



**FCC CFR47 PART 15 SUBPART E  
INDUSTRY CANADA RSS-210 ISSUE 7**

**CERTIFICATION TEST REPORT**

**FOR**

**802.11ab/g/n WLAN PCI-E MINICARD**

**MODEL NUMBER: BCM943228HM4L**

**FCC ID: QDS-BRCM1054  
IC: 4324A-BRCM1054**

**REPORT NUMBER: 10U13394-2, Revision A**

**ISSUE DATE: DECEMBER 10, 2010**

*Prepared for*

**BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, U.S.A.**

*Prepared by*

**COMPLIANCE CERTIFICATION SERVICES (UL CCS)  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/03/10	Initial Issue	T. Chan
A	12/09/10	Updated Output Power	V. Tran

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b>	<b>6</b>
<b>2. TEST METHODOLOGY</b>	<b>7</b>
<b>3. FACILITIES AND ACCREDITATION</b>	<b>7</b>
<b>4. CALIBRATION AND UNCERTAINTY</b>	<b>7</b>
4.1. MEASURING INSTRUMENT CALIBRATION	7
4.2. SAMPLE CALCULATION	7
4.3. MEASUREMENT UNCERTAINTY	7
<b>5. EQUIPMENT UNDER TEST</b>	<b>8</b>
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER	8
5.3. SOFTWARE AND FIRMWARE	9
5.4. WORST-CASE CONFIGURATION AND MODE	9
5.5. DESCRIPTION OF AVAILABLE ANTENNAS	10
5.6. DESCRIPTION OF TEST SETUP	10
<b>6. TEST AND MEASUREMENT EQUIPMENT</b>	<b>12</b>
<b>7. ANTENNA PORT TEST RESULTS</b>	<b>13</b>
7.1. 802.11a MODE IN THE 5.2 GHz BAND	13
7.1.1. 26 dB and 99% BANDWIDTH	13
7.1.2. OUTPUT POWER	16
7.1.3. PEAK POWER SPECTRAL DENSITY	19
7.1.4. PEAK EXCURSION	22
7.1.5. CONDUCTED SPURIOUS EMISSIONS	25
7.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND	29
7.2.1. 26 dB and 99% BANDWIDTH	29
7.2.2. OUTPUT POWER	34
7.2.3. PEAK POWER SPECTRAL DENSITY	39
7.2.4. PEAK EXCURSION	42
7.2.5. CONDUCTED SPURIOUS EMISSIONS	47
7.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND	51
7.3.1. 26 dB and 99% BANDWIDTH	51
7.3.2. OUTPUT POWER	54
7.3.3. PEAK POWER SPECTRAL DENSITY	57
7.3.4. PEAK EXCURSION	59
7.3.5. CONDUCTED SPURIOUS EMISSIONS	62
7.4. 802.11a MODE IN THE 5.3 GHz BAND	65
7.4.1. 26 dB and 99% BANDWIDTH	65
7.4.2. OUTPUT POWER	68

7.4.3.	PEAK POWER SPECTRAL DENSITY .....	71
7.4.4.	PEAK EXCURSION .....	74
7.4.5.	CONDUCTED SPURIOUS EMISSIONS.....	77
7.5.	<i>802.11n HT20 MODE IN THE 5.3 GHz BAND .....</i>	<i>81</i>
7.5.1.	26 dB and 99% BANDWIDTH .....	81
7.5.2.	OUTPUT POWER .....	86
7.5.3.	PEAK POWER SPECTRAL DENSITY .....	91
7.5.4.	PEAK EXCURSION .....	94
7.5.5.	CONDUCTED SPURIOUS EMISSIONS.....	99
7.6.	<i>802.11n HT40 MODE IN THE 5.3 GHz BAND.....</i>	<i>103</i>
7.6.1.	26 dB and 99% BANDWIDTH .....	103
7.6.2.	OUTPUT POWER .....	106
7.6.3.	PEAK POWER SPECTRAL DENSITY .....	109
7.6.4.	PEAK EXCURSION .....	111
7.6.5.	CONDUCTED SPURIOUS EMISSIONS.....	114
7.7.	<i>802.11a MODE IN THE 5.6 GHz BAND.....</i>	<i>117</i>
7.7.1.	26 dB and 99% BANDWIDTH .....	117
7.7.2.	OUTPUT POWER .....	120
7.7.3.	PEAK POWER SPECTRAL DENSITY .....	123
7.7.4.	PEAK EXCURSION .....	126
7.7.5.	CONDUCTED SPURIOUS EMISSIONS.....	129
7.8.	<i>802.11n HT20 MODE IN THE 5.6 GHz BAND .....</i>	<i>133</i>
7.8.1.	26 dB and 99% BANDWIDTH .....	133
7.8.2.	OUTPUT POWER .....	138
7.8.3.	PEAK POWER SPECTRAL DENSITY .....	143
7.8.4.	PEAK EXCURSION .....	146
7.8.5.	CONDUCTED SPURIOUS EMISSIONS.....	151
7.9.	<i>802.11n HT40 MODE IN THE 5.6 GHz BAND.....</i>	<i>155</i>
7.9.1.	26 dB and 99% BANDWIDTH .....	155
7.9.2.	OUTPUT POWER .....	160
7.9.3.	PEAK POWER SPECTRAL DENSITY .....	165
7.9.4.	PEAK EXCURSION .....	168
7.9.5.	CONDUCTED SPURIOUS EMISSIONS.....	173
<b>8.</b>	<b>RADIATED TEST RESULTS .....</b>	<b>177</b>
8.1.	<i>LIMITS AND PROCEDURE .....</i>	<i>177</i>
8.2.	<i>TRANSMITTER ABOVE 1 GHz .....</i>	<i>178</i>
8.2.1.	802.11a MODE IN THE LOWER 5.2 GHz BAND.....	178
8.2.2.	802.11n HT20 CDD MCS0 MODE IN THE LOWER 5.2 GHz BAND .....	180
8.2.3.	802.11n HT40 CDD MCS0 MODE IN THE LOWER 5.2 GHz BAND .....	182
8.2.4.	802.11a MODE IN THE UPPER 5.3 GHz BAND .....	184
8.2.5.	802.11n HT20 CDD MCS0 MODE IN THE UPPER 5.3 GHz BAND .....	186
8.2.6.	802.11n HT40 CDD MCS0 MODE IN THE UPPER 5.3 GHz BAND .....	188
8.2.7.	802.11a MODE IN THE 5.6 GHz BAND.....	190
8.2.8.	802.11n HT20 CDD MCS0 MODE IN THE 5.6 GHz BAND .....	193
8.2.9.	802.11n HT40 CDD MCS0 MODE IN THE 5.6 GHz BAND .....	196
8.3.	<i>RECEIVER ABOVE 1 GHz .....</i>	<i>199</i>

8.3.1.	FOR 20 MHz BANDWIDTH.....	199
8.3.2.	FOR 40 MHz BANDWIDTH.....	200
8.4.	WORST-CASE BELOW 1 GHz.....	201
<b>9.</b>	<b>AC POWER LINE CONDUCTED EMISSIONS .....</b>	<b>202</b>
<b>10.</b>	<b>DYNAMIC FREQUENCY SELECTION .....</b>	<b>206</b>
10.1.	OVERVIEW.....	206
10.1.1.	LIMITS.....	206
10.1.2.	TEST AND MEASUREMENT SYSTEM.....	209
10.1.3.	SETUP OF EUT .....	212
10.1.4.	DESCRIPTION OF EUT.....	213
10.2.	RESULTS FOR 20 MHz BANDWIDTH.....	214
10.2.1.	TEST CHANNEL .....	214
10.2.2.	RADAR WAVEFORM AND TRAFFIC.....	214
10.2.3.	OVERLAPPING CHANNEL TESTS.....	216
10.2.4.	MOVE AND CLOSING TIME.....	216
10.3.	RESULTS FOR 40 MHz BANDWIDTH.....	222
10.3.1.	TEST CHANNEL .....	222
10.3.2.	RADAR WAVEFORM AND TRAFFIC.....	222
10.3.3.	OVERLAPPING CHANNEL TESTS.....	224
10.3.4.	MOVE AND CLOSING TIME.....	224
10.3.5.	NON-OCCUPANCY PERIOD.....	230
<b>11.</b>	<b>MAXIMUM PERMISSIBLE EXPOSURE .....</b>	<b>231</b>
<b>12.</b>	<b>SETUP PHOTOS .....</b>	<b>235</b>

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, USA

**EUT DESCRIPTION:** 802.11a/b/g/n WLAN PCI-E MINICARD

**MODEL:** BCM943228HM4L

**SERIAL NUMBER:** 436 (P316)

**DATE TESTED:** NOVEMBER 01 – DECEMBER 09, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (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:

Tested By:



THU CHAN  
ENGINEERING MANAGER  
UL CCS



VIEN TRAN  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

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

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

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

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n WLAN PCI-E Minicard.  
The radio module is manufactured by Broadcom.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5150 to 5250 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5180 - 5240	802.11a Legacy			13.67	23.28
5180 - 5240	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5180 - 5240	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5180 - 5240	802.11n 20MHz CDD	10.51	10	13.27	21.25
5190 - 5230	802.11n 40MHz SISO	Not Applicable			
5190 - 5230	802.11n 40MHz CDD	10.43	10.22	13.34	21.56

#### 5250 - 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5260 - 5320	802.11a Legacy			17.69	58.75
5260 - 5320	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5260 - 5320	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5260 - 5320	802.11n 20MHz CDD	15.24	15.39	18.33	68.01
5270 - 5310	802.11n 40MHz SISO	Not Applicable			
5270 - 5310	802.11n 40MHz CDD	16.26	17.21	19.77	94.87

#### 5470 - 5725 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5500 - 5700	802.11a Legacy			18.22	66.37
5500 - 5700	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5500 - 5700	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5500 - 5700	802.11n 20MHz CDD	19.24	16.34	21.04	127.00
5510 - 5670	802.11n 40MHz SISO	Not Applicable			
5510 - 5670	802.11n 40MHz CDD	18.16	18.05	21.12	129.29

### **5.3. SOFTWARE AND FIRMWARE**

The EUT driver software installed during testing was Broadcom, rev. 5.100.93  
The test utility software used during testing was BCM Internal, rev. 5.100.RC82.20.

### **5.4. WORST-CASE CONFIGURATION AND MODE**

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

For 5GHz Band:

All final tests in the 802.11a Legacy mode were made at 6 Mb/s.

All final tests in the 802.11n 20 MHz CDD/SDM mode were made at MCS0.

All final tests in the 802.11n 40 MHz CDD/SDM mode were made at 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, that was determined to be 11n HT20 mode, mid channel..

For MIMO conducted spurious measurement preliminary testing showed that combiner is worst-case compared to individual chains; therefore final measurements were performed using combiner for all channels and modes.

For MIMO PSD measurement preliminary testing showed that combiner is worst-case compared to individual chains; therefore final measurements were performed using combiner for all channels and modes.

For radiated band edge measurements preliminary testing showed that the worst case was vertical polarization, so final measurements were performed with vertical polarization.

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

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

## 5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two antennas, with the maximum gain as shown below:

GHz	Antenna Gain		Antenna Gain
	Ant 1 dBi	Ant 2 dBi	Combined dBi
5.2	5.6	5.6	8.61
5.3	5.6	5.6	8.61
5.5	4.2	4.2	7.21

## 5.6. DESCRIPTION OF TEST SETUP

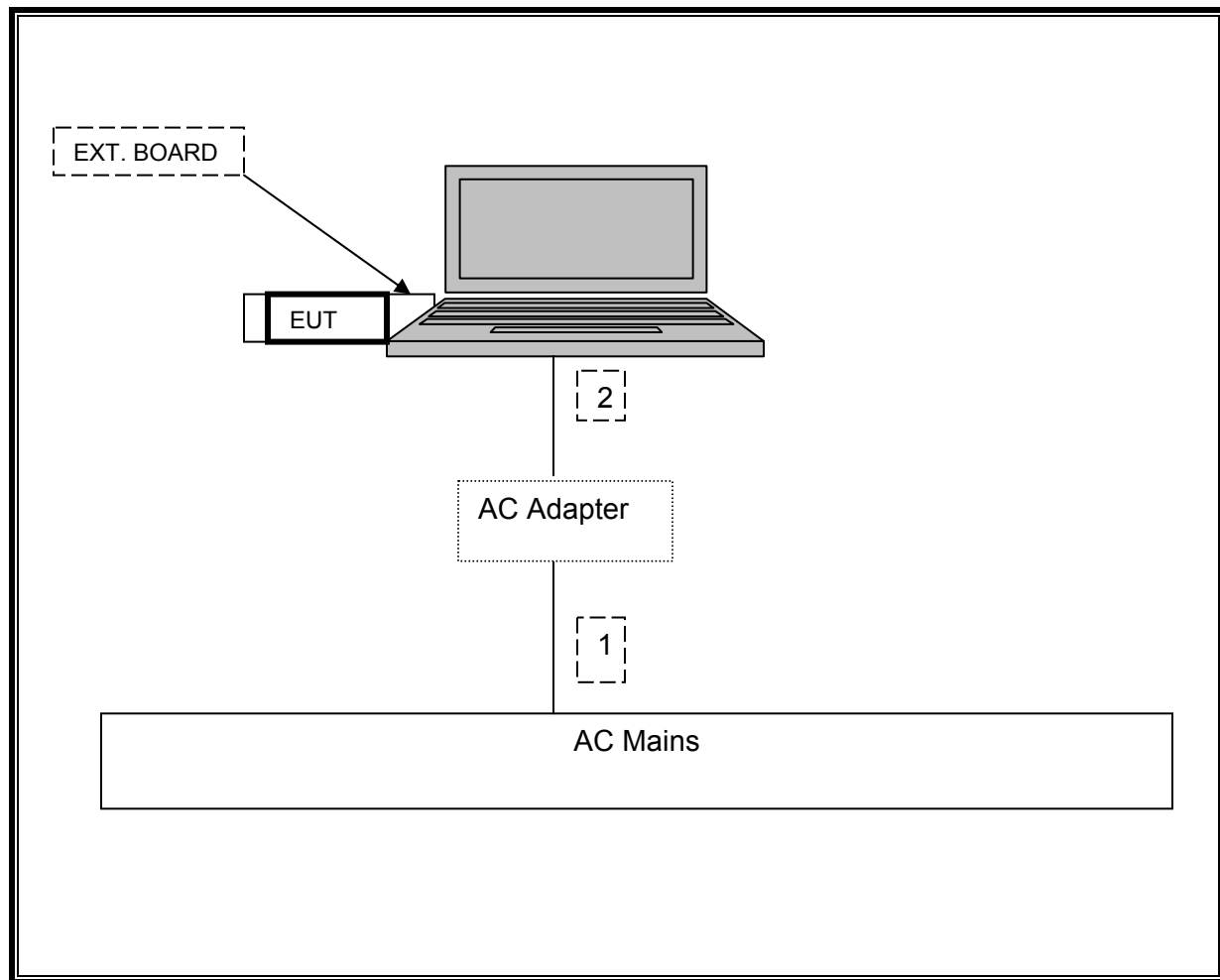
### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	Dell	Inspiron 1526	N/A	DoC
AC Adapter	Dell	DA90PS1-00	CN-0MM545-48661-78J-9M4Q	N/A
Adapter Board	Catalyst	MINI2EXP	BRCM07	N/A

### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	1.8 m	N/A
2	DC	1	DC	Unshielded	1.8 m	Ferrite on laptop's end

## SETUP DIAGRAM



## TEST SETUP

The EUT is attached to a jig board which is installed in the PCMCIA slot of a host laptop computer during the tests. Test software exercised the radio card.

## 6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	01/05/10	01/05/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	01/14/10	01/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/10	04/22/11
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	09/29/10	11/28/11
Antenna, Horn, 40 GHz	ARA	MWH-2640B	C00981	05/21/10	05/21/11
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/10	10/11/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/10	03/31/11
Preamplifier, 1-26GHz	Agilent / HP	8449B	C01052	07/05/10	07/05/11
Peak Power Meter	Agilent / HP	E9327A	C00964	01/07/10	12/04/11
Peak Power Sensor	Agilent / HP	E4416A	C00963	12/04/09	12/04/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/10	10/29/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	02/06/10	02/06/11

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 802.11a MODE IN THE 5.2 GHz BAND

#### 7.1.1. 26 dB and 99% BANDWIDTH

##### LIMITS

None; for reporting purposes only.

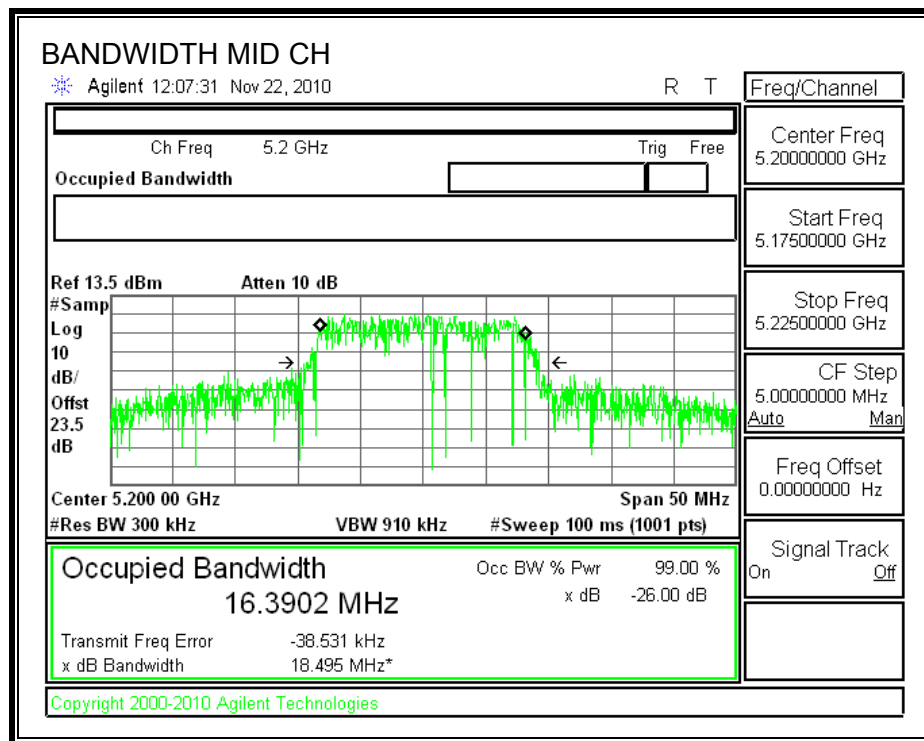
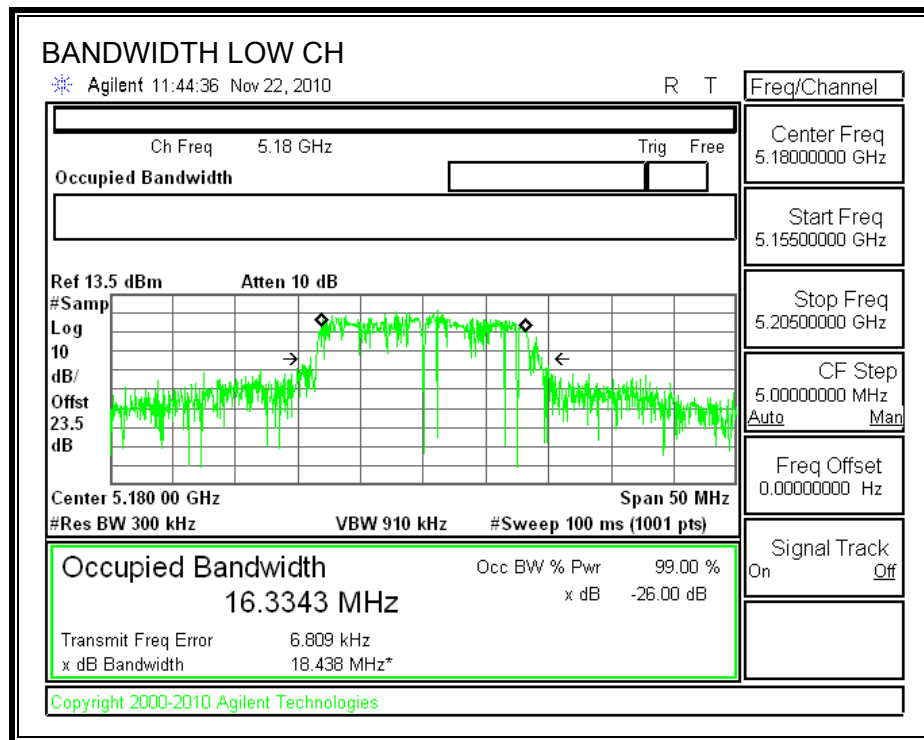
##### TEST PROCEDURE

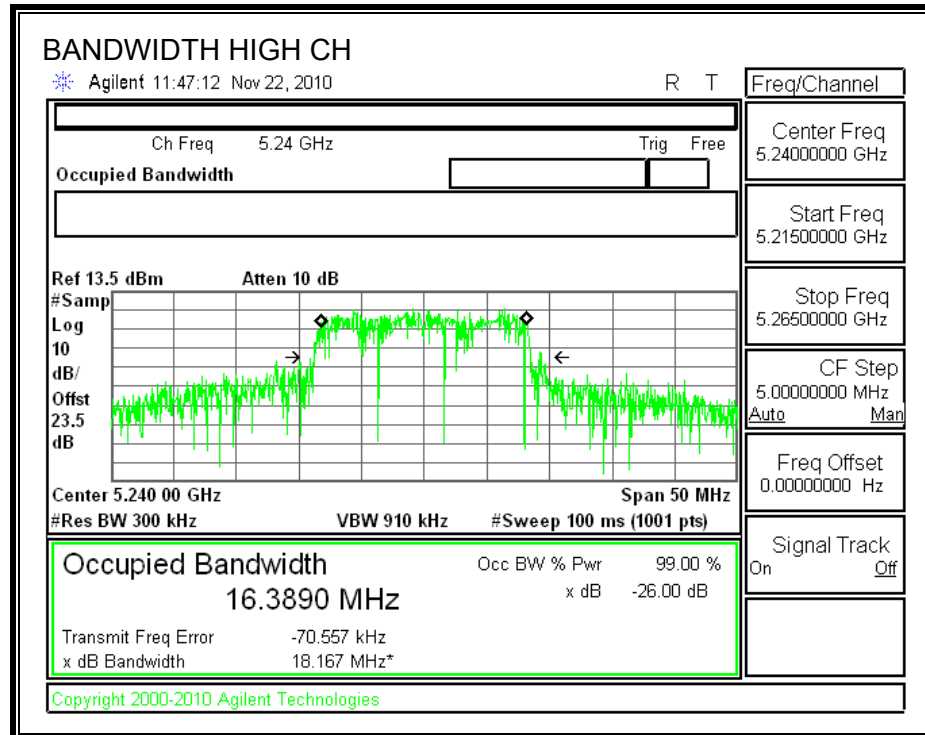
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

##### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	18.438	16.3343
Middle	5200	18.495	16.3902
High	5240	18.167	16.3890

**26 dB & 99%BANDWIDTH**





## 7.1.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, 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. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 5.6 dBi

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

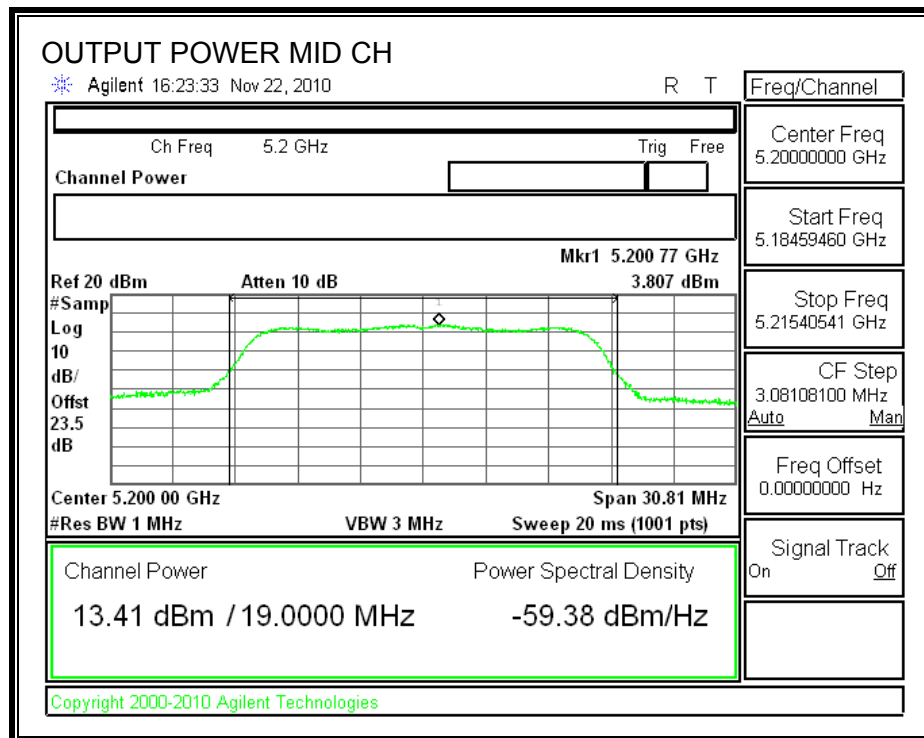
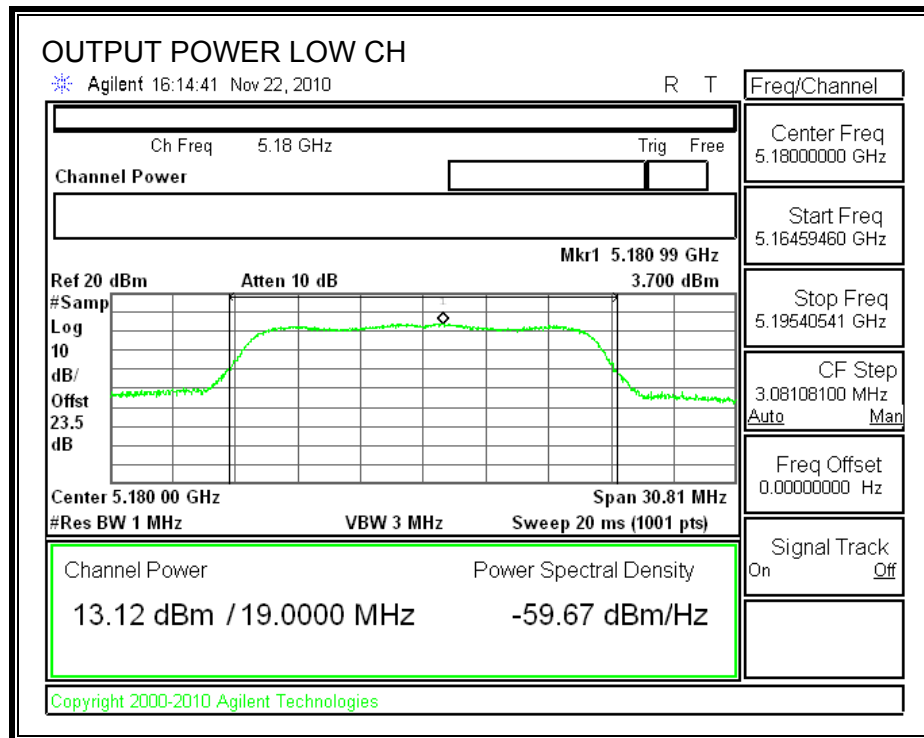
#### Limit

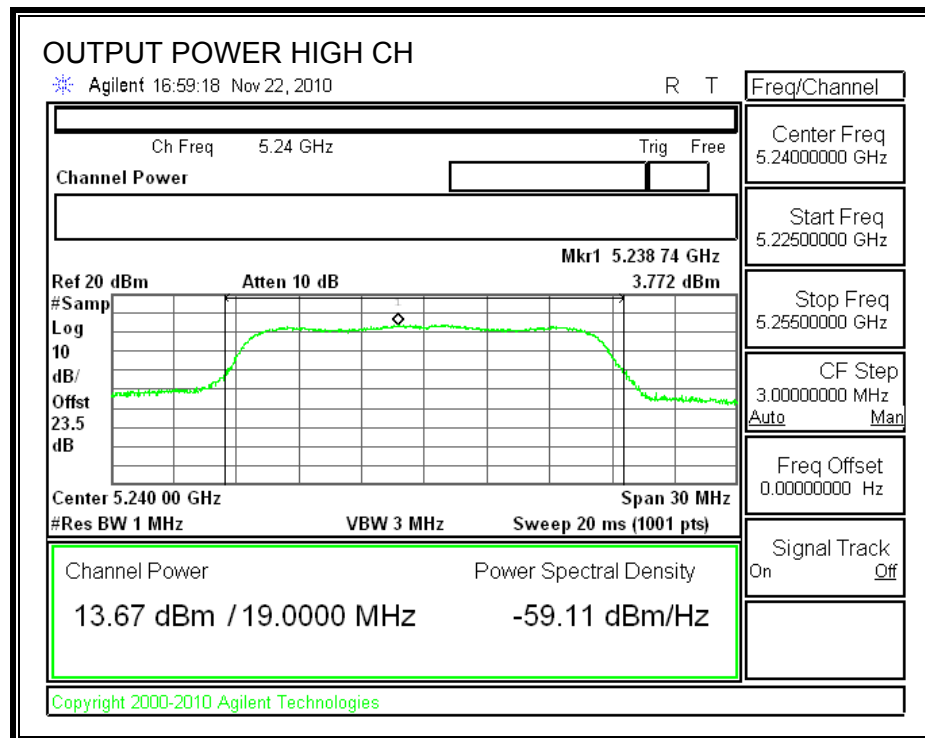
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	18.438	16.66	5.60	16.66
Mid	5200	17	18.495	16.67	5.60	16.67
High	5240	17	18.167	16.59	5.60	16.59

#### Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	13.12	16.66	-3.54
Mid	5200	13.41	16.67	-3.26
High	5240	13.67	16.59	-2.92

## OUTPUT POWER





### 7.1.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, 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 peak transmit 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.

The maximum antenna gain is equal to 5.6 dBi, therefore the limit is 4 dBm.

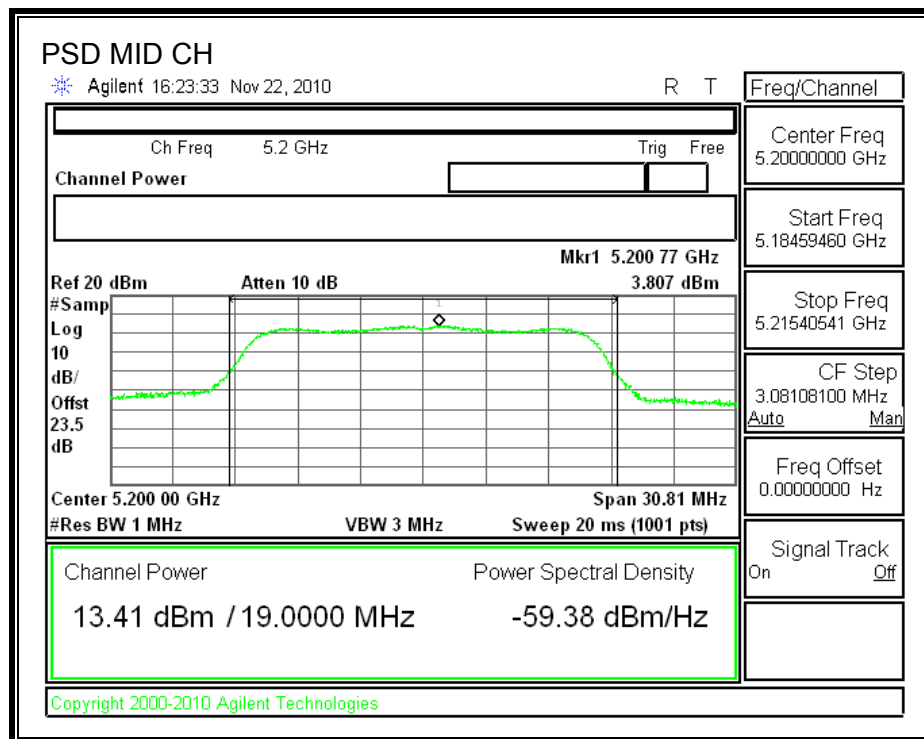
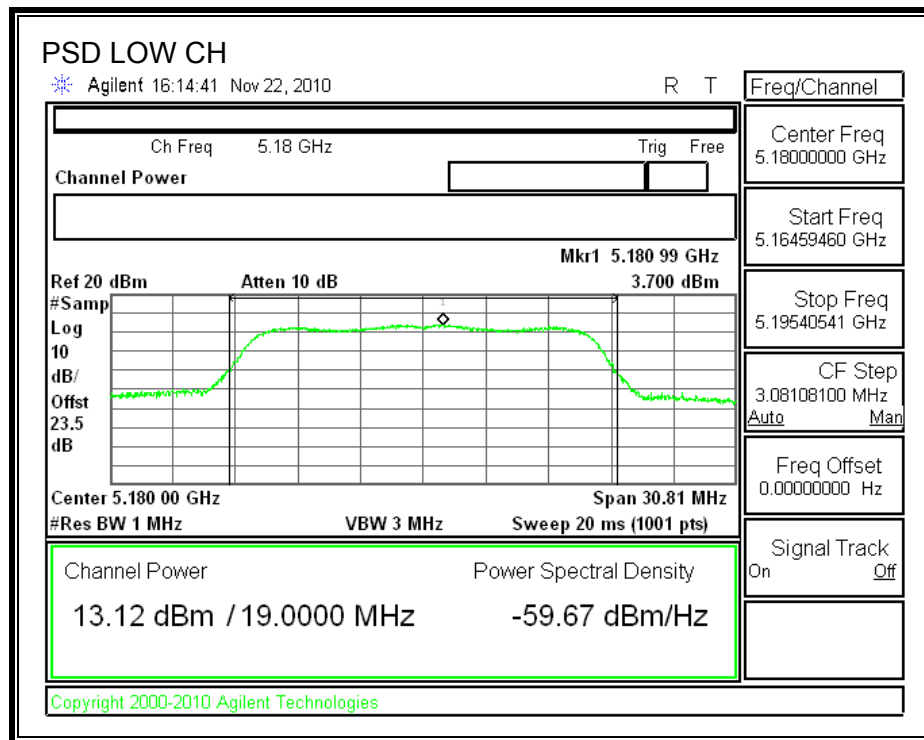
#### TEST PROCEDURE

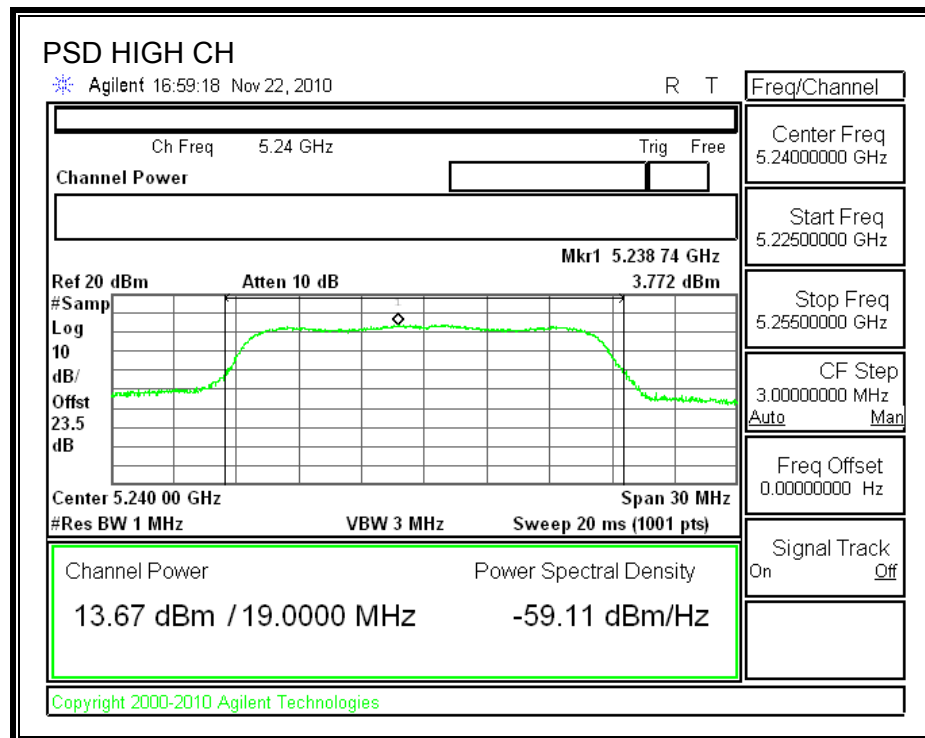
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.70	4.00	-0.30
Middle	5200	3.81	4.00	-0.19
High	5240	3.77	4.00	-0.23

# POWER SPECTRAL DENSITY





## 7.1.4. 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.

### TEST PROCEDURE

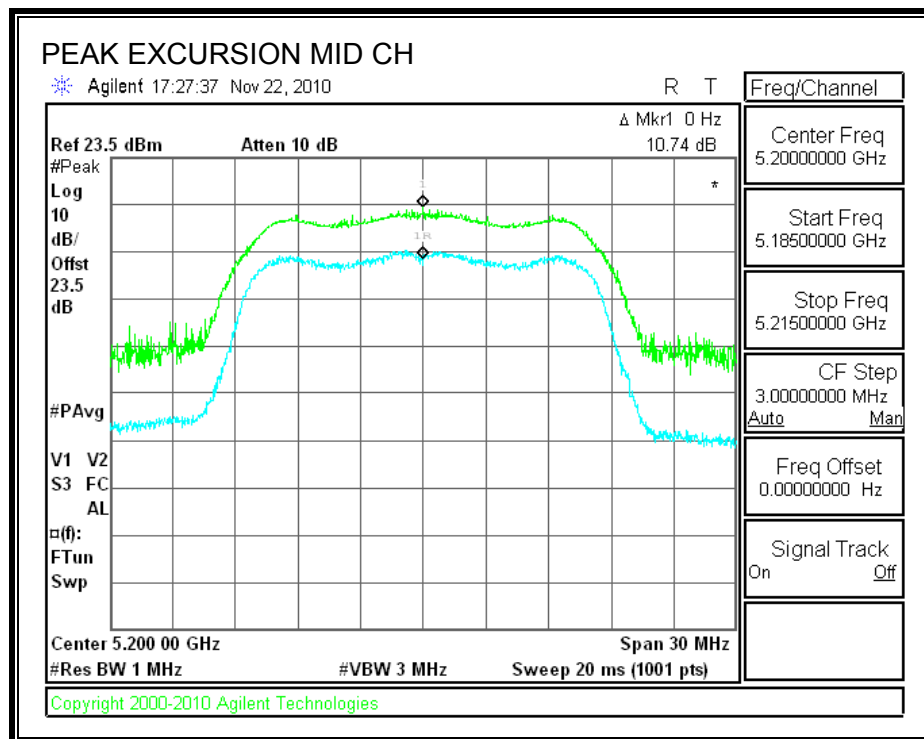
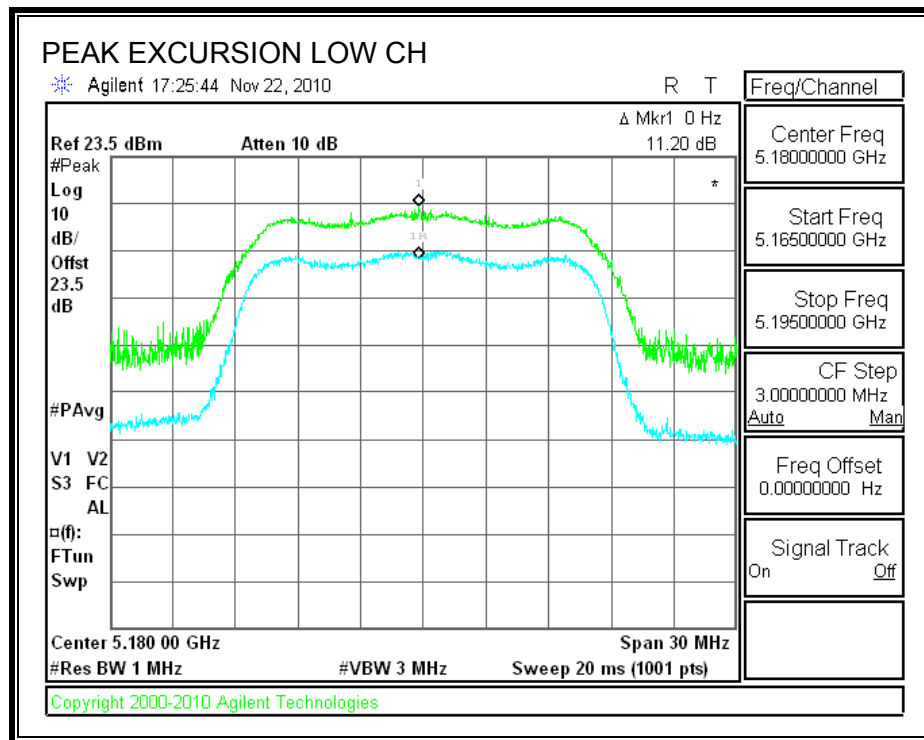
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

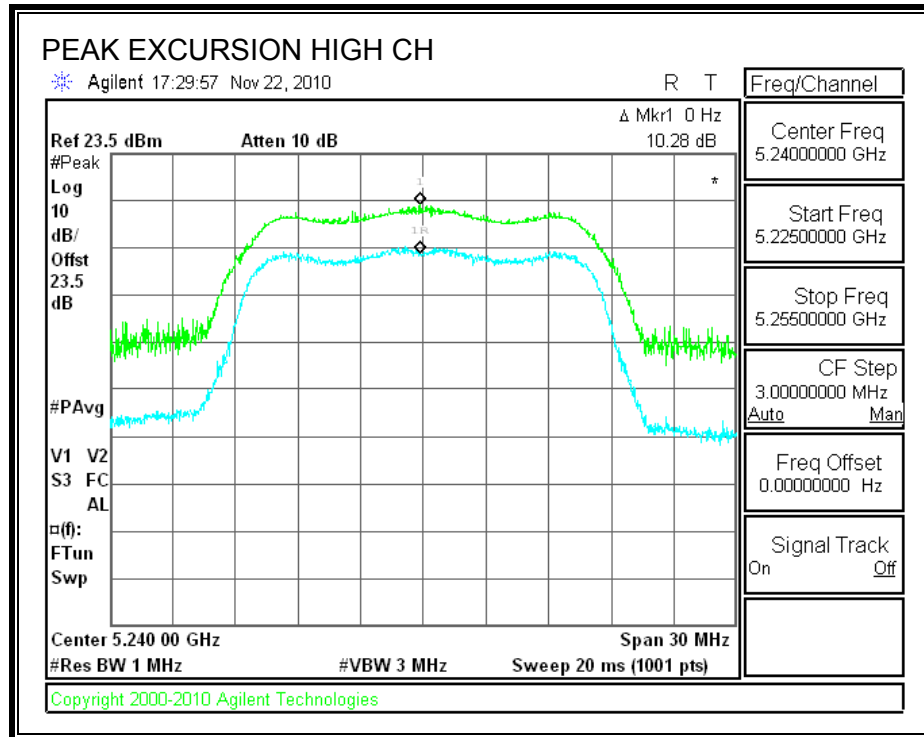
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	11.20	13	-1.80
Middle	5200	10.74	13	-2.26
High	5240	10.28	13	-2.72

## PEAK EXCURSION





## **7.1.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

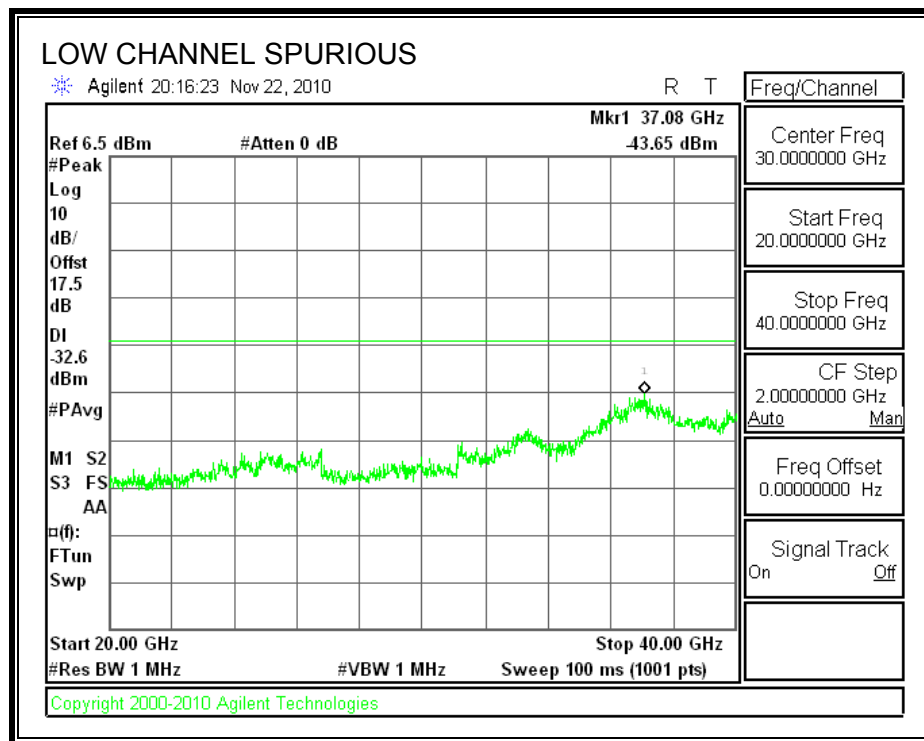
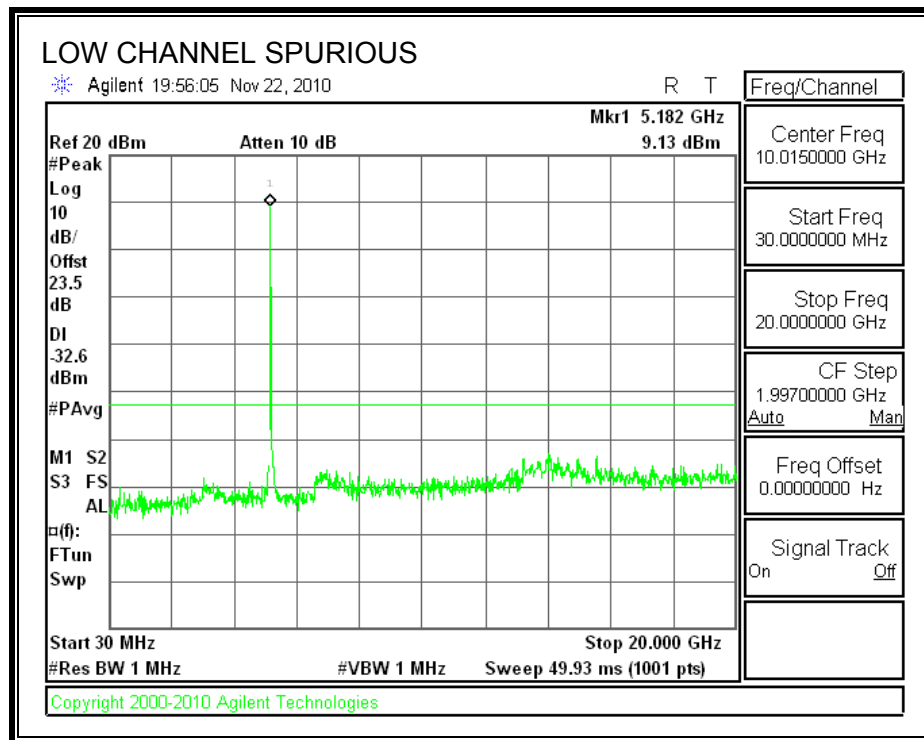
### **TEST PROCEDURE**

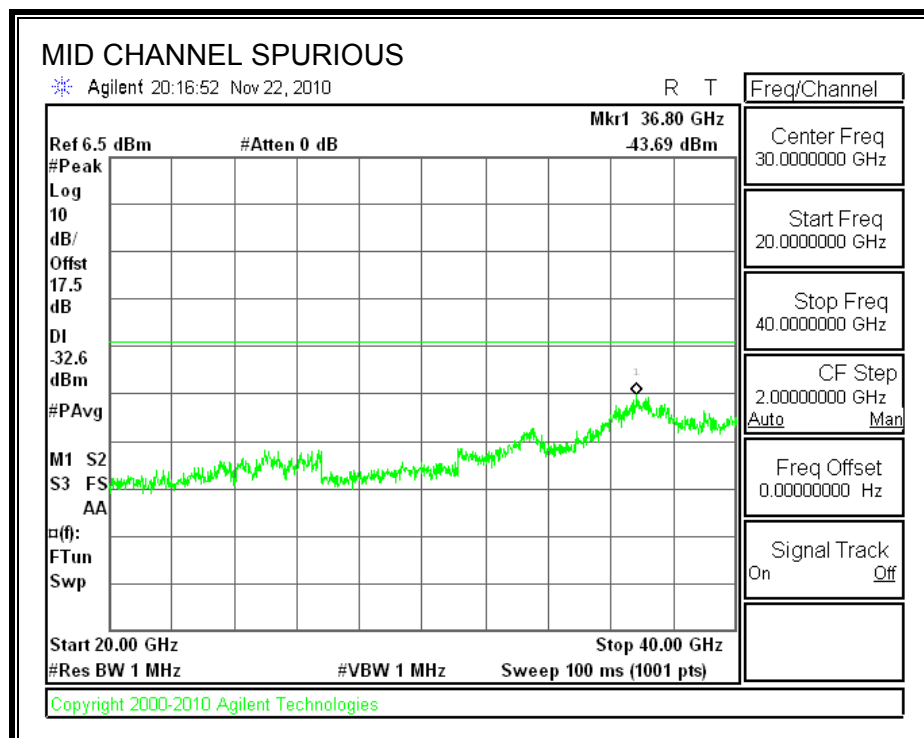
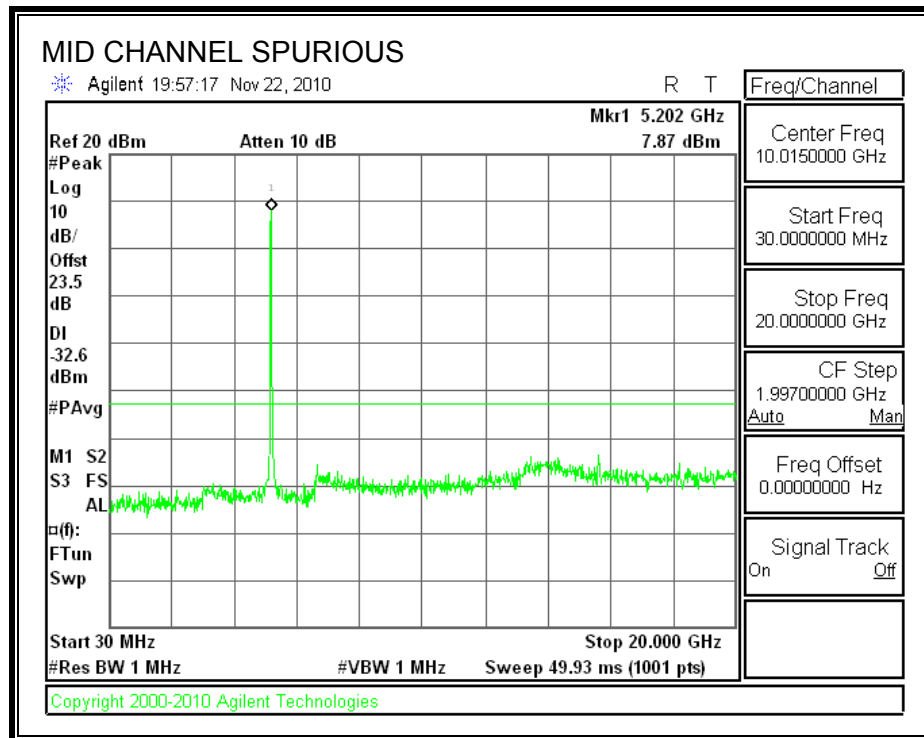
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

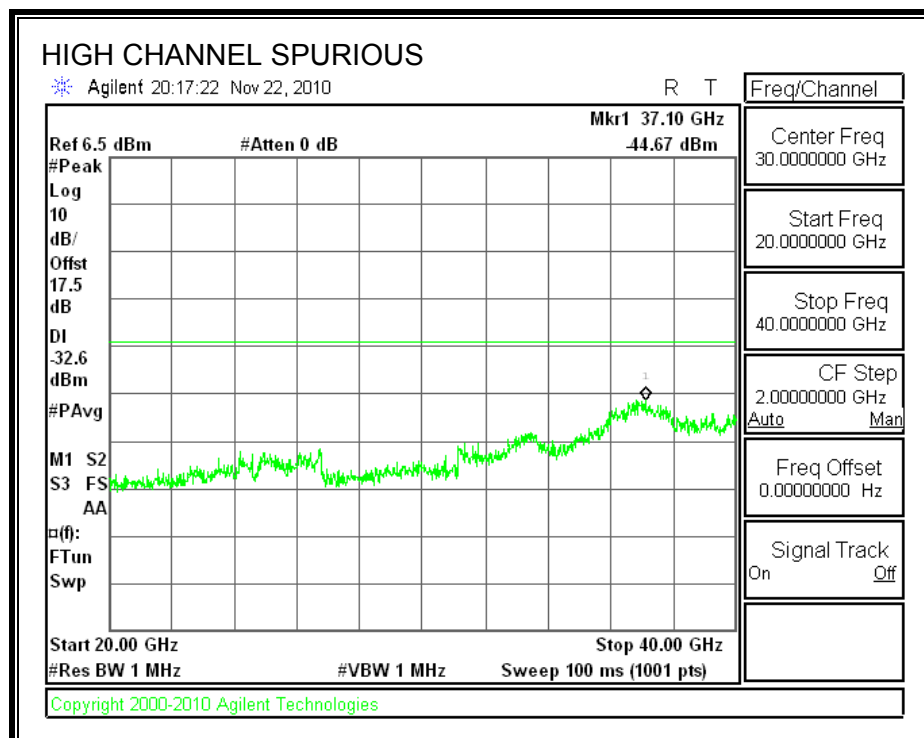
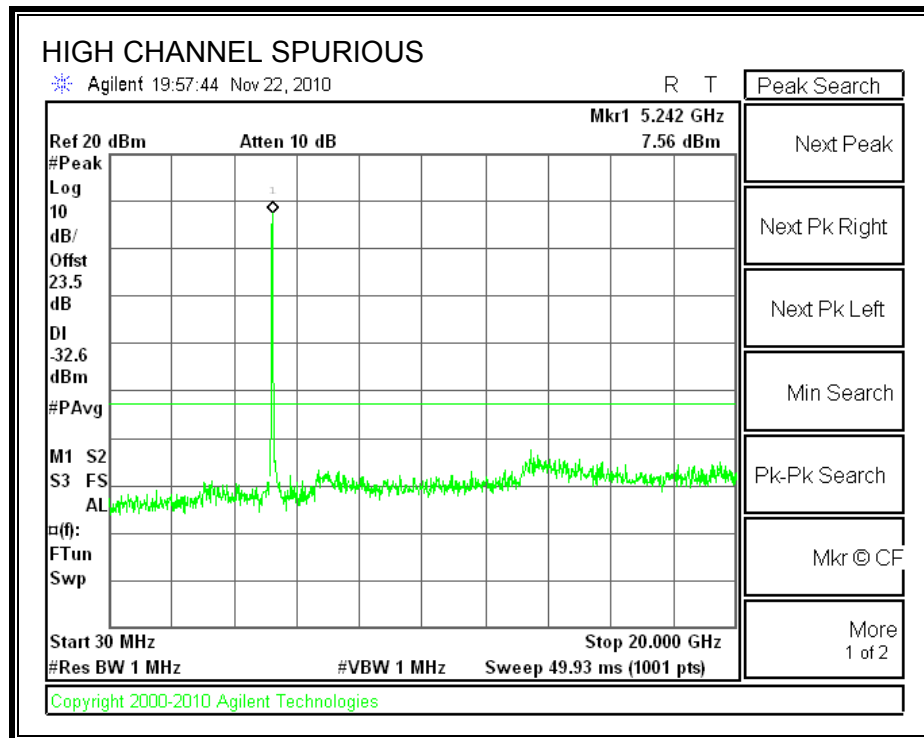
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## SPURIOUS EMISSIONS







## 7.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

### 7.2.1. 26 dB and 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### RESULTS

##### CHAIN 1

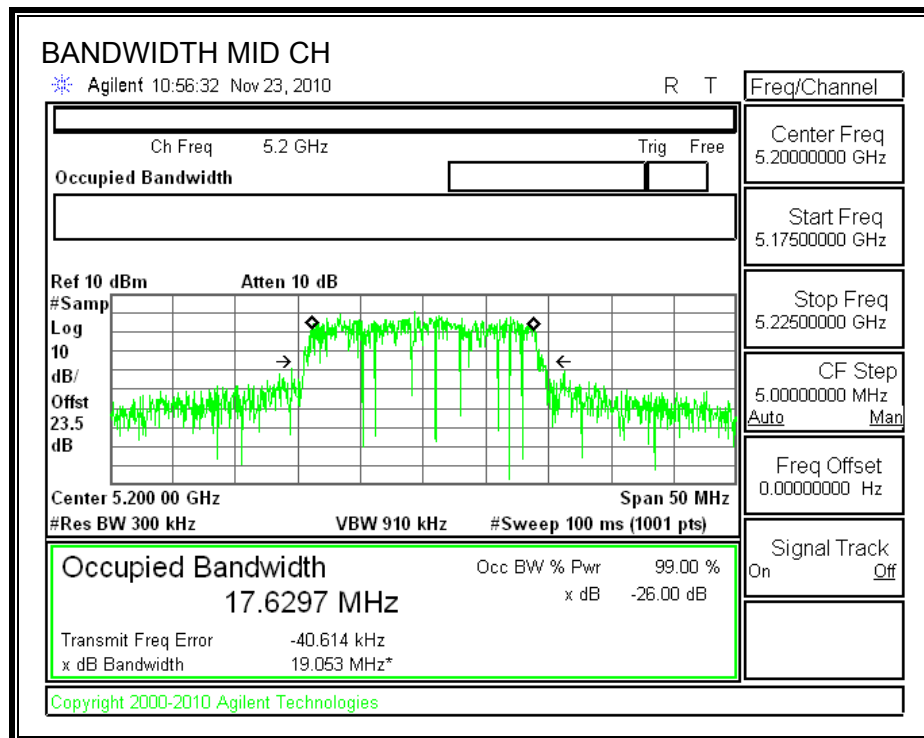
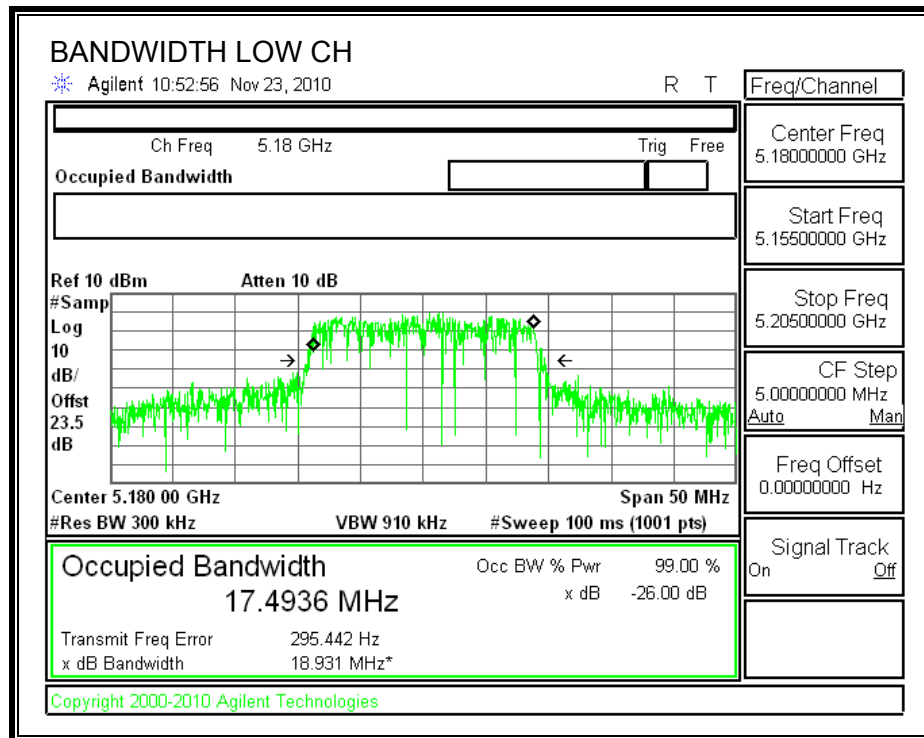
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	18.931	17.4936
Middle	5200	19.053	17.6297
High	5240	19.446	17.5515

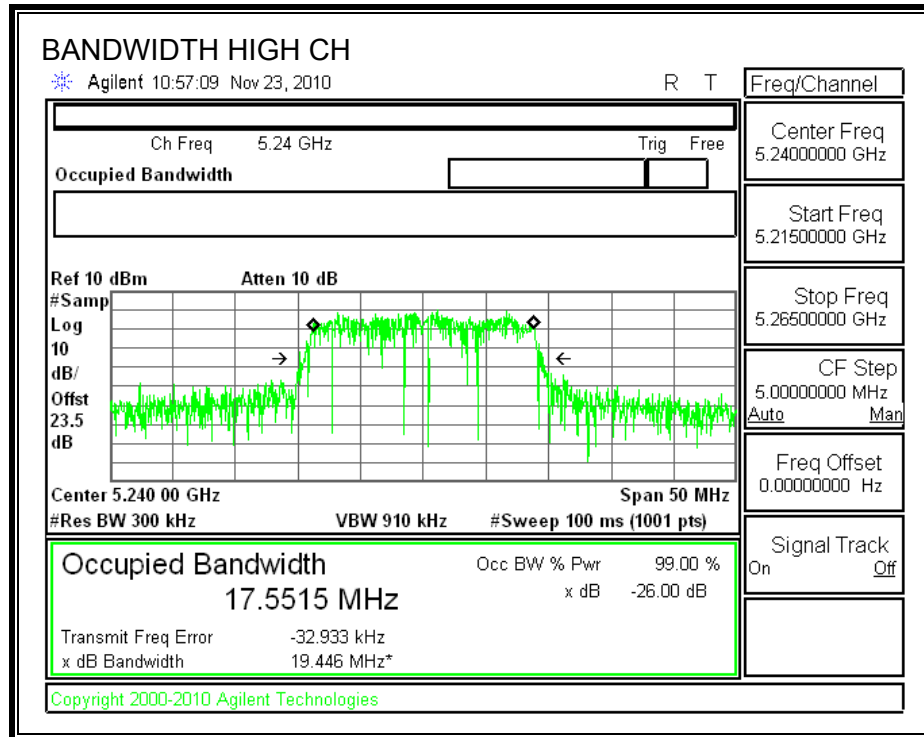
##### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	18.882	17.5902
Middle	5200	18.299	17.4629
High	5240	19.082	17.5249

## CHAIN 1

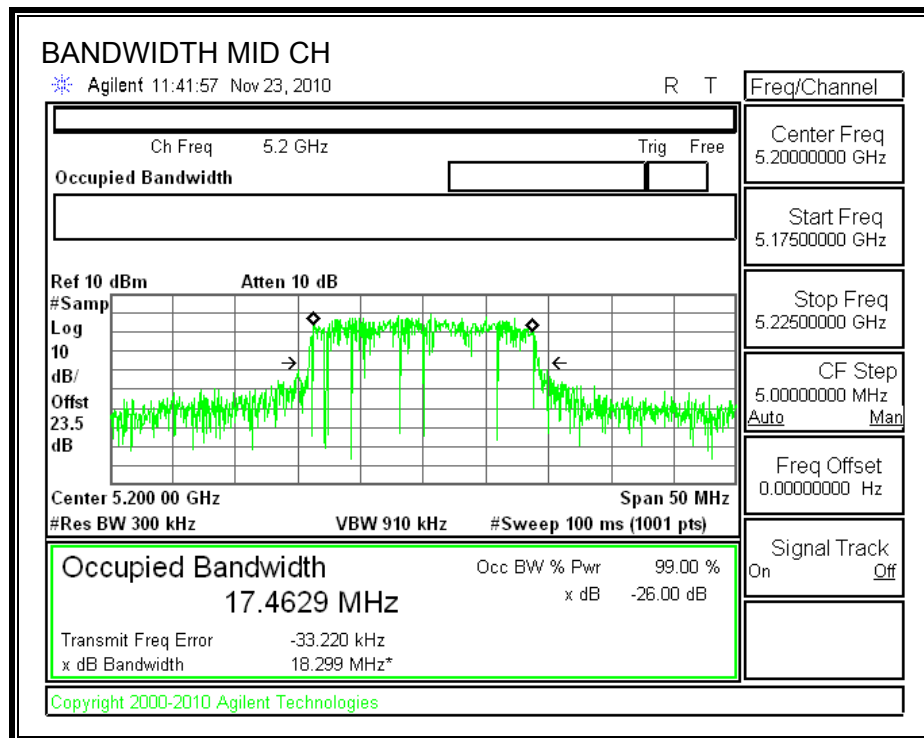
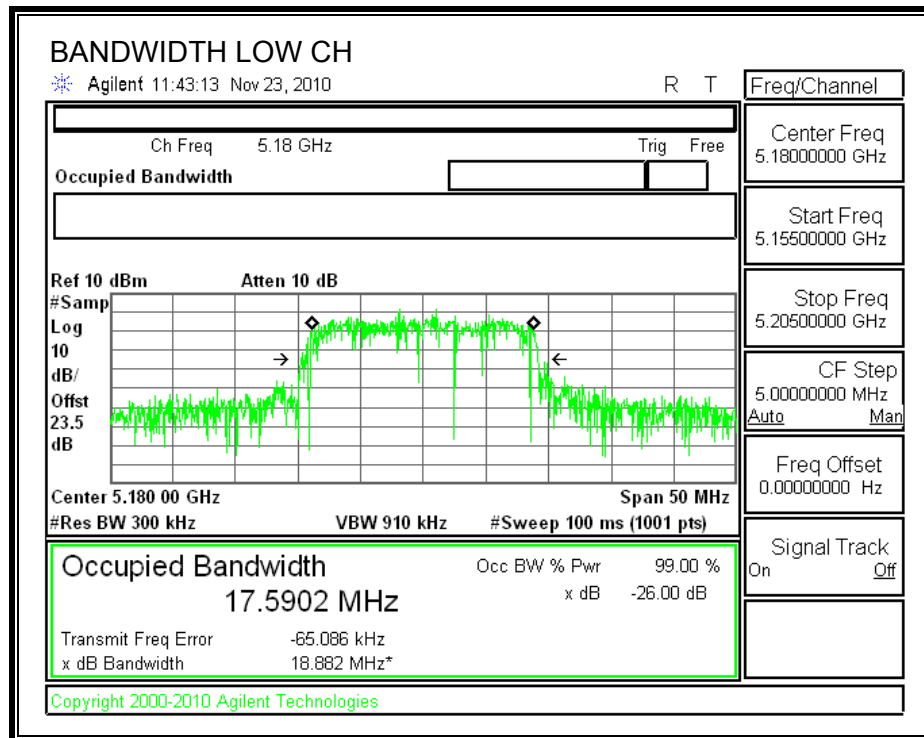
### 26 dB and 99% BANDWIDTH

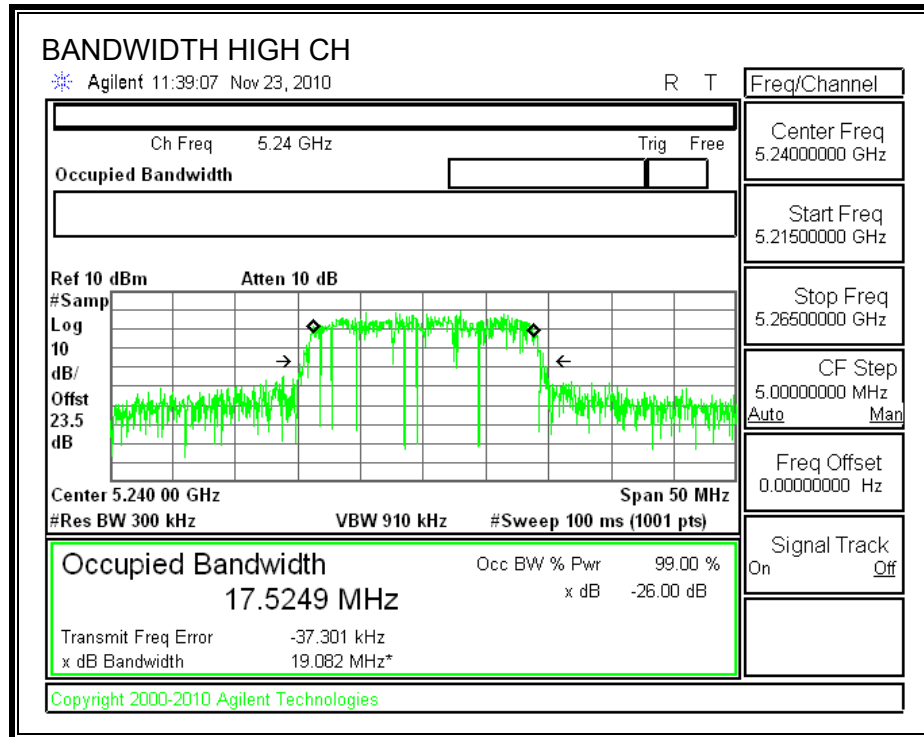




## CHAIN 2

### 26 dB and 99% BANDWIDTH





## 7.2.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

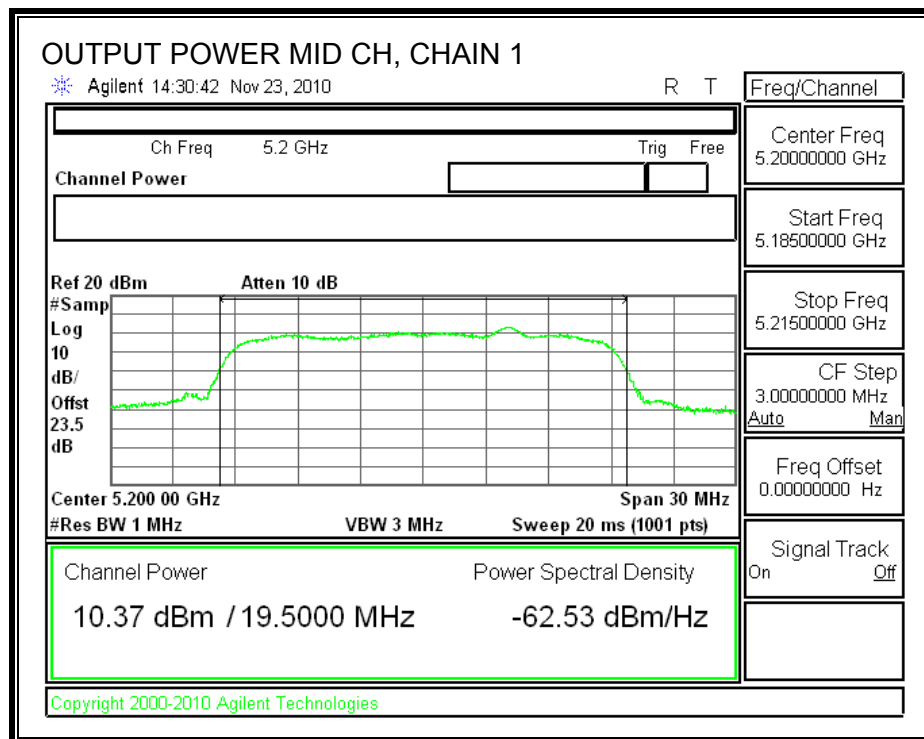
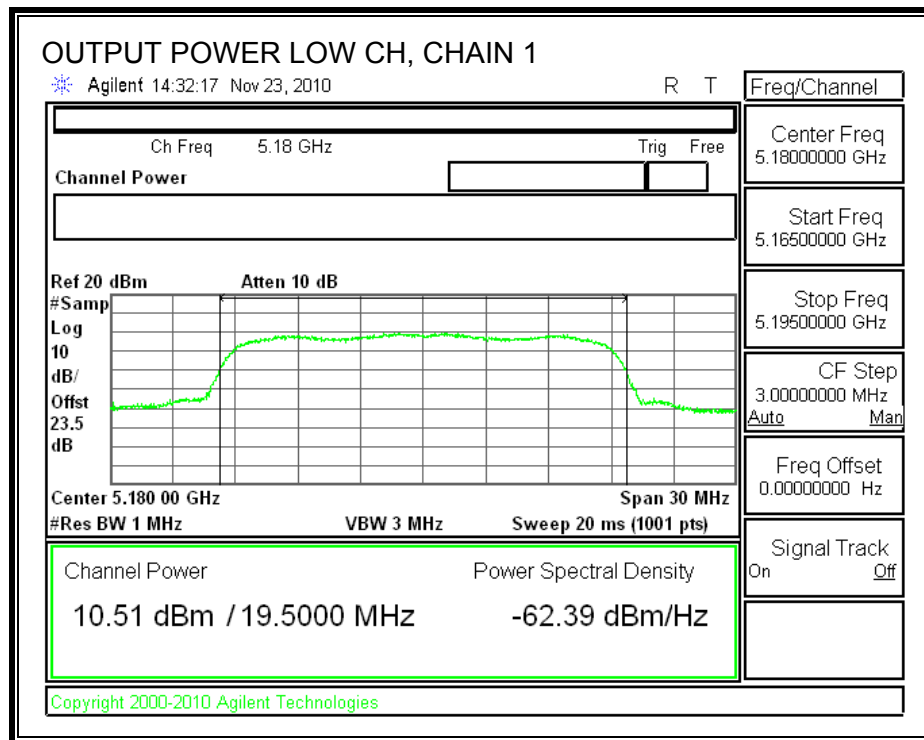
#### Limit

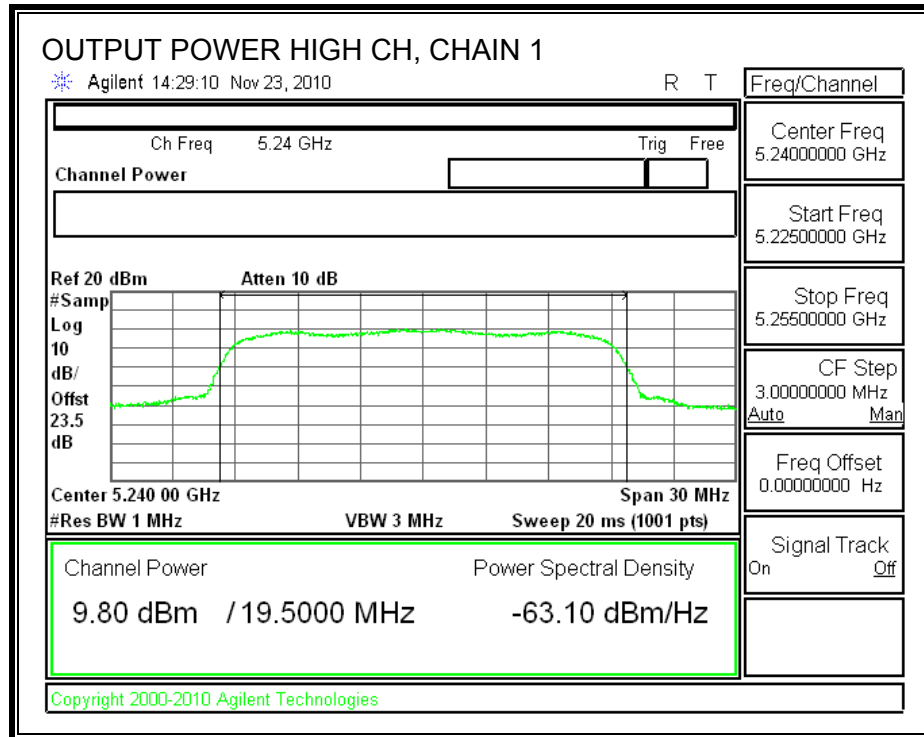
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	18.931	16.77	8.61	14.16
Mid	5200	17	19.053	16.80	8.61	14.19
High	5240	17	19.446	16.89	8.61	14.28

#### Individual Chain Results

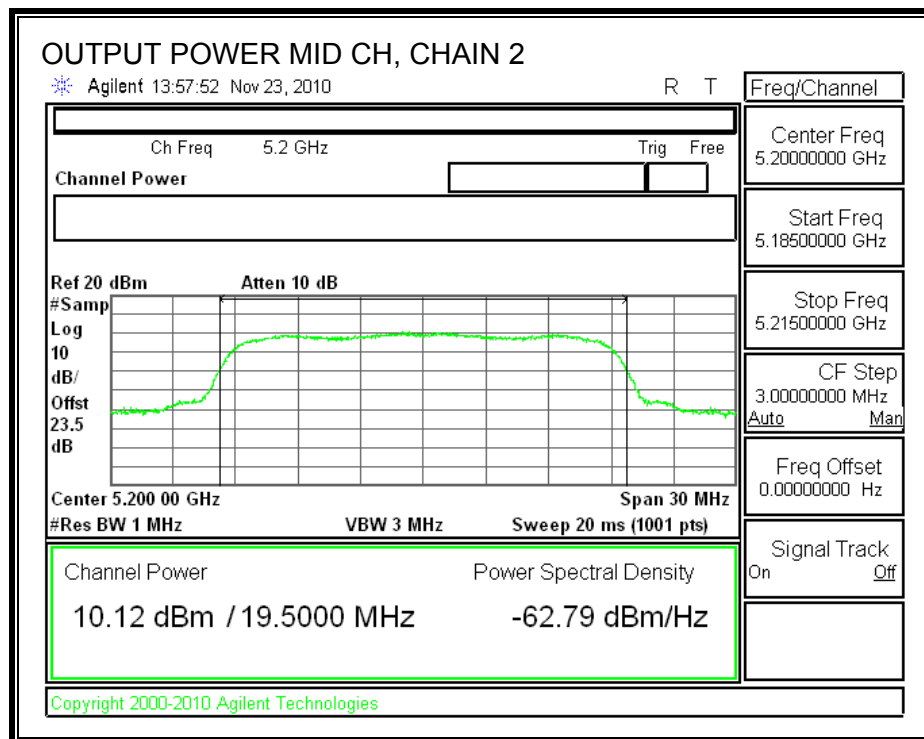
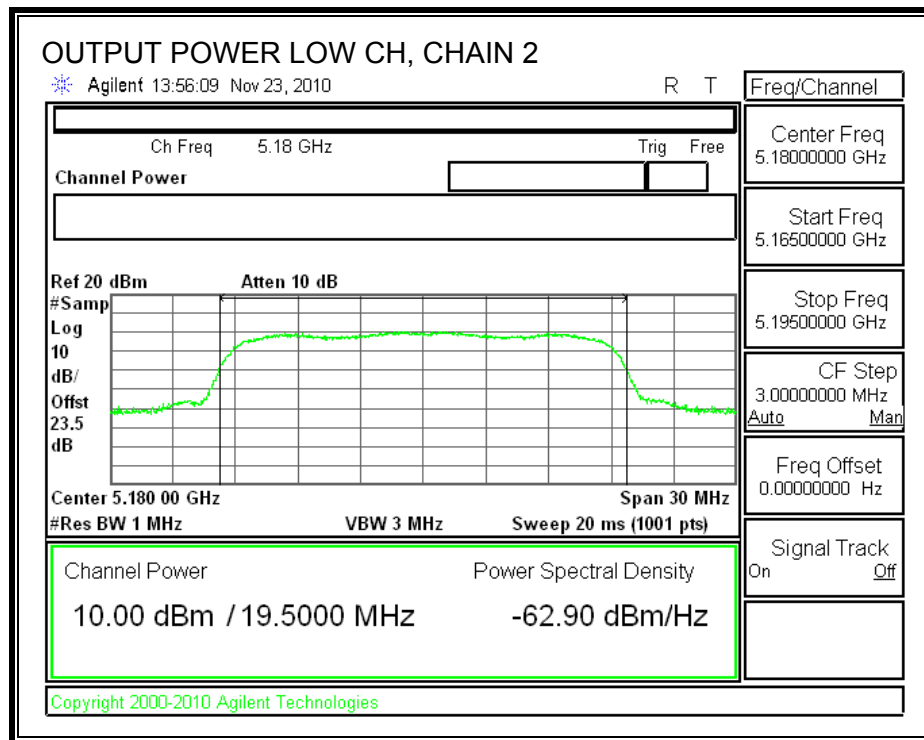
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.51	10.00	13.27	14.16	-0.89
Mid	5200	10.37	10.12	13.26	14.19	-0.93
High	5240	9.80	10.11	12.97	14.28	-1.31

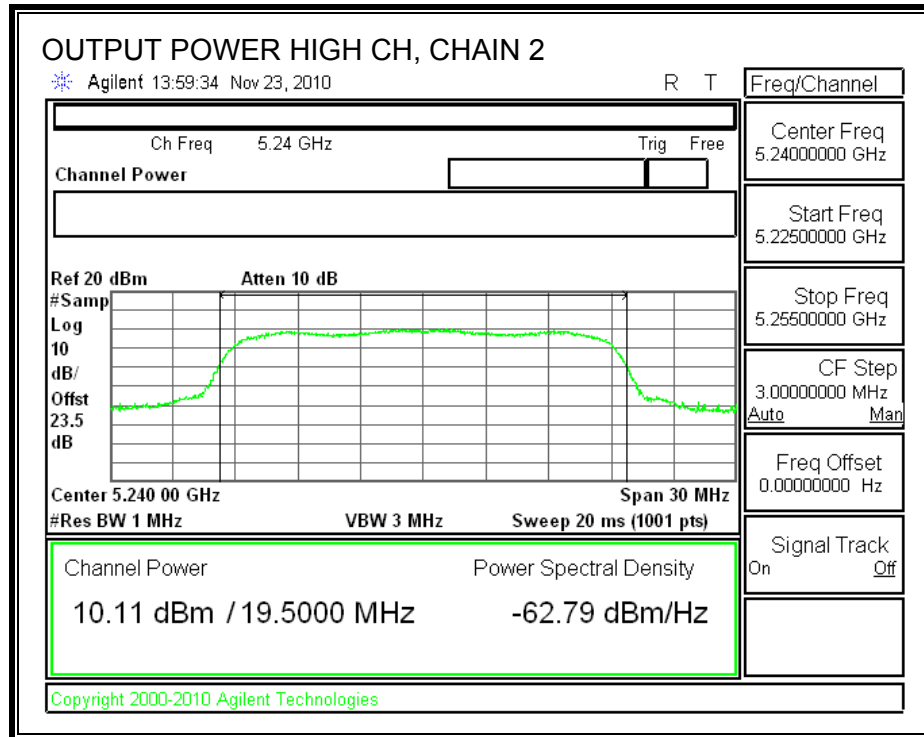
# **CHAIN 1 OUTPUT POWER**





## CHAIN 2 OUTPUT POWER





### 7.2.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, 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 peak transmit 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.

The maximum antenna gain is 8.61 dBi, therefore the limit is 1.39 dBm.

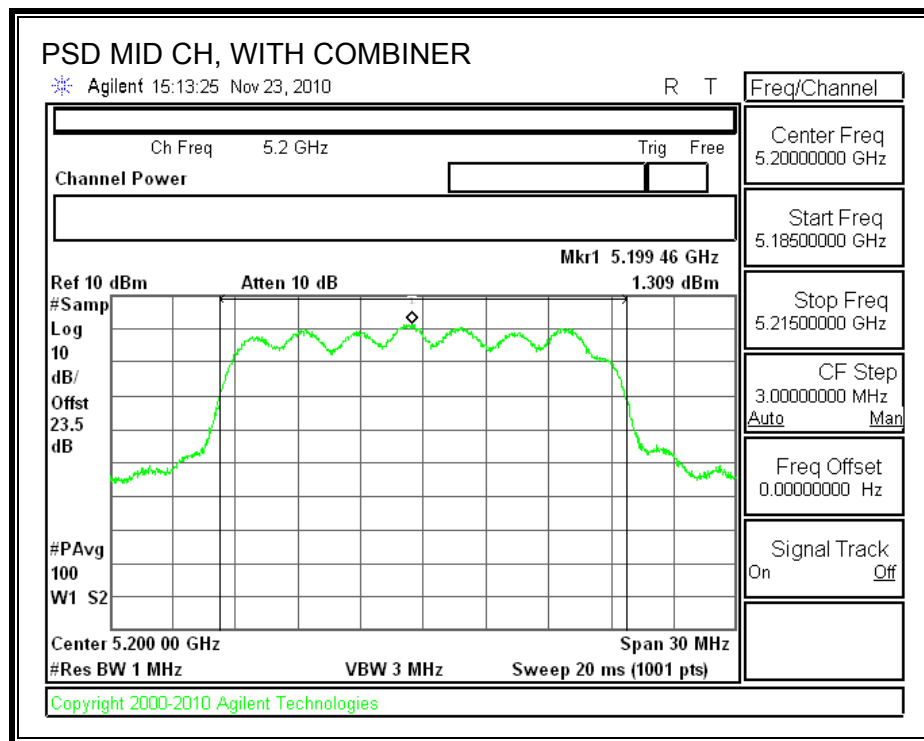
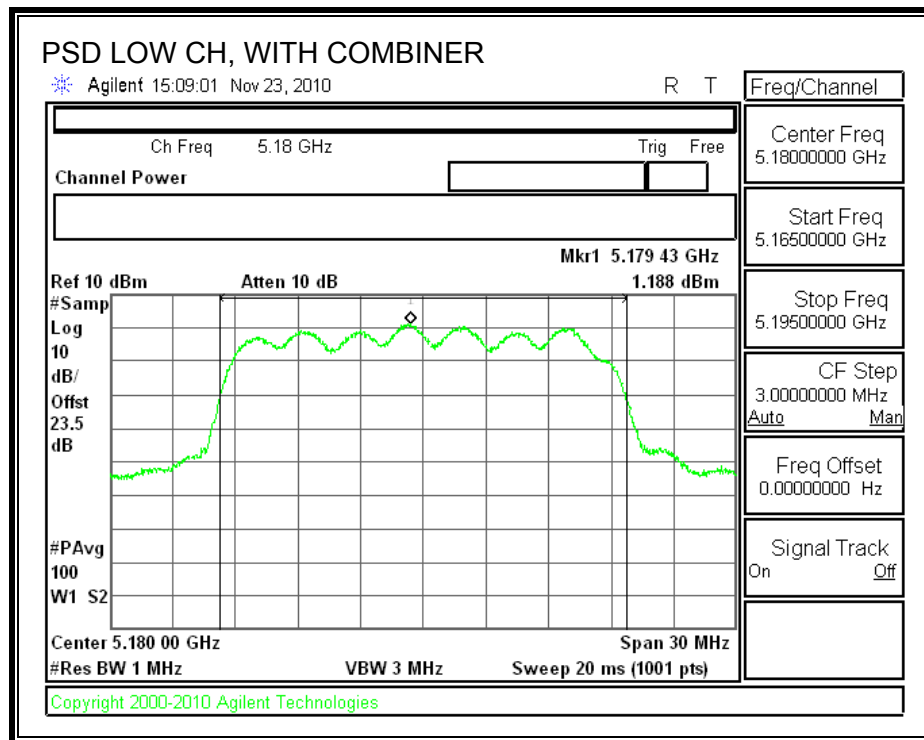
#### TEST PROCEDURE

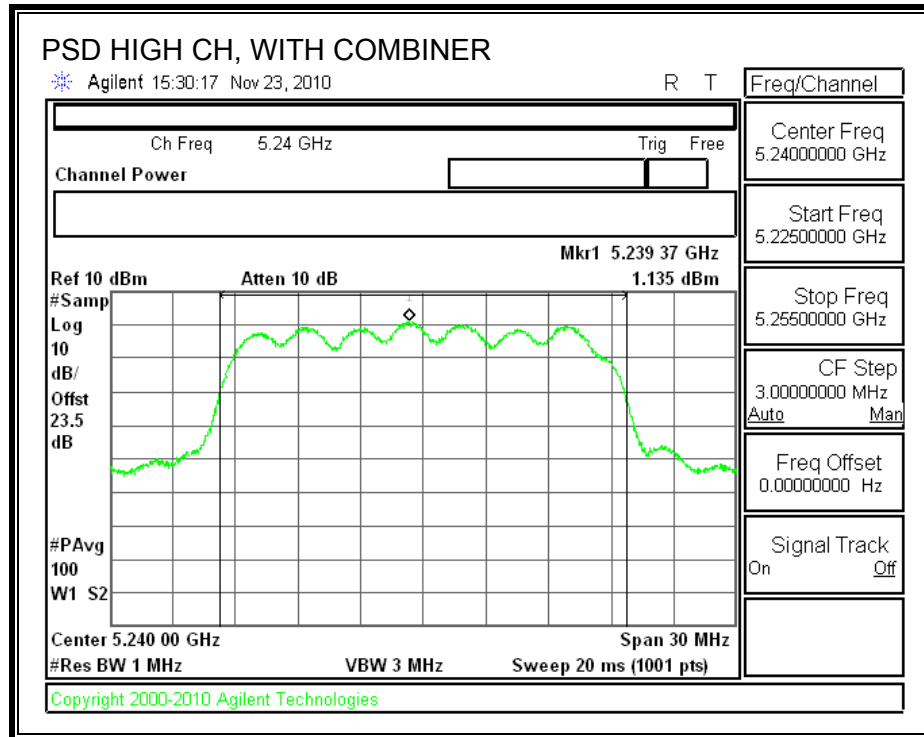
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	1.188	1.39	-0.20
Middle	5200	1.309	1.39	-0.08
High	5240	1.135	1.39	-0.26

# POWER SPECTRAL DENSITY WITH COMBINER





## 7.2.4. 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.

### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

#### CHAIN 1

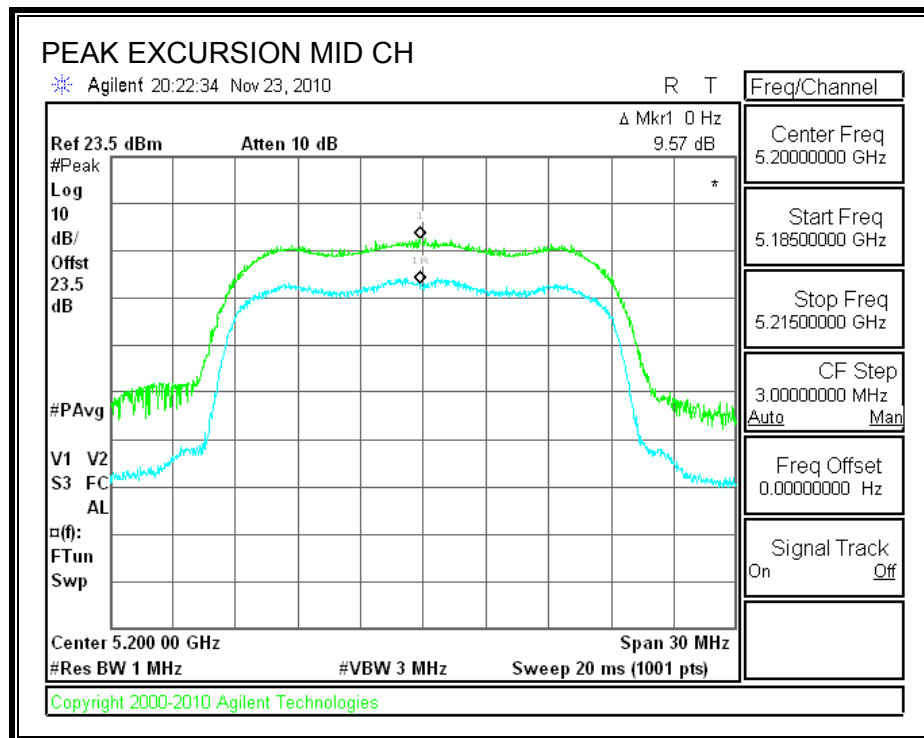
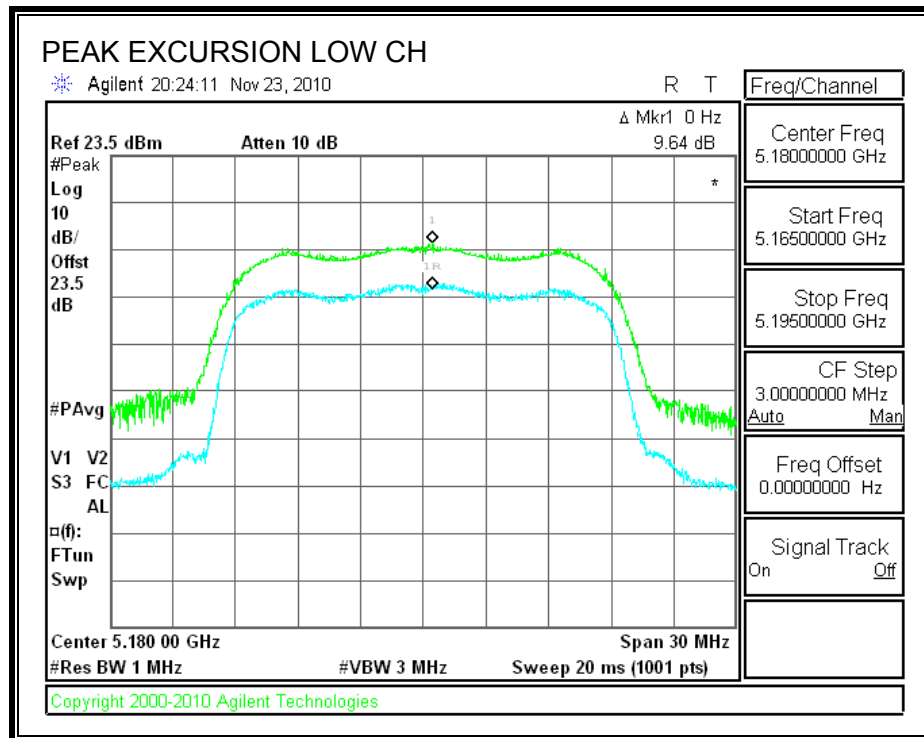
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.64	13	-3.36
Middle	5200	9.57	13	-3.43
High	5240	10.18	13	-2.82

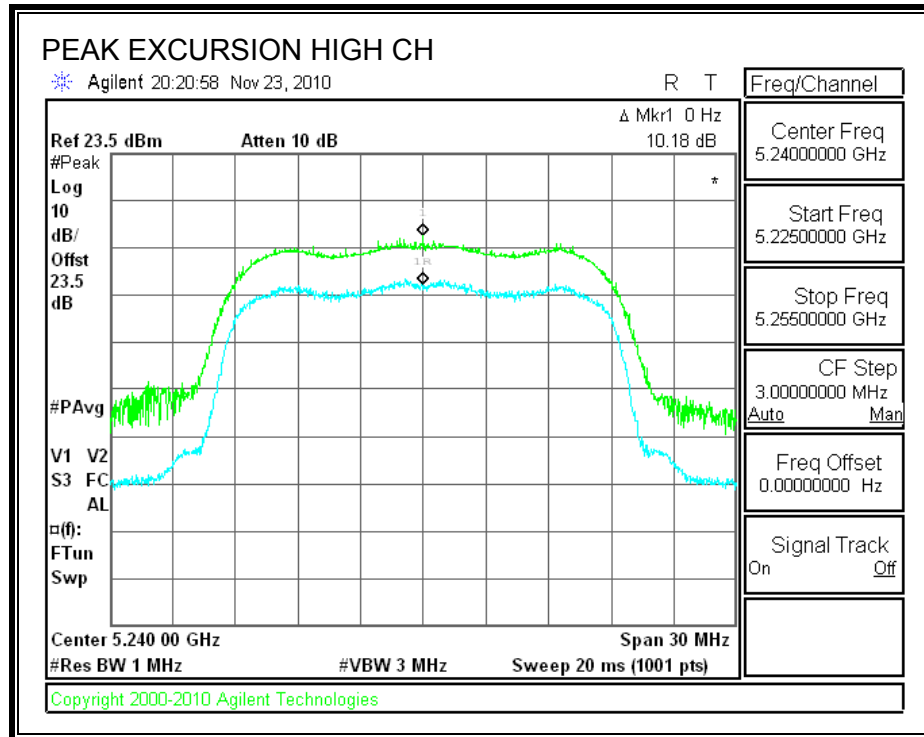
#### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.36	13	-2.64
Middle	5200	11.11	13	-1.89
High	5240	10.44	13	-2.56

## CHAIN 1

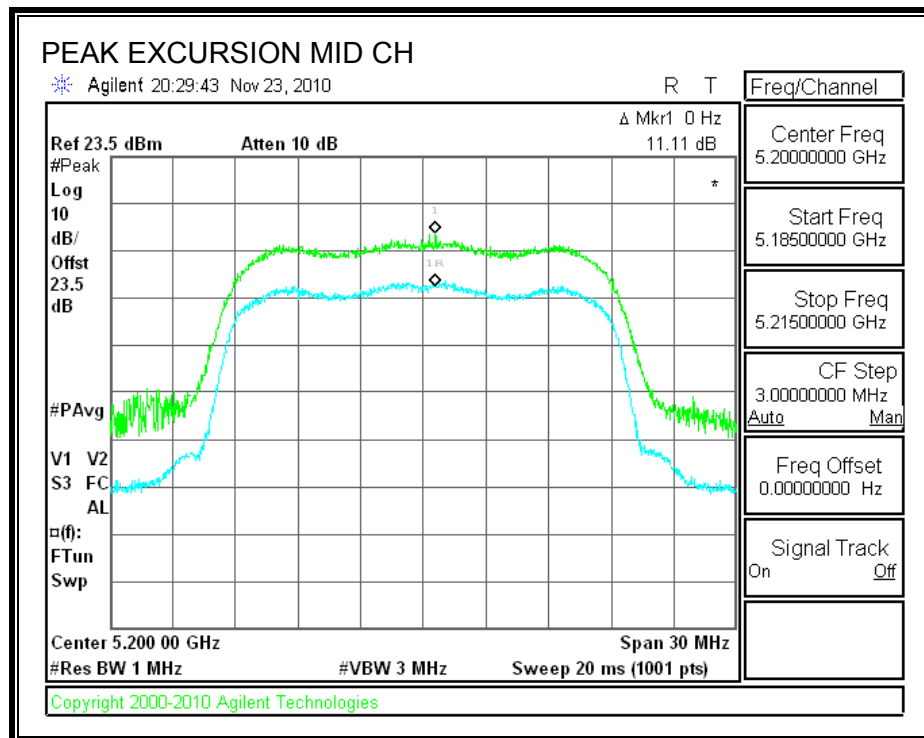
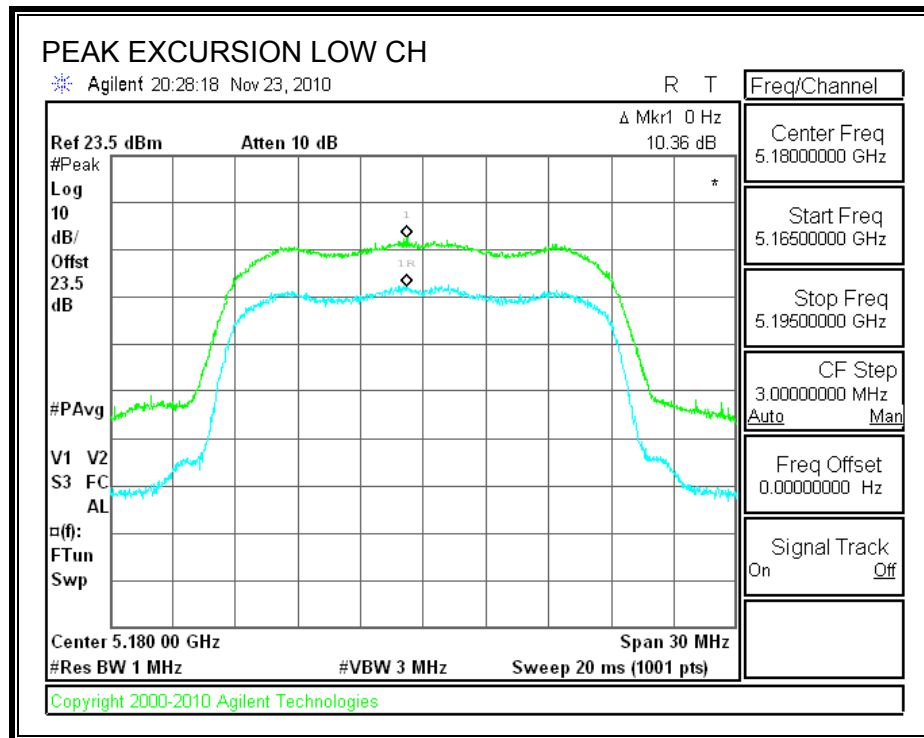
### PEAK EXCURSION

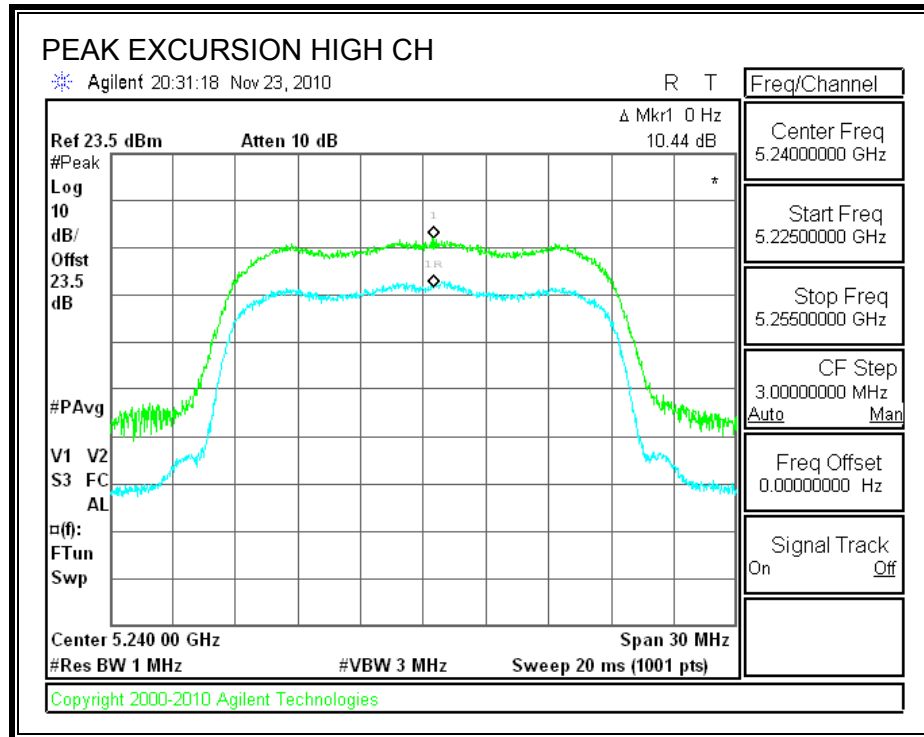




## CHAIN 2

### PEAK EXCURSION





## **7.2.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

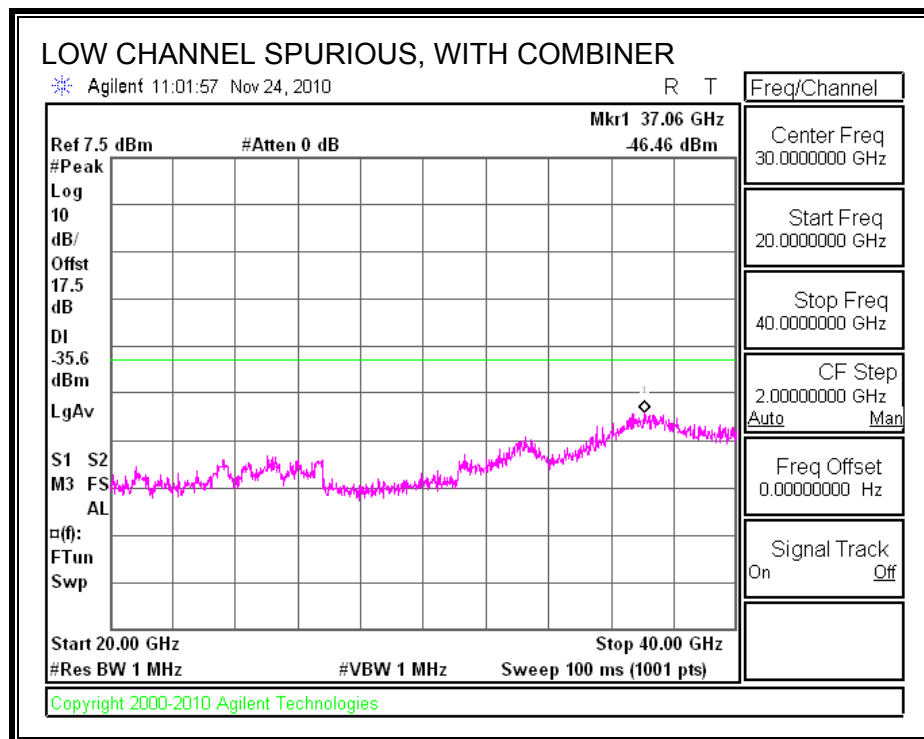
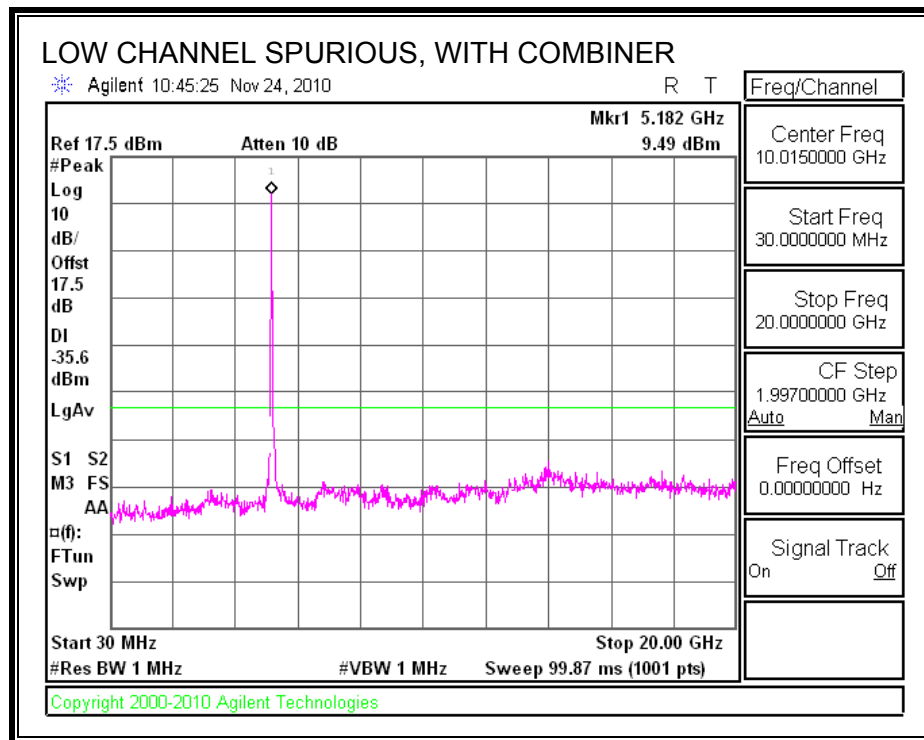
### **TEST PROCEDURE**

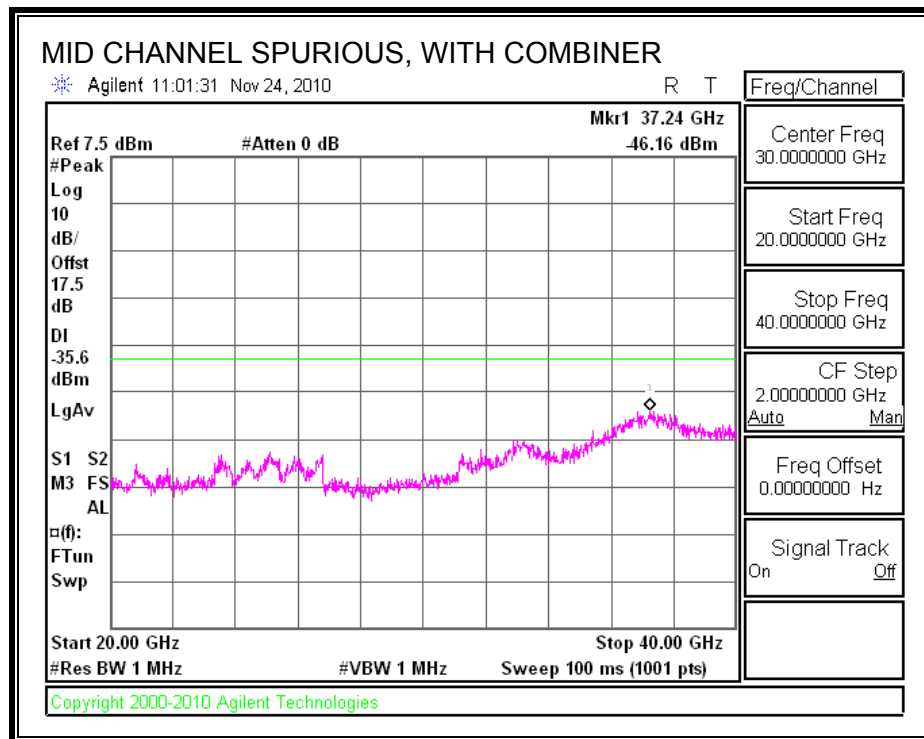
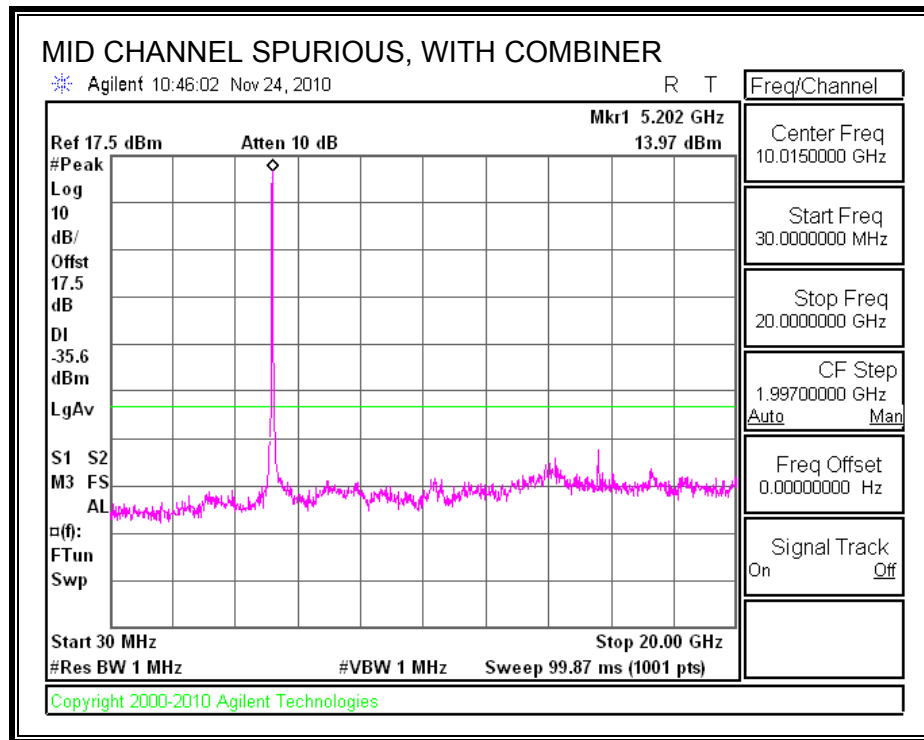
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

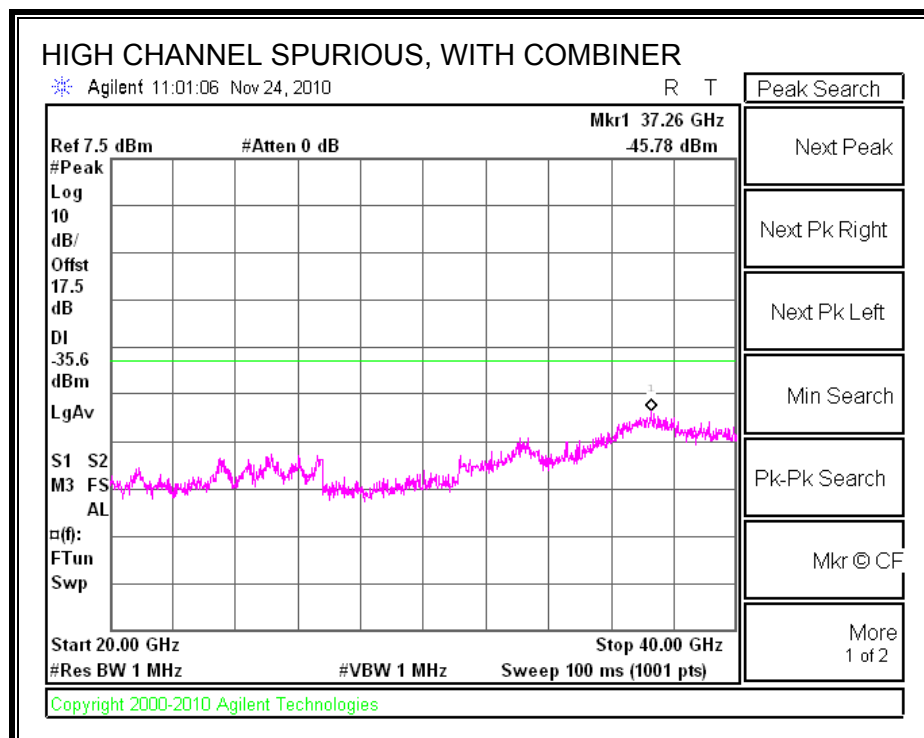
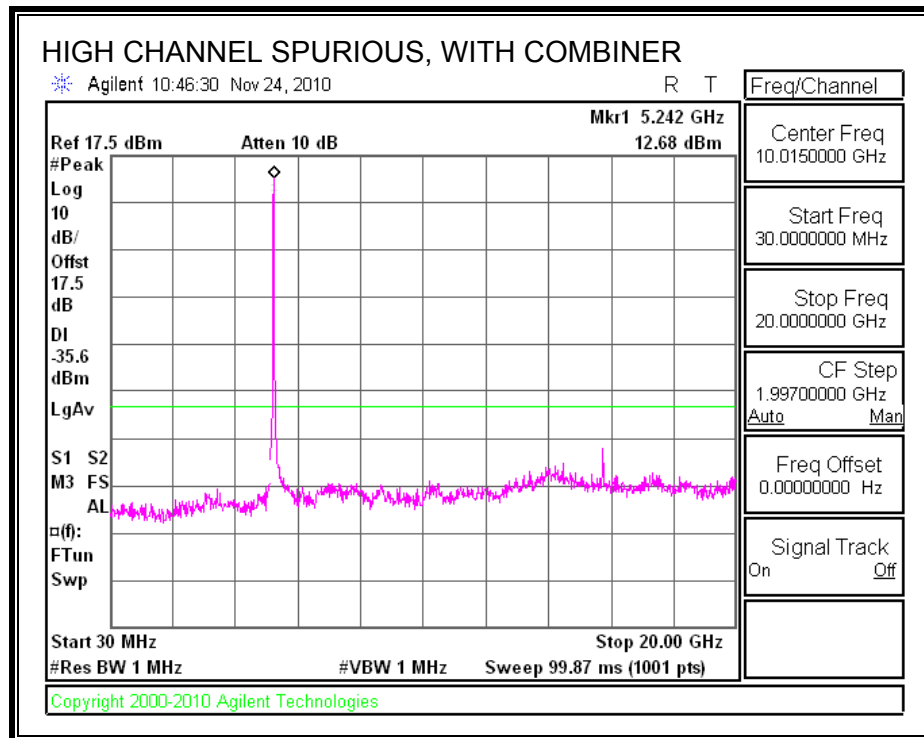
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

# SPURIOUS EMISSIONS WITH COMBINER







### 7.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

#### 7.3.1. 26 dB and 99% BANDWIDTH

##### LIMITS

None; for reporting purposes only.

##### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

##### RESULTS

###### CHAIN 1

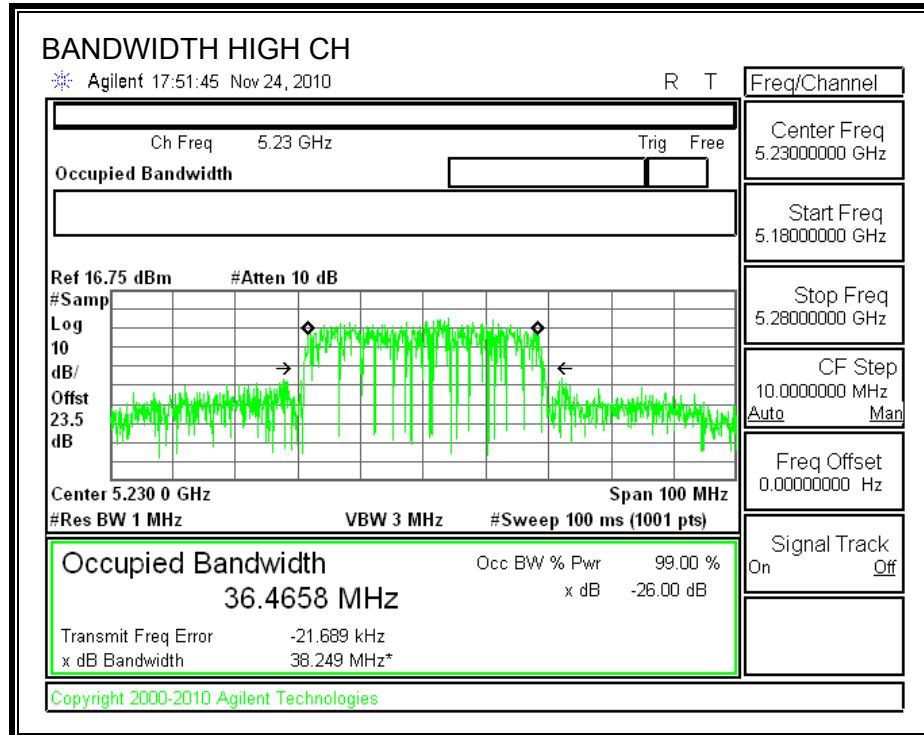
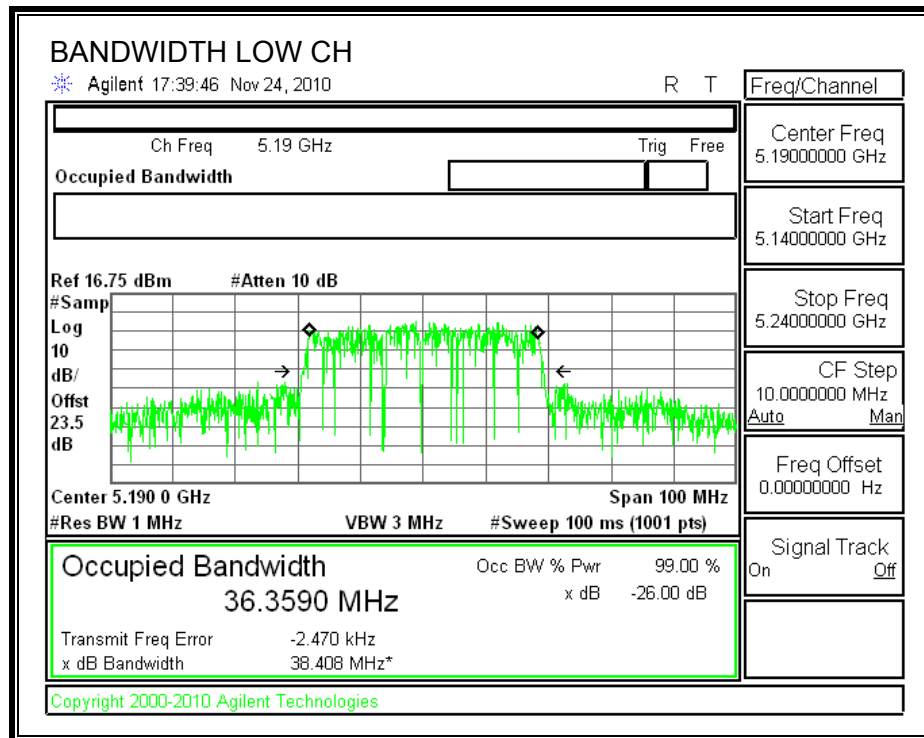
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	38.408	36.359
High	5230	38.249	36.4658

###### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	38.454	36.3689
High	5230	38.371	36.4715

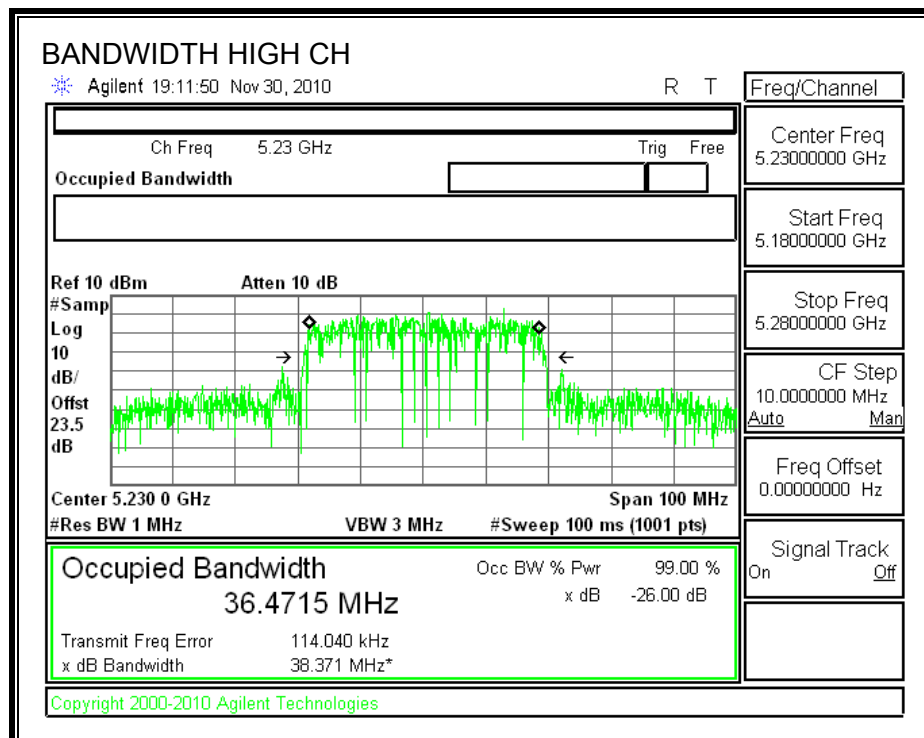
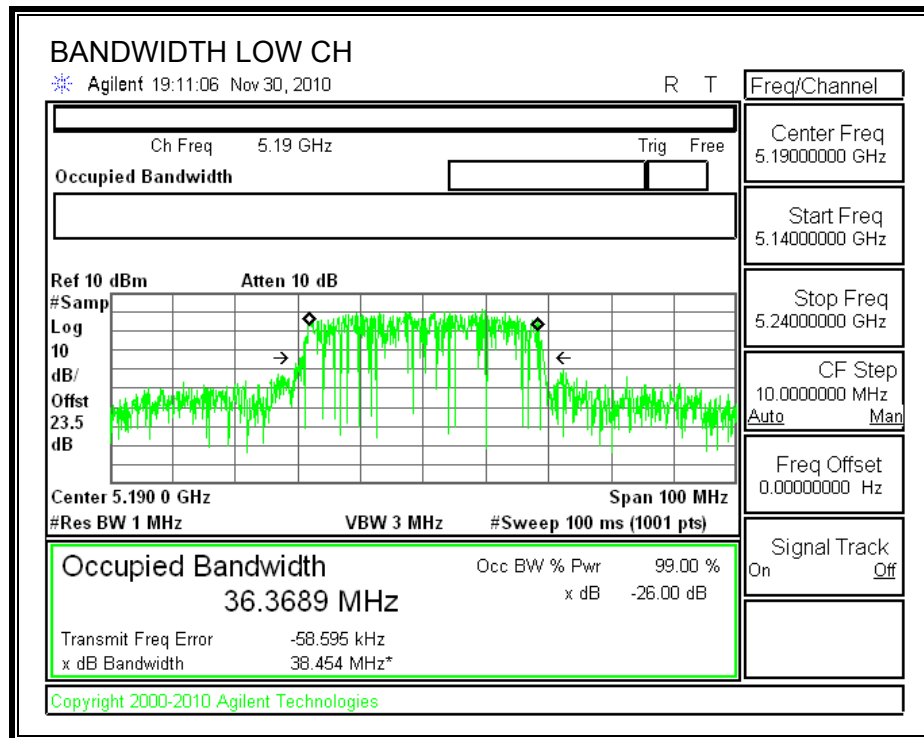
## CHAIN 1

### 26 dB and 99% BANDWIDTH



## CHAIN 2

### 26 dB and 99% BANDWIDTH



### 7.3.2. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

#### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

#### RESULTS

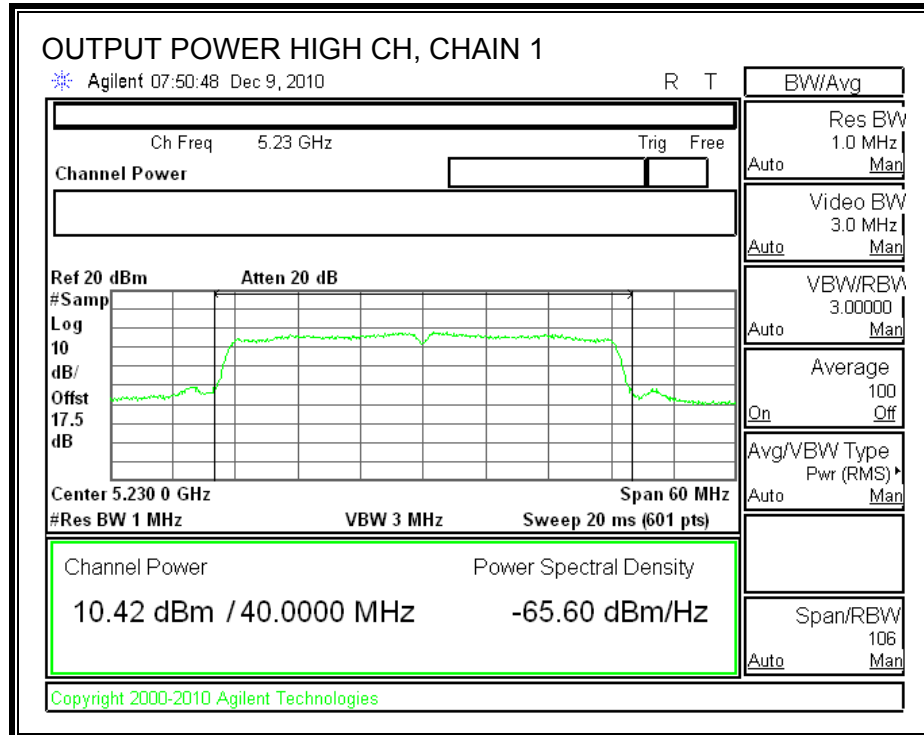
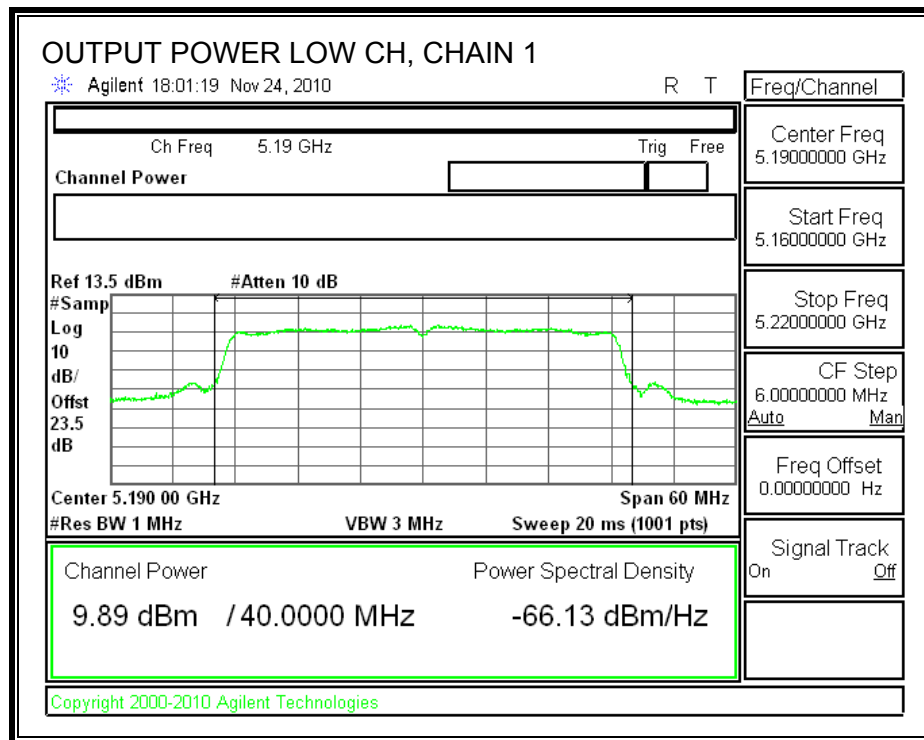
##### Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	38.454	19.85	8.61	14.39
High	5230	17	38.371	19.84	8.61	14.39

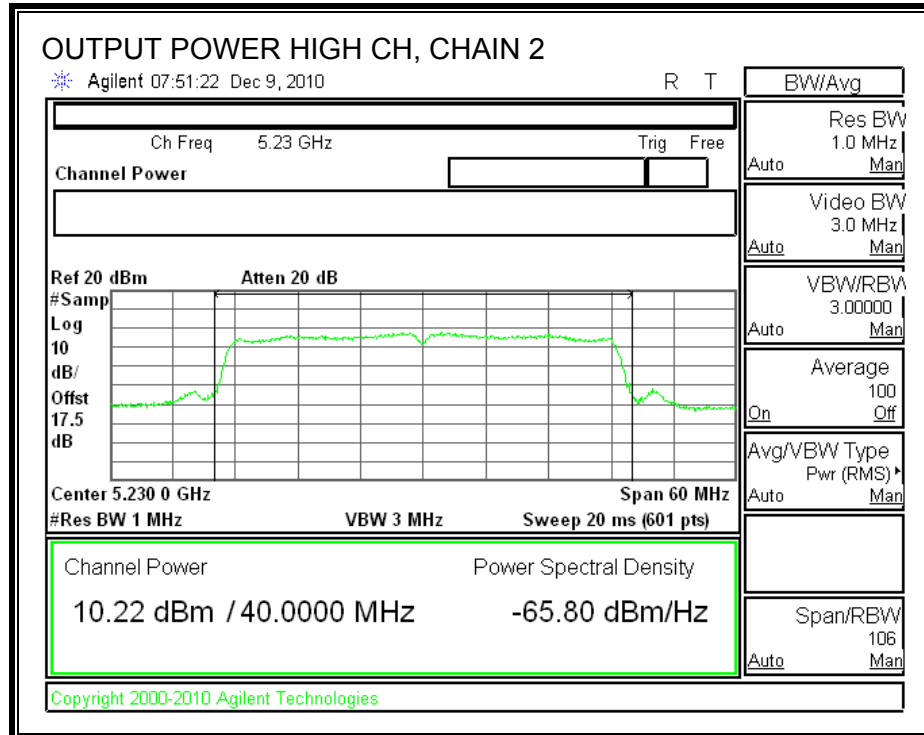
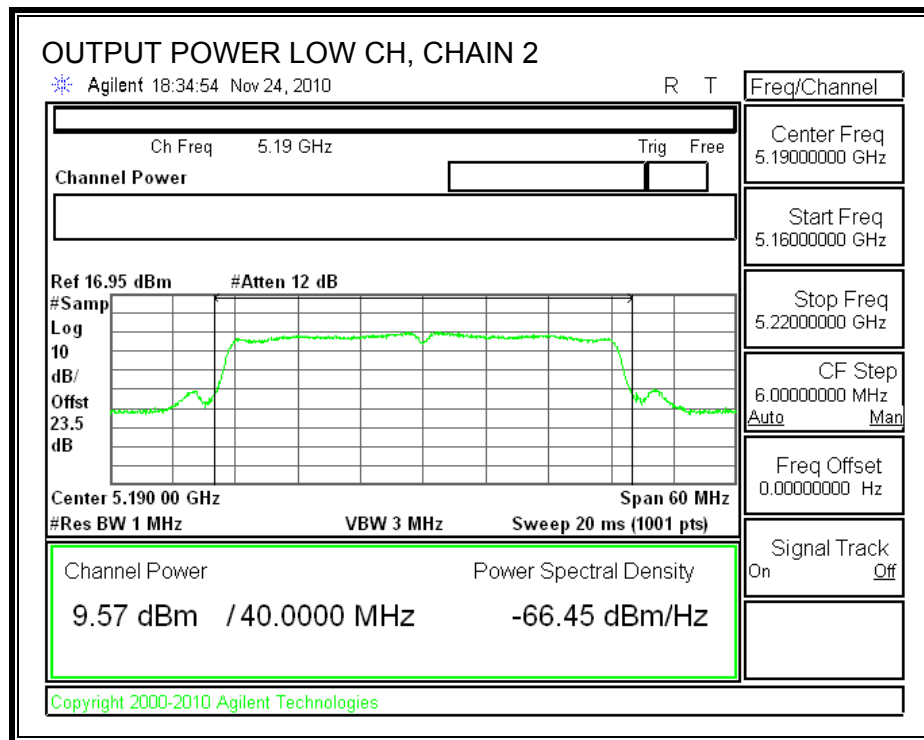
##### Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	9.89	9.57	12.74	14.39	-1.65
High	5230	10.43	10.22	13.34	14.39	-1.05

# **CHAIN 1 OUTPUT POWER**



## CHAIN 2 OUTPUT POWER



### 7.3.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, 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 peak transmit 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.

The maximum antenna gain is 8.61 dBi, therefore the limit is 1.39 dBm.

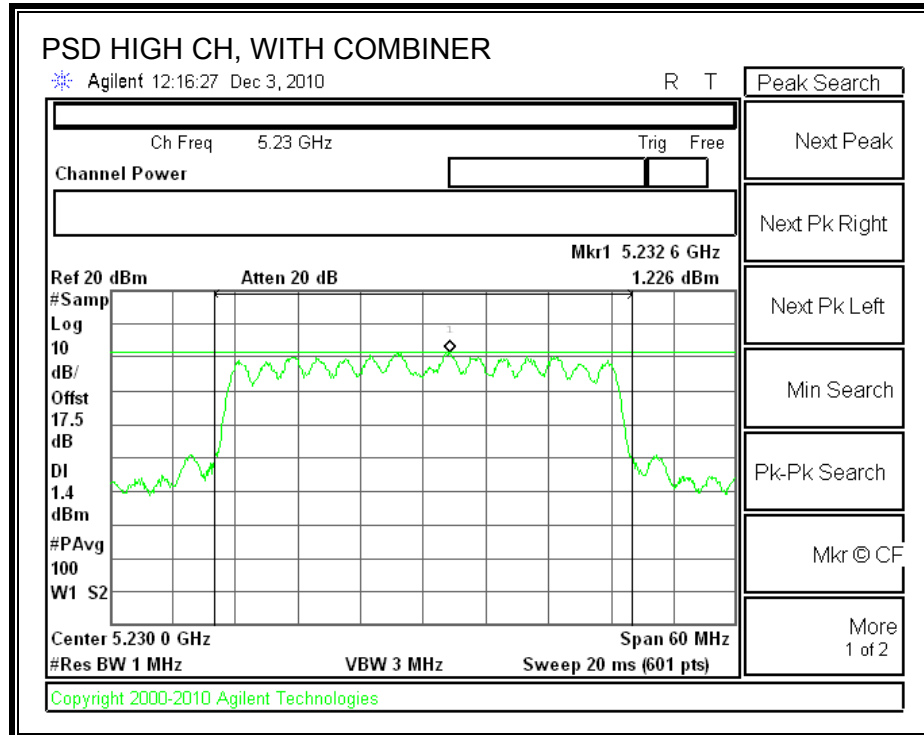
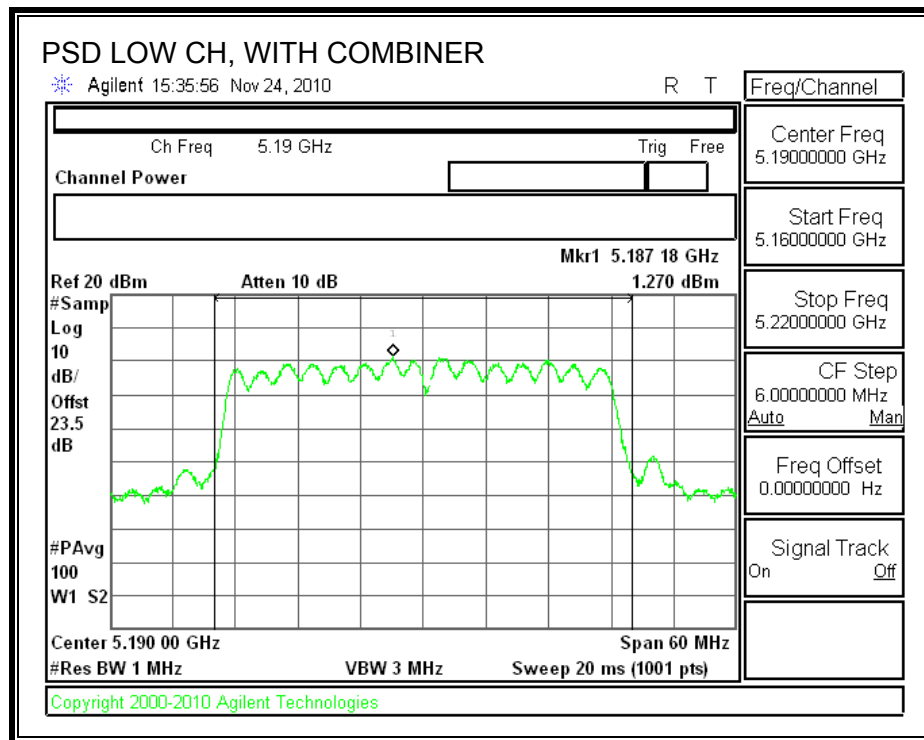
#### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5190	1.27	1.39	-0.12
High	5230	1.23	1.39	-0.16

# POWER SPECTRAL DENSITY WITH COMBINER



### 7.3.4. 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.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

#### RESULTS

##### CHAIN 1

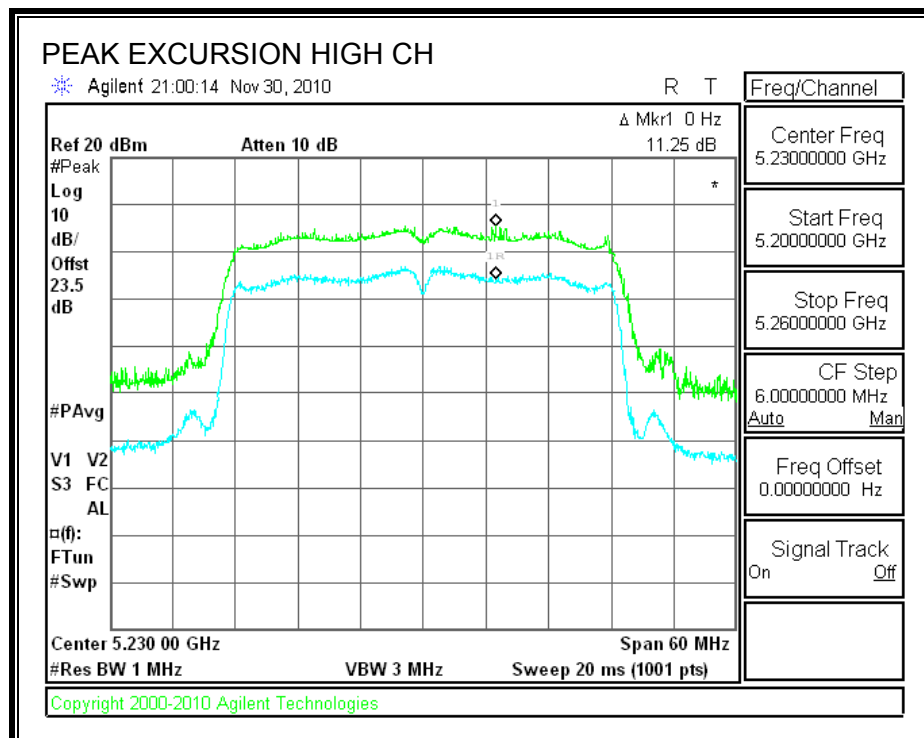
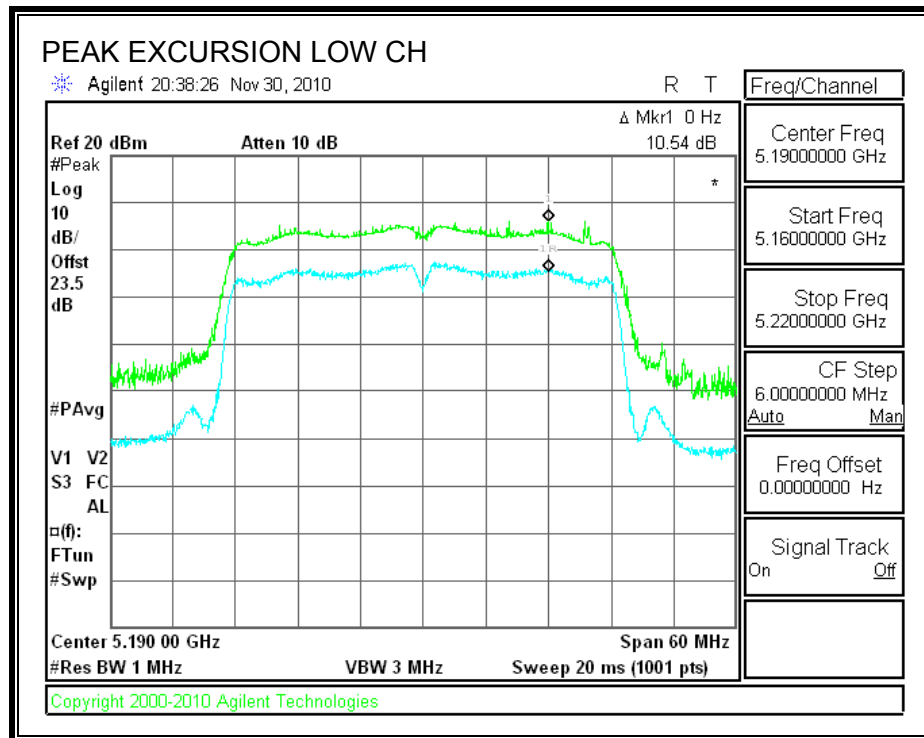
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.54	13	-2.46
High	5230	11.25	13	-1.75

##### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.05	13	-2.95
High	5230	9.88	13	-3.12

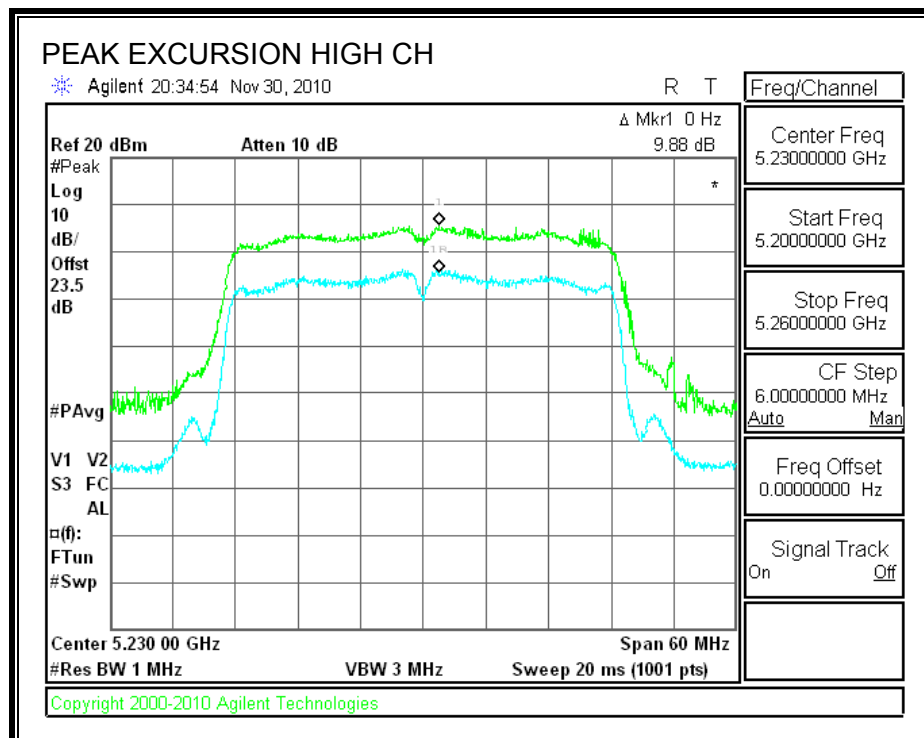
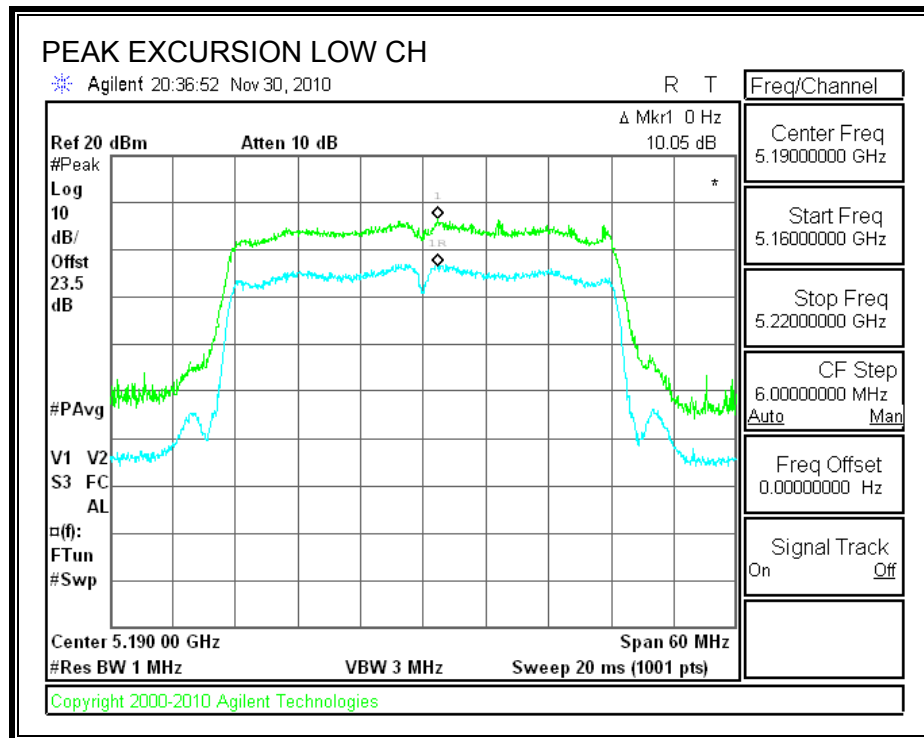
## CHAIN 1

### PEAK EXCURSION



## CHAIN 2

### PEAK EXCURSION



### **7.3.5. CONDUCTED SPURIOUS EMISSIONS**

#### **LIMITS**

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

#### **TEST PROCEDURE**

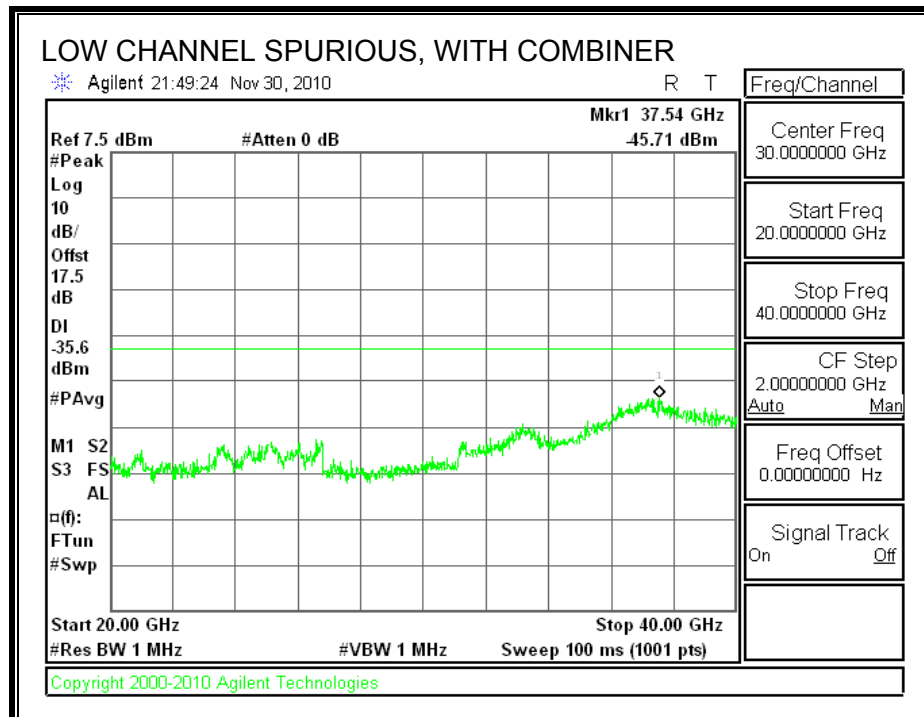
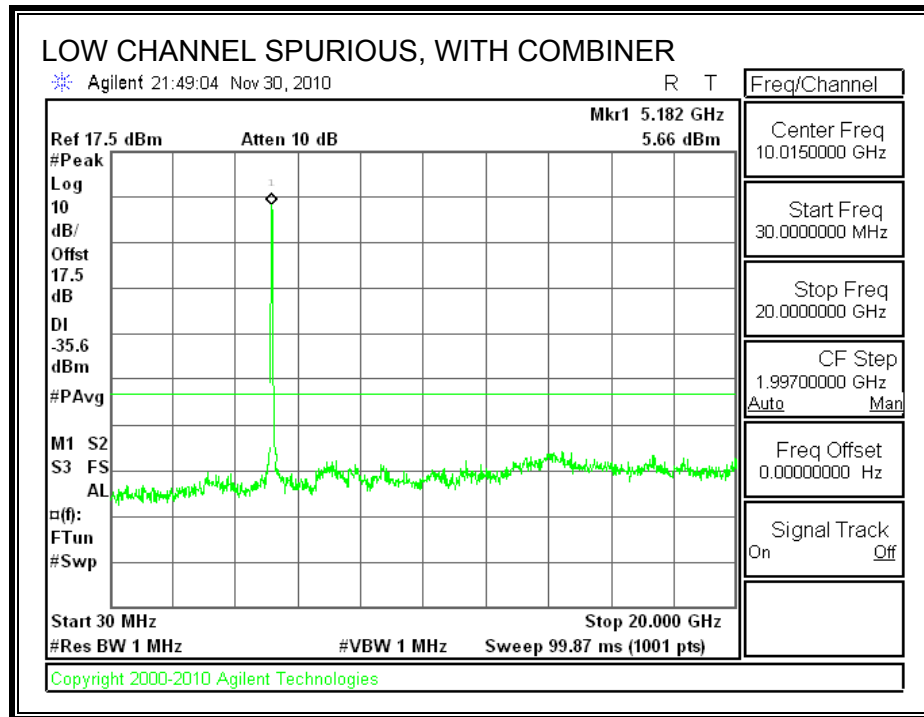
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

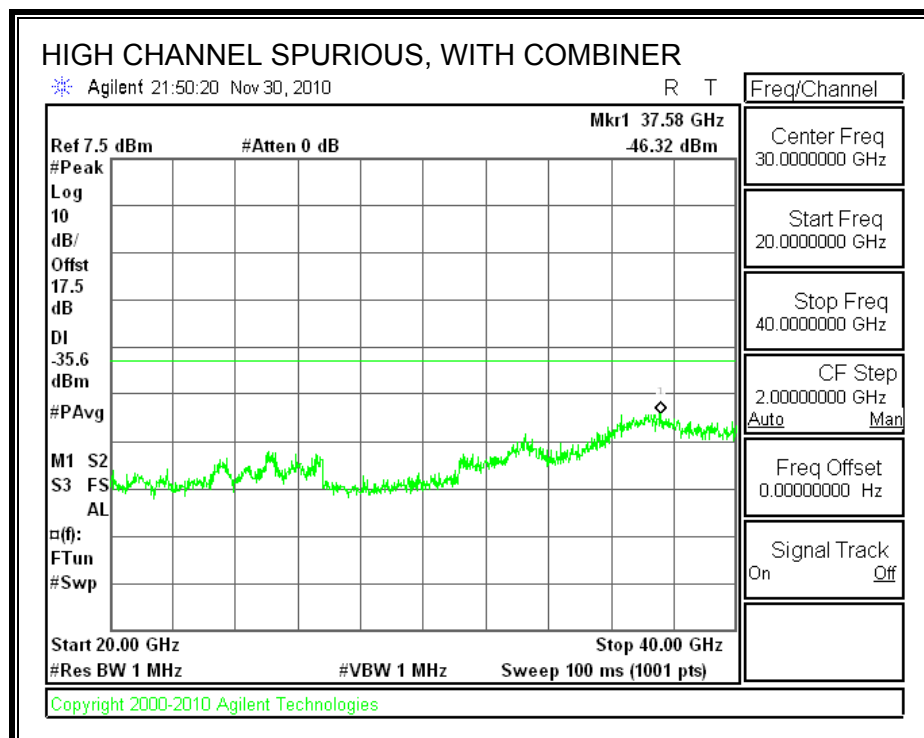
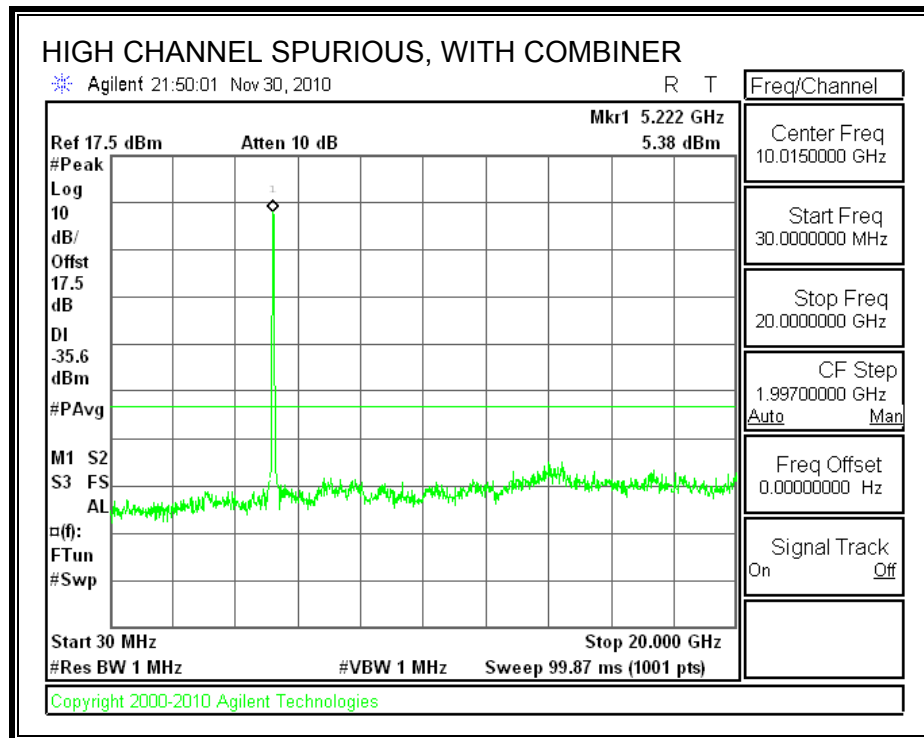
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

### SPURIOUS EMISSIONS WITH COMBINER





## **7.4. 802.11a MODE IN THE 5.3 GHz BAND**

### **7.4.1. 26 dB and 99% BANDWIDTH**

#### **LIMITS**

None; for reporting purposes only.

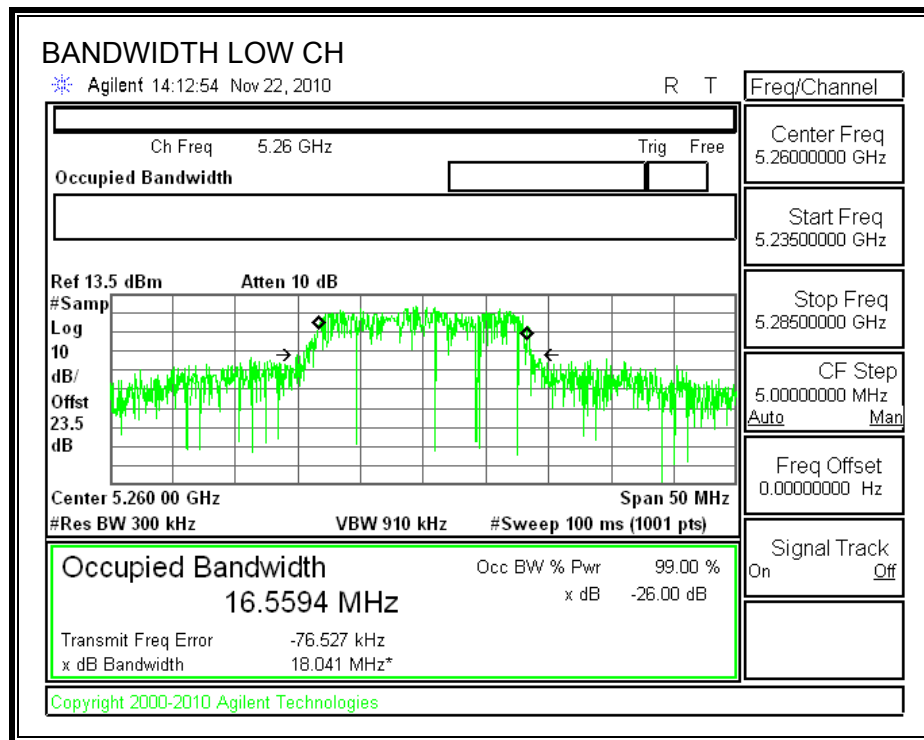
#### **TEST PROCEDURE**

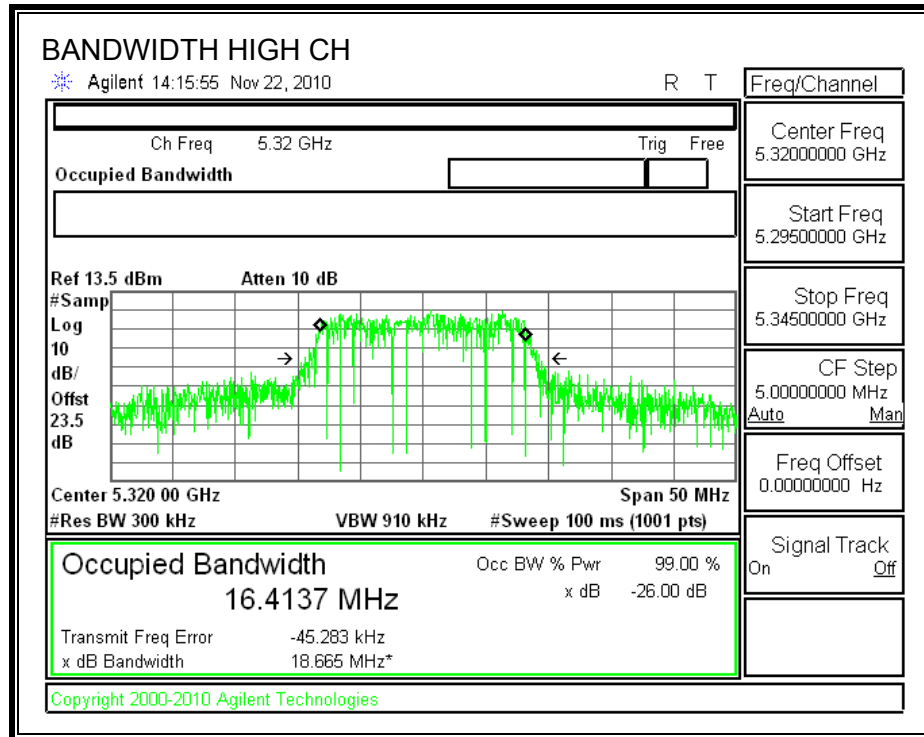
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### **RESULTS**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	18.041	16.5594
Middle	5300	18.243	16.3829
High	5320	18.665	16.4137

## 26 dB & 99% BANDWIDTH





## 7.4.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

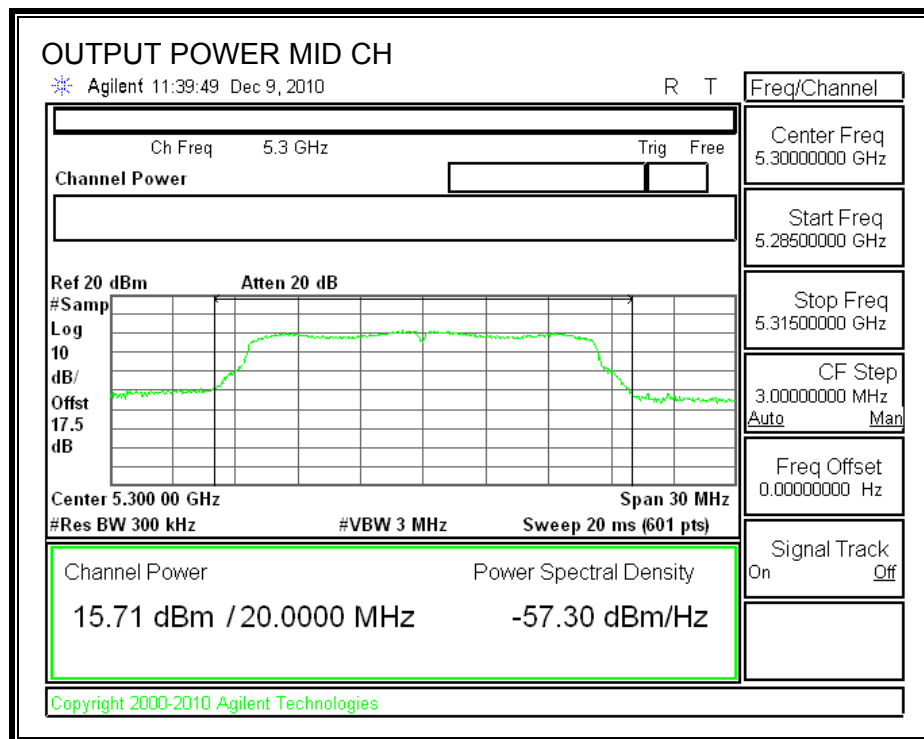
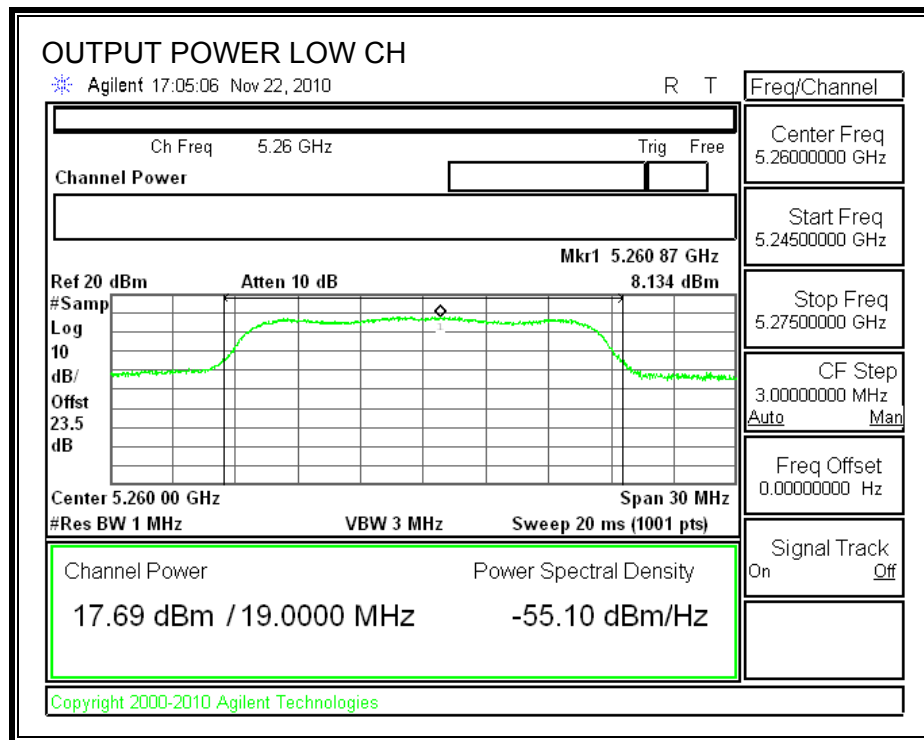
#### Limit

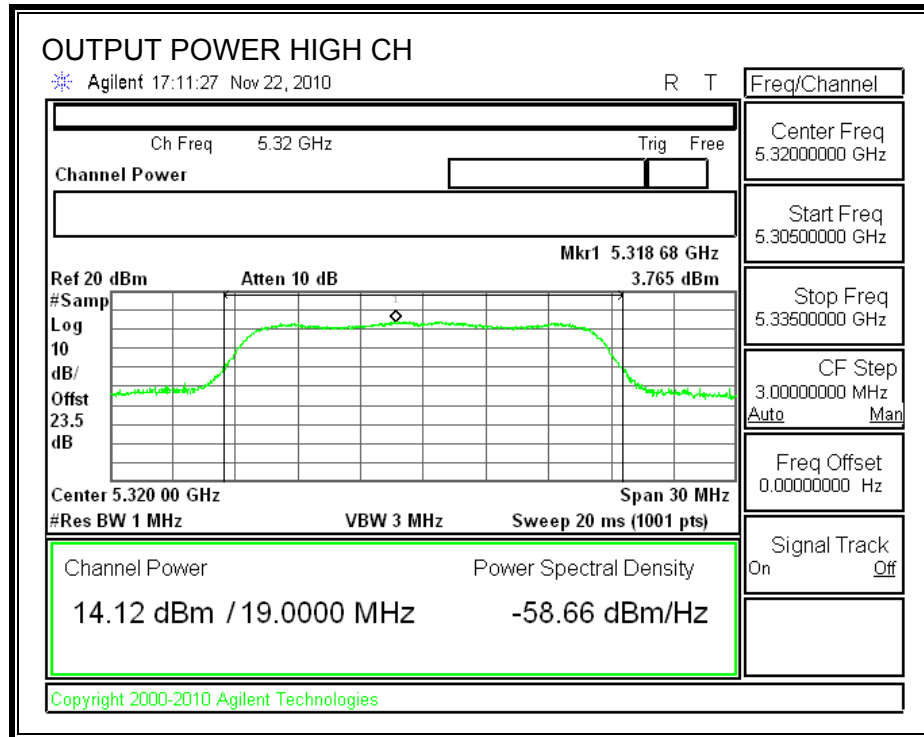
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	18.041	23.56	5.60	23.56
Mid	5300	24	18.243	23.61	5.60	23.61
High	5320	24	18.665	23.71	5.60	23.71

#### Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	17.69	23.56	-5.87
Mid	5300	15.71	23.61	-7.90
High	5320	14.12	23.71	-9.59

## OUTPUT POWER





### 7.4.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is equal to 5.6 dBi, therefore the limit is 11 dBm.

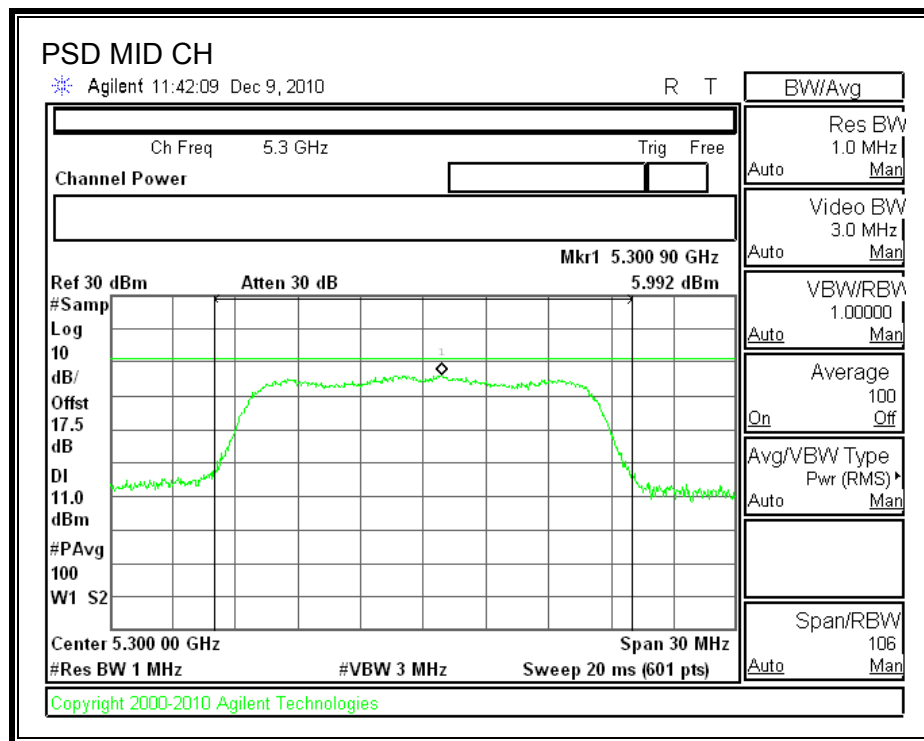
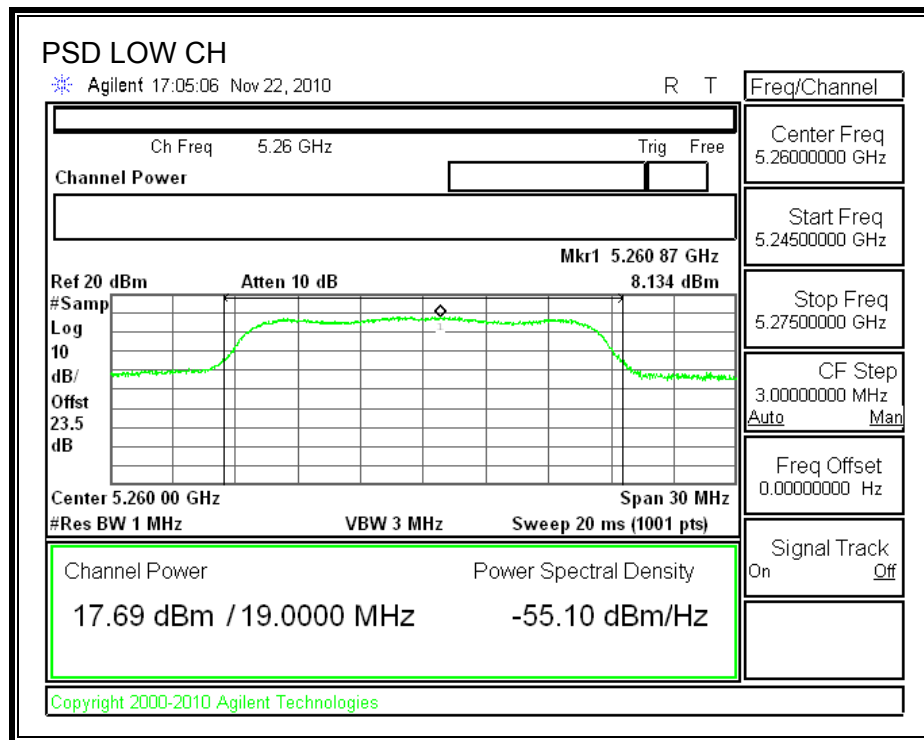
#### TEST PROCEDURE

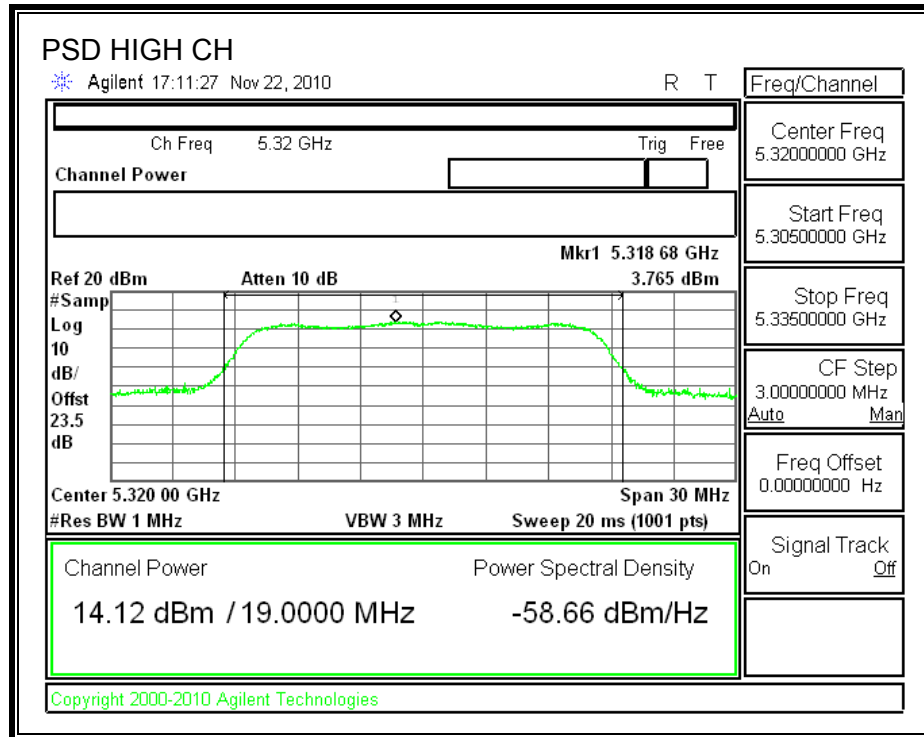
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	8.13	11.00	-2.87
Middle	5300	5.99	11.00	-5.01
High	5320	3.77	11.00	-7.24

# POWER SPECTRAL DENSITY





#### 7.4.4. 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.

##### TEST PROCEDURE

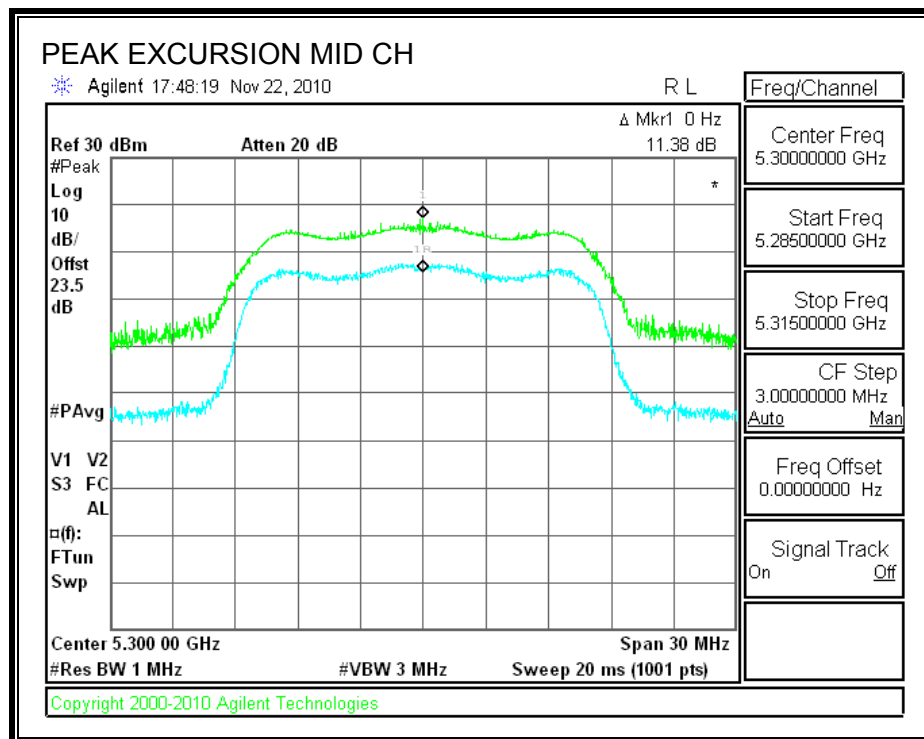
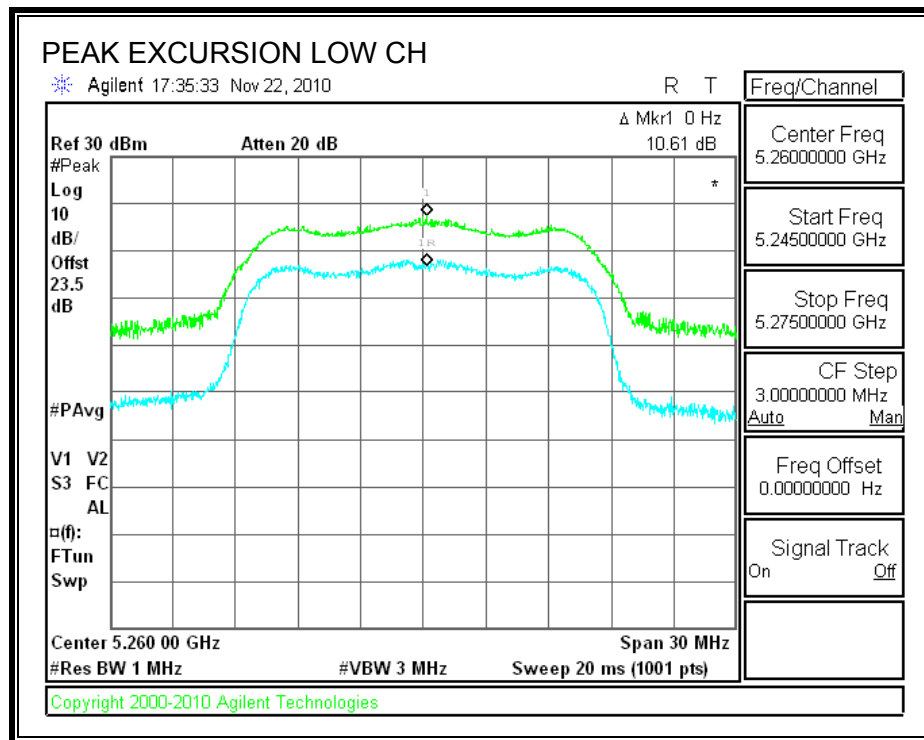
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

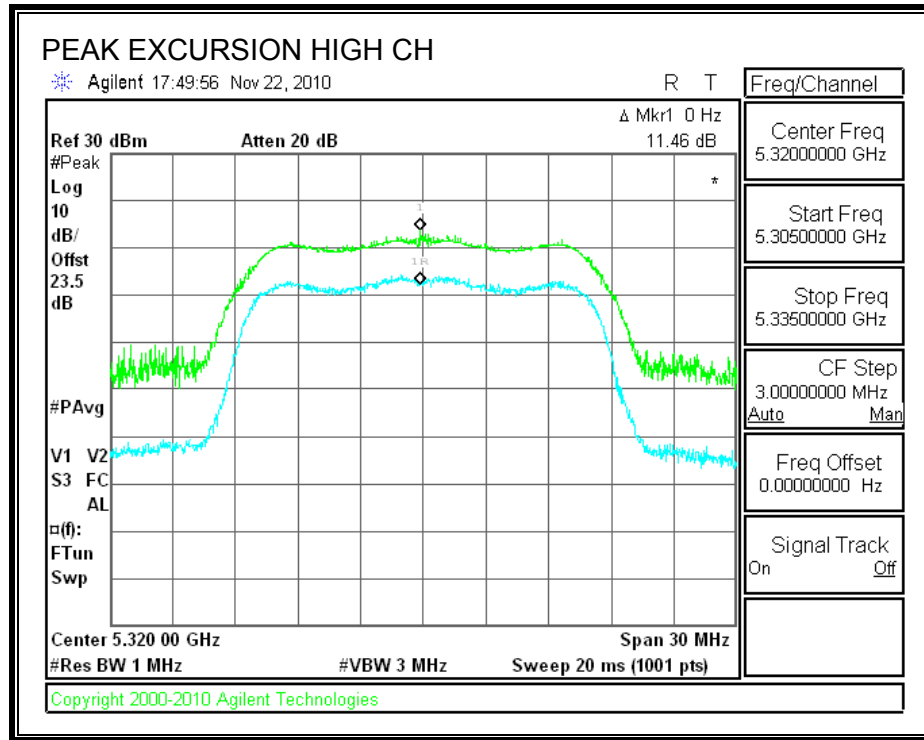
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

##### RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	10.61	13	-2.39
Middle	5300	11.38	13	-1.62
High	5320	11.46	13	-1.54

## PEAK EXCURSION





## **7.4.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.25-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

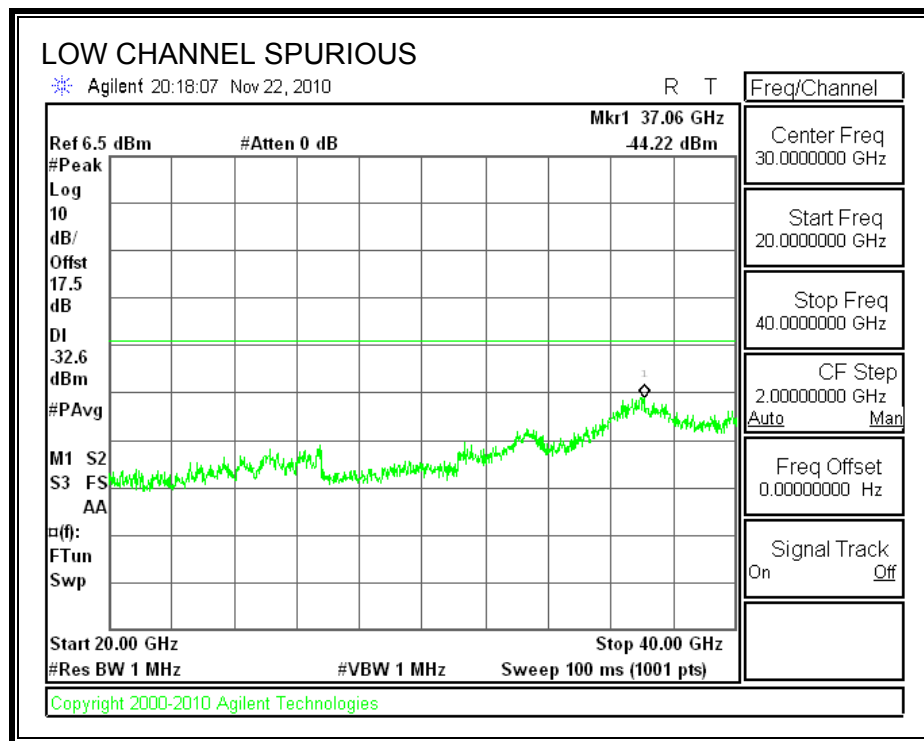
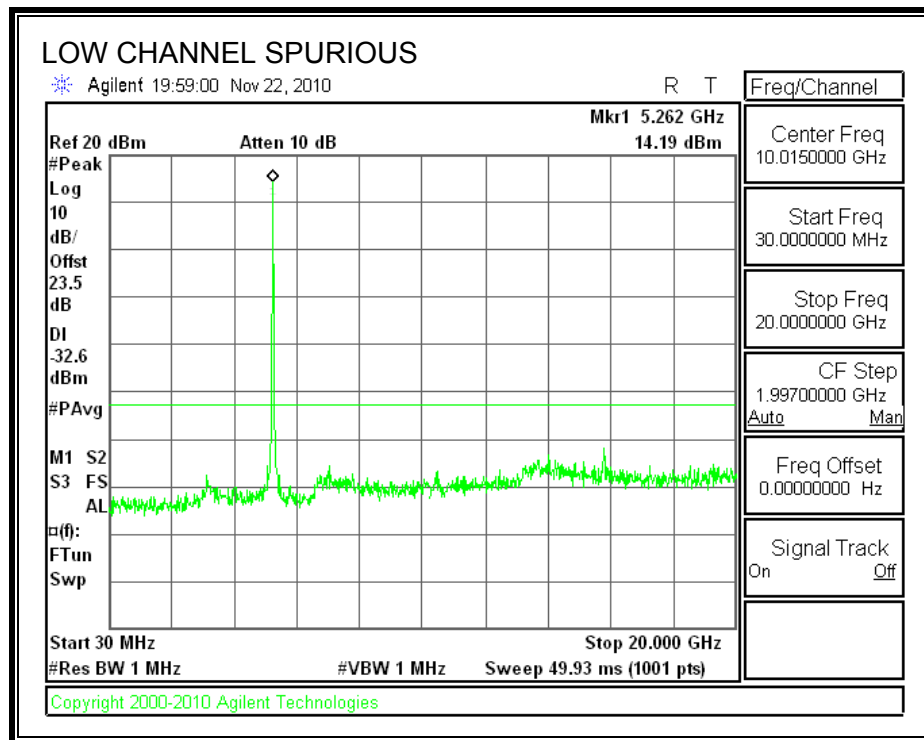
### **TEST PROCEDURE**

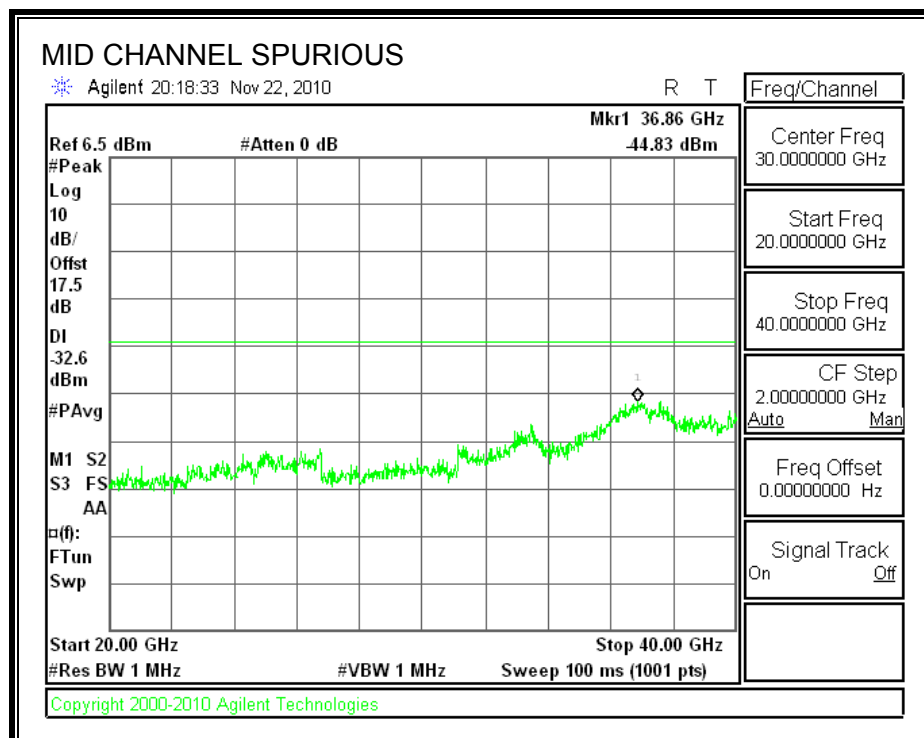
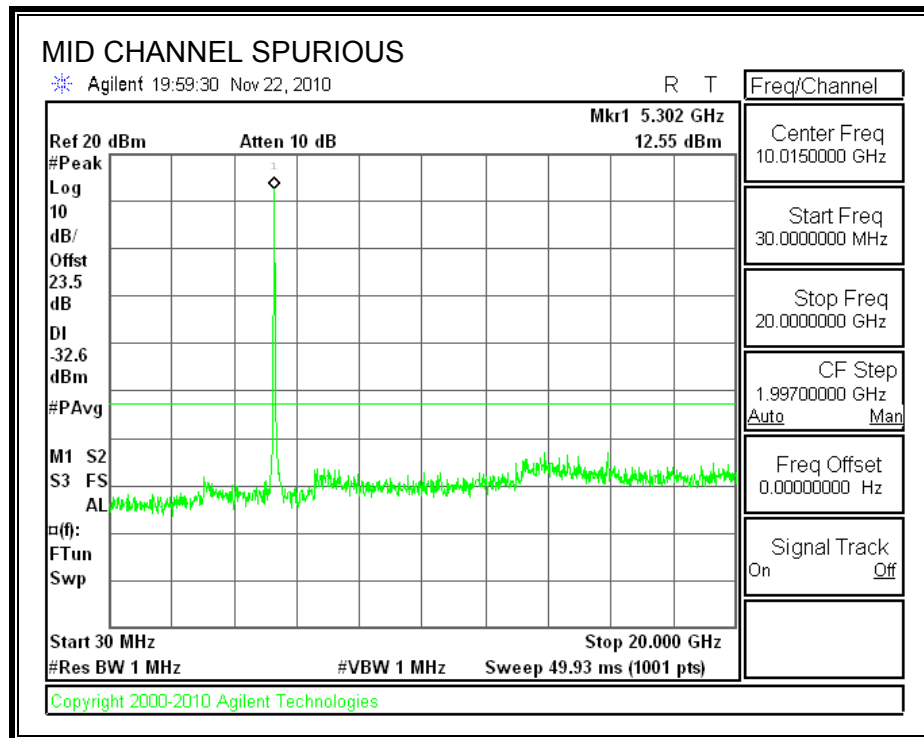
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

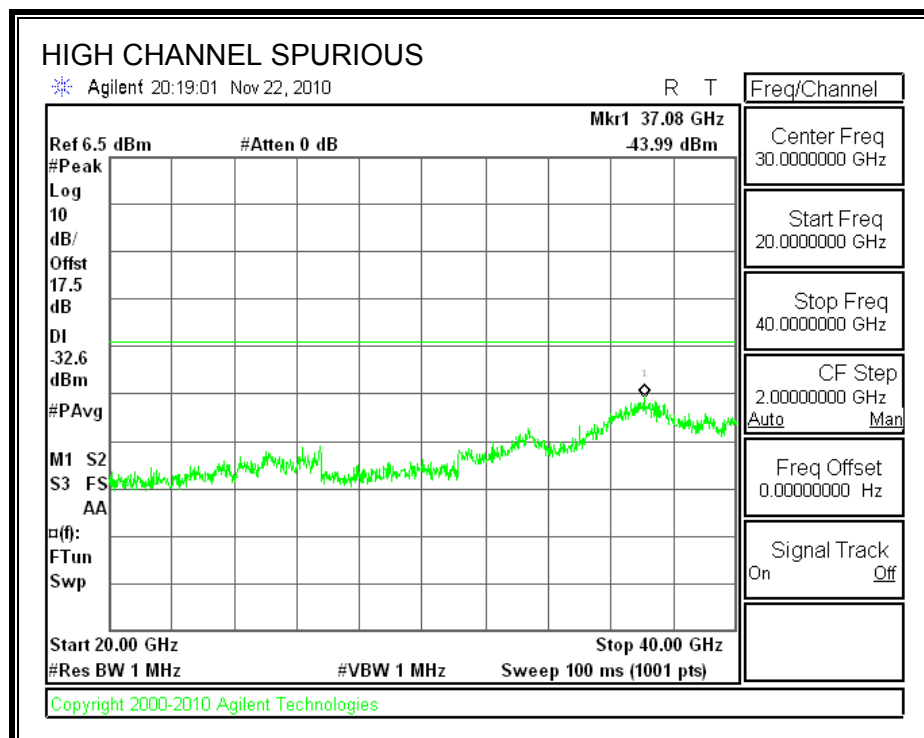
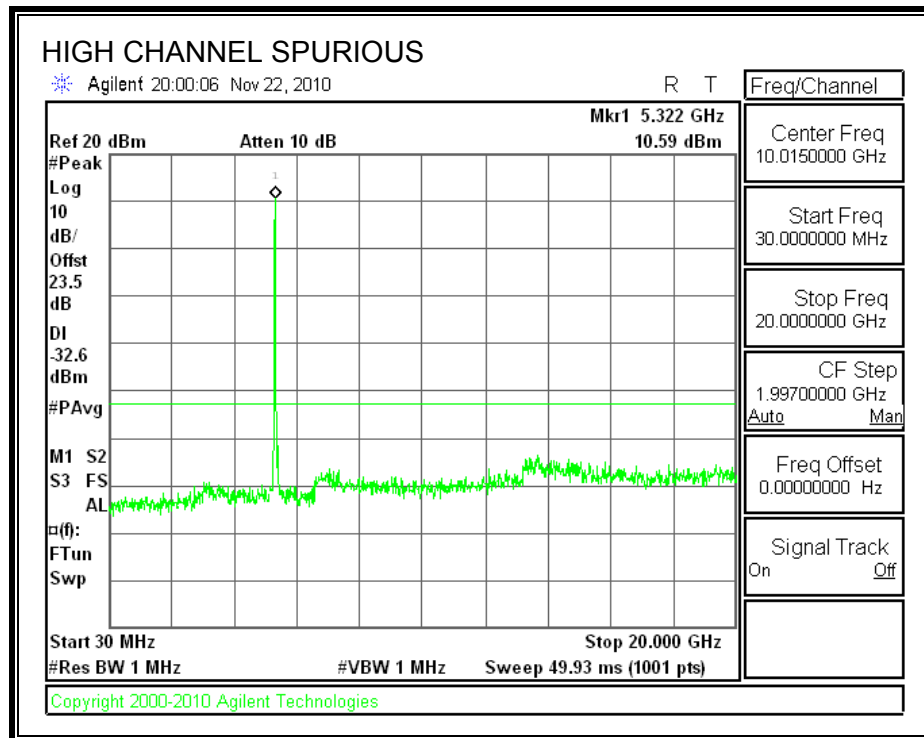
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## SPURIOUS EMISSIONS







## 7.5. 802.11n HT20 MODE IN THE 5.3 GHz BAND

### 7.5.1. 26 dB and 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### RESULTS

##### CHAIN 1

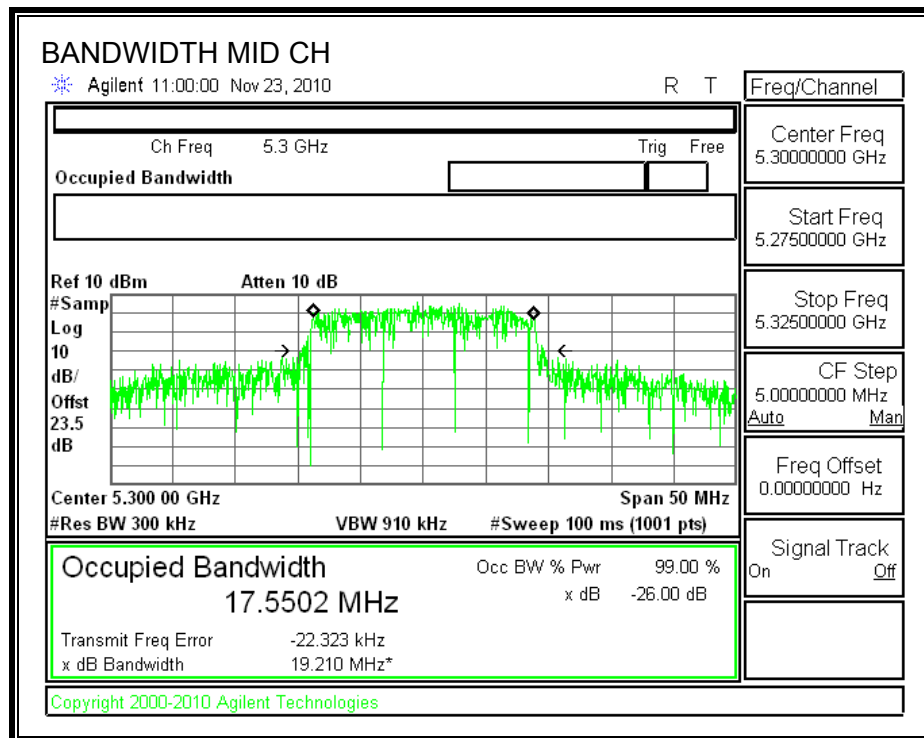
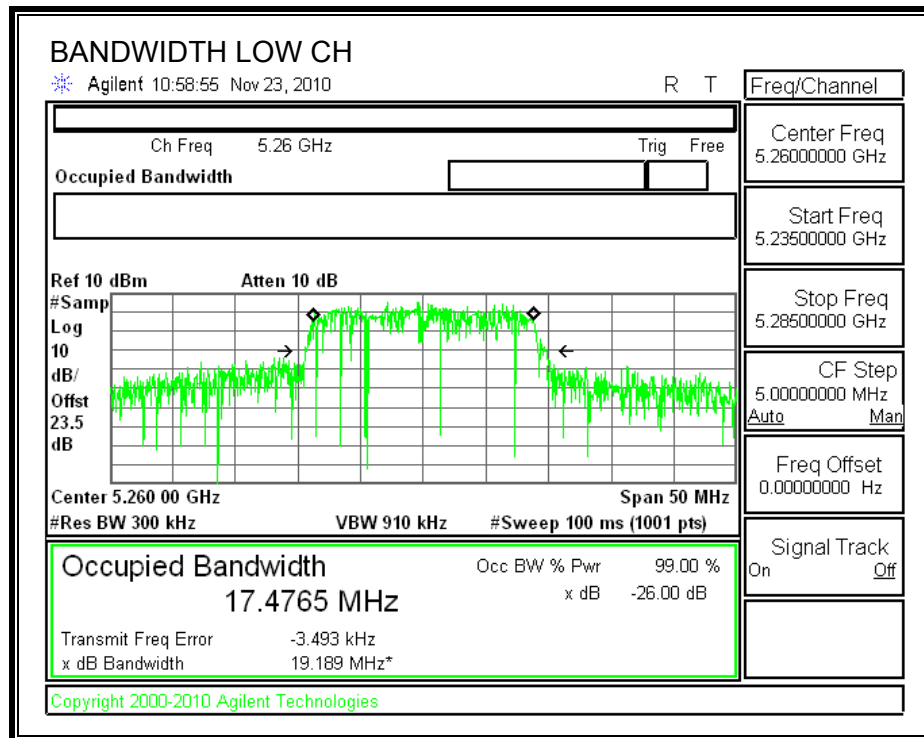
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	19.189	17.4765
Middle	5300	19.210	17.5502
High	5320	18.979	17.6148

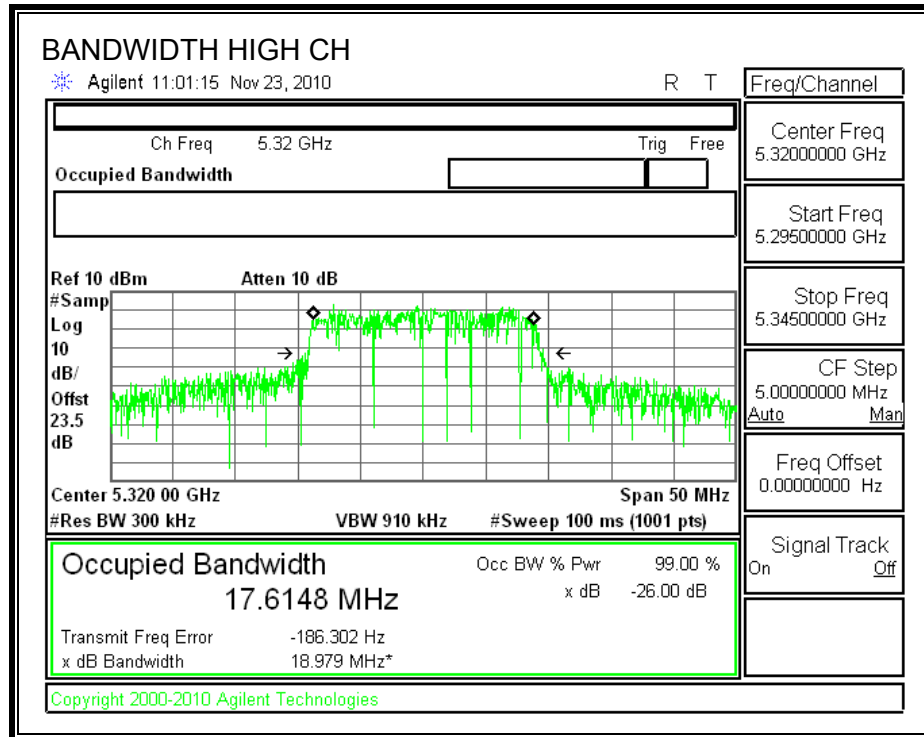
##### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	18.403	17.4752
Middle	5300	18.467	17.5336
High	5320	18.915	17.709

## CHAIN 1

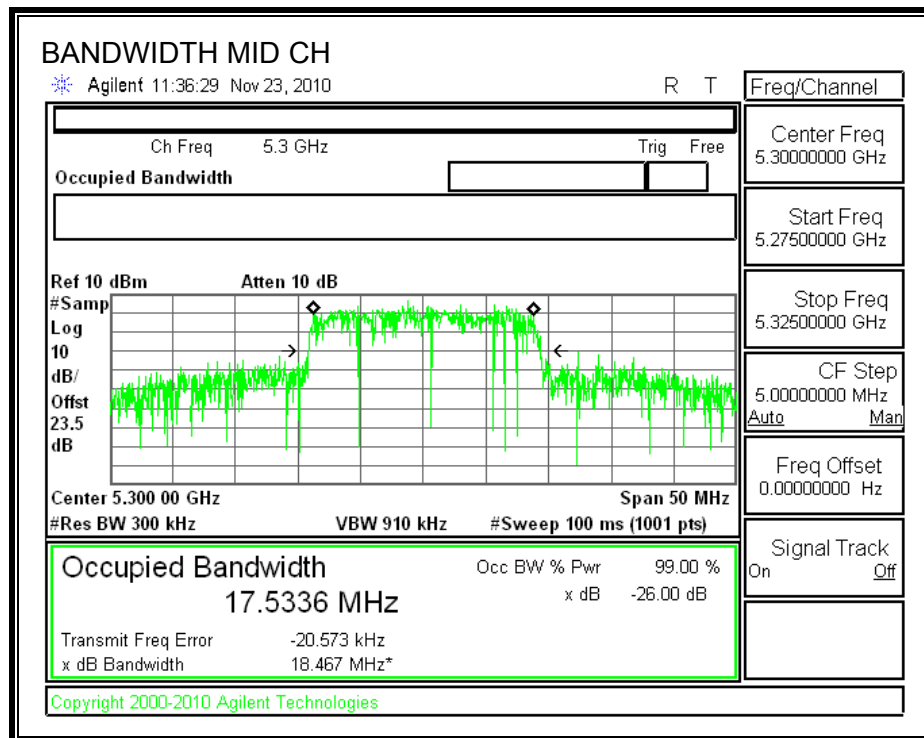
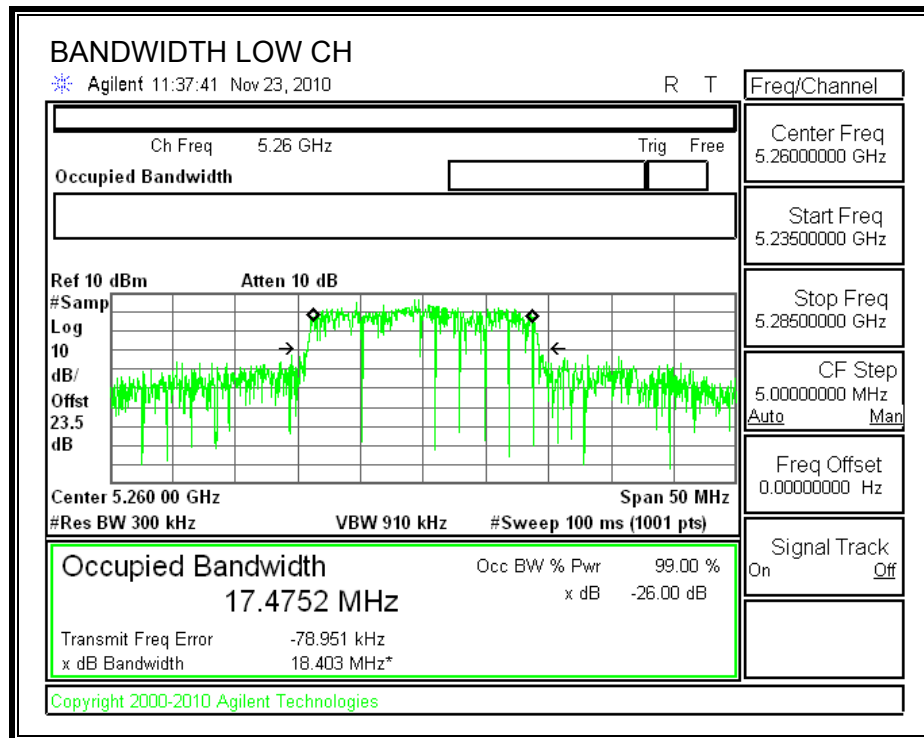
### 26 dB and 99% BANDWIDTH

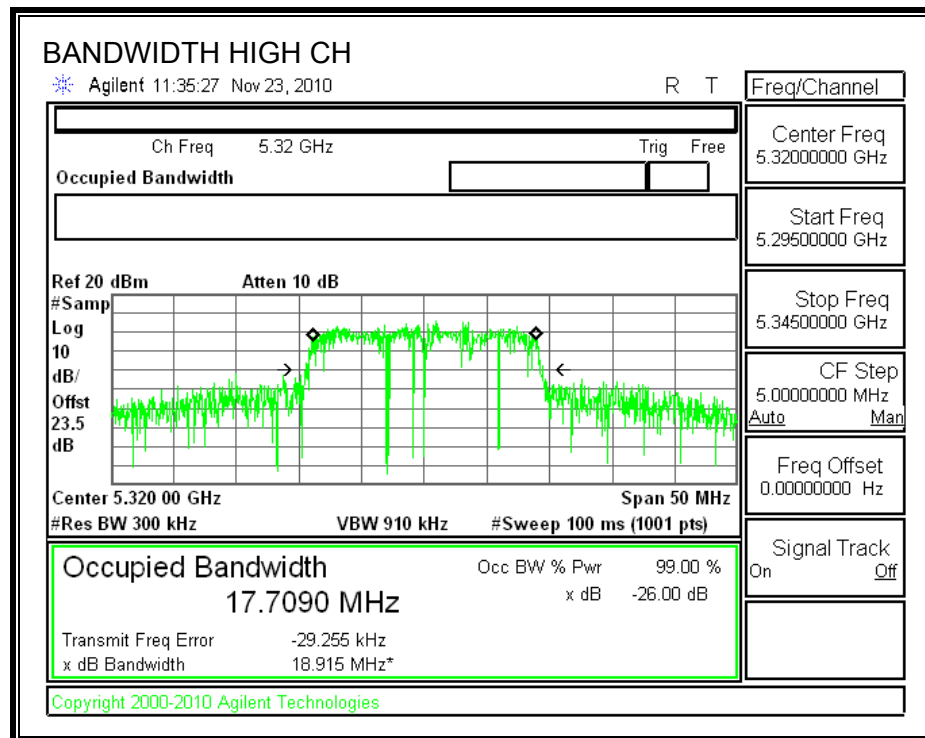




## CHAIN 2

### 26 dB and 99% BANDWIDTH





## 7.5.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

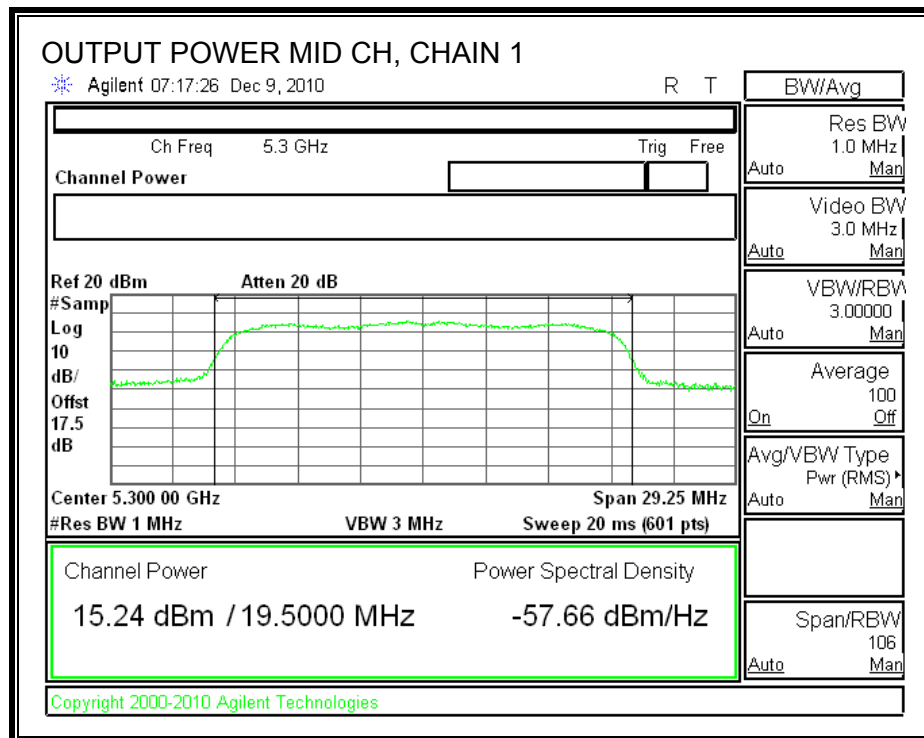
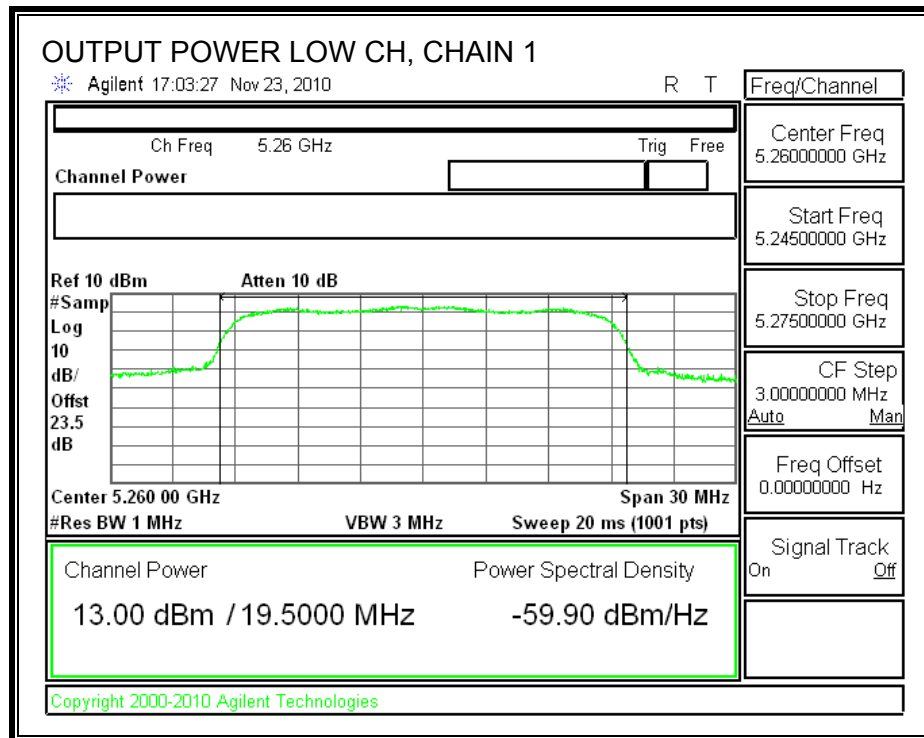
#### Limit

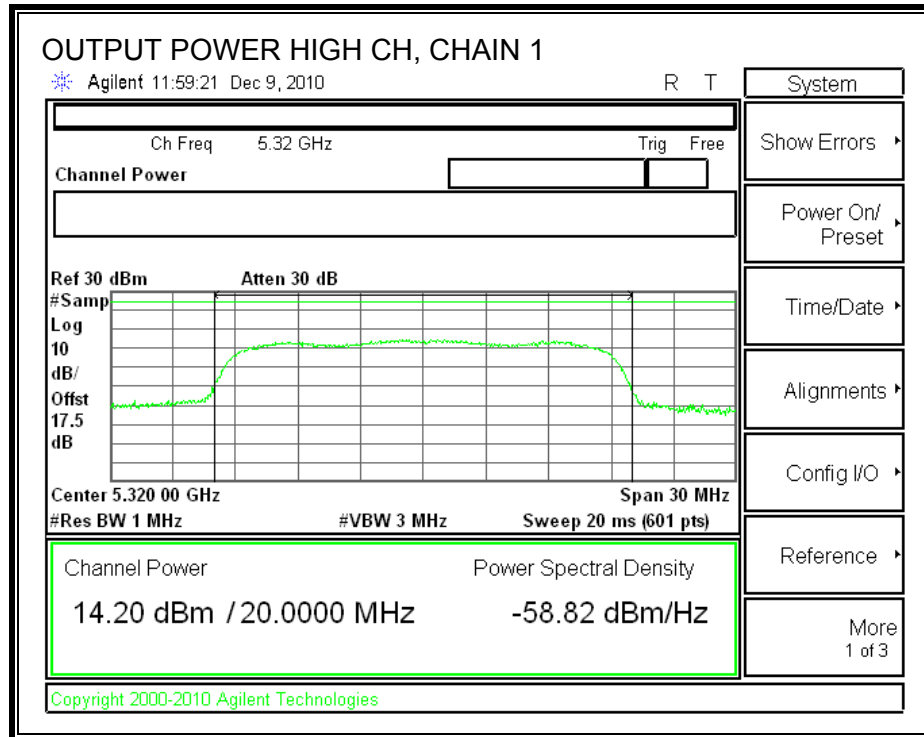
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	19.189	23.83	8.61	21.22
Mid	5300	24	19.210	23.84	8.61	21.23
High	5320	24	18.979	23.78	8.61	21.17

#### Individual Chain Results

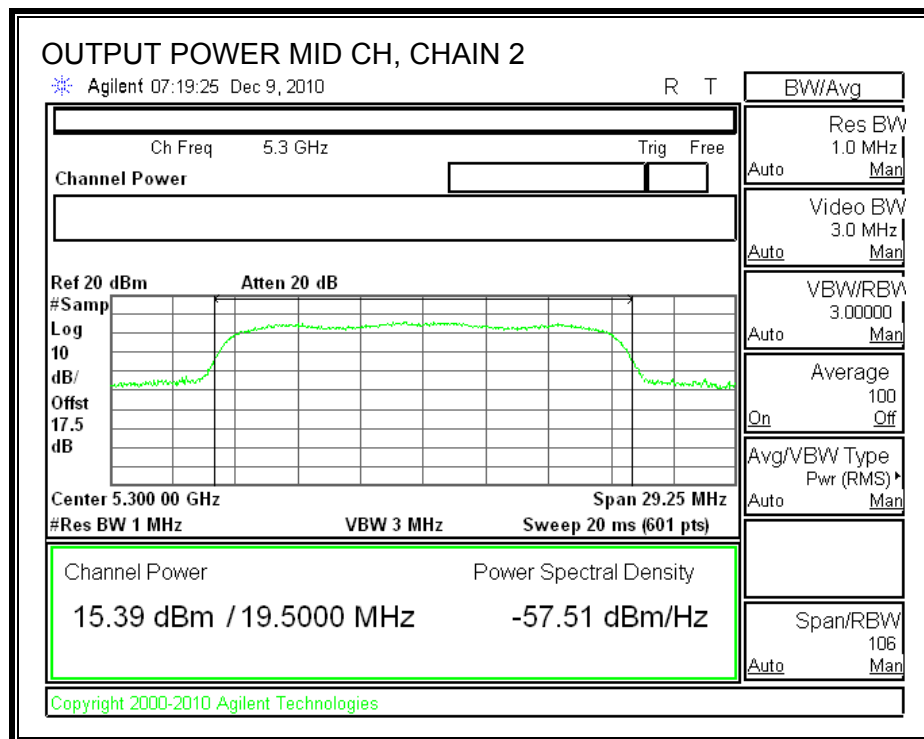
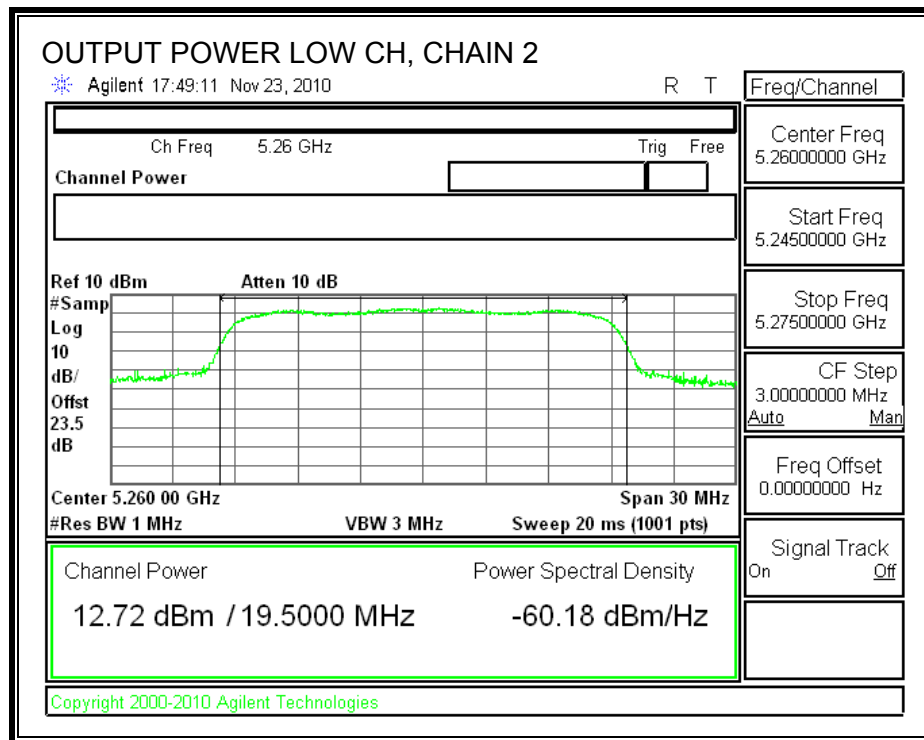
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	13.00	12.72	15.87	21.22	-5.35
Mid	5300	15.24	15.39	18.33	21.23	-2.90
High	5320	14.20	14.38	17.30	21.17	-3.87

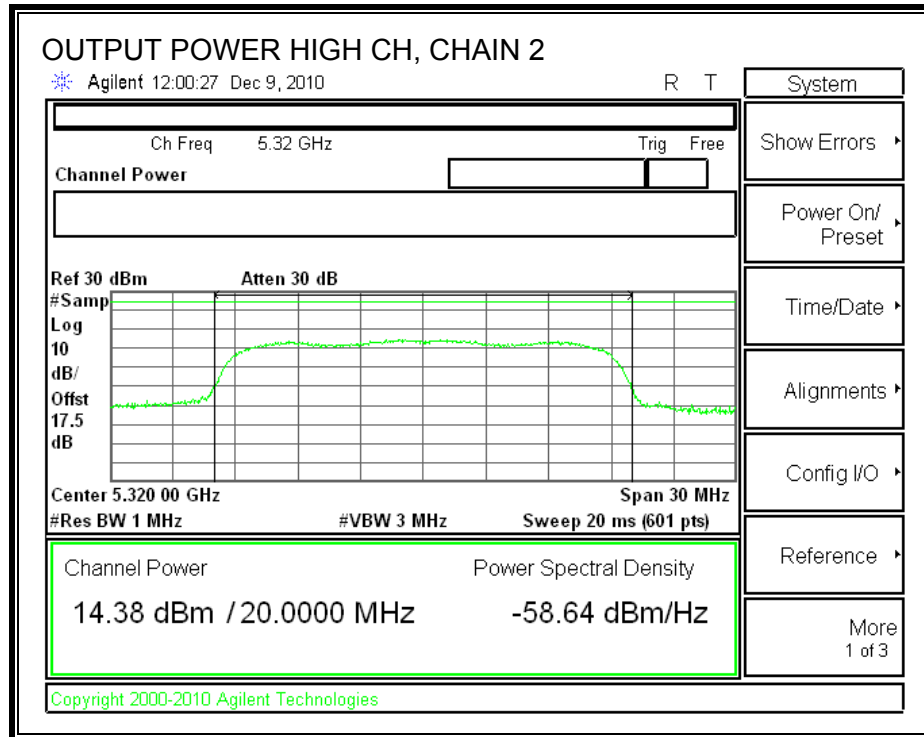
# **CHAIN 1 OUTPUT POWER**





## CHAIN 2 OUTPUT POWER





### 7.5.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 8.61 dBi, therefore the limit is 8.39 dBm.

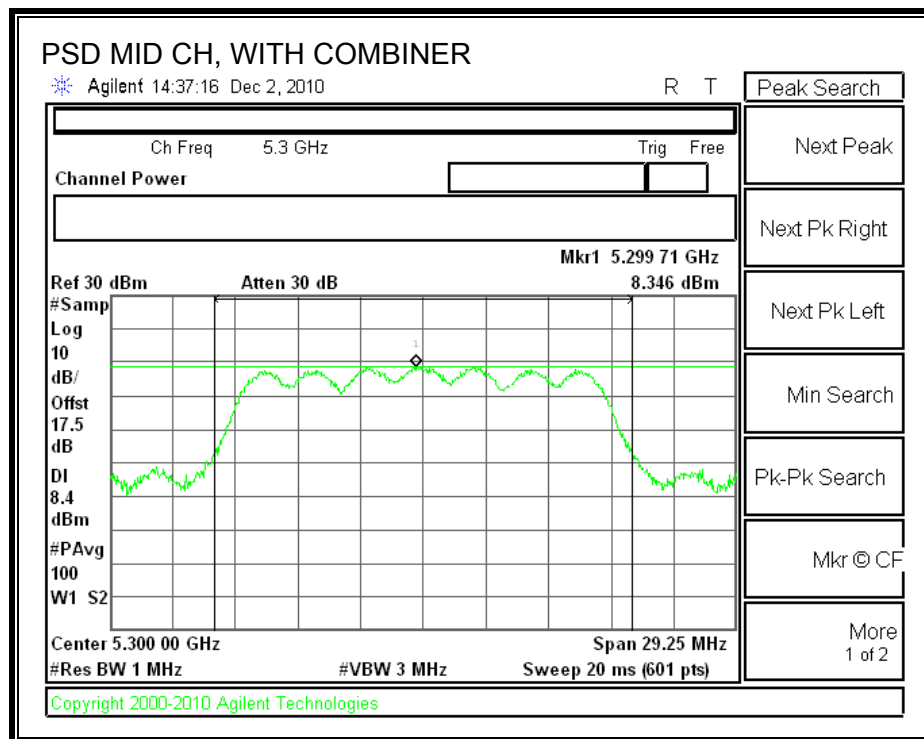
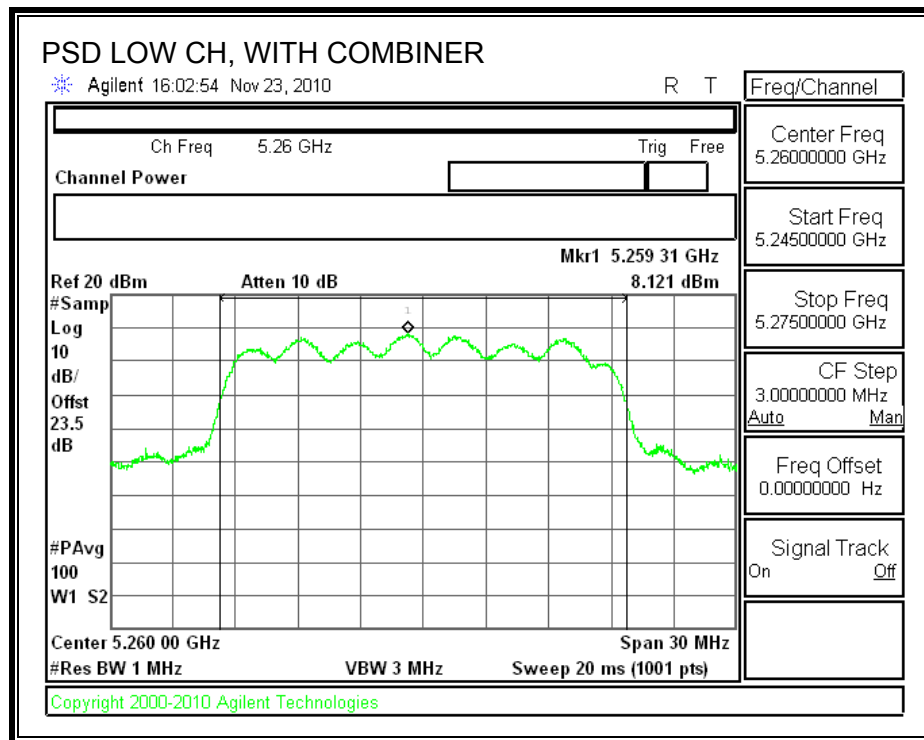
#### TEST PROCEDURE

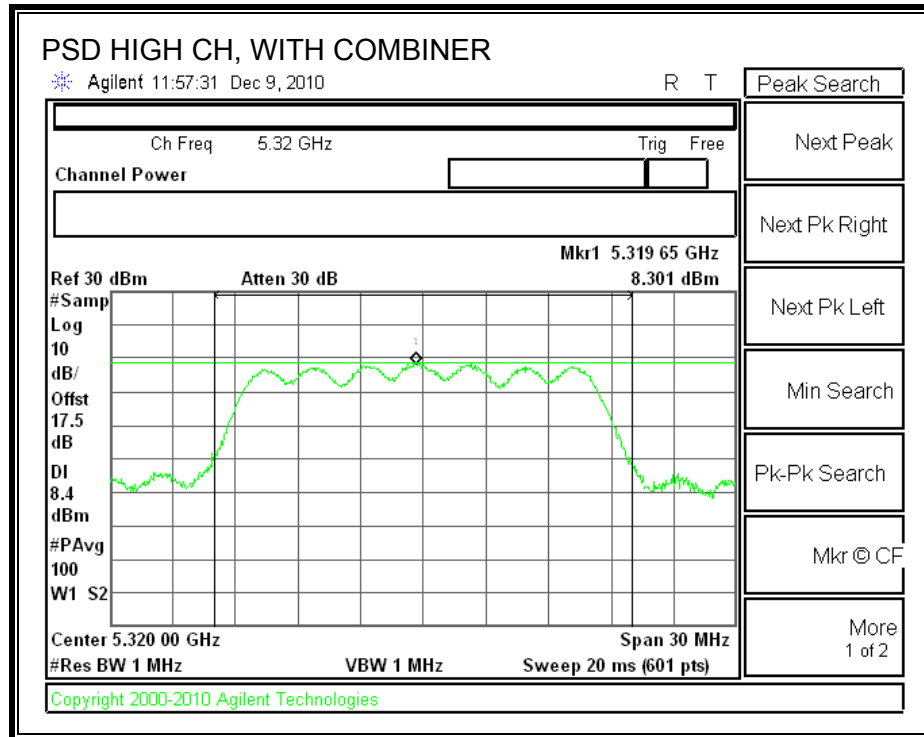
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5260	8.121	8.39	-0.27
Middle	5300	8.346	8.39	-0.04
High	5320	8.301	8.39	-0.09

# POWER SPECTRAL DENSITY WITH COMBINER





## 7.5.4. 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.

### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

#### CHAIN 1

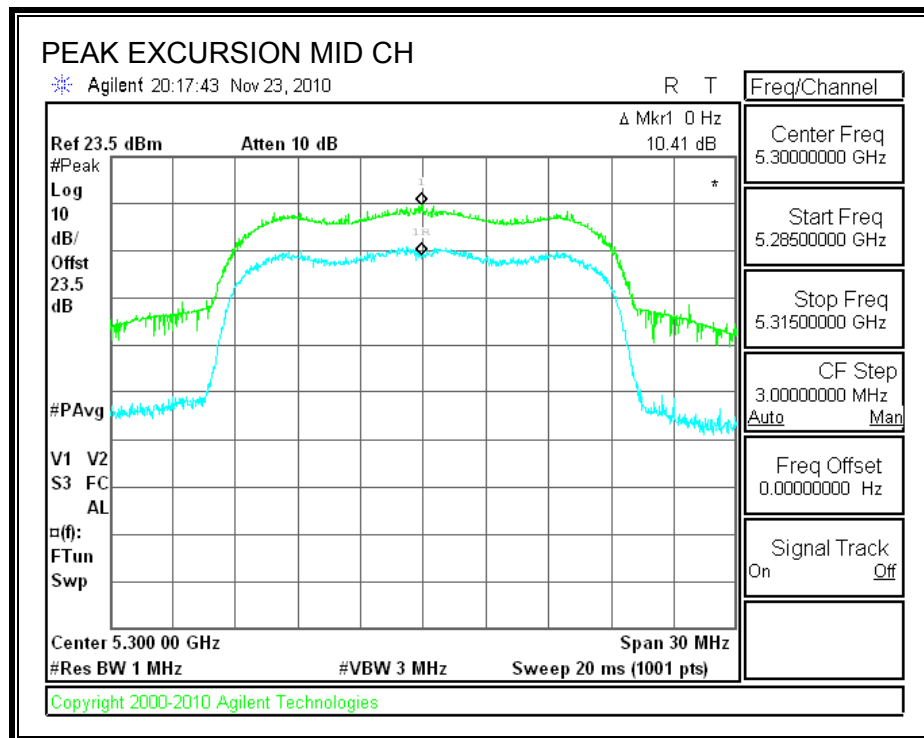
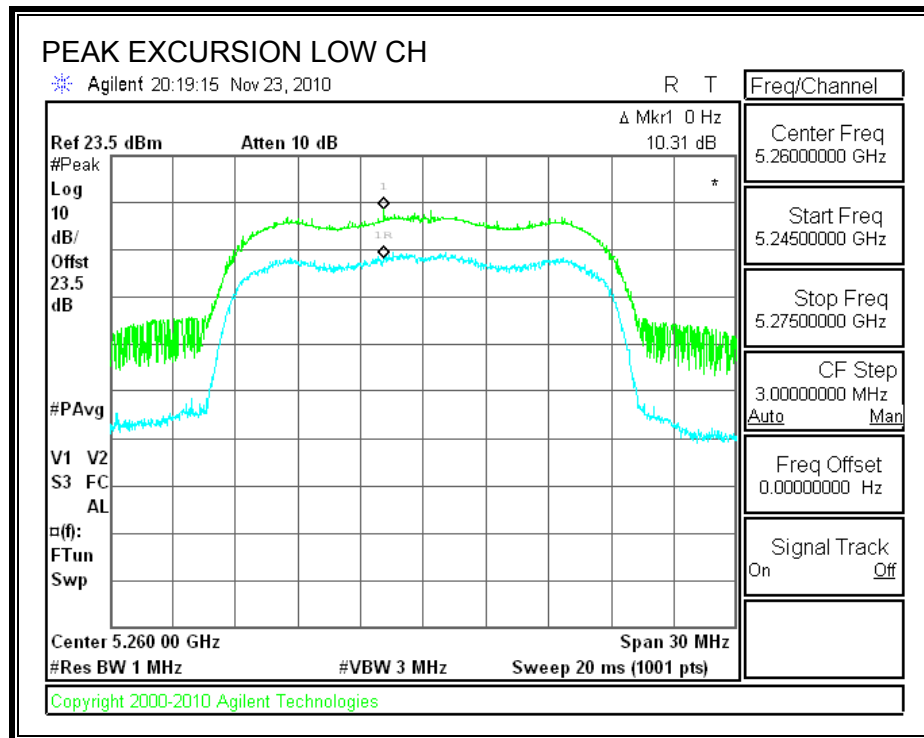
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	10.31	13	-2.69
Middle	5300	10.41	13	-2.59
High	5320	10.81	13	-2.19

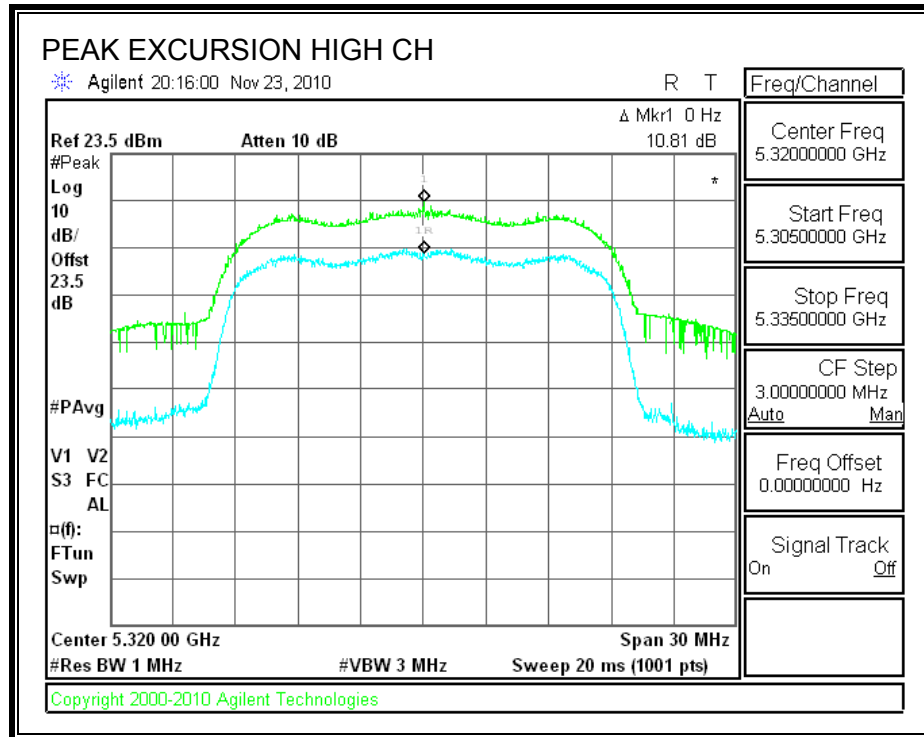
#### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	9.28	13	-3.72
Middle	5300	10.94	13	-2.06
High	5320	9.99	13	-3.01

## CHAIN 1

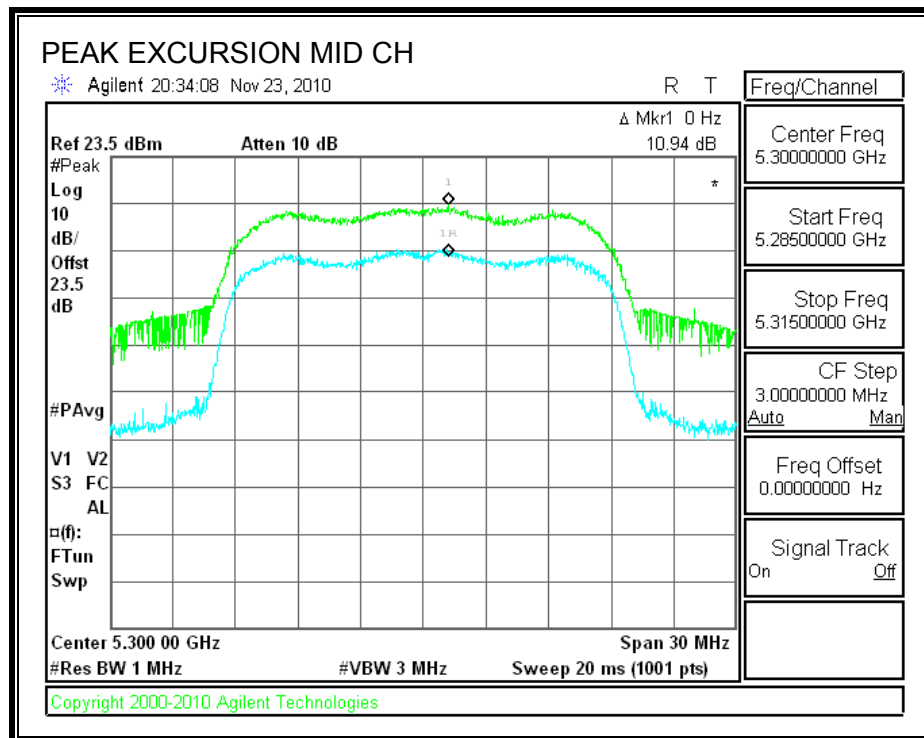
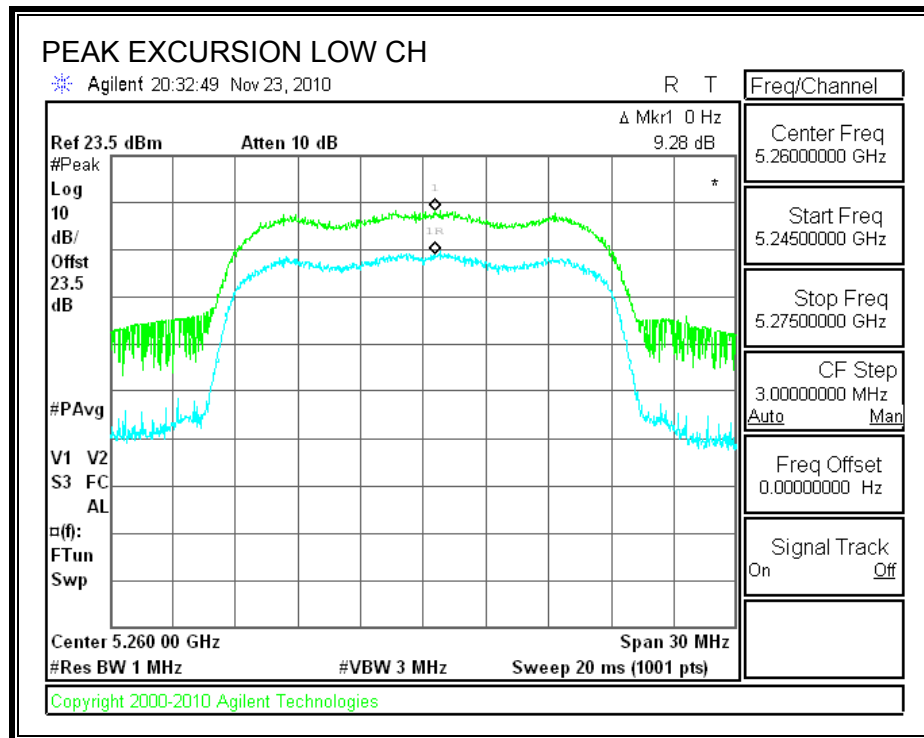
### PEAK EXCURSION

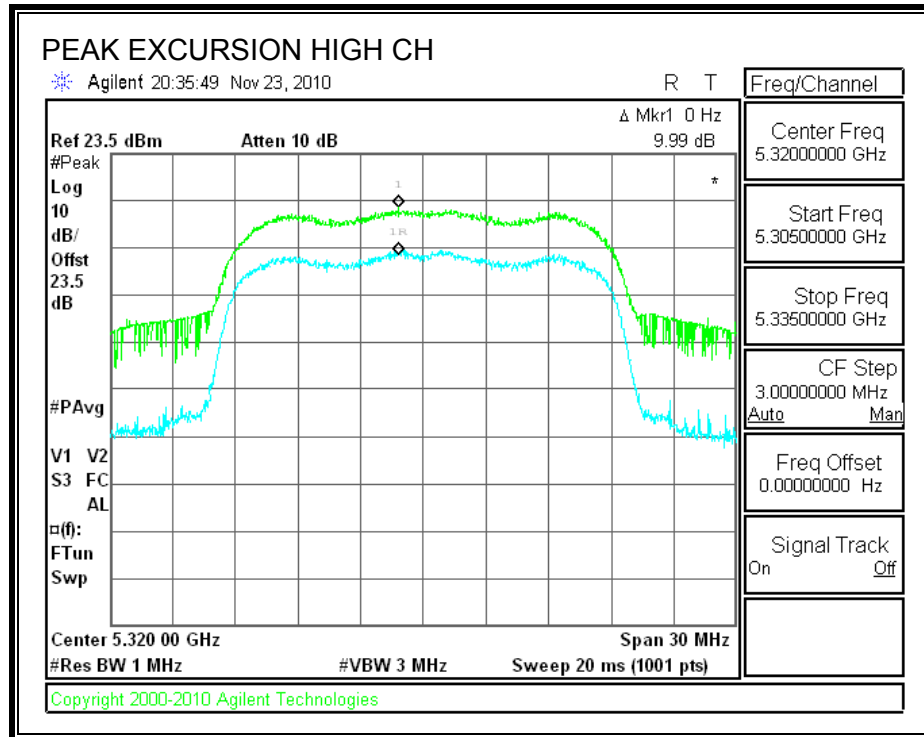




## CHAIN 2

### PEAK EXCURSION





## **7.5.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.25-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

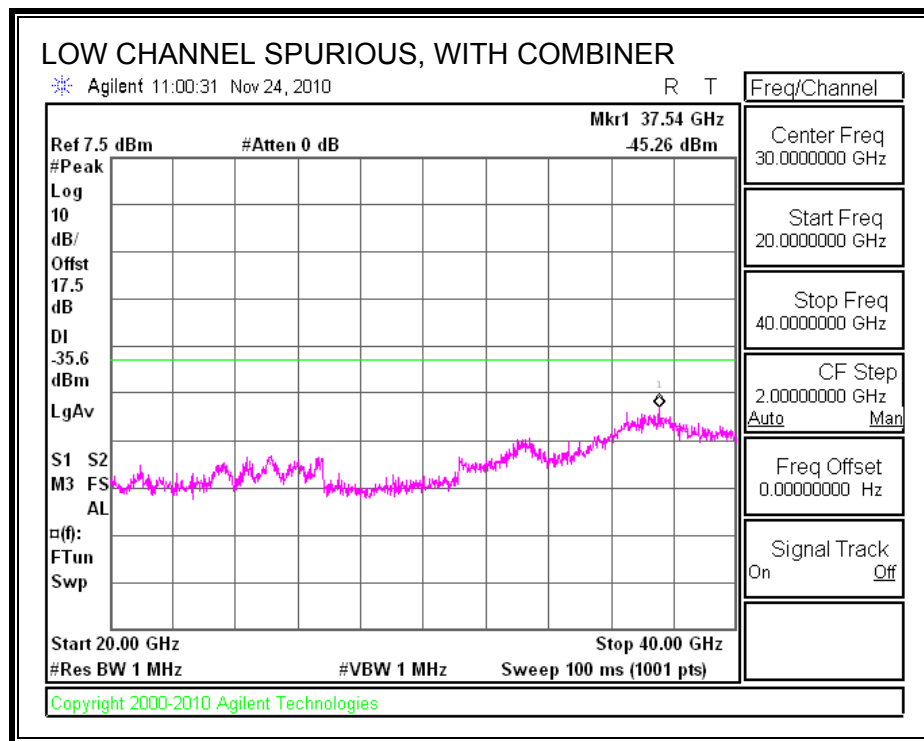
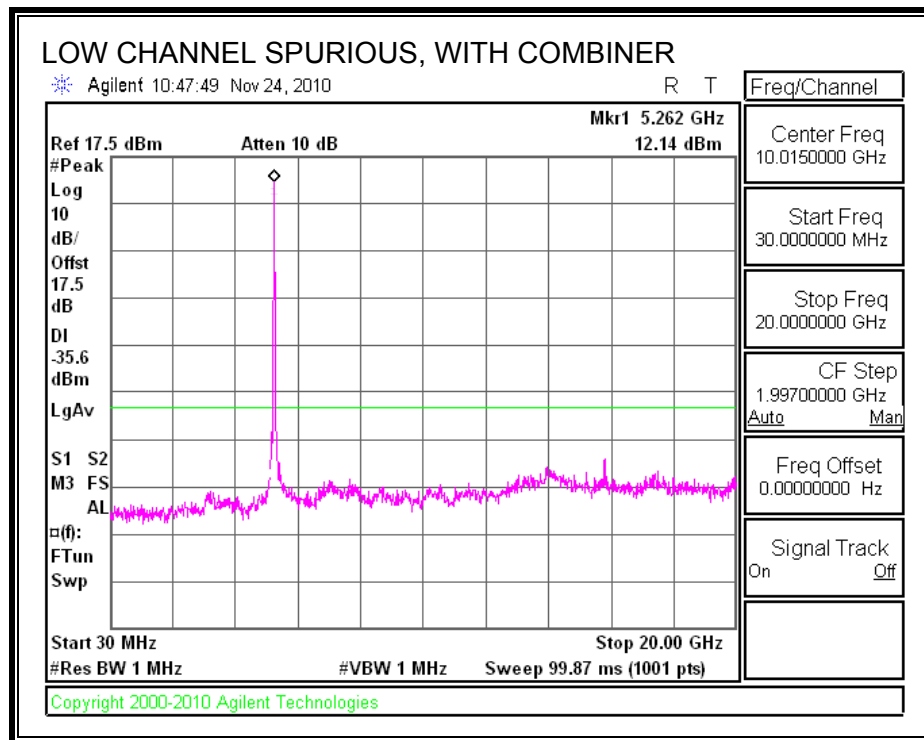
### **TEST PROCEDURE**

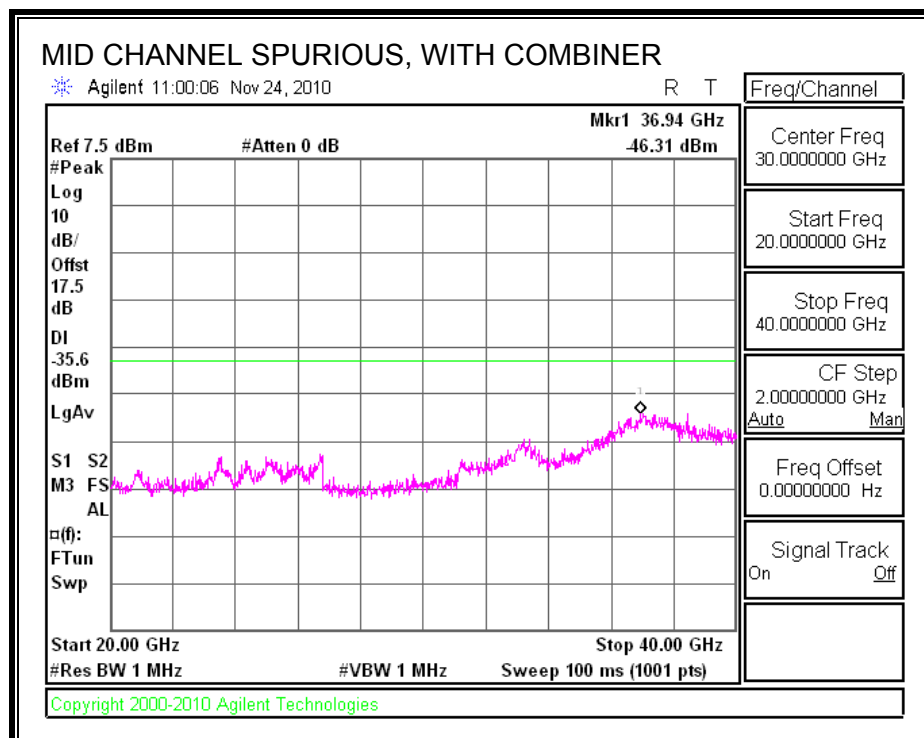
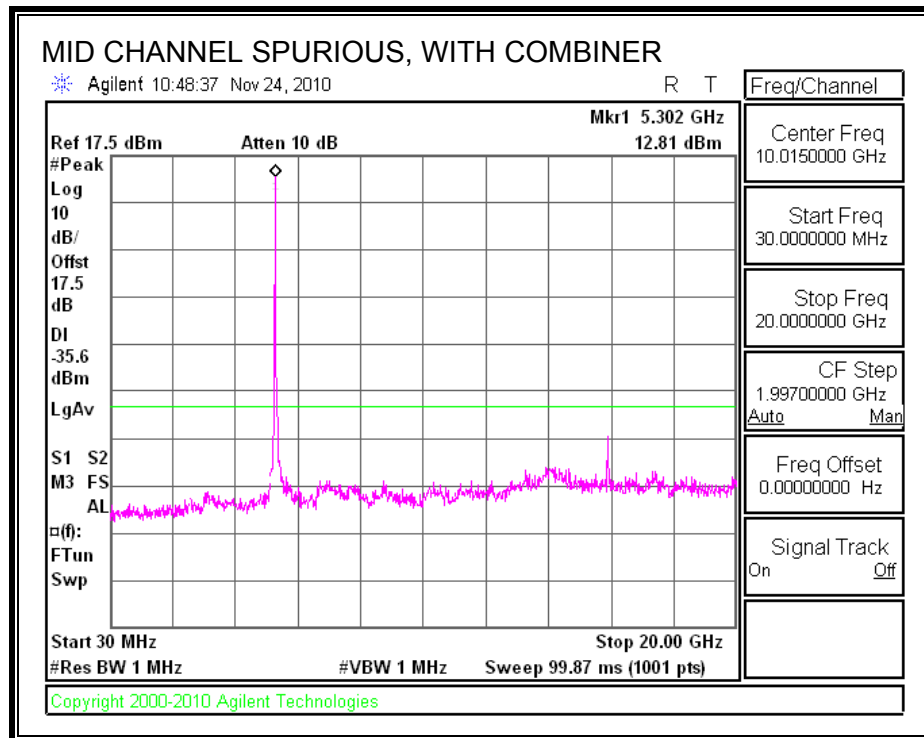
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

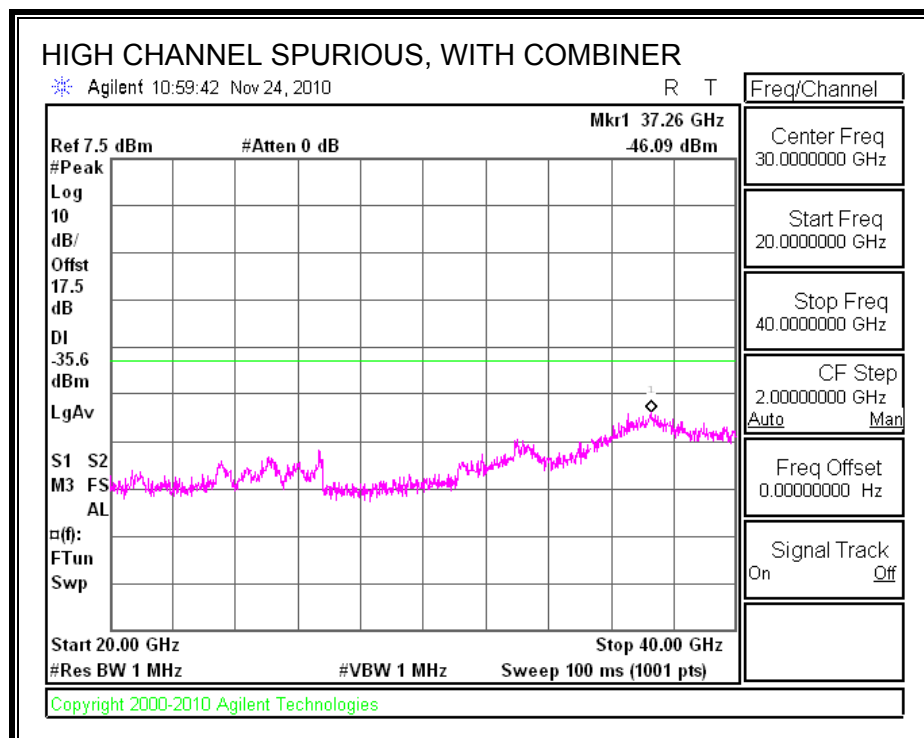
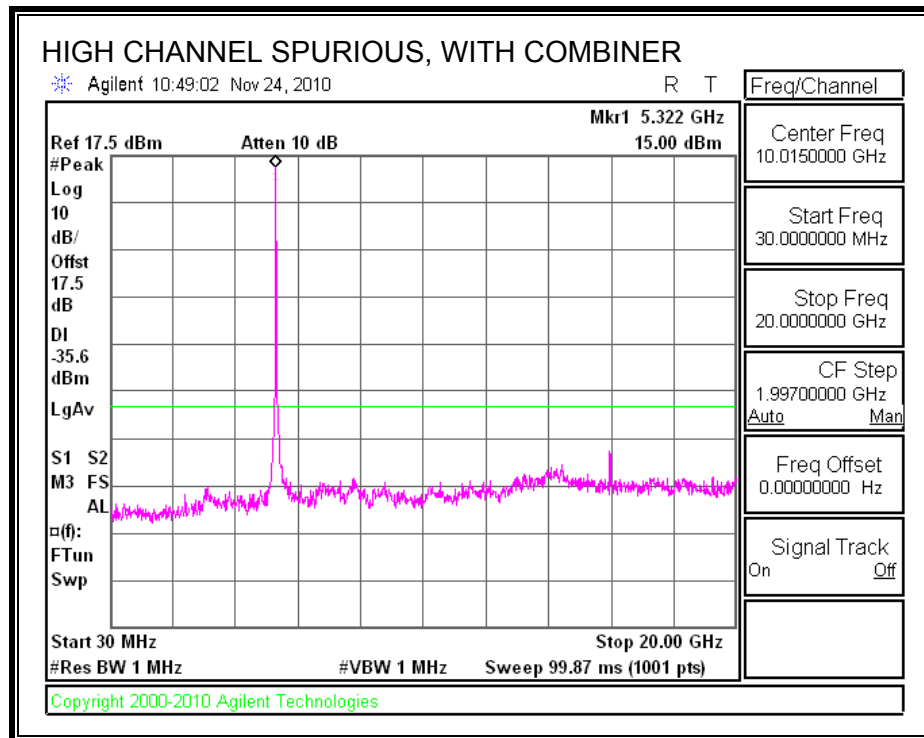
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

# SPURIOUS EMISSIONS WITH COMBINER







## 7.6. 802.11n HT40 MODE IN THE 5.3 GHz BAND

### 7.6.1. 26 dB and 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### RESULTS

##### CHAIN 1

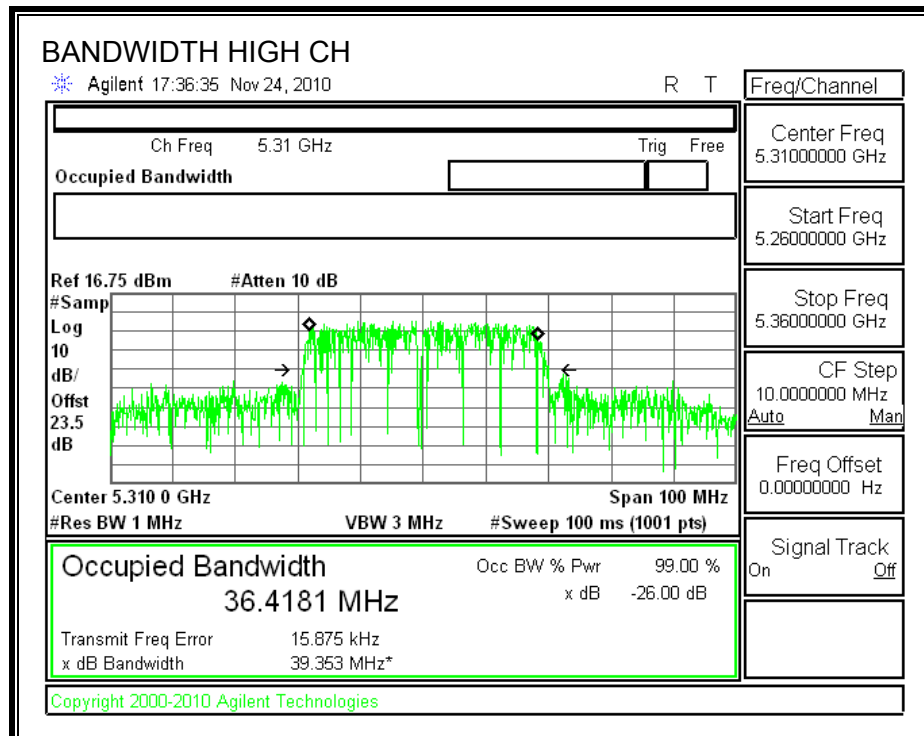
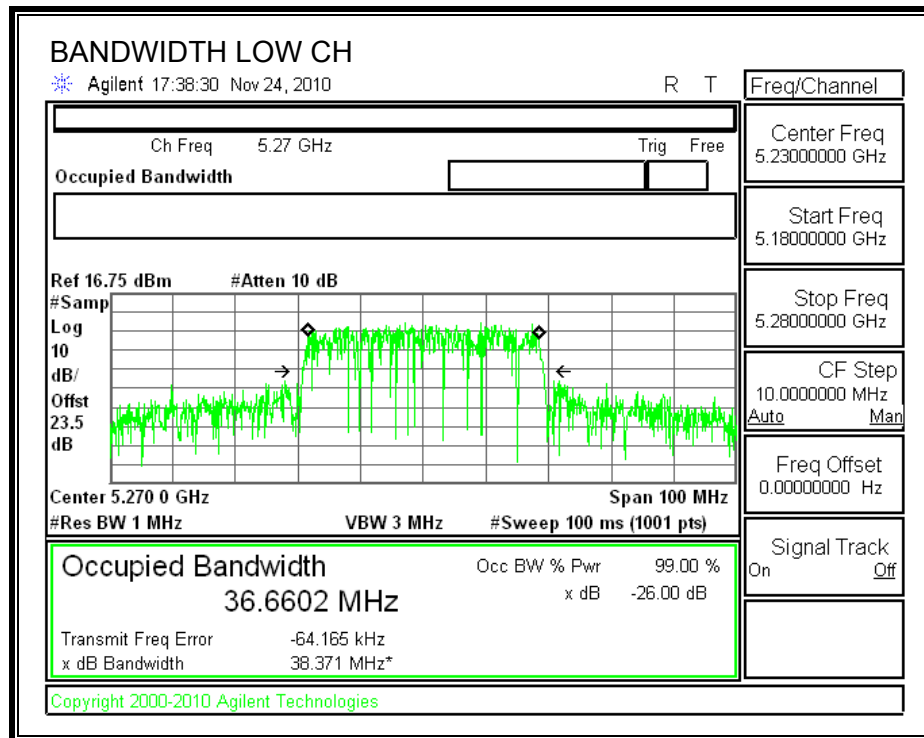
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	38.371	36.6602
High	5310	39.353	36.4181

##### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	38.499	36.8208
High	5310	38.529	36.6112

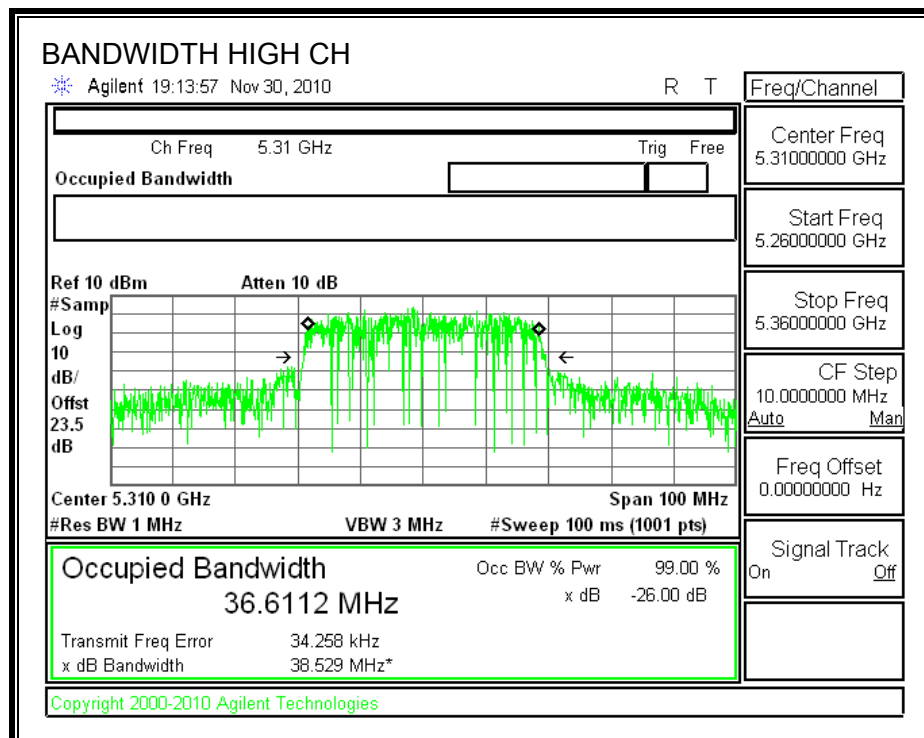
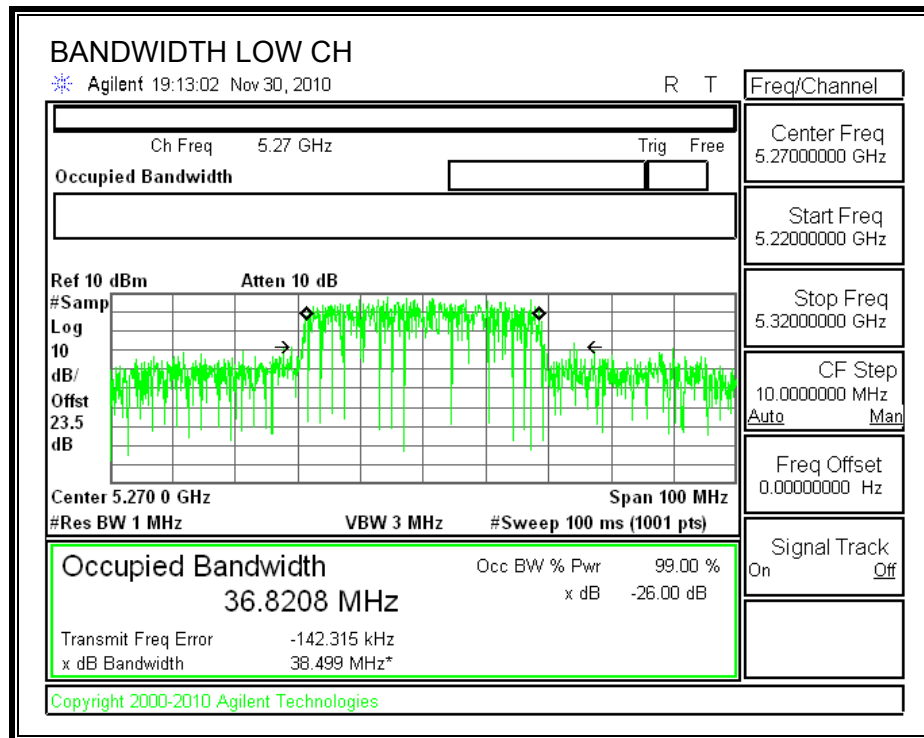
## CHAIN 1

### 26 dB and 99% BANDWIDTH



## CHAIN 2

### 26 dB and 99% BANDWIDTH



## 7.6.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

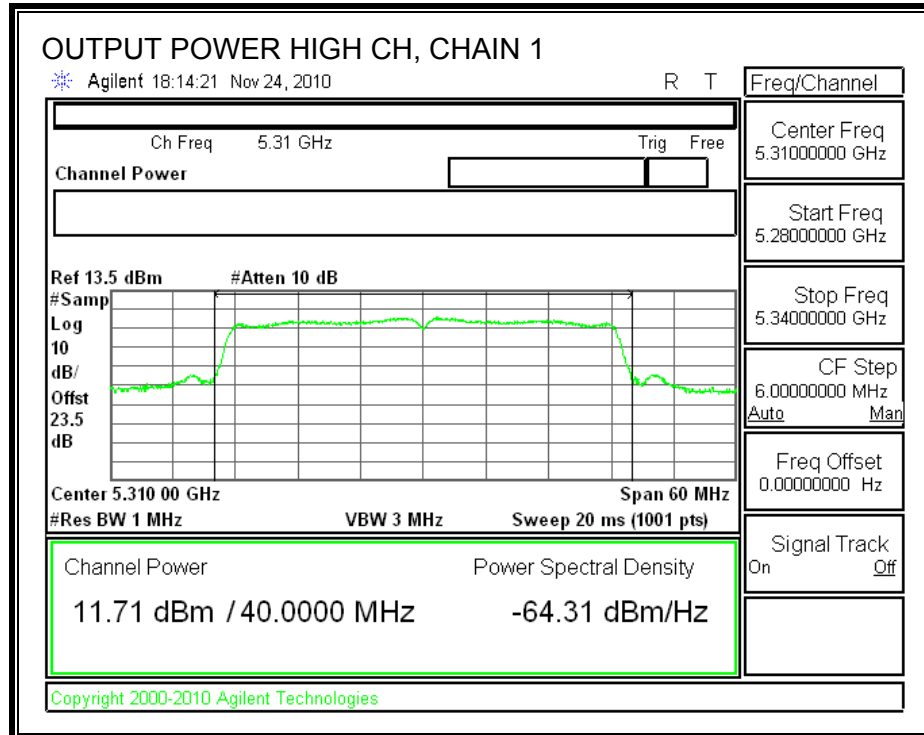
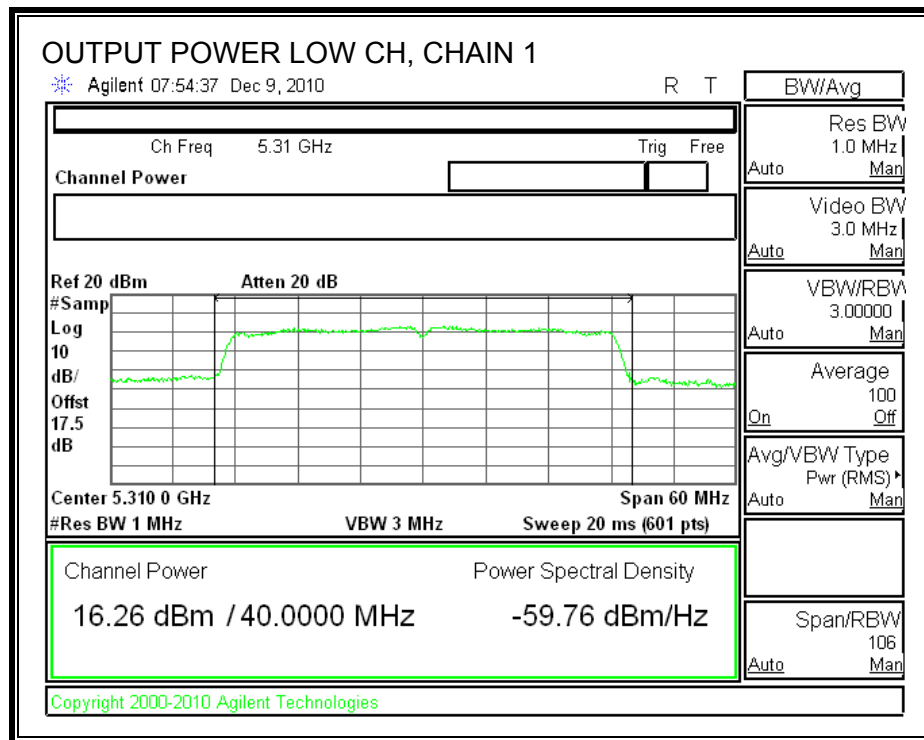
#### Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5270	24	38.499	26.85	8.61	21.39
High	5310	24	39.353	26.95	8.61	21.39

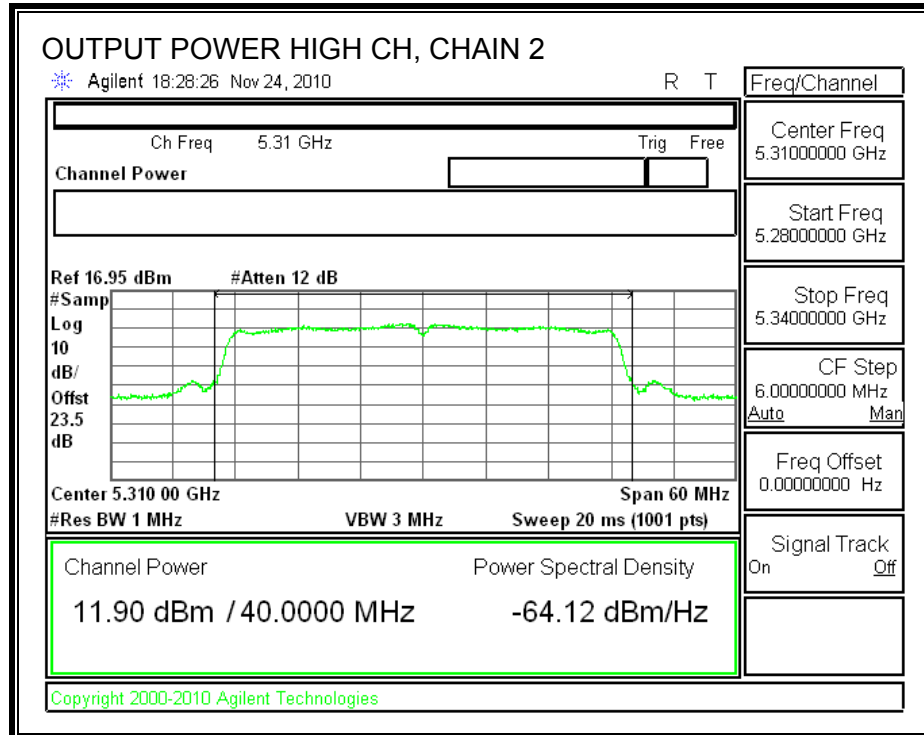
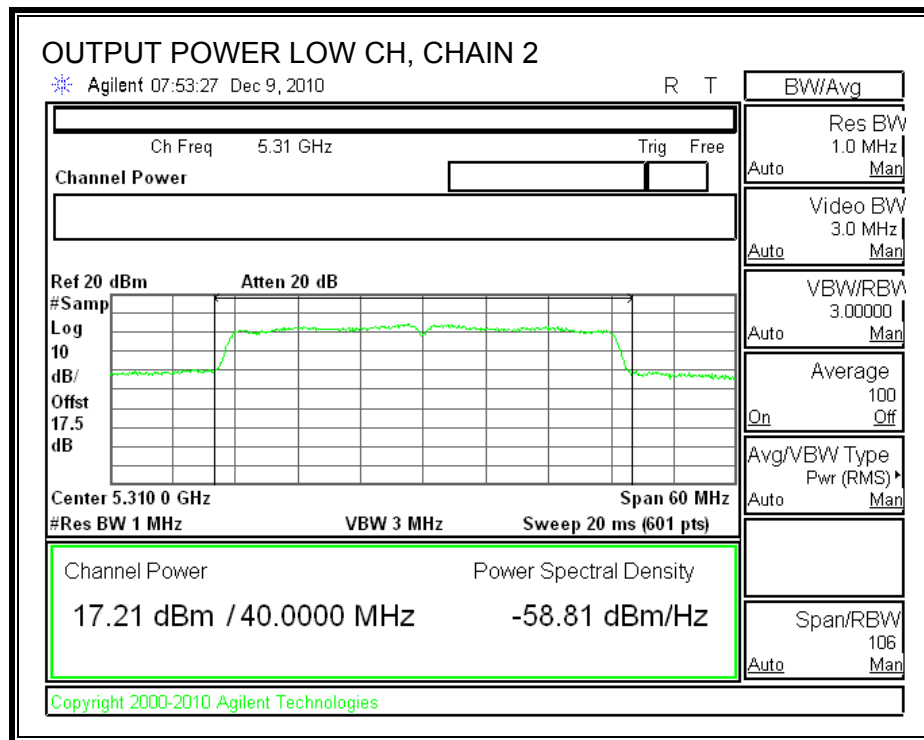
#### Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	16.26	17.21	19.77	21.39	-1.62
High	5310	11.71	11.90	14.82	21.39	-6.57

# **CHAIN 1 OUTPUT POWER**



## CHAIN 2 OUTPUT POWER



### 7.6.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 8.61 dBi, therefore the limit is 8.39 dBm.

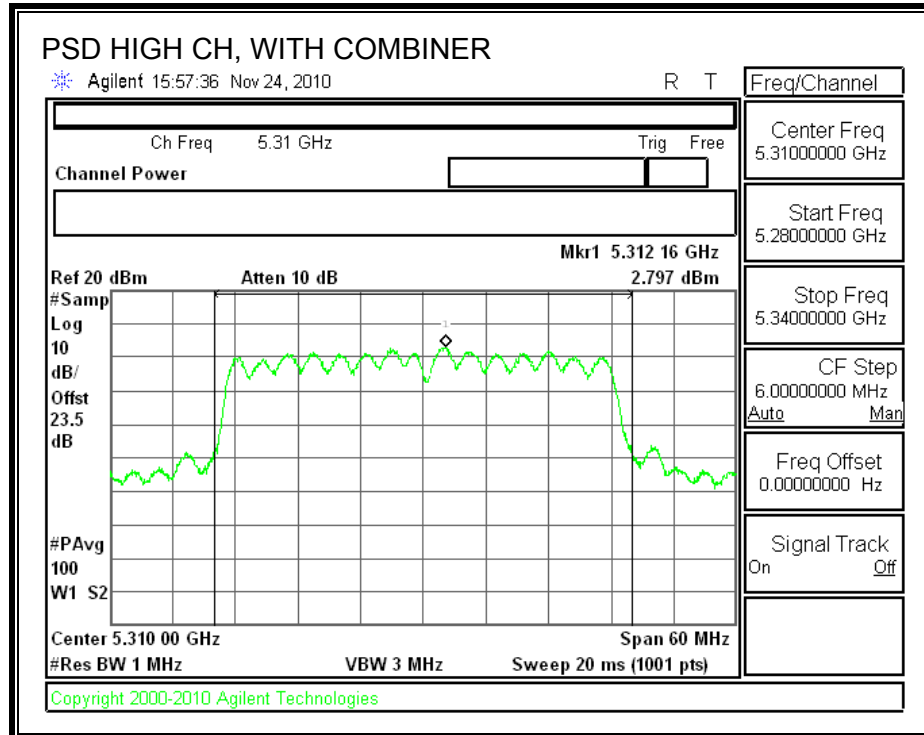
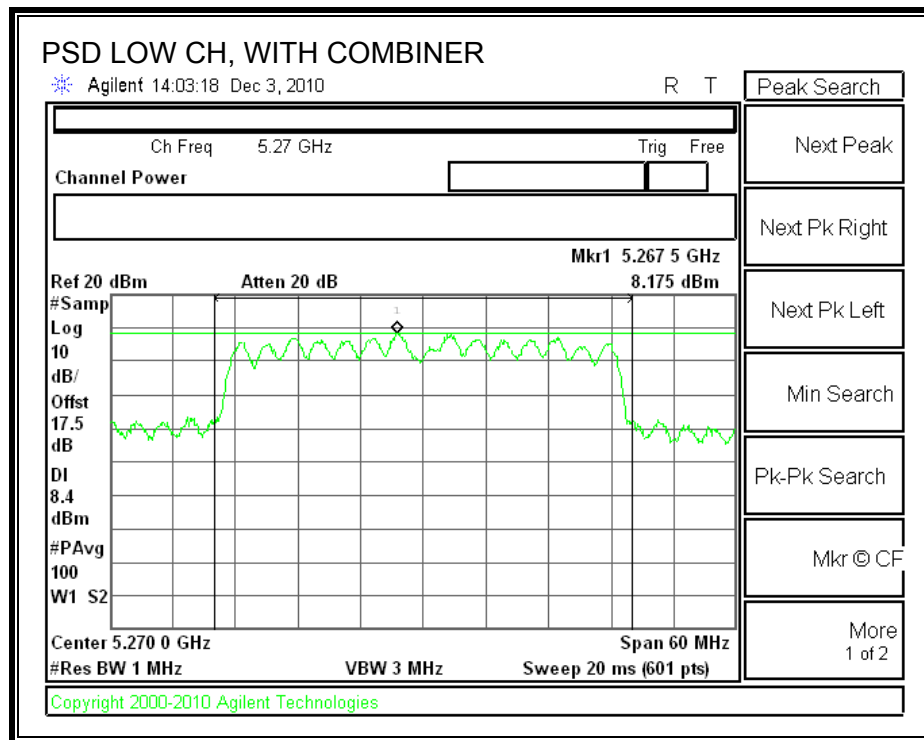
#### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5270	8.18	8.39	-0.22
High	5310	2.80	8.39	-5.59

# **POWER SPECTRAL DENSITY WITH COMBINER**



## 7.6.4. 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.

### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

#### CHAIN 1

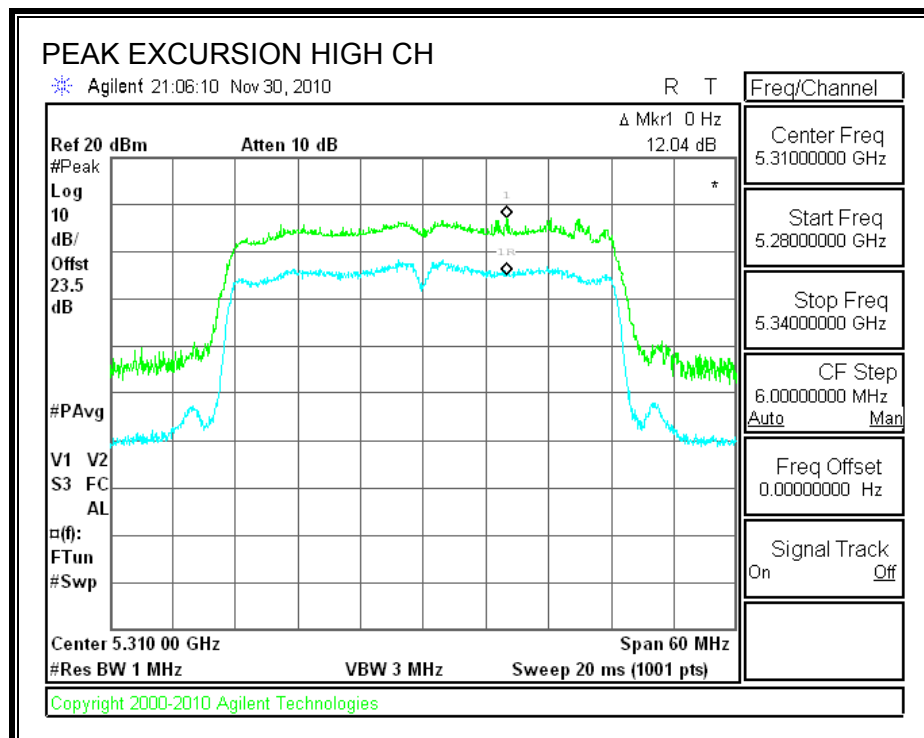
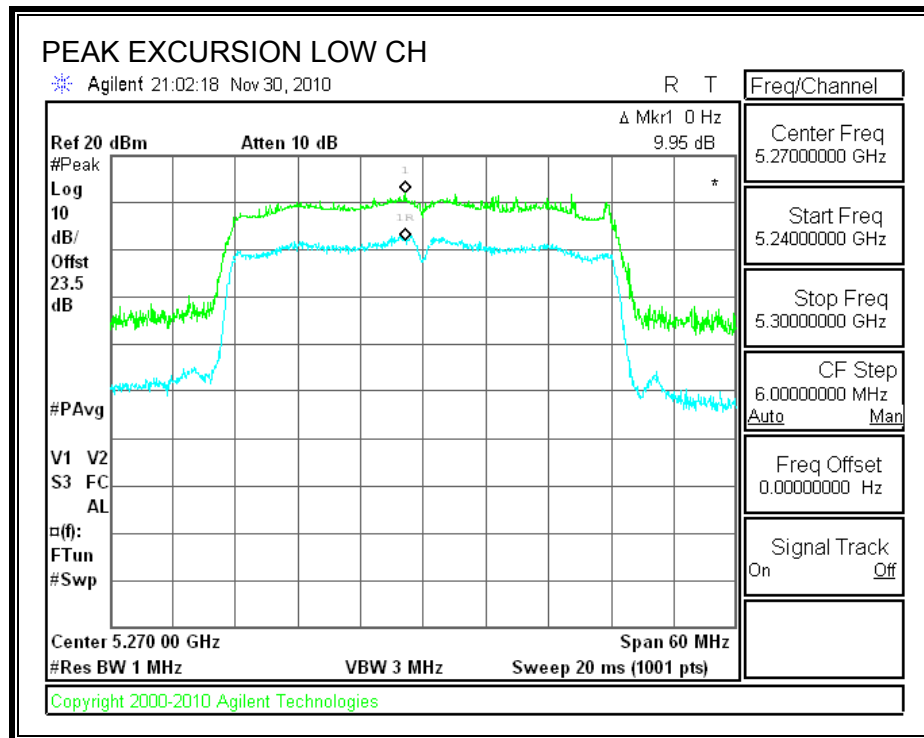
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	9.95	13	-3.05
High	5310	12.04	13	-0.96

#### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	11.62	13	-1.38
High	5310	10.54	13	-2.46

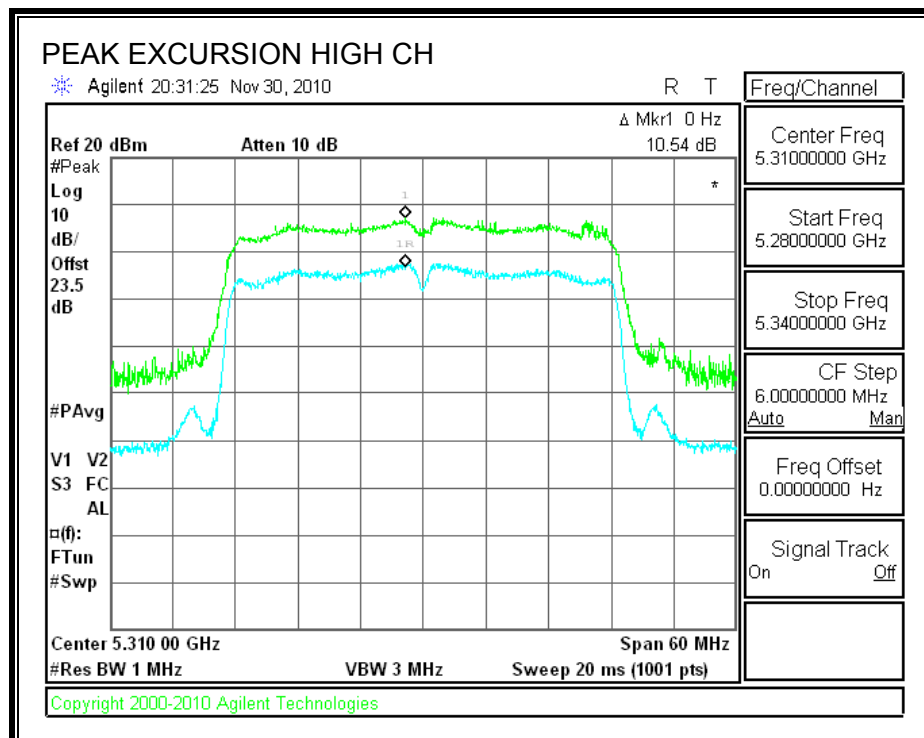
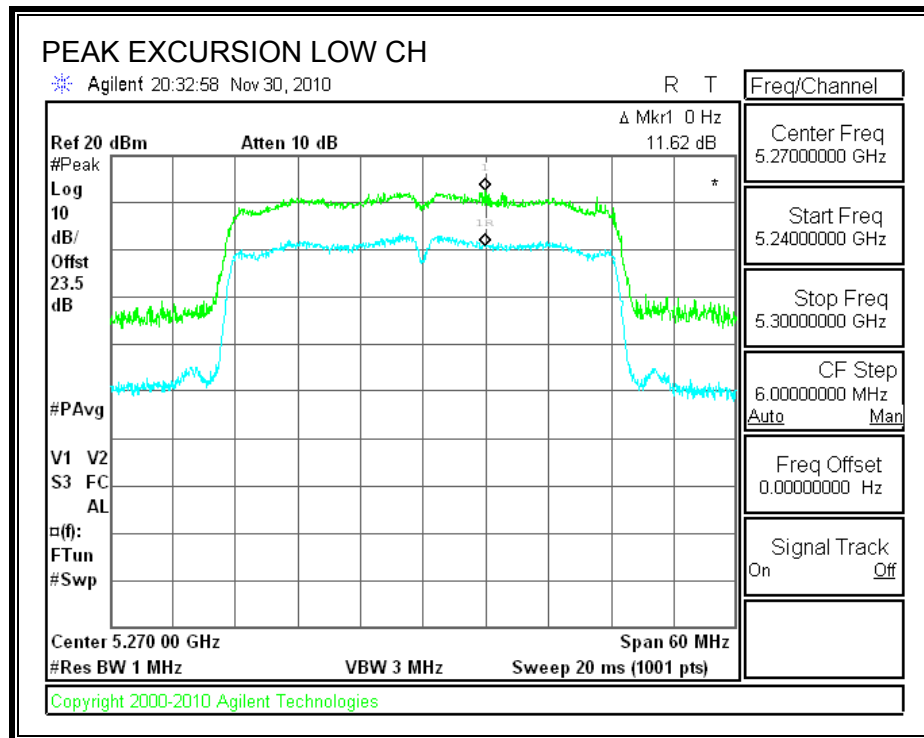
## CHAIN 1

### PEAK EXCURSION



## CHAIN 2

### PEAK EXCURSION



## **7.6.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.25-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

### **TEST PROCEDURE**

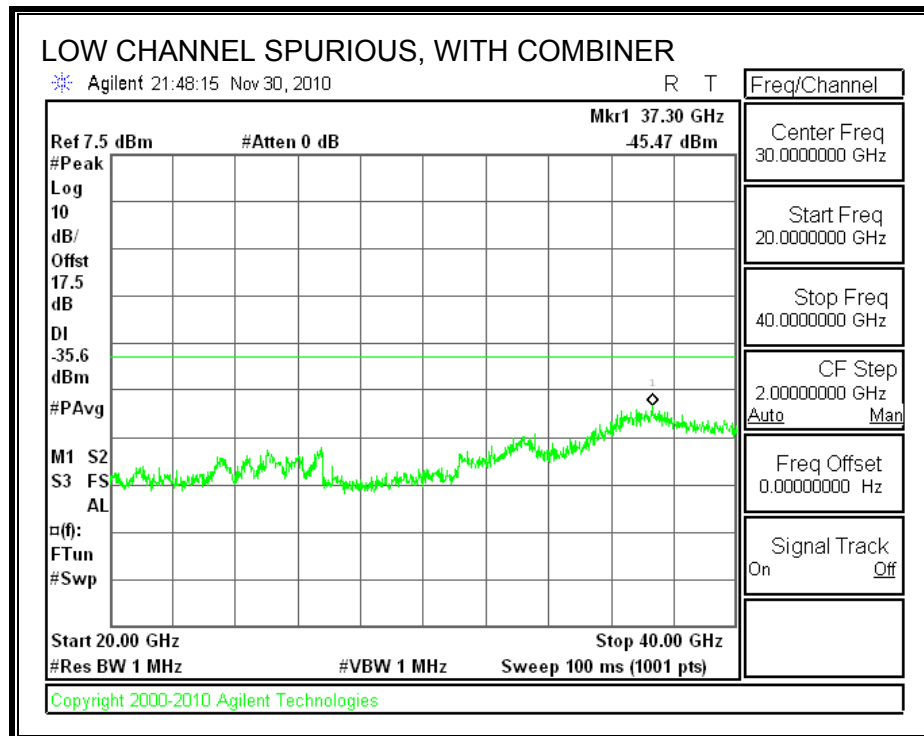
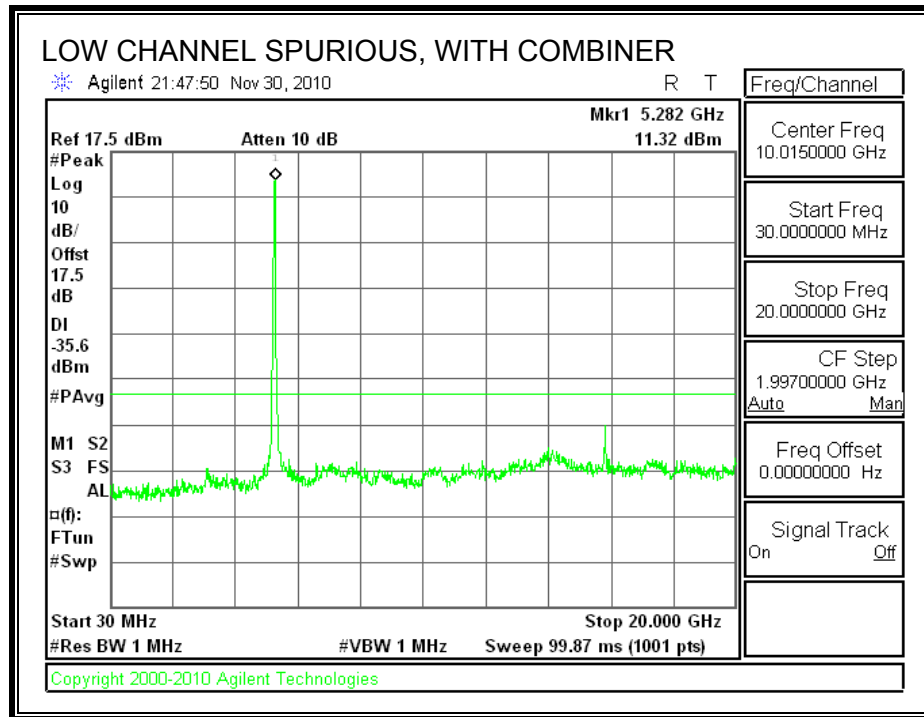
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

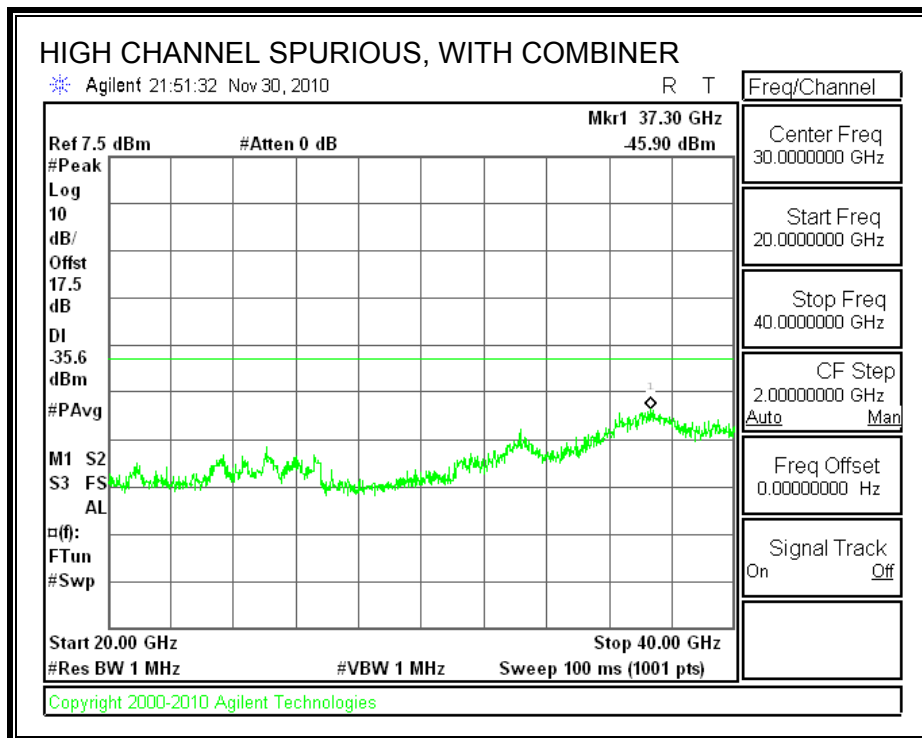
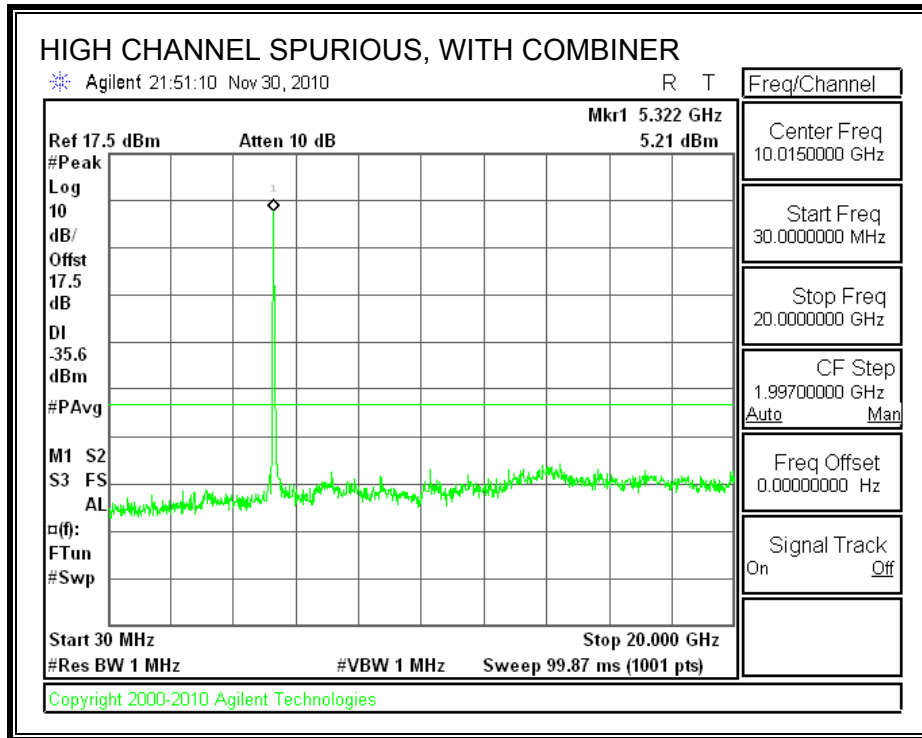
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

### SPURIOUS EMISSIONS WITH COMBINER





## **7.7. 802.11a MODE IN THE 5.6 GHz BAND**

### **7.7.1. 26 dB and 99% BANDWIDTH**

#### **LIMITS**

None; for reporting purposes only.

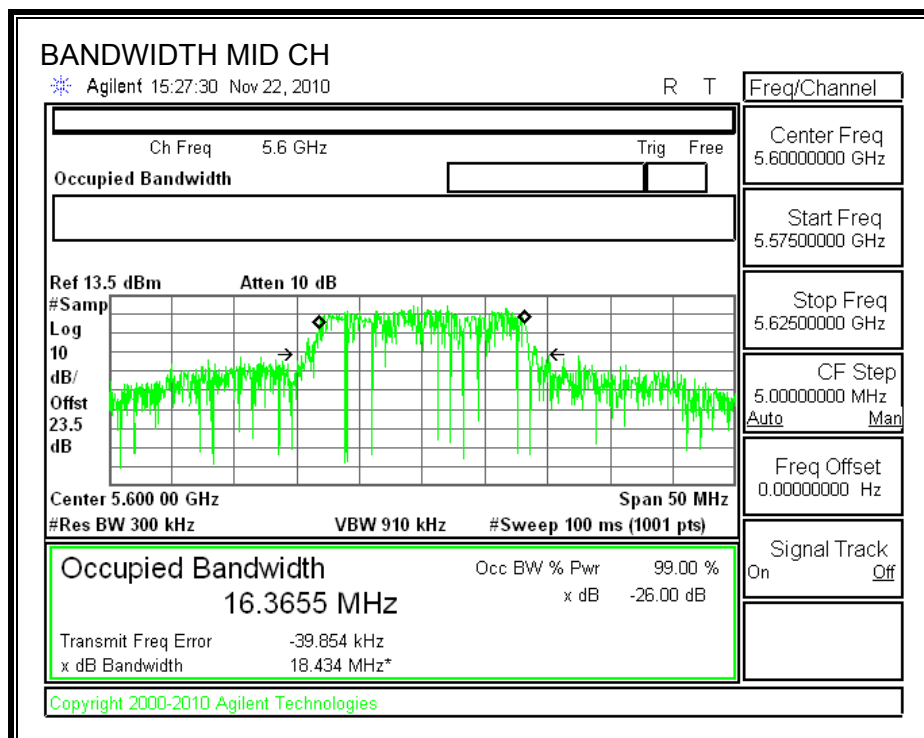
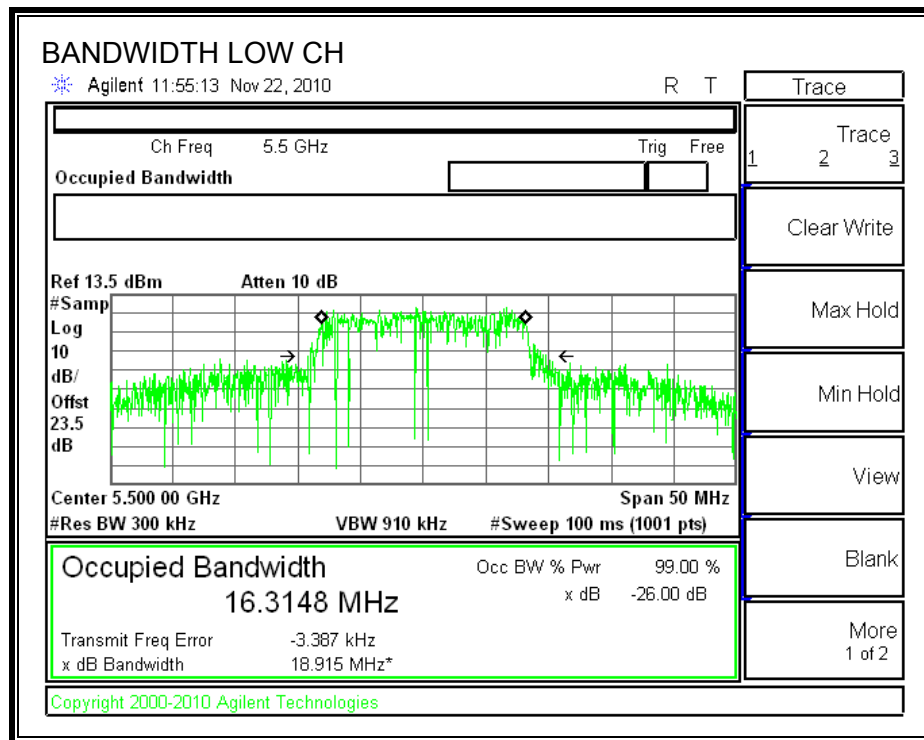
#### **TEST PROCEDURE**

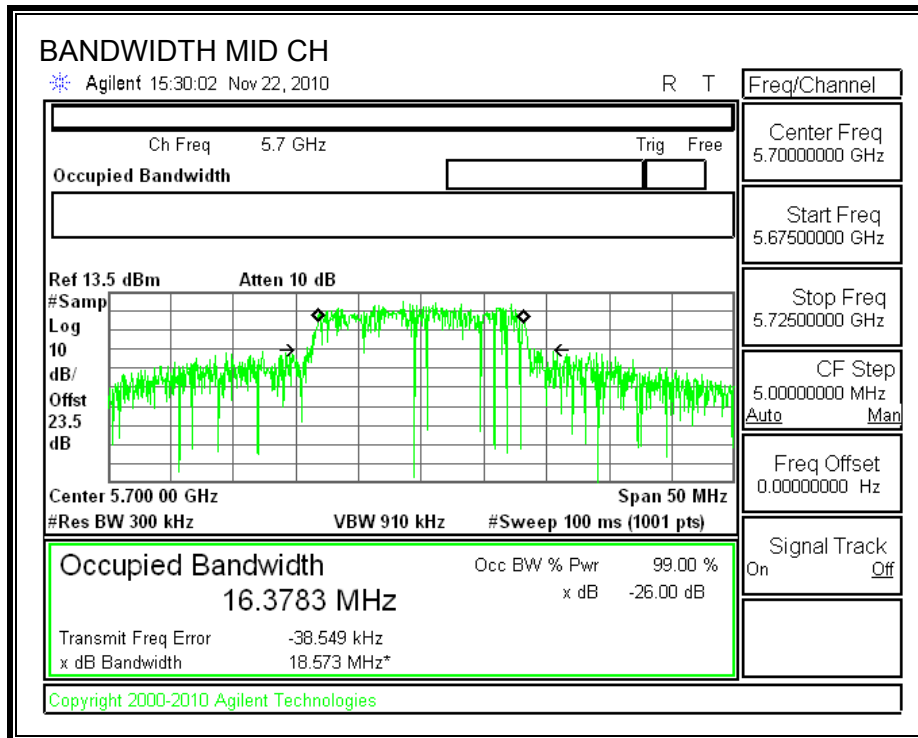
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### **RESULTS**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	18.915	16.3148
Mid	5600	18.434	16.3655
High	5700	18.573	16.3783

**26 dB and 99% BANDWIDTH**





## 7.7.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

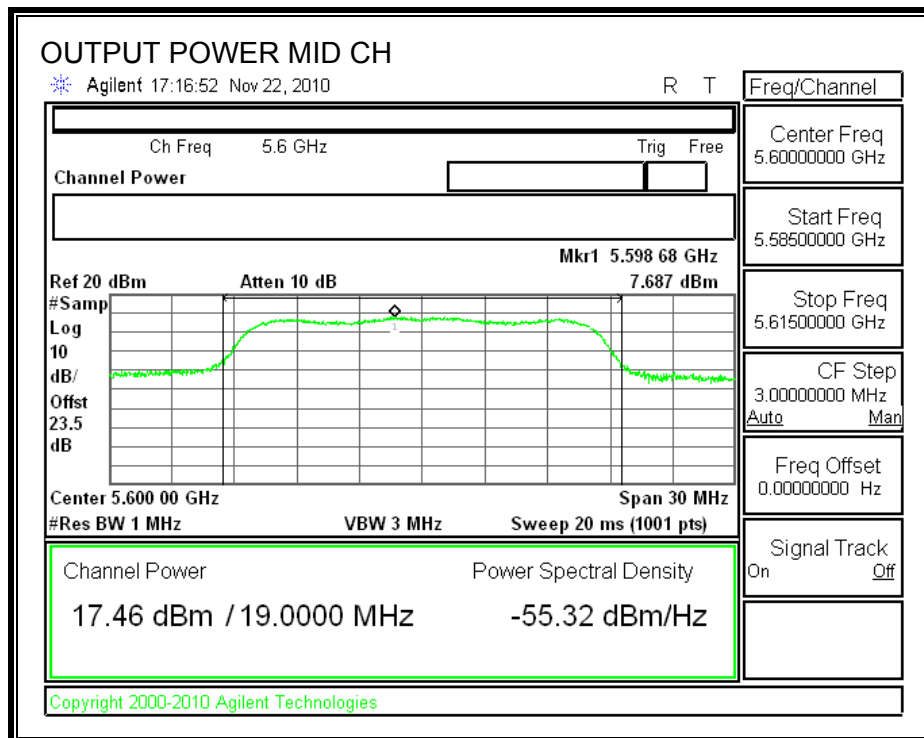
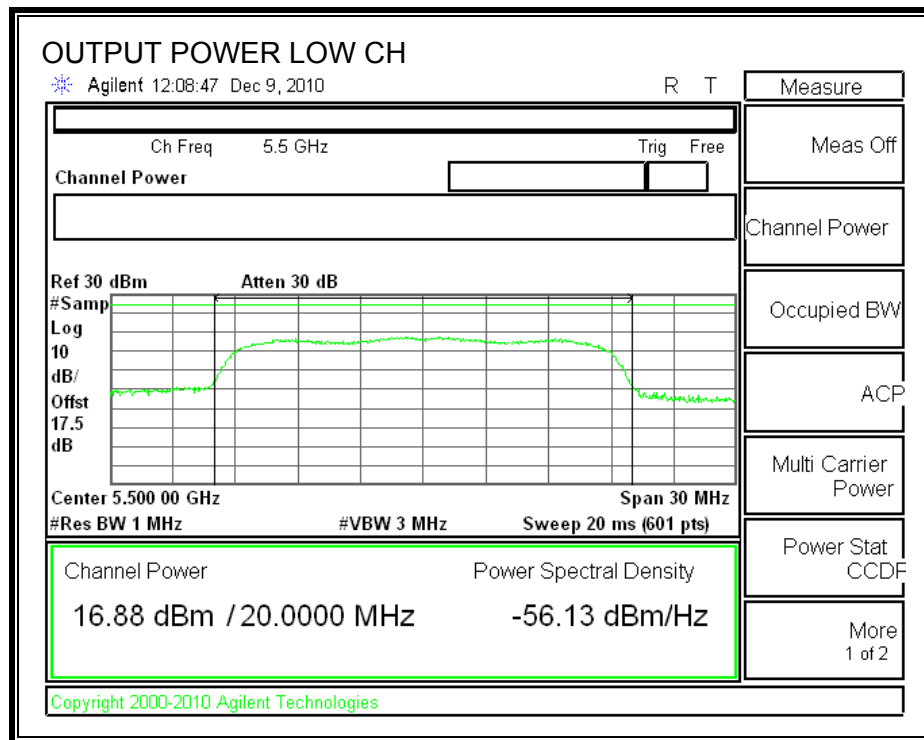
#### Limit

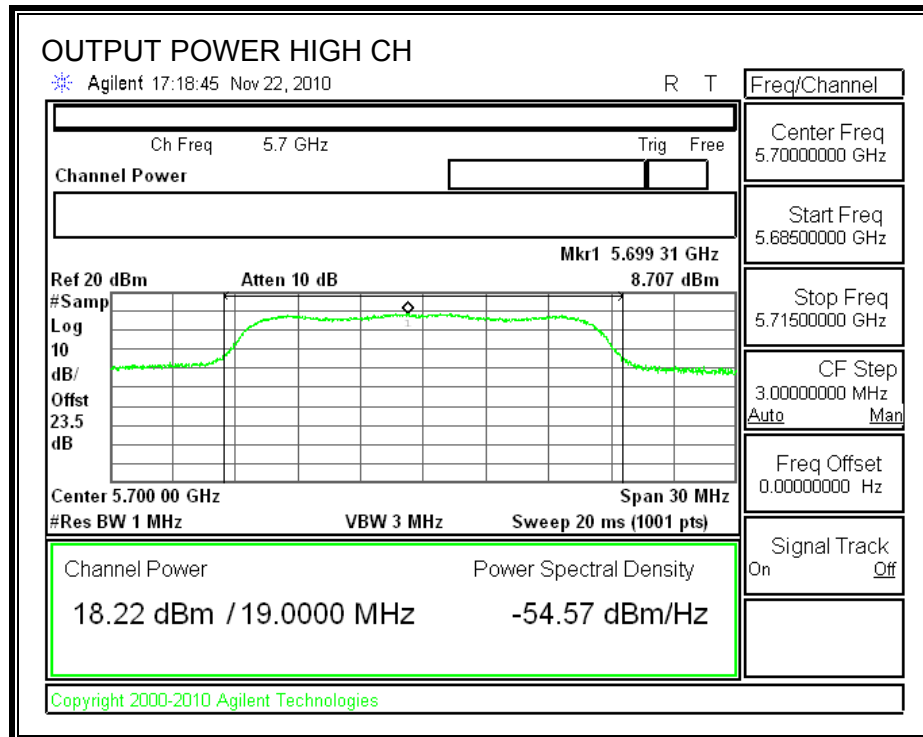
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	18.915	23.77	4.20	23.77
Mid	5600	24	18.434	23.66	4.20	23.66
High	5700	24	18.573	23.69	4.20	23.69

#### Individual Chain Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	16.88	23.77	-6.89
Mid	5600	17.46	23.66	-6.20
High	5700	18.22	23.69	-5.47

## OUTPUT POWER





### 7.7.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 4.20 dBi, therefore the limit is 11 dBm.

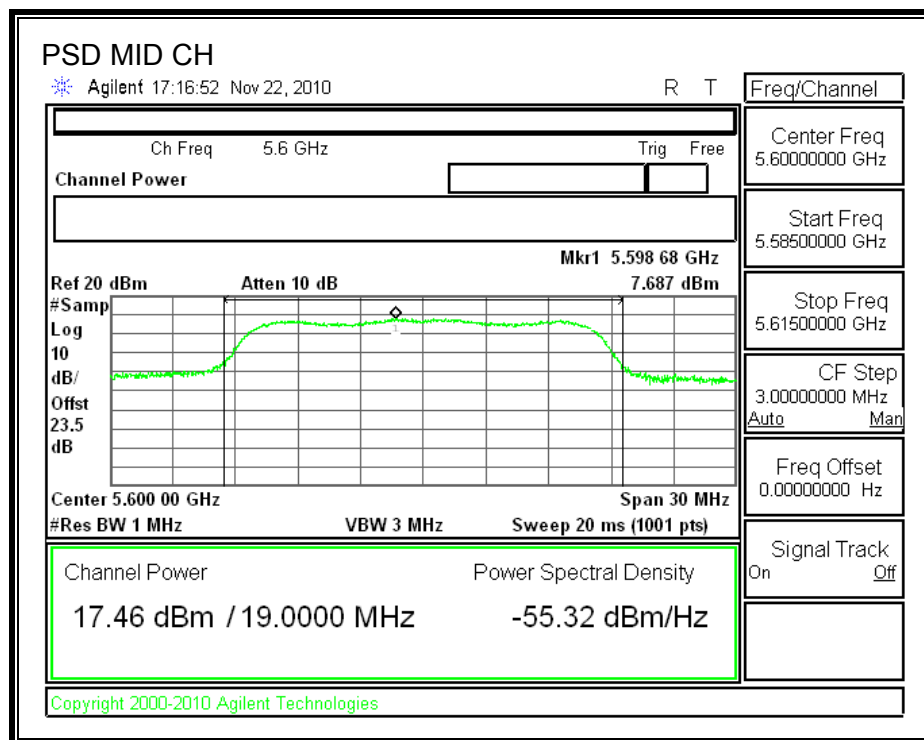
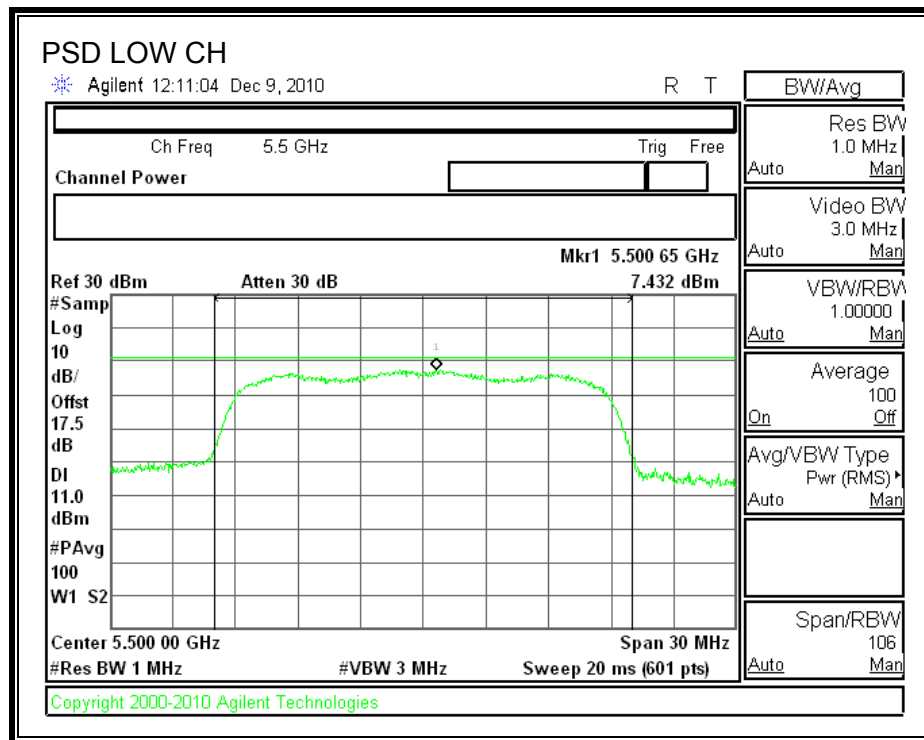
#### TEST PROCEDURE

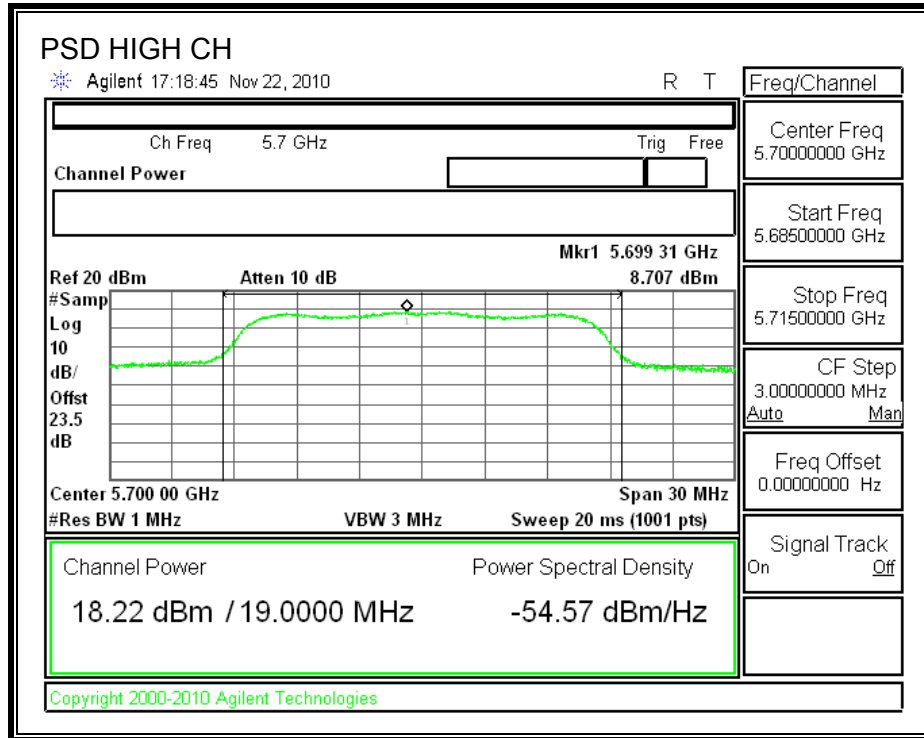
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	7.432	11.00	-3.57
Mid	5590	7.687	11.00	-3.31
High	5670	8.707	11.00	-2.29

# POWER SPECTRAL DENSITY





#### 7.7.4. 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.

##### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

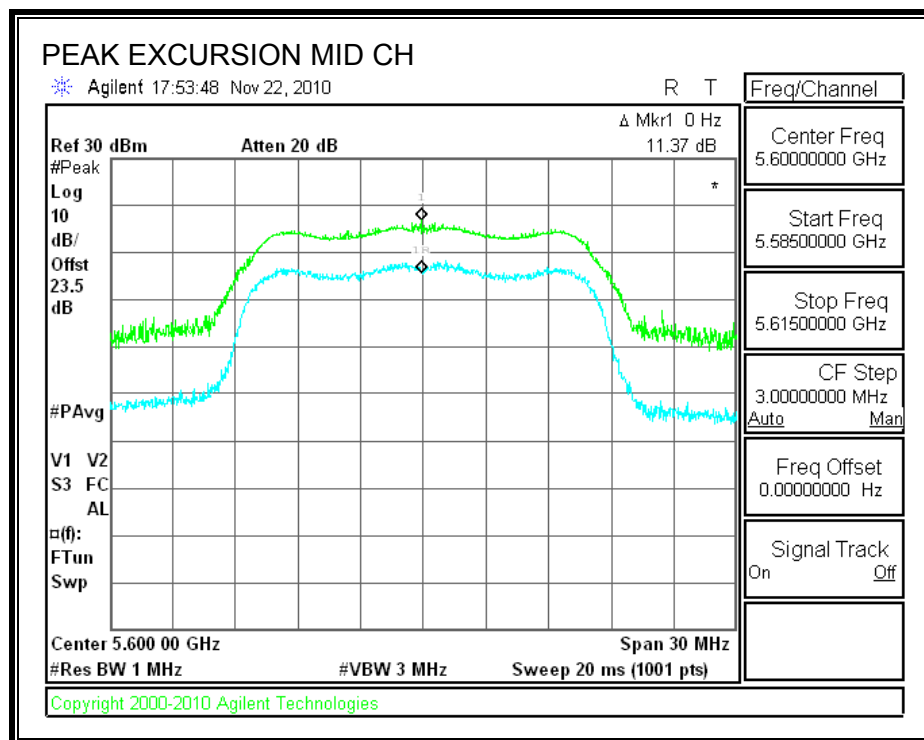
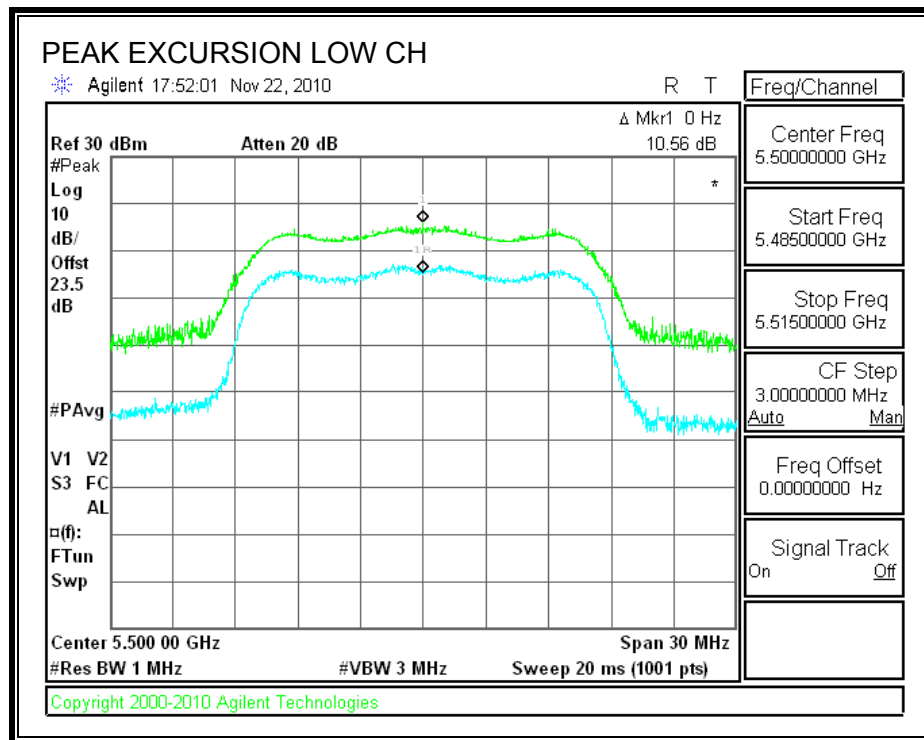
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

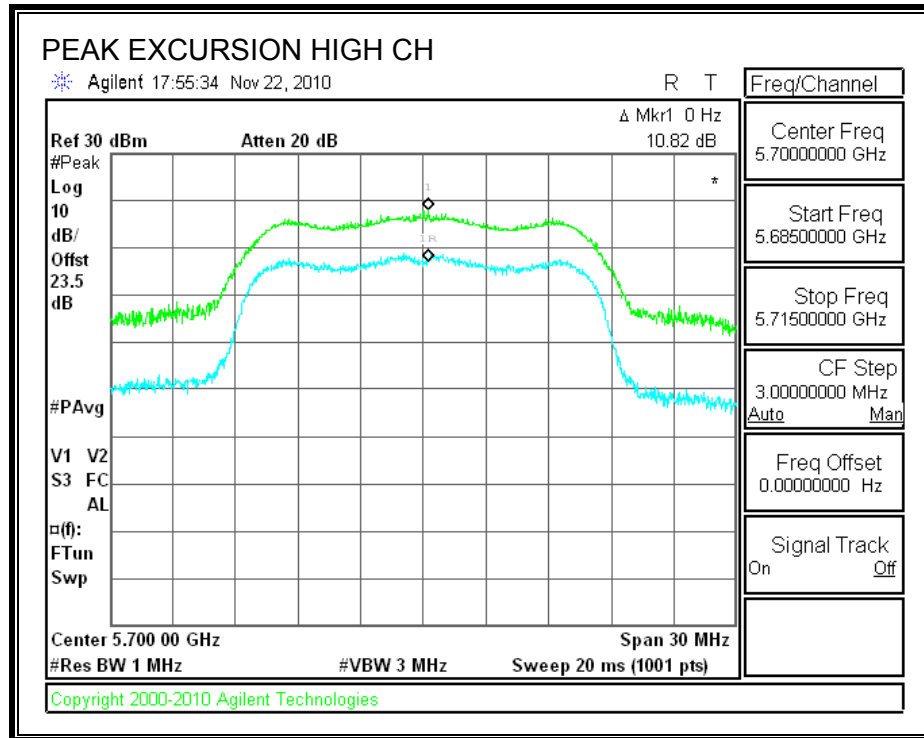
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

##### RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	10.56	13	-2.44
Mid	5600	11.37	13	-1.63
High	5700	10.82	13	-2.18

## PEAK EXCURSION





## **7.7.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

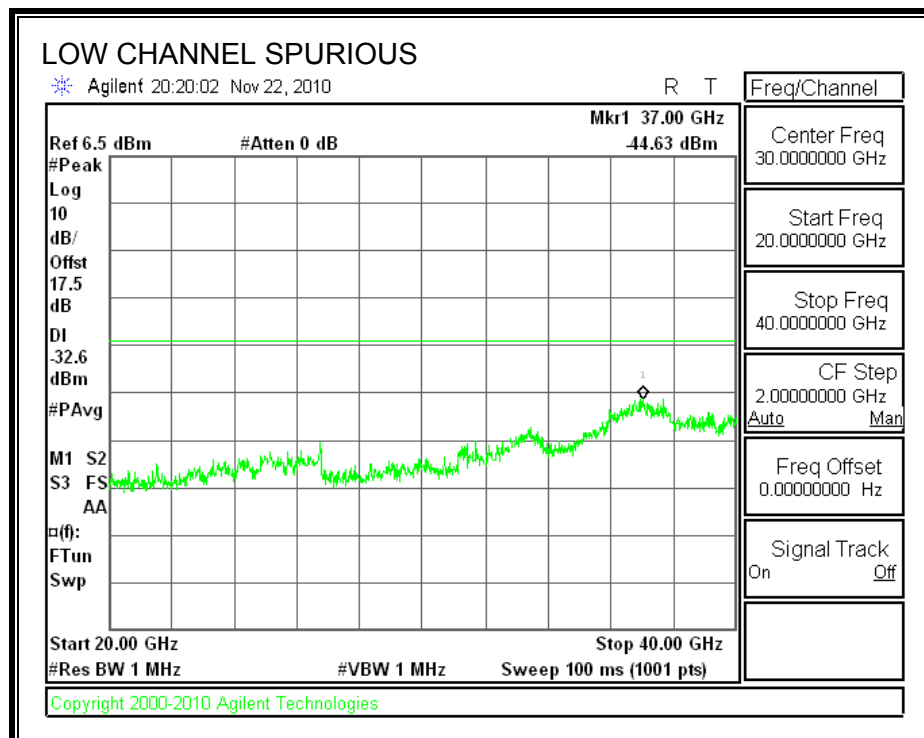
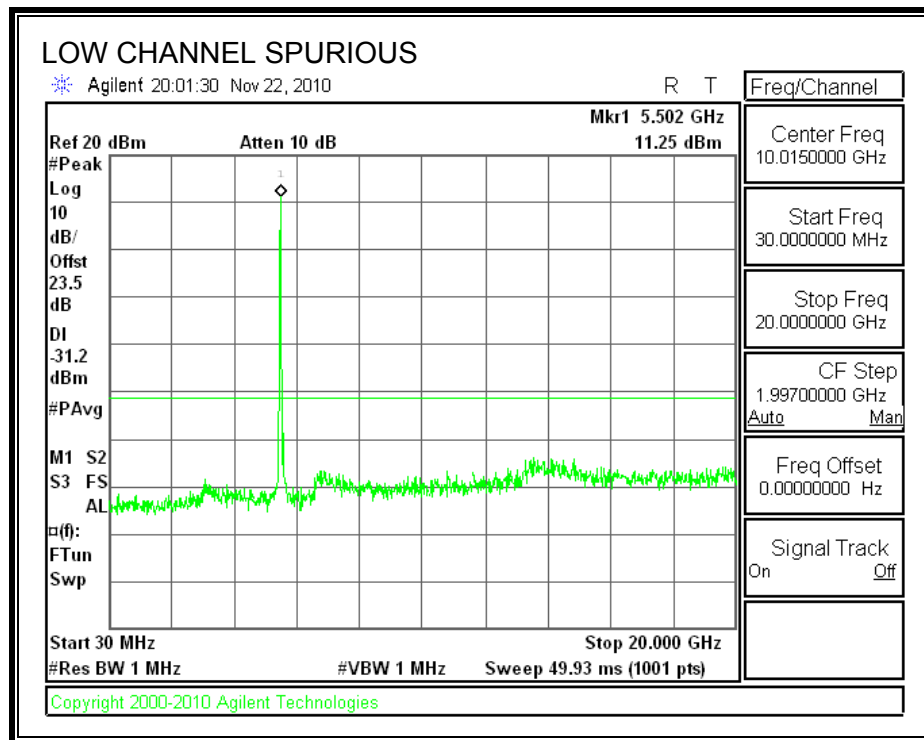
### **TEST PROCEDURE**

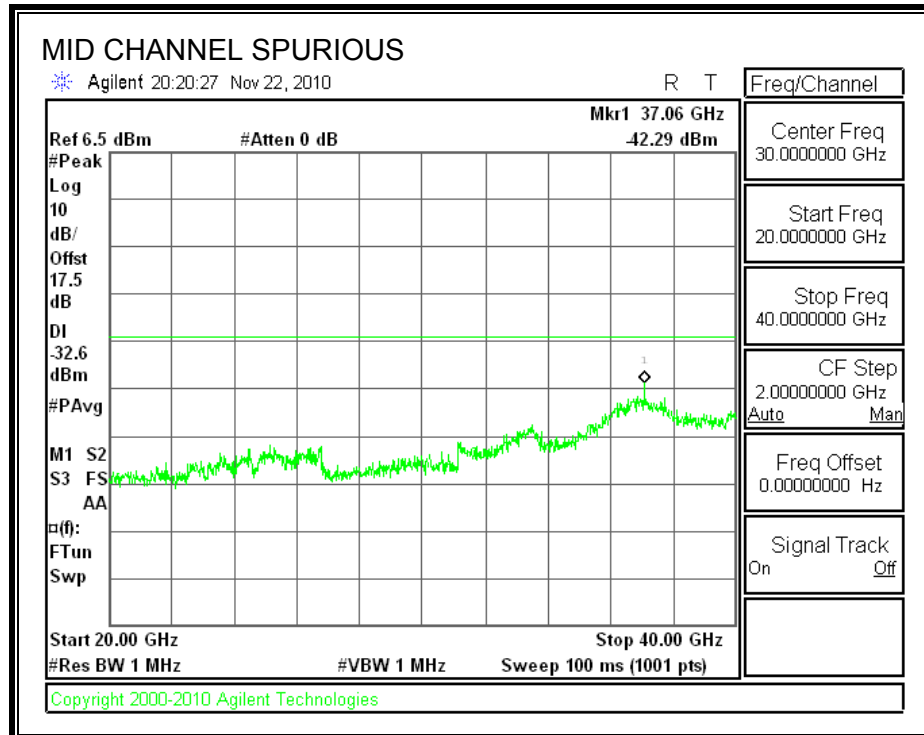
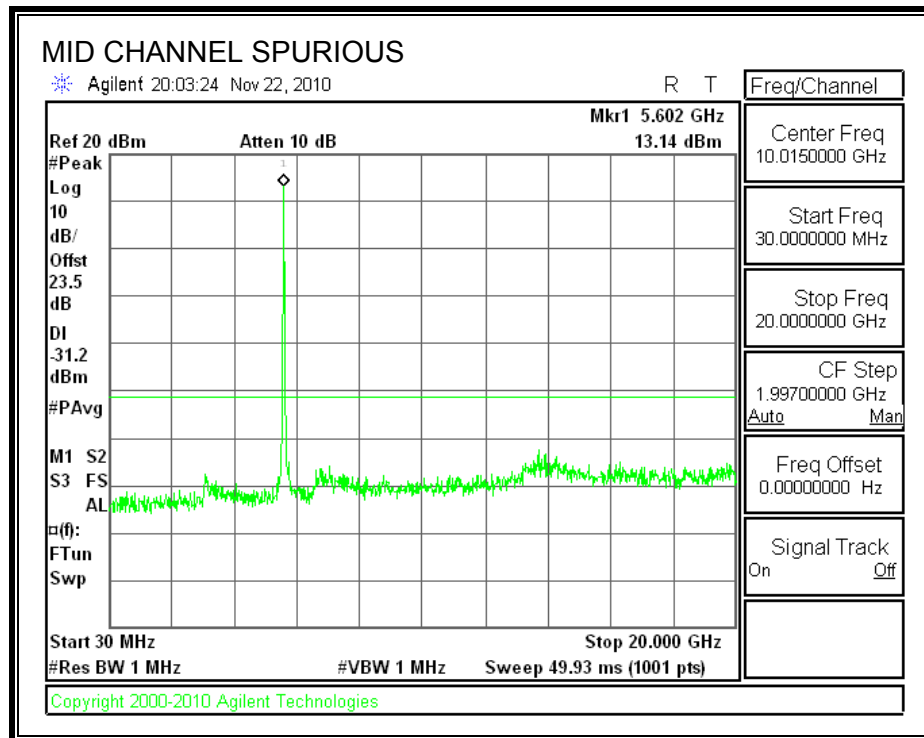
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

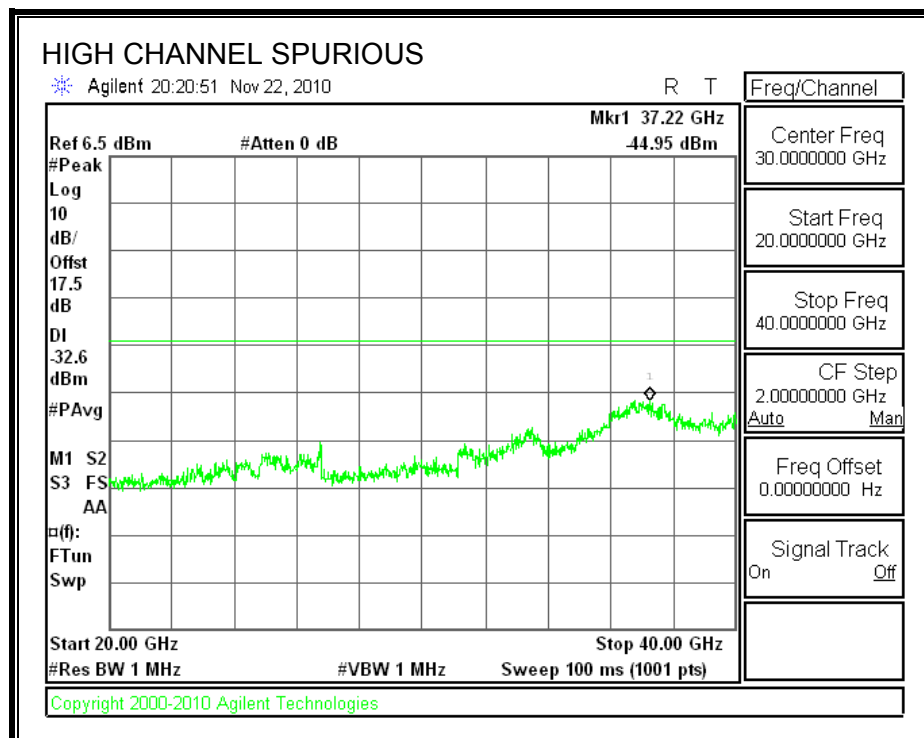
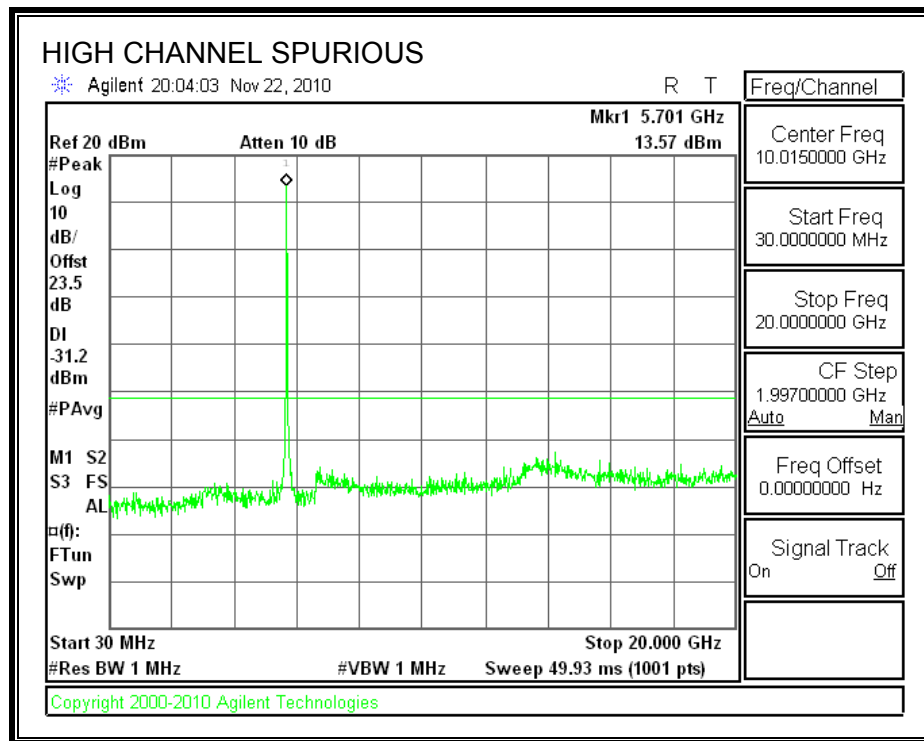
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

# **SPURIOUS EMISSIONS**







## 7.8. 802.11n HT20 MODE IN THE 5.6 GHz BAND

### 7.8.1. 26 dB and 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### RESULTS

##### CHAIN 1

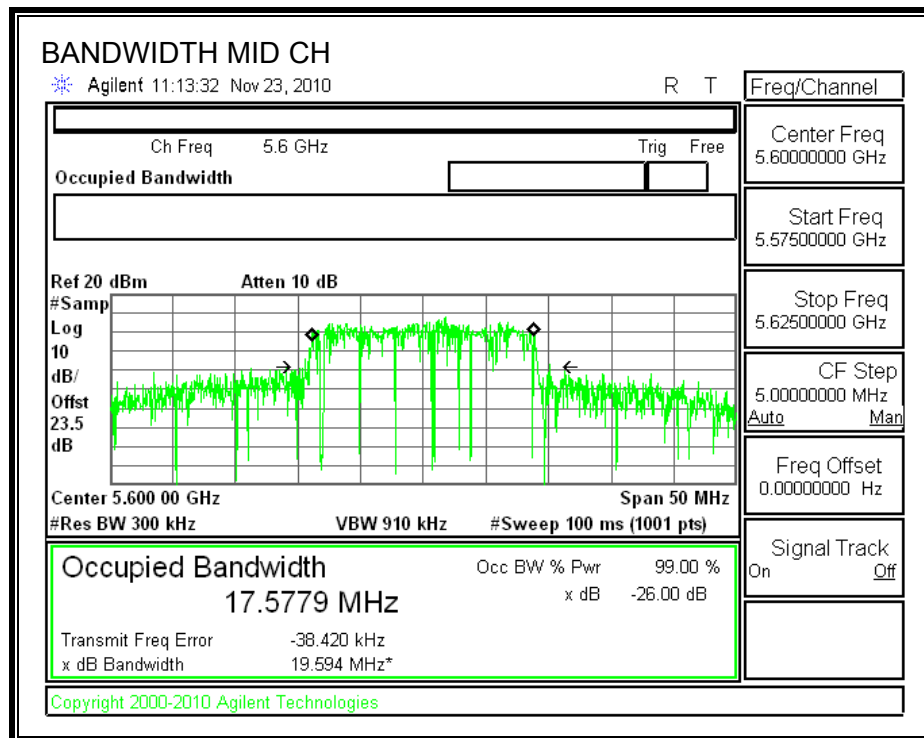
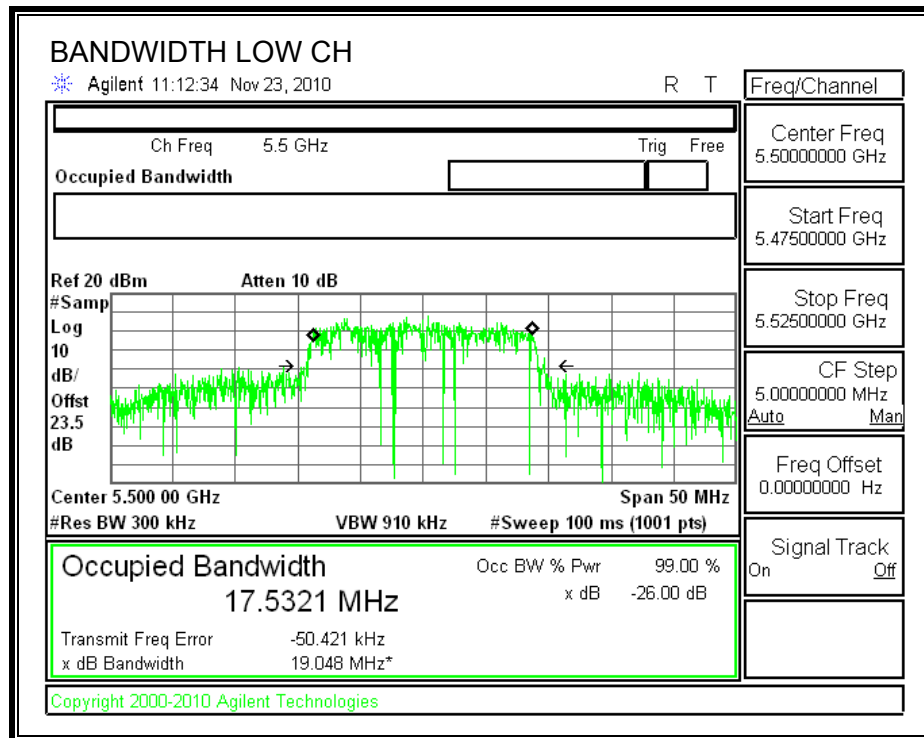
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	19.048	17.5321
Middle	5600	19.594	17.5779
High	5700	19.332	17.6564

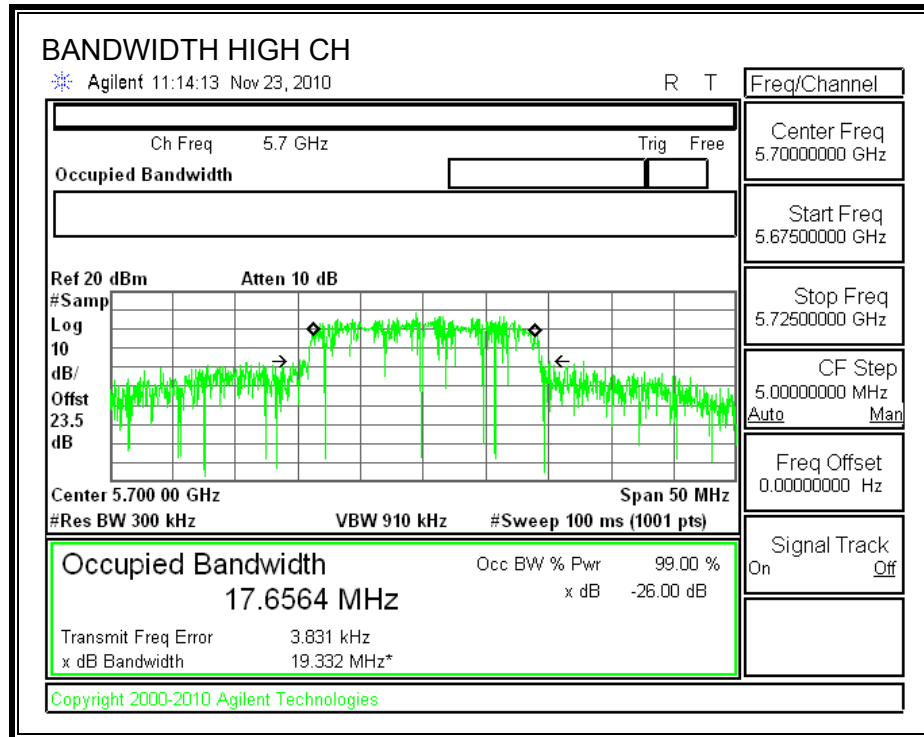
##### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	19.025	17.5344
Middle	5600	19.092	17.6783
High	5700	19.686	17.6543

## CHAIN 1

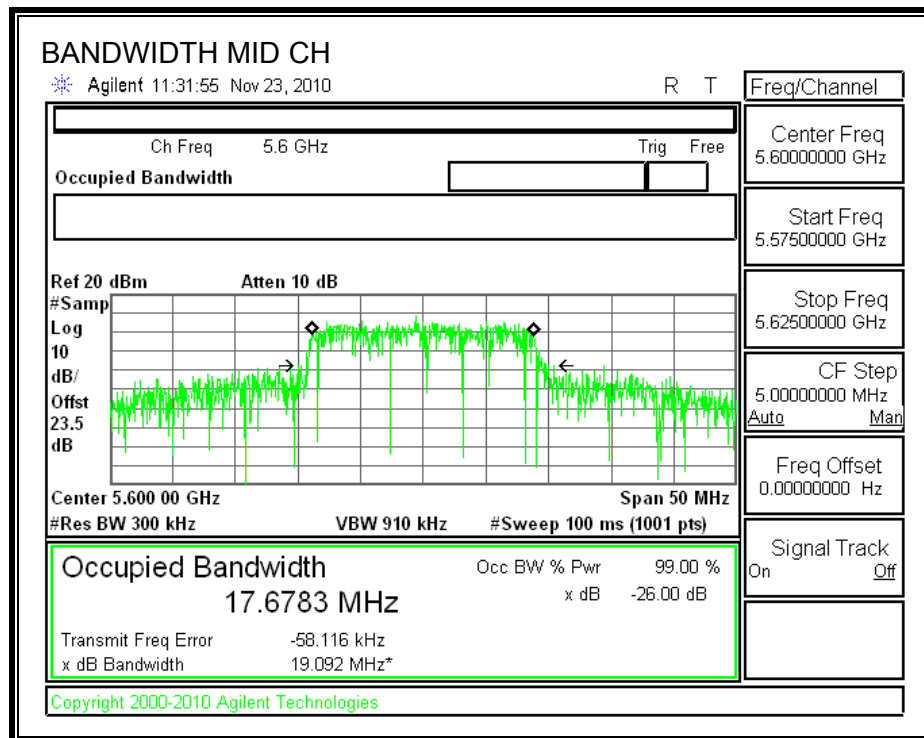
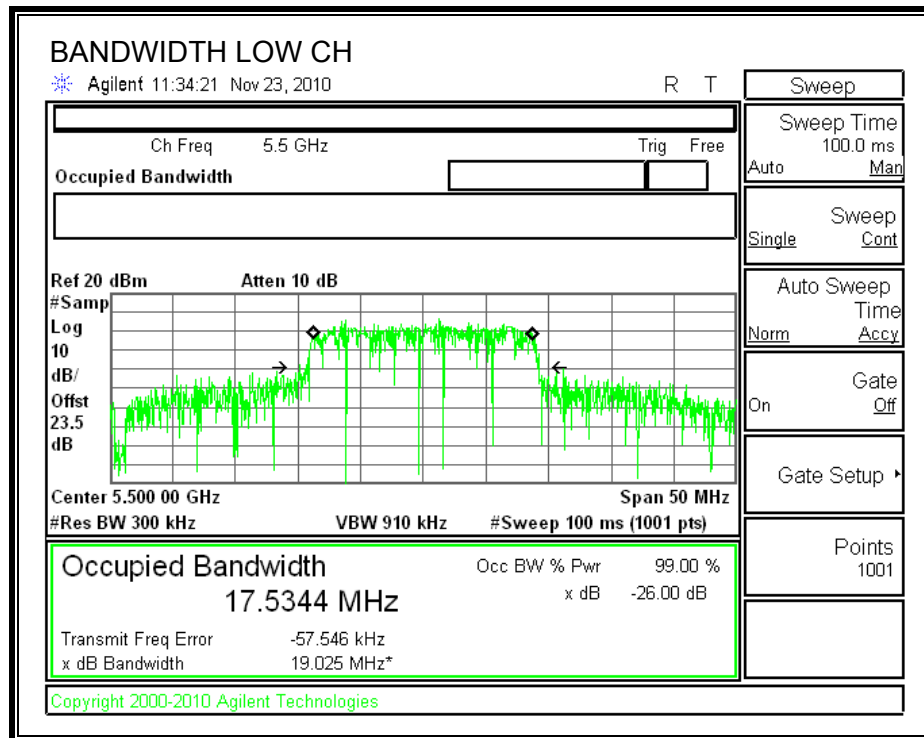
### 26 dB and 99% BANDWIDTH

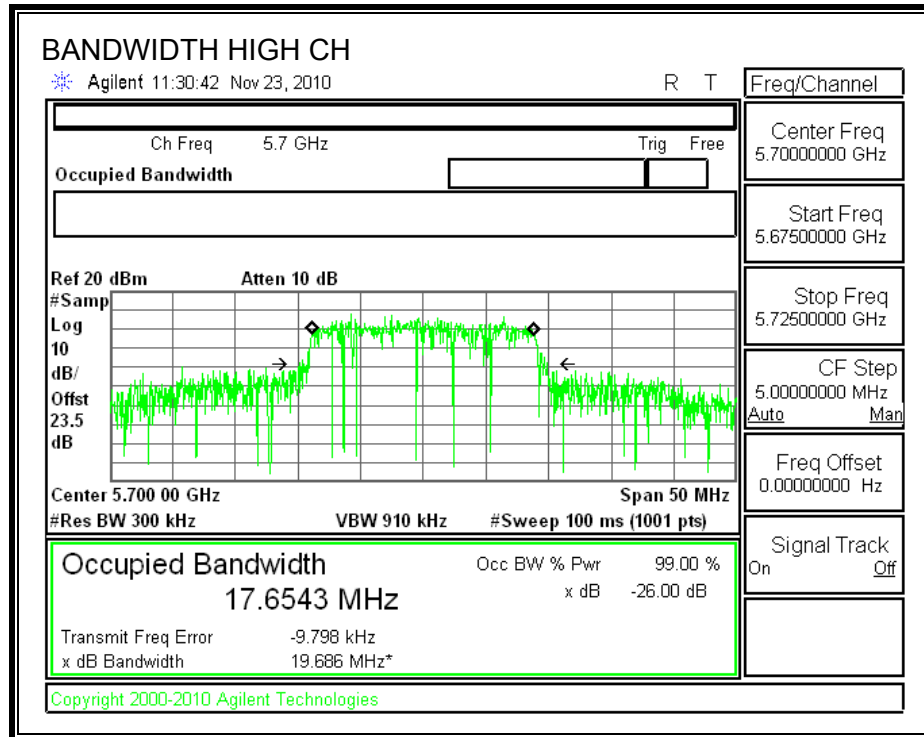




## CHAIN 2

### 26 dB and 99% BANDWIDTH





## 7.8.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

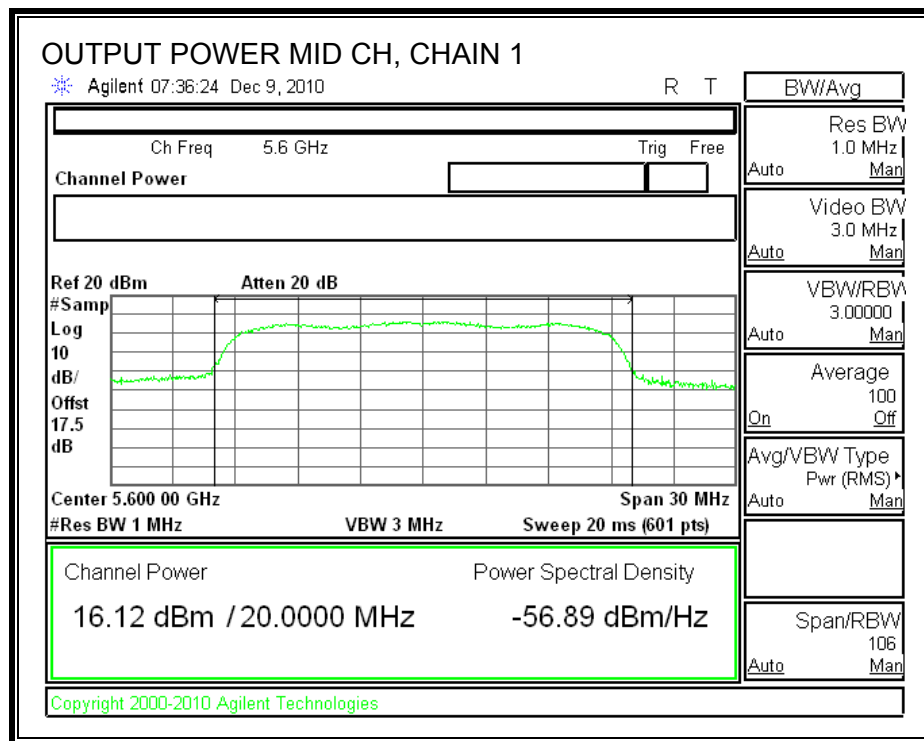
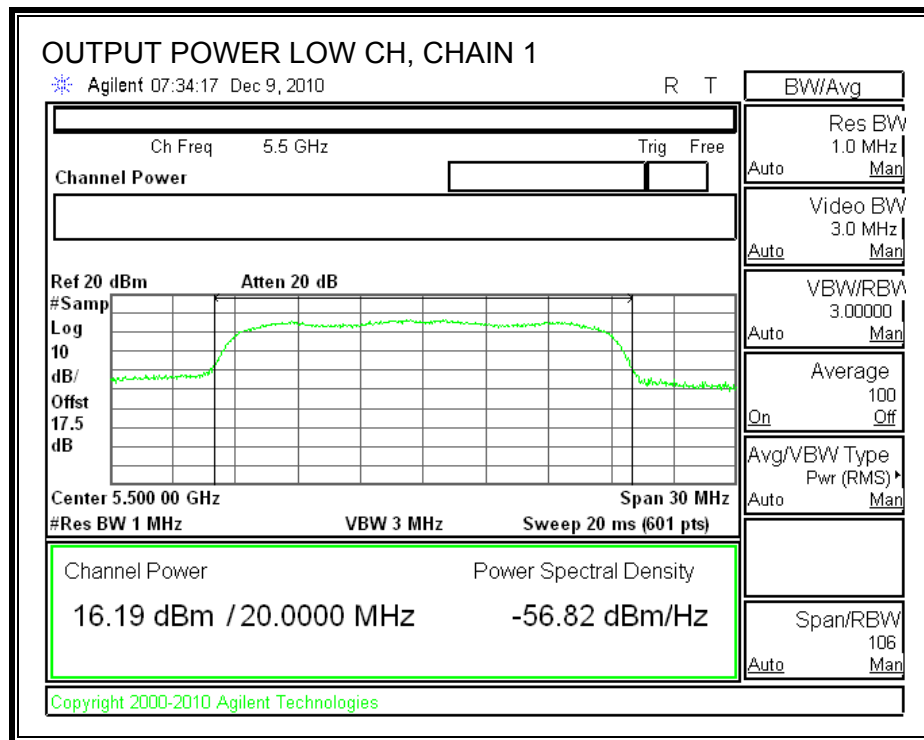
#### Limit

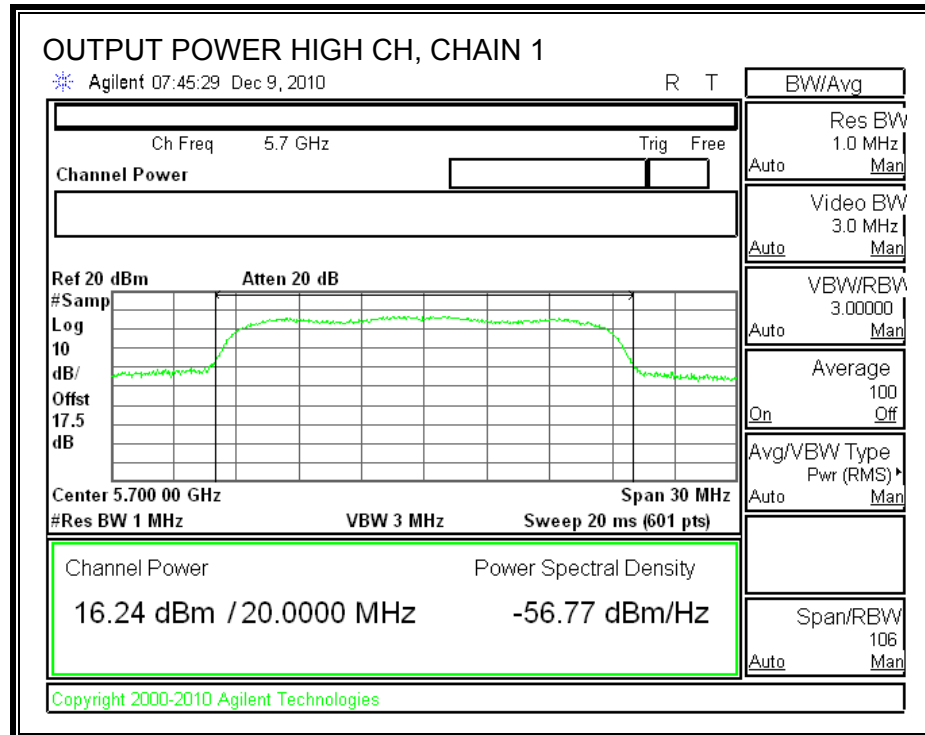
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	19.048	23.80	7.21	22.59
Mid	5600	24	19.594	23.92	7.21	22.71
High	5700	24	19.686	23.94	7.21	22.73

#### Individual Chain Results

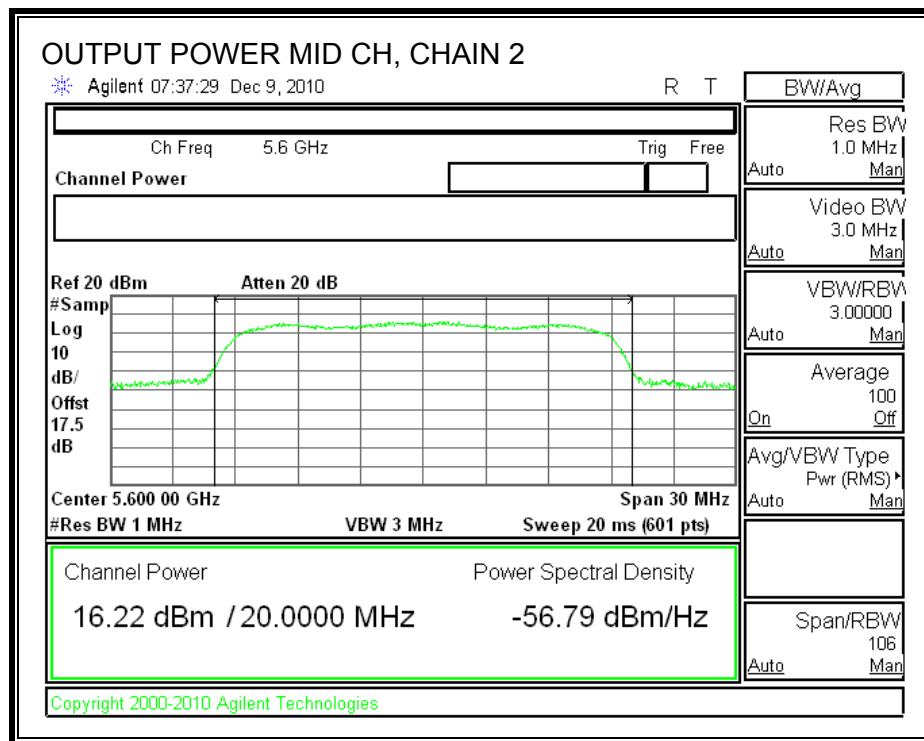
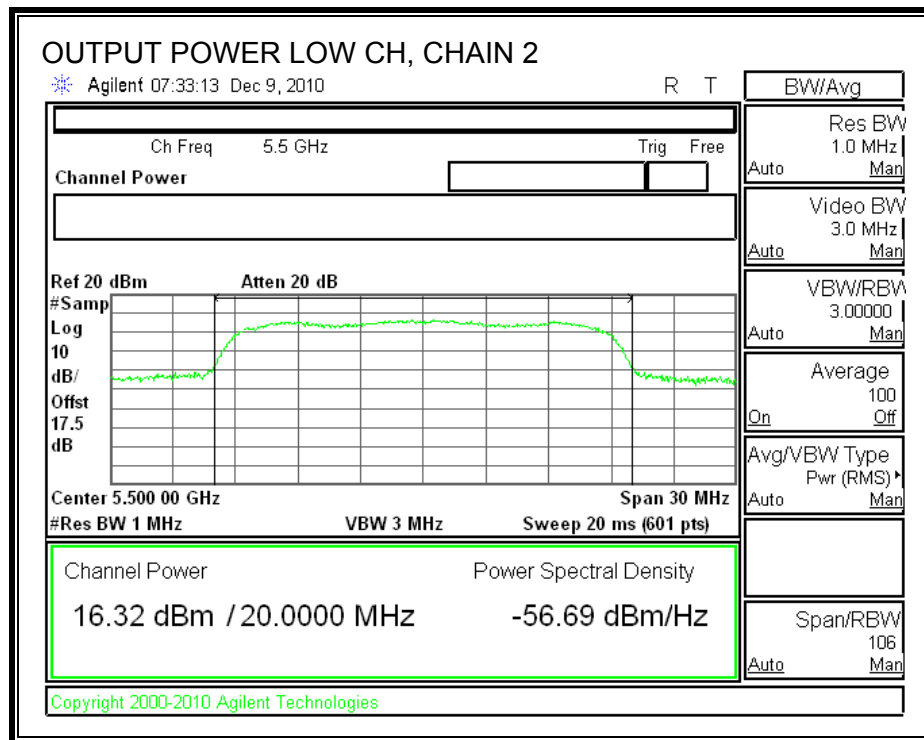
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	16.19	16.32	19.27	22.59	-3.32
Mid	5600	16.12	16.22	19.18	22.71	-3.53
High	5700	16.24	16.34	19.30	22.73	-3.43

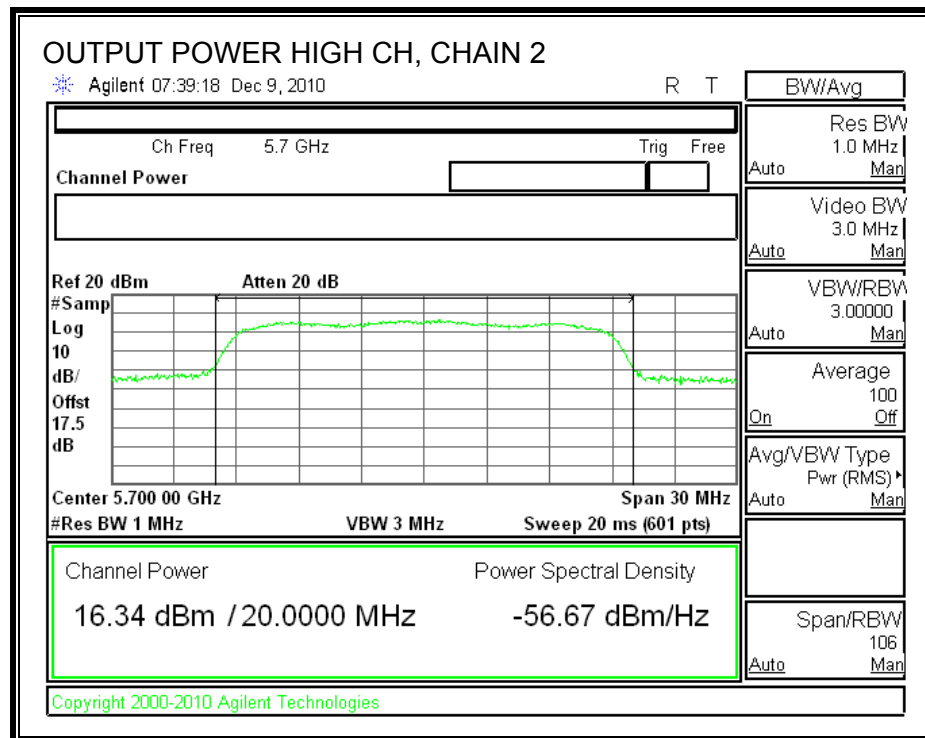
### CHAIN 1 OUTPUT POWER





## CHAIN 2 OUTPUT POWER





### 7.8.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 7.21 dBi, therefore the limit is 9.79 dBm.

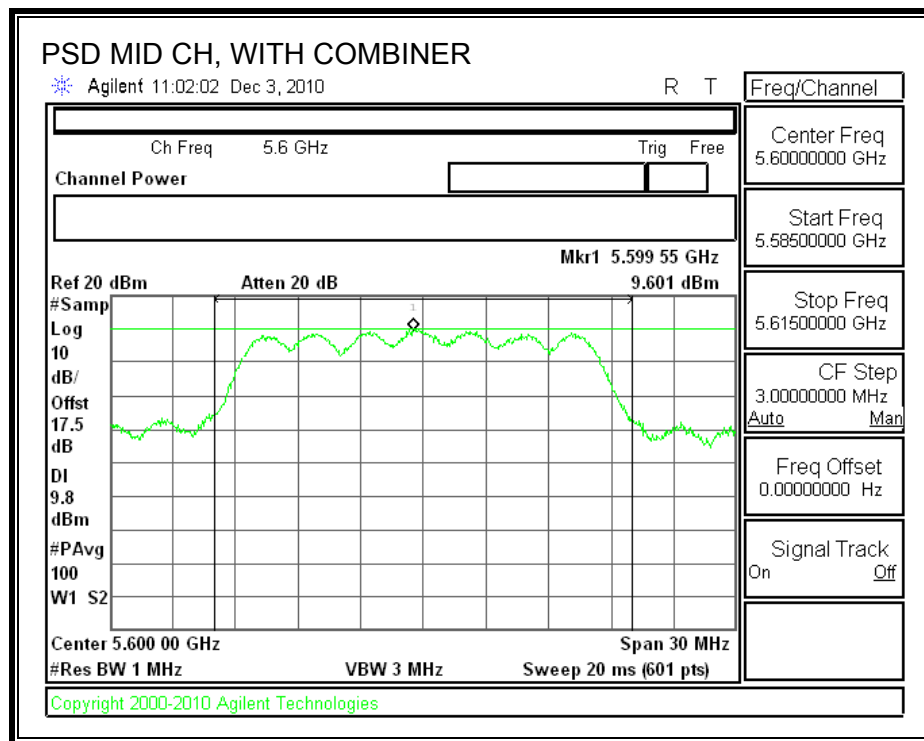
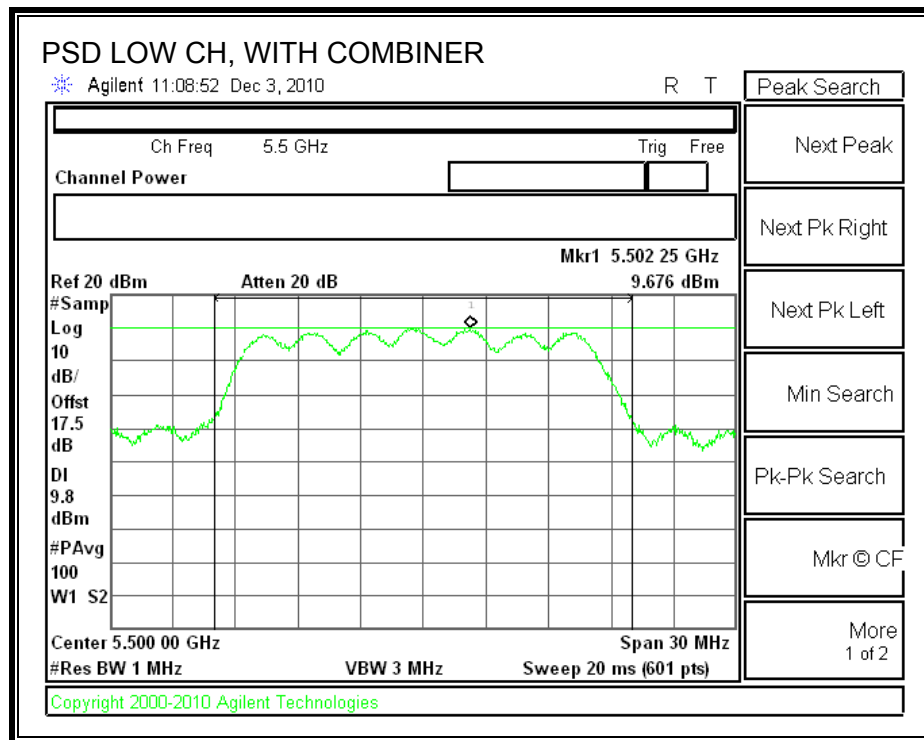
#### TEST PROCEDURE

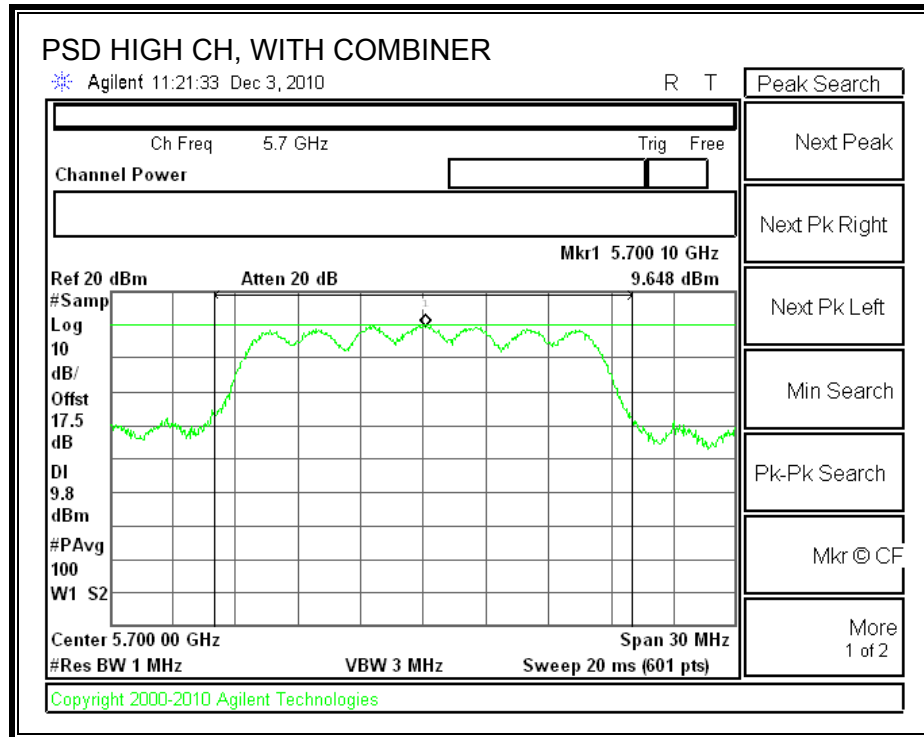
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5500	9.676	9.79	-0.11
Middle	5600	9.601	9.79	-0.19
High	5700	9.648	9.79	-0.14

# POWER SPECTRAL DENSITY WITH COMBINER





## 7.8.4. 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.

### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

#### CHAIN 1

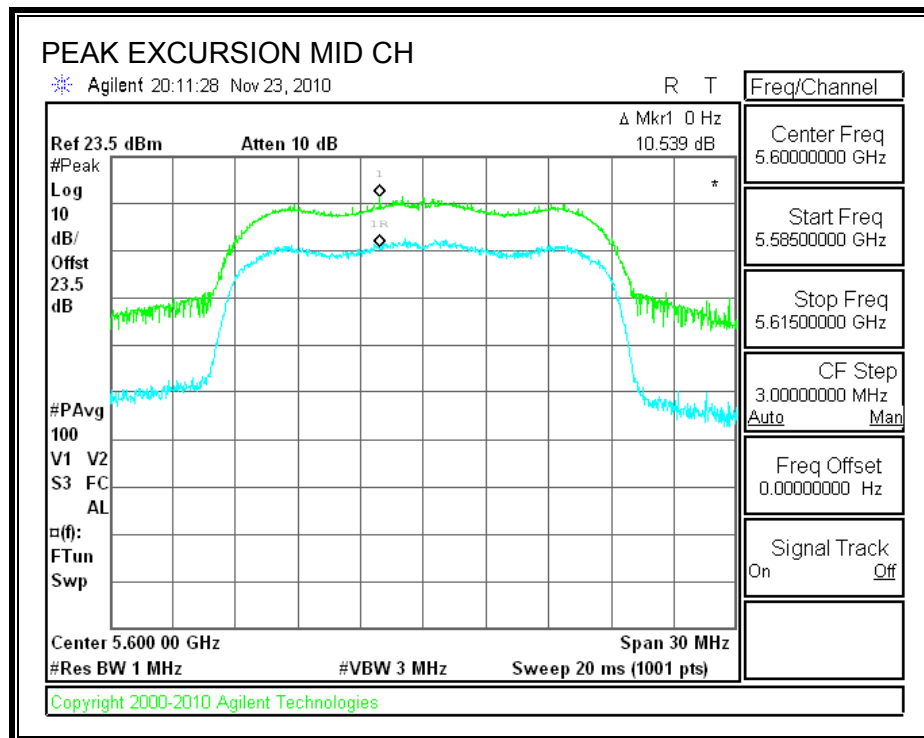
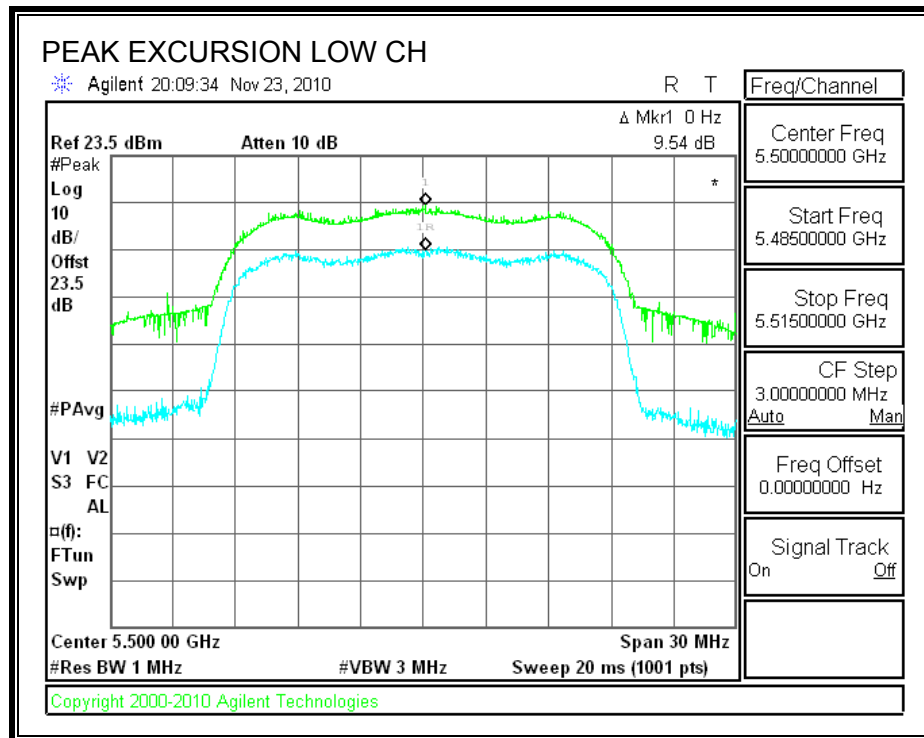
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	9.54	13	-3.46
Middle	5600	10.54	13	-2.46
High	5700	10.57	13	-2.43

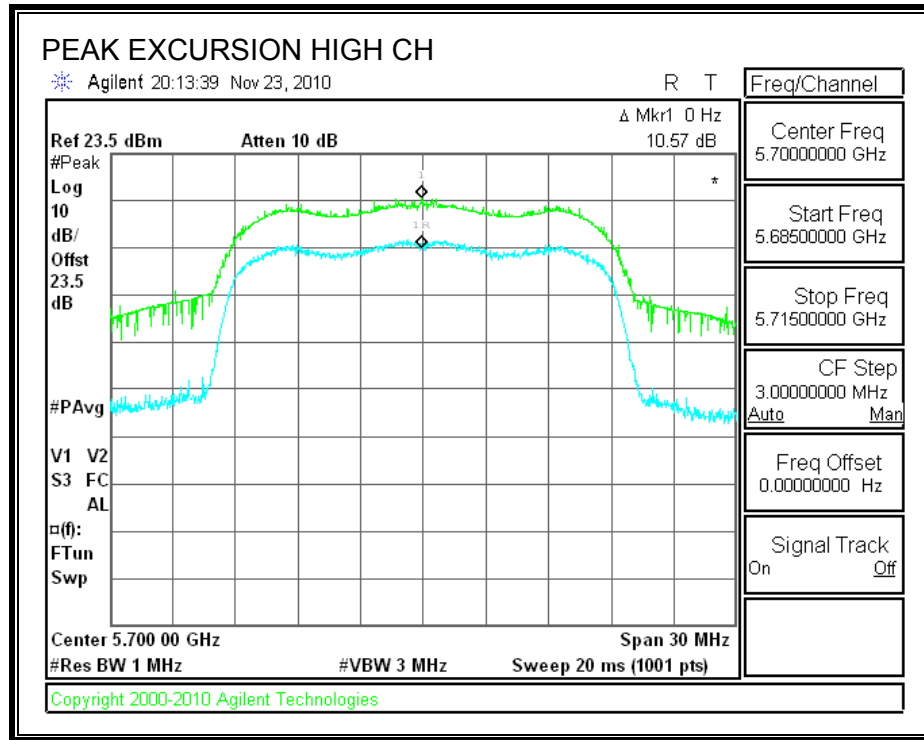
#### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	9.31	13	-3.69
Middle	5600	10.69	13	-2.31
High	5700	10.60	13	-2.40

## CHAIN 1

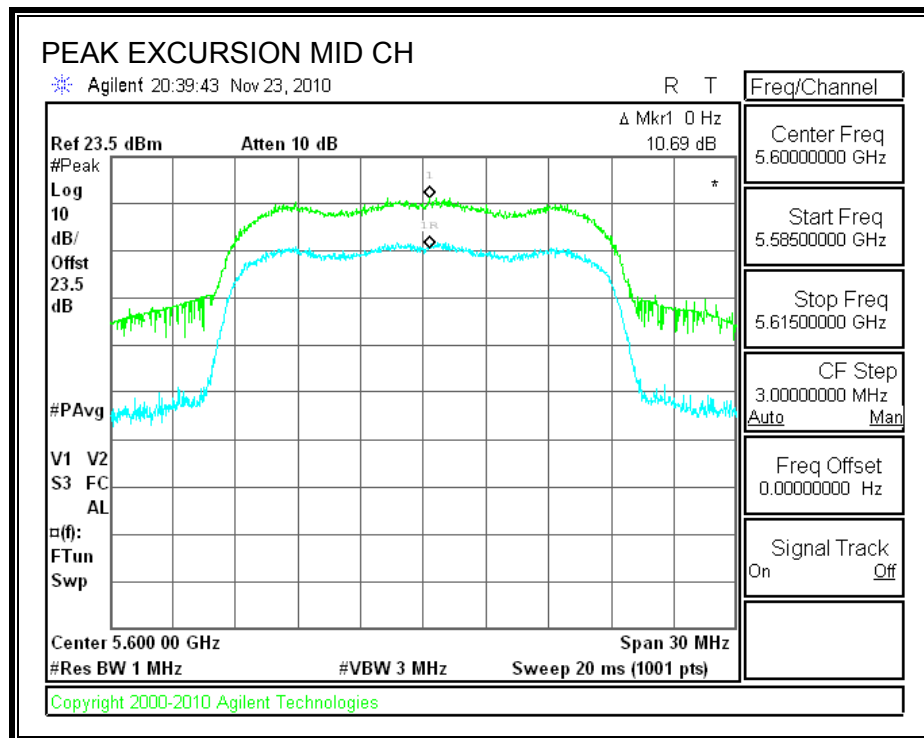
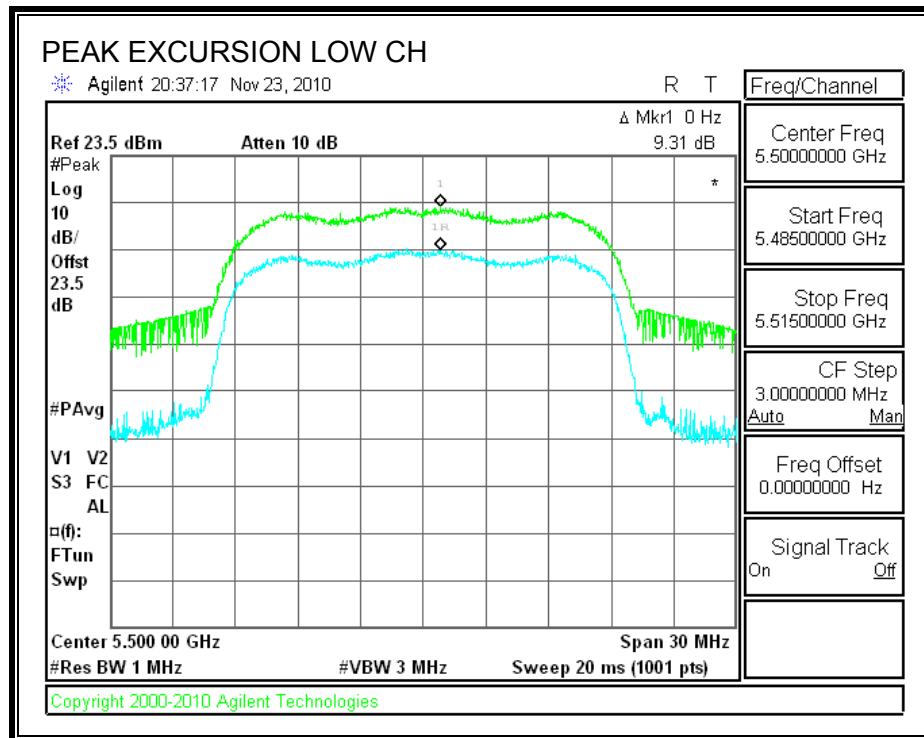
### PEAK EXCURSION

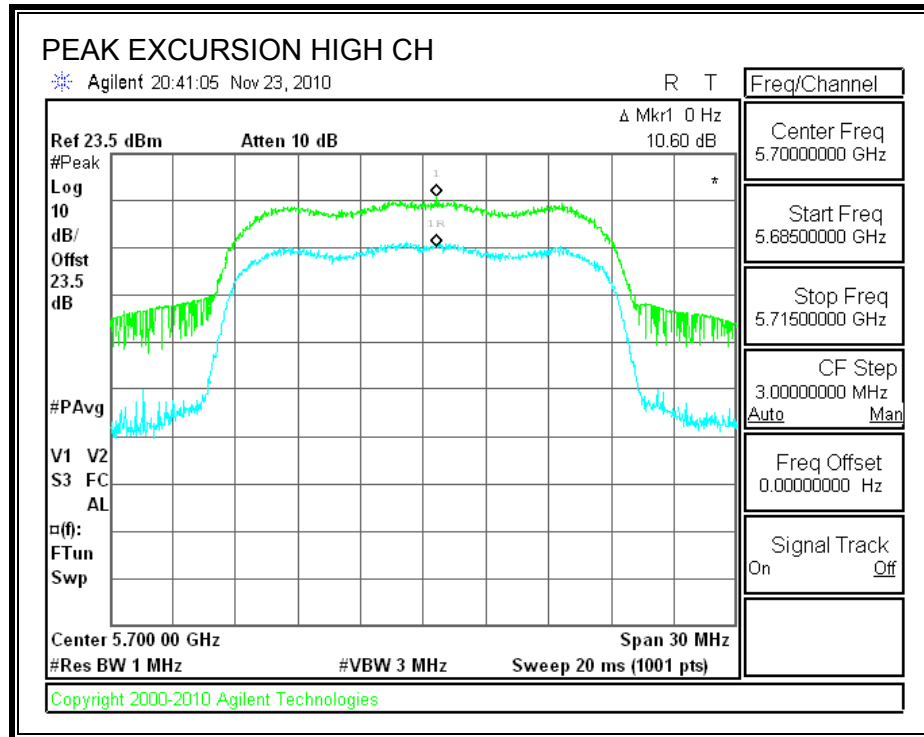




## CHAIN 2

### PEAK EXCURSION





## **7.8.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

### **TEST PROCEDURE**

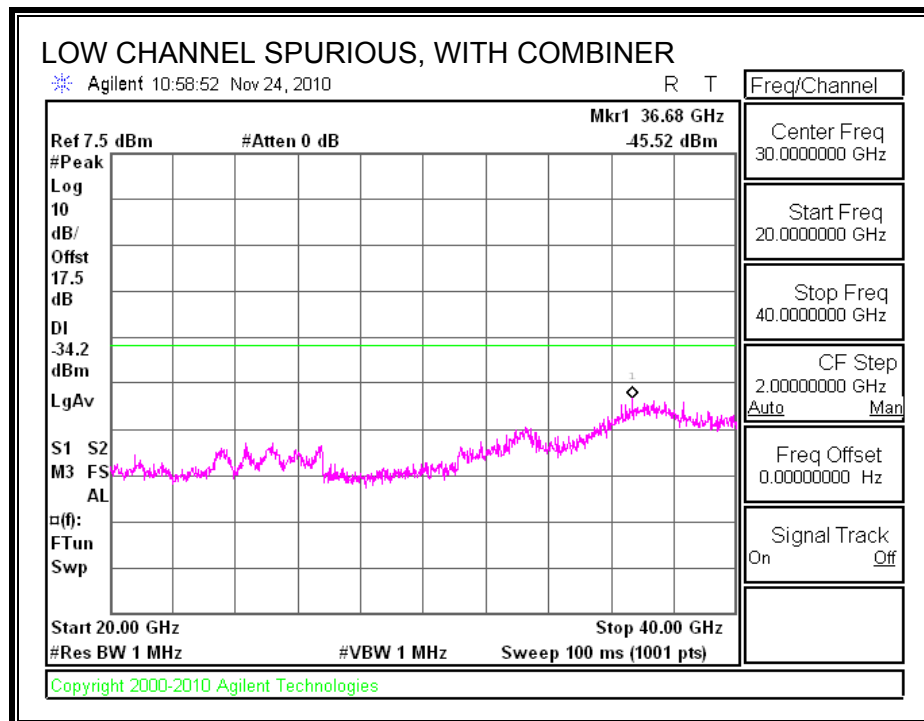
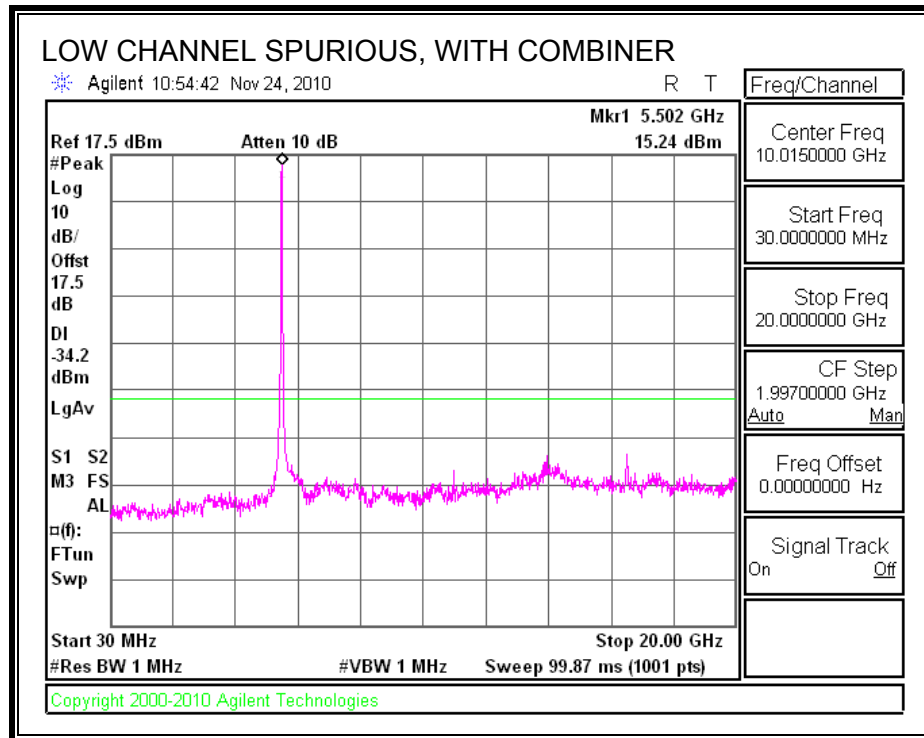
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

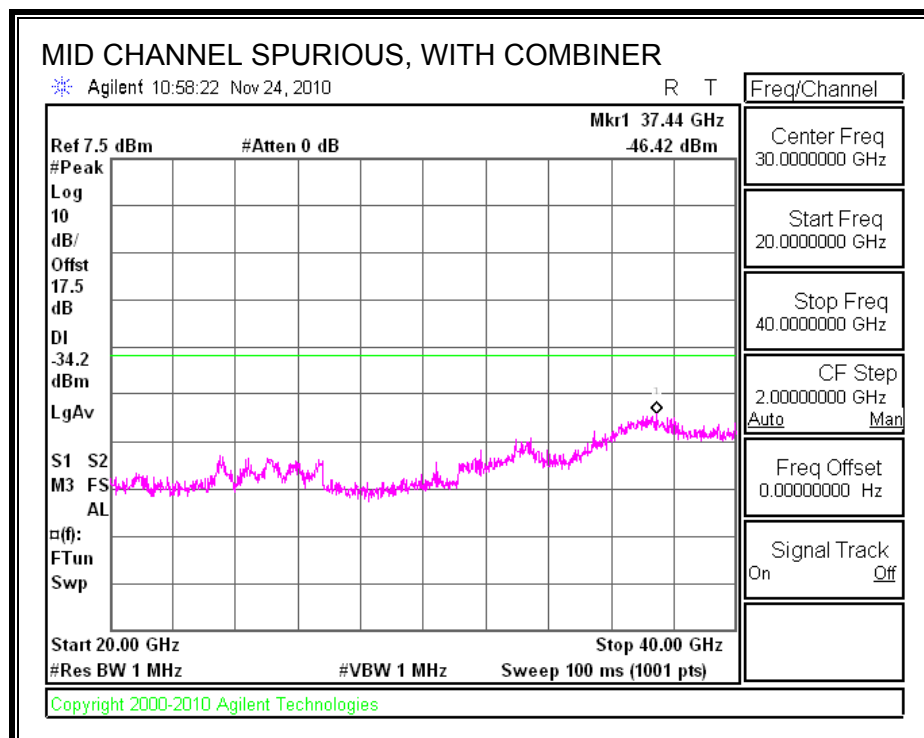
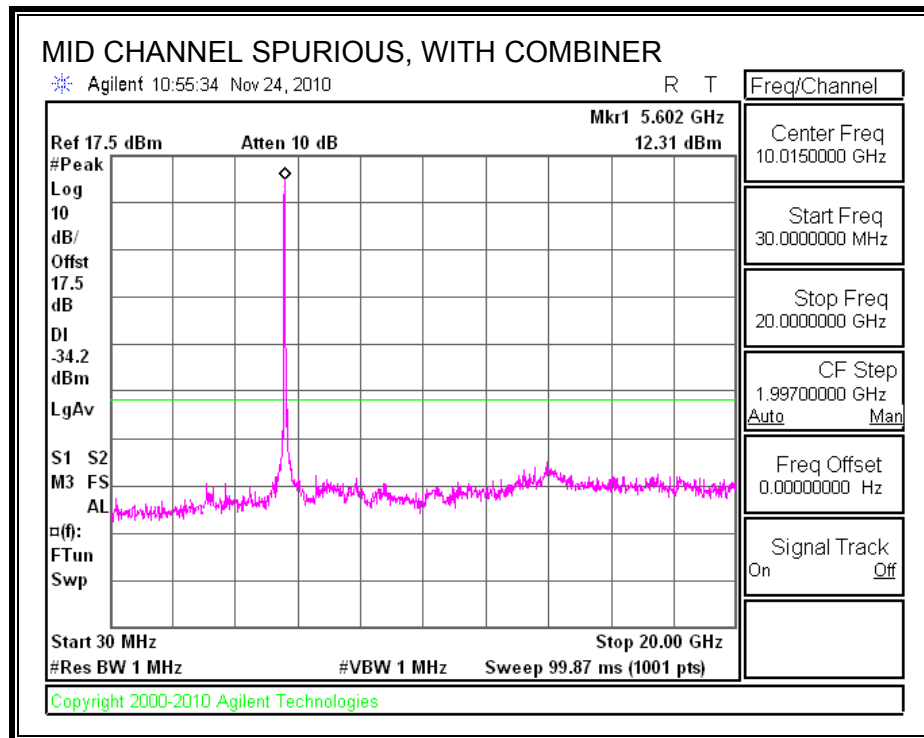
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

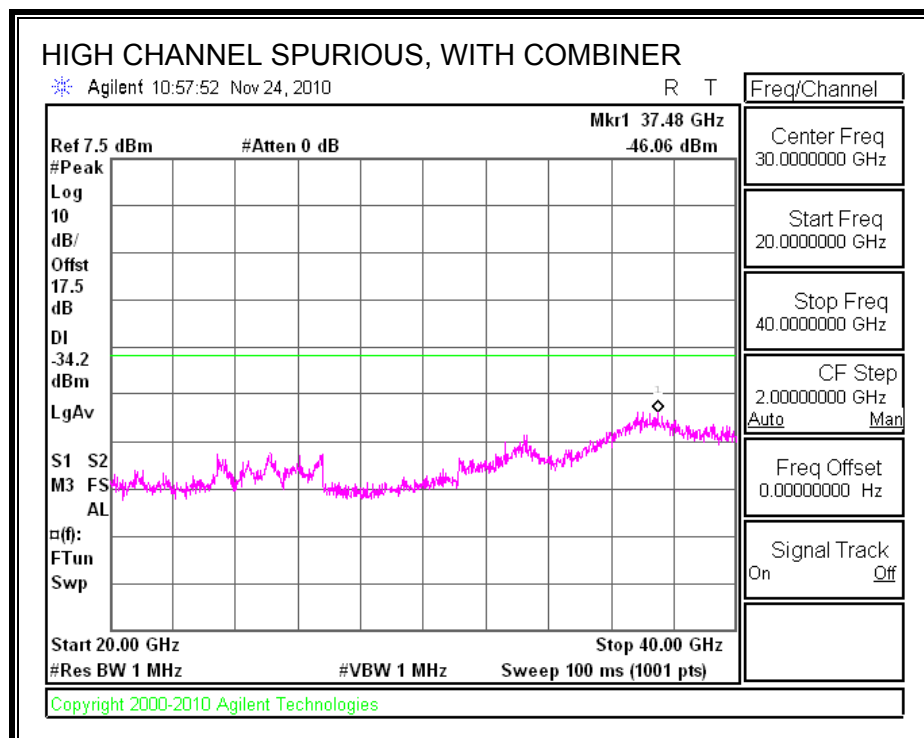
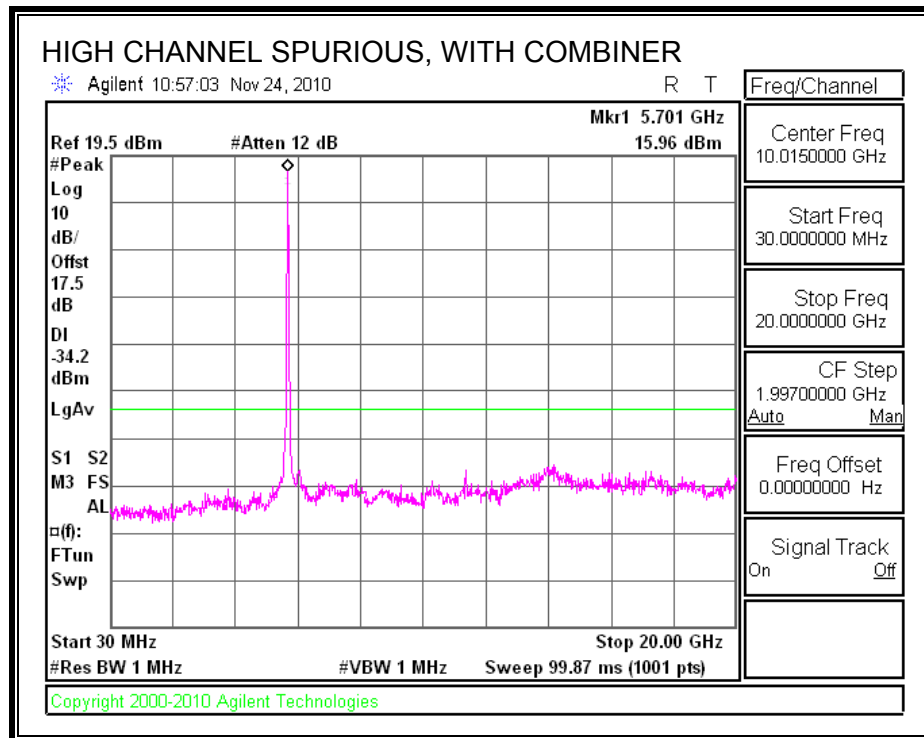
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

### SPURIOUS EMISSIONS WITH COMBINER







## 7.9. 802.11n HT40 MODE IN THE 5.6 GHz BAND

### 7.9.1. 26 dB and 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

#### RESULTS

##### CHAIN 1

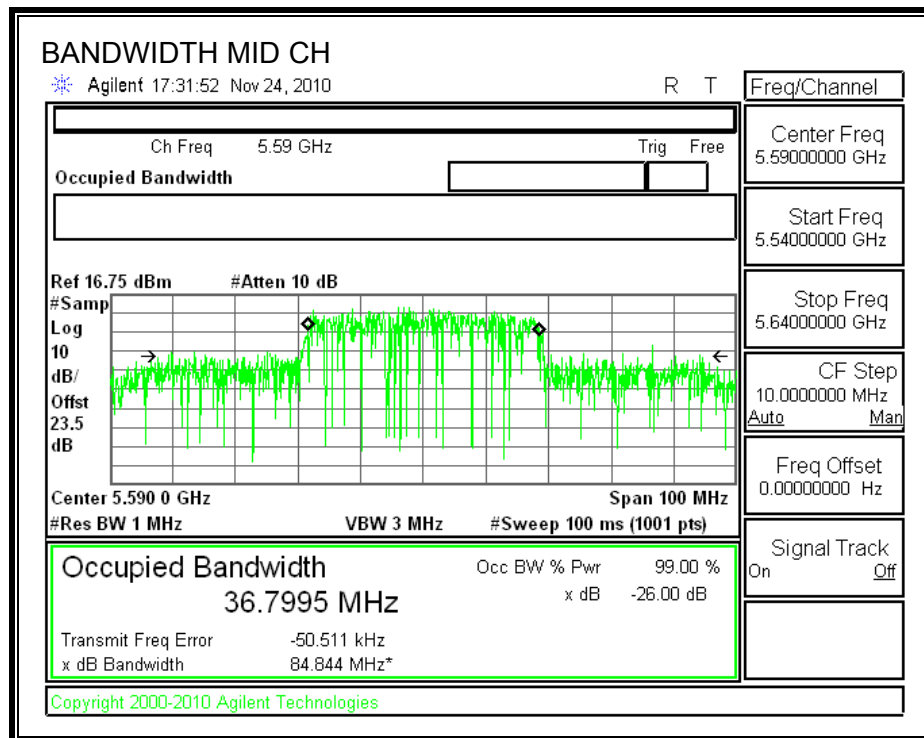
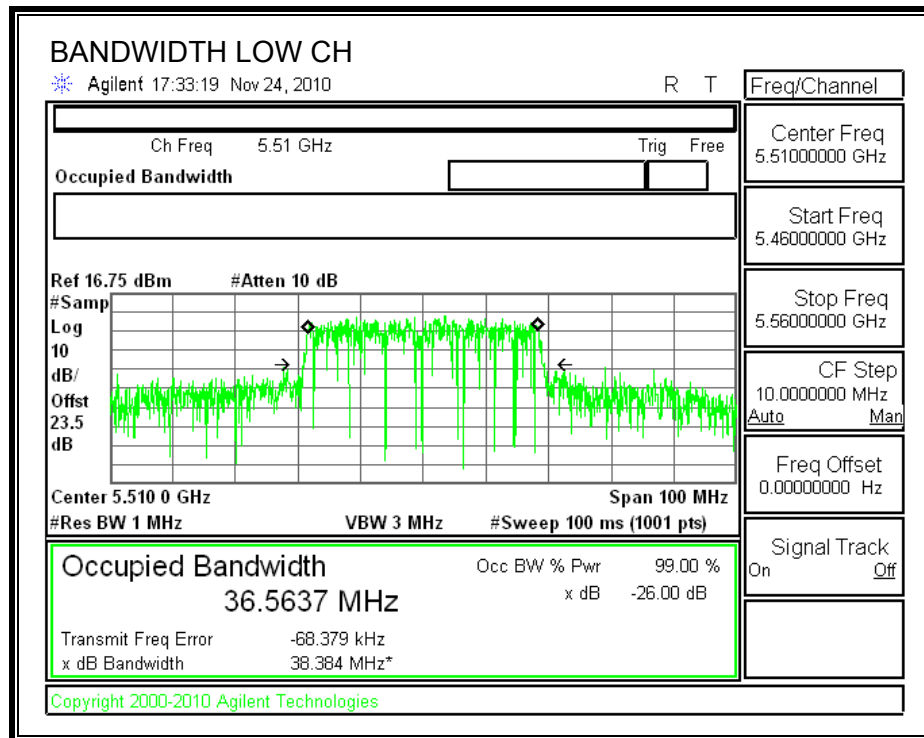
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	38.384	36.5637
Middle	5590	84.844	36.7995
High	5670	84.753	36.8075

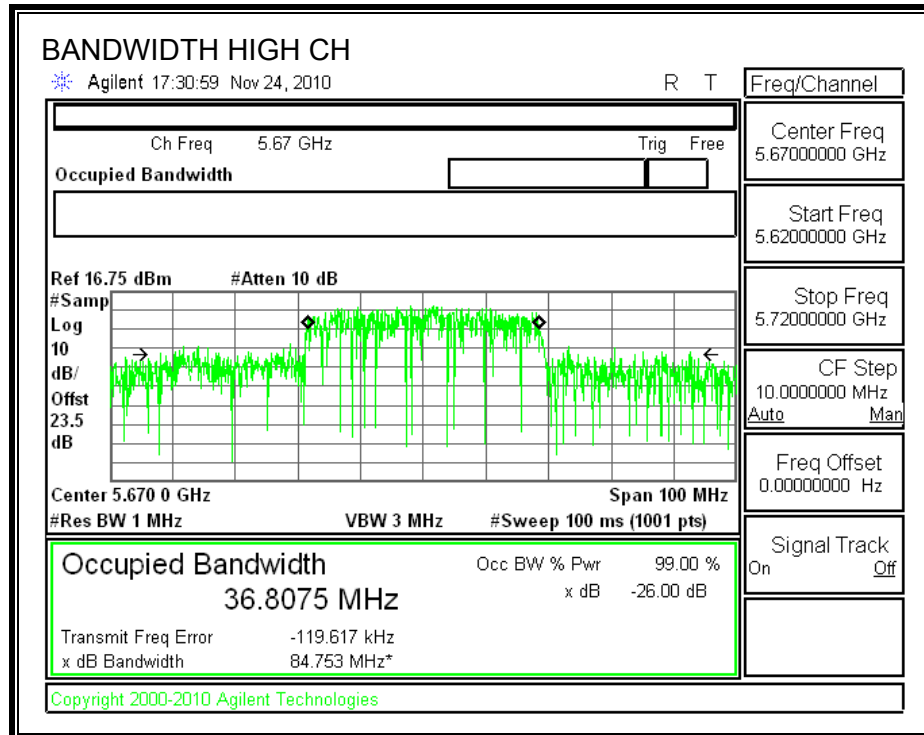
##### CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	39.294	36.29
Middle	5590	83.512	36.9393
High	5670	59.448	36.9527

## CHAIN 1

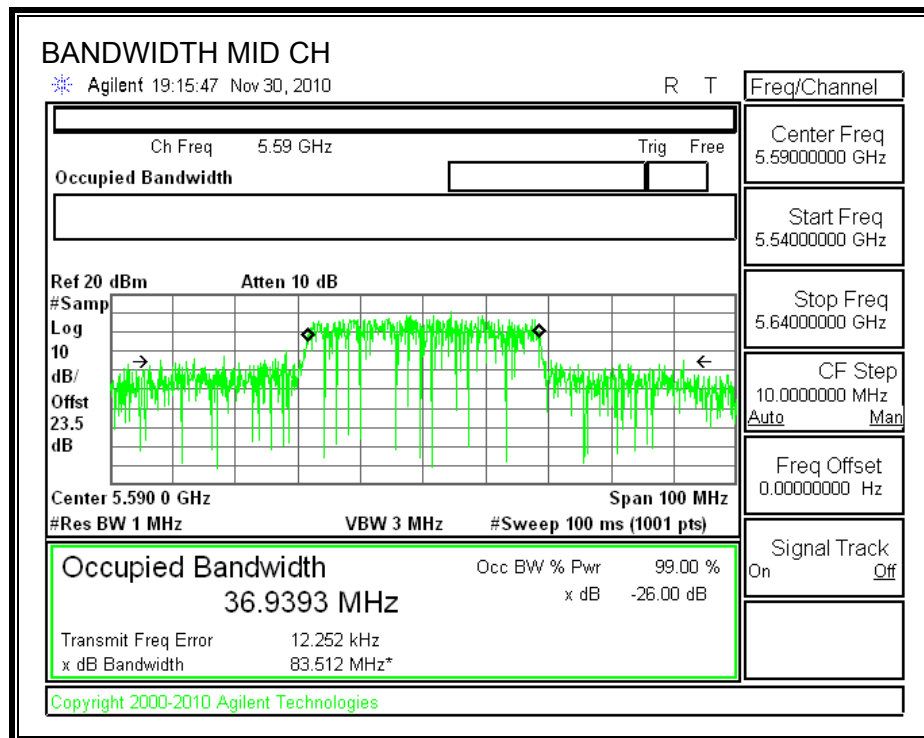
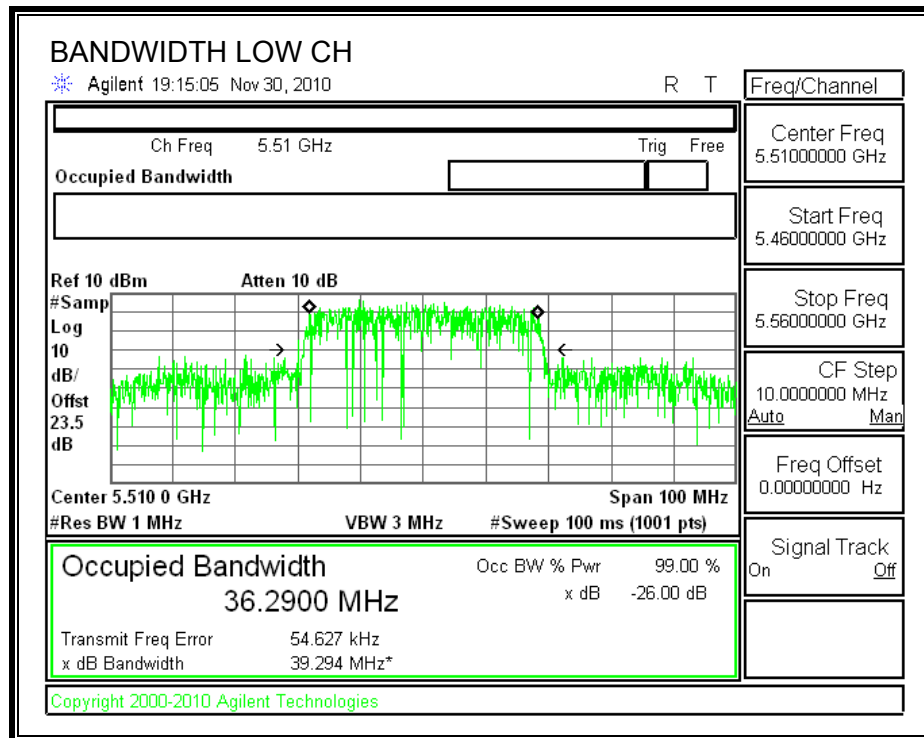
### 26 dB and 99% BANDWIDTH

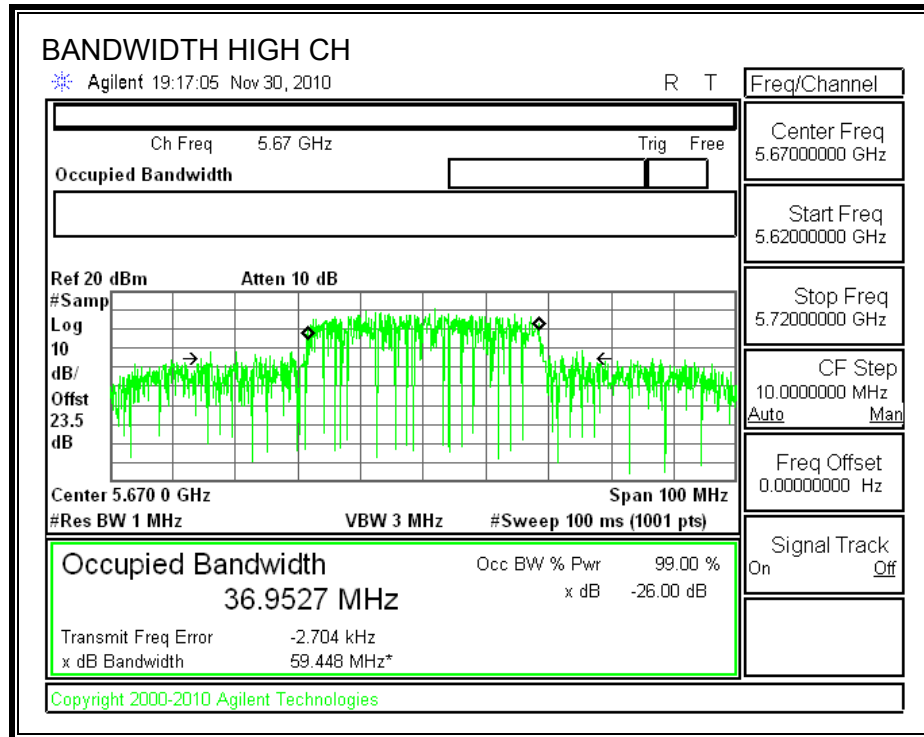




## CHAIN 2

### 26 dB and 99% BANDWIDTH





## 7.9.2. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

### RESULTS

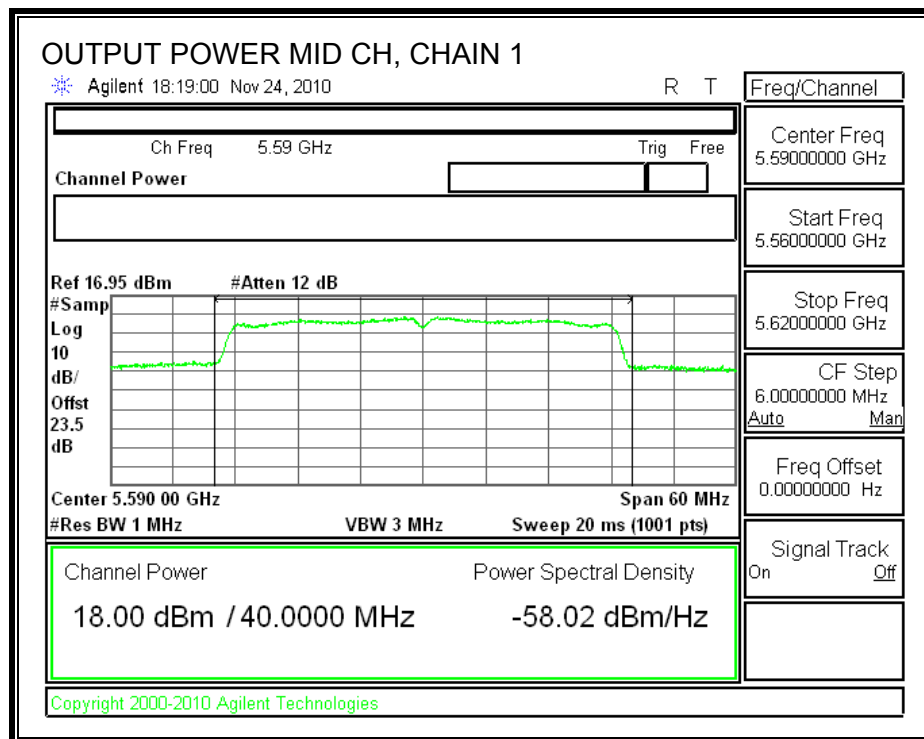
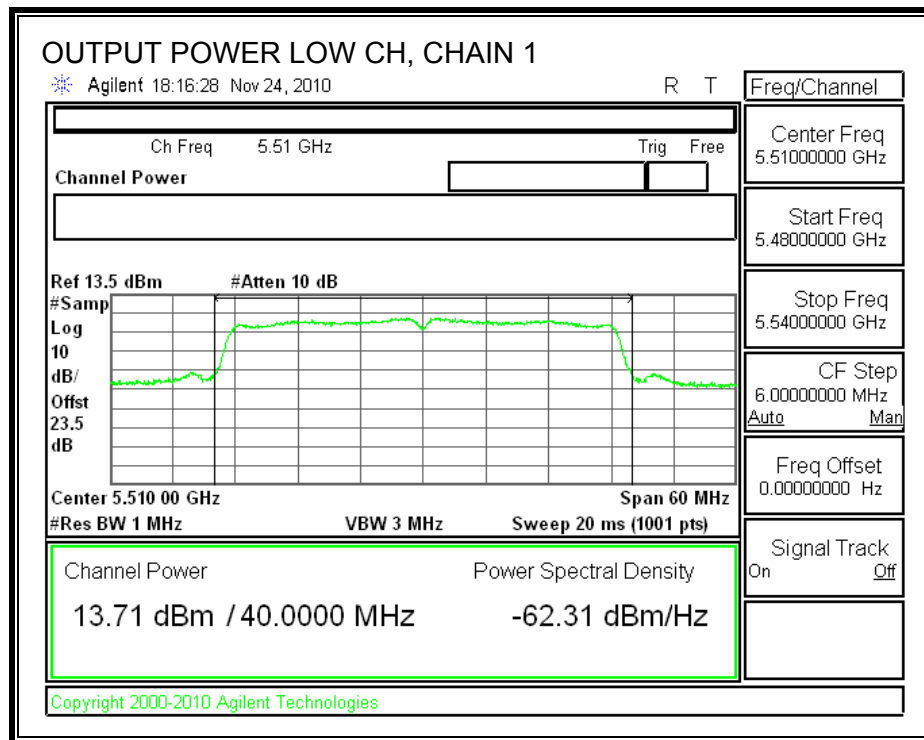
#### Limit

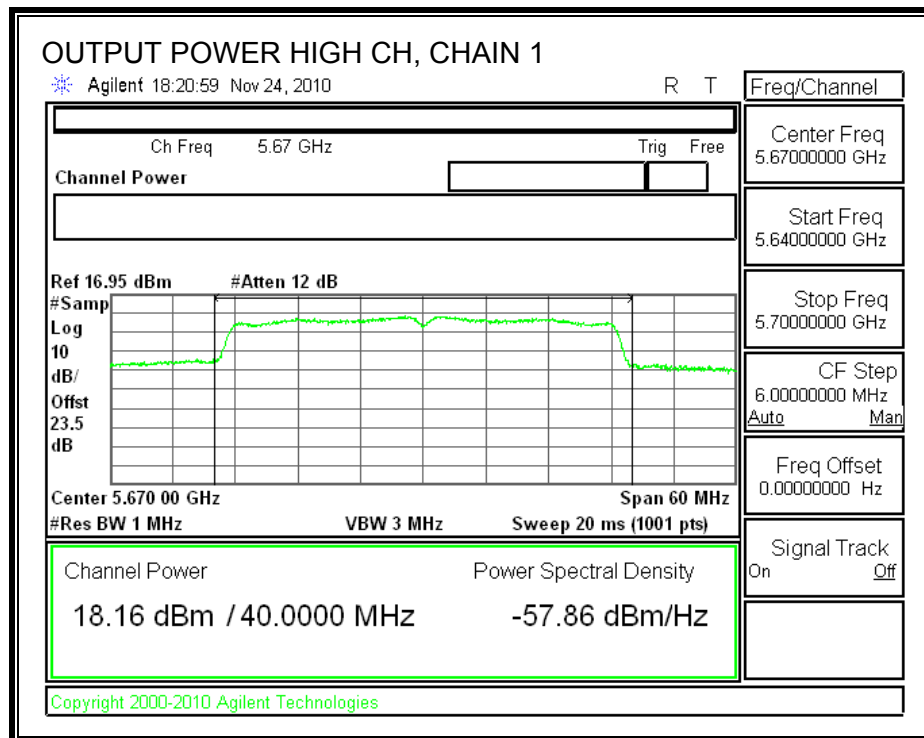
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5510	24	39.294	26.94	7.21	22.79
Mid	5550	24	84.844	30.29	7.21	22.79
High	5670	24	84.753	30.28	7.21	22.79

#### Individual Chain Results

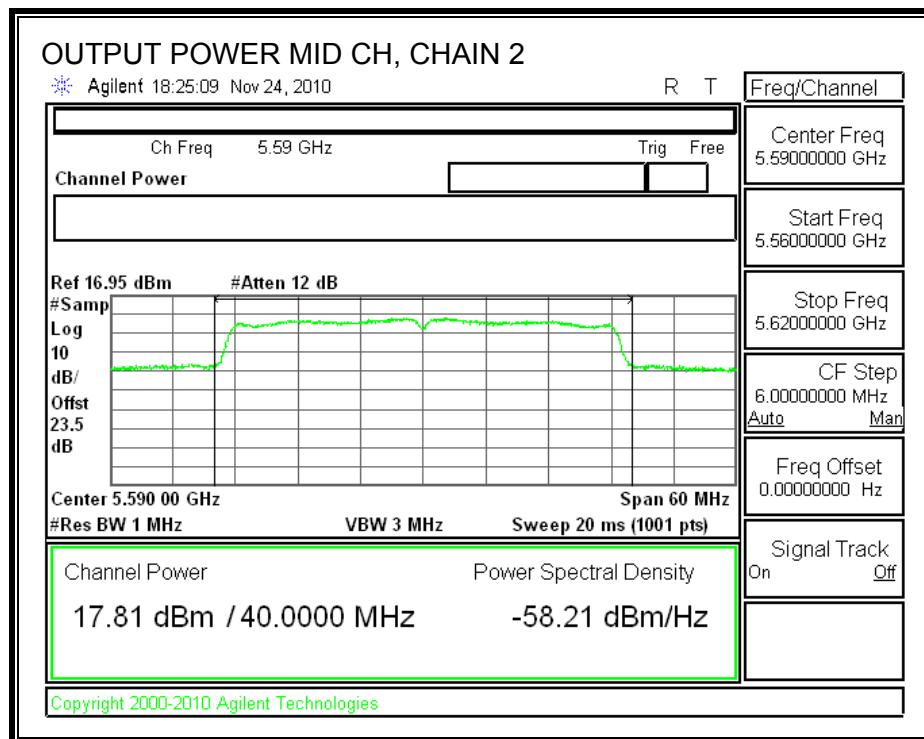
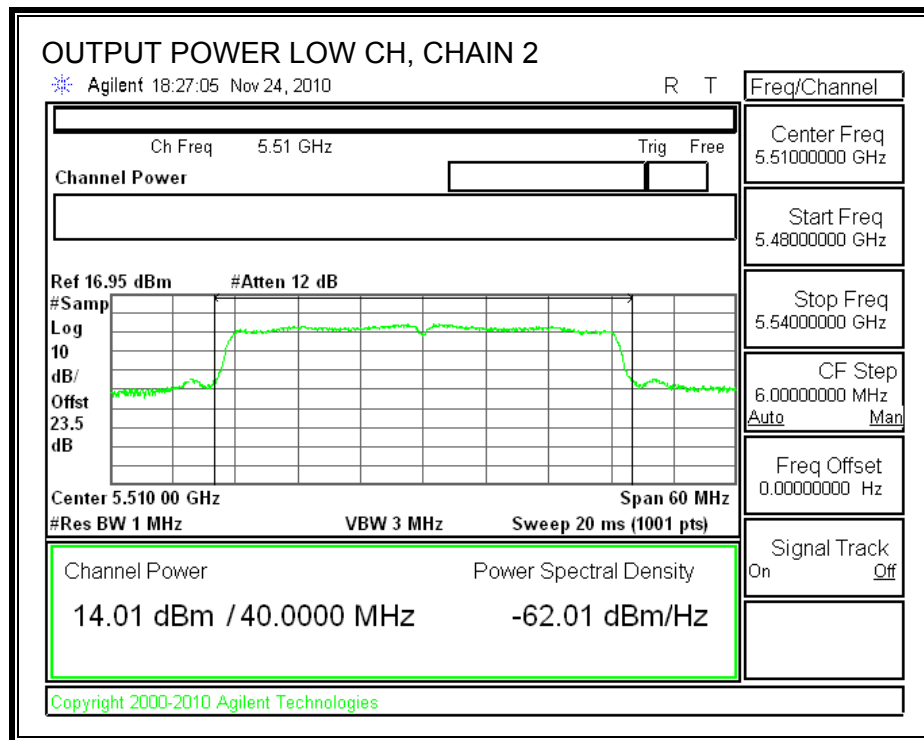
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	13.71	14.01	16.87	22.79	-5.92
Mid	5550	18.00	17.81	20.92	22.79	-1.87
High	5670	18.16	18.05	21.12	22.79	-1.67

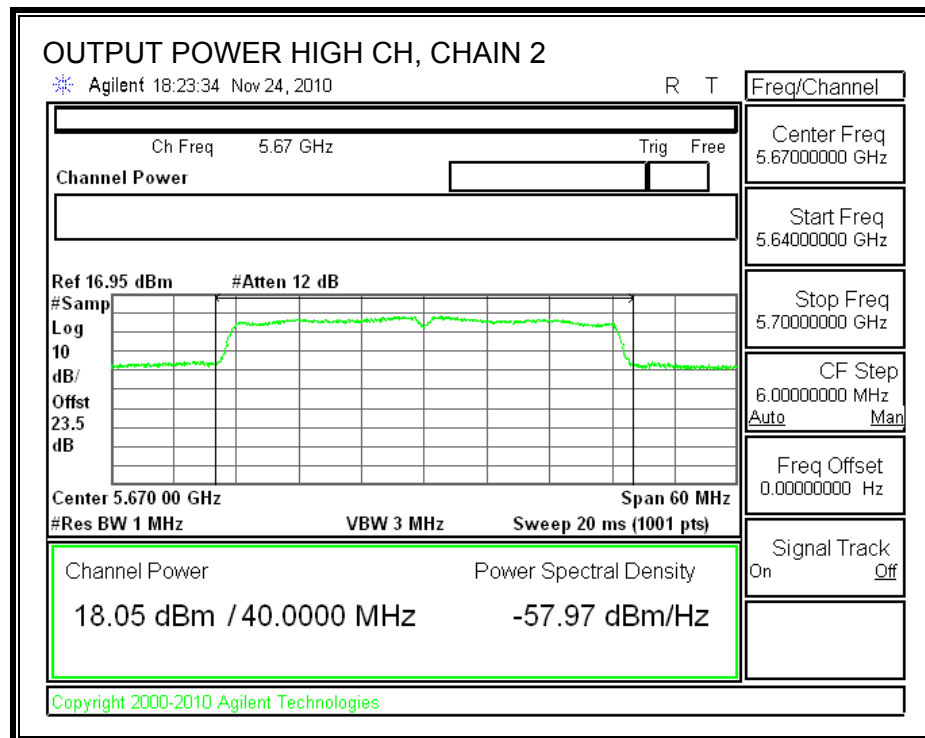
# **CHAIN 1 OUTPUT POWER**





## CHAIN 2 OUTPUT POWER





### 7.9.3. PEAK POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit 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.

The maximum antenna gain is 7.21 dBi, therefore the limit is 9.79 dBm.

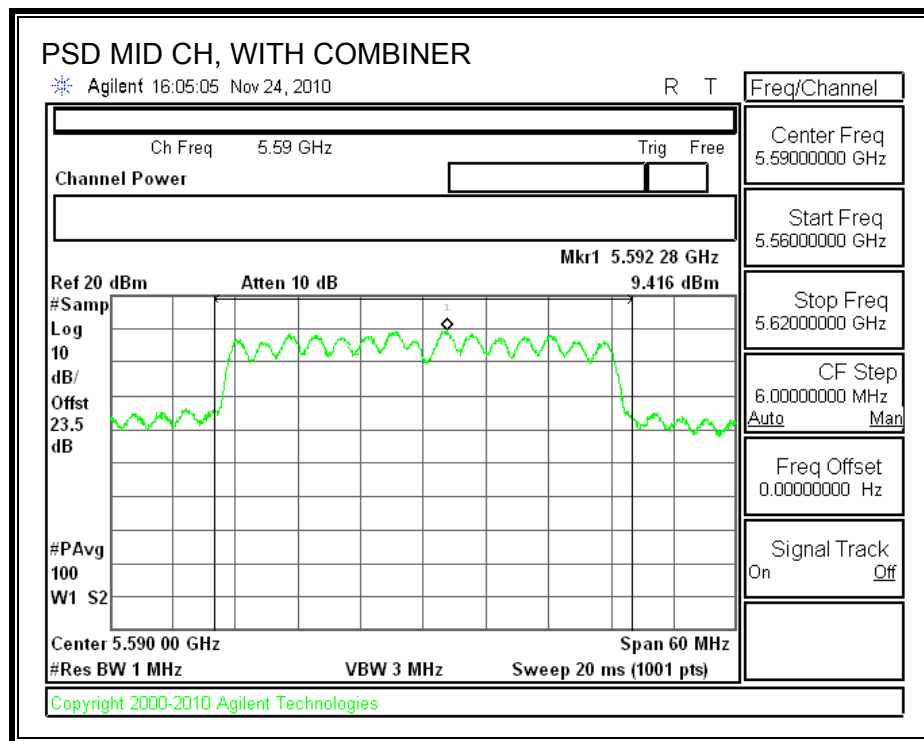
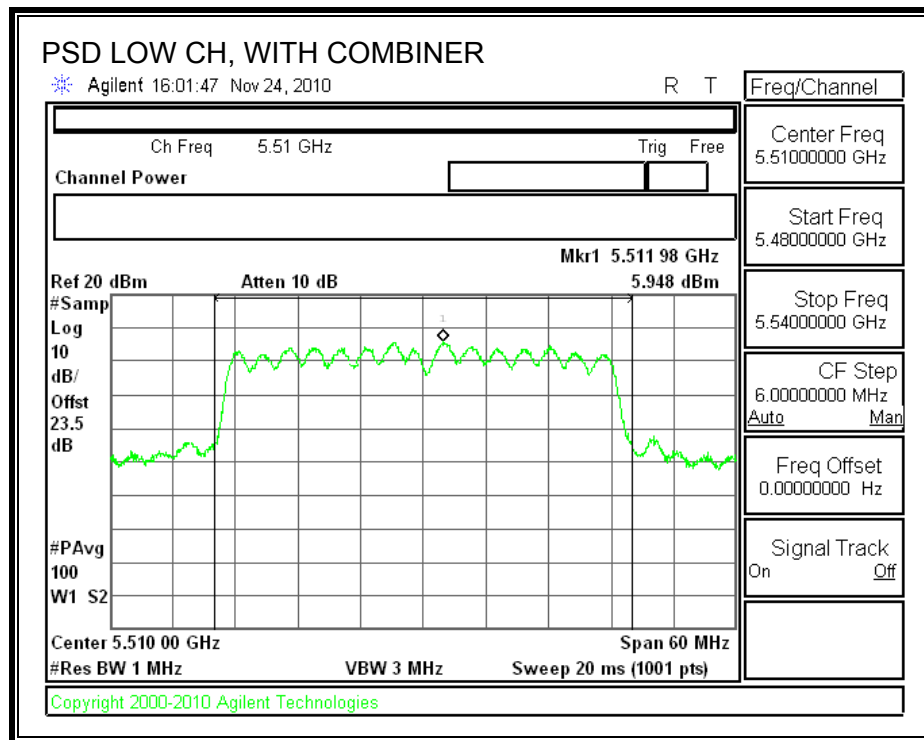
#### TEST PROCEDURE

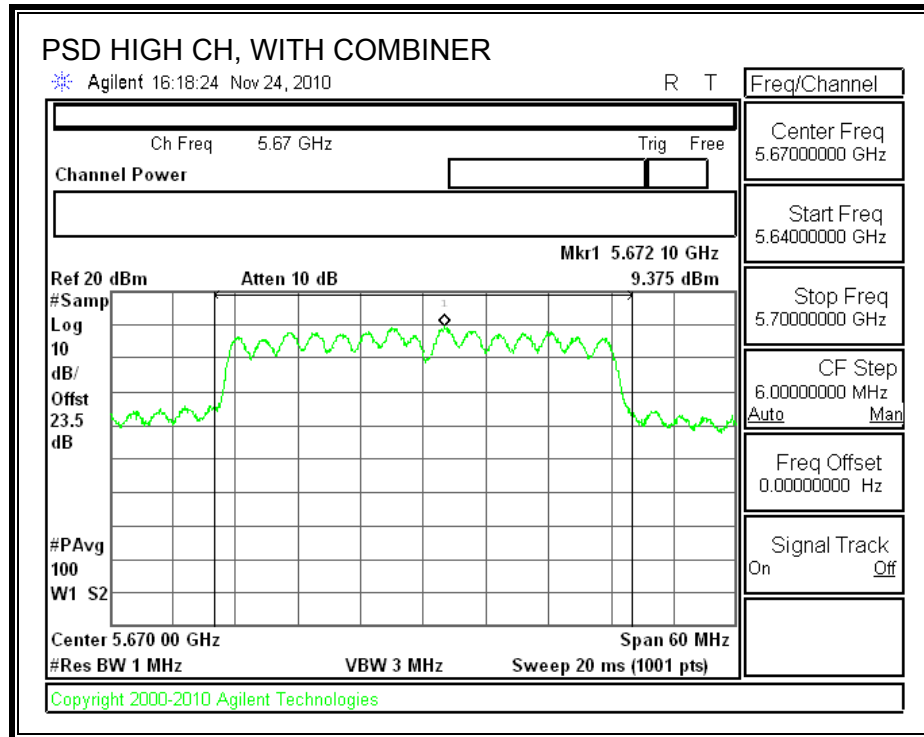
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

#### RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5510	5.948	9.79	-3.84
Middle	5550	9.416	9.79	-0.37
High	5670	9.375	9.79	-0.41

## POWER SPECTRAL DENSITY WITH COMBINER





## 7.9.4. 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.

### TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

### RESULTS

#### CHAIN 1

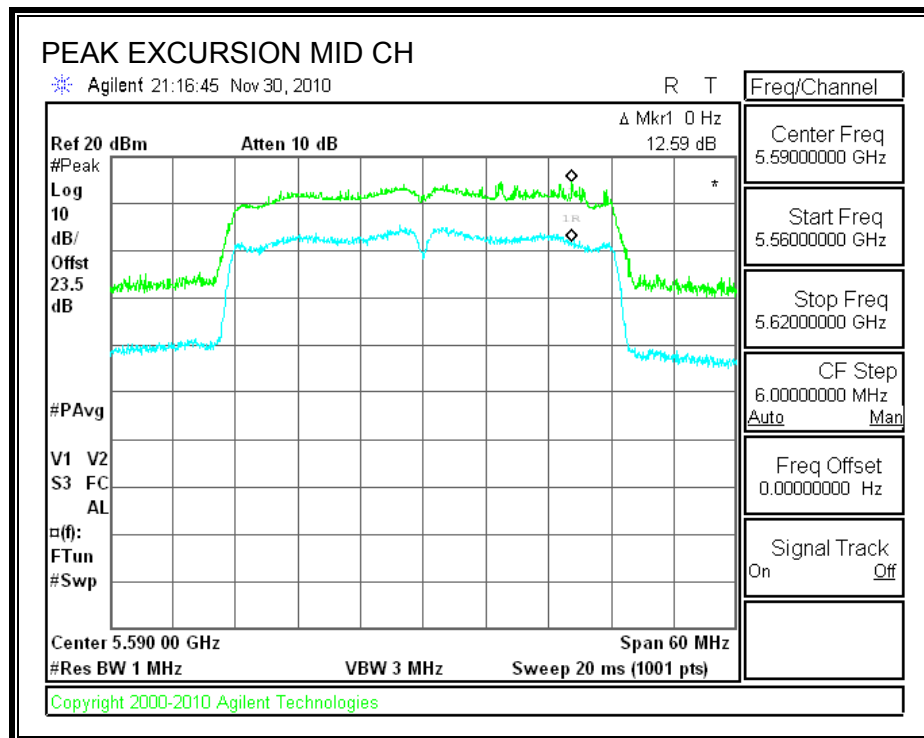
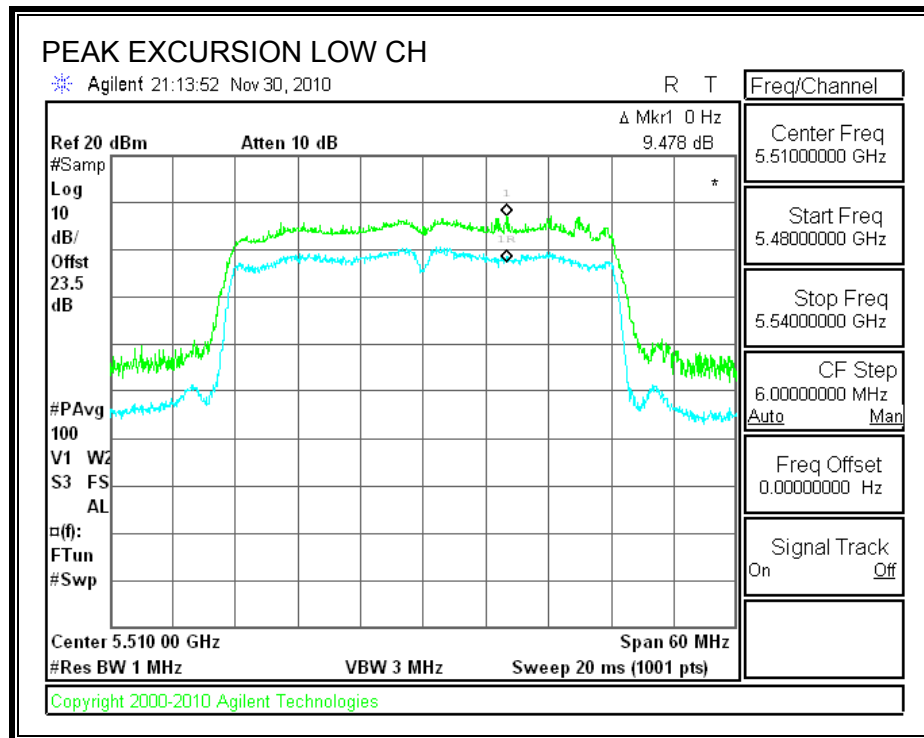
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	9.48	13	-3.52
Middle	5590	12.59	13	-0.41
High	5670	12.70	13	-0.30

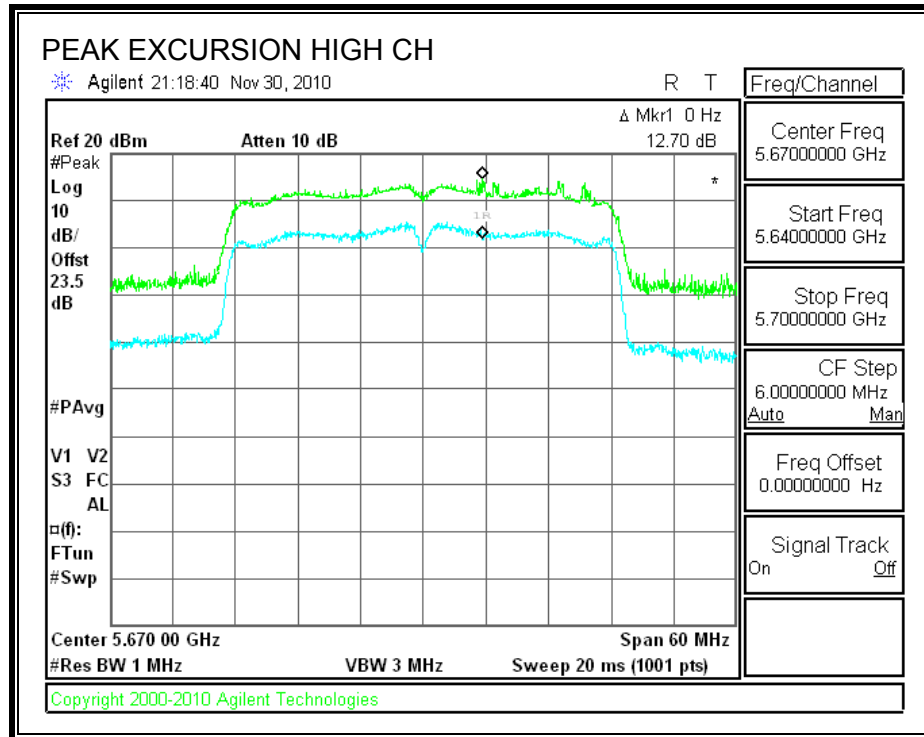
#### CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	10.15	13	-2.85
Middle	5590	9.69	13	-3.31
High	5670	11.52	13	-1.48

## CHAIN 1

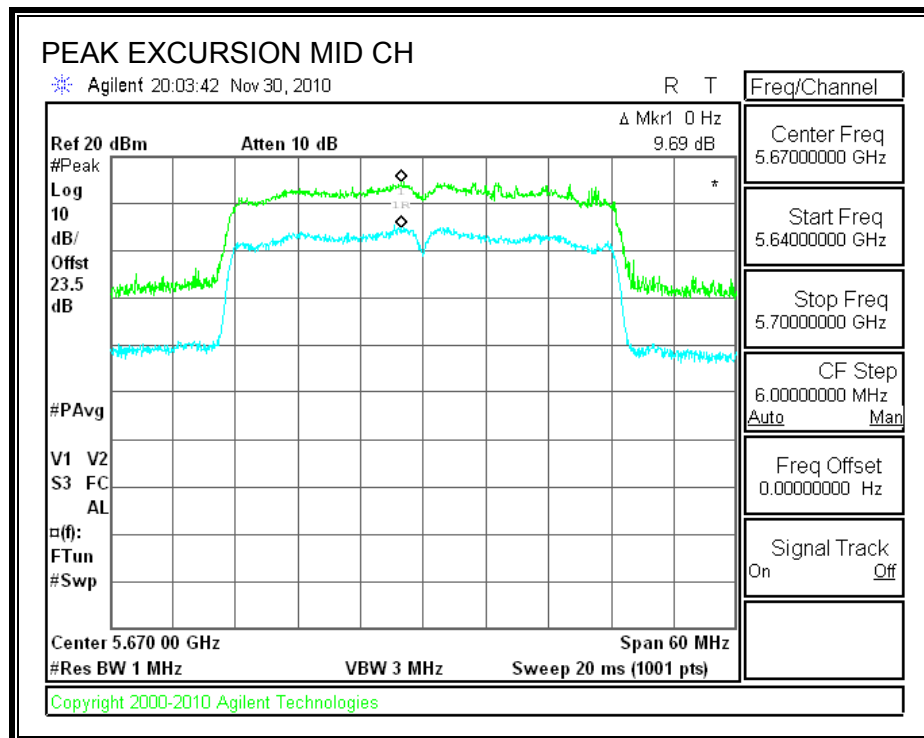
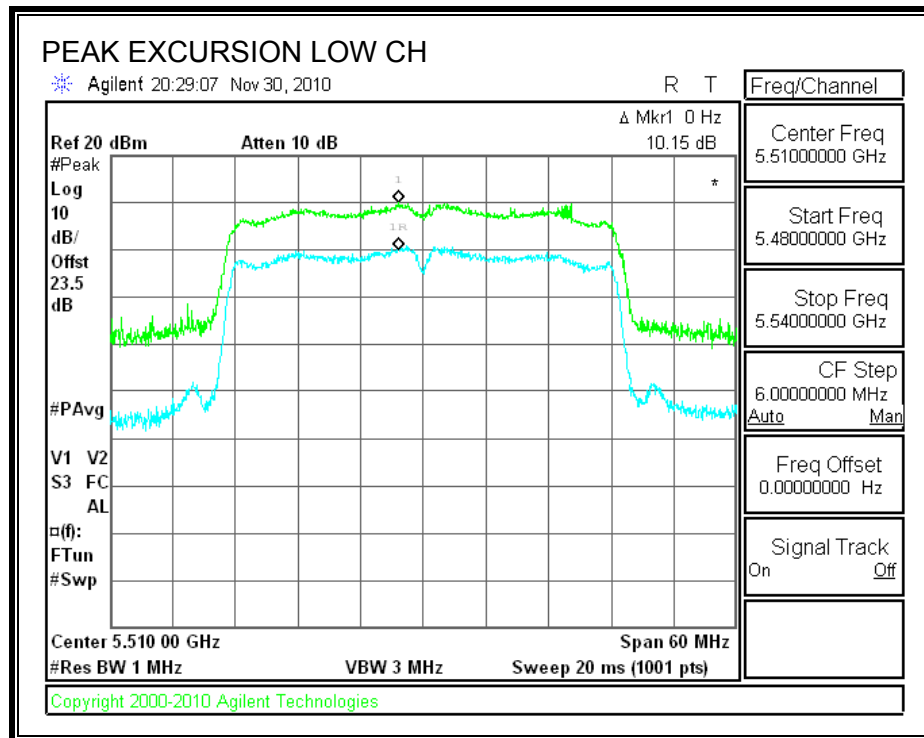
### PEAK EXCURSION

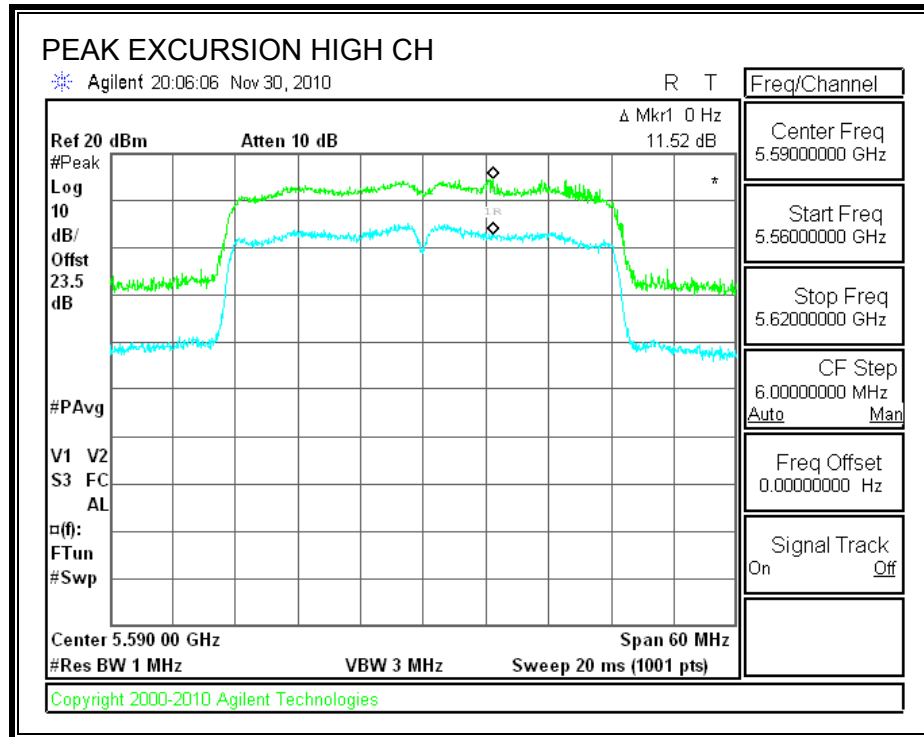




## CHAIN 2

### PEAK EXCURSION





## **7.9.5. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

### **TEST PROCEDURE**

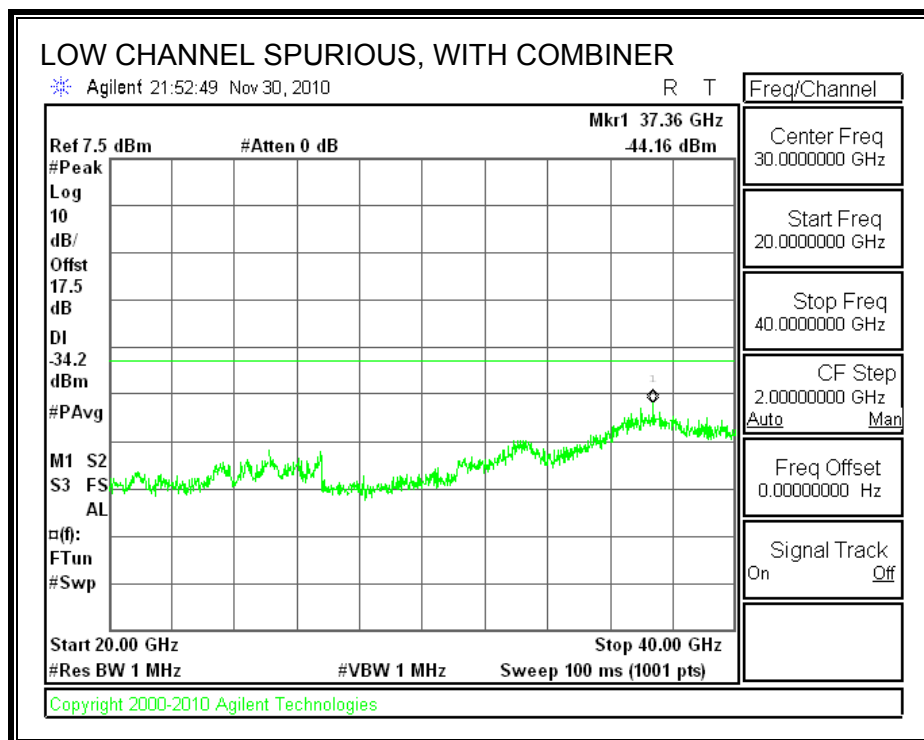
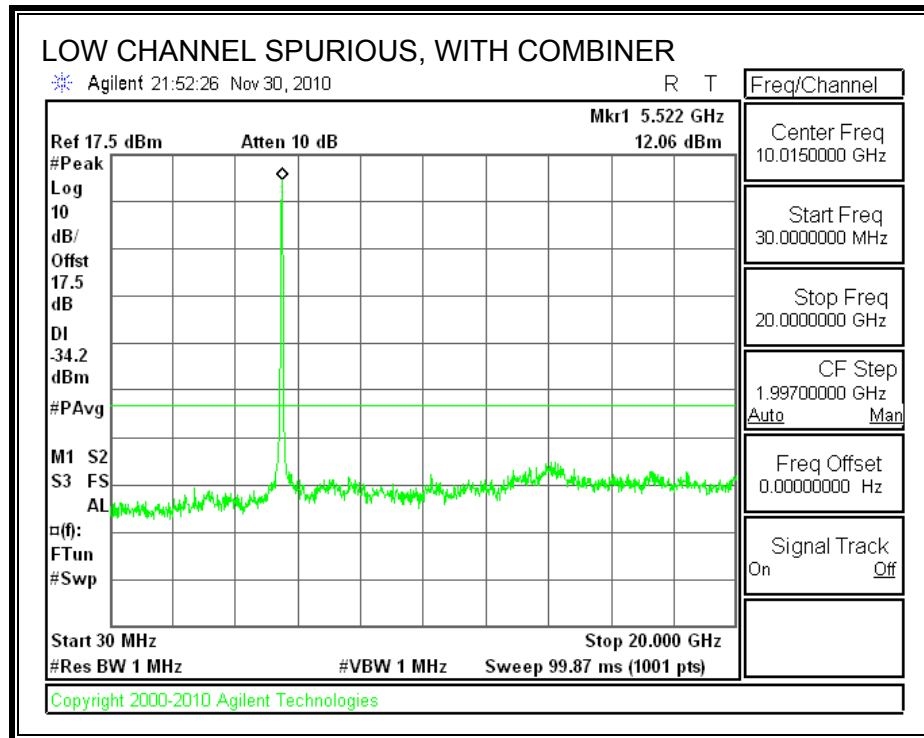
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

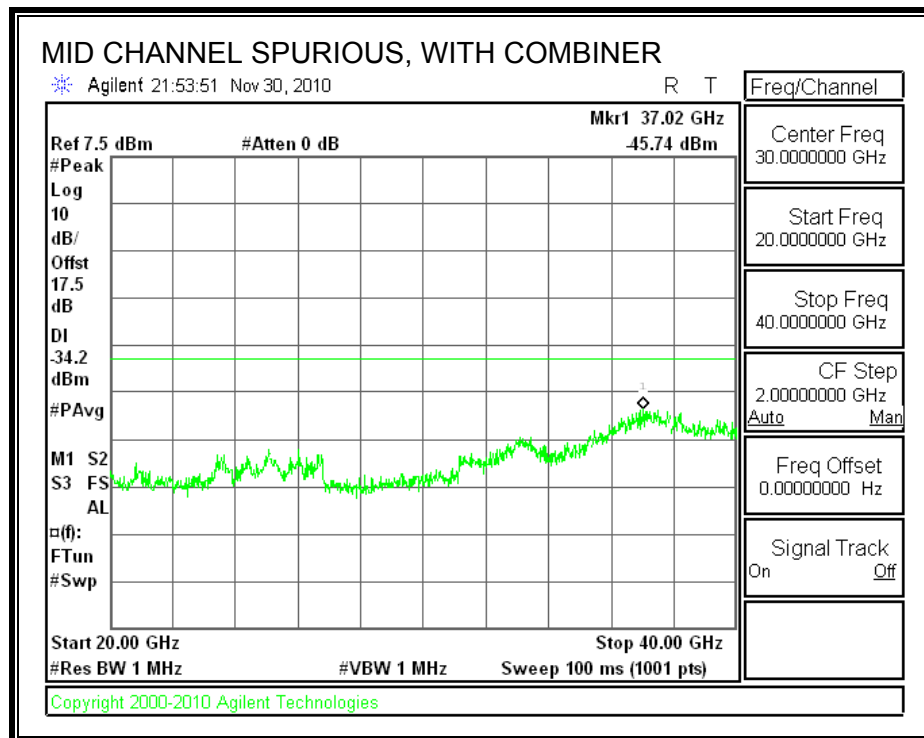
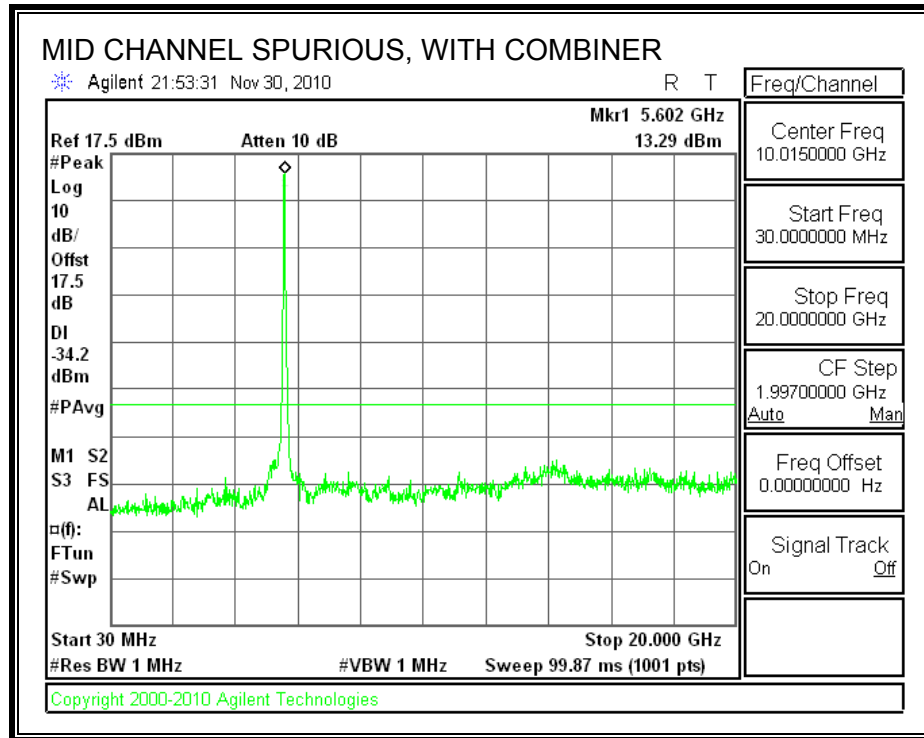
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

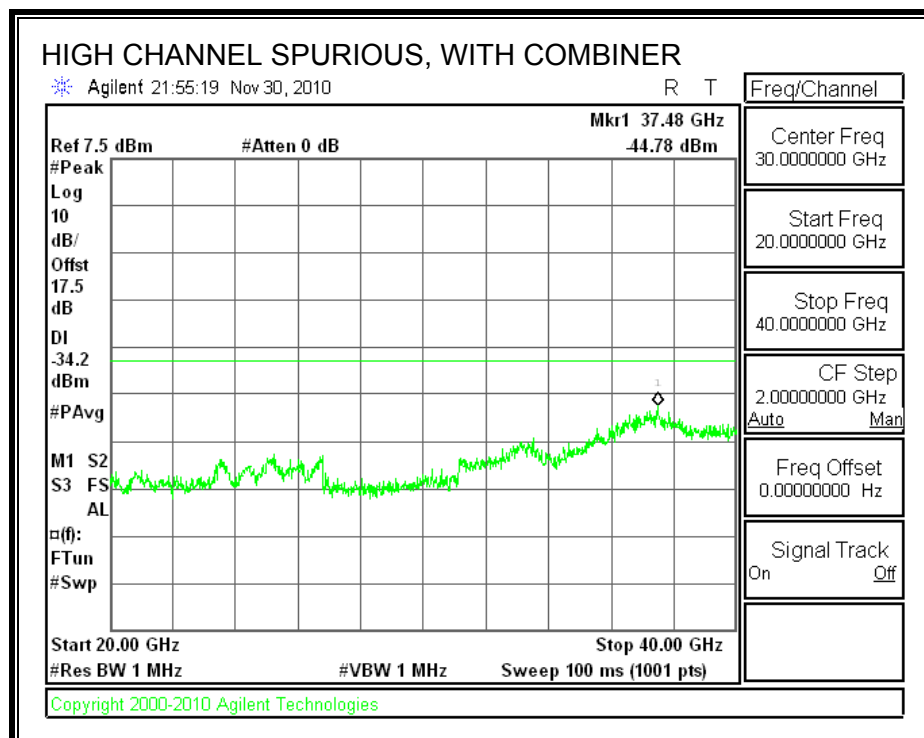
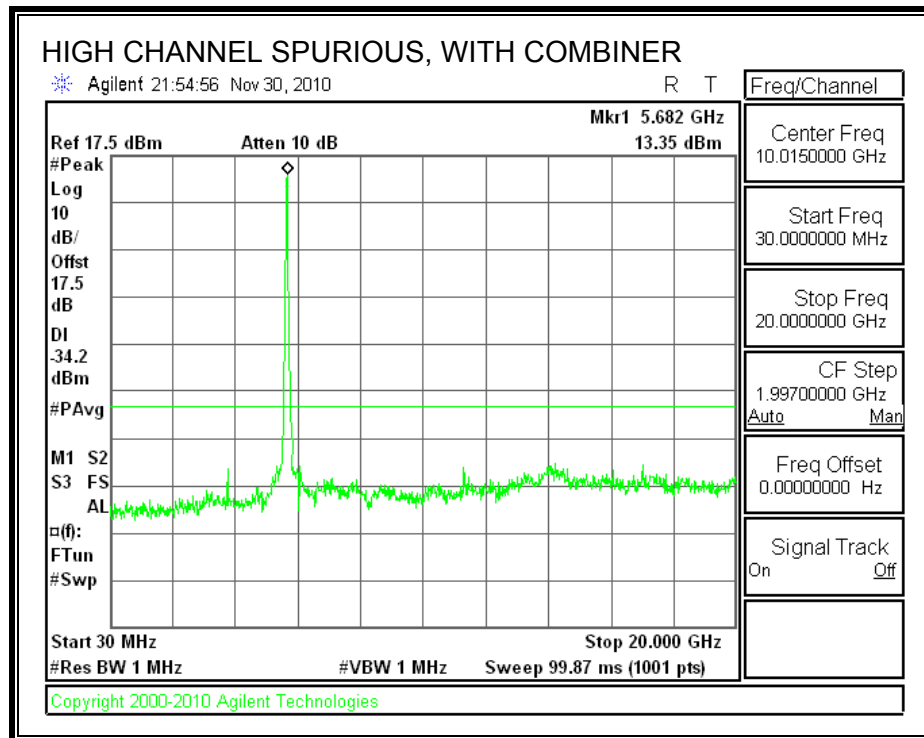
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

### SPURIOUS EMISSIONS WITH COMBINER







## 8. RADIATED TEST RESULTS

### 8.1. 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. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

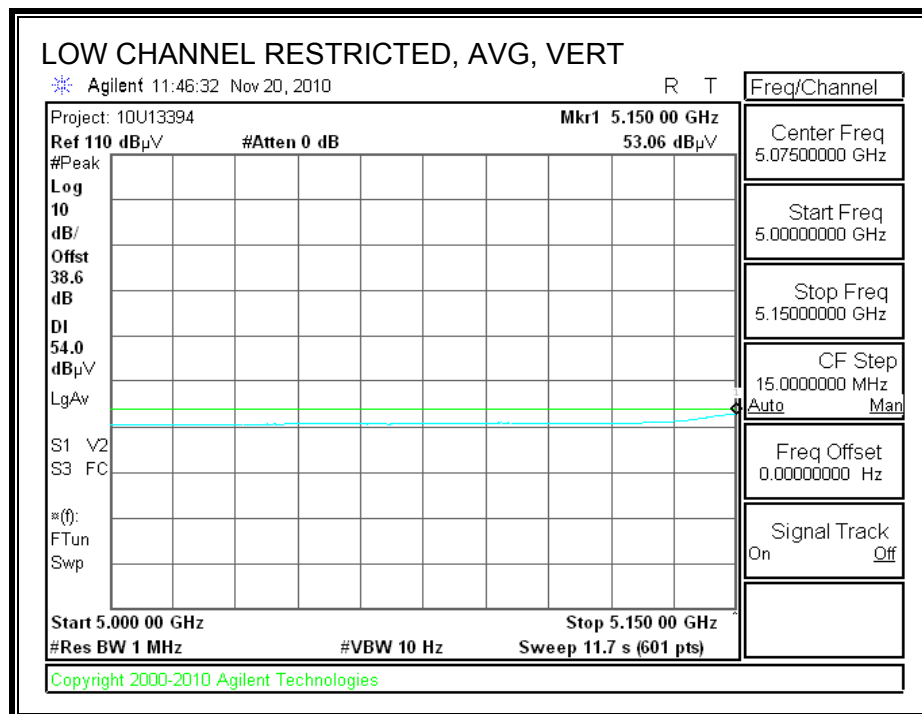
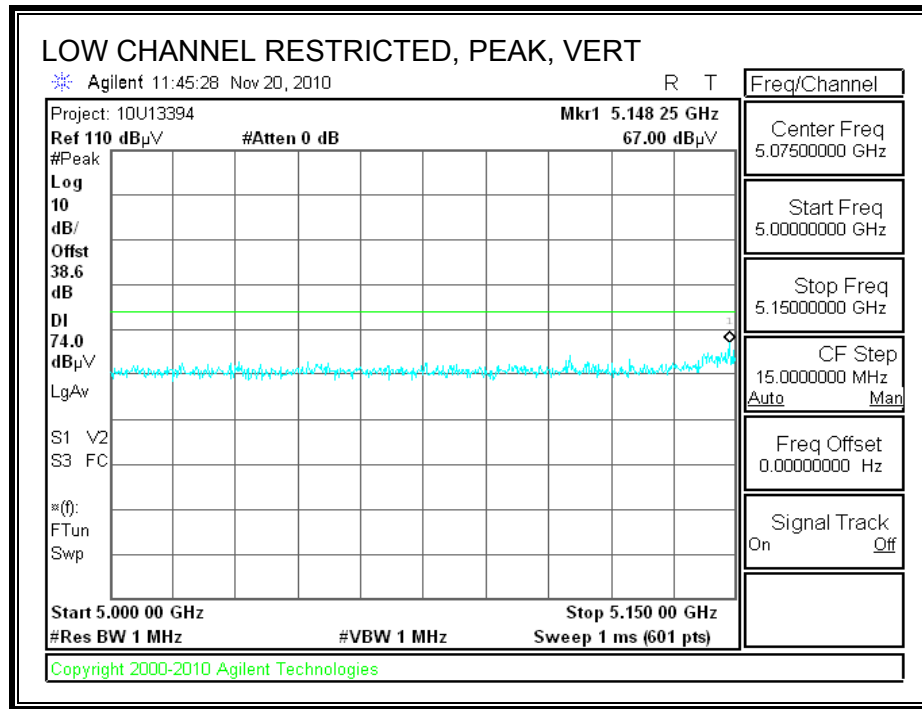
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. 802.11a MODE IN THE LOWER 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 3m Chamber

Test Engr: Vien Tran  
Date: 11/21/10  
Project #: 10U13394  
Company: Broadcom  
Test Target: FCC B  
Mode Oper: Tx 11a Mode 5.2 GHz Band

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	

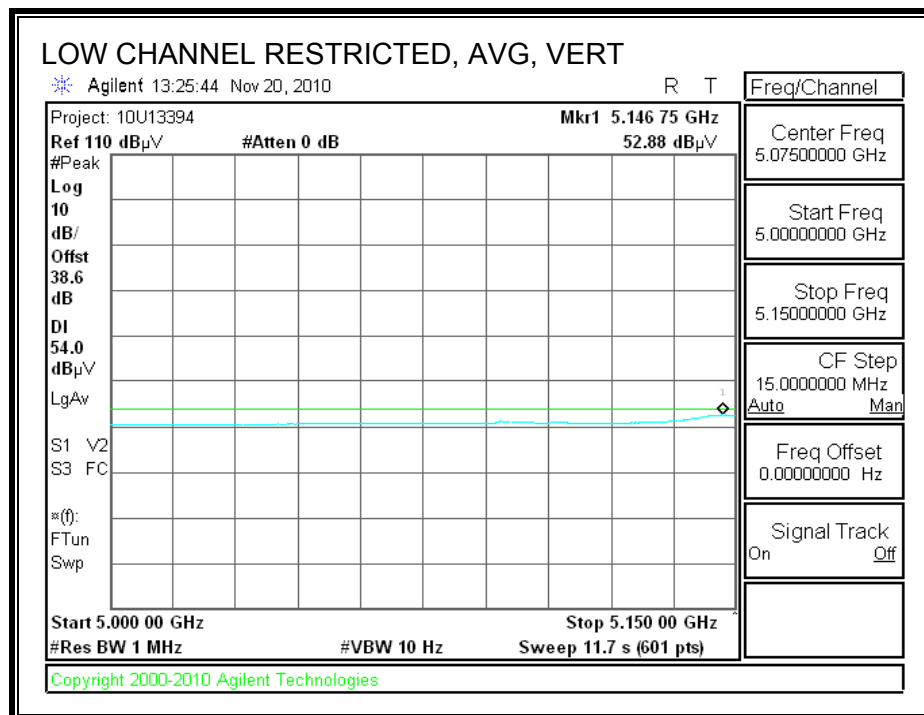
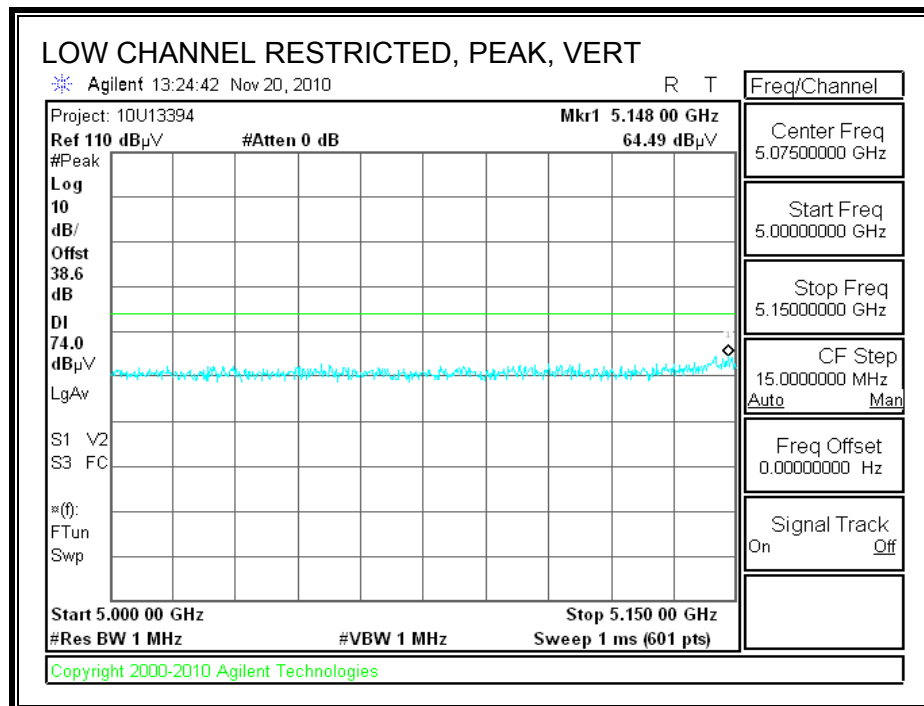
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL (36), 5180MHz</b>													
15.540	3.0	47.9	38.5	11.3	-32.2	0.0	0.0	65.6	74.0	-8.4	V	P	
15.540	3.0	32.3	38.5	11.3	-32.2	0.0	0.0	49.9	54.0	-4.1	V	A	
15.540	3.0	41.9	38.5	11.3	-32.2	0.0	0.0	59.5	74.0	-14.5	H	P	
15.540	3.0	27.4	38.5	11.3	-32.2	0.0	0.0	45.1	54.0	-8.9	H	A	
<b>MID CHANNEL (40), 5200MHz</b>													
15.600	3.0	45.0	38.3	11.4	-32.2	0.0	0.0	62.5	74.0	-11.5	V	P	
15.600	3.0	29.6	38.3	11.4	-32.2	0.0	0.0	47.1	54.0	-6.9	V	A	
15.600	3.0	39.3	38.3	11.4	-32.2	0.0	0.0	56.8	74.0	-17.2	H	P	
15.600	3.0	25.9	38.3	11.4	-32.2	0.0	0.0	43.4	54.0	-10.6	H	A	
<b>HIGH CHANNEL (48), 5240MHz</b>													
15.720	3.0	38.9	38.0	11.4	-32.2	0.0	0.0	56.2	74.0	-17.8	V	P	
15.720	3.0	24.4	38.0	11.4	-32.2	0.0	0.0	41.6	54.0	-12.4	V	A	
15.720	3.0	35.0	38.0	11.4	-32.2	0.0	0.0	52.2	74.0	-21.8	H	P	
15.720	3.0	22.3	38.0	11.4	-32.2	0.0	0.0	39.5	54.0	-14.5	H	A	

Rev. 4.1.2.7

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

## 8.2.2. 802.11n HT20 CDD MCS0 MODE IN THE LOWER 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 3m Chamber

Test Engr: Vien Tran  
Date: 11/21/10  
Project #: 10U13394  
Company: Broadcom  
Test Target: FCC B  
Mode Oper: Tx HT20 Mode\_5.2 GHz Band

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	

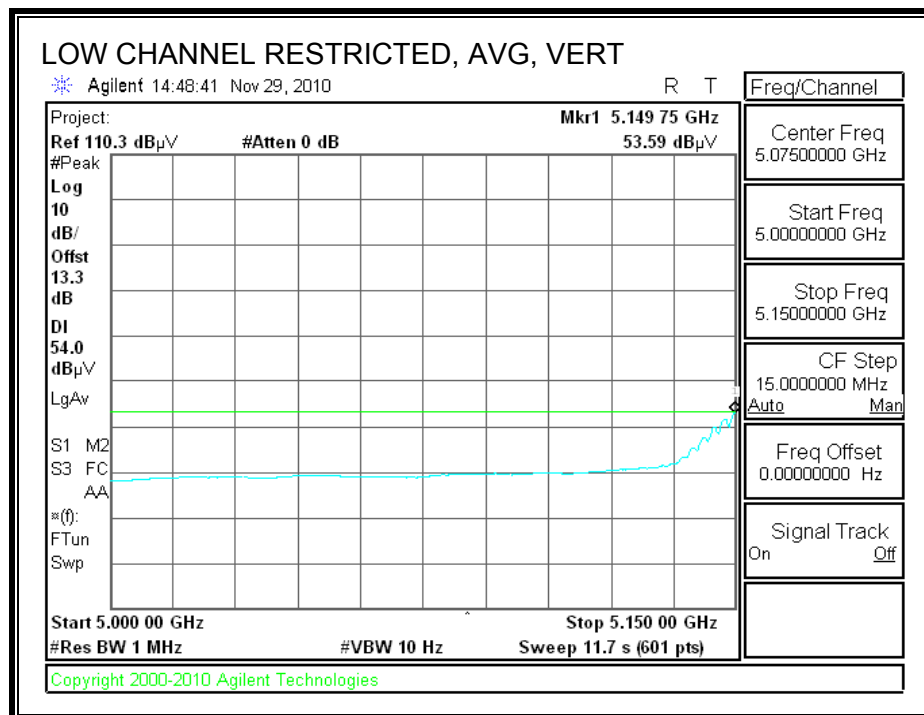
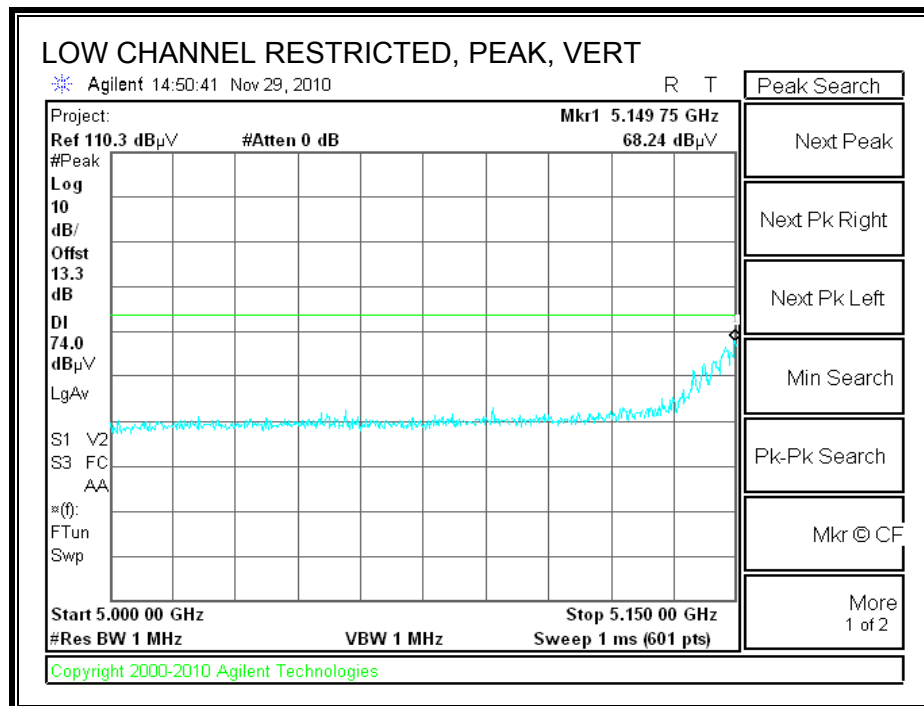
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL (36), 5180MHz</b>													
15.540	3.0	38.9	38.5	11.3	-32.2	0.0	0.0	56.5	74.0	-17.5	V	P	
15.540	3.0	24.3	38.5	11.3	-32.2	0.0	0.0	41.9	54.0	-12.1	V	A	
15.540	3.0	33.5	38.5	11.3	-32.2	0.0	0.0	51.2	74.0	-22.8	H	P	
15.540	3.0	21.4	38.5	11.3	-32.2	0.0	0.0	39.0	54.0	-15.0	H	A	
<b>MID CHANNEL (40), 5200MHz</b>													
15.600	3.0	42.7	38.3	11.4	-32.2	0.0	0.0	60.2	74.0	-13.8	V	P	
15.600	3.0	28.3	38.3	11.4	-32.2	0.0	0.0	45.8	54.0	-8.2	V	A	
15.600	3.0	39.3	38.3	11.4	-32.2	0.0	0.0	56.8	74.0	-17.2	H	P	
15.600	3.0	24.8	38.3	11.4	-32.2	0.0	0.0	42.3	54.0	-11.7	H	A	
<b>HIGH CHANNEL (48), 5240MHz</b>													
15.720	3.0	43.3	38.0	11.4	-32.2	0.0	0.0	60.6	74.0	-13.4	V	P	
15.720	3.0	27.8	38.0	11.4	-32.2	0.0	0.0	45.0	54.0	-9.0	V	A	
15.720	3.0	36.3	38.0	11.4	-32.2	0.0	0.0	53.6	74.0	-20.4	H	P	
15.720	3.0	23.7	38.0	11.4	-32.2	0.0	0.0	40.9	54.0	-13.1	H	A	

Rev. 4.1.2.7

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

### 8.2.3. 802.11n HT40 CDD MCS0 MODE IN THE LOWER 5.2 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

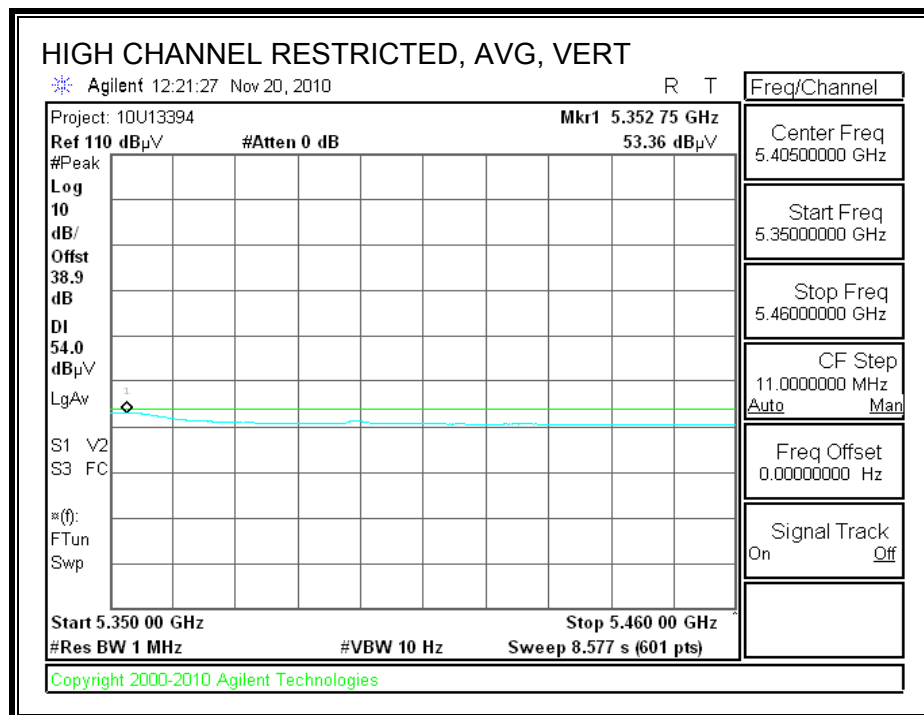
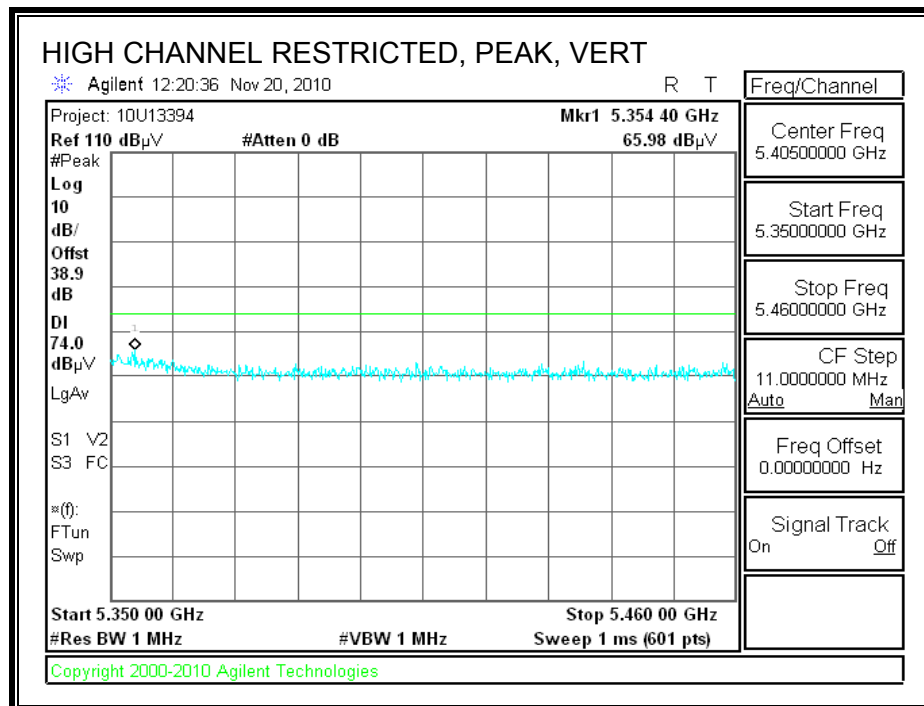


## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																																													
Compliance Certification Services, Fremont 5m Chamber																																													
Company:		Broadcom																																											
Project #:		10U13394																																											
Date:		11/24/2010																																											
Test Engineer:		Thanh Nguyen																																											
Configuration:		EUT and support laptop																																											
Mode:		Transmit HT 40 CDD 5.2GHz band.																																											
Test Equipment:																																													
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit																																			
T73; S/N: 6717 @3m		T144 Miteq 3008A00931								FCC 15.209																																			
Hi Frequency Cables																																													
3' cable 22807700		12' cable 22807600		20' cable 22807500		HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz																																			
3' cable 22807700		12' cable 22807600		20' cable 22807500				R_002																																					
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																														
CH 38 (5190MHz)																																													
10.380	3.0	41.1	29.1	37.7	8.9	-36.8	0.0	0.0	50.9	38.9	74	54	-23.1	-15.1	V																														
15.570	3.0	35.4	25.4	38.6	11.4	-34.8	0.0	0.0	50.5	40.5	74	54	-23.5	-13.5	V																														
10.380	3.0	39.9	30.6	37.7	8.9	-36.8	0.0	0.0	49.7	40.4	74	54	-24.3	-13.6	H																														
15.570	3.0	35.4	25.4	38.6	11.4	-34.8	0.0	0.0	50.5	40.5	74	54	-23.5	-13.5	H																														
Ch 46(5230MHz)																																													
10.460	3.0	43.9	31.2	37.7	9.0	-36.7	0.0	0.0	53.8	41.1	74	54	-20.2	-12.9	V																														
15.690	3.0	35.9	25.1	38.3	11.4	-34.7	0.0	0.0	50.9	40.0	74	54	-23.1	-14.0	V																														
10.460	3.0	43.4	32.2	37.7	9.0	-36.7	0.0	0.0	53.3	42.1	74	54	-20.7	-11.9	H																														
15.690	3.0	34.7	24.8	38.3	11.4	-34.7	0.0	0.0	49.7	39.7	74	54	-24.3	-14.3	H																														
<table style="width: 100%; border: none;"> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>																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		
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																																										

## 8.2.4. 802.11a MODE IN THE UPPER 5.3 GHz BAND

### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 3m Chamber

Test Engr: Vien Tran  
Date: 11/21/10  
Project #: 10U13394  
Company: Broadcom  
Test Target: FCC B  
Mode Oper: Tx 11a Mode\_5.3 GHz Band

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

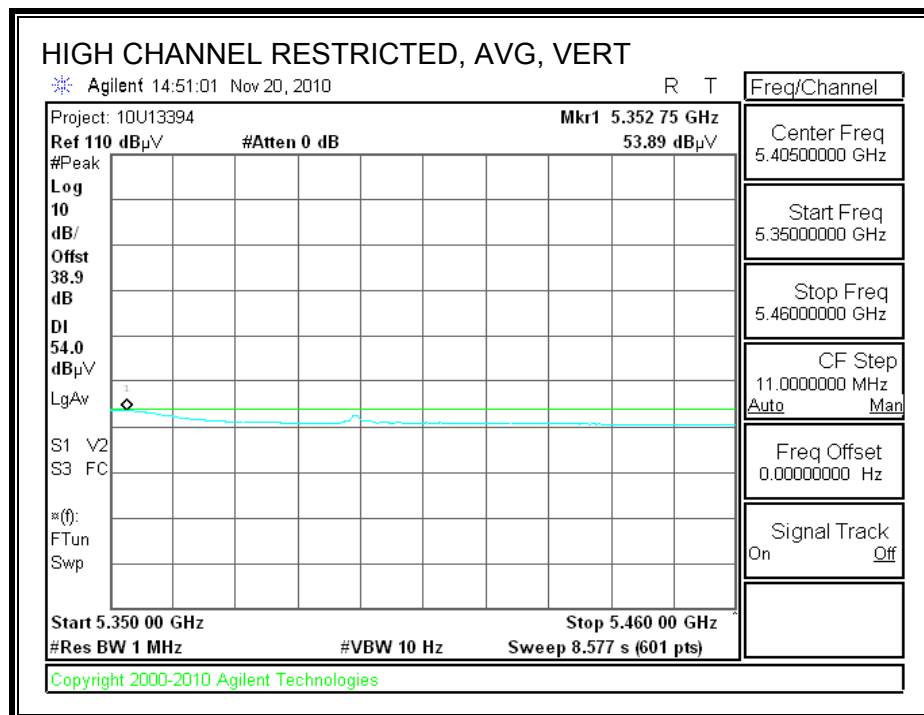
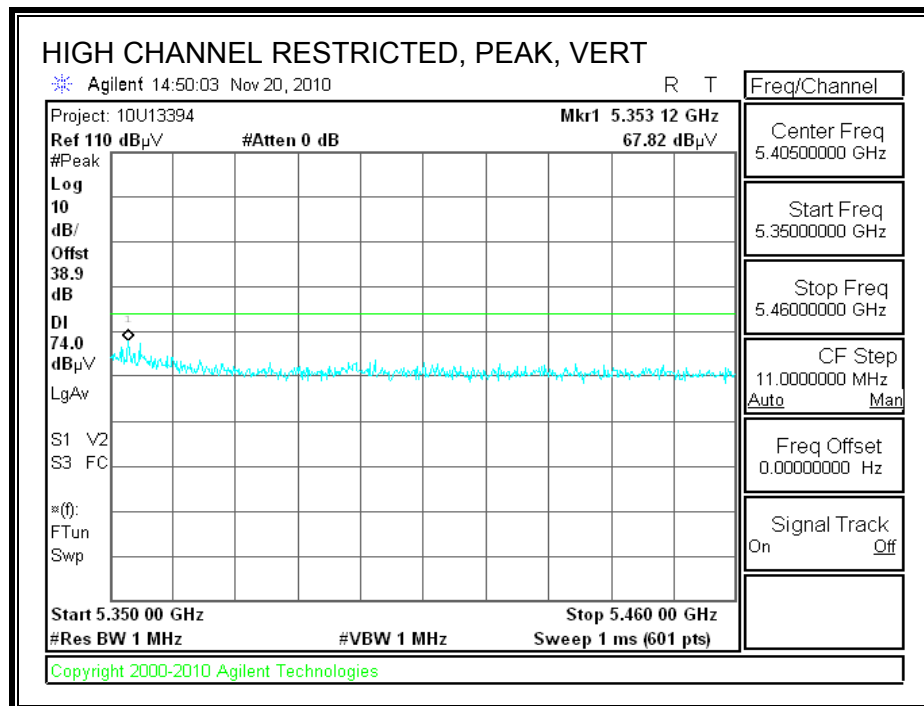
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL (52), 5260MHz</b>													
15.780	3.0	45.6	37.8	11.5	-32.2	0.0	0.0	62.7	74.0	-11.3	V	P	
15.780	3.0	31.4	37.8	11.5	-32.2	0.0	0.0	48.5	54.0	-5.5	V	A	
15.780	3.0	39.6	37.8	11.5	-32.2	0.0	0.0	56.7	74.0	-17.3	H	P	
15.780	3.0	25.8	37.8	11.5	-32.2	0.0	0.0	42.9	54.0	-11.1	H	A	
<b>MID CHANNEL (60), 5300MHz</b>													
10.600	3.0	54.3	37.6	9.0	-32.6	0.0	0.0	68.3	74.0	-5.7	V	P	
10.600	3.0	39.5	37.6	9.0	-32.6	0.0	0.0	53.5	54.0	-0.5	V	A	
15.900	3.0	41.0	37.5	11.5	-32.1	0.0	0.0	57.8	74.0	-16.2	V	P	
15.900	3.0	25.6	37.5	11.5	-32.1	0.0	0.0	42.4	54.0	-11.6	V	A	
10.600	3.0	48.5	37.6	9.0	-32.6	0.0	0.0	62.5	74.0	-11.5	H	P	
10.600	3.0	33.6	37.6	9.0	-32.6	0.0	0.0	47.6	54.0	-6.4	H	A	
15.900	3.0	35.0	37.5	11.5	-32.1	0.0	0.0	51.8	74.0	-22.2	H	P	
15.900	3.0	22.6	37.5	11.5	-32.1	0.0	0.0	39.4	54.0	-14.6	H	A	
10.600	3.0	51.6	37.6	9.0	-32.6	0.0	0.0	65.6	74.0	-8.4	H	P	
10.600	3.0	38.6	37.6	9.0	-32.6	0.0	0.0	52.6	54.0	-1.4	H	A	
15.900	3.0	38.3	37.5	11.5	-32.1	0.0	0.0	55.1	74.0	-18.9	H	P	
15.900	3.0	25.8	37.5	11.5	-32.1	0.0	0.0	42.6	54.0	-11.4	H	A	
<b>HIGH CHANNEL (64), 5320MHz</b>													
10.640	3.0	52.0	37.6	9.1	-32.6	0.0	0.0	66.1	74.0	-7.9	V	P	
10.640	3.0	35.7	37.6	9.1	-32.6	0.0	0.0	49.7	54.0	-4.3	V	A	
15.960	3.0	36.3	37.3	11.5	-32.1	0.0	0.0	53.0	74.0	-21.0	V	P	
15.960	3.0	23.4	37.3	11.5	-32.1	0.0	0.0	40.1	54.0	-13.9	V	A	
10.640	3.0	43.8	37.6	9.1	-32.6	0.0	0.0	57.8	74.0	-16.2	H	P	
10.640	3.0	27.6	37.6	9.1	-32.6	0.0	0.0	41.7	54.0	-12.3	H	A	
15.960	3.0	34.7	37.3	11.5	-32.1	0.0	0.0	51.4	74.0	-22.6	H	P	
15.960	3.0	21.7	37.3	11.5	-32.1	0.0	0.0	38.4	54.0	-15.6	H	A	

Rev. 4.1.2.7

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

## 8.2.5. 802.11n HT20 CDD MCS0 MODE IN THE UPPER 5.3 GHz BAND

### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 3m Chamber

Test Engr: Vien Tran  
Date: 11/21/10  
Project #: 10U13394  
Company: Broadcom  
Test Target: FCC B  
Mode Oper: Tx HT20 Mode\_5.3 GHz Band

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

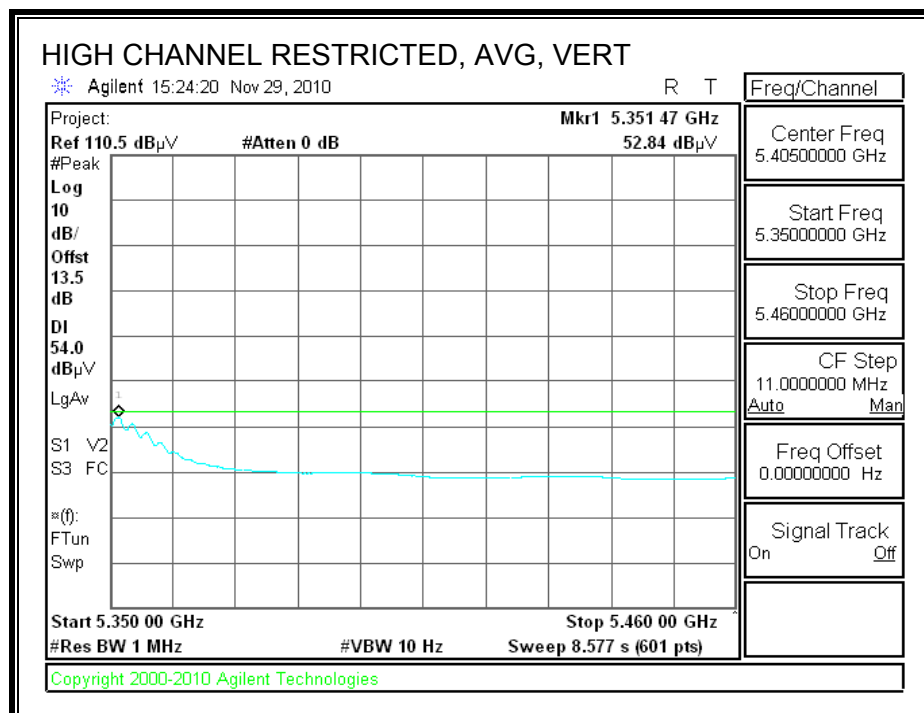
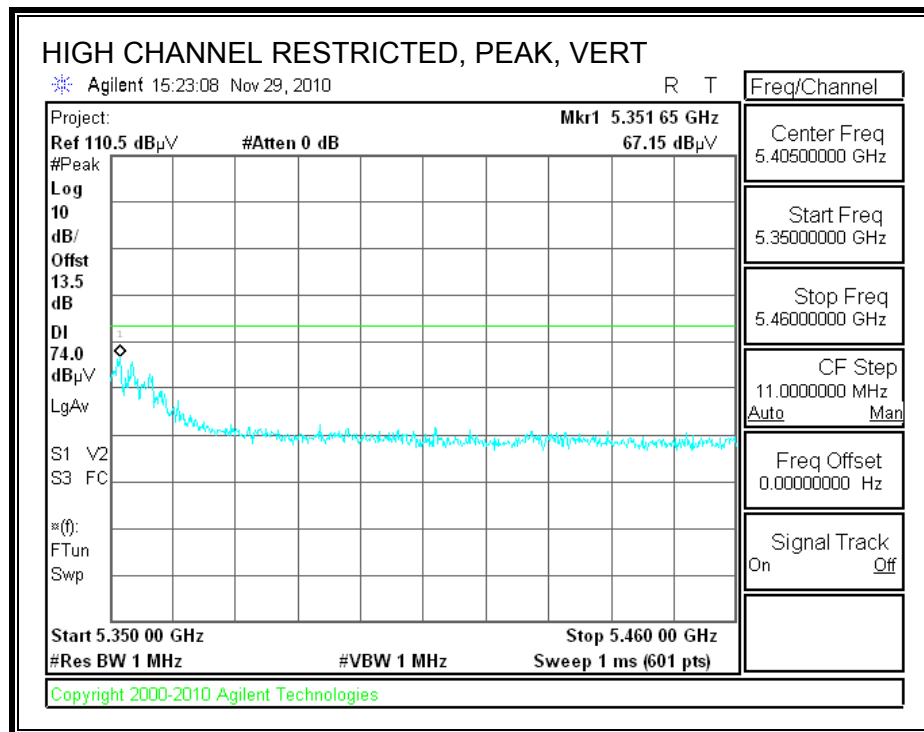
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL (52), 5260MHz</b>													
15.780	3.0	45.7	37.8	11.5	-32.2	0.0	0.0	62.9	74.0	-11.1	V	P	
15.780	3.0	32.1	37.8	11.5	-32.2	0.0	0.0	49.2	54.0	-4.8	V	A	
15.780	3.0	40.5	37.8	11.5	-32.2	0.0	0.0	57.6	74.0	-16.4	H	P	
15.780	3.0	26.8	37.8	11.5	-32.2	0.0	0.0	43.9	54.0	-10.1	H	A	
<b>MID CHANNEL (60), 5300MHz</b>													
10.600	3.0	53.1	37.6	9.0	-32.6	0.0	0.0	67.1	74.0	-6.9	V	P	
10.600	3.0	39.5	37.6	9.0	-32.6	0.0	0.0	53.5	54.0	-0.5	V	A	
15.900	3.0	40.6	37.5	11.5	-32.1	0.0	0.0	57.4	74.0	-16.6	V	P	
15.900	3.0	27.8	37.5	11.5	-32.1	0.0	0.0	44.6	54.0	-9.4	V	A	
10.600	3.0	44.2	37.6	9.0	-32.6	0.0	0.0	58.2	74.0	-15.8	H	P	
10.600	3.0	30.9	37.6	9.0	-32.6	0.0	0.0	44.9	54.0	-9.1	H	A	
15.900	3.0	39.7	37.5	11.5	-32.1	0.0	0.0	56.5	74.0	-17.5	H	P	
15.900	3.0	26.2	37.5	11.5	-32.1	0.0	0.0	43.1	54.0	-10.9	H	A	
<b>HIGH CHANNEL (64), 5320MHz</b>													
10.640	3.0	54.8	37.6	9.1	-32.6	0.0	0.0	68.8	74.0	-5.2	V	P	
10.640	3.0	39.4	37.6	9.1	-32.6	0.0	0.0	53.4	54.0	-0.6	V	A	
15.960	3.0	33.4	37.3	11.5	-32.1	0.0	0.0	50.1	74.0	-23.9	V	P	
15.960	3.0	21.2	37.3	11.5	-32.1	0.0	0.0	37.9	54.0	-16.1	V	A	
10.640	3.0	39.1	37.6	9.1	-32.6	0.0	0.0	53.2	74.0	-20.8	H	P	
10.640	3.0	25.4	37.6	9.1	-32.6	0.0	0.0	39.4	54.0	-14.6	H	A	
15.960	3.0	34.4	37.3	11.5	-32.1	0.0	0.0	51.1	74.0	-22.9	H	P	
15.960	3.0	22.1	37.3	11.5	-32.1	0.0	0.0	38.8	54.0	-15.2	H	A	

Rev. 4.1.2.7

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

## 8.2.6. 802.11n HT40 CDD MCS0 MODE IN THE UPPER 5.3 GHz BAND

### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



## HARMONICS AND SPURIOUS EMISSIONS

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

Company: Broadcom  
Project #: 10U13394  
Date: 11/24/2010  
Test Engineer: Thanh Nguyen  
Configuration: EUT and support laptop  
Mode: Transmit HT 40 CDD 5.3GHz band.

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

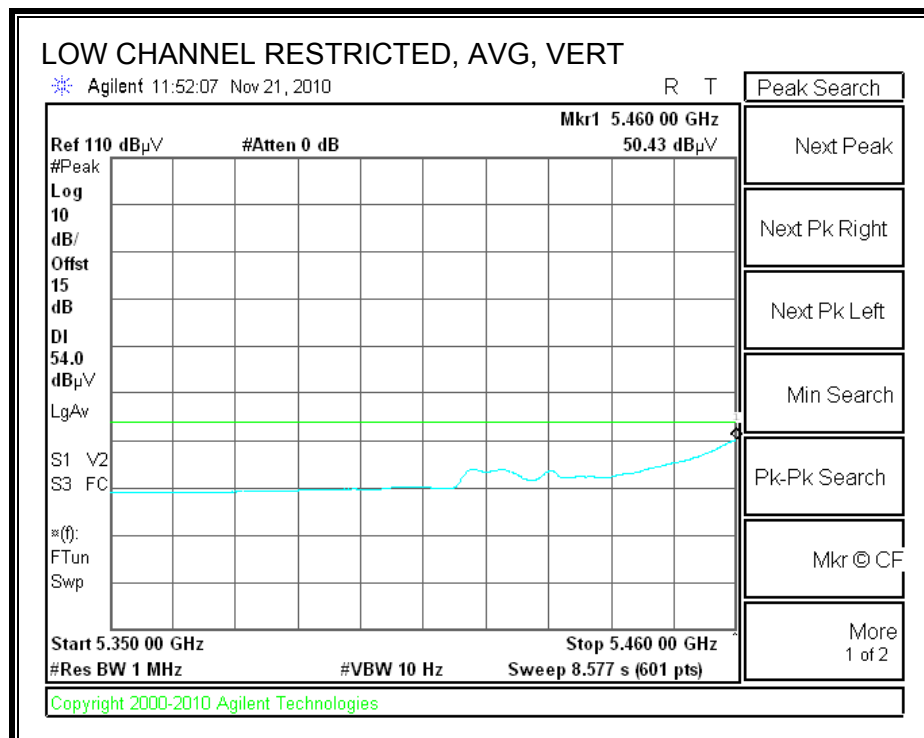
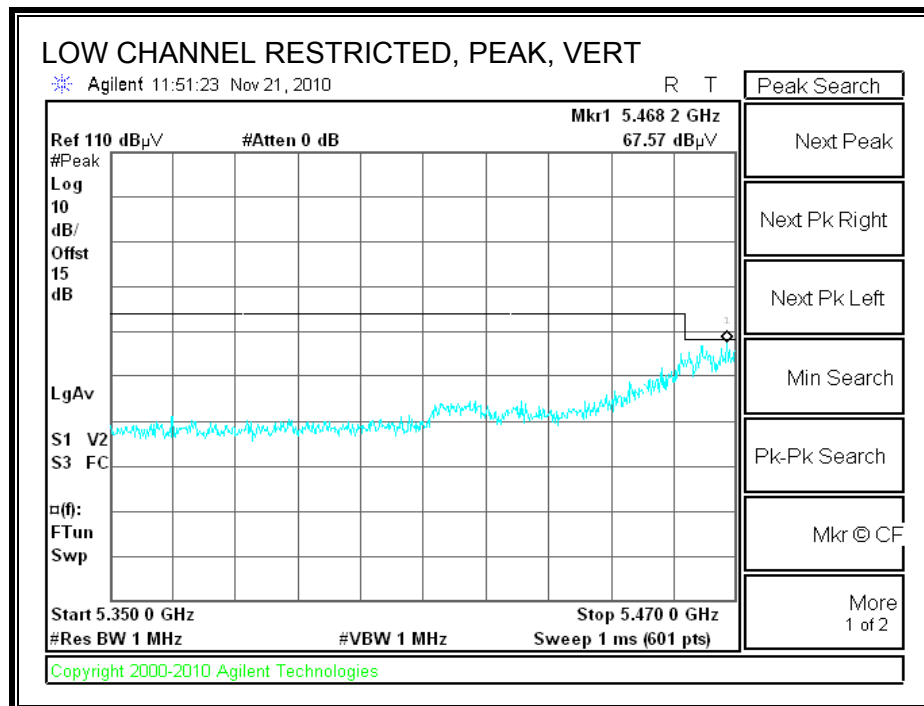
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_002	

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Ch 54 (5270MHz)</b>															
10.540	3.0	45.0	34.1	37.7	9.0	-36.7	0.0	0.0	55.1	44.2	74	54	-18.9	-9.8	V
15.810	3.0	36.2	25.7	37.9	11.5	-34.6	0.0	0.0	51.0	40.5	74	54	-23.0	-13.5	V
10.540	3.0	52.2	41.2	37.7	9.0	-36.7	0.0	0.0	62.3	51.3	74	54	-11.7	-2.7	H
15.810	3.0	35.4	25.7	37.9	11.5	-34.6	0.0	0.0	50.2	40.5	74	54	-23.8	-13.5	H
<b>Ch 62 (5310MHz)</b>															
10.620	3.0	40.9	34.1	37.7	9.0	-36.6	0.0	0.0	51.1	44.3	74	54	-22.9	-9.7	V
15.930	3.0	39.7	27.7	37.6	11.5	-34.5	0.0	0.0	54.3	42.3	74	54	-19.7	-11.7	V
10.620	3.0	40.1	26.5	37.7	9.0	-36.6	0.0	0.0	50.3	36.6	74	54	-23.7	-17.4	H
15.930	3.0	39.5	27.6	37.6	11.5	-34.5	0.0	0.0	54.1	42.2	74	54	-19.9	-11.8	H

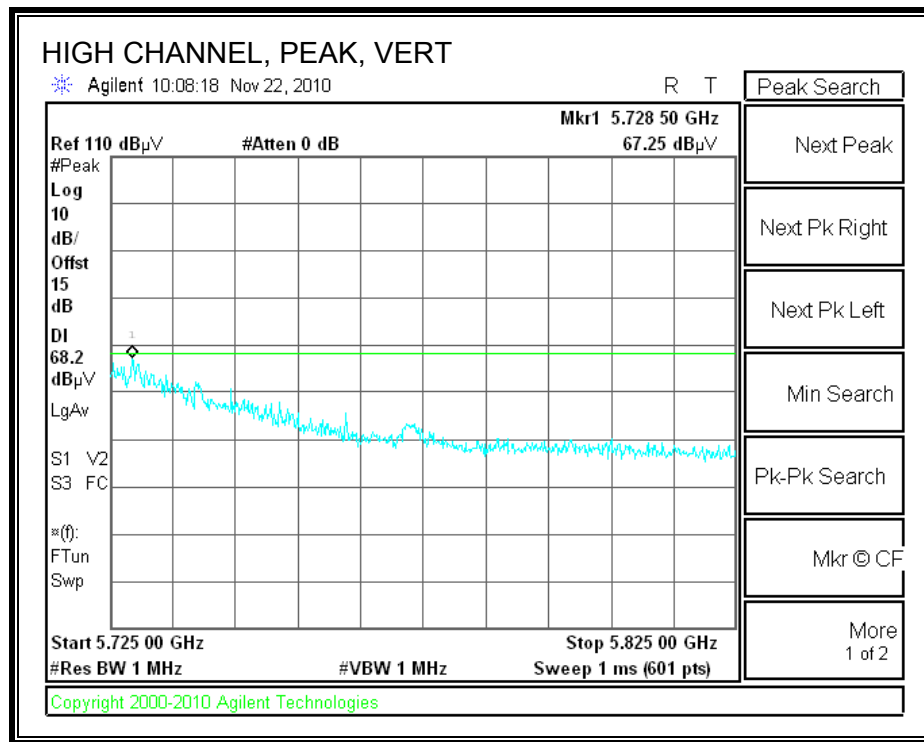
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

## 8.2.7. 802.11a MODE IN THE 5.6 GHz BAND

### RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



**AUTVERTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement

Compliance Certification Services, Fremont 3m Chamber

Test Engr: Vien Tran  
Date: 11/21/10  
Project #: 10U13394  
Company: Broadcom  
Test Target: FCC B  
Mode Oper: Tx 11a Mode\_5.6 GHz Band

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

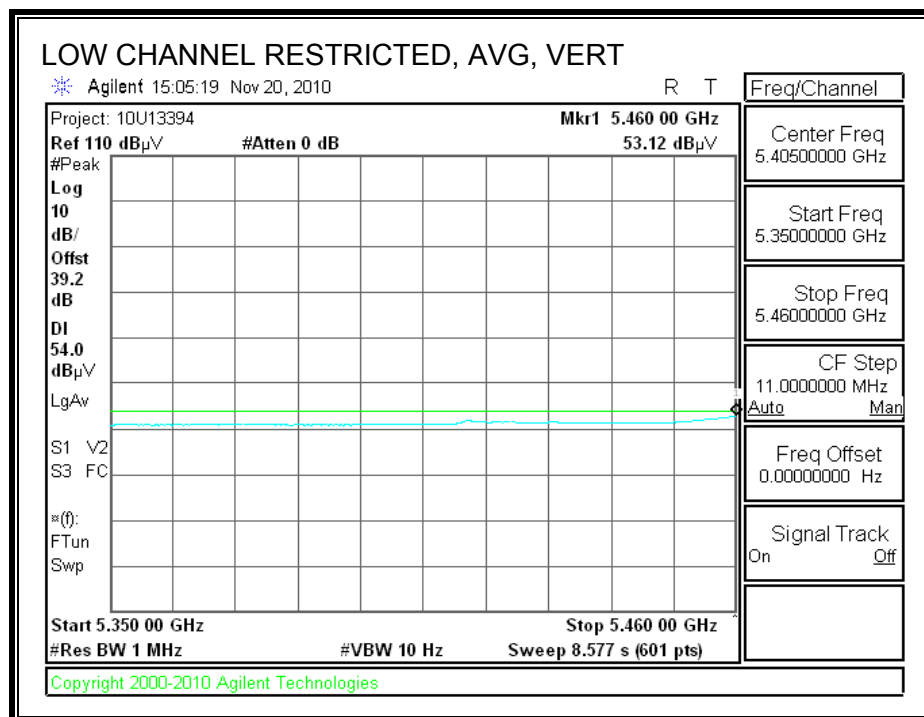
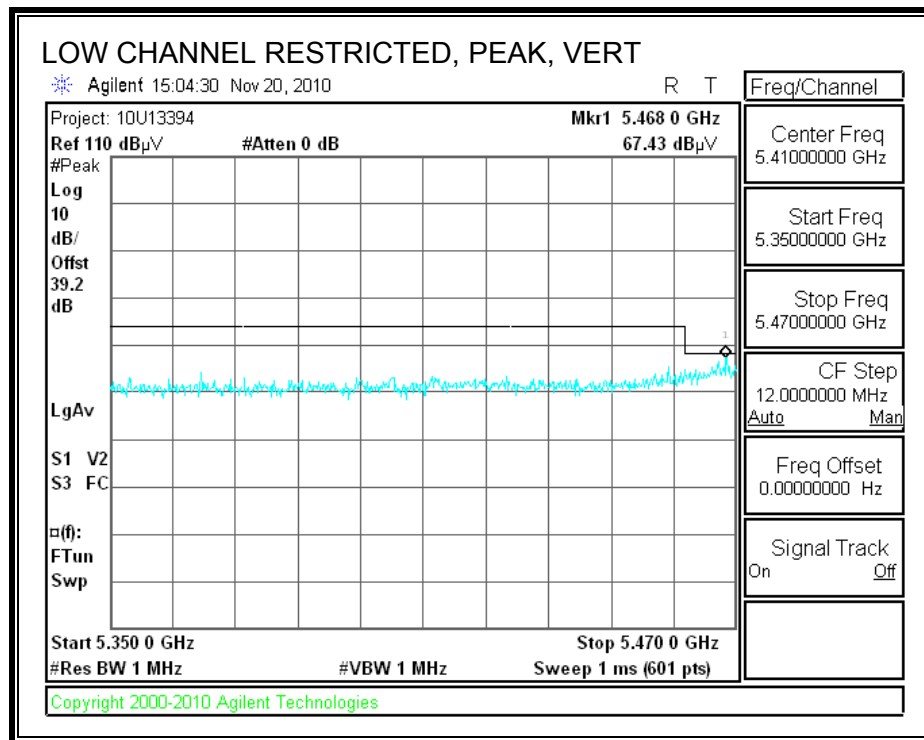
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
LOW CHANNEL (100), 5500MHz													
11.000	3.0	52.9	37.6	9.2	-32.6	0.0	0.0	67.1	74.0	-6.9	V	P	
11.000	3.0	39.4	37.6	9.2	-32.6	0.0	0.0	53.7	54.0	-0.3	V	A	
11.000	3.0	42.3	37.6	9.2	-32.6	0.0	0.0	56.5	74.0	-17.5	H	P	
11.000	3.0	29.1	37.6	9.2	-32.6	0.0	0.0	43.4	54.0	-10.6	H	A	
MID CHANNEL (120), 5600MHz													
11.200	3.0	39.8	37.8	9.3	-32.6	0.0	0.0	54.3	74.0	-19.7	V	P	
11.200	3.0	26.9	37.8	9.3	-32.6	0.0	0.0	41.4	54.0	-12.6	V	A	
11.200	3.0	42.3	37.8	9.3	-32.6	0.0	0.0	56.8	74.0	-17.2	H	P	
11.200	3.0	29.5	37.8	9.3	-32.6	0.0	0.0	44.0	54.0	-10.0	H	A	
HIGH CHANNEL (140), 5700MHz													
11.400	3.0	42.6	38.0	9.4	-32.5	0.0	0.0	57.4	74.0	-16.6	H	P	
11.400	3.0	28.7	38.0	9.4	-32.5	0.0	0.0	43.5	54.0	-10.5	H	A	
11.400	3.0	45.2	38.0	9.4	-32.5	0.0	0.0	60.0	74.0	-14.0	V	P	
11.400	3.0	32.2	38.0	9.4	-32.5	0.0	0.0	47.1	54.0	-6.9	V	A	

Rev. 4.1.2.7

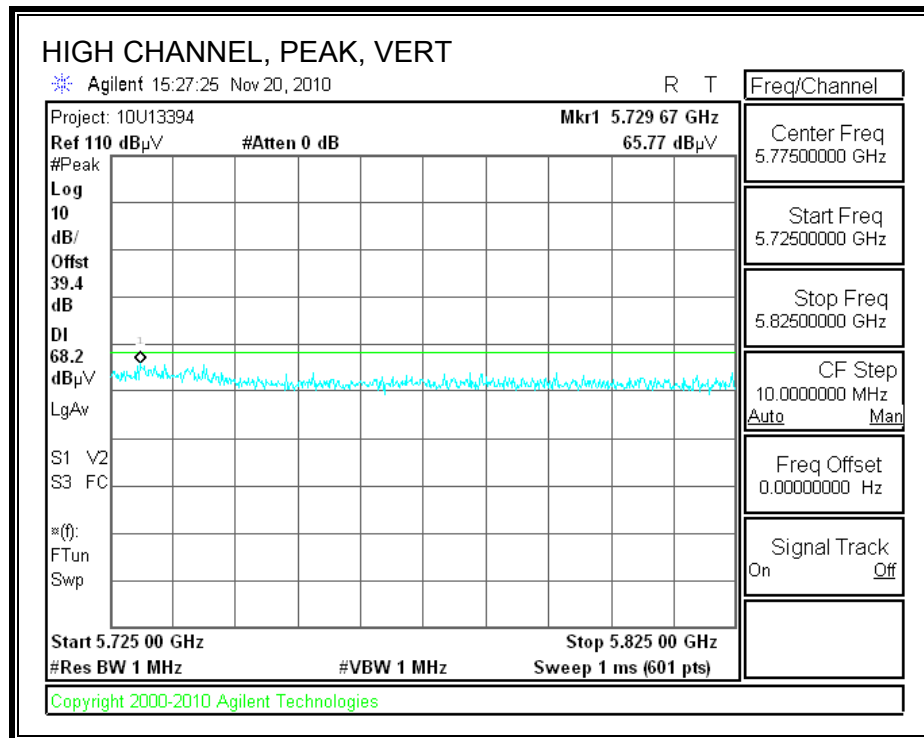
Note: No other emissions were detected above the system noise floor.

## 8.2.8. 802.11n HT20 CDD MCS0 MODE IN THE 5.6 GHz BAND

### RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



**AUTVERTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

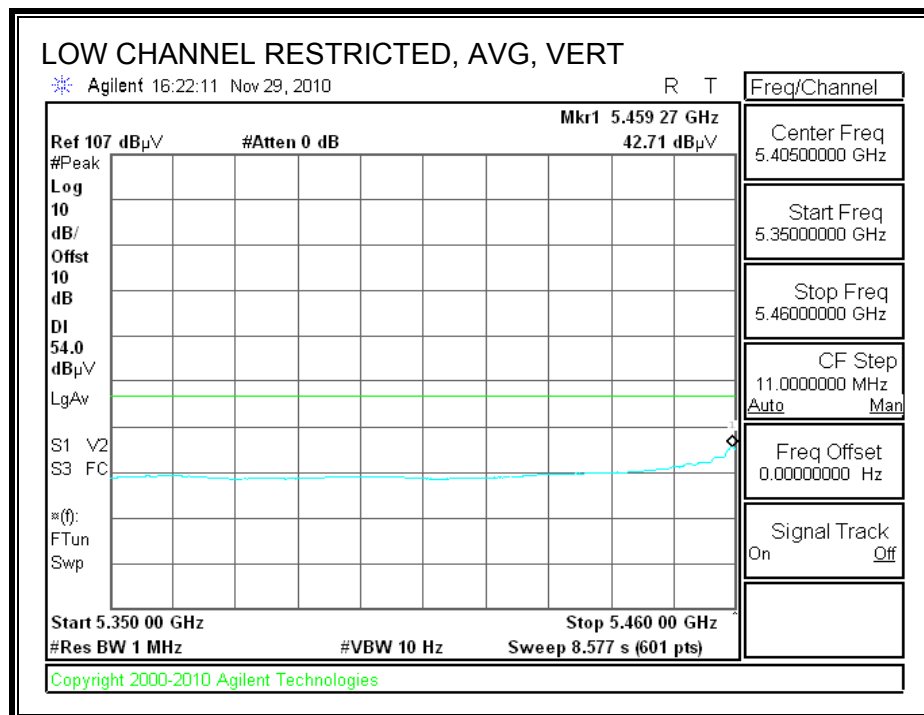
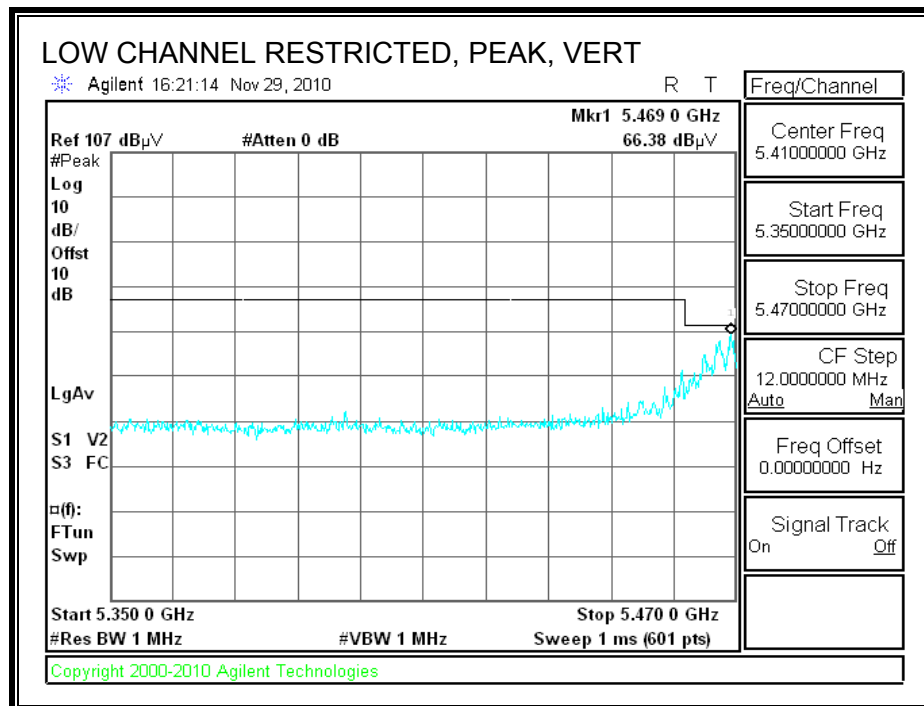


## HARMONICS AND SPURIOUS EMISSIONS

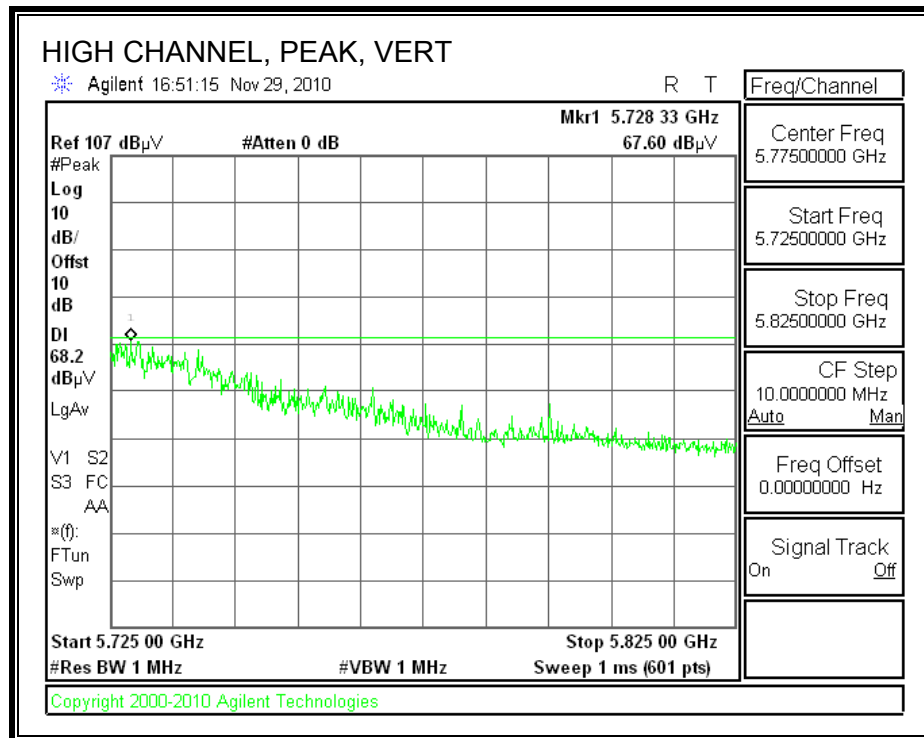
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company:		Broadcom													
Project #:		10U13394													
Date:		11/24/2010													
Test Engineer:		Thanh Nguyen													
Configuration:		EUT and support laptop													
Mode:		Transmit 11n HT20 CDD mode.													
Test Equipment:															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T73; S/N: 6717 @3m			T144 Miteq 3008A00931									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						R_001			
<div style="display: flex; justify-content: space-between;"> <div> <b>Peak Measurements</b> RBW=VBW=1MHz <b>Average Measurements</b> RBW=1MHz ; VBW=10Hz </div> </div>															
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>CH 100 (5500MHz)</b>															
11.000	3.0	42.7	30.3	37.9	9.2	-36.3	0.0	0.0	53.5	41.1	74	54	-20.5	-12.9	V
16.500	3.0	34.6	24.4	38.7	11.8	-34.1	0.0	0.0	51.1	40.8	74	54	-22.9	-13.2	V
11.000	3.0	40.8	27.8	37.9	9.2	-36.3	0.0	0.0	51.6	38.7	74	54	-22.4	-15.3	H
16.500	3.0	34.7	24.4	38.7	11.8	-34.1	0.0	0.0	51.2	40.9	74	54	-22.8	-13.1	H
<b>Ch 120(5600MHz)</b>															
11.200	3.0	42.5	31.4	38.1	9.3	-36.1	0.0	0.0	53.8	42.8	74	54	-20.2	-11.2	V
16.800	3.0	35.3	24.9	39.6	12.0	-33.8	0.0	0.0	53.0	42.6	74	54	-21.0	-11.4	V
11.200	3.0	42.7	32.3	38.1	9.3	-36.1	0.0	0.0	54.1	43.6	74	54	-19.9	-10.4	H
16.800	3.0	35.6	24.6	39.6	12.0	-33.8	0.0	0.0	53.3	42.3	74	54	-20.7	-11.7	H
<b>Ch 140 (5700MHz)</b>															
11.400	3.0	42.8	31.1	38.3	9.4	-35.9	0.0	0.0	54.6	42.9	74	54	-19.4	-11.1	V
17.100	3.0	34.3	24.2	40.7	12.1	-33.7	0.0	0.0	53.5	43.4	74	54	-20.5	-10.6	V
11.400	3.0	48.7	37.4	38.3	9.4	-35.9	0.0	0.0	60.5	49.2	74	54	-13.5	-4.8	H
17.100	3.0	35.2	24.3	40.7	12.1	-33.7	0.0	0.0	54.3	43.4	74	54	-19.7	-10.6	H
<div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div> f      Measurement Frequency  Dist    Distance to Antenna  Read    Analyzer Reading  AF      Antenna Factor  CL      Cable Loss </div> <div> Amp    Preamp Gain  D Corr   Distance Correct to 3 meters  Avg      Average Field Strength @ 3 m  Peak    Calculated Peak Field Strength  HPF     High Pass Filter </div> <div> Avg Lim    Average Field Strength Limit  Pk Lim    Peak Field Strength Limit  Avg Mar    Margin vs. Average Limit  Pk Mar    Margin vs. Peak Limit </div> </div>															

## 8.2.9. 802.11n HT40 CDD MCS0 MODE IN THE 5.6 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Broadcom															
Project #:		10U13394															
Date:		11/24/2010															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT and support laptop															
Mode:		Transmit HT 40 CDD 5.6GHz band.															
Test Equipment:																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T73; S/N: 6717 @3m				T144 Miteq 3008A00931												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								R_002	
<div> <div>Peak Measurements</div> <div>RBW=VBW=1MHz</div> <div>Average Measurements</div> <div>RBW=1MHz ; VBW=10Hz</div> </div>																	
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Ftr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes		
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)		
Ch 102(5510MHz)																	
11.020	3.0	36.1	25.8	37.9	9.2	-36.3	0.0	0.0	47.0	36.6	74	54	-27.0	-17.4	V		
16.530	3.0	34.3	24.5	38.8	11.8	-34.0	0.0	0.0	50.9	41.1	74	54	-23.1	-12.9	V		
11.020	3.0	39.2	25.6	37.9	9.2	-36.3	0.0	0.0	50.0	36.5	74	54	-24.0	-17.5	H		
16.530	3.0	34.9	25.1	38.8	11.8	-34.0	0.0	0.0	51.5	41.7	74	54	-22.5	-12.3	H		
Ch 118 (5590MHz)																	
11.180	3.0	44.4	34.1	38.1	9.3	-36.1	0.0	0.0	55.6	45.4	74	54	-18.4	-8.6	V		
16.770	3.0	35.0	25.4	39.5	11.9	-33.8	0.0	0.0	52.6	43.0	74	54	-21.4	-11.0	V		
11.180	3.0	49.4	40.2	38.1	9.3	-36.1	0.0	0.0	60.7	51.5	74	54	-13.3	-2.5	H		
16.770	3.0	34.8	25.0	39.5	11.9	-33.8	0.0	0.0	52.4	42.6	74	54	-21.6	-11.4	H		
Ch 134 (5670MHz)																	
11.330	3.0	43.1	30.1	38.2	9.4	-36.0	0.0	0.0	54.8	41.7	74	54	-19.2	-12.3	V		
17.010	3.0	39.5	26.8	40.2	12.1	-33.7	0.0	0.0	58.1	45.4	74	54	-15.9	-8.6	V		
11.330	3.0	49.6	37.6	38.2	9.4	-36.0	0.0	0.0	61.3	49.3	74	54	-12.7	-4.7	H		
17.010	3.0	39.1	26.8	40.2	12.1	-33.7	0.0	0.0	57.6	45.4	74	54	-16.4	-8.6	H		
Rev. 07.22.09																	
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										

### 8.3. RECEIVER ABOVE 1 GHz

#### 8.3.1. FOR 20 MHz BANDWIDTH

High Frequency Measurement																	
Compliance Certification Services, Fremont 3m Chamber																	
Company:		Broadcom															
Project #:		10U13394															
Date:		11/19/10															
Test Engineer:		Vien Tran															
Configuration:		EUT / Laptop															
Mode:		Rx Mode_20MHz Bandwidth															
<b>Test Equipment:</b>																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T60; S/N: 2238 @3m				T34 HP 8449B												RX RSS 210	
<b>Hi Frequency Cables</b>																	
3' cable 22807700				12' cable 22807600				20' cable 22807500				HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz, VBW=10Hz	
3' cable 22807700				12' cable 22807600				20' cable 22807500									
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
1.200	3.0	54.0	35.9	25.1	2.6	-38.0	0.0	0.0	43.7	25.6	74	54	-30.3	-28.4	H		
2.437	3.0	51.4	48.8	28.1	3.9	-36.3	0.0	0.0	47.1	44.5	74	54	-26.9	-9.5	H		
2.493	3.0	53.6	33.5	28.3	3.9	-36.3	0.0	0.0	49.5	29.5	74	54	-24.5	-24.5	H		
1.700	3.0	56.9	35.8	26.8	3.2	-37.3	0.0	0.0	49.6	28.5	74	54	-24.4	-25.5	V		
2.437	3.0	47.9	44.2	28.1	3.9	-36.3	0.0	0.0	43.6	39.9	74	54	-30.4	-14.1	V		
2.493	3.0	56.8	34.7	28.3	3.9	-36.3	0.0	0.0	52.8	30.7	74	54	-21.2	-23.3	V		
No other emissions were detected above system noise floor																	
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										

### 8.3.2. FOR 40 MHz BANDWIDTH

High Frequency Measurement																	
Compliance Certification Services, Fremont 3m Chamber																	
Company:		Broadcom															
Project #:		10U13394															
Date:		11/19/10															
Test Engineer:		Vien Tran															
Configuration:		EUT / Laptop															
Mode:		Rx Mode_40MHz Bandwidth															
Test Equipment:																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T60; S/N: 2238 @3m				T34 HP 8449B												RX RSS 210	
Hi Frequency Cables																	
3' cable 22807700				12' cable 22807600				20' cable 22807500				HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz	
3' cable 22807700				12' cable 22807600				20' cable 22807500									
f	Dist	Read Pk	Read Avg	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes		
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)		
2.437	3.0	51.4	48.8	28.1	3.9	-36.3	0.0	0.0	47.1	44.5	74	54	-26.9	-9.5	H		
2.493	3.0	53.6	33.5	28.3	3.9	-36.3	0.0	0.0	49.5	29.5	74	54	-24.5	-24.5	H		
2.437	3.0	47.9	44.2	28.1	3.9	-36.3	0.0	0.0	43.6	39.9	74	54	-30.4	-14.1	V		
2.493	3.0	56.8	34.7	28.3	3.9	-36.3	0.0	0.0	52.8	30.7	74	54	-21.2	-23.3	V		
No other emissions were detected above system noise floor																	
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										

## 8.4. WORST-CASE BELOW 1 GHz

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

30-1000MHz Frequency Measurement													
Compliance Certification Services, Fremont 3m Chamber													
Test Engr:		Vien Tran											
Date:		11/19/10											
Project #:		10U13394											
Company:		Broadcom											
Test Target:		FCC B											
Mode Oper:		Tx Worst-Case											
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit								
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters										
Read	Analyzer Reading	Filter	Filter Insert Loss										
AF	Antenna Factor	Corr.	Calculated Field Strength										
CL	Cable Loss	Limit	Field Strength Limit										
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Vertical													
75.122	3.0	46.4	8.1	0.7	28.3	0.0	0.0	27.0	40.0	-13.0	V	P	
120.004	3.0	52.1	13.5	0.9	28.1	0.0	0.0	38.5	43.5	-5.0	V	P	
284.17	3.0	54.7	13.0	1.4	27.4	0.0	0.0	41.7	46.0	-4.3	V	P	
336.013	3.0	51.3	14.0	1.6	27.6	0.0	0.0	39.2	46.0	-6.8	V	P	
350.173	3.0	49.5	14.3	1.6	27.7	0.0	0.0	37.6	46.0	-8.4	V	P	
399.855	3.0	50.1	15.0	1.7	28.0	0.0	0.0	38.9	46.0	-7.1	V	P	
566.542	3.0	48.4	17.9	2.1	28.6	0.0	0.0	39.8	46.0	-6.2	V	P	
587.063	3.0	44.9	18.2	2.2	28.6	0.0	0.0	36.7	46.0	-9.3	V	P	
599.904	3.0	47.1	18.4	2.2	28.6	0.0	0.0	39.1	46.0	-6.9	V	P	
615.624	3.0	44.7	18.5	2.2	28.6	0.0	0.0	36.9	46.0	-9.1	V	P	
671.906	3.0	44.7	18.8	2.3	28.5	0.0	0.0	37.3	46.0	-8.7	V	P	
Horizontal													
32.28	3.0	42.4	18.9	0.5	28.4	0.0	0.0	33.3	40.0	-6.7	H	P	
105.963	3.0	51.4	10.6	0.8	28.2	0.0	0.0	34.7	43.5	-8.9	H	P	
199.807	3.0	50.3	11.9	1.2	27.4	0.0	0.0	36.0	43.5	-7.5	H	P	
213.128	3.0	50.2	11.9	1.2	27.4	0.0	0.0	35.9	43.5	-7.6	H	P	
284.17	3.0	47.8	13.0	1.4	27.4	0.0	0.0	34.7	46.0	-11.3	H	P	
353.893	3.0	45.8	14.3	1.6	27.7	0.0	0.0	34.0	46.0	-12.0	H	P	
399.855	3.0	45.5	15.0	1.7	28.0	0.0	0.0	34.3	46.0	-11.7	H	P	
528.021	3.0	43.3	17.3	2.0	28.6	0.0	0.0	34.0	46.0	-12.0	H	P	
566.422	3.0	46.2	17.9	2.1	28.6	0.0	0.0	37.6	46.0	-8.4	H	P	
599.904	3.0	46.1	18.4	2.2	28.6	0.0	0.0	38.1	46.0	-7.9	H	P	
Rev. 1.27.09													
Note: No other emissions were detected above the system noise floor.													

## 9. 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 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup> Decreases with the logarithm of the frequency.

### TEST PROCEDURE

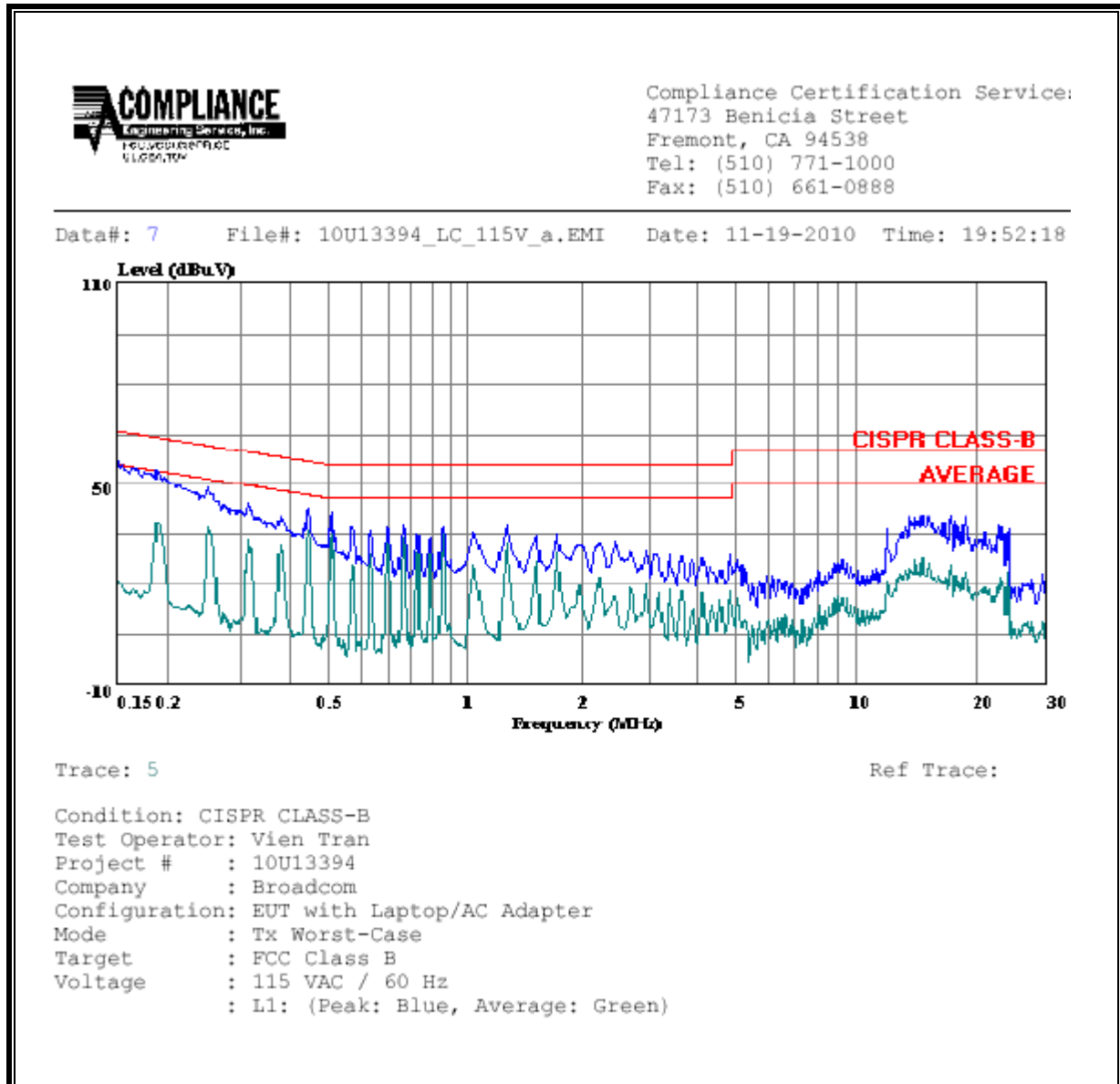
ANSI C63.4

### RESULTS

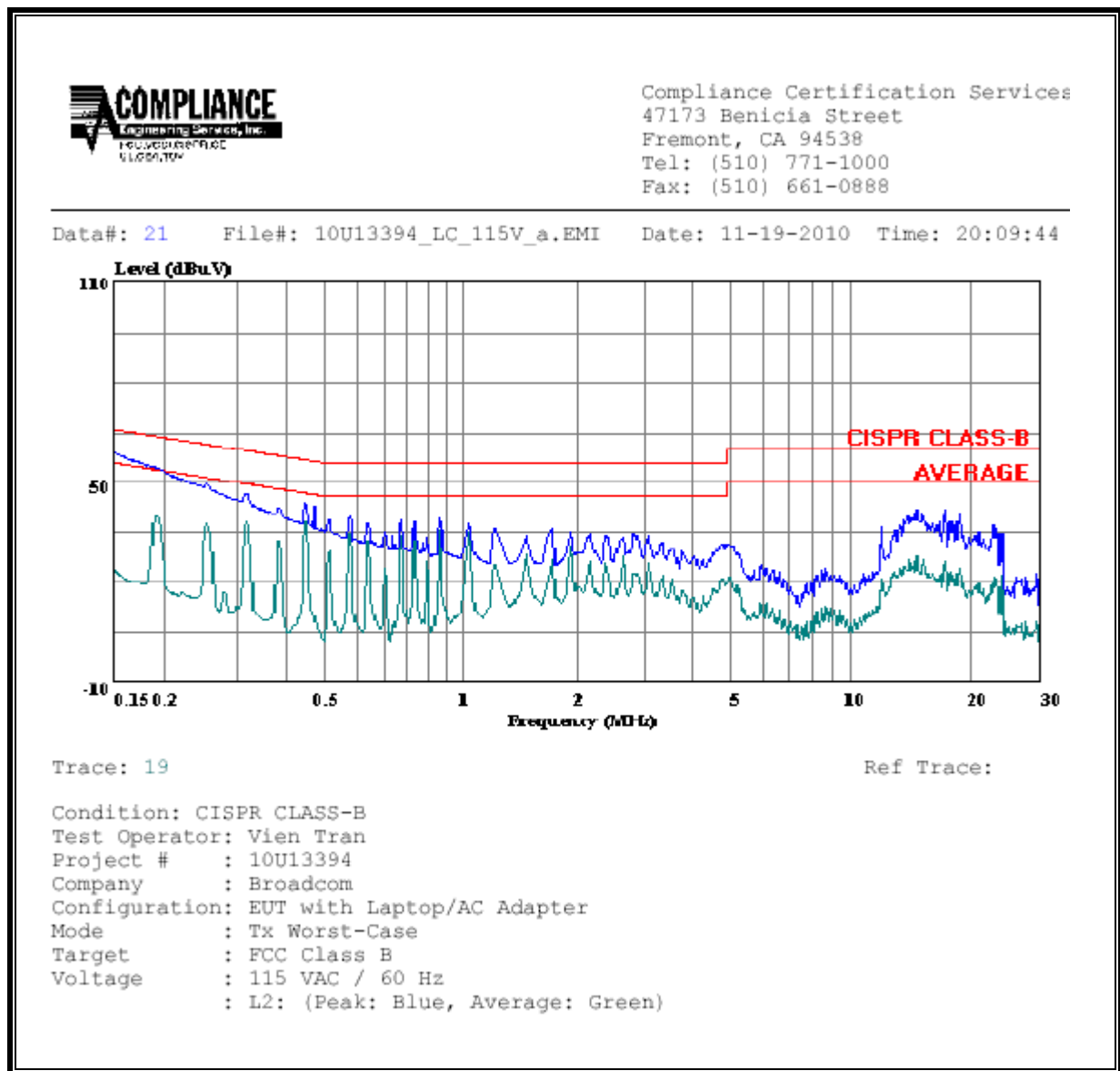
## 6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	56.78	--	21.06	0.00	66.00	56.00	-9.22	-34.94	L1
0.51	41.77	--	34.98	0.00	56.00	46.00	-14.23	-11.02	L1
14.75	40.78	--	25.00	0.00	60.00	50.00	-19.22	-25.00	L1
0.15	59.33	--	23.58	0.00	66.00	56.00	-6.67	-32.42	L2
0.96	39.70	--	37.70	0.00	56.00	46.00	-16.30	-8.30	L2
14.75	39.90	--	24.30	0.00	60.00	50.00	-20.10	-25.70	L2
6 Worst Data									

## LINE 1 RESULTS



## LINE 2 RESULTS



## 10. DYNAMIC FREQUENCY SELECTION

### 10.1. OVERVIEW

#### 10.1.1. LIMITS

##### INDUSTRY CANADA

IC RSS-210 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-210 Issue 7 A9.4 (b) (ii) **Channel Availability Check Time:** ...

**Additional requirements for the band 5600-5650 MHz:** Until further notice, devices subject to this Section shall not be capable of transmitting in the band 5600-5650 MHz, so that Environment Canada weather radars operating in this band are protected.

RSS-210 Issue 7 A9.4 (b) (iv) **Channel closing time:** the maximum channel closing time is 260 ms.

##### FCC

§15.407 (h) and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

**Table 1: Applicability of DFS requirements prior to use of a channel**

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required

**Table 2: Applicability of DFS requirements during normal operation**

Requirement	Operational Mode		
	Master	Client (without DFS)	Client (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes

**Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring**

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
<p>Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna</p> <p>Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p>	

**Table 4: DFS Response requirement values**

Parameter	Value
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period
<p>The instant that the <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> begins is as follows:</p> <p>For the Short pulse radar Test Signals this instant is the end of the <i>Burst</i>.</p> <p>For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.</p> <p>For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.</p> <p>The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.</p>	

**Table 5 – Short Pulse Radar Test Waveforms**

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

**Table 6 – Long Pulse Radar Test Signal**

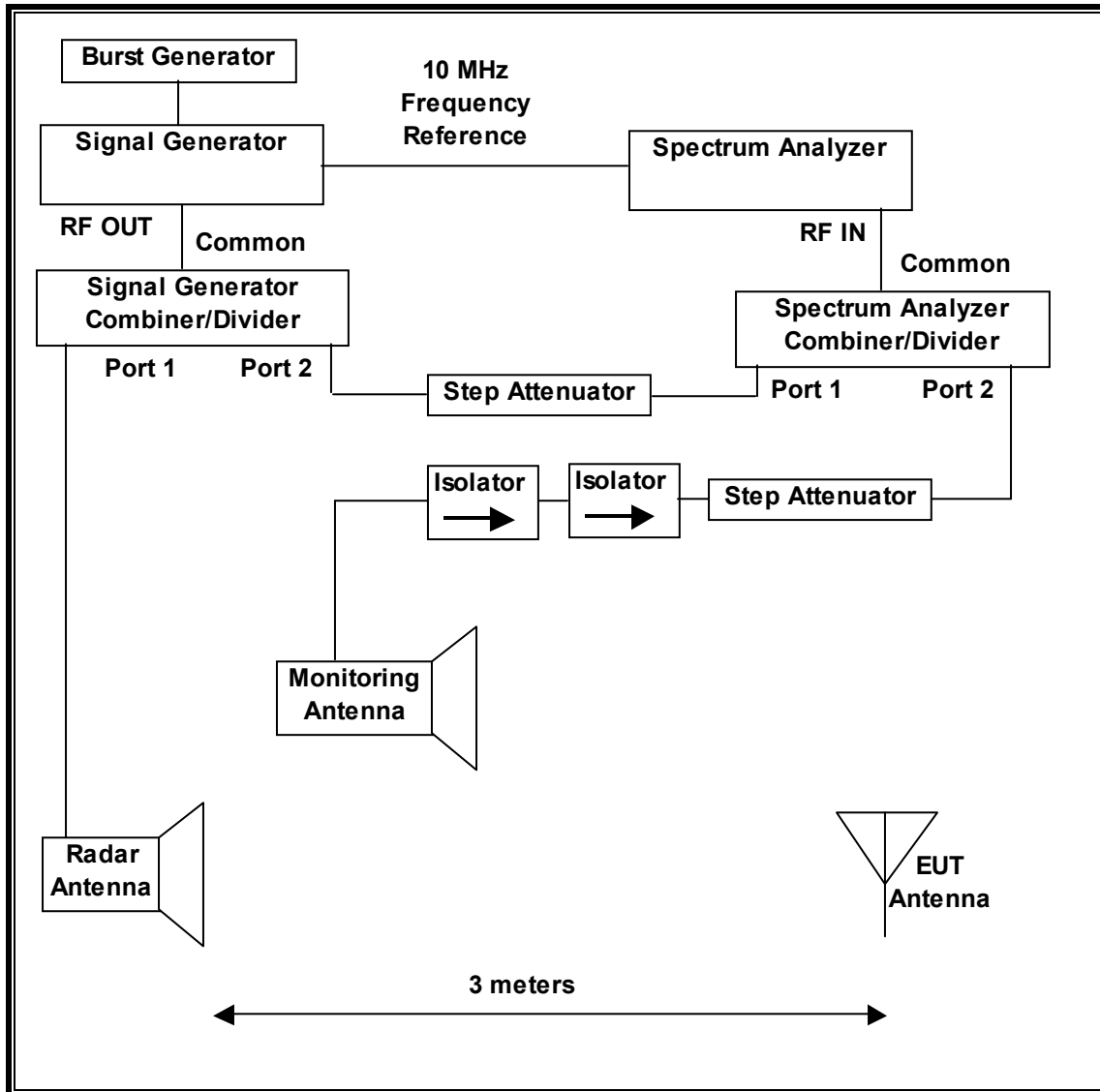
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

**Table 7 – Frequency Hopping Radar Test Signal**

Radar Waveform	Pulse Width (µsec)	PRI (µsec)	Burst Length (ms)	Pulses per Hop	Hopping Rate (kHz)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	300	9	.333	70%	30

## 10.1.2. TEST AND MEASUREMENT SYSTEM

### RADIATED METHOD SYSTEM BLOCK DIAGRAM



## **SYSTEM OVERVIEW**

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from  $F_L$  to  $F_H$  for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

## **SYSTEM CALIBRATION**

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

### **ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL**

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

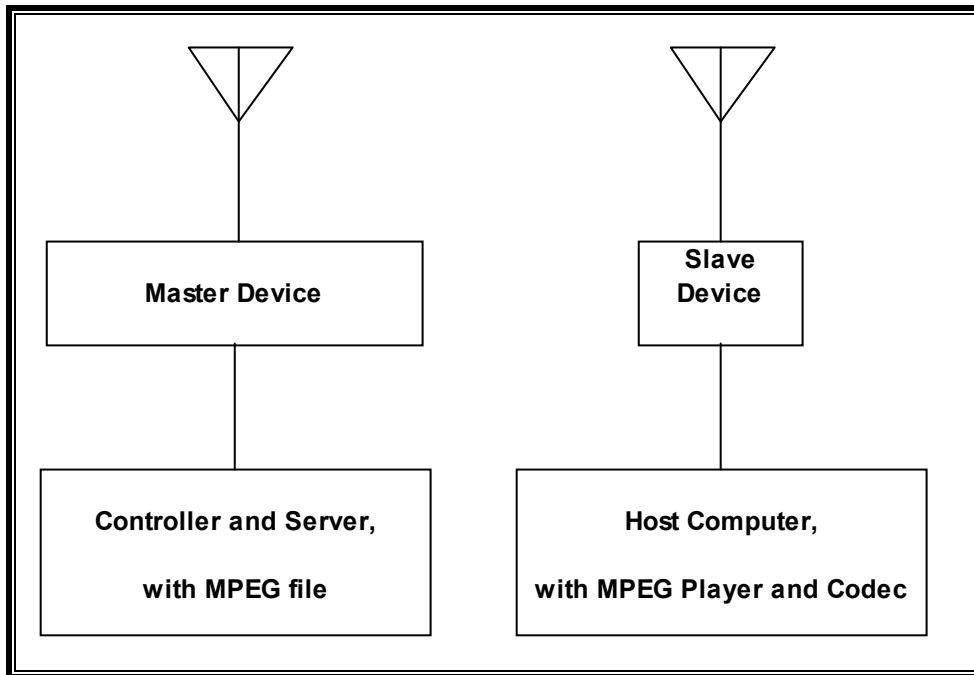
### **TEST AND MEASUREMENT EQUIPMENT**

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	10/29/11
Vector signal generator, 20GHz	Agilent / HP	E8267C	C01066	02/12/12

### 10.1.3. SETUP OF EUT

#### RADIATED METHOD EUT TEST SETUP



#### SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Wireless Access Point (Master Radio Device)	Linksys	WRT600NV11	MNR007800466	Q87-WRT600NV11
AC Adapter (AP)	DVE	DSA-30W-12	01008	DoC
Notebook PC (Host)	HP	Pavilion zv6000	CND5290401	DoC
AC Adapter (Host PC)	HP	PA-1121-12HD	58B240ALLRK0HU	DoC
Notebook PC (Client)	Dell	Inspiron 7N557	814D90101452900162 KS00	DoC
AC Adapter (Client PC)	Delta Electronics	ADP-60NH B	CN-0TD230-48661- 57C-005B	DoC

#### **10.1.4. DESCRIPTION OF EUT**

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without Radar Detection.

The highest power level within these bands is 25.32 dBm EIRP.

The antenna assembly utilized with the EUT has a gain of 5.6 dBi in the 5250-5350 MHz band and 4.2 dBi in the 5470-5725 MHz band.

The EUT uses two transmitter/receiver chains each connected to an antenna to perform radiated tests.

WLAN traffic is generated by streaming the video file TestFile.mp2 "6 ½ Magic Hours" from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm), however TPC is implemented.

The EUT utilizes the 802.11a/n architecture. Two nominal channel bandwidths are implemented: 20 MHz and 40 MHz.

The EUT driver software installed during testing was Broadcom revision 5.100.82.20.

#### **MANUFACTURER'S STATEMENT REGARDING UNIFORM CHANNEL SPREADING**

Not Applicable for Slave Devices.

#### **OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS**

The Master Device is a Linux Access Point, FCC ID: Q87-WRT600NV11. The DFS software installed in the Master Device is Linux revision 4.101.27. The minimum antenna gain for the Master Device is 1.6 dBi.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm.

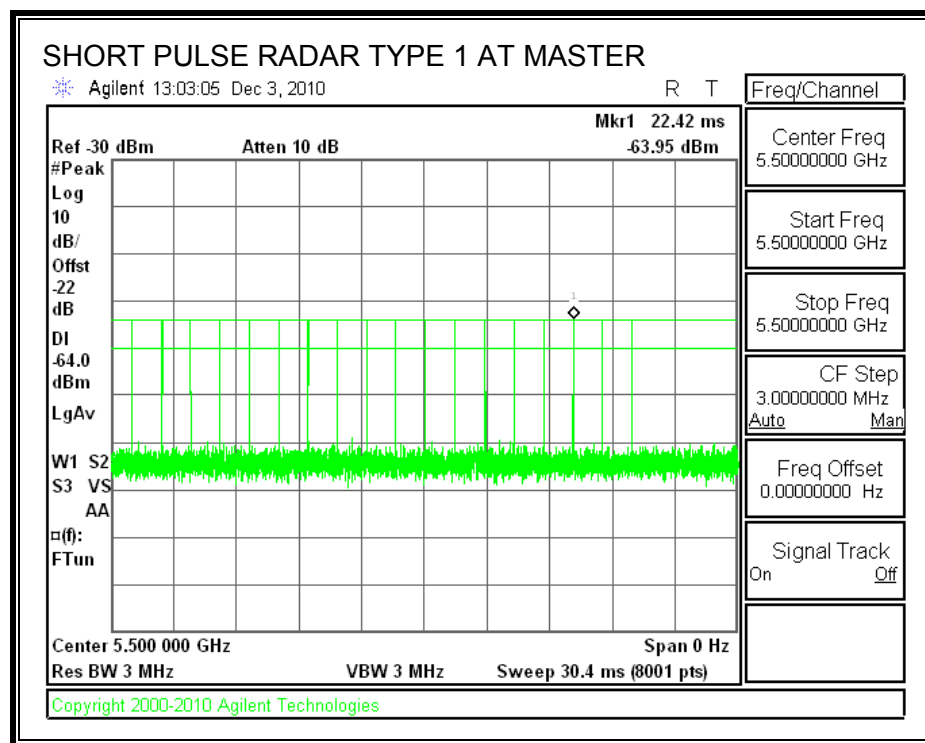
## 10.2. RESULTS FOR 20 MHz BANDWIDTH

### 10.2.1. TEST CHANNEL

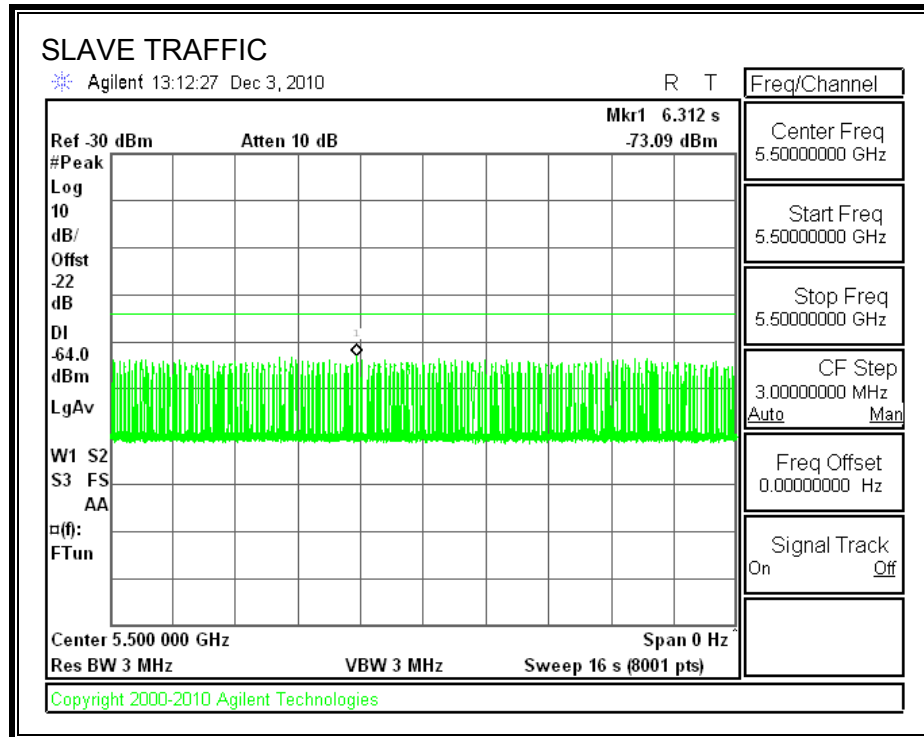
All tests were performed at a channel center frequency of 5500 MHz.

### 10.2.2. RADAR WAVEFORM AND TRAFFIC

#### RADAR WAVEFORM



**TRAFFIC**



### 10.2.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 10.2.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

The observation period over which the FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

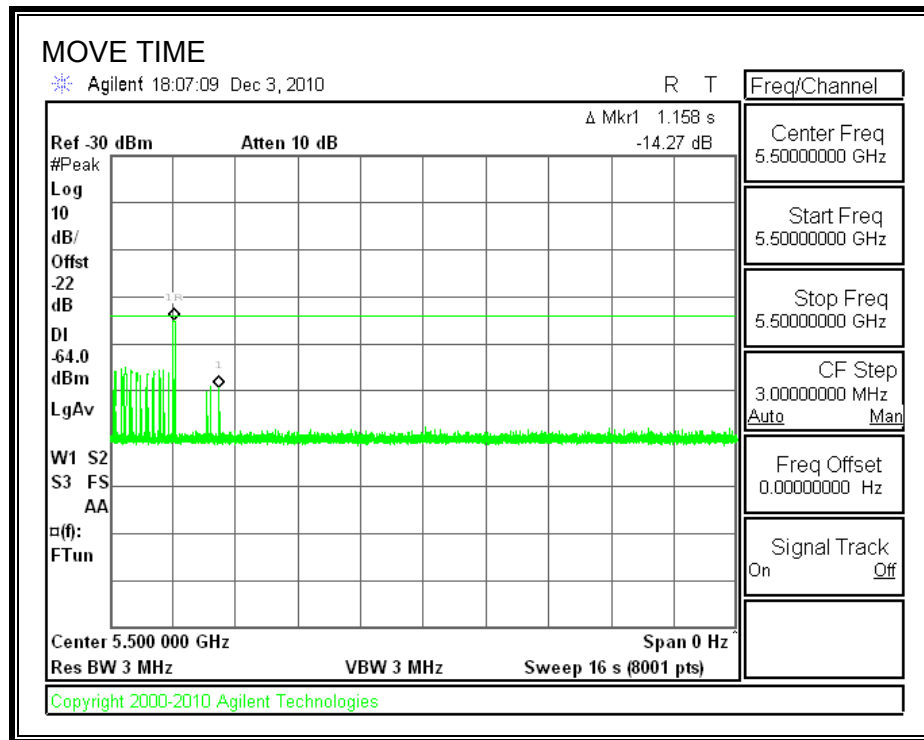
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

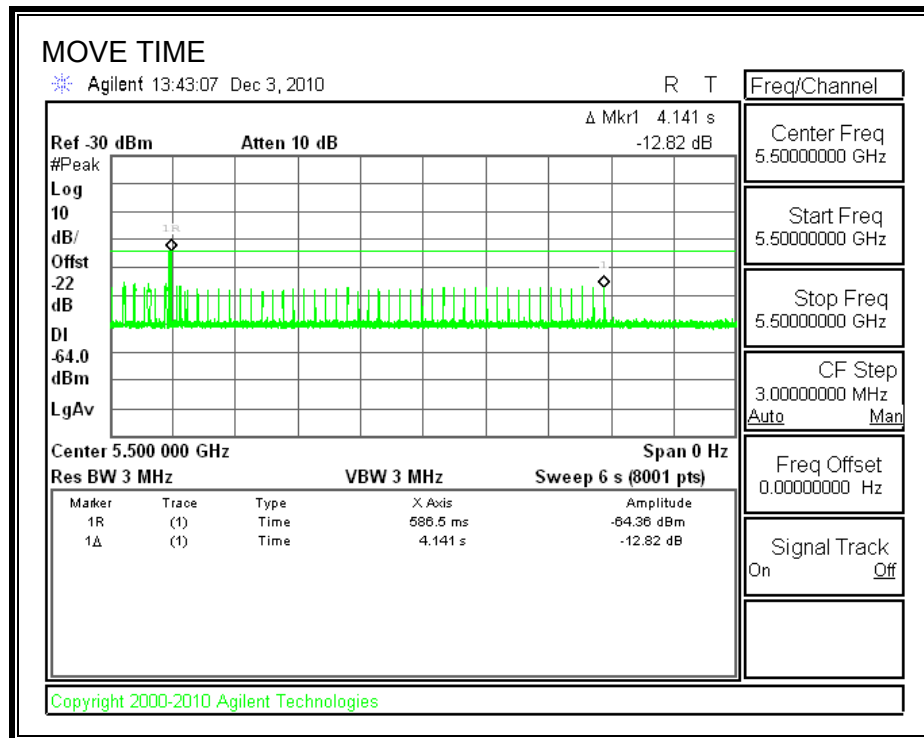
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	4.141	10

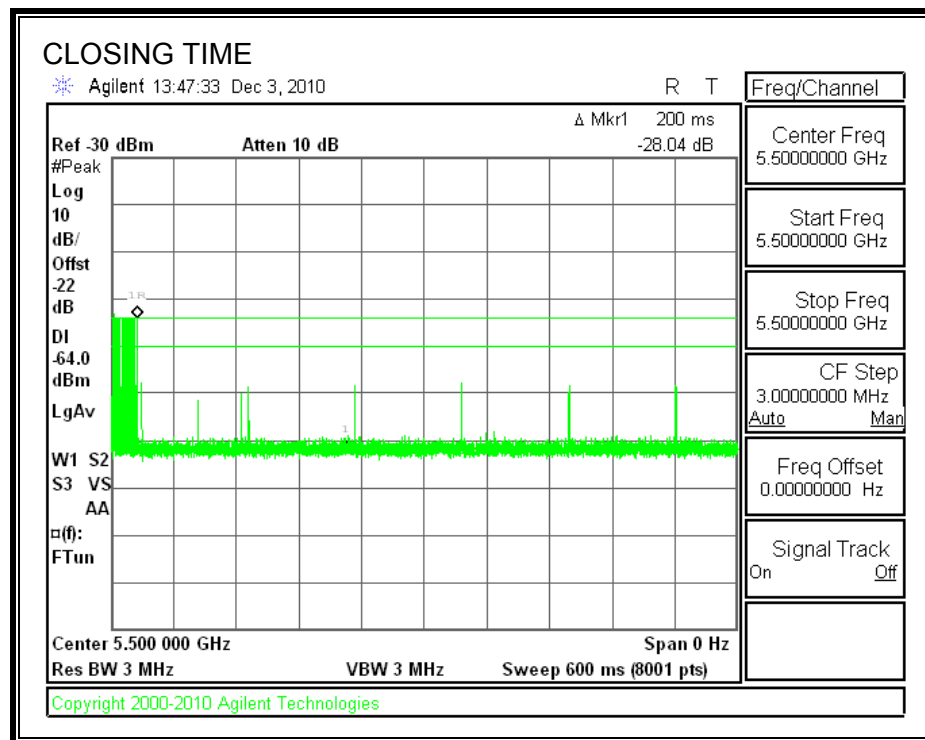
Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	58.5	60
IC	78.0	260

# MOVE TIME



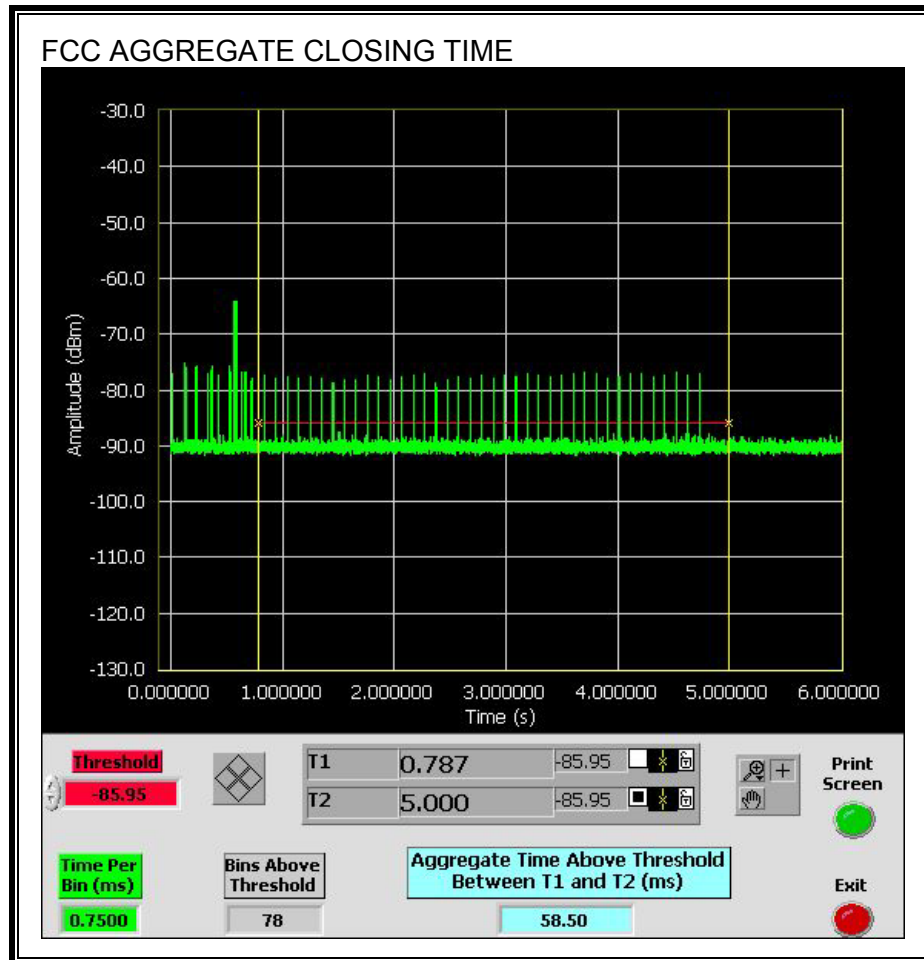
**MOVE TIME CLOSE-UP**



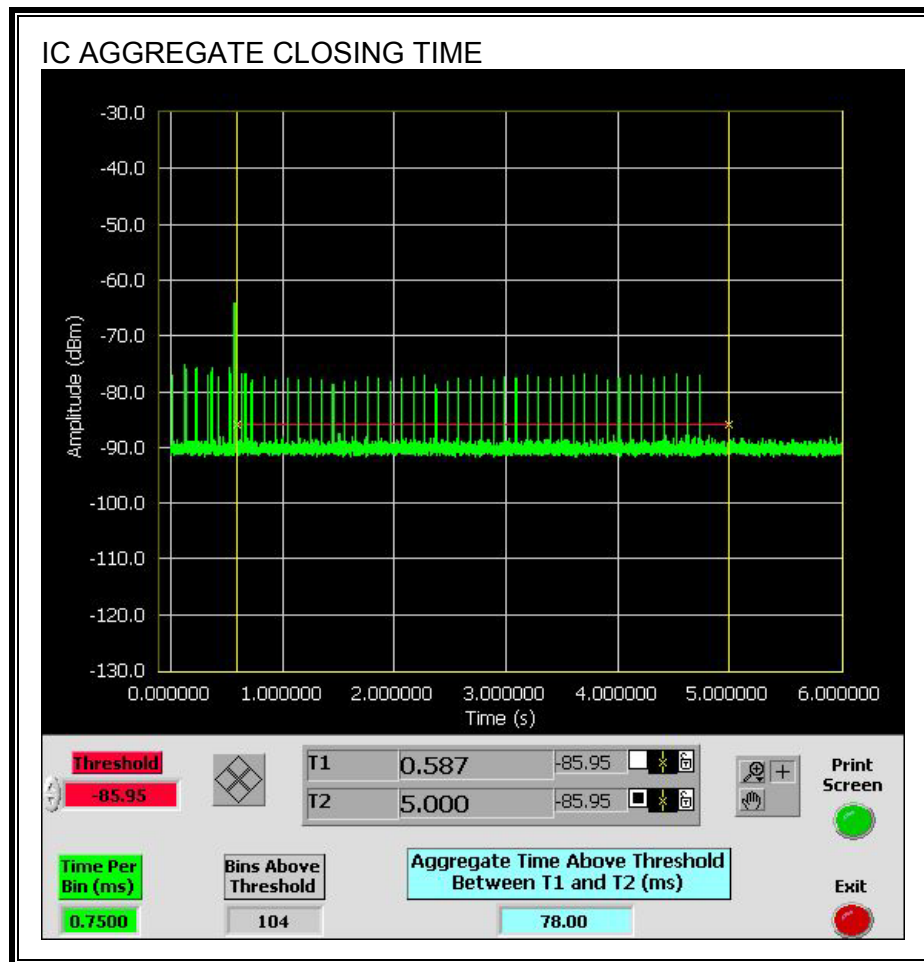


### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the FCC aggregate monitoring period.



Only intermittent transmissions are observed during the IC aggregate monitoring period.



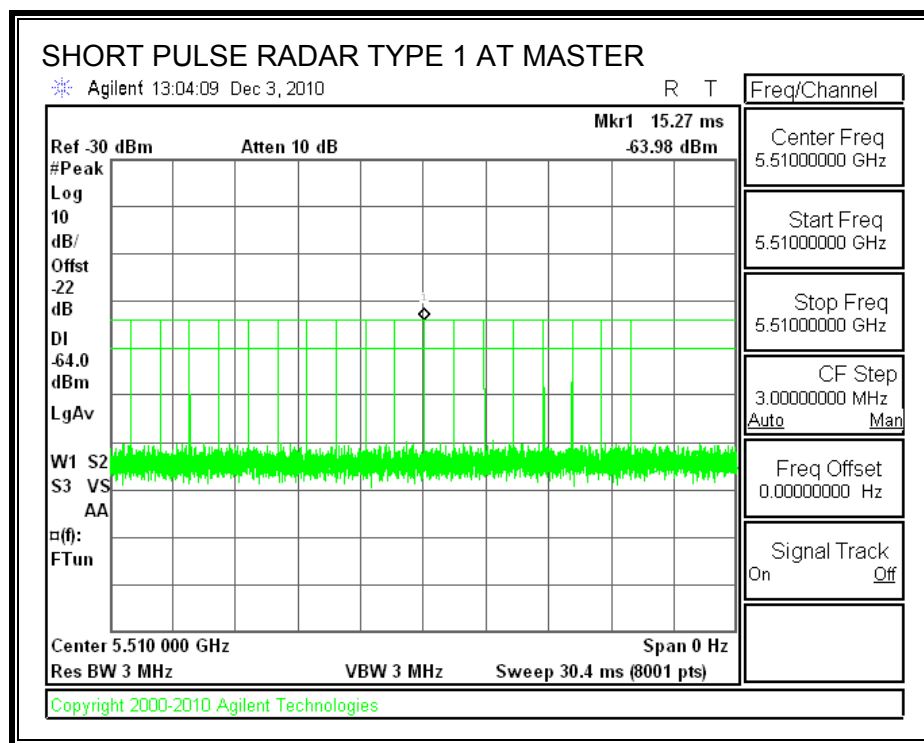
### 10.3. RESULTS FOR 40 MHz BANDWIDTH

#### 10.3.1. TEST CHANNEL

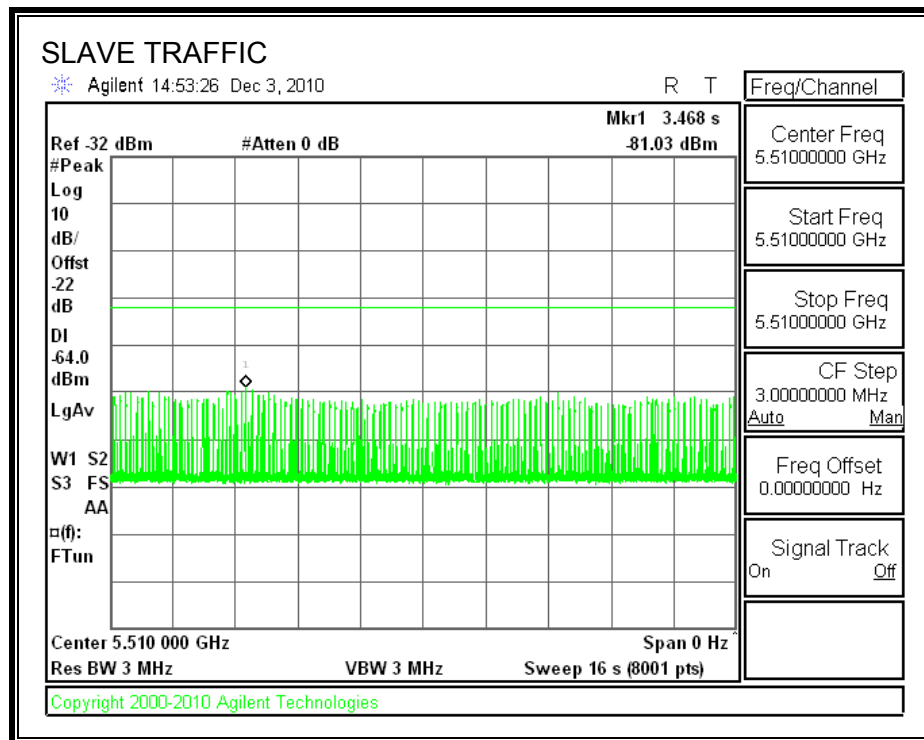
All tests were performed at a channel center frequency of 5510 MHz.

#### 10.3.2. RADAR WAVEFORM AND TRAFFIC

##### RADAR WAVEFORM



**TRAFFIC**



### 10.3.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 10.3.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

The observation period over which the FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

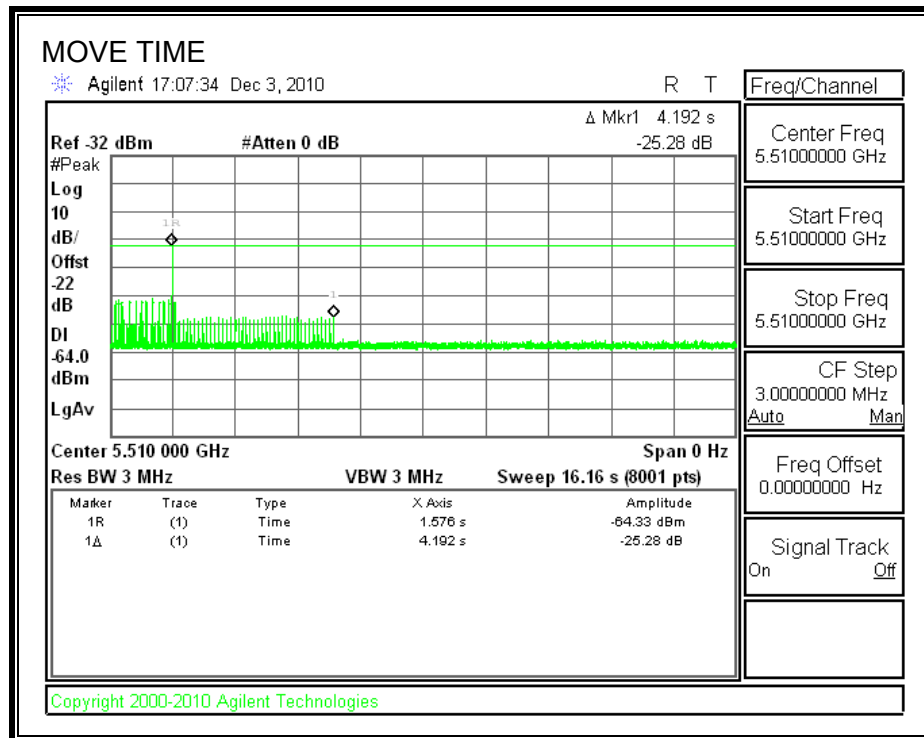
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

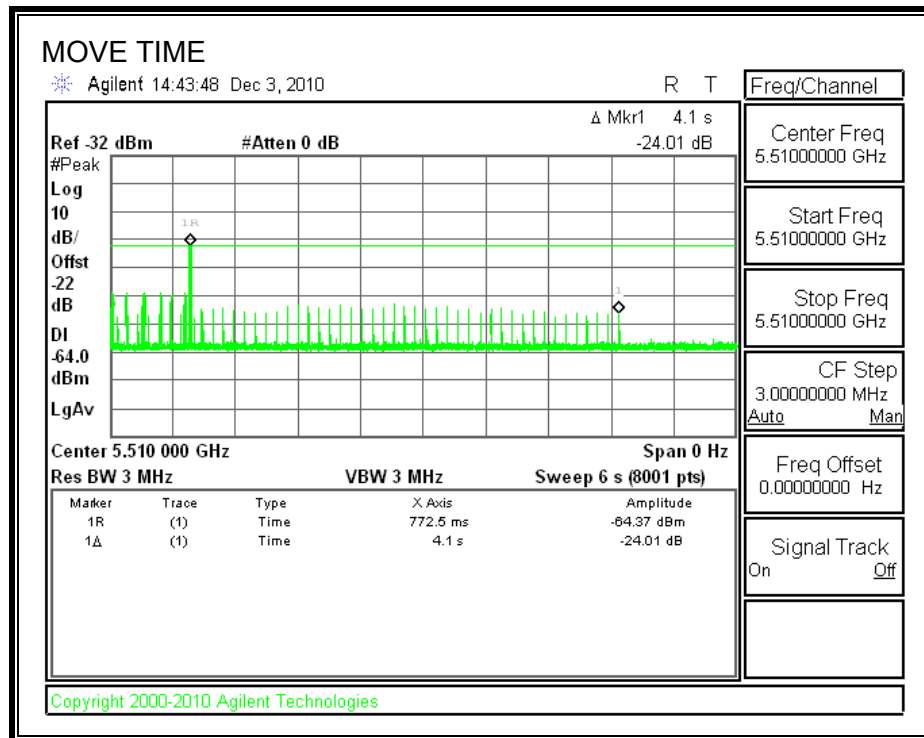
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	4.192	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	59.3	60
IC	63.0	260

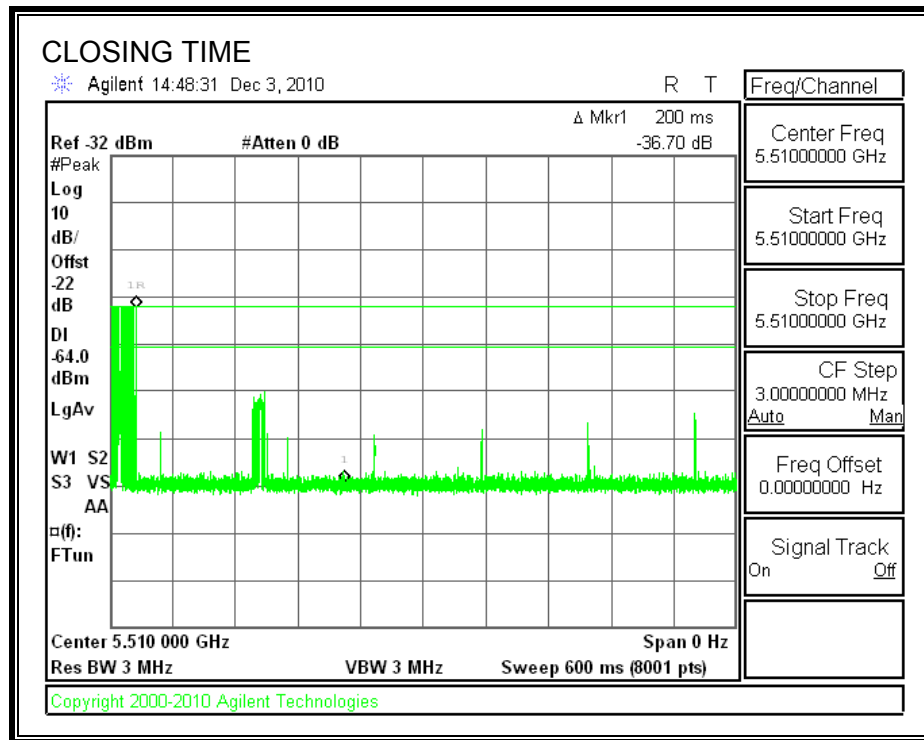
# MOVE TIME



**MOVE TIME CLOSE-UP**

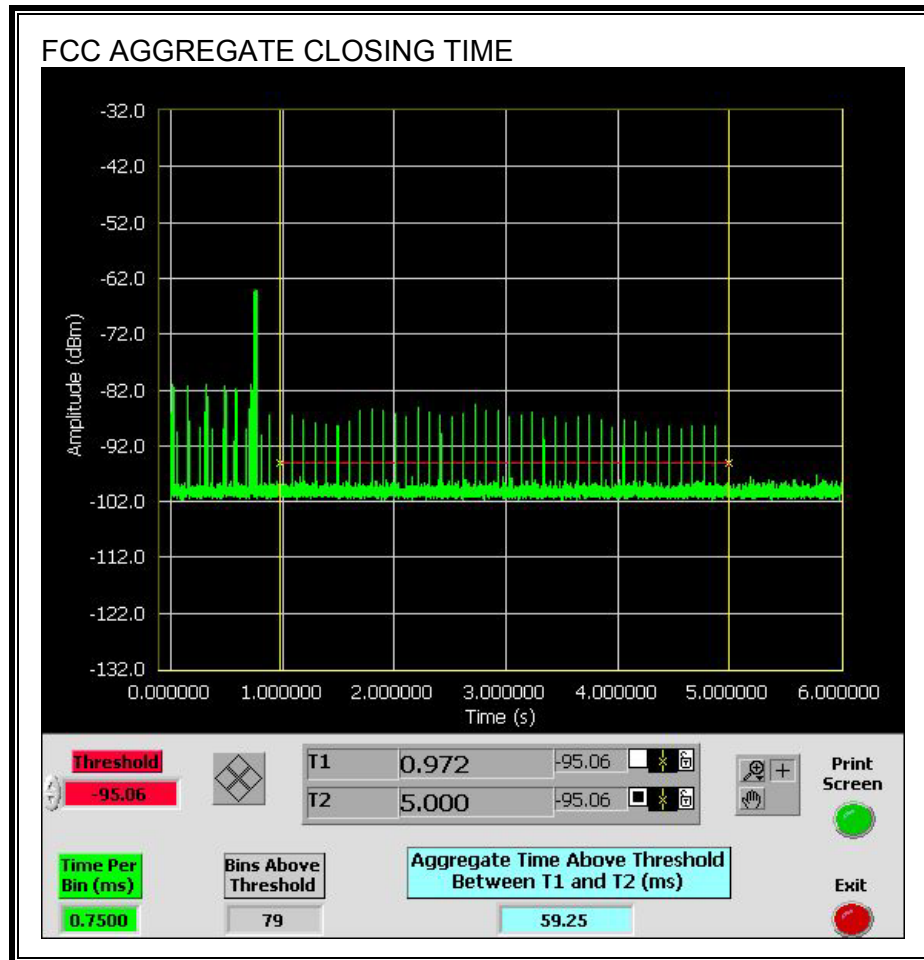


# **CHANNEL CLOSING TIME**

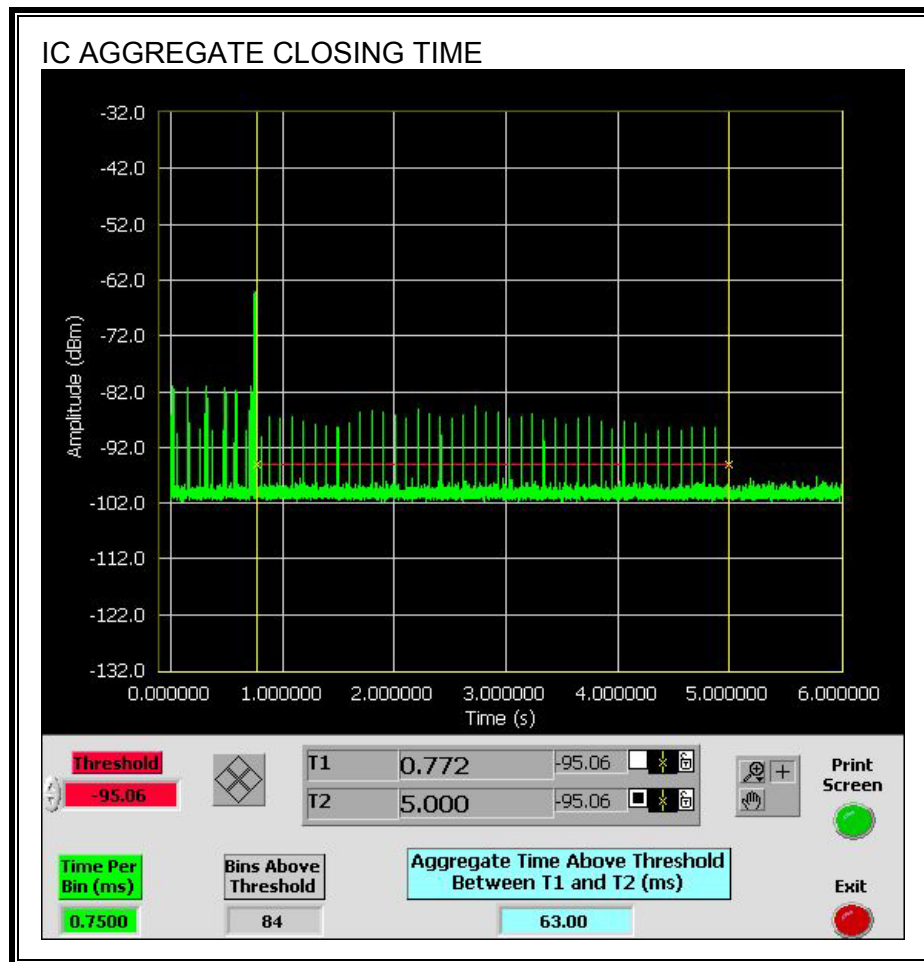


### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the FCC aggregate monitoring period.



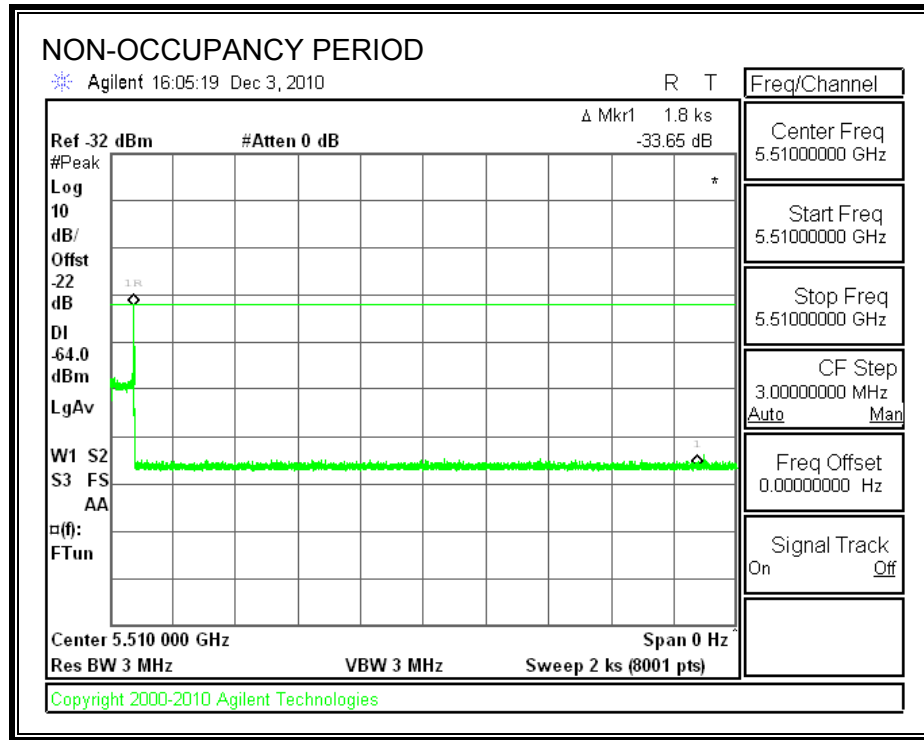
Only intermittent transmissions are observed during the IC aggregate monitoring period.



### 10.3.5. NON-OCCUPANCY PERIOD

#### RESULTS

No EUT transmissions were observed on the test channel during the 30-minute observation time.



## 11. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5**  
**Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> <sup>1.2</sup>
150 000–300 000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616 000 / <i>f</i> <sup>1.2</sup>

\* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## **EQUATIONS**

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

where

S = Power density in W/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mWc/m<sup>2</sup> by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m<sup>2</sup>

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power \* Gain product (in linear units) of each transmitter.

$$\text{Total EIRP} = (P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)$$

where

Px = Power of transmitter x

Gx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

## **LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of  $S = 1.0 \text{ mW/cm}^2$

From IC Safety Code 6, Section 2.2 Table 5 Column 4,  $S = 10 \text{ W/m}^2$

## **RESULTS**

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	IC Power Density ( $\text{W/m}^2$ )	FCC Power Density ( $\text{mW/cm}^2$ )
5.2 GHz	Legacy	0.20	13.67	5.60	19.27	0.17	0.017
5.3 GHz	Legacy	0.20	17.69	5.60	23.29	0.42	0.042
5.6 GHz	Legacy	0.20	18.22	4.20	22.42	0.35	0.035
5.2 GHz	Main		10.51	5.60	16.11		
5.2 GHz	Aux		10.22	5.60	15.82		
5.2 GHz	Total	0.20			18.98	0.16	0.016
5.3 GHz	Main		16.26	5.60	21.86		
5.3 GHz	Aux		17.21	5.60	22.81		
5.3 GHz	Total	0.20			25.37	0.69	0.069
5.6 GHz	Main		18.16	4.20	22.36		
5.6 GHz	Aux		18.05	4.20	22.25		
5.6 GHz	Total	0.20			25.32	0.68	0.068