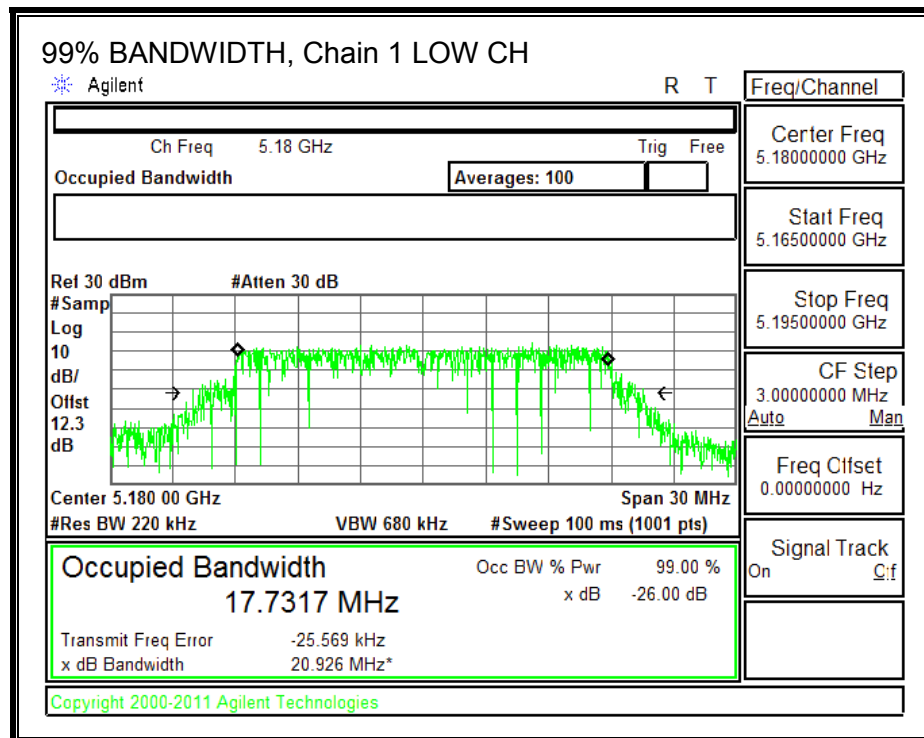
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.7175                    | 17.7317                    |
| Mid     | 5200               | 17.7240                    | 17.7225                    |
| High    | 5240               | 17.7251                    | 17.7251                    |

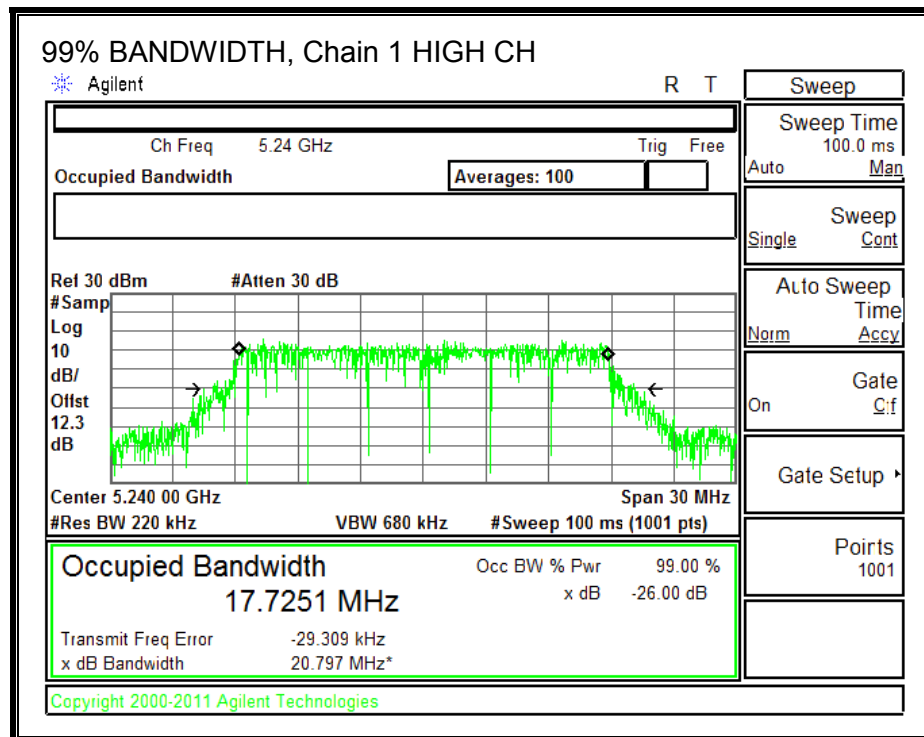
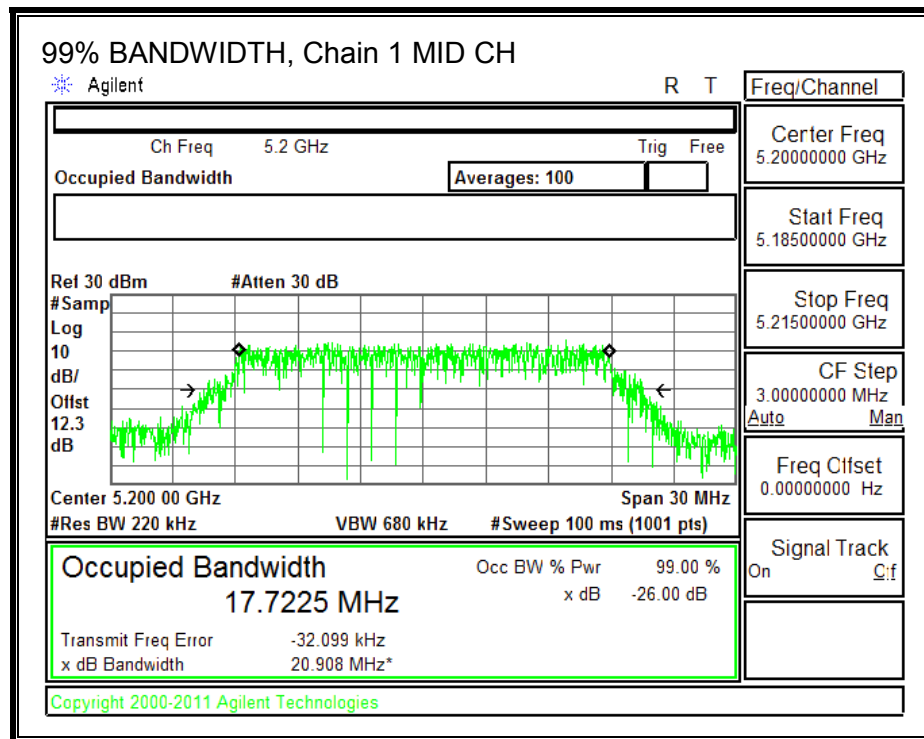
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 9.3.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

## 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               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |
| Mid     | 5200               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |
| High    | 5240               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

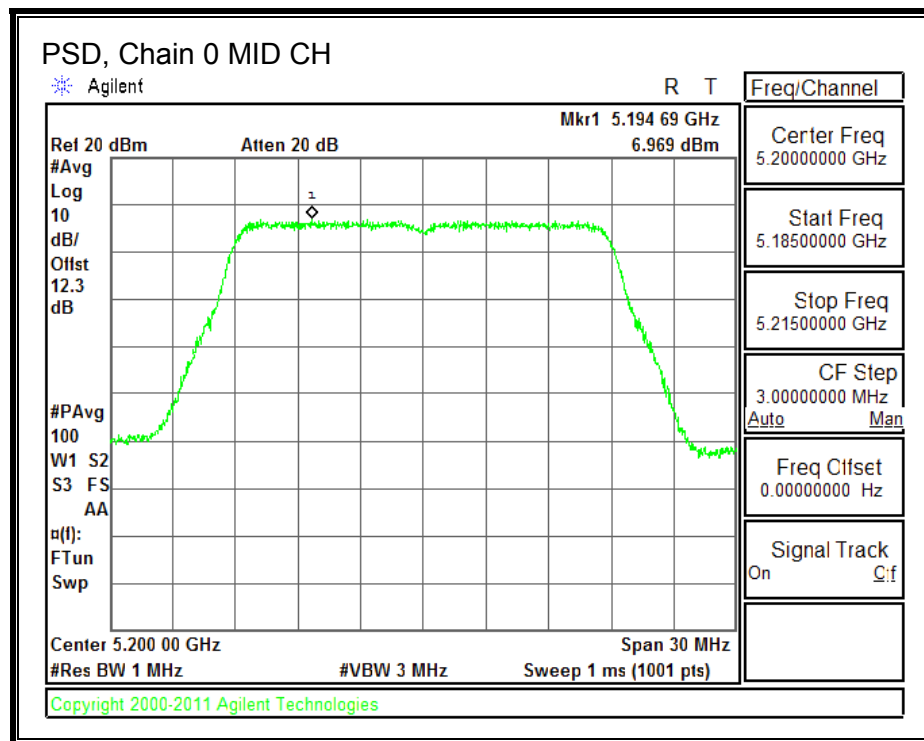
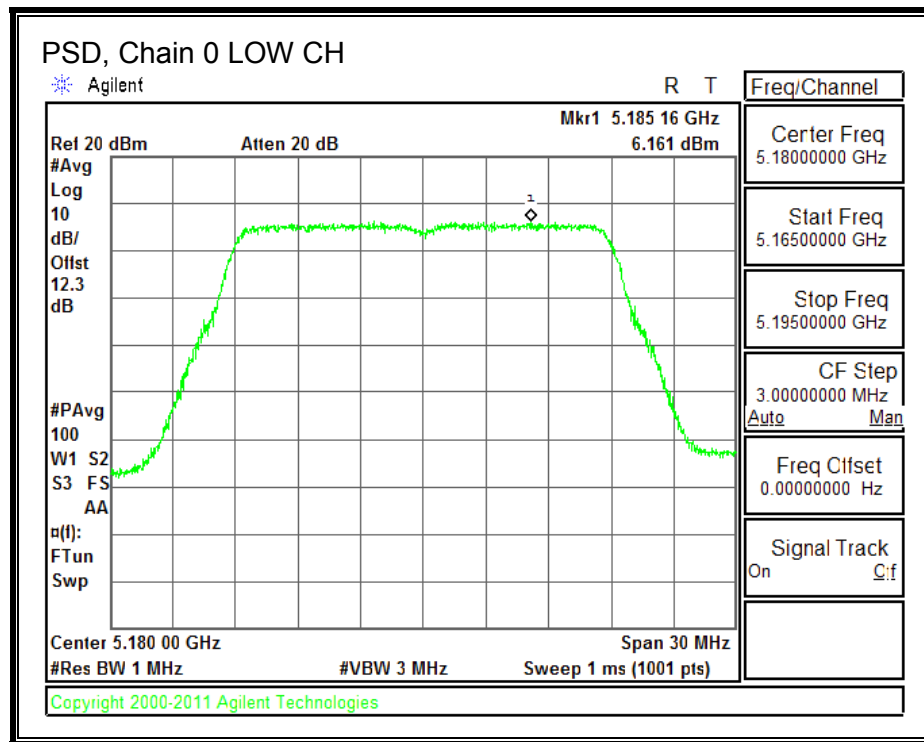
### Output Power Results

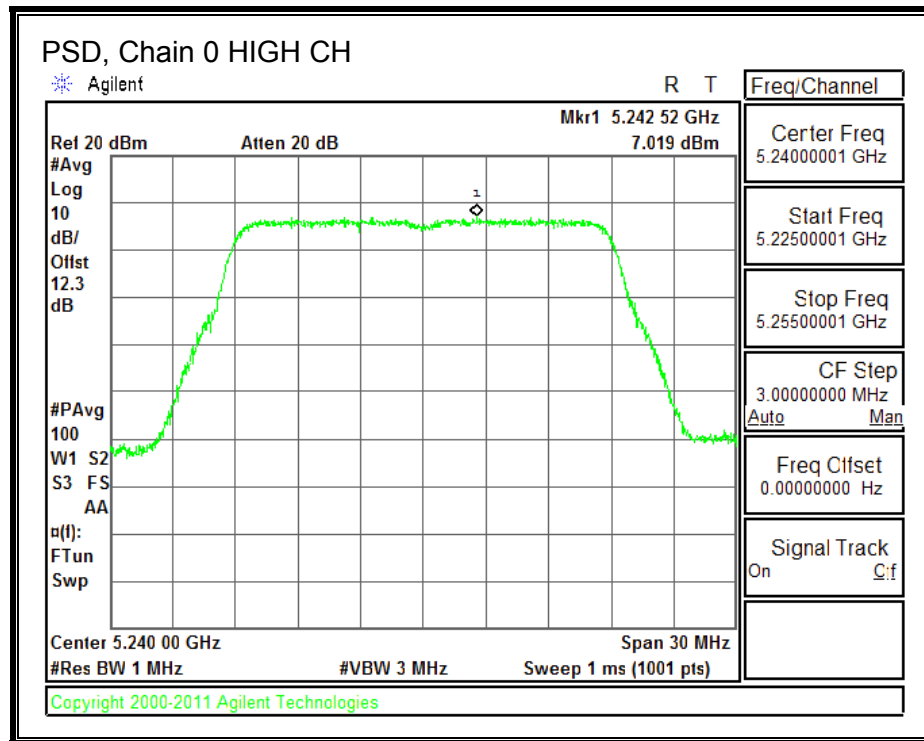
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 15.94                             | 15.96                             | 18.96                             | 24.00                   | -5.04                   |
| Mid     | 5200               | 16.94                             | 16.96                             | 19.96                             | 24.00                   | -4.04                   |
| High    | 5240               | 16.99                             | 16.98                             | 20.00                             | 24.00                   | -4.00                   |

### PSD Results

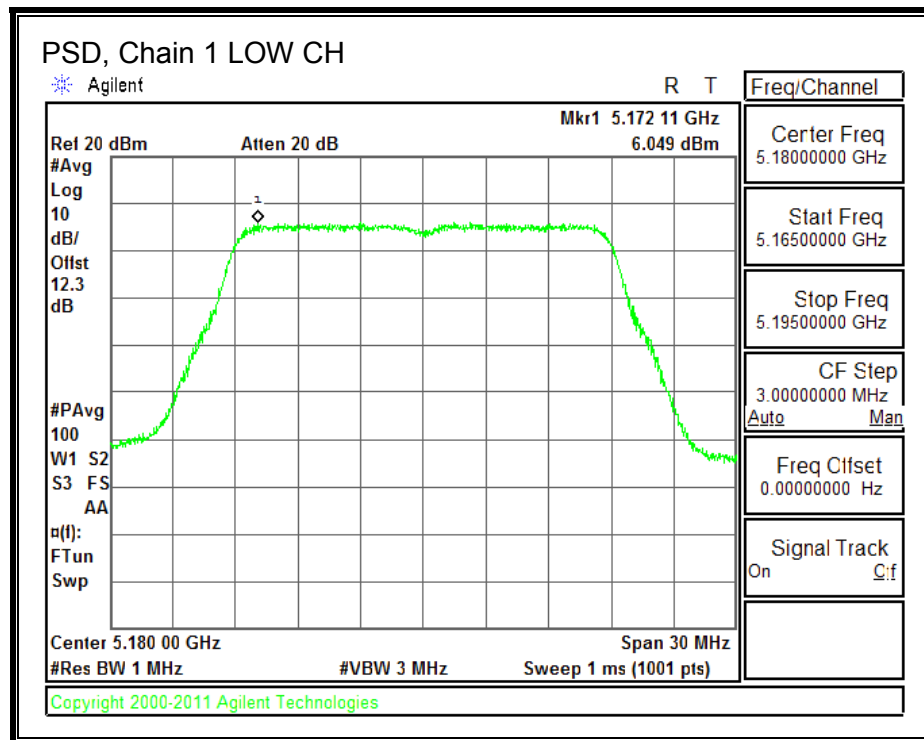
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 6.16                            | 6.05                            | 9.12                            | 11.00                 | -1.88                 |
| Mid     | 5200               | 6.97                            | 6.88                            | 9.93                            | 11.00                 | -1.07                 |
| High    | 5240               | 7.02                            | 6.65                            | 9.85                            | 11.00                 | -1.15                 |

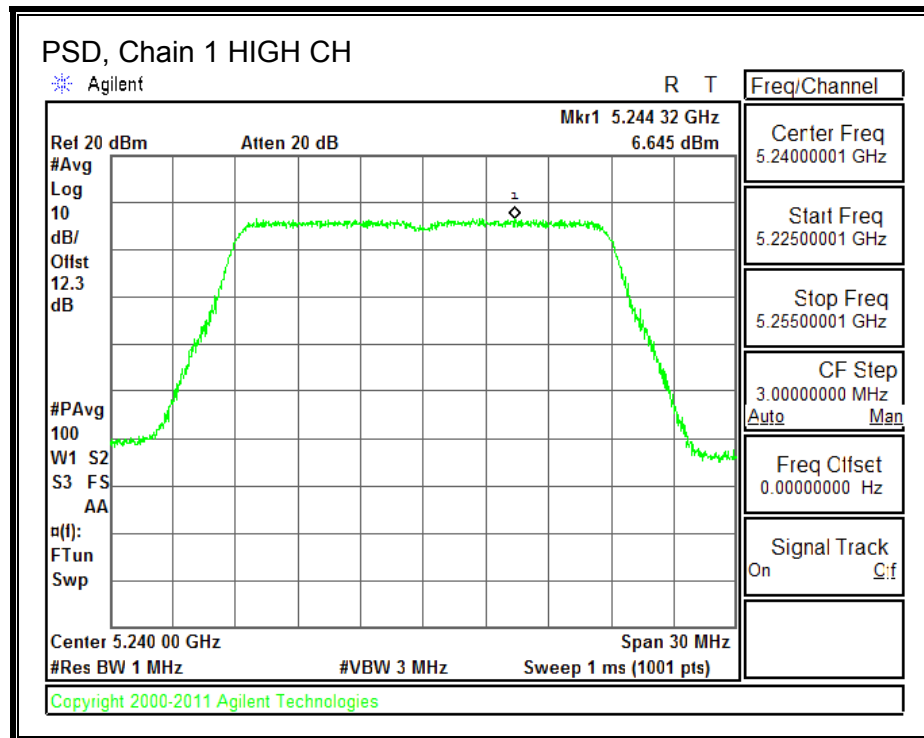
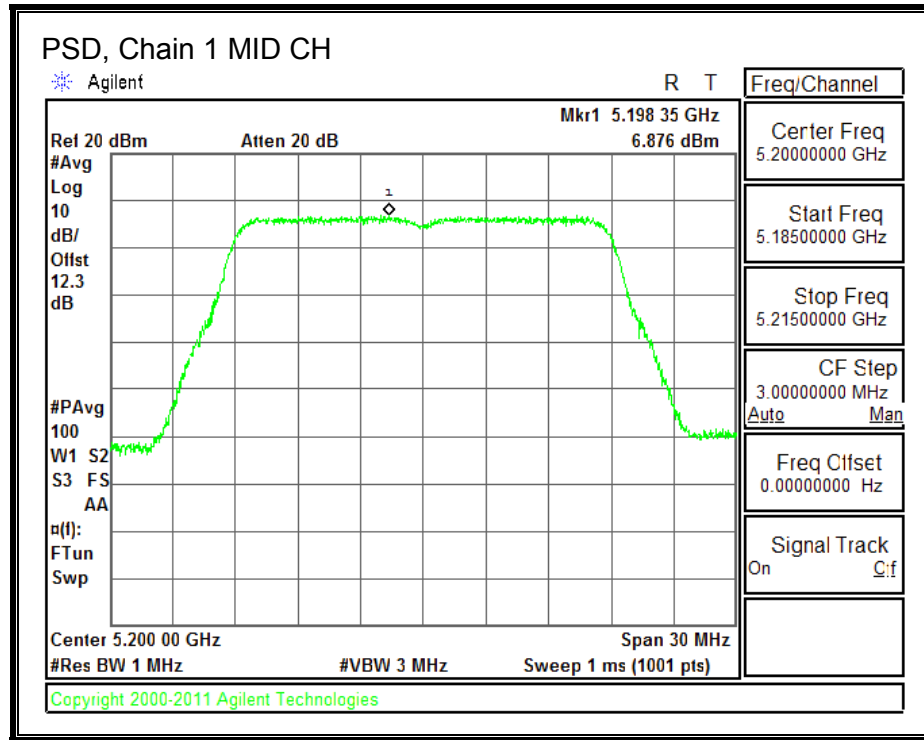
**PSD, Chain 0**





PSD, Chain 1





## 9.4. 802.11ac VHT20 2TX BF IN THE 5.2 GHz BAND

Refer to Section 9.2, 802.11n HT20 2TX CDD mode in the 5.2 GHz Band.

The power per chain used for 802.11n HT20 2TX CDD IN THE 5.2 GHz mode is the same power per chain that will be for 802.11n HT20 2TX BF IN THE 5.2 GHz mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated antenna gain for this mode shows it is still compliant.

### 9.4.1. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## RESULTS

### Antenna Gain and Limits

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Power<br>Limit<br>(dBm) |
|---------|--------------------|-------------------------------------------|-------------------------|
| Low     | 5180               | 6.02                                      | 23.98                   |
| Mid     | 5200               | 6.02                                      | 23.98                   |
| High    | 5240               | 6.02                                      | 23.98                   |

|                    |      |                                          |
|--------------------|------|------------------------------------------|
| Duty Cycle CF (dB) | 0.12 | Included in Calculations of Corr'd Power |
|--------------------|------|------------------------------------------|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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               | 15.97                             | 15.92                             | 19.08                             | 23.98                   | -4.90                   |
| Mid     | 5200               | 15.95                             | 15.88                             | 19.05                             | 23.98                   | -4.93                   |
| High    | 5240               | 15.99                             | 15.89                             | 19.07                             | 23.98                   | -4.91                   |

## 9.5. 802.11n HT40 1TX MODE IN THE 5.2 GHz BAND

### 9.5.1. 26 dB BANDWIDTH

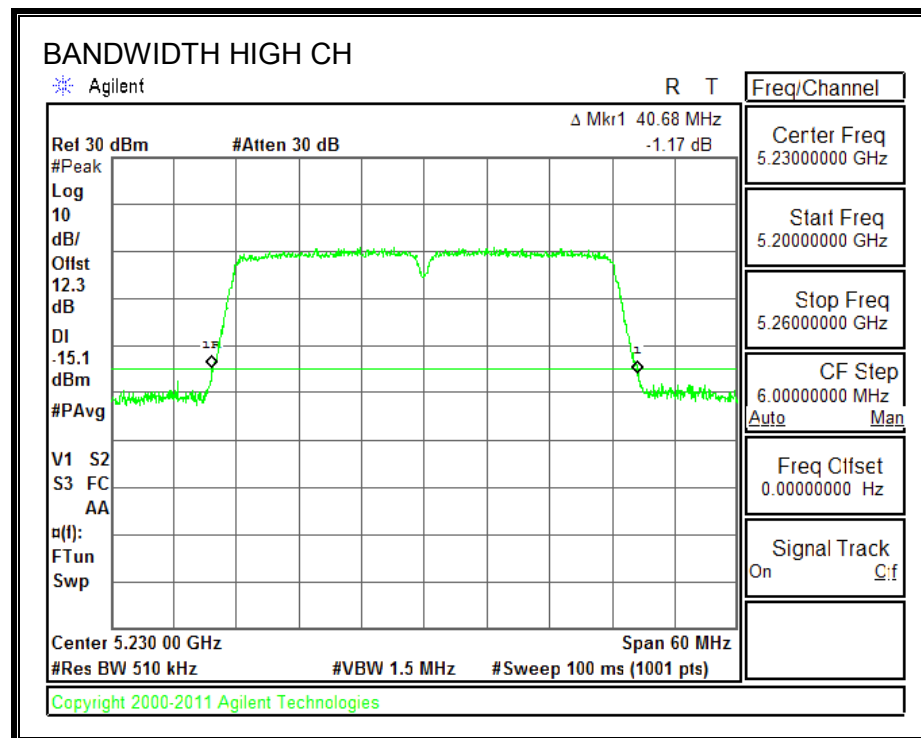
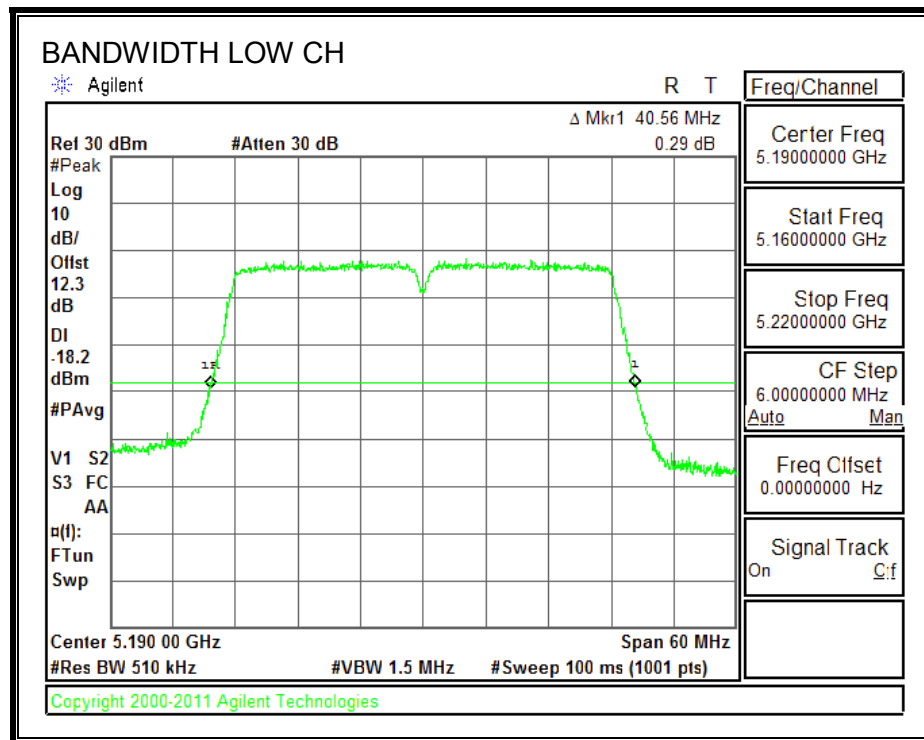
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5190               | 40.56                    |
| High    | 5230               | 40.68                    |

**26 dB BANDWIDTH**



## 9.5.2. 99% BANDWIDTH

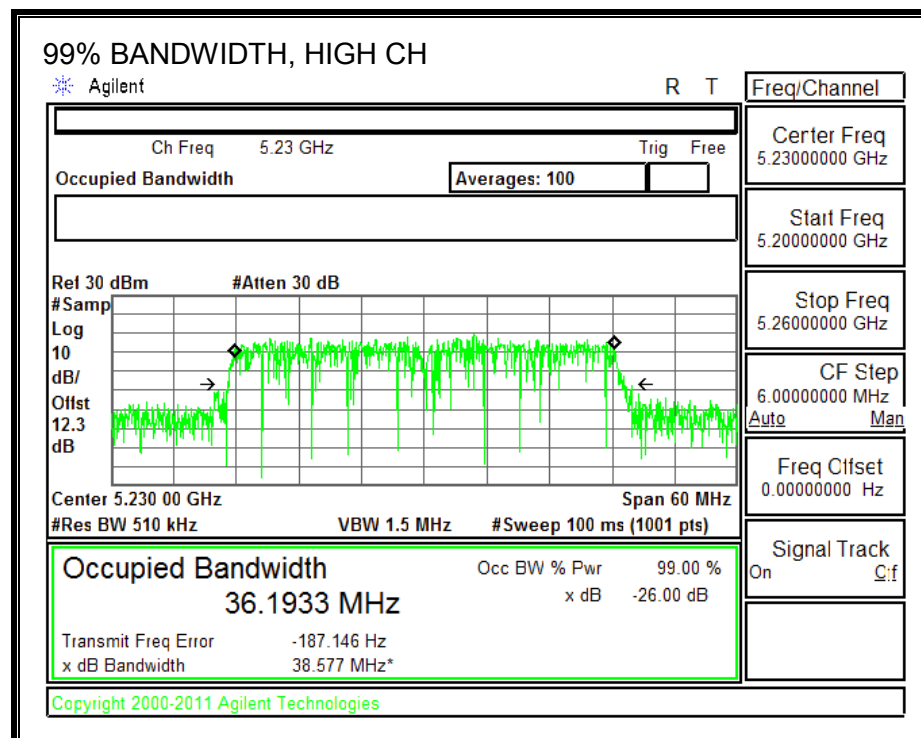
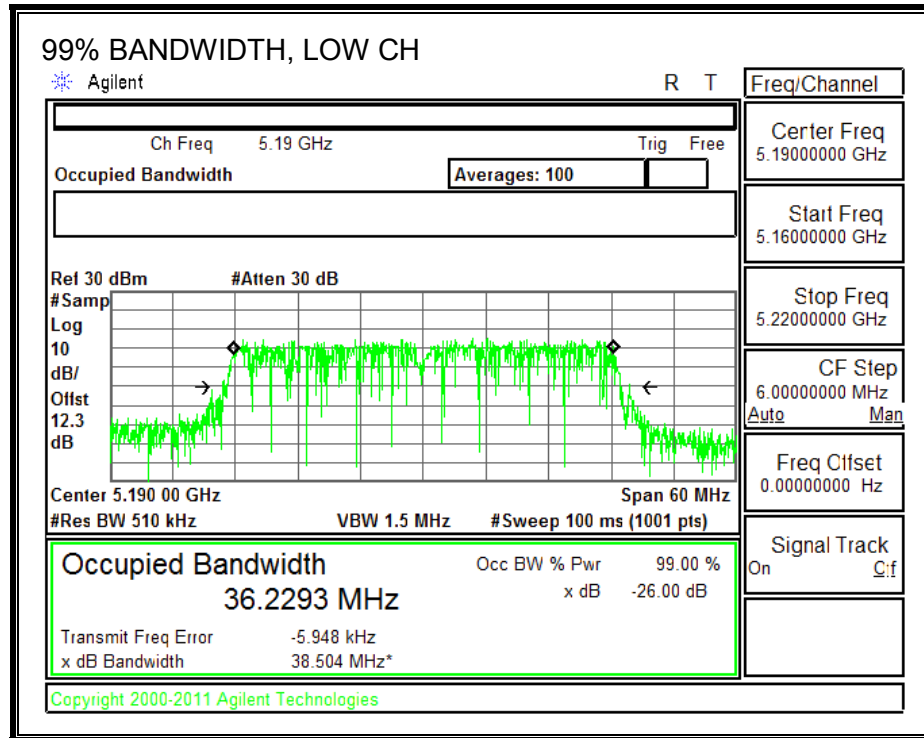
### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5190               | 36.2293                |
| High    | 5230               | 36.1933                |

**99% BANDWIDTH**



### 9.5.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.11                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 2.90                     |

## 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               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |
| High    | 5230               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

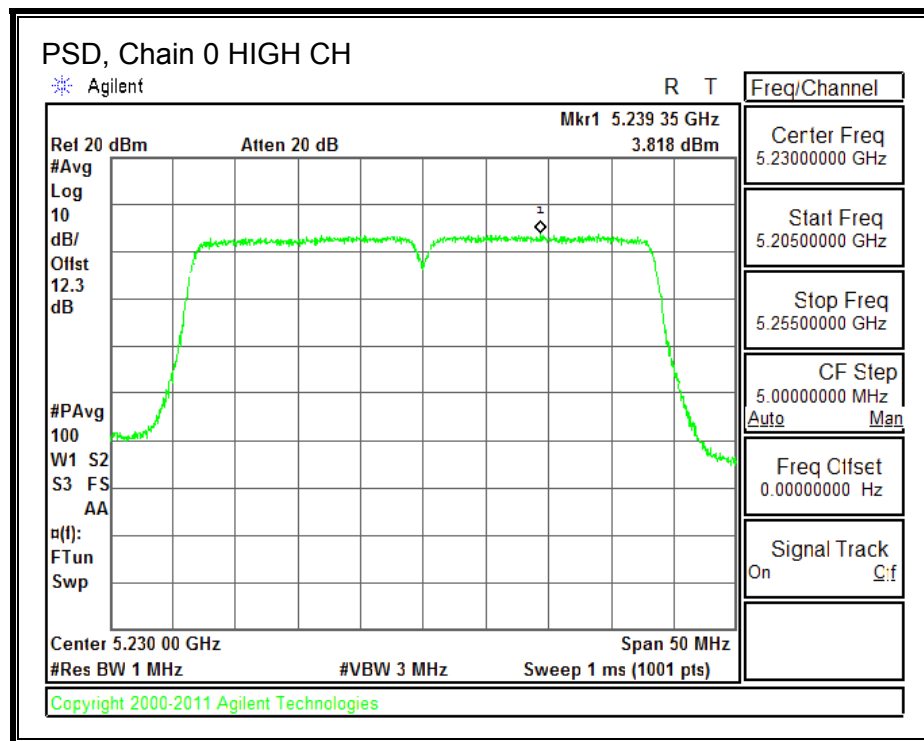
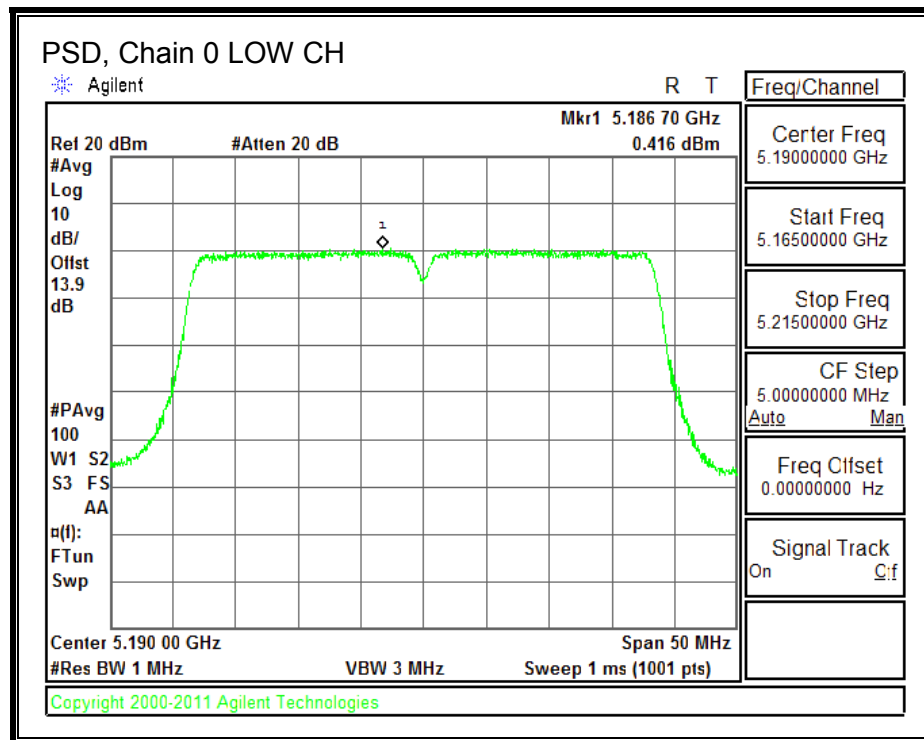
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<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               | 14.46                             | 14.46                             | 24.00                   | -9.54                   |
| High    | 5230               | 17.84                             | 17.84                             | 24.00                   | -6.16                   |

### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<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               | 0.42                            | 0.42                            | 11.00                 | -10.58                |
| High    | 5230               | 3.82                            | 3.82                            | 11.00                 | -7.18                 |

**PSD, Chain 0**



## 9.6. 802.11n HT40 2TX CDD MODE IN THE 5.2 GHz BAND

### 9.6.1. 26 dB BANDWIDTH

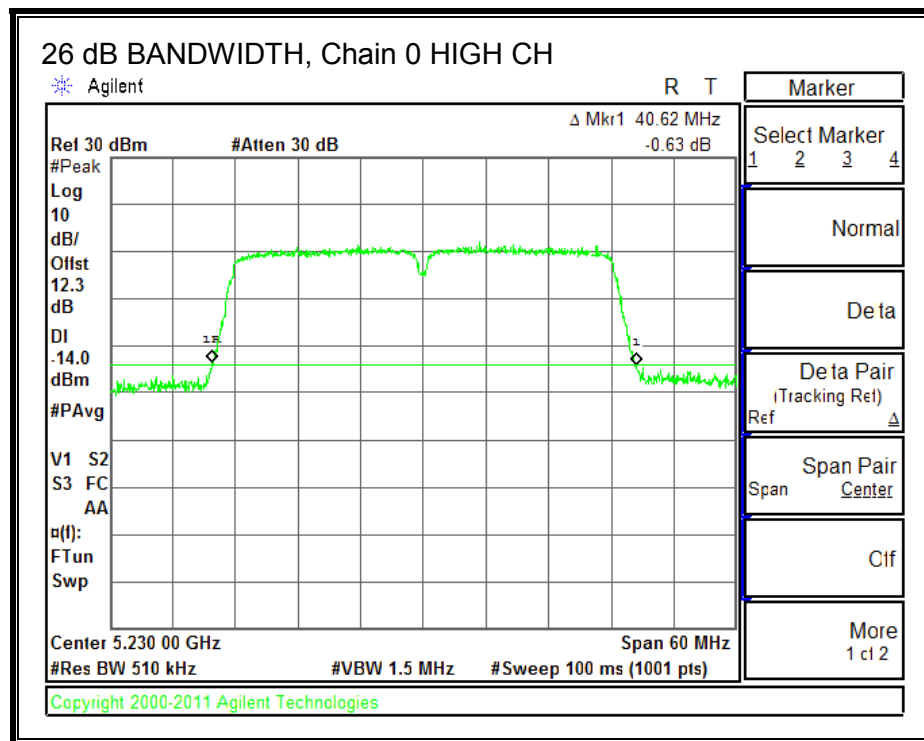
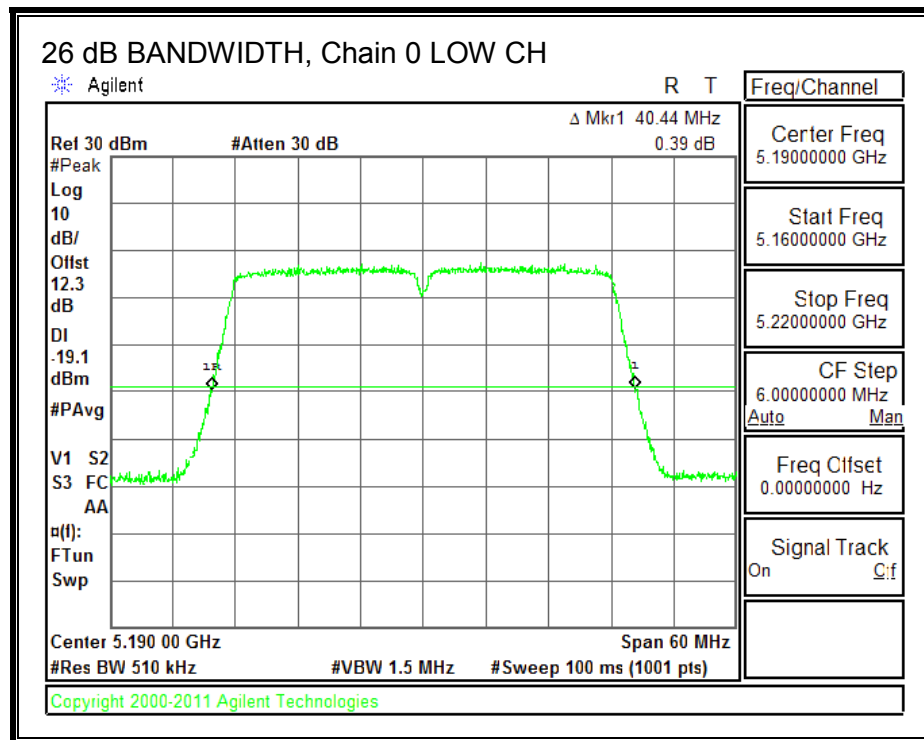
#### LIMITS

None; for reporting purposes only.

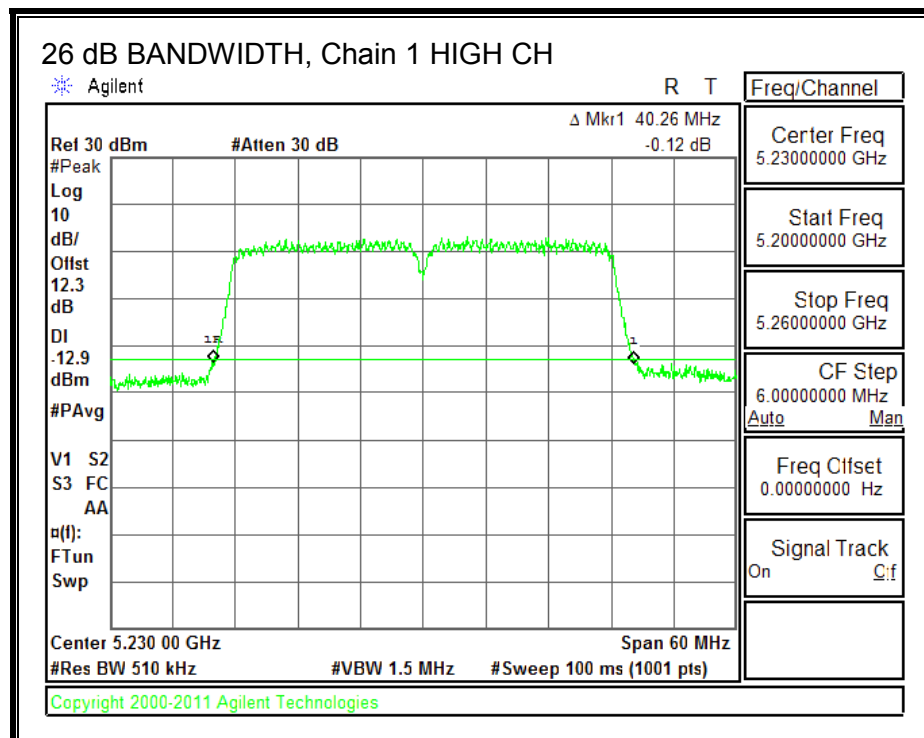
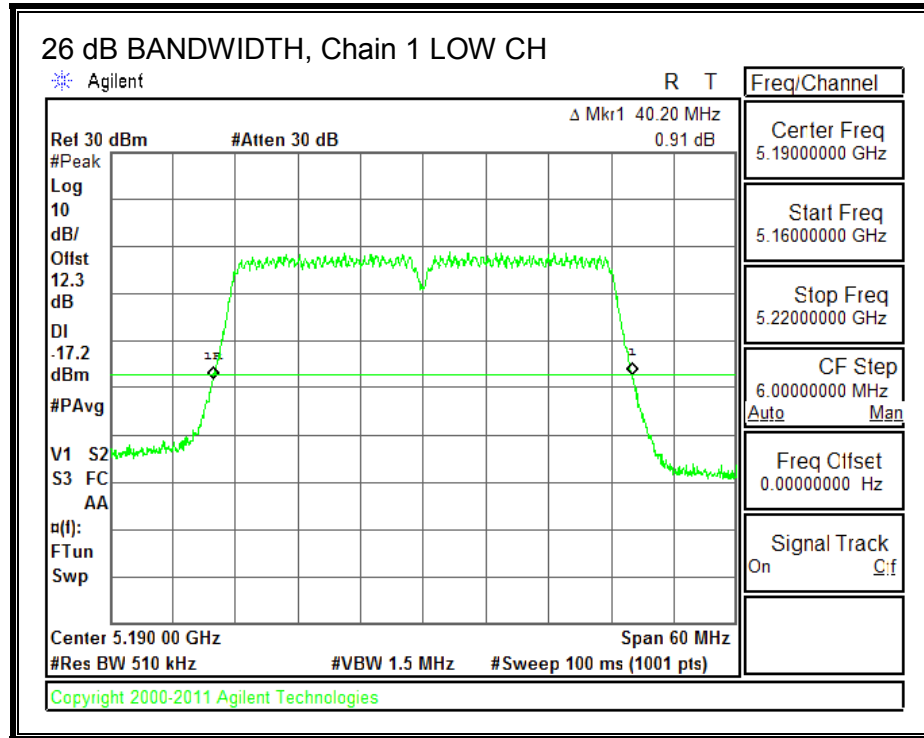
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5190               | 40.44                        | 40.20                        |
| High    | 5230               | 40.62                        | 40.26                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.6.2. 99% BANDWIDTH

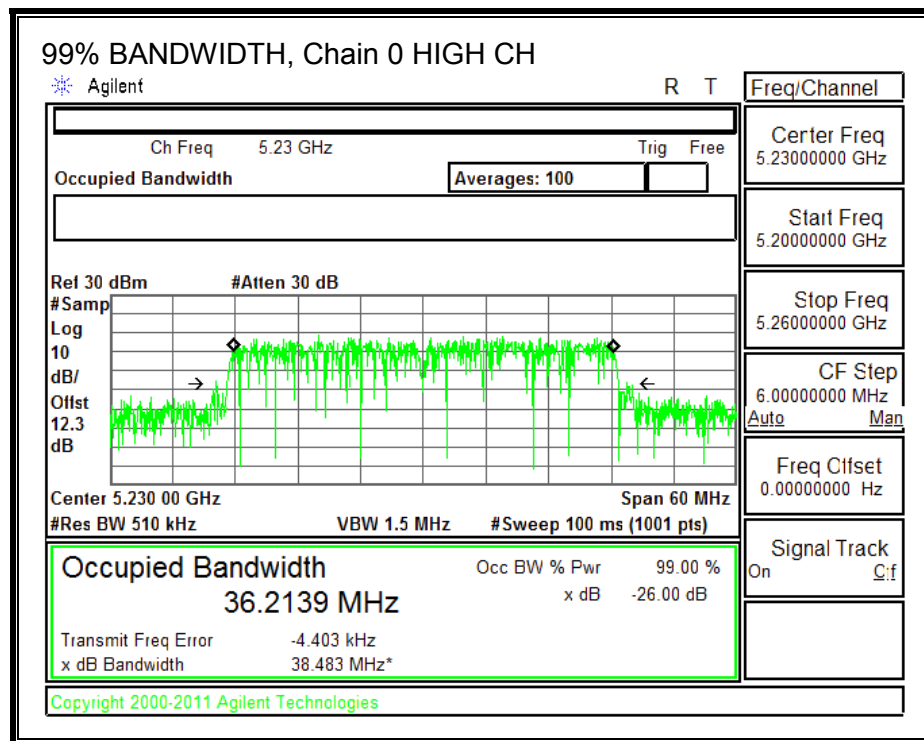
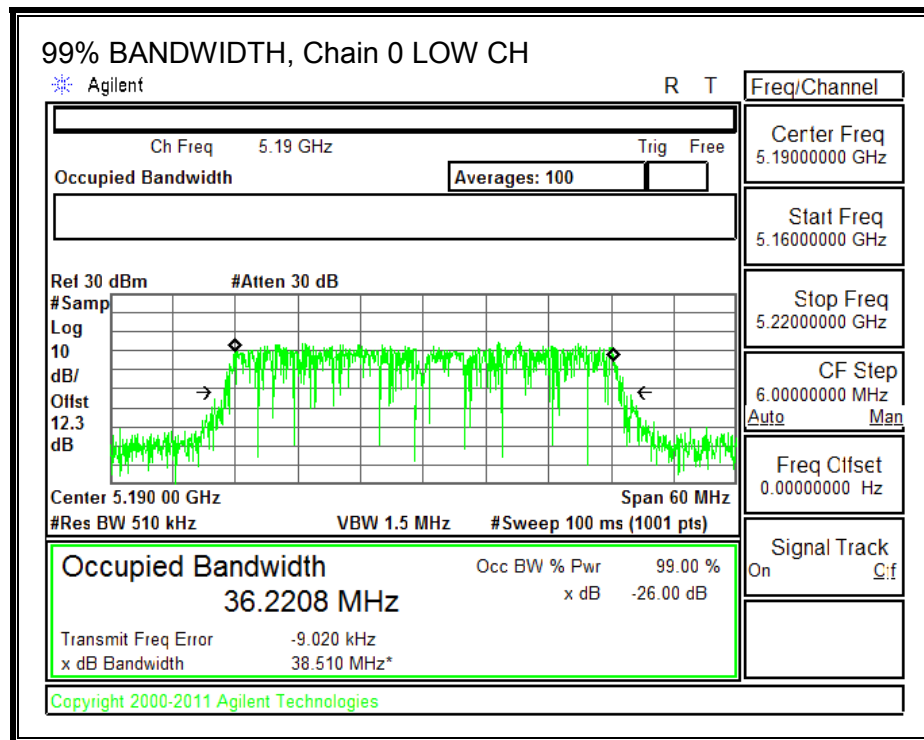
### LIMITS

None; for reporting purposes only.

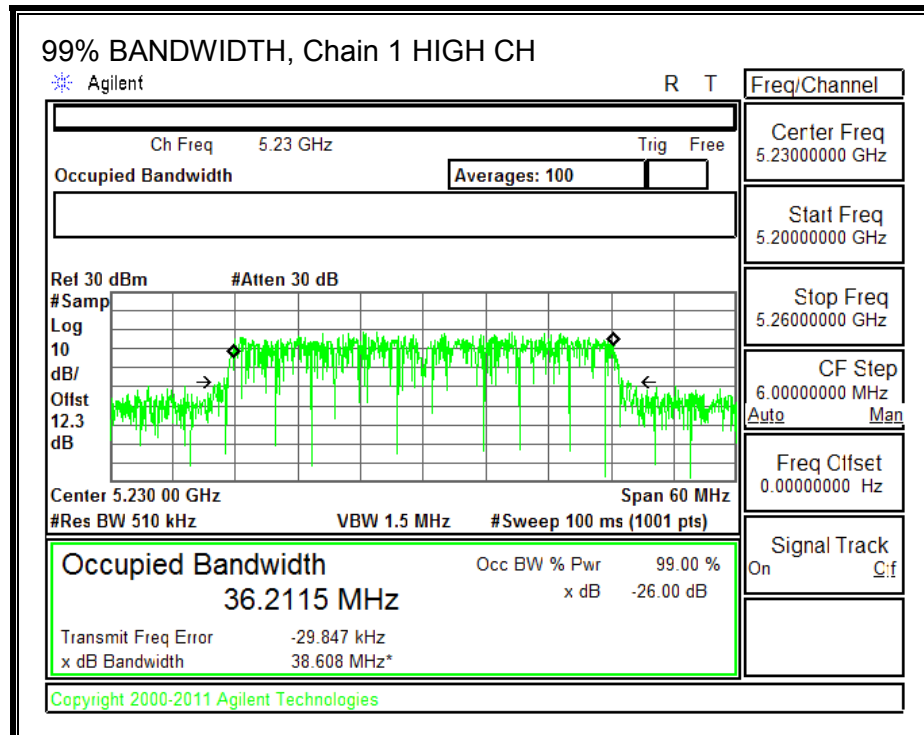
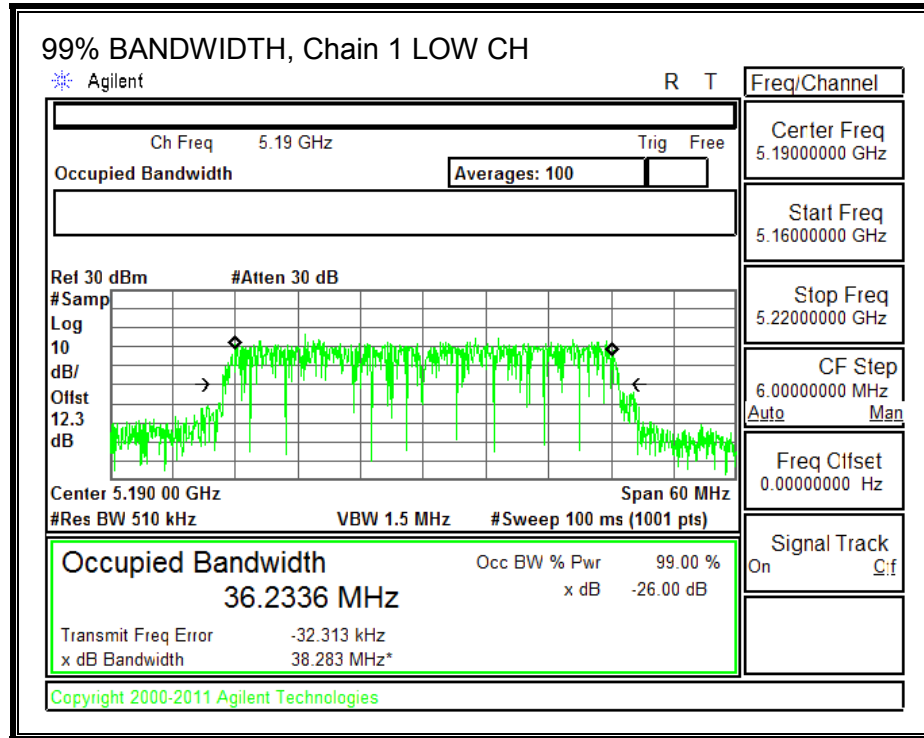
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.2208                    | 36.2336                    |
| High    | 5230               | 36.2139                    | 36.2115                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.6.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## 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               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |
| High    | 5230               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

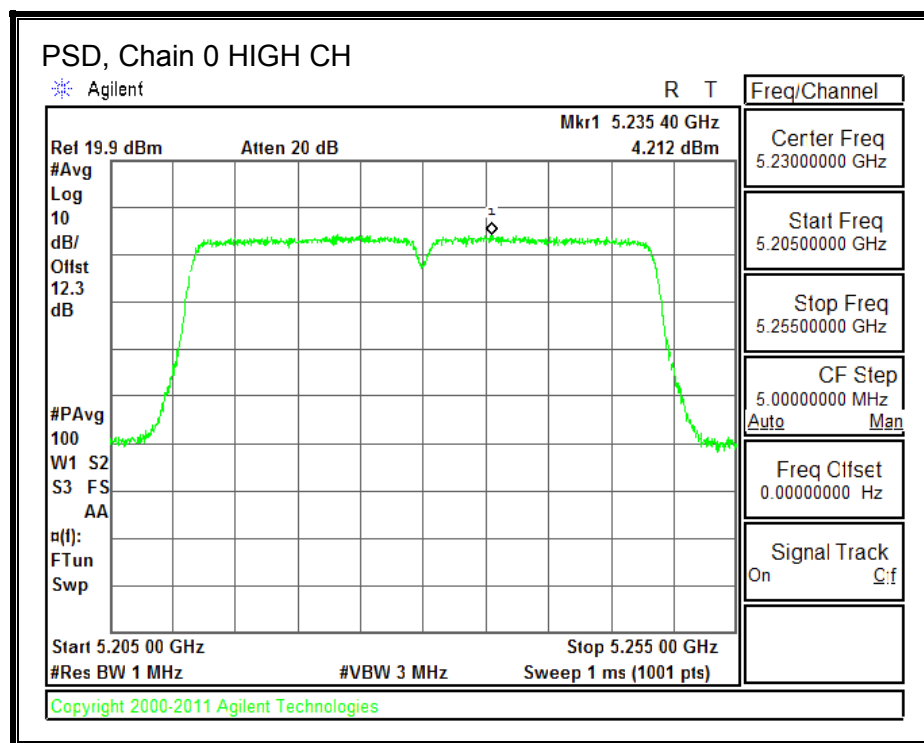
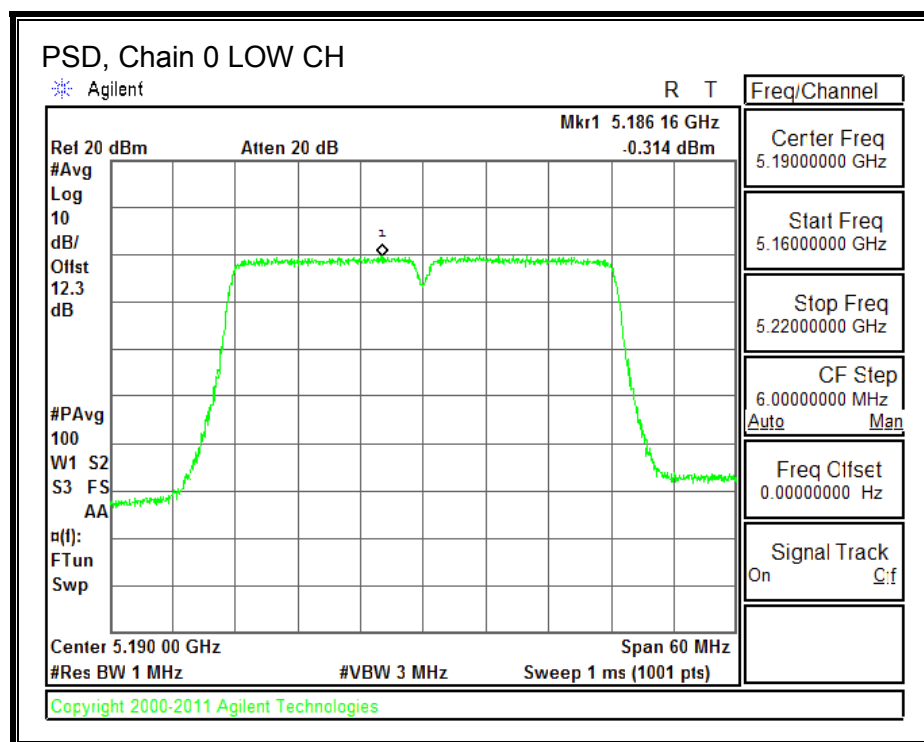
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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               | 13.98                             | 13.70                             | 16.85                             | 24.00                   | -7.15                   |
| High    | 5230               | 17.98                             | 17.80                             | 20.90                             | 24.00                   | -3.10                   |

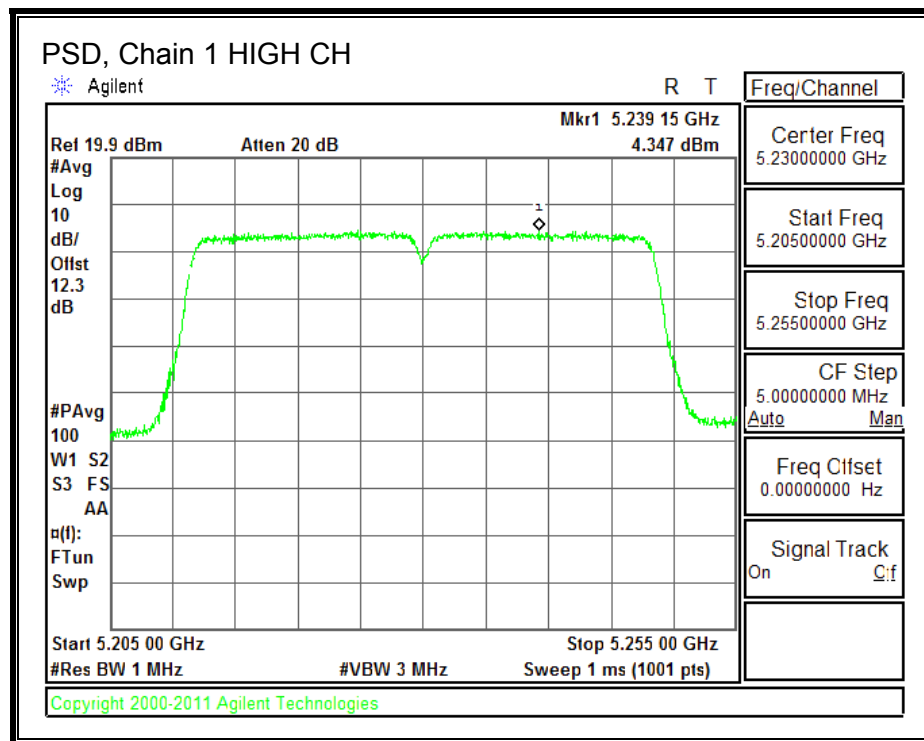
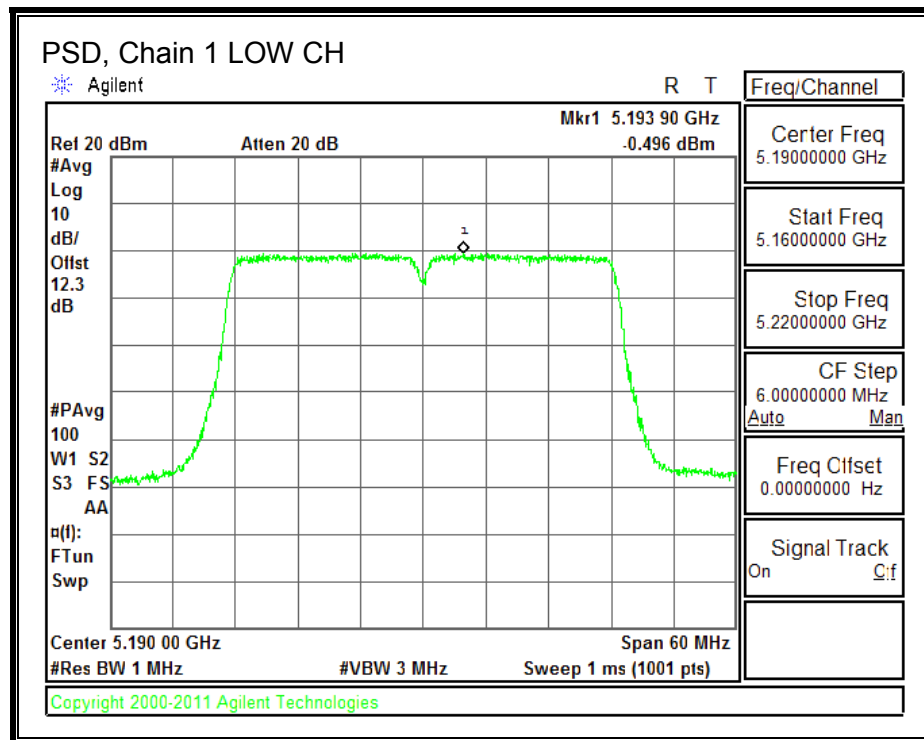
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<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               | -0.31                           | -0.50                           | 2.61                            | 10.98                 | -8.37                 |
| High    | 5230               | 4.21                            | 4.35                            | 7.29                            | 10.98                 | -3.69                 |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.7. 802.11n HT40 2TX STBC MODE IN THE 5.2 GHz BAND

### 9.7.1. 26 dB BANDWIDTH

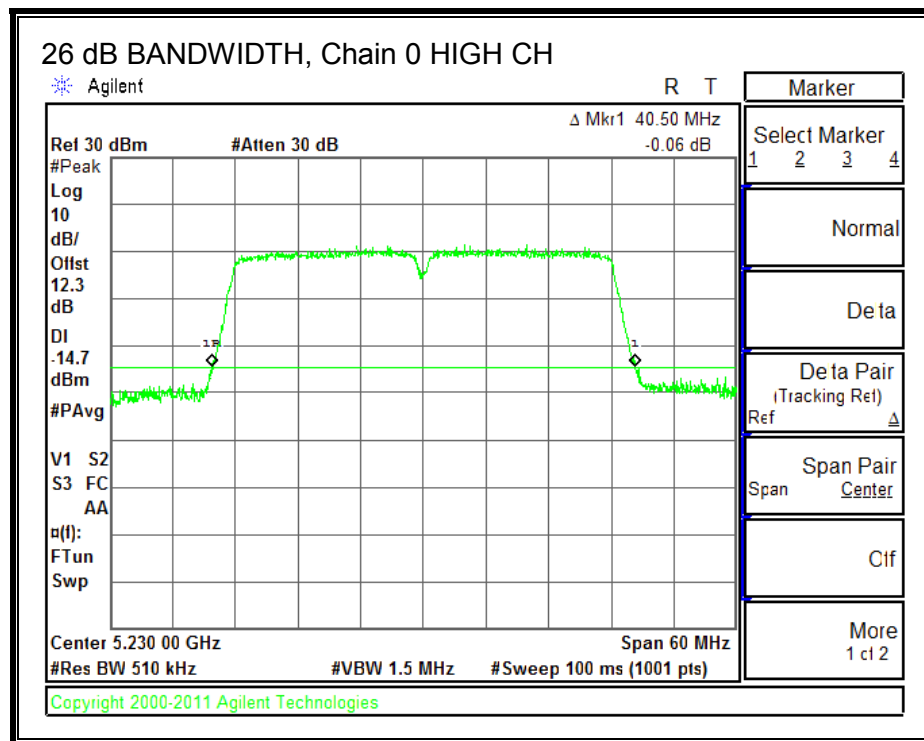
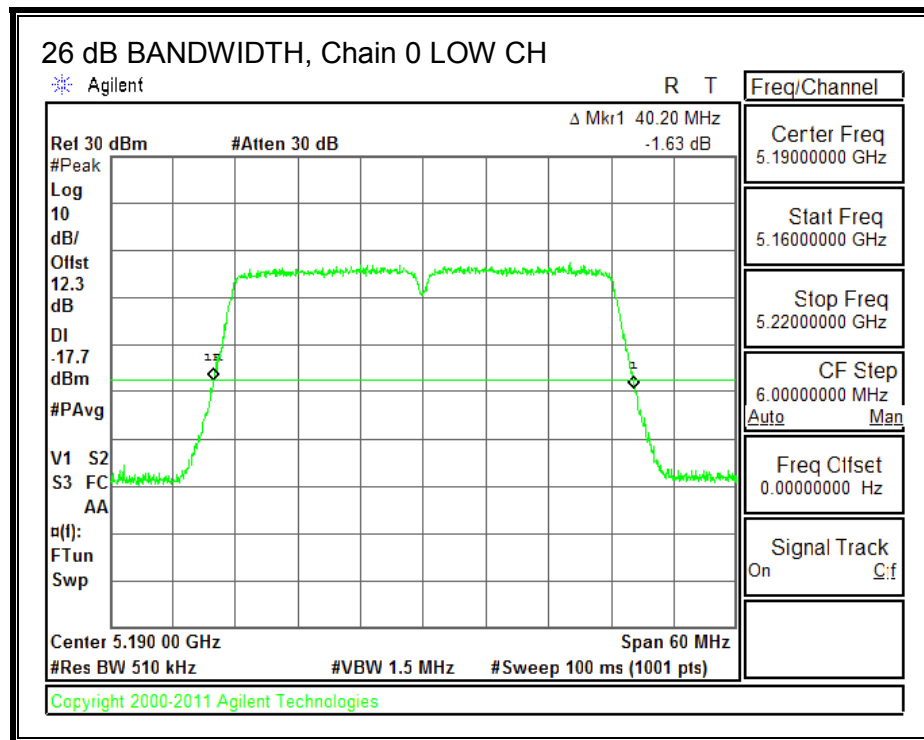
#### LIMITS

None; for reporting purposes only.

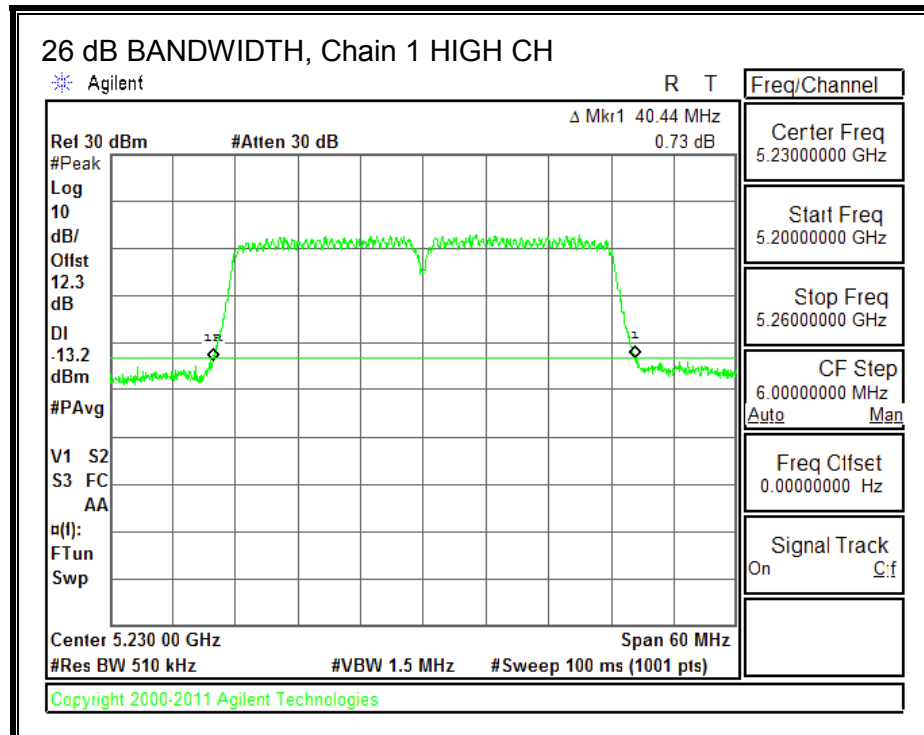
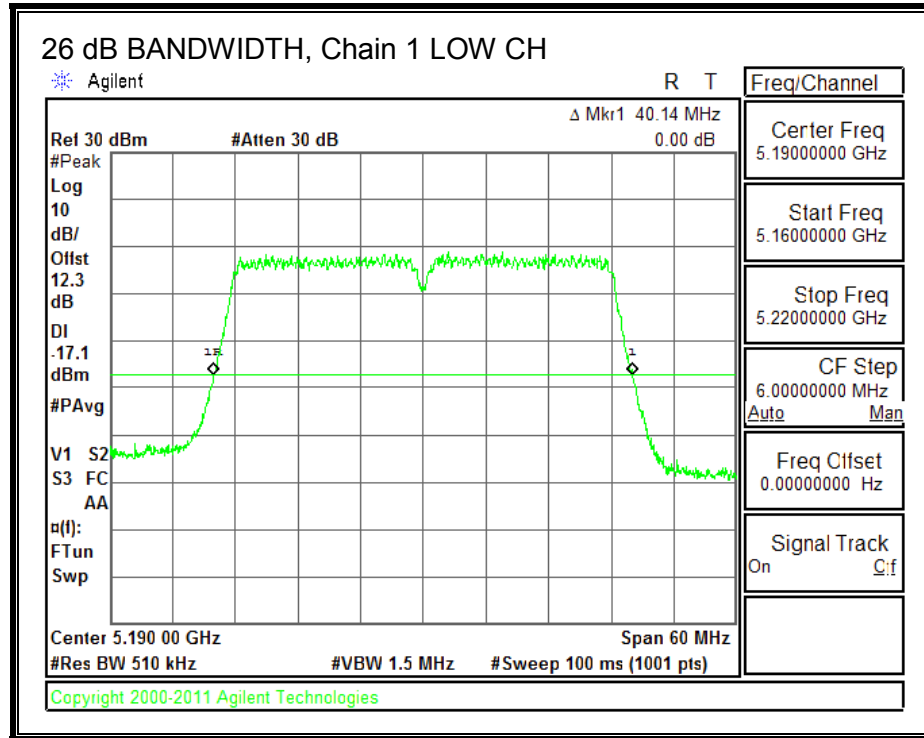
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5190               | 40.20                        | 40.14                        |
| High    | 5230               | 40.50                        | 40.44                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.7.2. 99% BANDWIDTH

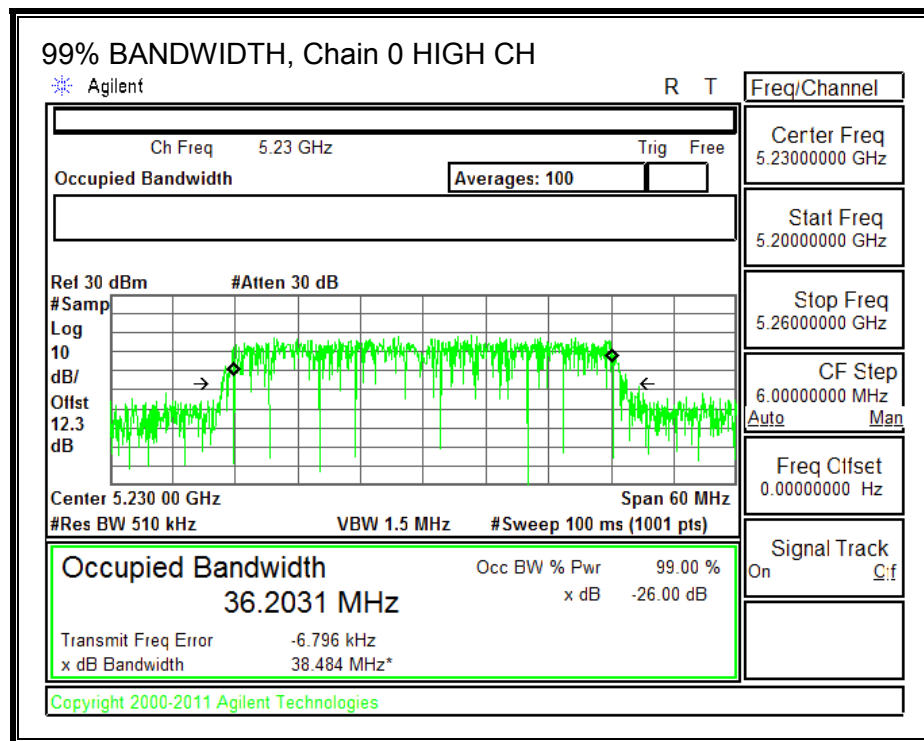
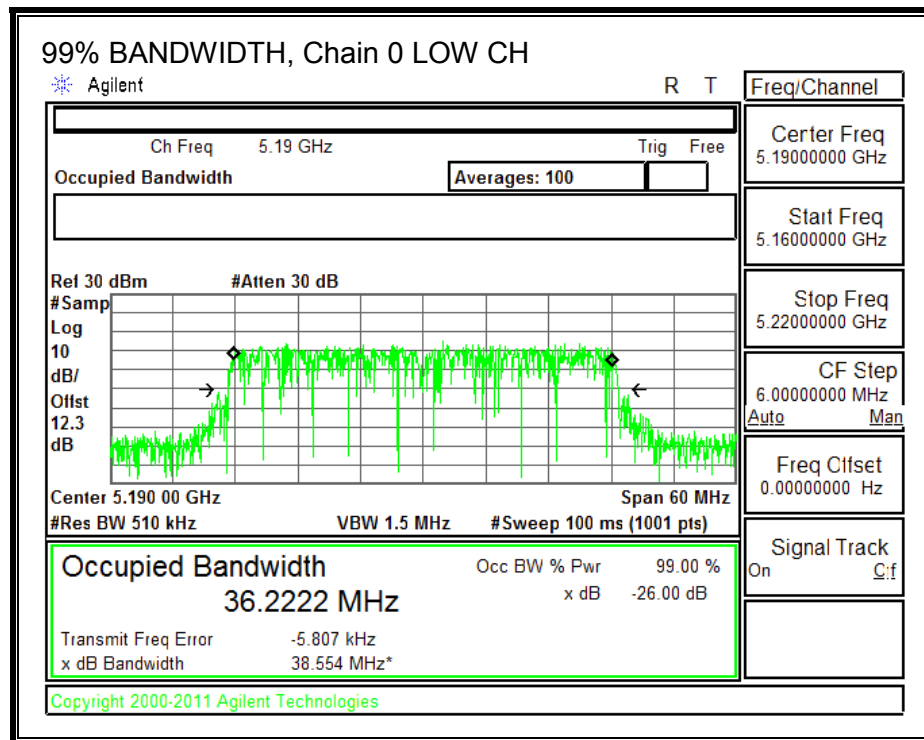
### LIMITS

None; for reporting purposes only.

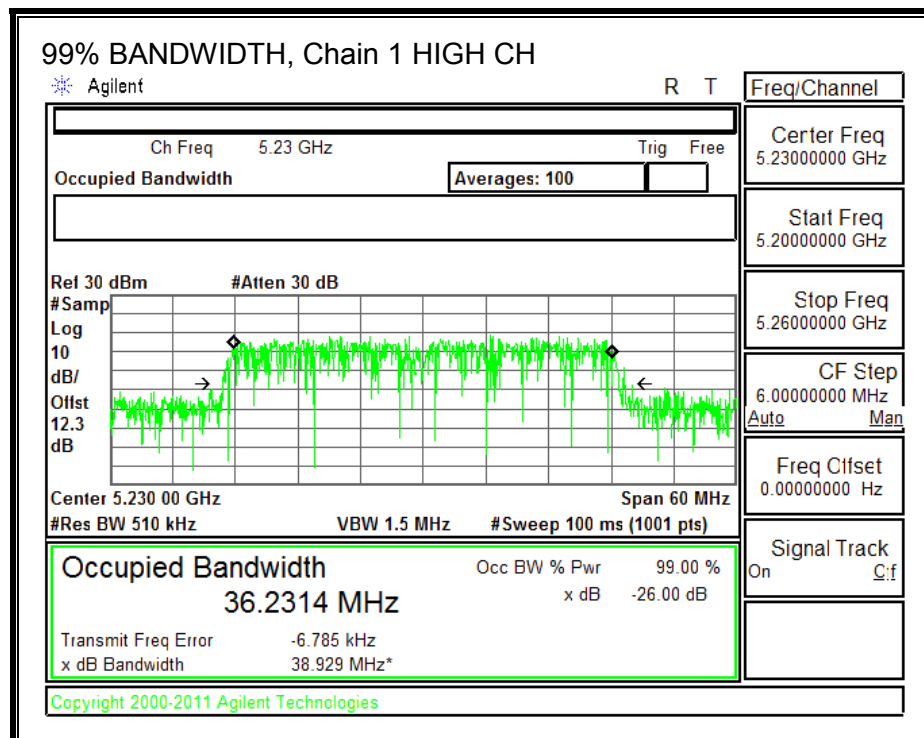
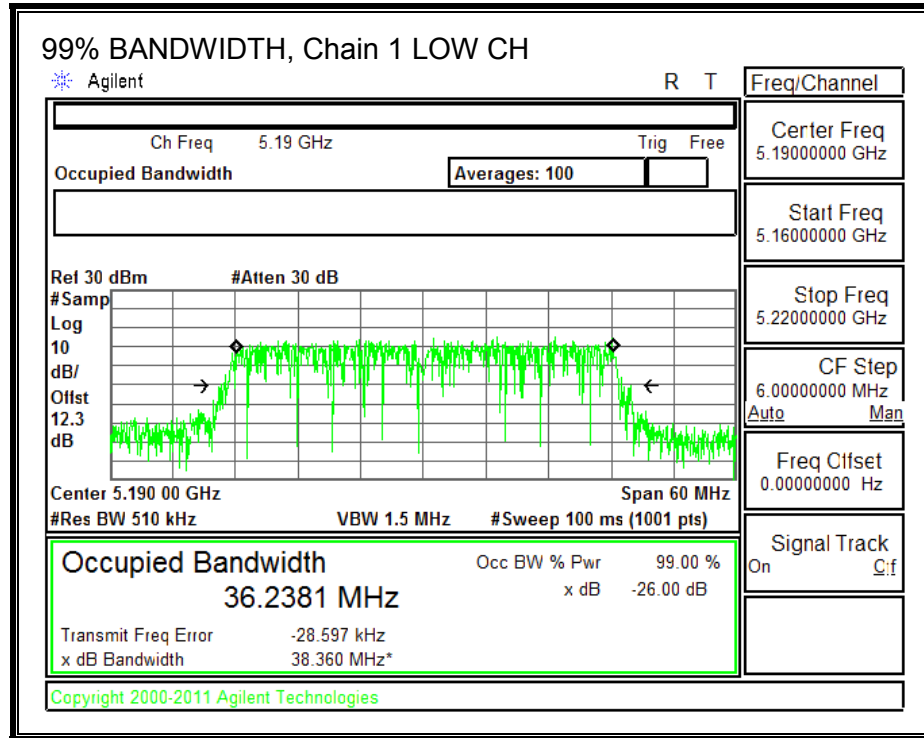
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.2222                    | 36.2381                    |
| High    | 5230               | 36.2031                    | 36.2314                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.7.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

## 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               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |
| High    | 5230               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

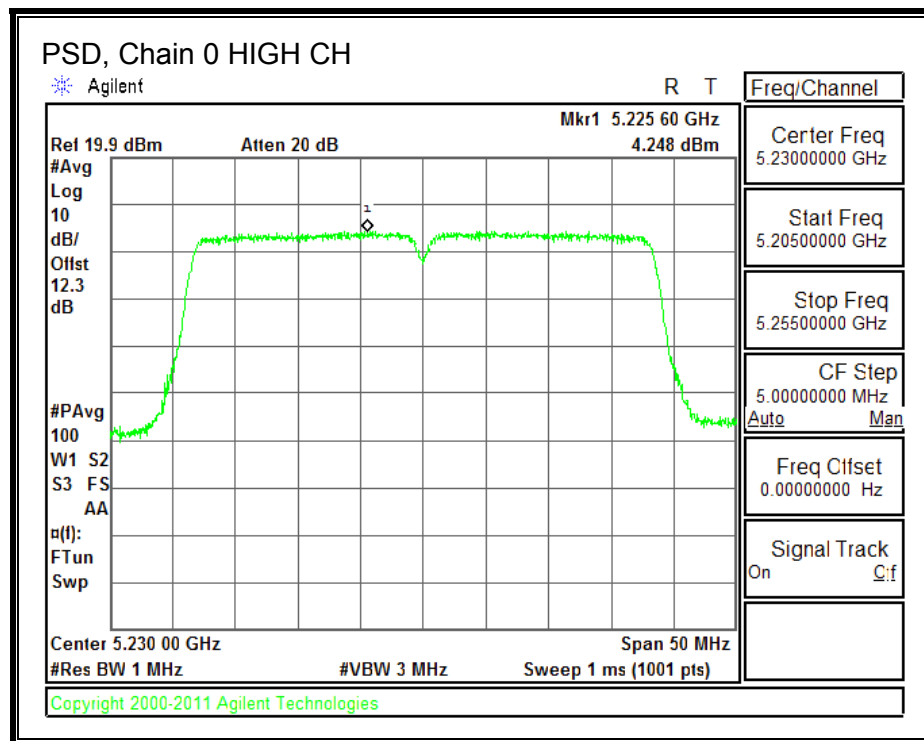
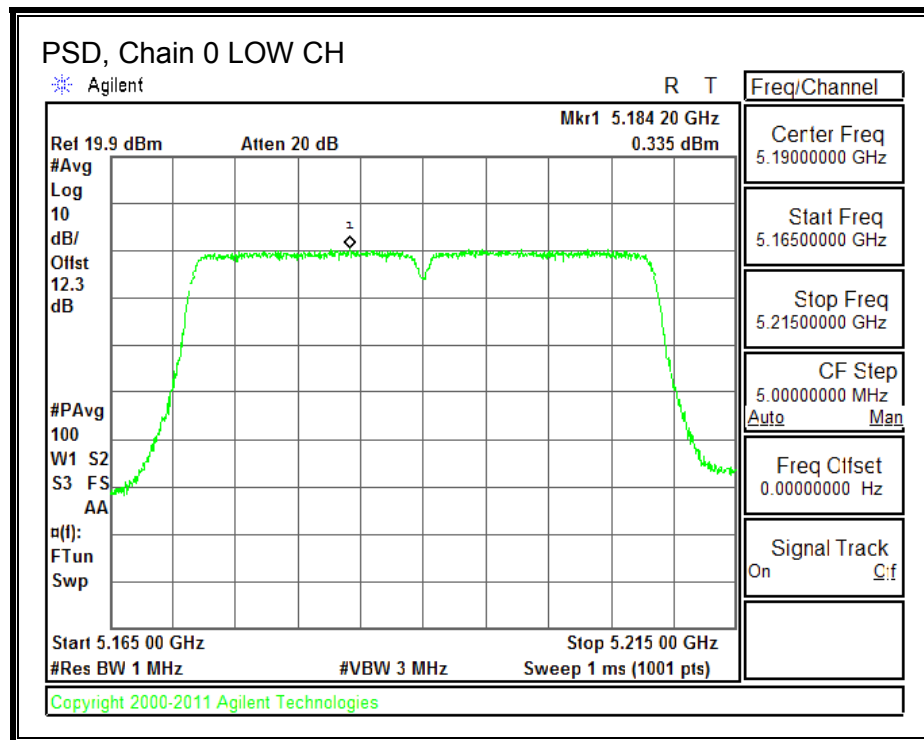
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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               | 13.82                             | 13.56                             | 16.70                             | 24.00                   | -7.30                   |
| High    | 5230               | 17.84                             | 17.90                             | 20.88                             | 24.00                   | -3.12                   |

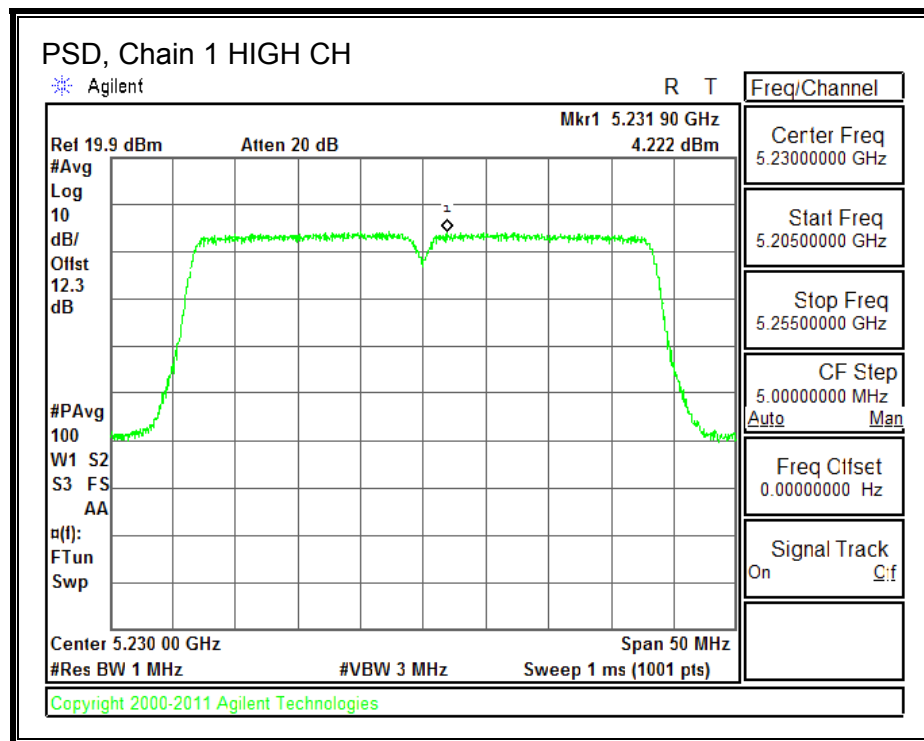
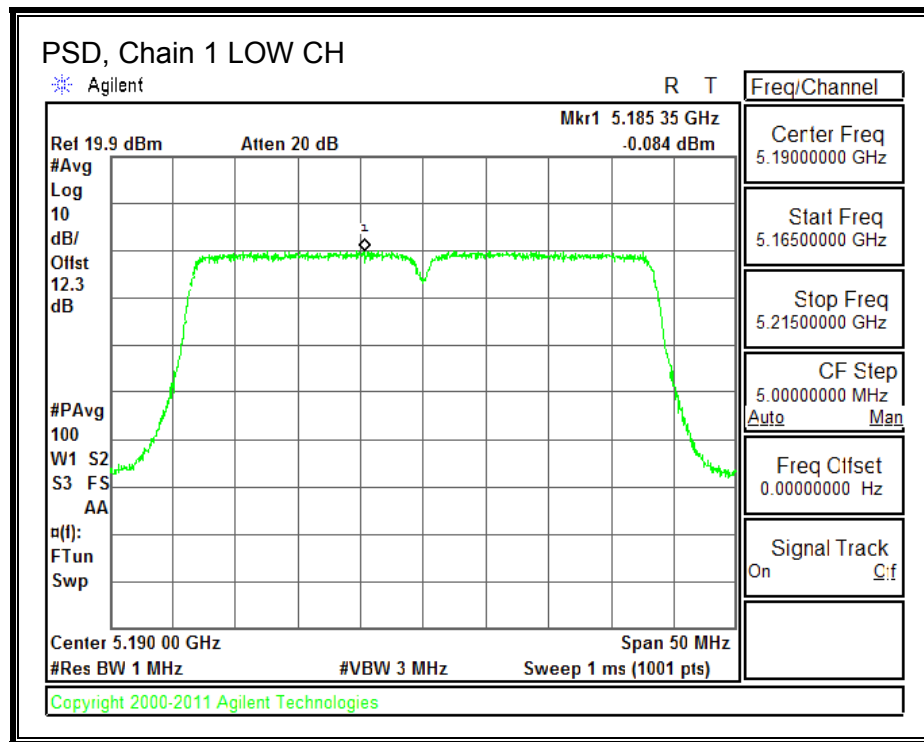
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<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               | 0.34                            | -0.08                           | 3.14                            | 11.00                 | -7.86                 |
| High    | 5230               | 4.25                            | 4.22                            | 7.25                            | 11.00                 | -3.75                 |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.8. 802.11ac VHT40 2TX BF IN THE 5.2 GHz BAND

Refer to Section 9.6, 802.11n HT40 2TX CDD MODE IN THE 5.2 GHz BAND.

The power per chain used for 802.11n HT40 2TX CDD IN THE 5.2 GHz mode is the same power per chain that will be for 802.11n HT40 2TX BF IN THE 5.2 GHz mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated antenna gain for this mode shows it is still compliant.

### 9.8.1. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## RESULTS

### Antenna Gain and Limits

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Power<br>Limit<br>(dBm) |
|---------|--------------------|-------------------------------------------|-------------------------|
| Low     | 5190               | 6.02                                      | 23.98                   |
| High    | 5230               | 6.02                                      | 23.98                   |

|                    |      |                                          |
|--------------------|------|------------------------------------------|
| Duty Cycle CF (dB) | 0.12 | Included in Calculations of Corr'd Power |
|--------------------|------|------------------------------------------|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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               | 13.98                             | 13.70                             | 16.97                             | 23.98                   | -7.01                   |
| High    | 5230               | 17.98                             | 17.80                             | 21.02                             | 23.98                   | -2.96                   |

## 9.9. 802.11ac VHT80 1TX MODE IN THE 5.2 GHz BAND

### 9.9.1. 26 dB BANDWIDTH

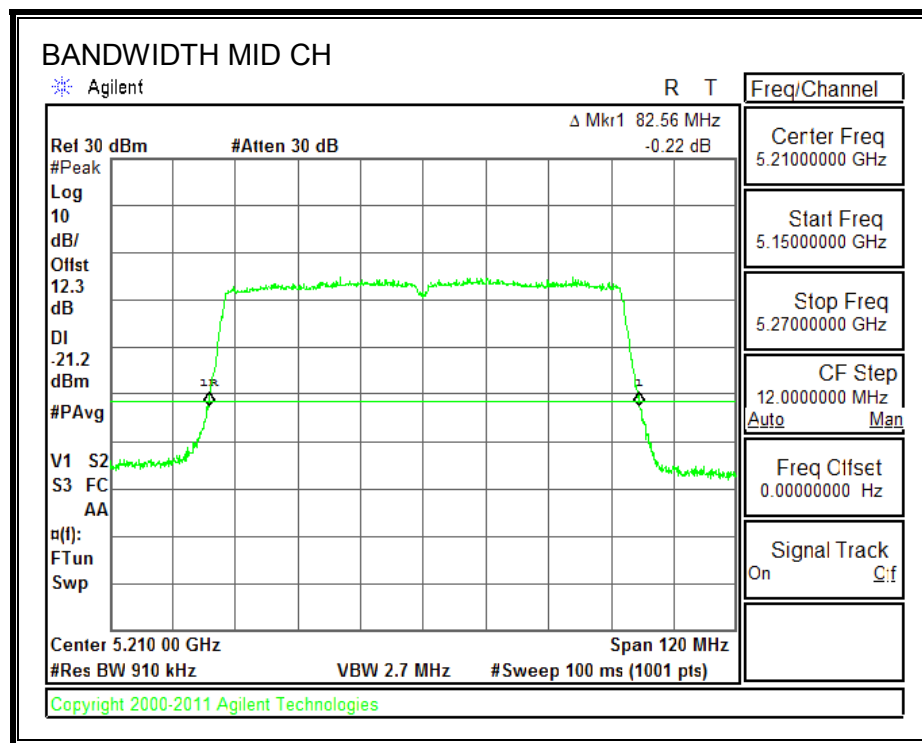
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Mid     | 5210               | 82.56                    |

#### 26 dB BANDWIDTH



## 9.9.2. 99% BANDWIDTH

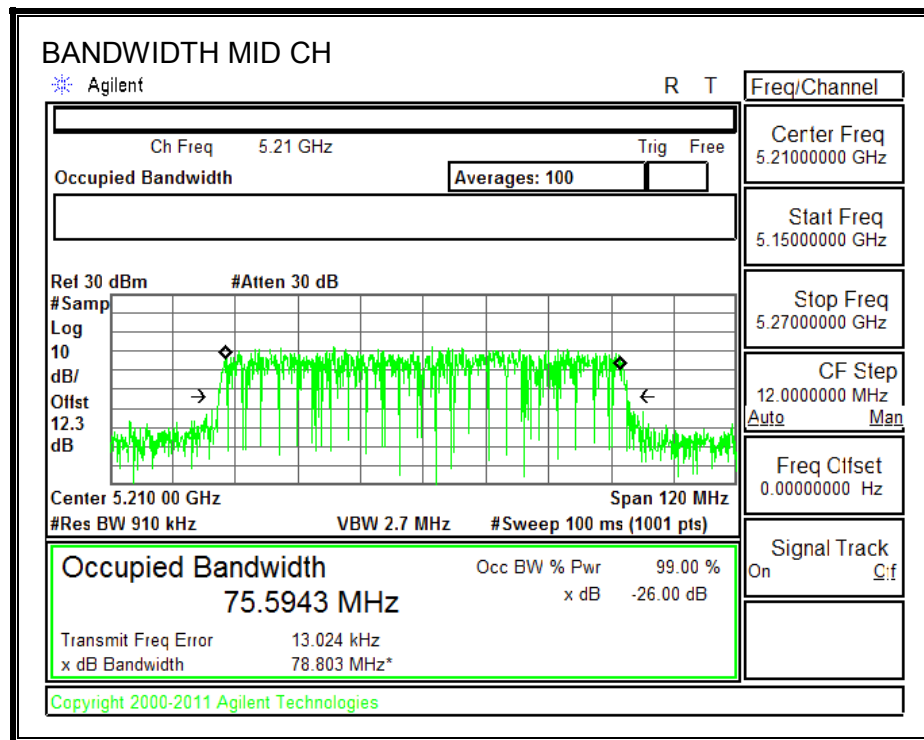
### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Mid     | 5210               | 75.5943                |

### 99% BANDWIDTH



### 9.9.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.11                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 2.90                     |

## 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) |
|---------|--------------------|-------------------------------------------|-----------------------------------------|-------------------------|-----------------------|
| Mid     | 5210               | 3.11                                      | 3.11                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.22 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

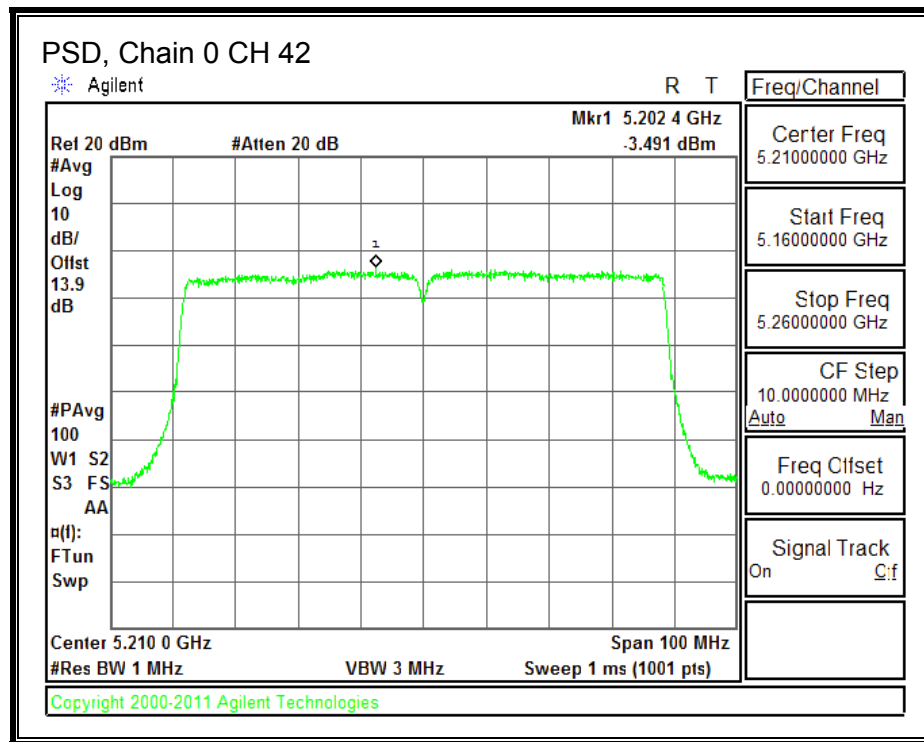
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5210               | 12.75                             | 12.97                             | 24.00                   | -11.03                  |

### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | -3.49                           | -3.27                           | 11.00                 | -14.27                |

**PSD, Chain 0**



## 9.10. 802.11ac VHT80 2TX CDD MODE IN THE 5.2 GHz BAND

### 9.10.1. 26 dB BANDWIDTH

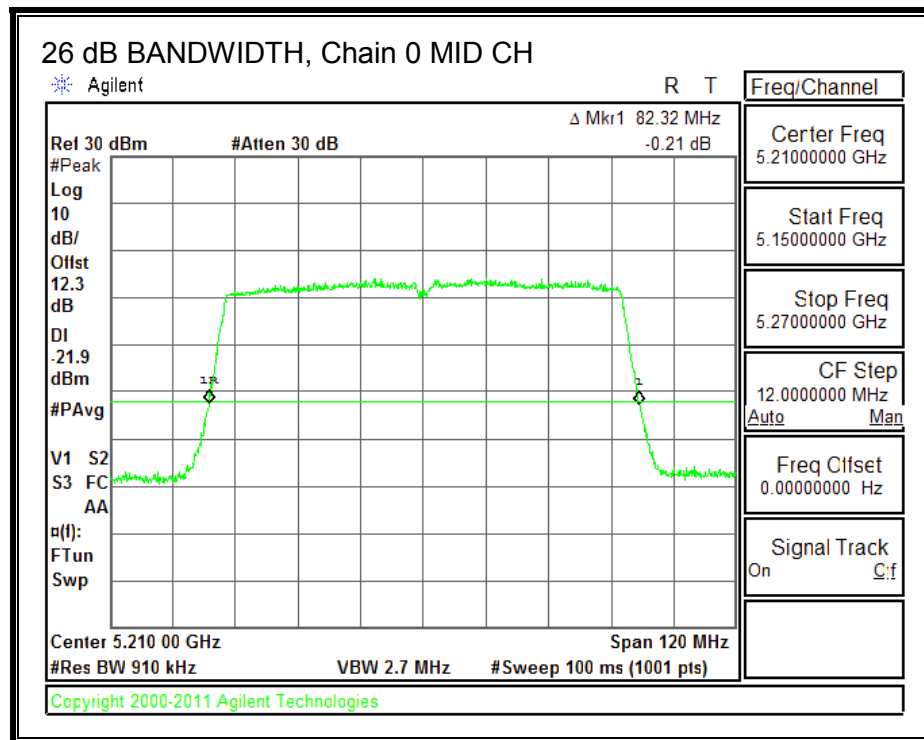
#### LIMITS

None; for reporting purposes only.

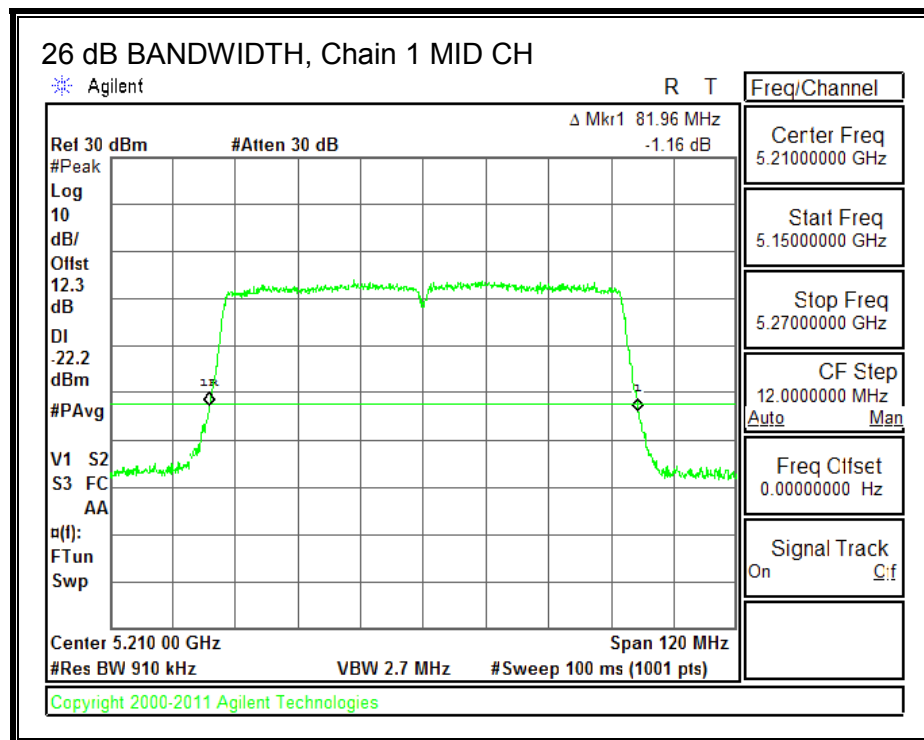
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Mid     | 5210               | 82.32                        | 81.96                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.10.2. 99% BANDWIDTH

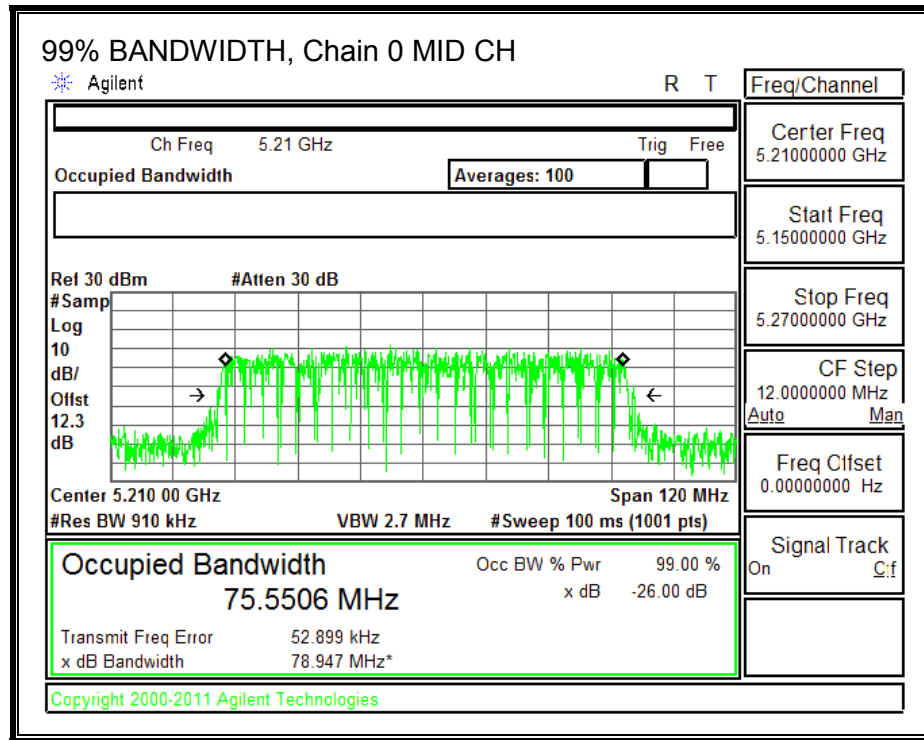
### LIMITS

None; for reporting purposes only.

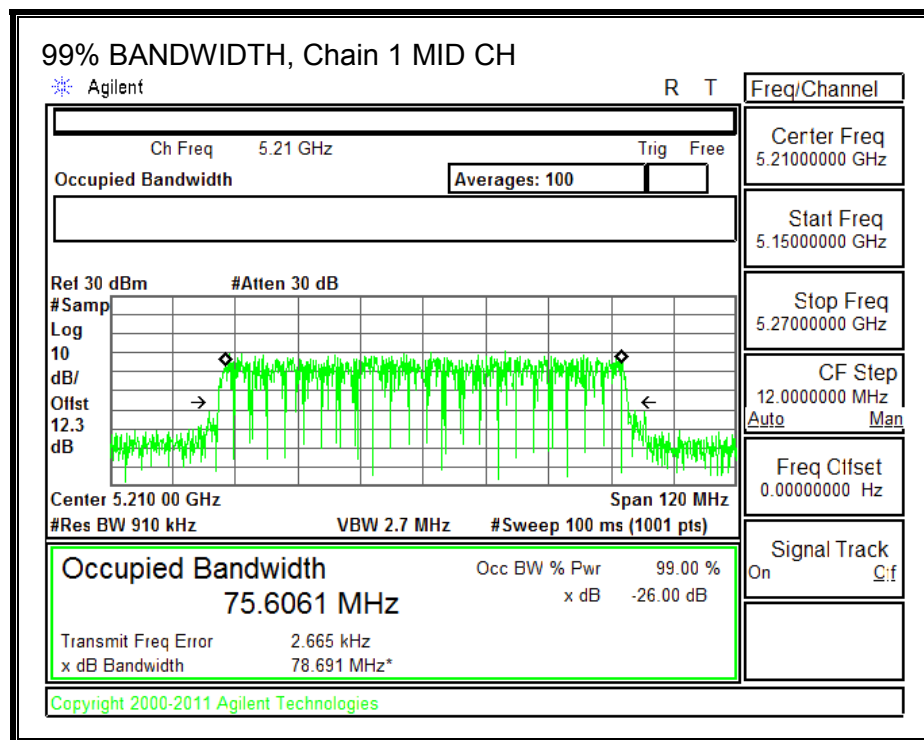
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.5506                    | 75.6061                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.10.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## 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) |
|---------|--------------------|-------------------------------------------|-----------------------------------------|-------------------------|-----------------------|
| Mid     | 5210               | 3.01                                      | 6.02                                    | 24.00                   | 10.98                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.22 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

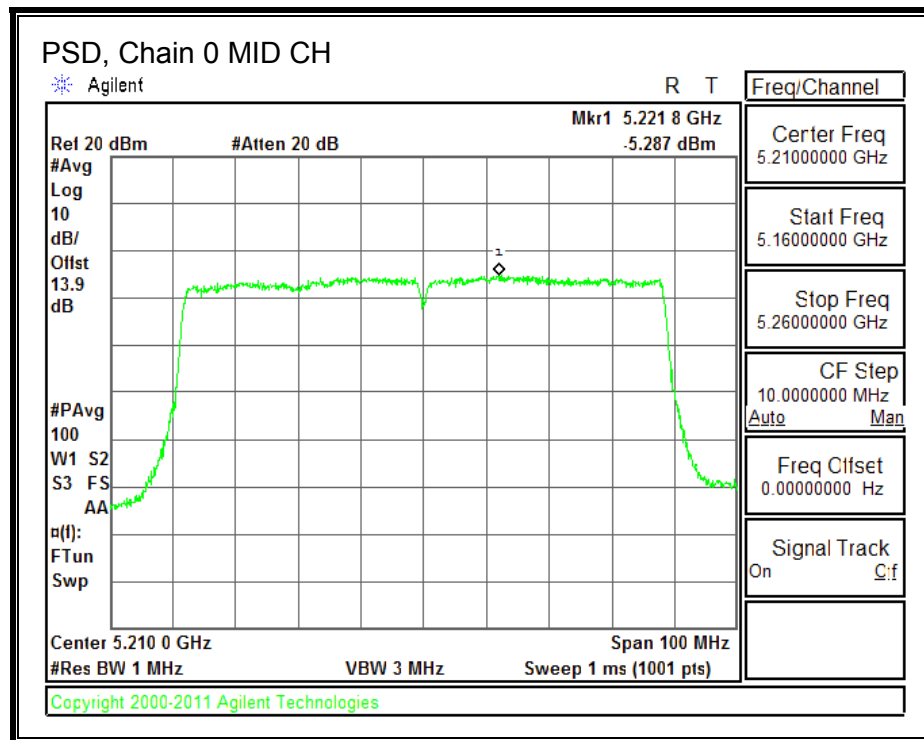
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5210               | 11.73                             | 11.78                             | 14.99                             | 24.00                   | -9.01                   |

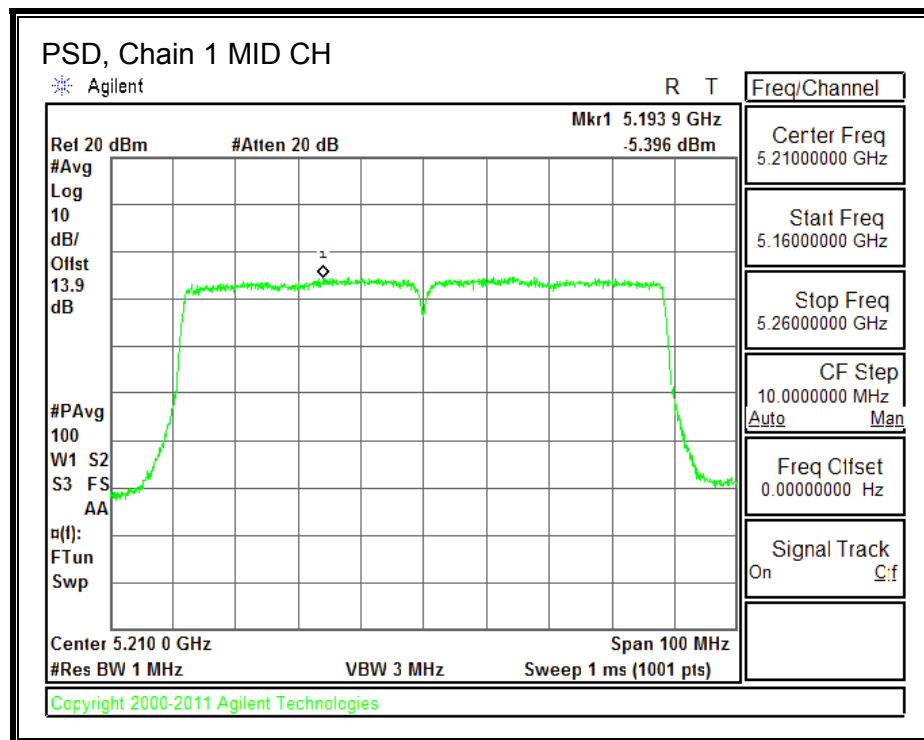
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | -5.29                           | -5.40                           | -2.11                           | 10.98                 | -13.09                |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.11. 802.11ac VHT80 2TX STBC MODE IN THE 5.2 GHz BAND

### 9.11.1. 26 dB BANDWIDTH

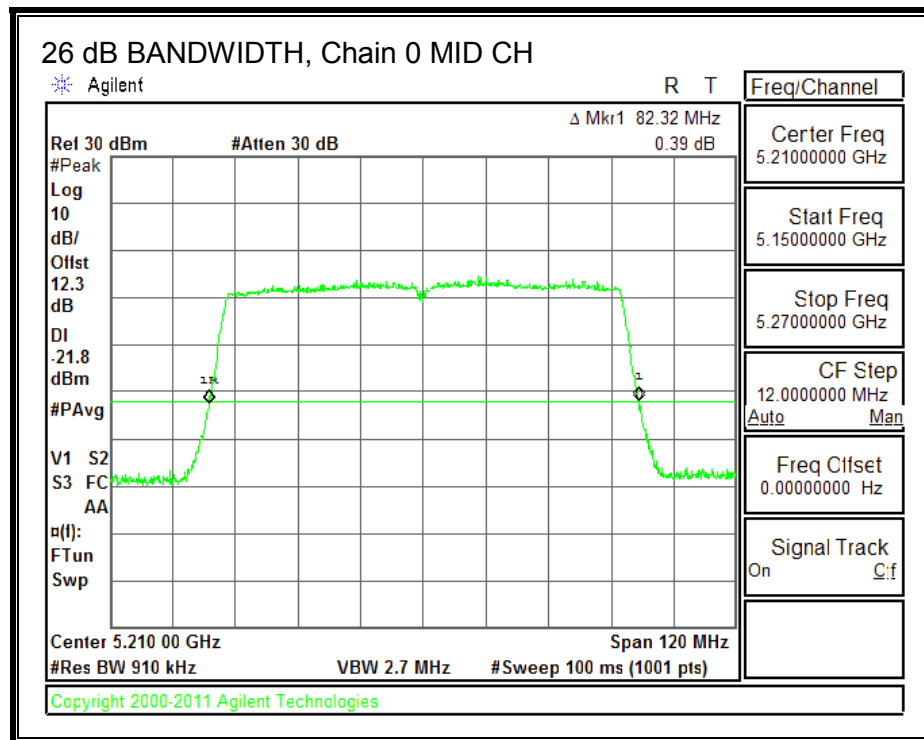
#### LIMITS

None; for reporting purposes only.

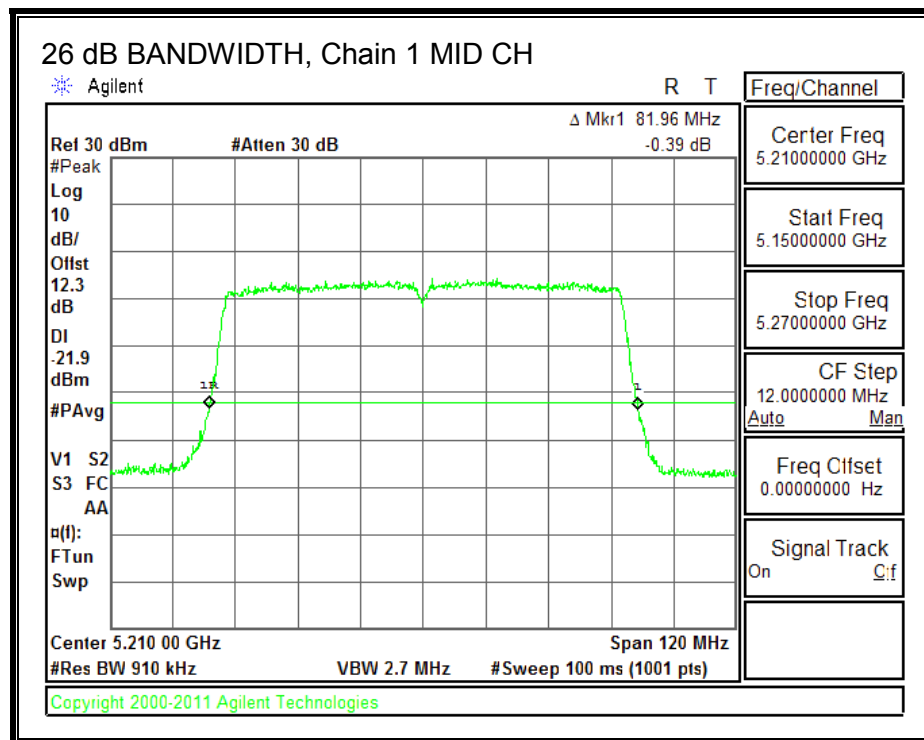
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Mid     | 5210               | 82.32                        | 81.96                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.11.2. 99% BANDWIDTH

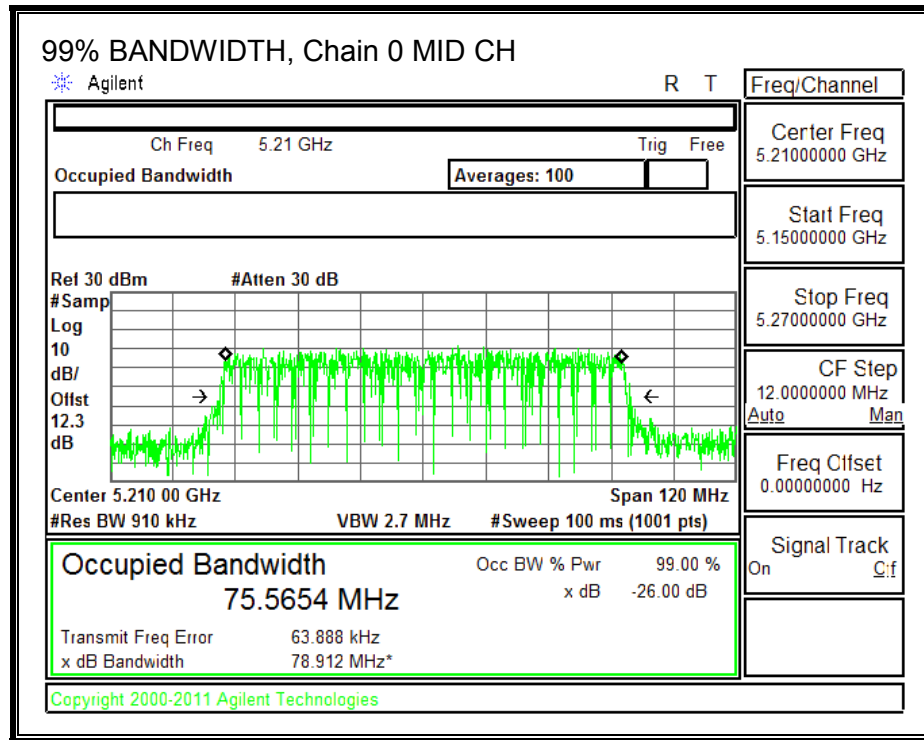
### LIMITS

None; for reporting purposes only.

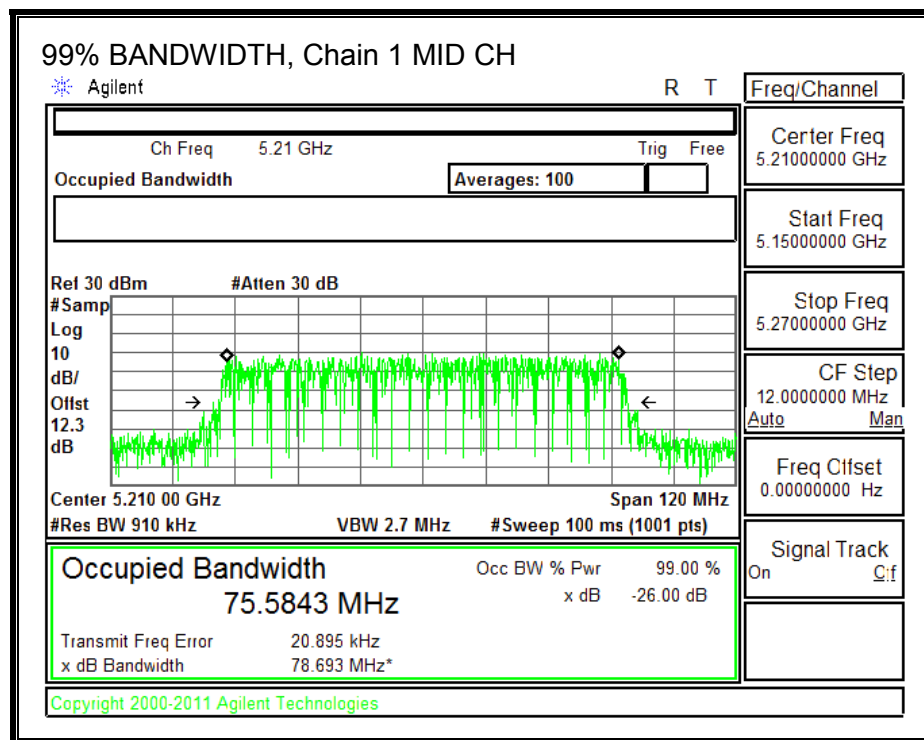
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.5654                    | 75.5843                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.11.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.11                                | 2.90                                | 3.01                                                |

## 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) |
|---------|--------------------|-------------------------------------------|-----------------------------------------|-------------------------|-----------------------|
| Mid     | 5210               | 3.01                                      | 3.01                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.22 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

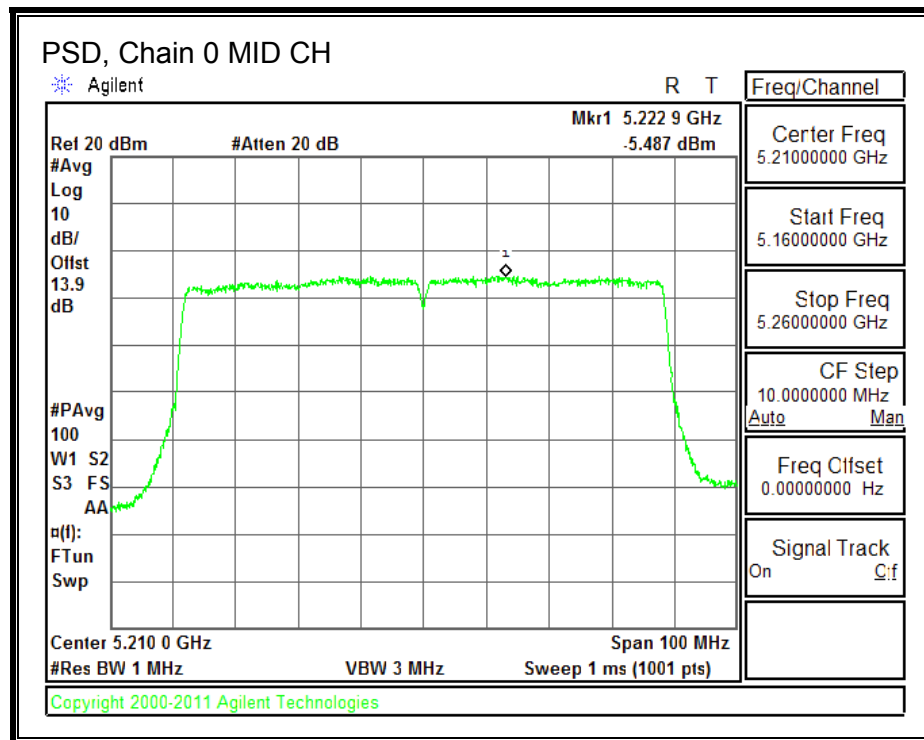
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5210               | 11.74                             | 11.77                             | 14.99                             | 24.00                   | -9.01                   |

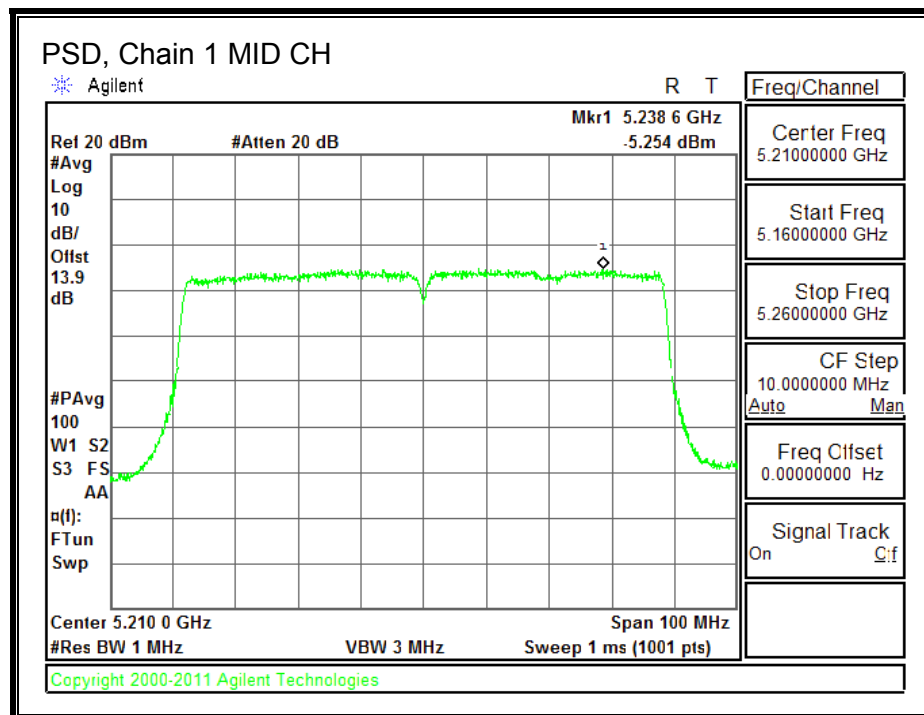
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | -5.49                           | -5.25                           | -2.14                           | 11.00                 | -13.14                |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.12. 802.11ac VHT80 2TX BF IN THE 5.2 GHz BAND

Refer to Section 9.10, 802.11ac VHT80 2Tx CDD MODE IN THE 5.2 GHz BAND

The power per chain used for 802.11ac VHT80 2TX CDD IN THE 5.2 GHz mode is the same power per chain that will be for 802.11ac VHT80 2TX BF IN THE 5.2 GHz mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated antenna gain for this mode shows it is still compliant.

### 9.12.1. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (1)

(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.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.11                                | 2.90                                | 6.02                                              |

## RESULTS

| Channel | Frequency<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Power<br>Limit<br>(dBm) |
|---------|--------------------|-------------------------------------------|-------------------------|
| Mid     | 5210               | 6.02                                      | 23.98                   |

|                    |      |                                          |
|--------------------|------|------------------------------------------|
| Duty Cycle CF (dB) | 0.26 | Included in Calculations of Corr'd Power |
|--------------------|------|------------------------------------------|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5210               | 11.73                             | 11.78                             | 15.03                             | 23.98                   | -8.95                   |

## 9.13. 802.11a 1TX MODE IN THE 5.3 GHz BAND

### 9.13.1. 26 dB BANDWIDTH

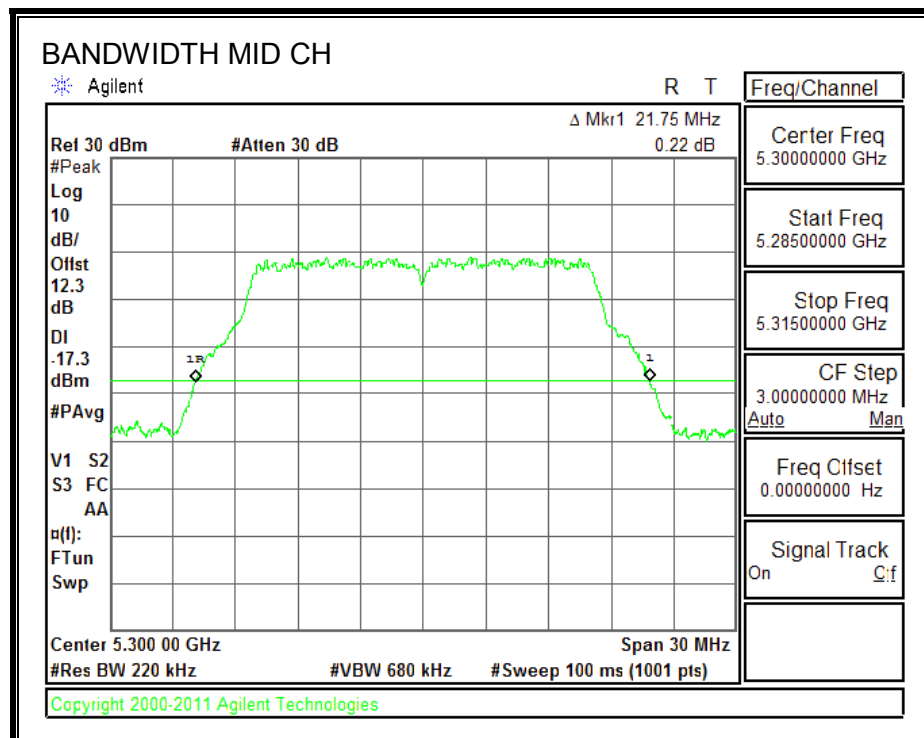
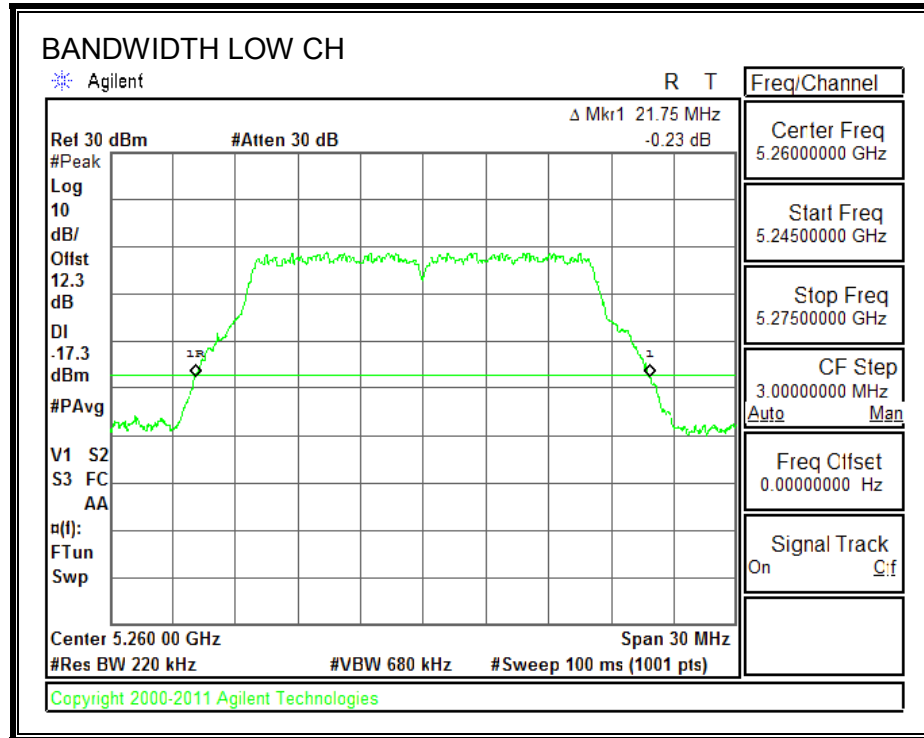
#### LIMITS

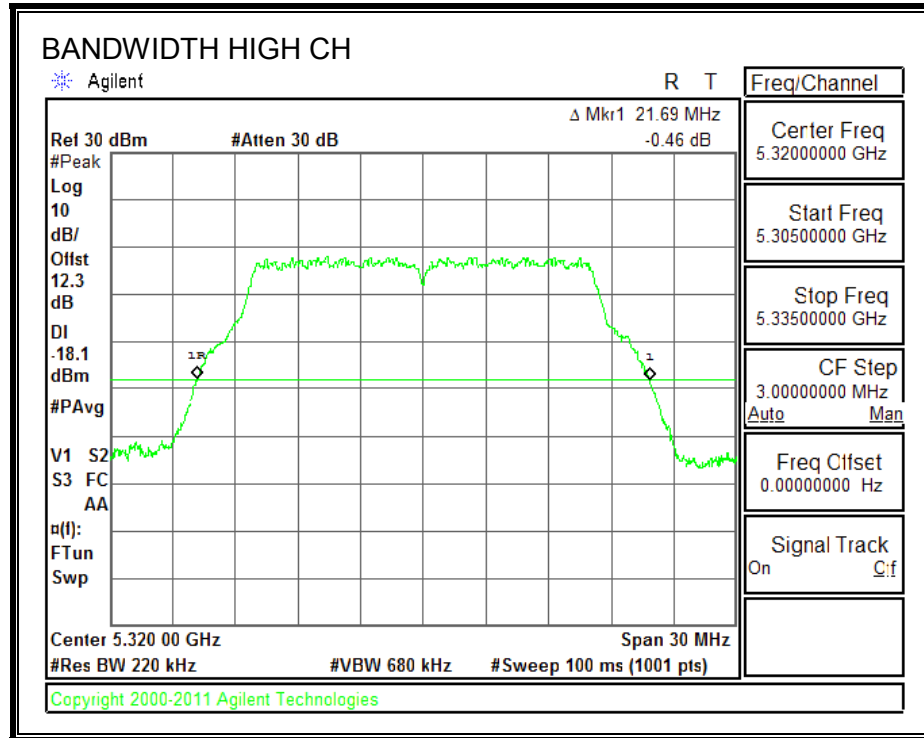
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5260               | 21.75                    |
| Mid     | 5300               | 21.75                    |
| High    | 5320               | 21.69                    |

## 26 dB BANDWIDTH





### 9.13.2. 99% BANDWIDTH

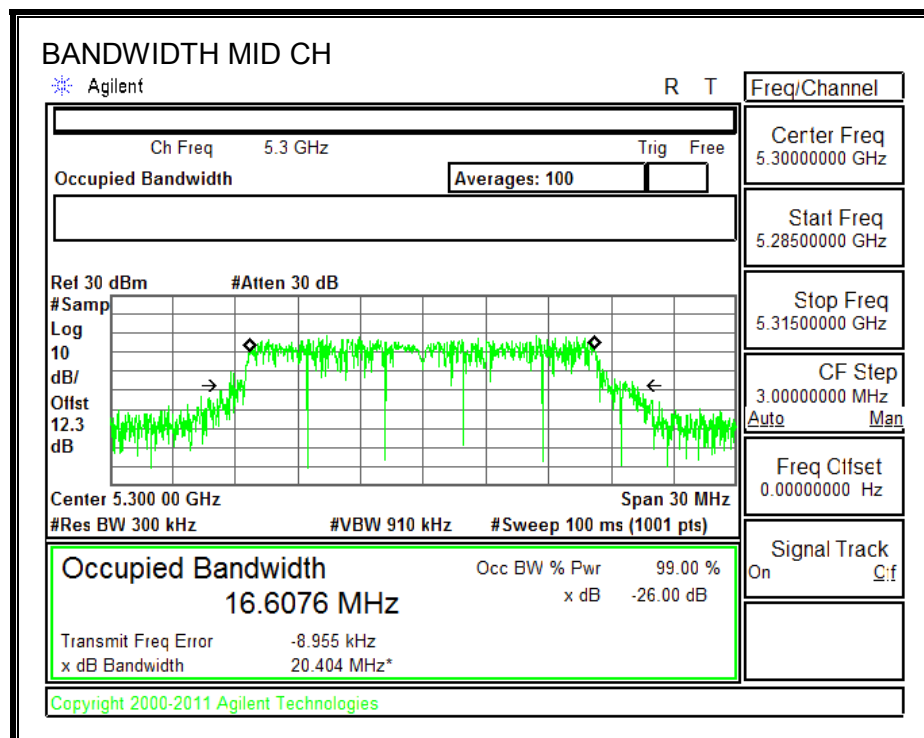
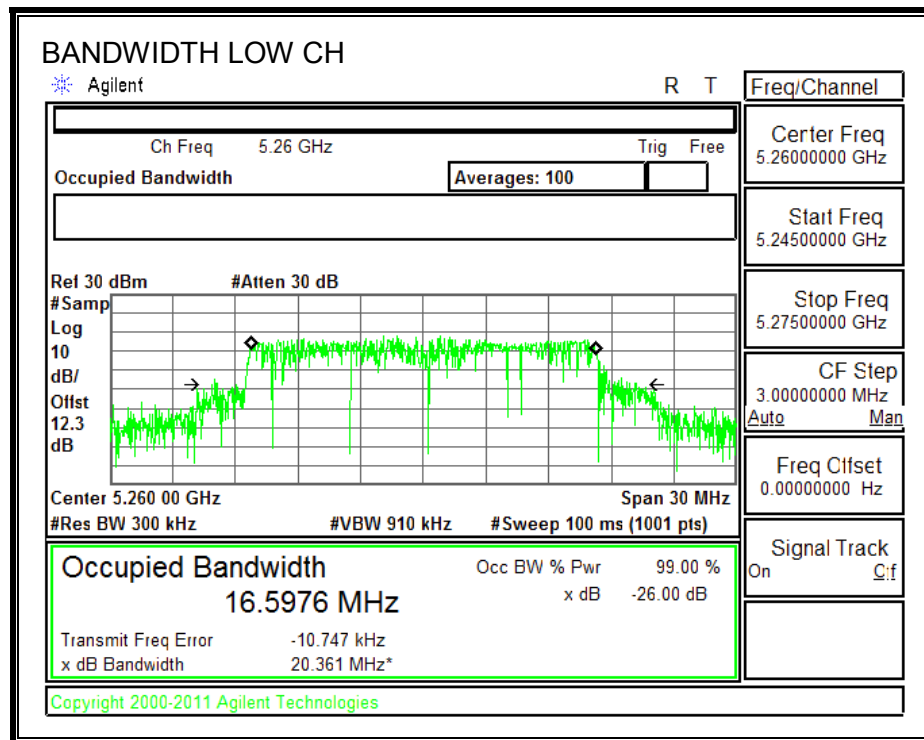
#### LIMITS

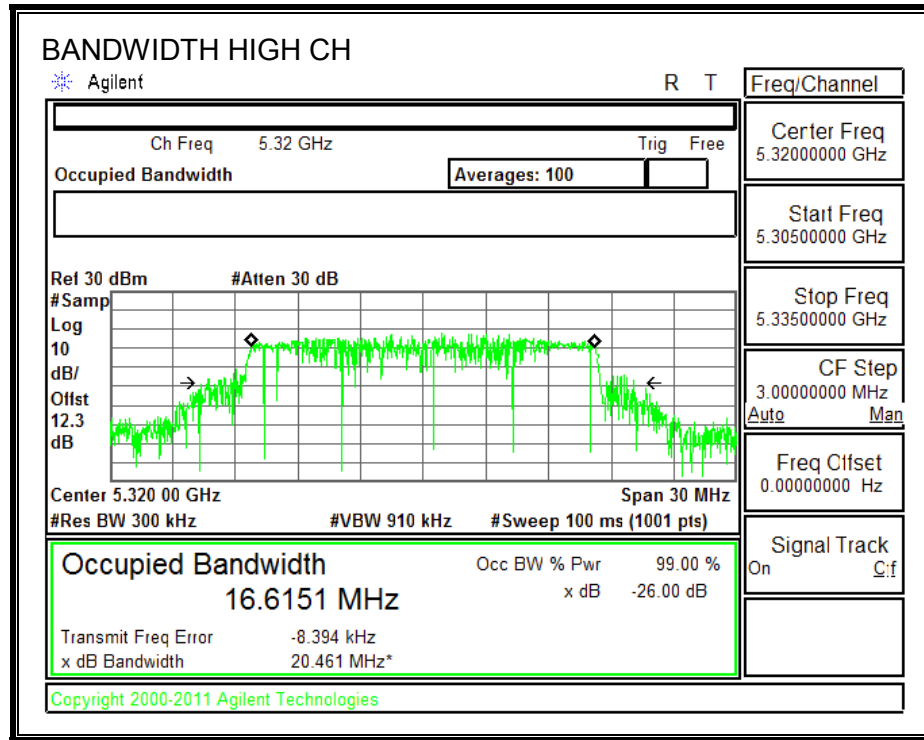
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5260               | 16.5976                |
| Mid     | 5300               | 16.6076                |
| High    | 5320               | 16.6151                |

**99% BANDWIDTH**





### 9.13.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.05                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.33                     |

## RESULTS

### Bandwidth, Antenna Gain, and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|-----------------------------|------------------------------|-------------------------|-----------------------|
| Low     | 5260               | 21.75                       | 3.33                         | 24.00                   | 11.00                 |
| Mid     | 5300               | 21.75                       | 3.33                         | 24.00                   | 11.00                 |
| High    | 5320               | 21.69                       | 3.33                         | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

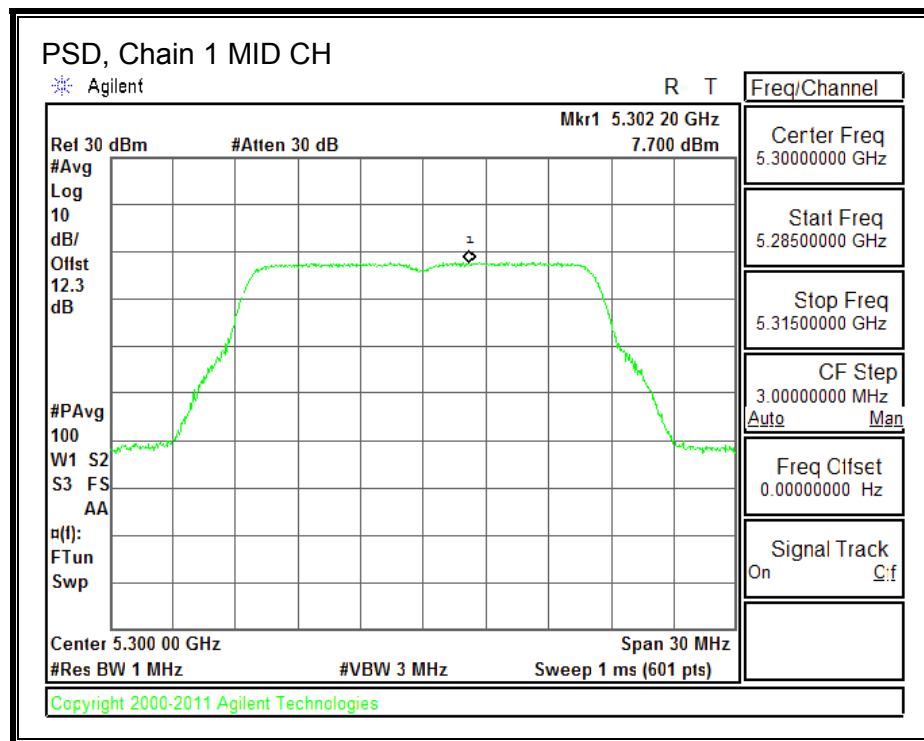
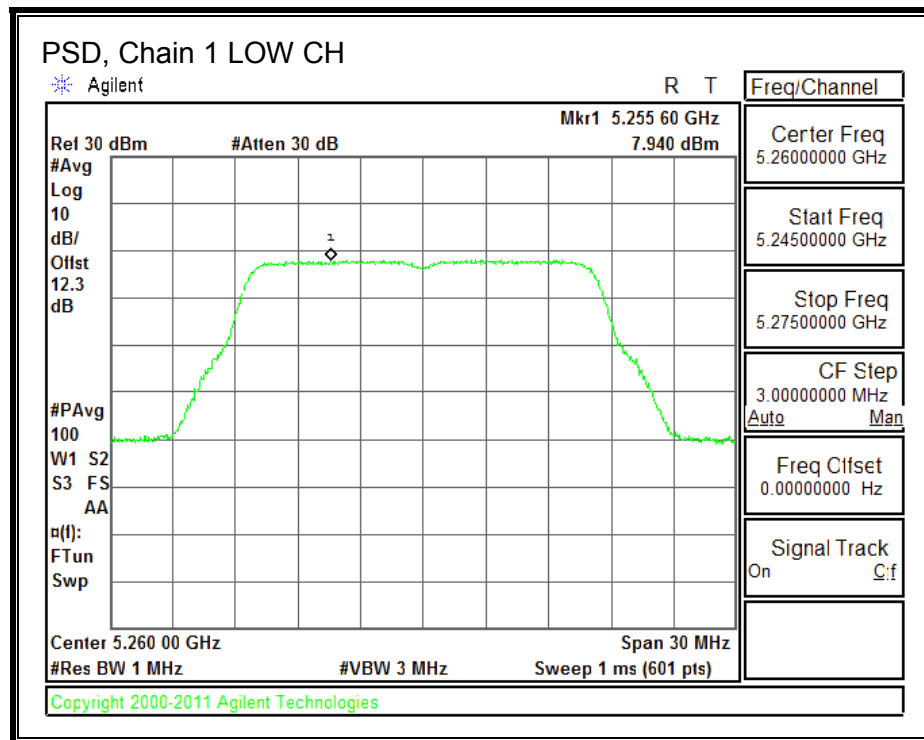
### Output Power Results

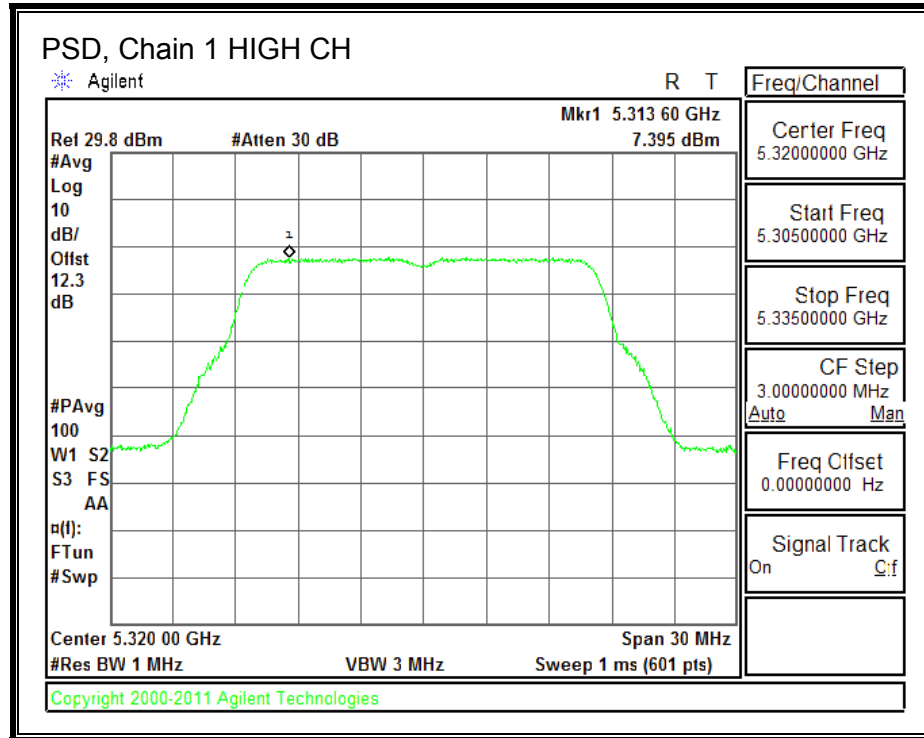
| Channel | Frequency<br>(MHz) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5260               | 17.98                             | 17.98                             | 24.00                   | -6.02                   |
| Mid     | 5300               | 17.97                             | 17.97                             | 24.00                   | -6.03                   |
| High    | 5320               | 17.44                             | 17.44                             | 24.00                   | -6.56                   |

### PSD Results

| Channel | Frequency<br>(MHz) | Chain 1<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     | 5260               | 7.94                            | 7.94                            | 11.00                 | -3.06                 |
| Mid     | 5300               | 7.70                            | 7.70                            | 11.00                 | -3.30                 |
| High    | 5320               | 7.40                            | 7.40                            | 11.00                 | -3.61                 |

**PSD, Chain 1**





## 9.14. 802.11n HT20 2TX CDD MODE IN THE 5.3 GHz BAND

### 9.14.1. 26 dB BANDWIDTH

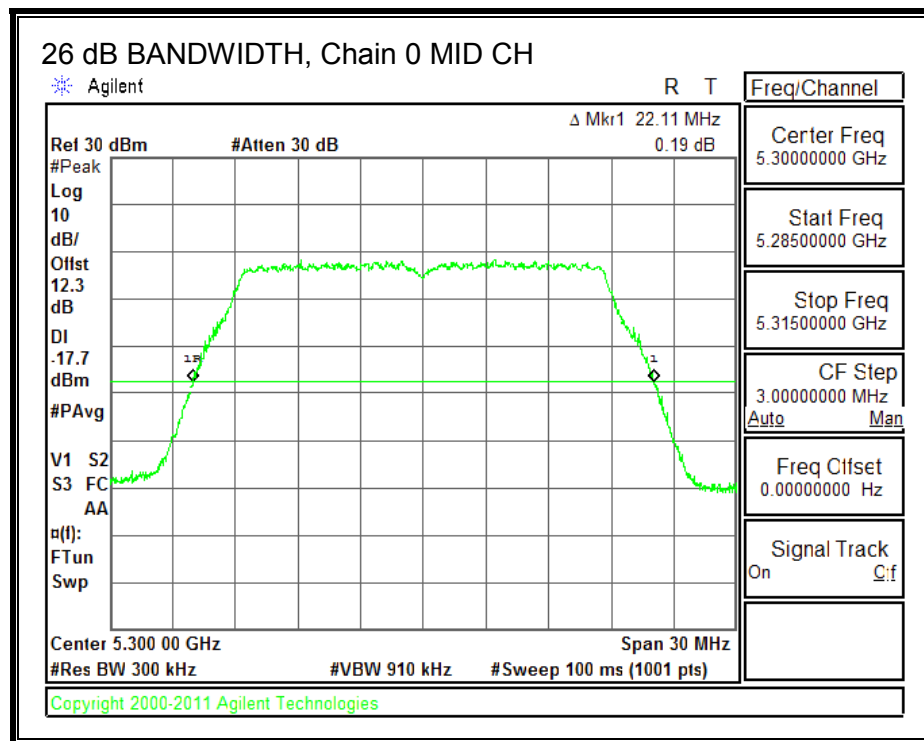
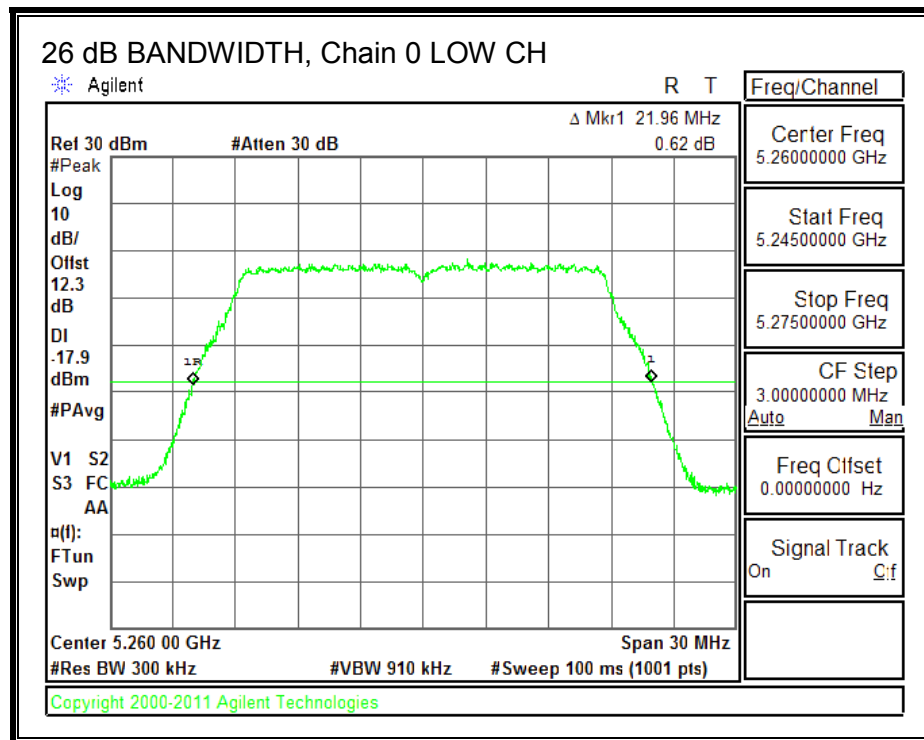
#### LIMITS

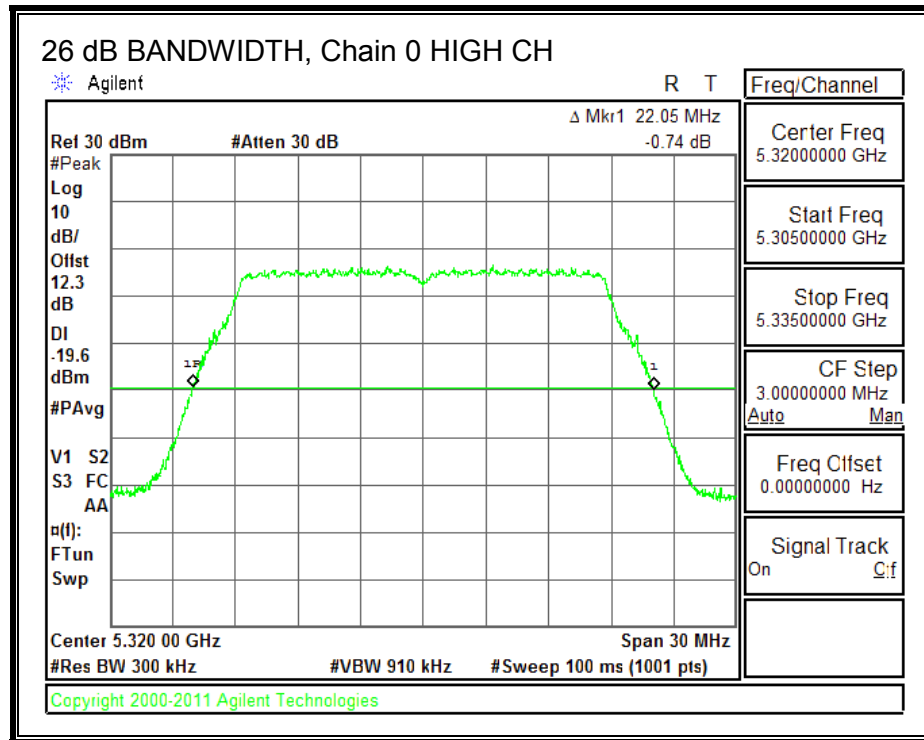
None; for reporting purposes only.

#### RESULTS

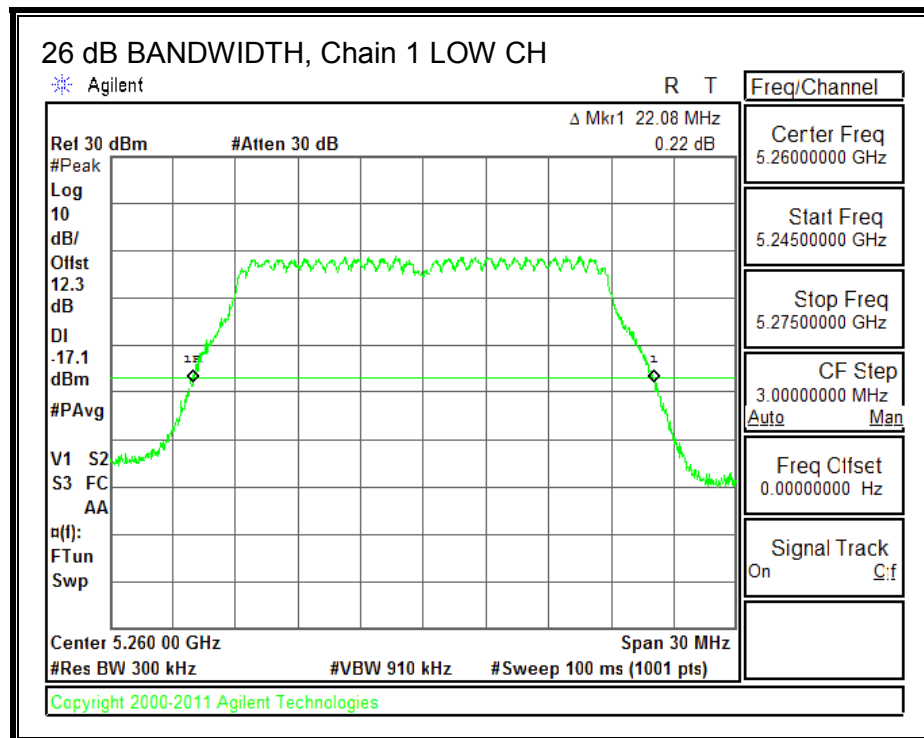
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5260               | 21.96                        | 22.08                        |
| Mid     | 5300               | 22.11                        | 22.02                        |
| High    | 5320               | 22.05                        | 21.84                        |

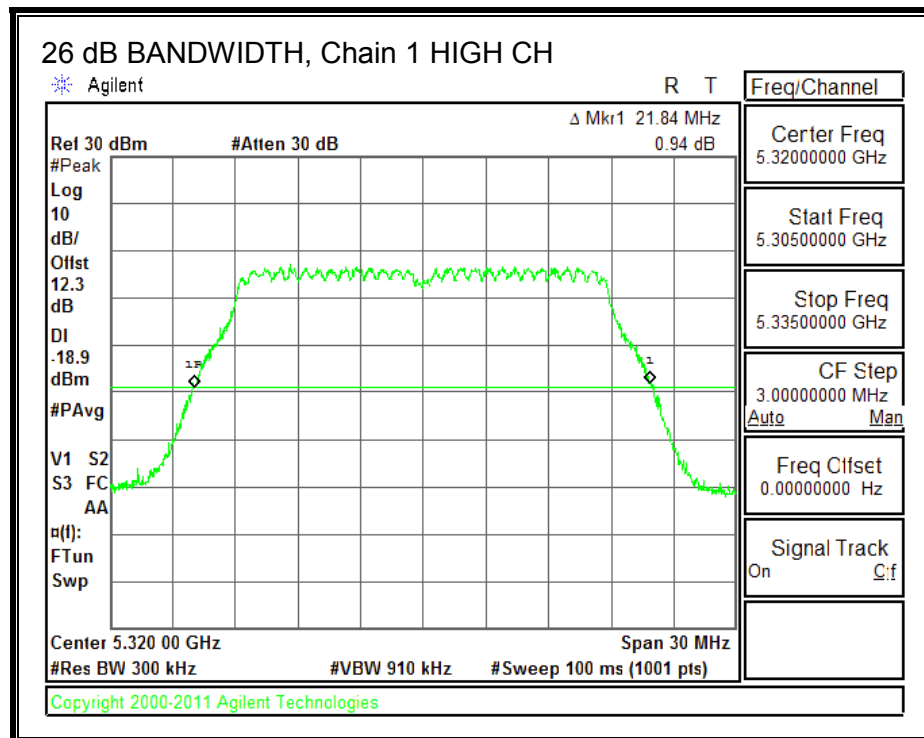
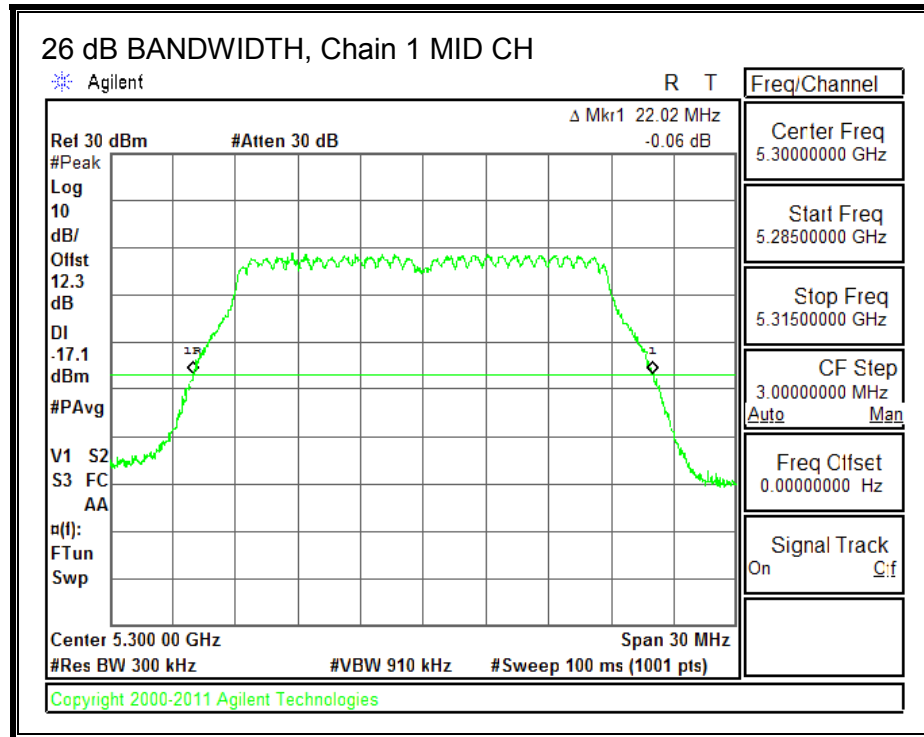
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





## 9.14.2. 99% BANDWIDTH

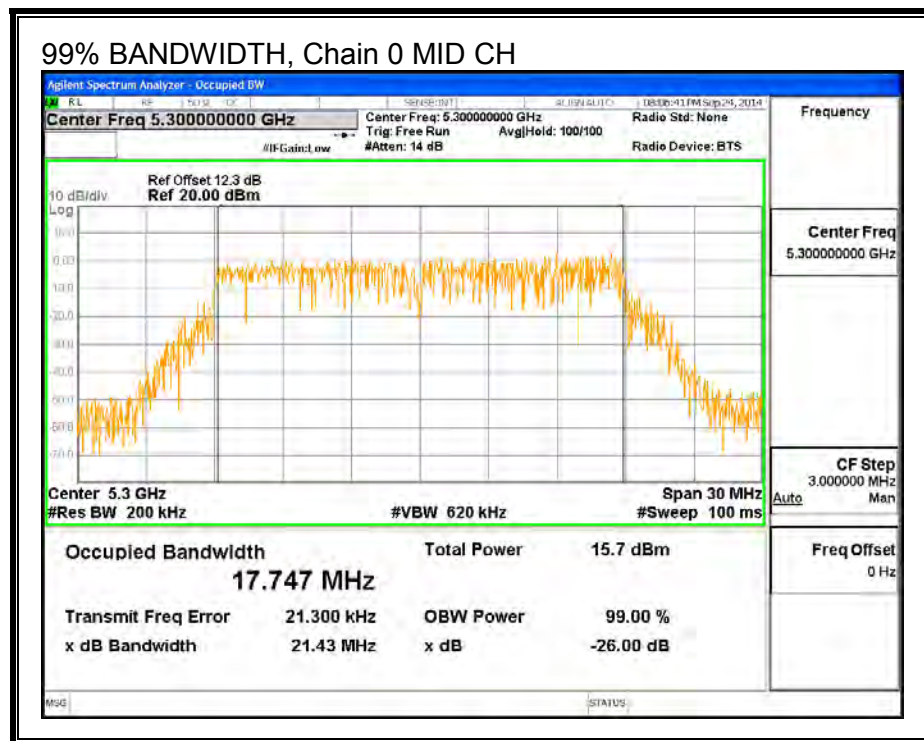
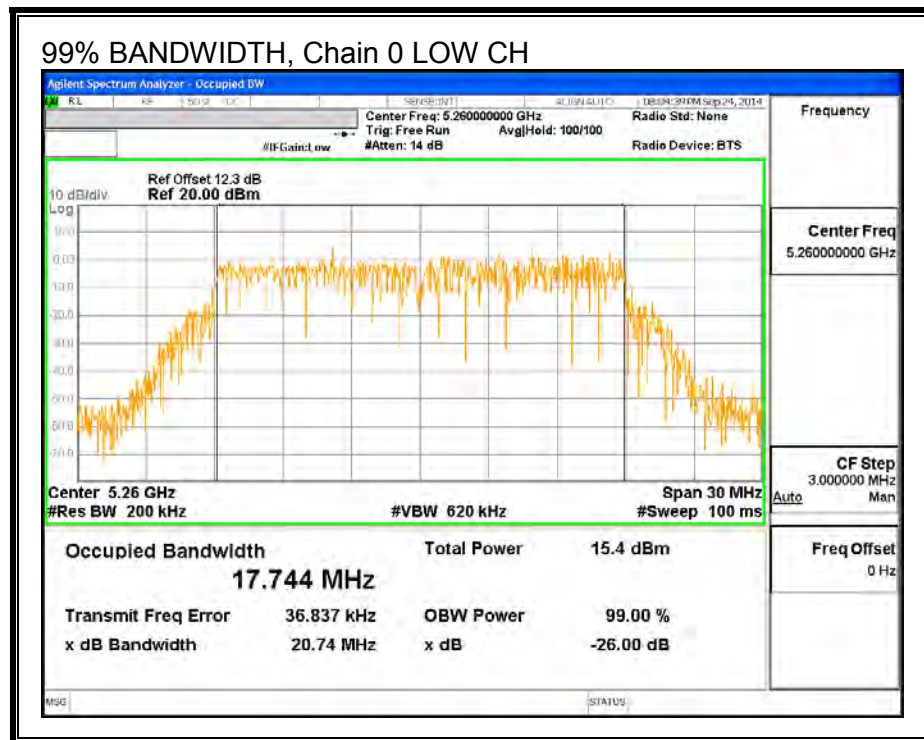
### LIMITS

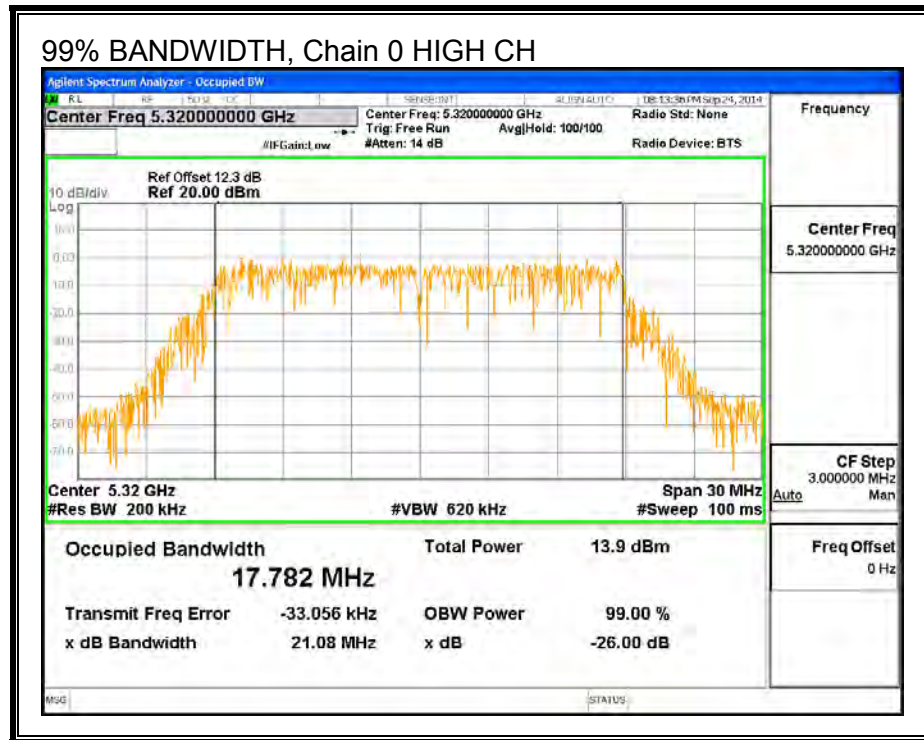
None; for reporting purposes only.

### RESULTS

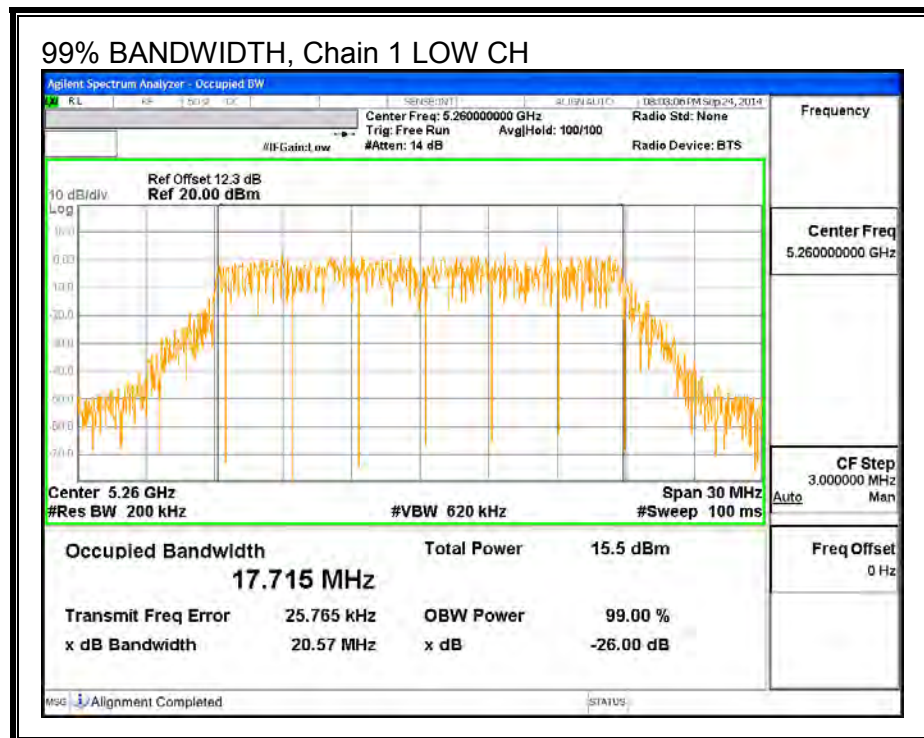
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5260               | 17.7440                    | 17.7150                    |
| Mid     | 5300               | 17.7470                    | 17.7540                    |
| High    | 5320               | 17.7820                    | 17.6670                    |

**99% BANDWIDTH, Chain 0**

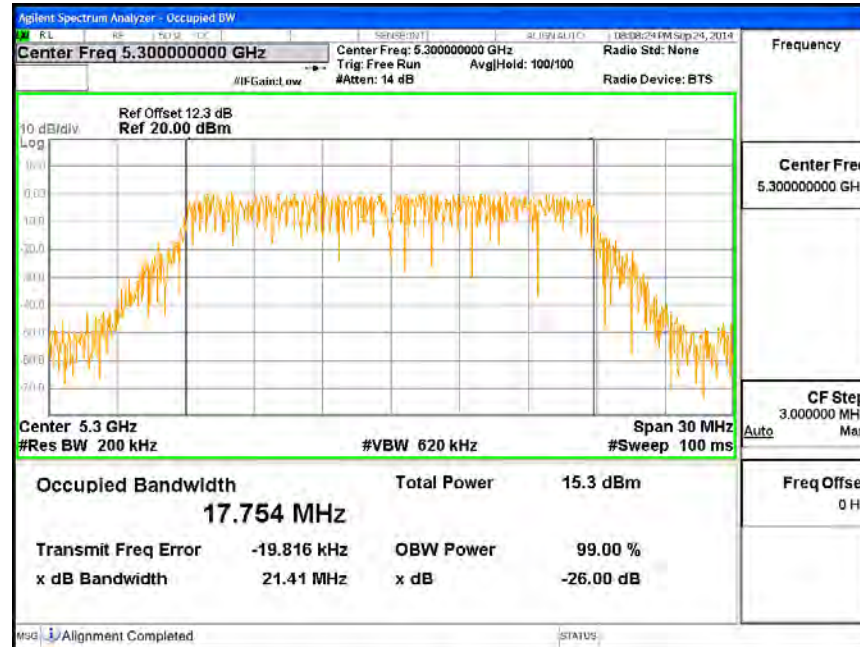




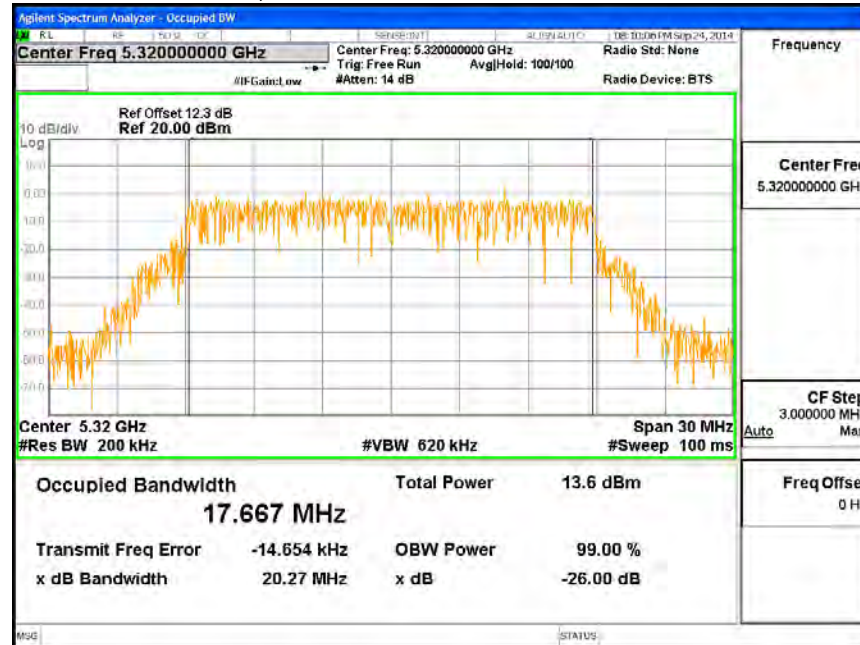
99% BANDWIDTH, Chain 1



### 99% BANDWIDTH, Chain 1 MID CH



### 99% BANDWIDTH, Chain 1 HIGH CH



### 9.14.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.05                                | 3.33                                | 3.19                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.05                                | 3.33                                | 6.20                                              |

## RESULTS

### Bandwidth, Antenna Gain and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<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     | 5260               | 21.96                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |
| Mid     | 5300               | 22.02                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |
| High    | 5320               | 21.84                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

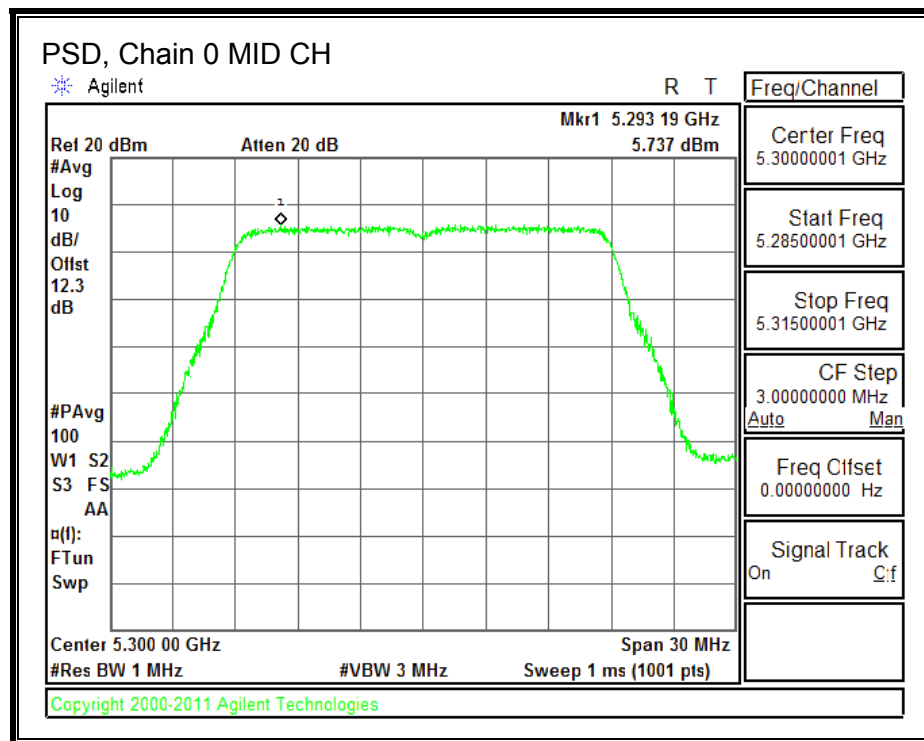
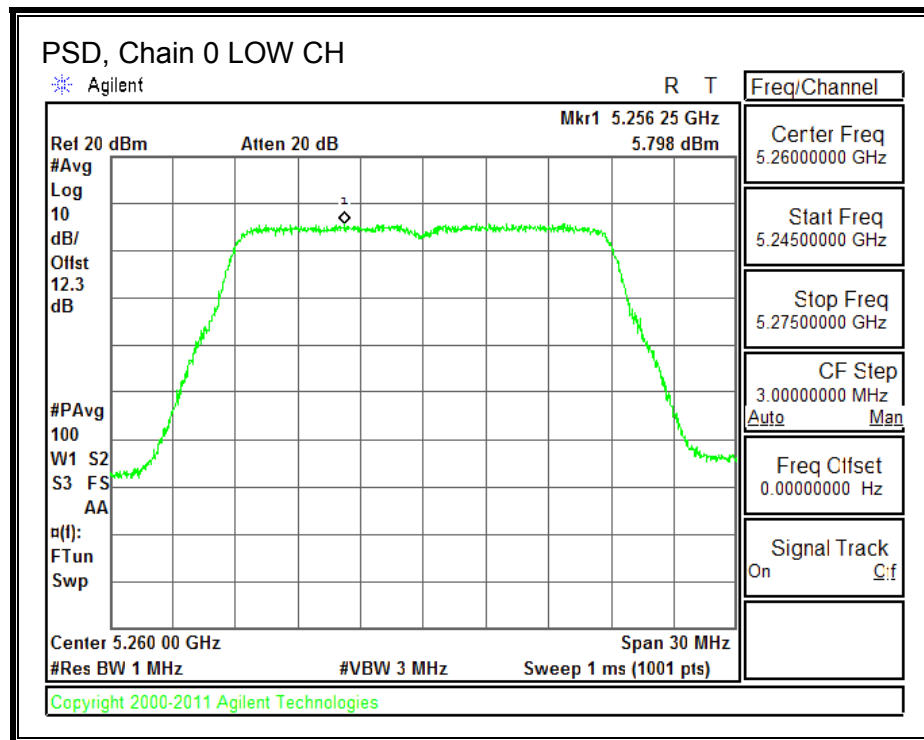
### Output Power Results

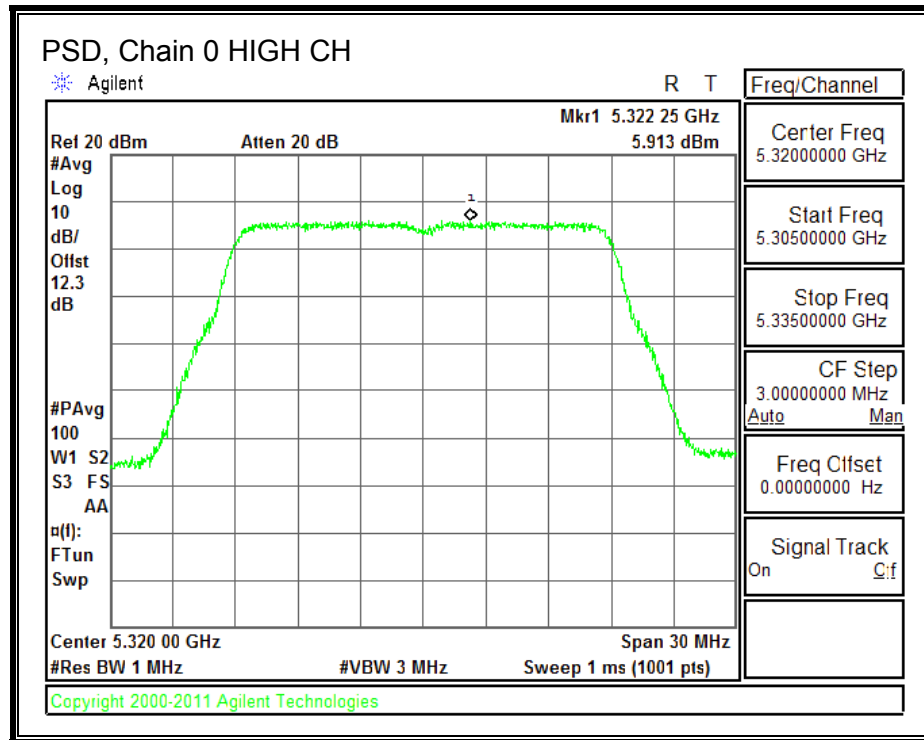
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5260               | 15.97                             | 15.98                             | 18.99                             | 24.00                   | -5.01                   |
| Mid     | 5300               | 15.95                             | 15.97                             | 18.97                             | 24.00                   | -5.03                   |
| High    | 5320               | 15.98                             | 15.93                             | 18.97                             | 24.00                   | -5.03                   |

### PSD Results

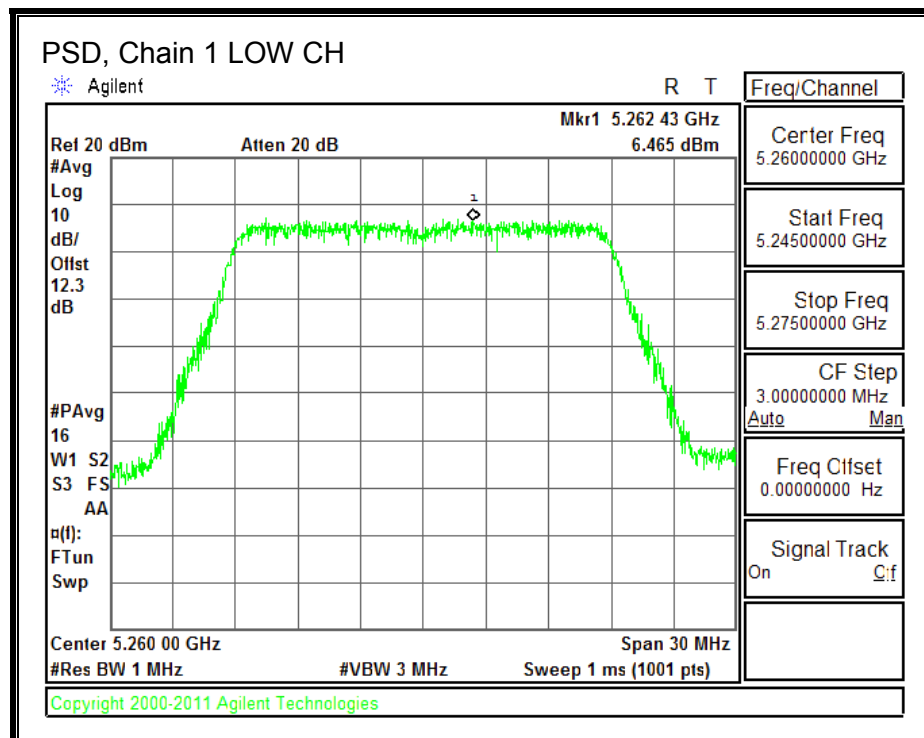
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5260               | 5.80                            | 6.47                            | 9.15                            | 10.80                 | -1.65                 |
| Mid     | 5300               | 5.74                            | 6.09                            | 8.93                            | 10.80                 | -1.87                 |
| High    | 5320               | 5.91                            | 6.23                            | 9.09                            | 10.80                 | -1.71                 |

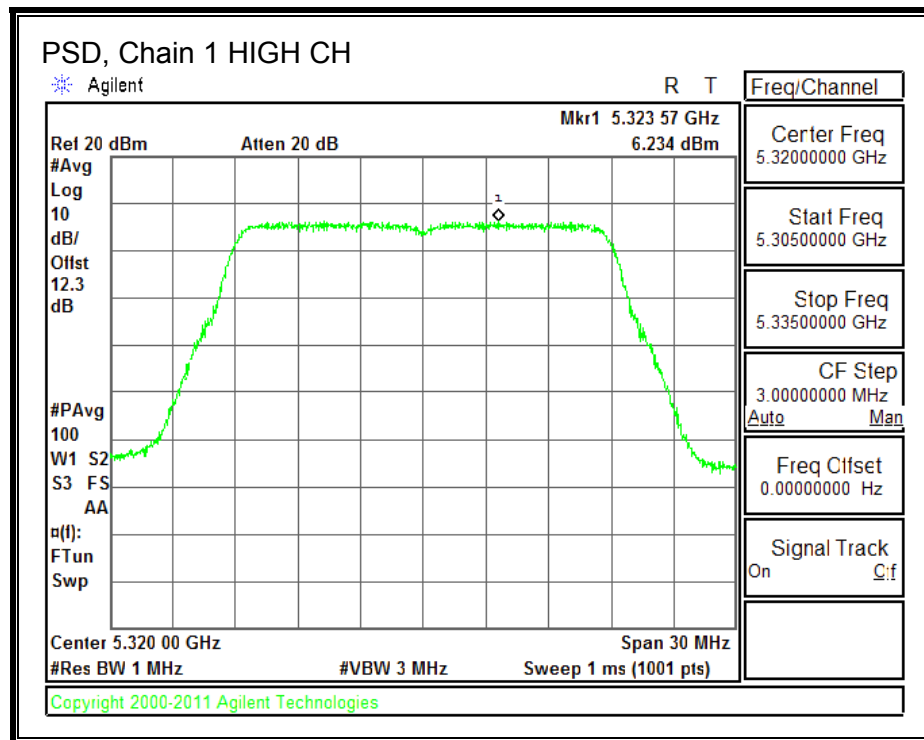
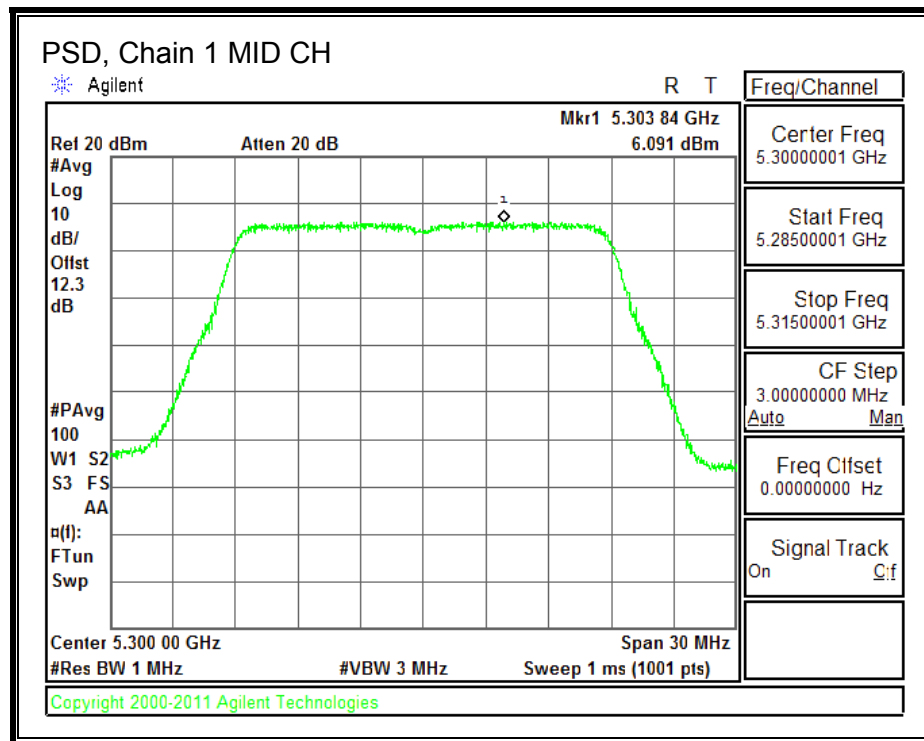
**PSD, Chain 0**





**PSD, Chain 1**





## **9.15. 802.11n HT20 2TX STBC MODE IN THE 5.3 GHz BAND**

### **9.15.1. 26 dB BANDWIDTH**

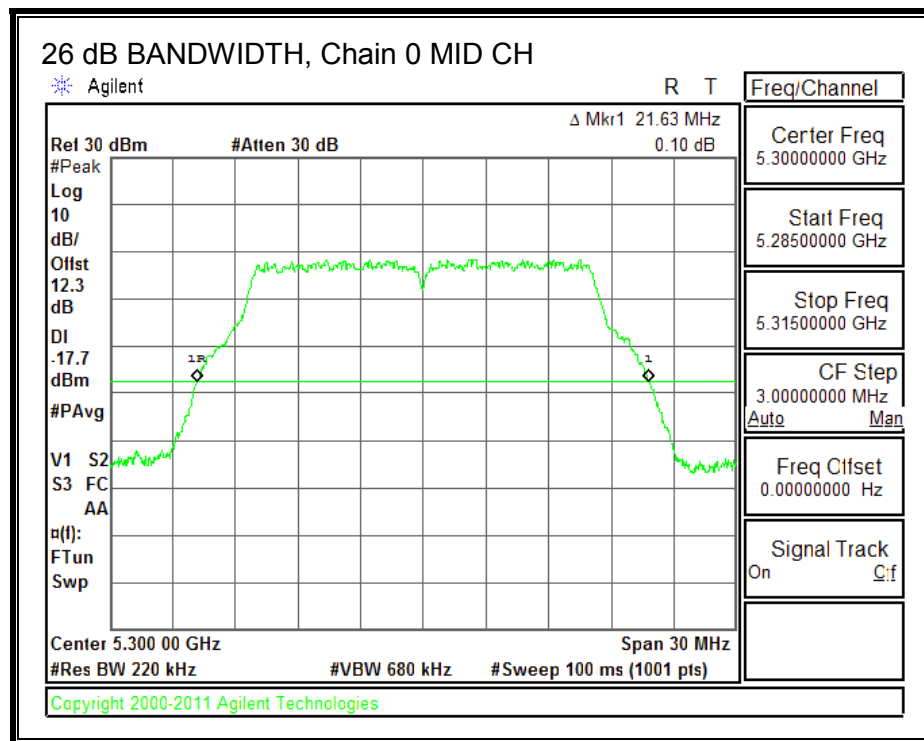
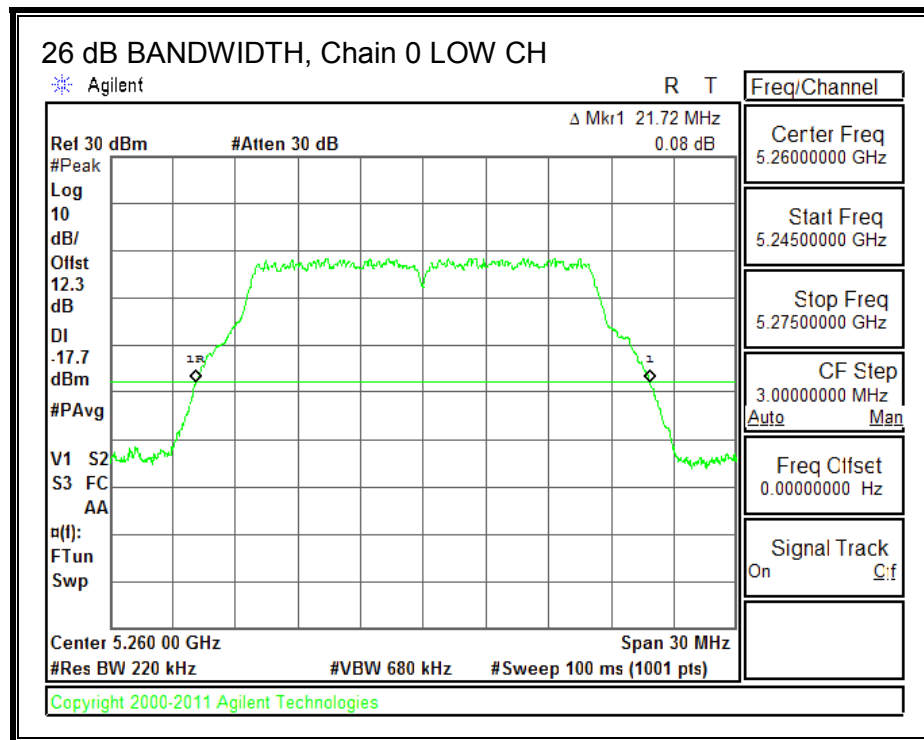
#### **LIMITS**

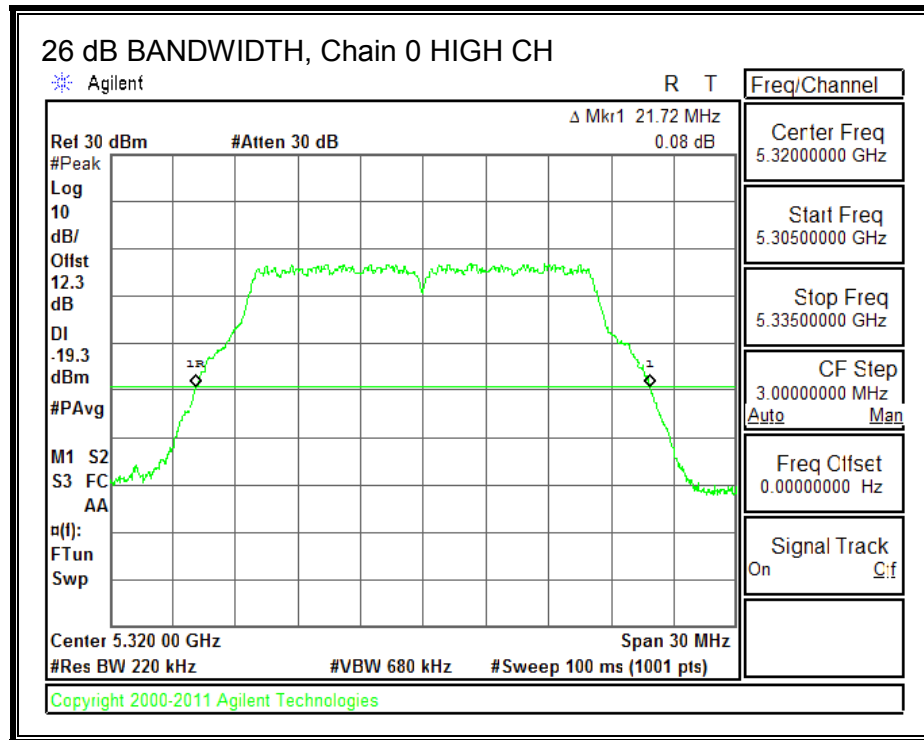
None; for reporting purposes only.

#### **RESULTS**

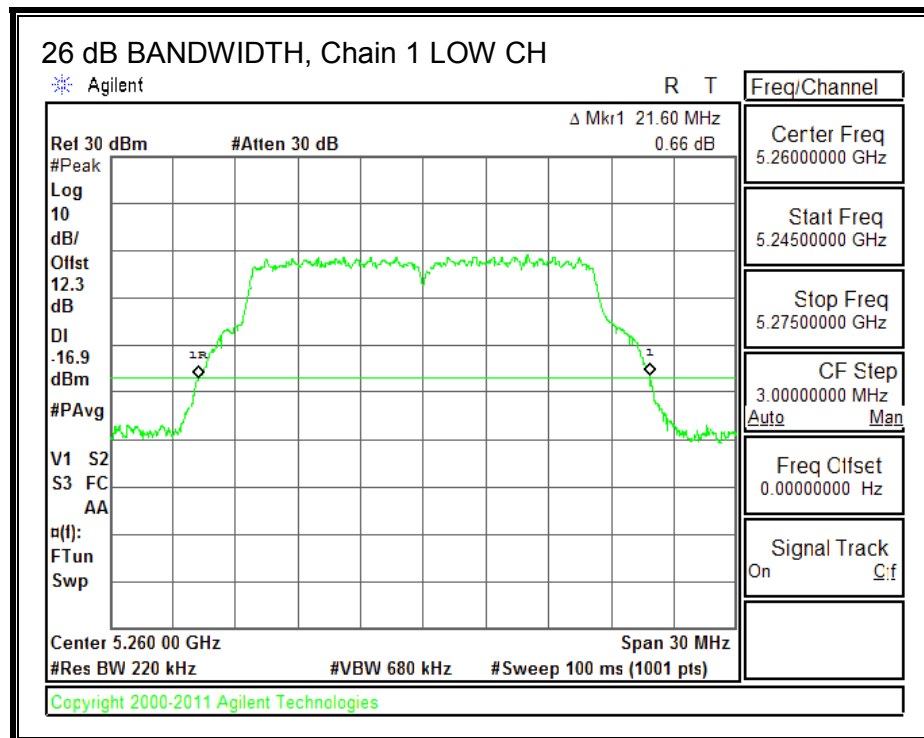
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5260               | 21.72                        | 21.60                        |
| Mid     | 5300               | 21.63                        | 21.57                        |
| High    | 5320               | 21.72                        | 21.72                        |

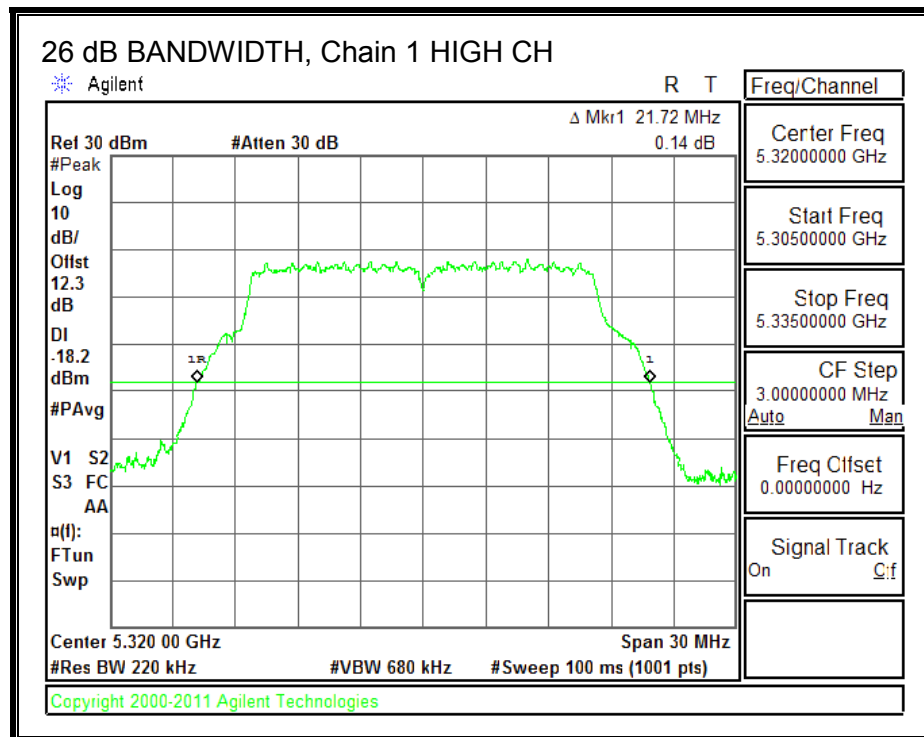
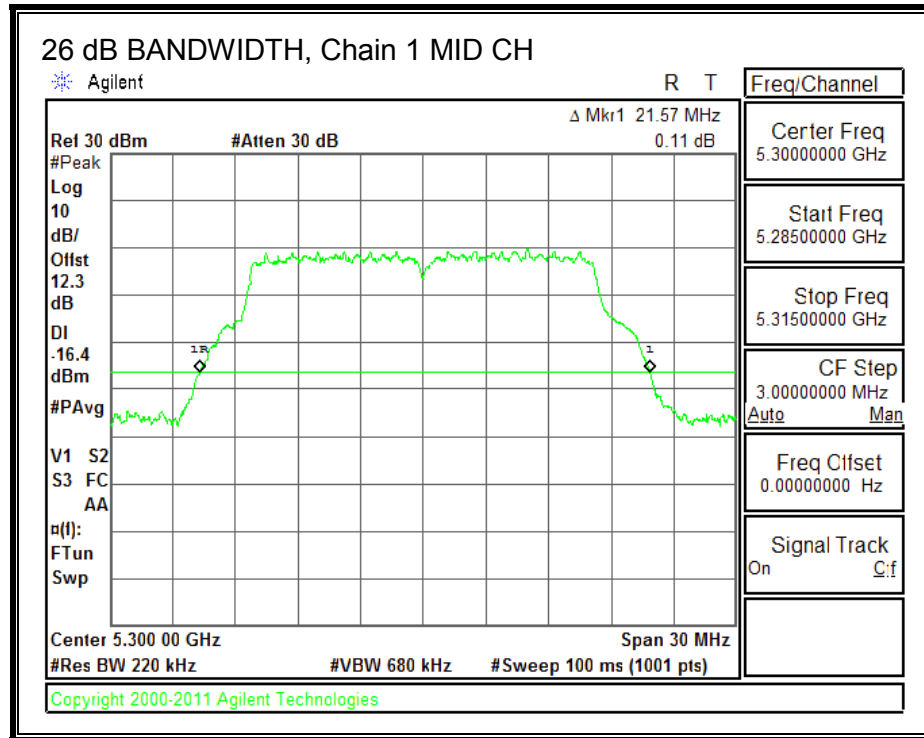
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





## 9.15.2. 99% BANDWIDTH

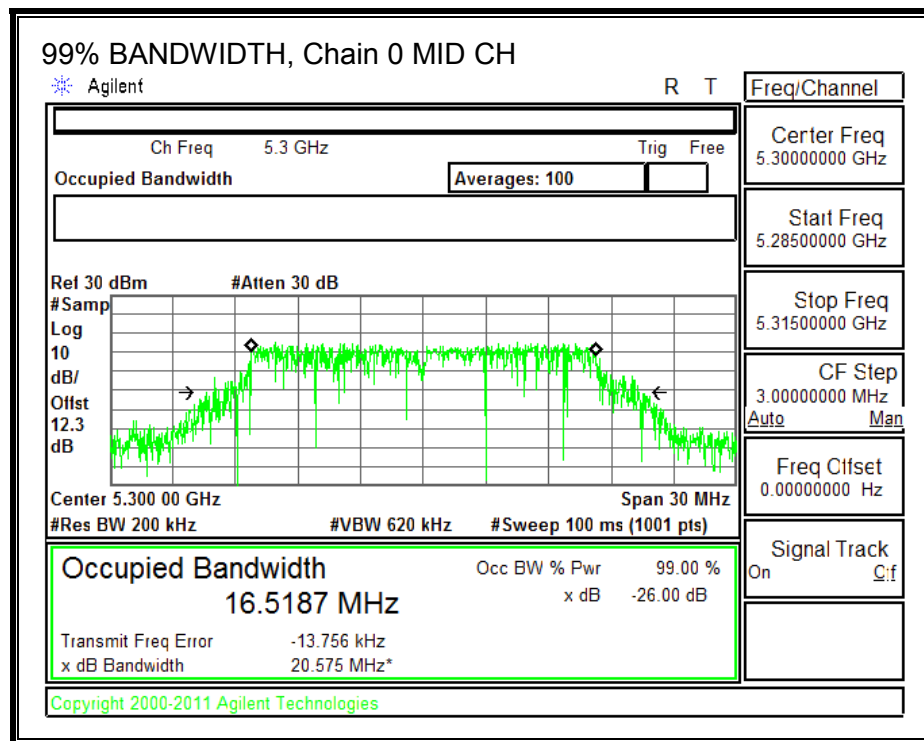
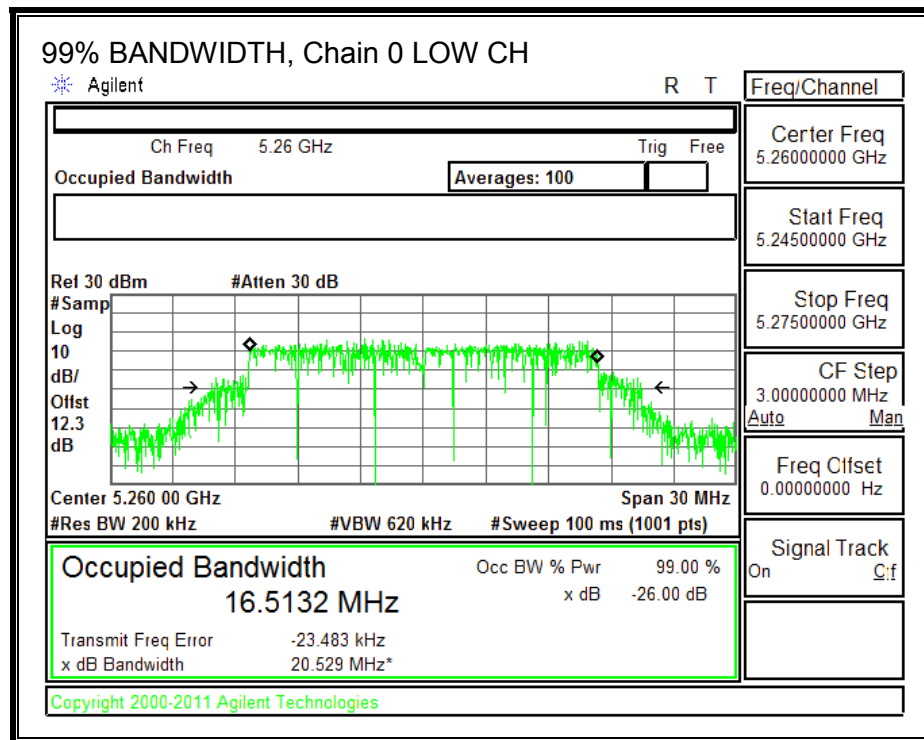
### LIMITS

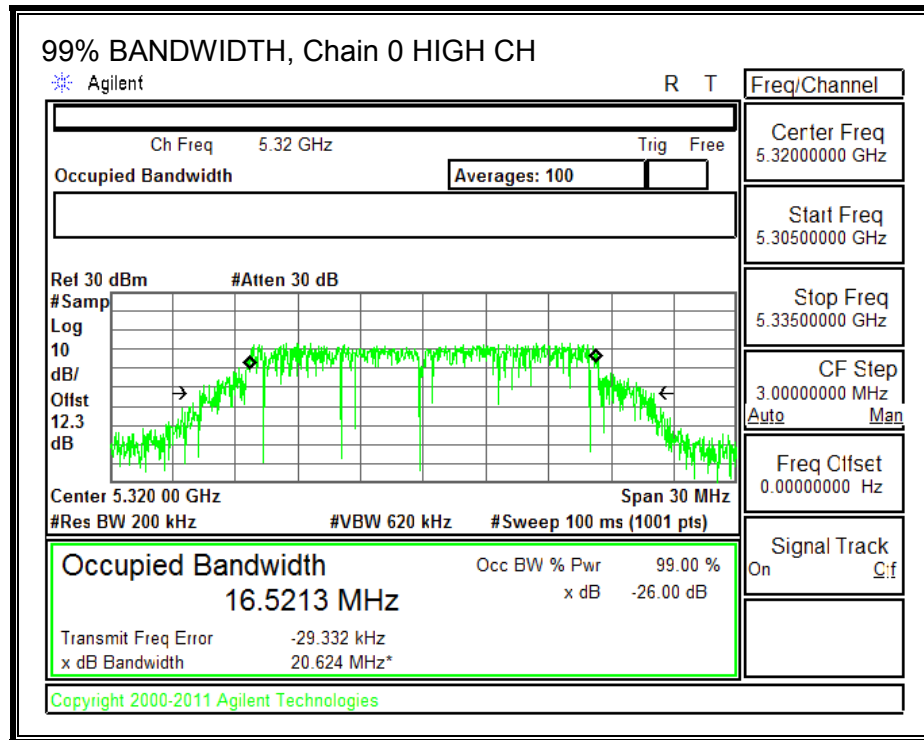
None; for reporting purposes only.

### RESULTS

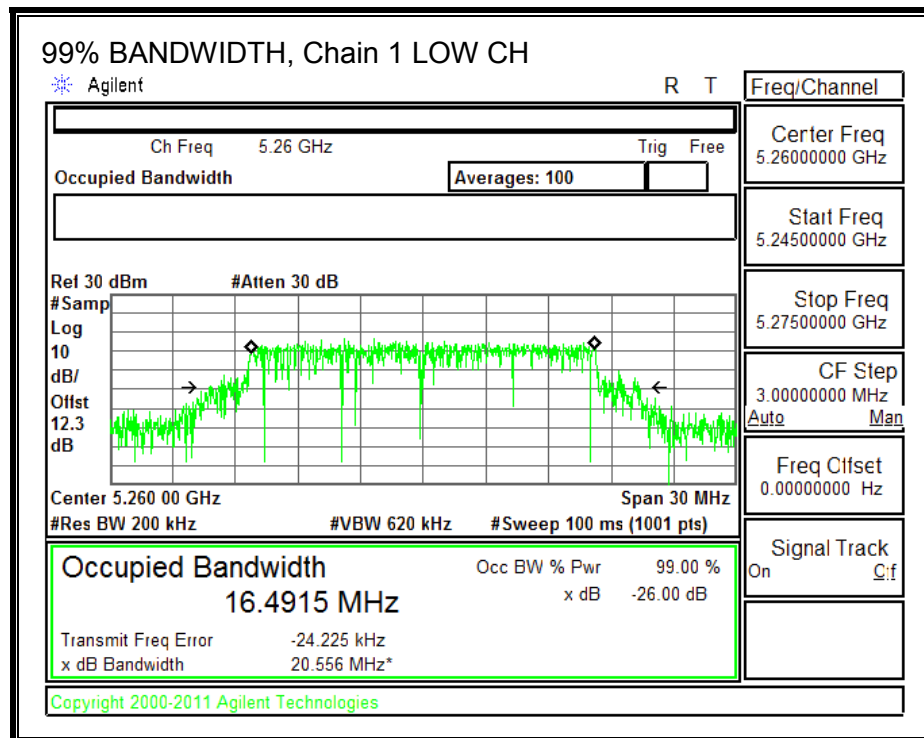
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5260               | 16.5132                    | 16.4915                    |
| Mid     | 5300               | 16.5187                    | 16.5162                    |
| High    | 5320               | 16.5213                    | 16.5076                    |

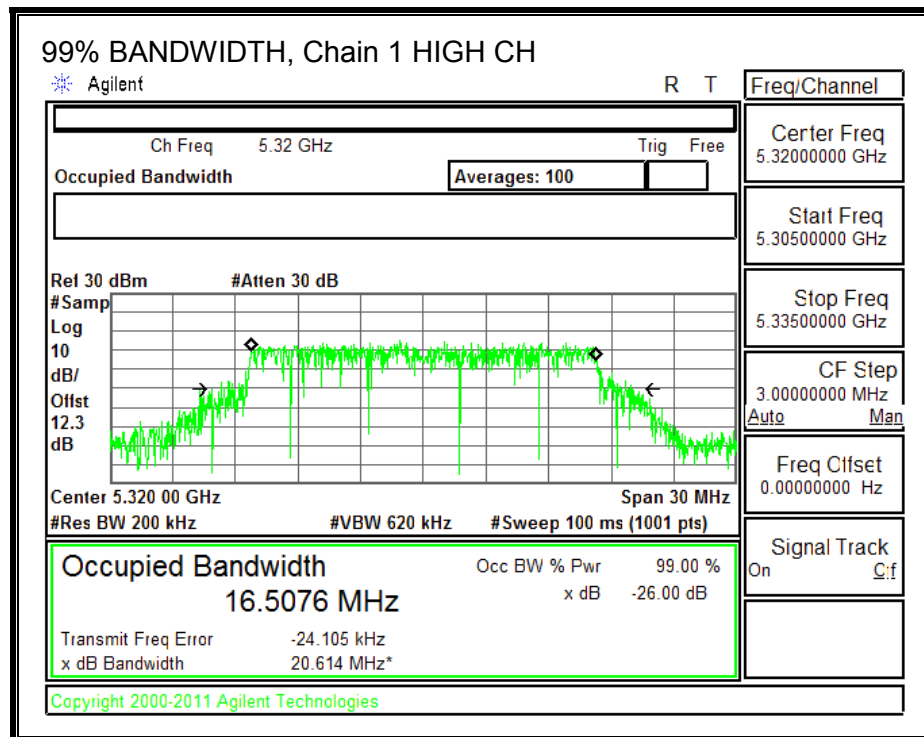
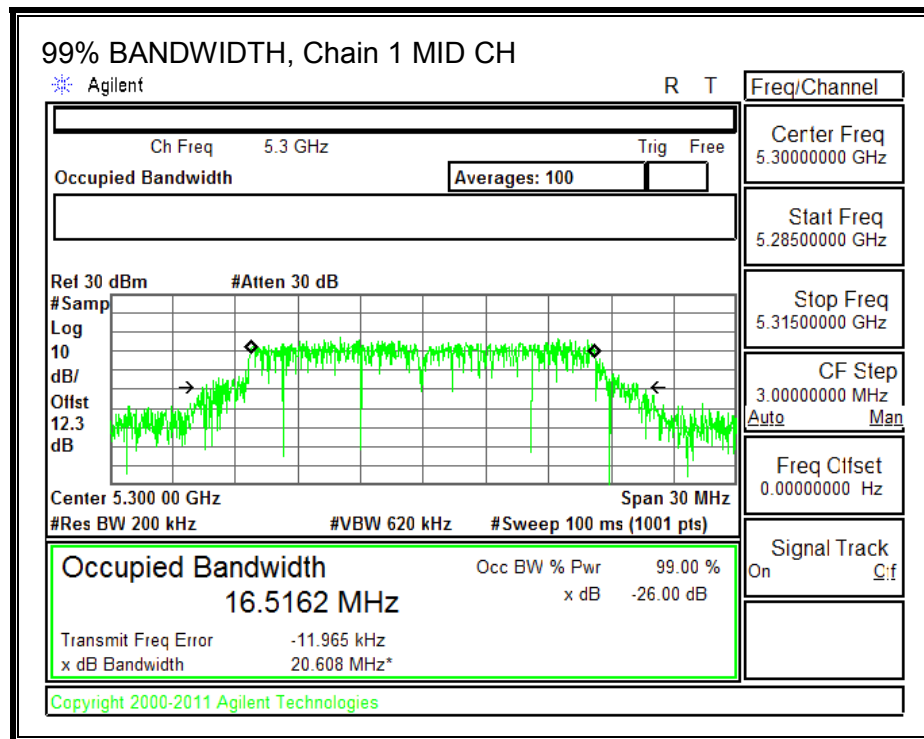
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 9.15.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.05                                | 3.33                                | 3.19                                                |

## **RESULTS**

### **Bandwidth, Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<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     | 5260               | 21.60                       | 3.19                                      | 3.19                                    | 24.00                   | 11.00                 |
| Mid     | 5300               | 21.57                       | 3.19                                      | 3.19                                    | 24.00                   | 11.00                 |
| High    | 5320               | 21.72                       | 3.19                                      | 3.19                                    | 24.00                   | 11.00                 |

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

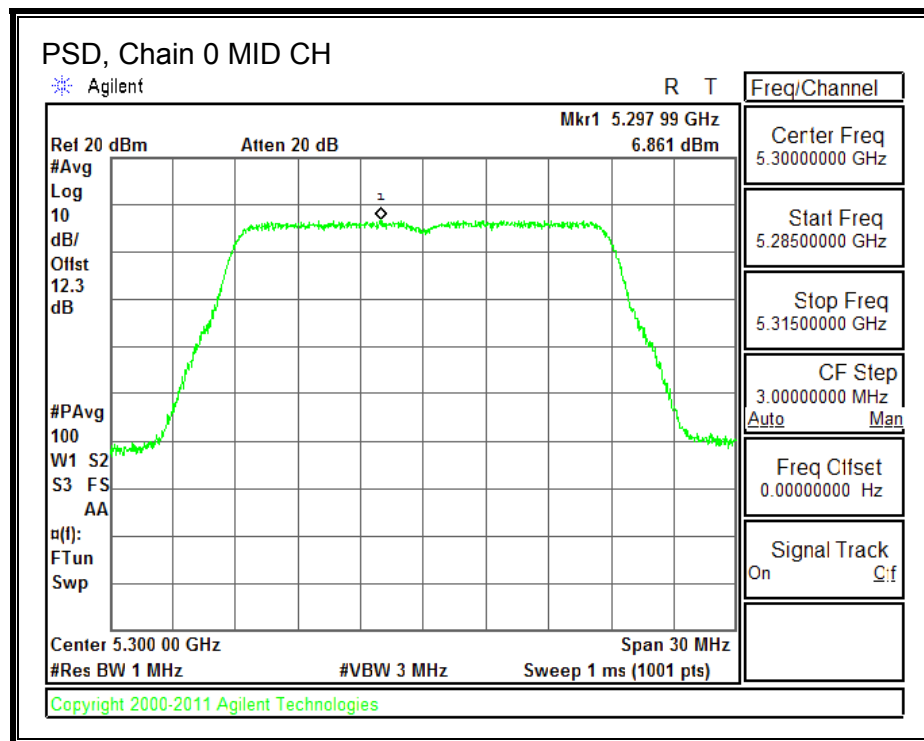
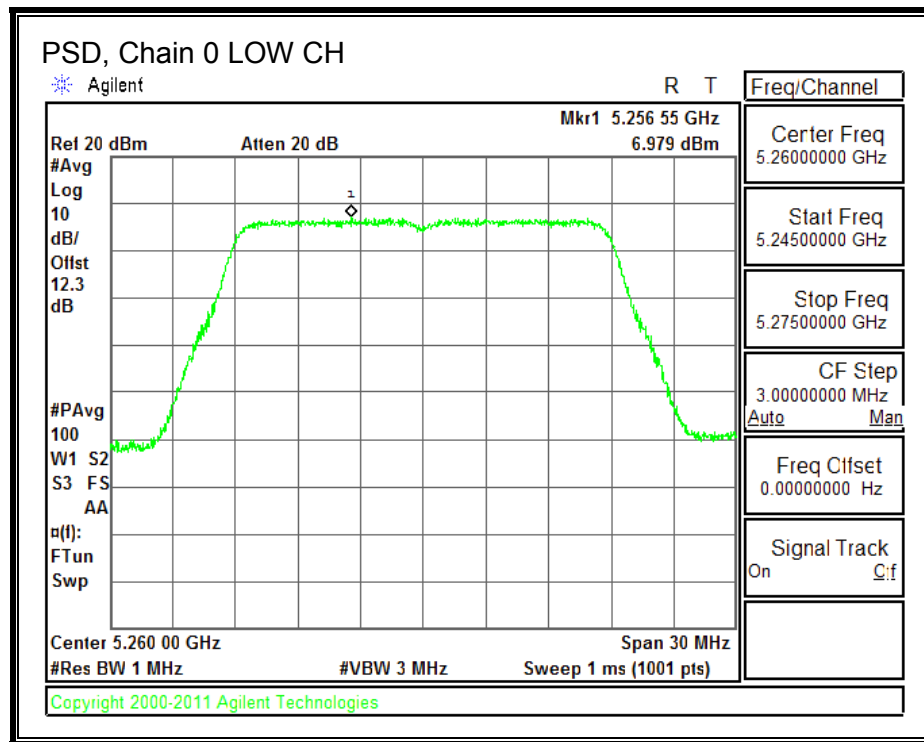
### **Output Power Results**

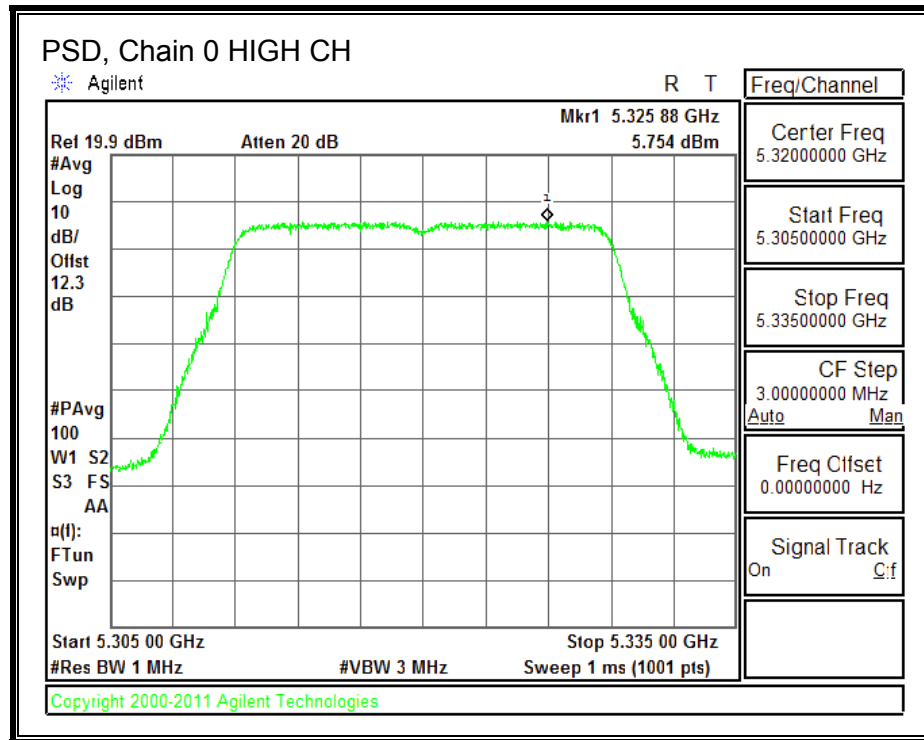
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5260               | 16.95                             | 16.98                             | 19.98                             | 24.00                   | -4.02                   |
| Mid     | 5300               | 16.92                             | 16.97                             | 19.96                             | 24.00                   | -4.04                   |
| High    | 5320               | 16.12                             | 16.45                             | 19.30                             | 24.00                   | -4.70                   |

### **PSD Results**

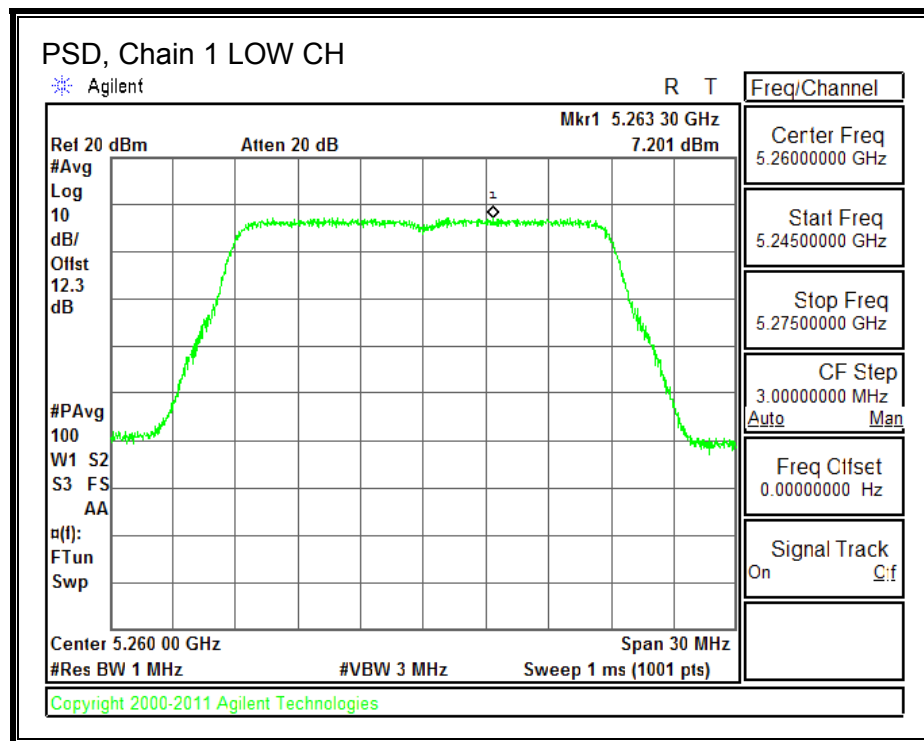
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5260               | 6.98                            | 7.20                            | 10.10                           | 11.00                 | -0.90                 |
| Mid     | 5300               | 6.86                            | 6.96                            | 9.92                            | 11.00                 | -1.08                 |
| High    | 5320               | 5.75                            | 6.45                            | 9.12                            | 11.00                 | -1.88                 |

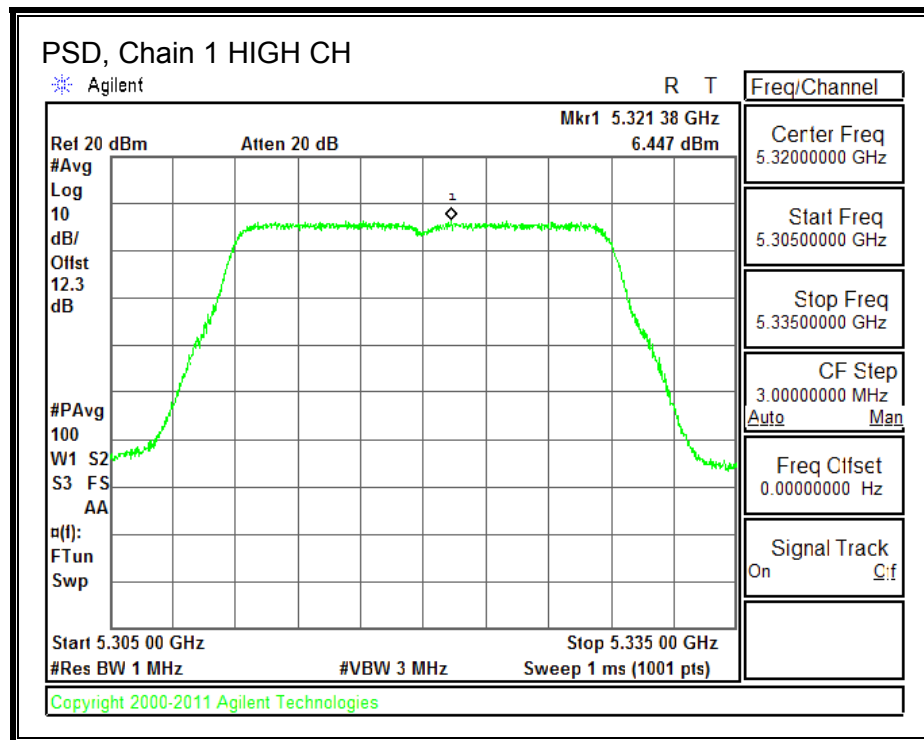
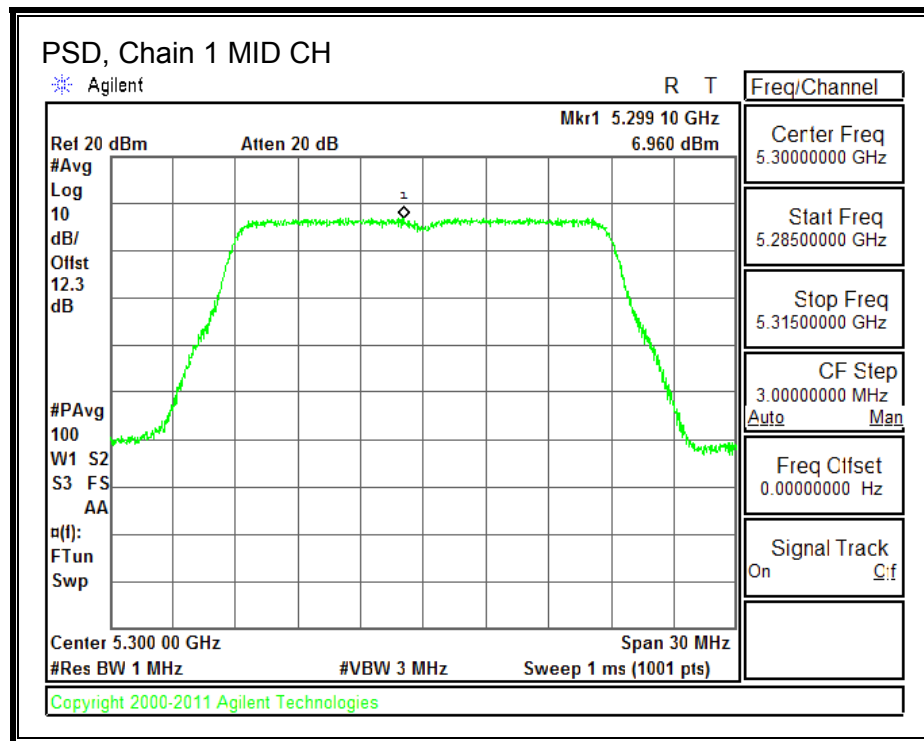
**PSD, Chain 0**





**PSD, Chain 1**





## **9.16. 802.11ac VHT20 2TX BF IN THE 5.3 GHz BAND**

Refer to Section 9.14, 802.11n HT20 2TX CDD MODE IN THE 5.3 GHz BAND

The power per chain used for 802.11n HT20 2TX CDD IN THE 5.3 GHz mode is the same power per chain that will be for 802.11n HT20 2TX BF IN THE 5.3 GHz mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated antenna gain for this mode shows it is still compliant.

### **9.16.1. OUTPUT POWER**

#### **LIMITS**

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **DIRECTIONAL ANTENNA GAIN**

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

| <b>Chain 0<br/>Antenna<br/>Gain<br/>(dBi)</b> | <b>Chain 1<br/>Antenna<br/>Gain<br/>(dBi)</b> | <b>Correlated Chains<br/>Directional<br/>Gain<br/>(dBi)</b> |
|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|
| 3.05                                          | 3.33                                          | 6.20                                                        |

## **RESULTS**

### **Bandwidth, Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Power<br>Limit<br>(dBm) |
|---------|--------------------|-----------------------------|-------------------------------------------|-------------------------|
| Low     | 5260               | 21.96                       | 6.20                                      | 23.80                   |
| Mid     | 5300               | 22.02                       | 6.20                                      | 23.80                   |
| High    | 5320               | 21.84                       | 6.20                                      | 23.80                   |

|                           |      |                                                 |
|---------------------------|------|-------------------------------------------------|
| <b>Duty Cycle CF (dB)</b> | 0.12 | <b>Included in Calculations of Corr'd Power</b> |
|---------------------------|------|-------------------------------------------------|

### **Output Power Results**

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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     | 5260               | 15.97                             | 15.98                             | 19.11                             | 23.80                   | -4.69                   |
| Mid     | 5300               | 15.95                             | 15.97                             | 19.09                             | 23.80                   | -4.71                   |
| High    | 5320               | 15.98                             | 15.93                             | 19.09                             | 23.80                   | -4.71                   |

## **9.17. 802.11n 1TX HT40 MODE IN THE 5.3 GHz BAND**

### **9.17.1. 26 dB BANDWIDTH**

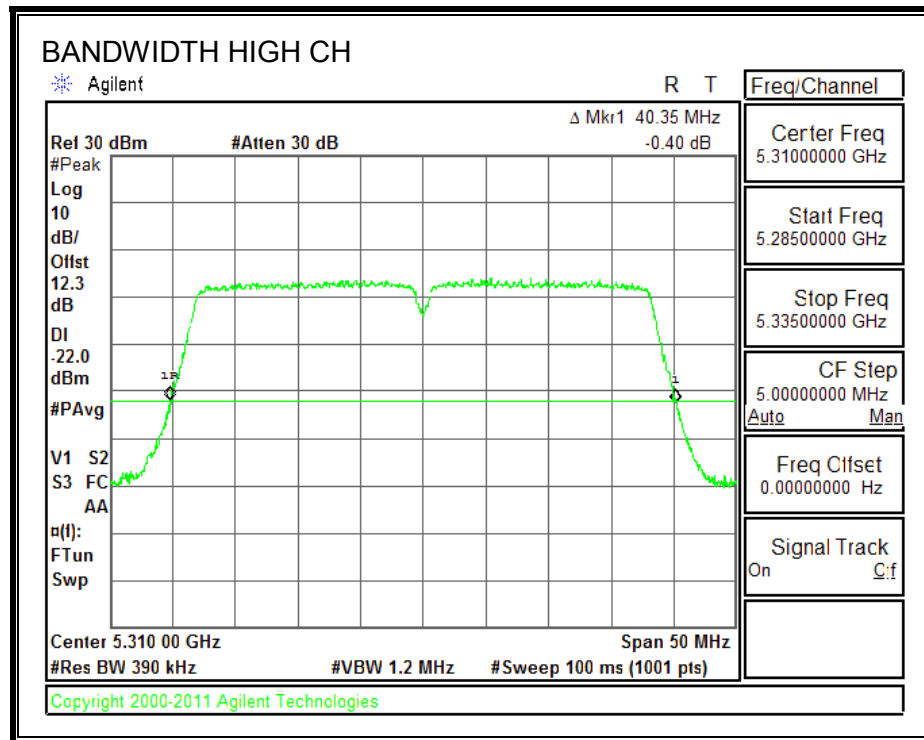
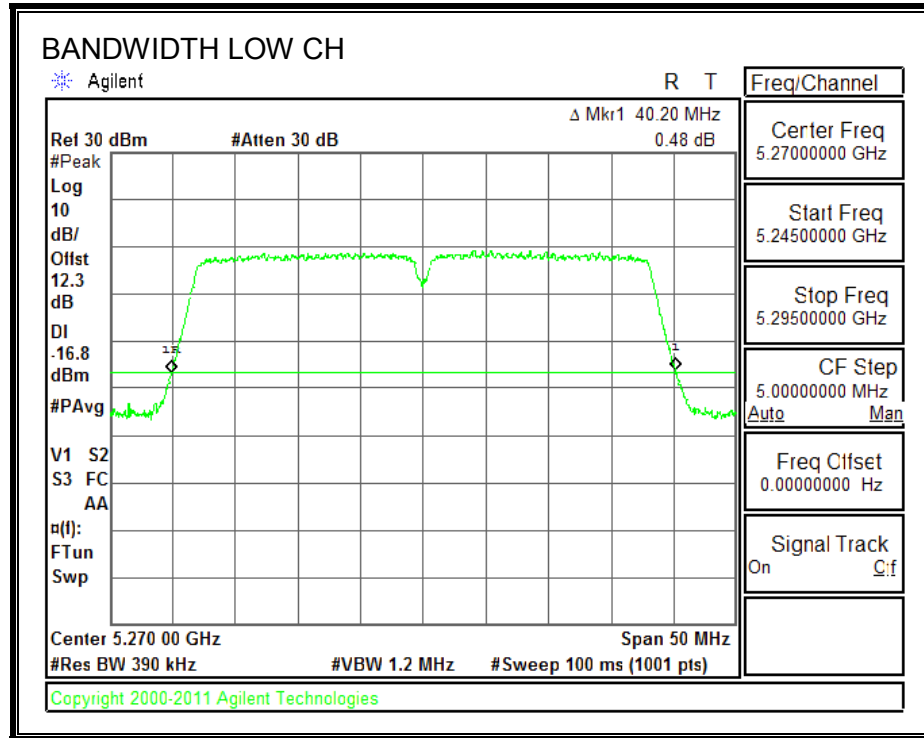
#### **LIMITS**

None; for reporting purposes only.

#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5270               | 40.20                    |
| High    | 5310               | 40.35                    |

## 26 dB BANDWIDTH



## 9.17.2. 99% BANDWIDTH

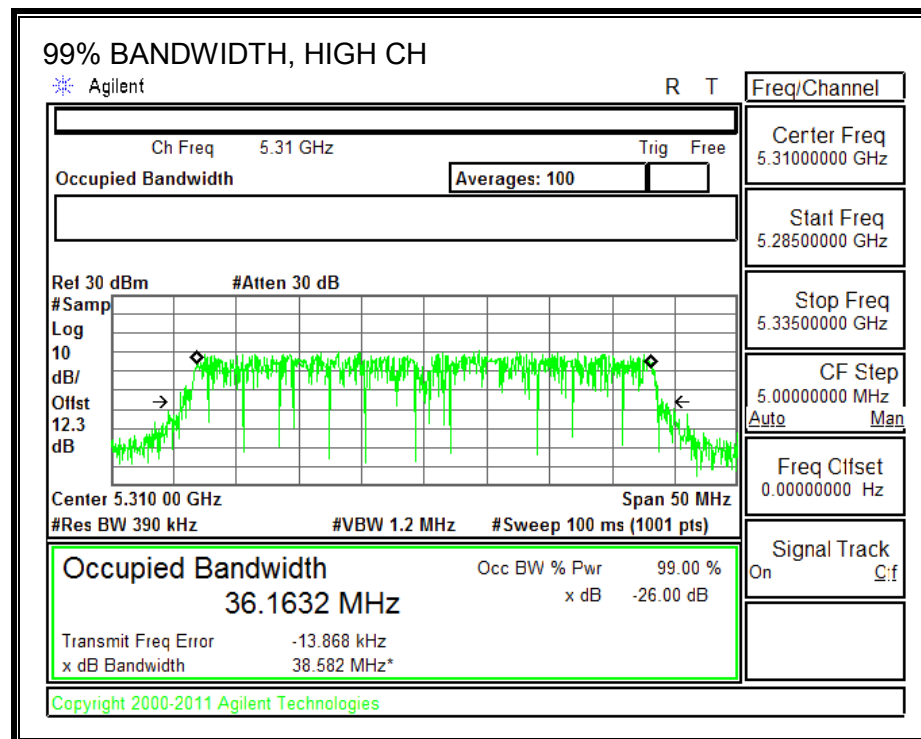
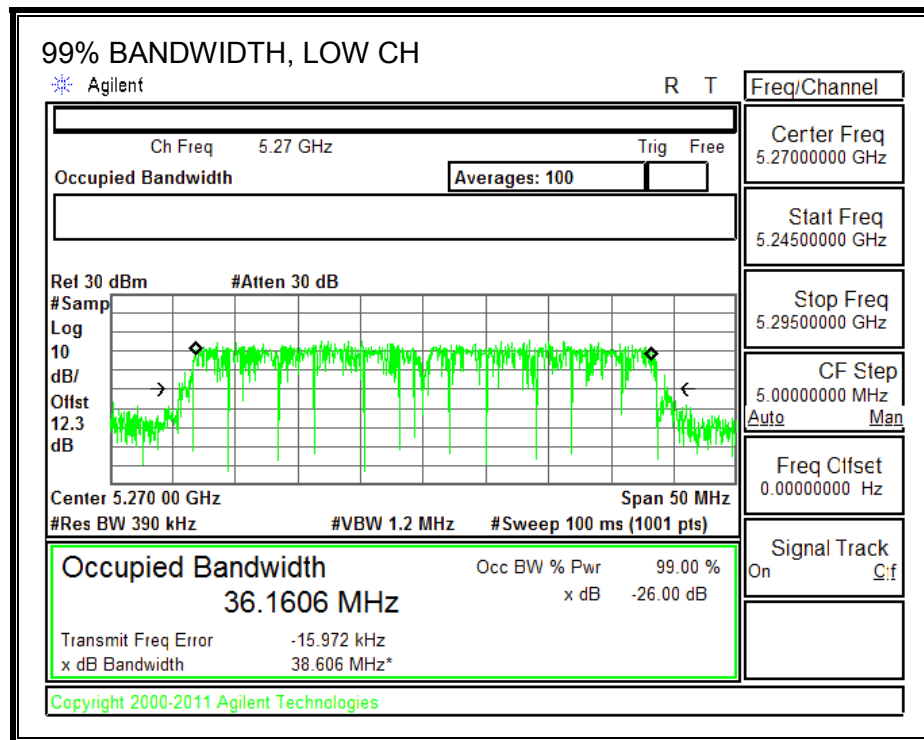
### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5270               | 36.1606                |
| High    | 5310               | 36.1632                |

**99% BANDWIDTH**



### 9.17.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.05                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.33                     |

## **RESULTS**

### **Bandwidth, Antenna Gain, and Limits**

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|-----------------------------|------------------------------|-------------------------|-----------------------|
| Low     | 5270               | 40.20                       | 3.33                         | 24.00                   | 11.00                 |
| High    | 5310               | 40.35                       | 3.33                         | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

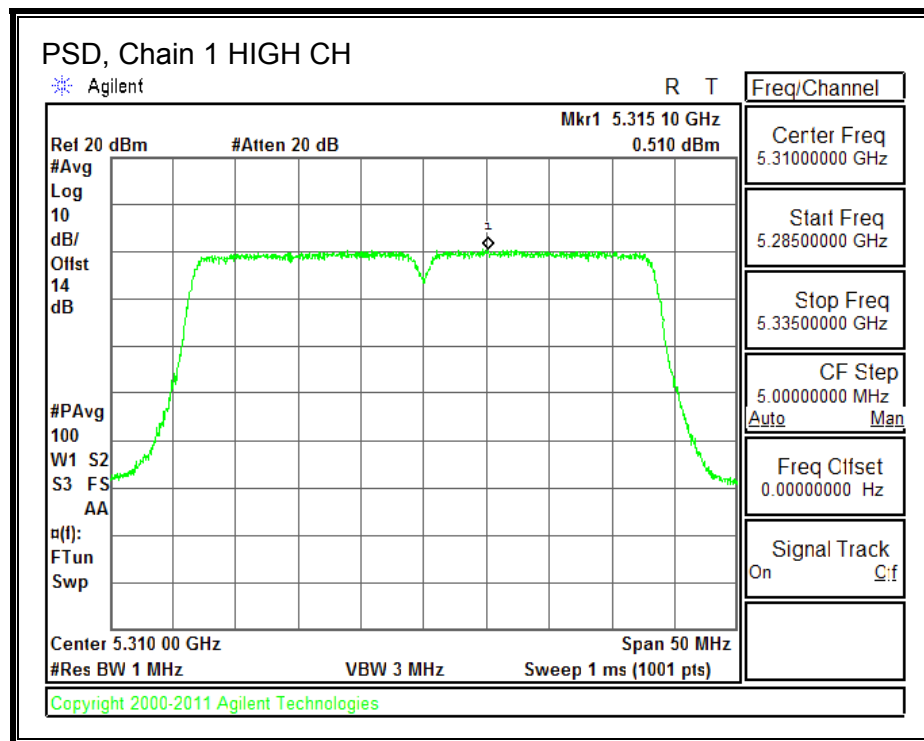
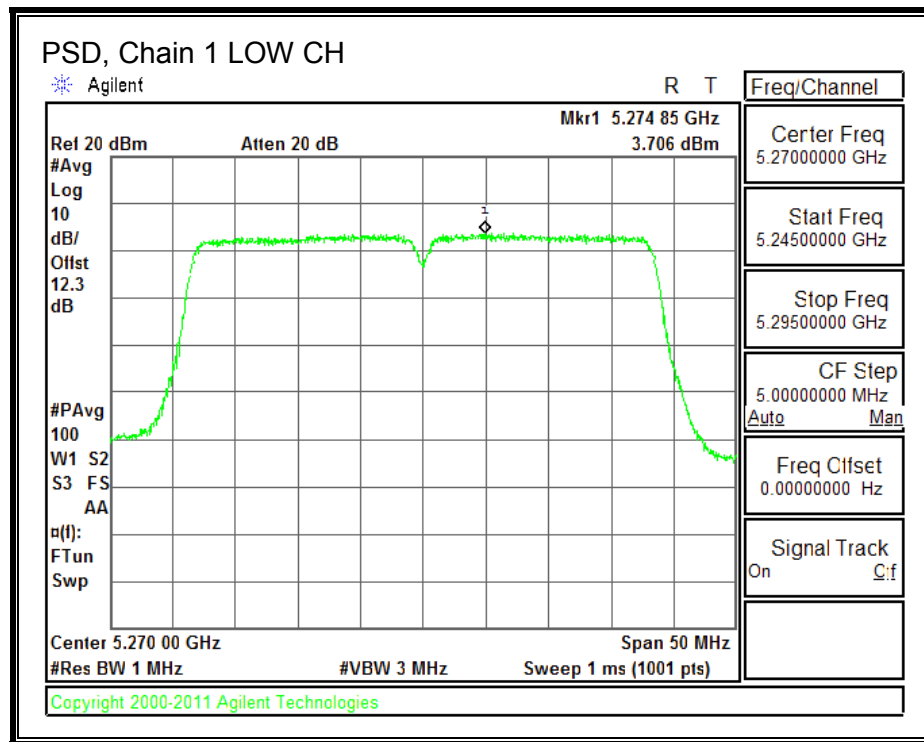
### **Output Power Results**

| Channel | Frequency<br>(MHz) | Chain 1<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     | 5270               | 17.91                             | 17.91                             | 24.00                   | -6.09                   |
| High    | 5310               | 14.49                             | 14.49                             | 24.00                   | -9.51                   |

### **PSD Results**

| Channel | Frequency<br>(MHz) | Chain 1<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     | 5270               | 3.71                            | 3.71                            | 11.00                 | -7.29                 |
| High    | 5310               | 0.51                            | 0.51                            | 11.00                 | -10.49                |

**PSD, Chain 1**



## 9.18. 802.11n HT40 2TX CDD MODE IN THE 5.3 GHz BAND

### 9.18.1. 26 dB BANDWIDTH

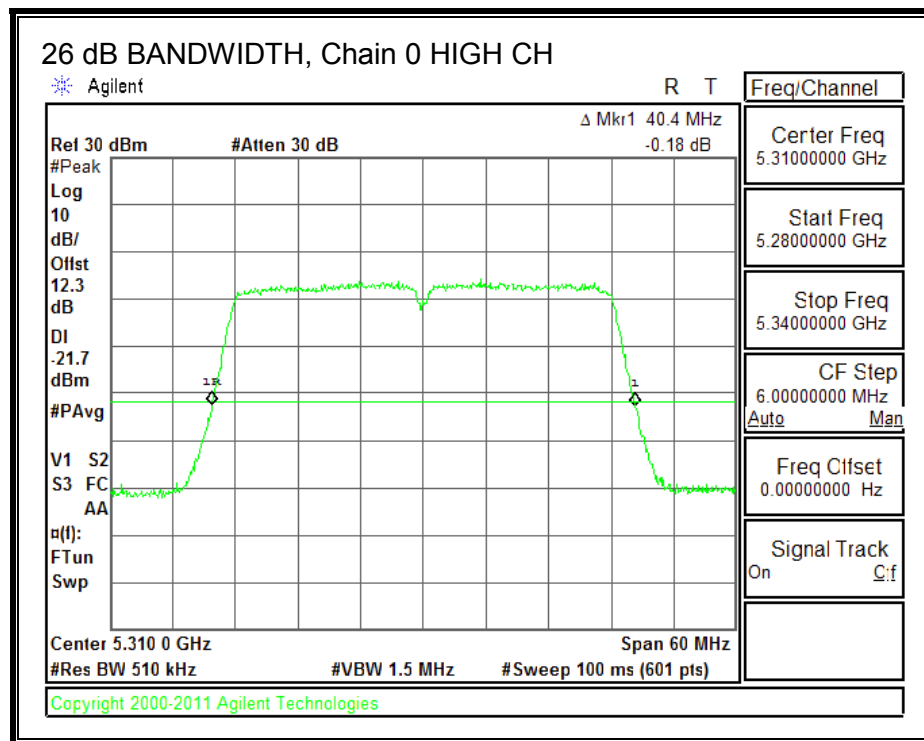
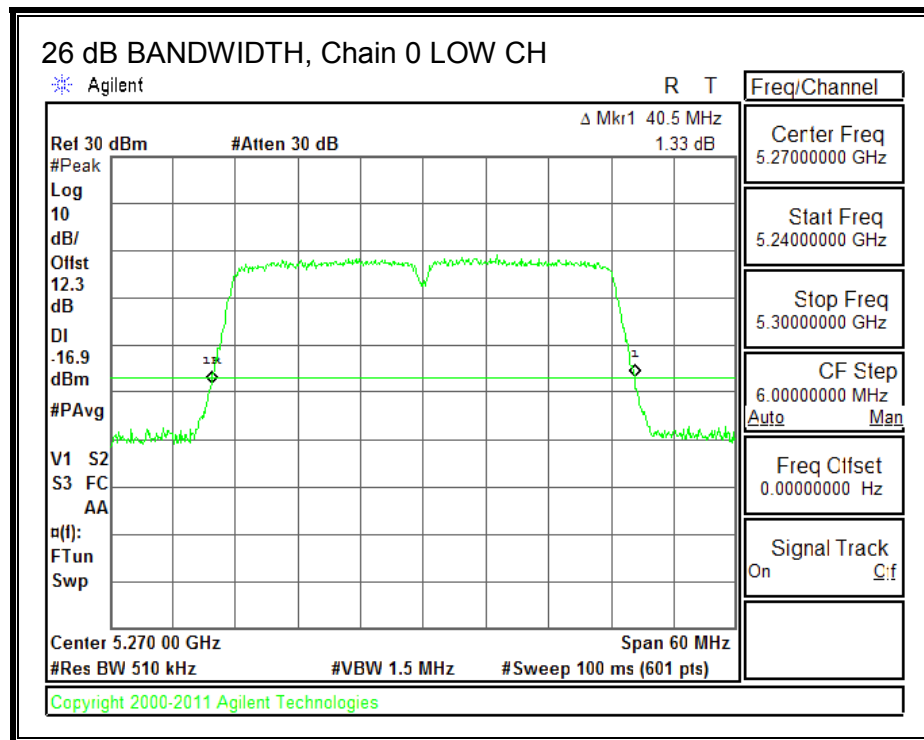
#### LIMITS

None; for reporting purposes only.

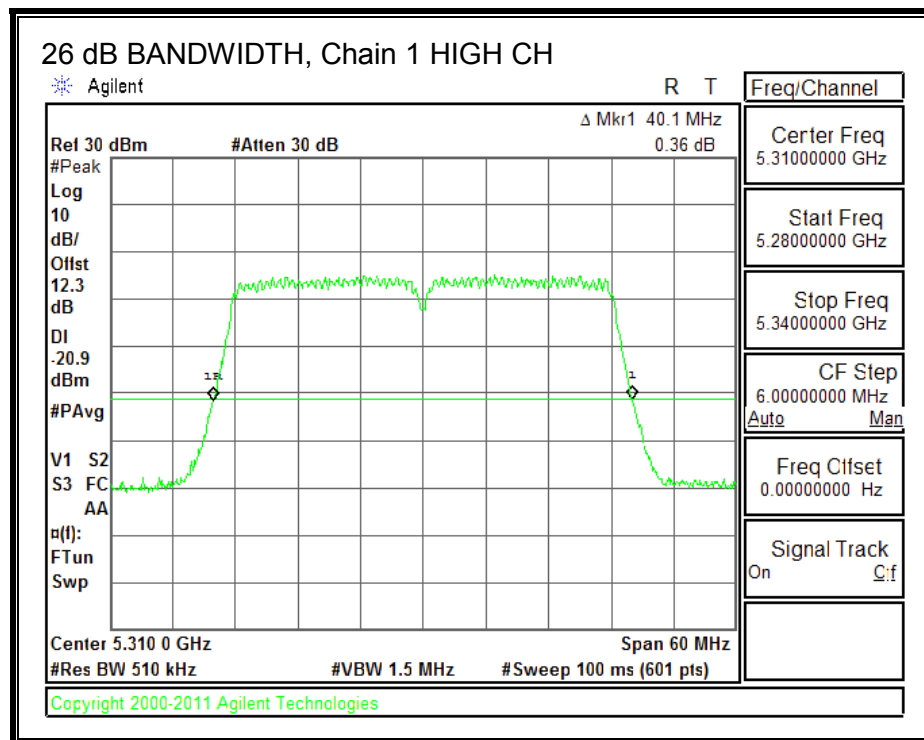
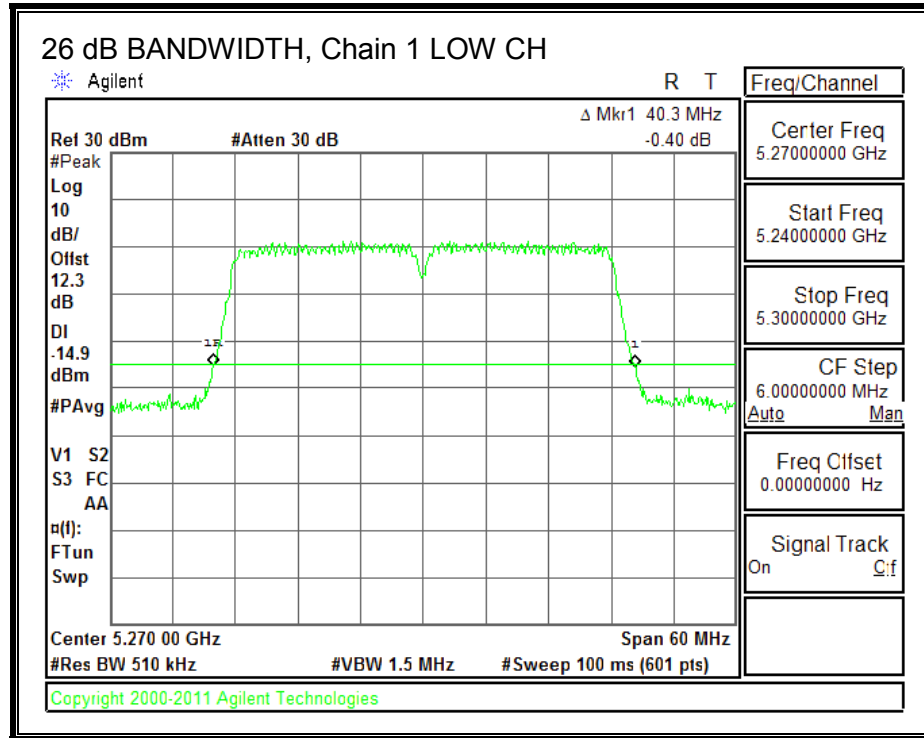
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5270               | 40.50                        | 40.30                        |
| High    | 5310               | 40.40                        | 40.10                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.18.2. 99% BANDWIDTH

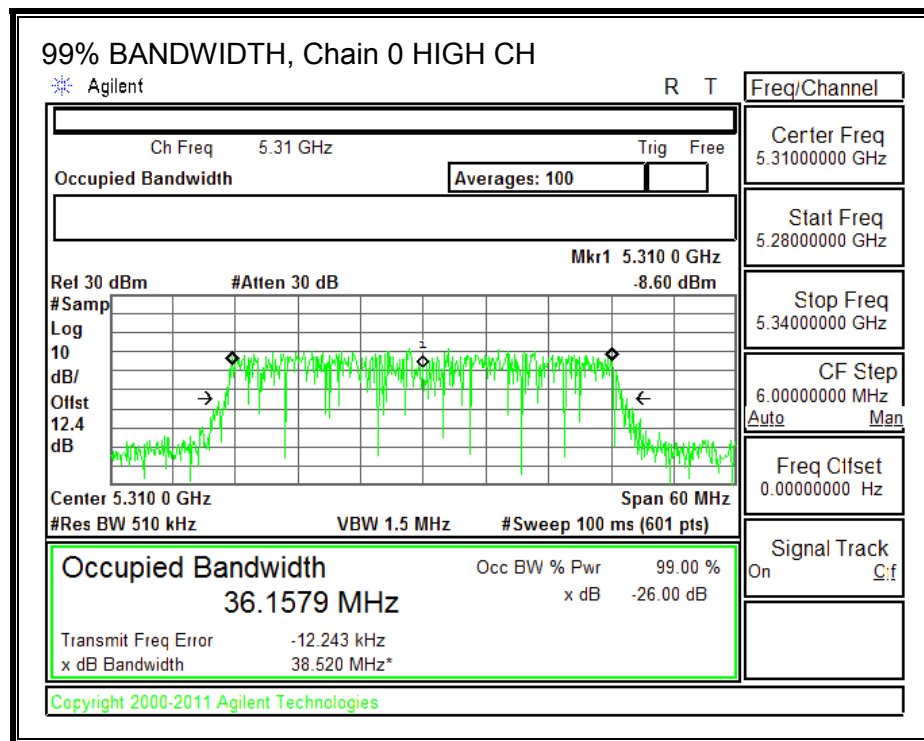
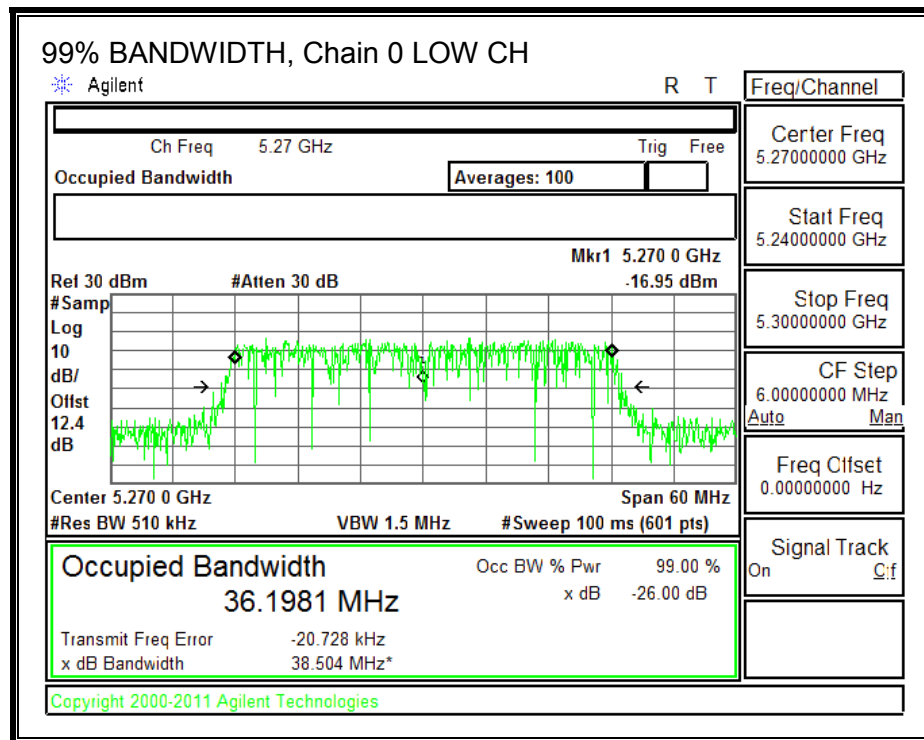
### LIMITS

None; for reporting purposes only.

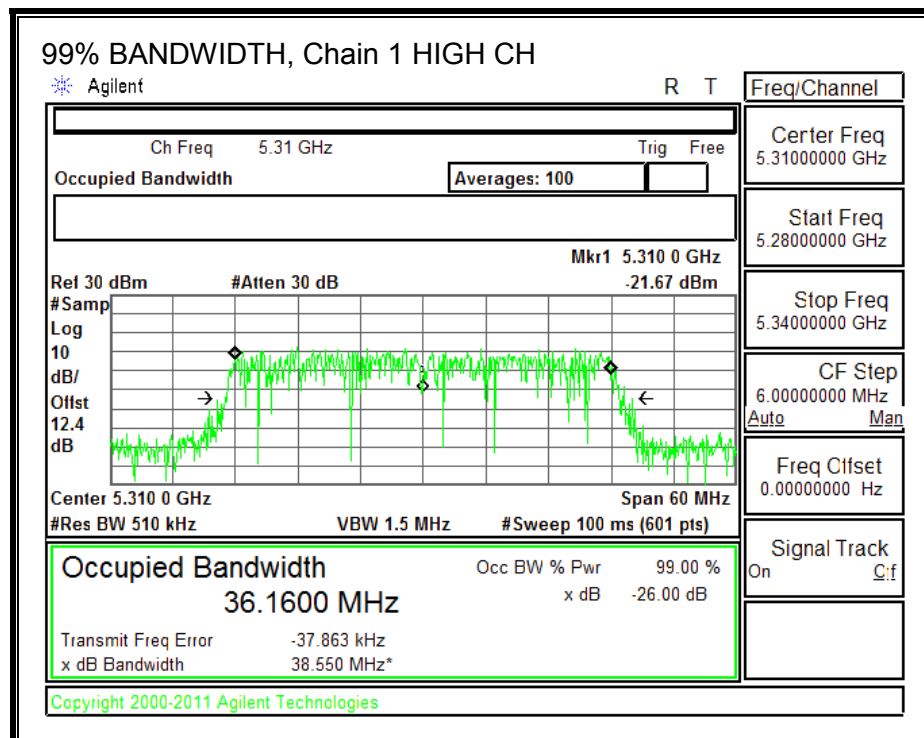
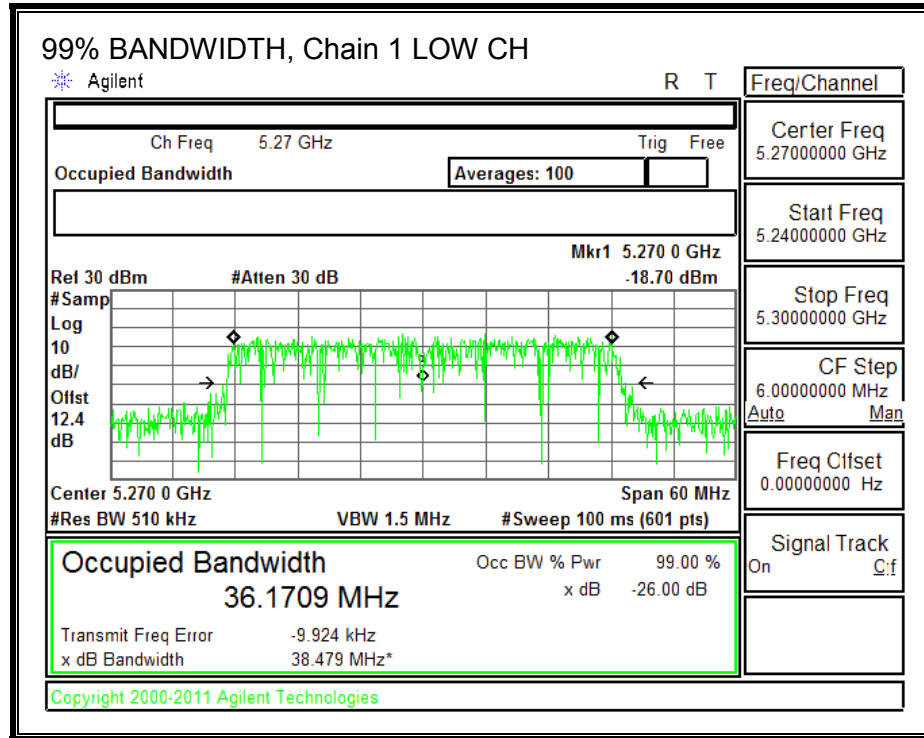
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5270               | 36.1981                    | 36.1709                    |
| High    | 5310               | 36.1579                    | 36.1600                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.18.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.05                                | 3.33                                | 3.19                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.05                                | 3.33                                | 6.20                                              |

## RESULTS

### Bandwidth, Antenna Gain and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<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     | 5270               | 40.30                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |
| High    | 5310               | 40.10                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

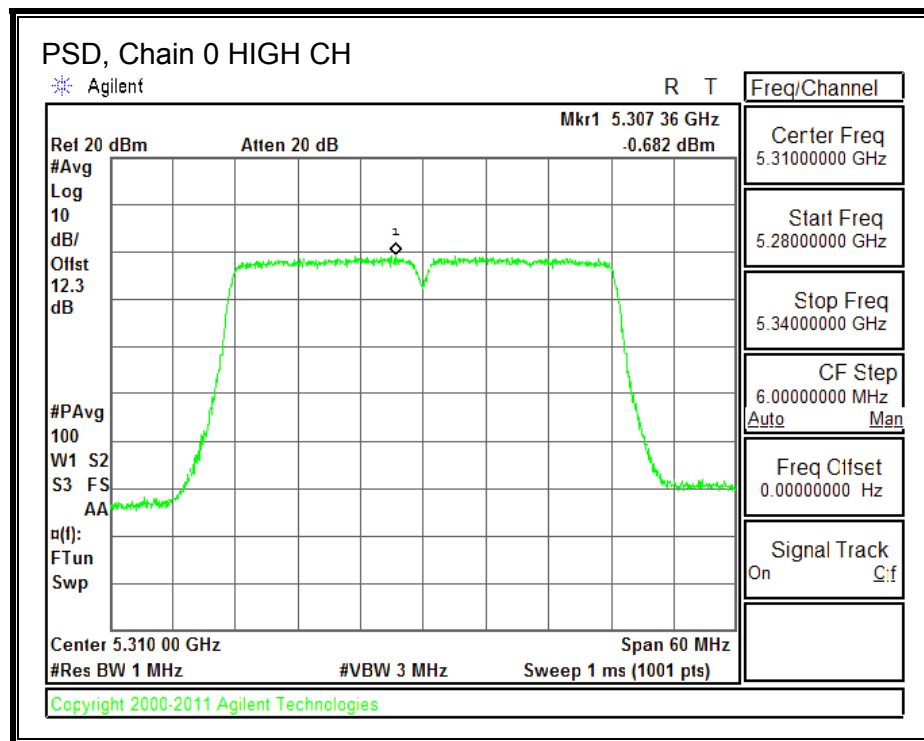
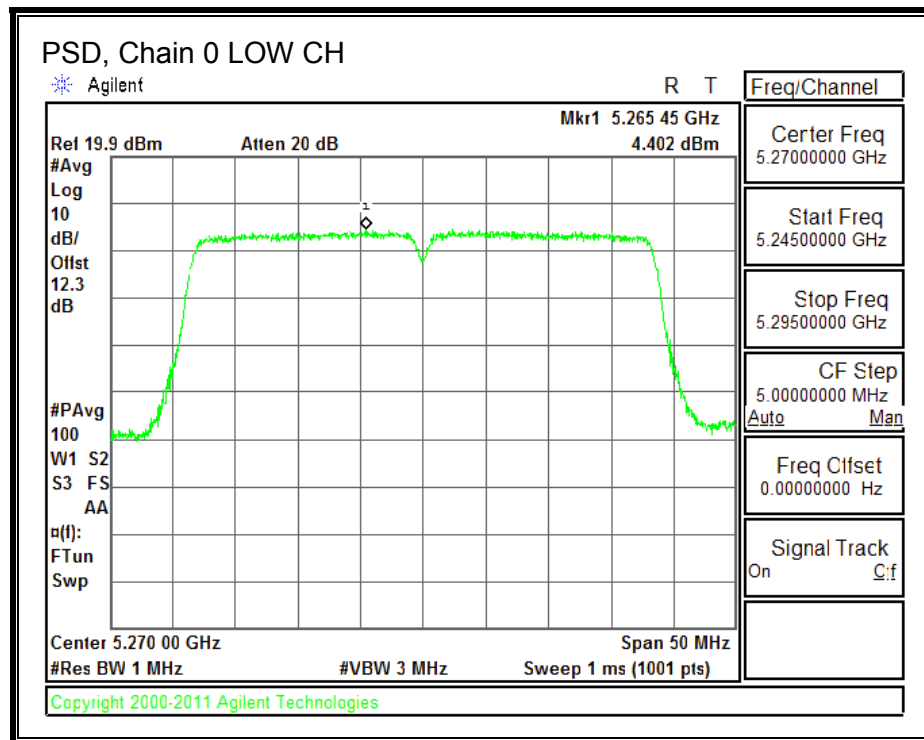
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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     | 5270               | 17.85                             | 17.76                             | 20.82                             | 24.00                   | -3.18                   |
| High    | 5310               | 12.72                             | 12.92                             | 15.83                             | 24.00                   | -8.17                   |

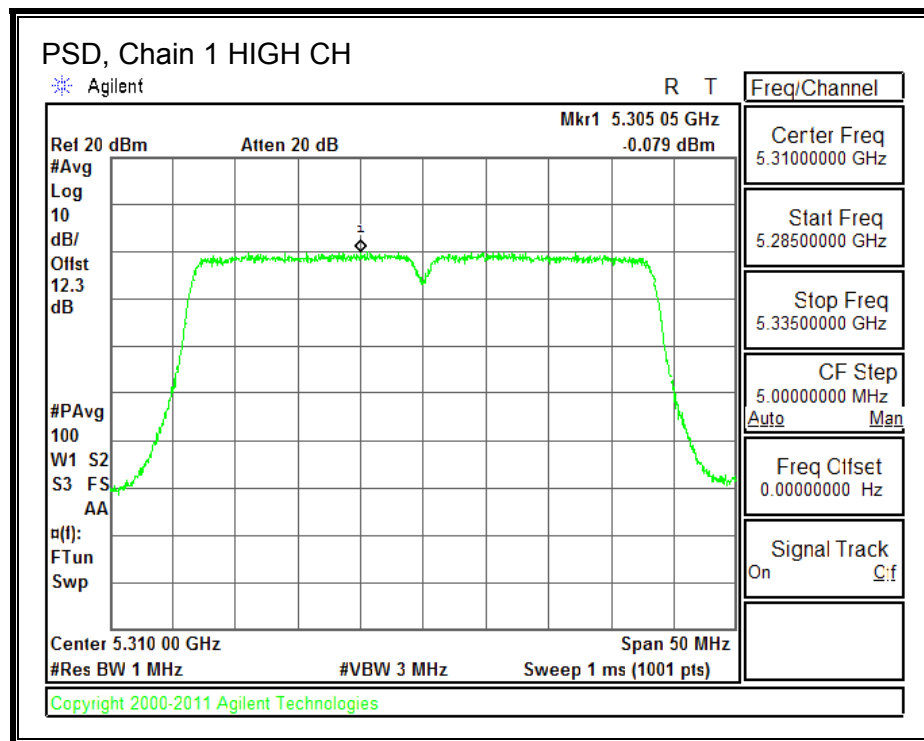
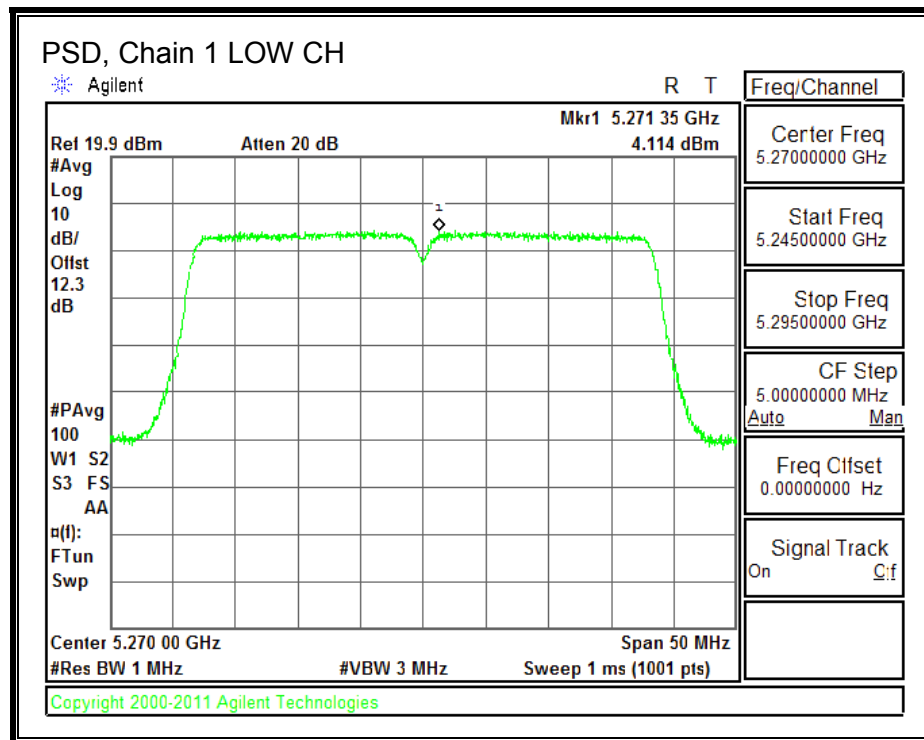
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<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     | 5270               | 4.40                            | 4.11                            | 7.27                            | 10.80                 | -3.53                 |
| High    | 5310               | -0.68                           | -0.08                           | 2.64                            | 10.80                 | -8.16                 |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.19. 802.11n HT40 2TX STBC MODE IN THE 5.3 GHz BAND

### 9.19.1. 26 dB BANDWIDTH

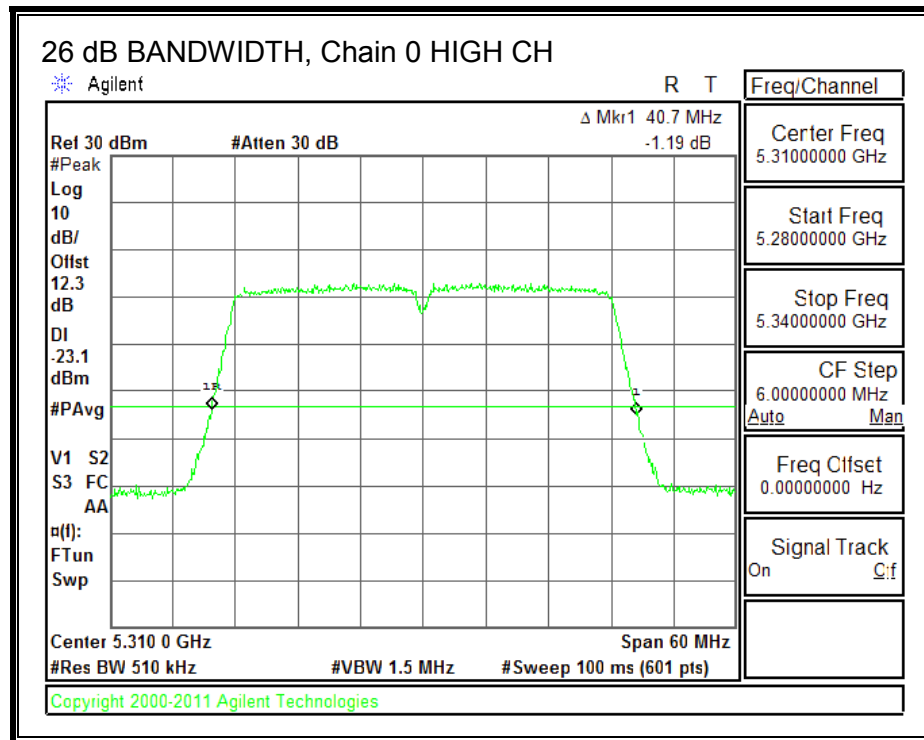
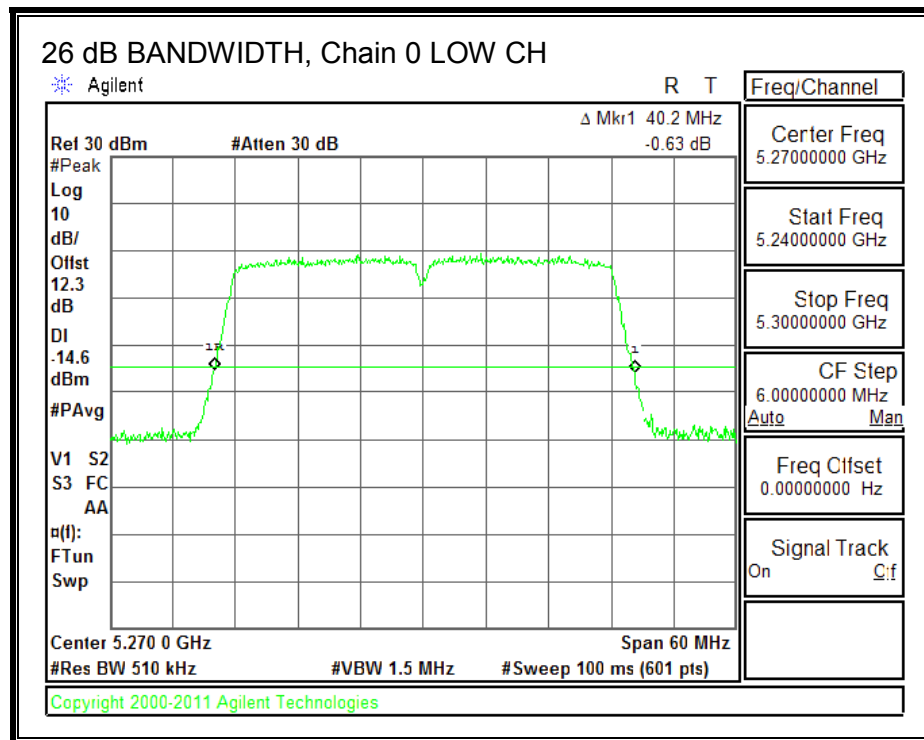
#### LIMITS

None; for reporting purposes only.

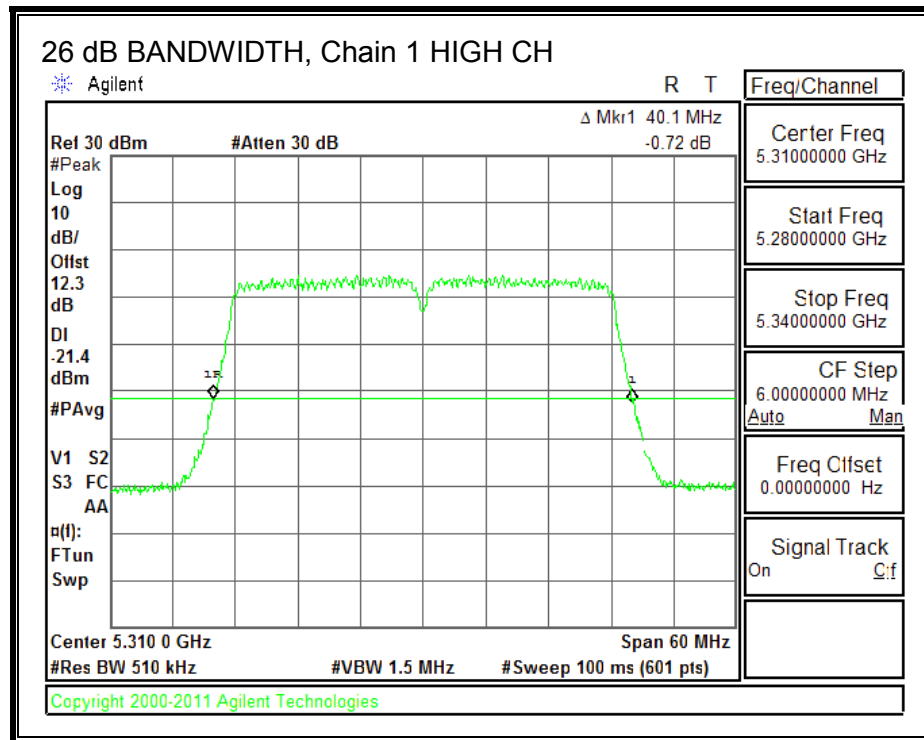
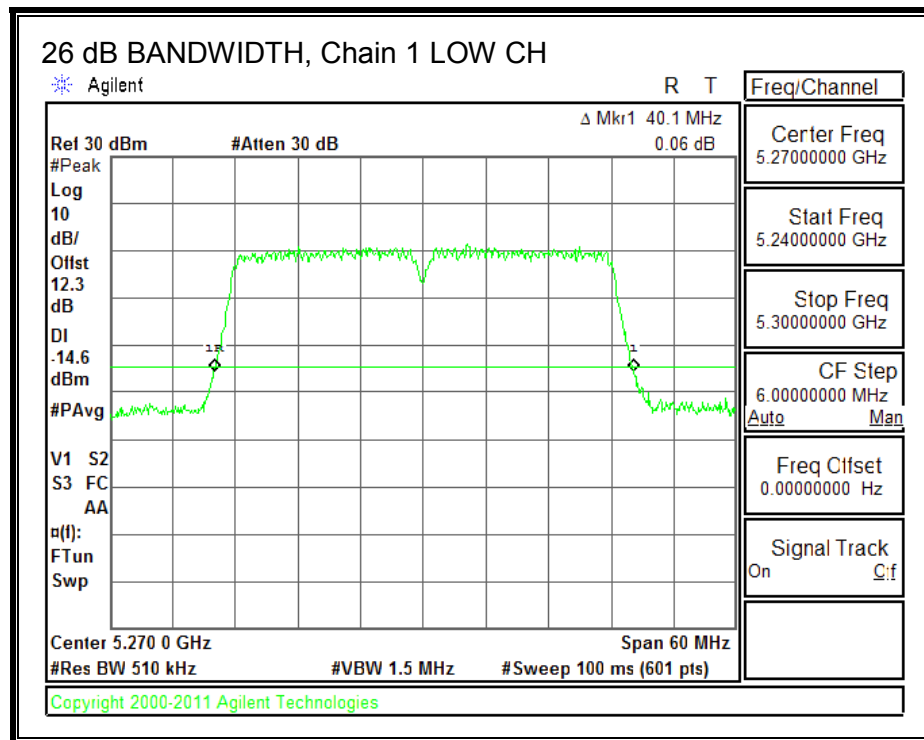
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5270               | 40.20                        | 40.10                        |
| High    | 5310               | 40.70                        | 40.10                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.19.2. 99% BANDWIDTH

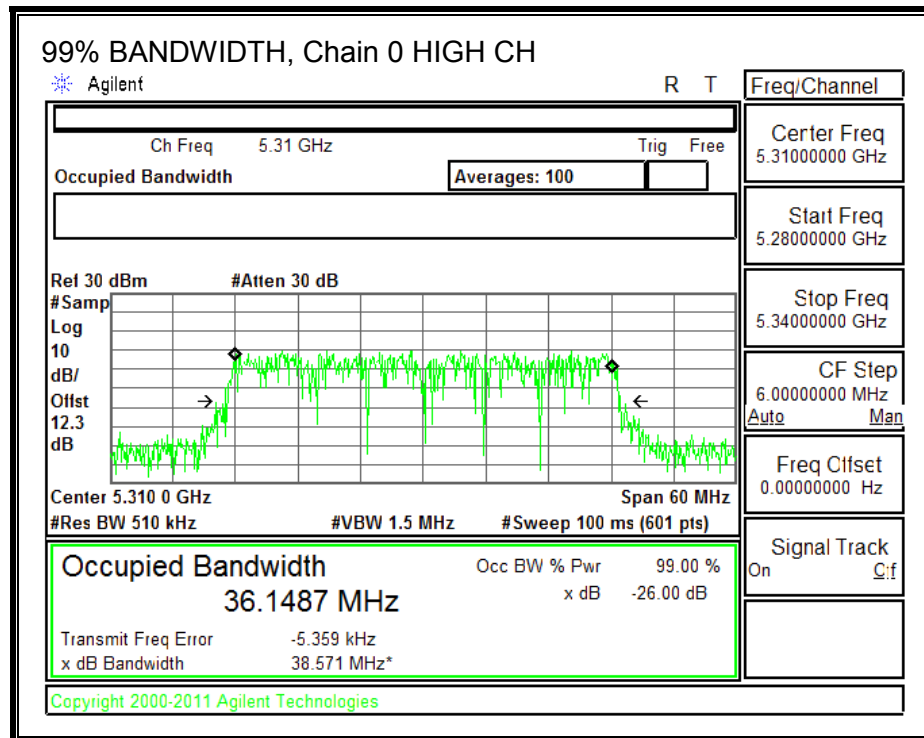
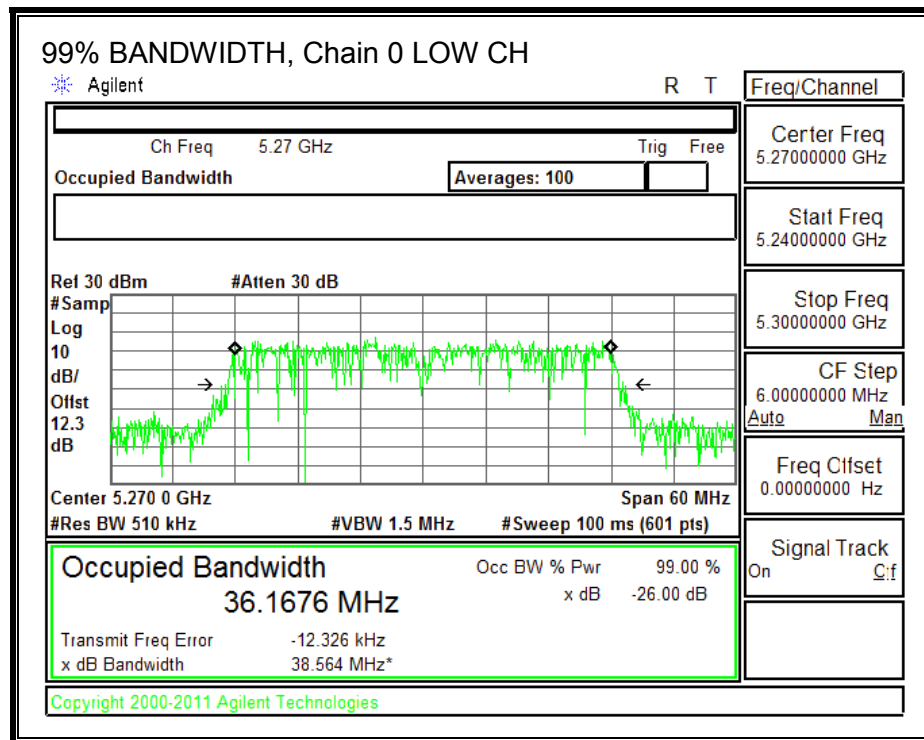
### LIMITS

None; for reporting purposes only.

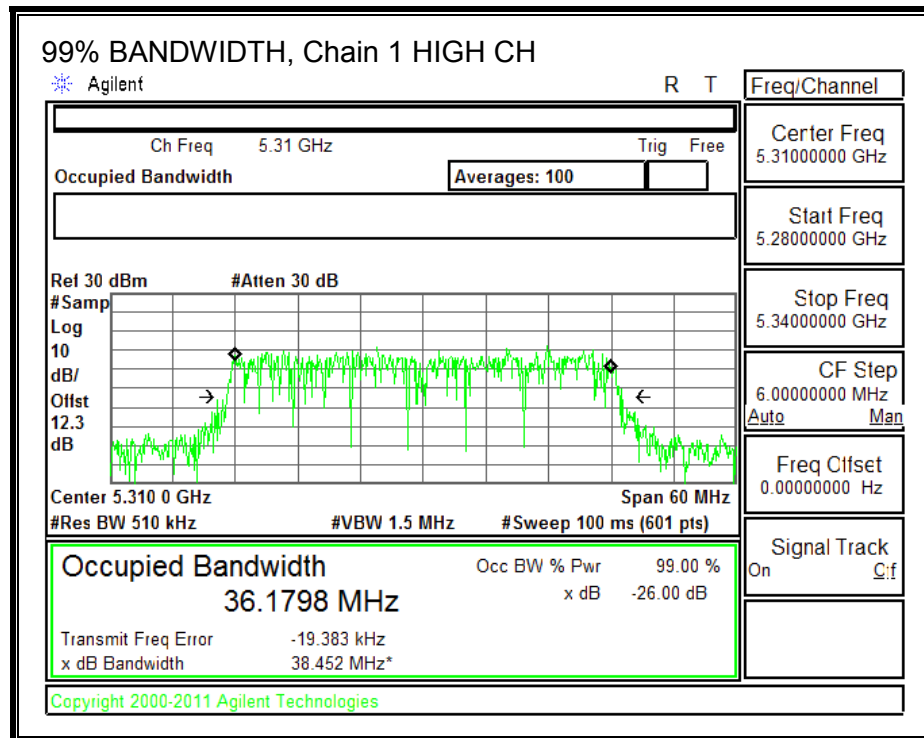
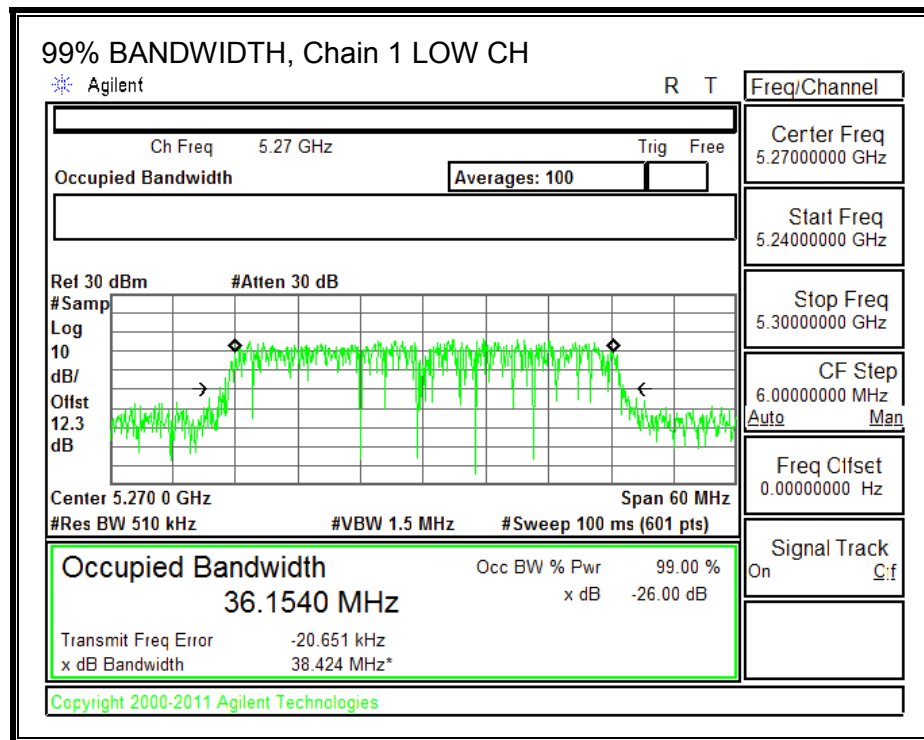
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5270               | 36.1676                    | 36.1540                    |
| High    | 5310               | 36.1487                    | 36.1798                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.19.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.05                                | 3.33                                | 3.19                                                |

## **RESULTS**

### **Bandwidth, Antenna Gain and Limits**

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<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     | 5270               | 40.10                       | 3.19                                      | 3.19                                    | 24.00                   | 11.00                 |
| High    | 5310               | 40.10                       | 3.19                                      | 3.19                                    | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

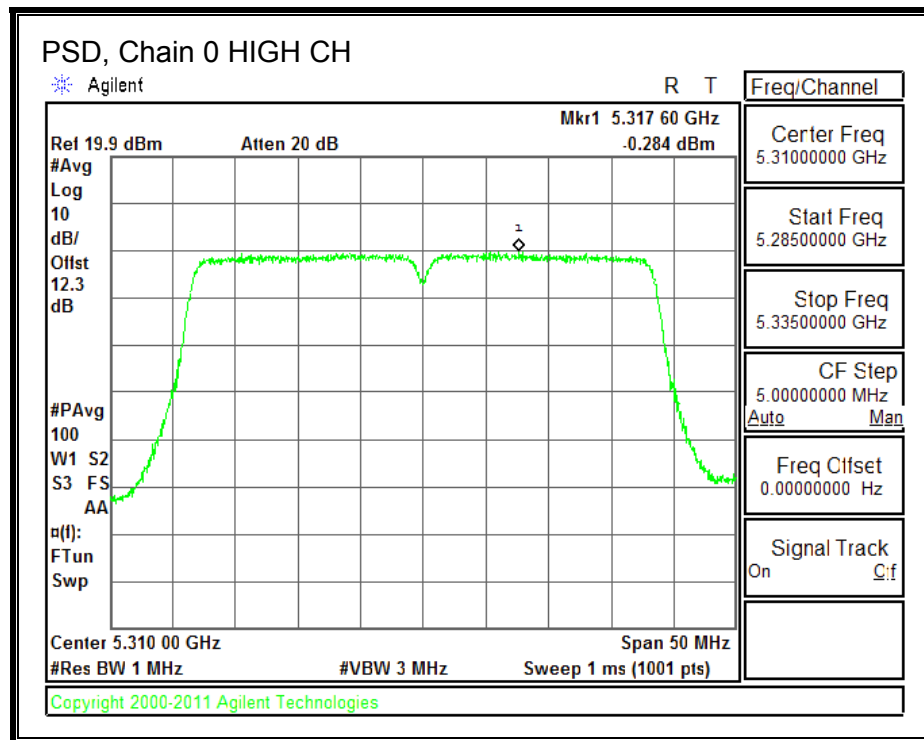
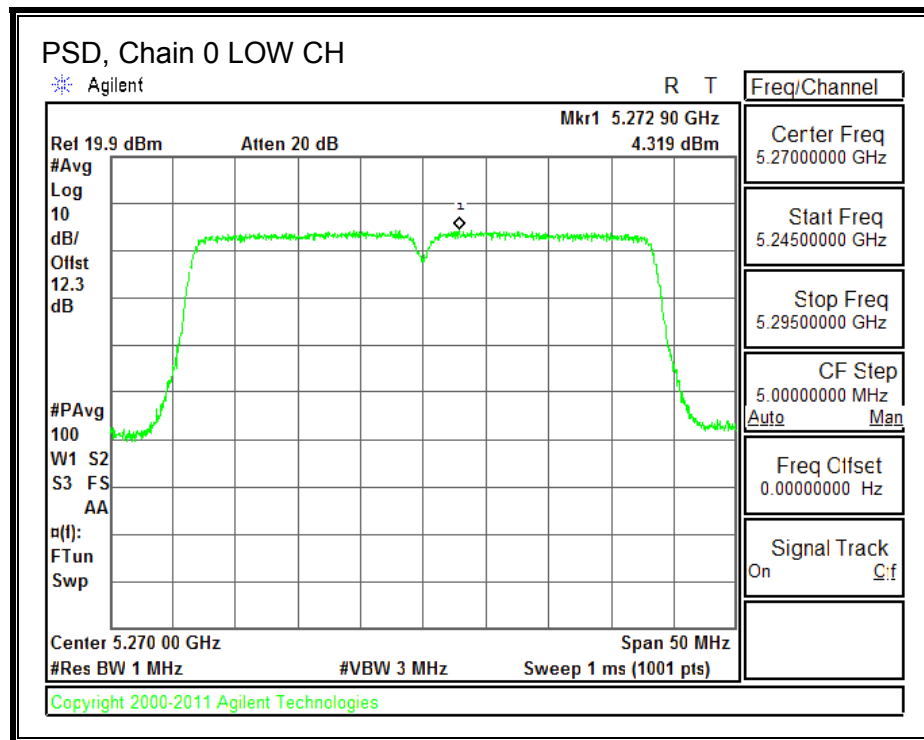
### **Output Power Results**

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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     | 5270               | 17.71                             | 17.74                             | 20.74                             | 24.00                   | -3.26                   |
| High    | 5310               | 12.83                             | 12.85                             | 15.85                             | 24.00                   | -8.15                   |

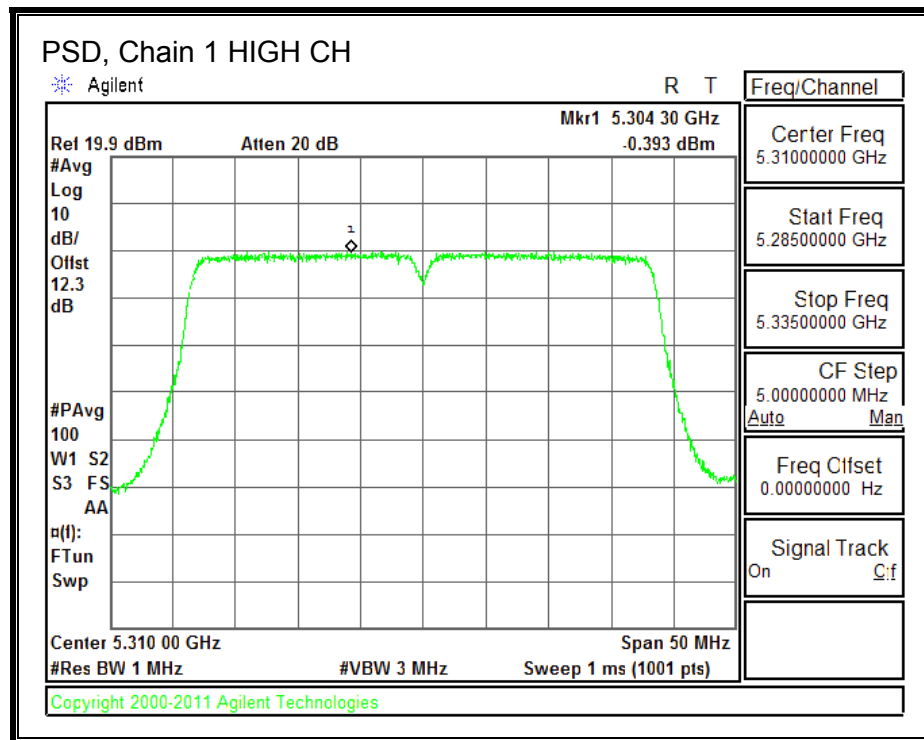
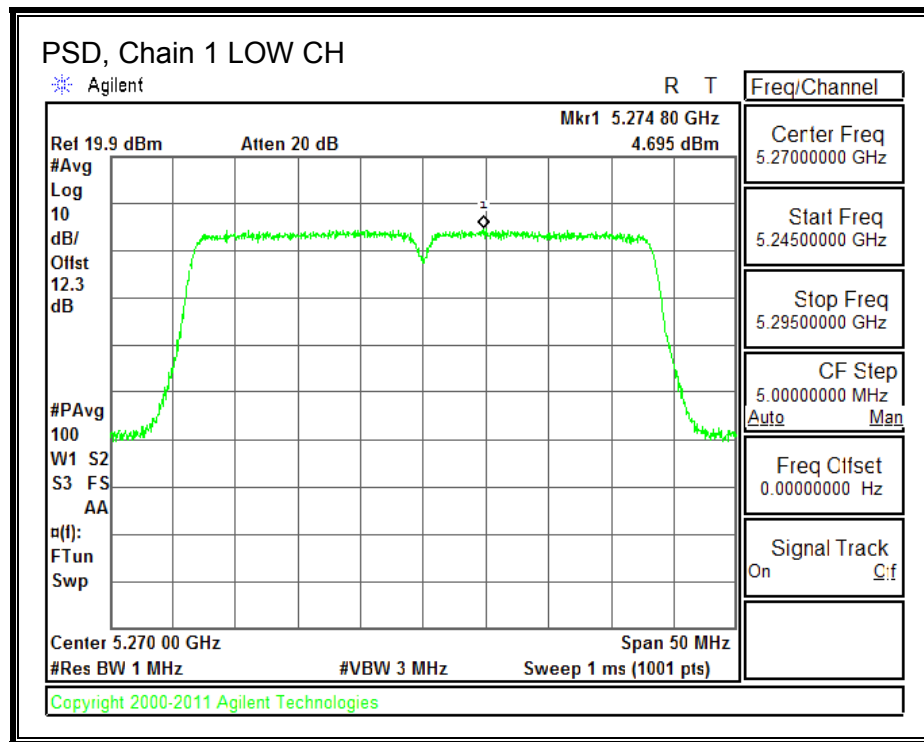
### **PSD Results**

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<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     | 5270               | 4.32                            | 4.70                            | 7.52                            | 11.00                 | -3.48                 |
| High    | 5310               | -0.28                           | -0.39                           | 2.67                            | 11.00                 | -8.33                 |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.20. 802.11ac VHT40 2TX BF IN THE 5.3 GHz BAND

Refer to Section 9.18, 802.11n HT40 2TX CDD MODE IN THE 5.3 GHz BAND

The power per chain used for 802.11n HT40 2TX CDD IN THE 5.3 GHz mode is the same power per chain that will be for 802.11n HT40 2TX BF IN THE 5.3 GHz mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated antenna gain for this mode shows it is still compliant.

### 9.20.1. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.05                                | 3.33                                | 6.20                                              |

## RESULTS

### Bandwidth, Antenna Gain and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Directional<br>Gain<br>for Power<br>(dBi) | Power<br>Limit<br>(dBm) |
|---------|--------------------|-----------------------------|-------------------------------------------|-------------------------|
| Low     | 5270               | 40.30                       | 6.20                                      | 23.80                   |
| High    | 5310               | 40.10                       | 6.20                                      | 23.80                   |

|                    |      |                                          |
|--------------------|------|------------------------------------------|
| Duty Cycle CF (dB) | 0.12 | Included in Calculations of Corr'd Power |
|--------------------|------|------------------------------------------|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<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     | 5270               | 17.85                             | 17.76                             | 20.94                             | 23.80                   | -2.86                   |
| High    | 5310               | 12.72                             | 12.92                             | 15.95                             | 23.80                   | -7.85                   |

## 9.21. 802.11ac VHT80 1TX MODE IN THE 5.3 GHz BAND

### 9.21.1. 26 dB BANDWIDTH

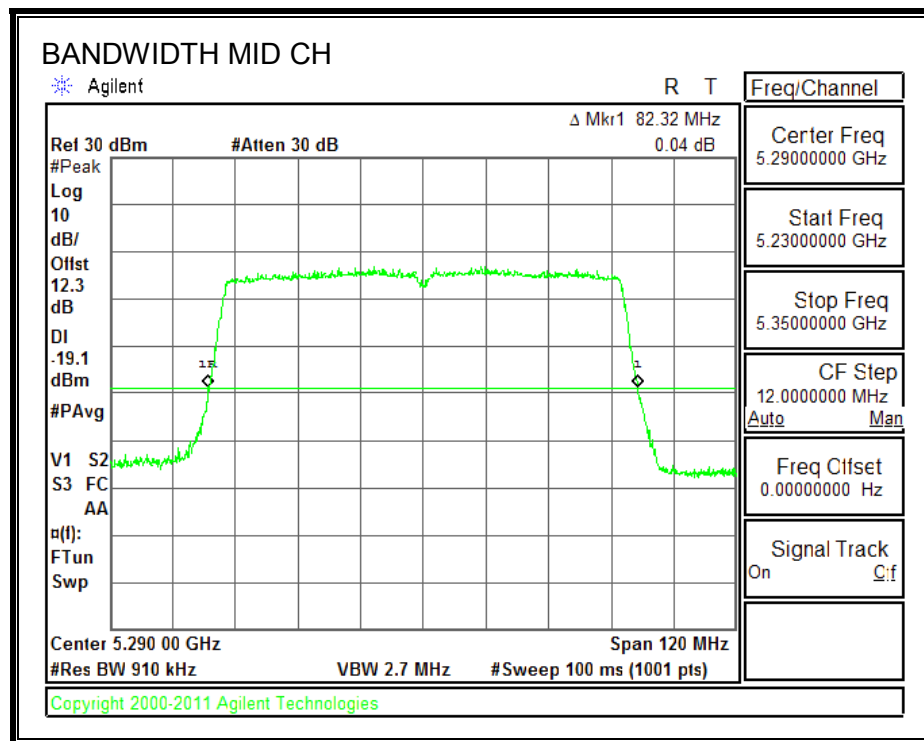
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Mid     | 5290               | 82.32                    |

#### 26 dB BANDWIDTH



## 9.21.2. 99% BANDWIDTH

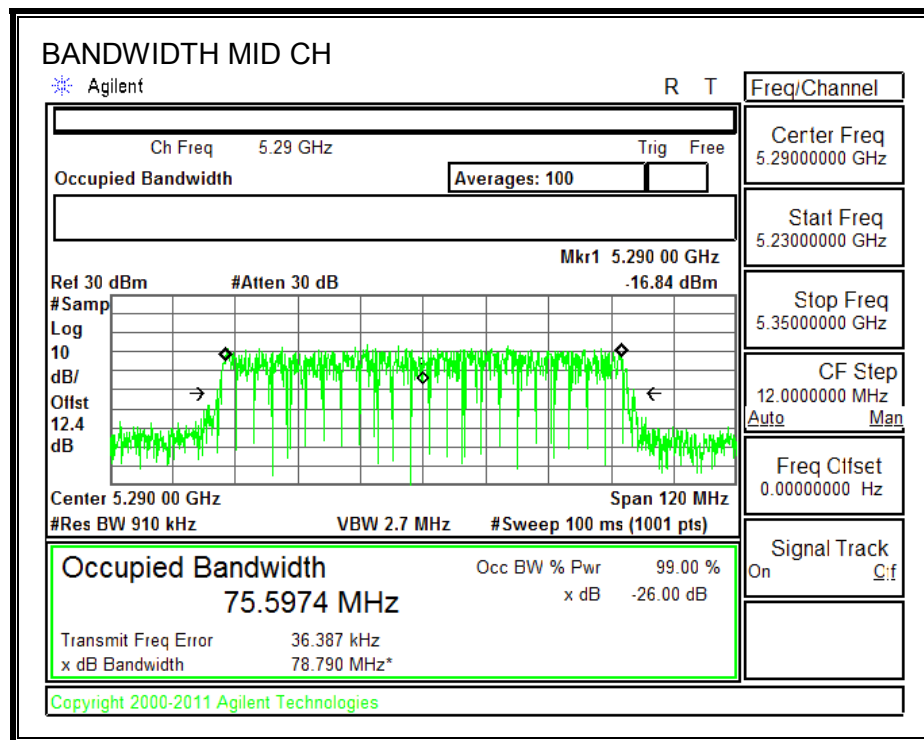
### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Mid     | 5290               | 75.5974                |

### 99% BANDWIDTH



### 9.21.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

#### ANTENNA 0

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.05                     |

#### ANTENNA 1

| Antenna<br>Gain<br>(dBi) |
|--------------------------|
| 3.33                     |

## RESULTS

### Bandwidth, Antenna Gain, and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) | Power<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|-----------------------------|------------------------------|-------------------------|-----------------------|
| Mid     | 5290               | 82.32                       | 3.33                         | 24.00                   | 11.00                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.22 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

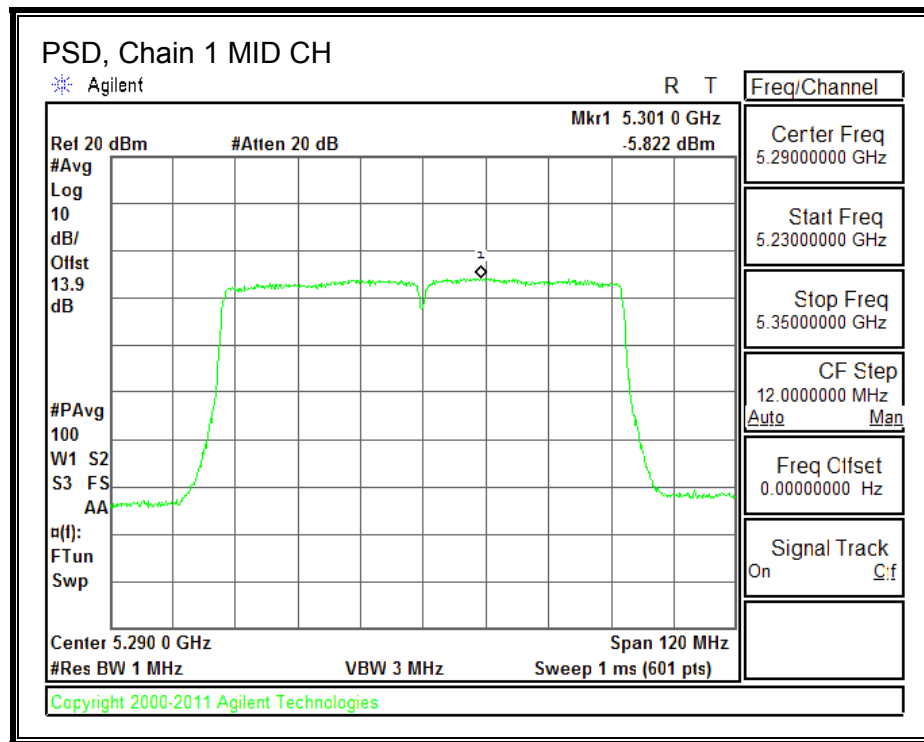
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5290               | 11.76                             | 11.98                             | 24.00                   | -12.02                  |

### PPSD Results

| Channel | Frequency<br>(MHz) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5290               | -5.82                           | -5.60                           | 11.00                 | -16.60                |

**PSD, Chain 1**



## 9.22. 802.11ac VHT80 2TX CDD MODE IN THE 5.3 GHz BAND

### 9.22.1. 26 dB BANDWIDTH

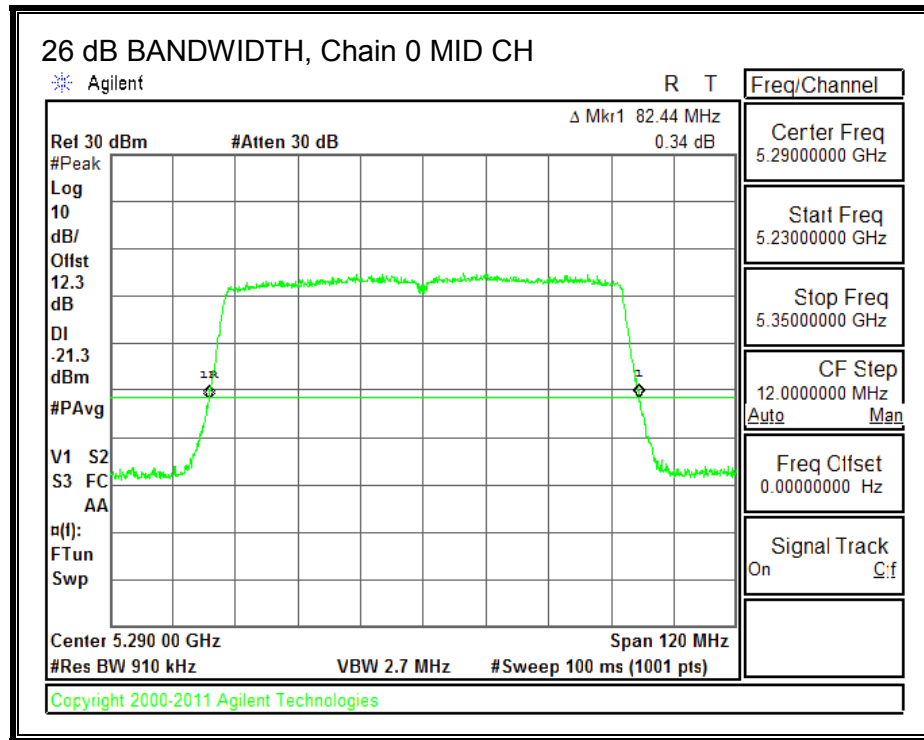
#### LIMITS

None; for reporting purposes only.

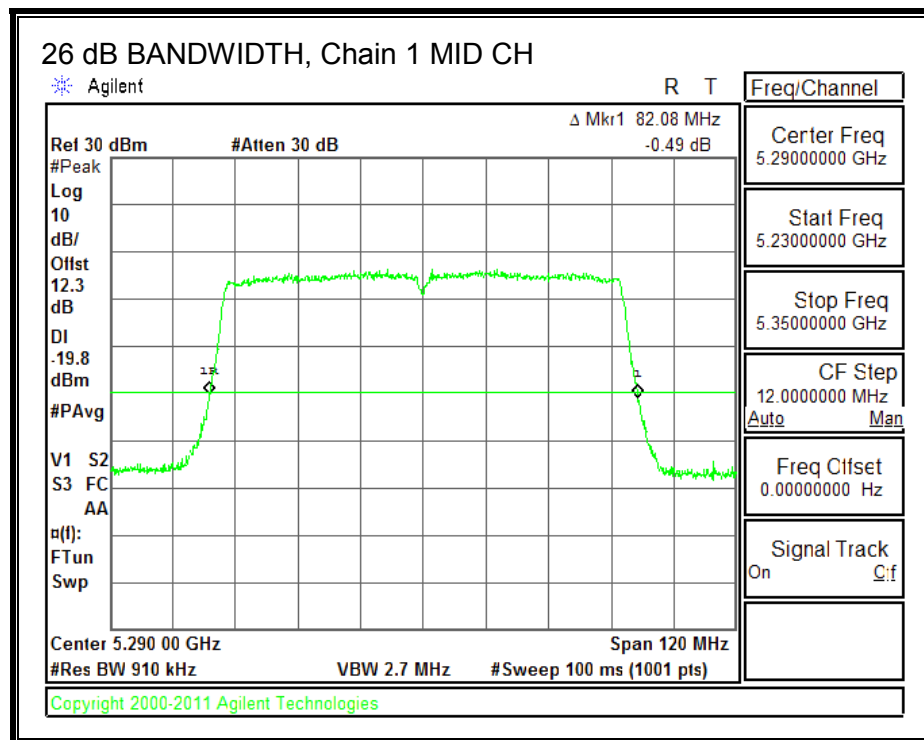
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Mid     | 5290               | 82.44                        | 82.08                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.22.2. 99% BANDWIDTH

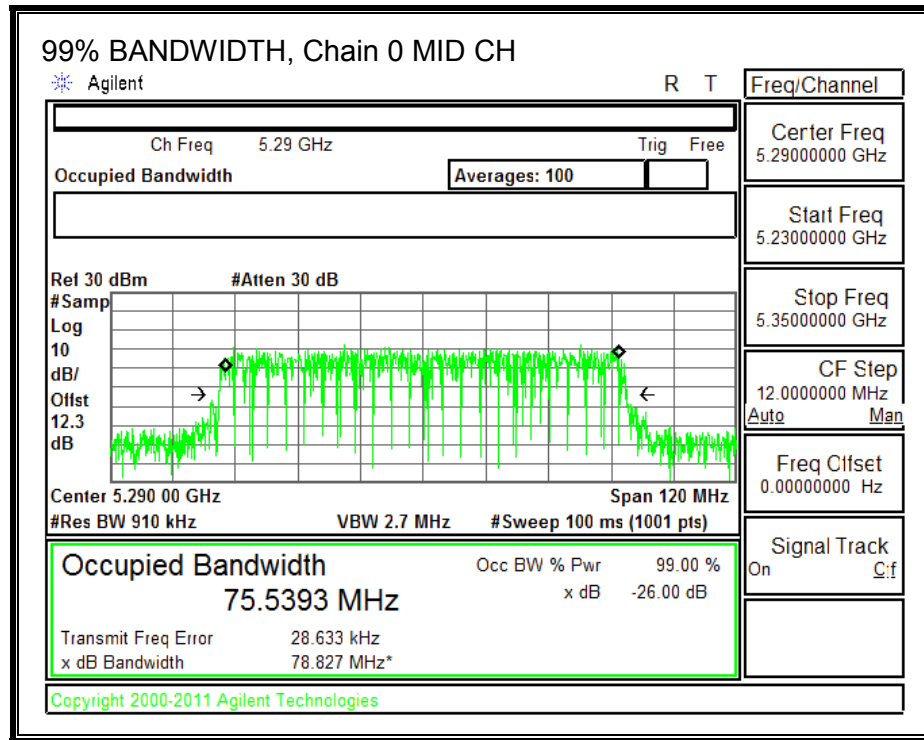
### LIMITS

None; for reporting purposes only.

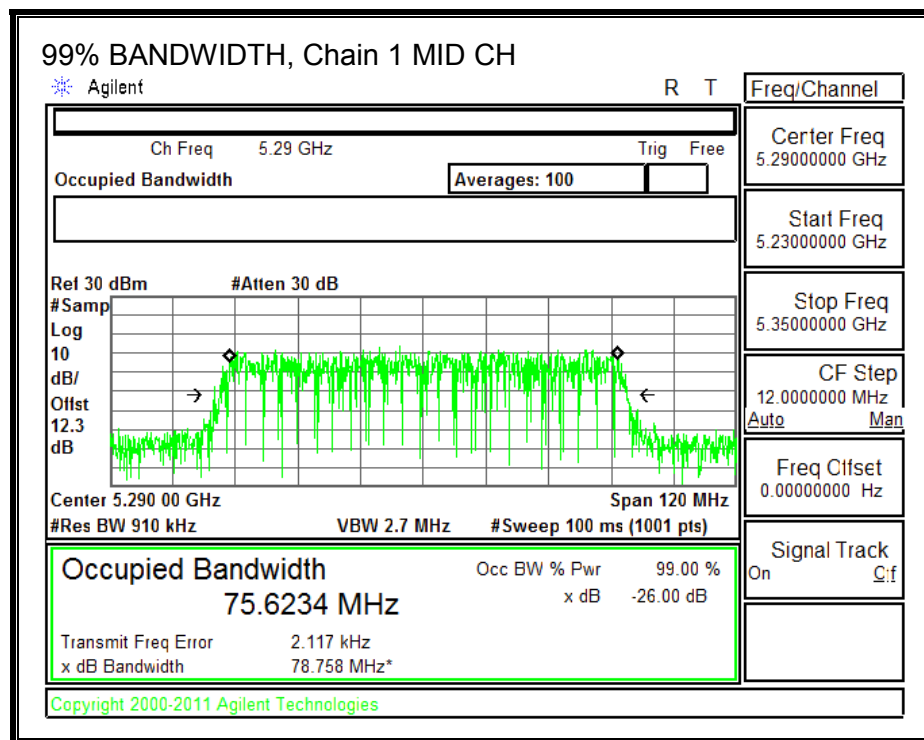
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5290               | 75.5393                    | 75.6234                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 9.22.3. OUTPUT POWER AND PSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### DIRECTIONAL ANTENNA GAIN

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.05                                | 3.33                                | 3.19                                                |

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

| Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.05                                | 3.33                                | 6.20                                              |

## RESULTS

### Bandwidth, Antenna Gain, and Limits

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<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) |
|---------|--------------------|-----------------------------|-------------------------------------------|-----------------------------------------|-------------------------|-----------------------|
| Mid     | 5290               | 82.08                       | 3.19                                      | 6.20                                    | 24.00                   | 10.80                 |

|                    |      |                                                |
|--------------------|------|------------------------------------------------|
| Duty Cycle CF (dB) | 0.22 | Included in Calculations of Corr'd Power & PSD |
|--------------------|------|------------------------------------------------|

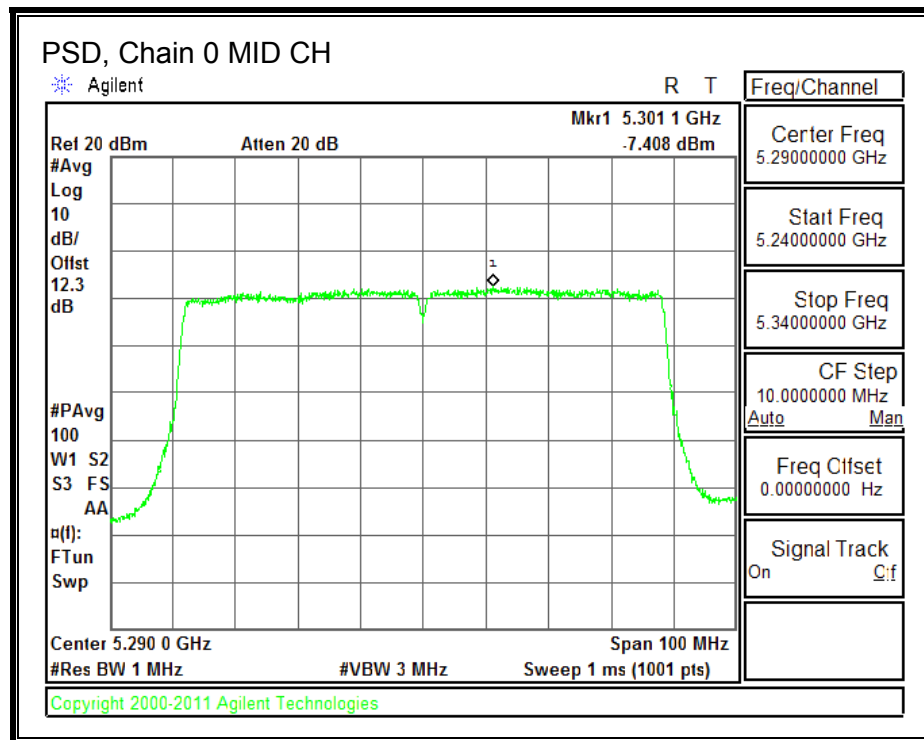
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5290               | 9.20                              | 9.28                              | 12.47                             | 24.00                   | -11.53                  |

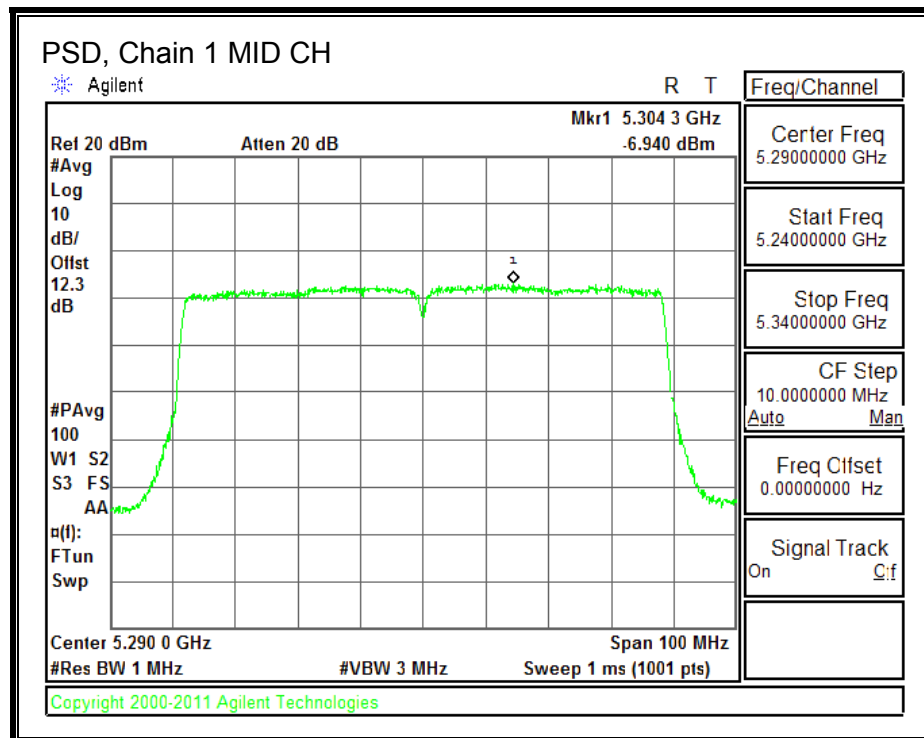
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5290               | -7.41                           | -6.94                           | -3.94                           | 10.80                 | -14.74                |

**PSD, Chain 0**



**PSD, Chain 1**



## 9.23. 802.11ac VHT80 2TX STBC MODE IN THE 5.3 GHz BAND

### 9.23.1. 26 dB BANDWIDTH

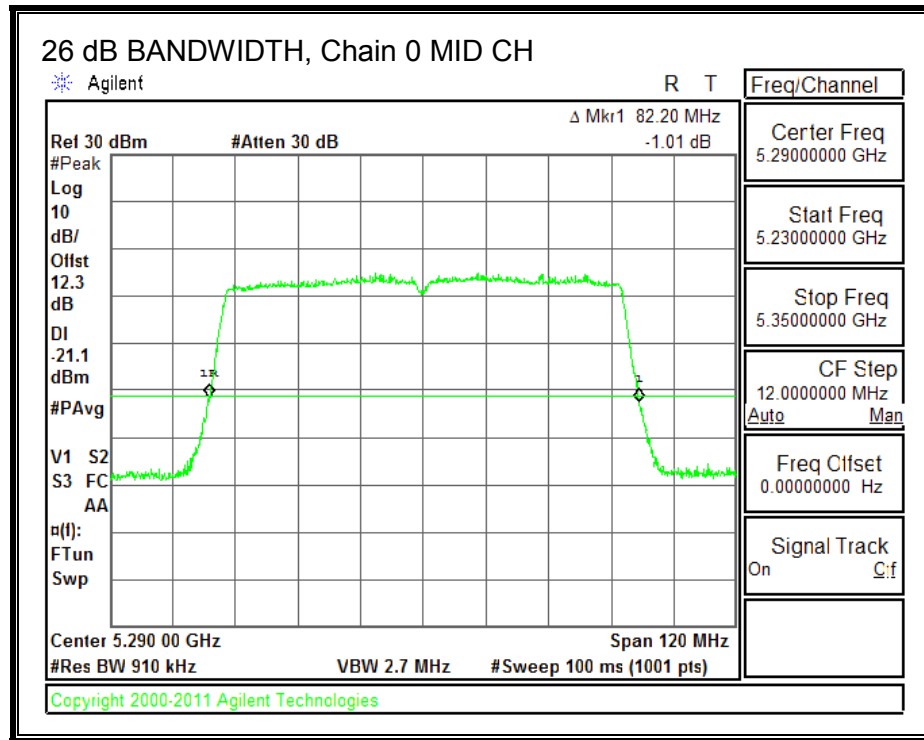
#### LIMITS

None; for reporting purposes only.

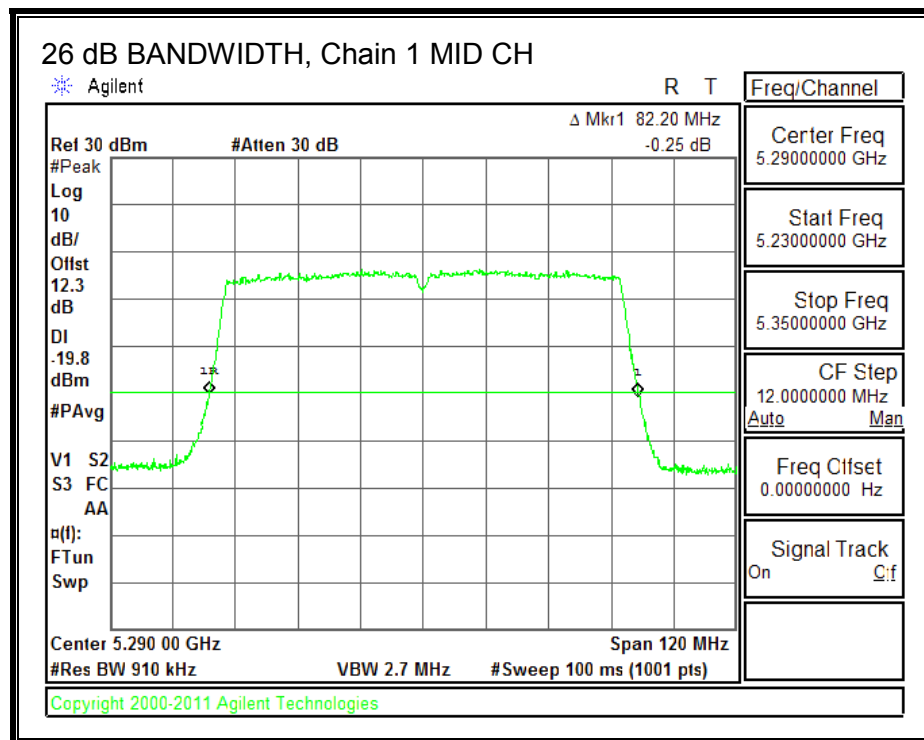
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Mid     | 5290               | 82.20                        | 82.20                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 9.23.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5290               | 75.5723                    | 75.5583                    |