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

# CERTIFICATION TEST REPORT

**FOR**

**802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card**

**MODEL NUMBER: BCM94331PCIEBT3B**

**FCC ID: QDS-BRCM1066**
**IC: 4324A-BRCM1066**

**REPORT NUMBER: 12U14373-3, Revision C**

**ISSUE DATE: JULY 13, 2012**

*Prepared for*
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**190 MATHILDA PLACE**
**SUNNYVALE, CA 94086, U.S.A.**

*Prepared by*
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NVLAP LAB CODE 200065-0

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 06/28/12 | Initial Issue | F. Ibrahim |
| A | 06/29/12 | Updated section 5.5, some tables to reflect correct channels and added radiated BE 5725-2825 MHz for some modes. | F. Ibrahim |
| B | 06/30/12 | Added DFS data | T. Lee |
| C | 07/13/12 | Updated Legacy and SISO Radiated Bandedge | T. Chan |

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# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| **COMPANY NAME:** | BROADCOM CORPORATION<br>190 MATHILDA PLACE<br>SUNNYVALE, CA 94086, U.S.A. |
| **EUT DESCRIPTION:** | 802.11a/b/g/n WLAN + Bluetooth PCI-E Custom Combination Card |
| **MODEL:** | BCM94331PCIEBT3B |
| **SERIAL NUMBER:** | C962154016AF2GQBL & C962154015FF2GQBL (P101) |
| **DATE TESTED:** | MAY 12 – JULY 13, 2012 |

| 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 |

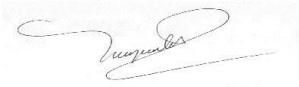
Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties 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.

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:



VIEN TRAN
EMC ENGINEER
UL CCS

# 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 C63.4-2003, 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 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 an 802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card

The radio module is manufactured by Broadcom.

## 5.2. MAXIMUM RMS OUTPUT POWER

The transmitter has a maximum RMS conducted output power as follows:

**5.2GHz BAND**

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| **5.2 GHz band, 1TX** | | | |
| 5180 - 5240 | 802.11a | 14.463 | 27.945 |
| 5190 - 5230 | 802.11n HT40 | 16.271 | 42.374 |
| **5.2 GHz band, 2TX** | | | |
| 5180 - 5240 | 802.11n HT20 CDD MCS0 | 12.497 | 17.771 |
| 5180 - 5240 | 802.11n HT20 STBC MCS0 | 14.966 | 31.376 |
| 5190 - 5230 | 802.11n HT40 CDD MCS0 | 14.589 | 28.767 |
| **5.2 GHz band, 3TX** | | | |
| 5180 - 5240 | 802.11n HT20 STBC MCS0 | 14.728 | 29.703 |
| 5190 - 5230 | 802.11n HT40 STBC MCS0 | 16.980 | 49.888 |

**5.3 GHz BAND**

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| **5.3 GHz band, 1TX** | | | |
| 5260 - 5320 | 802.11a | 19.365 | 86.397 |
| 5270 - 5310 | 802.11n HT40 | 18.141 | 65.178 |
| **5.3 GHz band, 2TX** | | | |
| 5270 - 5310 | 802.11n HT40 CDD MCS0 | 21.277 | 134.184 |
| **5.3 GHz band, 3TX** | | | |
| 5260 - 5320 | 802.11n HT20 CDD MCS0 | 17.779 | 59.965 |
| 5260 - 5320 | 802.11n HT20 SDM MCS21 | 22.177 | 165.082 |
| 5270 - 5310 | 802.11n HT40 CDD MCS0 | 20.067 | 101.555 |
| 5270 - 5310 | 802.11n HT40 SDM MCS21 | 21.025 | 126.619 |

**5.6 GHz BAND**

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| **5.6 GHz band, 1TX** | | | |
| 5500-5700 | 802.11a | 19.369 | 86.477 |
| 5510-5670 | 802.11n HT40 CDD MCS0 | 19.336 | 85.822 |
| **5.6 GHz band, 2TX** | | | |
| 5510-5670 | 802.11n HT40 CDD MCS0 | 19.754 | 94.493 |
| **5.6 GHz band, 3TX** | | | |
| 5500-5700 | 802.11n HT20 CDD MCS0 | 17.073 | 50.968 |
| 5500-5700 | 802.11n HT20 SDM MCS21 | 22.235 | 167.302 |
| 5510-5670 | 802.11n HT40 CDD MCS0 | 20.167 | 103.920 |
| 5510-5670 | 802.11n HT40 SDM MCS21 | 23.811 | 240.492 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

| FCC/IC/NCC FMA - BCM94331PCIEBT3B<br>FCC ID: QDS-BRCM1066<br>IC ID: 4324A-BRCM1066 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No. | Antenna Manufacturer | Antenna Type | Model | Peak gain (2.4GHz band) | Peak gain (5.2GHz band) | Peak gain (5.3GHz band) | Peak gain (5.6GHz band) | Peak gain (5.8GHz band) |
| 1 | Amphenol/Tyco | 802.11abgn WLAN Antenna | 631-1744 WiFi1 | 1.66 | 4.16 | 4 | 2.92 | 1.91 |
| 1 | Amphenol/Tyco | 802.11abgn WLAN/BT Antenna | 631-2082 WiFi2 | 1.11 | 2.51 | 3.81 | 4.71 | 4.18 |
| 1 | Amphenol/Tyco | 802.11abgn WLAN Antenna | 631-1771 WiFi3 | 6.77 | 5.65 | 5.61 | 5.35 | 4.39 |

## 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.106.98.77.
The test utility software used during testing was BCM Internal, rev. 5.106.RC98.77.

## 5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC. The EUT was oriented in a flat orientation, similar to the orientation it would have in real installations; see setup photos for details.

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

All final tests in the 802.11a Legacy mode were made at 6 Mb/s.
All final tests in the 802.11n 20 MHz CDD mode were made at MCS0.
All final tests in the 802.11n 20 MHz STBC mode were made at MCS0.
All final tests in the 802.11n 20 MHz SDM mode were made at MCS21.

All final tests in the 802.11n 40 MHz CDD mode were made at MCS0.
All final tests in the 802.11n 40 MHz STBC mode were made at MCS0.
All final tests in the 802.11n 40 MHz SDM mode were made at MCS21.

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.

All legacy modes were measured with the highest gain for each type of antenna.

All MIMO modes were measured with the highest combination of gains for each type of antenna. Note that this combination of antennas will not be implemented in the end product. This combination was selected for testing purposes only, to accommodate the highest gain of each antenna type in one single test configuration. The combined gain of this test configuration is higher than any combined gain that will be implemented in the end product.

For the modes where CH2 and CH10 were tested for output power, all other test items at CH1 and CH11 were performed with the higher power level between CH1 and CH2, and between CH10 and CH11 as worst-case scenario.

For all modes with single chain SISO, chain 3 (J2) was used for both 2.4GHz and 5GHz band as worst case.

Radiated testing with three antennas connected was conducted and passed; therefore, no conducted RF spurious testing was performed.

## 5.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| Laptop | Lenovo | G560 | CPU4495771 | DoC |
| Laptop | Lenovo | G560 | CPU4466228 | DoC |
| AC/DC Adapter | Lenovo | PA-1650-56LC | 11S36001646ZZ400008KCM8 | DoC |
| AC/DC Adapter | Lenovo | PA-1650-56LC | 11S36001646ZZ400011AAV4 | DoC |
| Adapter Board | Catalyst | MINI2EXP | BRCM 02 | N/A |
| Adapter Board | Catalyst | MINI2EXP | BRCM 01 | N/A |
| Adapter Board | Broadcom | BCM94331PCIBT4HAD | 93 | N/A |
| Adapter Board | Broadcom | BCM94331PCIBT4HAD | 101 | N/A |

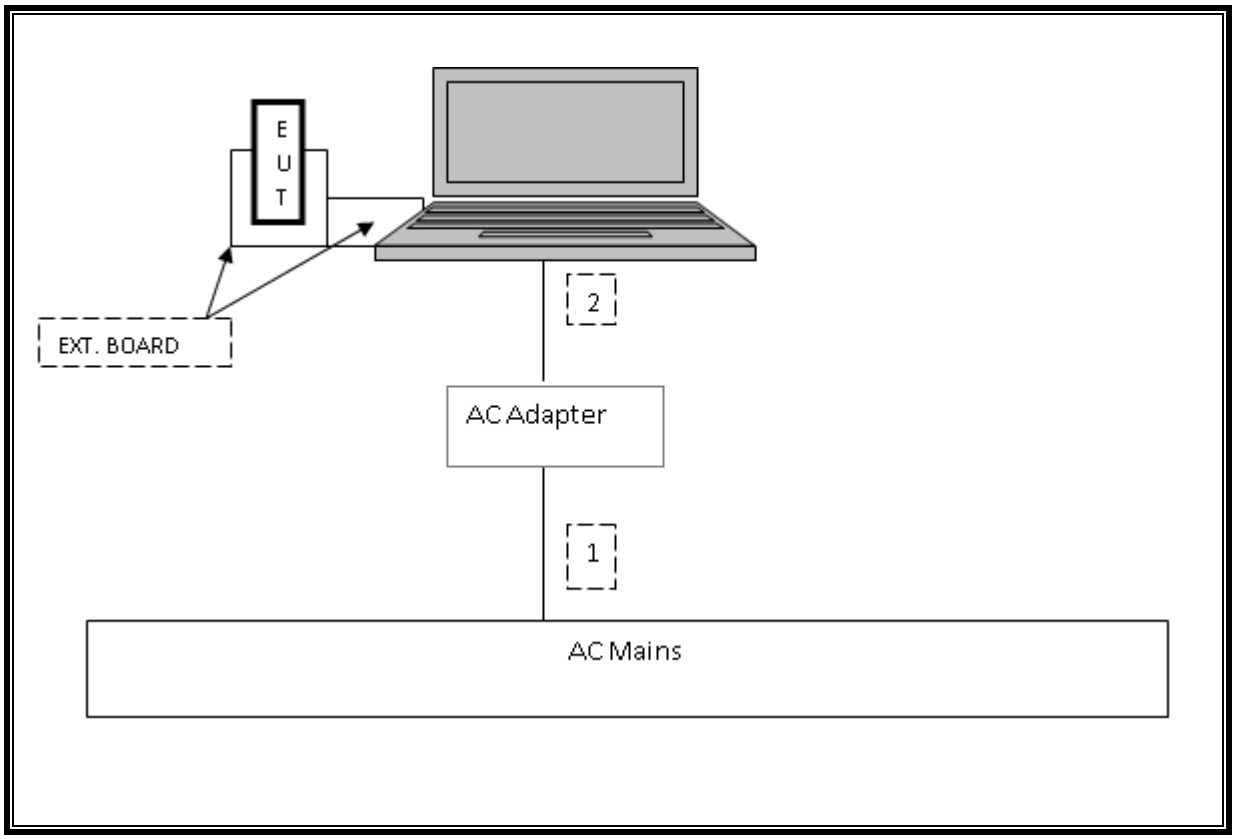
**I/O CABLES**

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length** | **Remarks** |
| 1 | AC | 1 | US 115V | Shielded | 1.5m | NA |
| 2 | DC | 1 | DC | Un-shielded | 1.5m | Ferrite at laptop's end |

**TEST SETUP**

The EUT is attached to a jig board which is installed in the PCMCI slot of a host laptop computer during the tests. 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, 44 GHz | Agilent / HP | E4446A | C01069 | 12/15/11 | 12/15/12 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01012 | 09/02/11 | 09/02/12 |
| EMI Test Receiver, 9 kHz-7 GHz | R & S | ESCI 7 | 1000741 | 07/06/11 | 07/06/12 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 08/19/11 | 08/19/13 |
| Peak Power Meter | Agilent / HP | E4416A | C00963 | 12/13/11 | 12/13/12 |
| Peak / Average Power Sensor | Agilent / HP | E9327A | C00964 | 12/13/11 | 12/13/12 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00872 | 09/20/11 | 09/20/12 |
| Antenna, Horn, 26.5 GHz | ARA | MWH-1826/B | C00589 | 07/28/11 | 07/28/12 |
| Antenna, Horn, 40 GHz | ARA | MWH-2640/B | C00981 | 06/14/11 | 06/14/12 |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1 | | 02/07/12 | 02/07/13 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01063 | 07/12/11 | 07/12/12 |
| Preamplifier, 40 GHz | Miteq | NSP4000-SP2 | C00990 | 08/02/11 | 08/02/12 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00885 | 11/11/11 | 11/11/12 |
| LISN, 30 MHz | FCC | 50/250-25-2 | C00626 | 12/13/11 | 12/13/12 |
| Reject Filter, 5.15-5.35 GHz | Micro-Tronics | BRC13190 | N02679 | CNR | CNR |
| Reject Filter, 5.15-5.35 GHz | Micro-Tronics | BRC13190 | N02680 | CNR | CNR |
| Reject Filter, 5.47-5.725 GHz | Micro-Tronics | BRC13191 | N02678 | CNR | CNR |

# 7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

**LIMITS**

None; for reporting purposes only.

**PROCEDURE**

KDB 789033 Zero-Span Spectrum Analyzer Method.

### 7.1.1. ON TIME AND DUTY CYCLE RESULTS

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| 802.11a 20 MHz_Legacy | 2.075 | 2.090 | 0.993 | 0.993 | 0.031 | 0.482 |
| 802.11n HT20 MCS0 CDD | 1.920 | 1.935 | 0.992 | 0.992 | 0.034 | 0.521 |
| 802.11n HT20 MCS0 STBC | 11.500 | 11.590 | 0.992 | 0.992 | 0.034 | 0.087 |
| 802.11n HT20 MCS21 SDM | 0.683 | 1.063 | 0.643 | 0.643 | 1.921 | 1.464 |
| 802.11n HT40 MCS0 CDD | 0.937 | 0.953 | 0.983 | 0.983 | 0.074 | 1.067 |
| 802.11n HT40 MCS0 STBC | 0.940 | 0.958 | 0.982 | 0.982 | 0.081 | 1.064 |
| 802.11n HT40 MCS21 SDM | 0.453 | 0.725 | 0.625 | 0.625 | 2.042 | 2.208 |

### 7.1.2. MEASUREMENT METHOD FOR POWER AND PPSD

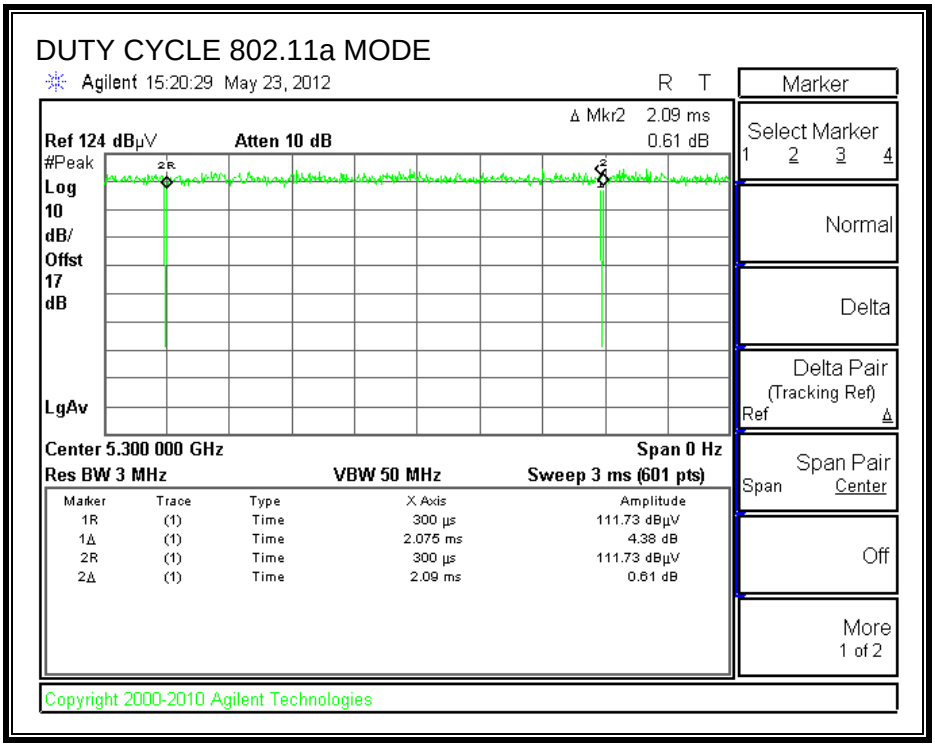
When Duty Cycle is greater than or equal to 98%, KDB 789033 Method SA-1 is used.

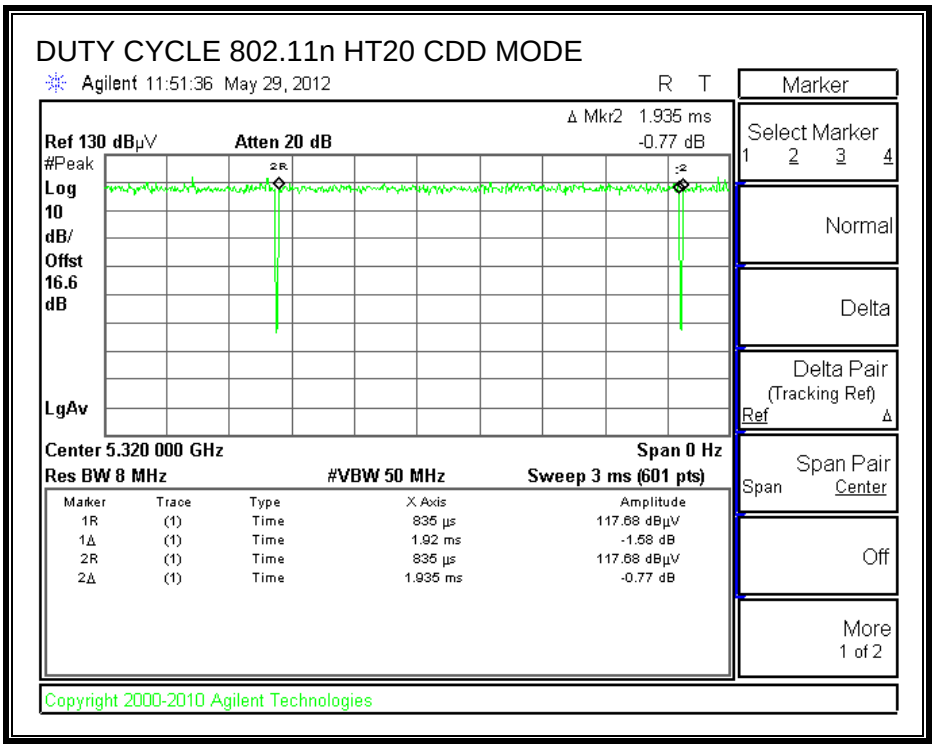
When Duty Cycle is less than 98% and consistent, KDB 789033 Method SA-2 is used.

### 7.1.3. MEASUREMENT METHOD FOR AVG SPURIOUS EMISSIONS ABOVE 1 GHz

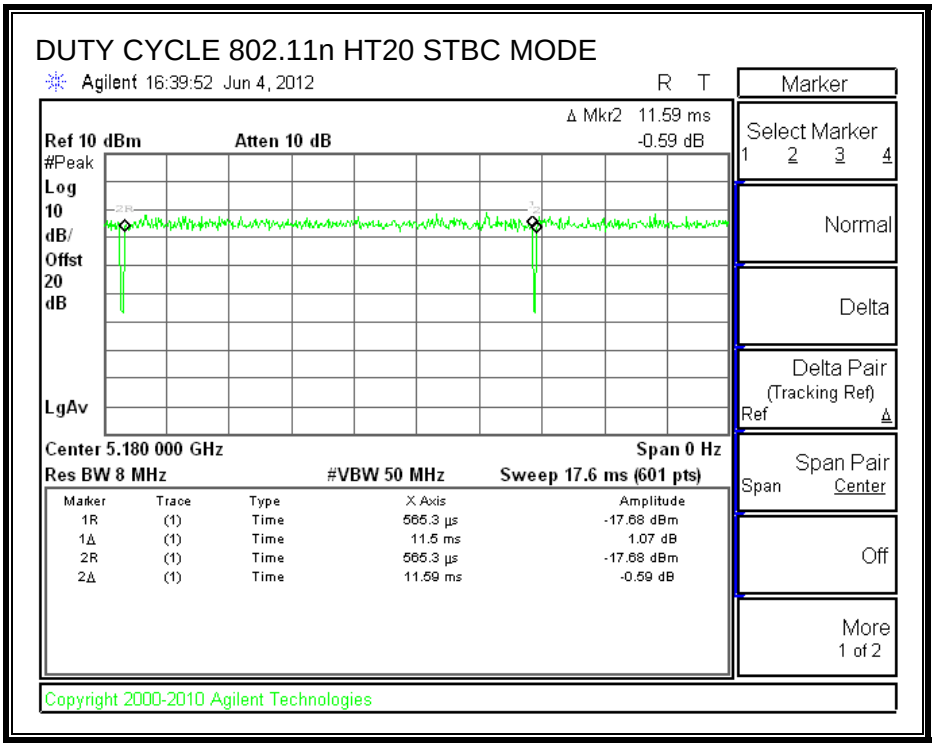
KDB 789033 Method VB with Power RMS Averaging is used for both cases of duty cycle greater than 98% and less than 98%.

## 7.1.4. DUTY CYCLE PLOTS

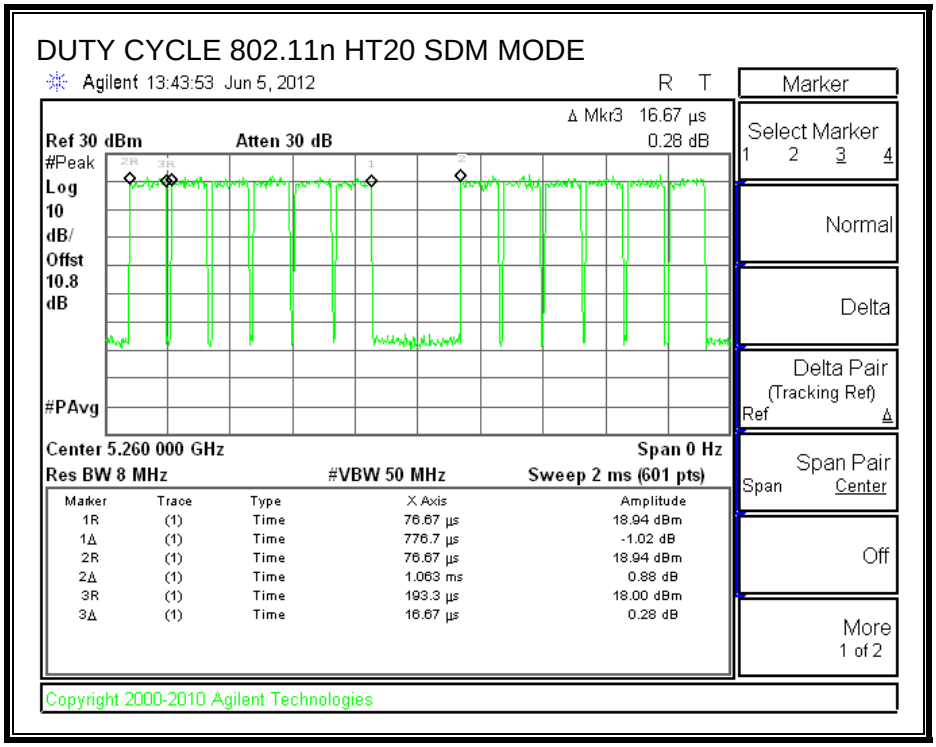


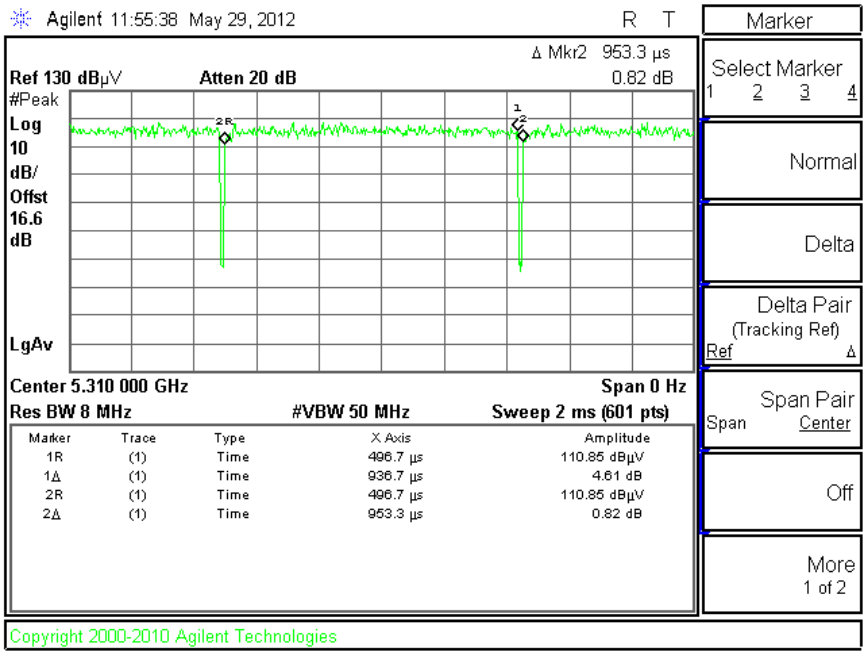
DUTY CYCLE 802.11n HT20 STBC MODE



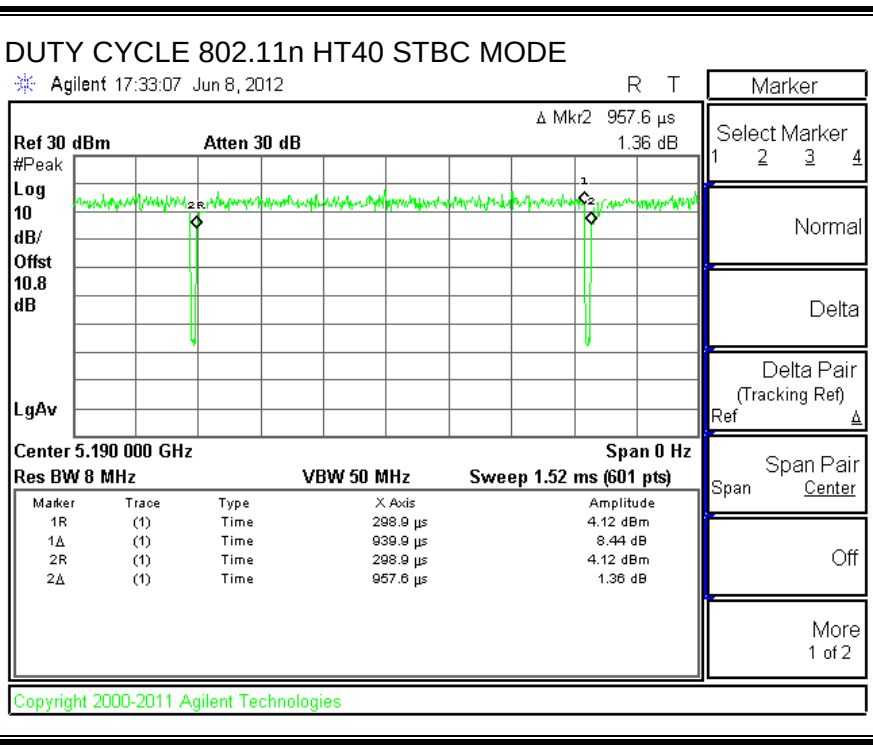

DUTY CYCLE 802.11n HT20 SDM MODE



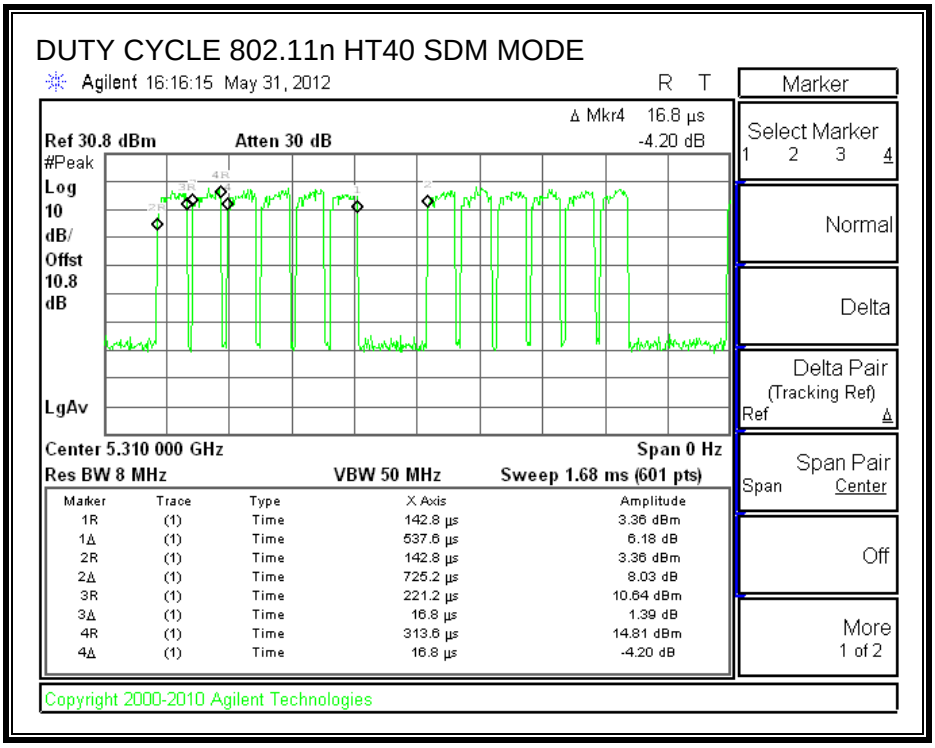
DUTY CYCLE 802.11n HT40 CDD MODE




DUTY CYCLE 802.11n HT40 STBC MODE



DUTY CYCLE 802.11n HT40 SDM MODE



# 8. ANTENNA PORT TEST RESULTS

## 8.1. 802.11a Legacy, 1TX, 5.2 GHz BAND

### 8.1.1. 26 dB BANDWIDTH

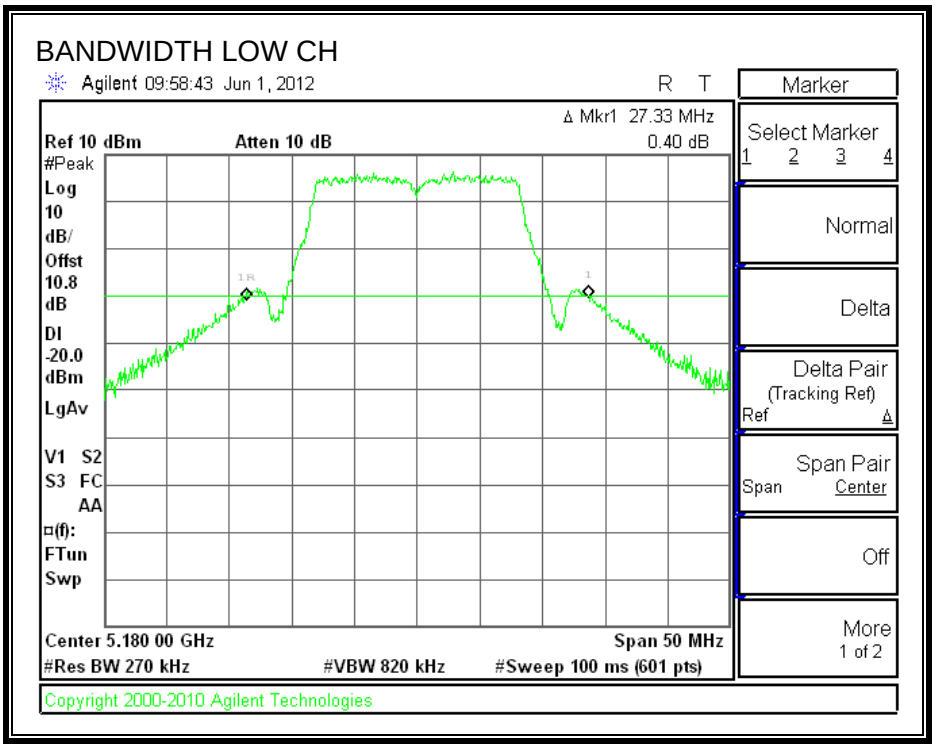
**LIMITS**

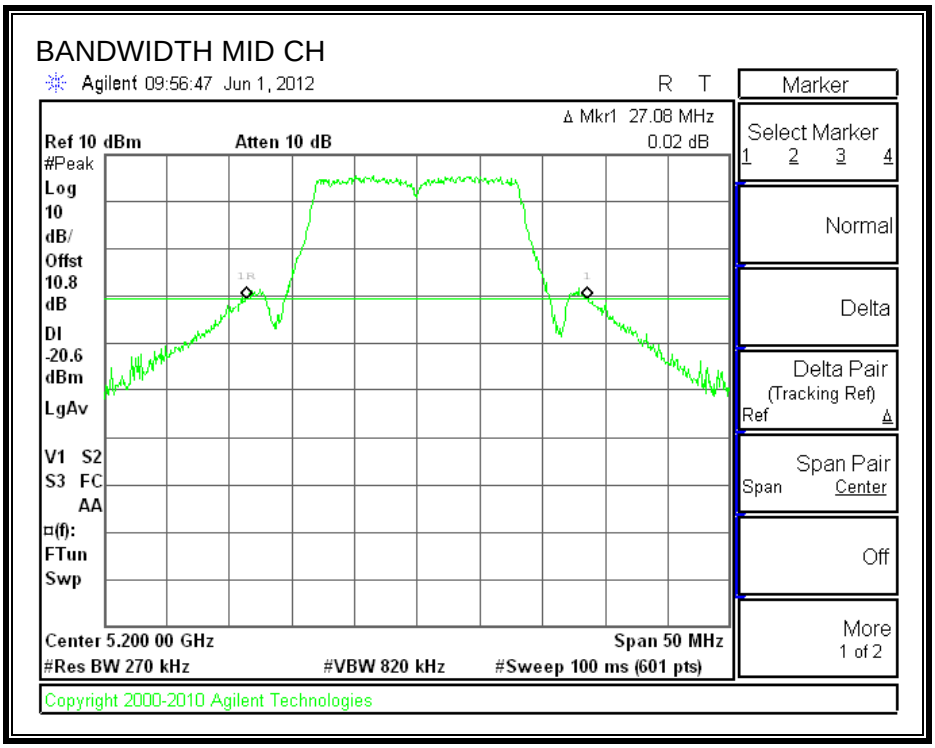
None; for reporting purposes only.

**RESULTS**

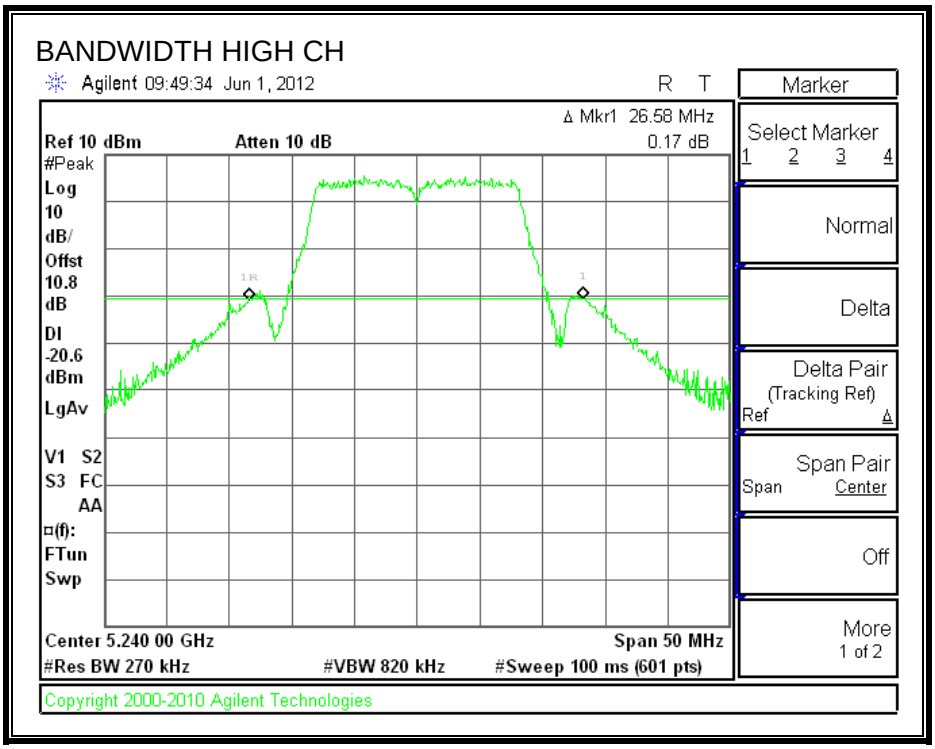
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 27.33 |
| Mid | 5200 | 27.08 |
| High | 5240 | 26.58 |

**26 dB BANDWIDTH**



BANDWIDTH HIGH CH



### 8.1.2. 99% BANDWIDTH

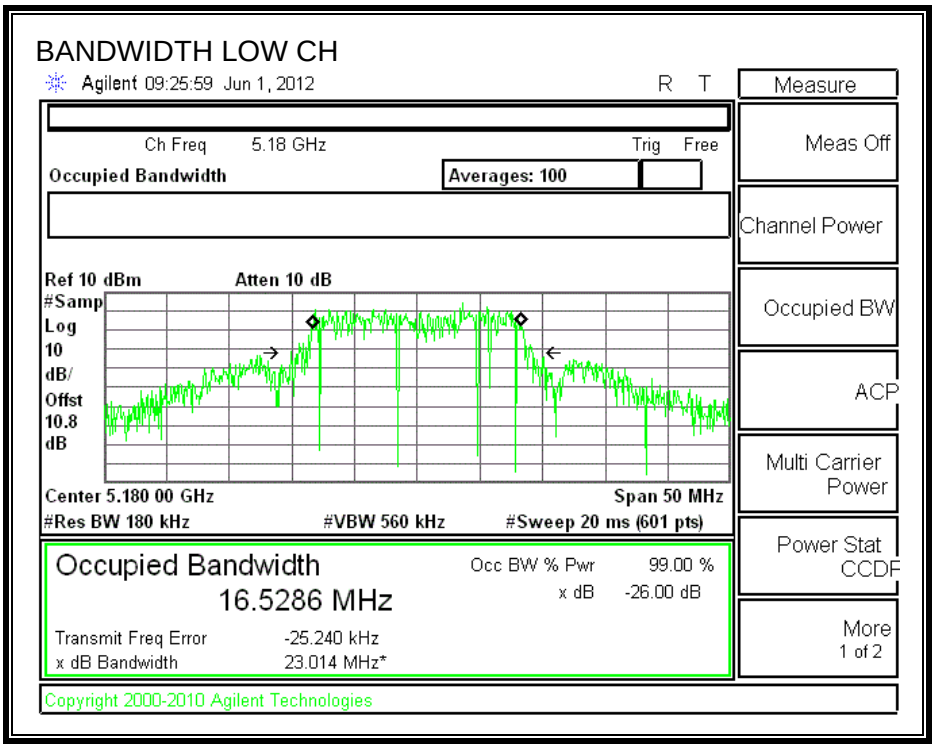
**LIMITS**

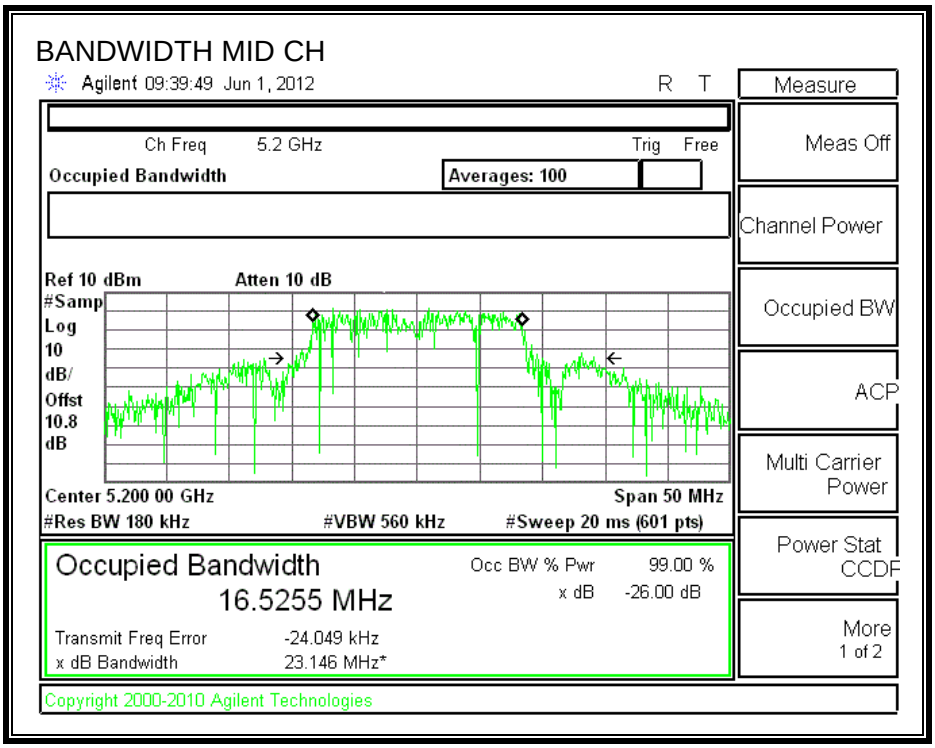
None; for reporting purposes only.

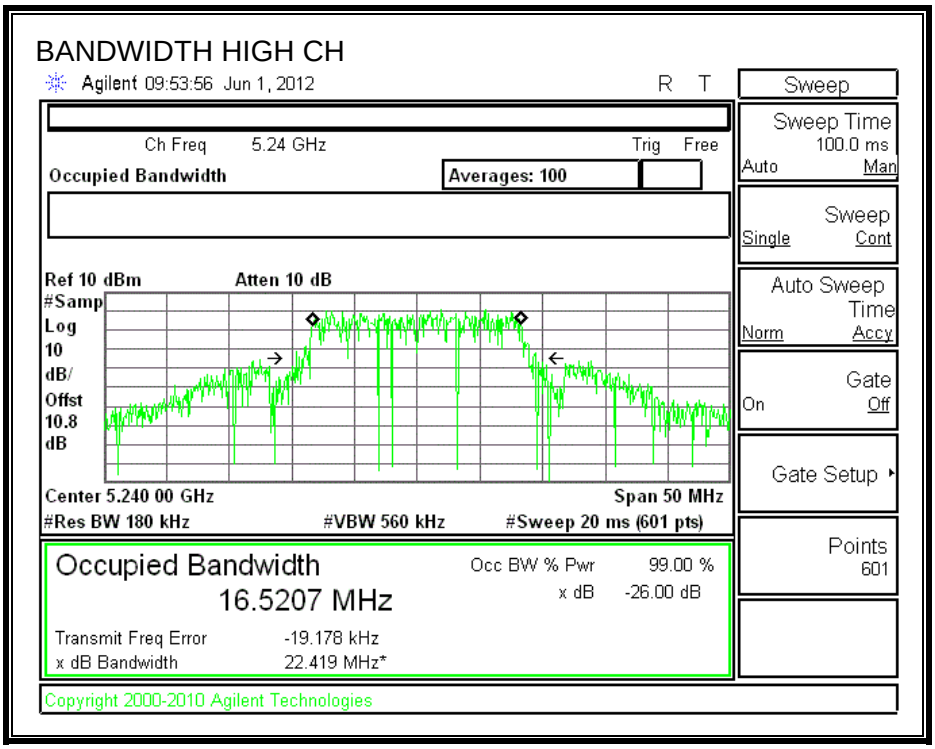
**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5180 | 16.5286 |
| Mid | 5200 | 16.5255 |
| High | 5240 | 16.5207 |

**99% BANDWIDTH**





### 8.1.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

| Channel | Frequency (MHz) | Power (dBm) |
|---|---|---|
| Low | 5180 | 14.2 |
| Mid | 5200 | 14.1 |
| High | 5240 | 14.0 |

## 8.1.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 27.33 | 18.37 | 5.65 | 17.00 | 4.00 |
| Mid | 5200 | 17 | 27.08 | 18.33 | 5.65 | 17.00 | 4.00 |
| High | 5240 | 17 | 26.58 | 18.25 | 5.65 | 17.00 | 4.00 |

**Output Power Results**

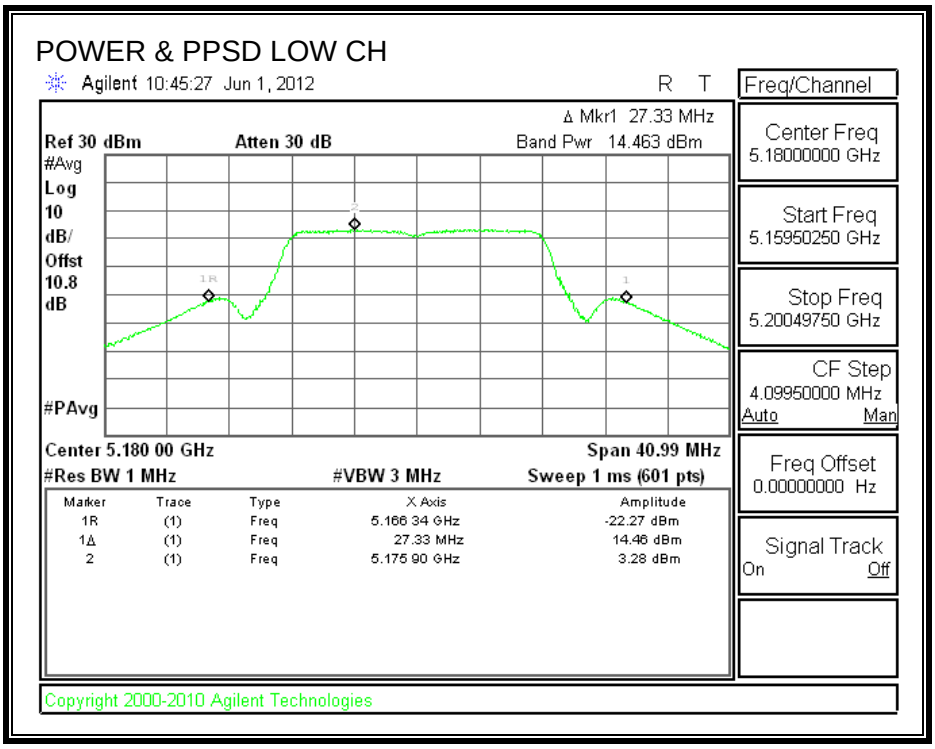
| Channel | Frequency (MHz) | Meas Power (dBm) | Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|
| Low | 5180 | 14.463 | 14.463 | 17.00 | -2.54 |
| Mid | 5200 | 14.422 | 14.422 | 17.00 | -2.58 |
| High | 5240 | 13.984 | 13.984 | 17.00 | -3.02 |

**PPSD Results**

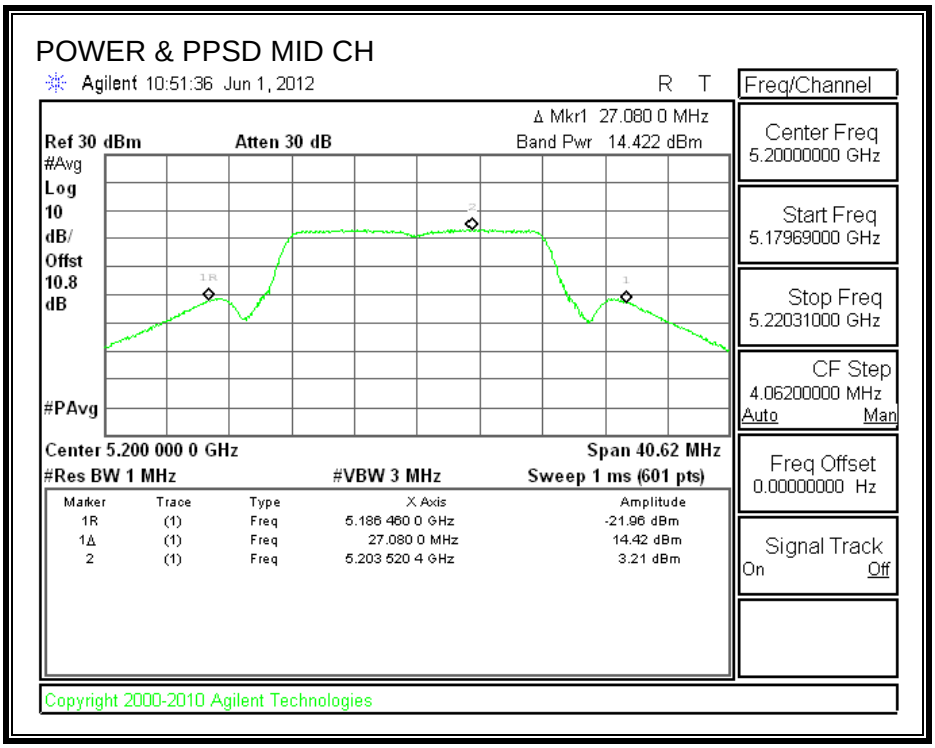
| Channel | Frequency (MHz) | Meas PPSD (dBm) | Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|
| Low | 5180 | 3.28 | 3.28 | 4.00 | -0.72 |
| Mid | 5200 | 3.21 | 3.21 | 4.00 | -0.79 |
| High | 5240 | 2.77 | 2.77 | 4.00 | -1.23 |

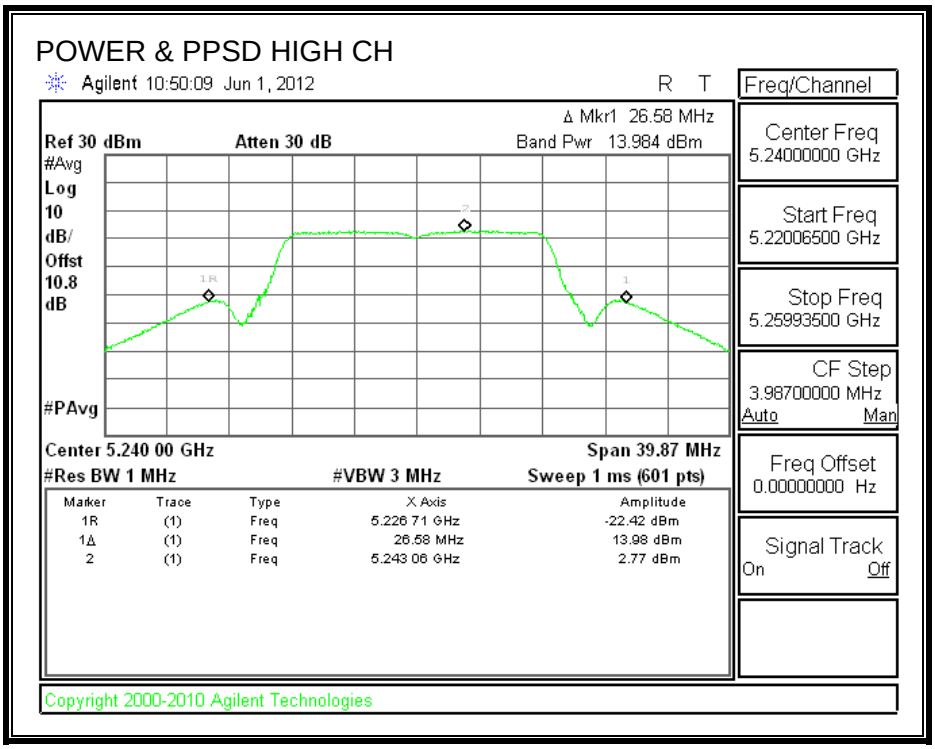
**OUTPUT POWER AND PPSD**

POWER & PPSD LOW CH




POWER & PPSD MID CH





### 8.1.5. PEAK EXCURSION

**LIMITS**

FCC §15.407 (a) (6)

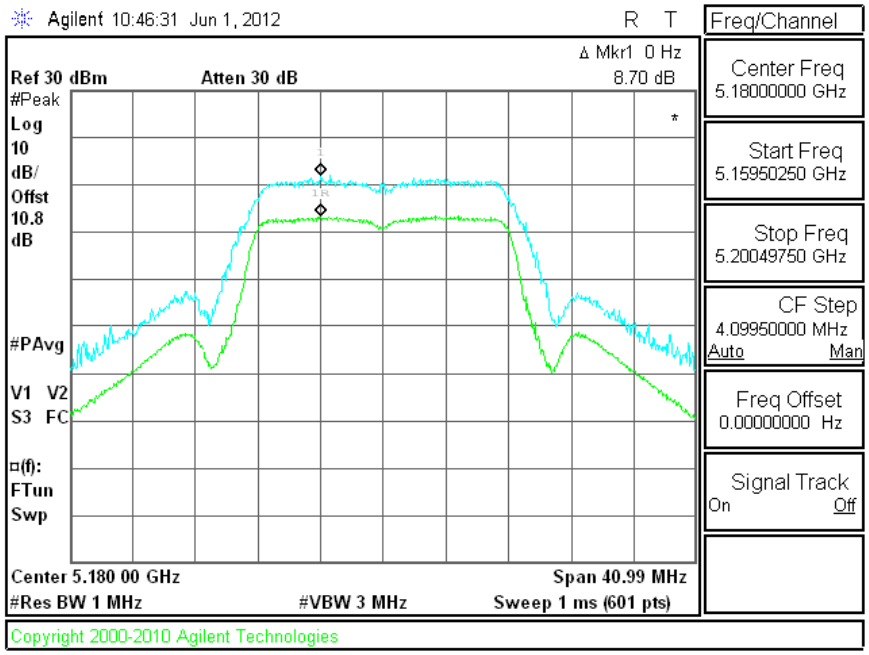
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

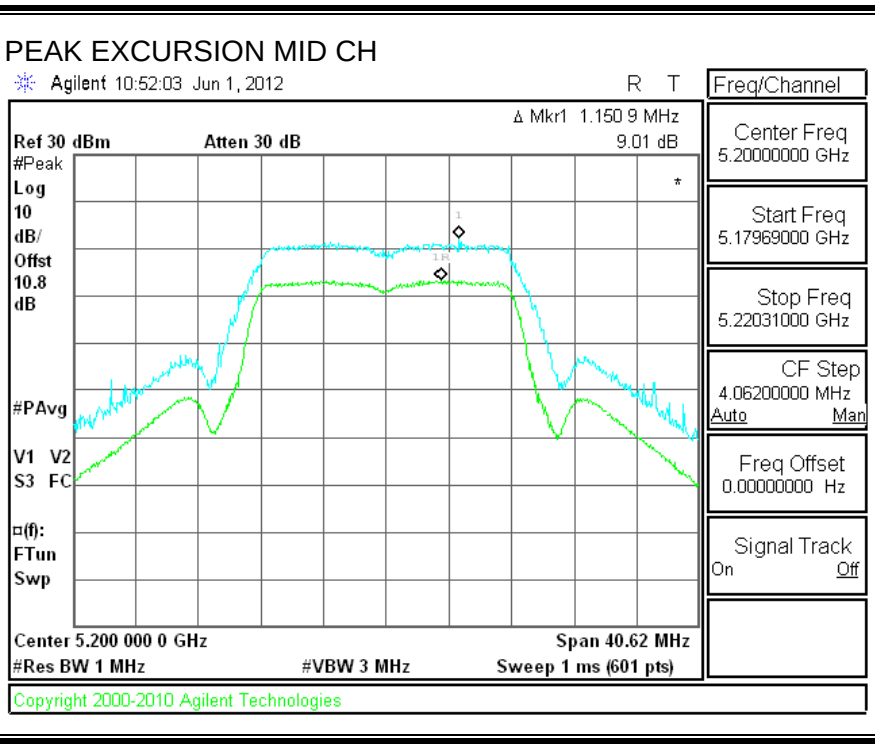
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 8.70 | 13 | -4.3 |
| Mid | 5200 | 9.01 | 13 | -4.0 |
| High | 5240 | 8.32 | 13 | -4.7 |

**PEAK EXCURSION**

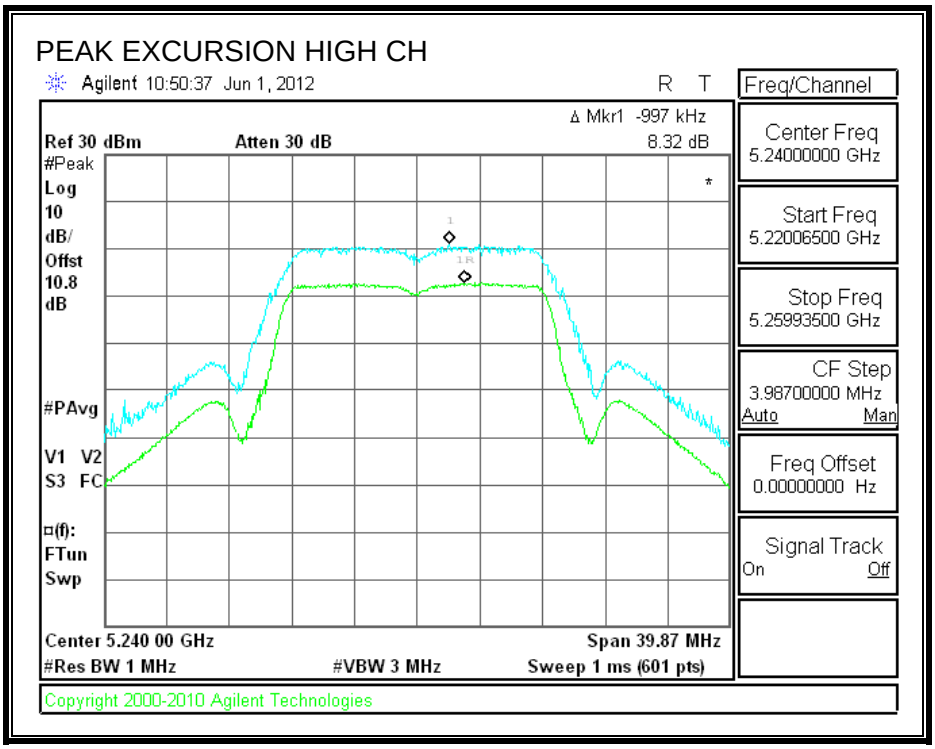
PEAK EXCURSION LOW CH




PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



## 8.2. 802.11n HT20, CDD MCS0, 2TX, 5.2 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

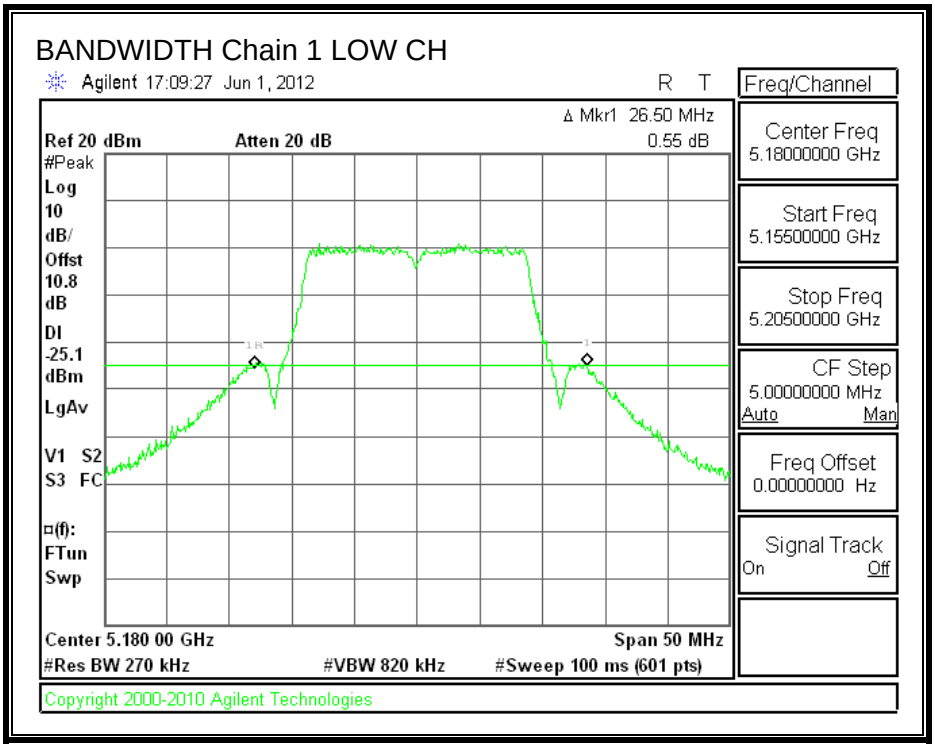
**LIMITS**

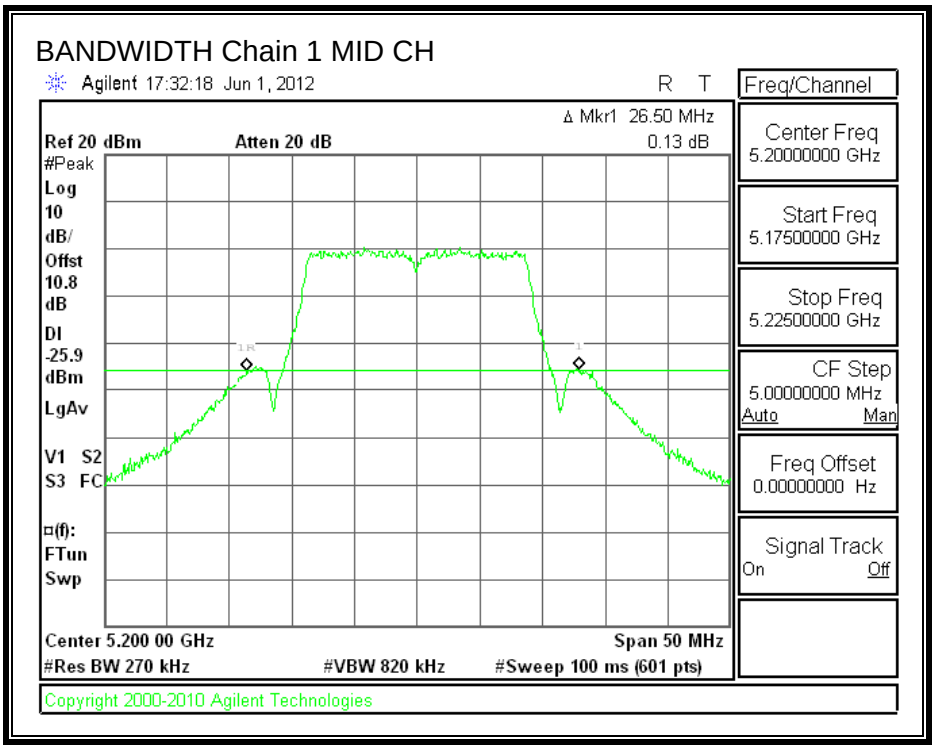
None; for reporting purposes only.

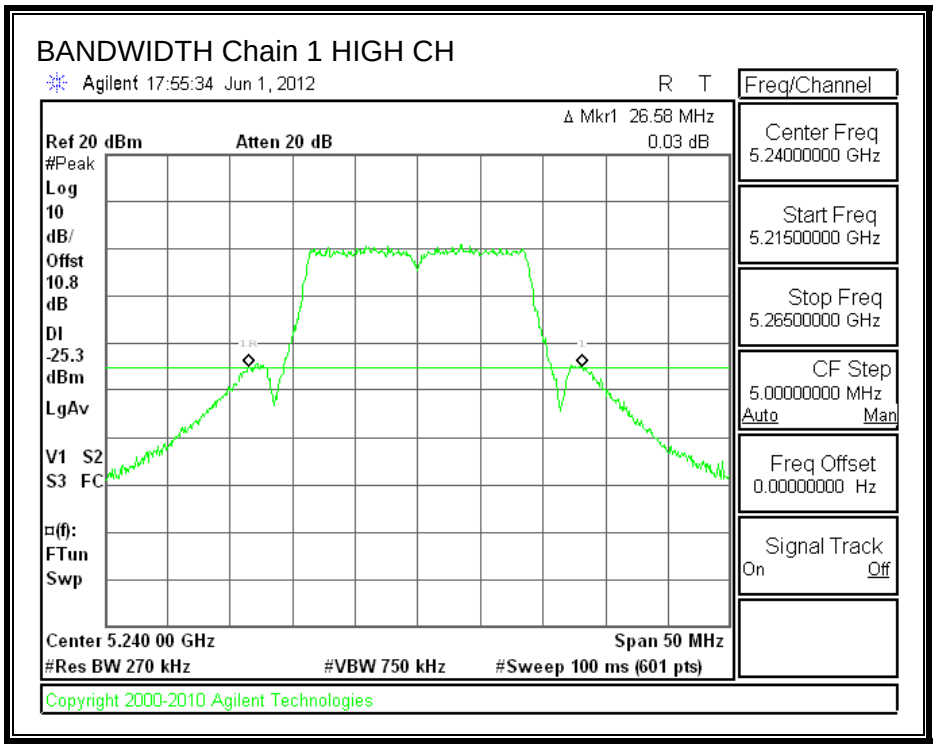
**RESULTS**

| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5180 | 26.50 | 26.50 |
| Mid | 5200 | 26.50 | 26.83 |
| High | 5240 | 26.58 | 26.33 |

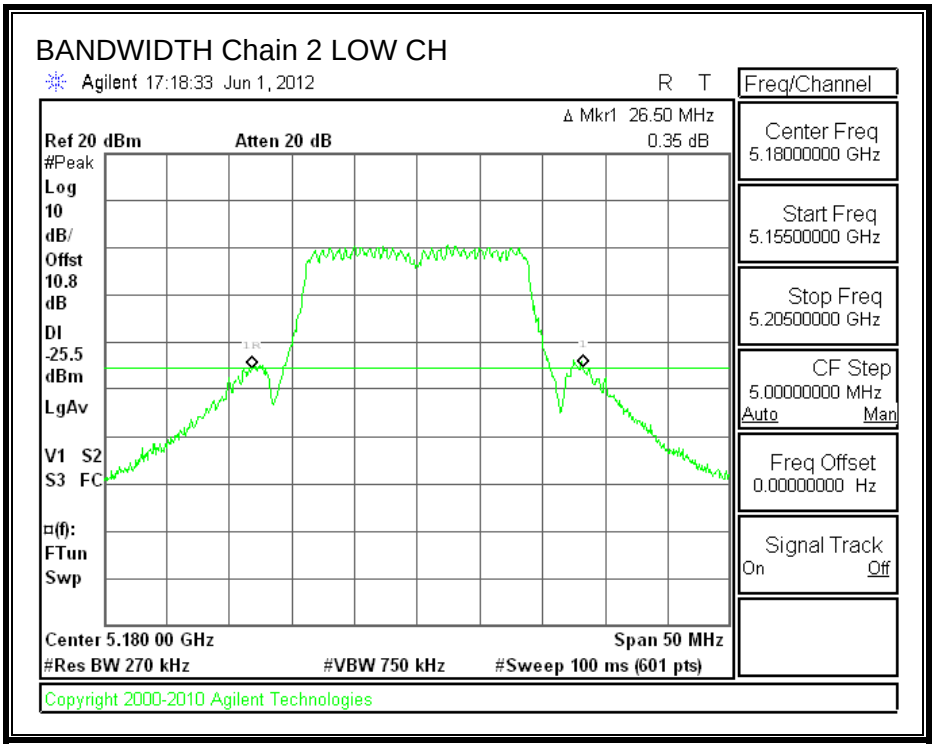
**26 dB BANDWIDTH, Chain 1**

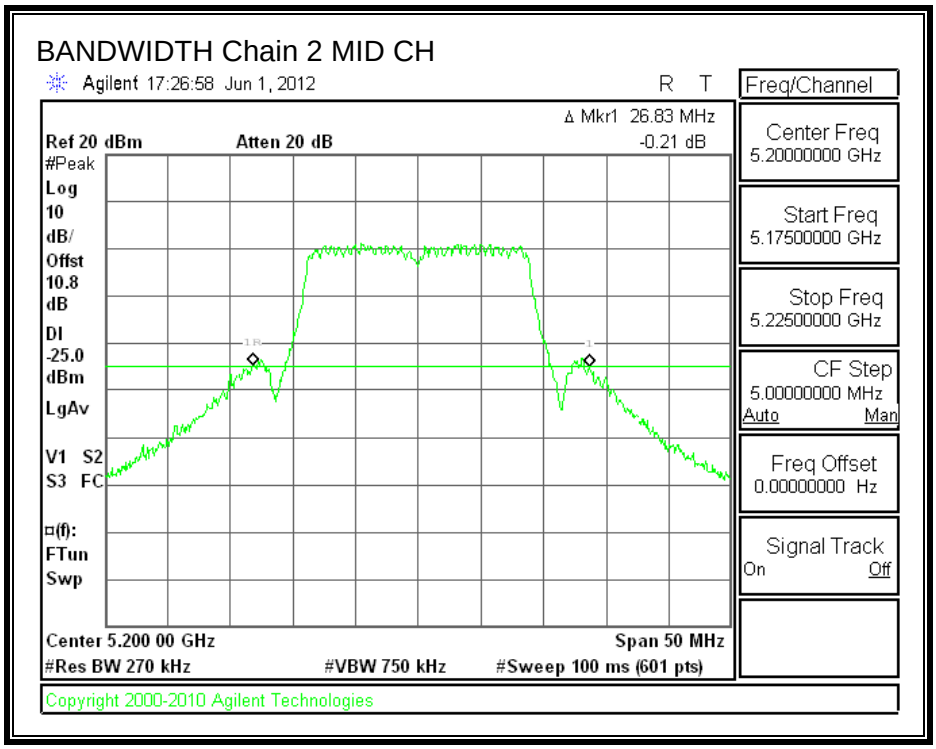


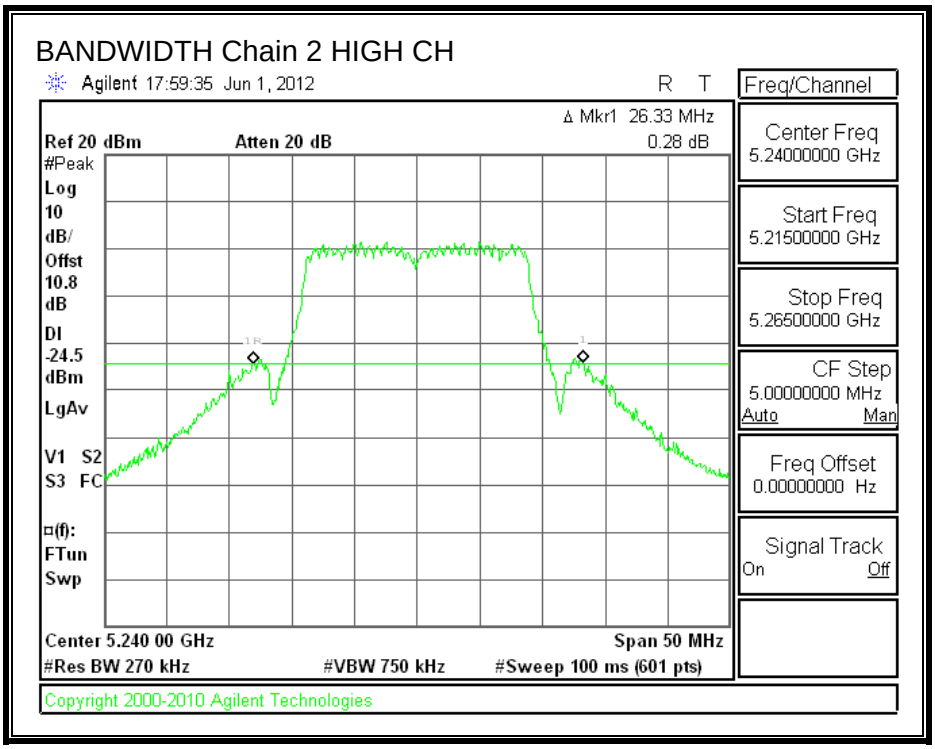





**26 dB BANDWIDTH, Chain 2**





### 8.2.2. 99% BANDWIDTH

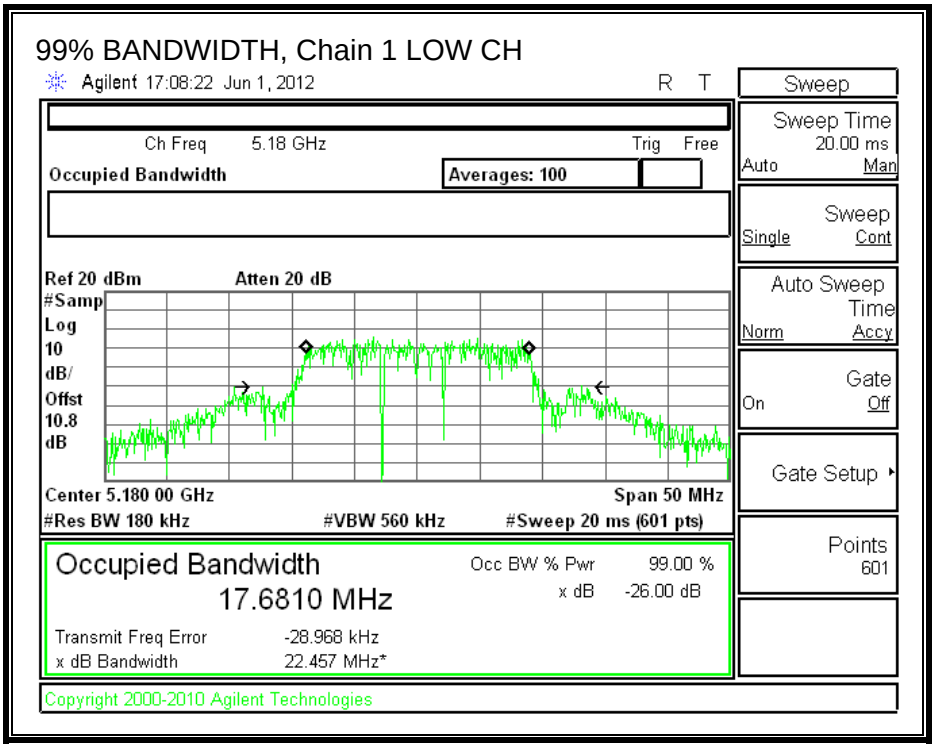
**LIMITS**

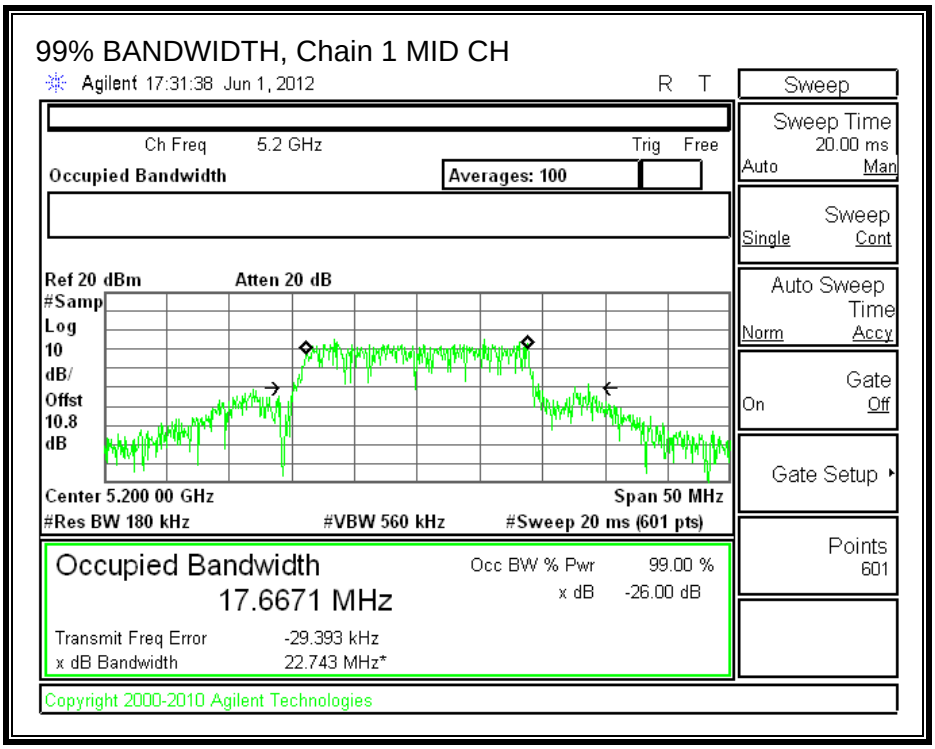
None; for reporting purposes only.

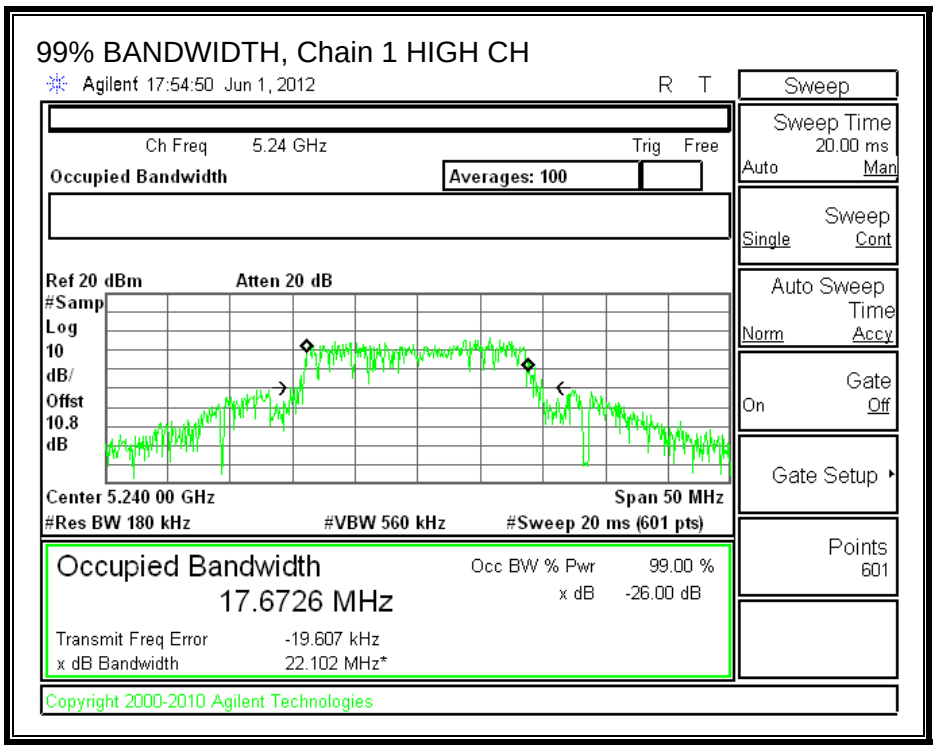
**RESULTS**

| Channel | Frequency (MHz) | 99% BW Chain 1 (MHz) | 99% BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5180 | 17.6810 | 17.6517 |
| Mid | 5200 | 17.6671 | 17.6552 |
| High | 5240 | 17.6726 | 17.6378 |

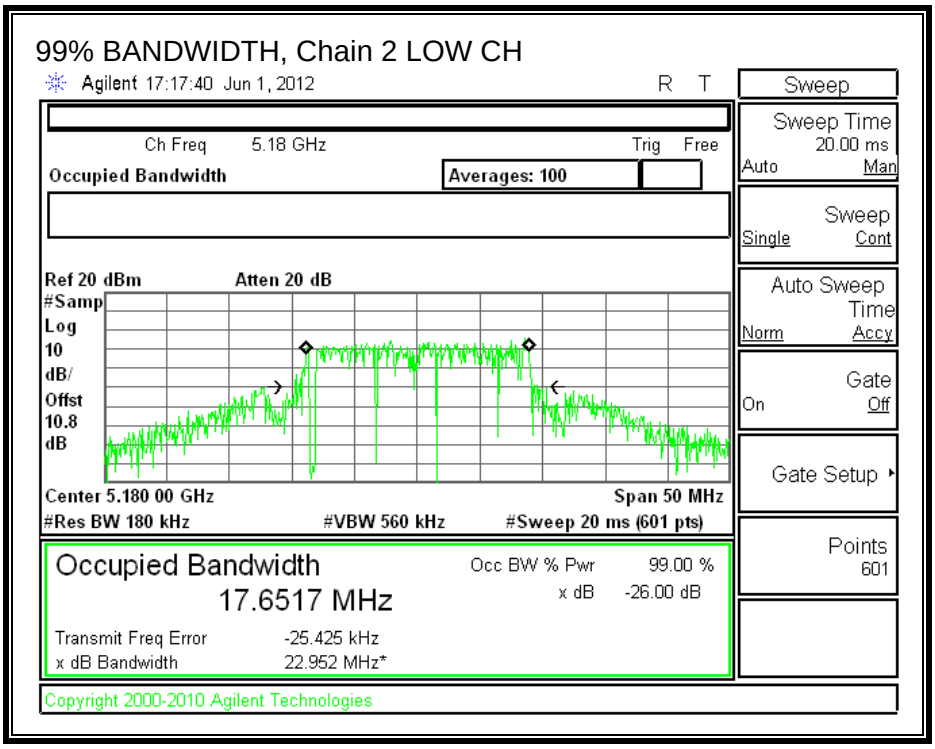
**99% BANDWIDTH, Chain 1**

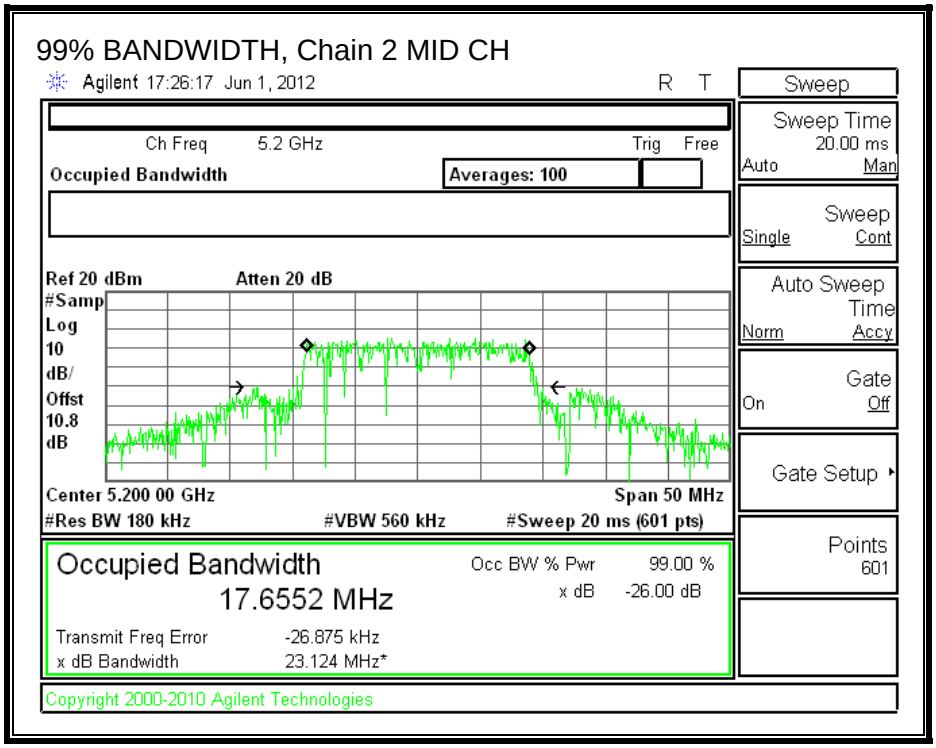


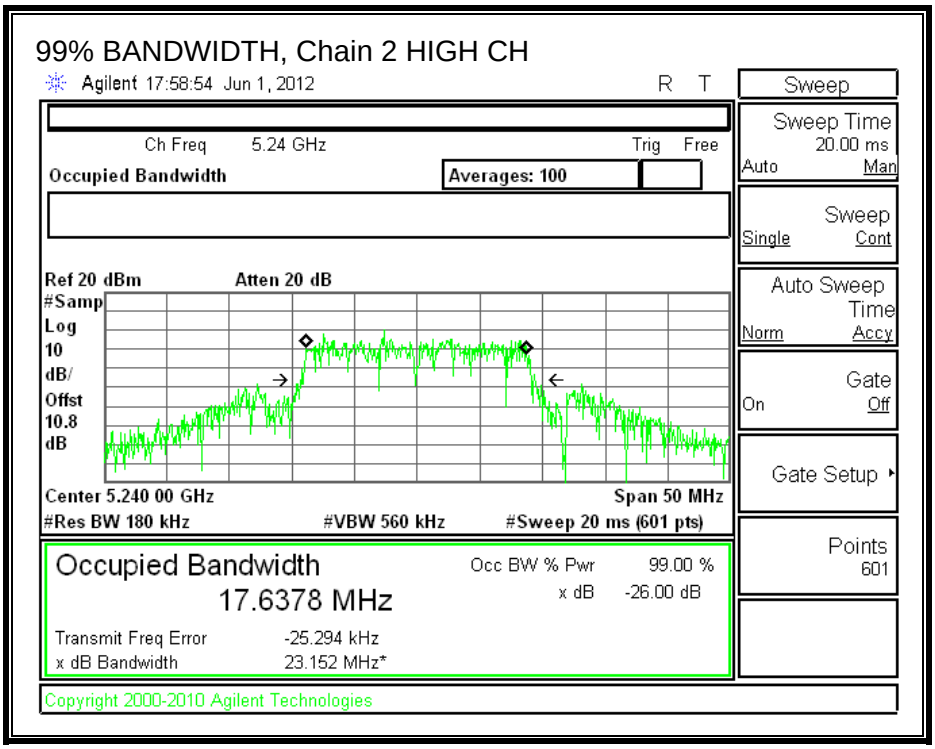





**99% BANDWIDTH, Chain 2**





## 8.2.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|
| Low | 5180 | 9.2 | 9.1 | 12.16 |
| Mid | 5200 | 9.1 | 8.9 | 12.01 |
| High | 5240 | 9.1 | 9.3 | 12.21 |

## 8.2.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

| Chain 1 Antenna Gain (dBi) | Chain 2 Antenna Gain (dBi) | Correlated Chains Directional Gain (dBi) |
|---|---|---|
| 4.16 | 5.65 | 7.95 |

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 26.50 | 18.23 | 7.95 | 15.05 | 2.05 |
| Mid | 5200 | 17 | 26.50 | 18.23 | 7.95 | 15.05 | 2.05 |
| High | 5240 | 17 | 26.33 | 18.20 | 7.95 | 15.05 | 2.05 |

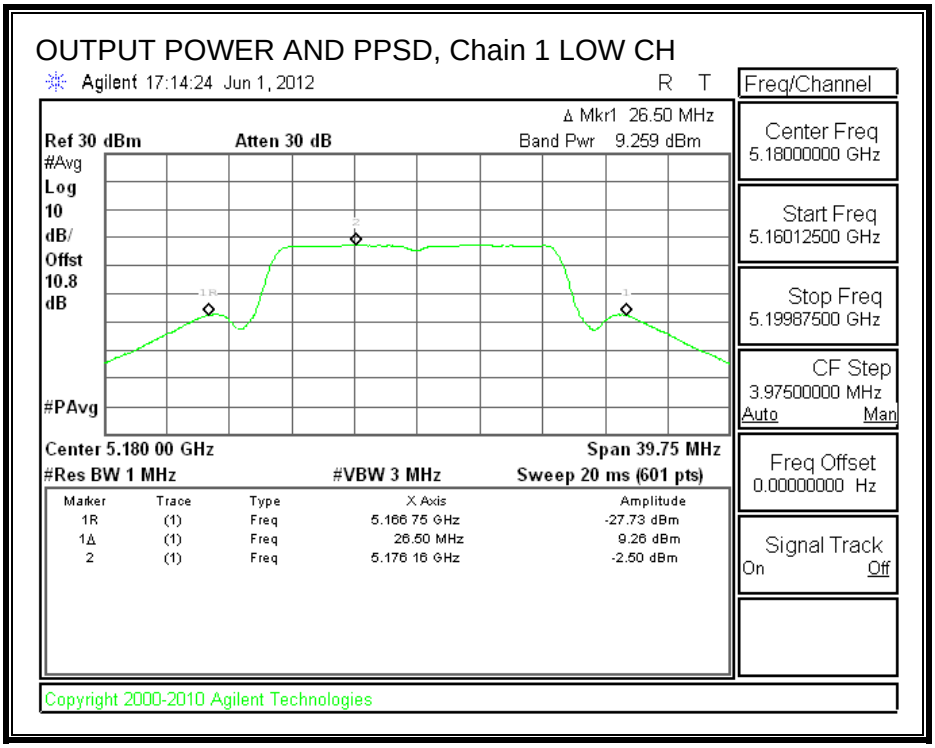
**Output Power Results**

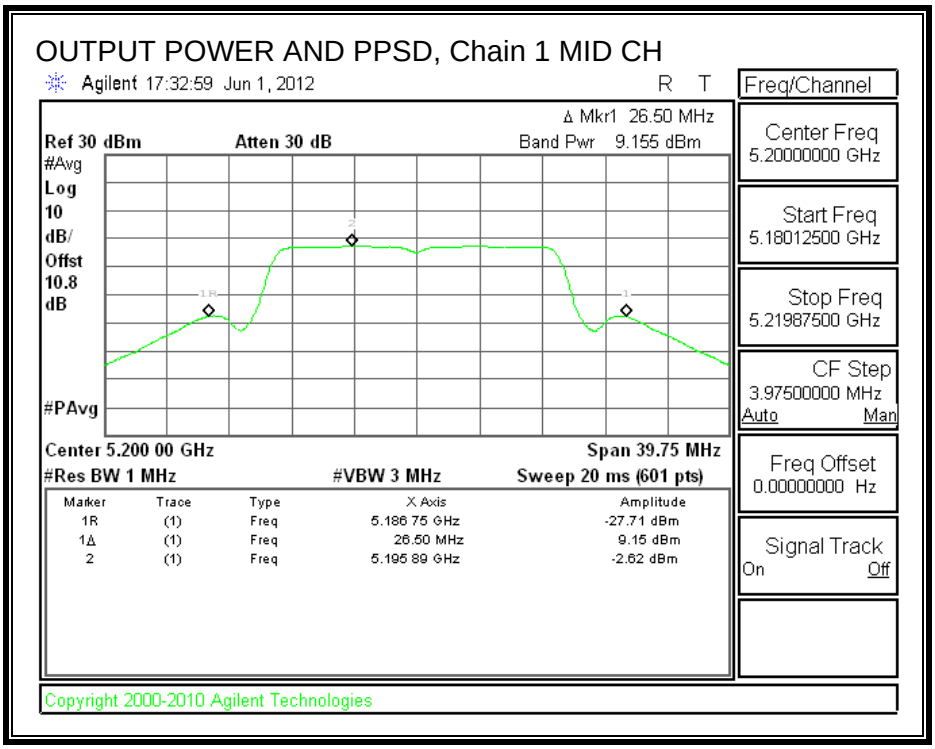
| Channel | Frequency (MHz) | Chain 1 Meas Power (dBm) | Chain 2 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 9.259 | 9.312 | 12.296 | 15.05 | -2.754 |
| Mid | 5200 | 9.155 | 9.789 | 12.494 | 15.05 | -2.556 |
| High | 5240 | 9.567 | 9.404 | 12.497 | 15.05 | -2.553 |

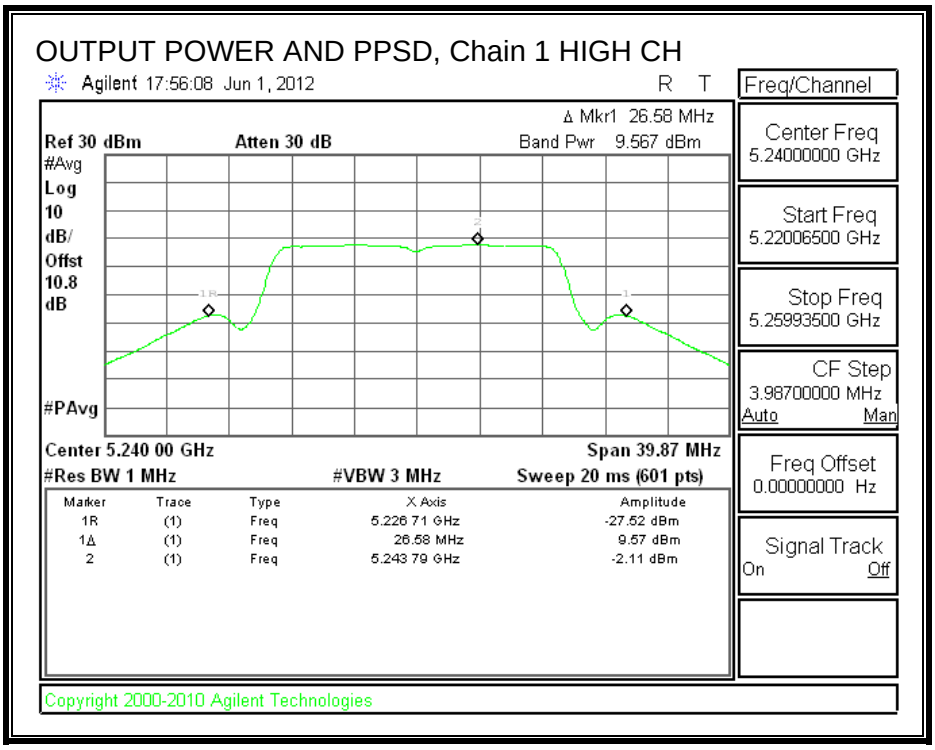
**PPSD Results**

| Channel | Frequency (MHz) | Chain 1 Meas PPSD (dBm) | Chain 2 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | -2.50 | -2.35 | 0.59 | 2.05 | -1.46 |
| Mid | 5200 | -2.62 | -1.87 | 0.78 | 2.05 | -1.27 |
| High | 5240 | -2.11 | -2.22 | 0.85 | 2.05 | -1.20 |

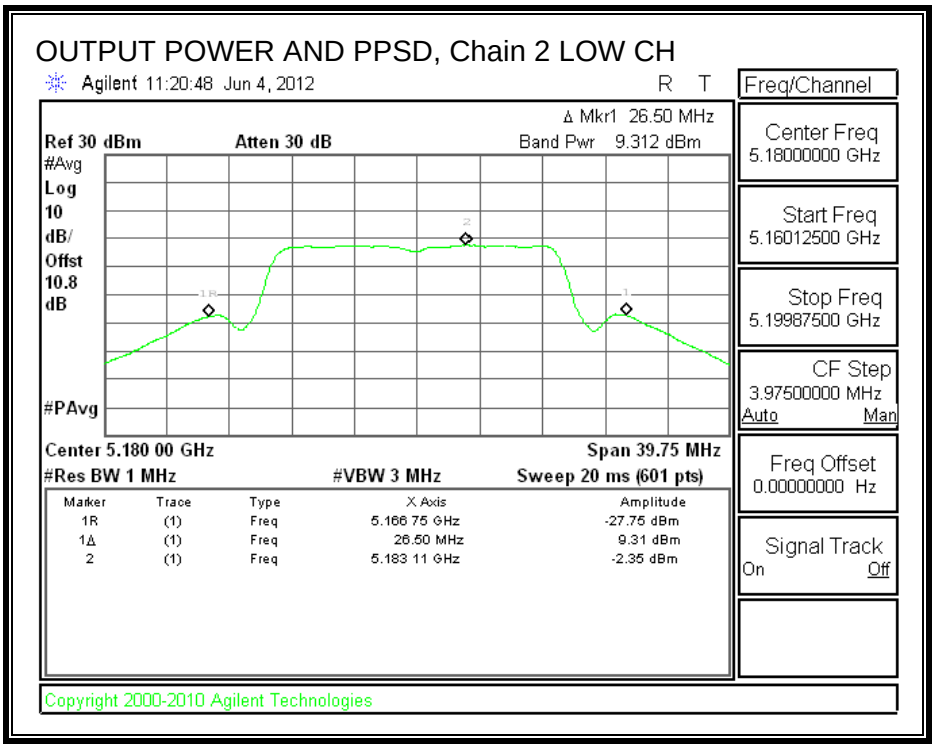
**OUTPUT POWER AND PPSD, Chain 1**

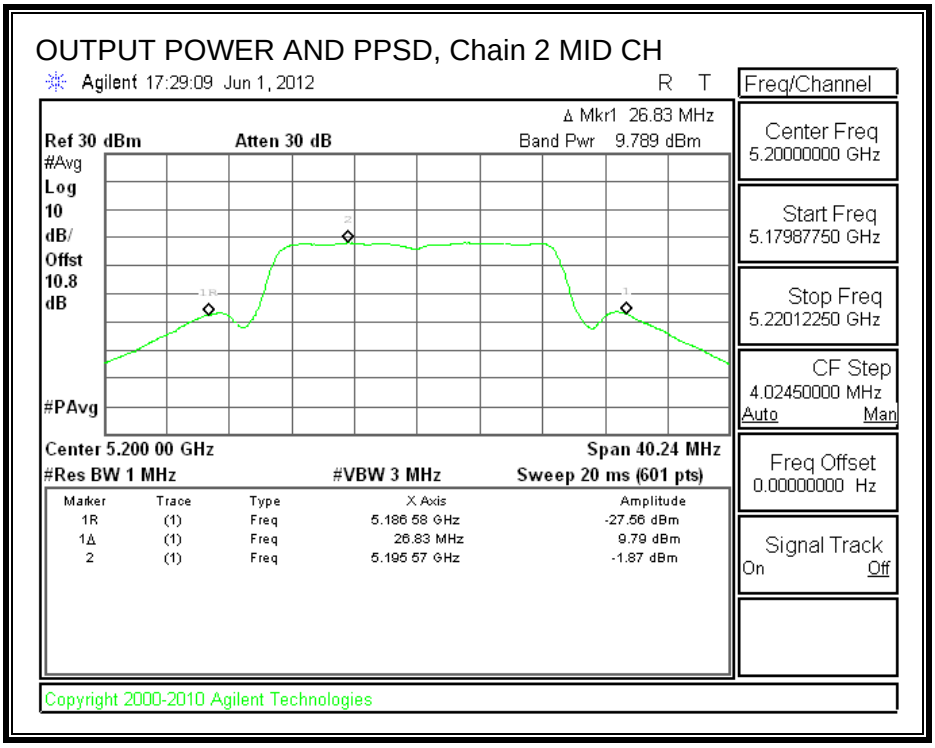


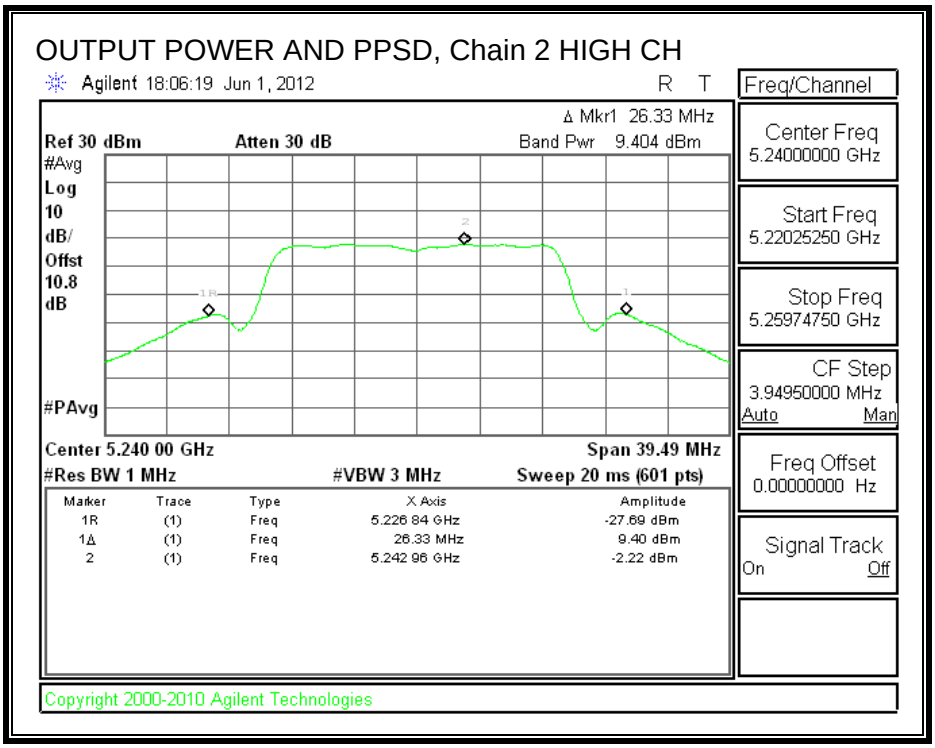






**OUTPUT POWER AND PPSD, Chain 2**





## 8.2.5. PEAK EXCURSION

**LIMITS**

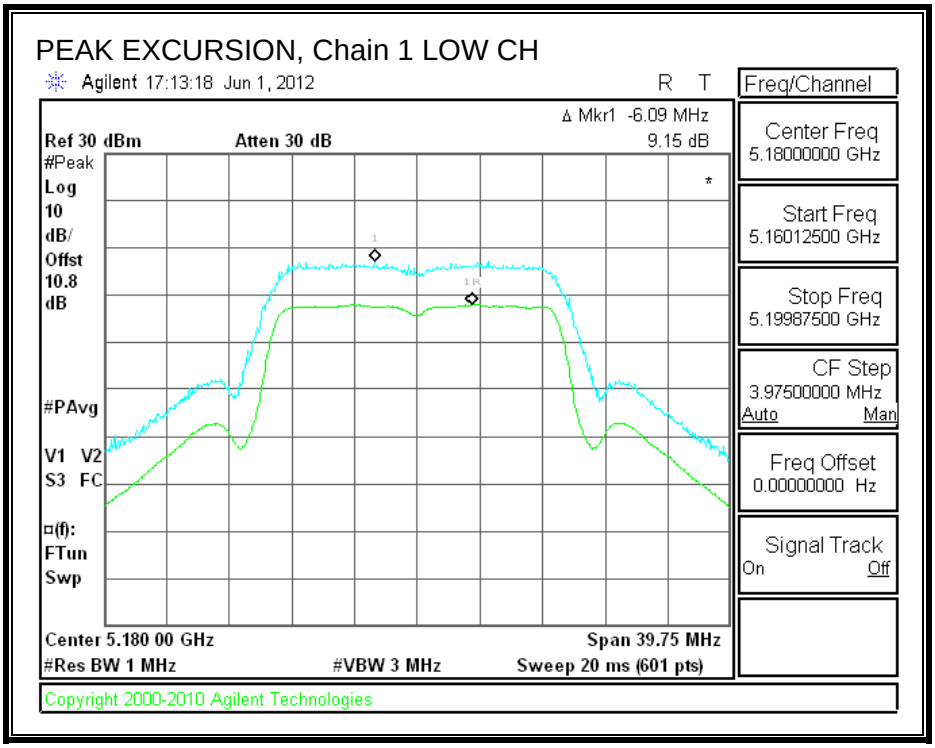
FCC §15.407 (a) (6)

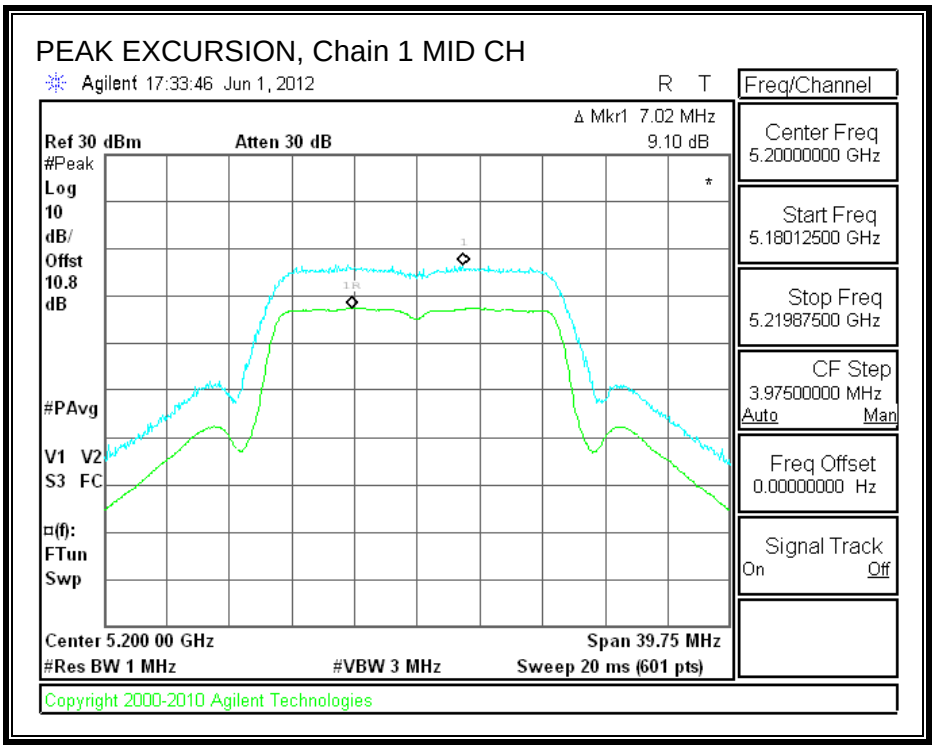
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

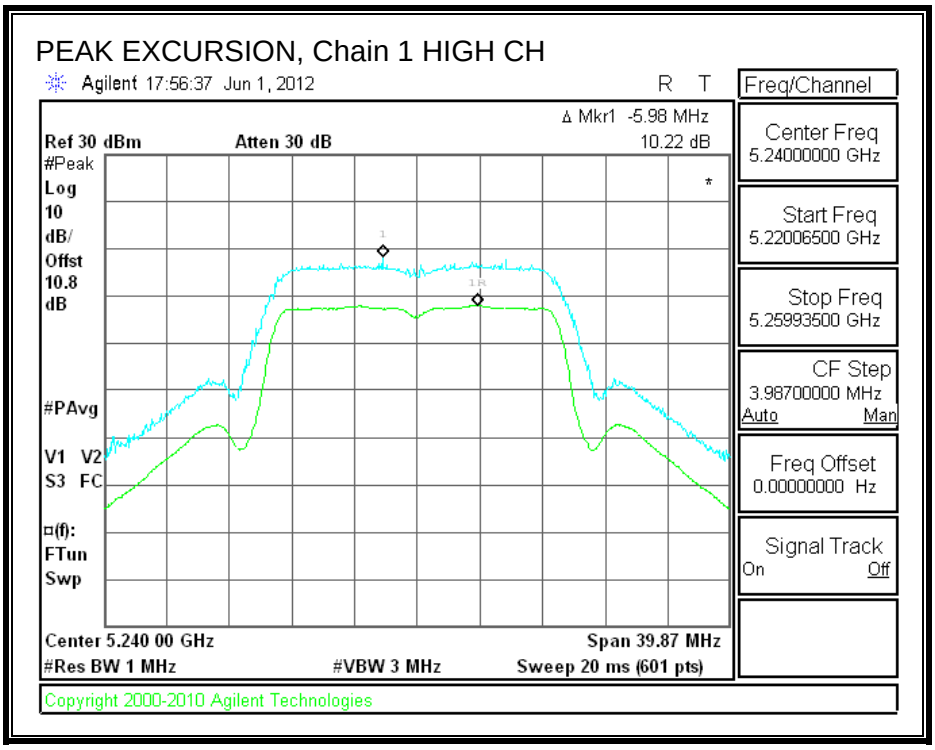
**RESULTS**

| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|
| Low | 5180 | 9.15 | 10.22 | 13 | -2.8 |
| Mid | 5200 | 9.10 | 10.28 | 13 | -2.7 |
| High | 5240 | 10.22 | 10.32 | 13 | -2.7 |

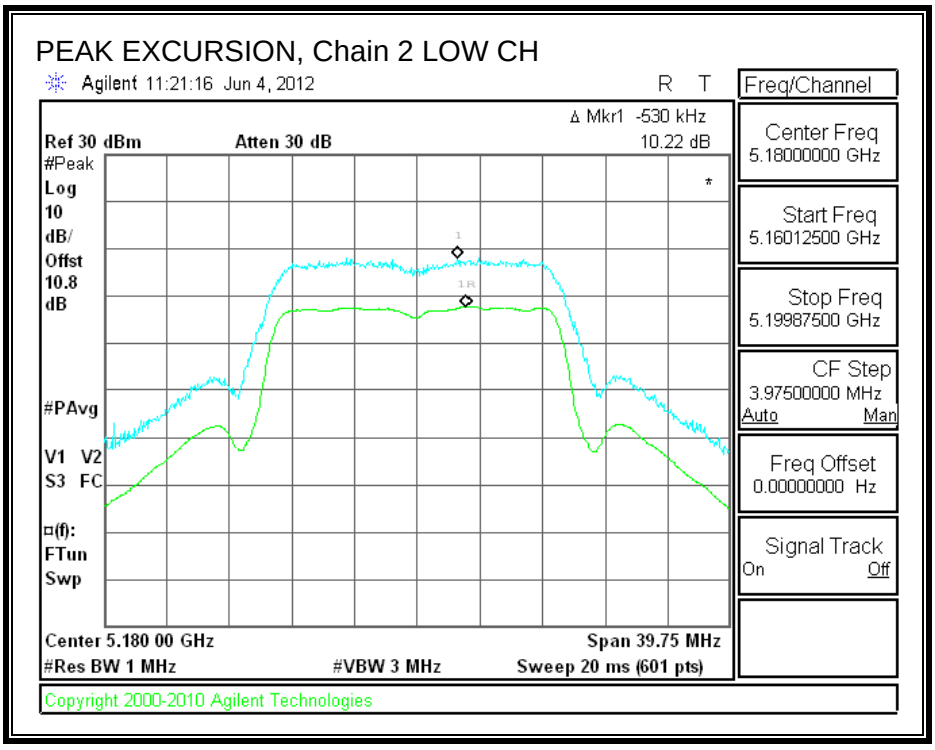
**PEAK EXCURSION, Chain 1**



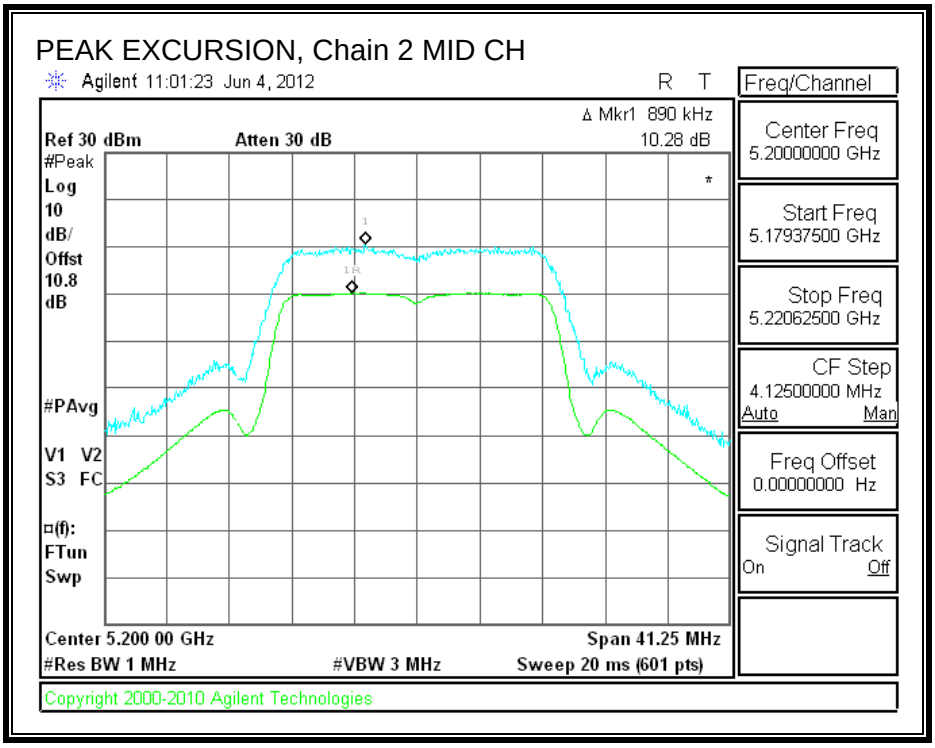





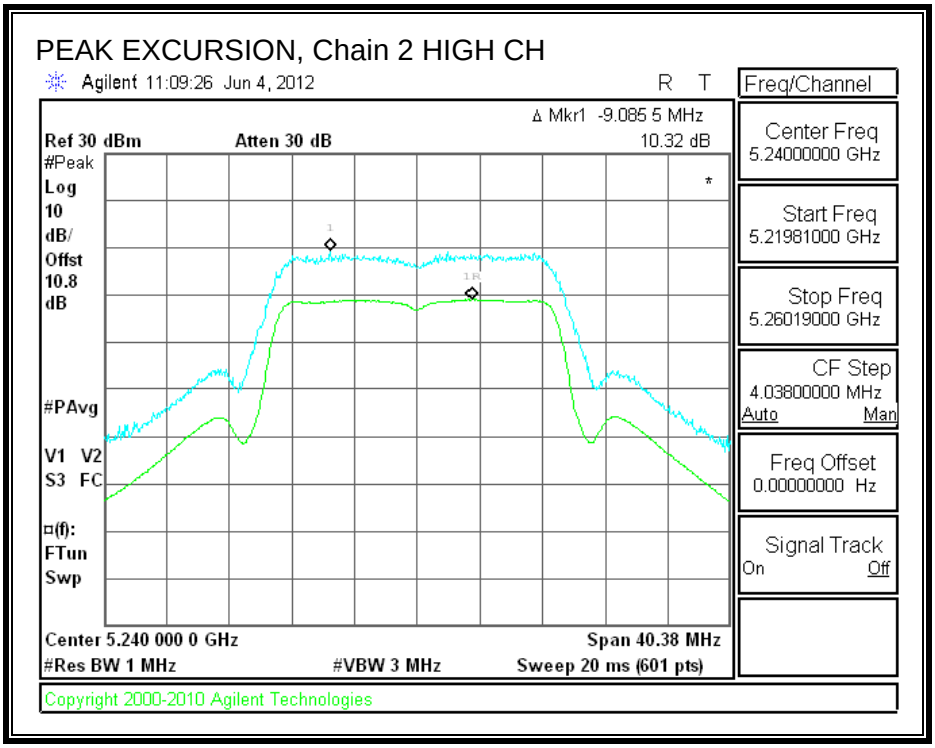

**PEAK EXCURSION, Chain 2**



PEAK EXCURSION, Chain 2 MID CH




PEAK EXCURSION, Chain 2 HIGH CH



## 8.3. 802.11n HT20, STBC MCS0, 2TX, 5.2 GHz BAND

### 8.3.1. 26 dB BANDWIDTH

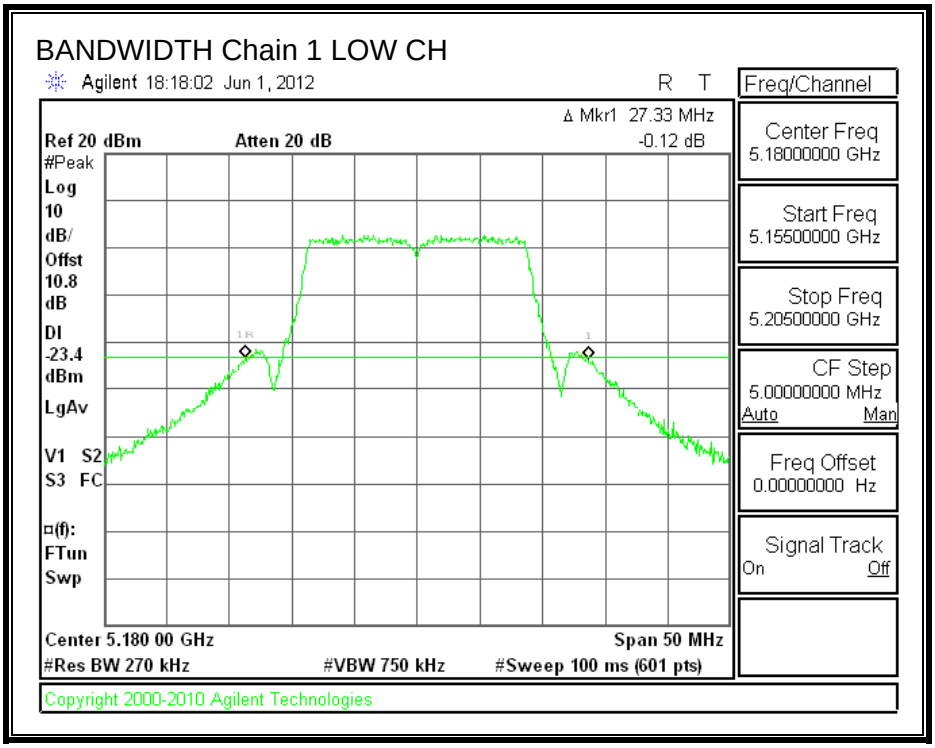
**LIMITS**

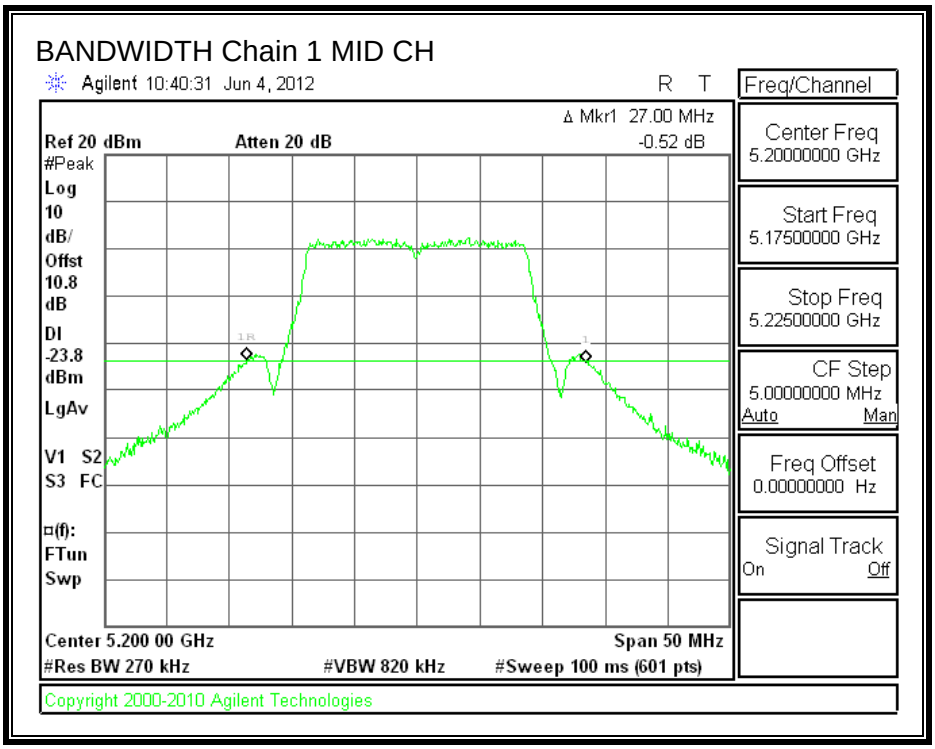
None; for reporting purposes only.

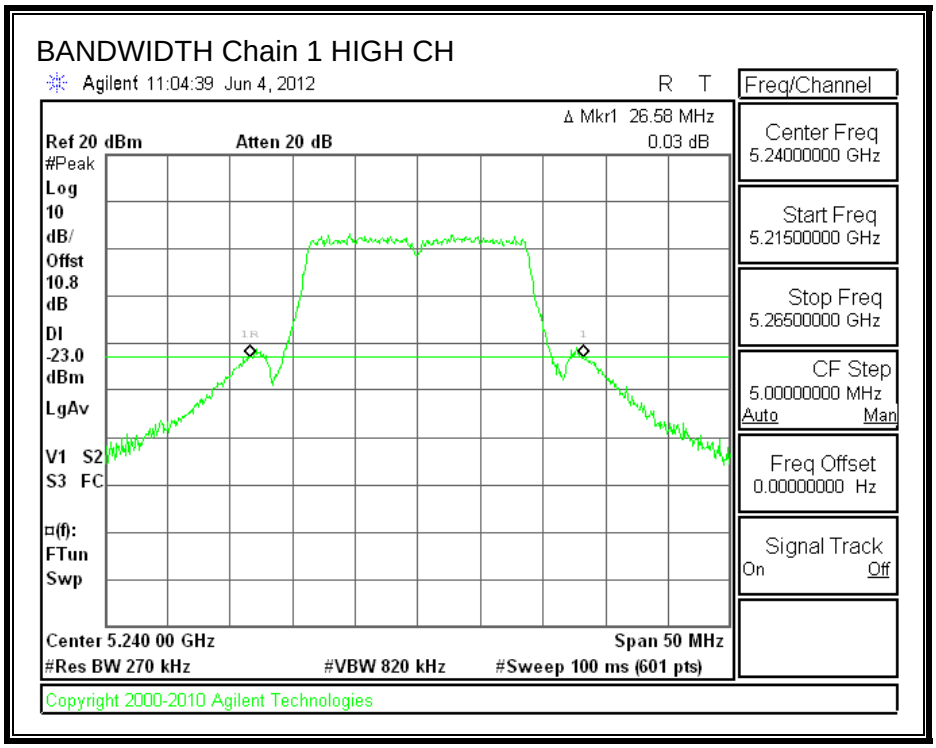
**RESULTS**

| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5180 | 27.33 | 27.50 |
| Mid | 5200 | 27.00 | 27.50 |
| High | 5240 | 26.58 | 26.92 |

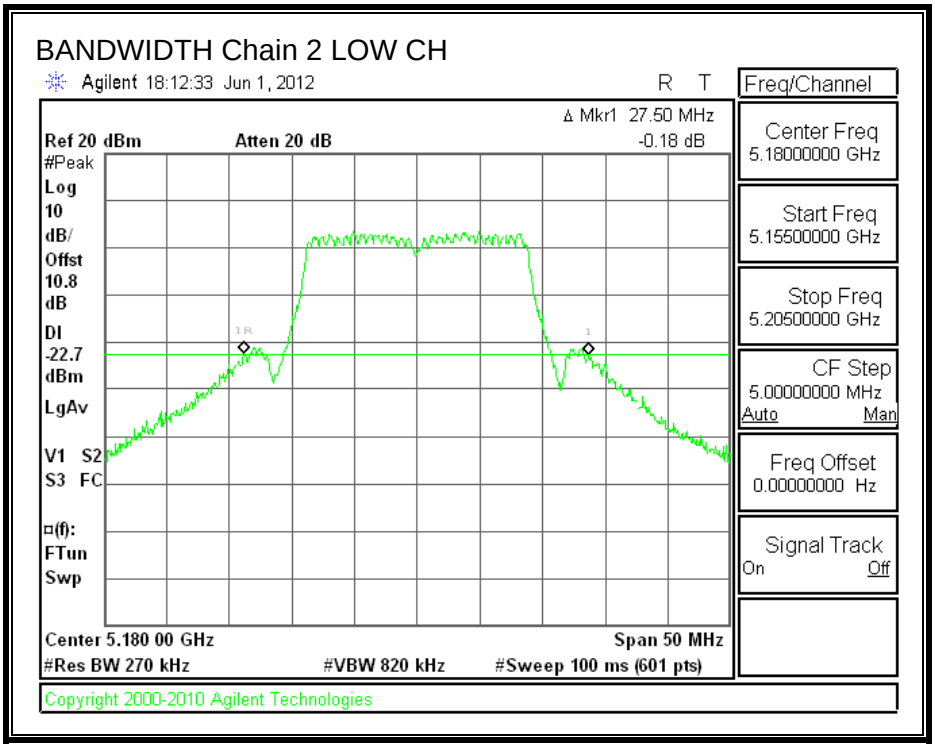
**26 dB BANDWIDTH, Chain 1**

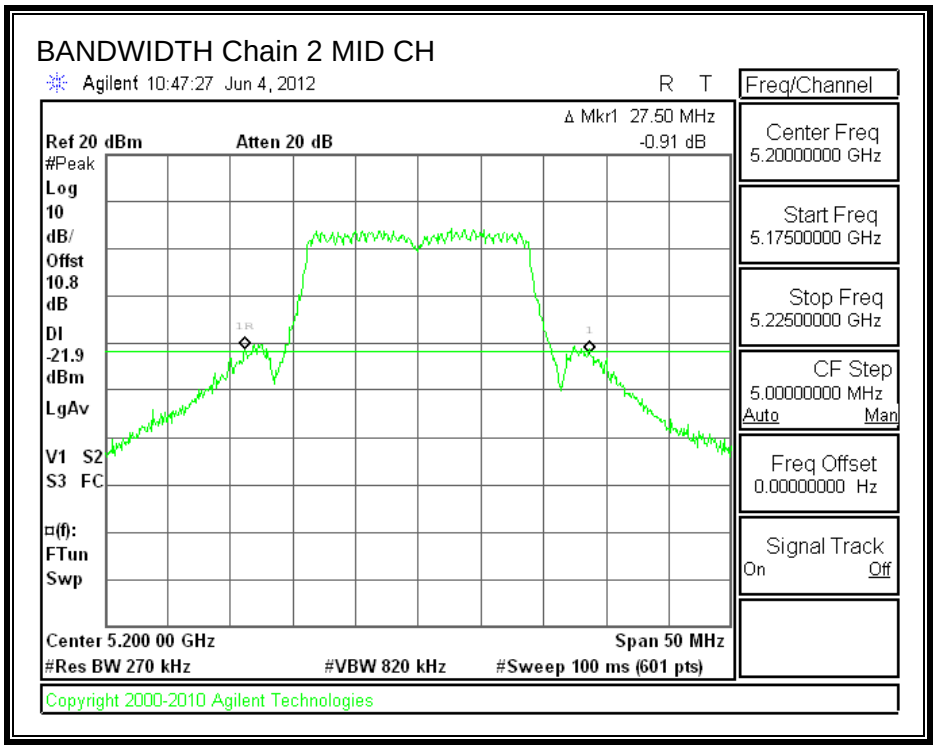


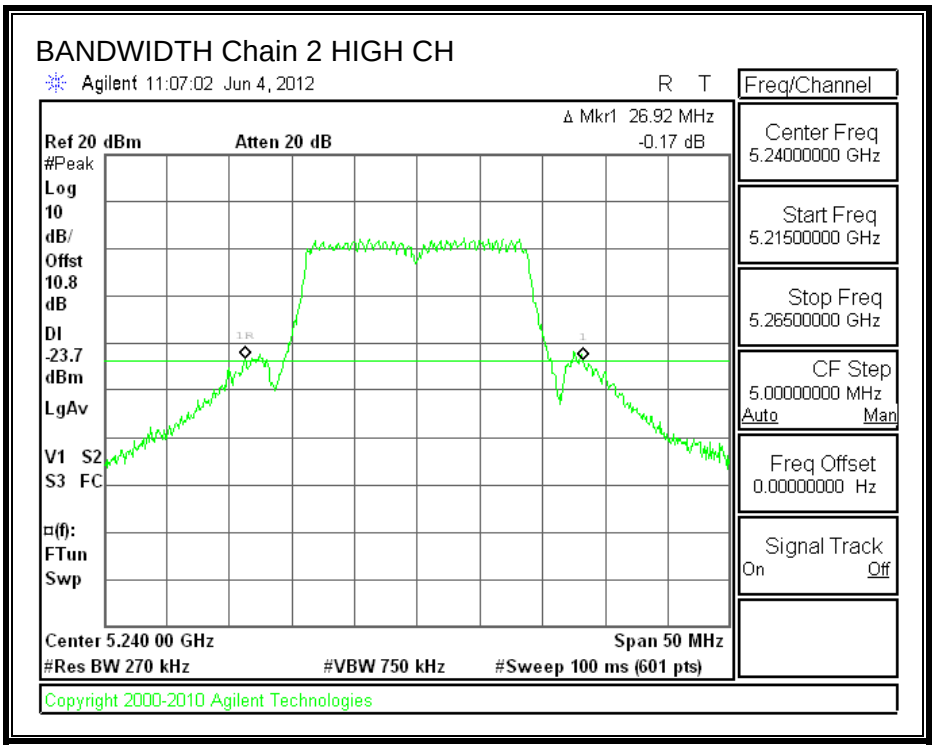





**26 dB BANDWIDTH, Chain 2**





### 8.3.2. 99% BANDWIDTH

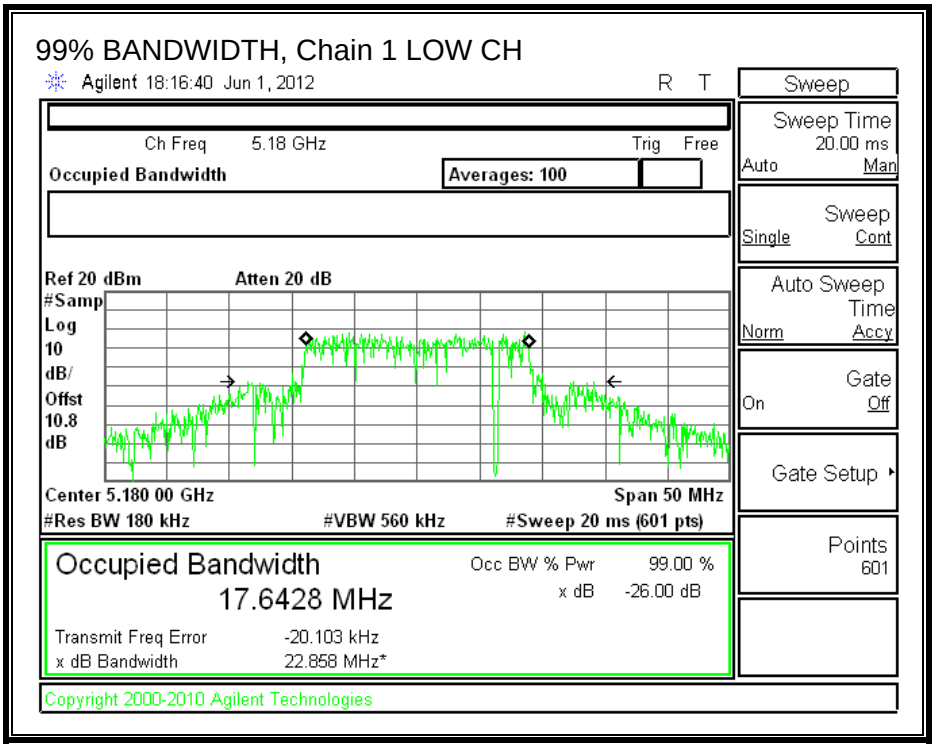
**LIMITS**

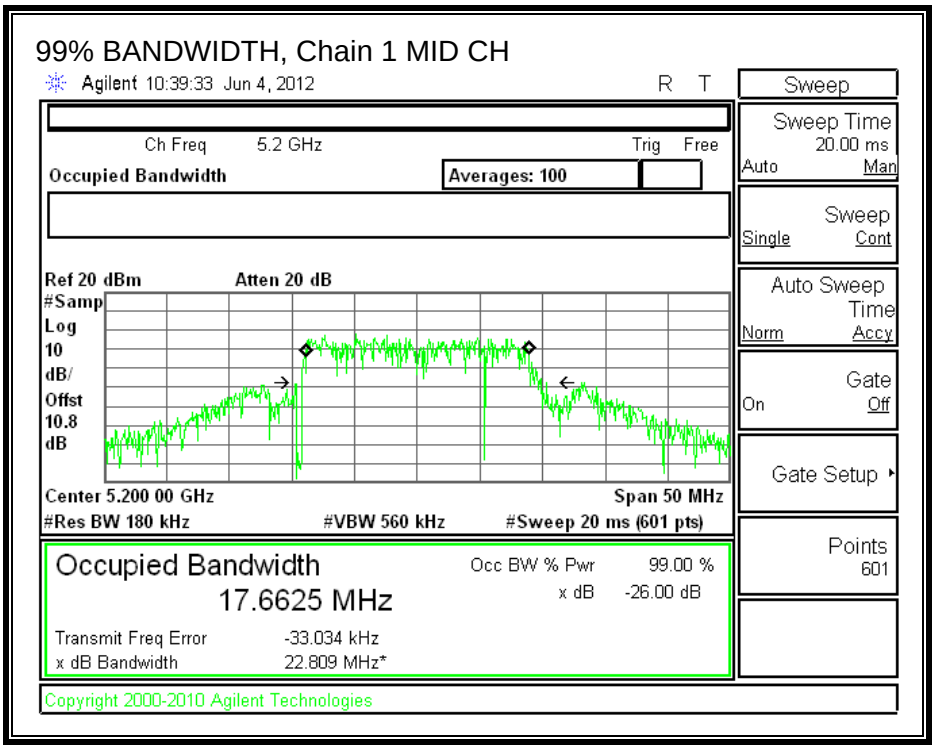
None; for reporting purposes only.

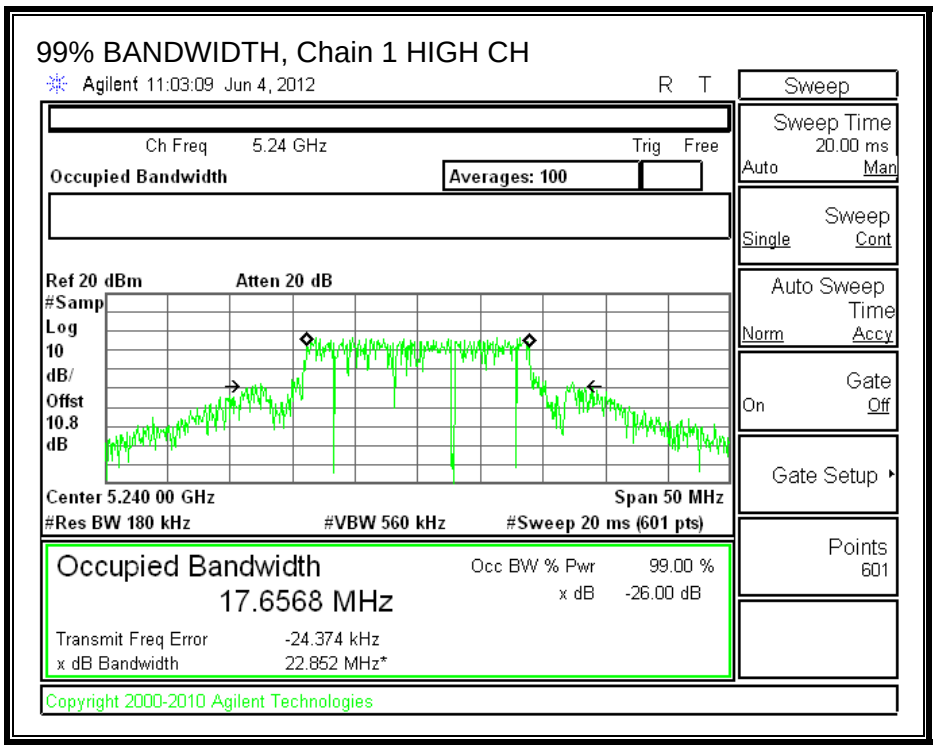
**RESULTS**

| Channel | Frequency (MHz) | 99% BW Chain 1 (MHz) | 99% BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5180 | 17.6428 | 17.6718 |
| Mid | 5200 | 17.6625 | 17.6538 |
| High | 5240 | 17.6568 | 17.6555 |

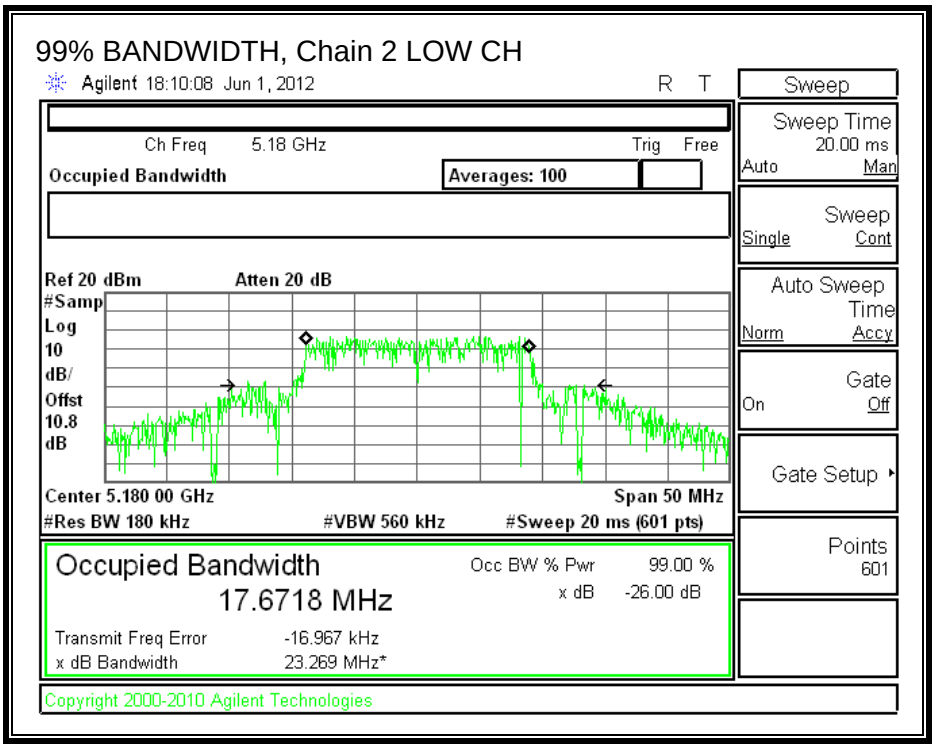
**99% BANDWIDTH, Chain 1**

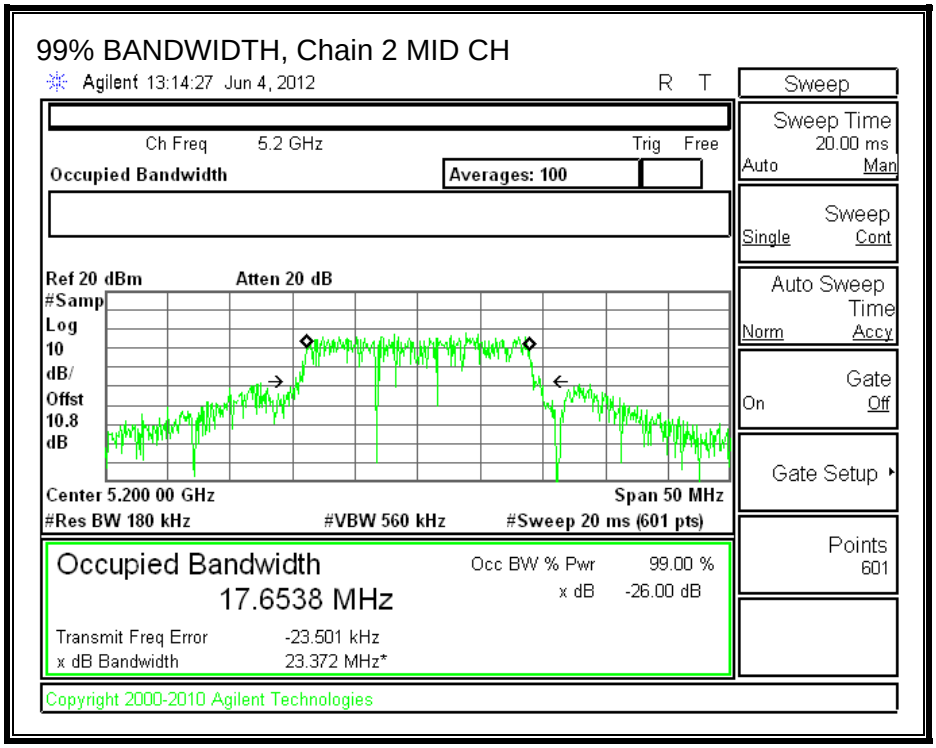


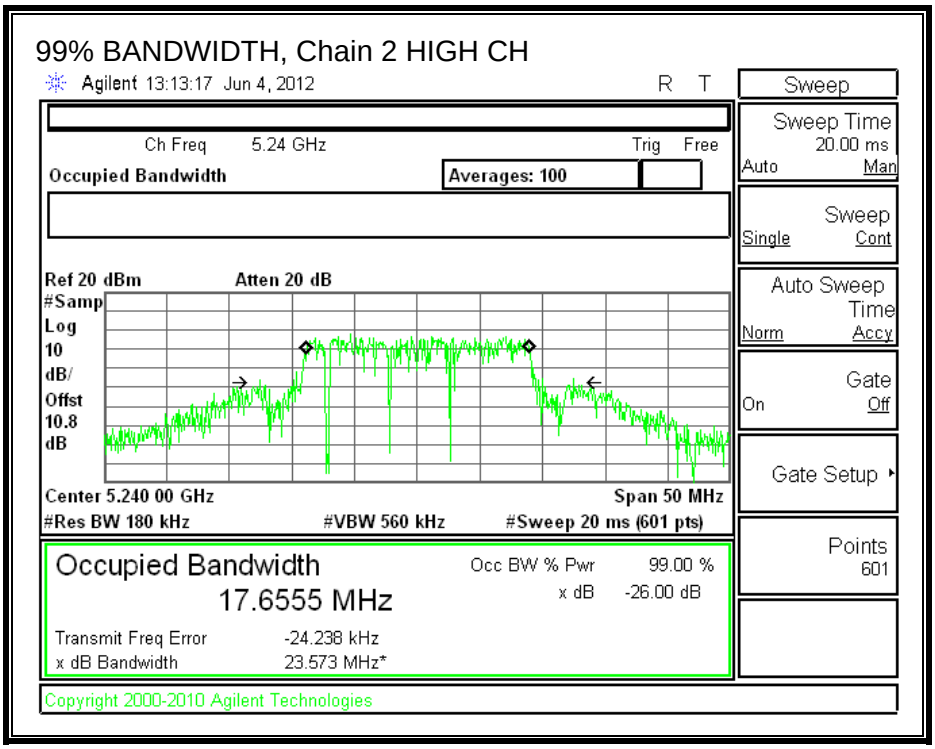





**99% BANDWIDTH, Chain 2**





## 8.3.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|
| Low | 5180 | 11.5 | 11.5 | 14.51 |
| Mid | 5200 | 11.4 | 11.6 | 14.51 |
| High | 5240 | 11.6 | 11.4 | 14.51 |

## 8.3.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

| Chain 1 Antenna Gain (dBi) | Chain 2 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|---|---|---|
| 4.16 | 5.65 | 4.97 |

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 27.33 | 18.37 | 4.97 | 17.00 | 4.00 |
| Mid | 5200 | 17 | 27.00 | 18.31 | 4.97 | 17.00 | 4.00 |
| High | 5240 | 17 | 26.58 | 18.25 | 4.97 | 17.00 | 4.00 |

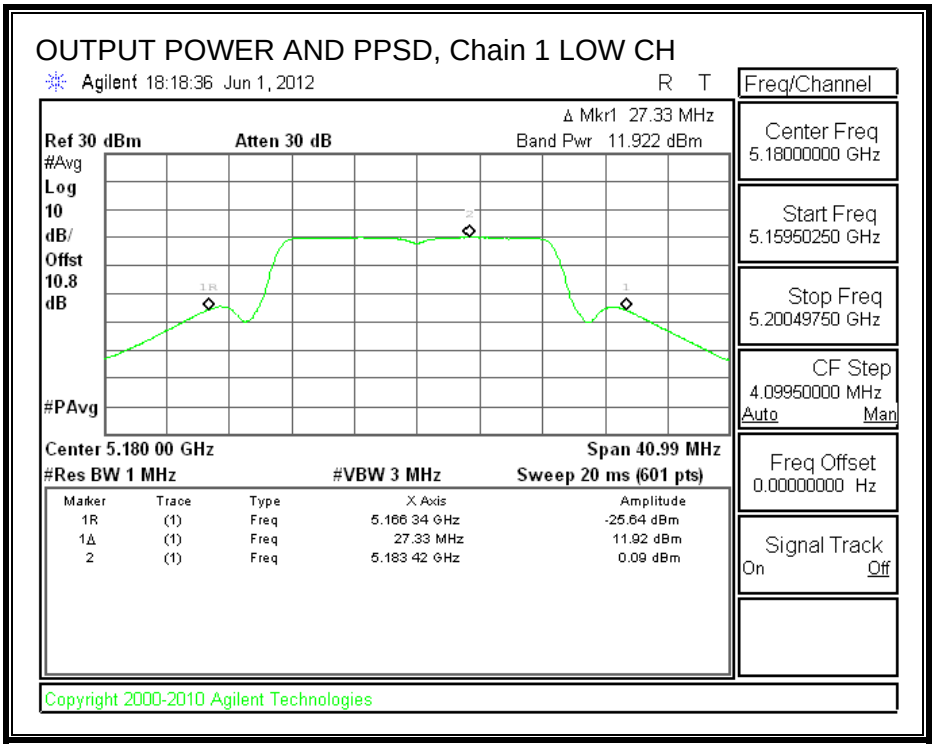
**Output Power Results**

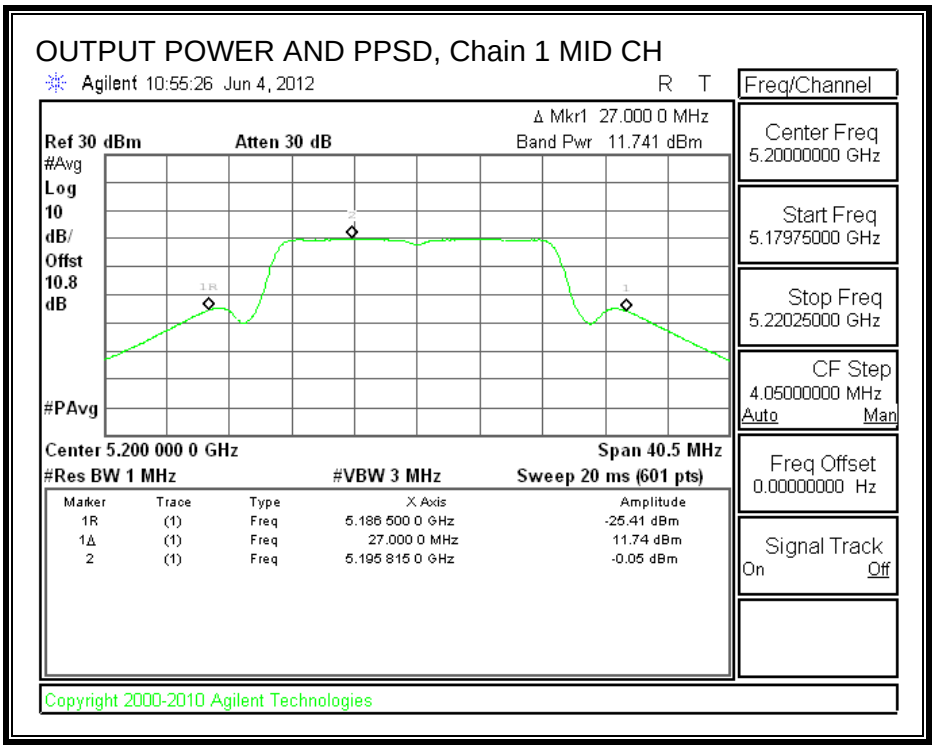
| Channel | Frequency (MHz) | Chain 1 Meas Power (dBm) | Chain 2 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 11.922 | 11.989 | 14.966 | 17.00 | -2.034 |
| Mid | 5200 | 11.741 | 12.039 | 14.903 | 17.00 | -2.097 |
| High | 5240 | 12.000 | 10.766 | 14.437 | 17.00 | -2.563 |

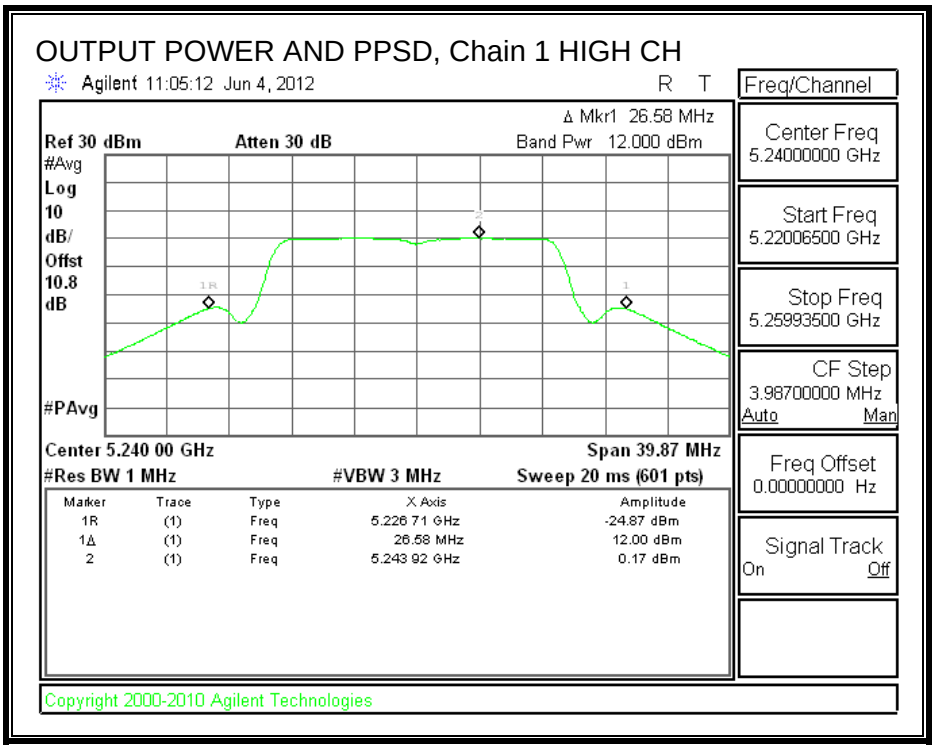
**PPSD Results**

| Channel | Frequency (MHz) | Chain 1 Meas PPSD (dBm) | Chain 2 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 0.09 | 0.21 | 3.16 | 4.00 | -0.84 |
| Mid | 5200 | -0.05 | 0.19 | 3.08 | 4.00 | -0.92 |
| High | 5240 | 0.17 | -1.02 | 2.63 | 4.00 | -1.37 |

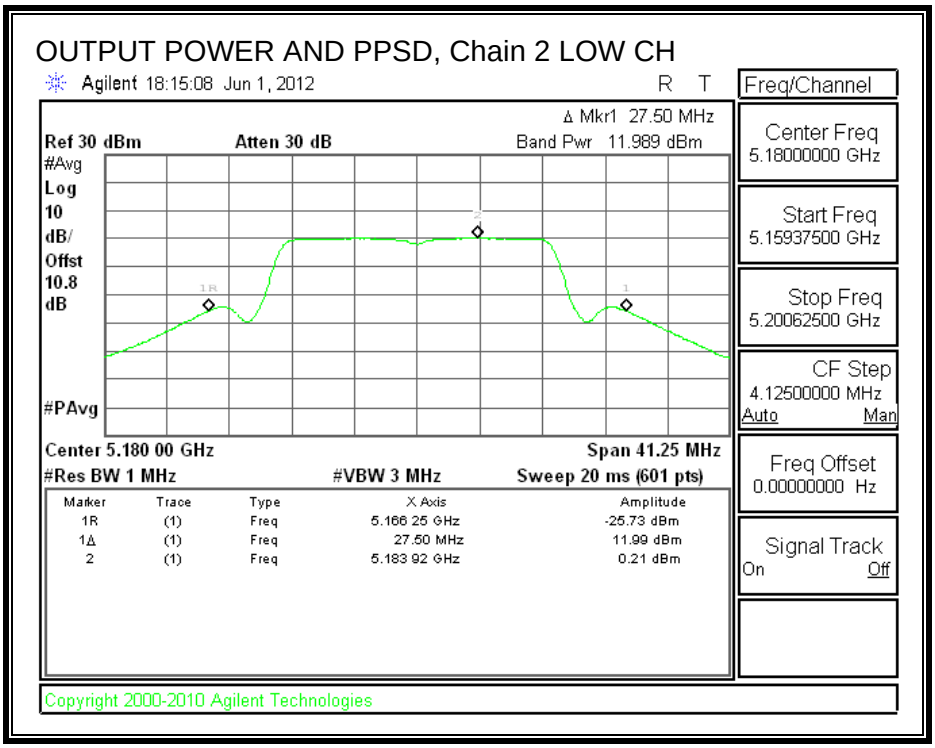
**OUTPUT POWER AND PPSD, Chain 1**

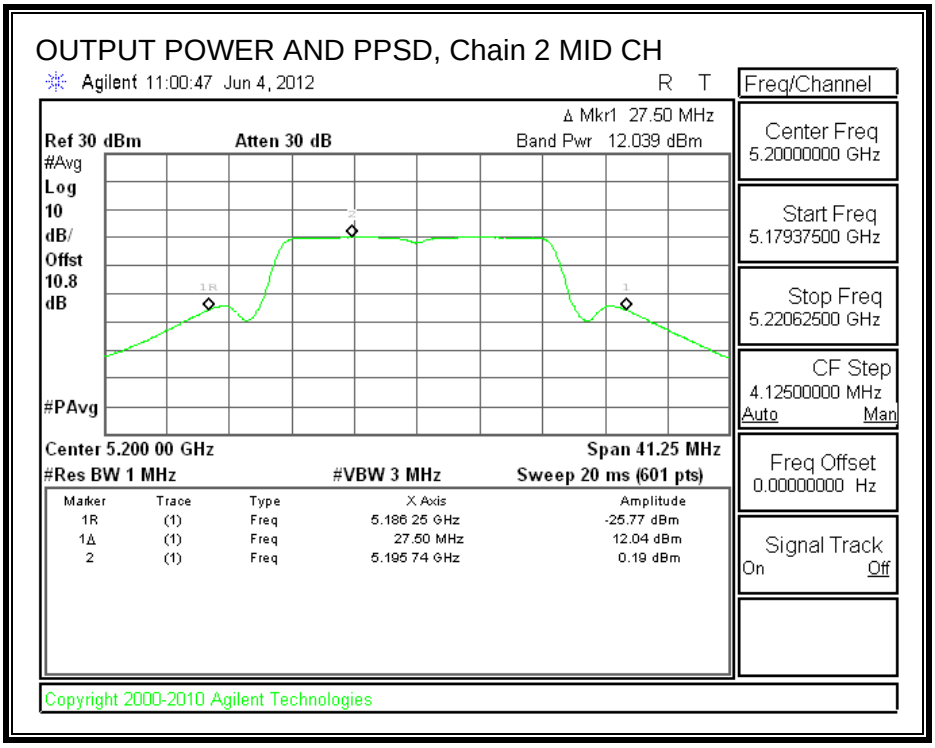


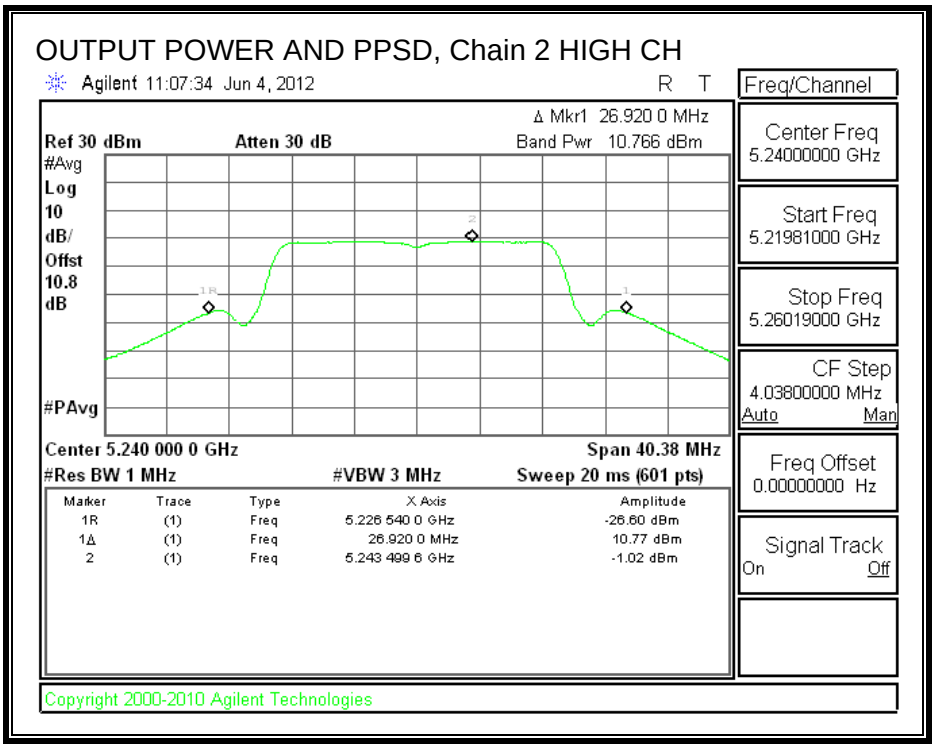






**OUTPUT POWER AND PPSD, Chain 2**





## 8.3.5. PEAK EXCURSION

**LIMITS**

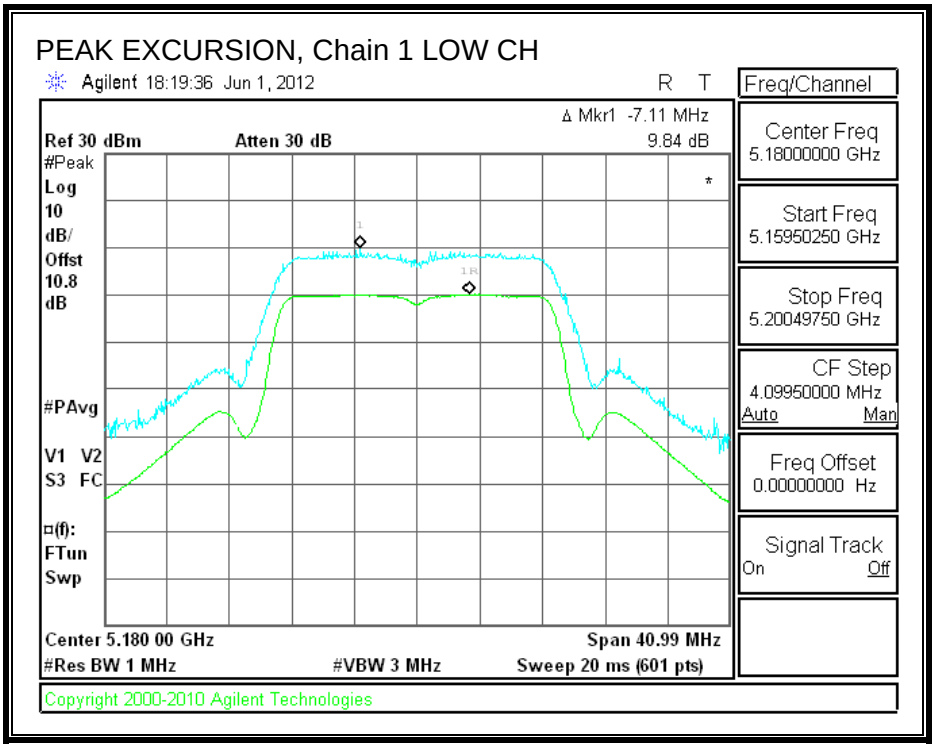
FCC §15.407 (a) (6)

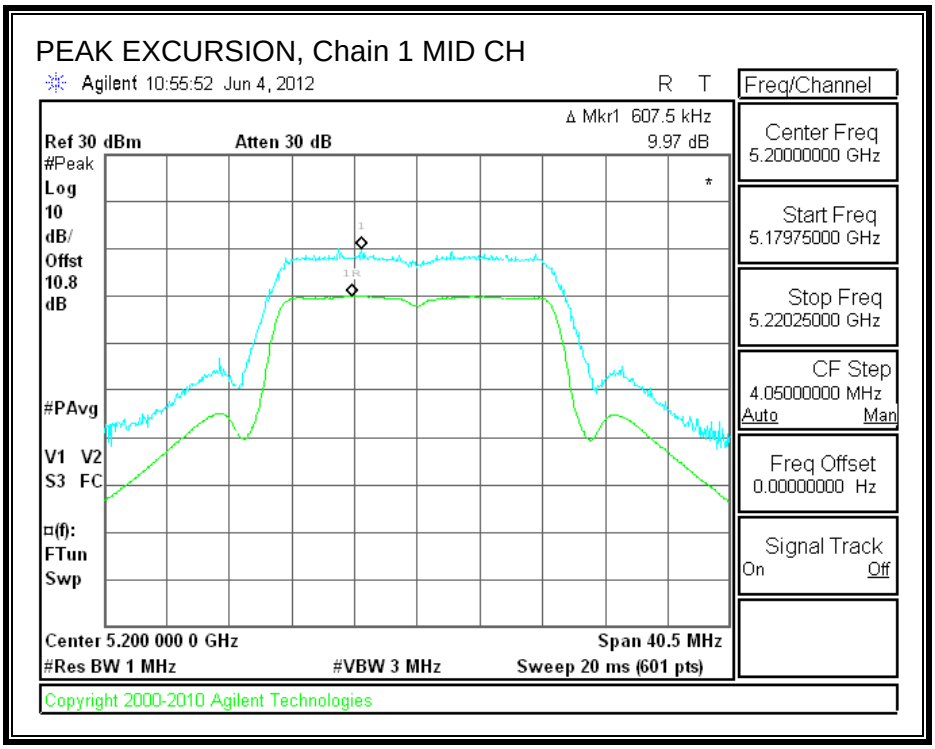
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

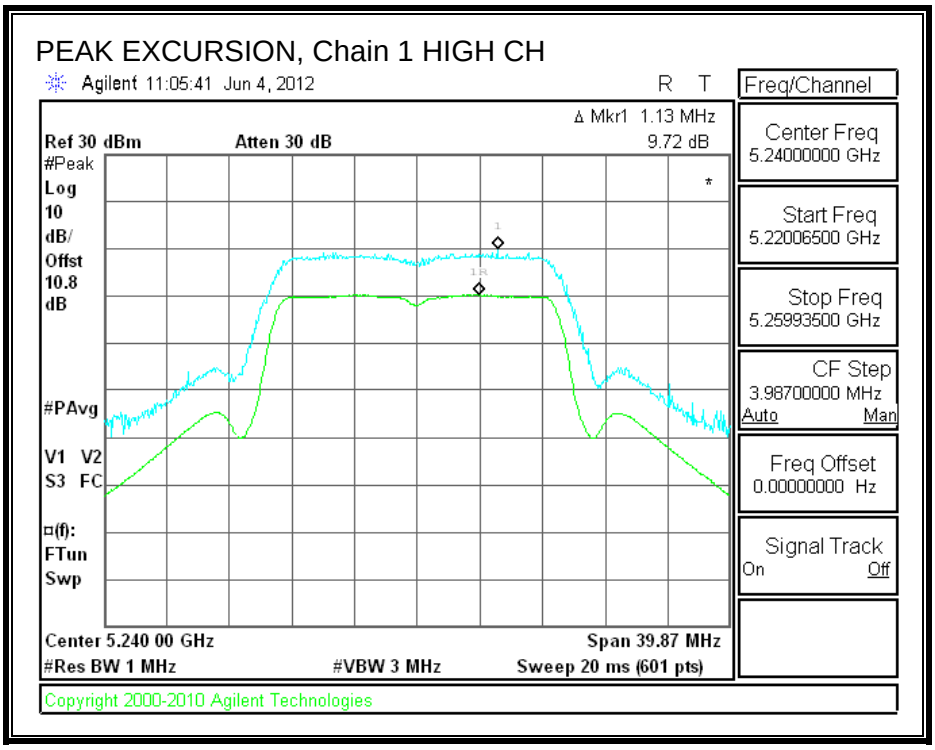
**RESULTS**

| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|
| Low | 5180 | 9.84 | 9.98 | 13 | -3.0 |
| Mid | 5200 | 9.97 | 10.28 | 13 | -2.7 |
| High | 5240 | 9.72 | 10.32 | 13 | -2.7 |

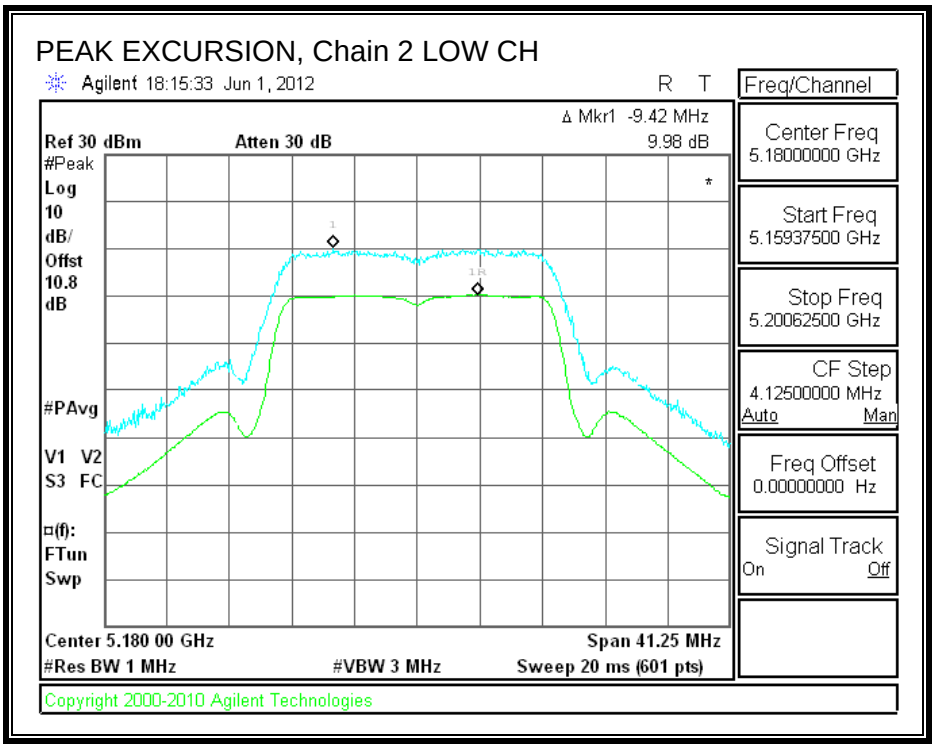
**PEAK EXCURSION, Chain 1**



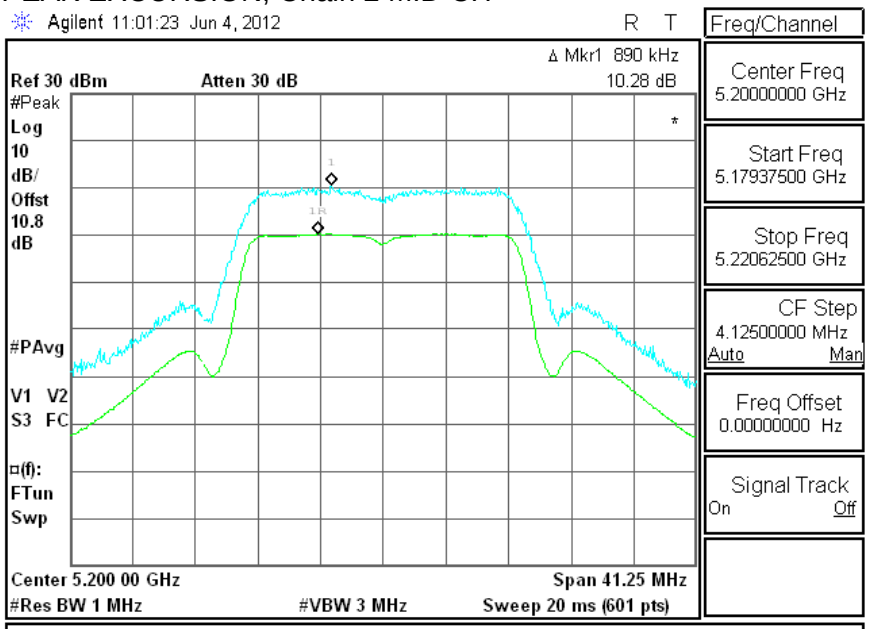





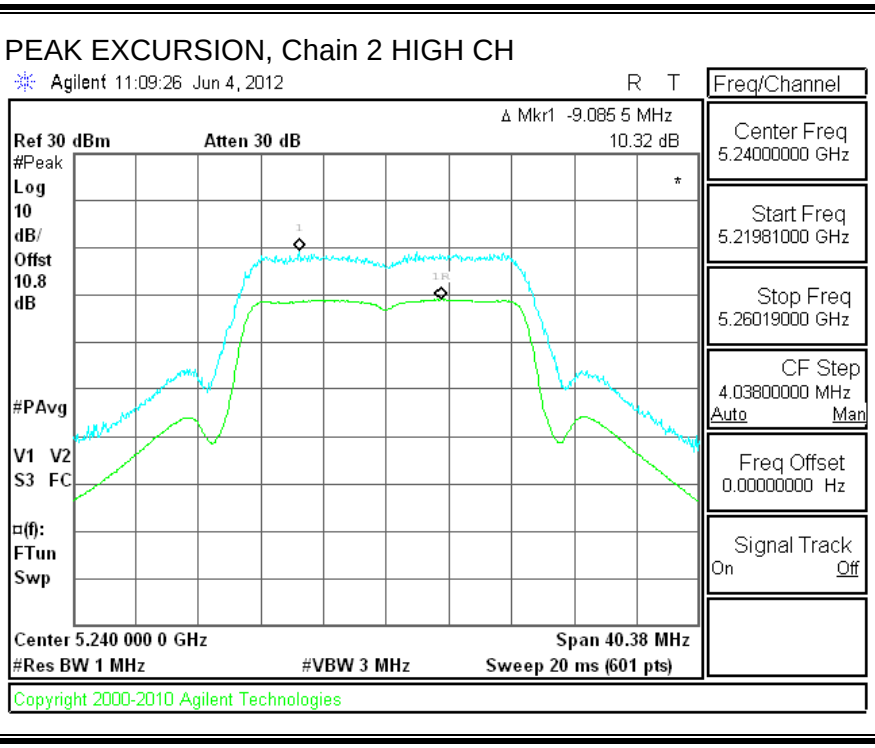

**PEAK EXCURSION, Chain 2**



PEAK EXCURSION, Chain 2 MID CH




PEAK EXCURSION, Chain 2 HIGH CH



## 8.4. 802.11n HT20, STBC MCS0, 3TX, 5.2 GHz BAND

### 8.4.1. 26 dB BANDWIDTH

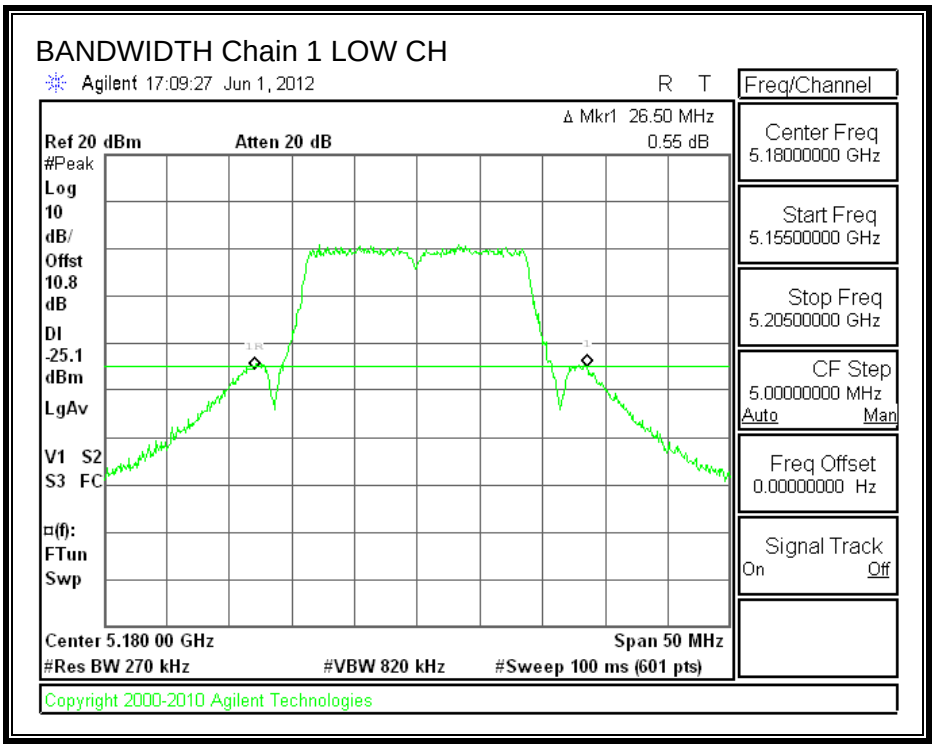
**LIMITS**

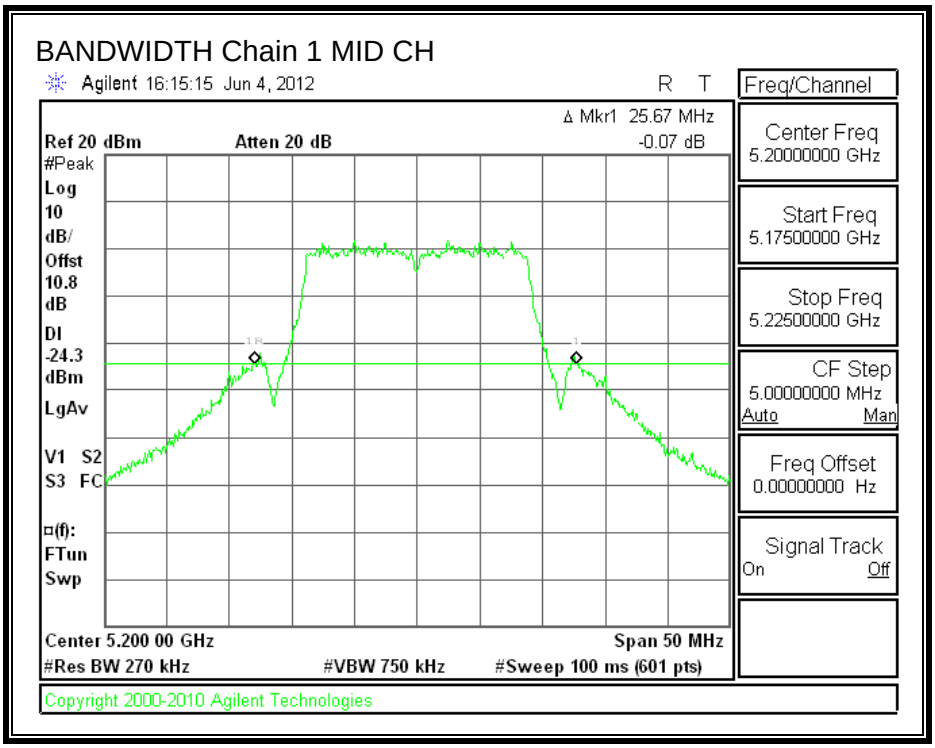
None; for reporting purposes only.

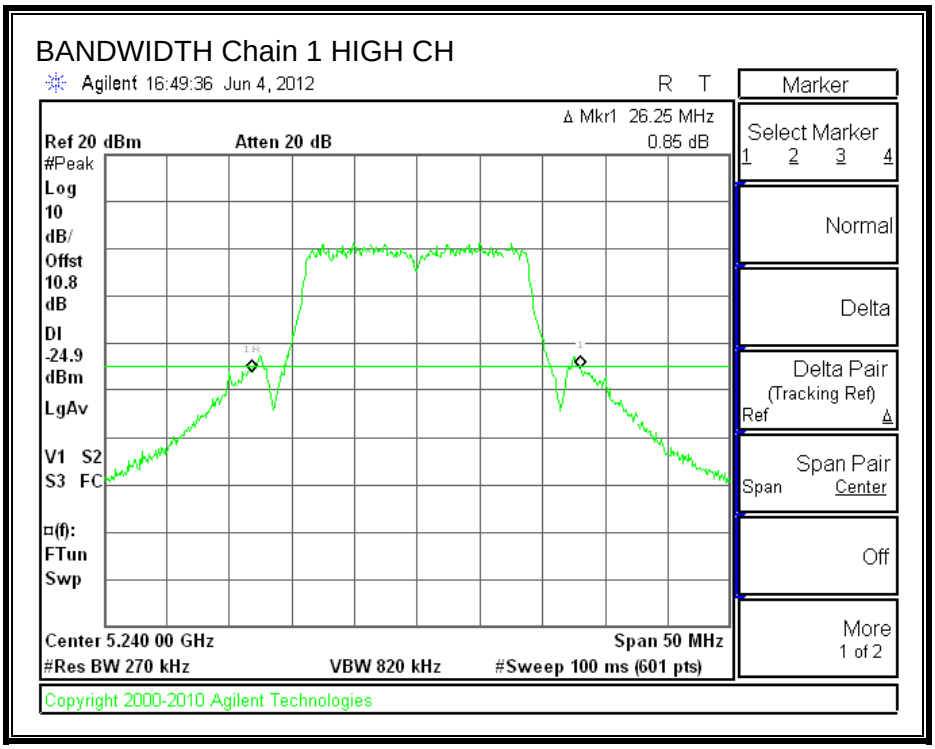
**RESULTS**

| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) | 26 dB BW Chain 3 (MHz) |
|---|---|---|---|---|
| Low | 5180 | 26.50 | 26.50 | 26.42 |
| Mid | 5200 | 26.67 | 26.42 | 26.83 |
| High | 5240 | 26.25 | 26.33 | 26.67 |

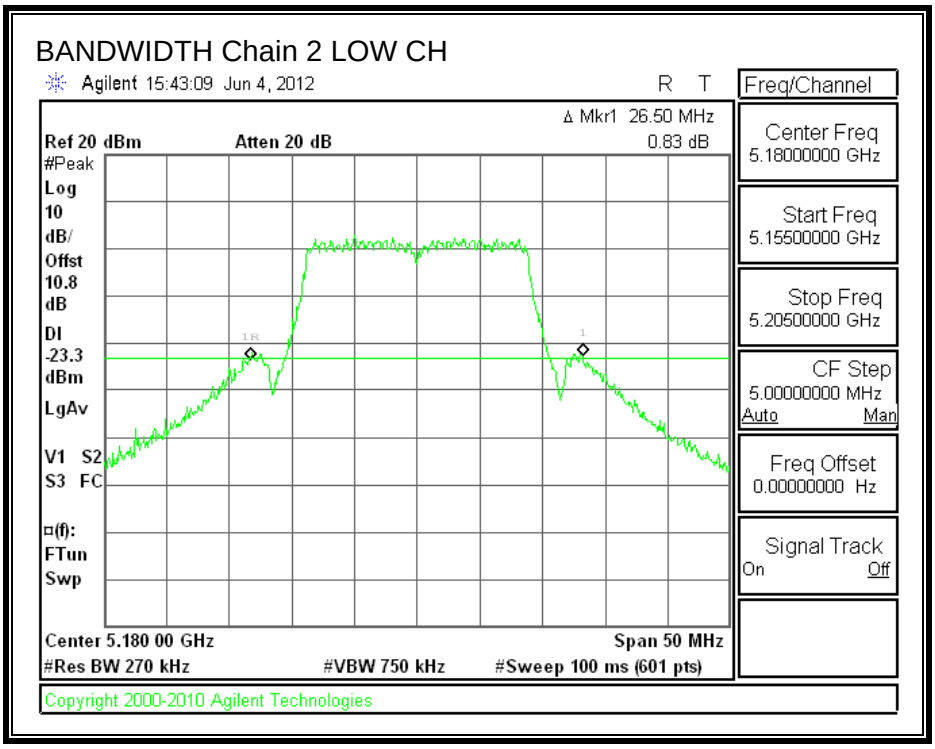
**26 dB BANDWIDTH, Chain 1**

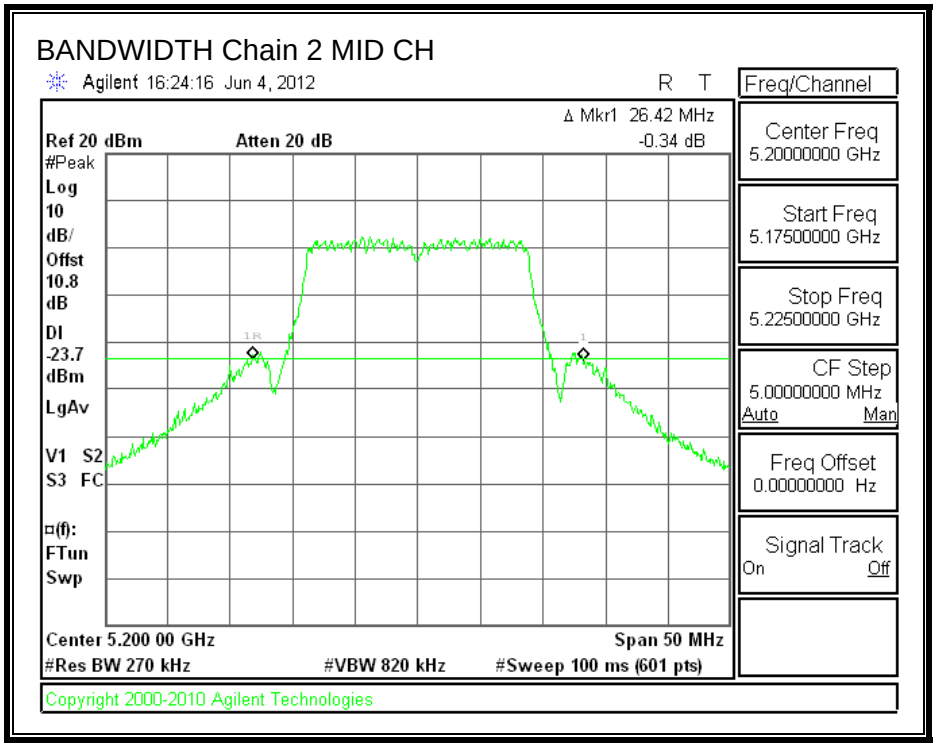


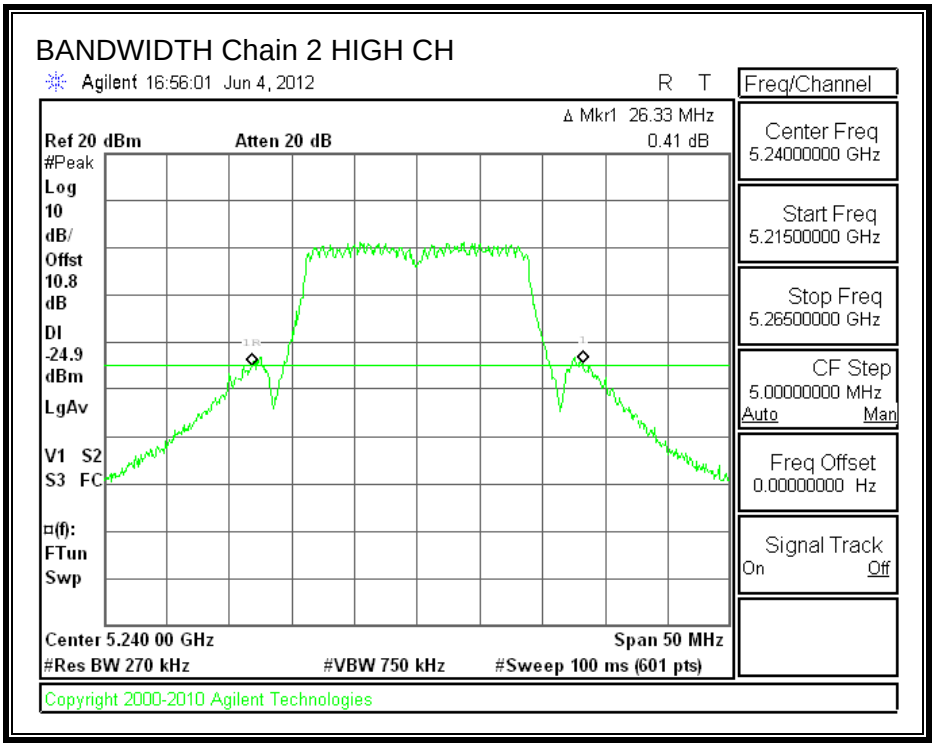





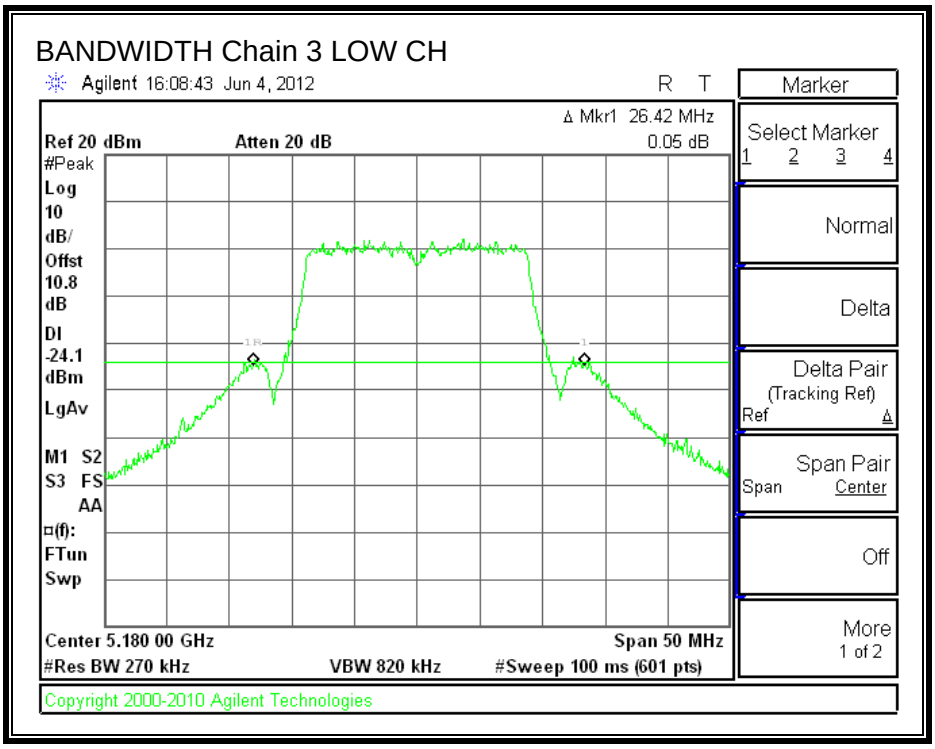
**26 dB BANDWIDTH, Chain 2**

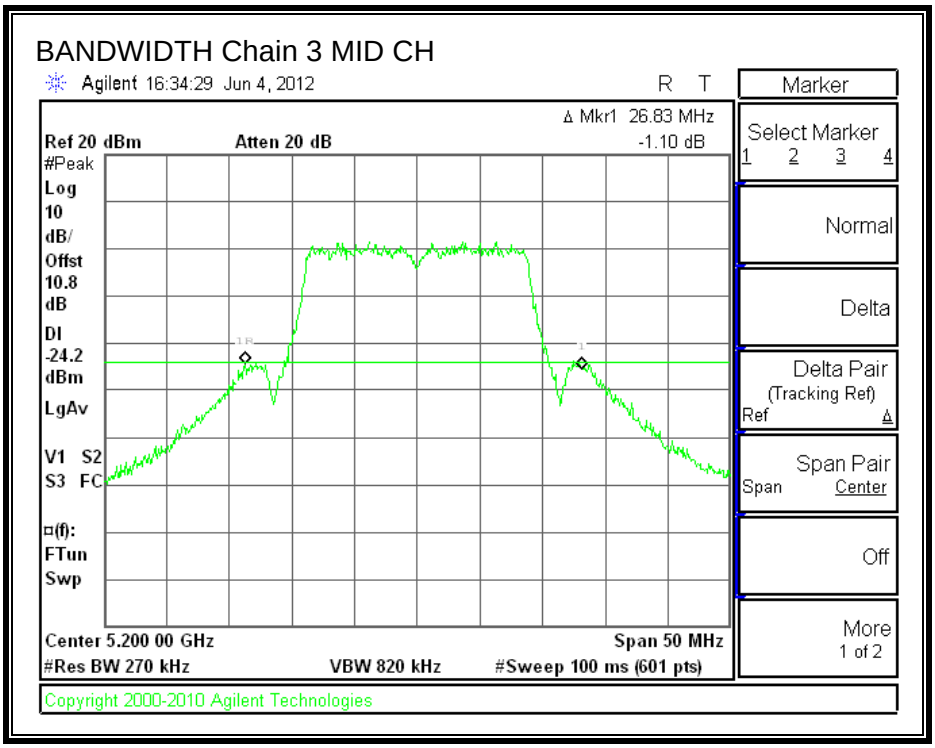


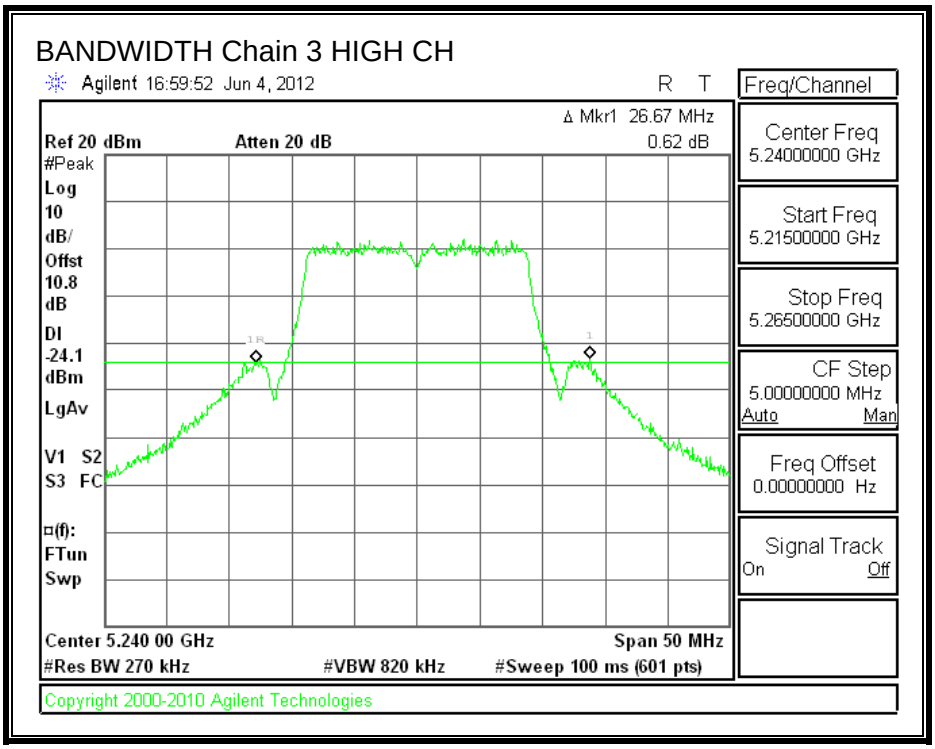





**26 dB BANDWIDTH, Chain 3**





### 8.4.2. 99% BANDWIDTH

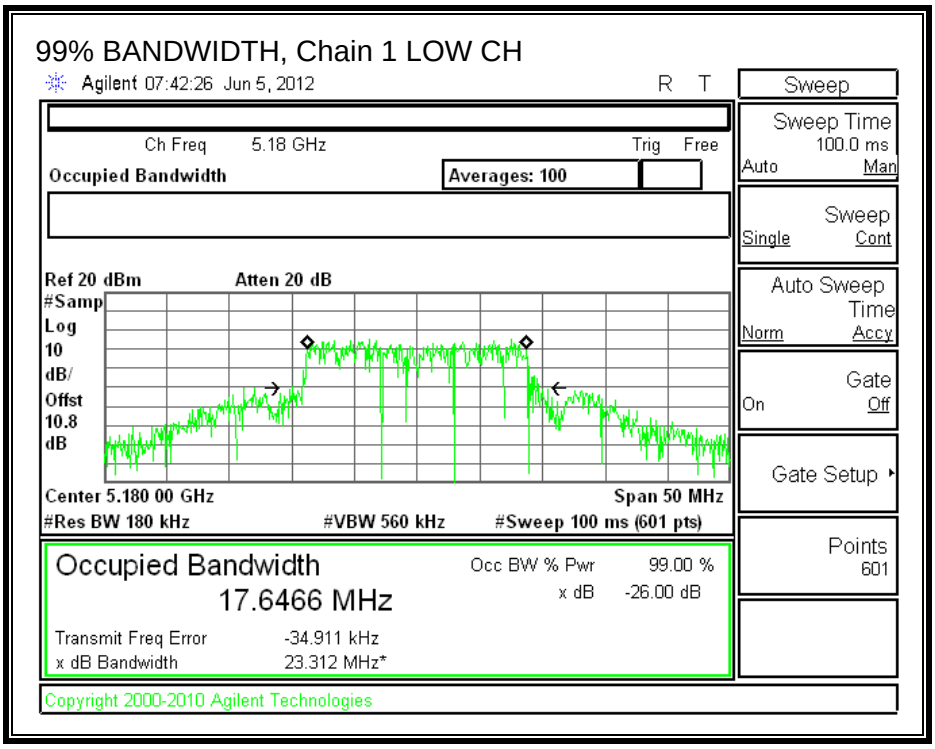
**LIMITS**

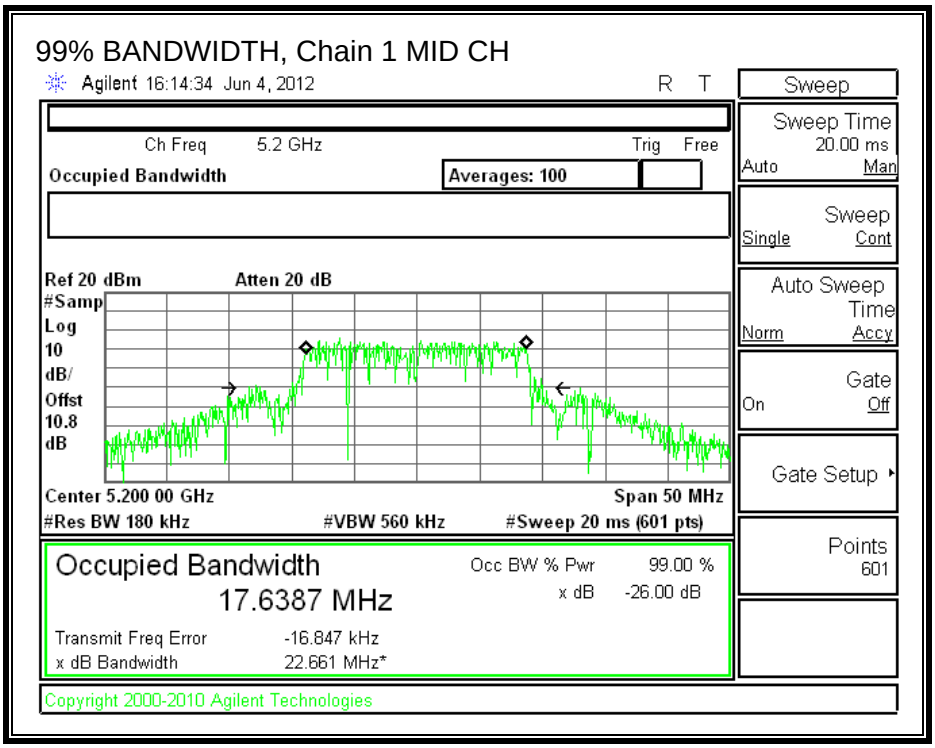
None; for reporting purposes only.

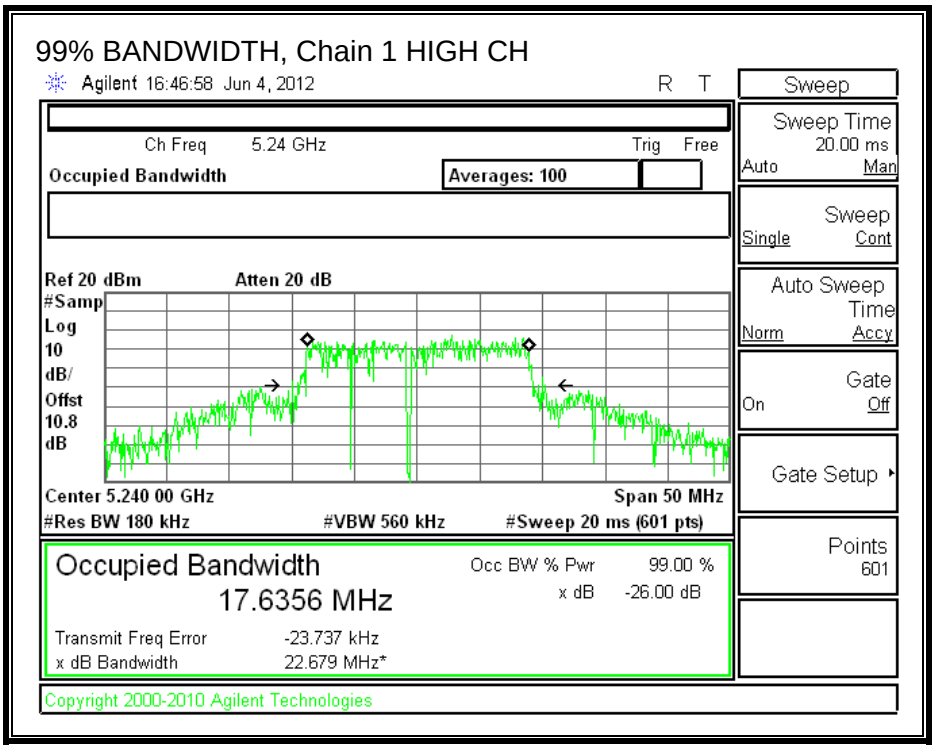
**RESULTS**

| Channel | Frequency (MHz) | 99% BW Chain 1 (MHz) | 99% BW Chain 2 (MHz) | 99% BW Chain 3 (MHz) |
|---|---|---|---|---|
| Low | 5180 | 17.6466 | 17.6737 | 17.6130 |
| Mid | 5200 | 17.6387 | 17.6645 | 17.6414 |
| High | 5240 | 17.6356 | 17.6515 | 17.6278 |

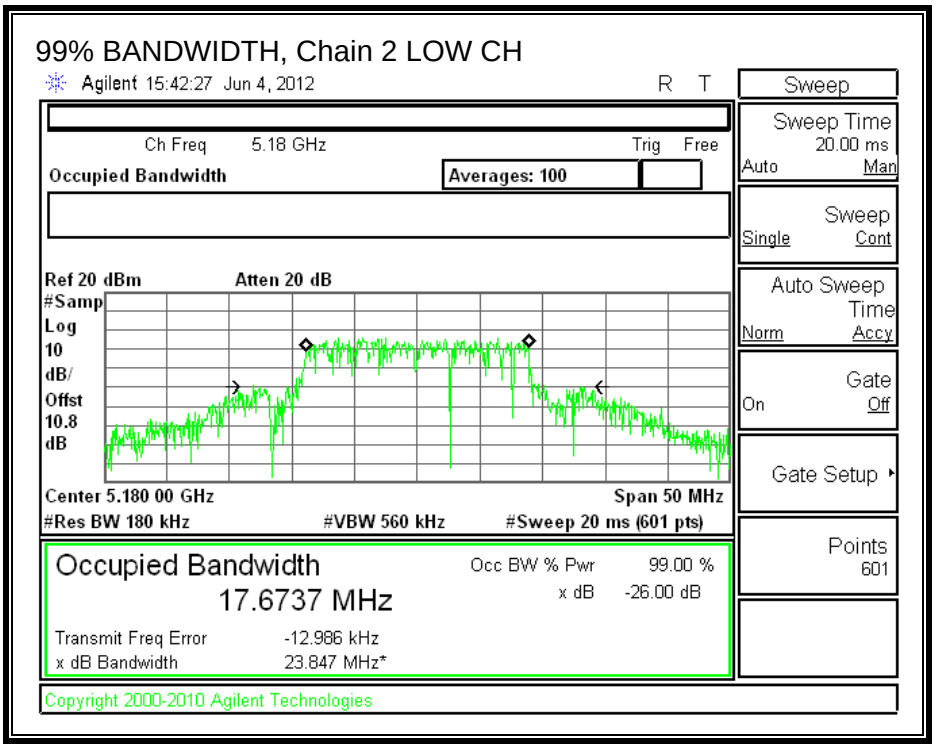
**99% BANDWIDTH, Chain 1**

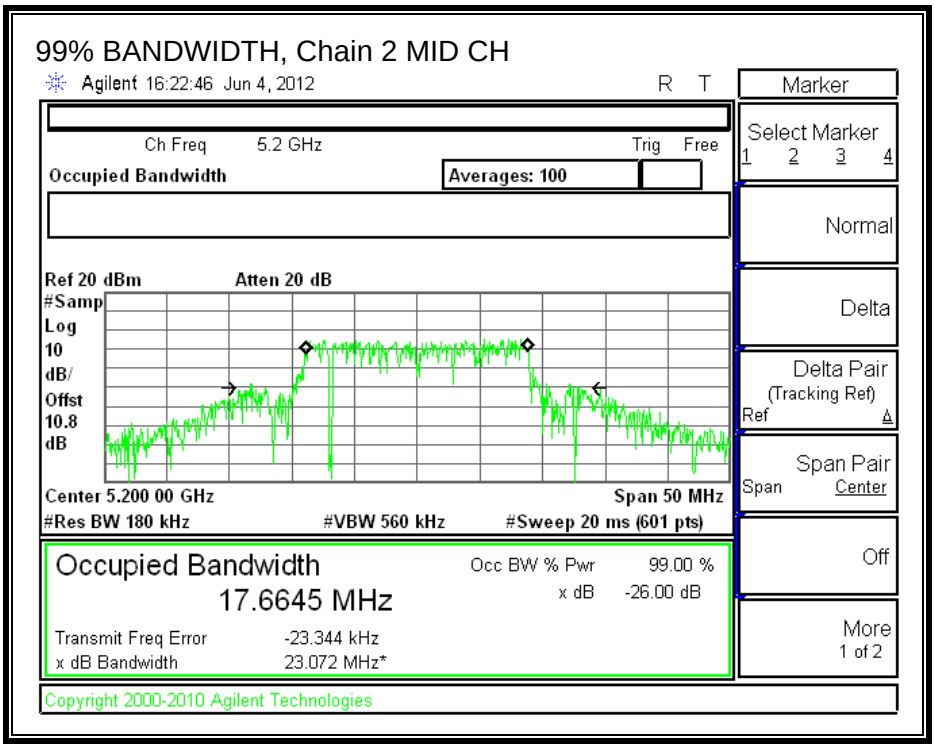


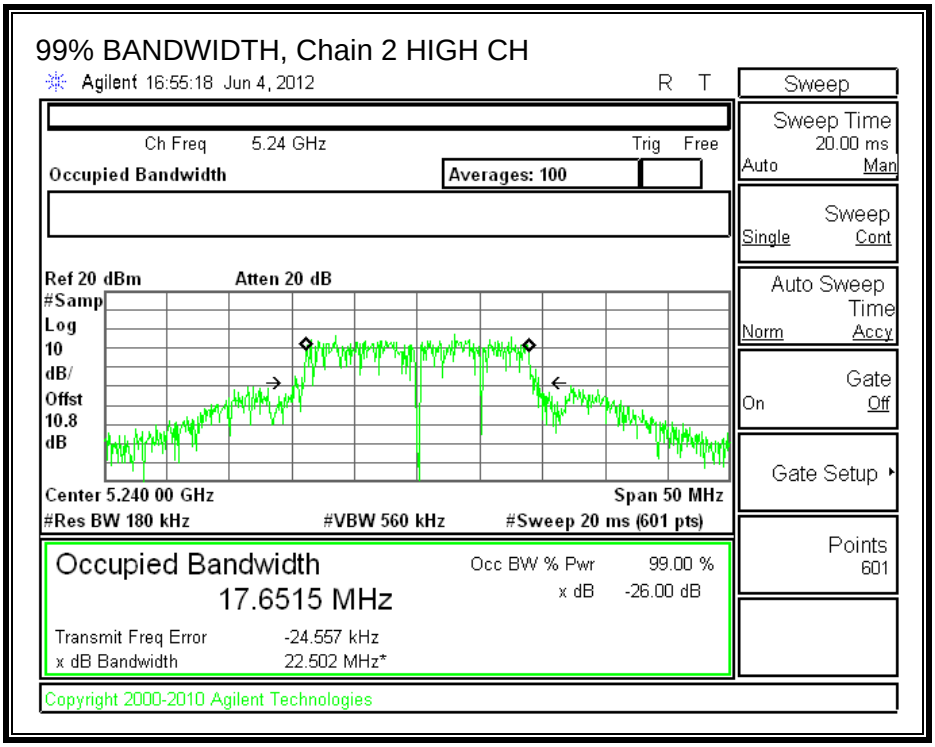





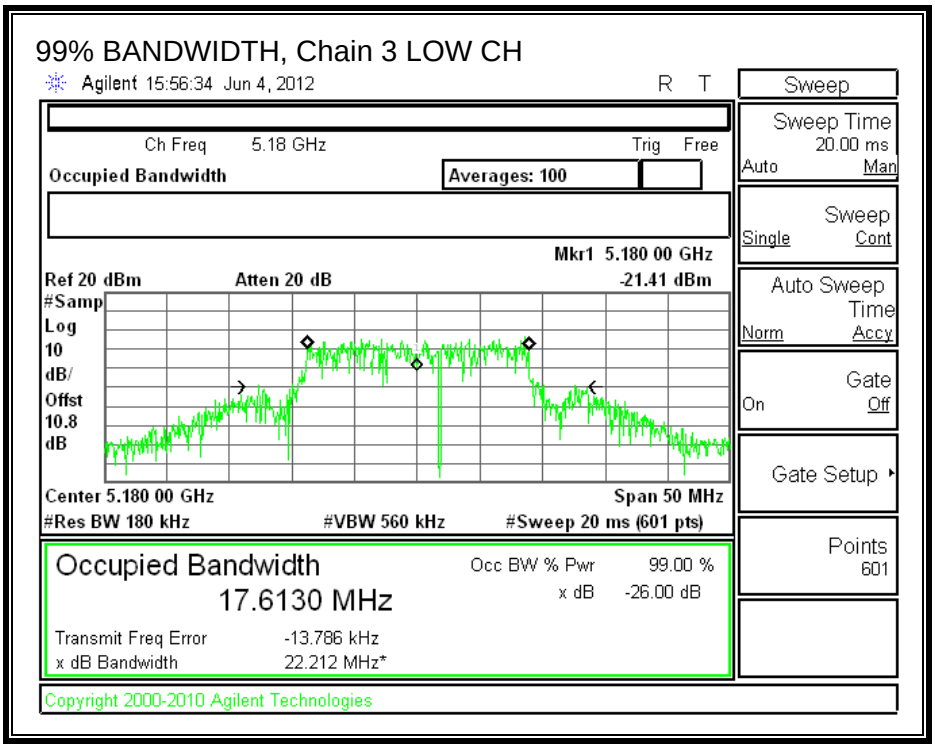
**99% BANDWIDTH, Chain 2**

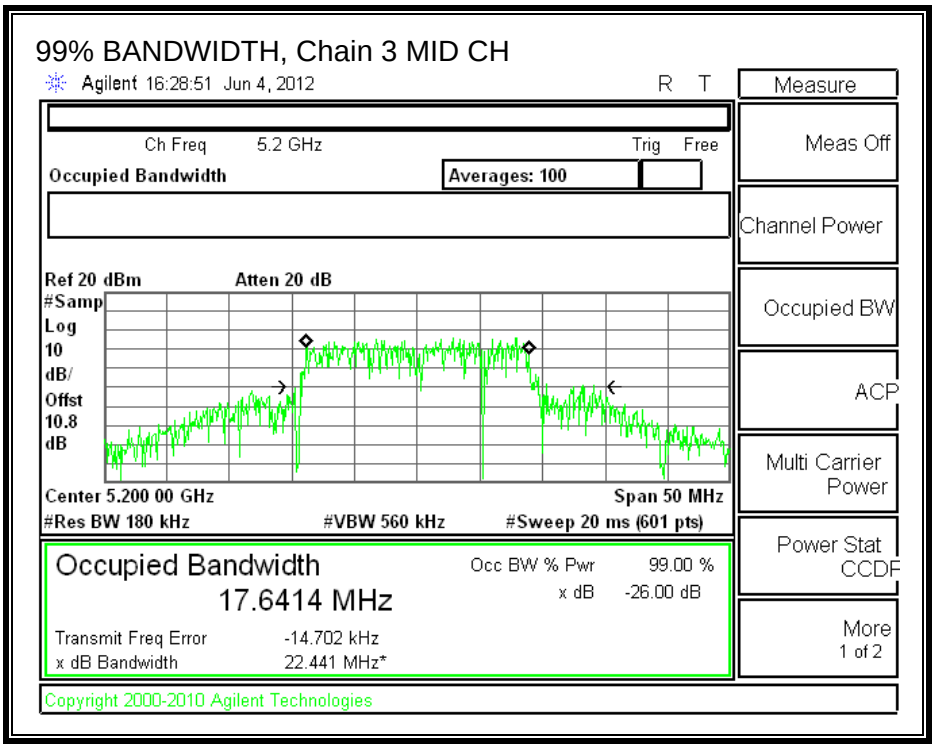


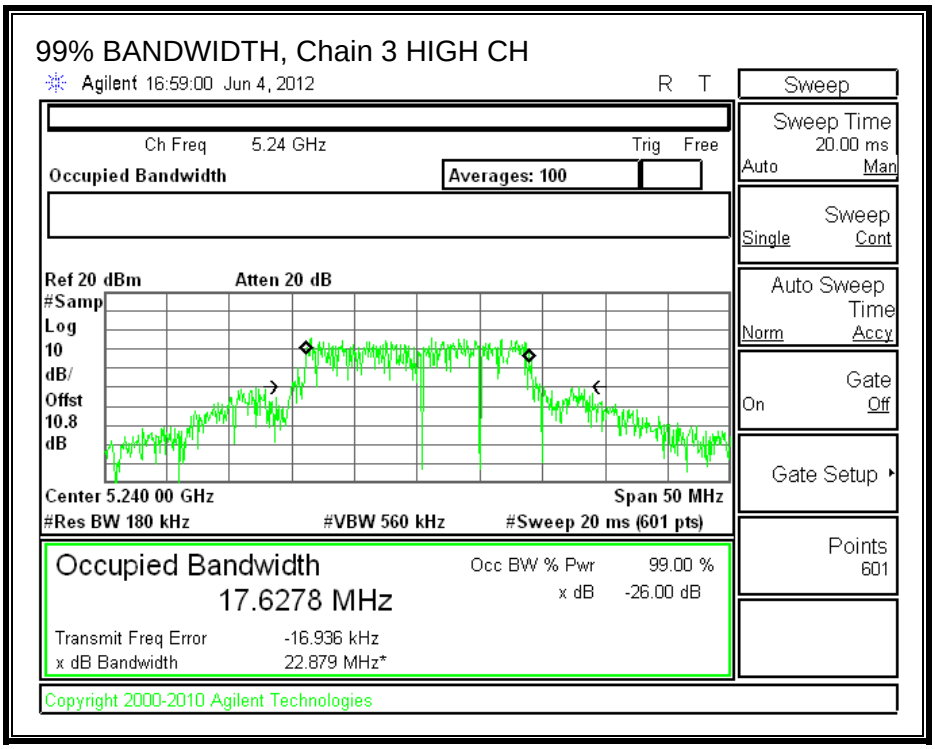





**99% BANDWIDTH, Chain 3**





## 8.4.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|---|
| Low | 5180 | 9.20 | 9.70 | 8.90 | 14.05 |
| Mid | 5200 | 9.10 | 9.80 | 8.98 | 14.08 |
| High | 5240 | 9.00 | 9.30 | 9.65 | 14.10 |

## 8.4.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

| Chain 1 Antenna Gain (dBi) | Chain 2 Antenna Gain (dBi) | Chain 3 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|---|---|---|---|
| 4.16 | 2.51 | 5.65 | 4.29 |

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 26.50 | 18.23 | 4.29 | 17.00 | 4.00 |
| Mid | 5200 | 17 | 26.83 | 18.29 | 4.29 | 17.00 | 4.00 |
| High | 5240 | 17 | 26.67 | 18.26 | 4.29 | 17.00 | 4.00 |

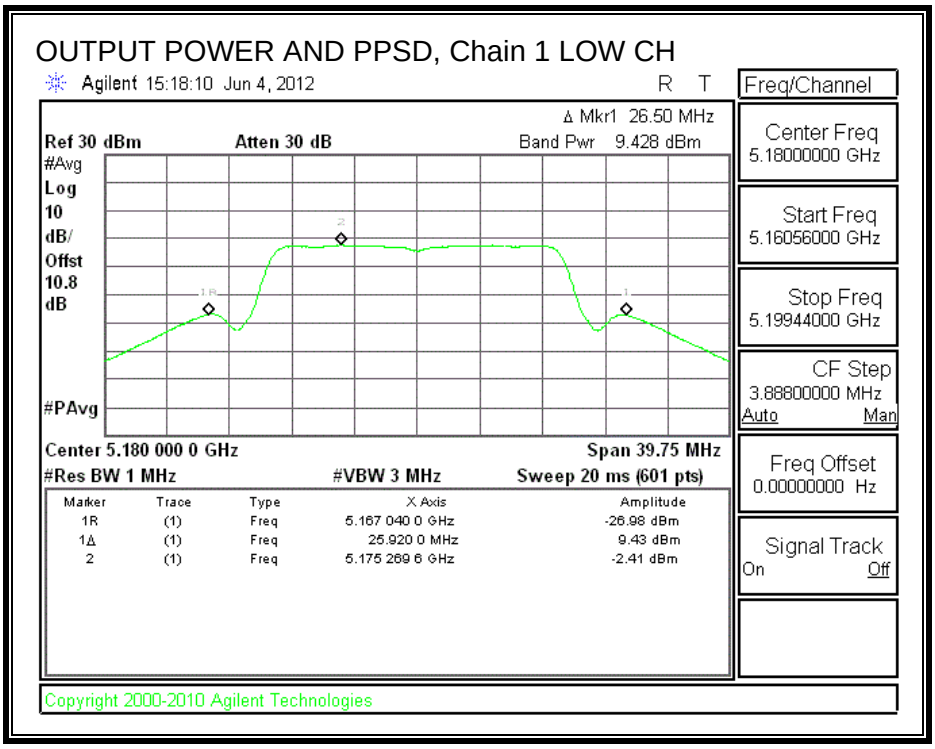
**Output Power Results**

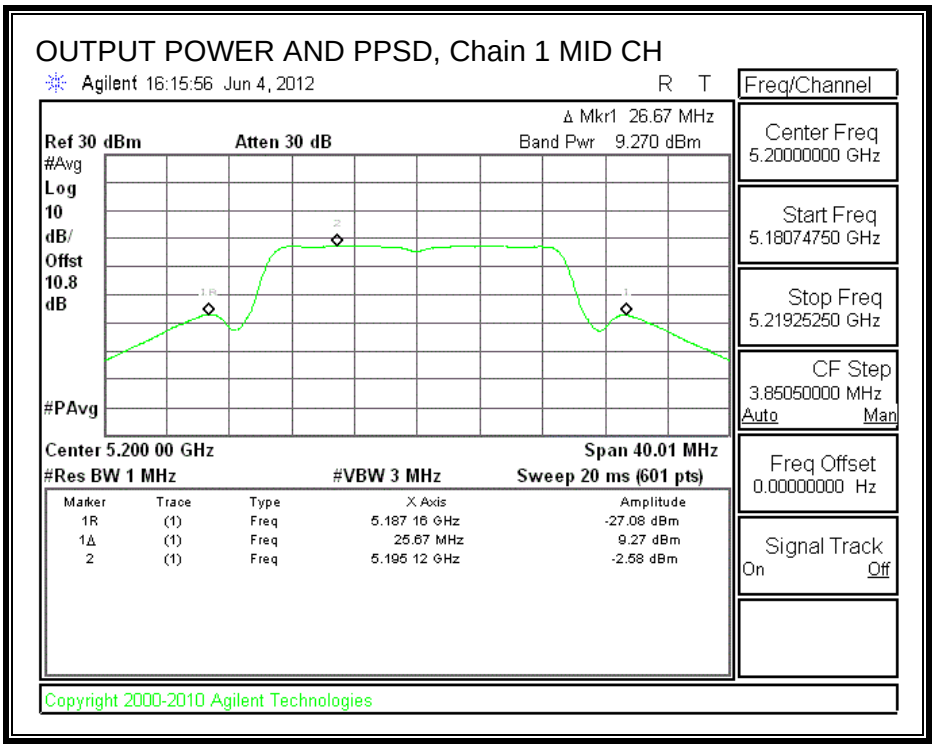
| Channel | Frequency (MHz) | Chain 1 Meas Power (dBm) | Chain 2 Meas Power (dBm) | Chain 3 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | 9.428 | 10.808 | 9.490 | 14.728 | 17.00 | -2.272 |
| Mid | 5200 | 9.270 | 10.670 | 9.420 | 14.605 | 17.00 | -2.395 |
| High | 5240 | 9.073 | 9.518 | 9.447 | 14.122 | 17.00 | -2.878 |

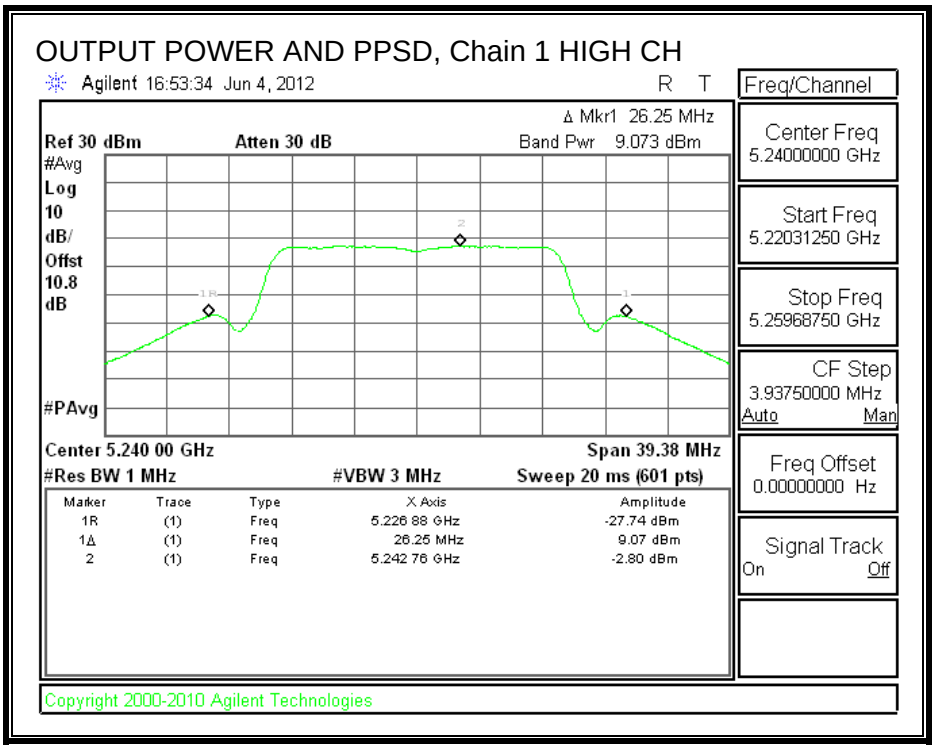
**PPSD Results**

| Channel | Frequency (MHz) | Chain 1 Meas PPSD (dBm) | Chain 2 Meas PPSD (dBm) | Chain 3 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low | 5180 | -2.41 | -1.00 | -2.21 | 2.94 | 4.00 | -1.06 |
| Mid | 5200 | -2.58 | -1.17 | -2.27 | 2.81 | 4.00 | -1.19 |
| High | 5240 | -2.80 | -2.23 | -2.27 | 2.35 | 4.00 | -1.65 |

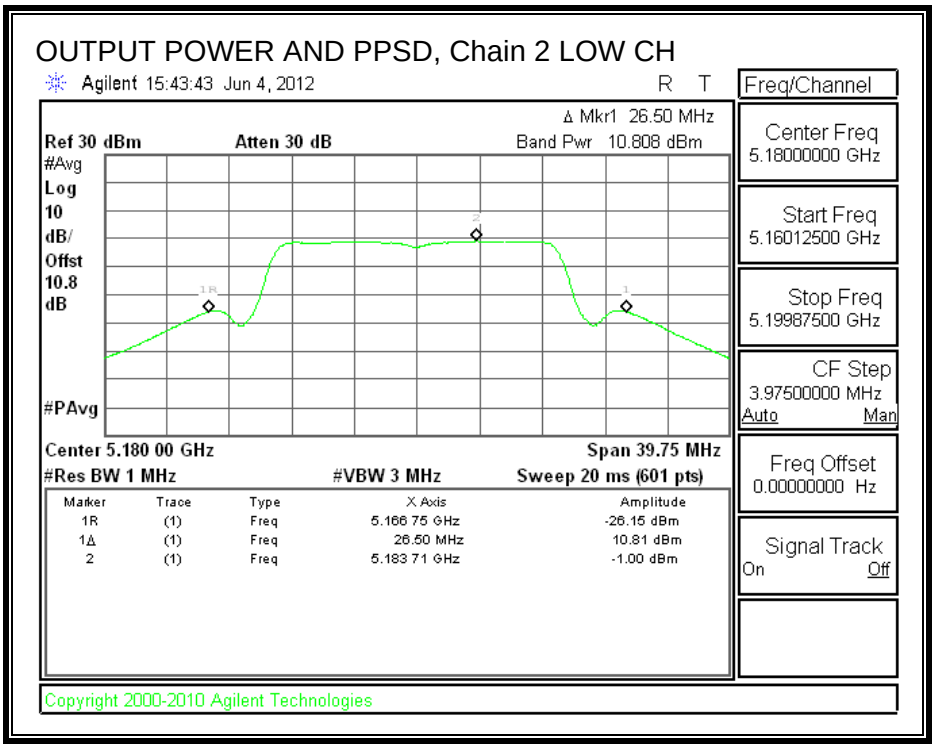
**OUTPUT POWER AND PPSD, Chain 1**

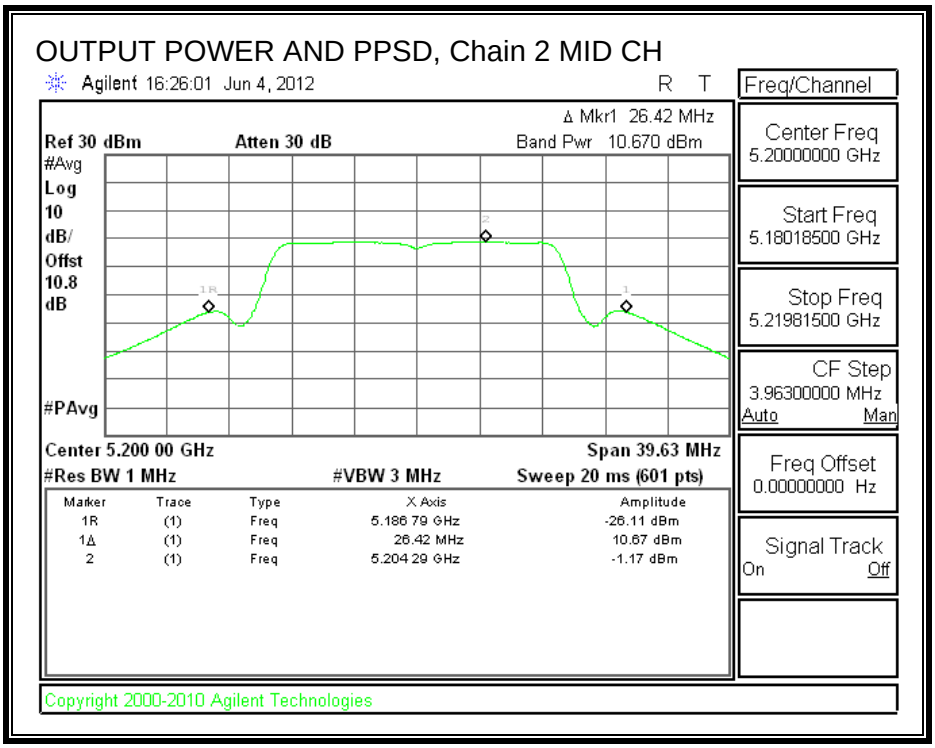


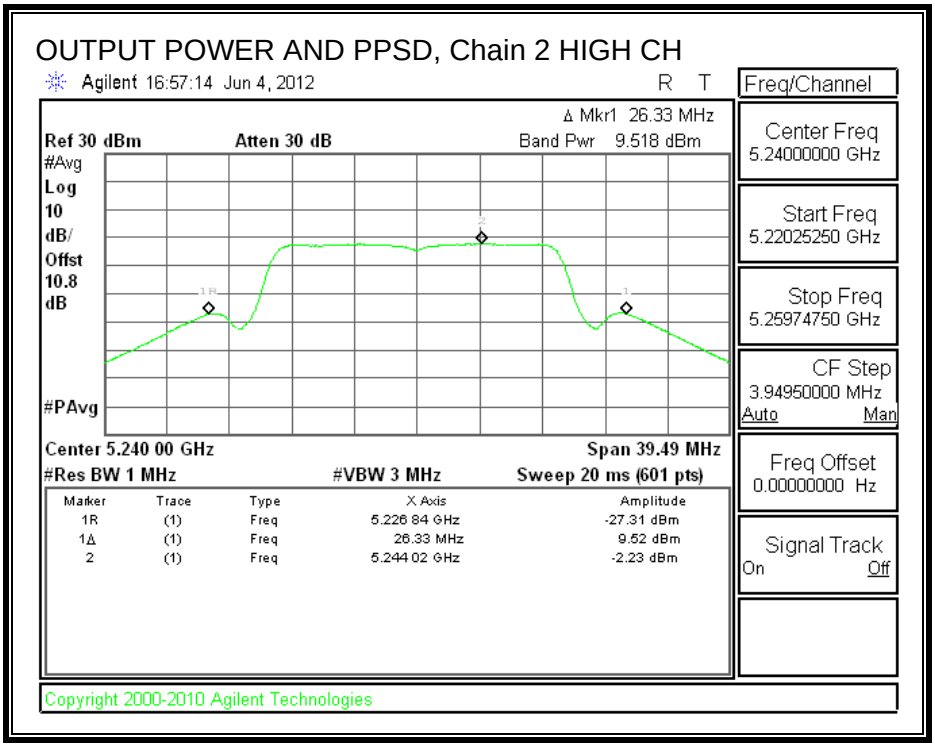





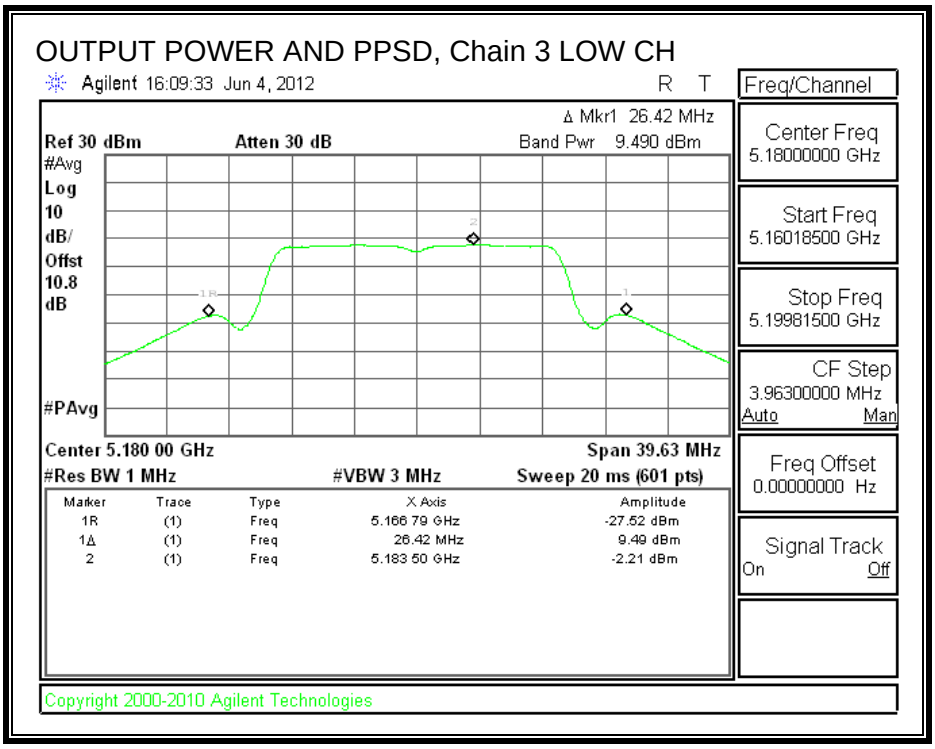
**OUTPUT POWER AND PPSD, Chain 2**

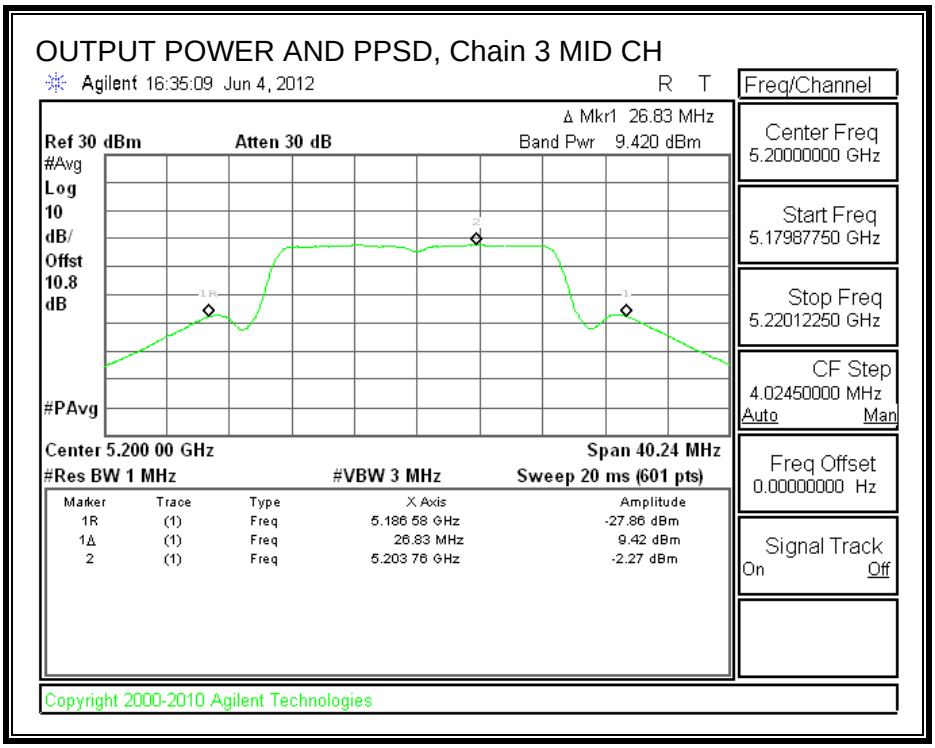


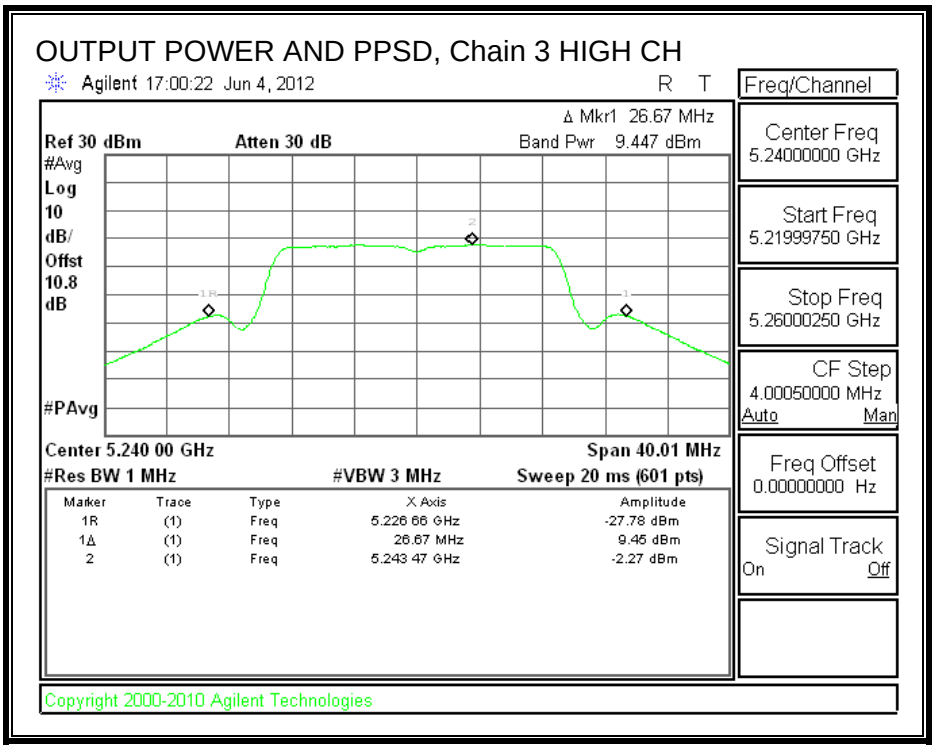


**OUTPUT POWER AND PPSD, Chain 3**



OUTPUT POWER AND PPSD, Chain 3 HIGH CH



## 8.4.5. PEAK EXCURSION

**LIMITS**

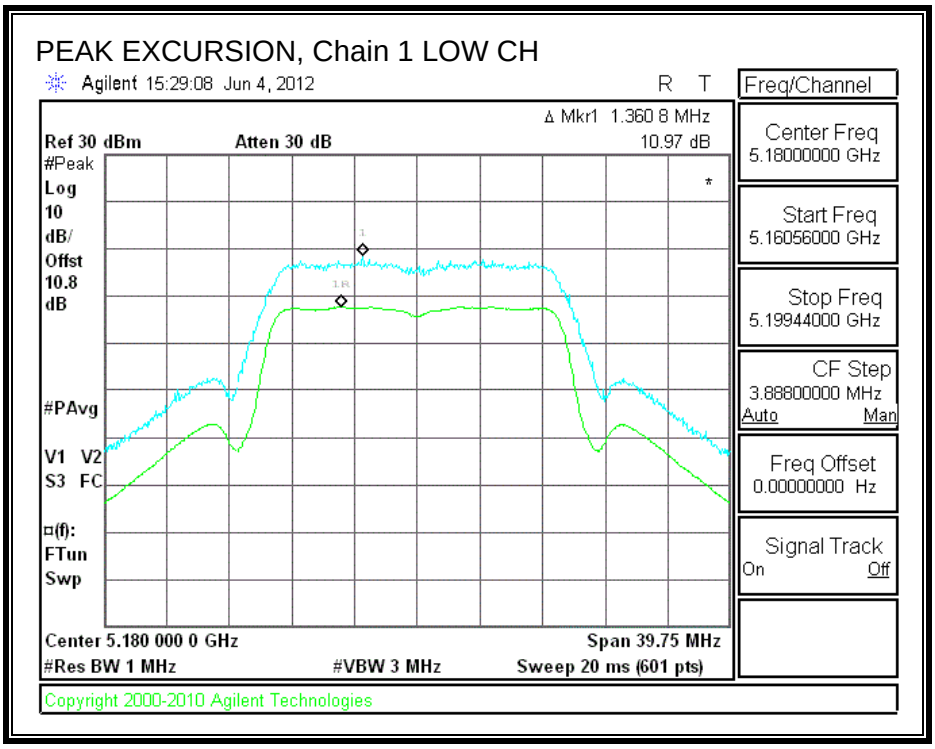
FCC §15.407 (a) (6)

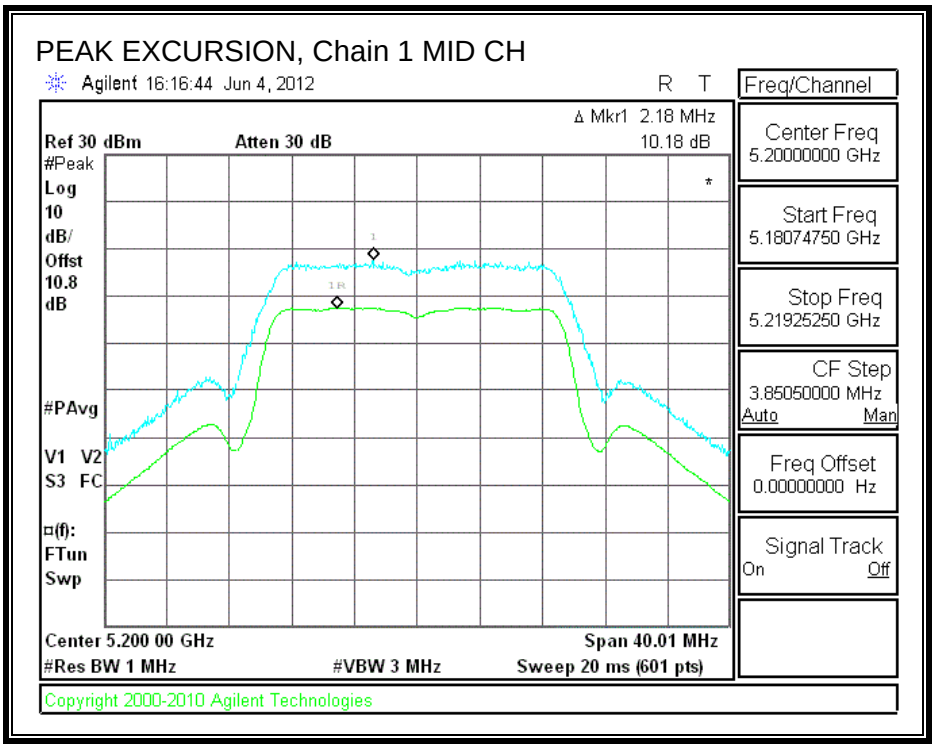
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

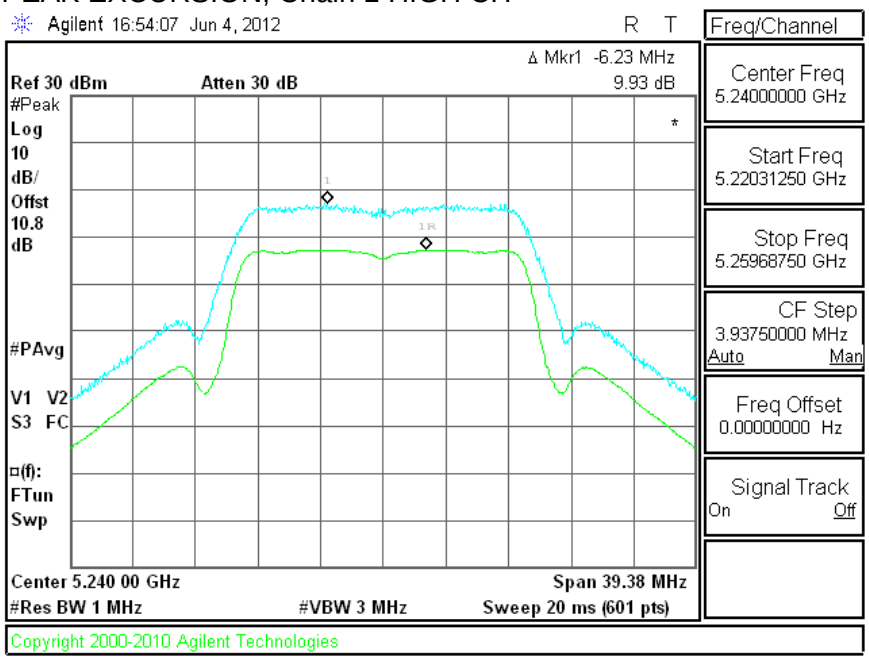
| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Pk Exc Chain 3 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 10.97 | 9.96 | 9.91 | 13 | -2.0 |
| Mid | 5200 | 10.18 | 9.79 | 10.01 | 13 | -2.8 |
| High | 5240 | 9.93 | 10.55 | 10.32 | 13 | -2.5 |

**PEAK EXCURSION, Chain 1**

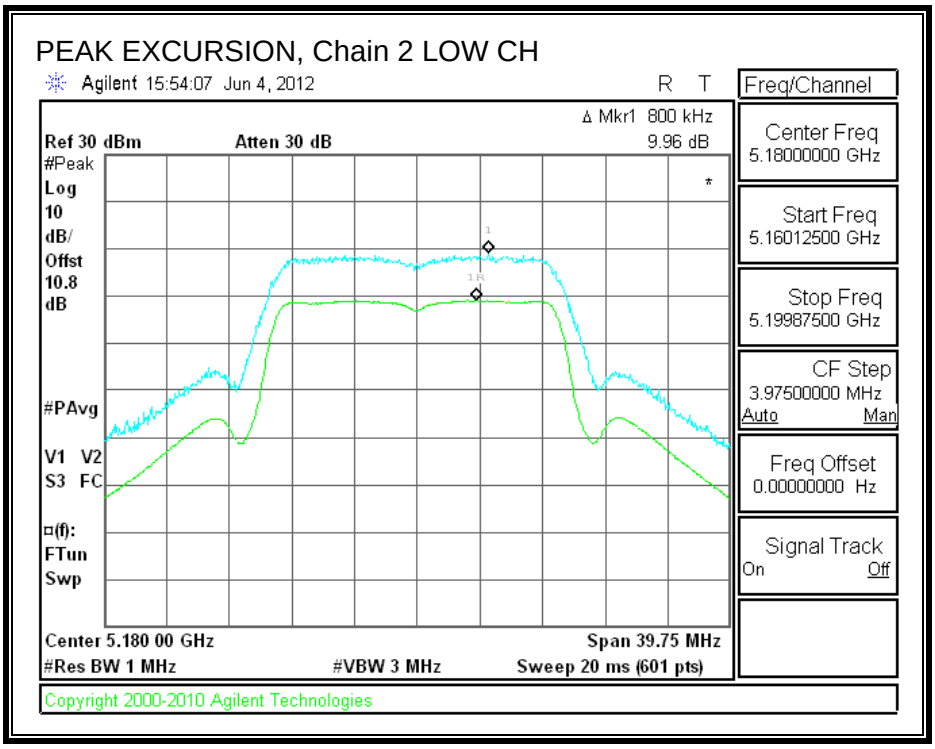


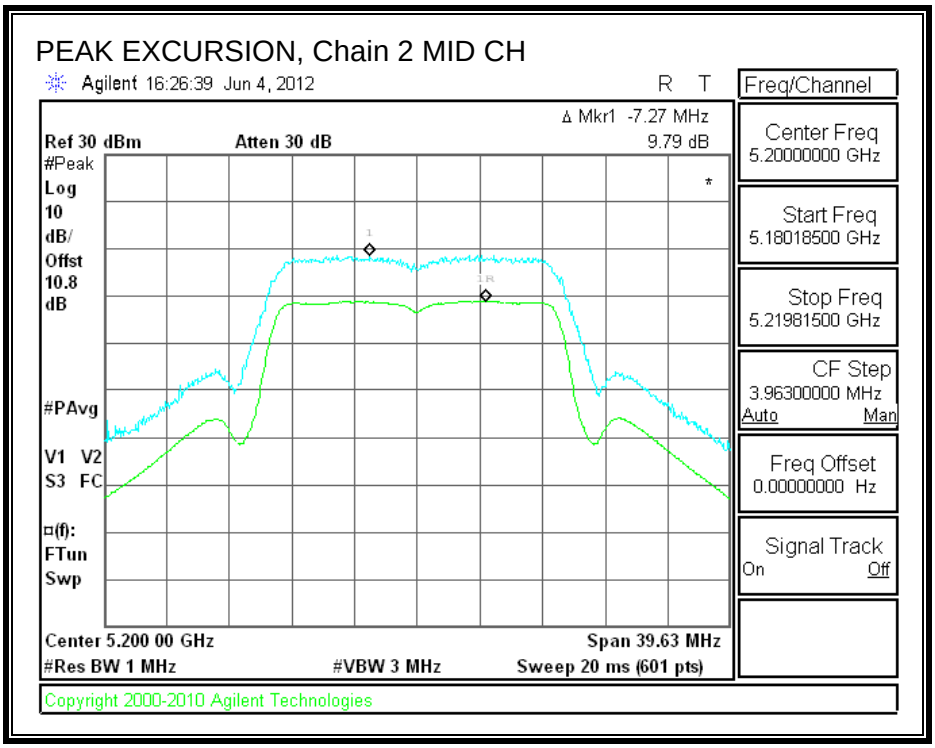



PEAK EXCURSION, Chain 1 HIGH CH

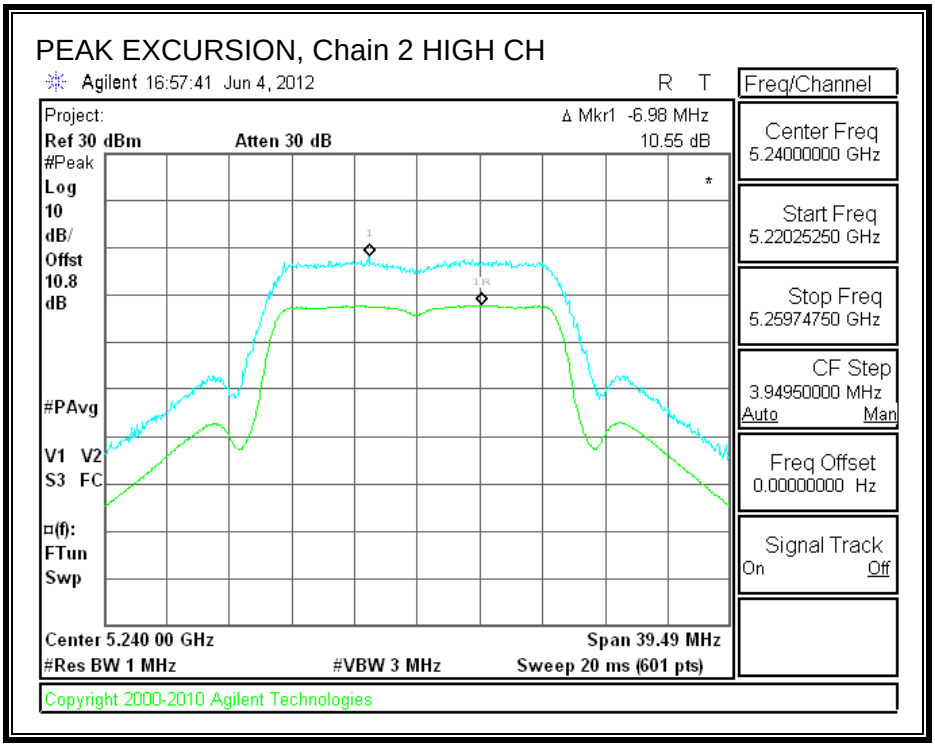


**PEAK EXCURSION, Chain 2**

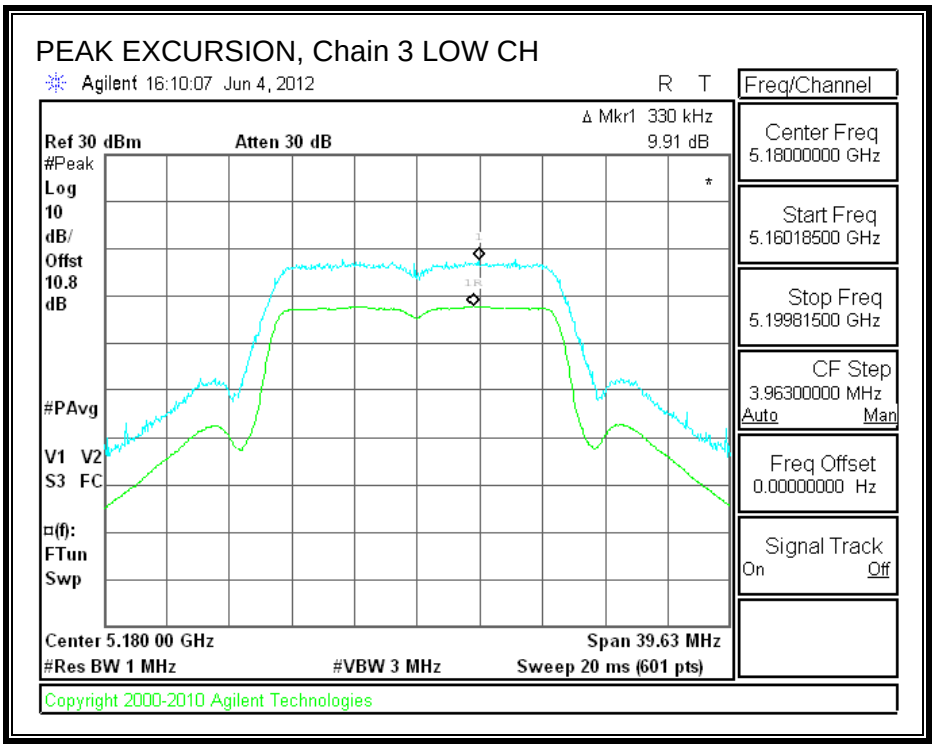


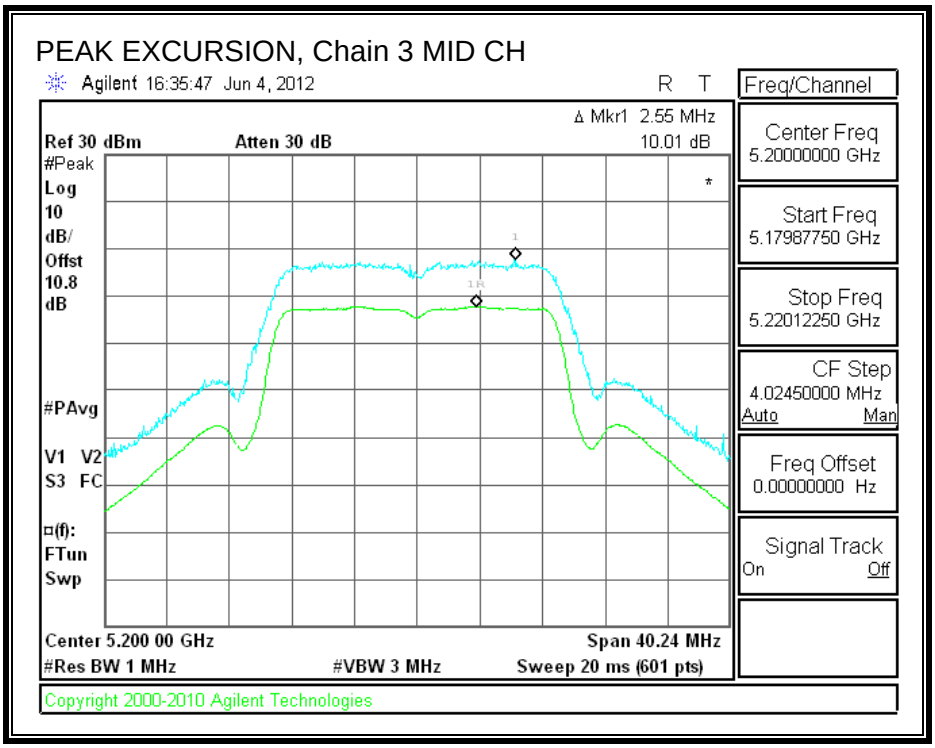



PEAK EXCURSION, Chain 2 HIGH CH

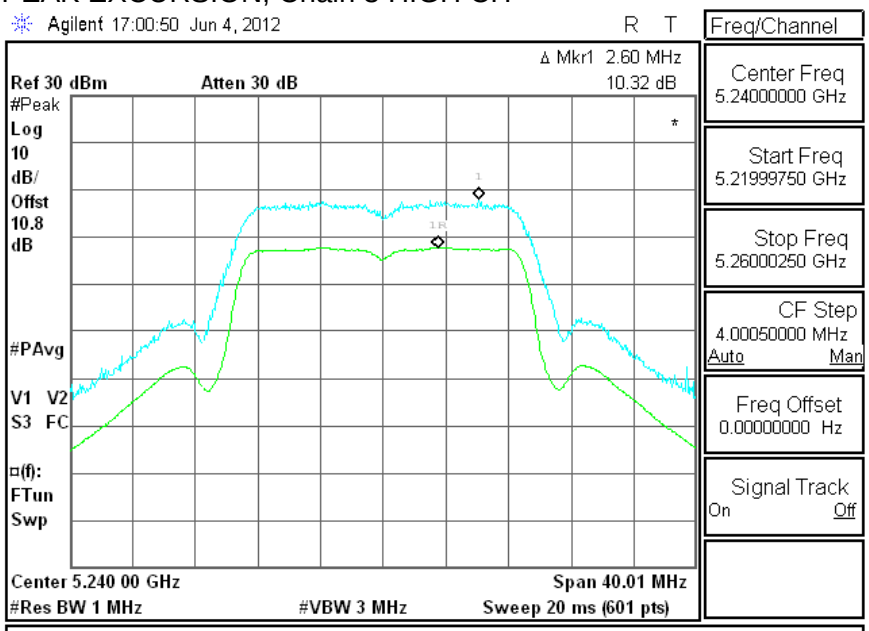


**PEAK EXCURSION, Chain 3**



PEAK EXCURSION, Chain 3 HIGH CH



## 8.5. 802.11n HT40, 1TX, CDD MCS0, 5.2 GHz BAND

### 8.5.1. 26 dB BANDWIDTH

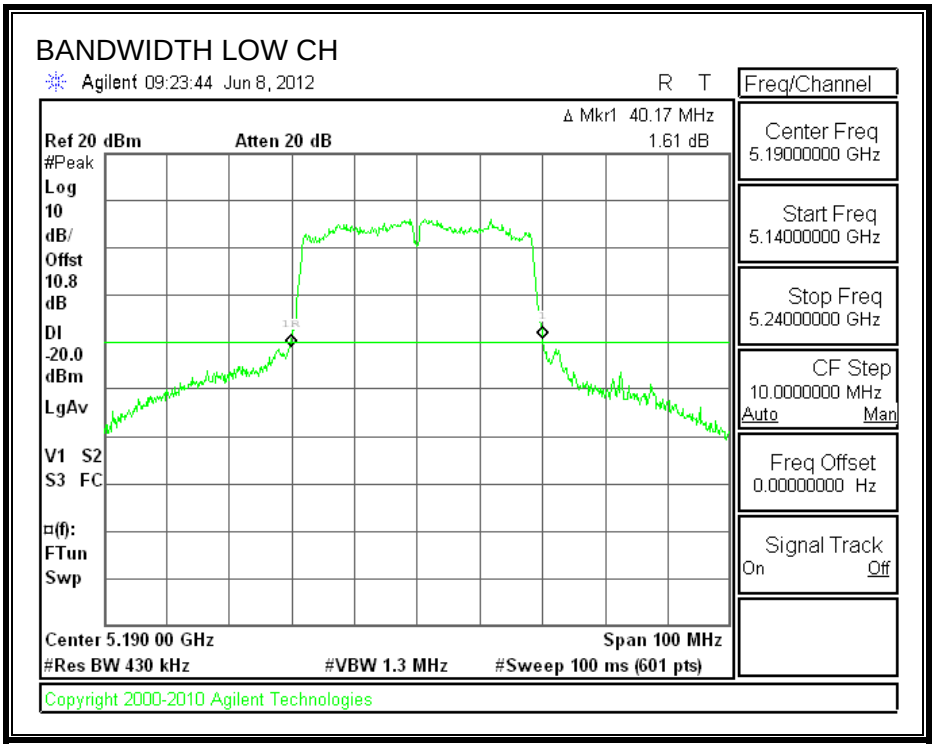
**LIMITS**

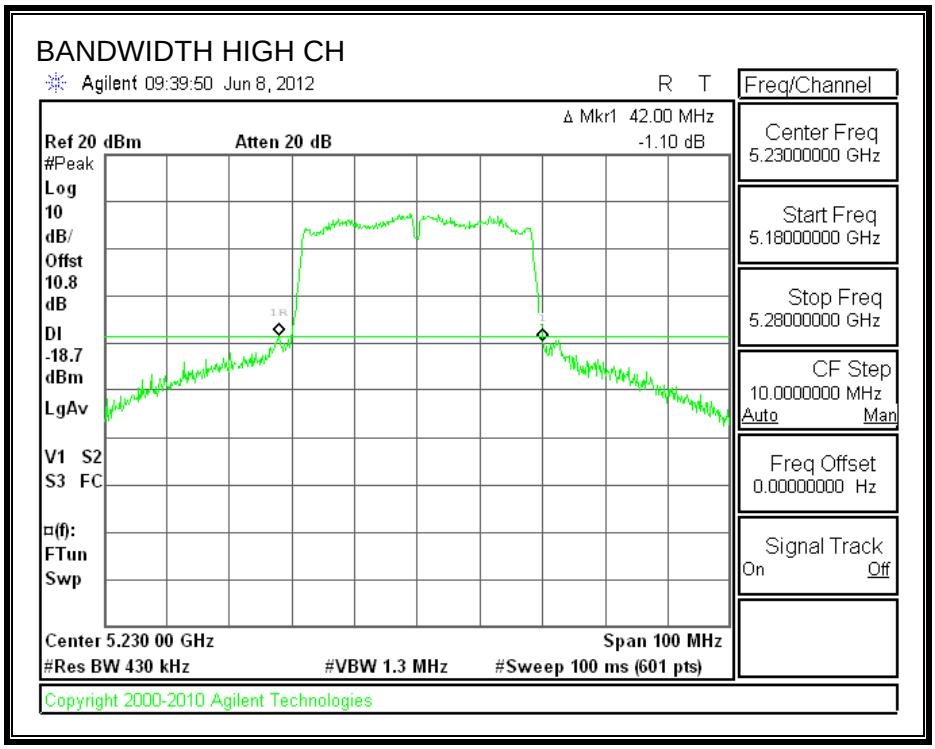
None; for reporting purposes only.

**RESULTS**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 40.17 |
| High | 5230 | 42.00 |

**26 dB BANDWIDTH**



### 8.5.2. 99% BANDWIDTH

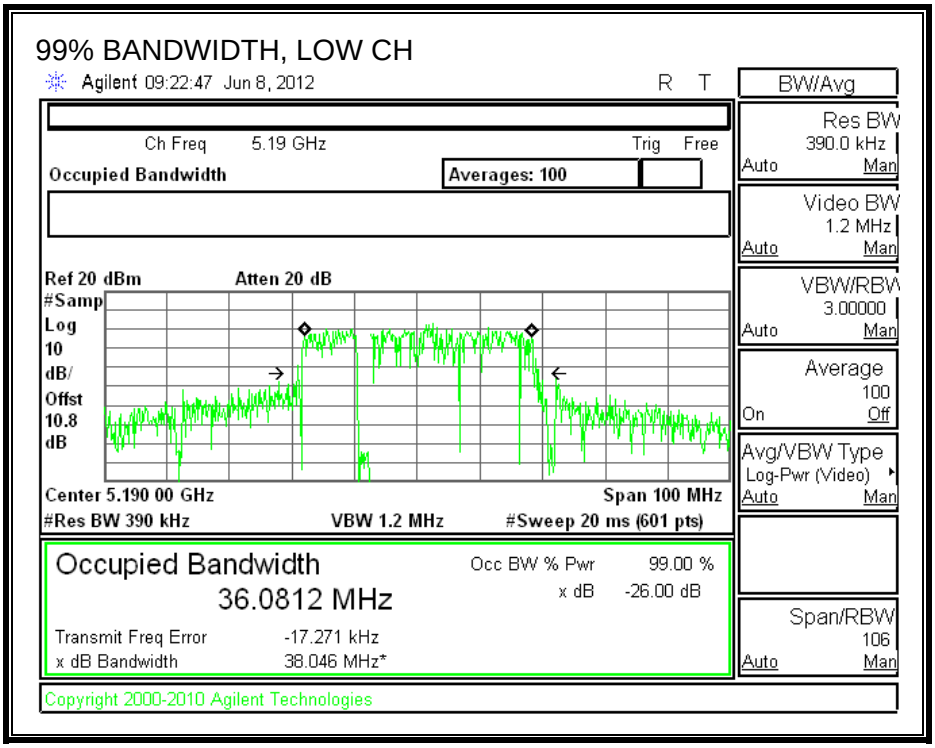
**LIMITS**

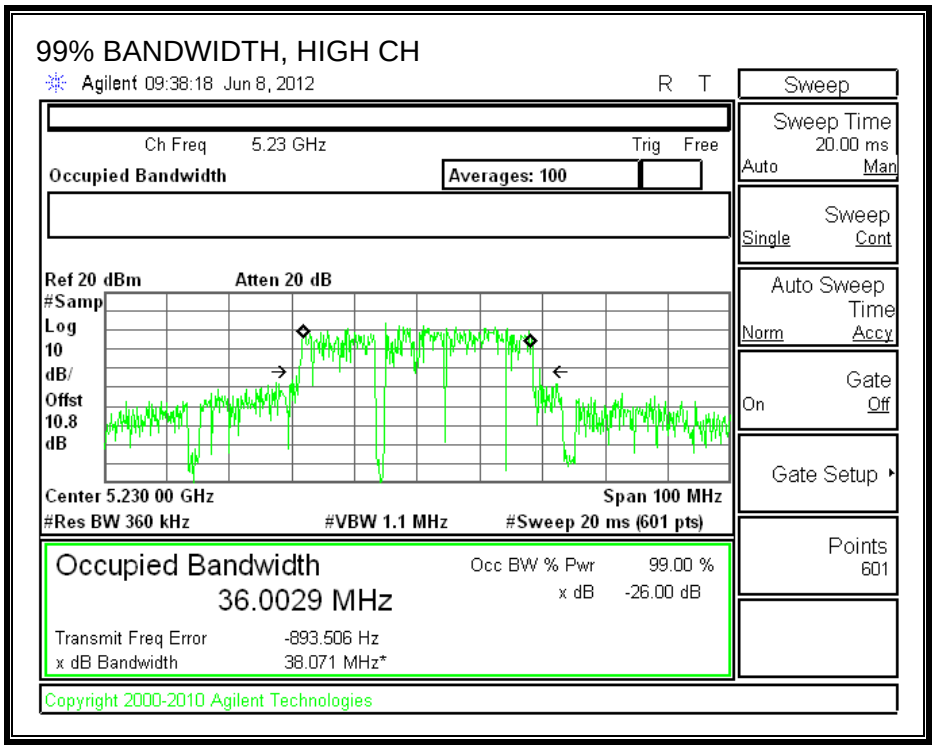
None; for reporting purposes only.

**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5190 | 36.0812 |
| High | 5230 | 36.0029 |

**99% BANDWIDTH**



## 8.5.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

| Channel | Frequency (MHz) | Power (dBm) |
|---|---|---|
| Low | 5190 | 14.5 |
| High | 5230 | 16.0 |

## 8.5.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5190 | 17 | 40.17 | 20.04 | 5.65 | 17.00 | 4.00 |
| High | 5230 | 17 | 42.00 | 20.23 | 5.65 | 17.00 | 4.00 |

**Output Power Results**

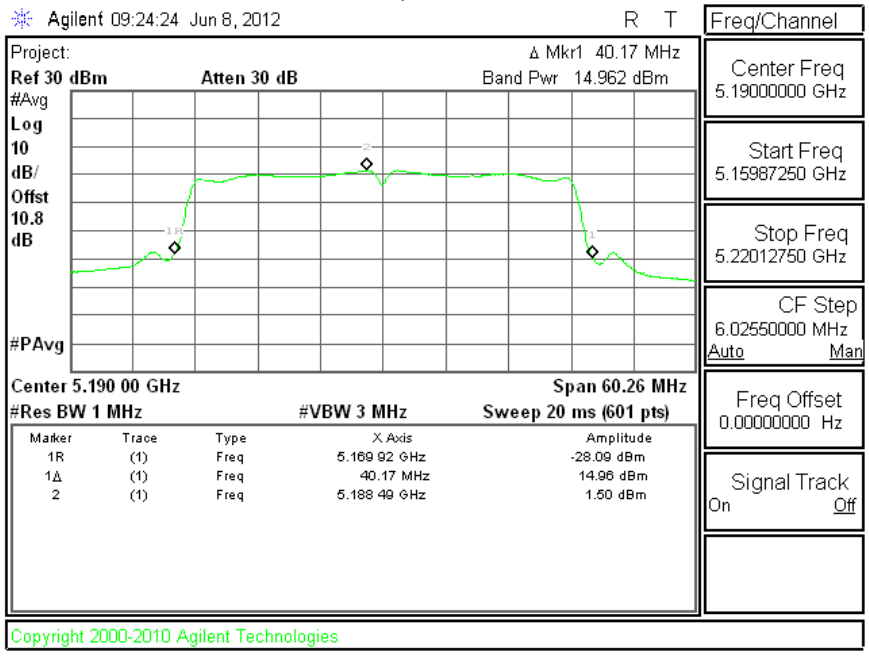
| Channel | Frequency (MHz) | Meas Power (dBm) | Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|
| Low | 5190 | 14.962 | 14.962 | 17.00 | -2.038 |
| High | 5230 | 16.271 | 16.271 | 17.00 | -0.729 |

**PPSD Results**

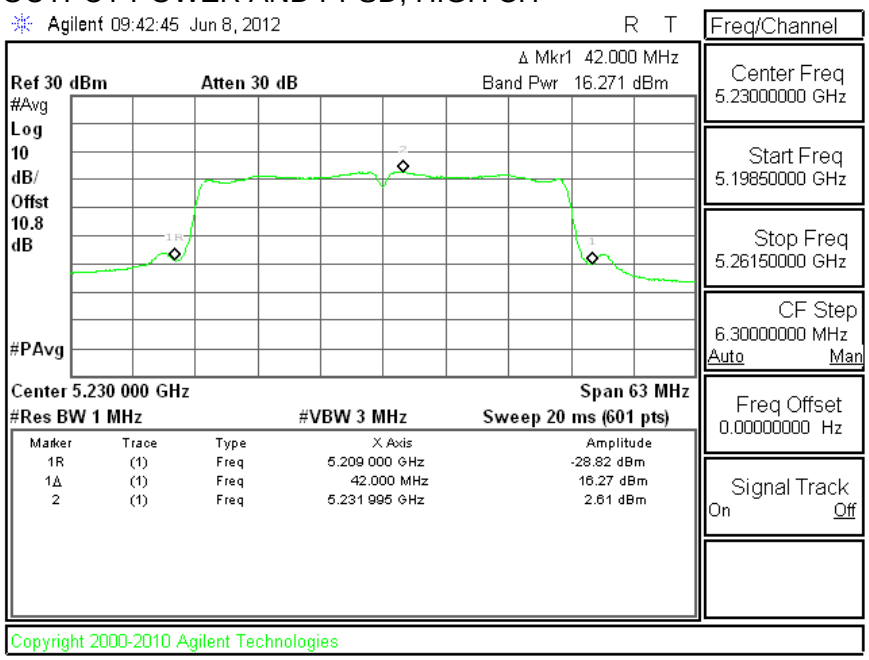
| Channel | Frequency (MHz) | Meas PPSD (dBm) | Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|
| Low | 5190 | 1.50 | 1.50 | 4.00 | -2.50 |
| High | 5230 | 2.61 | 2.61 | 4.00 | -1.39 |

**OUTPUT POWER AND PPSD**

OUTPUT POWER AND PPSD, LOW CH




OUTPUT POWER AND PPSD, HIGH CH



## 8.5.5. PEAK EXCURSION

**LIMITS**

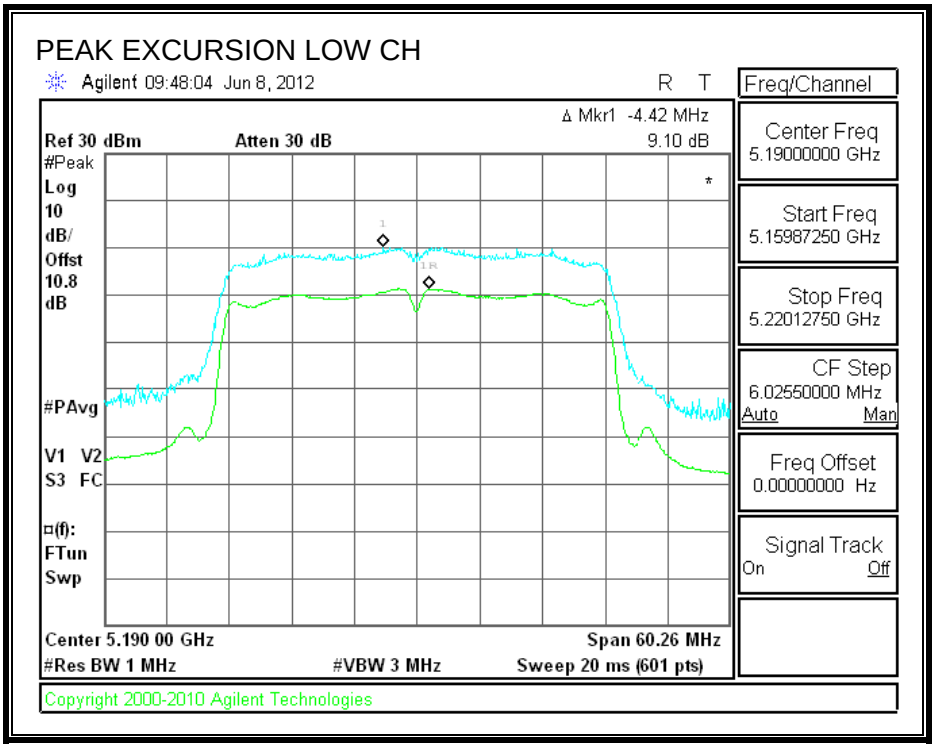
FCC §15.407 (a) (6)

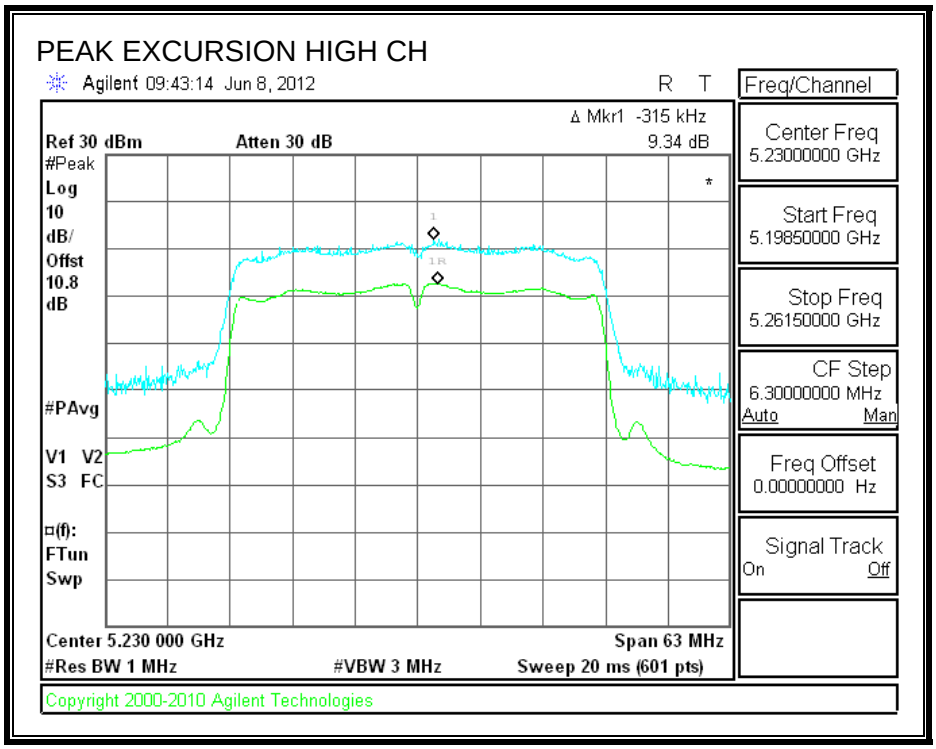
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5190 | 9.10 | 13 | -3.90 |
| High | 5230 | 9.34 | 13 | -3.66 |

**PEAK EXCURSION**



## 8.6. 802.11n HT40, CDD MCS0, 2TX, 5.2 GHz BAND

### 8.6.1. 26 dB BANDWIDTH

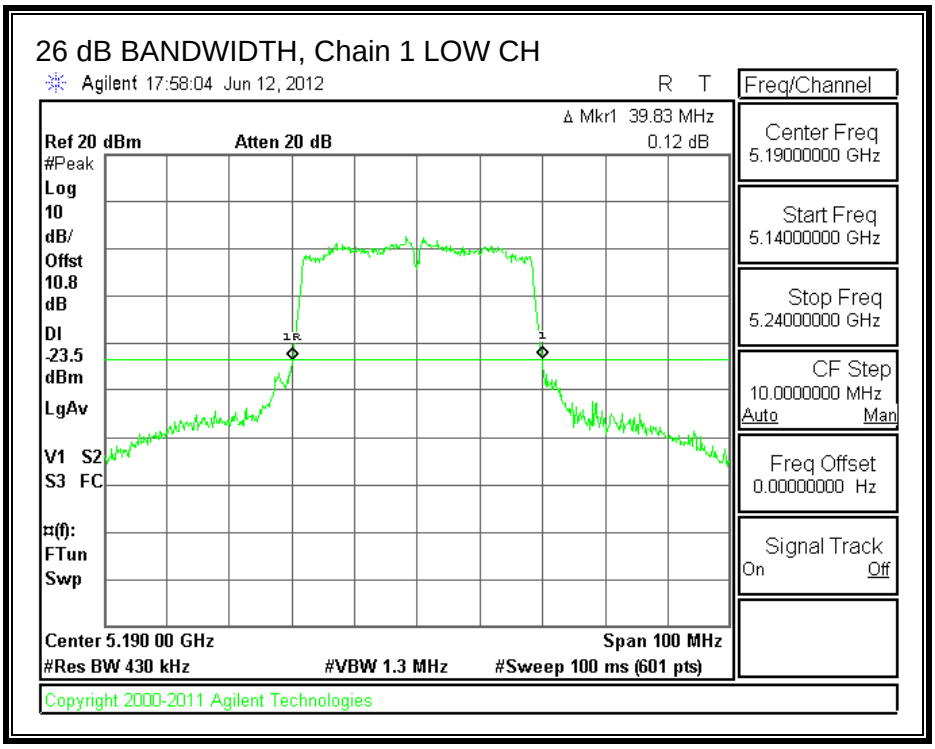
**LIMITS**

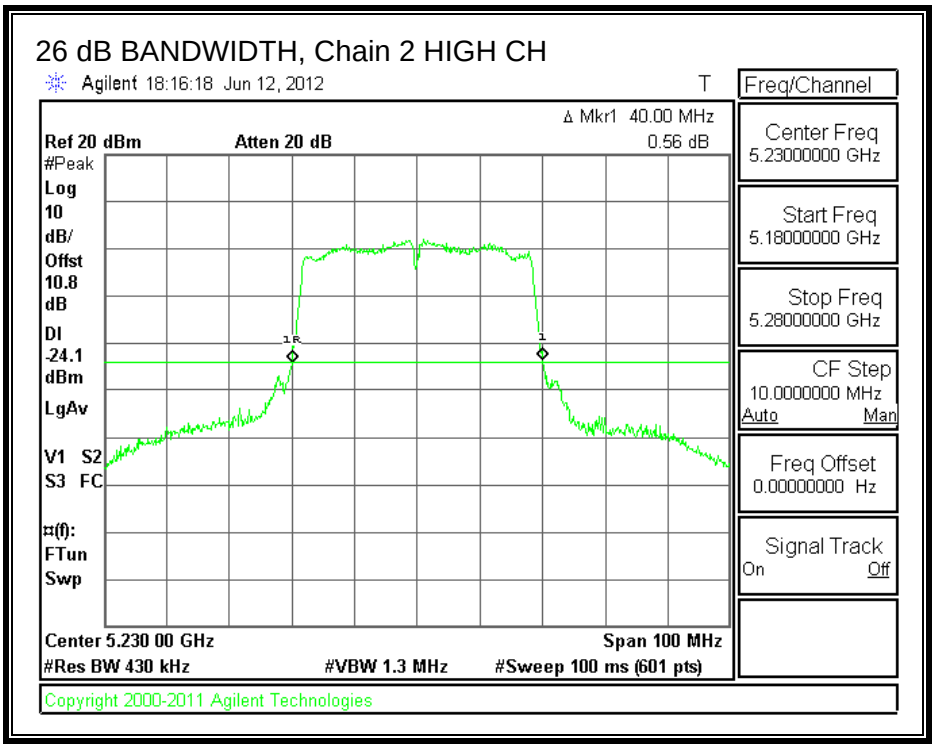
None; for reporting purposes only.

**RESULTS**

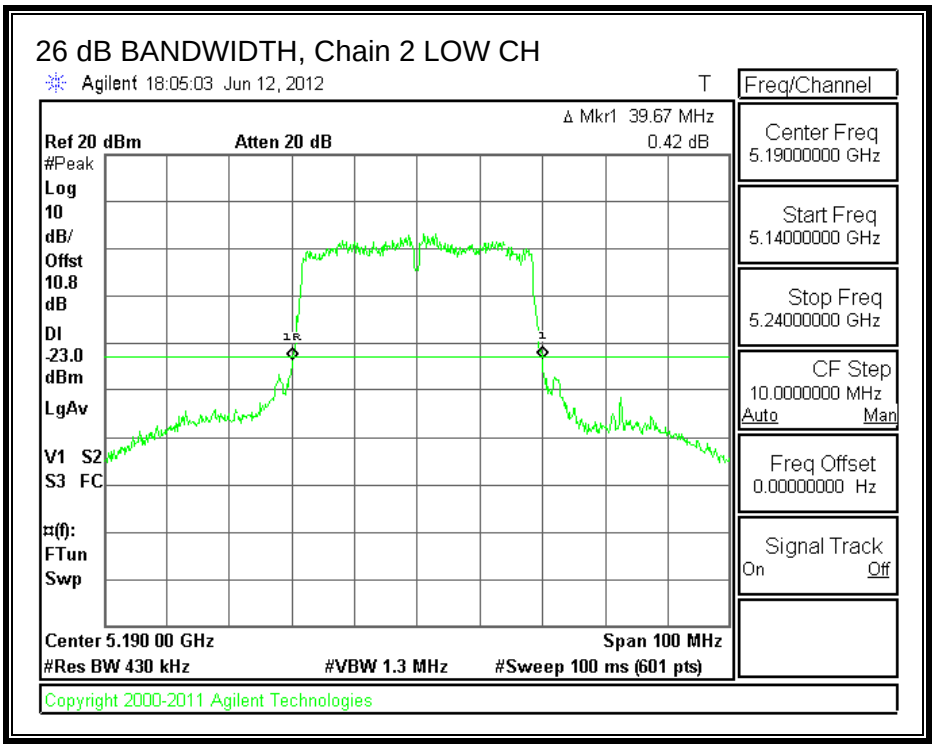
| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5190 | 39.83 | 39.67 |
| High | 5230 | 40.00 | 39.50 |

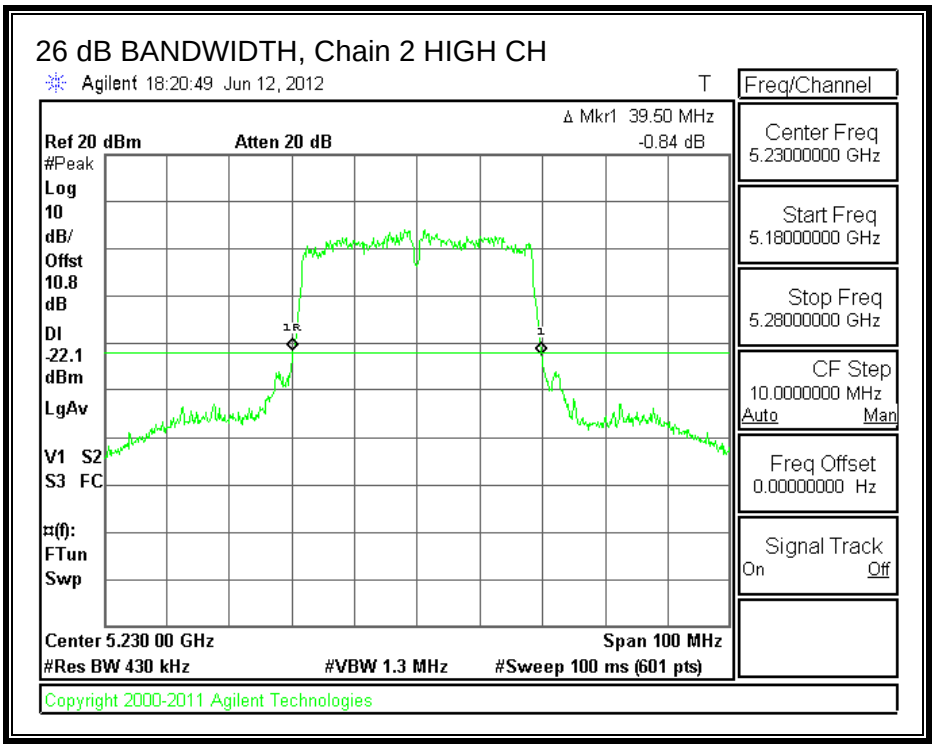
**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



### 8.6.2. 99% BANDWIDTH

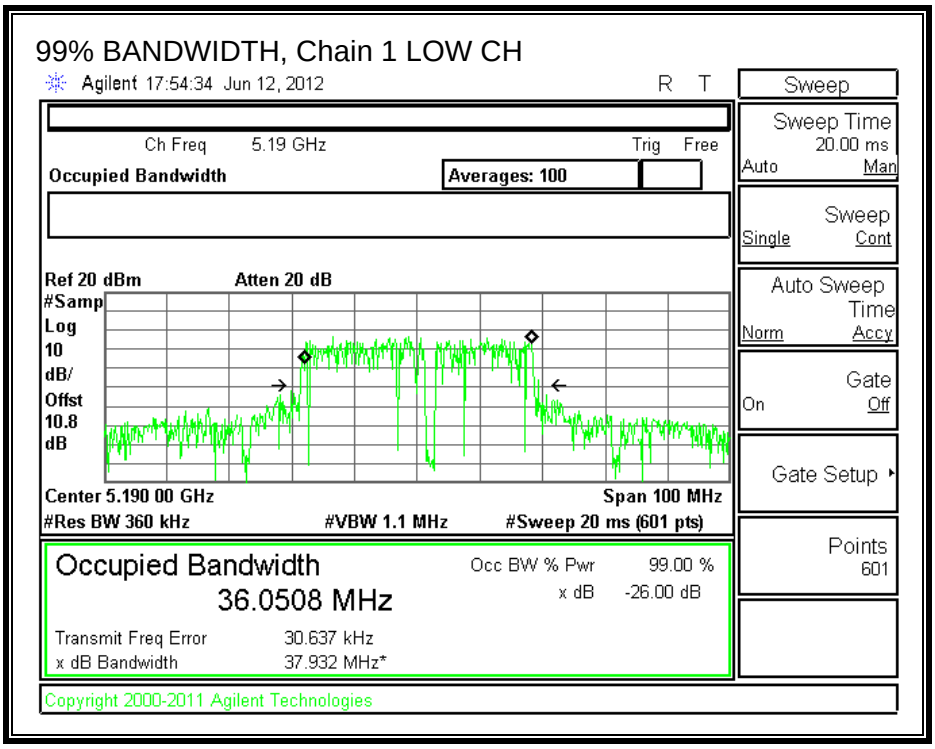
**LIMITS**

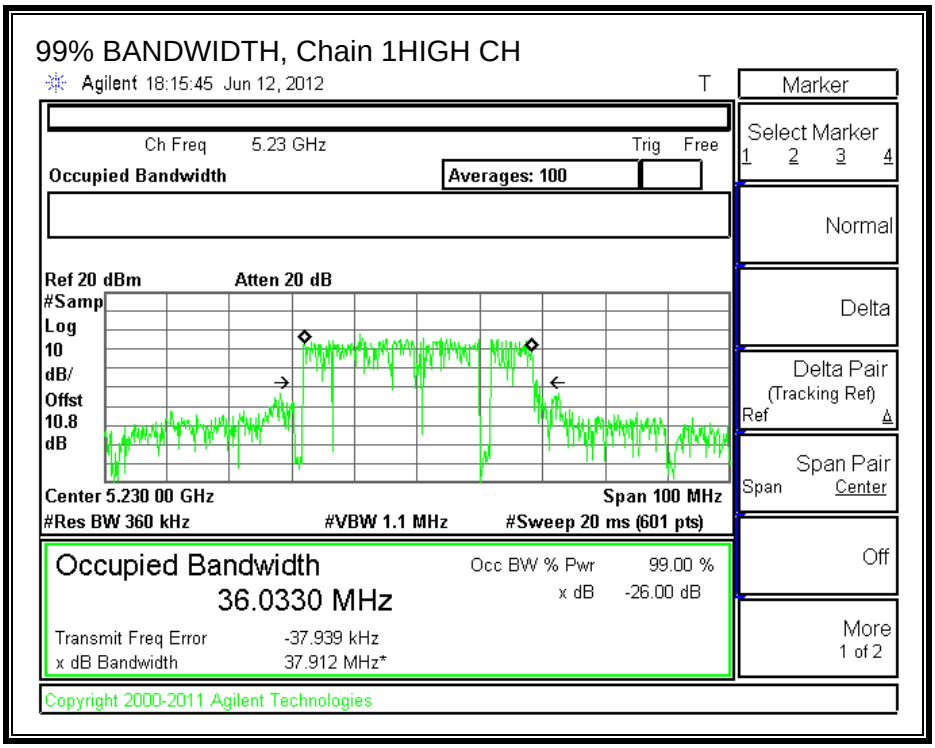
None; for reporting purposes only.

**RESULTS**

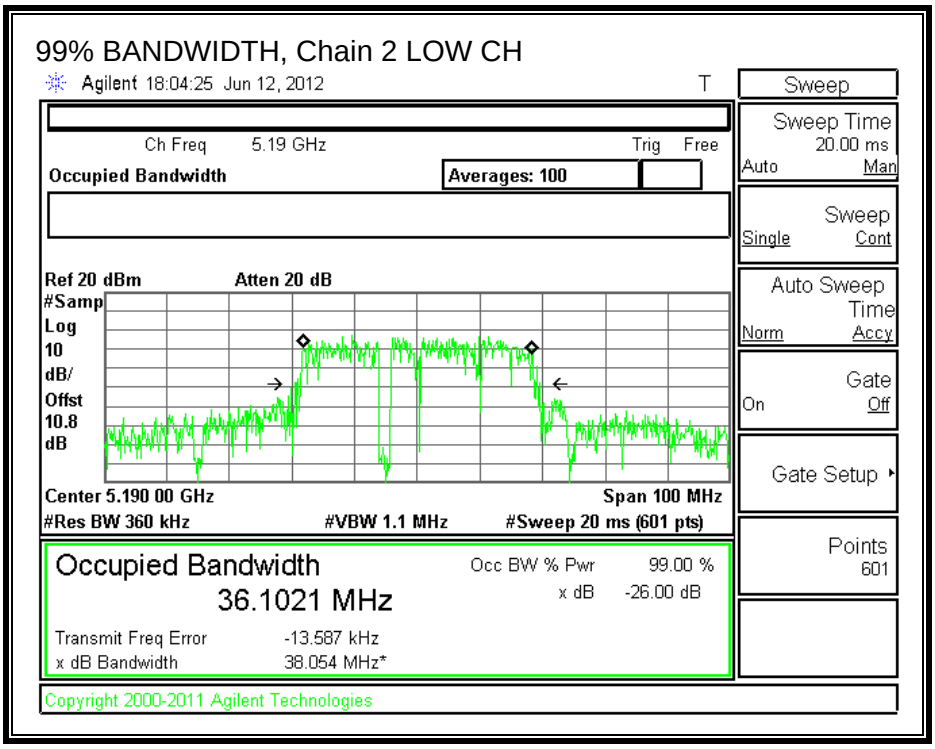
| Channel | Frequency (MHz) | 99% BW Chain 1 (MHz) | 99% BW Chain 2 (MHz) |
|---|---|---|---|
| Low | 5190 | 36.0508 | 36.1021 |
| High | 5230 | 36.0330 | 36.1473 |

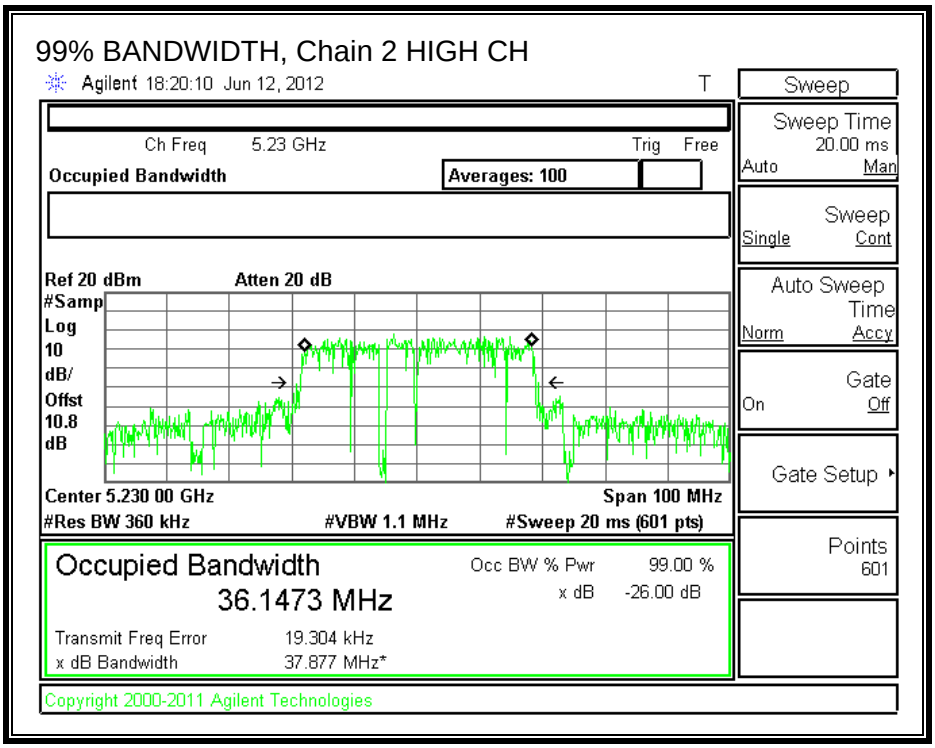
**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



## 8.6.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|
| Low | 5190 | 11.60 | 11.65 | 14.64 |
| High | 5230 | 10.60 | 10.60 | 13.61 |

## 8.6.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**DIRECTIONAL ANTENNA GAIN**

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

| Chain 1 Antenna Gain (dBi) | Chain 2 Antenna Gain (dBi) | Correlated Chains Directional Gain (dBi) |
|---|---|---|
| 4.16 | 5.65 | 7.95 |

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5190 | 17 | 39.67 | 19.98 | 7.95 | 15.05 | 2.05 |
| High | 5230 | 17 | 39.50 | 19.97 | 7.95 | 15.05 | 2.05 |

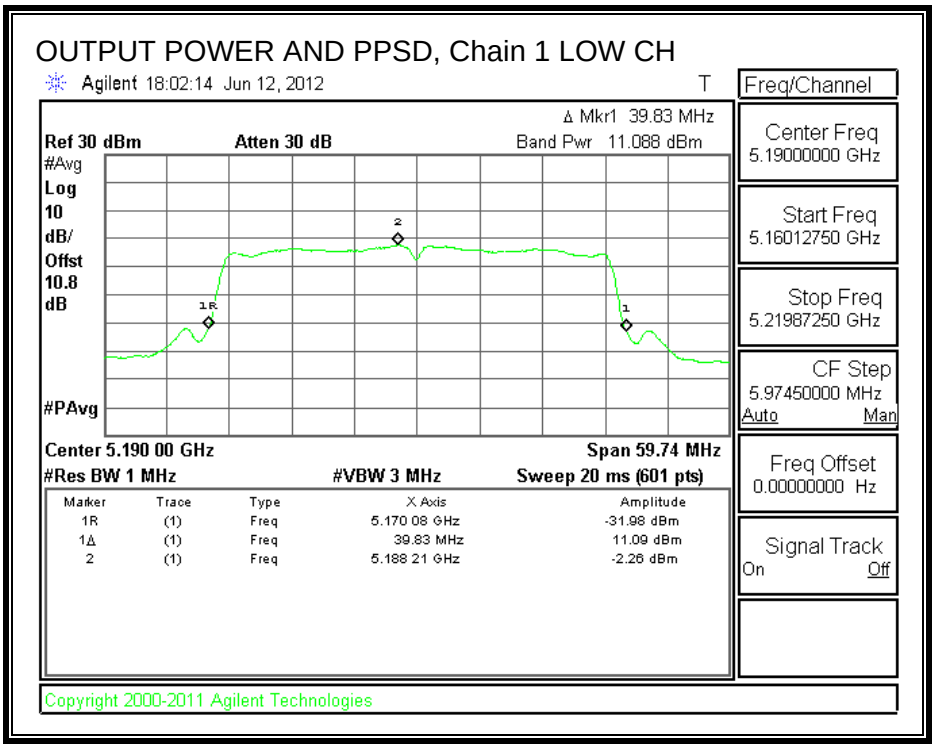
**Output Power Results**

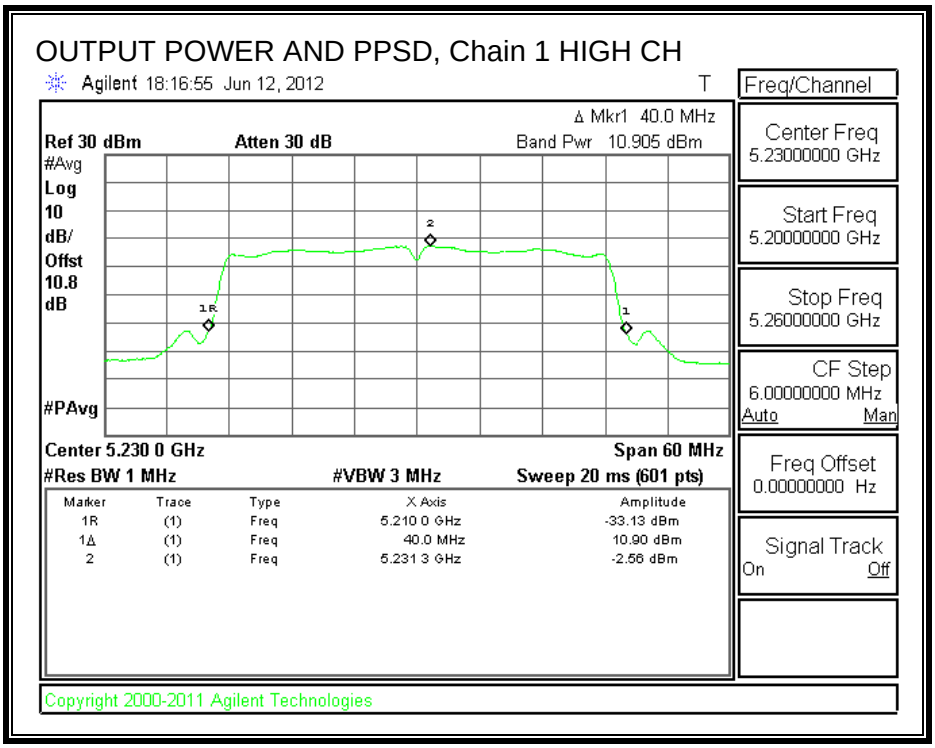
| Channel | Frequency (MHz) | Chain 1 Meas Power (dBm) | Chain 2 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | 11.088 | 12.019 | 14.589 | 15.05 | -0.461 |
| High | 5230 | 10.905 | 11.150 | 14.040 | 15.05 | -1.010 |

**PPSD Results**

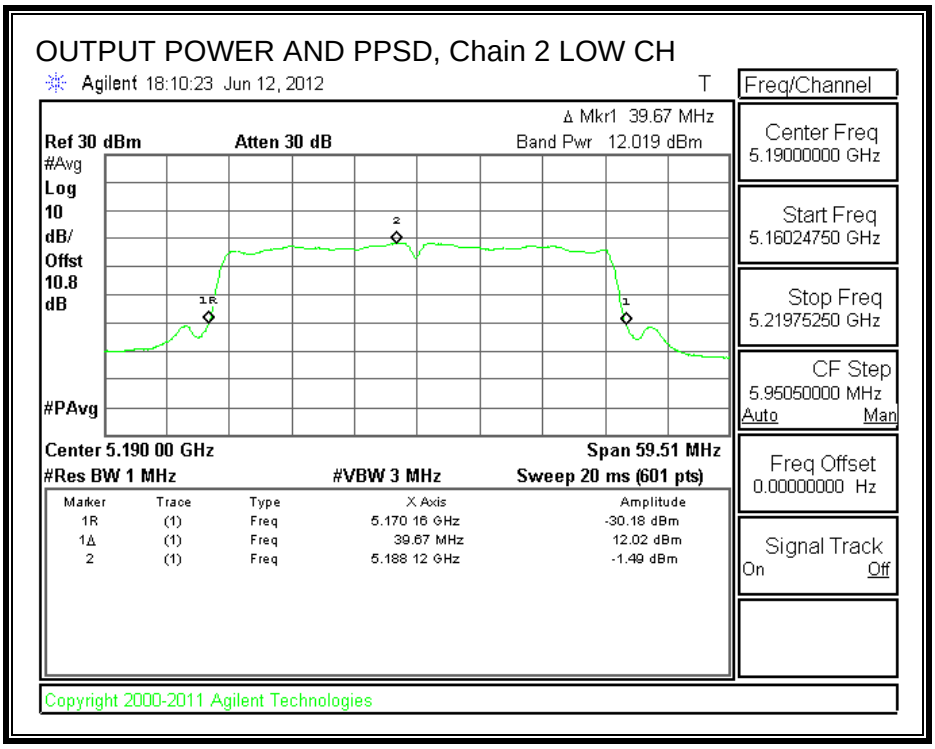
| Channel | Frequency (MHz) | Chain 1 Meas PPSD (dBm) | Chain 2 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | -2.26 | -1.49 | 1.15 | 2.05 | -0.90 |
| High | 5230 | -2.56 | -2.41 | 0.53 | 2.05 | -1.52 |

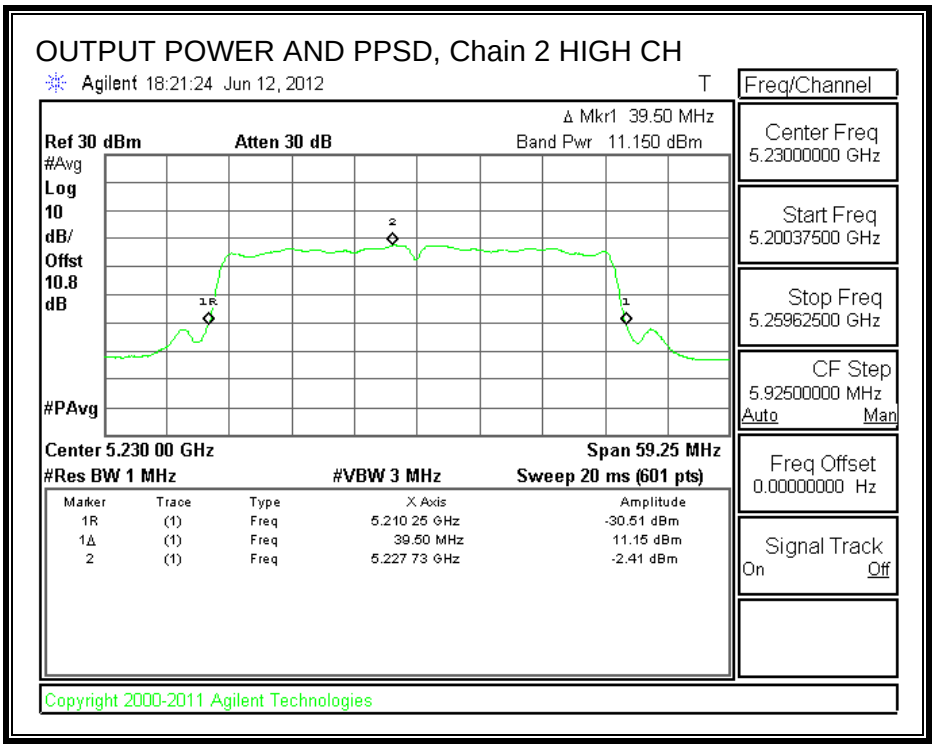
**OUTPUT POWER AND PPSD, Chain 1**



**OUTPUT POWER AND PPSD, Chain 2**



## 8.6.5. PEAK EXCURSION

**LIMITS**

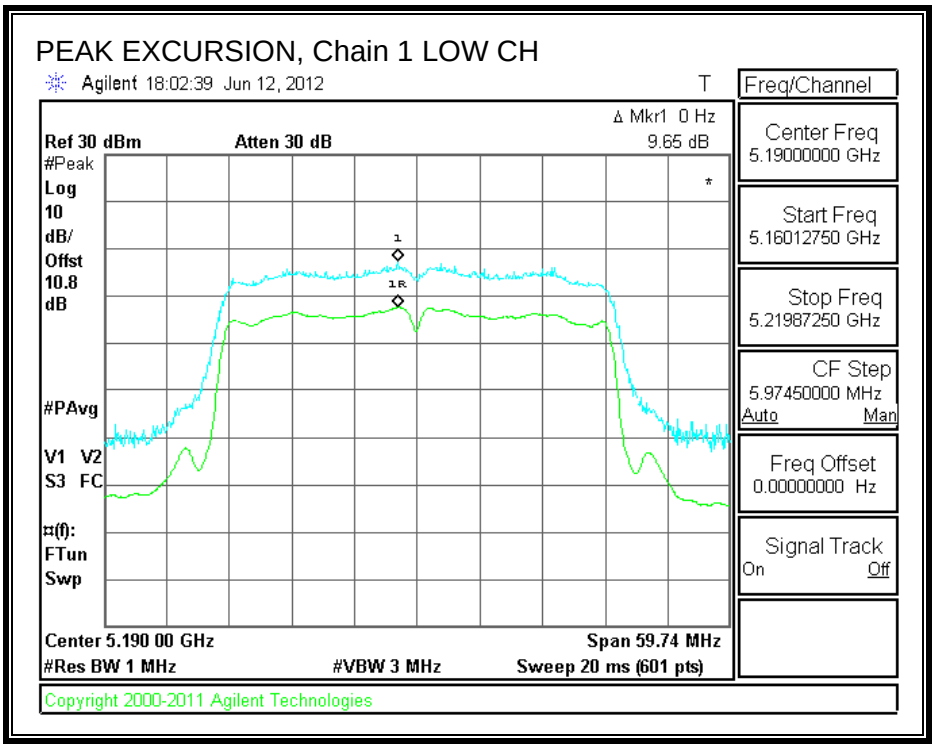
FCC §15.407 (a) (6)

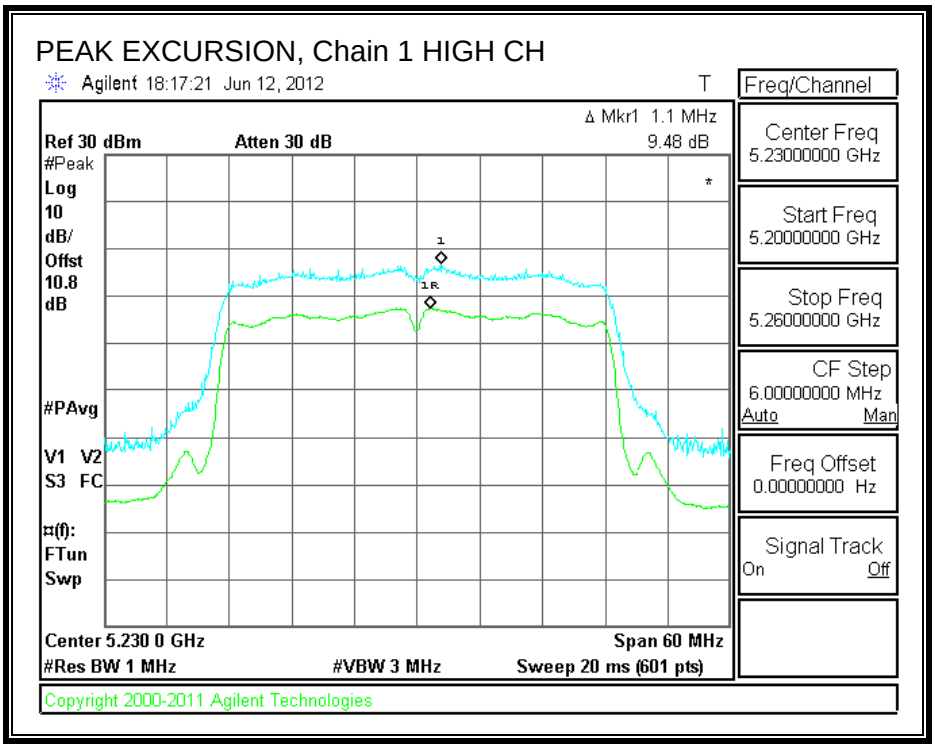
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

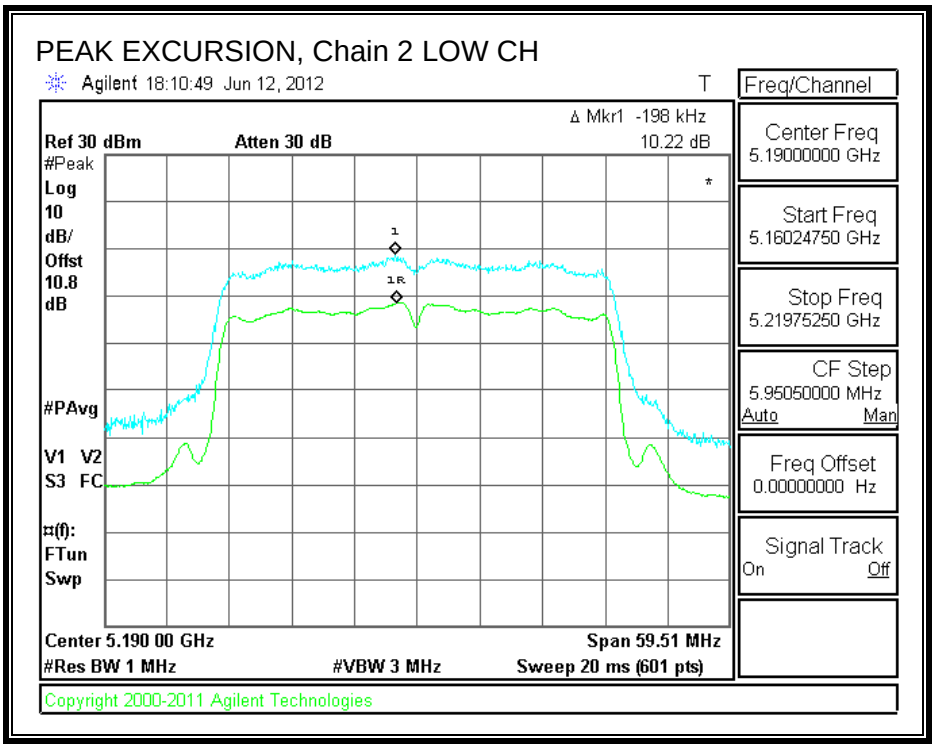
| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|
| Low | 5190 | 9.65 | 10.22 | 13 | -2.8 |
| High | 5230 | 9.48 | 9.69 | 13 | -3.3 |

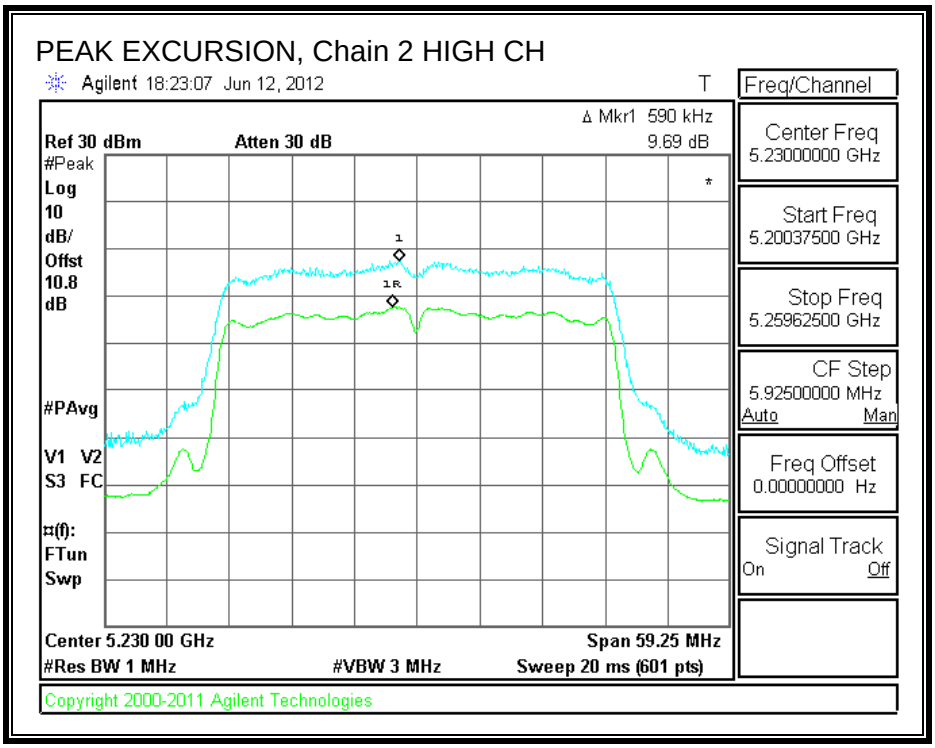
**PEAK EXCURSION, Chain 1**



**PEAK EXCURSION, Chain 2**



## 8.7. 802.11n HT40, CDD MCS0, 3TX, 5.2 GHz BAND

**Note:** Only AVG power and Peak Excursion were performed for this mode based on client's test plan.

### 8.7.1. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|---|
| Low | 5190 | 14.50 | 14.50 | 14.60 | 19.30 |
| High | 5230 | 18.10 | 18.10 | 18.00 | 22.84 |

## 8.7.2. PEAK EXCURSION

**LIMITS**

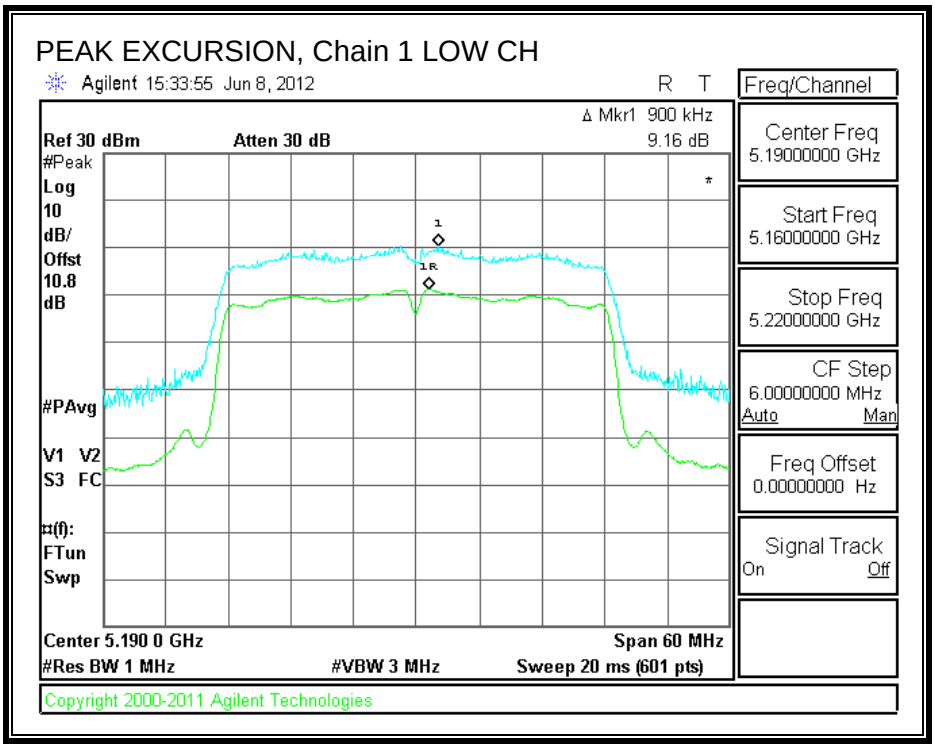
FCC §15.407 (a) (6)

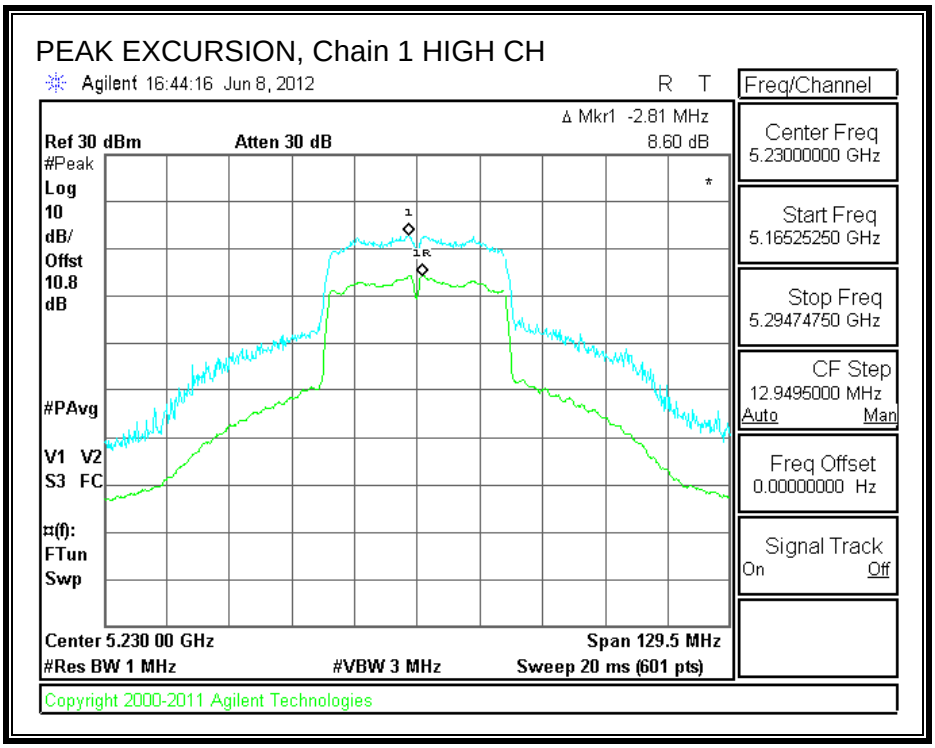
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

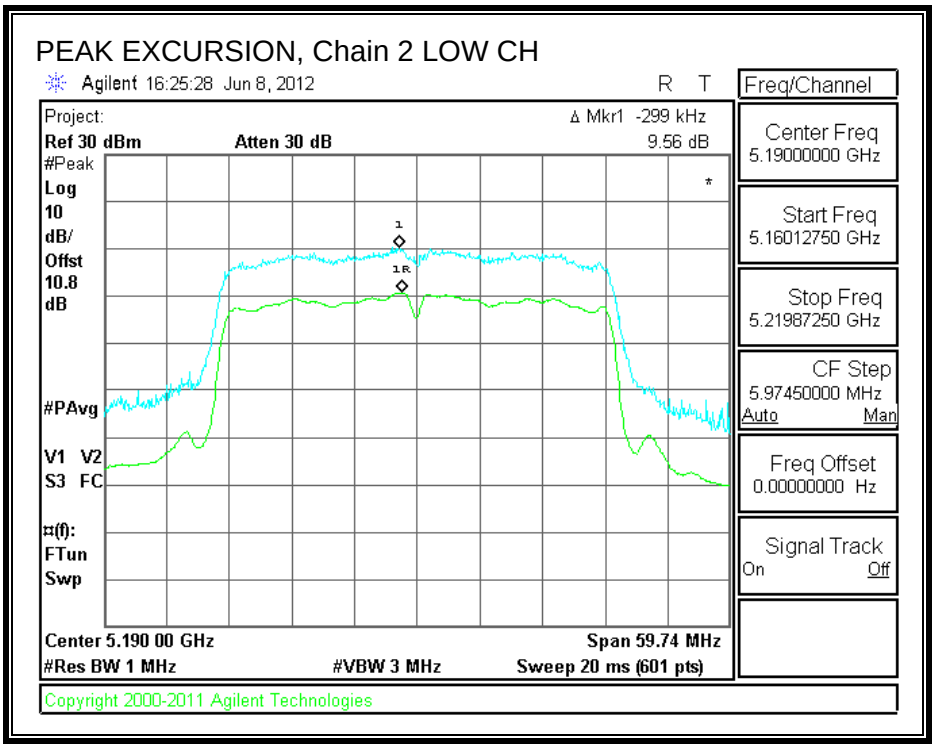
| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Pk Exc Chain 3 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | 9.16 | 9.56 | 9.52 | 13 | -3.4 |
| High | 5230 | 8.60 | 10.09 | 10.12 | 13 | -2.9 |

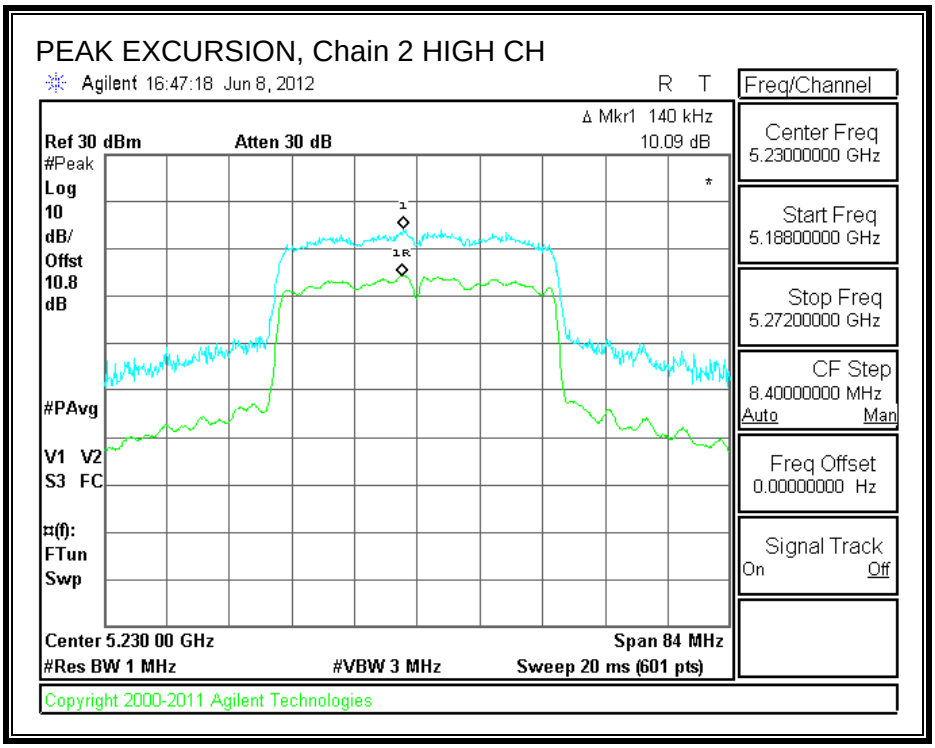
**PEAK EXCURSION, Chain 1**



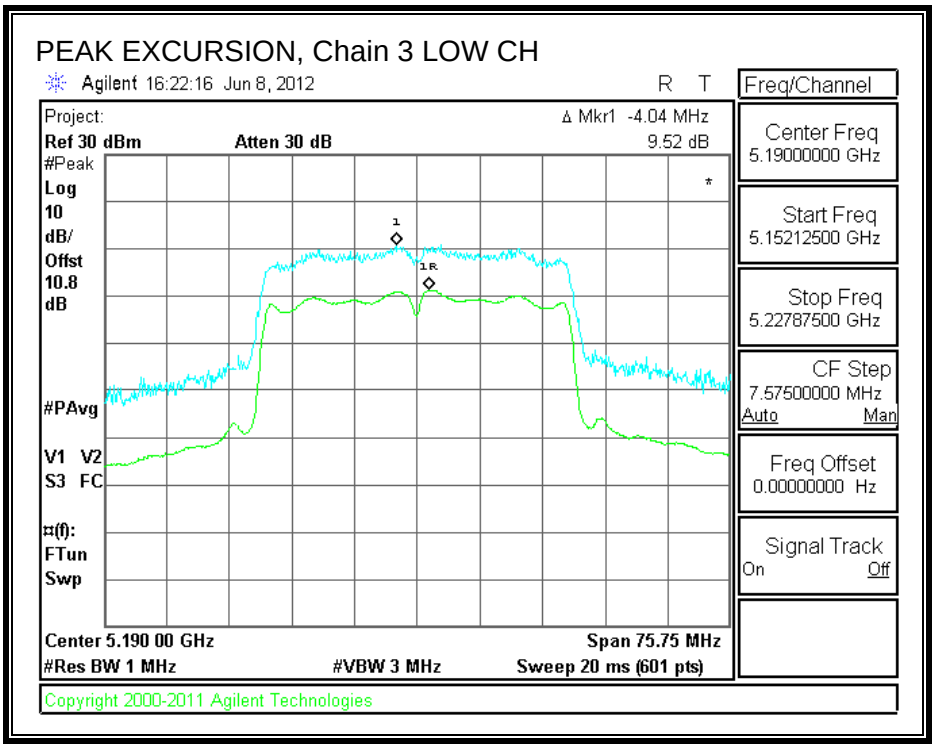



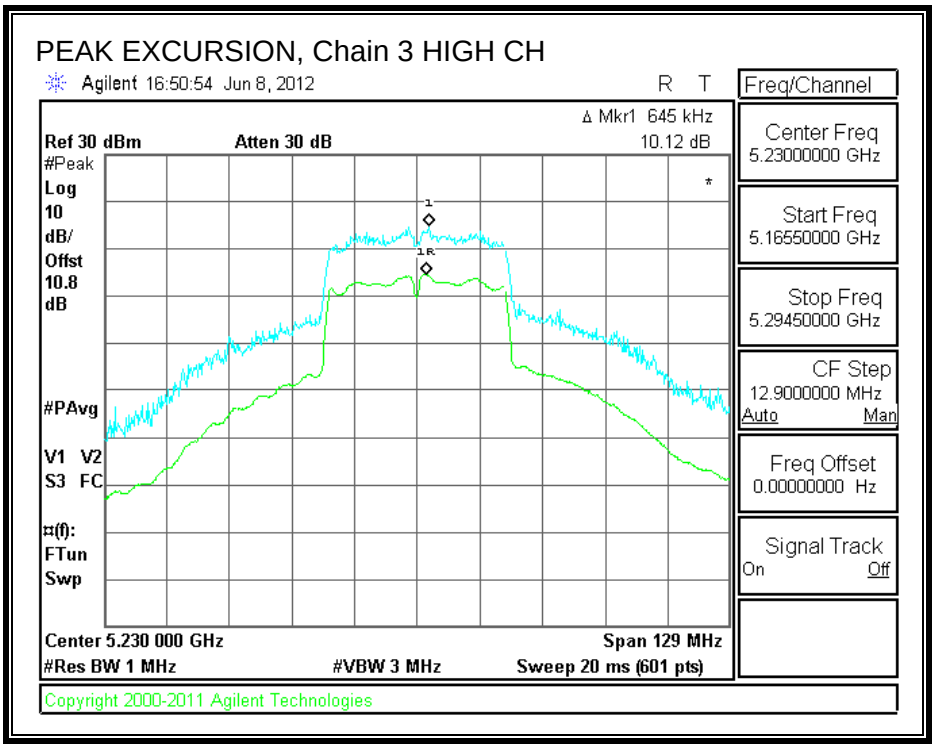
**PEAK EXCURSION, Chain 2**



**PEAK EXCURSION, Chain 3**



## 8.8. 802.11n HT40, STBC MCS0, 3TX, 5.2 GHz BAND

### 8.8.1. 26 dB BANDWIDTH

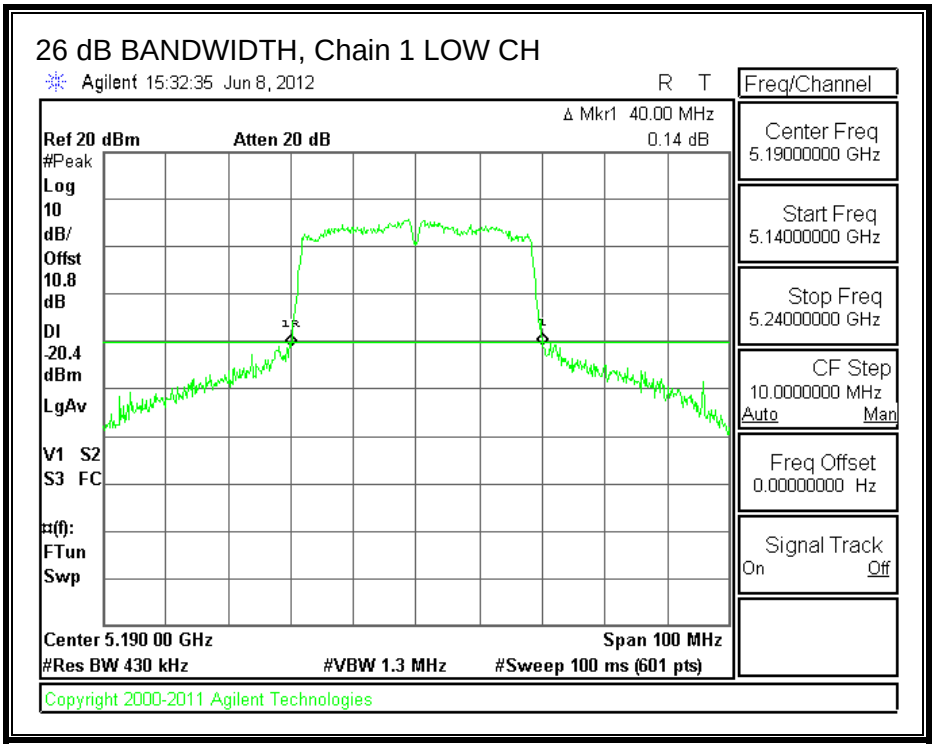
**LIMITS**

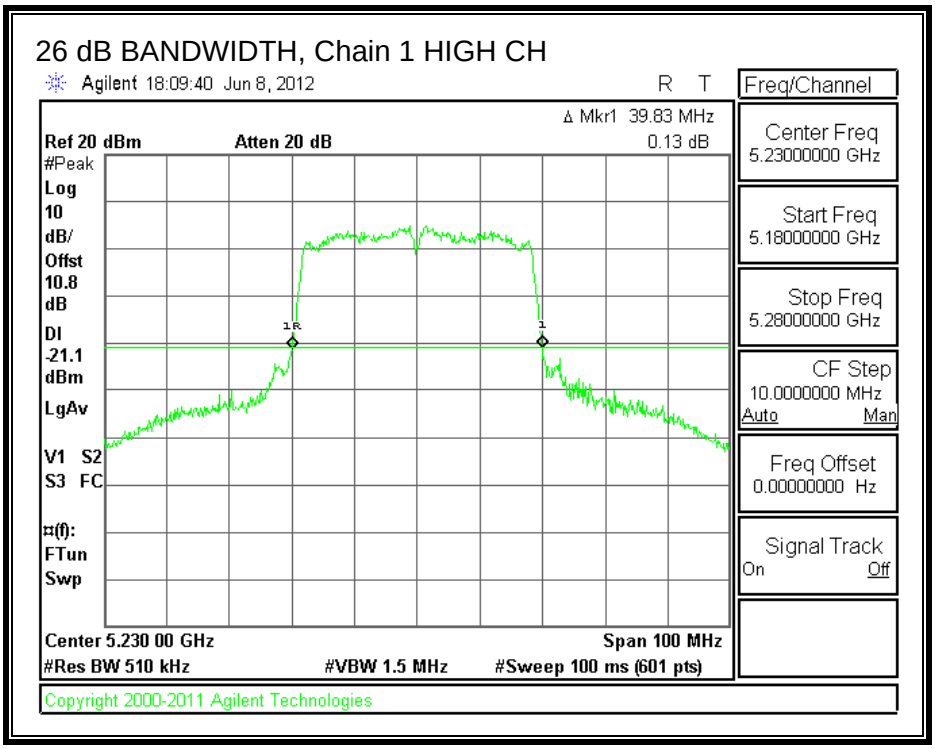
None; for reporting purposes only.

**RESULTS**

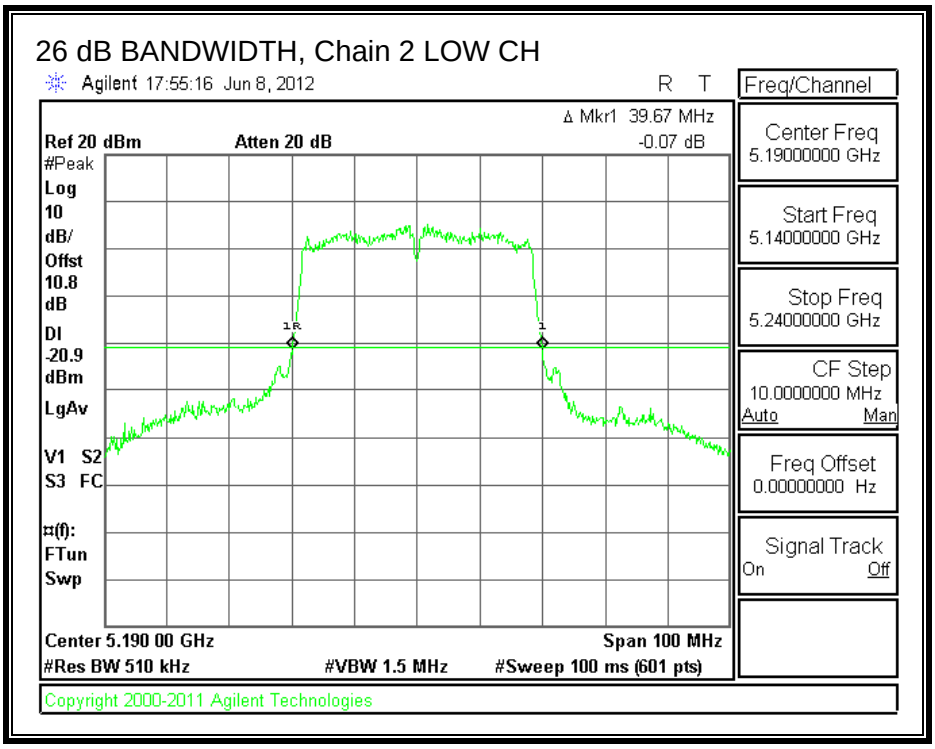
| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) | 26 dB BW Chain 3 (MHz) |
|---|---|---|---|---|
| Low | 5190 | 40.00 | 39.67 | 40.00 |
| High | 5230 | 39.83 | 39.67 | 40.17 |

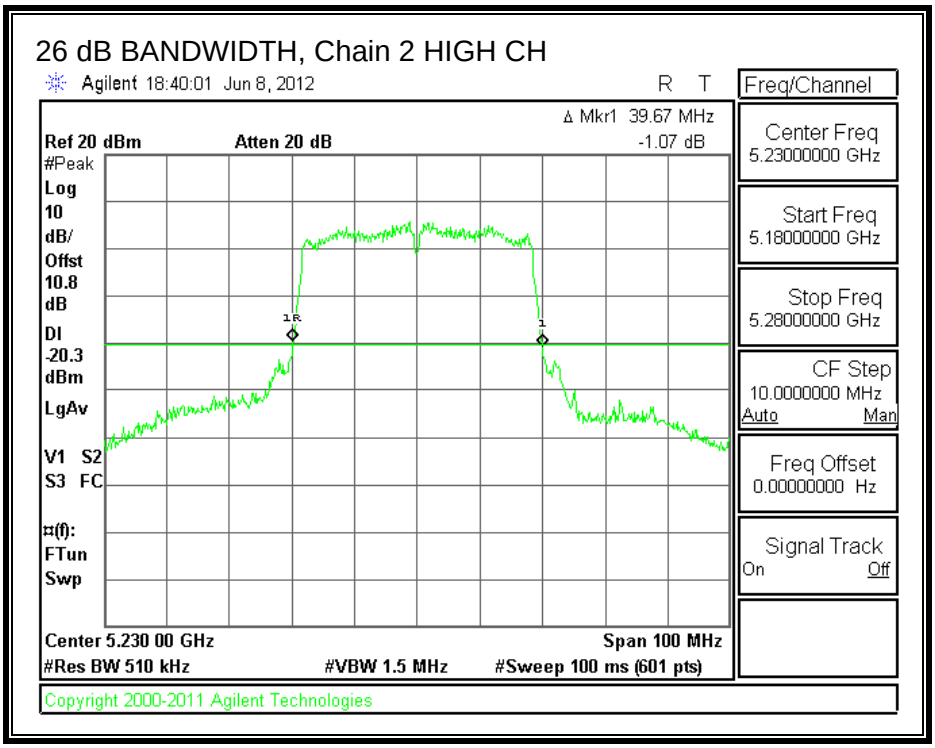
**26 dB BANDWIDTH, Chain 1**



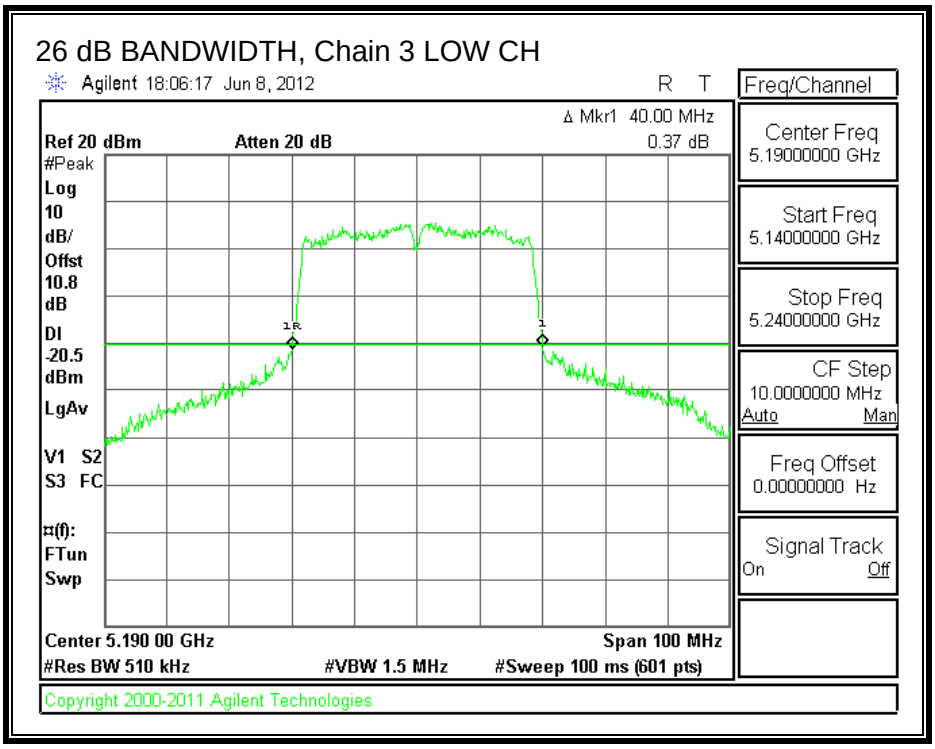



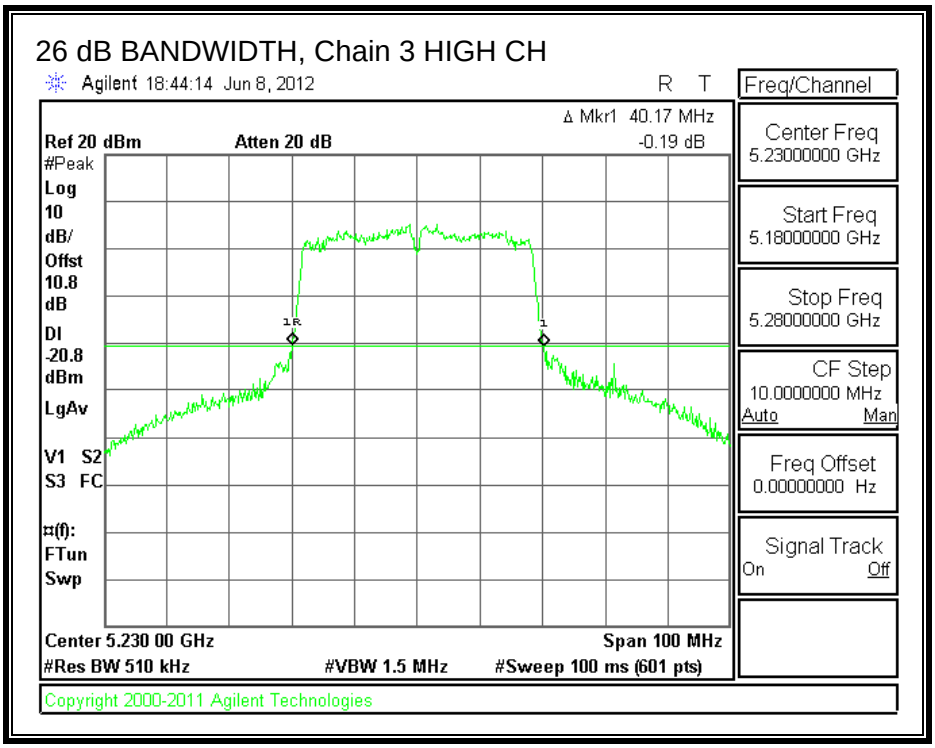
**26 dB BANDWIDTH, Chain 2**



**26 dB BANDWIDTH, Chain 3**



### 8.8.2. 99% BANDWIDTH

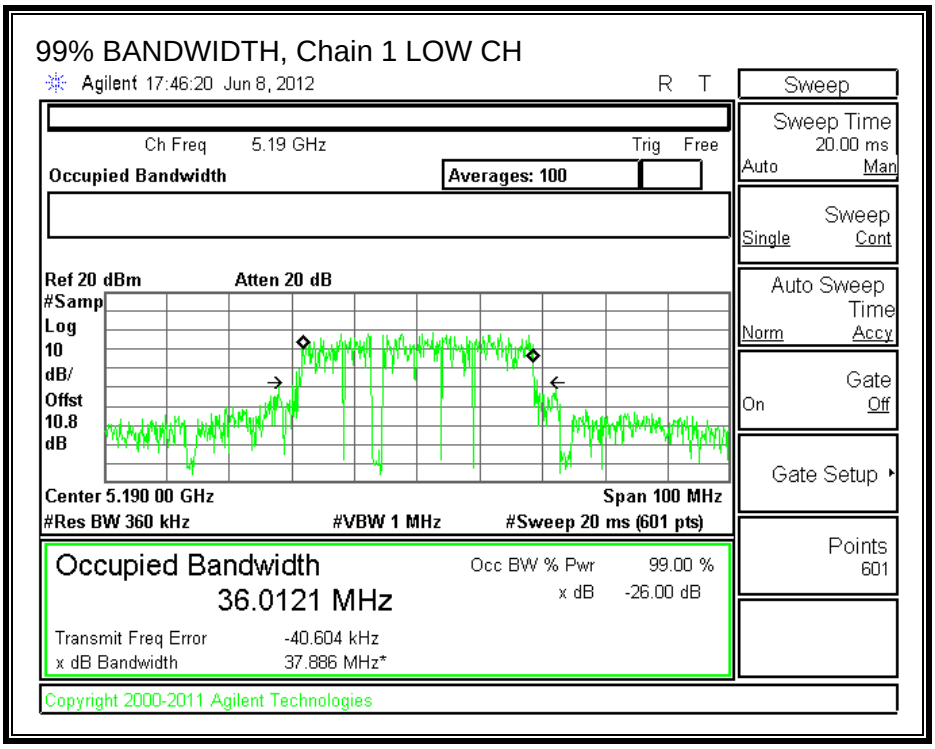
**LIMITS**

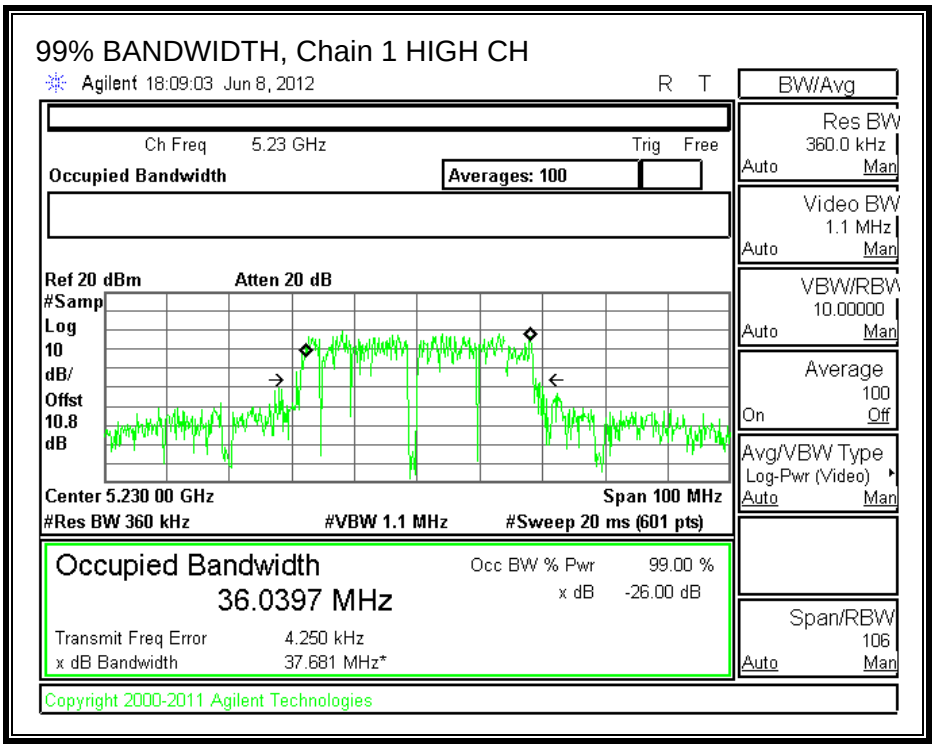
None; for reporting purposes only.

**RESULTS**

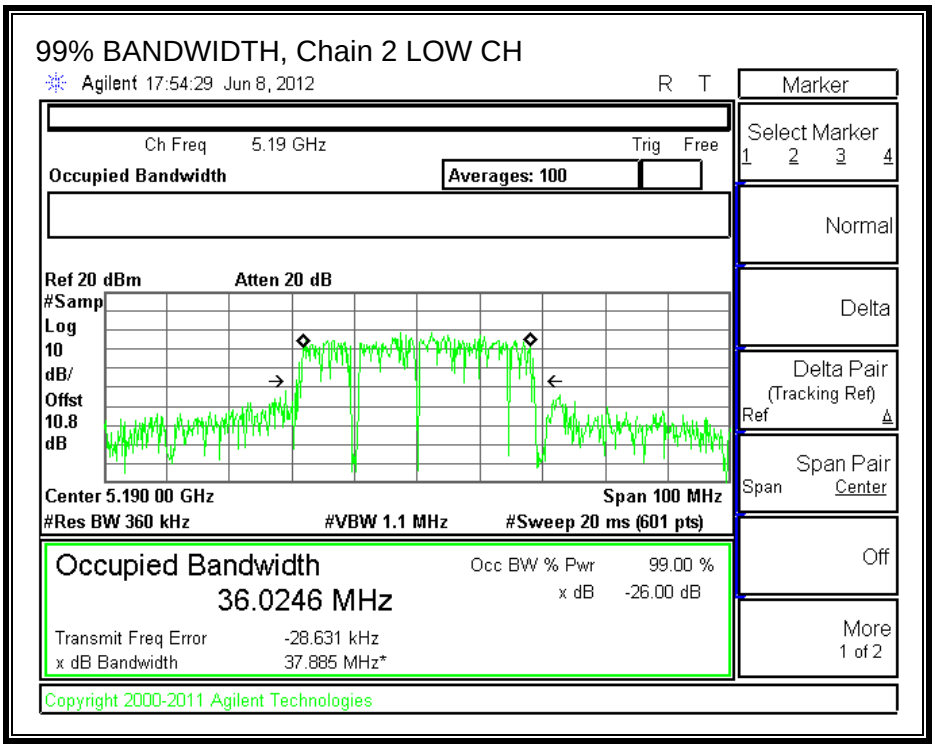
| Channel | Frequency (MHz) | 99% BW Chain 1 (MHz) | 99% BW Chain 2 (MHz) | 99% BW Chain 3 (MHz) |
|---|---|---|---|---|
| Low | 5190 | 36.0121 | 36.0246 | 36.0675 |
| High | 5230 | 36.0397 | 35.9789 | 36.0740 |

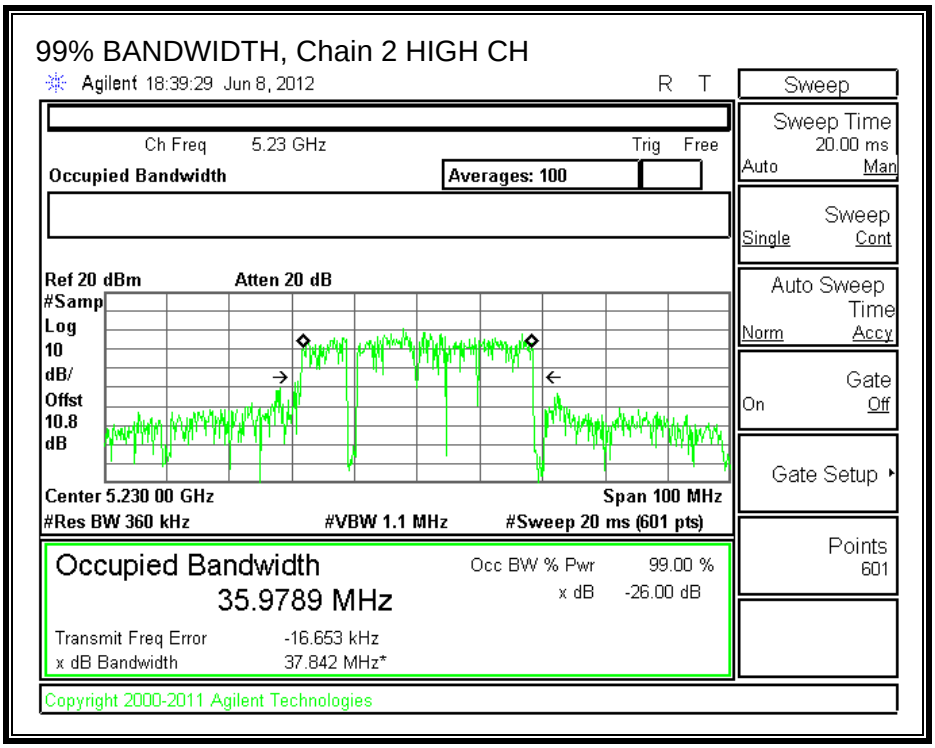
**99% BANDWIDTH, Chain 1**



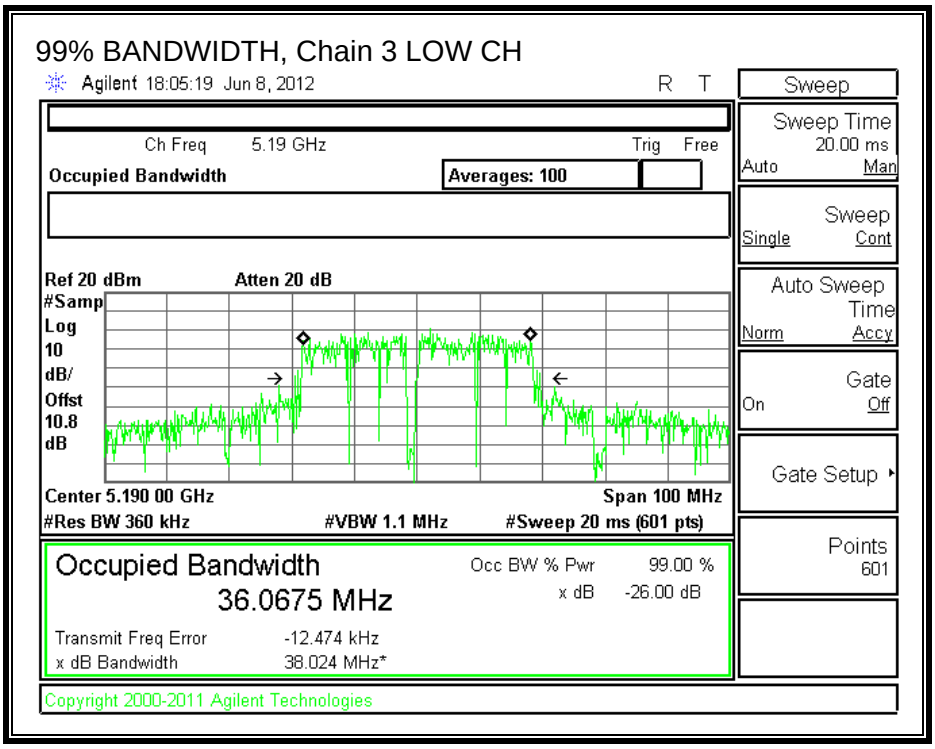



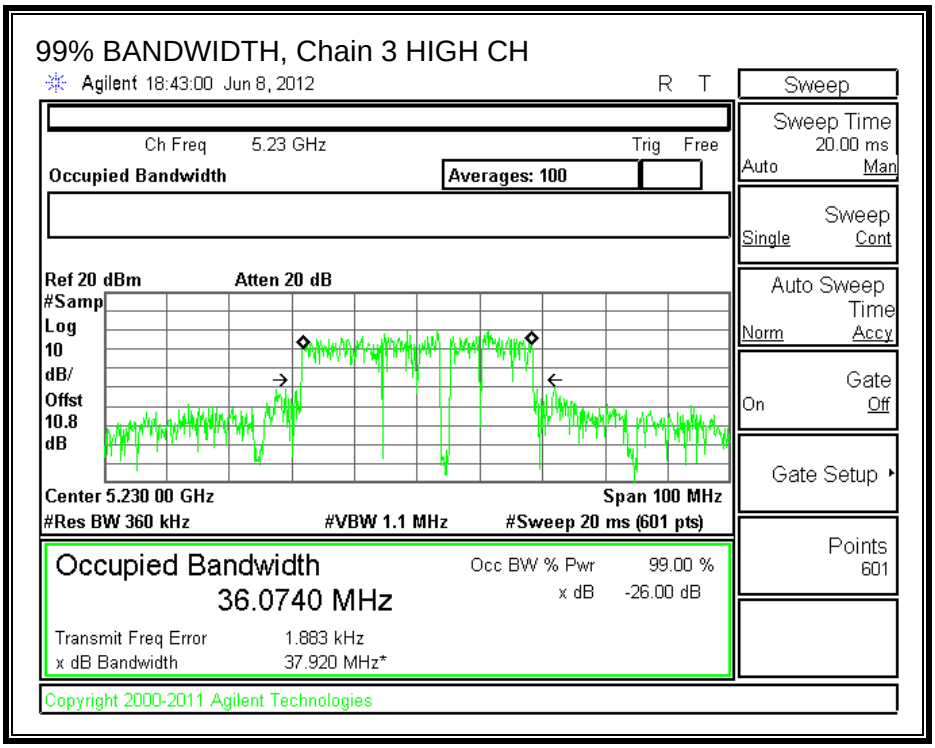
**99% BANDWIDTH, Chain 2**



**99% BANDWIDTH, Chain 3**



## 8.8.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

**Average Power Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) |
|---|---|---|---|---|---|
| Low | 5190 | 12.10 | 12.12 | 12.00 | 16.84 |
| High | 5230 | 12.15 | 12.20 | 12.00 | 16.89 |

## 8.8.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (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.

**DIRECTIONAL ANTENNA GAIN**

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

| Chain 1 Antenna Gain (dBi) | Chain 2 Antenna Gain (dBi) | Chain 3 Antenna Gain (dBi) | Uncorrelated Chains Directional Gain (dBi) |
|---|---|---|---|
| 4.16 | 2.51 | 5.65 | 4.29 |

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5190 | 17 | 40.00 | 20.02 | 4.29 | 17.00 | 4.00 |
| High | 5230 | 17 | 40.17 | 20.04 | 4.29 | 17.00 | 4.00 |

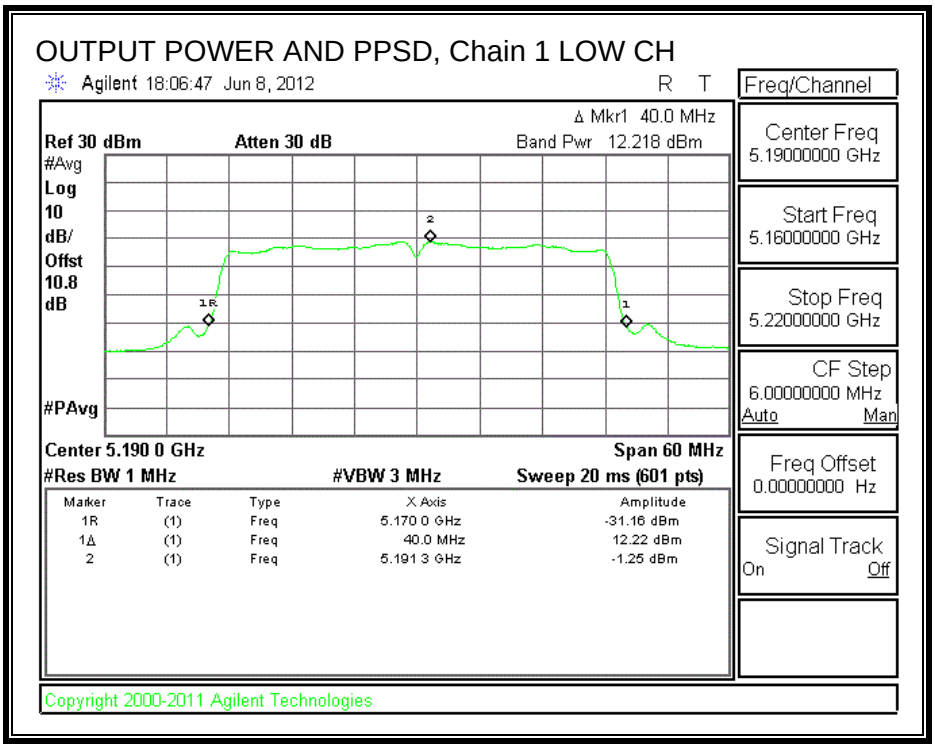
**Output Power Results**

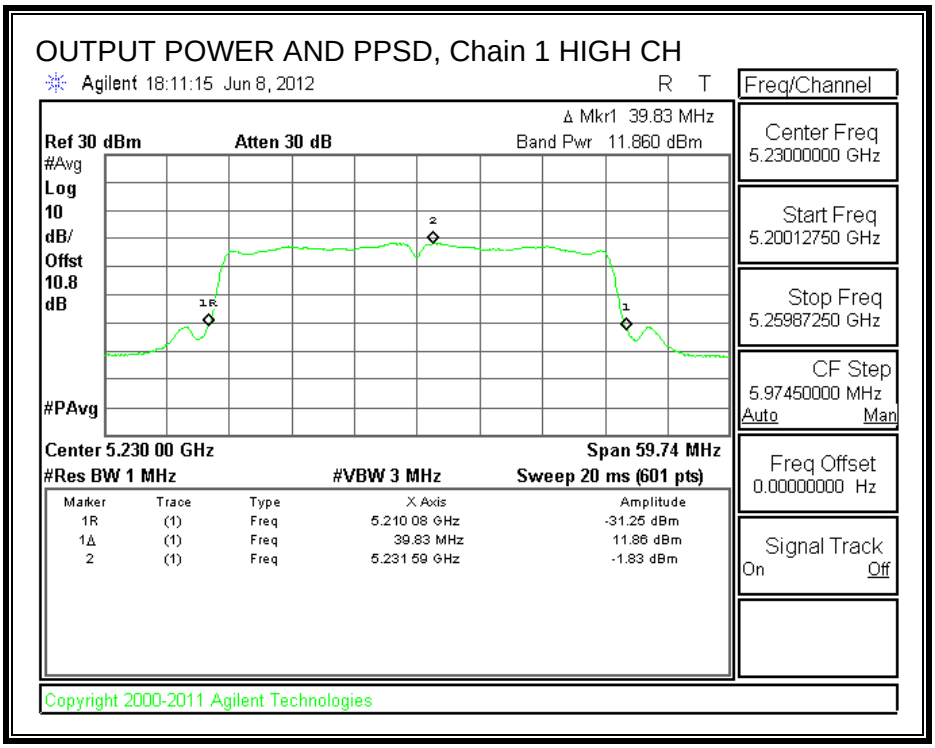
| Channel | Frequency (MHz) | Chain 1 Meas Power (dBm) | Chain 2 Meas Power (dBm) | Chain 3 Meas Power (dBm) | Total Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low | 5190 | 12.218 | 12.189 | 12.218 | 16.980 | 17.00 | -0.020 |
| High | 5230 | 11.860 | 11.765 | 11.755 | 16.565 | 17.00 | -0.435 |

**PPSD Results**

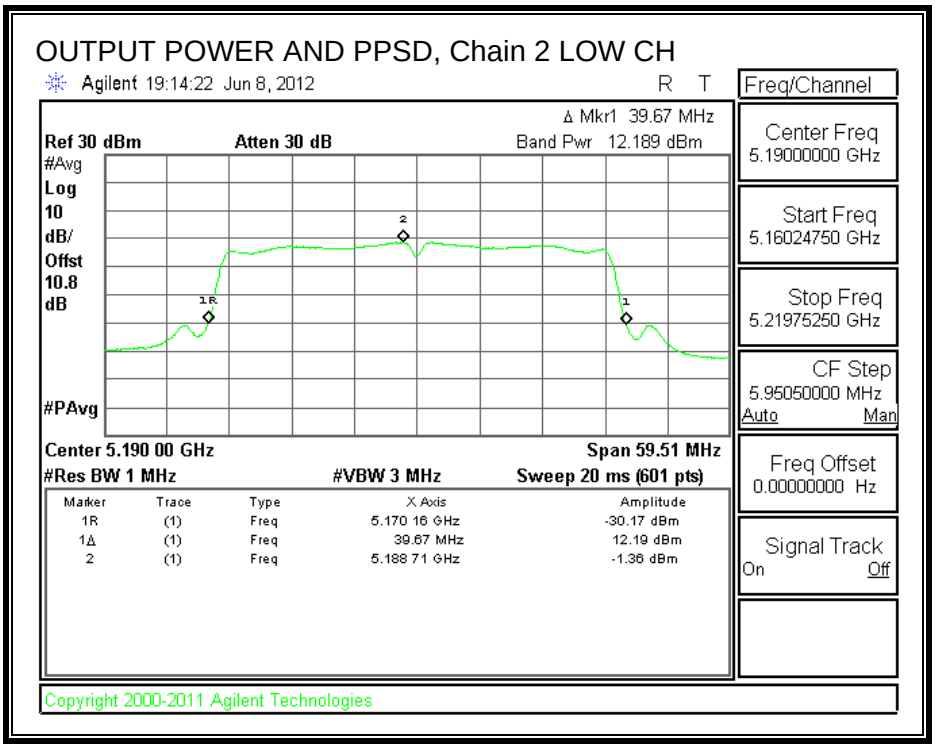
| Channel | Frequency (MHz) | Chain 1 Meas PPSD (dBm) | Chain 2 Meas PPSD (dBm) | Chain 3 Meas PPSD (dBm) | Total Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low | 5190 | -1.25 | -1.35 | -1.25 | 3.49 | 4.00 | -0.51 |
| High | 5230 | -1.83 | -1.71 | -1.76 | 3.00 | 4.00 | -1.00 |

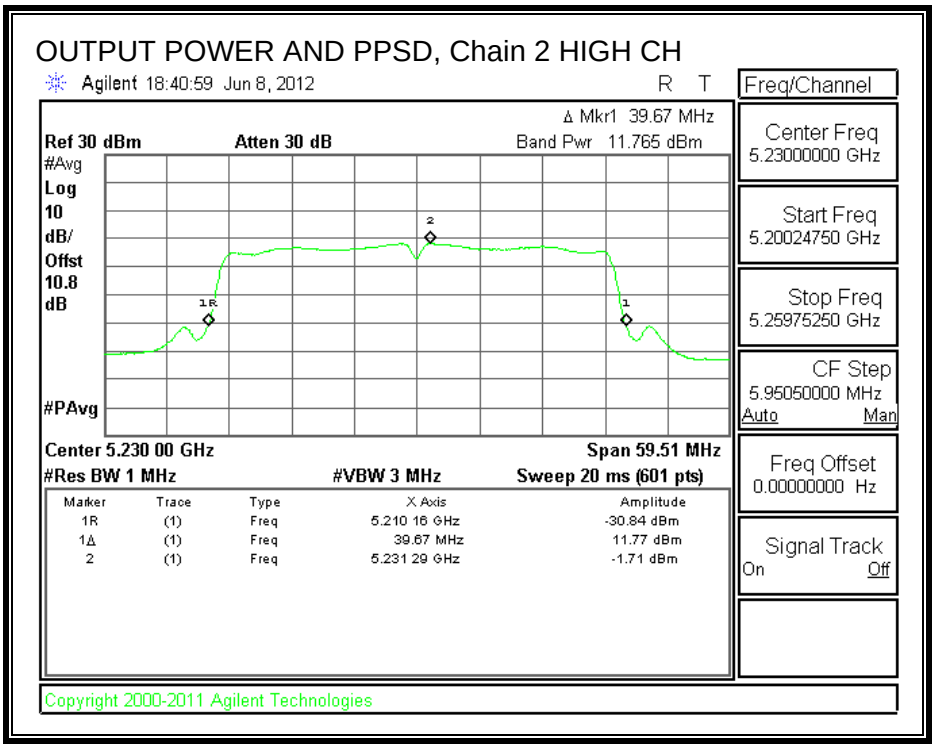
**OUTPUT POWER AND PPSD, Chain 1**



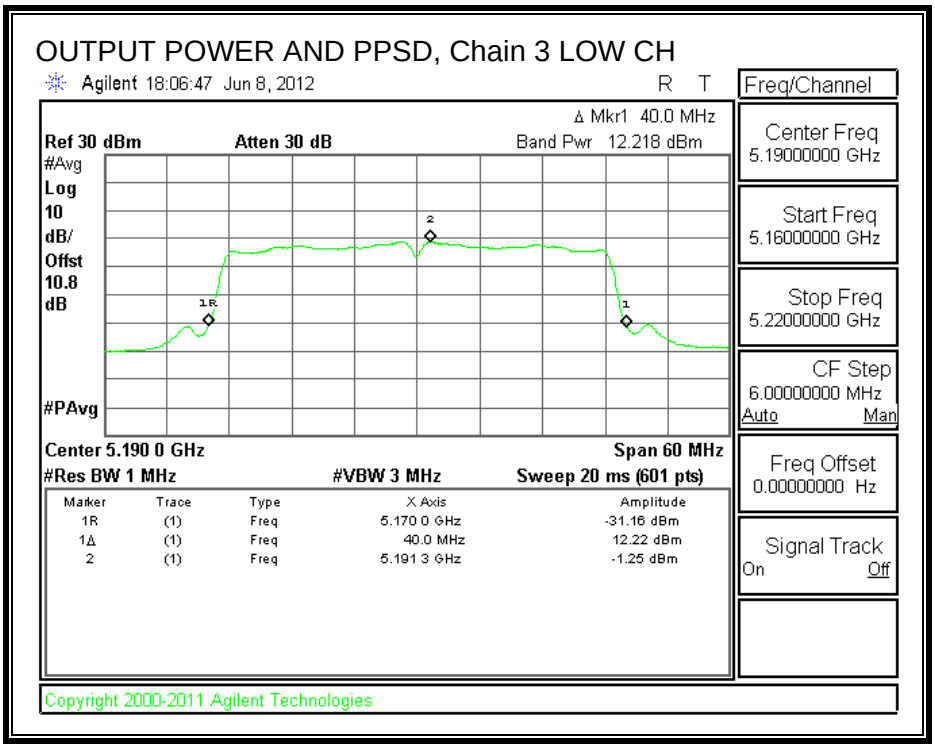



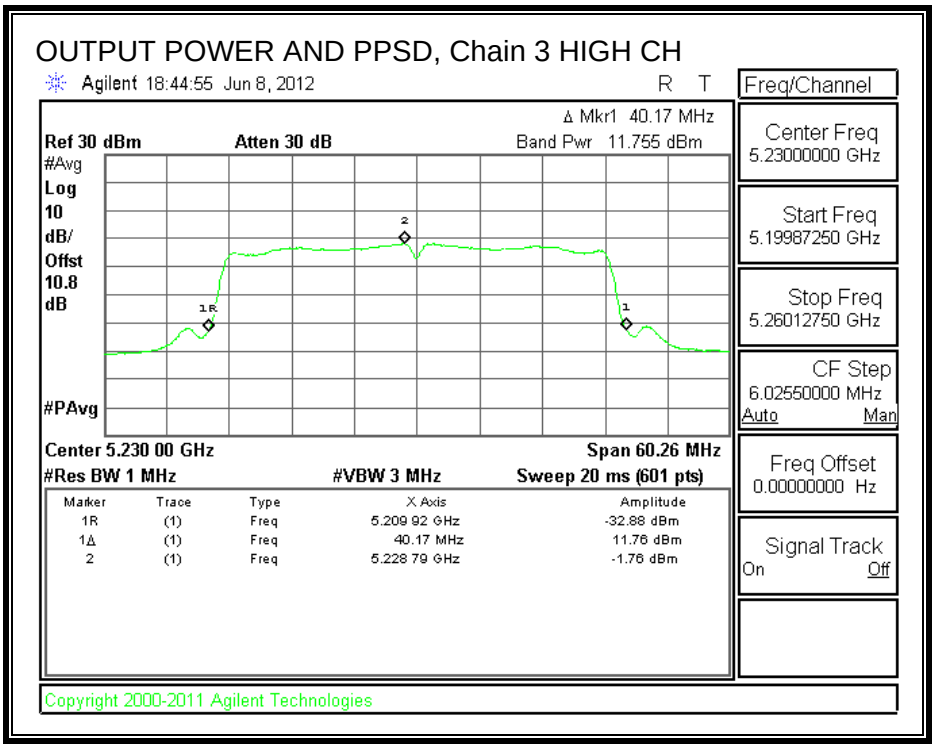
**OUTPUT POWER AND PPSD, Chain 2**



**OUTPUT POWER AND PPSD, Chain 3**



## 8.8.5. PEAK EXCURSION

**LIMITS**

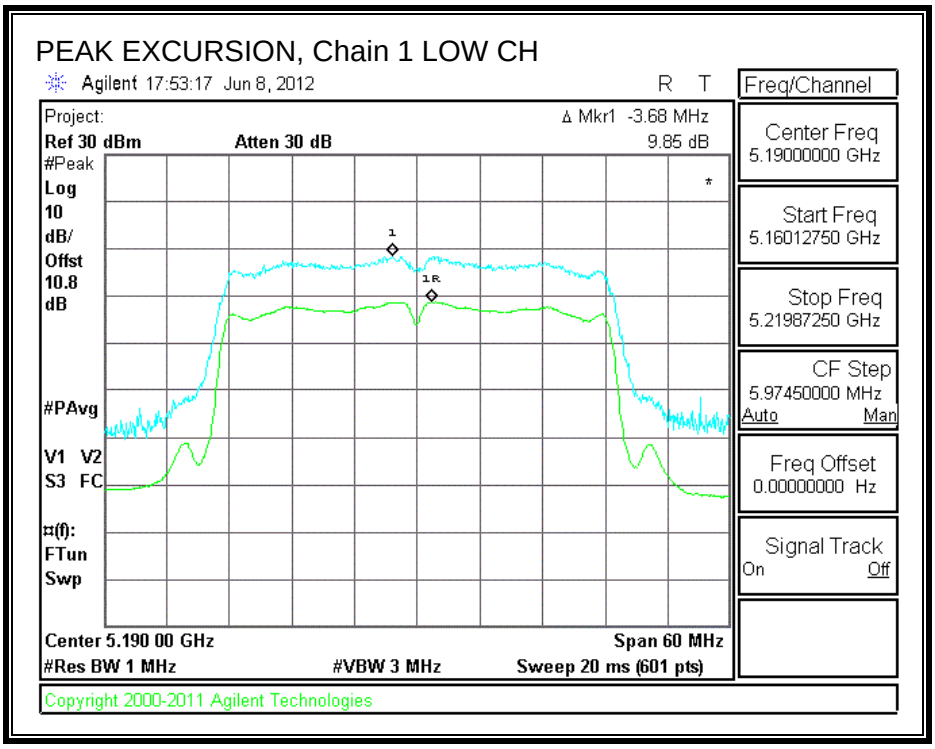
FCC §15.407 (a) (6)

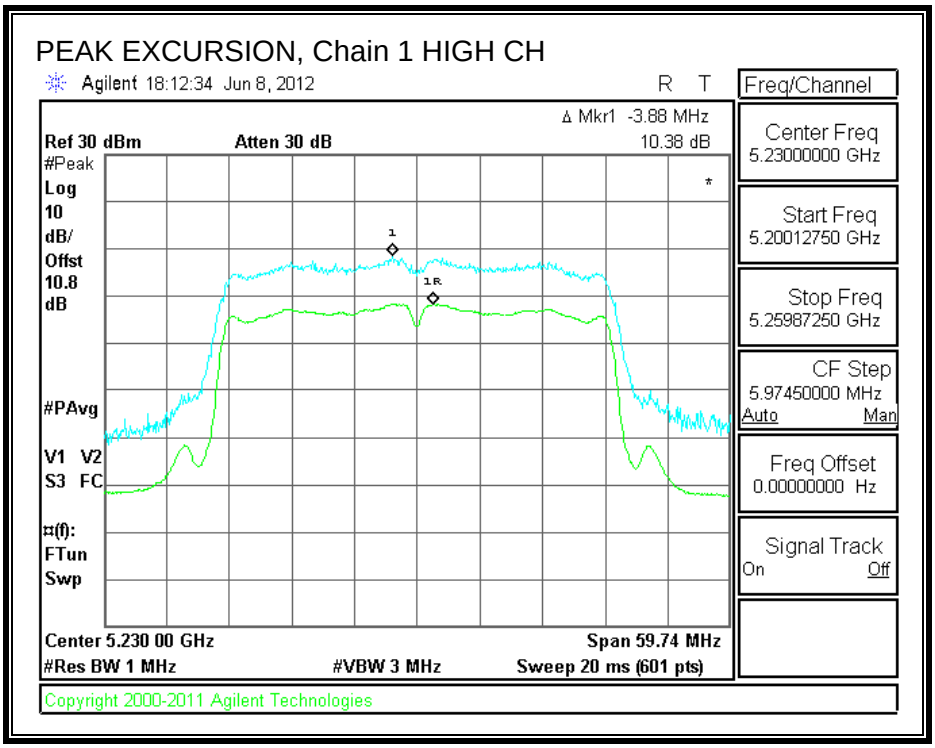
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

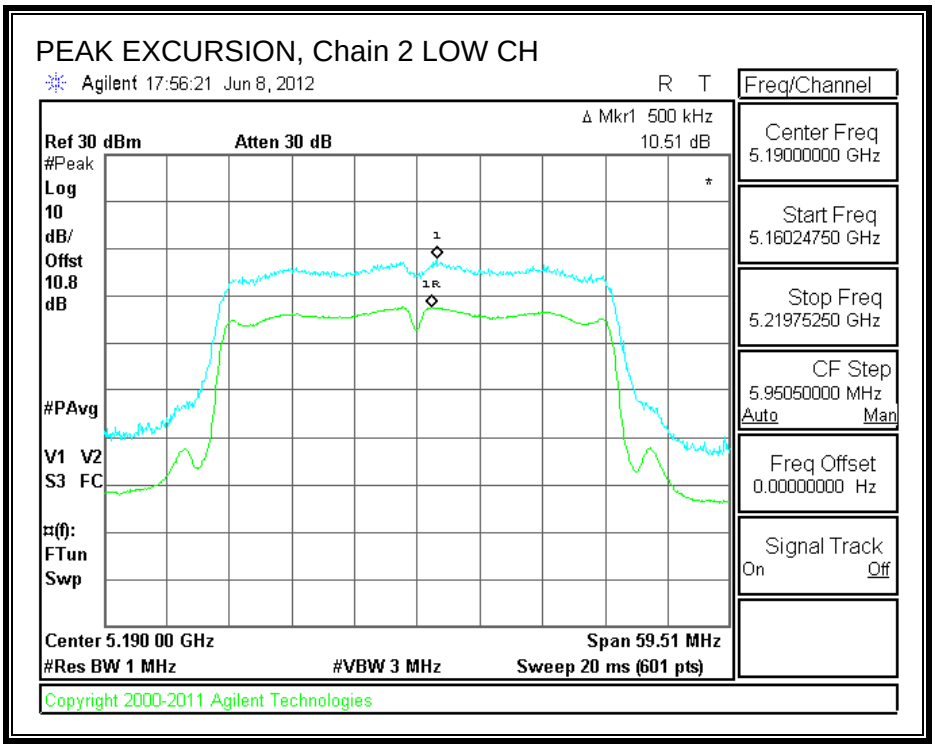
| Channel | Frequency (MHz) | Pk Exc Chain 1 (dB) | Pk Exc Chain 2 (dB) | Pk Exc Chain 3 (dB) | Limit (dB) | Worst-Case Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | 9.85 | 10.51 | 10.16 | 13 | -2.5 |
| High | 5230 | 10.38 | 9.65 | 9.49 | 13 | -2.6 |

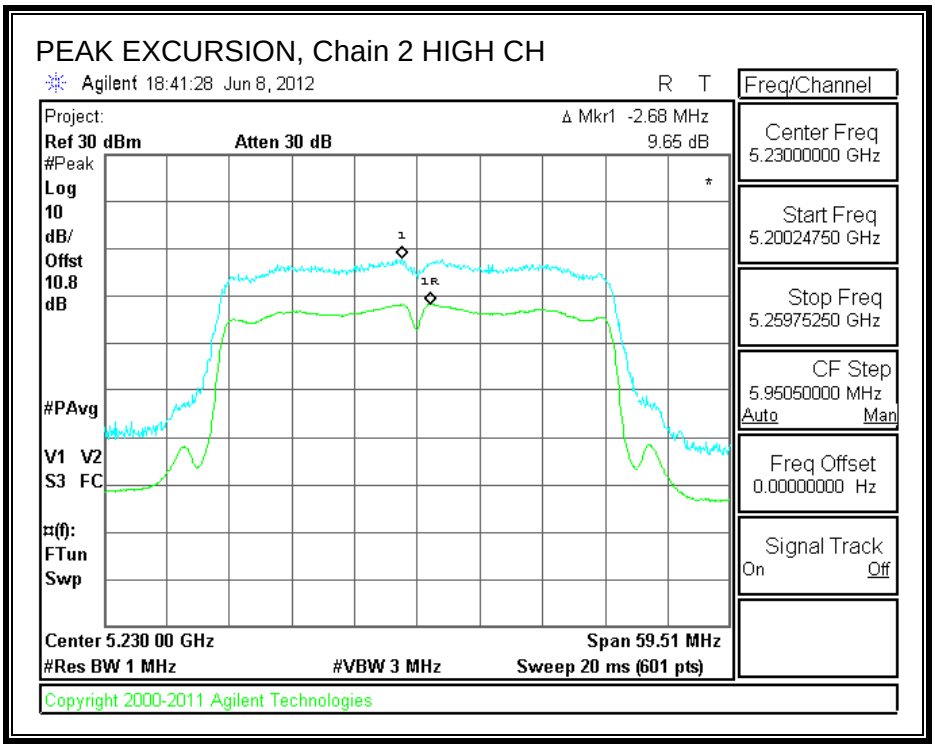
**PEAK EXCURSION, Chain 1**



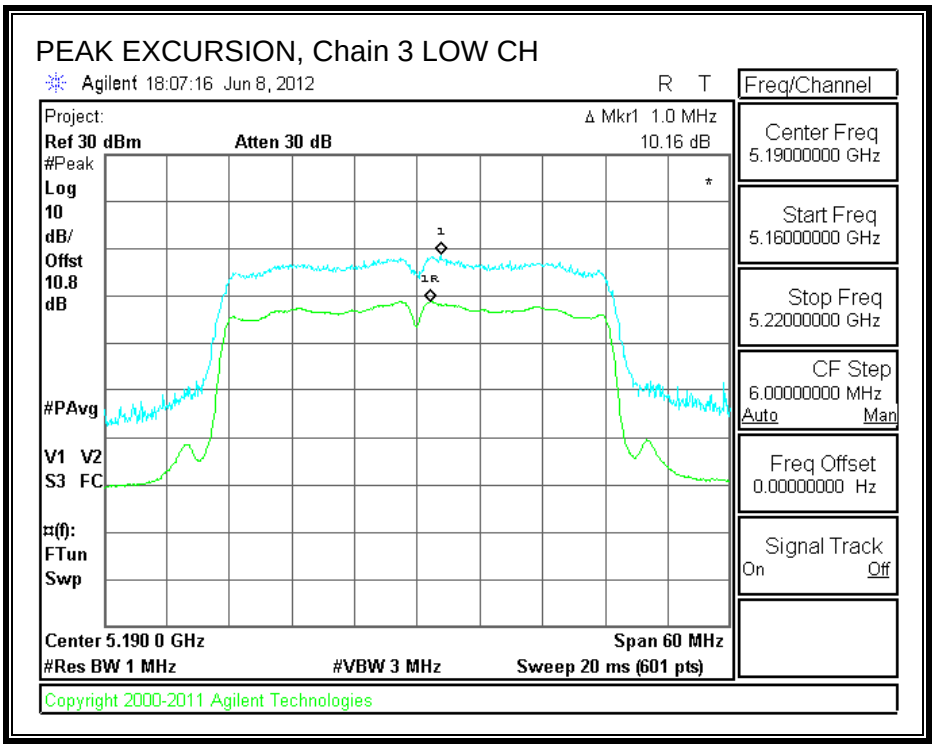



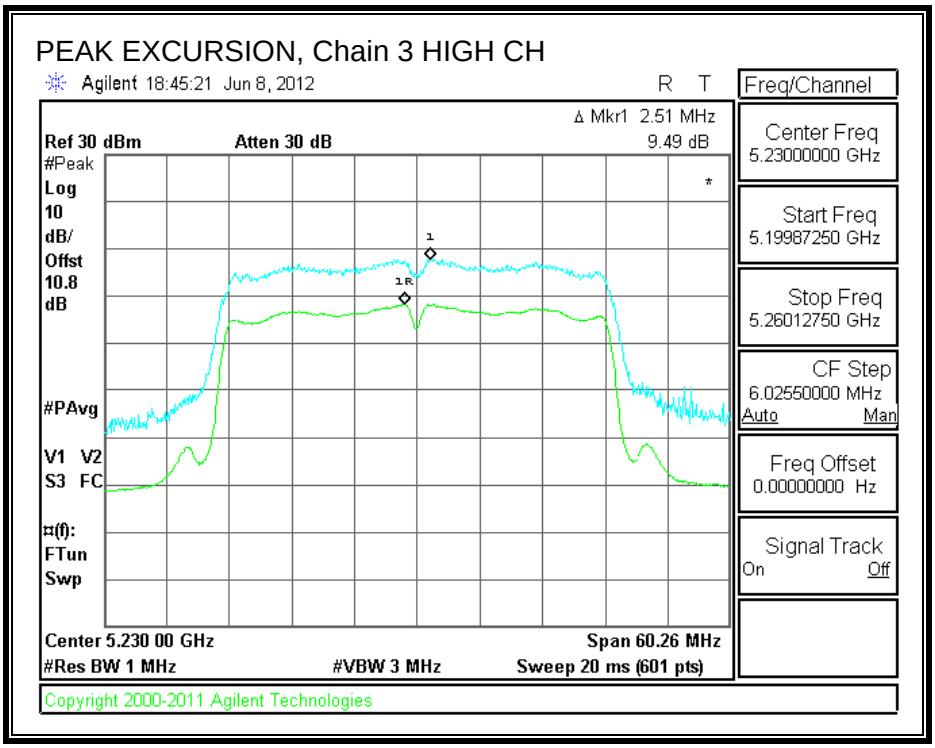
**PEAK EXCURSION, Chain 2**



**PEAK EXCURSION, Chain 3**



## 8.9. 802.11a, Legacy, 1TX, 5.3 GHz BAND

### 8.9.1. 26dB BANDWIDTH

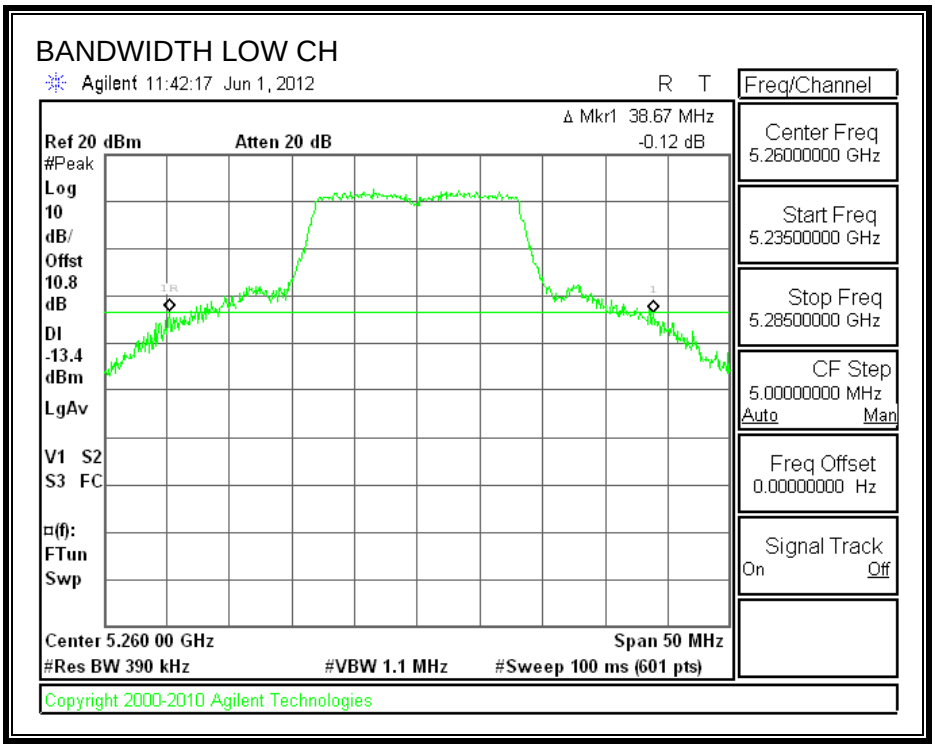
**LIMITS**

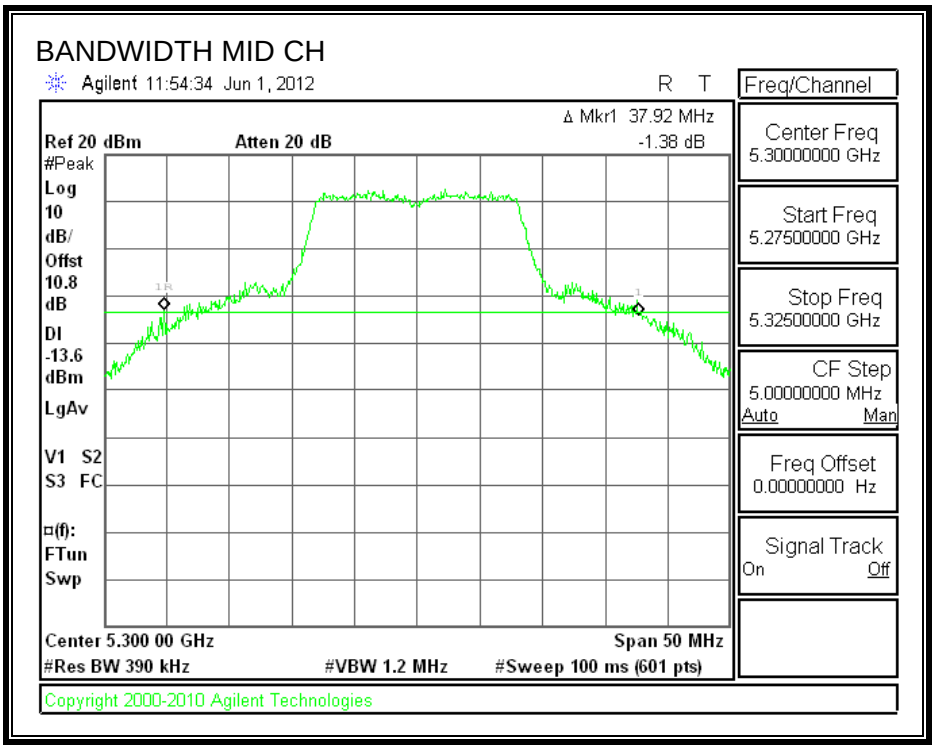
None; for reporting purposes only.

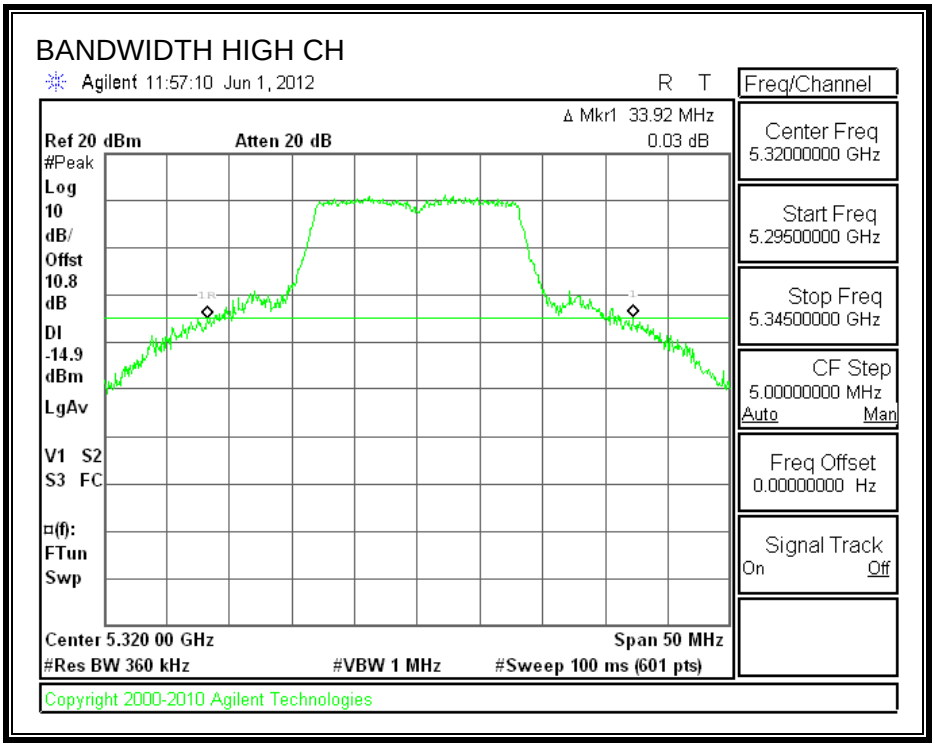
**RESULTS**

| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| Low | 5260 | 38.67 |
| Mid | 5300 | 37.92 |
| High | 5320 | 33.92 |

**26dB BANDWIDTH**





### 8.9.2. 99% dB BANDWIDTH

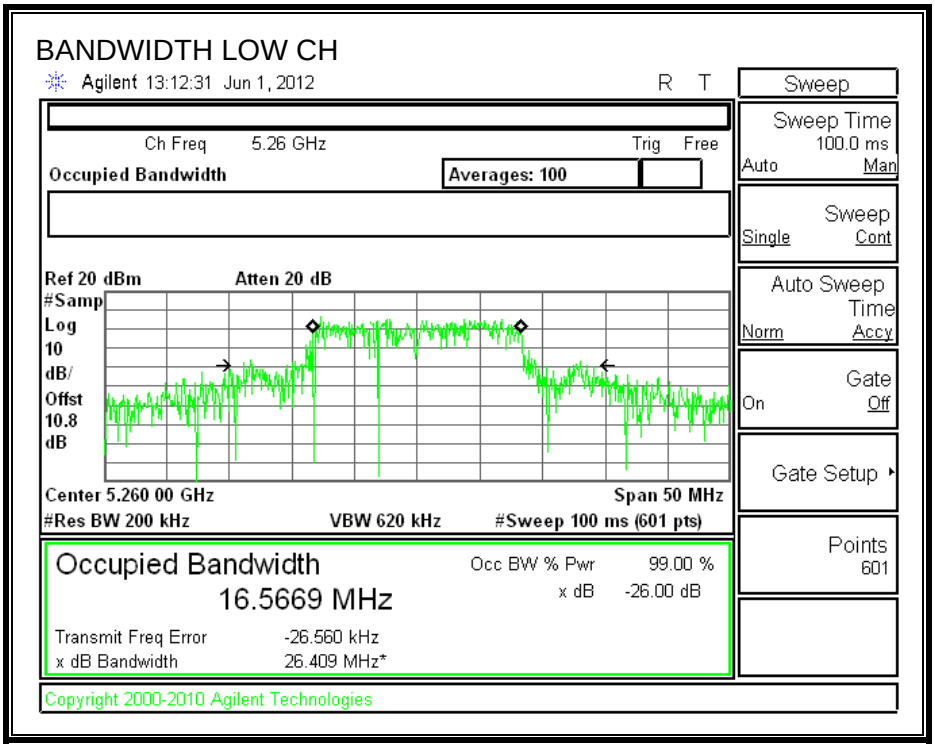
**LIMITS**

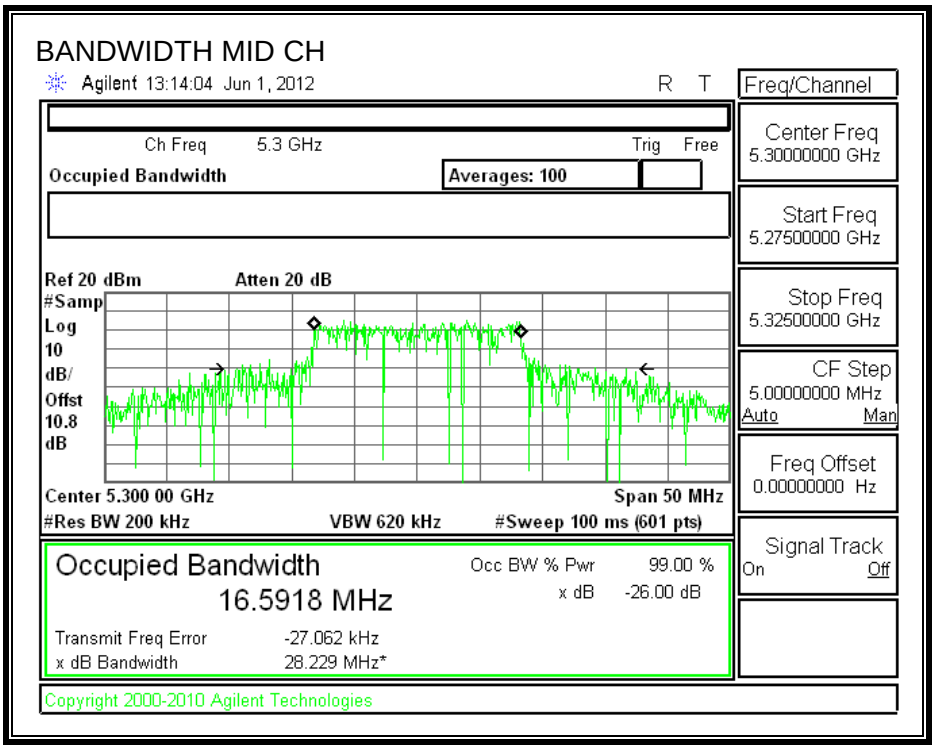
None; for reporting purposes only.

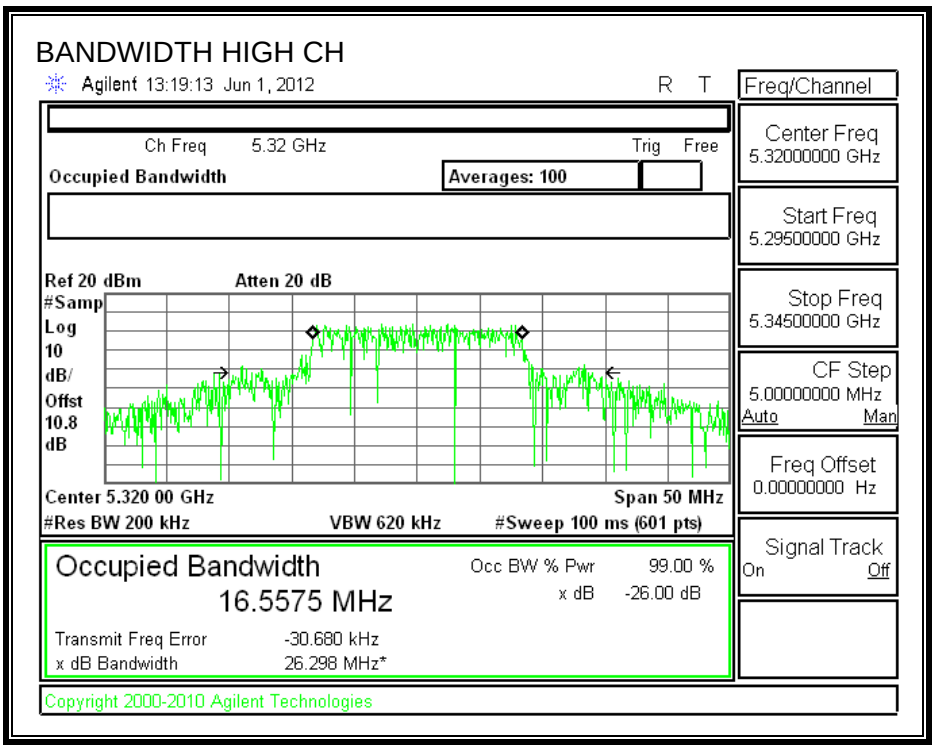
**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 5260 | 16.5669 |
| Mid | 5300 | 16.5918 |
| High | 5320 | 16.5575 |

**99% BANDWIDTH**





### 8.9.3. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

| Channel | Frequency (MHz) | Power (dBm) |
|---|---|---|
| Low | 5260 | 19.0 |
| Mid | 5300 | 19.2 |
| High | 5320 | 18.1 |

## 8.9.4. OUTPUT POWER AND PPSD

**LIMITS**

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

**Limits**

| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 11 + 10 Log B Limit (dBm) | Directional Gain (dBi) | Power Limit (dBm) | PPSD Limit (dBm) |
|---|---|---|---|---|---|---|---|
| Low | 5260 | 24 | 38.67 | 26.87 | 5.61 | 24.00 | 11.00 |
| Mid | 5300 | 24 | 37.92 | 26.79 | 5.61 | 24.00 | 11.00 |
| High | 5320 | 24 | 33.92 | 26.30 | 5.61 | 24.00 | 11.00 |

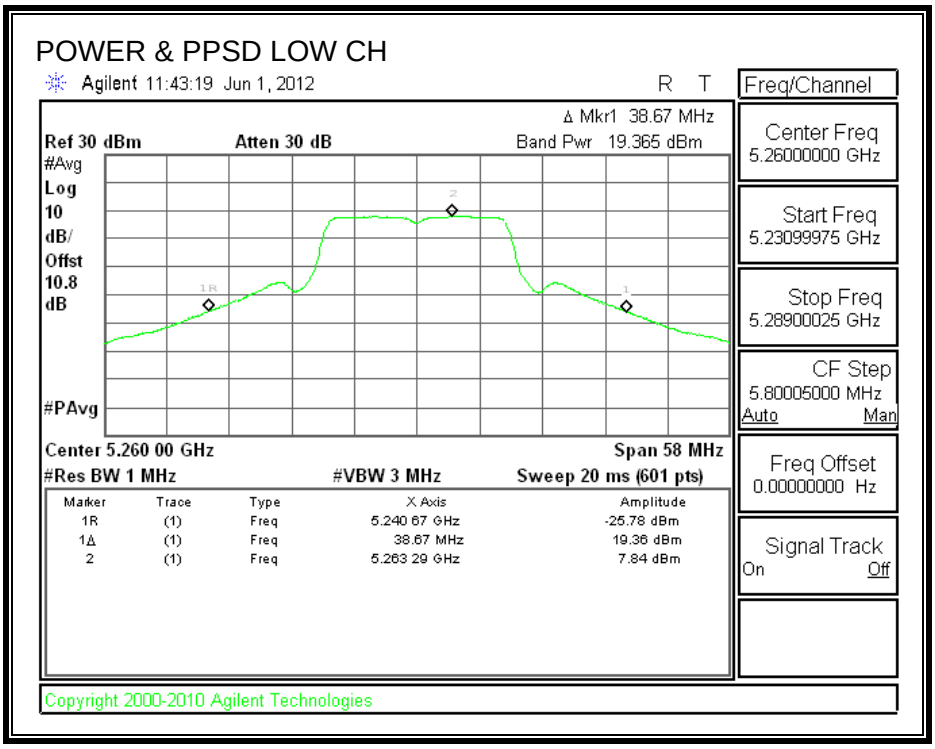
**Output Power Results**

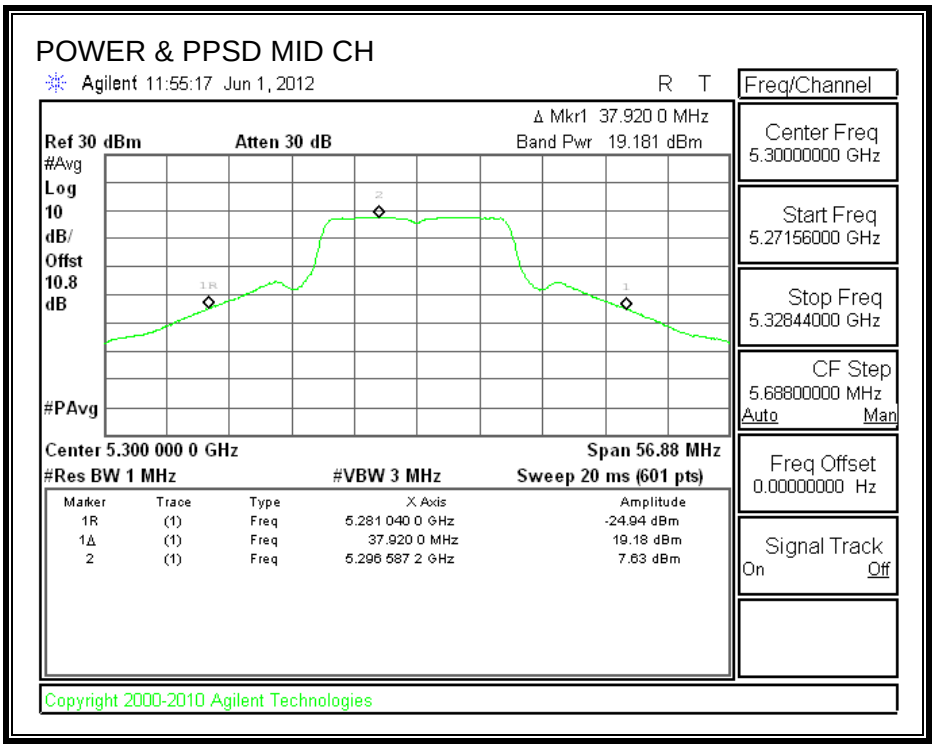
| Channel | Frequency (MHz) | Meas Power (dBm) | Corr'd Power (dBm) | Power Limit (dBm) | Power Margin (dB) |
|---|---|---|---|---|---|
| Low | 5260 | 19.365 | 19.365 | 24.00 | -4.64 |
| Mid | 5300 | 19.181 | 19.181 | 24.00 | -4.82 |
| High | 5320 | 18.260 | 18.260 | 24.00 | -5.74 |

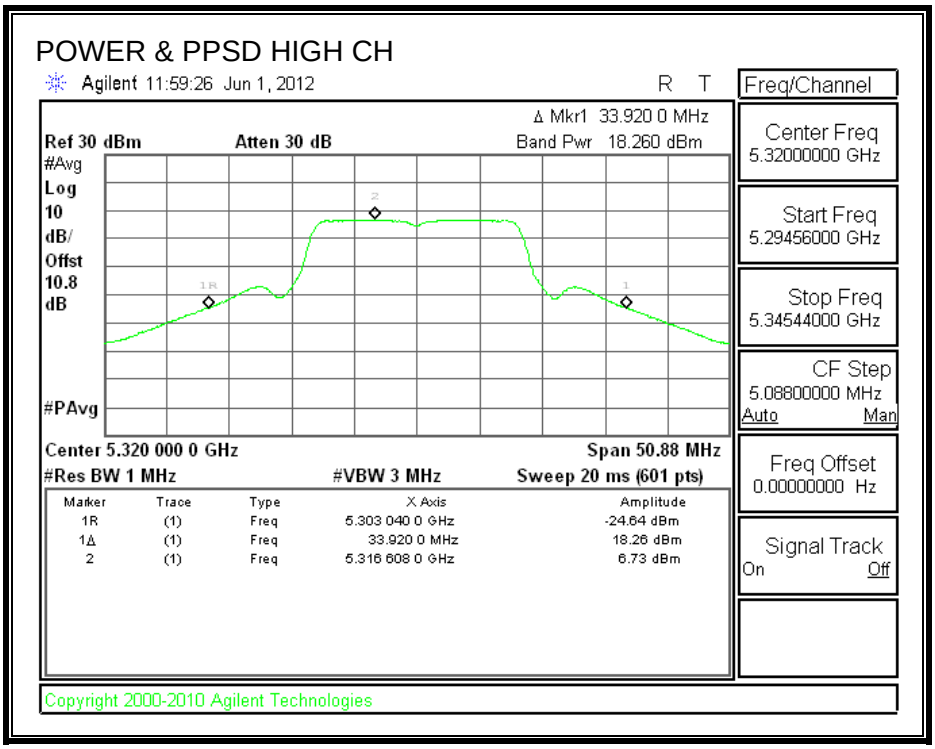
**PPSD Results**

| Channel | Frequency (MHz) | Meas PPSD (dBm) | Corr'd PPSD (dBm) | PPSD Limit (dBm) | PPSD Margin (dB) |
|---|---|---|---|---|---|
| Low | 5260 | 7.84 | 7.84 | 11.00 | -3.16 |
| Mid | 5300 | 7.63 | 7.63 | 11.00 | -3.37 |
| High | 5320 | 6.73 | 6.73 | 11.00 | -4.27 |

**OUTPUT POWER AND PPSD**





## 8.9.5. PEAK EXCURSION

**LIMITS**

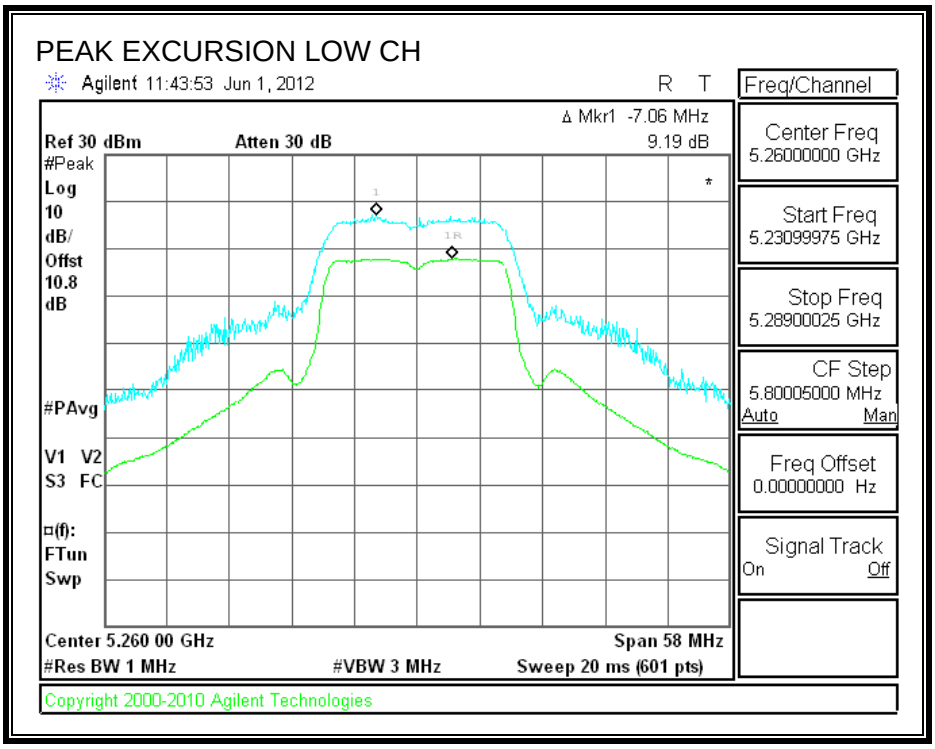
FCC §15.407 (a) (6)

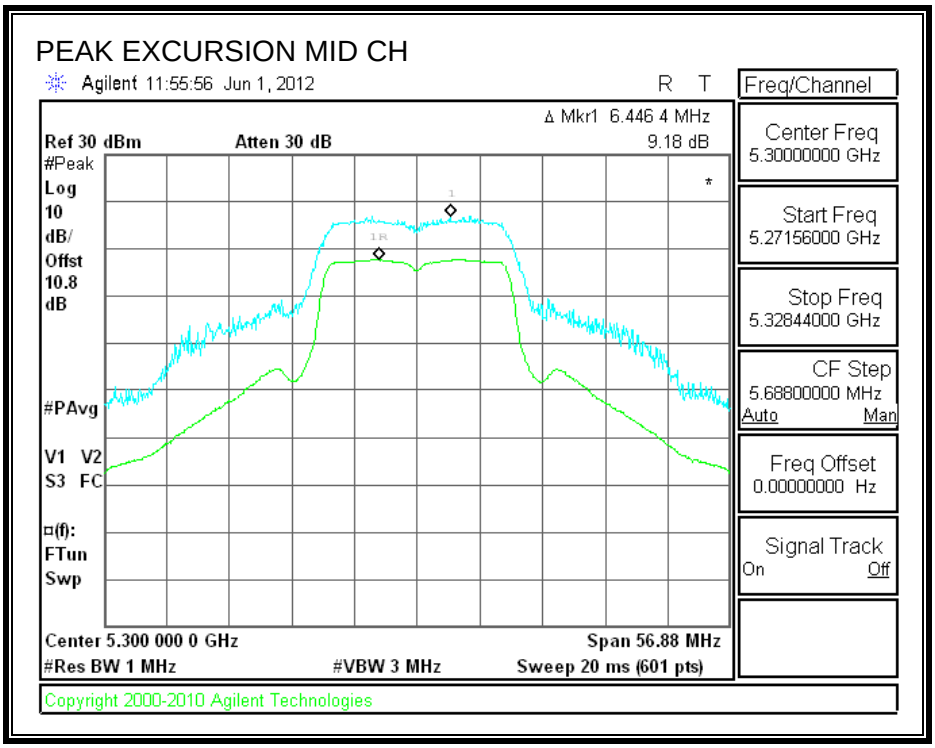
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**RESULTS**

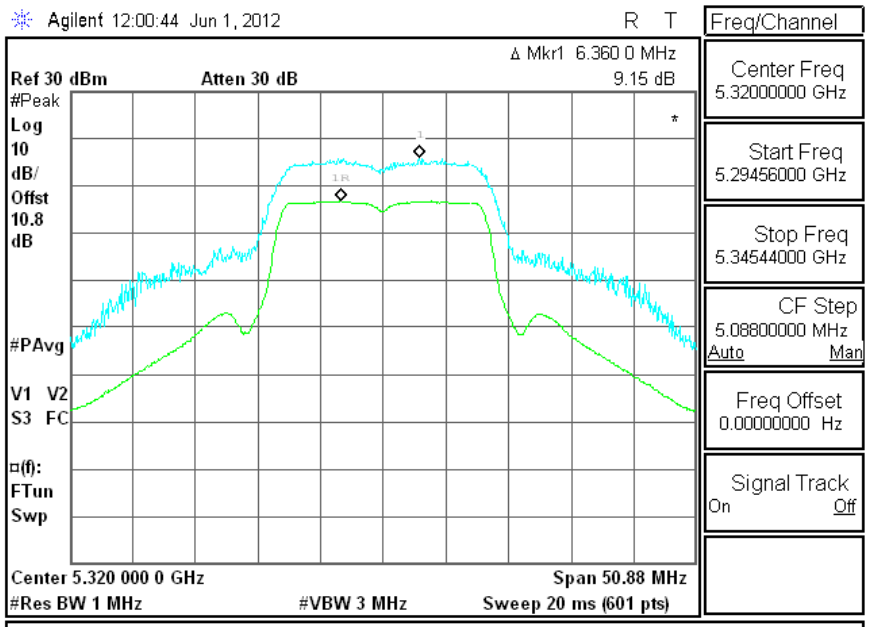
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5260 | 9.19 | 13 | -3.8 |
| Mid | 5300 | 9.18 | 13 | -3.8 |
| High | 5320 | 9.15 | 13 | -3.9 |

**PEAK EXCURSION**



PEAK EXCURSION HIGH CH



## 8.10. 802.11n HT20, CDD MCS0, 3TX, 5.3 GHz BAND

### 8.10.1. 26 dB BANDWIDTH

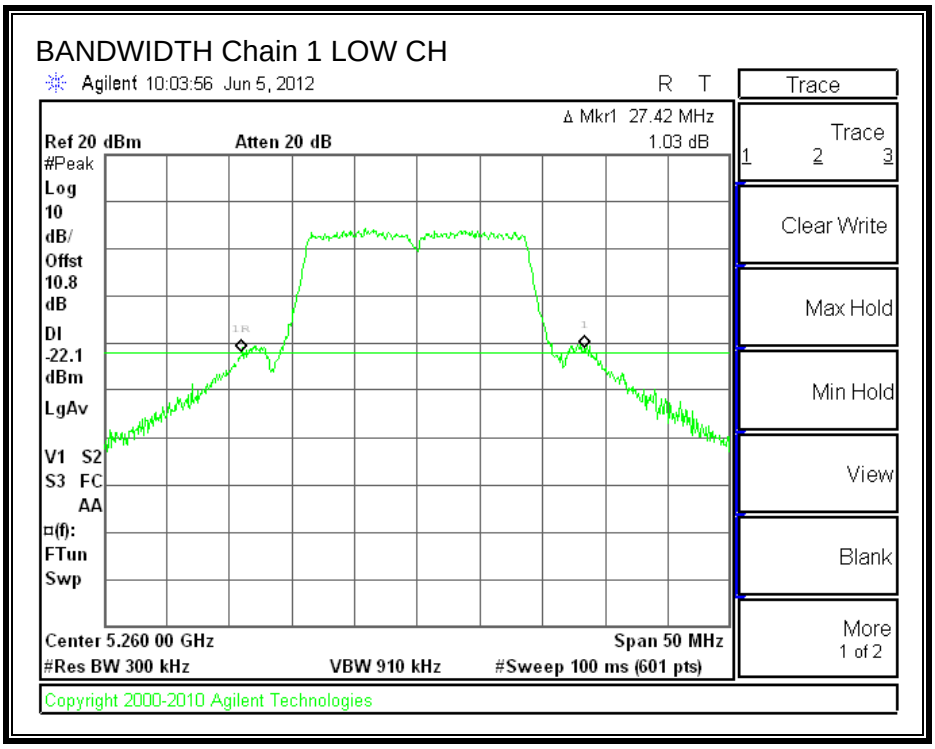
**LIMITS**

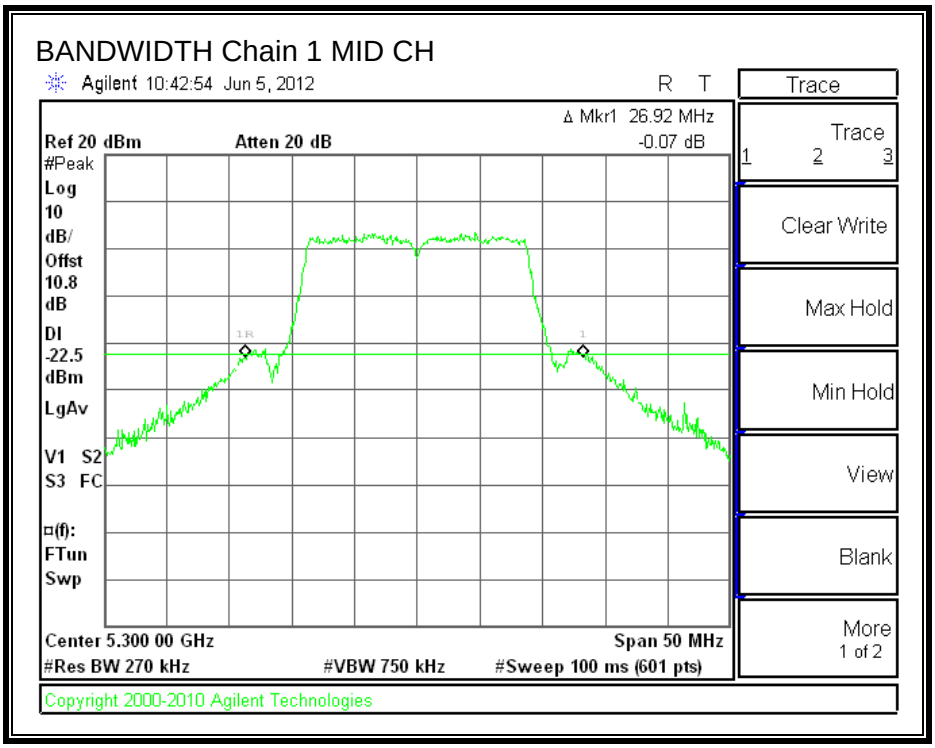
None; for reporting purposes only.

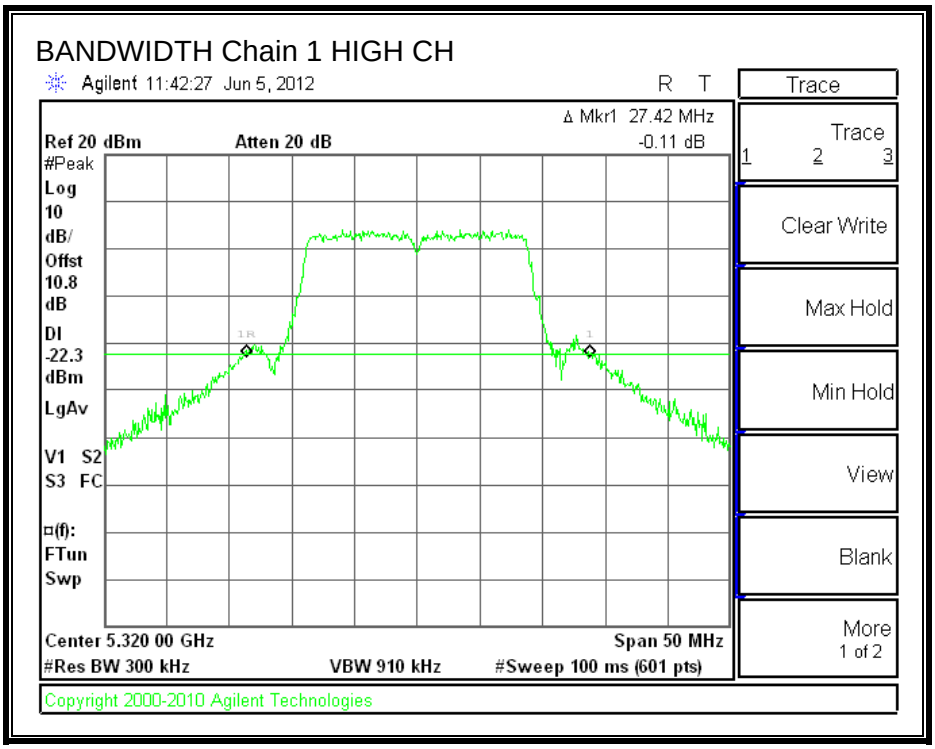
**RESULTS**

| Channel | Frequency (MHz) | 26 dB BW Chain 1 (MHz) | 26 dB BW Chain 2 (MHz) | 26 dB BW Chain 3 (MHz) |
|---|---|---|---|---|
| Low | 5260 | 27.42 | 25.67 | 26.50 |
| Mid | 5300 | 26.92 | 26.33 | 27.08 |
| High | 5320 | 27.42 | 26.08 | 27.83 |

**26 dB BANDWIDTH, Chain 1**





**26 dB BANDWIDTH, Chain 2**