



**FCC CFR47 PART 15 SUBPART E  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**3x3 MIMO BASE STATION**

**MODEL NUMBER: A1470**

**FCC ID: BCGA1470  
IC: 579C-A1470**

**REPORT NUMBER: 12U14745-5**

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**NVLAP LAB CODE 200065-0**

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** 3x3 MIMO BASE STATION

**MODEL:** A1470

**SERIAL NUMBER:** C86K500PFGCP and C86K5029FGCP (RF);  
C86K5013FGCP (DFS)

**DATE TESTED:** DECEMBER 10, 2012 to MARCH 22, 2013 and  
APRIL 04 to 08, 2013

| APPLICABLE STANDARDS                    |              |
|-----------------------------------------|--------------|
| STANDARD                                | TEST RESULTS |
| CFR 47 Part 15 Subpart E                | Pass         |
| INDUSTRY CANADA RSS-210 Issue 8 Annex 9 | Pass         |
| INDUSTRY CANADA RSS-GEN Issue 3         | Pass         |

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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.

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## 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 06-96, FCC KDB 789033, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 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:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB     |
| Radiated Disturbance, 30 to 1000 MHz  | 4.94 dB     |

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



## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a 3x3 802.11a/g/n/ac MIMO base station. The EUT also supports Transmit beam forming on 11n and 11ac modes.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

| 5150-5250 MHz Authorized Frequency Band |                         |                          |                          |                          |                       |                      |
|-----------------------------------------|-------------------------|--------------------------|--------------------------|--------------------------|-----------------------|----------------------|
| Frequency Range (MHz)                   | Mode                    | Avg Power, Chain 0 (dBm) | Avg Power, Chain 1 (dBm) | Avg Power, Chain 2 (dBm) | Total Avg power (dBm) | Total Avg power (mW) |
| 5180-5240                               | 802.11a Legacy 1TX      | N/A                      | 14.1                     | N/A                      | 14.10                 | 25.70                |
| 5180-5240                               | 802.11n HT20 CDD 2TX    | 10.26                    | 10.00                    | N/A                      | 13.14                 | 20.61                |
| 5180-5240                               | 802.11n HT20 BF 2TX     | 10.26                    | 10.00                    | N/A                      | 13.14                 | 20.61                |
| 5180-5240                               | 802.11n HT20 STBC 2TX   | 11.20                    | 11.10                    | N/A                      | 14.16                 | 26.06                |
| 5180-5240                               | 802.11n HT20 CDD 3TX    | 7.15                     | 7.31                     | 7.66                     | 12.15                 | 16.41                |
| 5180-5240                               | 802.11n HT20 BF 3TX     | 7.15                     | 7.31                     | 7.66                     | 12.15                 | 16.41                |
| 5180-5240                               | 802.11n HT20 STBC 3TX   | 9.40                     | 9.10                     | 8.96                     | 13.93                 | 24.72                |
| 5190-5230                               | 802.11n HT40 1TX        | N/A                      | 16.5                     | N/A                      | 16.50                 | 44.67                |
| 5190-5230                               | 802.11n HT40 CDD 2TX    | 12.70                    | 12.80                    | N/A                      | 15.76                 | 37.67                |
| 5190-5230                               | 802.11n HT40 BF 2TX     | 12.70                    | 12.80                    | N/A                      | 15.76                 | 37.67                |
| 5190-5230                               | 802.11n HT40 STBC 2TX   | 13.70                    | 13.80                    | N/A                      | 16.76                 | 47.42                |
| 5190-5230                               | 802.11n HT40 CDD 3TX    | 9.80                     | 9.50                     | 9.60                     | 14.41                 | 27.61                |
| 5190-5230                               | 802.11n HT40 BF 3TX     | 9.80                     | 9.50                     | 9.60                     | 14.41                 | 27.61                |
| 5190-5230                               | 802.11n HT40 STBC 3TX   | 11.73                    | 11.55                    | 11.50                    | 16.37                 | 43.35                |
| 5210                                    | 802.11ac VHT80 1TX      | N/A                      | 13.00                    | N/A                      | 13.00                 | 19.95                |
| 5210                                    | 802.11ac VHT80 CDD 2TX  | 12.50                    | 12.60                    | N/A                      | 15.56                 | 35.97                |
| 5210                                    | 802.11ac VHT80 BF 2TX   | 12.50                    | 12.60                    | N/A                      | 15.56                 | 35.97                |
| 5210                                    | 802.11ac VHT80 STBC 2TX | 12.70                    | 12.40                    | N/A                      | 15.56                 | 35.97                |
| 5210                                    | 802.11ac VHT80 CDD 3TX  | 11.90                    | 12.10                    | 11.95                    | 16.76                 | 47.42                |
| 5210                                    | 802.11ac VHT80 BF 3TX   | 10.00                    | 10.30                    | 10.10                    | 14.91                 | 30.97                |
| 5210                                    | 802.11ac VHT80 STBC 3TX | 11.90                    | 11.98                    | 12.10                    | 16.77                 | 47.53                |

### Note:

802.11n HT20 BF 3TX was tested for BE and Harmonics, and this covers 802.11n HT20 BF 2TX, 802.11n AC20 BF 2TX, and 802.11n AC20 BF 3TX.

802.11ac VHT20 SISO is leveraged from HT20 SISO.  
802.11ac VHT20 2TX CDD is leveraged from HT20 2TX CDD.  
802.11ac VHT20 2TX STBC is leveraged from HT20 2TX STBC.  
802.11ac VHT20 3TX CDD is leveraged from HT20 3TX CDD.  
802.11ac VHT20 3TX STBC is leveraged from HT20 3TX STBC.

802.11ac VHT40 SISO is leveraged from HT40 SISO.  
802.11ac VHT40 2TX CDD is leveraged from HT40 2TX CDD.  
802.11ac VHT40 2TX STBC is leveraged from HT40 2TX STBC.  
802.11ac VHT40 3TX CDD is leveraged from HT40 3TX CDD.  
802.11ac VHT40 3TX STBC is leveraged from HT40 3TX STBC.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

| Band<br>(GHz) | Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|---------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 2.4           | 3.00                                | 3.00                                | 3.10                                | 3.03                                                |
| 5.2           | 3.20                                | 1.40                                | 2.20                                | 2.33                                                |
| 5.8           | 2.70                                | 1.90                                | 4.40                                | 3.13                                                |

| Band<br>(GHz) | Chain 0<br>Antenna<br>Gain<br>(dBi) | Chain 1<br>Antenna<br>Gain<br>(dBi) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|---------------|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 2.4           | 3.00                                | 3.00                                | 3.10                                | 7.80                                              |
| 5.2           | 3.20                                | 1.40                                | 2.20                                | 7.07                                              |
| 5.8           | 2.70                                | 1.90                                | 4.40                                | 7.83                                              |

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 6.10.56.166.

## 5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental emission of the EUT was investigated in three orthogonal orientations; X,Y and Z. It was determined that Y orientation is worst-case; therefore, all final radiated emissions testing was performed with the EUT in Y orientation

The EUT was a 3x3 MIMO Base Station connected to a host Laptop PC.

Worst-Case data rates, as provided by the client, were as follows:

For 5 GHz Bands:

802.11a: 6 Mb/s.

802.11n 20MHz, CDD and STBC: MCS0.

802.11n 40MHz, CDD and STBC: MCS0.

802.11n 80MHz, CDD and STBC: MCS0.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power.

For the modes where a second LOW channel and a second HIGH channel were tested for output power, all other test items at the second LOW and second HIGH channels were performed with the higher power level between LOW and second LOW channels, and between HIGH and second HIGH channels, as worst-case scenario.

For all modes with single chain, chain 1 was selected per the software provided by the client. Based on the client a preliminary investigation was performed on the three chains and chain 1 was found to be worst-case.

Peak Excursion testing was performed for each modulation in the 5.2 GHz band to show compliance with the applicable limits.

Nss (number of spatial streams) used for all the testing on 2Tx & 3Tx modes was 1 as worst-case scenario.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List       |              |              |               |        |
|------------------------------|--------------|--------------|---------------|--------|
| Description                  | Manufacturer | Model        | Serial Number | FCC ID |
| Laptop PC                    | Apple        | MacBook M42A | PT358811      | DoC    |
| Direct Plug-In AC-DC Adapter | Apple        | PA-1850      | N/A           | N/A    |
| Mouse                        | HP           | MOE2UO       | CNP10300BB    | DoC    |

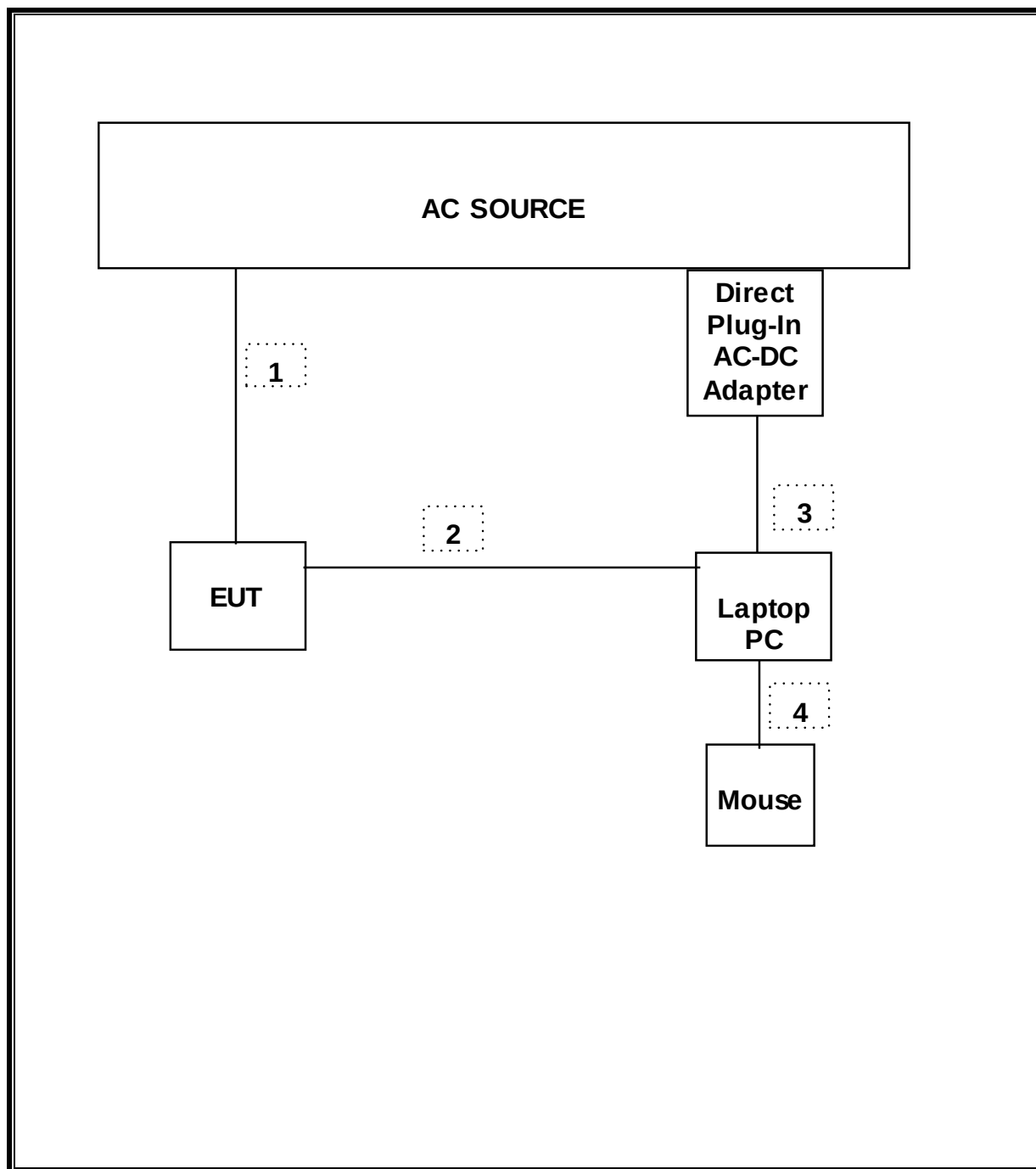
### I/O CABLES

| I/O Cable List |          |                      |                |              |                  |         |
|----------------|----------|----------------------|----------------|--------------|------------------|---------|
| Cable No       | Port     | # of identical ports | Connector Type | Cable Type   | Cable Length (m) | Remarks |
| 1              | AC       | 1                    | 2P             | Non-shielded | 1.8              |         |
| 2              | Ethernet | 1                    | Ethernet       | Non-shielded | 3                |         |
| 3              | DC       | 1                    | DC             | Non-shielded | 1.75             |         |
| 4              | USB      | 1                    | USB            | Non-shielded | 0.6              |         |

### TEST SETUP

The EUT is powered by AC source only during test. Test software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**



## 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       | Asset   | Cal Date | Cal Due  |
| Spectrum Analyzer, 26.5 GHz         | Agilent / HP   | E4440A      | C01179  | 02/16/12 | 02/26/14 |
| Spectrum Analyzer, 44 GHz           | Agilent / HP   | E4446A      | C01012  | 10/21/12 | 10/21/13 |
| EMI Test Receiver, 9 kHz-7 GHz      | R & S          | ESCI 7      | 1000741 | 08/08/12 | 08/08/13 |
| EMI Test Receiver, 9 kHz-7 GHz      | R & S          | ESCI 7      | N/A     | 08/21/12 | 08/21/13 |
| EMI Test Receiver, 30 MHz           | R & S          | ESHS 20     | N02396  | 08/08/12 | 08/08/13 |
| Antenna, Horn, 18 GHz               | EMCO           | 3115        | C00945  | 11/12/12 | 11/12/13 |
| Antenna, Horn, 26.5 GHz             | ARA            | MWH-1826/B  | C00980  | 11/14/12 | 11/14/13 |
| Antenna, Horn, 40 GHz               | ARA            | MWH-2640/B  | C00981  | 06/14/11 | 06/14/13 |
| Antenna, Bilog, 30MHz-1 GHz         | Sunol Sciences | JB1         | N/A     | 02/07/12 | 03/06/14 |
| Preamplifier, 26.5 GHz              | Agilent / HP   | 8449B       | C00749  | 10/19/12 | 10/19/13 |
| Preamplifier, 26.5 GHz              | Agilent / HP   | 8449B       | C01052  | 10/22/12 | 10/22/13 |
| Preamplifier, 40 GHz                | Miteq          | NSP4000-SP2 | C00990  | 08/02/11 | 08/02/13 |
| Preamplifier, 1300 MHz              | Agilent / HP   | 8447D       | C00885  | 12/20/11 | 12/30/13 |
| P-Series single channel Power Meter | Agilent / HP   | N1911A      | N/A     | 07/27/12 | 07/27/13 |
| Peak / Average Power Sensor         | Agilent / HP   | E9323A      | N/A     | 07/26/12 | 07/26/13 |
| LISN, 30 MHz                        | FCC            | 50/250-25-2 | C00626  | 12/13/11 | 01/13/14 |

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

### LIMITS

None; for reporting purposes only.

### PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

#### 7.1. ON TIME AND DUTY CYCLE RESULTS

| Mode                | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|---------------------|------------------------|------------------|-----------------------------|----------------------|-----------------------------------------|-----------------------------|
| 802.11a 20 MHz      | 2.055                  | 2.090            | 0.983                       | 98.3%                | 0.00                                    | 0.010                       |
| 802.11n HT20 CDD    | 1.915                  | 1.940            | 0.987                       | 98.7%                | 0.00                                    | 0.010                       |
| 802.11n HT20 STBC   | 1.925                  | 1.945            | 0.990                       | 99.0%                | 0.00                                    | 0.010                       |
| 802.11n HT40 SISO   | 0.9424                 | 0.9601           | 0.982                       | 98.2%                | 0.00                                    | 0.010                       |
| 802.11n HT40 CDD    | 0.9449                 | 0.9627           | 0.982                       | 98.2%                | 0.00                                    | 0.010                       |
| 802.11n HT40 STBC   | 0.9520                 | 0.9707           | 0.981                       | 98.1%                | 0.00                                    | 0.010                       |
| 802.11ac VHT80 SISO | 0.6000                 | 0.6133           | 0.978                       | 97.8%                | 0.10                                    | 1.667                       |
| 802.11ac VHT80 CDD  | 0.5953                 | 0.6080           | 0.979                       | 97.9%                | 0.09                                    | 1.680                       |
| 802.11ac VHT80 STBC | 0.5979                 | 0.6105           | 0.979                       | 97.9%                | 0.09                                    | 1.673                       |

#### 7.2. MEASUREMENT METHOD FOR POWER AND PPSD

For output power measurement, KDB 789033 Method PM as described in section C) f) was used.

For PSD measurement, KDB 789033 Method SA-1 was used when Duty Cycle is greater than or equal to 98%.

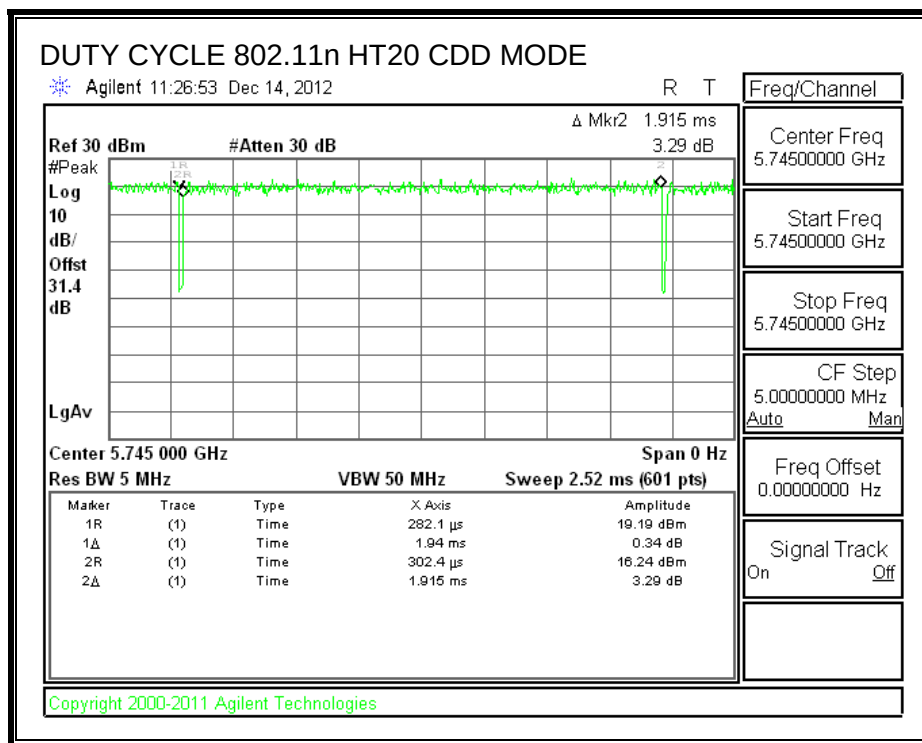
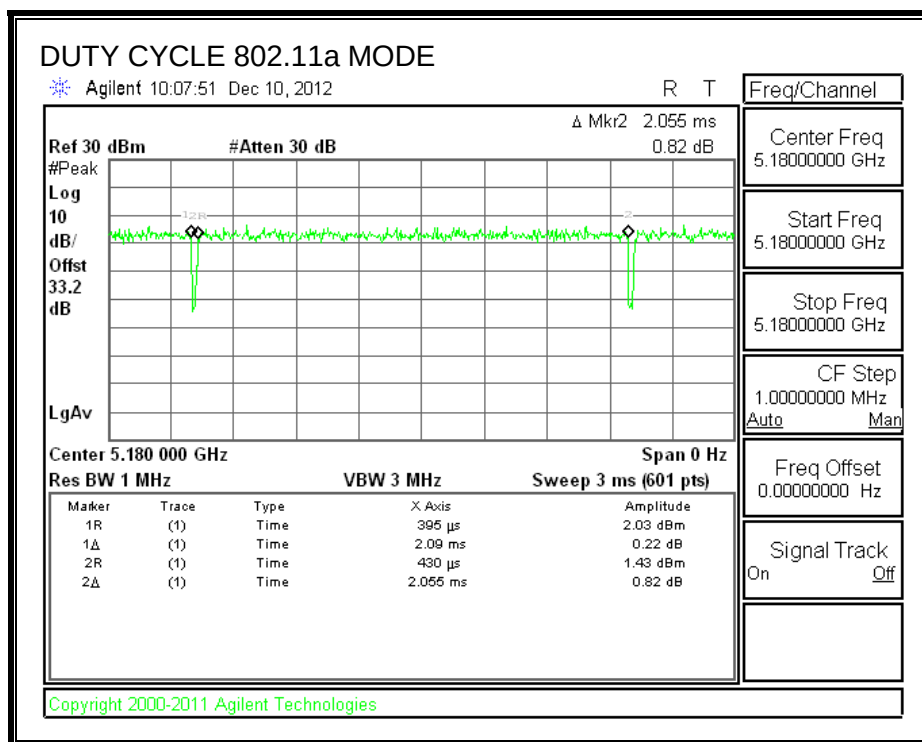
For PSD measurement, KDB 789033 Method SA-2 was used when Duty Cycle is less than 98%.

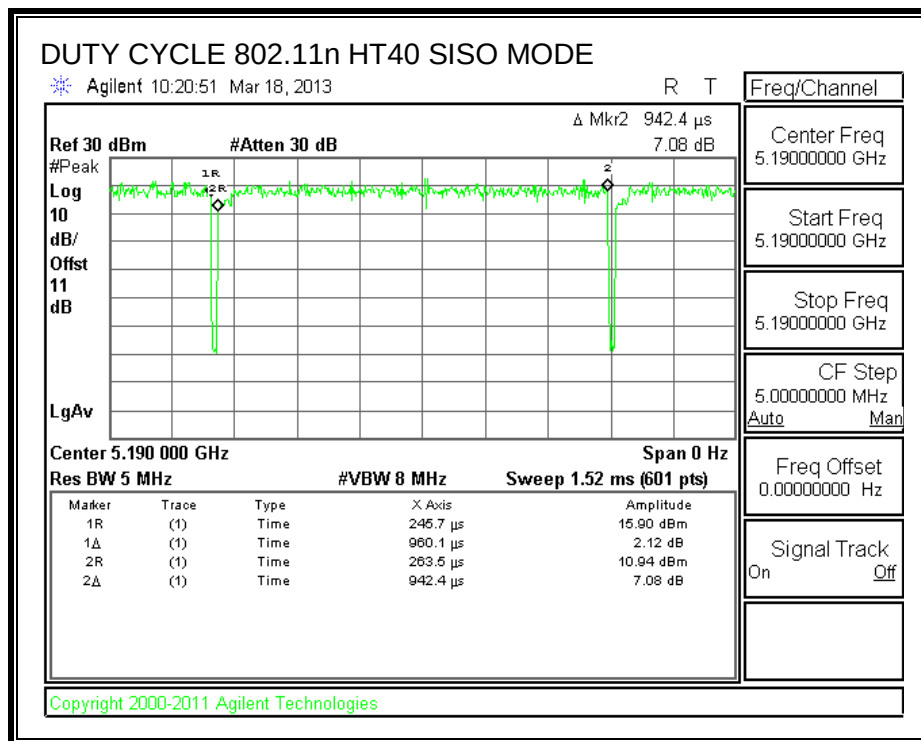
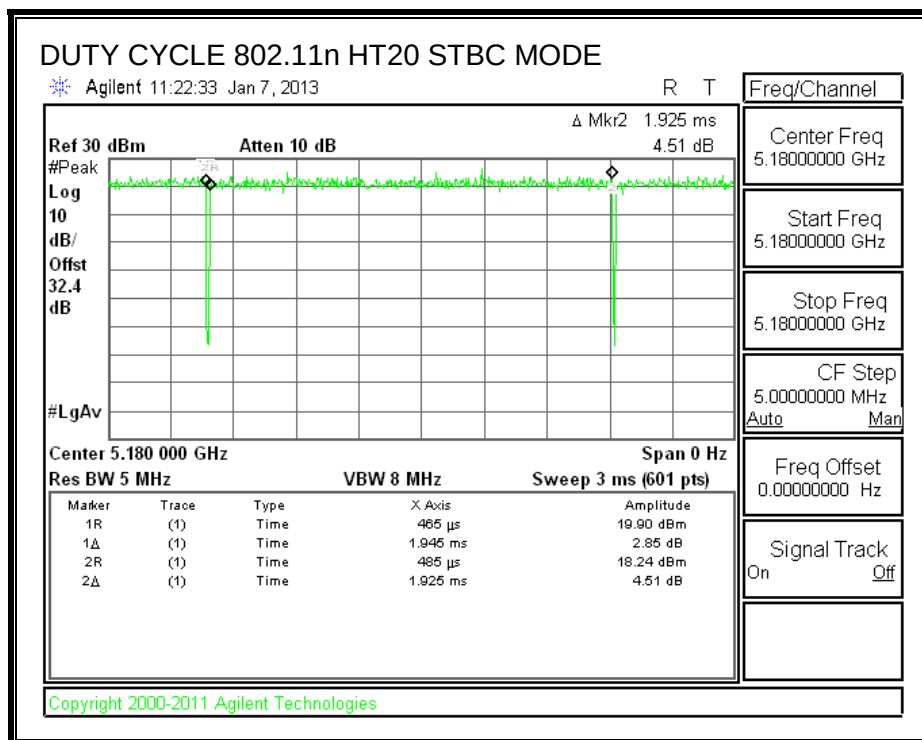
#### 7.3. MEASUREMENT METHOD FOR AVG SPURIOUS EMISSION ABOVE 1 GHz

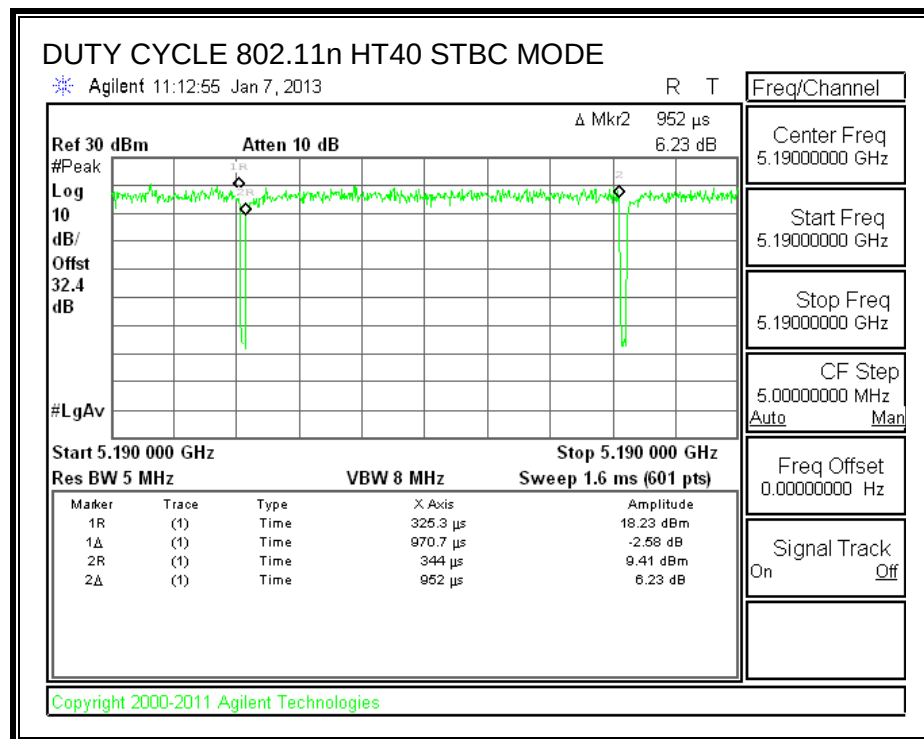
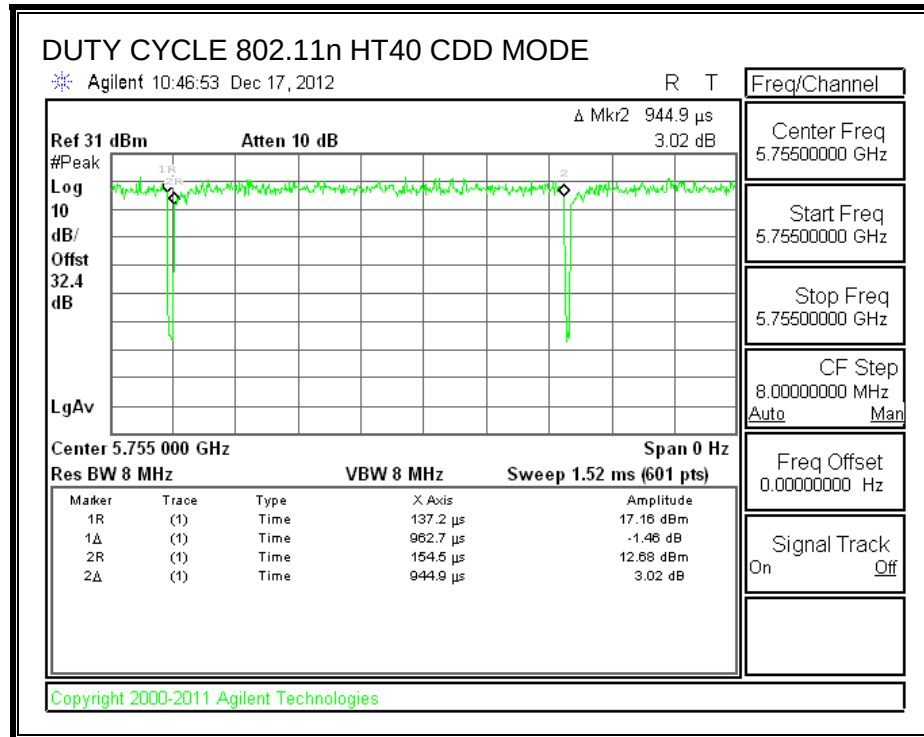
KDB 789033 Method VB with Power RMS Averaging is used.

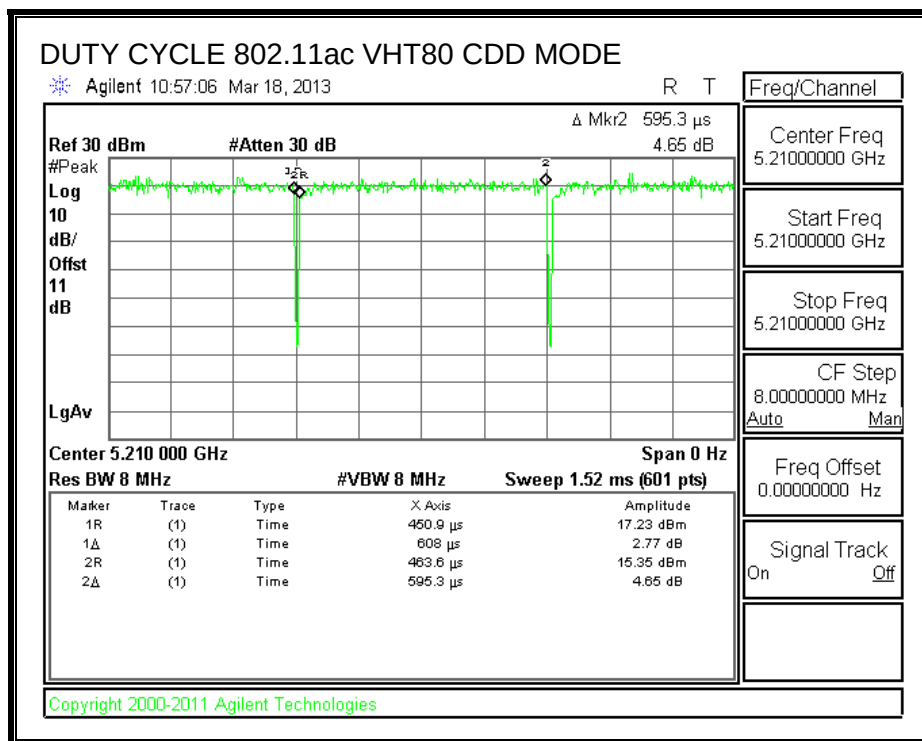
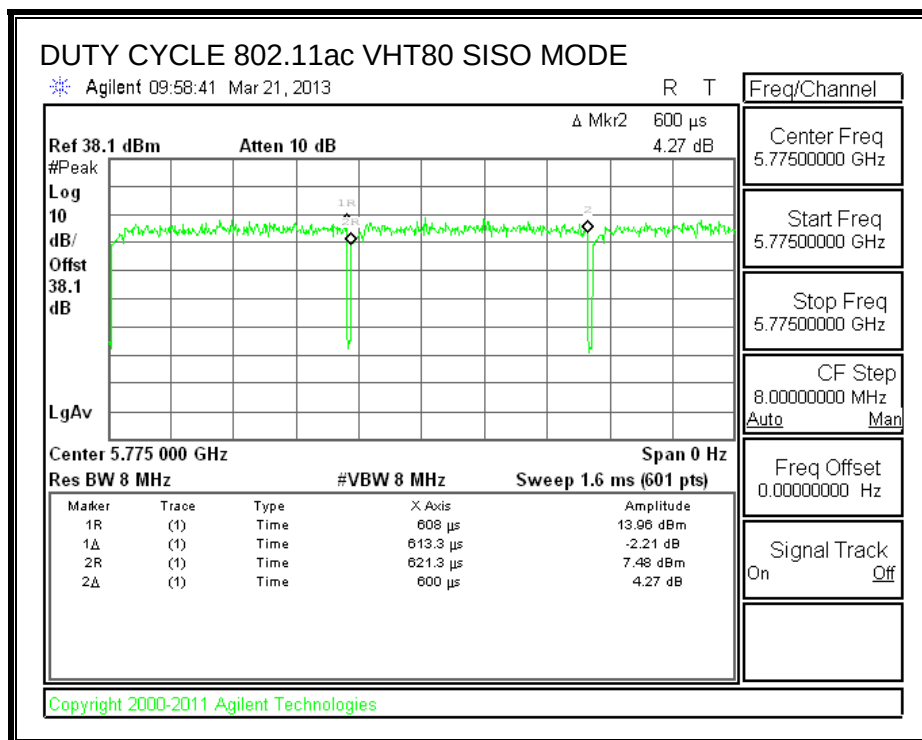


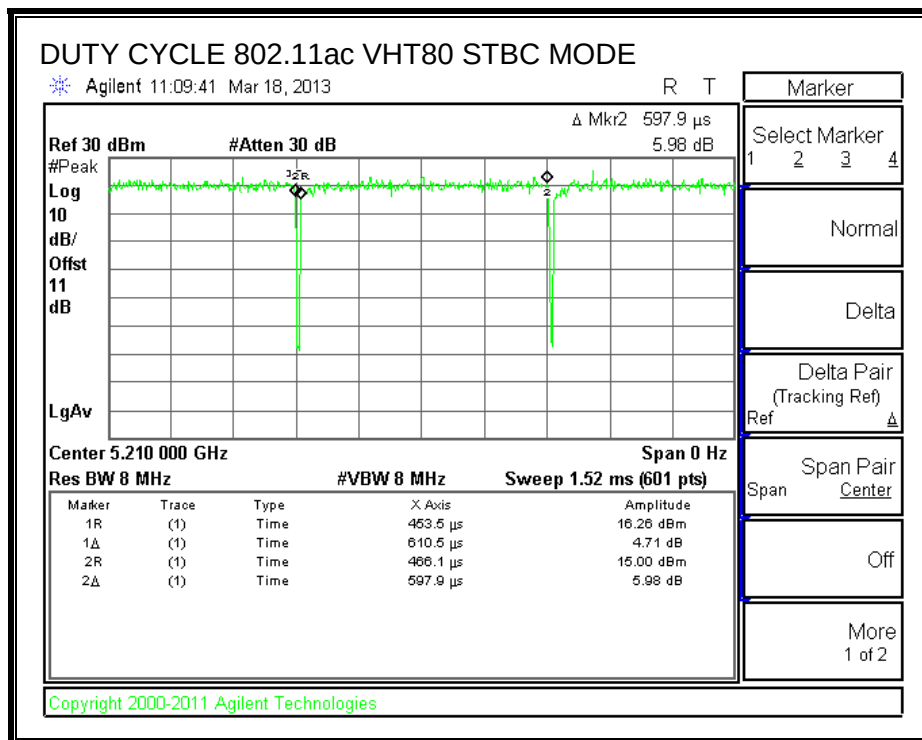
## 7.4. DUTY CYCLE PLOTS











## 8. ANTENNA PORT TEST RESULTS

### 8.1. 802.11a Legacy 1TX MODE IN THE 5.2 GHz BAND

#### 8.1.1. 26 dB BANDWIDTH

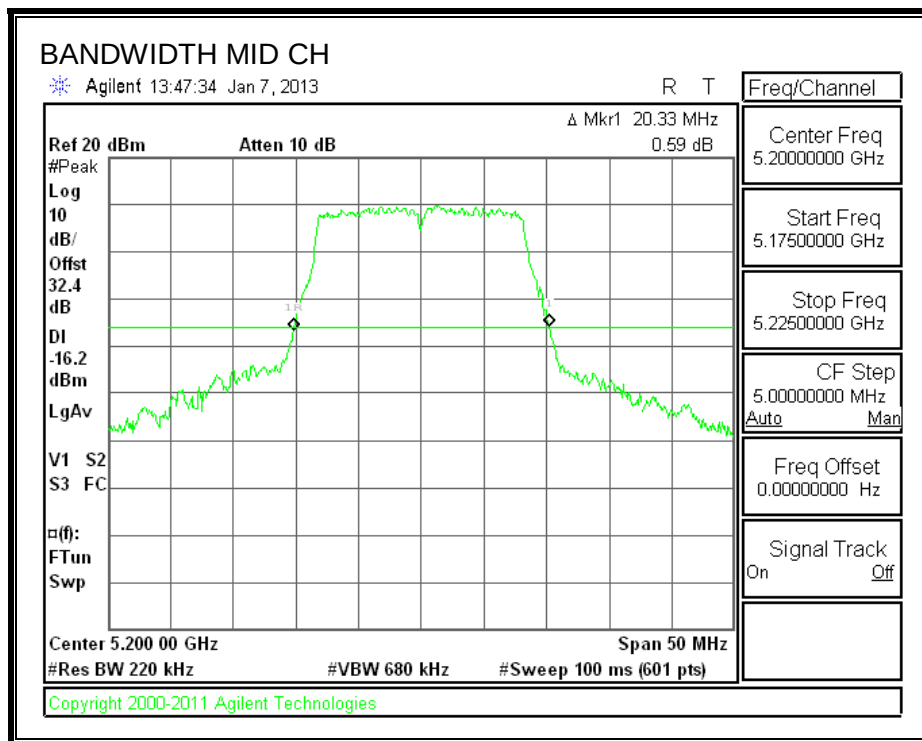
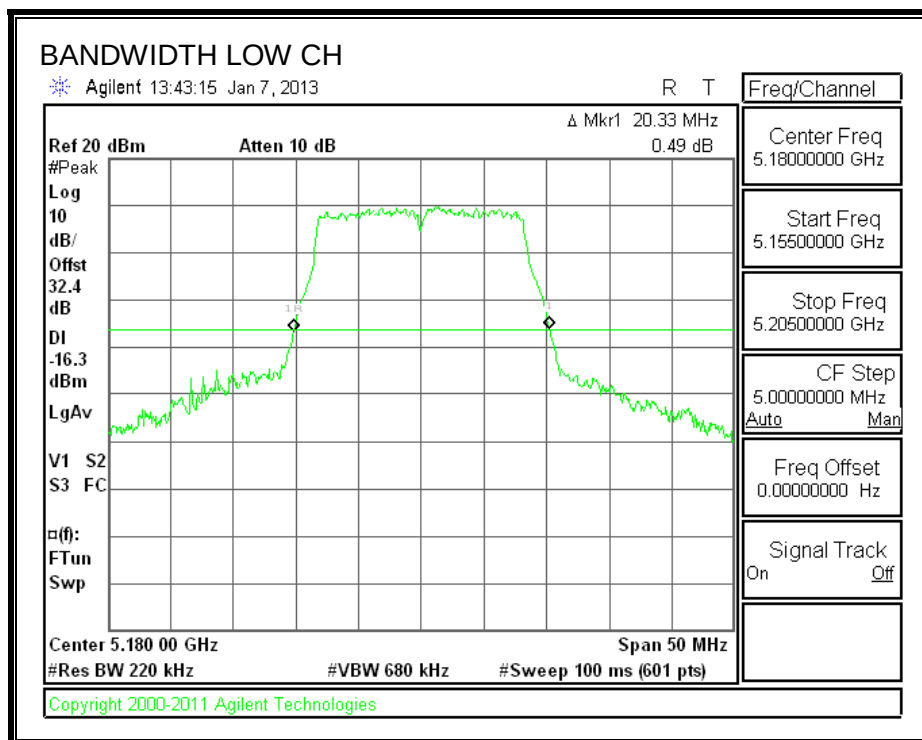
##### LIMITS

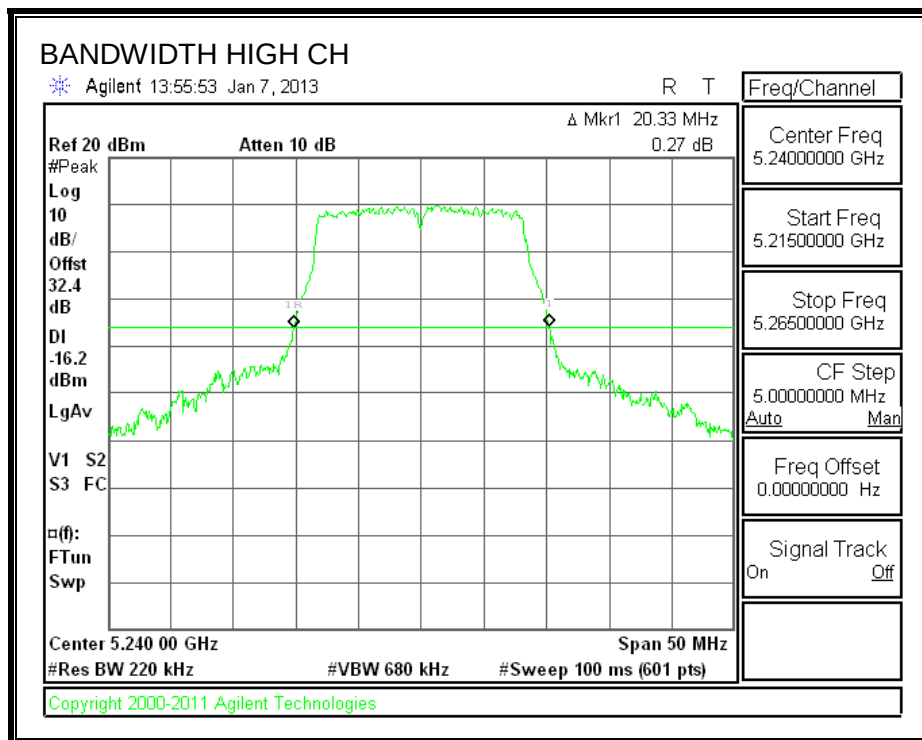
None; for reporting purposes only.

##### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5180               | 20.33                    |
| Mid     | 5200               | 20.33                    |
| High    | 5240               | 20.33                    |

**26 dB BANDWIDTH**







### 8.1.2. 99% BANDWIDTH

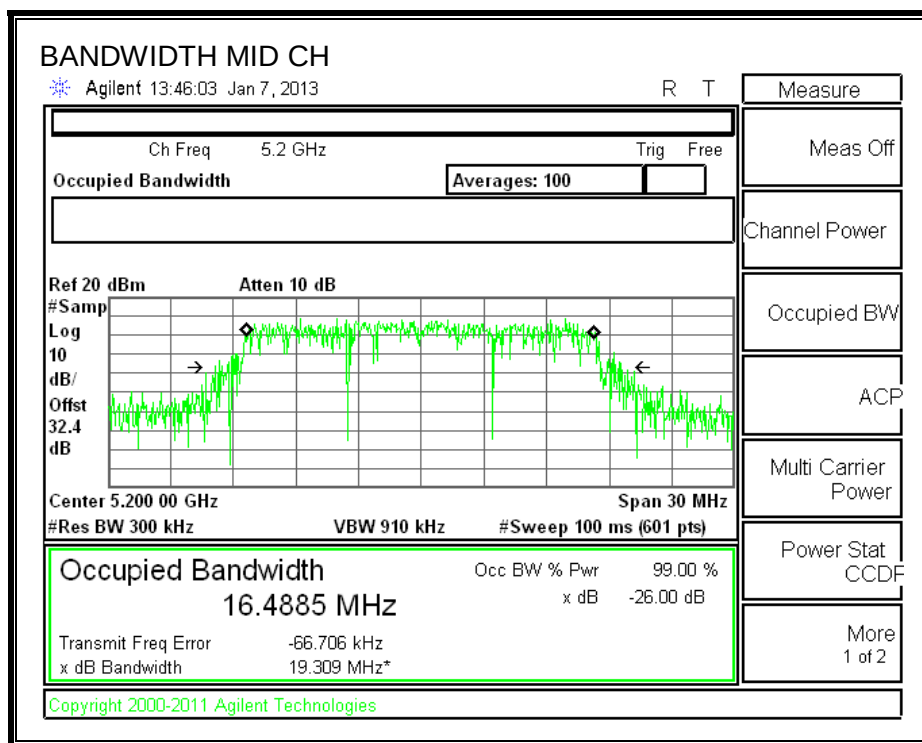
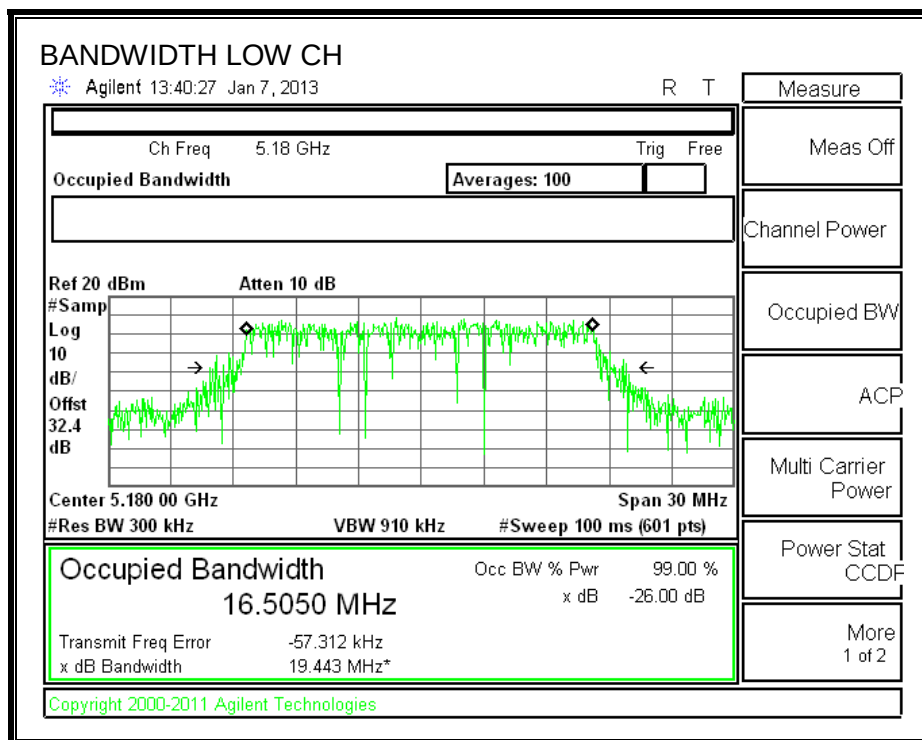
#### LIMITS

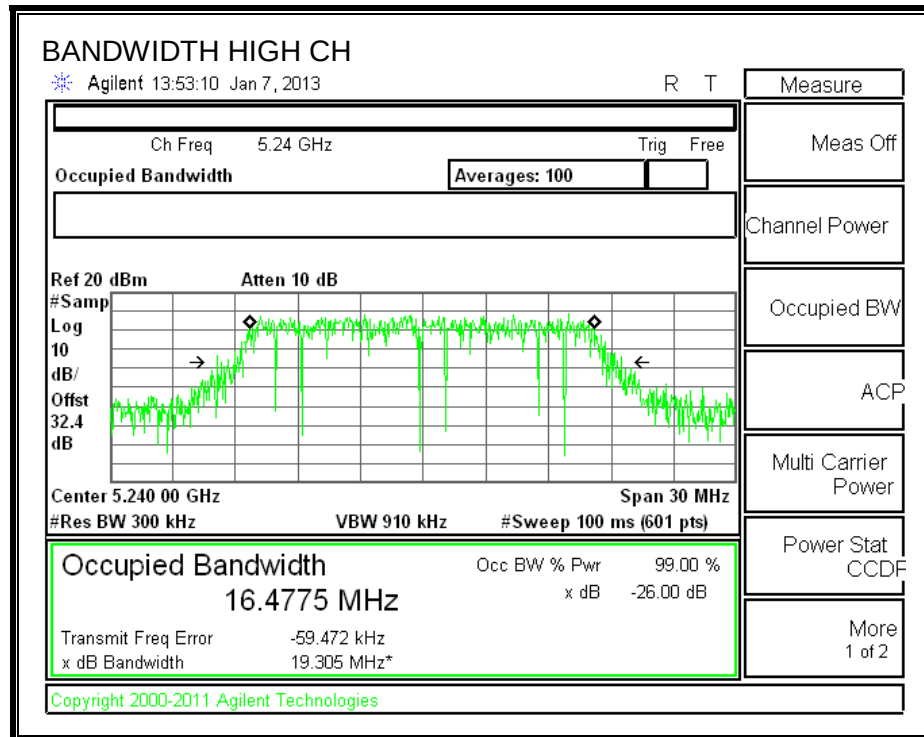
None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5180               | 16.5050                |
| Mid     | 5200               | 16.4885                |
| High    | 5240               | 16.4770                |

**99% BANDWIDTH**





### **8.1.3. OUTPUT AVERAGE POWER AND PSD**

#### **LIMITS**

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### **DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5180               | 20.33                       | 16.5050                   | 3.20                         |
| Mid     | 5200               | 20.33                       | 16.4885                   | 3.20                         |
| High    | 5240               | 20.33                       | 16.4770                   | 3.20                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5180               | 17.00                          | 22.18                        | 18.98                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| Mid     | 5200               | 17.00                          | 22.17                        | 18.97                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5240               | 17.00                          | 22.17                        | 18.97                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

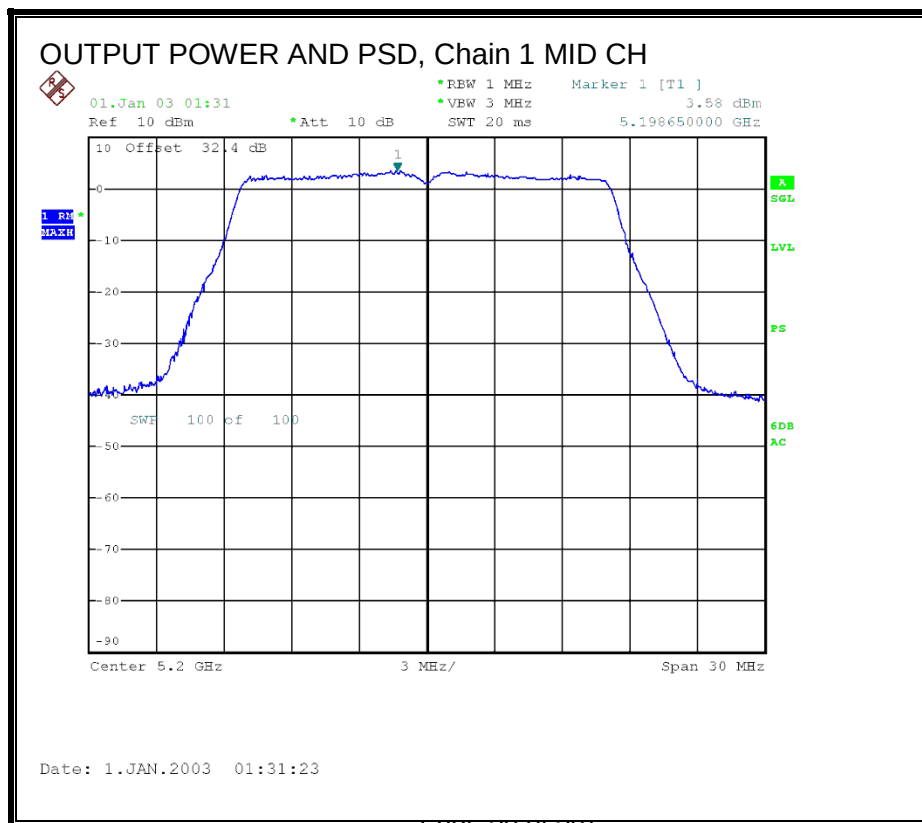
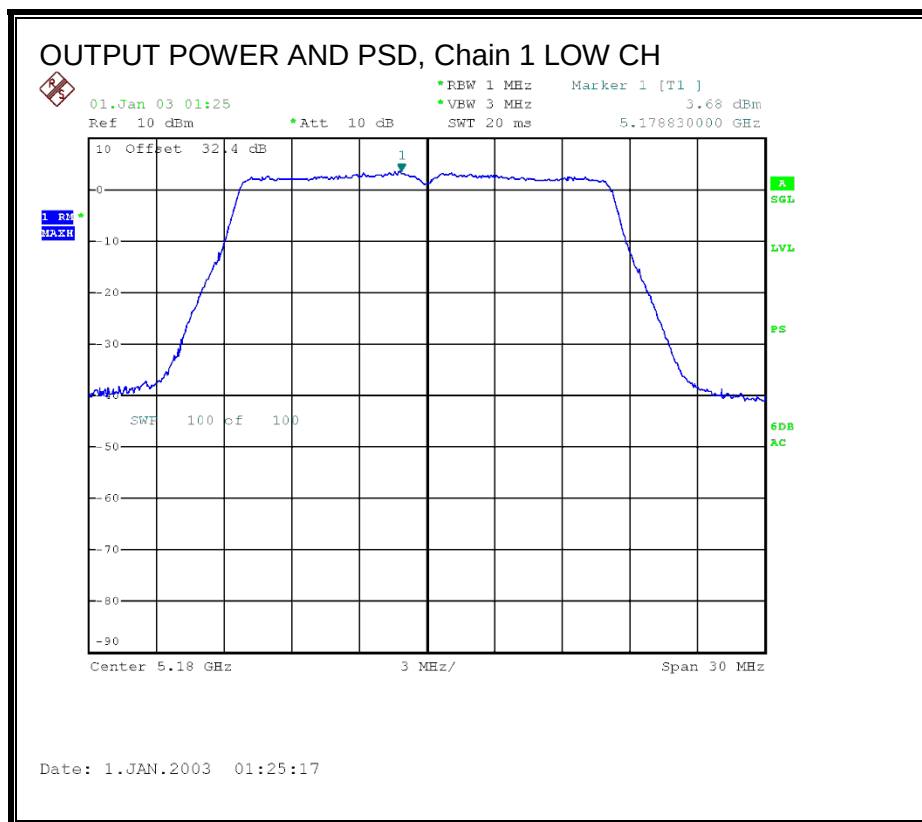
### Output Power Results

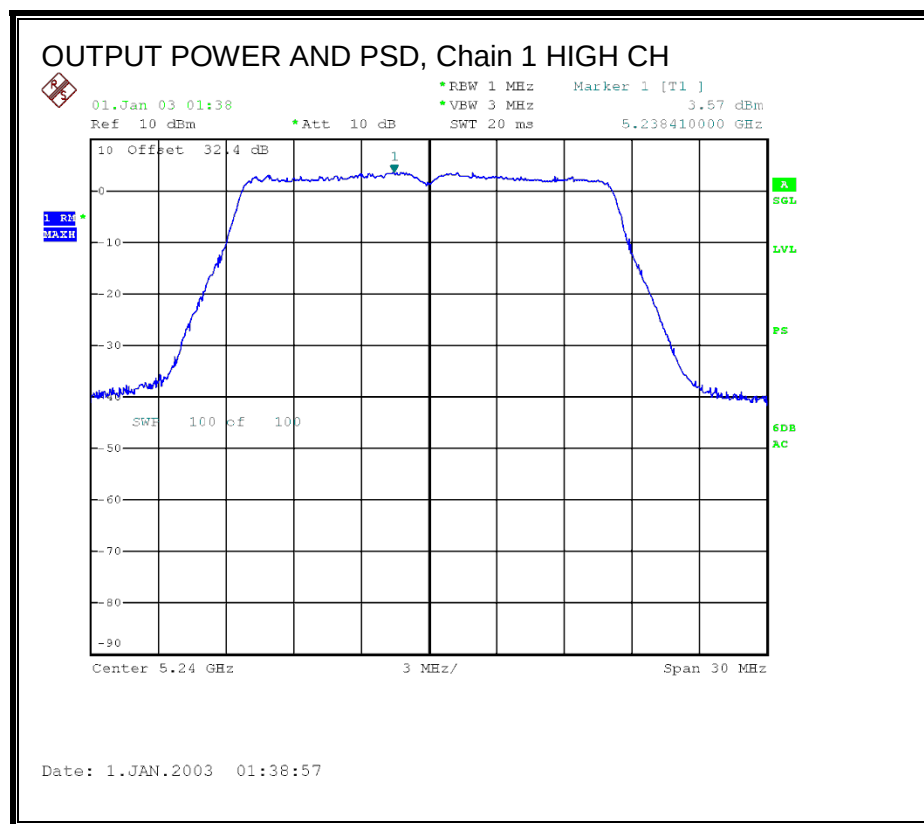
| Channel | Frequency<br>(MHz) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 14.00                             | 14.00                             | 17.00                   | -3.00                   |
| Mid     | 5200               | 14.10                             | 14.10                             | 17.00                   | -2.90                   |
| High    | 5240               | 14.00                             | 14.00                             | 17.00                   | -3.00                   |

### 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     | 5180               | 3.68                            | 3.68                            | 4.00                  | -0.32                 |
| Mid     | 5200               | 3.58                            | 3.58                            | 4.00                  | -0.42                 |
| High    | 5240               | 3.57                            | 3.57                            | 4.00                  | -0.43                 |

**OUTPUT POWER AND PSD, Chain 1**





#### 8.1.4. PEAK EXCURSION

##### LIMITS

FCC §15.407 (a) (6)

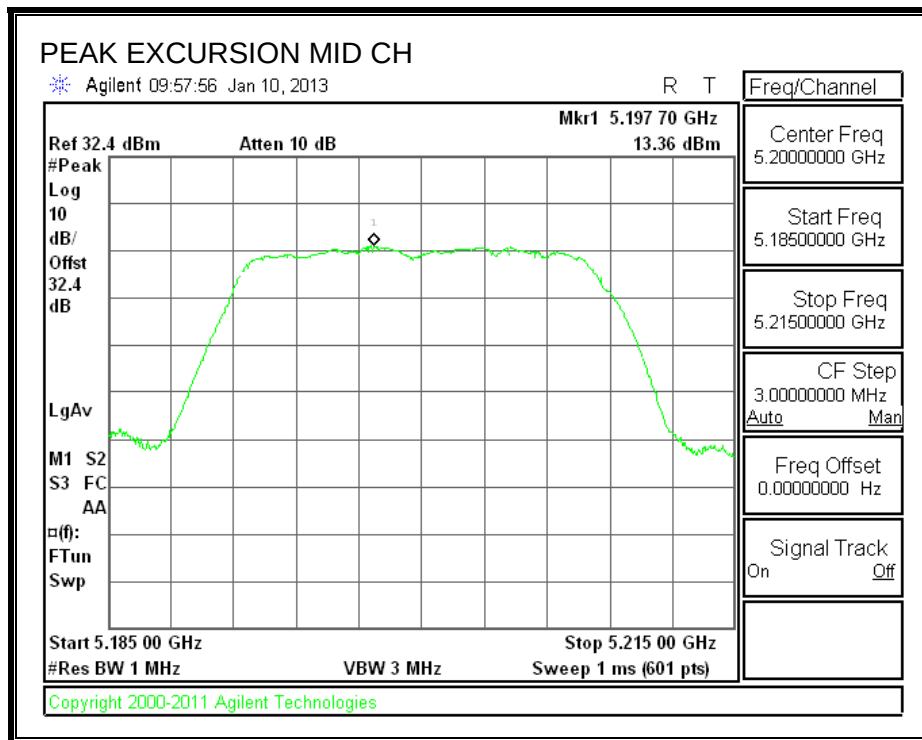
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

##### RESULTS

| Channel | Frequency<br>(MHz) | PK Level<br>(dBm) | PSD<br>(dBm) | DCCF<br>(dB) | Peak Excursion<br>(dB) | Limit<br>(dB) | Margin<br>(dB) |
|---------|--------------------|-------------------|--------------|--------------|------------------------|---------------|----------------|
| Mid     | 5200               | 13.36             | 3.58         | 0.00         | 9.78                   | 13            | -3.22          |



**PEAK EXCURSION**



## 8.2. 802.11n HT20 CDD 2TX MODE IN THE 5.2 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

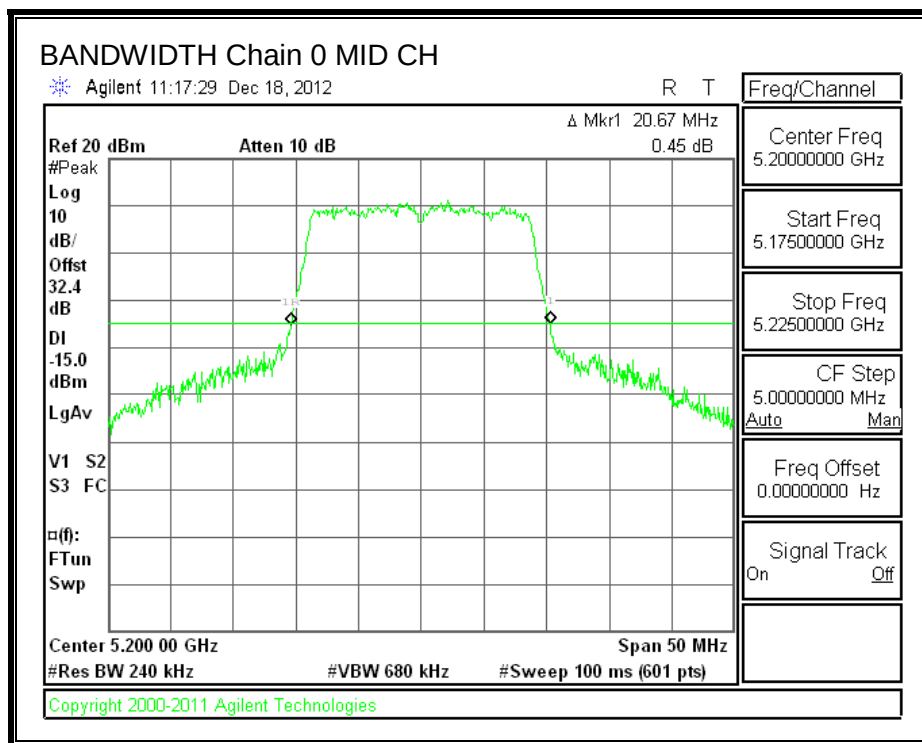
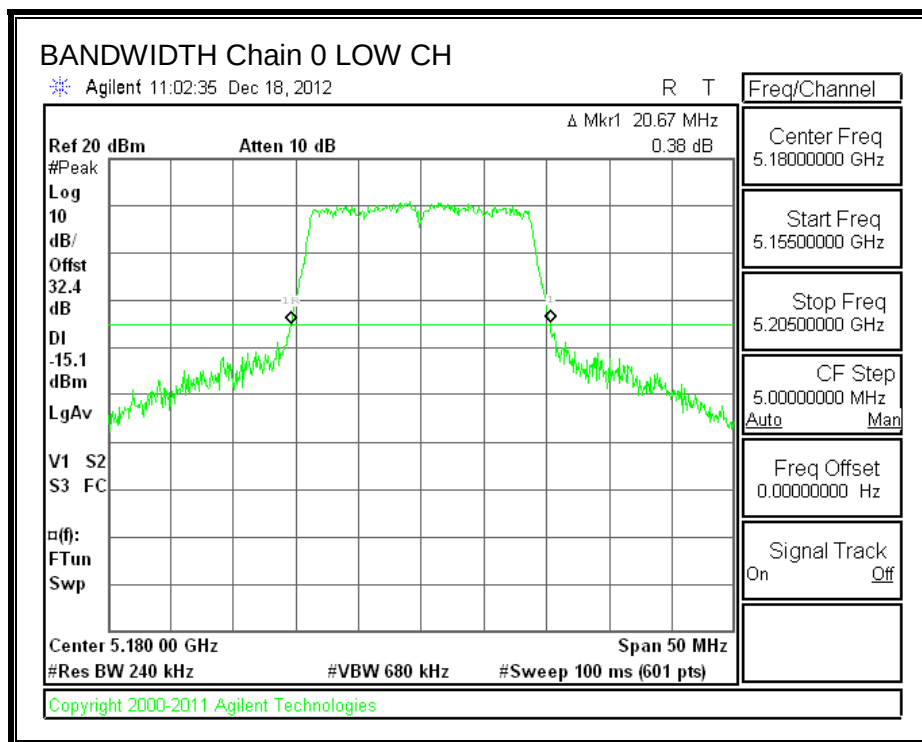
#### LIMITS

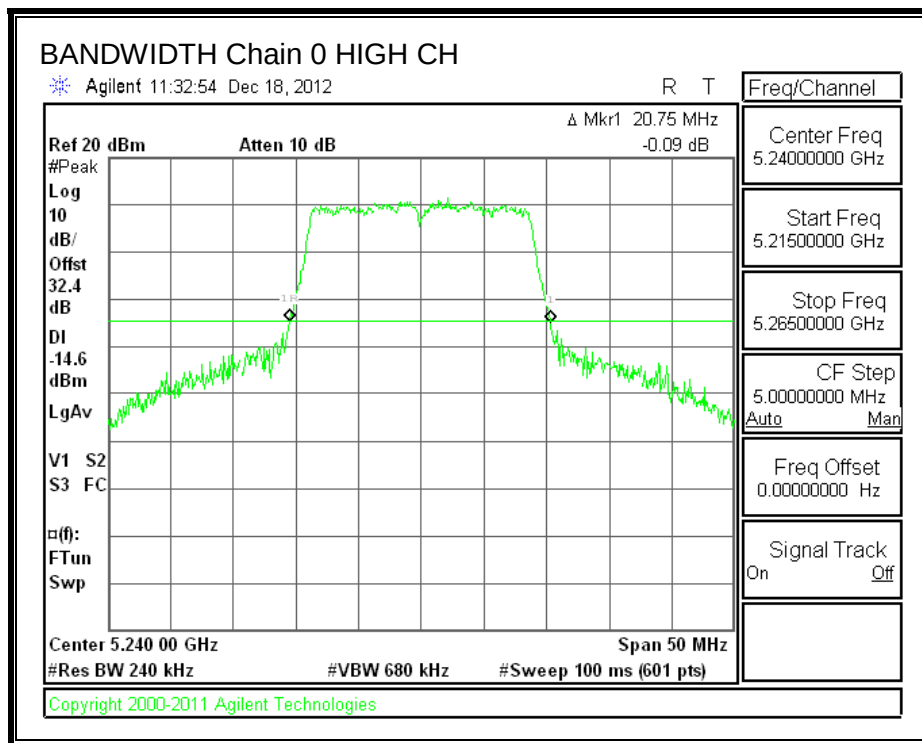
None; for reporting purposes only.

#### RESULTS

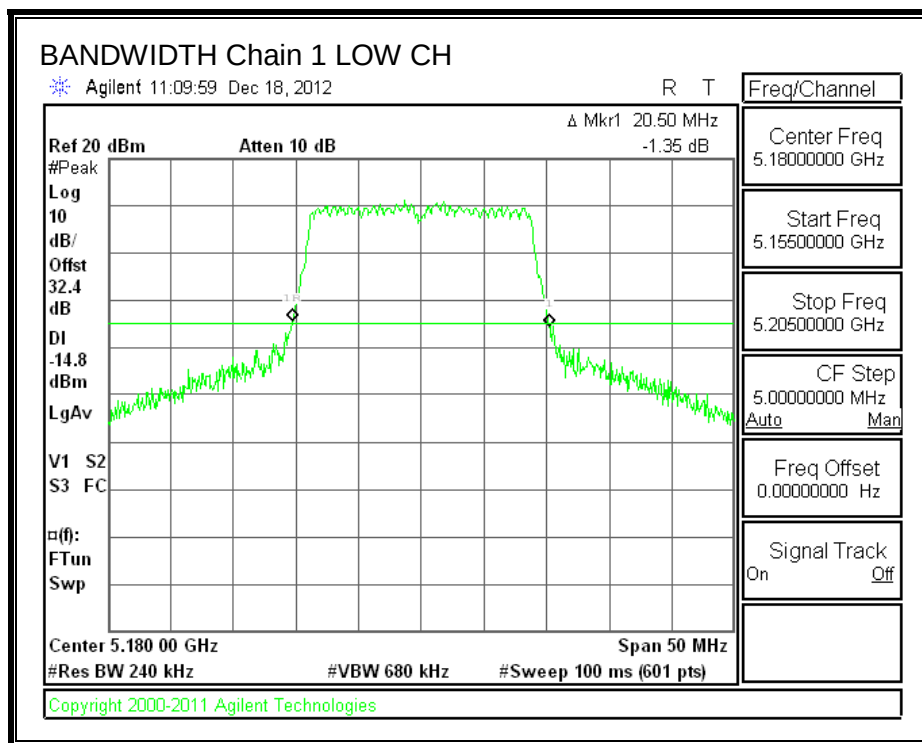
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 20.67                        | 20.50                        |
| Mid     | 5200               | 20.67                        | 20.42                        |
| High    | 5240               | 20.75                        | 20.42                        |

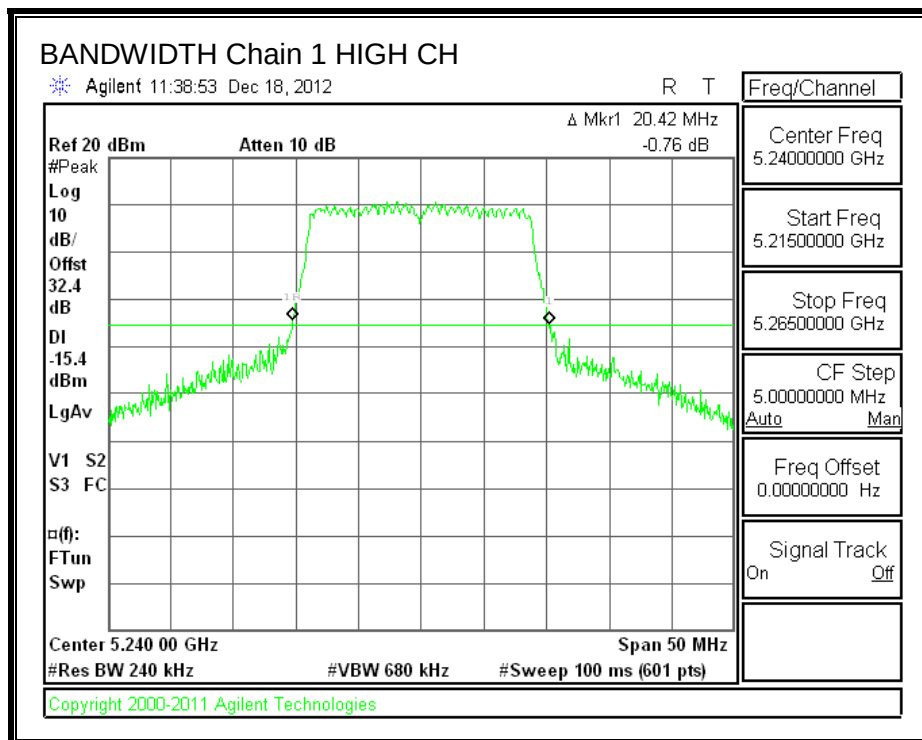
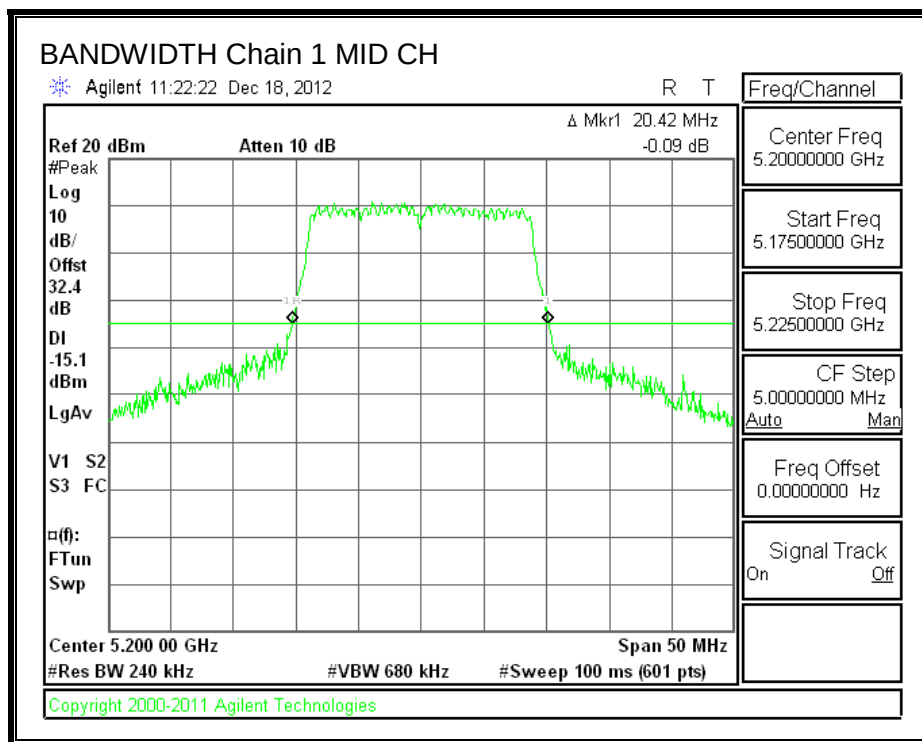
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





## 8.2.2. 99% BANDWIDTH

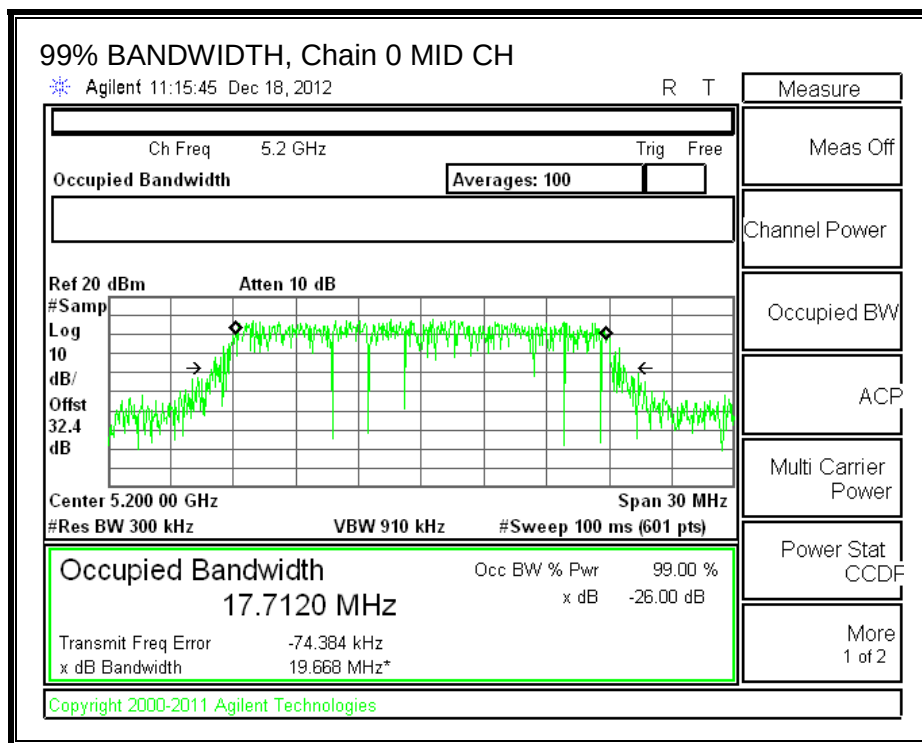
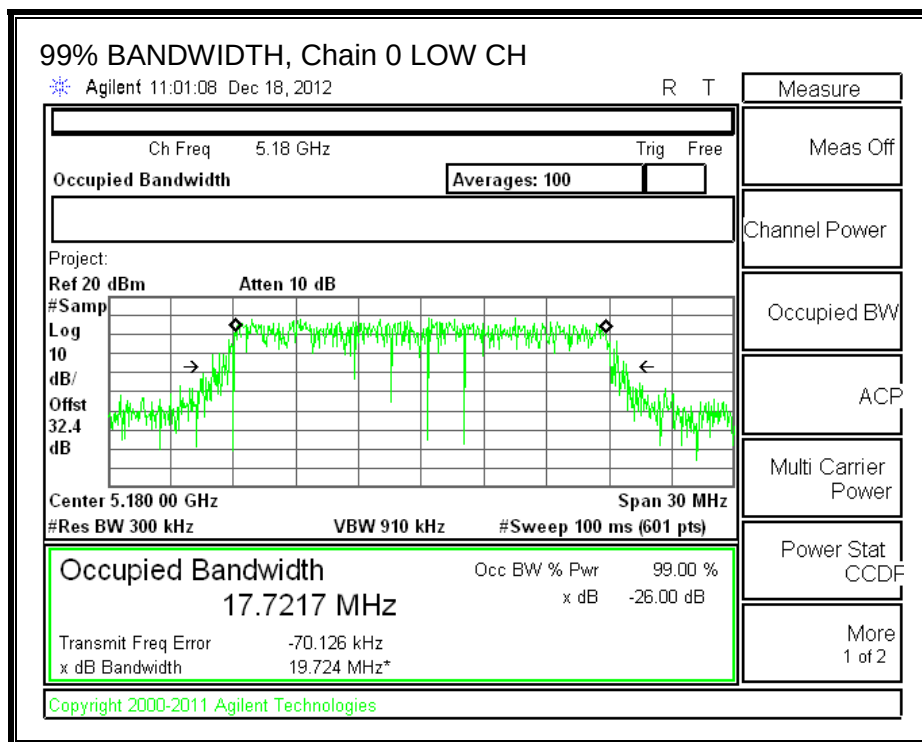
### LIMITS

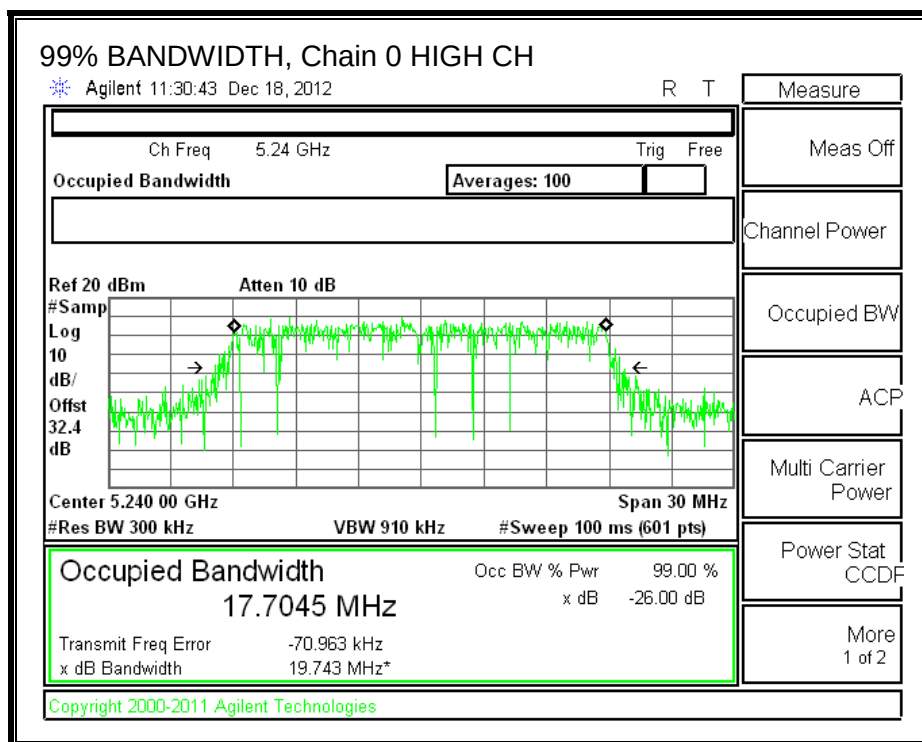
None; for reporting purposes only.

### RESULTS

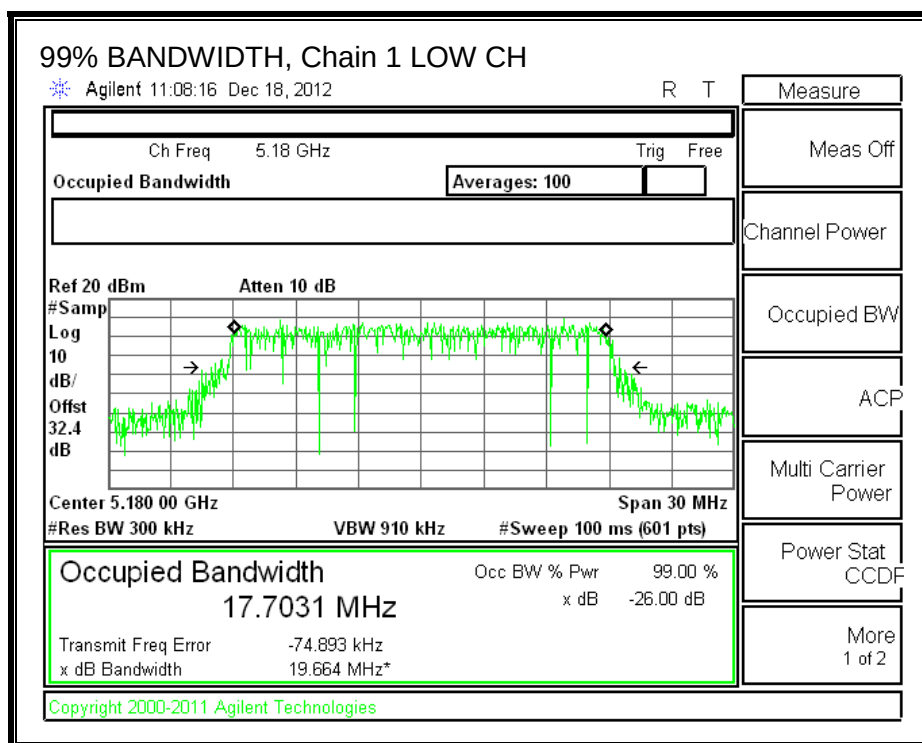
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.7217                    | 17.7031                    |
| Mid     | 5200               | 17.7120                    | 17.7066                    |
| High    | 5240               | 17.7045                    | 17.6986                    |

**99% BANDWIDTH, Chain 0**

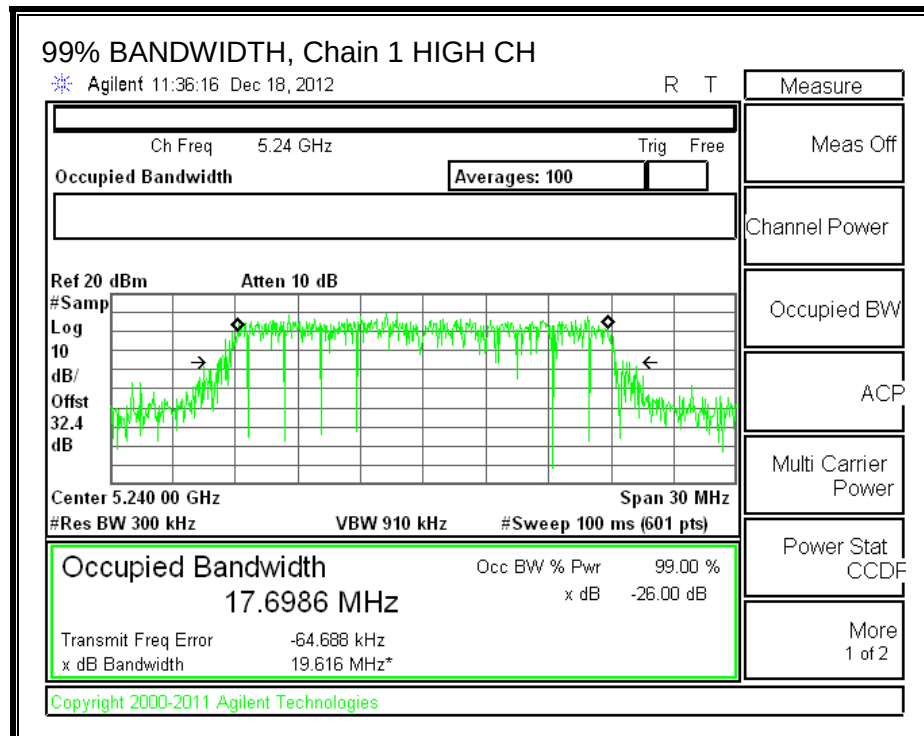
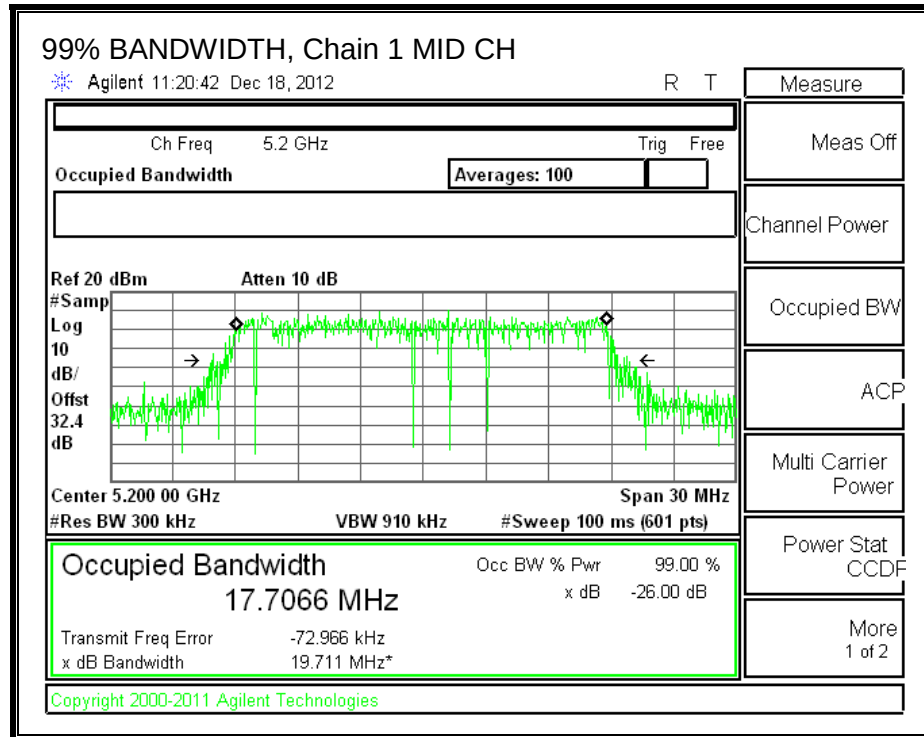




**99% BANDWIDTH, Chain 1**







### 8.2.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

For PSD, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Uncorrelated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|----------------------------------------------|
| Low     | 5180               | 20.5                        | 17.6                      | 5.72                                       | 2.73                                         |
| Mid     | 5200               | 20.4                        | 17.7                      | 5.72                                       | 2.73                                         |
| High    | 5240               | 20.4                        | 17.7                      | 5.72                                       | 2.73                                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5180               | 17.00                          | 22.46                        | 19.73                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| Mid     | 5200               | 17.00                          | 22.48                        | 19.75                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5240               | 17.00                          | 22.48                        | 19.75                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.00 |
|--------------------|------|

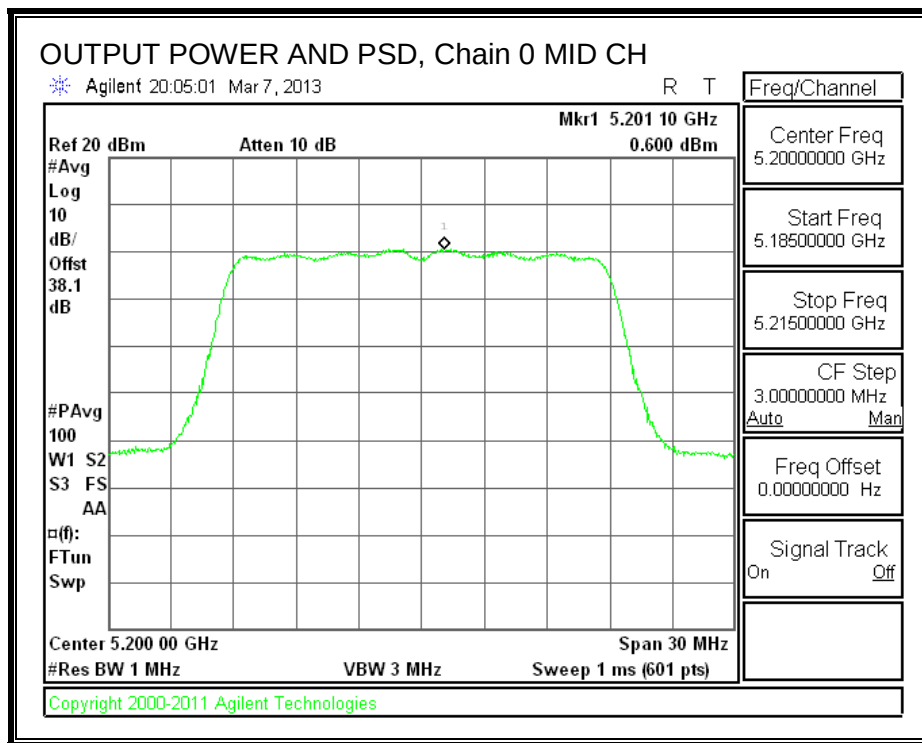
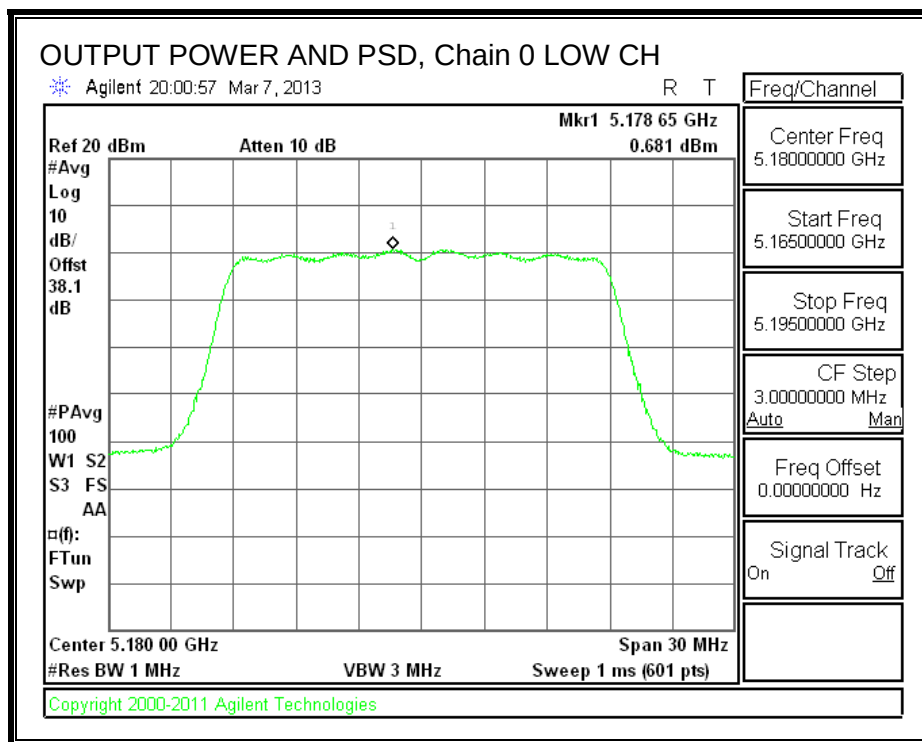
### Output Power Results

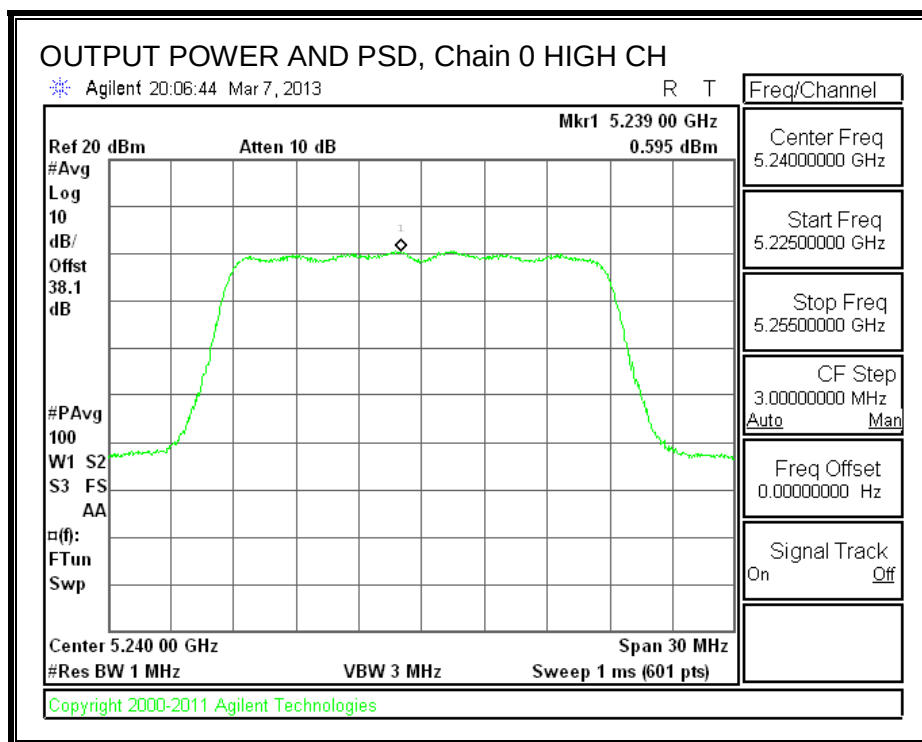
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 10.10                             | 10.00                             | 13.06                             | 17.00                   | -3.94                   |
| Mid     | 5200               | 10.10                             | 9.90                              | 13.01                             | 17.00                   | -3.99                   |
| High    | 5240               | 10.26                             | 10.00                             | 13.14                             | 17.00                   | -3.86                   |

### PSD Results

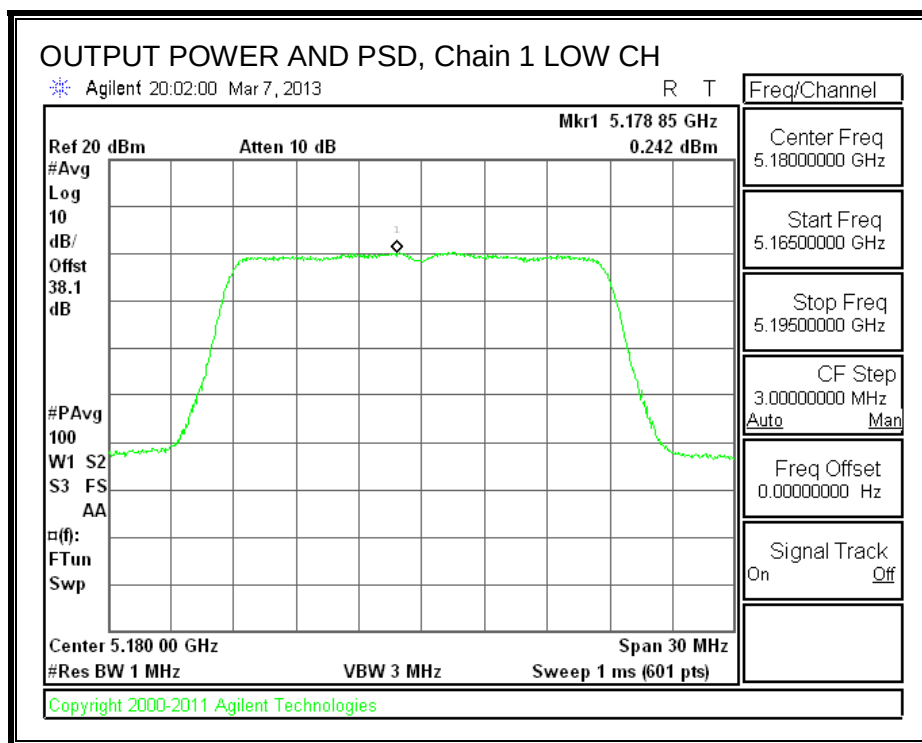
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 0.681                           | 0.242                           | 3.48                            | 4.00                  | -0.52                 |
| Mid     | 5200               | 0.600                           | 0.191                           | 3.41                            | 4.00                  | -0.59                 |
| High    | 5240               | 0.595                           | 0.255                           | 3.44                            | 4.00                  | -0.56                 |

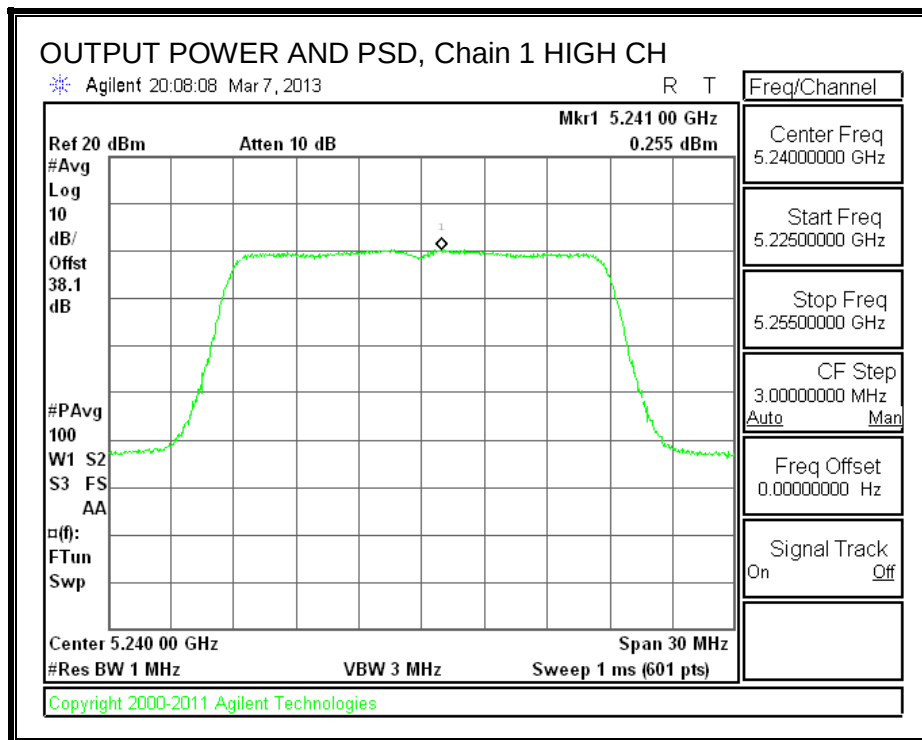
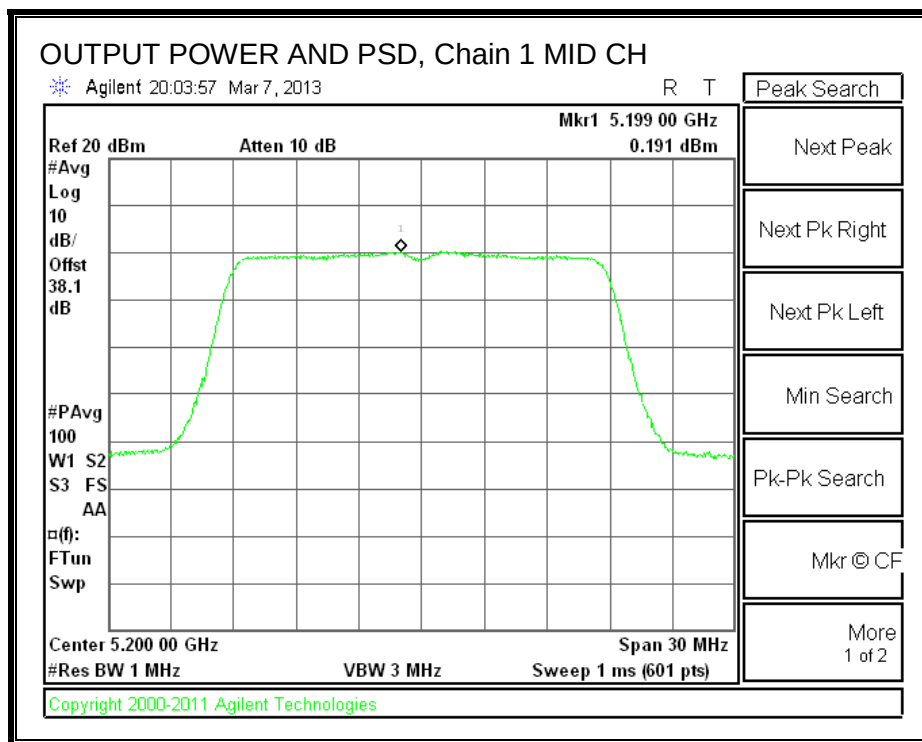
**OUTPUT POWER AND PSD, Chain 0**





**OUTPUT POWER AND PSD, Chain 1**





## 8.2.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

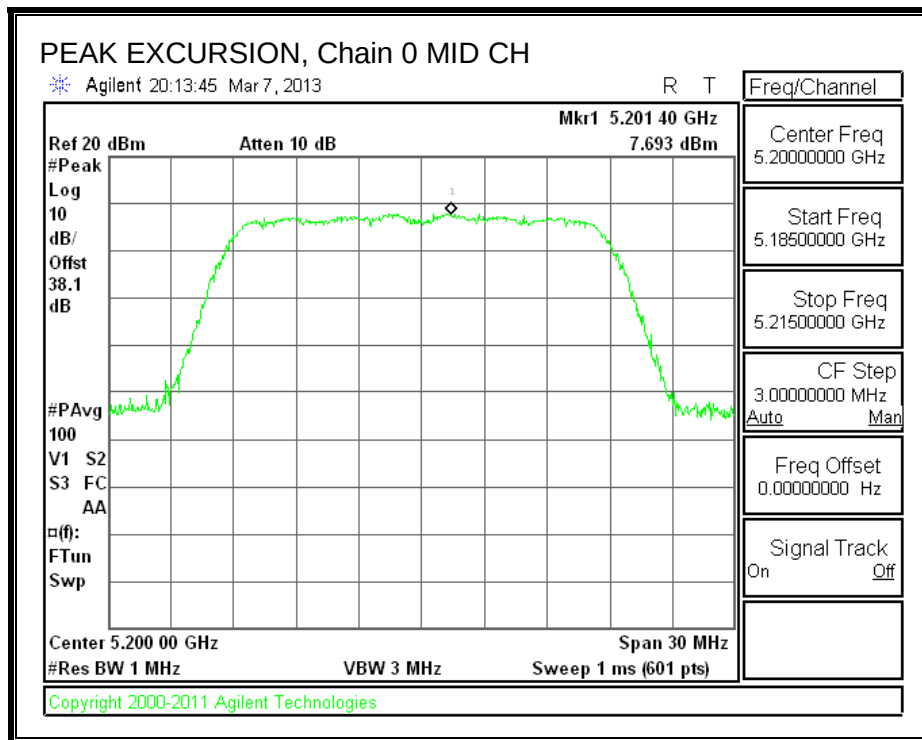
Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 7.693          | 0.600     | 0.00      | 7.09                | 13         | -5.91       |

Chain 1

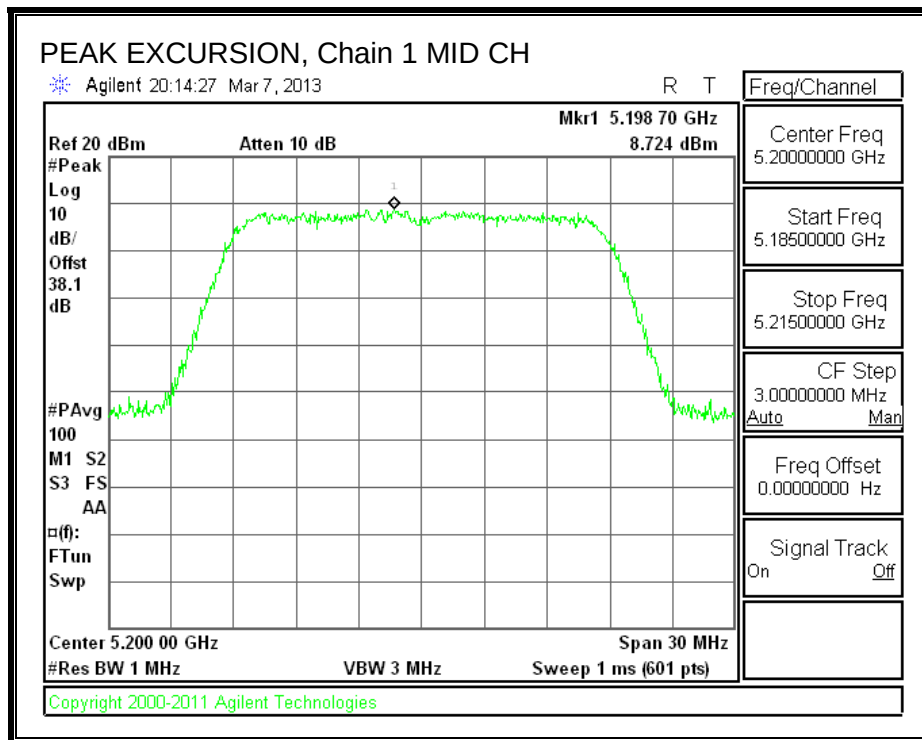
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 8.724          | 0.191     | 0.00      | 8.53                | 13         | -4.47       |

**PEAK EXCURSION, Chain 0**





**PEAK EXCURSION, Chain 1**



### 8.3. 802.11n HT20 BF 2TX MODE IN THE 5.2 GHz BAND

Covered by testing HT20 CDD 2TX mode, the power per chain used for HT20 CDD 2TX mode is the same power per chain that will be used for HT20 BF 2TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

#### 8.3.1. OUTPUT AVERAGE POWER

##### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

##### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Low     | 5180               | 20.5                        | 17.6                      | 5.72                                       |
| Mid     | 5200               | 20.4                        | 17.7                      | 5.72                                       |
| High    | 5240               | 20.4                        | 17.7                      | 5.72                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Low     | 5180               | 17.00                          | 22.46                        | 16.74                       | 16.74                   |
| Mid     | 5200               | 17.00                          | 22.48                        | 16.76                       | 16.76                   |
| High    | 5240               | 17.00                          | 22.48                        | 16.76                       | 16.76                   |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

### 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               | 10.10                             | 10.00                             | 13.06                             | 16.74                   | -3.68                   |
| Mid     | 5200               | 10.10                             | 9.90                              | 13.01                             | 16.76                   | -3.75                   |
| High    | 5240               | 10.26                             | 10.00                             | 13.14                             | 16.76                   | -3.62                   |

#### 8.4. 802.11n HT20 STBC 2TX MODE IN THE 5.2 GHz BAND

##### 8.4.1. 26 dB BANDWIDTH

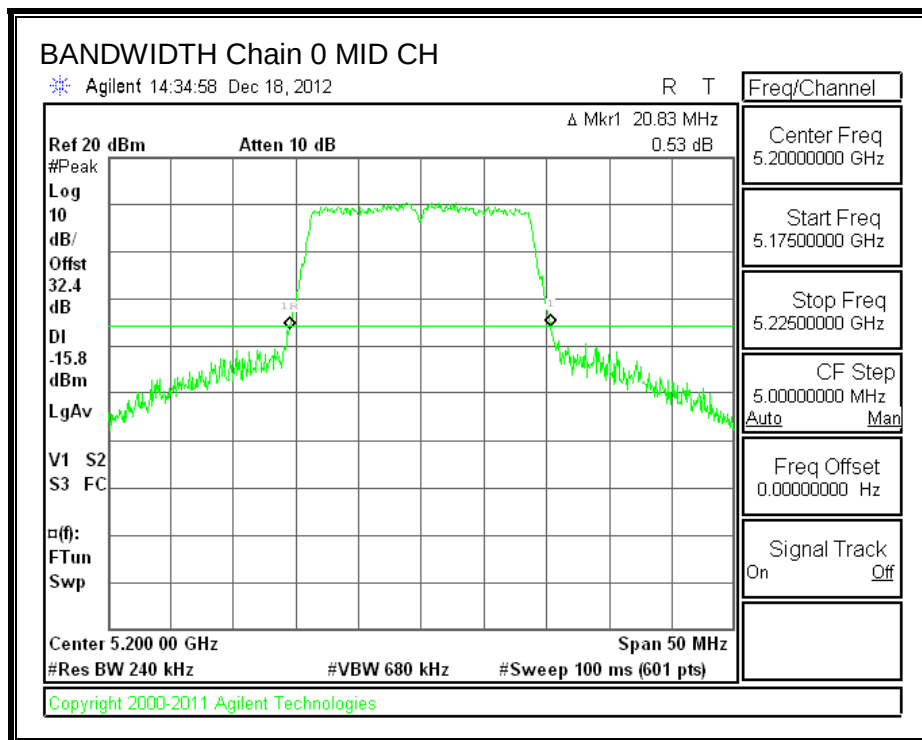
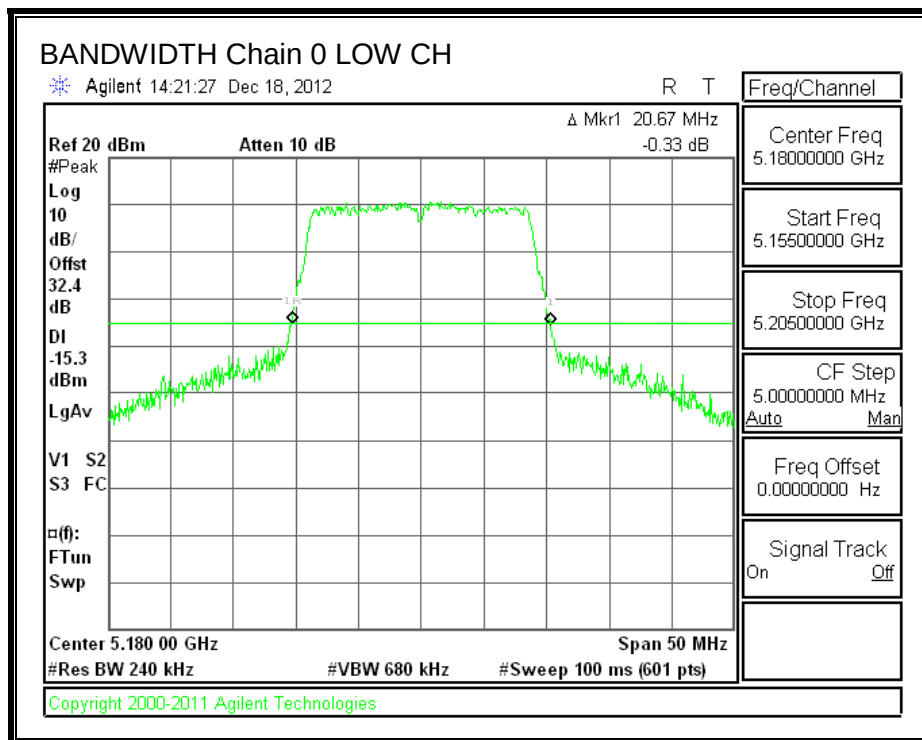
###### LIMITS

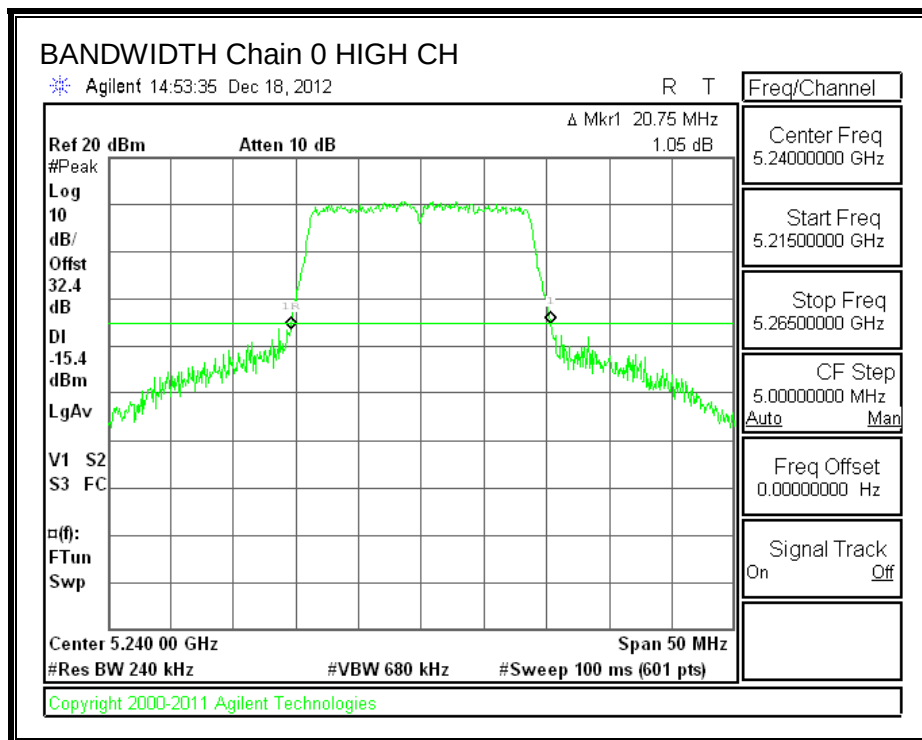
None; for reporting purposes only.

###### RESULTS

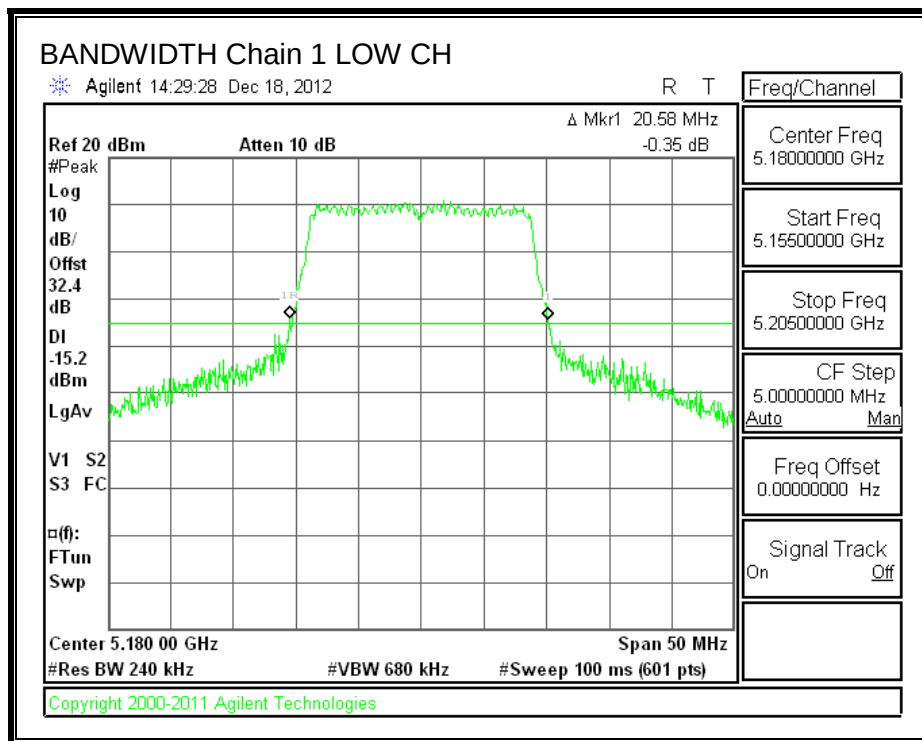
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5180               | 20.67                        | 20.58                        |
| Mid     | 5200               | 20.83                        | 20.58                        |
| High    | 5240               | 20.75                        | 20.50                        |

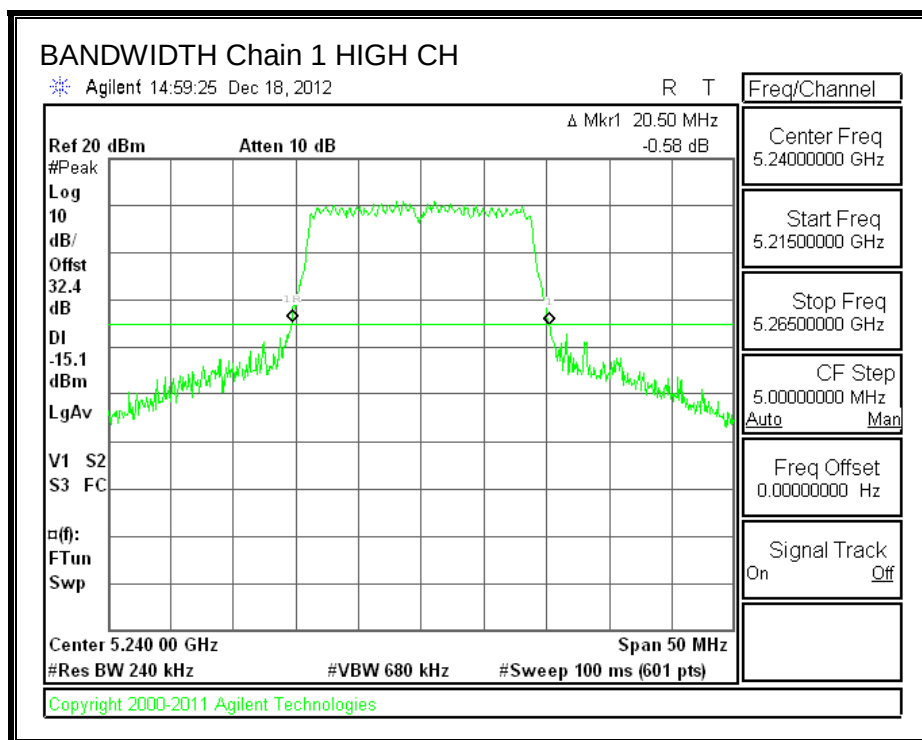
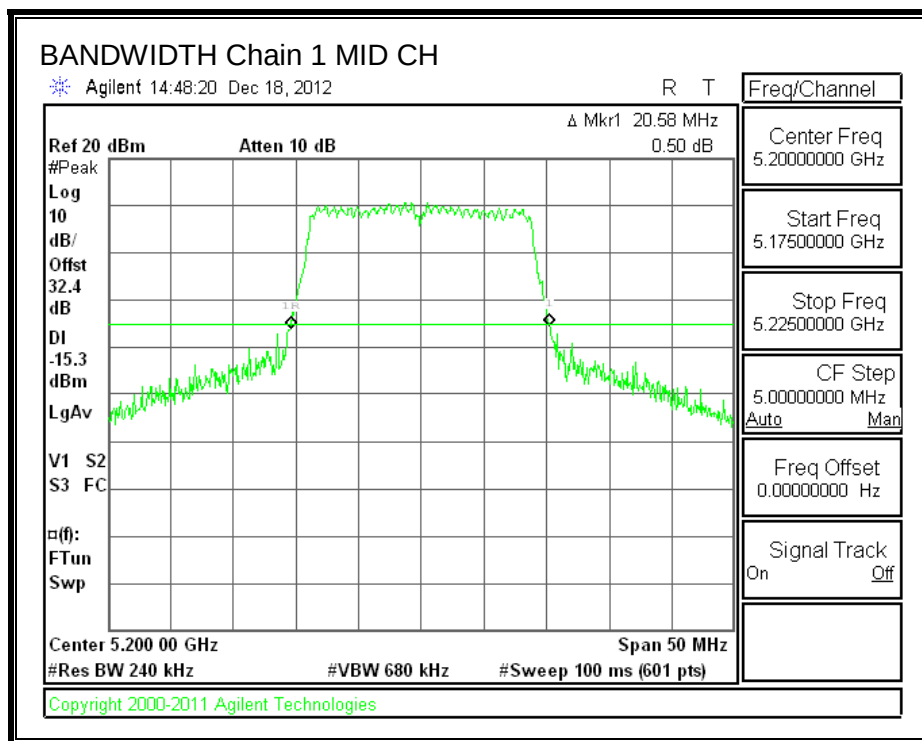
**26 dB BANDWIDTH, Chain 0**





**26 dB BANDWIDTH, Chain 1**





#### 8.4.2. 99% BANDWIDTH

##### LIMITS

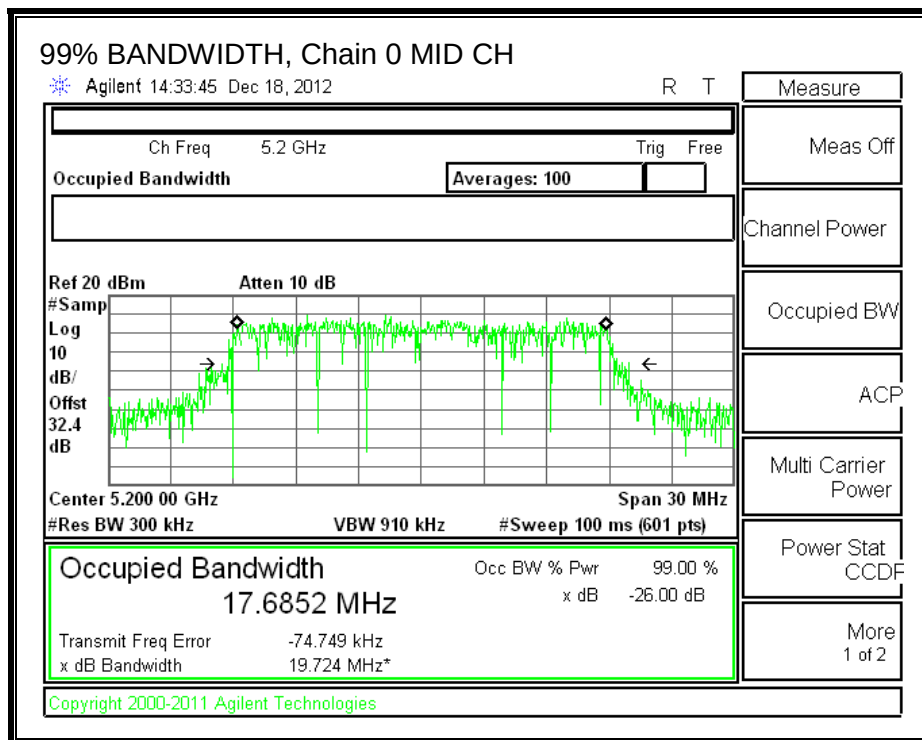
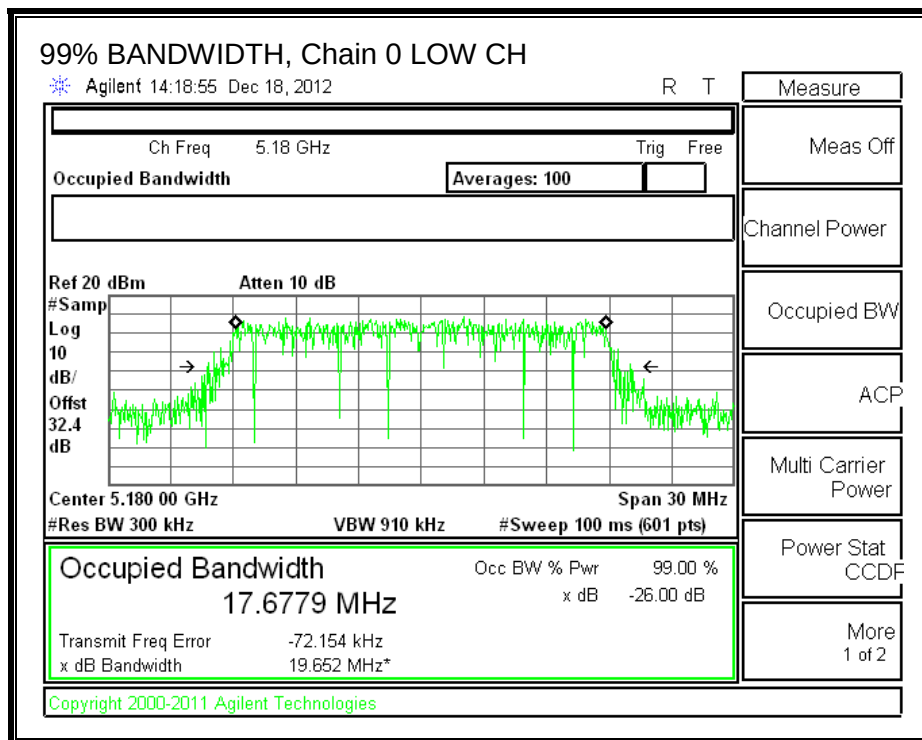
None; for reporting purposes only.

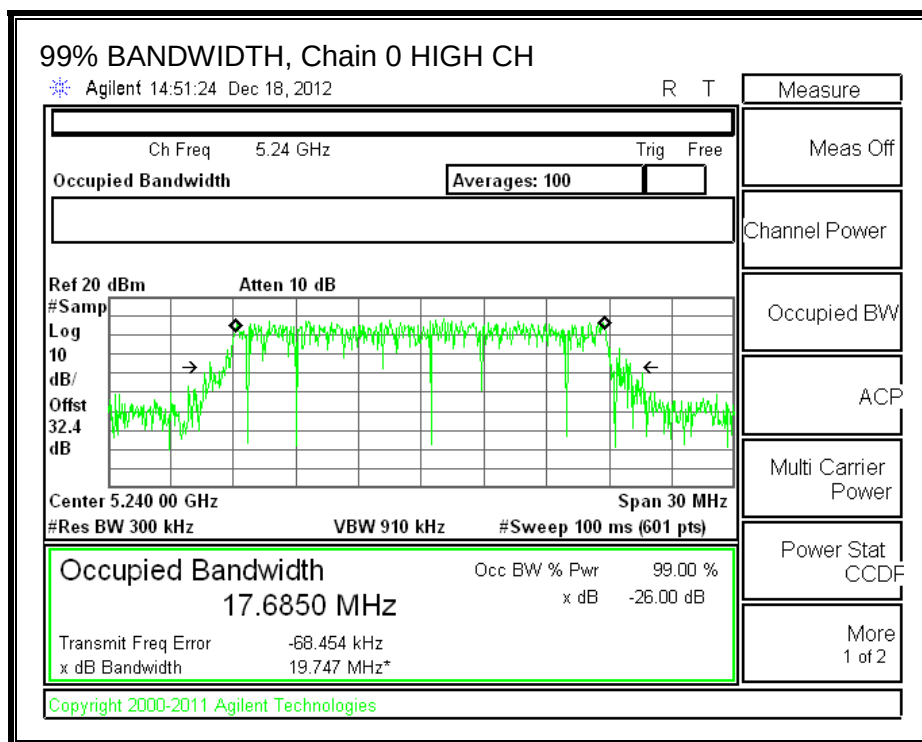
##### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.6779                    | 17.6947                    |
| Mid     | 5200               | 17.6852                    | 17.6885                    |
| High    | 5240               | 17.6850                    | 17.6906                    |

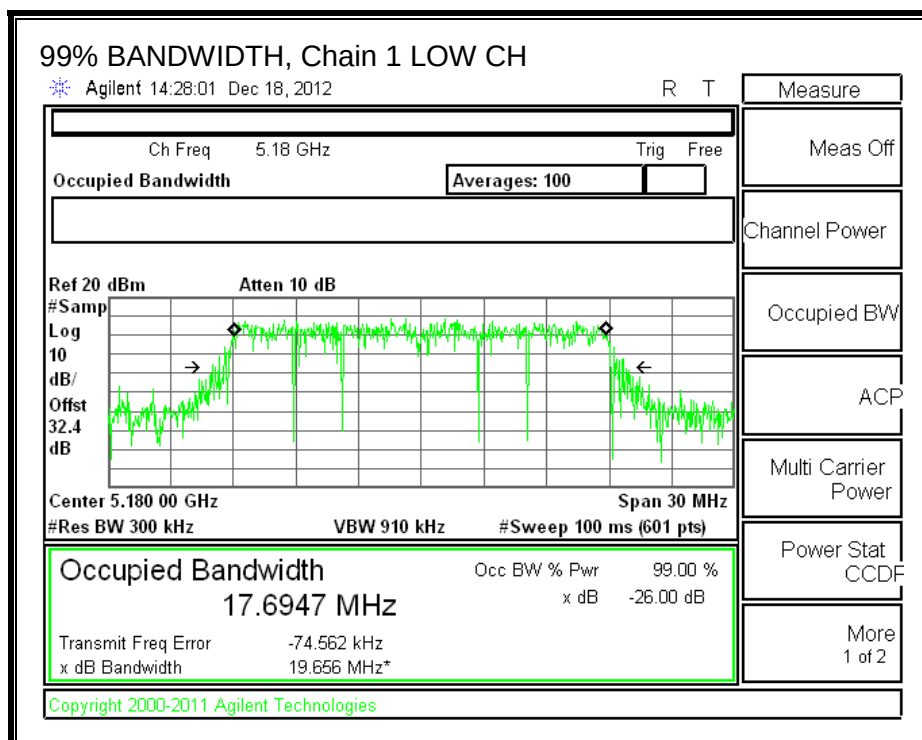


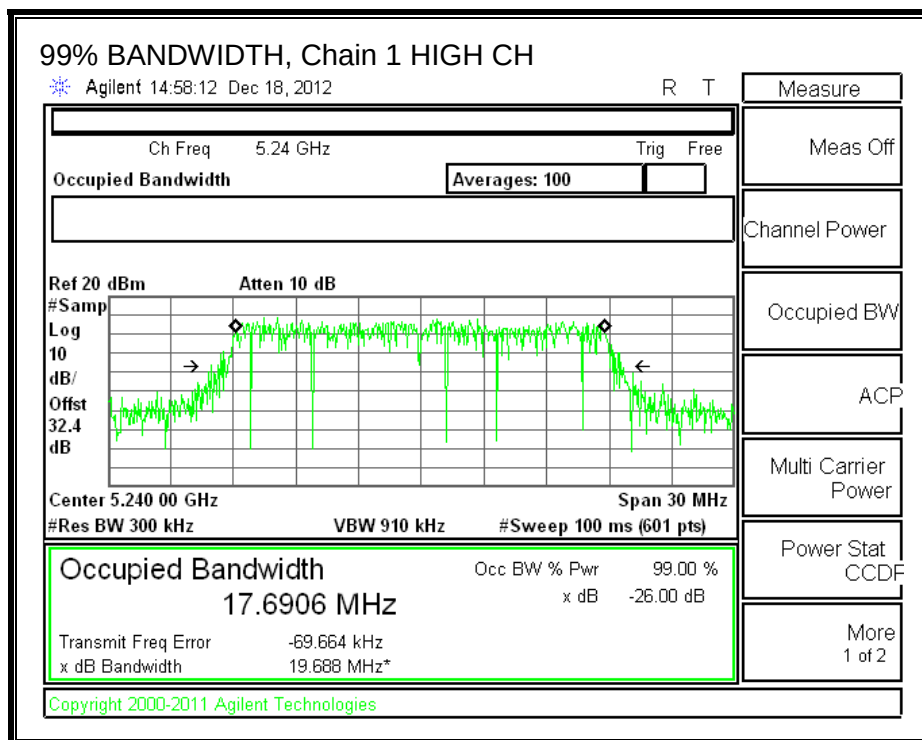
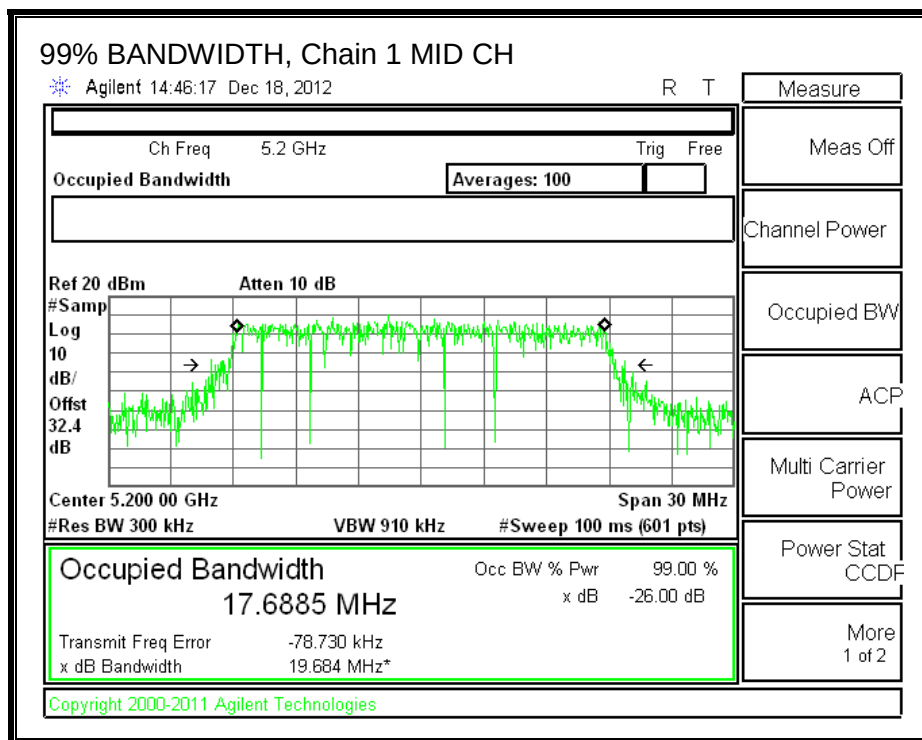
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 8.4.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5180               | 20.58                       | 17.6779                   | 2.73                         |
| Mid     | 5200               | 20.58                       | 17.6852                   | 2.73                         |
| High    | 5240               | 20.50                       | 17.6850                   | 2.73                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5180               | 17.00                          | 22.47                        | 19.74                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| Mid     | 5200               | 17.00                          | 22.48                        | 19.75                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5240               | 17.00                          | 22.48                        | 19.75                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.00 |
|--------------------|------|

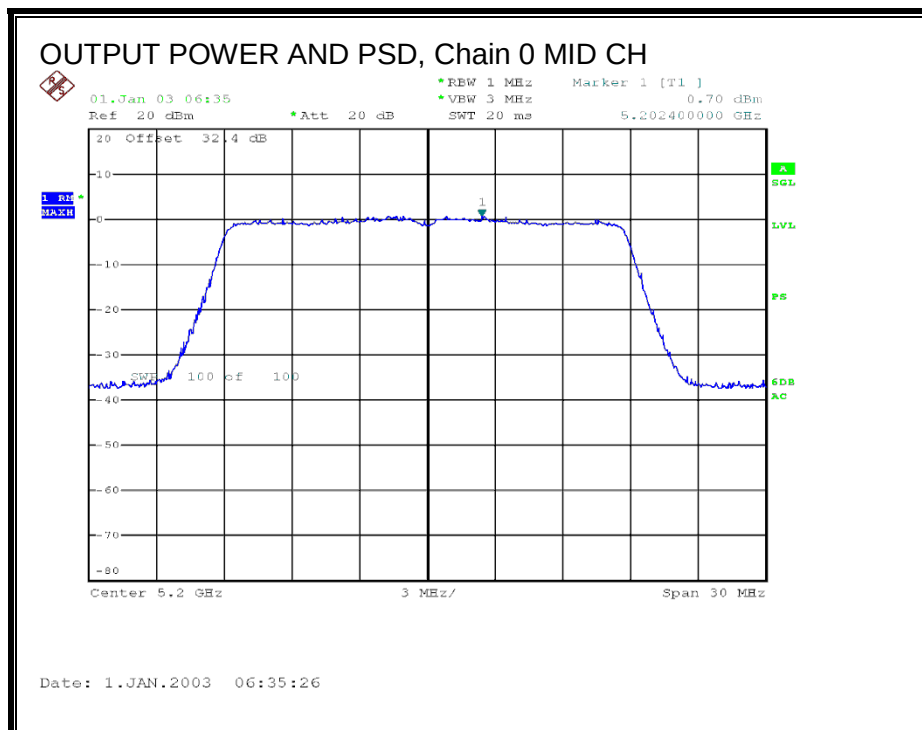
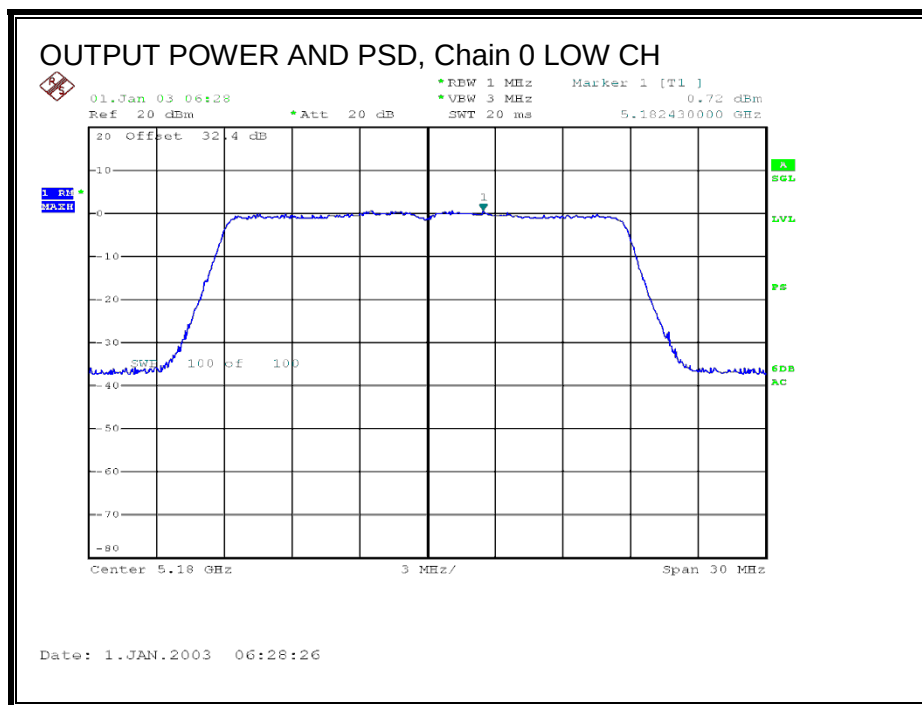
### Output Power Results

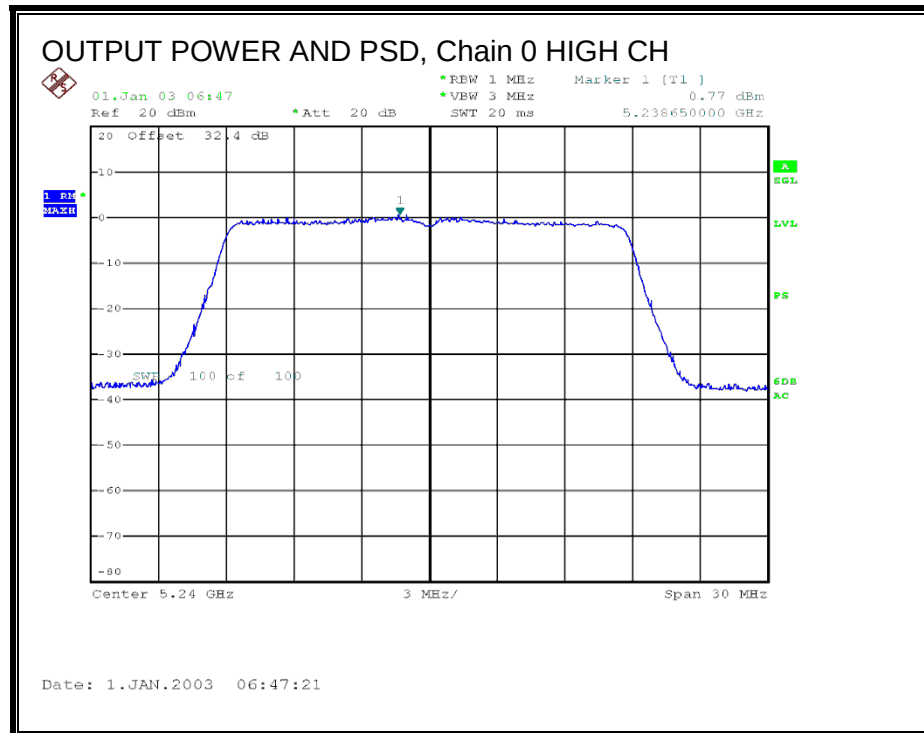
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 11.10                             | 11.20                             | 14.16                             | 17.00                   | -2.84                   |
| Mid     | 5200               | 11.21                             | 10.98                             | 14.11                             | 17.00                   | -2.89                   |
| High    | 5240               | 11.20                             | 11.10                             | 14.16                             | 17.00                   | -2.84                   |

### PSD Results

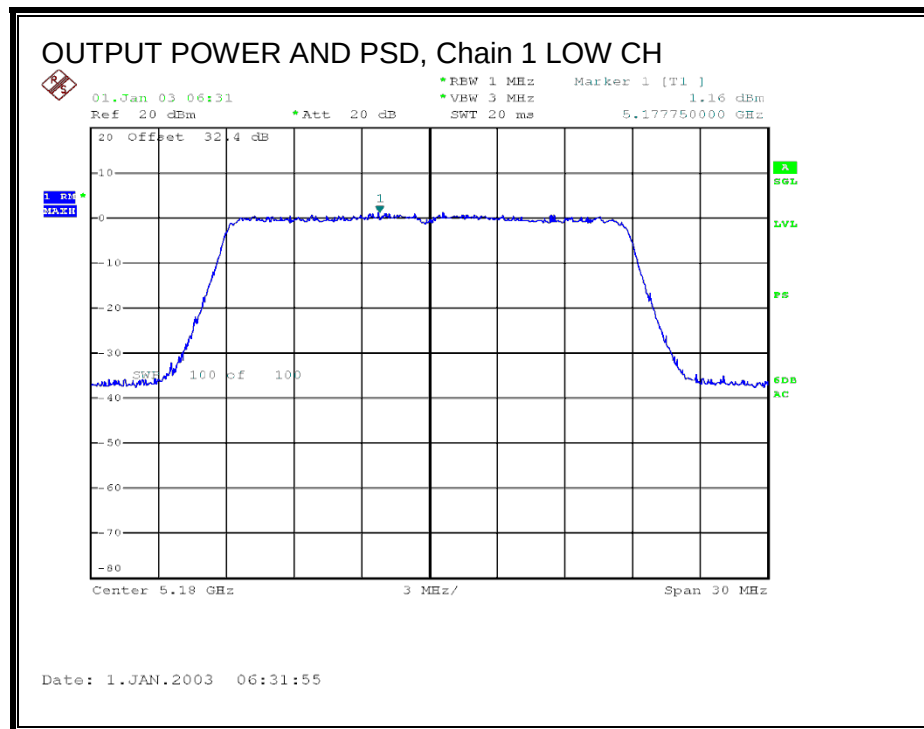
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | 0.72                            | 1.16                            | 3.96                            | 4.00                  | -0.04                 |
| Mid     | 5200               | 0.70                            | 1.12                            | 3.93                            | 4.00                  | -0.07                 |
| High    | 5240               | 0.77                            | 0.67                            | 3.73                            | 4.00                  | -0.27                 |

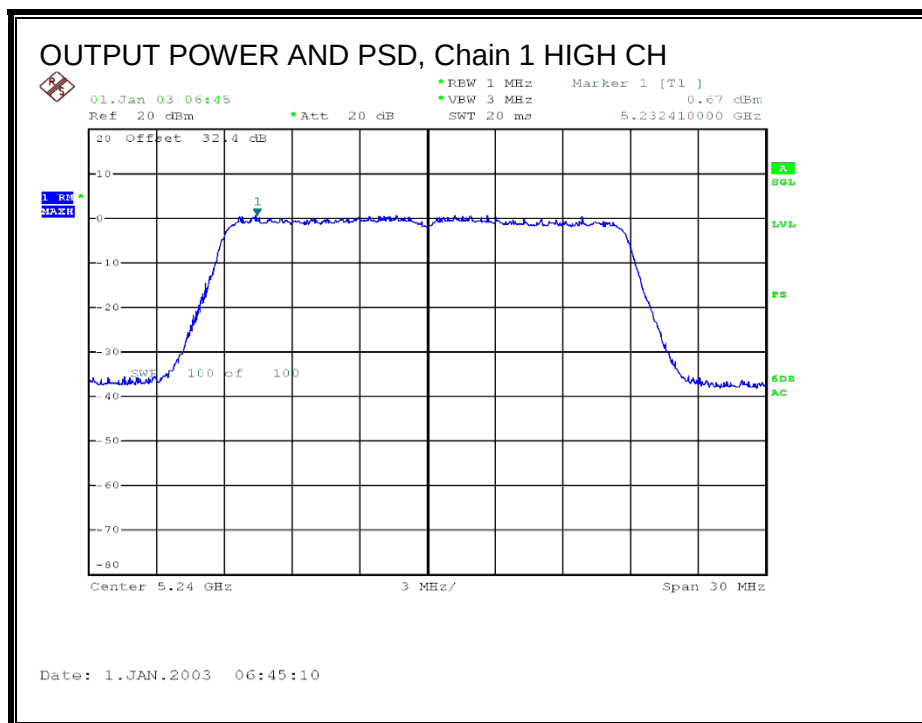
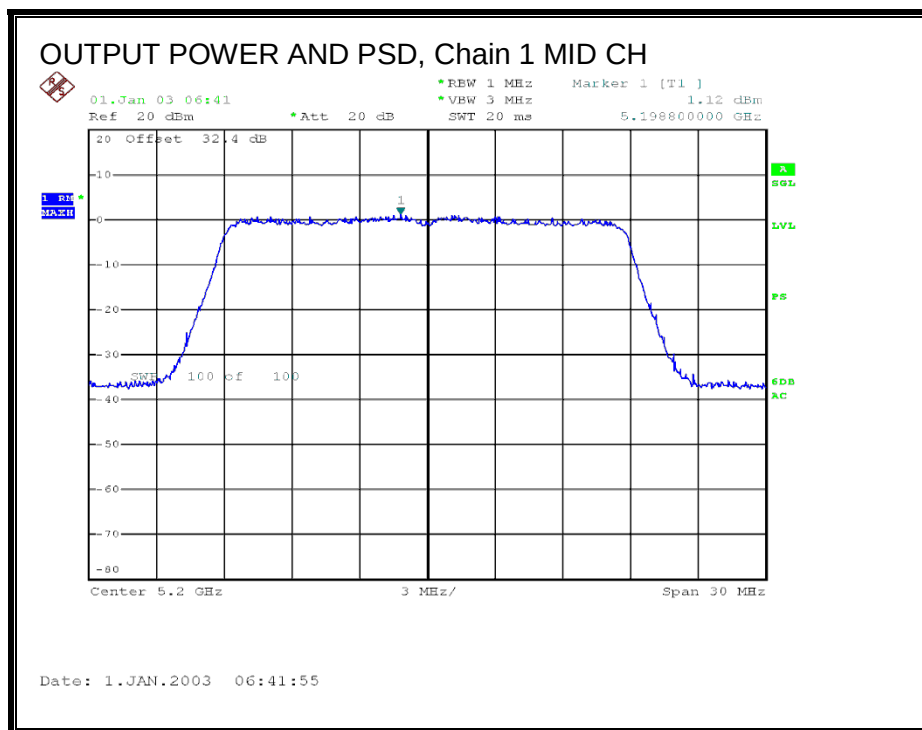
**OUTPUT POWER AND PSD, Chain 0**





**OUTPUT POWER AND PSD, Chain 1**







#### 8.4.4. PEAK EXCURSION

##### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

##### RESULTS

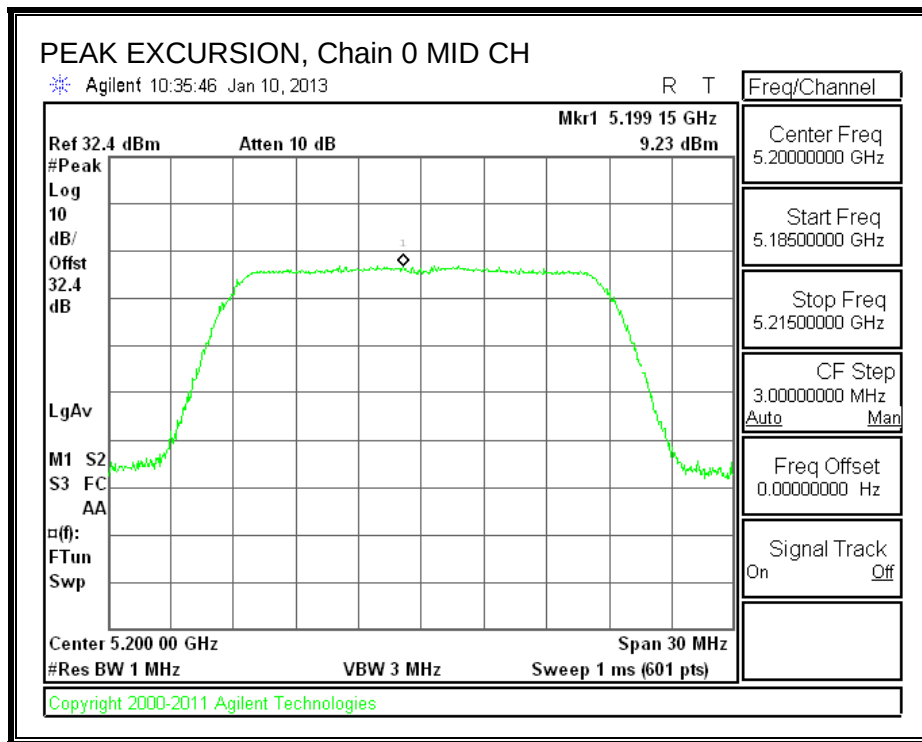
Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 9.23           | 0.70      | 0.00      | 8.53                | 13         | -4.47       |

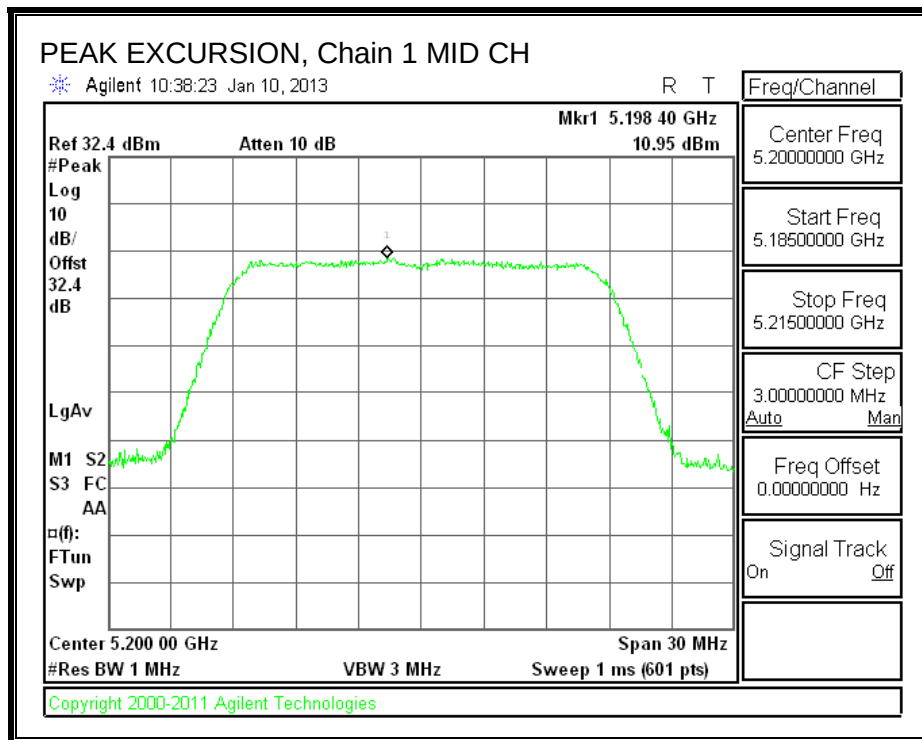
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 10.95          | 1.12      | 0.00      | 9.83                | 13         | -3.17       |

**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



## 8.5. 802.11n HT20 CDD 3TX MODE IN THE 5.2 GHz BAND

### 8.5.1. 26 dB BANDWIDTH

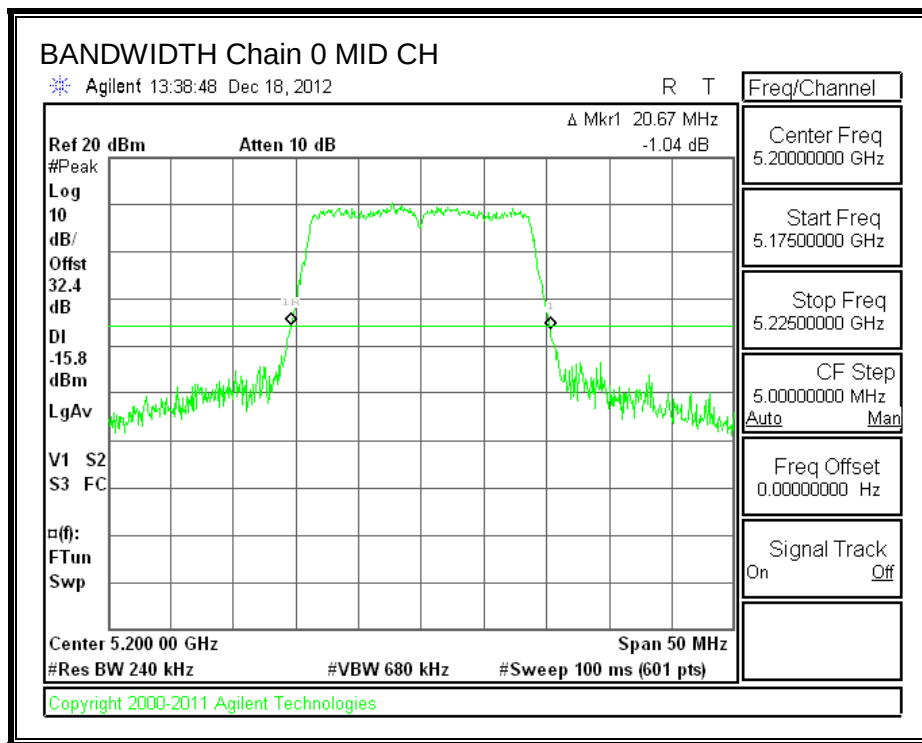
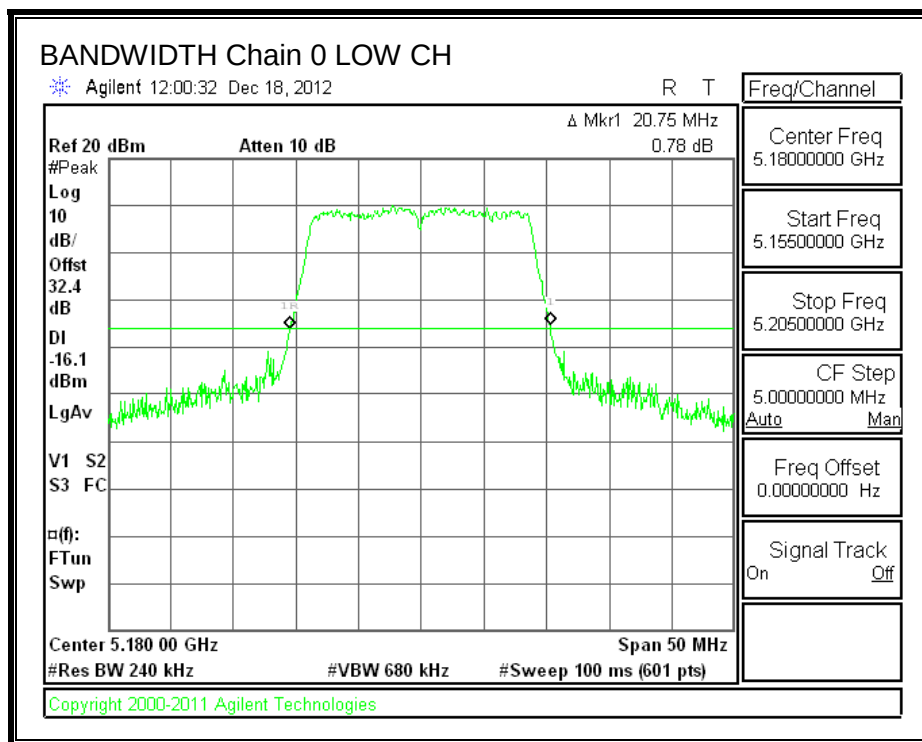
#### LIMITS

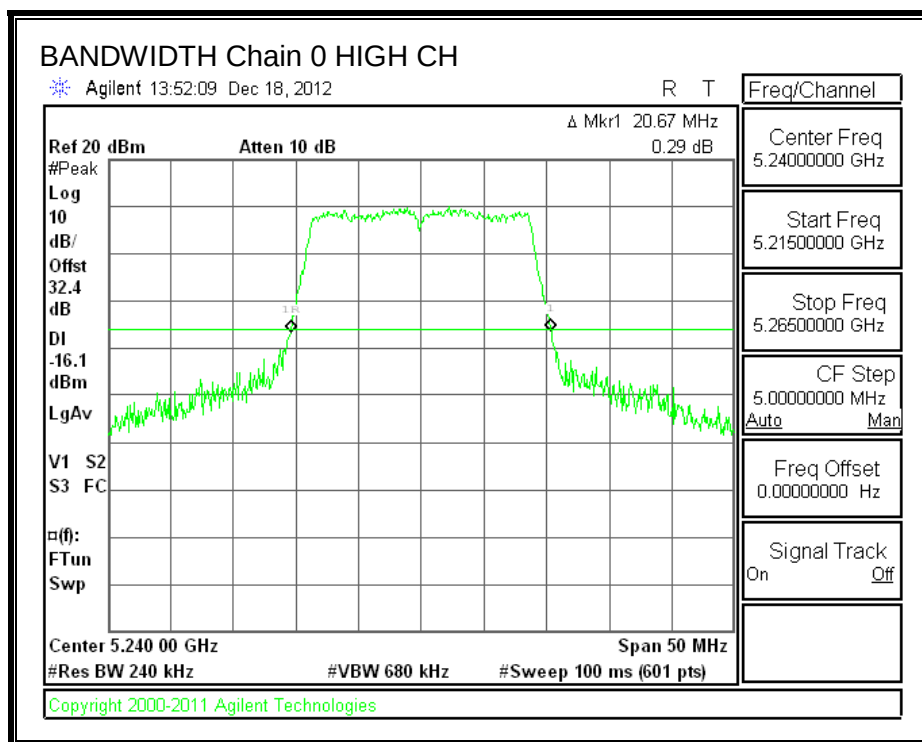
None; for reporting purposes only.

#### RESULTS

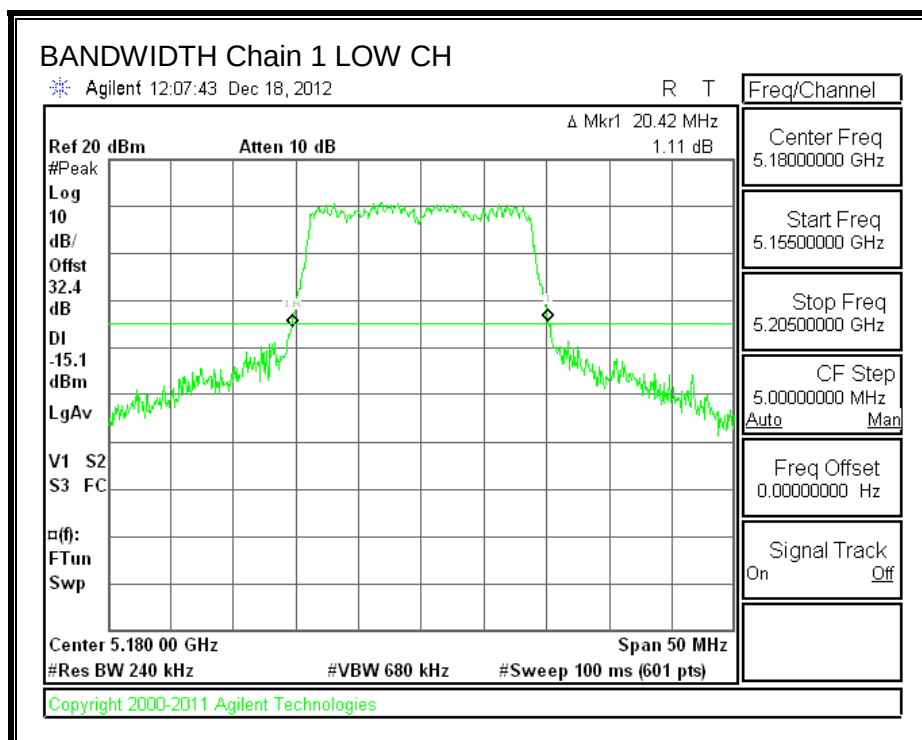
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Low     | 5180               | 20.75                        | 20.42                        | 20.67                        |
| Mid     | 5200               | 20.67                        | 20.50                        | 20.67                        |
| High    | 5240               | 20.67                        | 20.50                        | 20.92                        |

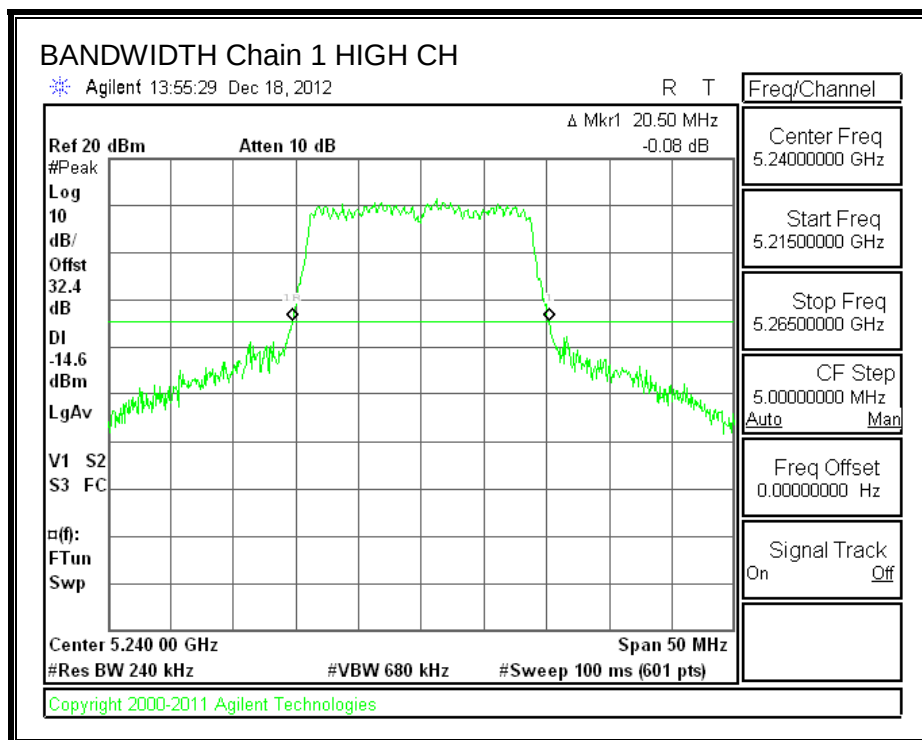
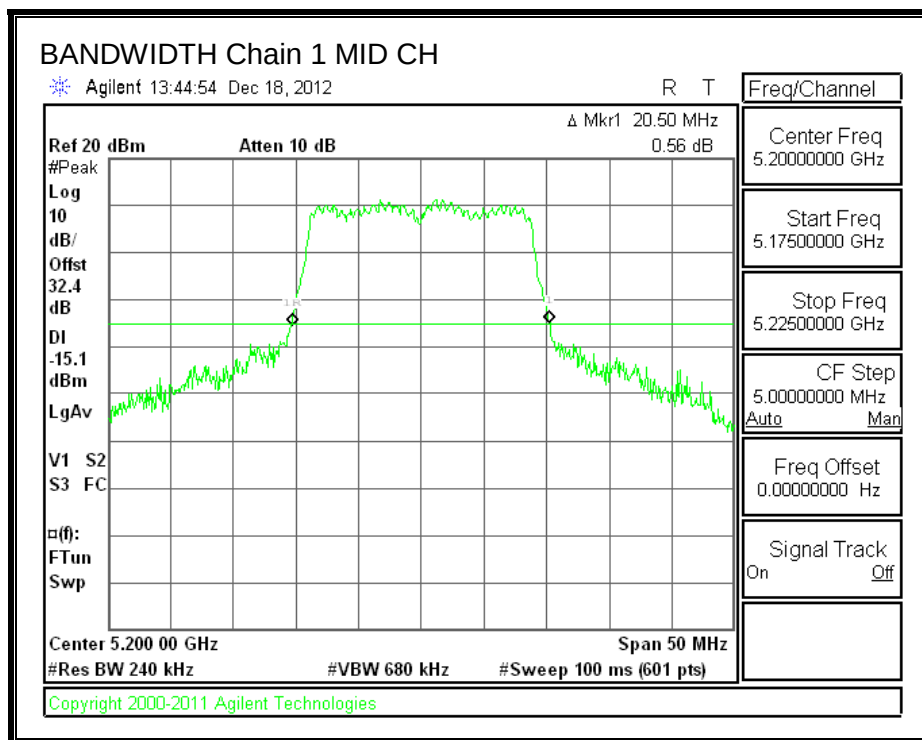
**26 dB BANDWIDTH, Chain 0**



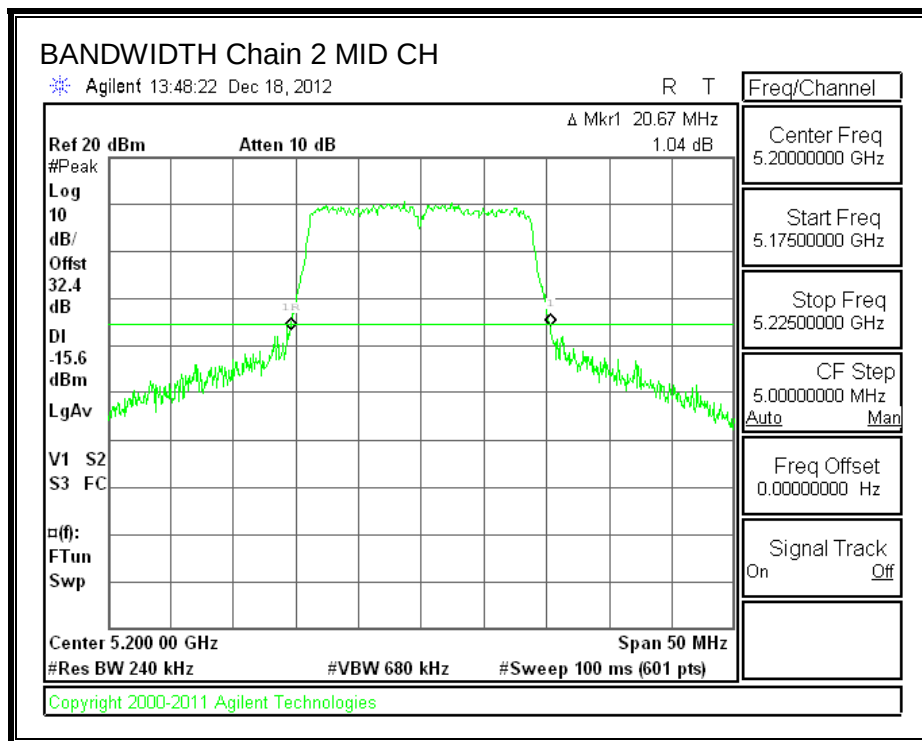
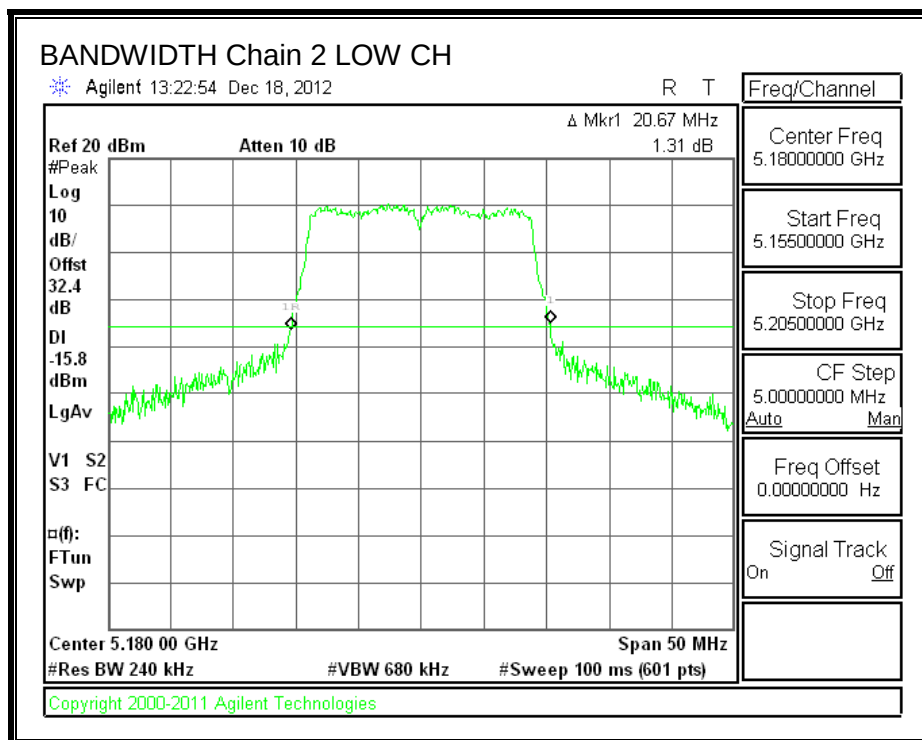


**26 dB BANDWIDTH, Chain 1**

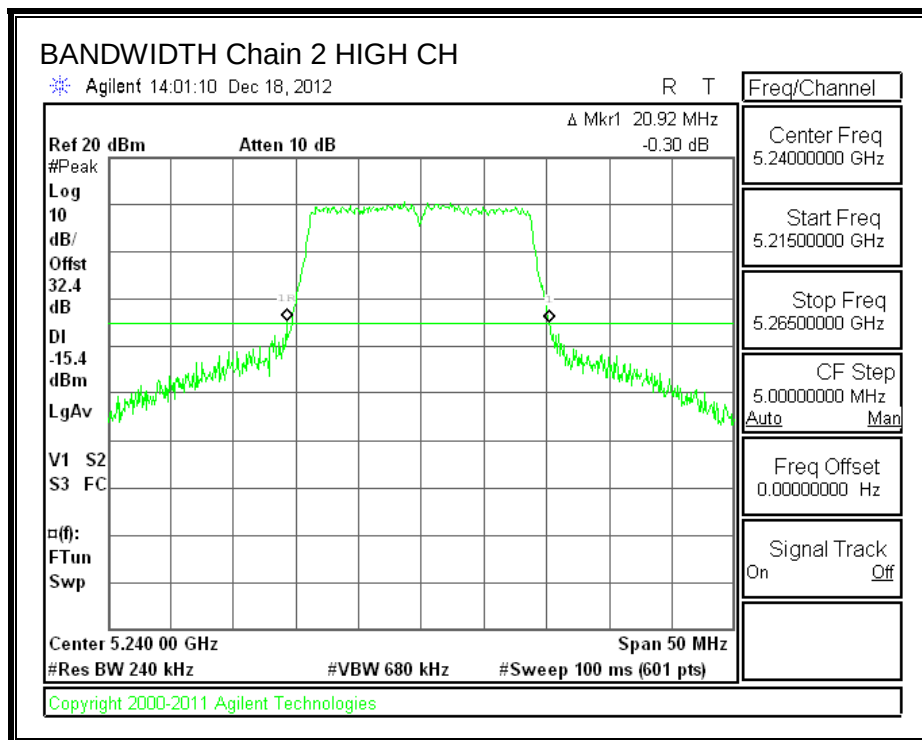




**26 dB BANDWIDTH, Chain 2**







## 8.5.2. 99% BANDWIDTH

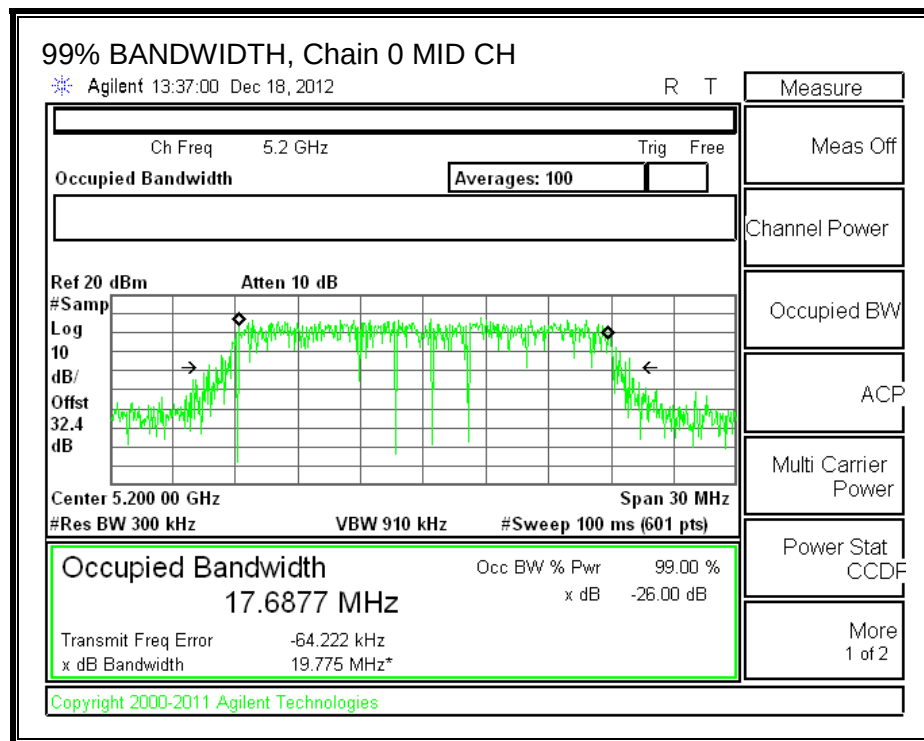
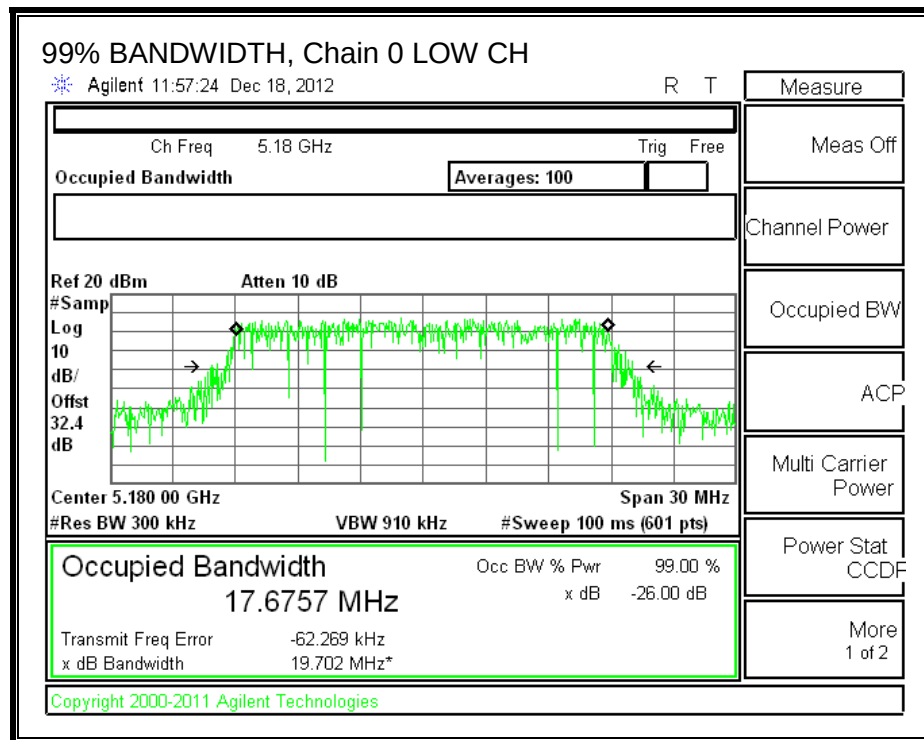
### LIMITS

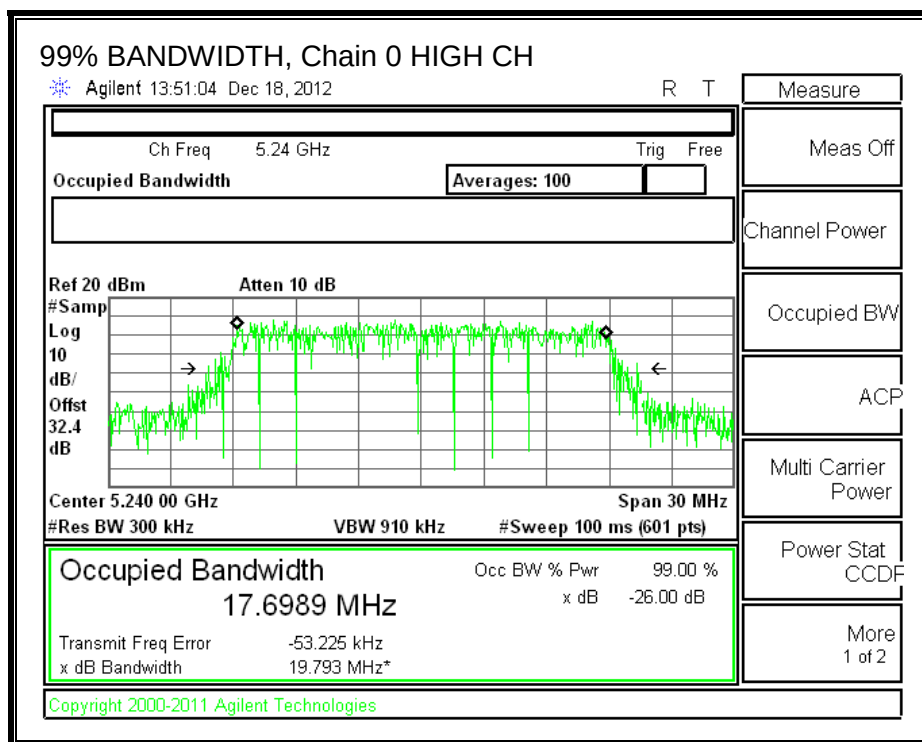
None; for reporting purposes only.

### RESULTS

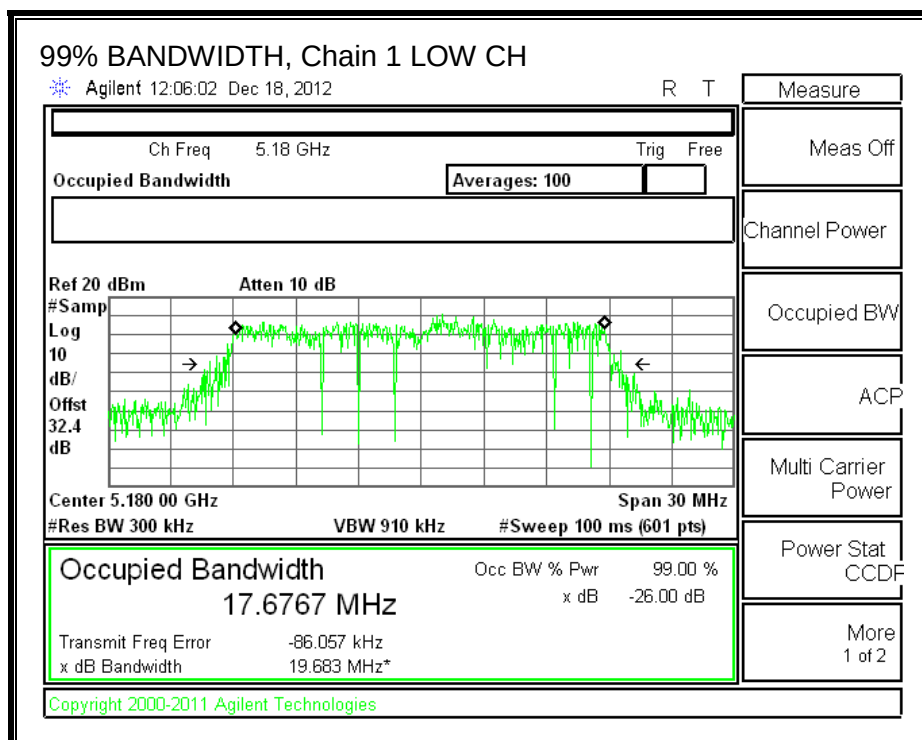
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.6757                    | 17.6767                    | 17.6812                    |
| Mid     | 5200               | 17.6877                    | 17.6801                    | 17.6888                    |
| High    | 5240               | 17.6989                    | 17.6850                    | 17.6956                    |

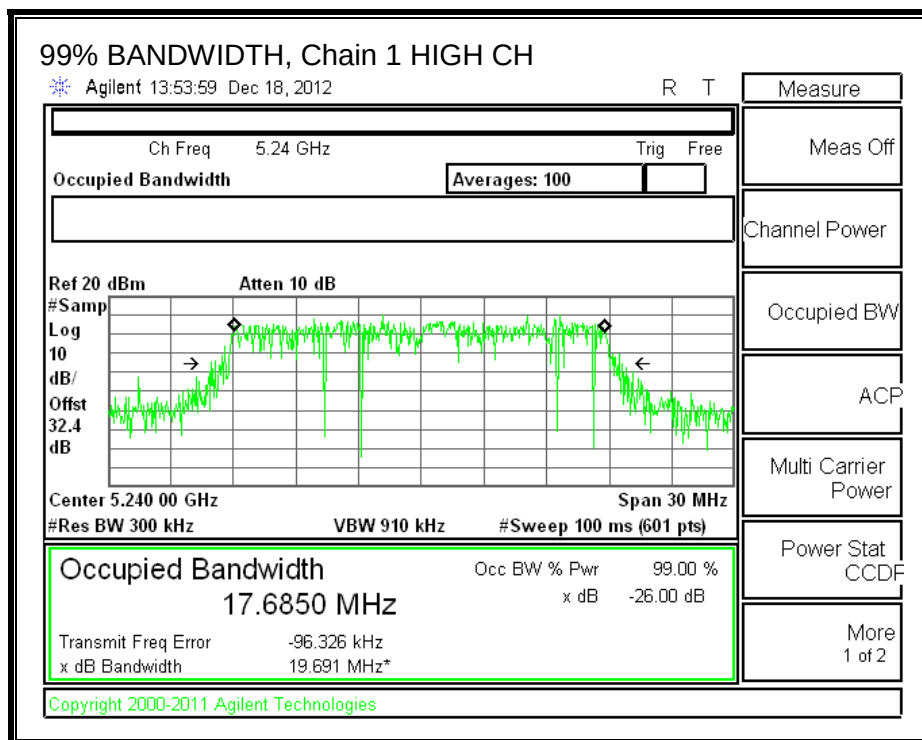
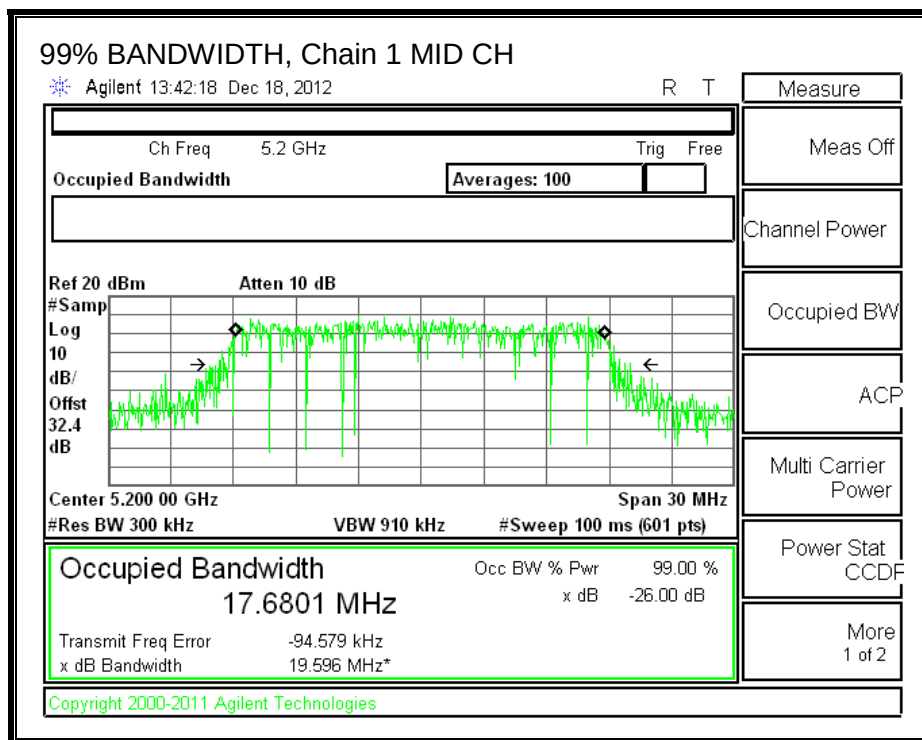
**99% BANDWIDTH, Chain 0**



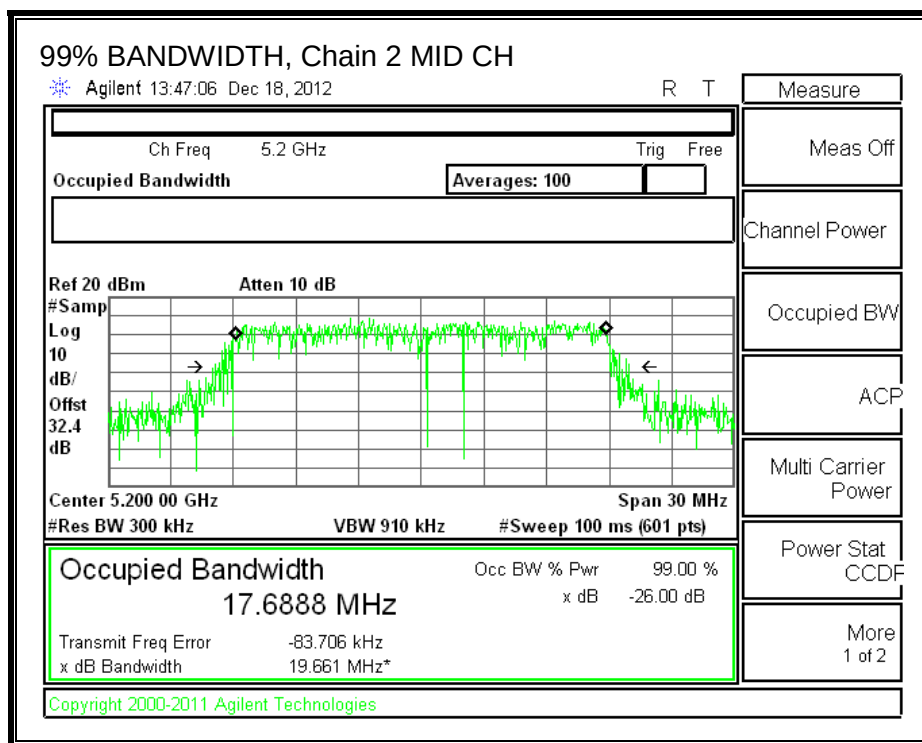
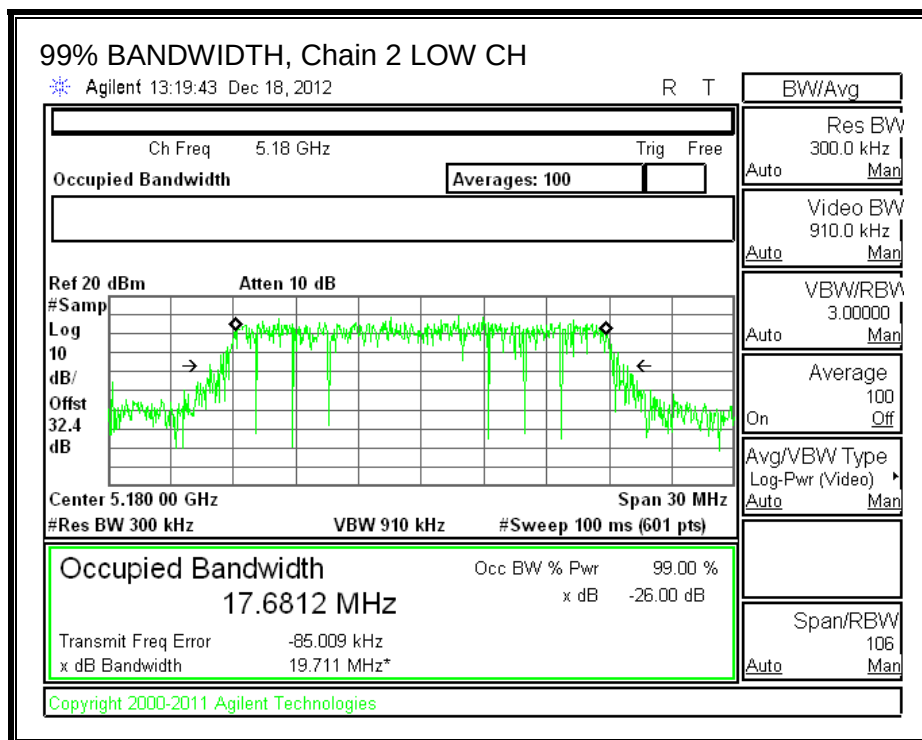


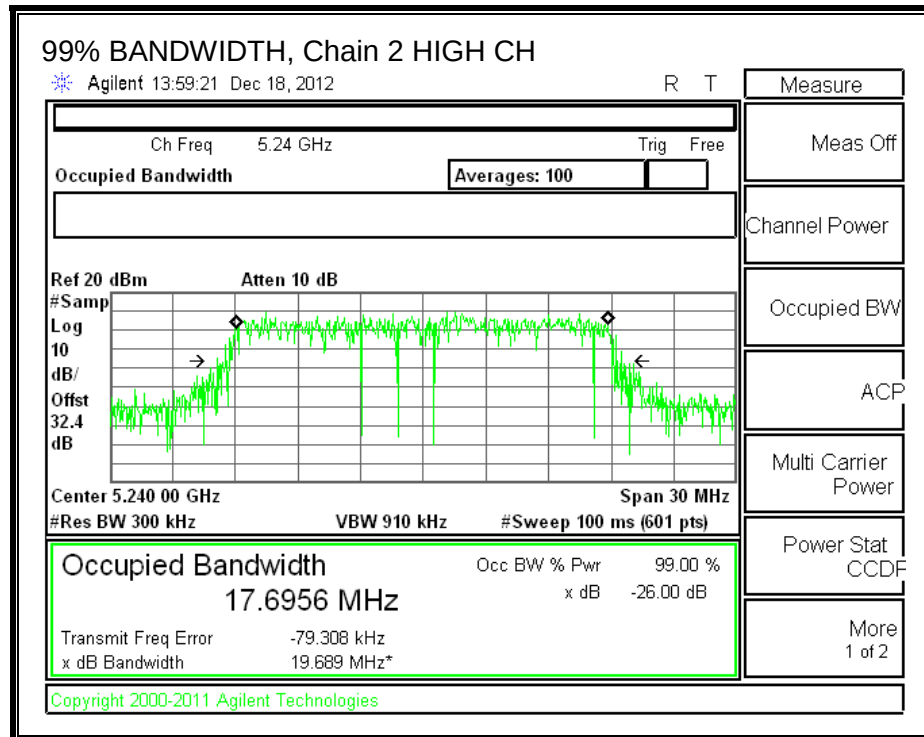
**99% BANDWIDTH, Chain 1**





**99% BANDWIDTH, Chain 2**





### 8.5.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log<sub>10</sub> B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

The TX chains are correlated for PSD 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |



## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Uncorrelated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|----------------------------------------------|
| Low     | 5180               | 20.42                       | 17.6757                   | 7.07                                       | 2.33                                         |
| Mid     | 5200               | 20.50                       | 17.6801                   | 7.07                                       | 2.33                                         |
| High    | 5240               | 20.50                       | 17.6850                   | 7.07                                       | 2.33                                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5180               | 17.00                          | 22.47                        | 20.14                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |
| Mid     | 5200               | 17.00                          | 22.47                        | 20.14                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |
| High    | 5240               | 17.00                          | 22.48                        | 20.15                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.00 |
|--------------------|------|

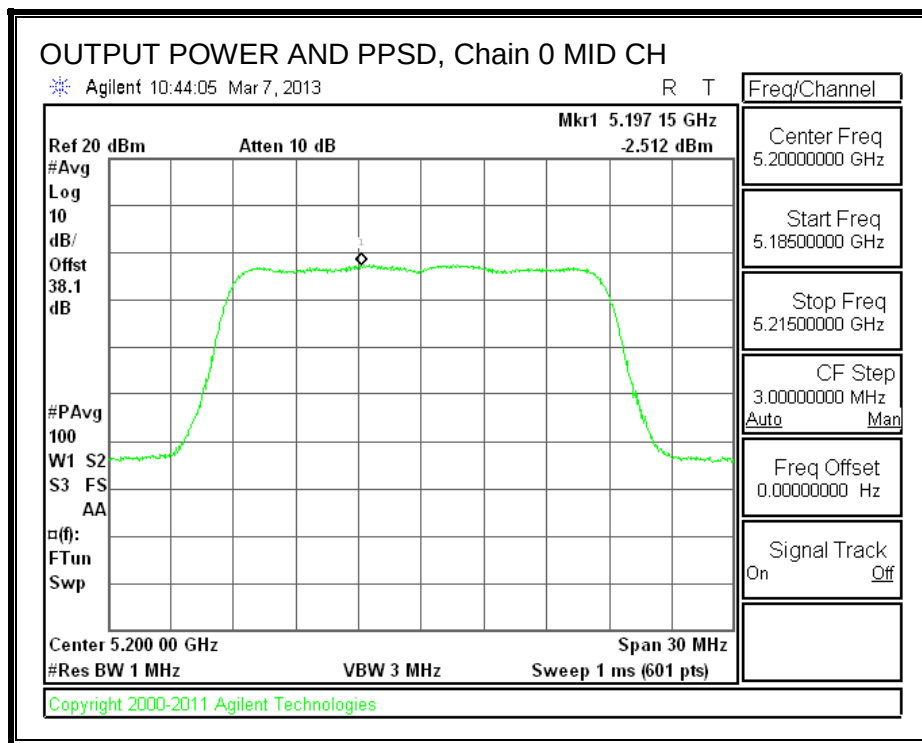
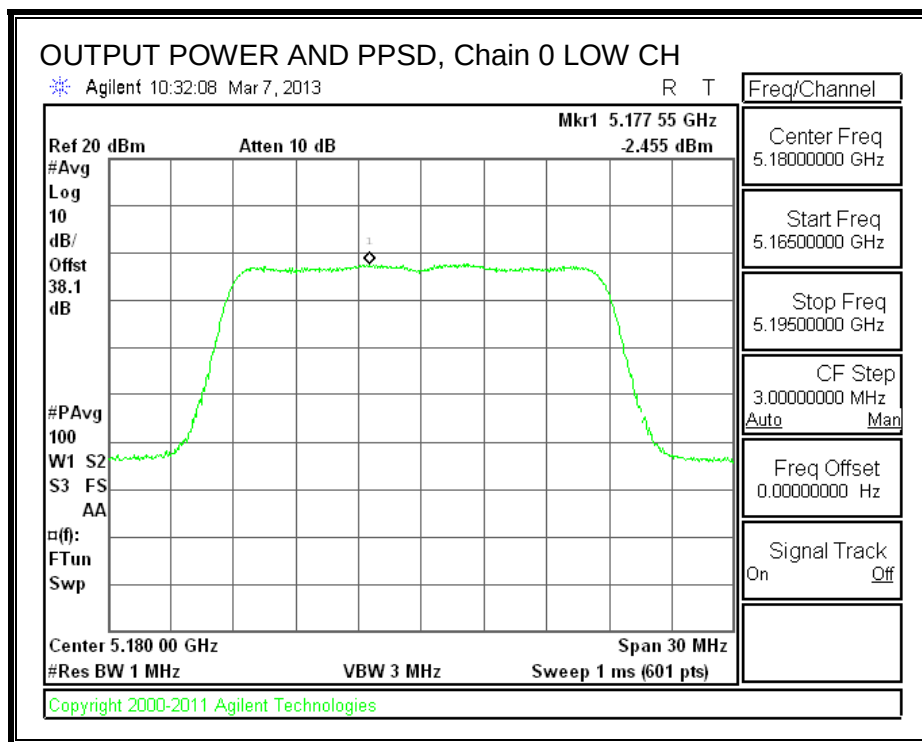
### Output Power Results

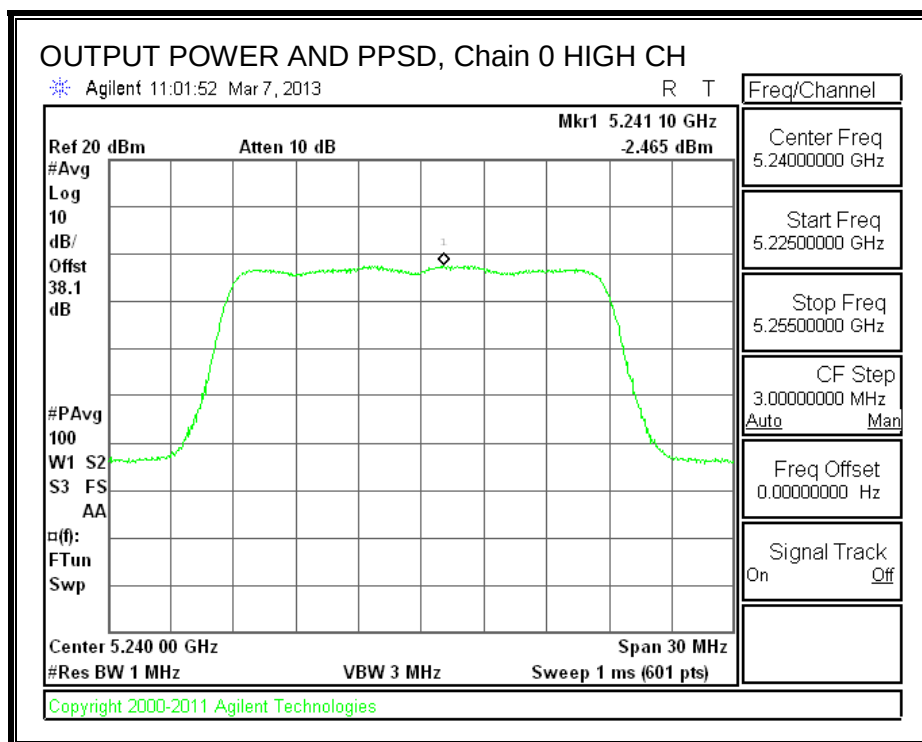
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 7.10                              | 7.10                              | 7.40                              | 11.97                             | 17.00                   | -5.03                   |
| Mid     | 5200               | 7.06                              | 7.30                              | 7.42                              | 12.03                             | 17.00                   | -4.97                   |
| High    | 5240               | 7.15                              | 7.31                              | 7.66                              | 12.15                             | 17.00                   | -4.85                   |

### PSD Results

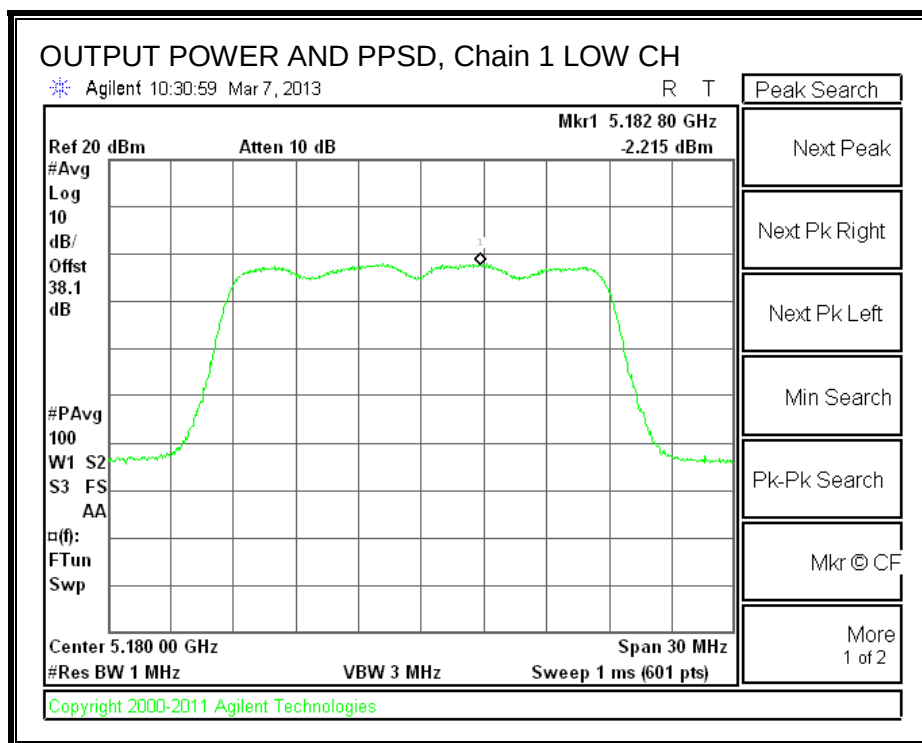
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | -2.455                          | -2.215                          | -1.661                          | 2.67                            | 2.93                  | -0.26                 |
| Mid     | 5200               | -2.512                          | -2.098                          | -2.077                          | 2.55                            | 2.93                  | -0.38                 |
| High    | 5240               | -2.465                          | -1.885                          | -1.989                          | 2.67                            | 2.93                  | -0.26                 |

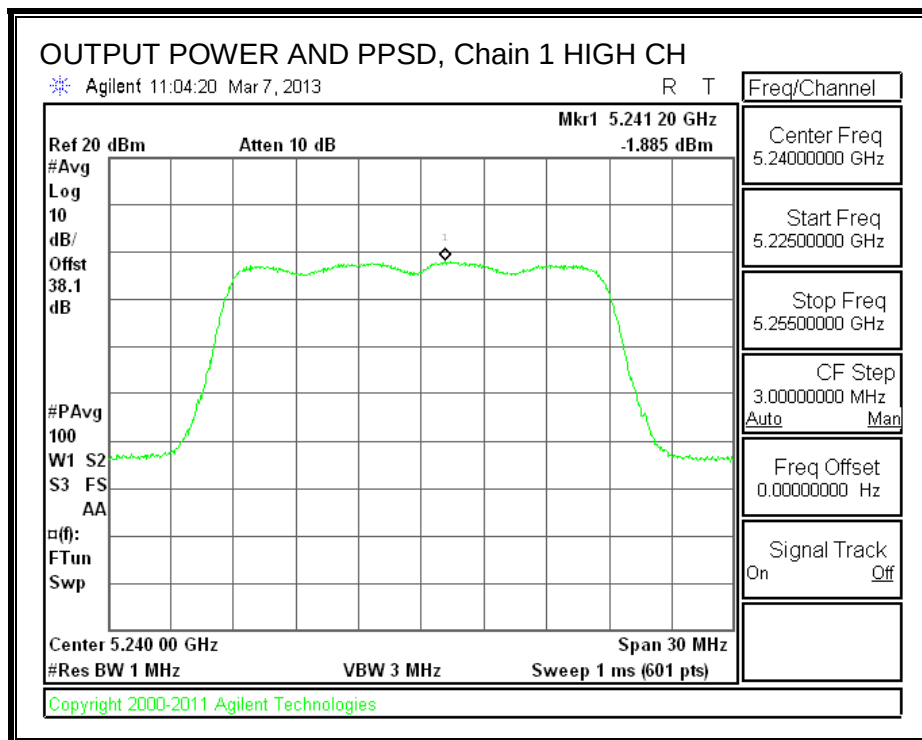
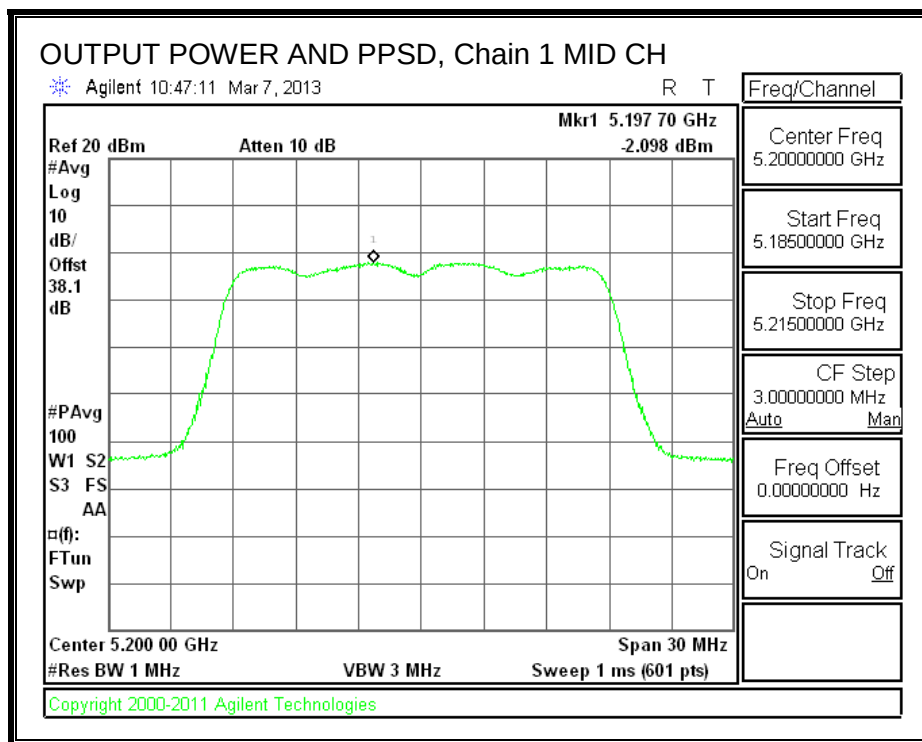
# OUTPUT POWER AND PPSD, Chain 0



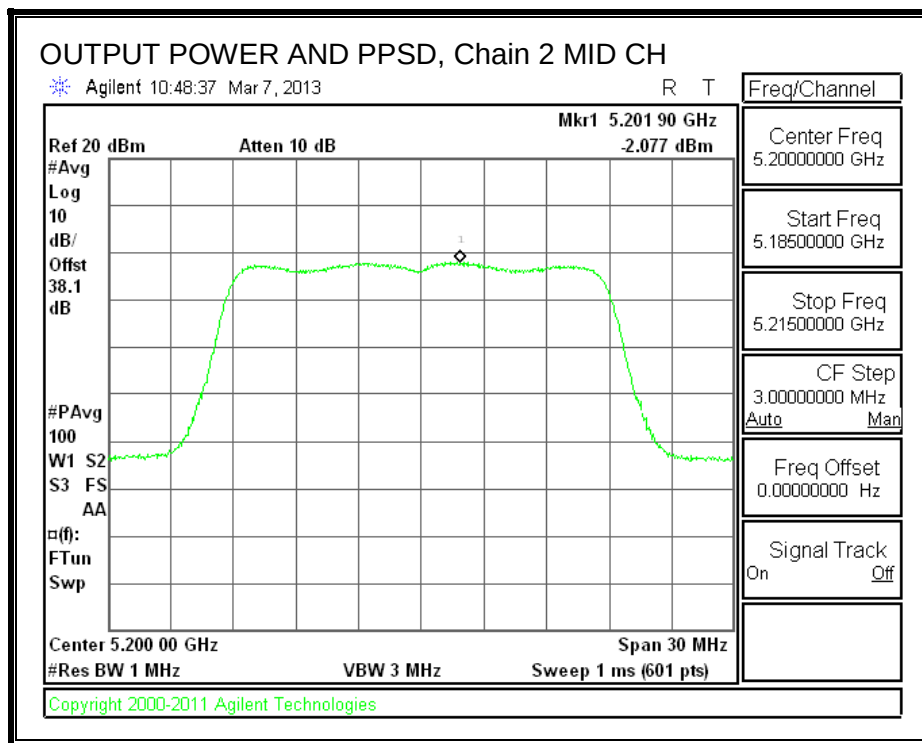
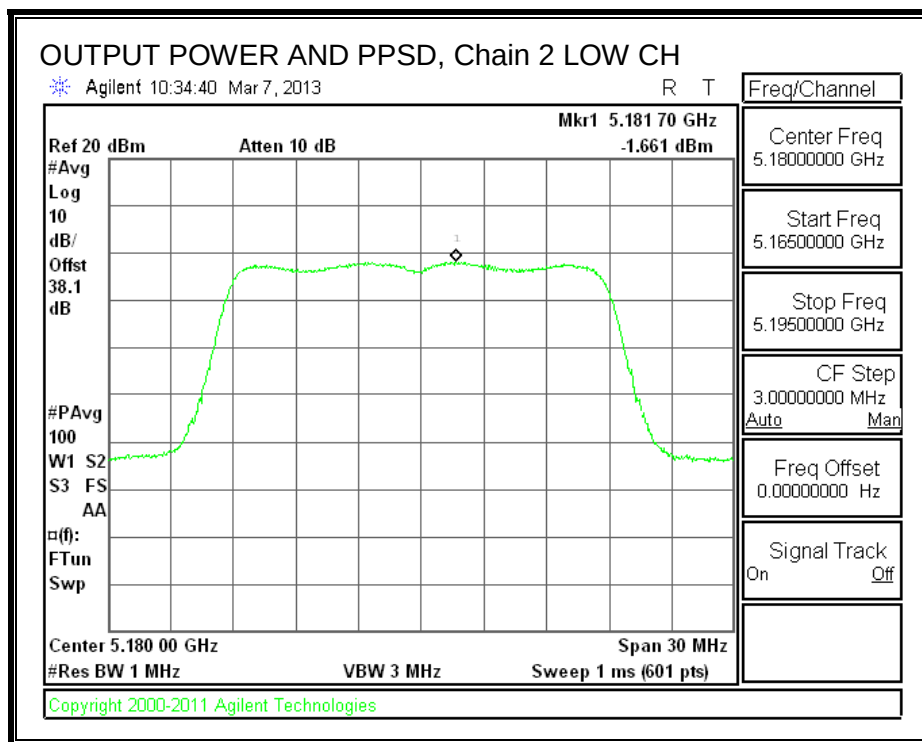


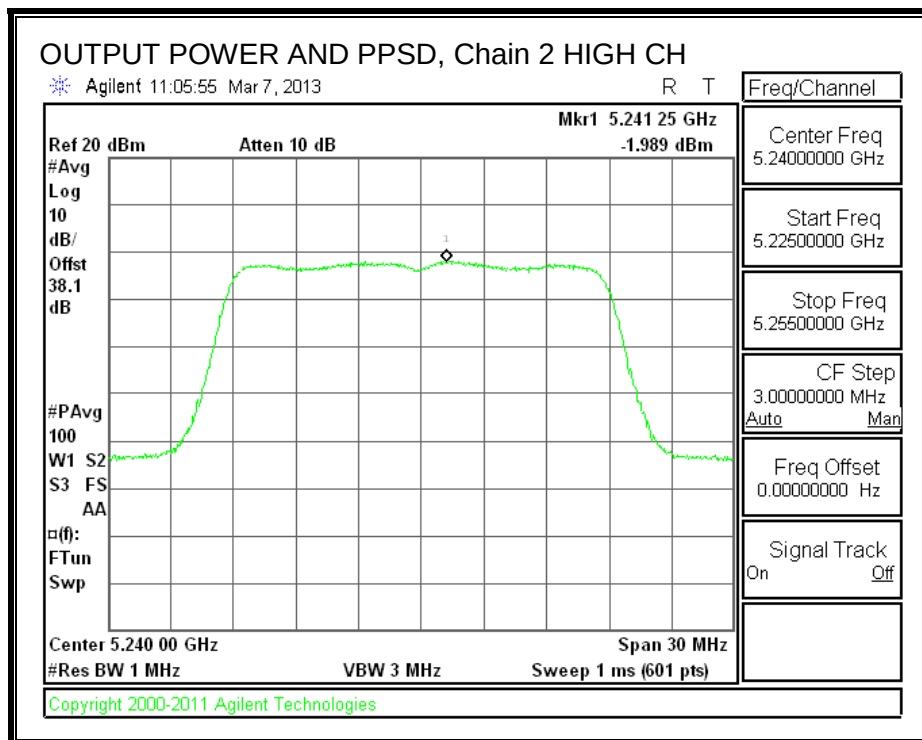
**OUTPUT POWER AND PPSD, Chain 1**





## OUTPUT POWER AND PPSD, Chain 2





## 8.5.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 6.069          | -2.512    | 0.00      | 8.58                | 13         | -4.42       |

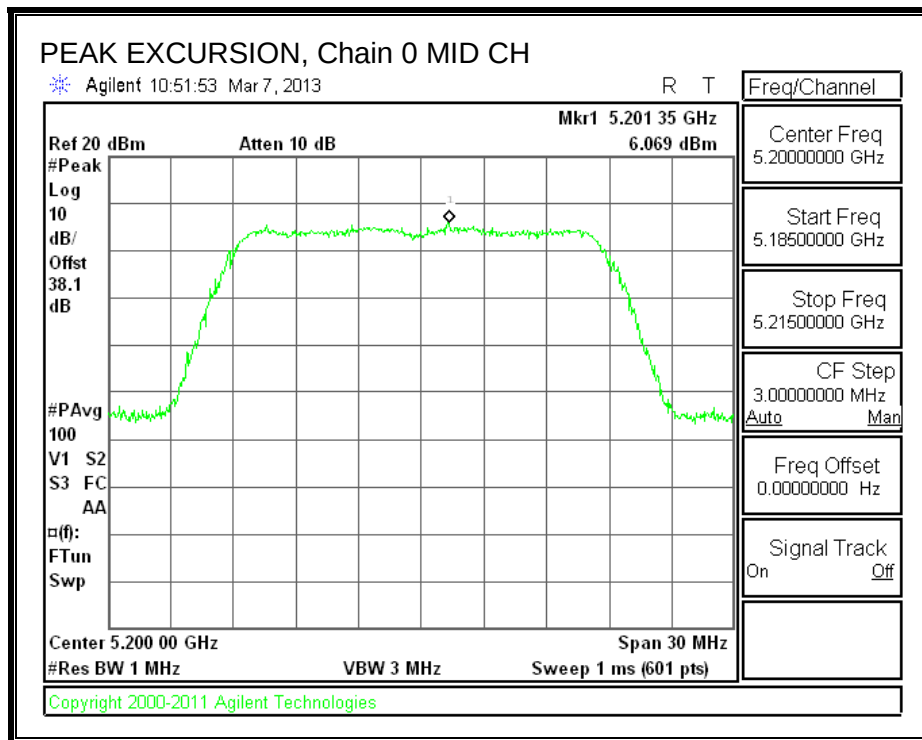
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 6.952          | -2.098    | 0.00      | 9.05                | 13         | -3.95       |

Chain 2

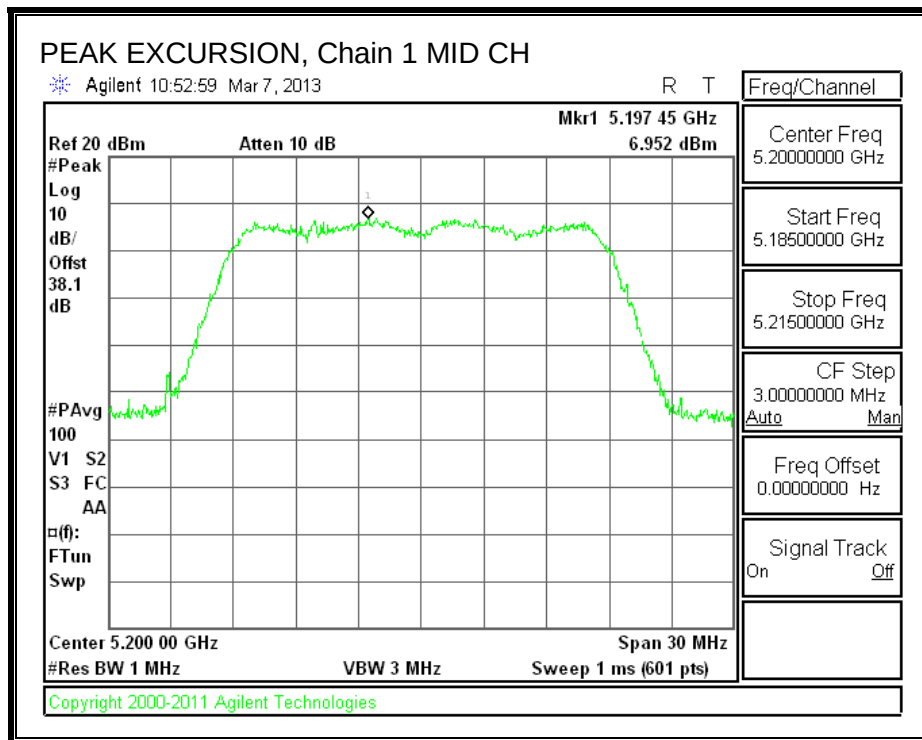
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 8.105          | -2.077    | 0.00      | 10.18               | 13         | -2.82       |

**PEAK EXCURSION, Chain 0**

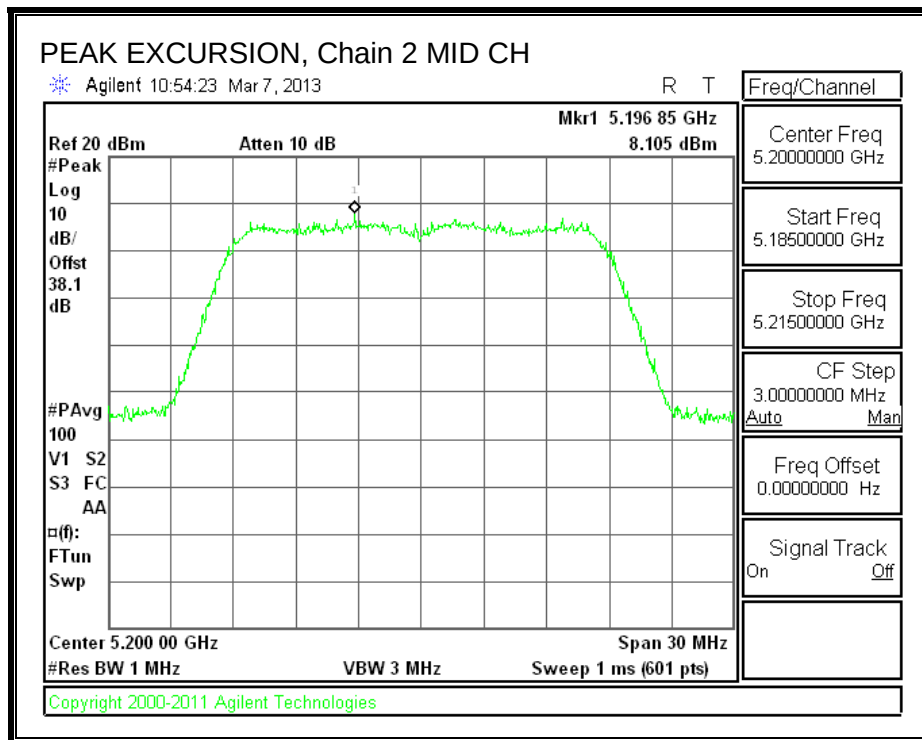




**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## 8.6. 802.11n HT20 BF 3TX MODE IN THE 5.2 GHz BAND

Covered by testing HT20 CDD 3TX mode, the power per chain used for HT20 CDD 3TX mode is the same power per chain that will be used for HT20 BF 3TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.6.1. OUTPUT AVERAGE POWER

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are correlated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Low     | 5180               | 20.42                       | 17.6757                   | 7.07                                       |
| Mid     | 5200               | 20.50                       | 17.6801                   | 7.07                                       |
| High    | 5240               | 20.50                       | 17.6850                   | 7.07                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Low     | 5180               | 15.93                          | 22.47                        | 15.40                       | 15.40                   |
| Mid     | 5200               | 15.93                          | 22.47                        | 15.40                       | 15.40                   |
| High    | 5240               | 15.93                          | 22.48                        | 15.41                       | 15.41                   |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 7.10                              | 7.10                              | 7.40                              | 11.97                             | 15.40                   | -3.43                   |
| Mid     | 5200               | 7.06                              | 7.30                              | 7.42                              | 12.03                             | 15.40                   | -3.37                   |
| High    | 5240               | 7.15                              | 7.31                              | 7.66                              | 12.15                             | 15.41                   | -3.26                   |

## 8.7. 802.11n HT20 STBC 3TX MODE IN THE 5.2 GHz BAND

### 8.7.1. 26 dB BANDWIDTH

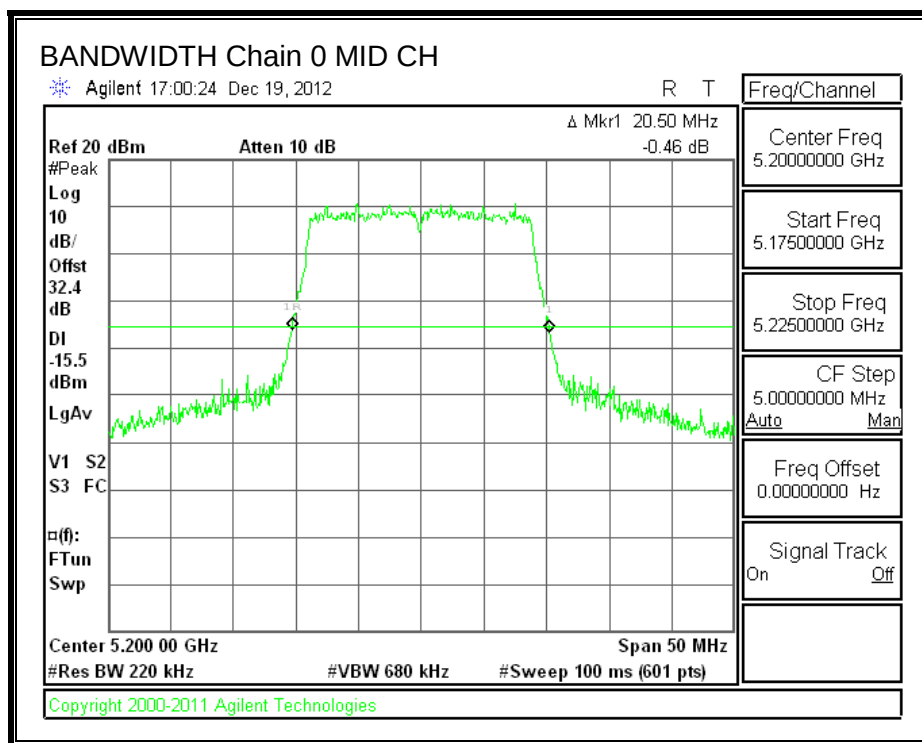
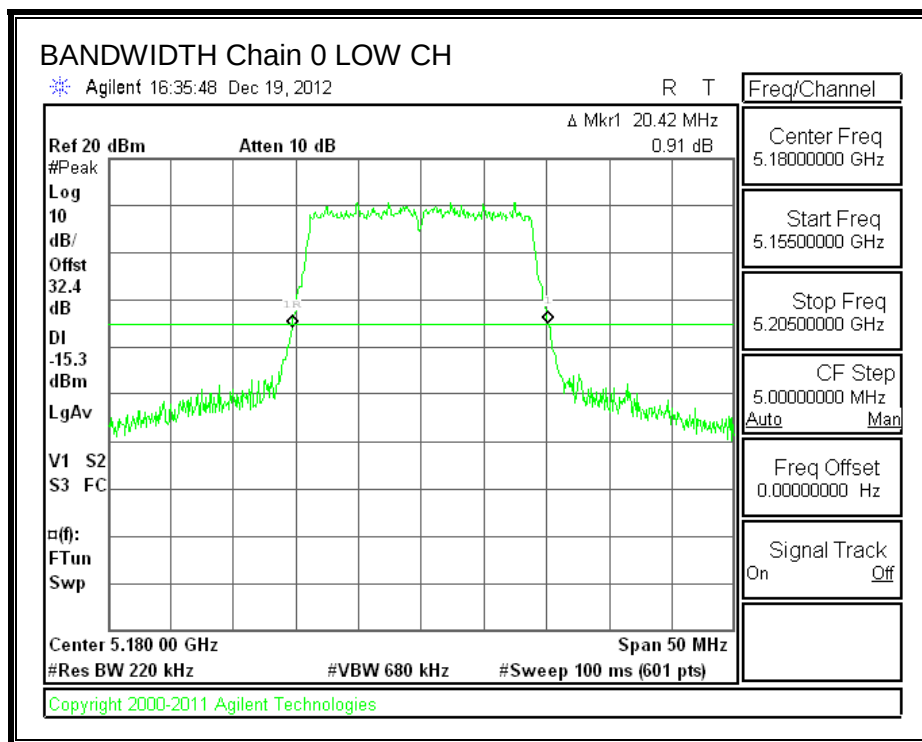
#### LIMITS

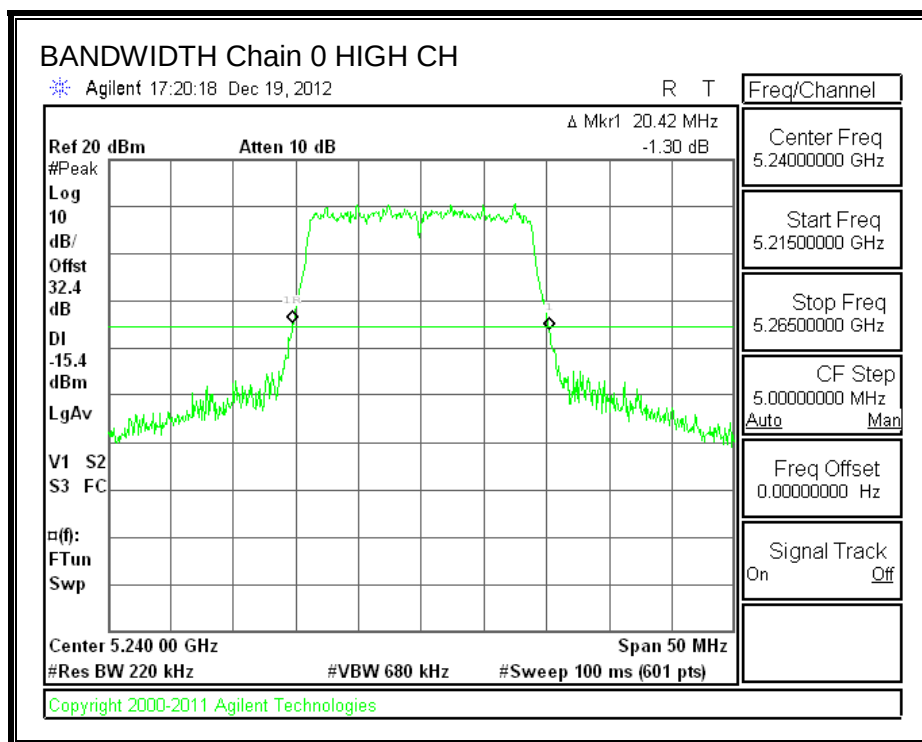
None; for reporting purposes only.

#### RESULTS

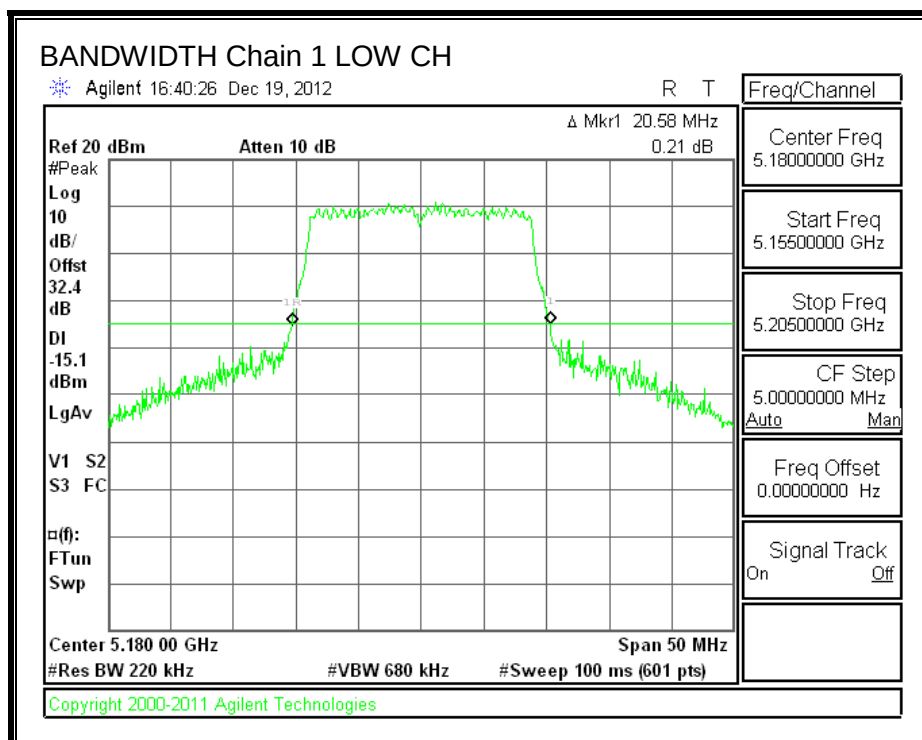
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Low     | 5180               | 20.42                        | 20.58                        | 20.33                        |
| Mid     | 5200               | 20.50                        | 20.67                        | 20.42                        |
| High    | 5240               | 20.42                        | 21.00                        | 20.42                        |

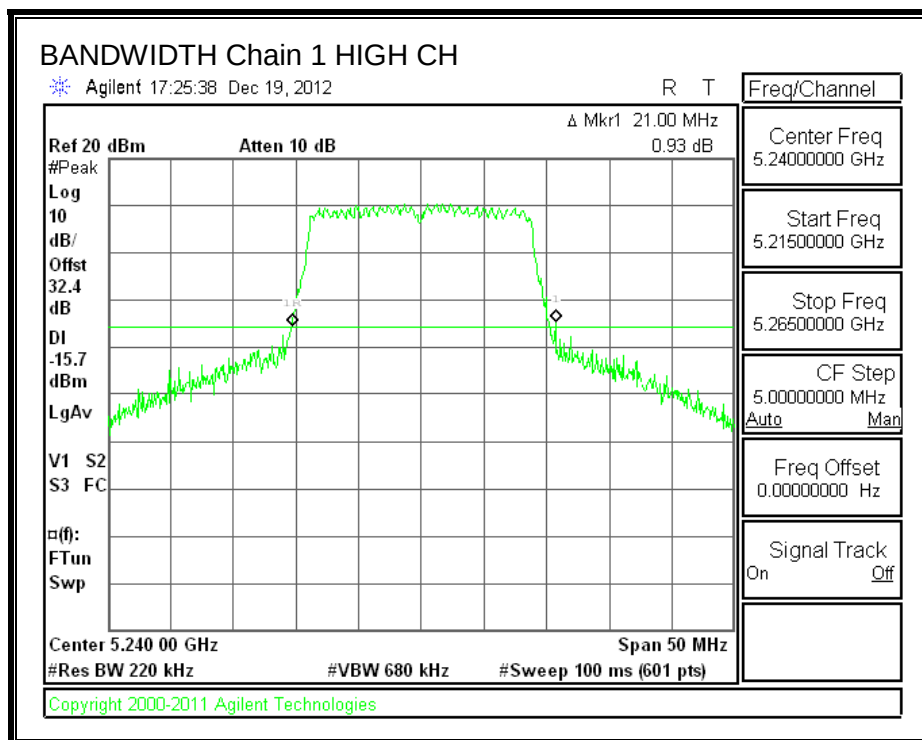
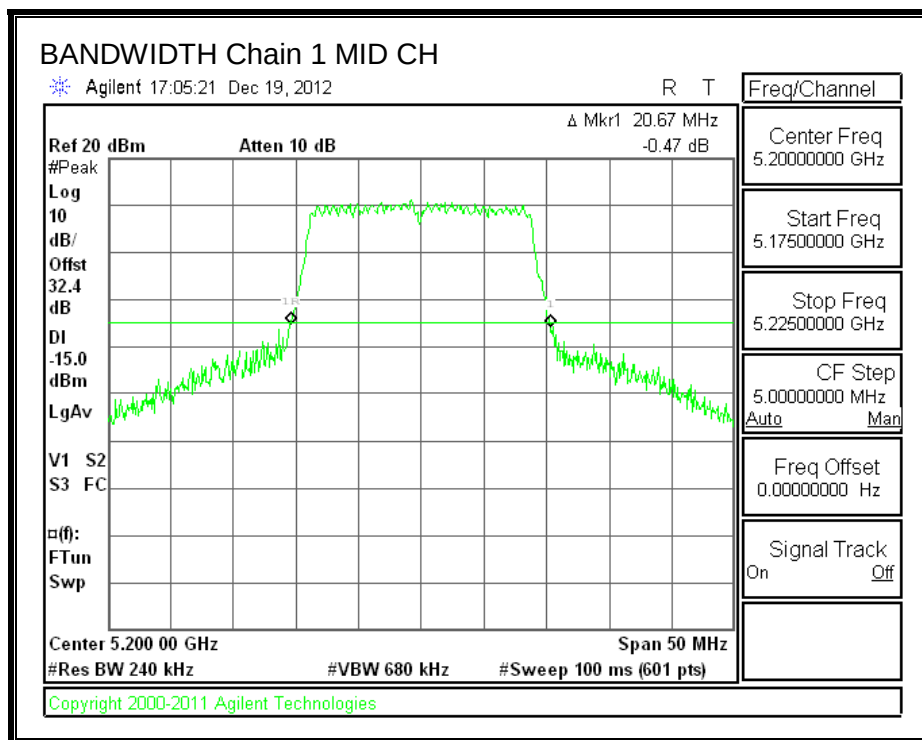
**26 dB BANDWIDTH, Chain 0**





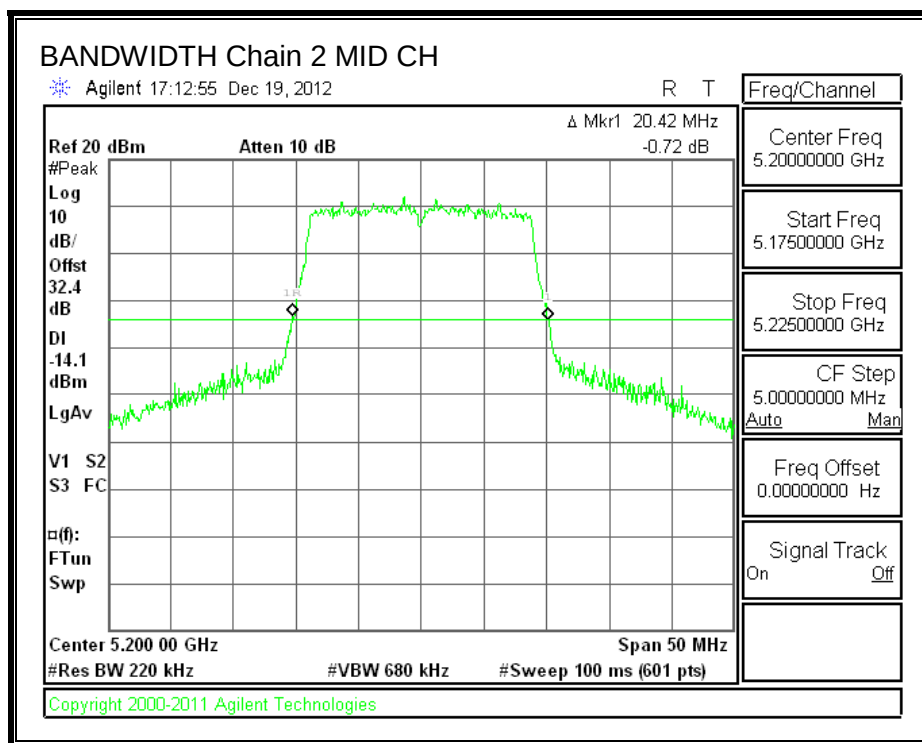
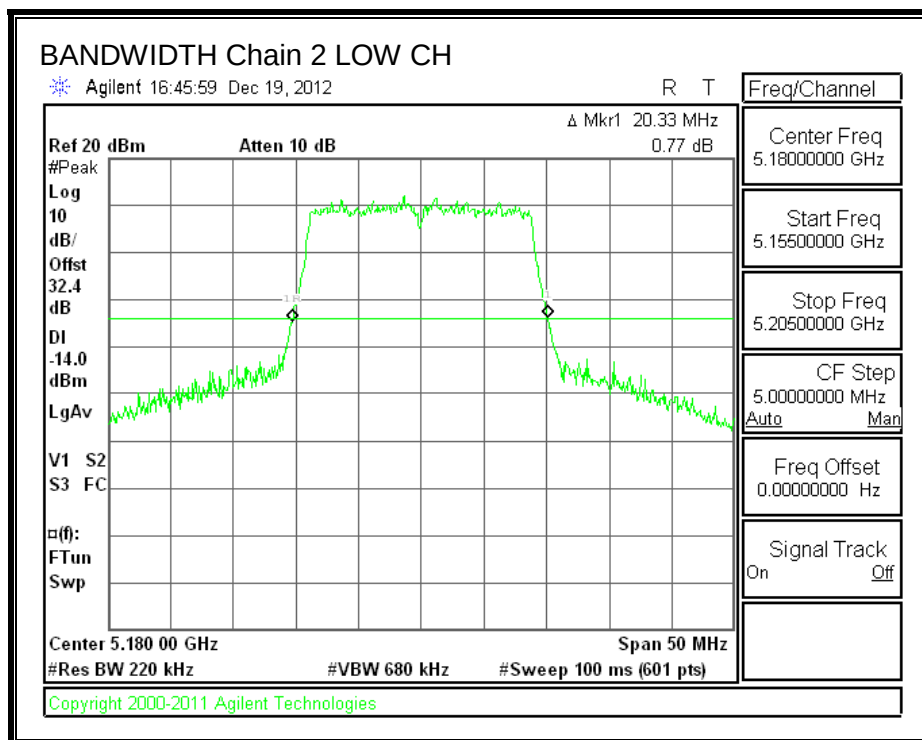
**26 dB BANDWIDTH, Chain 1**

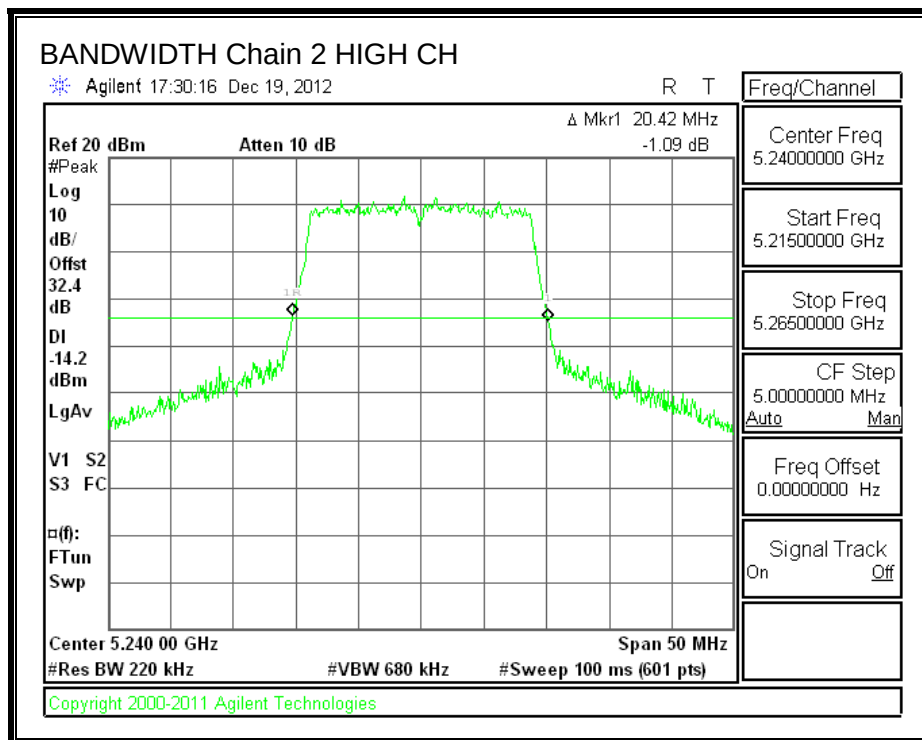






**26 dB BANDWIDTH, Chain 2**





## 8.7.2. 99% BANDWIDTH

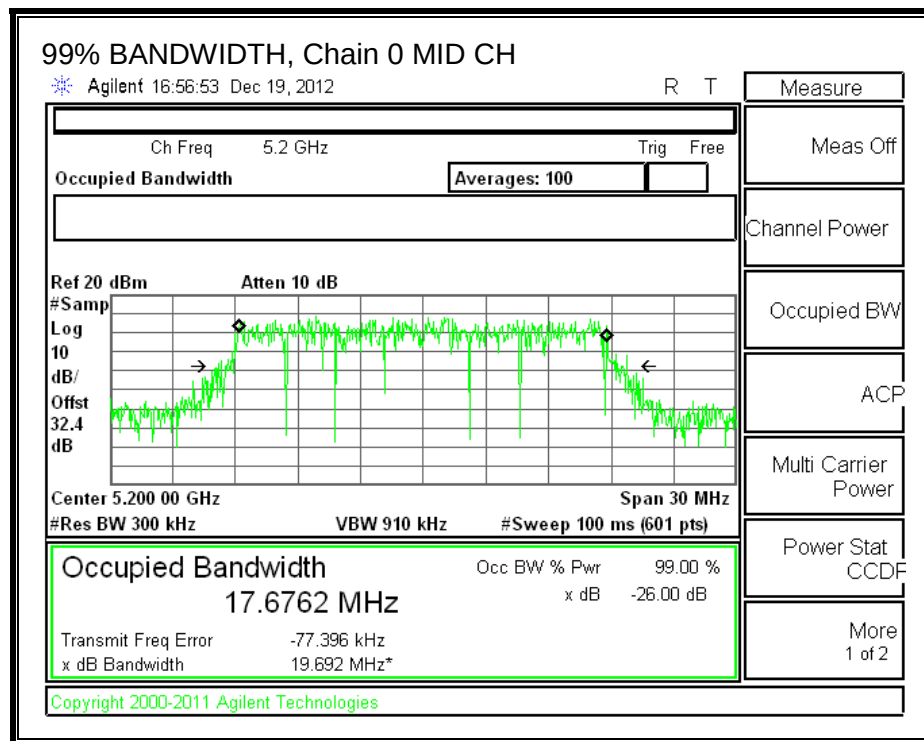
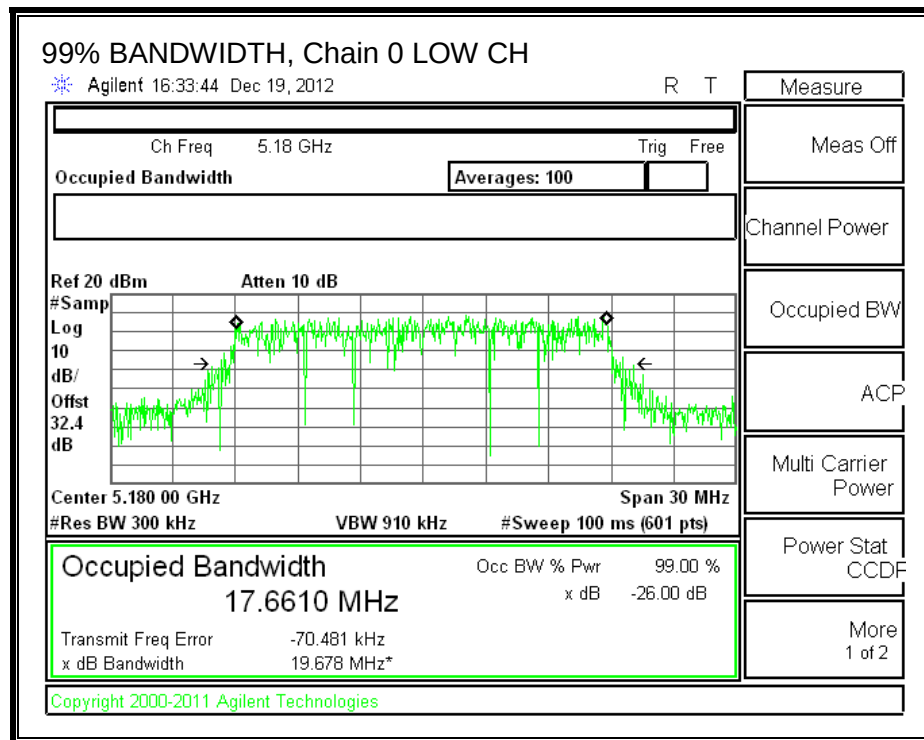
### LIMITS

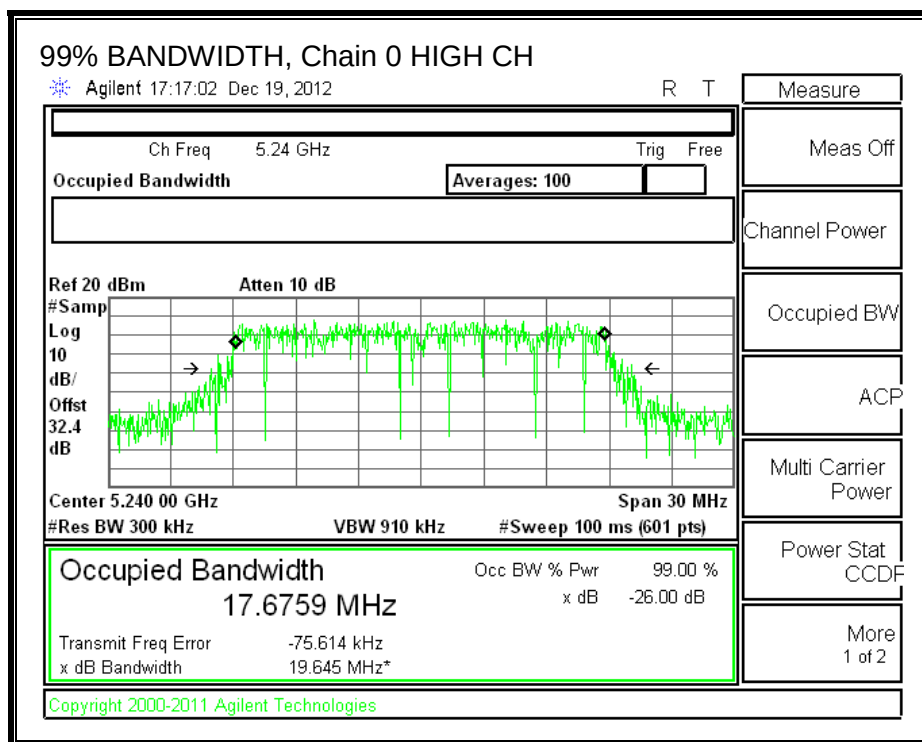
None; for reporting purposes only.

### RESULTS

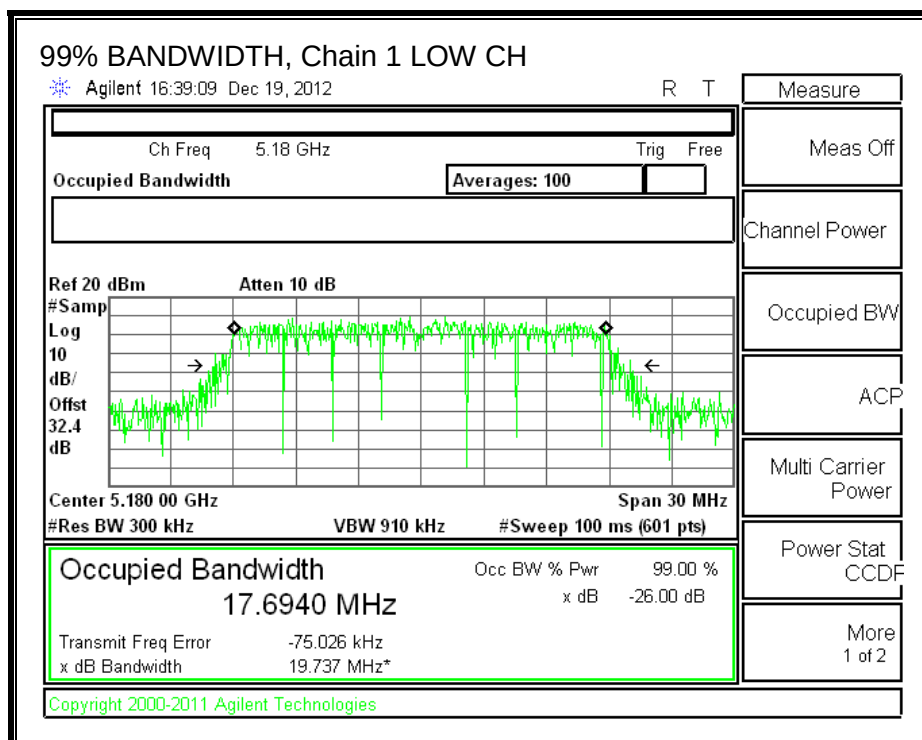
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Low     | 5180               | 17.6610                    | 17.6940                    | 17.6556                    |
| Mid     | 5200               | 17.6762                    | 17.6872                    | 17.6725                    |
| High    | 5240               | 17.6759                    | 17.6865                    | 17.6673                    |

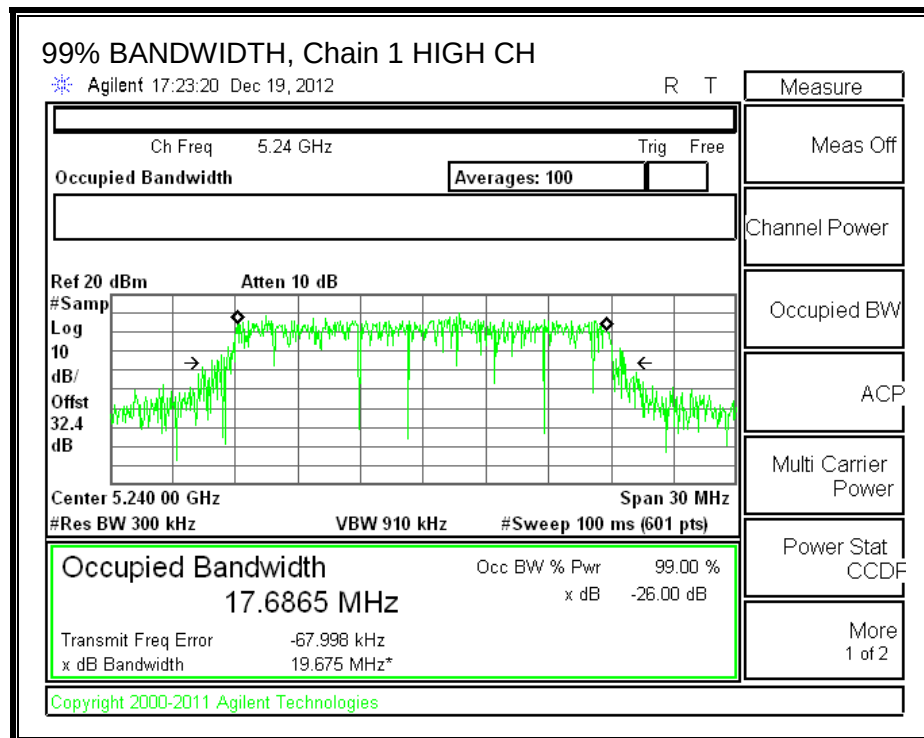
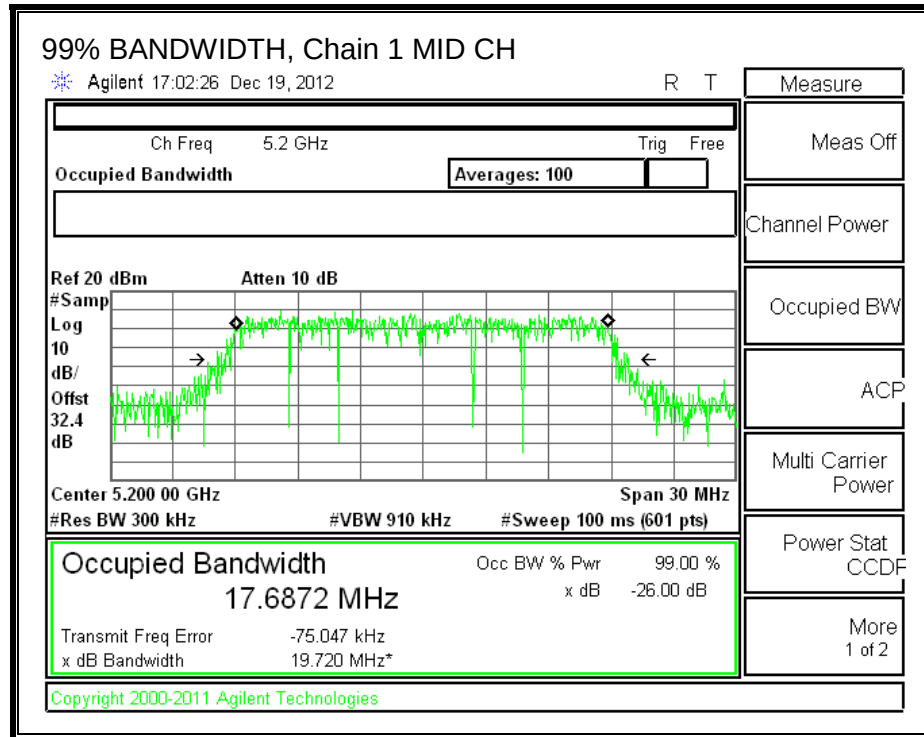
**99% BANDWIDTH, Chain 0**



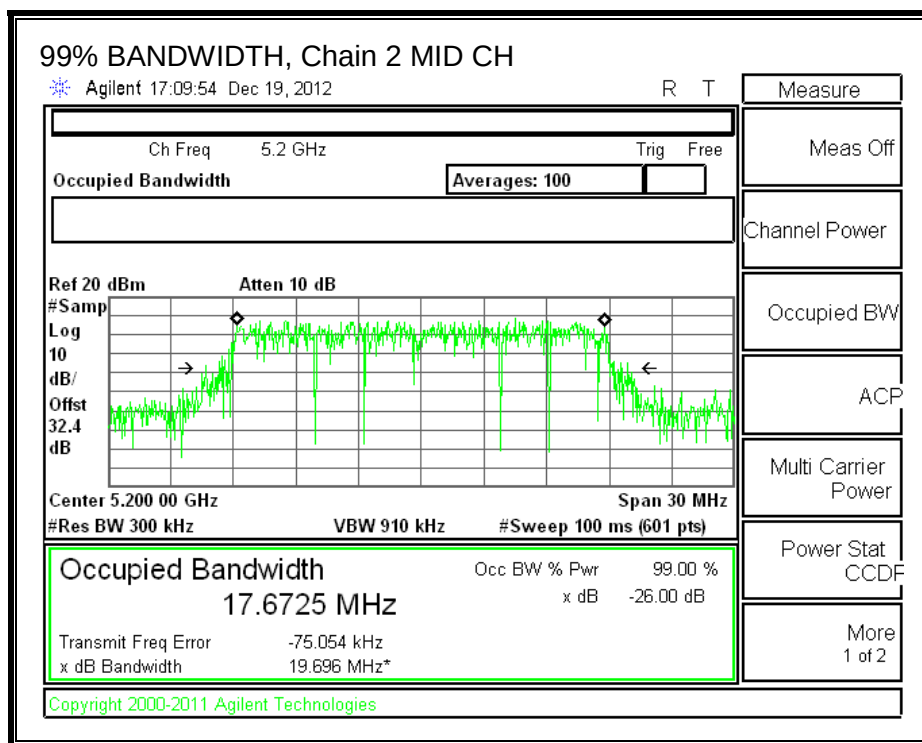
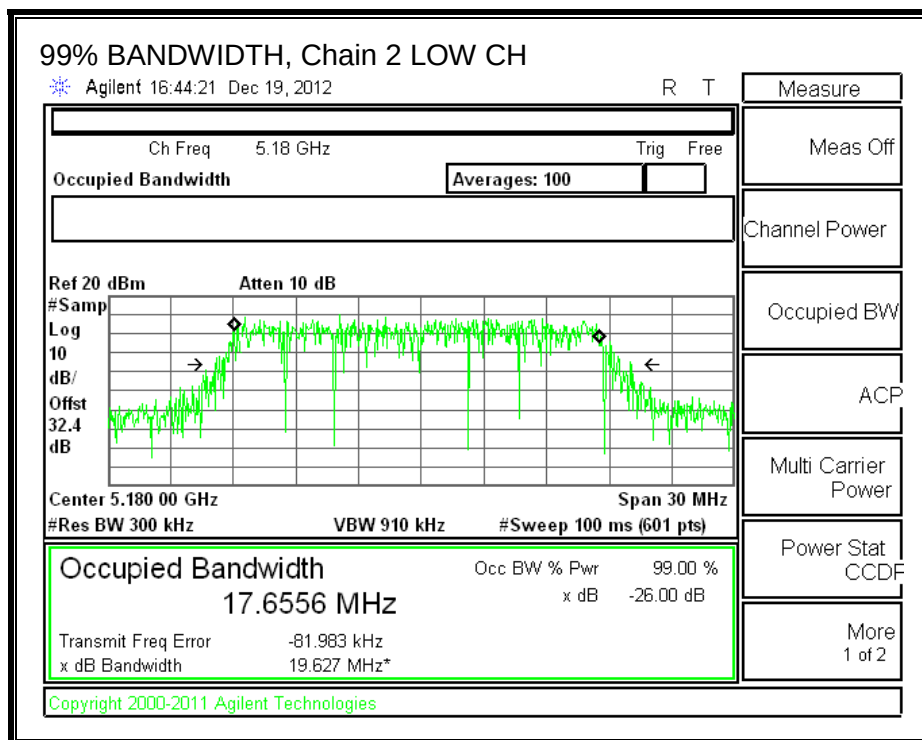


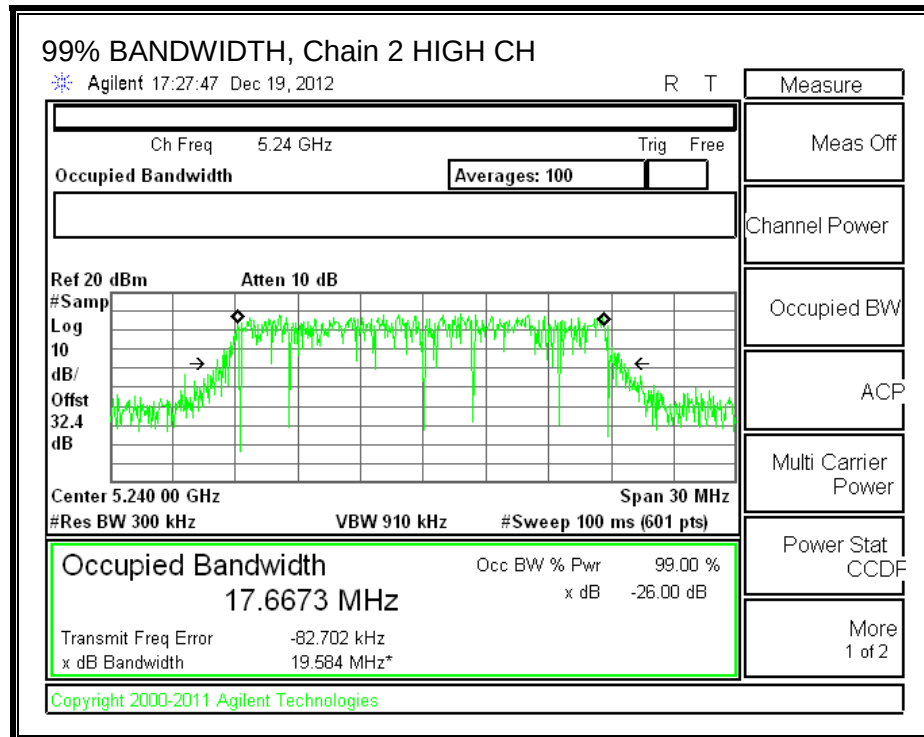
**99% BANDWIDTH, Chain 1**





**99% BANDWIDTH, Chain 2**







### 8.7.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5180               | 20.33                       | 17.6556                   | 2.33                         |
| Mid     | 5200               | 20.42                       | 17.6725                   | 2.33                         |
| High    | 5240               | 20.42                       | 17.6673                   | 2.33                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5180               | 17.00                          | 22.47                        | 20.14                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| Mid     | 5200               | 17.00                          | 22.47                        | 20.14                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5240               | 17.00                          | 22.47                        | 20.14                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.00 |
|--------------------|------|

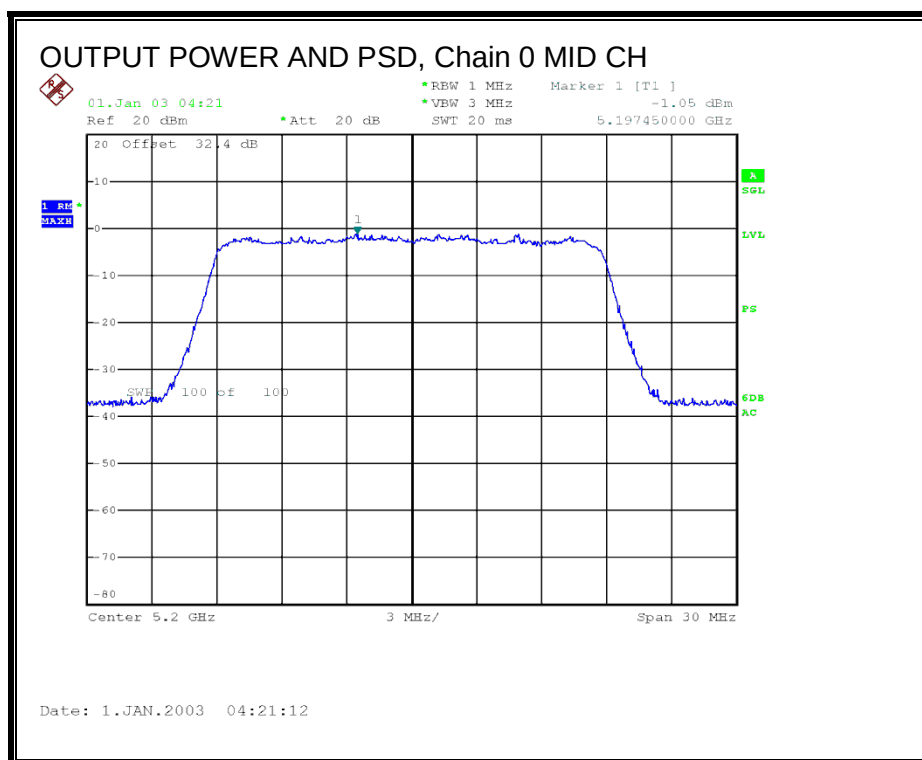
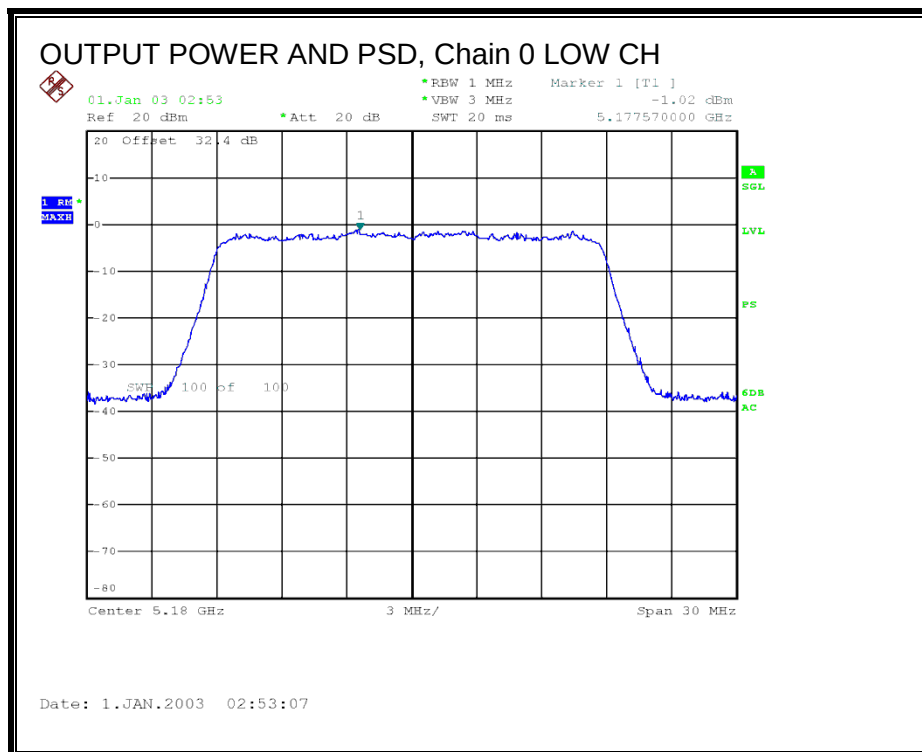
### Output Power Results

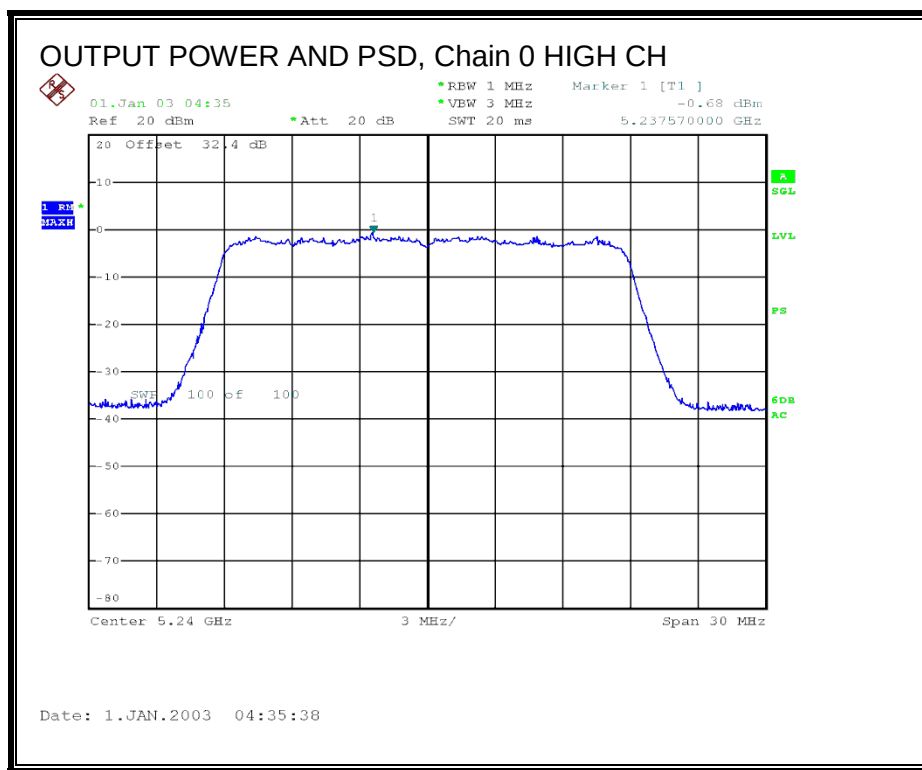
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5180               | 9.00                              | 8.95                              | 8.96                              | 13.74                             | 17.00                   | -3.26                   |
| Mid     | 5200               | 8.90                              | 8.95                              | 8.86                              | 13.67                             | 17.00                   | -3.33                   |
| High    | 5240               | 9.40                              | 9.10                              | 8.96                              | 13.93                             | 17.00                   | -3.07                   |

### PSD Results

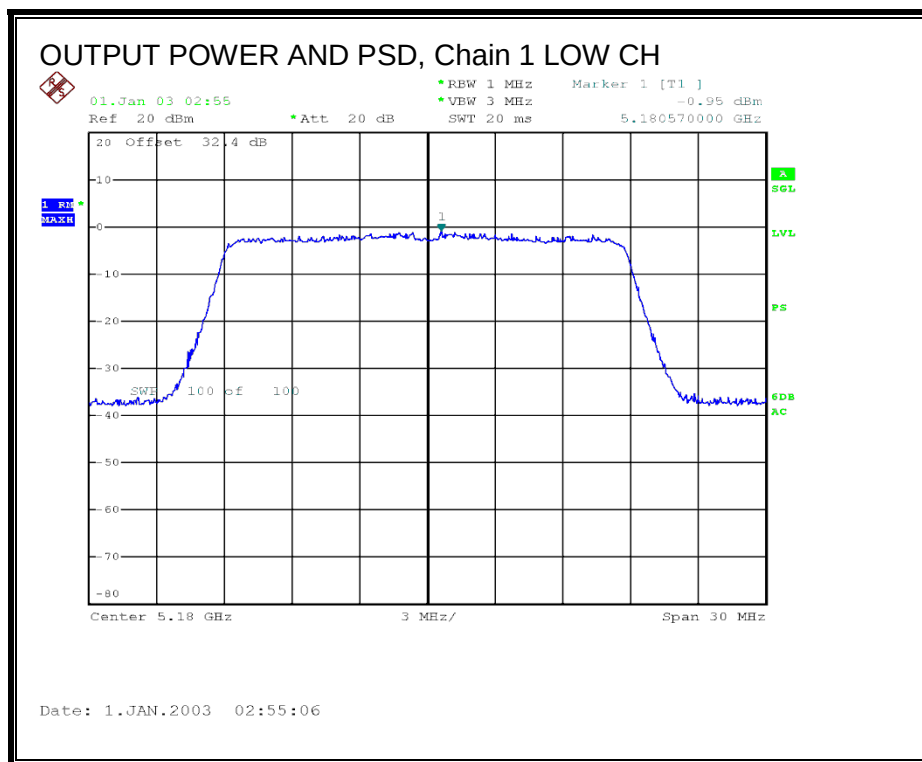
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Low     | 5180               | -1.02                           | -0.95                           | -0.92                           | 3.81                            | 4.00                  | -0.19                 |
| Mid     | 5200               | -1.05                           | -0.93                           | -0.95                           | 3.79                            | 4.00                  | -0.21                 |
| High    | 5240               | -0.68                           | -1.24                           | -1.35                           | 3.69                            | 4.00                  | -0.31                 |

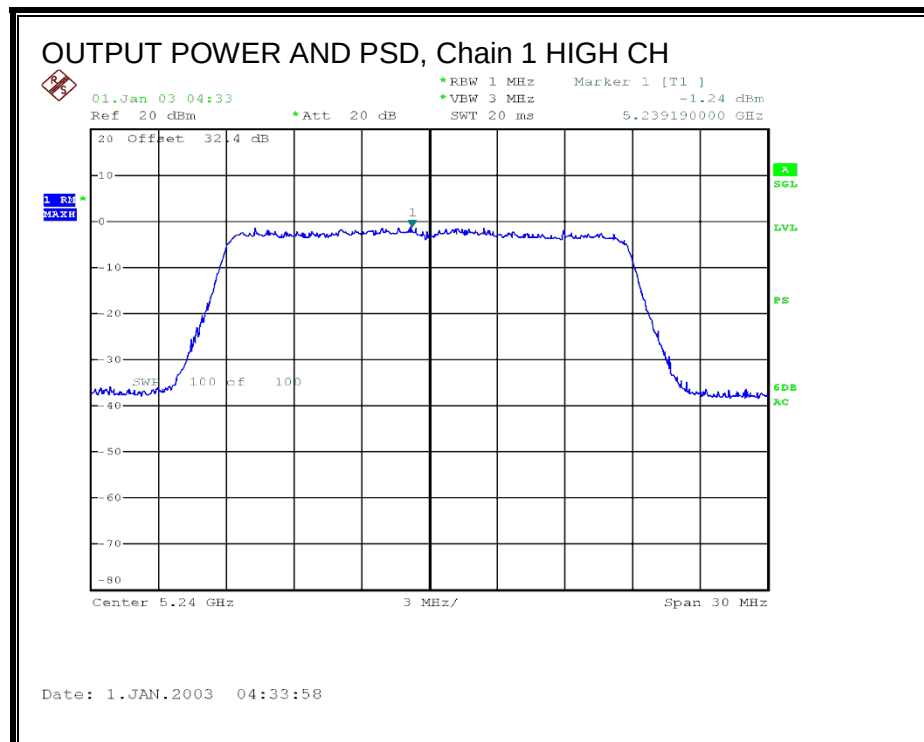
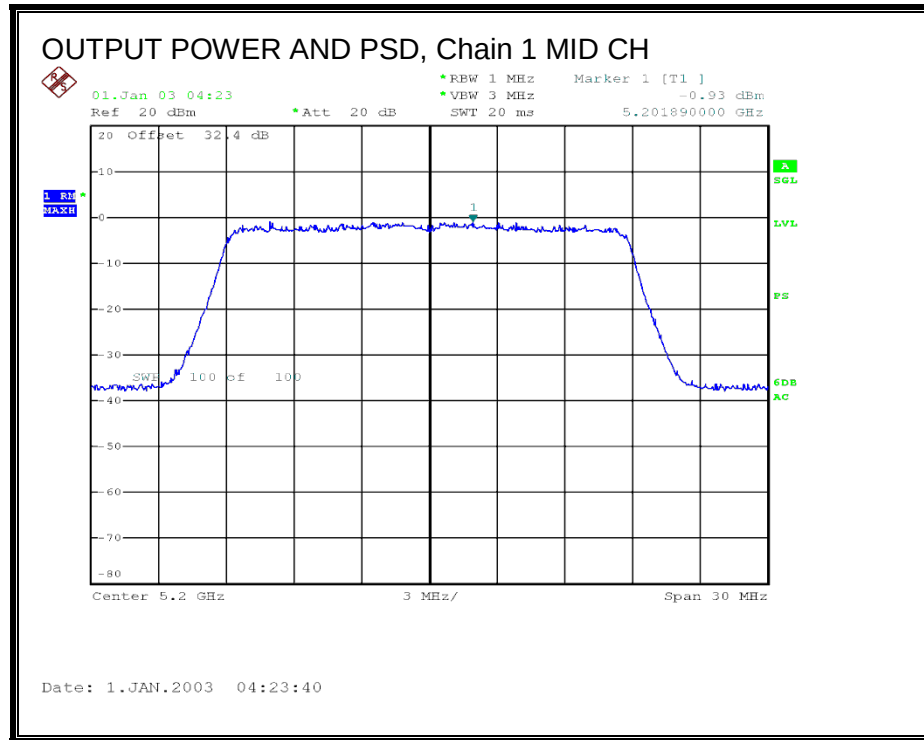
**OUTPUT POWER AND PSD, Chain 0**



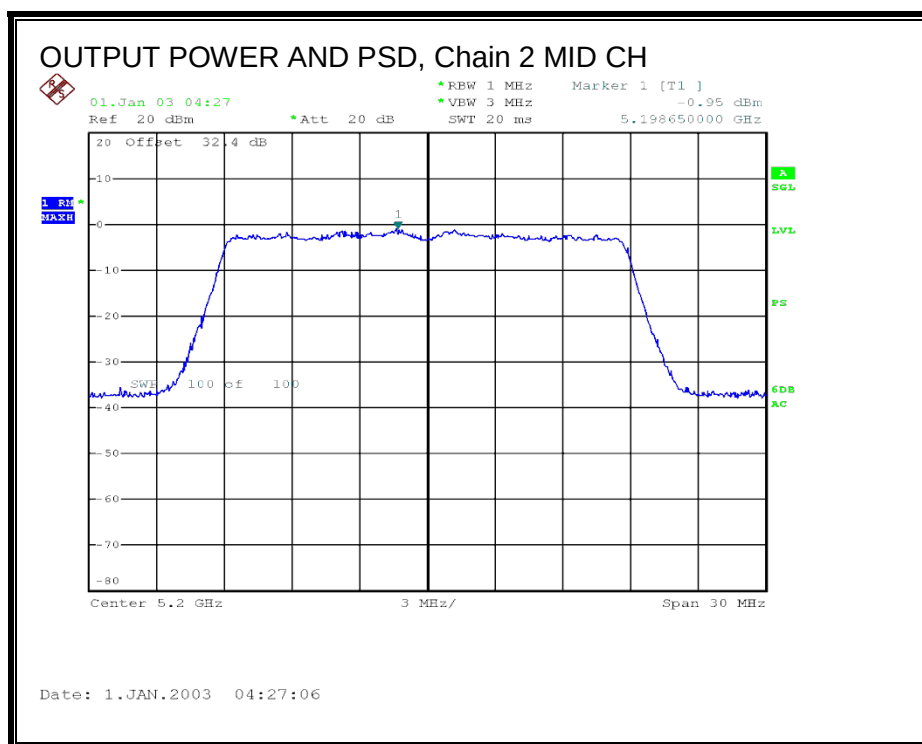
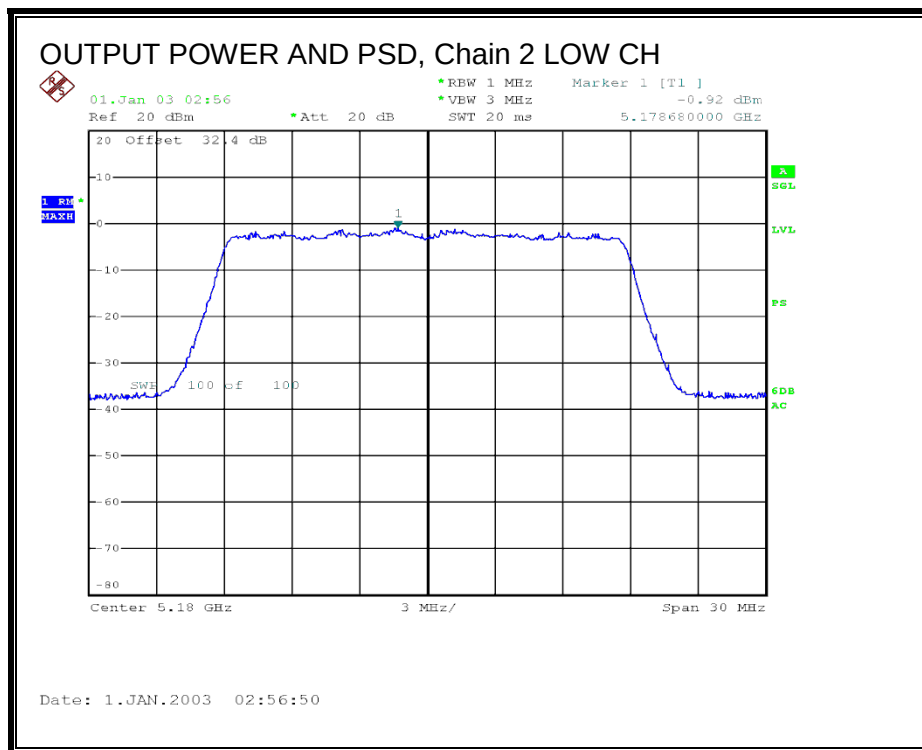


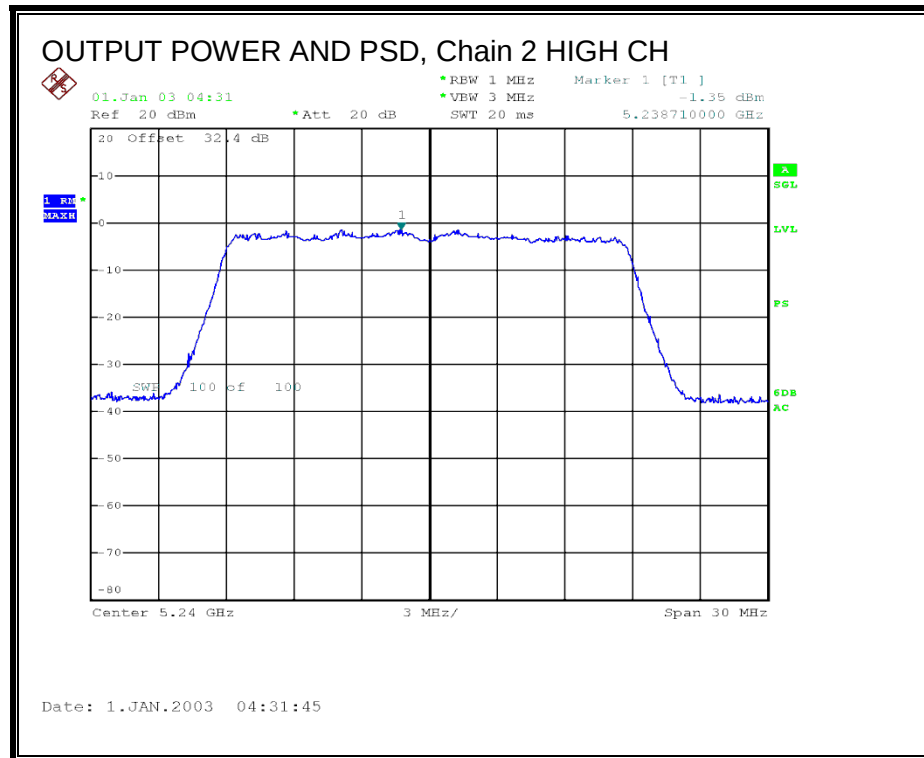
**OUTPUT POWER AND PSD, Chain 1**





**OUTPUT POWER AND PSD, Chain 2**





## 8.7.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 8.50           | -1.05     | 0.00      | 9.55                | 13         | -3.45       |

Chain 1

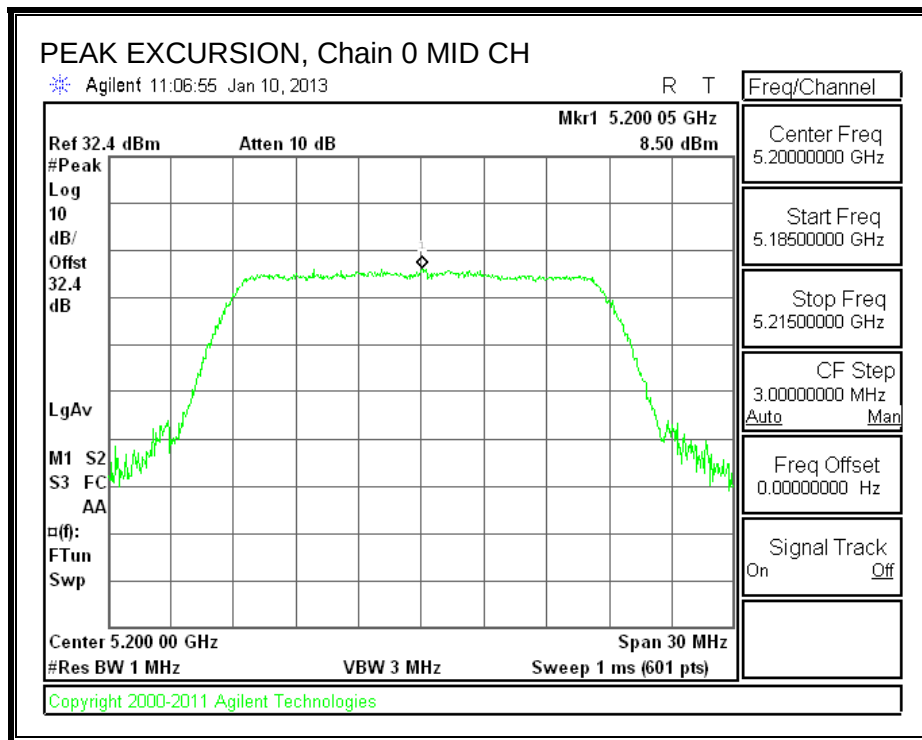
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 8.73           | -0.93     | 0.00      | 9.66                | 13         | -3.34       |

Chain 2

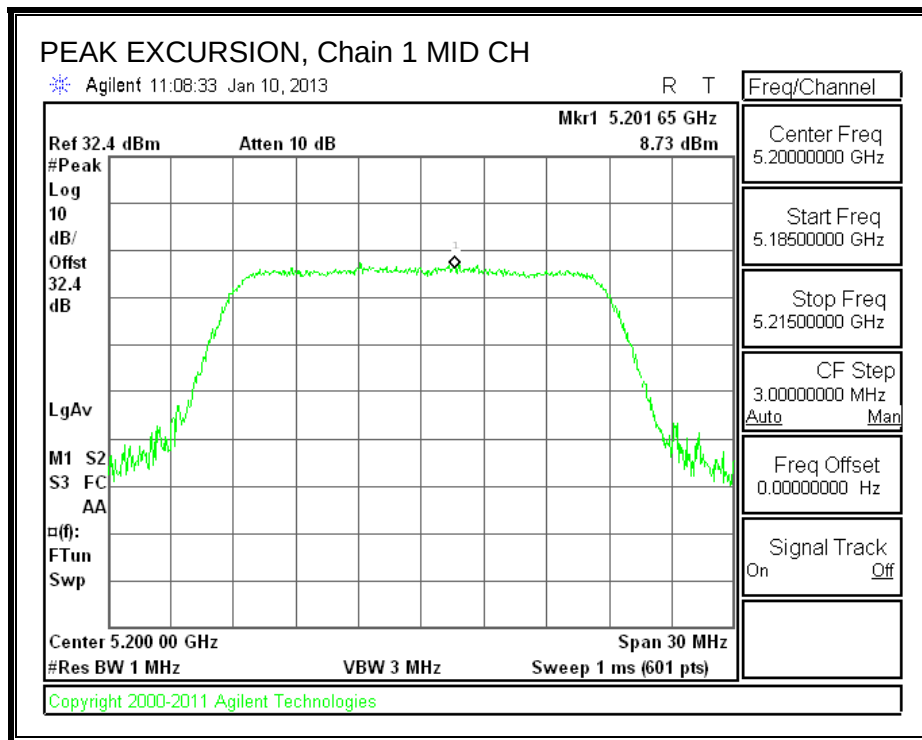
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5200            | 9.52           | -0.95     | 0.00      | 10.47               | 13         | -2.53       |



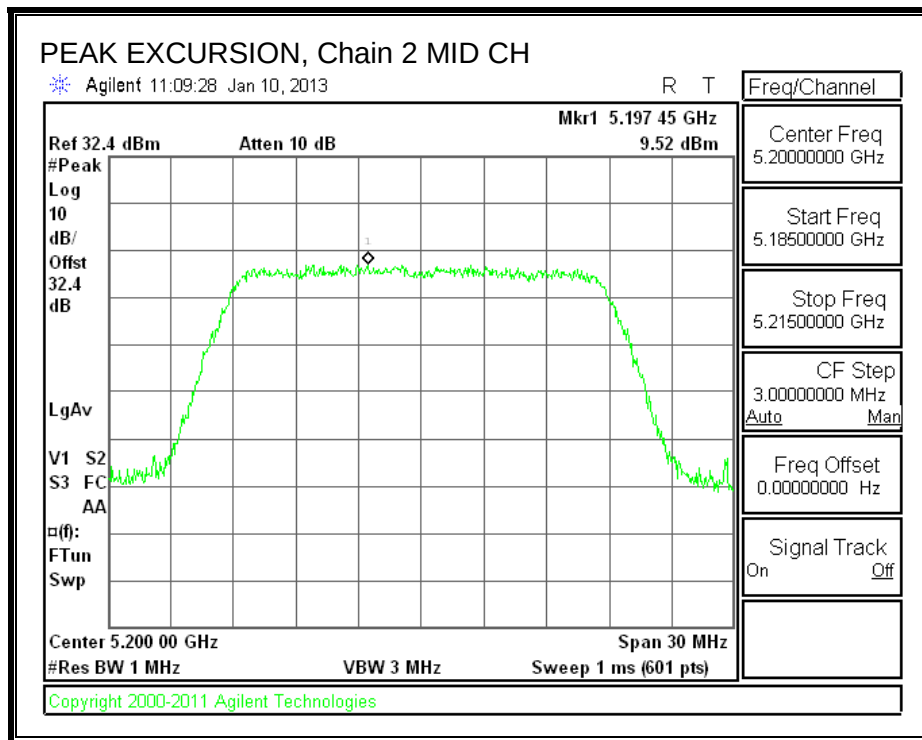
**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## **8.8. 802.11n HT40 1TX MODE IN THE 5.2 GHz BAND**

### **8.8.1. 26 dB BANDWIDTH**

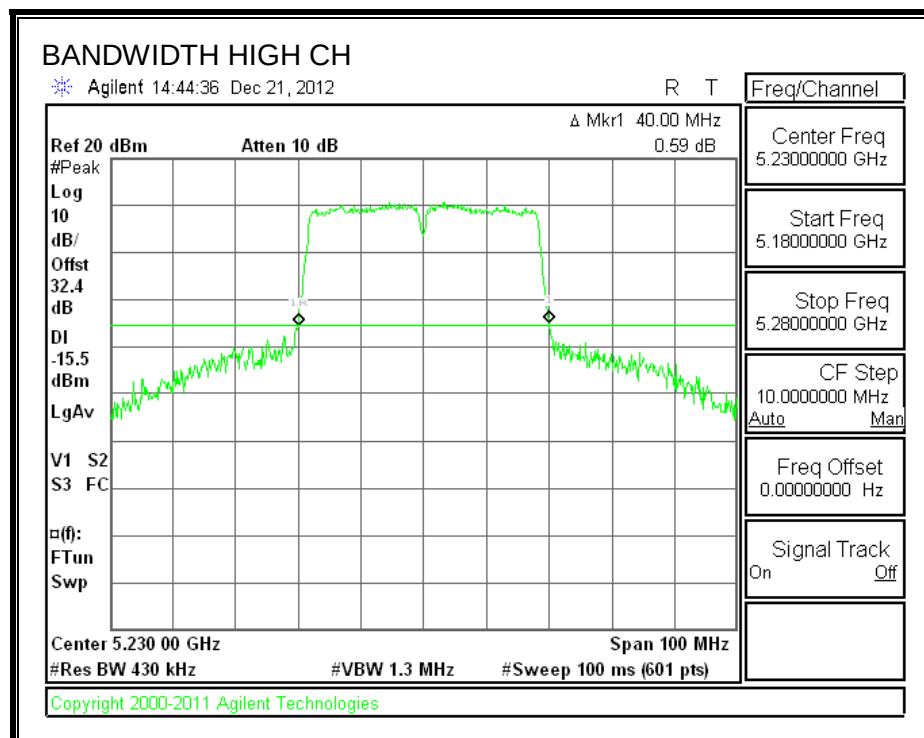
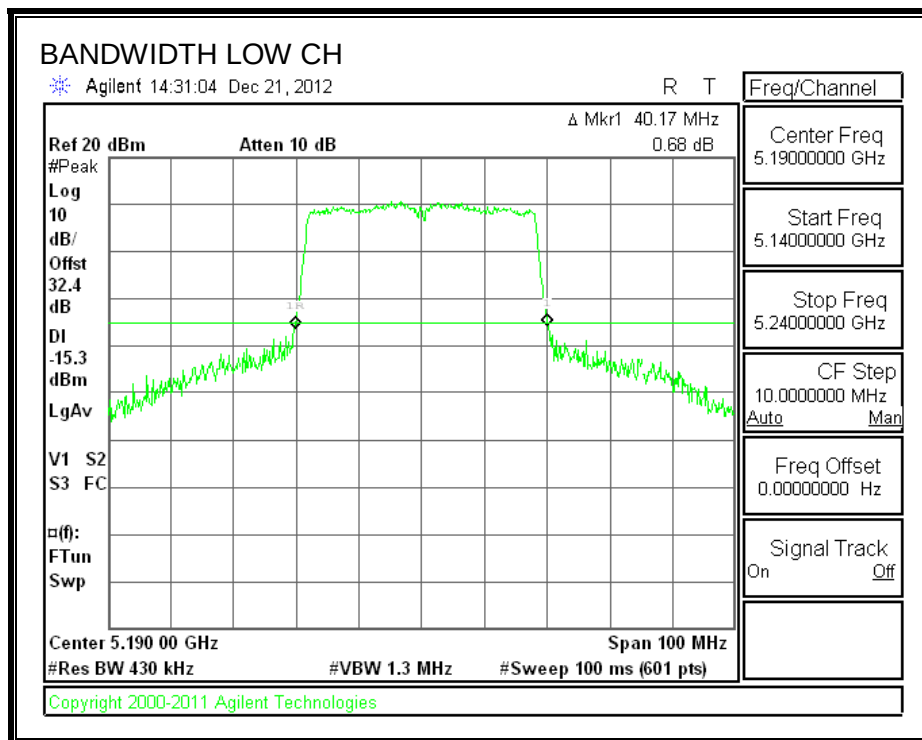
#### **LIMITS**

None; for reporting purposes only.

#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB Bandwidth<br>(MHz) |
|---------|--------------------|--------------------------|
| Low     | 5190               | 40.17                    |
| High    | 5230               | 40.00                    |

## 26 dB BANDWIDTH



### 8.8.2. 99% BANDWIDTH

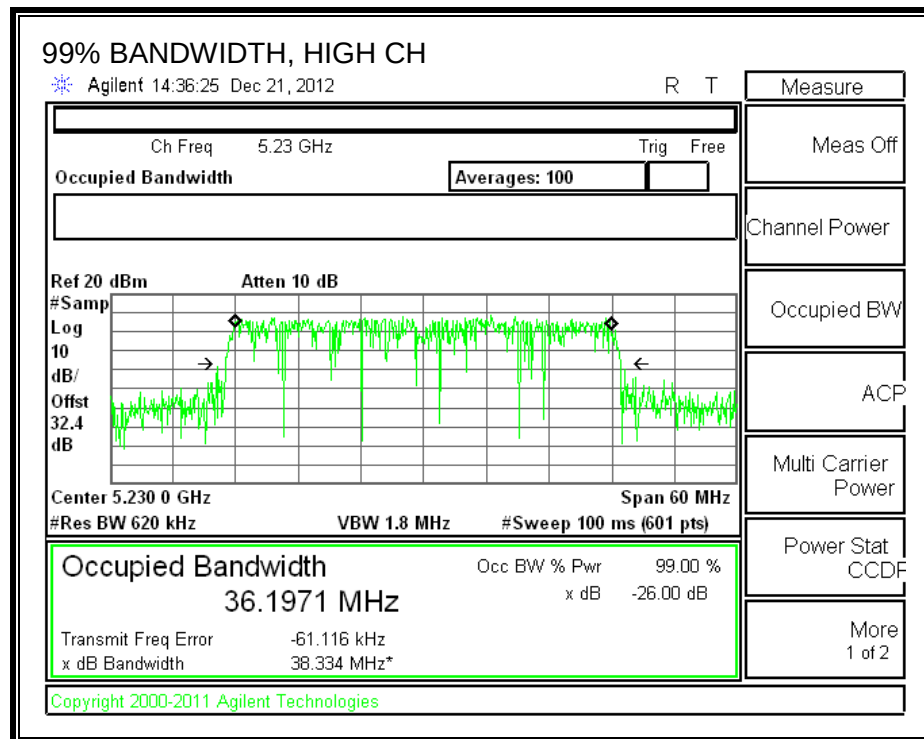
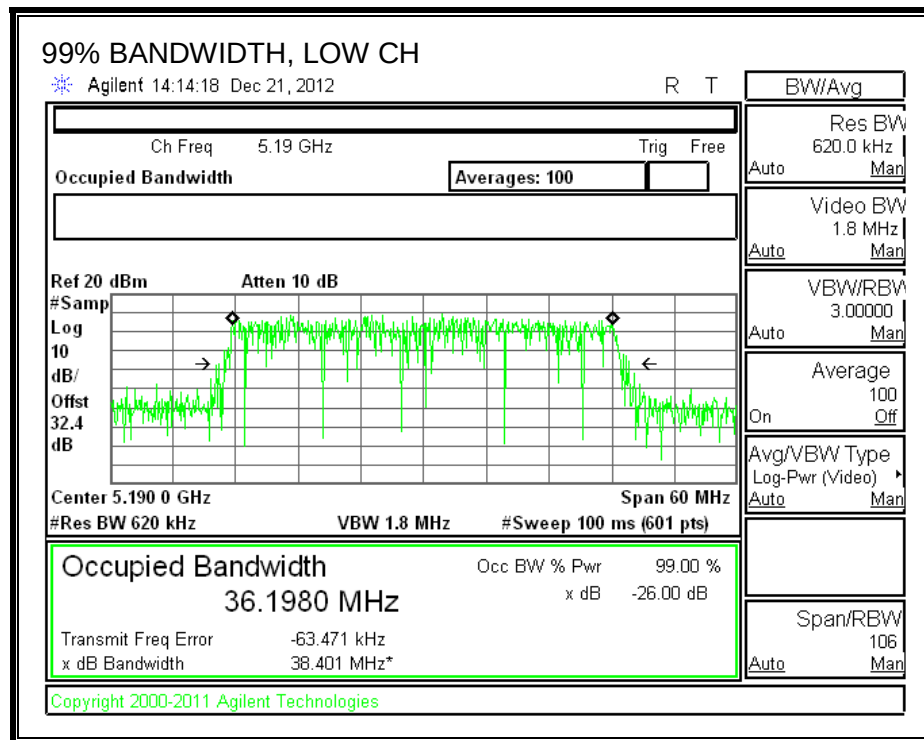
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 5190               | 36.1980                |
| High    | 5230               | 36.1971                |

**99% BANDWIDTH**



### **8.8.3. OUTPUT AVERAGE POWER AND PSD**

#### **LIMITS**

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### **DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5190               | 40.17                       | 36.1980                   | 3.20                         |
| High    | 5230               | 40.00                       | 36.1971                   | 3.20                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 19.80                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5230               | 17.00                          | 23.00                        | 19.80                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

### Output Power Results

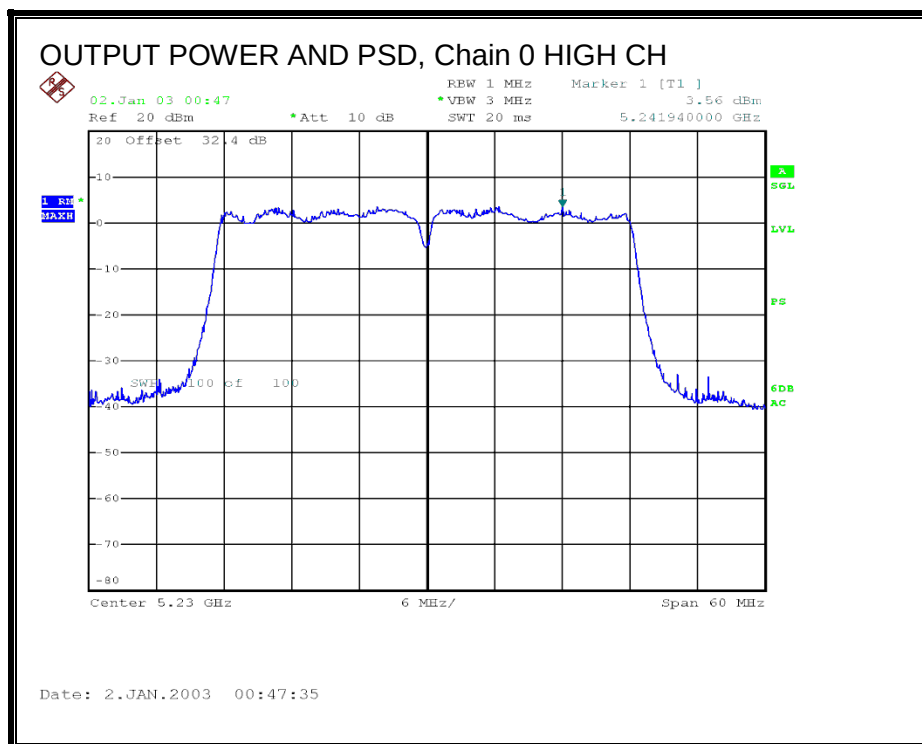
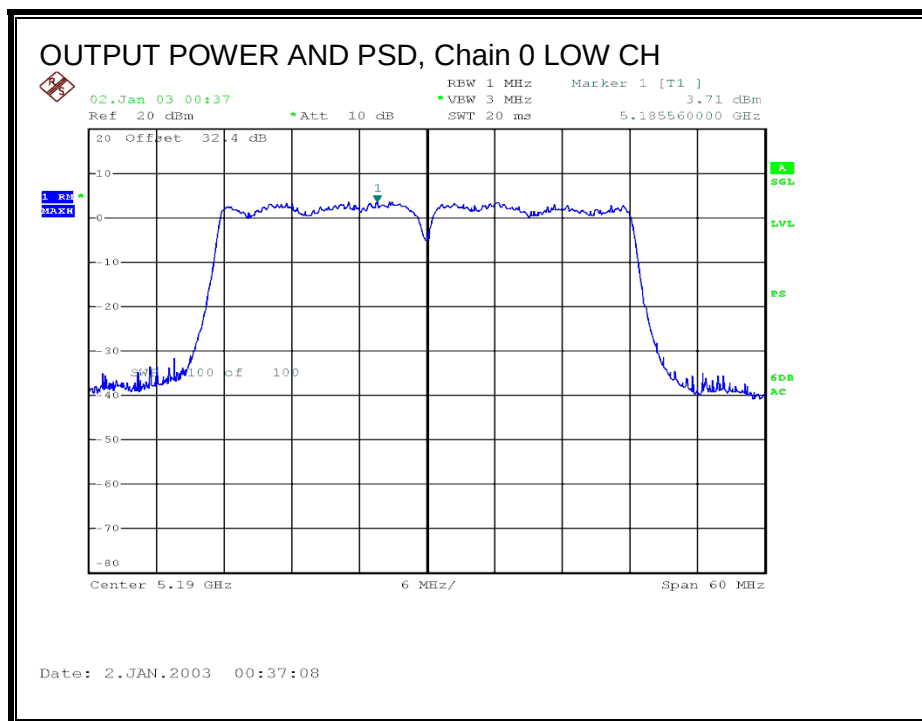
| Channel | Frequency<br>(MHz) | Chain 1<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low     | 5190               | 15.00                             | 15.00                             | 17.00                   | -2.00                   |
| High    | 5230               | 16.50                             | 16.50                             | 17.00                   | -0.50                   |

### 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     | 5190               | 3.71                            | 3.71                            | 4.00                  | -0.29                 |
| High    | 5230               | 3.56                            | 3.56                            | 4.00                  | -0.44                 |



**OUTPUT POWER AND PSD, Chain 1**



#### 8.8.4. PEAK EXCURSION

##### LIMITS

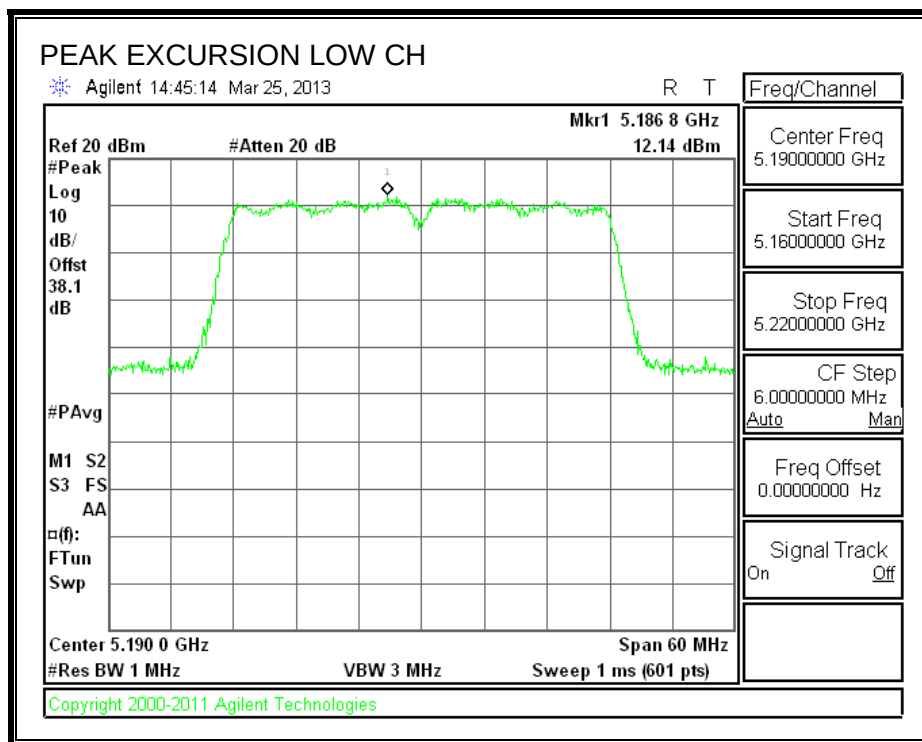
FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

##### RESULTS

| Channel | Frequency<br>(MHz) | PK Level<br>(dBm) | PSD<br>(dBm) | DCCF<br>(dB) | Peak Excursion<br>(dB) | Limit<br>(dB) | Margin<br>(dB) |
|---------|--------------------|-------------------|--------------|--------------|------------------------|---------------|----------------|
| Low     | 5190               | 12.14             | 3.71         | 0.00         | 8.43                   | 13            | -4.57          |

**PEAK EXCURSION**



## 8.9. 802.11n HT40 CDD 2TX MODE IN THE 5.2 GHz BAND

### 8.9.1. 26 dB BANDWIDTH

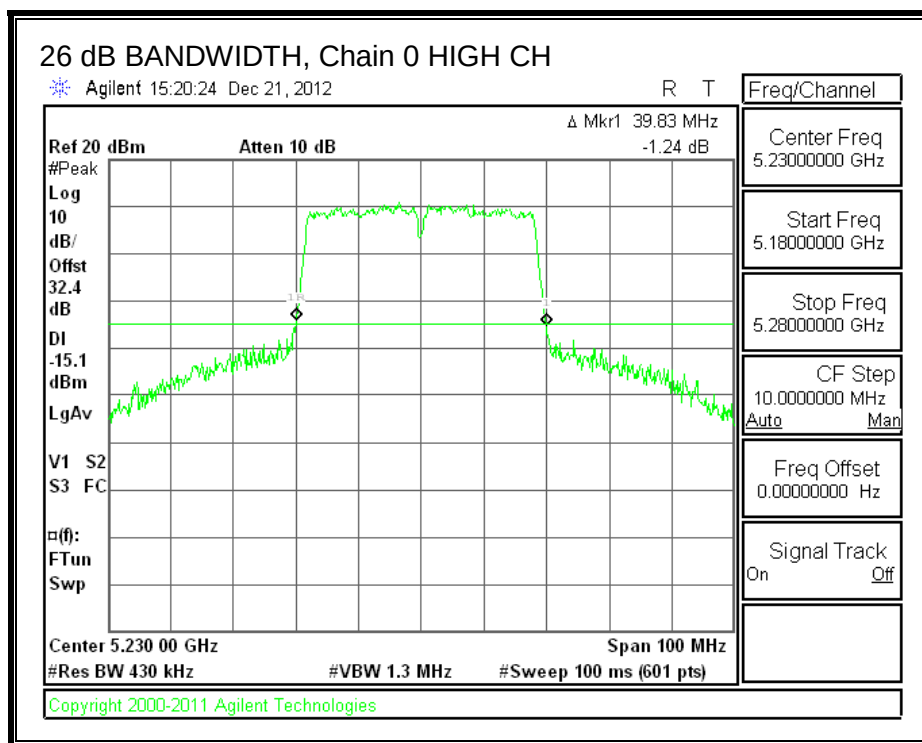
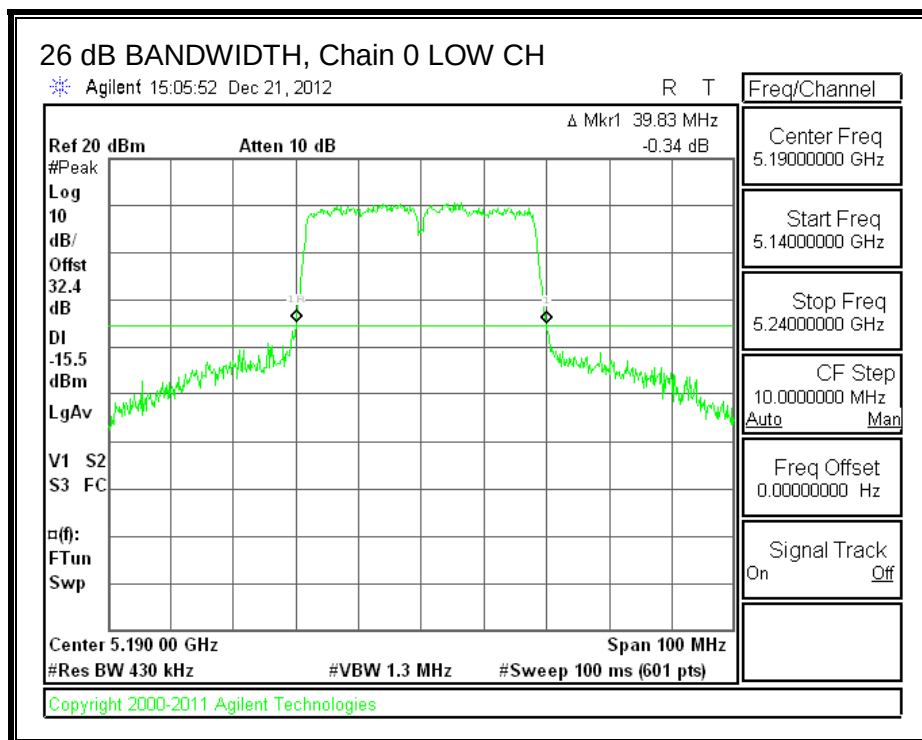
#### LIMITS

None; for reporting purposes only.

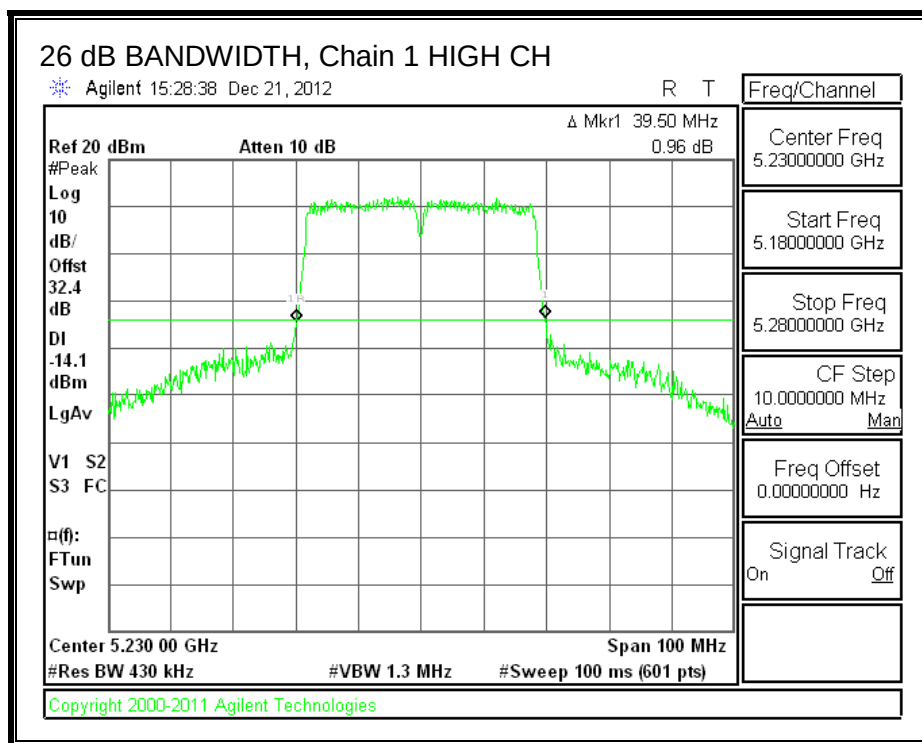
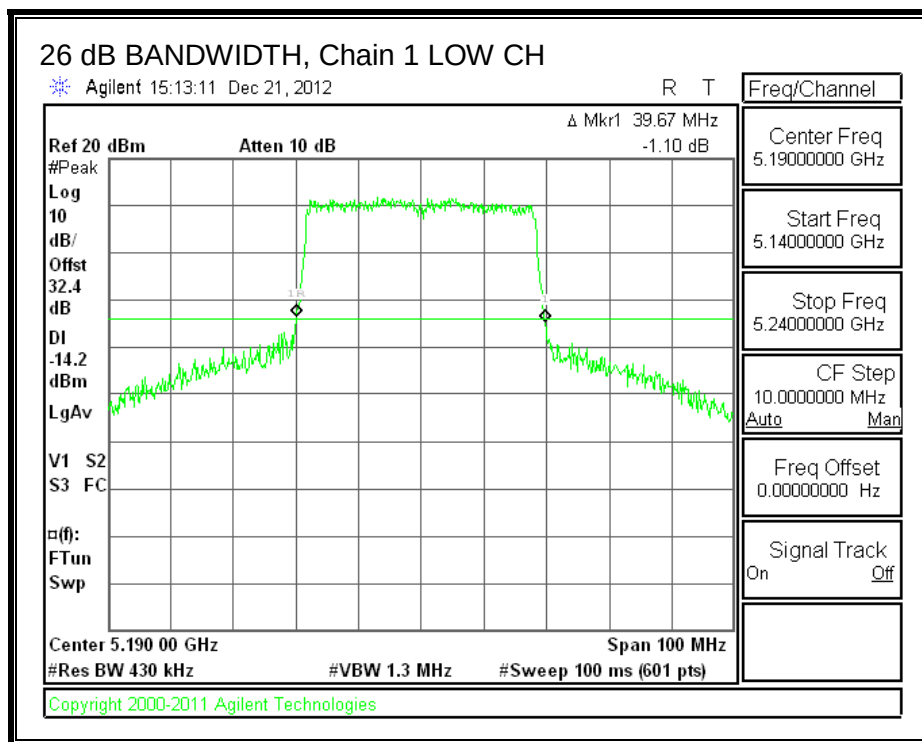
#### RESULTS

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5190               | 39.83                        | 39.67                        |
| High    | 5230               | 39.83                        | 39.50                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 8.9.2. 99% BANDWIDTH

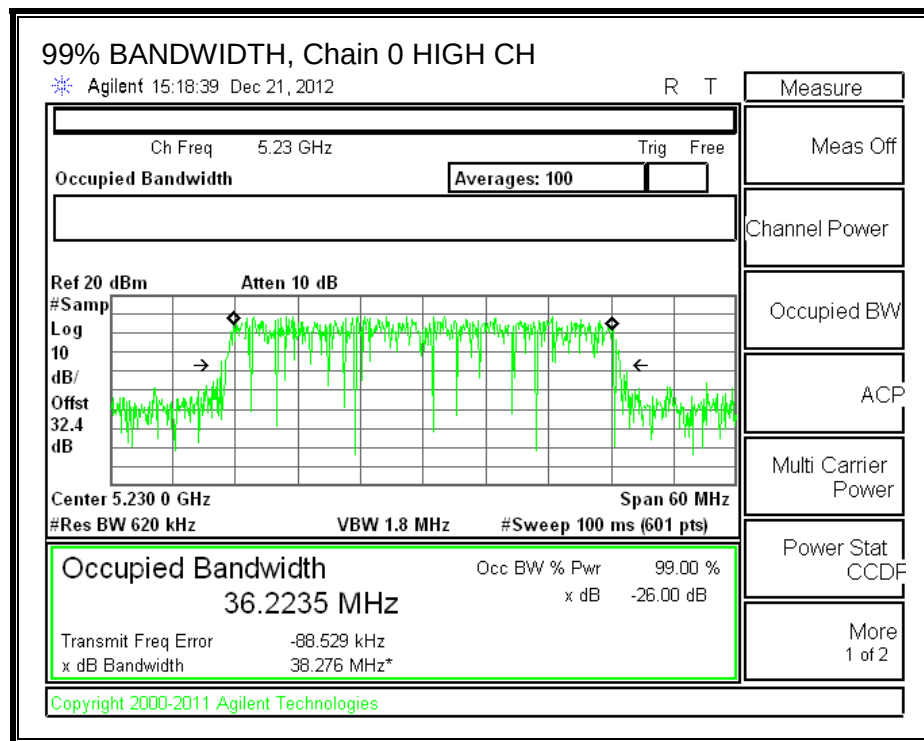
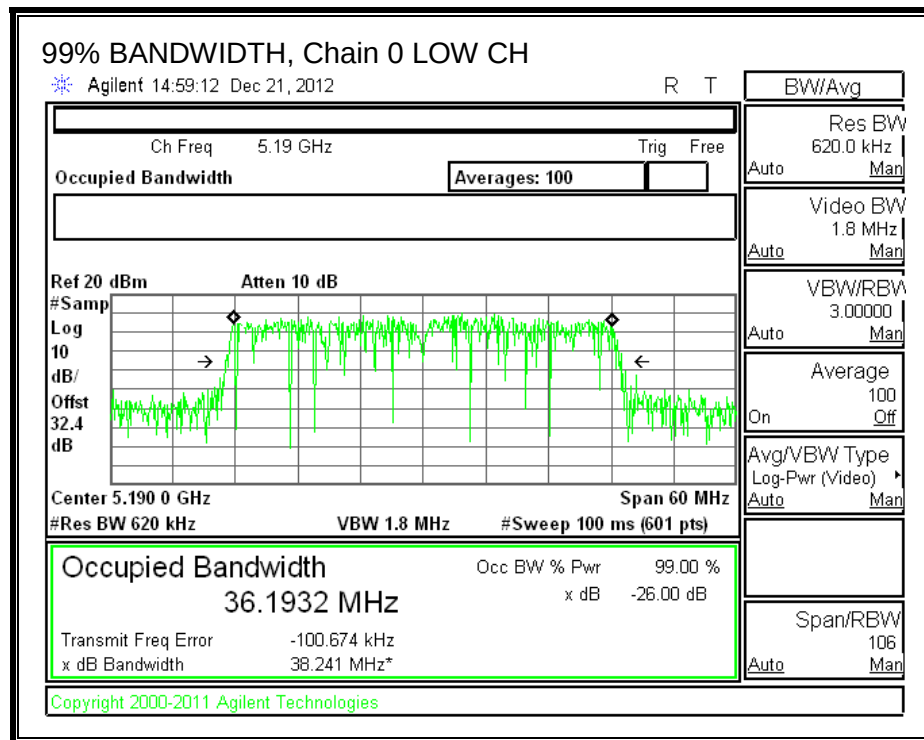
### LIMITS

None; for reporting purposes only.

### RESULTS

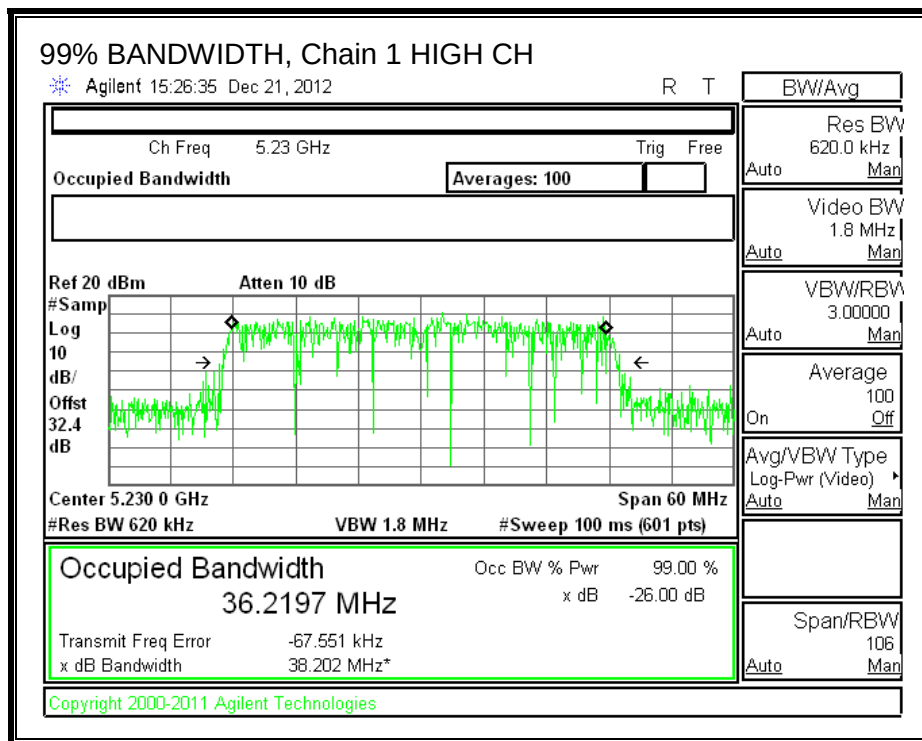
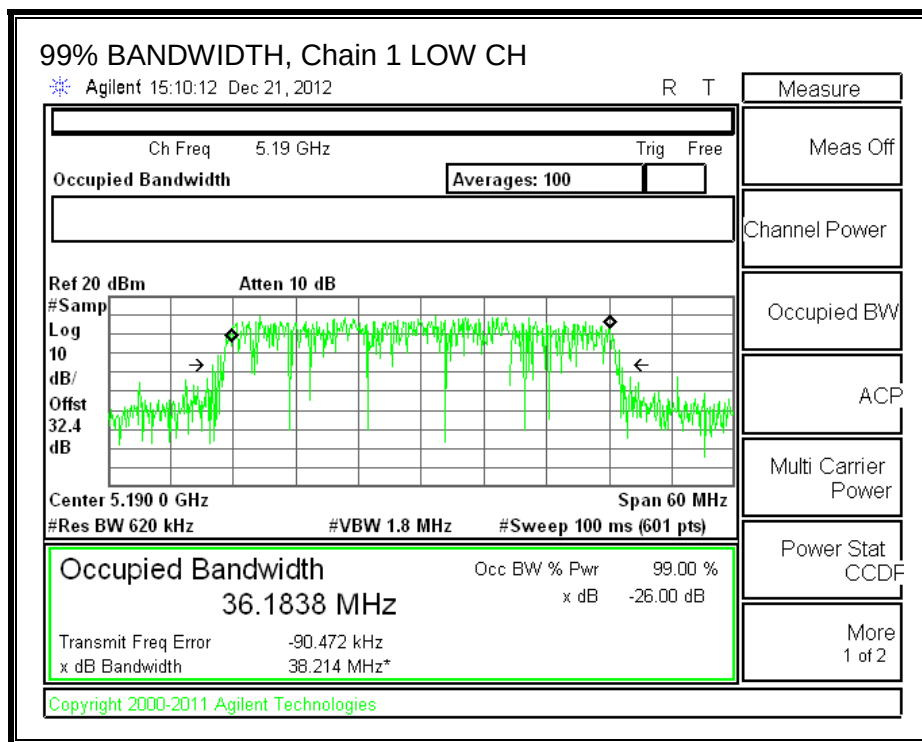
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.1932                    | 36.1838                    |
| High    | 5230               | 36.2235                    | 36.2197                    |

**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**



### 8.9.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

For PSD, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|--------------------------------------------|
| Low     | 5190               | 39.67                       | 36.1838                   | 5.72                                       | 2.73                                       |
| High    | 5230               | 39.50                       | 36.2197                   | 5.72                                       | 2.73                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5230               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

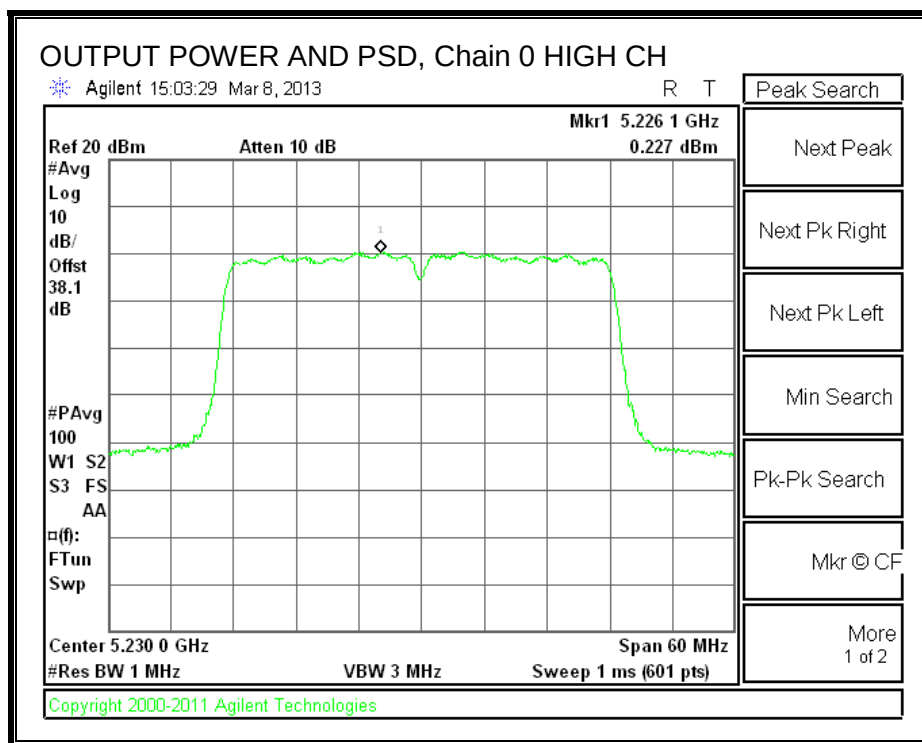
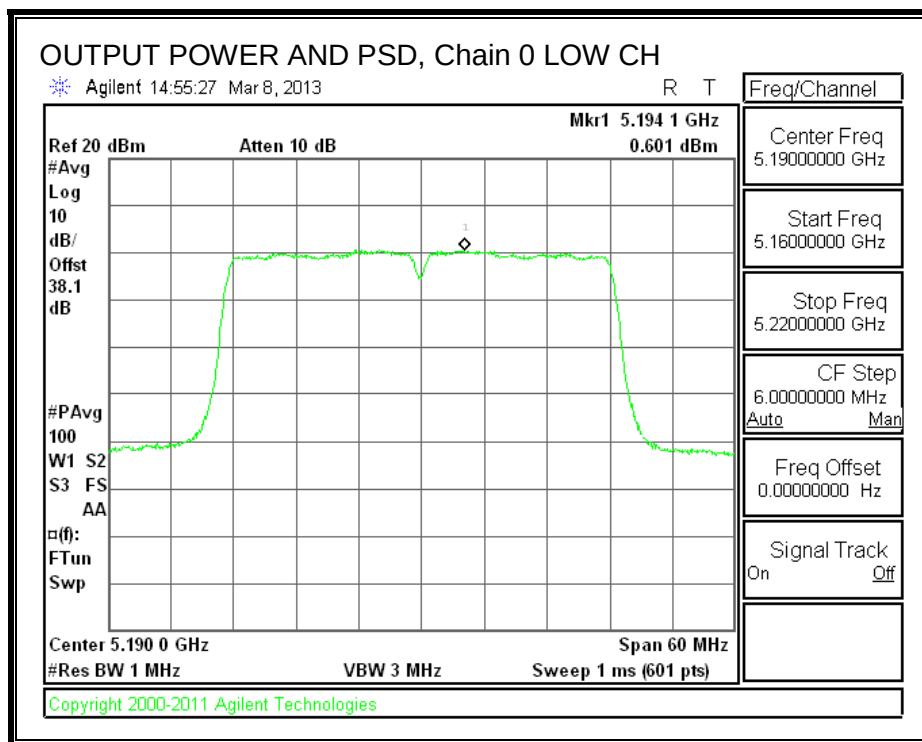
### Output Power Results

| 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               | 12.80                             | 12.50                             | 15.66                             | 17.00                   | -1.34                   |
| High    | 5230               | 12.70                             | 12.80                             | 15.76                             | 17.00                   | -1.24                   |

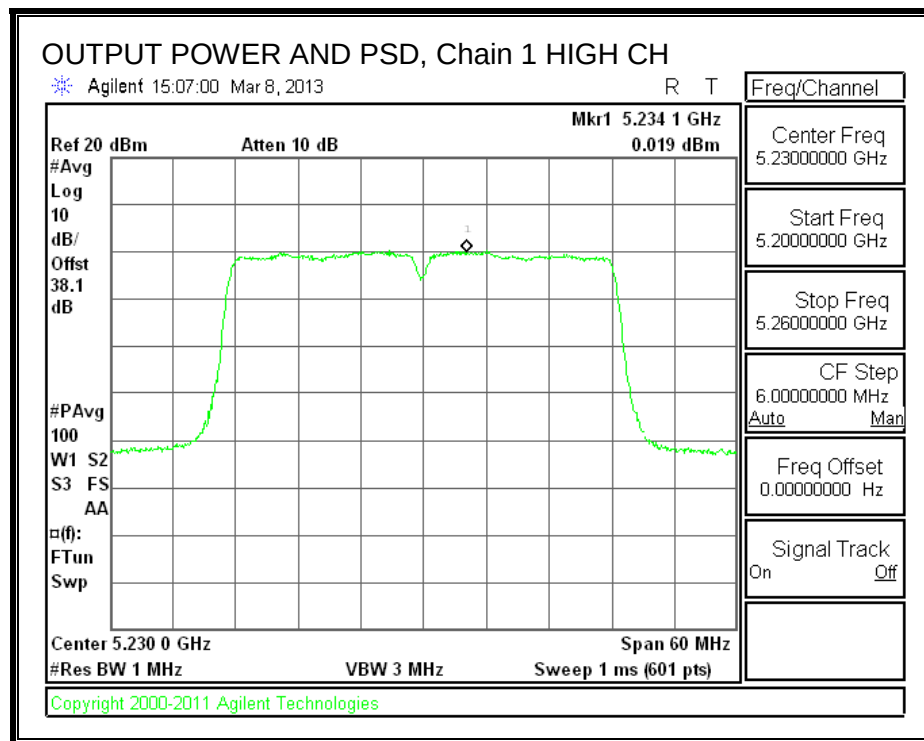
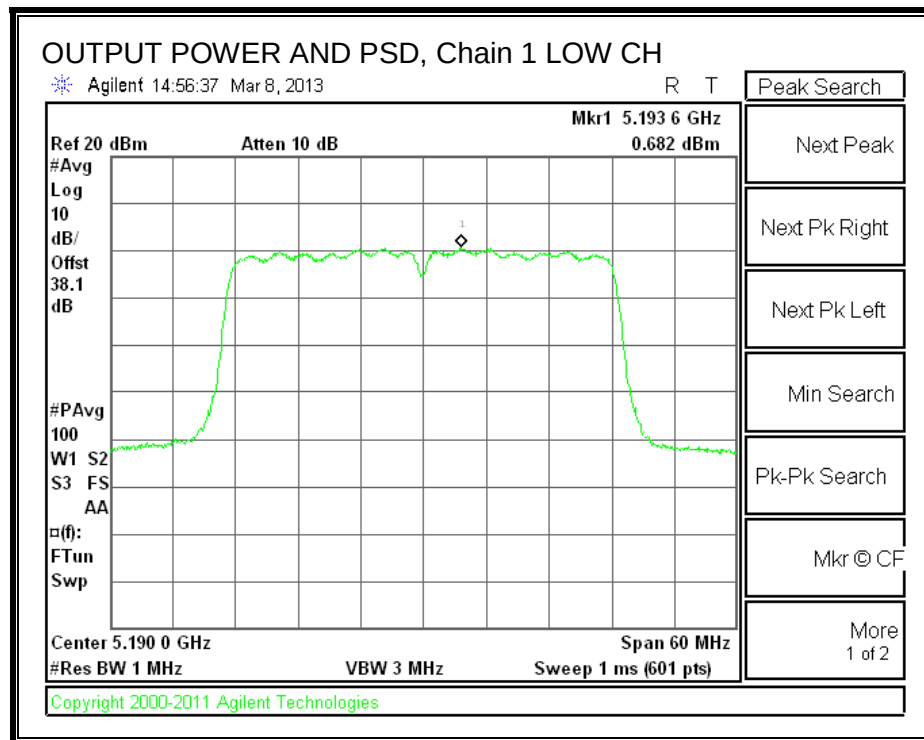
### PSD Results

| 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               | 0.601                           | 0.682                           | 3.65                            | 4.00                  | -0.35                 |
| High    | 5230               | 0.227                           | 0.019                           | 3.13                            | 4.00                  | -0.87                 |

**OUTPUT POWER AND PSD, Chain 0**



**OUTPUT POWER AND PSD, Chain 1**



#### 8.9.4. PEAK EXCURSION

##### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

##### RESULTS

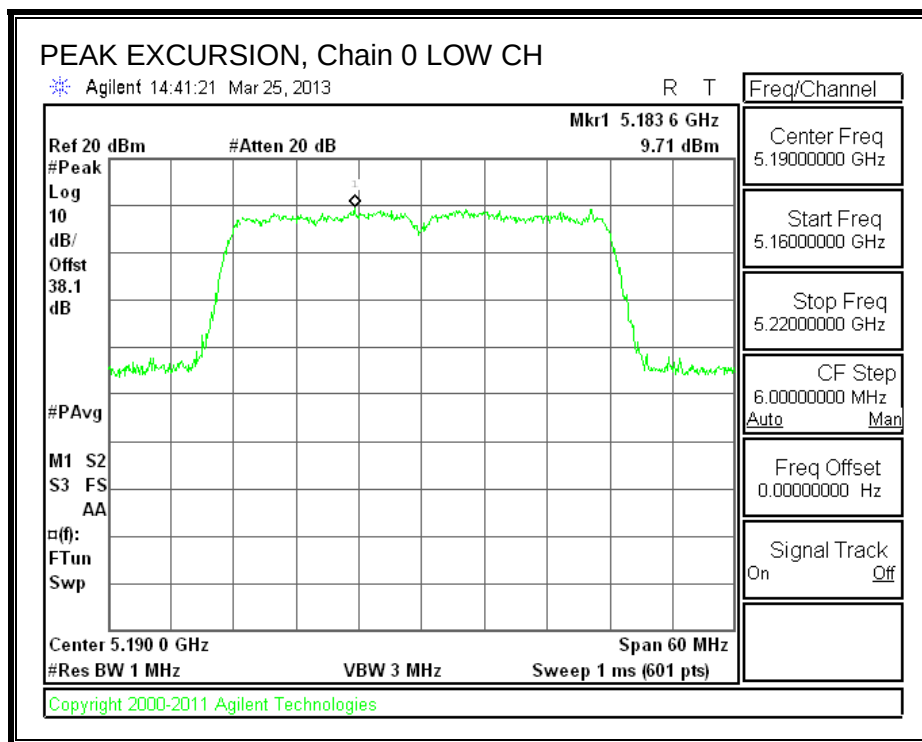
Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 9.71           | 0.601     | 0.00      | 9.11                | 13         | -3.89       |

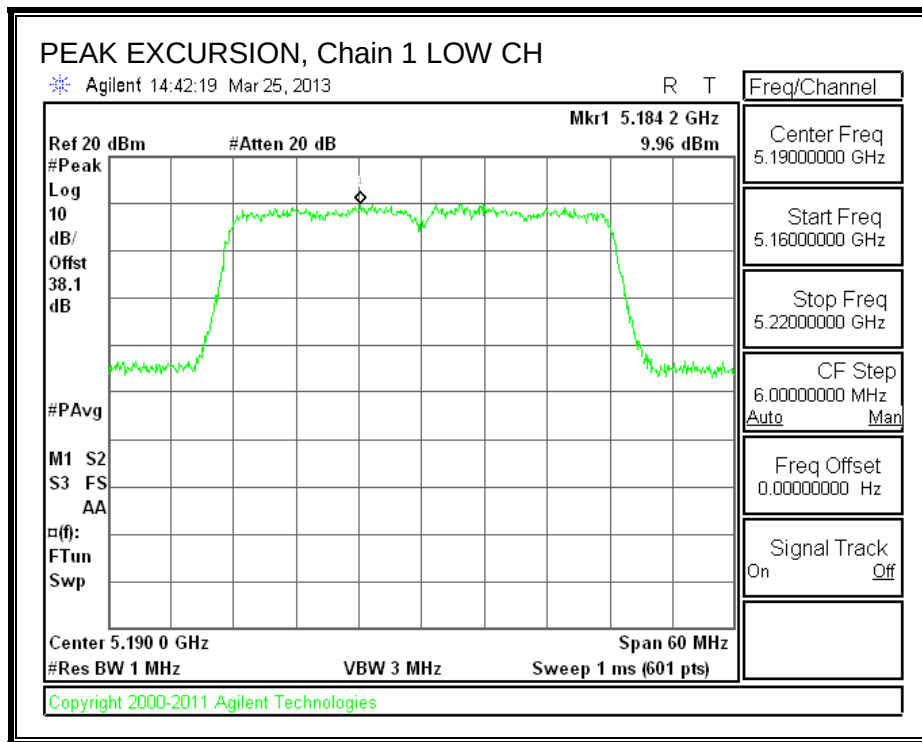
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 9.96           | 0.682     | 0.00      | 9.28                | 13         | -3.72       |

**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**





## 8.10. 802.11n HT40 BF 2TX MODE IN THE 5.2 GHz BAND

Covered by testing HT40 CDD 2TX mode, the power per chain used for HT40 CDD 2TX mode is the same power per chain that will be used for HT40 BF 2TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.10.1. OUTPUT AVERAGE POWER

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Low     | 5190               | 39.67                       | 36.1838                   | 5.72                                       |
| High    | 5230               | 39.50                       | 36.2197                   | 5.72                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 17.28                       | 17.00                   |
| High    | 5230               | 17.00                          | 23.00                        | 17.28                       | 17.00                   |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

### 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               | 12.80                             | 12.50                             | 15.66                             | 17.00                   | -1.34                   |
| High    | 5230               | 12.70                             | 12.80                             | 15.76                             | 17.00                   | -1.24                   |

## **8.11. 802.11n HT40 STBC 2TX MODE IN THE 5.2 GHz BAND**

### **8.11.1. 26 dB BANDWIDTH**

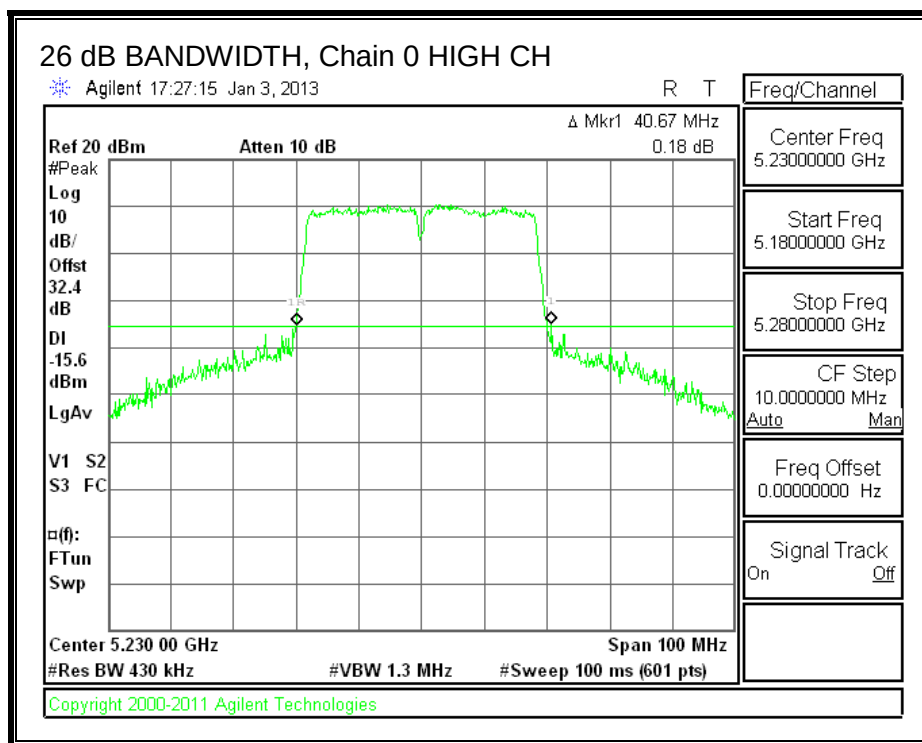
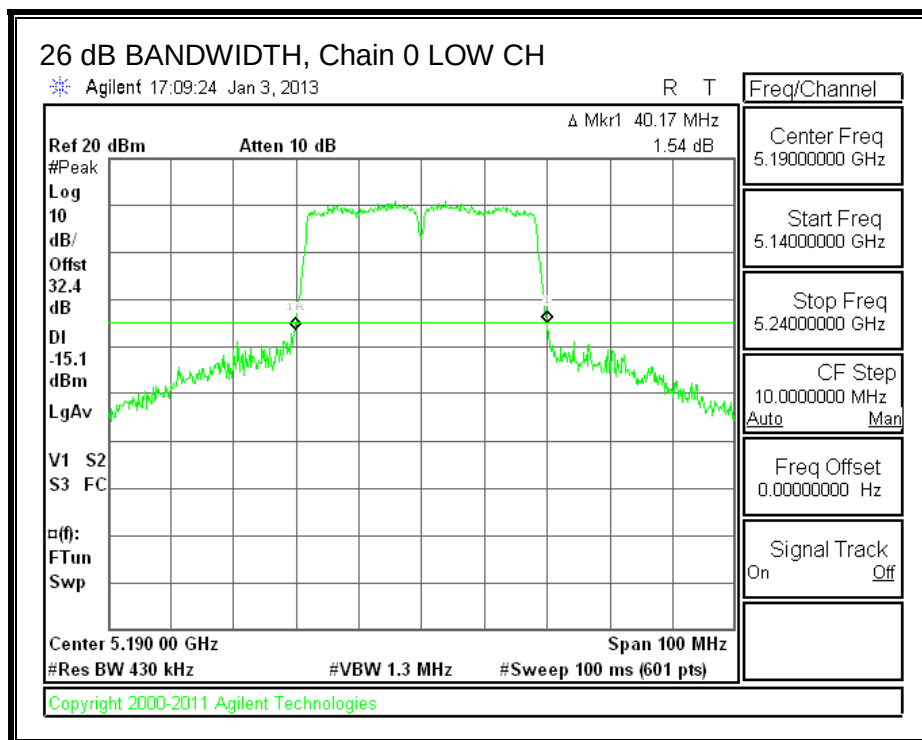
#### **LIMITS**

None; for reporting purposes only.

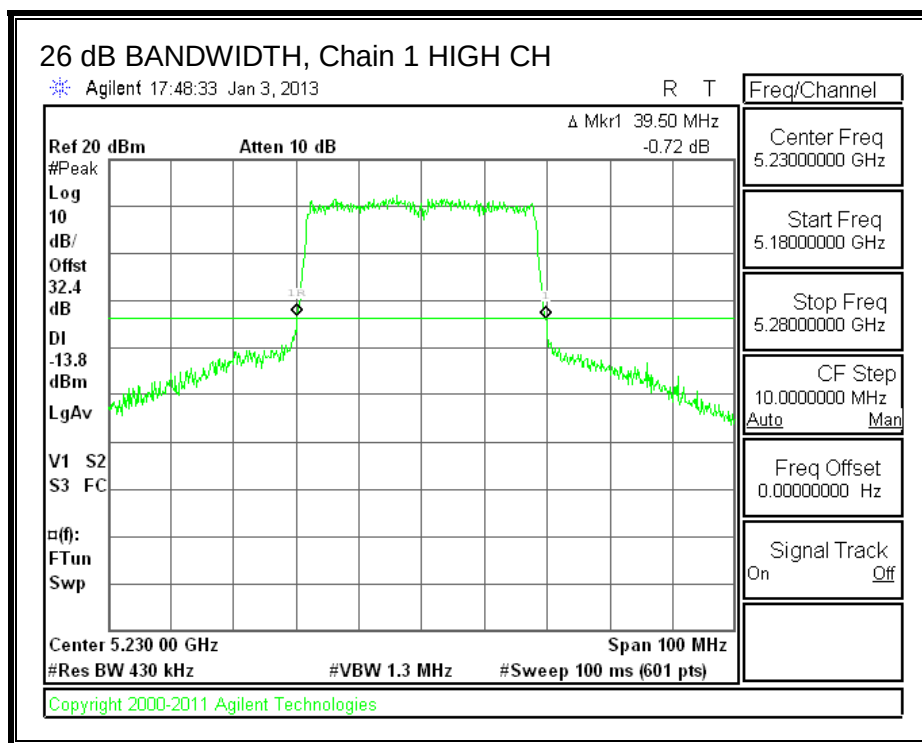
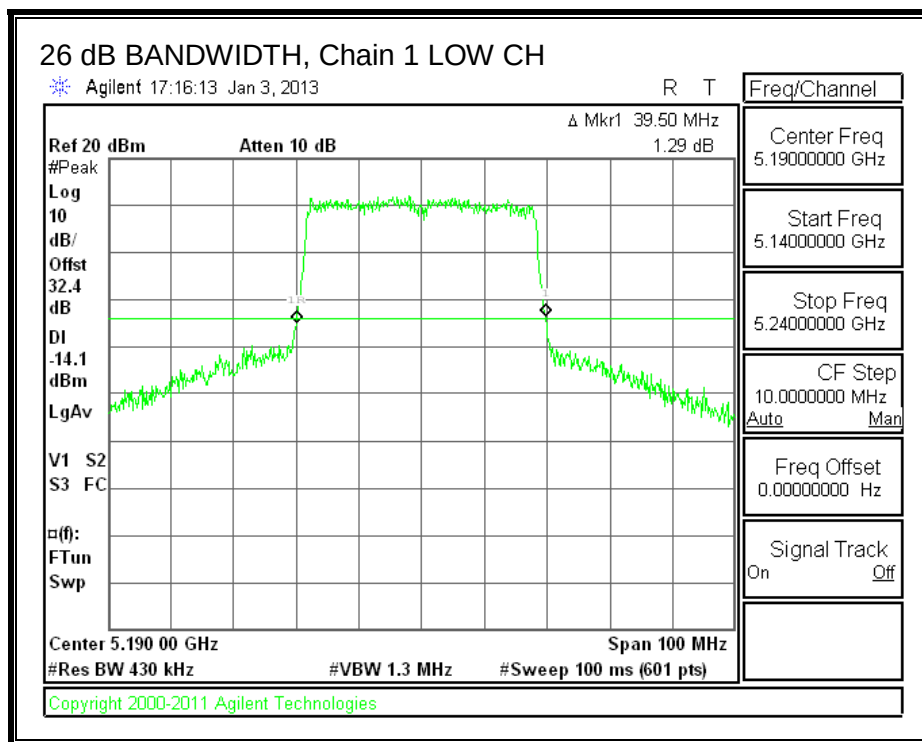
#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5190               | 40.17                        | 39.50                        |
| High    | 5230               | 40.67                        | 39.50                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 8.11.2. 99% BANDWIDTH

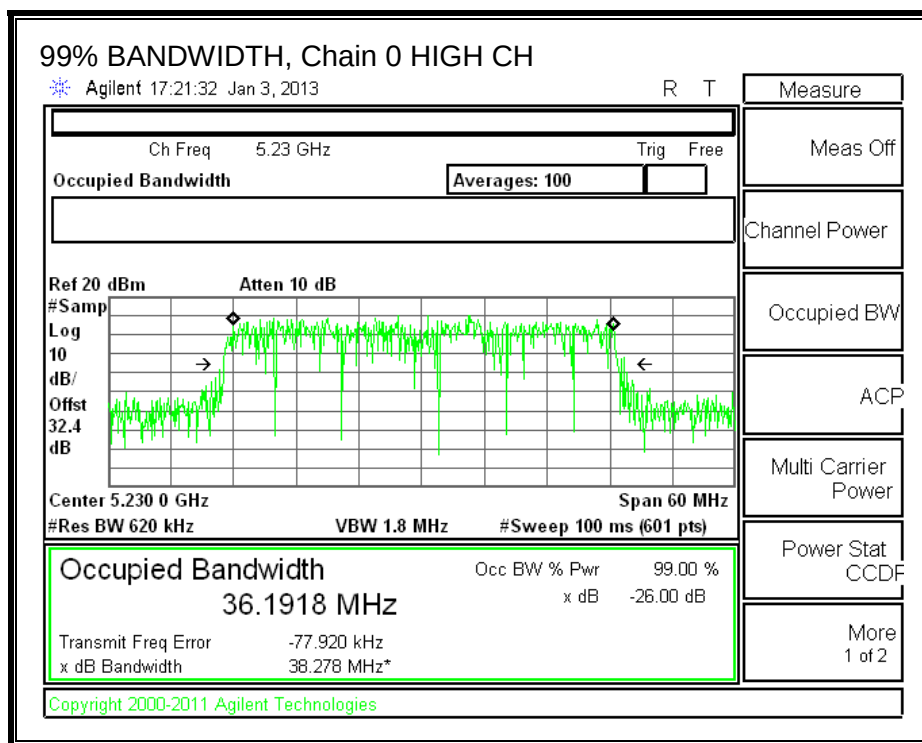
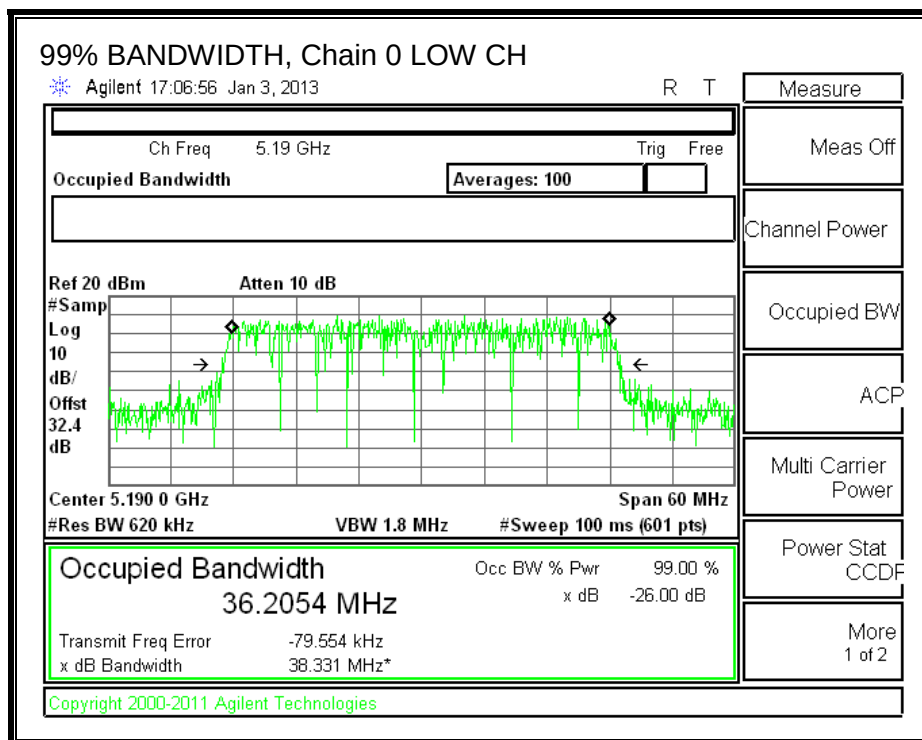
### LIMITS

None; for reporting purposes only.

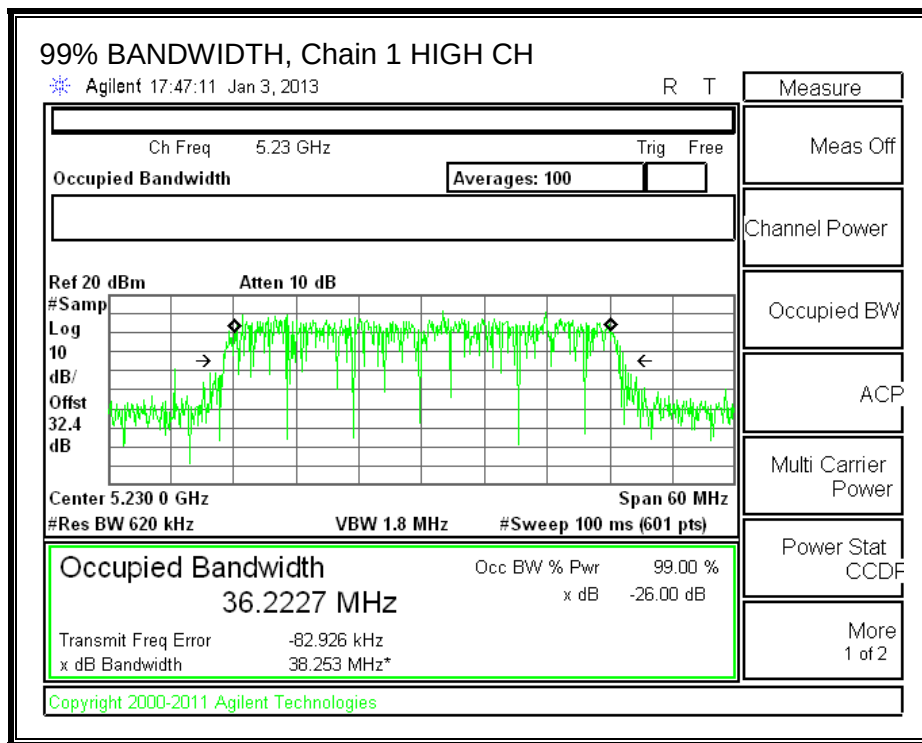
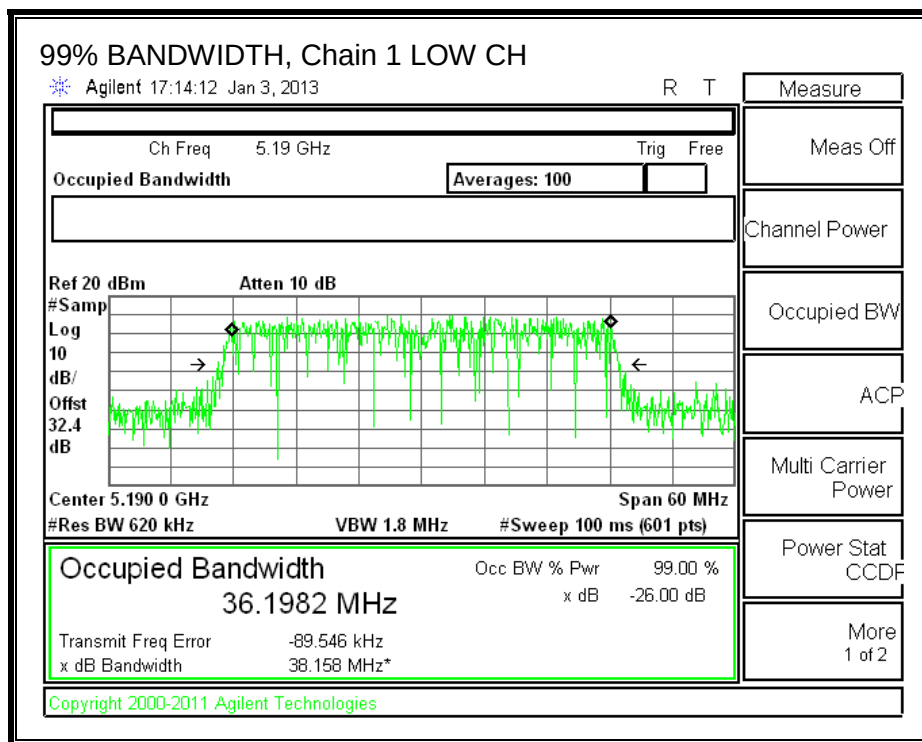
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.2054                    | 36.1982                    |
| High    | 5230               | 36.1918                    | 36.2227                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**





### 8.11.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5190               | 39.50                       | 36.1982                   | 2.73                         |
| High    | 5230               | 39.50                       | 36.1918                   | 2.73                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5230               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

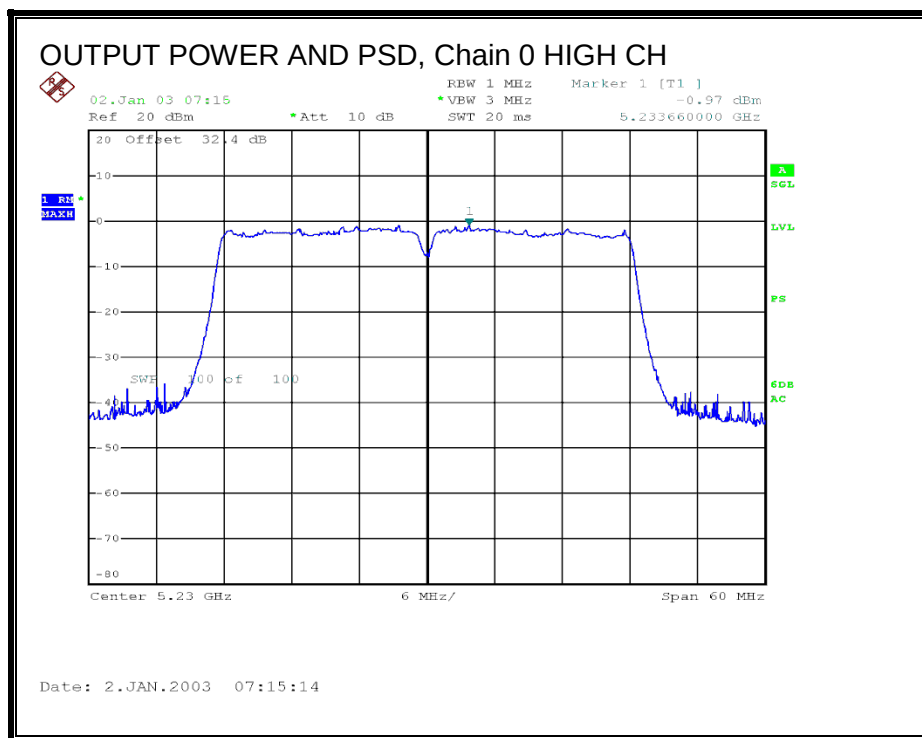
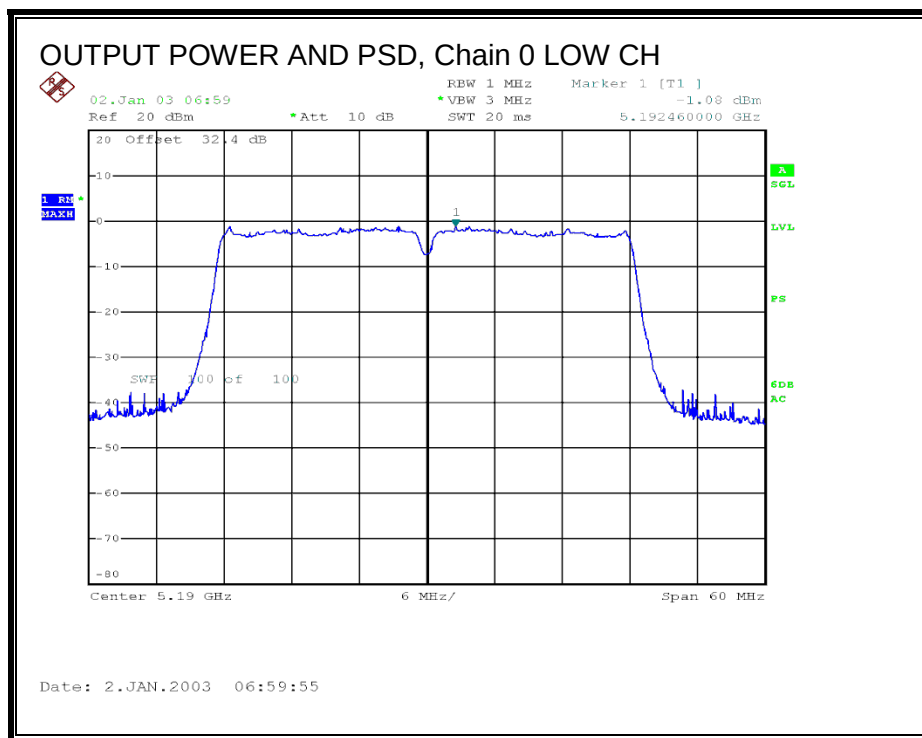
### Output Power Results

| 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               | 13.70                             | 13.80                             | 16.76                             | 17.00                   | -0.24                   |
| High    | 5230               | 13.60                             | 13.70                             | 16.66                             | 17.00                   | -0.34                   |

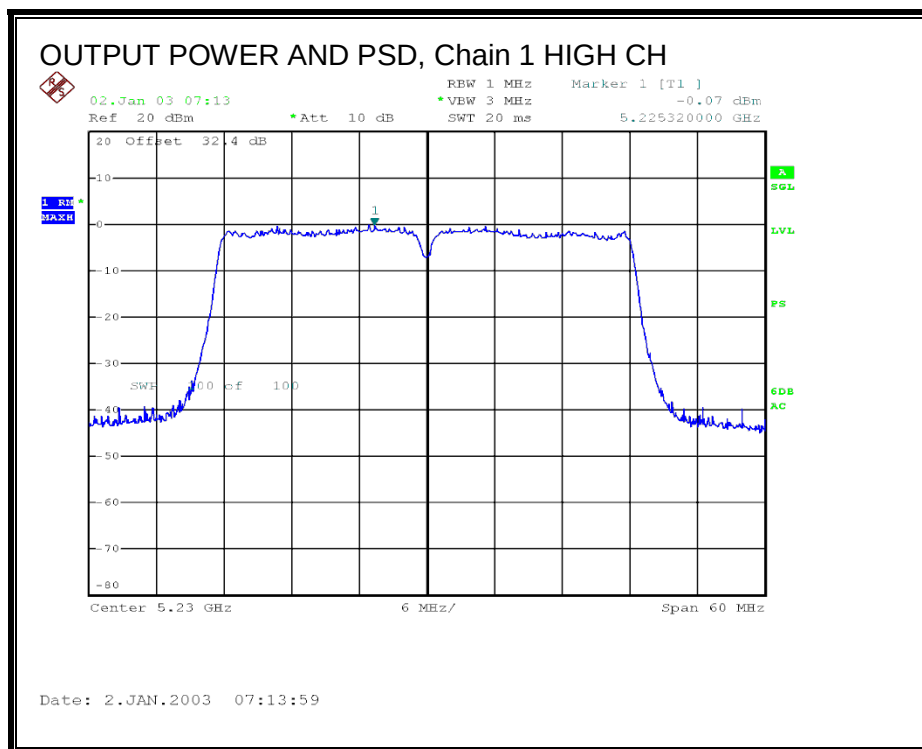
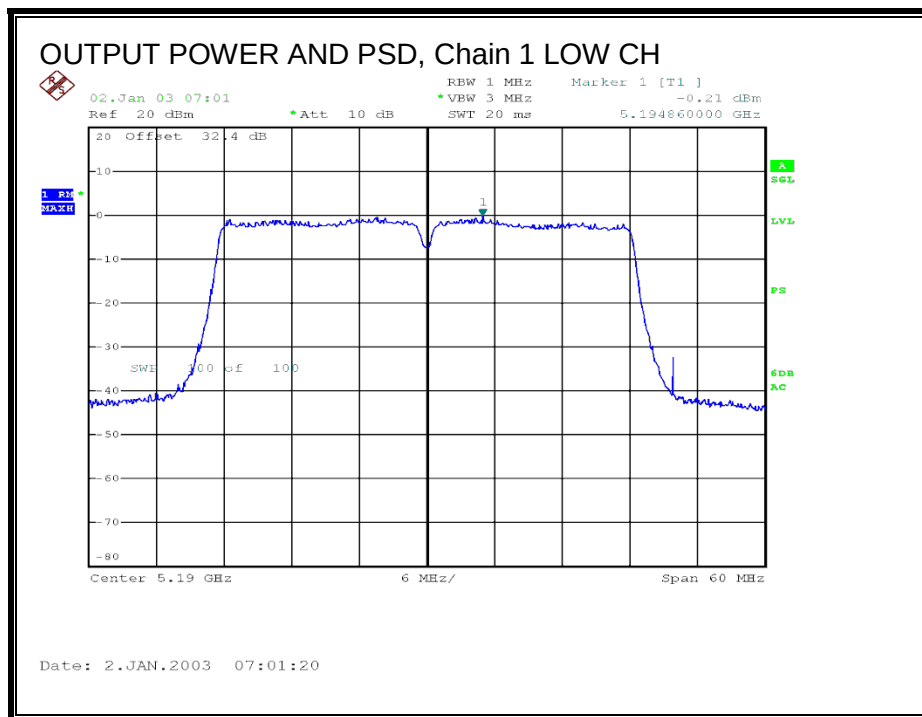
### PSD Results

| 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               | -1.08                           | -0.21                           | 2.39                            | 4.00                  | -1.61                 |
| High    | 5230               | -0.97                           | -0.07                           | 2.51                            | 4.00                  | -1.49                 |

**OUTPUT POWER AND PSD, Chain 0**



**OUTPUT POWER AND PSD, Chain 1**



## 8.11.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

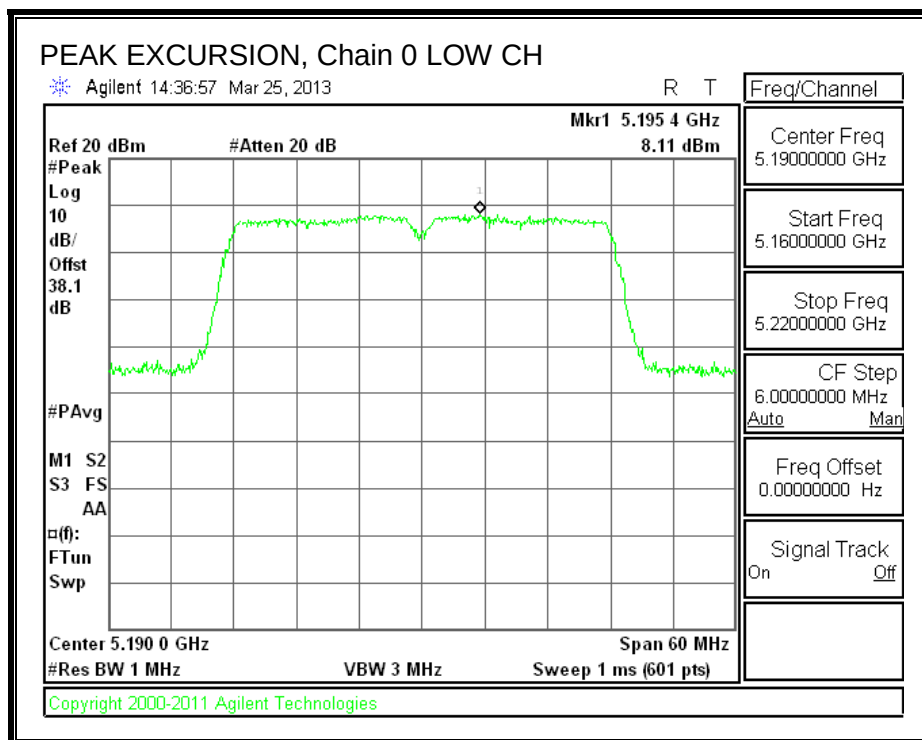
Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 8.11           | -1.08     | 0.00      | 9.19                | 13         | -3.81       |

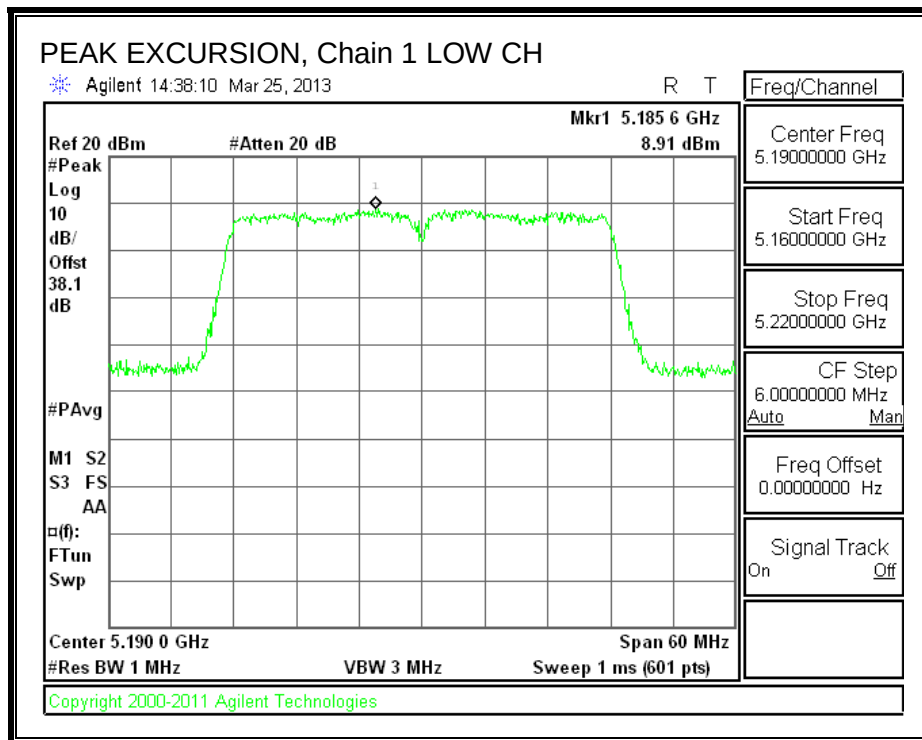
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 8.91           | -0.21     | 0.00      | 9.12                | 13         | -3.88       |

**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



## 8.12. 802.11n HT40 CDD 3TX MODE IN THE 5.2 GHz BAND

### 8.12.1. 26 dB BANDWIDTH

#### LIMITS

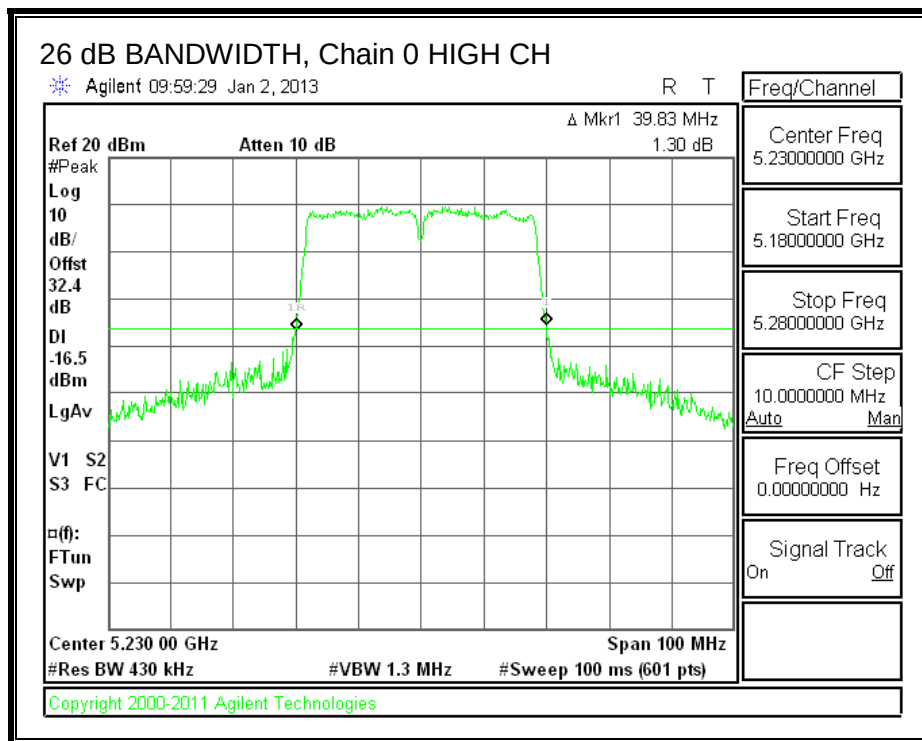
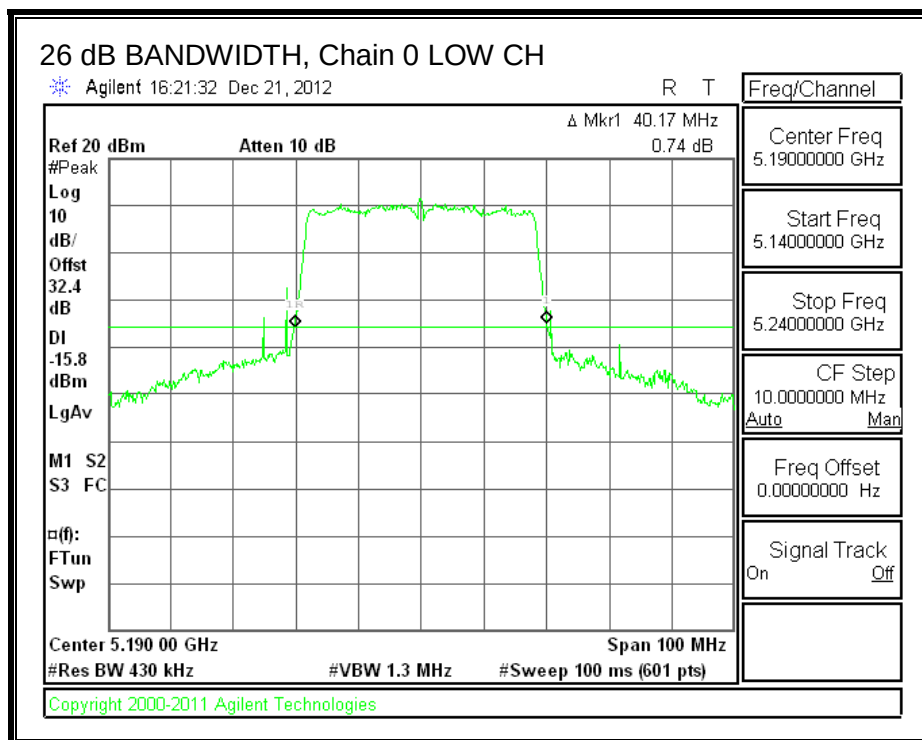
None; for reporting purposes only.

#### RESULTS

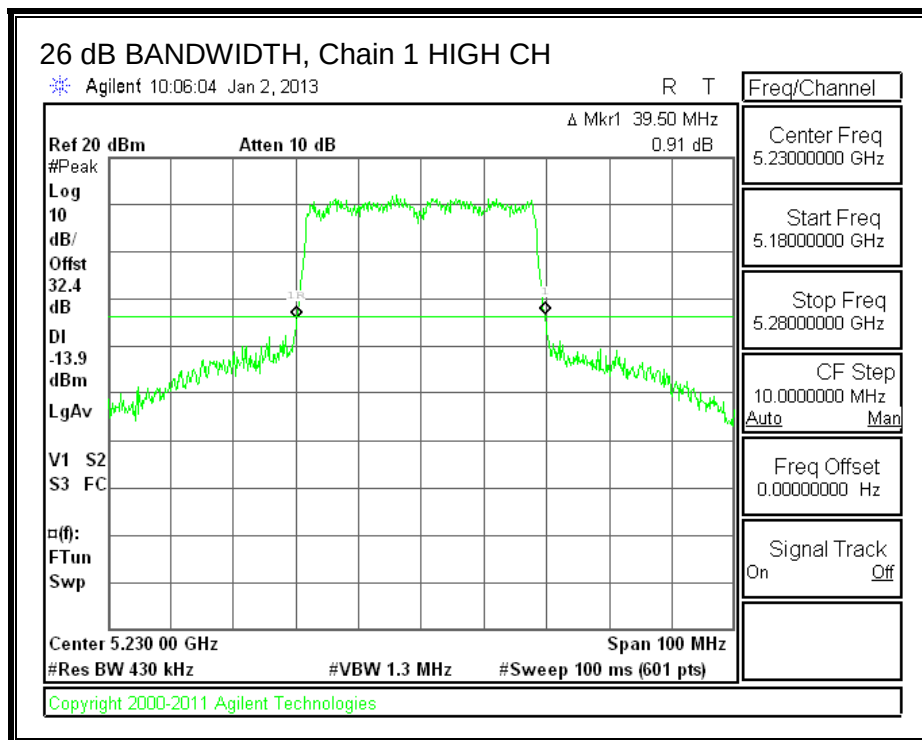
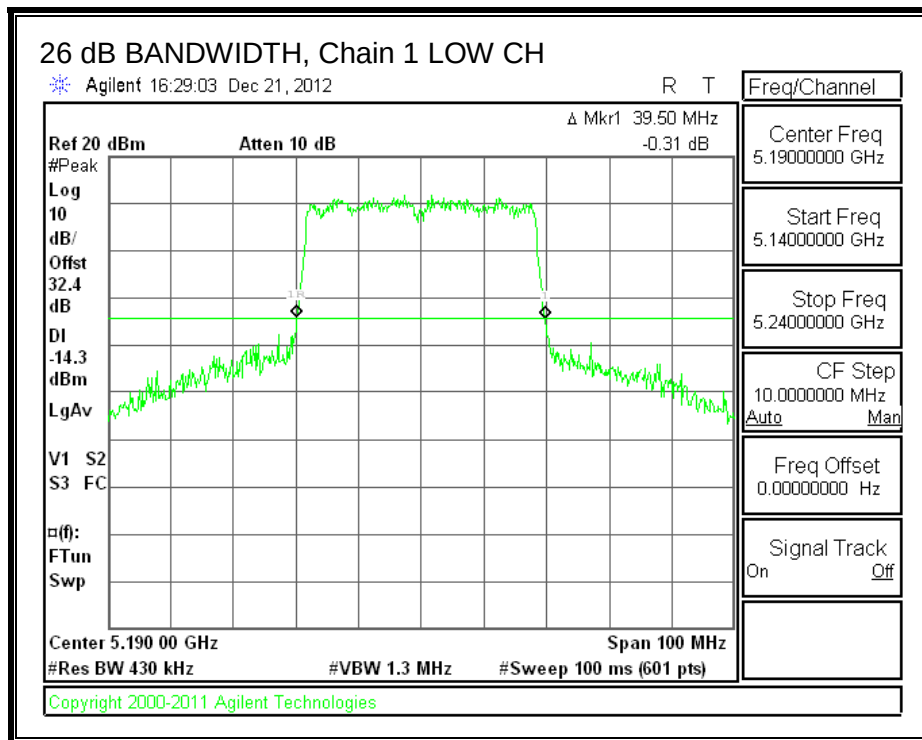
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Low     | 5190               | 40.17                        | 39.50                        | 39.50                        |
| High    | 5230               | 39.83                        | 39.50                        | 39.50                        |



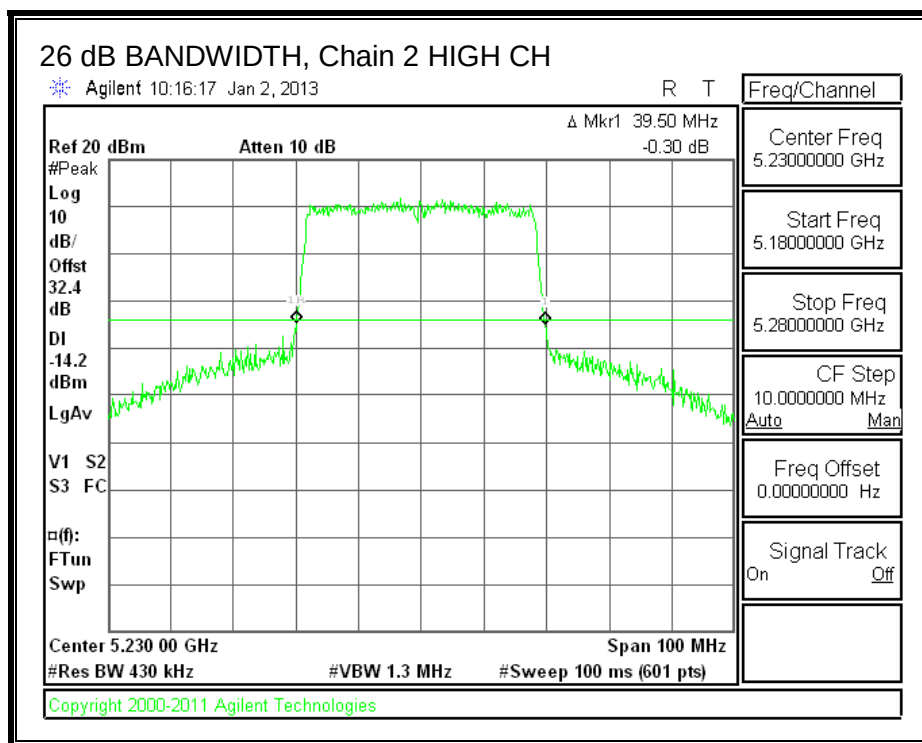
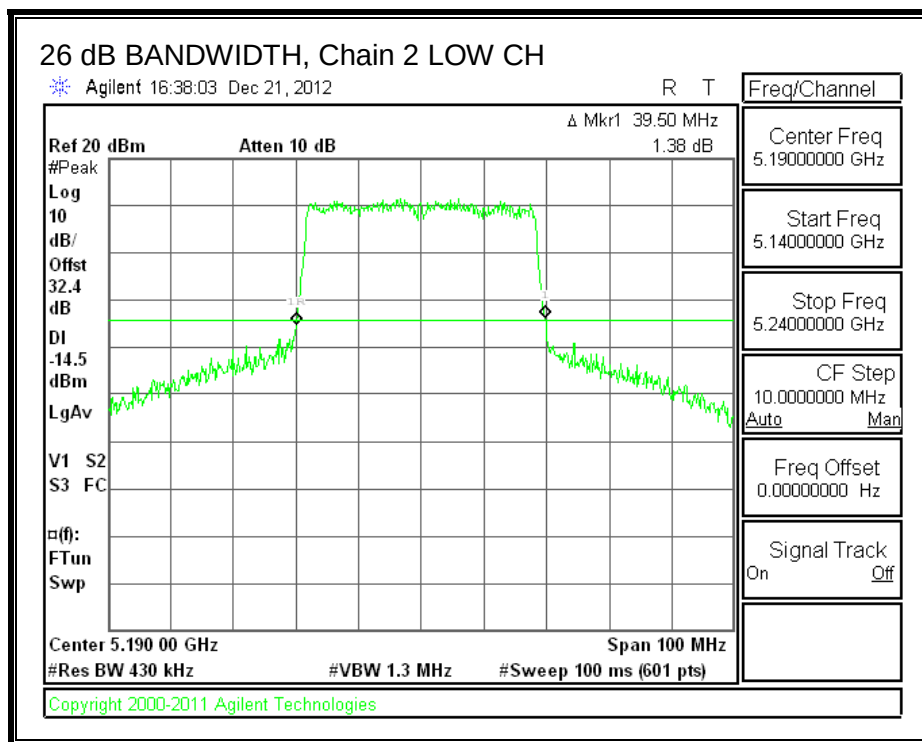
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.12.2. 99% BANDWIDTH

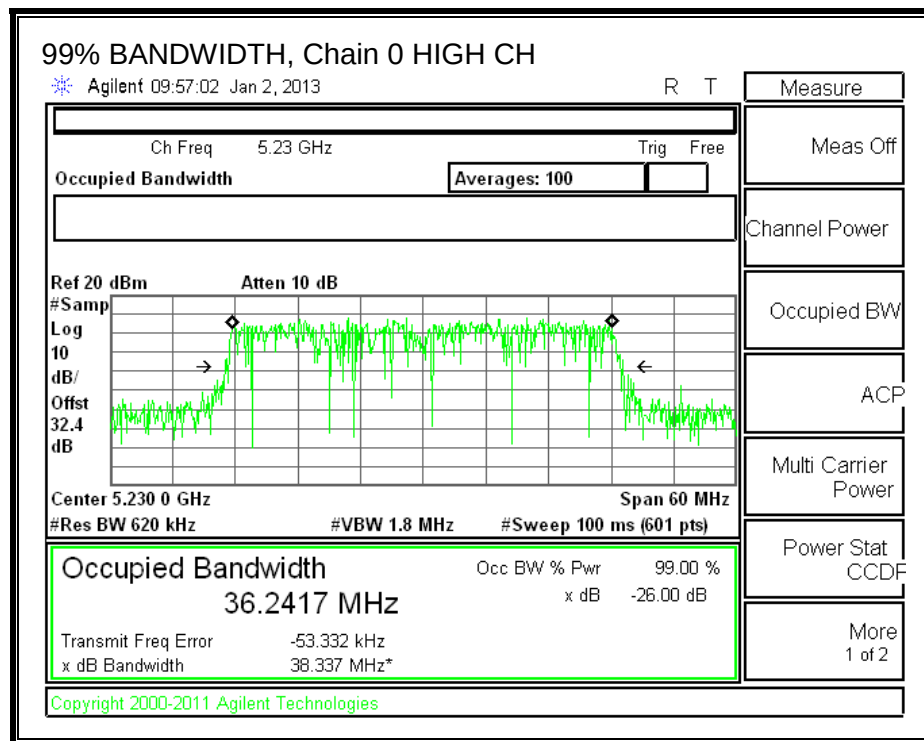
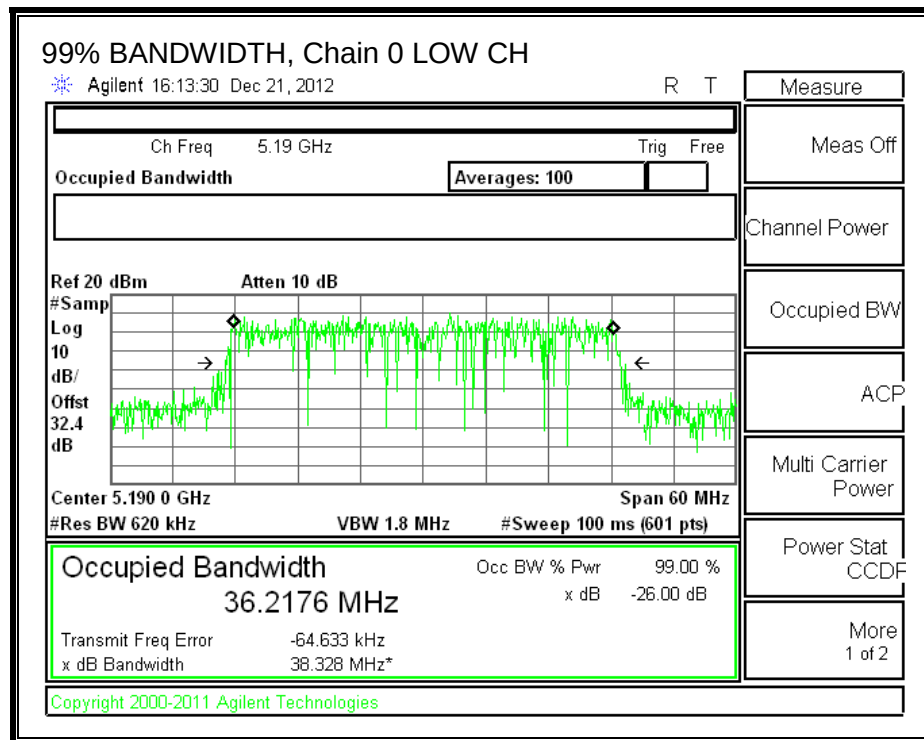
### LIMITS

None; for reporting purposes only.

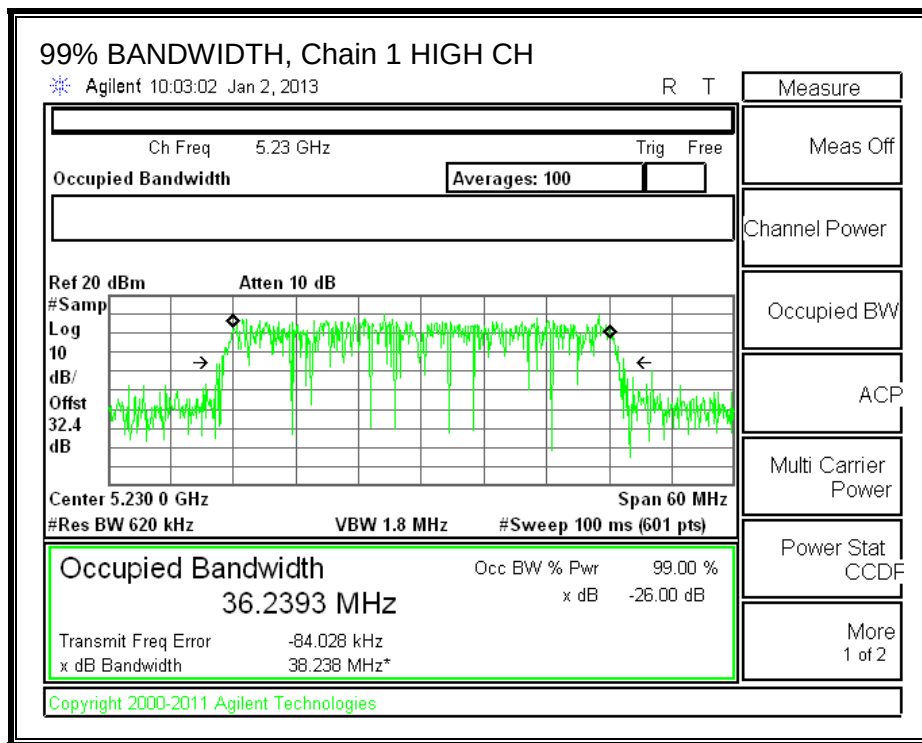
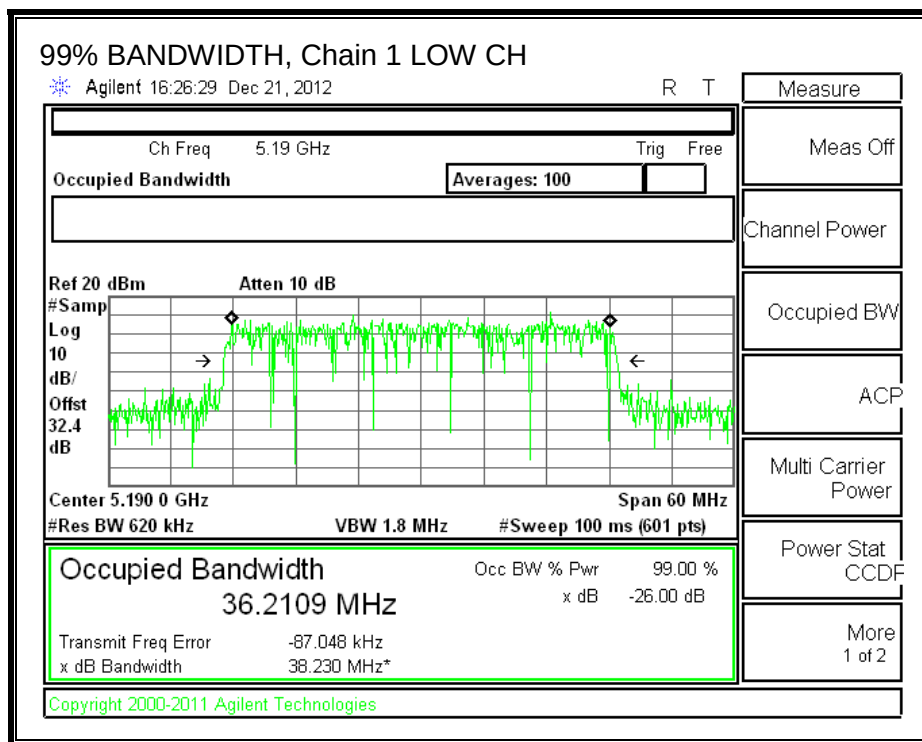
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.2176                    | 36.2109                    | 36.2162                    |
| High    | 5230               | 36.2417                    | 36.2393                    | 36.2273                    |

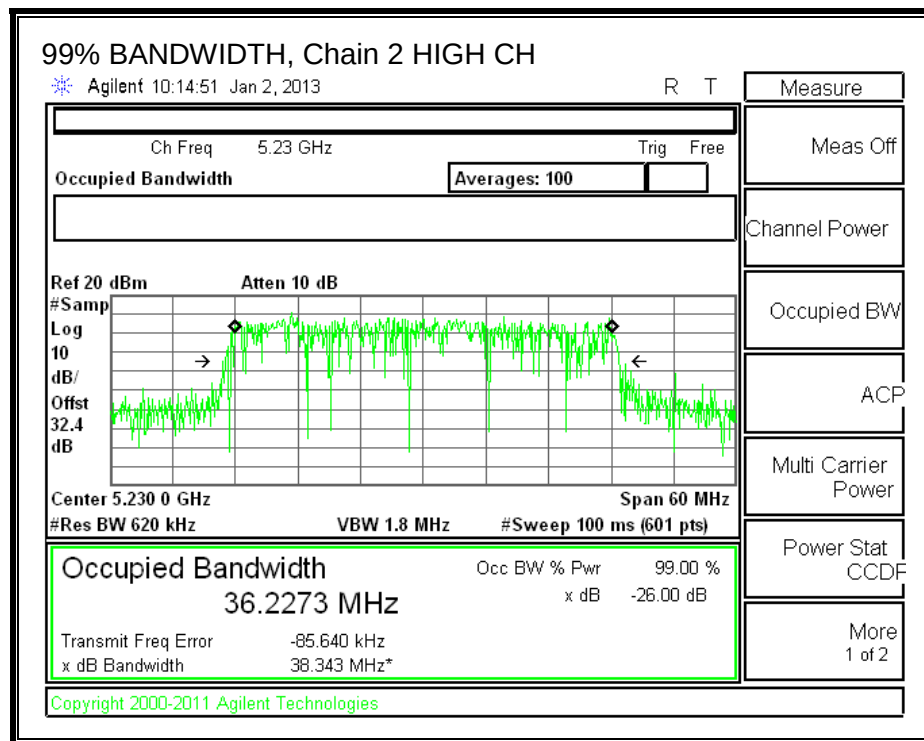
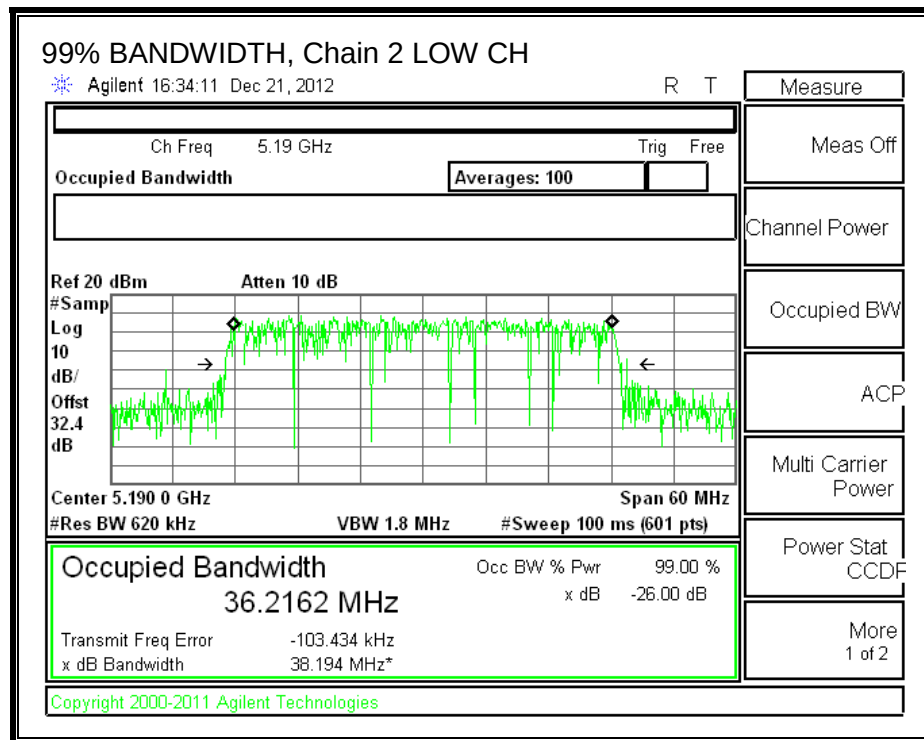
**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.12.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

The TX chains are correlated for PSD 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |



## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Uncorrelated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|----------------------------------------------|
| Low     | 5190               | 39.50                       | 36.2109                   | 7.07                                       | 2.33                                         |
| High    | 5230               | 39.50                       | 36.2273                   | 7.07                                       | 2.33                                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |
| High    | 5230               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

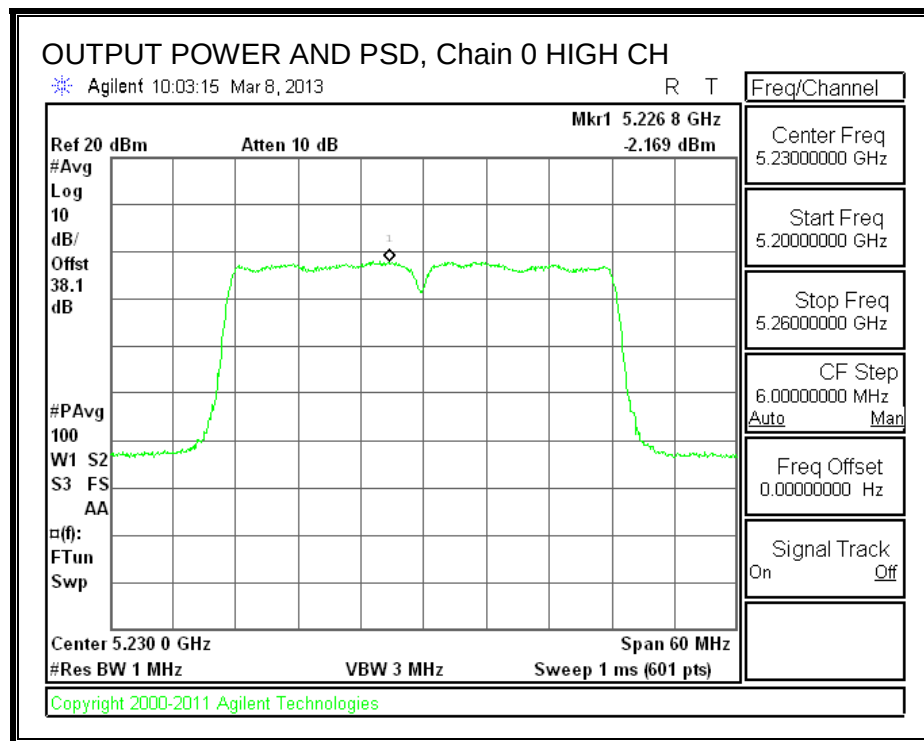
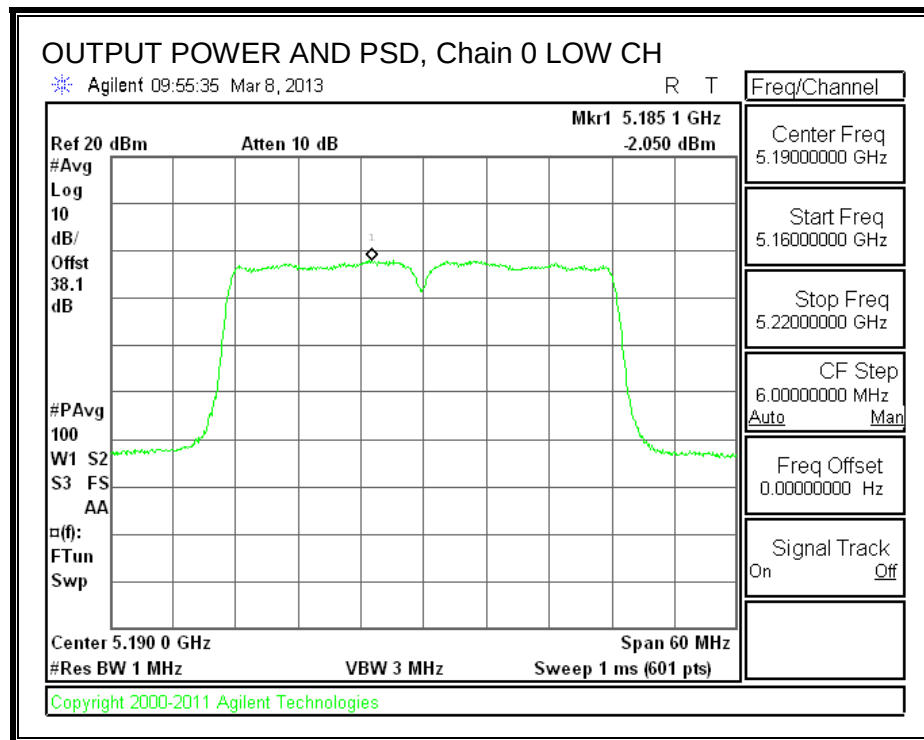
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 9.80                              | 9.50                              | 9.60                              | 14.41                             | 17.00                   | -2.59                   |
| High    | 5230               | 9.70                              | 9.50                              | 9.60                              | 14.37                             | 17.00                   | -2.63                   |

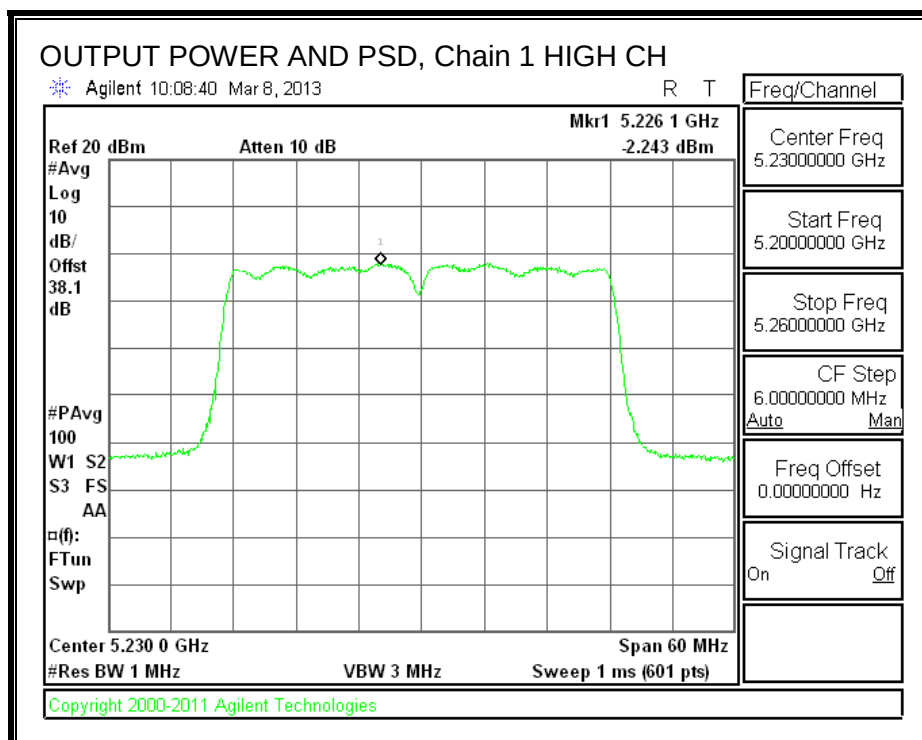
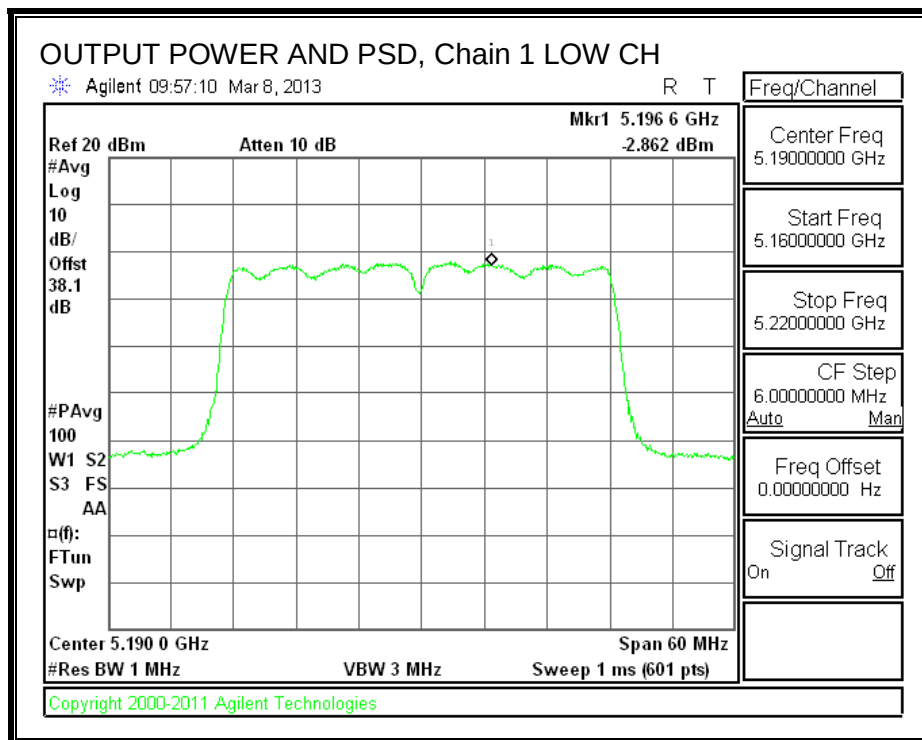
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<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               | -2.050                          | -2.860                          | -2.097                          | 2.45                            | 2.93                  | -0.48                 |
| High    | 5230               | -2.169                          | -2.243                          | -2.284                          | 2.54                            | 2.93                  | -0.39                 |

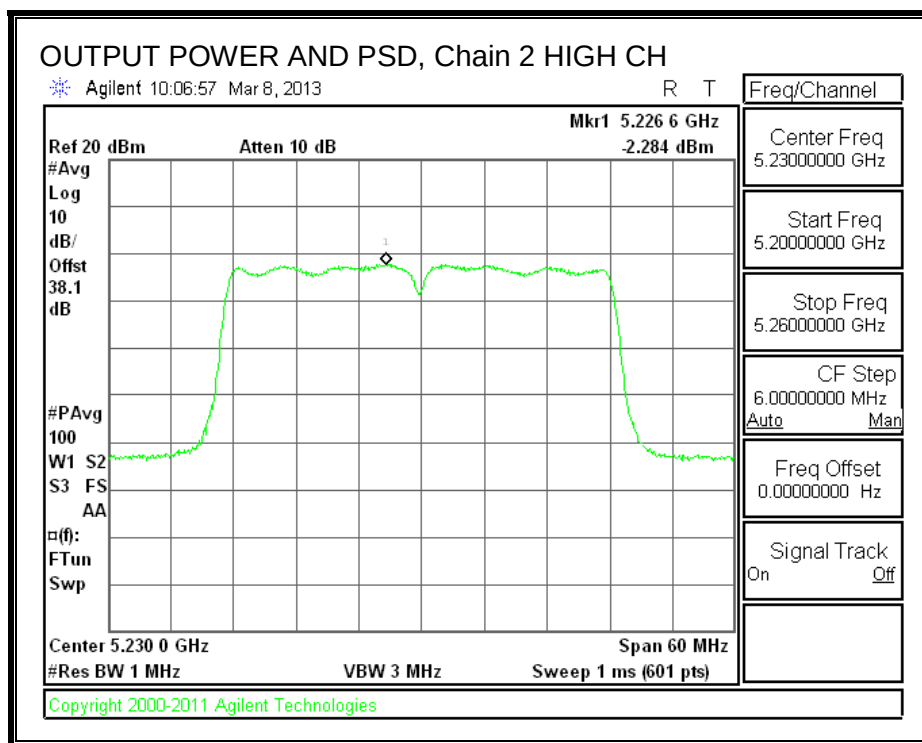
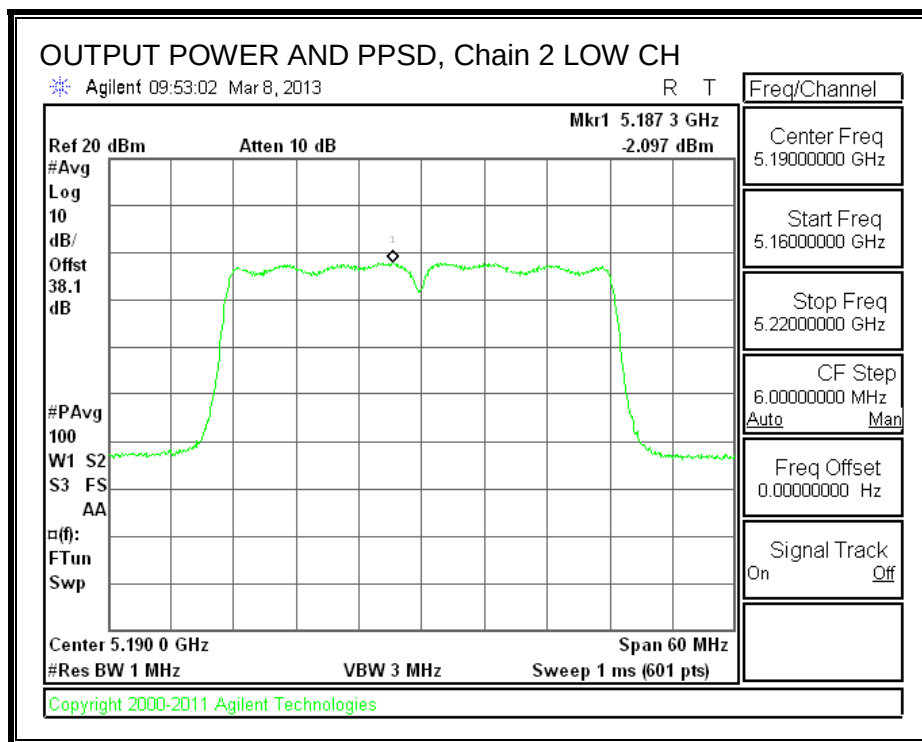
**OUTPUT POWER AND PSD, Chain 0**



# OUTPUT POWER AND PSD, Chain 1



# OUTPUT POWER AND PSD, Chain 2



## 8.12.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 6.68           | -2.050    | 0.00      | 8.73                | 13         | -4.27       |

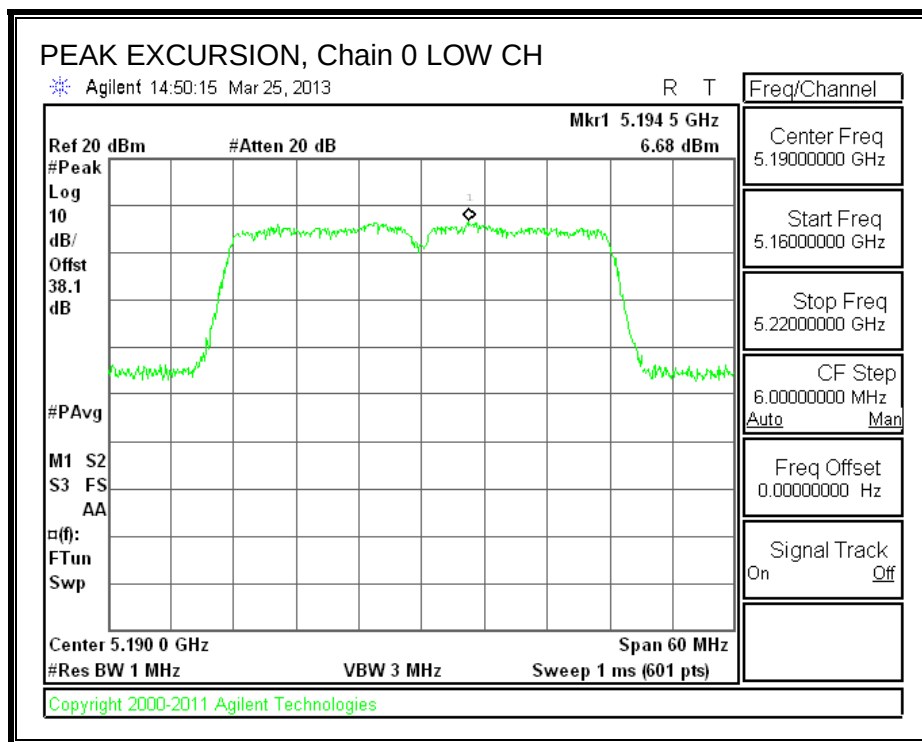
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 6.89           | -2.860    | 0.00      | 9.75                | 13         | -3.25       |

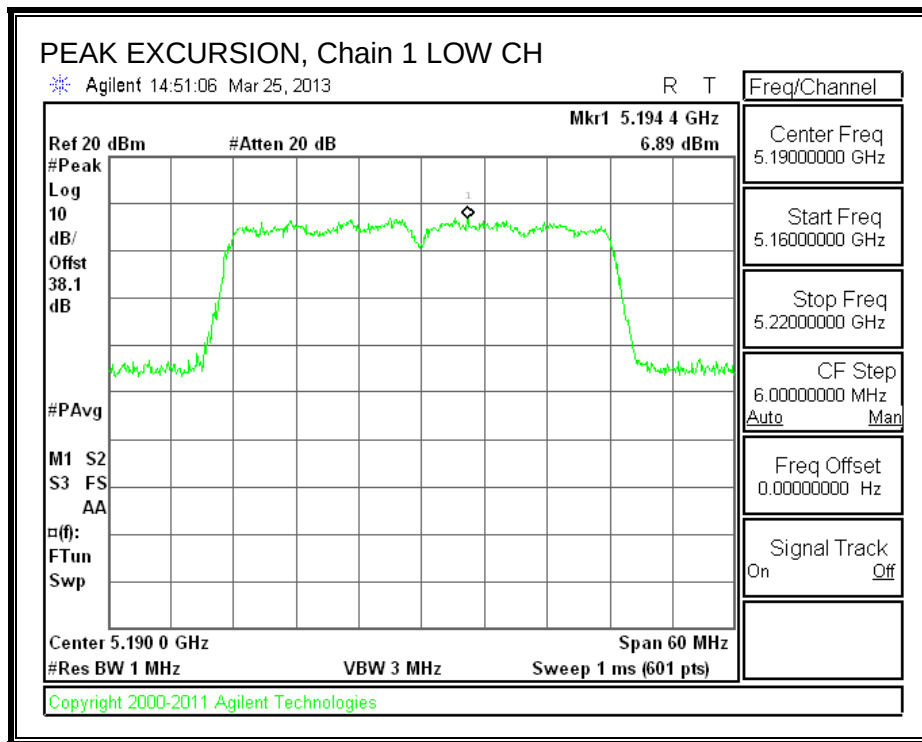
Chain 2

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 7.87           | -2.097    | 0.00      | 9.97                | 13         | -3.03       |

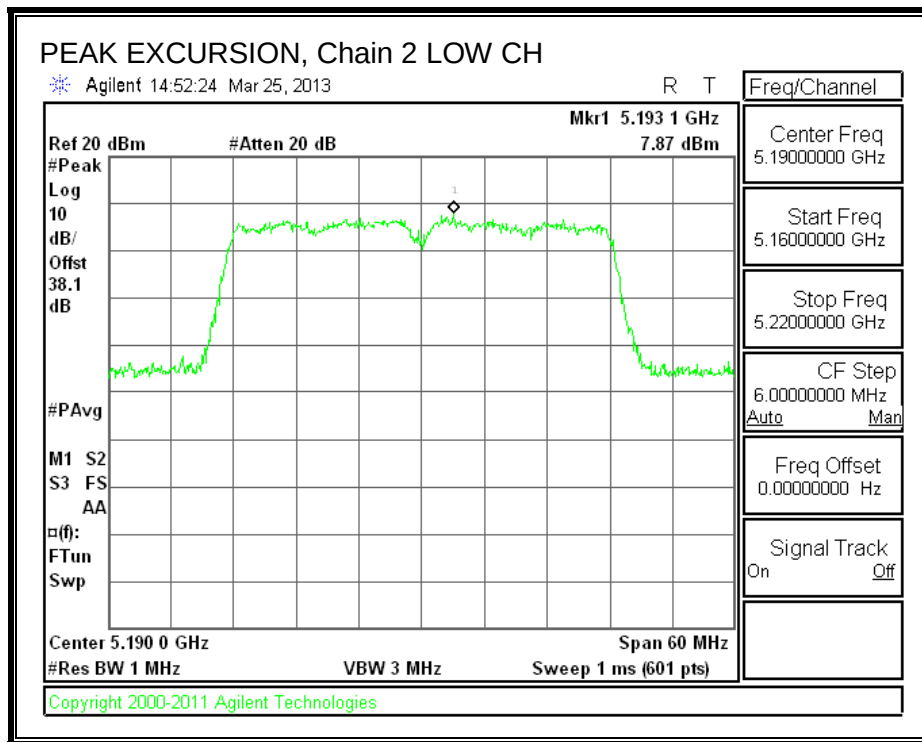
**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**





### 8.13. 802.11n HT40 BF 3TX MODE IN THE 5.2 GHz BAND

Covered by testing HT40 CDD 3TX mode, the power per chain used for HT40 CDD 3TX mode is the same power per chain that will be used for HT40 BF 3TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

#### 8.13.1. OUTPUT AVERAGE POWER

##### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

##### DIRECTIONAL ANTENNA GAIN

The TX chains are correlated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Low     | 5190               | 39.50                       | 36.2109                   | 7.07                                       |
| High    | 5230               | 39.50                       | 36.2273                   | 7.07                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Low     | 5190               | 15.93                          | 23.00                        | 15.93                       | 15.93                   |
| High    | 5230               | 15.93                          | 23.00                        | 15.93                       | 15.93                   |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.00 |
|--------------------|------|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 9.80                              | 9.50                              | 9.60                              | 14.41                             | 15.93                   | -1.52                   |
| High    | 5230               | 9.70                              | 9.50                              | 9.60                              | 14.37                             | 15.93                   | -1.56                   |

## **8.14. 802.11n HT40 STBC 3TX MODE IN THE 5.2 GHz BAND**

### **8.14.1. 26 dB BANDWIDTH**

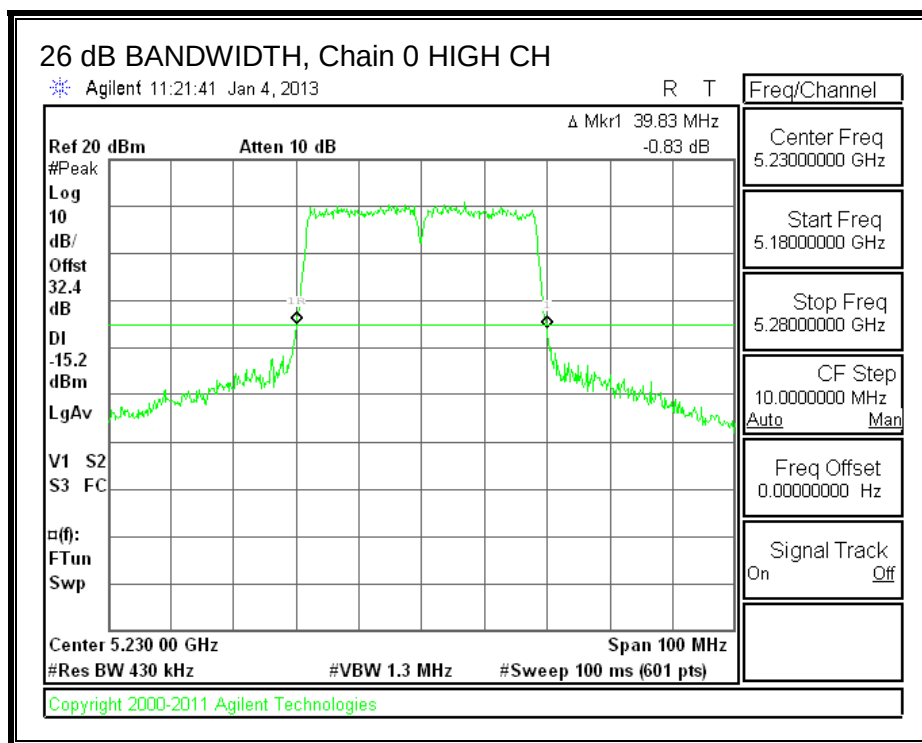
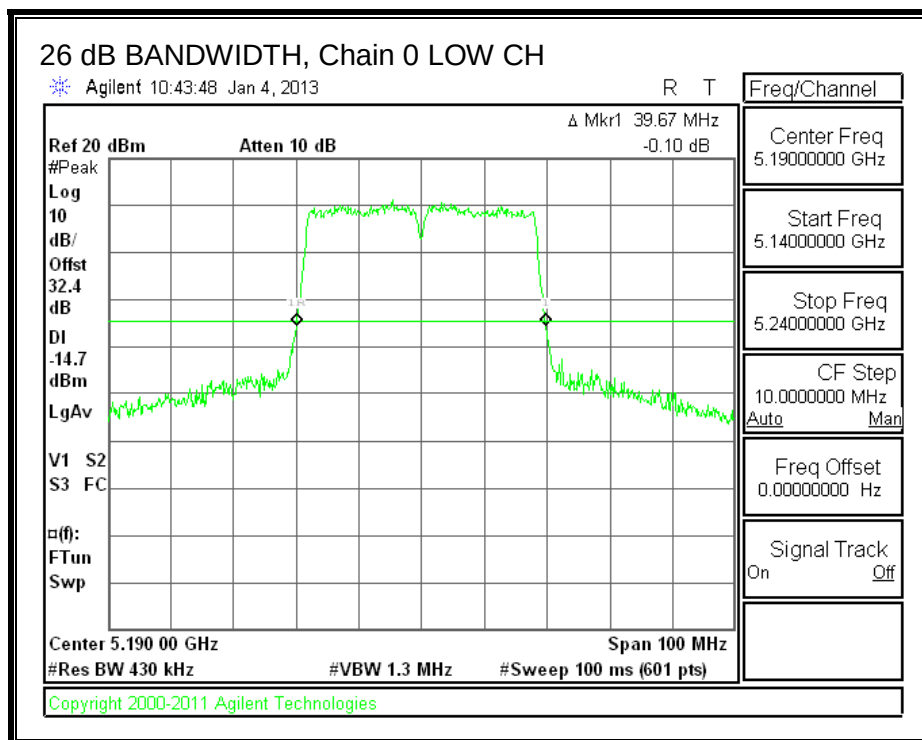
#### **LIMITS**

None; for reporting purposes only.

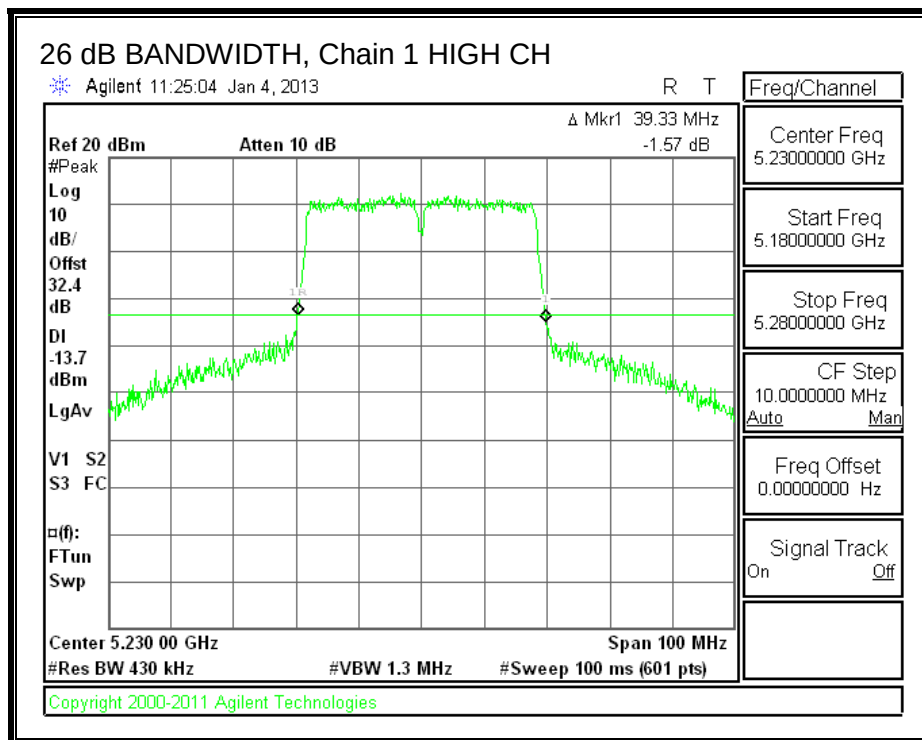
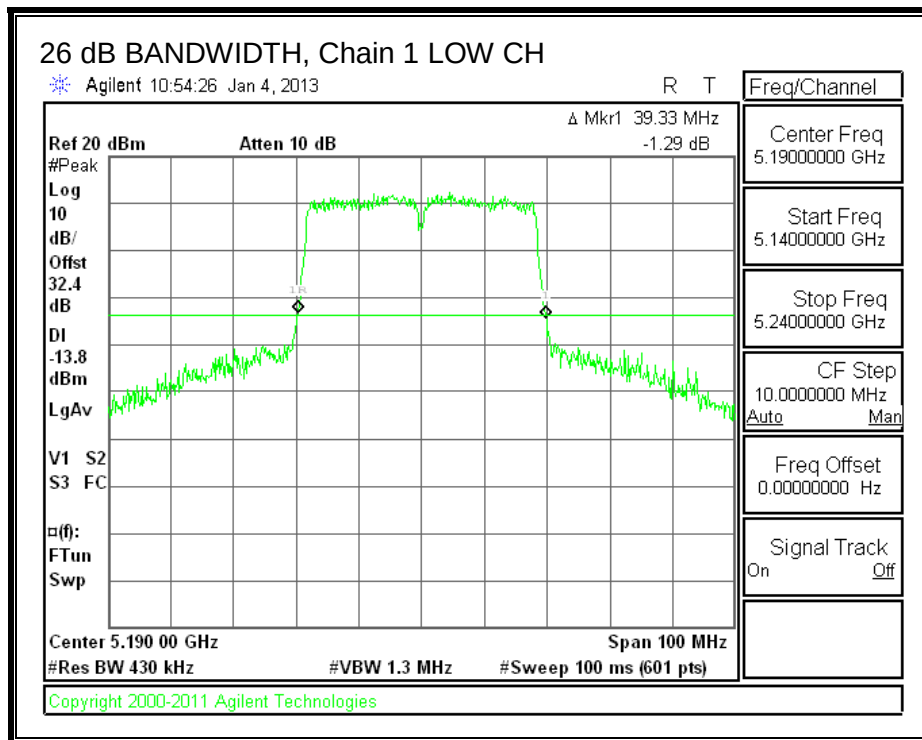
#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Low     | 5190               | 39.67                        | 39.33                        | 39.67                        |
| High    | 5230               | 39.83                        | 39.33                        | 39.50                        |

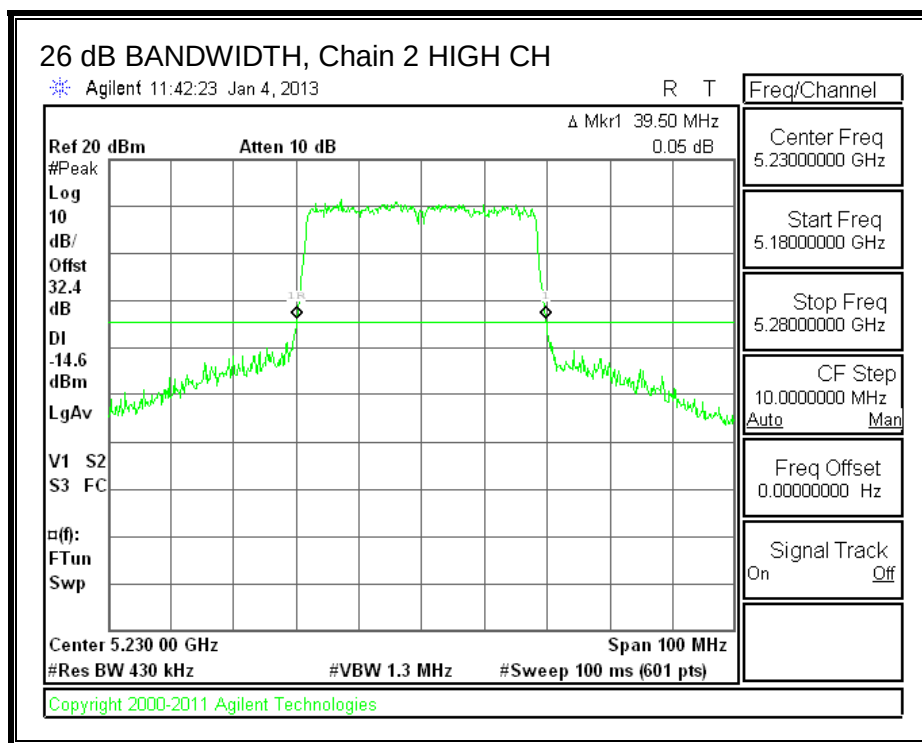
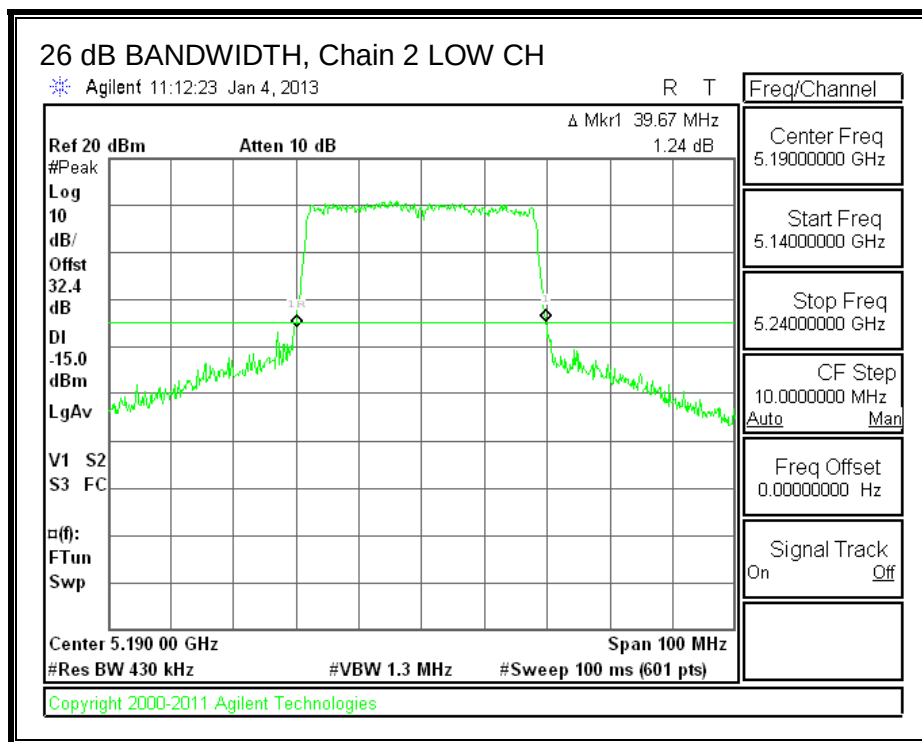
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.14.2. 99% BANDWIDTH

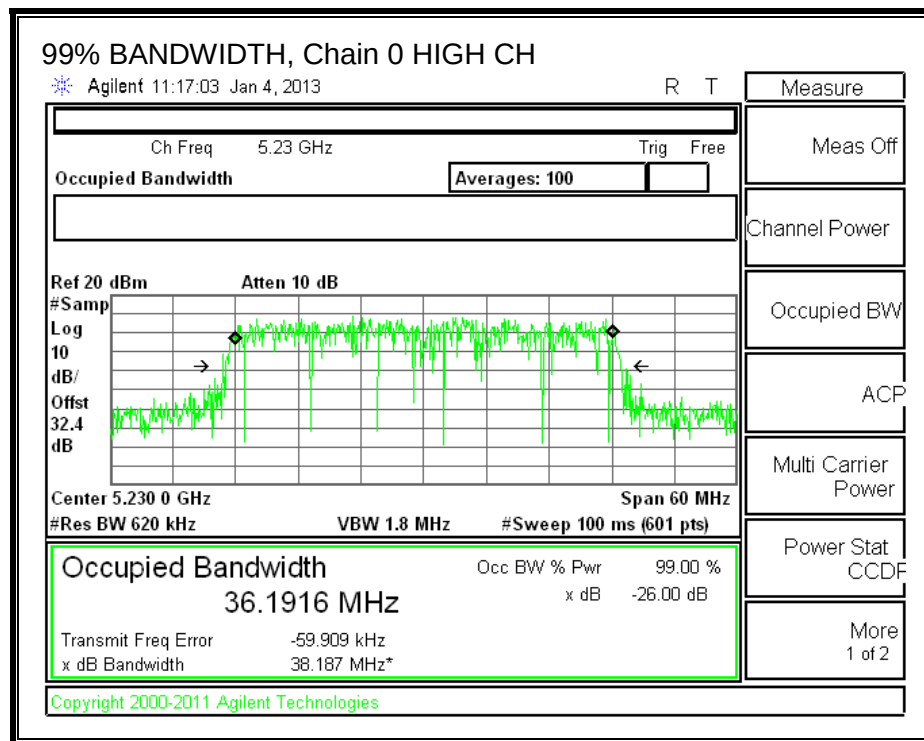
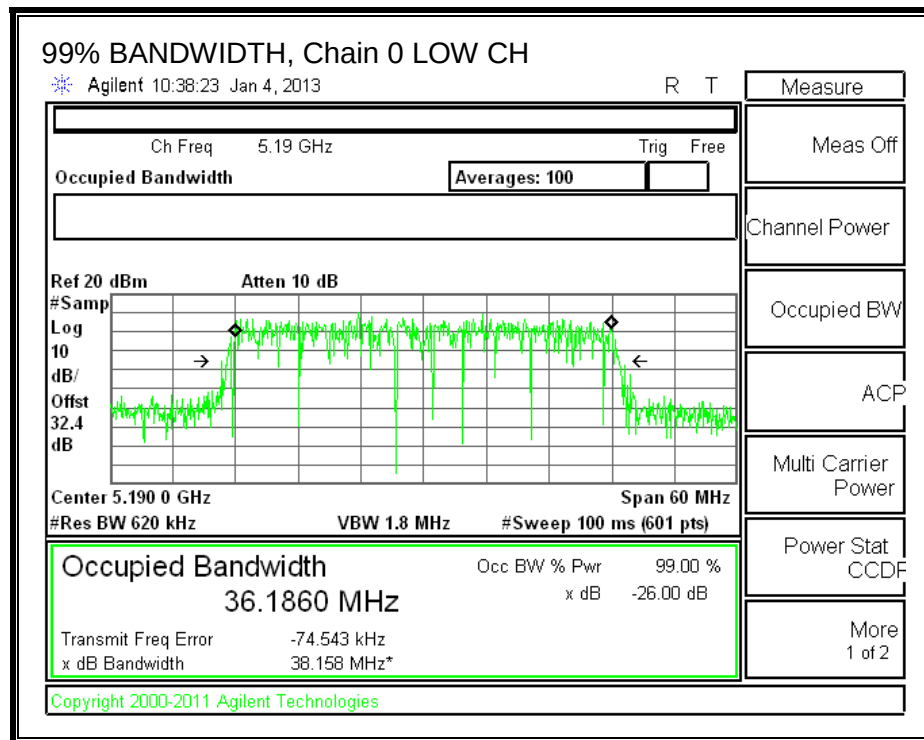
### LIMITS

None; for reporting purposes only.

### RESULTS

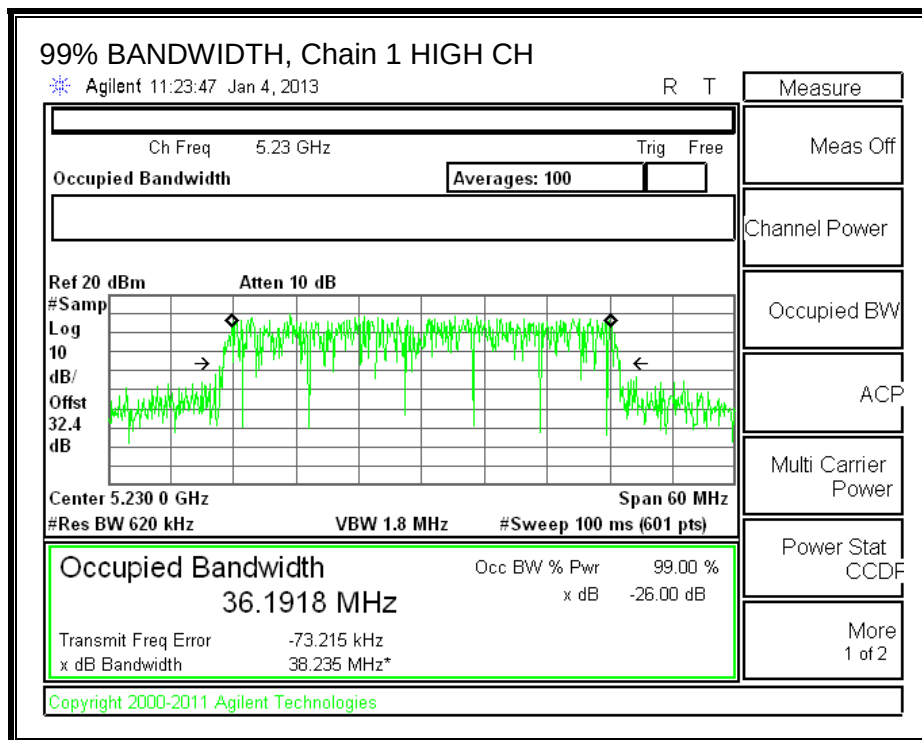
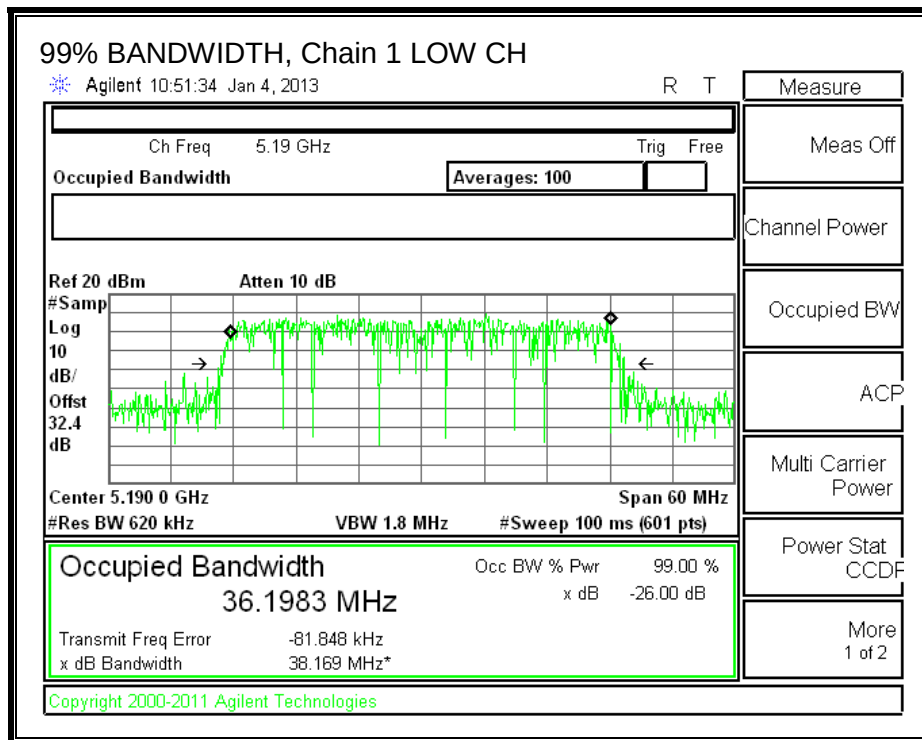
| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Low     | 5190               | 36.1860                    | 36.1983                    | 36.2039                    |
| High    | 5230               | 36.1916                    | 36.1918                    | 36.1916                    |

**99% BANDWIDTH, Chain 0**

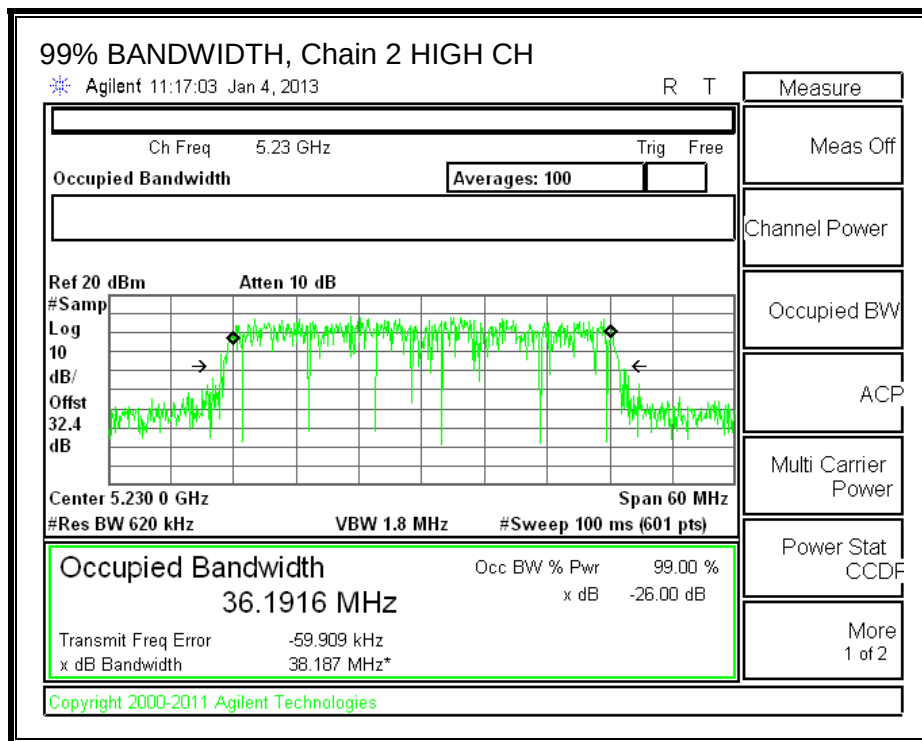
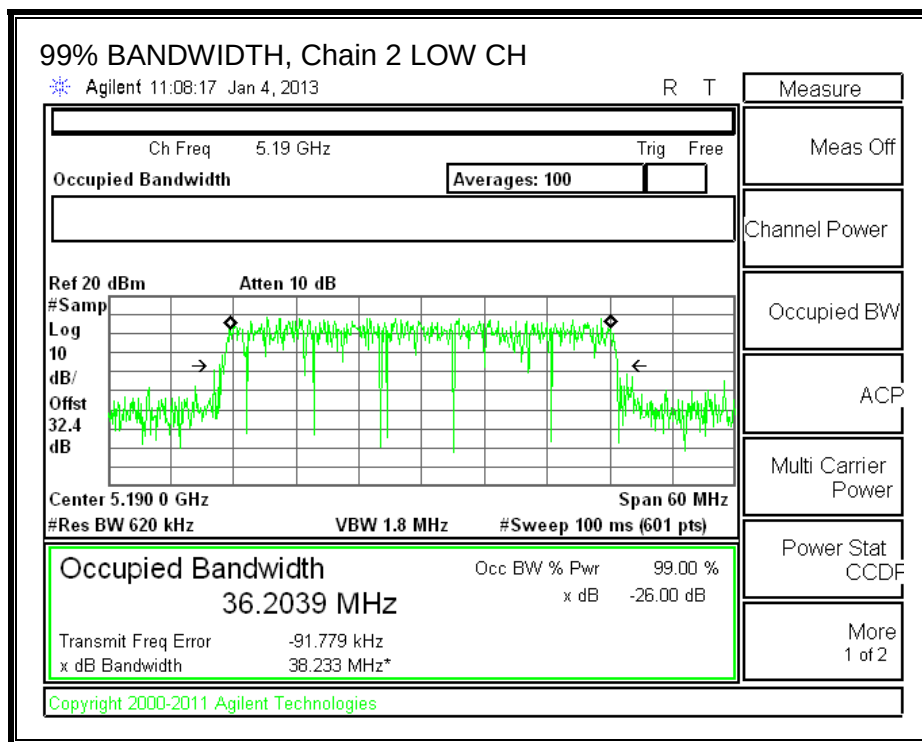




**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.14.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5190               | 39.33                       | 36.1860                   | 2.33                         |
| High    | 5230               | 39.33                       | 36.1916                   | 2.33                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5190               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |
| High    | 5230               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 |  |
|--------------------|------|--|

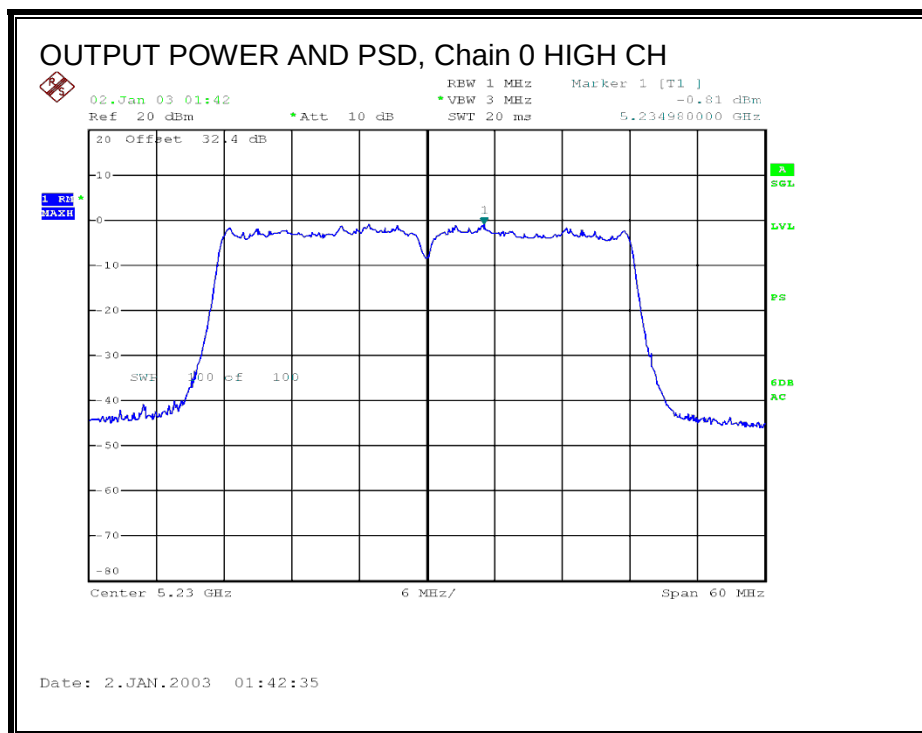
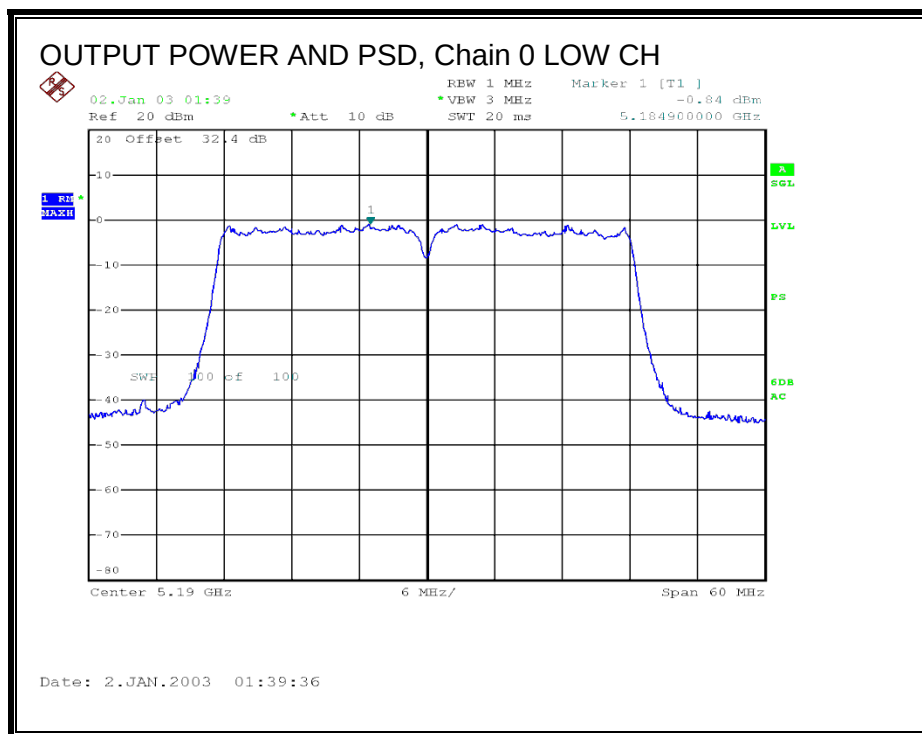
### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 11.73                             | 11.55                             | 11.50                             | 16.37                             | 17.00                   | -0.63                   |
| High    | 5230               | 11.60                             | 11.50                             | 11.45                             | 16.29                             | 17.00                   | -0.71                   |

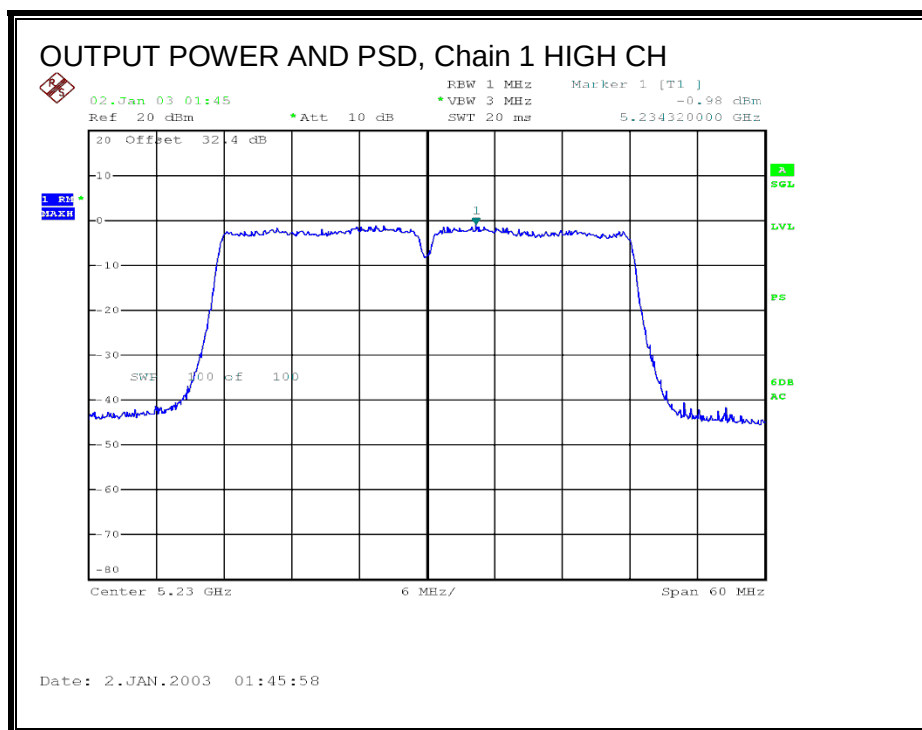
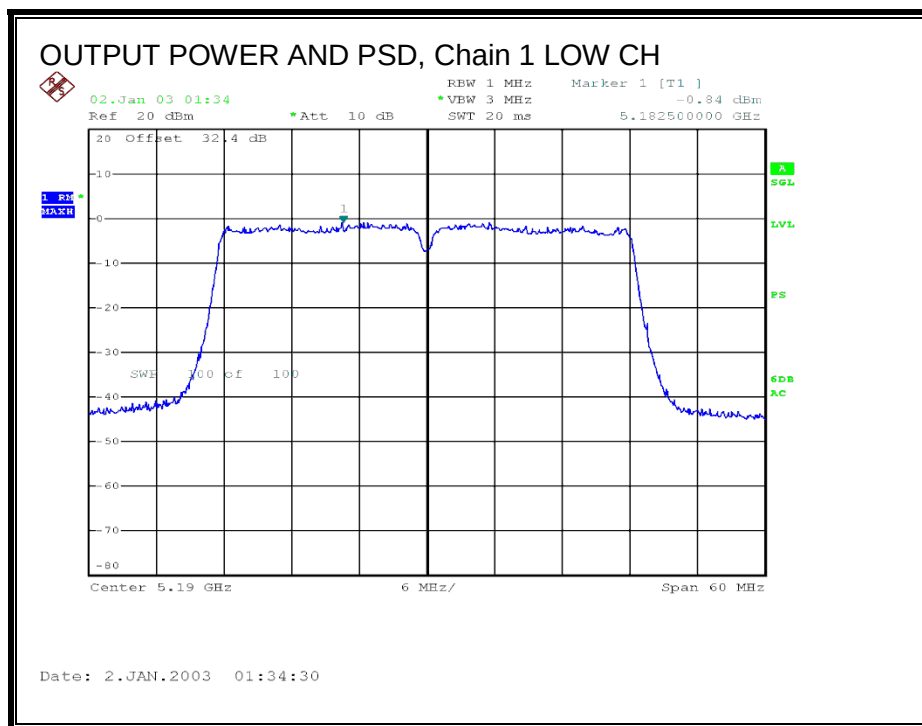
### PSD Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<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               | -0.84                           | -0.84                           | -0.99                           | 3.88                            | 4.00                  | -0.12                 |
| High    | 5230               | -0.81                           | -0.98                           | -1.07                           | 3.82                            | 4.00                  | -0.18                 |

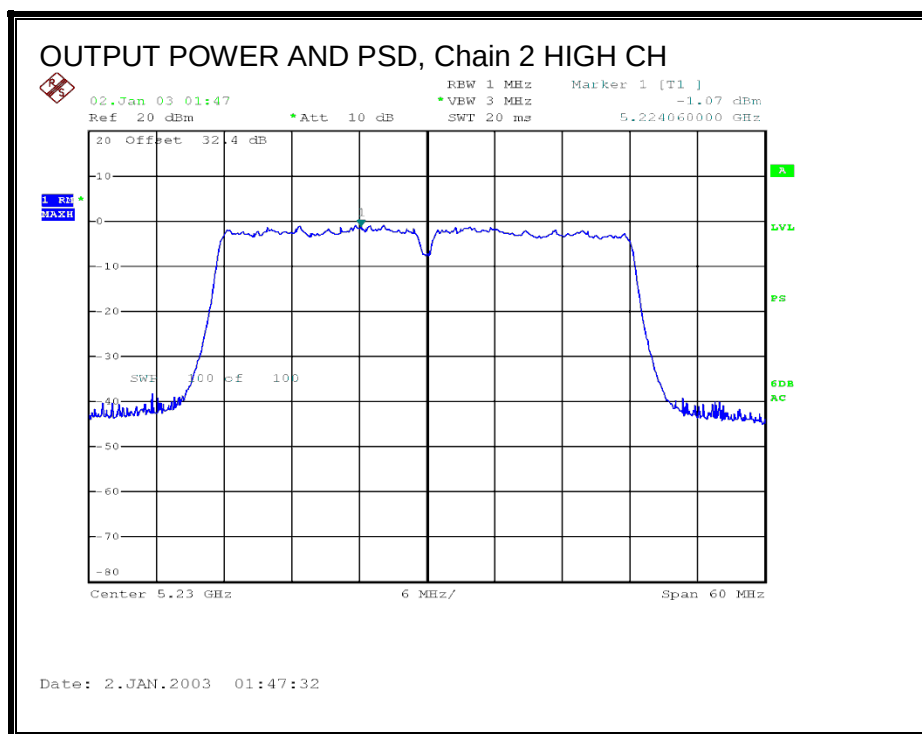
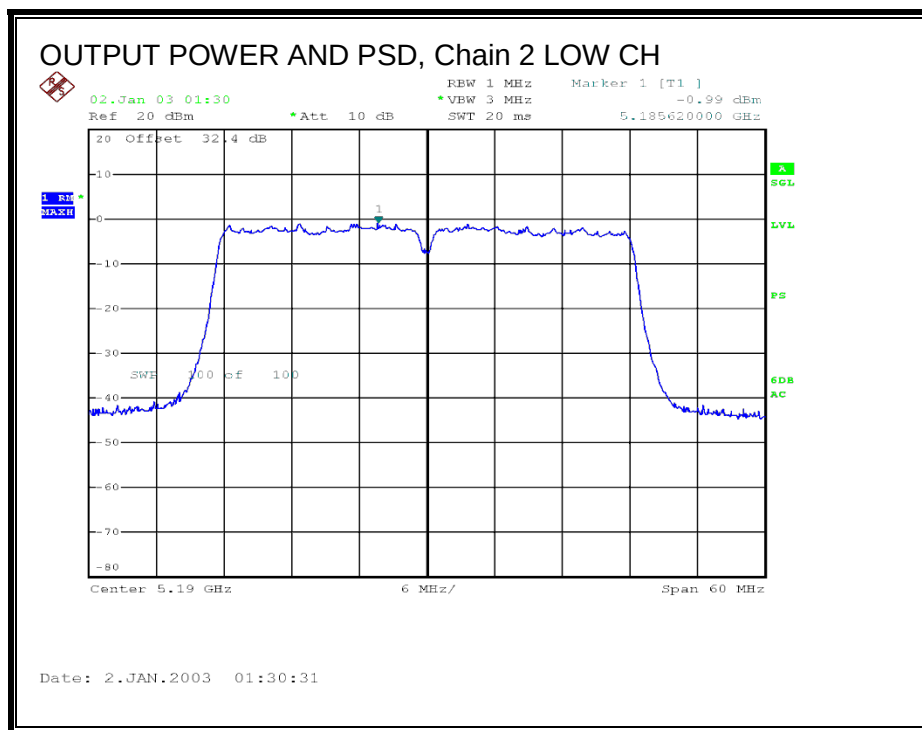
**OUTPUT POWER AND PSD, Chain 0**



**OUTPUT POWER AND PSD, Chain 1**



**OUTPUT POWER AND PSD, Chain 2**



#### 8.14.4. PEAK EXCURSION

##### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

##### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 7.30           | -0.84     | 0.00      | 8.14                | 13         | -4.86       |

Chain 1

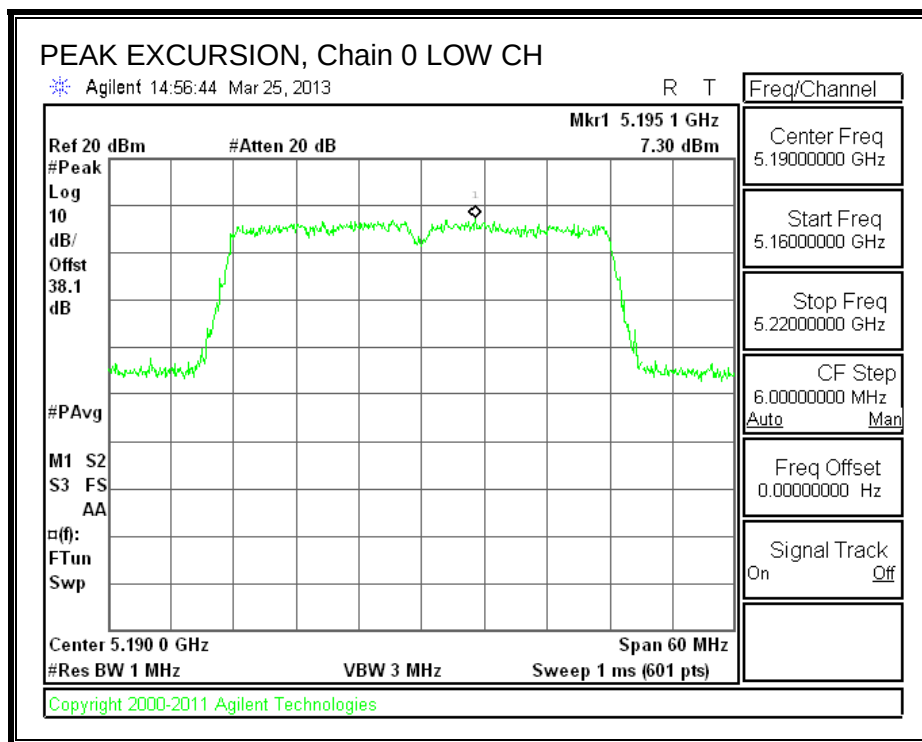
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 7.04           | -0.84     | 0.00      | 7.88                | 13         | -5.12       |

Chain 2

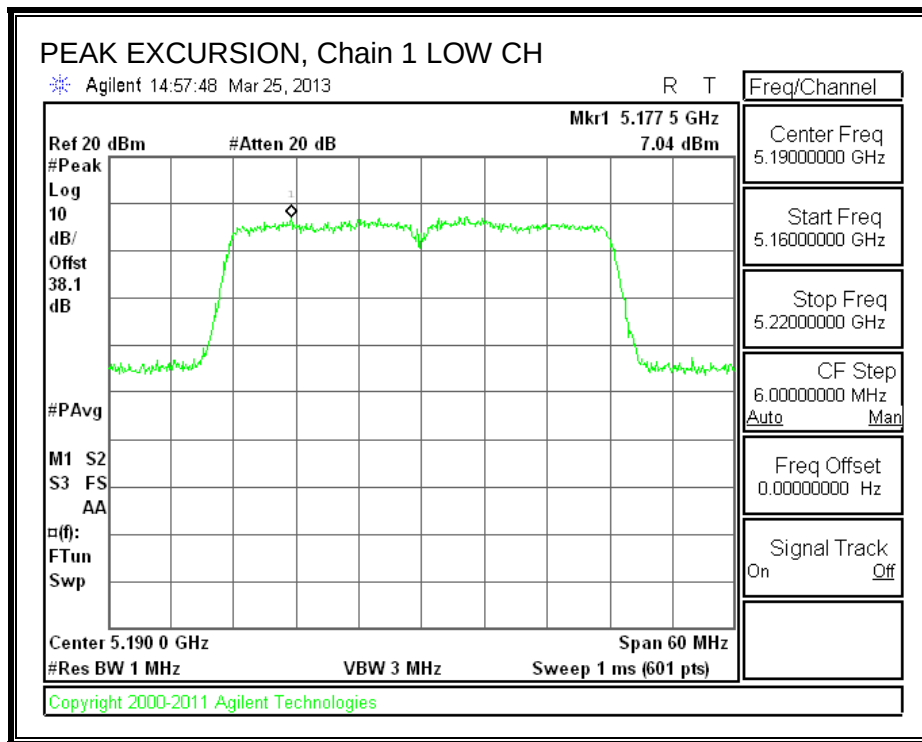
| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Low     | 5190            | 7.28           | -0.99     | 0.00      | 8.27                | 13         | -4.73       |



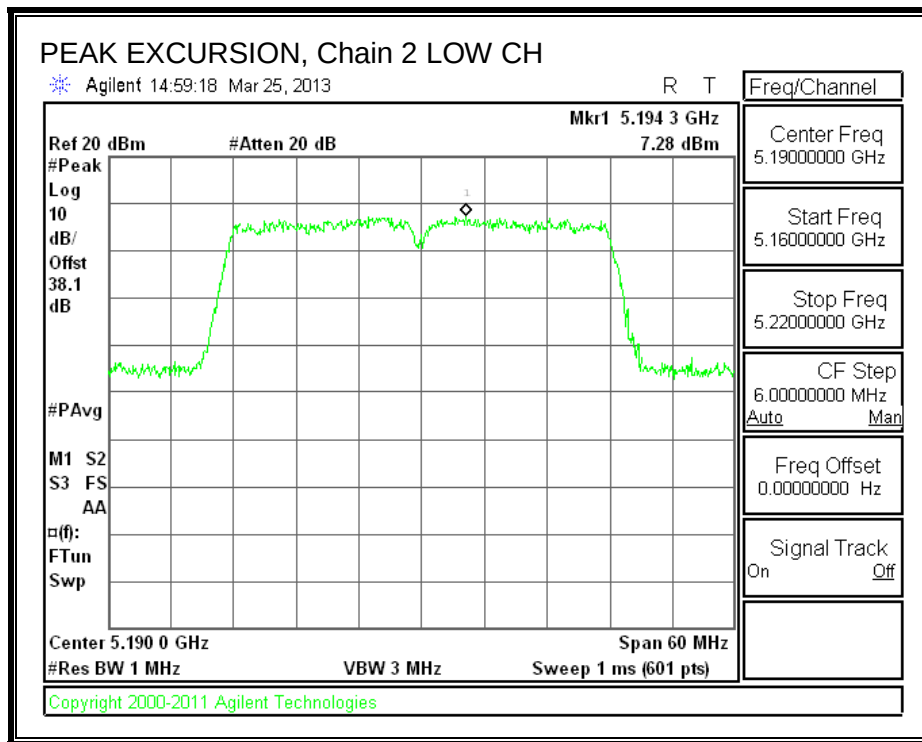
**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## 8.15. 802.11ac VHT80 1TX MODE IN THE 5.2 GHz BAND

### 8.15.1. 26 dB BANDWIDTH

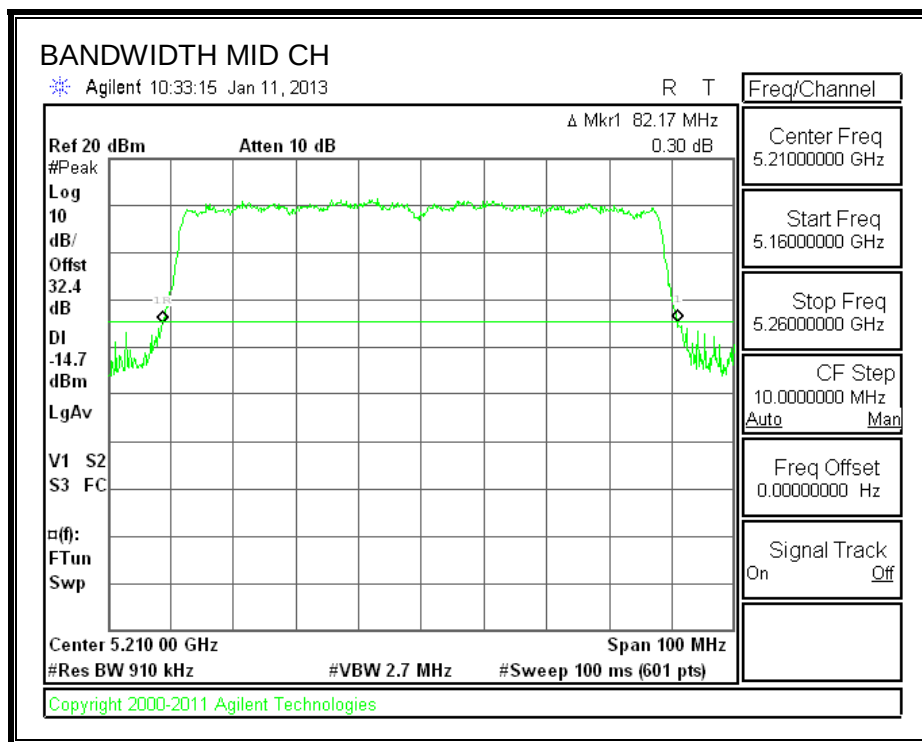
#### LIMITS

None; for reporting purposes only.

#### RESULTS

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Mid     | 5210            | 82.17                 |

#### 26 dB BANDWIDTH



## 8.15.2. 99% BANDWIDTH

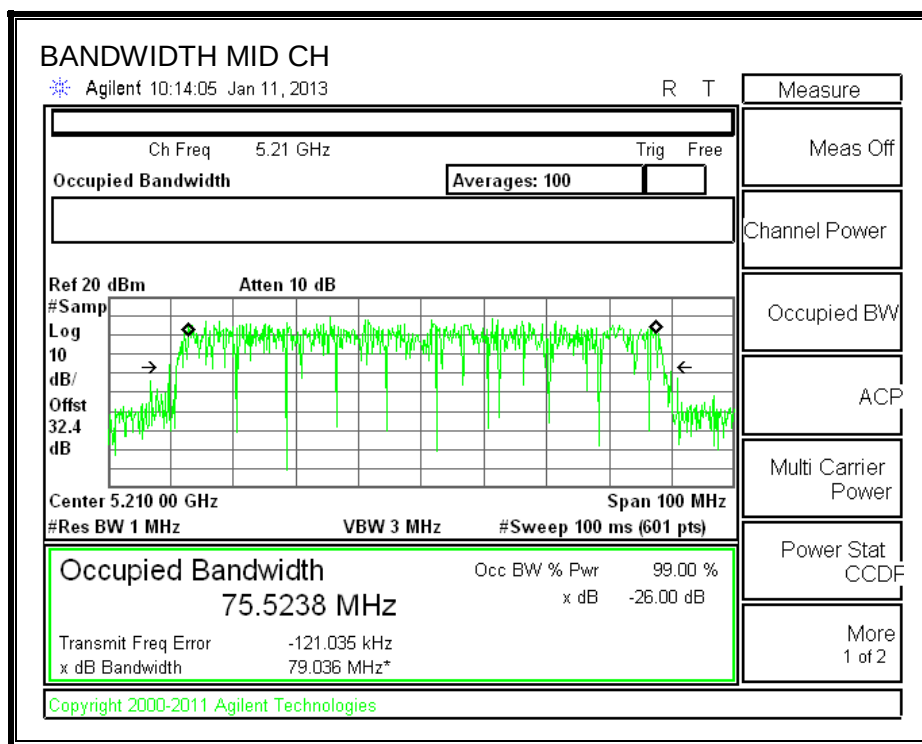
### LIMITS

None; for reporting purposes only.

### RESULTS

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Mid     | 5210            | 75.5238             |

### 99% BANDWIDTH



### **8.15.3. OUTPUT POWER AND PSD**

#### **LIMITS**

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### **DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Mid     | 5210               | 82.17                       | 75.5238                   | 3.20                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 19.80                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.10 |  |
|--------------------|------|--|

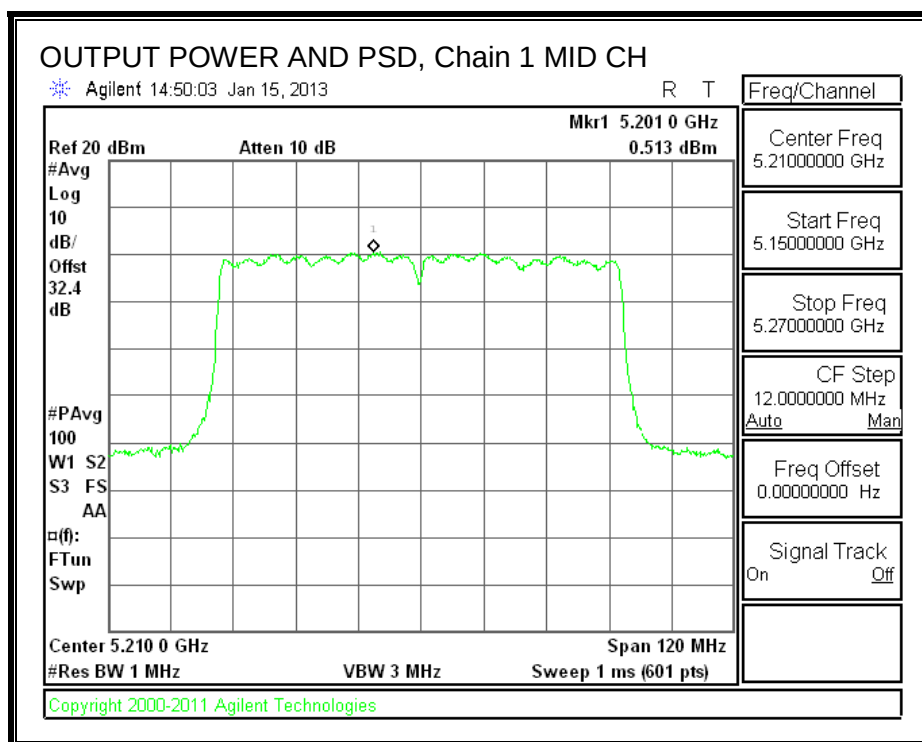
### Output Power Results

| 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     | 5210               | 13.00                             | 13.00                             | 17.00                   | -4.00                   |

### 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) |
|---------|--------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | 0.513                           | 0.613                           | 4.00                  | -3.39                 |

**OUTPUT POWER AND PSD, Chain 1**





## 8.15.4. PEAK EXCURSION

### LIMITS

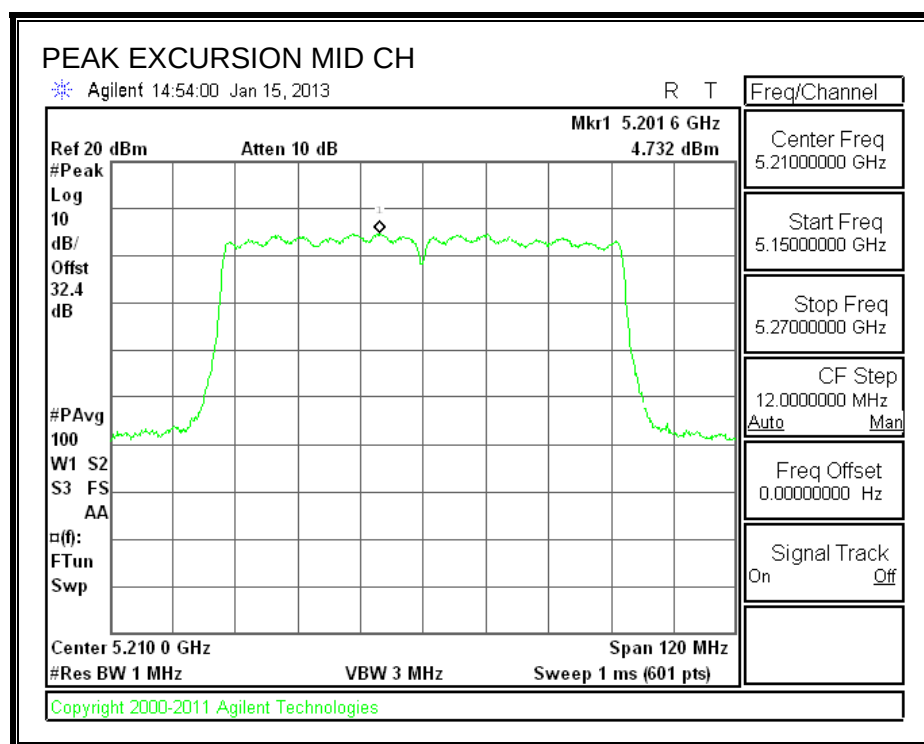
FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | 4.732          | 0.513     | 0.10      | 4.12                | 13         | -8.88       |

### PEAK EXCURSION



## **8.16. 802.11ac VHT80 CDD 2TX MODE IN THE 5.2 GHz BAND**

### **8.16.1. 26 dB BANDWIDTH**

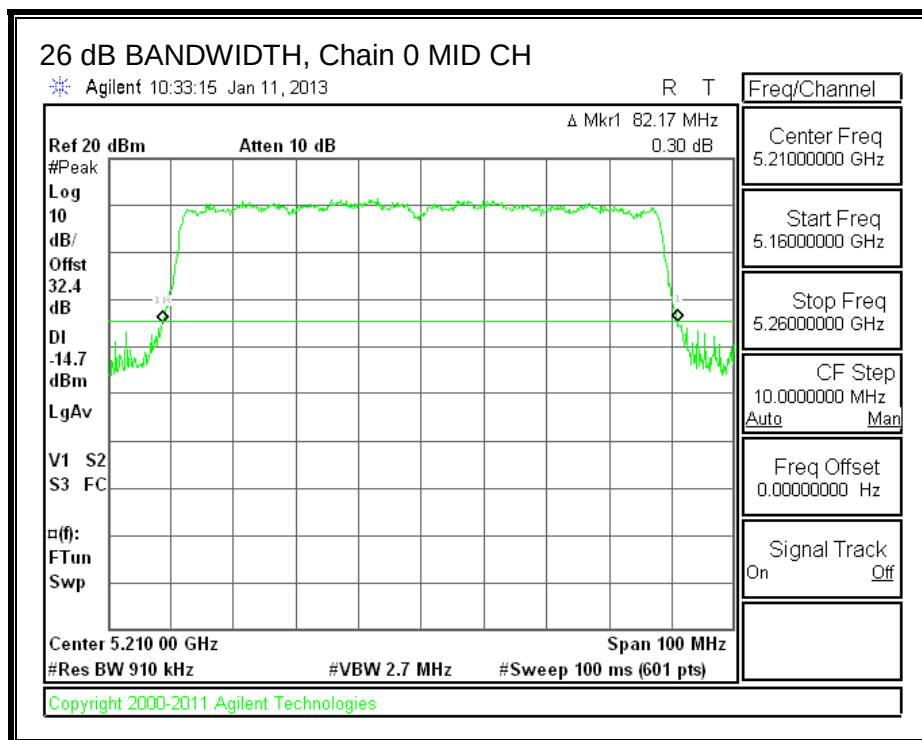
#### **LIMITS**

None; for reporting purposes only.

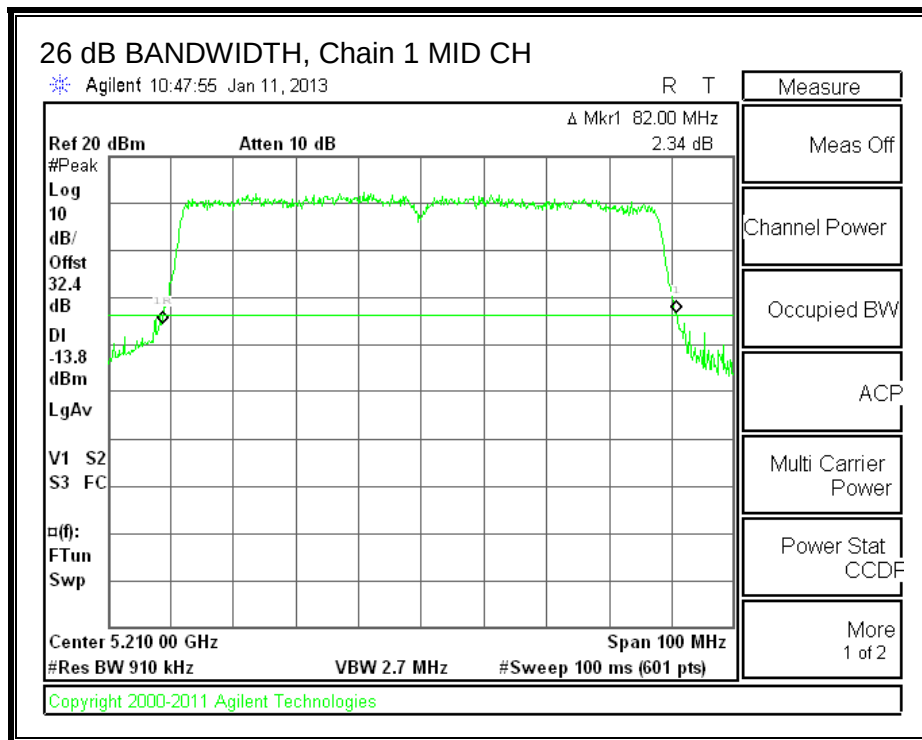
#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Mid     | 5210               | 82.17                        | 82.00                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



## 8.16.2. 99% BANDWIDTH

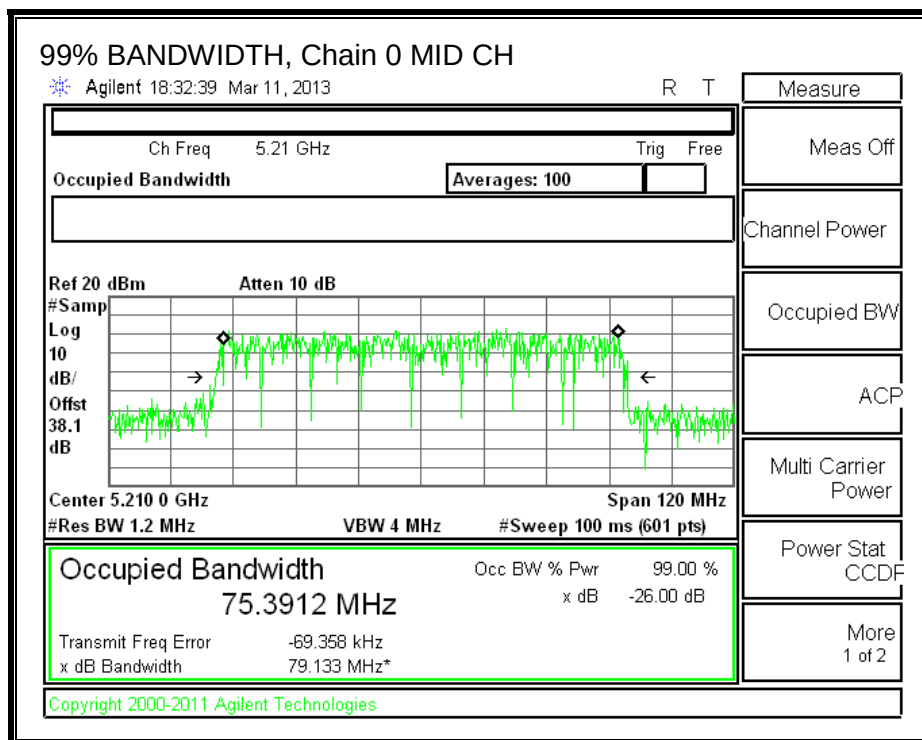
### LIMITS

None; for reporting purposes only.

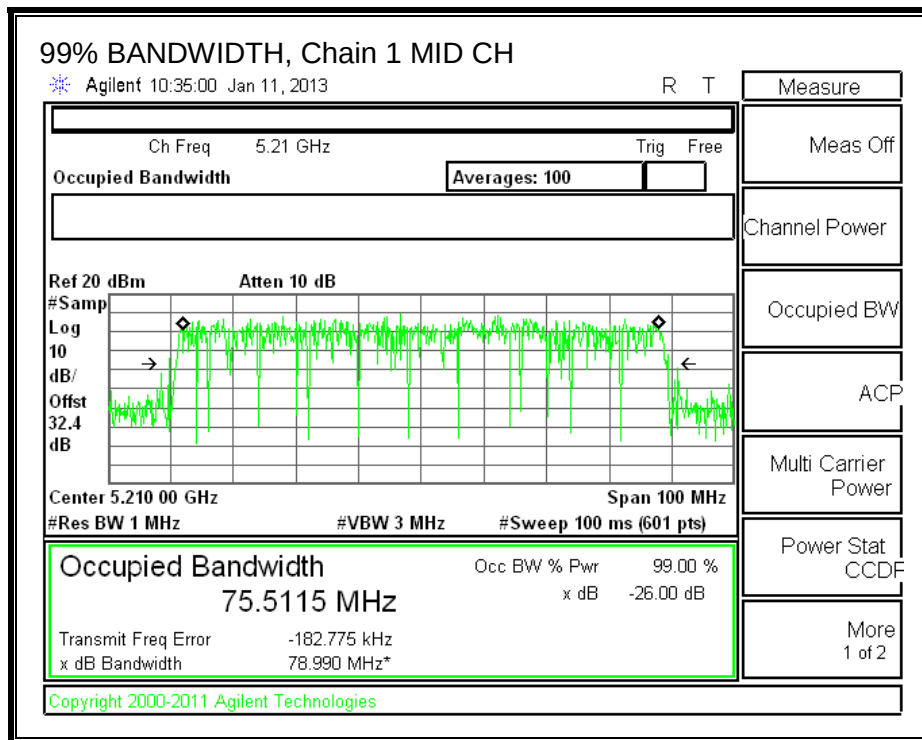
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.3912                    | 75.5115                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 8.16.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

For PSD, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |



## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Unrelated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|-------------------------------------------|
| Mid     | 5210               | 82.00                       | 75.3912                   | 5.72                                       | 2.73                                      |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

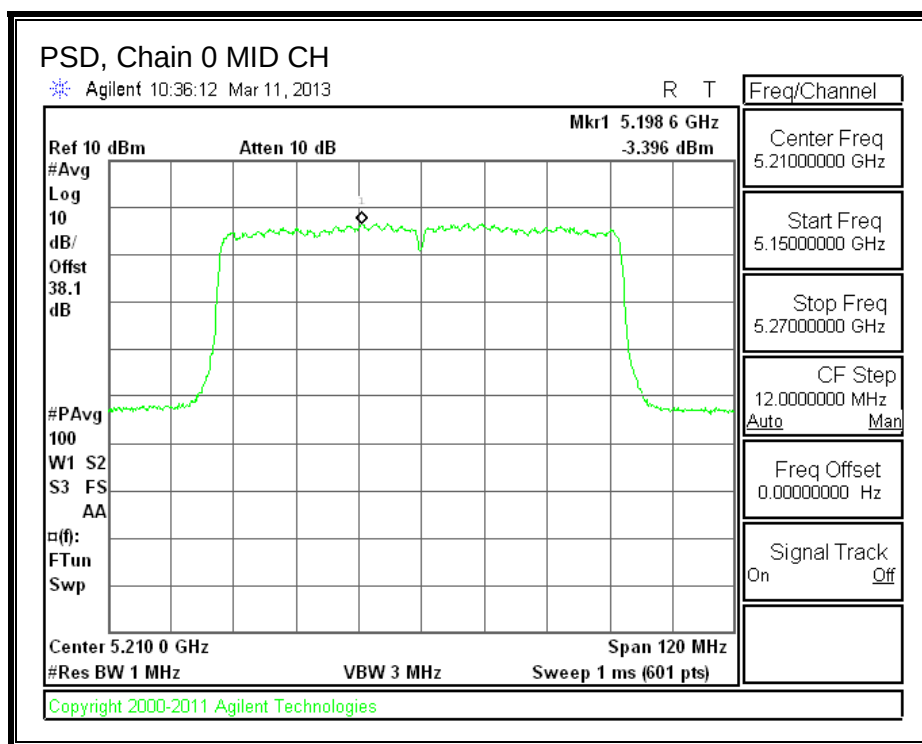
### Output Power Results

| 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               | 12.50                             | 12.60                             | 15.56                             | 17.00                   | -1.44                   |

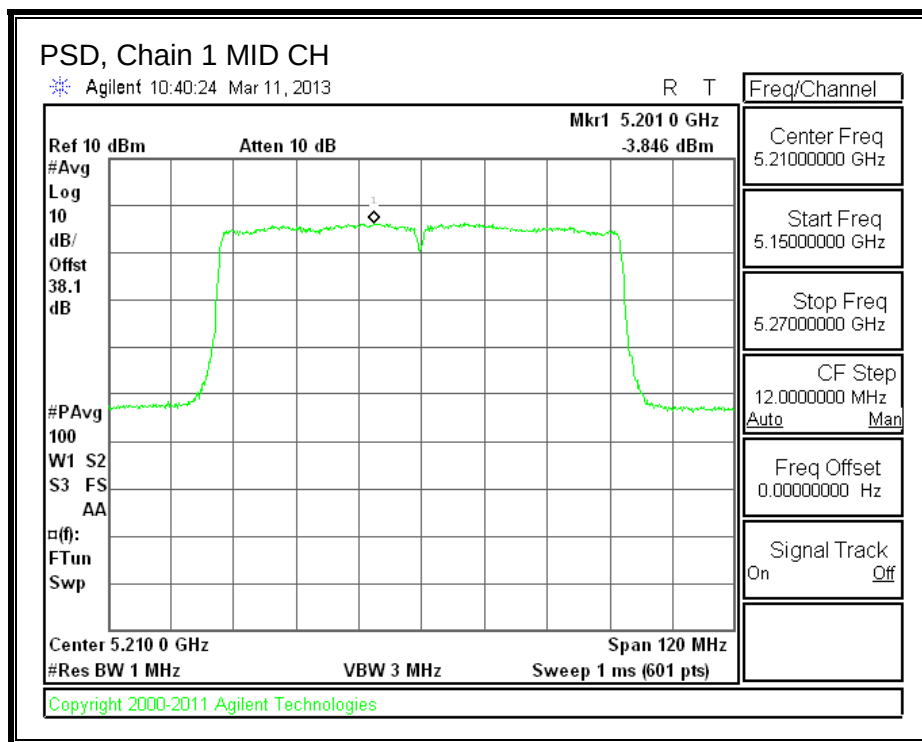
### PSD Results

| 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               | -3.396                          | -3.846                          | -0.51                           | 4.00                  | -4.51                 |

**PSD, Chain 0**



**PSD, Chain 1**



## 8.17. 802.11ac VHT80 BF 2TX MODE IN THE 5.2 GHz BAND

Covered by testing 11ac VHT80 CDD 2TX mode, the power per chain used for 11ac VHT80 CDD 2TX mode is the same power per chain that will be used for 11ac VHT80 BF 2TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.17.1. OUTPUT AVERAGE POWER

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

For output power, the two chains are considered 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) |
|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 2.20                                | 5.72                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Mid     | 5210               | 82.00                       | 75.3912                   | 5.72                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 17.28                       | 17.00                   |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

### 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               | 12.50                             | 12.60                             | 15.56                             | 17.00                   | -1.44                   |

## **8.18. 802.11ac VHT80 STBC 2TX MODE IN THE 5.2 GHz BAND**

### **8.18.1. 26 dB BANDWIDTH**

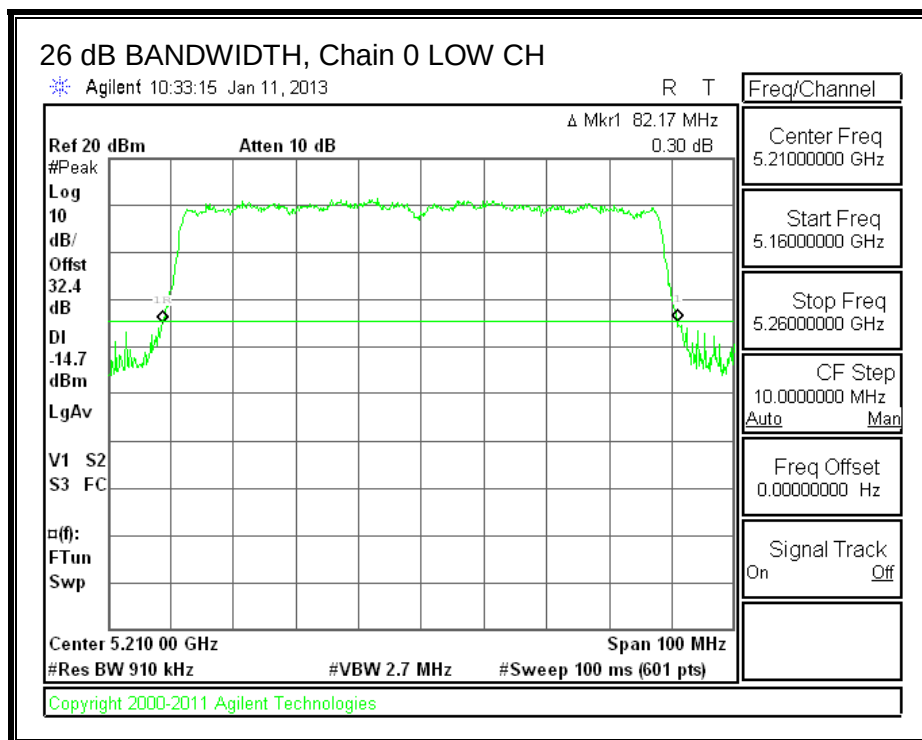
#### **LIMITS**

None; for reporting purposes only.

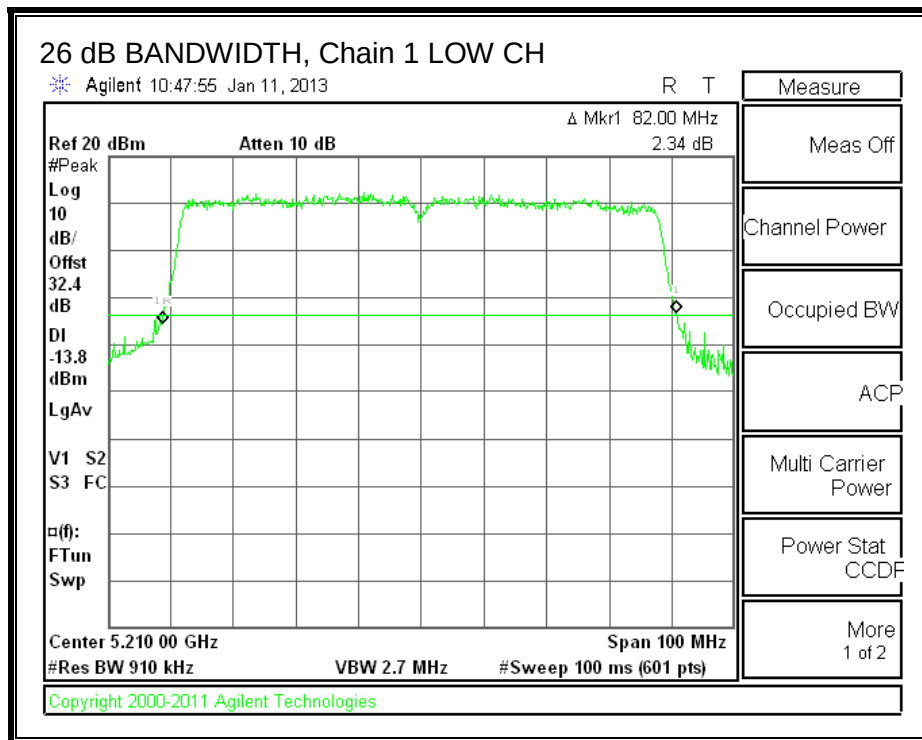
#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|
| Low     | 5210               | 82.17                        | 82.00                        |

**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**





## 8.18.2. 99% BANDWIDTH

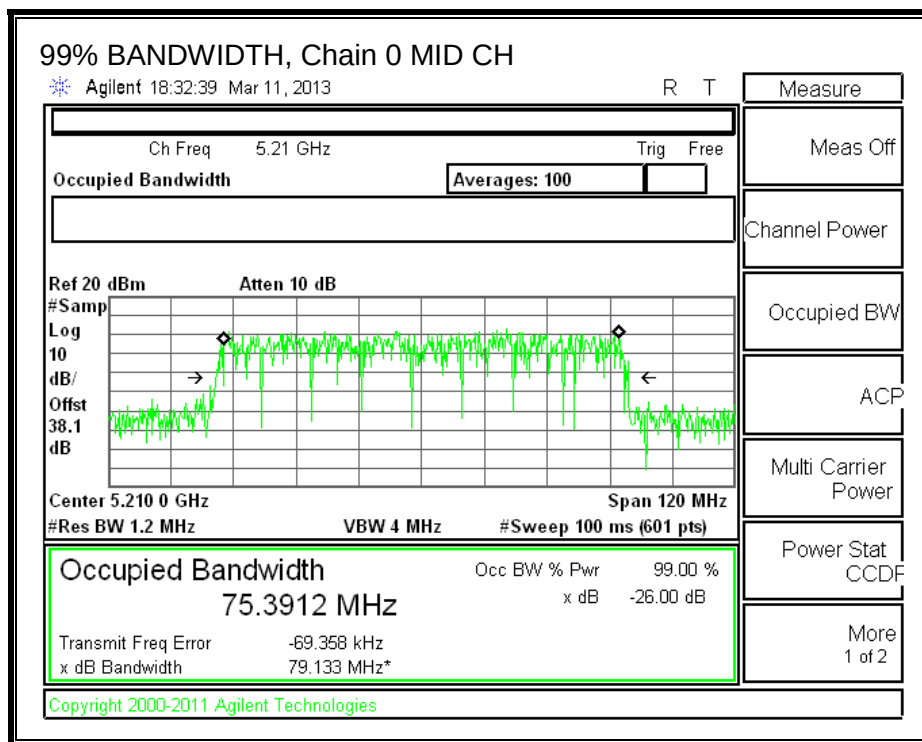
### LIMITS

None; for reporting purposes only.

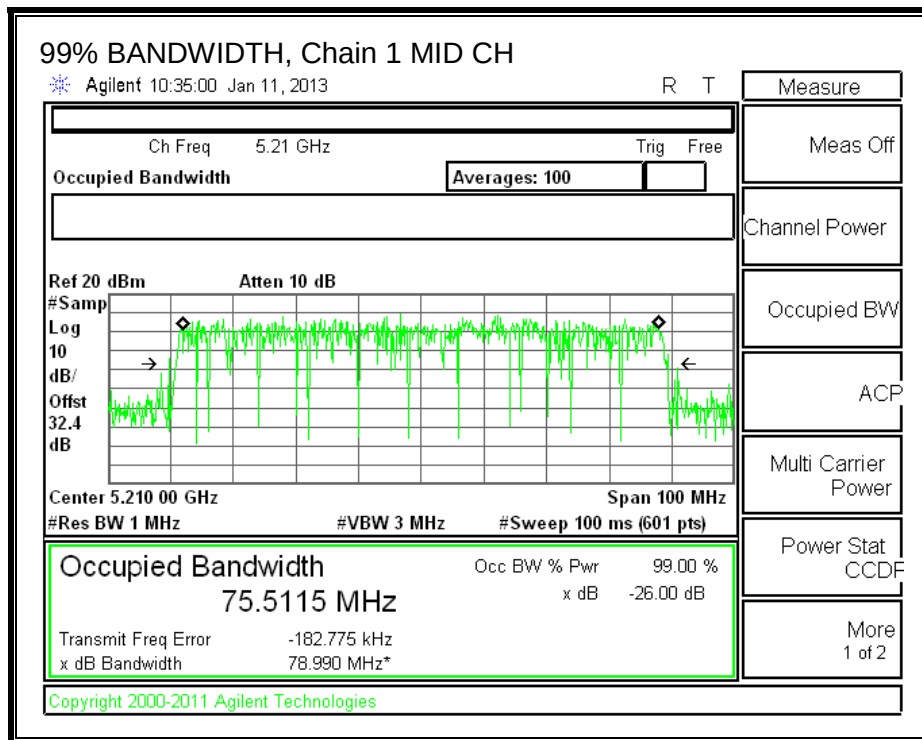
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.3912                    | 75.5115                    |

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 8.18.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) |
|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 2.20                                | 2.73                                                |

## **RESULTS**

### **Bandwidth and Antenna Gain**

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5210               | 82.00                       | 75.3912                   | 2.73                         |

### **Limits**

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PPSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|-------------------------------|-------------------------------------|-----------------------|
| Low     | 5210               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                          | 10.00                               | 4.00                  |

### **Gated Output Power Measurement**

| 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     | 5210               | 12.70                             | 12.40                             | 15.56                             | 17.00                   | -1.44                   |

#### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Low     | 5210               | 82.00                       | 75.3912                   | 2.73                         |

#### Limits

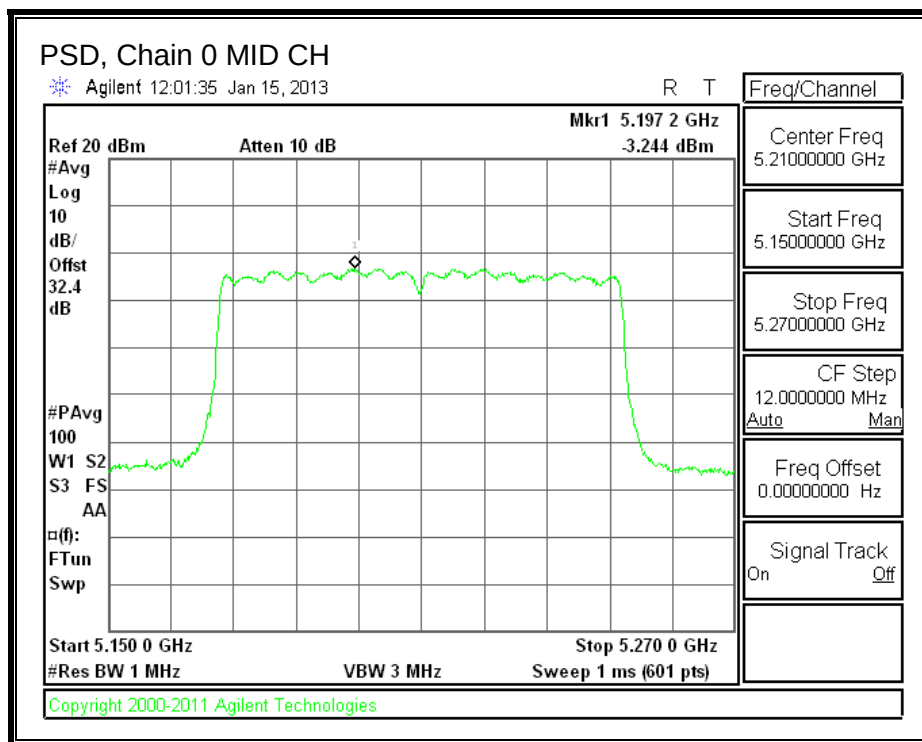
| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Low     | 5210               | 17.00                          | 23.00                        | 20.27                       | 17.00                   | 4.00                         | 10.00                               | 4.00                  |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

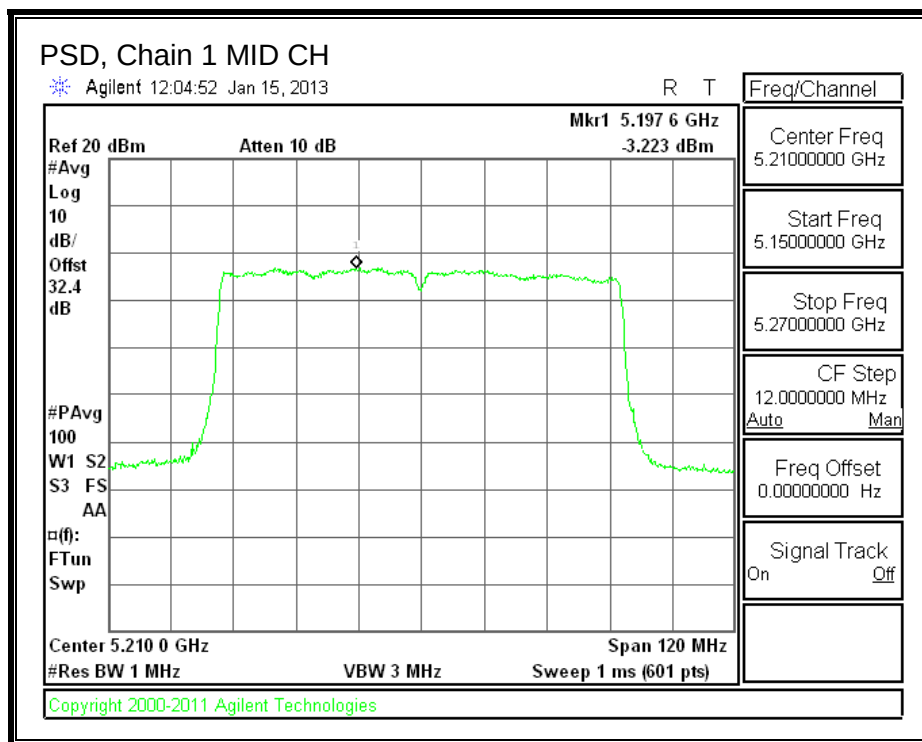
#### PSD Results

| 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     | 5210               | -3.244                          | -3.223                          | -0.133                          | 4.00                  | -4.13                 |

**PSD, Chain 0**



**PSD, Chain 1**





## **8.19. 802.11ac VHT80 CDD 3TX MODE IN THE 5.2 GHz BAND**

### **8.19.1. 26 dB BANDWIDTH**

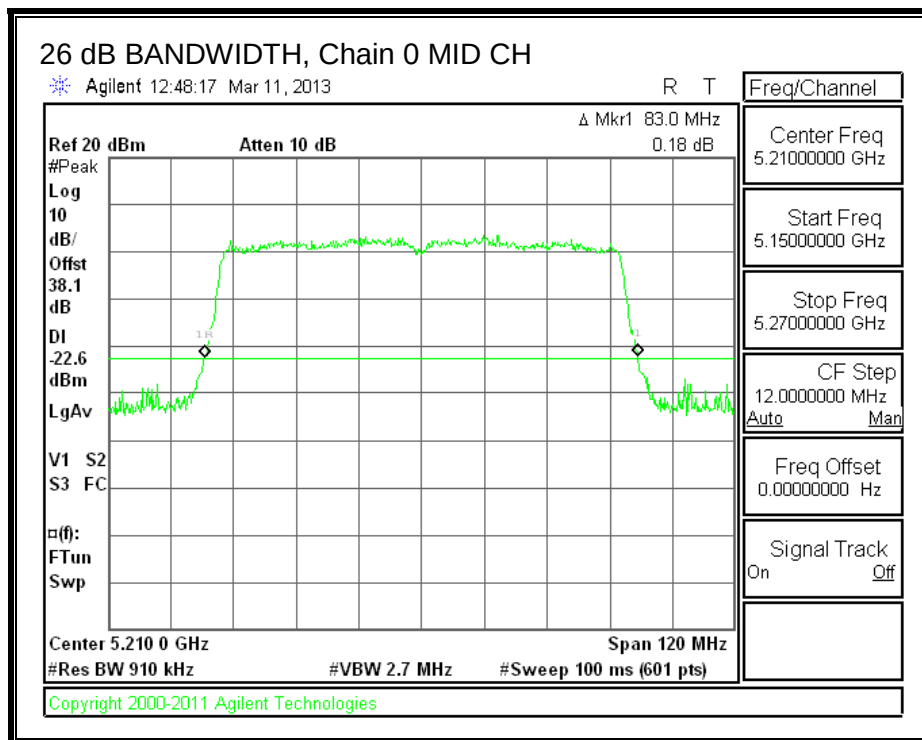
#### **LIMITS**

None; for reporting purposes only.

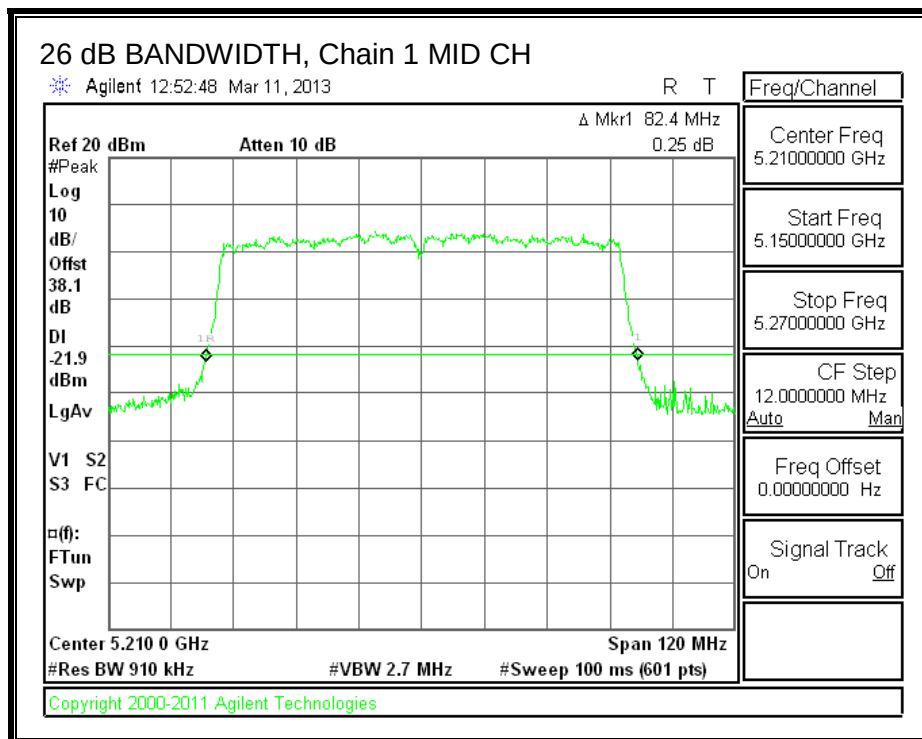
#### **RESULTS**

| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Mid     | 5210               | 83.00                        | 82.40                        | 81.40                        |

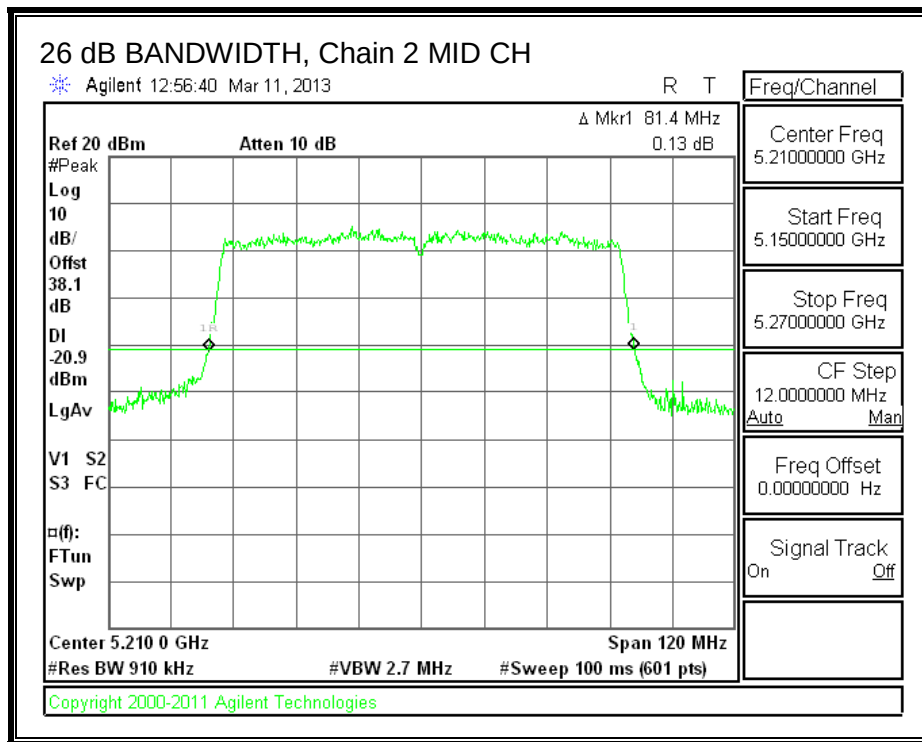
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.19.2. 99% BANDWIDTH

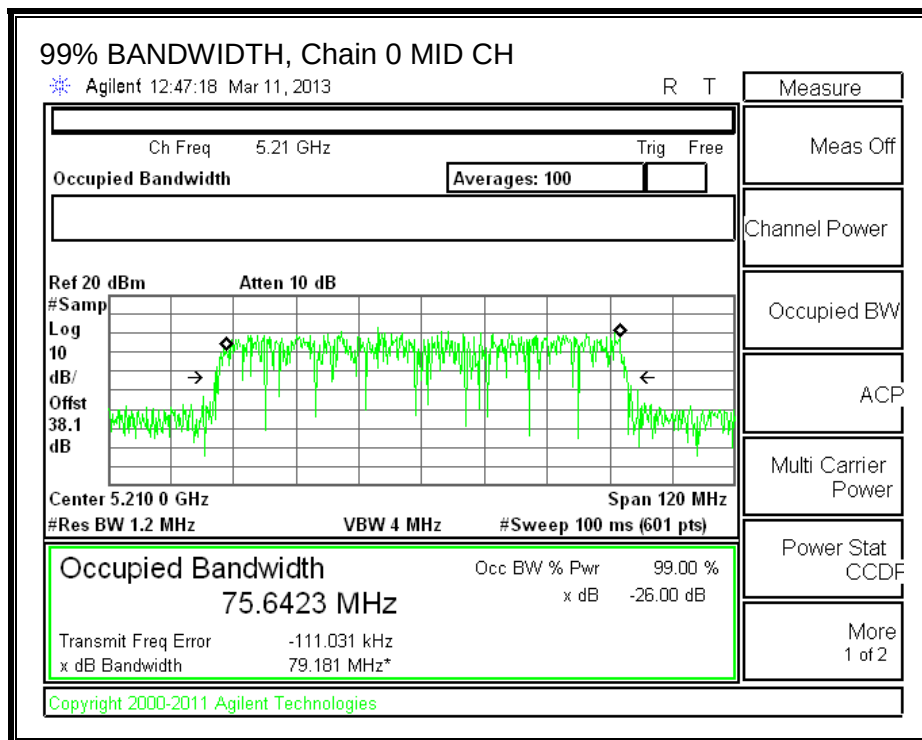
### LIMITS

None; for reporting purposes only.

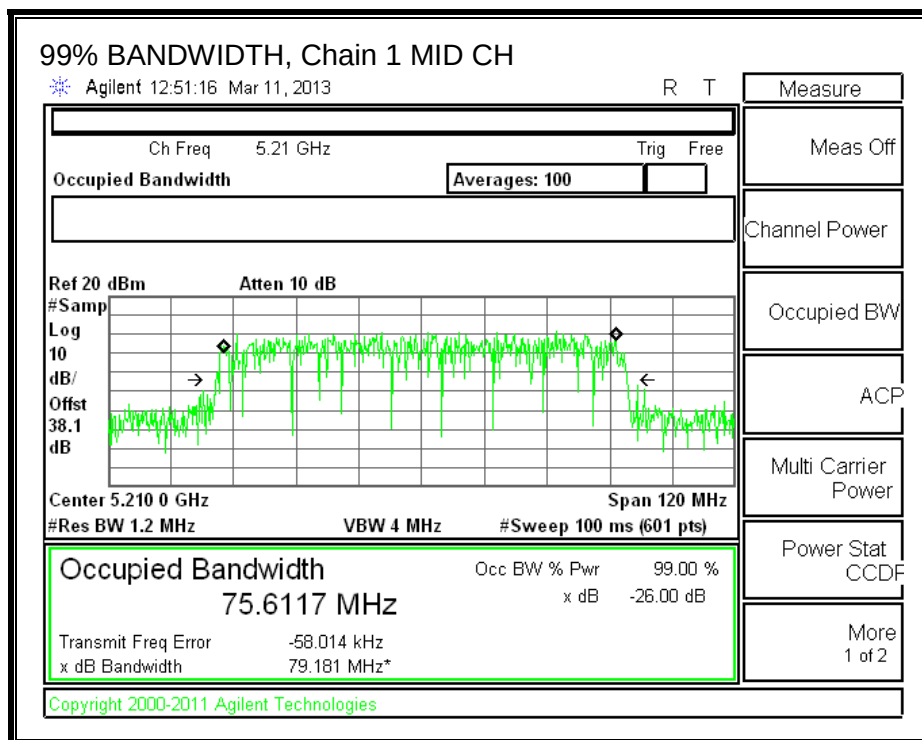
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.6423                    | 75.6117                    | 75.5864                    |

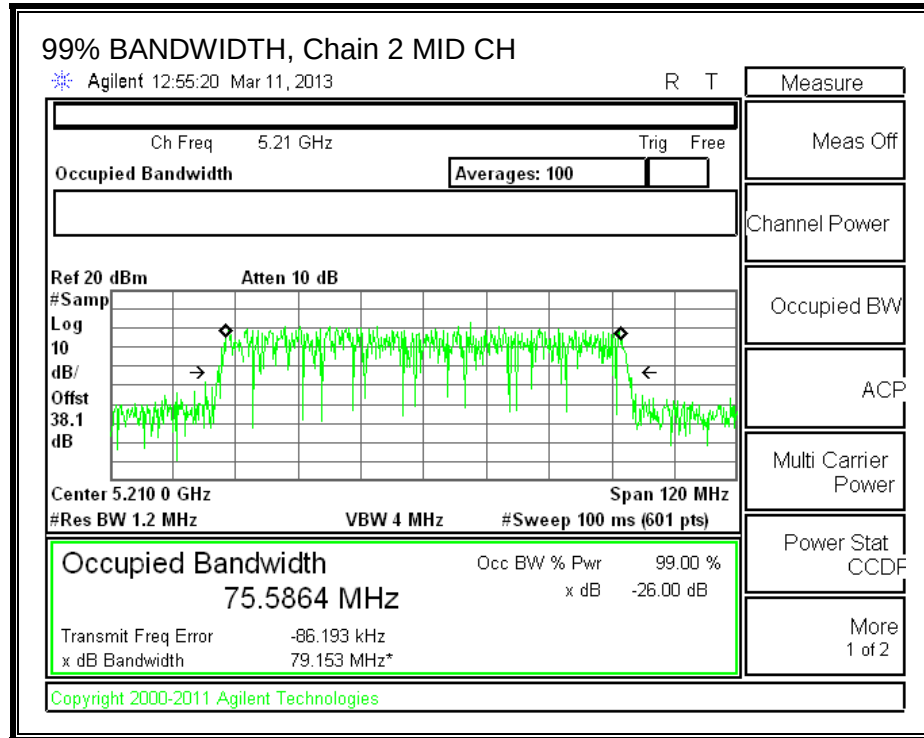
**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.19.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

The TX chains are correlated for PSD 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) | Uncorrelated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|----------------------------------------------|
| Mid     | 5210               | 81.40                       | 75.5864                   | 7.07                                       | 2.33                                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|-----------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 2.93                         | 10.00                               | 2.93                  |

|                    |      |
|--------------------|------|
| Duty Cycle CF (dB) | 0.09 |
|--------------------|------|

### Output Power Results

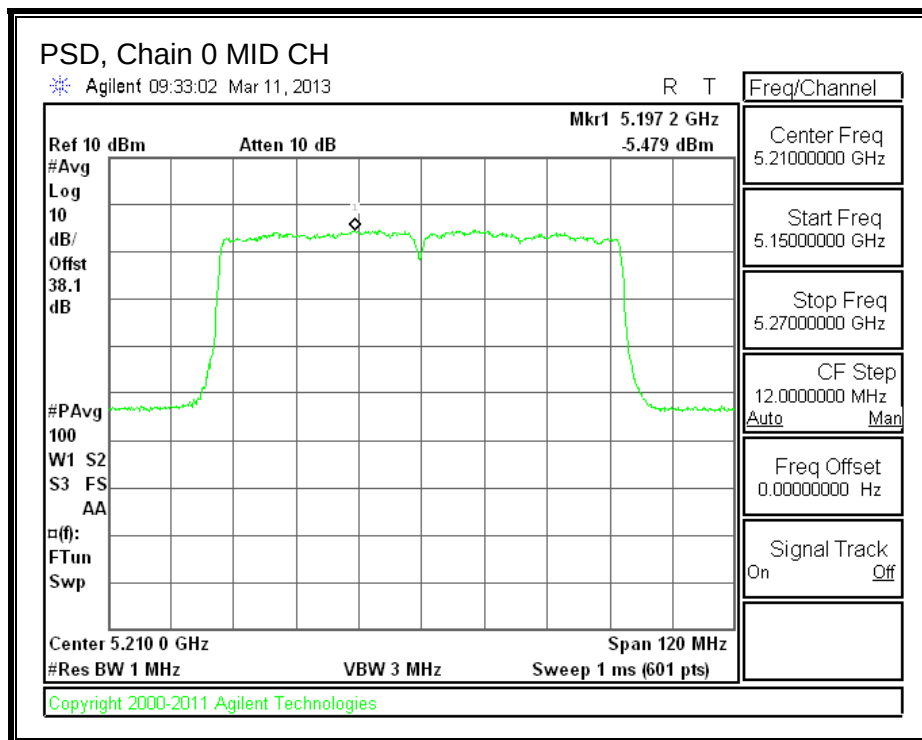
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<br>Meas<br>Power<br>(dBm) | Total<br>Corr'd<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Power<br>Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| Mid     | 5210               | 11.90                             | 12.10                             | 11.95                             | 16.76                             | 17.00                   | -0.24                   |

### PSD Results

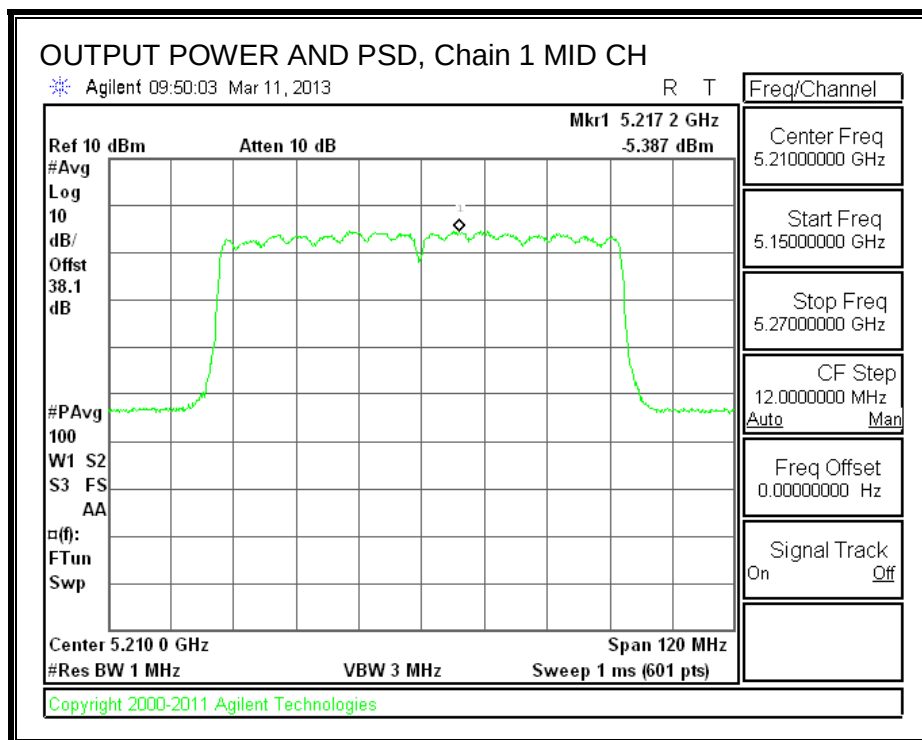
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | -5.479                          | -5.387                          | -5.062                          | -0.44                           | 2.93                  | -3.37                 |



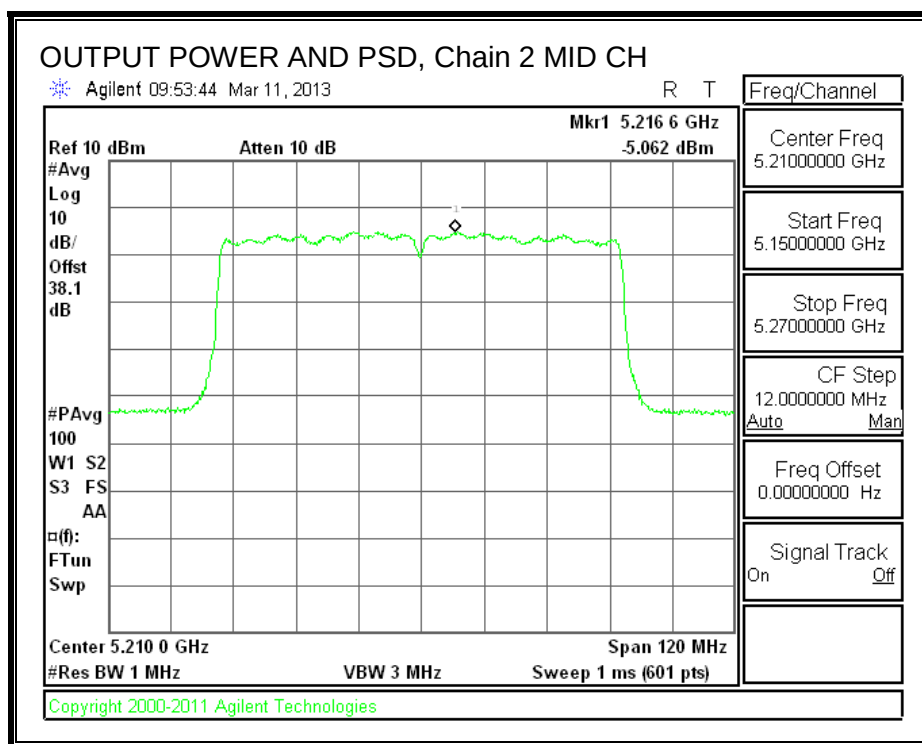
# PSD, Chain 0



# PSD, Chain 1



**PSD, Chain 2**



## 8.19.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | 3.02           | -5.479    | 0.09      | 8.41                | 13         | -4.59       |

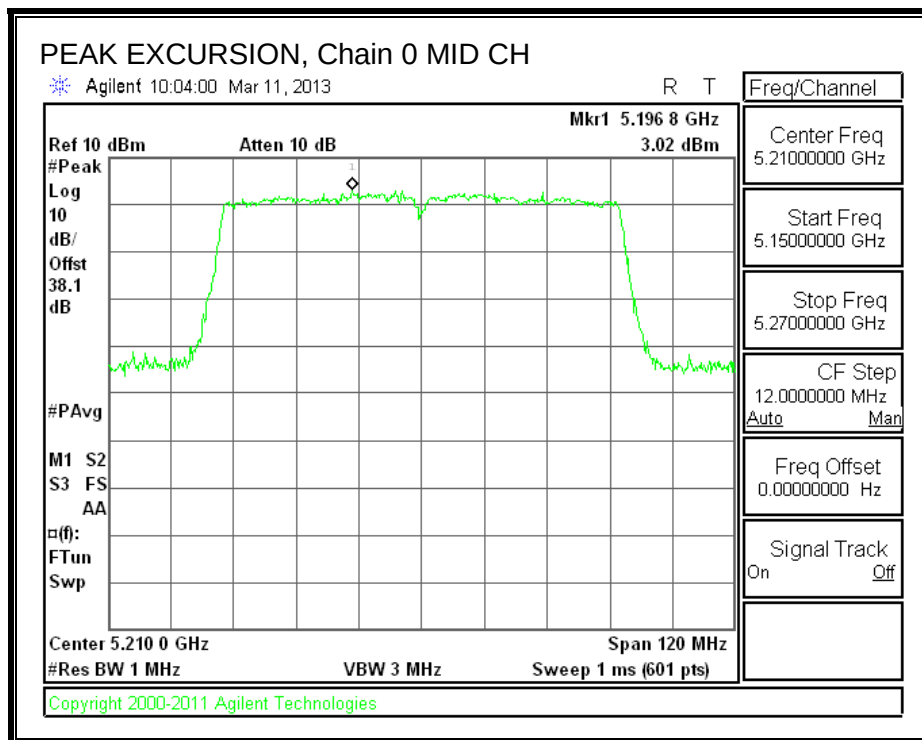
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | 3.49           | -5.387    | 0.09      | 8.79                | 13         | -4.21       |

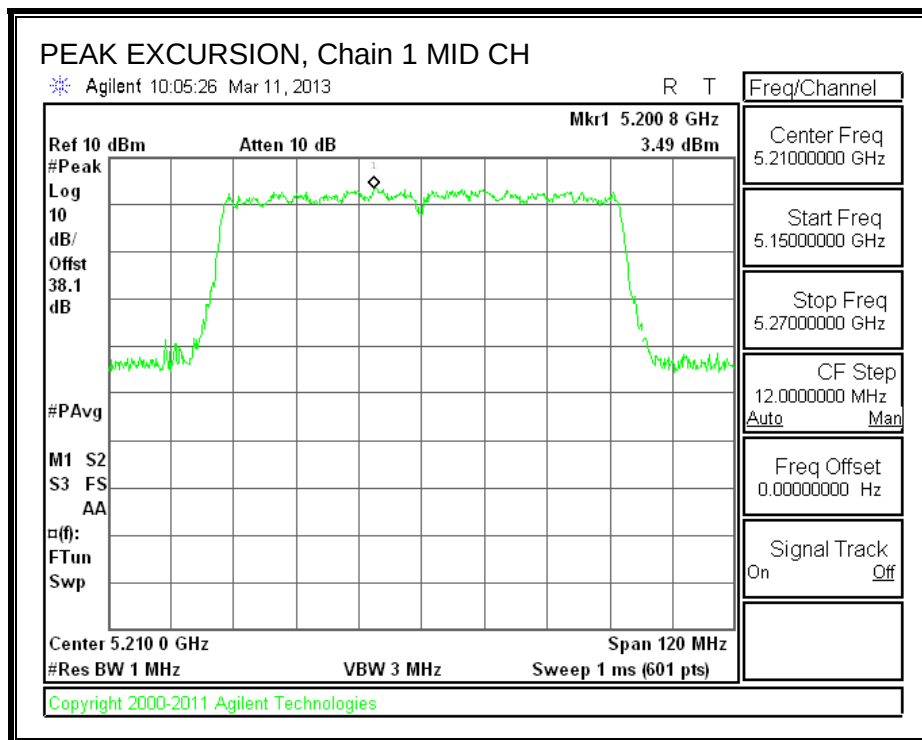
Chain 2

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | 4.24           | -5.062    | 0.09      | 9.21                | 13         | -3.79       |

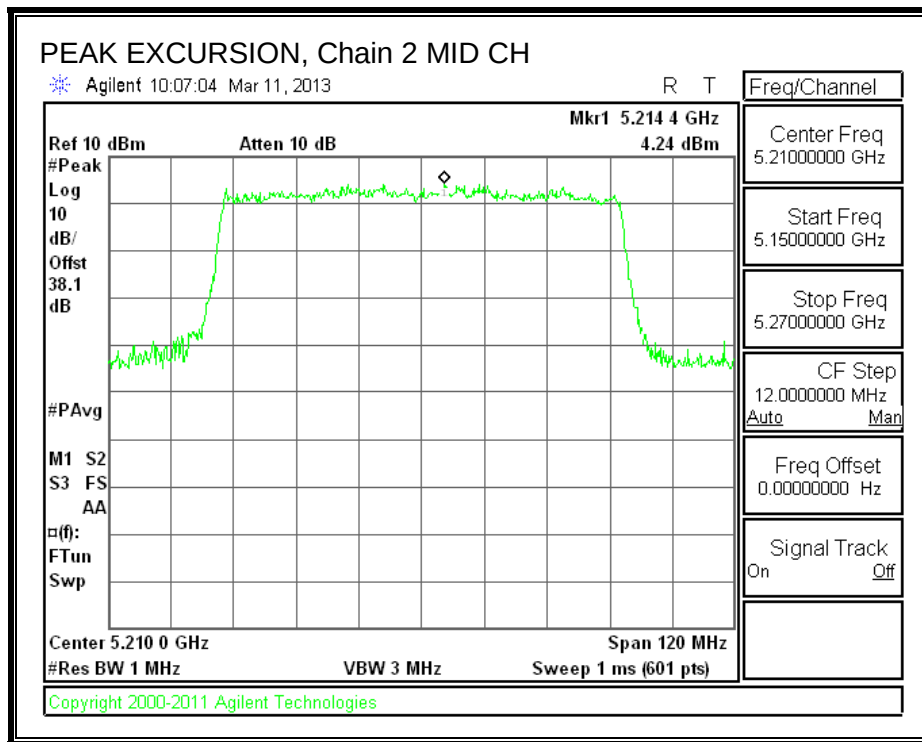
**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## 8.20. 802.11ac VHT80 BF 3TX MODE IN THE 5.2 GHz BAND

Covered by testing 11ac VHT80 CDD 3TX mode, the power per chain used for 11ac VHT80 CDD 3TX mode is the same power per chain that will be used for 11ac VHT80 BF 3TX mode. However, since BF is correlated and CDD is uncorrelated for output power, the section below for output power using correlated AG for this BF mode shows it is still compliant.

### 8.20.1. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### DIRECTIONAL ANTENNA GAIN

The TX chains are correlated for output power 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 7.07                                              |

## RESULTS

### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Correlated<br>Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|--------------------------------------------|
| Mid     | 5210               | 81.40                       | 75.5864                   | 7.07                                       |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|
| Mid     | 5210               | 15.93                          | 23.00                        | 15.93                       | 15.93                   |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

### Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 10.00                             | 10.30                             | 10.10                             | 14.91                             | 15.93                   | -1.02                   |

## **8.21. 802.11ac VHT80 STBC 3TX MODE IN THE 5.2 GHz BAND**

### **8.21.1. 26 dB BANDWIDTH**

#### **LIMITS**

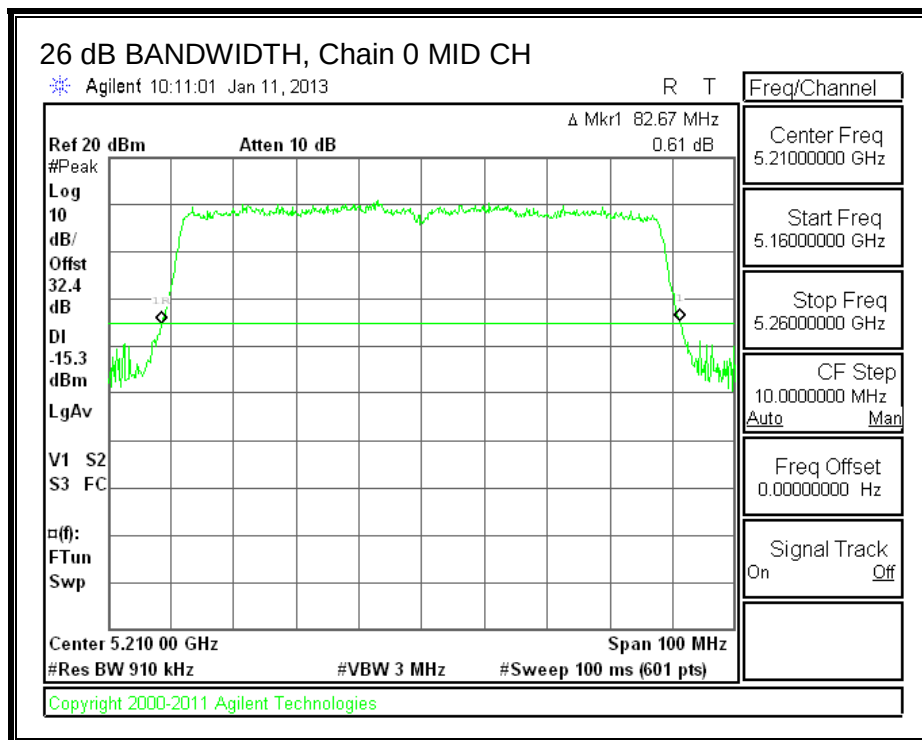
None; for reporting purposes only.

#### **RESULTS**

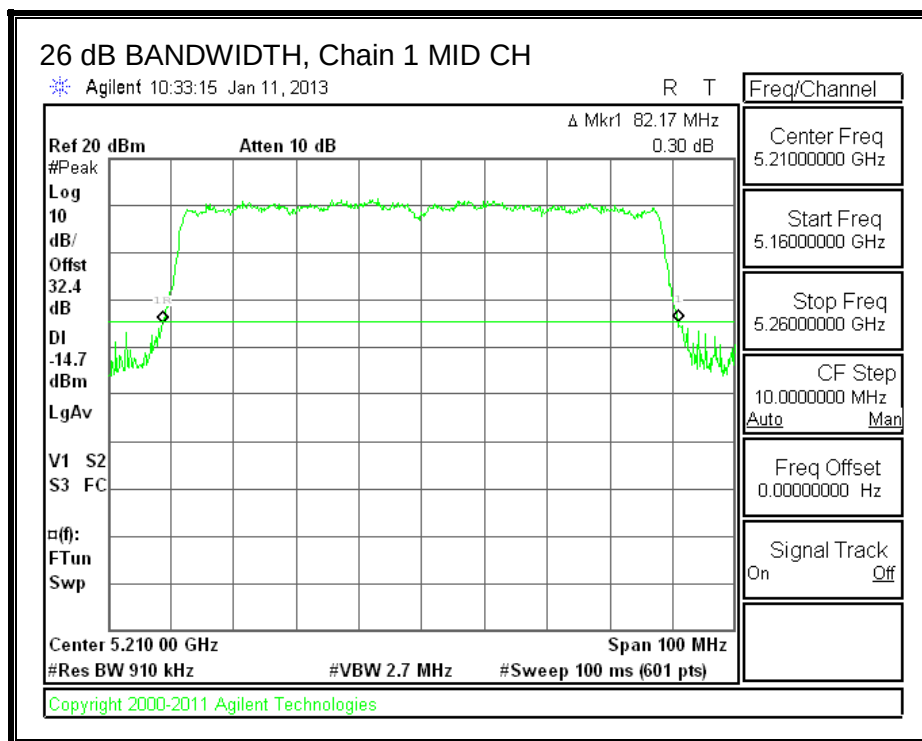
| Channel | Frequency<br>(MHz) | 26 dB BW<br>Chain 0<br>(MHz) | 26 dB BW<br>Chain 1<br>(MHz) | 26 dB BW<br>Chain 2<br>(MHz) |
|---------|--------------------|------------------------------|------------------------------|------------------------------|
| Mid     | 5210               | 82.67                        | 82.17                        | 82.00                        |



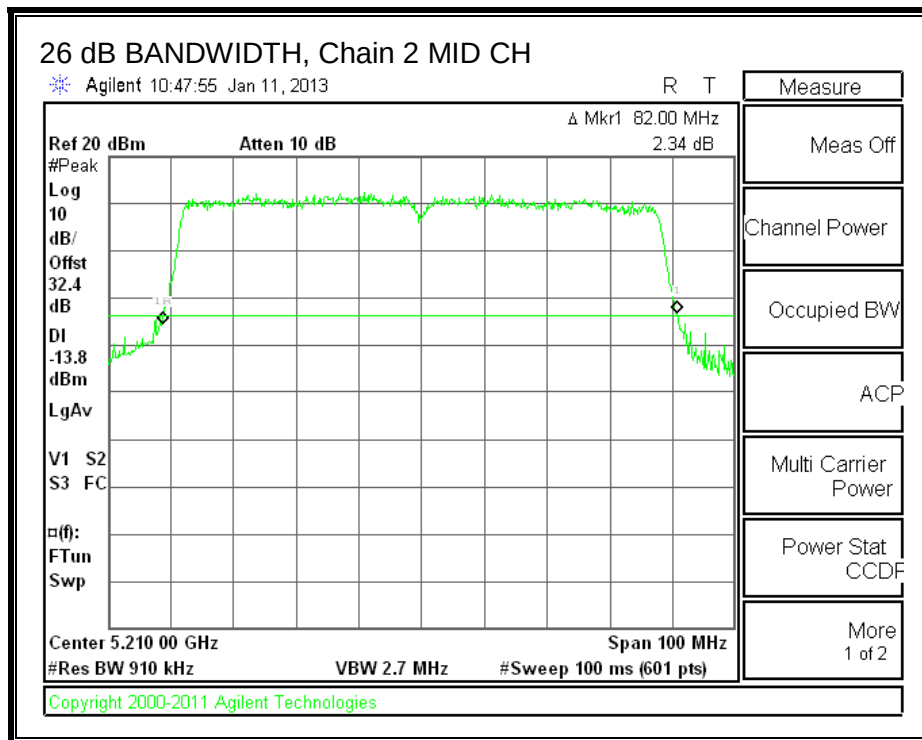
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.21.2. 99% BANDWIDTH

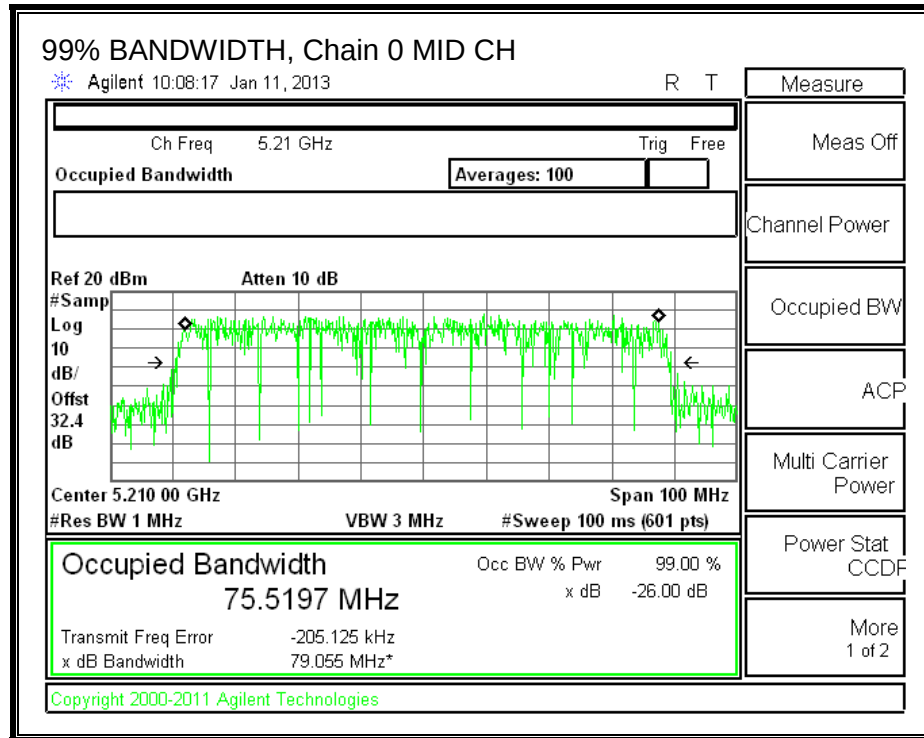
### LIMITS

None; for reporting purposes only.

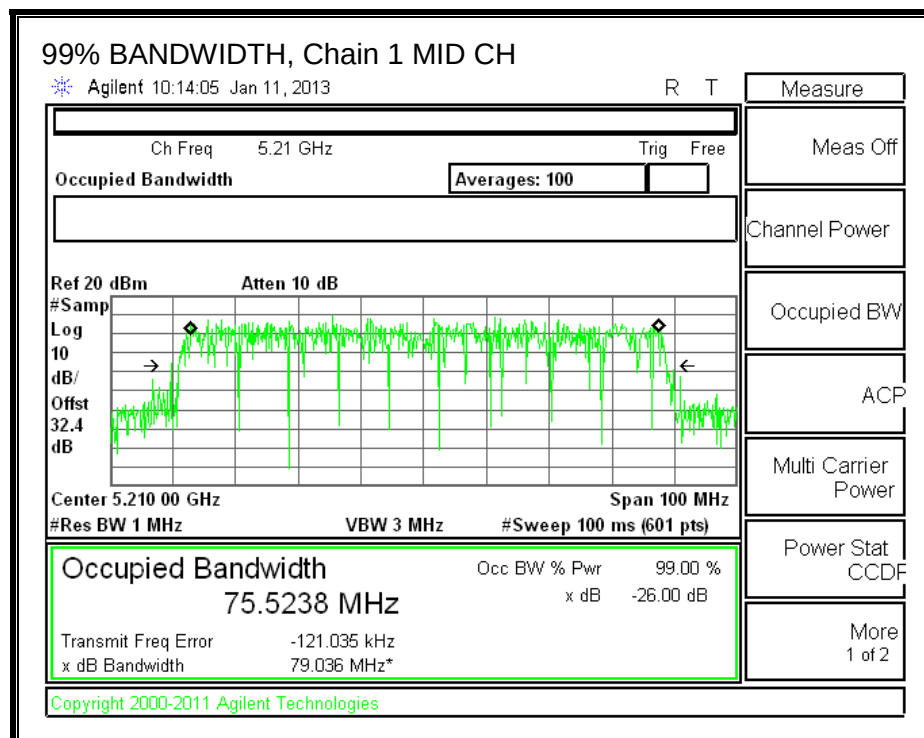
### RESULTS

| Channel | Frequency<br>(MHz) | 99% BW<br>Chain 0<br>(MHz) | 99% BW<br>Chain 1<br>(MHz) | 99% BW<br>Chain 2<br>(MHz) |
|---------|--------------------|----------------------------|----------------------------|----------------------------|
| Mid     | 5210               | 75.5197                    | 75.5238                    | 75.5115                    |

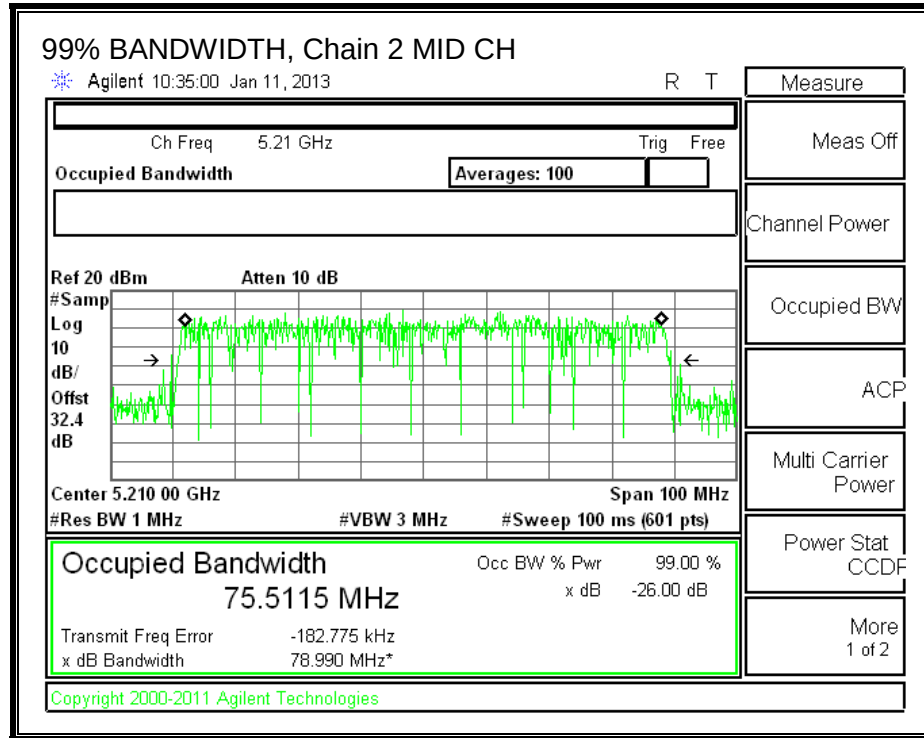
**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.21.3. OUTPUT AVERAGE POWER AND PSD

#### LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 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.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### 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) | Chain 2<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| 3.20                                | 1.40                                | 2.20                                | 2.33                                                |

## RESULTS

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Mid     | 5210               | 82.00                       | 75.5115                   | 2.33                         |

### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|------------------------------|-------------------------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 4.00                         | 10.00                               |

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

### Gated Output Power Results

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Chain 1<br>Meas<br>Power<br>(dBm) | Chain 2<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               | 11.90                             | 11.98                             | 12.10                             | 16.77                             | 17.00                   | -0.23                   |

#### Bandwidth and Antenna Gain

| Channel | Frequency<br>(MHz) | Min<br>26 dB<br>BW<br>(MHz) | Min<br>99%<br>BW<br>(MHz) | Directional<br>Gain<br>(dBi) |
|---------|--------------------|-----------------------------|---------------------------|------------------------------|
| Mid     | 5210               | 82.00                       | 75.5115                   | 2.33                         |

#### Limits

| Channel | Frequency<br>(MHz) | FCC<br>Power<br>Limit<br>(dBm) | IC<br>EIRP<br>Limit<br>(dBm) | Max<br>IC<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | FCC<br>PPSD<br>Limit<br>(dBm) | IC<br>eirp<br>PSD<br>Limit<br>(dBm) | PSD<br>Limit<br>(dBm) |
|---------|--------------------|--------------------------------|------------------------------|-----------------------------|-------------------------|-------------------------------|-------------------------------------|-----------------------|
| Mid     | 5210               | 17.00                          | 23.00                        | 20.67                       | 17.00                   | 4.00                          | 10.00                               | 4.00                  |

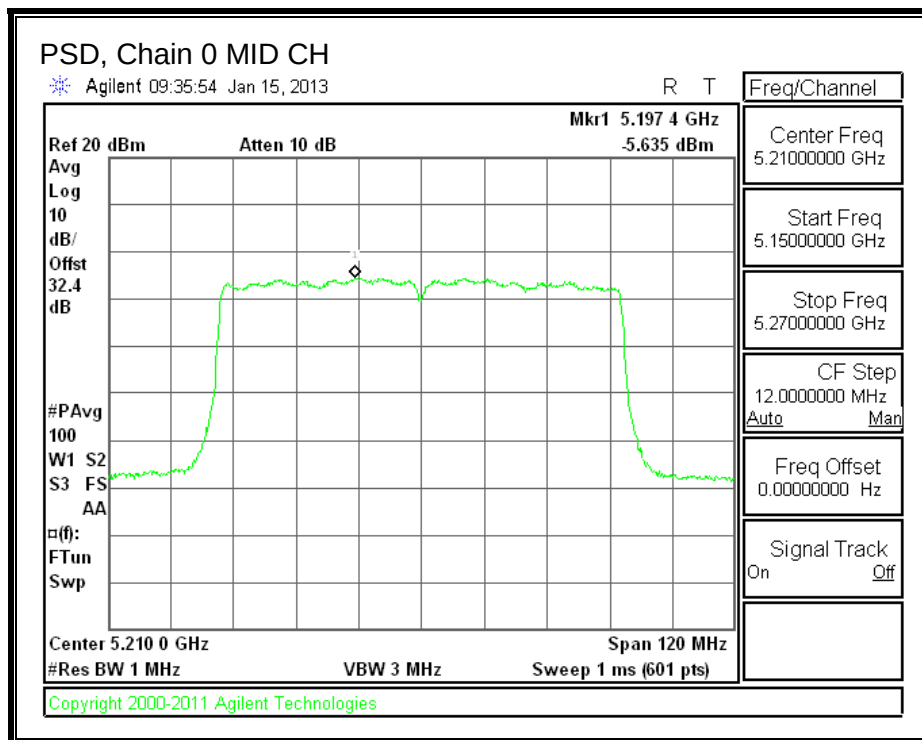
|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.09 |  |
|--------------------|------|--|

#### PSD Results

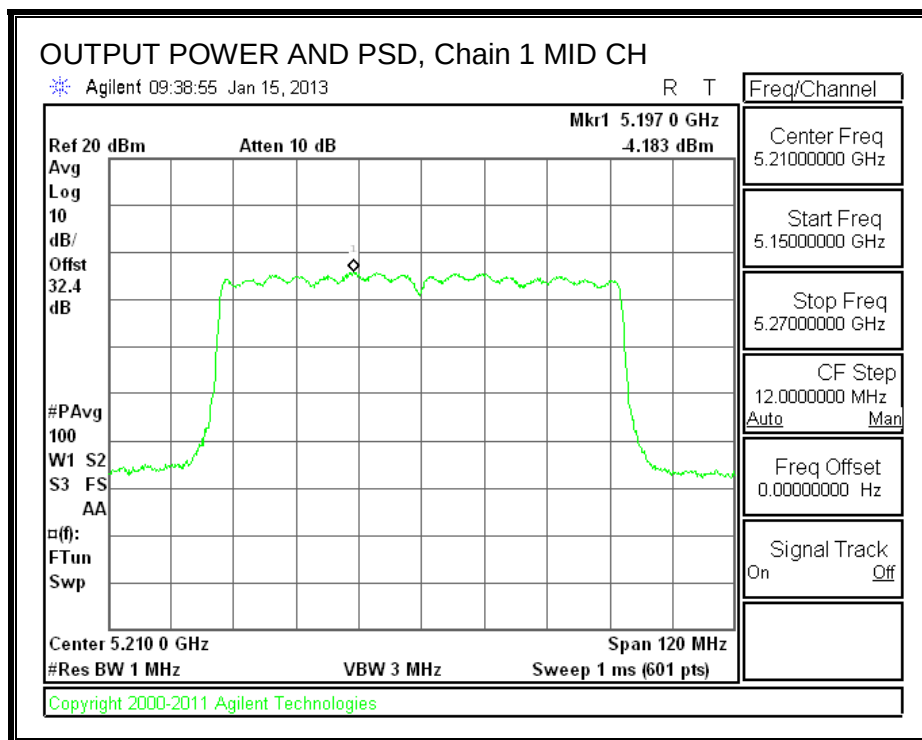
| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>PSD<br>(dBm) | Chain 1<br>Meas<br>PSD<br>(dBm) | Chain 2<br>Meas<br>PSD<br>(dBm) | Total<br>Corr'd<br>PSD<br>(dBm) | PSD<br>Limit<br>(dBm) | PSD<br>Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|-----------------------|
| Mid     | 5210               | -5.635                          | -4.183                          | -3.917                          | 0.35                            | 4.00                  | -3.65                 |



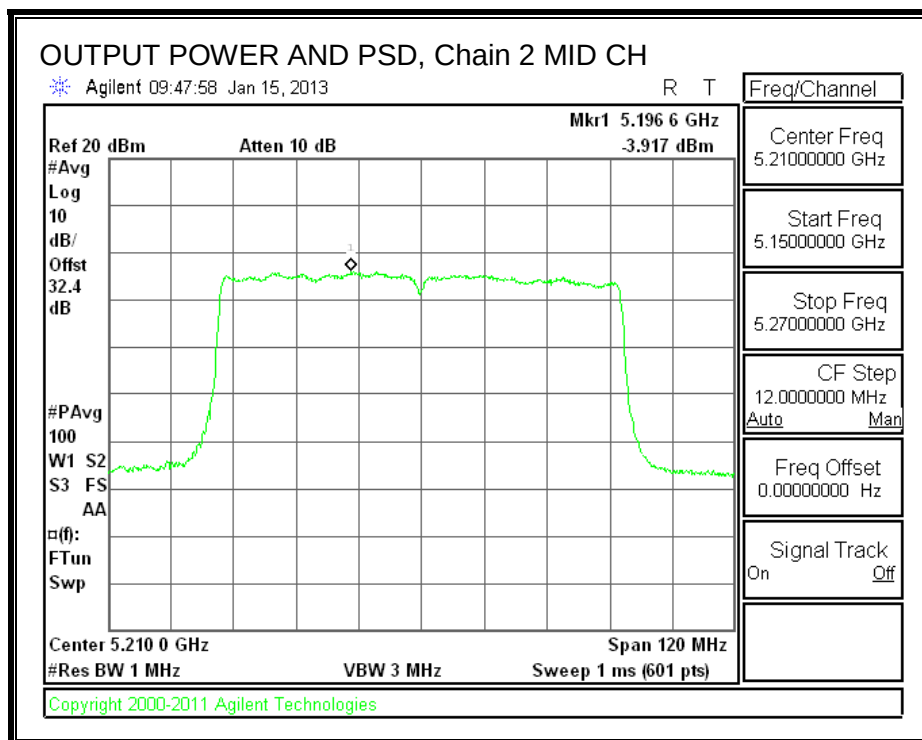
### PSD, Chain 0



### PSD, Chain 1



**PSD, Chain 2**



## 8.21.4. PEAK EXCURSION

### LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### RESULTS

Chain 0

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | -2.207         | -5.635    | 0.09      | 3.34                | 13         | -9.66       |

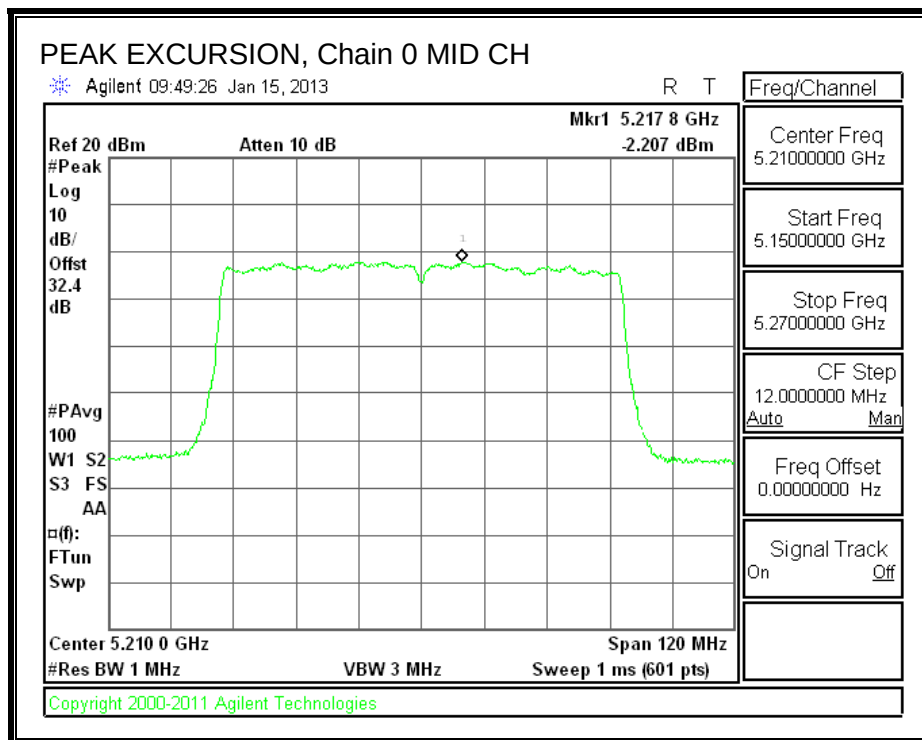
Chain 1

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | -0.745         | -4.183    | 0.09      | 3.35                | 13         | -9.65       |

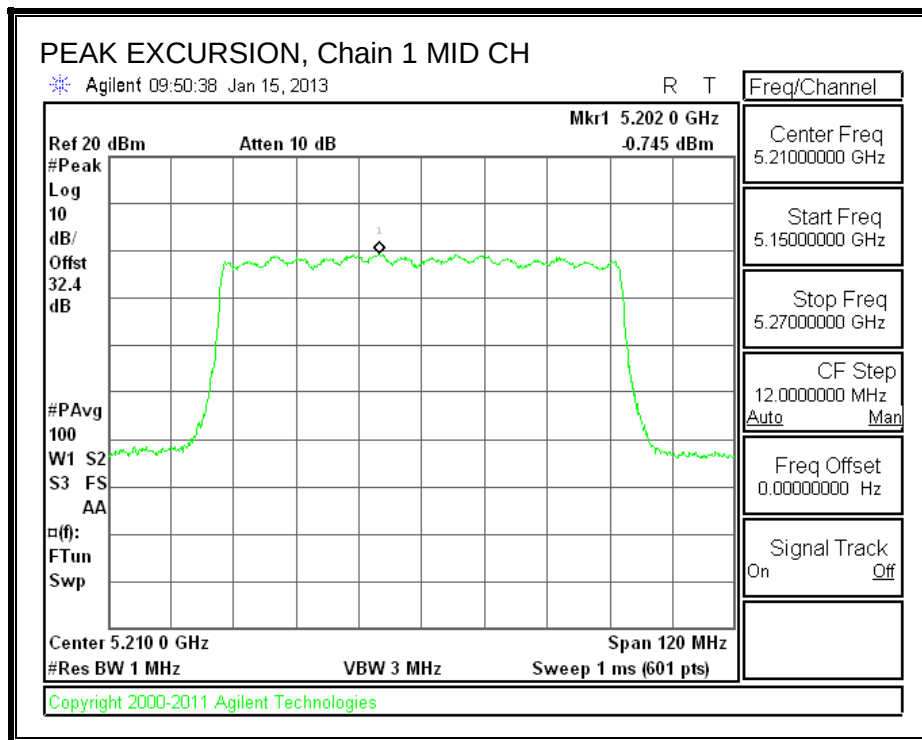
Chain 2

| Channel | Frequency (MHz) | PK Level (dBm) | PSD (dBm) | DCCF (dB) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---------|-----------------|----------------|-----------|-----------|---------------------|------------|-------------|
| Mid     | 5210            | -0.439         | -3.917    | 0.09      | 3.39                | 13         | -9.61       |

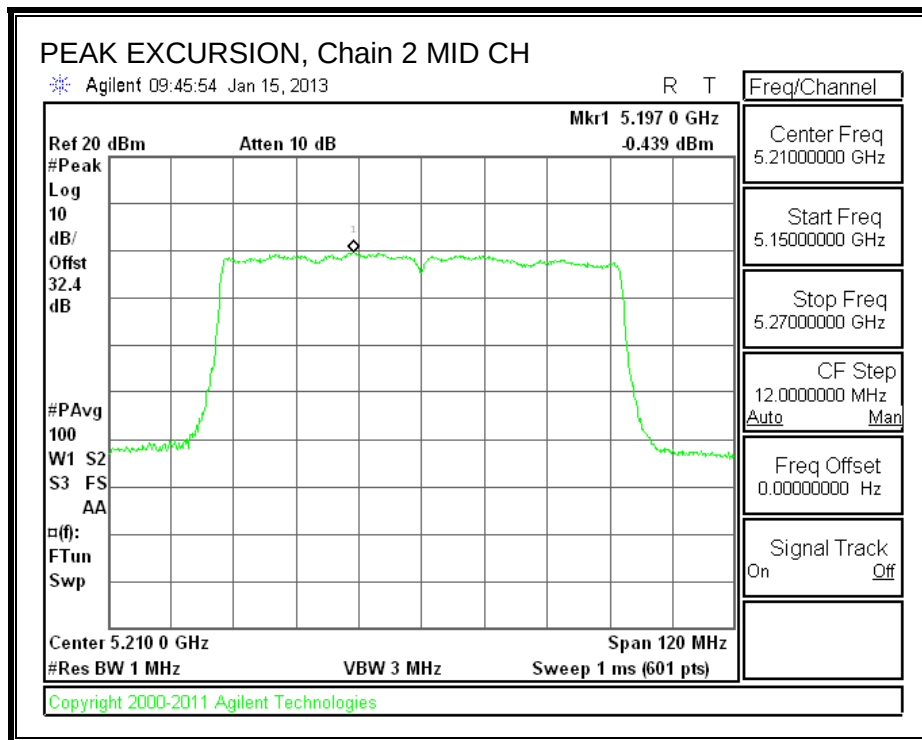
**PEAK EXCURSION, Chain 0**



**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

| Frequency Range<br>(MHz) | Field Strength Limit<br>( $\mu\text{V/m}$ ) at 3 m | Field Strength Limit<br>(dB $\mu\text{V/m}$ ) at 3 m |
|--------------------------|----------------------------------------------------|------------------------------------------------------|
| 30 - 88                  | 100                                                | 40                                                   |
| 88 - 216                 | 150                                                | 43.5                                                 |
| 216 - 960                | 200                                                | 46                                                   |
| Above 960                | 500                                                | 54                                                   |

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

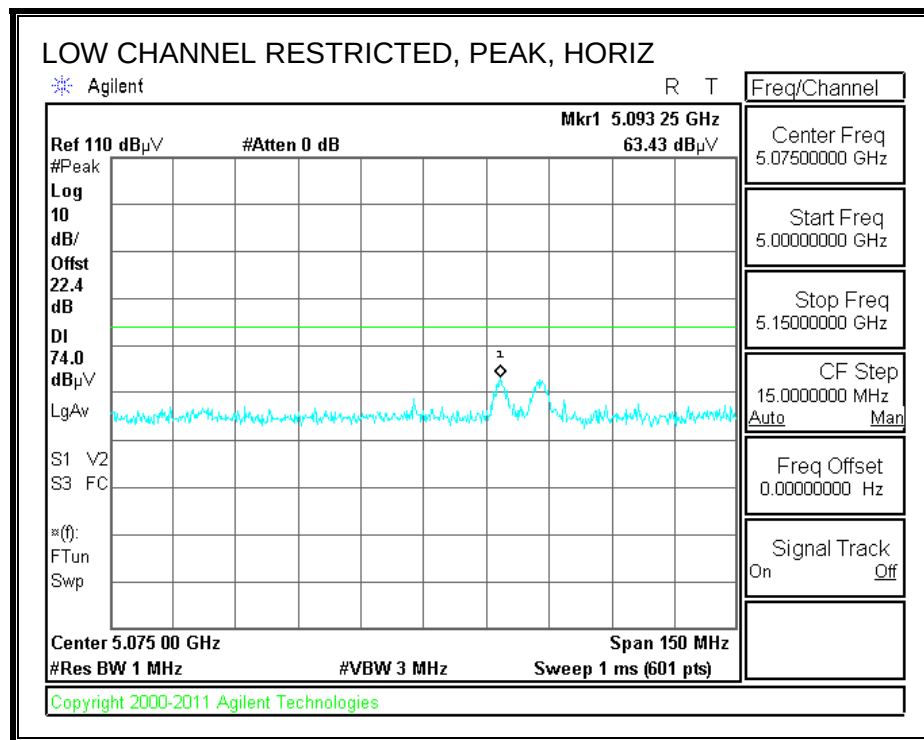
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

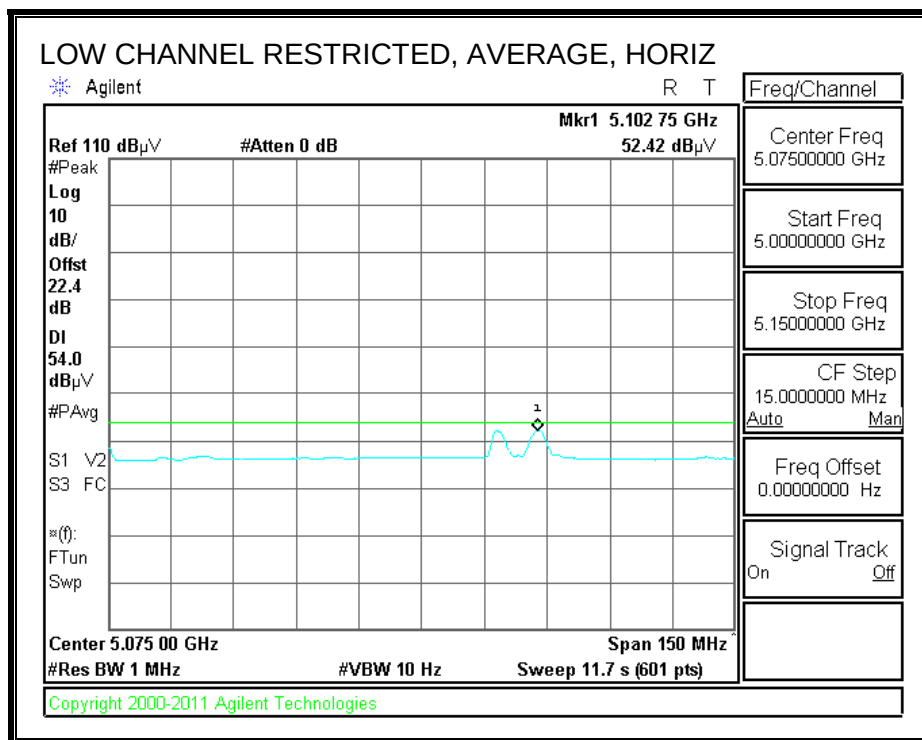
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 9.2. TRANSMITTER ABOVE 1 GHz

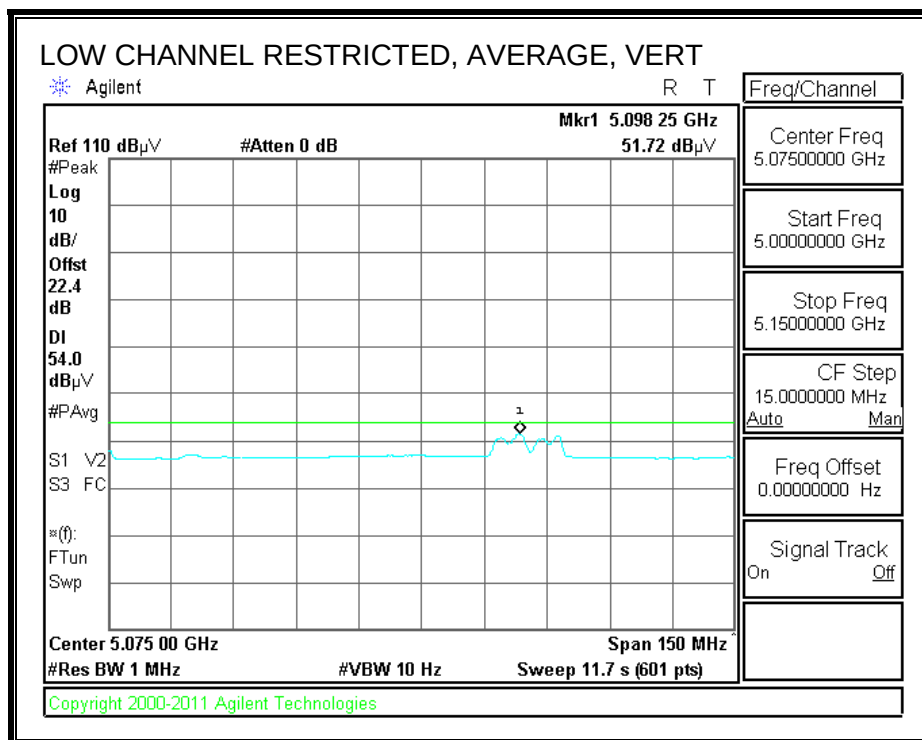
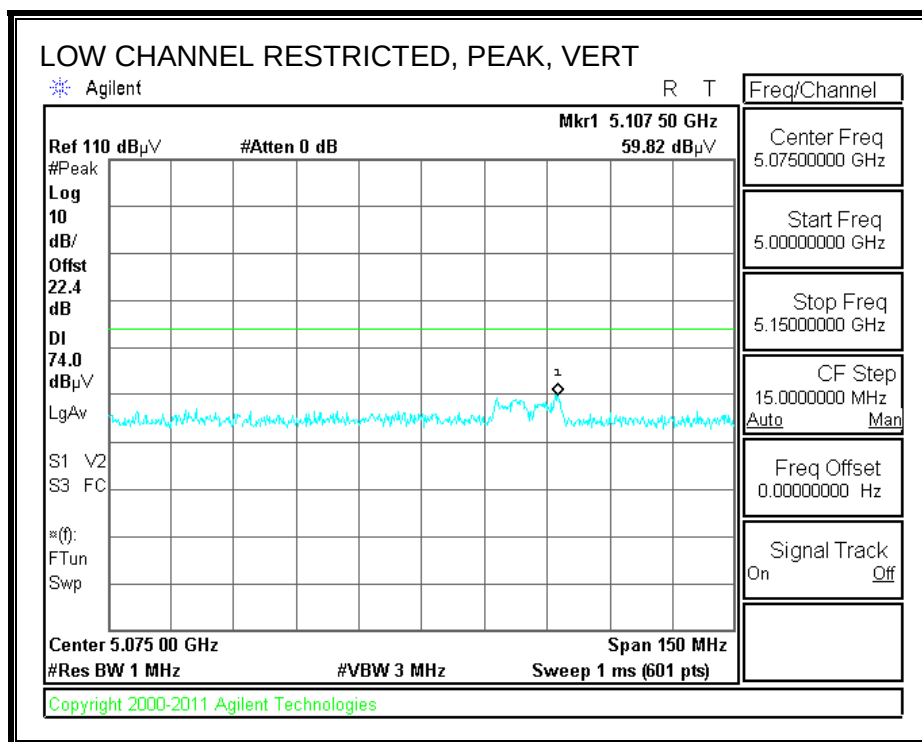
### 9.2.1. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)









# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT20 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

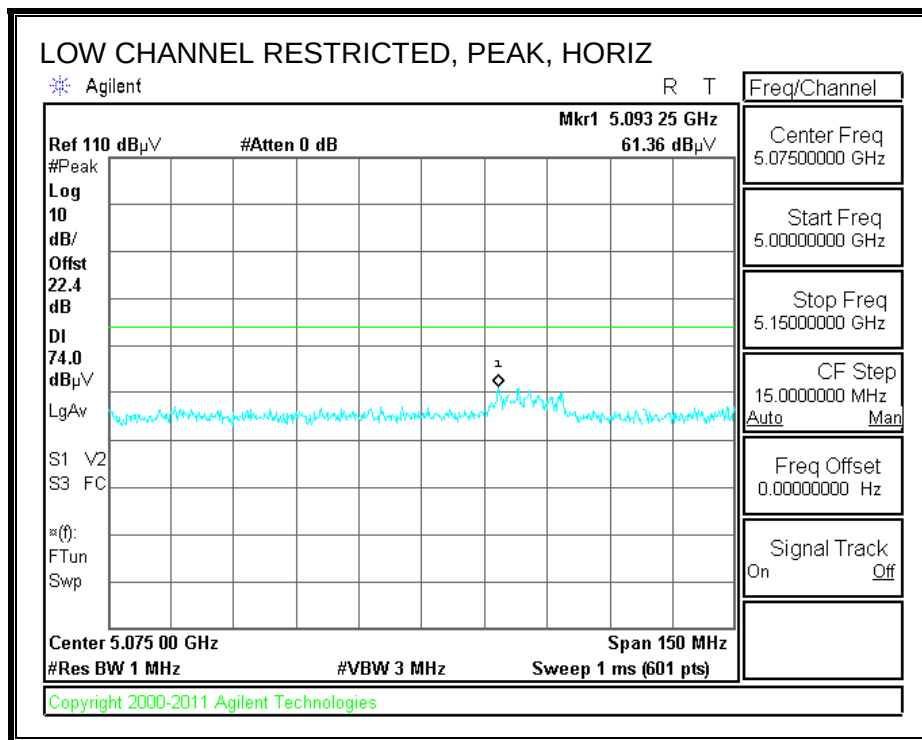
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5180 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.540                  | 3.0         | 32.9         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | H                | P               |       |
| 15.540                  | 3.0         | 22.7         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | H                | A               |       |
| 15.540                  | 3.0         | 34.0         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 54.8            | 74.0            | -19.2        | V                | P               |       |
| 15.540                  | 3.0         | 22.8         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.6            | 54.0            | -10.4        | V                | A               |       |
| <b>5200 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.600                  | 3.0         | 33.6         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 54.3            | 74.0            | -19.7        | V                | P               |       |
| 15.600                  | 3.0         | 22.2         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 42.9            | 54.0            | -11.1        | V                | A               |       |
| 15.600                  | 3.0         | 32.9         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.600                  | 3.0         | 26.4         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 47.1            | 54.0            | -6.9         | H                | A               |       |
| <b>5240 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.720                  | 3.0         | 33.6         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | H                | P               |       |
| 15.720                  | 3.0         | 22.9         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.2            | 54.0            | -10.8        | H                | A               |       |
| 15.720                  | 3.0         | 33.7         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.720                  | 3.0         | 23.1         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.4            | 54.0            | -10.6        | V                | A               |       |

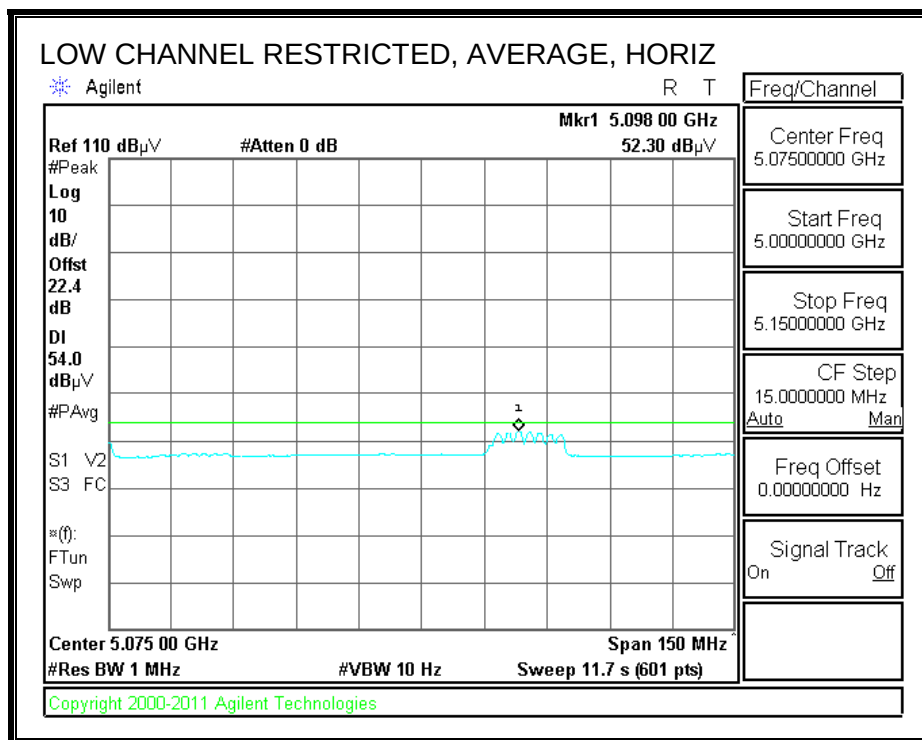
Rev. 4.1.2.7

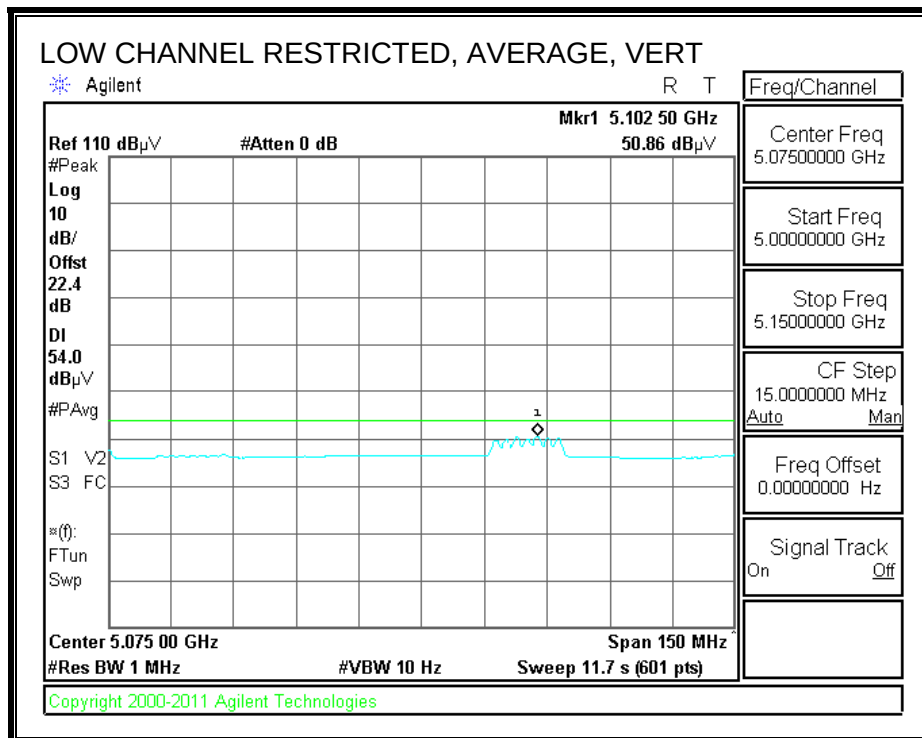
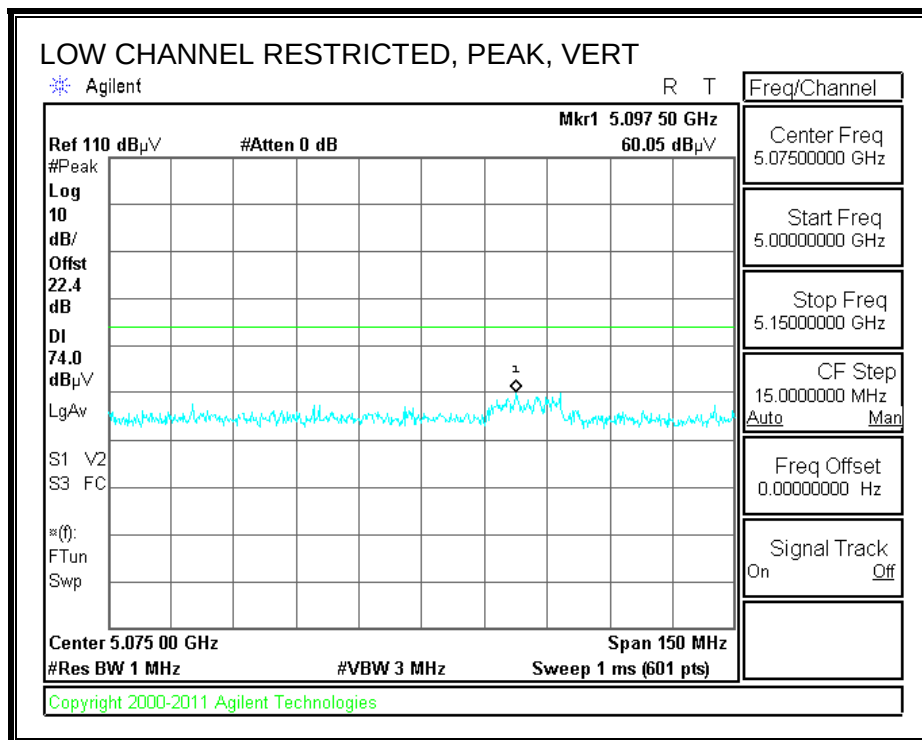
Note: No other emissions were detected above the system noise floor.

## 9.2.2. TX ABOVE 1 GHz, 802.11n HT20 CDD 2TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)







# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT20 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

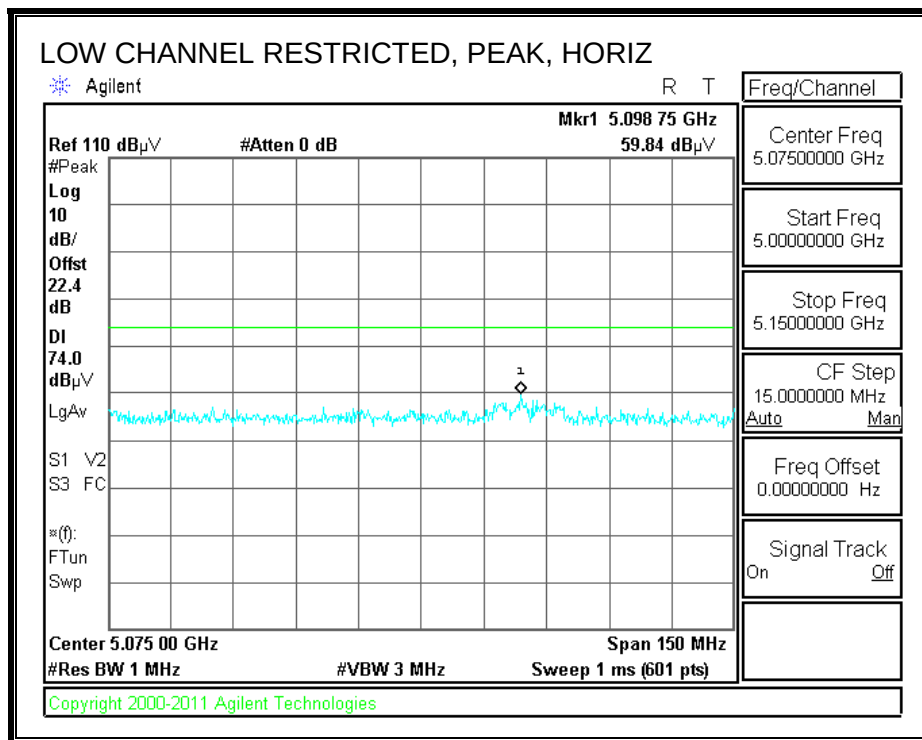
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5180 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.540                  | 3.0         | 32.9         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | H                | P               |       |
| 15.540                  | 3.0         | 22.7         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | H                | A               |       |
| 15.540                  | 3.0         | 34.0         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 54.8            | 74.0            | -19.2        | V                | P               |       |
| 15.540                  | 3.0         | 22.8         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.6            | 54.0            | -10.4        | V                | A               |       |
| <b>5200 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.600                  | 3.0         | 33.6         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 54.3            | 74.0            | -19.7        | V                | P               |       |
| 15.600                  | 3.0         | 22.2         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 42.9            | 54.0            | -11.1        | V                | A               |       |
| 15.600                  | 3.0         | 32.9         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.600                  | 3.0         | 26.4         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 47.1            | 54.0            | -6.9         | H                | A               |       |
| <b>5240 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.720                  | 3.0         | 33.6         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | H                | P               |       |
| 15.720                  | 3.0         | 22.9         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.2            | 54.0            | -10.8        | H                | A               |       |
| 15.720                  | 3.0         | 33.7         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.720                  | 3.0         | 23.1         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.4            | 54.0            | -10.6        | V                | A               |       |

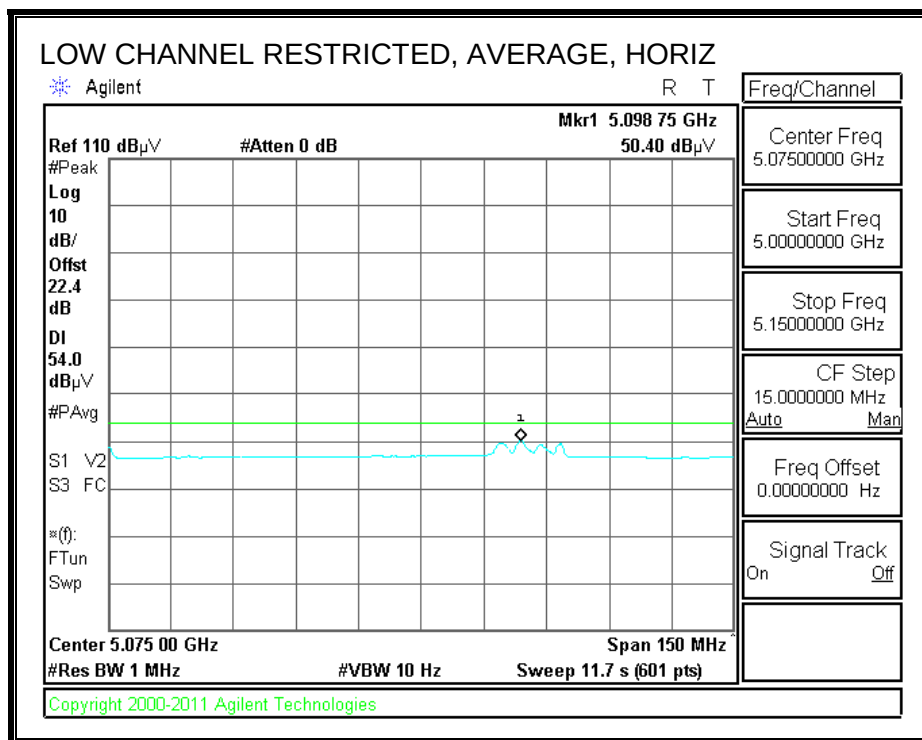
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

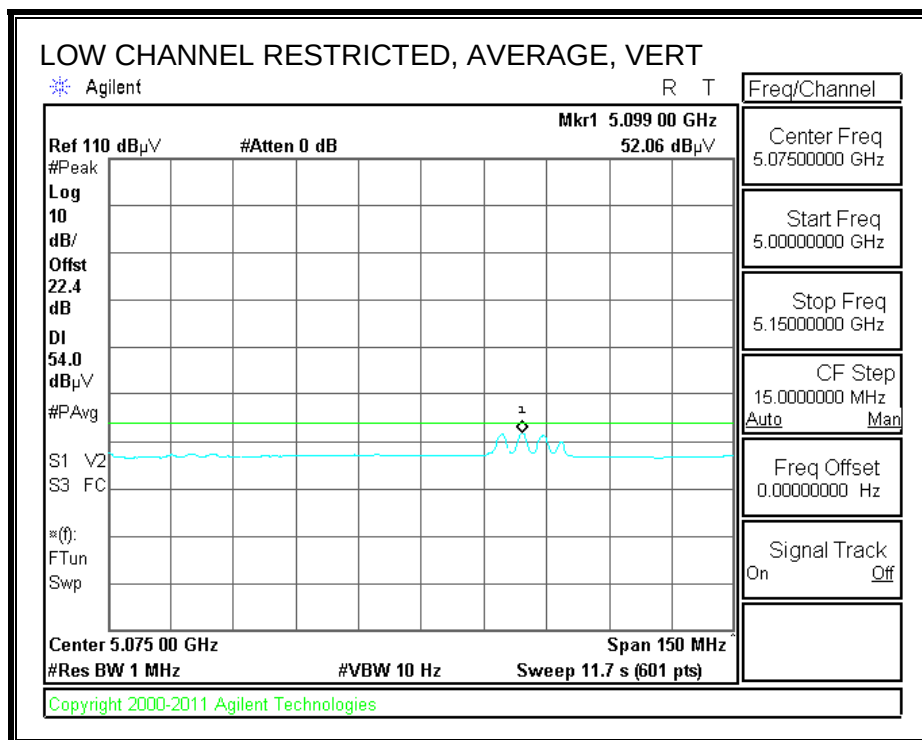
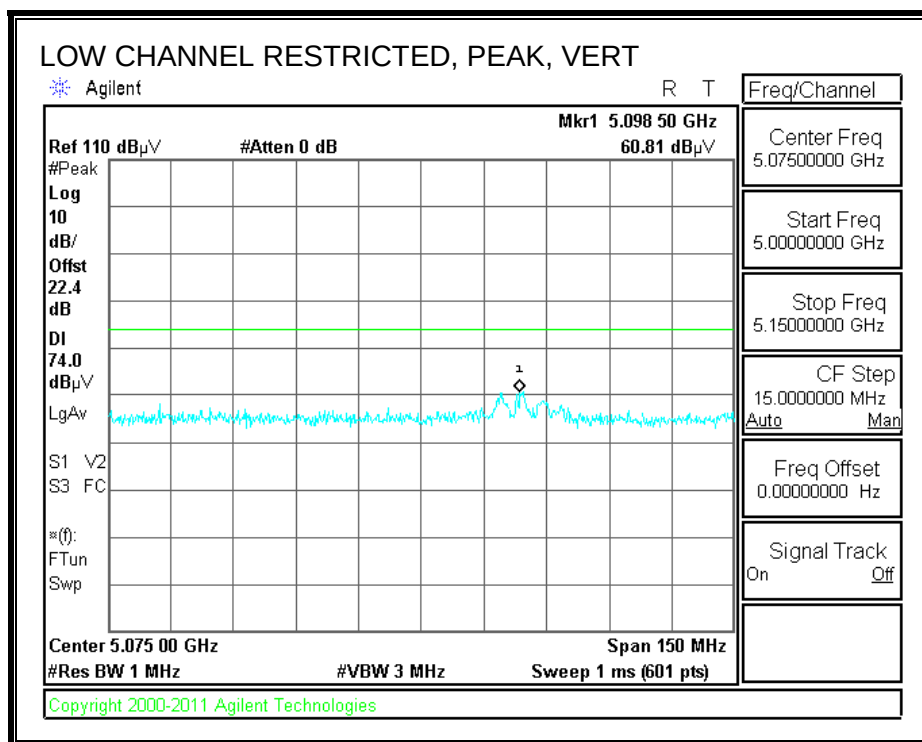
### 9.2.3. TX ABOVE 1 GHz 802.11n HT20 CDD 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)









# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT20 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

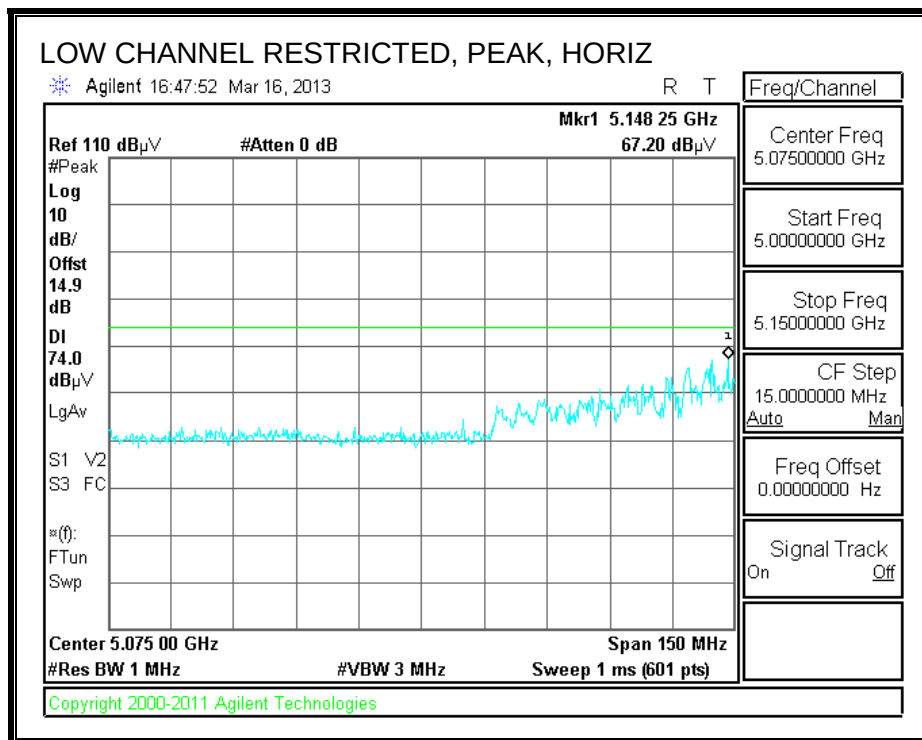
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5180 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.540                  | 3.0         | 32.9         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | H                | P               |       |
| 15.540                  | 3.0         | 22.7         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | H                | A               |       |
| 15.540                  | 3.0         | 34.0         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 54.8            | 74.0            | -19.2        | V                | P               |       |
| 15.540                  | 3.0         | 22.8         | 39.1       | 13.0     | -31.9     | 0.0          | 0.7        | 43.6            | 54.0            | -10.4        | V                | A               |       |
| <b>5200 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.600                  | 3.0         | 33.6         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 54.3            | 74.0            | -19.7        | V                | P               |       |
| 15.600                  | 3.0         | 22.2         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 42.9            | 54.0            | -11.1        | V                | A               |       |
| 15.600                  | 3.0         | 32.9         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.600                  | 3.0         | 26.4         | 38.8       | 13.0     | -31.9     | 0.0          | 0.7        | 47.1            | 54.0            | -6.9         | H                | A               |       |
| <b>5240 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.720                  | 3.0         | 33.6         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | H                | P               |       |
| 15.720                  | 3.0         | 22.9         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.2            | 54.0            | -10.8        | H                | A               |       |
| 15.720                  | 3.0         | 33.7         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.720                  | 3.0         | 23.1         | 38.4       | 13.1     | -31.9     | 0.0          | 0.7        | 43.4            | 54.0            | -10.6        | V                | A               |       |

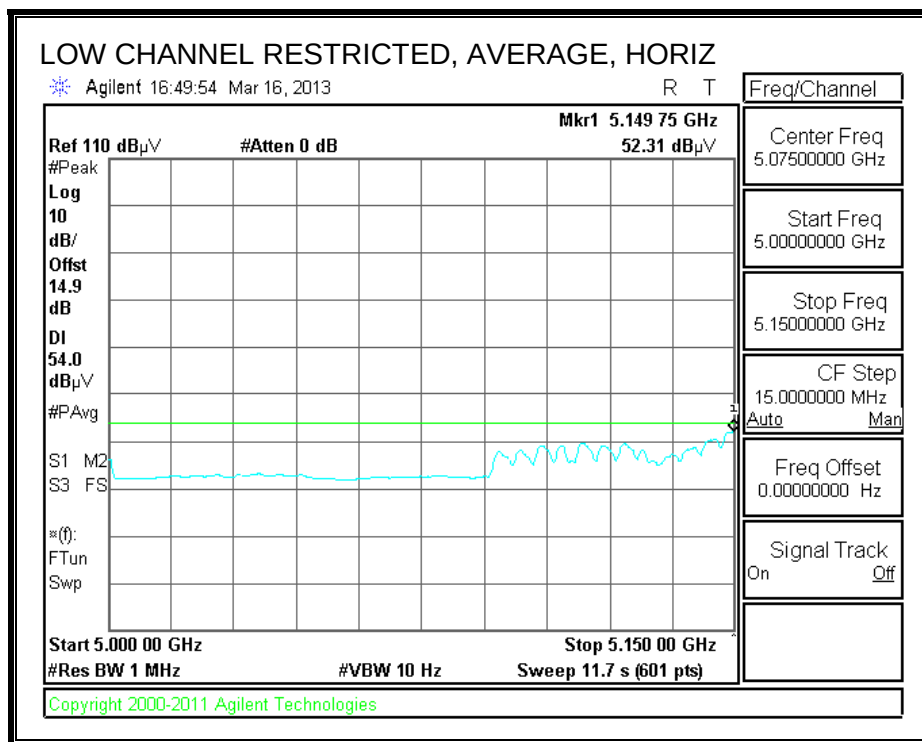
Rev. 4.1.2.7

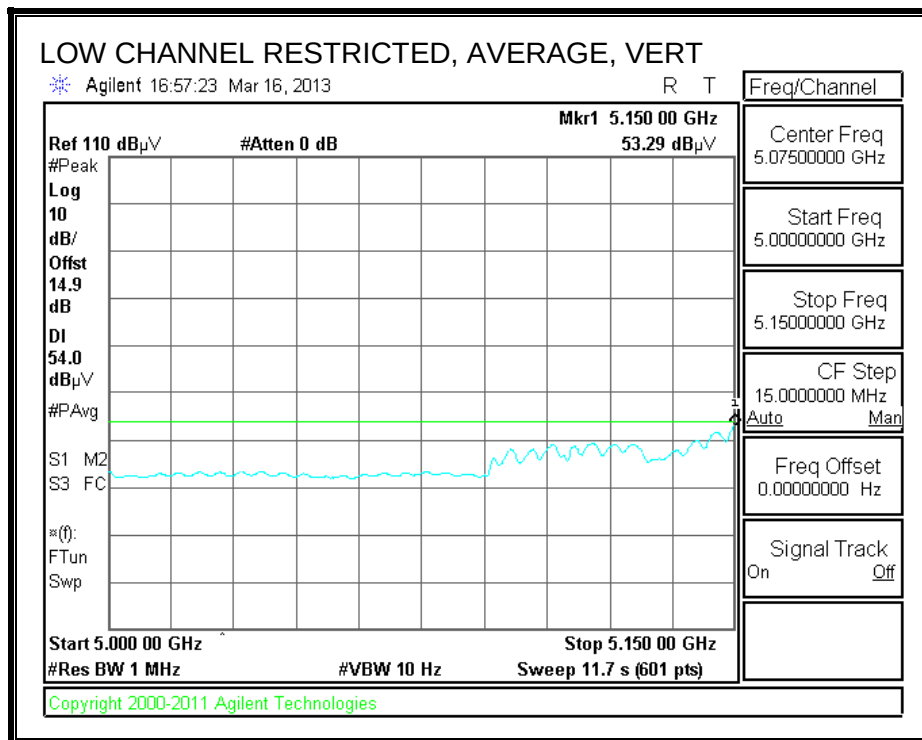
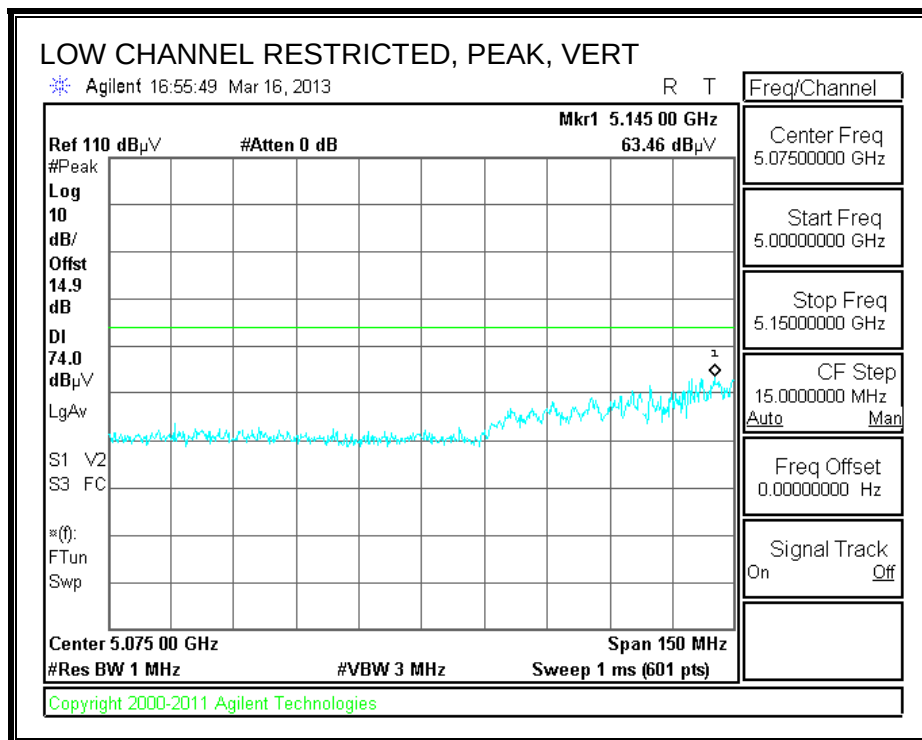
Note: No other emissions were detected above the system noise floor.

## 9.2.4. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)







# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

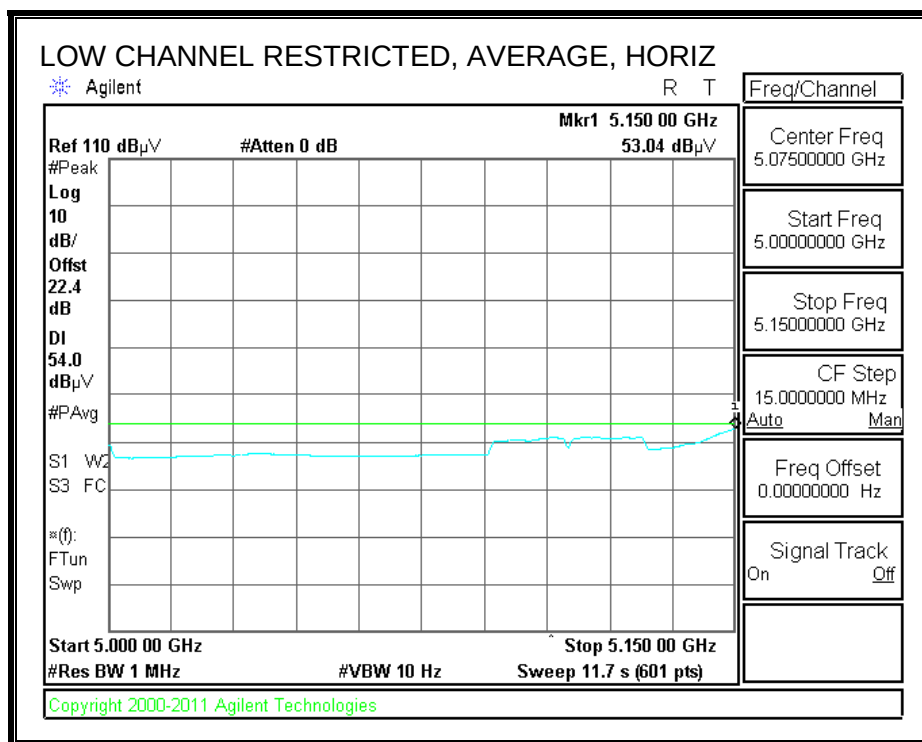
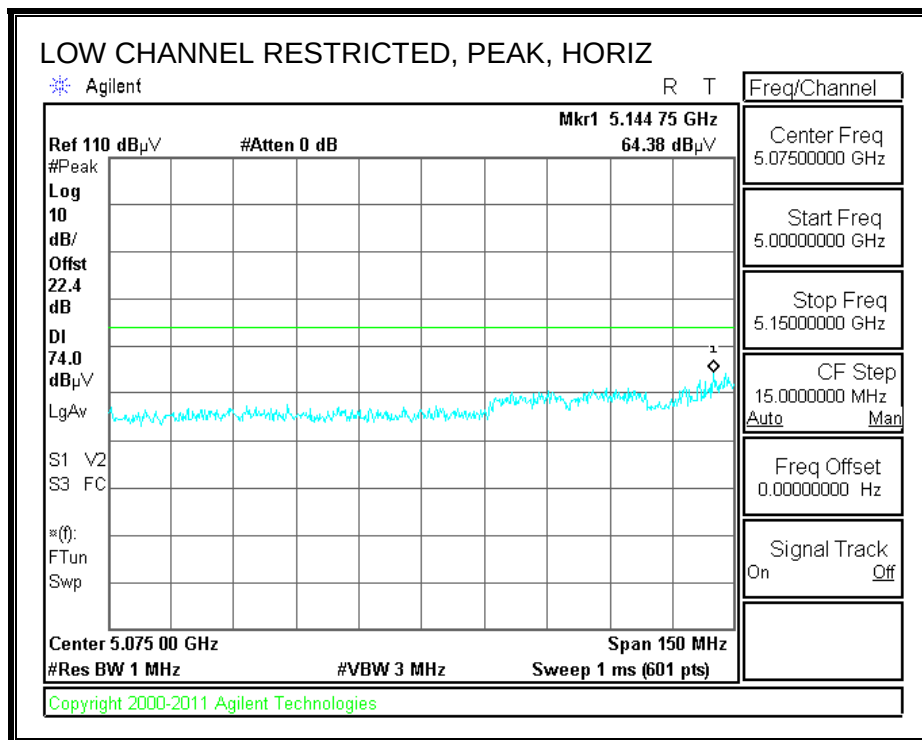
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5190 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.570                  | 3.0         | 33.5         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 54.2            | 74.0            | -19.8        | V                | P               |       |
| 15.570                  | 3.0         | 23.4         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | V                | A               |       |
| 15.570                  | 3.0         | 32.9         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.570                  | 3.0         | 23.1         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 43.9            | 54.0            | -10.1        | H                | A               |       |
| <b>5230 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.690                  | 3.0         | 34.1         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.5            | 74.0            | -19.5        | H                | P               |       |
| 15.690                  | 3.0         | 23.8         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | H                | A               |       |
| 15.690                  | 3.0         | 33.6         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.690                  | 3.0         | 23.7         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.1            | 54.0            | -9.9         | V                | A               |       |

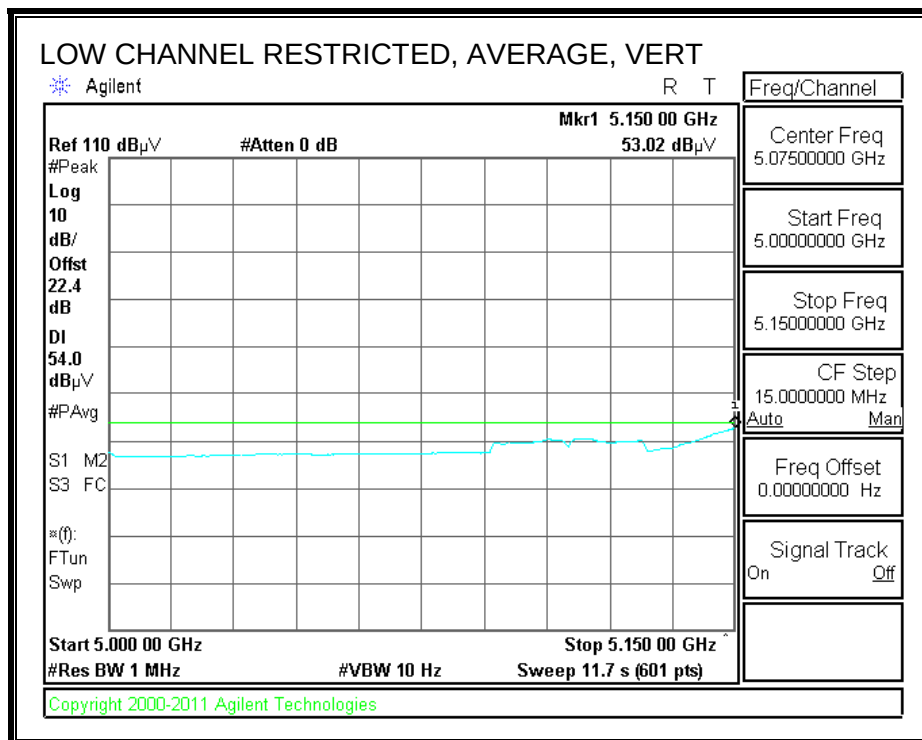
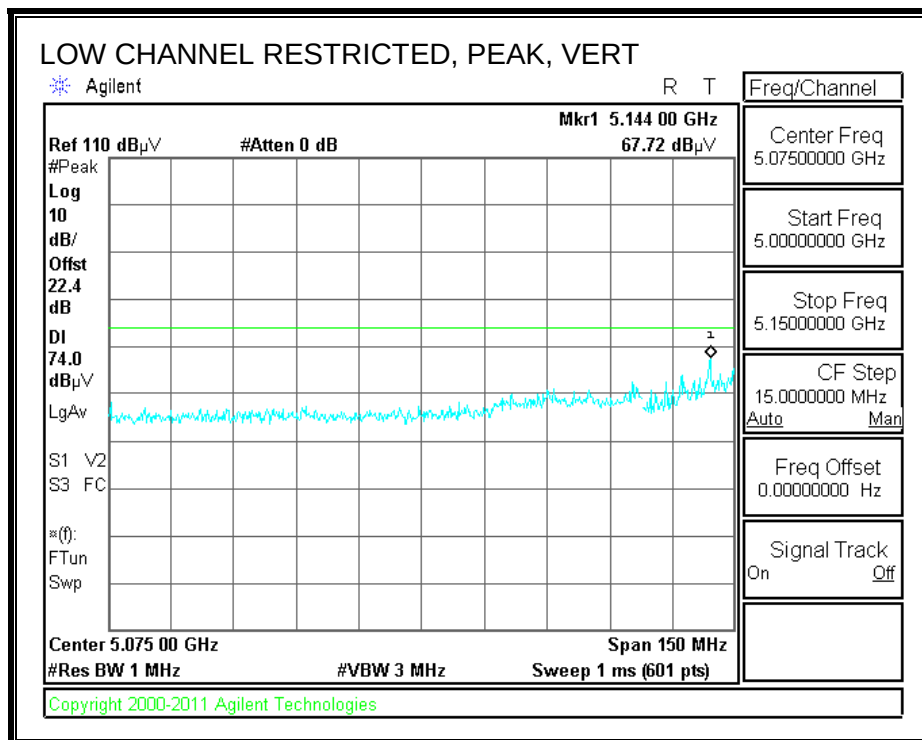
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

## 9.2.5. TX ABOVE 1 GHz, 802.11n HT40 CDD 2TX MODE, 5.2 GHz BAND

### RESTRICTED BANEDGE (LOW CHANNEL)







# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

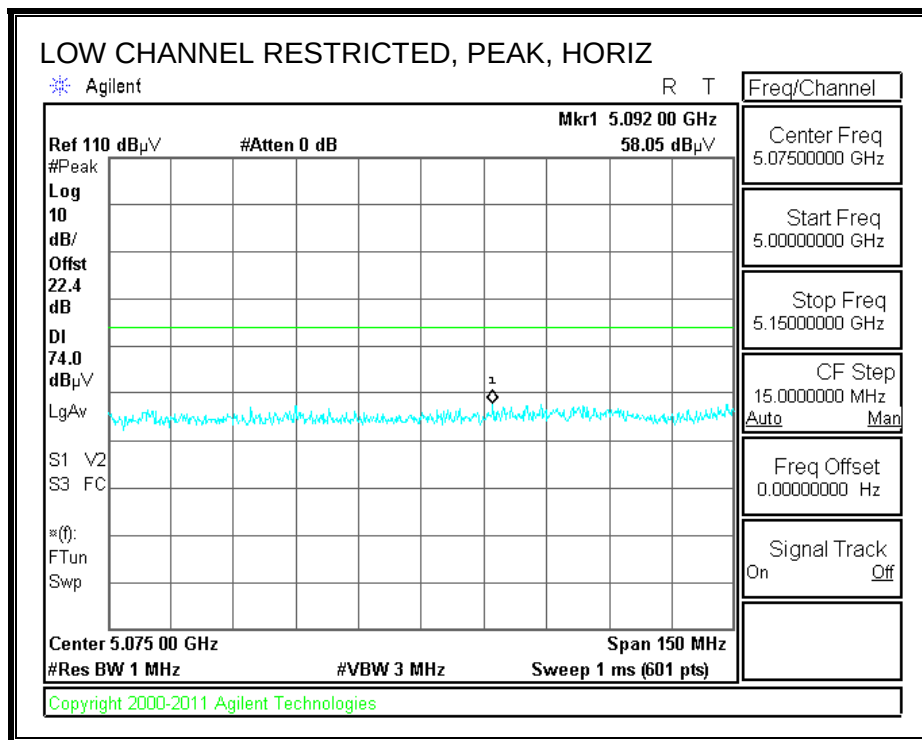
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5190 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.570                  | 3.0         | 33.5         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 54.2            | 74.0            | -19.8        | V                | P               |       |
| 15.570                  | 3.0         | 23.4         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | V                | A               |       |
| 15.570                  | 3.0         | 32.9         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.570                  | 3.0         | 23.1         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 43.9            | 54.0            | -10.1        | H                | A               |       |
| <b>5230 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.690                  | 3.0         | 34.1         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.5            | 74.0            | -19.5        | H                | P               |       |
| 15.690                  | 3.0         | 23.8         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | H                | A               |       |
| 15.690                  | 3.0         | 33.6         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.690                  | 3.0         | 23.7         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.1            | 54.0            | -9.9         | V                | A               |       |

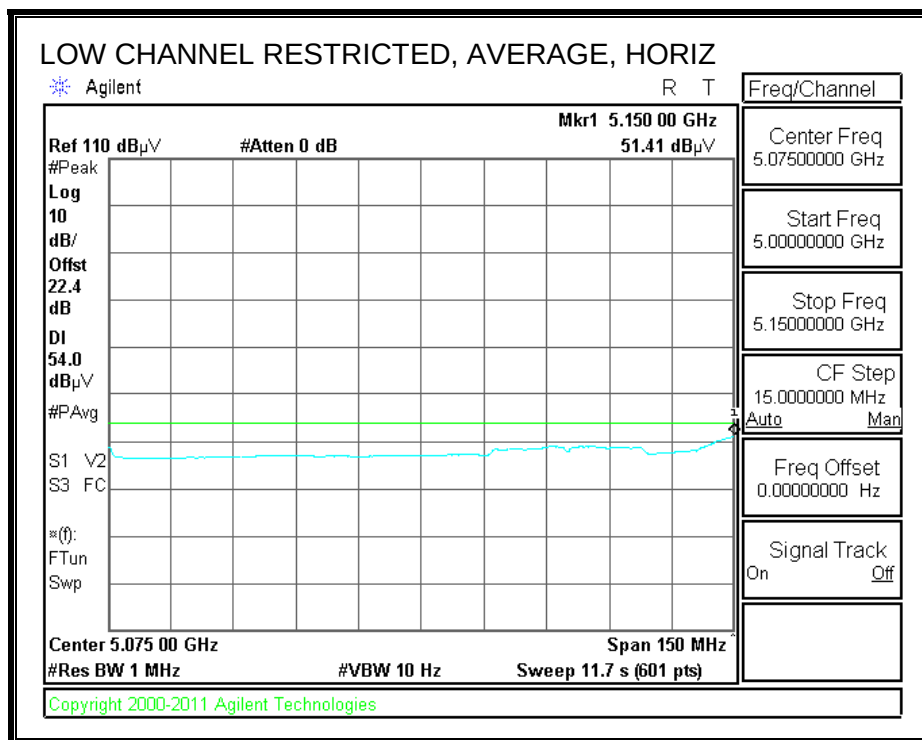
Rev. 4.1.2.7

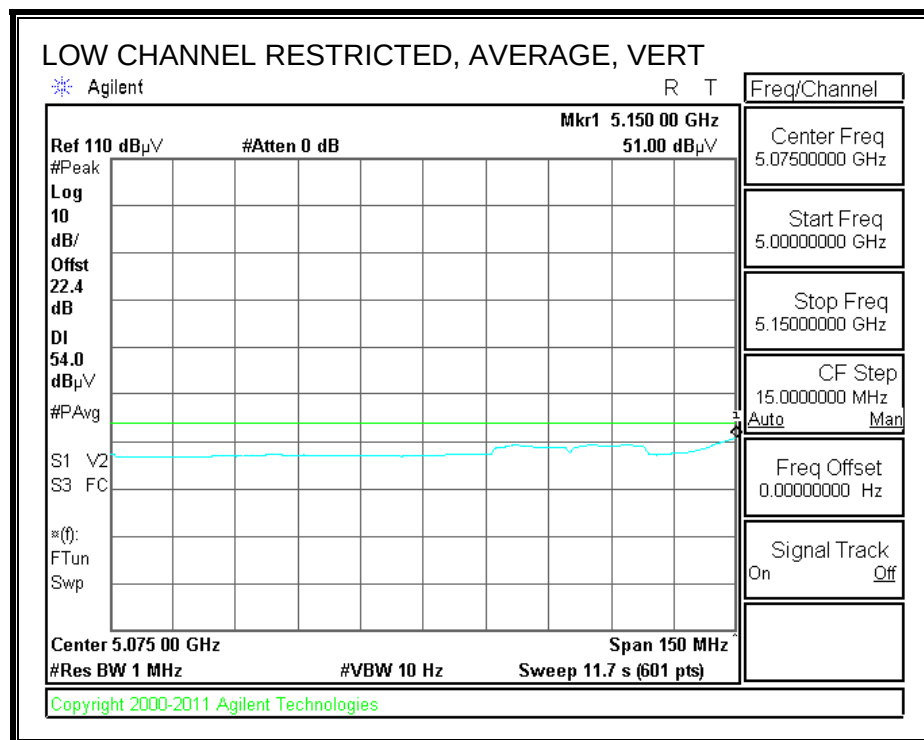
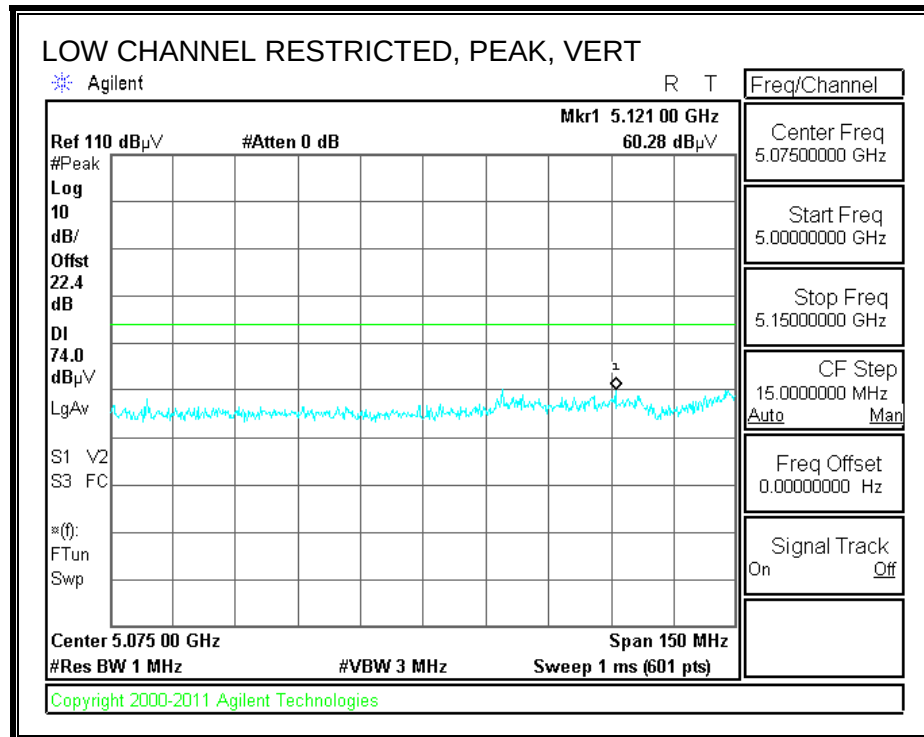
Note: No other emissions were detected above the system noise floor.

## 9.2.6. TX ABOVE 1 GHz, 802.11n HT40 CDD 3TX MODE, 5.2 GHz BAND

### RESTRICTED BANEDGE (LOW CHANNEL)







# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT40 3TX CDD

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

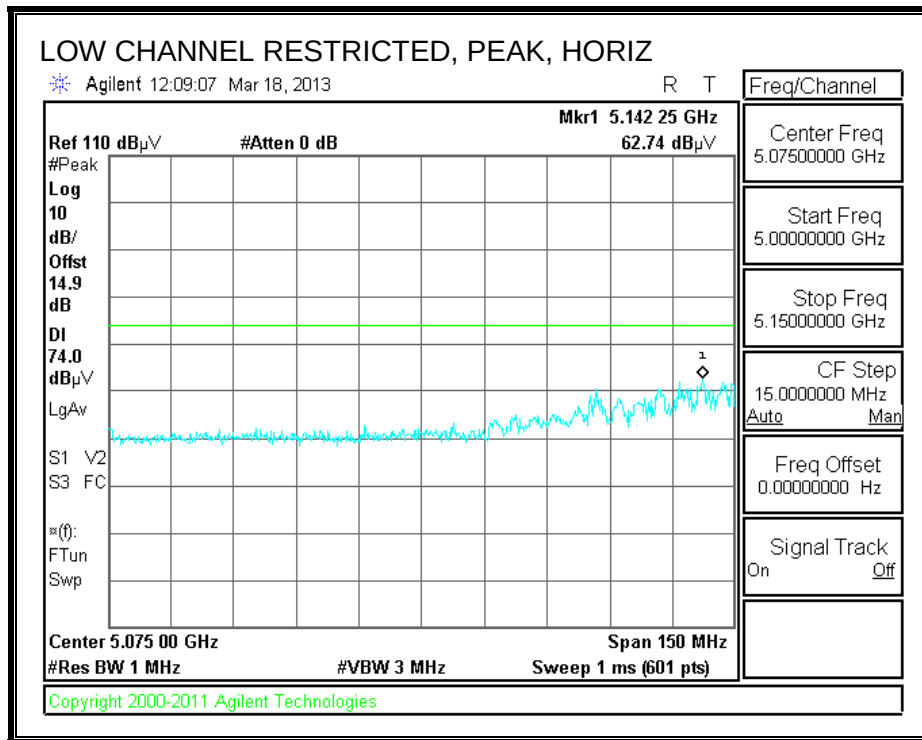
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5190 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.570                  | 3.0         | 33.5         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 54.2            | 74.0            | -19.8        | V                | P               |       |
| 15.570                  | 3.0         | 23.4         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | V                | A               |       |
| 15.570                  | 3.0         | 32.9         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 53.6            | 74.0            | -20.4        | H                | P               |       |
| 15.570                  | 3.0         | 23.1         | 38.9       | 13.0     | -31.9     | 0.0          | 0.7        | 43.9            | 54.0            | -10.1        | H                | A               |       |
| <b>5230 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.690                  | 3.0         | 34.1         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.5            | 74.0            | -19.5        | H                | P               |       |
| 15.690                  | 3.0         | 23.8         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.2            | 54.0            | -9.8         | H                | A               |       |
| 15.690                  | 3.0         | 33.6         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 54.0            | 74.0            | -20.0        | V                | P               |       |
| 15.690                  | 3.0         | 23.7         | 38.5       | 13.0     | -31.9     | 0.0          | 0.7        | 44.1            | 54.0            | -9.9         | V                | A               |       |

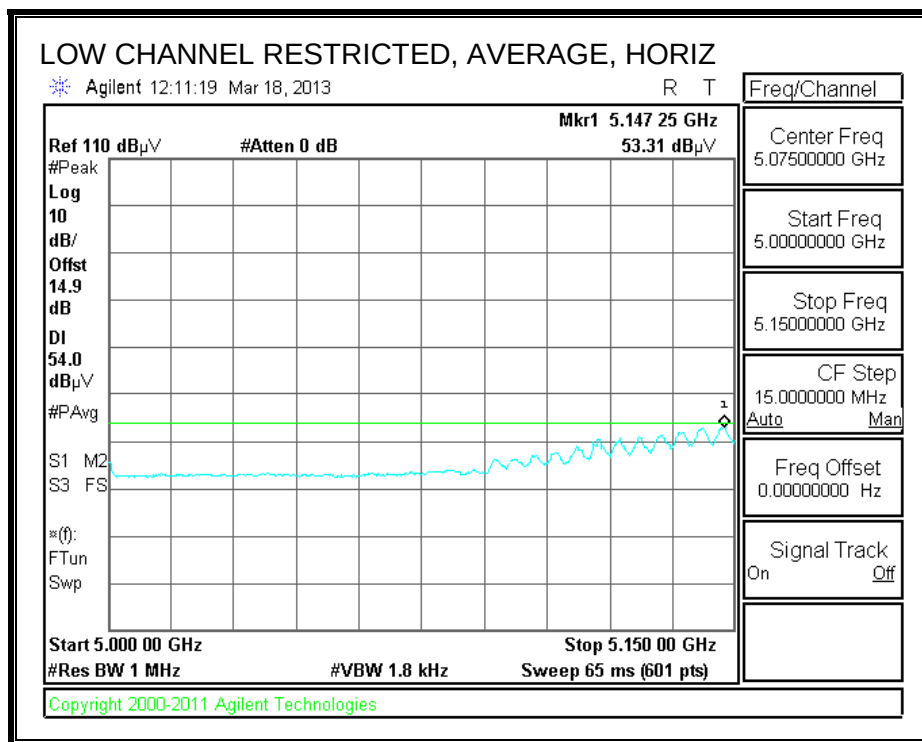
Rev. 4.1.2.7

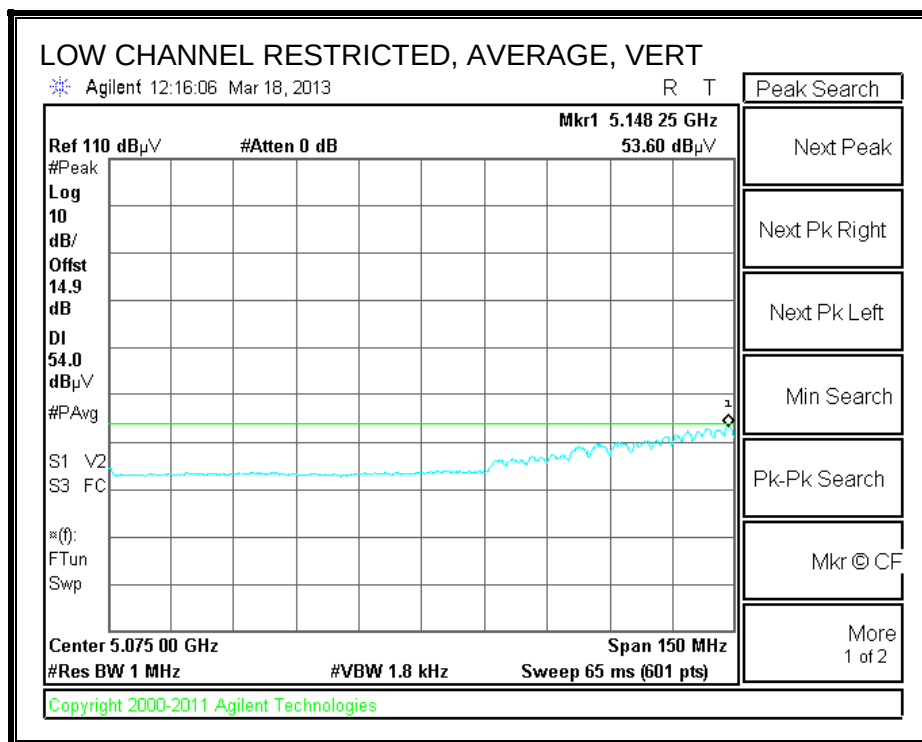
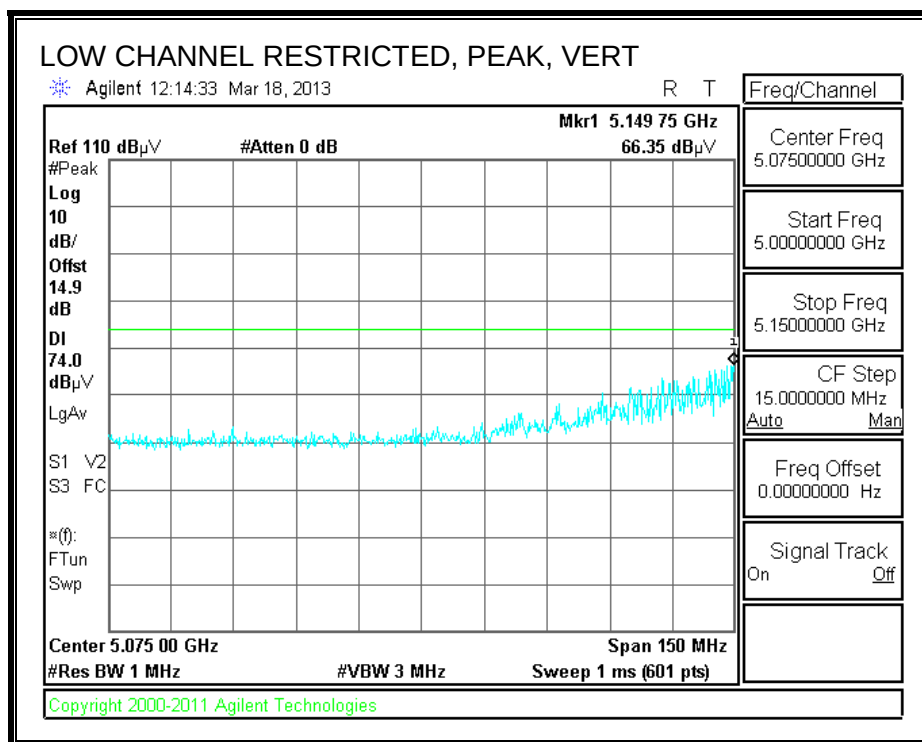
Note: No other emissions were detected above the system noise floor.

## 9.2.7. TX ABOVE 1 GHz, 802.11ac VHT80 1TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)









# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

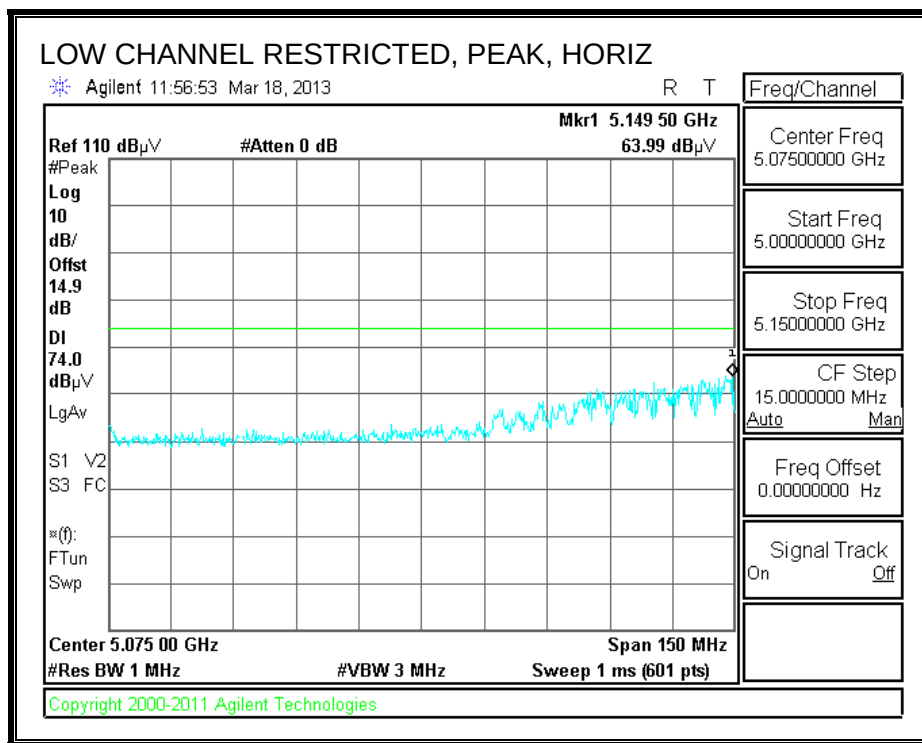
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5210 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630                  | 3.0         | 34.1         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.6            | 74.0            | -19.4        | V                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | V                | A               |       |
| 15.630                  | 3.0         | 33.5         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.1            | 74.0            | -19.9        | H                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| <b>5290 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630                  | 3.0         | 32.9         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.5            | 74.0            | -20.5        | H                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| 15.630                  | 3.0         | 33.3         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | V                | P               |       |
| 15.630                  | 3.0         | 24.0         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.6            | 54.0            | -9.4         | V                | A               |       |
| <b>5530 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.060                  | 3.0         | 34.0         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 50.2            | 74.0            | -23.8        | V                | P               |       |
| 11.060                  | 3.0         | 27.3         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | V                | A               |       |
| 11.060                  | 3.0         | 33.5         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 49.7            | 74.0            | -24.3        | H                | P               |       |
| 11.060                  | 3.0         | 24.2         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 40.4            | 54.0            | -13.6        | H                | A               |       |
| <b>5690 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.380                  | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | H                | P               |       |
| 11.380                  | 3.0         | 23.7         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 41.0            | 54.0            | -13.0        | H                | A               |       |
| 11.380                  | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | V                | P               |       |
| 11.380                  | 3.0         | 23.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 40.6            | 54.0            | -13.4        | V                | A               |       |

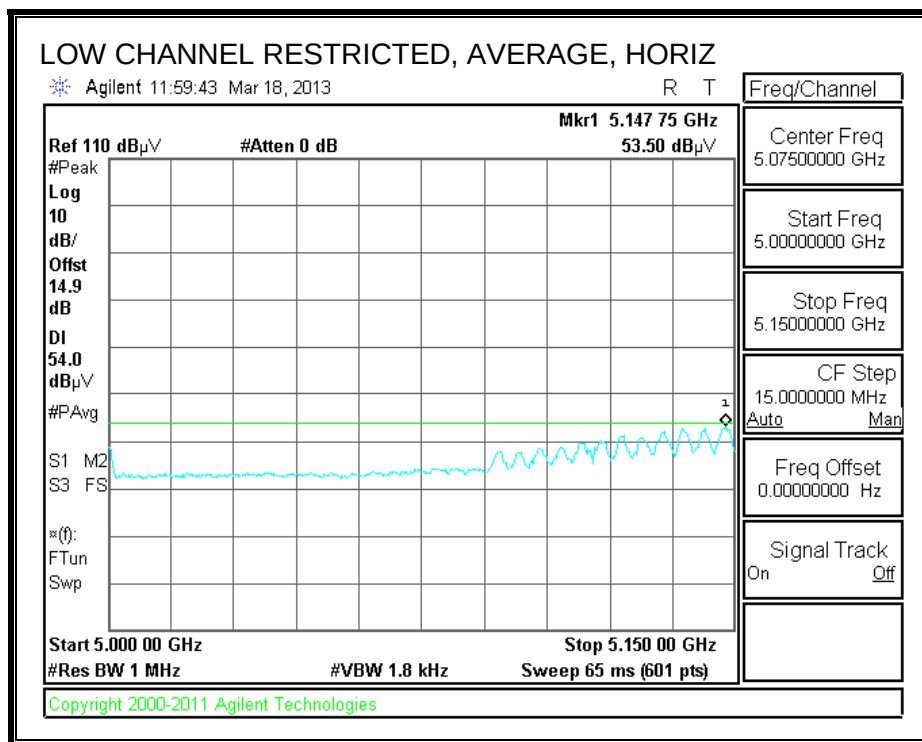
Rev. 4.1.2.7

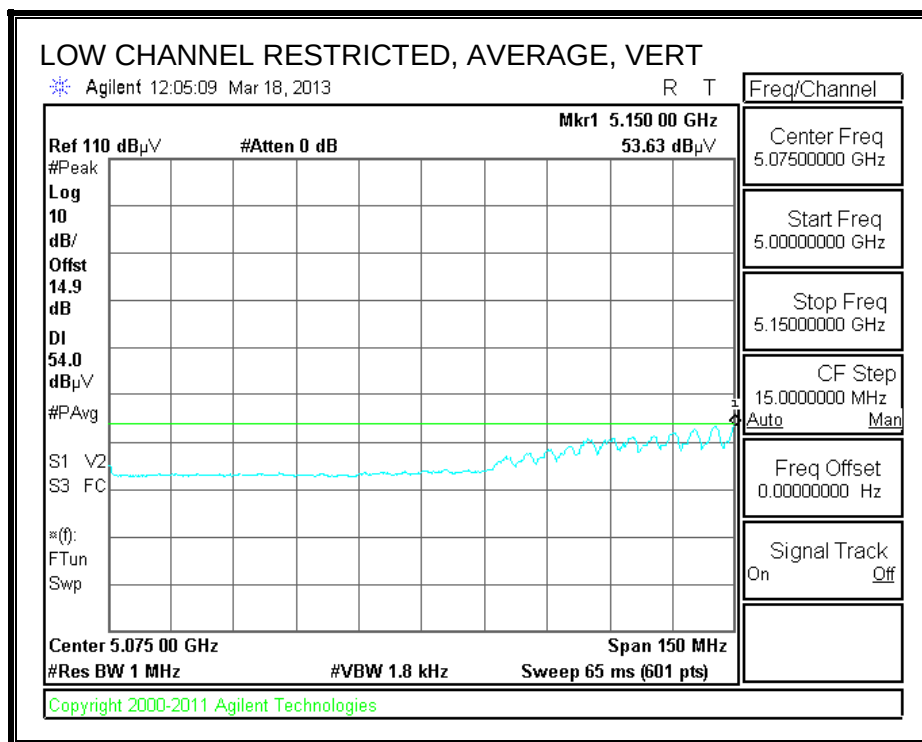
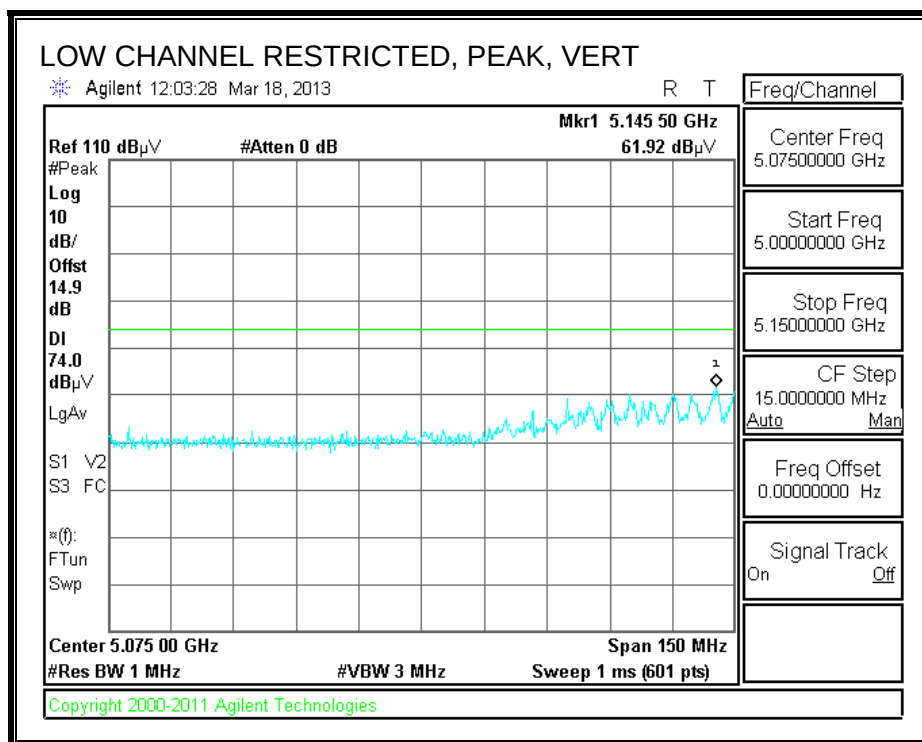
Note: No other emissions were detected above the system noise floor.

## 9.2.8. TX ABOVE 1 GHz, 802.11ac VHT80 2TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)







# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

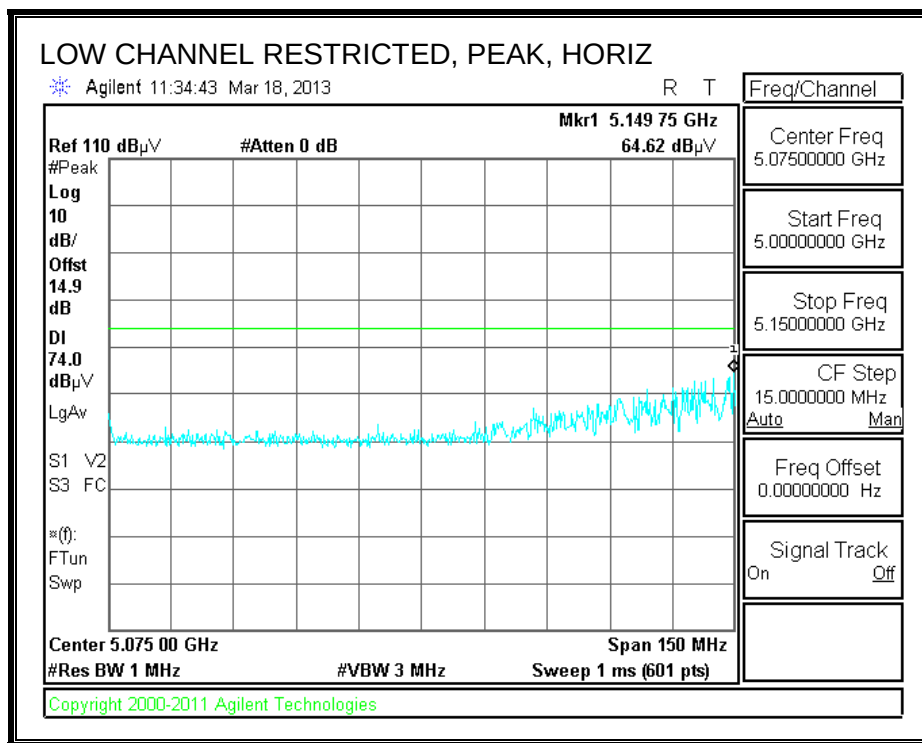
| f<br>GHz                | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|-------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| <b>5210 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630                  | 3.0         | 34.1         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.6            | 74.0            | -19.4        | V                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | V                | A               |       |
| 15.630                  | 3.0         | 33.5         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.1            | 74.0            | -19.9        | H                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| <b>5290 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630                  | 3.0         | 32.9         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.5            | 74.0            | -20.5        | H                | P               |       |
| 15.630                  | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| 15.630                  | 3.0         | 33.3         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | V                | P               |       |
| 15.630                  | 3.0         | 24.0         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.6            | 54.0            | -9.4         | V                | A               |       |
| <b>5530 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.060                  | 3.0         | 34.0         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 50.2            | 74.0            | -23.8        | V                | P               |       |
| 11.060                  | 3.0         | 27.3         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | V                | A               |       |
| 11.060                  | 3.0         | 33.5         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 49.7            | 74.0            | -24.3        | H                | P               |       |
| 11.060                  | 3.0         | 24.2         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 40.4            | 54.0            | -13.6        | H                | A               |       |
| <b>5690 MHz 3TX CDD</b> |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.380                  | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | H                | P               |       |
| 11.380                  | 3.0         | 23.7         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 41.0            | 54.0            | -13.0        | H                | A               |       |
| 11.380                  | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | V                | P               |       |
| 11.380                  | 3.0         | 23.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 40.6            | 54.0            | -13.4        | V                | A               |       |

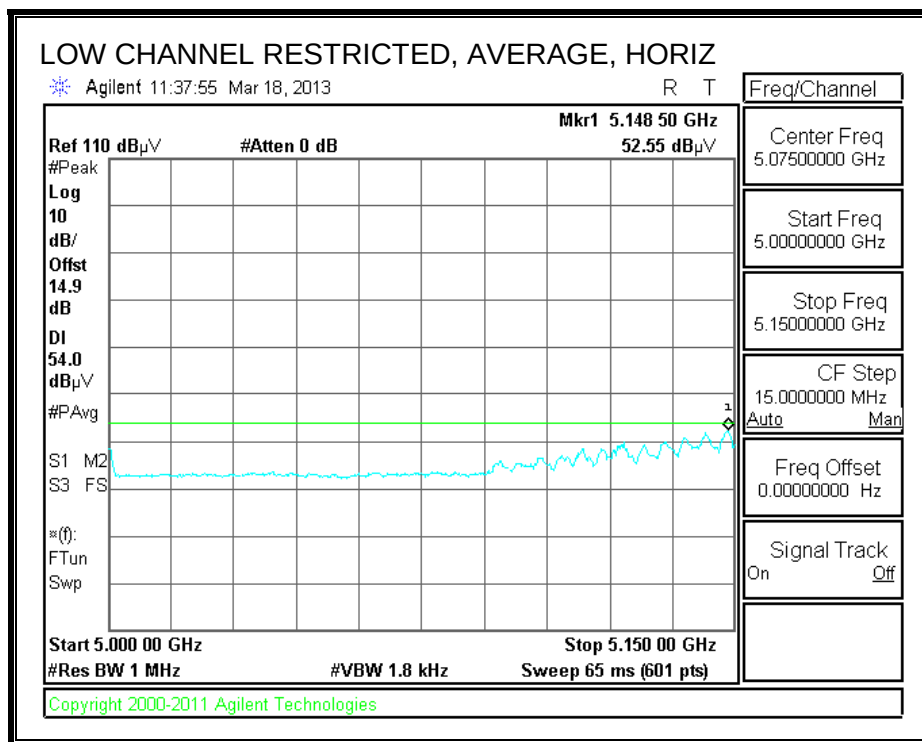
Rev. 4.1.2.7

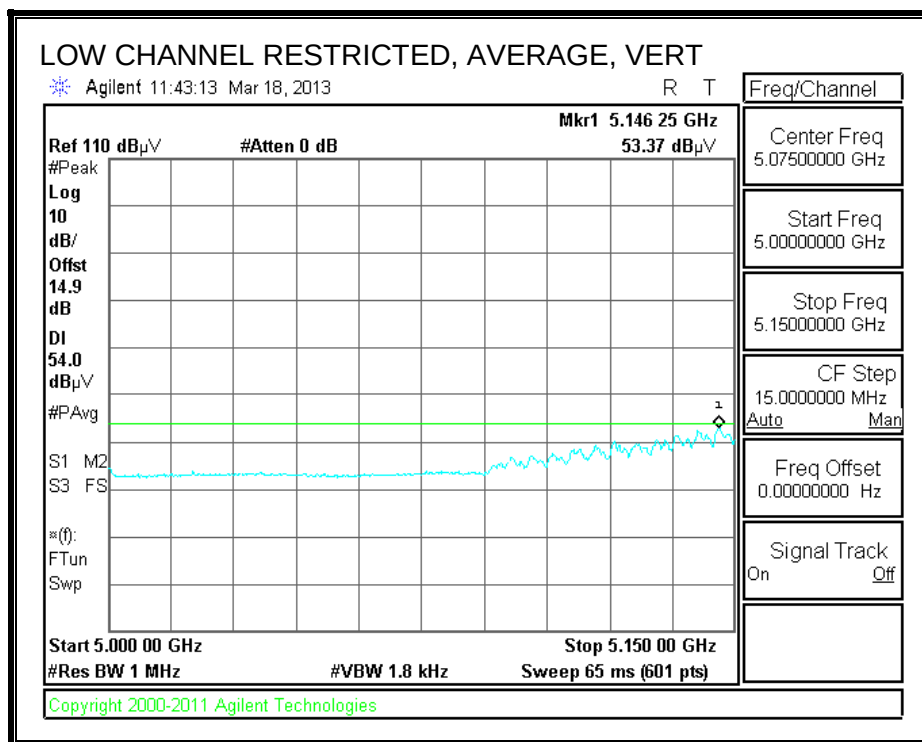
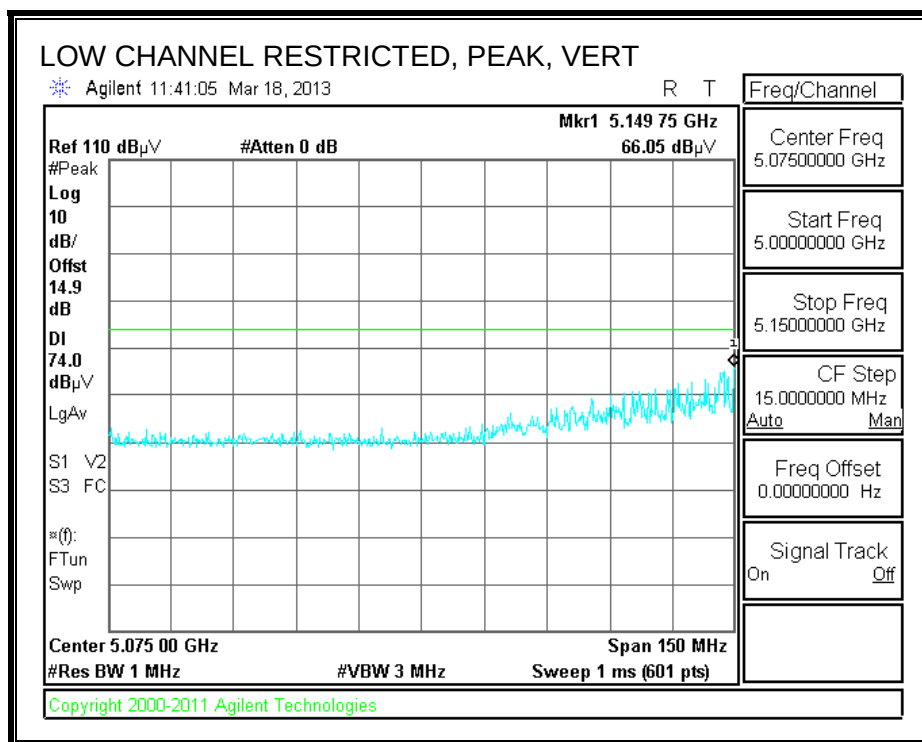
Note: No other emissions were detected above the system noise floor.

## 9.2.9. TX ABOVE 1 GHz, 802.11ac VHT80 3TX, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)









# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 02/20/13  
Project #: 12U14745  
Company: Apple Inc.  
Test Target: FCC Class B  
Mode Oper: HT80 3TX CDD CH42, CH58, CH106, CH138

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

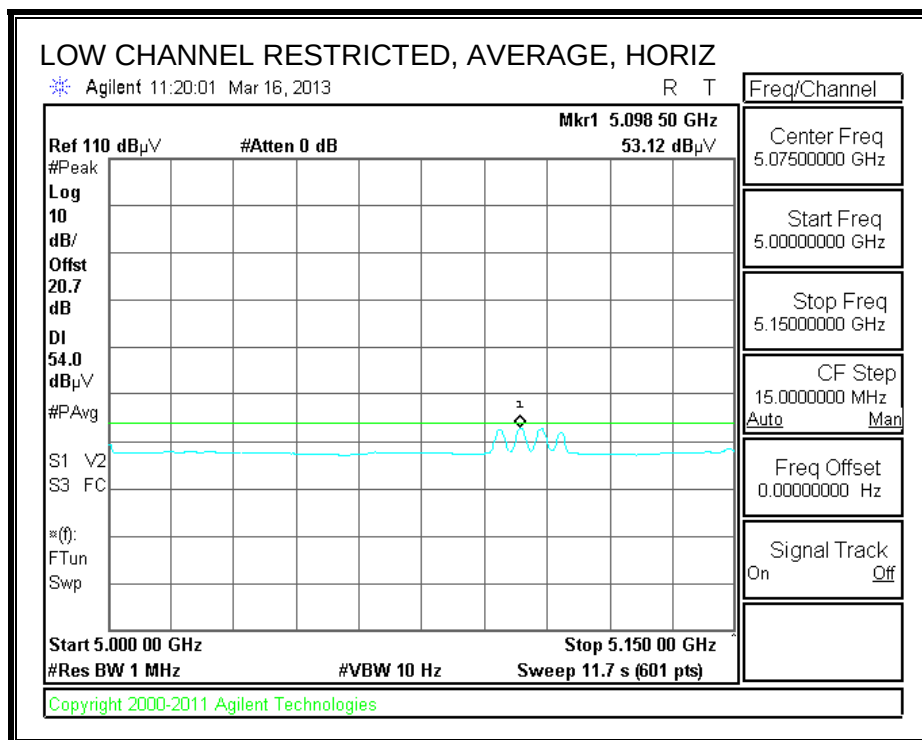
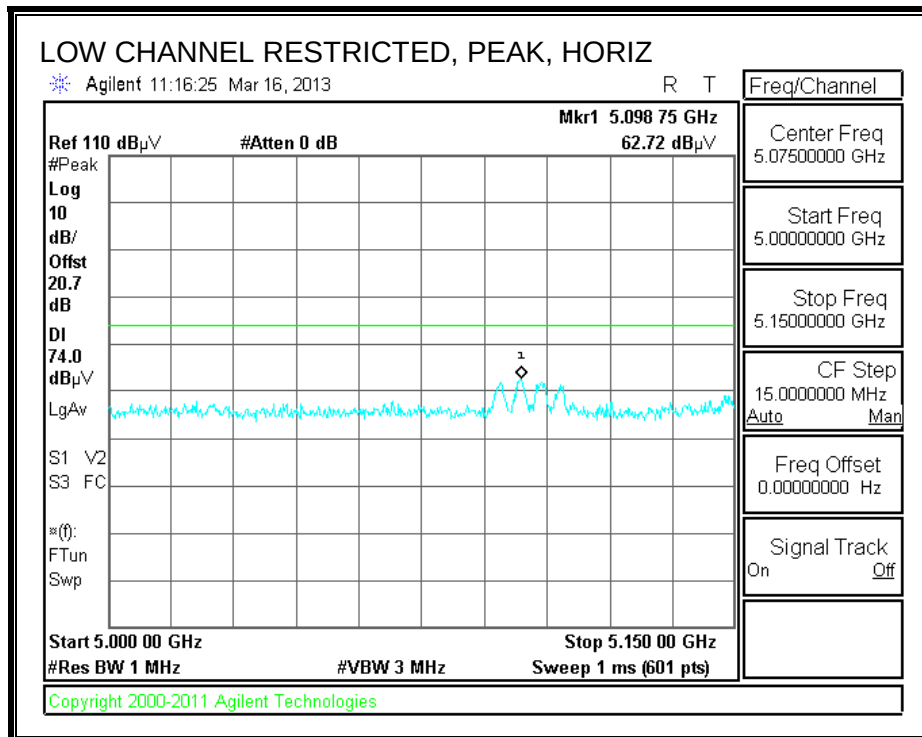
| f<br>GHz         | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fltr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/Q/P | Notes |
|------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|-----------------|-------|
| 5210 MHz 3TX CDD |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630           | 3.0         | 34.1         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.6            | 74.0            | -19.4        | V                | P               |       |
| 15.630           | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | V                | A               |       |
| 15.630           | 3.0         | 33.5         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 54.1            | 74.0            | -19.9        | H                | P               |       |
| 15.630           | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| 5290 MHz 3TX CDD |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 15.630           | 3.0         | 32.9         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.5            | 74.0            | -20.5        | H                | P               |       |
| 15.630           | 3.0         | 23.7         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.3            | 54.0            | -9.7         | H                | A               |       |
| 15.630           | 3.0         | 33.3         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 53.8            | 74.0            | -20.2        | V                | P               |       |
| 15.630           | 3.0         | 24.0         | 38.7       | 13.0     | -31.9     | 0.0          | 0.7        | 44.6            | 54.0            | -9.4         | V                | A               |       |
| 5530 MHz 3TX CDD |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.060           | 3.0         | 34.0         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 50.2            | 74.0            | -23.8        | V                | P               |       |
| 11.060           | 3.0         | 27.3         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 43.5            | 54.0            | -10.5        | V                | A               |       |
| 11.060           | 3.0         | 33.5         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 49.7            | 74.0            | -24.3        | H                | P               |       |
| 11.060           | 3.0         | 24.2         | 38.4       | 10.6     | -33.5     | 0.0          | 0.7        | 40.4            | 54.0            | -13.6        | H                | A               |       |
| 5690 MHz 3TX CDD |             |              |            |          |           |              |            |                 |                 |              |                  |                 |       |
| 11.380           | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | H                | P               |       |
| 11.380           | 3.0         | 23.7         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 41.0            | 54.0            | -13.0        | H                | A               |       |
| 11.380           | 3.0         | 33.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 50.6            | 74.0            | -23.4        | V                | P               |       |
| 11.380           | 3.0         | 23.3         | 38.8       | 11.0     | -33.2     | 0.0          | 0.7        | 40.6            | 54.0            | -13.4        | V                | A               |       |

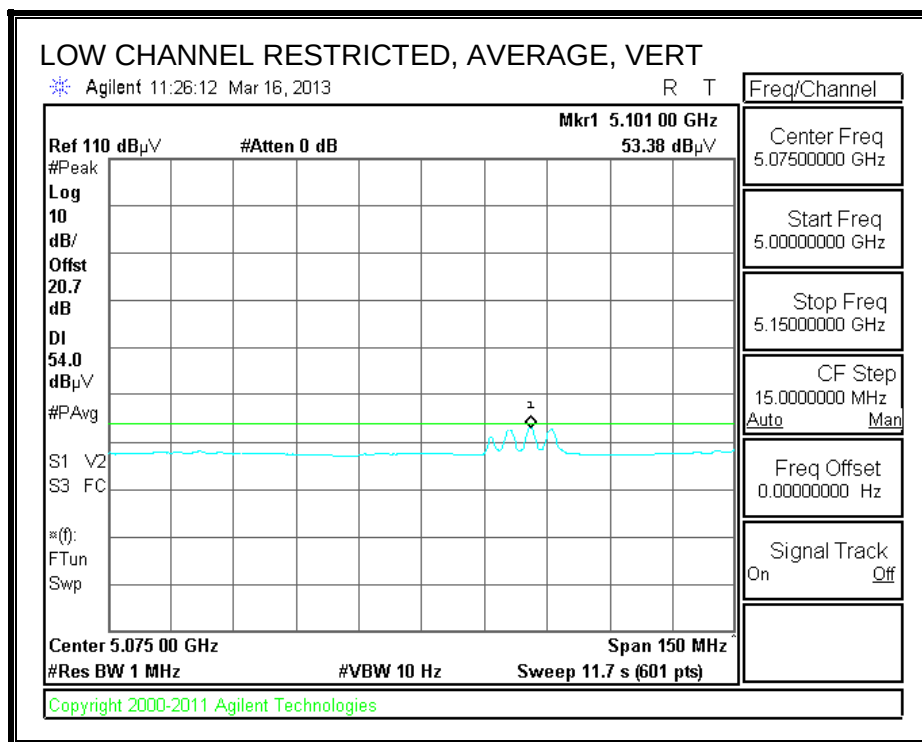
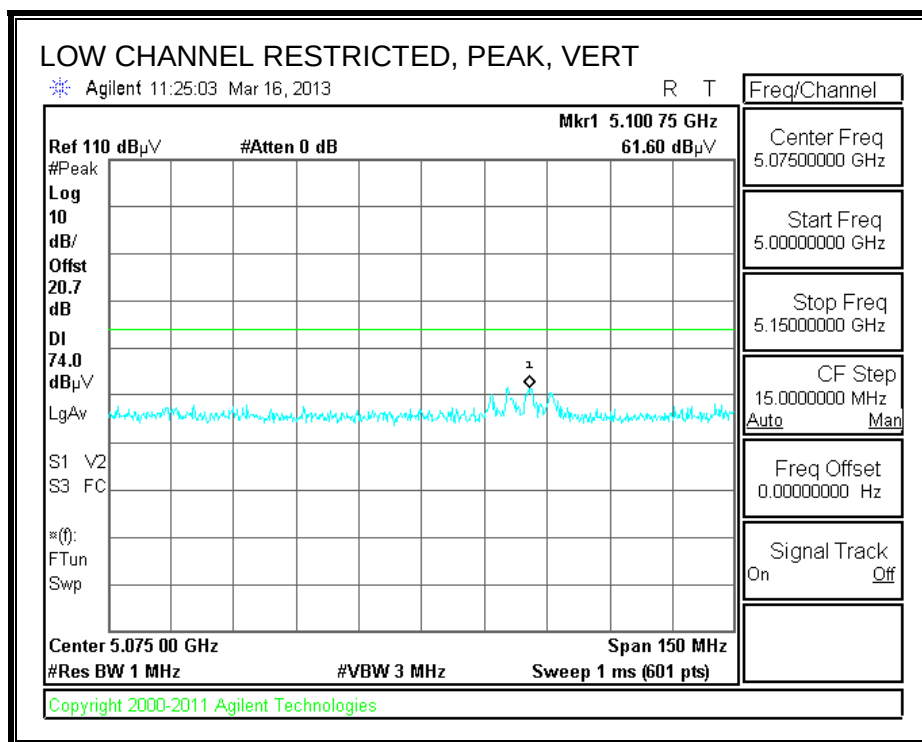
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

## 9.2.10. TX ABOVE 1 GHz, 802.11n HT20 BF 3TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)



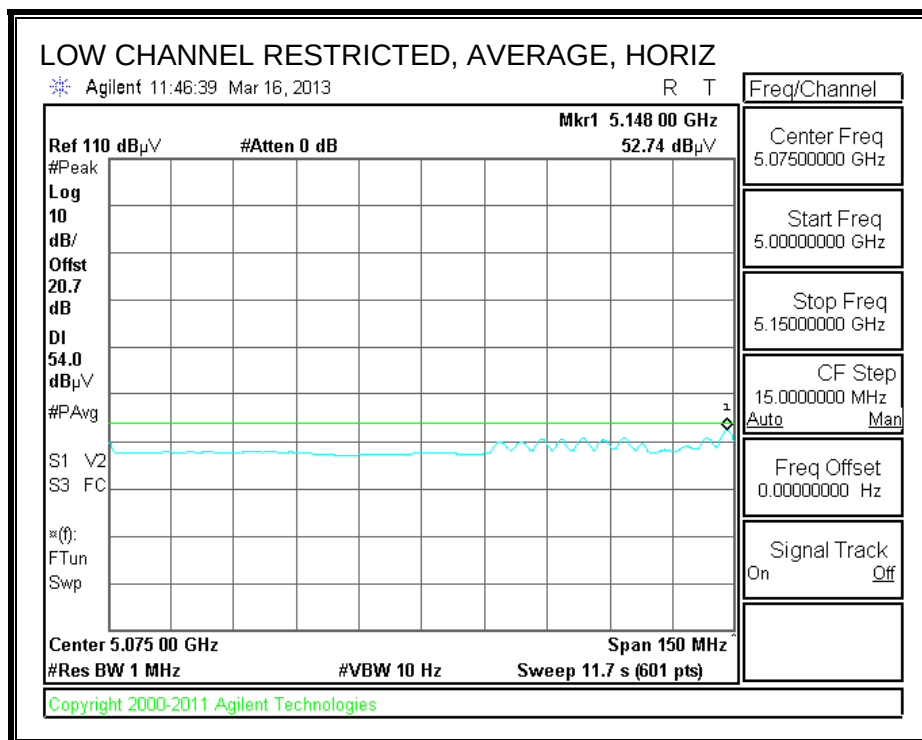
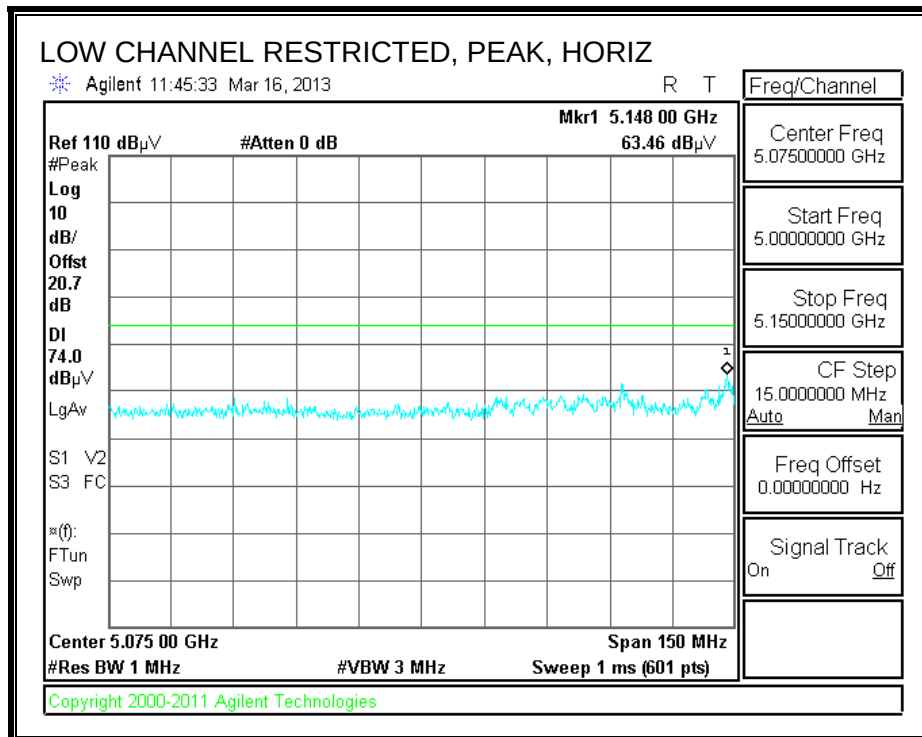


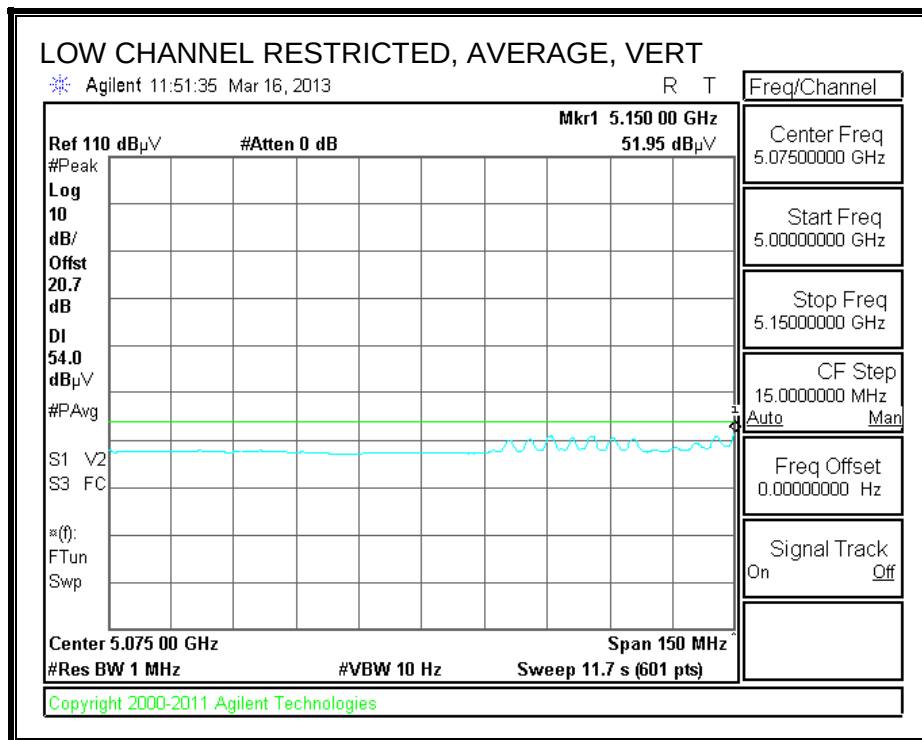
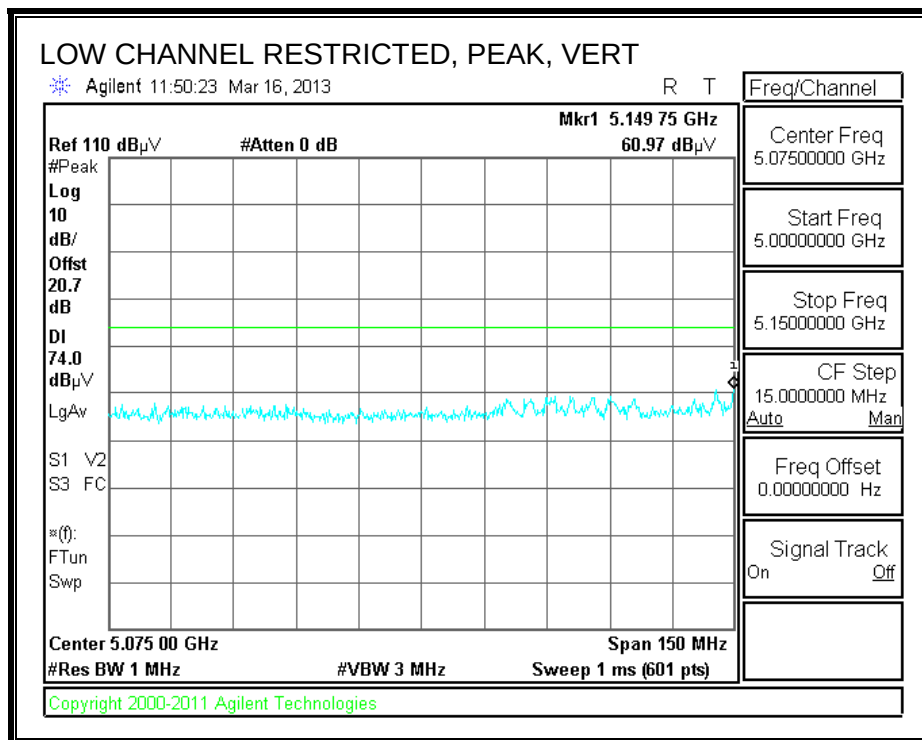
# HARMONICS AND SPURIOUS EMISSIONS

| <b>High Frequency Measurement</b><br>Compliance Certification Services, Fremont 5m Chamber-A                                                                                                     |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------|-------------------|-----------------------------------------------------|----------|-------------------------------------------------------|------------------------------|----------------------|----------------|------------------------------------------------------------------------------------------------|------------------|-------------------|--------------------------|---------------|----------------|-----------------------|--|
| <b>Company:</b> MENGISTU MEKURIA<br><b>Project #:</b> 03/17/13<br><b>Date:</b> 12U14745<br><b>Test Engineer:</b> Apple Inc.<br><b>Configuration:</b> FCC Class B<br><b>Mode:</b> HT20 3TX BF CDD |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| <b>Test Equipment:</b>                                                                                                                                                                           |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| <b>Horn 1-18GHz</b><br>T136; M/N: 3117 @3m                                                                                                                                                       |                       | <b>Pre-amplifier 1-26GHz</b><br>T145 Agilent 3008A0056 |                   | <b>Pre-amplifier 26-40GHz</b><br>T88 Miteq 26-40GHz |          | <b>Horn &gt; 18GHz</b><br>T39; ARA 18-26GHz; S/N:1013 |                              |                      |                | <b>Limit</b><br>FCC 15.205                                                                     |                  |                   |                          |               |                |                       |  |
| <b>Hi Frequency Cables</b>                                                                                                                                                                       |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| <b>3' cable 22807700</b><br>3' cable 22807700                                                                                                                                                    |                       | <b>12' cable 22807600</b><br>12' cable 22807600        |                   | <b>20' cable 22807500</b><br>20' cable 22807500     |          | <b>HPF</b><br>HPF_7.6GHz                              |                              | <b>Reject Filter</b> |                | <b>Peak Measurements</b><br>RBW=VBW=1MHz<br><b>Average Measurements</b><br>RBW=1MHz ; VBW=10Hz |                  |                   |                          |               |                |                       |  |
| f<br>GHz                                                                                                                                                                                         | Dist<br>(m)           | Read Pk<br>dBuV                                        | Read Avg.<br>dBuV | AF<br>dB/m                                          | CL<br>dB | Amp<br>dB                                             | D Corr<br>dB                 | Filtr<br>dB          | Peak<br>dBuV/m | Avg<br>dBuV/m                                                                                  | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB             | Avg Mar<br>dB | Notes<br>(V/H) |                       |  |
| Low Channel (5180 MHz)                                                                                                                                                                           |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| 15.540                                                                                                                                                                                           | 3.0                   | 35.2                                                   | 24.4              | 40.1                                                | 13.2     | -32.3                                                 | 0.0                          | 0.7                  | 57.0           | 46.2                                                                                           | 74               | 54                | -17.0                    | -7.8          | H              |                       |  |
| 15.540                                                                                                                                                                                           | 3.0                   | 35.1                                                   | 24.5              | 40.1                                                | 13.2     | -32.3                                                 | 0.0                          | 0.7                  | 56.8           | 46.2                                                                                           | 74               | 54                | -17.2                    | -7.8          | V              |                       |  |
| Mid Channel (5200 MHz)                                                                                                                                                                           |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| 15.600                                                                                                                                                                                           | 3.0                   | 35.1                                                   | 24.6              | 40.1                                                | 13.3     | -32.3                                                 | 0.0                          | 0.7                  | 56.9           | 46.4                                                                                           | 74               | 54                | -17.1                    | -7.6          | H              |                       |  |
| 15.600                                                                                                                                                                                           | 3.0                   | 35.1                                                   | 24.6              | 40.1                                                | 13.3     | -32.3                                                 | 0.0                          | 0.7                  | 56.9           | 46.4                                                                                           | 74               | 54                | -17.1                    | -7.6          | V              |                       |  |
| Hi Channel (5240 MHz)                                                                                                                                                                            |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| 15.720                                                                                                                                                                                           | 3.0                   | 36.1                                                   | 24.8              | 40.1                                                | 13.3     | -32.2                                                 | 0.0                          | 0.7                  | 58.1           | 46.7                                                                                           | 74               | 54                | -15.9                    | -7.3          | H              |                       |  |
| 15.720                                                                                                                                                                                           | 3.0                   | 35.8                                                   | 24.8              | 40.1                                                | 13.3     | -32.2                                                 | 0.0                          | 0.7                  | 57.7           | 46.7                                                                                           | 74               | 54                | -16.3                    | -7.3          | V              |                       |  |
| Rev. 01.30.13                                                                                                                                                                                    |                       |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| f                                                                                                                                                                                                | Measurement Frequency |                                                        | Amp               | Preamp Gain                                         |          | Avg Lim                                               | Average Field Strength Limit |                      | Pk Lim         | Peak Field Strength Limit                                                                      |                  | Avg Mar           | Margin vs. Average Limit |               | Pk Mar         | Margin vs. Peak Limit |  |
| Dist                                                                                                                                                                                             | Distance to Antenna   |                                                        | D Corr            | Distance Correct to 3 meters                        |          | Avg                                                   | Average Field Strength @ 3 m |                      | Peak           | Calculated Peak Field Strength                                                                 |                  | HPF               | High Pass Filter         |               |                |                       |  |
| Read                                                                                                                                                                                             | Analyzer Reading      |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| AF                                                                                                                                                                                               | Antenna Factor        |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |
| CL                                                                                                                                                                                               | Cable Loss            |                                                        |                   |                                                     |          |                                                       |                              |                      |                |                                                                                                |                  |                   |                          |               |                |                       |  |

## 9.2.11. TX ABOVE 1 GHz, 802.11n HT40 BF 3TX MODE, 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL)





# HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber-A

Company:

MENGISTU MEKURIA

Project #:

03/17/13

Date:

12U14745

Test Engineer:

Apple Inc.

Configuration:

FCC Class B

Mode:

HT40 3TX BF CDD

Test Equipment:

Horn 1-18GHz

Pre-amplifier 1-26GHz

Pre-amplifier 26-40GHz

Horn > 18GHz

Limit

T136; M/N: 3117 @3m

T145 Agilent 3008A0056

T88 Miteq 26-40GHz

T39; ARA 18-26GHz; S/N:1013

FCC 15.205

Hi Frequency Cables

3' cable 22807700

12' cable 22807600

20' cable 22807500

3' cable 22807700

12' cable 22807600

20' cable 22807500

HPF

Reject Filter

HPF\_7.6GHz

Peak Measurements

RBW=VBW=1MHz

Average Measurements

RBW=1MHz ; VBW=10Hz

| f<br>GHz               | Dist<br>(m) | Read Pk<br>dBuV | Read Avg.<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Filtr<br>dB | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes<br>(V/H) |
|------------------------|-------------|-----------------|-------------------|------------|----------|-----------|--------------|-------------|----------------|---------------|------------------|-------------------|--------------|---------------|----------------|
| Low Channel (5190 MHz) |             |                 |                   |            |          |           |              |             |                |               |                  |                   |              |               |                |
| 15.570                 | 3.0         | 35.1            | 24.5              | 40.1       | 13.2     | -32.3     | 0.0          | 0.7         | 56.9           | 46.3          | 74               | 54                | -17.1        | -7.7          | H              |
| 15.570                 | 3.0         | 35.2            | 24.5              | 40.1       | 13.2     | -32.3     | 0.0          | 0.7         | 57.0           | 46.3          | 74               | 54                | -17.0        | -7.7          | V              |
| Hi Channel (5230 MHz)  |             |                 |                   |            |          |           |              |             |                |               |                  |                   |              |               |                |
| 15.690                 | 3.0         | 35.9            | 24.8              | 40.1       | 13.3     | -32.3     | 0.0          | 0.7         | 57.8           | 46.7          | 74               | 54                | -16.2        | -7.3          | H              |
| 15.690                 | 3.0         | 35.0            | 24.8              | 40.1       | 13.3     | -32.3     | 0.0          | 0.7         | 56.9           | 46.7          | 74               | 54                | -17.1        | -7.3          | V              |

Rev. 01.30.13

f

Measurement Frequency

Amp

Preamp Gain

Avg Lim

Average Field Strength Limit

Dist

Distance to Antenna

D Corr

Distance Correct to 3 meters

Pk Lim

Peak Field Strength Limit

Read

Analyzer Reading

Avg

Average Field Strength @ 3 m

Avg Mar

Margin vs. Average Limit

AF

Antenna Factor

Peak

Calculated Peak Field Strength

Pk Mar

Margin vs. Peak Limit

CL

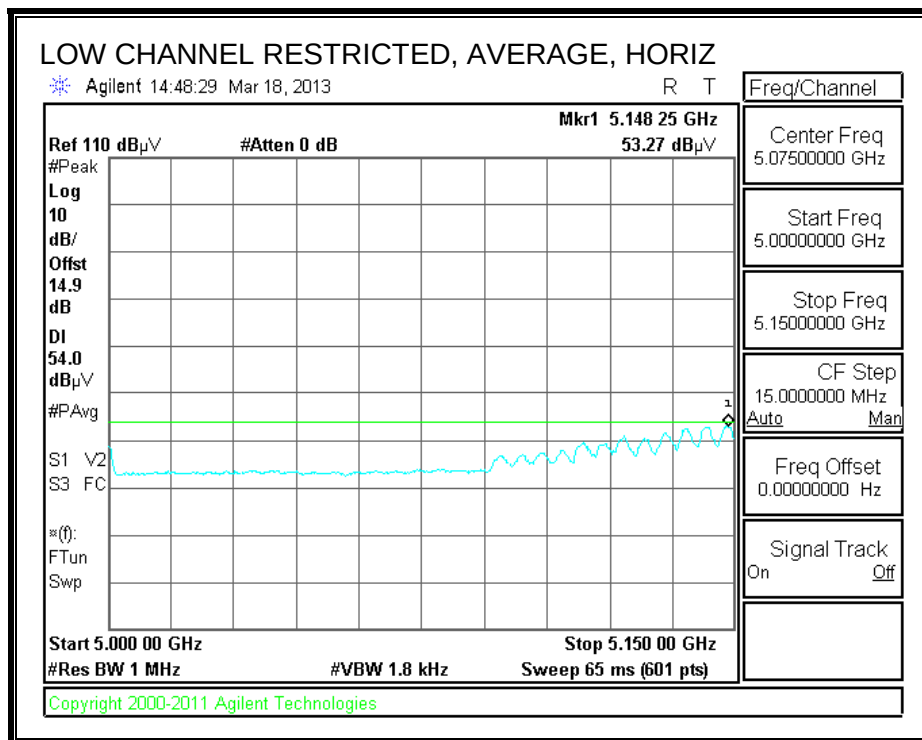
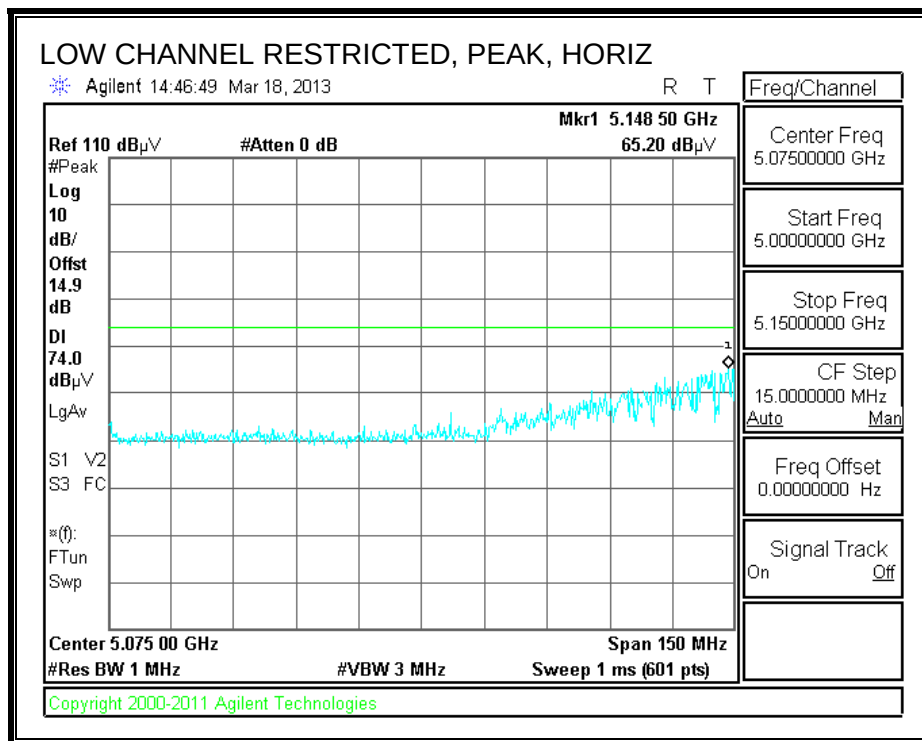
Cable Loss

HPF

High Pass Filter

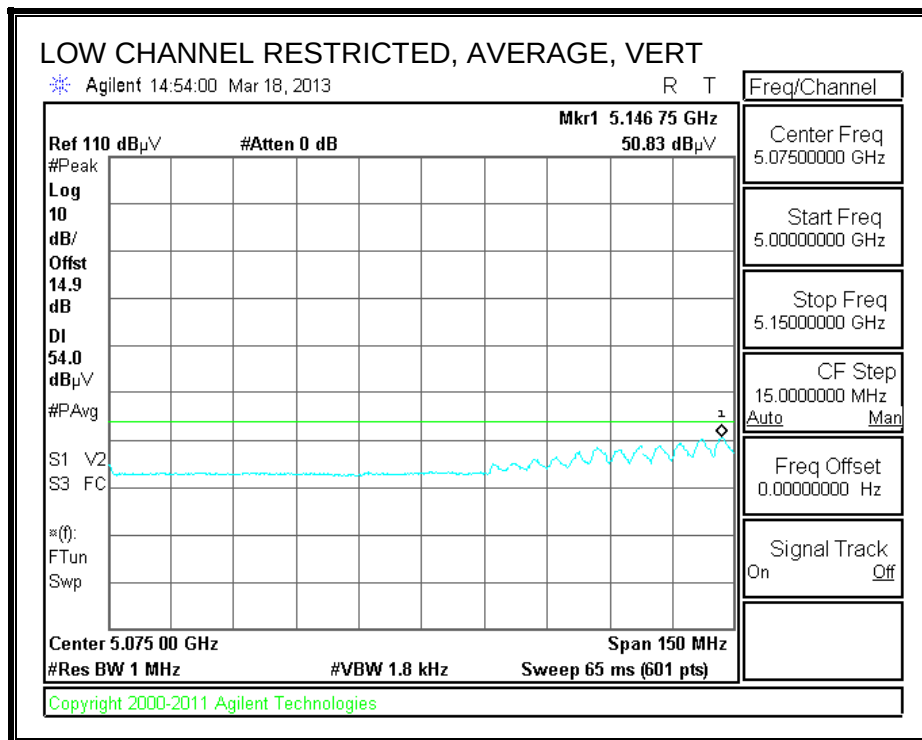
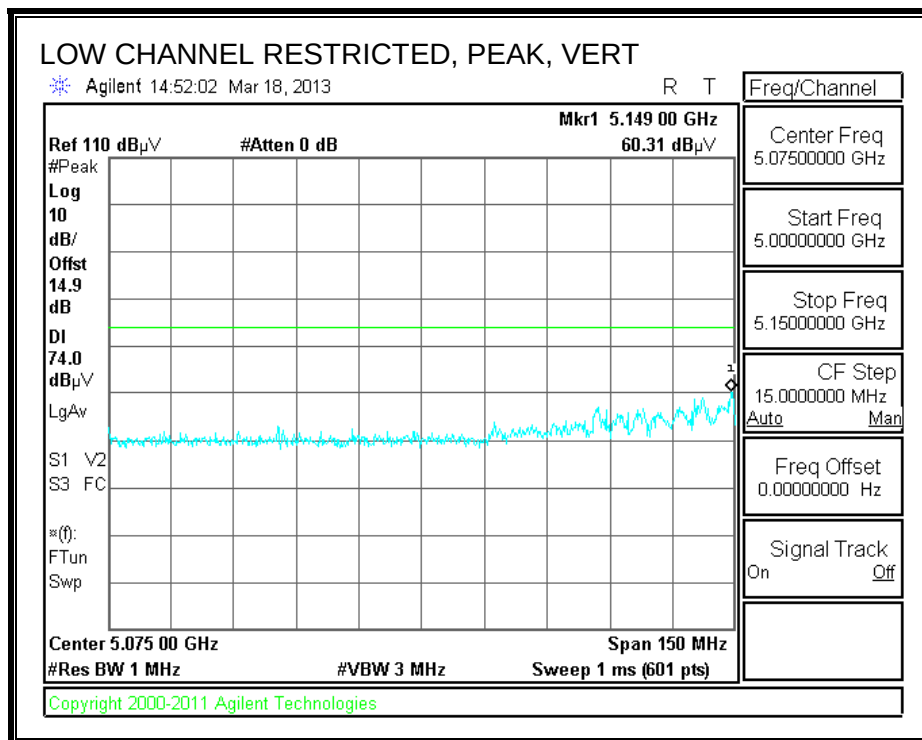
## 9.2.12. TX ABOVE 1 GHz, 802.11ac VHT80 BF 2TX MODE, 5.2 GHz BAND

### RESTRICTED BANEDGE (LOW CHANNEL)







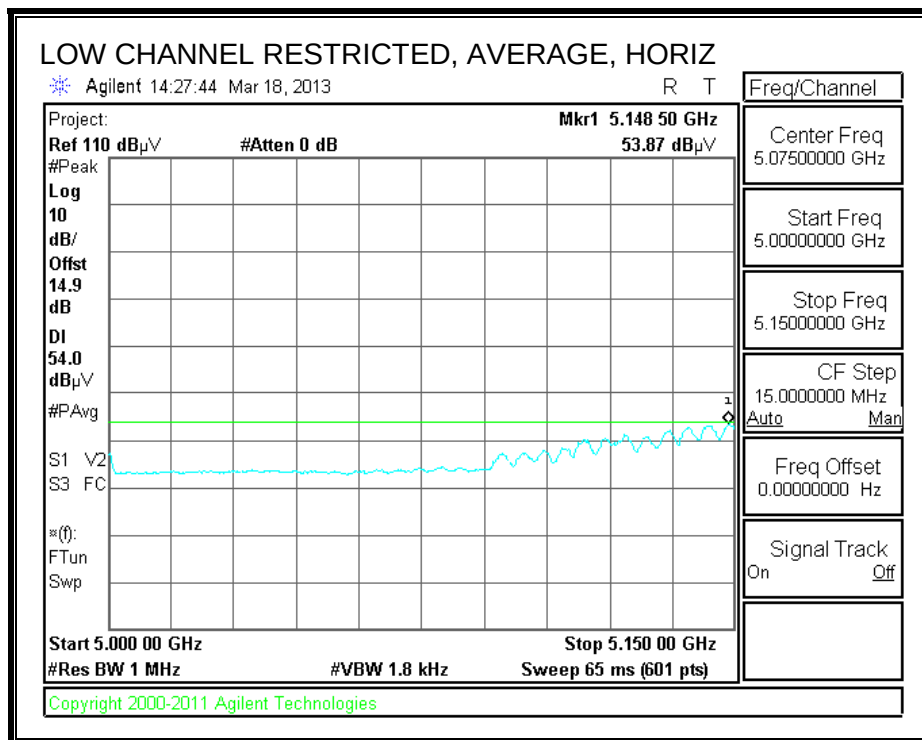
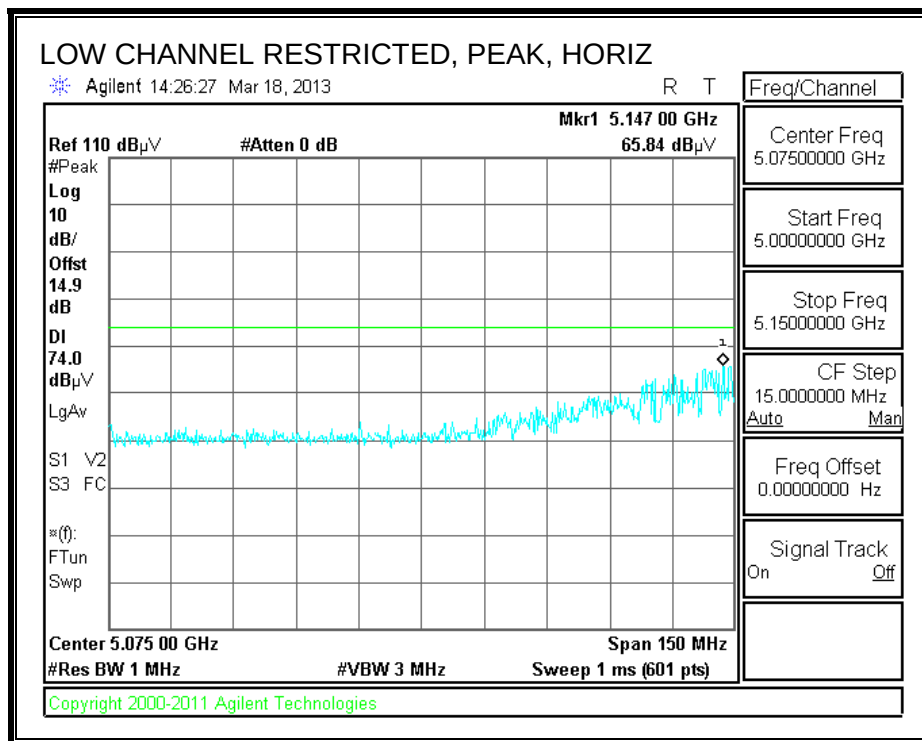


# HARMONICS AND SPURIOUS EMISSIONS

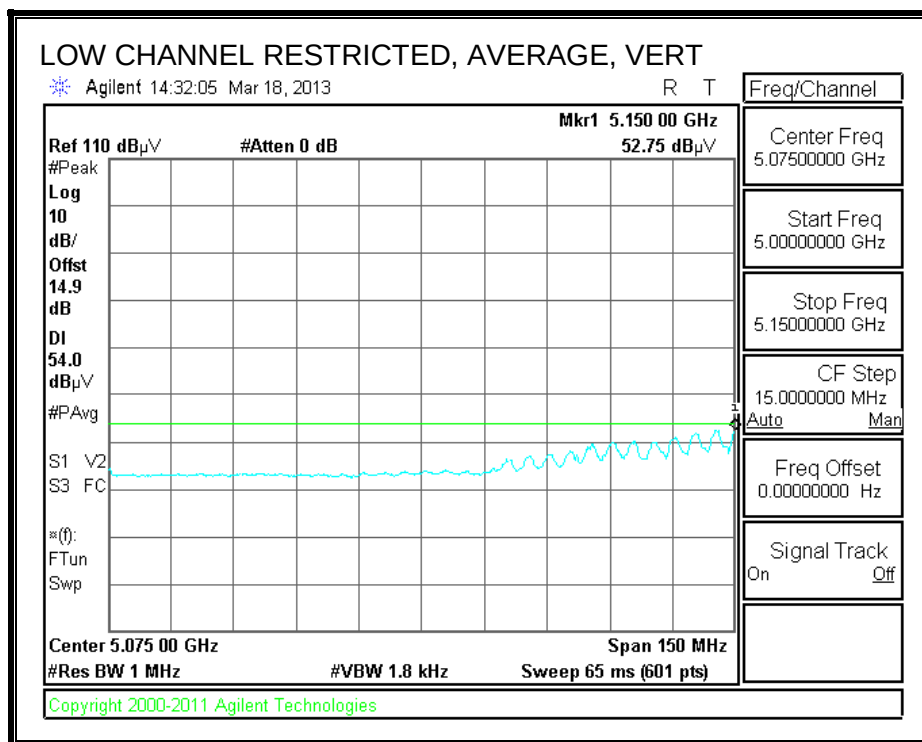
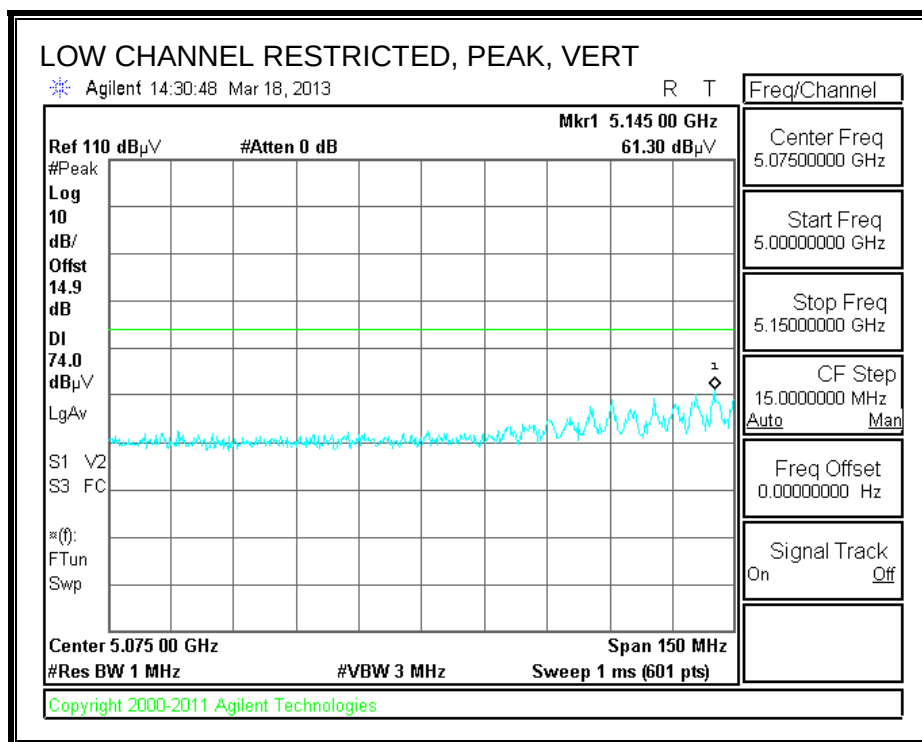
| High Frequency Measurement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------|-------------------|--------------------------------|----------|-----------|------------------------------|------------------------|----------------|---------------|------------------|-----------------------------|--------------|---------------|----------------|------------|--|
| Compliance Certification Services, Fremont 5m Chamber-A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Company:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       | MENGISTU MEKURIA |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Project #:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       | 03/17/13         |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       | 12U14745         |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Test Engineer:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | Apple Inc.       |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Configuration:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | FCC Class B      |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       | HT40 3TX BF CDD  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| <b>Test Equipment:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| Horn 1-18GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                  |                   | Pre-amplifier 1-26GHz          |          |           |                              | Pre-amplifier 26-40GHz |                |               |                  | Horn > 18GHz                |              |               |                | Limit      |  |
| T136; M/N: 3117 @3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                  |                   | T145 Agilent 3008A0056         |          |           |                              | T88 Miteq 26-40GHz     |                |               |                  | T39; ARA 18-26GHz; S/N:1013 |              |               |                | FCC 15.209 |  |
| <div style="display: flex; justify-content: space-between;"> <div> <div>HI Frequency Cables</div> <div>3' cable 22807700</div> <div>3' cable 22807700</div> </div> <div> <div>12' cable 22807600</div> <div>12' cable 22807600</div> </div> <div> <div>20' cable 22807500</div> <div>20' cable 22807500</div> </div> <div> <div>HPF</div> <div>HPF_7.6GHz</div> </div> <div> <div>Reject Filter</div> <div></div> </div> <div> <div>Peak Measurements</div> <div>RBW=VBW=1MHz</div> <div>Average Measurements</div> <div>RBW=1MHz ; VBW=10Hz</div> </div> </div> |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Dist<br>(m)           | Read Pk<br>dBuV  | Read Avg.<br>dBuV | AF<br>dB/m                     | CL<br>dB | Amp<br>dB | D Corr<br>dB                 | Filtr<br>dB            | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m           | Pk Mar<br>dB | Avg Mar<br>dB | Notes<br>(V/H) |            |  |
| <b>Low Channel (5210 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| 10.420                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 36.2             | 25.5              | 37.2                           | 10.6     | -34.1     | 0.0                          | 0.8                    | 50.6           | 39.9          | 74               | 54                          | -23.4        | -14.1         | H              |            |  |
| 10.420                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.6             | 25.4              | 37.2                           | 10.6     | -34.1     | 0.0                          | 0.8                    | 50.0           | 39.8          | 74               | 54                          | -24.0        | -14.2         | V              |            |  |
| <b>Mid Channel (5290 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| 10.580                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.3             | 25.0              | 37.3                           | 10.7     | -33.9     | 0.0                          | 0.8                    | 50.0           | 39.8          | 74               | 54                          | -24.0        | -14.2         | H              |            |  |
| 10.580                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.5             | 24.9              | 37.3                           | 10.7     | -33.9     | 0.0                          | 0.8                    | 50.2           | 39.6          | 74               | 54                          | -23.8        | -14.4         | V              |            |  |
| <b>Low Channel (5530 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| 11.060                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.1             | 24.7              | 37.6                           | 10.9     | -33.4     | 0.0                          | 0.7                    | 51.0           | 40.5          | 74               | 54                          | -23.0        | -13.5         | H              |            |  |
| 11.060                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.5             | 24.5              | 37.6                           | 10.9     | -33.4     | 0.0                          | 0.7                    | 51.4           | 40.4          | 74               | 54                          | -22.6        | -13.6         | V              |            |  |
| <b>Hi Channel (5690 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| 11.380                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 36.1             | 25.3              | 37.9                           | 11.1     | -33.0     | 0.0                          | 0.7                    | 52.8           | 42.0          | 74               | 54                          | -21.2        | -12.0         | H              |            |  |
| 11.380                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0                   | 35.4             | 25.1              | 37.9                           | 11.1     | -33.0     | 0.0                          | 0.7                    | 52.1           | 41.9          | 74               | 54                          | -21.9        | -12.1         | V              |            |  |
| Rev. 01.30.13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                  |                   |                                |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Measurement Frequency |                  | Amp               | Preamp Gain                    |          | Avg Lim   | Average Field Strength Limit |                        |                |               |                  |                             |              |               |                |            |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Distance to Antenna   |                  | D Corr            | Distance Correct to 3 meters   |          | Pk Lim    | Peak Field Strength Limit    |                        |                |               |                  |                             |              |               |                |            |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Analyzer Reading      |                  | Avg               | Average Field Strength @ 3 m   |          | Avg Mar   | Margin vs. Average Limit     |                        |                |               |                  |                             |              |               |                |            |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Antenna Factor        |                  | Peak              | Calculated Peak Field Strength |          | Pk Mar    | Margin vs. Peak Limit        |                        |                |               |                  |                             |              |               |                |            |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Cable Loss            |                  | HPF               | High Pass Filter               |          |           |                              |                        |                |               |                  |                             |              |               |                |            |  |

### 9.2.13. TX ABOVE 1 GHz, 802.11ac VHT80 BF 3TX MODE, 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL)





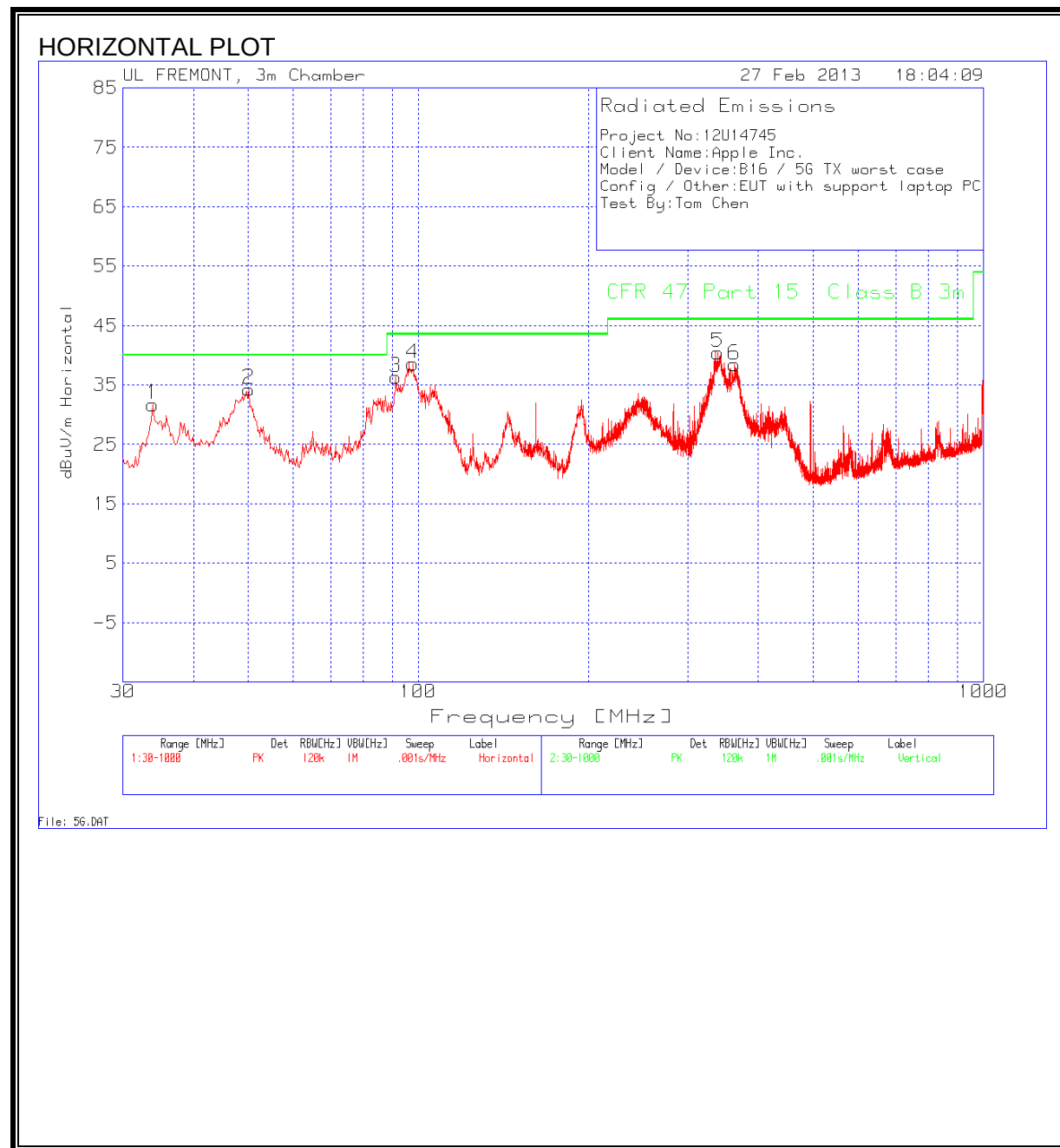


# HARMONICS AND SPURIOUS EMISSIONS

| <b>High Frequency Measurement</b><br><b>Compliance Certification Services, Fremont 5m Chamber-A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------|-------------------|------------------------------|----------|-----------|--------------------------------|-------------------------------|----------------|---------------|------------------|-----------------------------|------------------------------|---------------|----------------|--------------|--|
| <b>Company:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | MENGISTU MEKURIA |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Project #:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       | 03/17/13         |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Date:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | 12U14745         |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Test Engineer:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       | Apple Inc.       |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Configuration:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       | FCC Class B      |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Mode:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | HT40 3TX BF CDD  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Test Equipment:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| <b>Horn 1-18GHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                  |                   | <b>Pre-amplifier 1-26GHz</b> |          |           |                                | <b>Pre-amplifier 26-40GHz</b> |                |               |                  | <b>Horn &gt; 18GHz</b>      |                              |               |                | <b>Limit</b> |  |
| T136; M/N: 3117 @3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                  |                   | T145 Agilent 3008A0056       |          |           |                                | T88 Miteq 26-40GHz            |                |               |                  | T39; ARA 18-26GHz; S/N:1013 |                              |               |                | FCC 15.209   |  |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <div style="padding: 5px; text-align: center; margin-bottom: 5px;"><b>HI Frequency Cables</b></div> <div style="display: flex; justify-content: space-around;"> <div style="width: 30%; padding: 5px; text-align: center;"> <b>3' cable 22807700</b><br/> 3' cable 22807700 </div> <div style="width: 30%; padding: 5px; text-align: center;"> <b>12' cable 22807600</b><br/> 12' cable 22807600 </div> <div style="width: 30%; padding: 5px; text-align: center;"> <b>20' cable 22807500</b><br/> 20' cable 22807500 </div> </div> </div> <div style="width: 35%;"> <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="width: 45%; padding: 5px; text-align: center;"> <b>HPF</b><br/> HPF_7.6GHz </div> <div style="width: 45%; padding: 5px; text-align: center;"> <b>Reject Filter</b> </div> </div> <div style="padding: 5px;"> <b>Peak Measurements</b><br/> RBW=VBW=1MHz<br/> <b>Average Measurements</b><br/> RBW=1MHz ; VBW=10Hz </div> </div> </div> |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Dist<br>(m)           | Read Pk<br>dBuV  | Read Avg.<br>dBuV | AF<br>dB/m                   | CL<br>dB | Amp<br>dB | D Corr<br>dB                   | Filtr<br>dB                   | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m           | Pk Mar<br>dB                 | Avg Mar<br>dB | Notes<br>(V/H) |              |  |
| <b>Low Channel (5210 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| 10.420                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 36.2             | 25.5              | 37.2                         | 10.6     | -34.1     | 0.0                            | 0.8                           | 50.6           | 39.9          | 74               | 54                          | -23.4                        | -14.1         | H              |              |  |
| 10.420                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.6             | 25.4              | 37.2                         | 10.6     | -34.1     | 0.0                            | 0.8                           | 50.0           | 39.8          | 74               | 54                          | -24.0                        | -14.2         | V              |              |  |
| <b>Mid Channel (5290 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| 10.580                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.3             | 25.0              | 37.3                         | 10.7     | -33.9     | 0.0                            | 0.8                           | 50.0           | 39.8          | 74               | 54                          | -24.0                        | -14.2         | H              |              |  |
| 10.580                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.5             | 24.9              | 37.3                         | 10.7     | -33.9     | 0.0                            | 0.8                           | 50.2           | 39.6          | 74               | 54                          | -23.8                        | -14.4         | V              |              |  |
| <b>Low Channel (5530 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| 11.060                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.1             | 24.7              | 37.6                         | 10.9     | -33.4     | 0.0                            | 0.7                           | 51.0           | 40.5          | 74               | 54                          | -23.0                        | -13.5         | H              |              |  |
| 11.060                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.5             | 24.5              | 37.6                         | 10.9     | -33.4     | 0.0                            | 0.7                           | 51.4           | 40.4          | 74               | 54                          | -22.6                        | -13.6         | V              |              |  |
| <b>Hi Channel (5690 MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| 11.380                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 36.1             | 25.3              | 37.9                         | 11.1     | -33.0     | 0.0                            | 0.7                           | 52.8           | 42.0          | 74               | 54                          | -21.2                        | -12.0         | H              |              |  |
| 11.380                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.0                   | 35.4             | 25.1              | 37.9                         | 11.1     | -33.0     | 0.0                            | 0.7                           | 52.1           | 41.9          | 74               | 54                          | -21.9                        | -12.1         | V              |              |  |
| Rev. 01.30.13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                  |                   |                              |          |           |                                |                               |                |               |                  |                             |                              |               |                |              |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Measurement Frequency |                  |                   |                              |          | Amp       | Preamp Gain                    |                               |                |               |                  | Avg Lim                     | Average Field Strength Limit |               |                |              |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Distance to Antenna   |                  |                   |                              |          | D Corr    | Distance Correct to 3 meters   |                               |                |               |                  | Pk Lim                      | Peak Field Strength Limit    |               |                |              |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Analyzer Reading      |                  |                   |                              |          | Avg       | Average Field Strength @ 3 m   |                               |                |               |                  | Avg Mar                     | Margin vs. Average Limit     |               |                |              |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Antenna Factor        |                  |                   |                              |          | Peak      | Calculated Peak Field Strength |                               |                |               |                  | Pk Mar                      | Margin vs. Peak Limit        |               |                |              |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cable Loss            |                  |                   |                              |          | HPF       | High Pass Filter               |                               |                |               |                  |                             |                              |               |                |              |  |

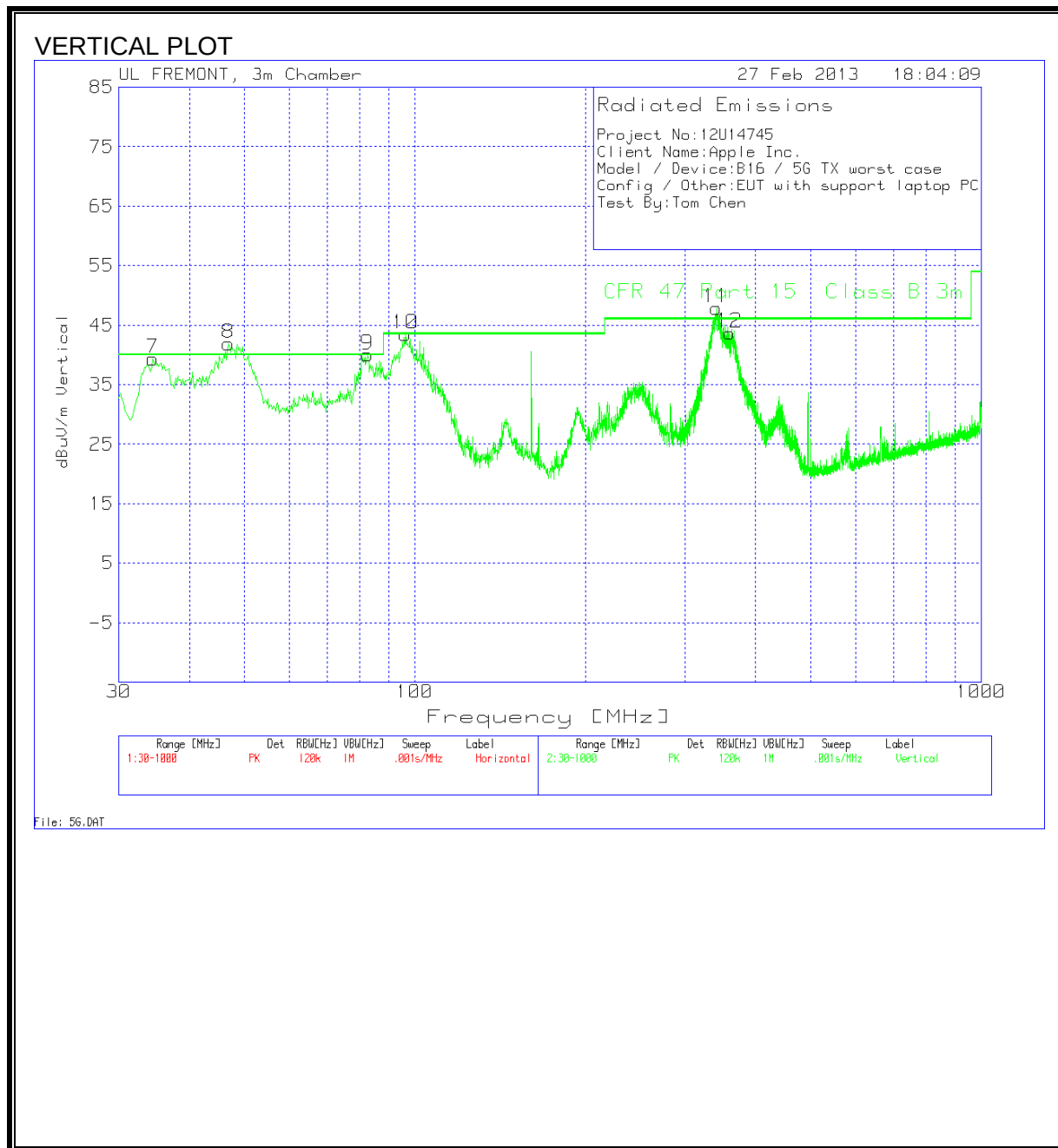
## 9.4. RADIATED EMISSIONS, WORST-CASE BELOW 1 GHz

### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)





**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



# HORIZONTAL AND VERTICAL DATA

Project No:12U14745  
Client Name:Apple Inc.  
Model / Device:B16 / 5G TX worst case  
Config / Other:EUT with support laptop PC  
Test By:Tom Chen

## Horizontal 30 - 1000MHz

| Marker No. | Test Frequency | Meter Reading | Detector | T130 8-14-12 (dB) | 3m Loop (dB) | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|------------|----------------|---------------|----------|-------------------|--------------|--------|---------------------------|--------|----------|
| 1          | 33.8769        | 41.12         | PK       | 18.1              | -27.5        | 31.72  | 40                        | -8.28  | Horz     |
| 2          | 50.1599        | 54.15         | PK       | 7.4               | -27.3        | 34.25  | 40                        | -5.75  | Horz     |
| 3          | 91.255         | 55.28         | PK       | 7.9               | -26.9        | 36.28  | 43.5                      | -7.22  | Horz     |
| 4          | 97.8457        | 55.75         | PK       | 9.6               | -26.8        | 38.55  | 43.5                      | -4.95  | Horz     |
| 5          | 338.9888       | 51.75         | PK       | 14                | -25.3        | 40.45  | 46                        | -5.55  | Horz     |
| 6          | 362.8317       | 49            | PK       | 14.8              | -25.4        | 38.4   | 46                        | -7.6   | Horz     |

## Vertical 30 - 1000MHz

| Marker No. | Test Frequency | Meter Reading | Detector | T130 8-14-12 (dB) | 3m Loop (dB) | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|------------|----------------|---------------|----------|-------------------|--------------|--------|---------------------------|--------|----------|
| 7          | 34.9151        | 39.72         | QP       | 17.4              | -27.5        | 29.62  | 40                        | -10.38 | Vert     |
| 8          | 48.201         | 27.07         | QP       | 8.2               | -27.3        | 7.97   | 40                        | -32.03 | Vert     |
| 9          | 82.966         | 53.87         | QP       | 7.2               | -27          | 34.07  | 40                        | -5.93  | Vert     |
| 10         | 95.473         | 51.22         | QP       | 8.9               | -26.8        | 33.32  | 43.5                      | -10.18 | Vert     |
| 11         | 340.97         | 23.59         | QP       | 14                | -25.3        | 12.29  | 46                        | -33.71 | Vert     |
| 12         | 359.4594       | 53.31         | QP       | 14.7              | -25.4        | 42.61  | 46                        | -3.39  | Vert     |

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |          |
|-----------------------------|------------------------|----------|
|                             | Quasi-peak             | Average  |
| 0.15-0.5                    | 66 to 56               | 56 to 46 |
| 0.5-5                       | 56                     | 46       |
| 5-30                        | 60                     | 50       |

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

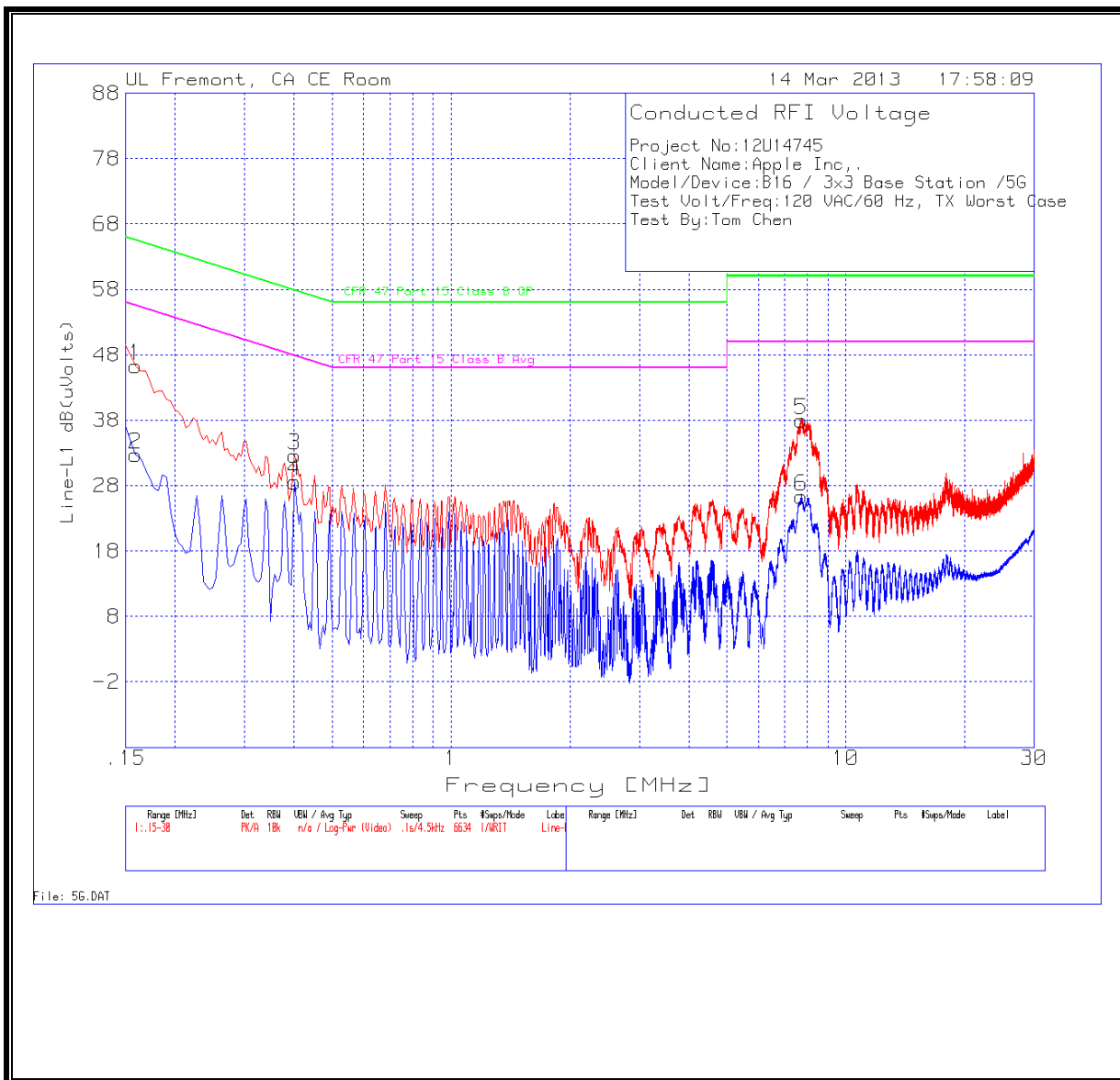
Line conducted data is recorded for both NEUTRAL and HOT lines.

## RESULTS

### 6 WORST EMISSIONS FOR 5G BAND

| Project No:12U14745                         |                |               |          |               |                   |            |                           |        |                            |        |
|---------------------------------------------|----------------|---------------|----------|---------------|-------------------|------------|---------------------------|--------|----------------------------|--------|
| Client Name:Apple Inc.,                     |                |               |          |               |                   |            |                           |        |                            |        |
| Model/Device:B16 / 3x3 Base Station /5G     |                |               |          |               |                   |            |                           |        |                            |        |
| Test Volt/Freq:120 VAC/60 Hz, TX Worst Case |                |               |          |               |                   |            |                           |        |                            |        |
| Test By:Tom Chen                            |                |               |          |               |                   |            |                           |        |                            |        |
| Line-L1 .15 - 30MHz                         |                |               |          |               |                   |            |                           |        |                            |        |
| Marker No.                                  | Test Frequency | Meter Reading | Detector | T24 IL L1.TXT | LC Cables 1&3.TXT | dB(uVolts) | CFR 47 Part 15 Class B QP | Margin | CFR 47 Part 15 Class B Avg | Margin |
| 1                                           | 0.159          | 46.19         | PK       | 0.1           | 0                 | 46.29      | 65.5                      | -19.21 | 55.5                       | -9.21  |
| 2                                           | 0.159          | 32.67         | Av       | 0.1           | 0                 | 32.77      | 65.5                      | -32.73 | 55.5                       | -22.73 |
| 3                                           | 0.402          | 32.5          | PK       | 0.1           | 0                 | 32.6       | 57.8                      | -25.2  | 47.8                       | -15.2  |
| 4                                           | 0.402          | 28.48         | Av       | 0.1           | 0                 | 28.58      | 57.8                      | -29.22 | 47.8                       | -19.22 |
| 5                                           | 7.71           | 37.82         | PK       | 0.1           | 0.1               | 38.02      | 60                        | -21.98 | 50                         | -11.98 |
| 6                                           | 7.71           | 26.15         | Av       | 0.1           | 0.1               | 26.35      | 60                        | -33.65 | 50                         | -23.65 |
| Line-L2 .15 - 30MHz                         |                |               |          |               |                   |            |                           |        |                            |        |
| Marker No.                                  | Test Frequency | Meter Reading | Detector | T24 IL L2.TXT | LC Cables 2&3.TXT | dB(uVolts) | CFR 47 Part 15 Class B QP | Margin | CFR 47 Part 15 Class B Avg | Margin |
| 7                                           | 0.159          | 45.11         | PK       | 0.1           | 0                 | 45.21      | 65.5                      | -20.29 | 55.5                       | -10.29 |
| 8                                           | 0.159          | 24.45         | Av       | 0.1           | 0                 | 24.55      | 65.5                      | -40.95 | 55.5                       | -30.95 |
| 9                                           | 0.3795         | 30.14         | PK       | 0.1           | 0                 | 30.24      | 58.3                      | -28.06 | 48.3                       | -18.06 |
| 10                                          | 0.3795         | 19.04         | Av       | 0.1           | 0                 | 19.14      | 58.3                      | -39.16 | 48.3                       | -29.16 |
| 11                                          | 7.863          | 35.41         | PK       | 0.1           | 0.1               | 35.61      | 60                        | -24.39 | 50                         | -14.39 |
| 12                                          | 7.863          | 22.68         | Av       | 0.1           | 0.1               | 22.88      | 60                        | -37.12 | 50                         | -27.12 |

**LINE 1 RESULTS**



**LINE 2 RESULTS**

