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INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

3x3 MIMO BASE STATION

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## 1. ATTESTATION OF TEST RESULTS

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

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

**MODEL:** A1521

**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.

Approved & Released For UL CCS By:



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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:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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 (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (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

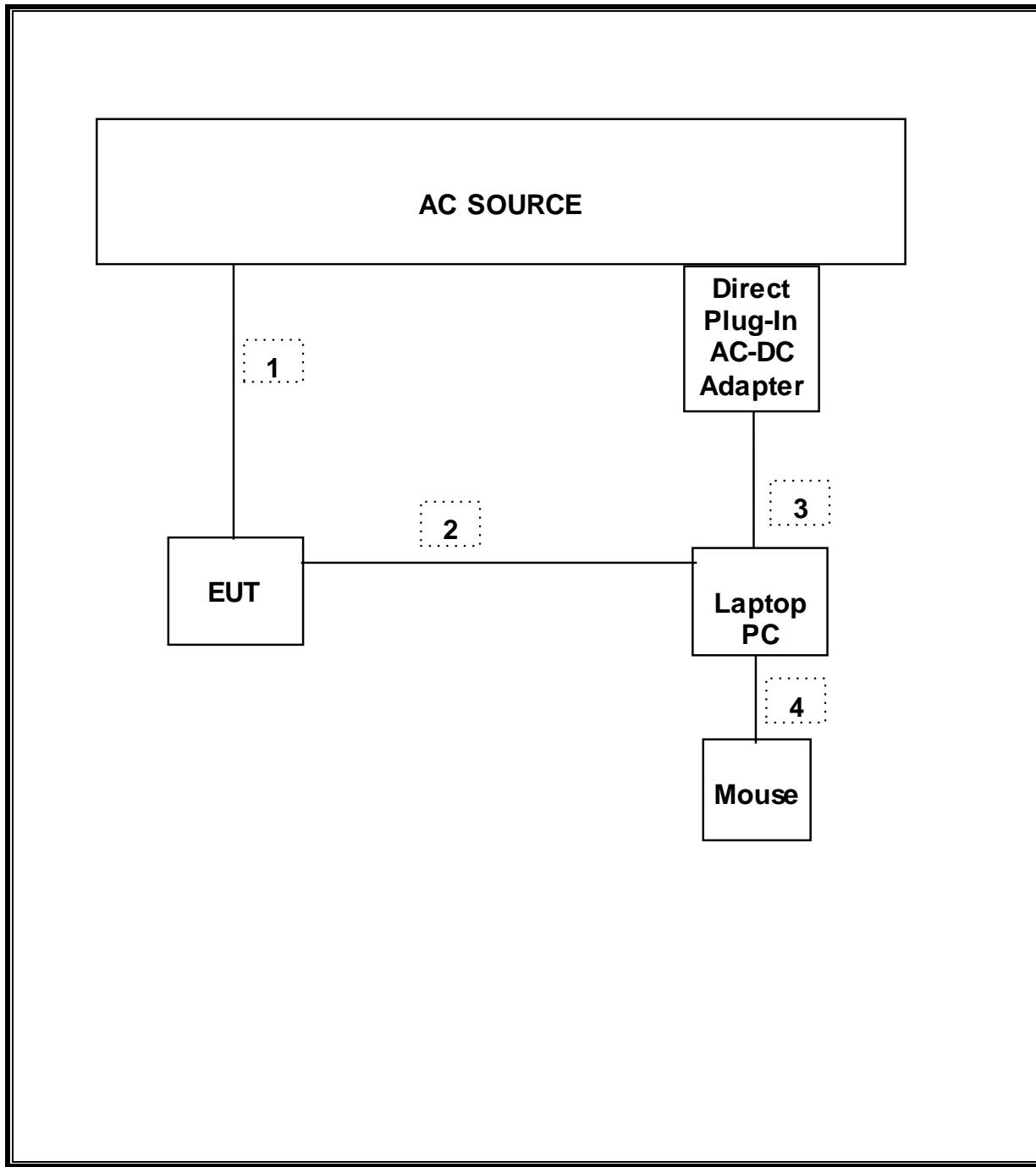
### I/O CABLES

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 B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (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.

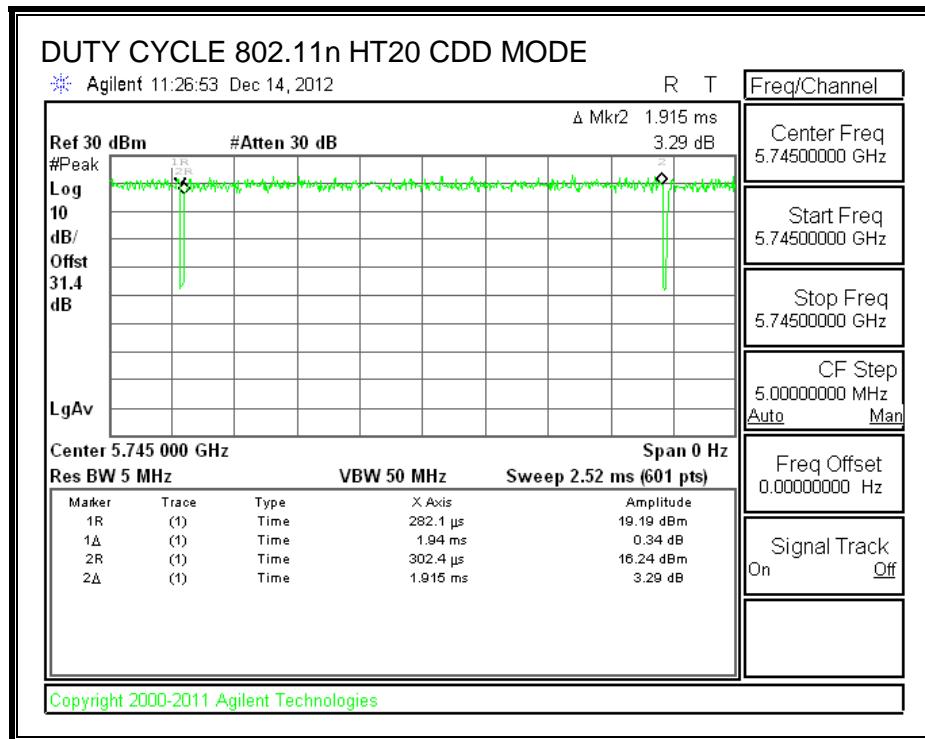
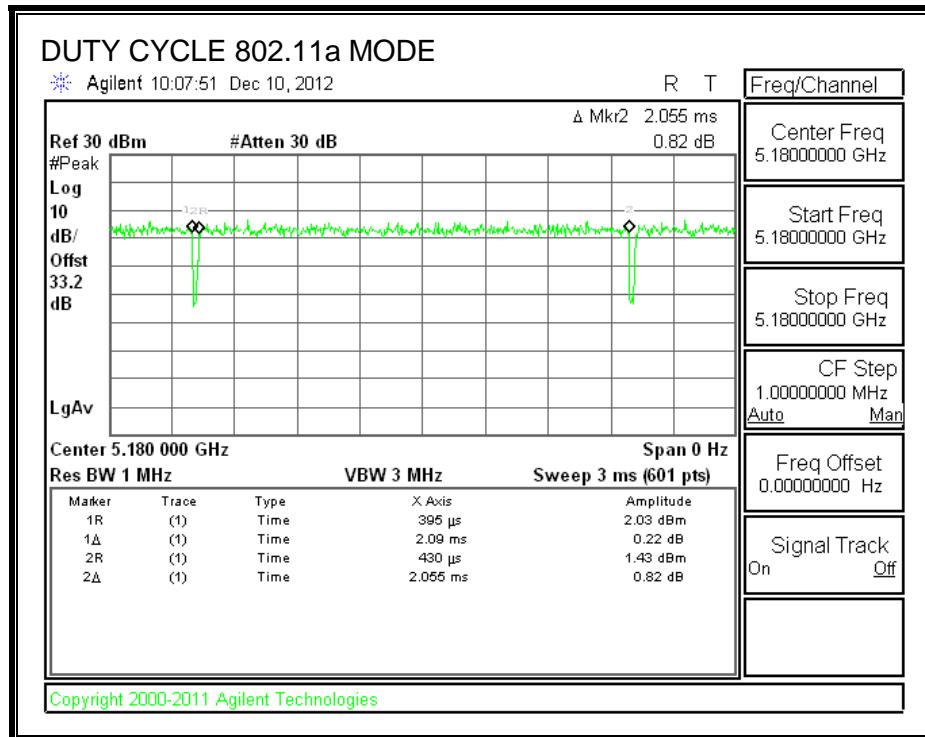
For PSD measurement, KDB 789033 Method SA-1 was used when Duty Cycle is greater than or equal to 98%.

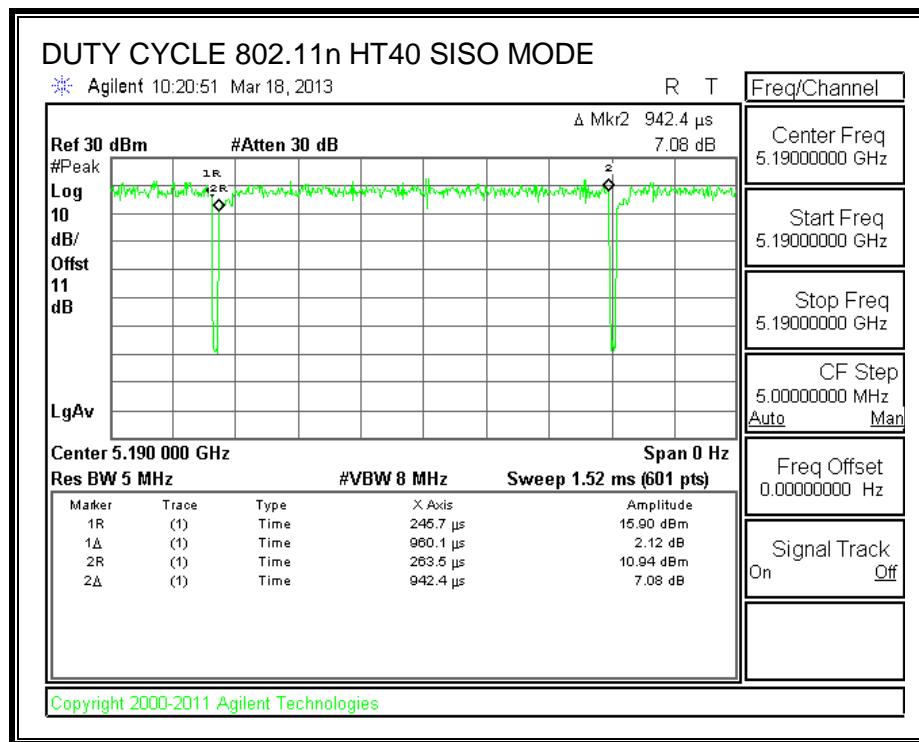
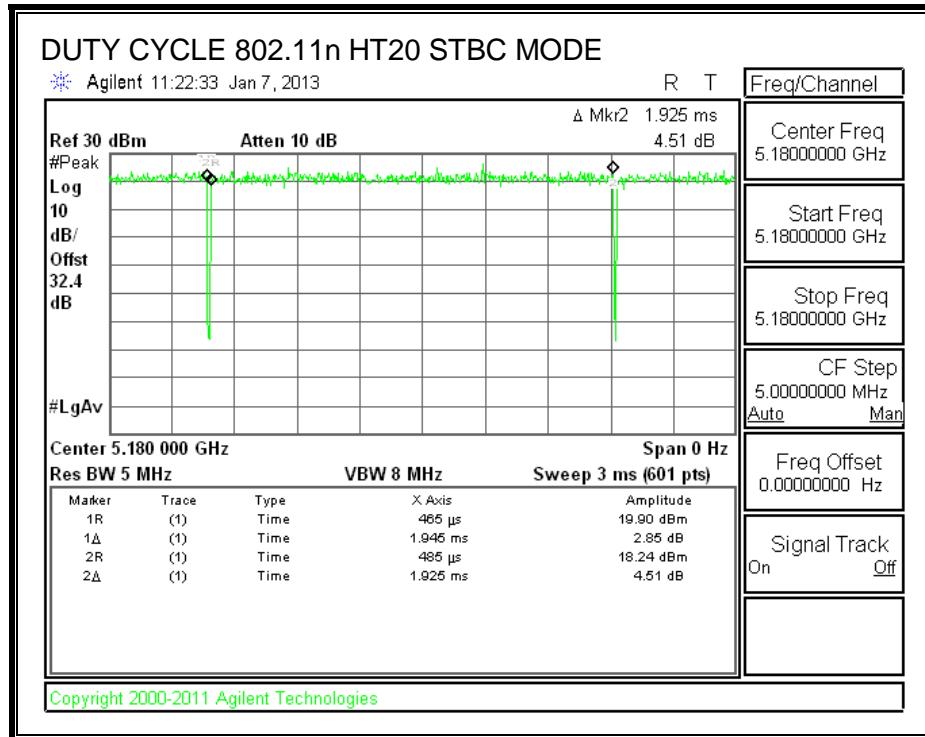
For PSD measurement, KDB 789033 Method SA-2 was used when Duty Cycle is less than 98%.

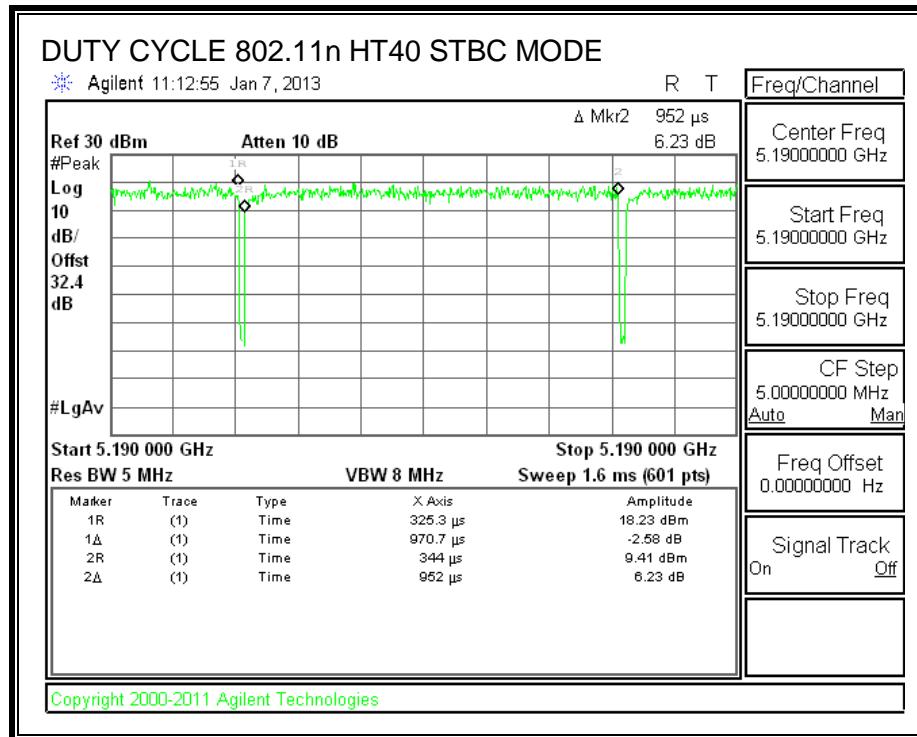
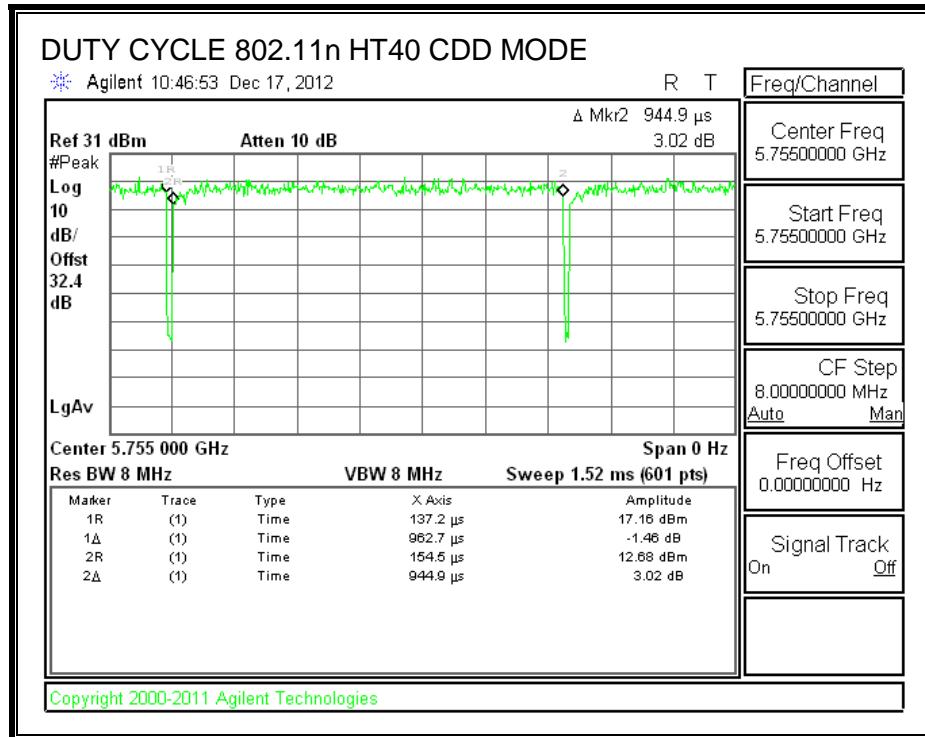
#### 7.3. MEASUREMENT METHOD FOR AVG SPURIOUS EMISSION ABOVE 1 GHz

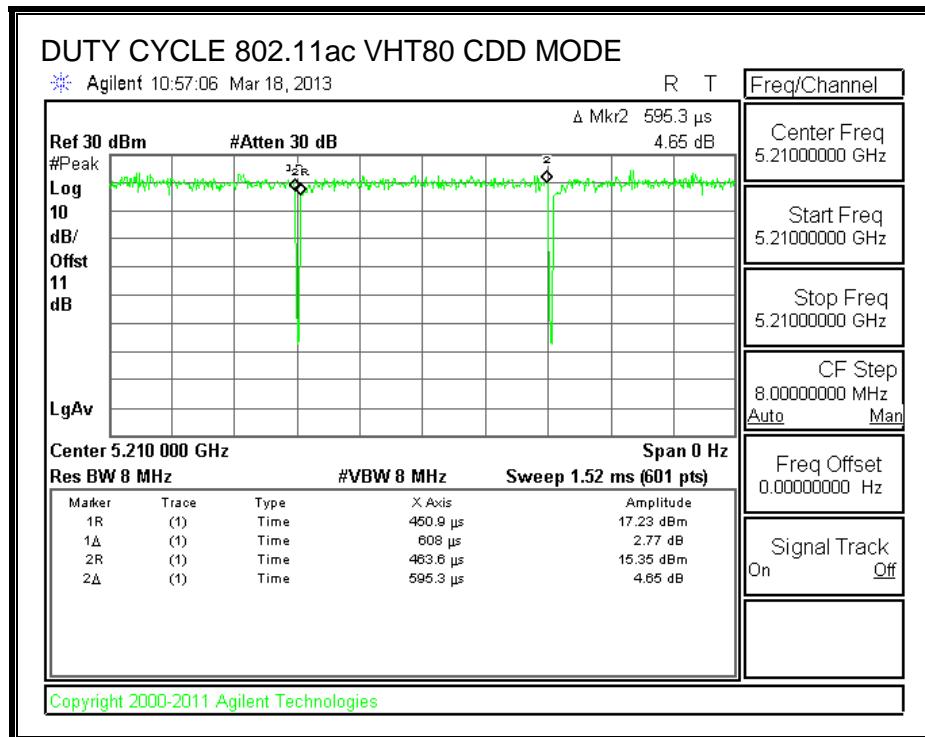
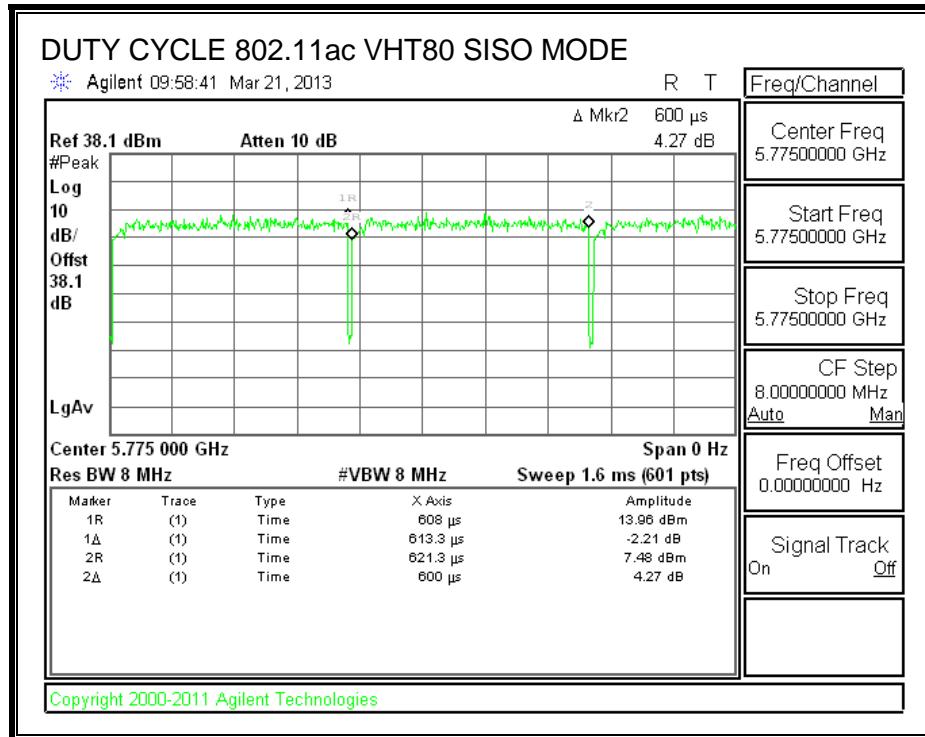
KDB 789033 Method VB with Power RMS Averaging is used.

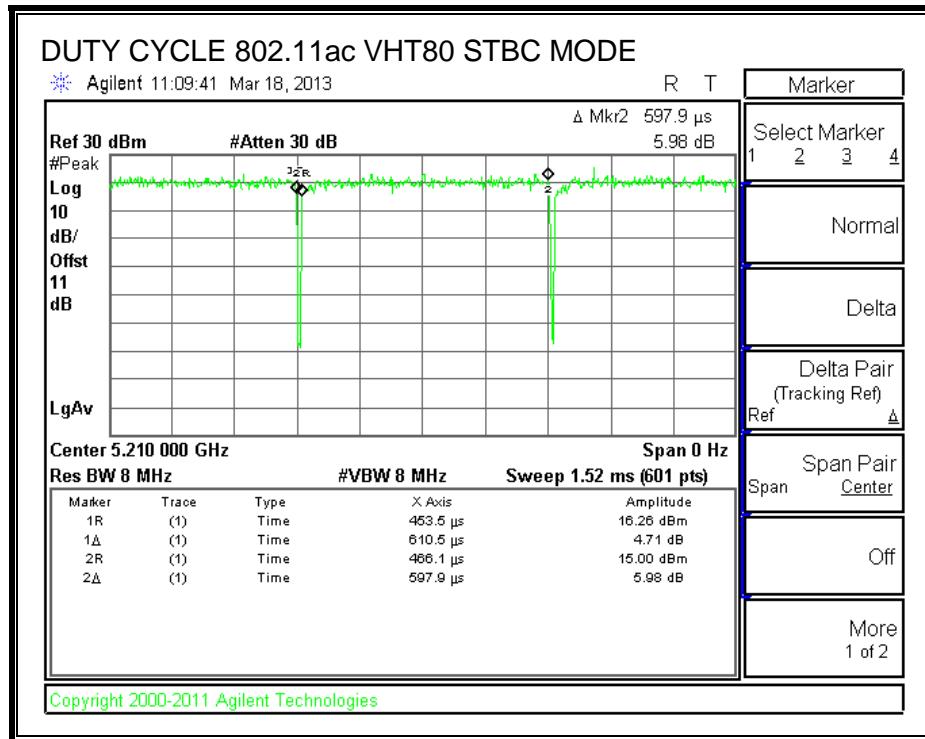
## 7.4. DUTY CYCLE PLOTS











## 8. ANTENNA PORT TEST RESULTS

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

#### 8.1.1. 26 dB BANDWIDTH

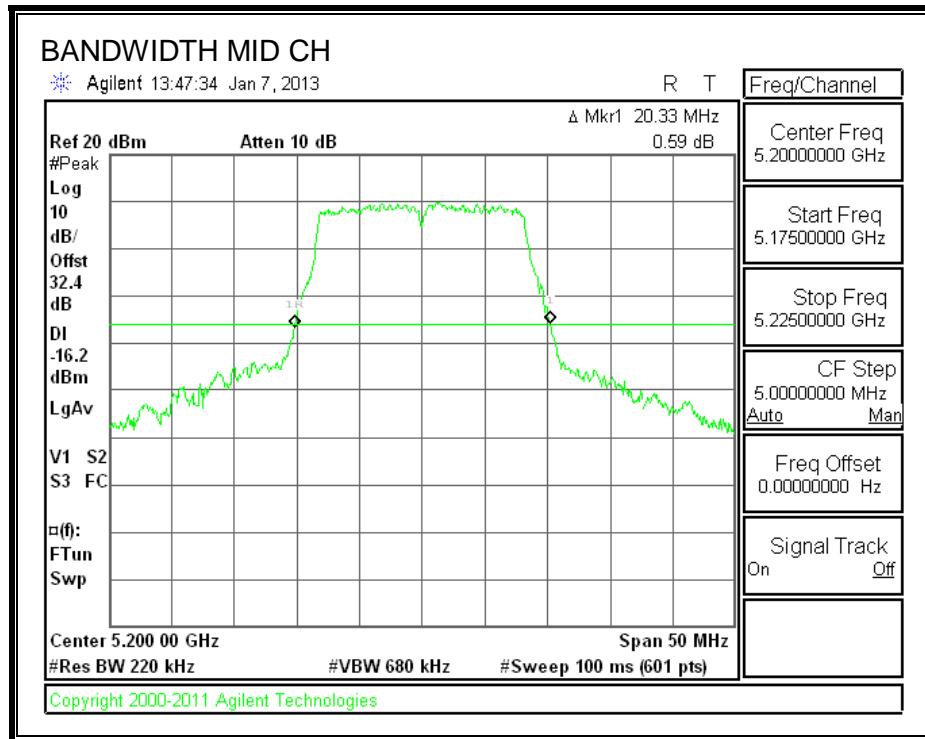
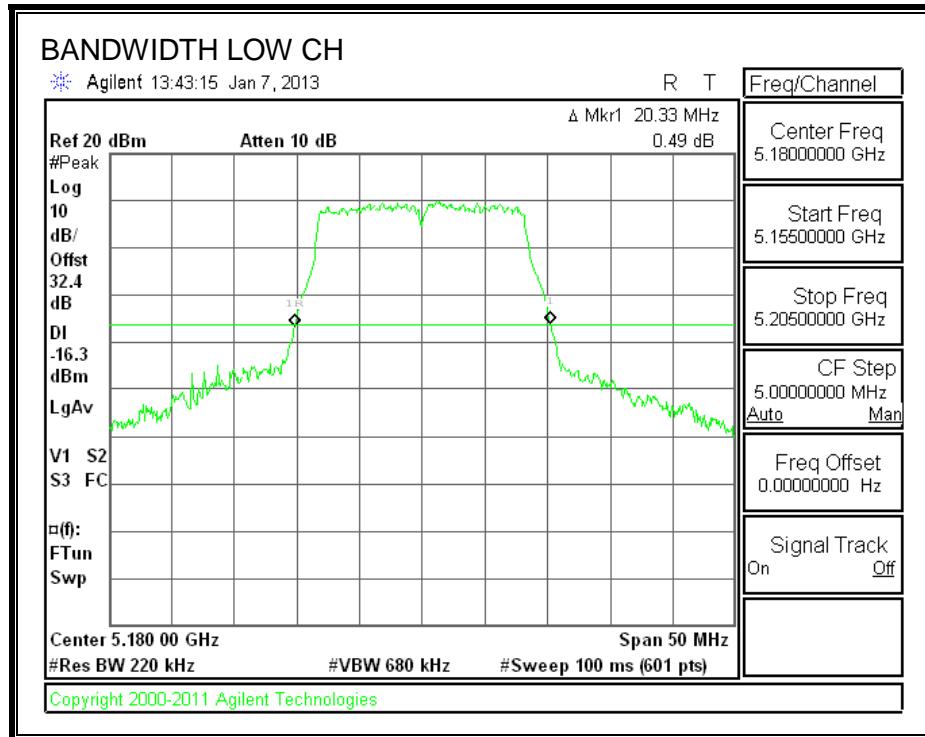
##### LIMITS

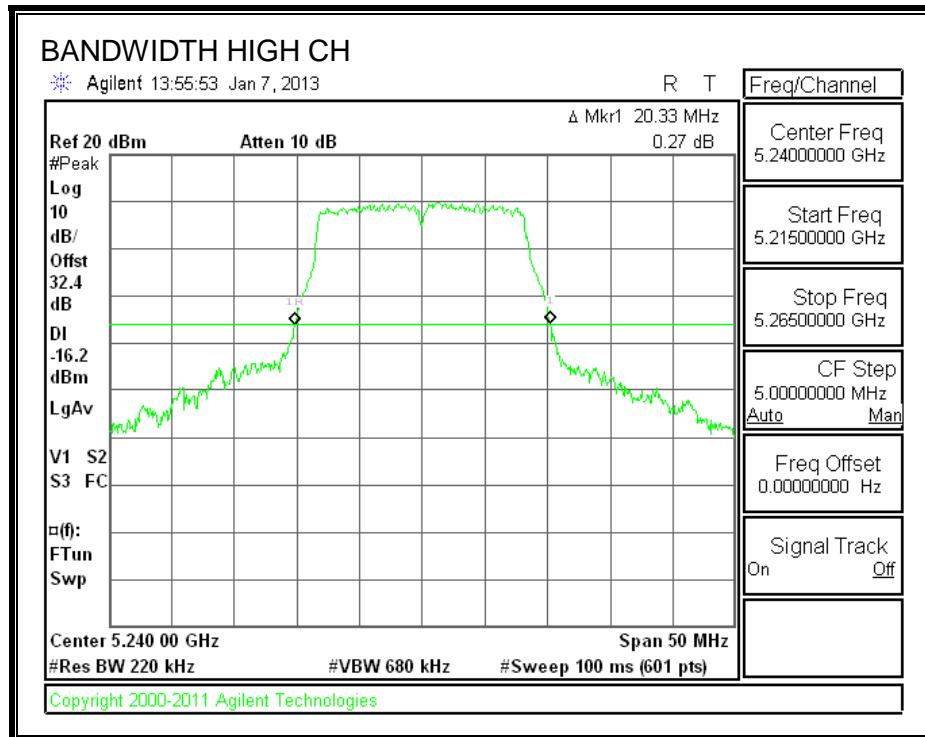
None; for reporting purposes only.

##### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.33
Mid	5200	20.33
High	5240	20.33

**26 dB BANDWIDTH**





### 8.1.2. 99% BANDWIDTH

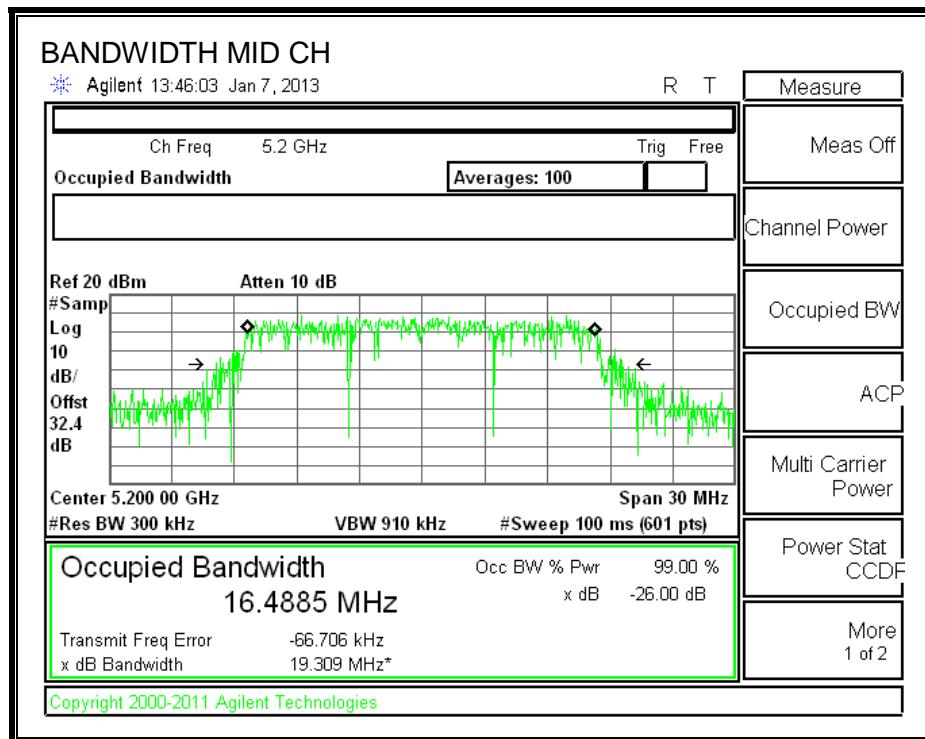
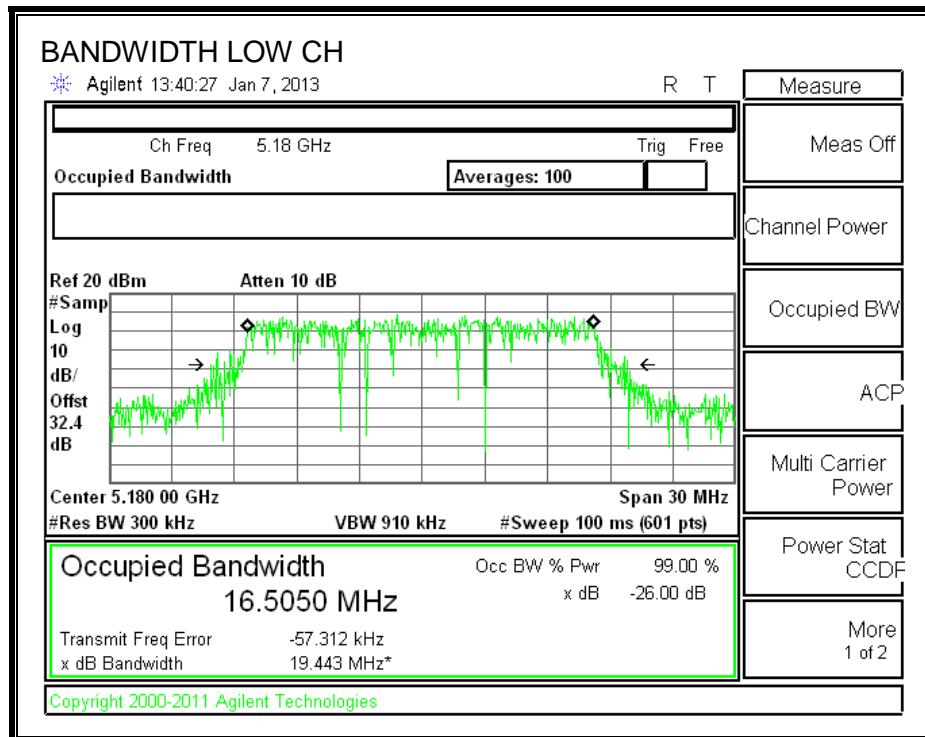
#### LIMITS

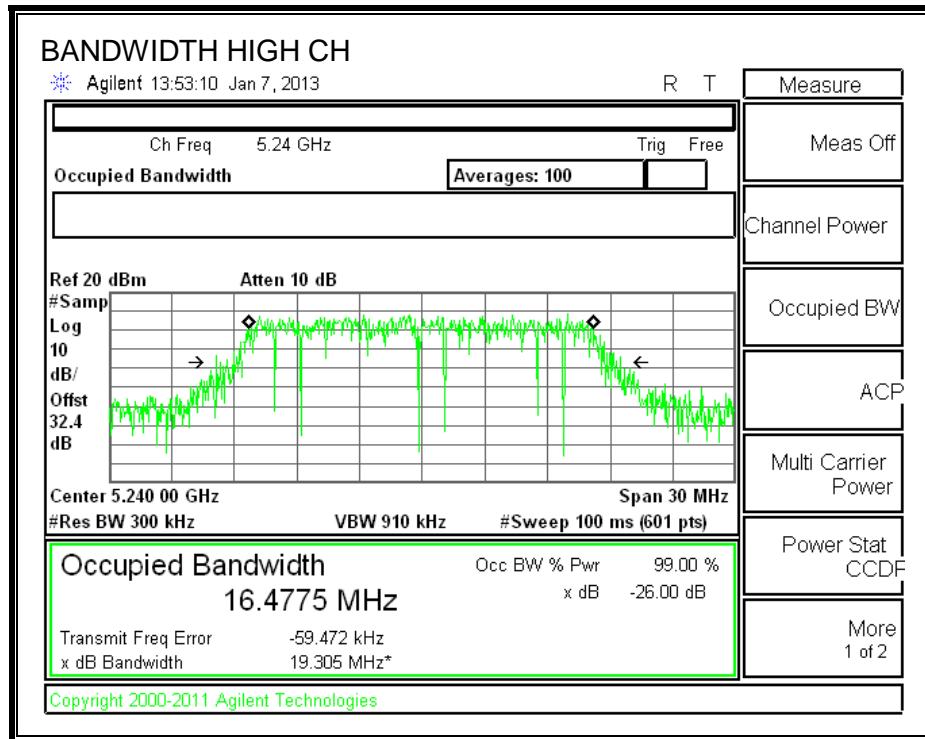
None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (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 (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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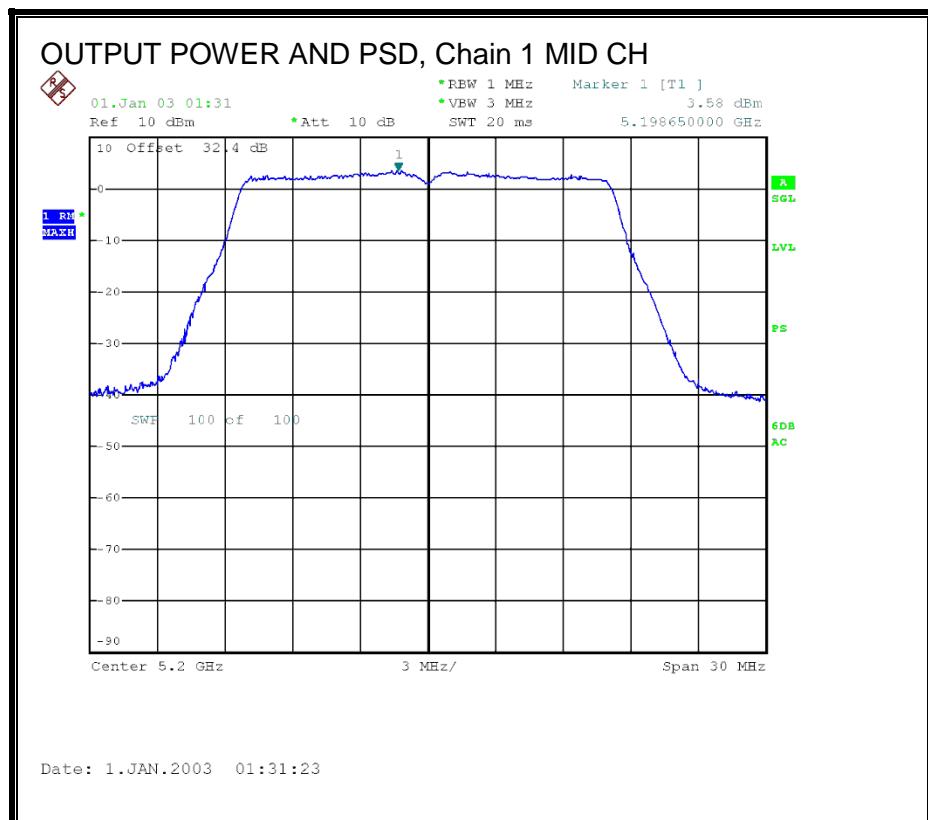
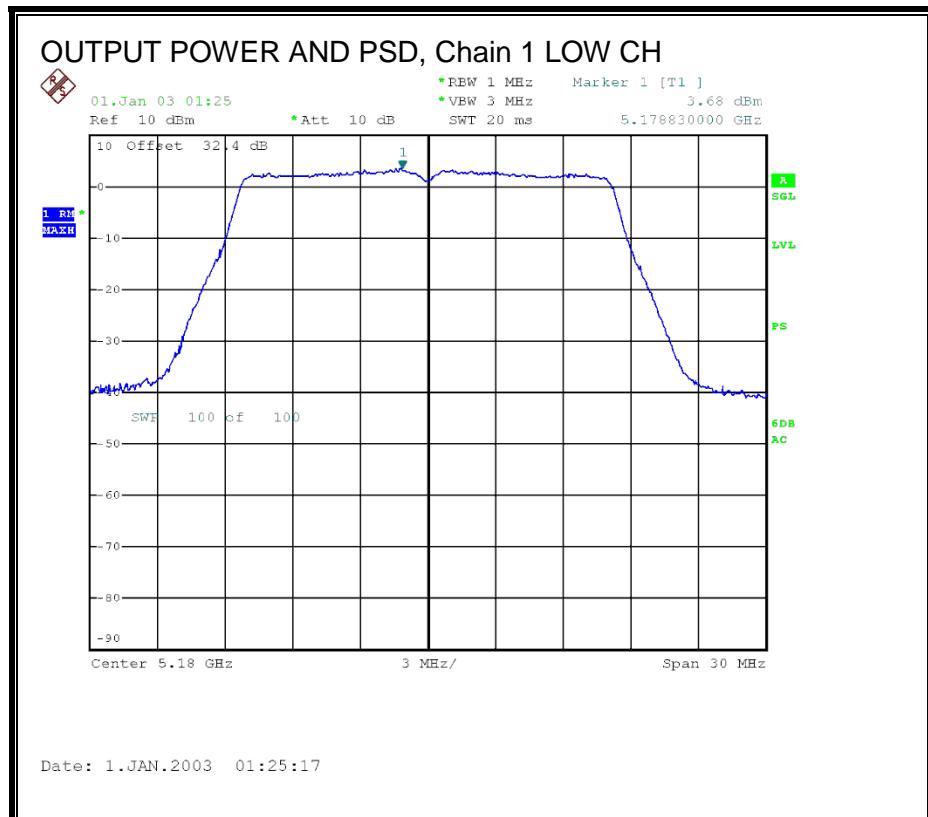
### Output Power Results

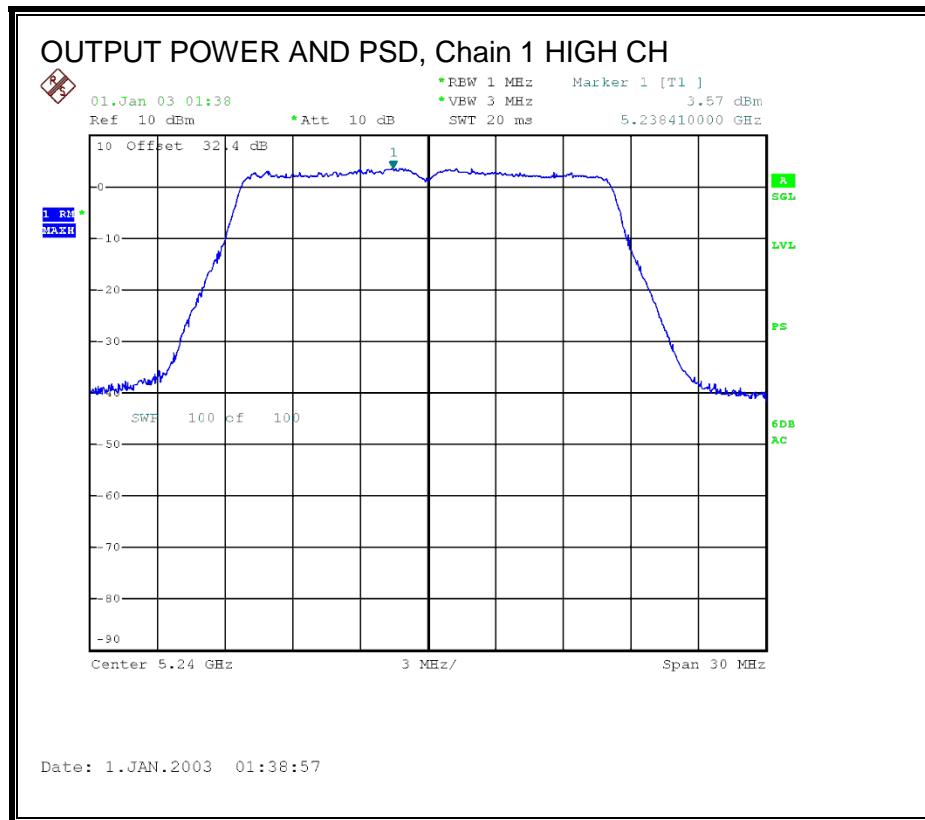
Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.00	14.00	17.00	-3.00
Mid	5200	14.10	14.10	17.00	-2.90
High	5240	14.00	14.00	17.00	-3.00

### PSD Results

Channel	Frequency (MHz)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

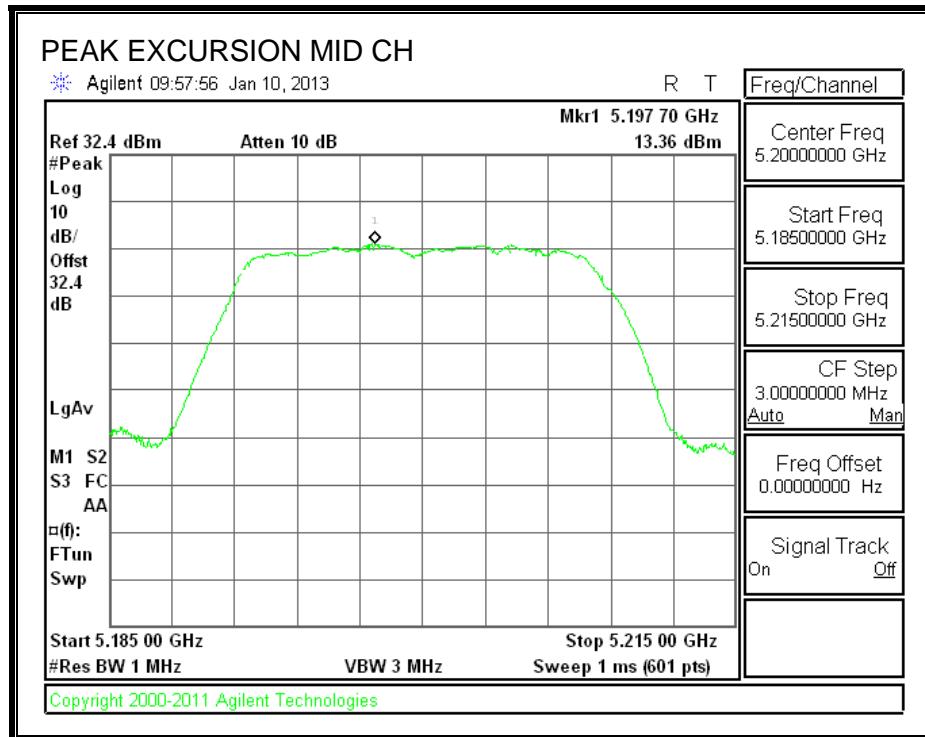
FCC §15.407 (a) (6)

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 (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (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

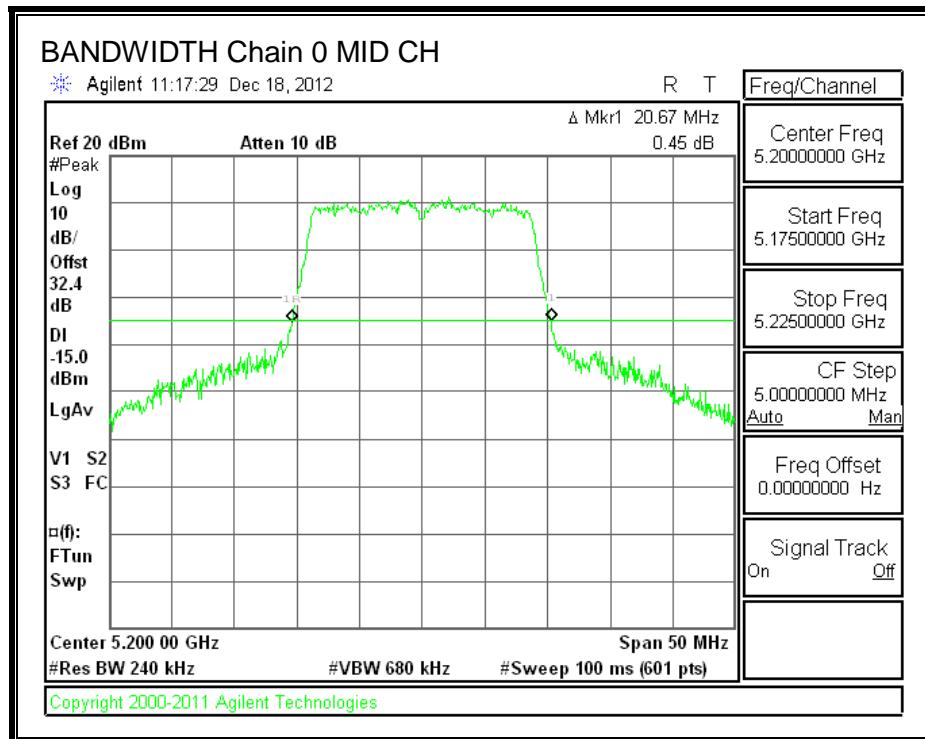
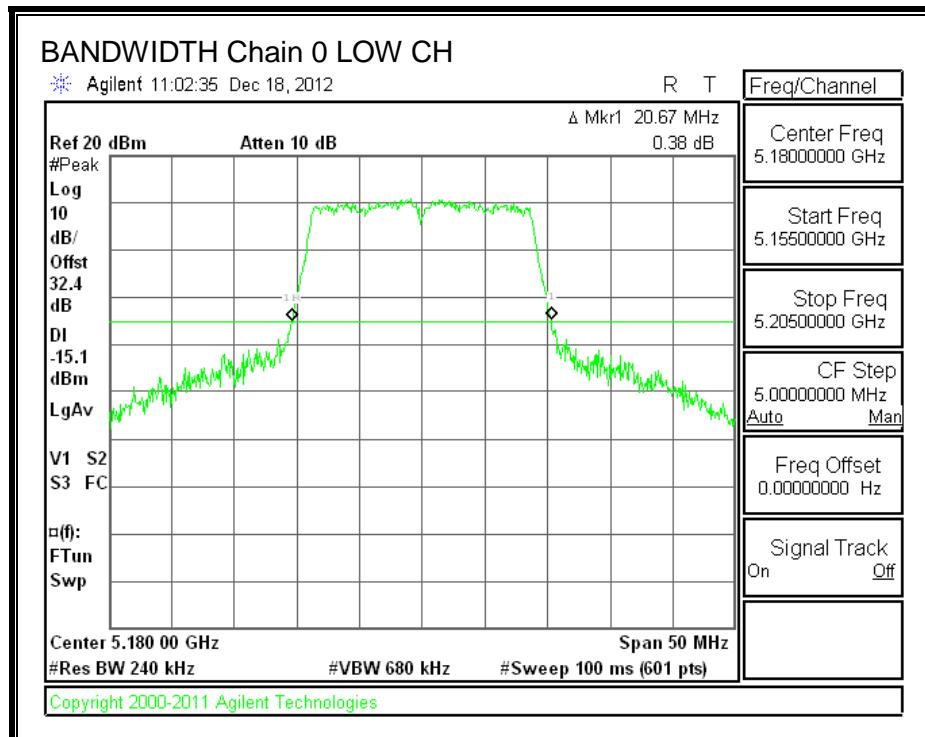
#### LIMITS

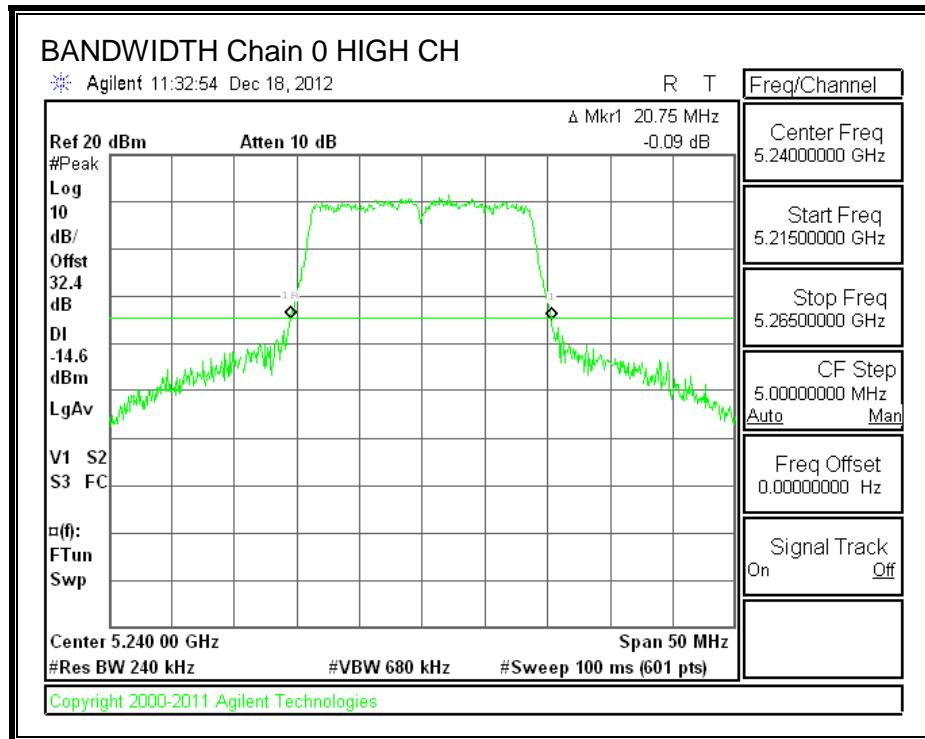
None; for reporting purposes only.

#### RESULTS

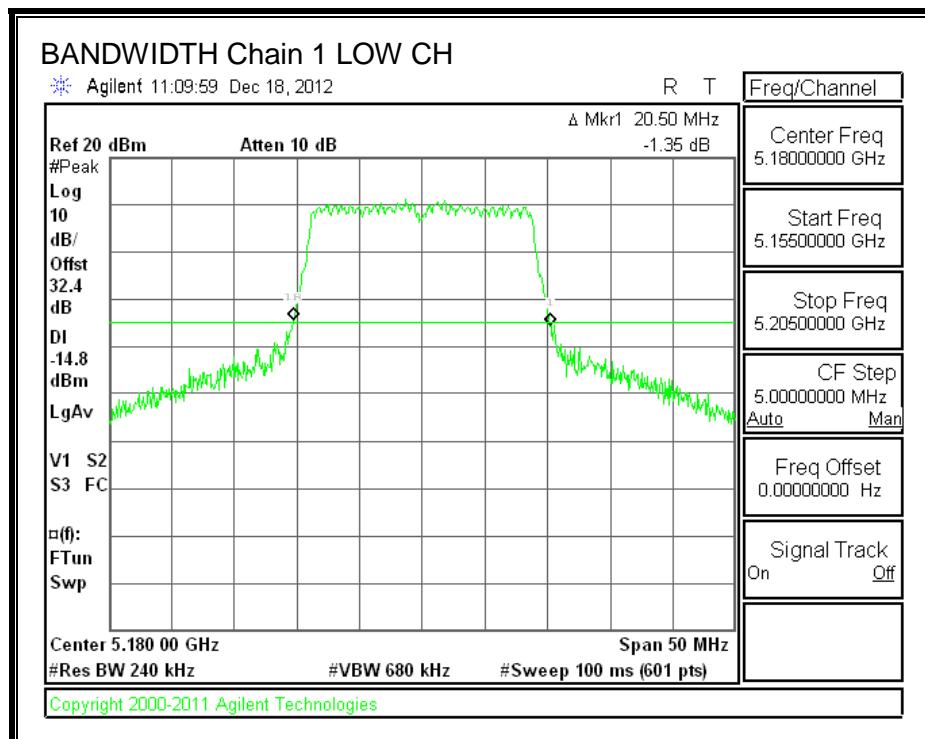
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	20.67	20.50
Mid	5200	20.67	20.42
High	5240	20.75	20.42

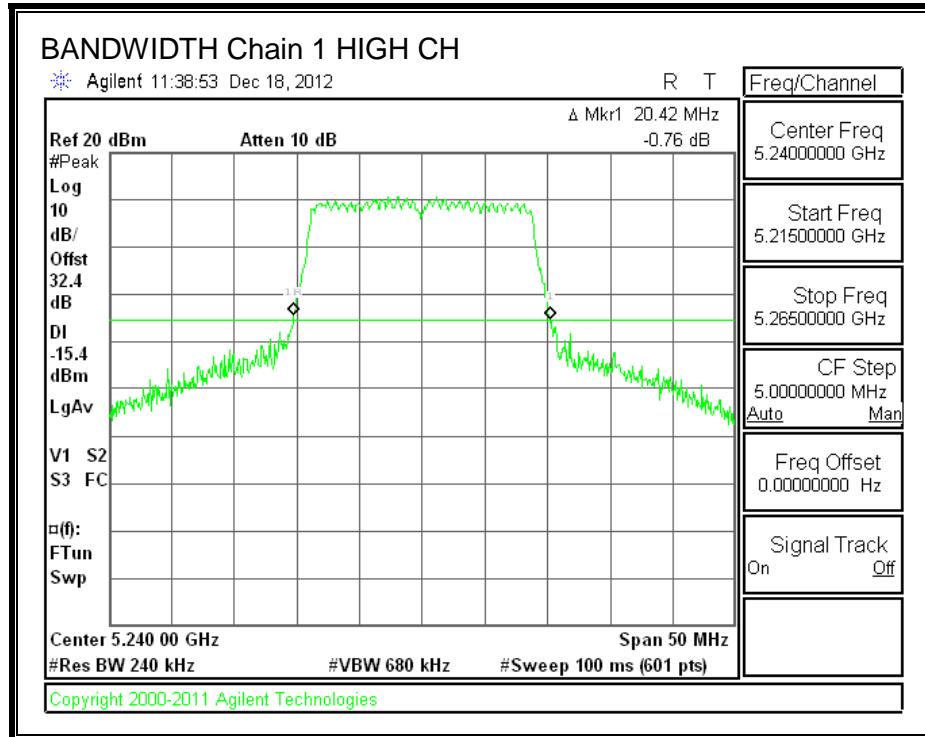
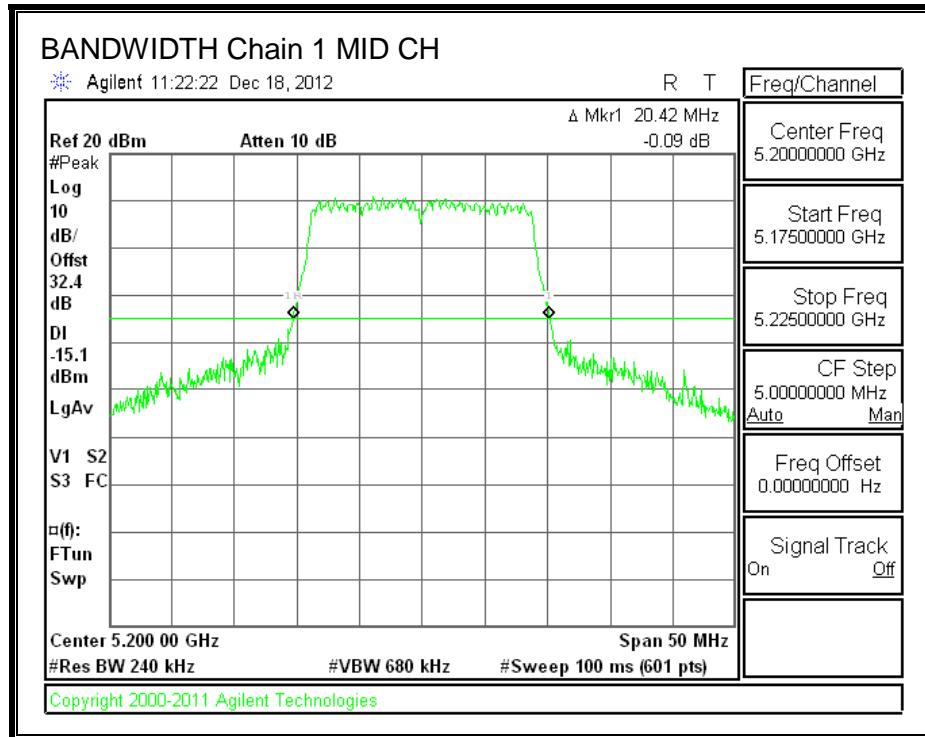
**26 dB BANDWIDTH, Chain 0**





## 26 dB BANDWIDTH, Chain 1





## 8.2.2. 99% BANDWIDTH

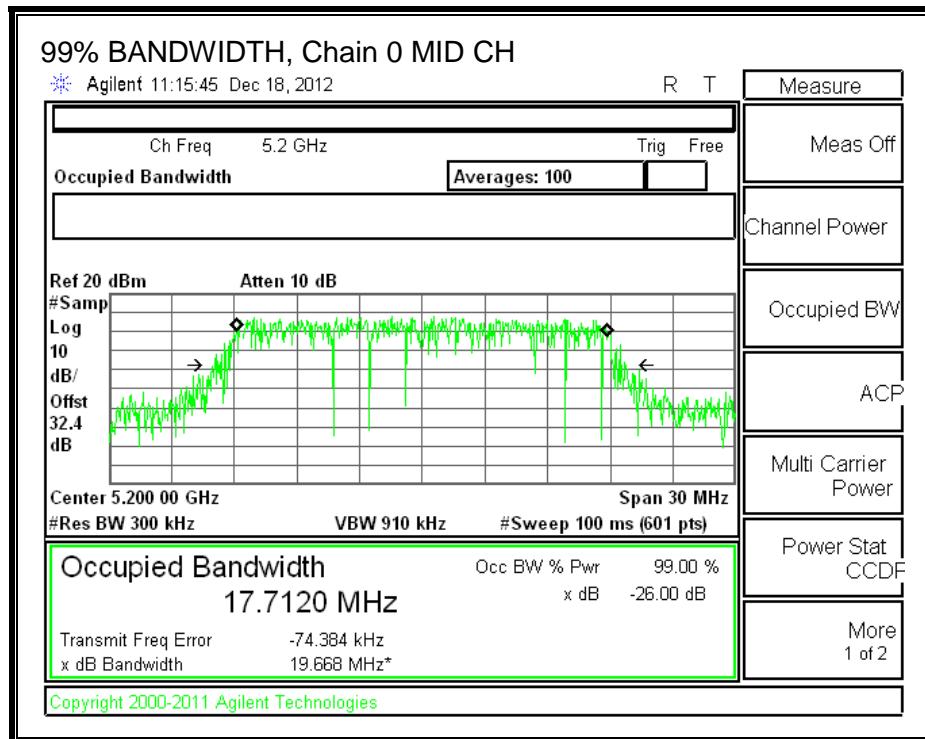
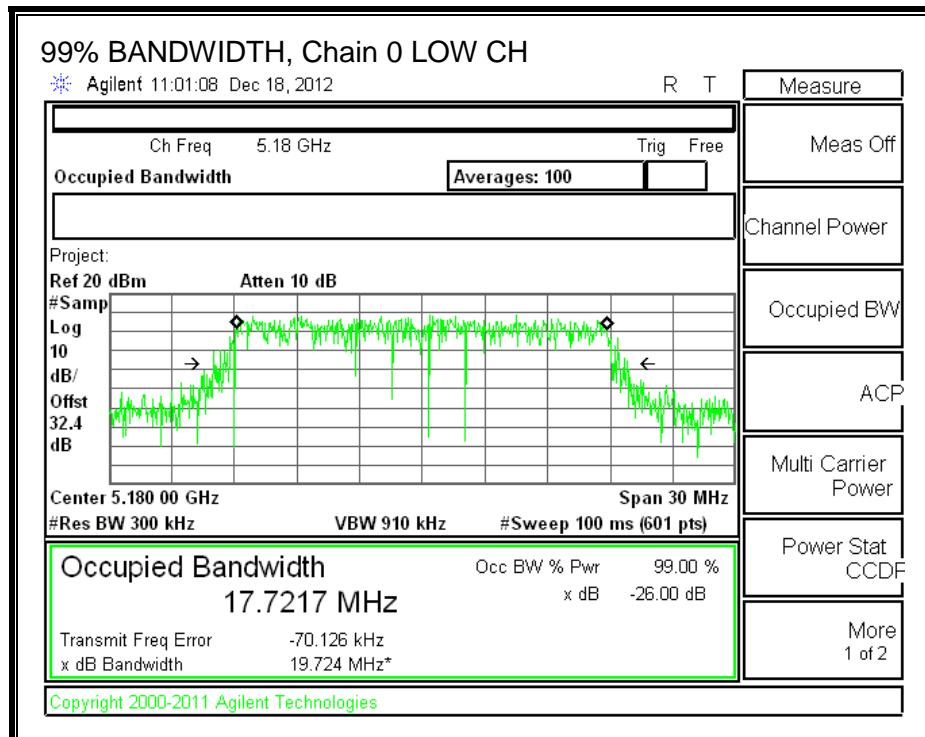
### LIMITS

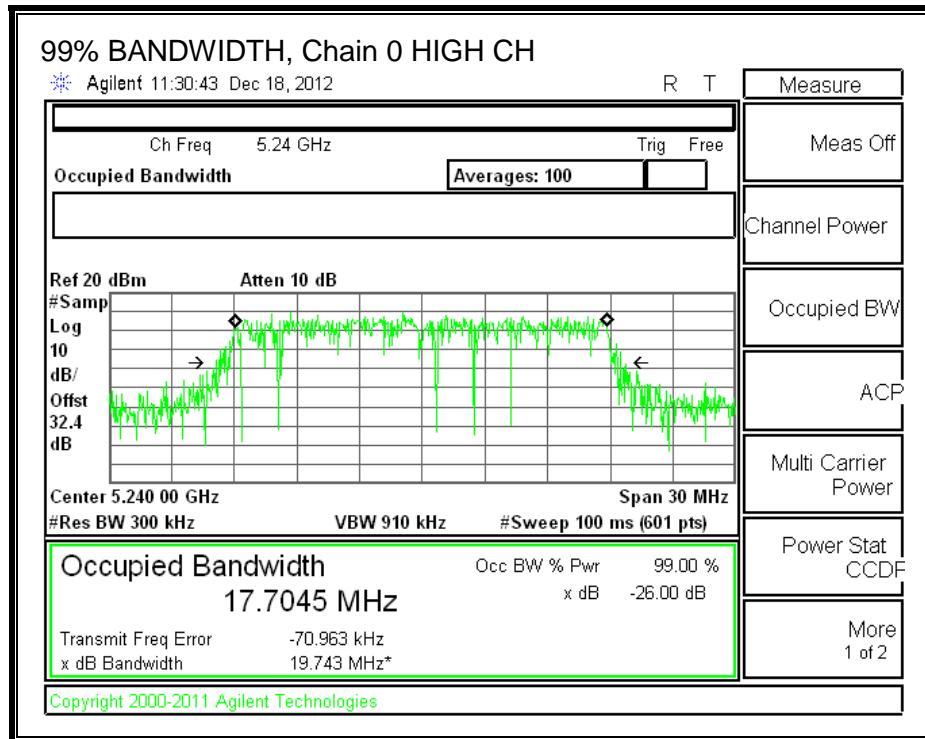
None; for reporting purposes only.

### RESULTS

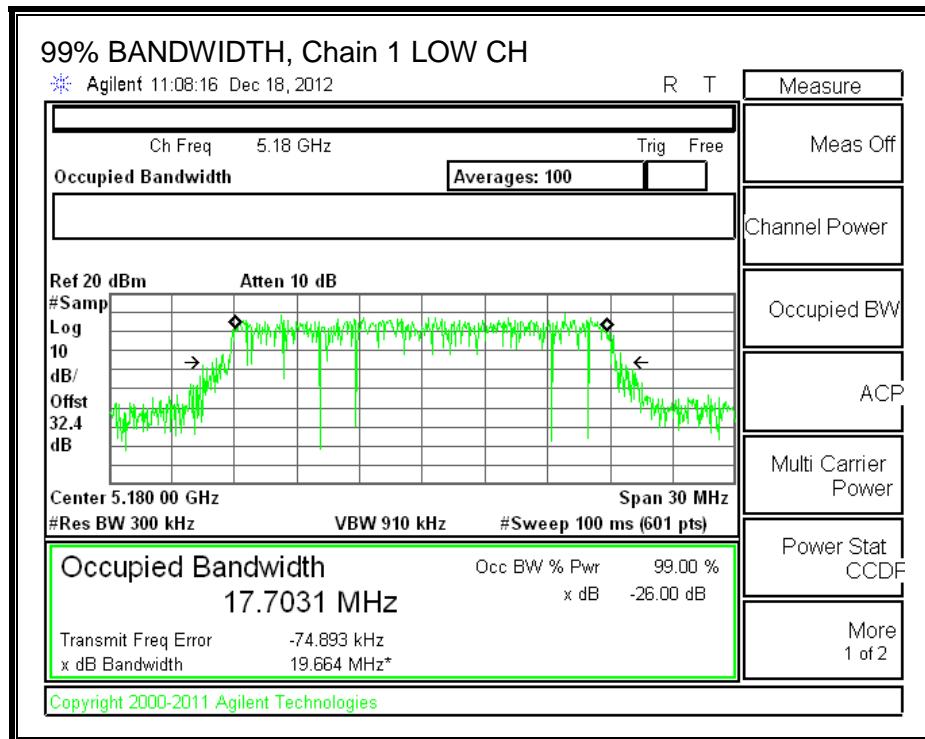
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.7217	17.7031
Mid	5200	17.7120	17.7066
High	5240	17.7045	17.6986

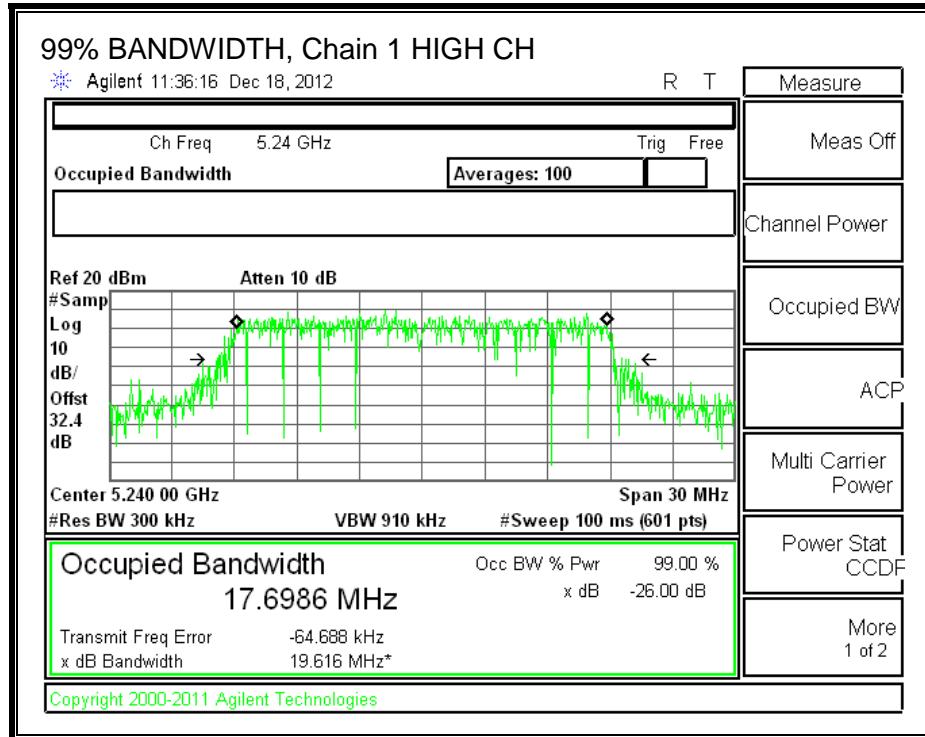
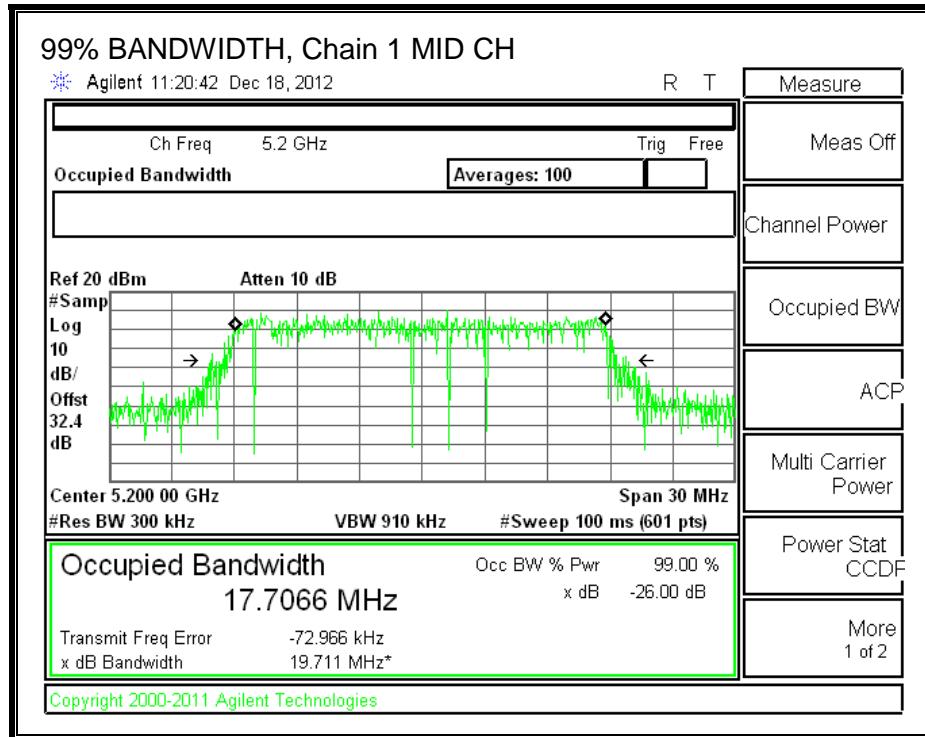
**99% BANDWIDTH, Chain 0**





### **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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Directional Gain (dBi)	Uncorrelated Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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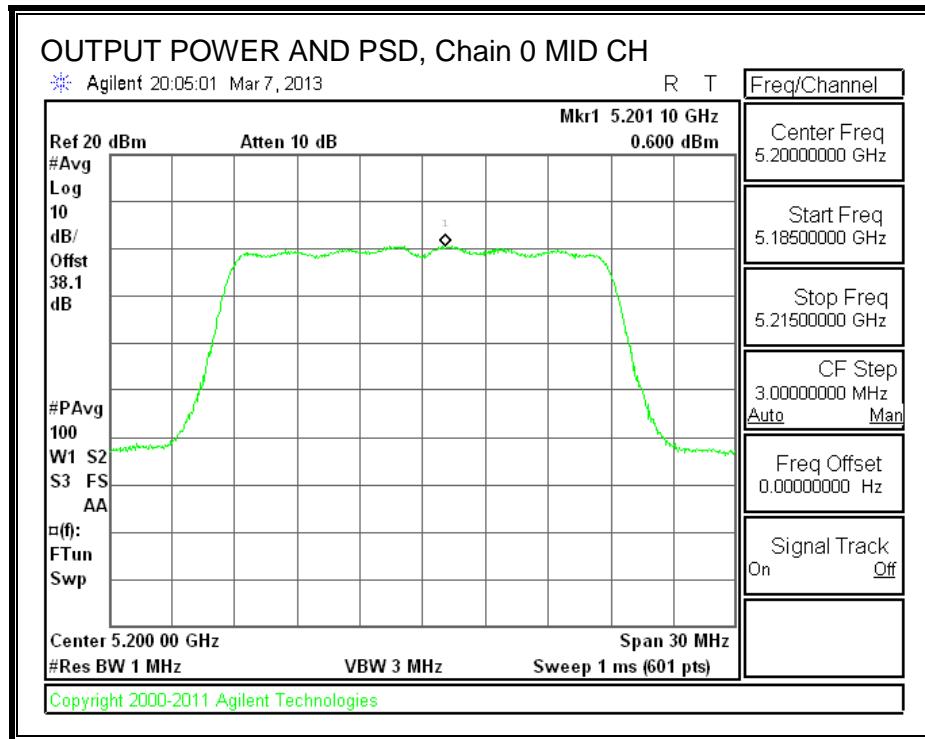
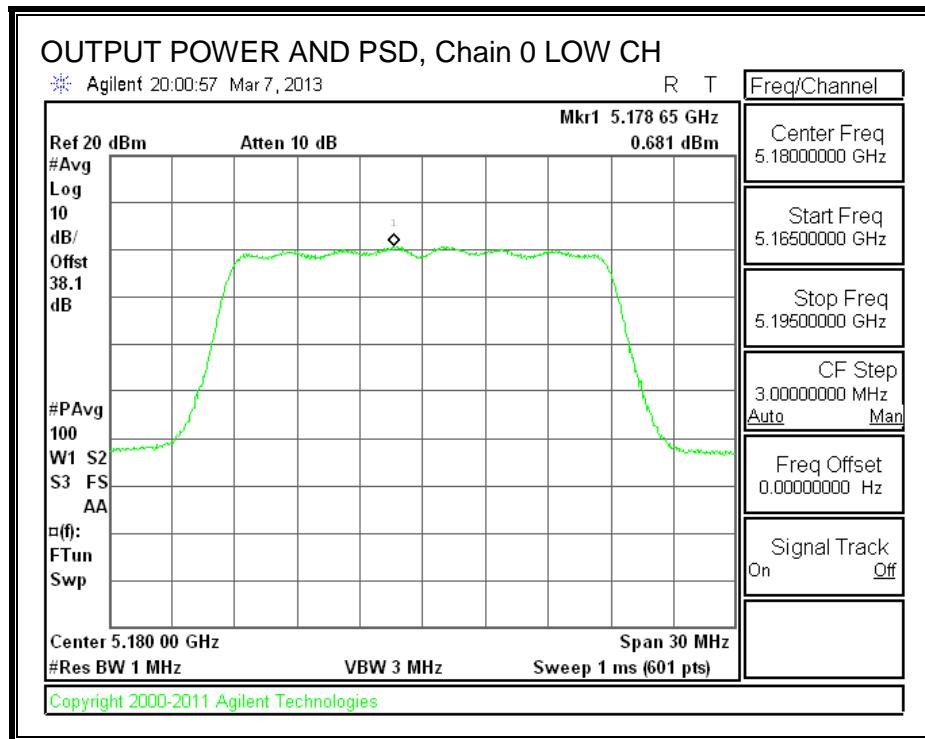
### Output Power Results

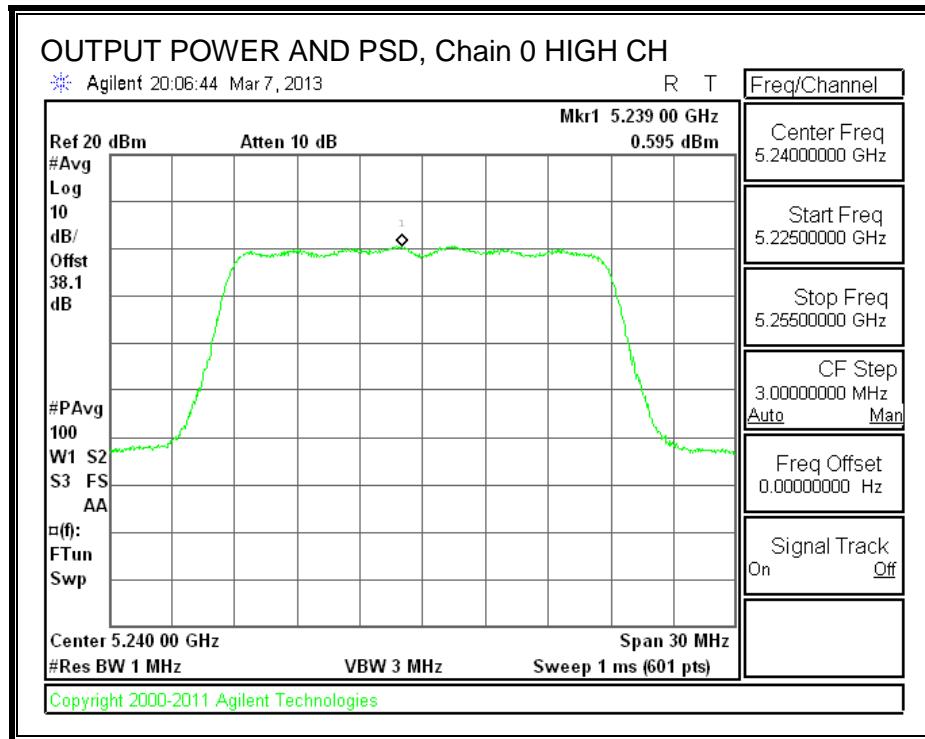
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	10.10	10.00	13.06	17.00	-3.94
Mid	5200	10.10	9.90	13.01	17.00	-3.99
High	5240	10.26	10.00	13.14	17.00	-3.86

### PSD Results

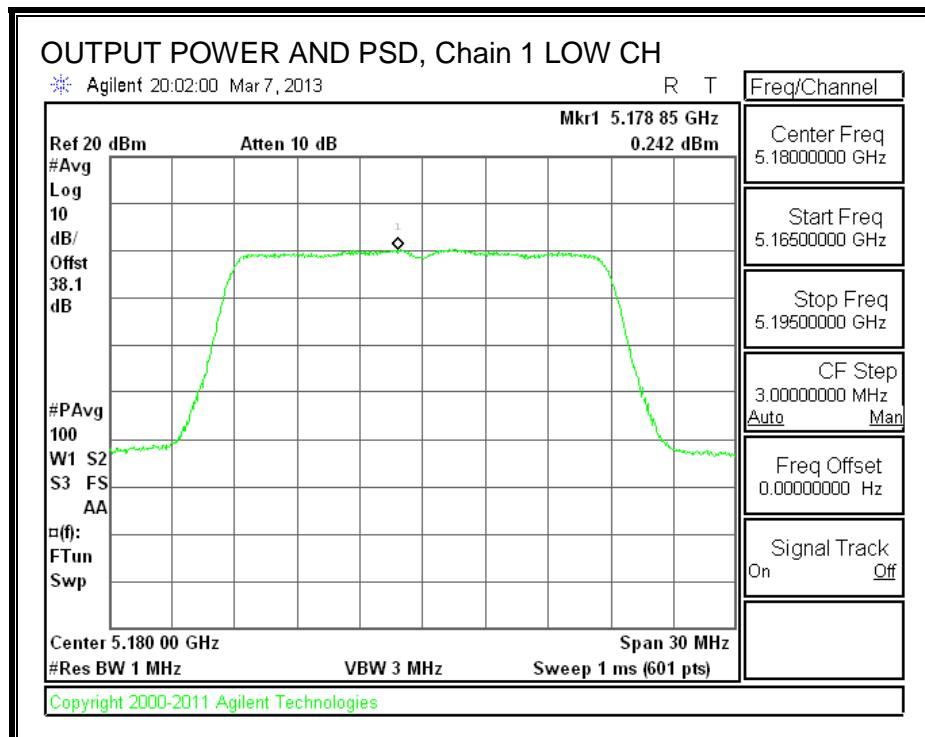
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	0.681	0.242	3.48	4.00	-0.52
Mid	5200	0.600	0.191	3.41	4.00	-0.59
High	5240	0.595	0.255	3.44	4.00	-0.56

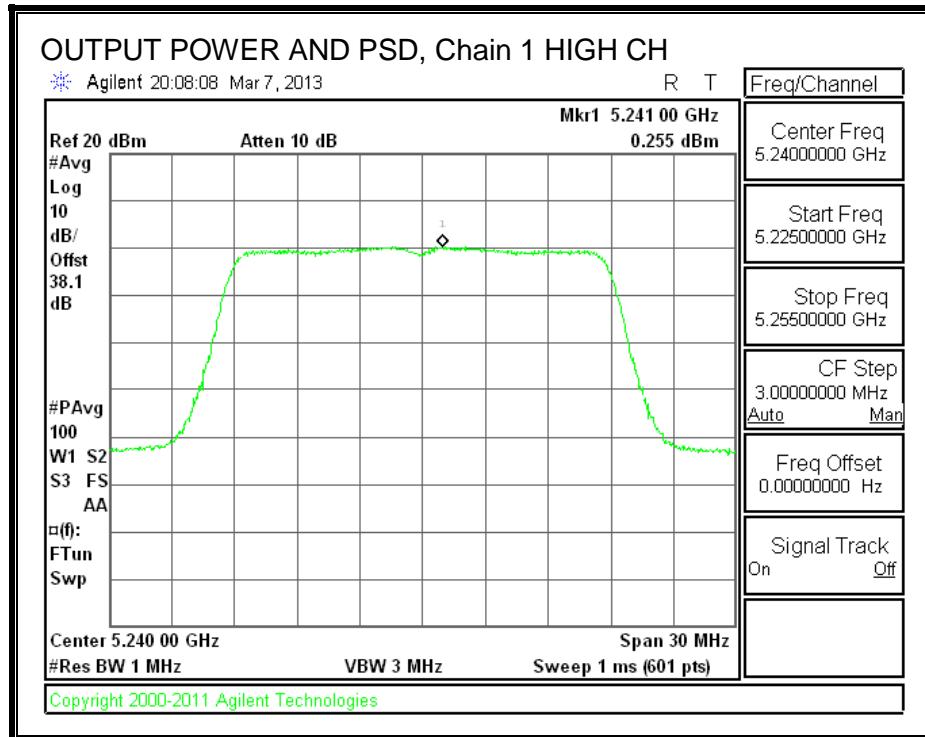
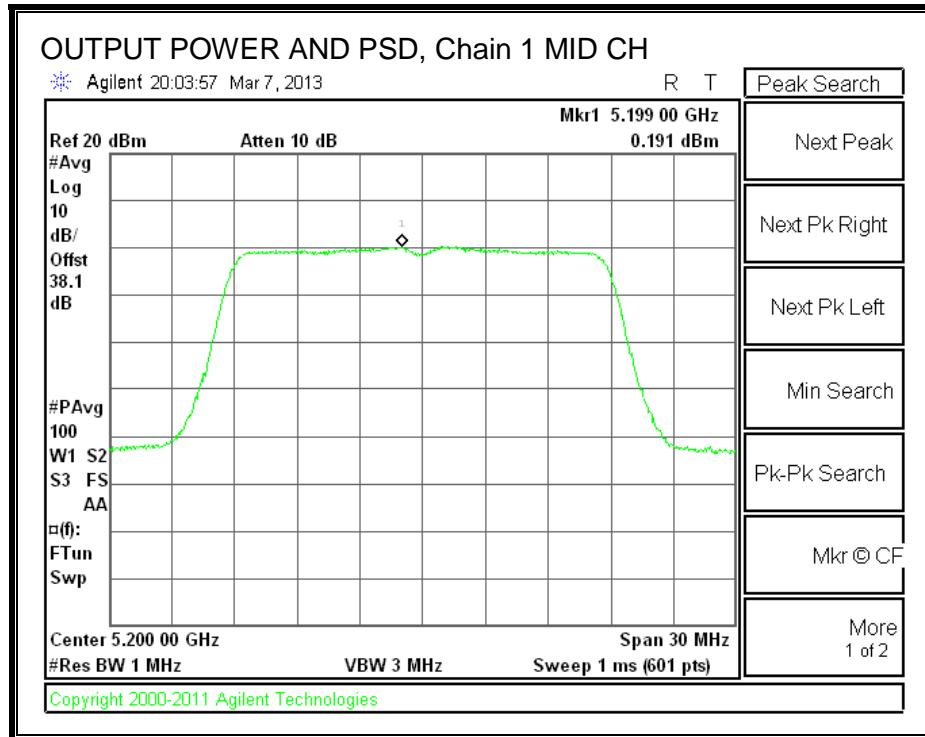
**OUTPUT POWER AND PSD, Chain 0**





### 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

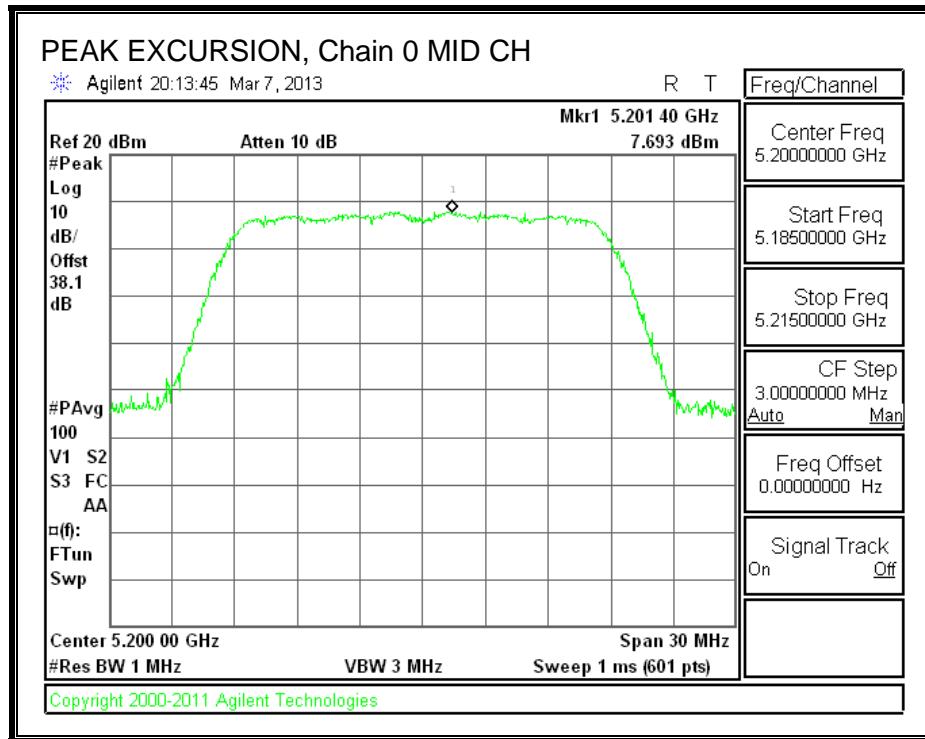
Chain 0

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

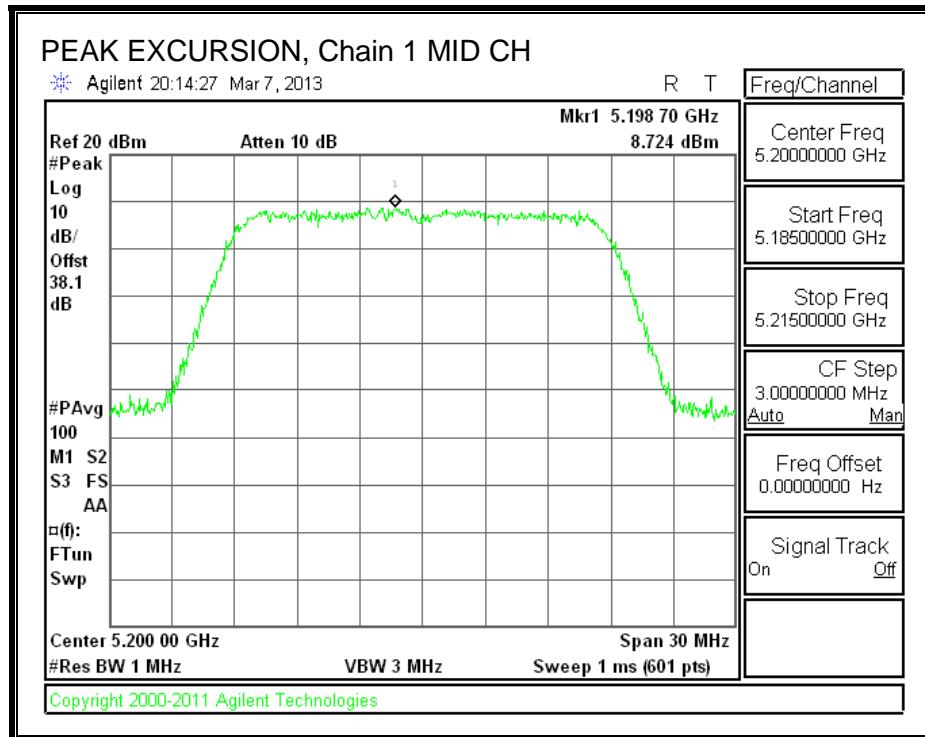
Chain 1

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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (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
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

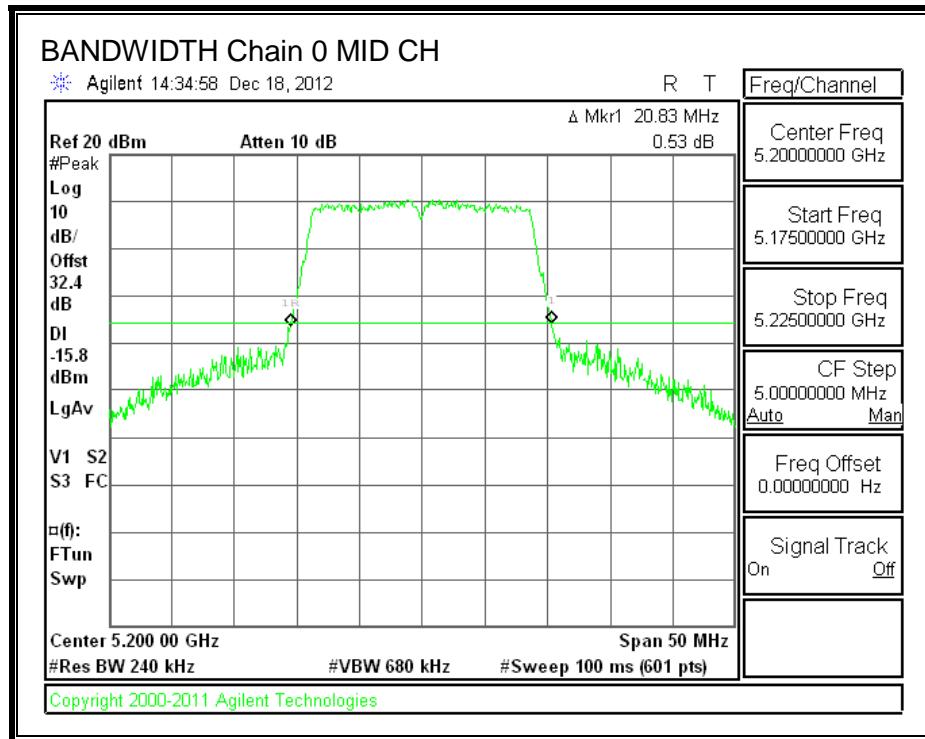
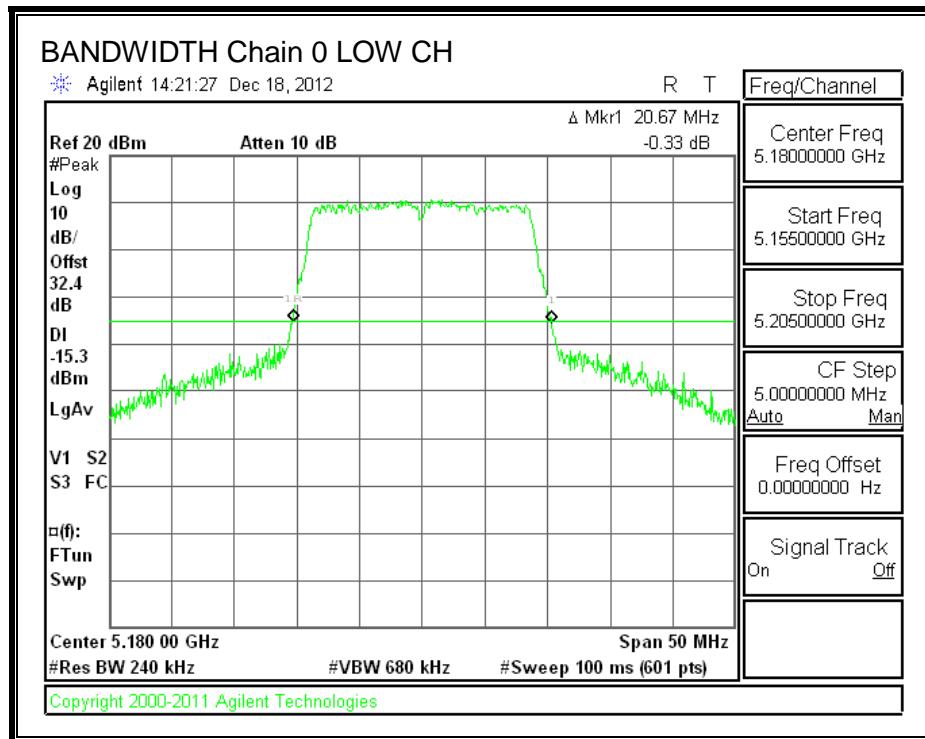
#### LIMITS

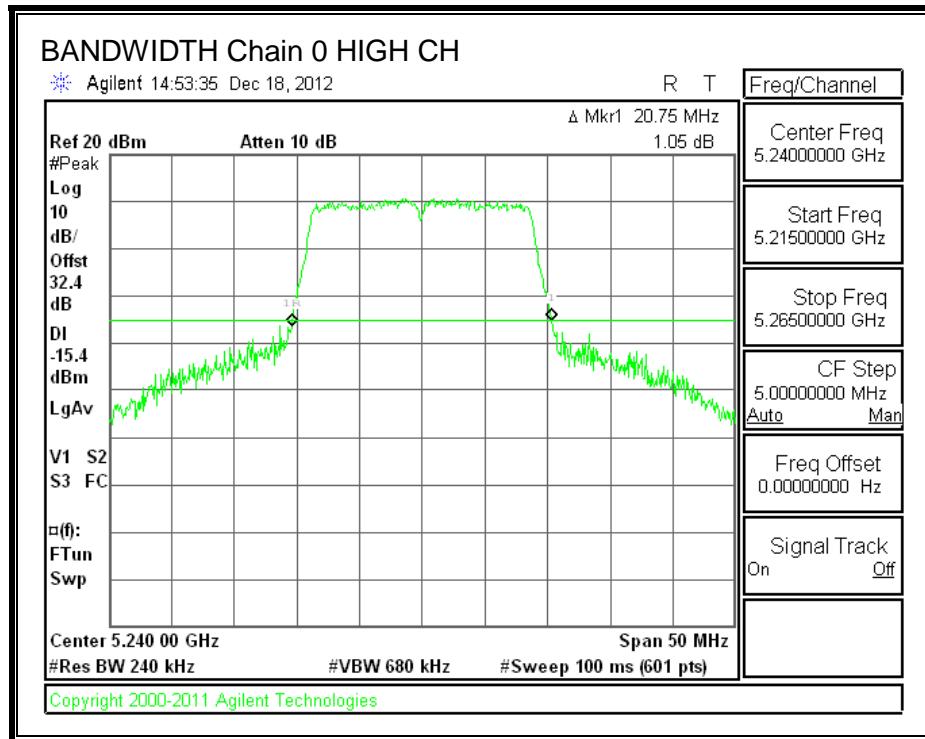
None; for reporting purposes only.

#### RESULTS

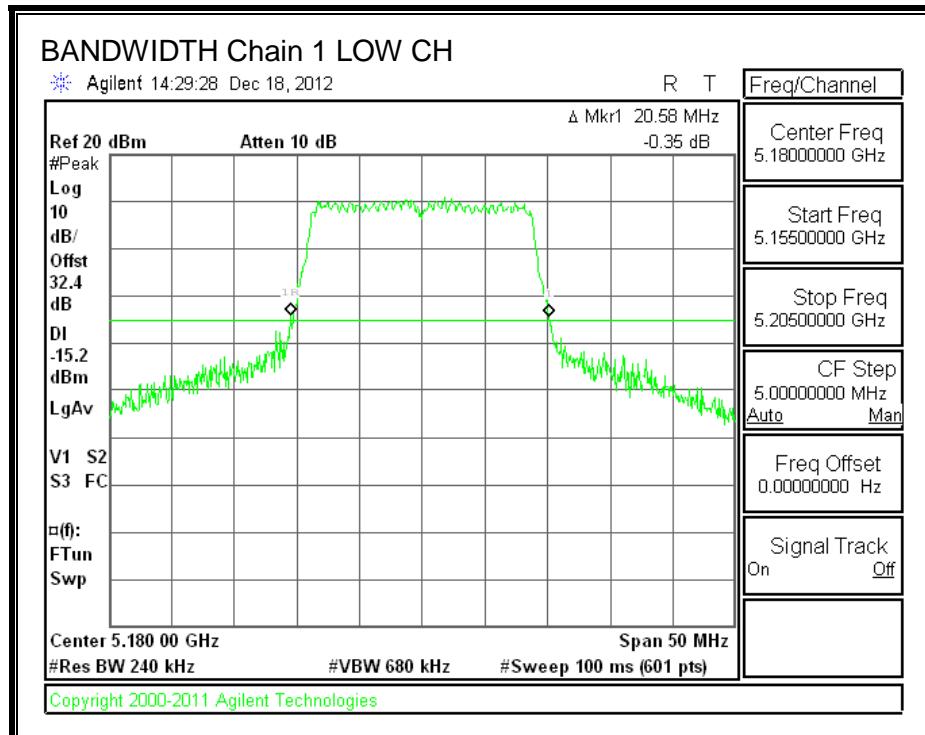
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	20.67	20.58
Mid	5200	20.83	20.58
High	5240	20.75	20.50

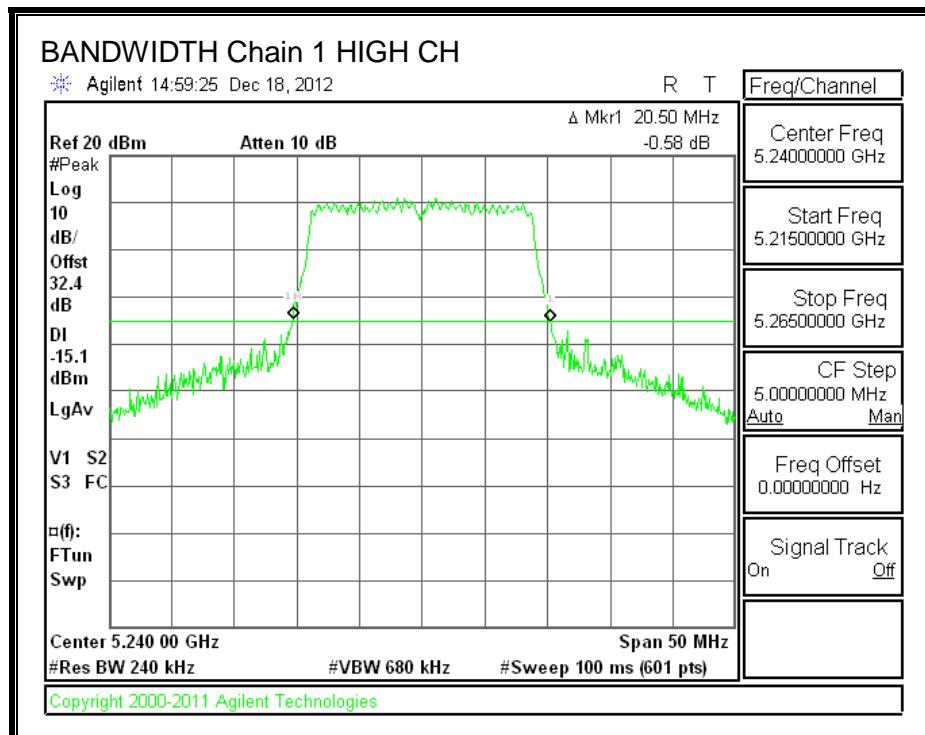
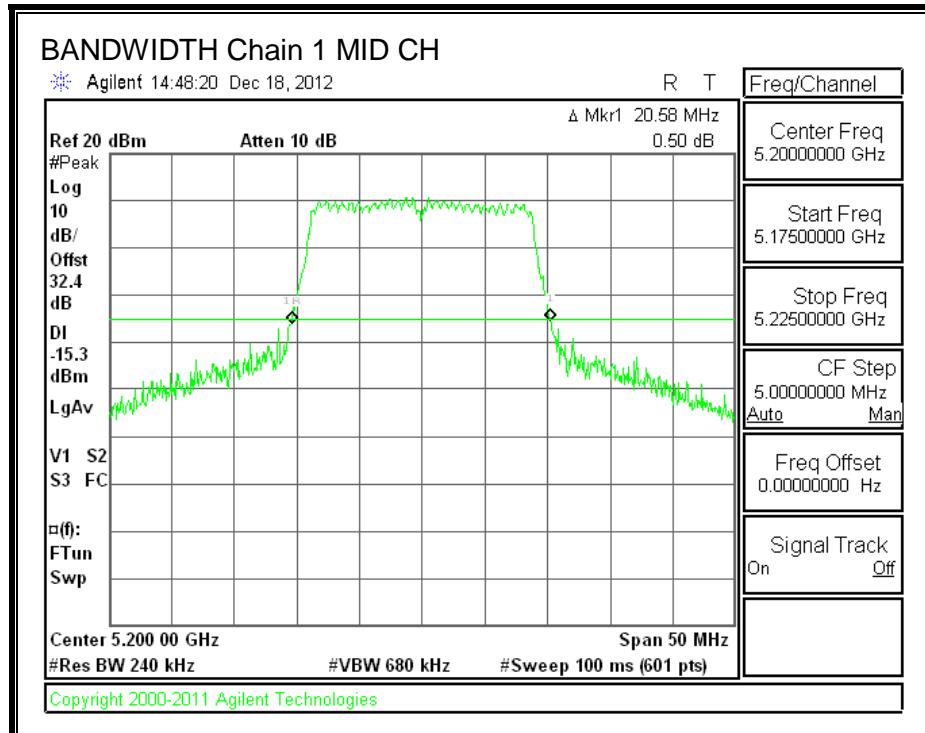
**26 dB BANDWIDTH, Chain 0**





## 26 dB BANDWIDTH, Chain 1





### 8.4.2. 99% BANDWIDTH

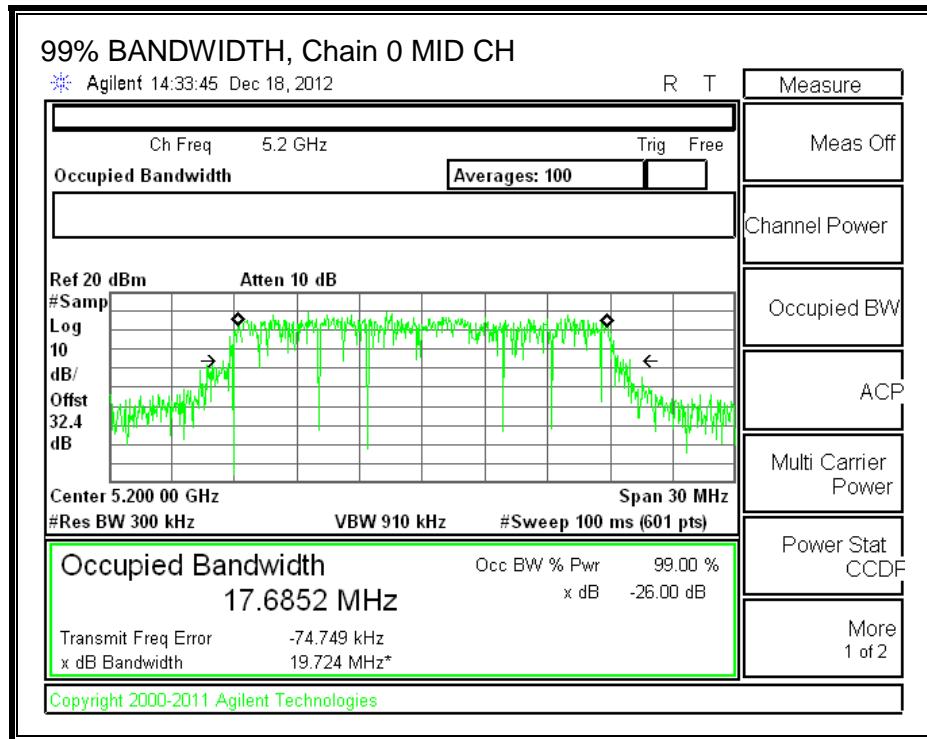
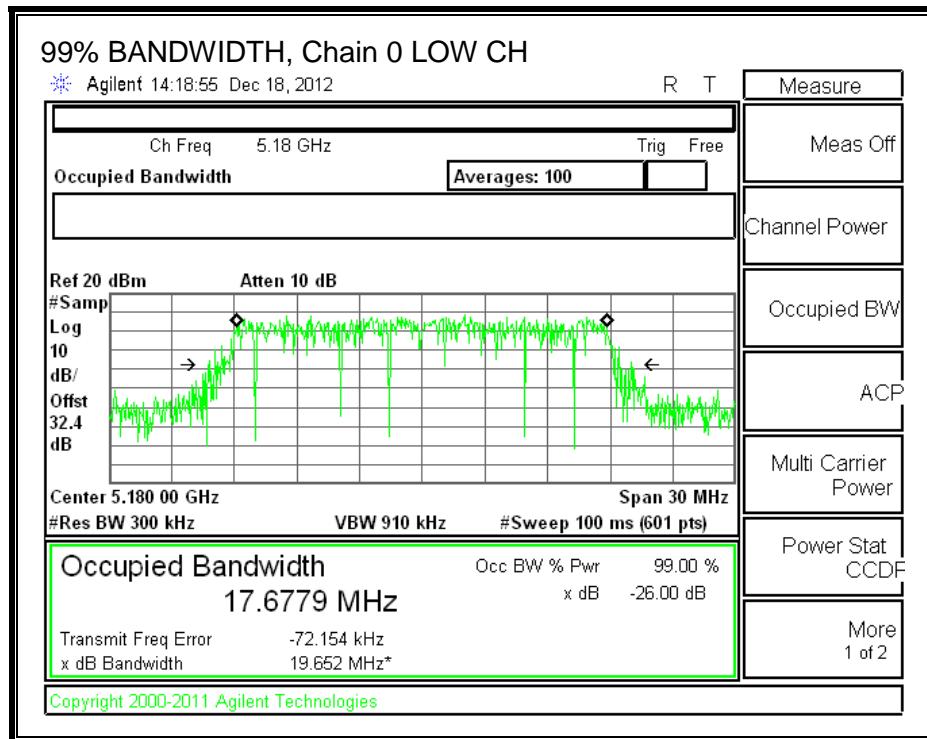
#### LIMITS

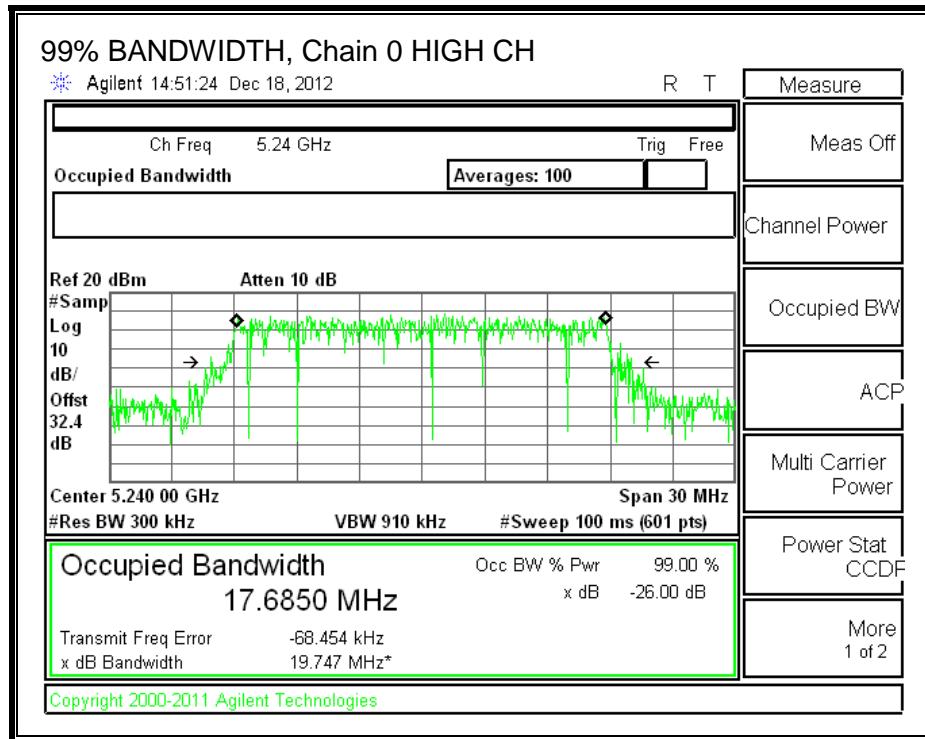
None; for reporting purposes only.

#### RESULTS

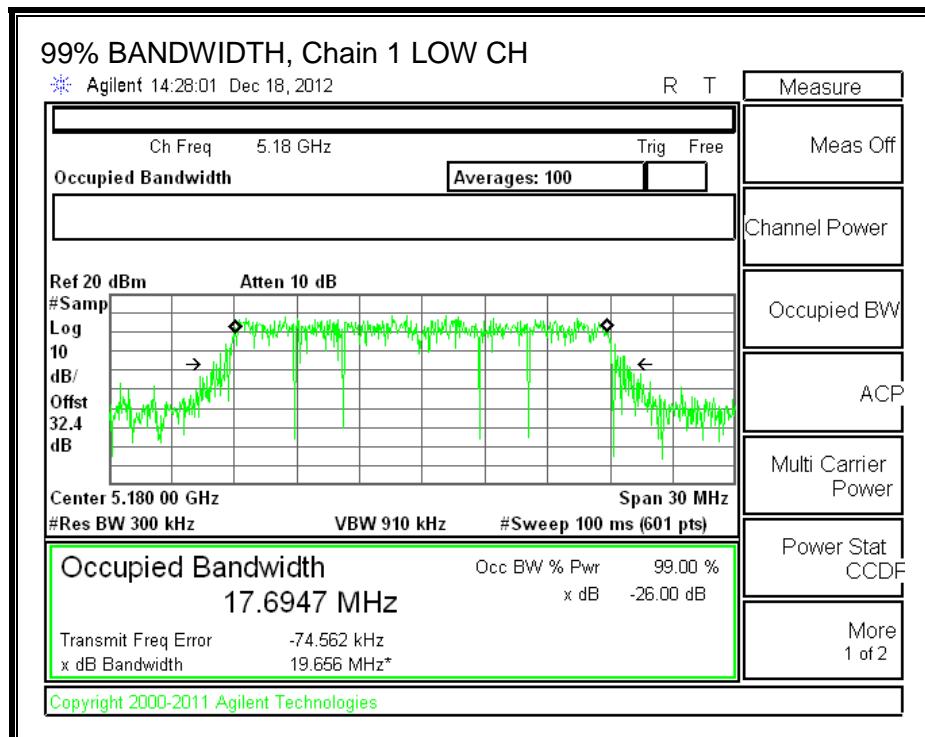
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.6779	17.6947
Mid	5200	17.6852	17.6885
High	5240	17.6850	17.6906

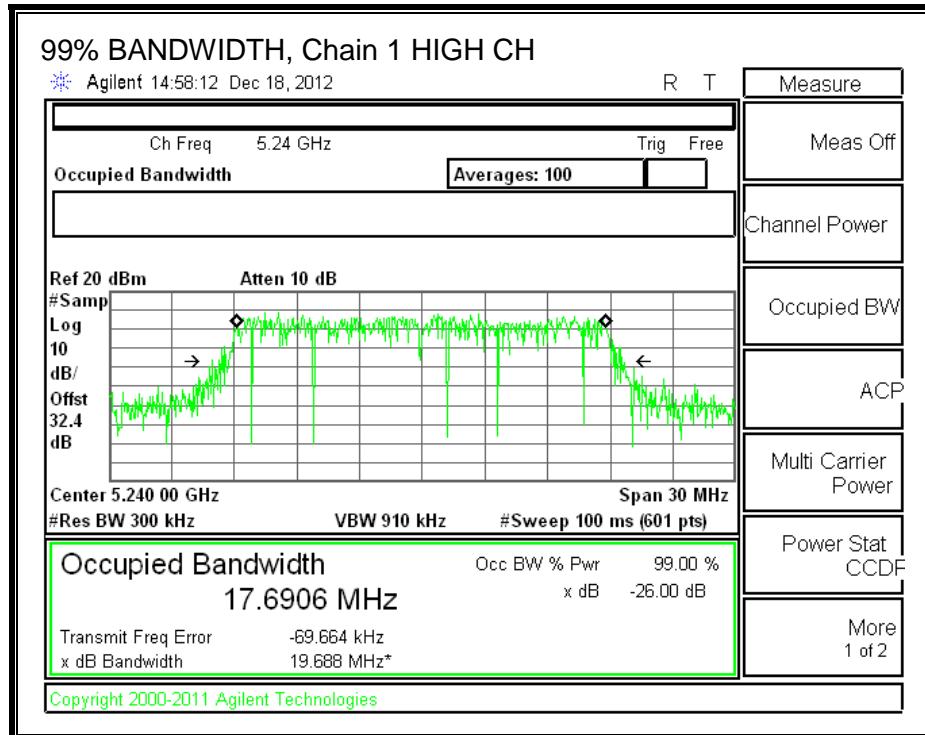
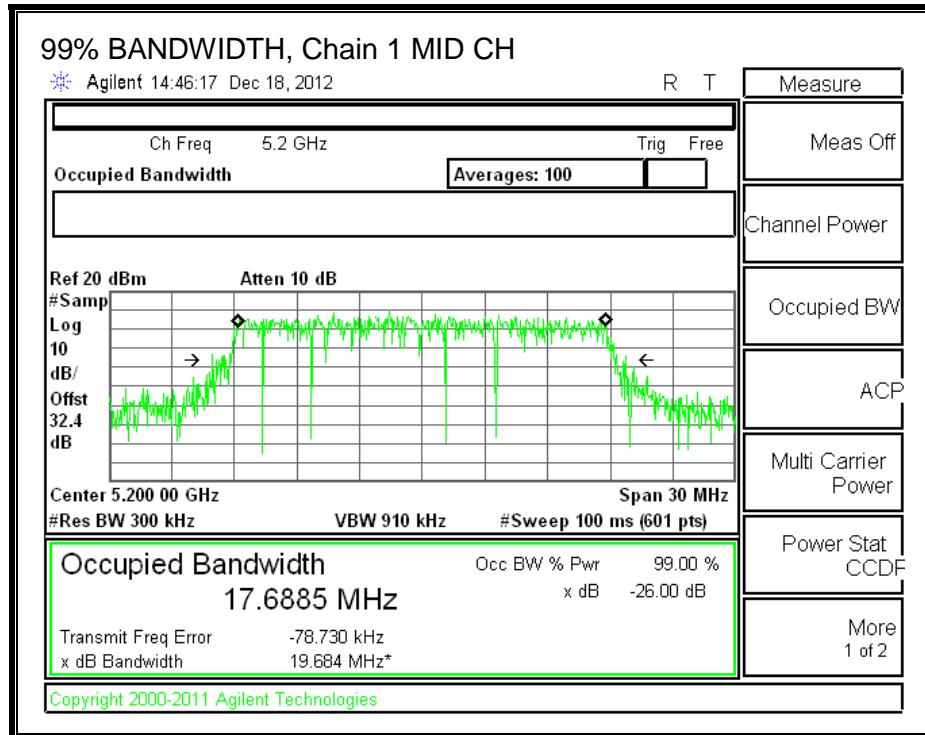
**99% BANDWIDTH, Chain 0**





### **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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	2.20	2.73

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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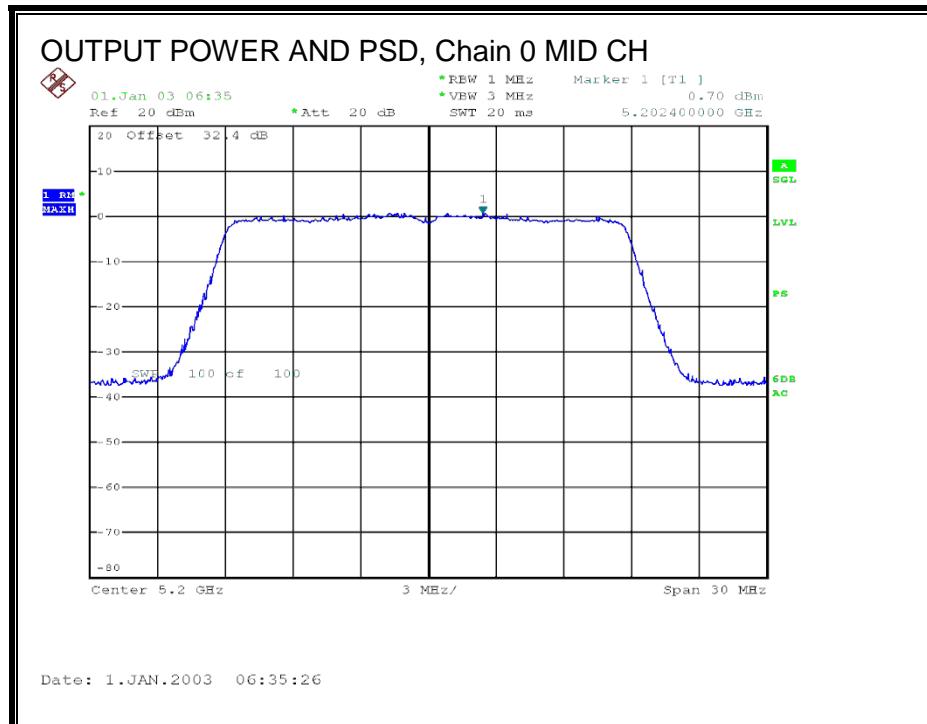
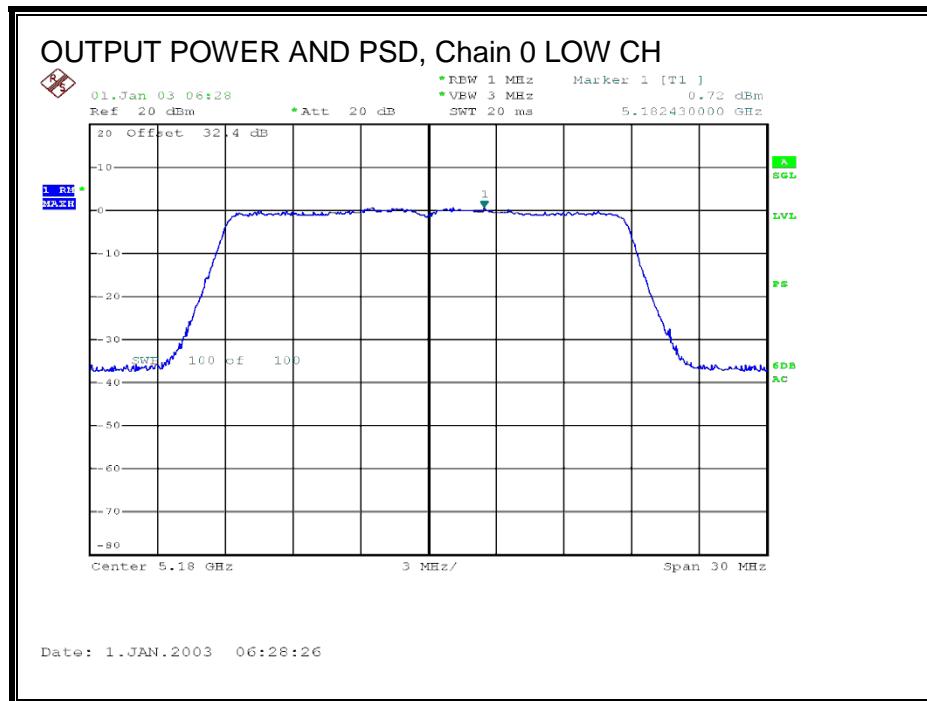
### Output Power Results

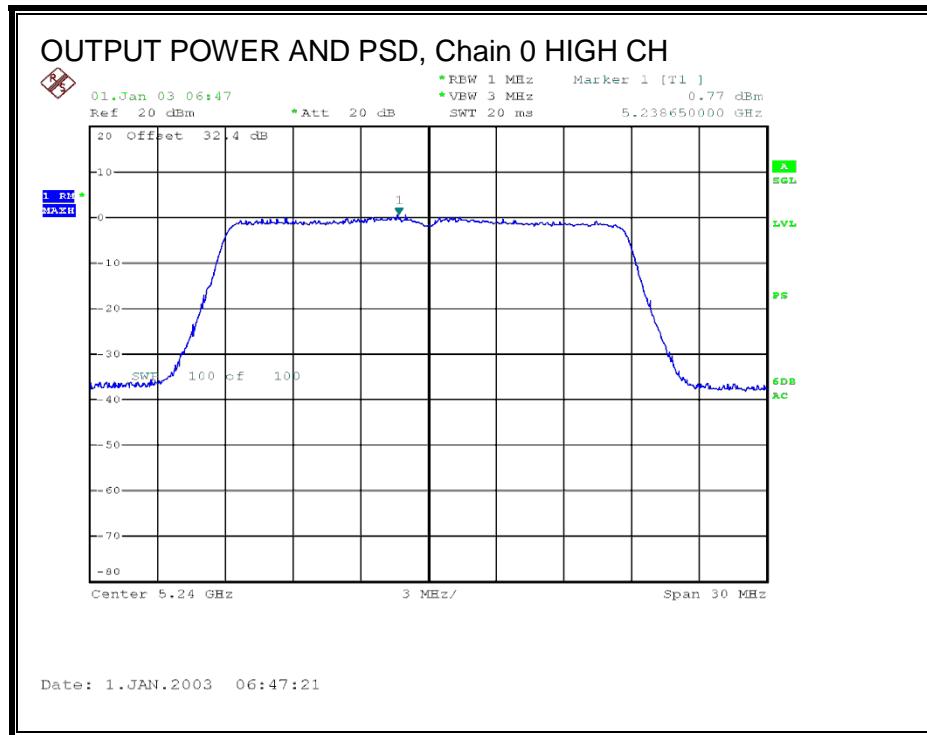
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	11.10	11.20	14.16	17.00	-2.84
Mid	5200	11.21	10.98	14.11	17.00	-2.89
High	5240	11.20	11.10	14.16	17.00	-2.84

### PSD Results

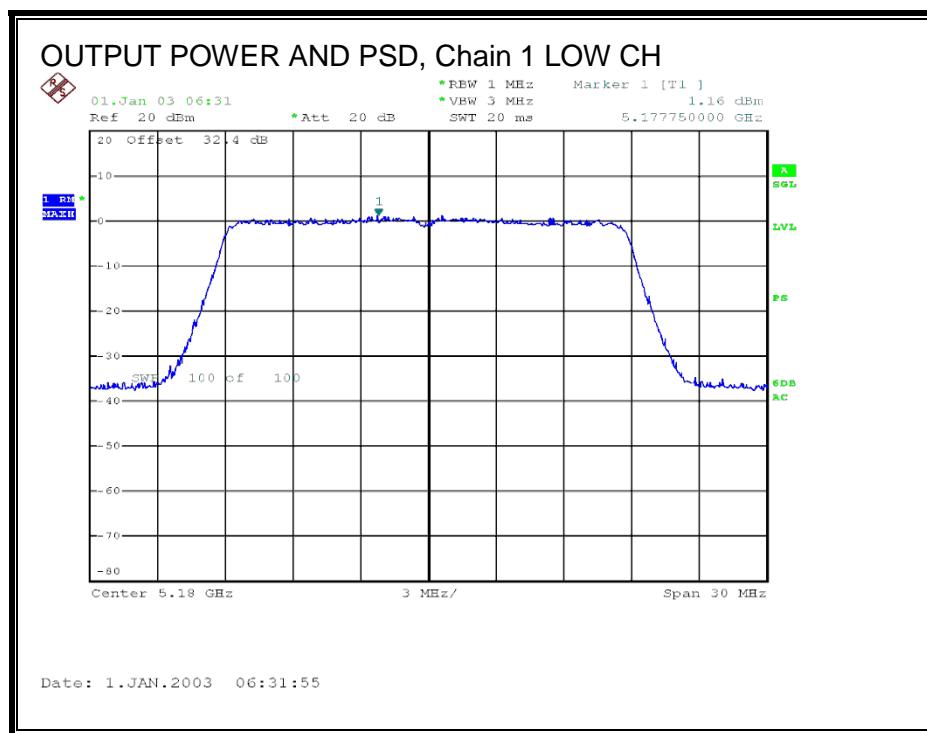
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	0.72	1.16	3.96	4.00	-0.04
Mid	5200	0.70	1.12	3.93	4.00	-0.07
High	5240	0.77	0.67	3.73	4.00	-0.27

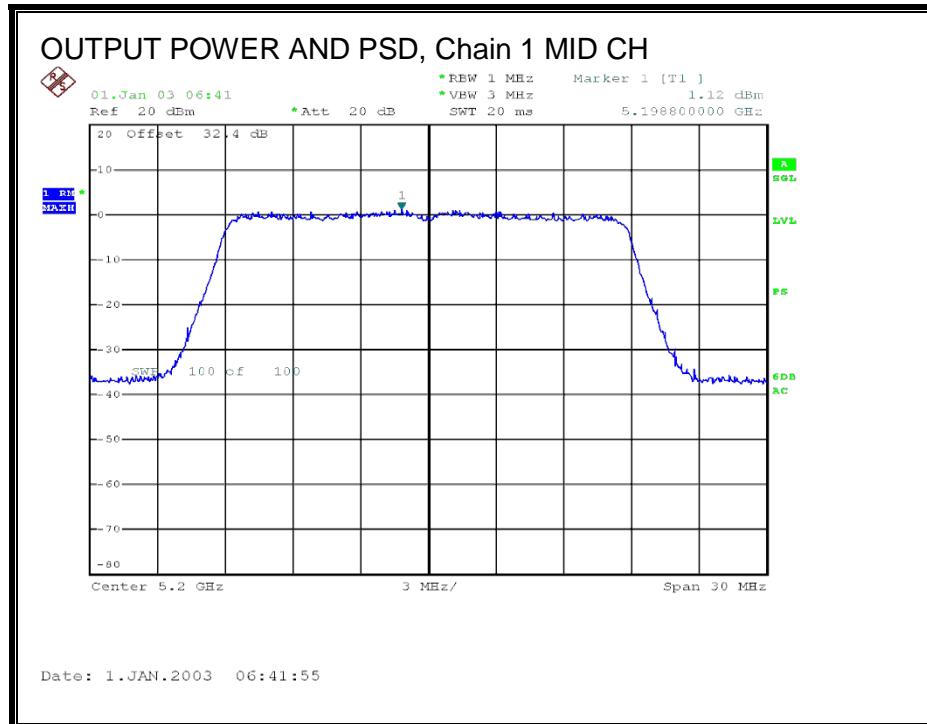
**OUTPUT POWER AND PSD, Chain 0**



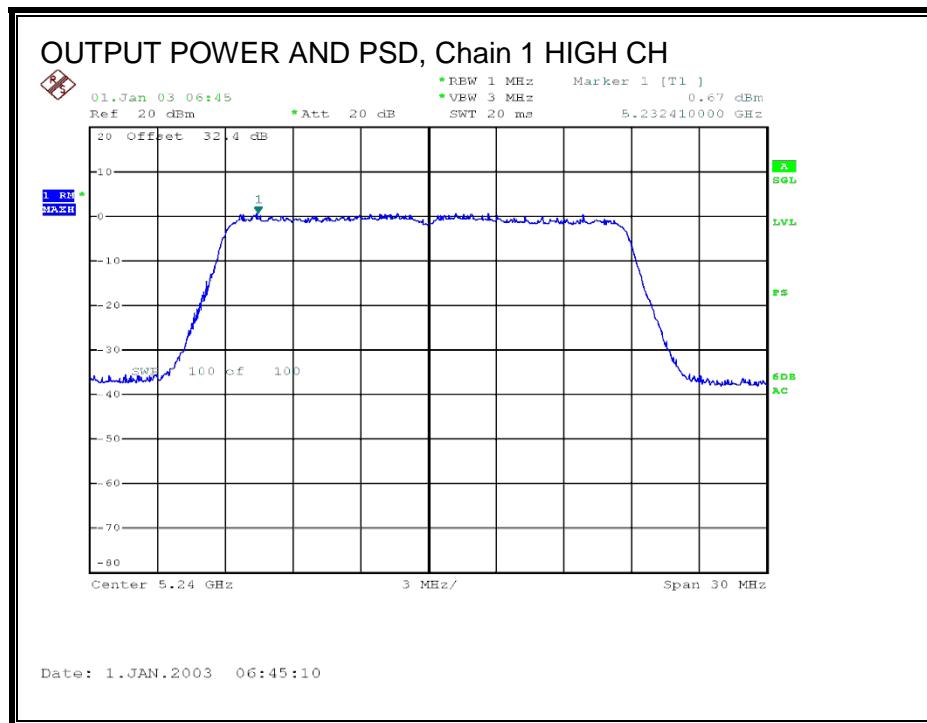


### OUTPUT POWER AND PSD, Chain 1





Date: 1.JAN.2003 06:41:55



Date: 1.JAN.2003 06:45:10

#### 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

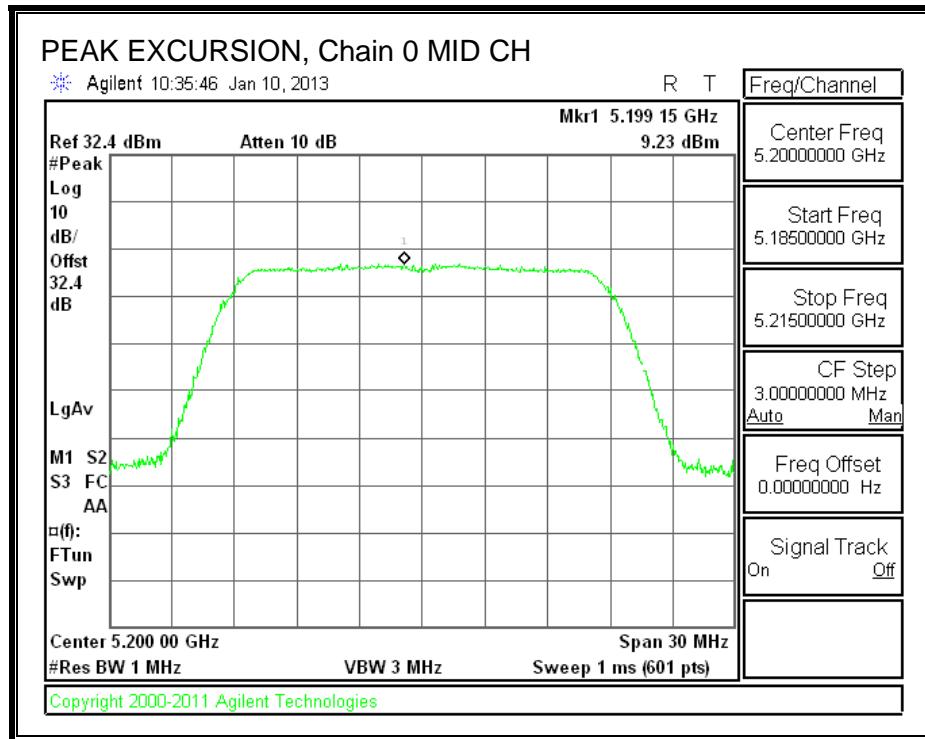
Chain 0

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

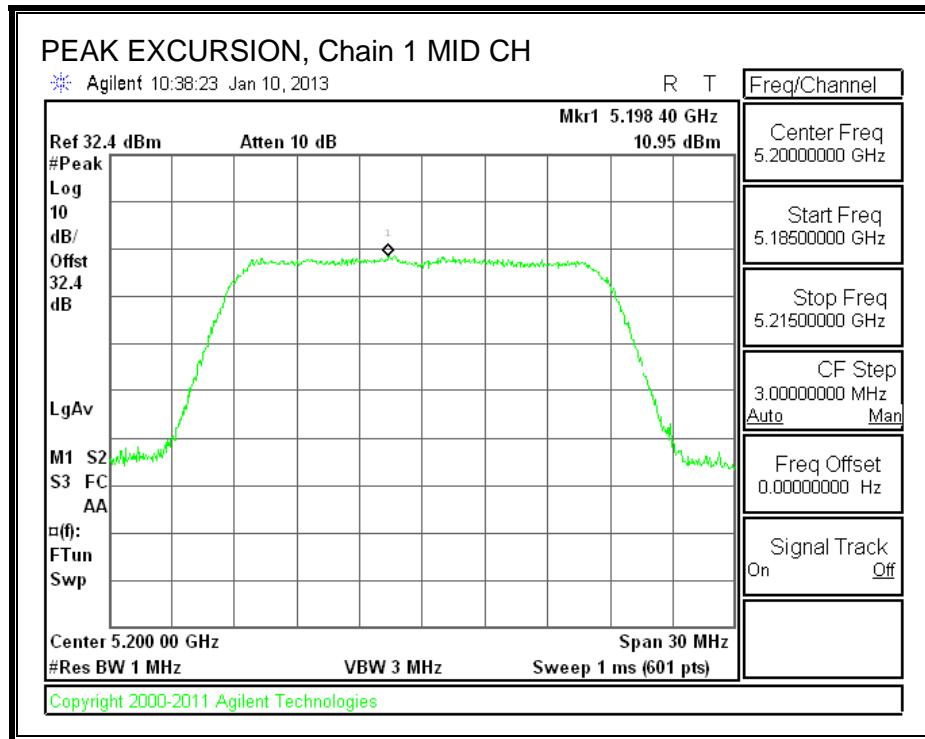
Chain 1

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

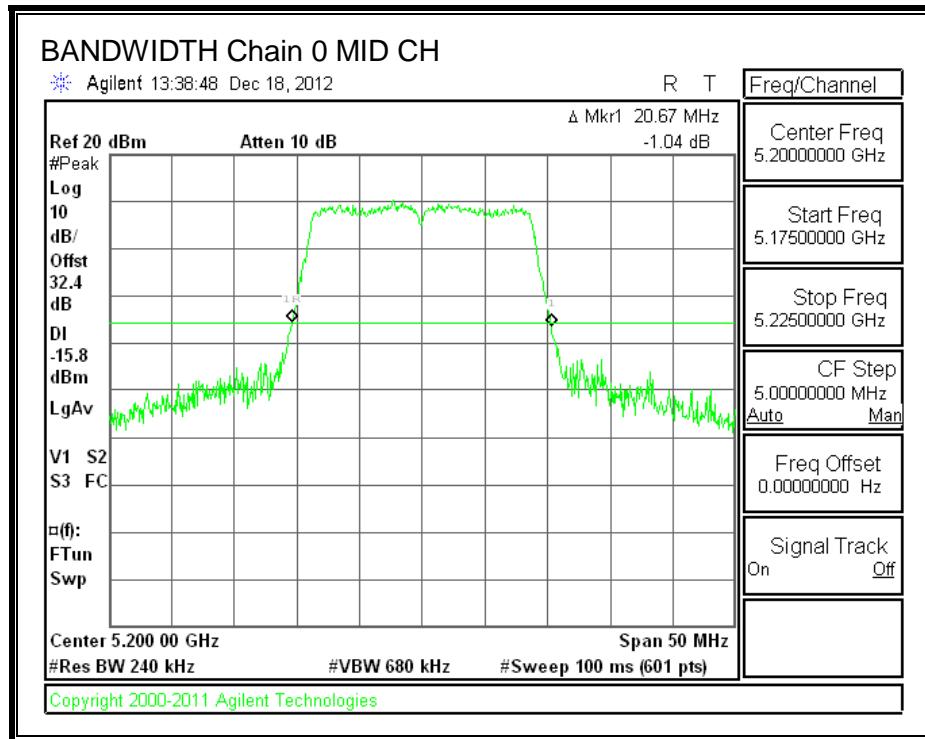
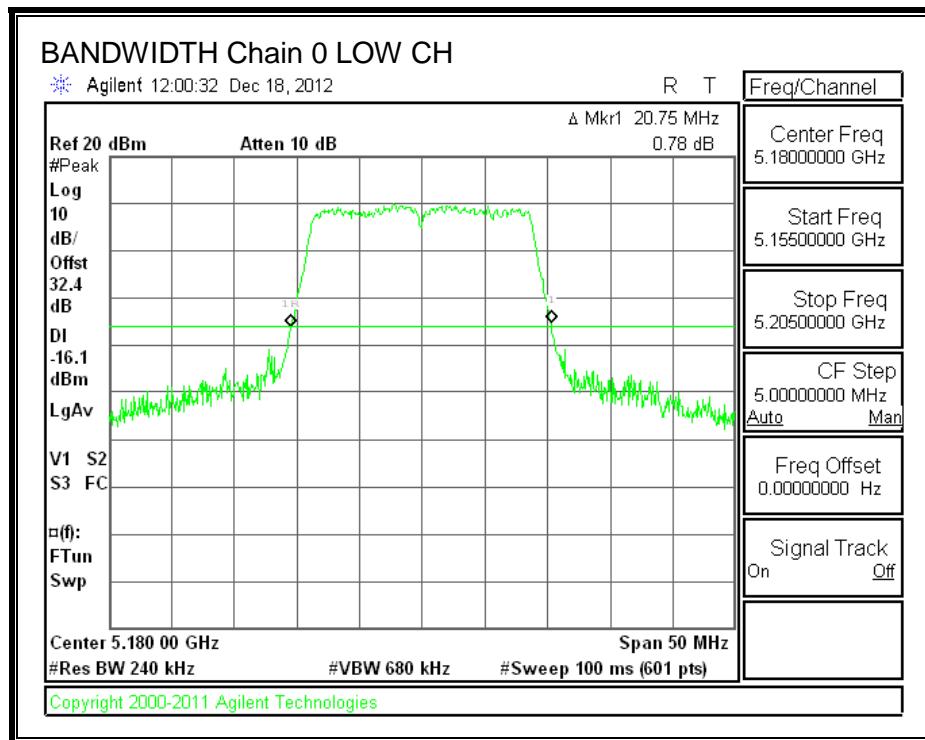
#### LIMITS

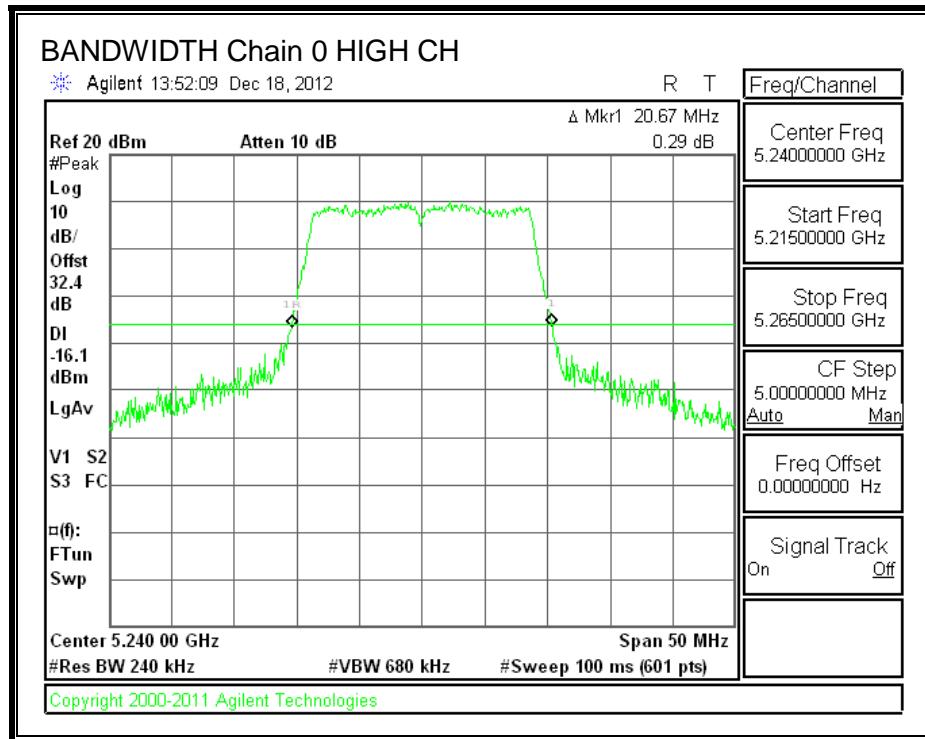
None; for reporting purposes only.

#### RESULTS

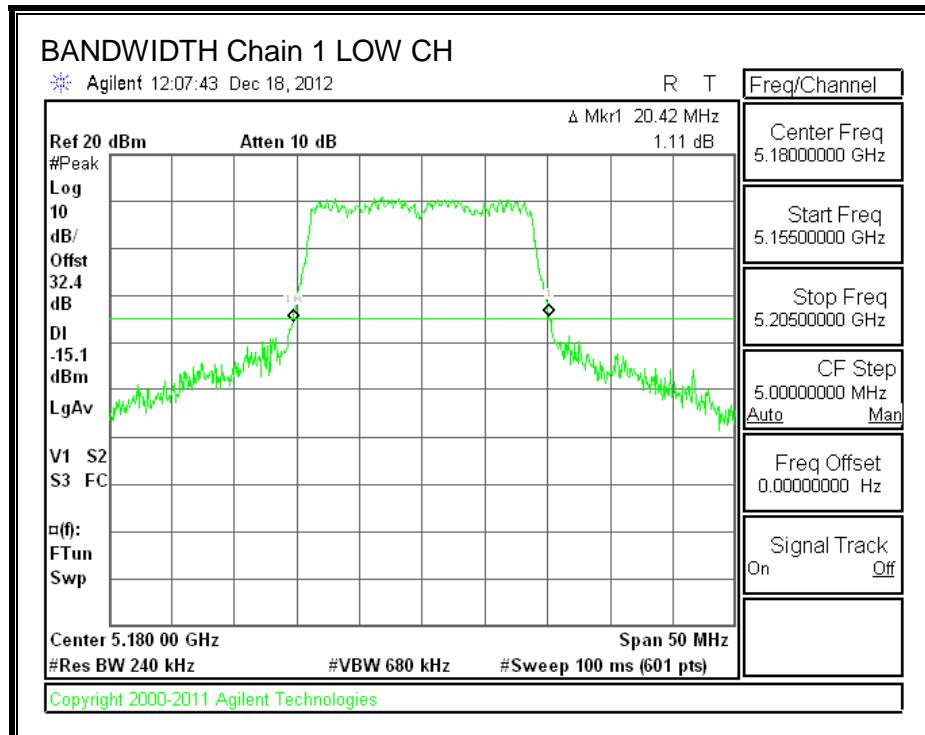
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	20.75	20.42	20.67
Mid	5200	20.67	20.50	20.67
High	5240	20.67	20.50	20.92

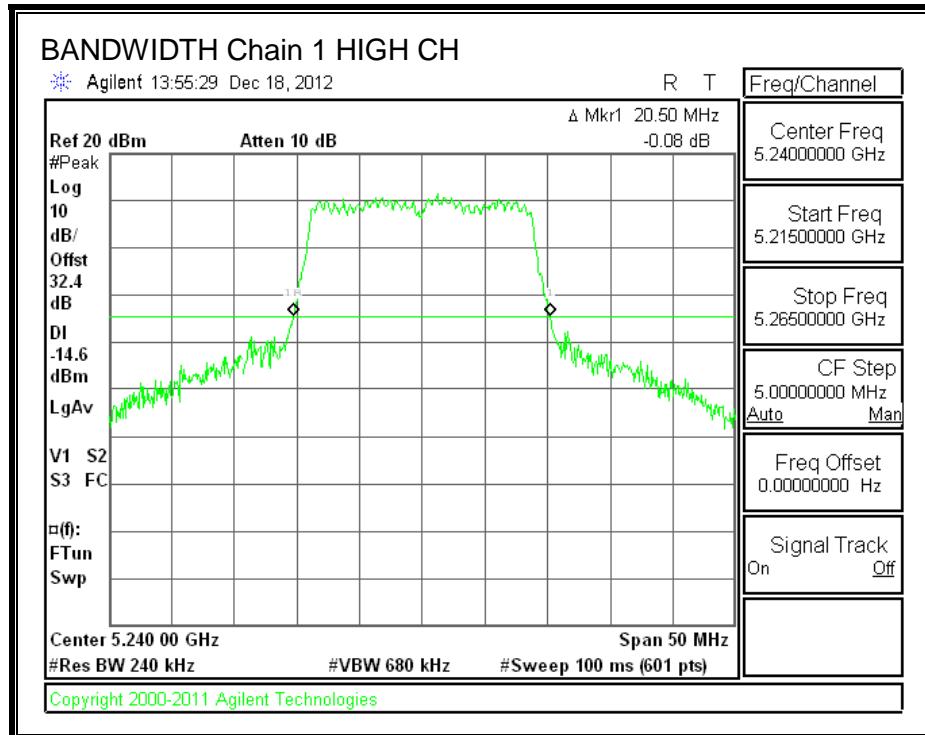
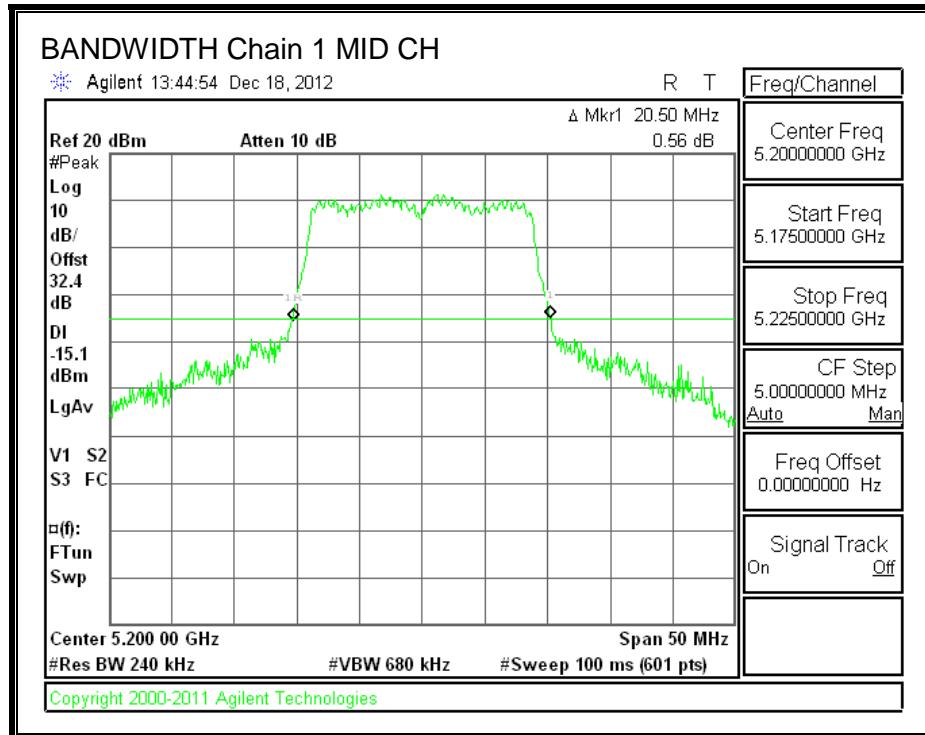
**26 dB BANDWIDTH, Chain 0**



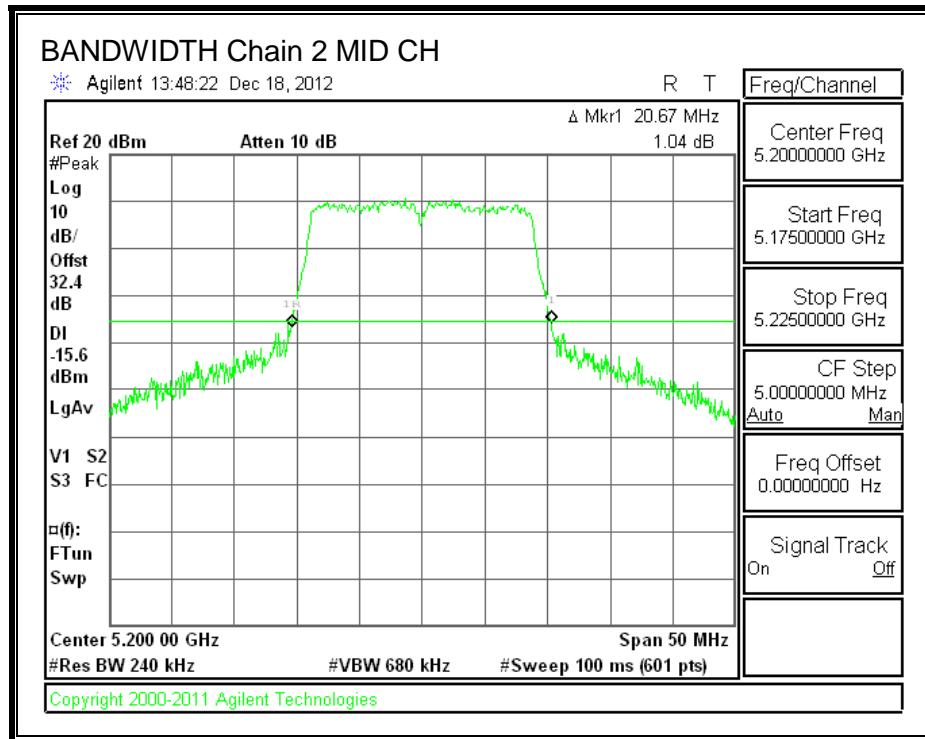
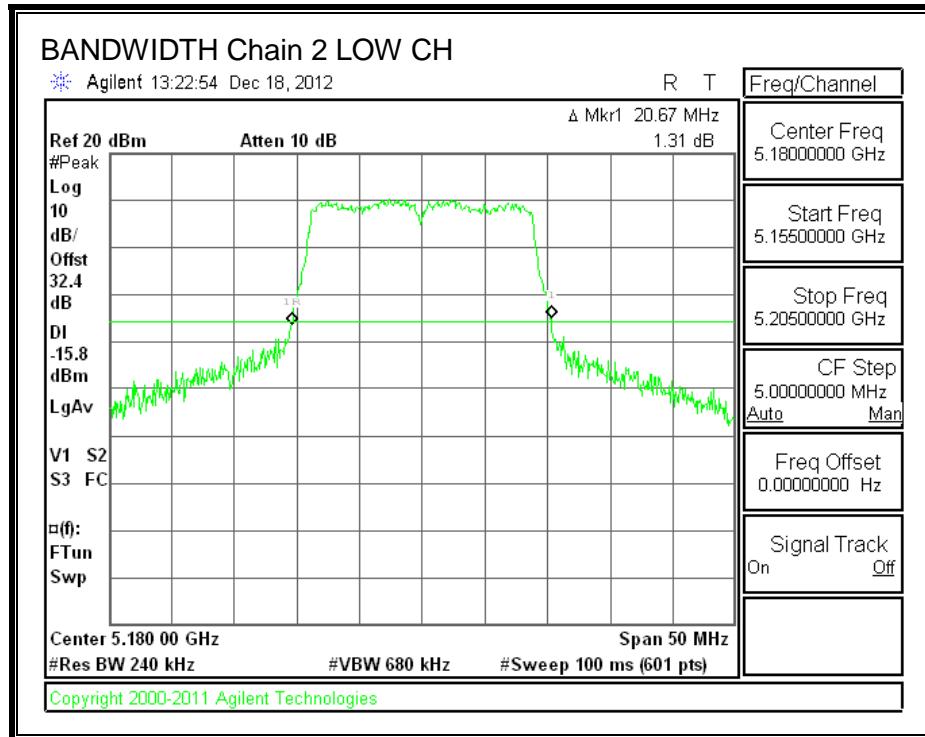


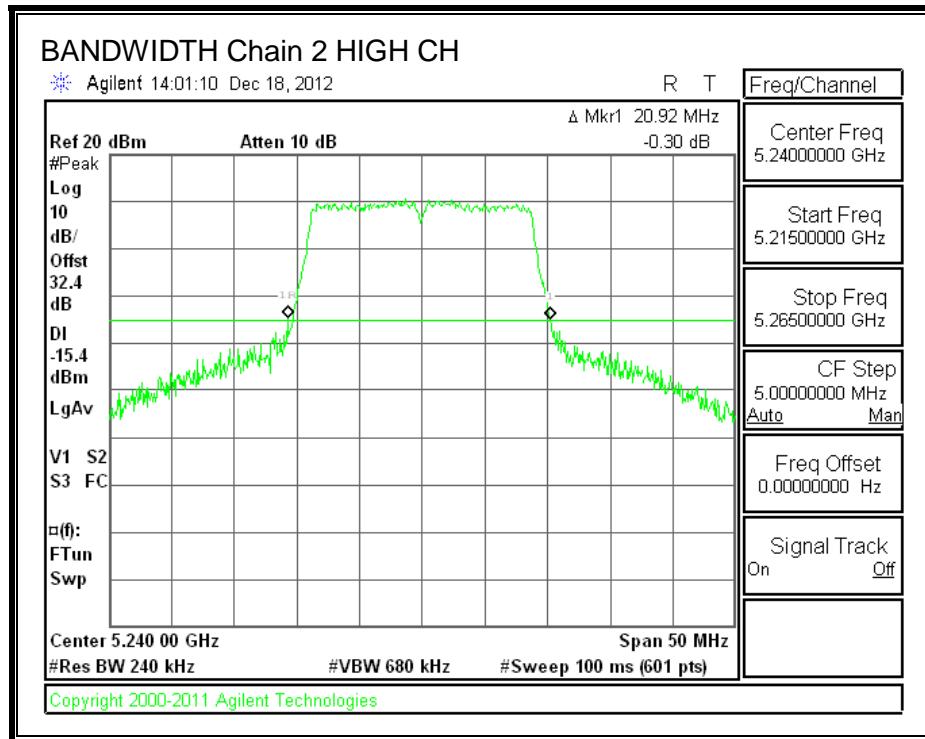
## 26 dB BANDWIDTH, Chain 1





**26 dB BANDWIDTH, Chain 2**





### 8.5.2. 99% BANDWIDTH

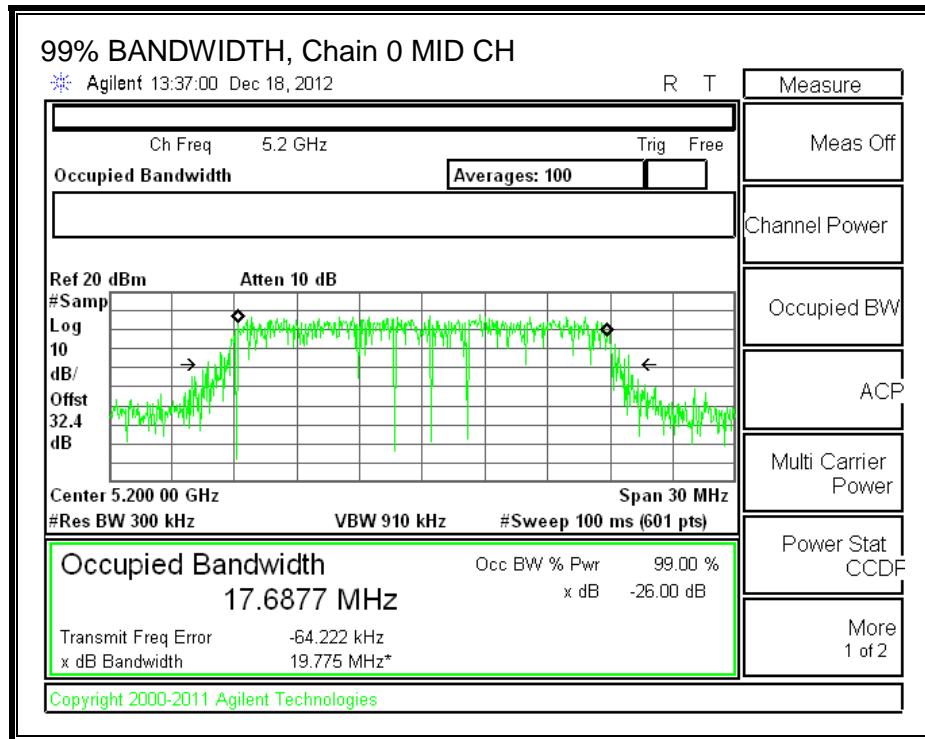
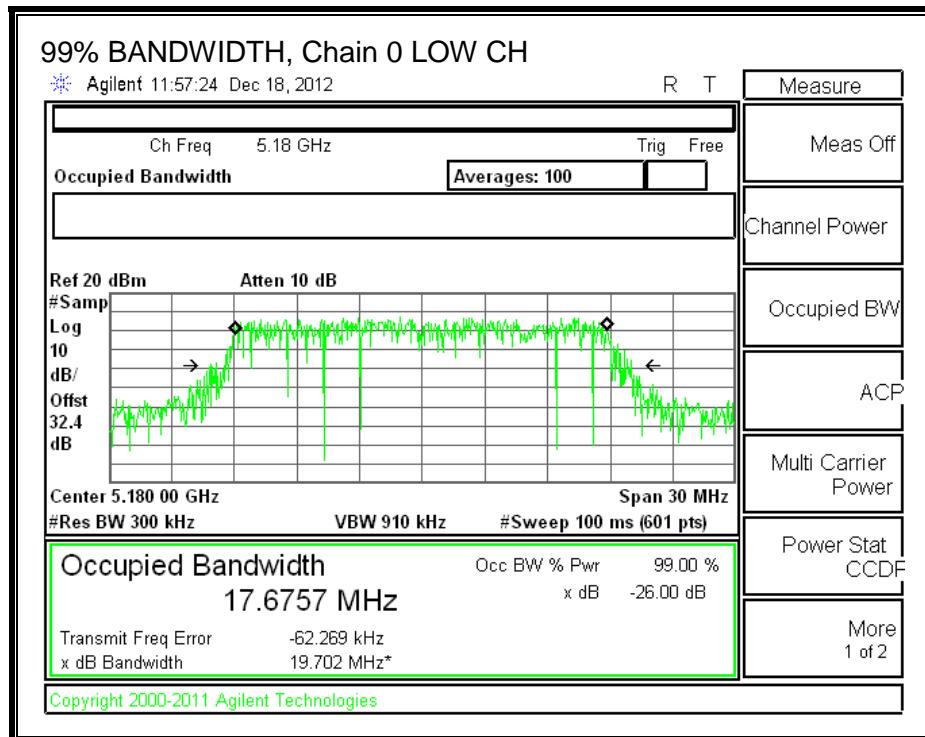
#### LIMITS

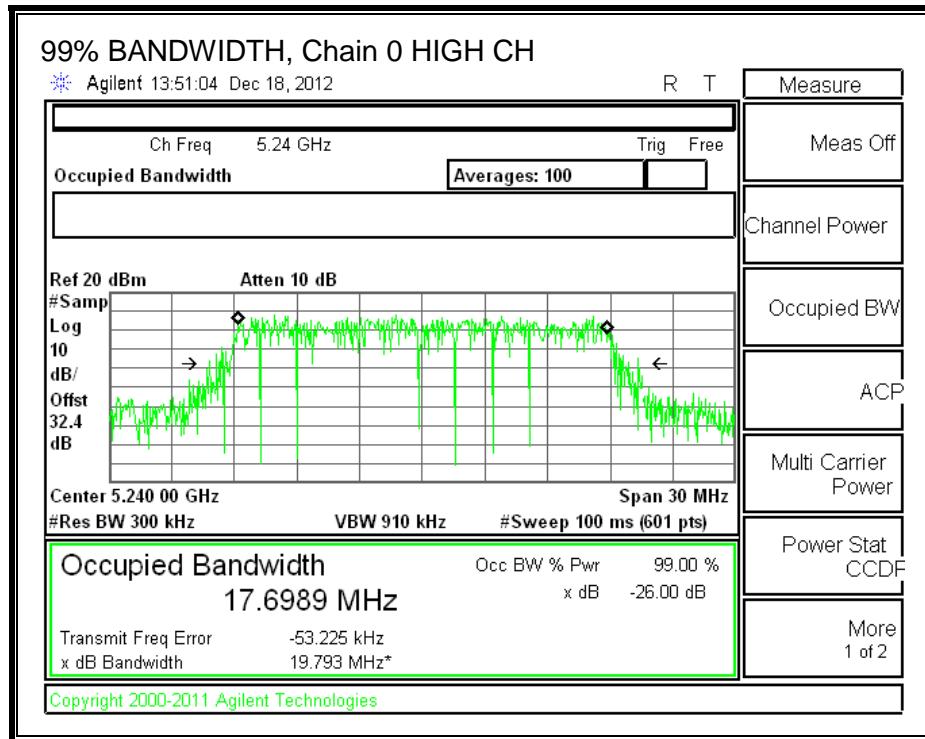
None; for reporting purposes only.

#### RESULTS

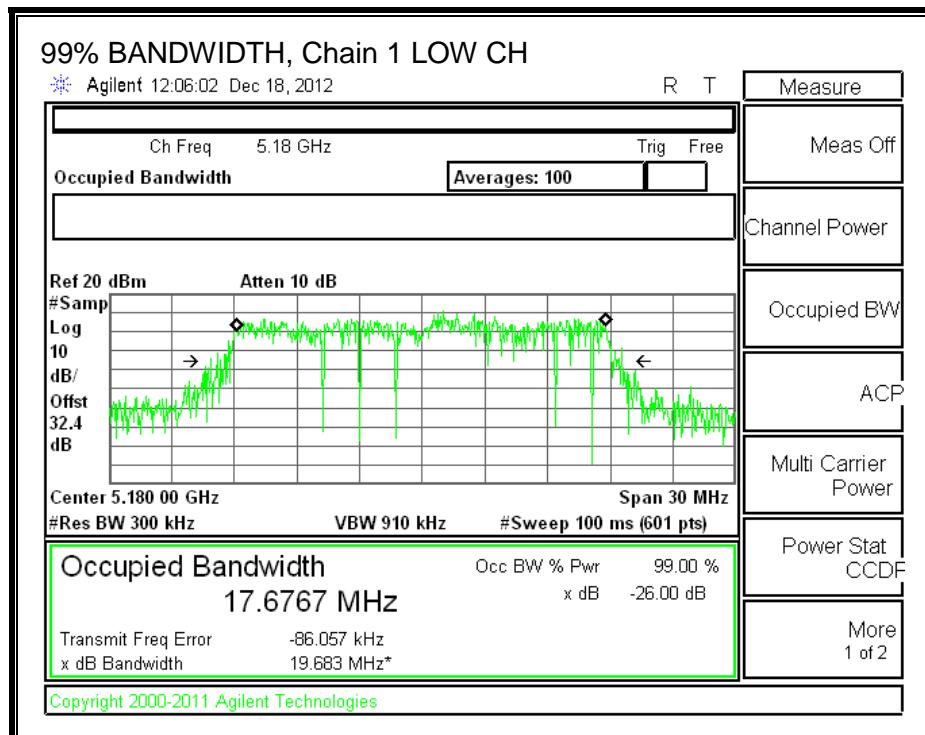
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5180	17.6757	17.6767	17.6812
Mid	5200	17.6877	17.6801	17.6888
High	5240	17.6989	17.6850	17.6956

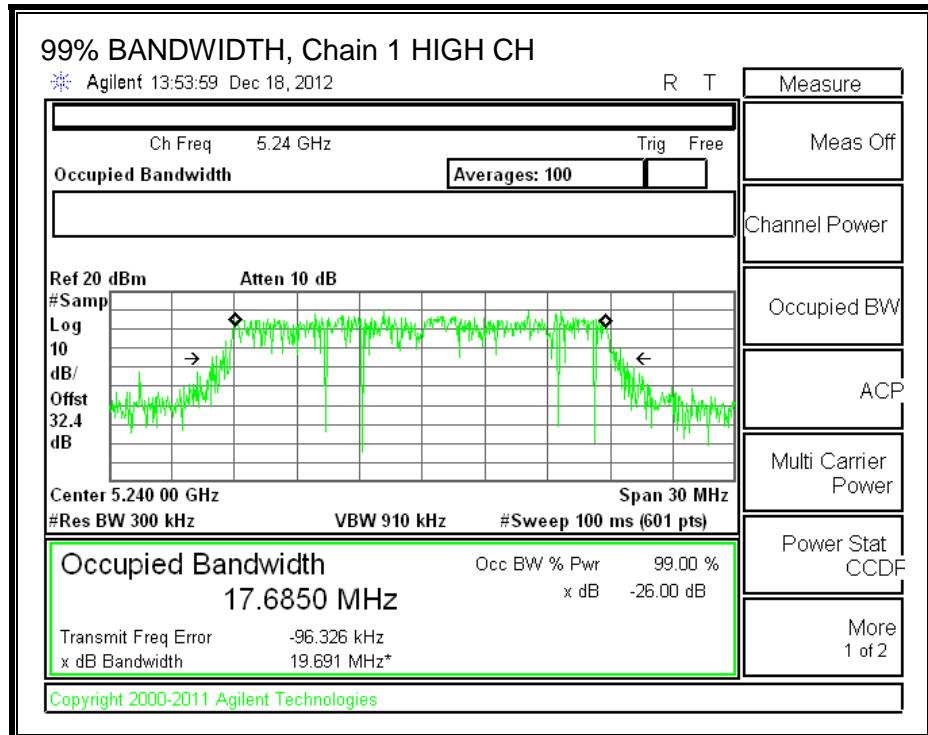
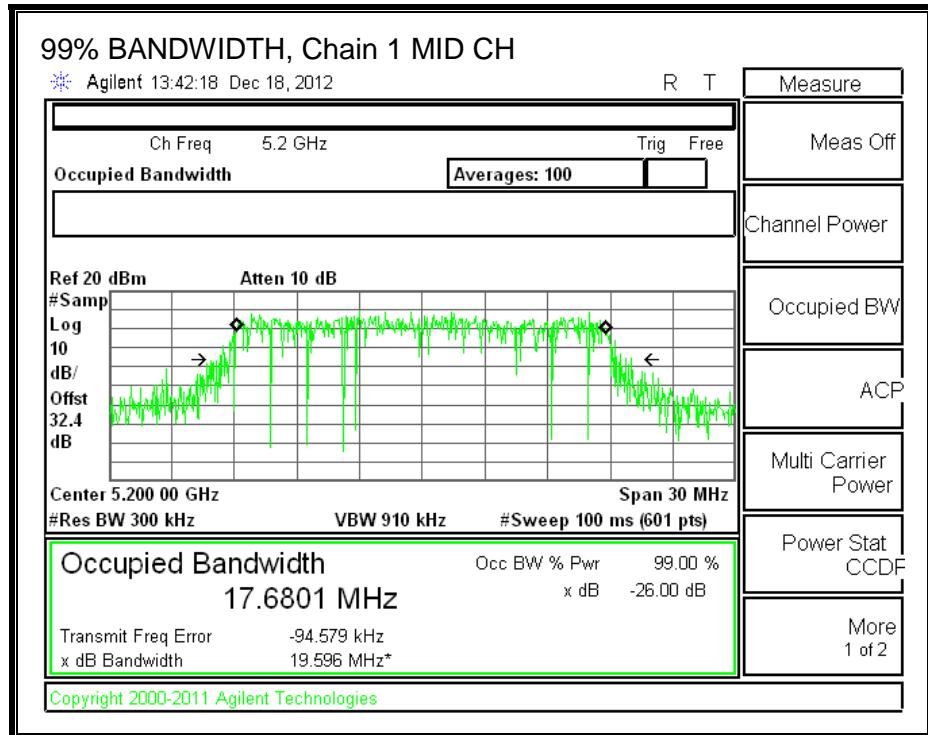
**99% BANDWIDTH, Chain 0**



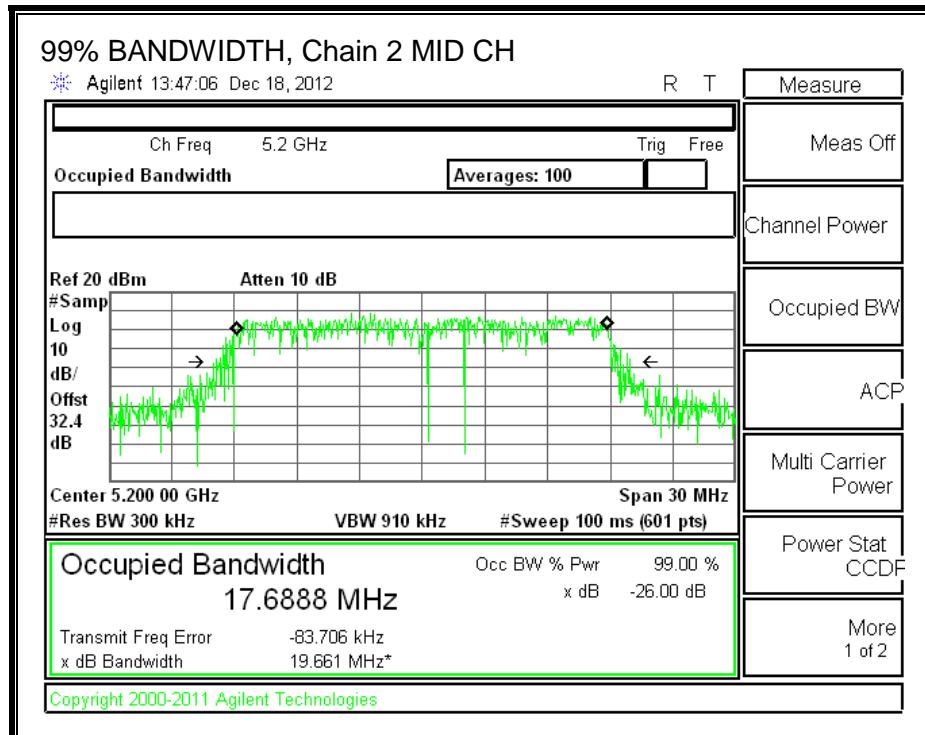
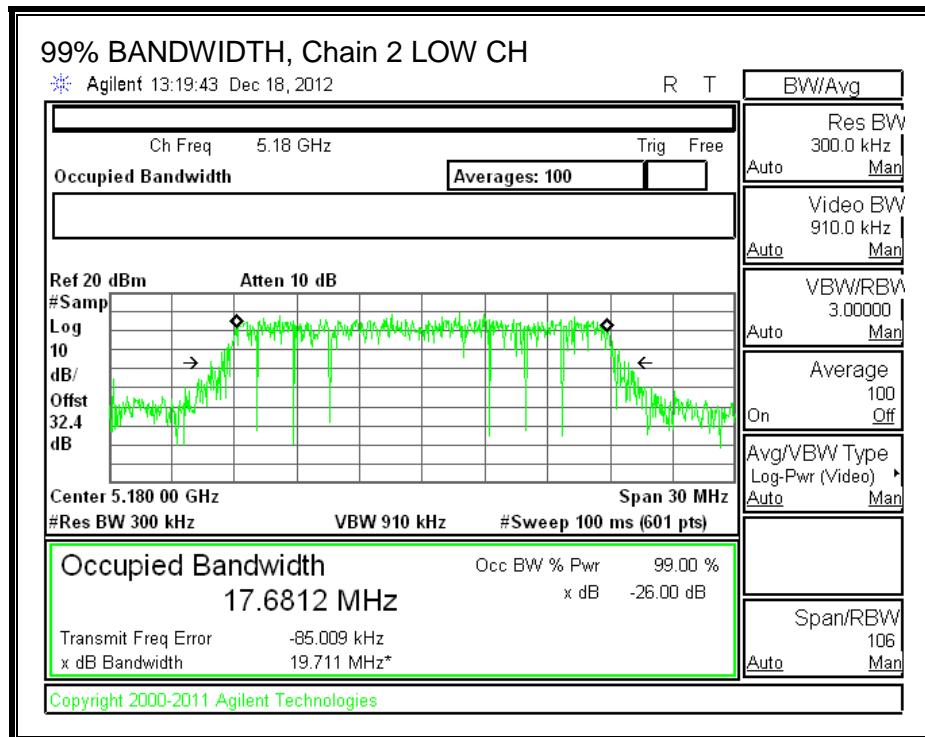


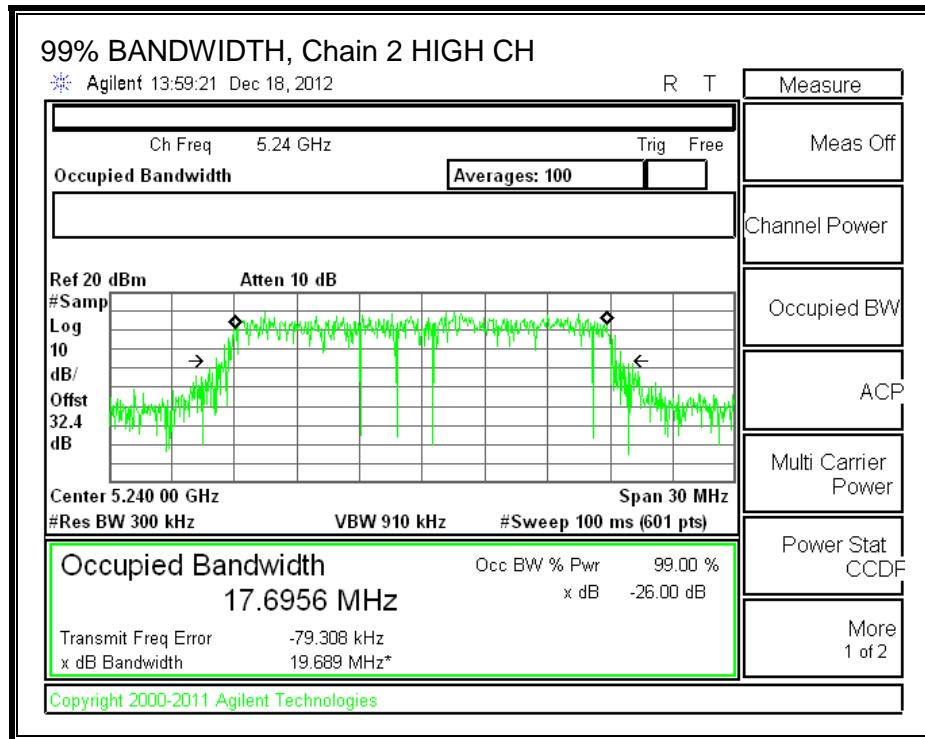
### **99% BANDWIDTH, Chain 1**





**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  $4 \text{ dBm} + 10 \log B$ , 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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Directional Gain (dBi)	Uncorrelated Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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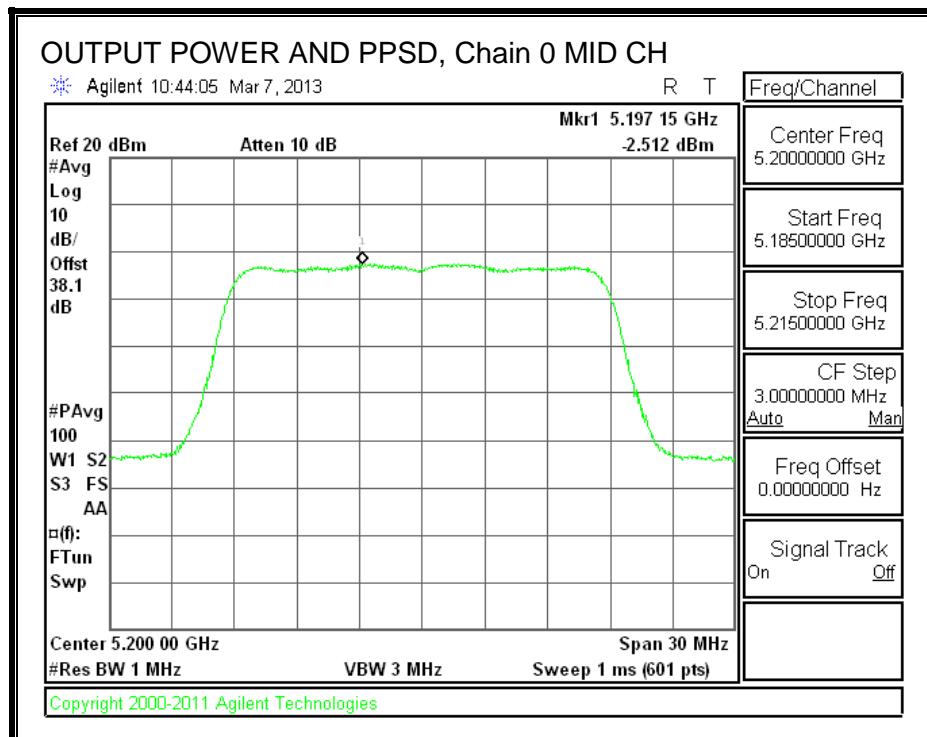
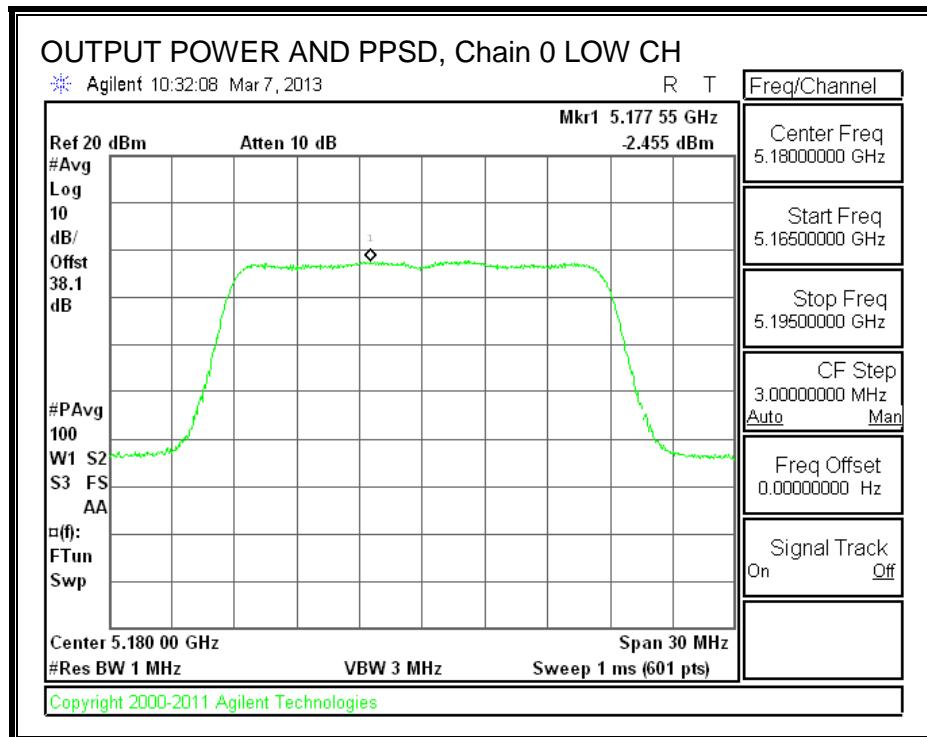
### Output Power Results

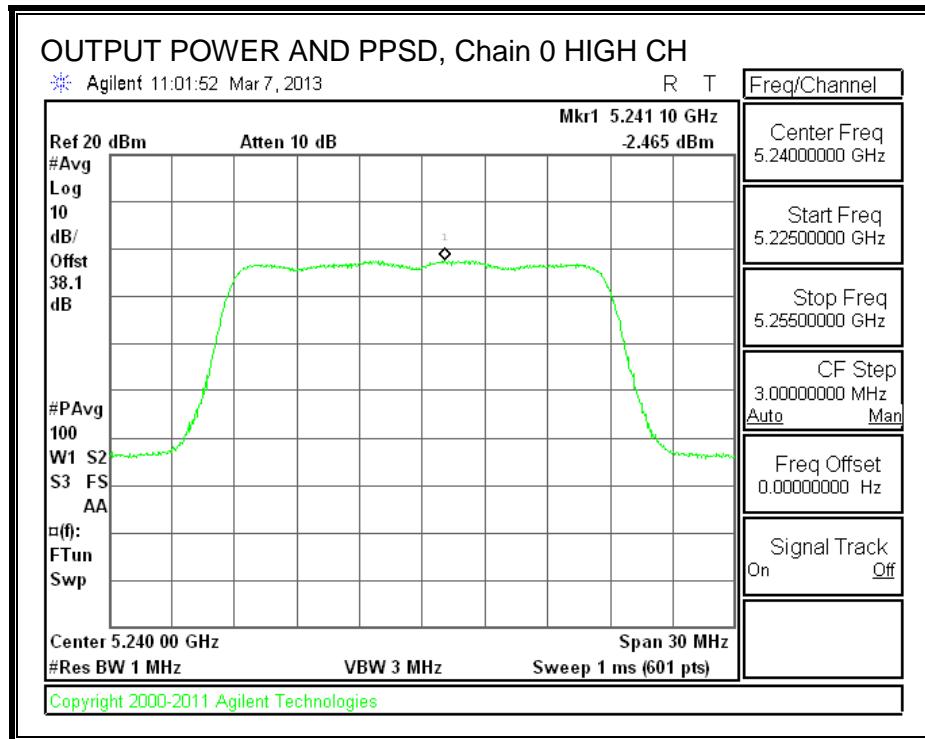
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	7.10	7.10	7.40	11.97	17.00	-5.03
Mid	5200	7.06	7.30	7.42	12.03	17.00	-4.97
High	5240	7.15	7.31	7.66	12.15	17.00	-4.85

### PSD Results

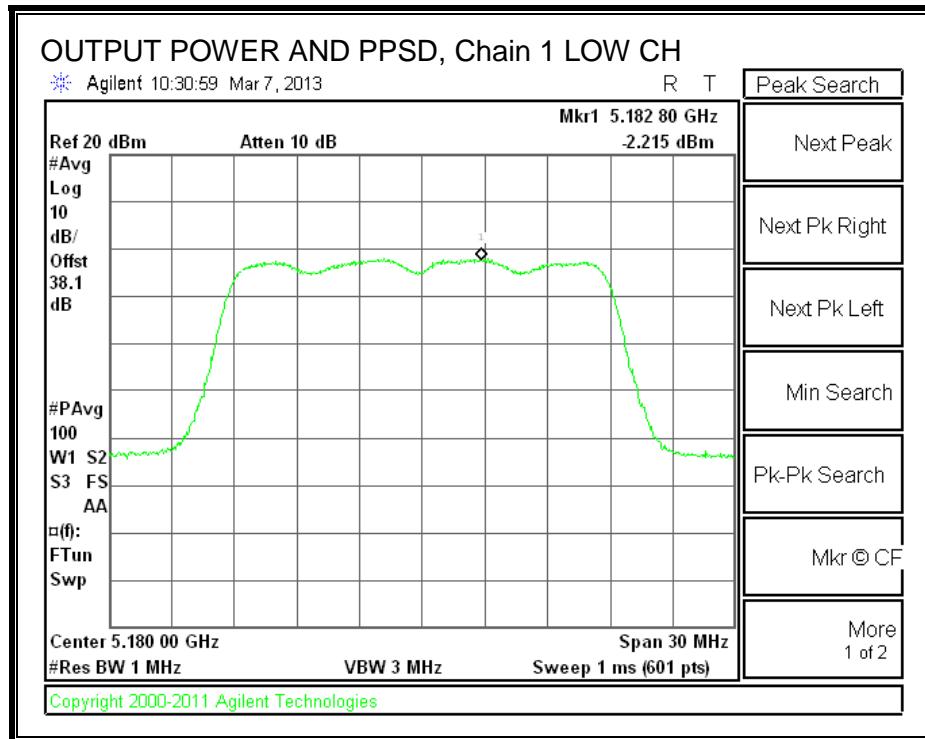
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	-2.455	-2.215	-1.661	2.67	2.93	-0.26
Mid	5200	-2.512	-2.098	-2.077	2.55	2.93	-0.38
High	5240	-2.465	-1.885	-1.989	2.67	2.93	-0.26

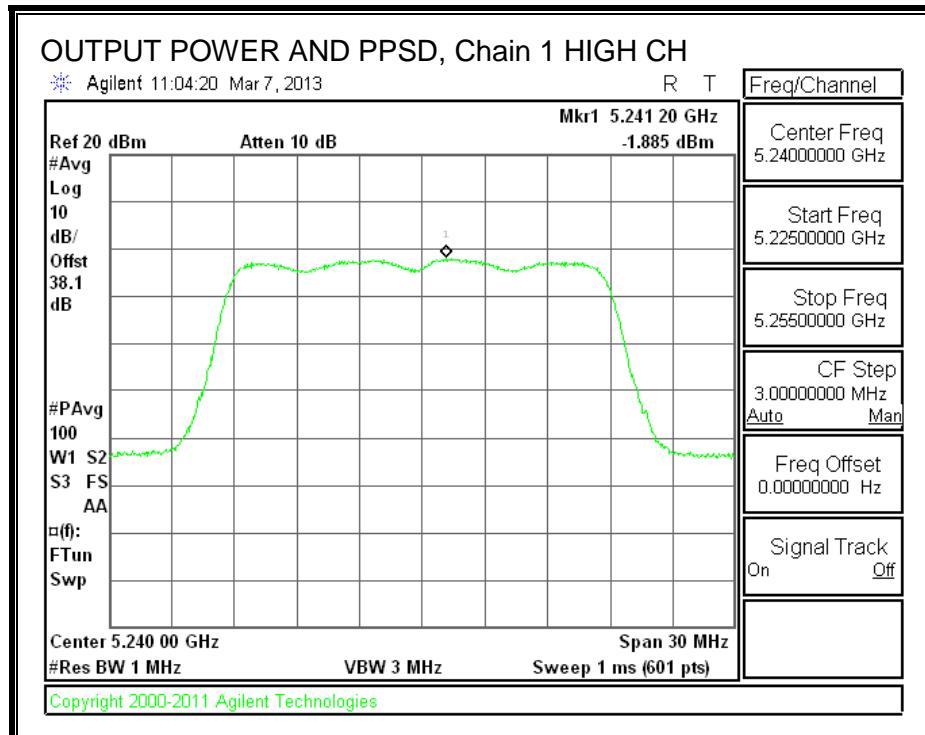
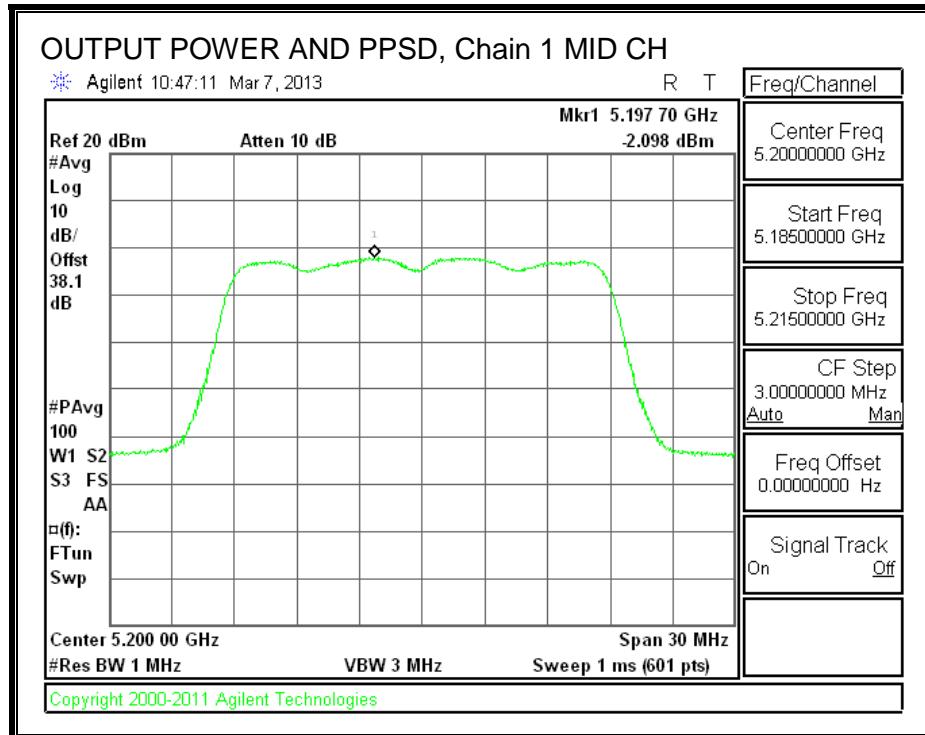
**OUTPUT POWER AND PPSD, Chain 0**



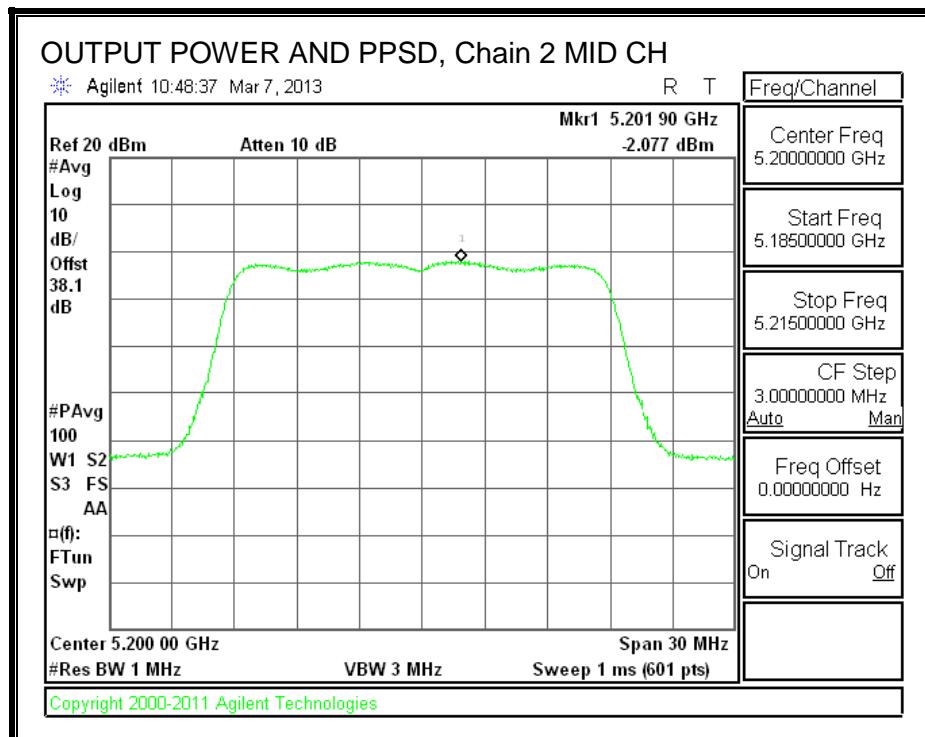
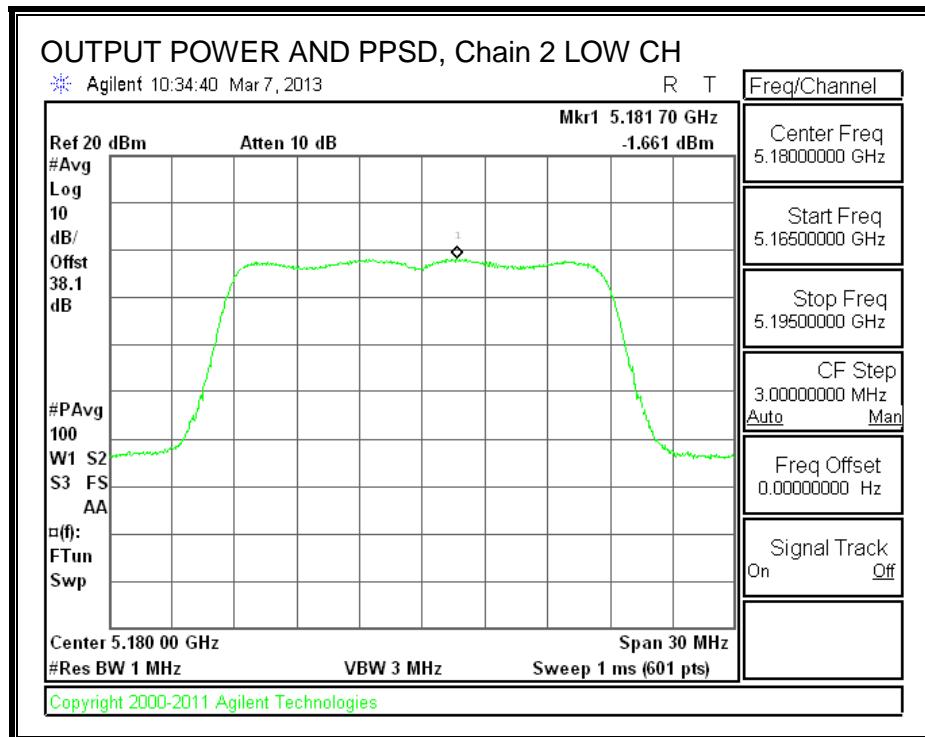


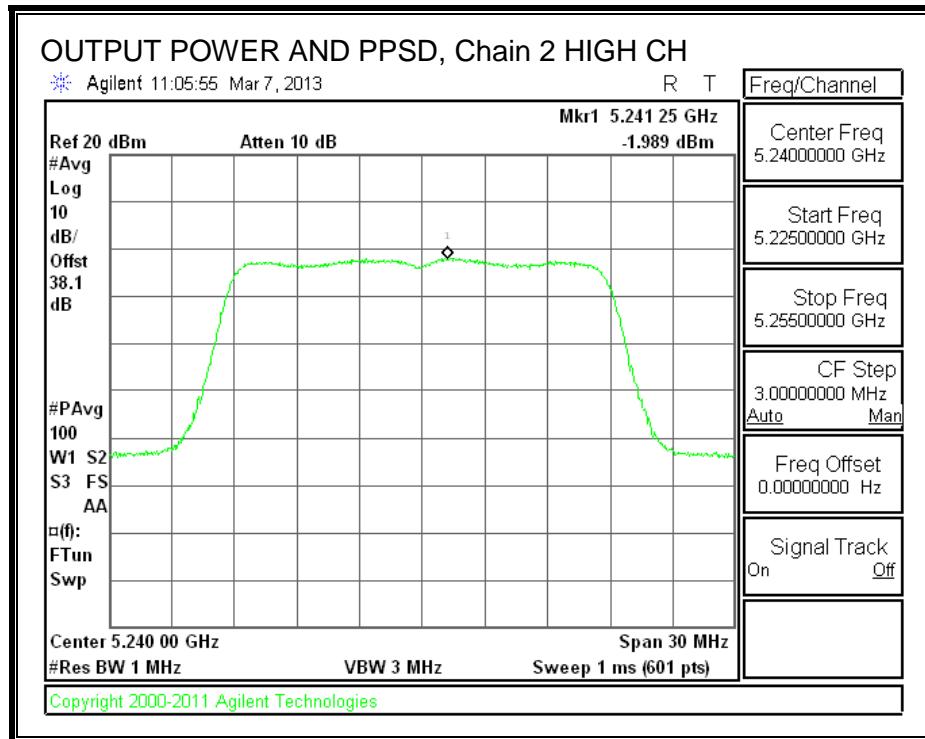
### OUTPUT POWER AND PPSD, Chain 1





**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

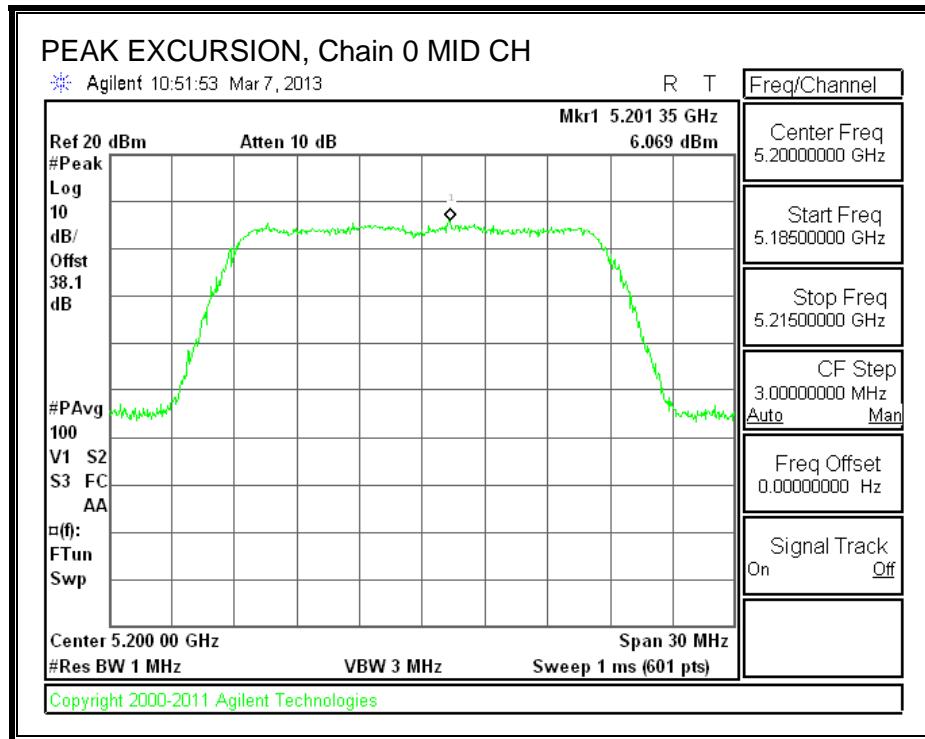
Chain 1

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

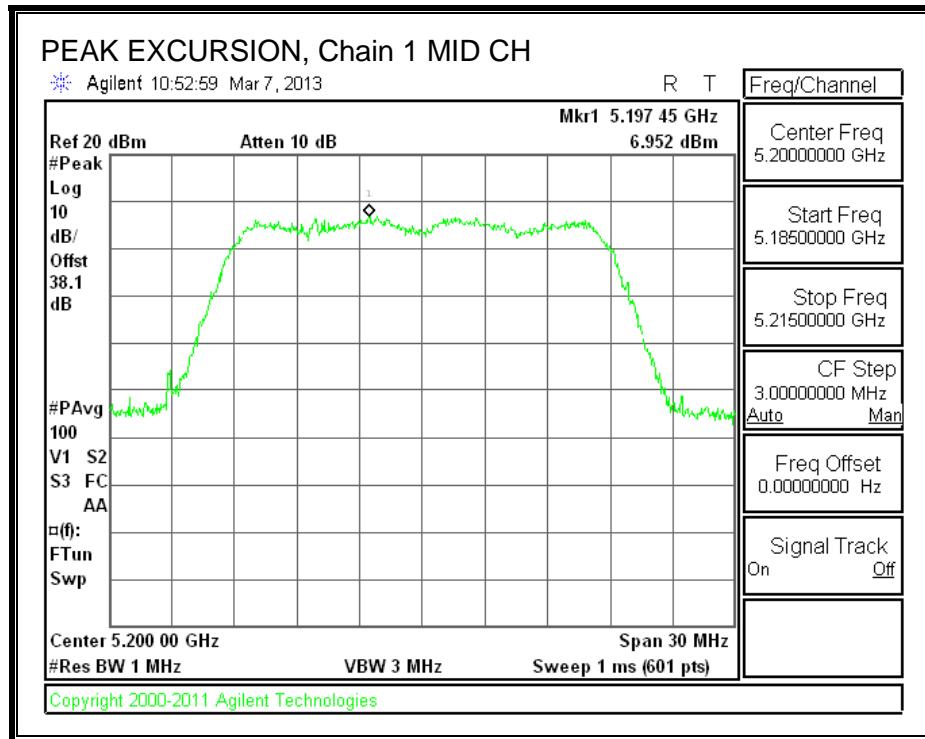
Chain 2

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

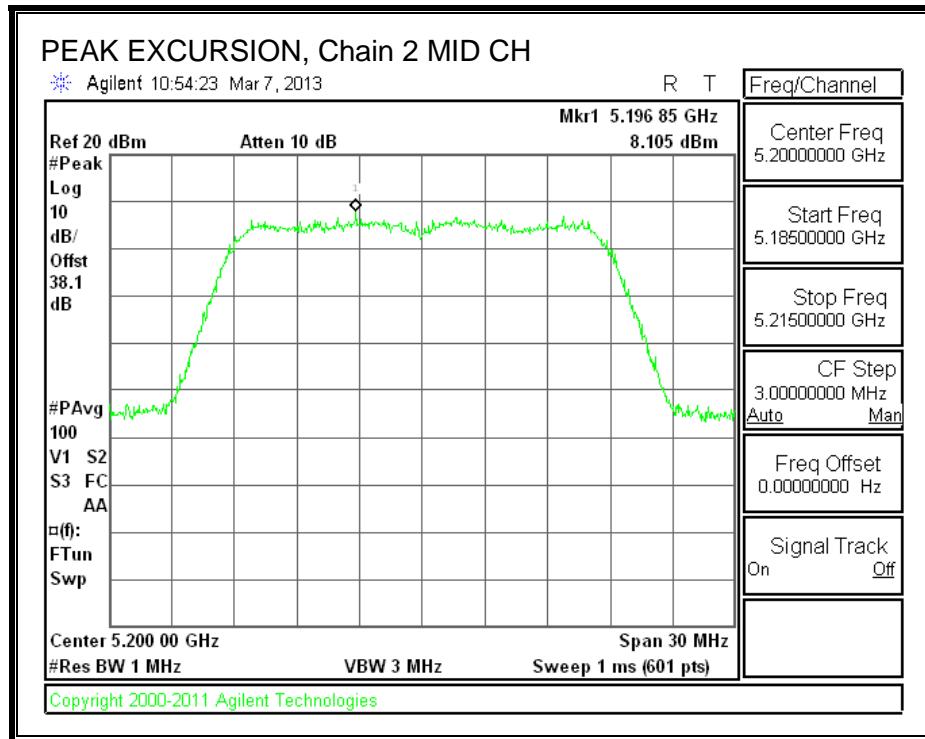
**PEAK EXCURSION, Chain 0**



**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Correlated Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (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	
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

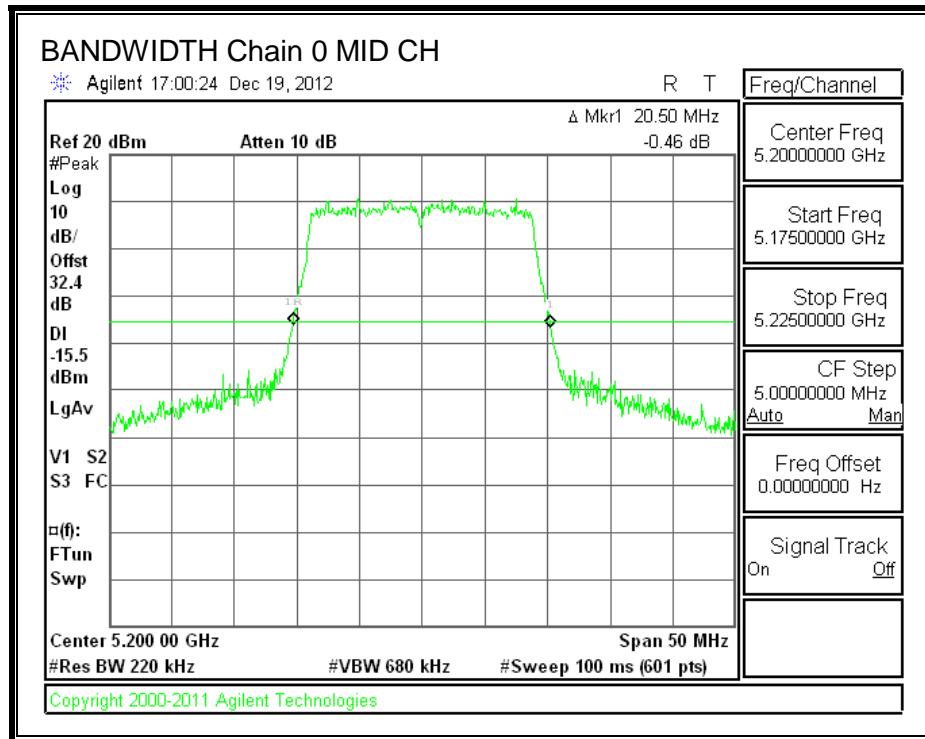
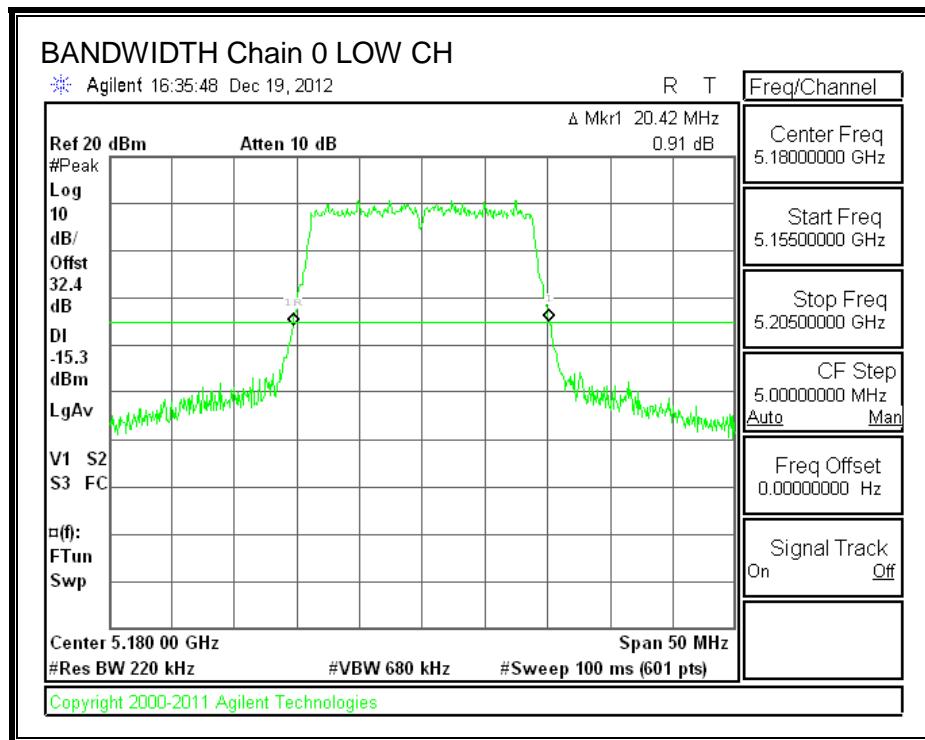
#### LIMITS

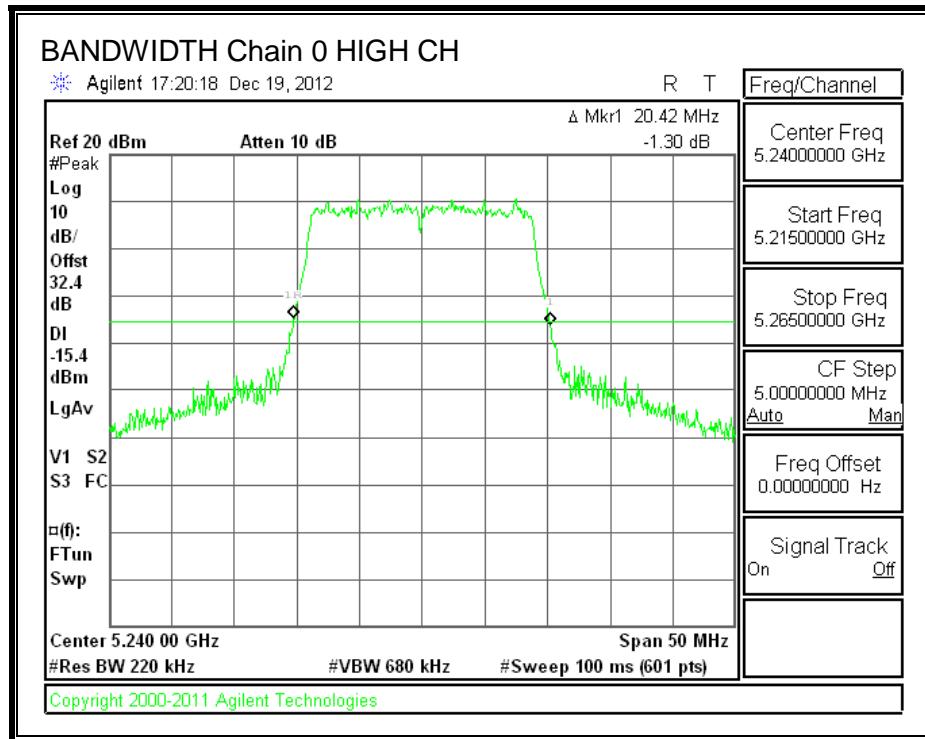
None; for reporting purposes only.

#### RESULTS

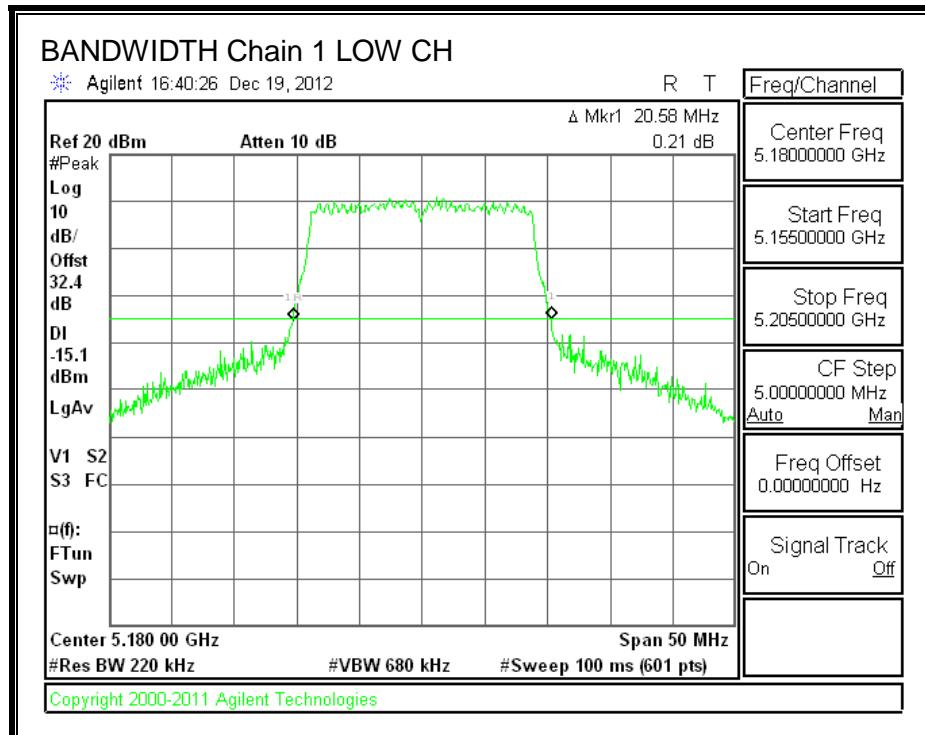
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	20.42	20.58	20.33
Mid	5200	20.50	20.67	20.42
High	5240	20.42	21.00	20.42

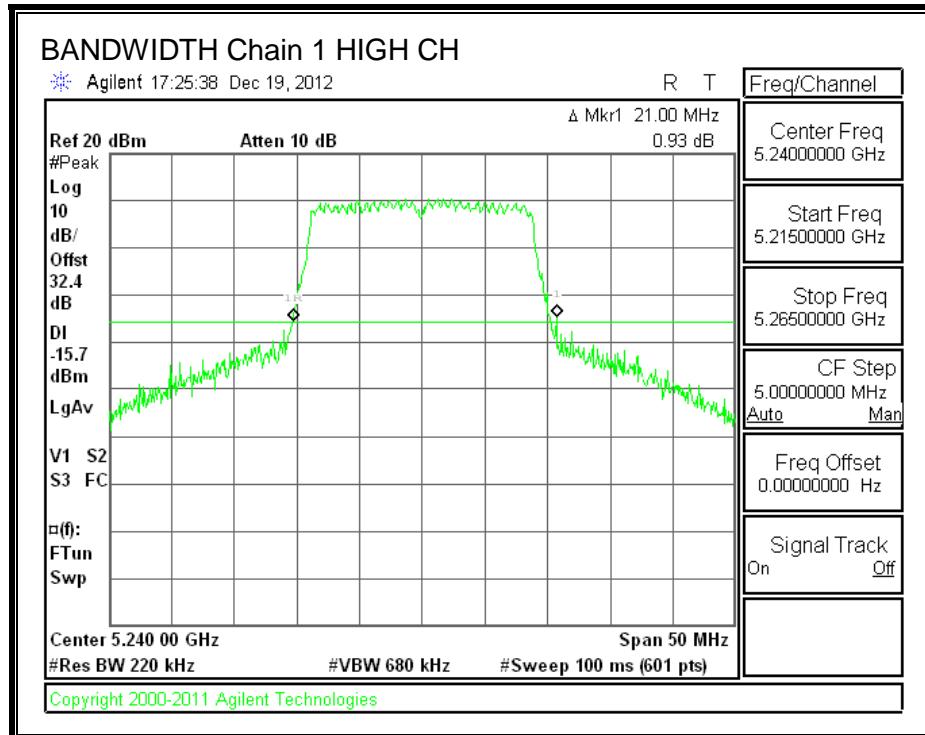
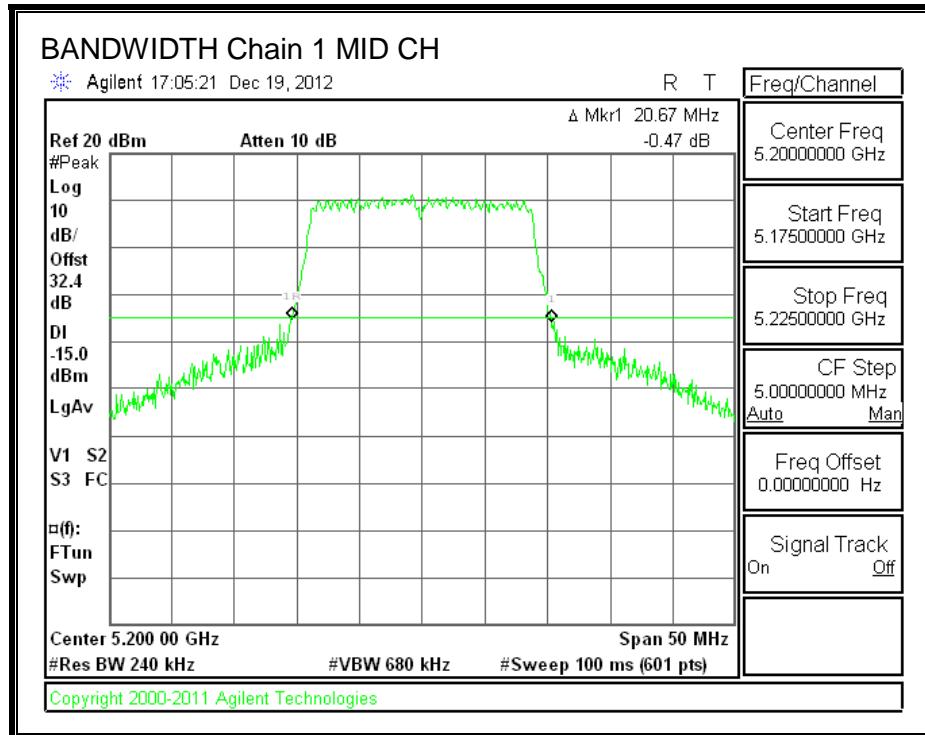
**26 dB BANDWIDTH, Chain 0**



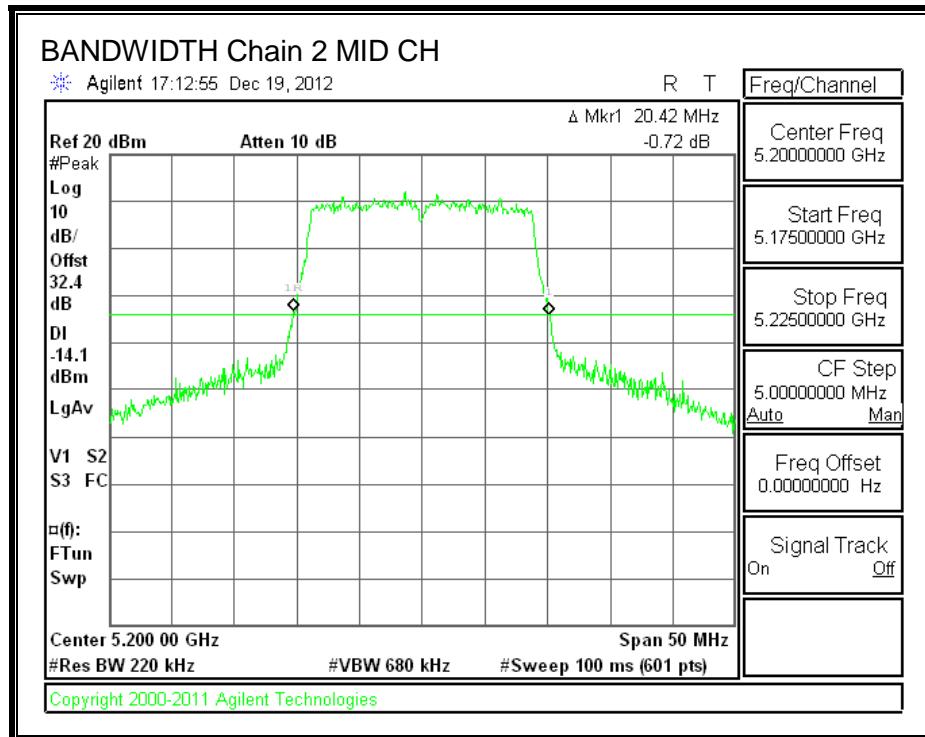
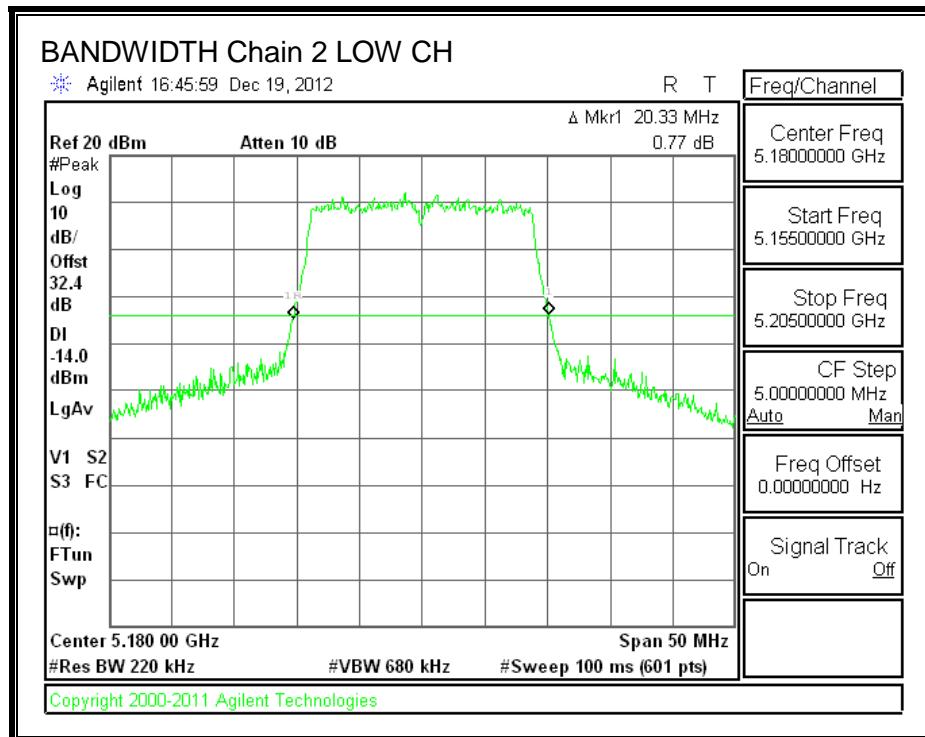


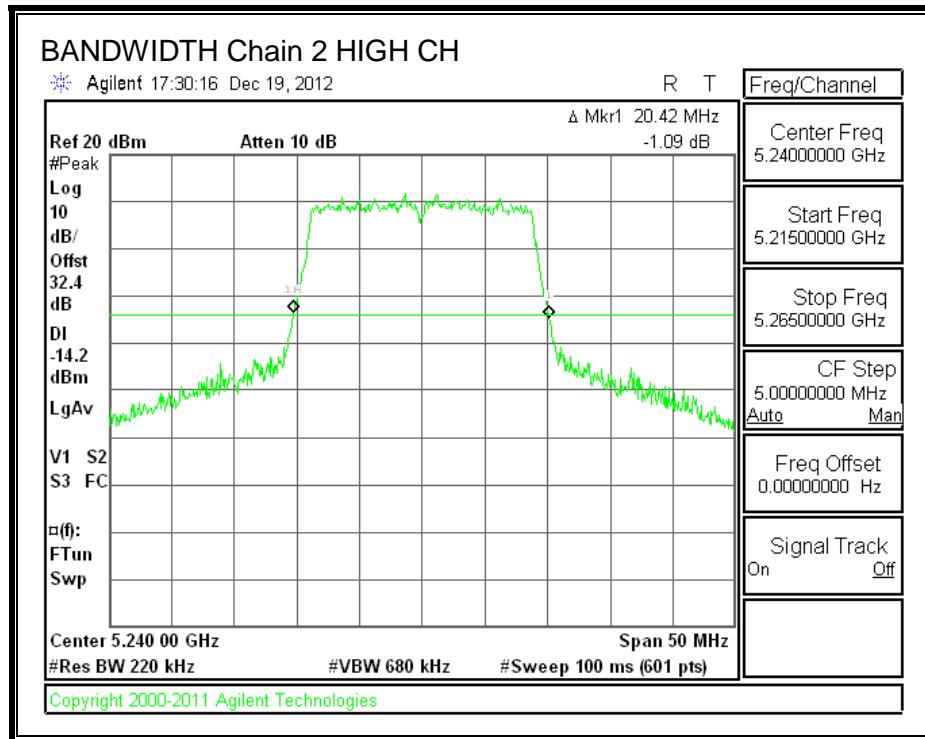
## 26 dB BANDWIDTH, Chain 1





**26 dB BANDWIDTH, Chain 2**





## 8.7.2. 99% BANDWIDTH

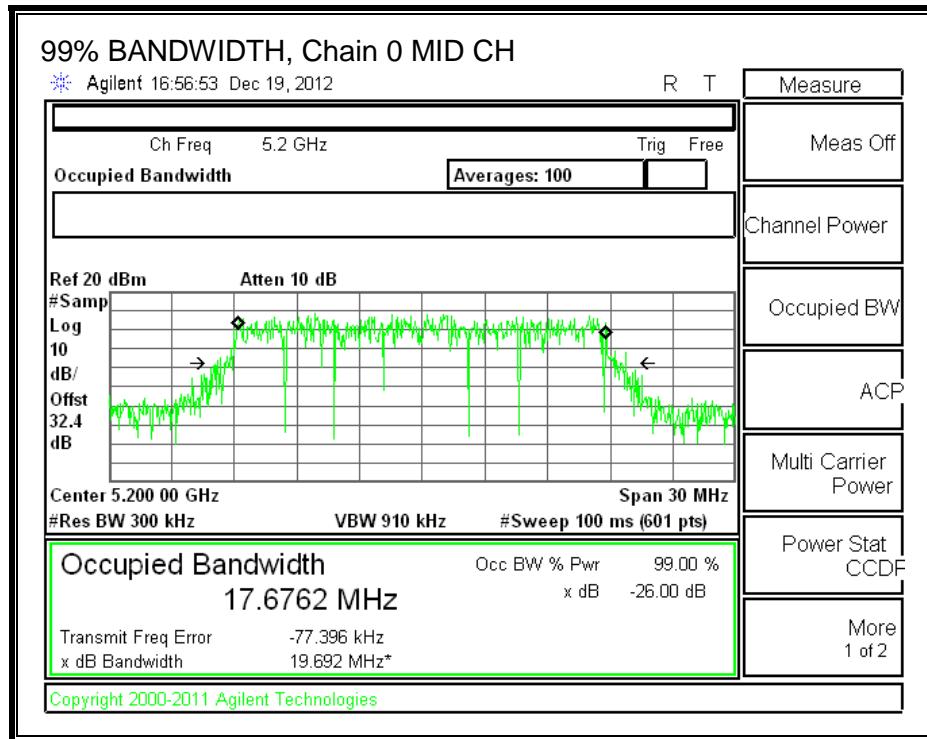
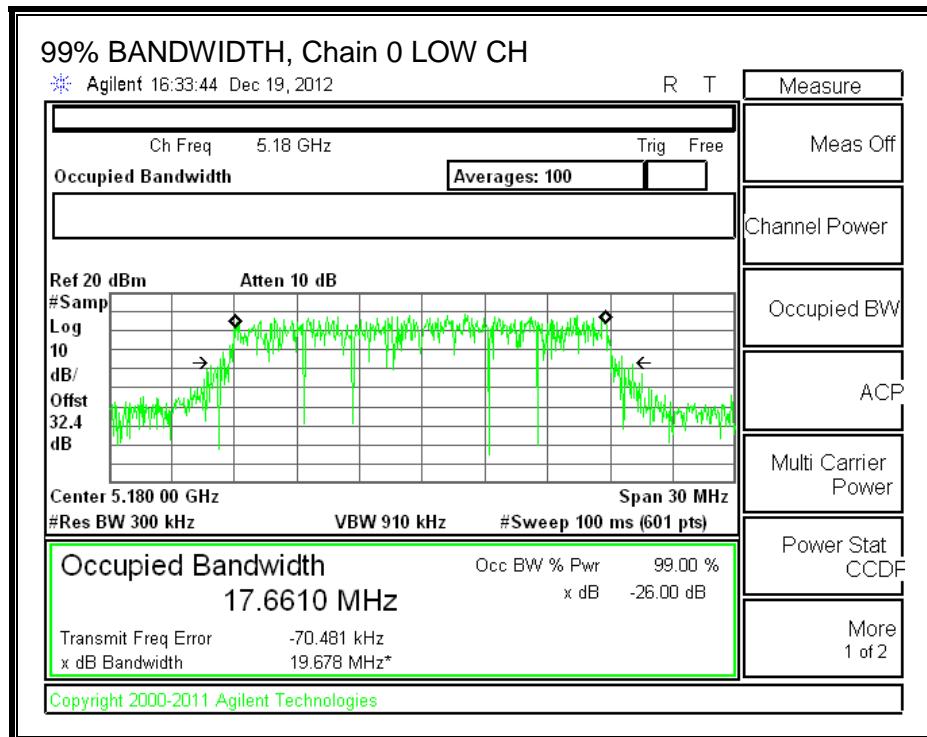
### LIMITS

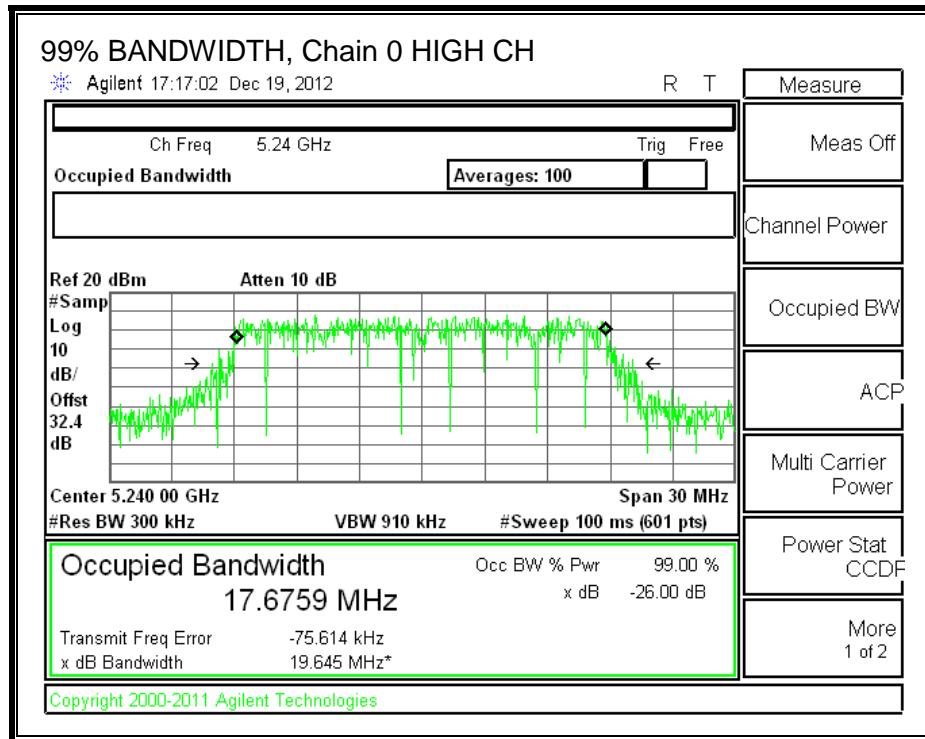
None; for reporting purposes only.

### RESULTS

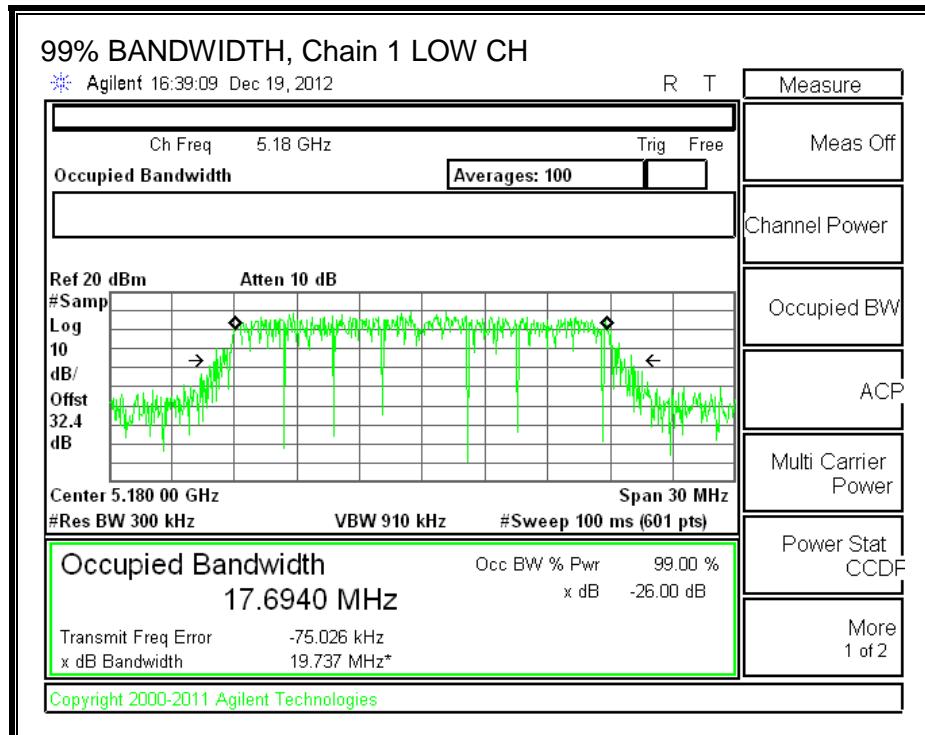
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5180	17.6610	17.6940	17.6556
Mid	5200	17.6762	17.6872	17.6725
High	5240	17.6759	17.6865	17.6673

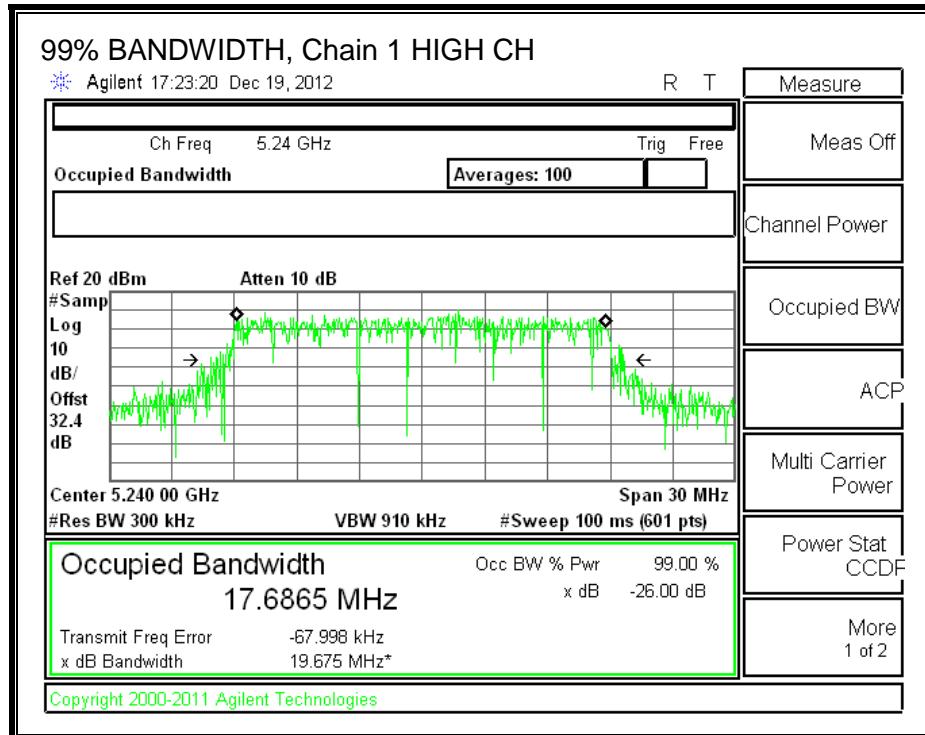
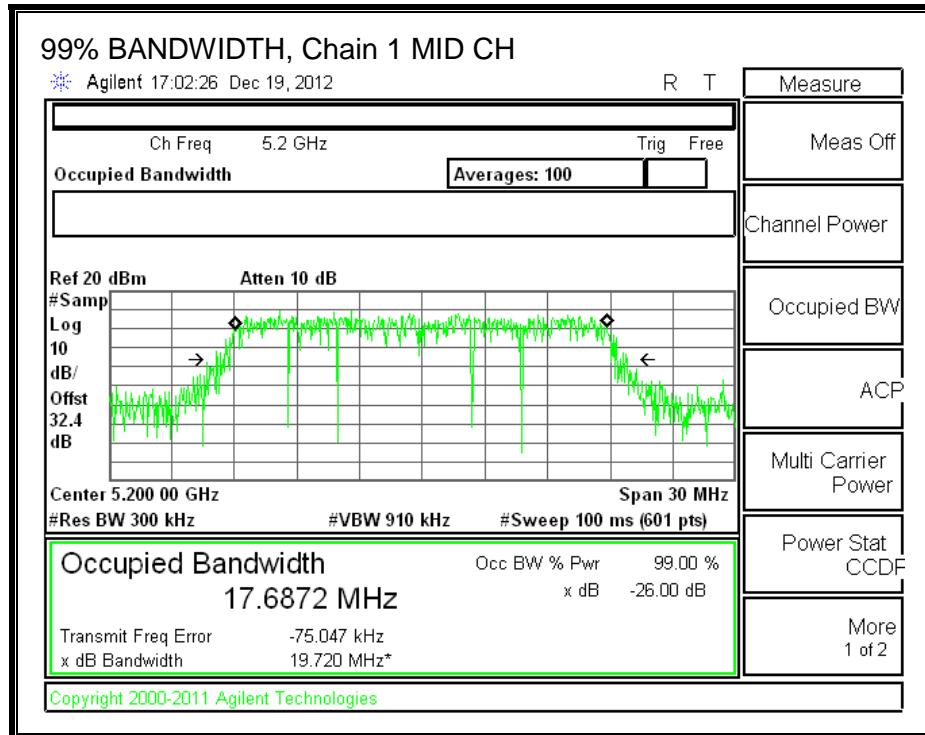
**99% BANDWIDTH, Chain 0**



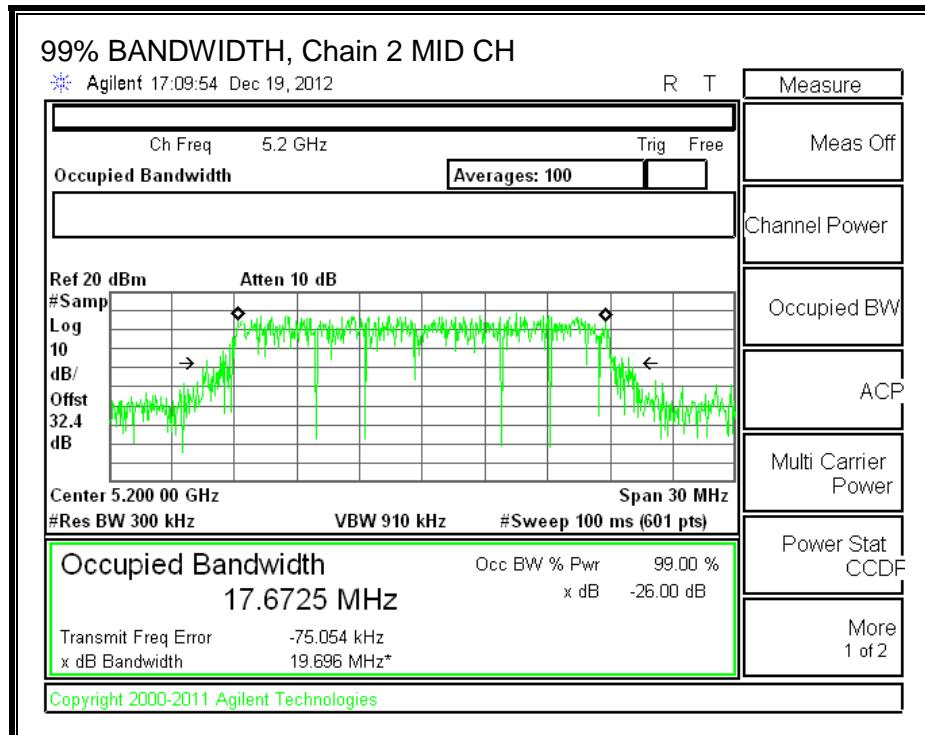
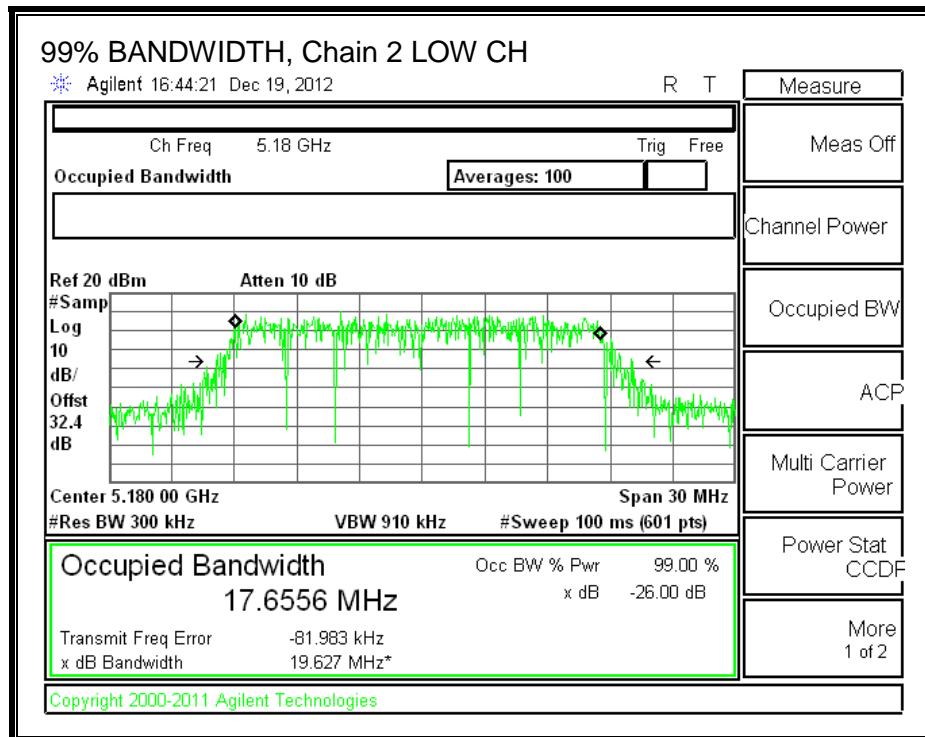


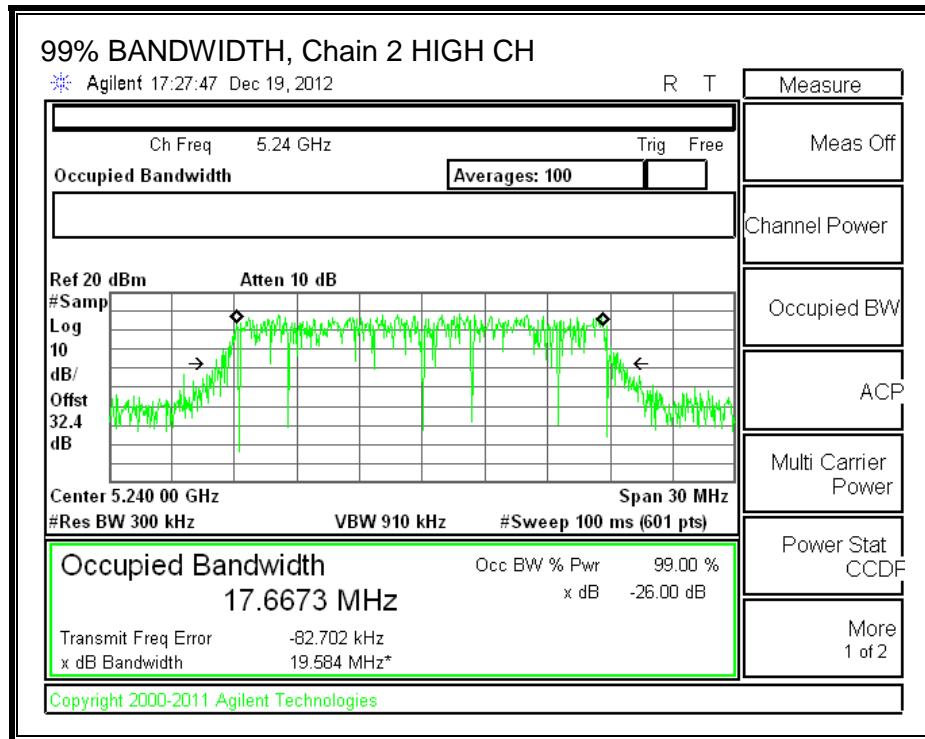
### **99% BANDWIDTH, Chain 1**





**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	1.40	2.20	2.33

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (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 (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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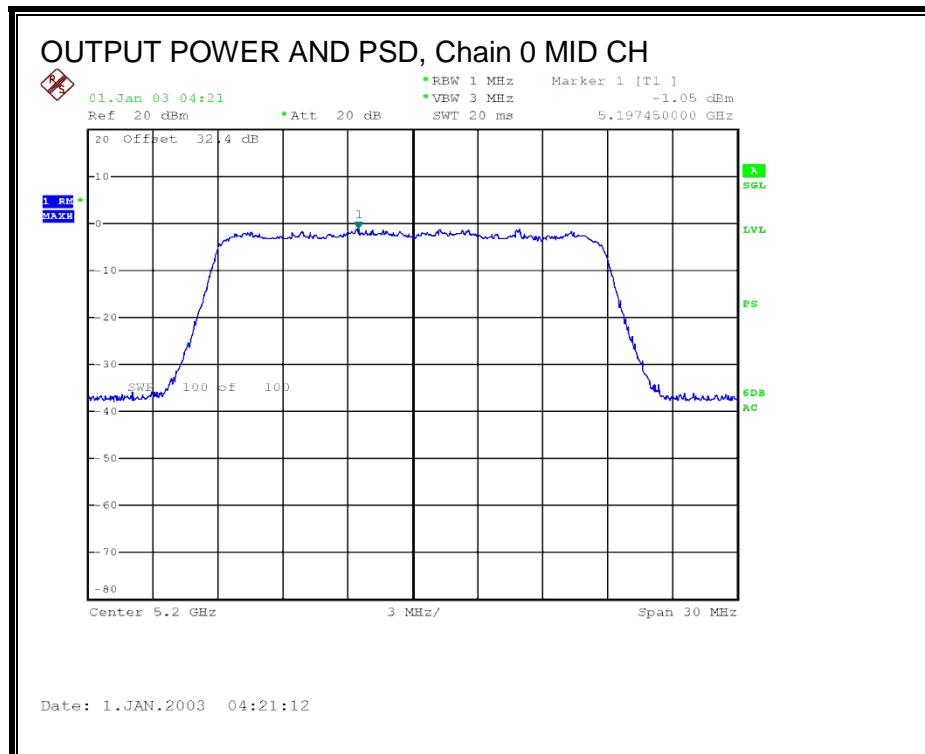
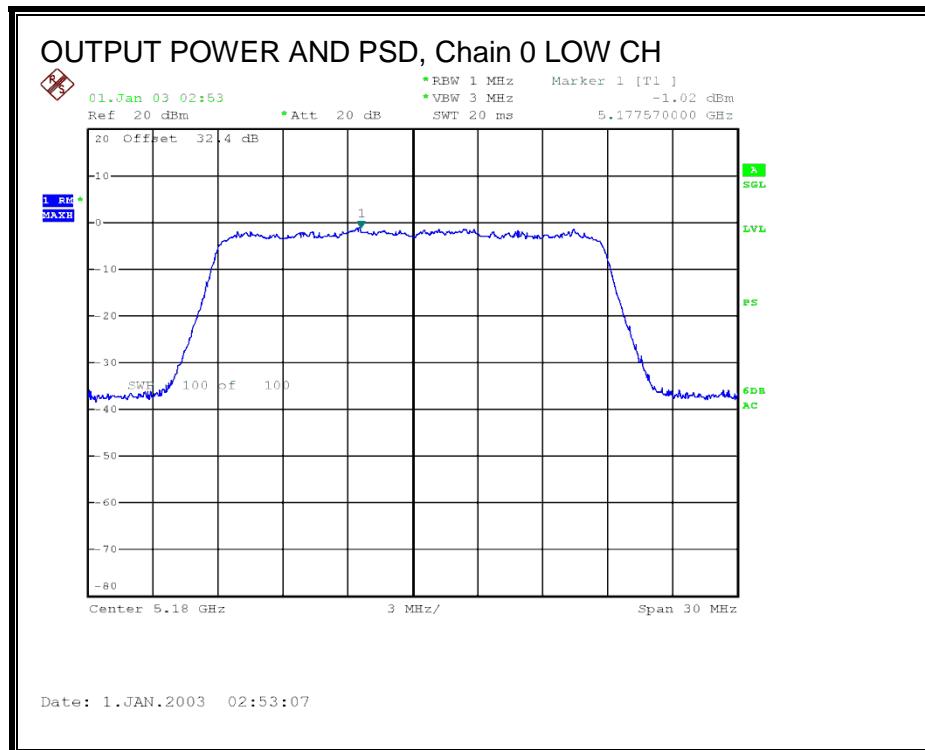
### Output Power Results

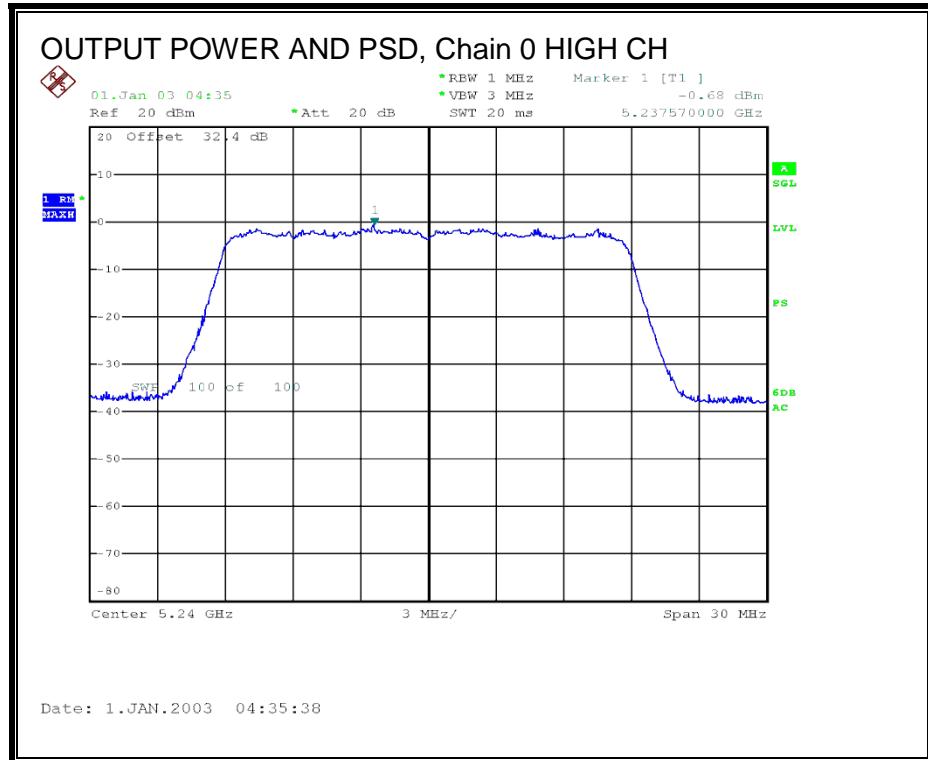
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	9.00	8.95	8.96	13.74	17.00	-3.26
Mid	5200	8.90	8.95	8.86	13.67	17.00	-3.33
High	5240	9.40	9.10	8.96	13.93	17.00	-3.07

### PSD Results

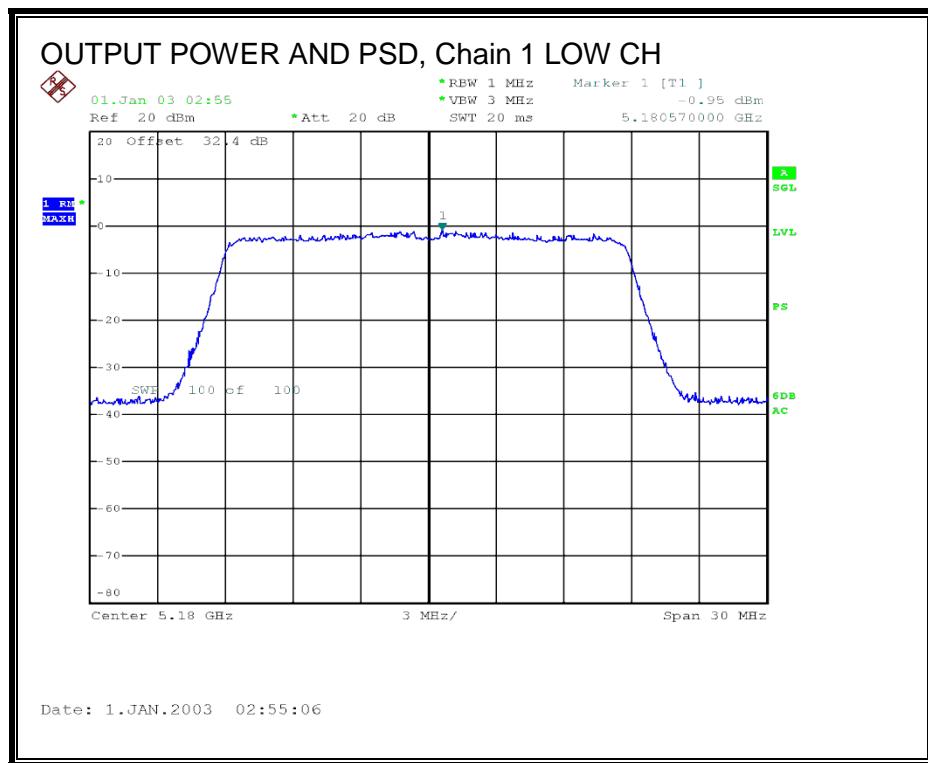
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	-1.02	-0.95	-0.92	3.81	4.00	-0.19
Mid	5200	-1.05	-0.93	-0.95	3.79	4.00	-0.21
High	5240	-0.68	-1.24	-1.35	3.69	4.00	-0.31

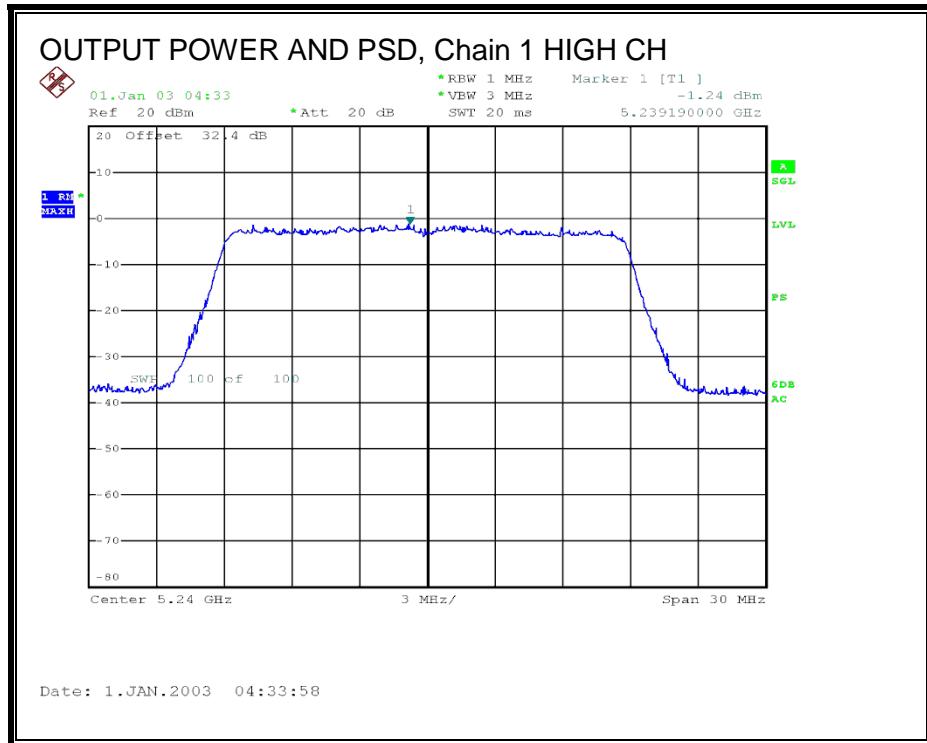
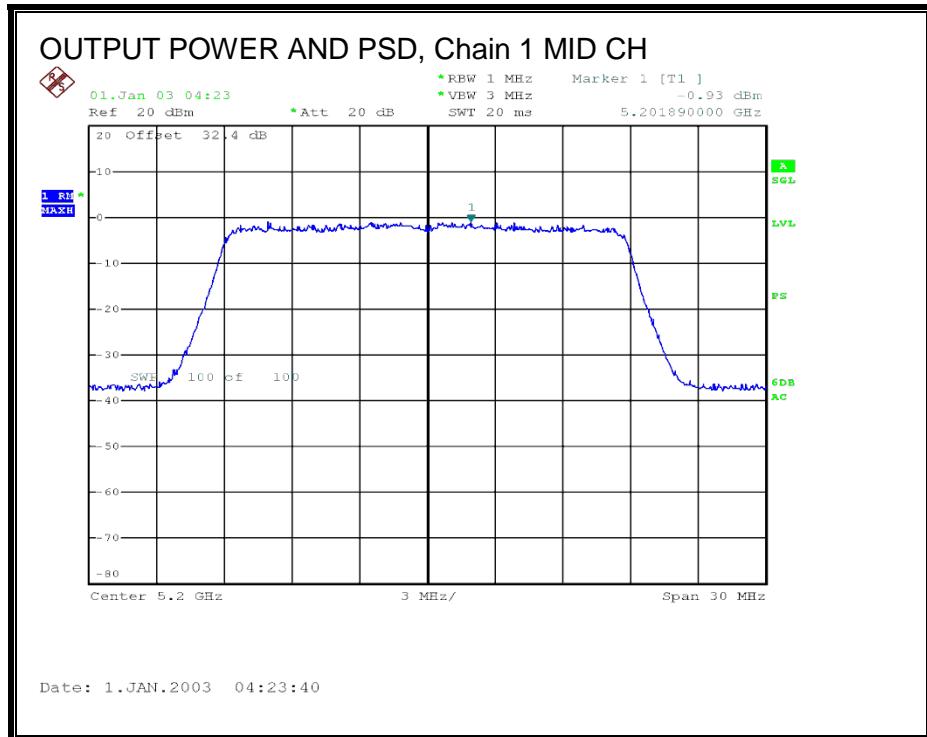
## OUTPUT POWER AND PSD, Chain 0



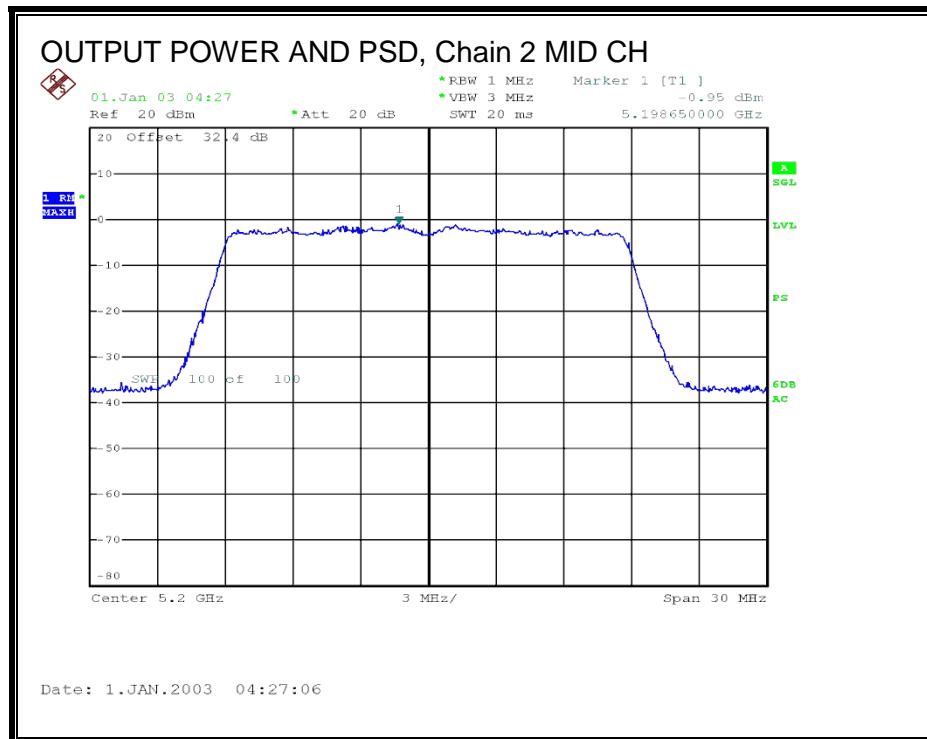
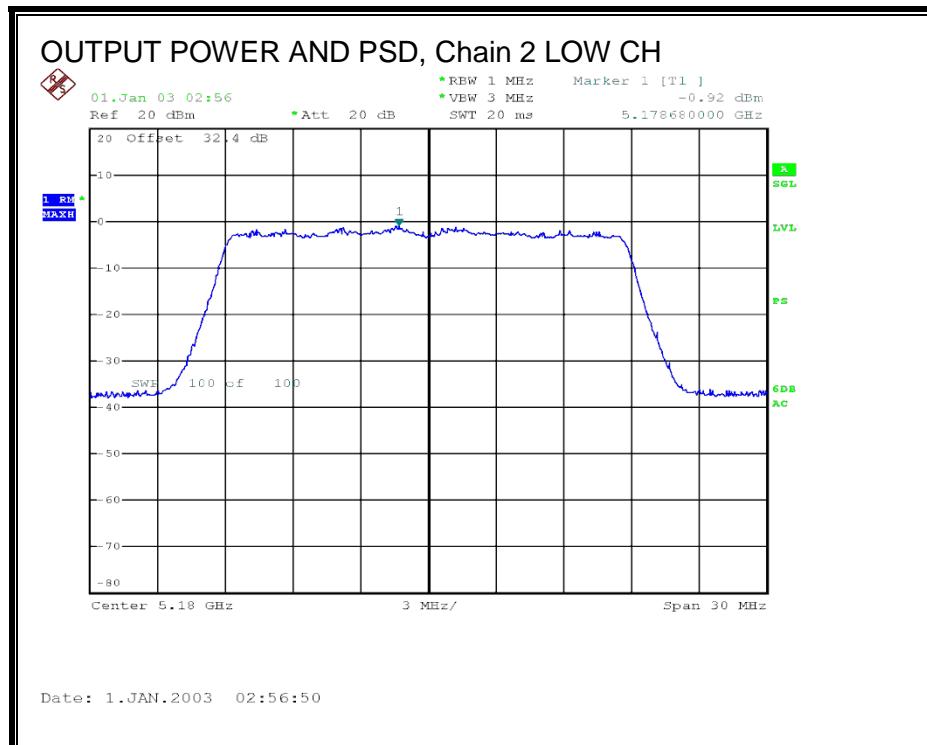


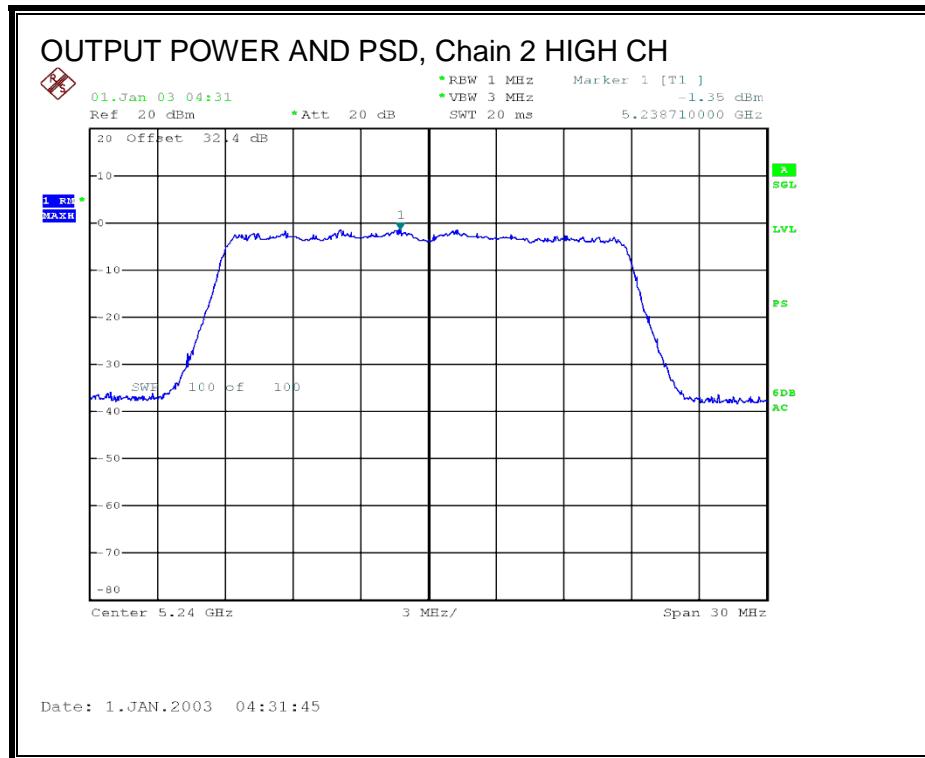
### OUTPUT POWER AND PSD, Chain 1





## 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

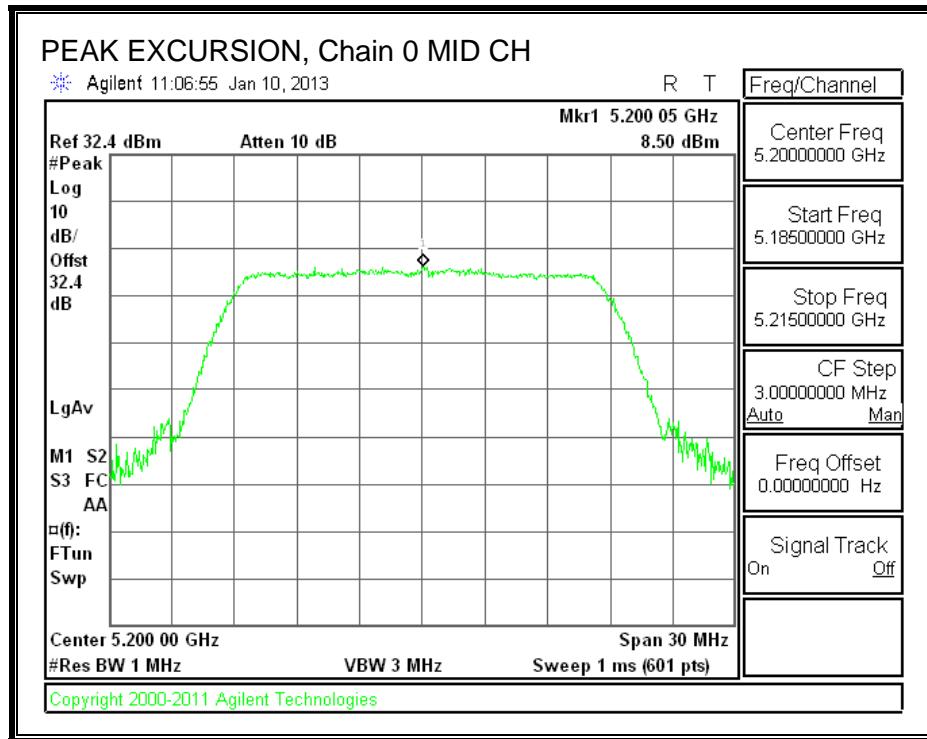
Chain 1

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

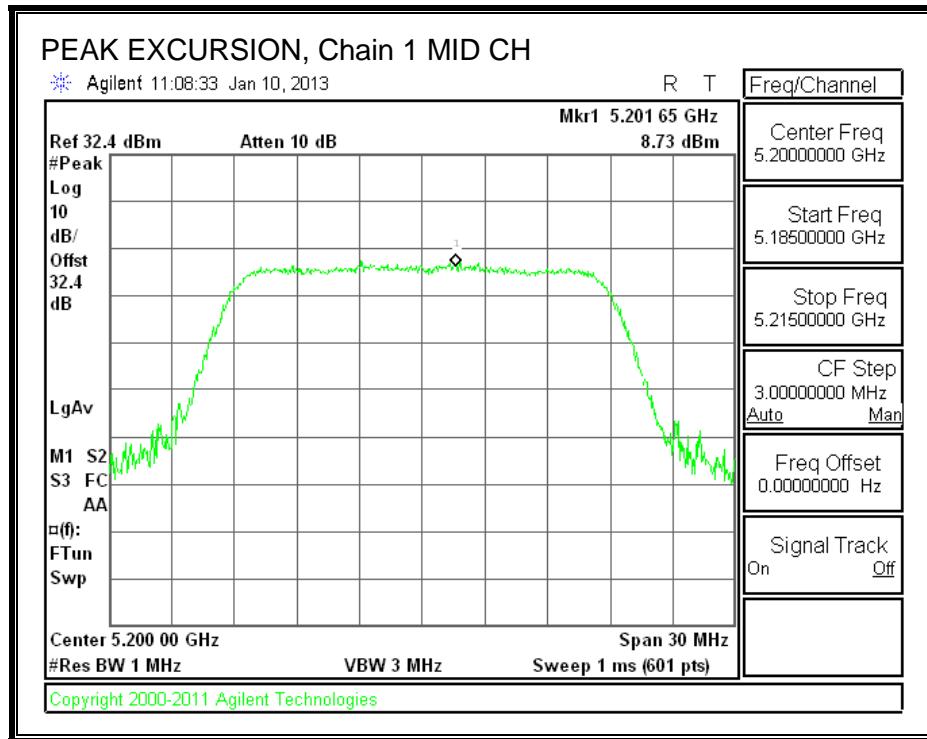
Chain 2

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

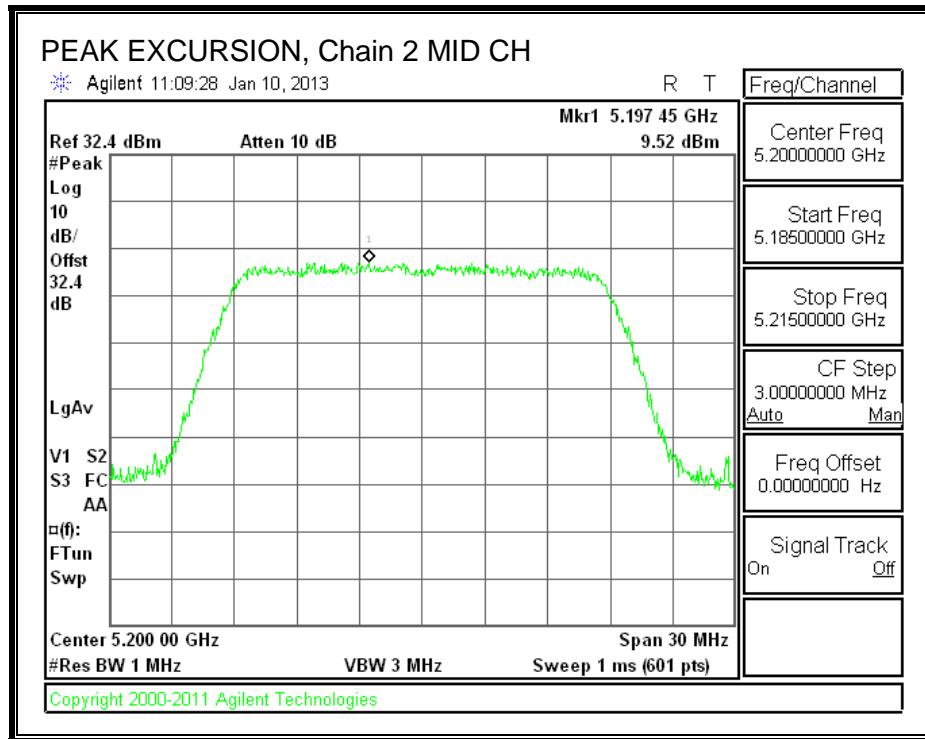
### PEAK EXCURSION, Chain 0



### 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

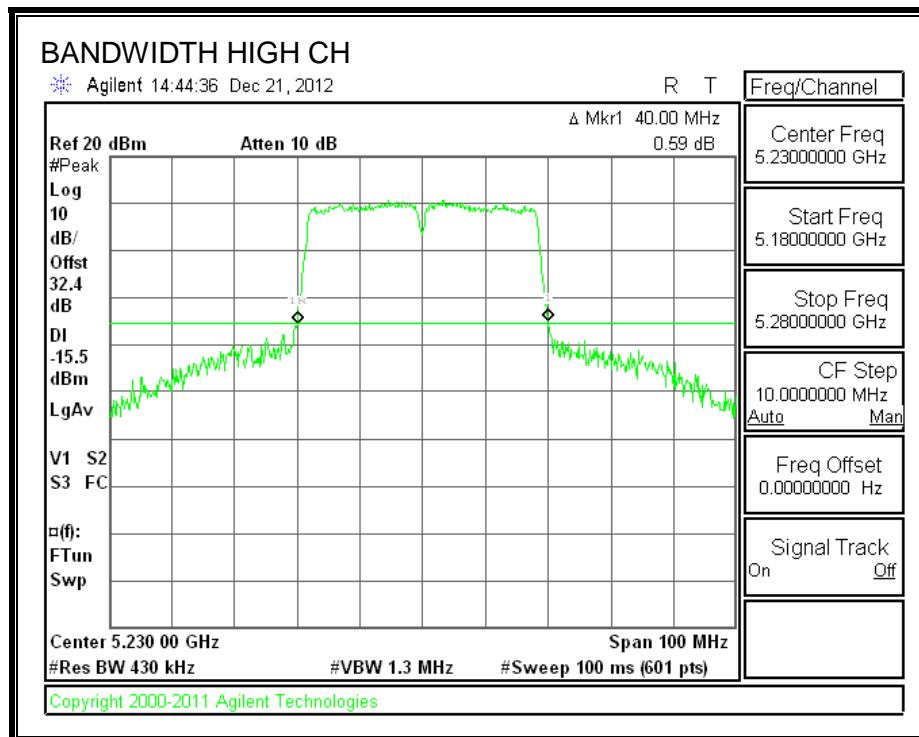
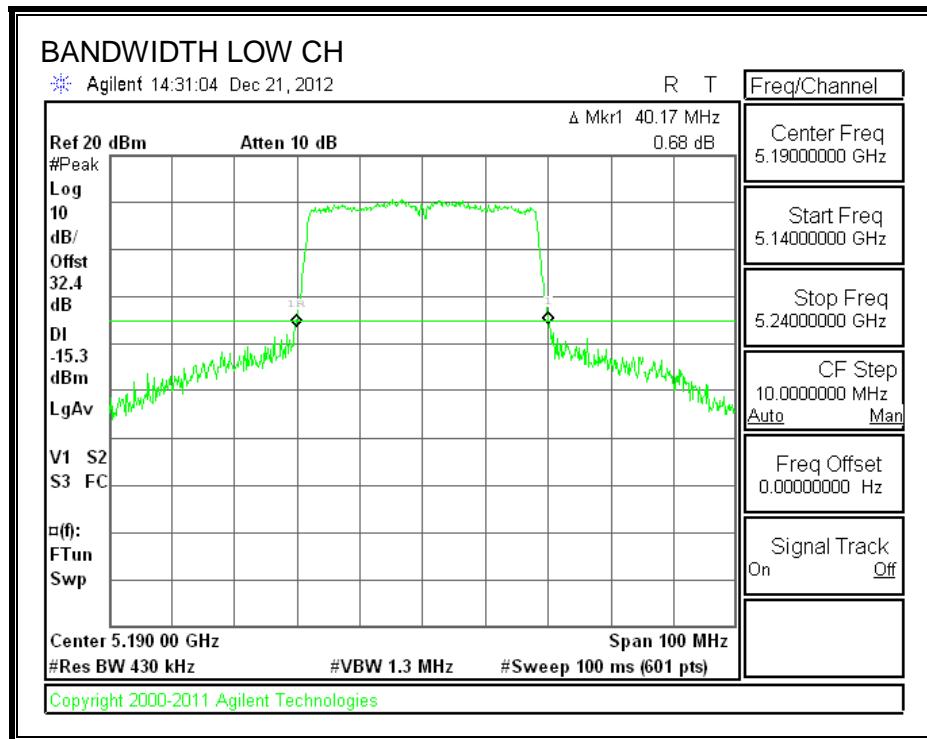
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	40.17
High	5230	40.00

## 26 dB BANDWIDTH



### 8.8.2. 99% BANDWIDTH

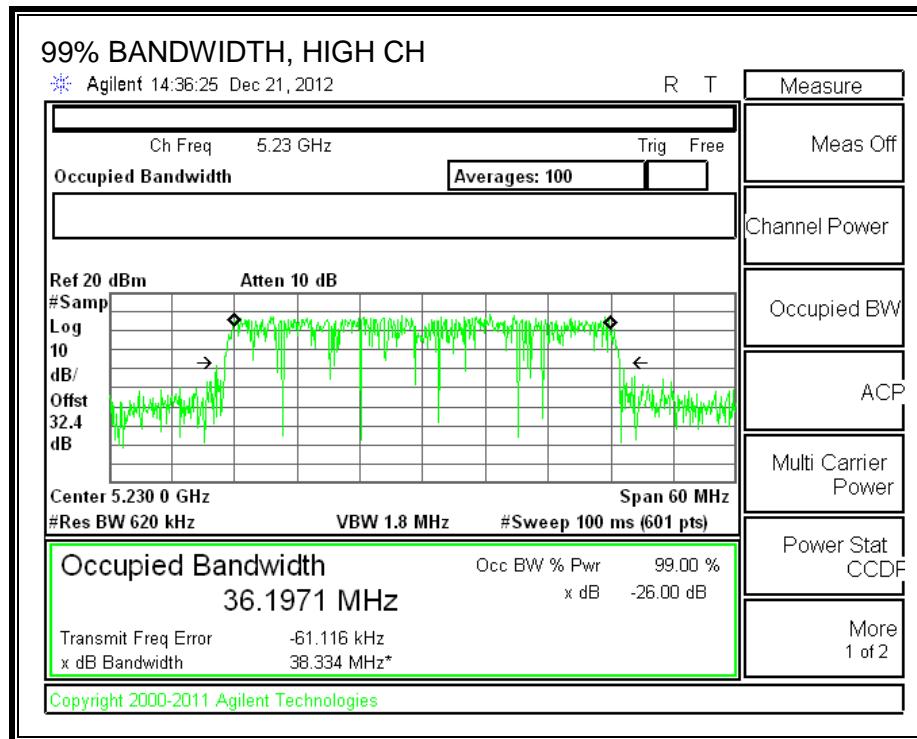
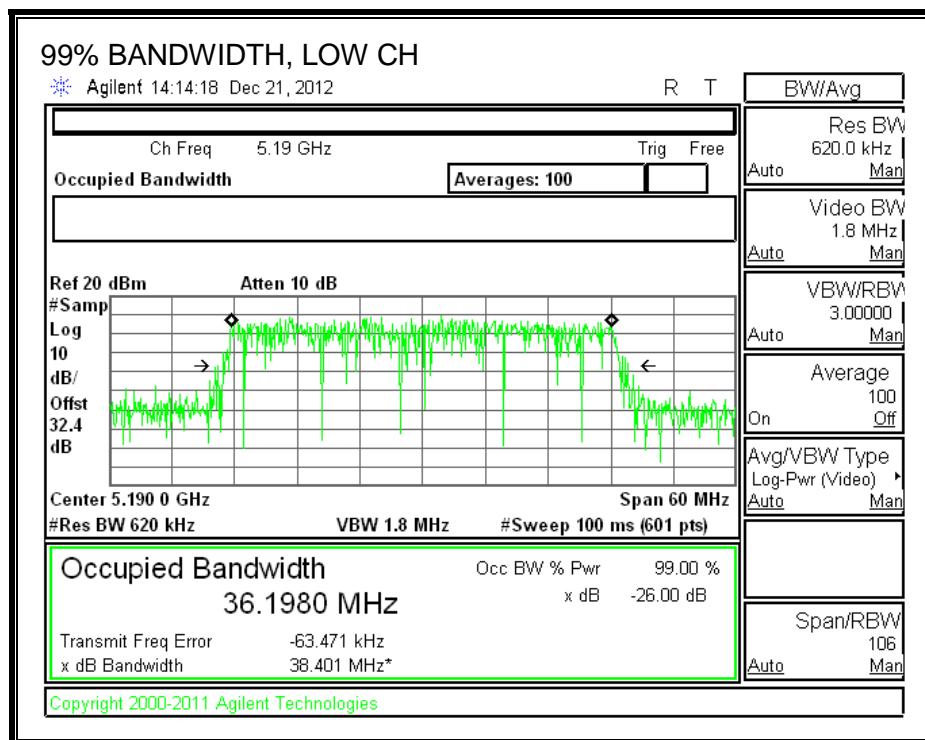
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (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 (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5190	40.17	36.1980	3.20
High	5230	40.00	36.1971	3.20

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	

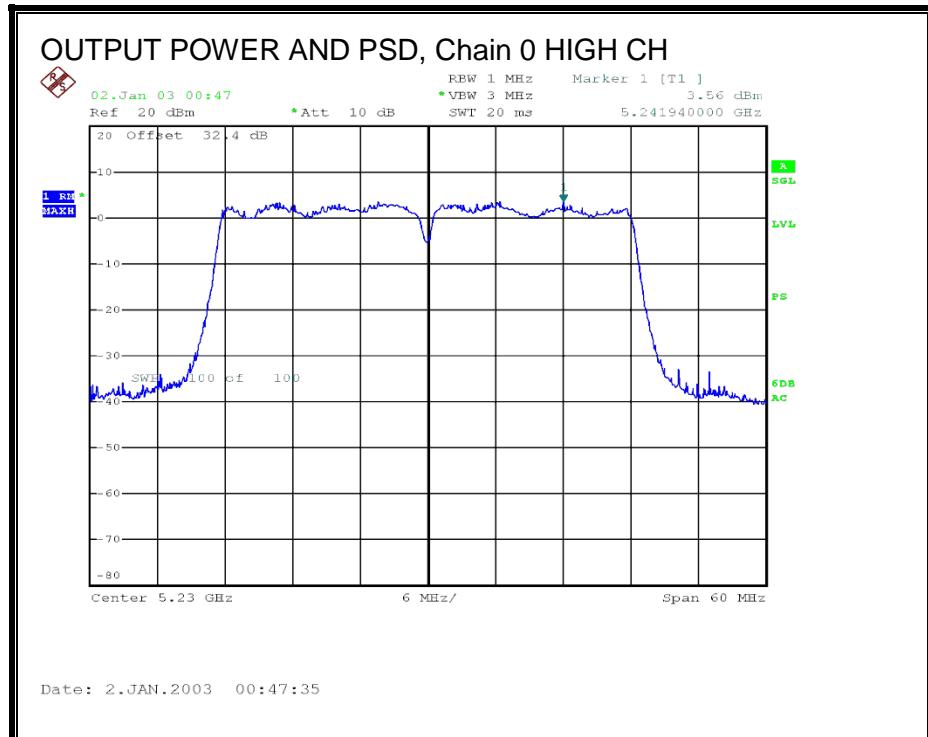
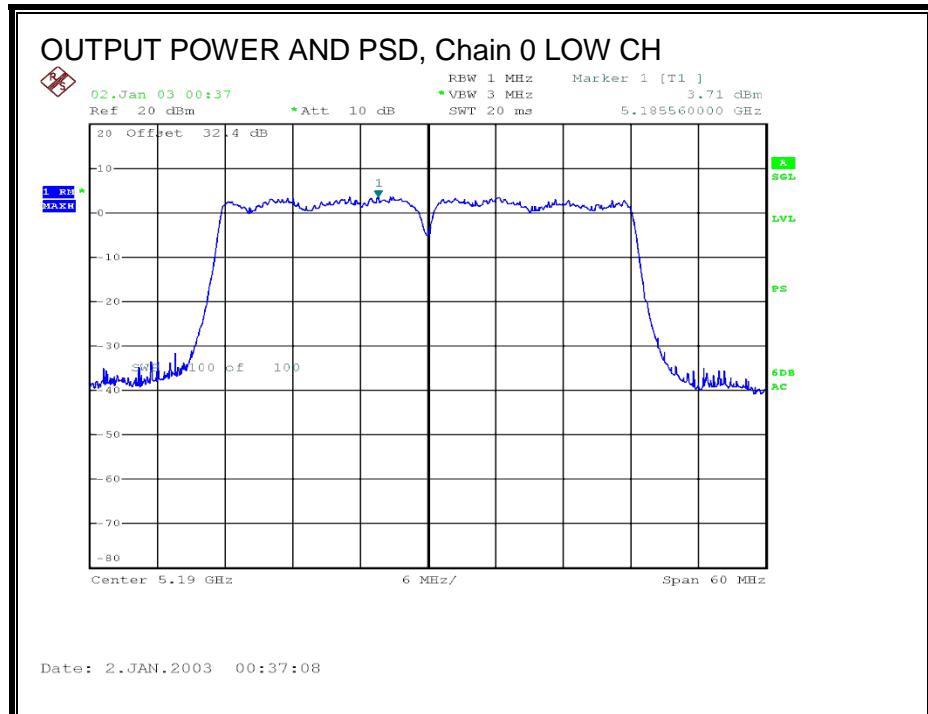
### Output Power Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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 (MHz)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

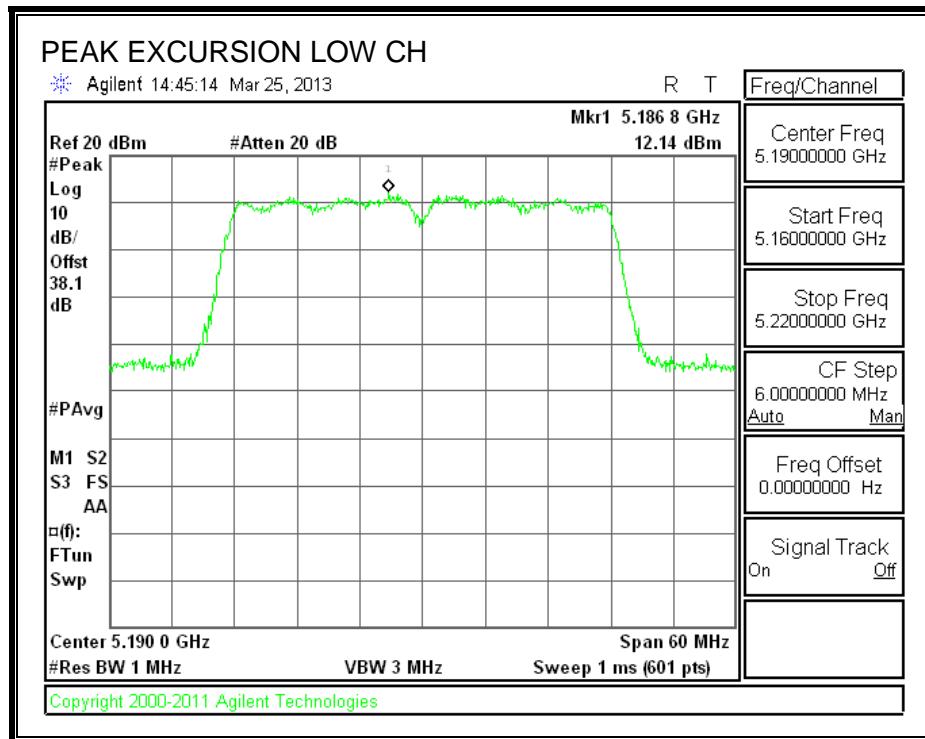
FCC §15.407 (a) (6)

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 (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (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

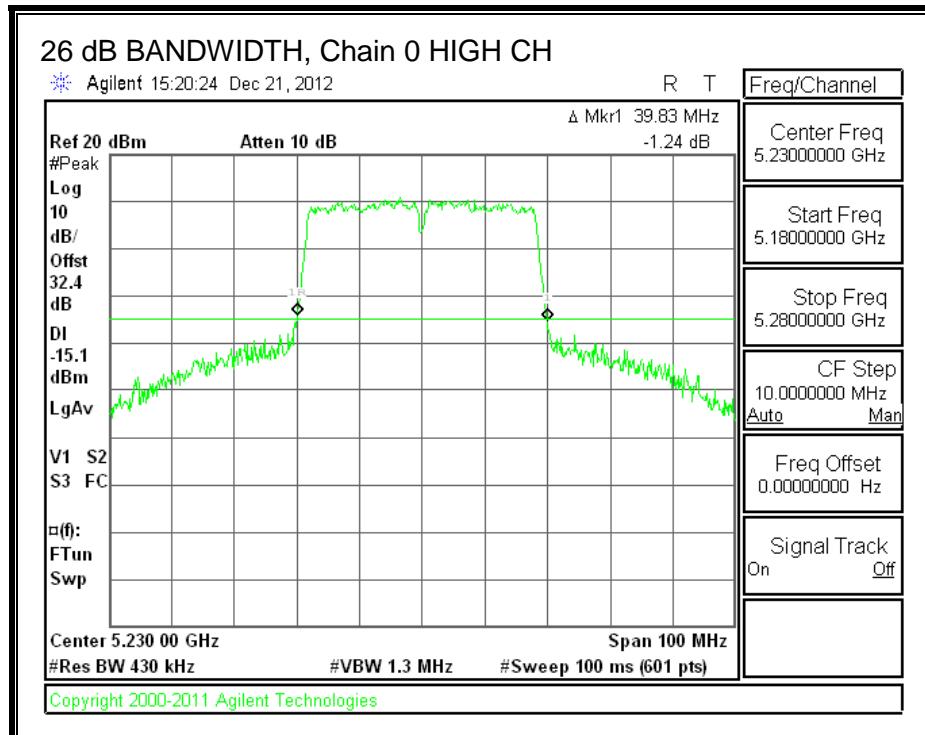
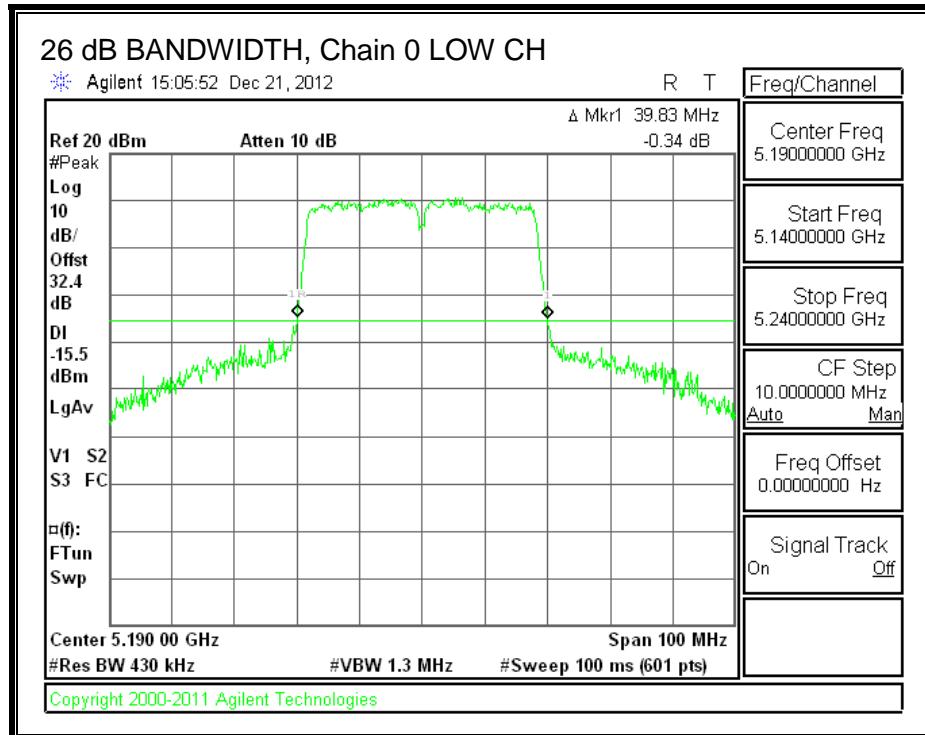
#### LIMITS

None; for reporting purposes only.

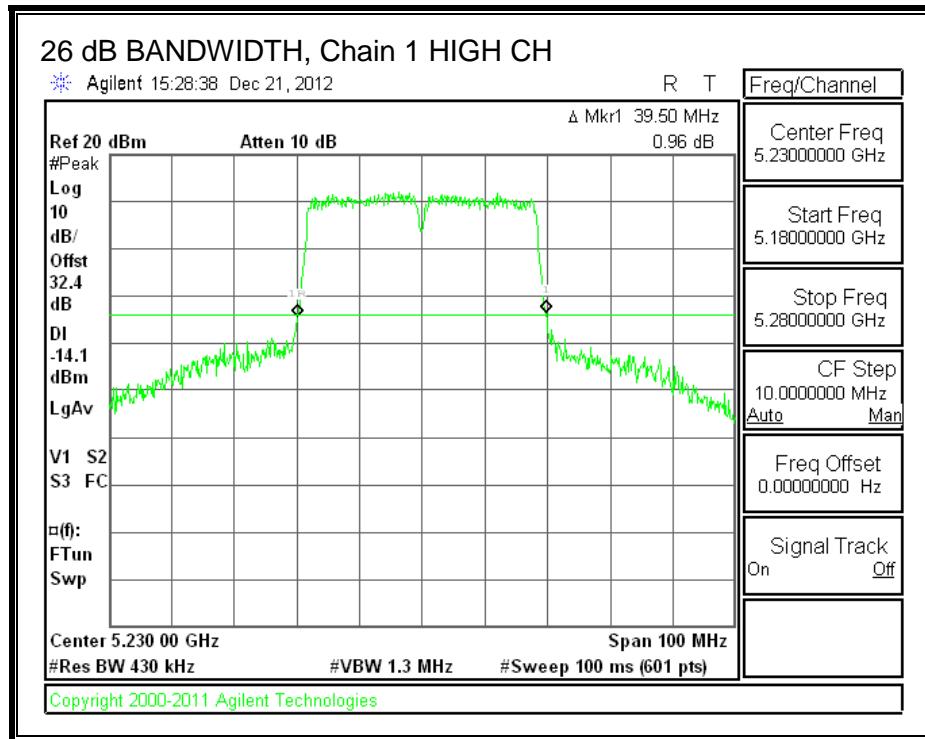
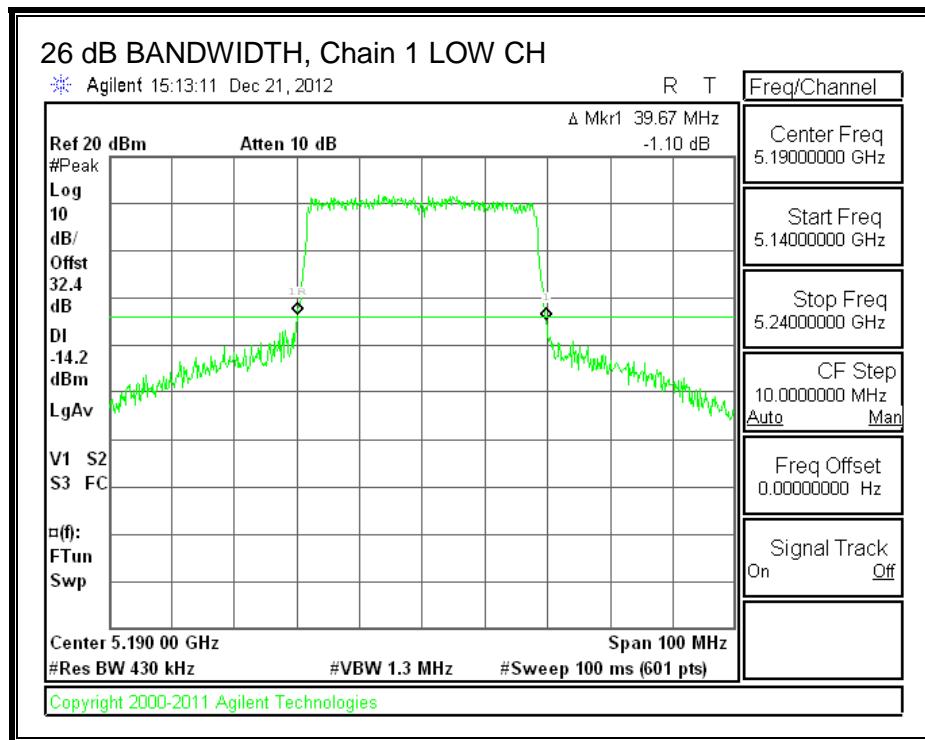
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (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

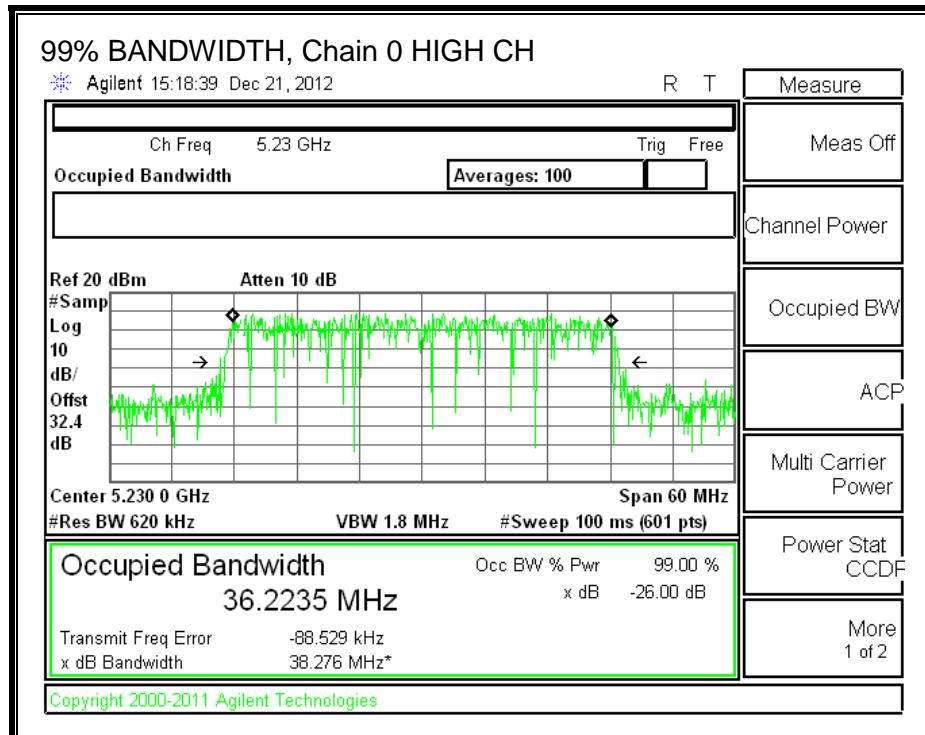
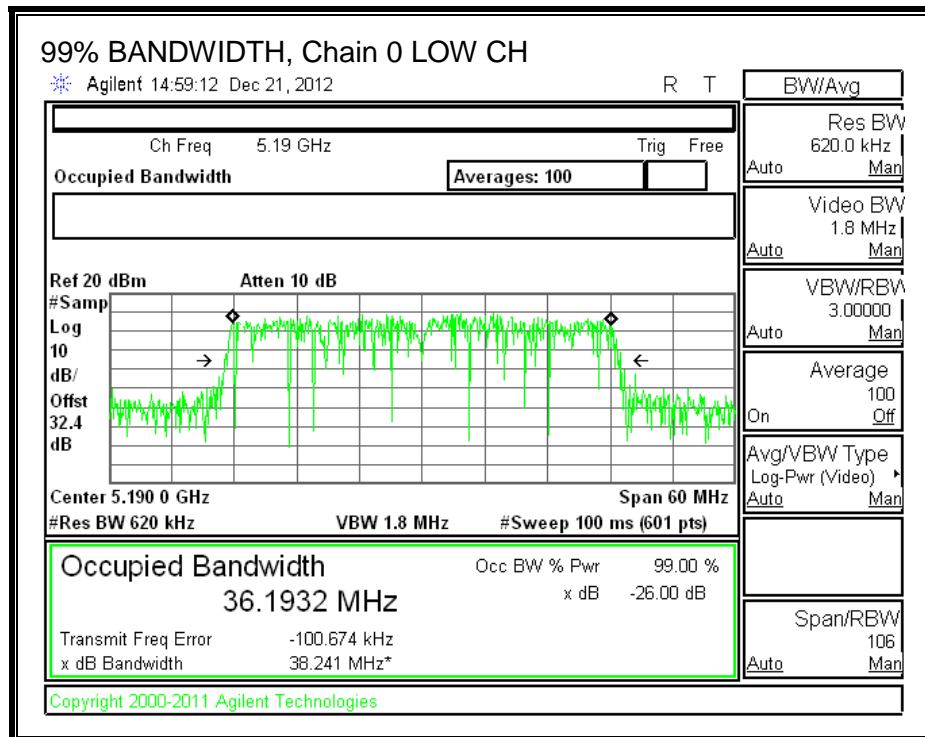
#### LIMITS

None; for reporting purposes only.

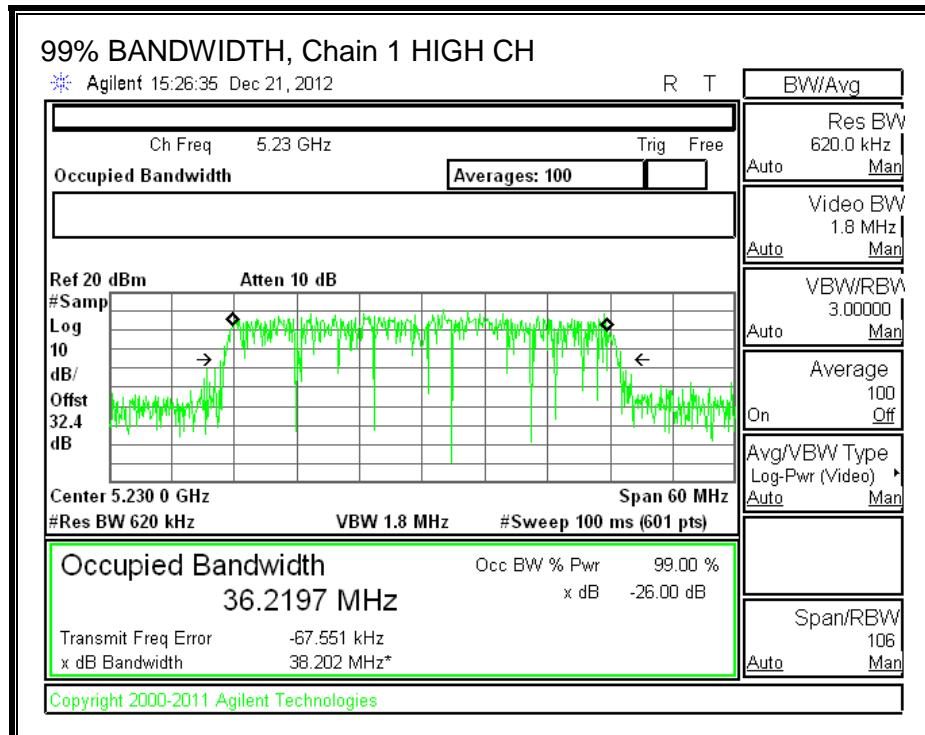
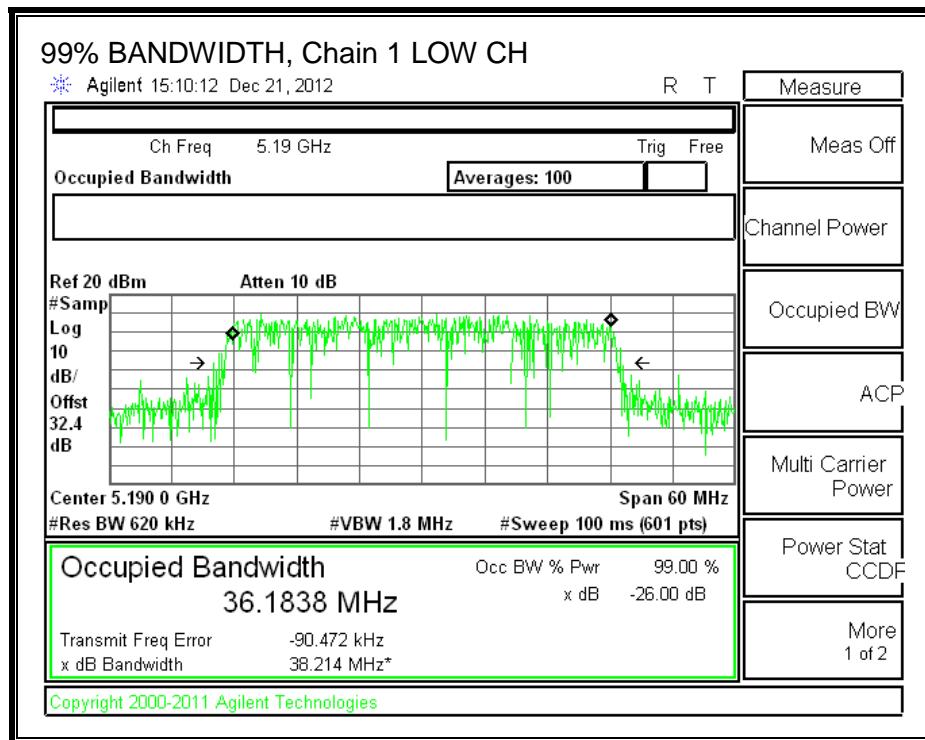
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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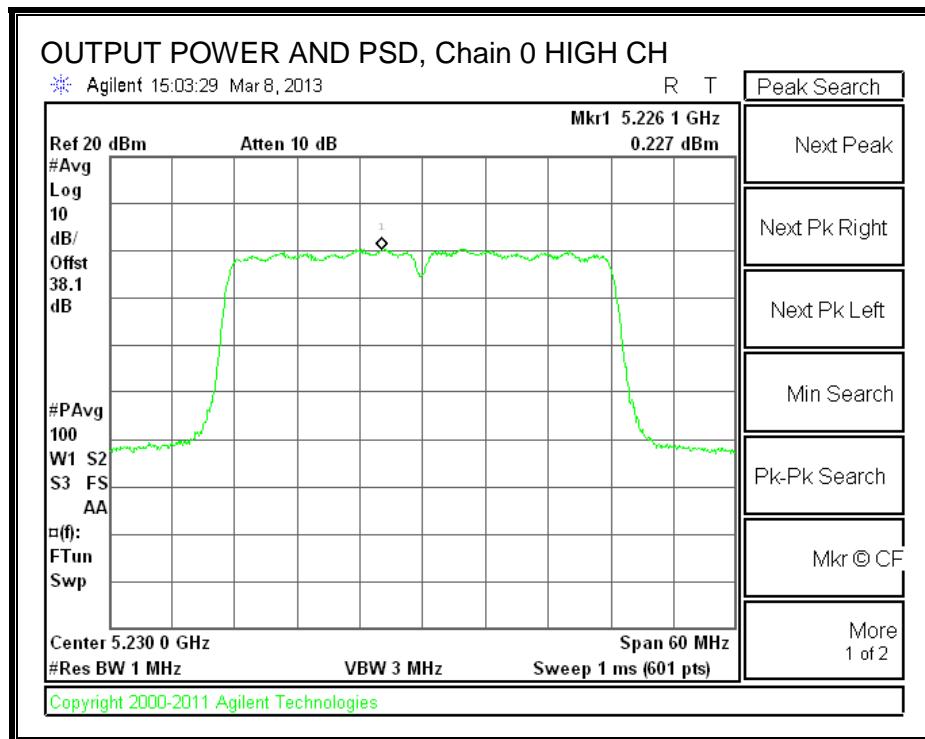
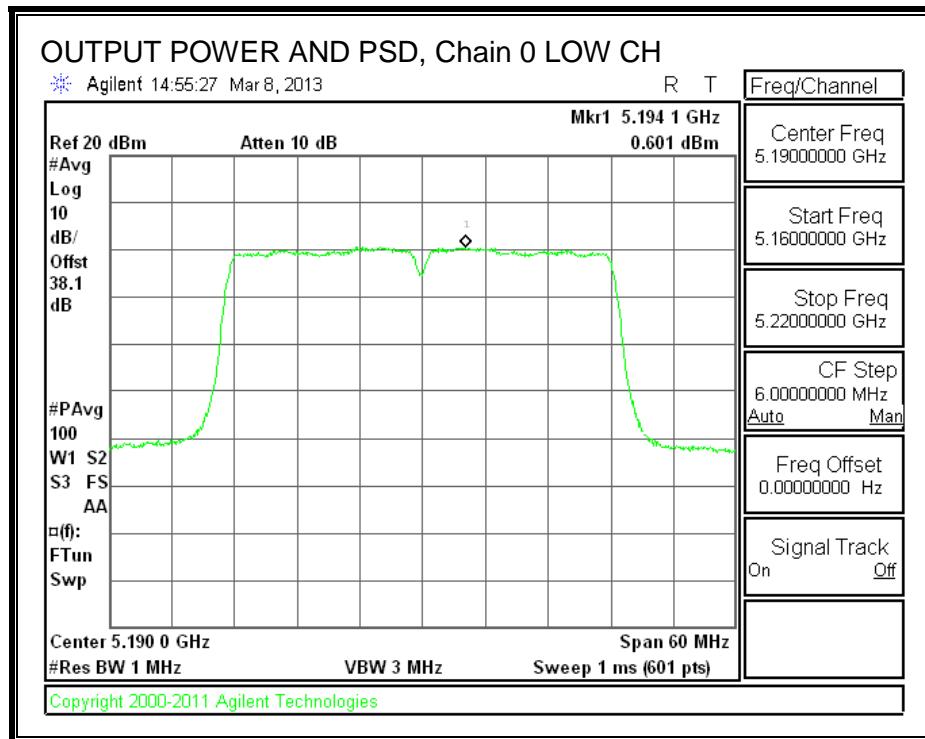
### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

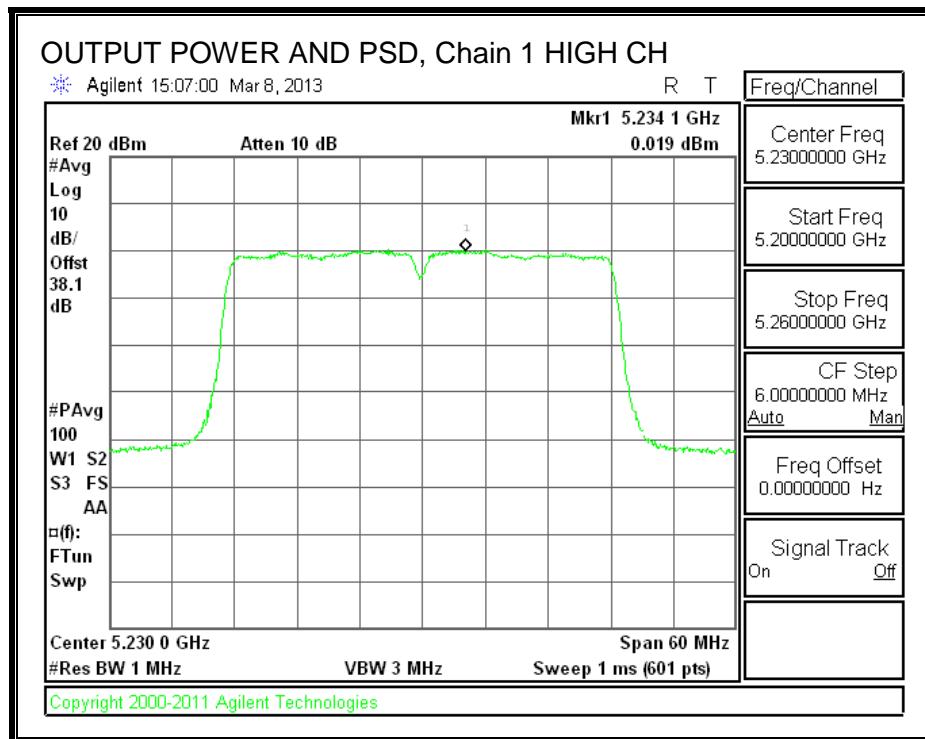
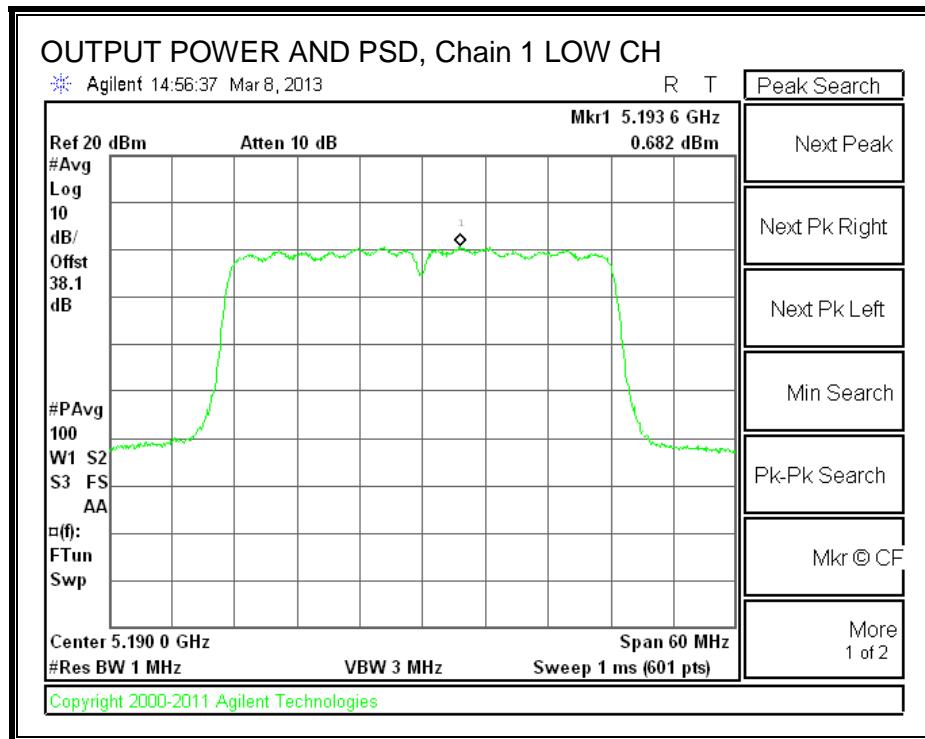
### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

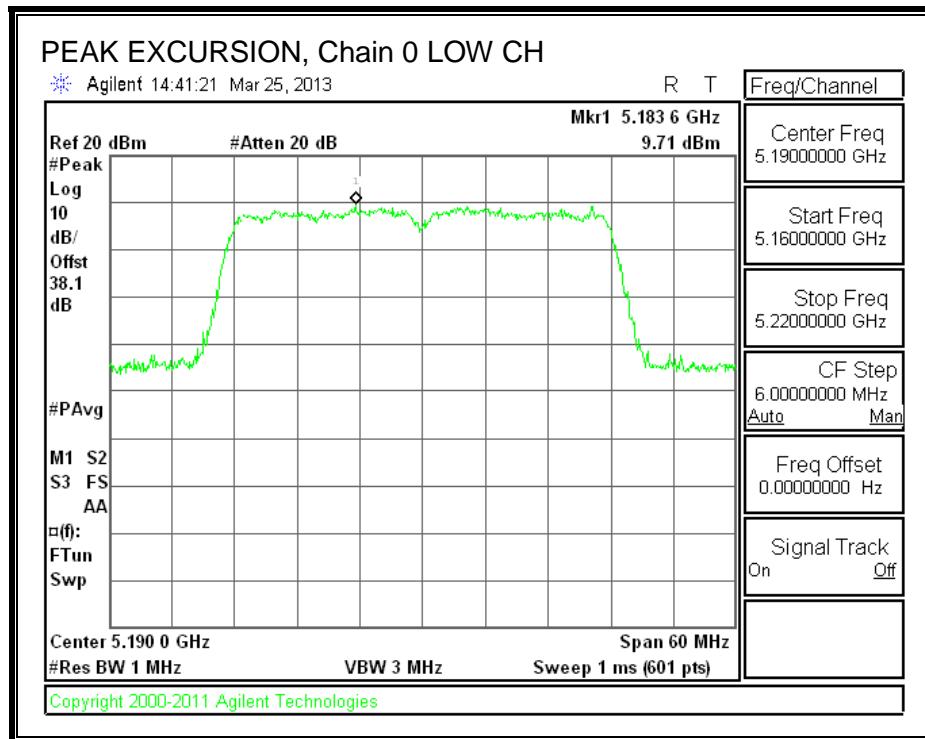
Chain 0

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

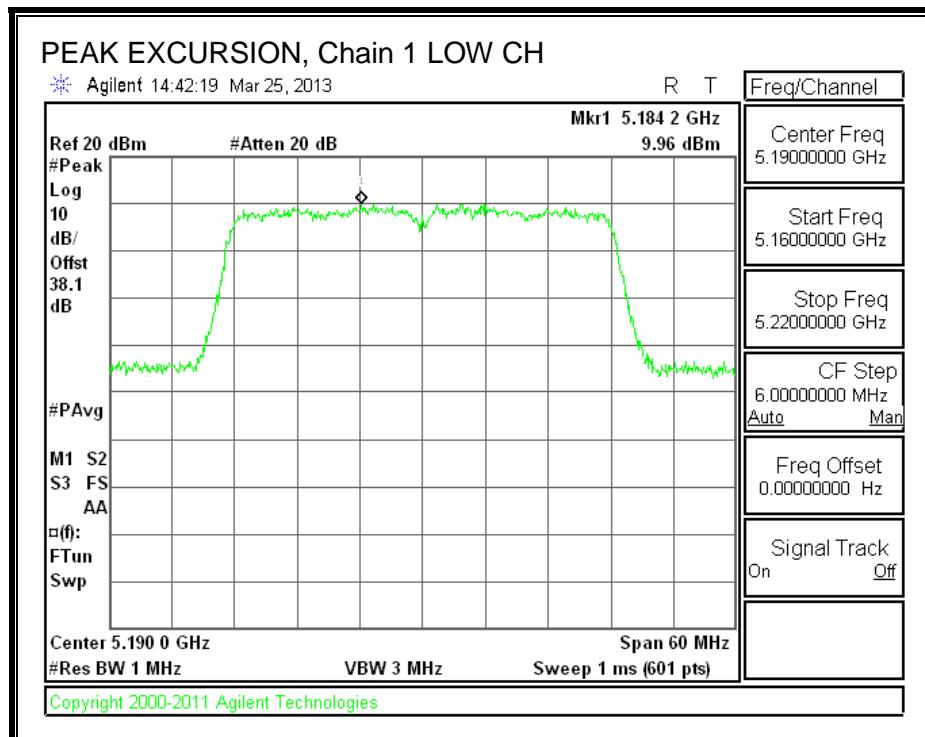
Chain 1

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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (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
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

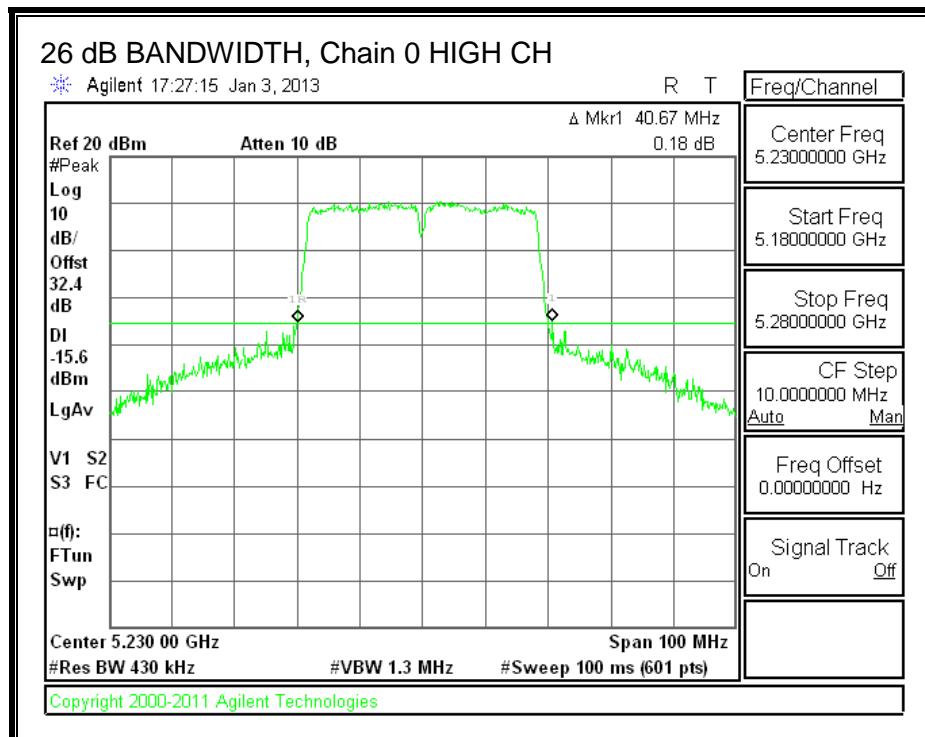
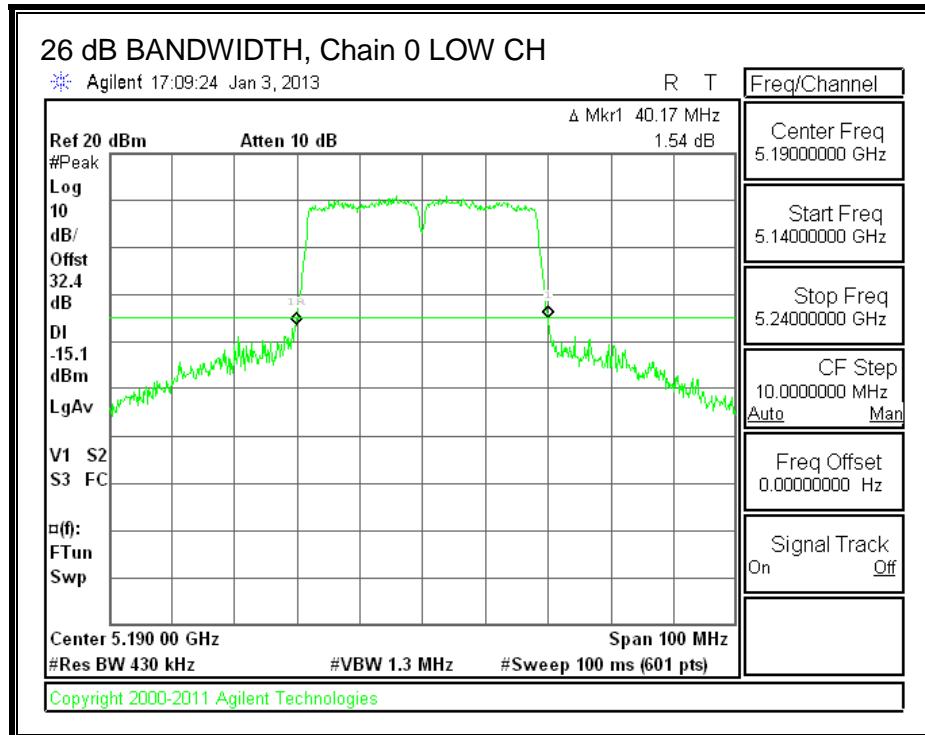
#### LIMITS

None; for reporting purposes only.

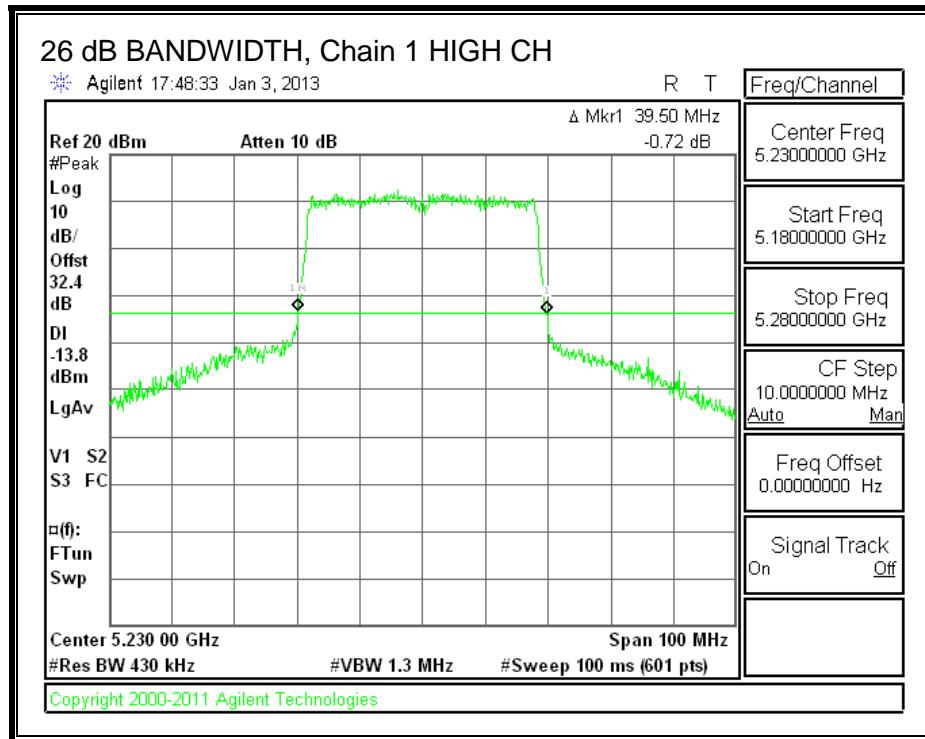
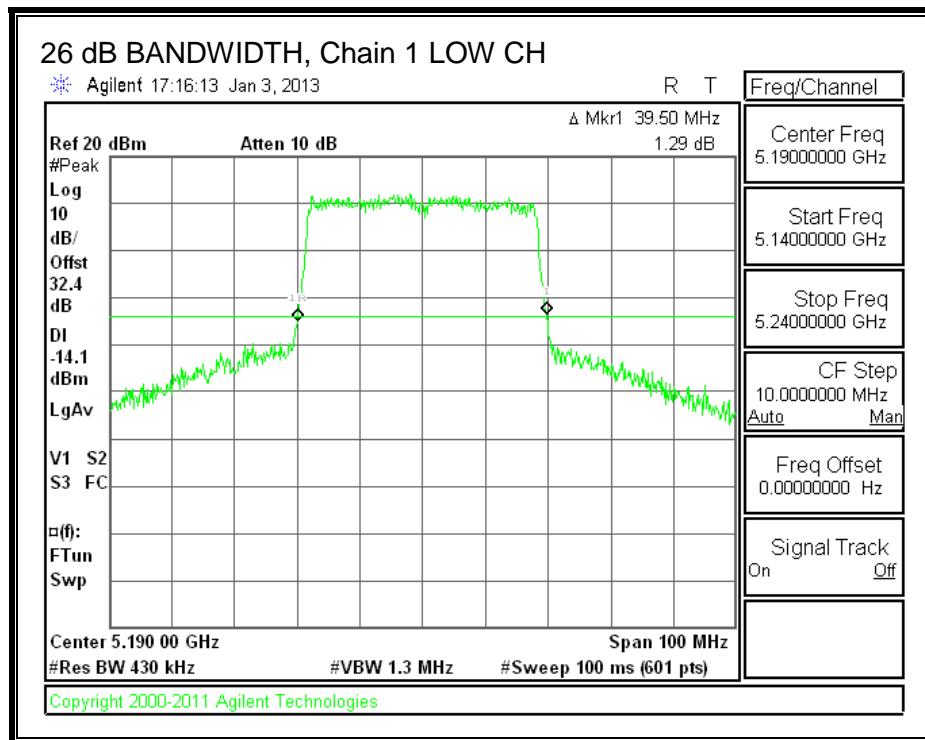
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (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

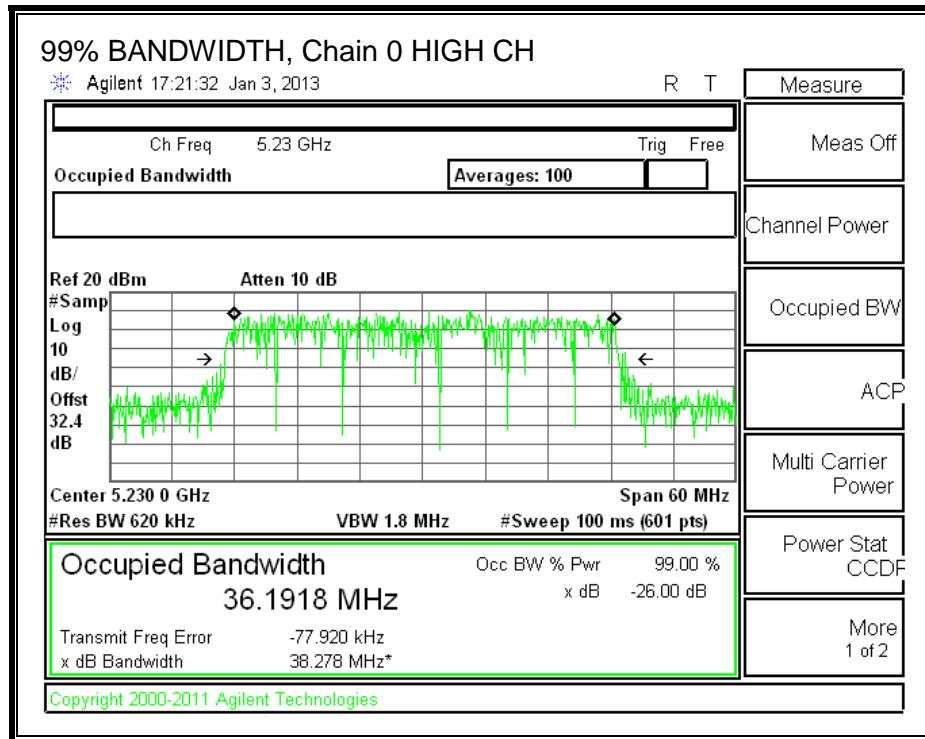
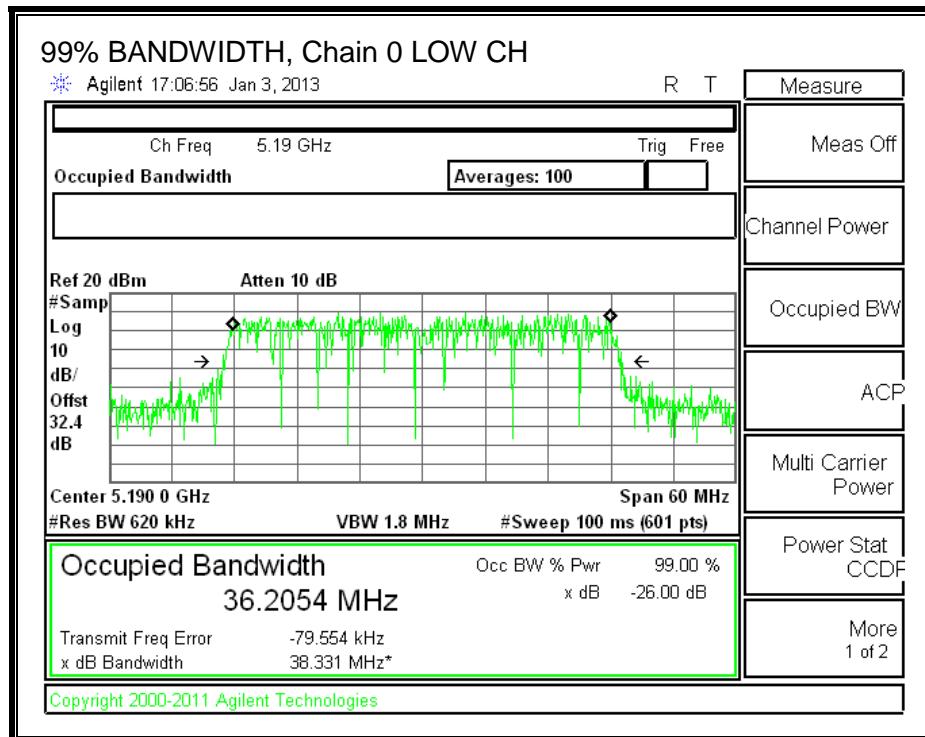
#### LIMITS

None; for reporting purposes only.

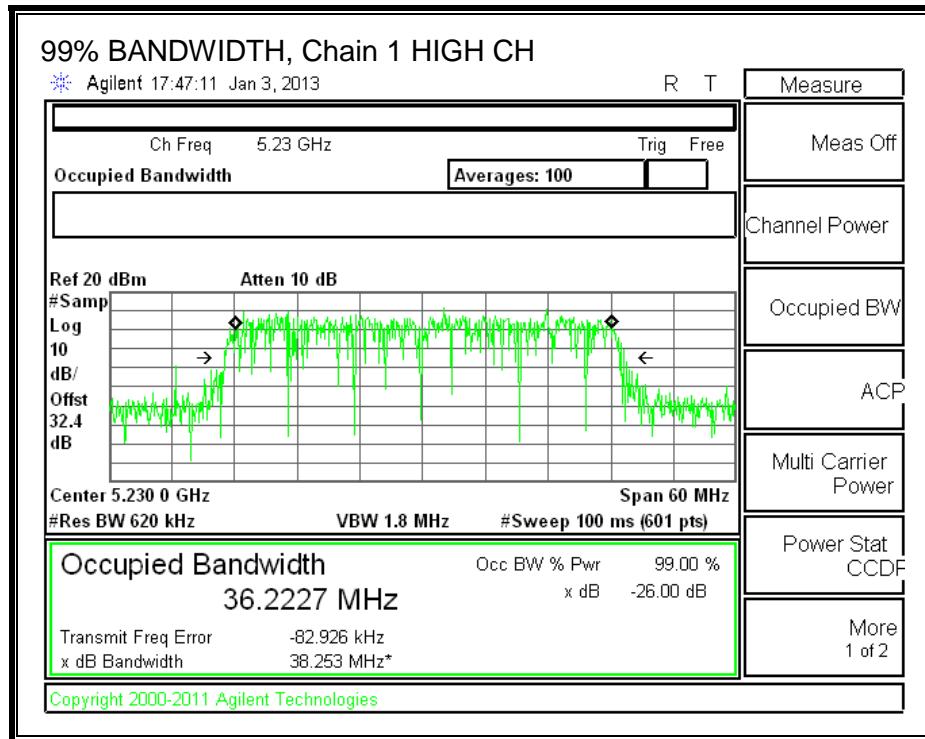
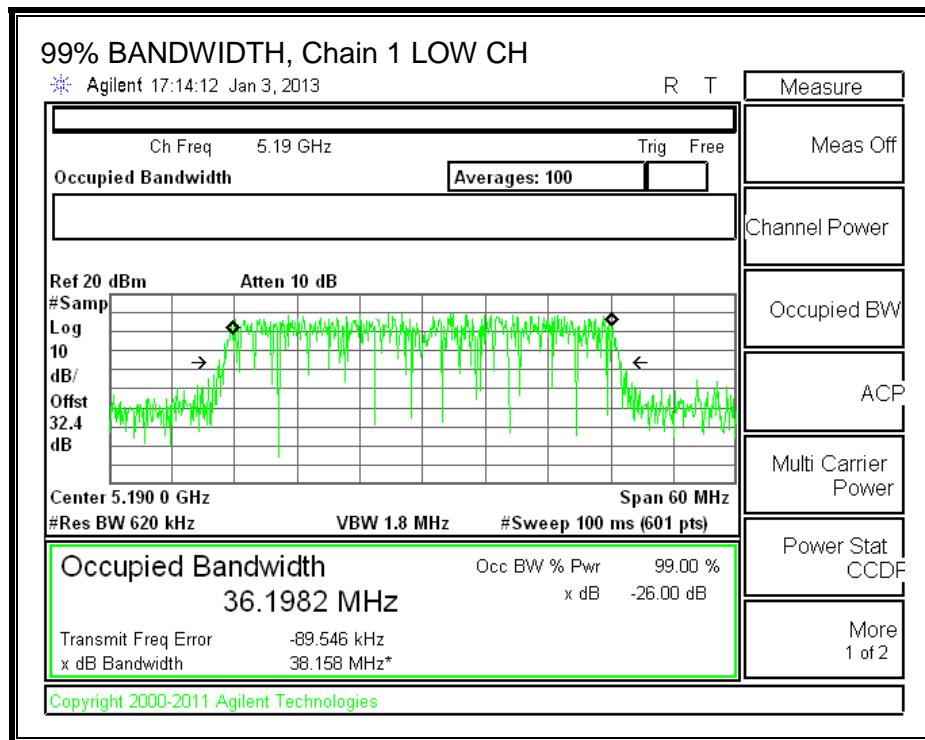
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	2.20	2.73

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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
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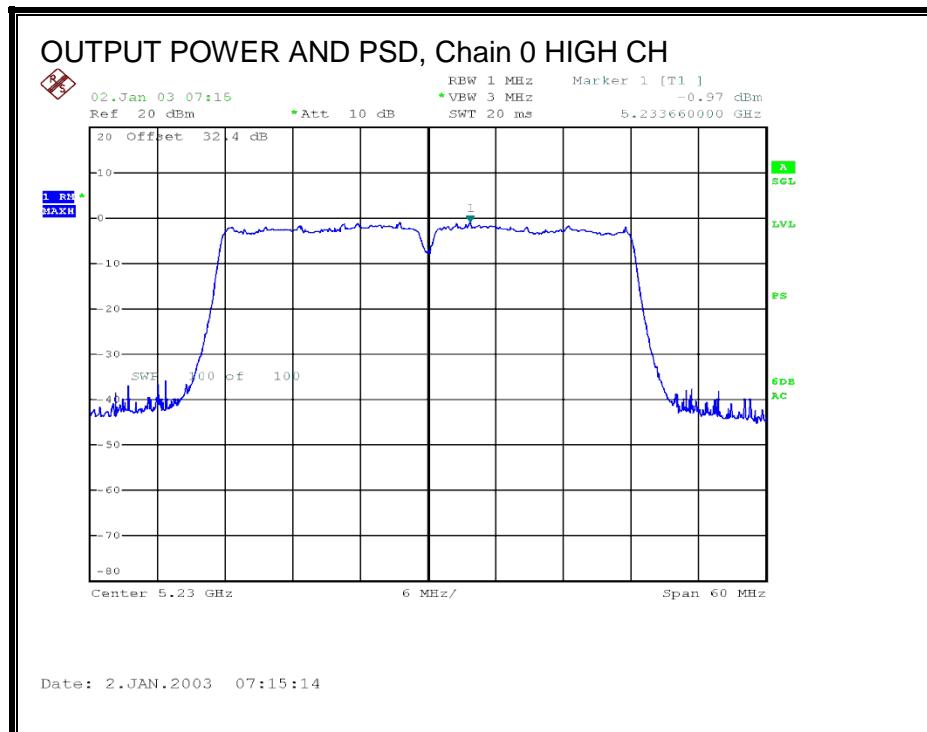
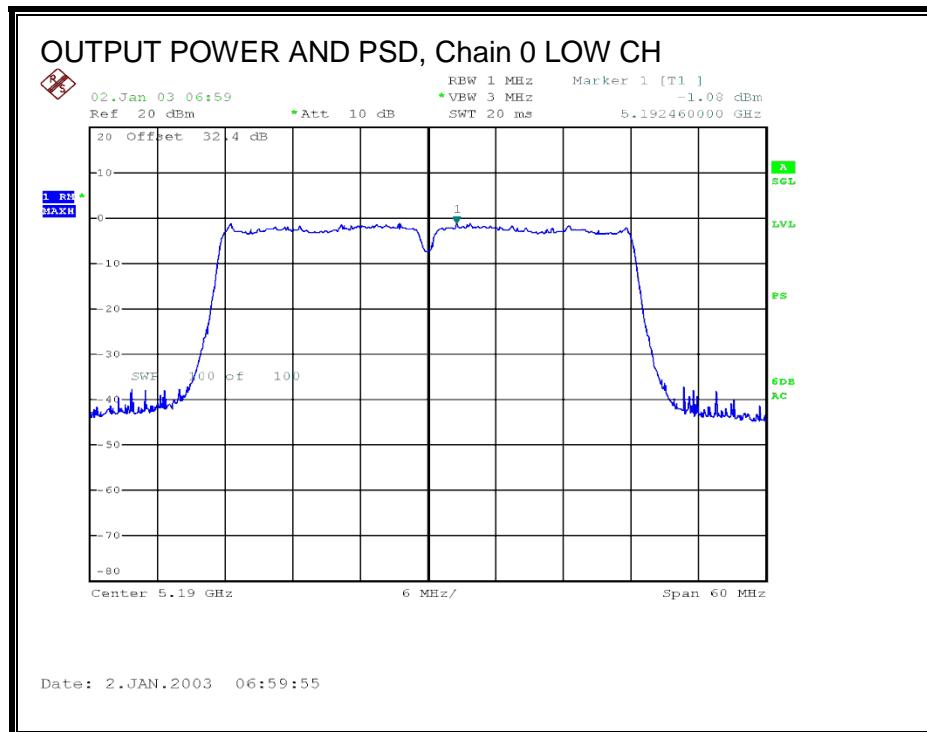
### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

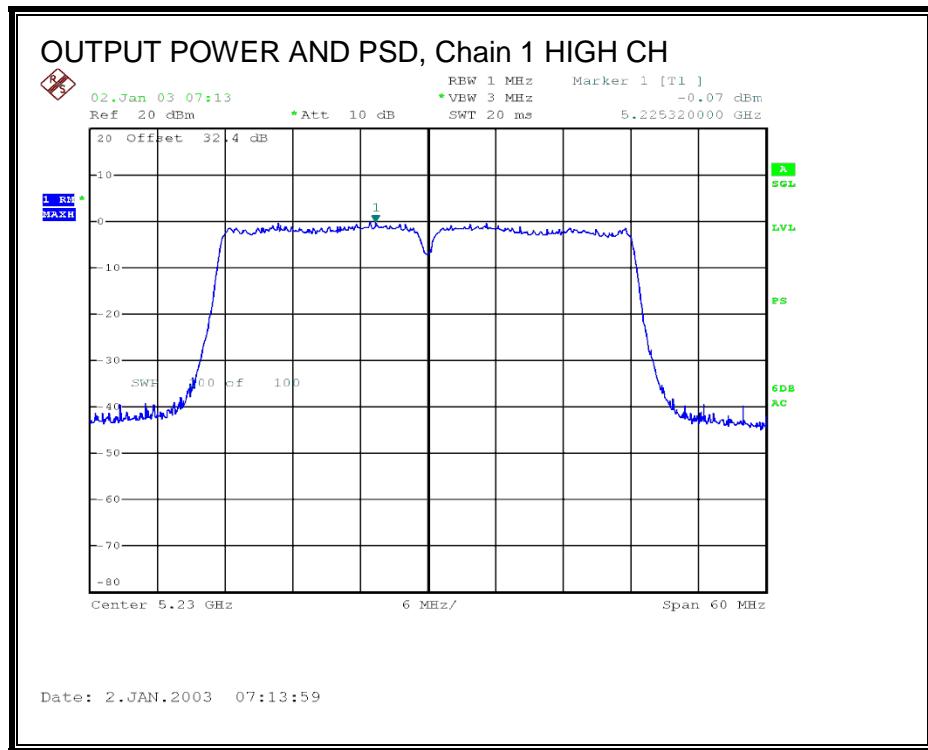
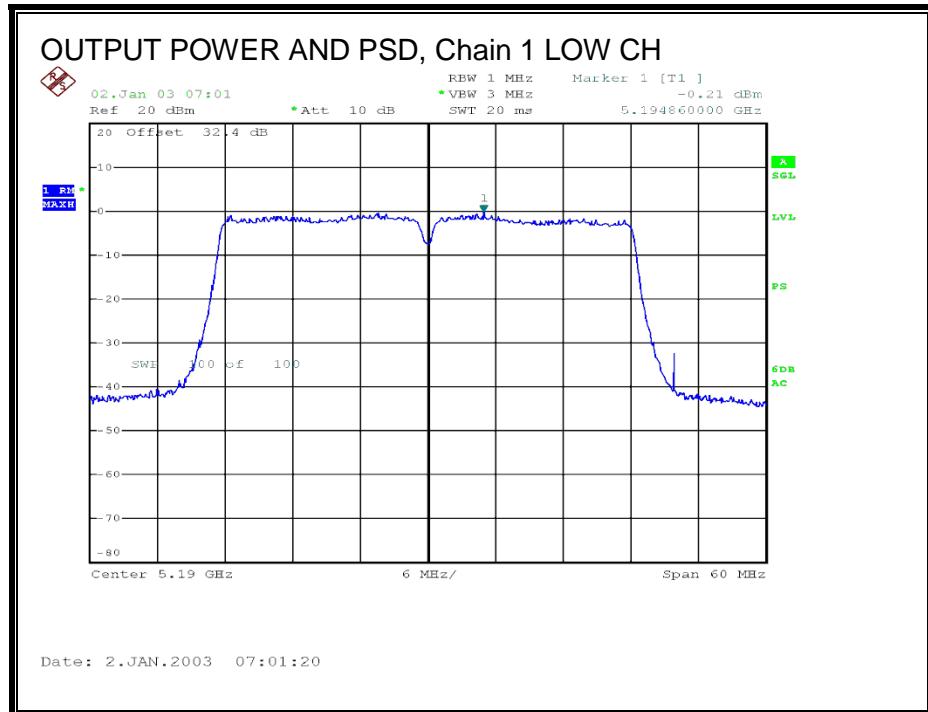
### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

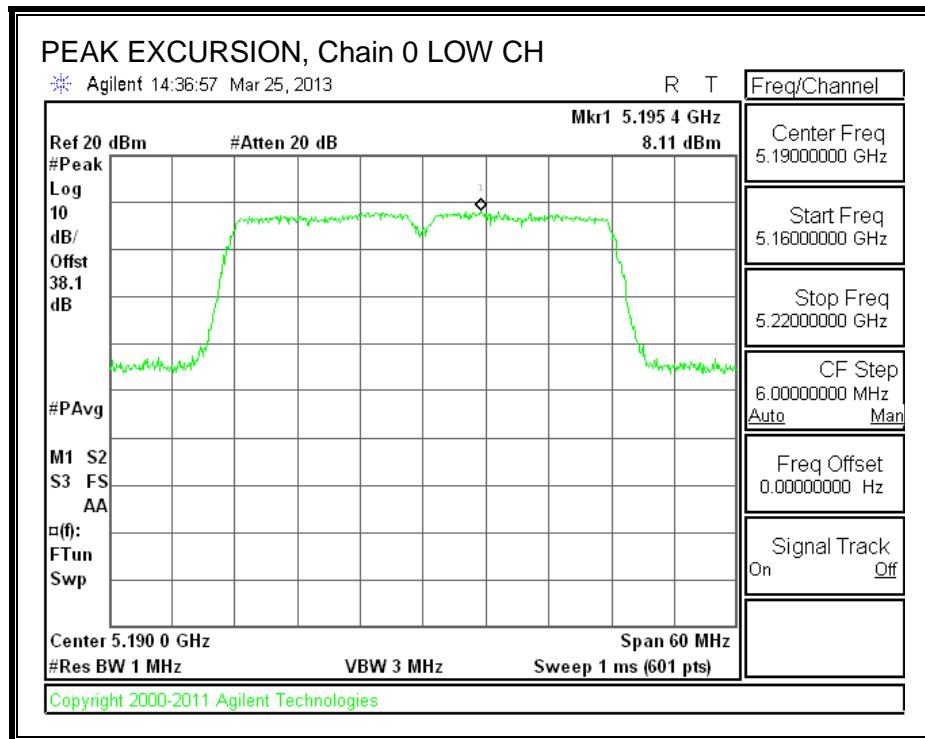
Chain 0

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

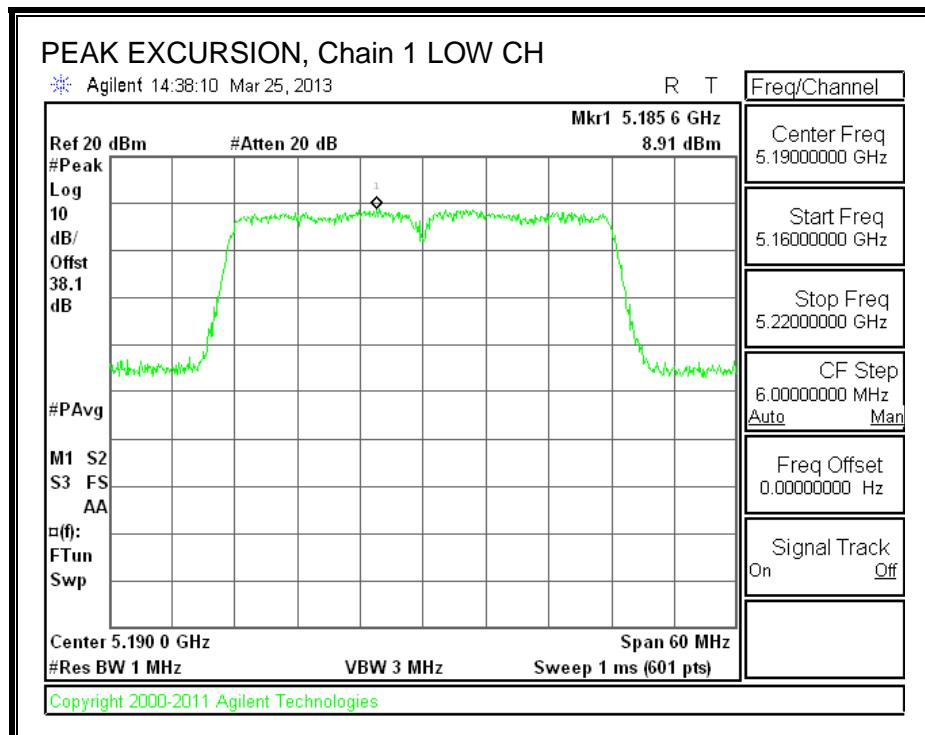
Chain 1

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

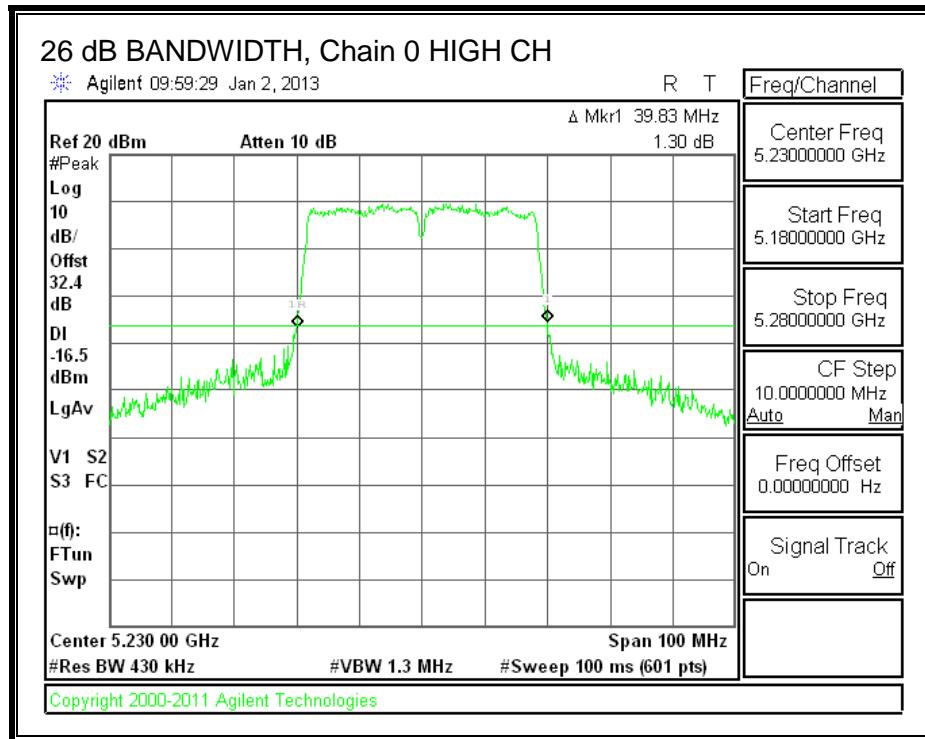
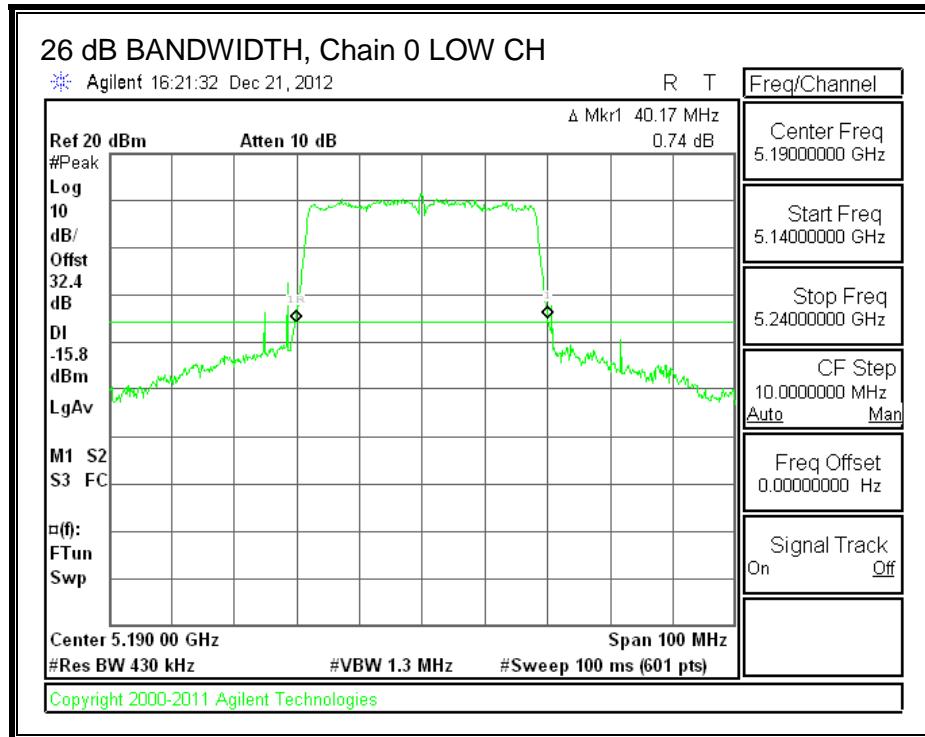
#### LIMITS

None; for reporting purposes only.

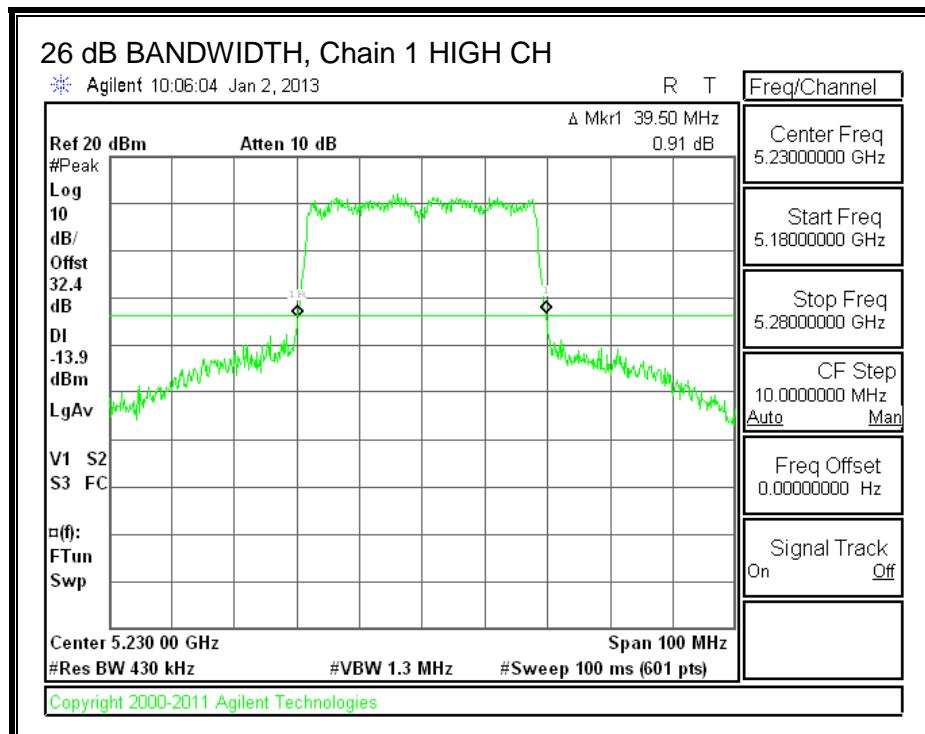
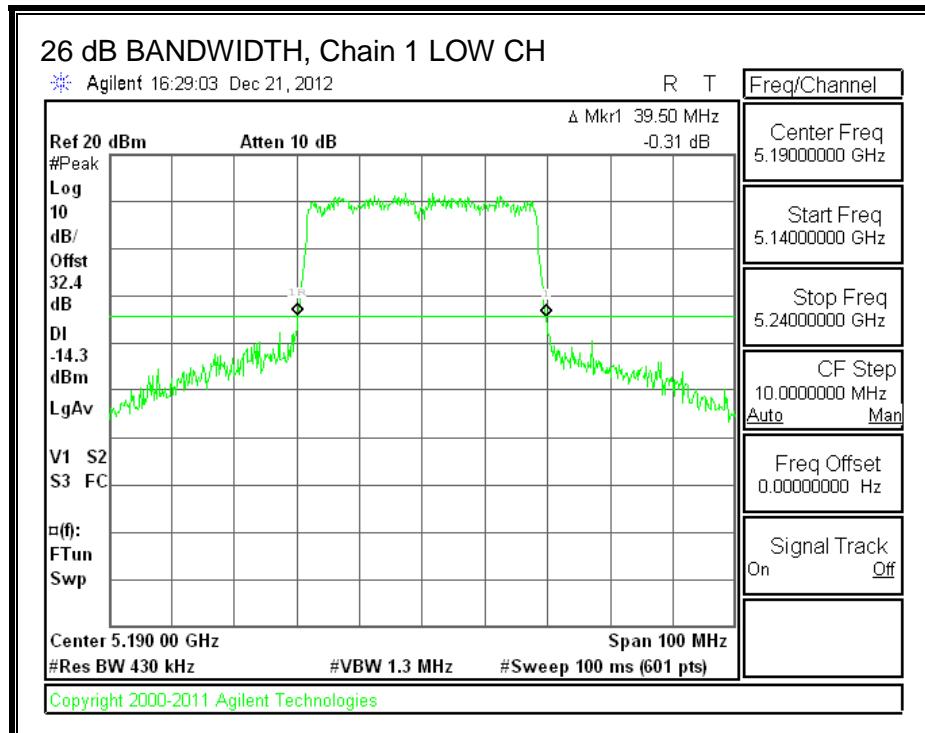
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5190	40.17	39.50	39.50
High	5230	39.83	39.50	39.50

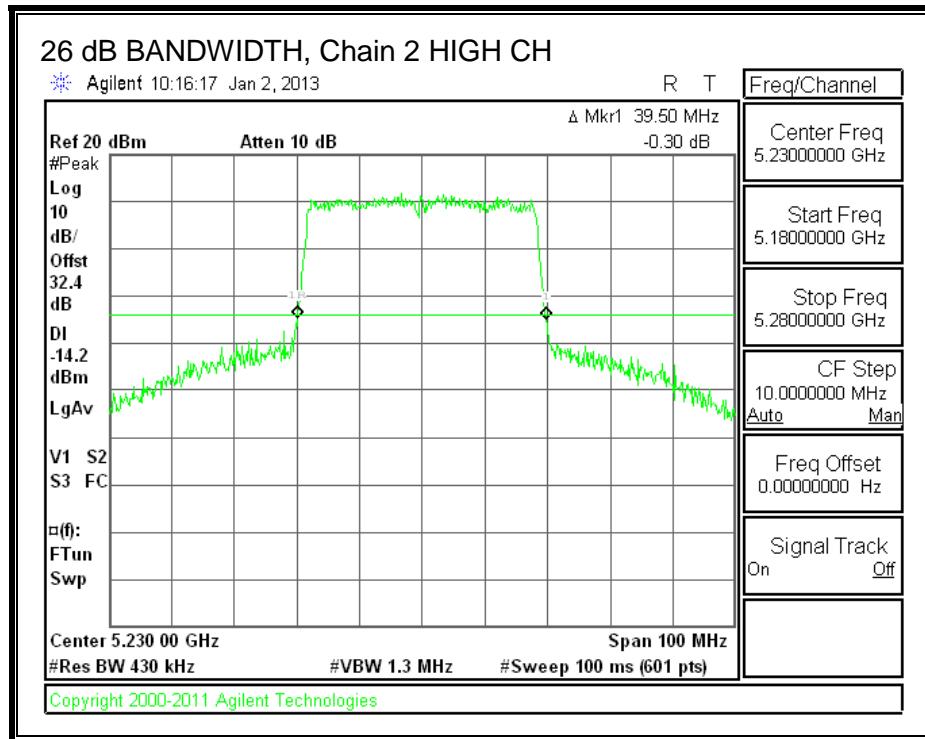
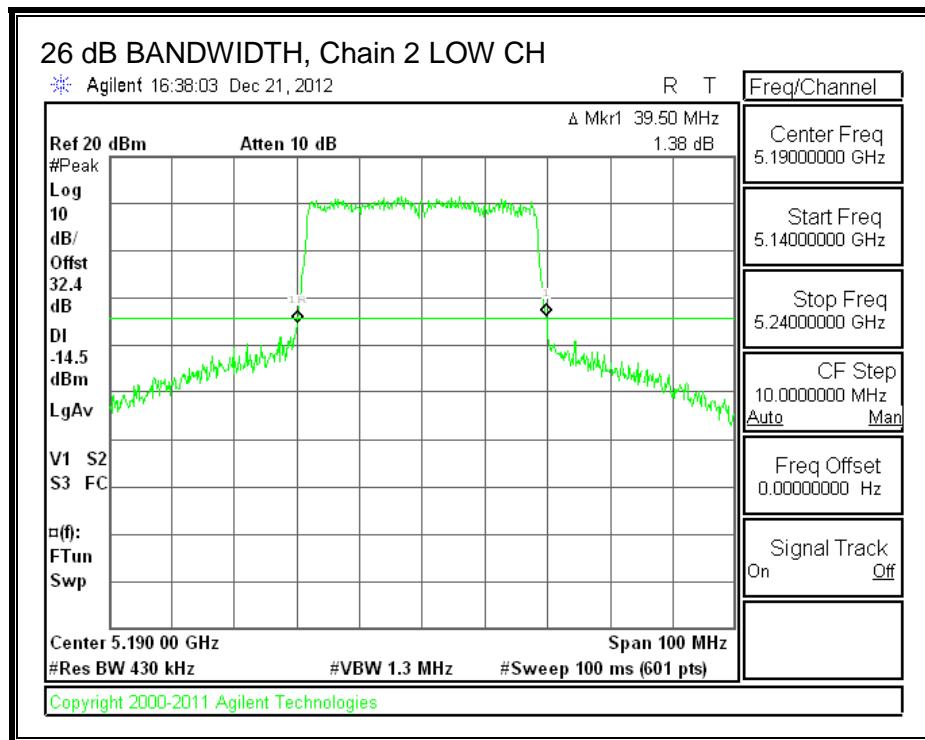
**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



**26 dB BANDWIDTH, Chain 2**



## 8.12.2. 99% BANDWIDTH

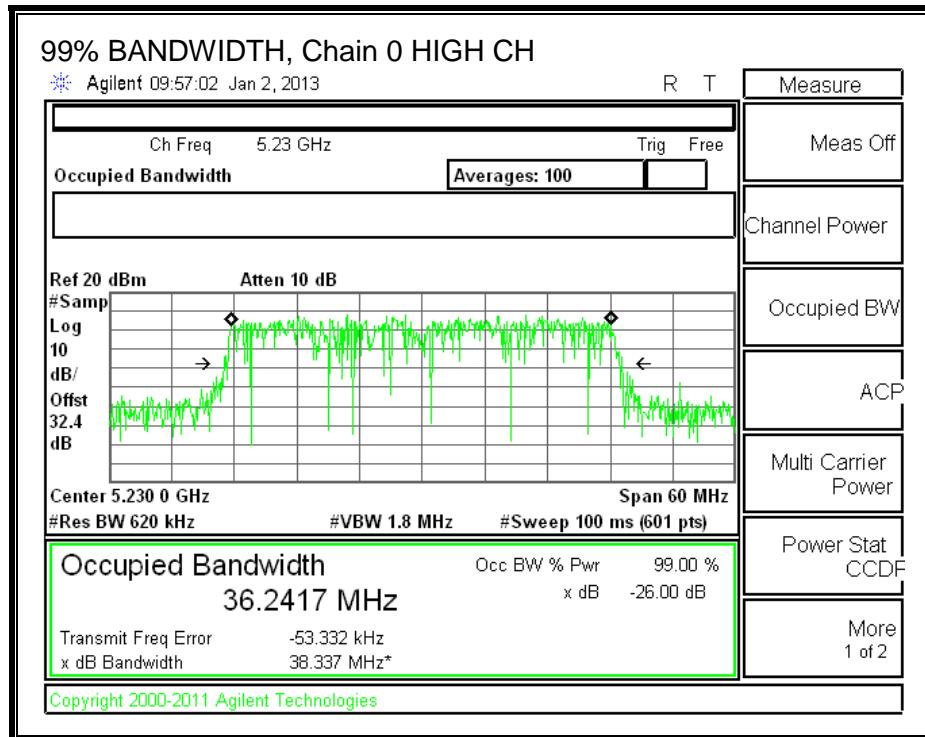
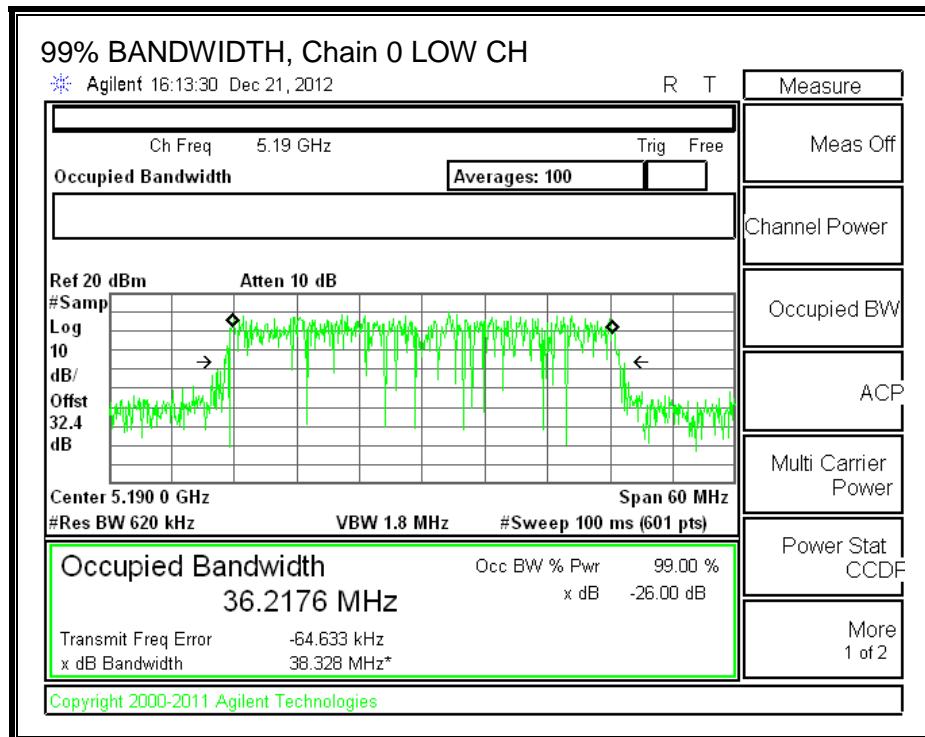
### LIMITS

None; for reporting purposes only.

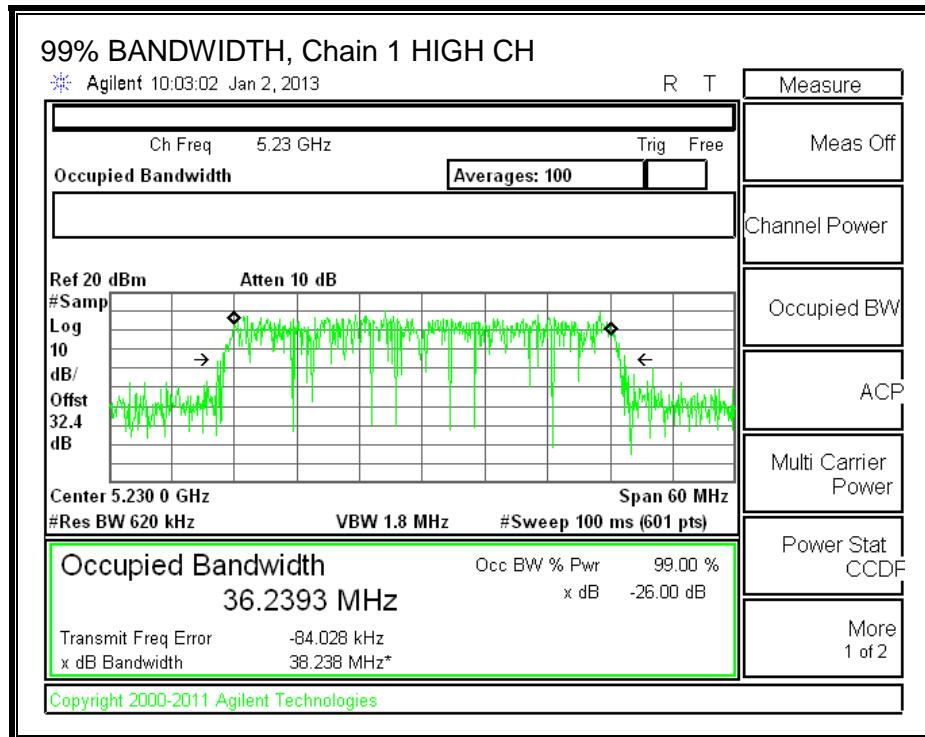
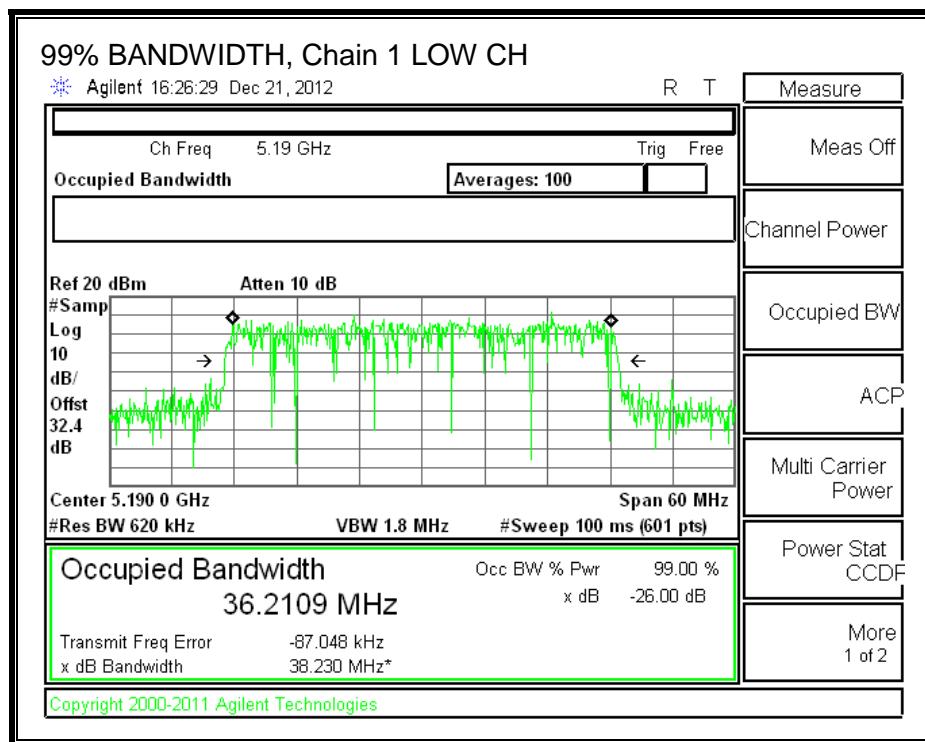
### RESULTS

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

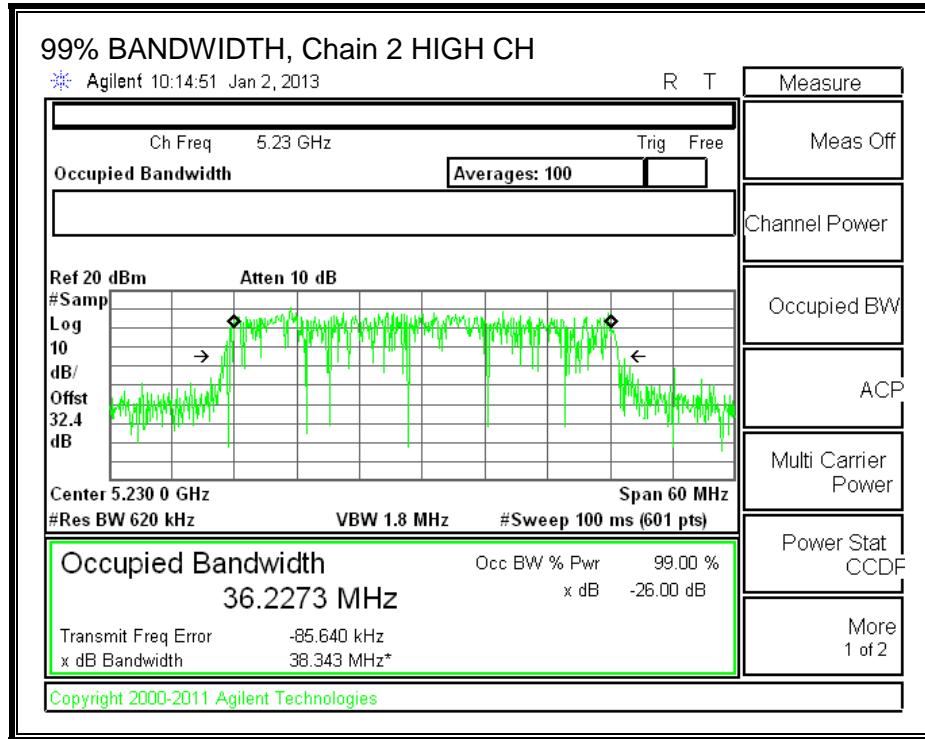
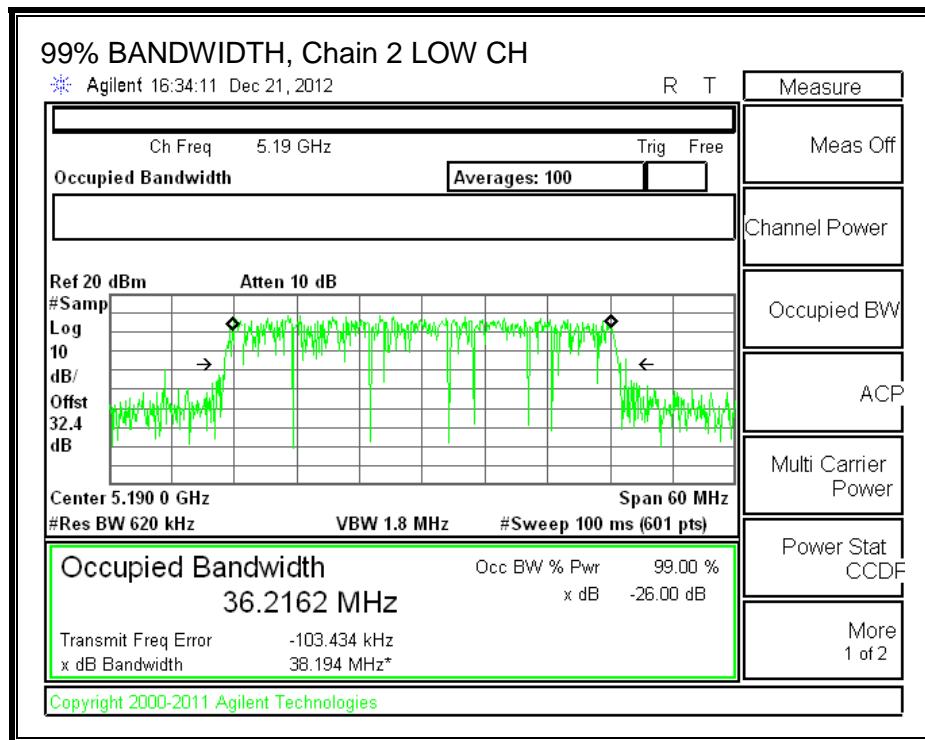
**99% BANDWIDTH, Chain 0**



**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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	
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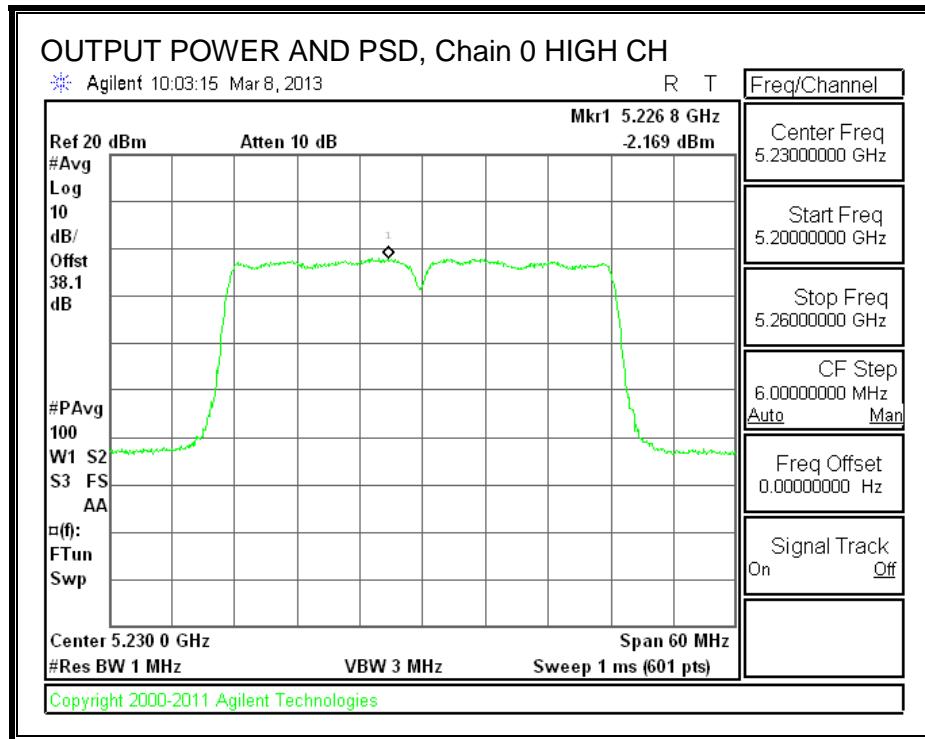
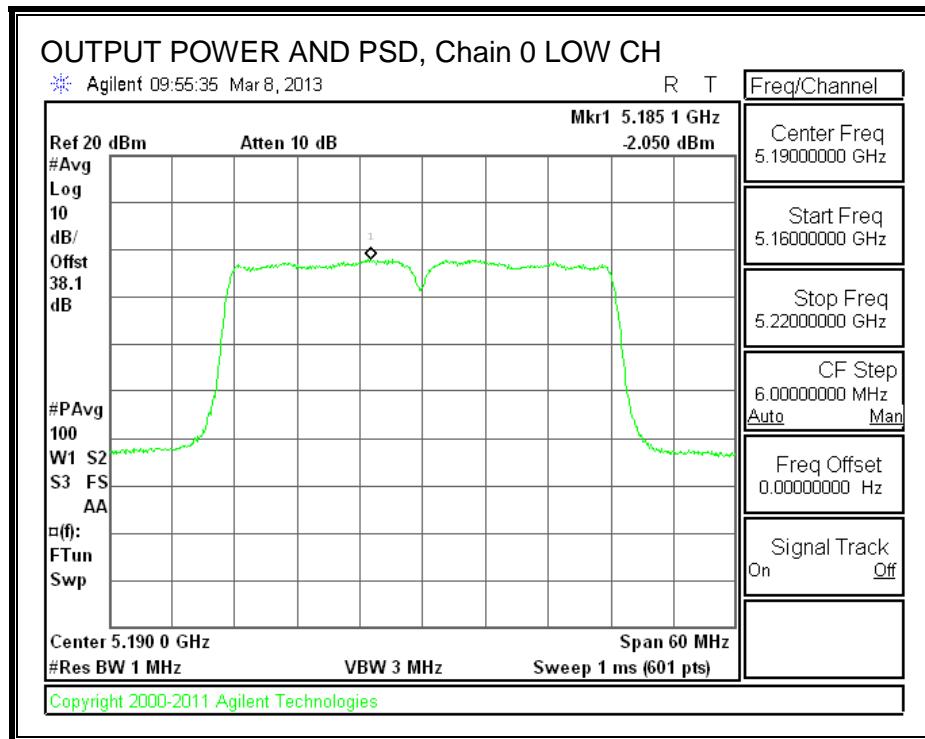
### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

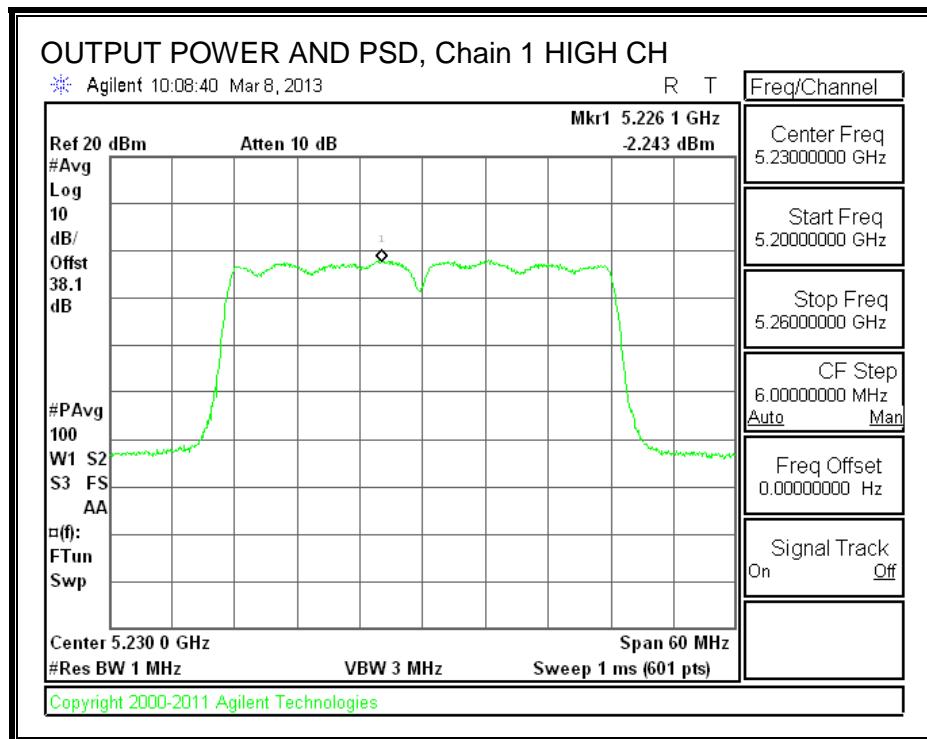
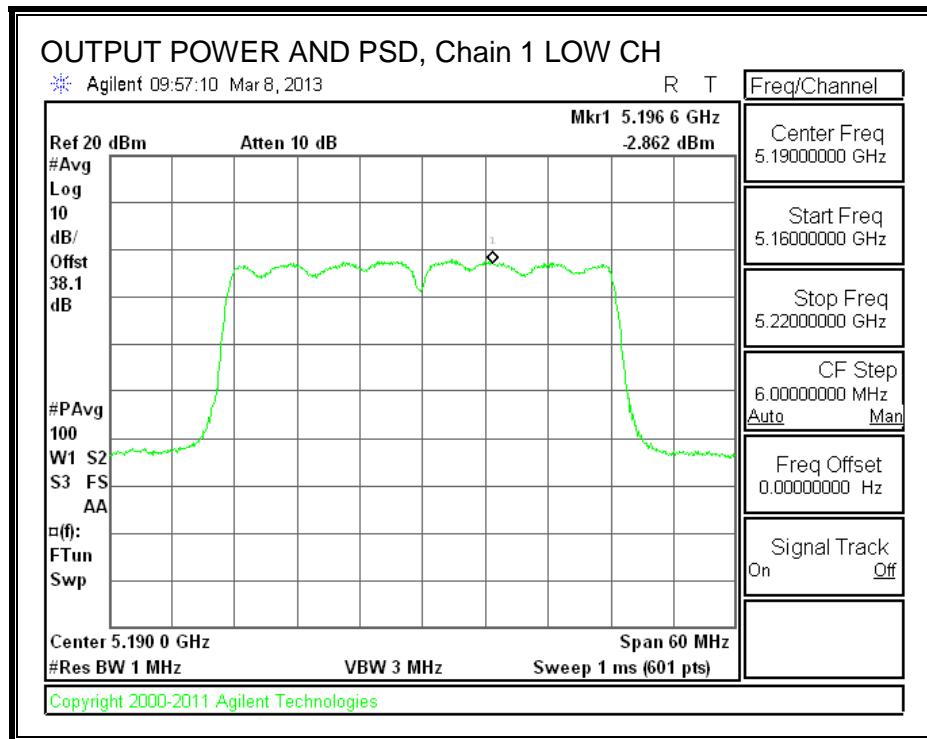
### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

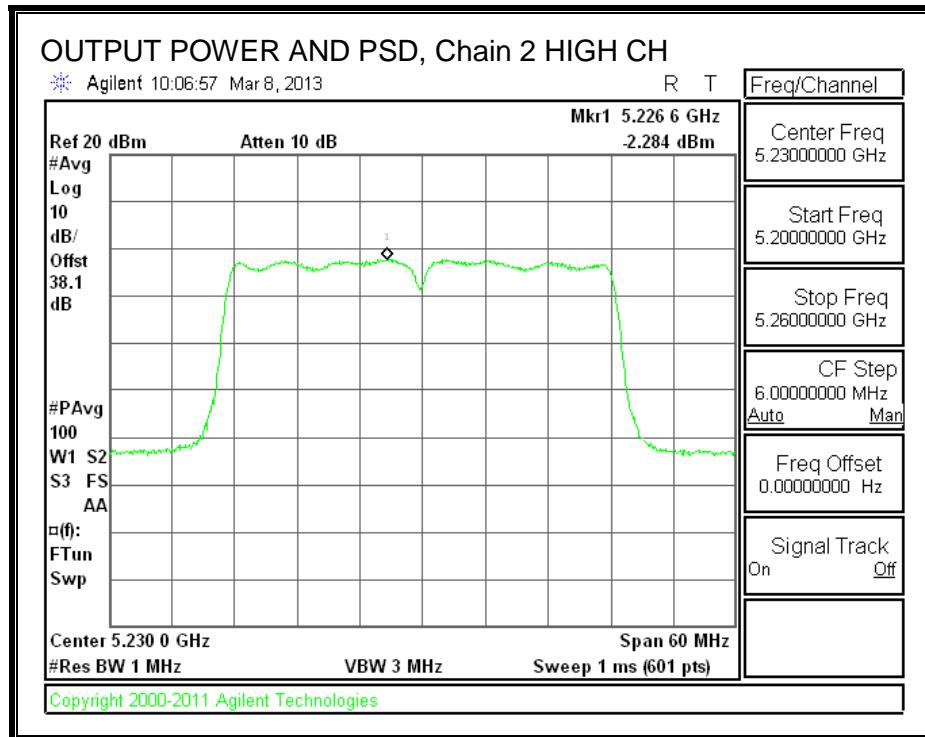
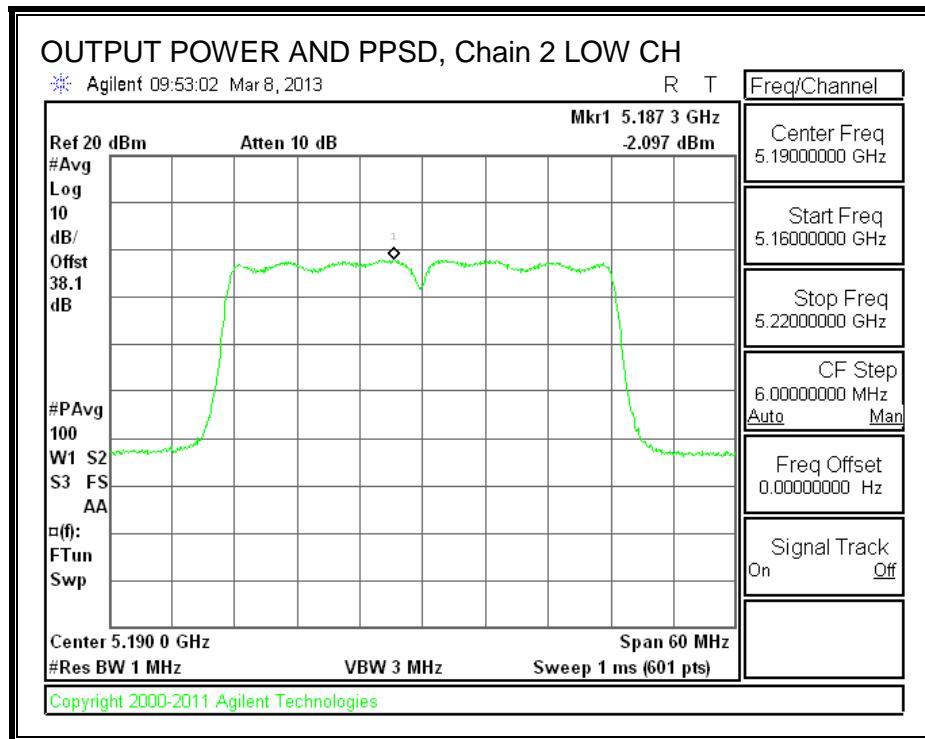
## OUTPUT POWER AND PSD, Chain 0



## 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

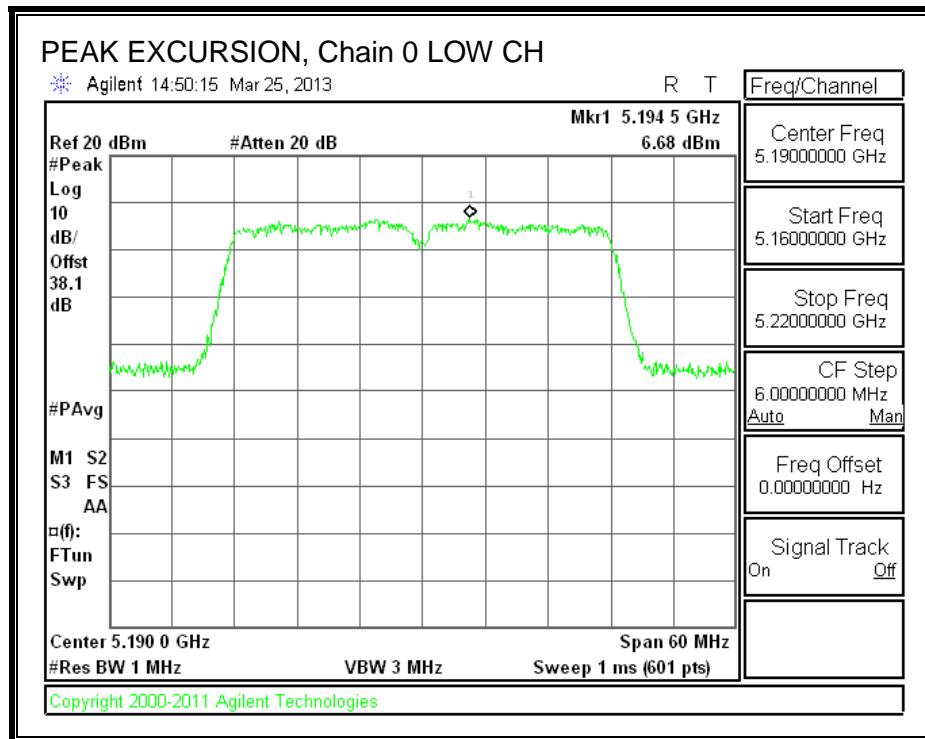
Chain 1

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

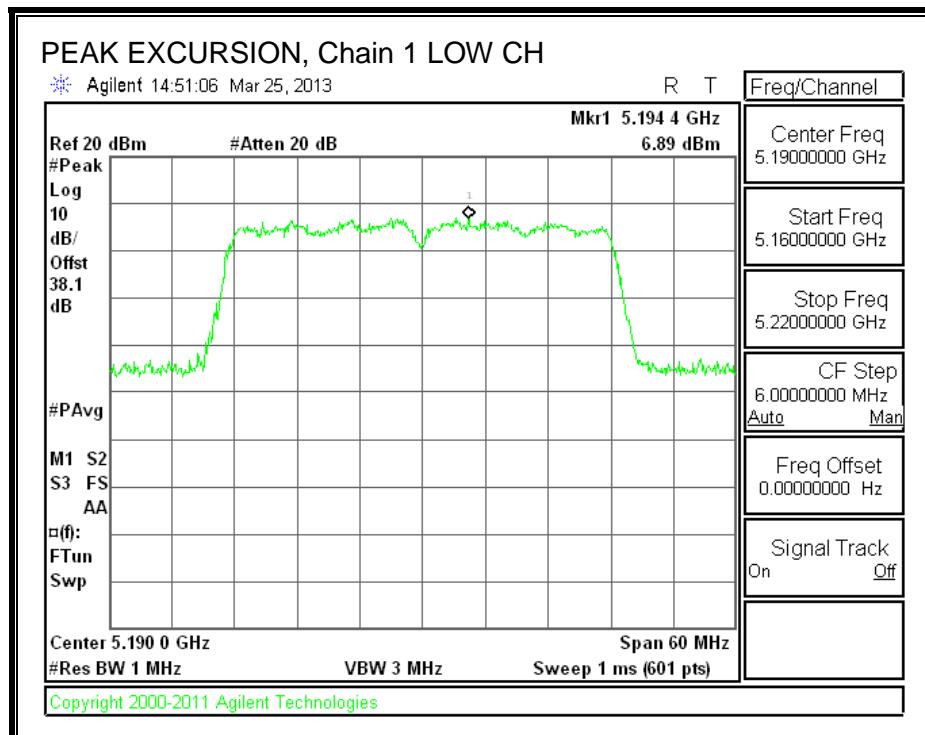
Chain 2

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

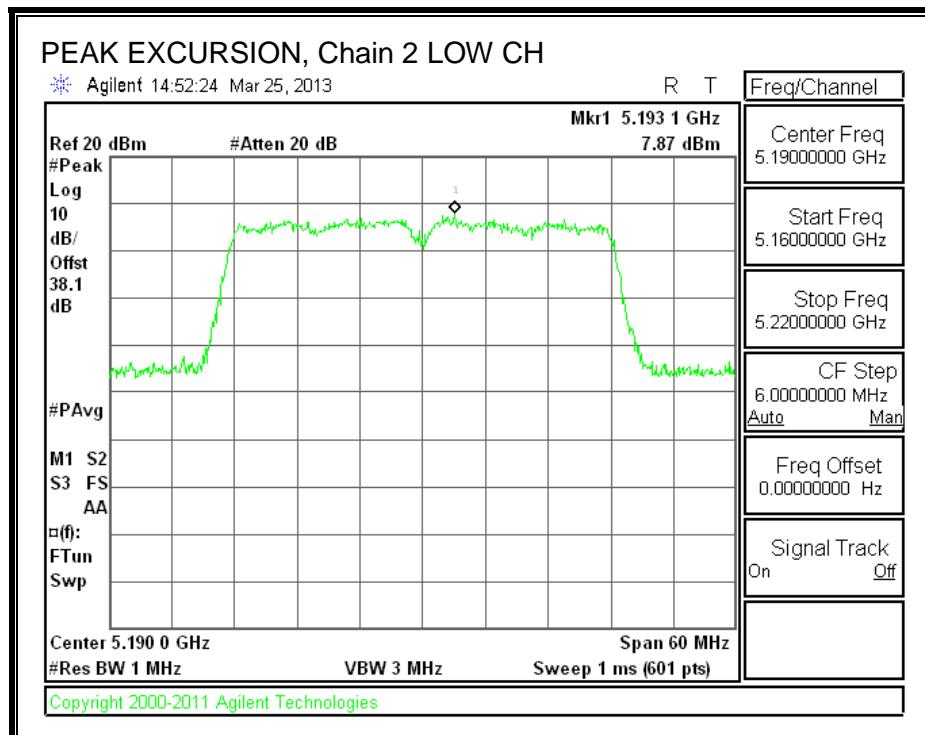
**PEAK EXCURSION, Chain 0**



**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (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	
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

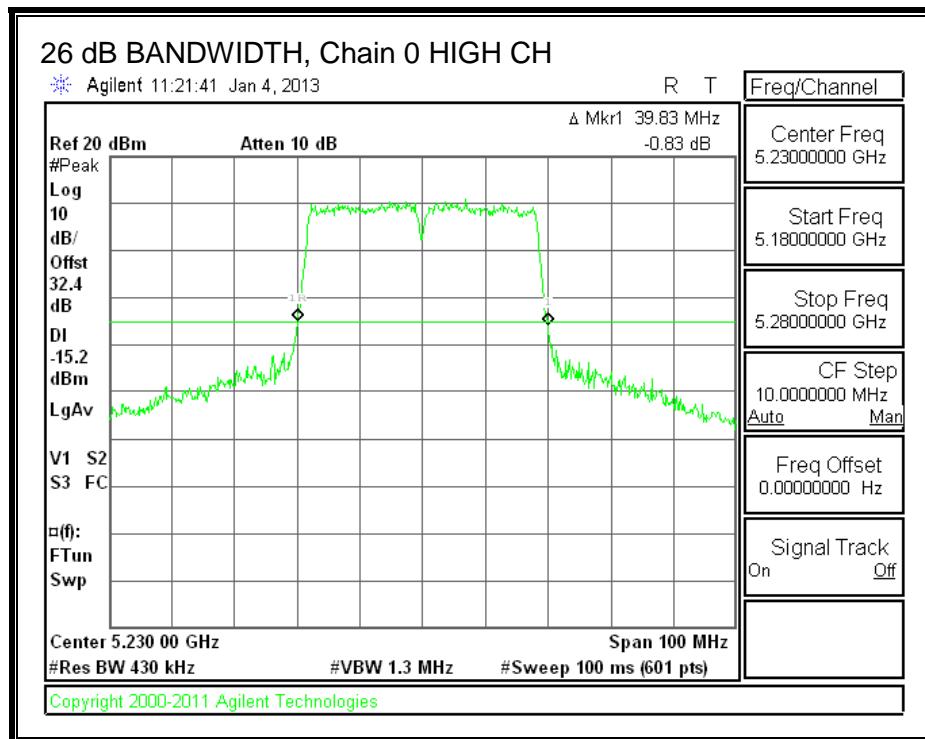
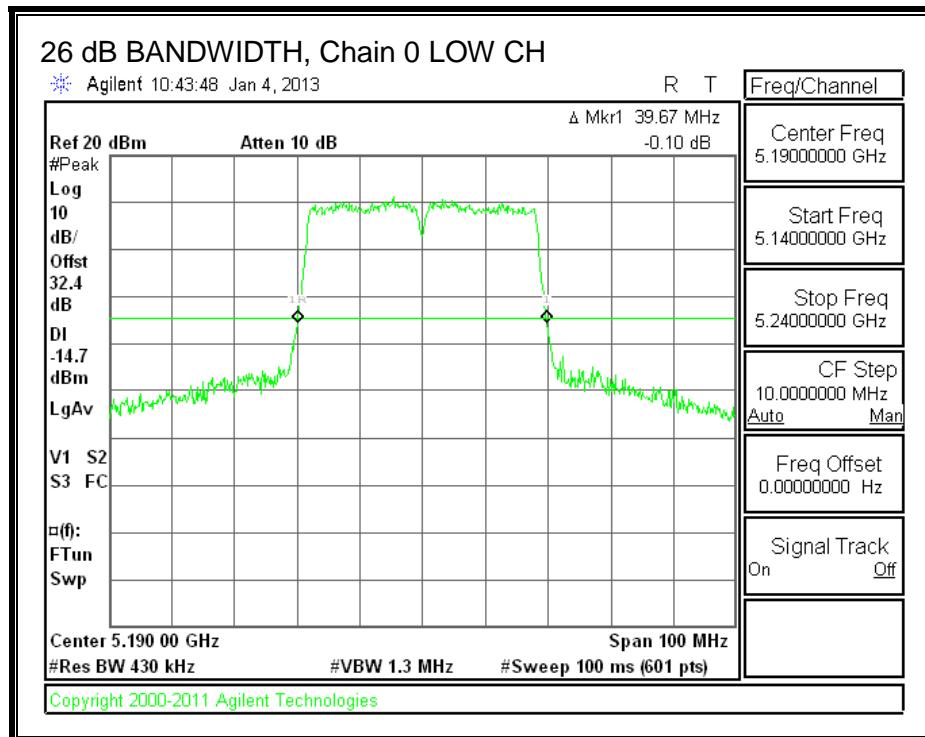
#### LIMITS

None; for reporting purposes only.

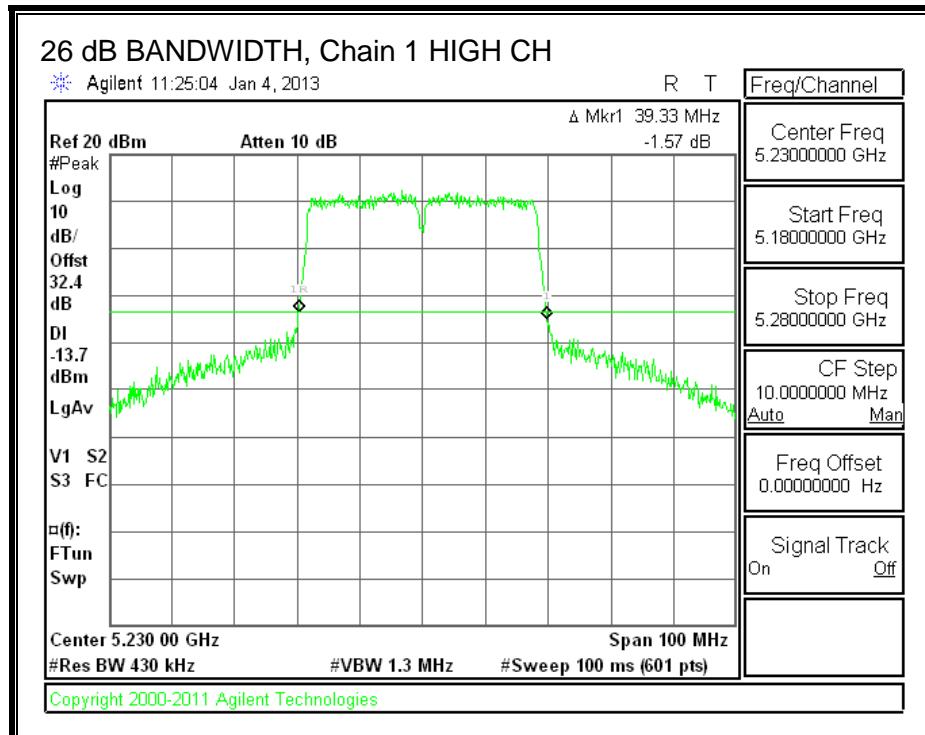
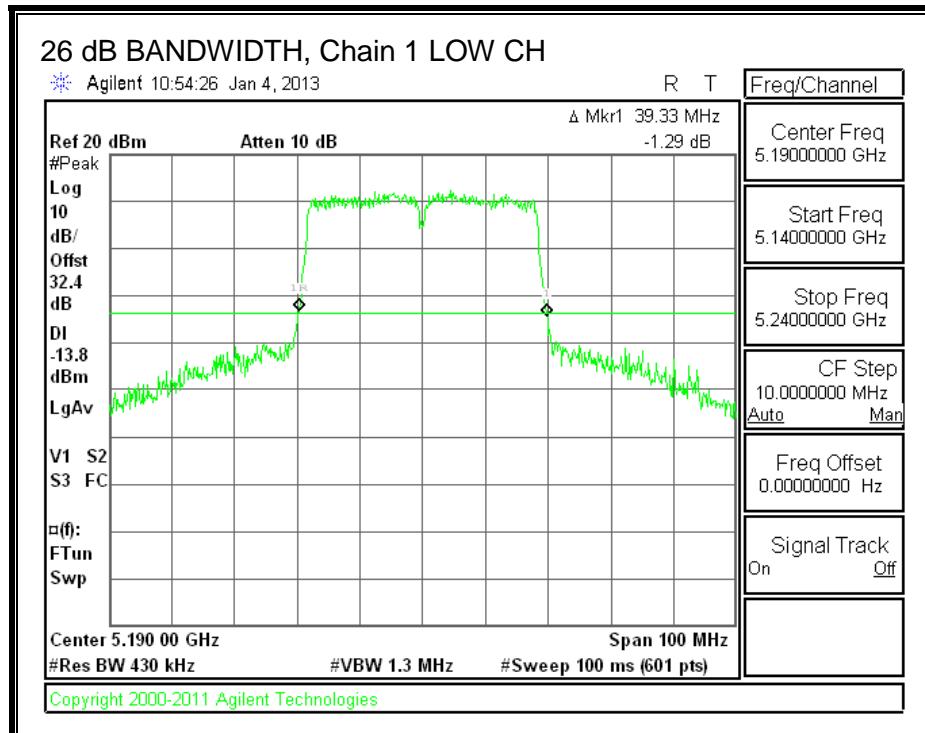
#### RESULTS

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

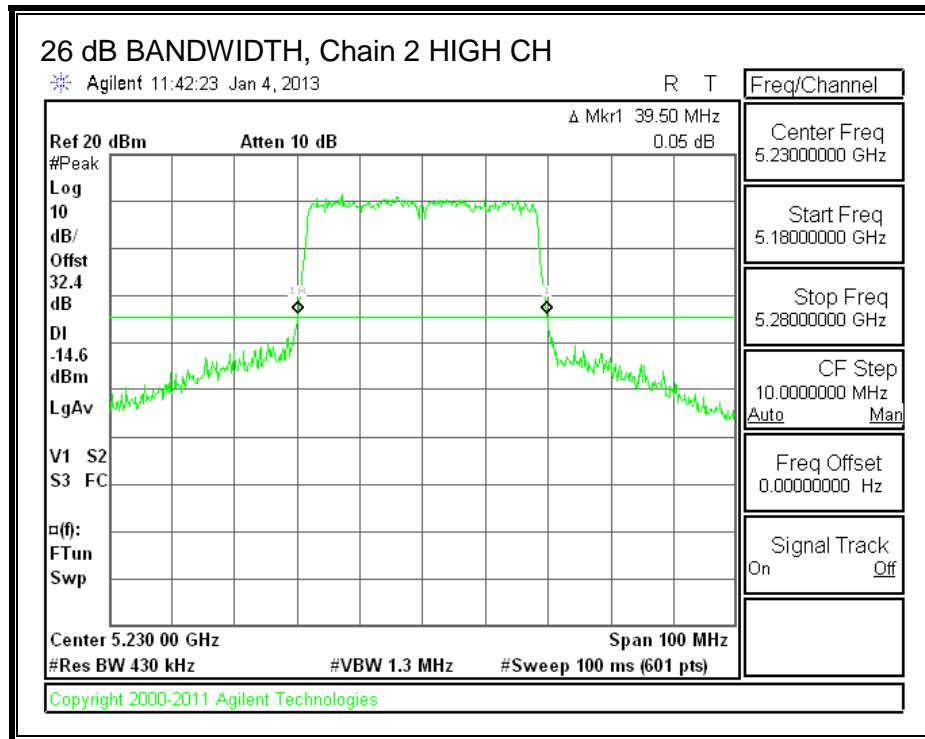
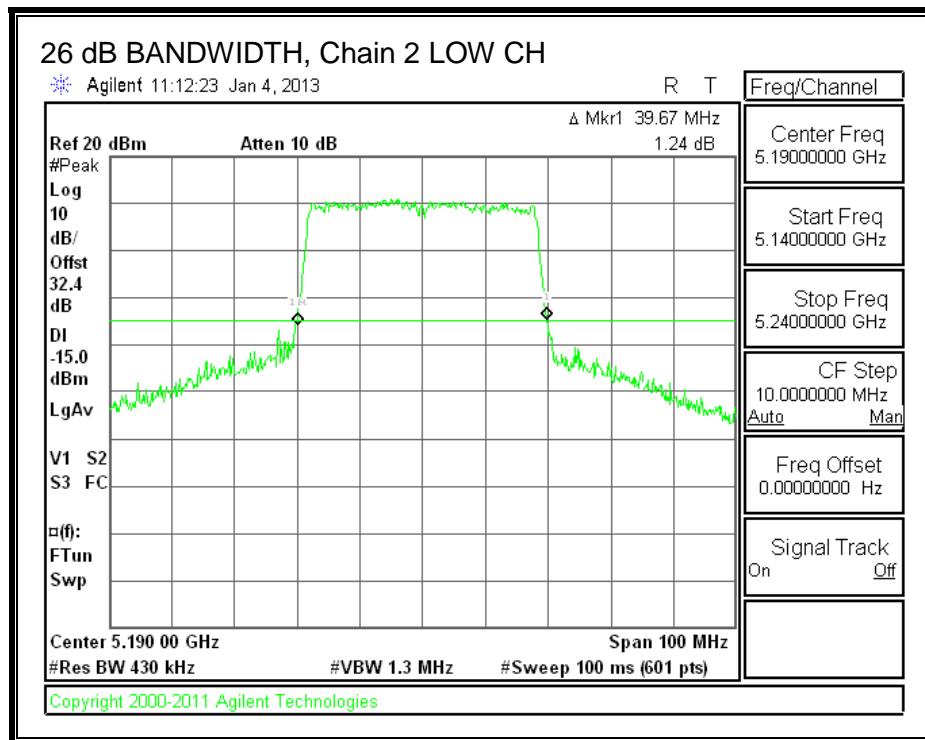
**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



**26 dB BANDWIDTH, Chain 2**



### 8.14.2. 99% BANDWIDTH

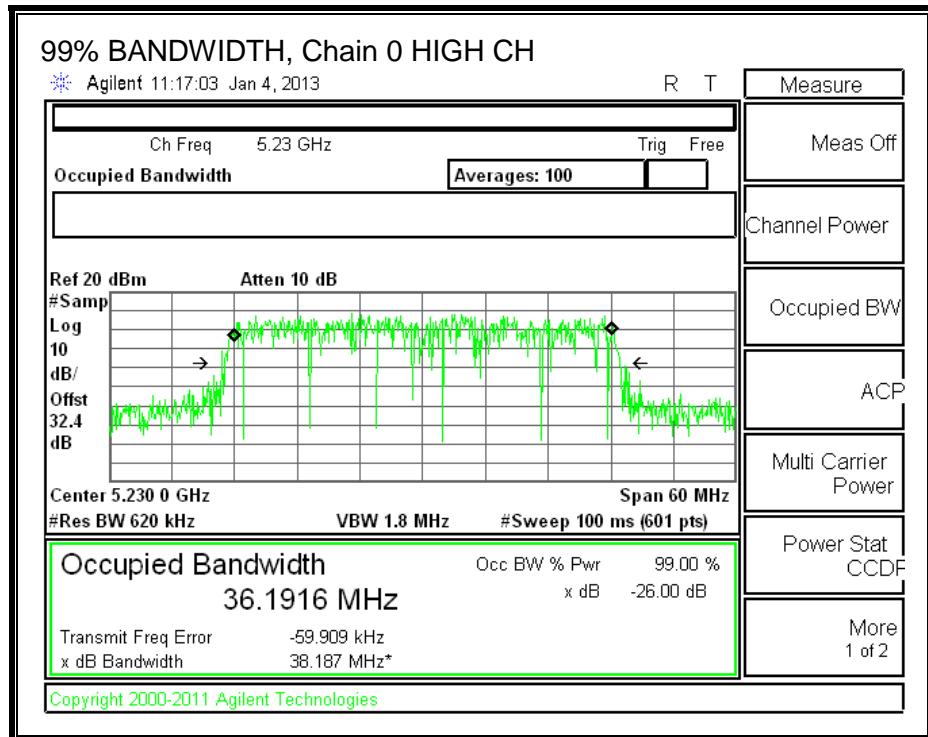
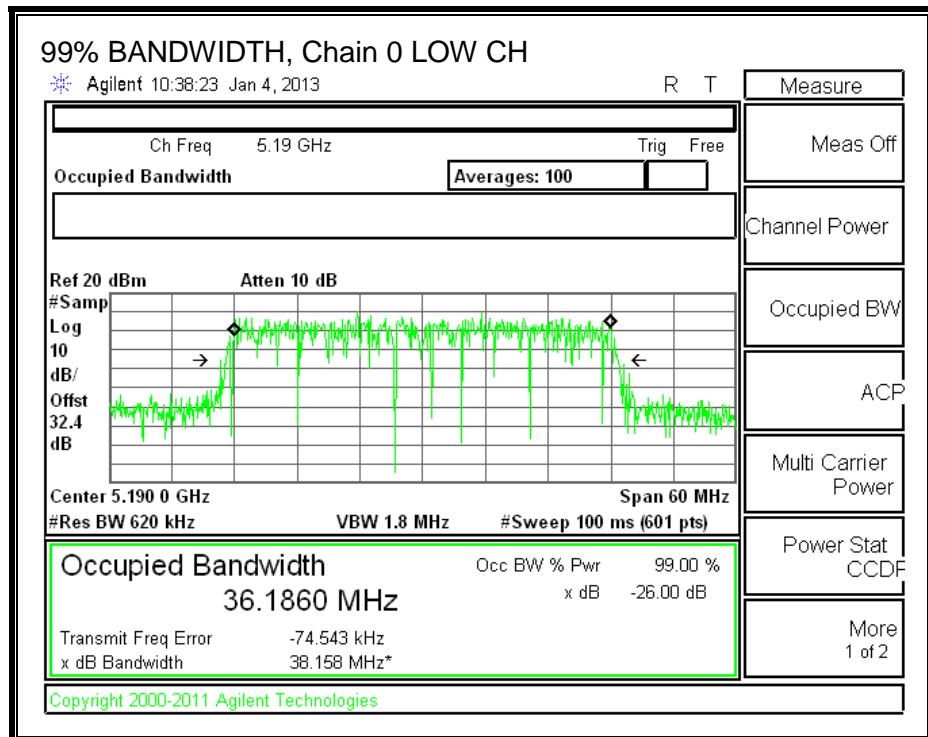
#### LIMITS

None; for reporting purposes only.

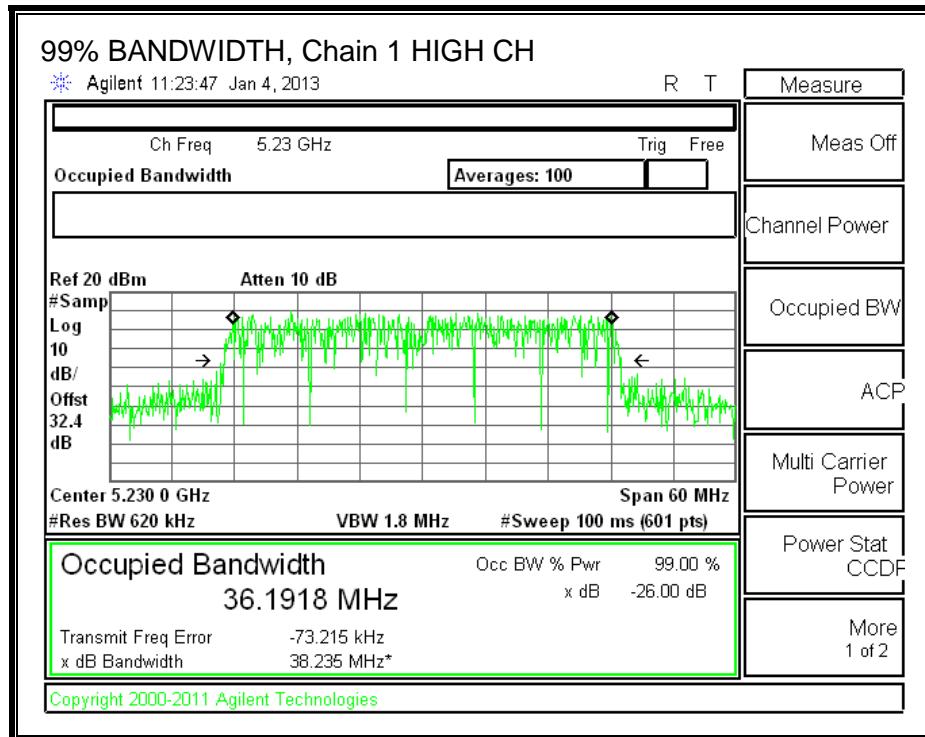
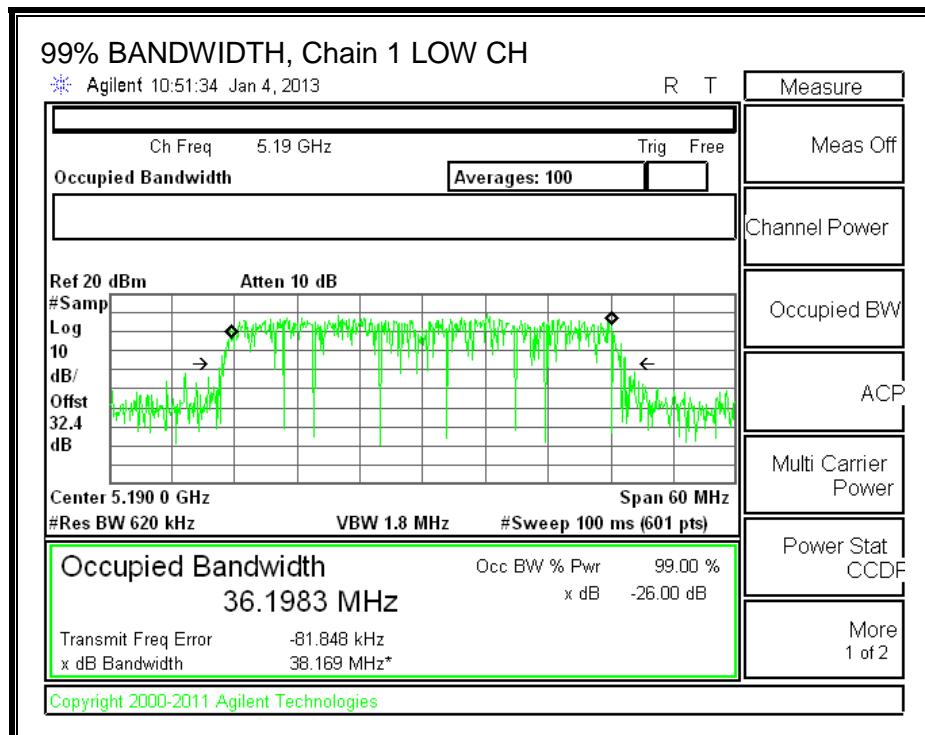
#### RESULTS

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

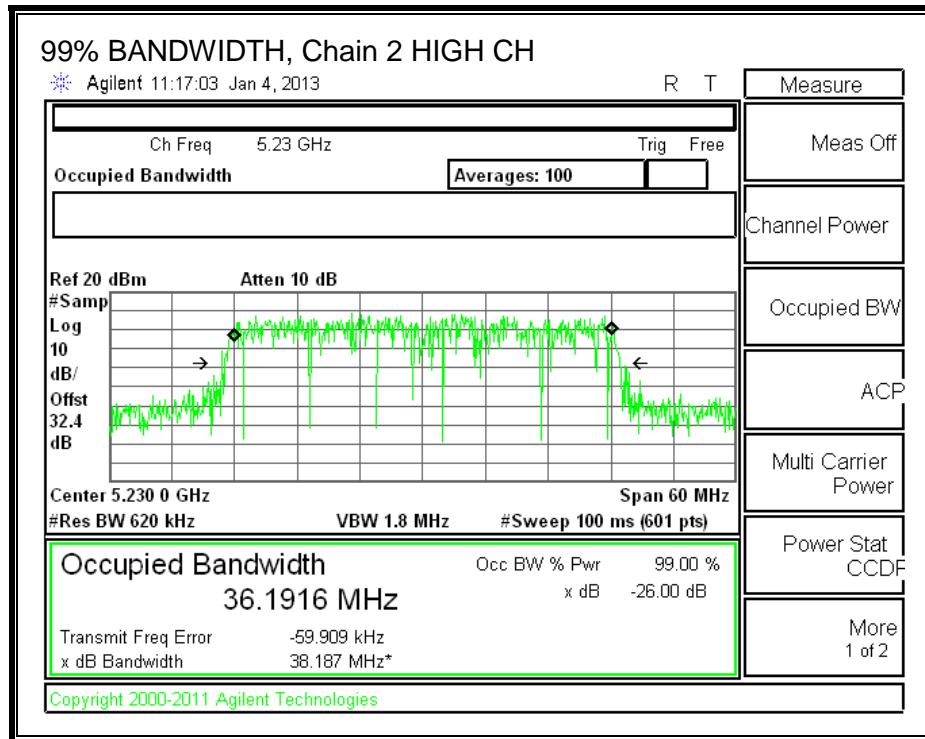
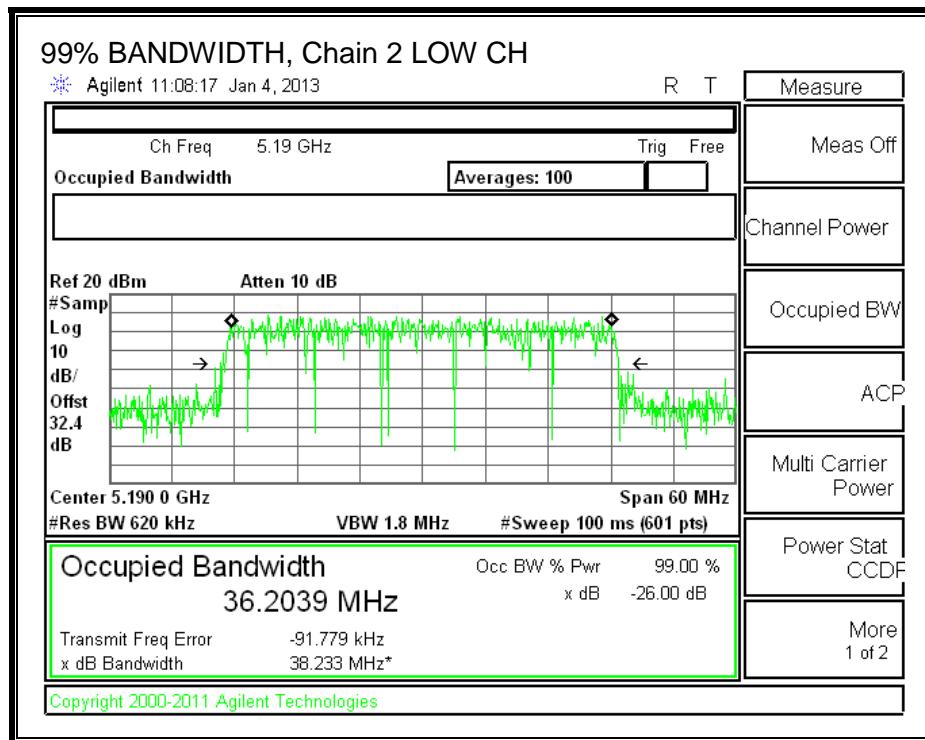
**99% BANDWIDTH, Chain 0**



**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	1.40	2.20	2.33

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (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
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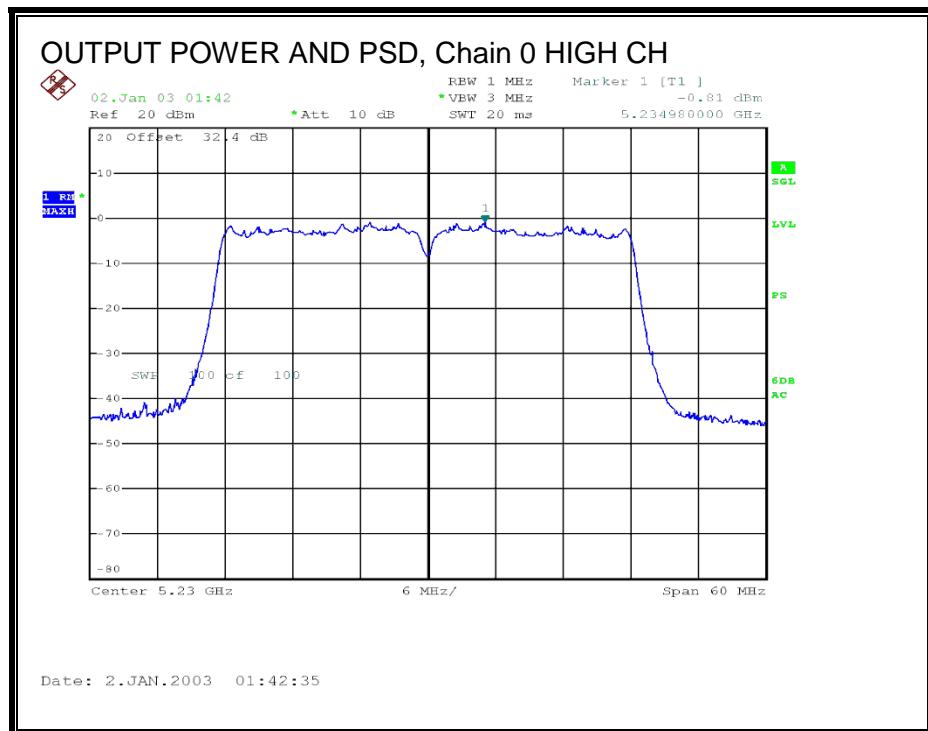
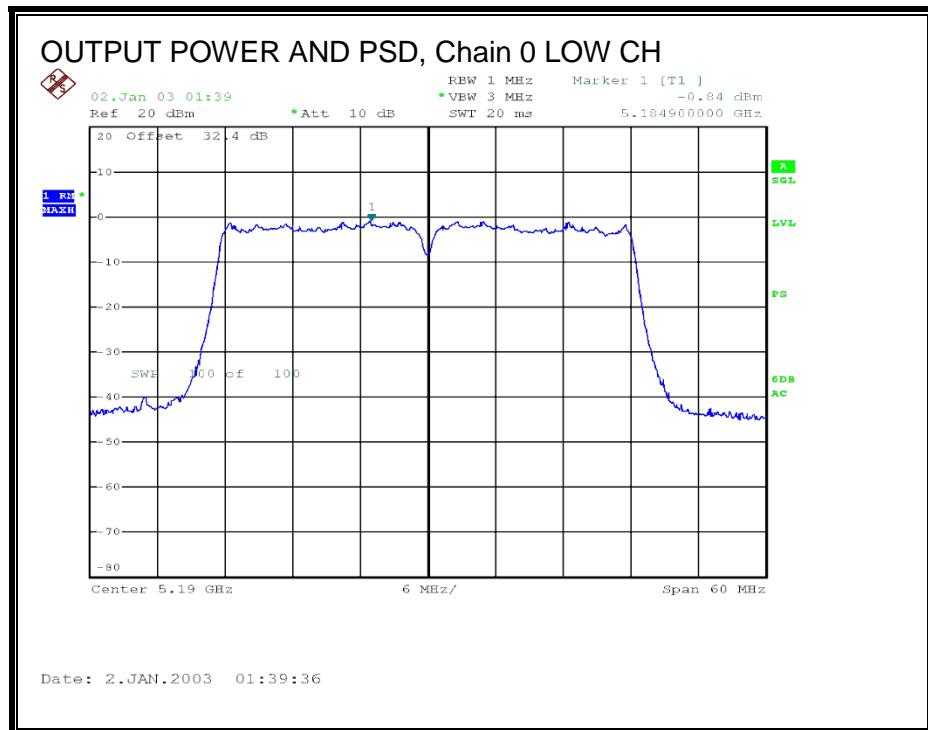
### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

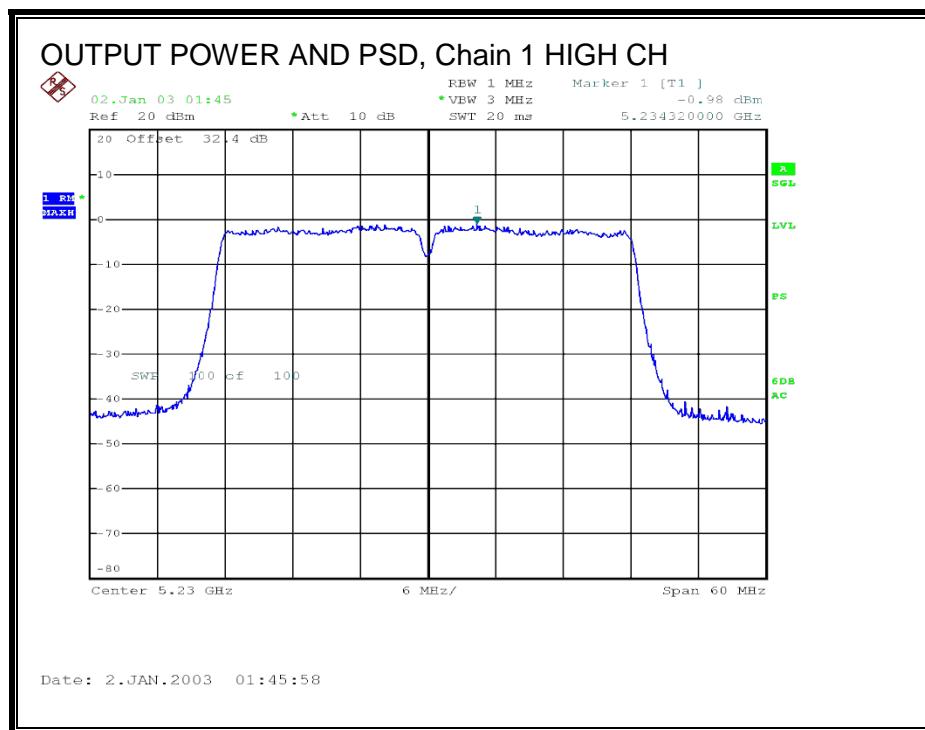
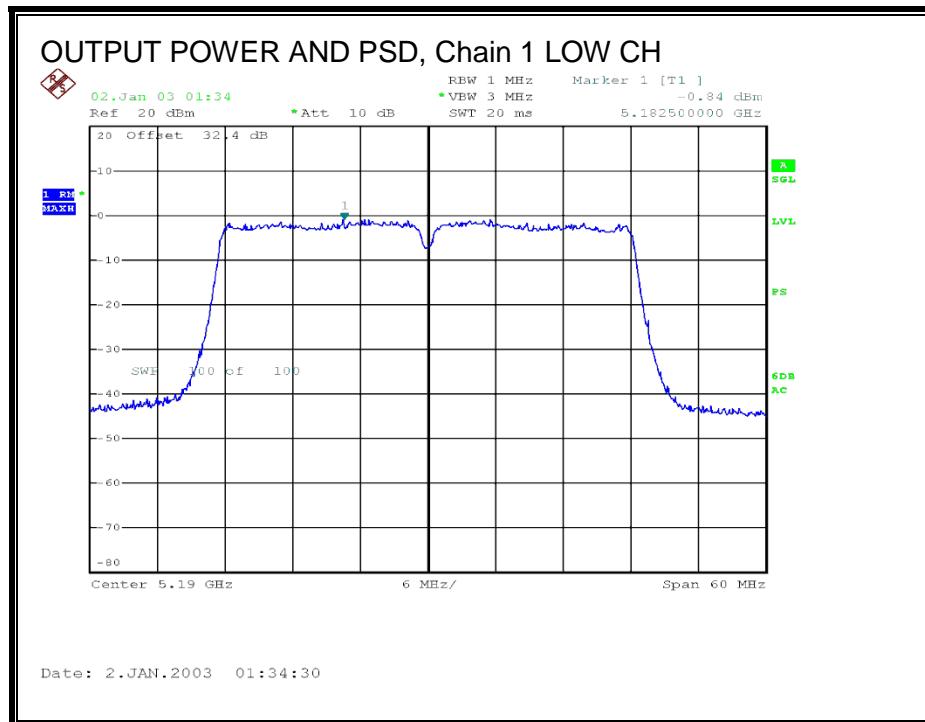
### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

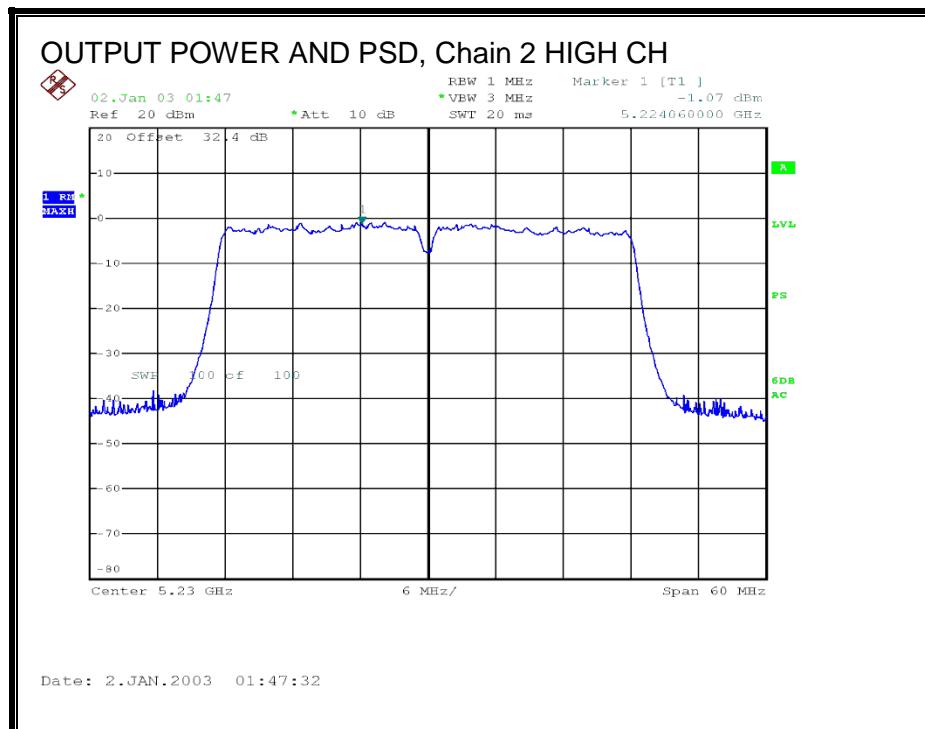
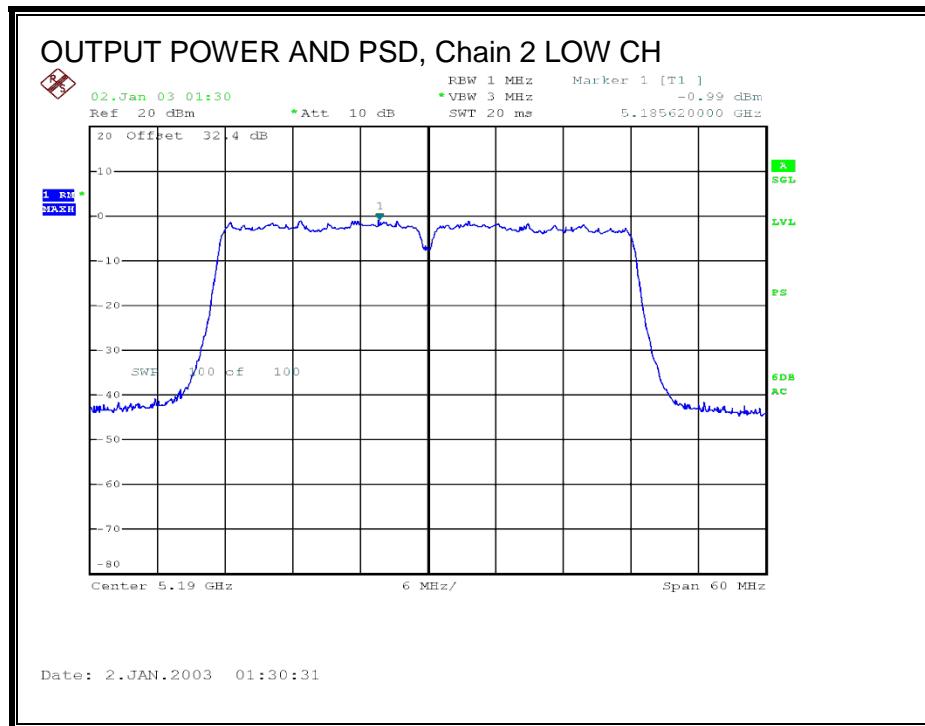
**OUTPUT POWER AND PSD, Chain 0**



**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

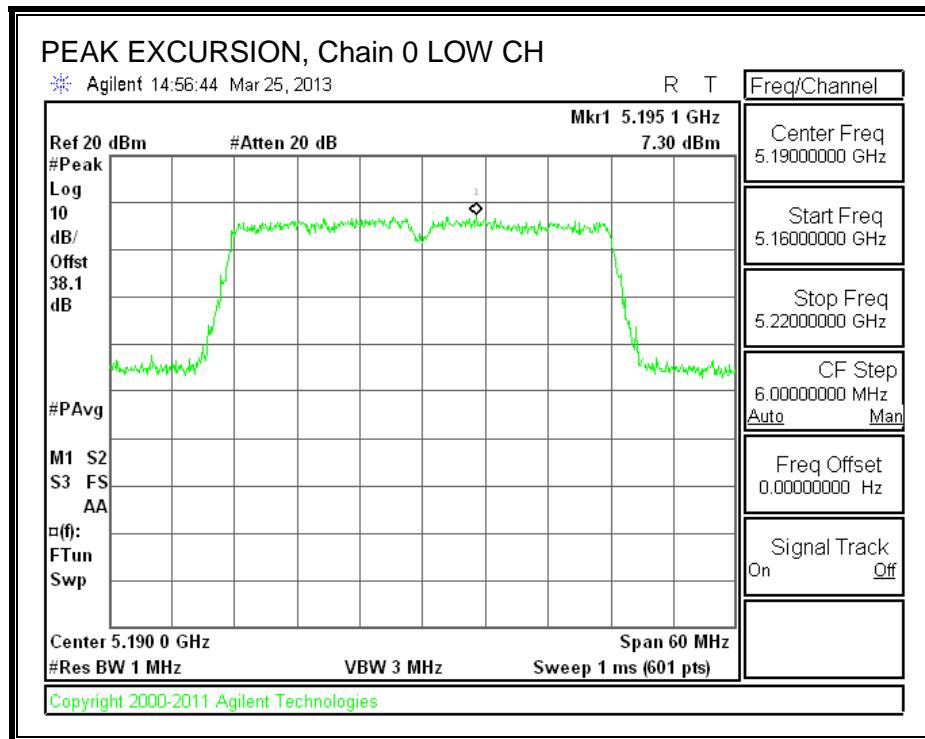
Chain 1

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

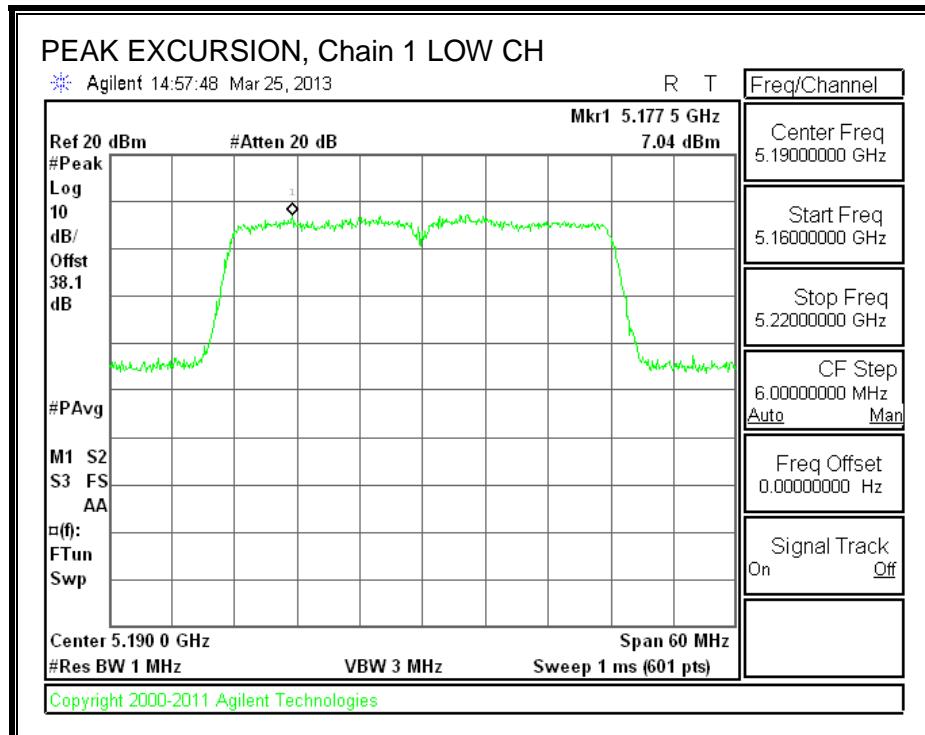
Chain 2

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

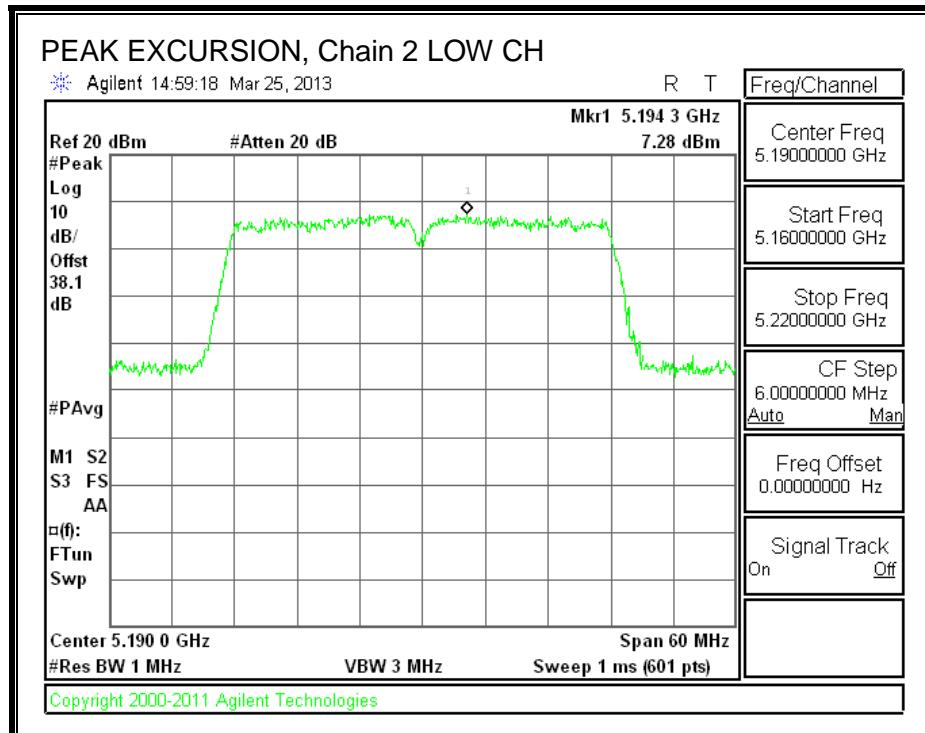
**PEAK EXCURSION, Chain 0**



**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

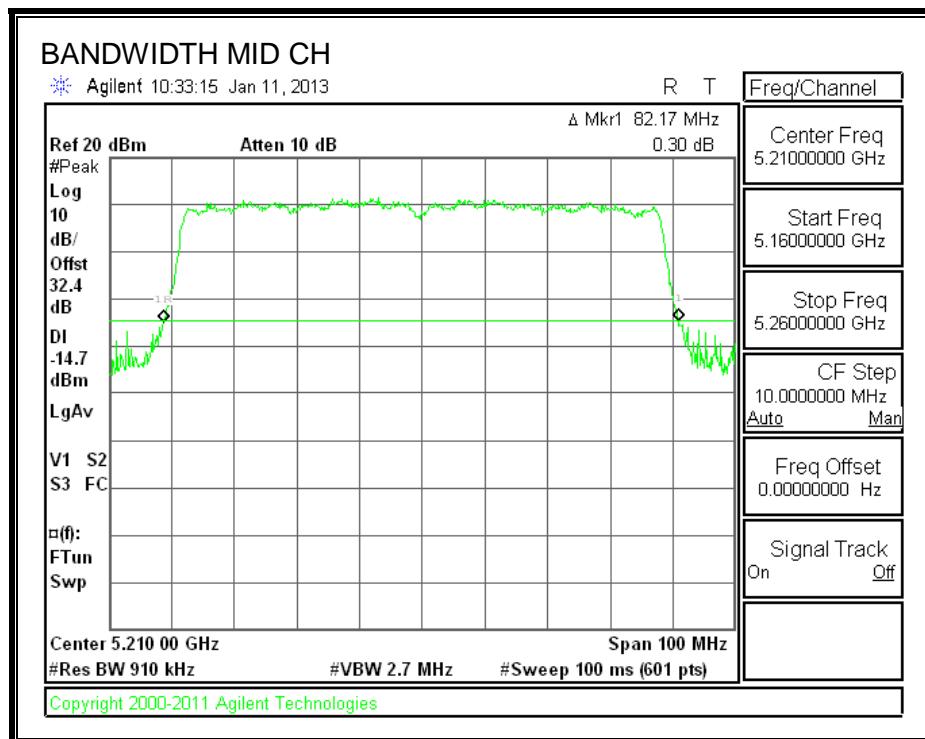
#### LIMITS

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

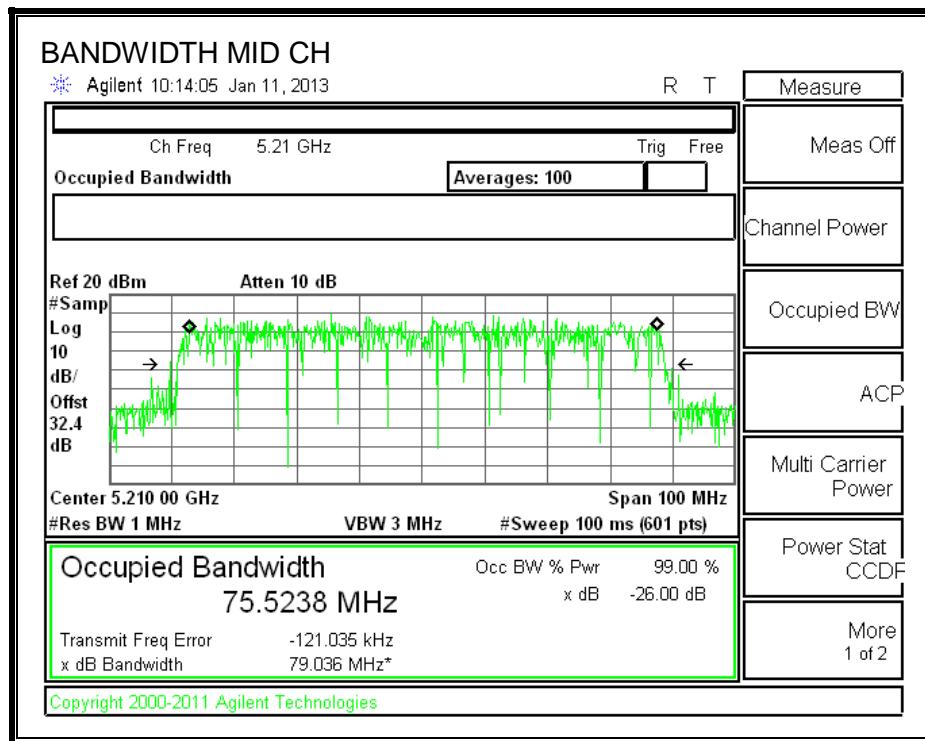
### LIMITS

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 (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Mid	5210	82.17	75.5238	3.20

### Limits

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

Duty Cycle CF (dB)	0.10
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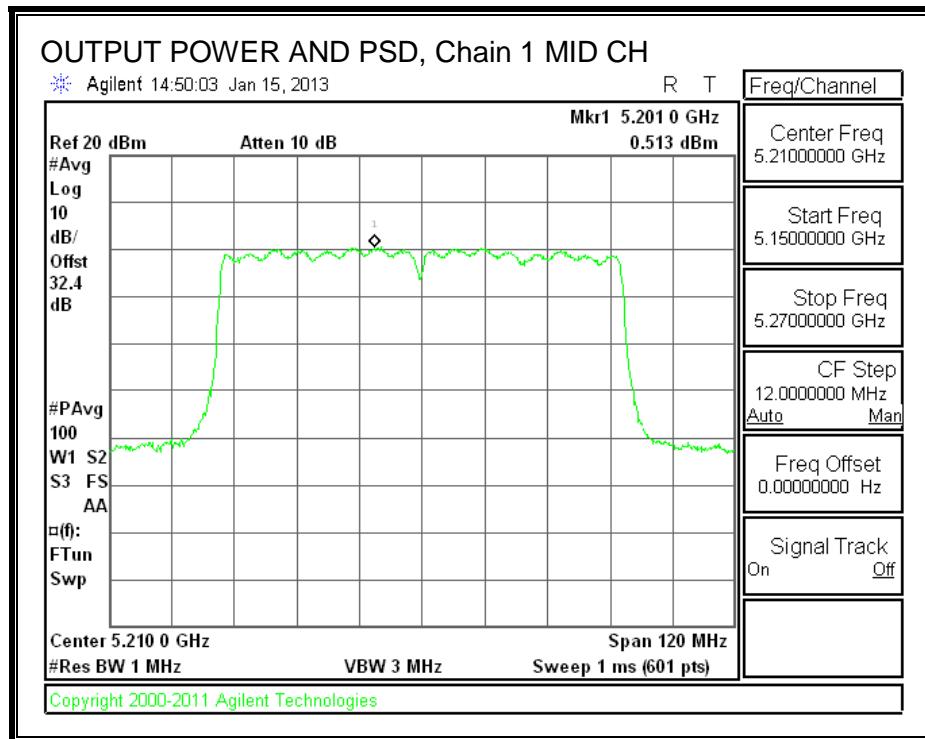
### Output Power Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	13.00	13.00	17.00	-4.00

### PSD Results

Channel	Frequency (MHz)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5210	0.513	0.613	4.00	-3.39

**OUTPUT POWER AND PSD, Chain 1**



### 8.15.4. PEAK EXCURSION

#### LIMITS

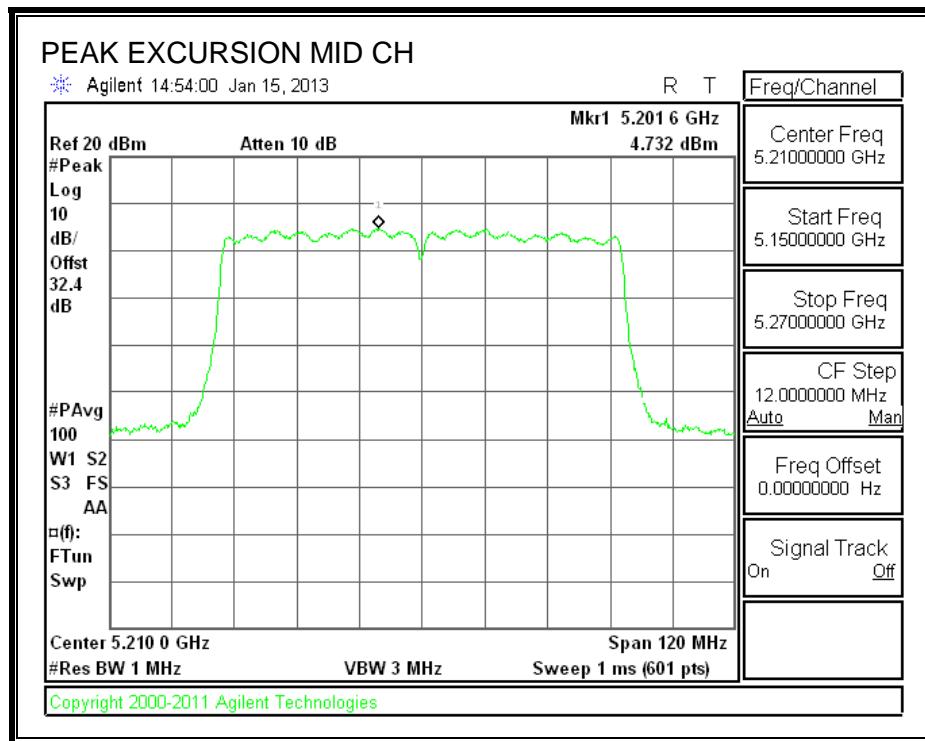
FCC §15.407 (a) (6)

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

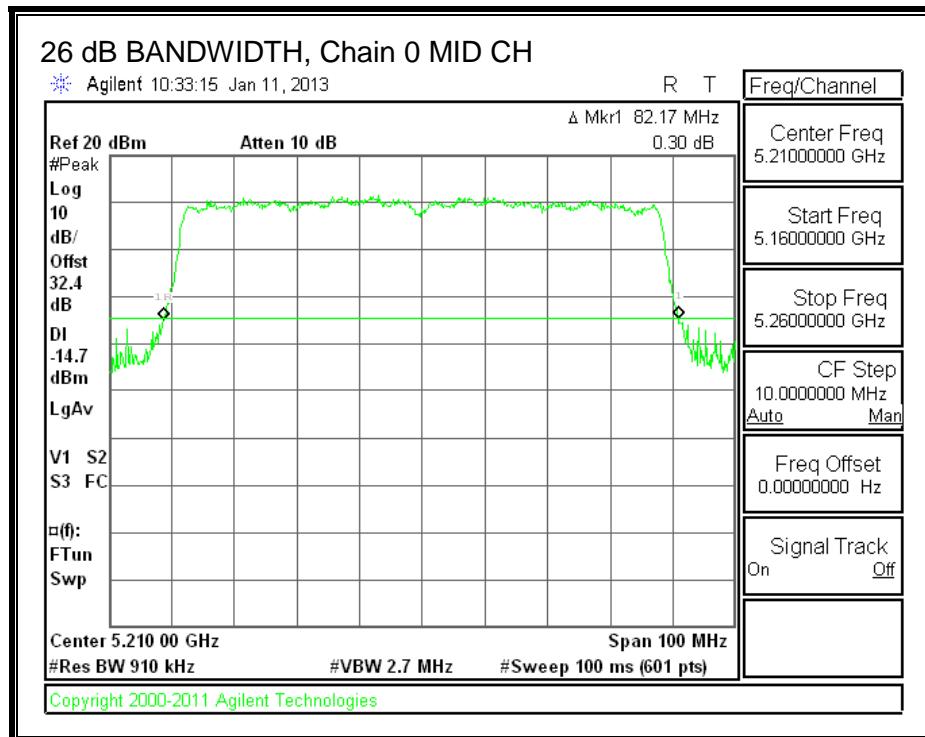
#### LIMITS

None; for reporting purposes only.

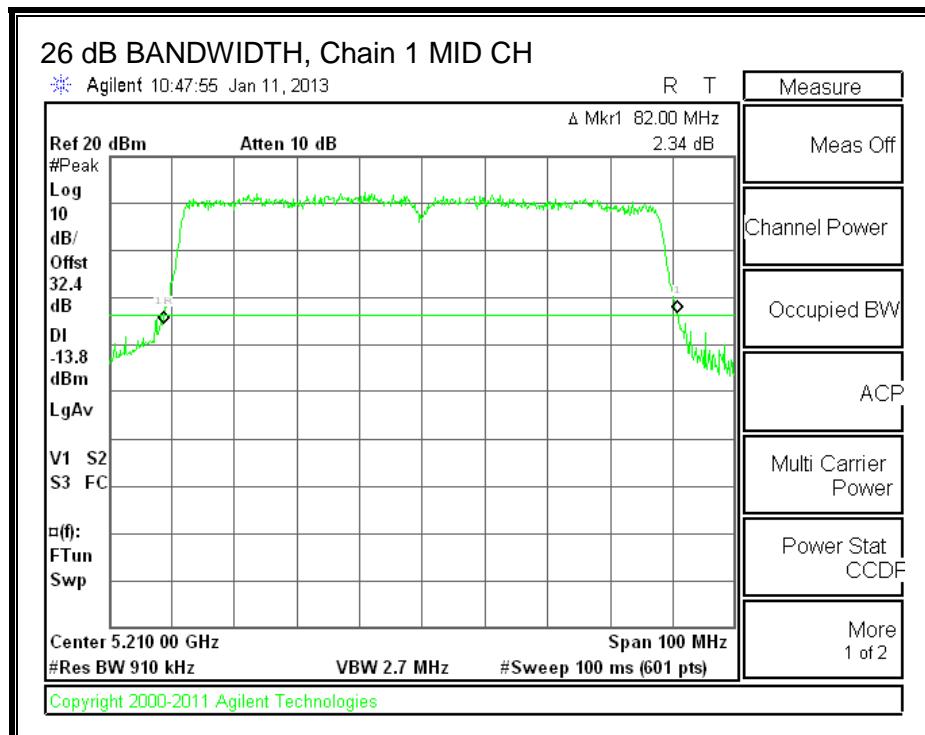
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Mid	5210	82.17	82.00

**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



## 8.16.2. 99% BANDWIDTH

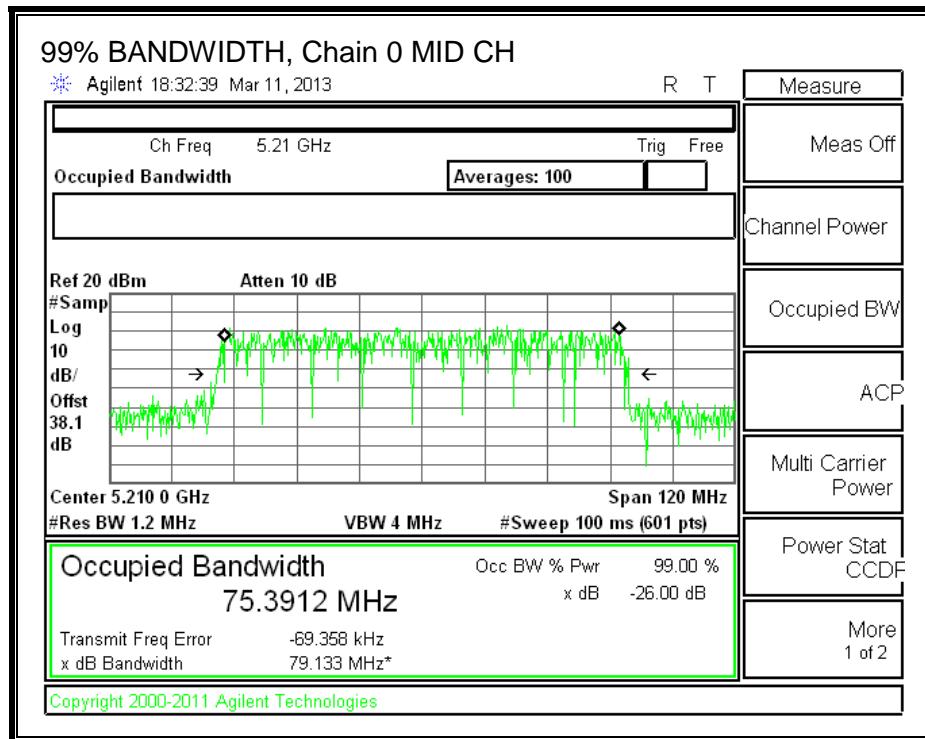
### LIMITS

None; for reporting purposes only.

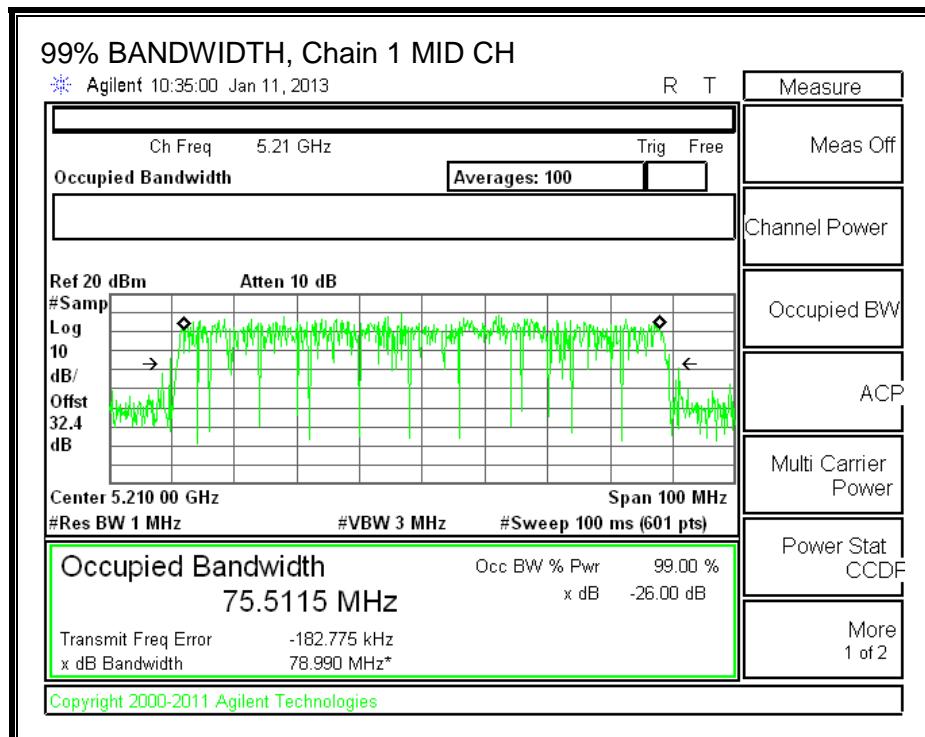
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

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

Duty Cycle CF (dB)	0.09
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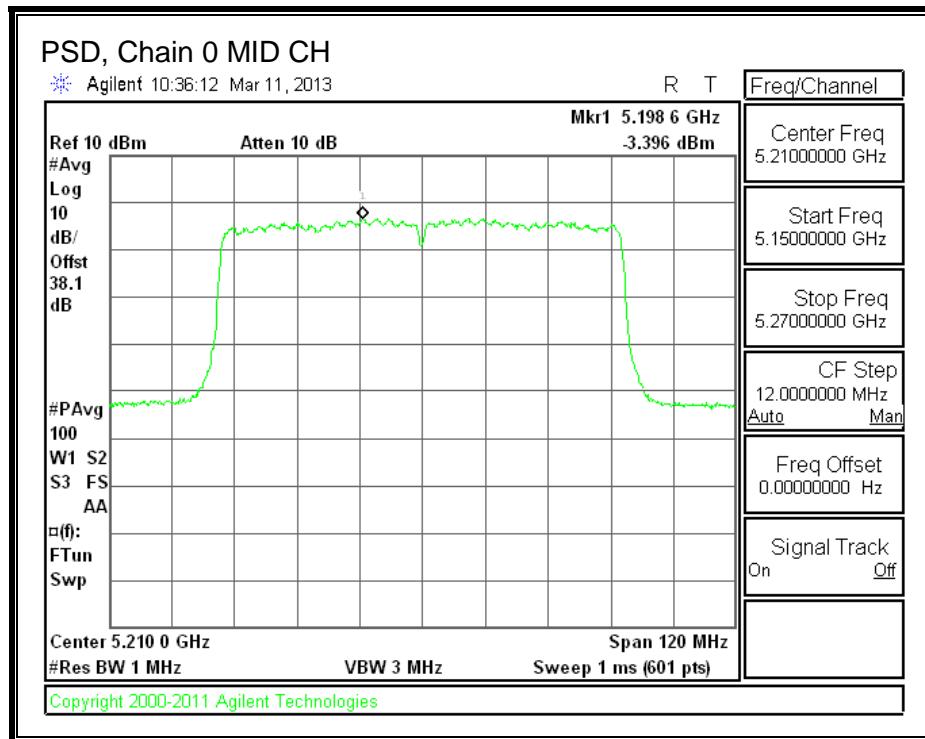
### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	12.50	12.60	15.56	17.00	-1.44

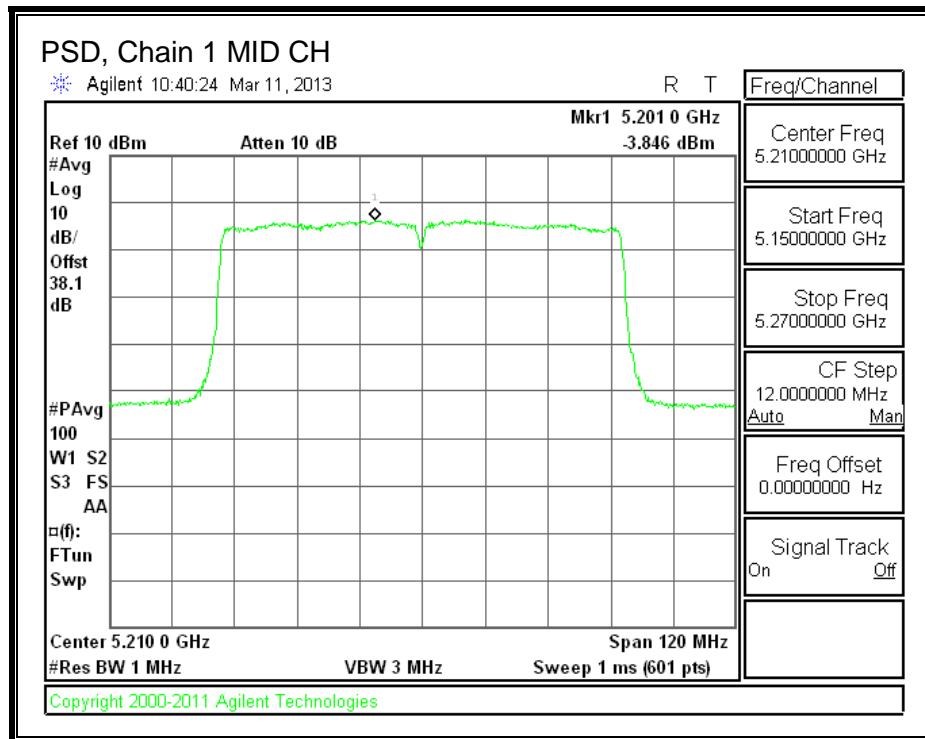
### PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	2.20	5.72

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)
Mid	5210	17.00	23.00	17.28	17.00

Duty Cycle CF (dB)	0.09	
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

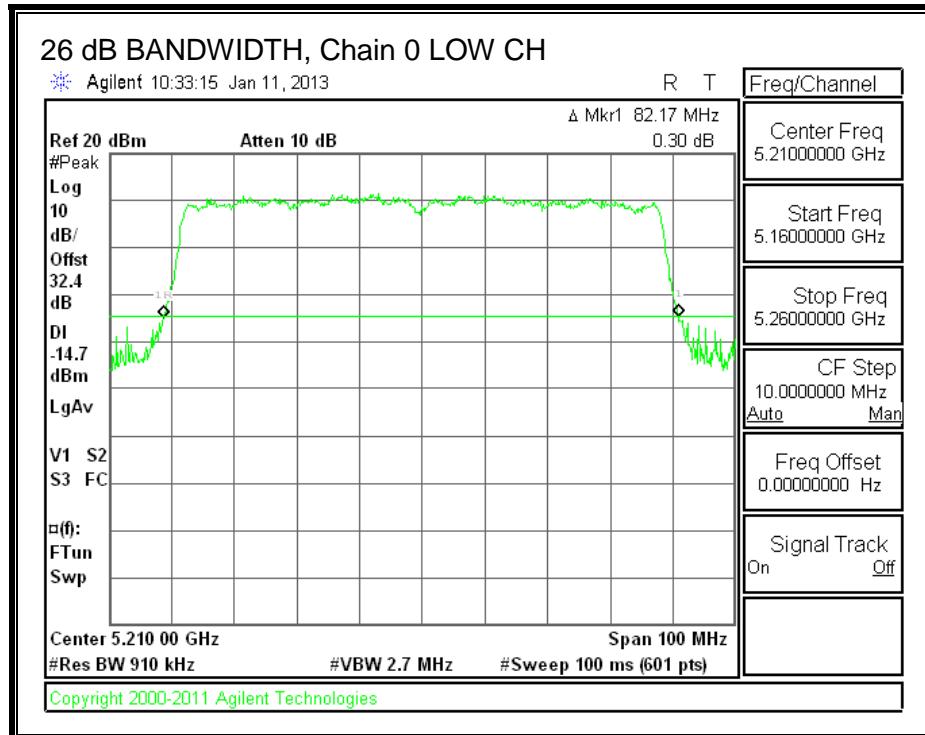
#### LIMITS

None; for reporting purposes only.

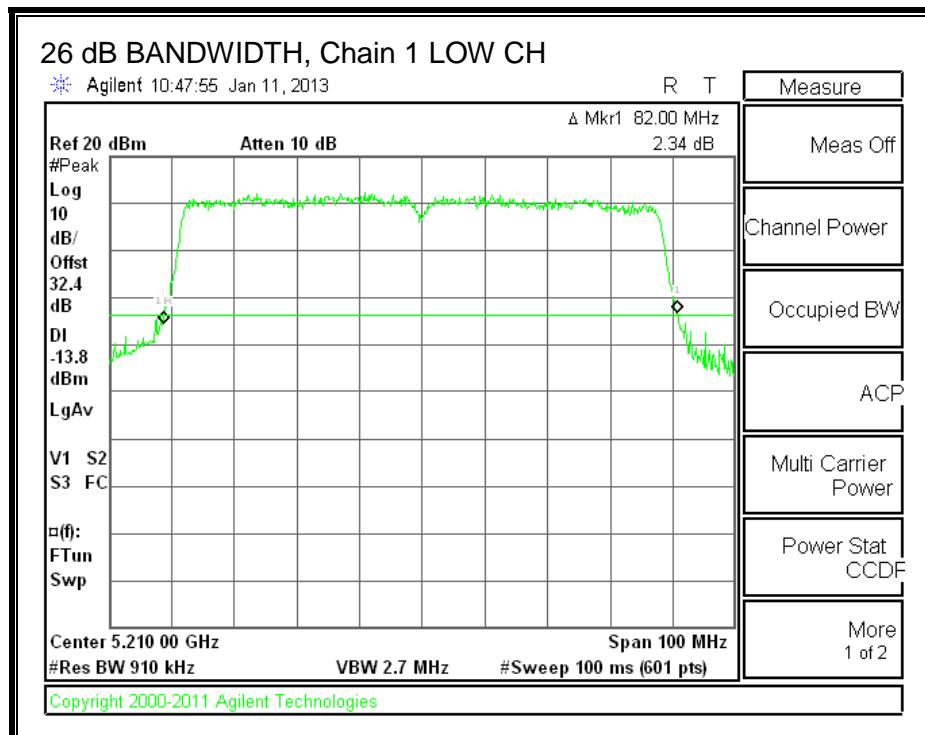
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5210	82.17	82.00

**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



## 8.18.2. 99% BANDWIDTH

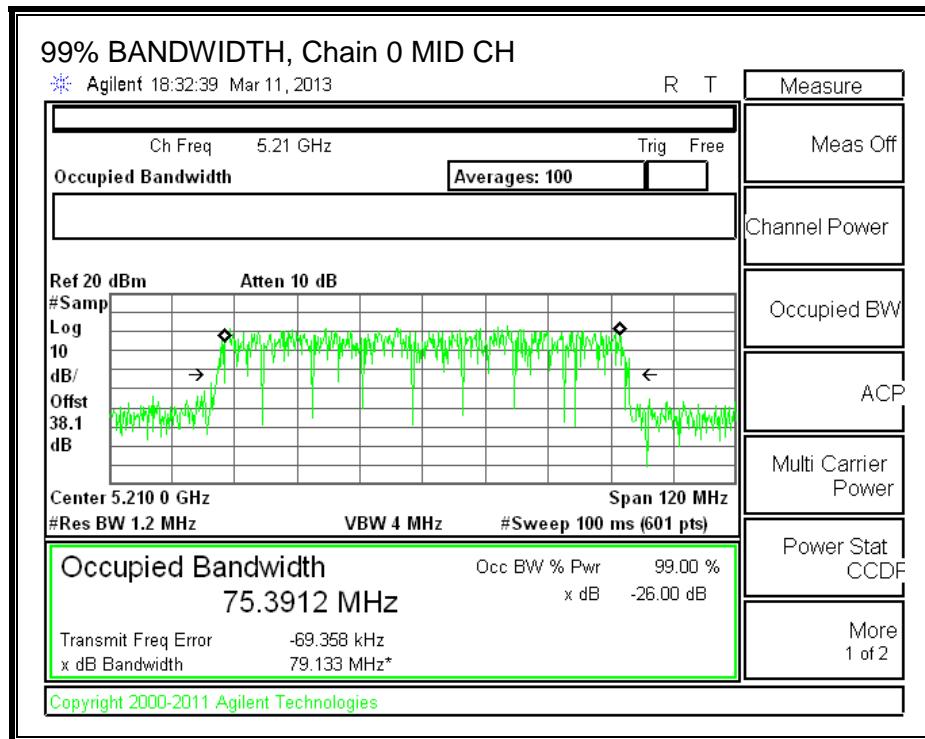
### LIMITS

None; for reporting purposes only.

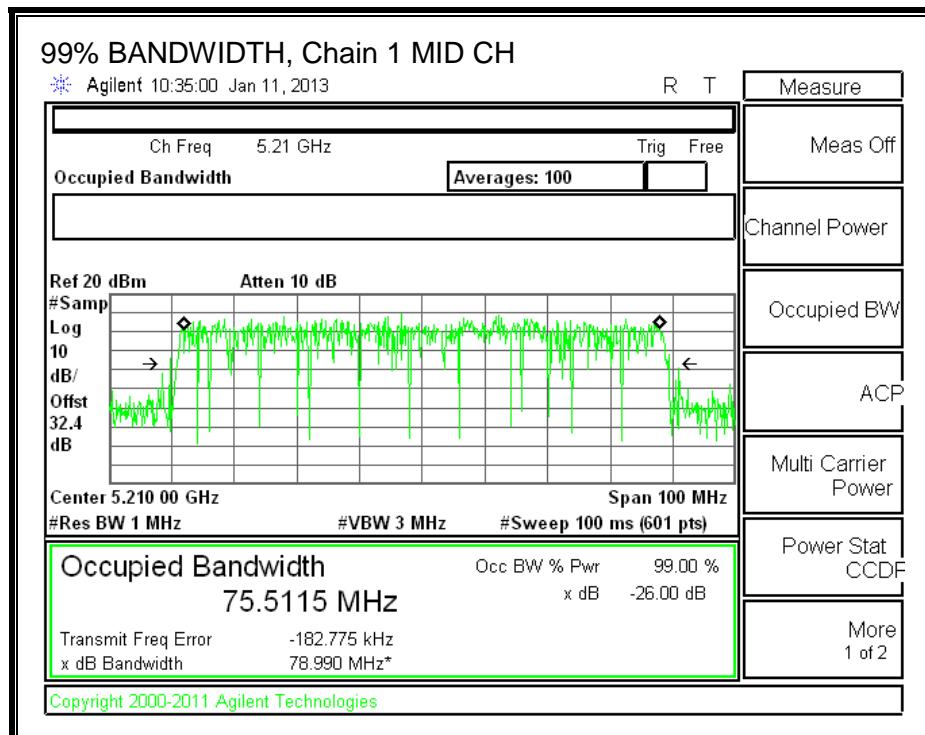
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	2.20	2.73

## RESULTS

### Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5210	82.00	75.3912	2.73

### Limits

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

### Gated Output Power Measurement

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5210	12.70	12.40	15.56	17.00	-1.44

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5210	82.00	75.3912	2.73

**Limits**

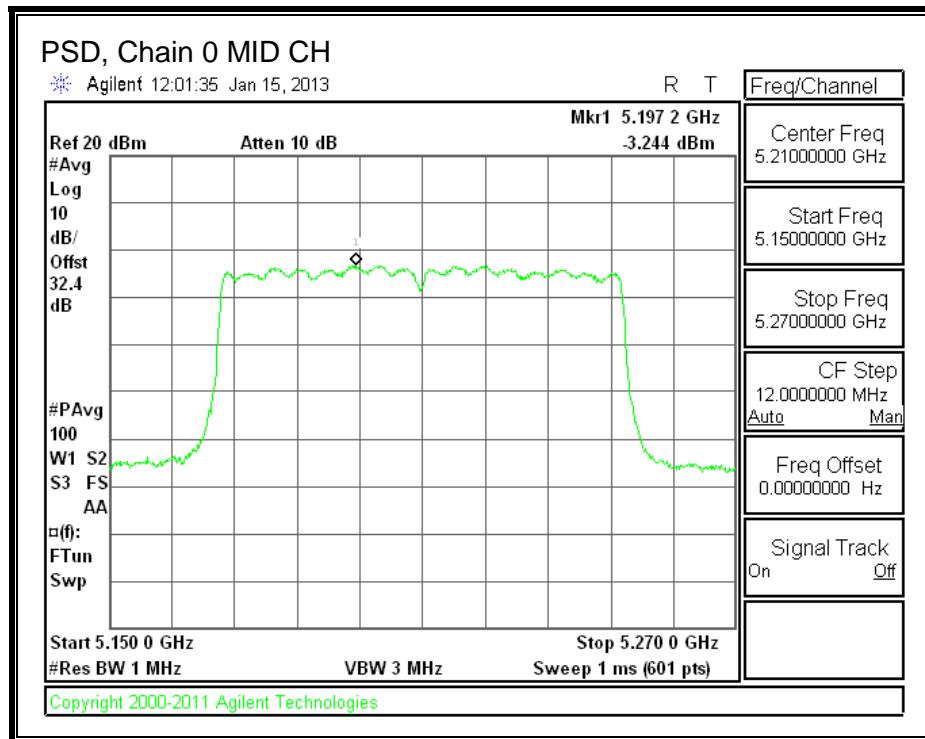
Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (dBm)
Low	5210	17.00	23.00	20.27	17.00	4.00	10.00	4.00

Duty Cycle CF (dB)	0.09
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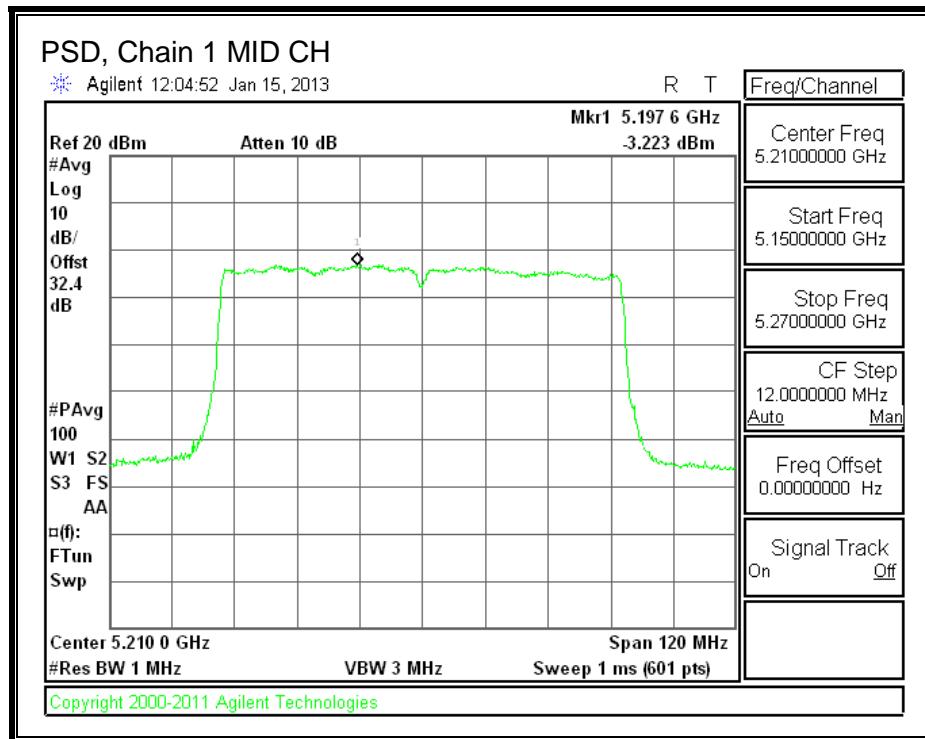
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (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

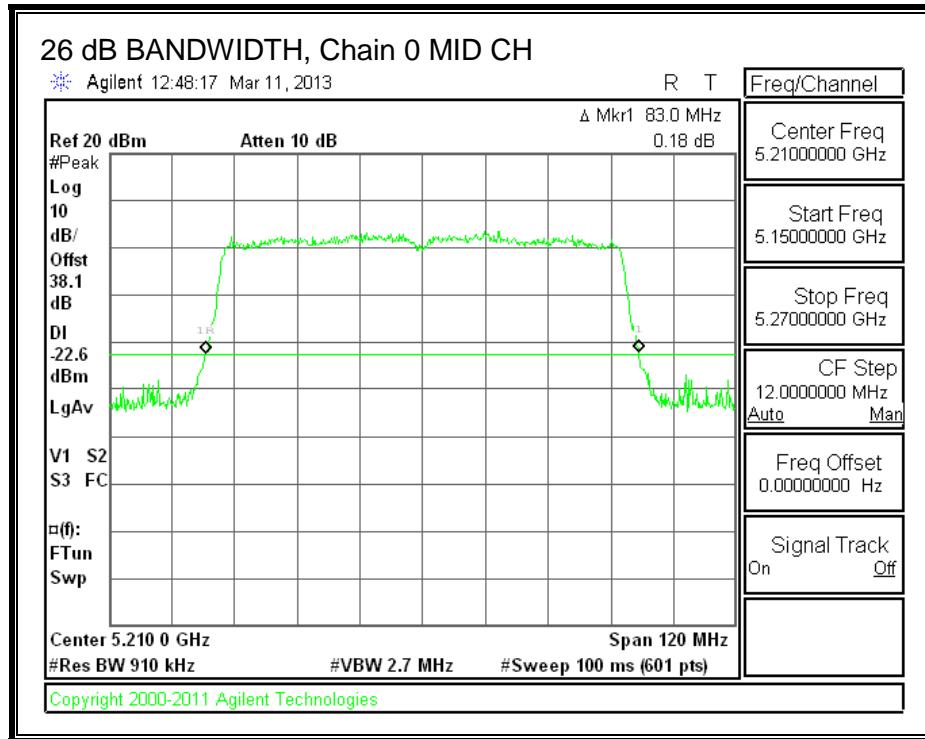
#### LIMITS

None; for reporting purposes only.

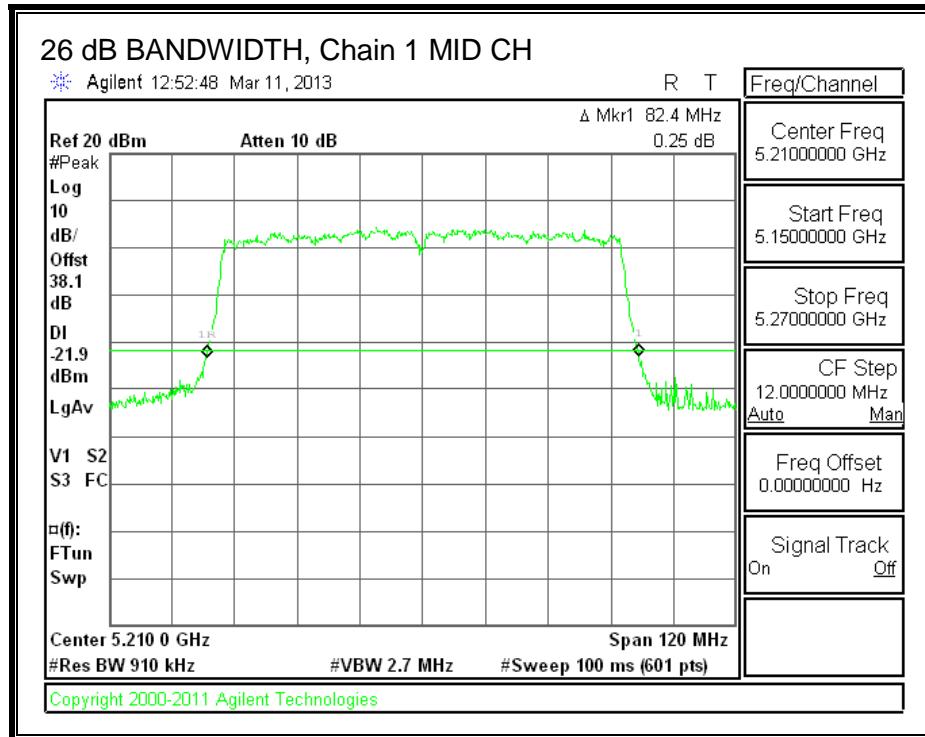
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5210	83.00	82.40	81.40

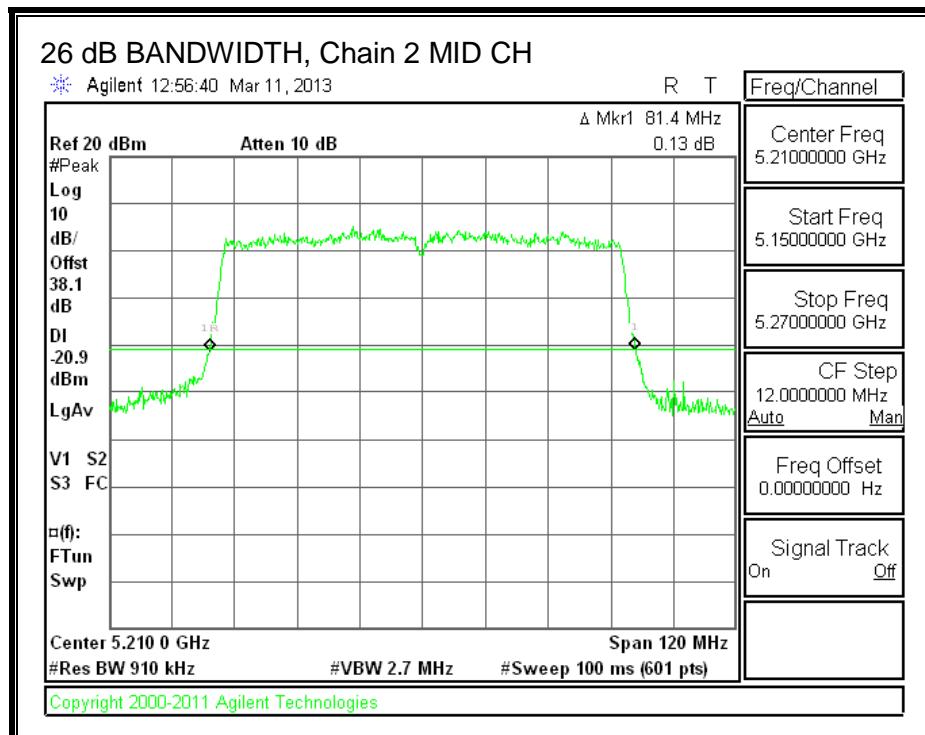
## 26 dB BANDWIDTH, Chain 0



## 26 dB BANDWIDTH, Chain 1



26 dB BANDWIDTH, Chain 2



## 8.19.2. 99% BANDWIDTH

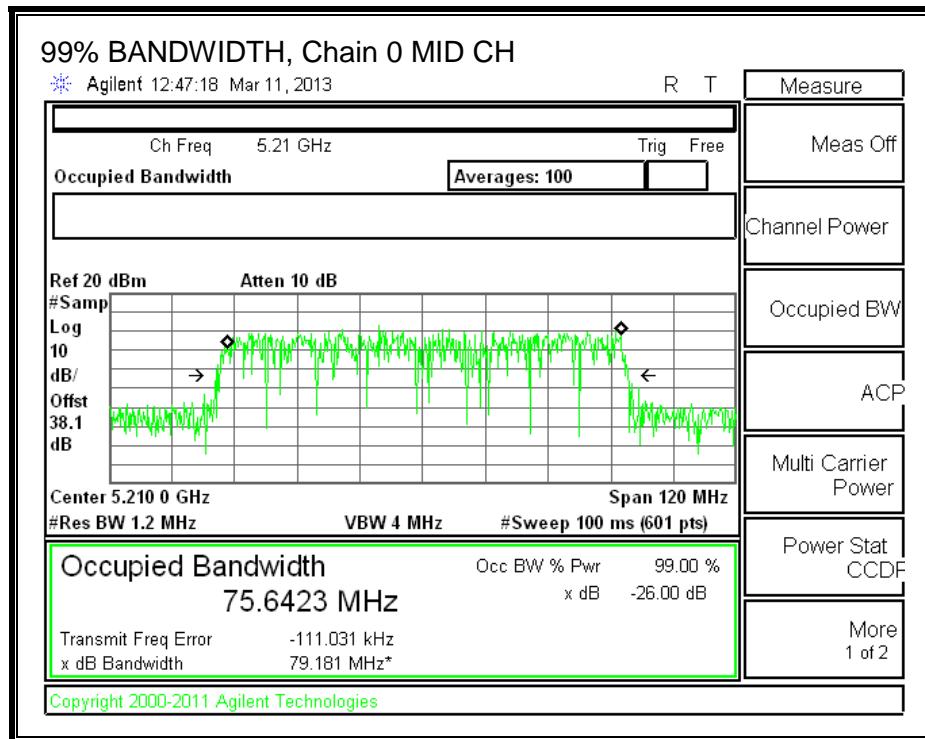
### LIMITS

None; for reporting purposes only.

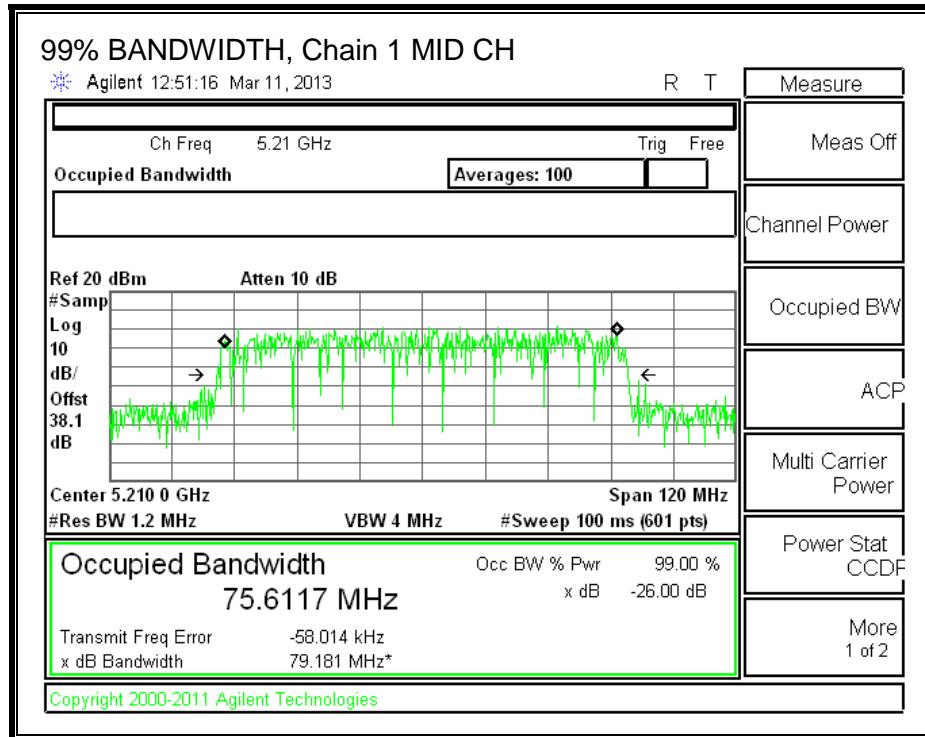
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Mid	5210	75.6423	75.6117	75.5864

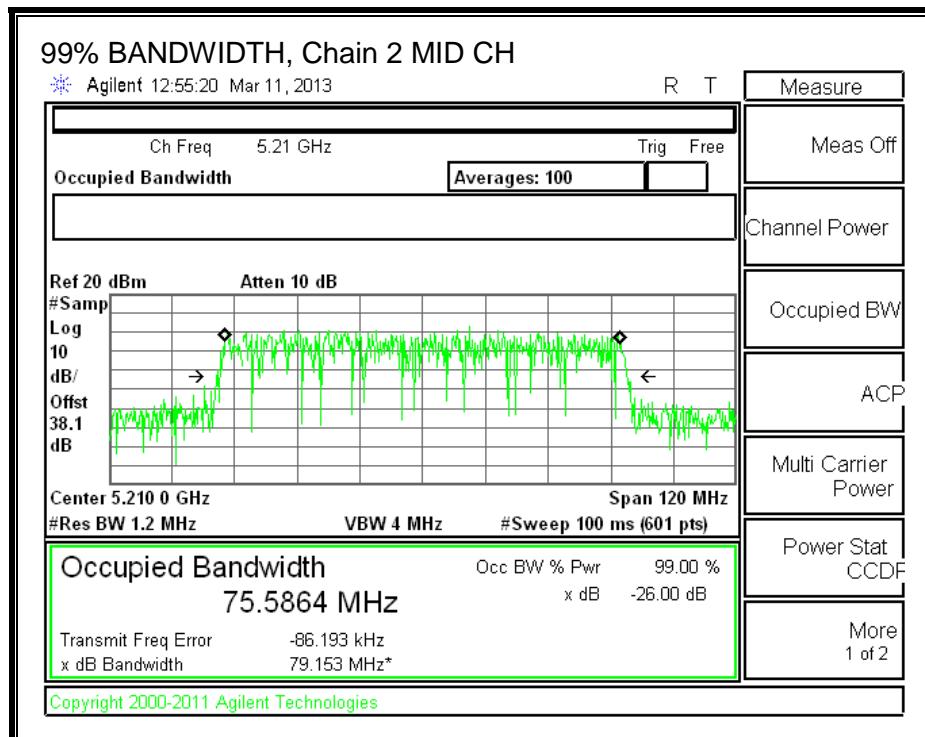
**99% BANDWIDTH, Chain 0**



**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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

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

Duty Cycle CF (dB)	0.09
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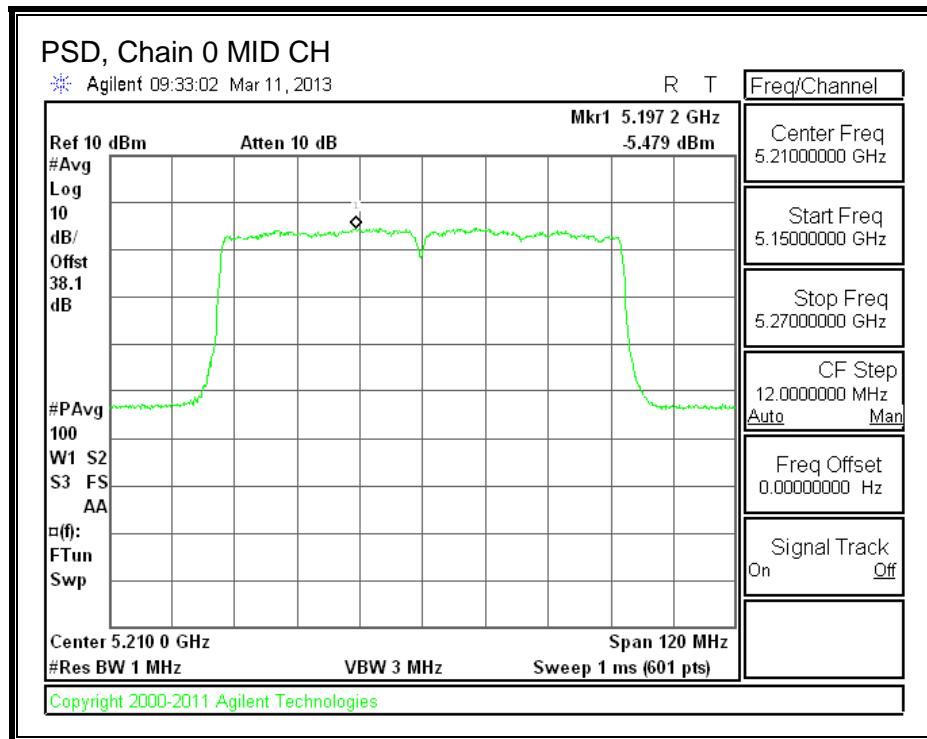
### Output Power Results

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

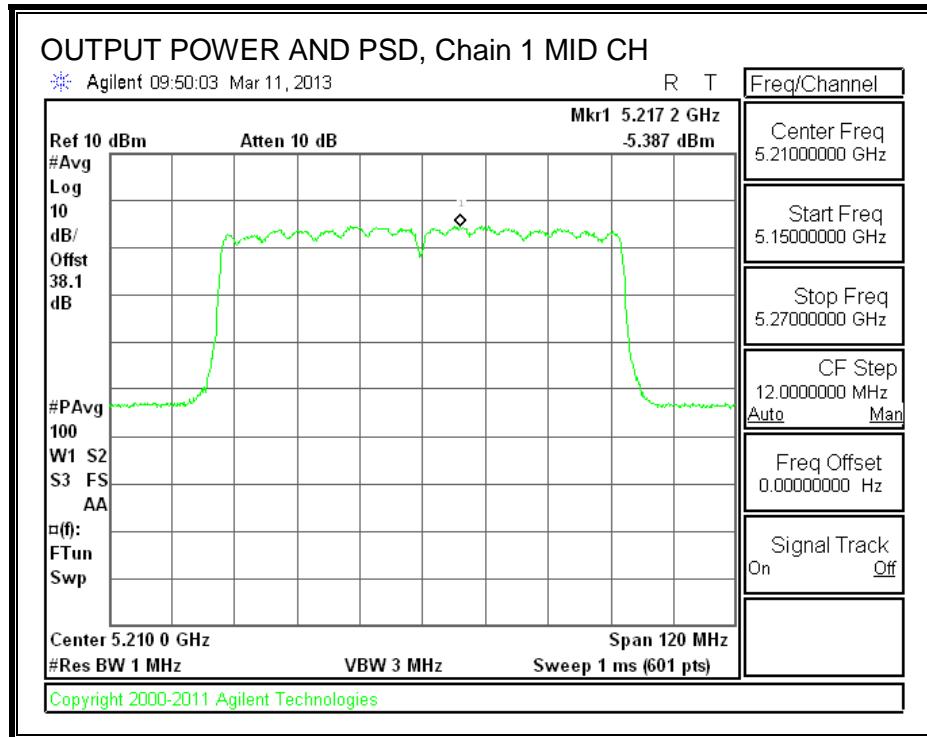
### PSD Results

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

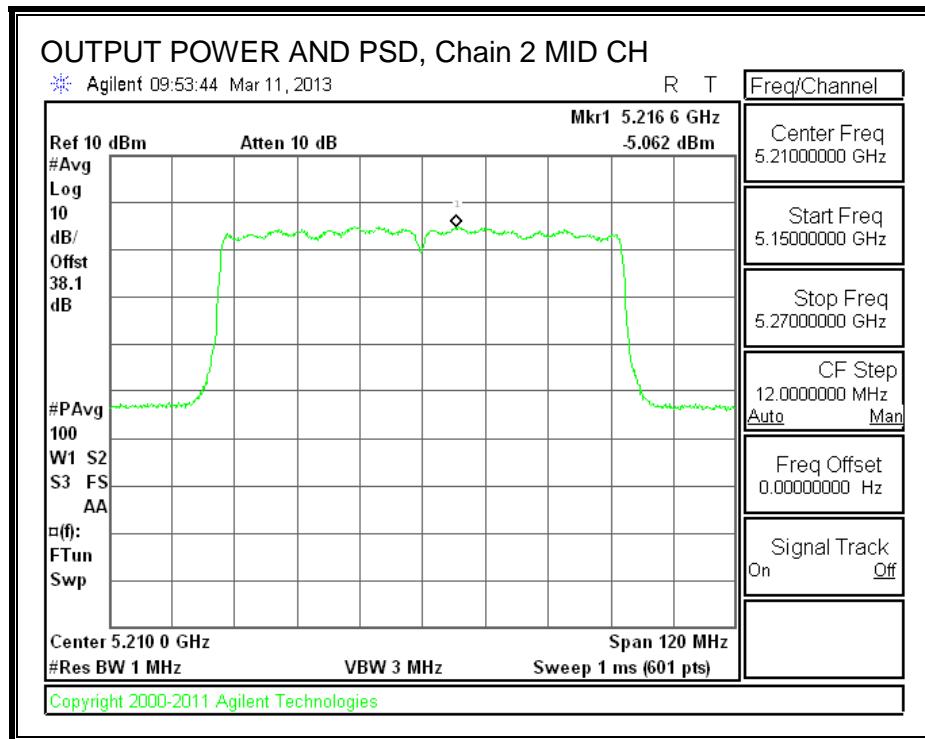
**PSD, Chain 0**



**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

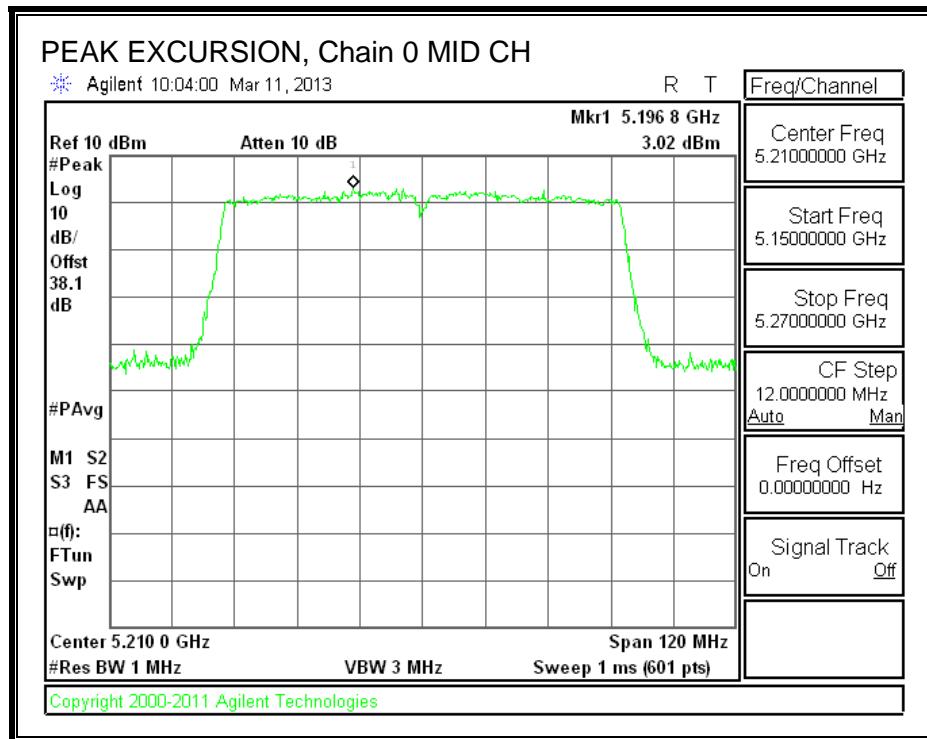
Chain 1

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

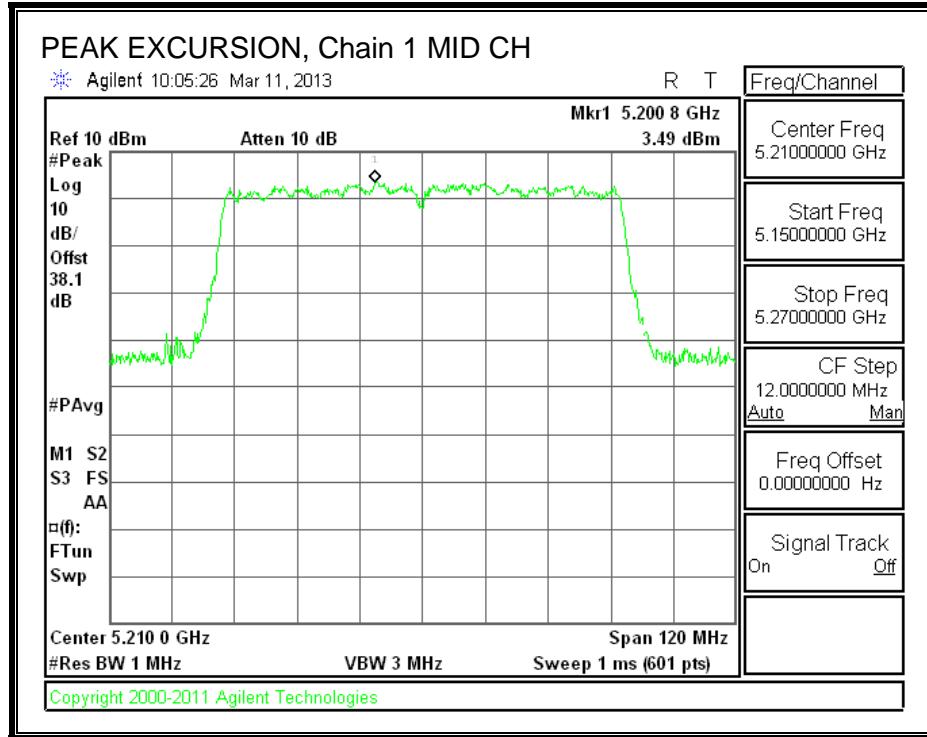
Chain 2

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

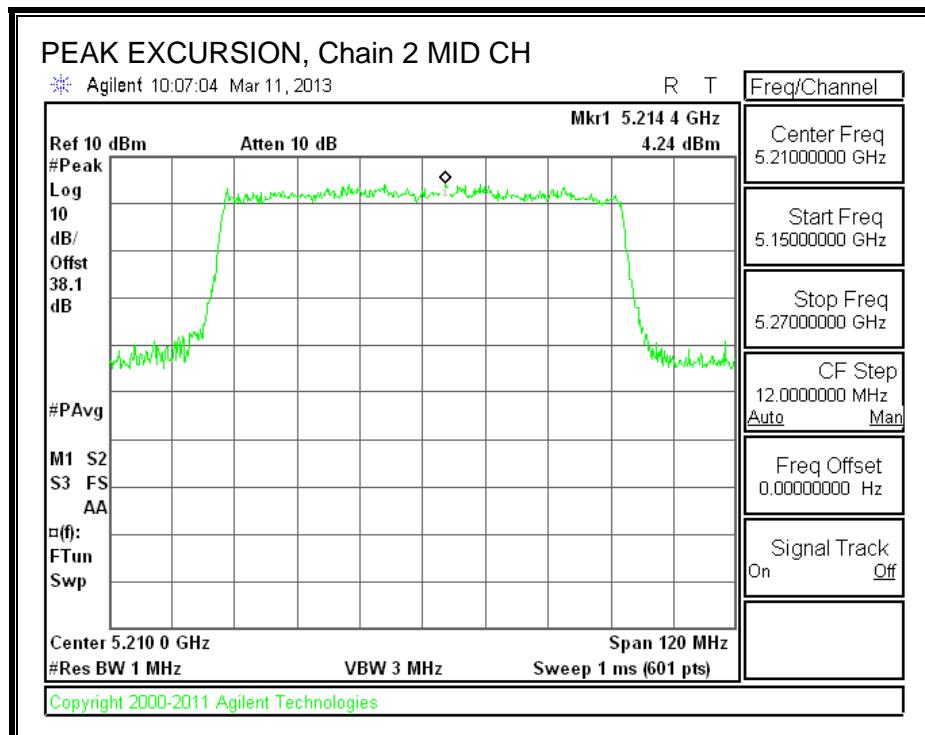
### PEAK EXCURSION, Chain 0



### 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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.20	1.40	2.20	7.07

## RESULTS

### Bandwidth and Antenna Gain

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

### Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)
Mid	5210	15.93	23.00	15.93	15.93

Duty Cycle CF (dB)	0.09	
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### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (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

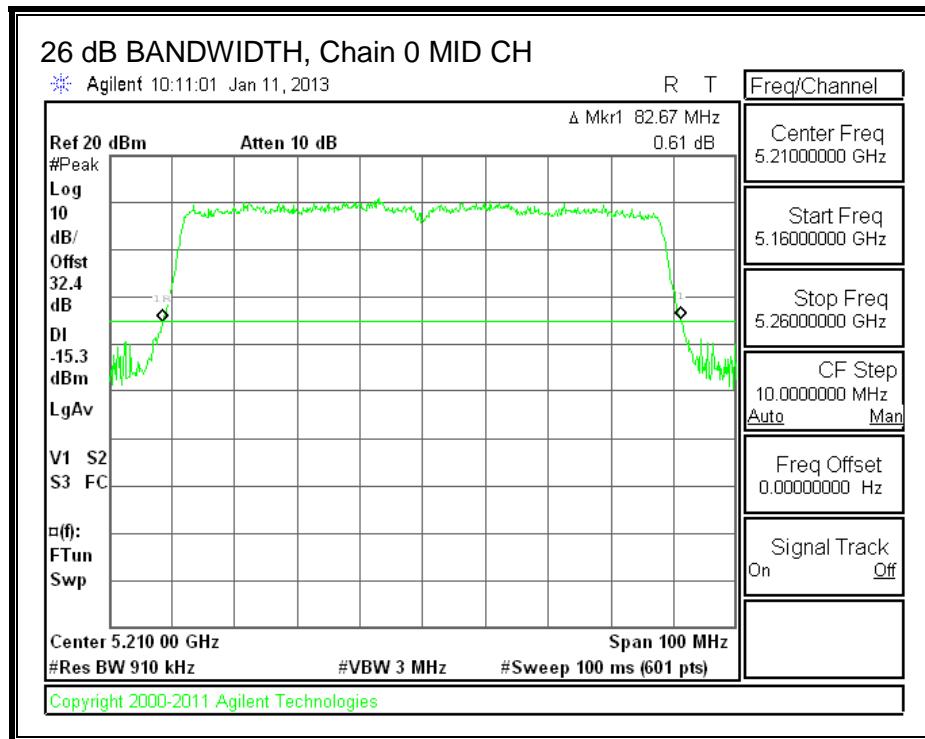
#### LIMITS

None; for reporting purposes only.

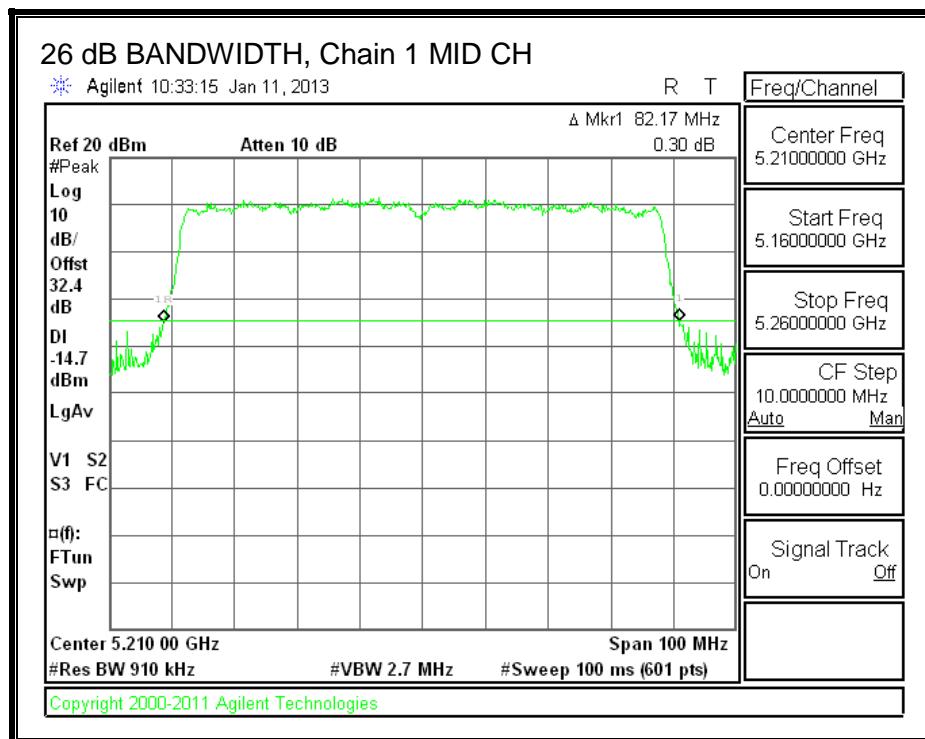
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5210	82.67	82.17	82.00

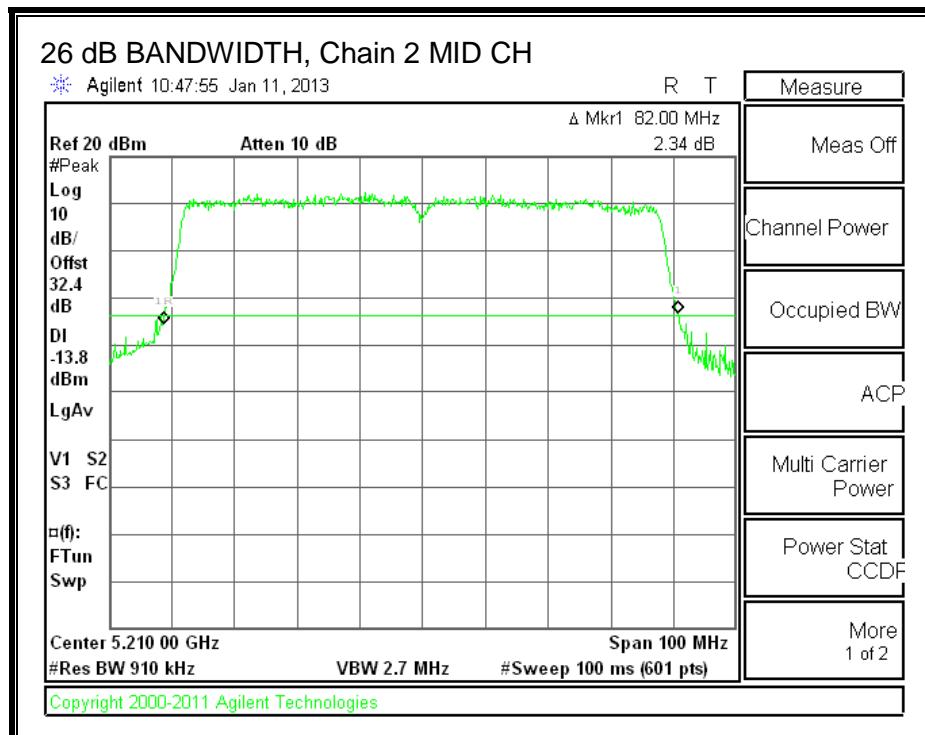
## 26 dB BANDWIDTH, Chain 0



## 26 dB BANDWIDTH, Chain 1



26 dB BANDWIDTH, Chain 2



## 8.21.2. 99% BANDWIDTH

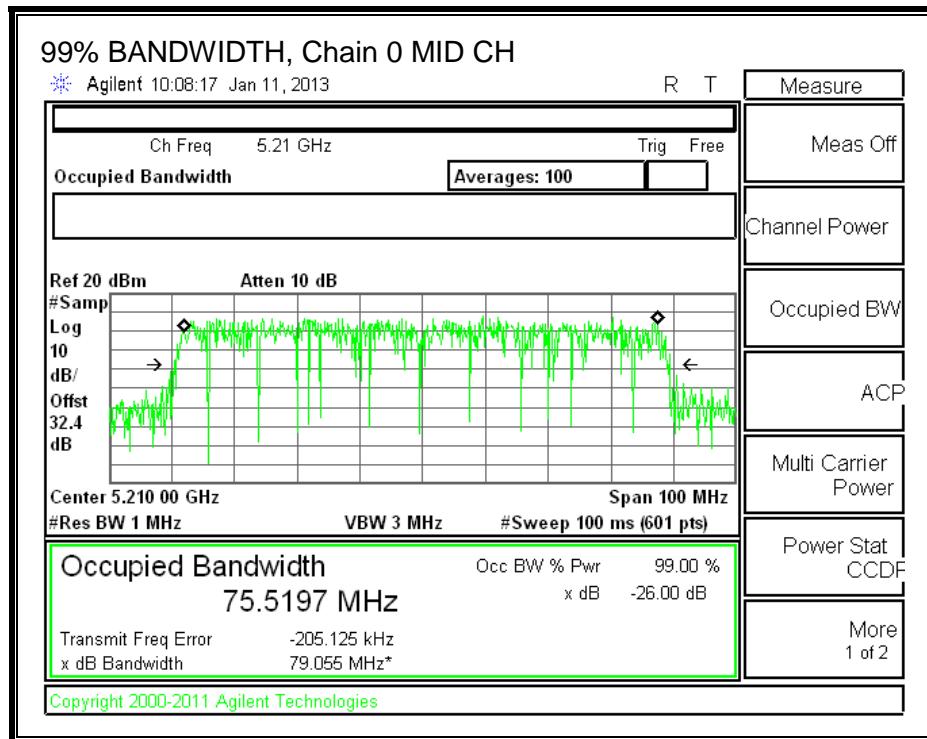
### LIMITS

None; for reporting purposes only.

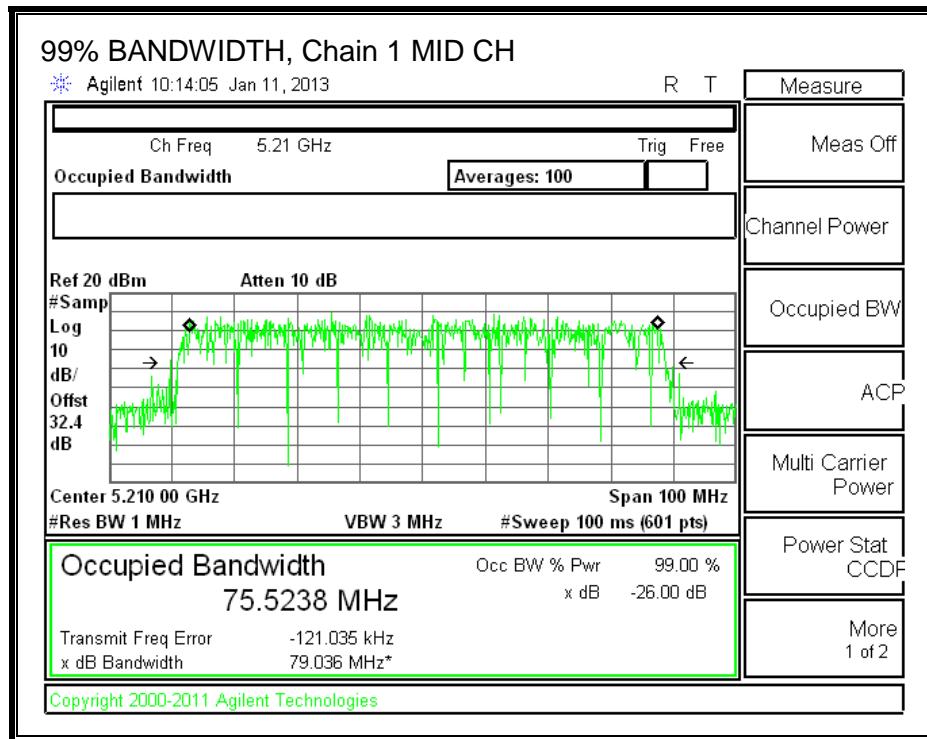
### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Mid	5210	75.5197	75.5238	75.5115

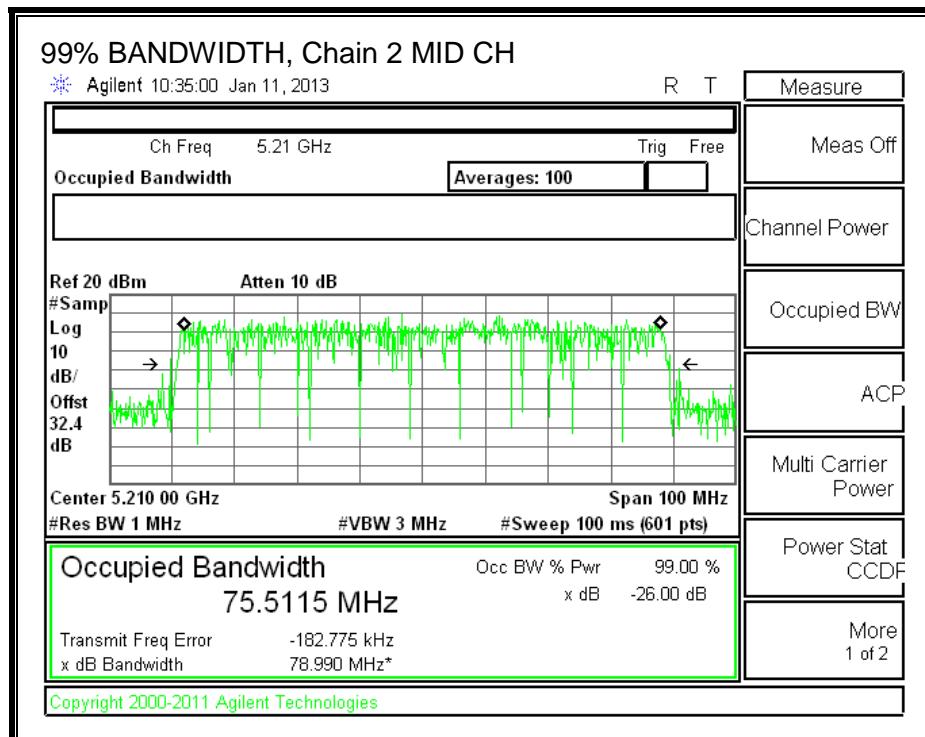
### 99% BANDWIDTH, Chain 0



### 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 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.20	1.40	2.20	2.33

## RESULTS

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Mid	5210	82.00	75.5115	2.33

### Limits

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

Duty Cycle CF (dB)	0.09	
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### Gated Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	11.90	11.98	12.10	16.77	17.00	-0.23

**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Mid	5210	82.00	75.5115	2.33

**Limits**

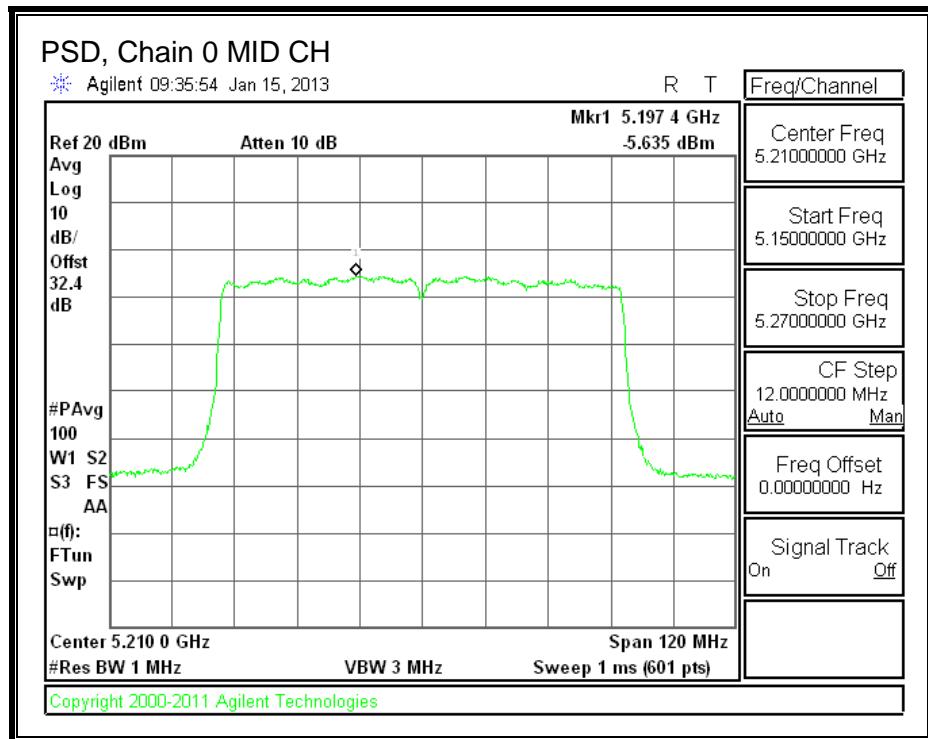
Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PSD Limit (dBm)
Mid	5210	17.00	23.00	20.67	17.00	4.00	10.00	4.00

Duty Cycle CF (dB)	0.09
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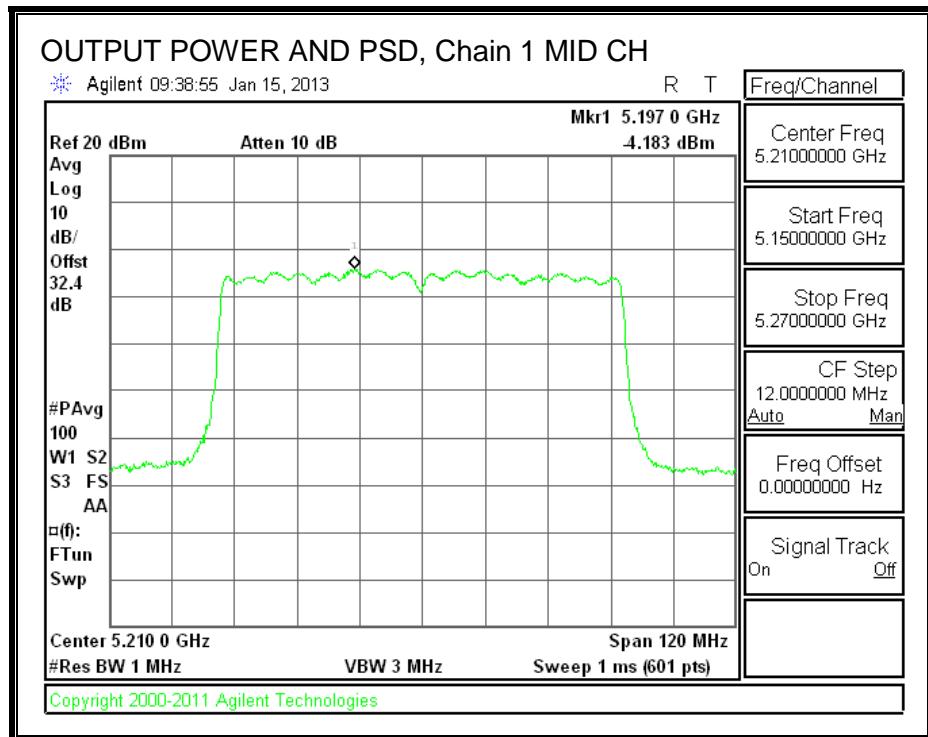
**PSD Results**

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

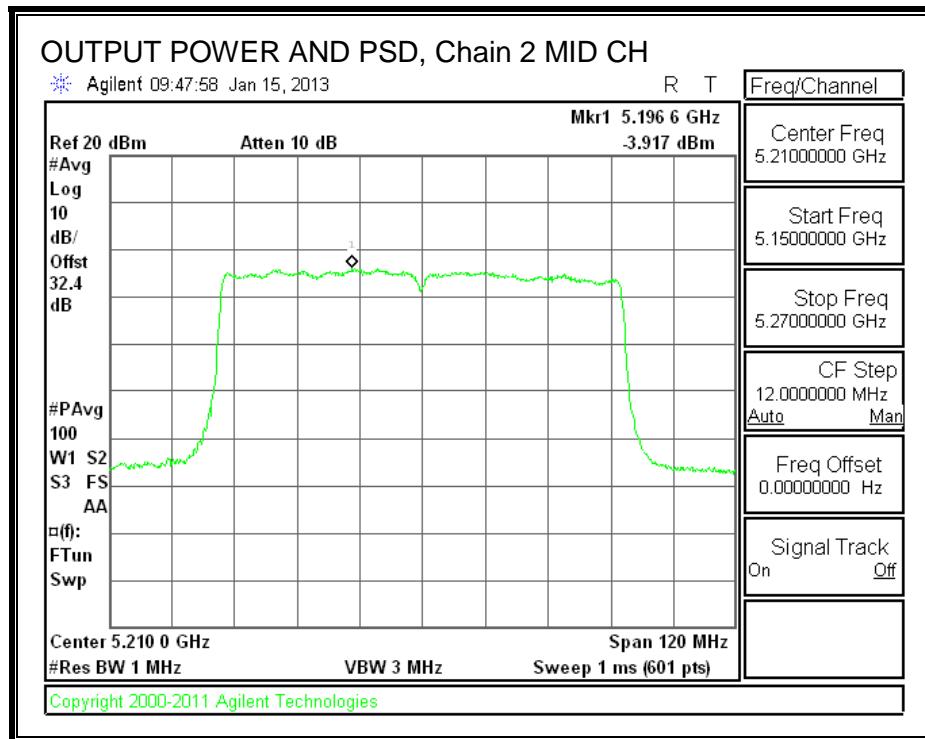
**PSD, Chain 0**



**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

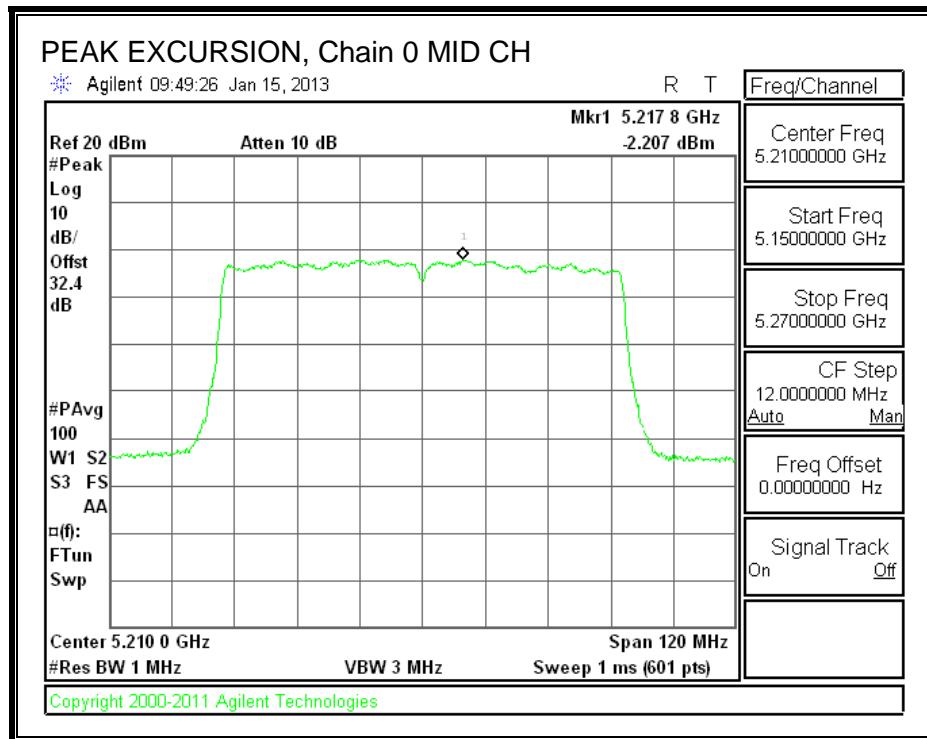
Chain 1

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

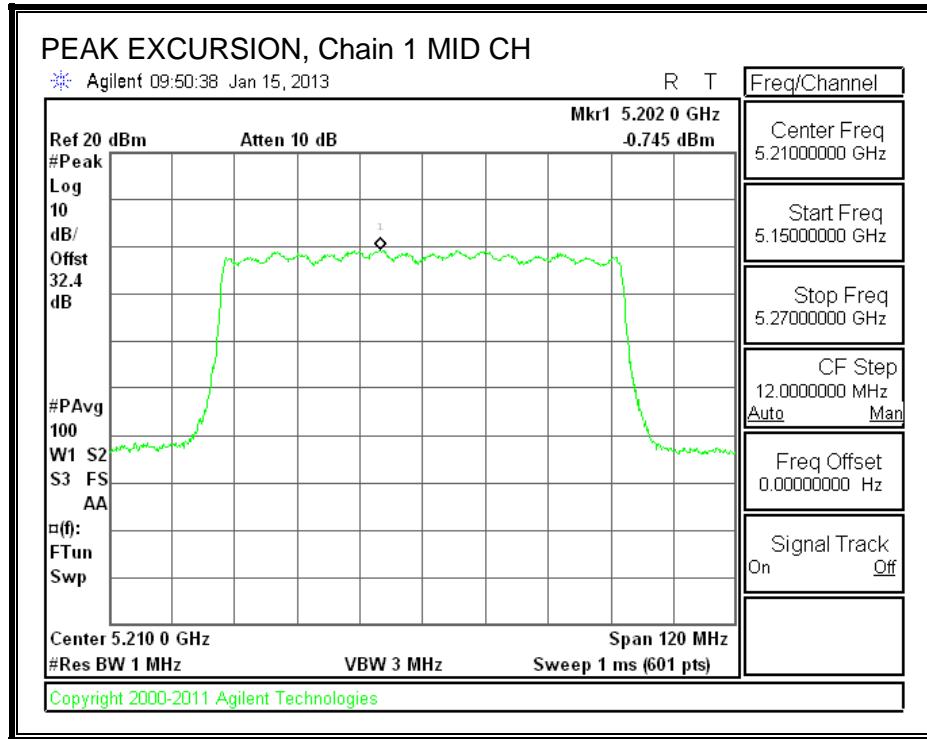
Chain 2

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

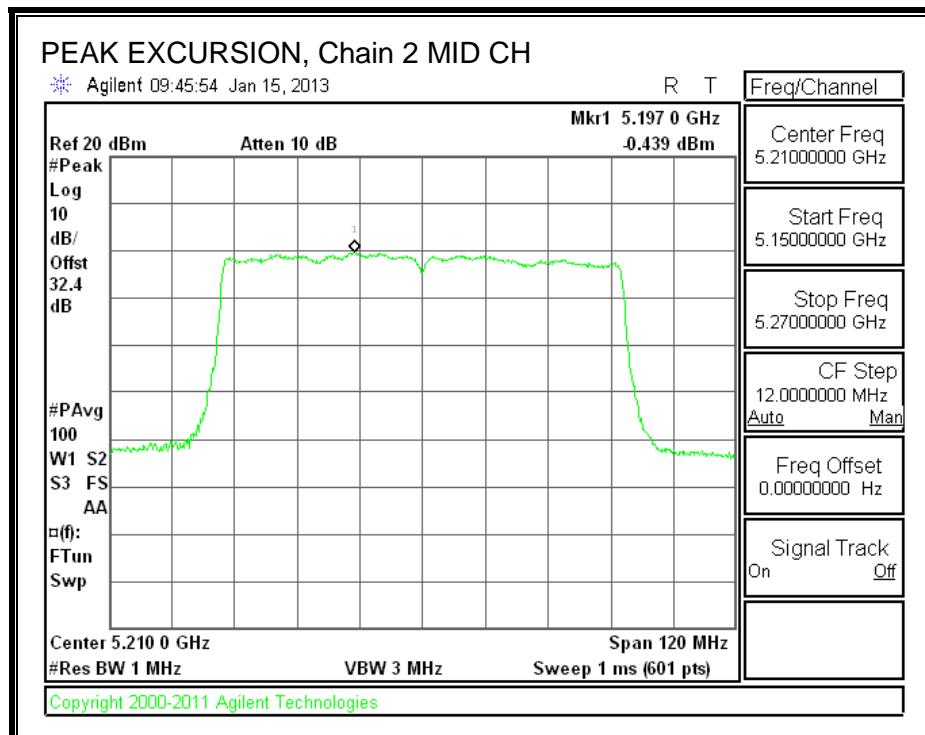
**PEAK EXCURSION, Chain 0**



**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 (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/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.

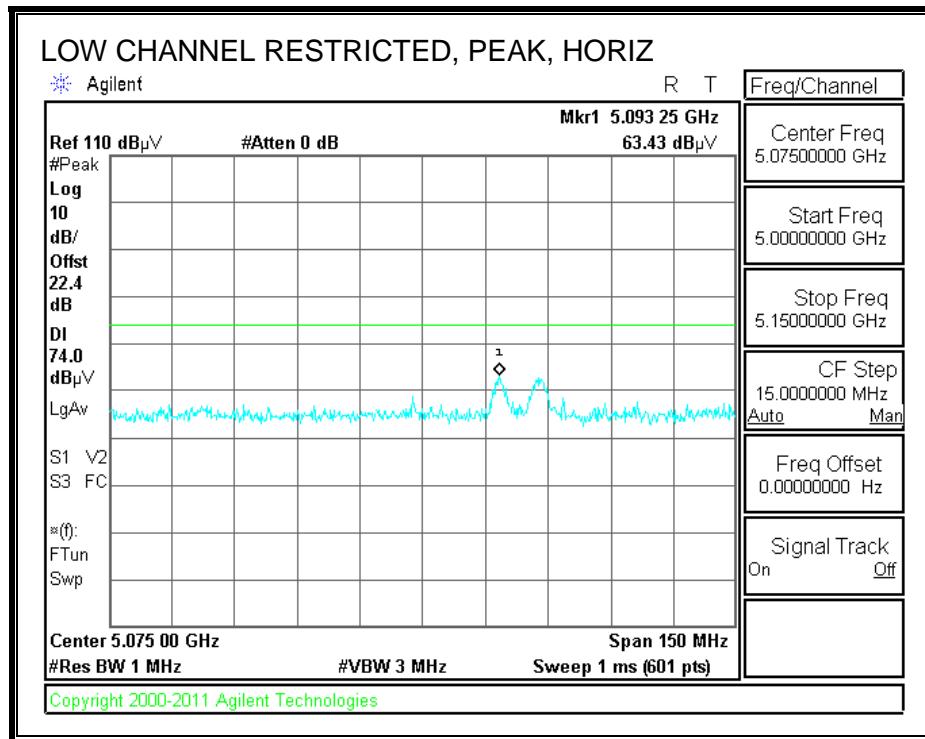
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

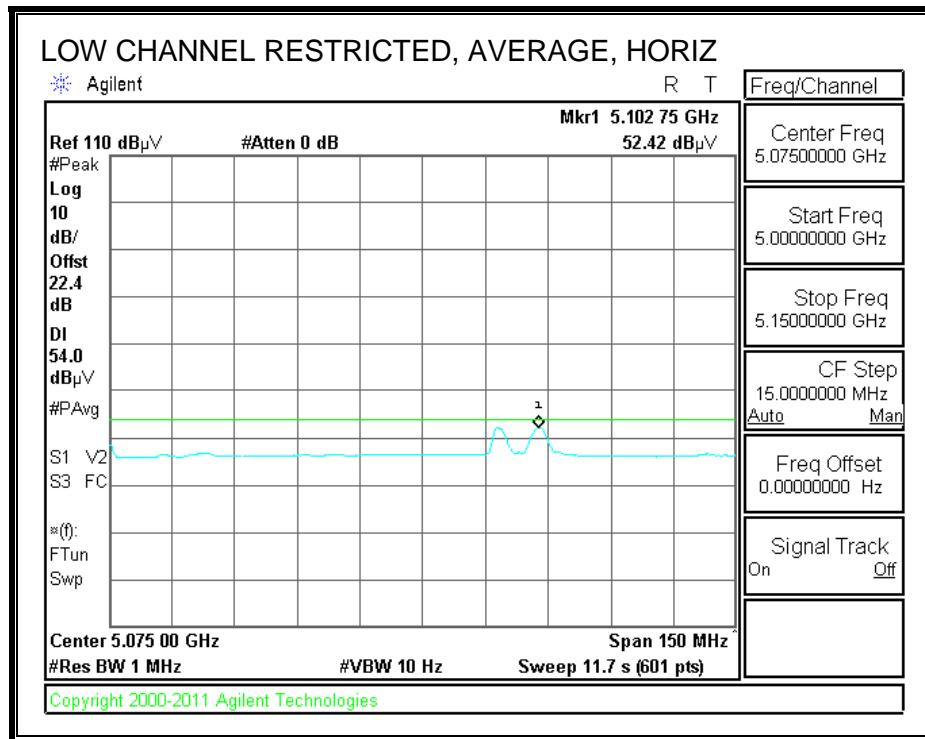
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

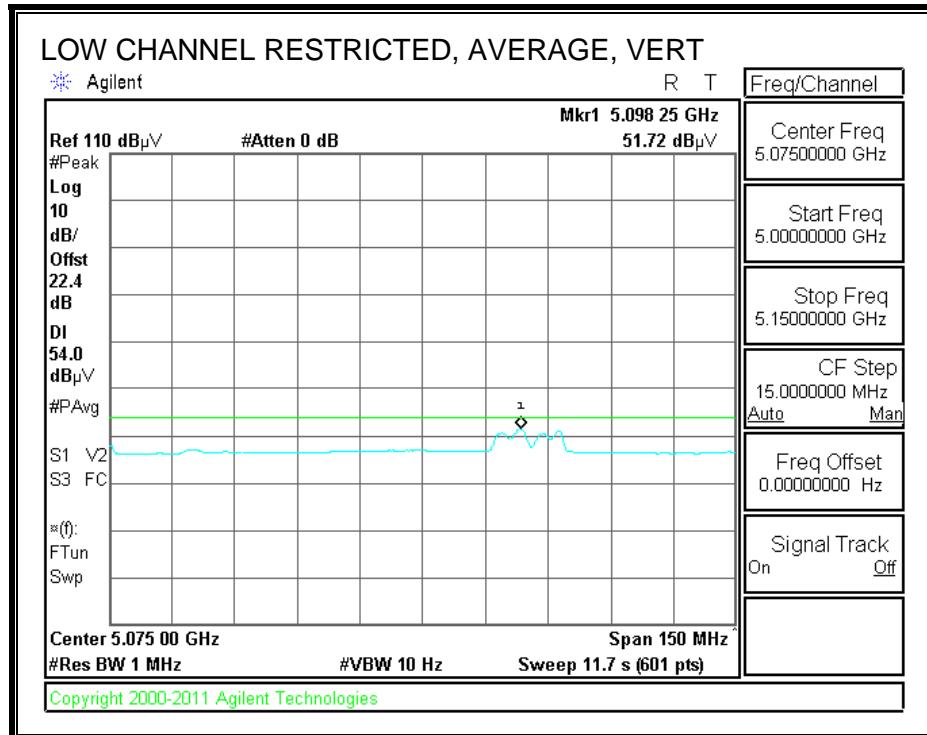
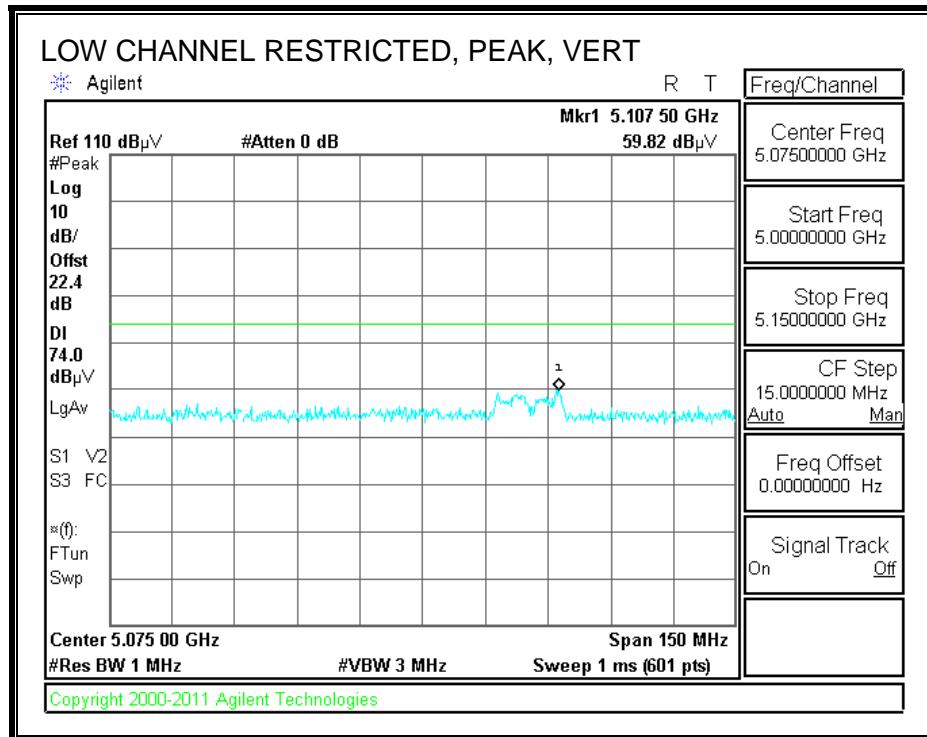
## 9.2. TRANSMITTER ABOVE 1 GHz

### 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 3IX 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	

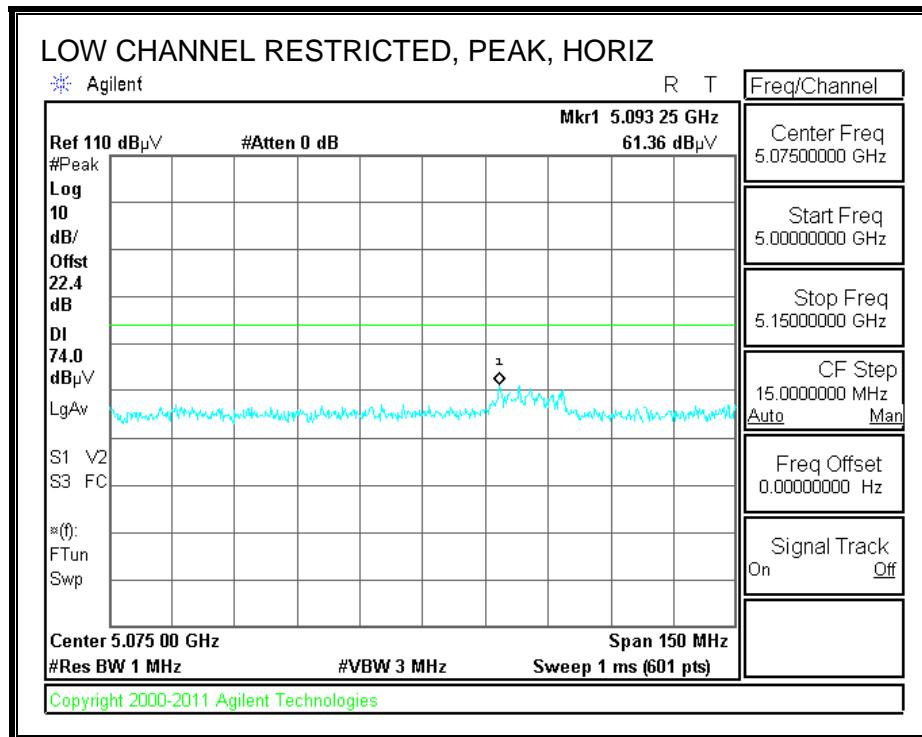
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	-20.2	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	-10.5	H	A	
15.540	3.0	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 3IX 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 3IX 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	

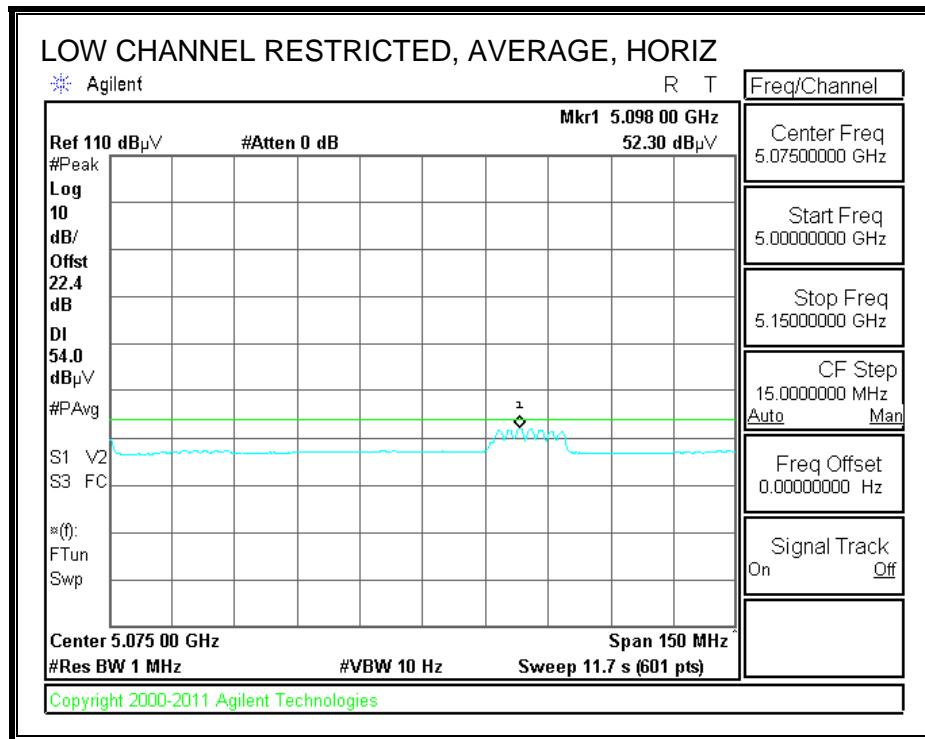
Rev. 4.1.2.7

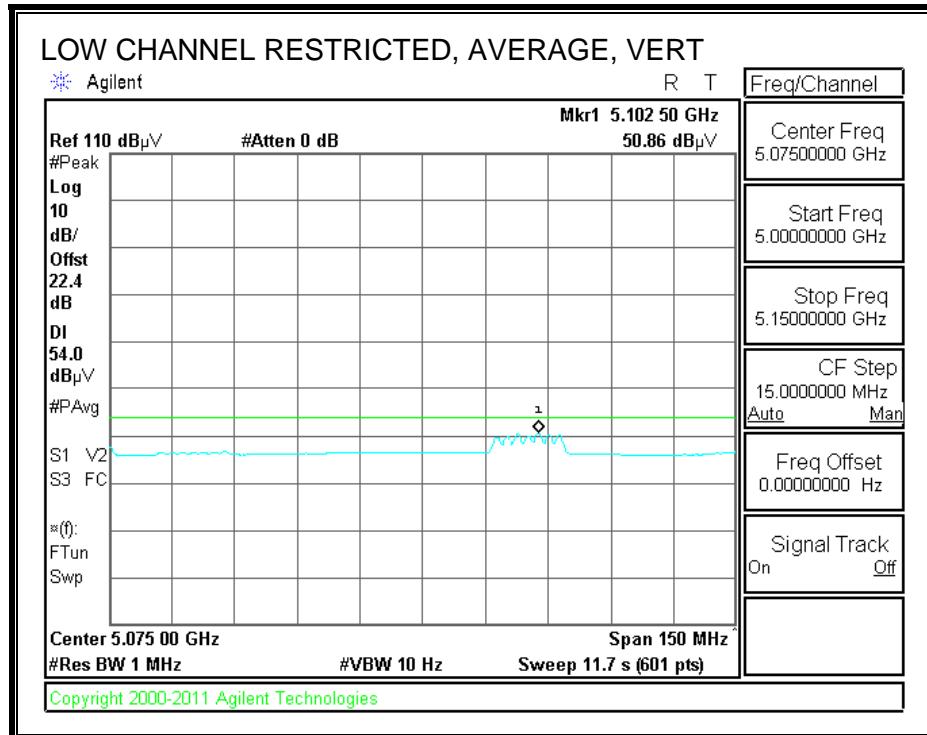
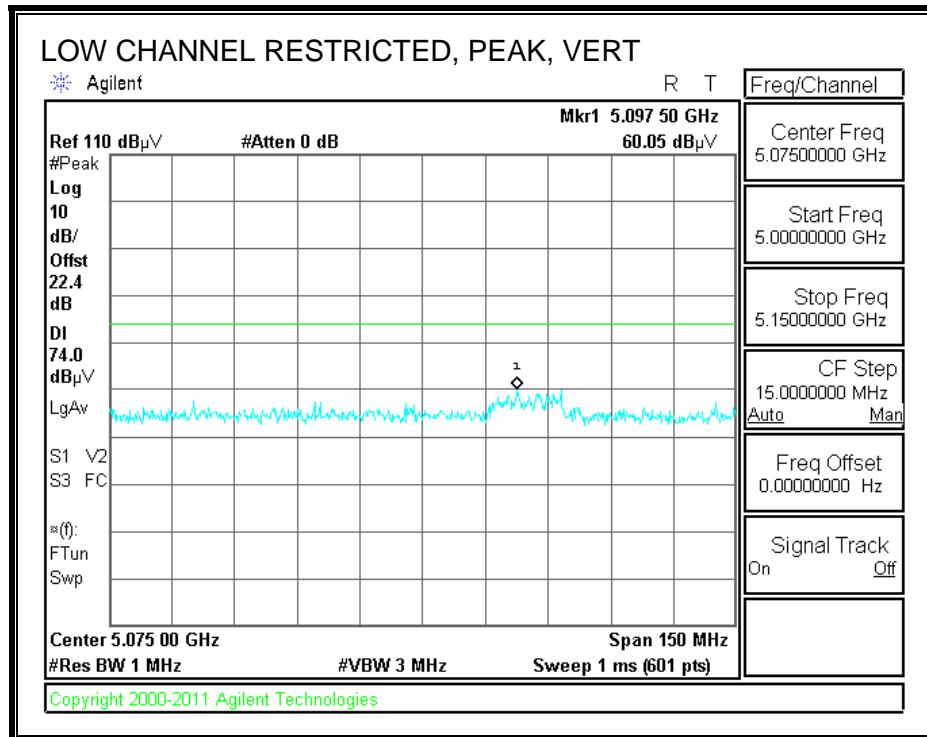
Note: No other emissions were detected above the system noise floor.

## 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 3IX 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	

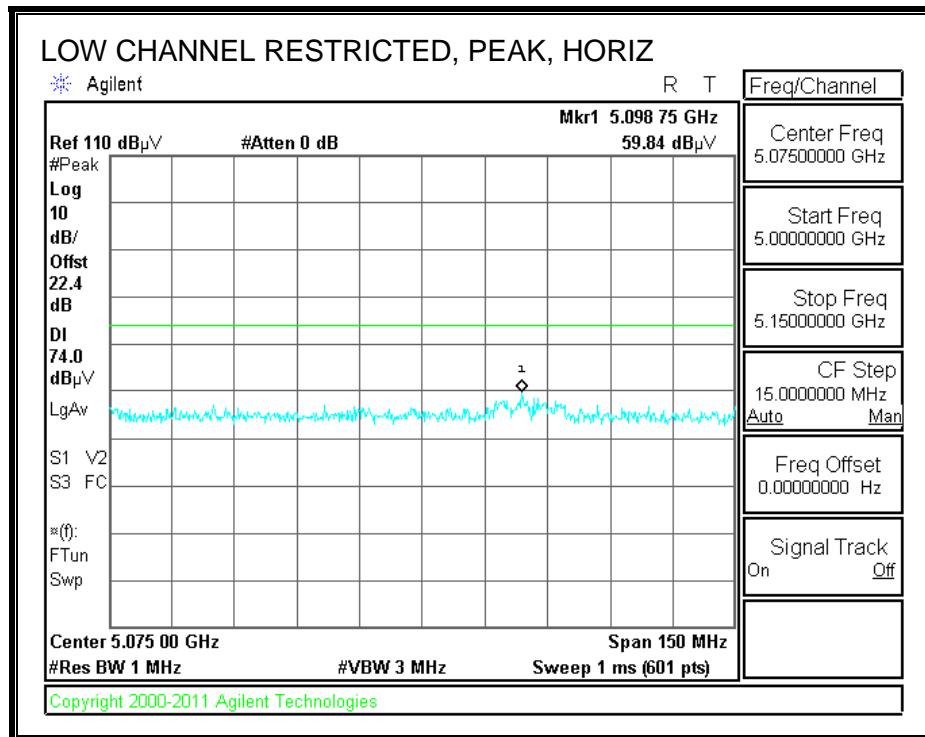
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	<b>-20.2</b>	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	<b>-10.5</b>	H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

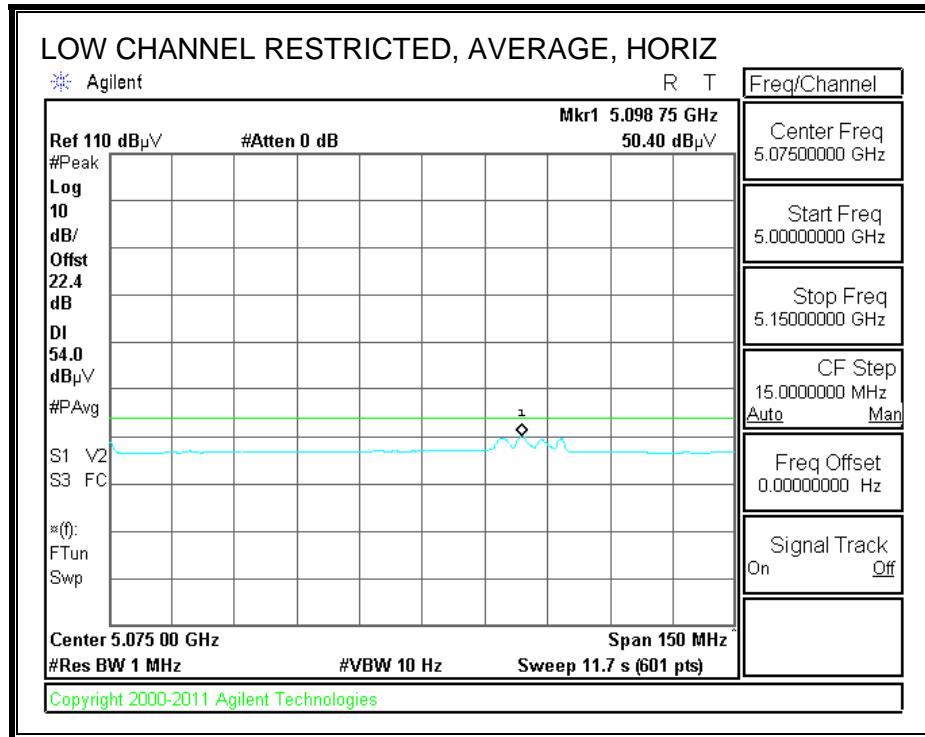
Rev. 4.1.2.7

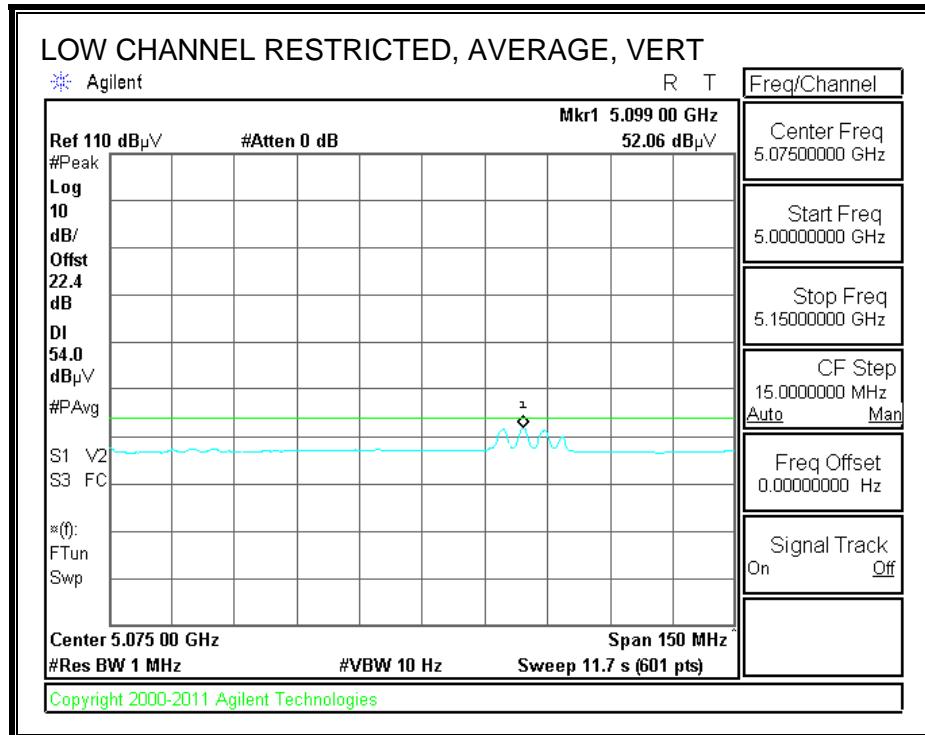
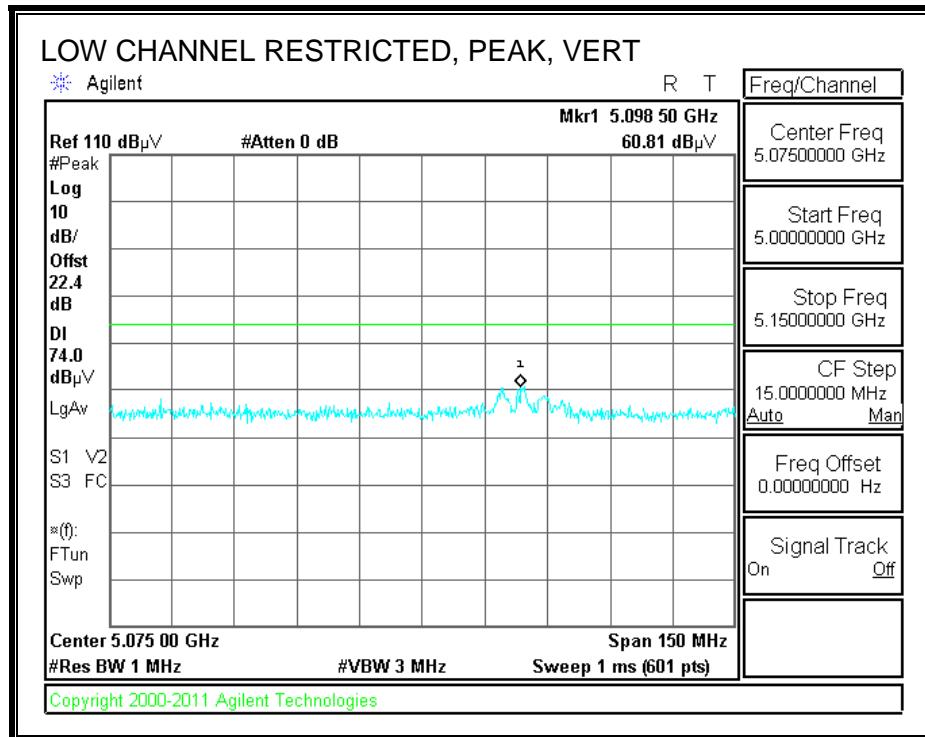
Note: No other emissions were detected above the system noise floor.

### 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 3IX 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	

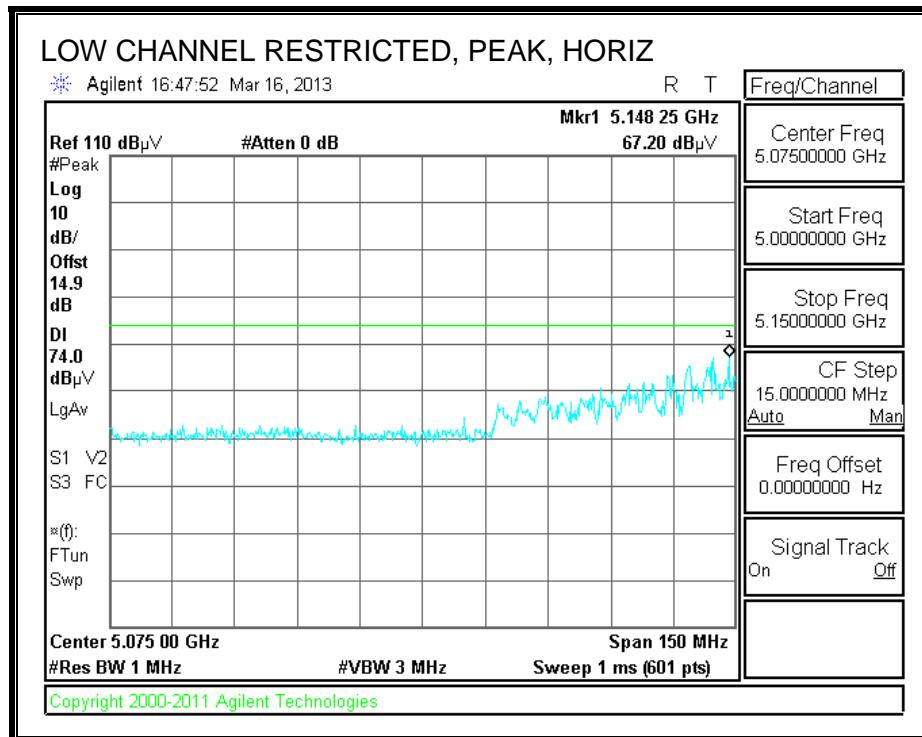
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5180 MHz 3IX CDD</b>													
15.540	3.0	32.9	39.1	13.0	-31.9	0.0	0.7	53.8	74.0	<b>-20.2</b>	H	P	
15.540	3.0	22.7	39.1	13.0	-31.9	0.0	0.7	43.5	54.0	<b>-10.5</b>	H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

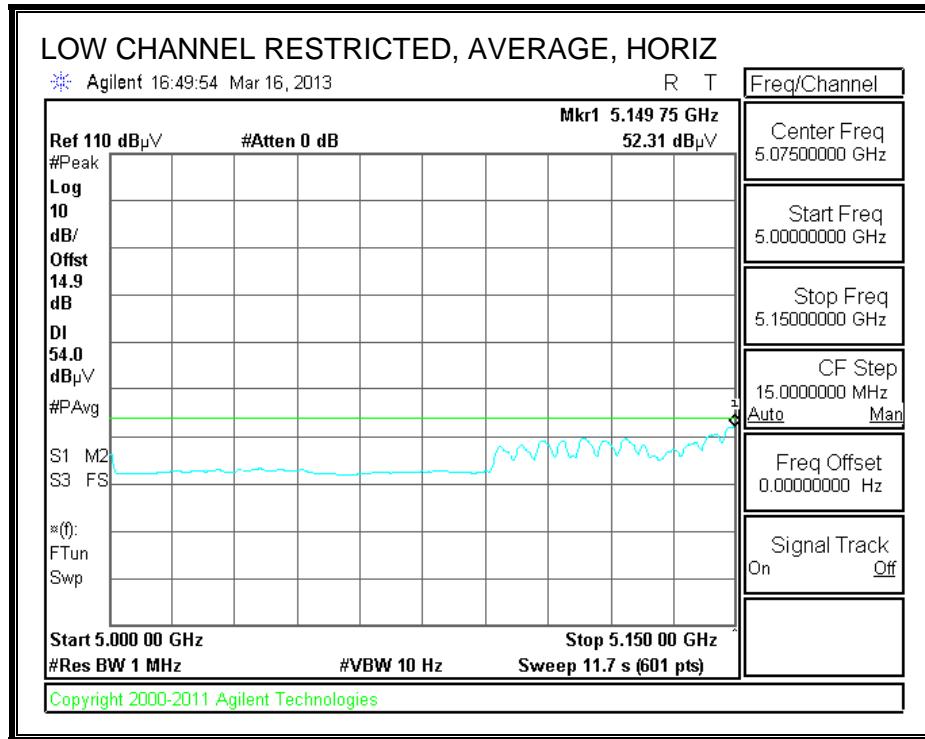
Rev. 4.1.2.7

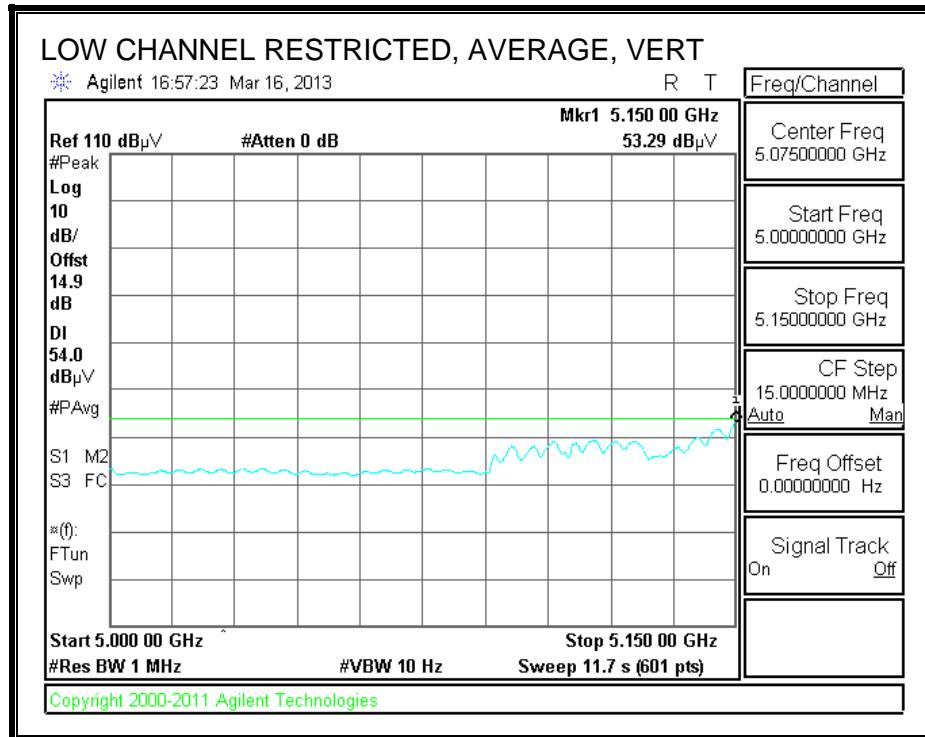
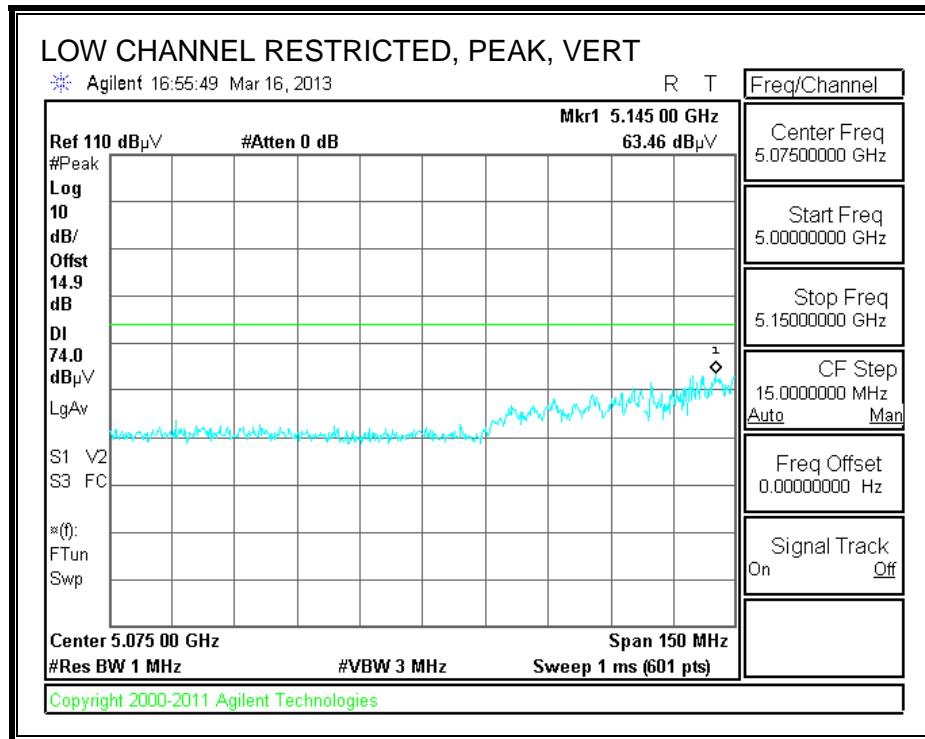
Note: No other emissions were detected above the system noise floor.

### 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 3IX 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	

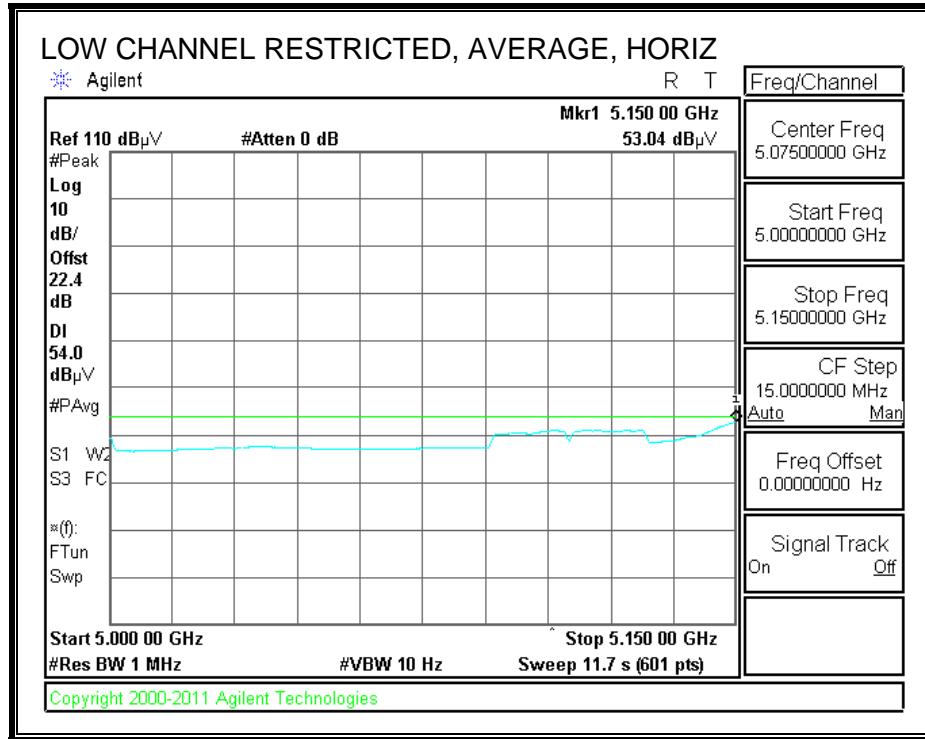
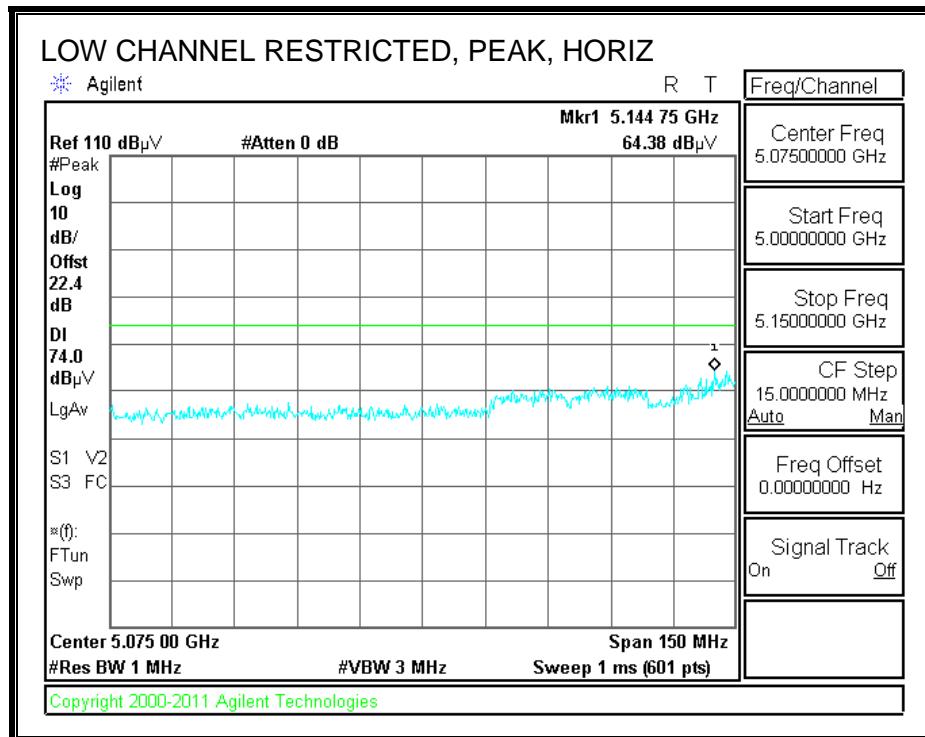
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	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 3IX 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	

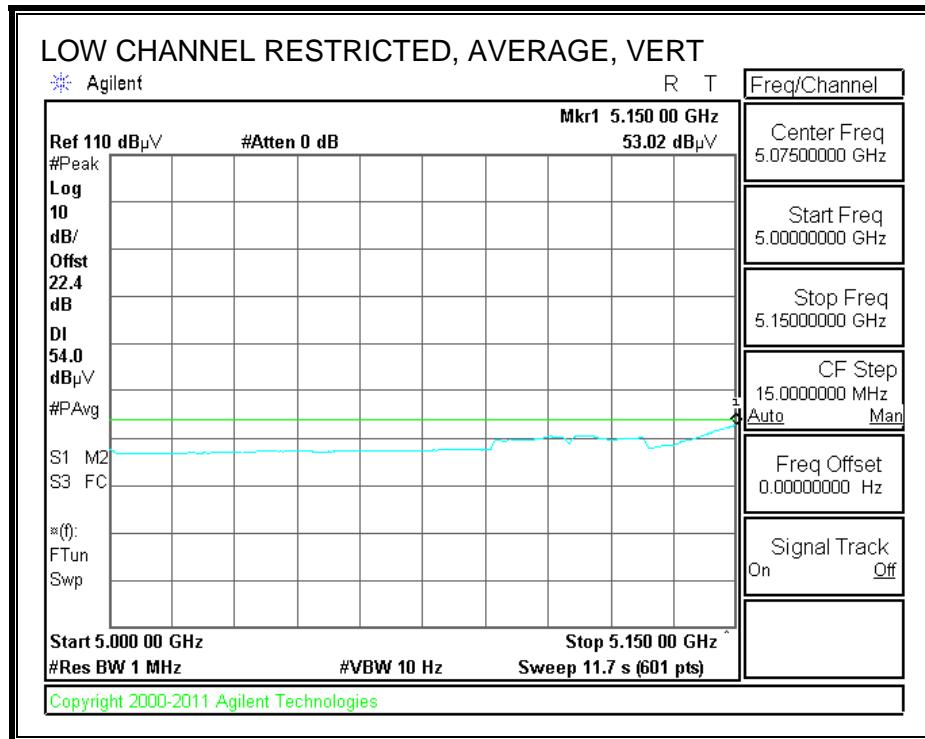
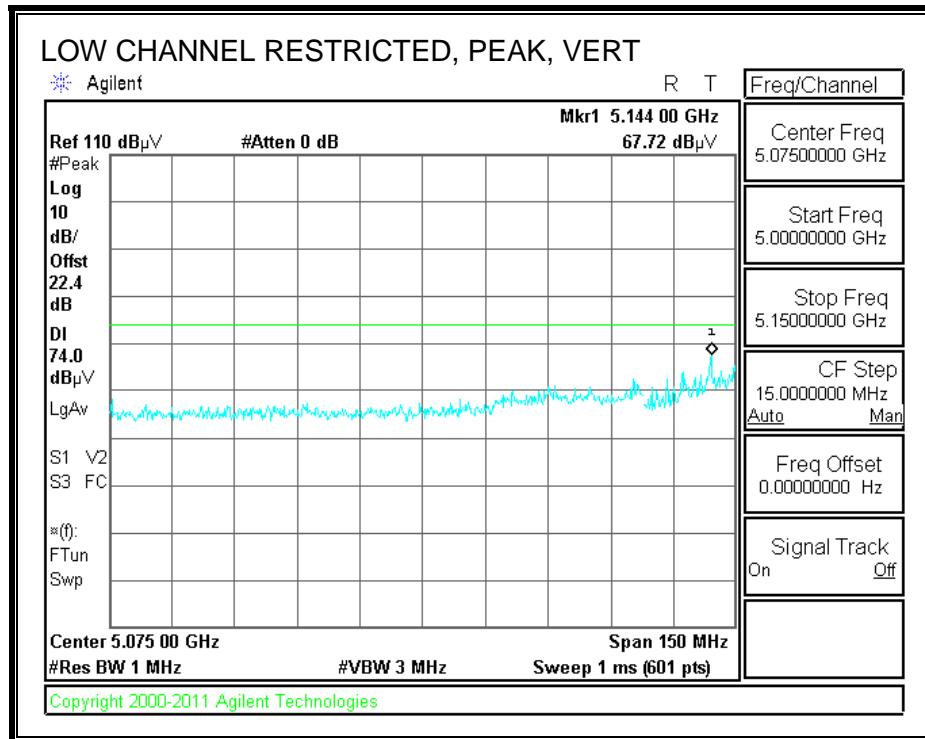
Rev. 4.1.2.7

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 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 3IX 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	

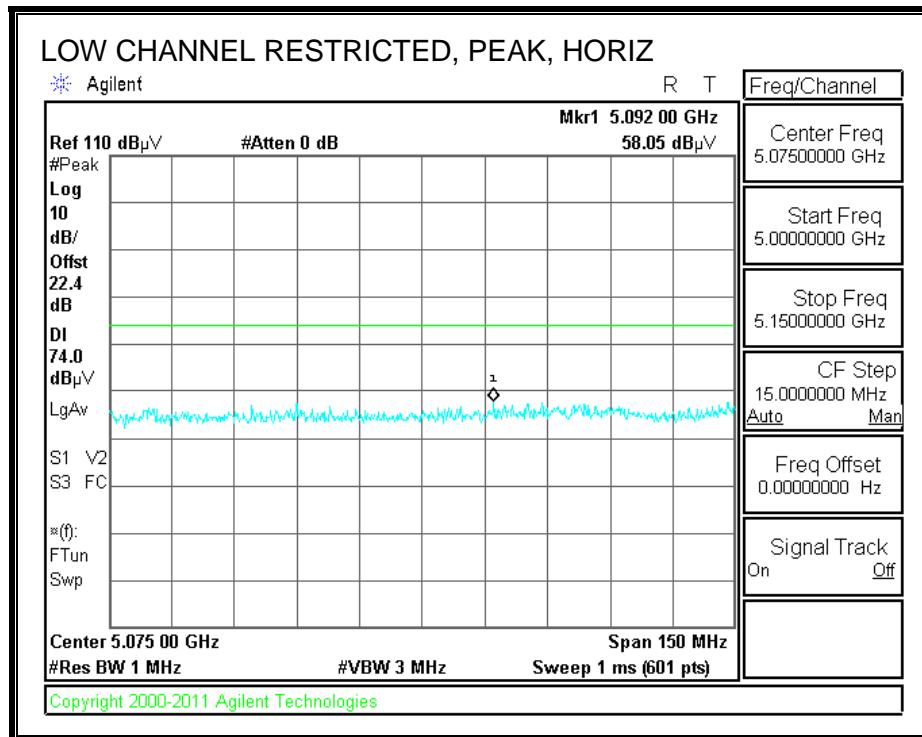
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	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 3IX 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	

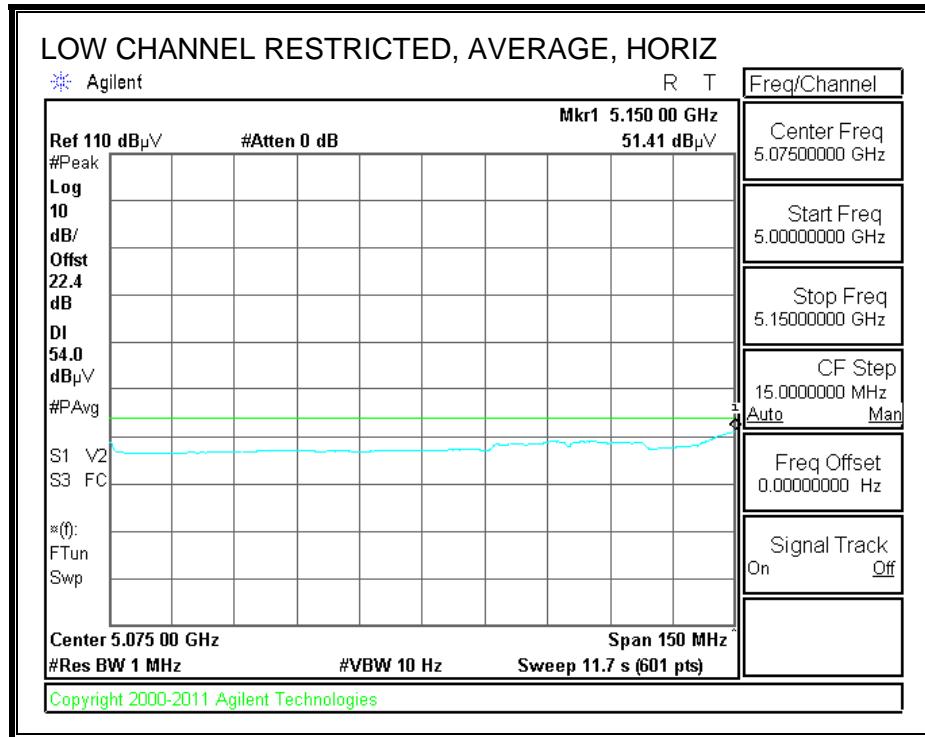
Rev. 4.1.2.7

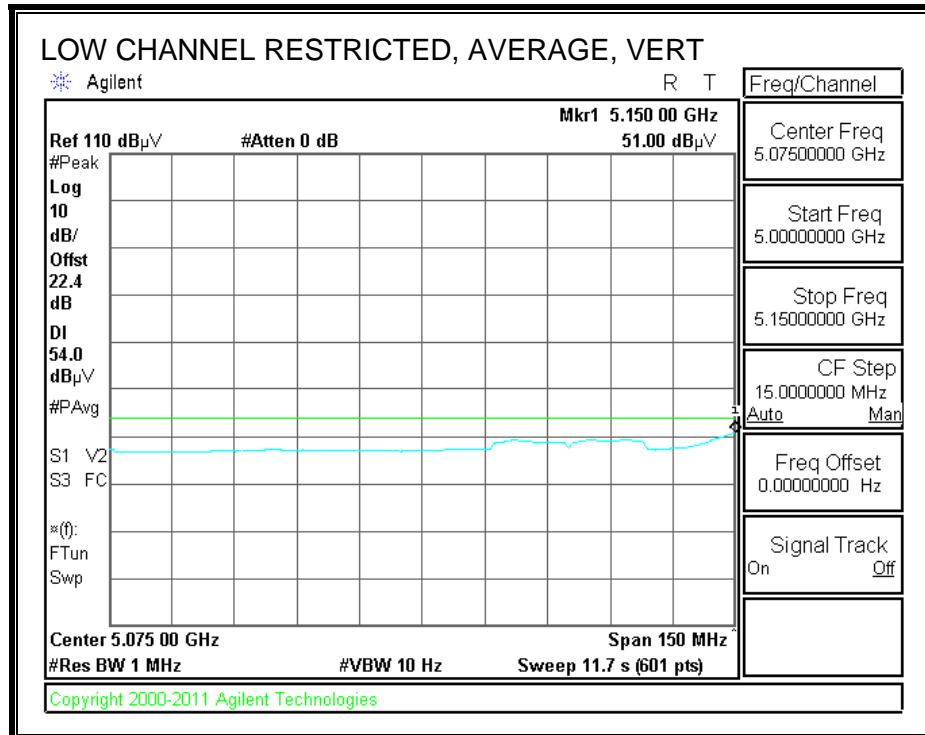
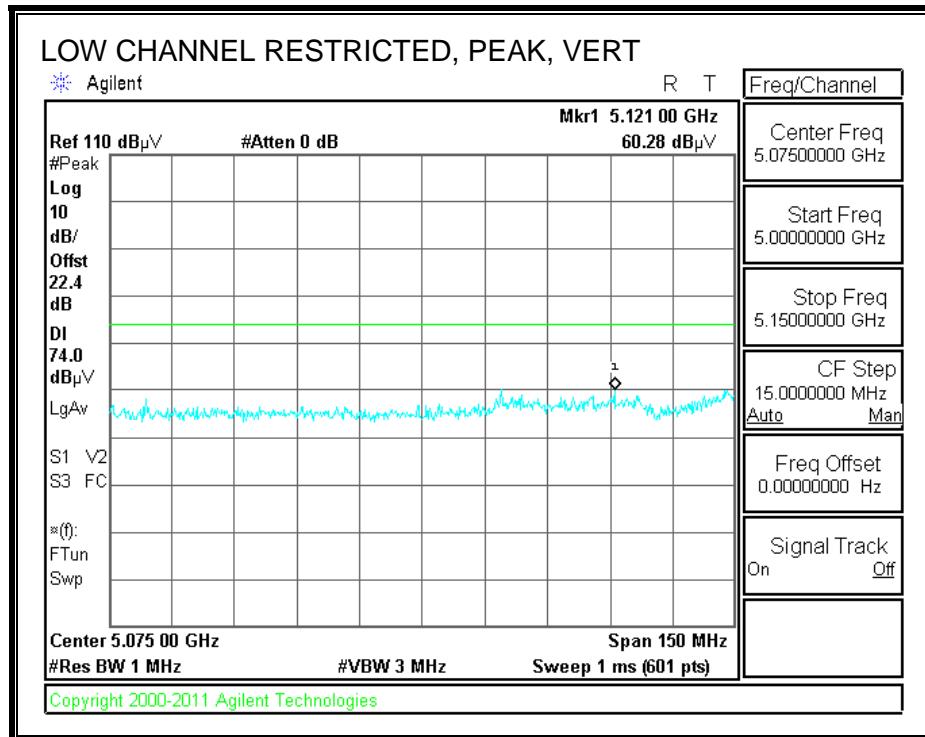
Note: No other emissions were detected above the system noise floor.

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

#### RESTRICTED 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 3IX 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	

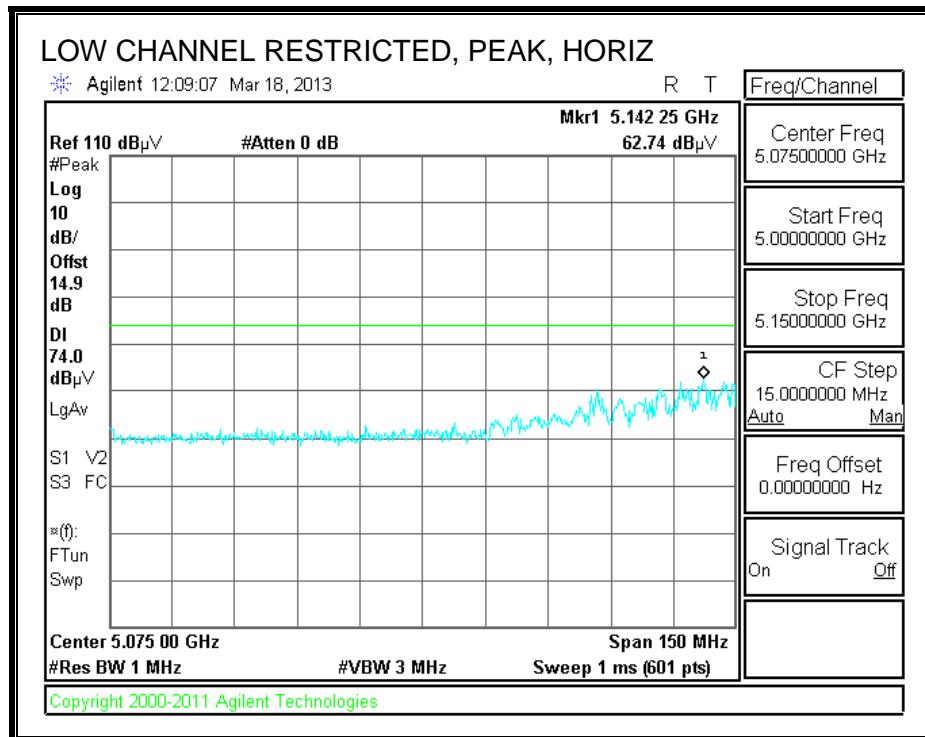
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5190 MHz 3IX CDD</b>													
15.570	3.0	33.5	38.9	13.0	-31.9	0.0	0.7	54.2	74.0	-19.8	V	P	
15.570	3.0	23.4	38.9	13.0	-31.9	0.0	0.7	44.2	54.0	-9.8	V	A	
15.570	3.0	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 3IX 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	

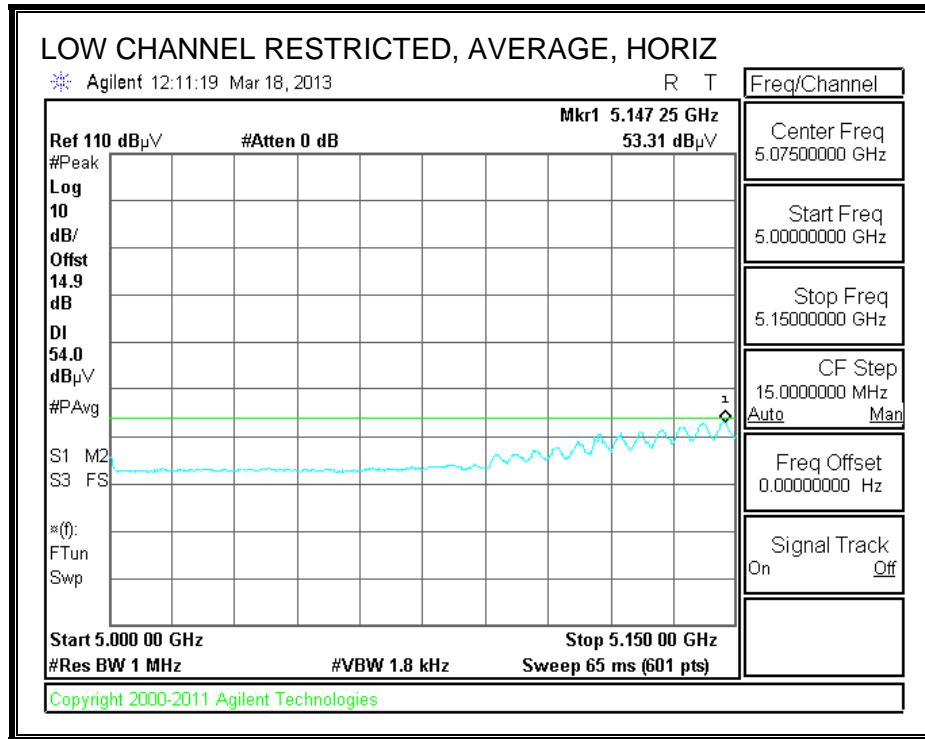
Rev. 4.1.2.7

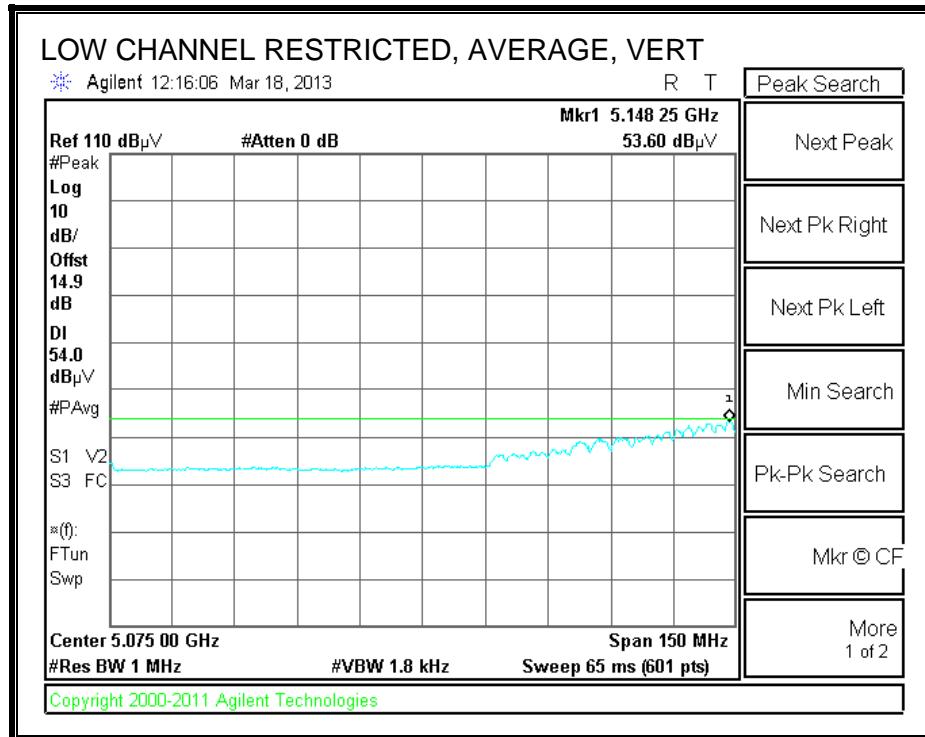
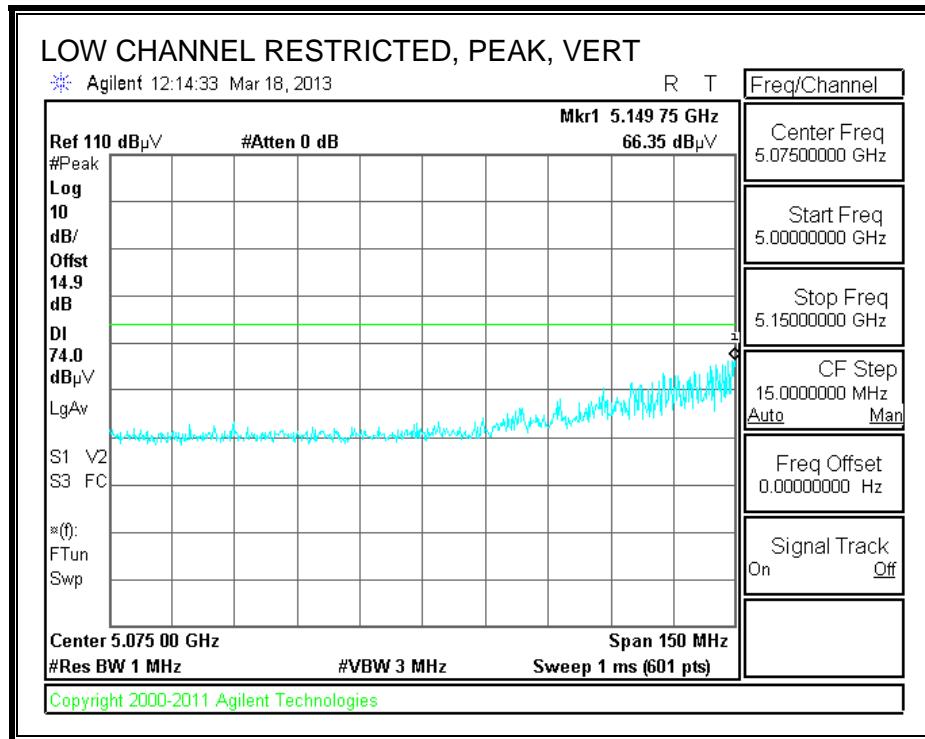
Note: No other emissions were detected above the system noise floor.

### 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 3IX 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	

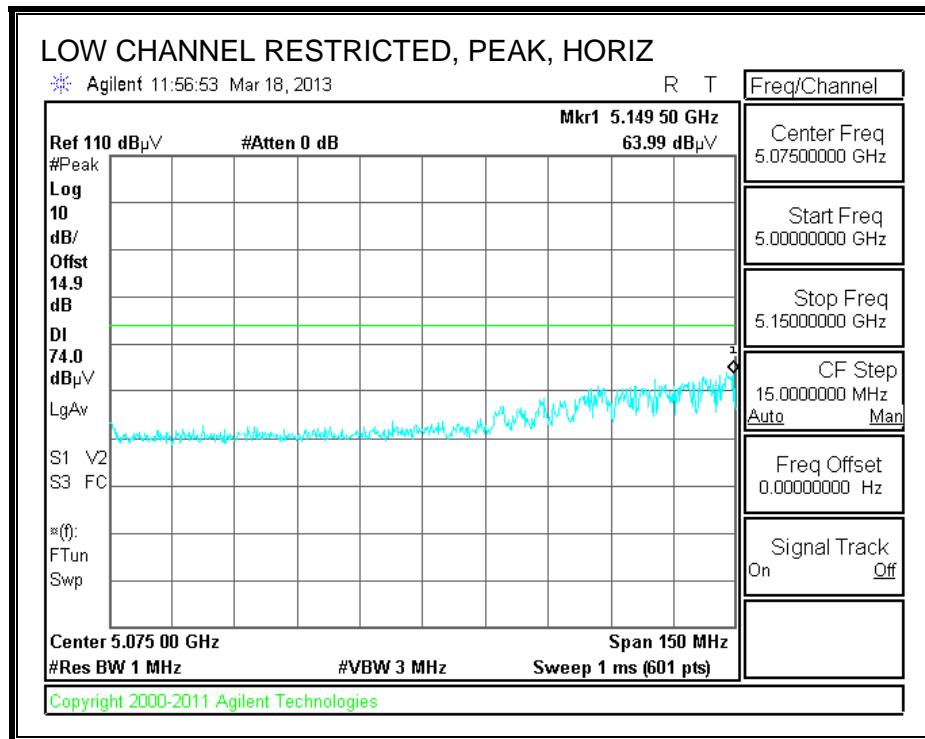
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	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 3IX 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 3IX 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 3IX 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	

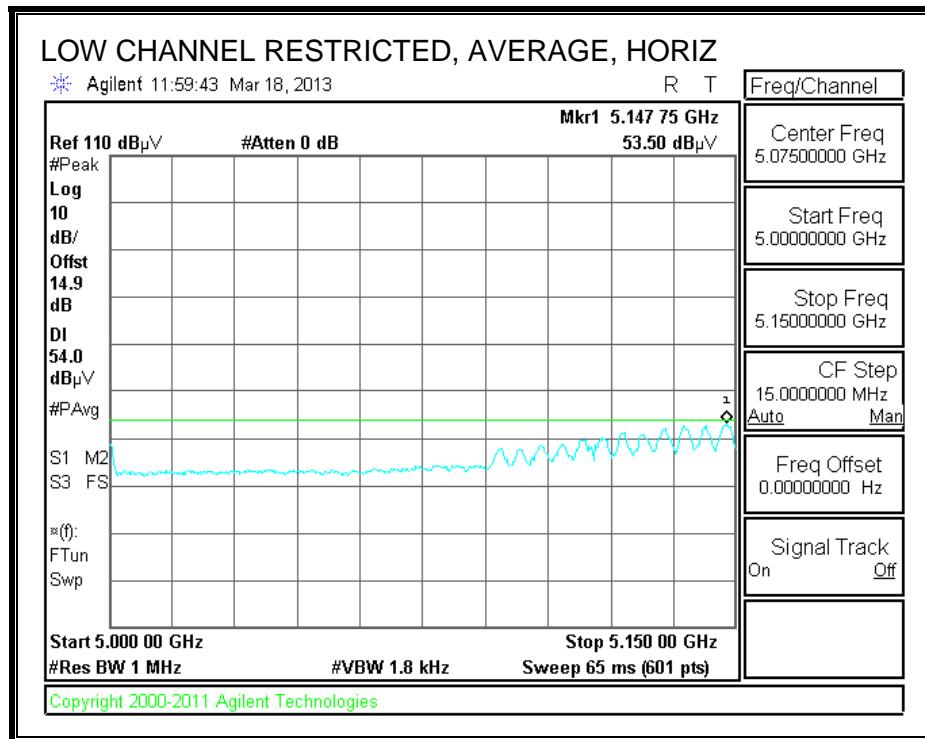
Rev. 4.1.2.7

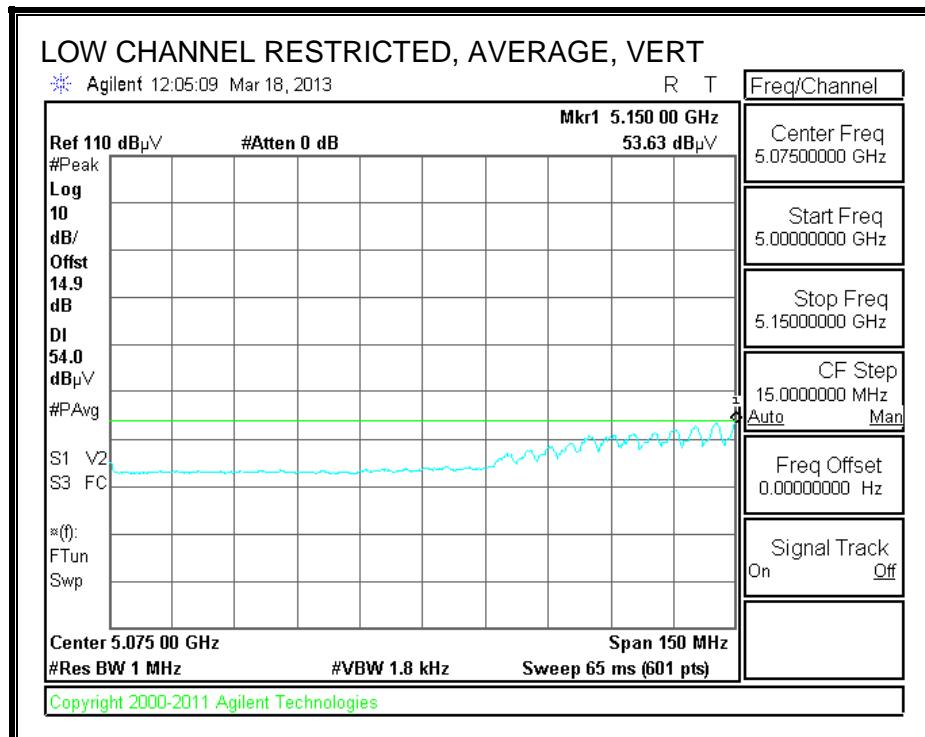
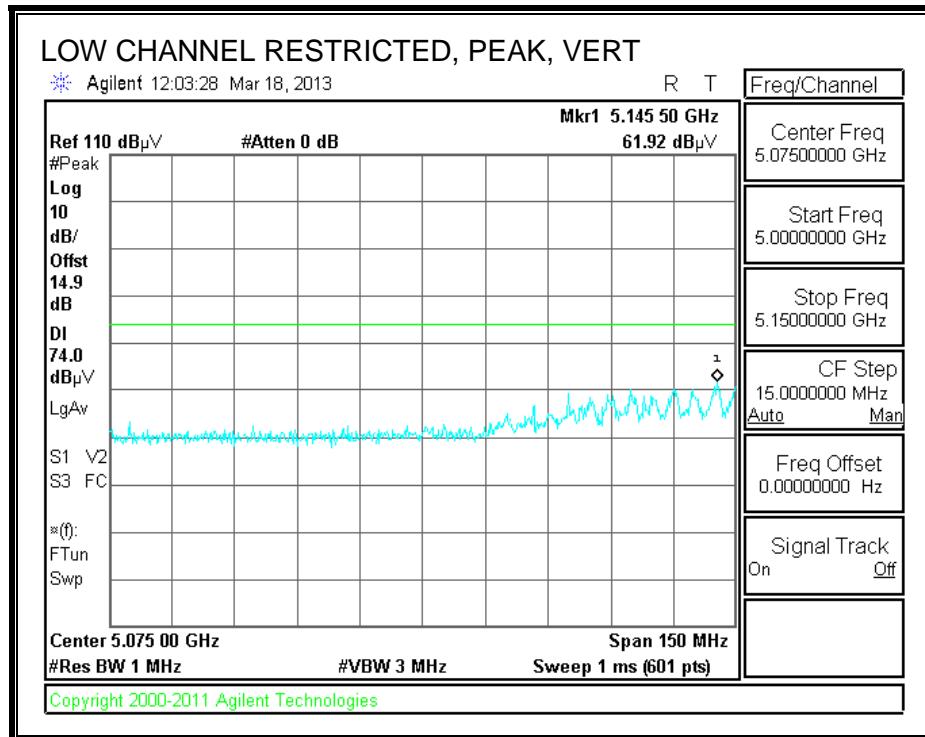
Note: No other emissions were detected above the system noise floor.

### 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 3IX 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	

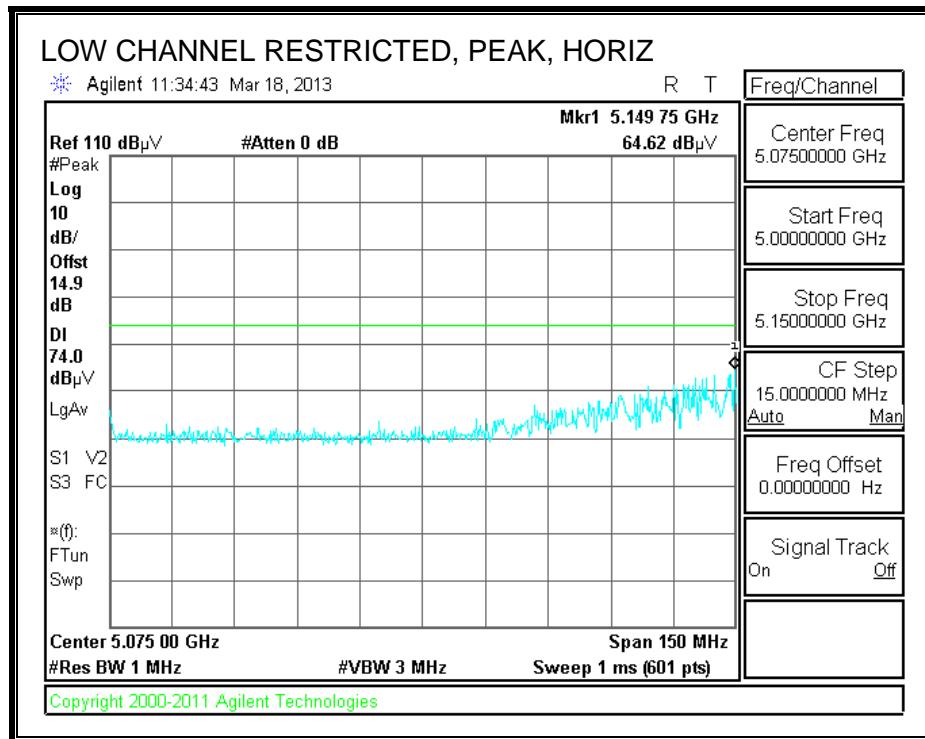
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	-19.4	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	-9.7	V	A	
15.630	3.0	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 3IX 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 3IX 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 3IX 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	

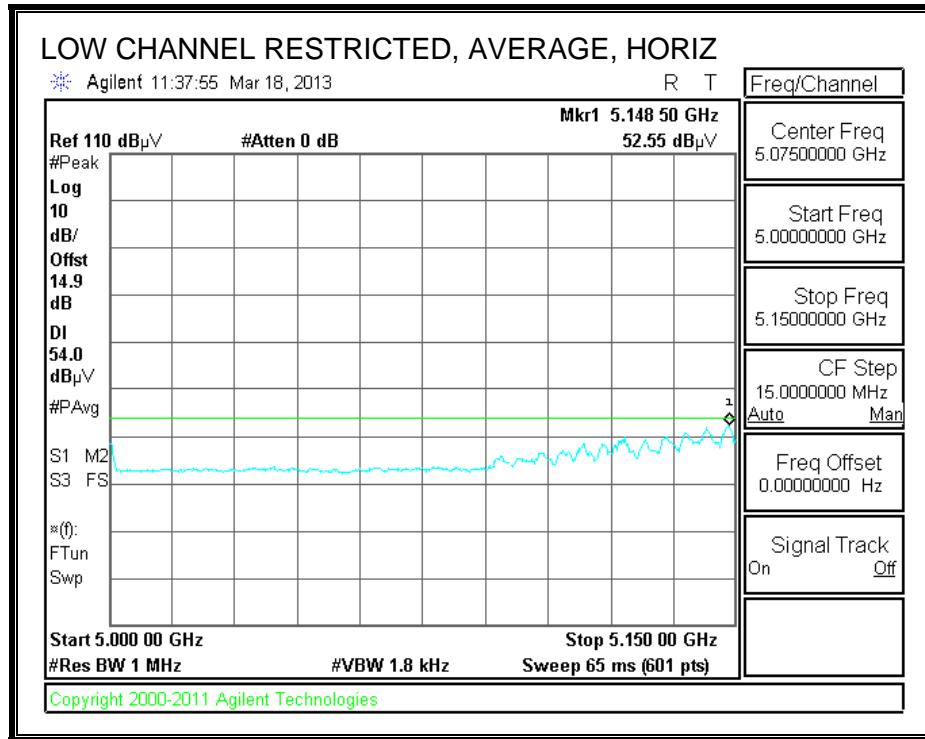
Rev. 4.1.2.7

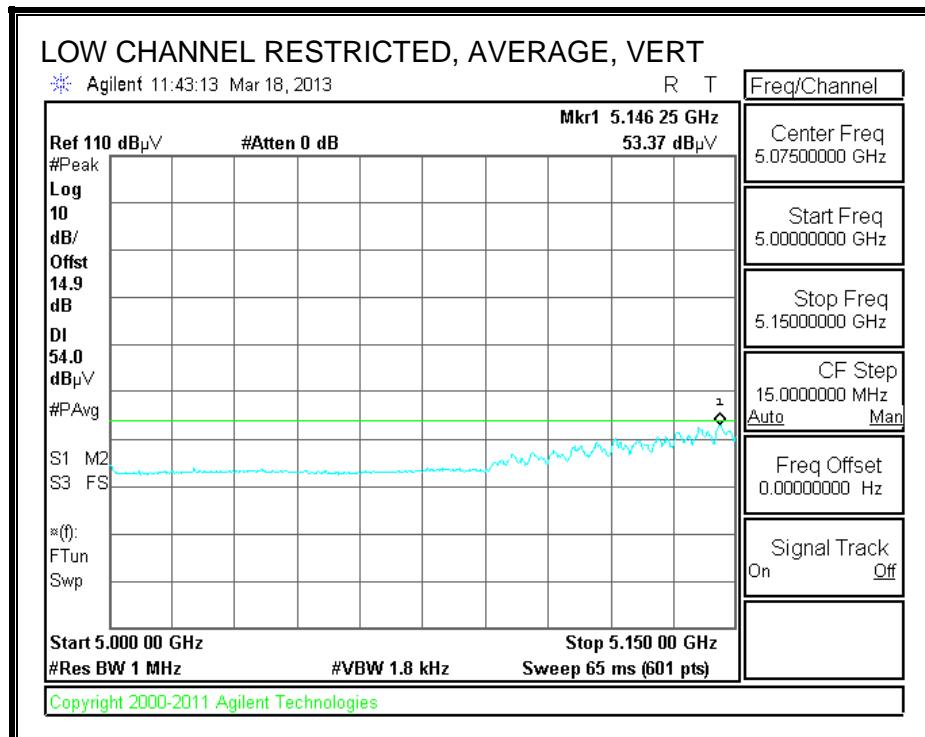
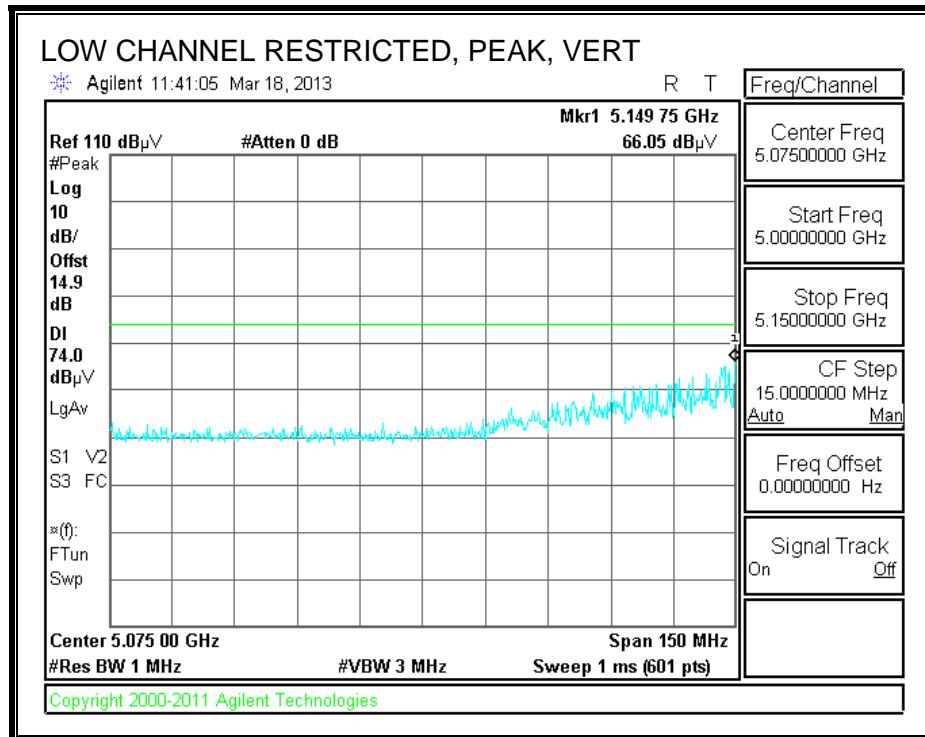
Note: No other emissions were detected above the system noise floor.

### 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	

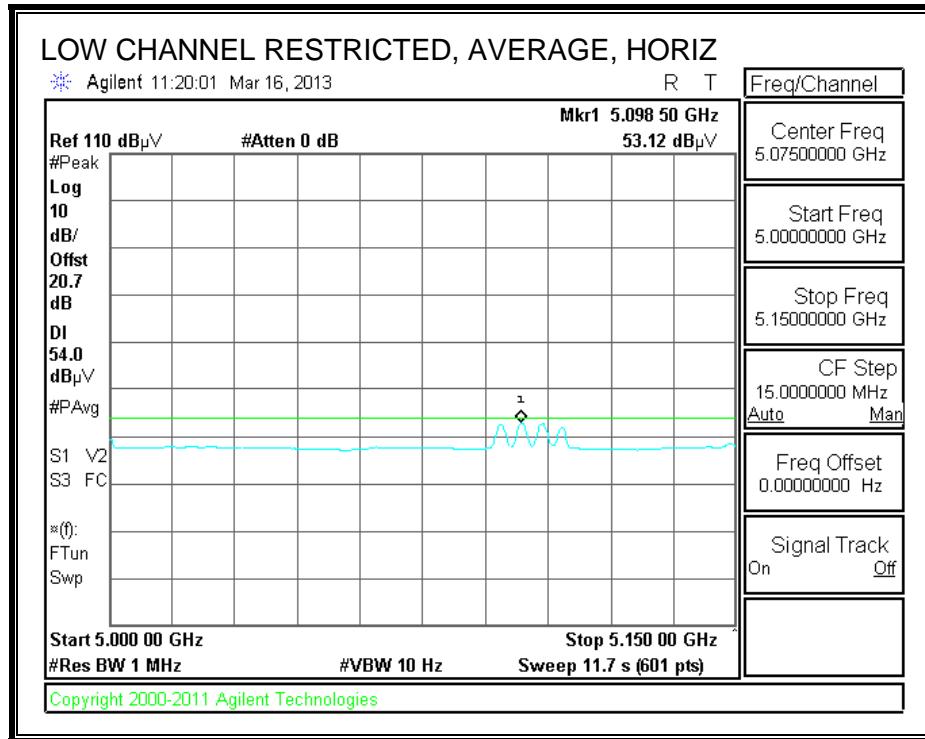
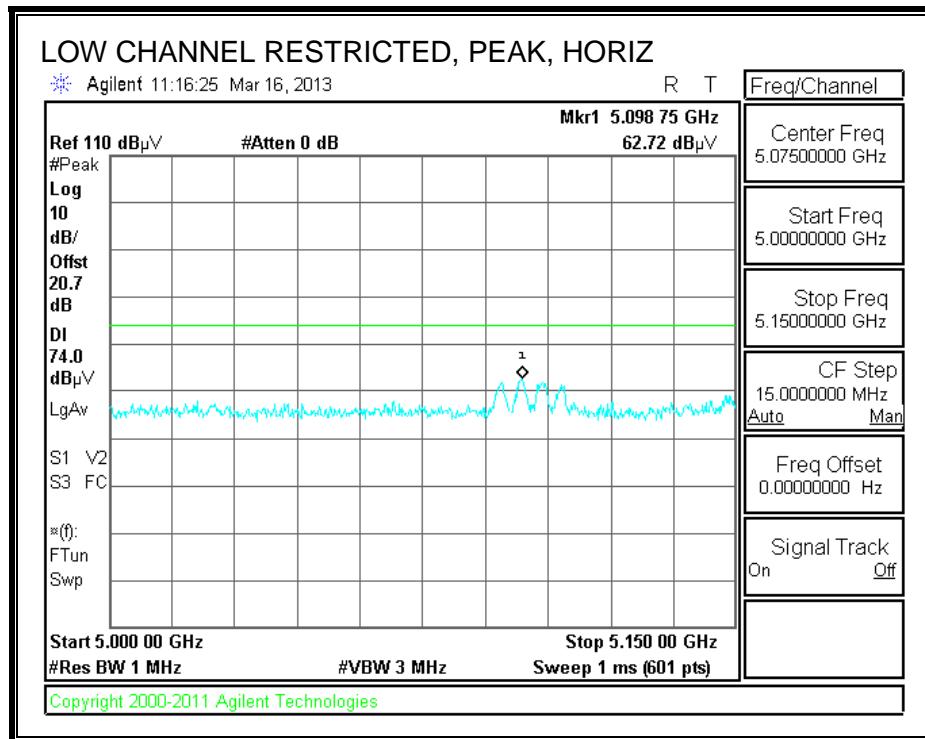
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>5210 MHz 3IX CDD</b>													
15.630	3.0	34.1	38.7	13.0	-31.9	0.0	0.7	54.6	74.0	<b>-19.4</b>	V	P	
15.630	3.0	23.7	38.7	13.0	-31.9	0.0	0.7	44.3	54.0	<b>-9.7</b>	V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

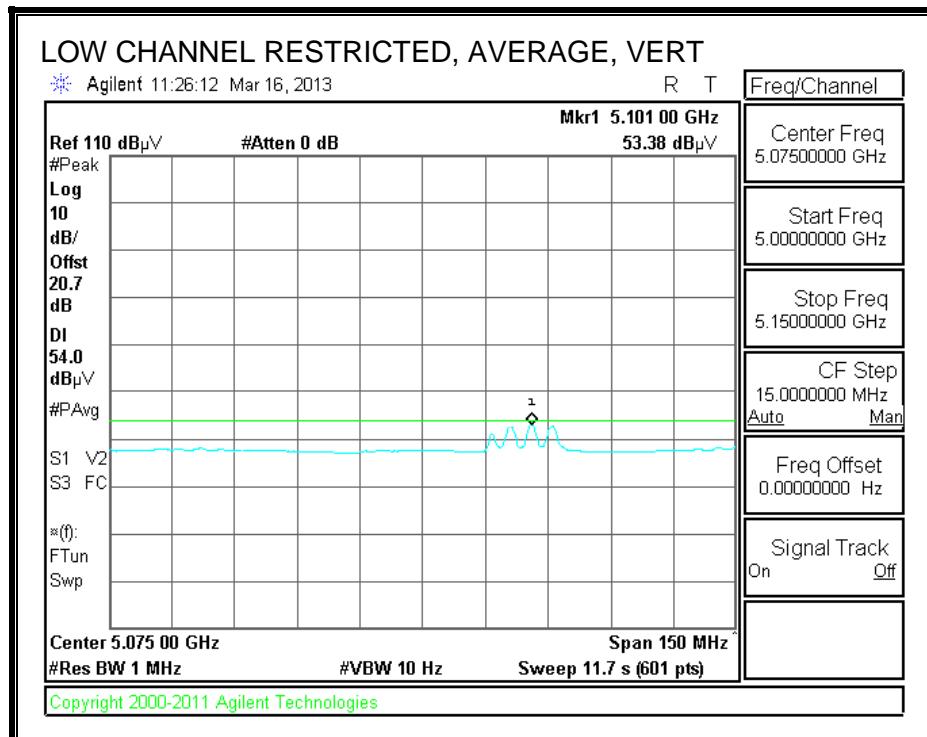
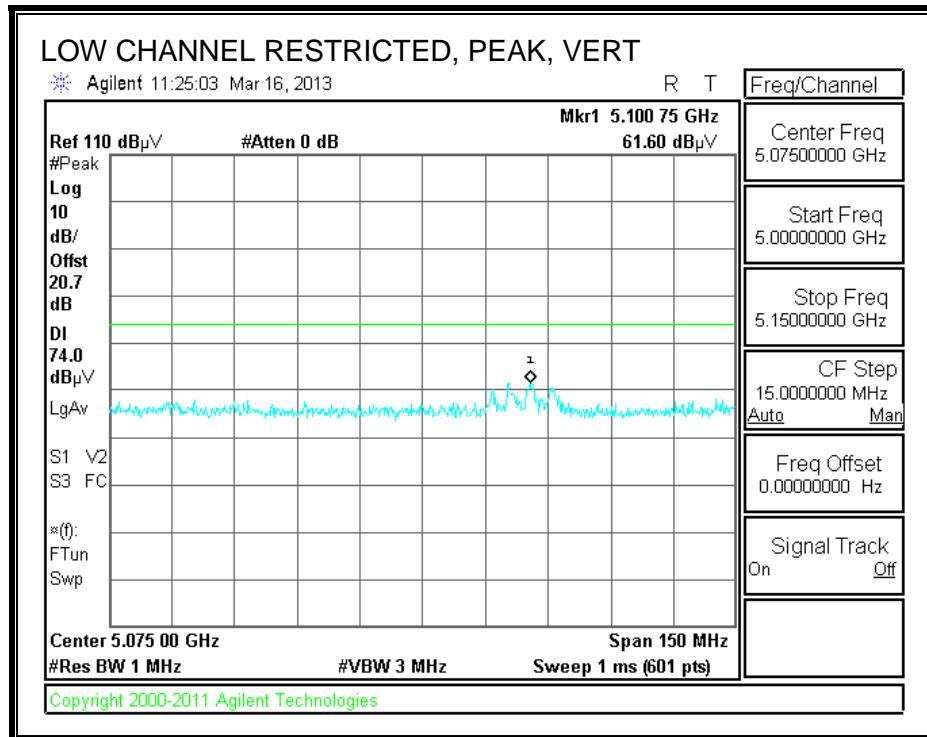
Rev. 4.1.2.7

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)



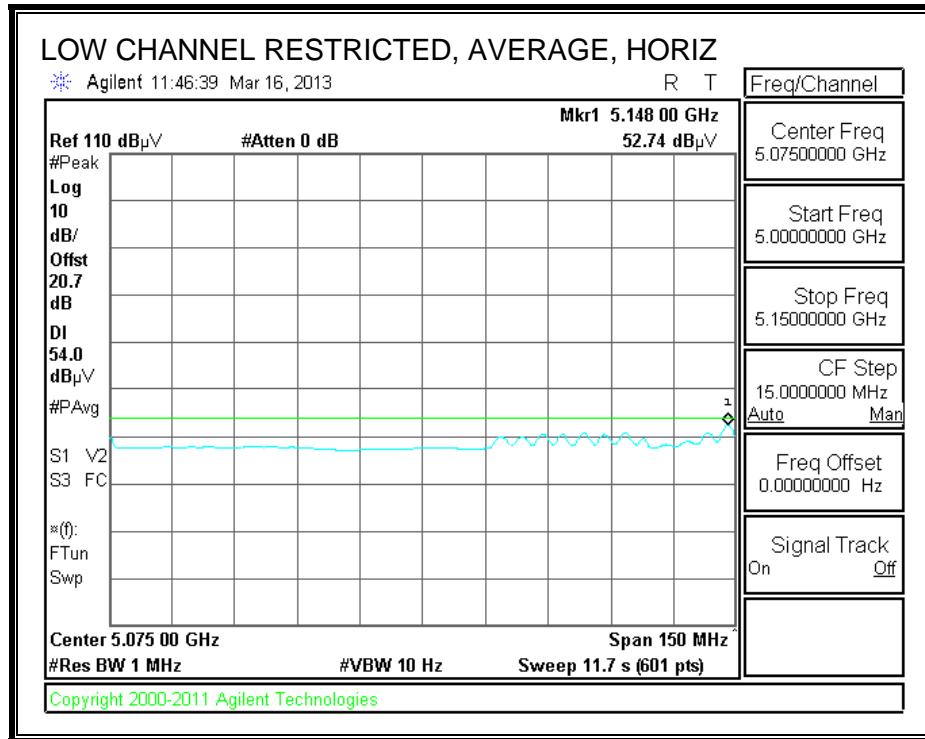
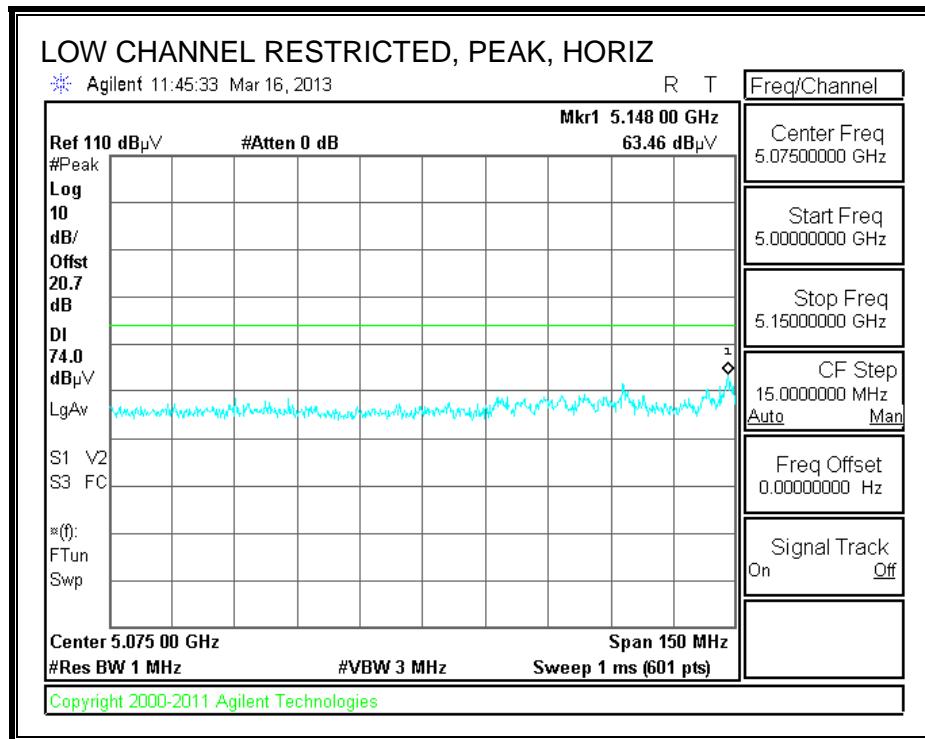


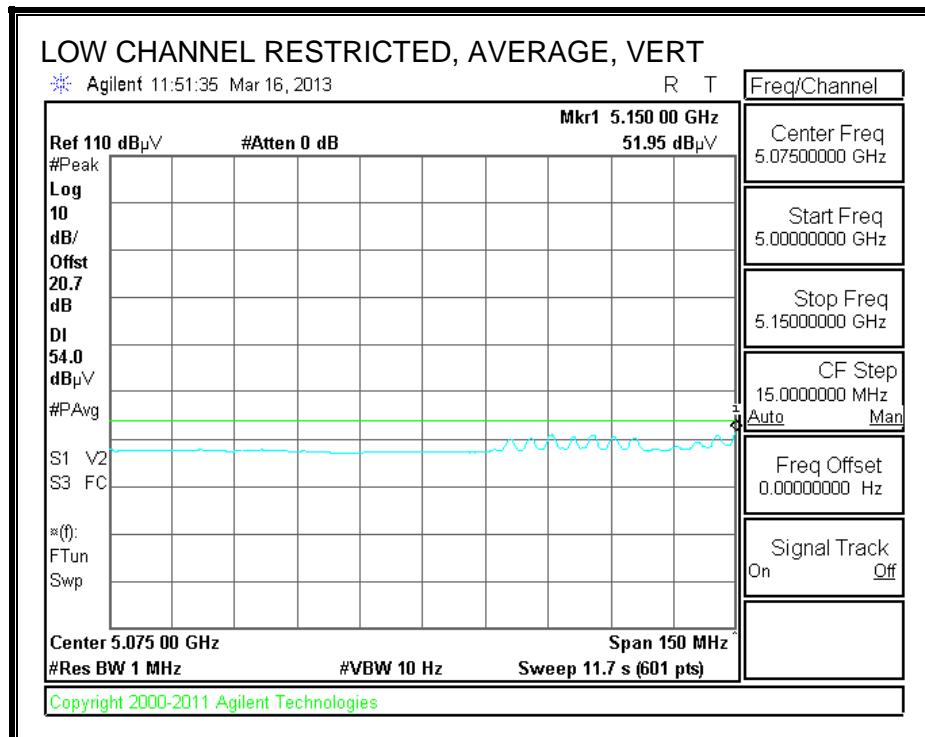
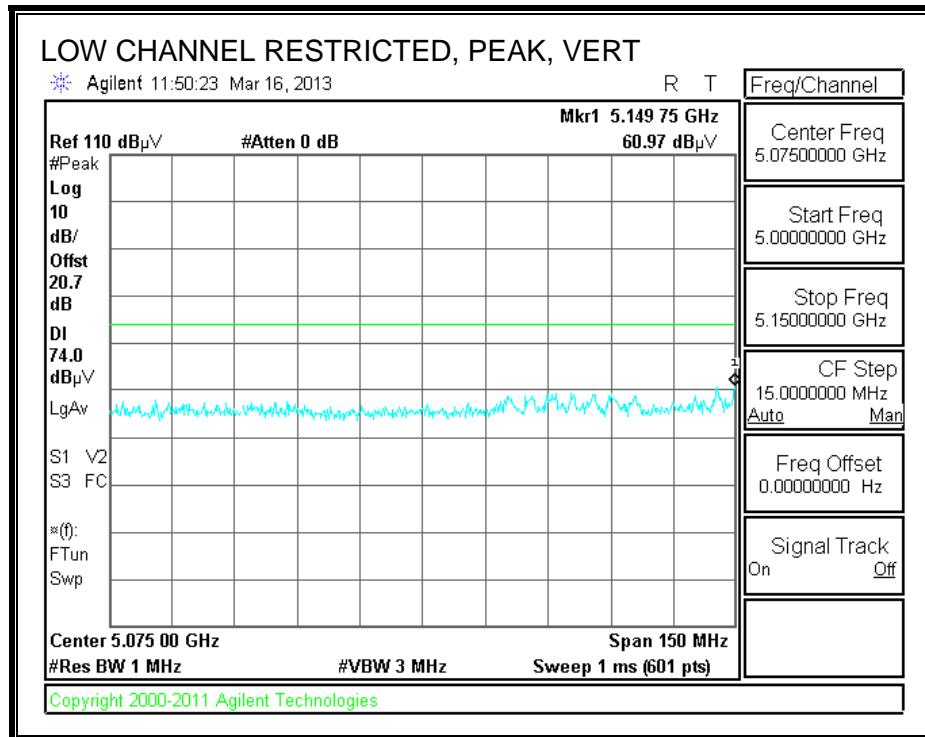
## **HARMONICS AND SPURIOUS EMISSIONS**

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:	HT20 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 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
												Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b>	<b>Dist</b>	<b>Read Pk</b>	<b>Read Avg.</b>	<b>AF</b>	<b>CL</b>	<b>Amp</b>	<b>D Corr</b>	<b>Fltr</b>	<b>Peak</b>	<b>Avg</b>	<b>Pk Lim</b>	<b>Avg Lim</b>	<b>Pk Mar</b>	<b>Avg Mar</b>	<b>Notes</b>
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(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					
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									

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

#### RESTRICTED BANDEDGE (LOW CHANNEL)



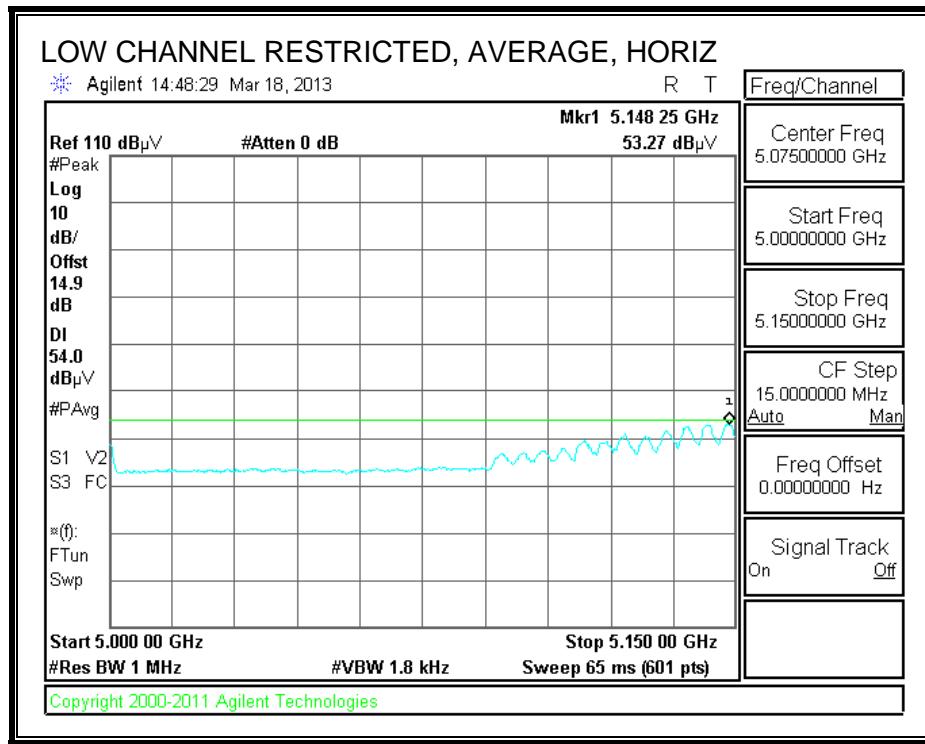
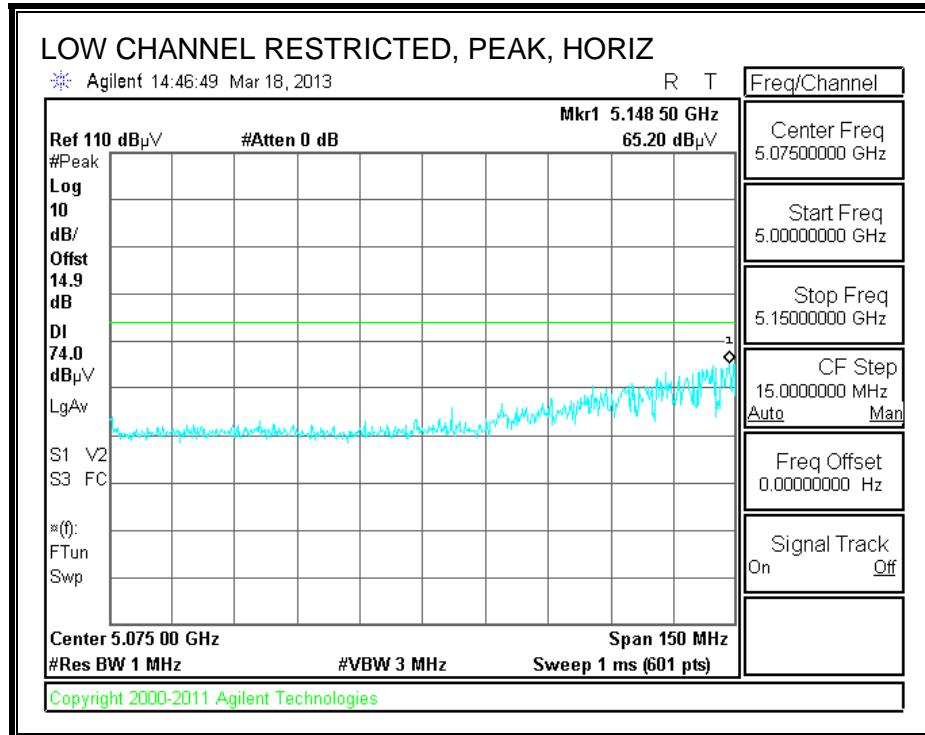


## **HARMONICS AND SPURIOUS EMISSIONS**

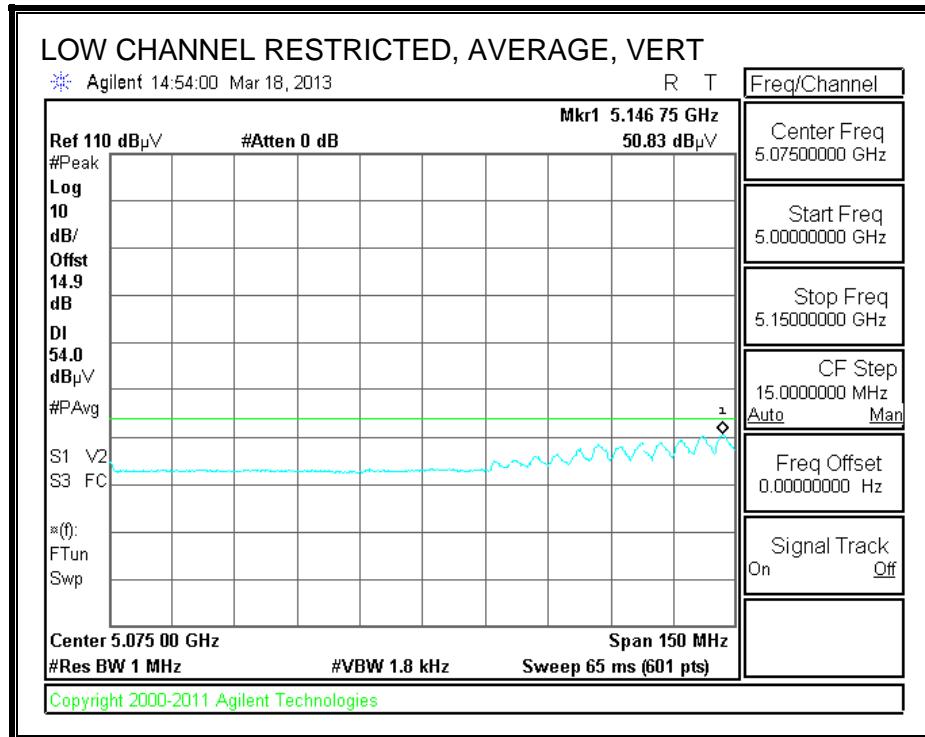
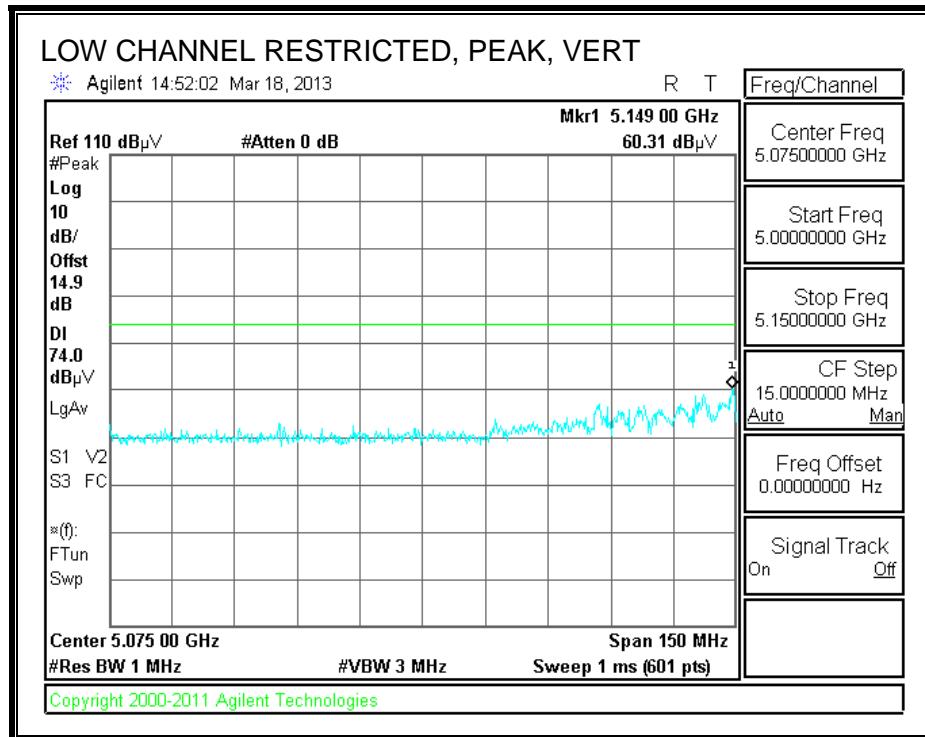
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<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 18-26 GHz; S/N:1013			FCC 15.205			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz						Average Measurements RBW=1MHz ; VBW=10Hz
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (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															
<b>f</b> Measurement Frequency	<b>Amp</b> Preamp Gain	<b>D Corr</b> Distance Correct to 3 meters	<b>Avg Lim</b> Average Field Strength Limit	<b>Dist</b> Distance to Antenna	<b>D Corr</b> Distance Correct to 3 meters	<b>Pk Lim</b> Peak Field Strength Limit	<b>Read</b> Analyzer Reading	<b>Avg</b> Average Field Strength @ 3 m	<b>Avg Mar</b> Margin vs. Average Limit	<b>Peak</b> Calculated Peak Field Strength	<b>Pk Mar</b> Margin vs. Peak Limit	<b>CL</b> Cable Loss	<b>HPF</b> High Pass Filter		

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

#### RESTRICTED BANDEDGE (LOW CHANNEL)





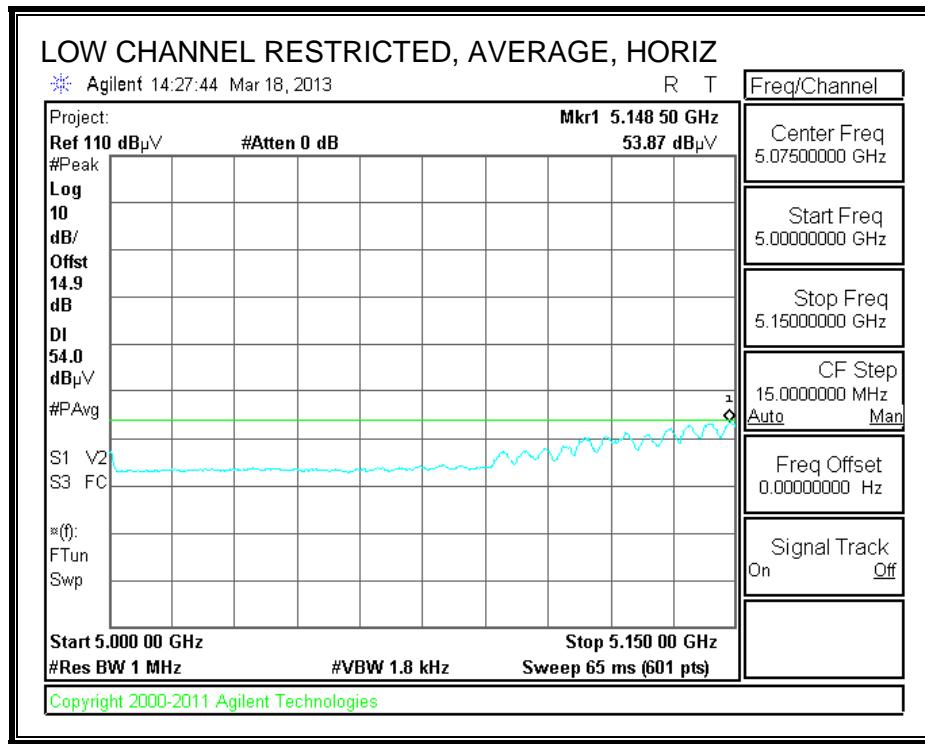
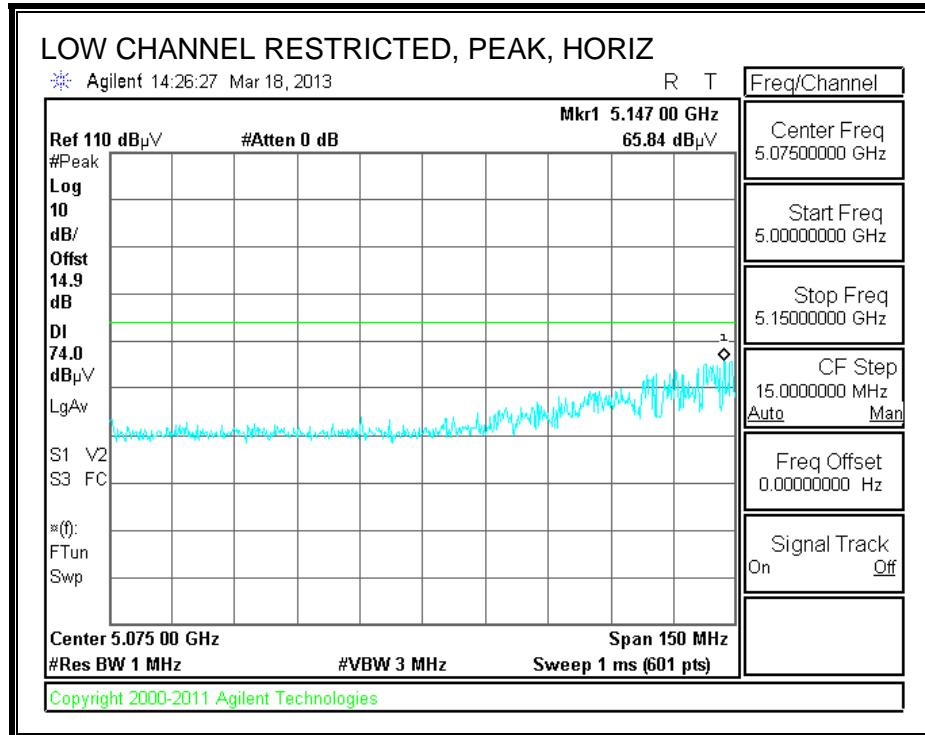


## **HARMONICS AND SPURIOUS EMISSIONS**

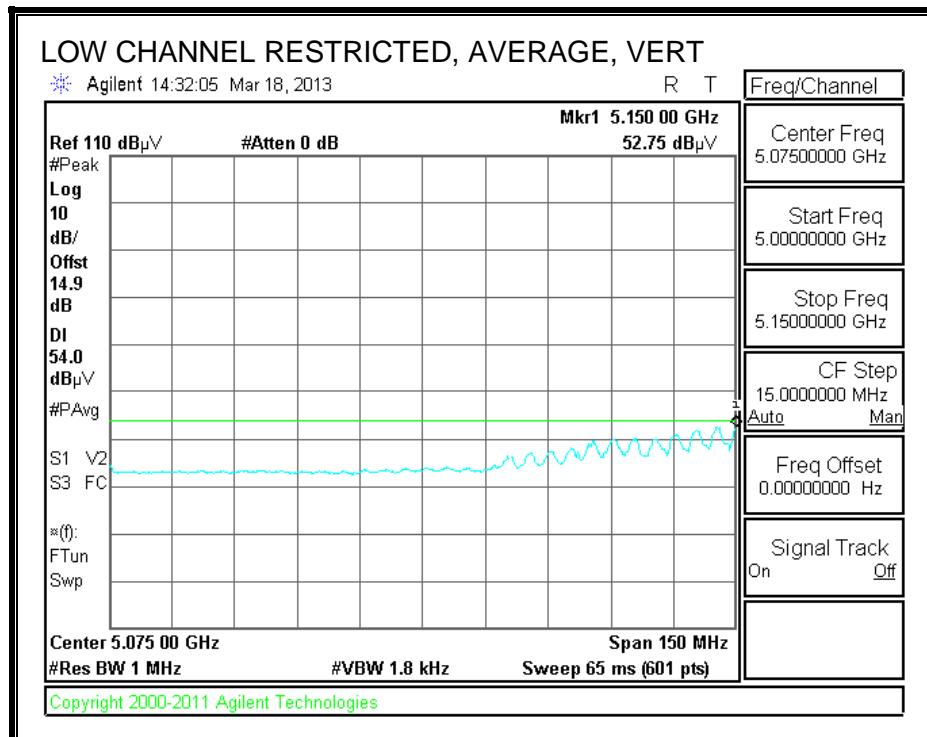
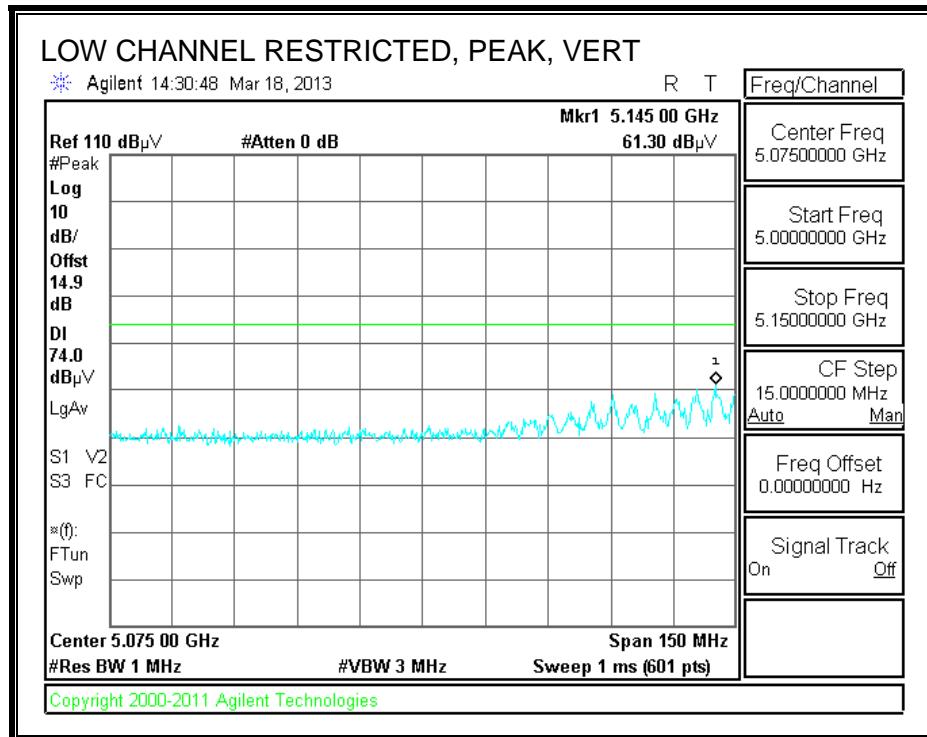
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<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			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Reject Filter			Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b>	<b>Dist</b>	<b>Read Pk</b>	<b>Read Avg.</b>	<b>AF</b>	<b>CL</b>	<b>Amp</b>	<b>D Corr</b>	<b>Fltr</b>	<b>Peak</b>	<b>Avg</b>	<b>Pk Lim</b>	<b>Avg Lim</b>	<b>Pk Mar</b>	<b>Avg Mar</b>	<b>Notes</b>
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dB	dB	dB	(V/H)
Low Channel (5210 MHz)															
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
Mid Channel (5290 MHz)															
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
Low Channel (5530 MHz)															
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
Hi Channel (5690 MHz)															
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)





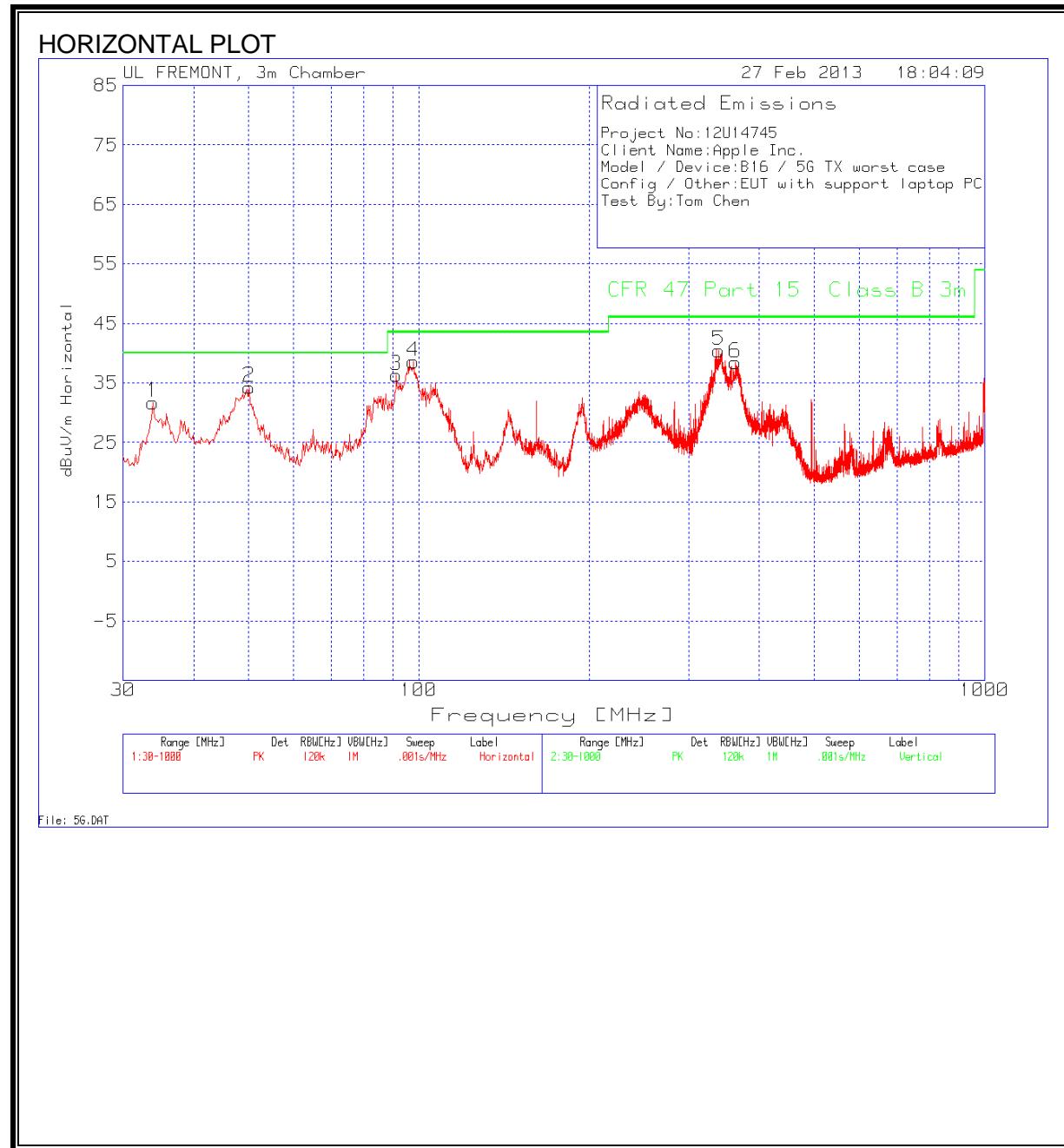


## HARMONICS AND SPURIOUS EMISSIONS

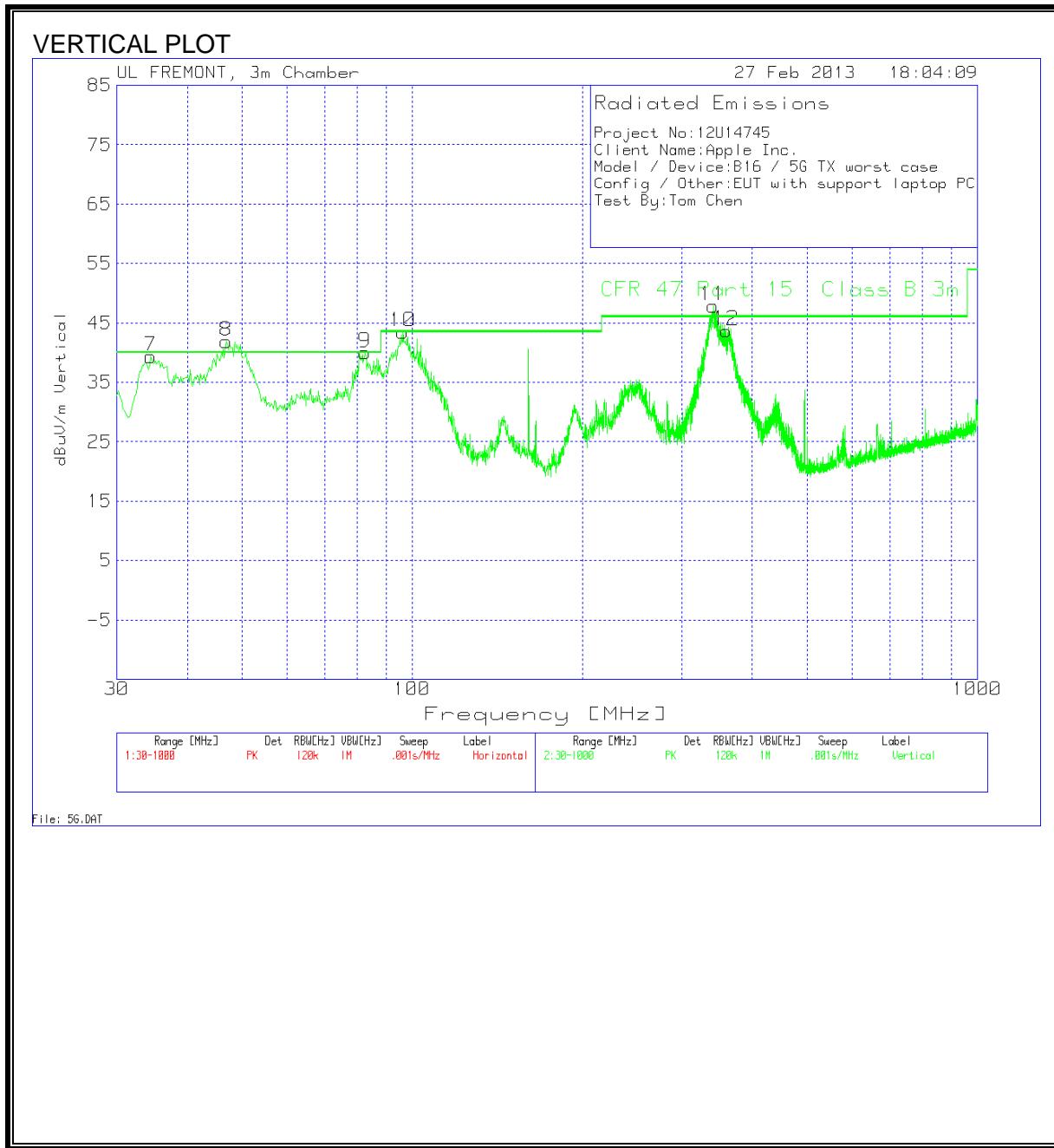
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber-A															
Company:	MENGISTU MEKURIA														
Project #:	03/17/13														
Date:	12U14745														
Test Engineer:	Apple Inc.														
Configuration:	FCC Class B														
Mode:	HT40 3TX BF CDD														
<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			
Hi Frequency Cables															
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Peak Measurements RBW=VBW=1MHz			
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF_7.6GHz			Average Measurements RBW=1MHz ; VBW=10Hz			
<b>f</b> GHz	<b>Dist</b> (m)	<b>Read Pk</b> dBuV	<b>Read Avg.</b> dBuV	<b>AF</b> dB/m	<b>CL</b> dB	<b>Amp</b> dB	<b>D Corr</b> dB	<b>Fltr</b> dB	<b>Peak</b> dBuV/m	<b>Avg</b> dBuV/m	<b>Pk Lim</b> dBuV/m	<b>Avg Lim</b> dBuV/m	<b>Pk Mar</b> dB	<b>Avg Mar</b> dB	<b>Notes</b> (V/H)
Low Channel (5210 MHz)															
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
Mid Channel (5290 MHz)															
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
Low Channel (5530 MHz)															
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
Hi Channel (5690 MHz)															
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

<sup>\*</sup> 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											

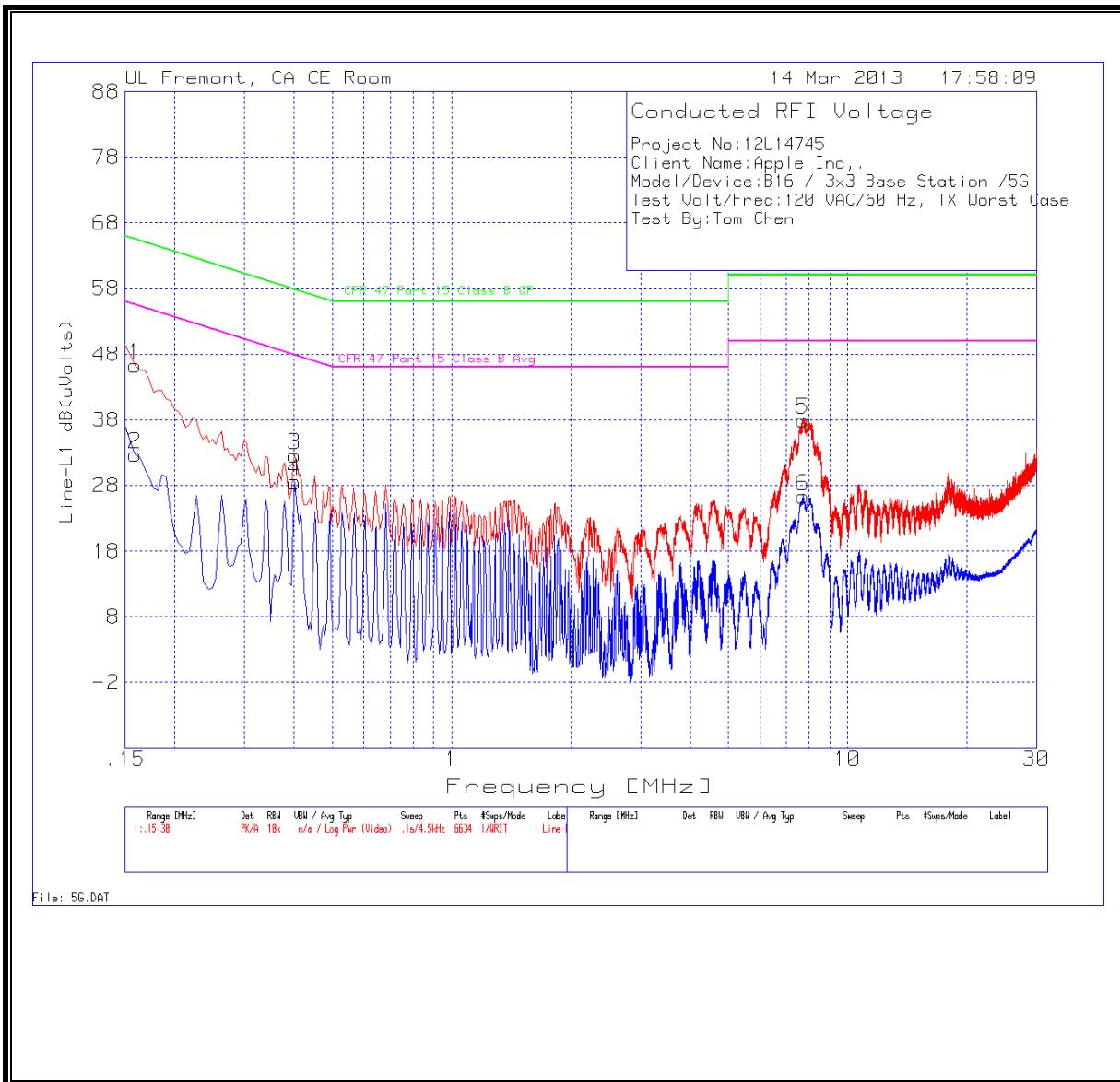
Line-L1 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L1.TXT	LC Cables 1&3.TXT	dB(uVolt s)	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(uVolt s)	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**

