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INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

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

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FCC ID: QDS-BRCM1059
IC: 4324A-BRCM1059

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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

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--	05/02/11	Initial Issue	T. Chan
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA
EUT DESCRIPTION:	802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card
MODEL:	BCM94331PCIEBT3A
SERIAL NUMBER:	C961095004UDJY01W
DATE TESTED:	MARCH 17 to MAY 06, 2011

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

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

VIEN TRAN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

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

5.2 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz BAND, 1x3			
5180 - 5240	802.11a	14.91	30.97
5190 - 5230	SISO HT40	16.85	48.42
5.2 GHz BAND, 2x2 HT20 MODE			
5180 - 5240	CDD MCS 0	12.50	17.78
5180 - 5240	STBC MCS0	14.77	29.99
5.2 GHz BAND, 3x3 HT20 MODE			
5180 - 5240	STBC MCS0	15.00	31.62
5180 - 5240	SDM MCS 21	15.14	32.66
5.2 GHz BAND, 2X2 HT40 MODE			
5190 - 5230	CDD MCS 0	11.91	15.52
5190 - 5230	STBC MCS0	16.84	48.31
5.2 GHz BAND, 3x3 HT40 MODE			
5190 - 5230	STBC MCS0	16.94	49.43
5190 - 5230	SDM MCS 21	15.49	35.40

5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3 GHz BAND, 1x3			
5260 - 5320	802.11a	20.50	112.20
5270 - 5310	SISO HT40	18.95	78.52
5.3 GHz BAND, 2x2 HT20 MODE			
5260 - 5320	CDD MCS 0	16.45	44.16
5.3 GHz BAND, 3x3 HT20 MODE			
5260 - 5320	CDD MCS 0	18.17	65.61
5260 - 5320	SDM MCS 21	21.30	134.90
5.3 GHz BAND, 2X2 HT40 MODE			
5270 - 5310	CDD MCS 0	21.26	133.66
5.3 GHz BAND, 3X3 HT40 MODE			
5270 - 5310	CDD MCS 0	20.55	113.50
5270 - 5310	SDM MCS 21	20.64	115.88

5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6 GHz BAND, 1X3			
5500 - 5700	802.11a	20.45	110.92
5510 - 5670	SISO HT40	20.36	108.64
5.6 GHz BAND, 2x2 HT20 MODE			
5500 - 5700	CDD MCS0	16.68	46.56
5.6 GHz BAND, 3X3 HT20 MODE			
5500 - 5700	CDD MCS0	18.38	68.87
5500 - 5700	SDM MCS21	21.63	145.55
5.6 GHz BAND, 2X2 HT40 MODE			
5510 - 5670	CDD MCS0	20.66	116.41
5.6 GHz BAND, 3X3 HT40 MODE			
5510 - 5670	CDD MCS0	20.74	118.58
5510 - 5670	SDM MCS21	22.66	184.50

5.1. DESCRIPTION OF AVAILABLE ANTENNAS

2X2 ANTENNA

	Antenna Gain		Antenna Gain		Antenna Gain	Antenna Gain
GHz	Ant 1 dBi	Ant 3 dBi	Ant 1 Numeric	Ant 3 Numeric	Combined Numeric	Combined dBi
5.2	4.16	**5.65**	2.61	3.67	6.28	**7.98**
5.3	4.00	**5.61**	2.51	3.64	6.15	**7.89**
5.5	4.71	**5.35**	2.96	3.43	6.39	**8.05**

3X3 ANTENNA

	Antenna Gain			Antenna Gain			Antenna Gain	Antenna Gain
GHz	Ant 1 dBi	Ant 2 dBi	Ant 3 dBi	Ant 1 Numeric	Ant 2 Numeric	Ant 3 Numeric	Combined Numeric	Combined dBi
5.2	4.16	2.51	**5.65**	2.61	1.78	3.67	8.06	**9.06**
5.3	4.00	3.81	**5.61**	2.51	2.40	3.64	8.56	**9.32**
5.5	2.92	4.71	**5.35**	1.96	2.96	3.43	8.34	**9.21**

5.2. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.100.98.29.
The test utility software used during testing was BCM Internal, rev. 5.100.RC98.29.

5.3. 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 to individual chains; therefore final measurements were performed using individual chains 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.

5.1. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	G560	CPU4495728	DoC
AC Adapter	Lenovo	ADP-65KH B	11S36001646ZZ1000AD9WJ	DoC
Adapter Board	Catalyst	MINI2EXP	BRCM 02	N/A
Adapter Board	Broadcom	BCM94331PCIBT4HAD	1385233	N/A

I/O CABLES

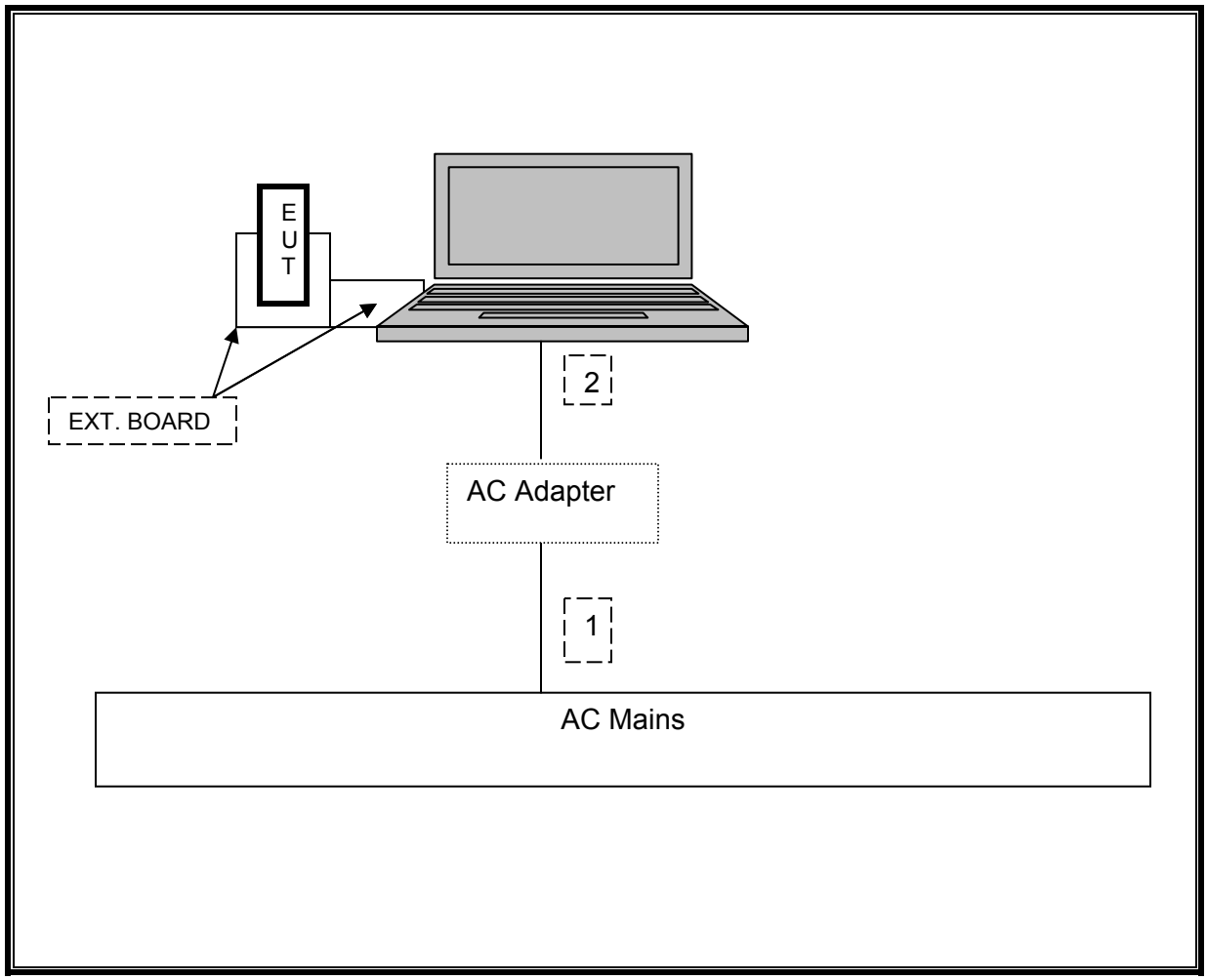
TEST SETUP

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

TEST SETUP

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

SETUP DIAGRAM



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 Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	10/29/11
EMI Receiver, 6.5 GHz	Agilent / HP	8546A	1963	08/19/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	07/29/11
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	07/29/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	07/06/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	08/04/11
Peak Power Meter	Agilent / HP	E9327A	C00964	12/04/11
Peak Power Sensor	Agilent / HP	E4416A	C00963	12/04/11
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02679	CNR
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02680	CNR
Reject Filter, 5.47-5.725 GHz	Micro-Tronics	BRC13191	N02678	CNR
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-	N02481	11/05/11

7. ANTENNA PORT TEST RESULTS

7.1. 802.11a MODE IN THE 5.2 GHz BAND

LEGACY

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

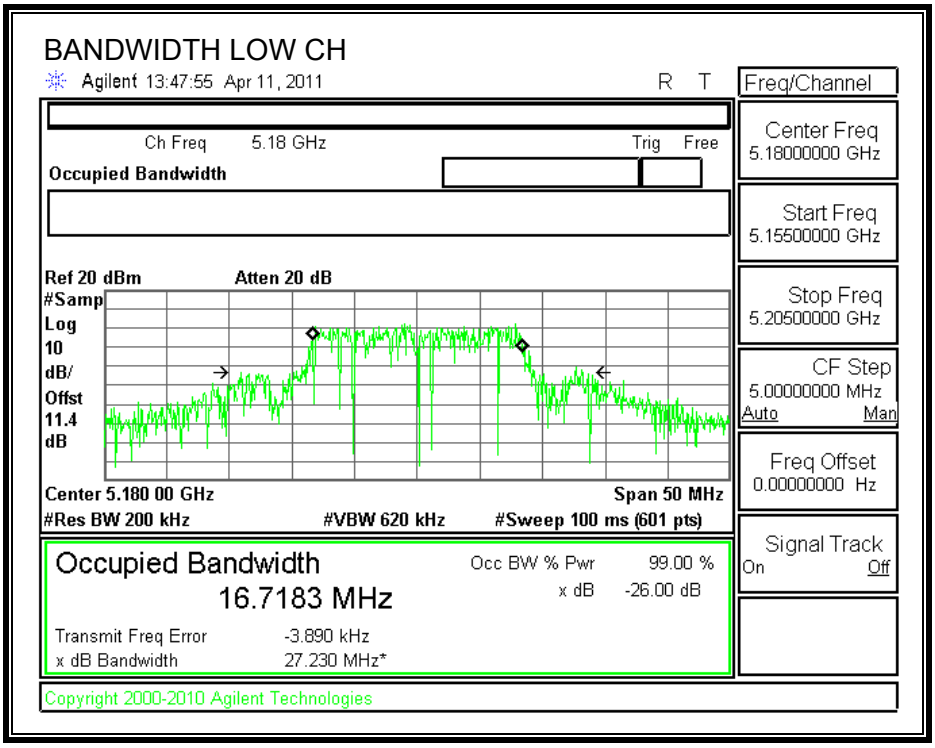
TEST PROCEDURE

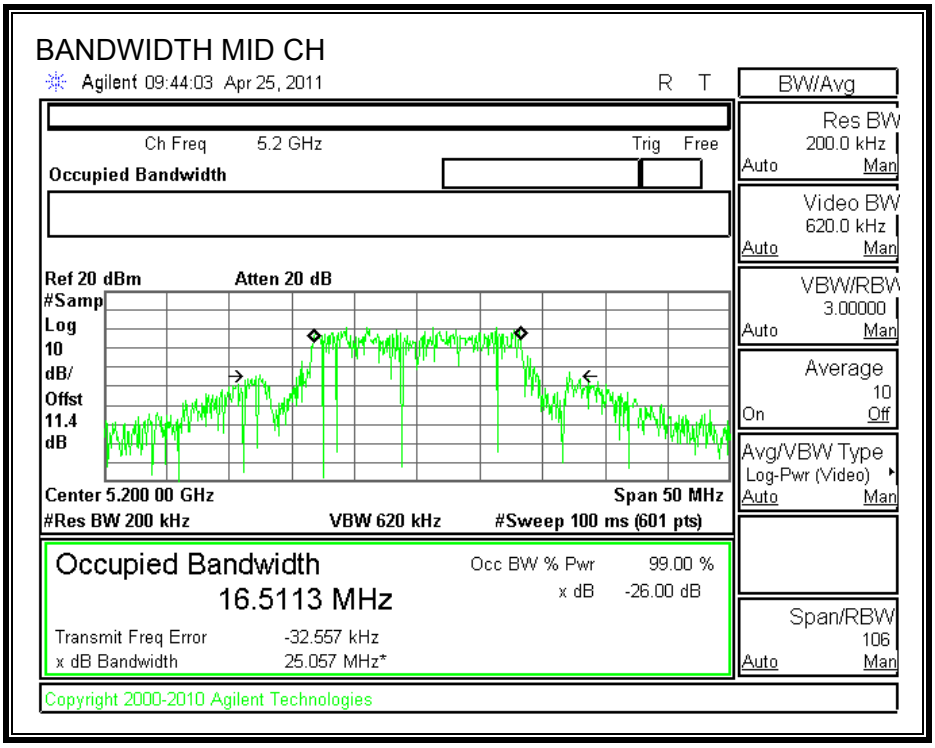
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

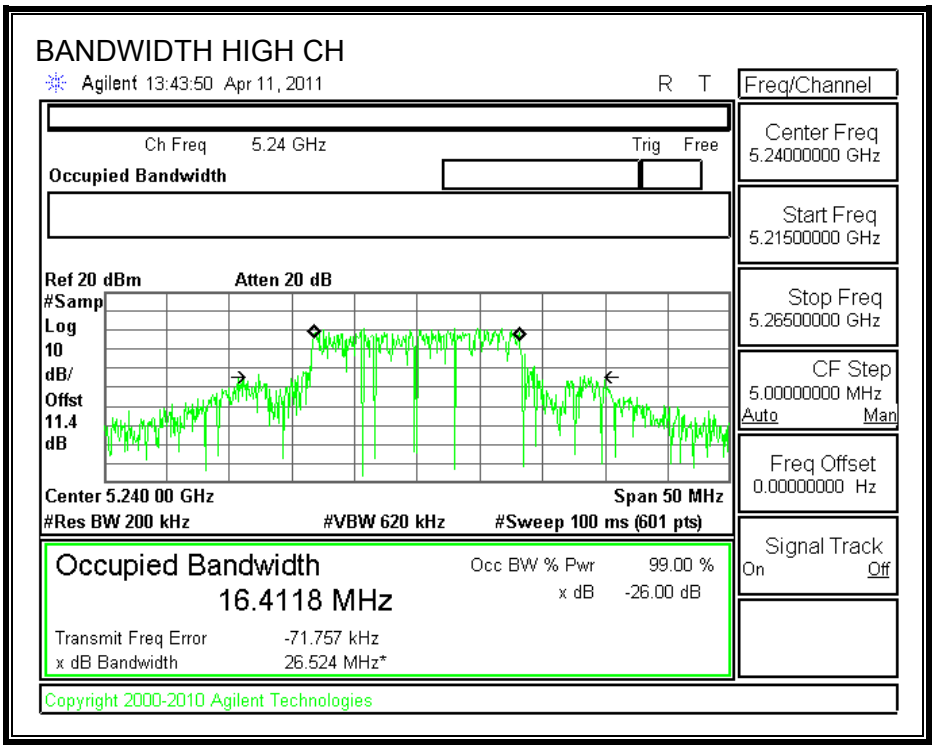
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	27.107	16.7183
Middle	5200	26.563	16.5113
High	5240	27.283	16.4118

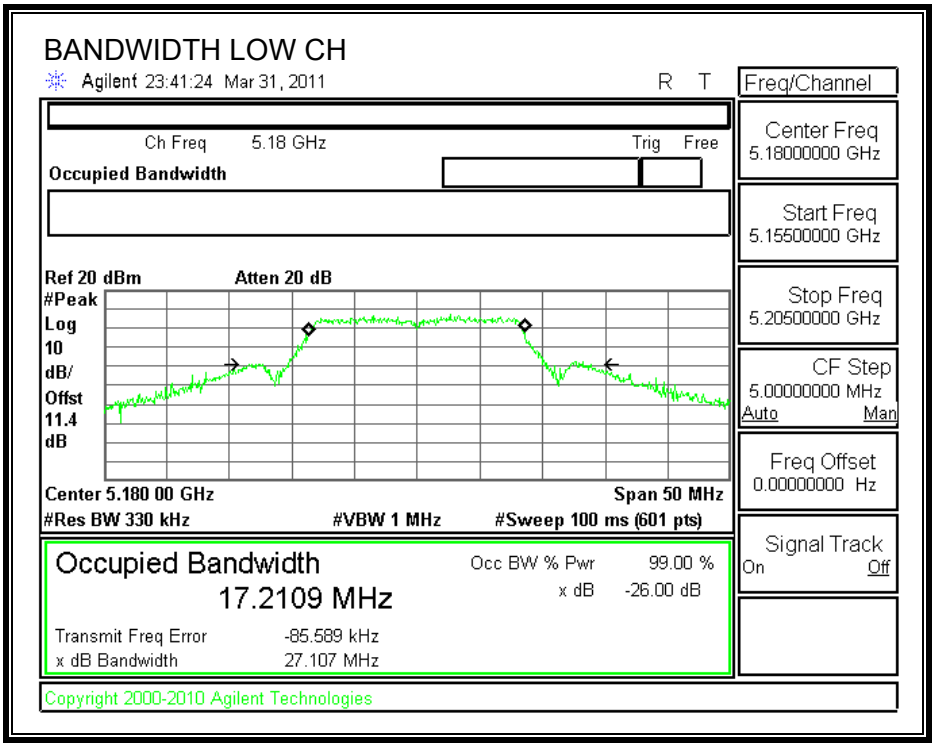
99% BANDWIDTH

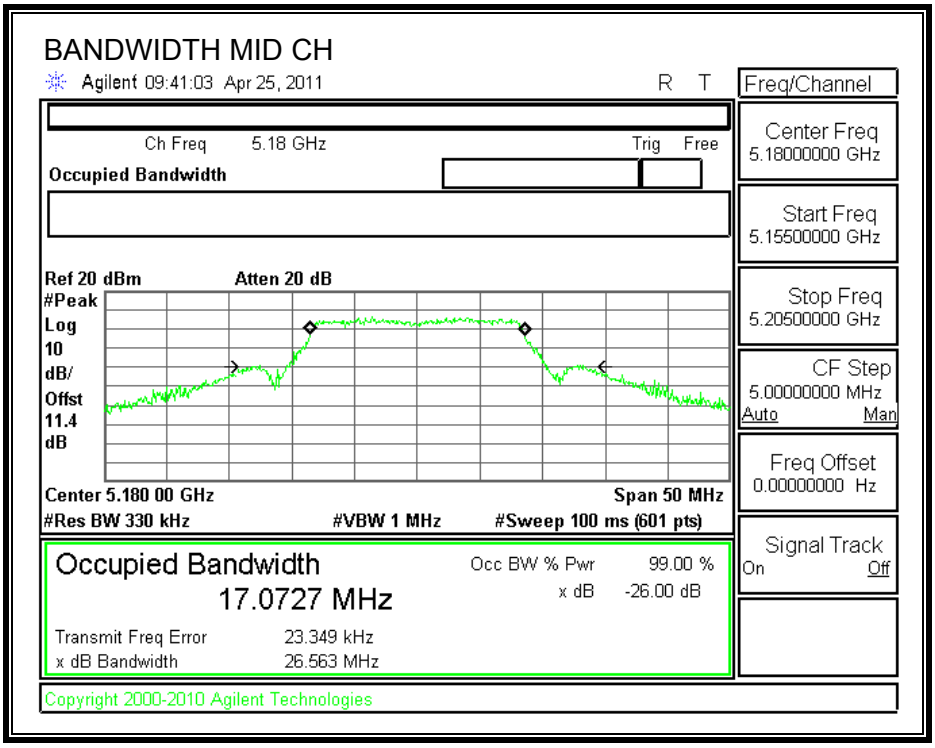


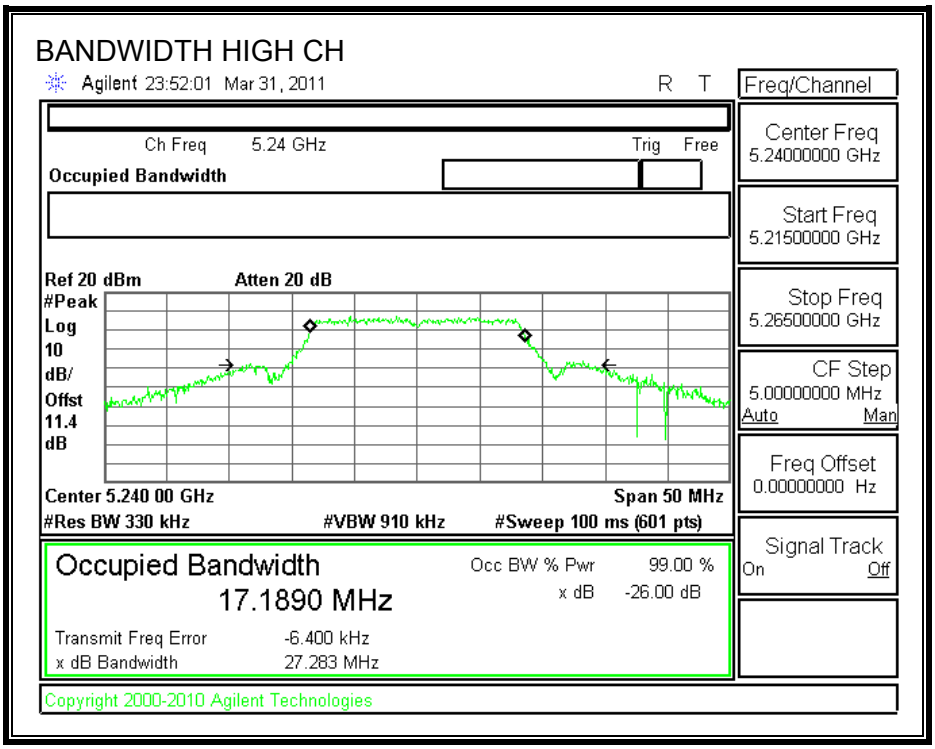




26 dB BANDWIDTH







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

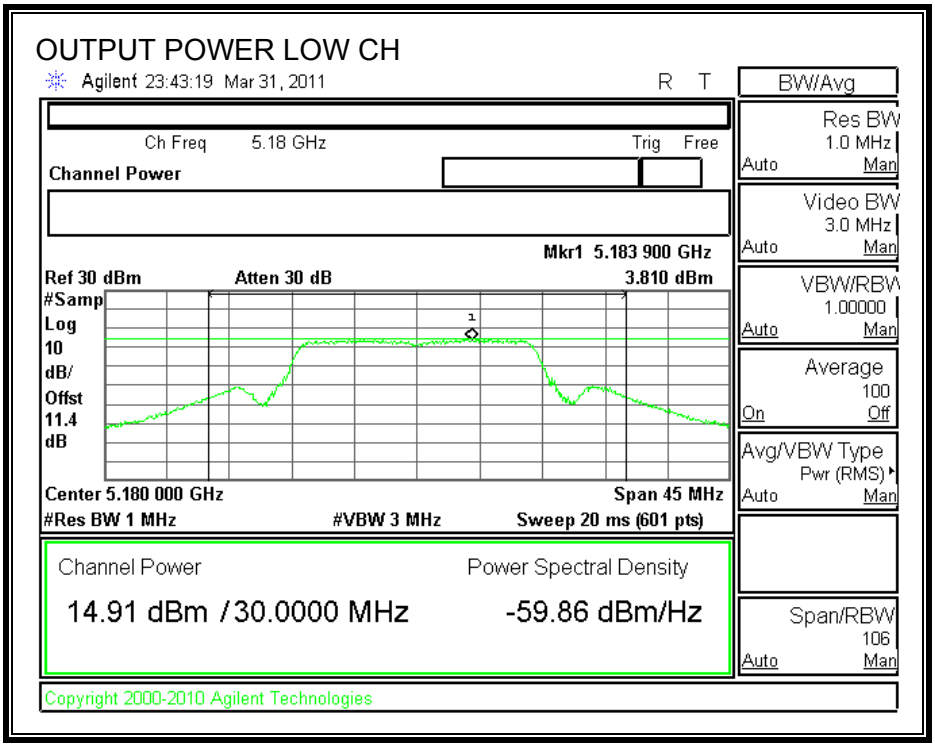
Limit

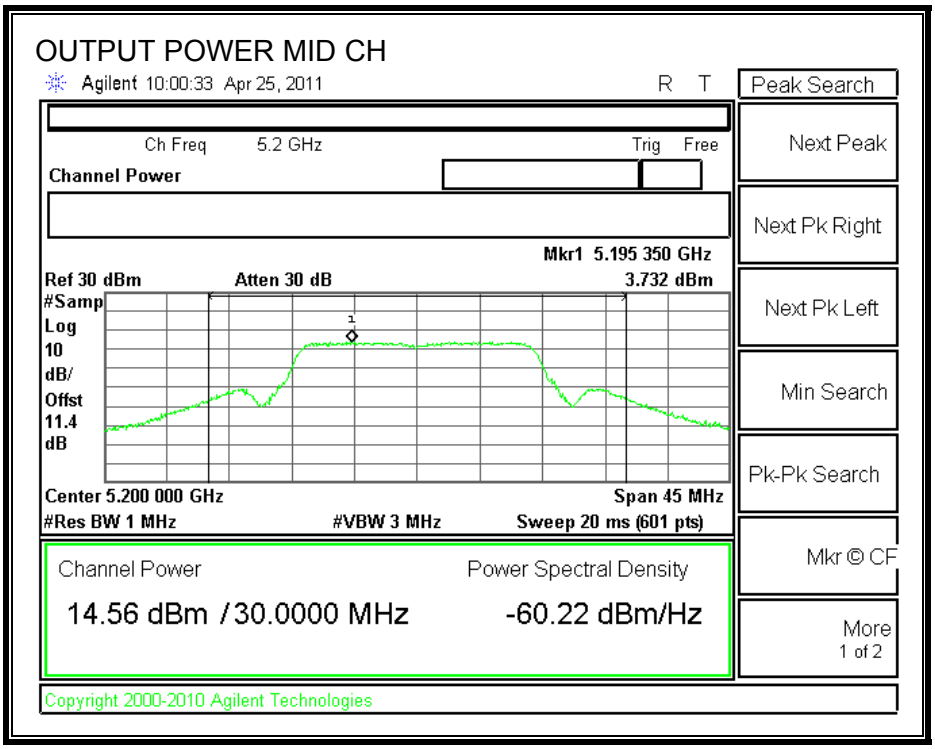
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	27.107	18.33	5.65	17.00
Mid	5200	17	26.563	18.24	5.65	17.00
High	5240	17	27.283	18.36	5.65	17.00

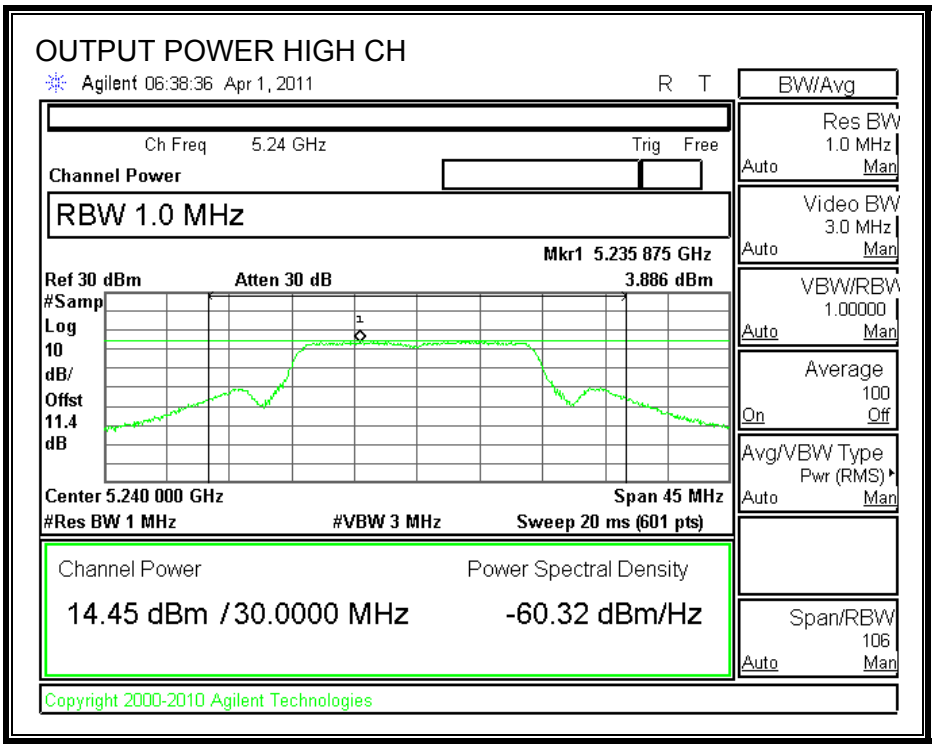
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	14.91	17.00	-2.09
Mid	5200	14.56	17.00	-2.44
High	5240	14.45	17.00	-2.55

OUTPUT POWER







7.1.2. 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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

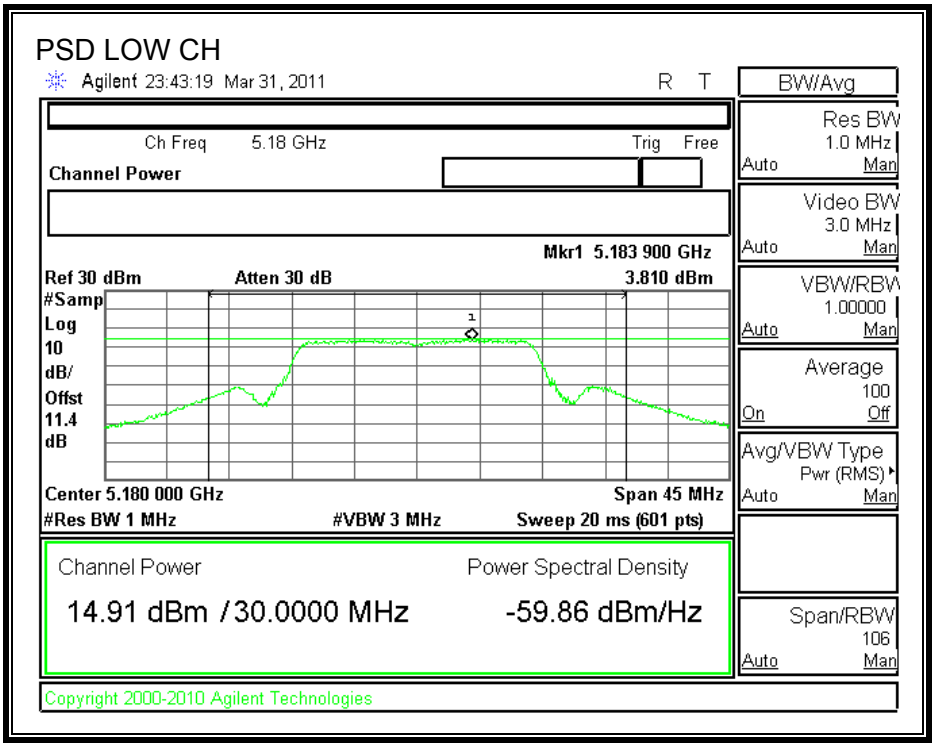
TEST PROCEDURE

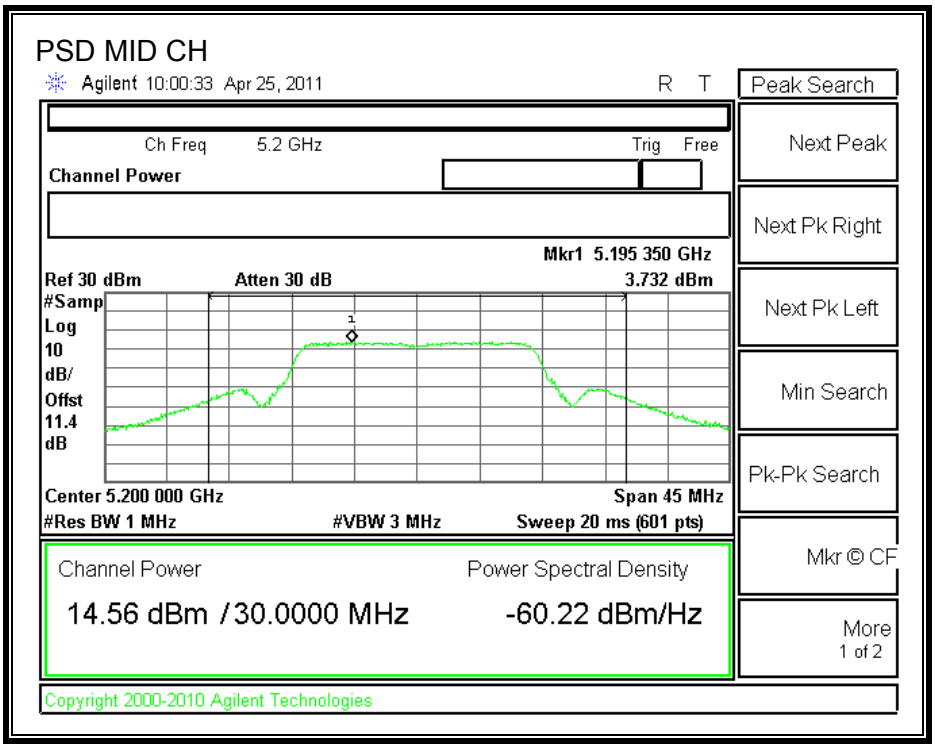
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

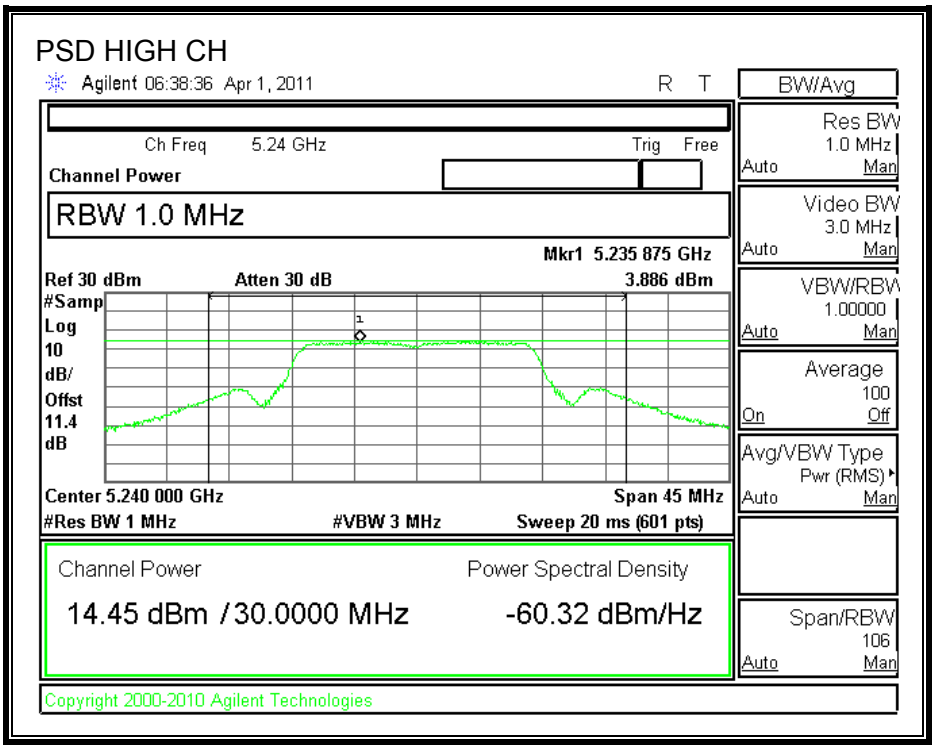
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.81	4	-0.19
Mid	5200	3.73	4	-0.27
High	5240	3.89	4	-0.11

POWER SPECTRAL DENSITY







7.1.3. 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

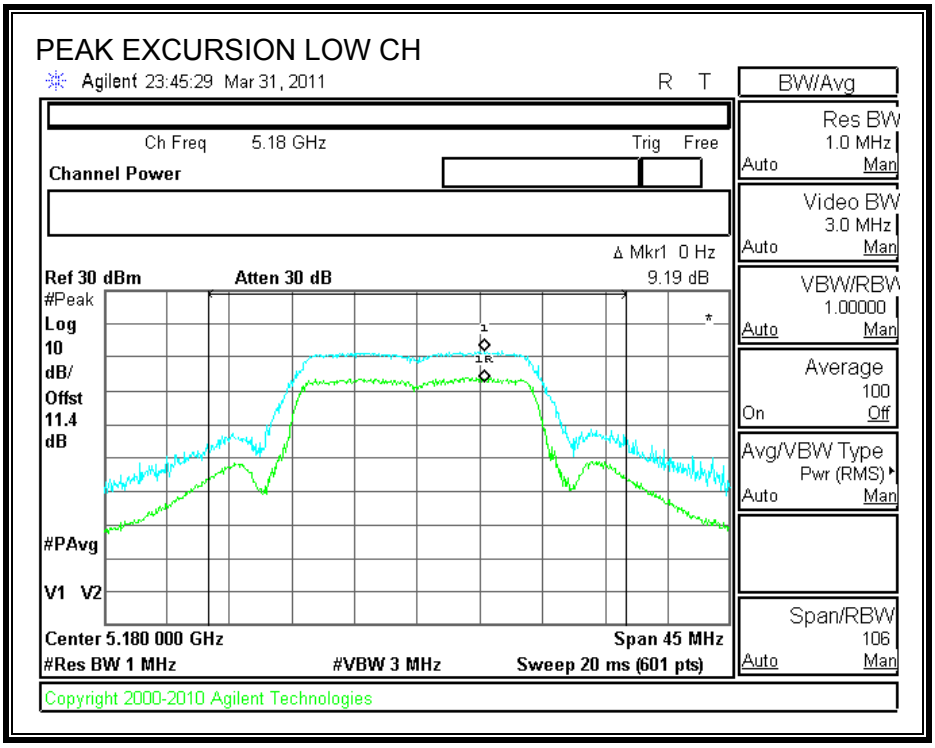
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

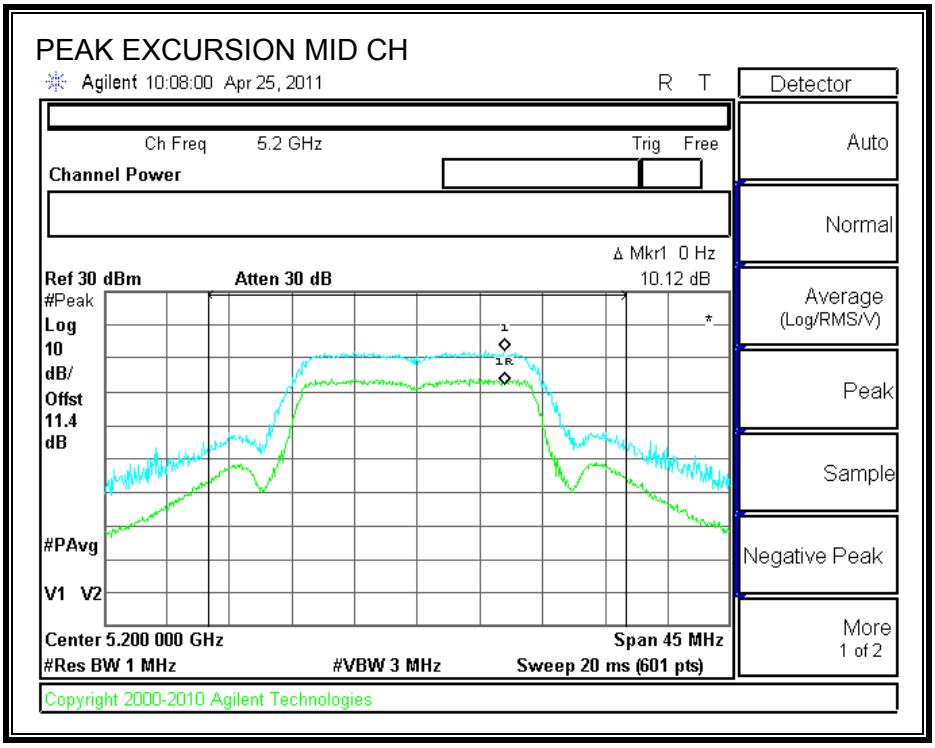
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

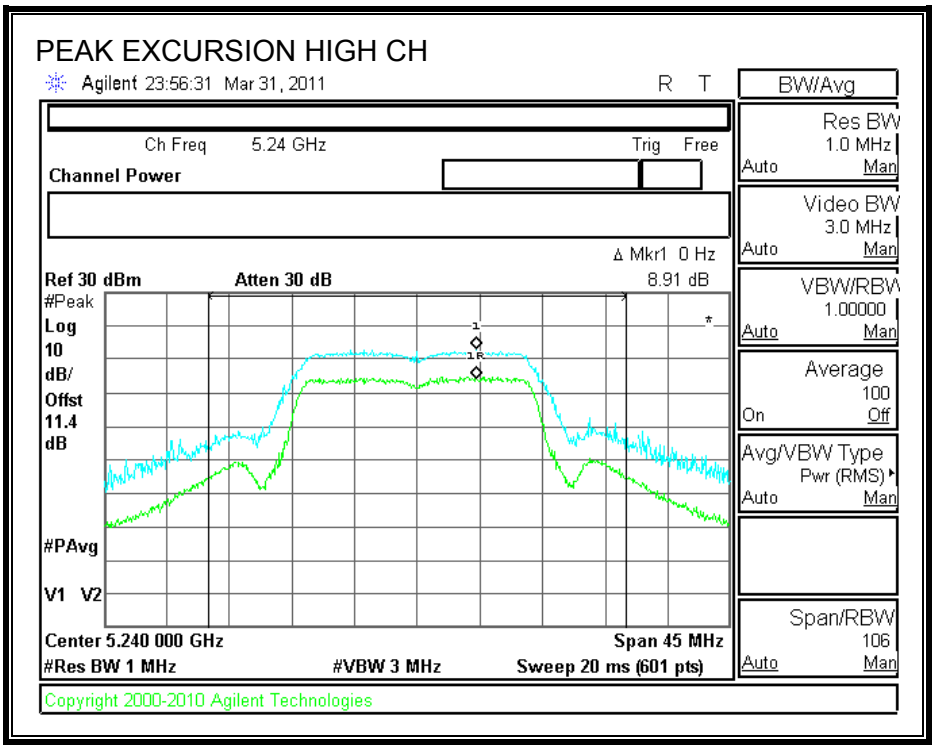
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.19	13	-3.81
Mid	5200	10.12	13	-2.88
High	5240	8.91	13	-4.09

PEAK EXCURSION







7.1.4. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CDD MCS0.

7.2. 802.11n DUAL CHAIN HT20 MODE IN THE 5.2 GHz BAND

CDD MCS0

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

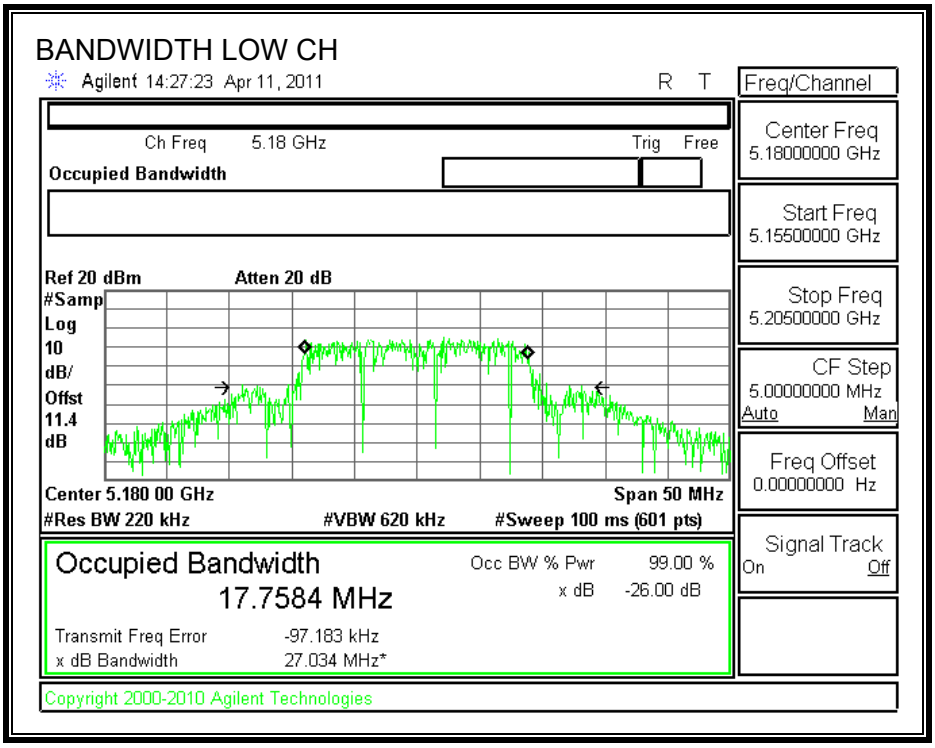
TEST PROCEDURE

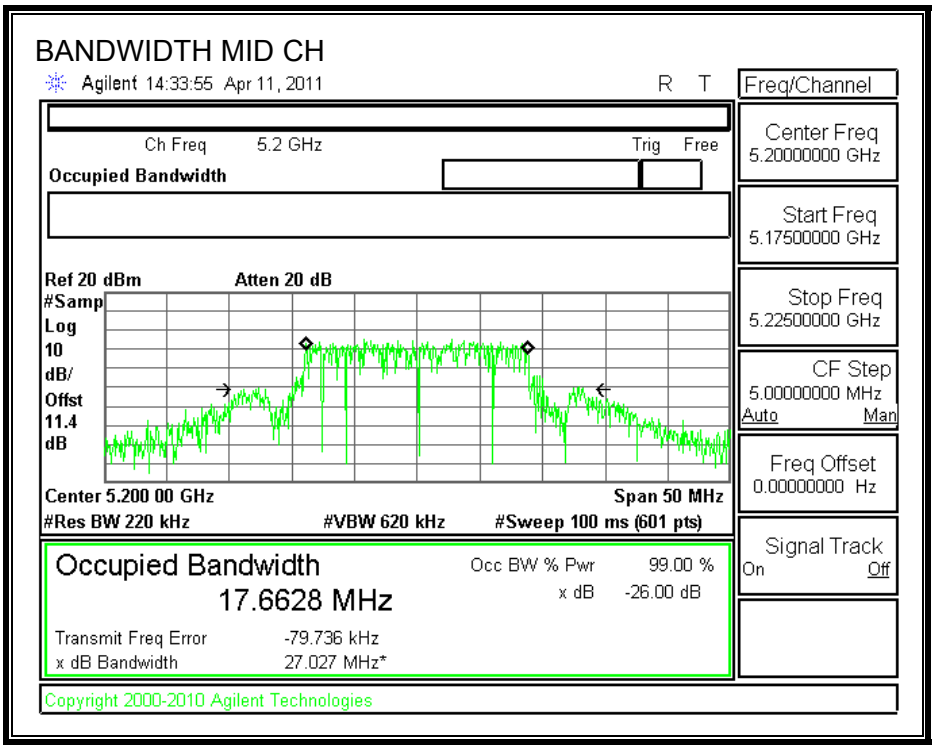
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

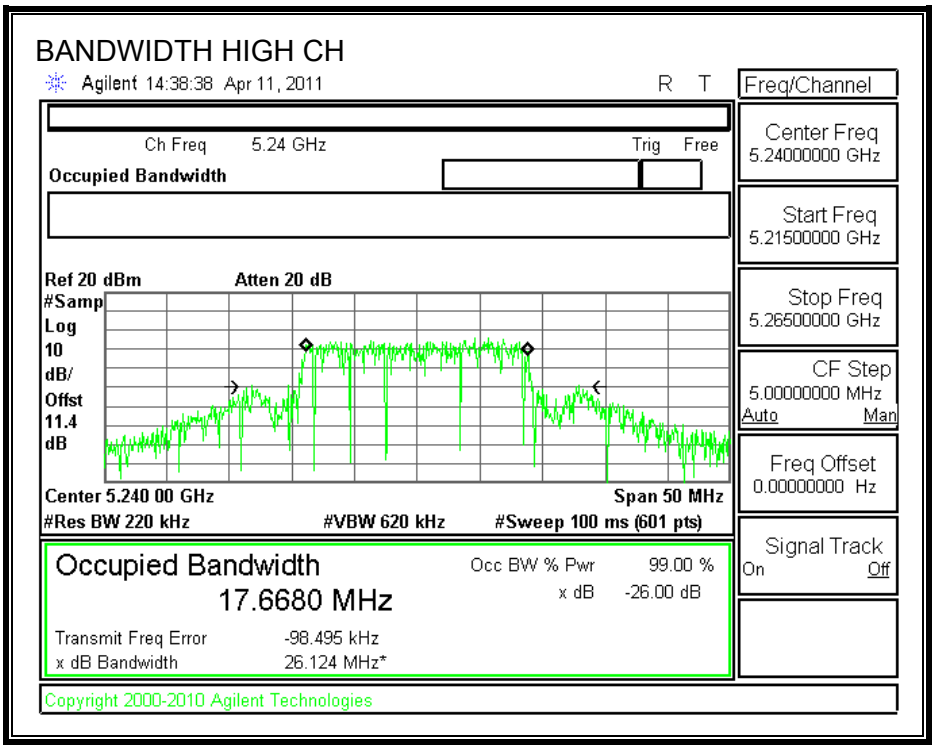
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	26.463	17.7584
Middle	5200	28.627	17.6628
High	5240	29.699	17.668

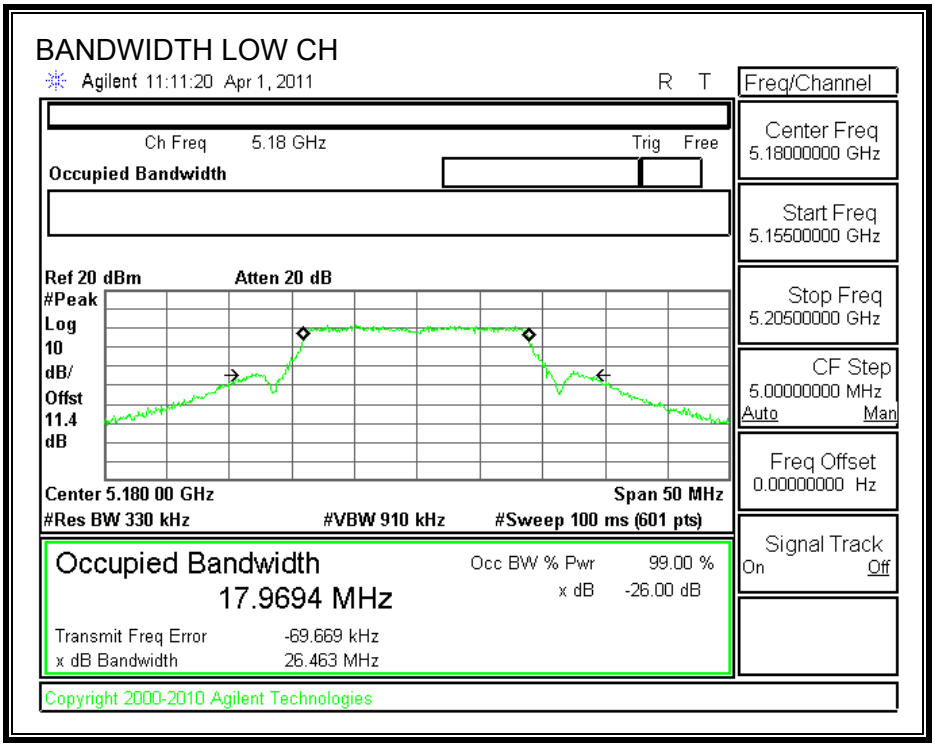
99% BANDWIDTH

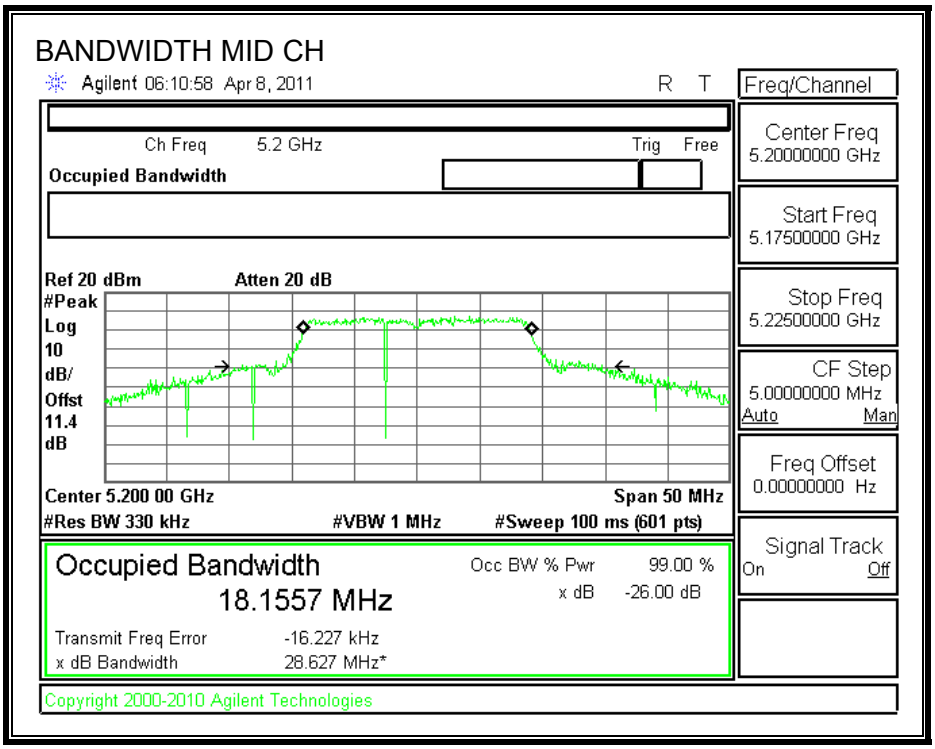


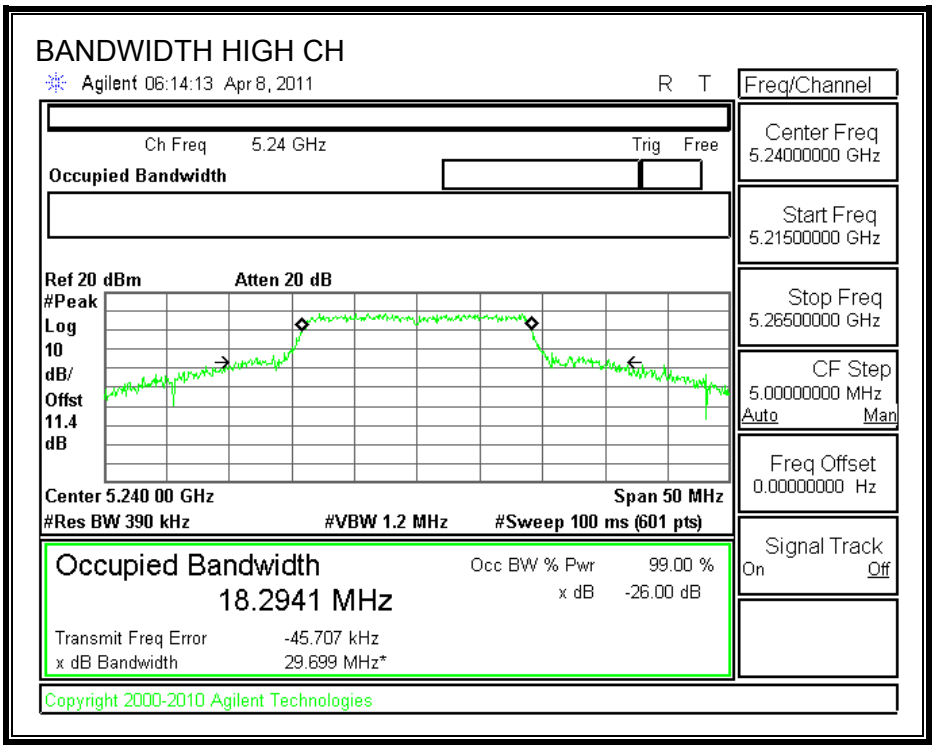




26 dB BANDWIDTH







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

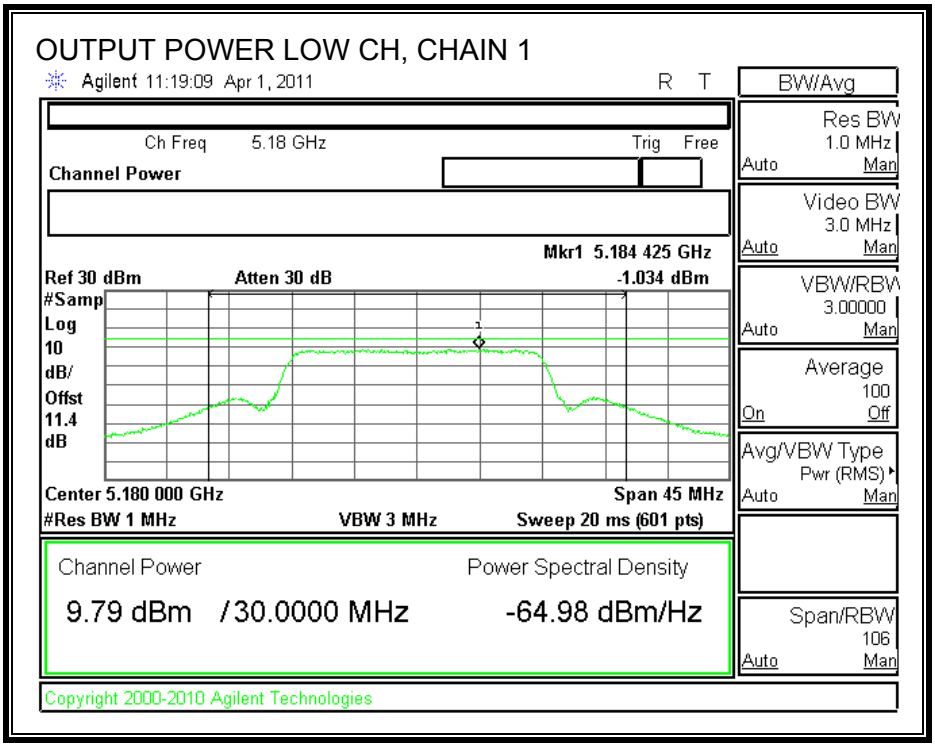
Limit

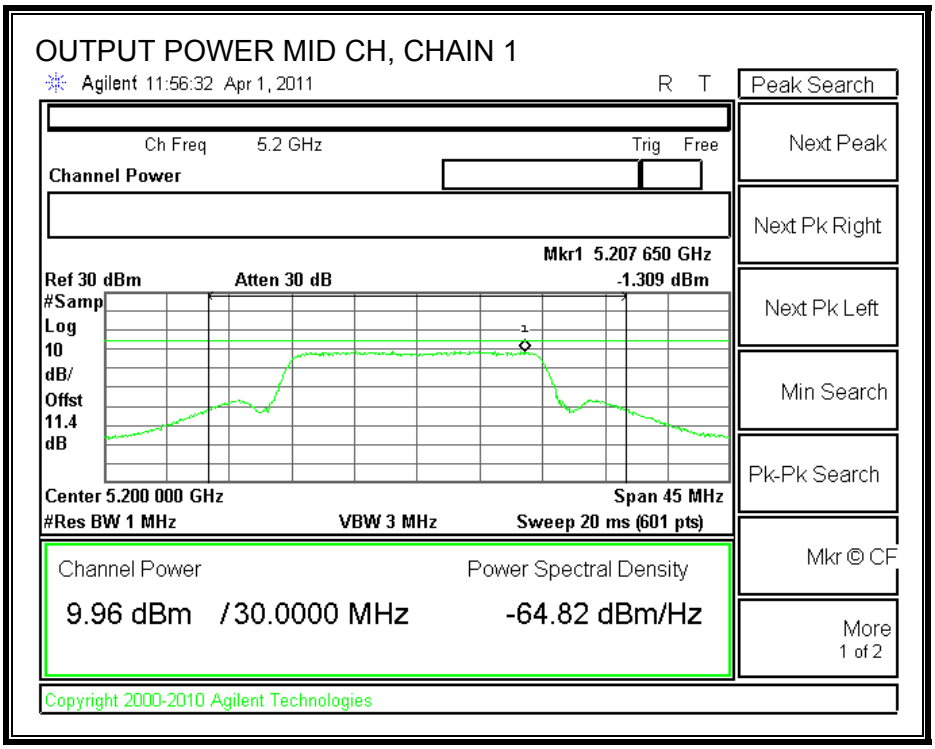
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	26.463	18.23	7.98	15.02
Mid	5200	17	28.627	18.57	7.98	15.02
High	5240	17	29.699	18.73	7.98	15.02

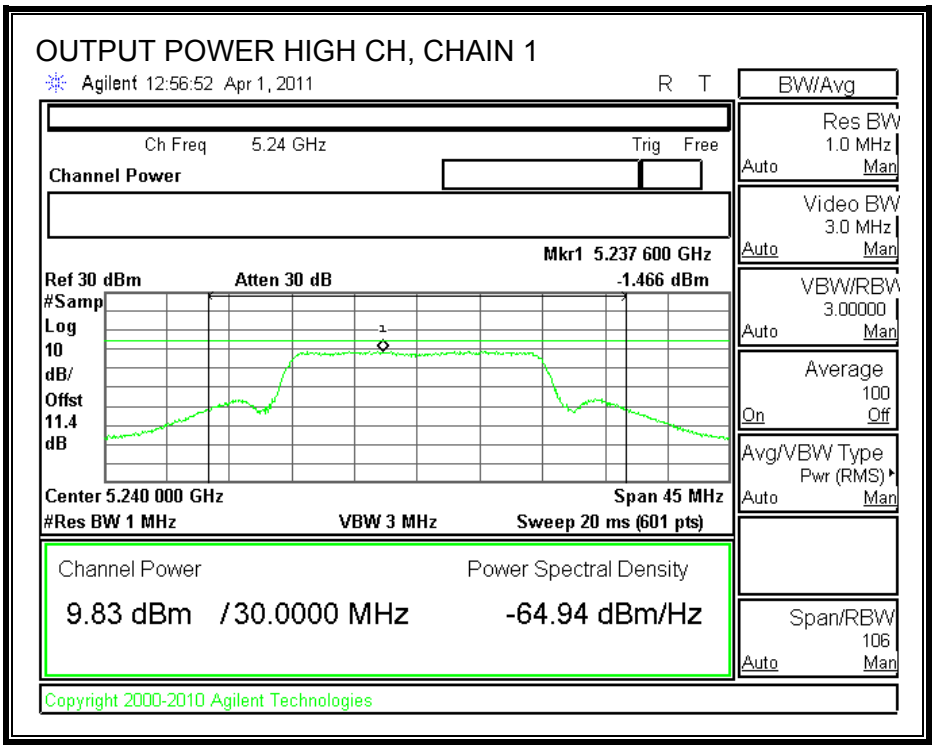
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	9.79	8.81	12.34	15.02	-2.68
Mid	5200	9.96	8.97	12.50	15.02	-2.52
High	5240	9.83	8.93	12.41	15.02	-2.61

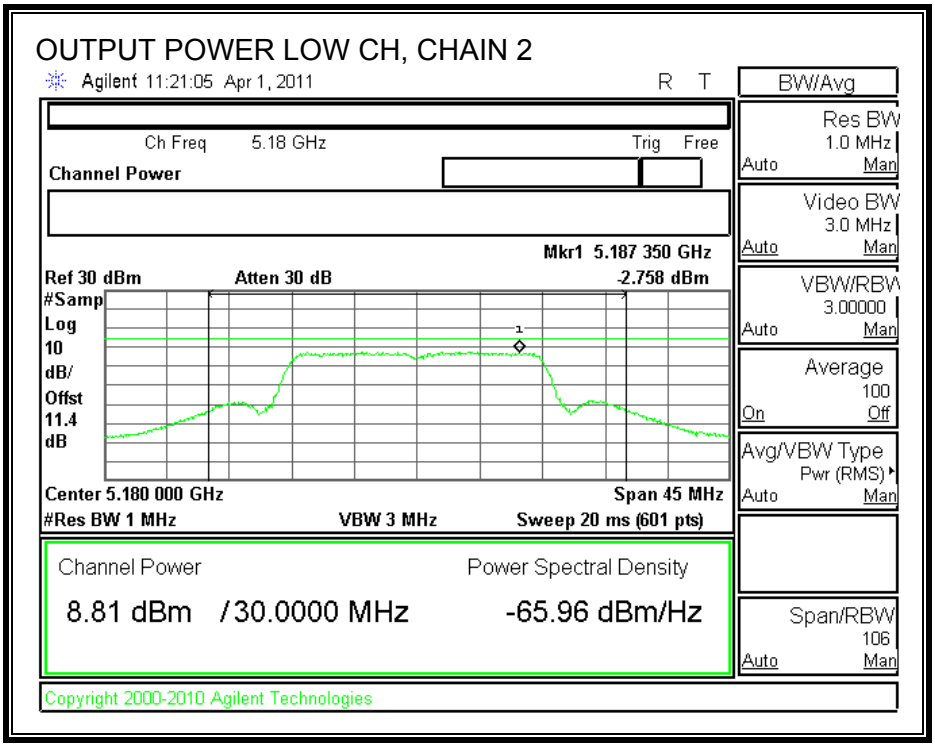
CHAIN 1 OUTPUT POWER

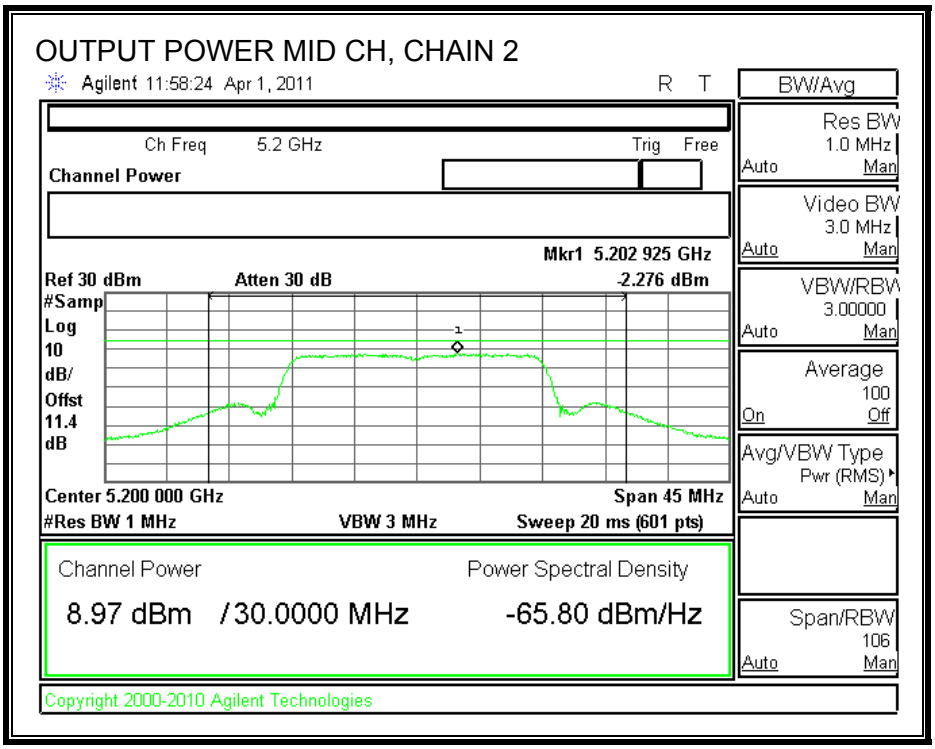


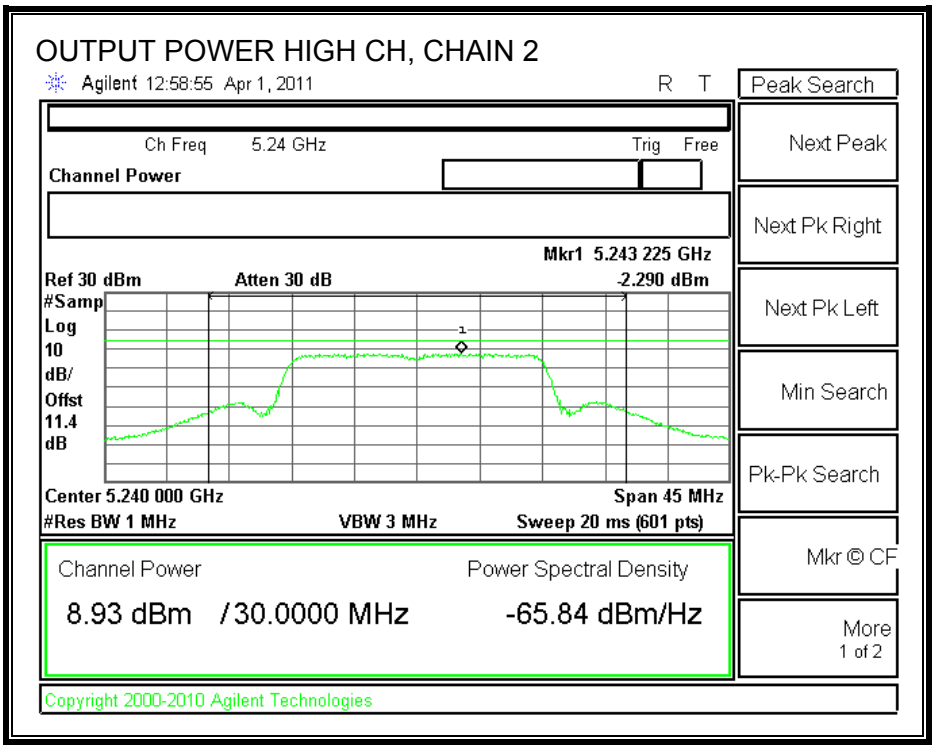




CHAIN 2 OUTPUT POWER







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 effective antenna gain is 7.98 dBi, therefore the limit is 2.02 dBm.

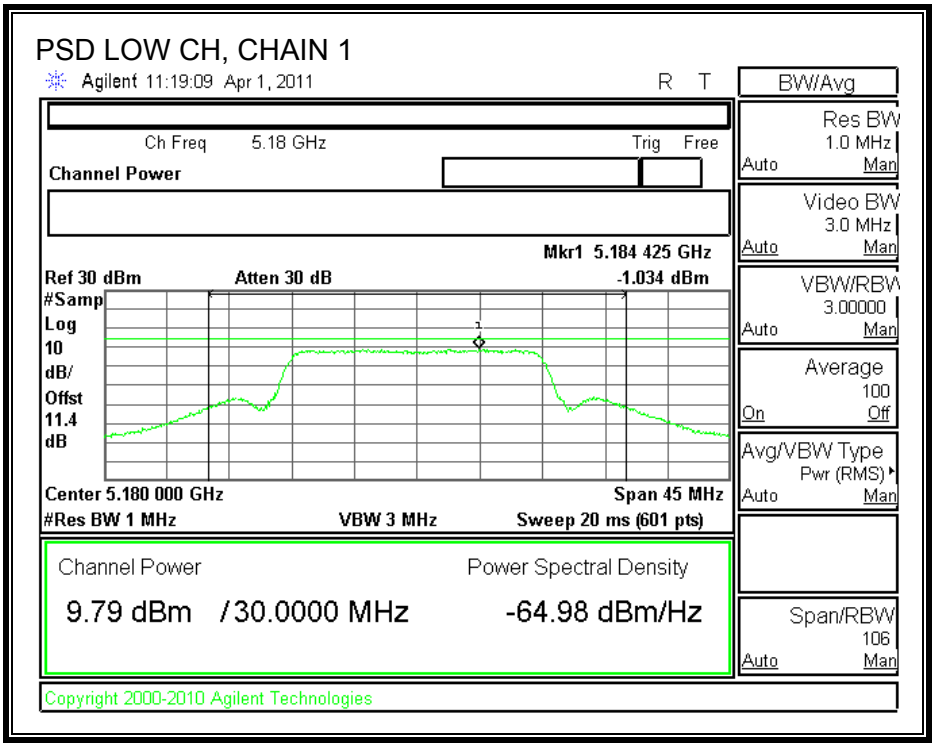
TEST PROCEDURE

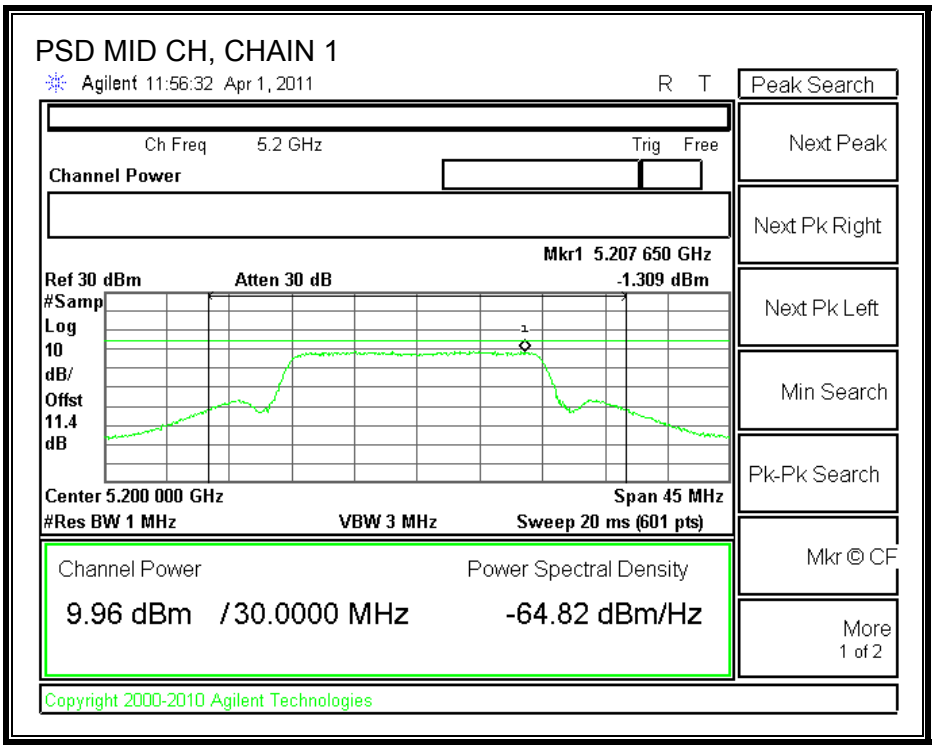
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

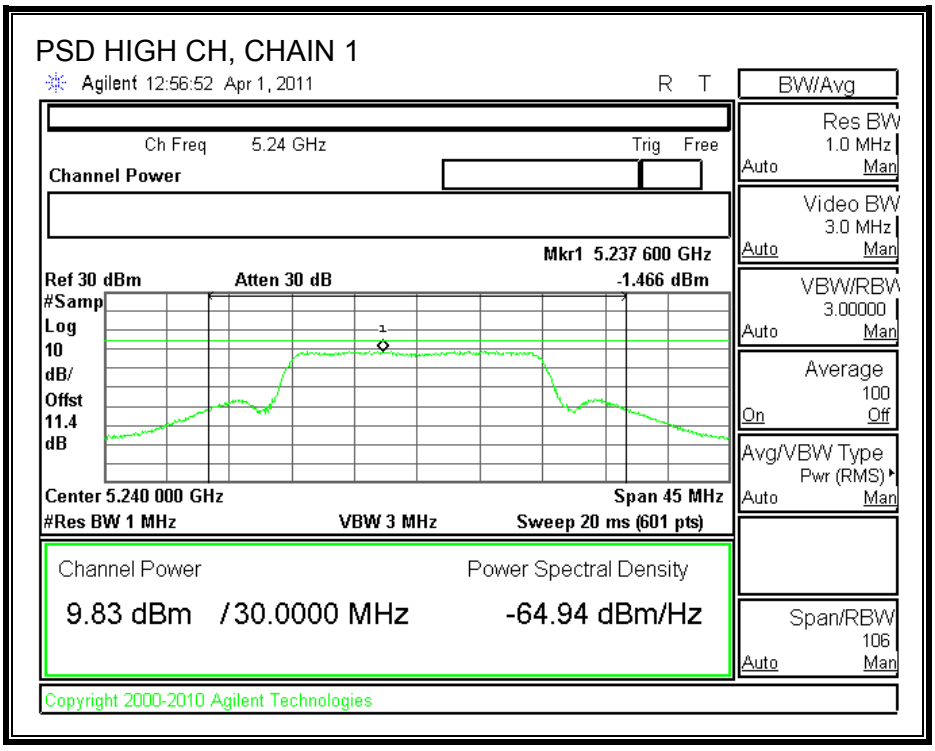
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-1.034	-2.758	1.20	2	-0.82
Middle	5200	-1.309	-2.276	1.24	2	-0.78
High	5240	-1.466	-2.290	1.15	2	-0.87

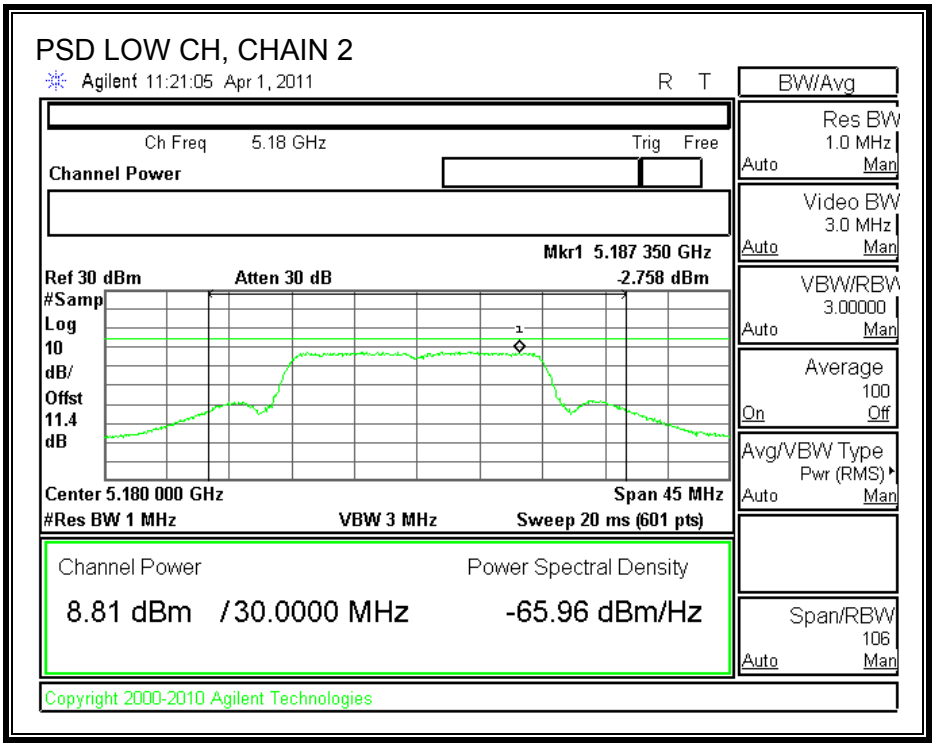
CHAIN 1 POWER SPECTRAL DENSITY

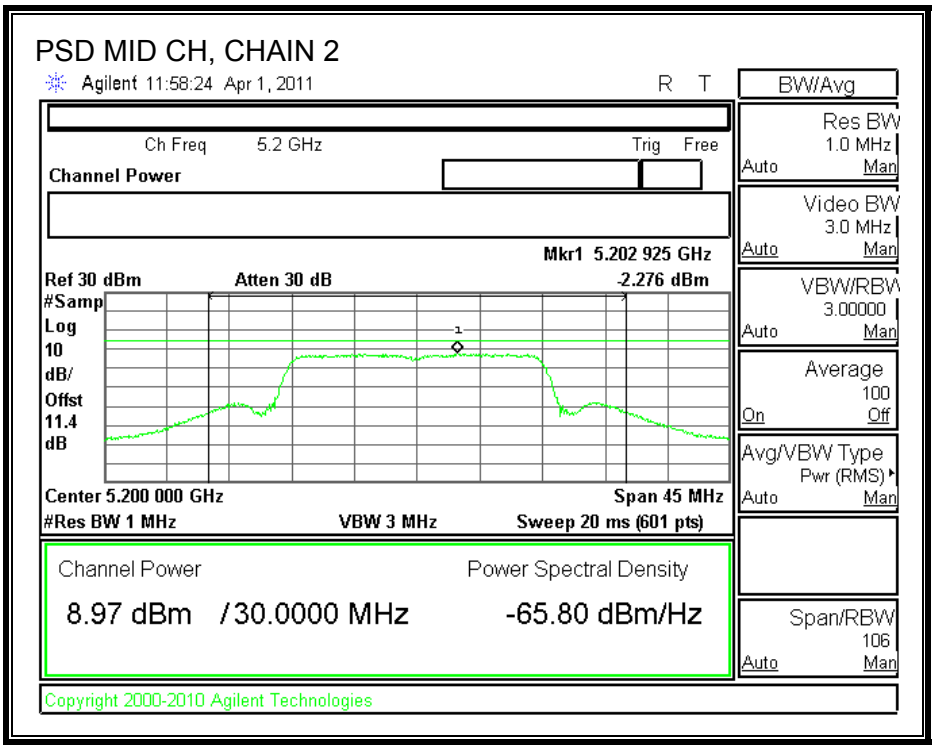


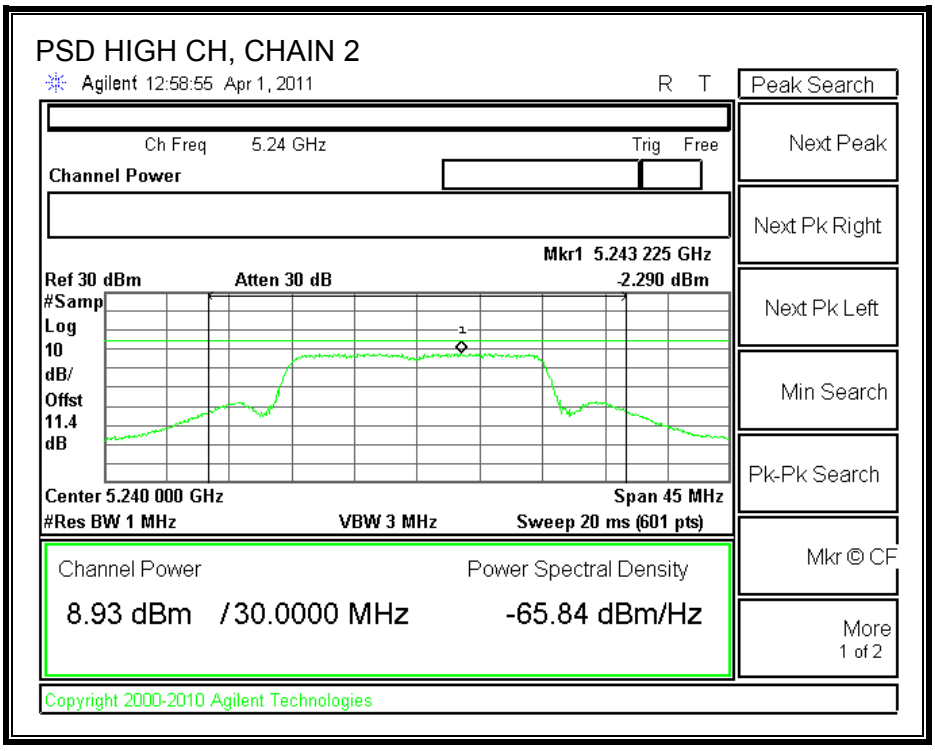




CHAIN 2 POWER SPECTRAL DENSITY







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.

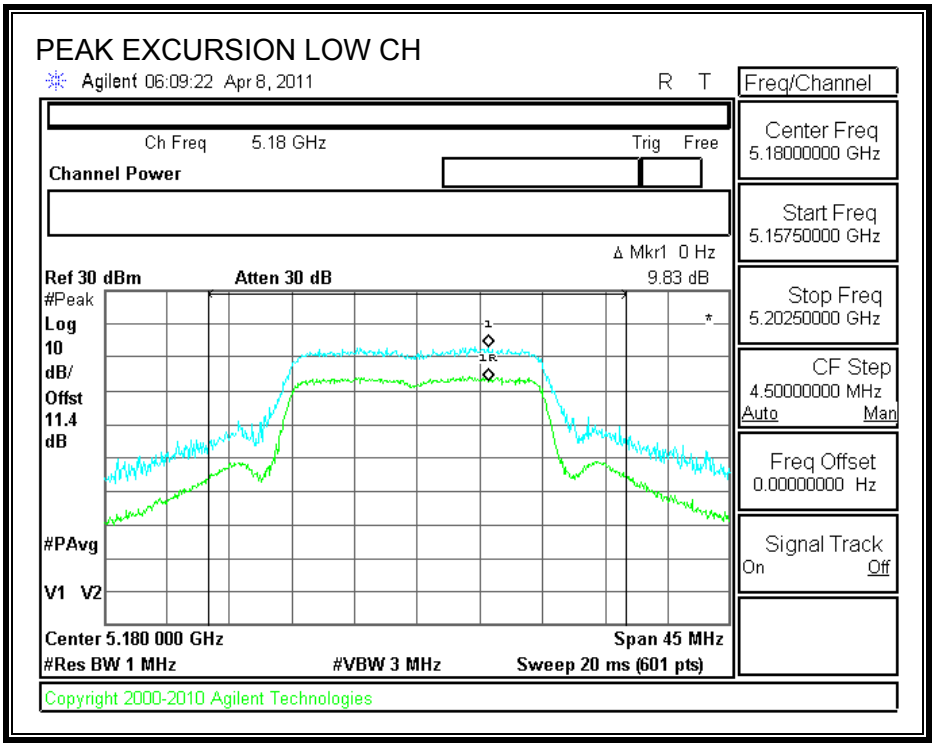
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

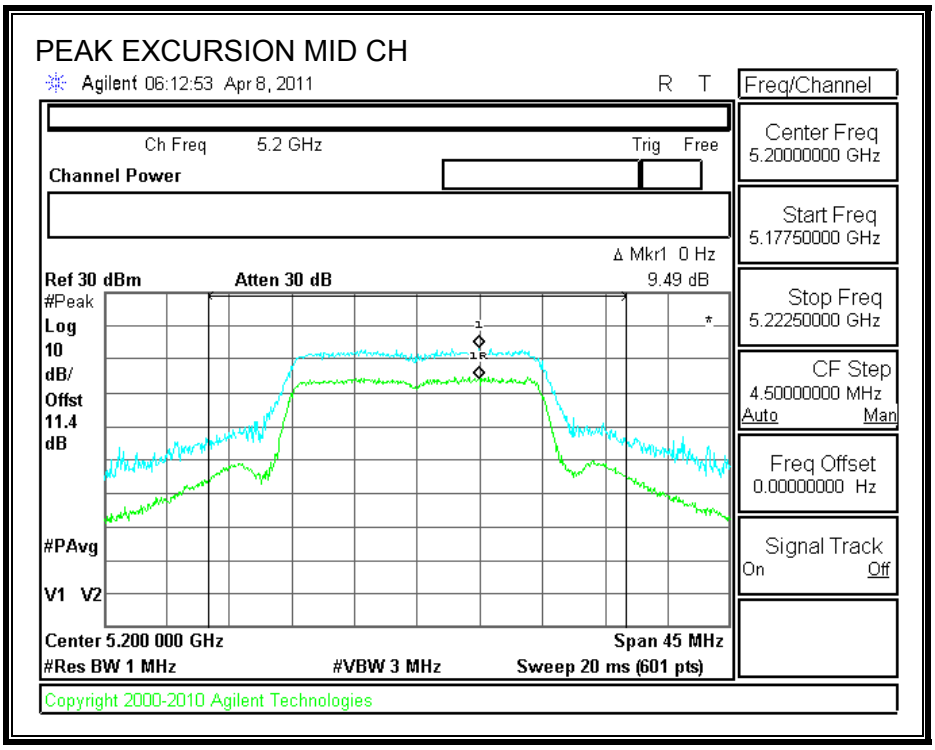
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

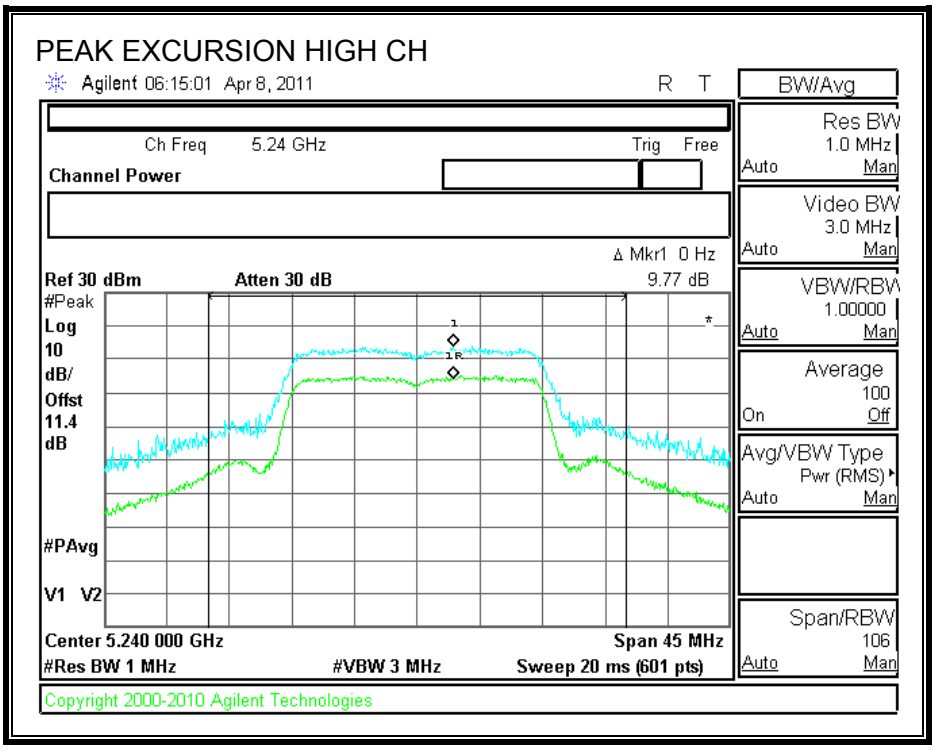
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.83	13	-3.17
Middle	5200	9.49	13	-3.51
High	5240	9.77	13	-3.23

PEAK EXCURSION







7.2.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to HT20 3x3 CDD MCS0

STBC MCS0

7.2.6. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

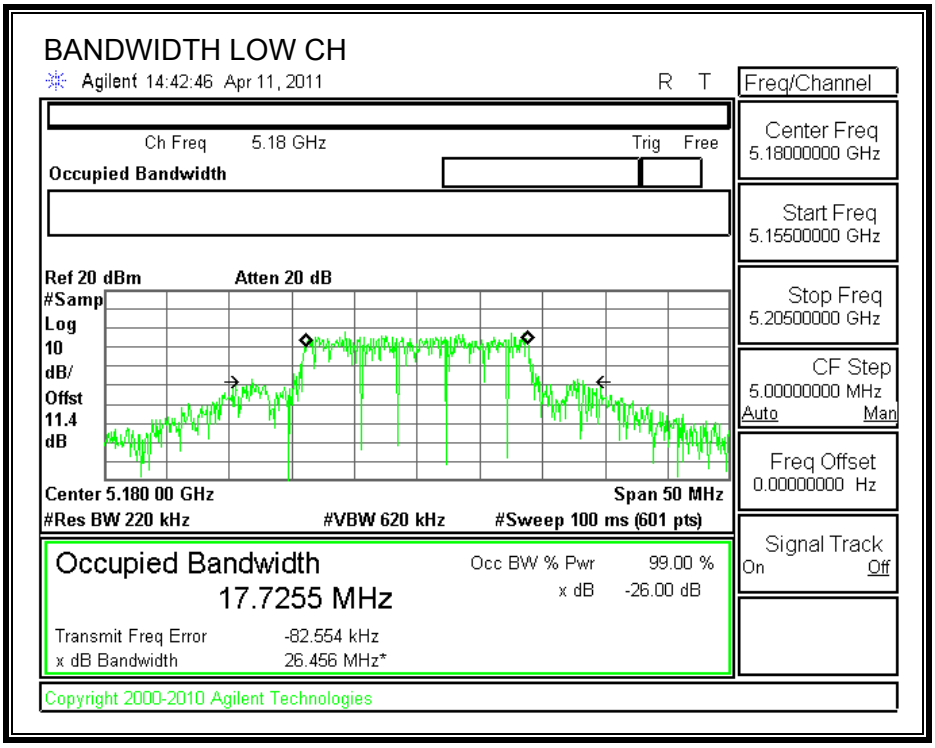
TEST PROCEDURE

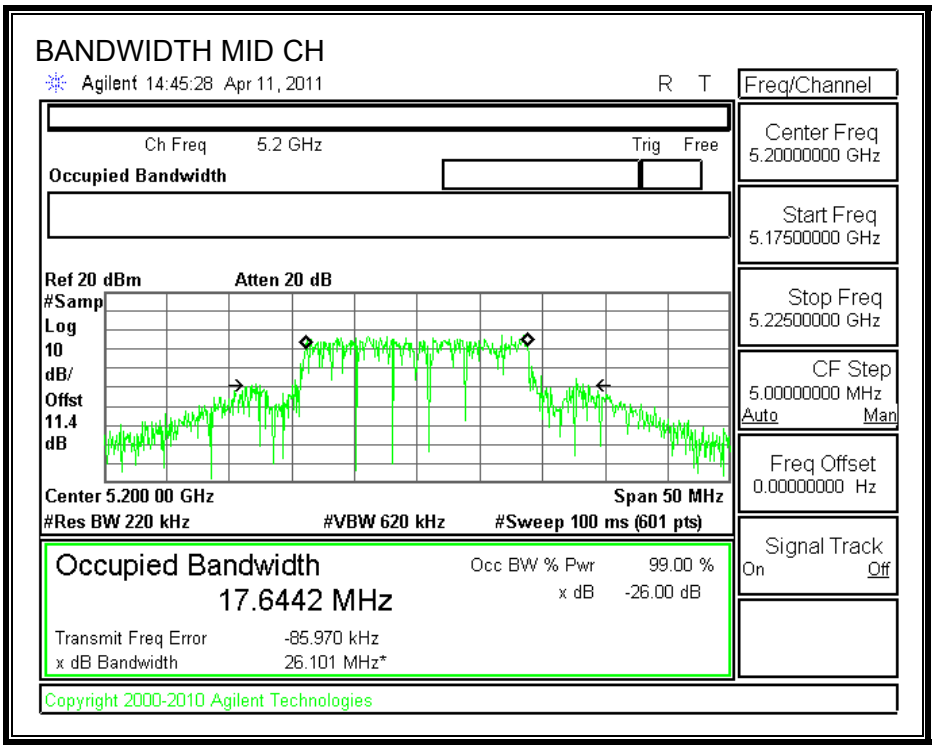
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

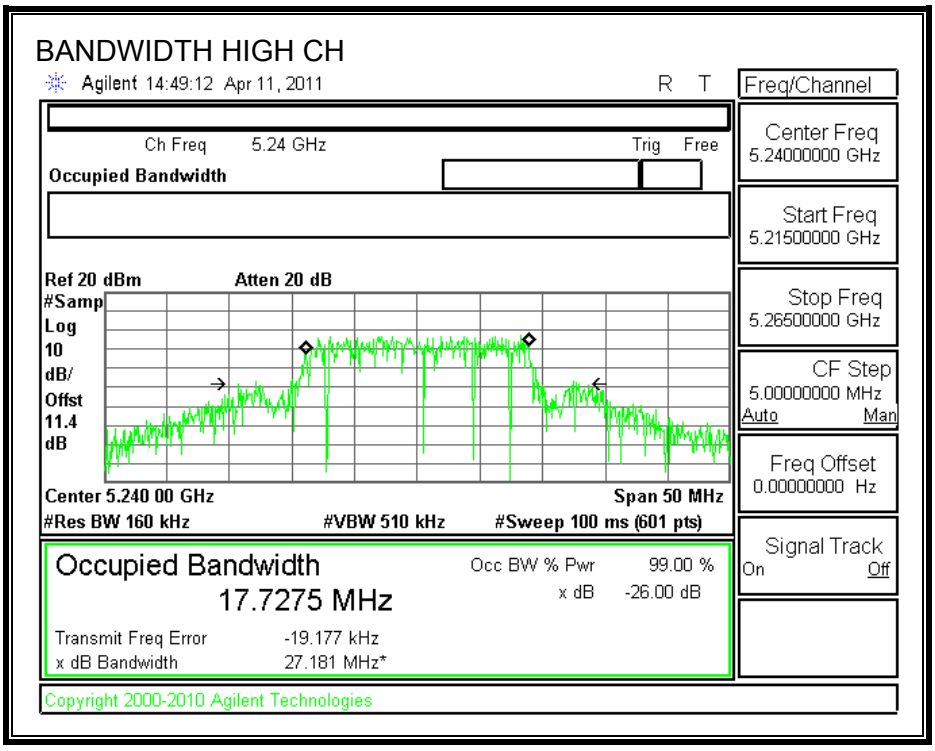
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	26.603	17.7255
Middle	5200	28.351	17.6442
High	5240	29.521	17.7275

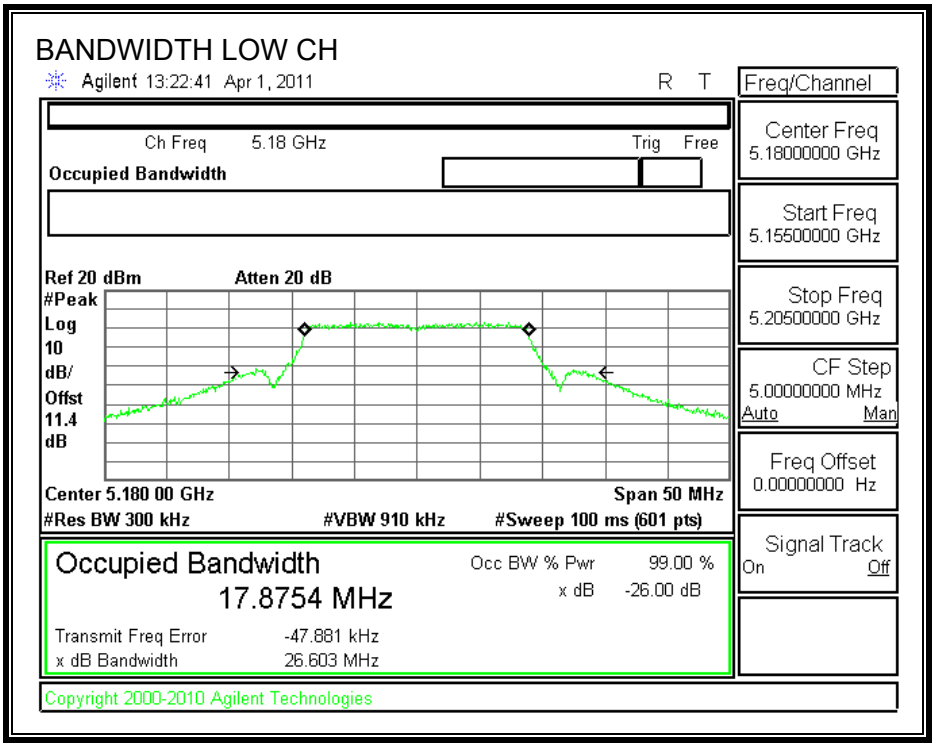
99% BANDWIDTH

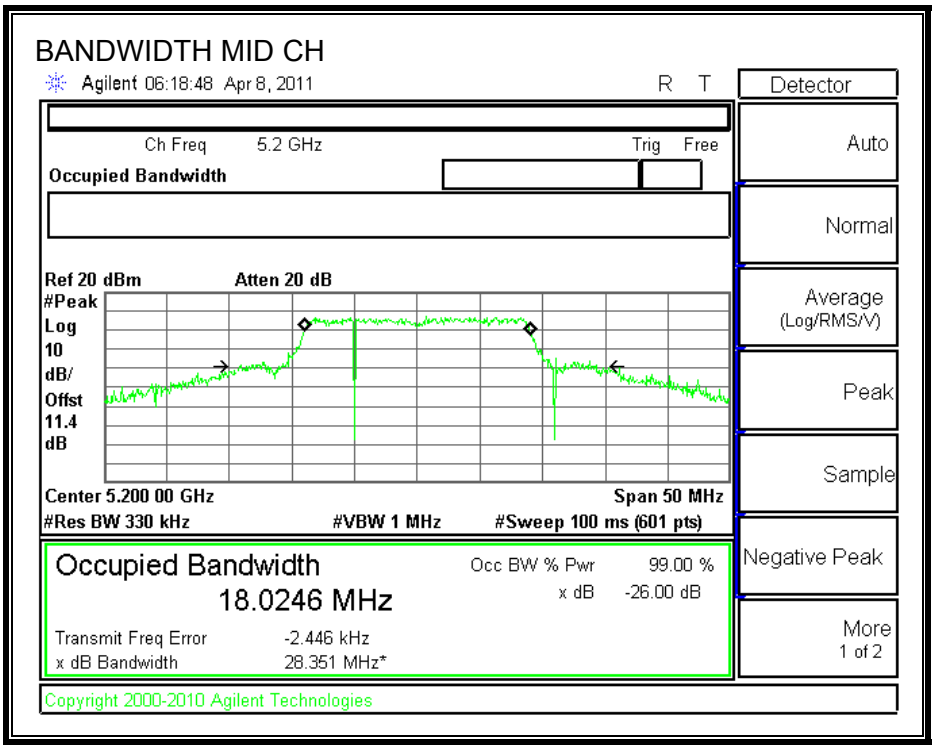


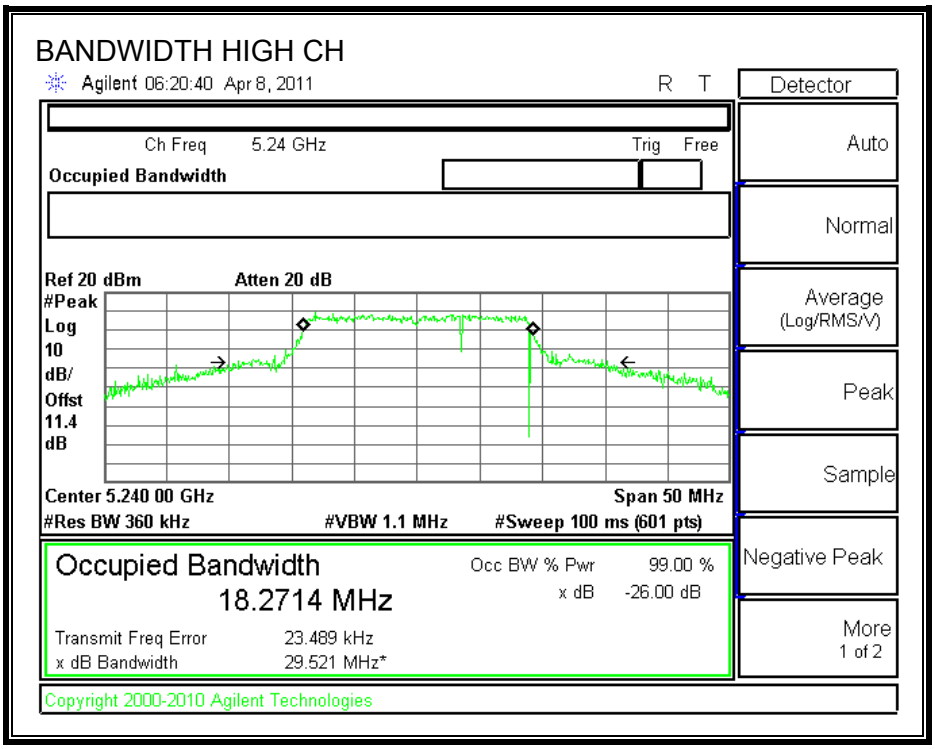




26 dB BANDWIDTH







7.2.7. 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

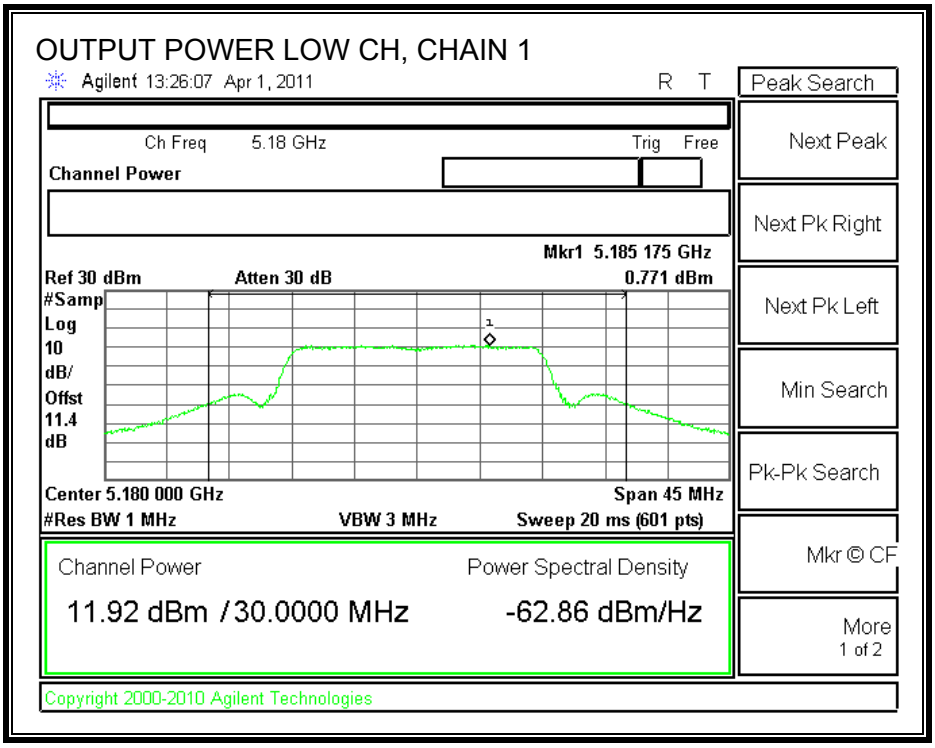
Limit

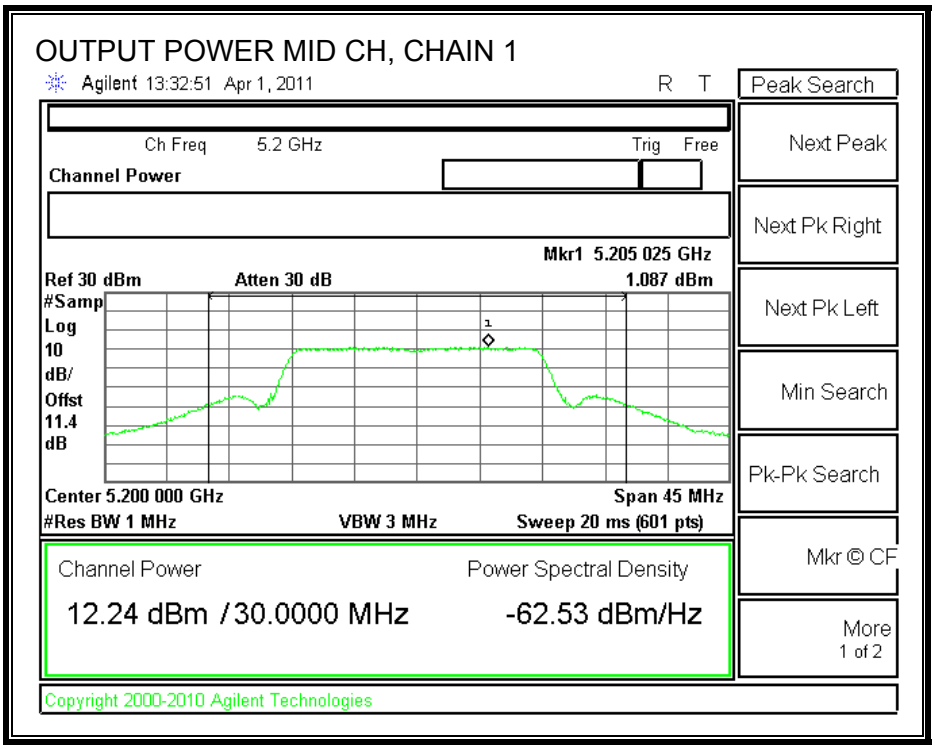
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	26.603	18.25	5.65	17.00
Mid	5200	17	28.351	18.53	5.65	17.00
High	5240	17	29.521	18.70	5.65	17.00

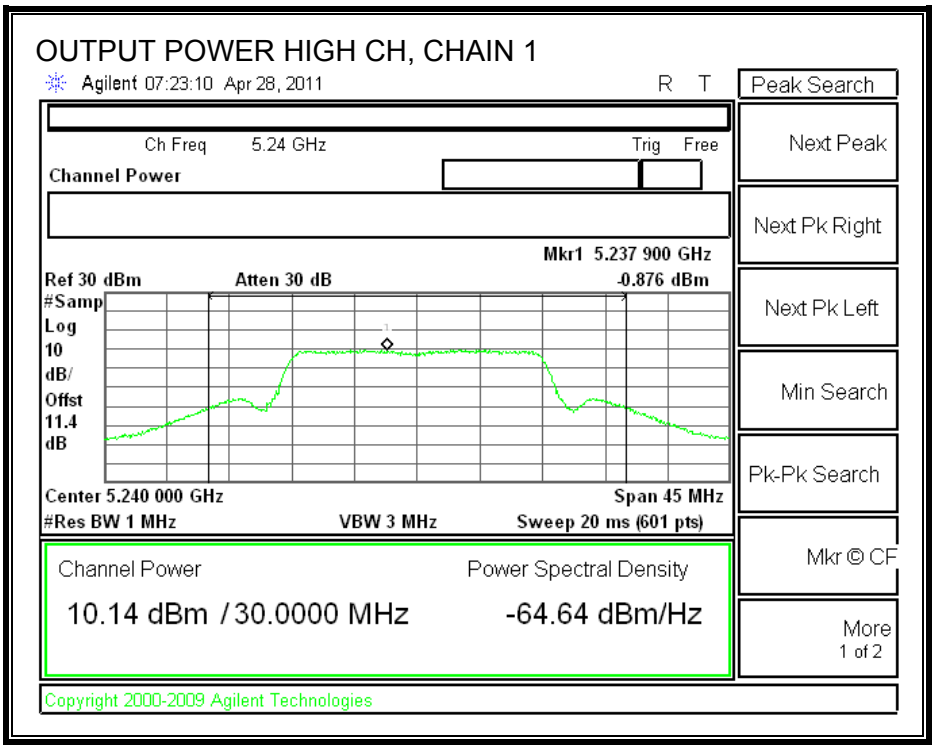
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.92	10.92	14.46	17.00	-2.54
Mid	5200	12.24	11.23	14.77	17.00	-2.23
High	5240	10.14	12.67	14.60	17.00	-2.40

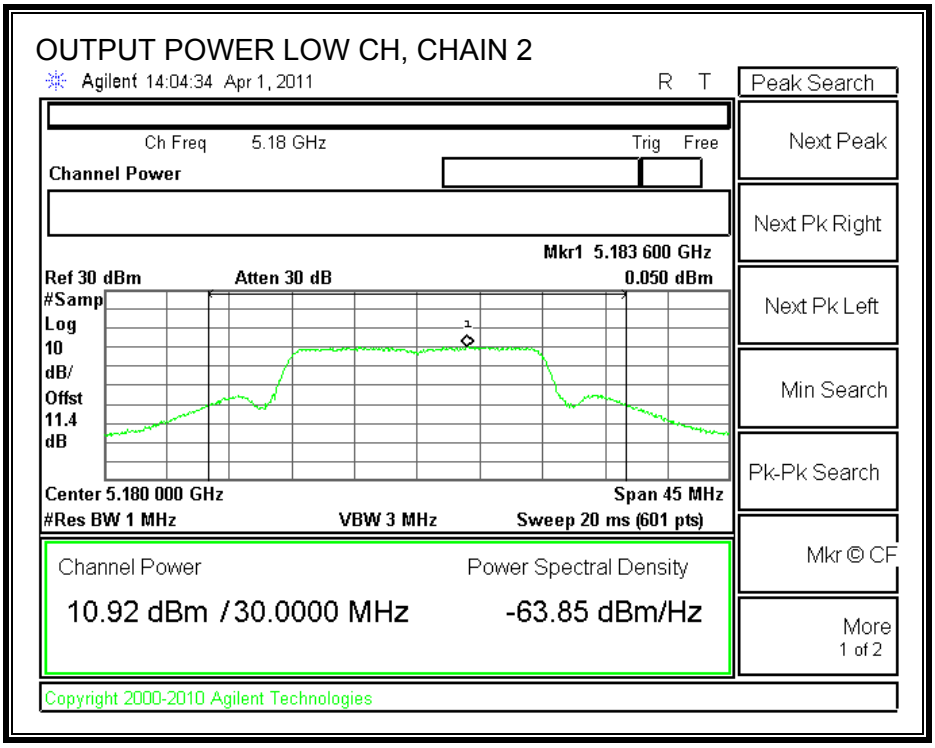
CHAIN 1 OUTPUT POWER

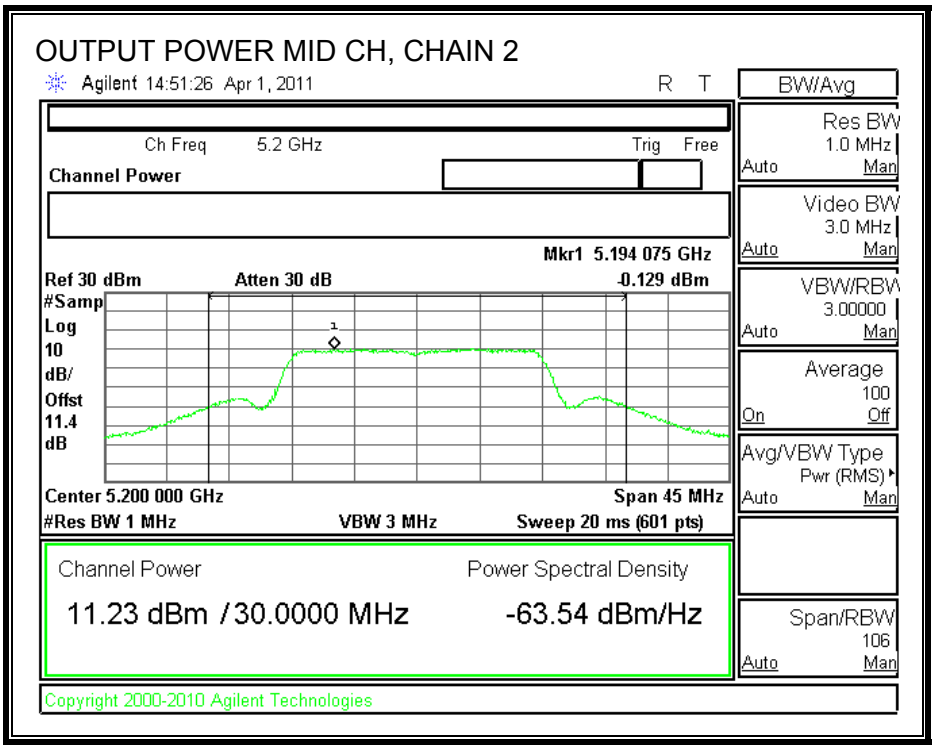


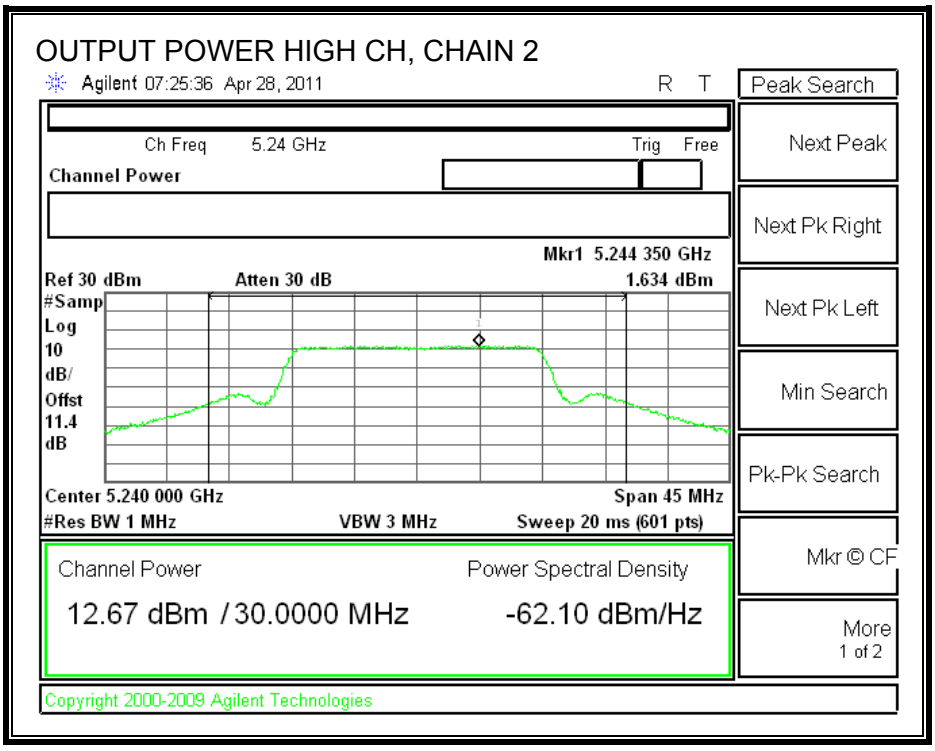




CHAIN 2 OUTPUT POWER







7.2.8. 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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

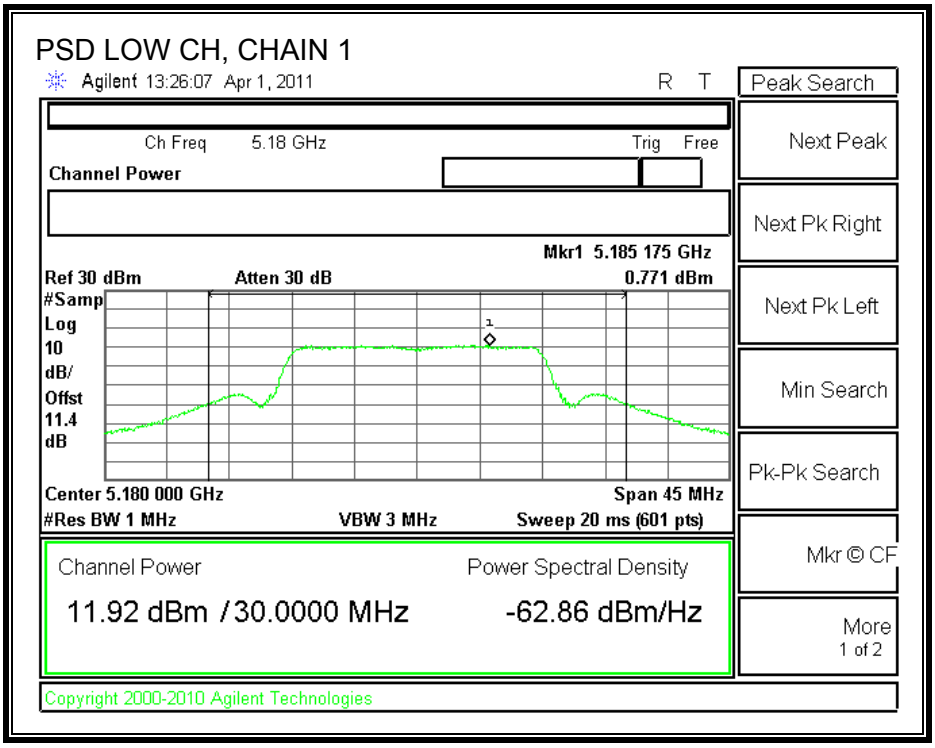
TEST PROCEDURE

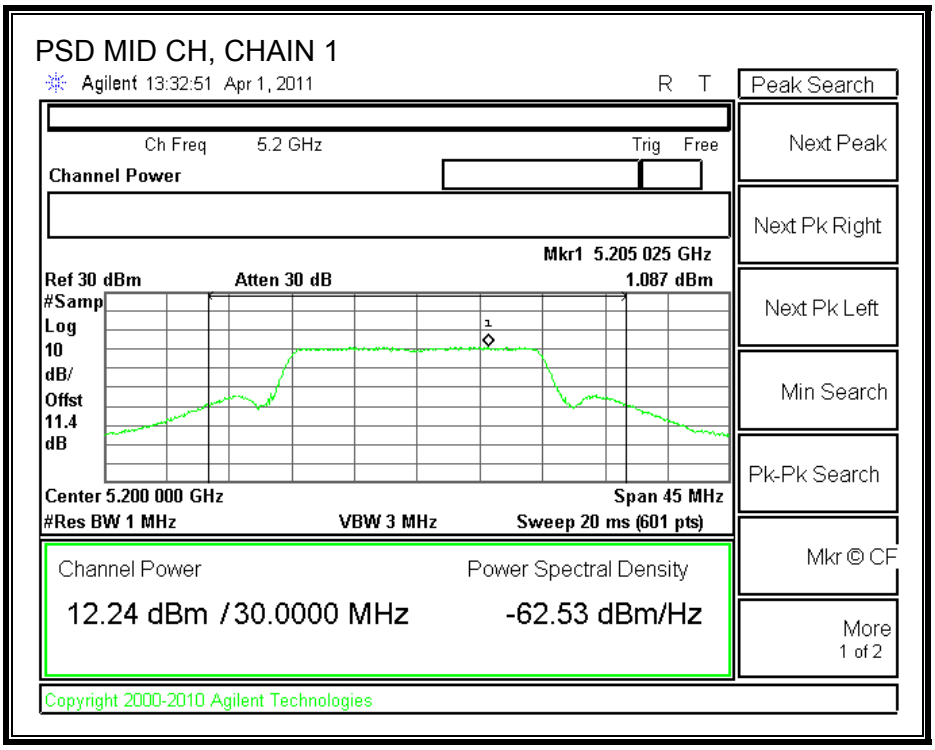
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

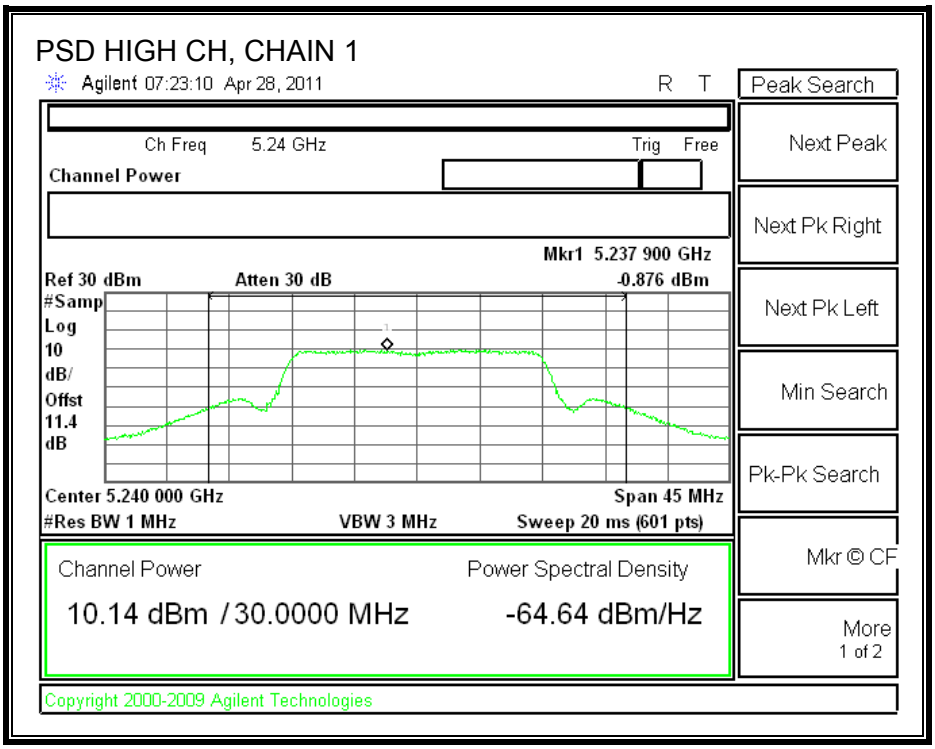
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.771	0.05	3.44	4	-0.56
Middle	5200	1.087	-0.129	3.53	4	-0.47
High	5240	-0.876	1.634	3.57	4	-0.43

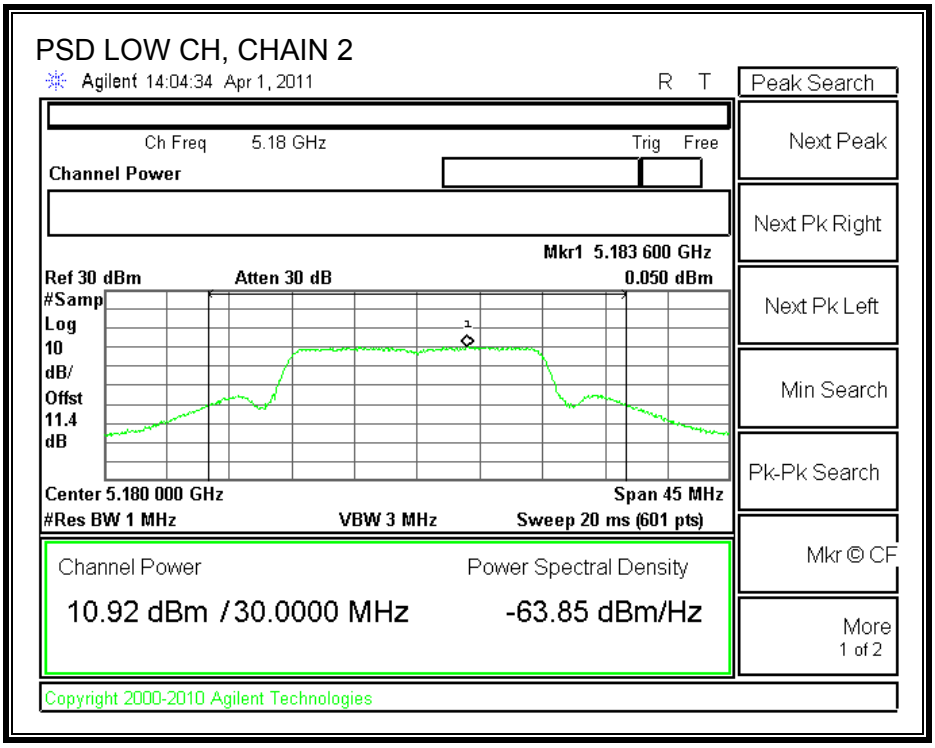
CHAIN 1 POWER SPECTRAL DENSITY

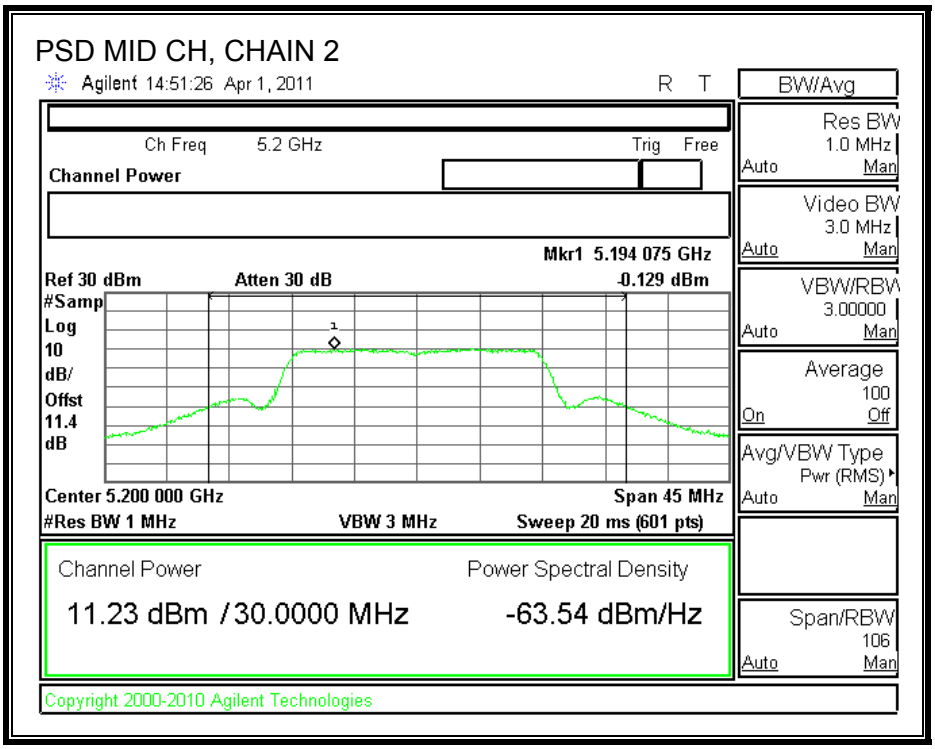


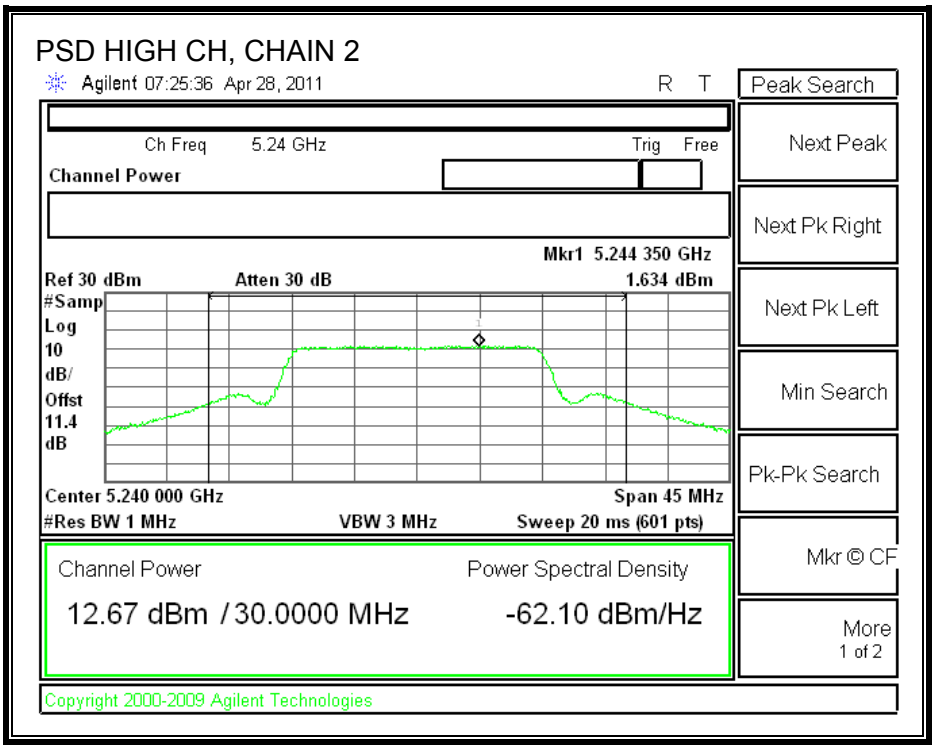




CHAIN 2 POWER SPECTRAL DENSITY







7.2.9. 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.

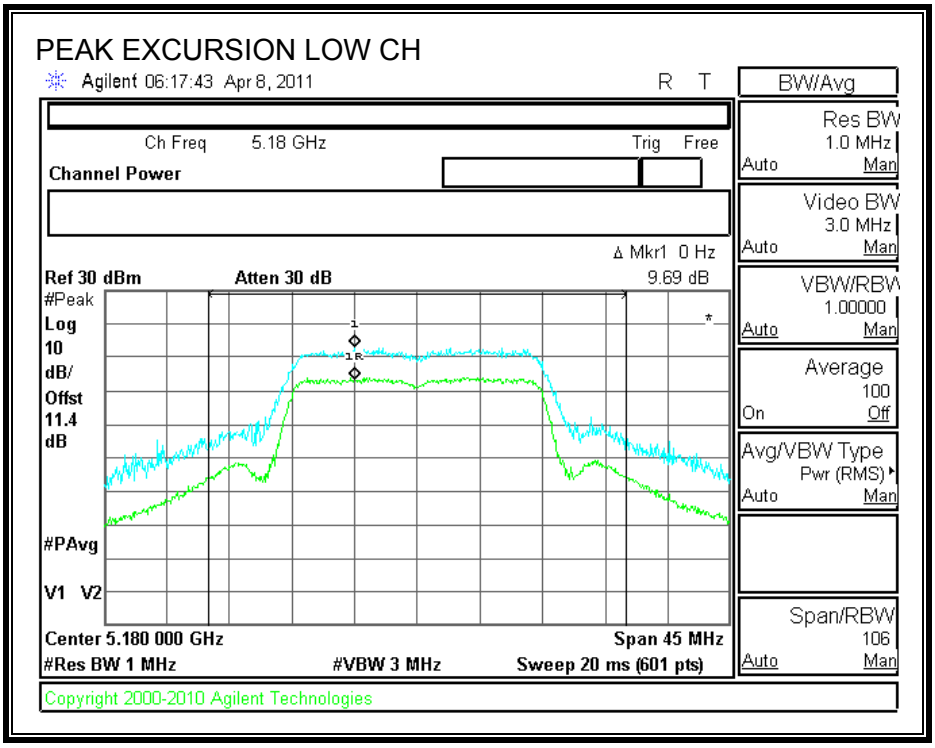
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

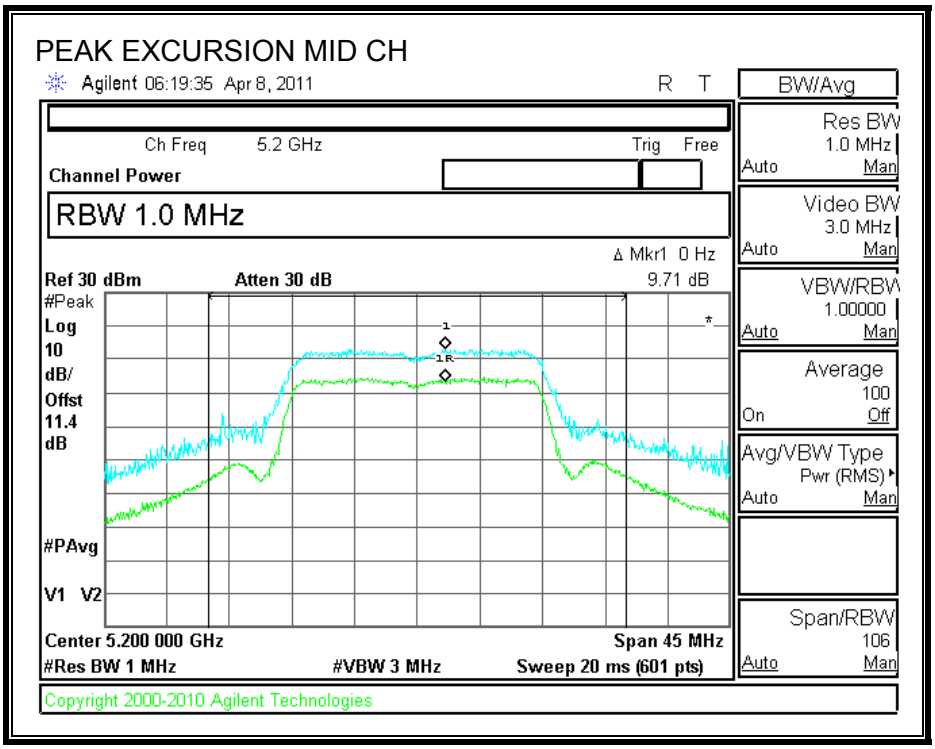
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

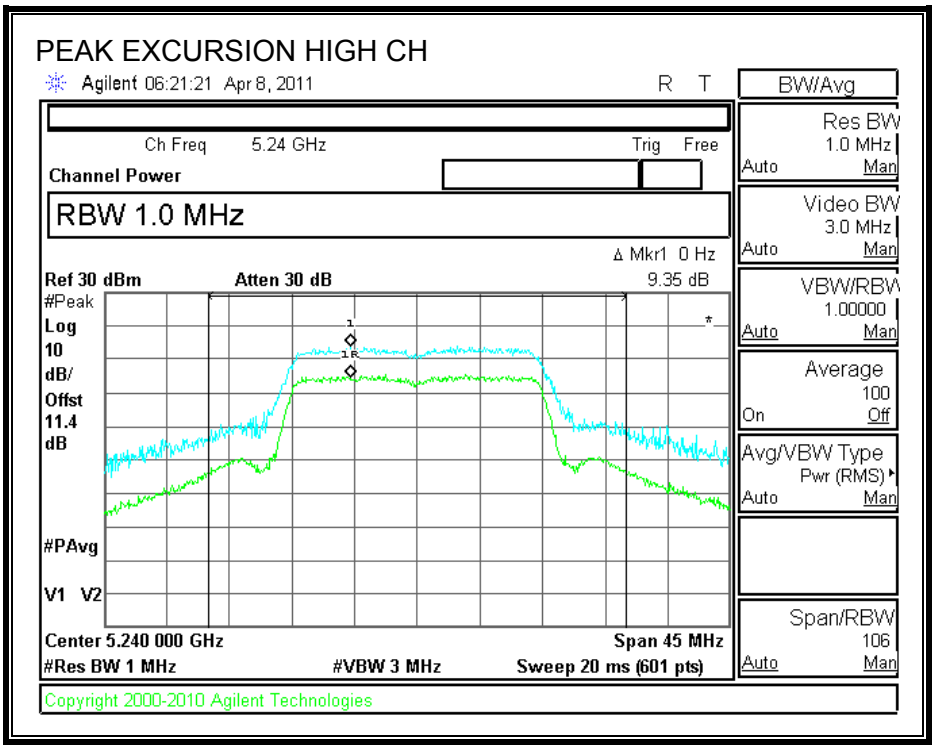
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.69	13	-3.31
Middle	5200	9.71	13	-3.29
High	5240	9.35	13	-3.65

PEAK EXCURSION







7.2.10. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to HT20 3x3 CDD MCS0.

7.3. 802.11n THREE CHAINS HT20 MODE IN THE LOWER 5.2 GHz BAND

CDD MCS0:

This mode is not implemented in the 5.2 GHz band and will be disabled in production devices.

This mode is tested for harmonic / band edge / spurious emissions @ 18dBm average power per chain at worst case mode / power to cover all 1x3 & 2x2 modes.

7.3.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.4 dB (including 10 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)
Low	5180	18.11	18.22	18.15
Middle	5200	18.09	18.26	18.11
High	5240	18.05	18.18	18.10

7.3.2. 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.

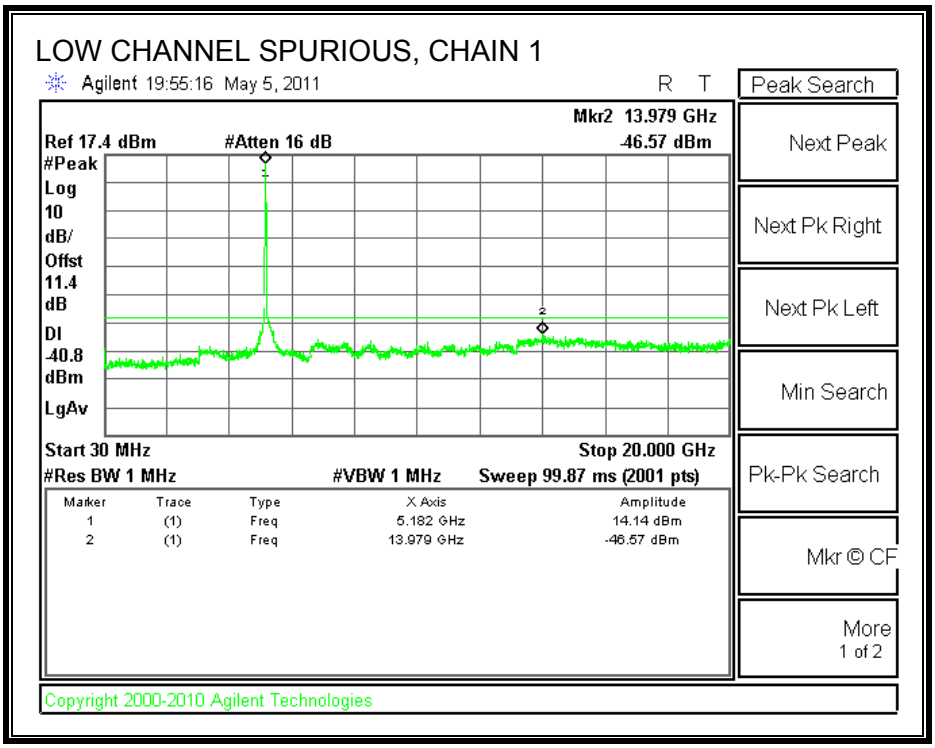
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

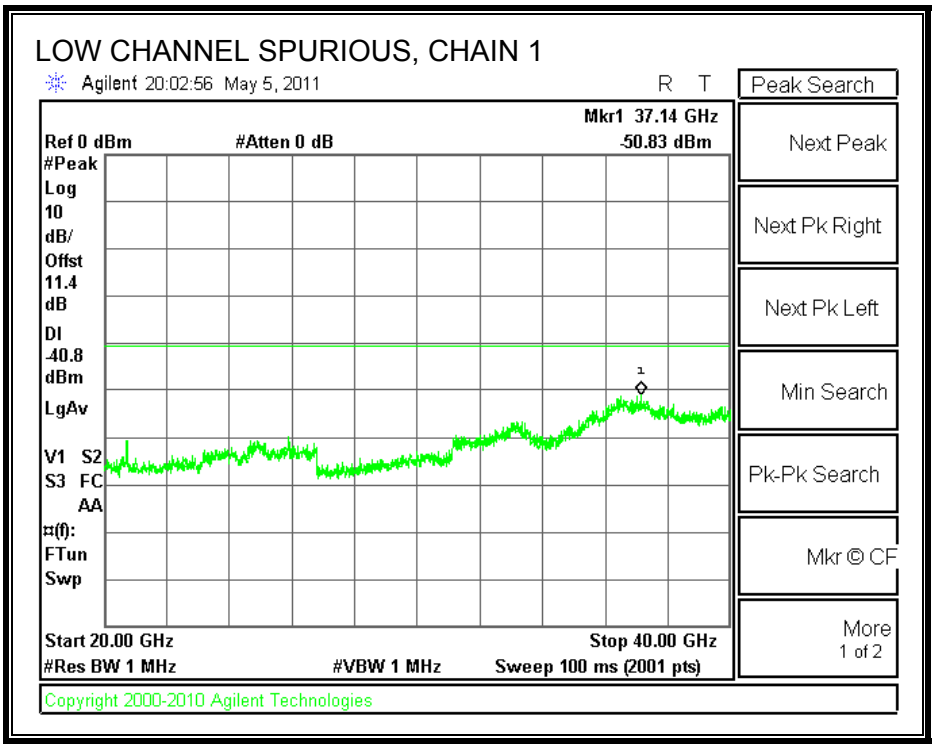
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

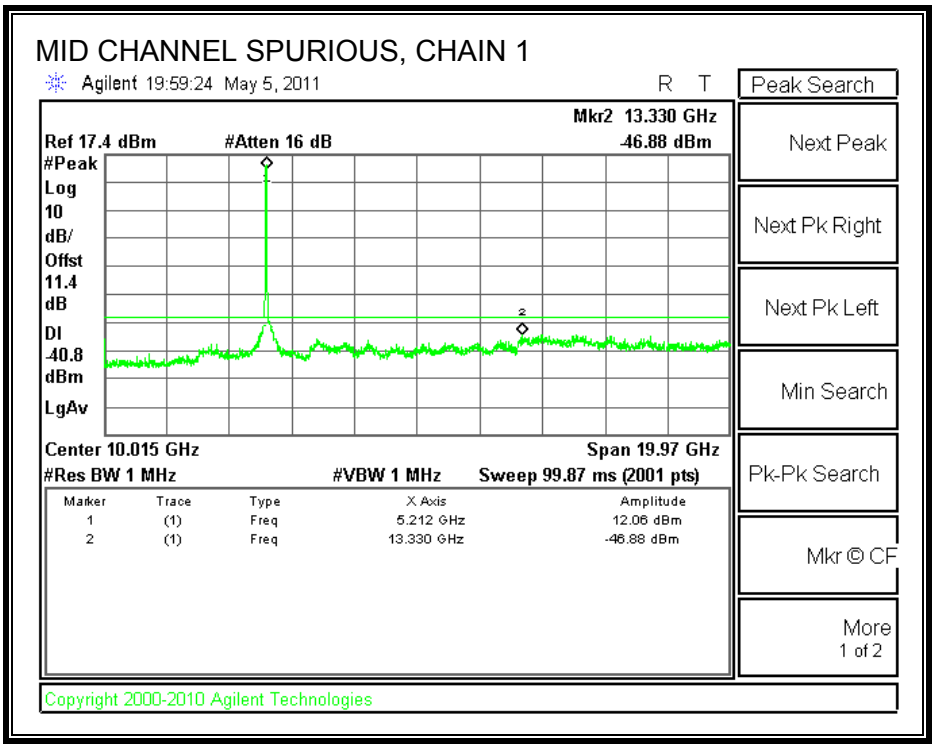
RESULTS

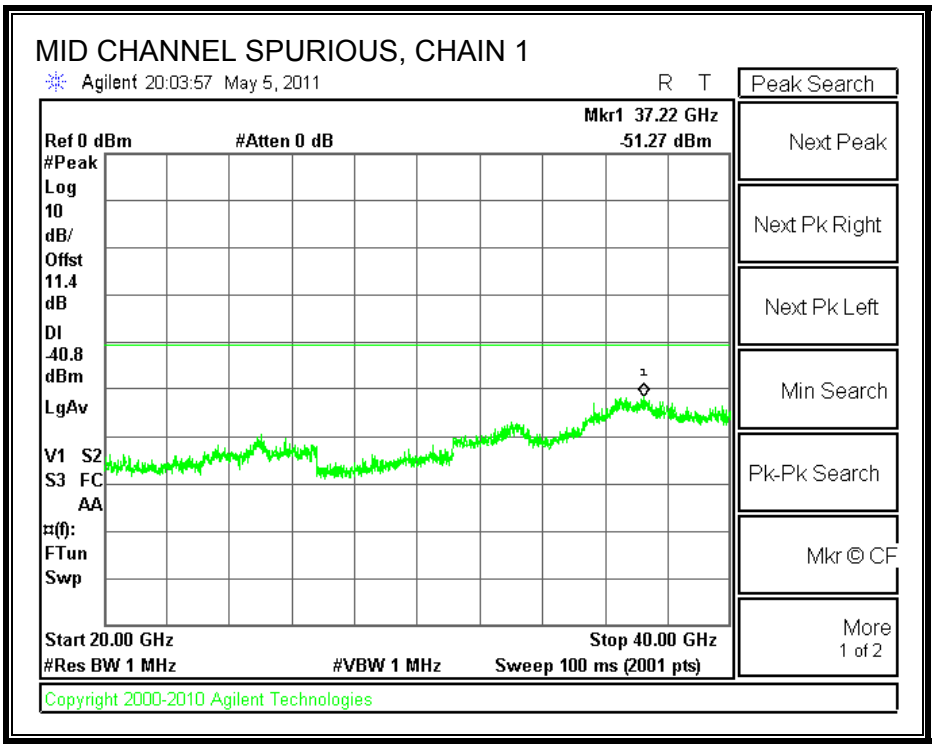
Limit = -27 dBm + Antenna Gain + 10log (N) dB

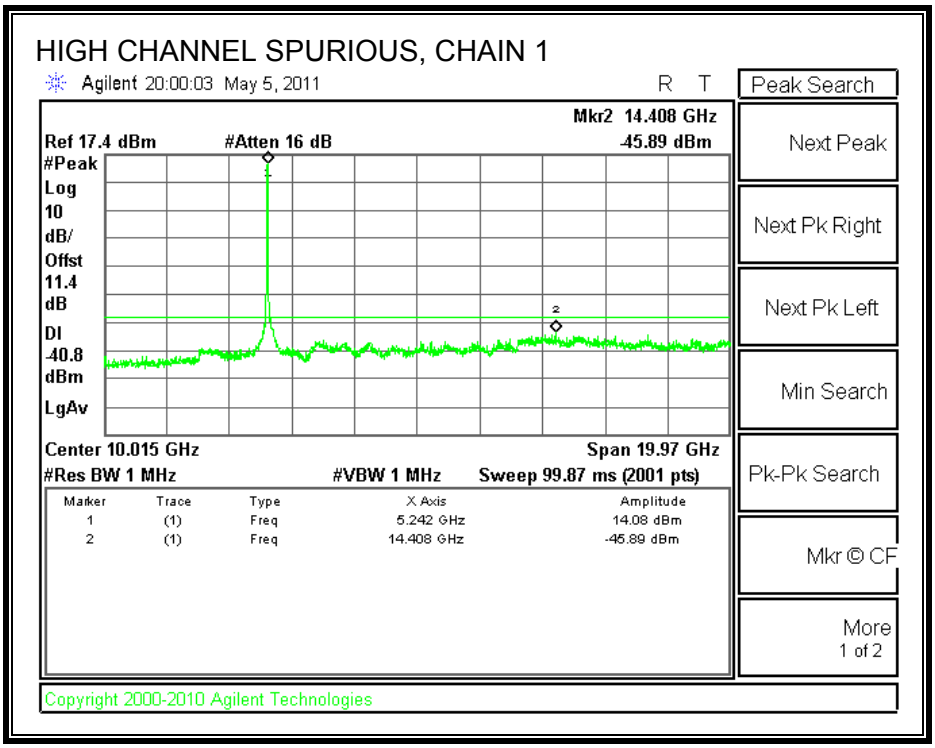
CHAIN 1 SPURIOUS EMISSIONS

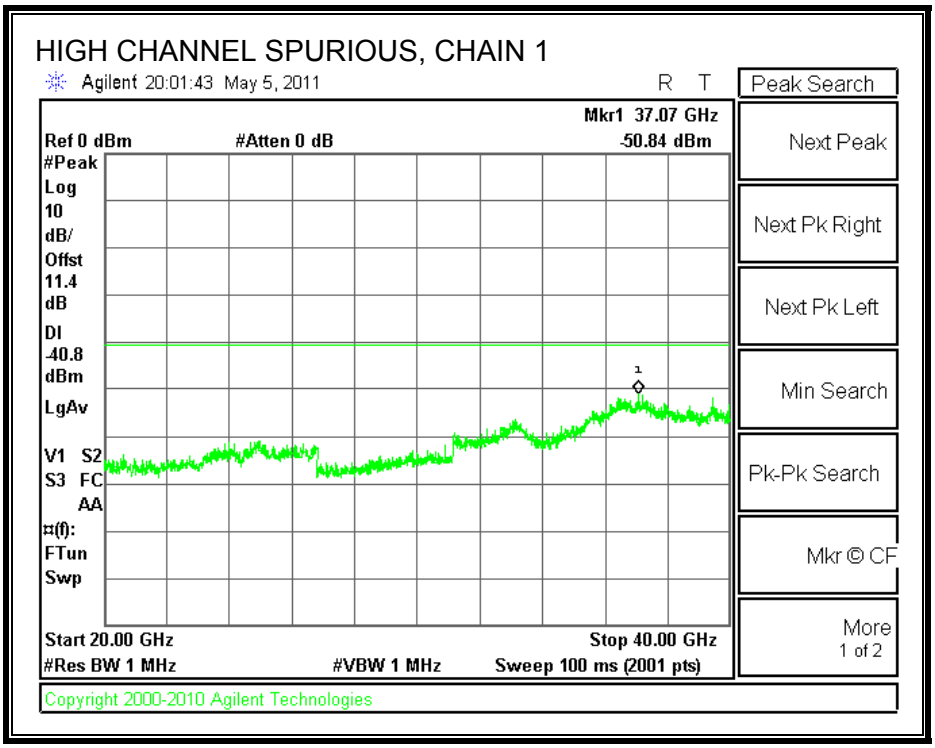




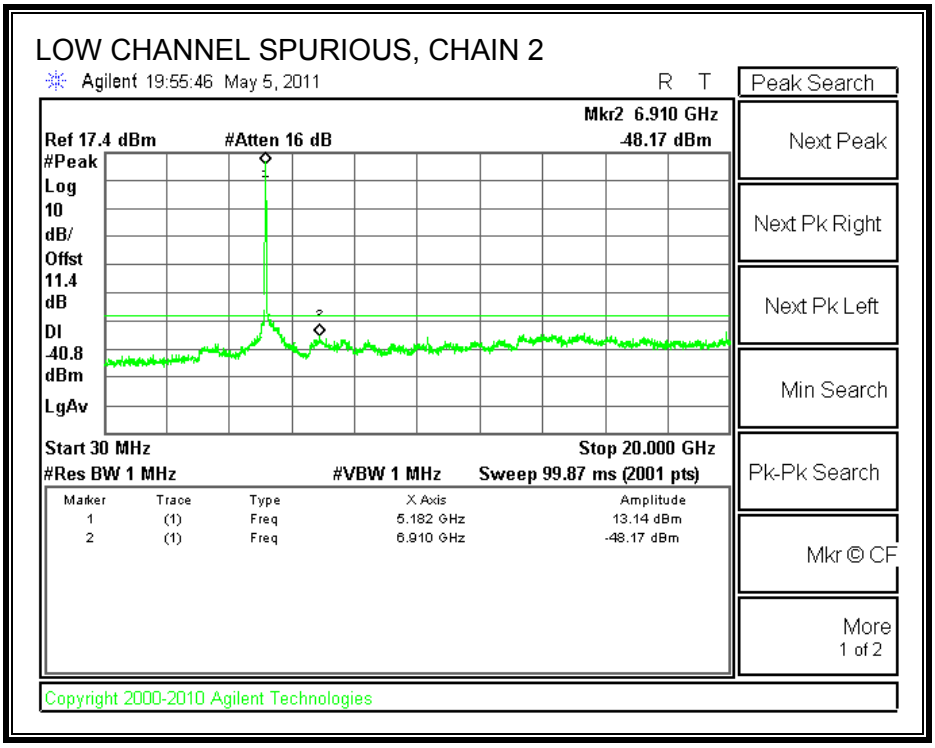


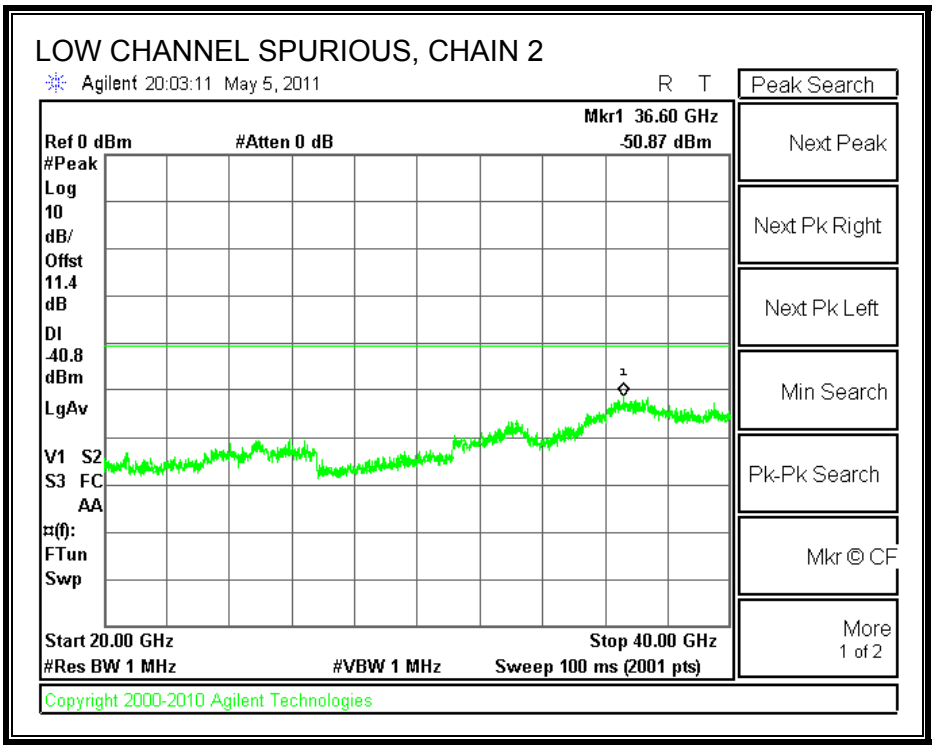


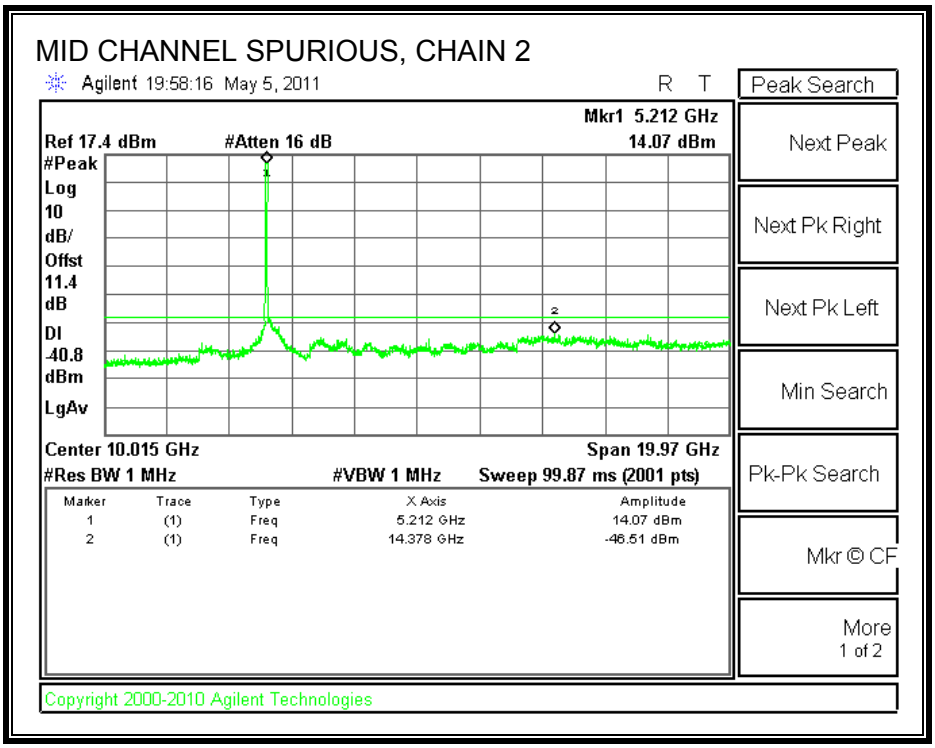


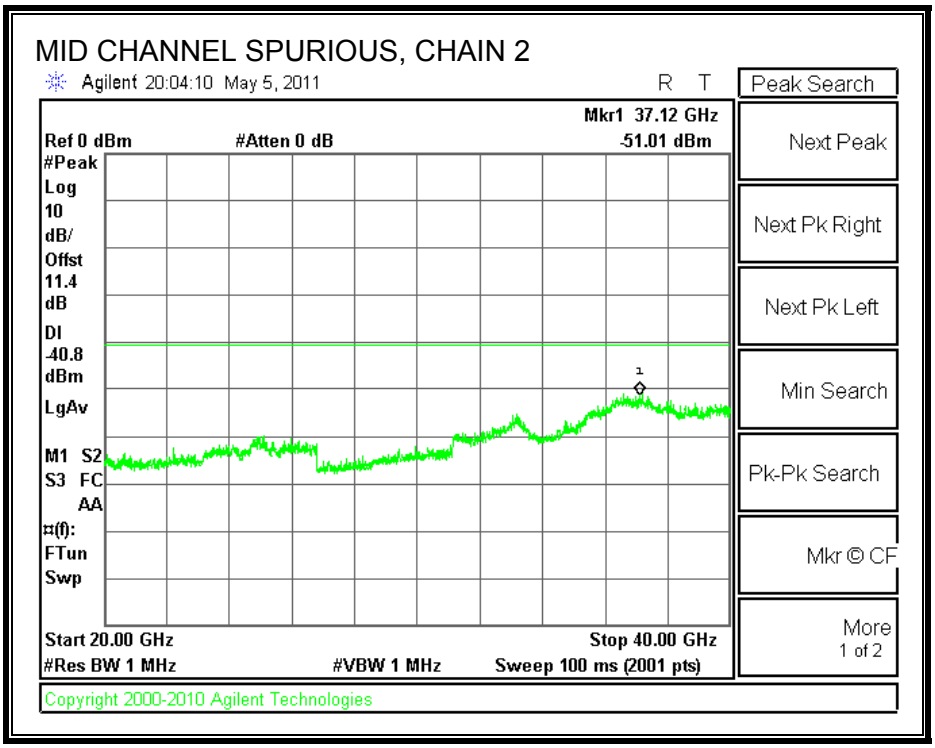


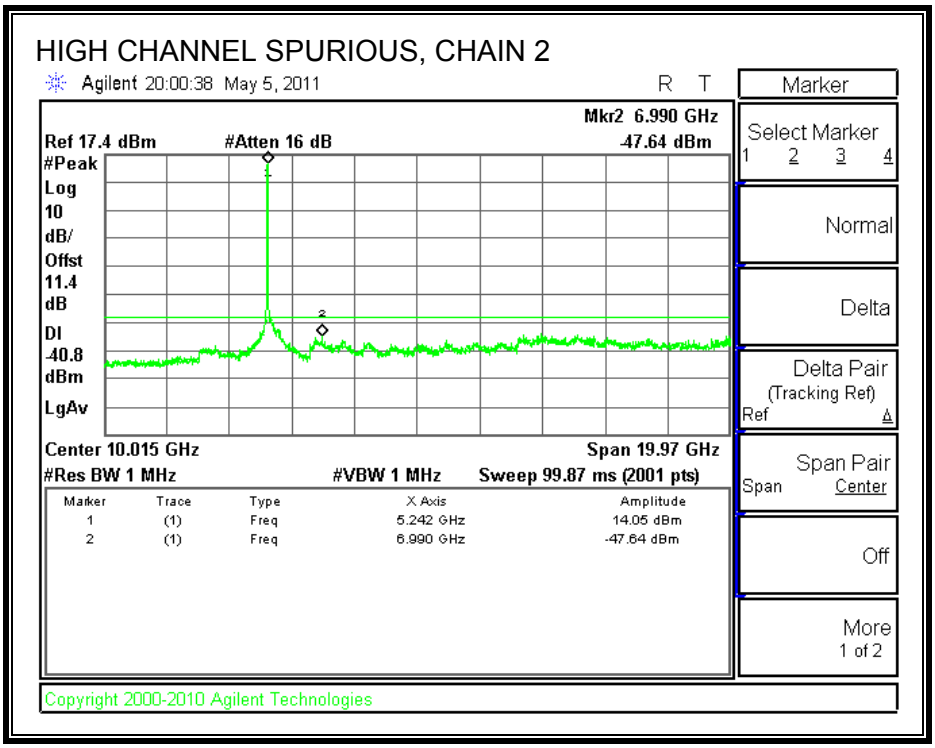
CHAIN 2 SPURIOUS EMISSIONS

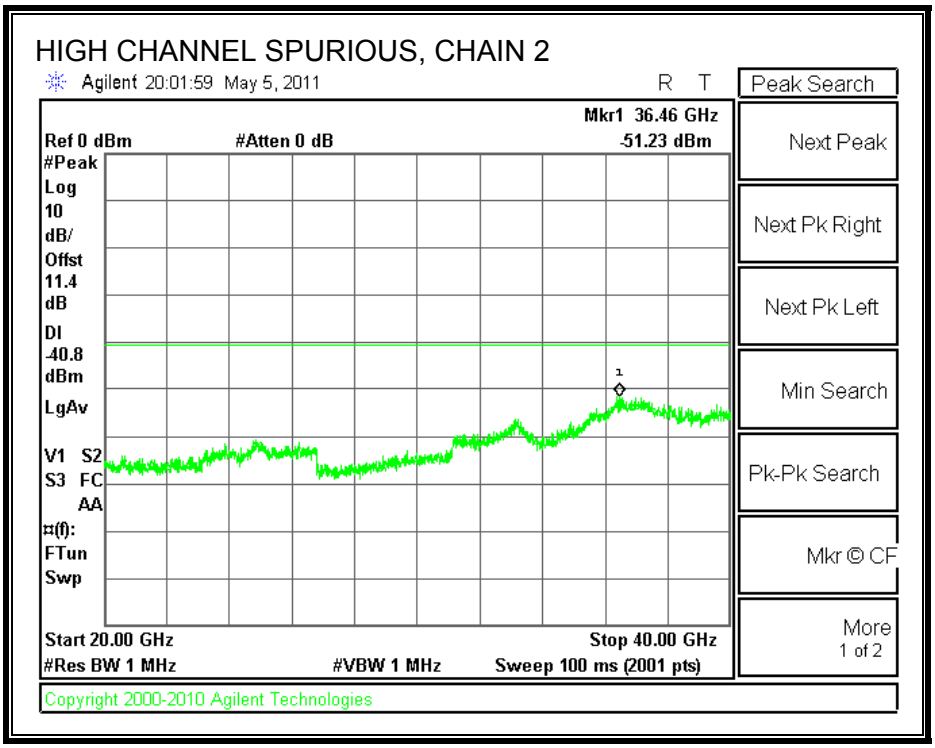




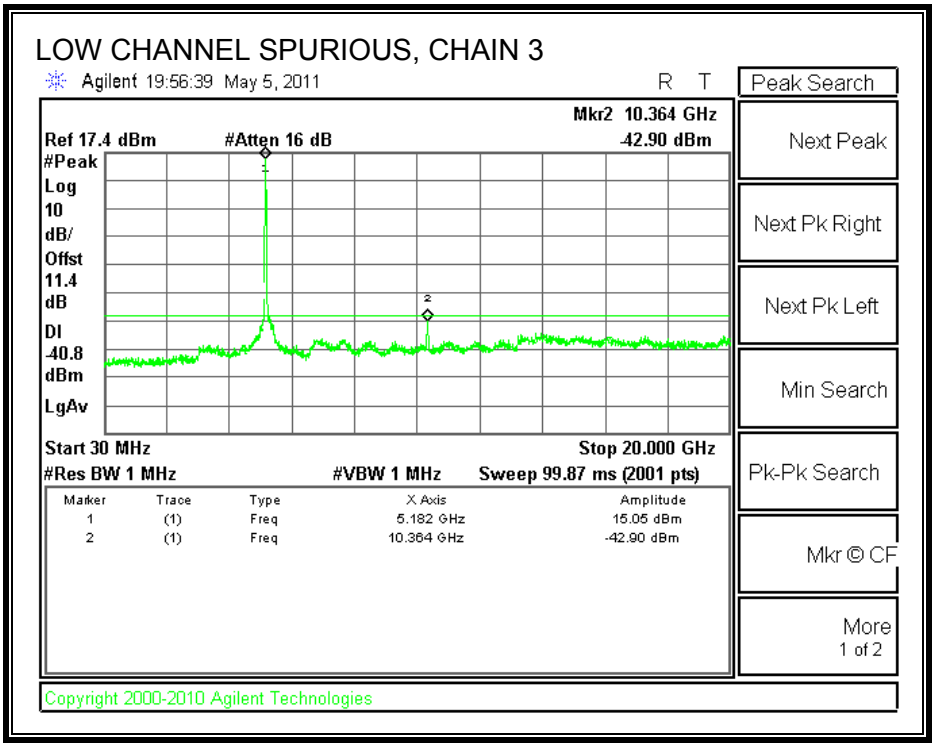


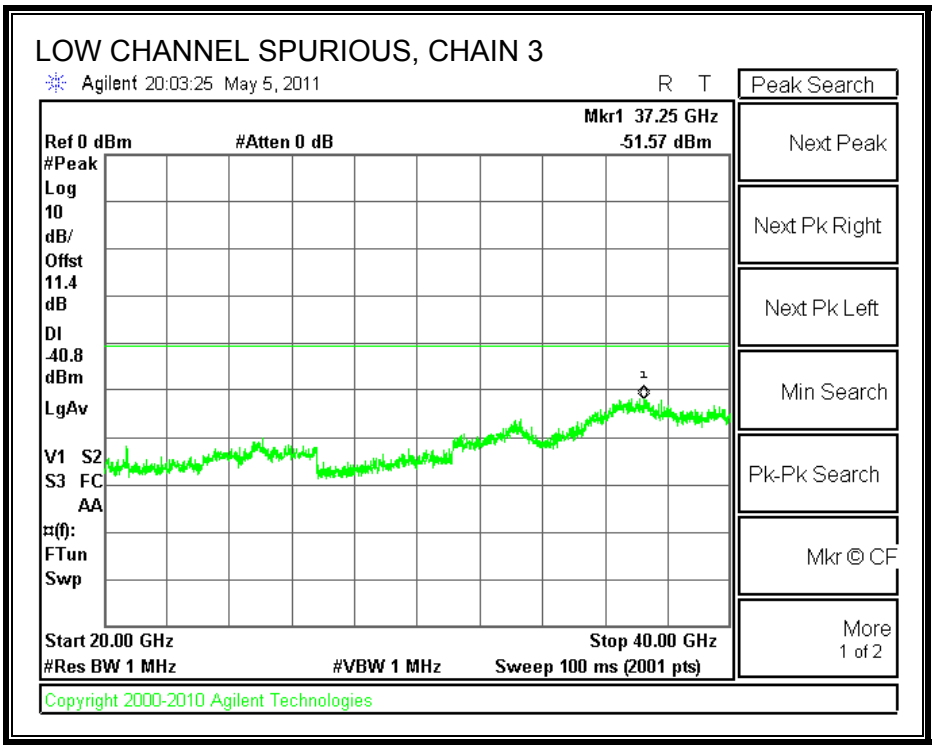


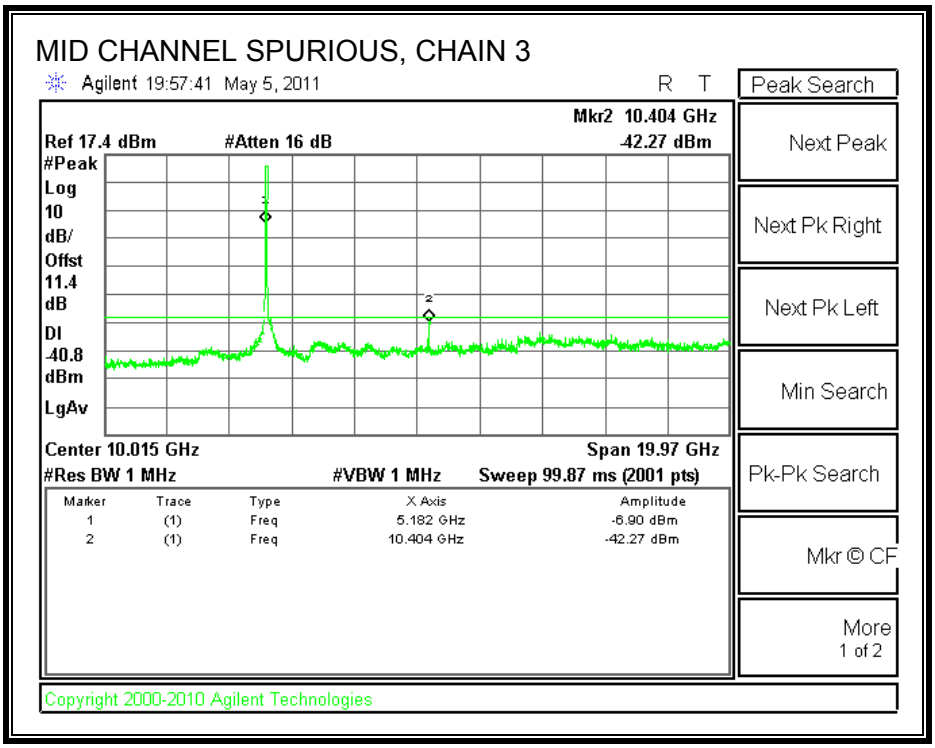


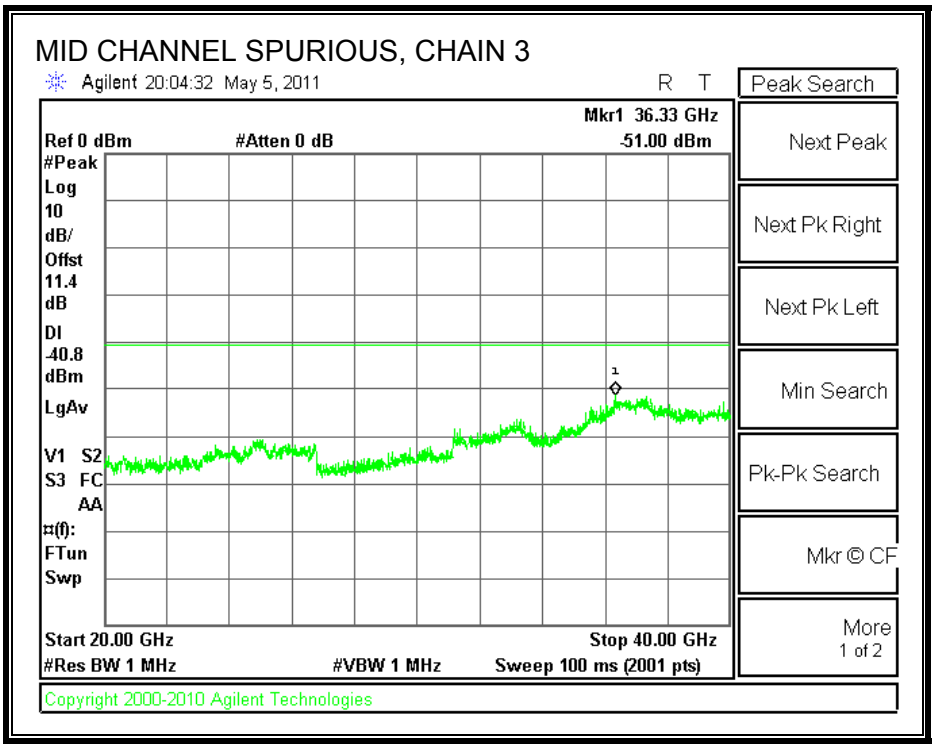


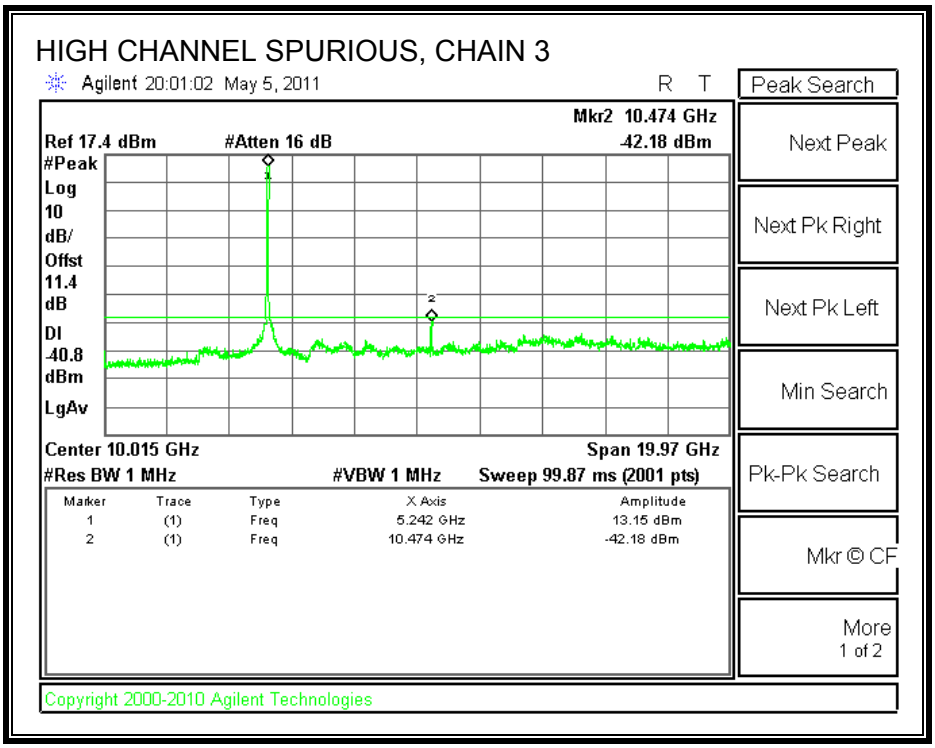
CHAIN 3 SPURIOUS EMISSIONS

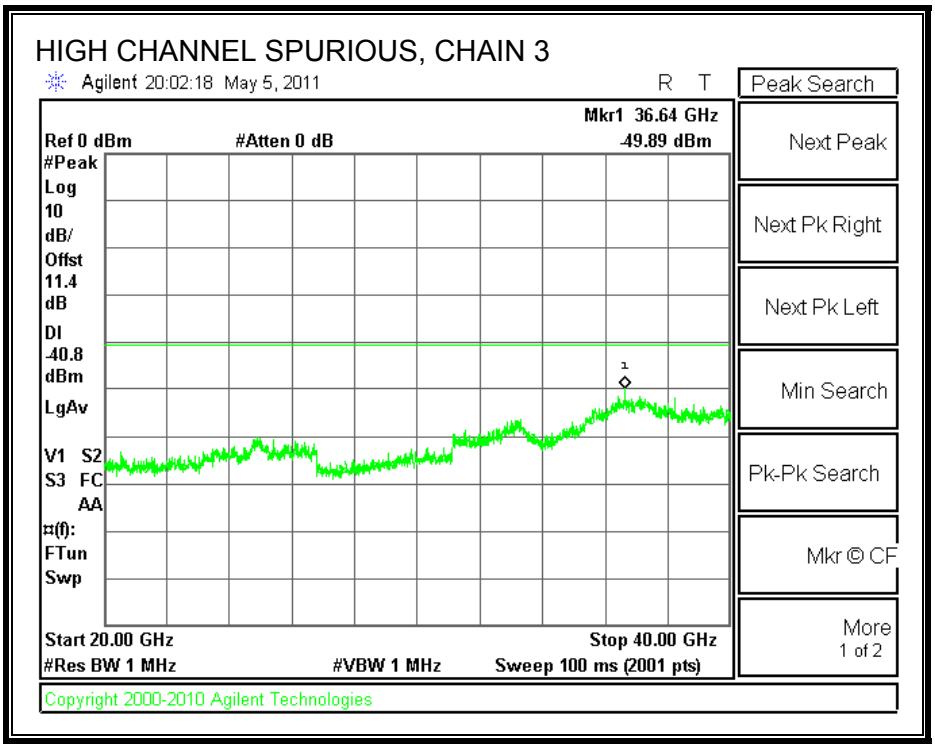












STBC MCS0

7.3.3. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

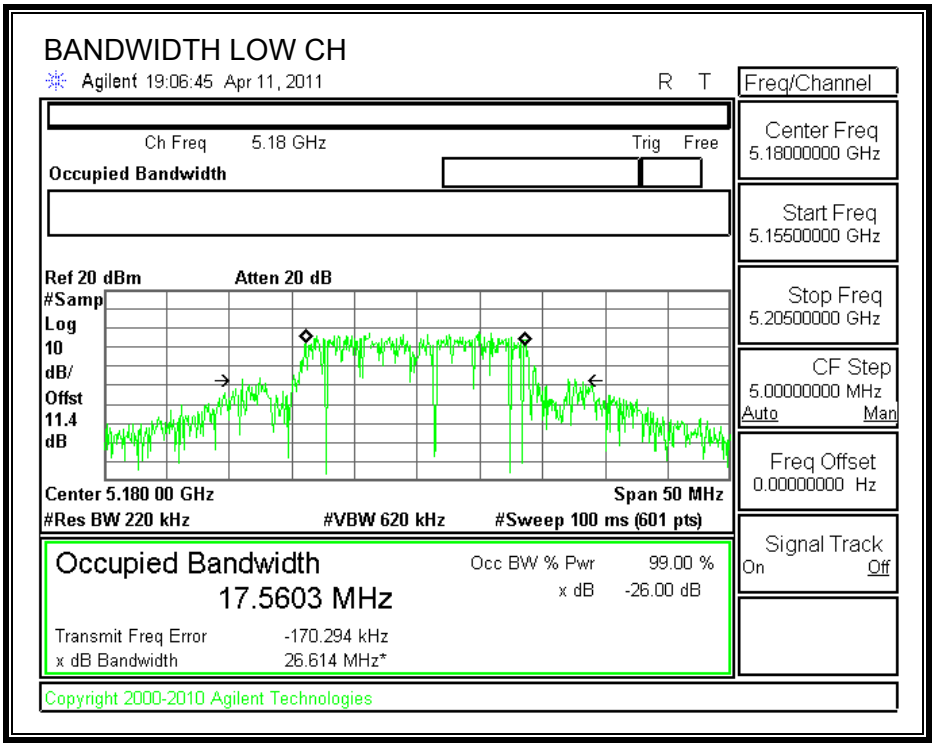
TEST PROCEDURE

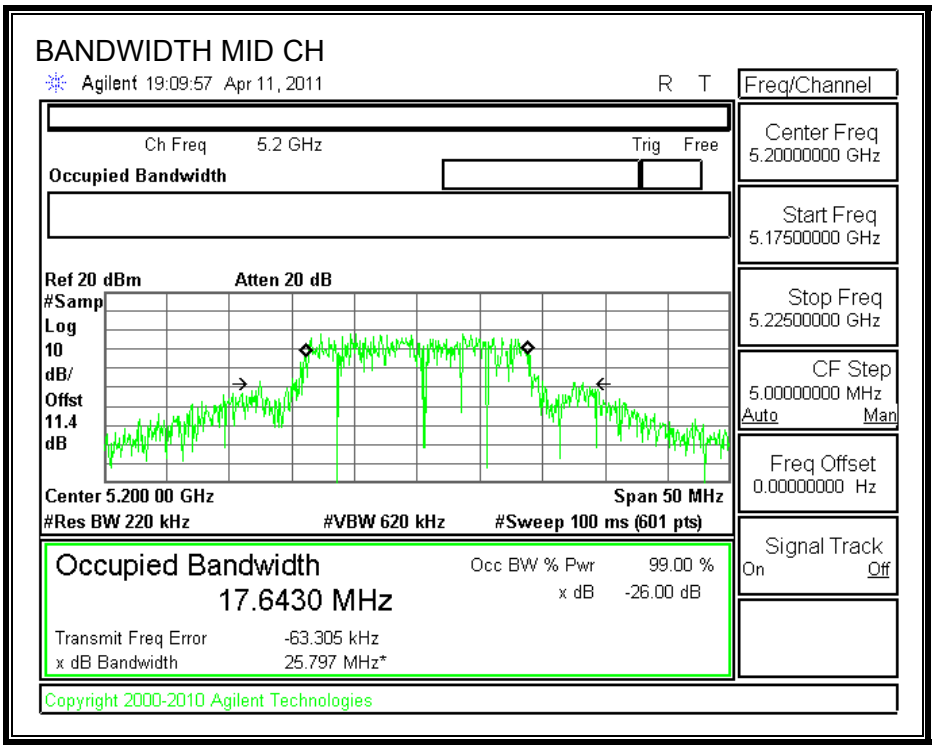
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

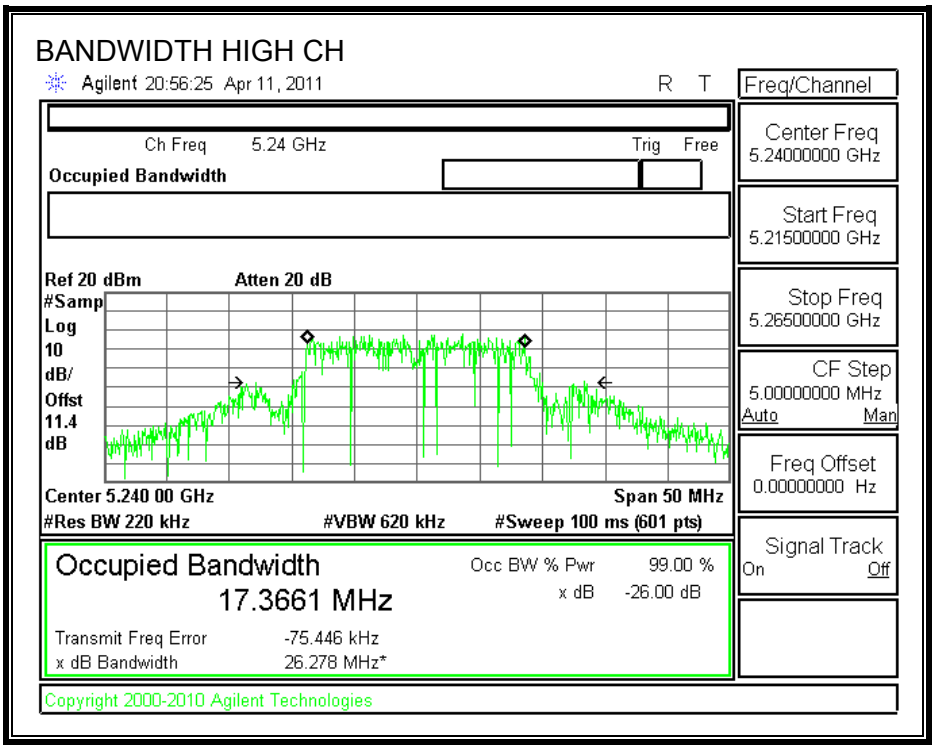
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	25.848	17.560
Middle	5200	25.028	17.643
High	5240	26.364	17.366

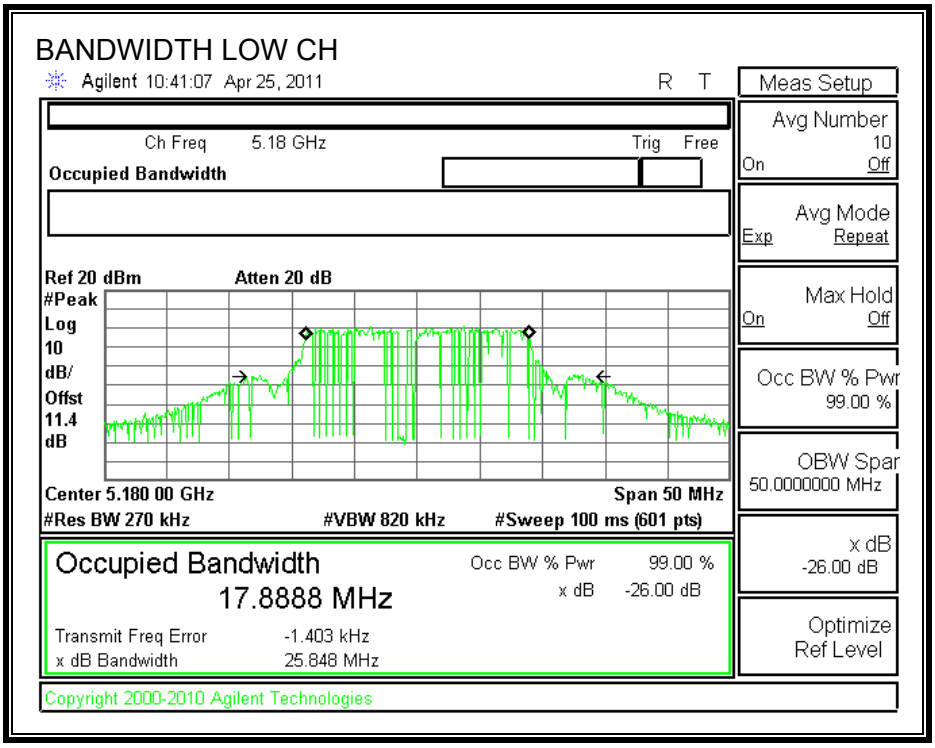
99% BANDWIDTH

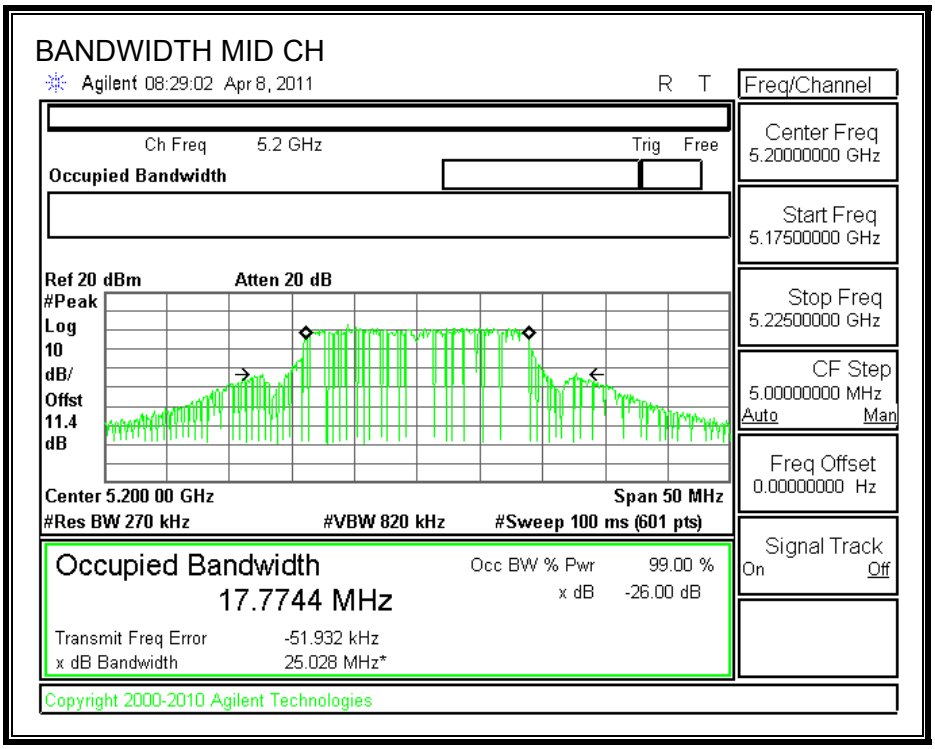


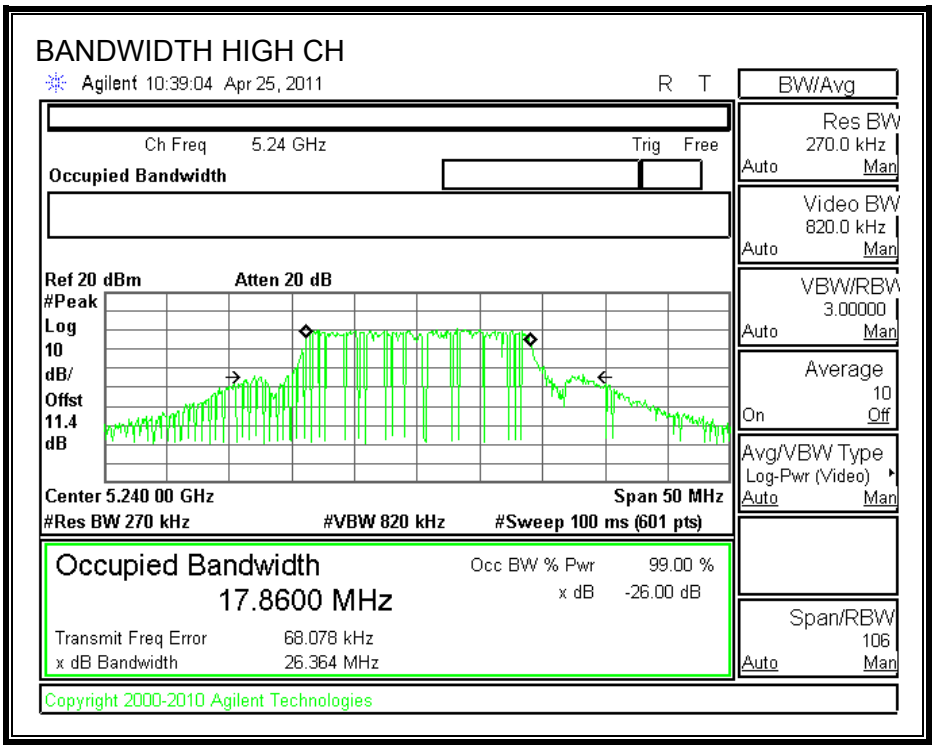




26 dB BANDWIDTH







7.3.4. 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

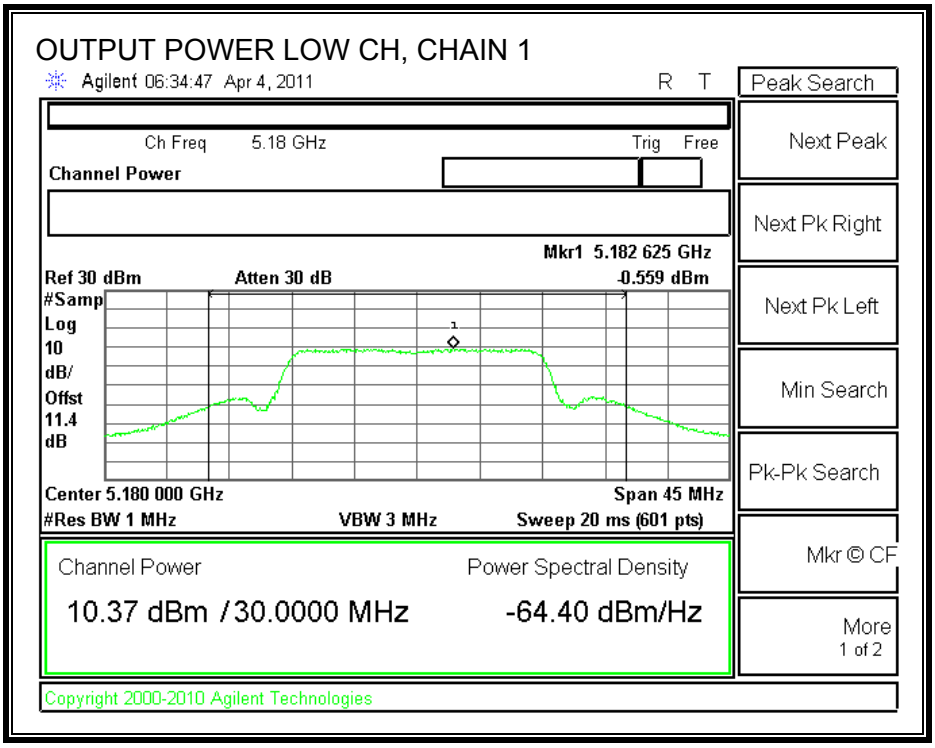
Limit

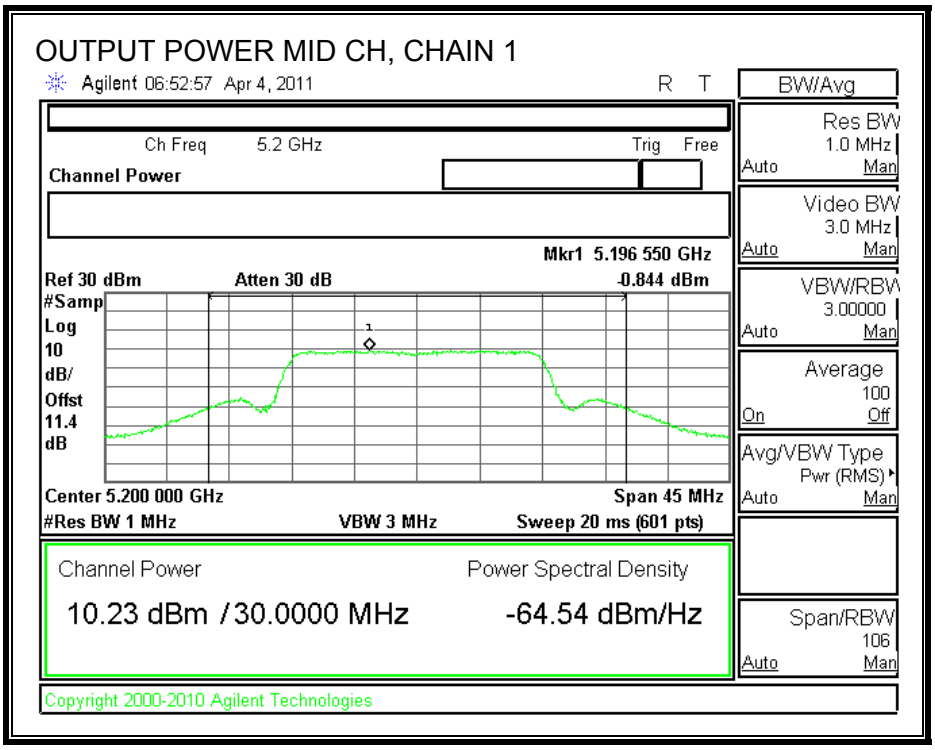
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	16.99	25.848	18.12	5.65	16.99
Mid	5200	16.99	25.028	17.98	5.65	16.99
High	5240	16.99	26.364	18.21	5.65	16.99

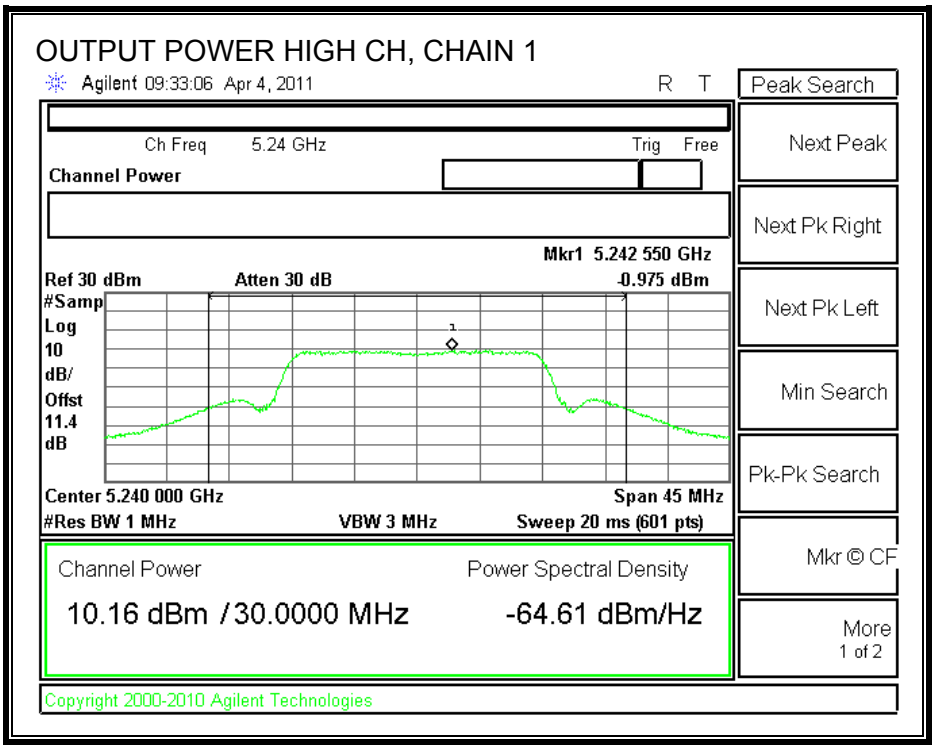
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.37	10.11	10.19	15.00	16.99	-1.99
Mid	5200	10.23	10.21	10.21	14.99	16.99	-2.00
High	5240	10.16	10.14	10.14	14.92	16.99	-2.07

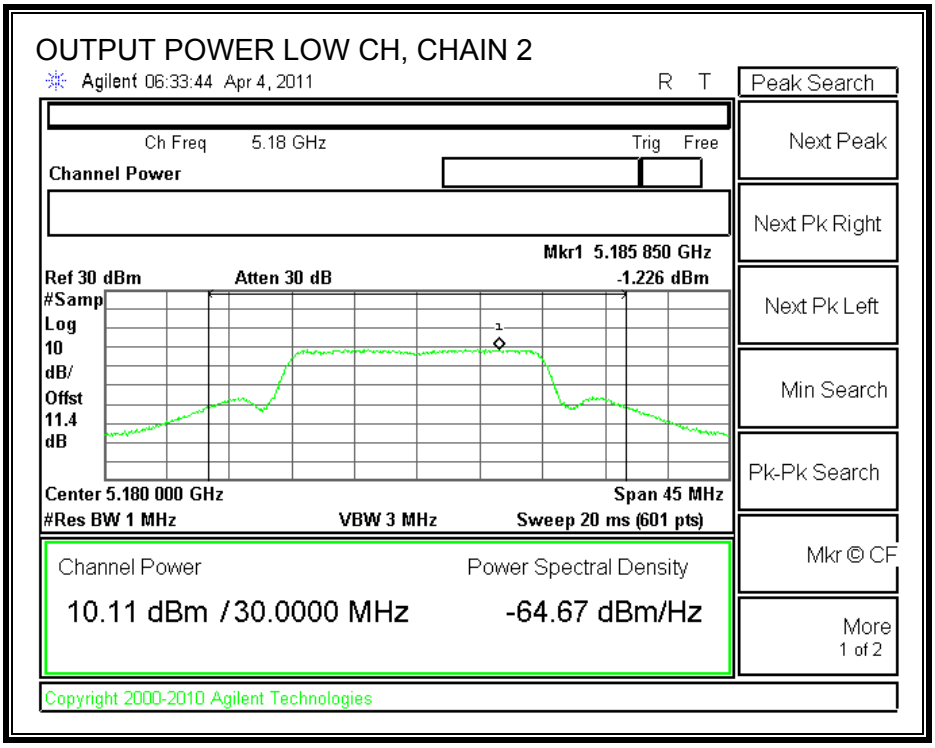
CHAIN 1 OUTPUT POWER

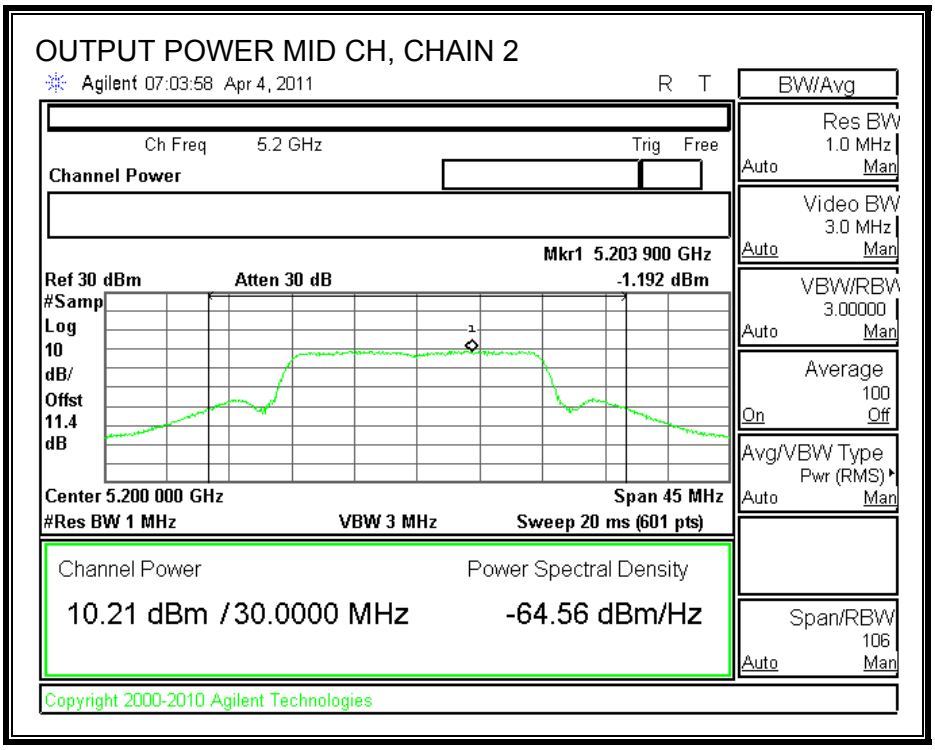


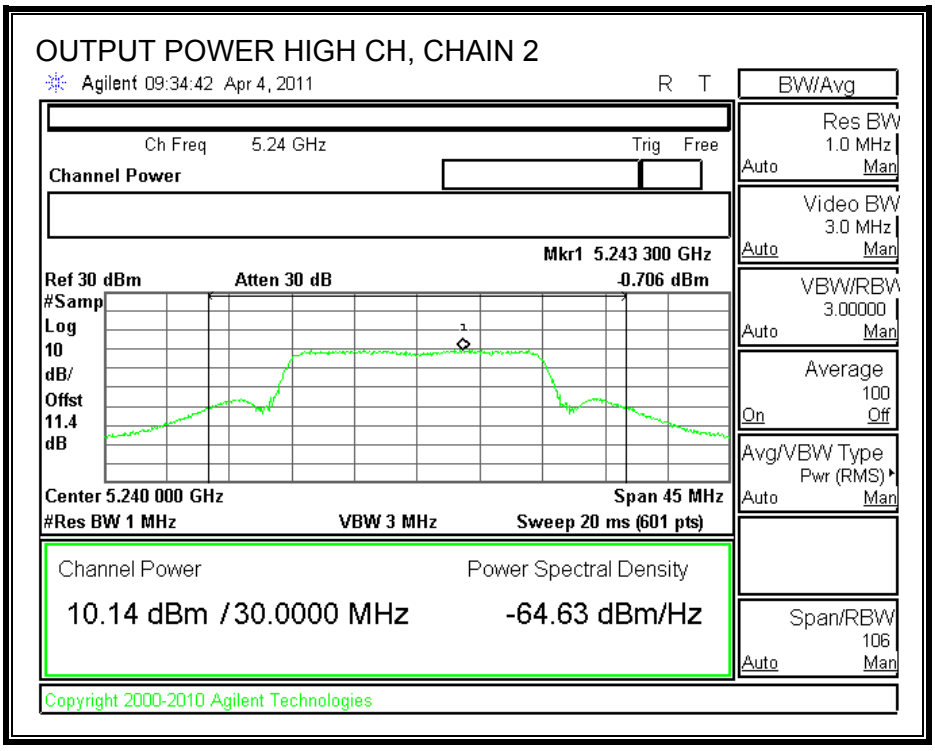




CHAIN 2 OUTPUT POWER







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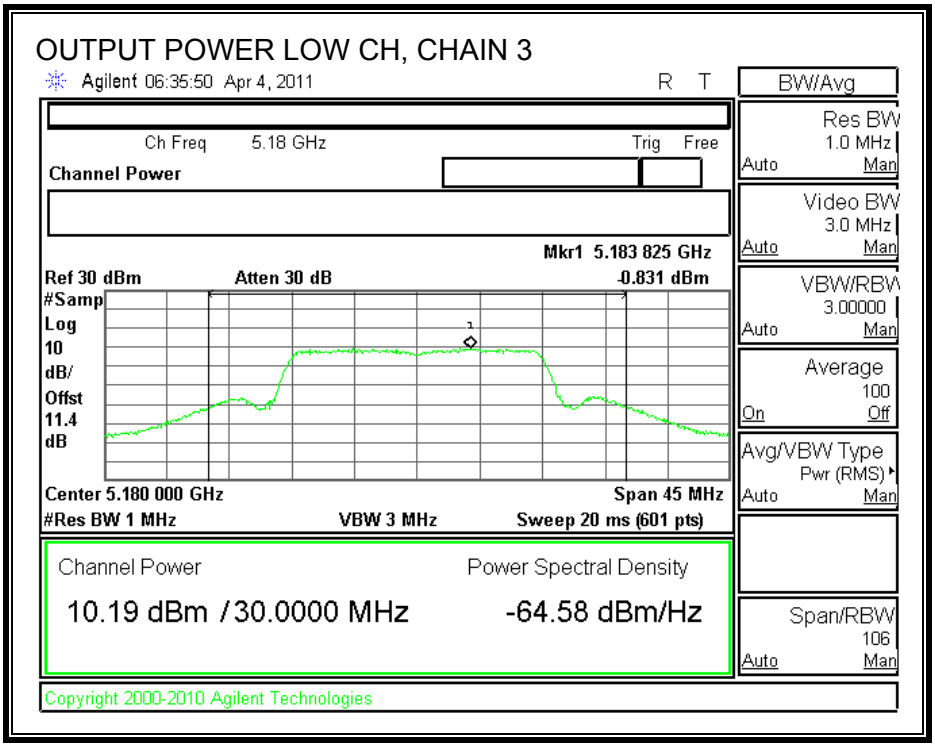
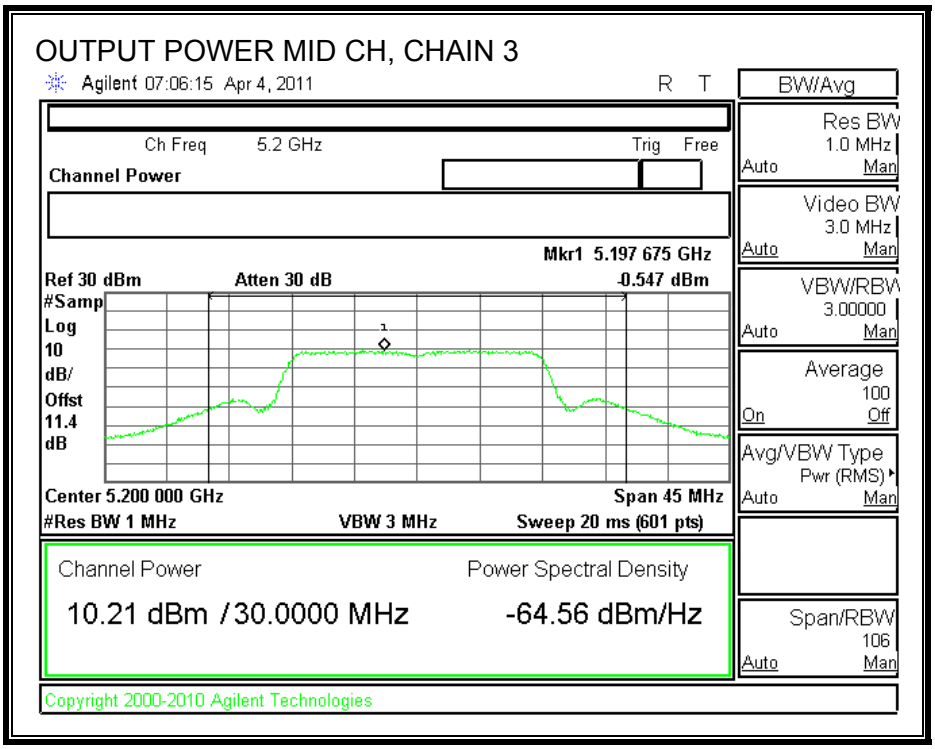
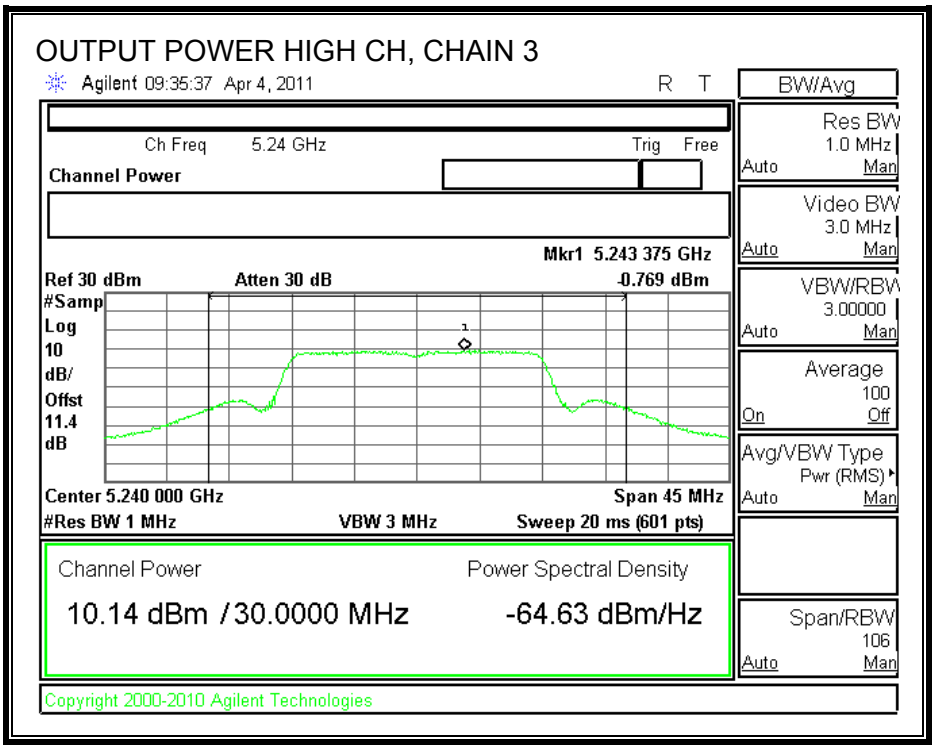






7.3.5. PEAK POWER SPECTRAL DENSITY

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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

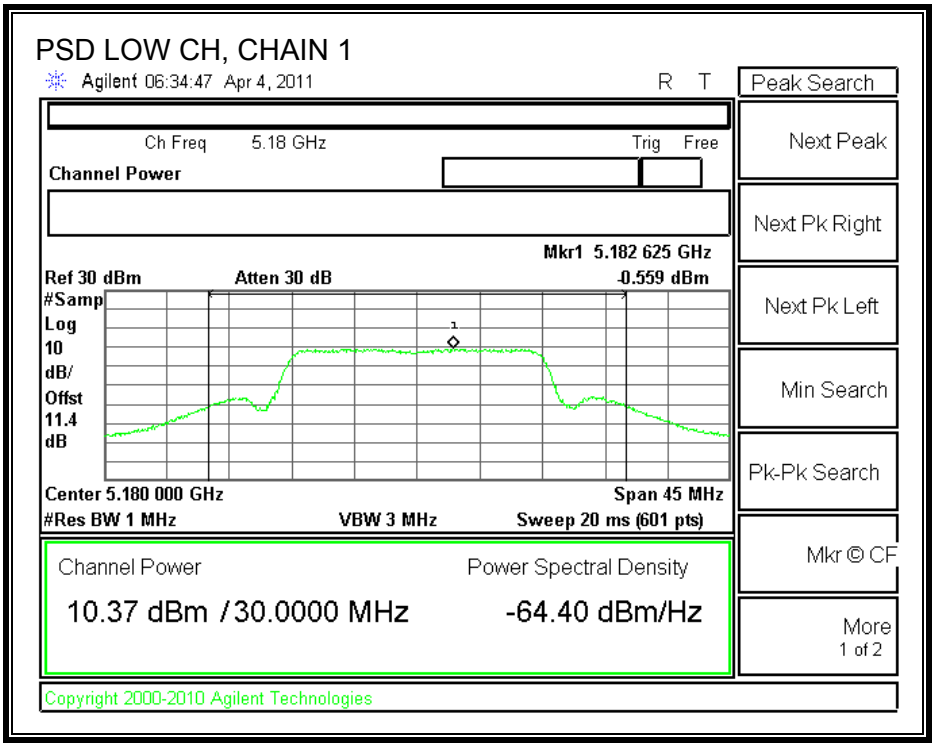
TEST PROCEDURE

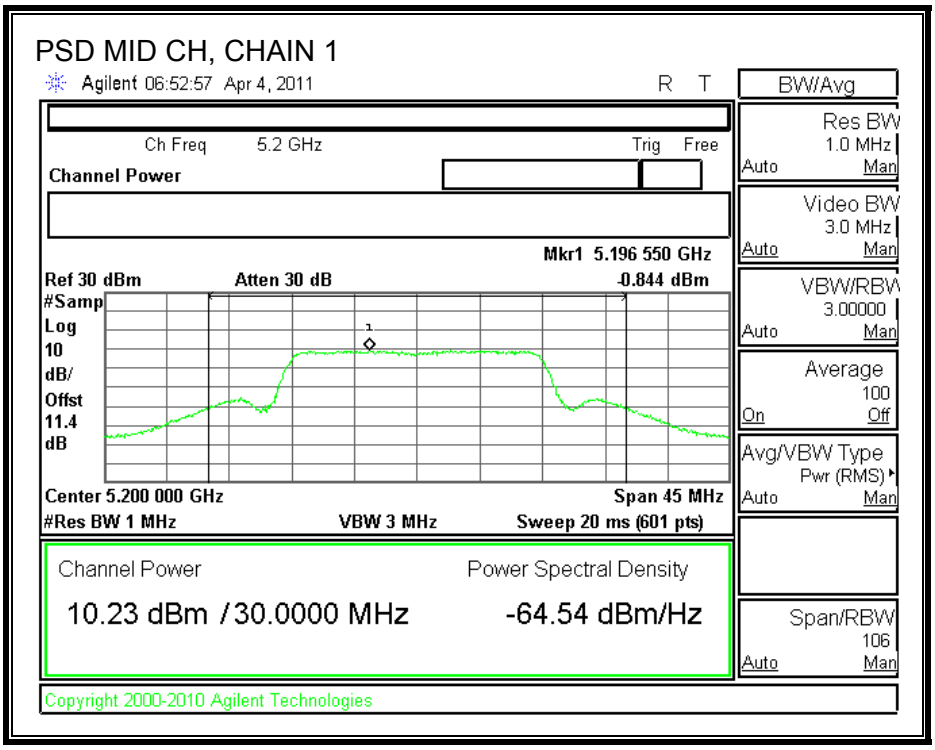
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

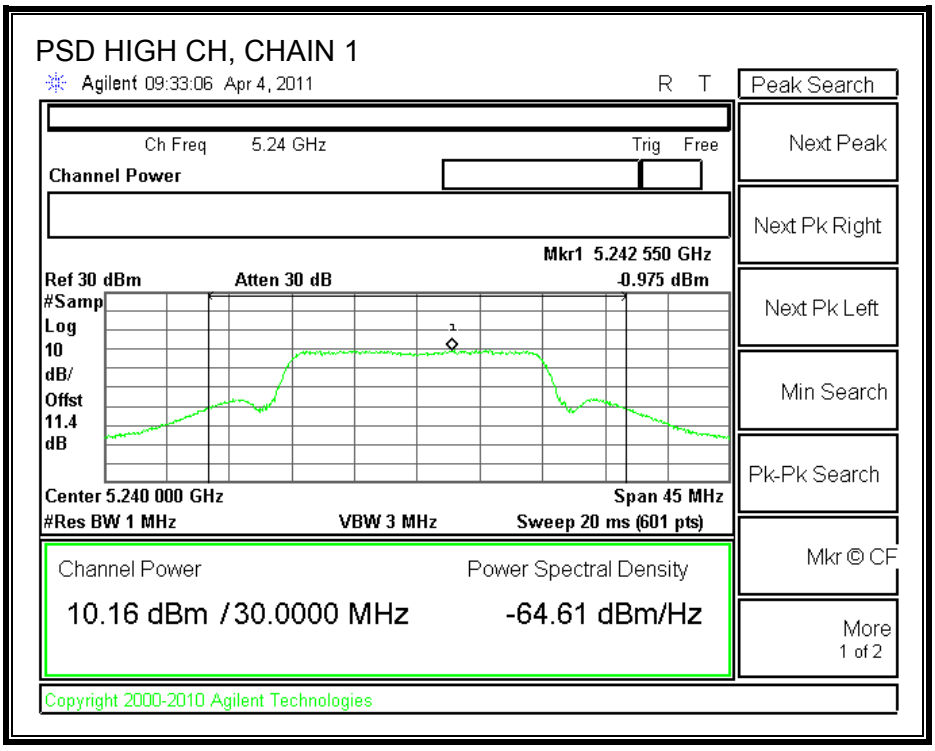
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-0.559	-1.226	-0.831	3.91	4.00	-0.09
Mid	5200	-0.844	-1.192	-0.547	3.92	4.00	-0.08
High	5240	-0.975	-0.706	-0.769	3.96	4.00	-0.04

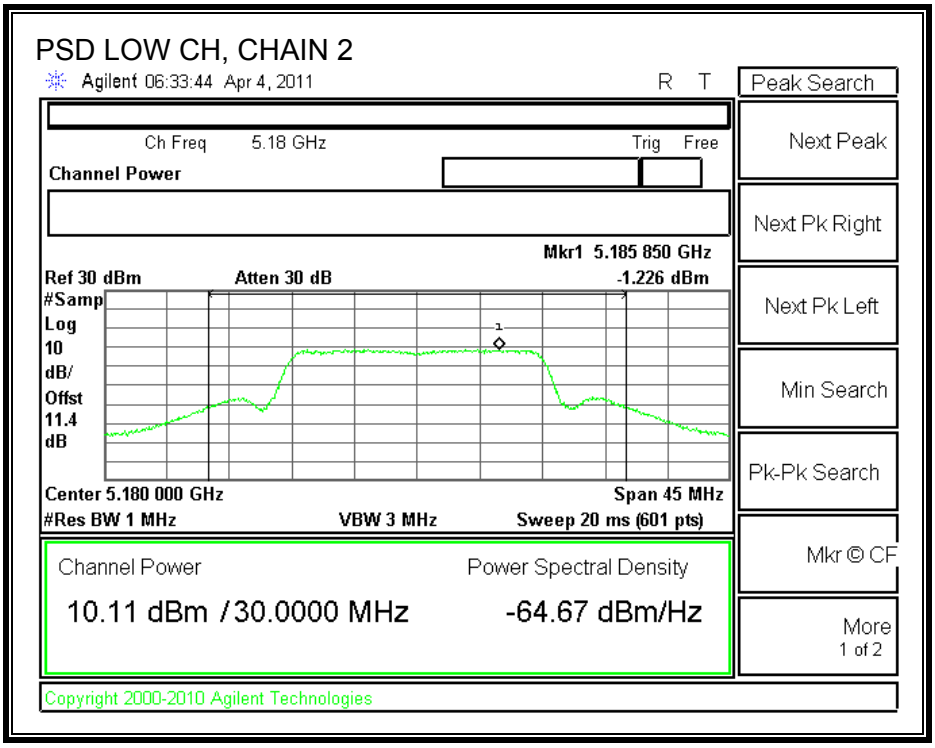
CHAIN 1 POWER SPECTRAL DENSITY

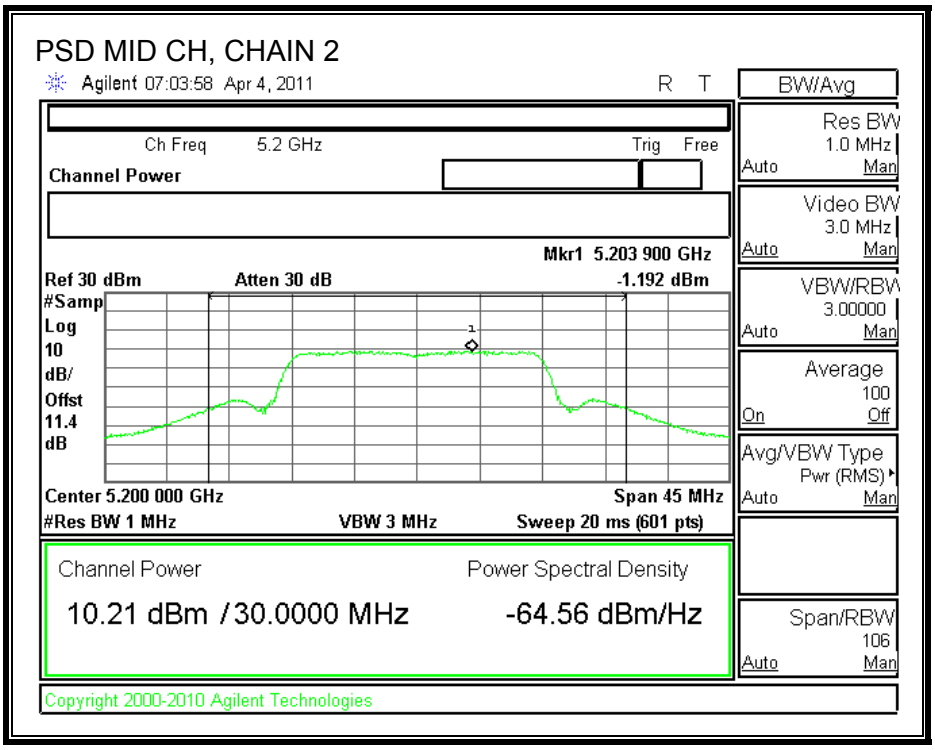


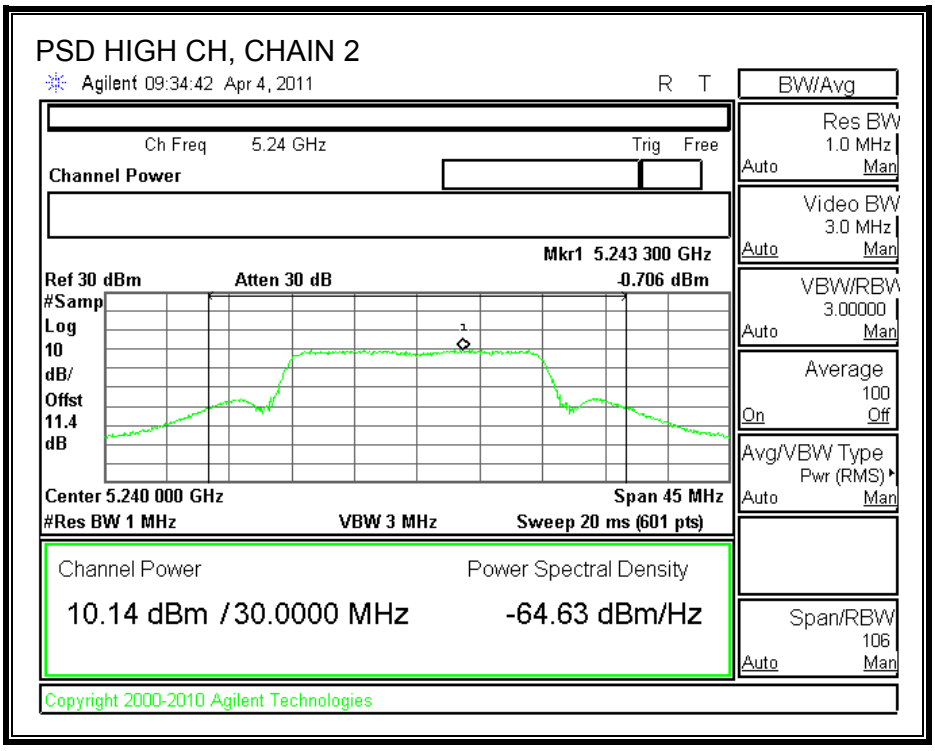




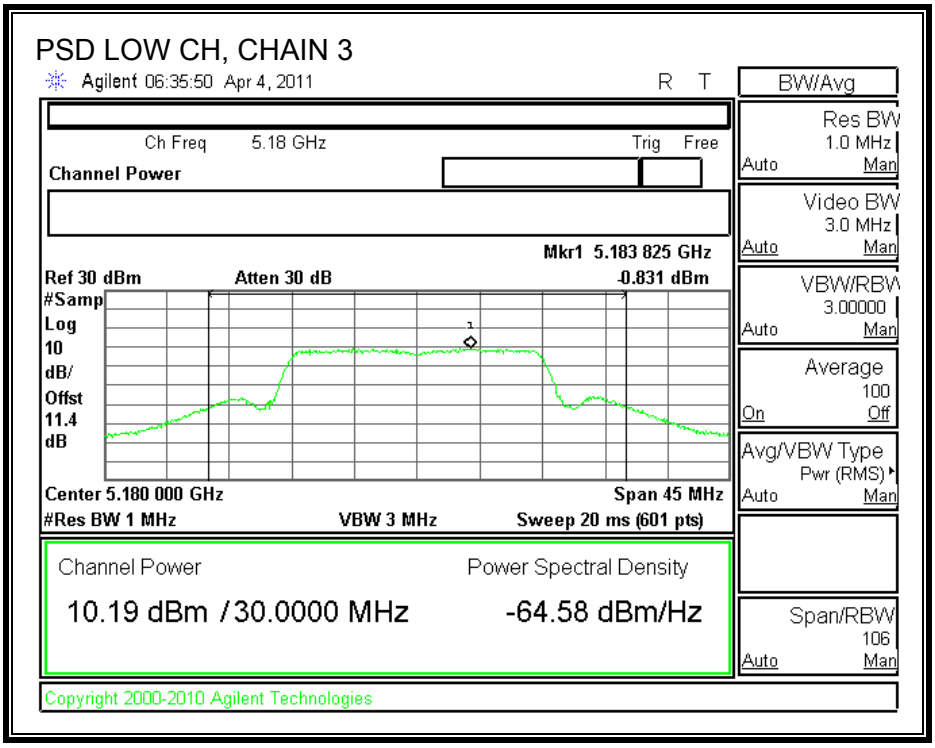
CHAIN 2 POWER SPECTRAL DENSITY

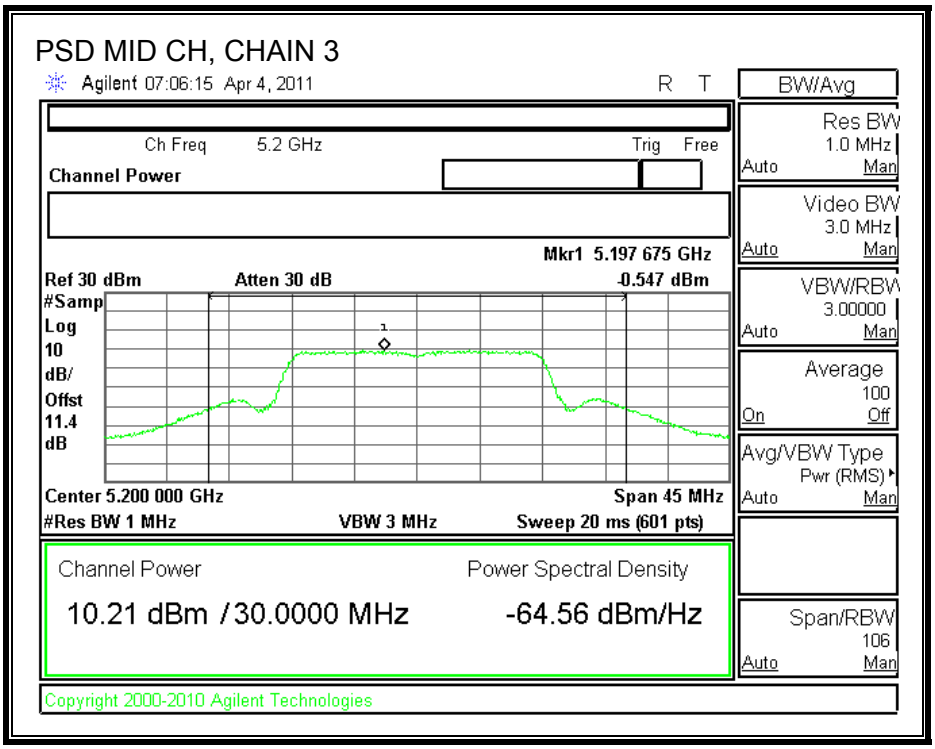


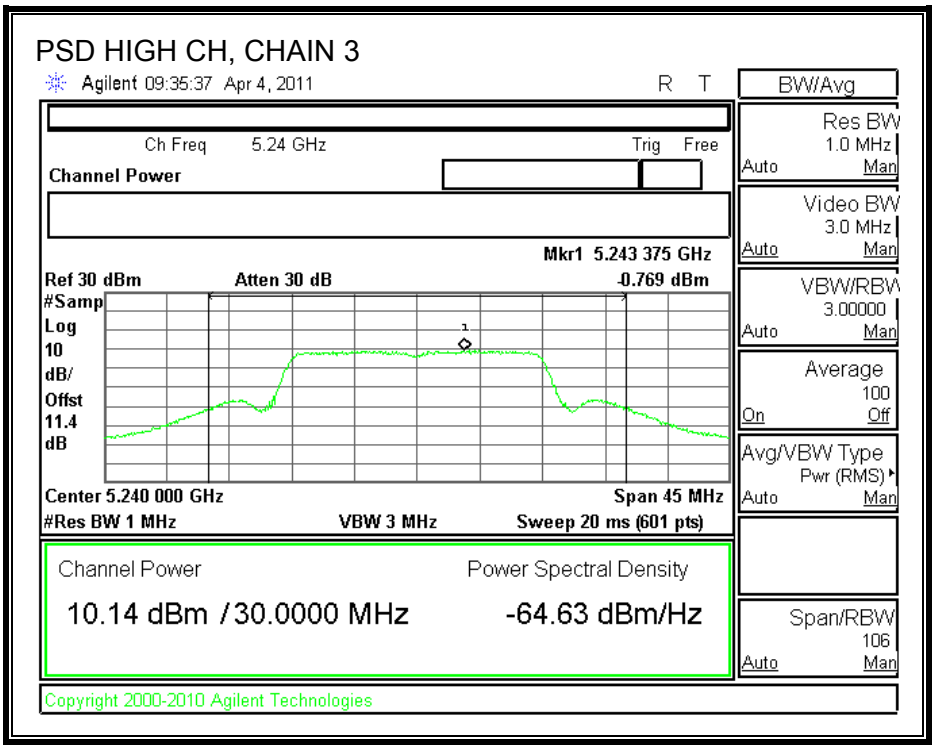




CHAIN 3 POWER SPECTRAL DENSITY







7.3.6. 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.

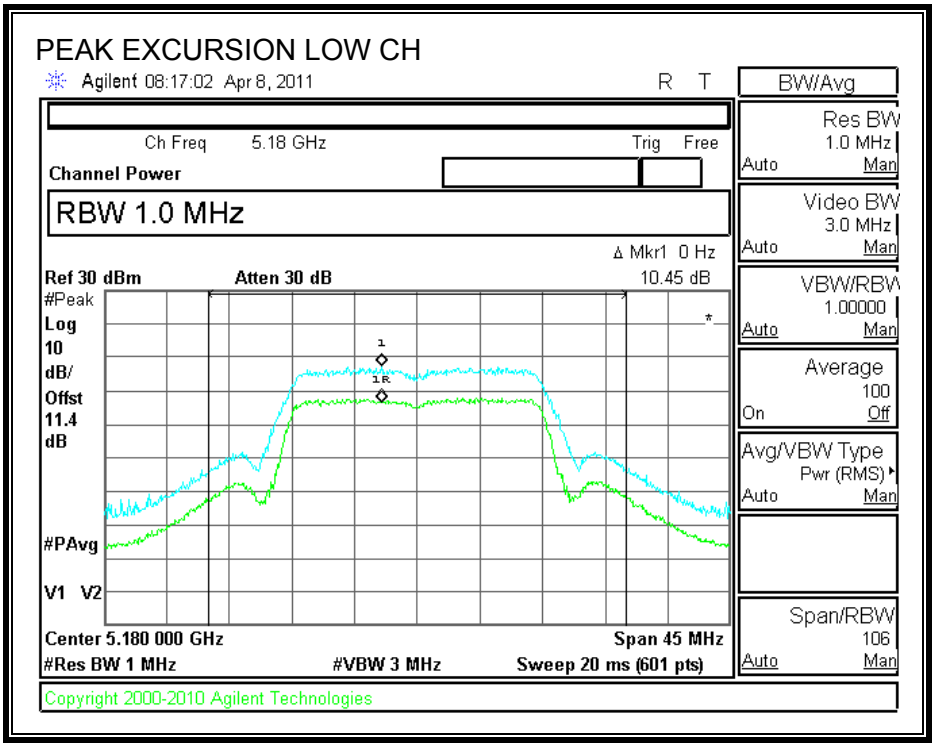
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

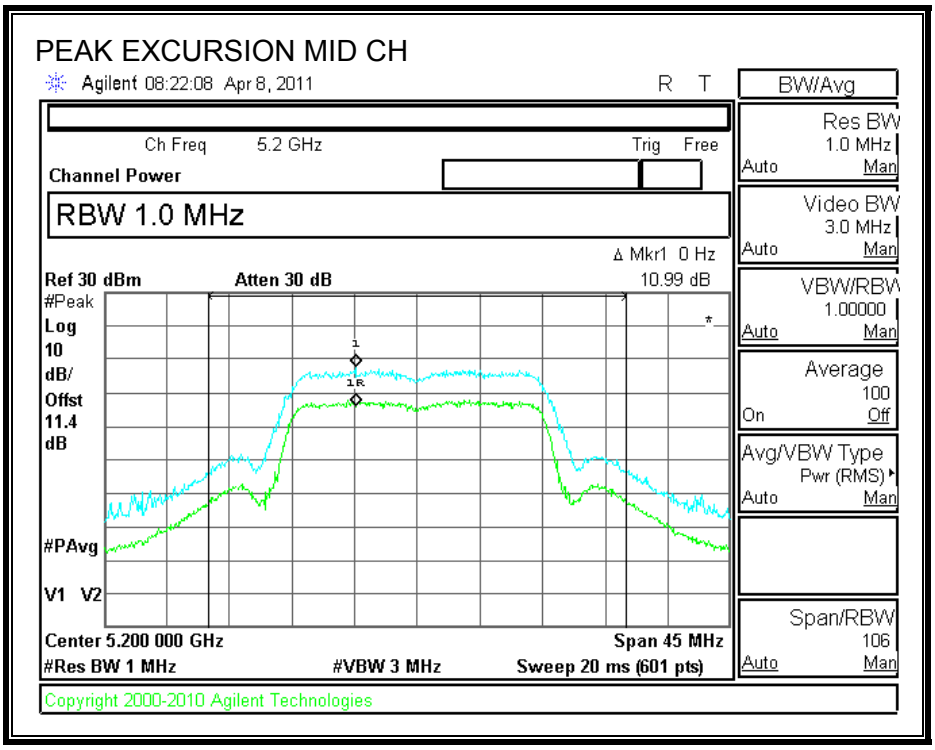
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

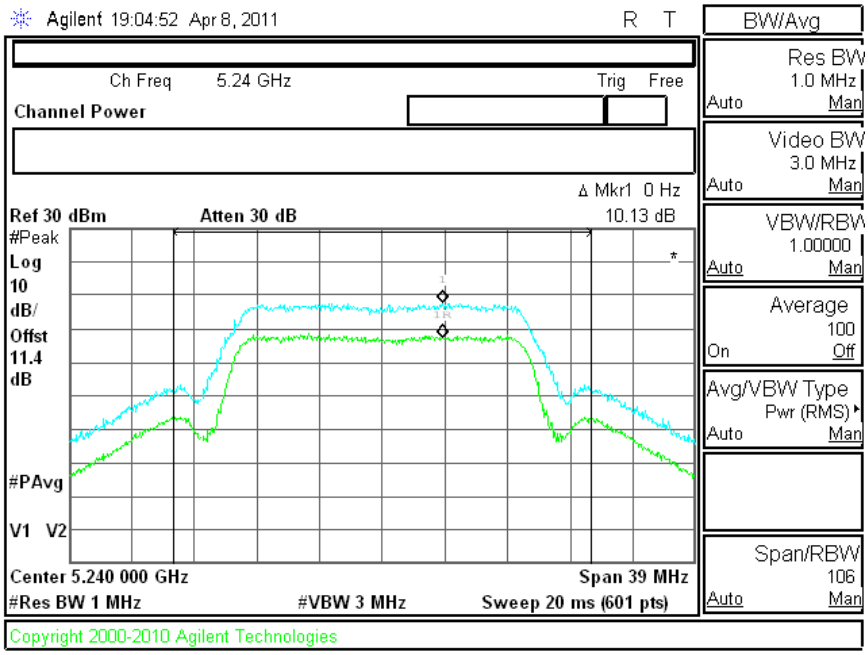
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.45	13	-2.55
Middle	5200	10.99	13	-2.01
High	5240	10.13	13	-2.87

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.3.7. CONDUCTED SPURIOUS EMISSIONS

Covered by HT20 3x3 CDD MCS0 testing.

SDM MCS21

7.3.8. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

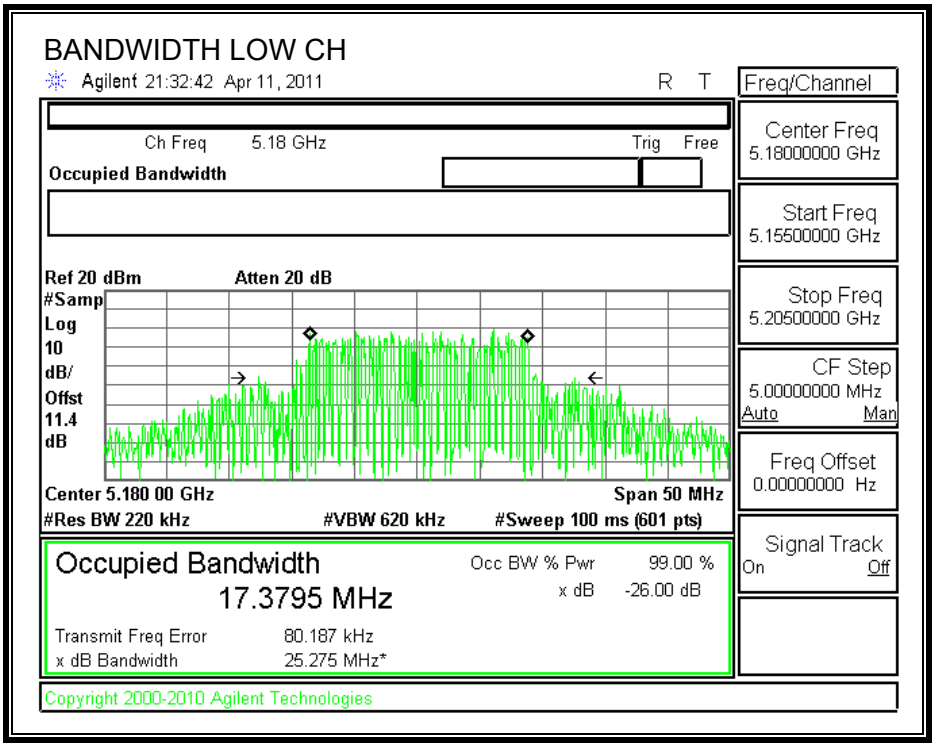
TEST PROCEDURE

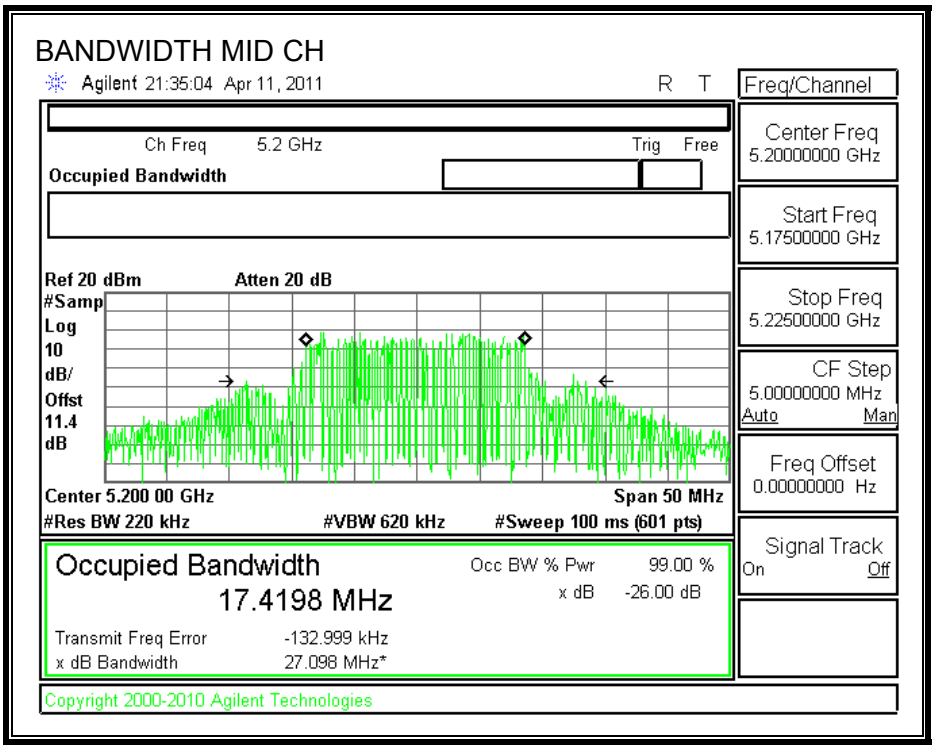
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

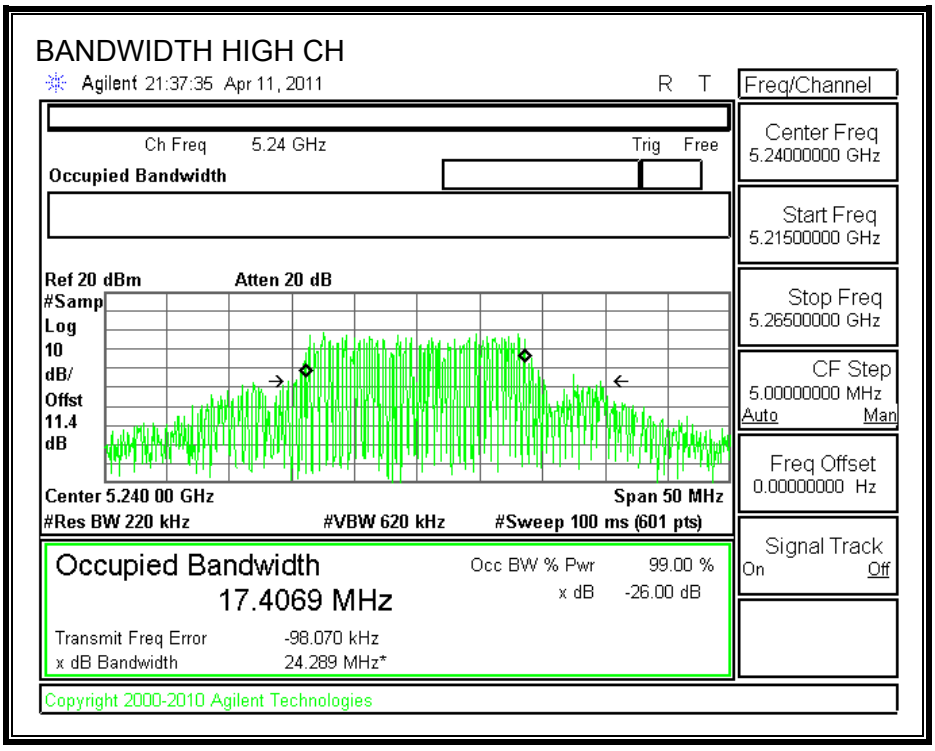
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	26.130	17.3795
Middle	5200	25.028	17.4198
High	5240	25.611	17.4069

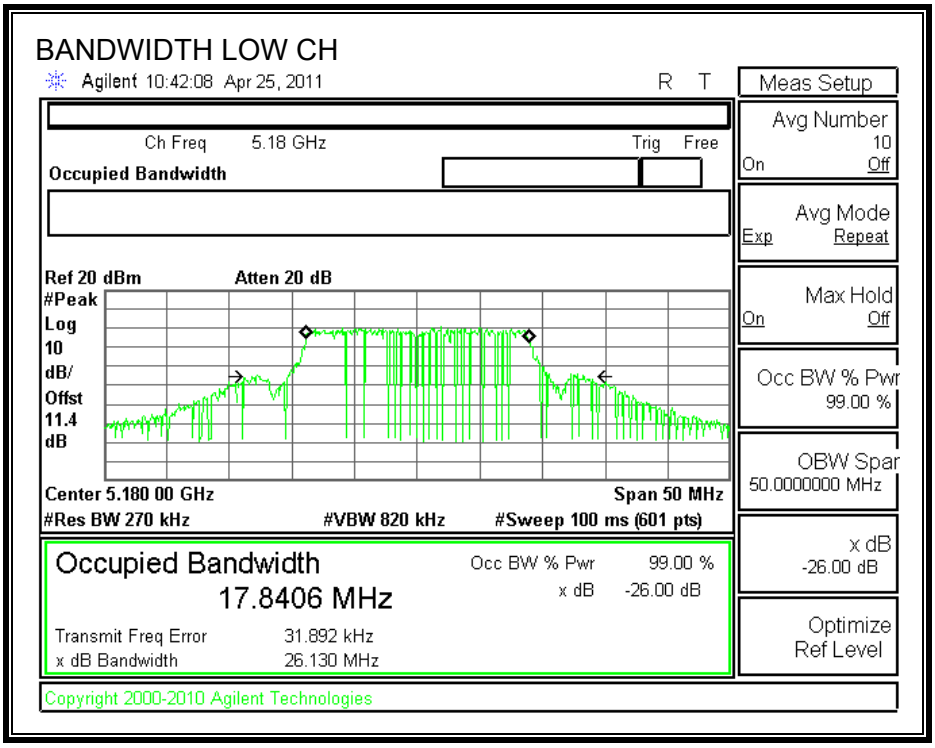
99% BANDWIDTH

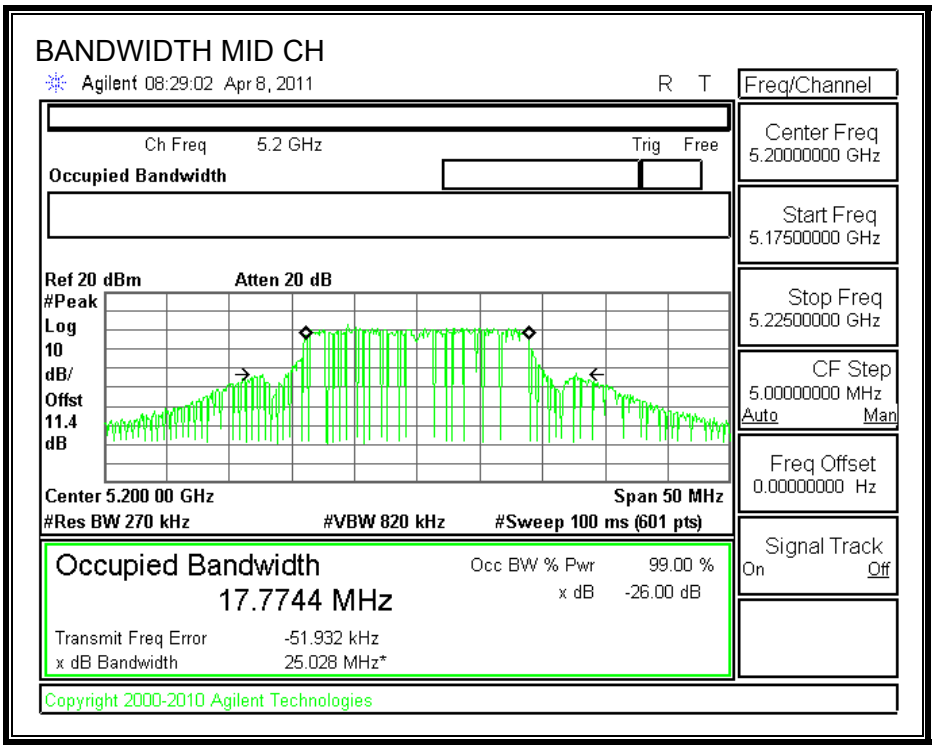


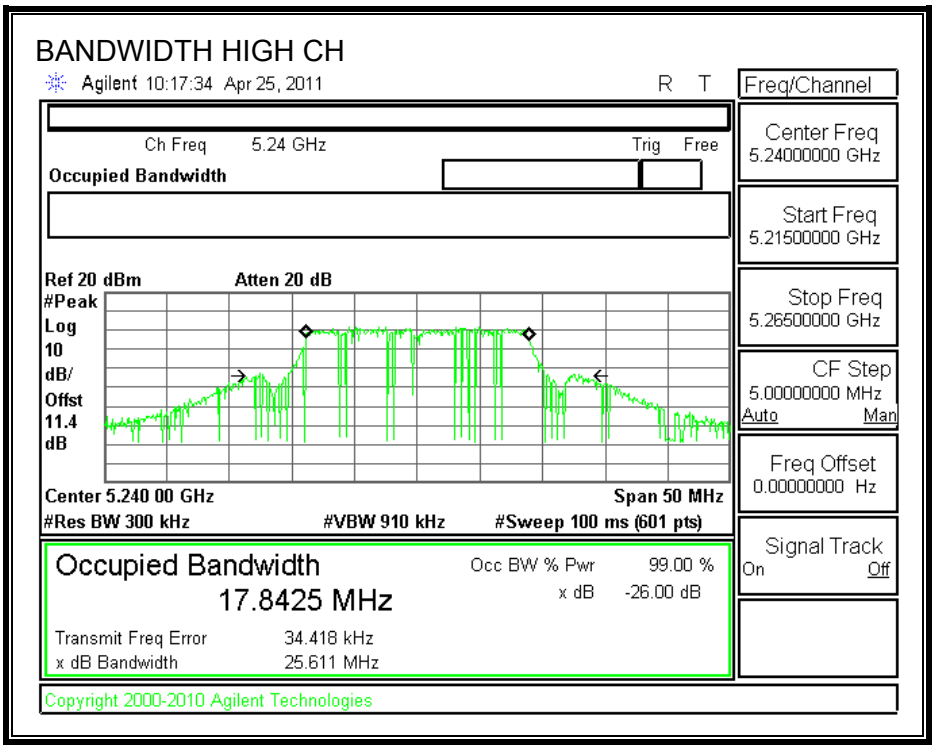




26 dB BANDWIDTH







7.3.9. 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

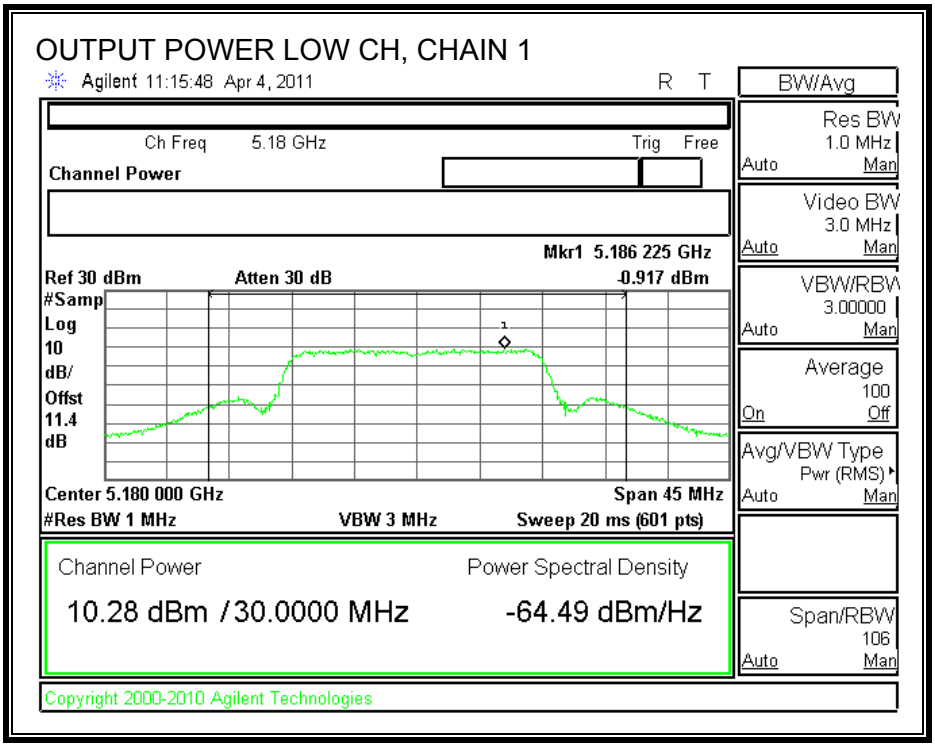
Limit

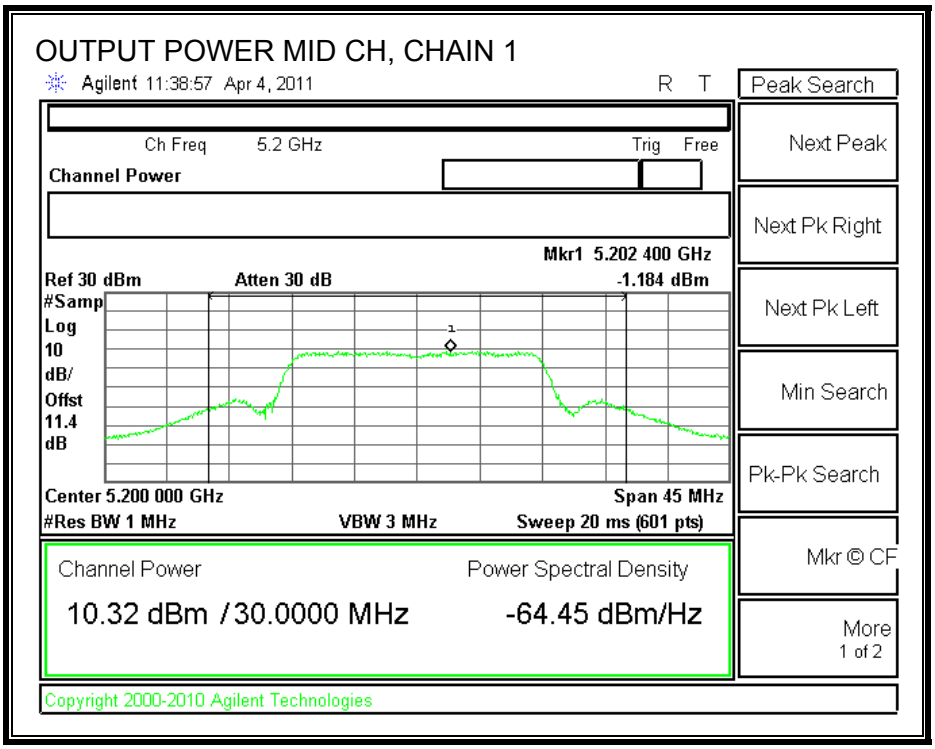
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	16.99	26.130	18.17	5.65	16.99
Mid	5200	16.99	25.028	17.98	5.65	16.99
High	5240	16.99	25.611	18.08	5.65	16.99

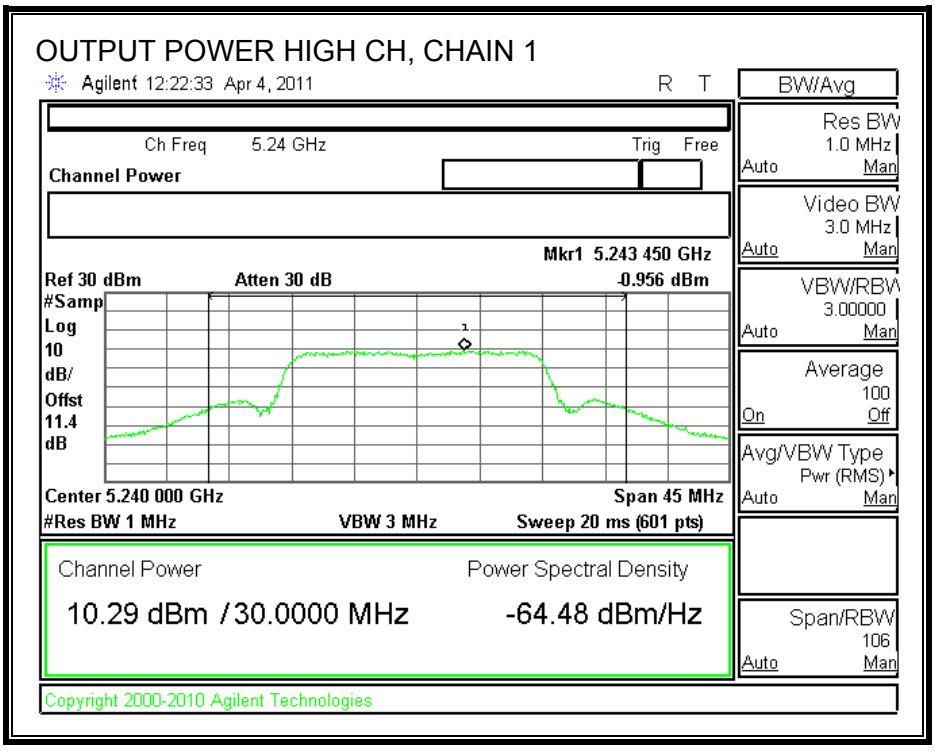
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.28	10.44	10.26	15.10	16.99	-1.89
Mid	5200	10.32	10.37	10.42	15.14	16.99	-1.85
High	5240	10.29	10.33	10.28	15.07	16.99	-1.92

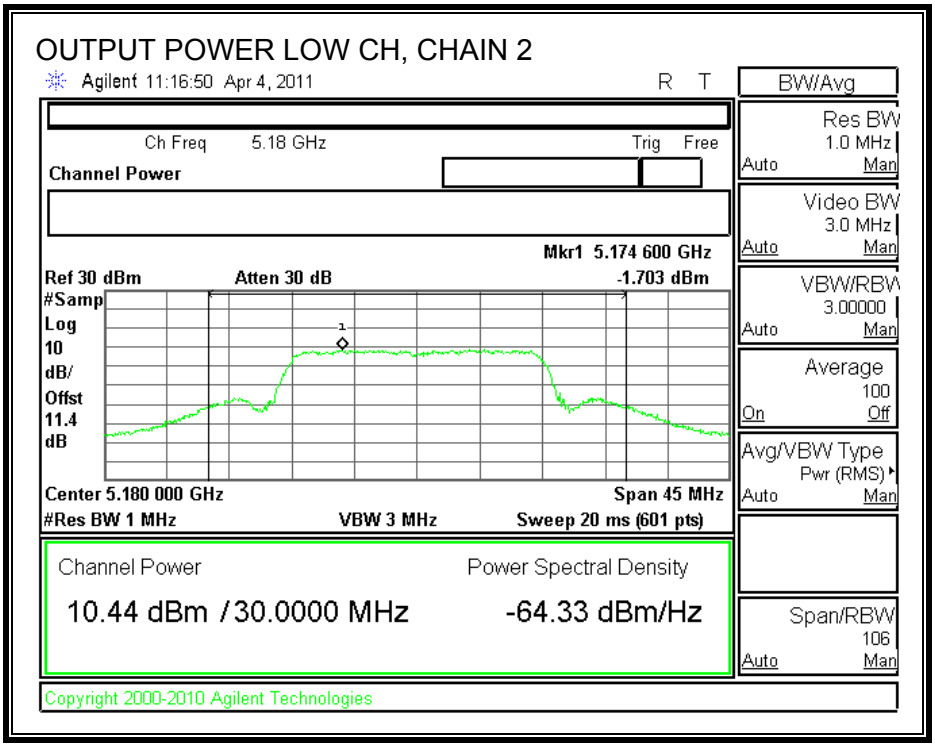
CHAIN 1 OUTPUT POWER

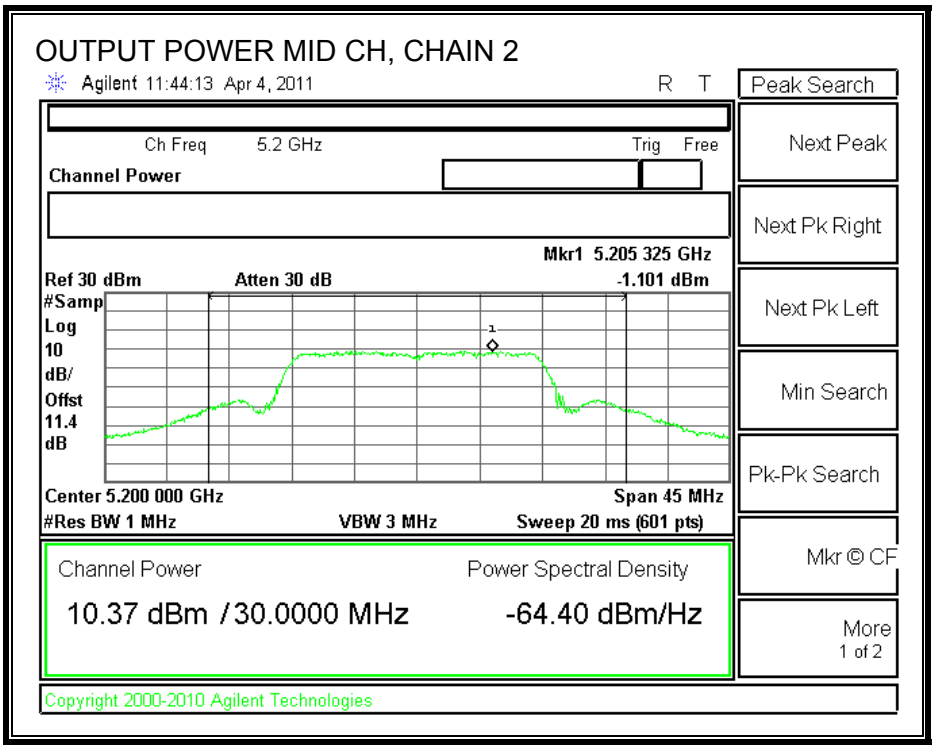


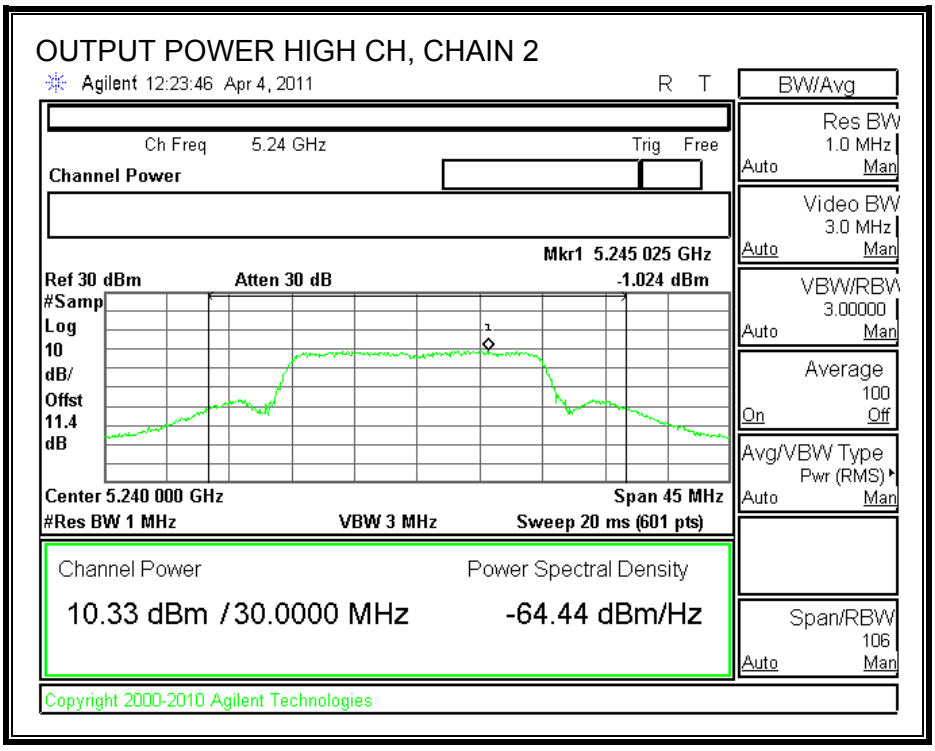




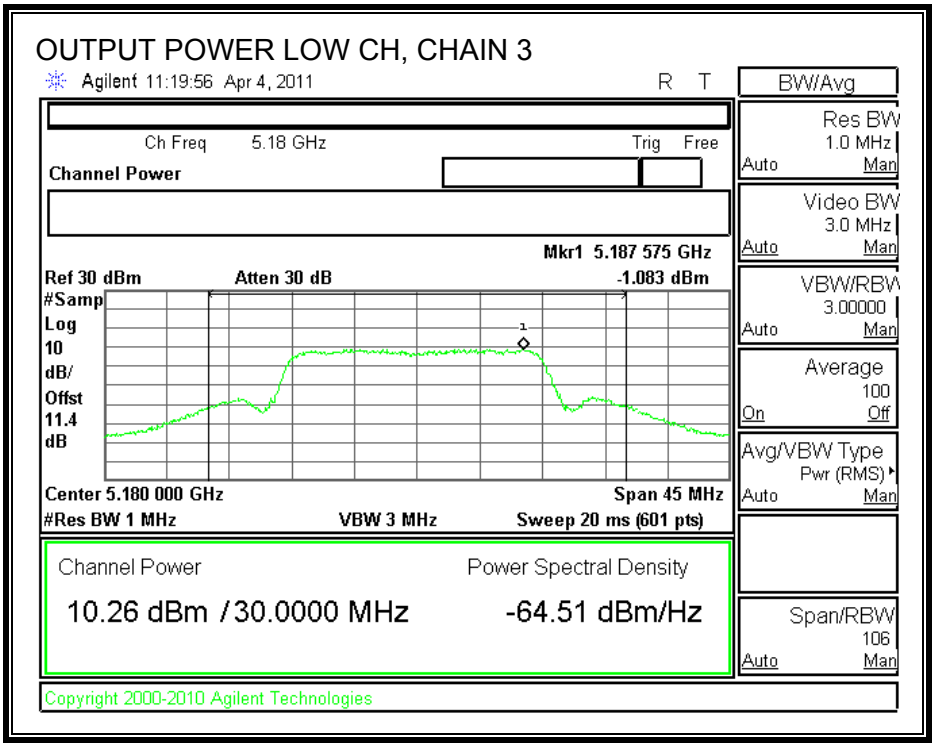
CHAIN 2 OUTPUT POWER

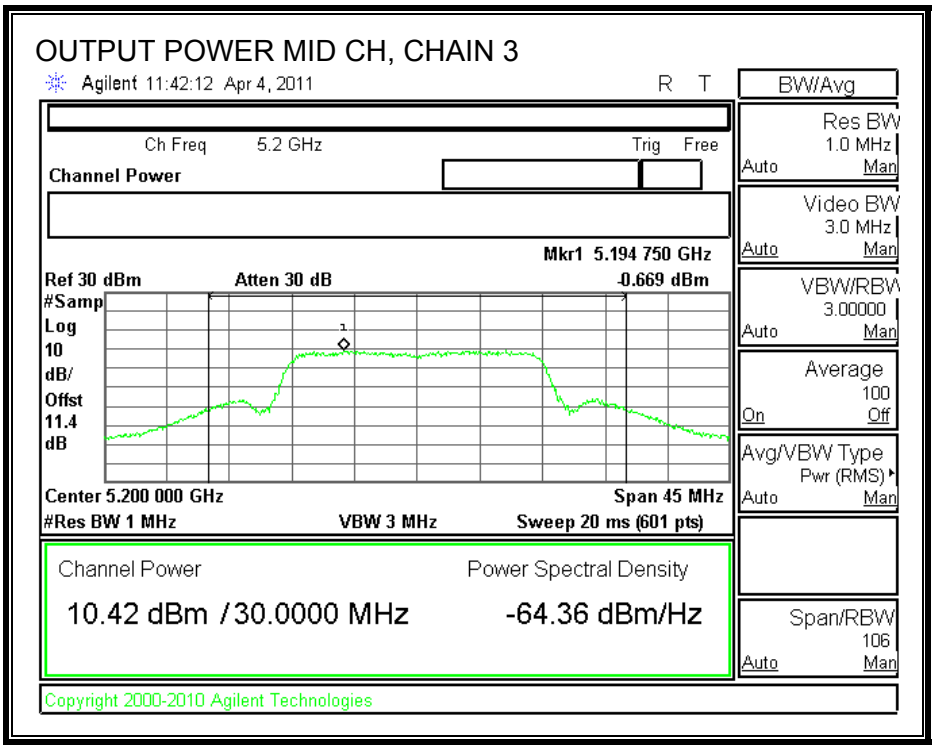


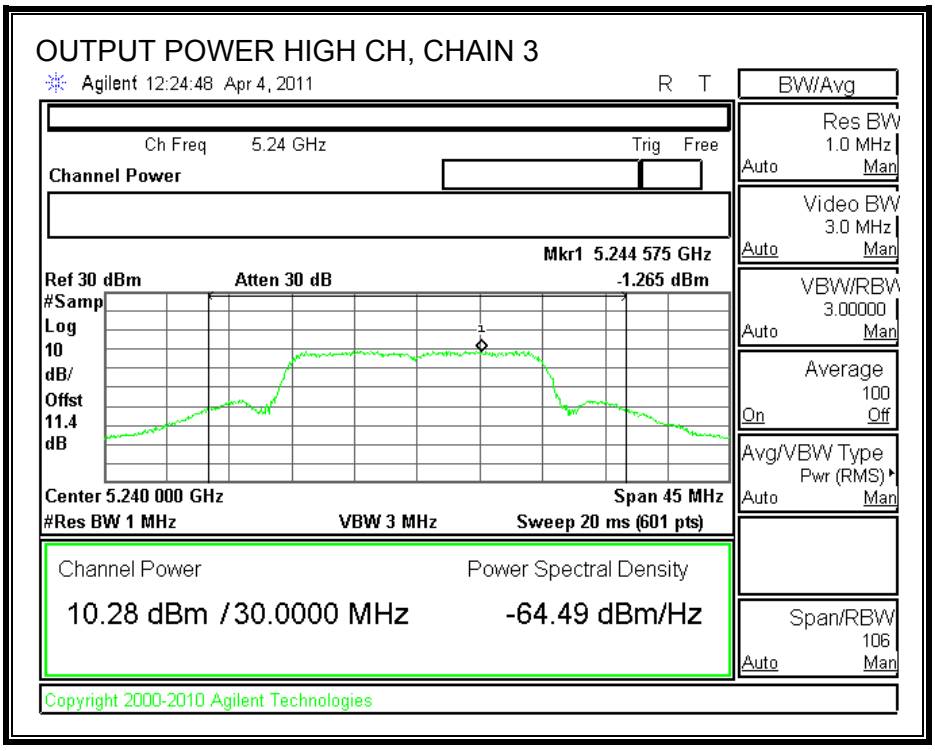




CHAIN 3 OUTPUT POWER







7.3.10. 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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

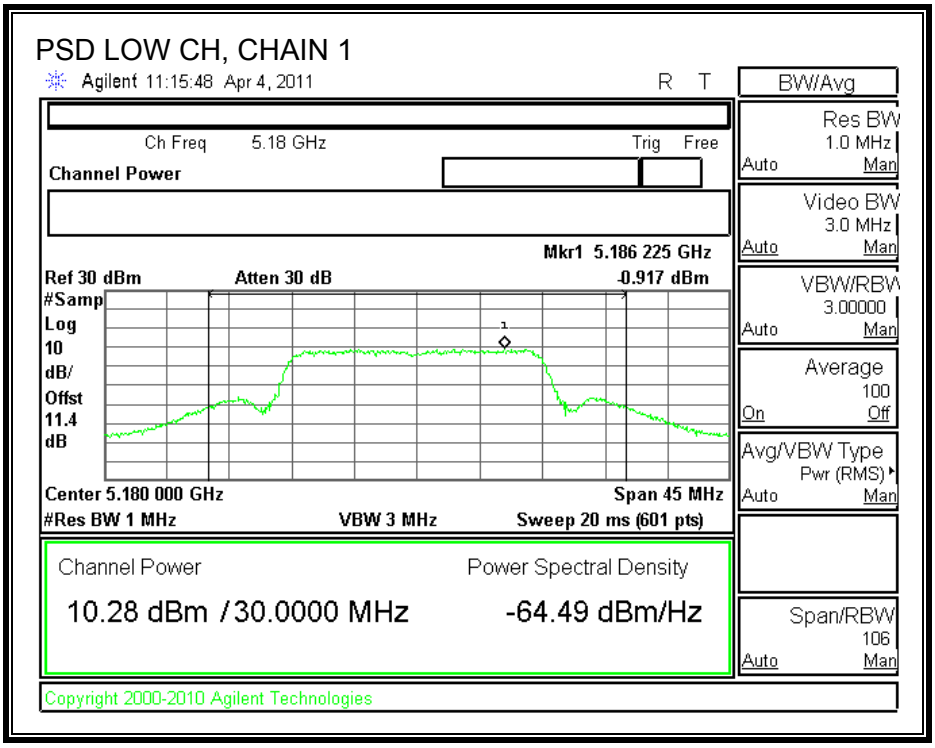
TEST PROCEDURE

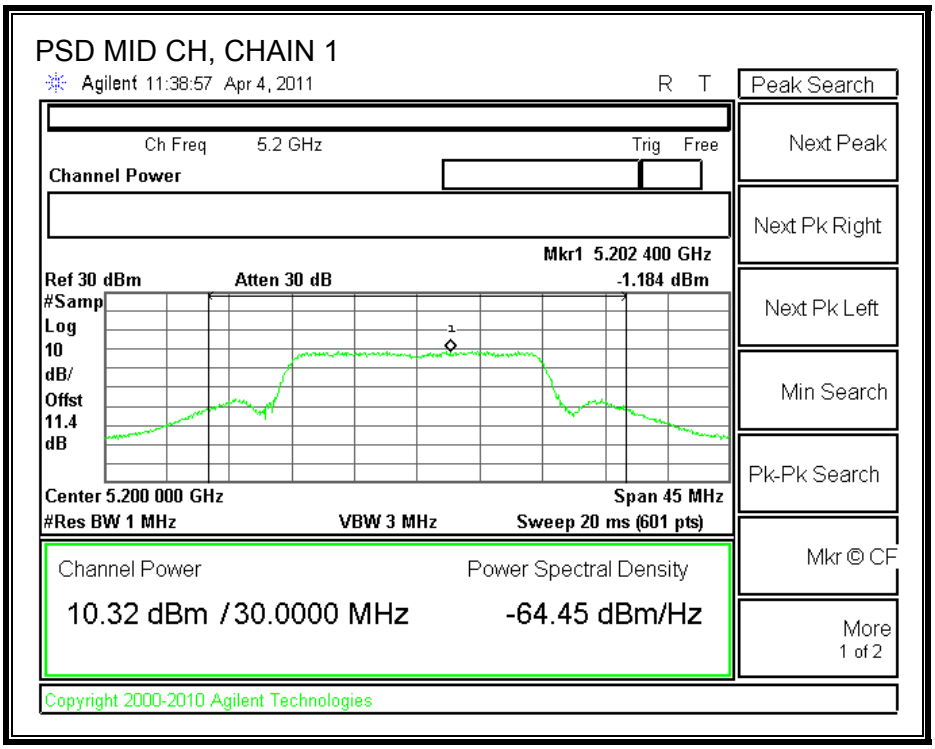
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

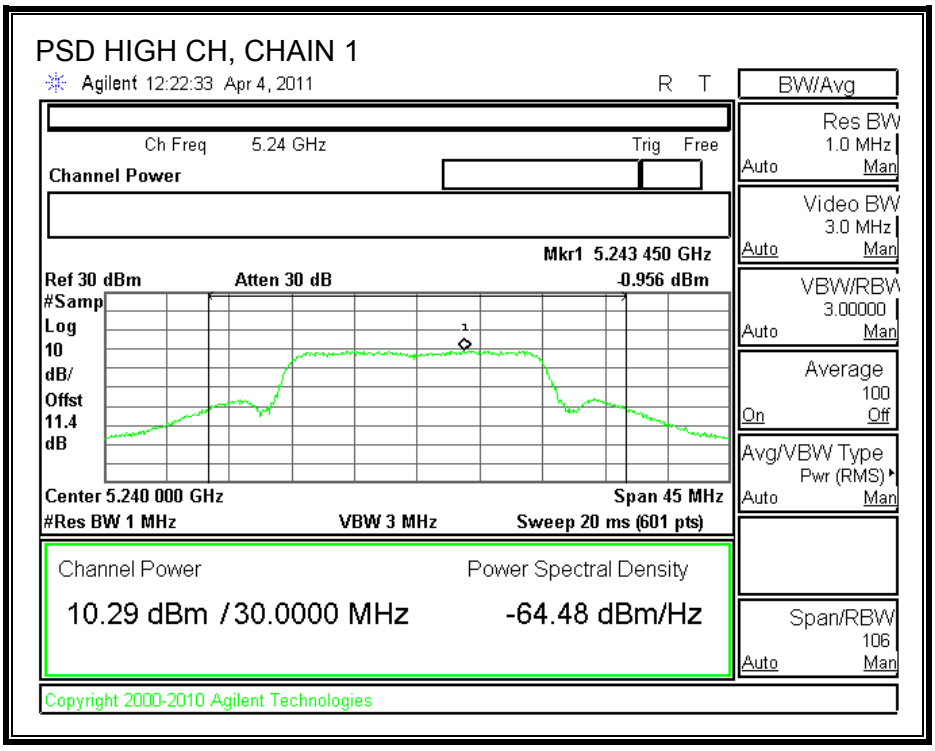
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-0.917	-1.703	-1.083	3.55	4.00	-0.45
Mid	5200	-1.184	-1.101	-0.669	3.79	4.00	-0.21
High	5240	-0.956	-1.024	-1.265	3.69	4.00	-0.31

CHAIN 1 POWER SPECTRAL DENSITY







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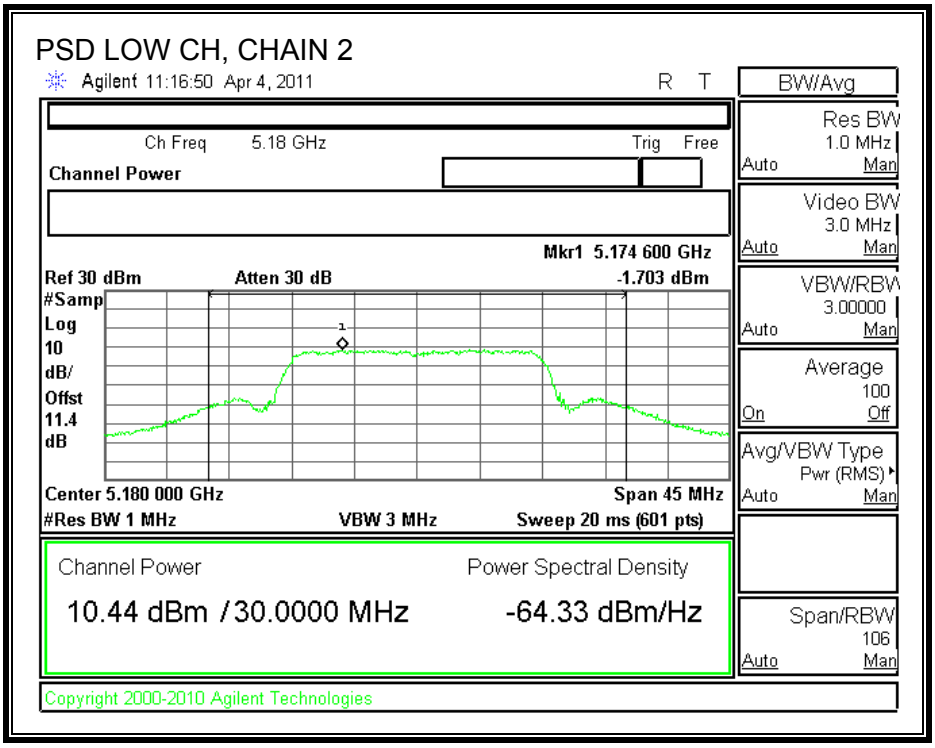
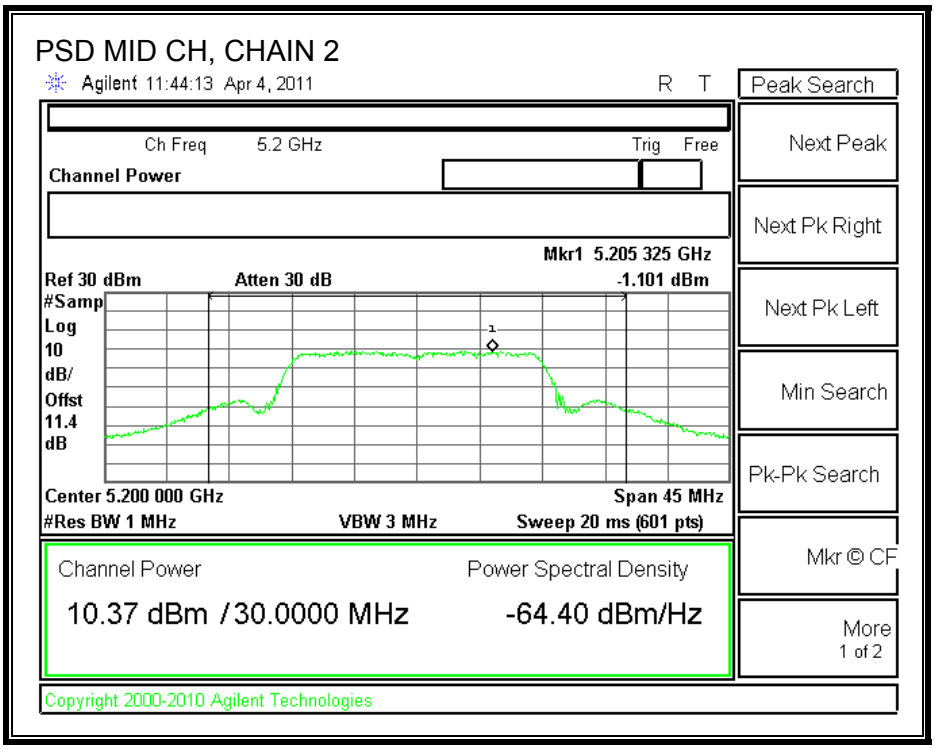
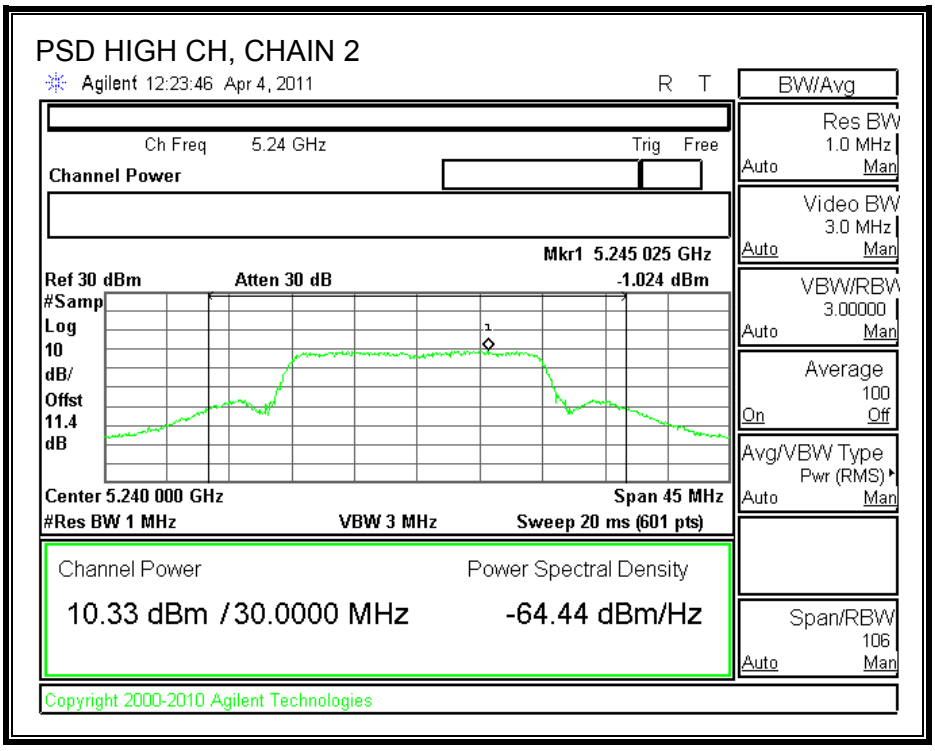
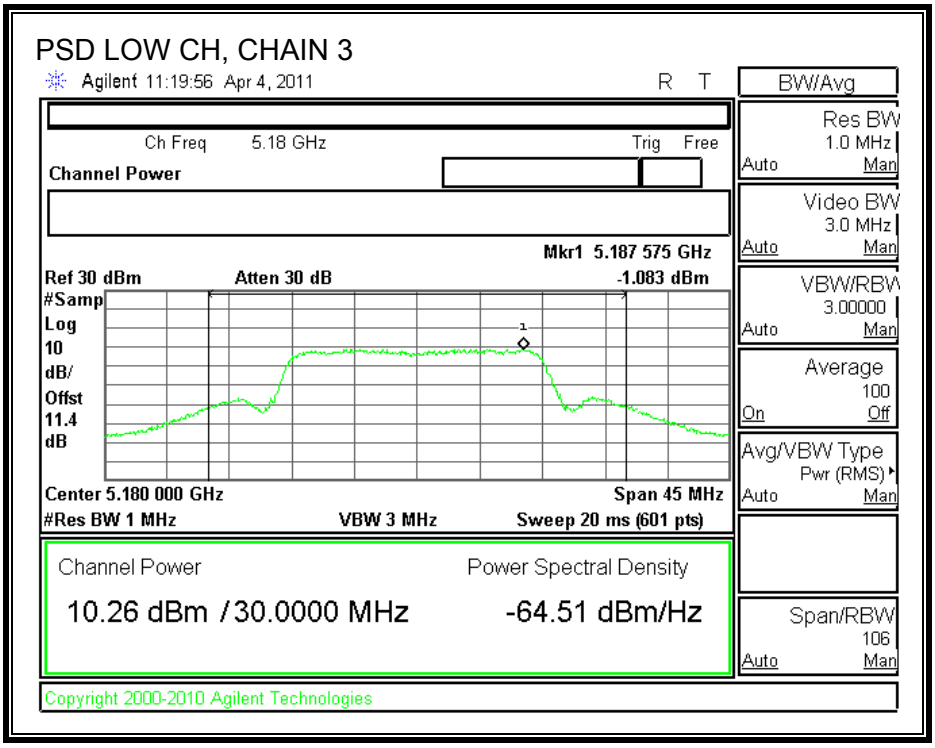
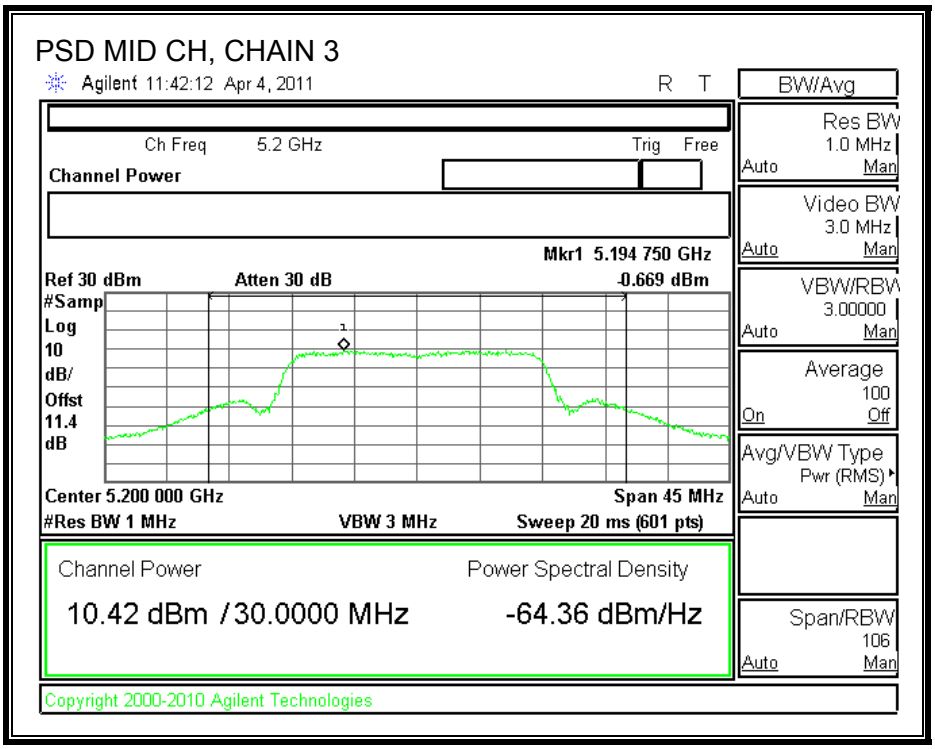


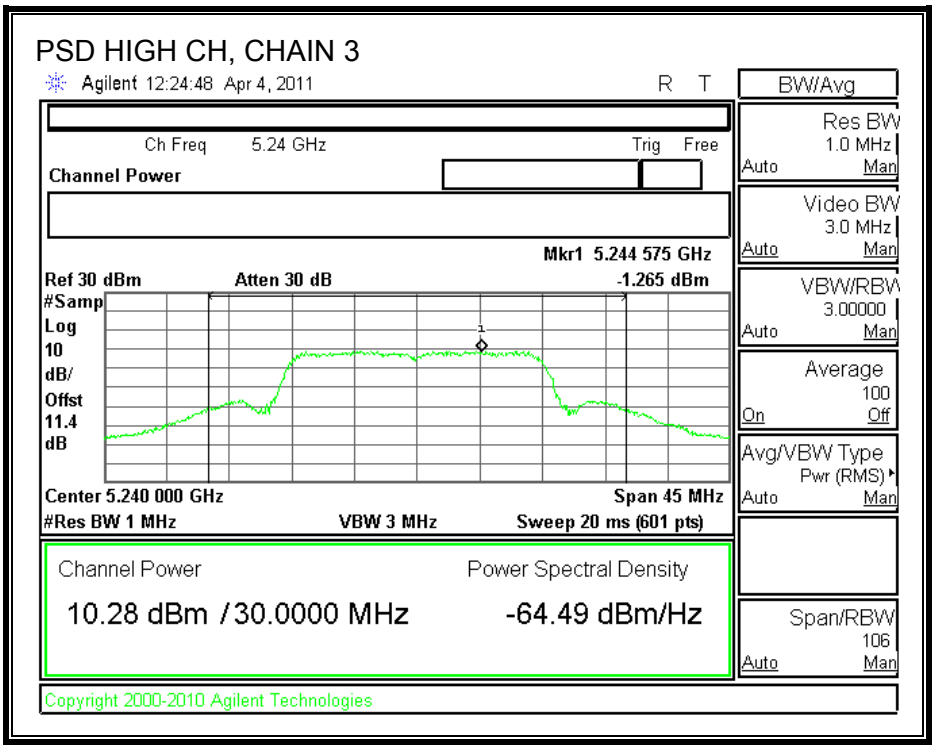




CHAIN 3 POWER SPECTRAL DENSITY







7.3.11. 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.

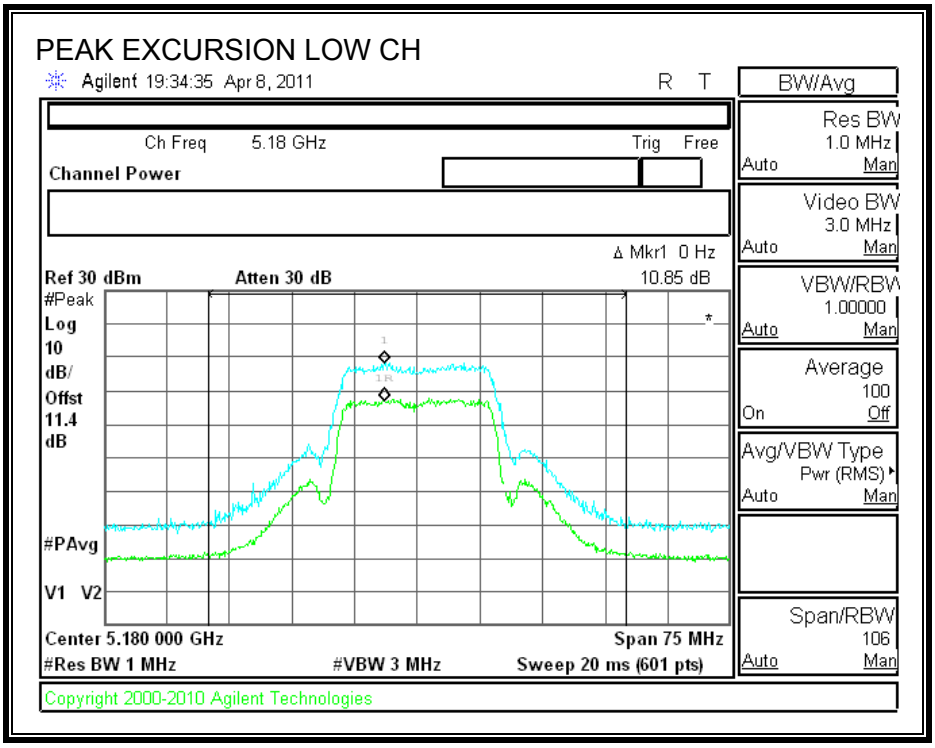
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

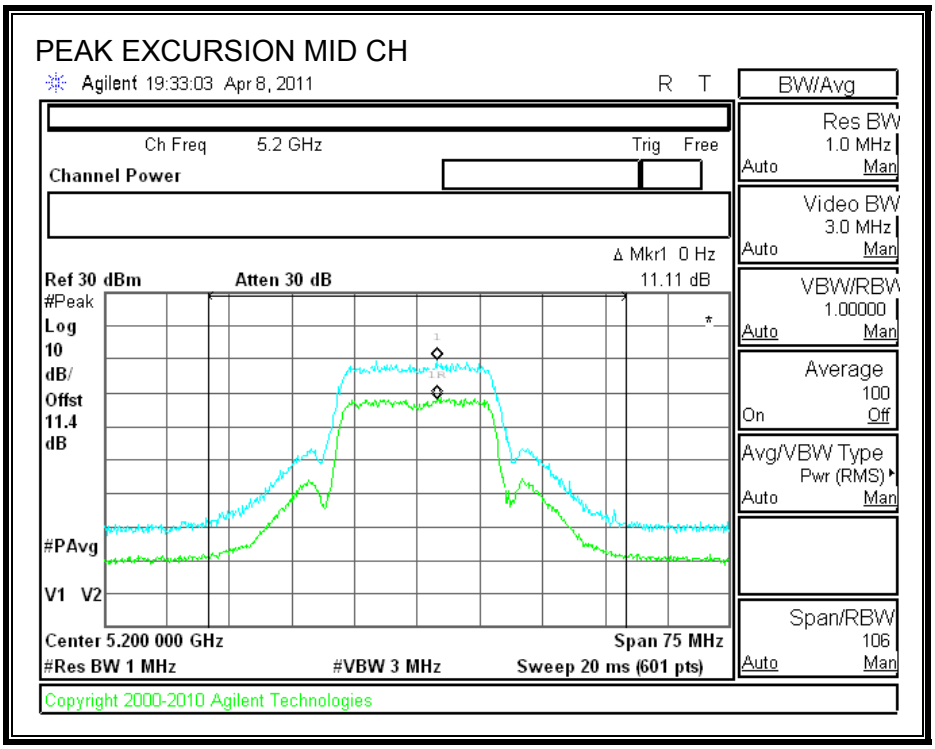
RESULTS

CHAIN 1

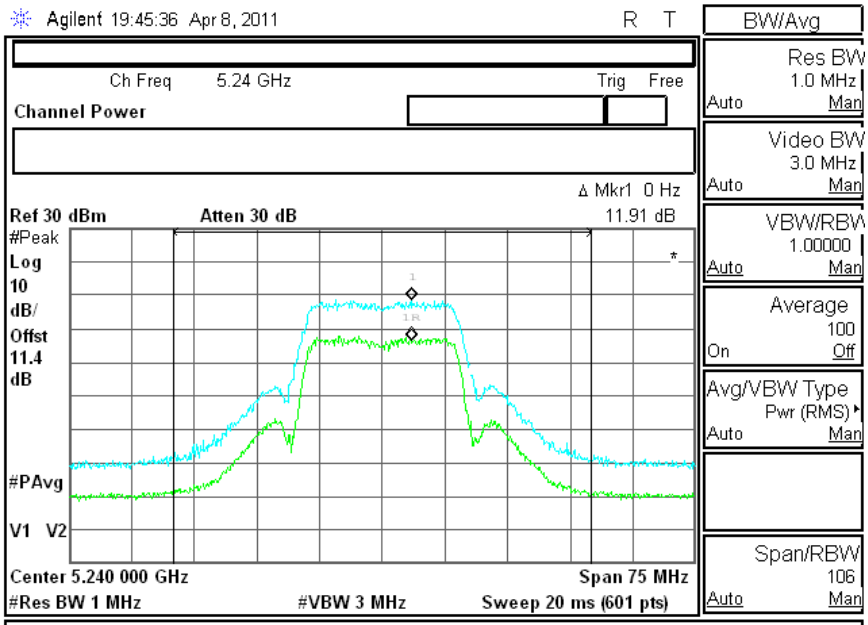
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.85	13	-2.15
Middle	5200	11.11	13	-1.89
High	5240	11.91	13	-1.09

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.3.12. CONDUCTED SPURIOUS EMISSIONS

Covered by HT20 3x3 CDD MCS0 testing.

7.4. 802.11n HT40 SISO MODE IN THE 5.2 GHz BAND

CDD MCS0

7.4.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

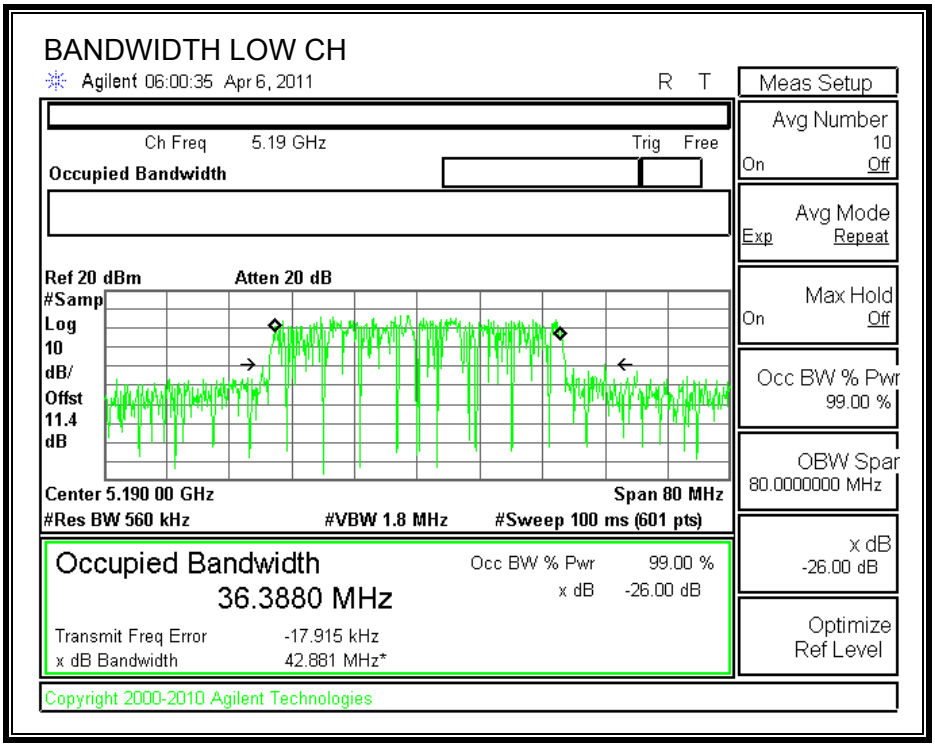
TEST PROCEDURE

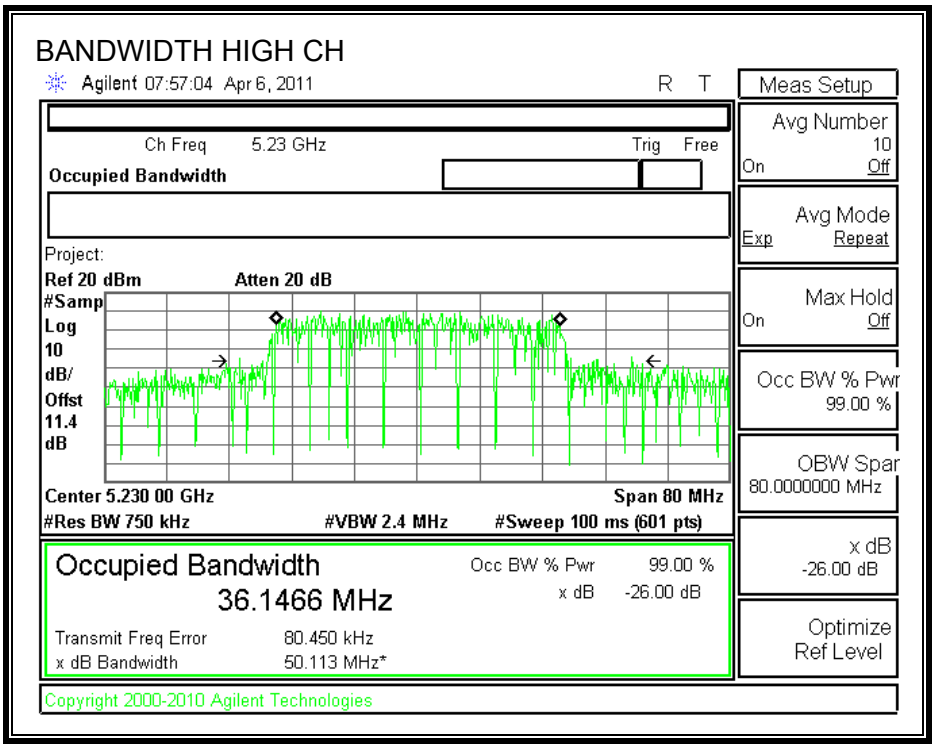
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	42.881	36.3880
High	5230	50.113	36.1466

26 dB and 99% BANDWIDTH





7.4.2. 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

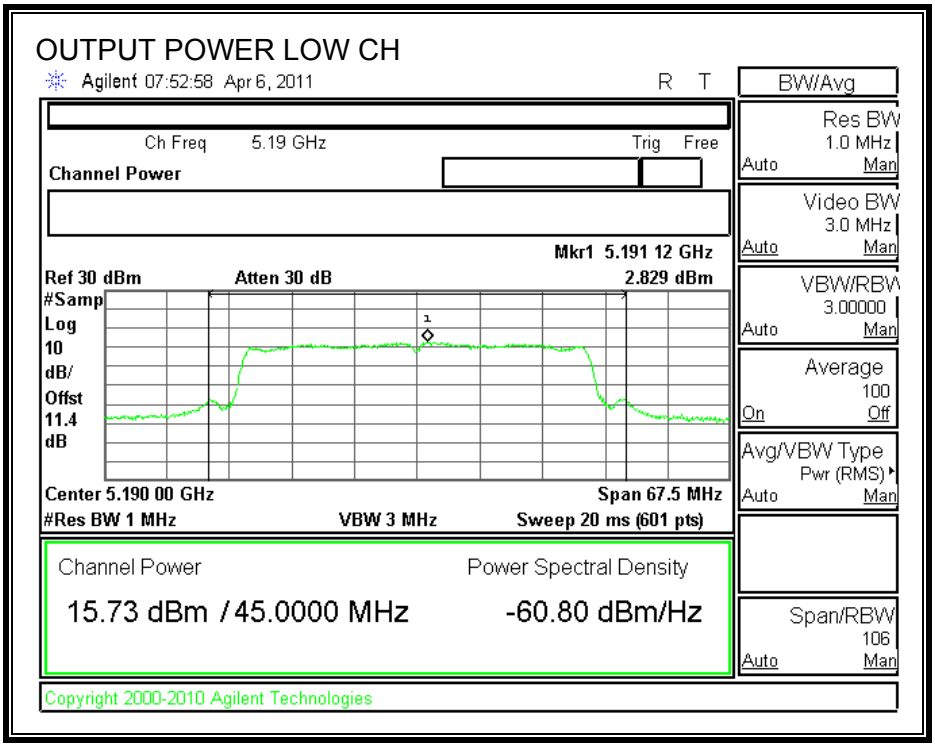
Limit

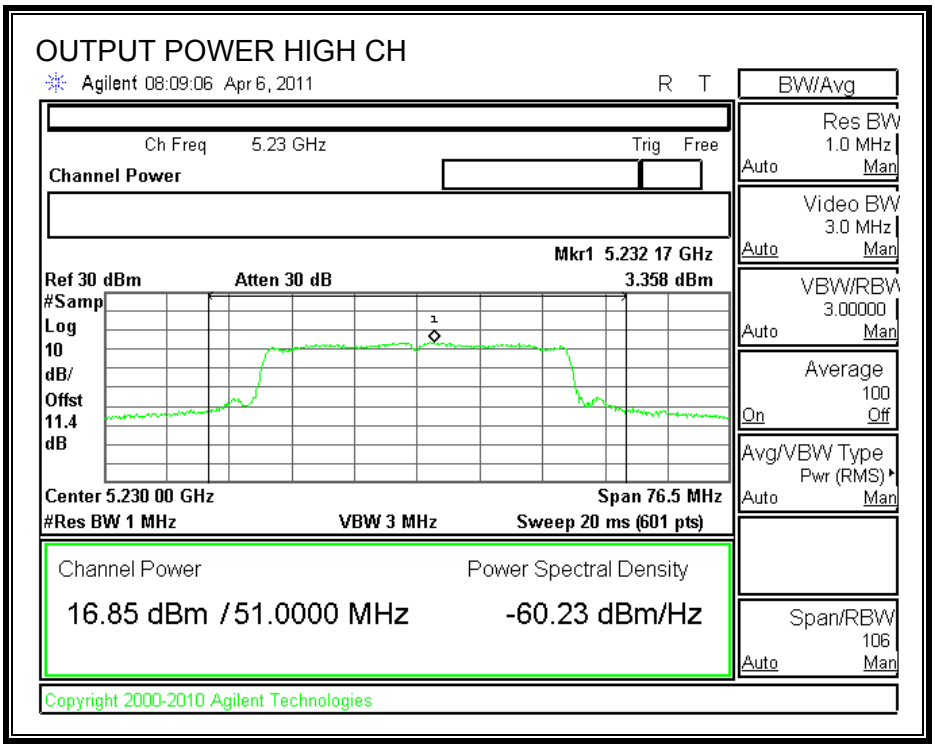
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	42.881	20.32	5.65	17.00
High	5230	17	50.113	21.00	5.65	17.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	15.73	17.00	-1.27
High	5230	16.85	17.00	-0.15

OUTPUT POWER





7.4.3. 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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

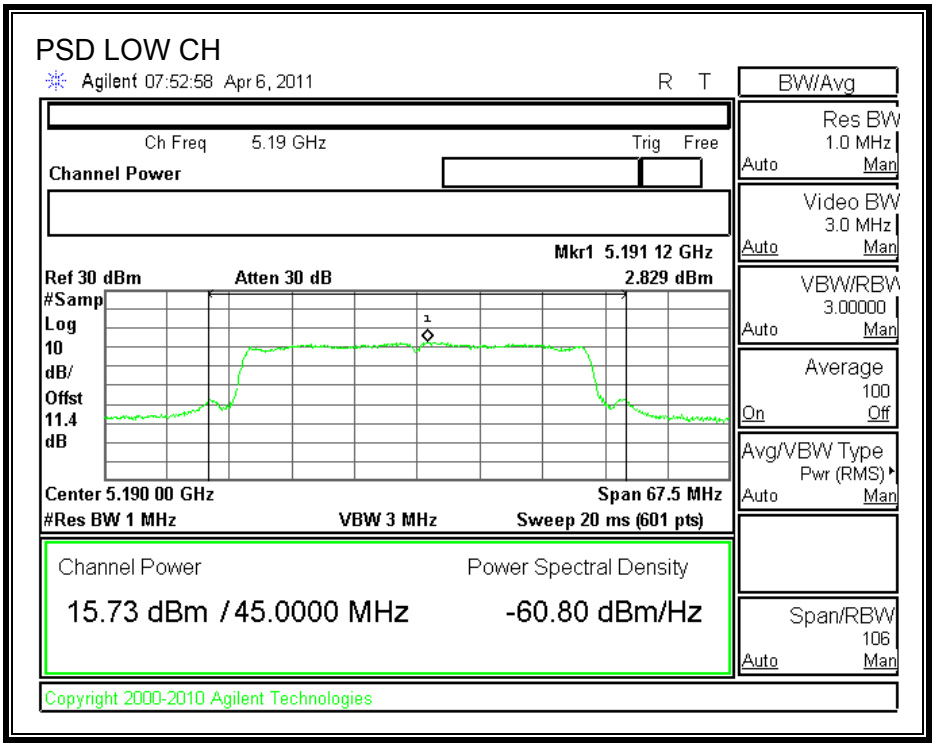
TEST PROCEDURE

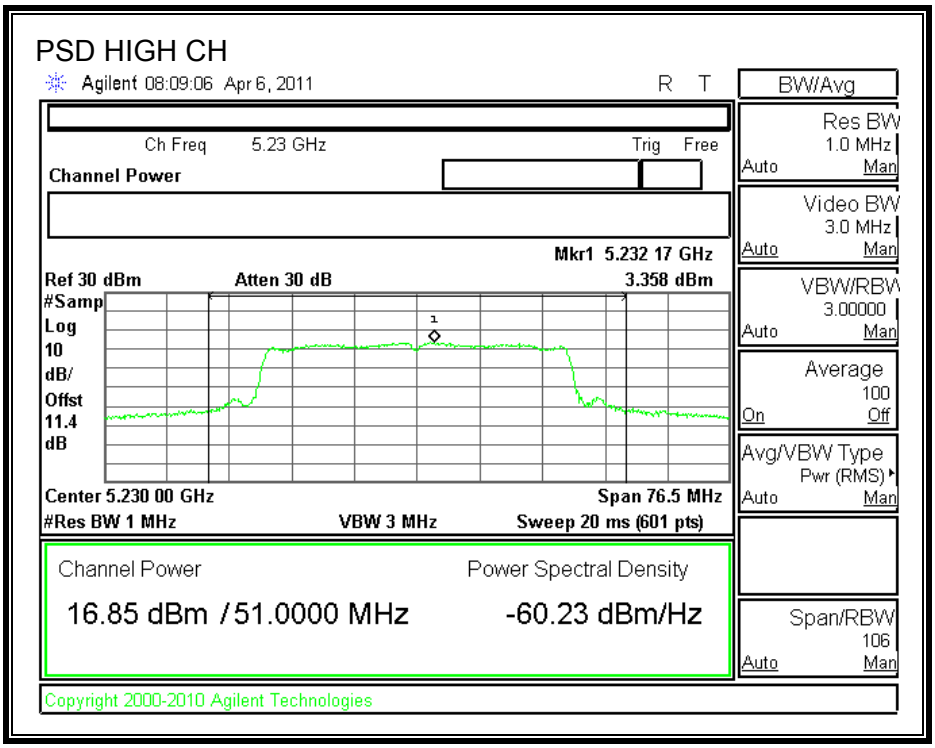
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	2.83	4	-1.17
High	5230	3.36	4	-0.64

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

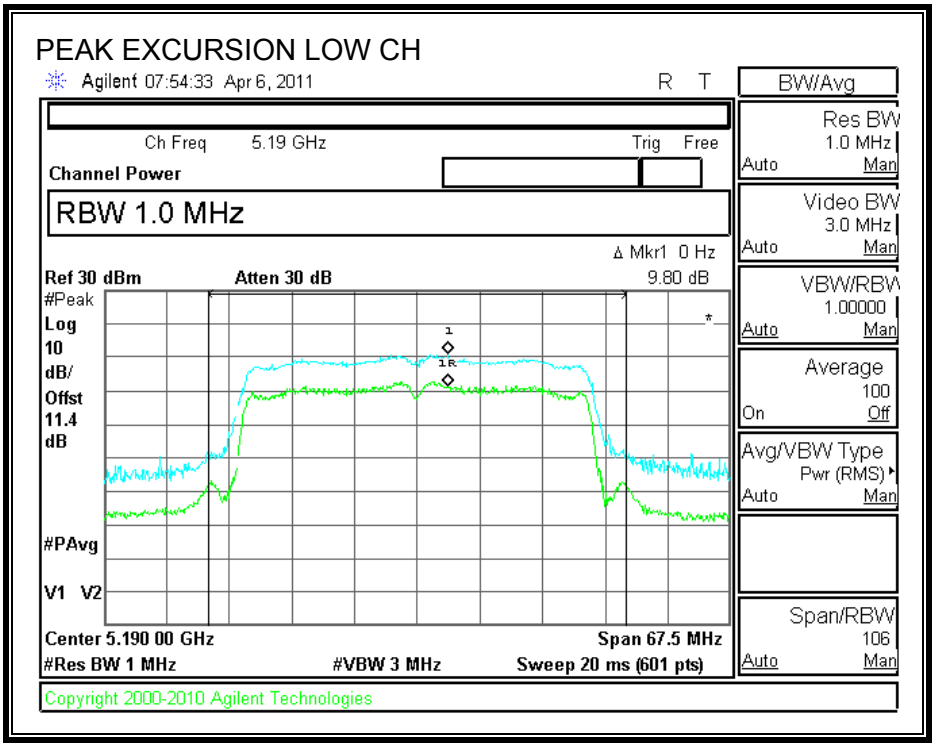
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

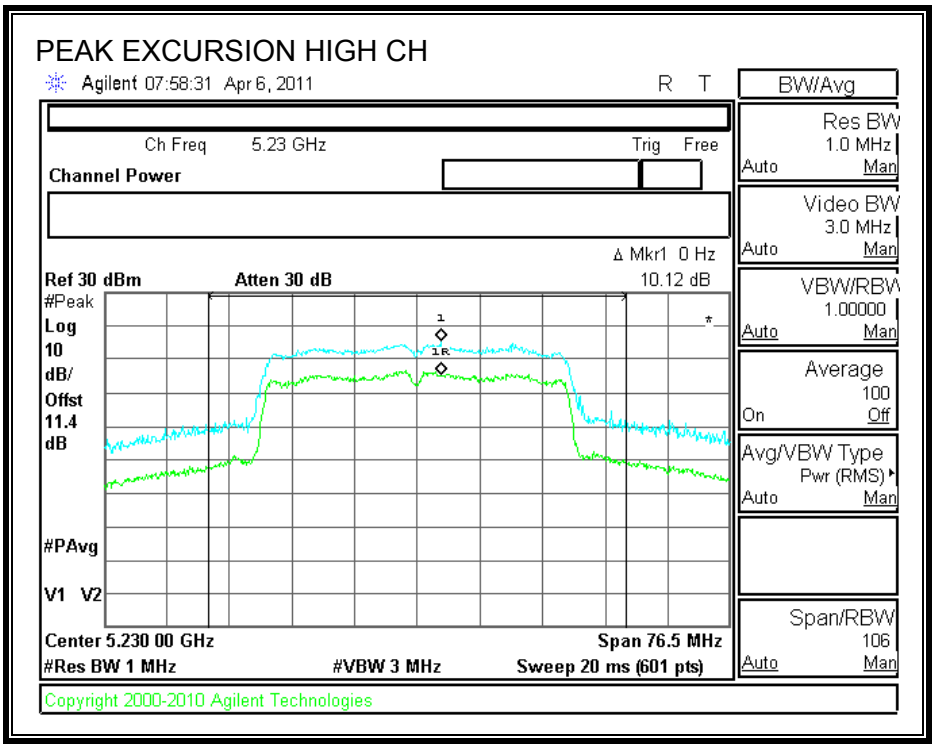
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	9.80	13	-3.20
High	5230	10.12	13	-2.88

PEAK EXCURSION





7.4.5. 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.

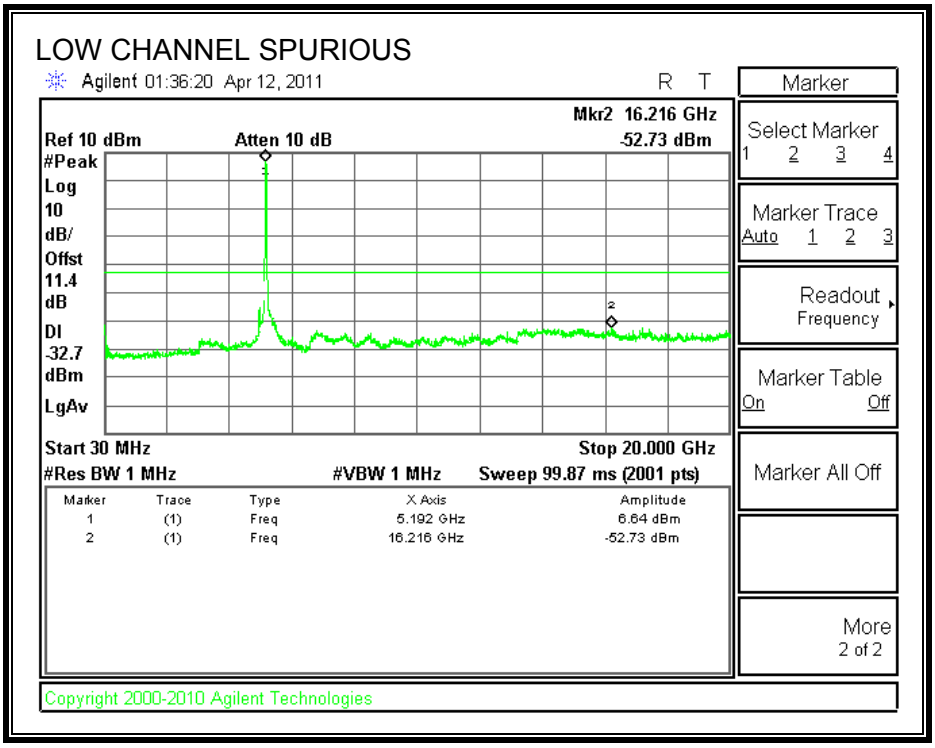
TEST PROCEDURE

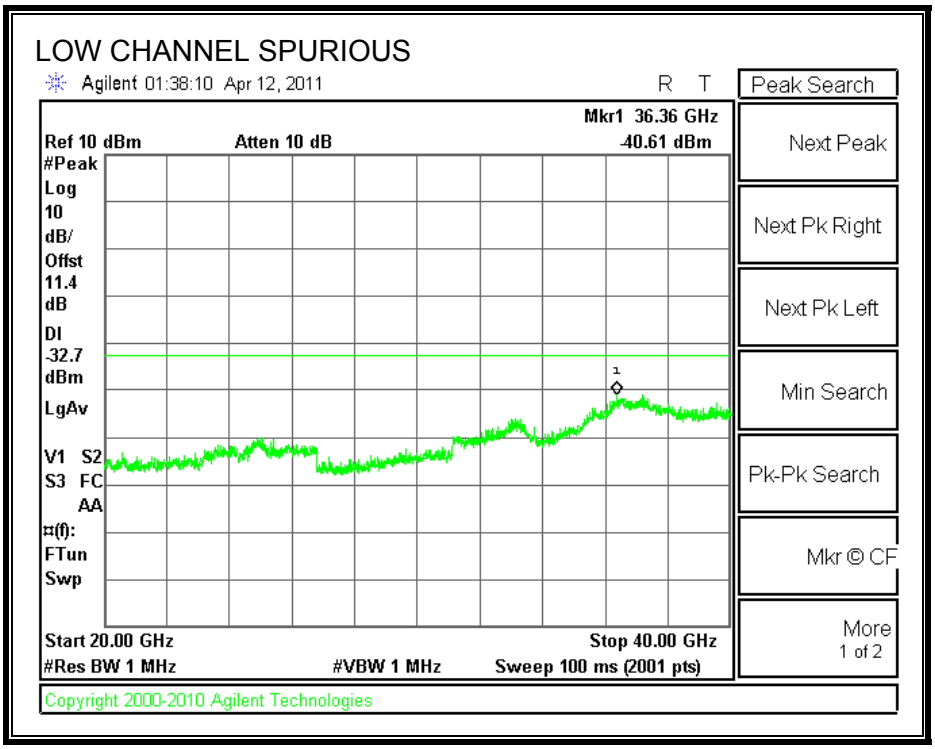
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

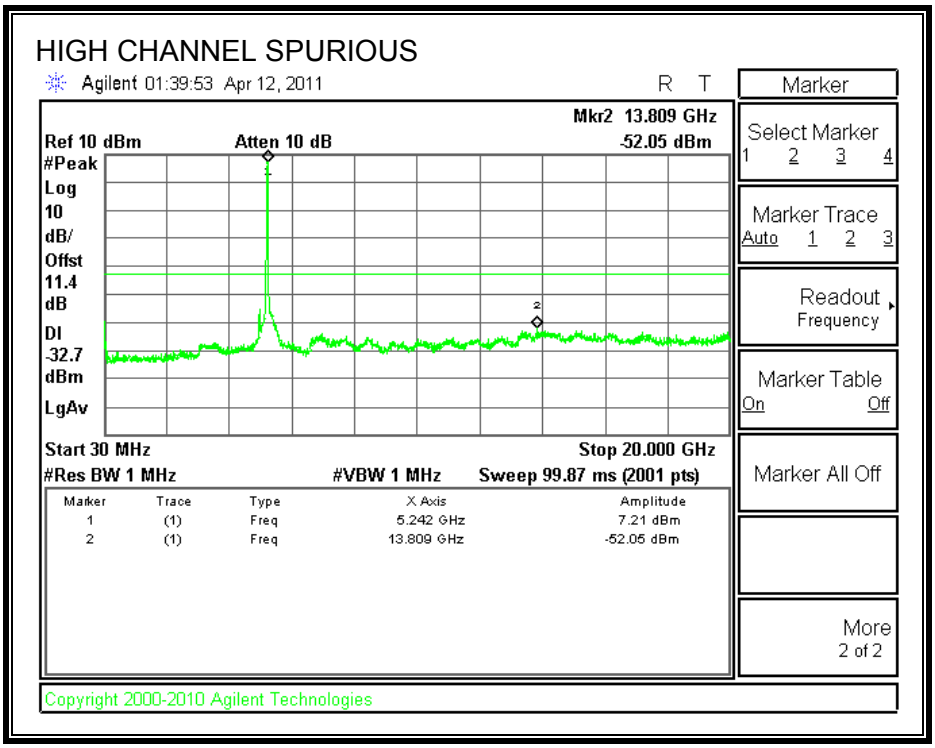
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

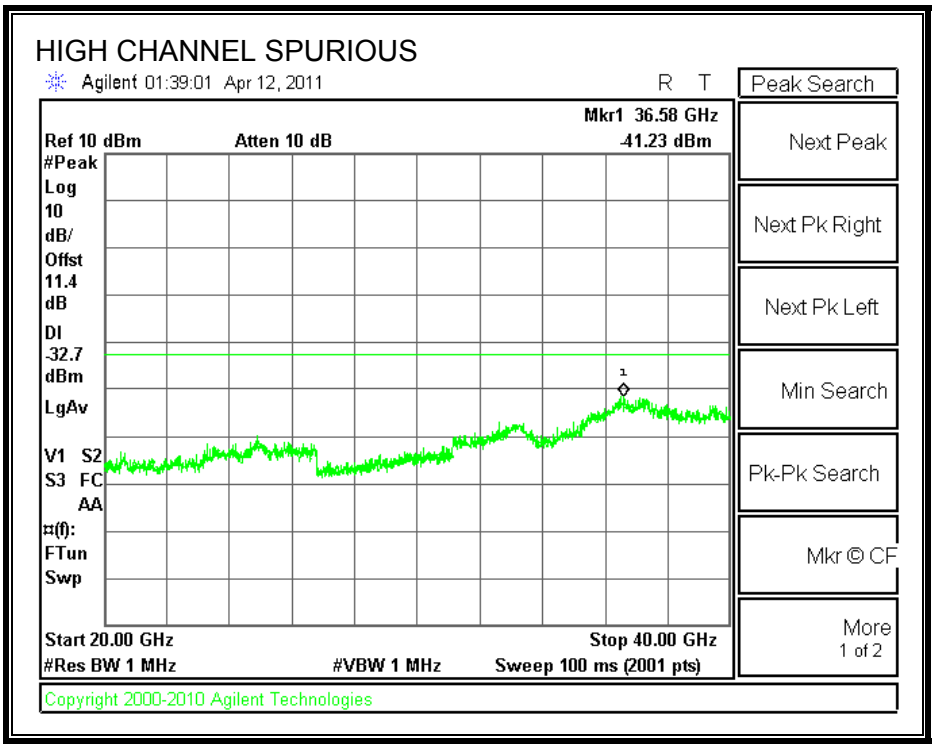
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS









7.5. 802.11n DUAL CHAIN HT40 MODE IN THE 5.2 GHz BAND

CDD MCS0

7.5.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

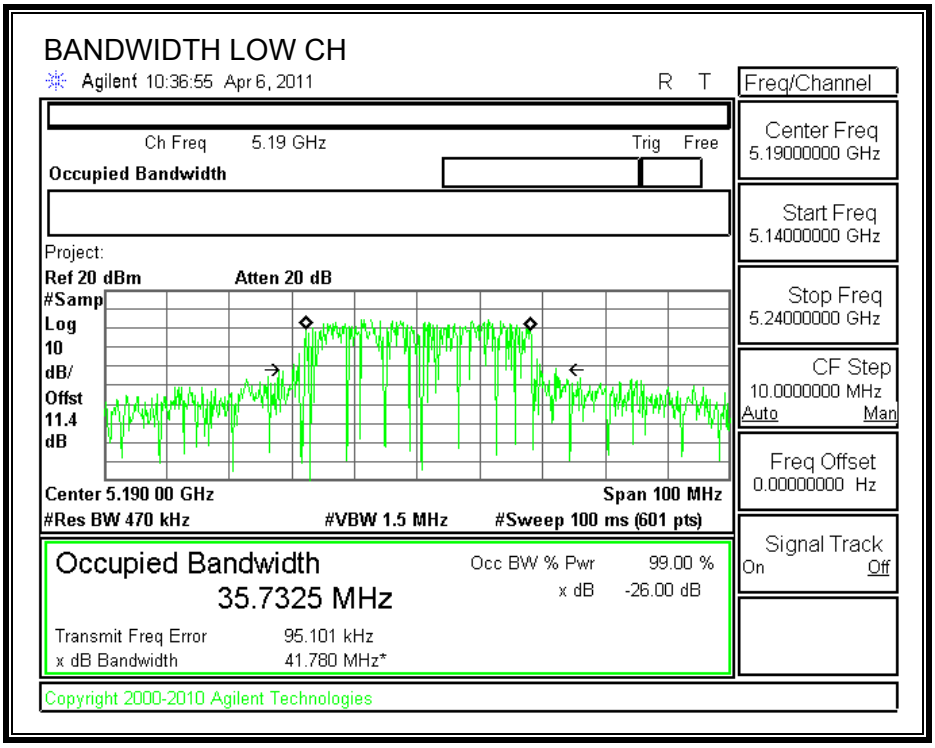
TEST PROCEDURE

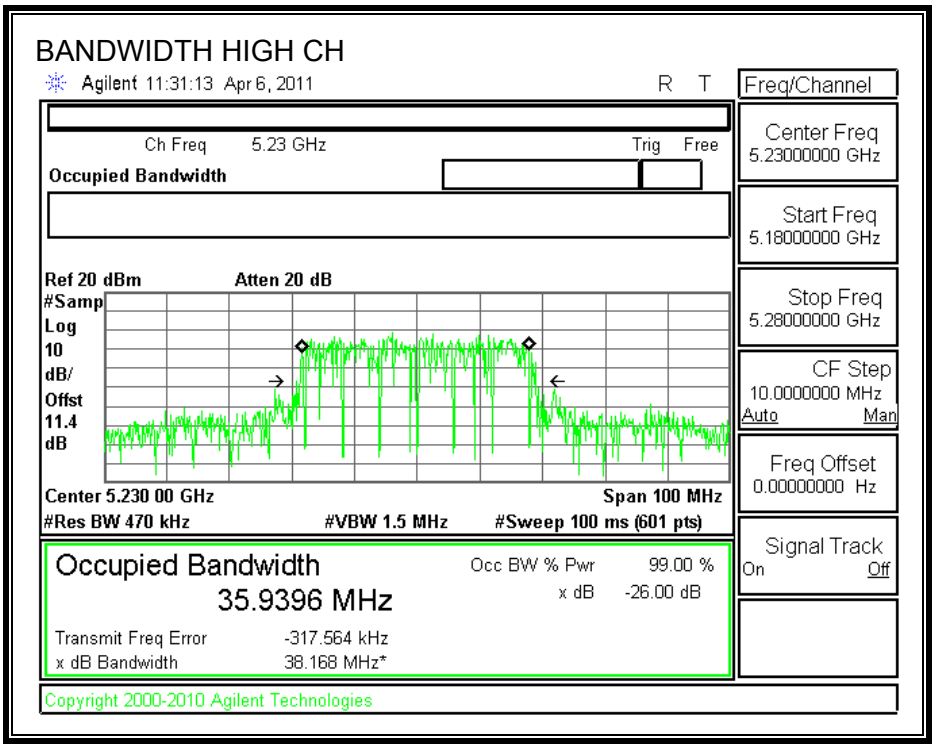
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	41.780	35.7325
High	5230	38.168	35.9396

26 dB and 99% BANDWIDTH





7.5.2. 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

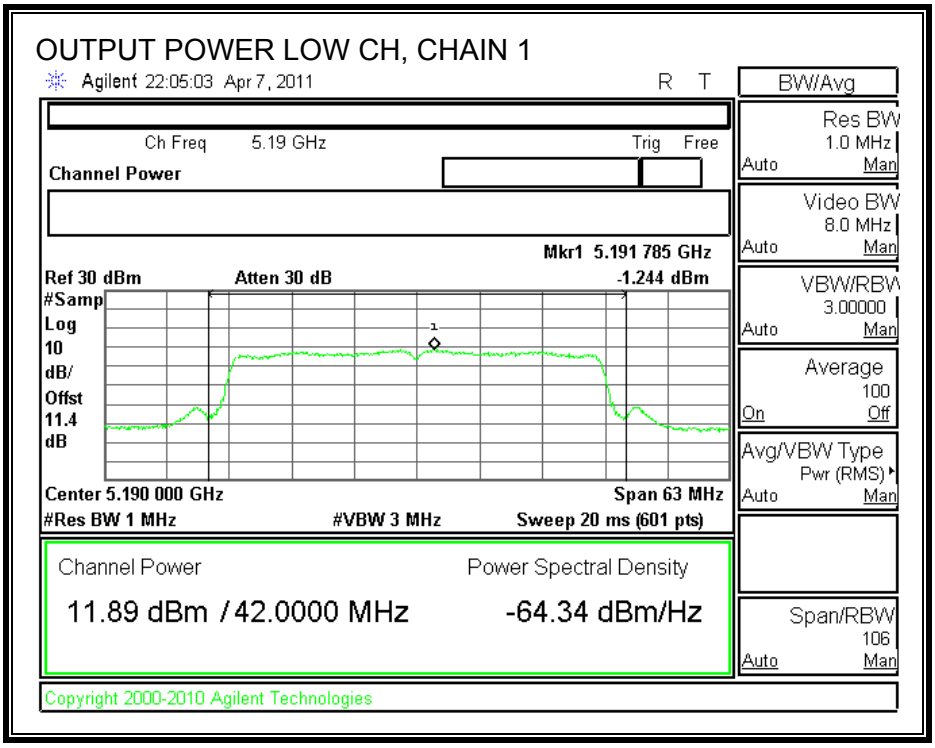
Limit

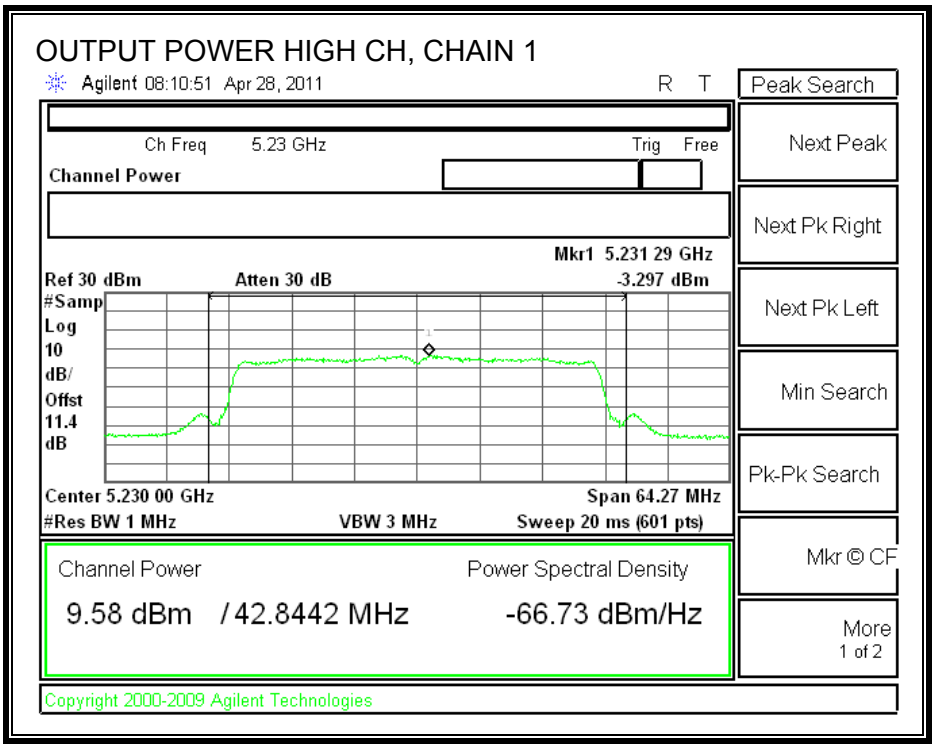
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	41.780	20.21	7.98	15.02
High	5230	17	38.168	19.82	7.98	15.02

Individual Chain Results

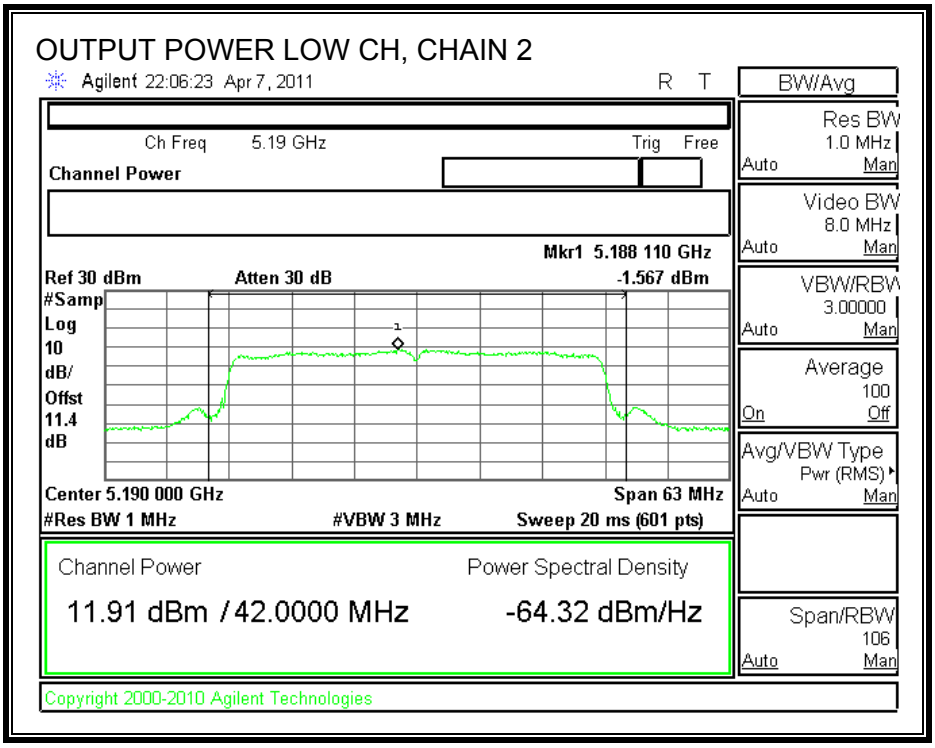
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	11.89	11.91	14.91	15.02	-0.11
High	5230	9.58	12.88	14.55	15.02	-0.47

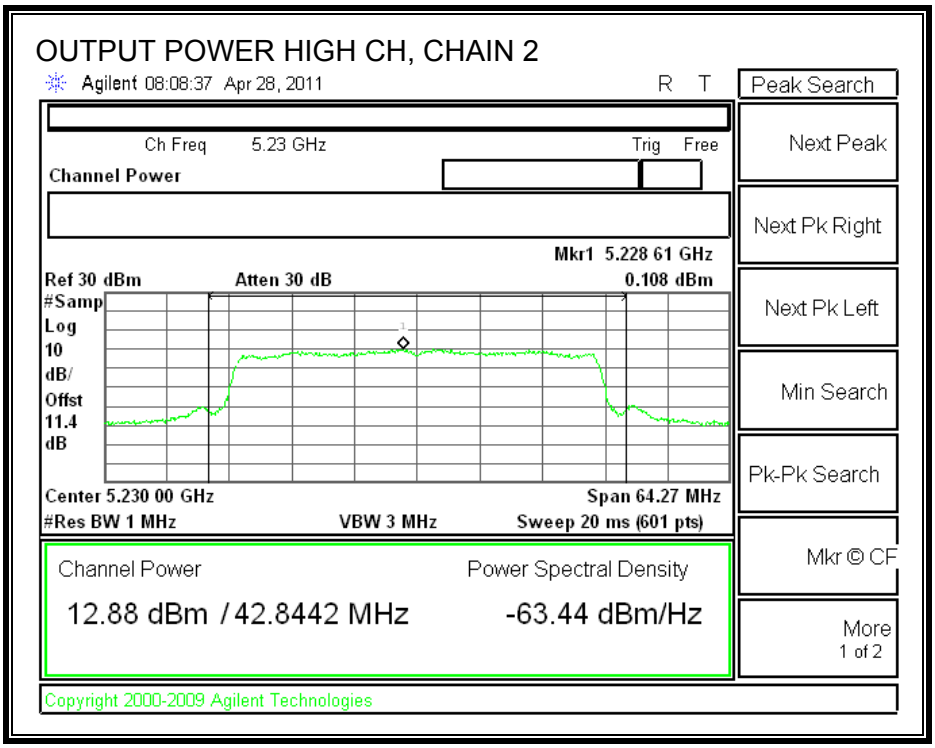
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.5.3. 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 effective antenna gain is 7.98 dBi, therefore the limit is 2.02 dBm.

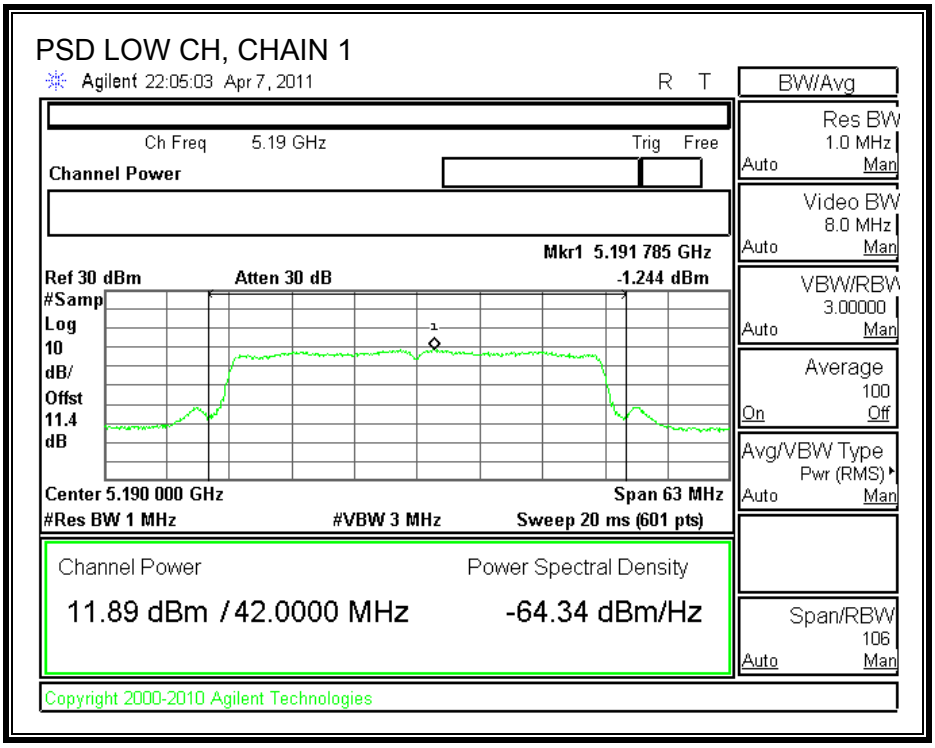
TEST PROCEDURE

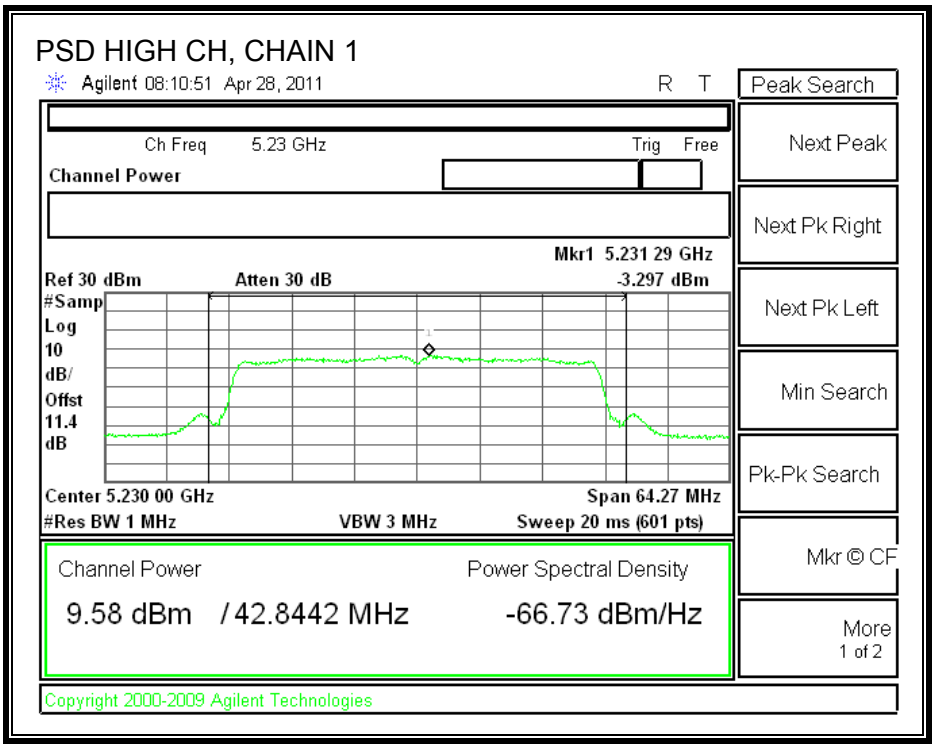
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

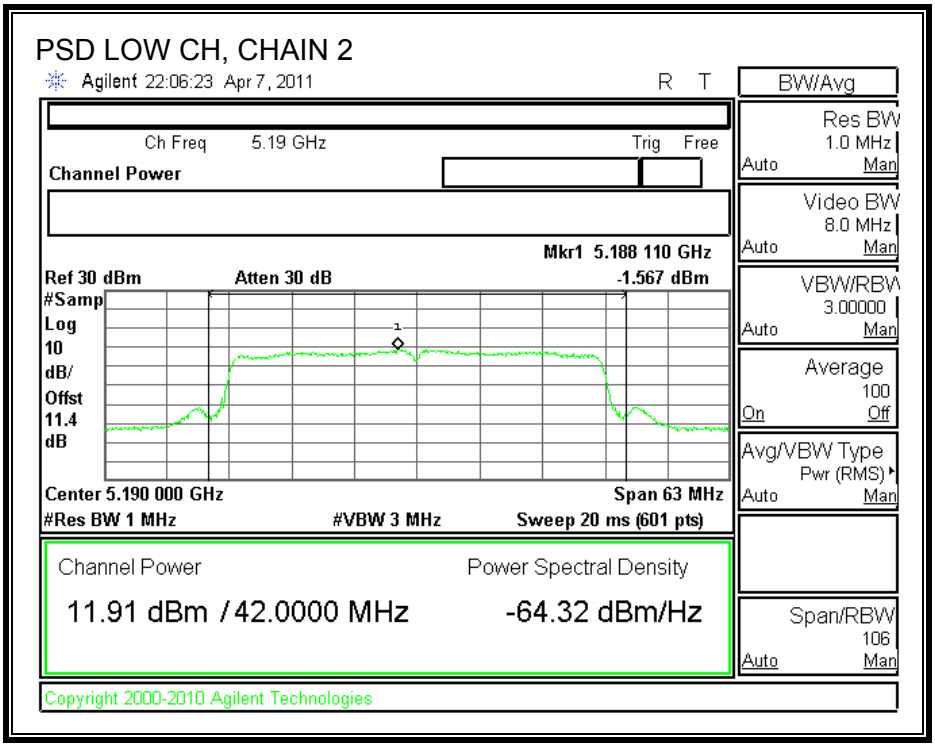
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-1.244	-1.567	1.61	2	-0.41
High	5230	-3.297	0.108	1.74	2	-0.28

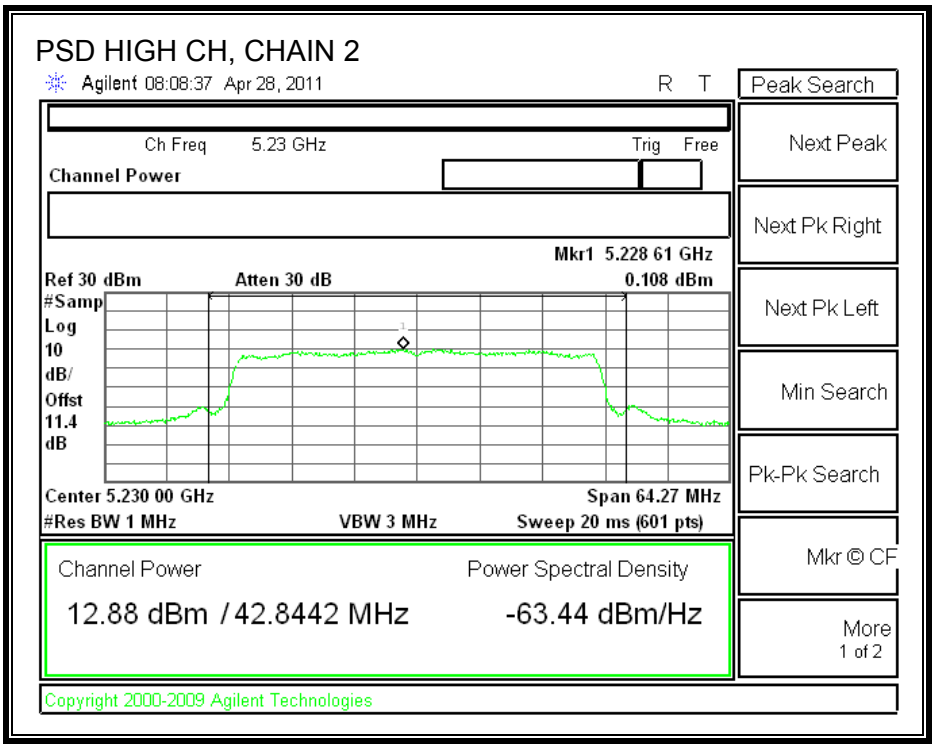
CHAIN 1 POWER SPECTRAL DENSITY





CHAIN 2 POWER SPECTRAL DENSITY





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.

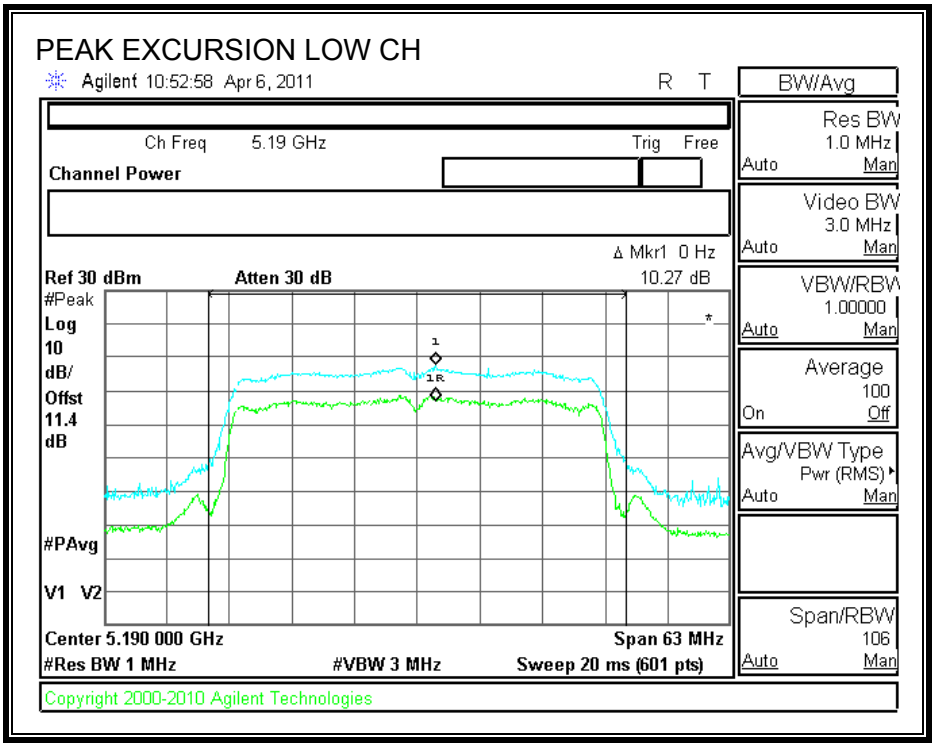
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

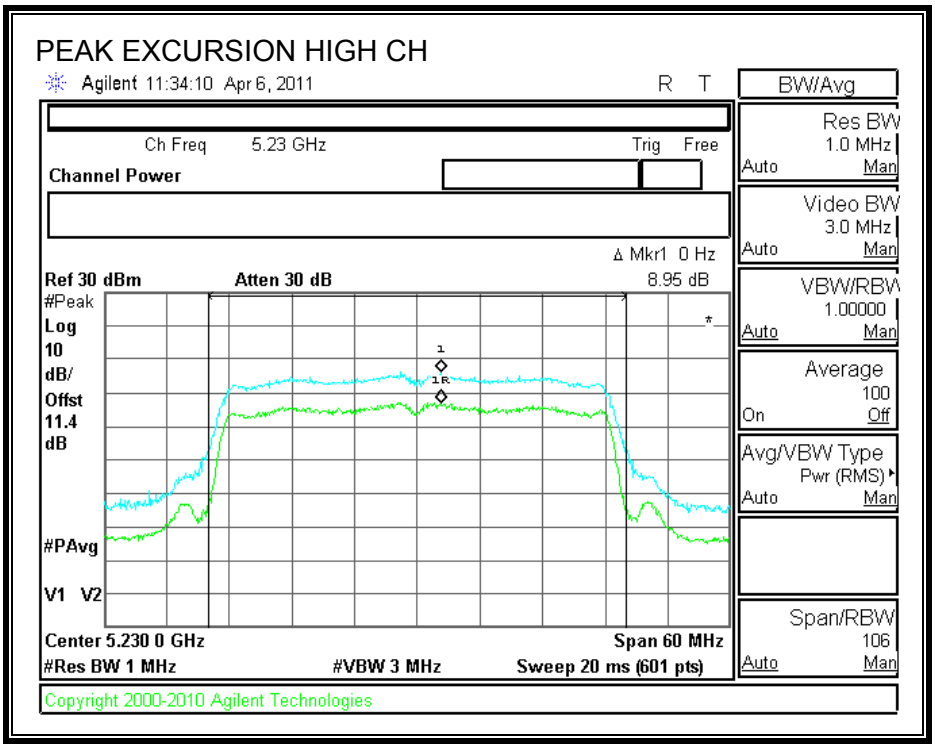
RESULTS

CHAIN 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.27	13	-2.73
High	5230	8.95	13	-4.05

PEAK EXCURSION





7.5.5. CONDUCTED SPURIOUS EMISSIONS

Covered by H40 3x3 CDD MCS0 testing.

STBC MCS0

7.5.6. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

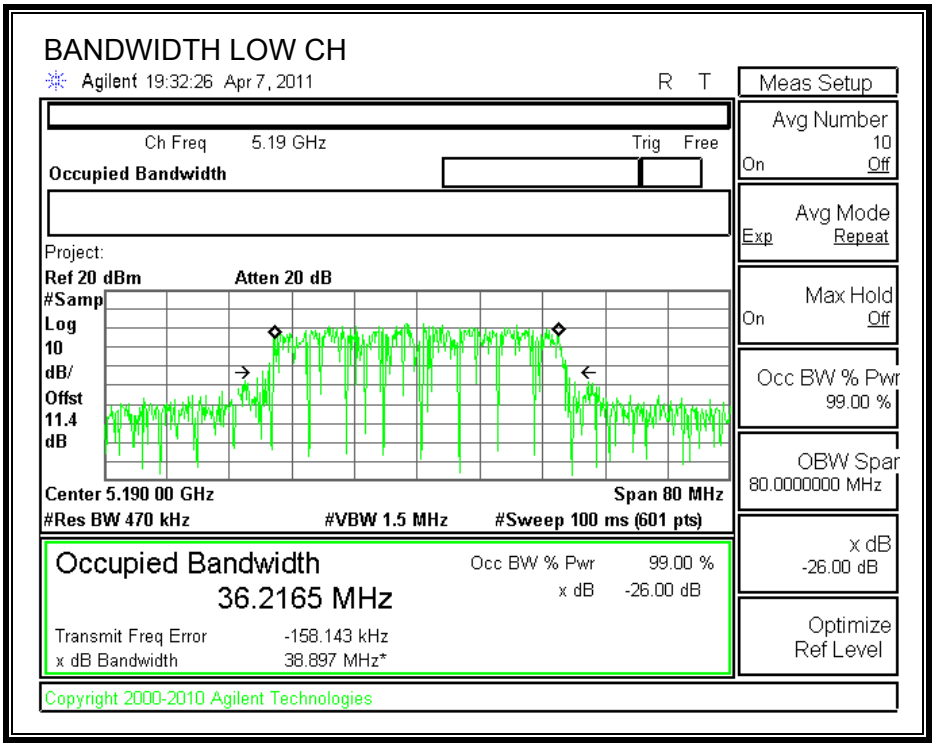
TEST PROCEDURE

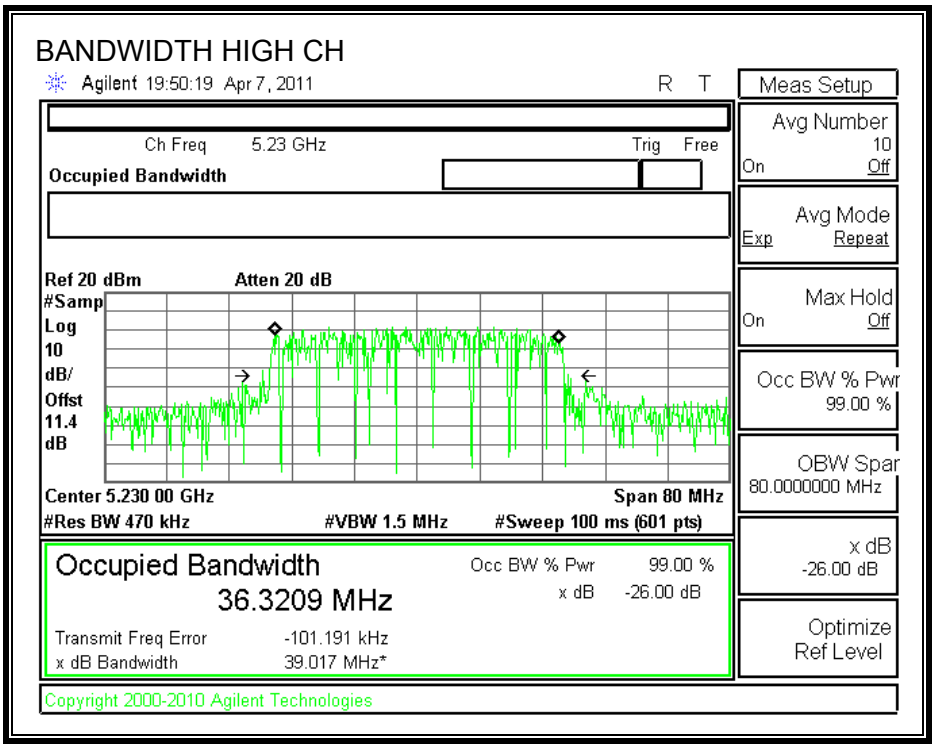
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	38.897	36.2165
High	5230	39.017	36.3209

26 dB and 99% BANDWIDTH





7.5.7. 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

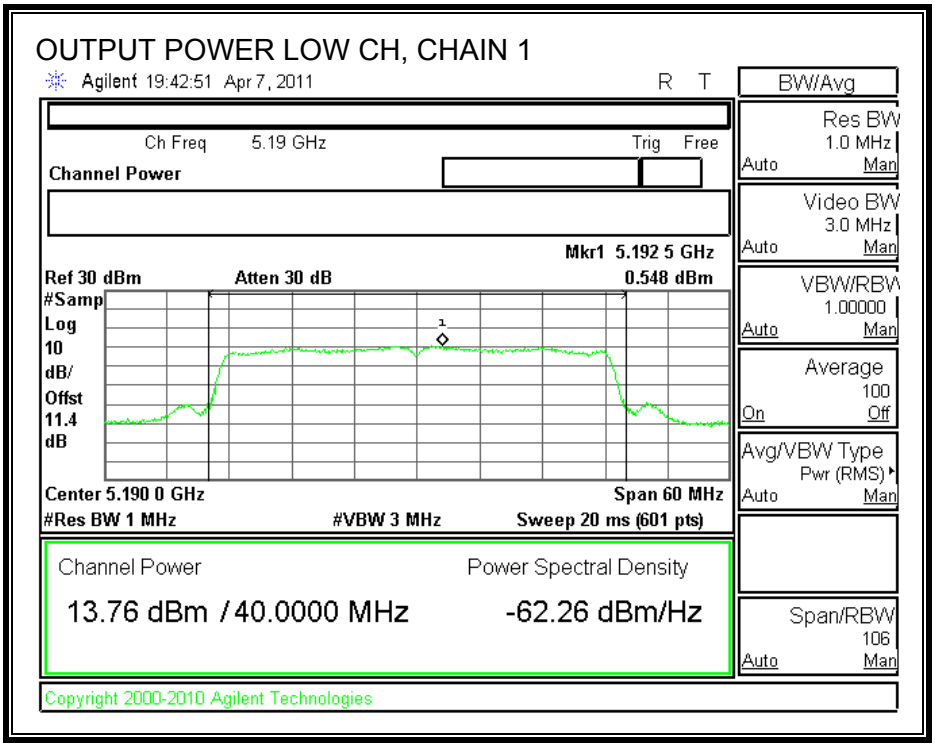
Limit

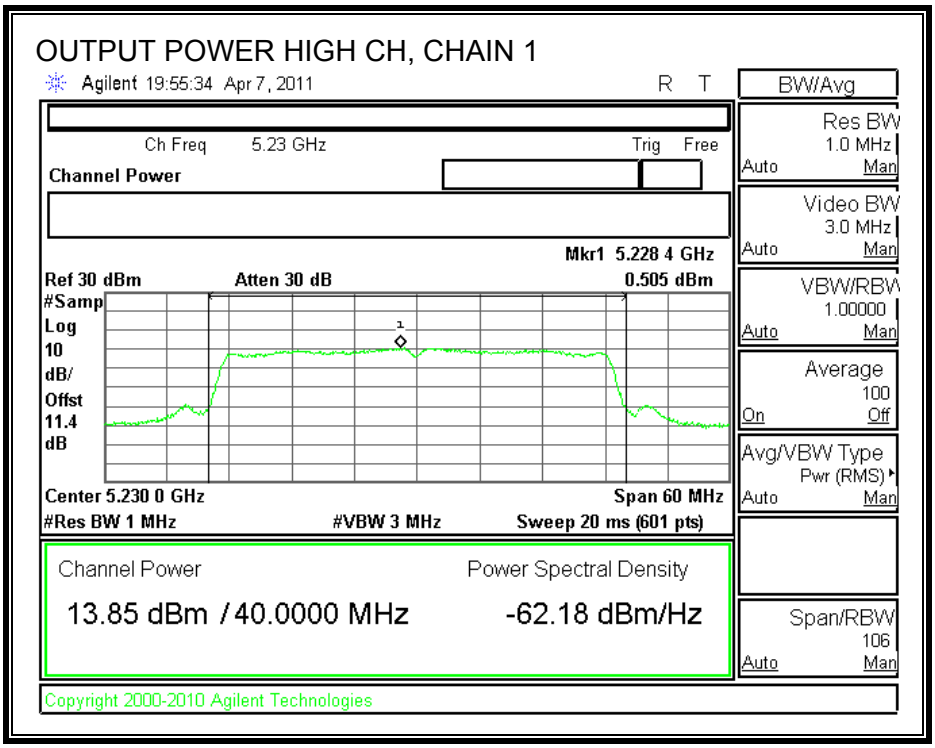
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	38.897	19.90	5.65	17.00
High	5230	17	39.017	19.91	5.65	17.00

Individual Chain Results

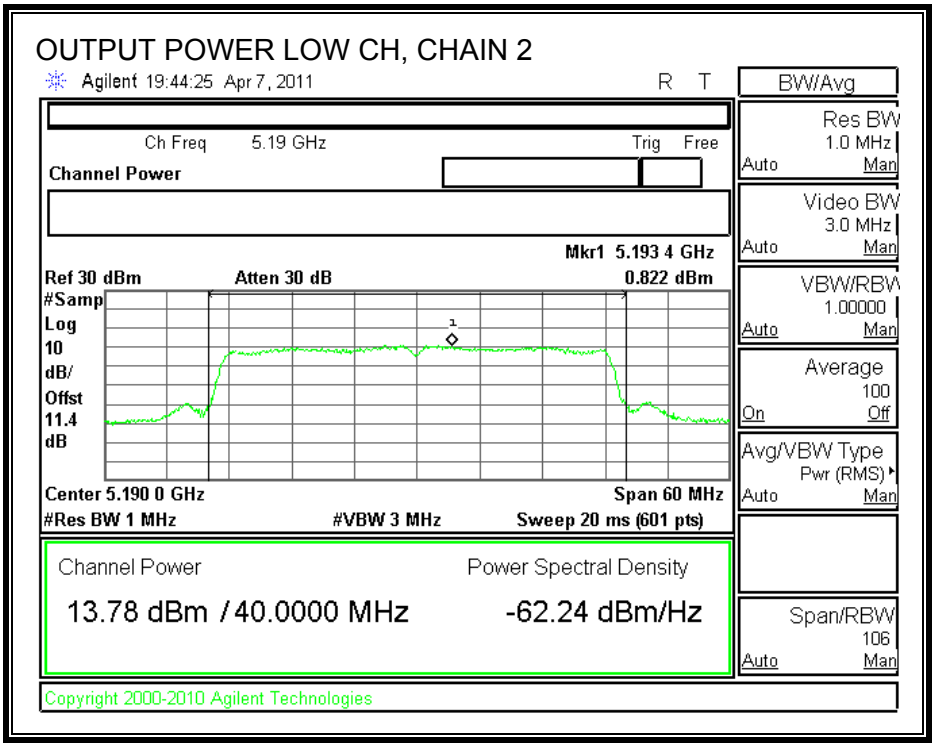
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	13.76	13.78	16.78	17.00	-0.22
High	5230	13.85	13.81	16.84	17.00	-0.16

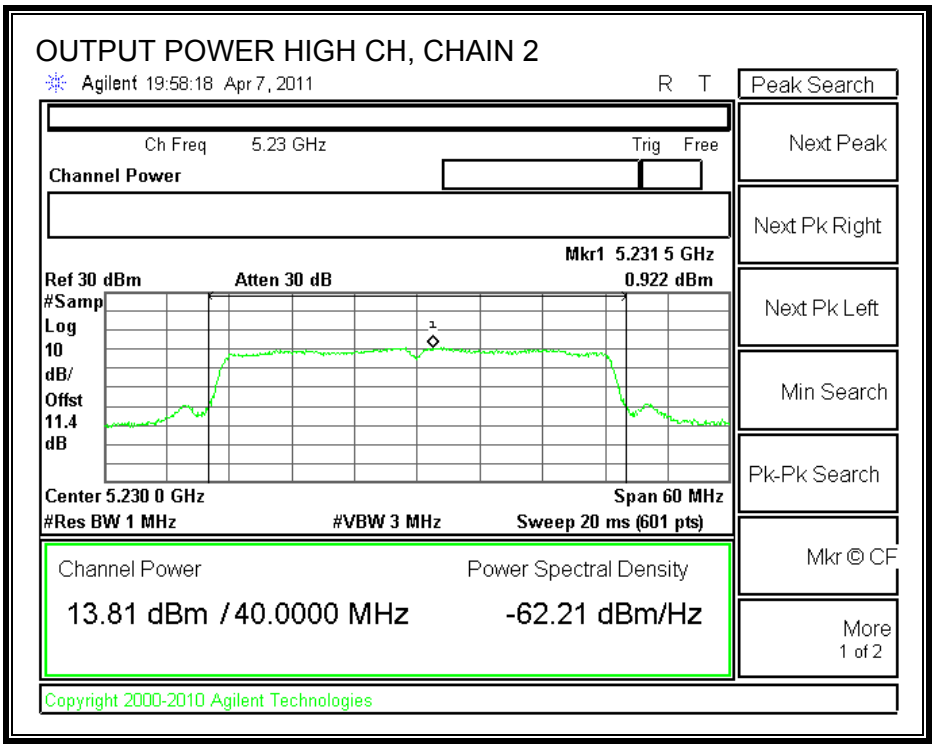
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.5.8. 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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

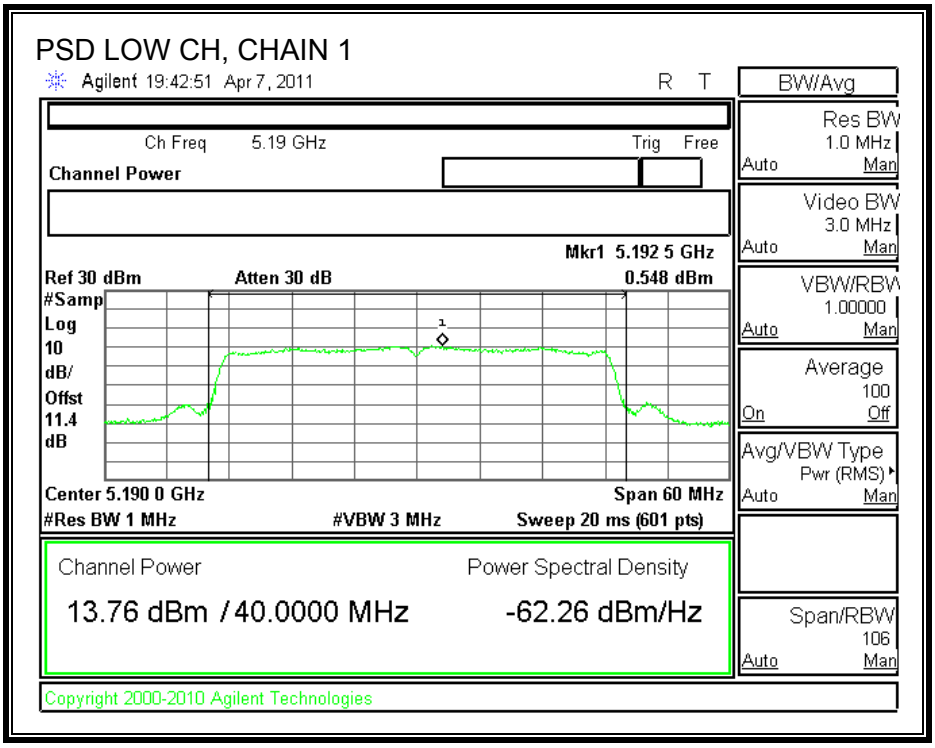
TEST PROCEDURE

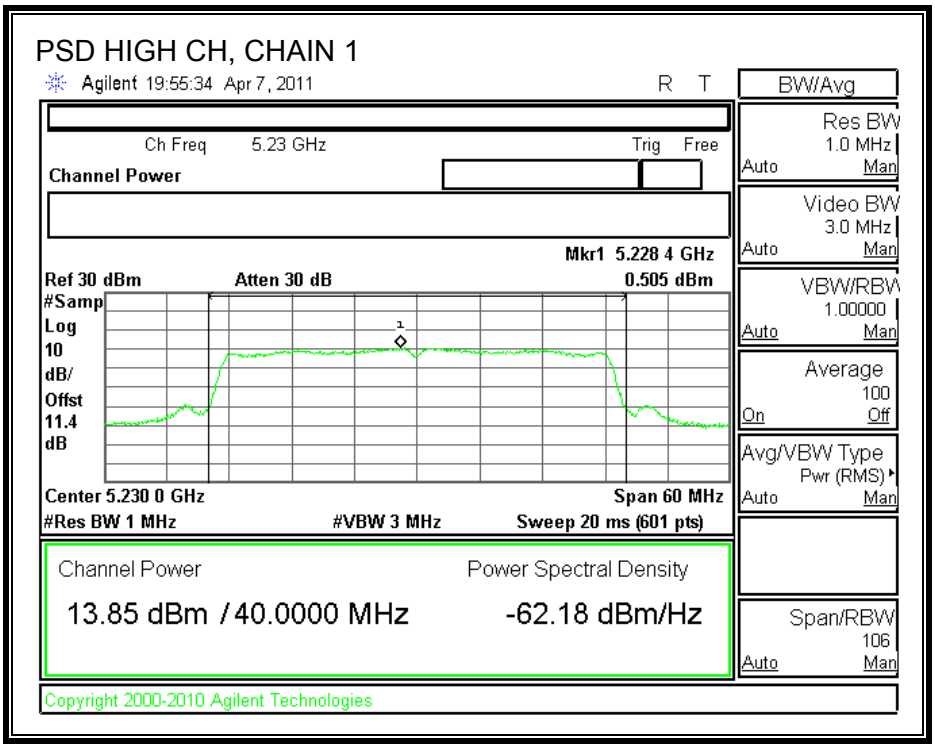
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

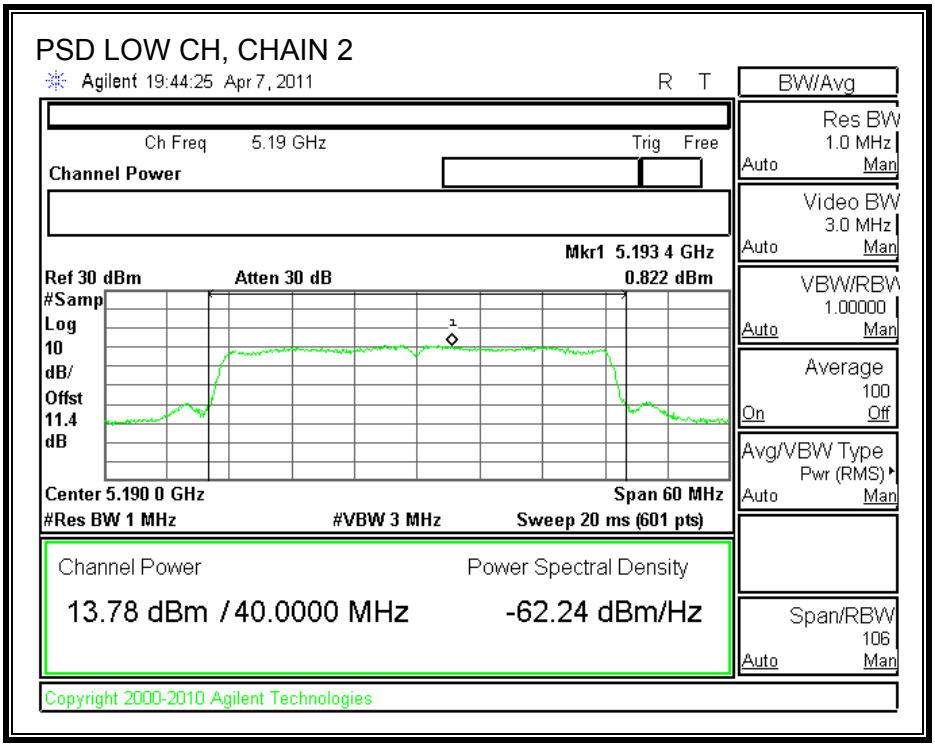
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	0.548	0.822	3.70	4	-0.30
High	5230	0.505	0.922	3.73	4	-0.27

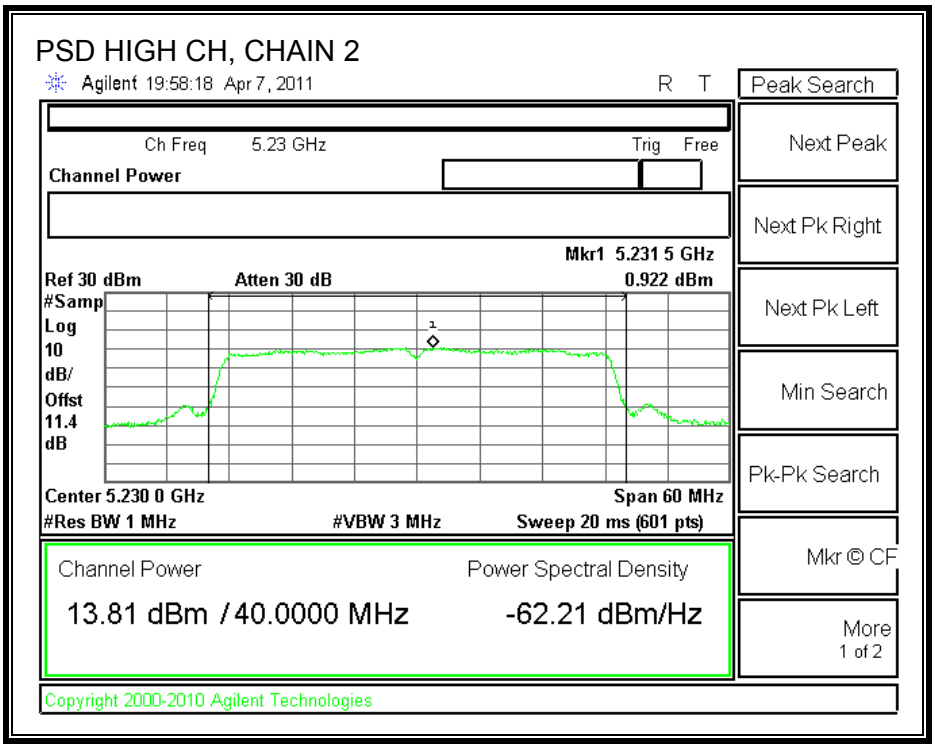
CHAIN 1 POWER SPECTRAL DENSITY





CHAIN 2 POWER SPECTRAL DENSITY





7.5.9. 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.

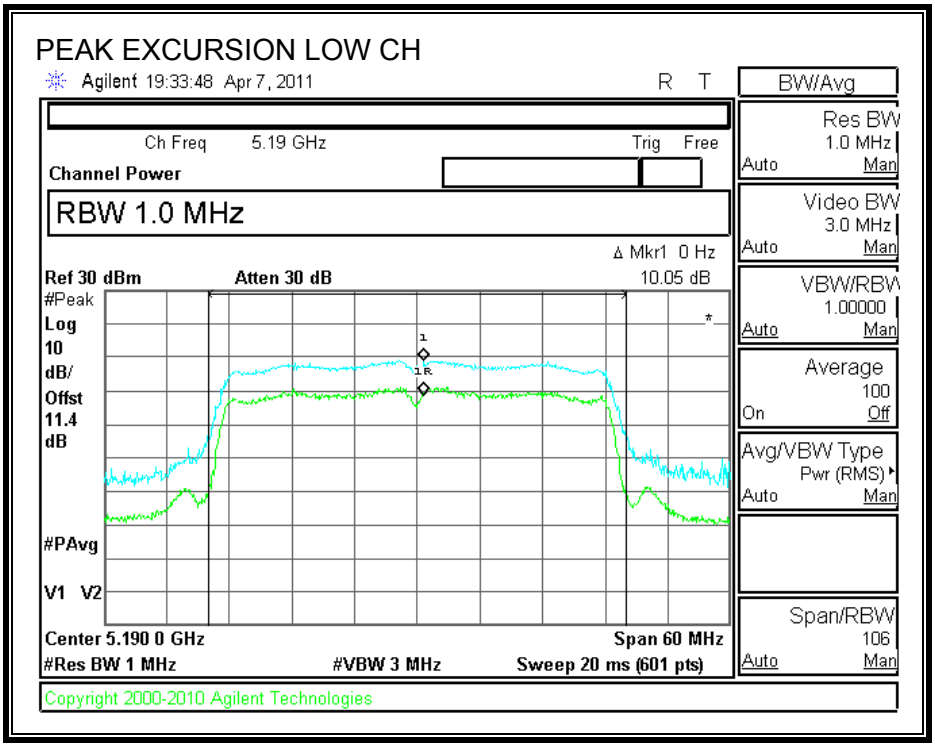
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

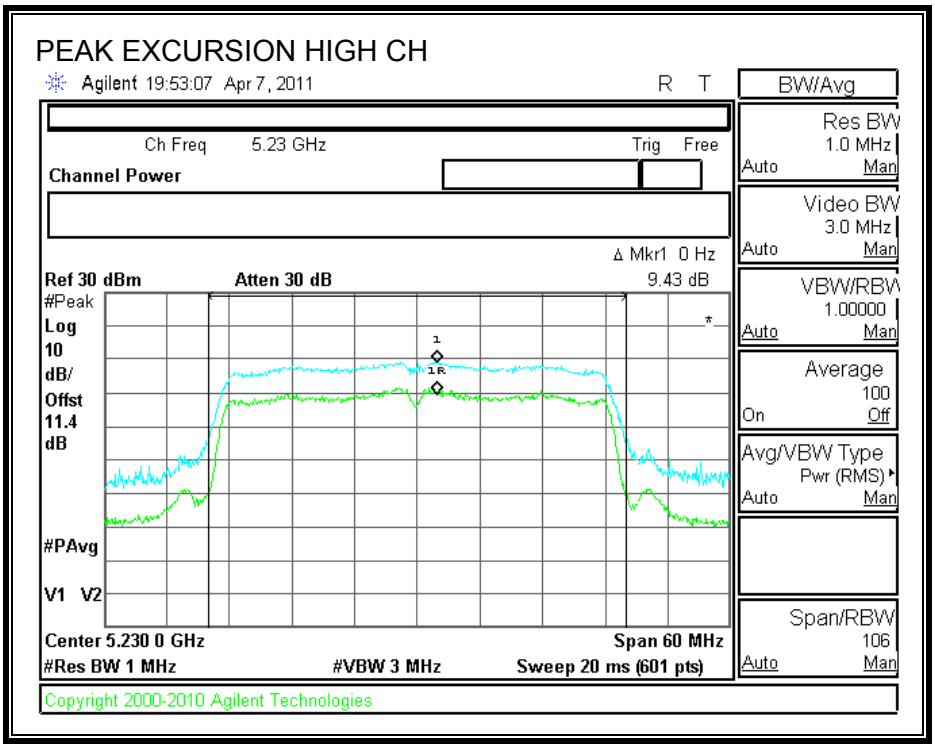
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.05	13	-2.95
High	5230	9.43	13	-3.57

PEAK EXCURSION





7.5.10. CONDUCTED SPURIOUS EMISSIONS

Covered by H40 3x3 CDD MCS0 testing.

7.6. 802.11n THREE CHAINS HT40 MODE IN THE LOWER 5.2 GHz BAND

CDD MCS0:

This mode is not implemented in the 5.2 GHz band and will be disabled in production devices.

This mode is tested for harmonic / spurious emissions @ 18dBm average power per chain at worst case mode / power to cover all 1x3 & 2x2 modes.

7.6.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.40 dB (including 10 dB pad and 1.40 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)
Low	5190	15.47	15.87	15.49	20.39
High	5230	18.14	18.21	12.11	21.69

7.6.2. 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.

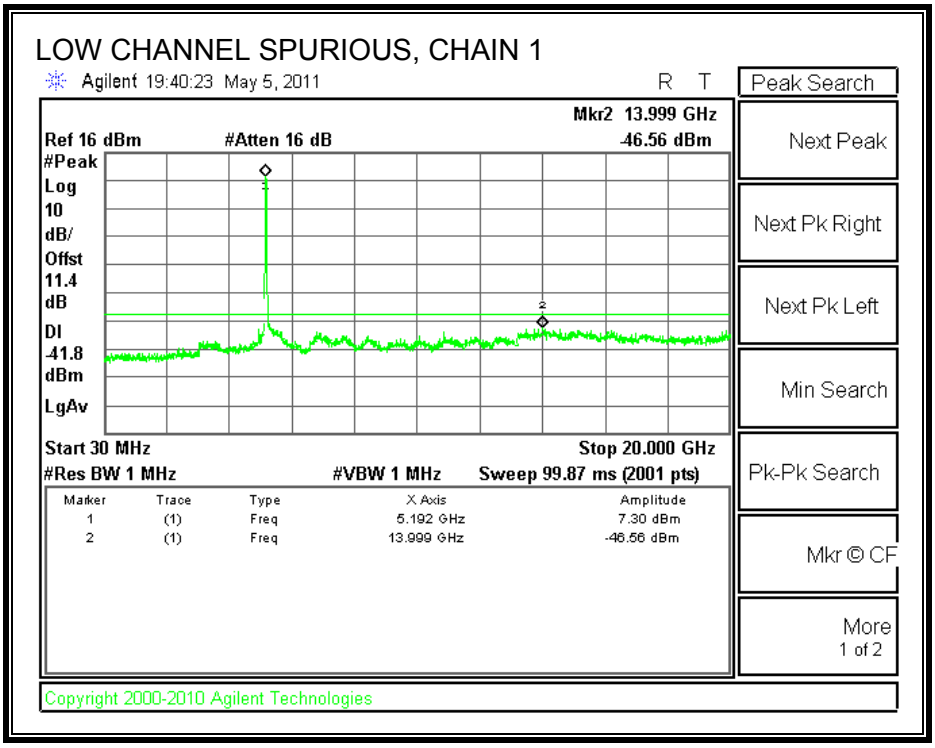
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

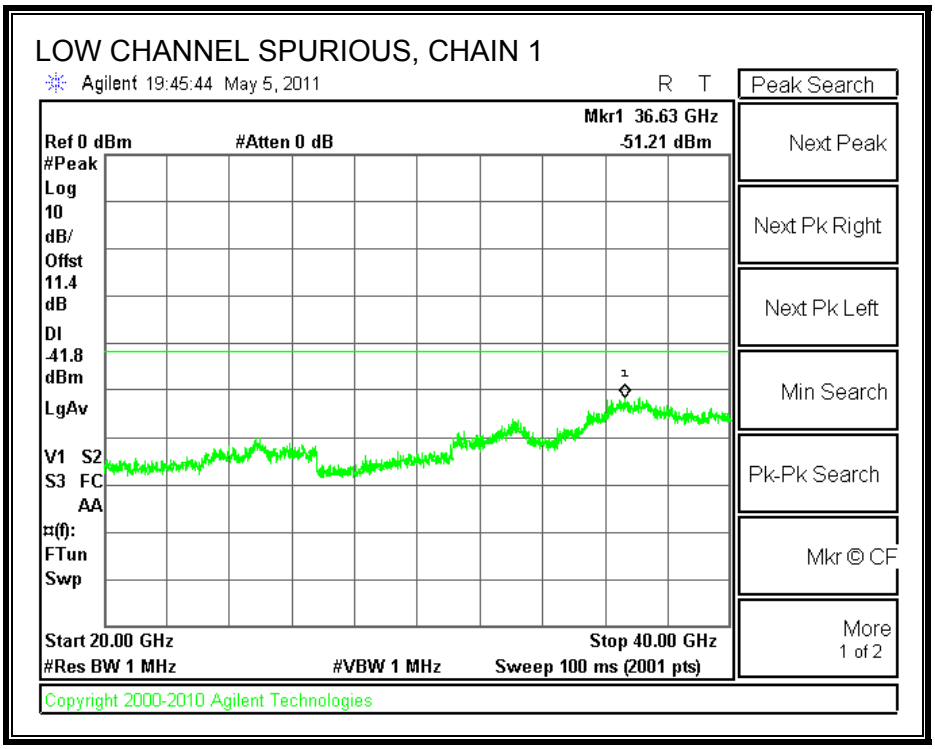
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

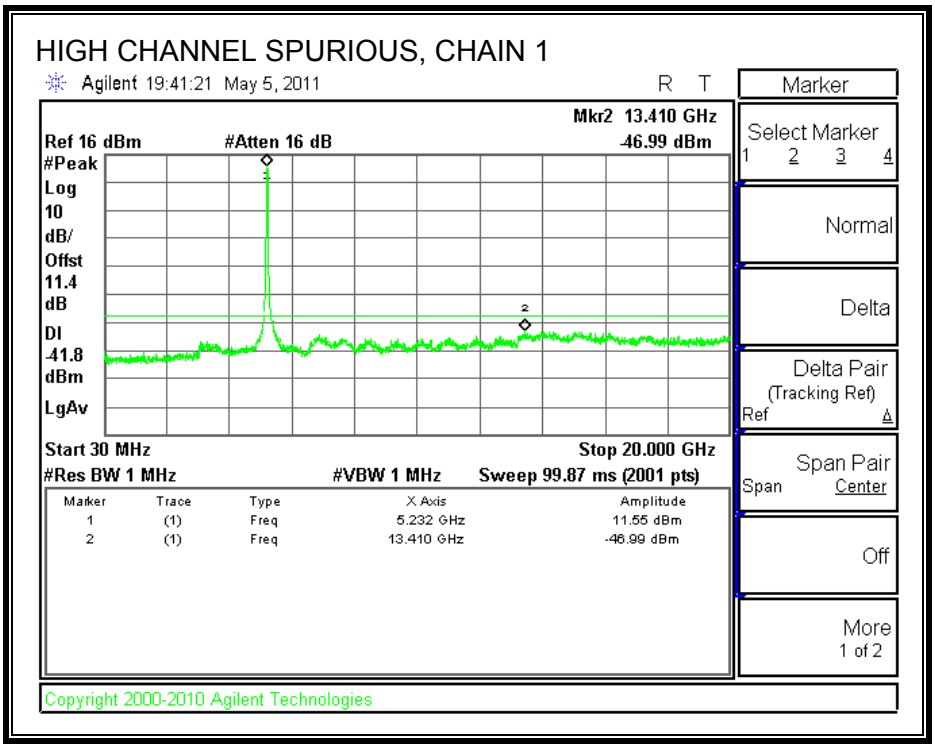
RESULTS

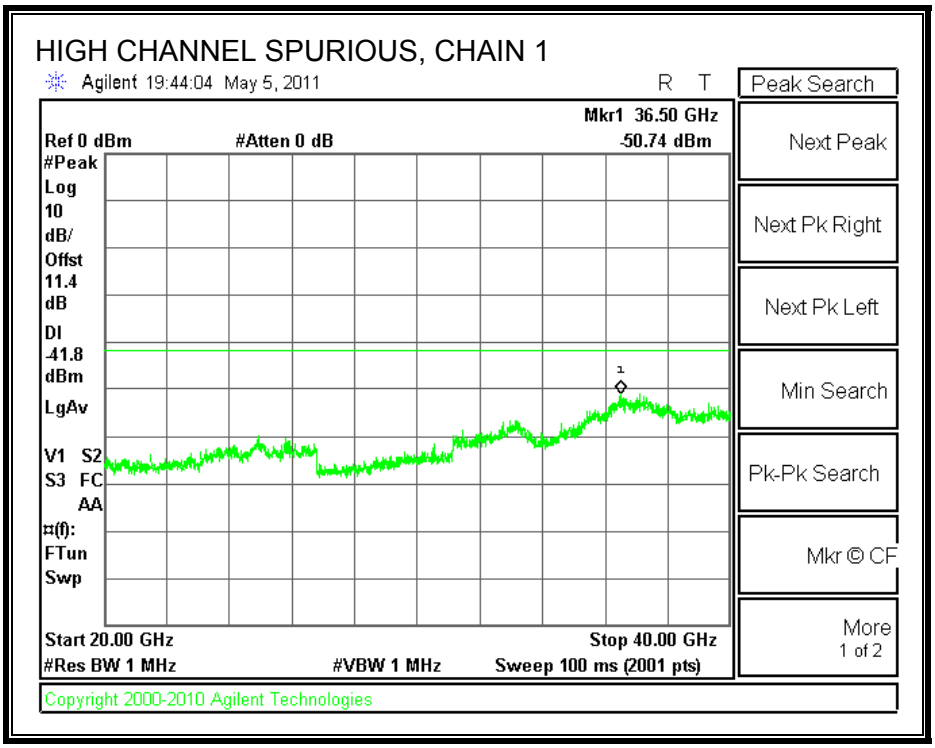
Limit = -27 dBm + Antenna Gain + 10log (N) dB

CHAIN 1 SPURIOUS EMISSIONS

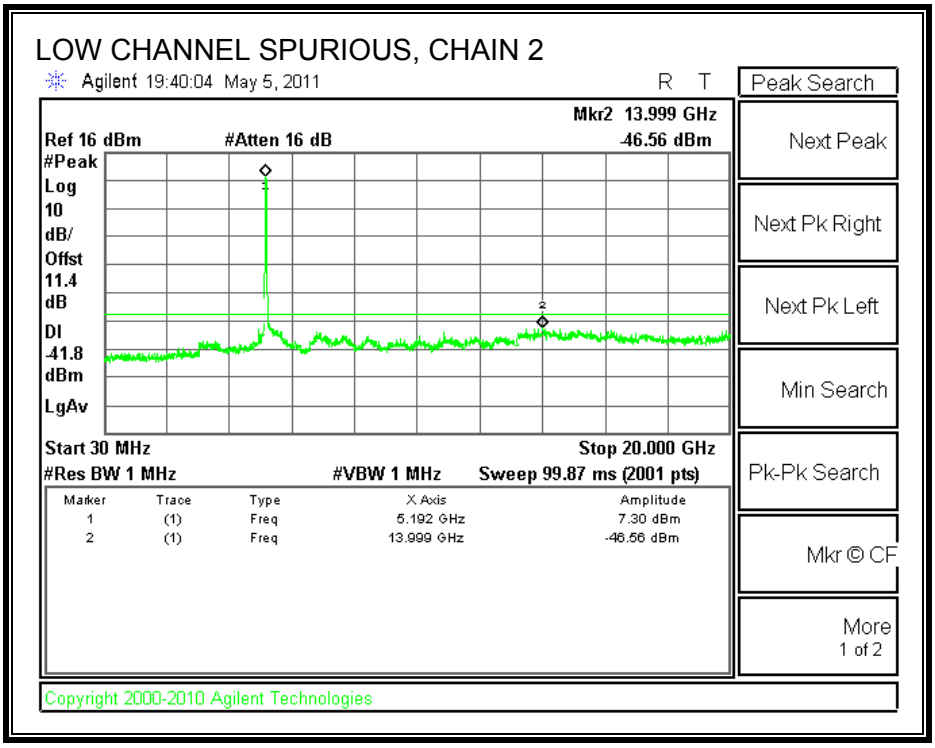


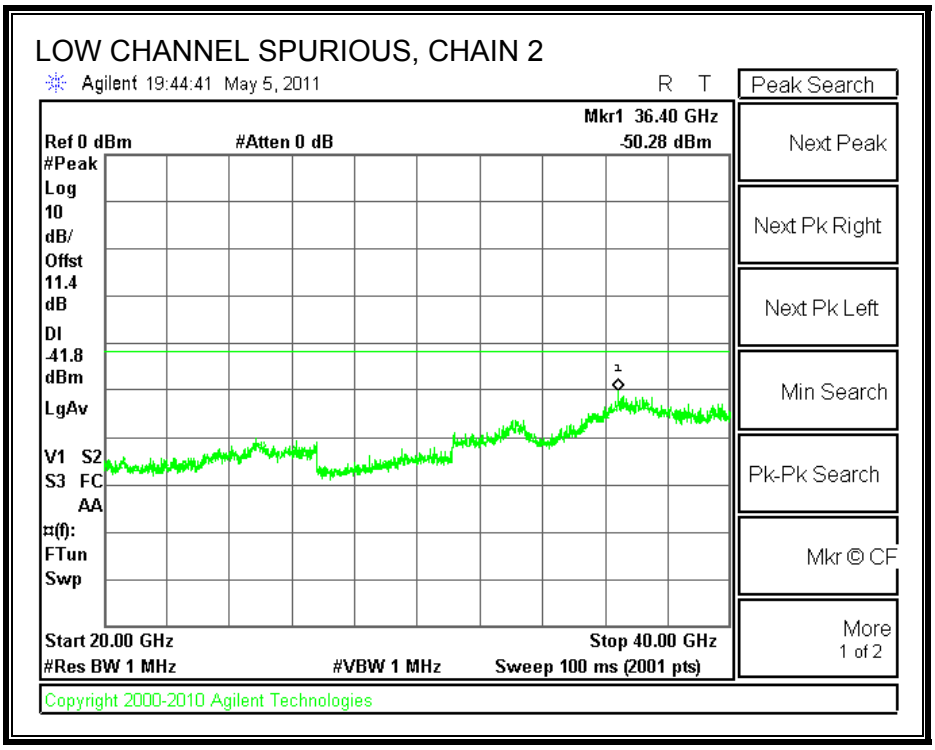


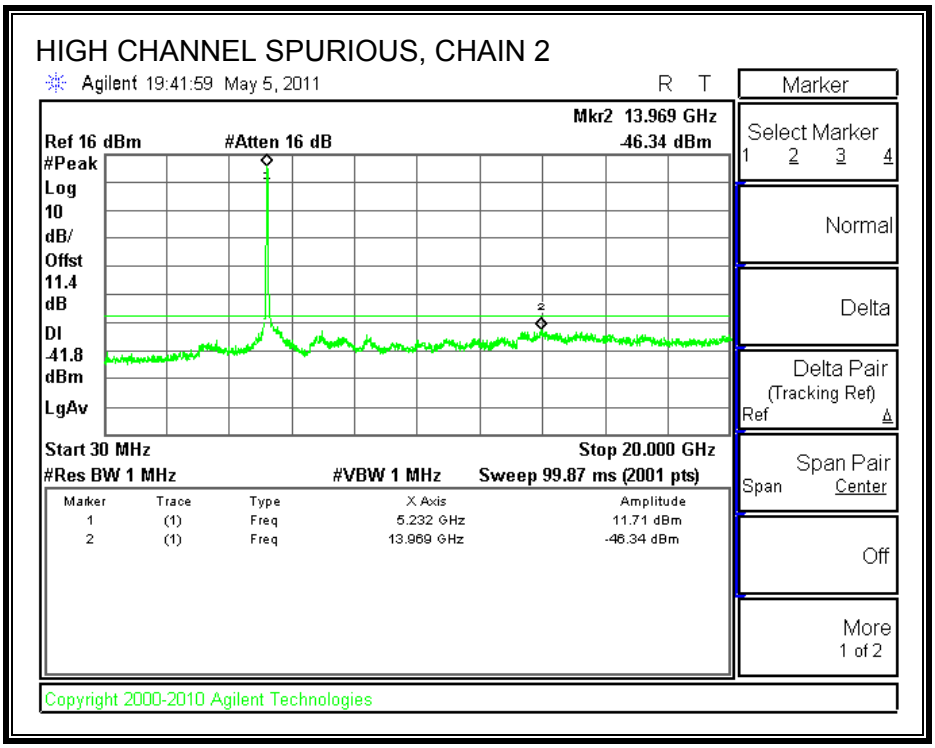


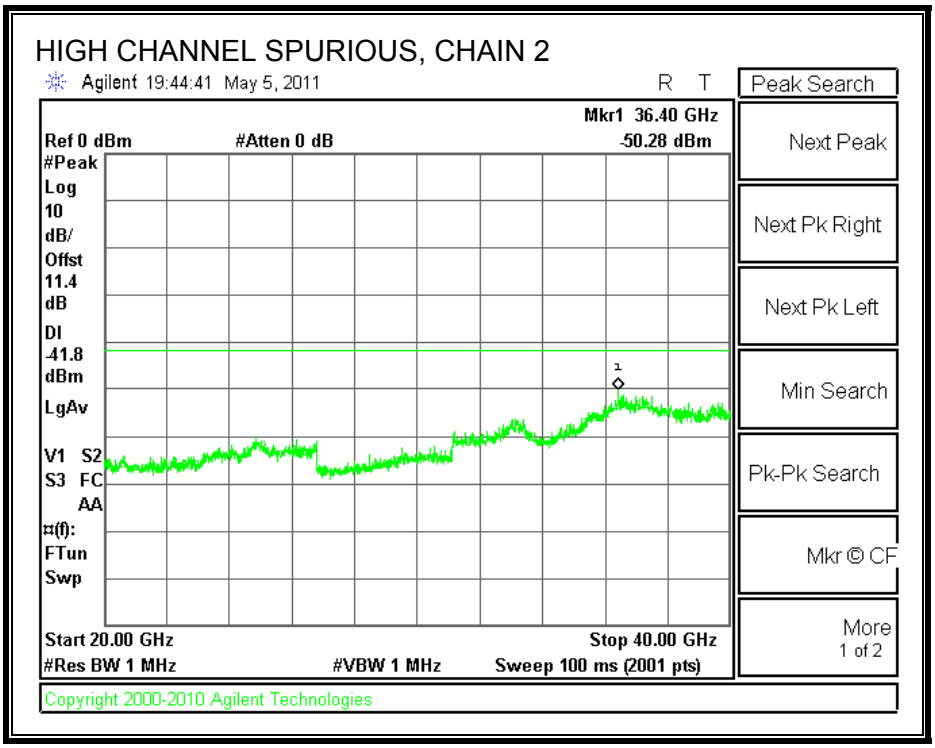


CHAIN 2 SPURIOUS EMISSIONS

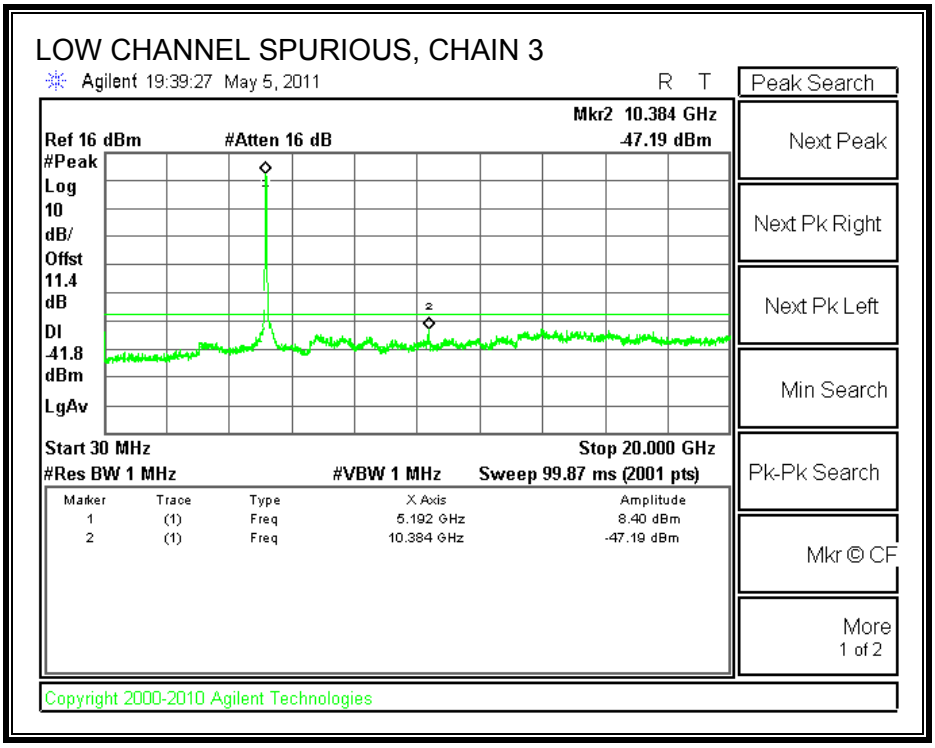


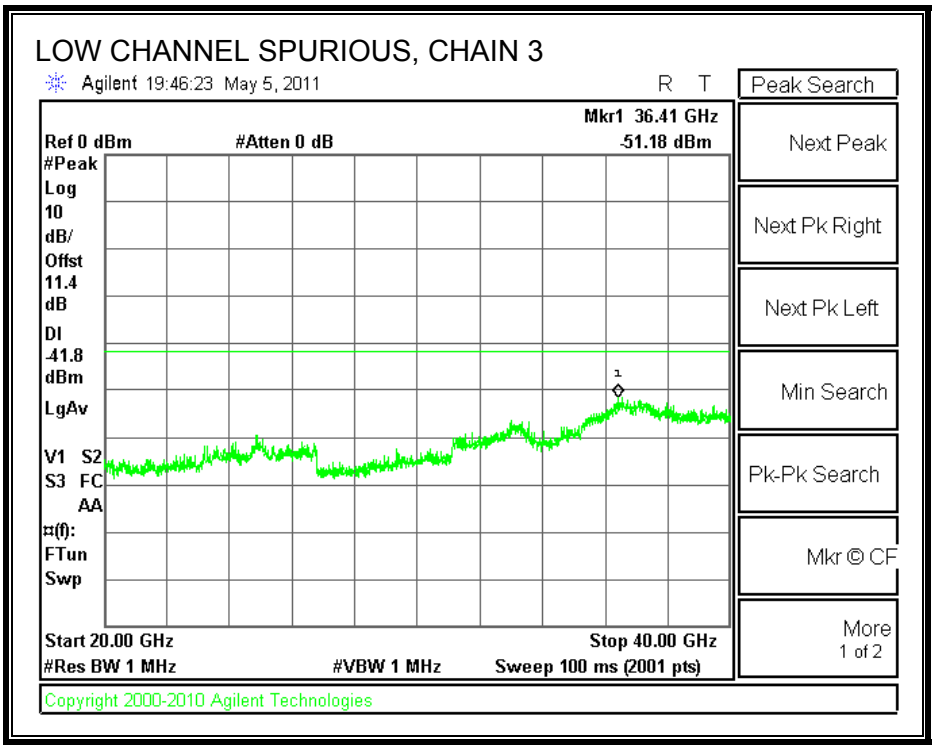


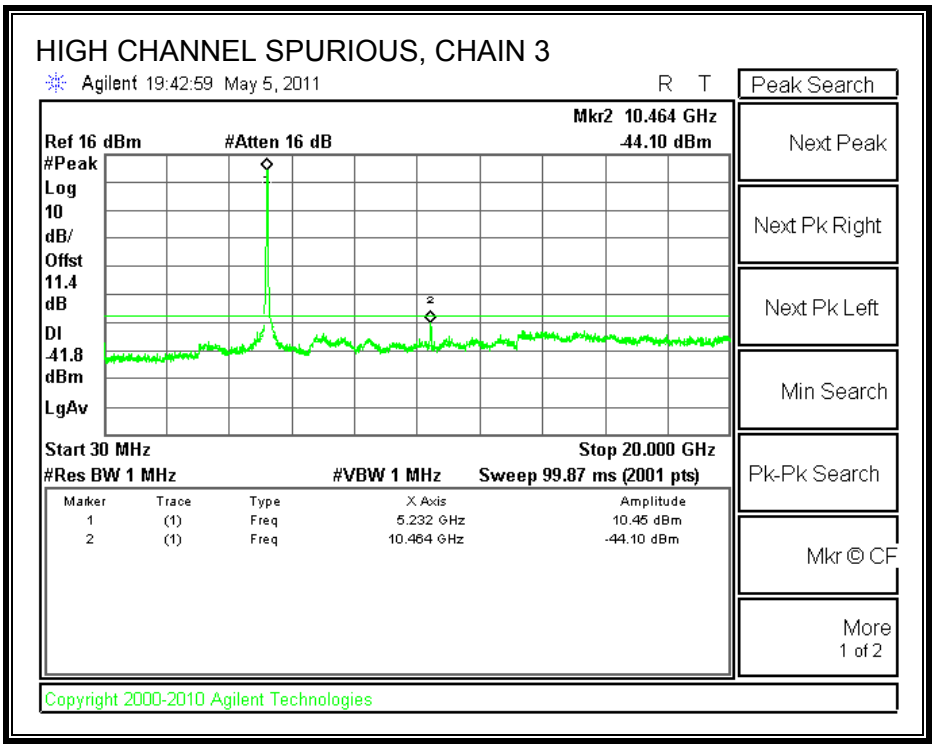


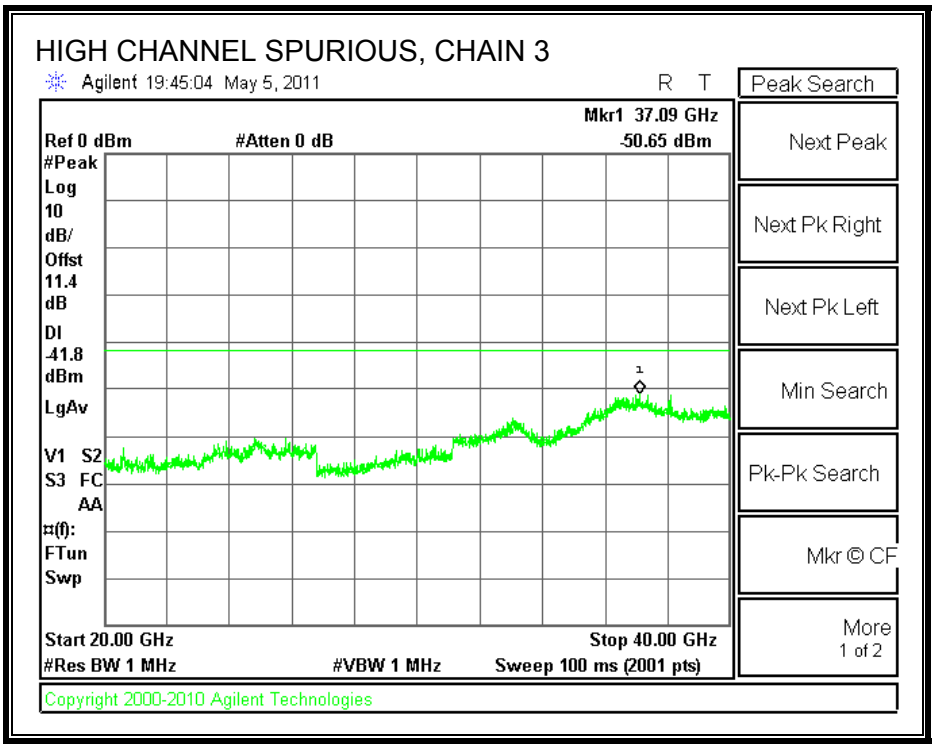


CHAIN 3 SPURIOUS EMISSIONS









STBC MCS0

7.6.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

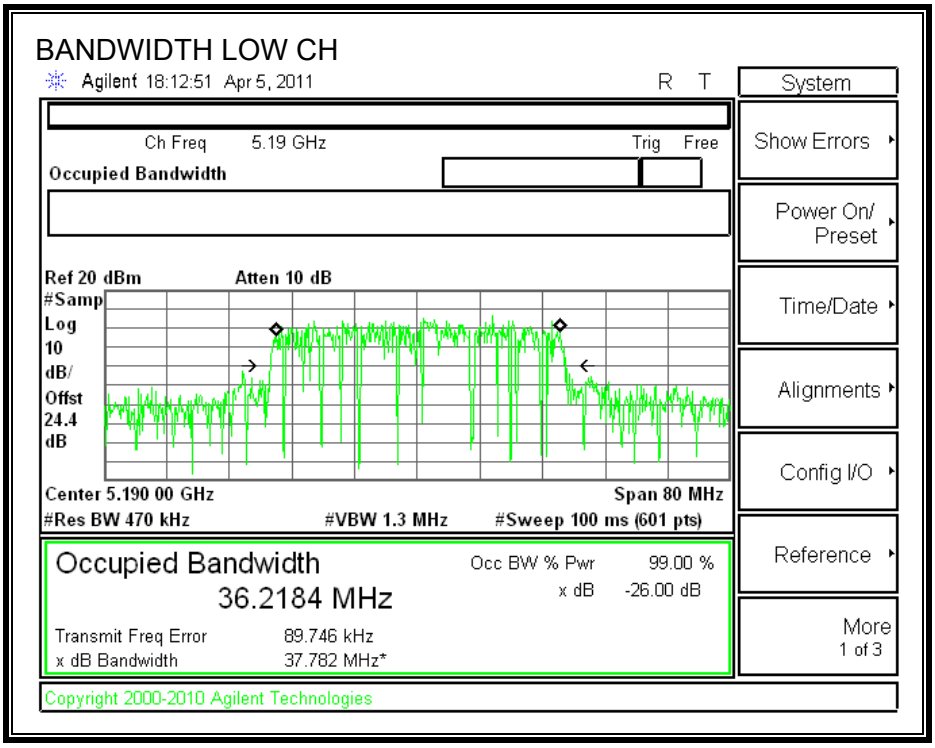
TEST PROCEDURE

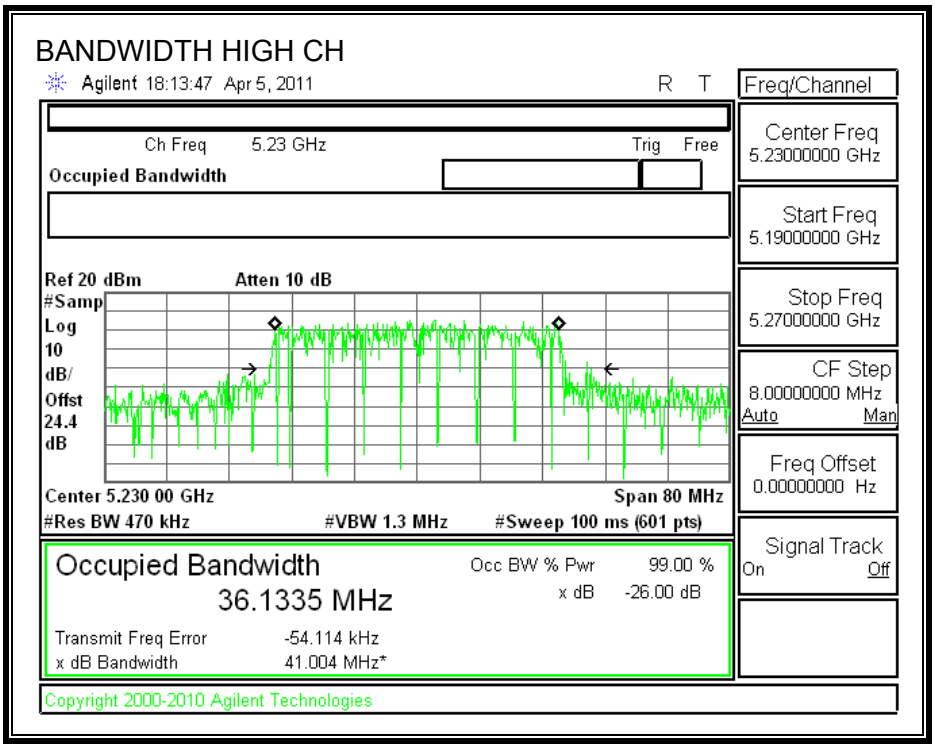
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	37.782	36.2184
High	5230	41.004	36.1335

26 dB and 99% BANDWIDTH





7.6.2. 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

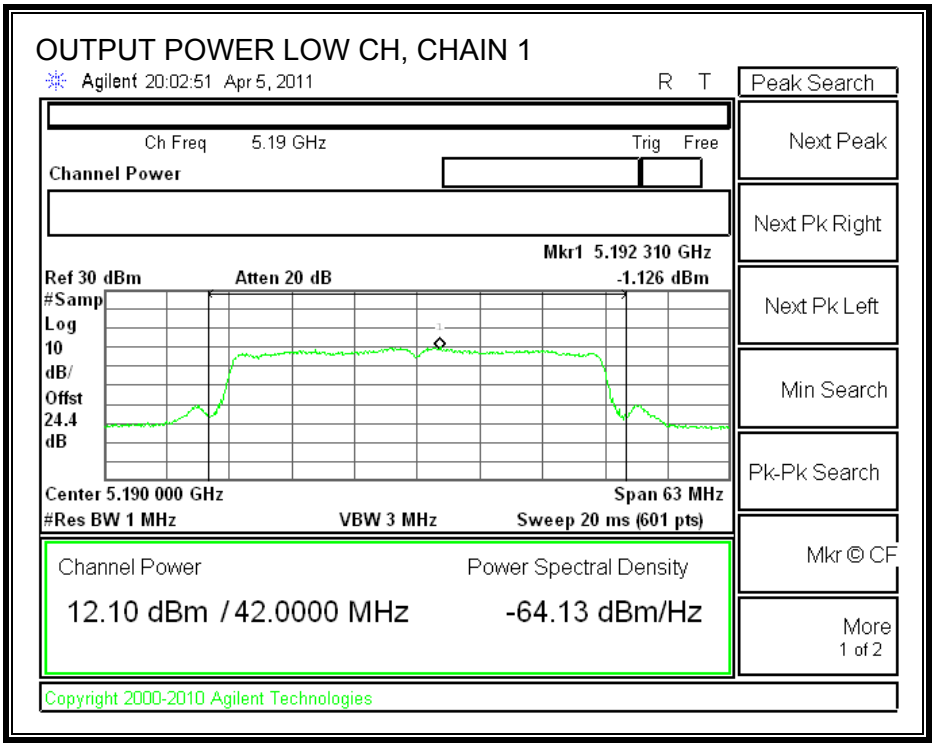
Limit

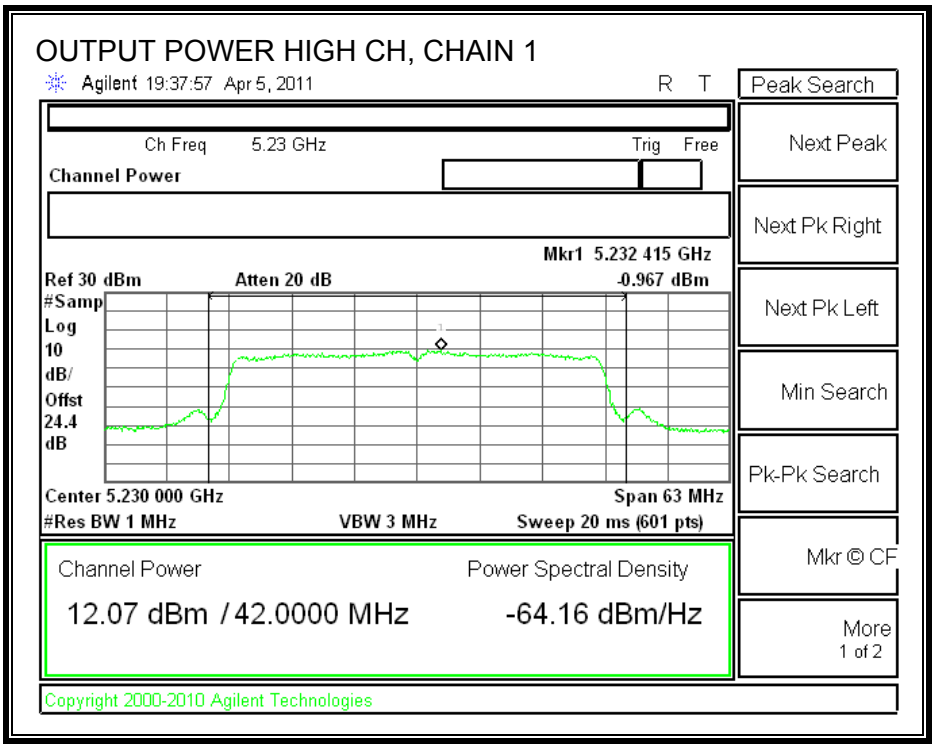
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	16.99	37.782	19.77	5.65	16.99
High	5230	16.99	41.004	20.13	5.65	16.99

Individual Chain Results

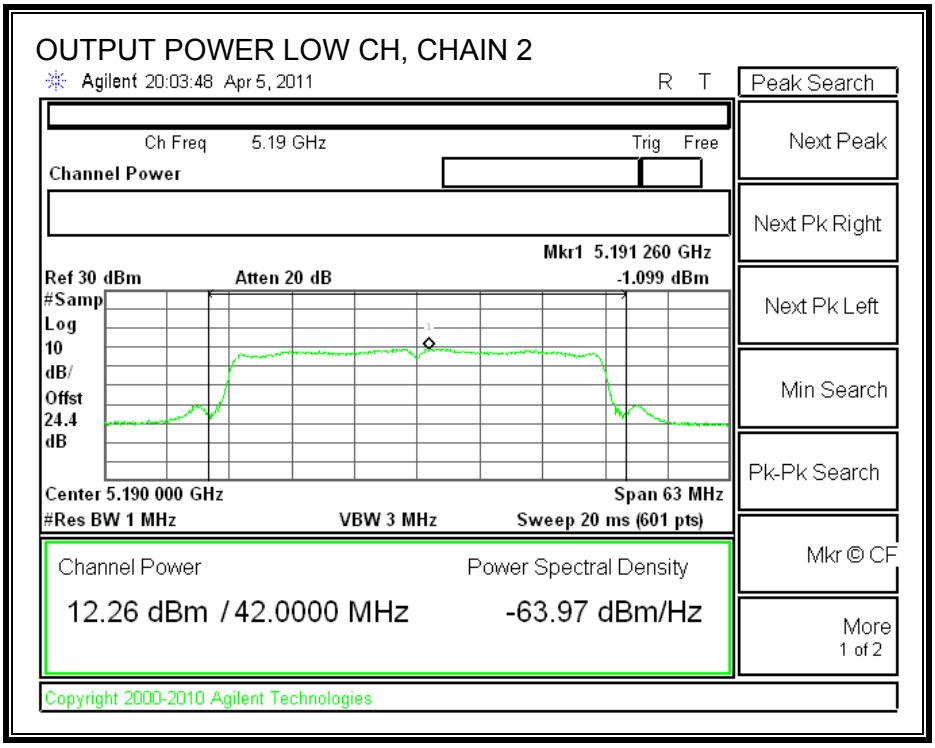
Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	12.10	12.26	12.14	16.94	16.99	-0.05
High	5230	12.07	12.07	12.15	16.87	16.99	-0.12

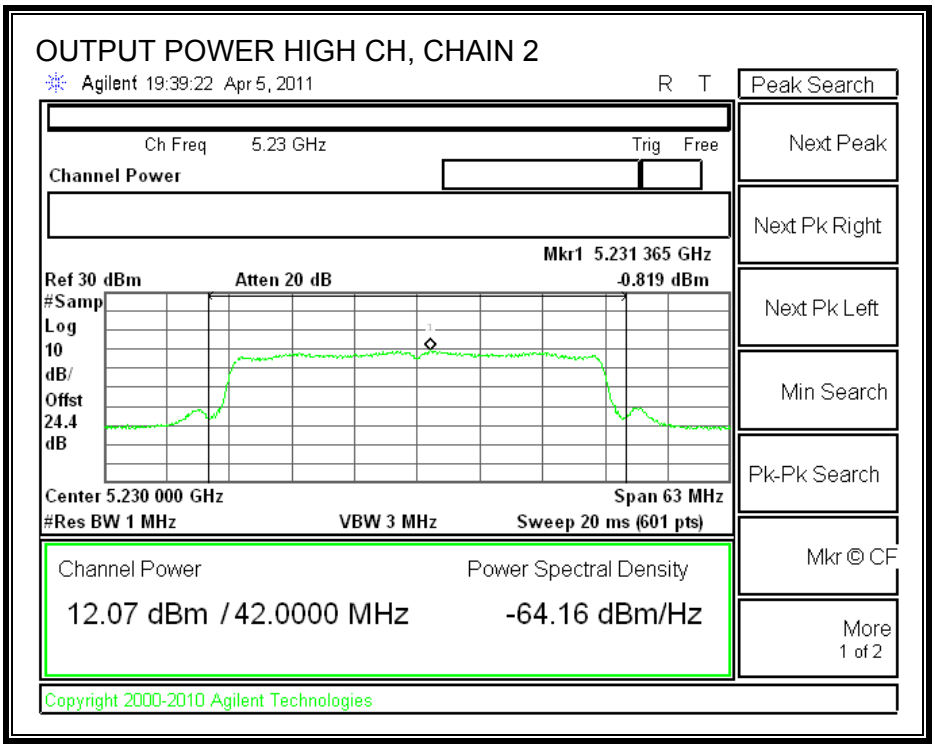
CHAIN 1 OUTPUT POWER



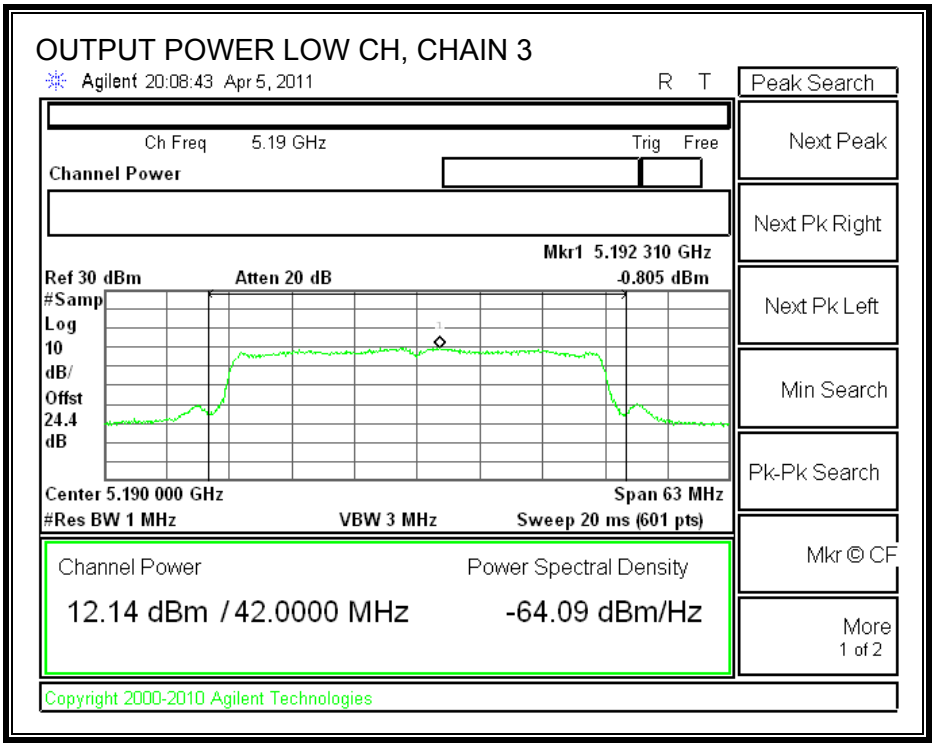


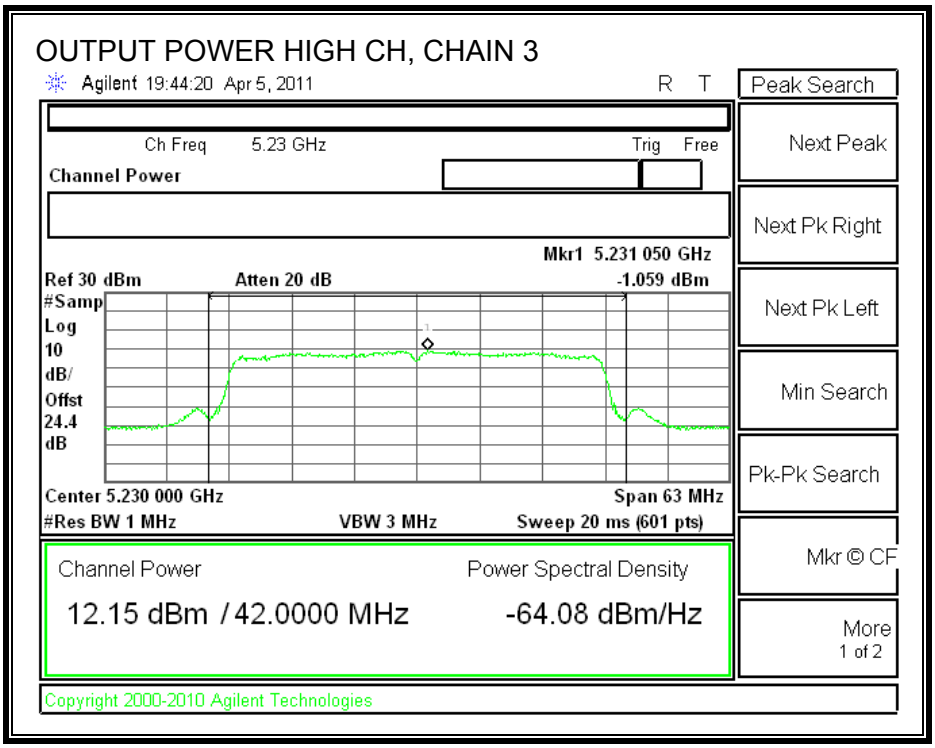
CHAIN 2 OUTPUT POWER





CHAIN 3 OUTPUT POWER





7.6.3. 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 5.65 dBi, therefore the limit is 4.0 dBm.

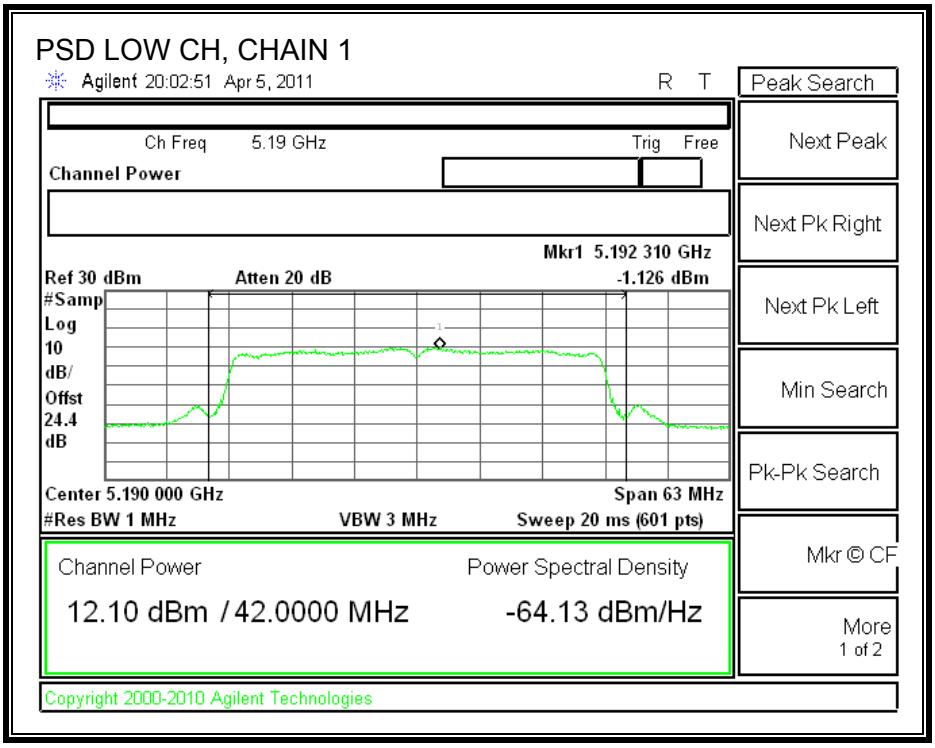
TEST PROCEDURE

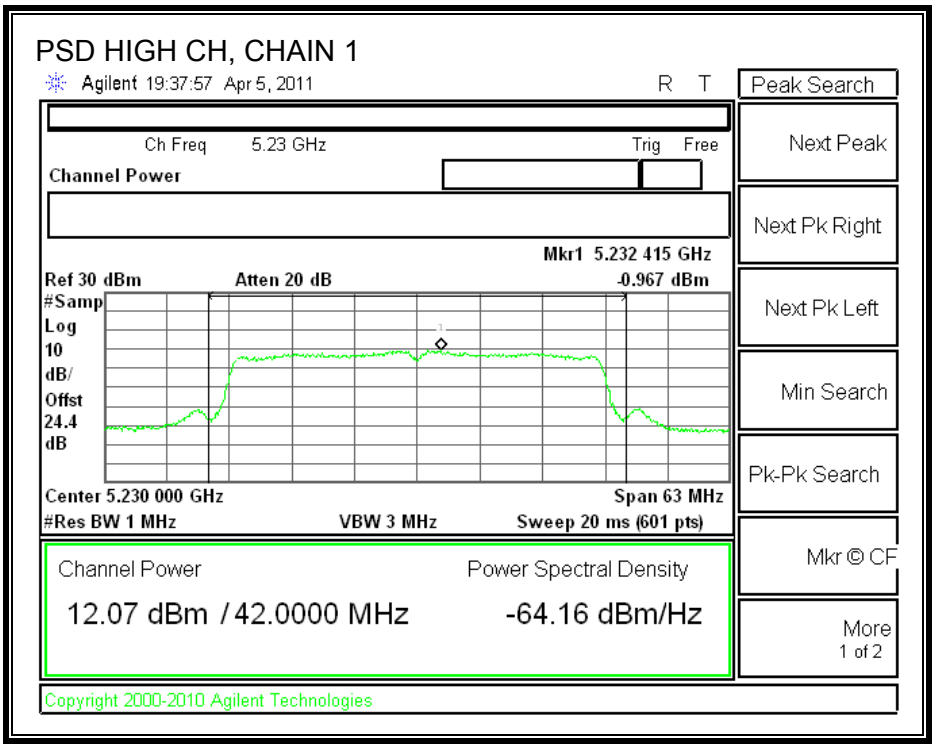
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

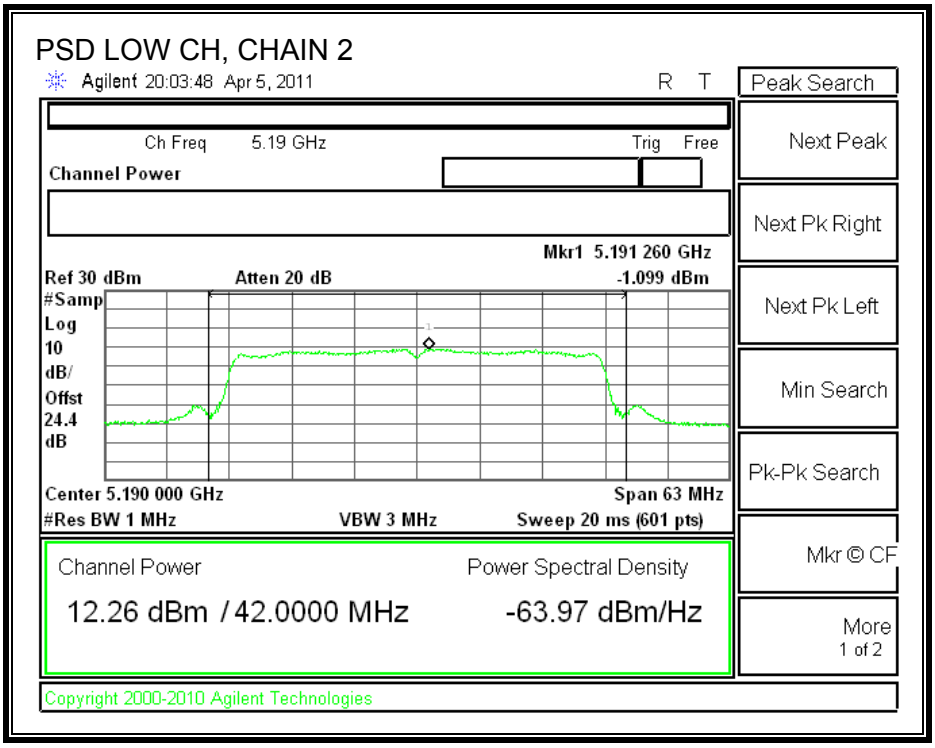
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-1.126	-1.099	-0.805	3.764	4.00	-0.24
High	5230	-0.967	-0.819	-1.059	3.824	4.00	-0.18

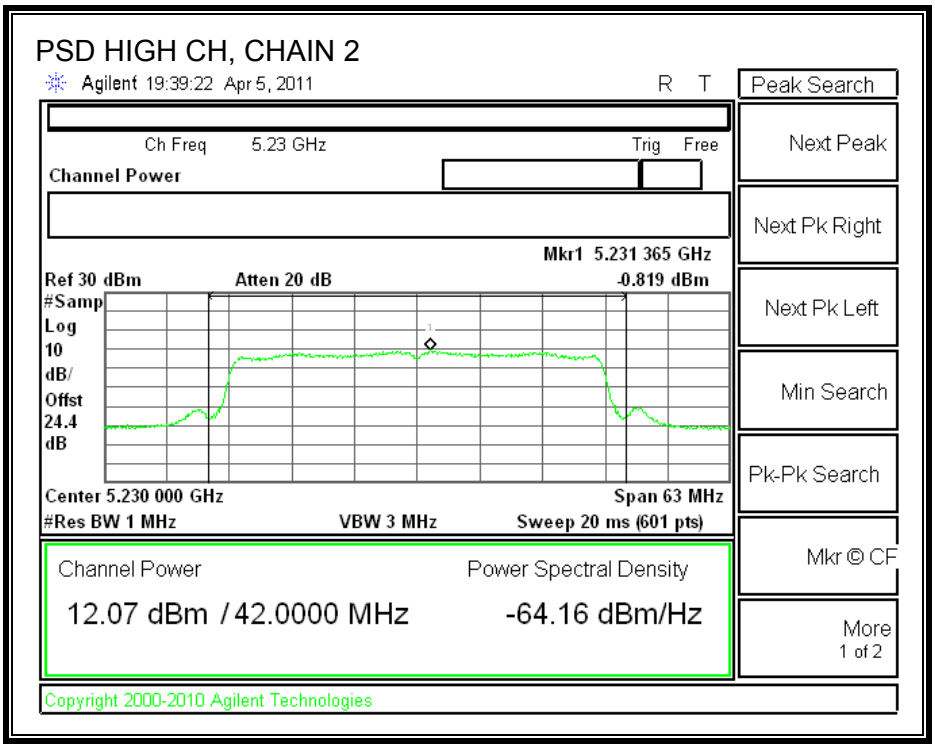
CHAIN 1 OUTPUT POWER SPECTRAL DENSITY



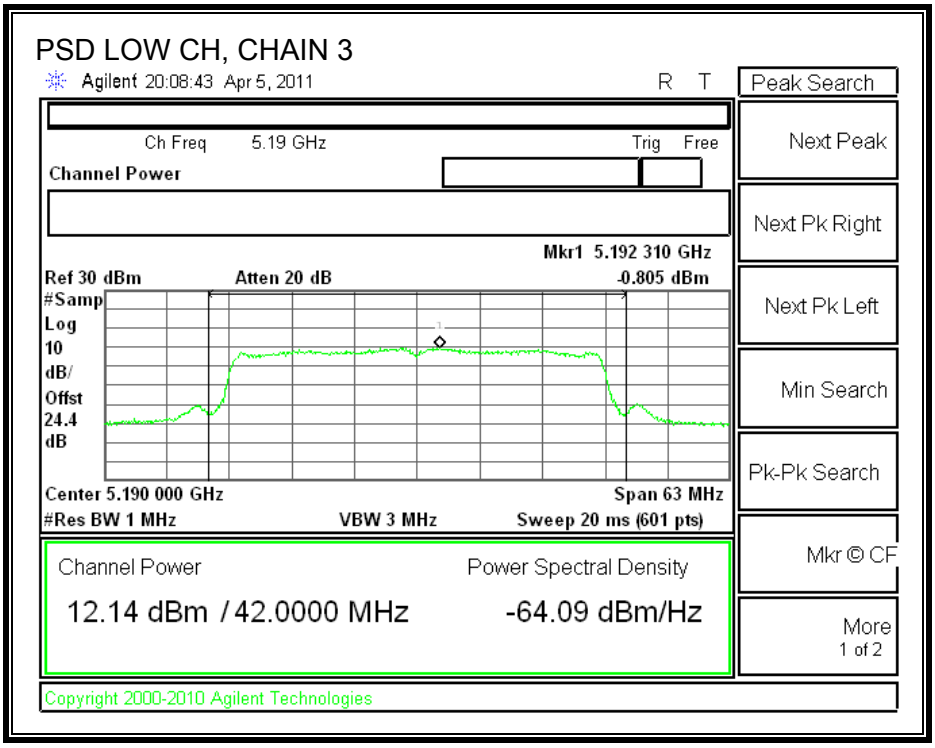


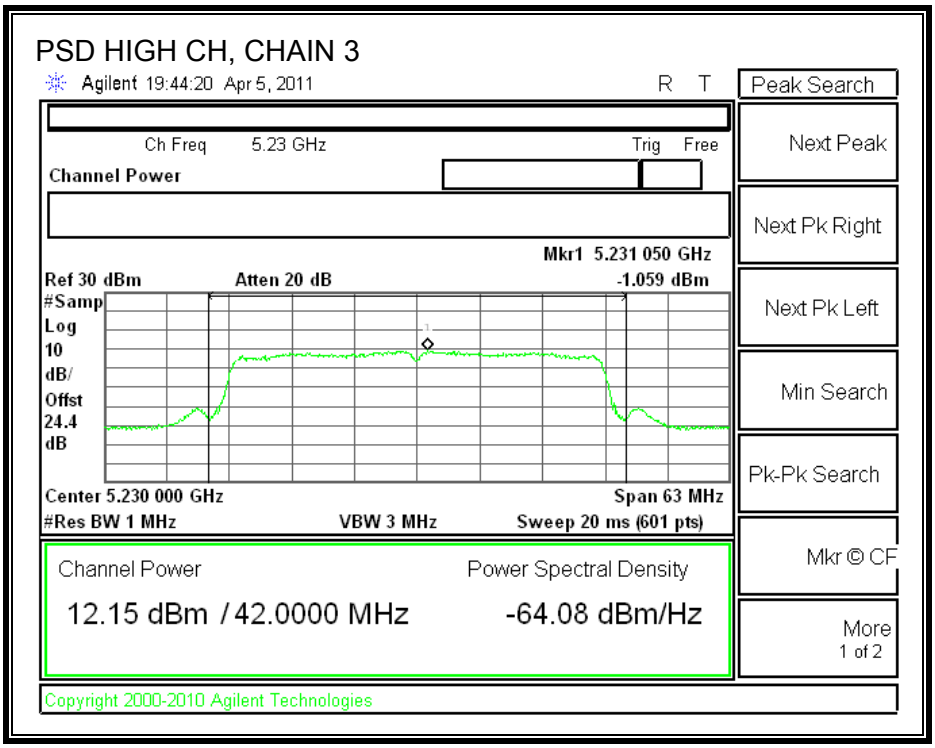
CHAIN 2 OUTPUT POWER SPECTRAL DENSITY





CHAIN 3 OUTPUT POWER SPECTRAL DENSITY





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.

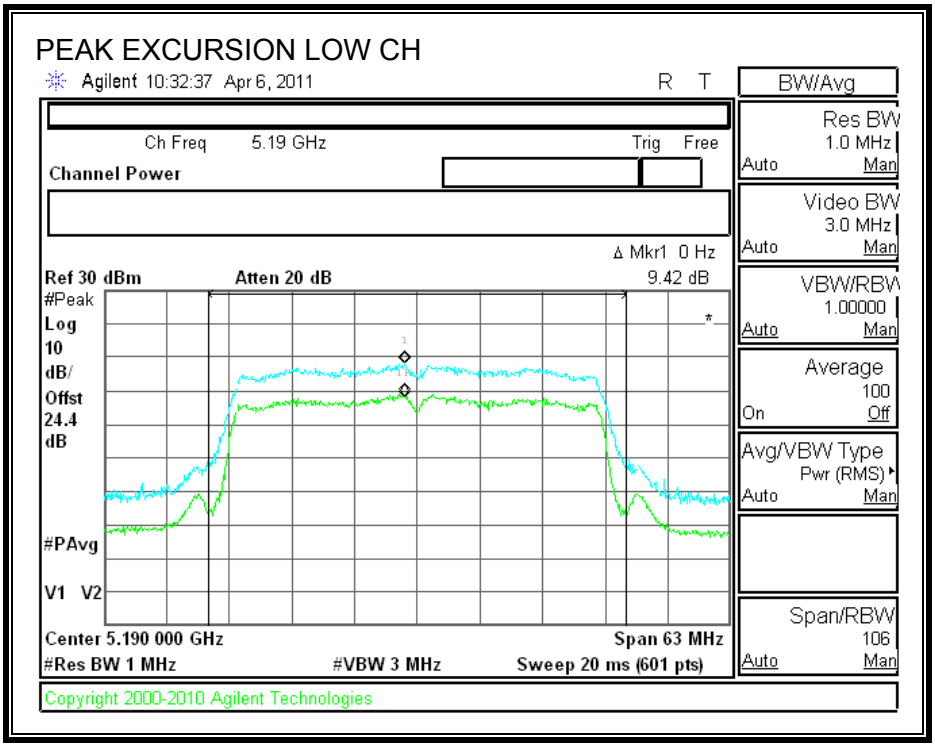
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

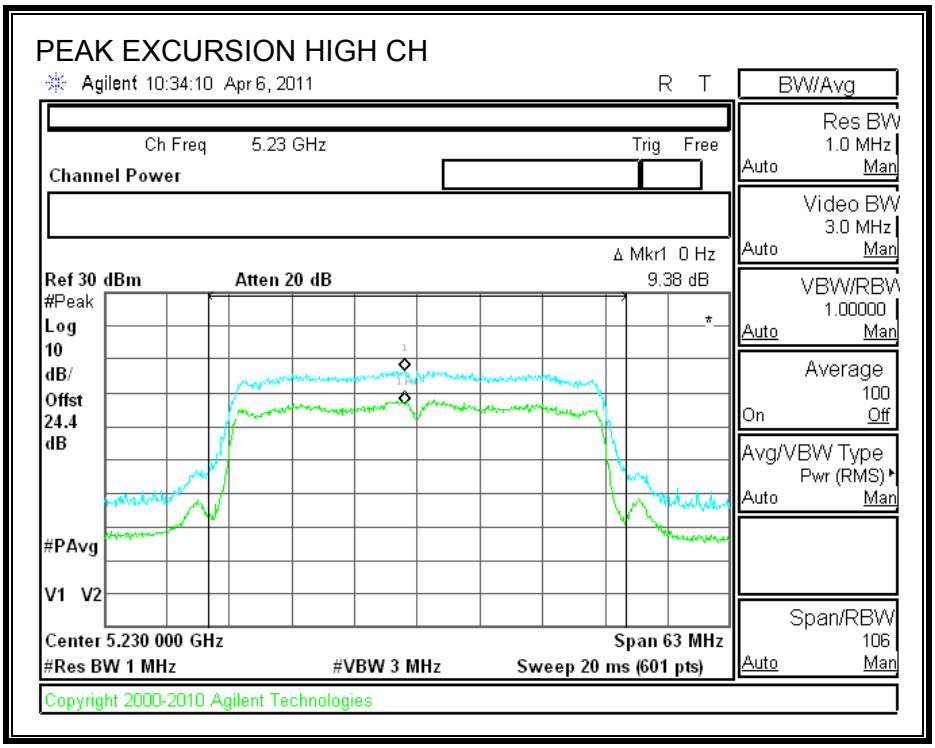
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	9.42	13	-3.58
High	5230	9.38	13	-3.62

PEAK EXCURSION





7.6.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0

SDM MCS21

7.6.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

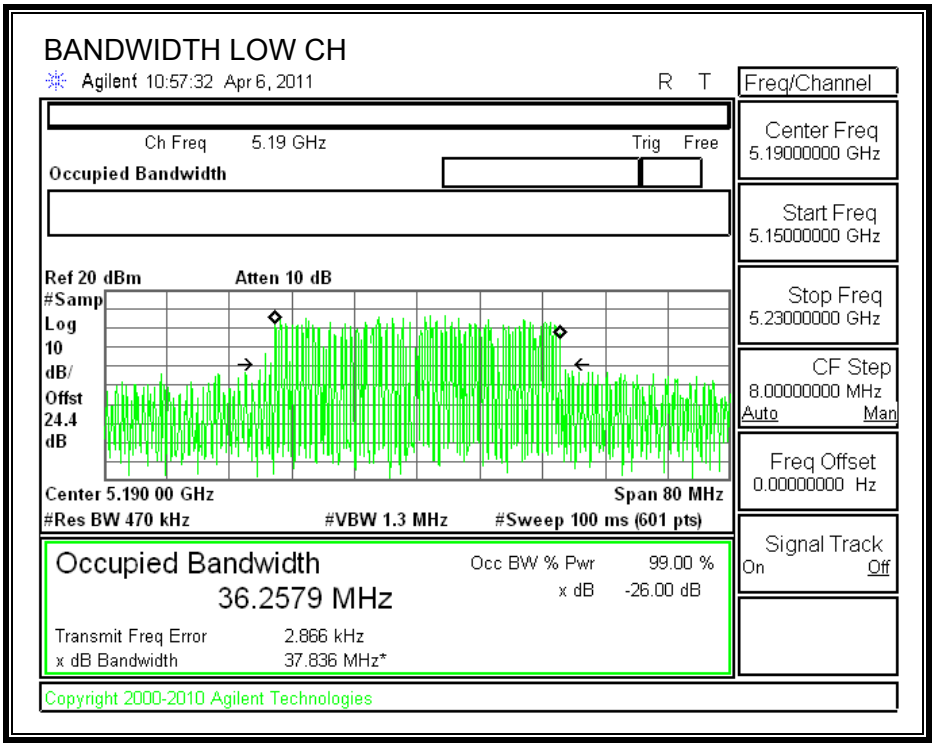
TEST PROCEDURE

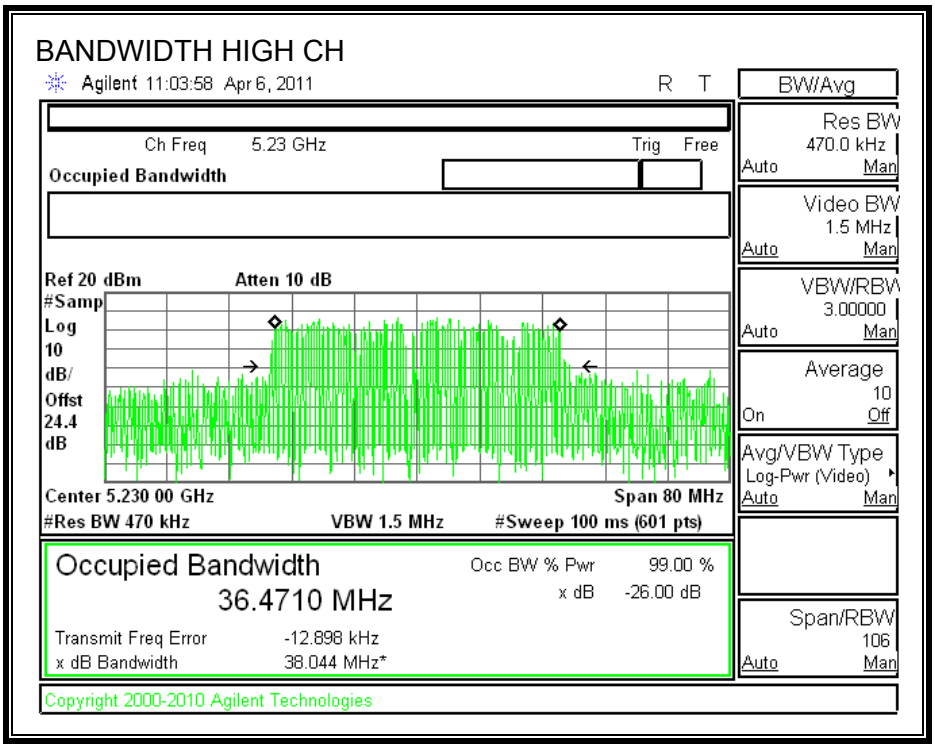
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	37.836	36.2579
High	5230	38.044	36.4710

26 dB and 99% BANDWIDTH





7.6.2. 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

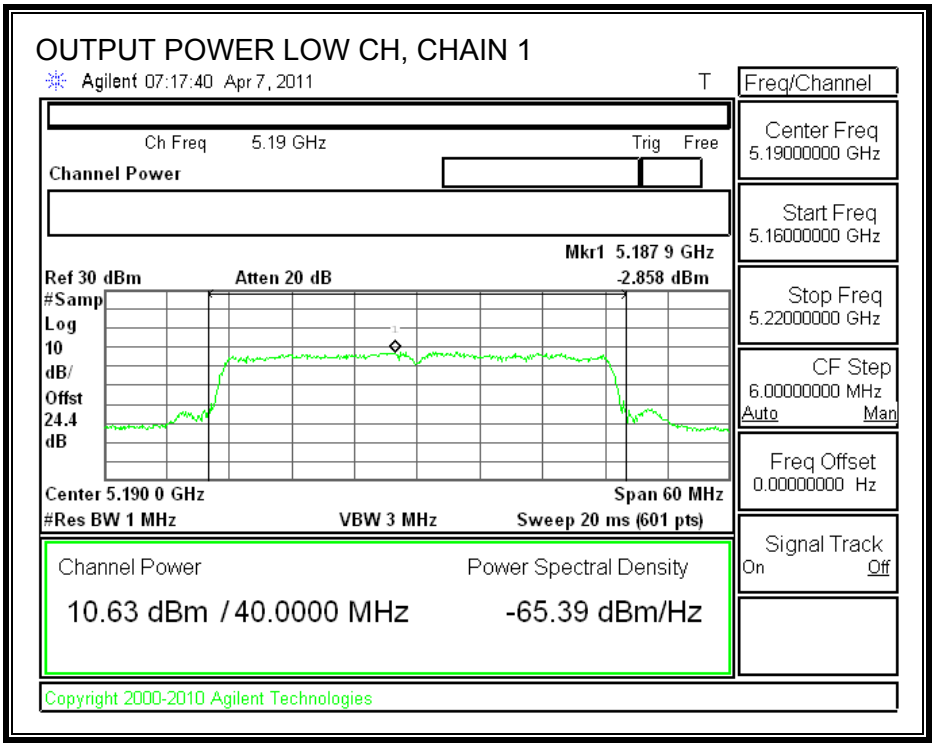
Limit

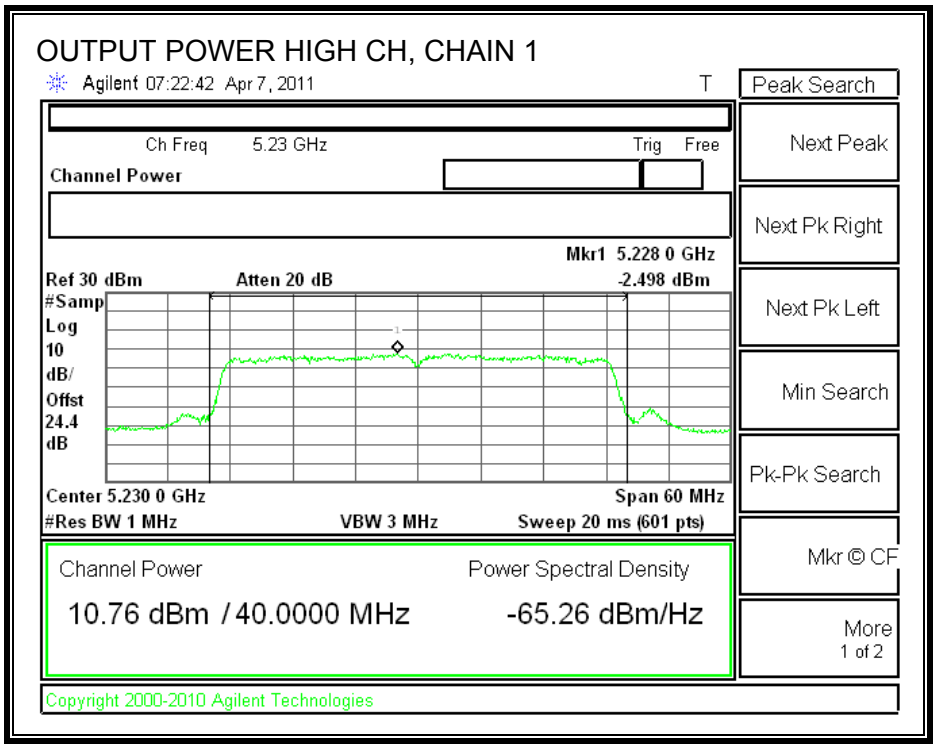
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	16.99	37.836	19.78	5.65	16.99
High	5230	16.99	38.044	19.80	5.65	16.99

Individual Chain Results

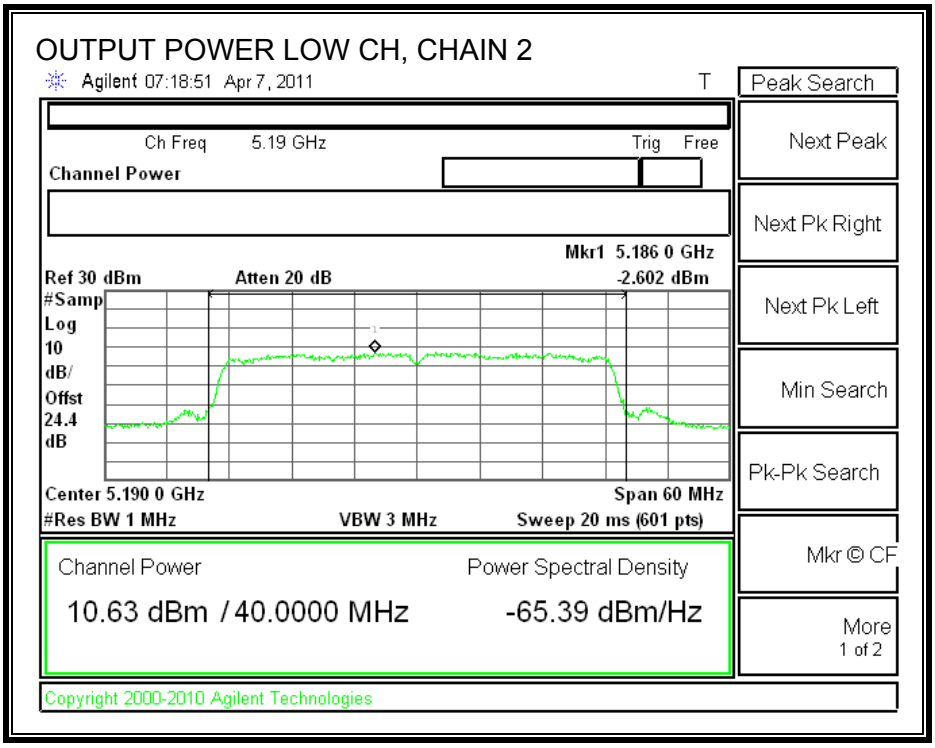
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	10.63	10.63	10.71	15.43	16.99	-1.56
High	5230	10.76	10.65	10.76	15.49	16.99	-1.50

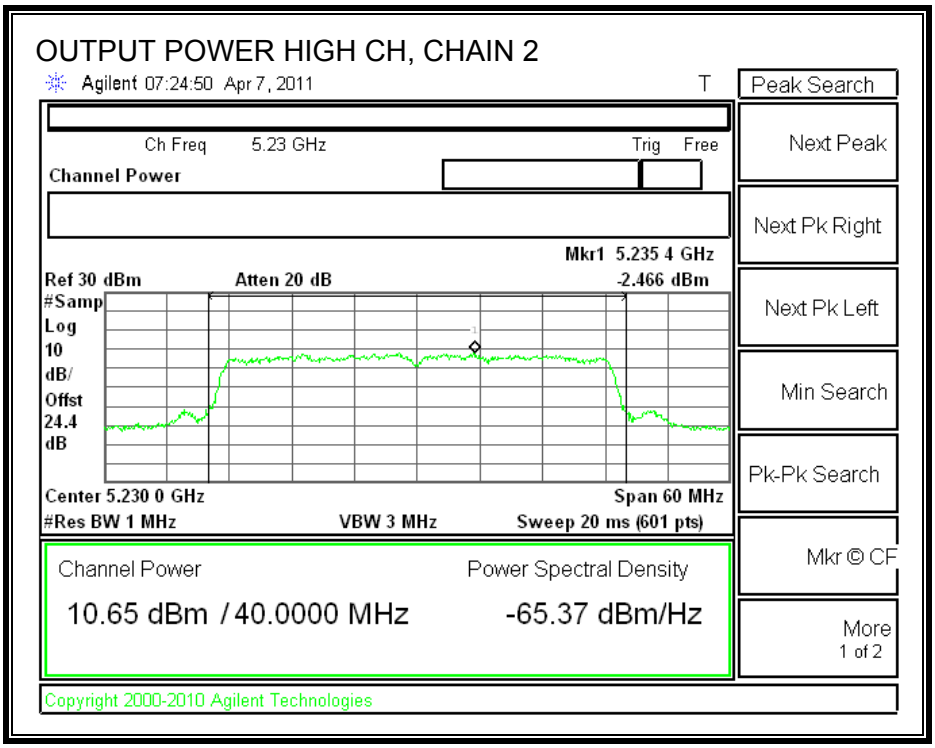
CHAIN 1 OUTPUT POWER



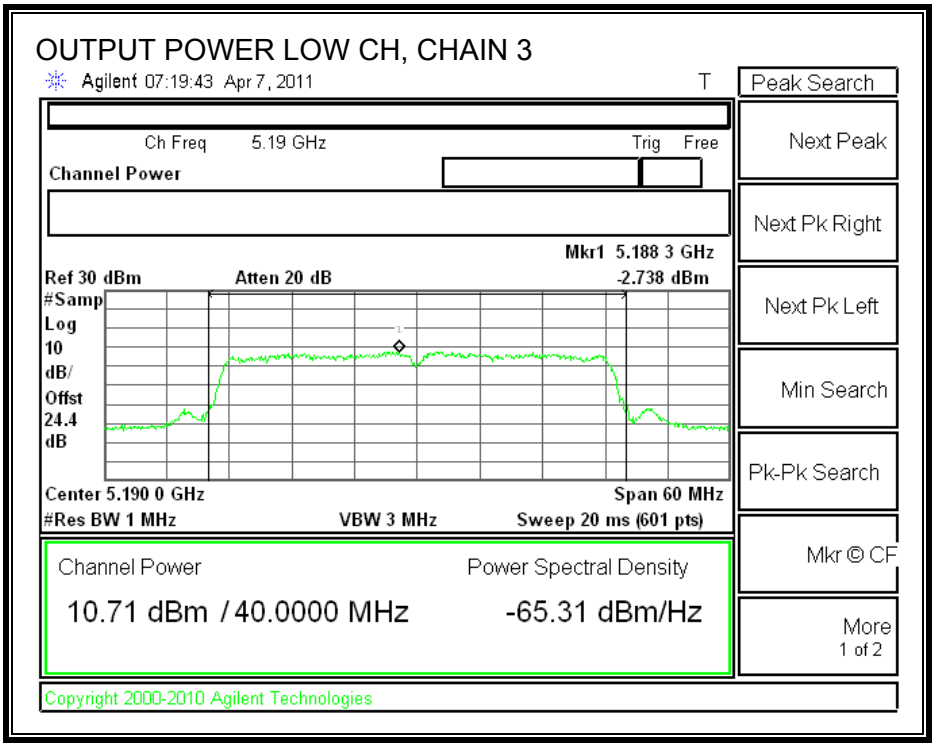


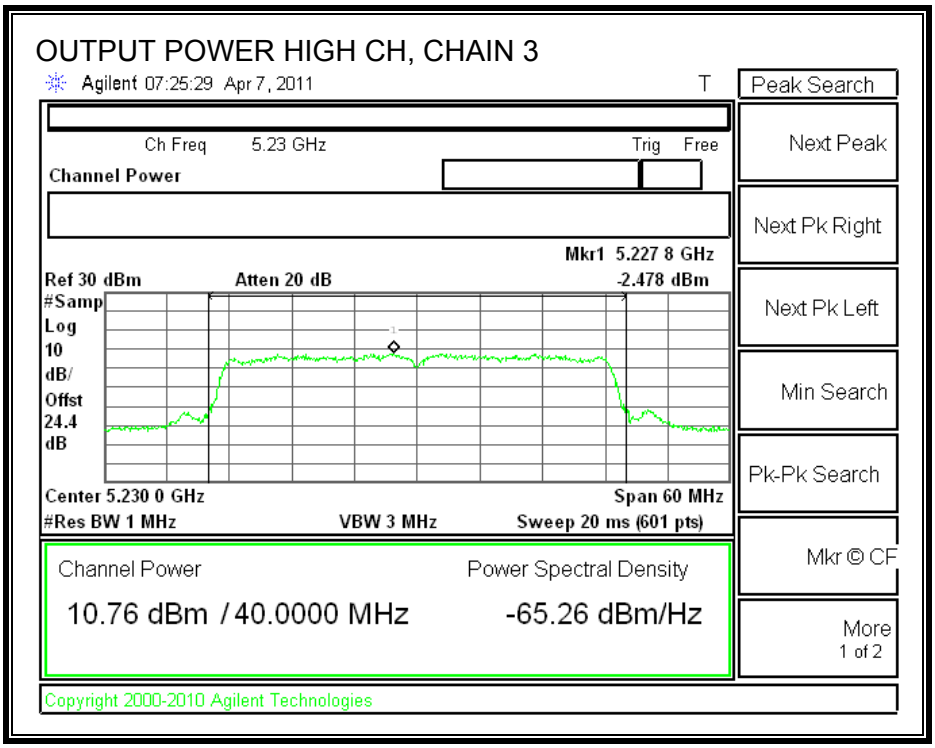
CHAIN 2 OUTPUT POWER





CHAIN 3 OUTPUT POWER





7.6.3. 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 5.65 dBi, therefore the limit is 4.0 dBm.

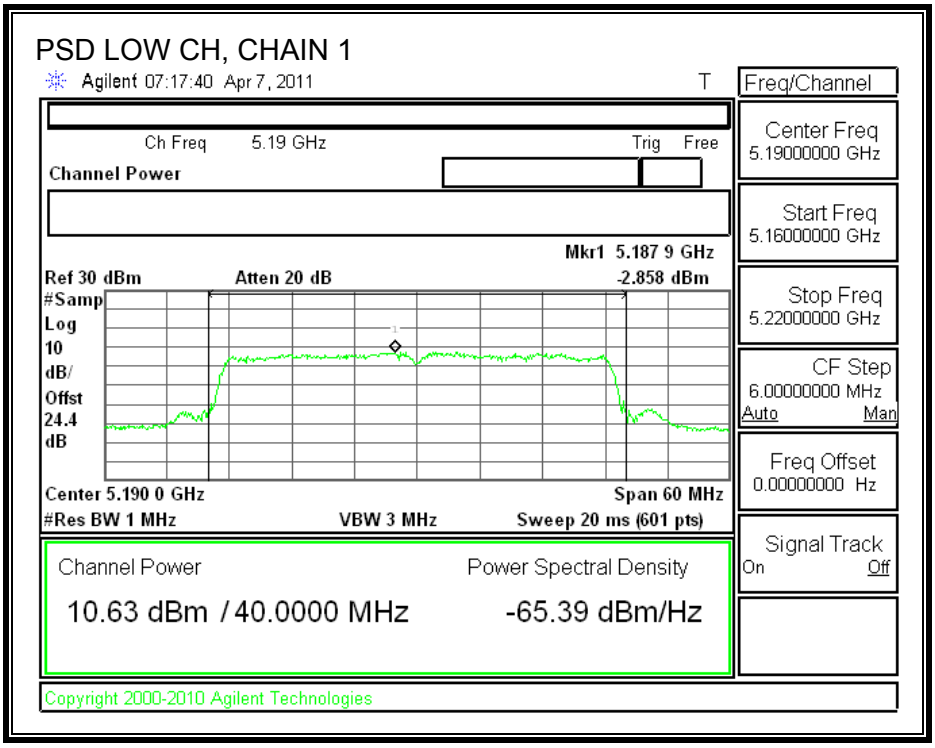
TEST PROCEDURE

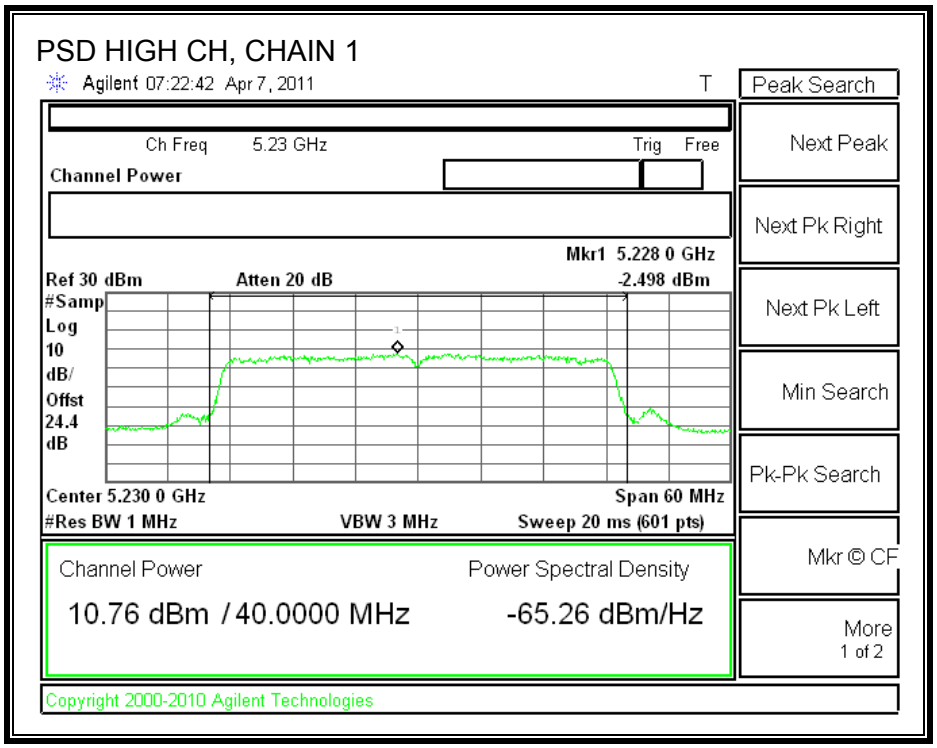
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

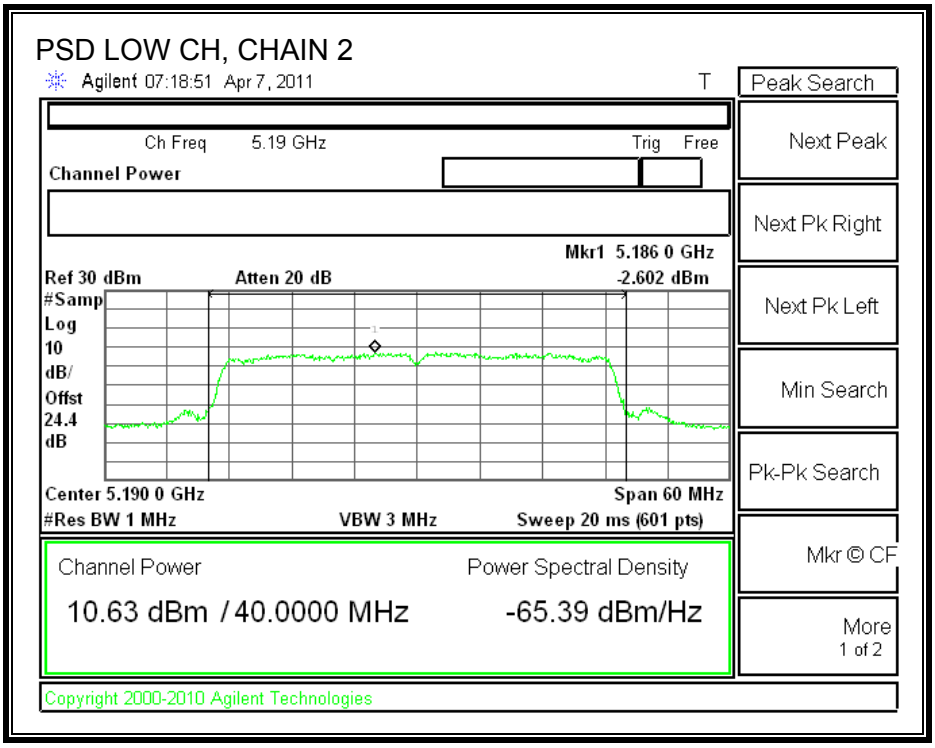
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total	Limit (dBm)	Margin (dB)
Low	5190	-2.858	-2.602	-2.738	2.040	4.00	-1.96
High	5230	-2.498	-2.466	-2.478	2.291	4.00	-1.71

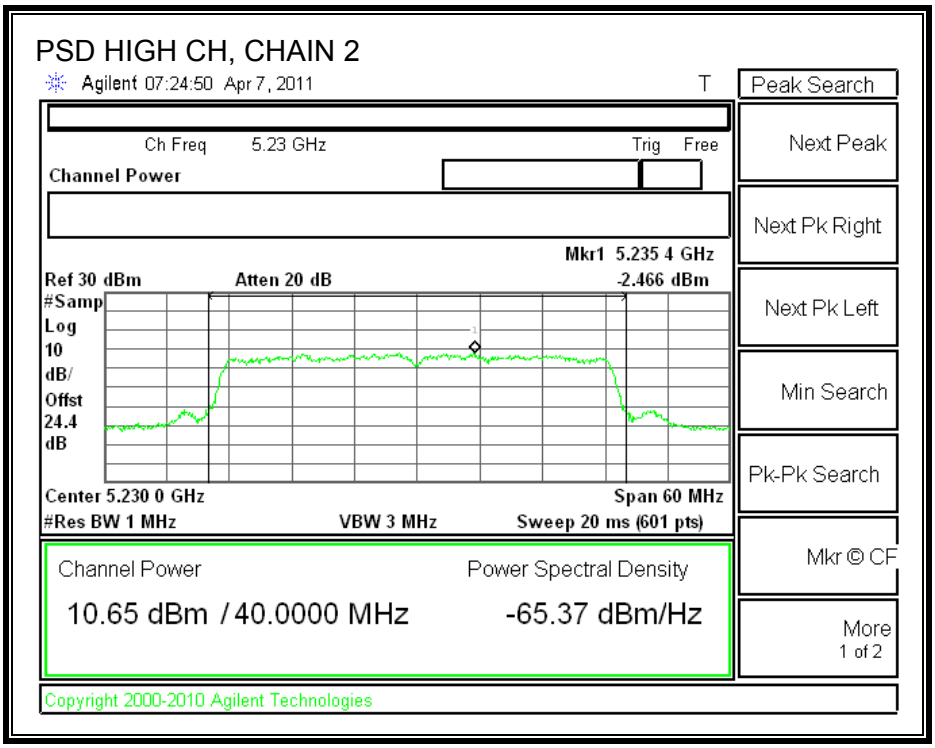
CHAIN 1 POWER SPECTRAL DENSITY



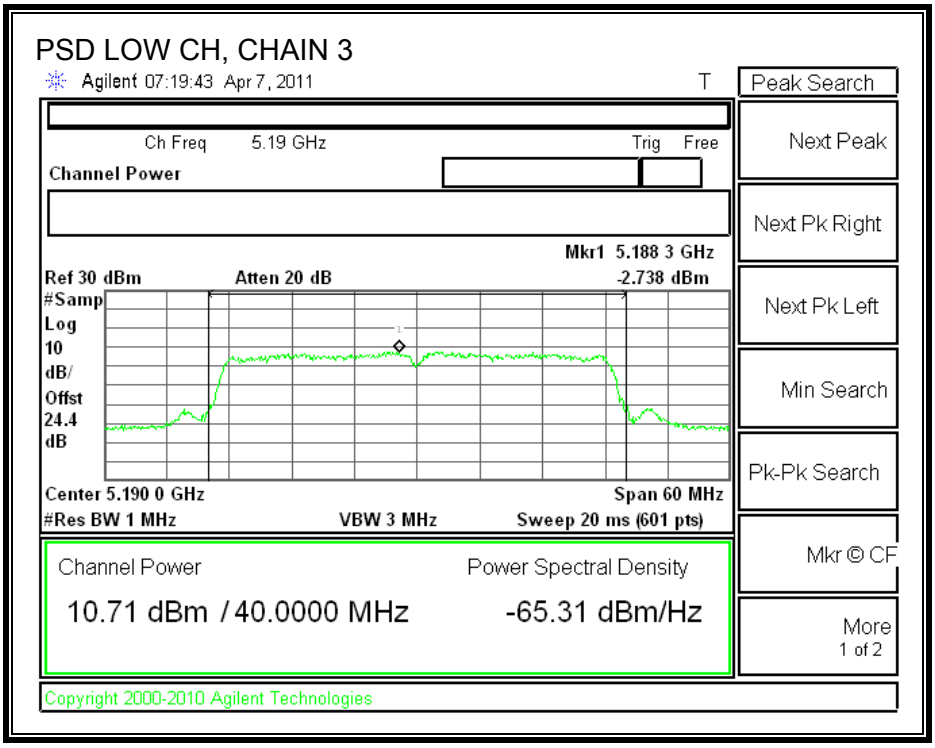


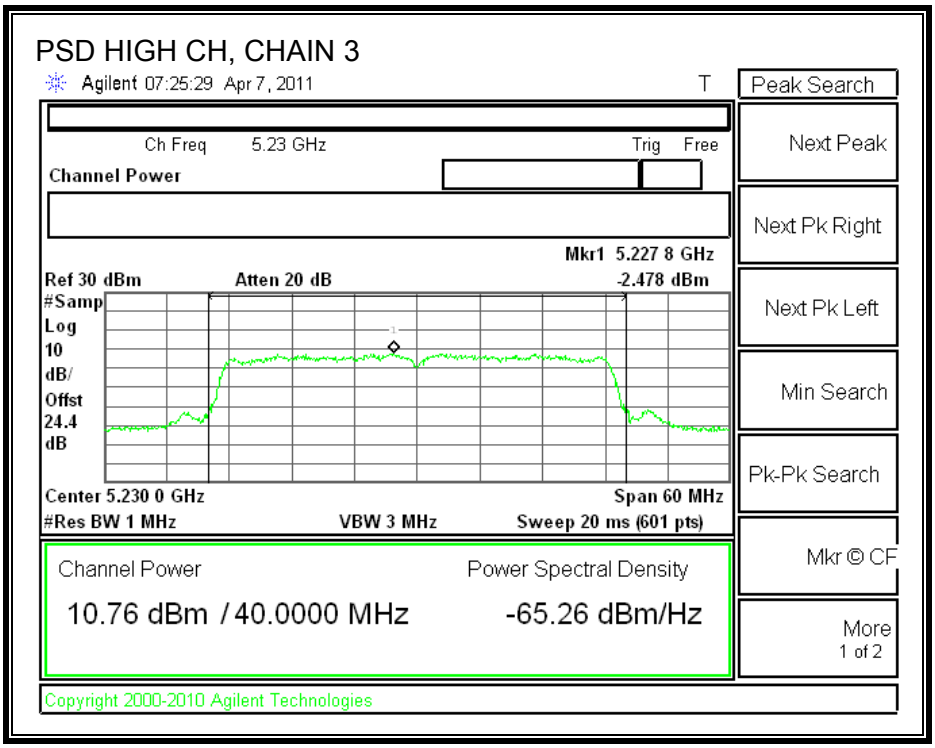
CHAIN 2 POWER SPECTRAL DENSITY





CHAIN 3 POWER SPECTRAL DENSITY





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.

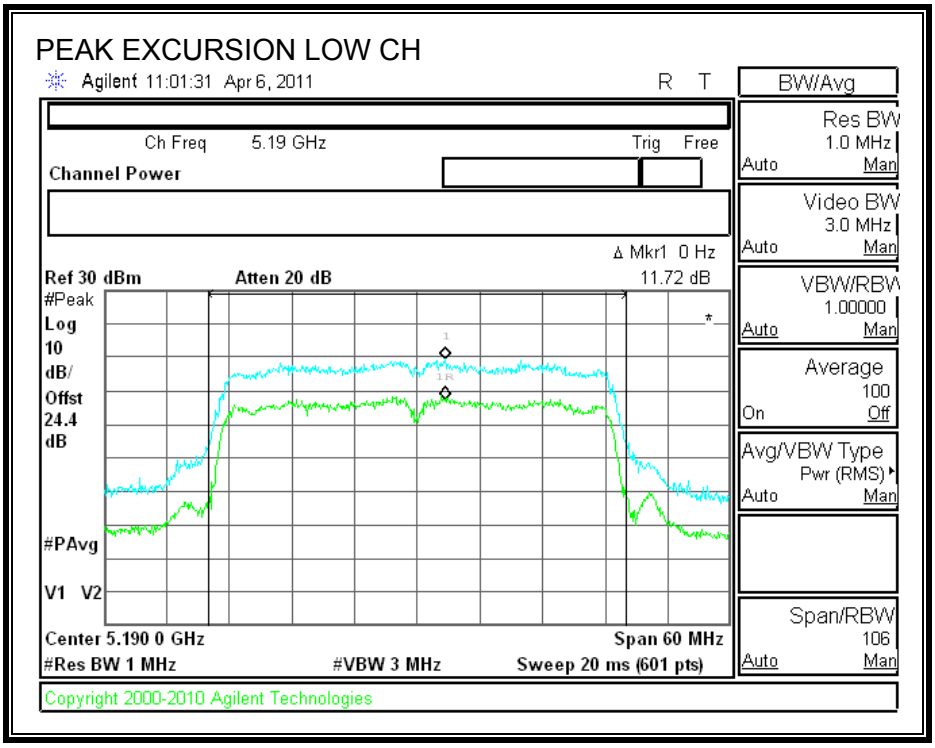
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

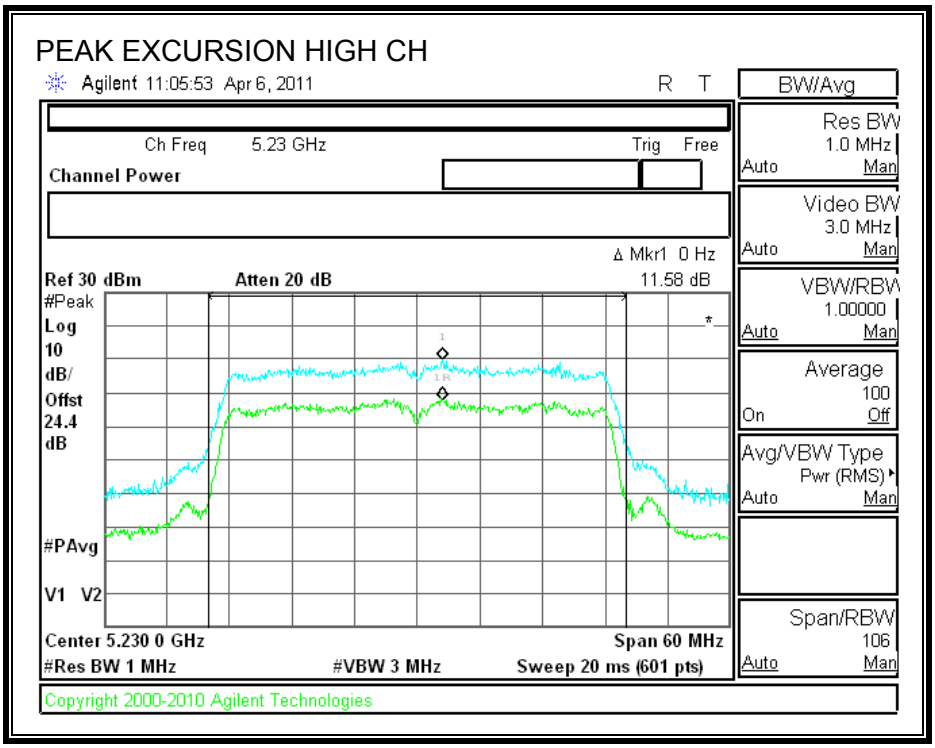
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	11.72	13	-1.28
High	5230	11.58	13	-1.42

PEAK EXCURSION





7.6.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0

7.7. 802.11a MODE IN THE 5.3 GHz BAND

LEGACY

7.7.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

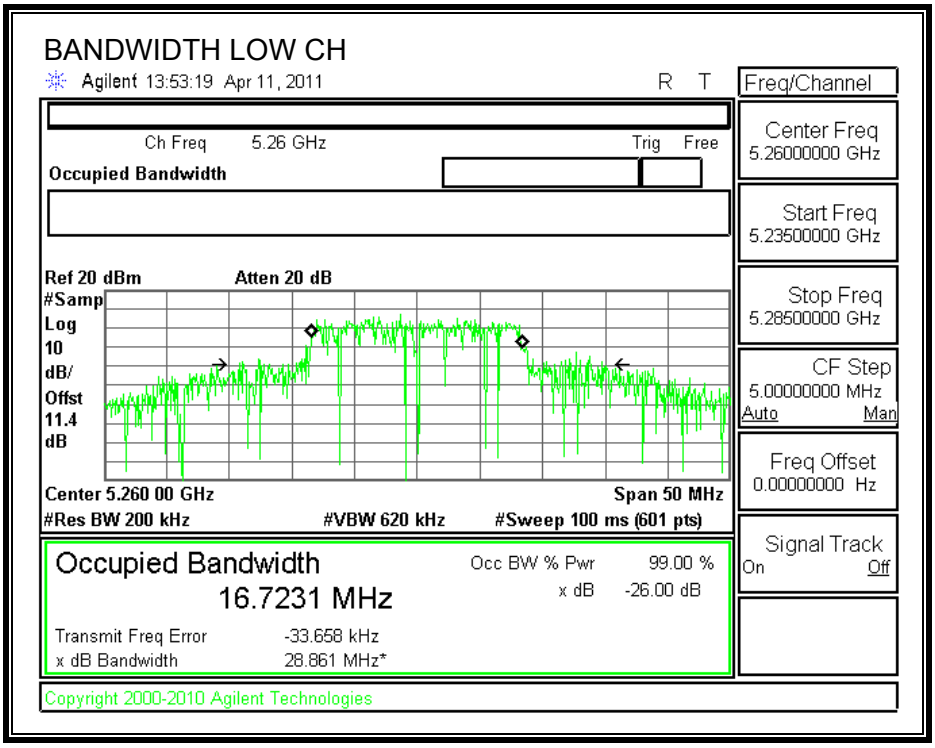
TEST PROCEDURE

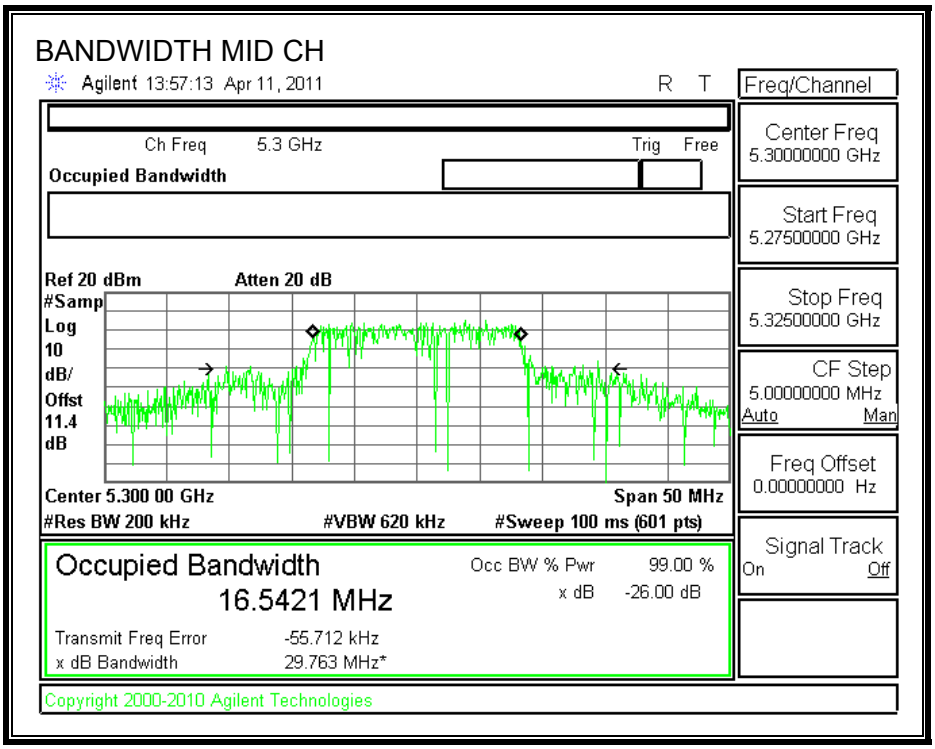
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

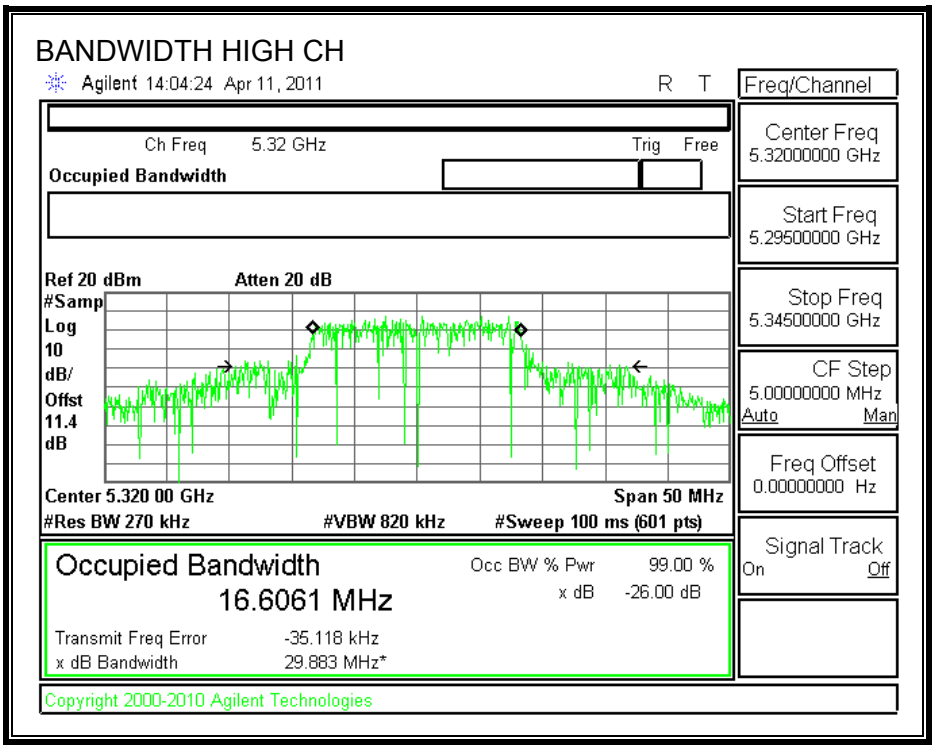
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	29.940	16.7231
Middle	5300	33.071	16.5421
High	5320	34.555	16.6061

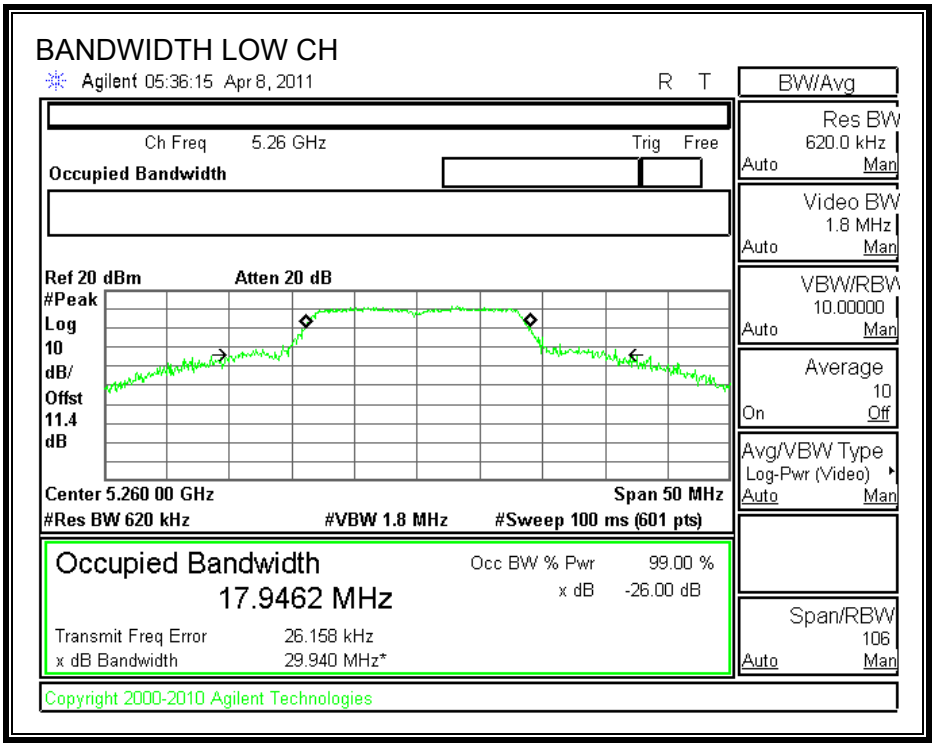
99% BANDWIDTH

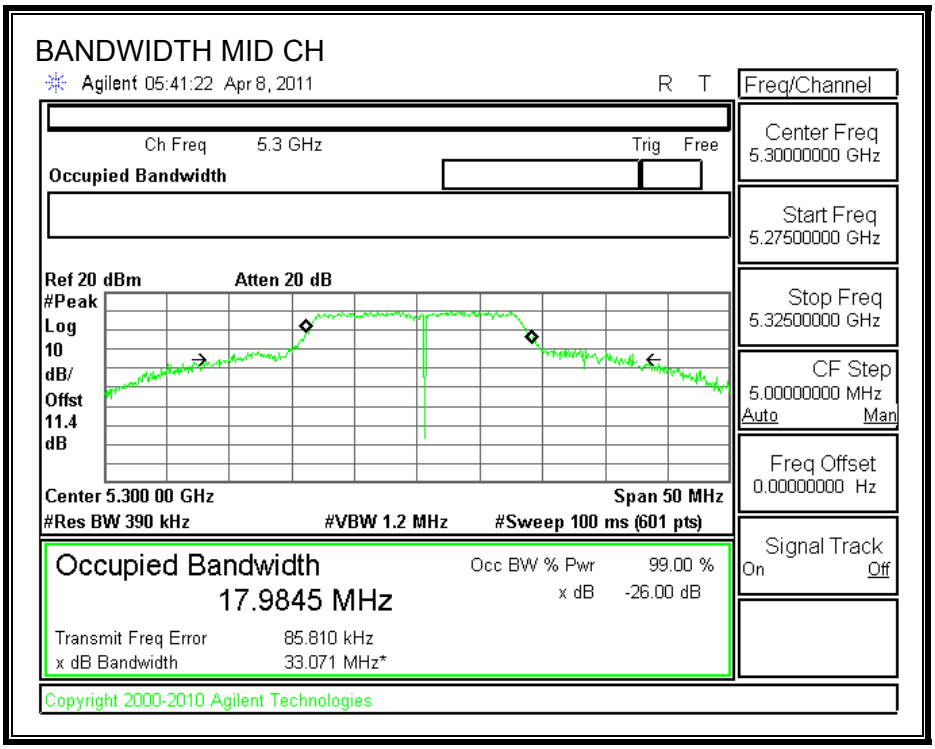


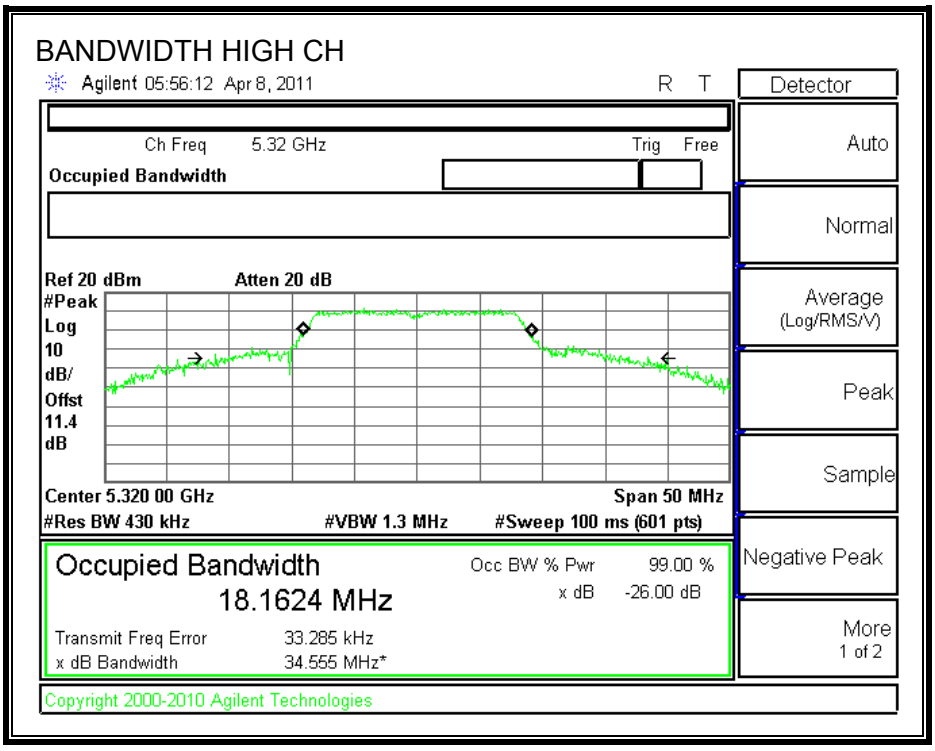




26 dB BANDWIDTH







7.7.2. 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 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

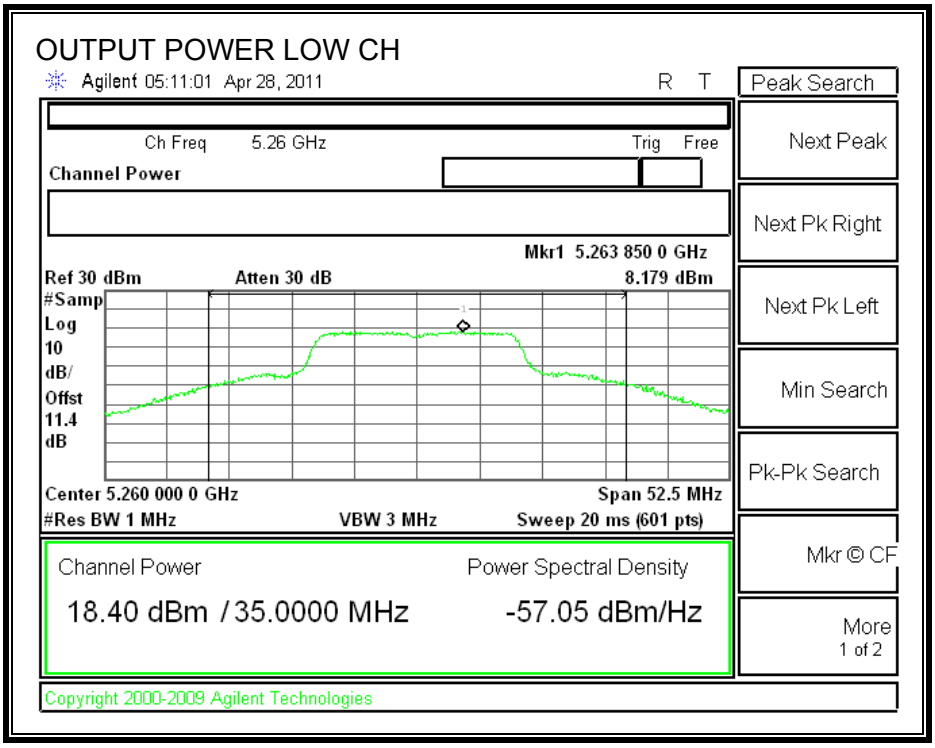
Limit

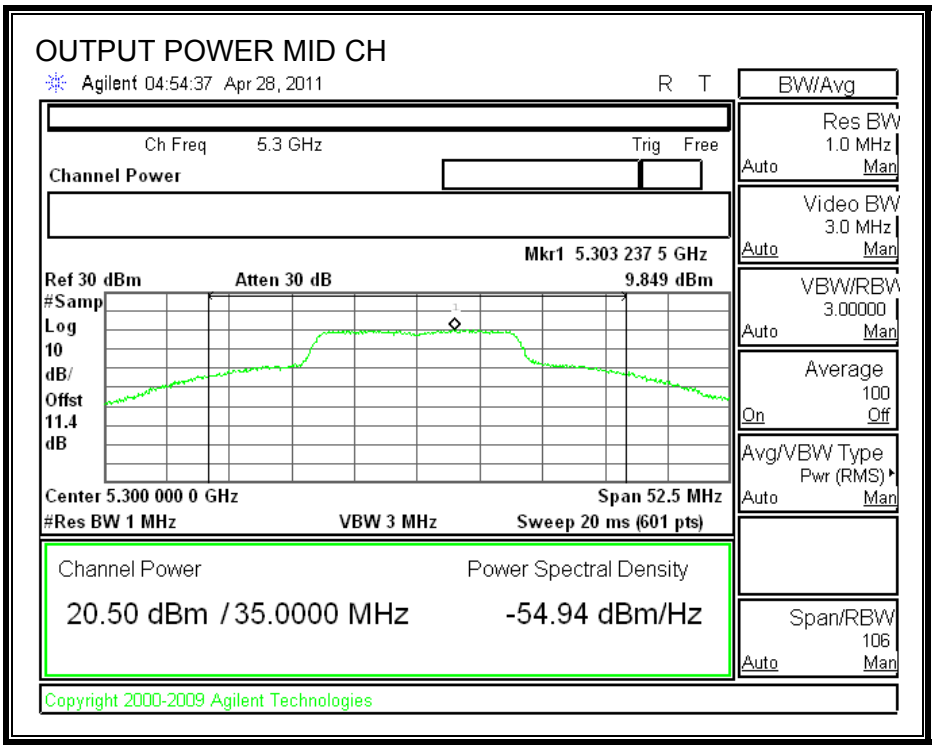
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	29.940	25.76	9.32	20.68
Mid	5300	24	33.071	26.19	9.32	20.68
High	5320	24	34.555	26.39	9.32	20.68

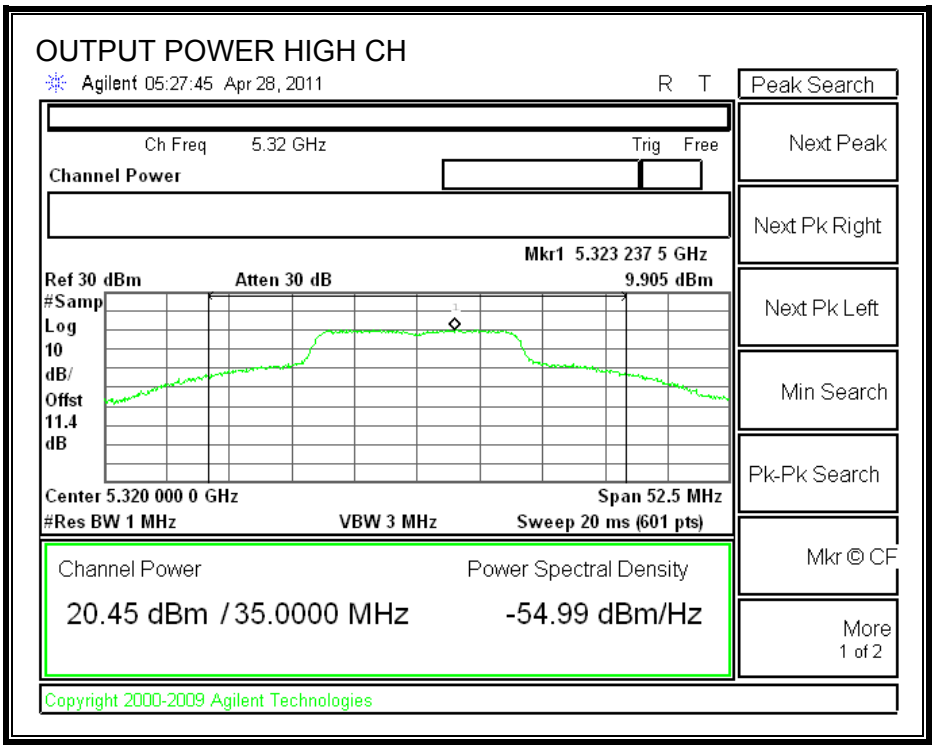
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	18.40	20.68	-2.28
Mid	5300	20.50	20.68	-0.18
High	5320	20.45	20.68	-0.23

OUTPUT POWER







7.7.1. 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

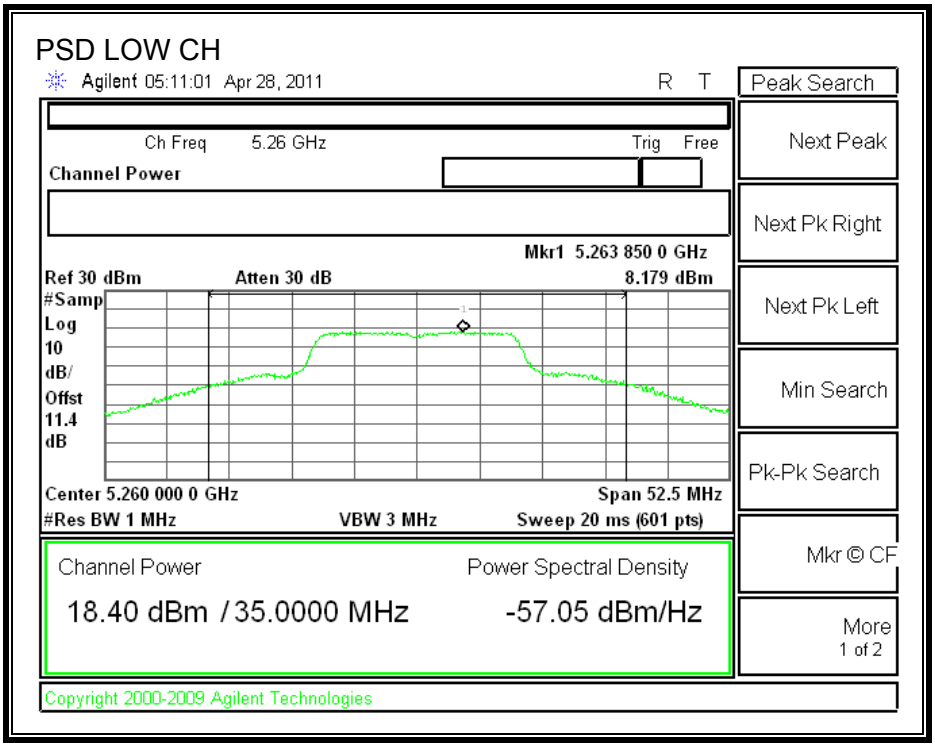
TEST PROCEDURE

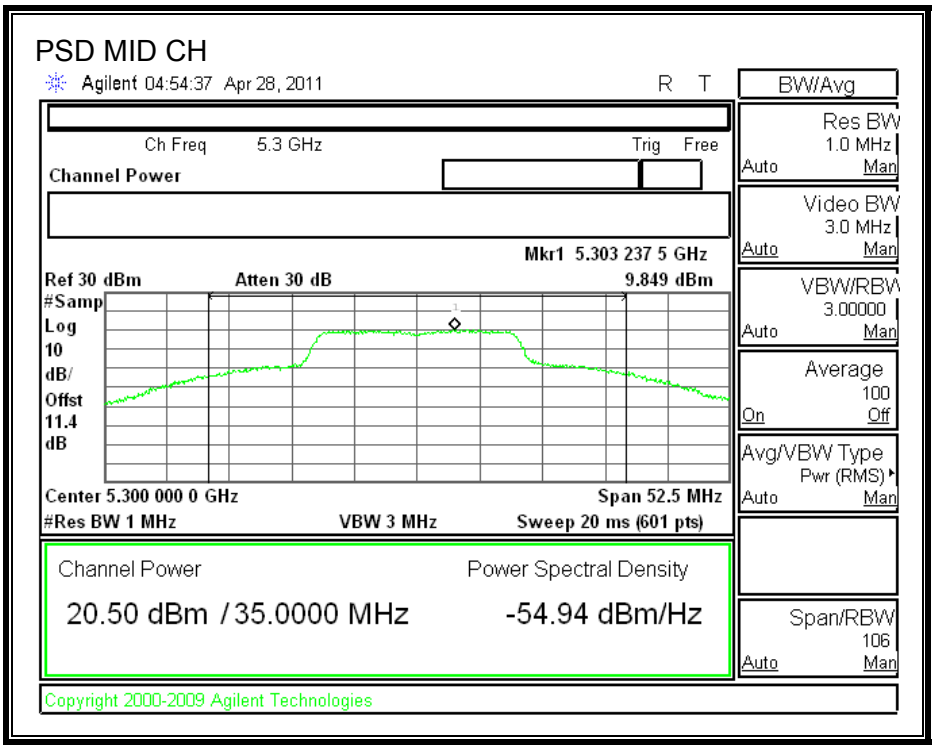
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

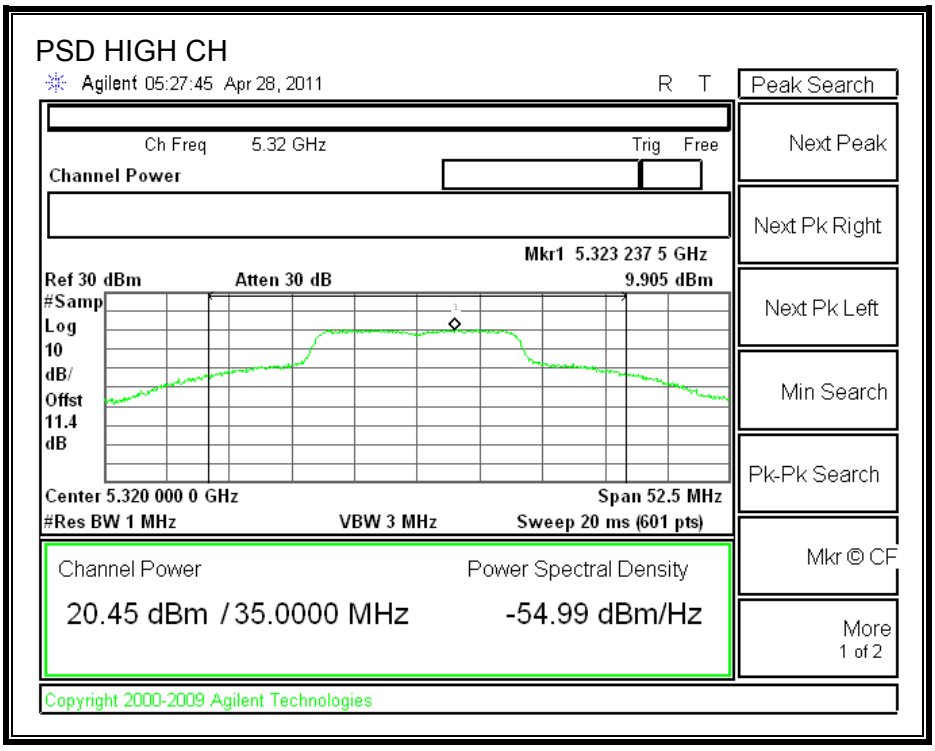
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	8.179	11	-2.82
Middle	5300	9.849	11	-1.15
High	5320	9.905	11	-1.10

POWER SPECTRAL DENSITY







7.7.2. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

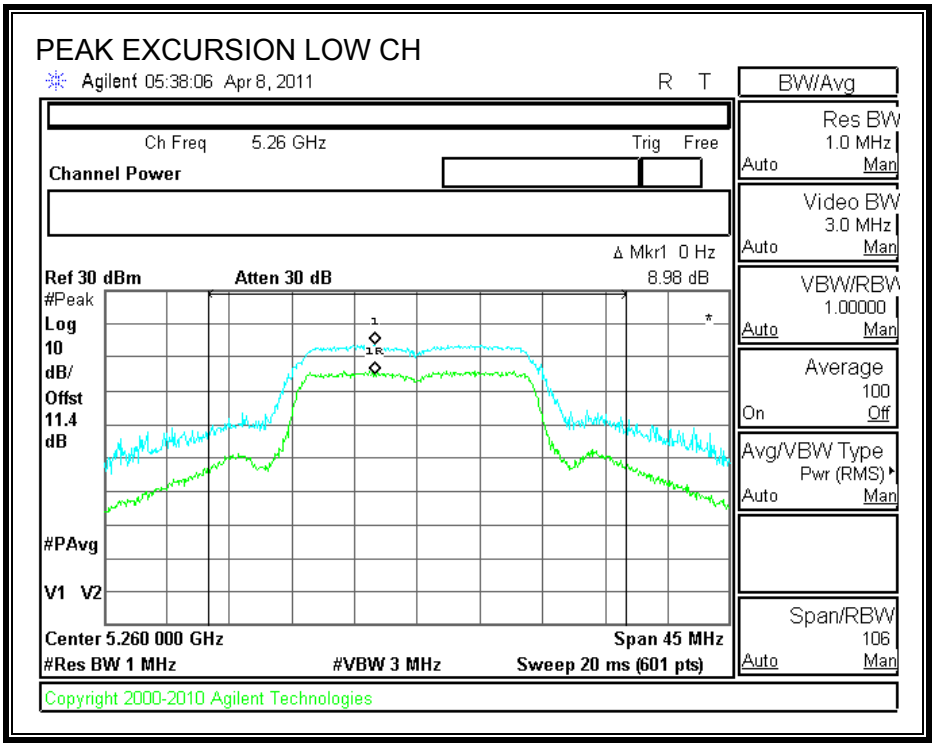
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

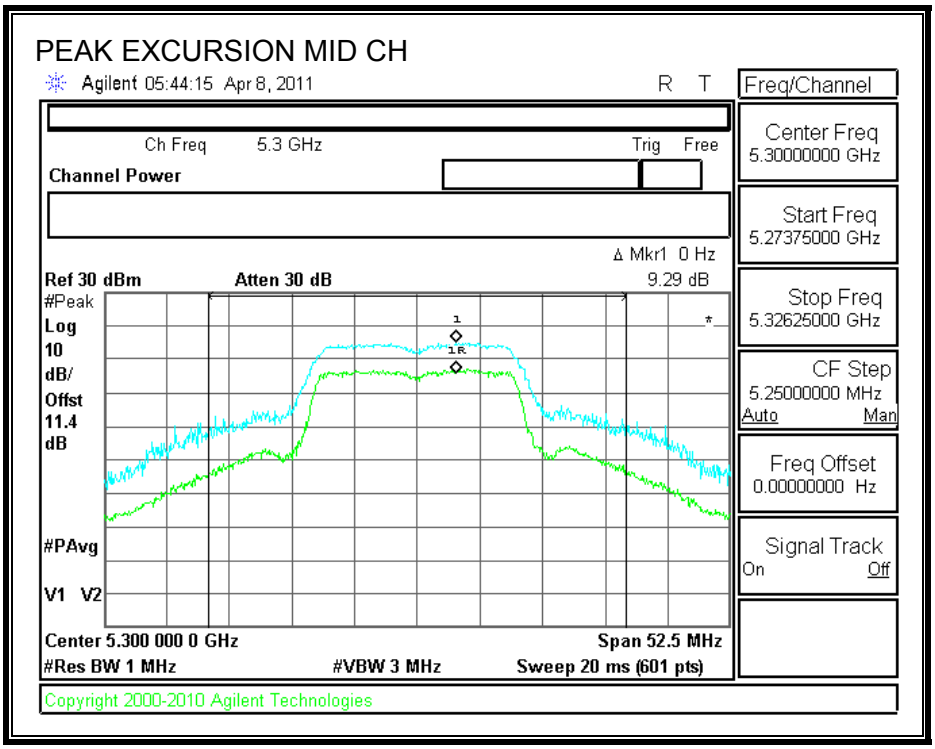
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

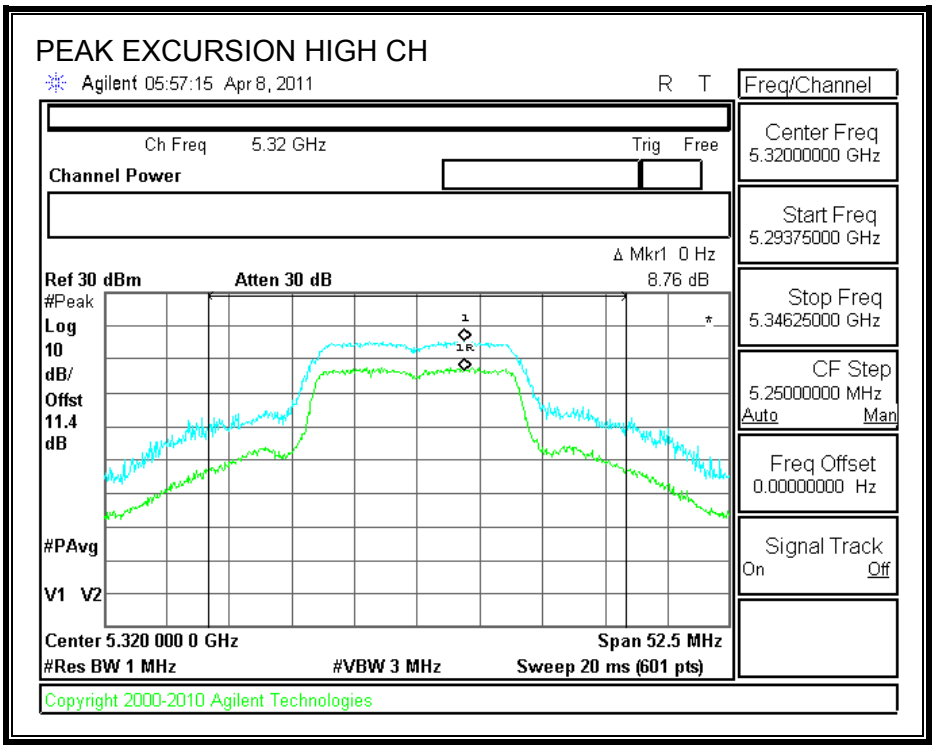
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	8.98	13	-4.02
Middle	5300	9.29	13	-3.71
High	5320	8.76	13	-4.24

PEAK EXCURSION







7.7.3. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to HT20 3x3 CDD MCS0.

7.8. 802.11n DUAL CHAIN HT20 MODE IN THE 5.3 GHz BAND

CDD MCS0

7.8.1. 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 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

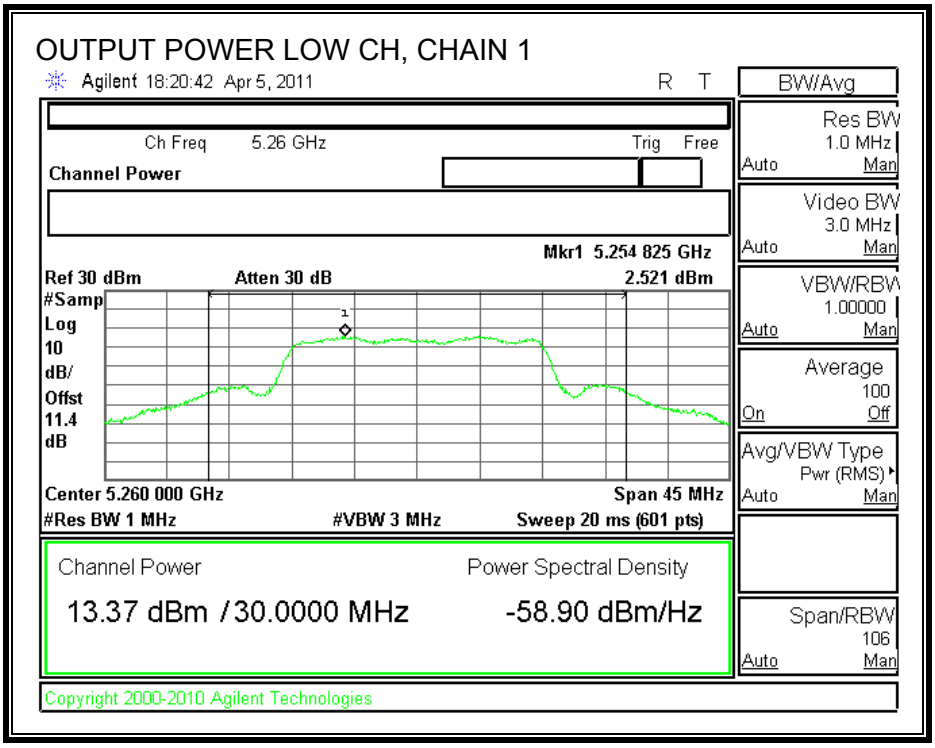
Limit

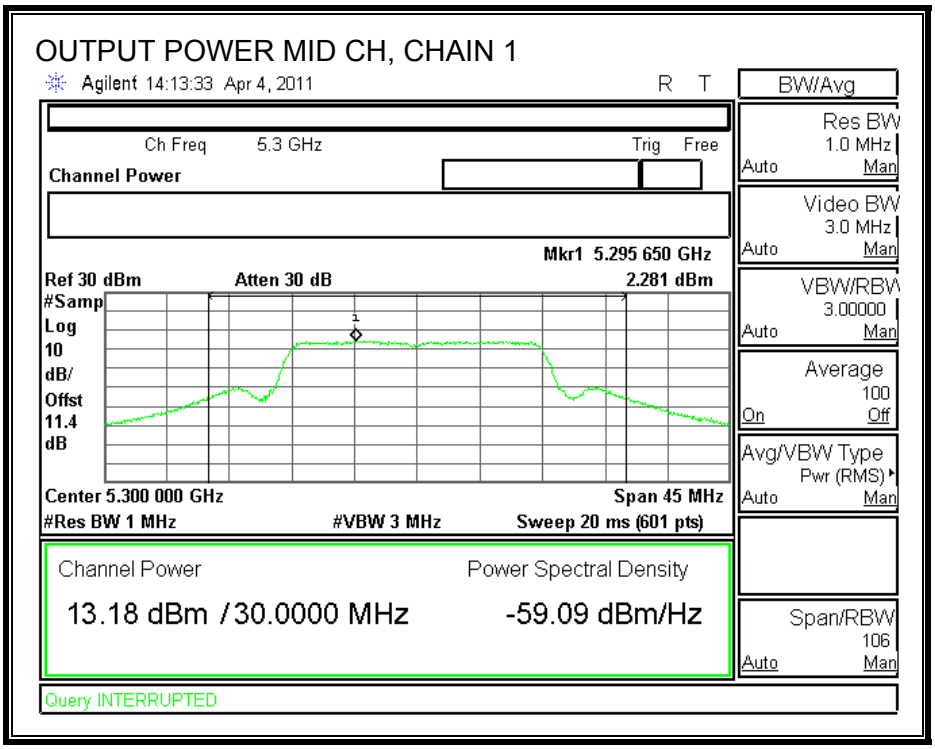
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	26.731	25.27	7.98	22.02
Mid	5300	24	26.011	25.15	7.98	22.02
High	5320	24	27.998	25.47	7.98	22.02

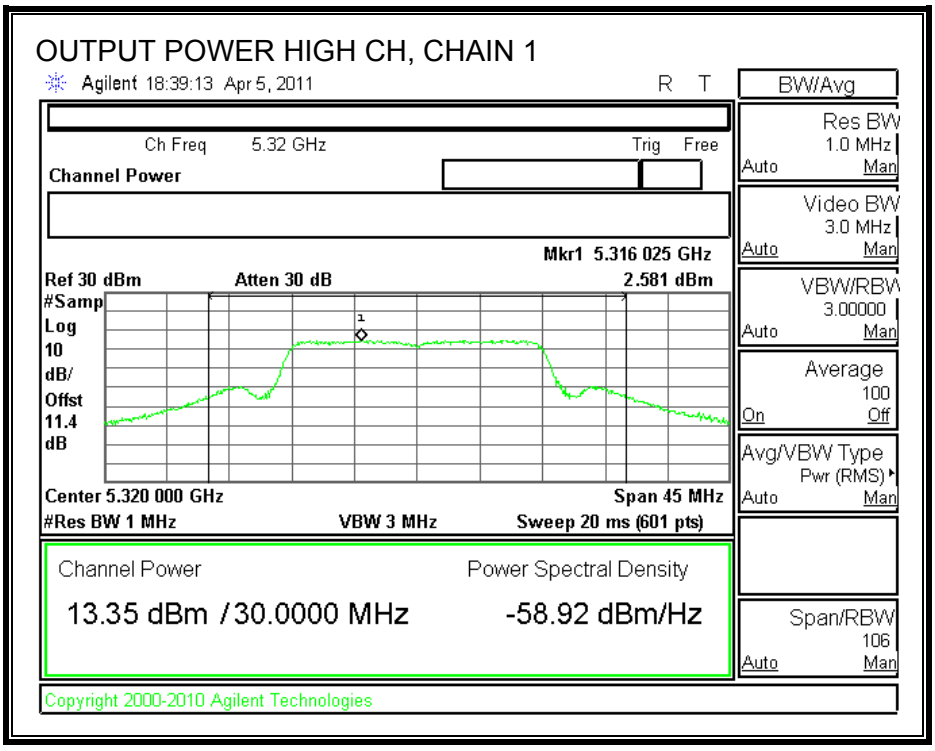
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	13.37	13.46	16.43	22.02	-5.59
Mid	5300	13.18	13.24	16.22	22.02	-5.80
High	5320	13.35	13.52	16.45	22.02	-5.57

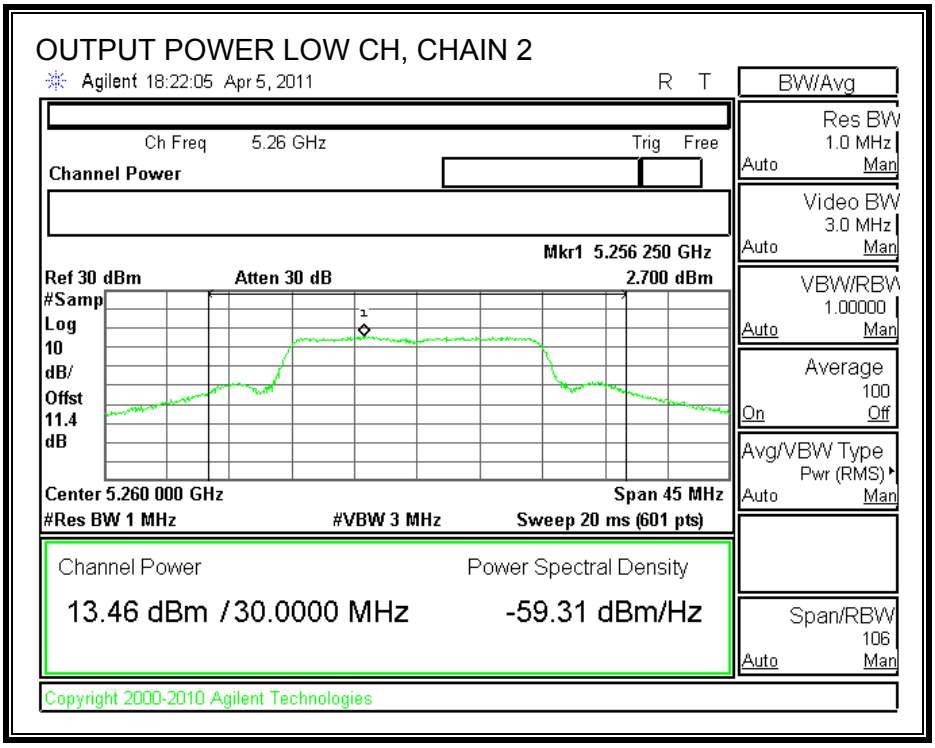
CHAIN 1 OUTPUT POWER

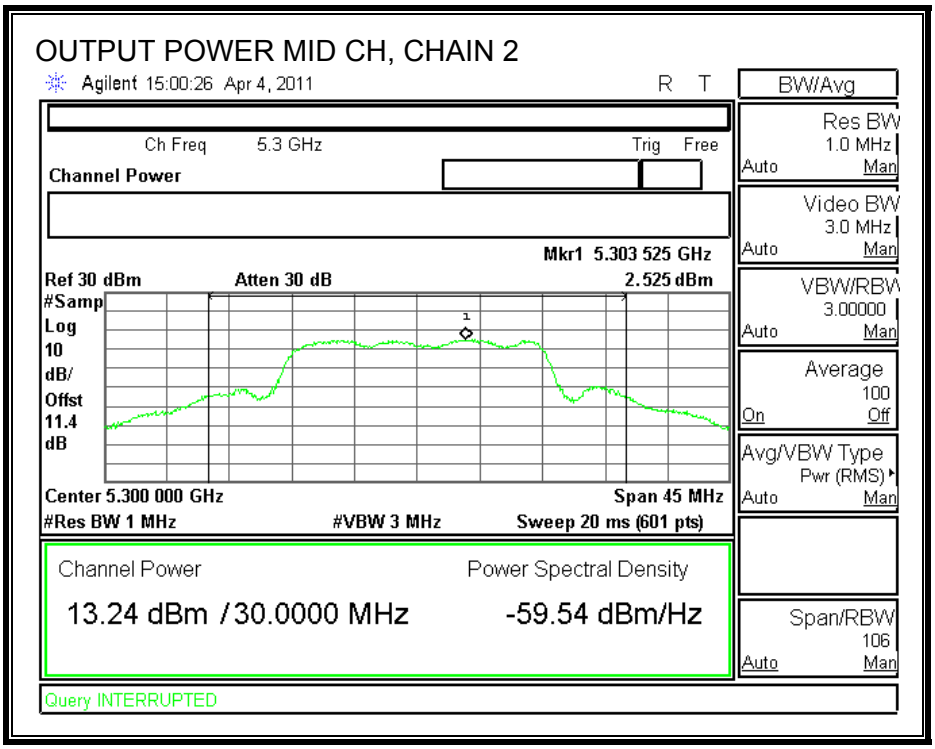


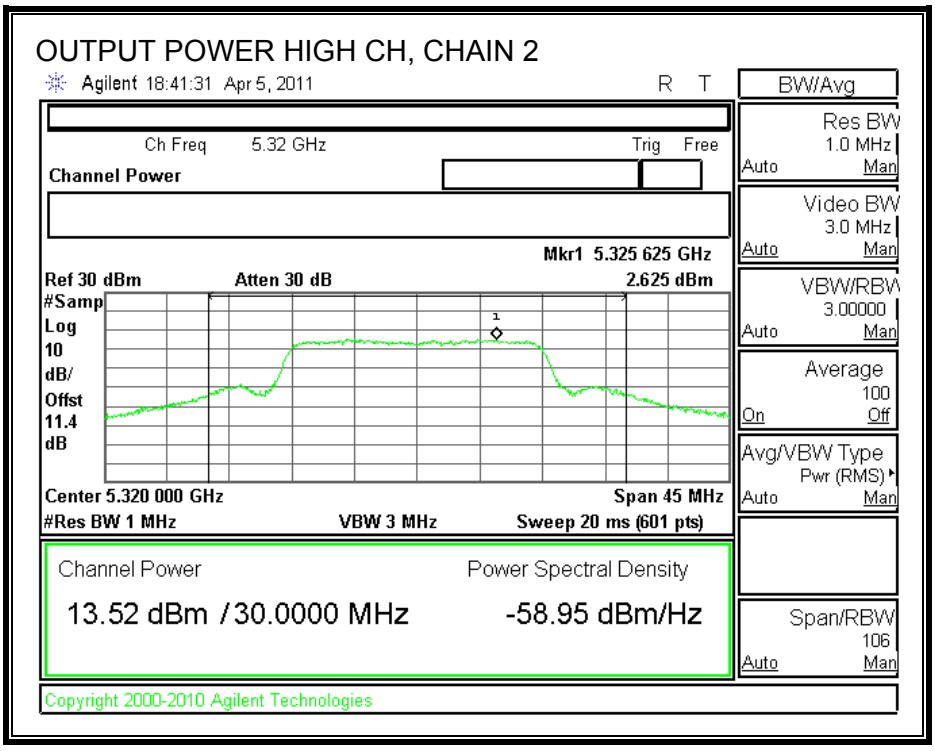




CHAIN 2 OUTPUT POWER







7.9. 802.11n THREE CHAINS HT20 MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

7.9.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

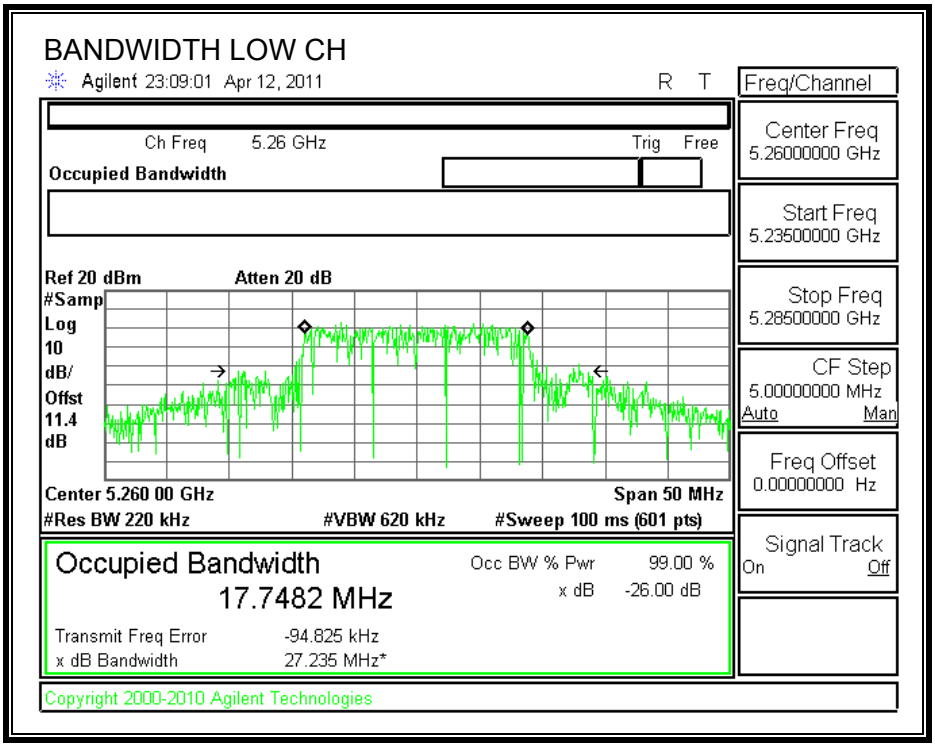
TEST PROCEDURE

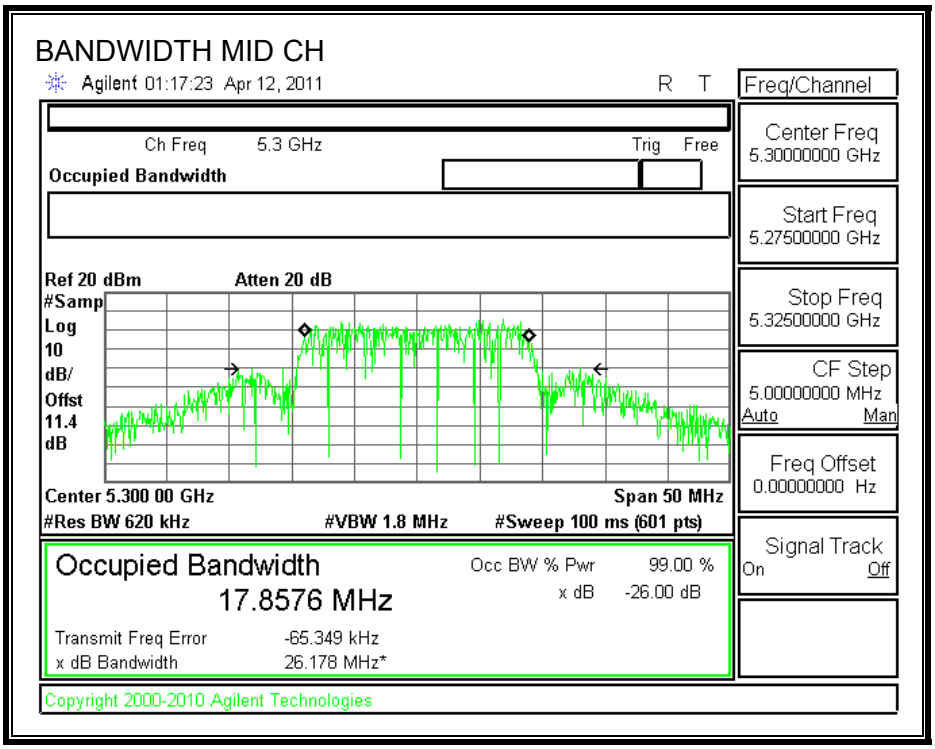
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

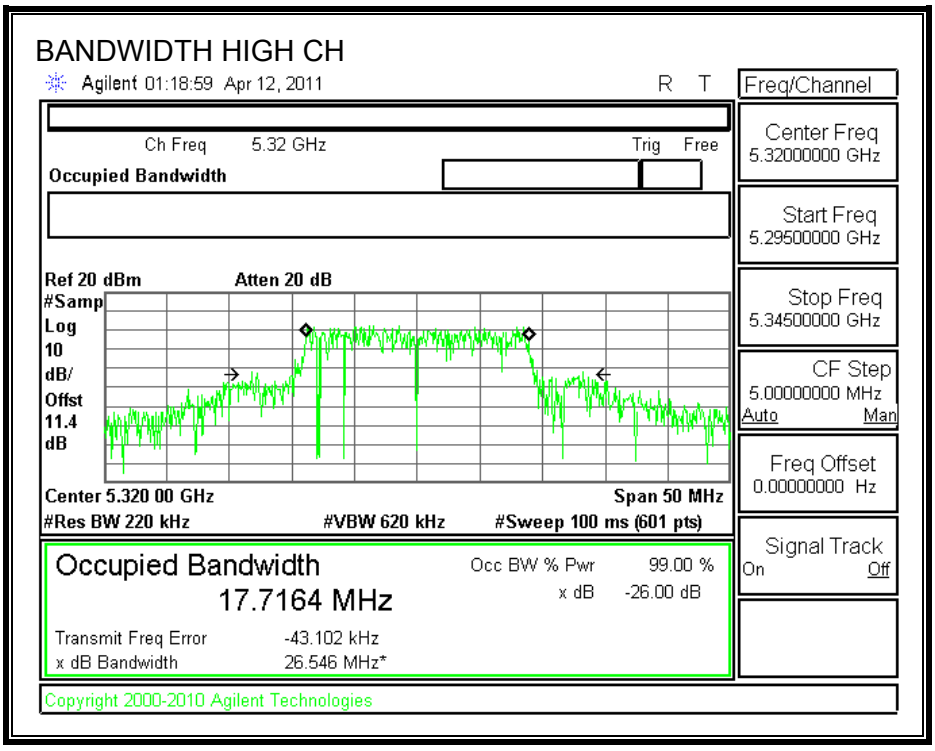
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	26.731	17.7482
Middle	5300	26.011	17.8576
High	5320	27.998	17.7164

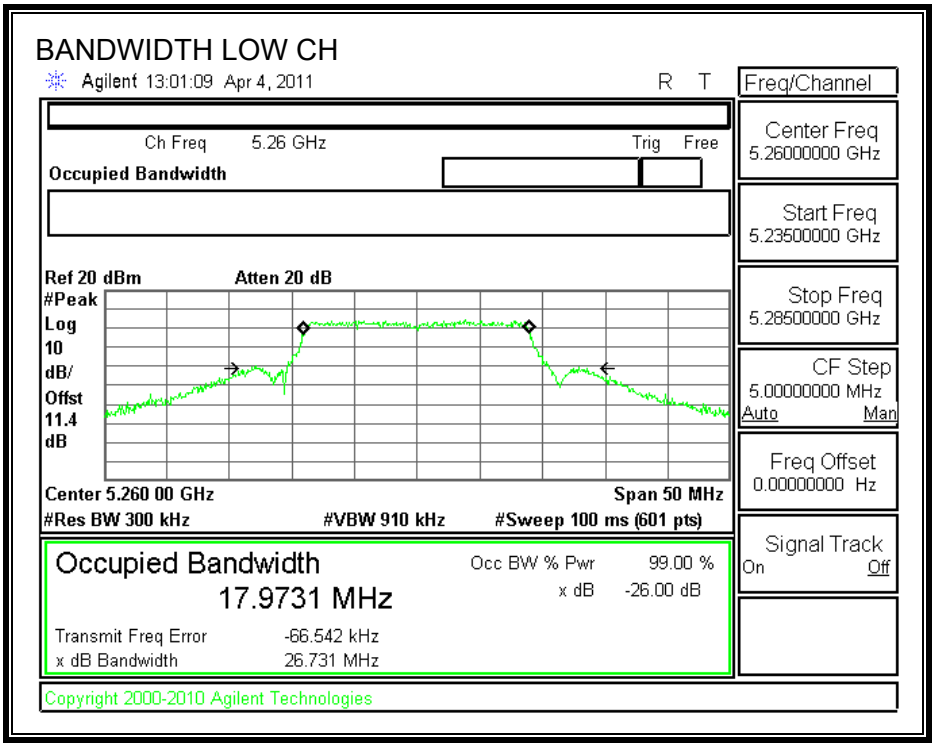
99% BANDWIDTH

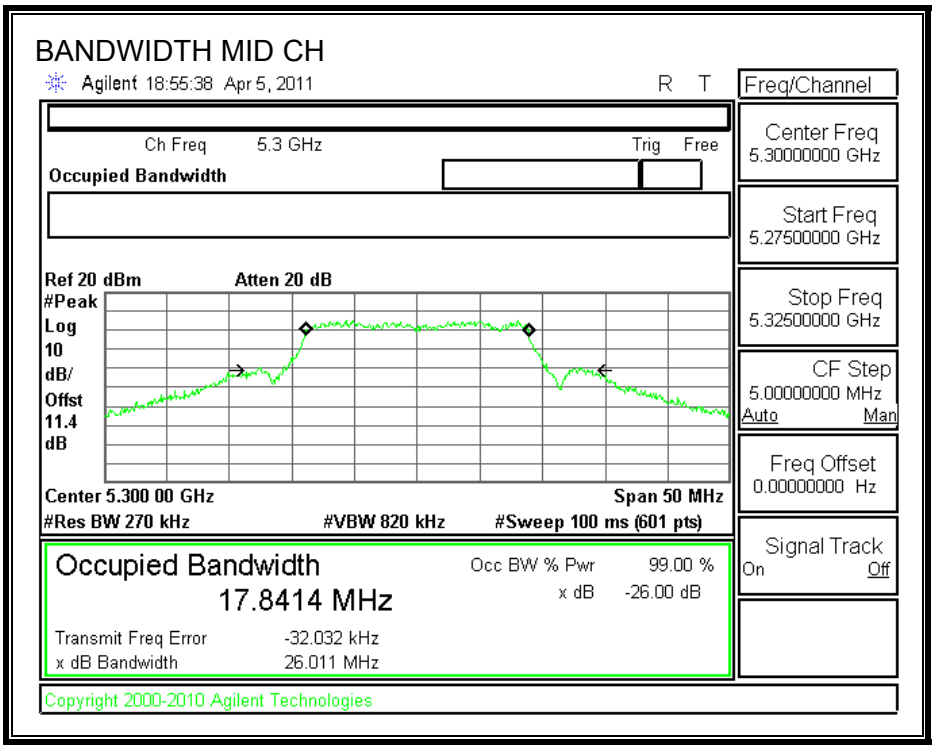


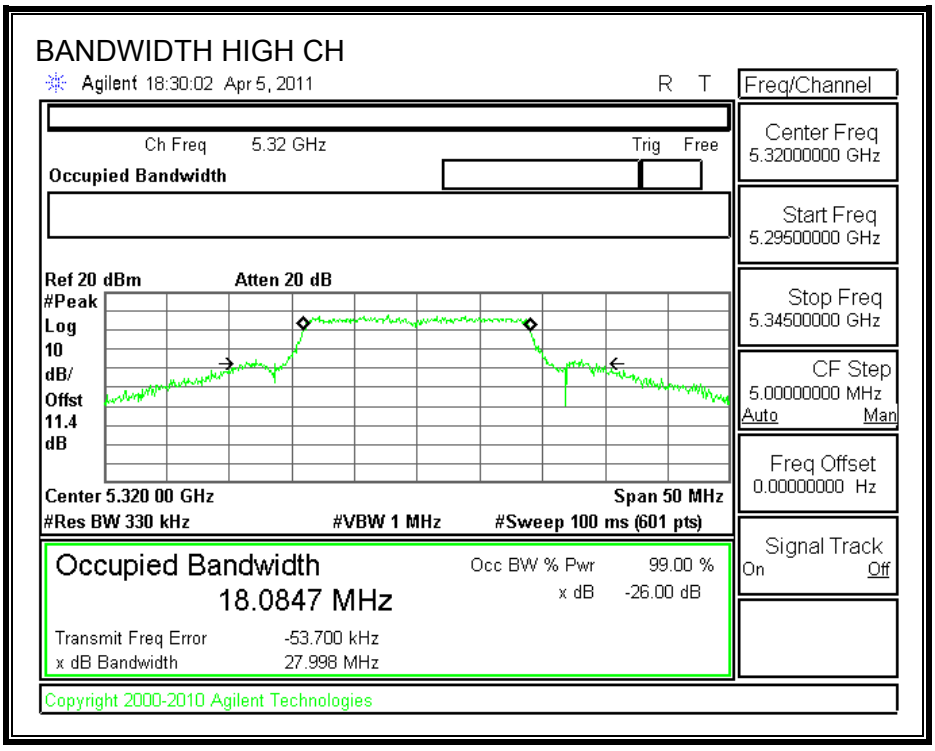




26 dB BANDWIDTH







7.9.2. 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 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

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	23.98	26.731	25.27	9.32	20.66
Mid	5300	23.98	26.011	25.15	9.32	20.66
High	5320	23.98	27.998	25.47	9.32	20.66

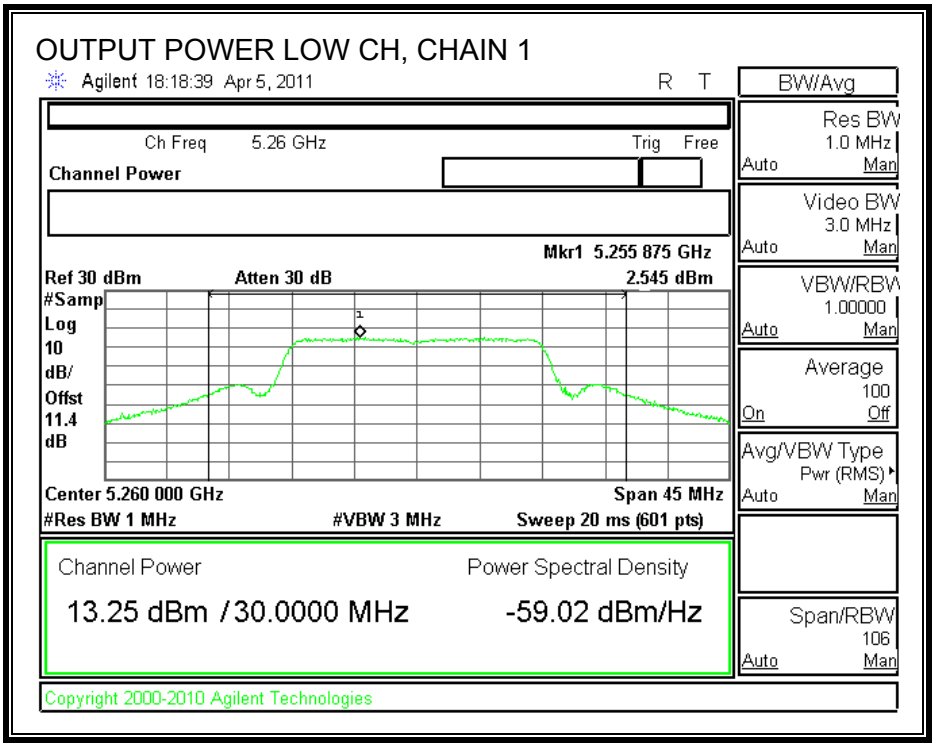
Individual Chain Results

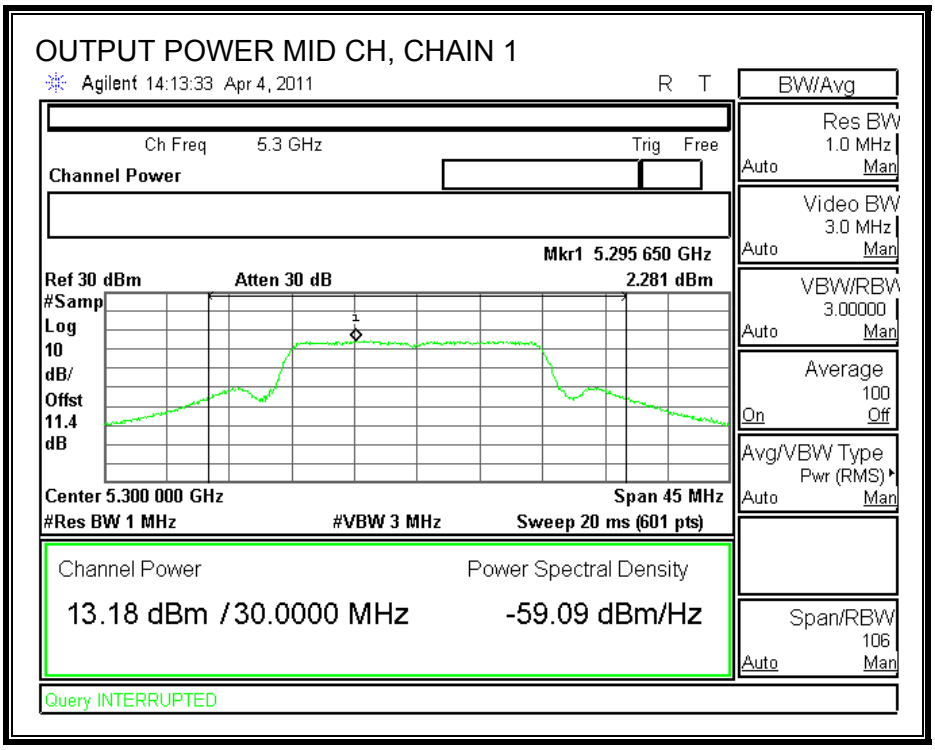
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	13.25	13.37	13.46	18.13	20.66	-2.53
Mid	5300	13.18	13.24	13.02	17.92	20.66	-2.74
High	5320	13.35	13.32	13.52	18.17	20.66	-2.49

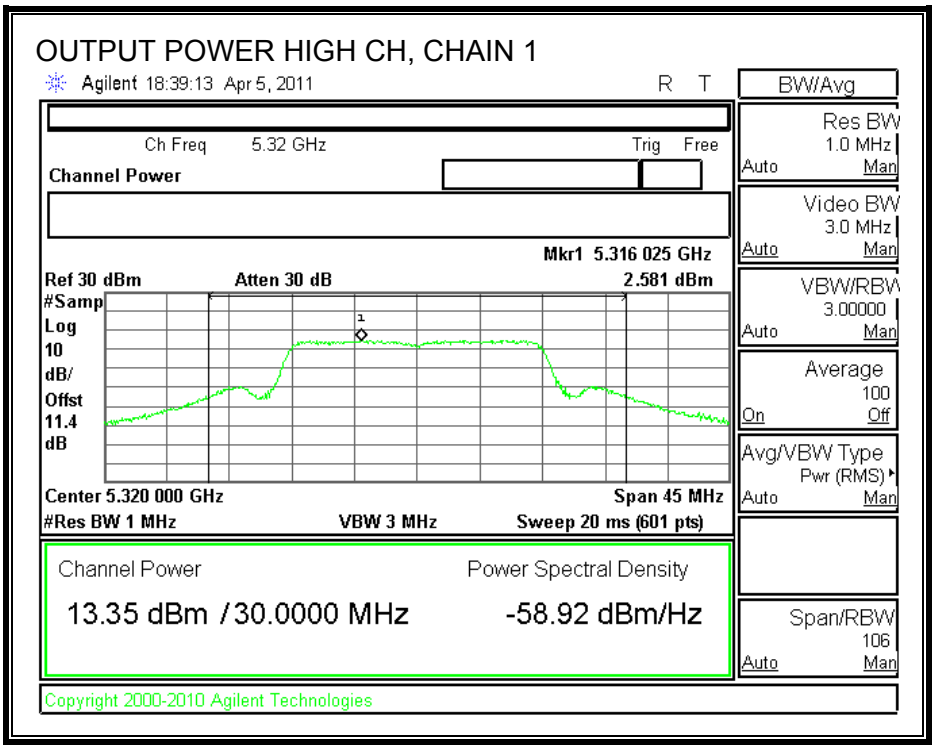
TPC Results

TPC Delta Power		Chain 1	Chain 2	Chain 3			
		3.50	3.55	2.87			
Worst-case TPC Power		Chain 1	Chain 2	Chain 3	Total Power	Ant Gain	EIRP
Low	5320	9.85	9.77	9.65	14.53	9.32	23.85
						TPC Limit (dBm)	24
						Margin (dB)	-0.15

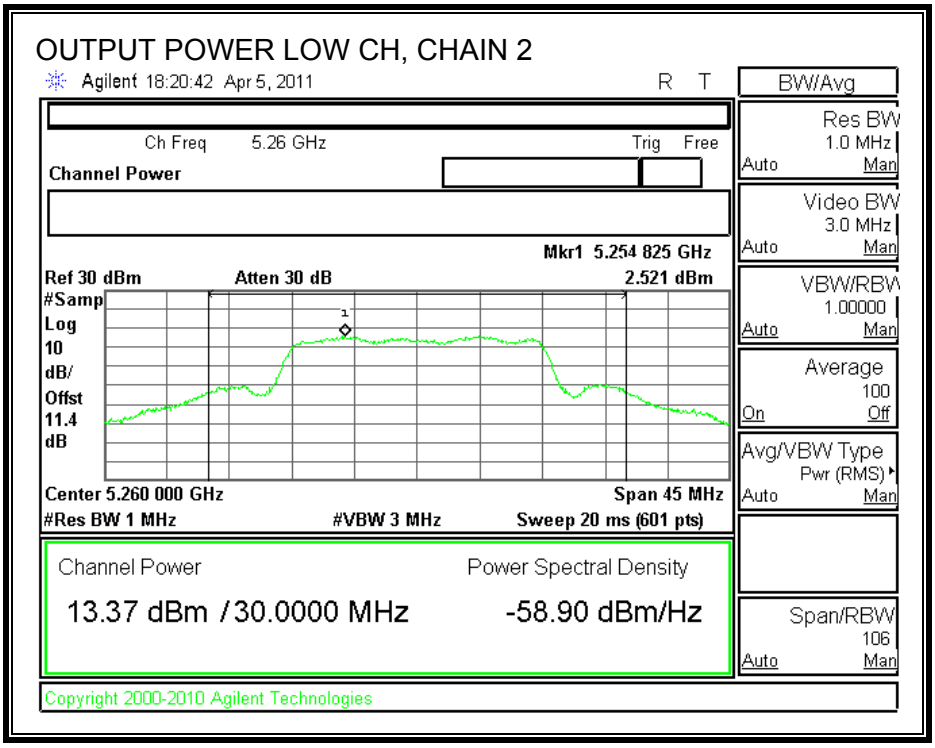
CHAIN 1 OUTPUT POWER

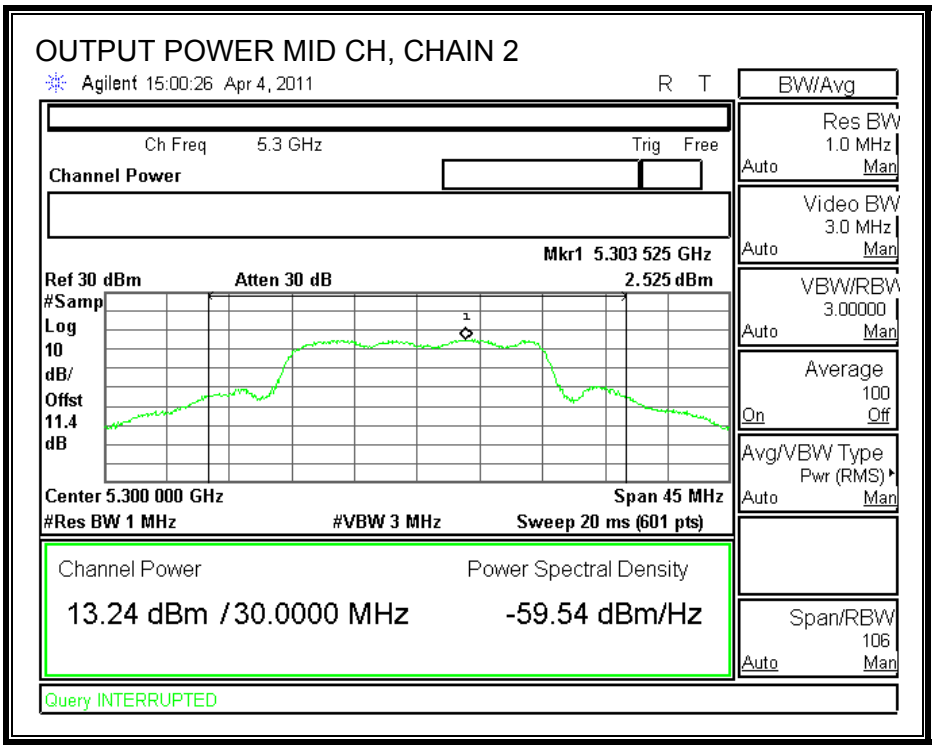


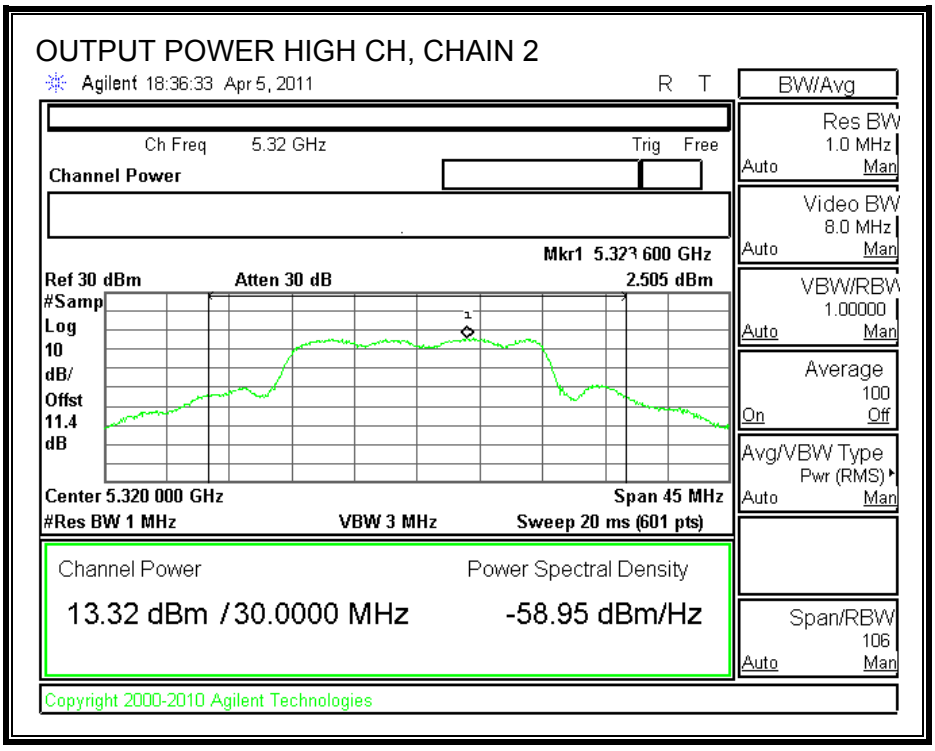




CHAIN 2 OUTPUT POWER







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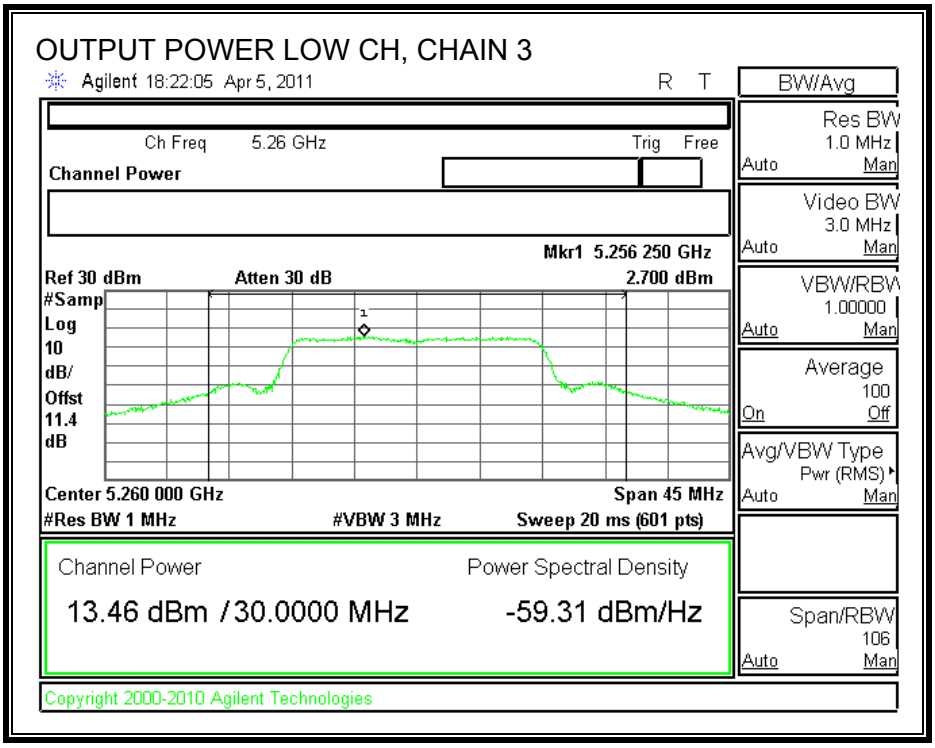
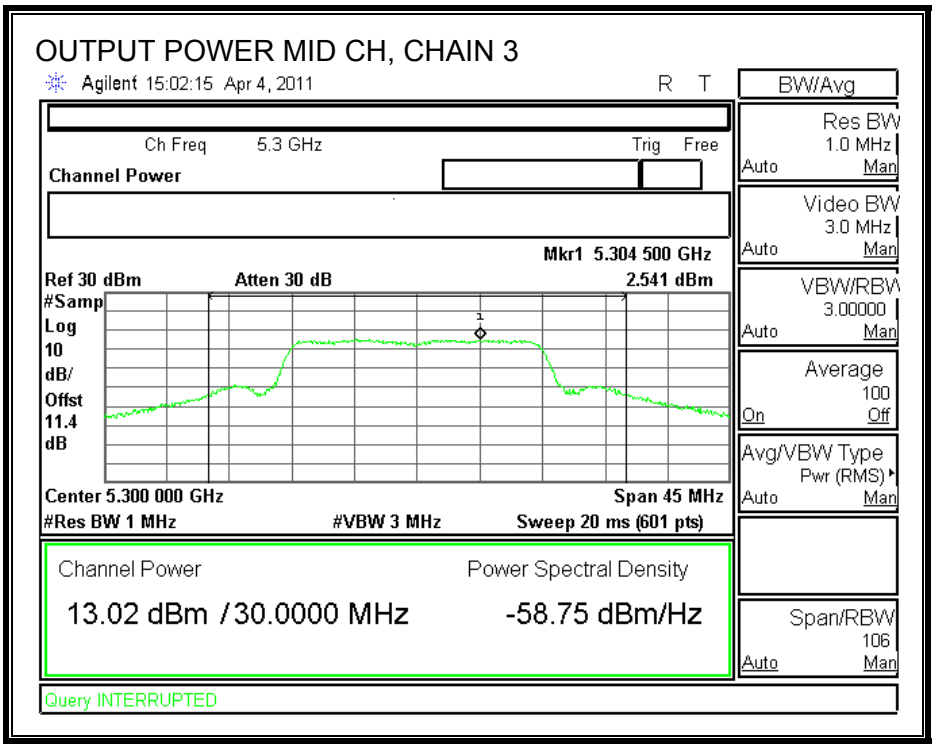
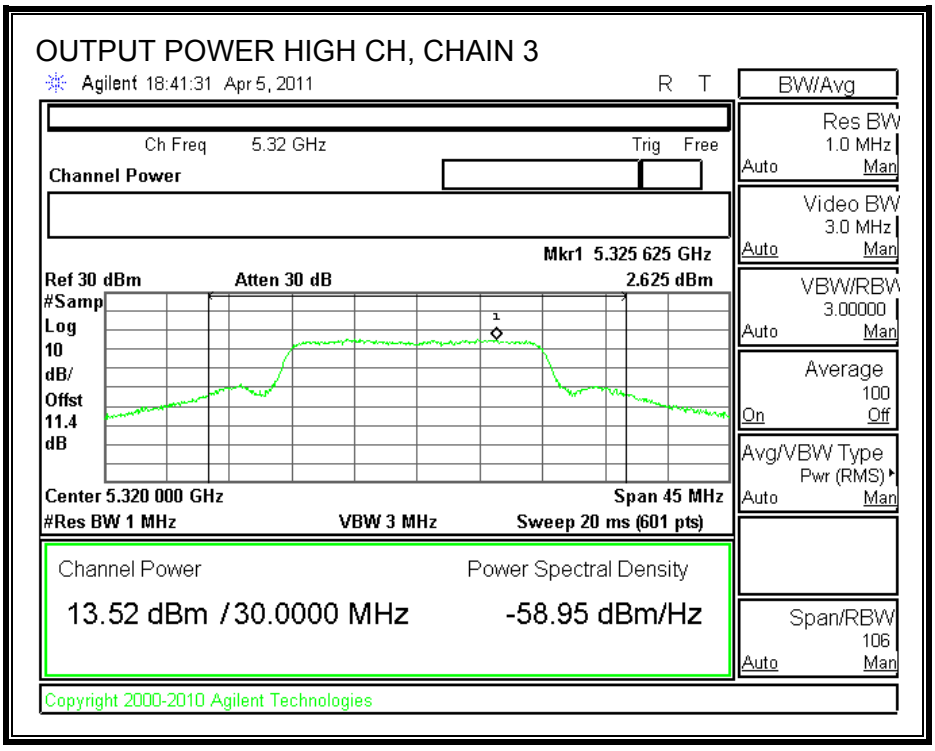
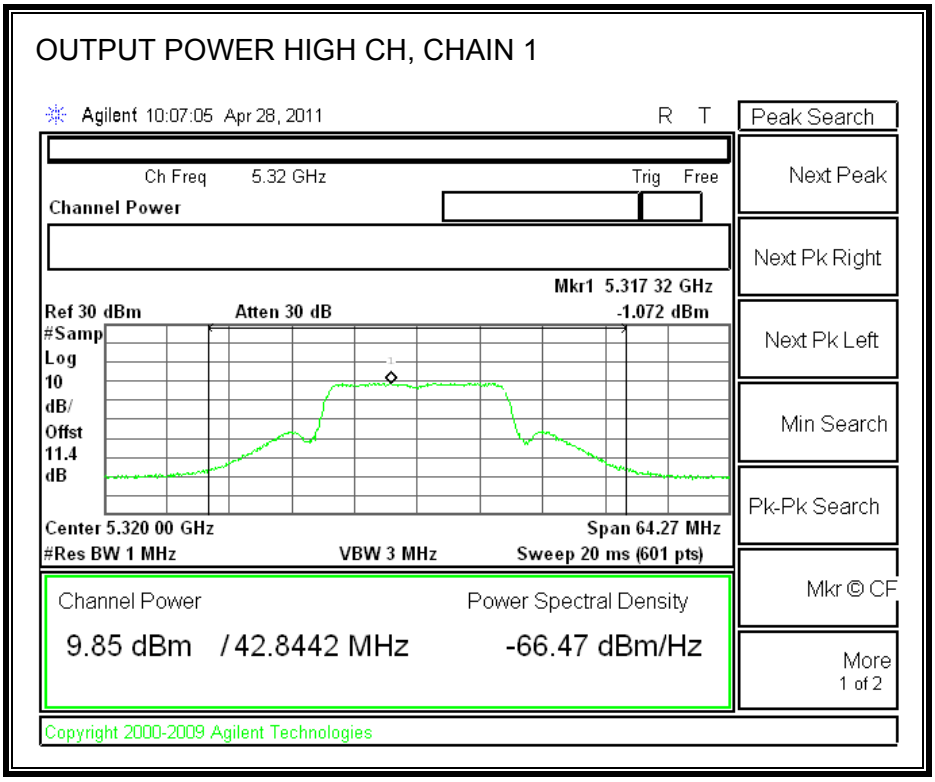




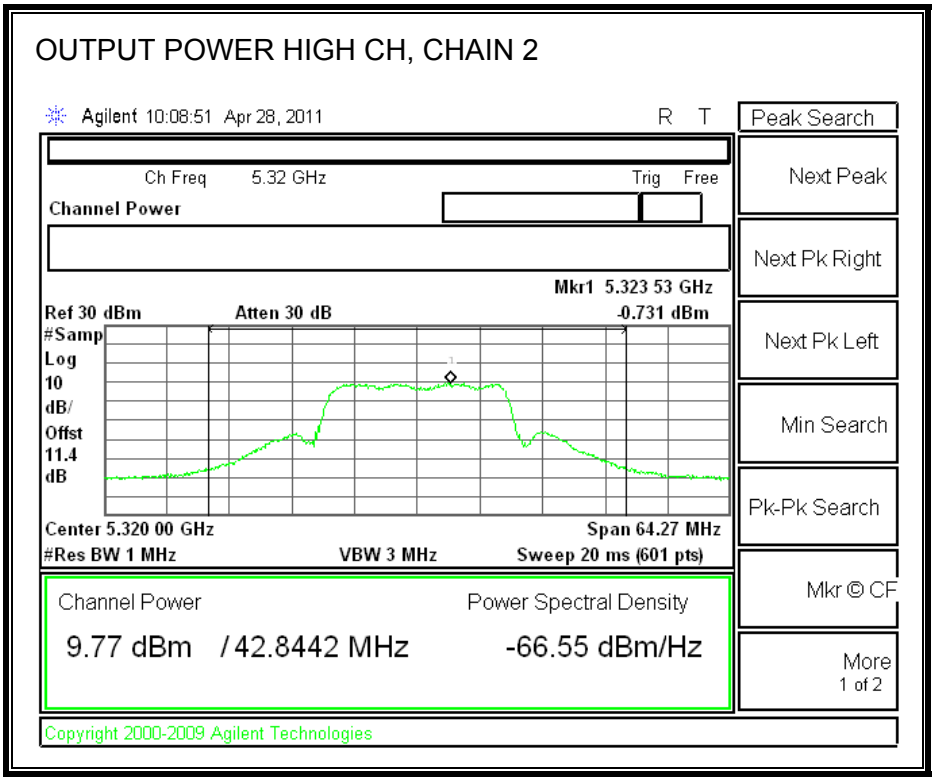


TPC OUTPUT POWER

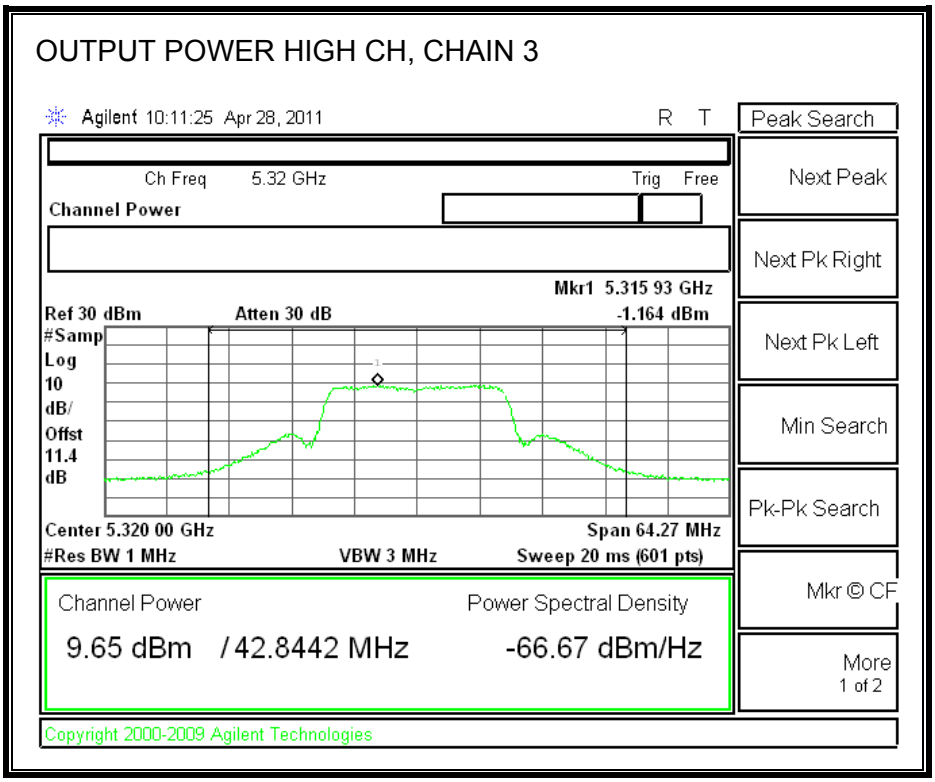
OUTPUT POWER HIGH CH, CHAIN 1



OUTPUT POWER HIGH CH, CHAIN 2



OUTPUT POWER HIGH CH, CHAIN 3



7.9.3. 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 composite antenna gain is equal to 9.32 dBi, therefore the limit is 7.68 dBm.

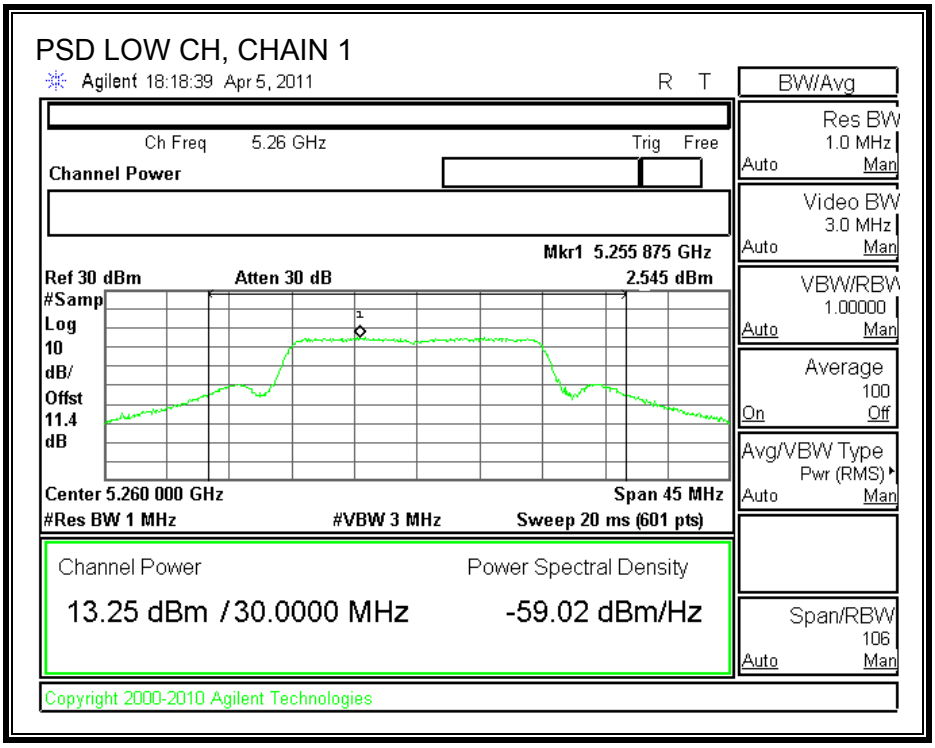
TEST PROCEDURE

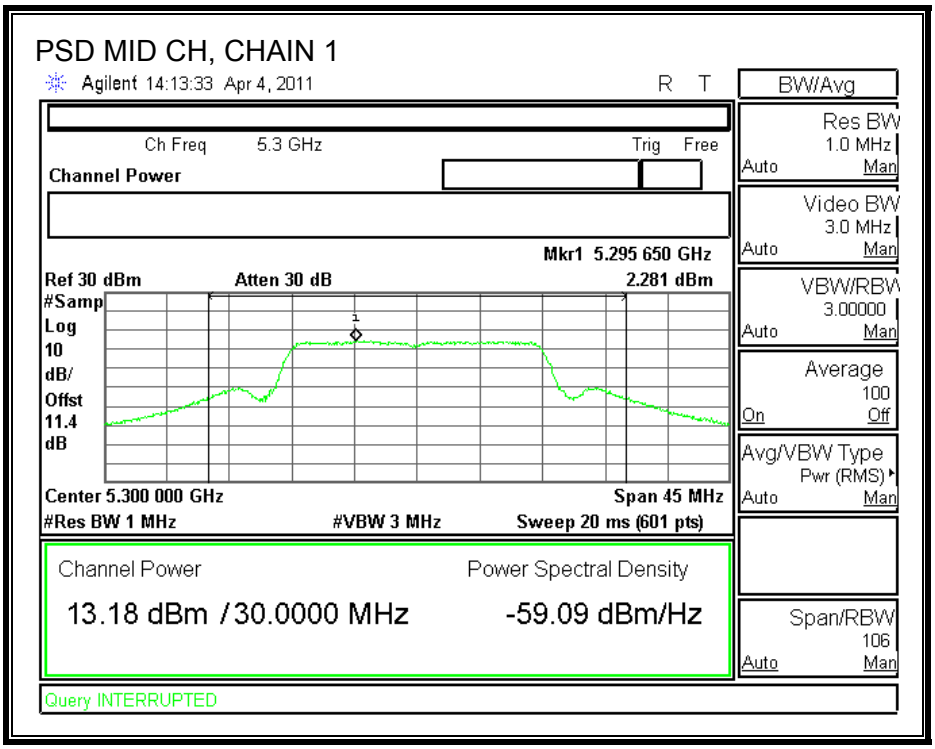
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

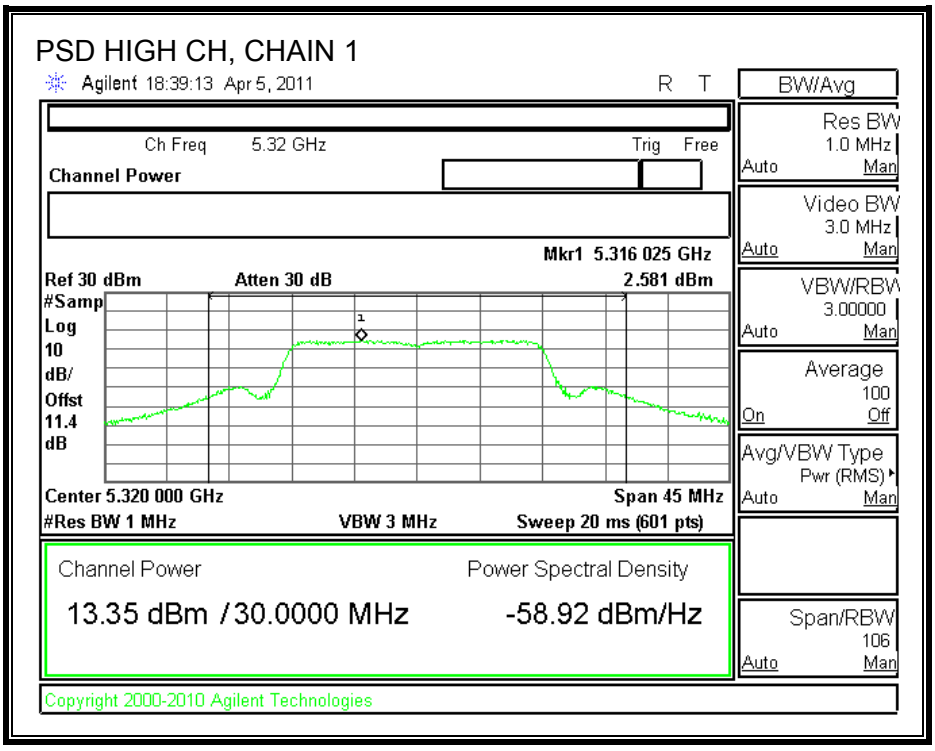
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	2.545	2.521	2.700	7.36	7.68	-0.32
Mid	5300	2.281	2.525	2.541	7.22	7.68	-0.46
High	5320	2.581	2.505	2.625	7.34	7.68	-0.34

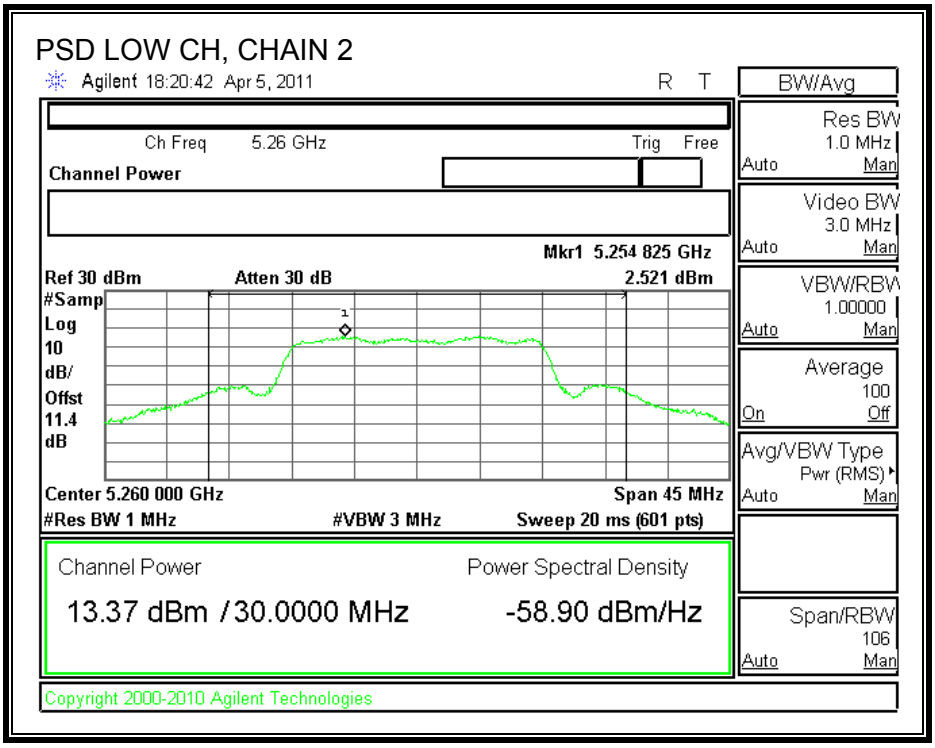
CHAIN 1 POWER SPECTRAL DENSITY

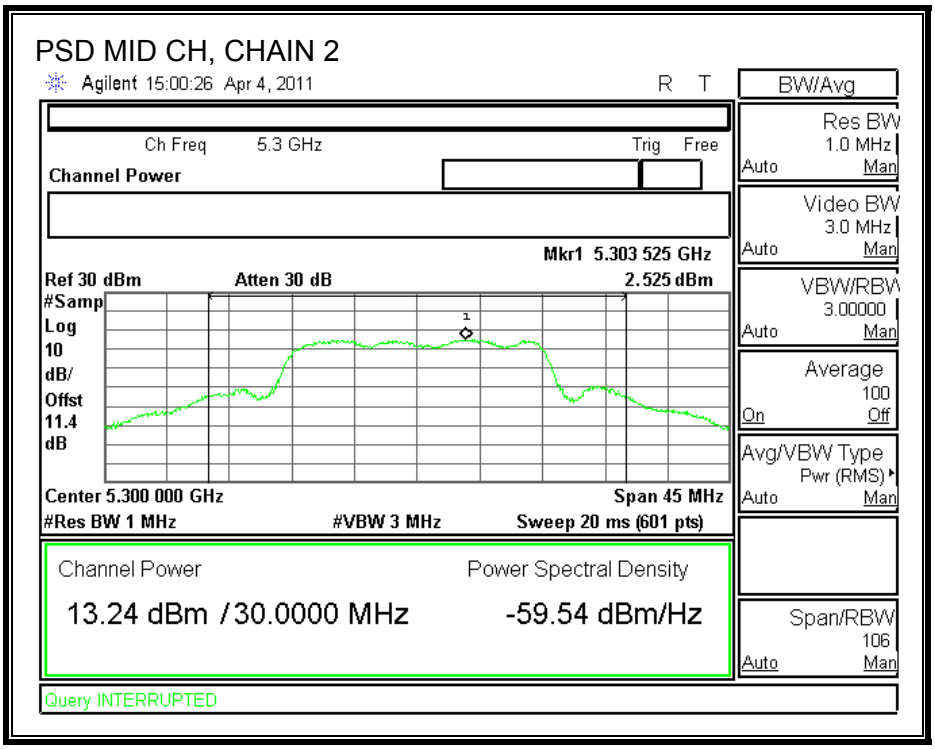


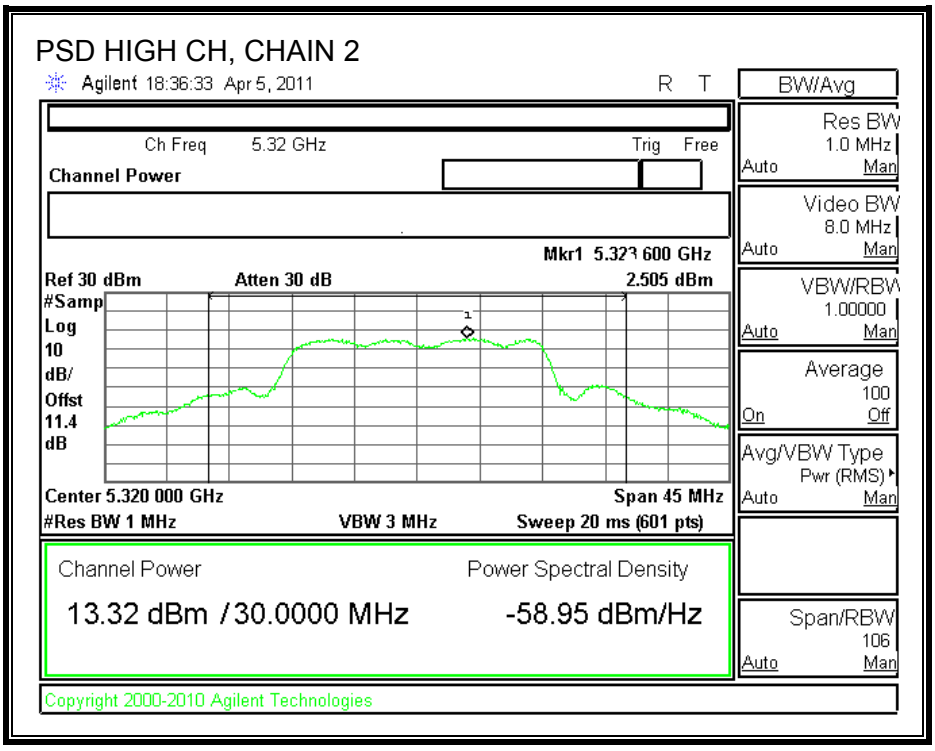




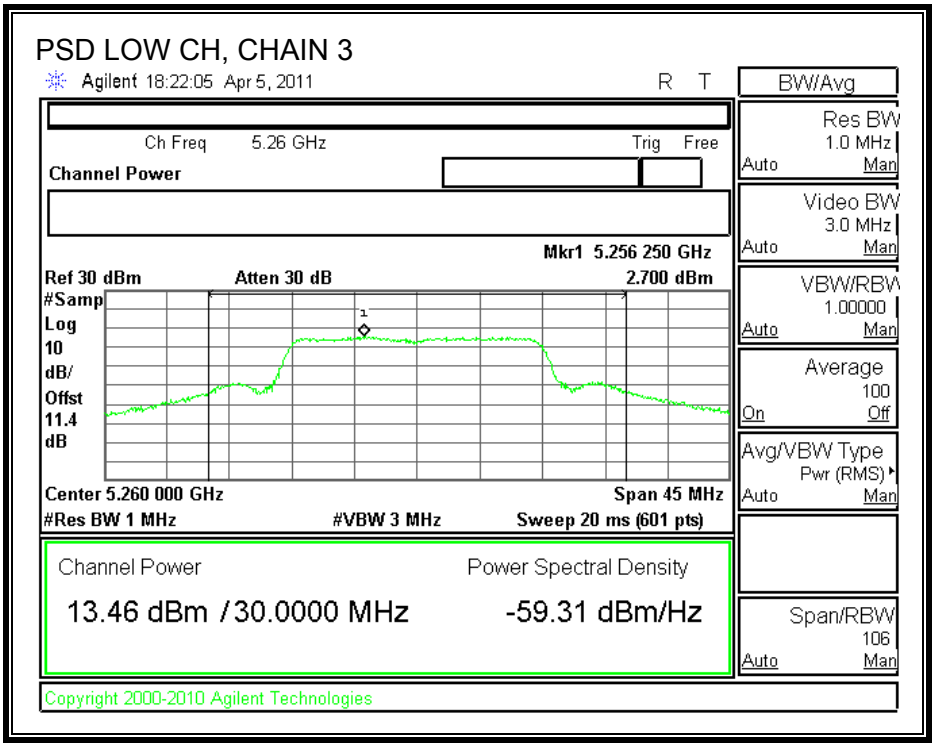
CHAIN 2 POWER SPECTRAL DENSITY

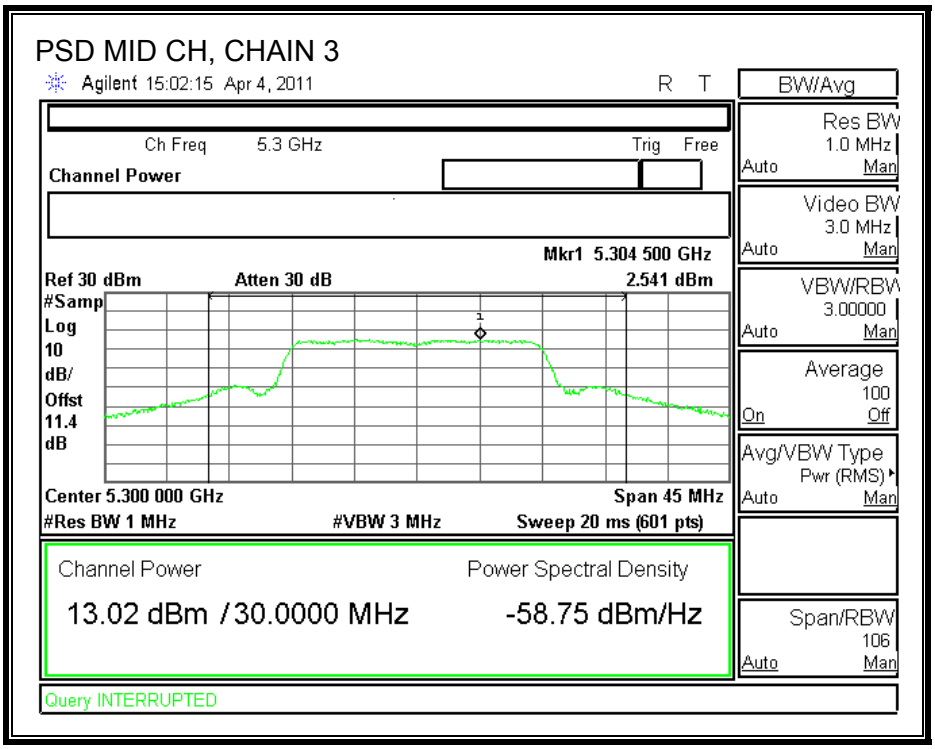


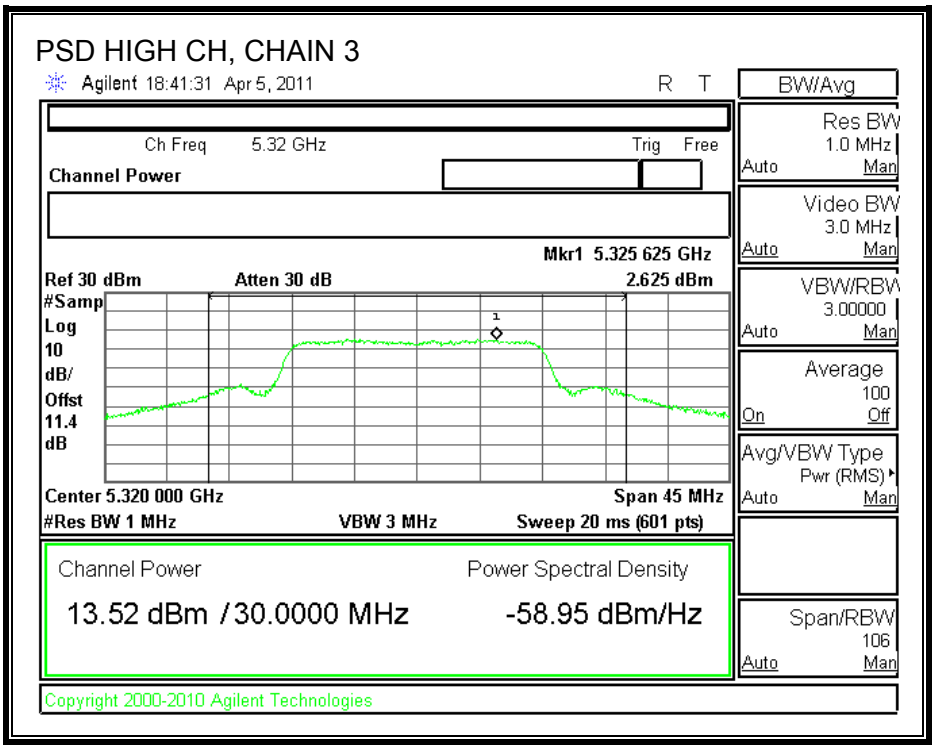




CHAIN 3 POWER SPECTRAL DENSITY







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.

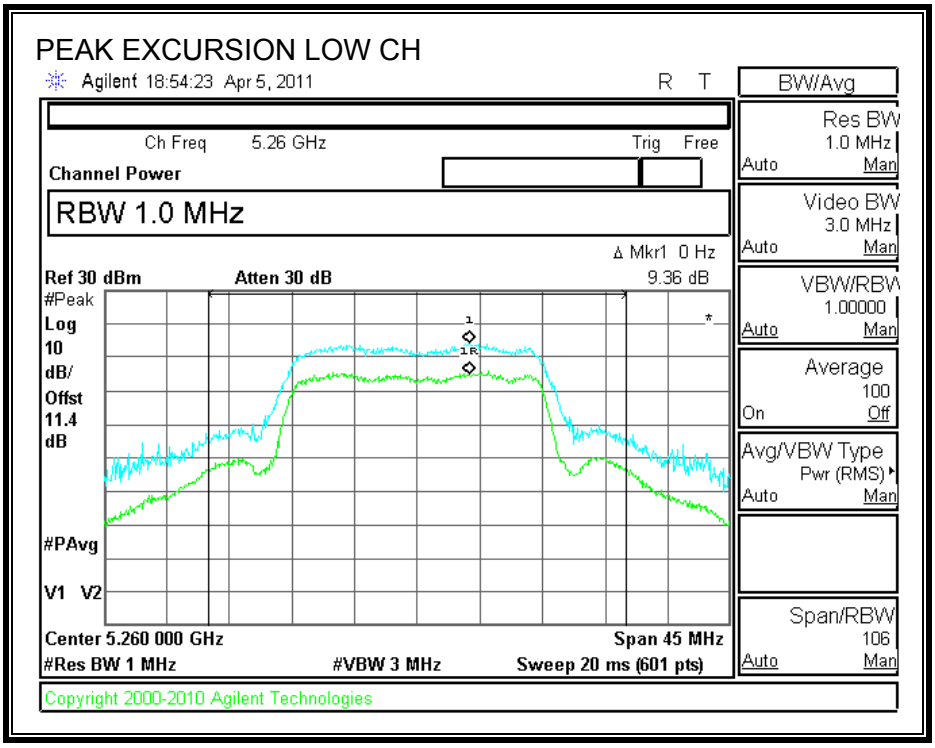
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

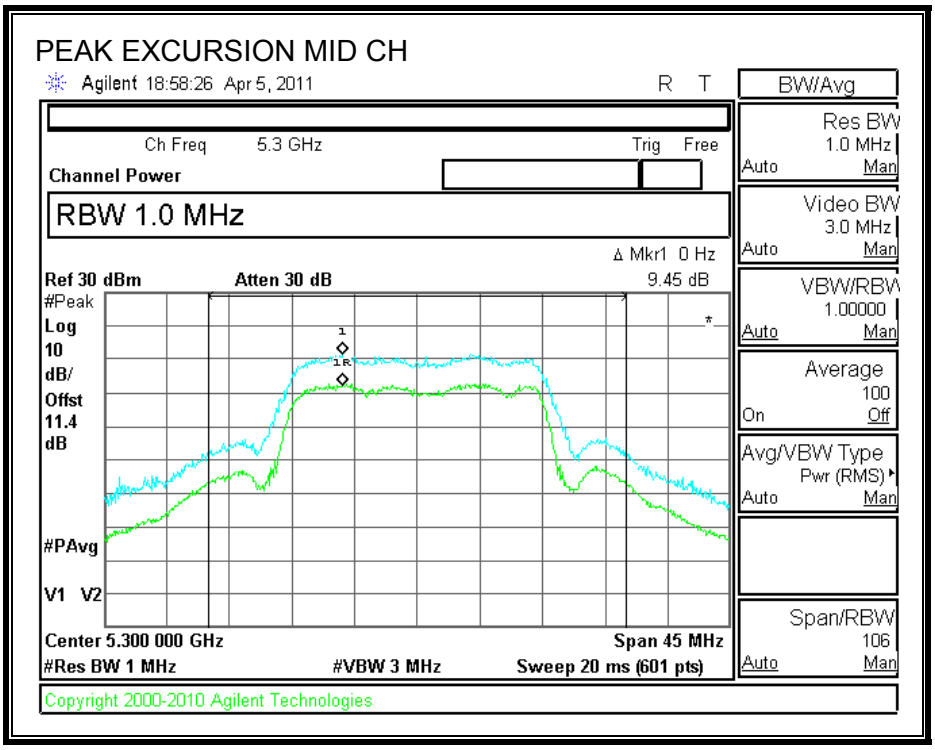
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

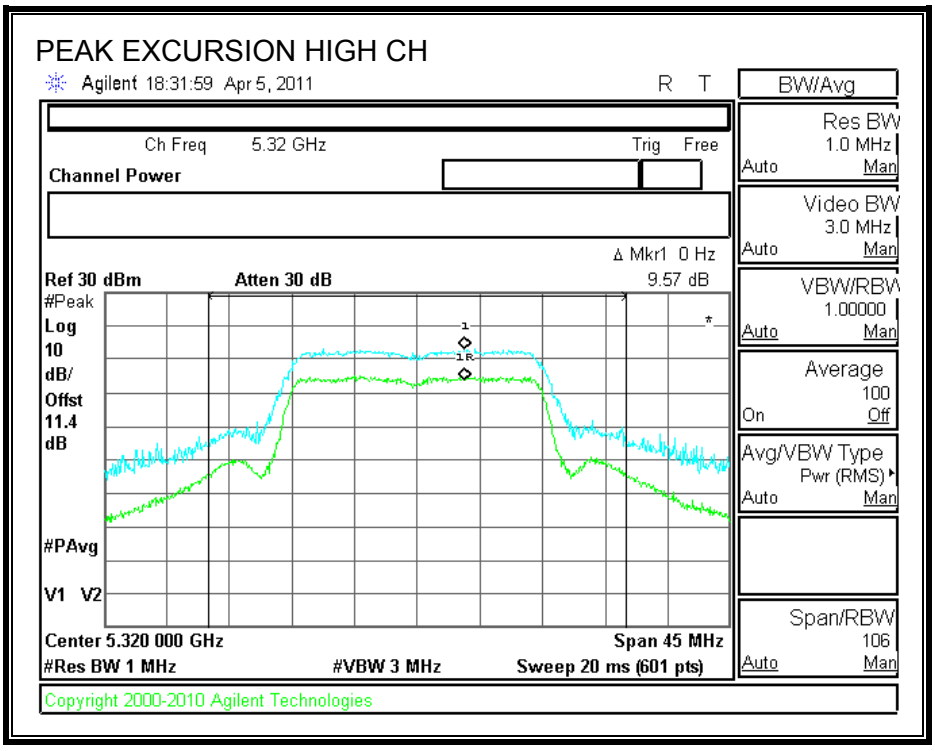
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	9.36	13	-3.64
Middle	5300	9.45	13	-3.55
High	5320	9.57	13	-3.43

PEAK EXCURSION







7.9.5. 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.

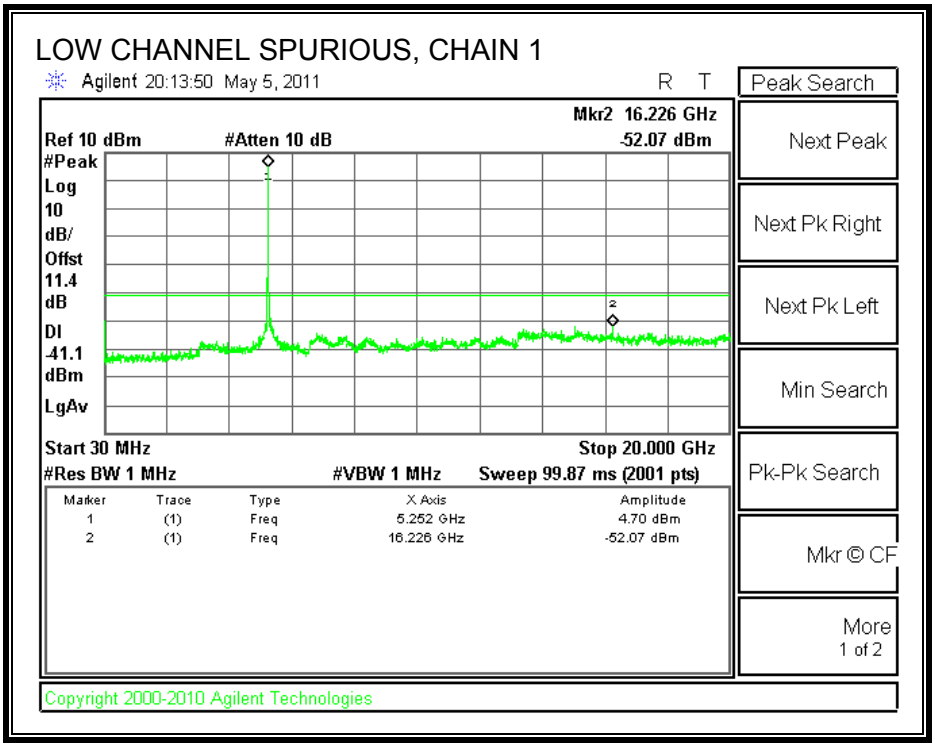
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

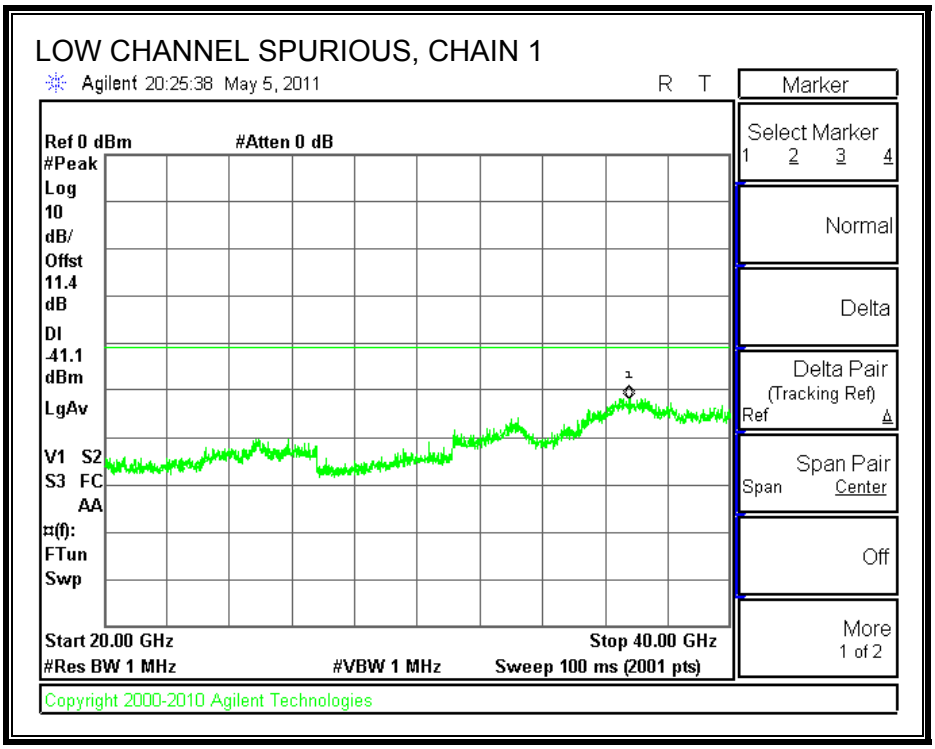
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

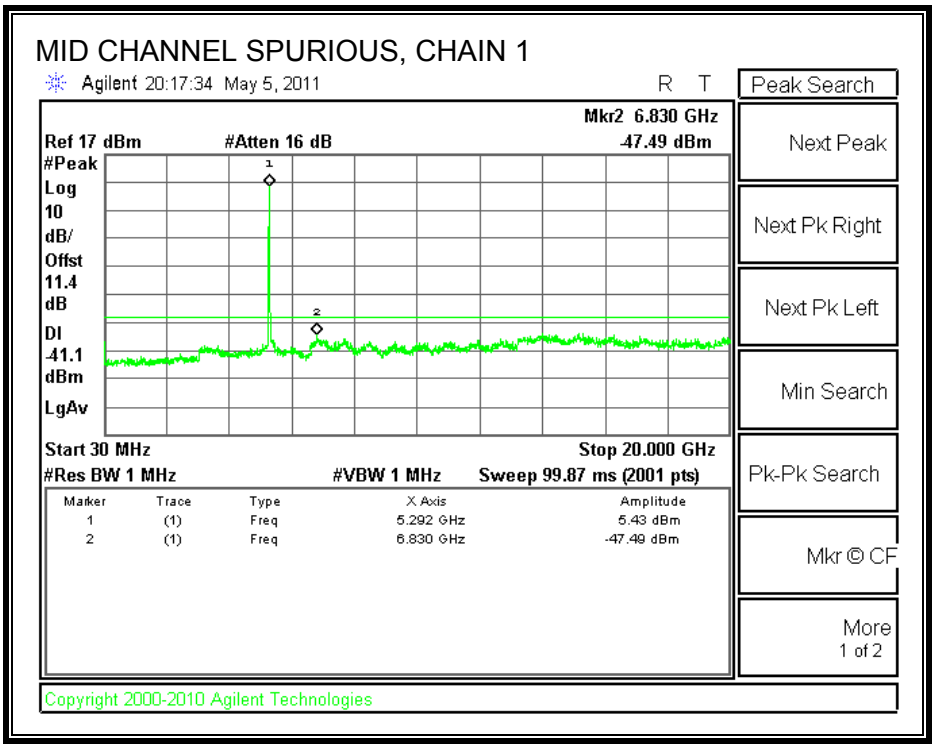
RESULTS

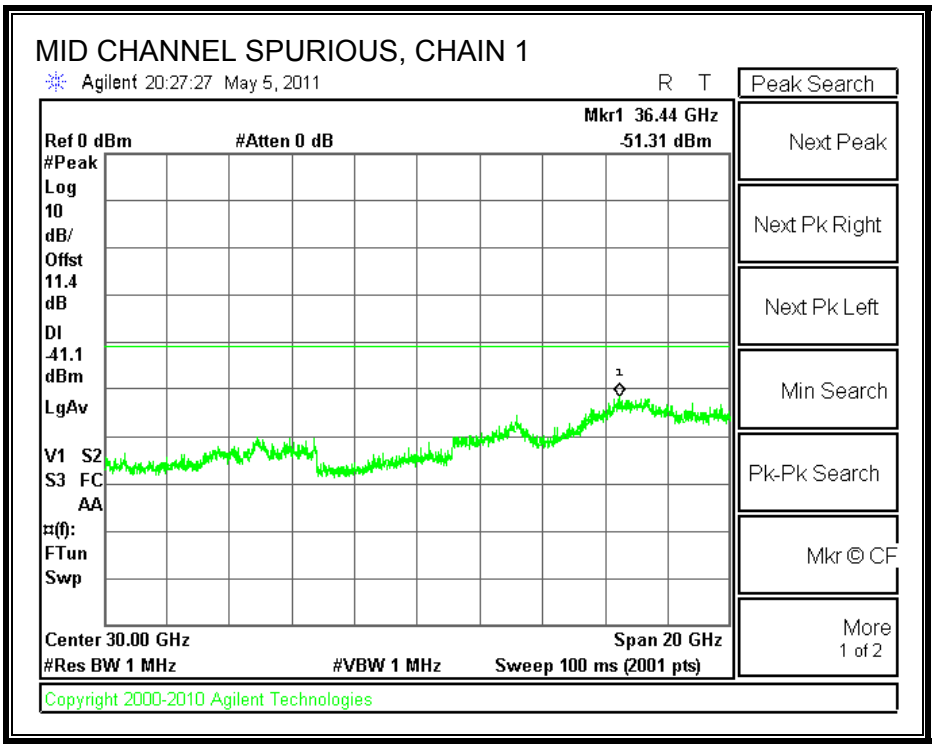
Limit = -27 dBm + Antenna Gain + 10log (N) dB

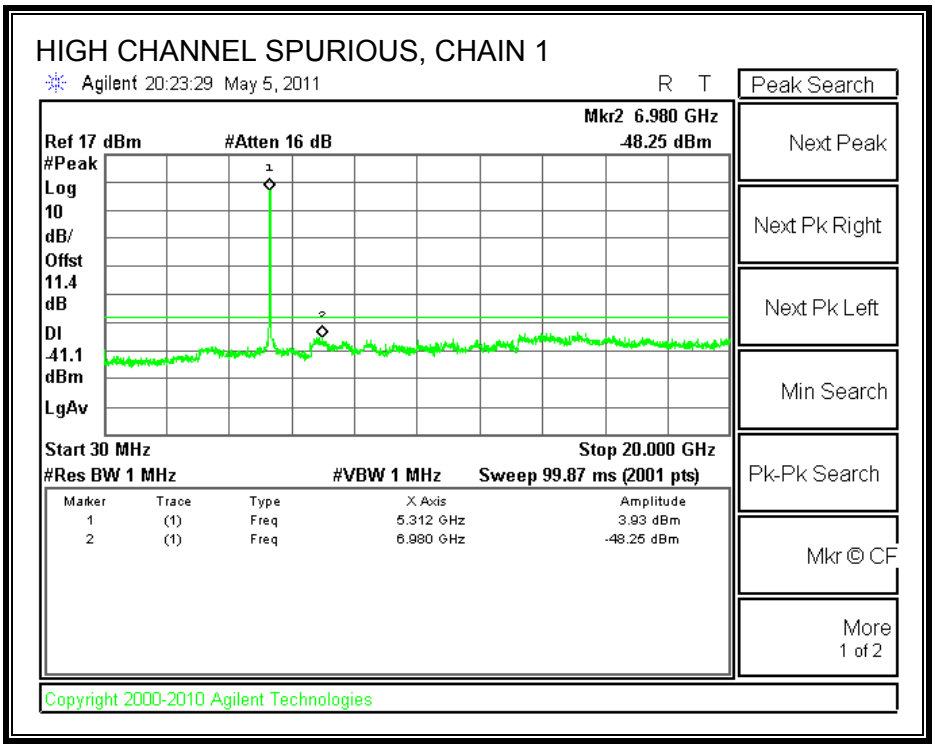
CHAIN 1 SPURIOUS EMISSIONS

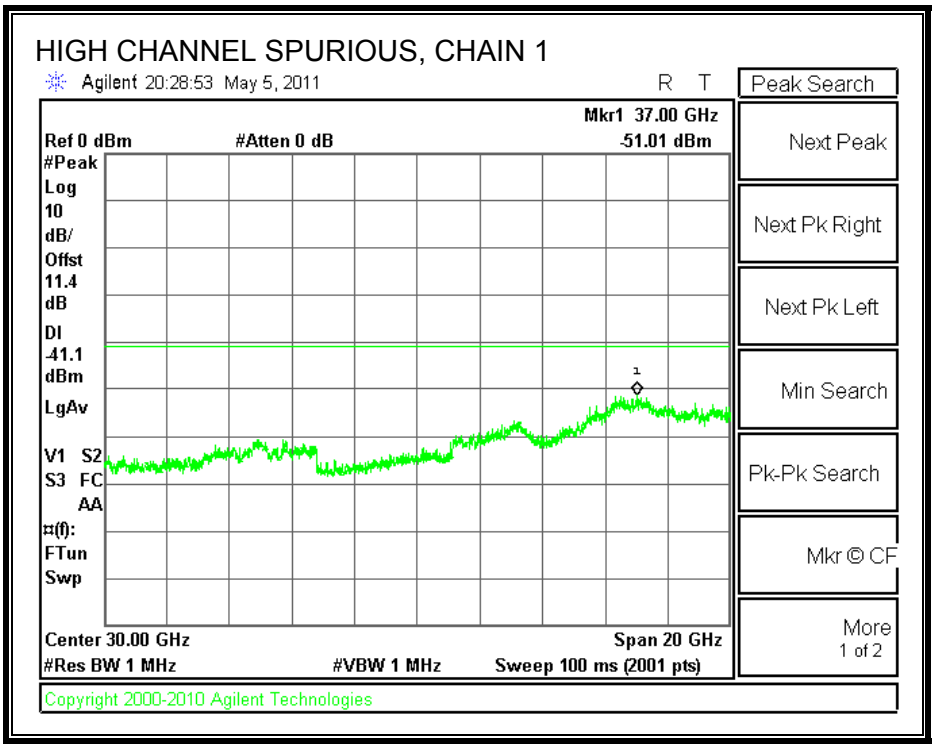




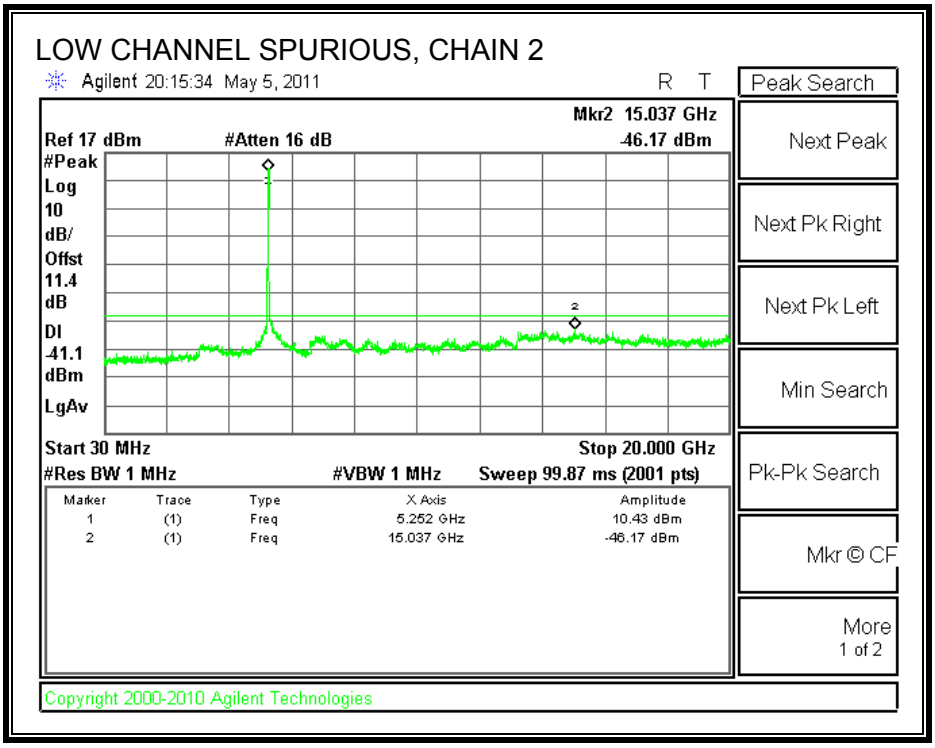


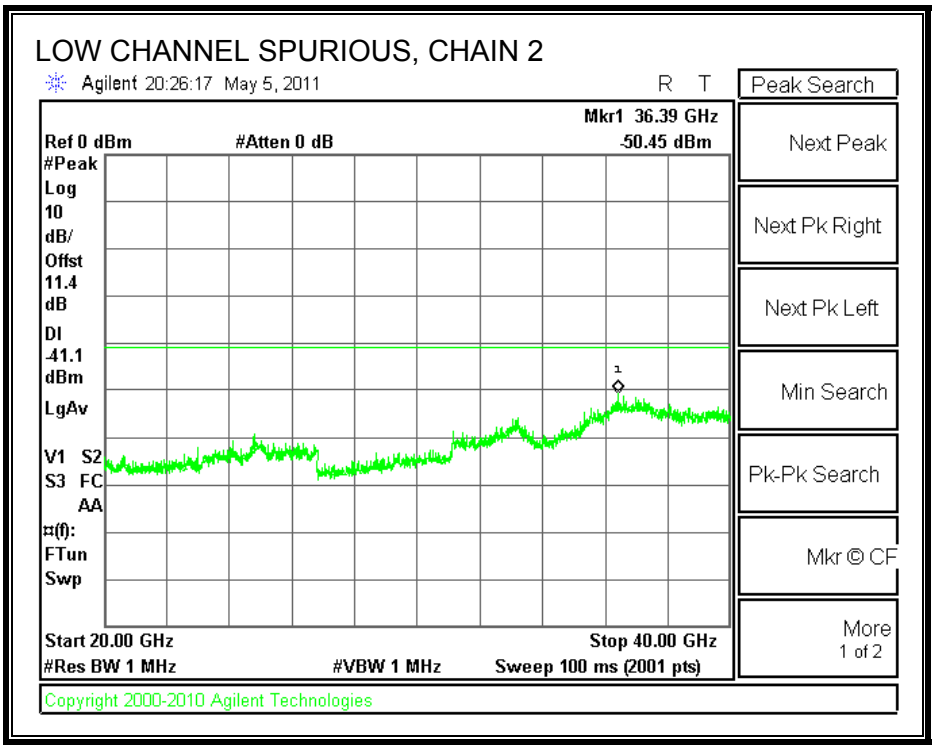


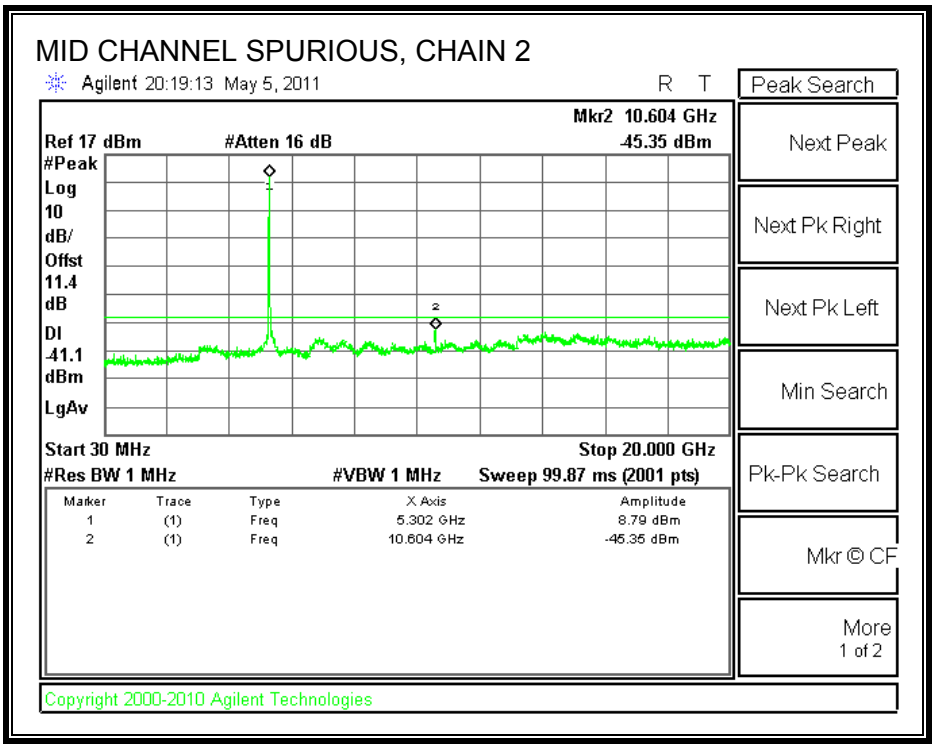


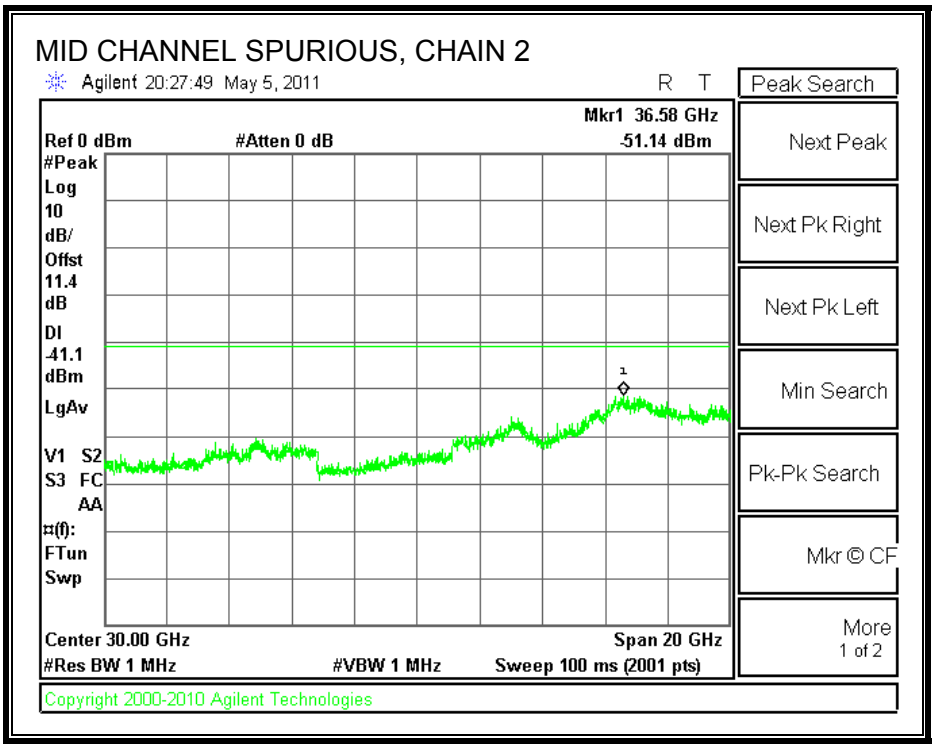


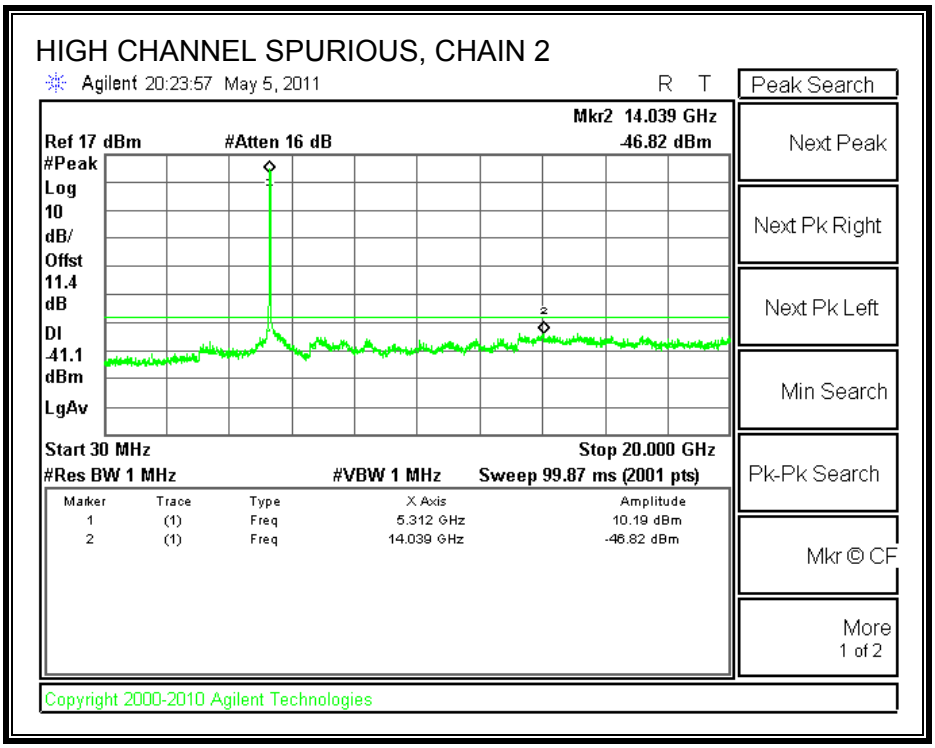
CHAIN 2 SPURIOUS EMISSIONS

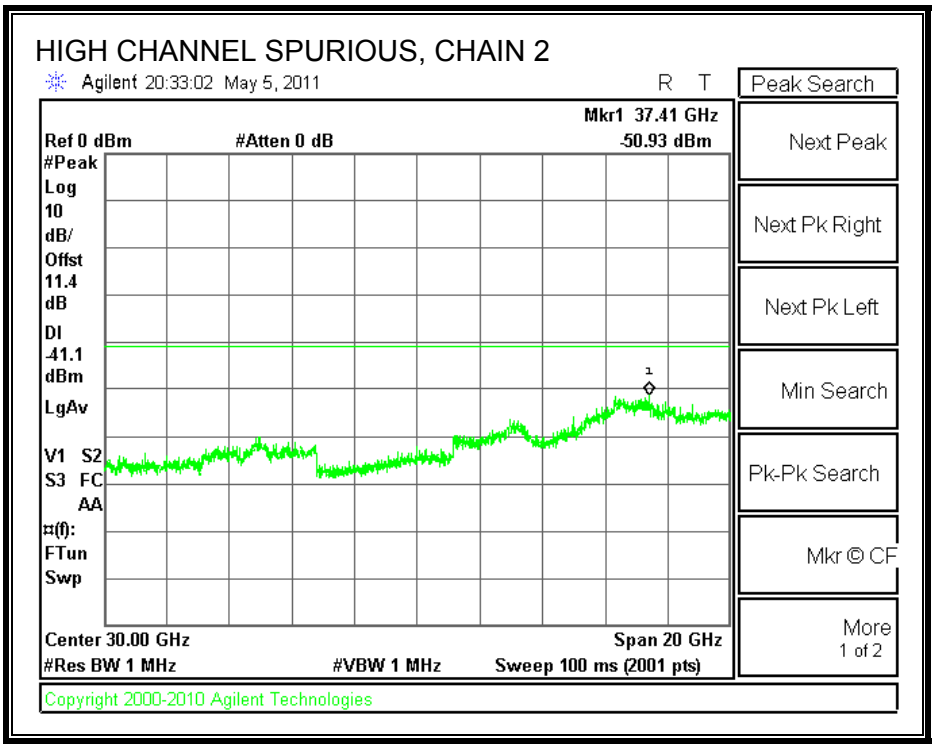




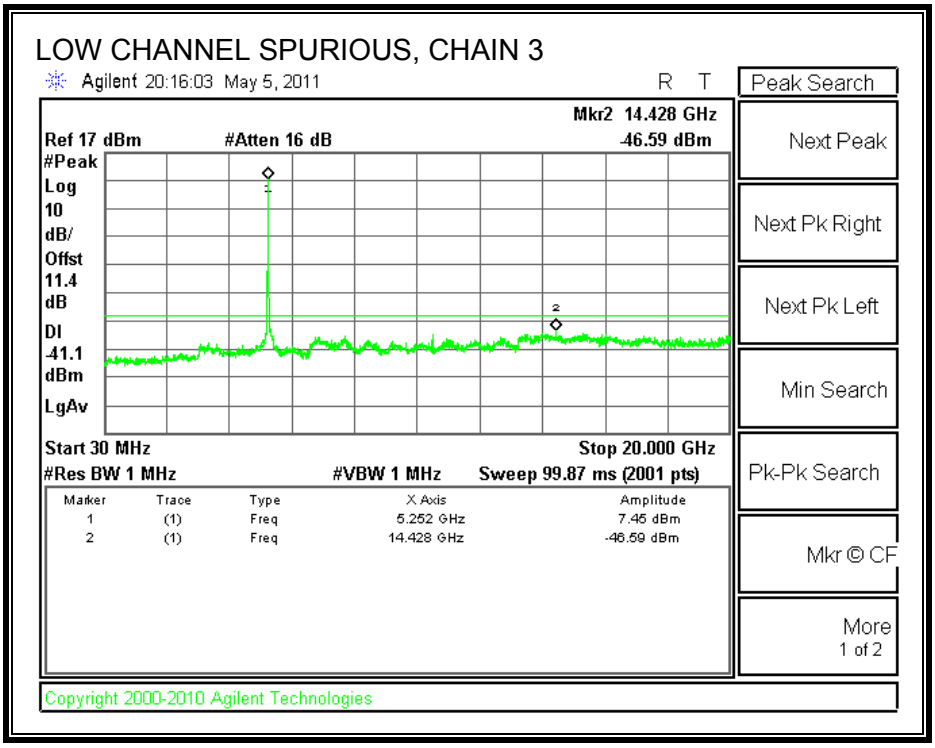


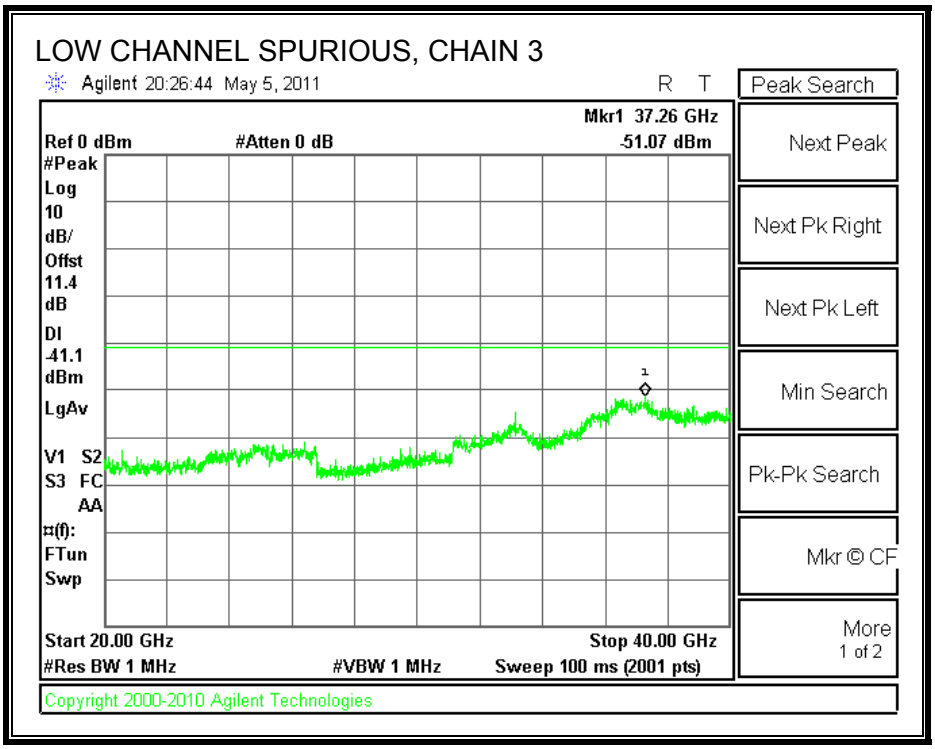


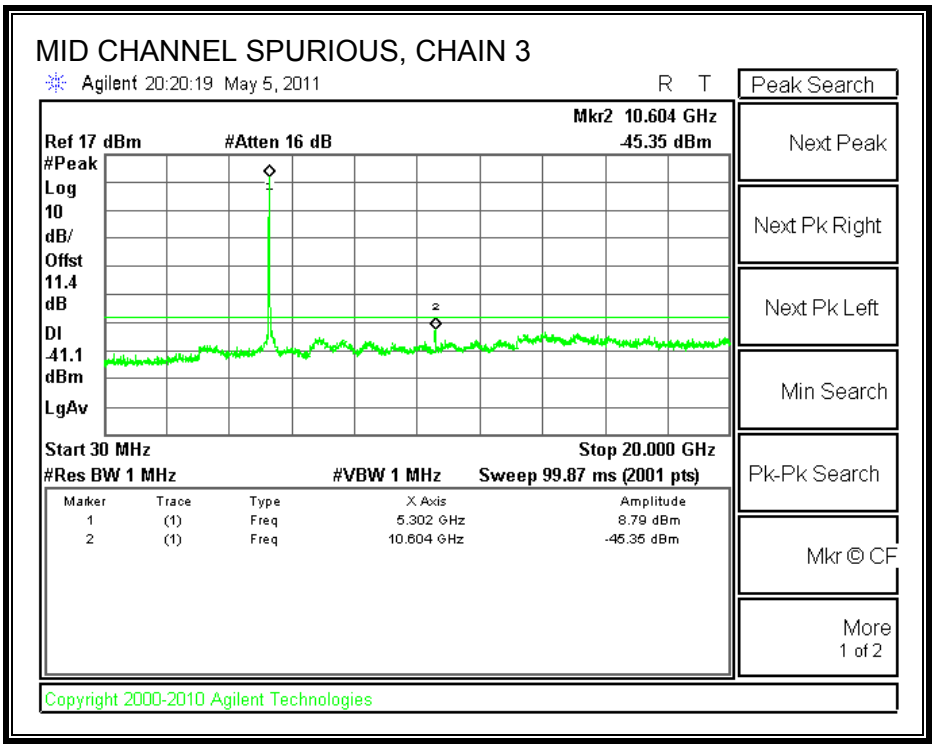


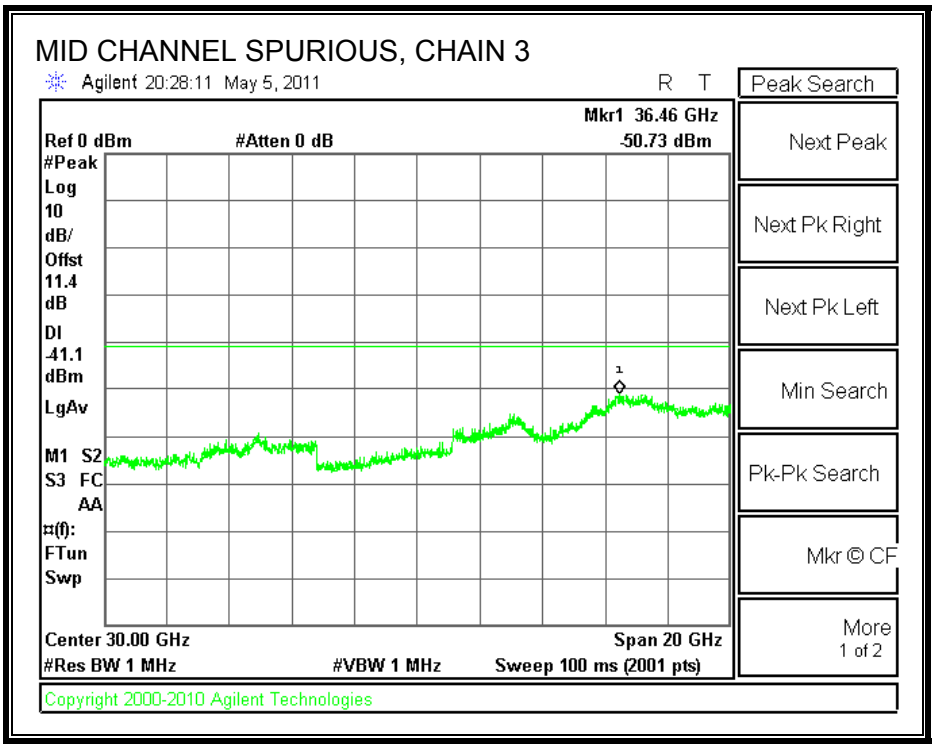


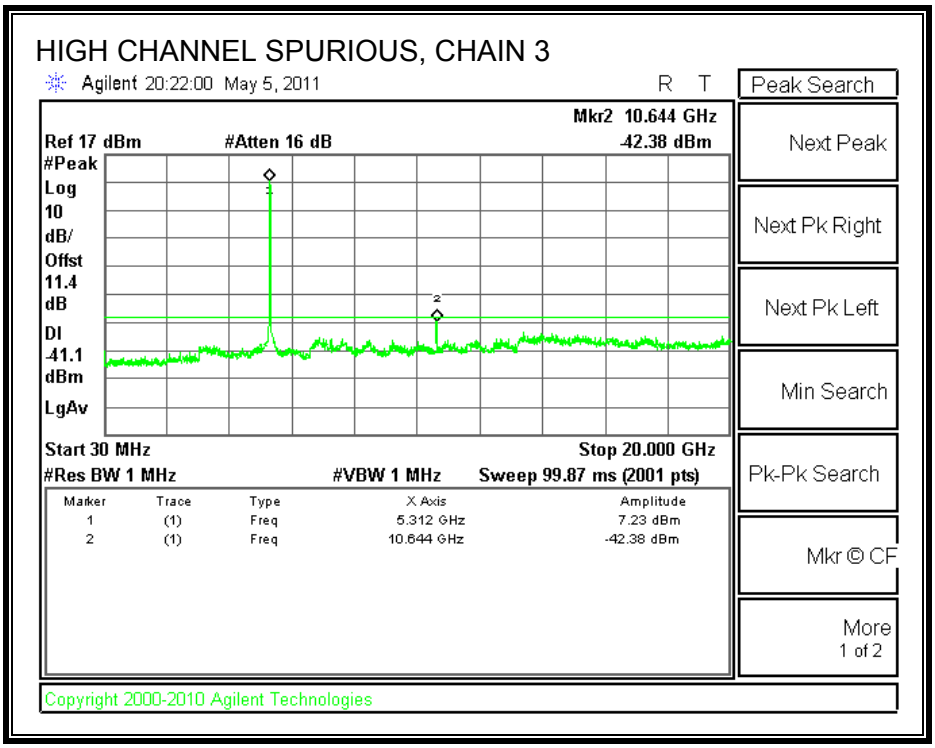
CHAIN 3 SPURIOUS EMISSIONS

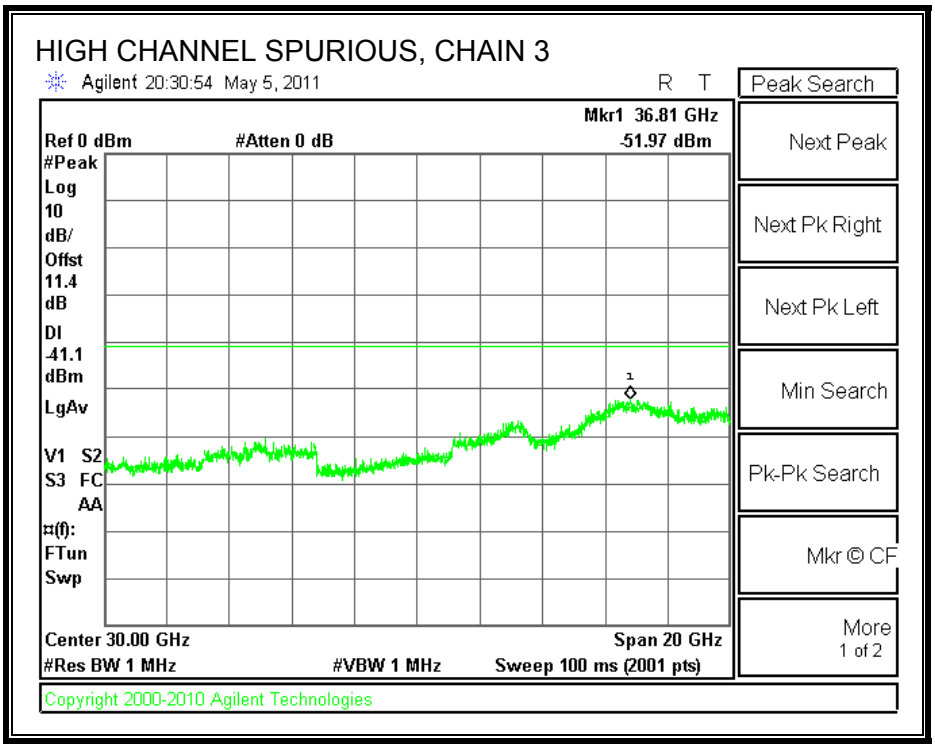












SDM MCS21

7.9.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

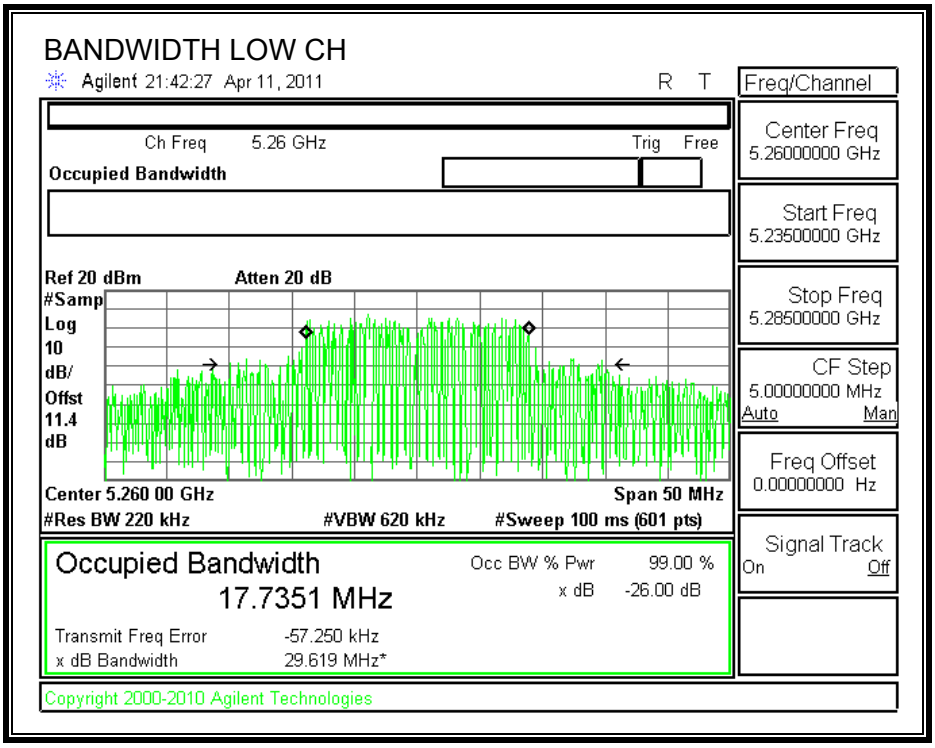
TEST PROCEDURE

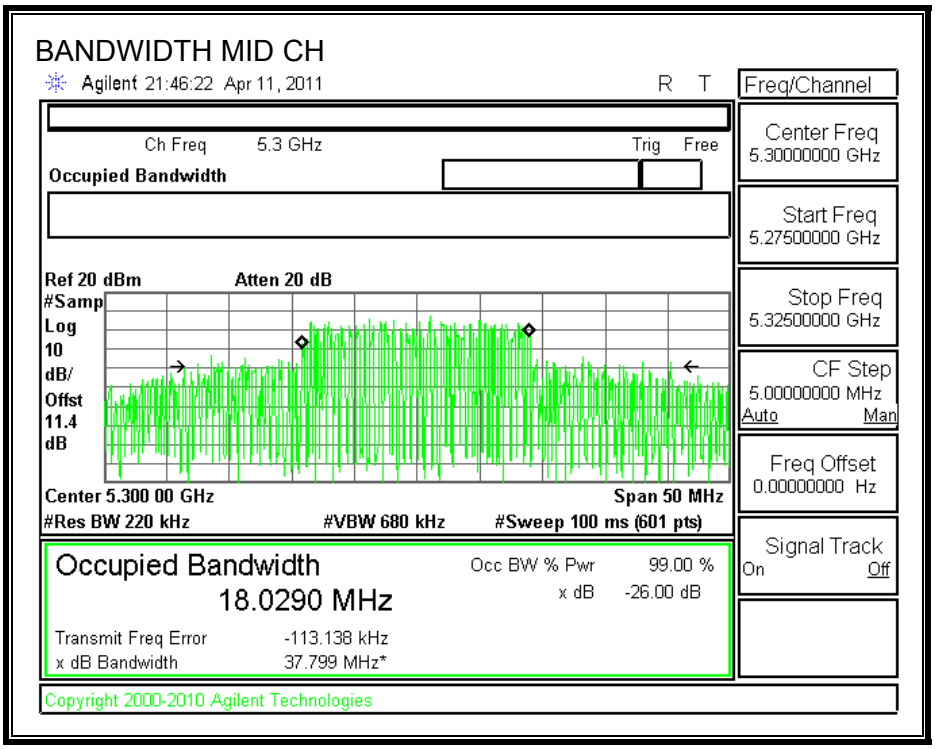
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

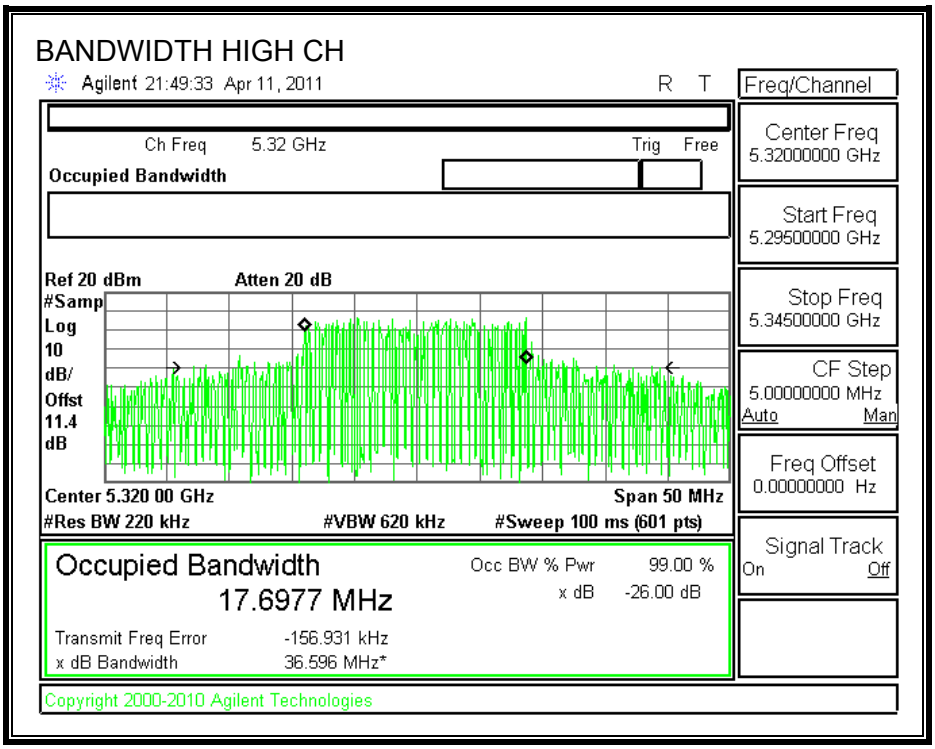
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	29.875	17.7351
Middle	5300	41.957	18.0290
High	5320	40.882	17.6977

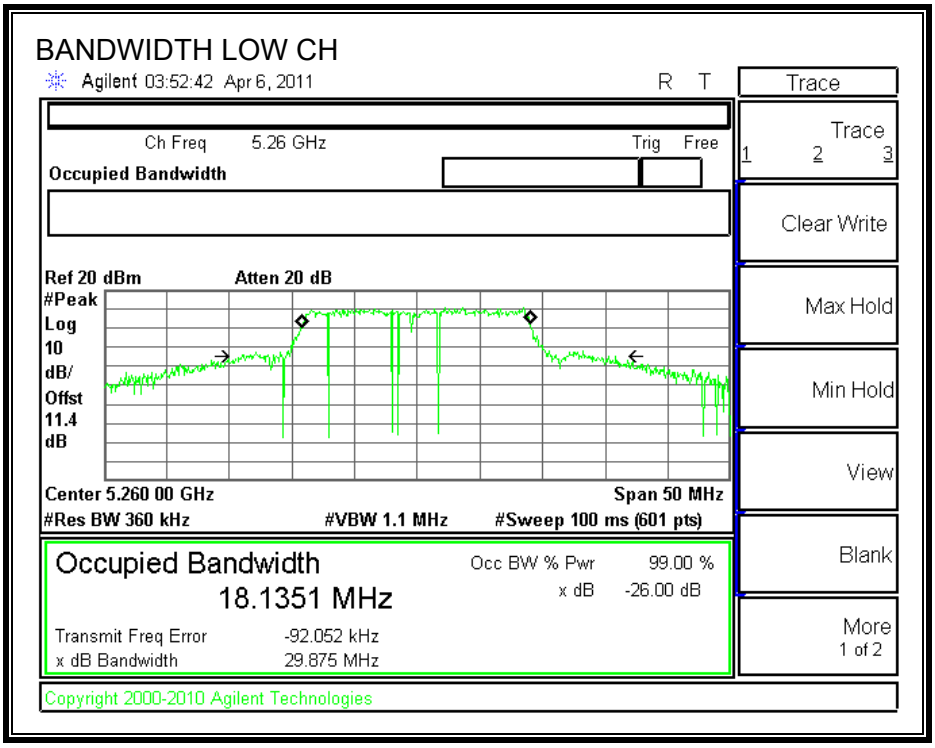
99% BANDWIDTH

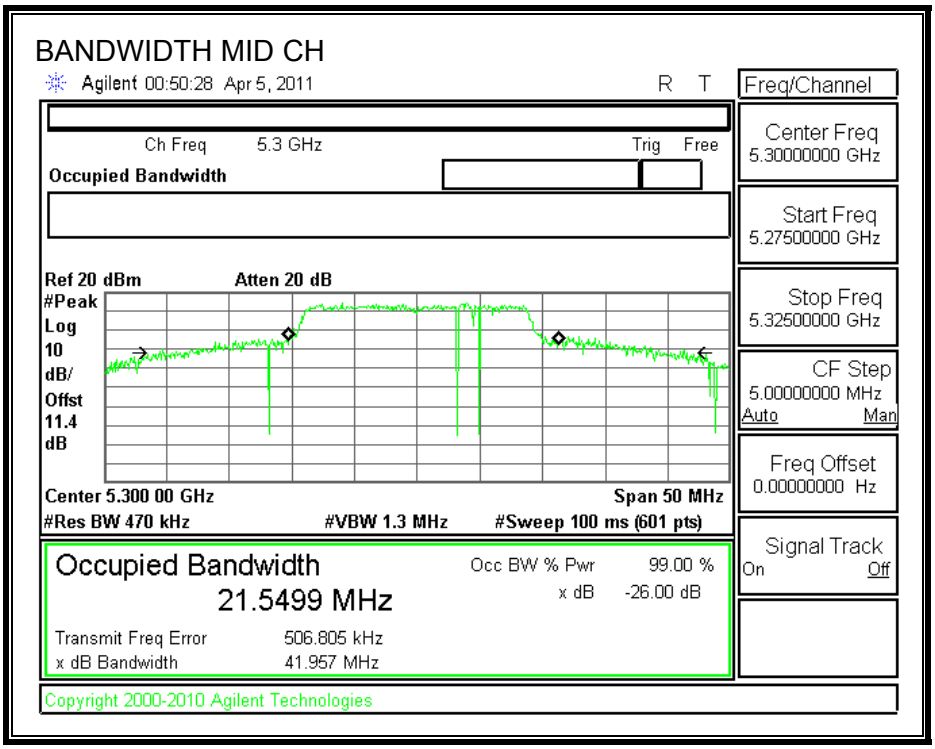


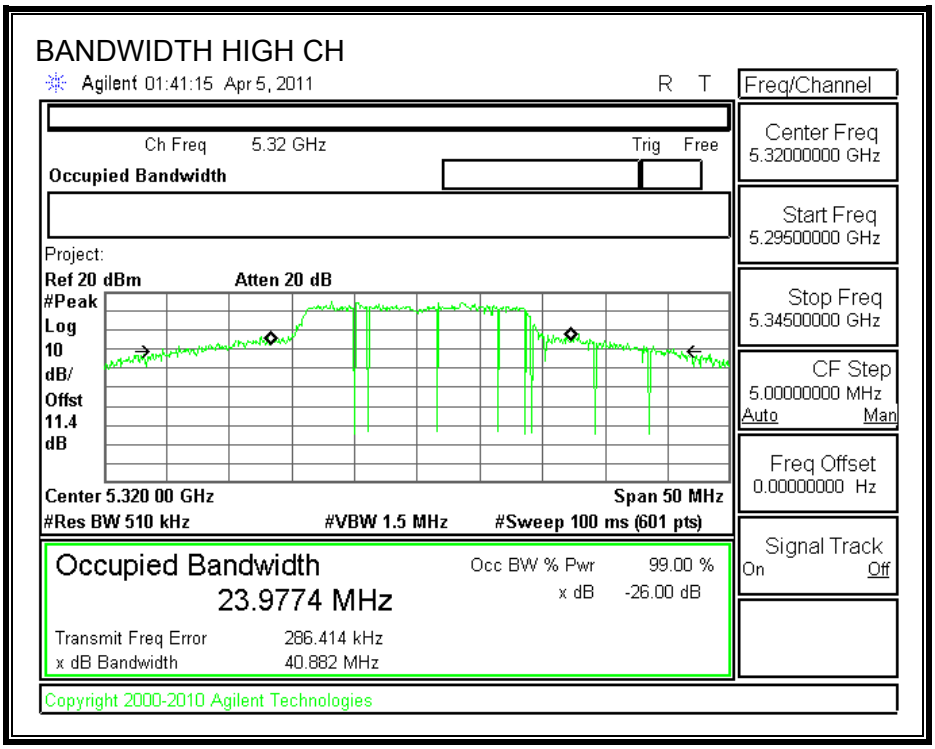




26 dB BANDWIDTH







7.9.2. 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 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.

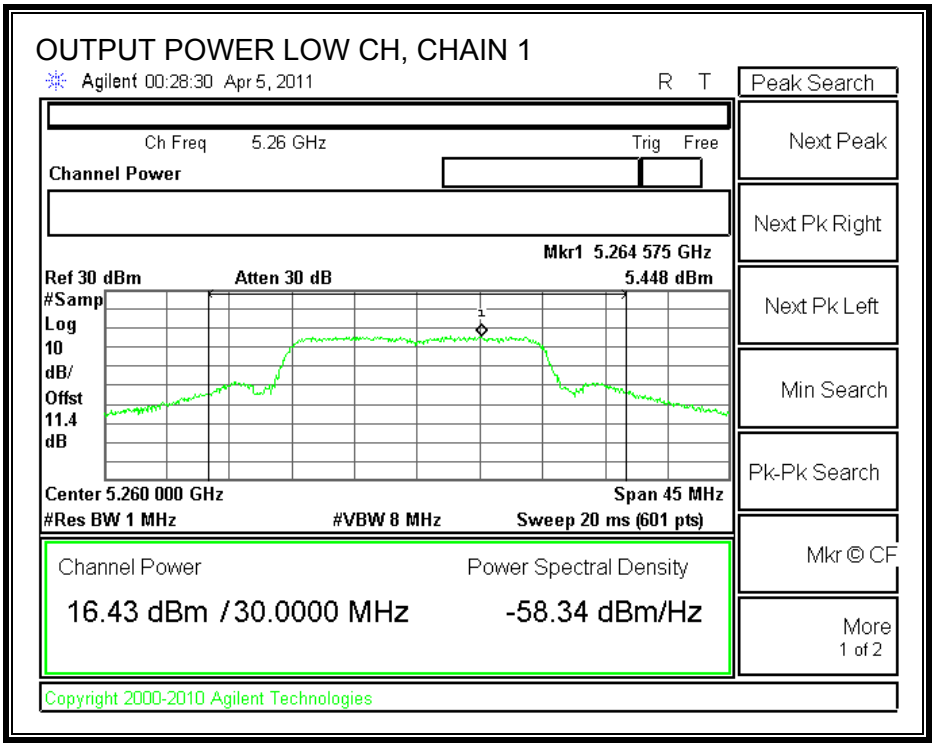
RESULTS

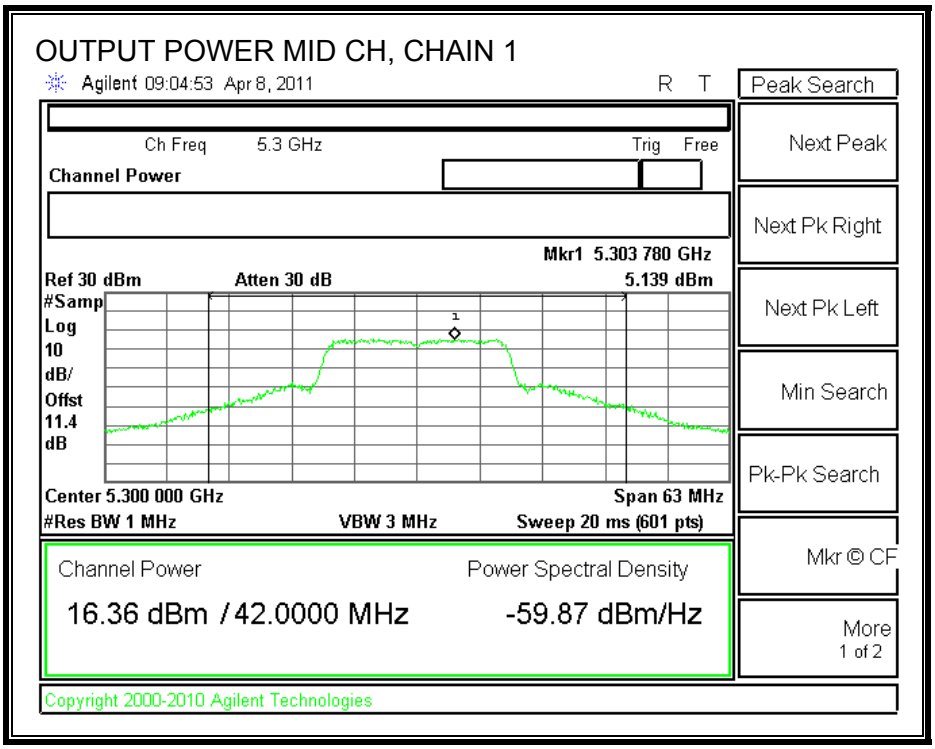
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	23.98	29.875	25.75	5.61	23.98
Mid	5300	23.98	41.957	27.23	5.61	23.98
High	5320	23.98	40.882	27.12	5.61	23.98

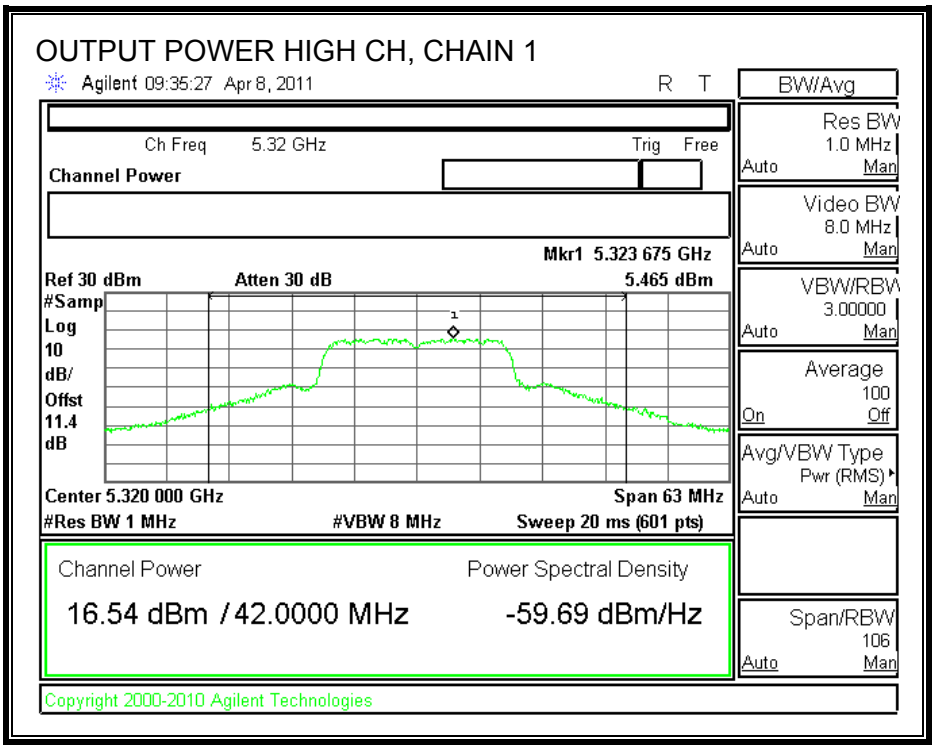
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	16.43	16.77	16.39	21.30	23.98	-2.68
Mid	5300	16.36	16.16	16.48	21.11	23.98	-2.87
High	5320	16.54	16.31	16.48	21.22	23.98	-2.76

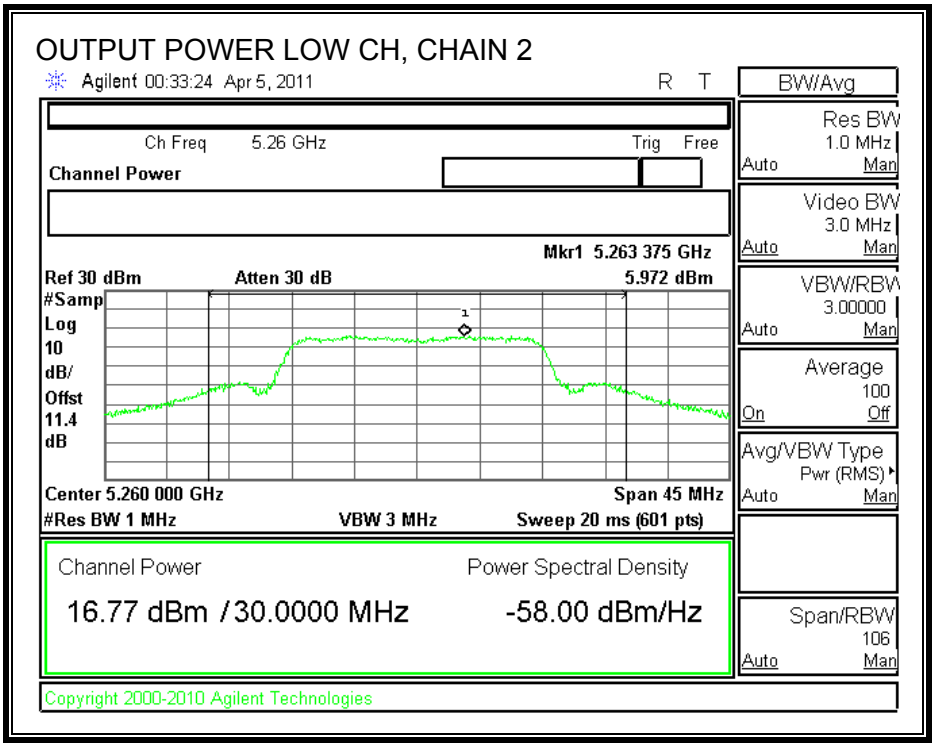
CHAIN 1 OUTPUT POWER

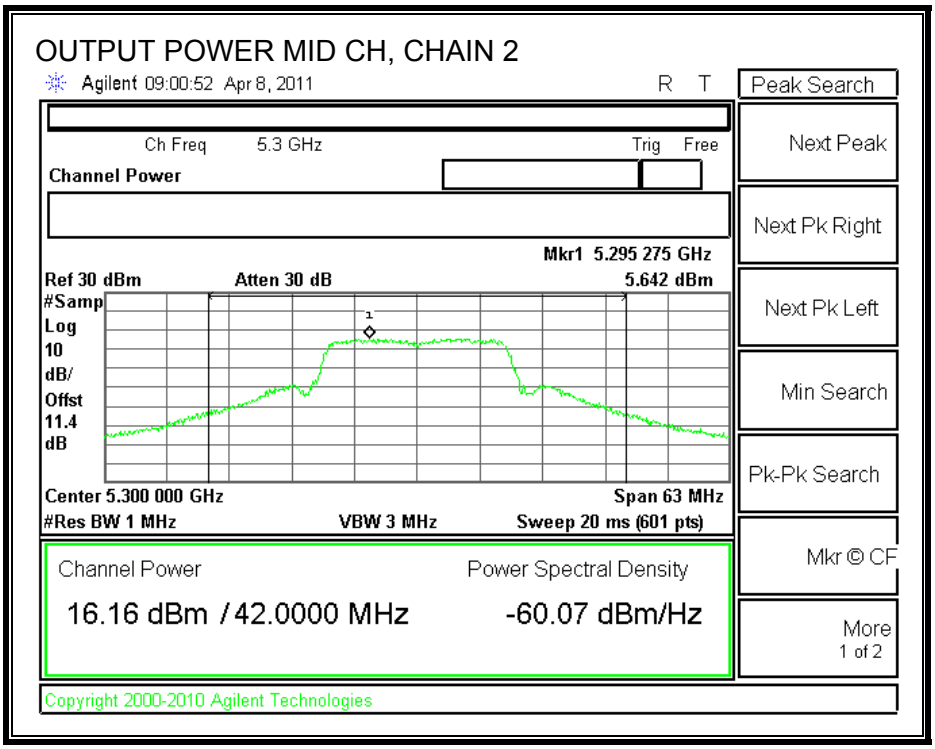


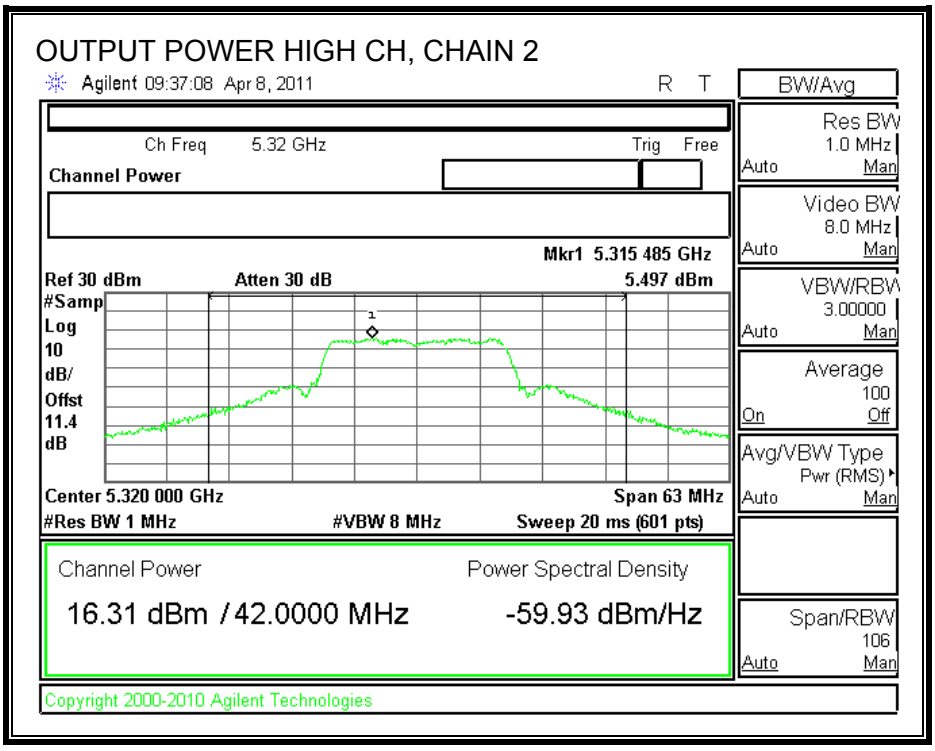




CHAIN 2 OUTPUT POWER







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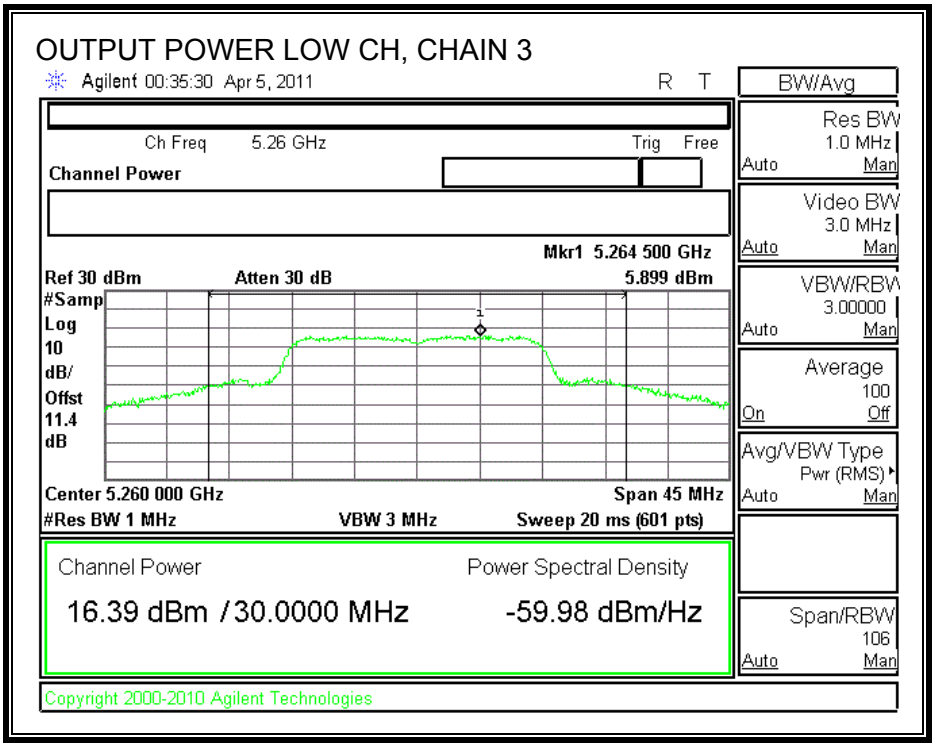
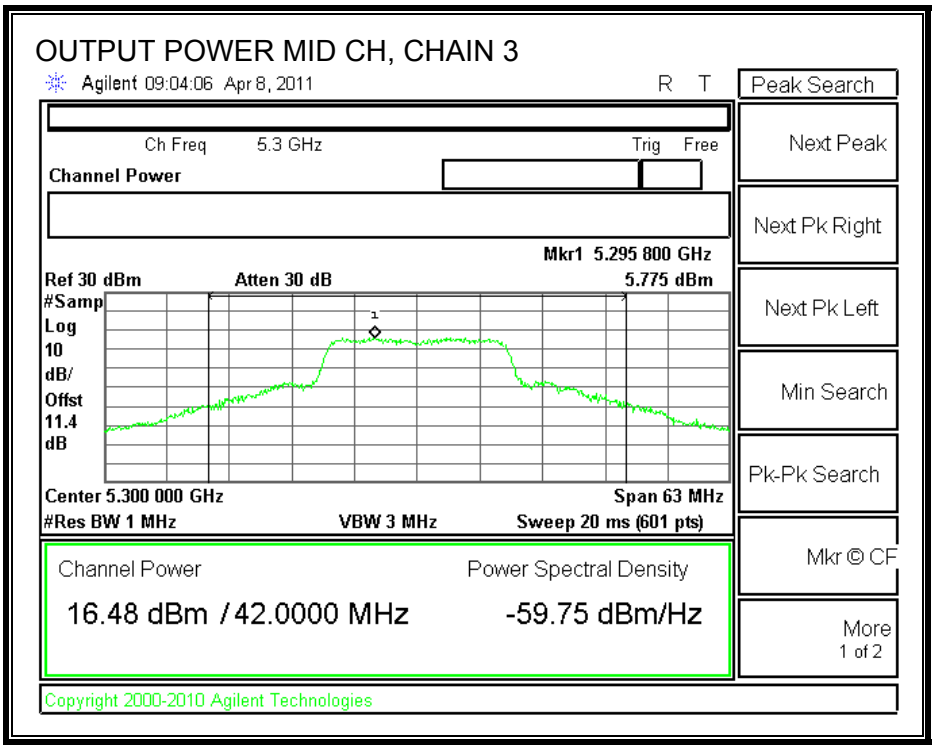
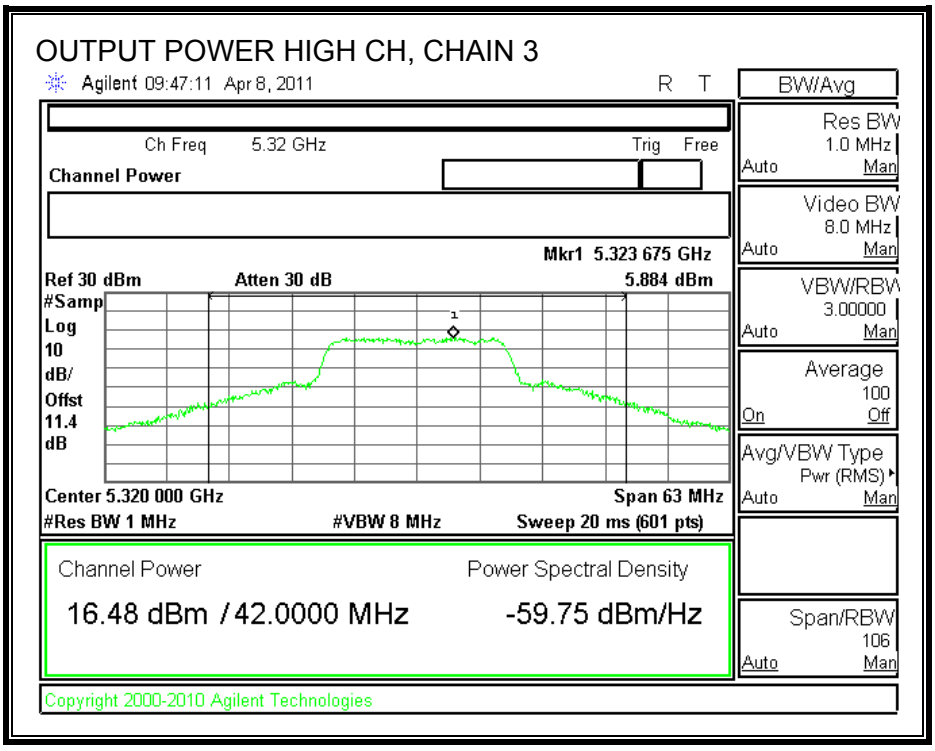






7.9.3. PEAK POWER SPECTRAL DENSITY

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 5.61 dBi, therefore the limit is 11 dBm.

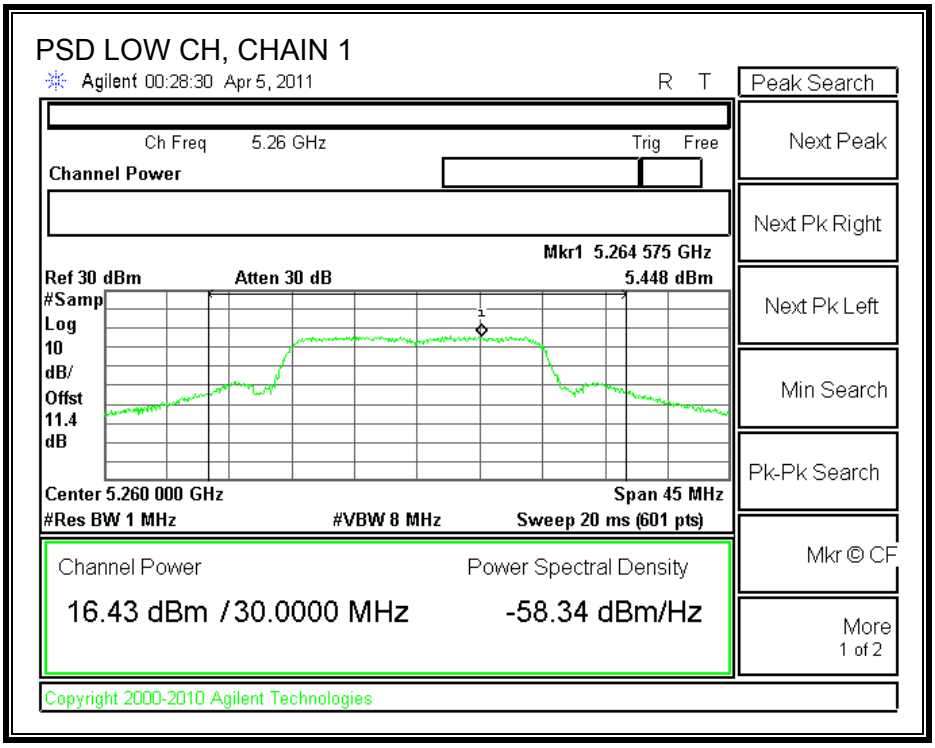
TEST PROCEDURE

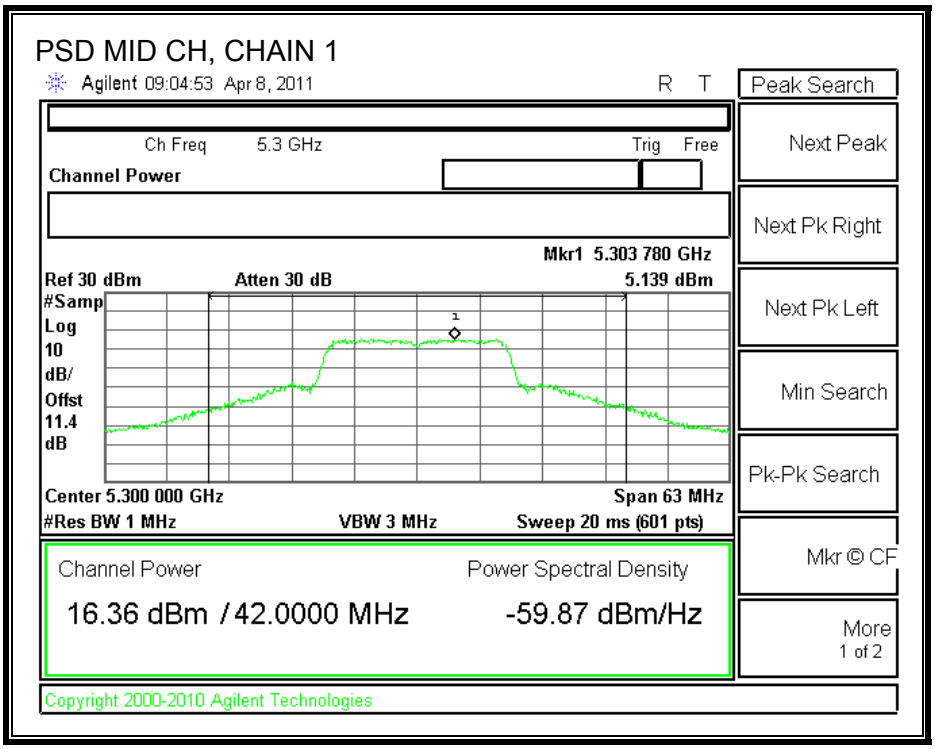
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

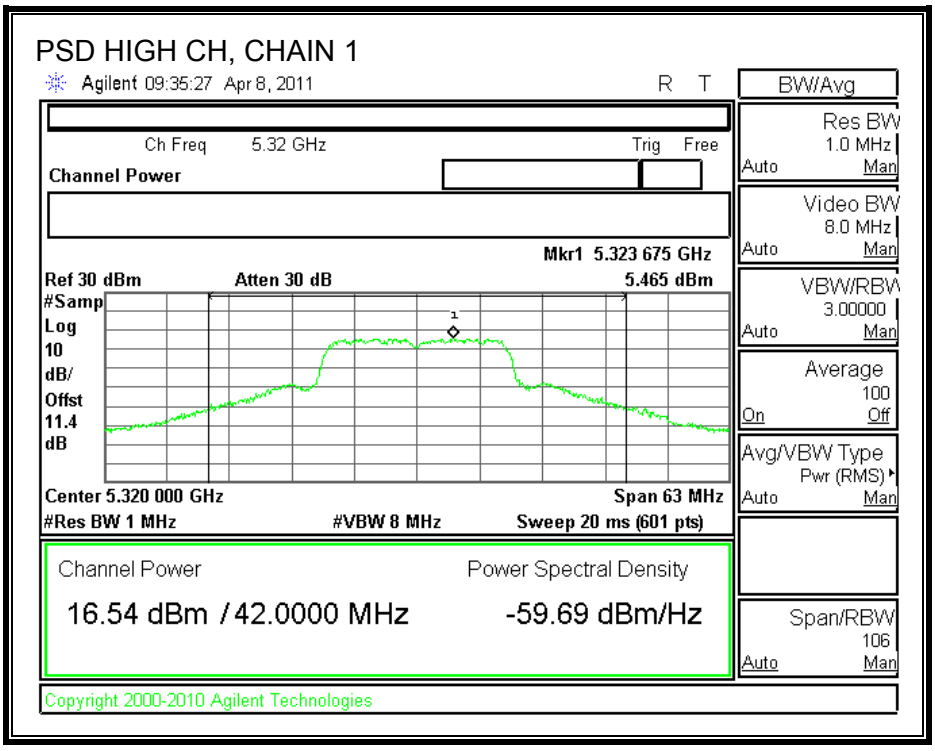
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	5.448	5.972	5.899	10.55	11.00	-0.45
Mid	5300	5.139	5.642	5.775	10.30	11.00	-0.70
High	5320	5.465	5.444	5.884	10.37	11.00	-0.63

CHAIN 1 POWER SPECTRAL DENSITY







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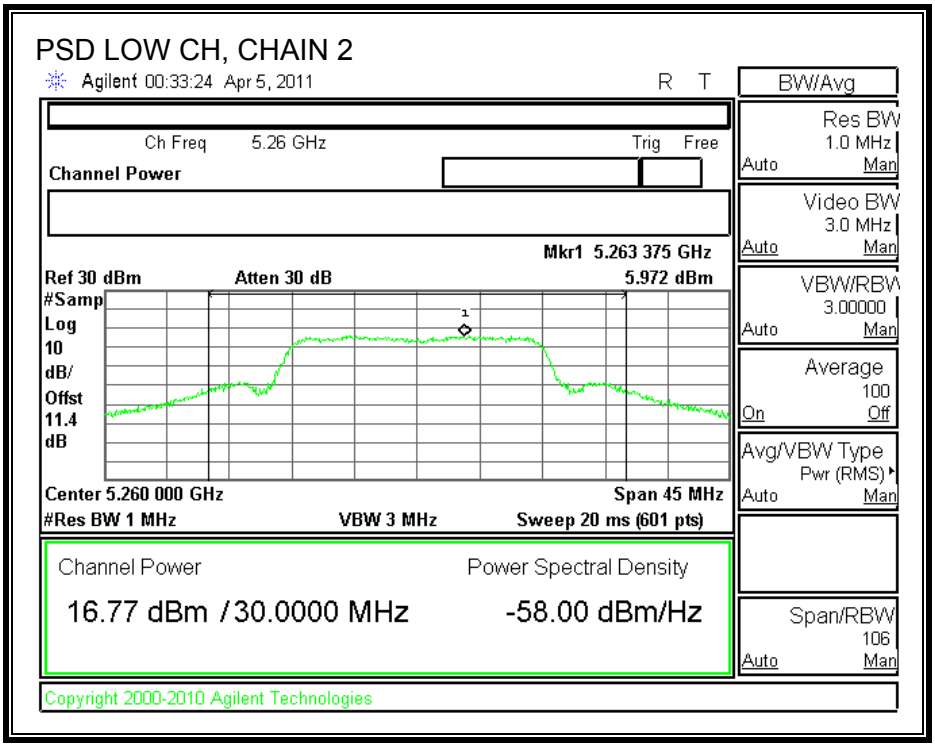
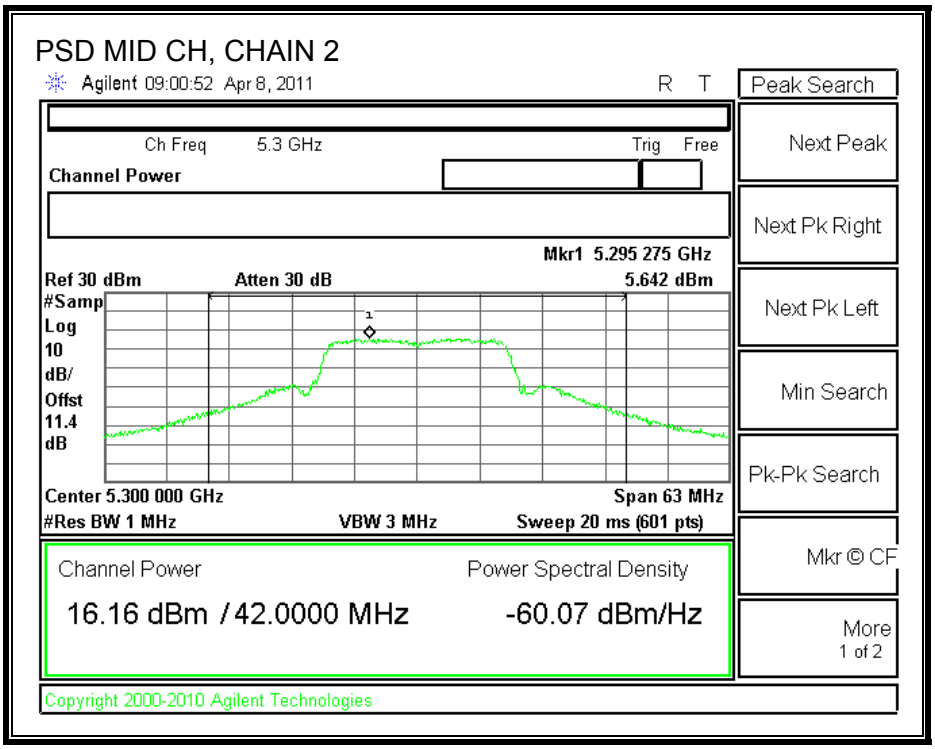
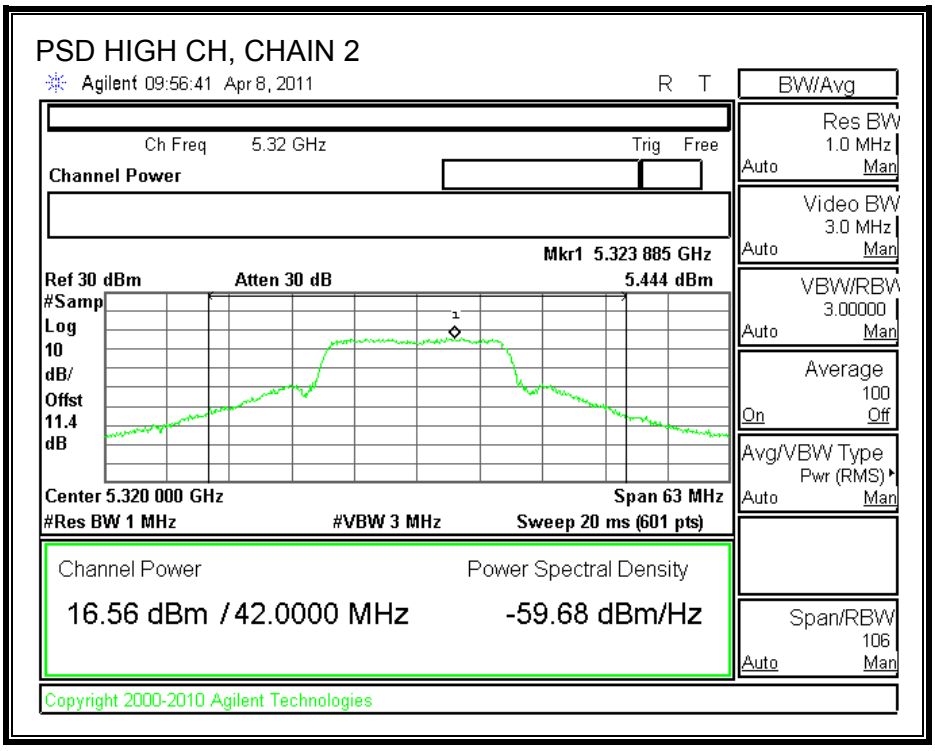
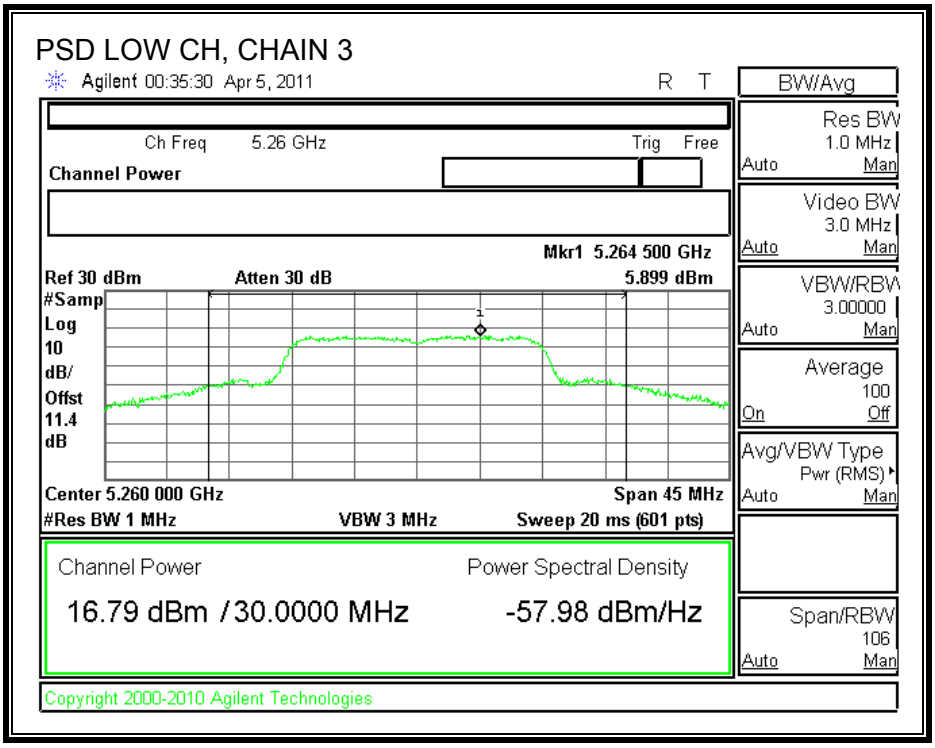
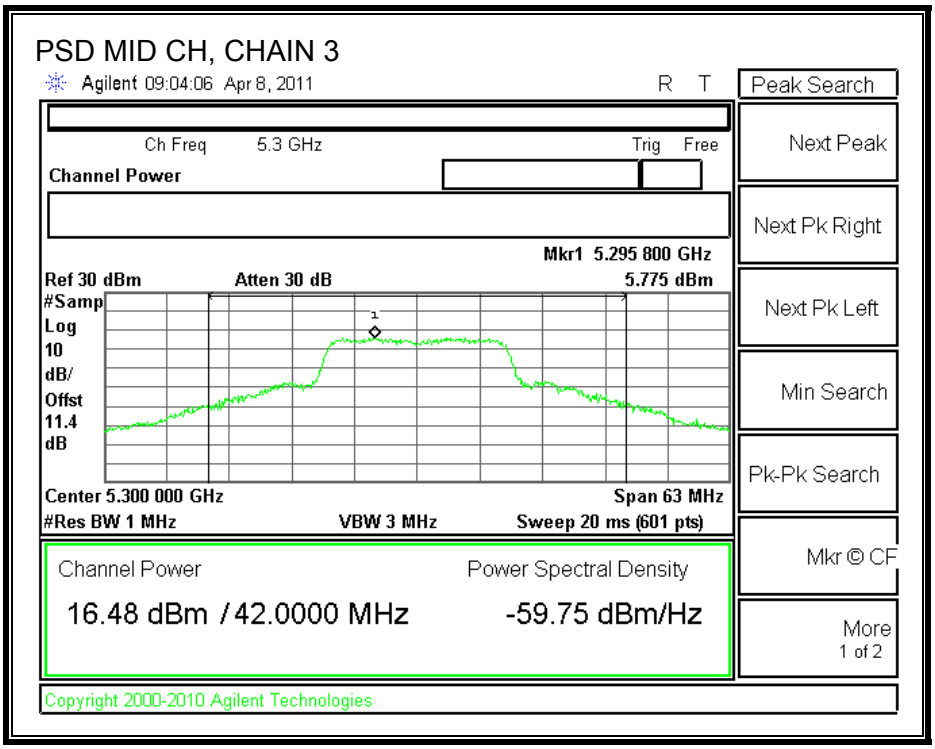


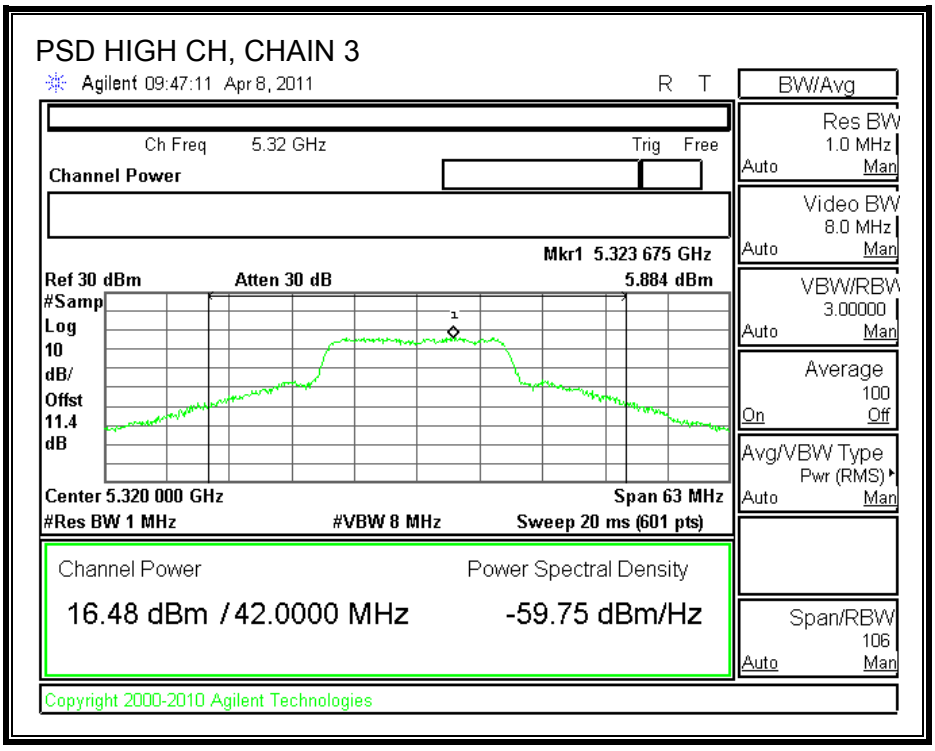




CHAIN 3 POWER SPECTRAL DENSITY







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.

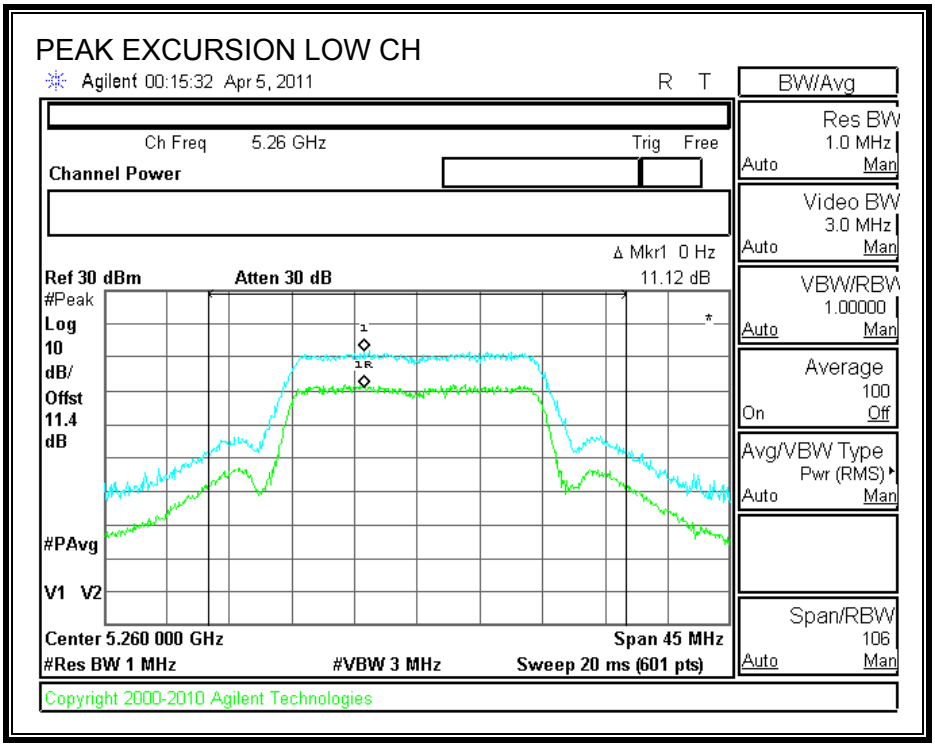
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

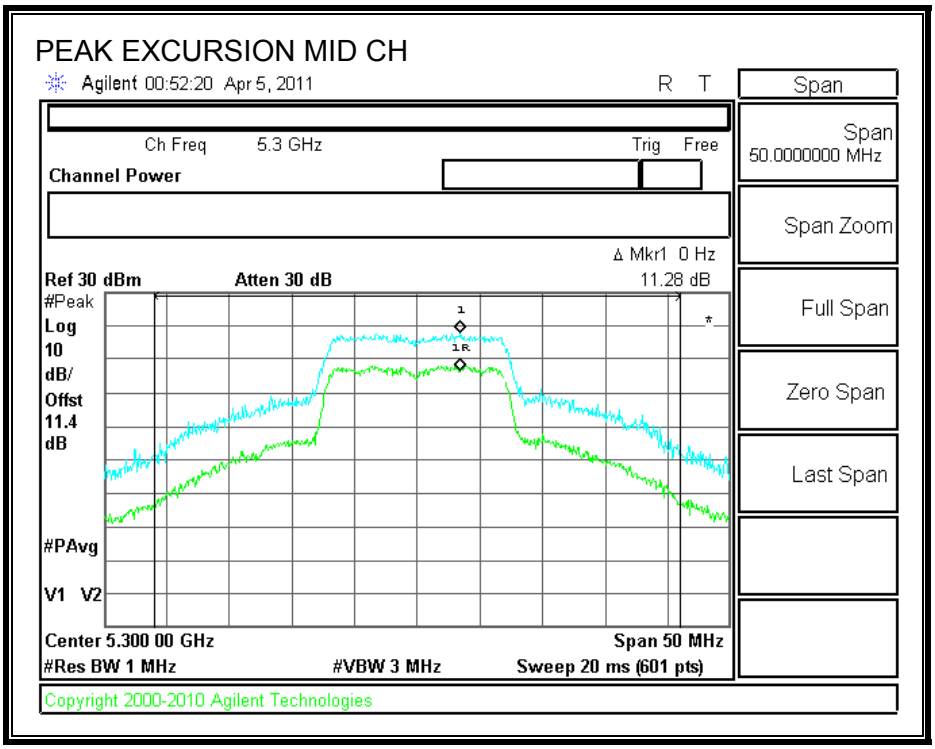
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

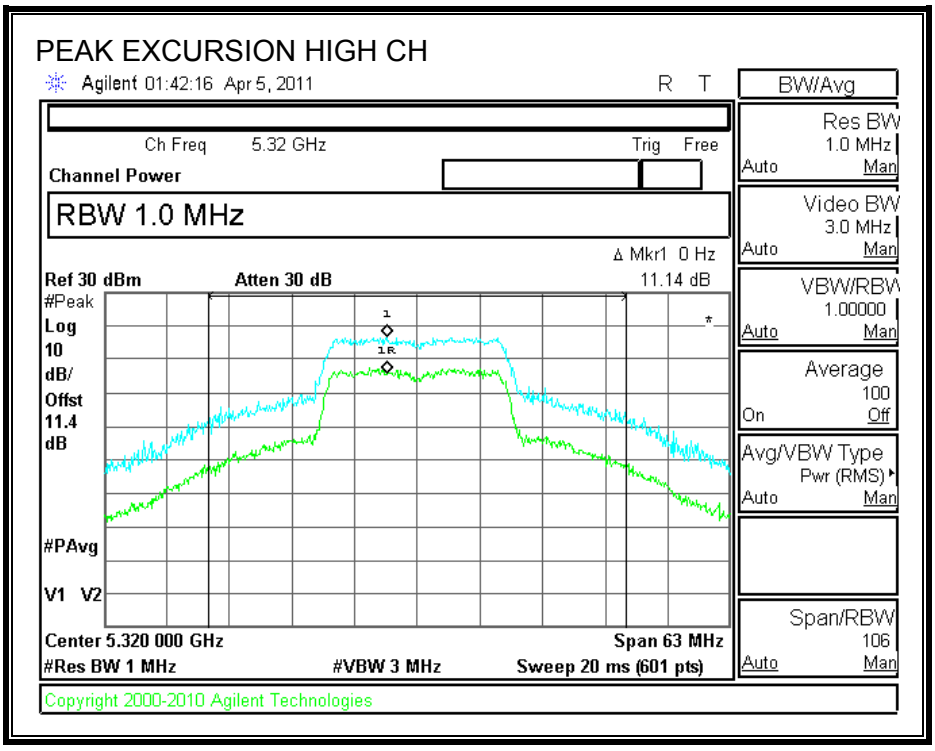
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	11.12	13	-1.88
Middle	5300	11.28	13	-1.72
High	5320	11.14	13	-1.86

PEAK EXCURSION







7.9.5. CONDUCTED SPURIOUS EMISSIONS

Covered by HT20 3x3 CDD MCS0 testing

7.10. 802.11n HT40 SISO MODE IN THE 5.3 GHz BAND

CDD MCS0

7.10.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

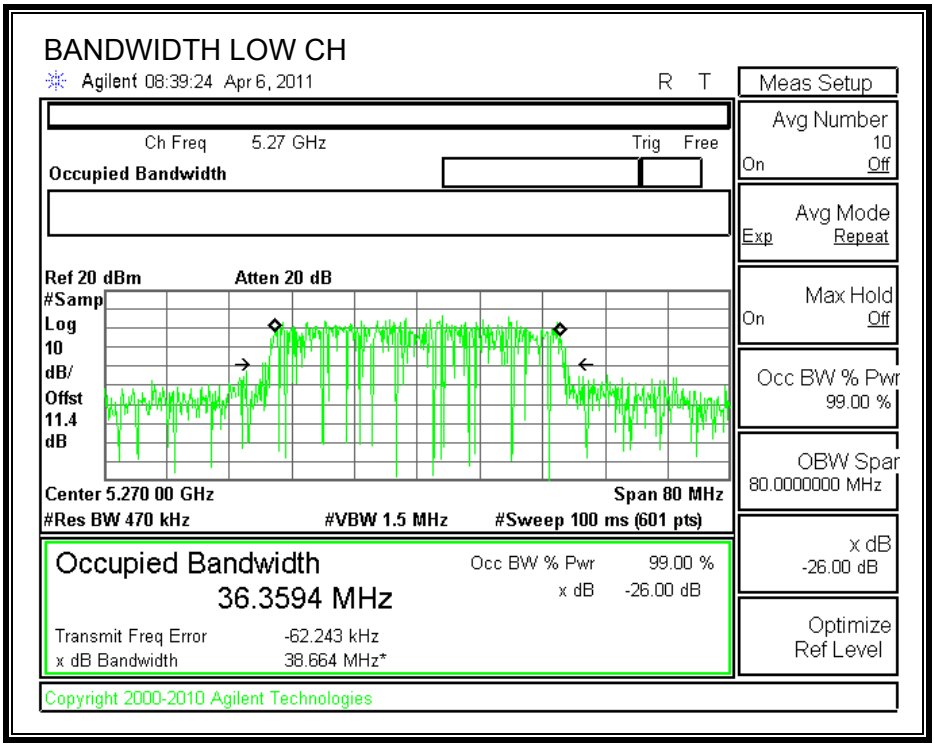
TEST PROCEDURE

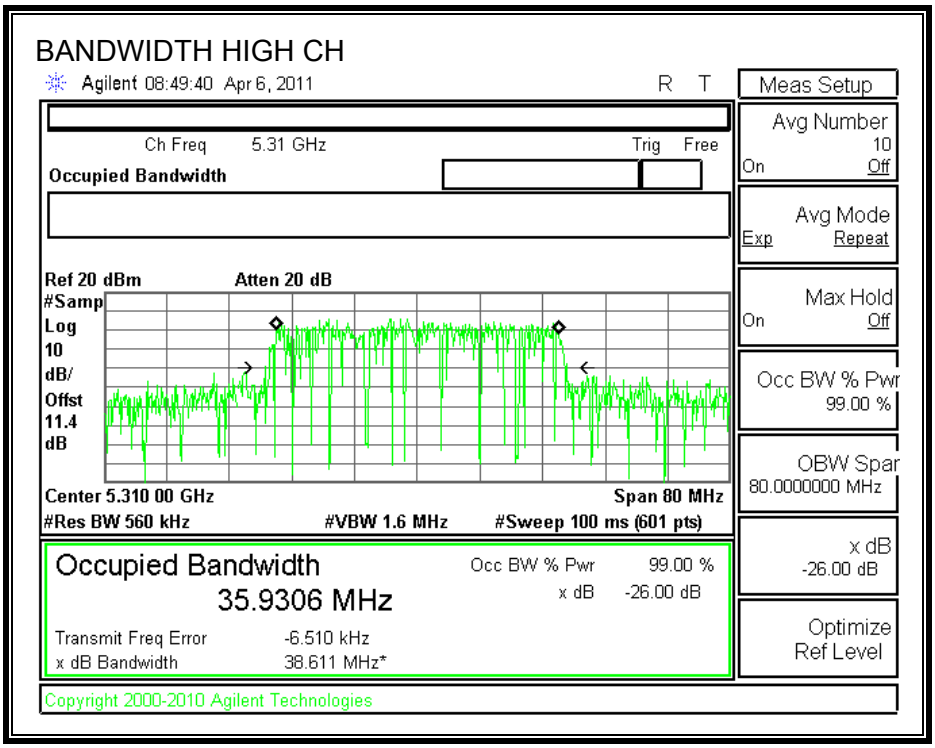
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	38.664	36.3594
High	5310	38.611	35.9306

26 dB and 99% BANDWIDTH





7.10.2. 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 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

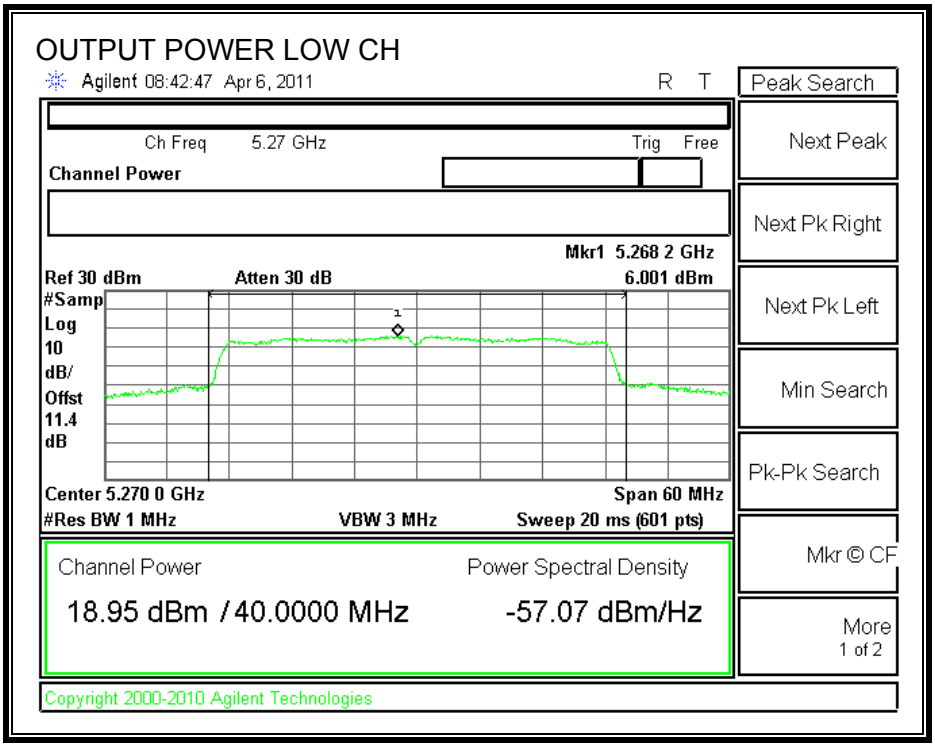
Limit

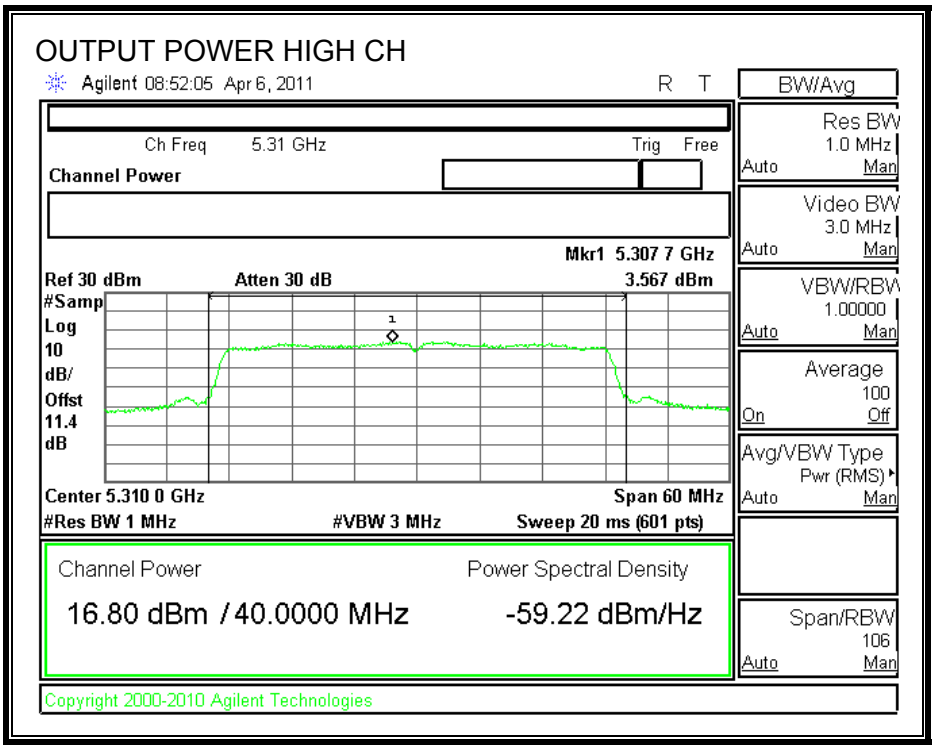
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5270	24	38.664	26.87	5.61	24.00
High	5310	24	38.611	26.87	5.61	24.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	18.95	24.00	-5.05
High	5310	16.80	24.00	-7.20

OUTPUT POWER





7.10.3. 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

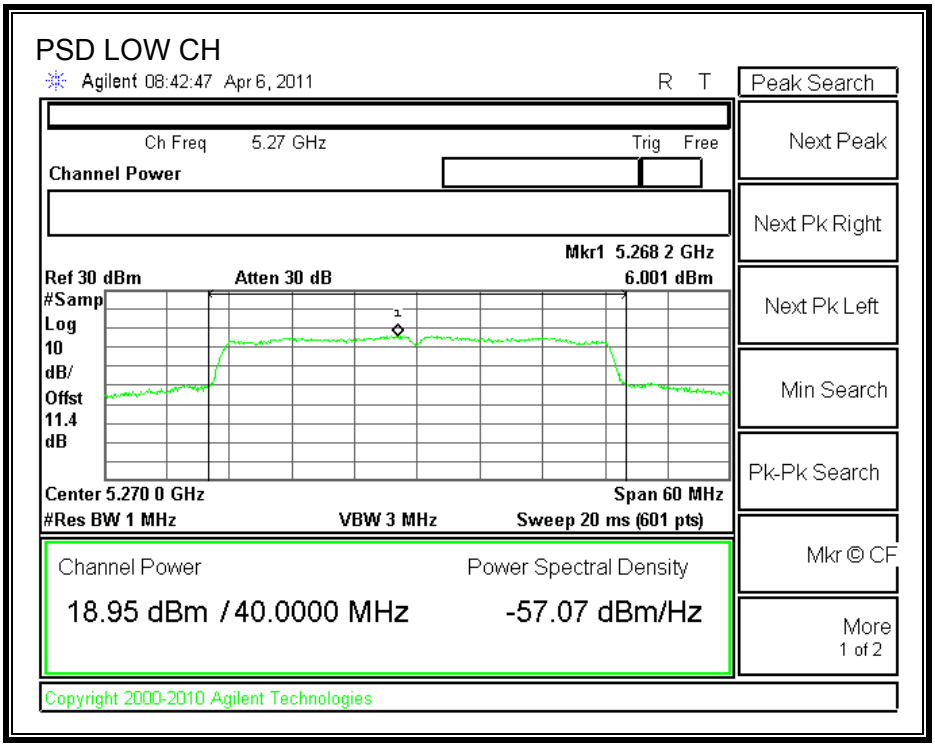
TEST PROCEDURE

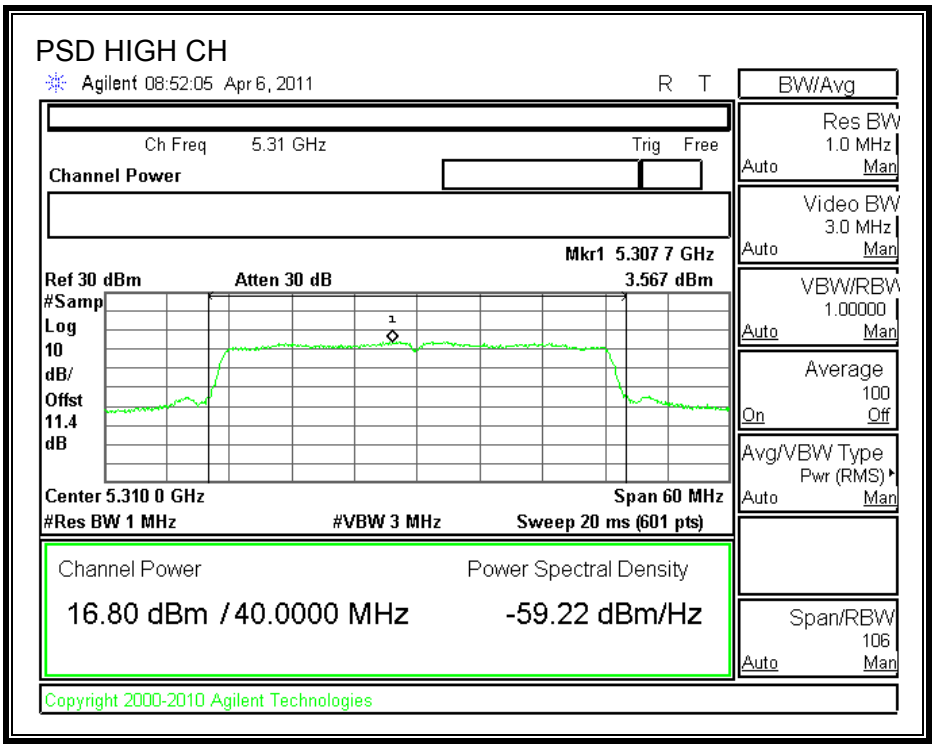
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5270	6.00	11	-5.00
High	5310	3.57	11	-7.43

POWER SPECTRAL DENSITY





7.10.4. 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

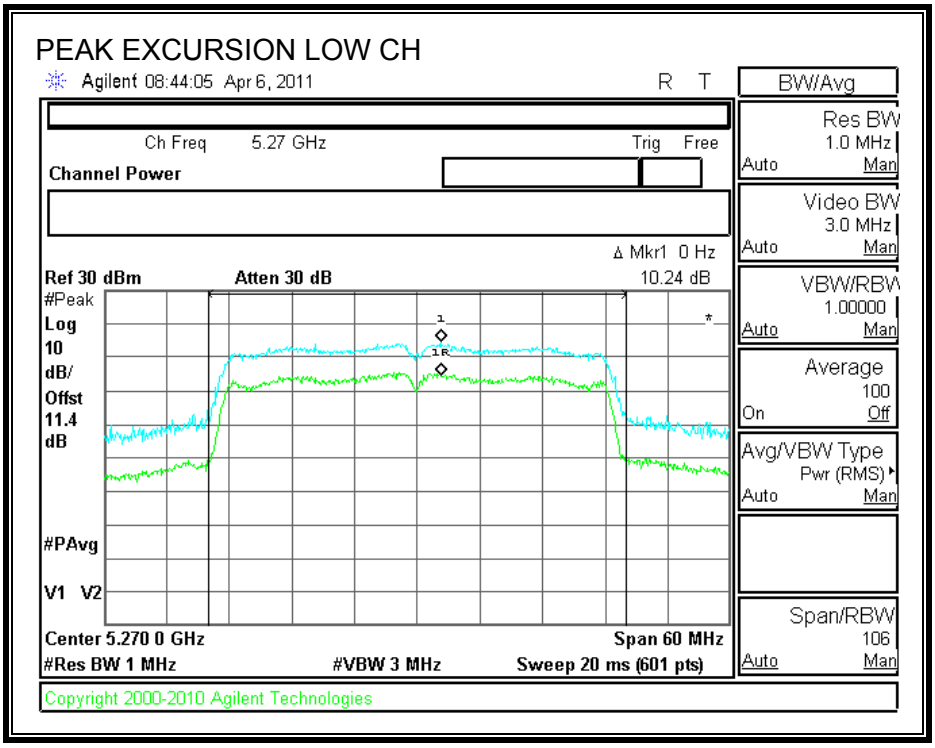
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

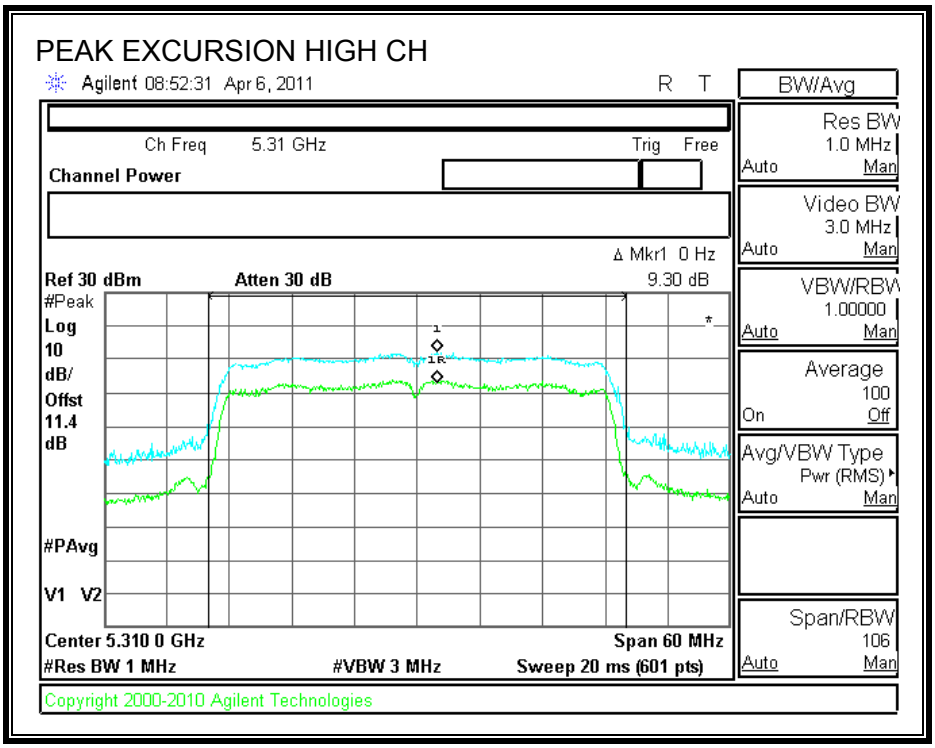
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	10.24	13	-2.76
High	5310	9.30	13	-3.70

PEAK EXCURSION





7.10.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to HT40 3x3 CDD MCS0 testing

7.11. 802.11n DUAL CHAIN HT40 MODE IN THE 5.3 GHz BAND

CDD MCS0

7.11.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

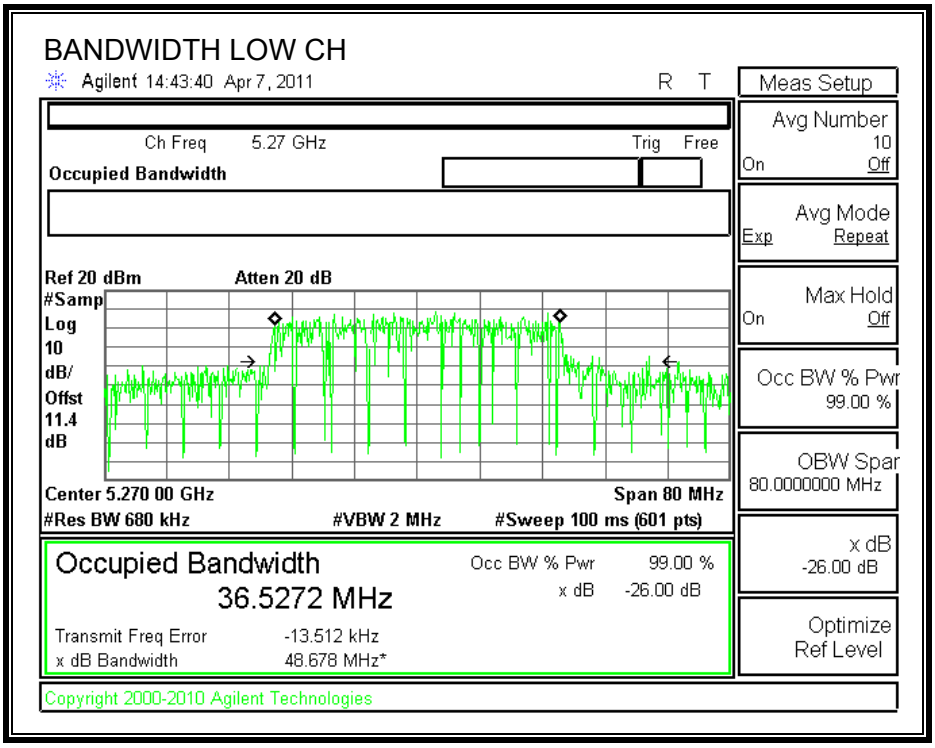
TEST PROCEDURE

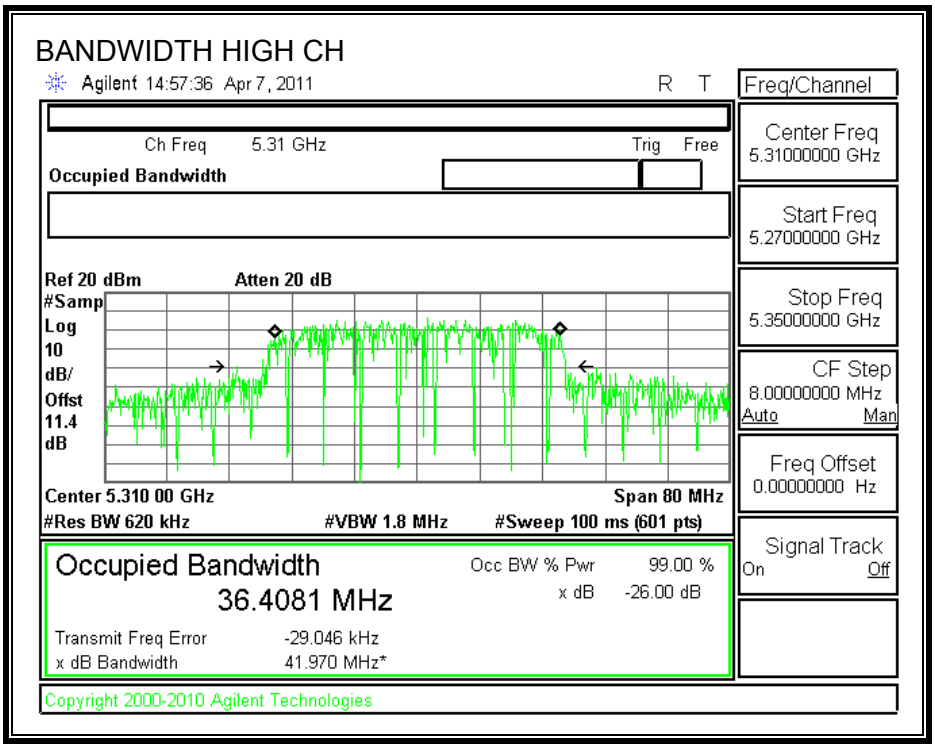
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	48.678	36.5272
High	5310	41.970	36.4081

26 dB and 99% BANDWIDTH





7.11.2. 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 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	48.678	27.87	7.89	22.11
High	5310	24	41.970	27.23	7.89	22.11

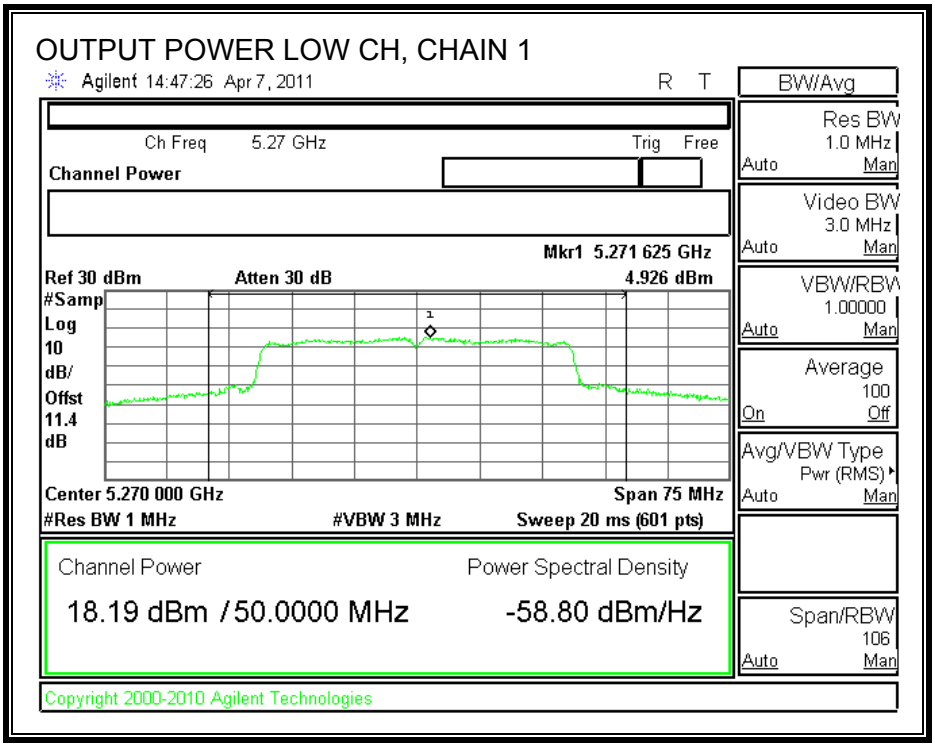
Individual Chain Results

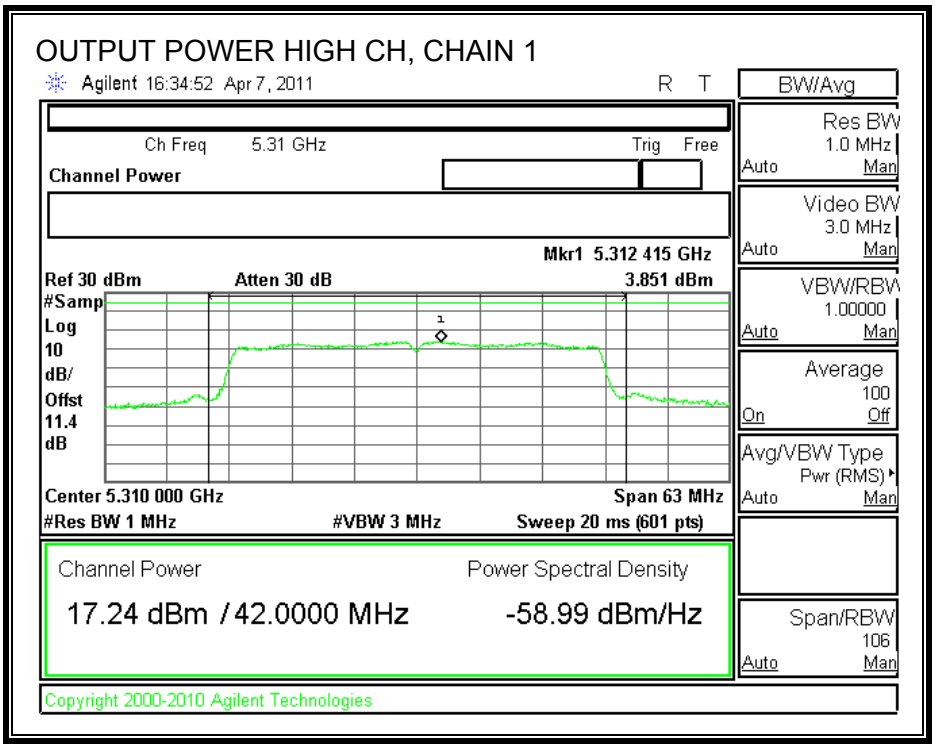
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	18.19	18.30	21.26	22.11	-0.85
High	5310	17.24	17.17	20.22	22.11	-1.89

TPC Results

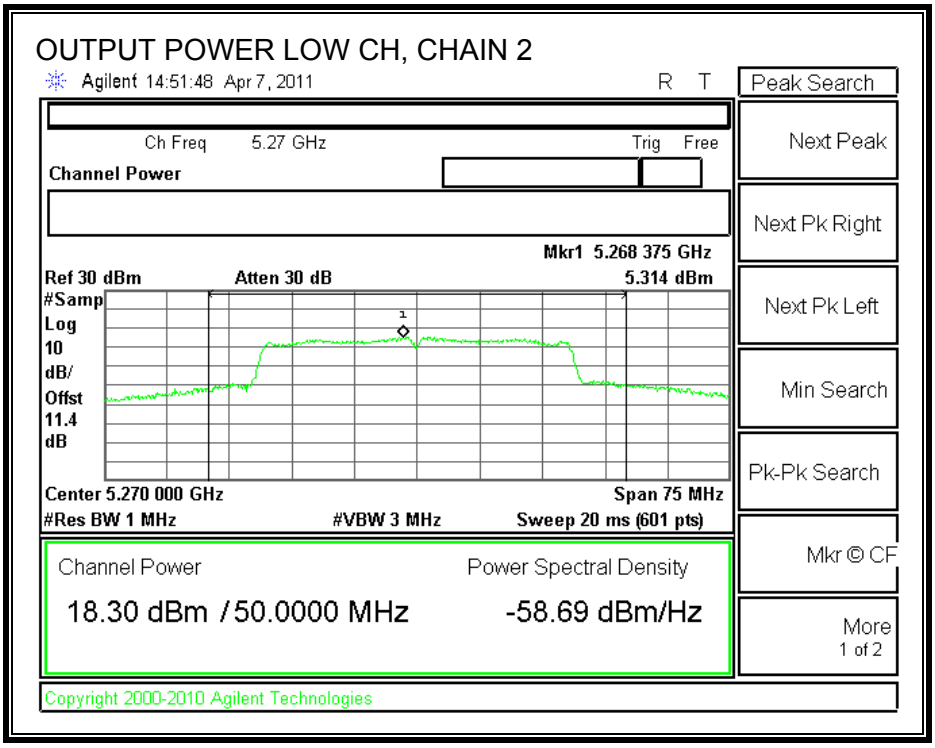
TPC Delta Power		Chain 1	Chain 2			
		5.68	4.73			
Worst-case TPC Power		Chain 1	Chain 2	Total Power	Ant Gain	EIRP
Low	5270	12.51	13.57	16.08	7.89	23.97
					TPC Limit (dBm)	24
					Margin (dB)	-0.03

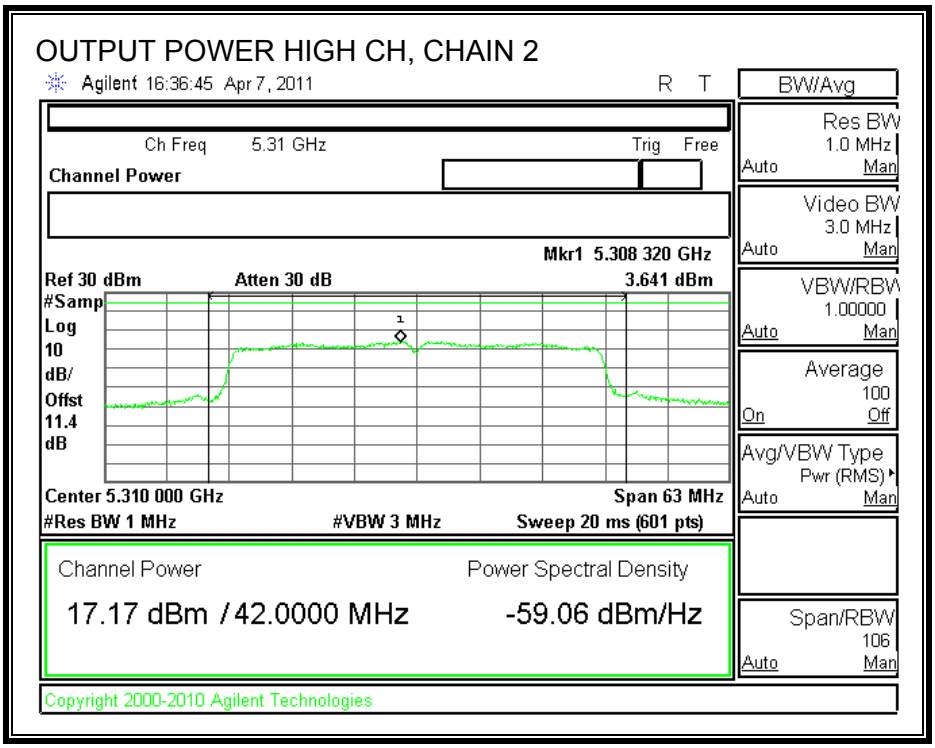
CHAIN 1 OUTPUT POWER



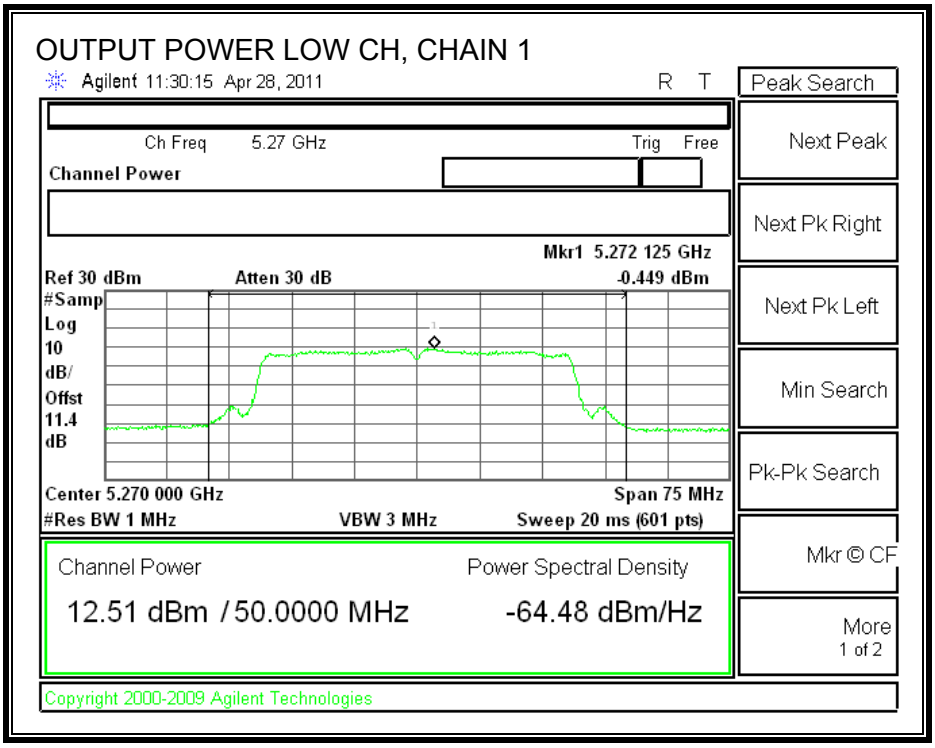


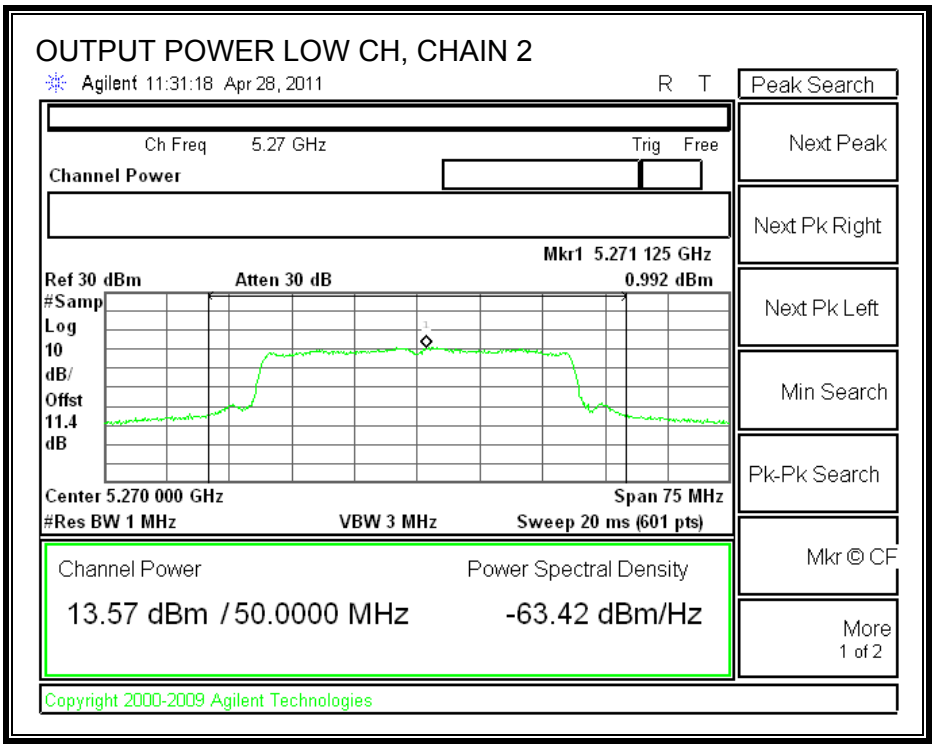
CHAIN 2 OUTPUT POWER





TPC OUTPUT POWER





7.11.3. 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 composite antenna gain is equal to 7.89 dBi, therefore the limit is 9.11 dBm.

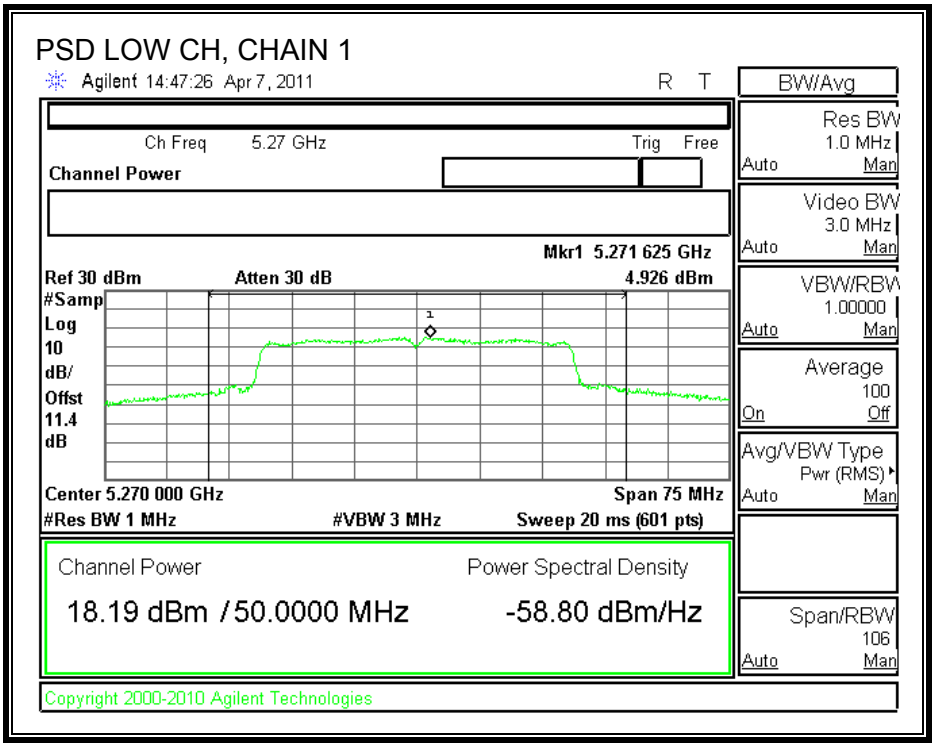
TEST PROCEDURE

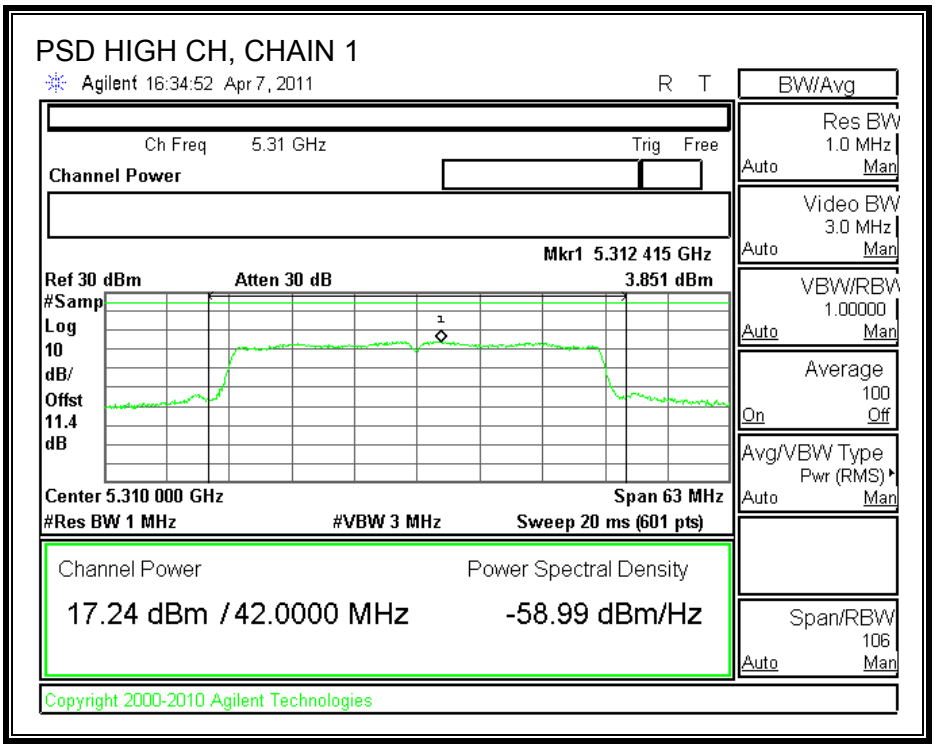
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

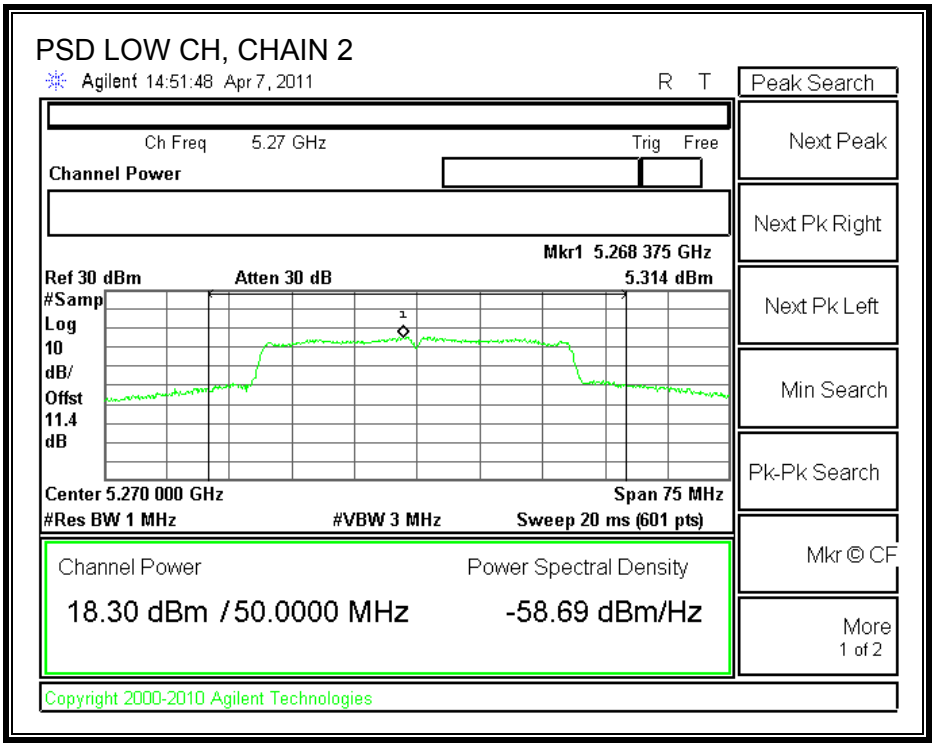
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5270	4.926	5.314	8.13	9.11	-0.98
High	5310	3.851	3.641	6.76	9.11	-2.35

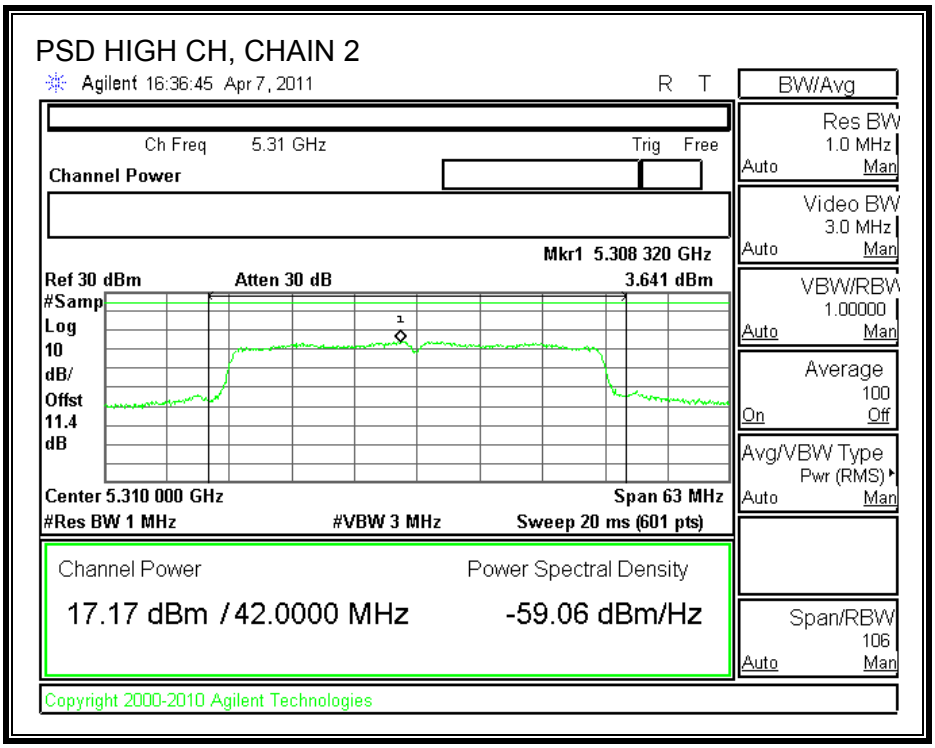
CHAIN 1 POWER SPECTRAL DENSITY





CHAIN 2 POWER SPECTRAL DENSITY





7.11.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

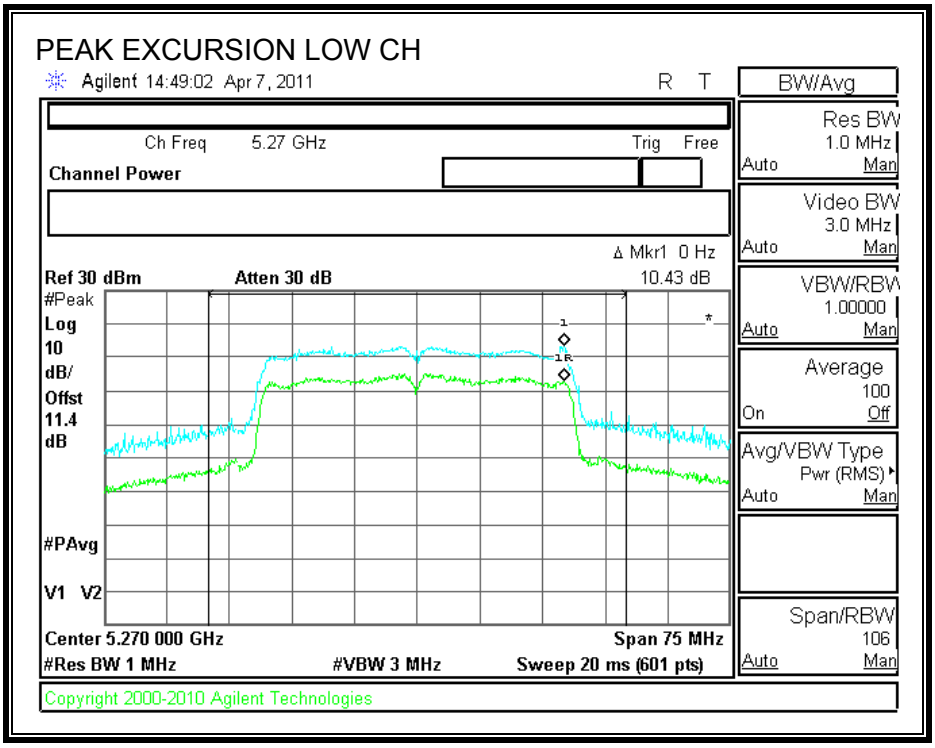
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

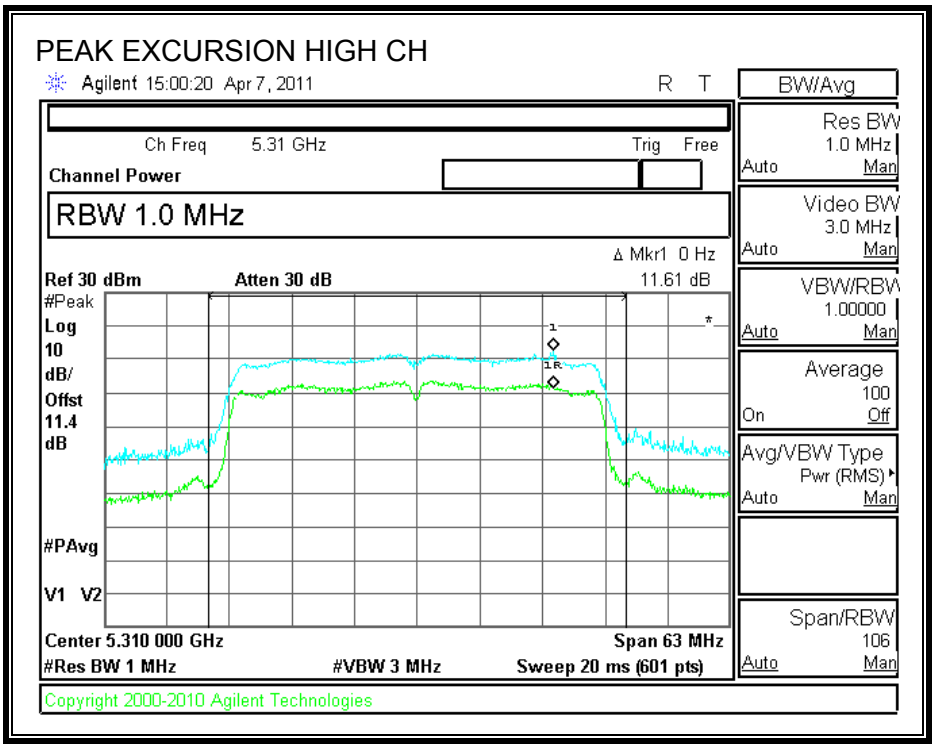
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	10.43	13	-2.57
High	5310	11.61	13	-1.39

PEAK EXCURSION





7.11.5. CONDUCTED SPURIOUS EMISSIONS

Covered by 11n HT40 3x3 CDD MCS0 testing

7.12. 802.11n THREE CHAINS HT40 MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

7.12.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

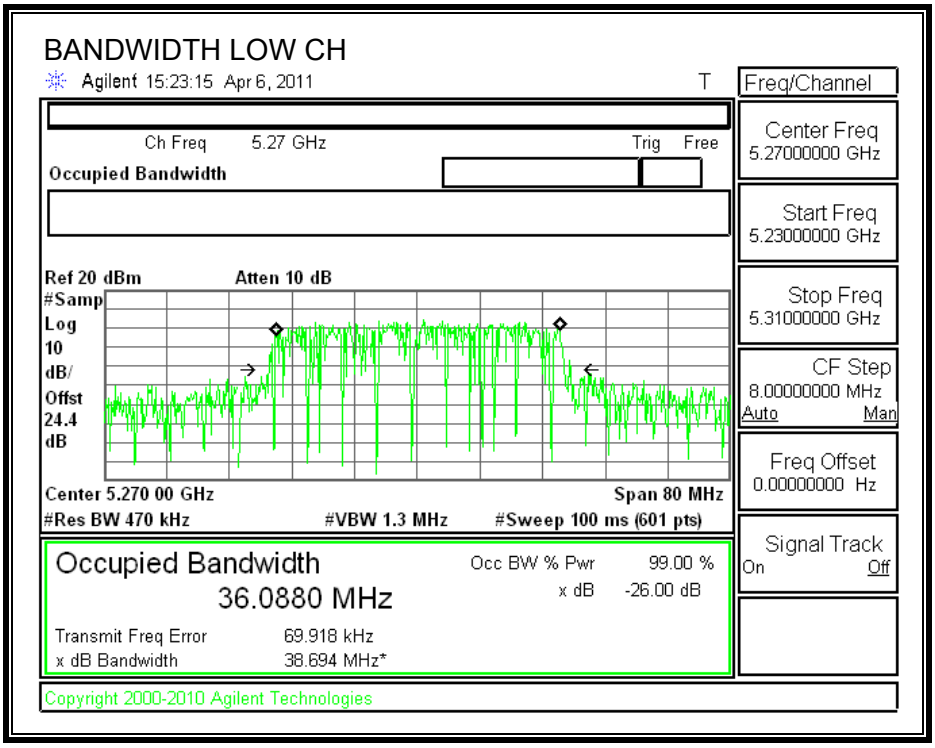
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

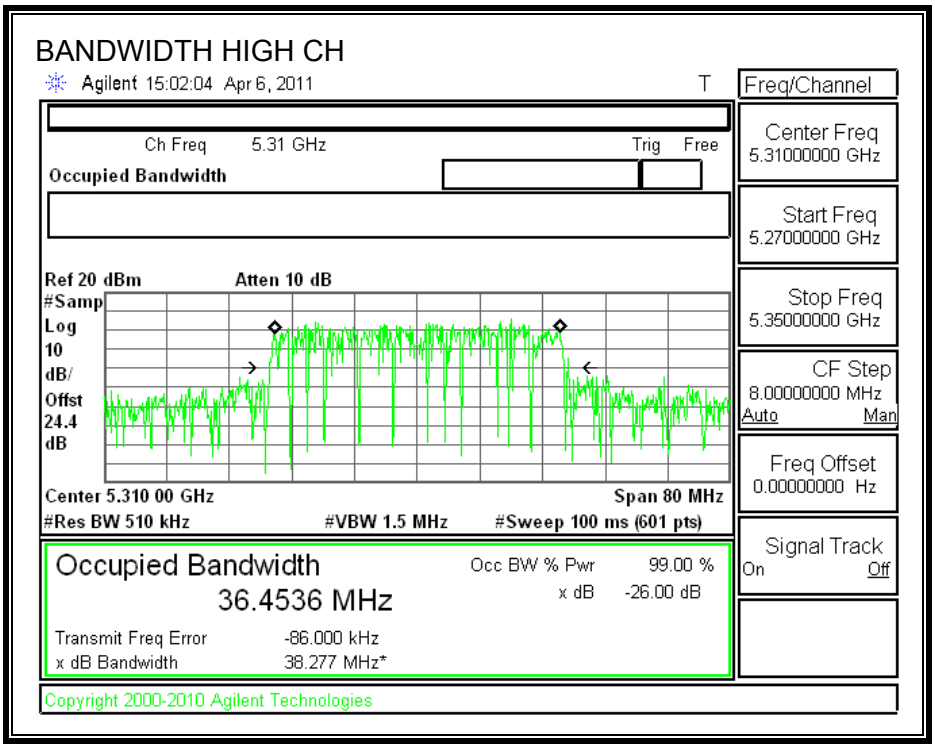
RESULTS

CHAIN 1

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	38.694	36.088
High	5310	38.277	36.4536

26 dB and 99% BANDWIDTH





7.12.2. 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 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	23.98	38.694	26.88	9.32	20.66
High	5310	23.98	38.277	26.83	9.32	20.66

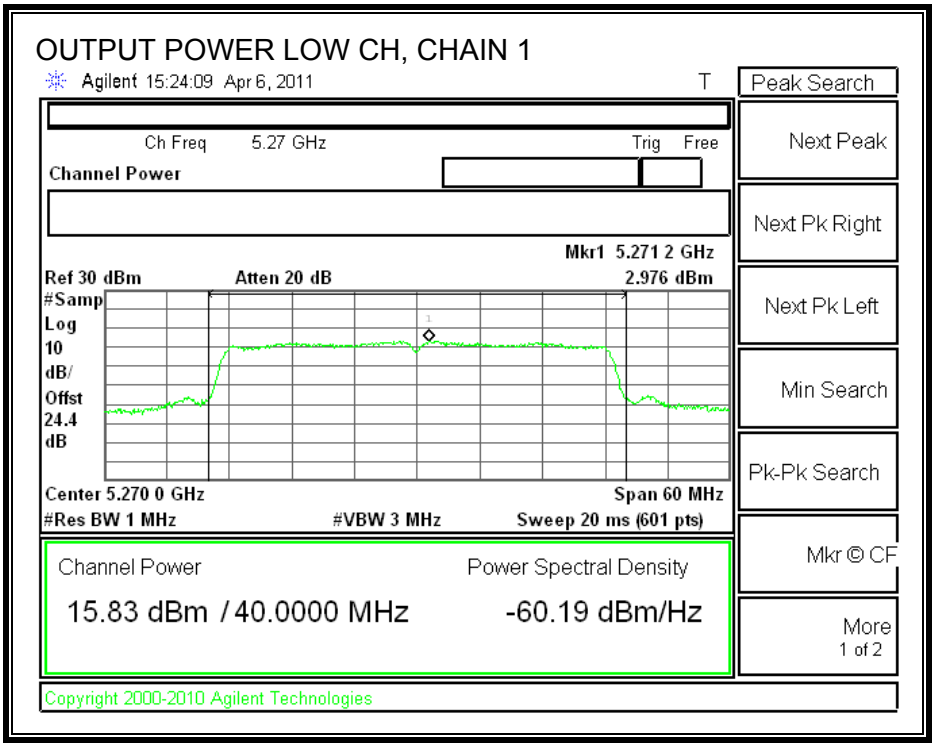
Individual Chain Results

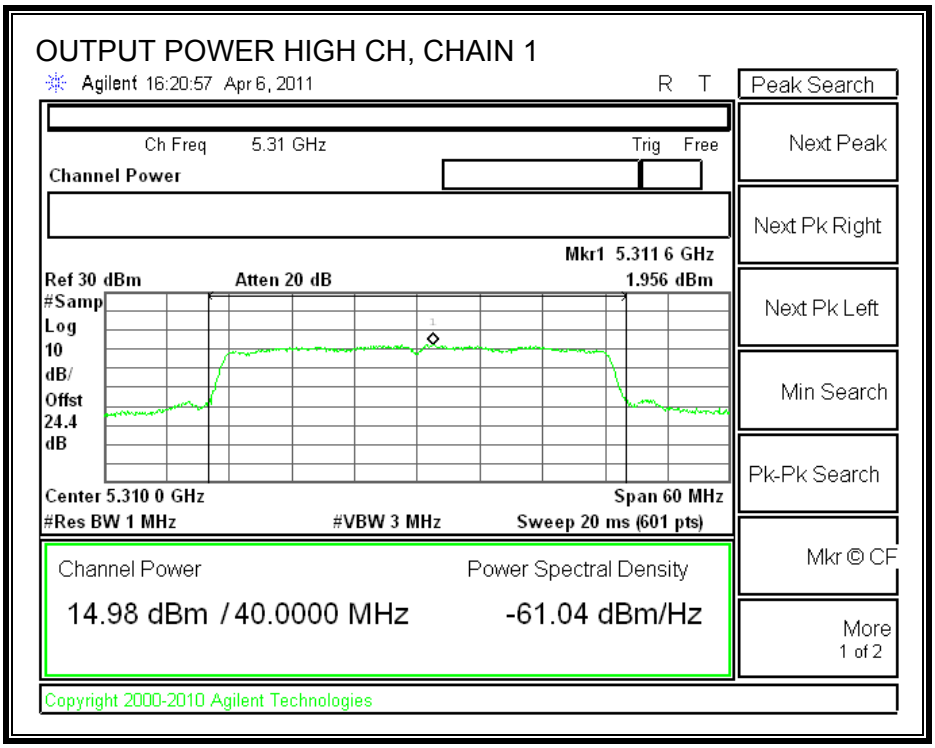
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	15.83	15.79	15.73	20.55	20.66	-0.11
High	5310	14.98	14.81	14.79	19.63	20.66	-1.03

TPC Results

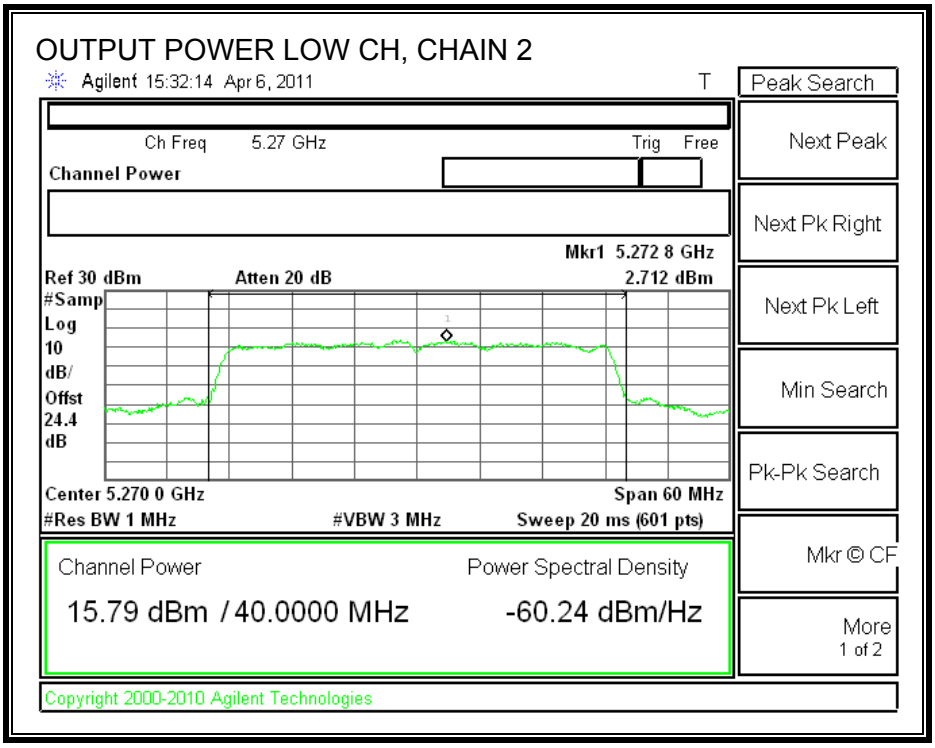
TPC Delta Power		Chain 1	Chain 2	Chain 3			
		5.97	6.05	6.08			
Worst-case TPC Power		Chain 1	Chain 2	Chain 3	Total Power	Ant Gain	EIRP
Low	5270	9.86	9.74	9.65	14.52	9.32	23.84
						TPC Limit (dBm)	24
						Margin (dB)	-0.16

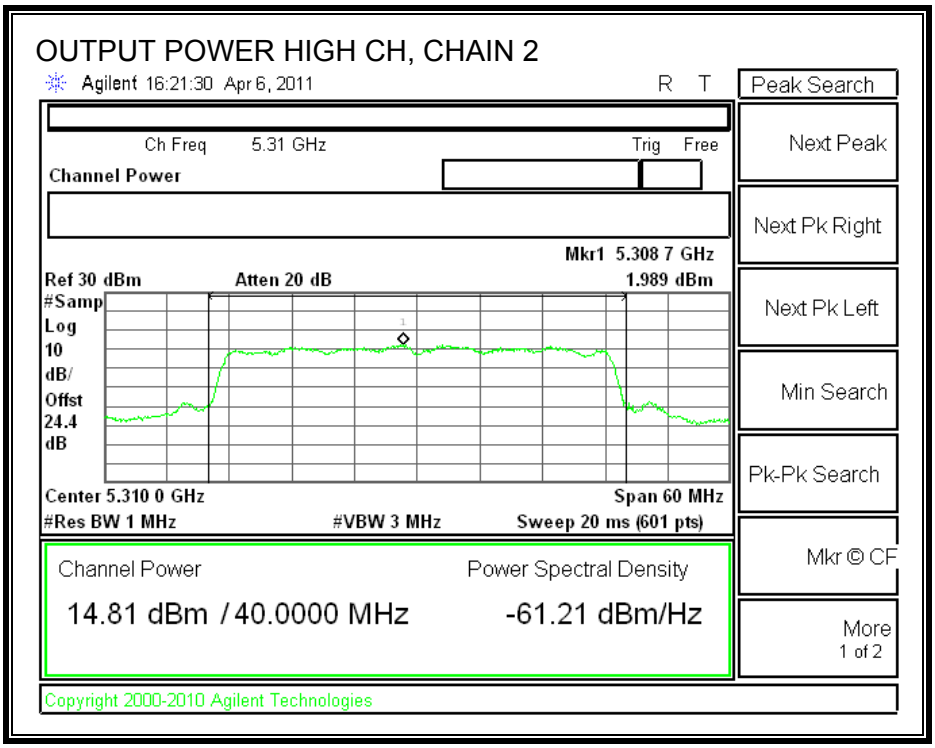
CHAIN 1 OUTPUT POWER



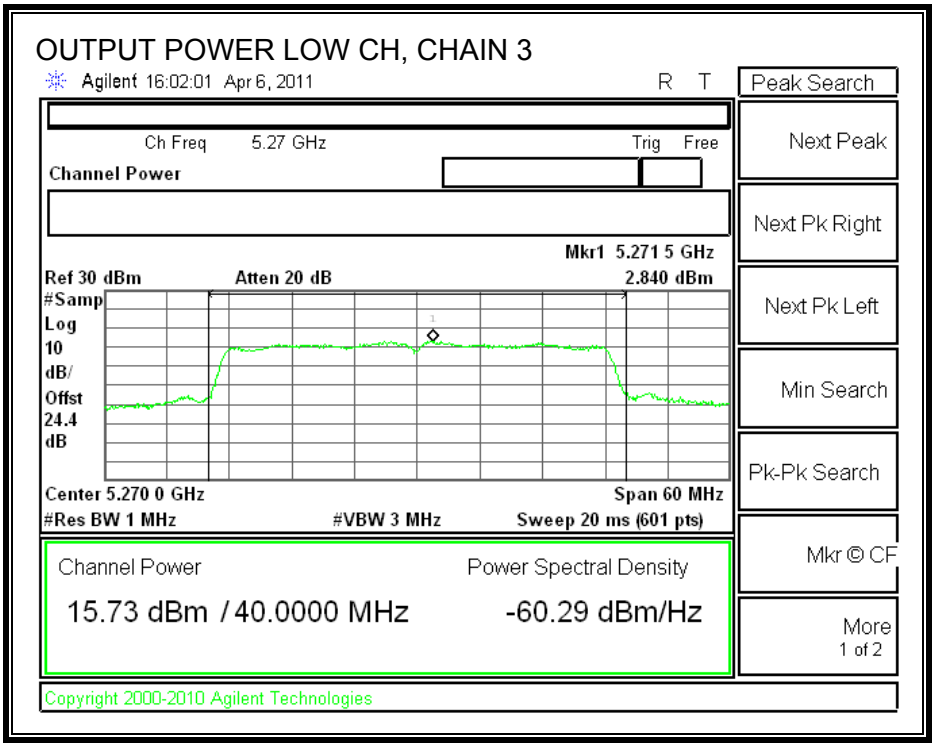


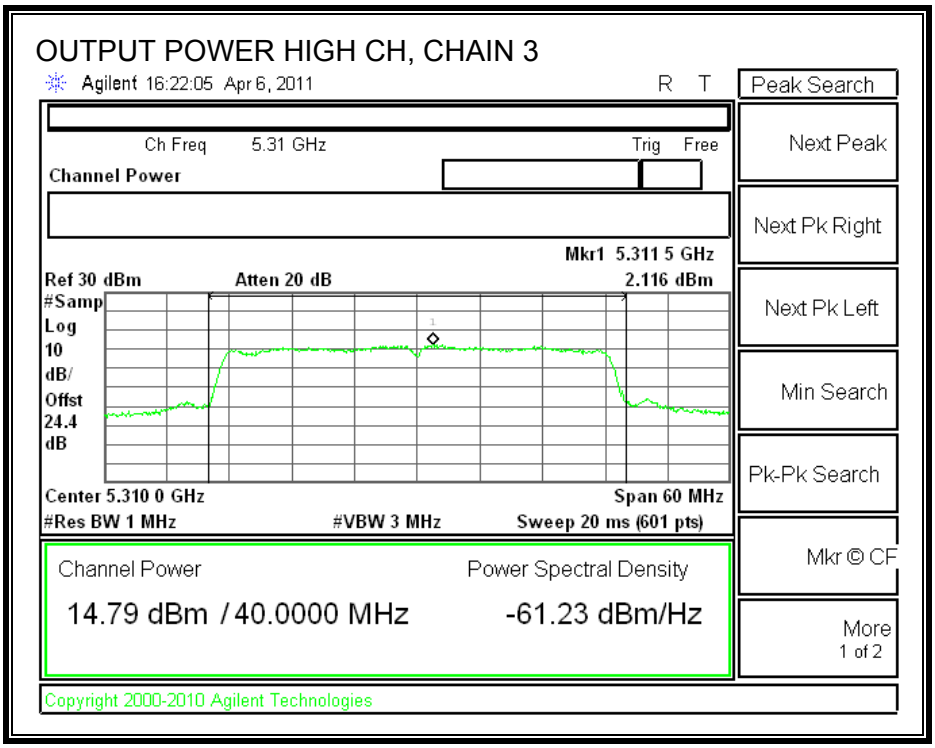
CHAIN 2 OUTPUT POWER



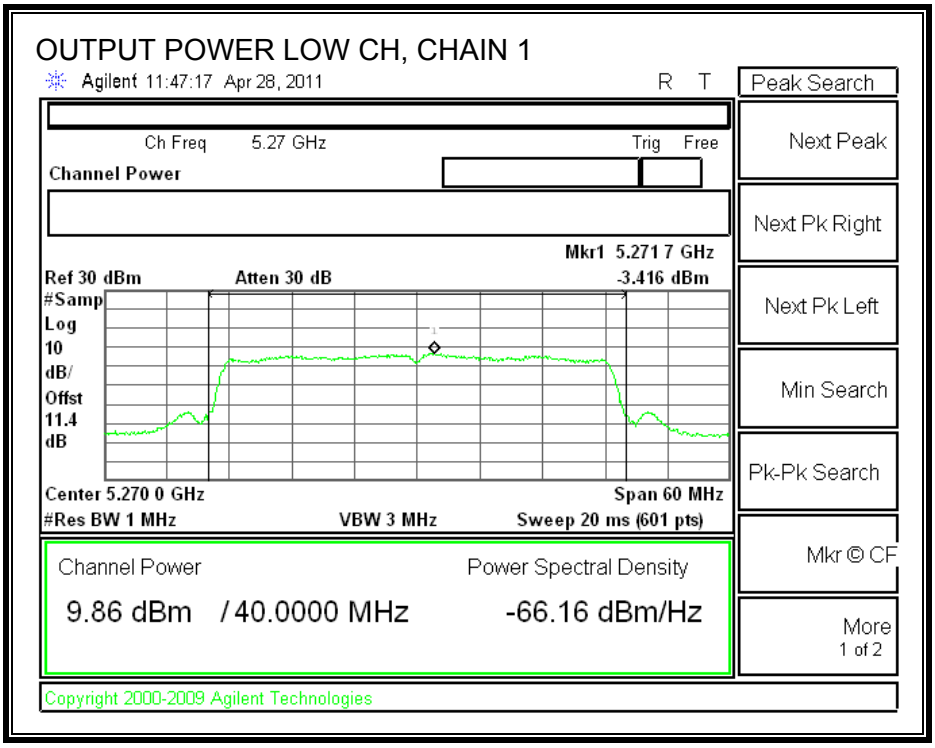


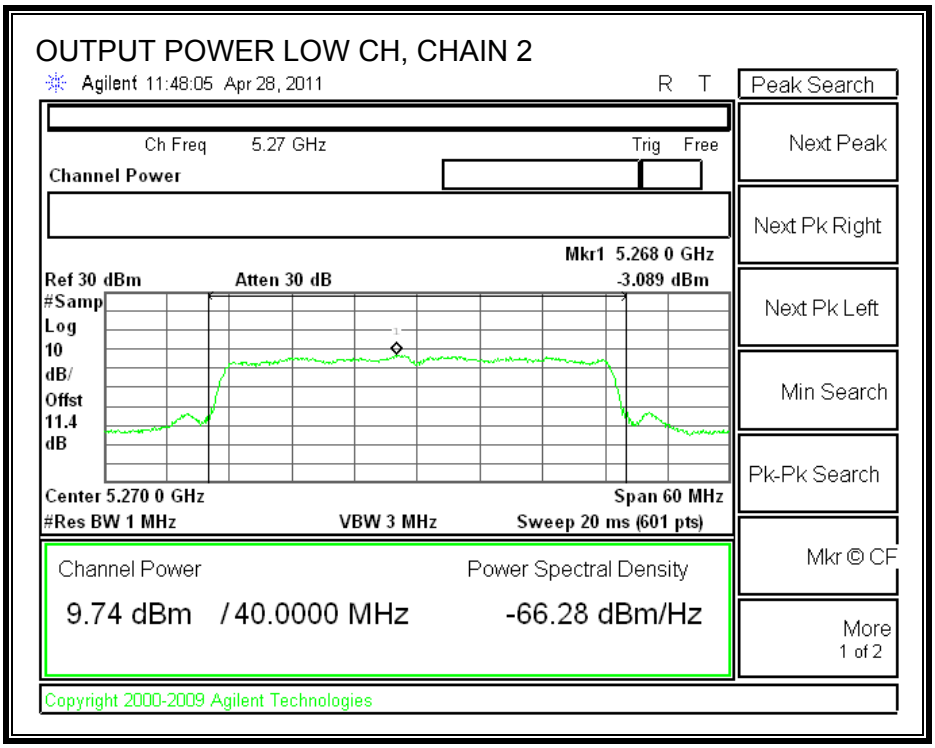
CHAIN 3 OUTPUT POWER

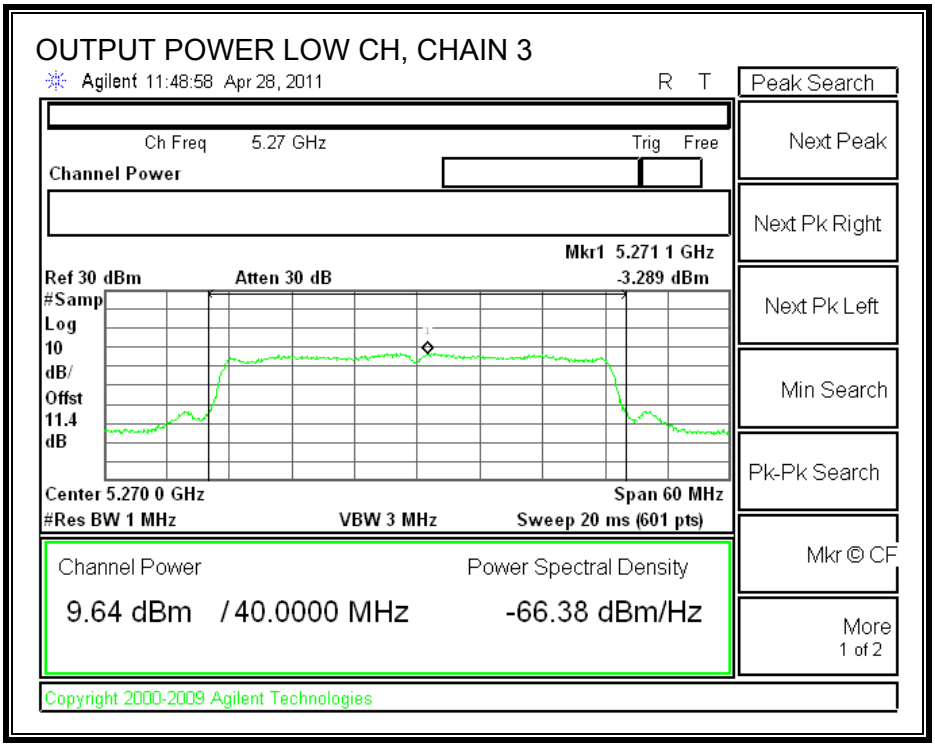




TPC OUTPUT POWER







7.12.3. 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 effective antenna gain is 9.32 dBi, therefore the limit is 7.68 dBm.

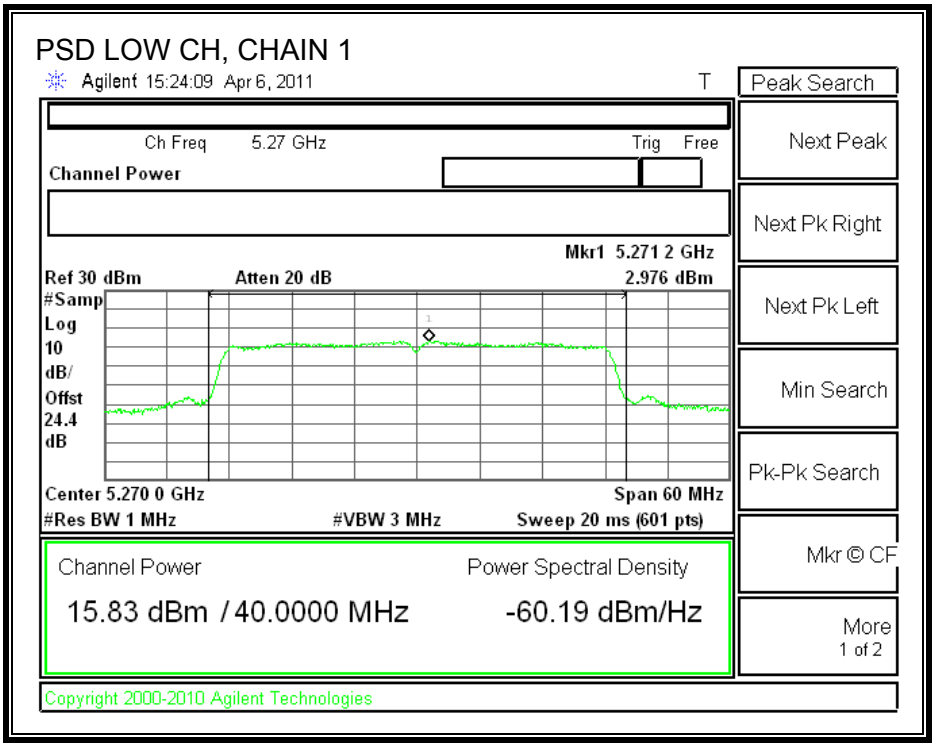
TEST PROCEDURE

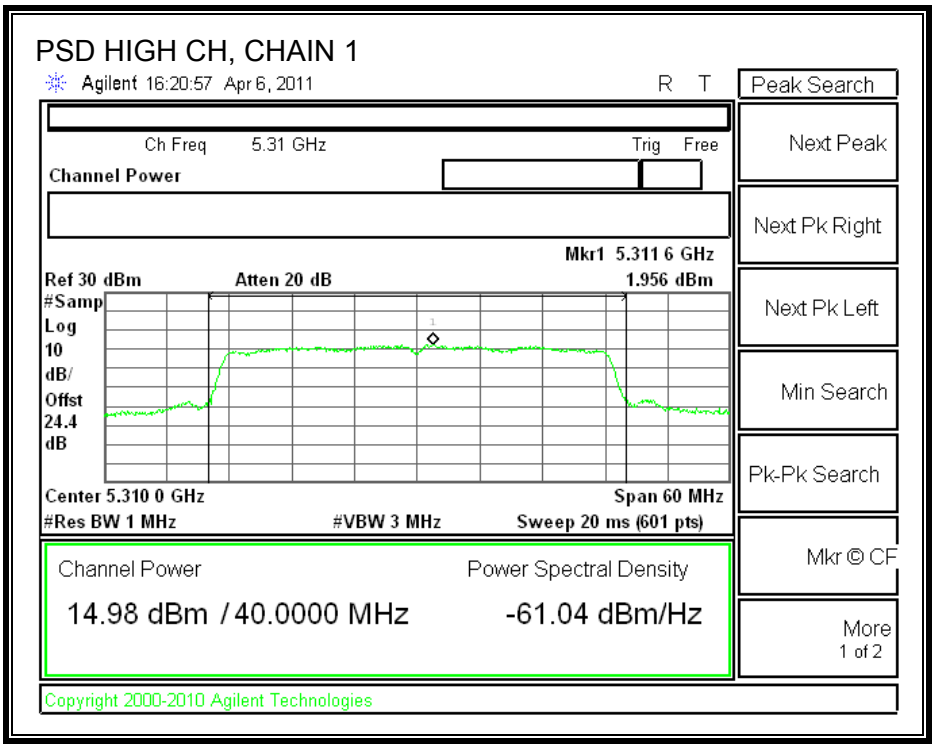
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

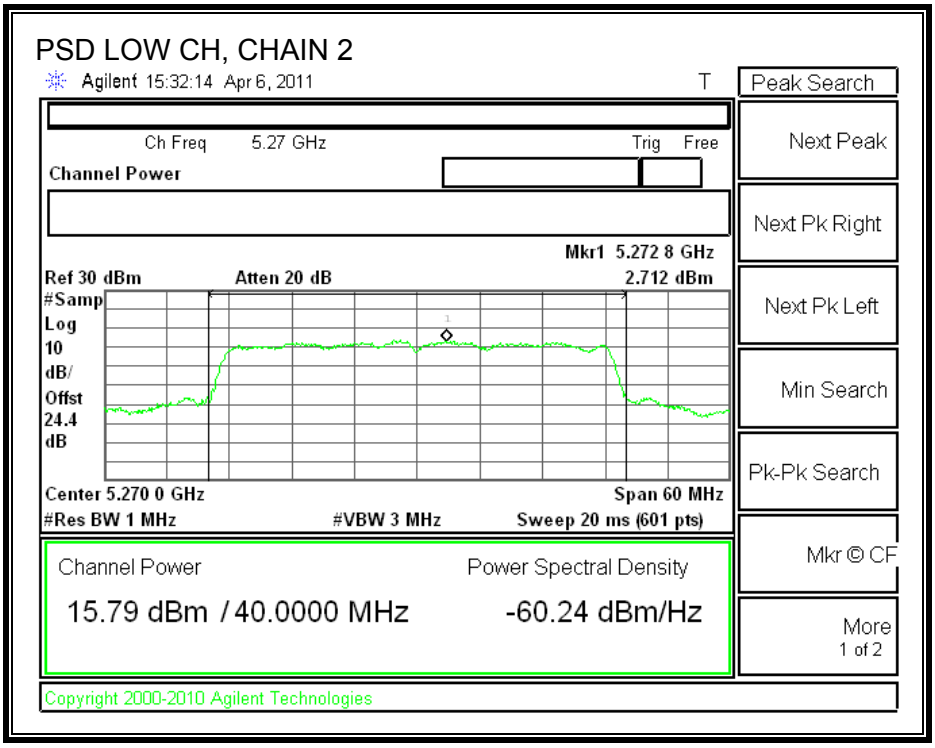
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5270	2.976	2.712	2.84	7.62	7.68	-0.06
High	5310	1.956	1.989	2.116	6.79	7.68	-0.89

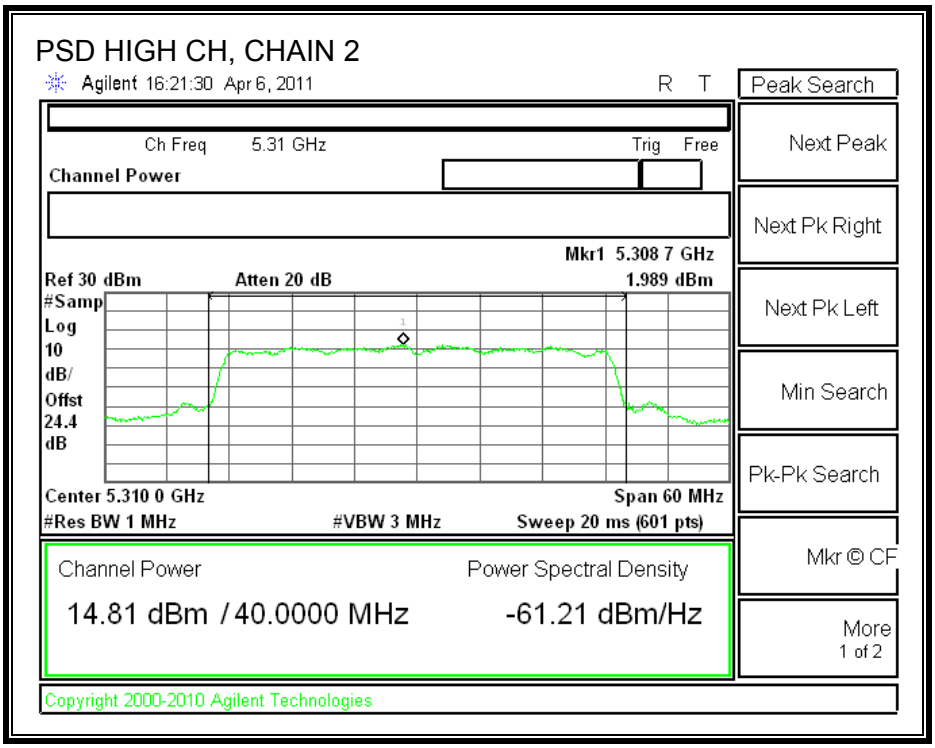
CHAIN 1 POWER SPECTRAL DENSITY



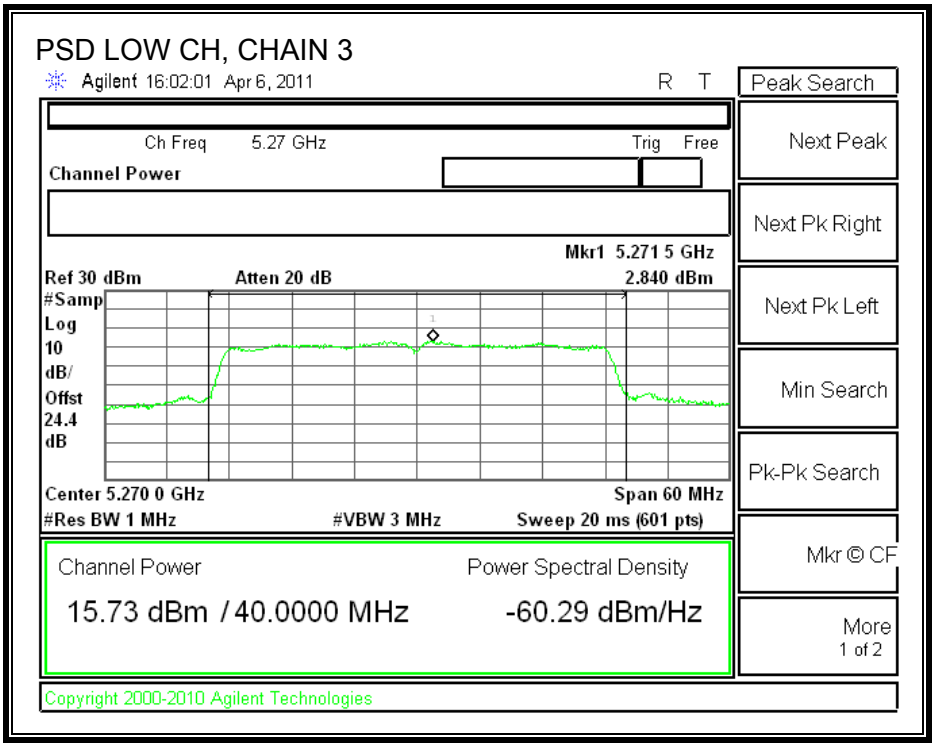


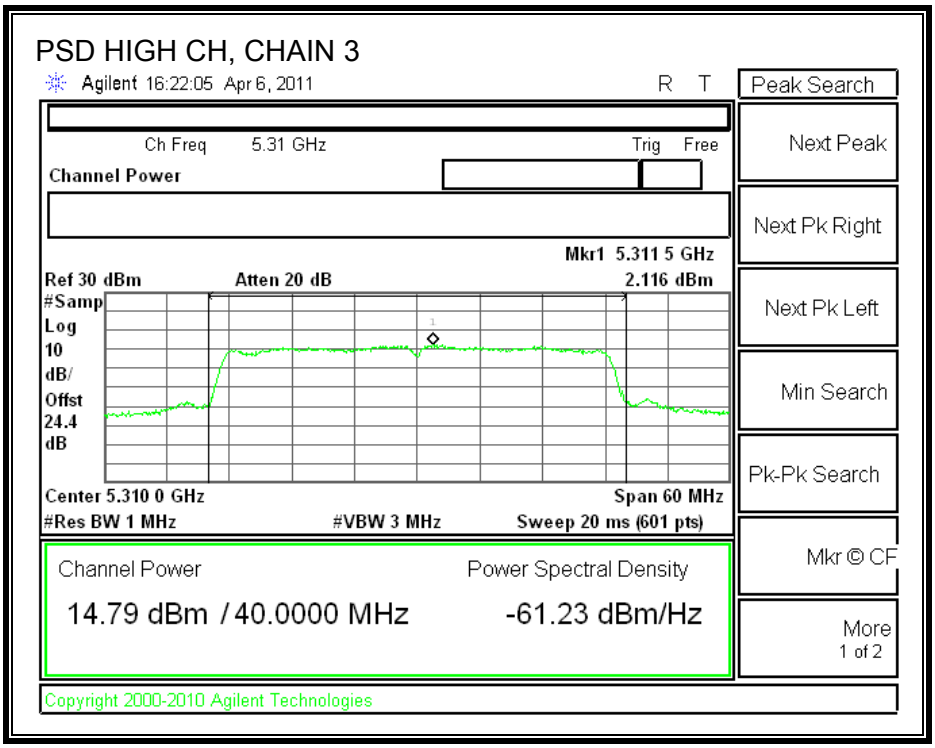
CHAIN 2 POWER SPECTRAL DENSITY





CHAIN 3 POWER SPECTRAL DENSITY





7.12.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

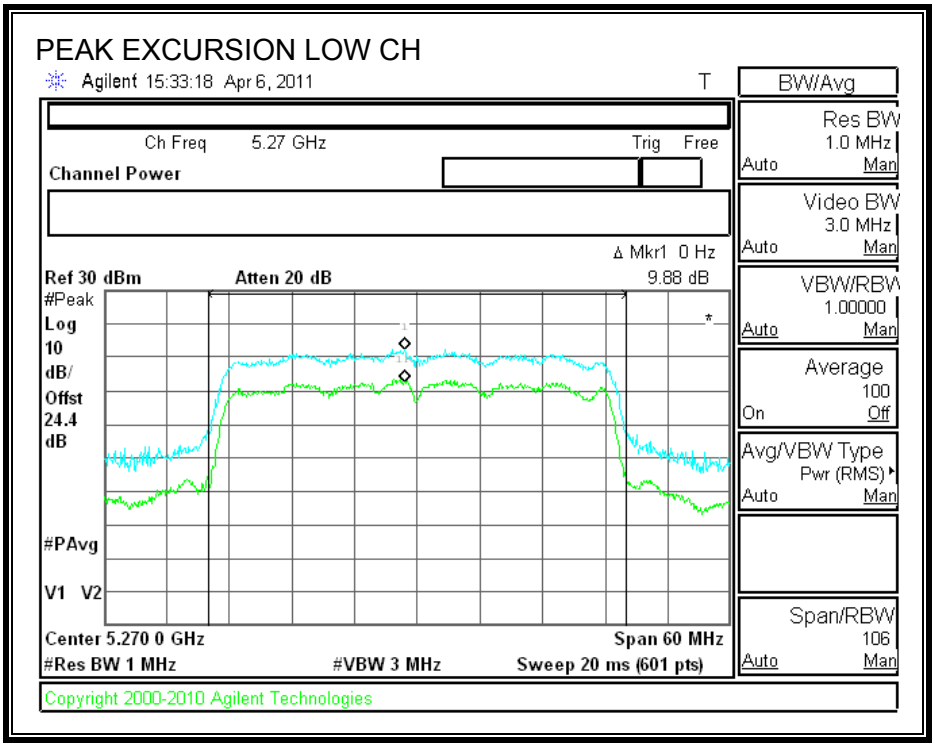
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

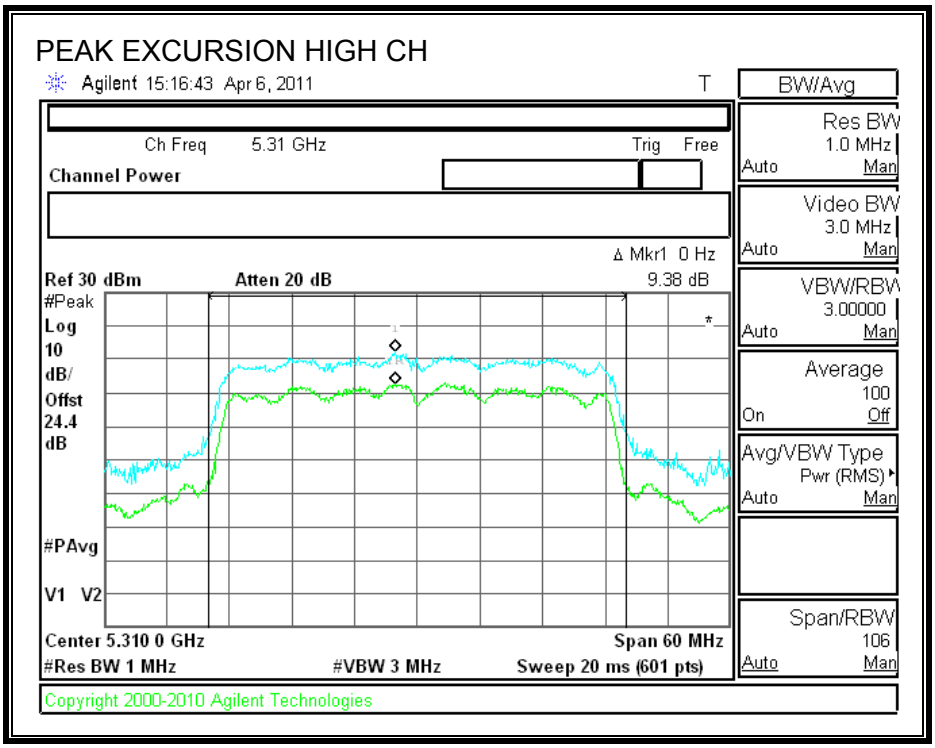
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5290		13	-13.00
High	5310	9.38	13	-3.62

PEAK EXCURSION





7.12.5. 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.

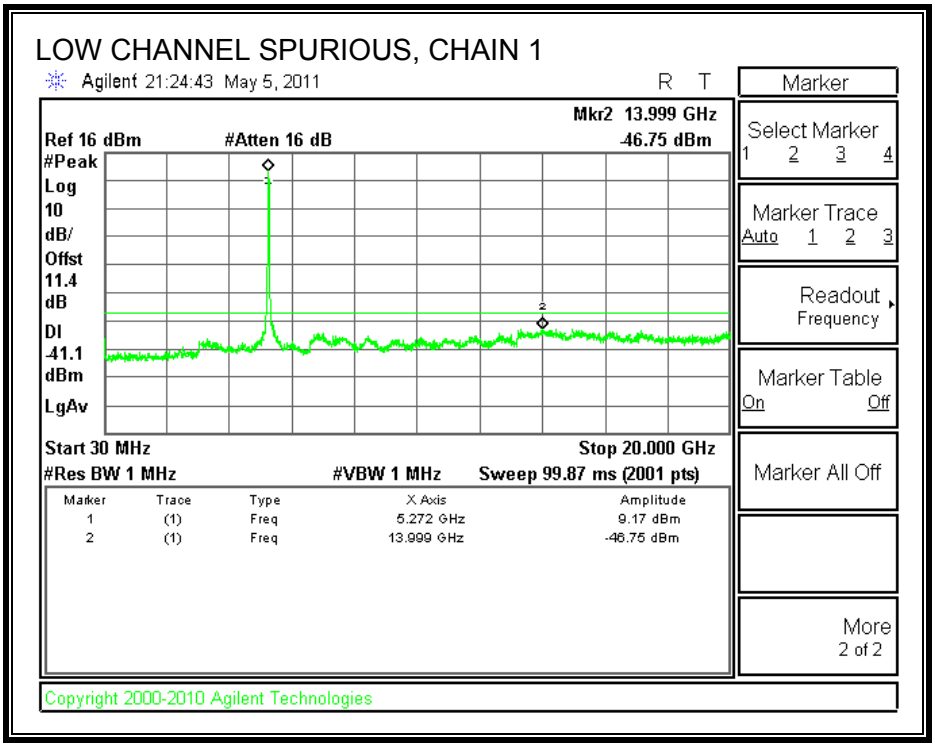
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

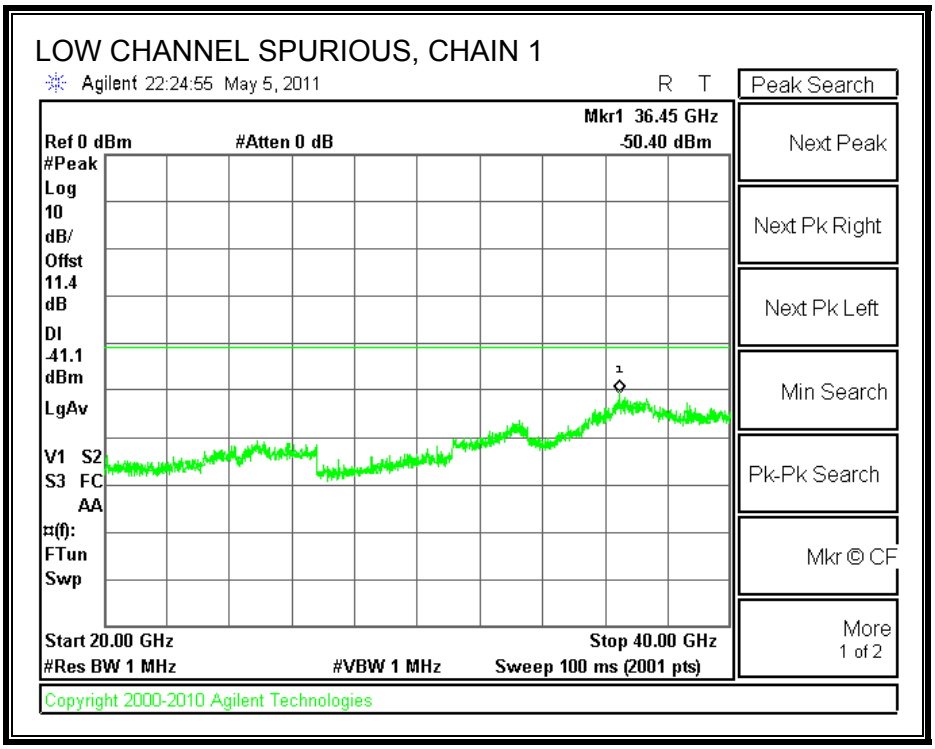
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

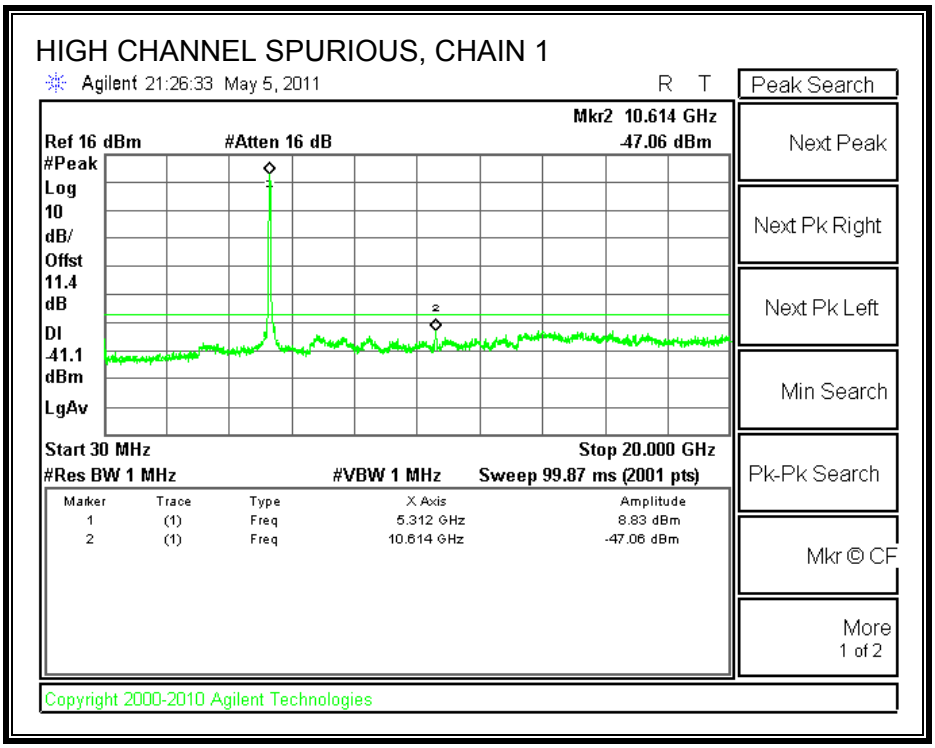
RESULTS

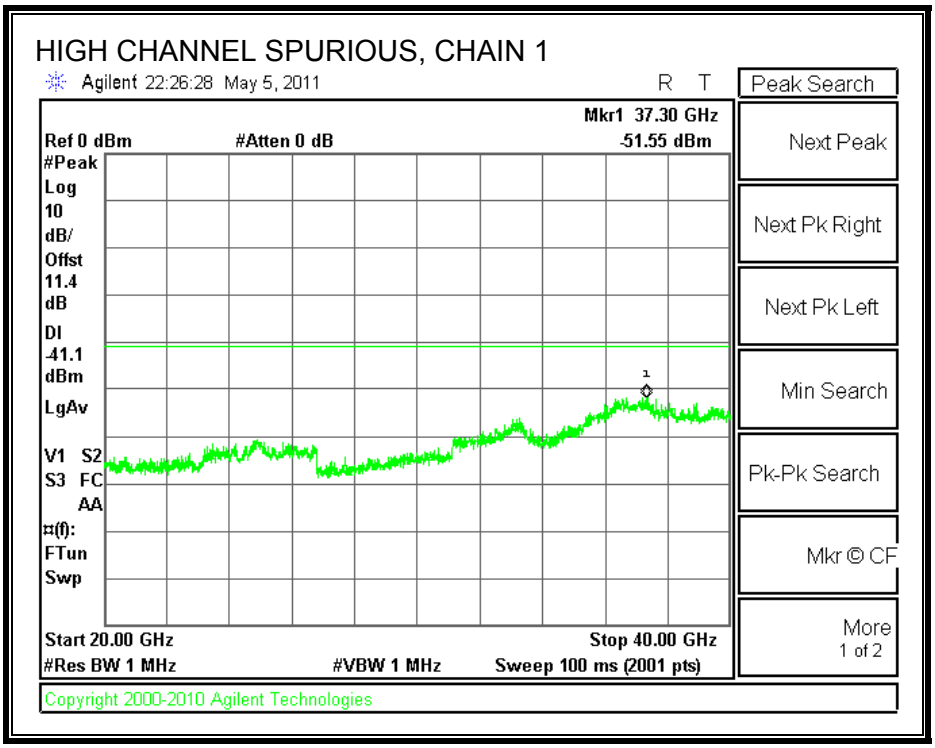
Limit = -27 dBm + Antenna Gain + 10log (N) dB

CHAIN 1 SPURIOUS EMISSIONS

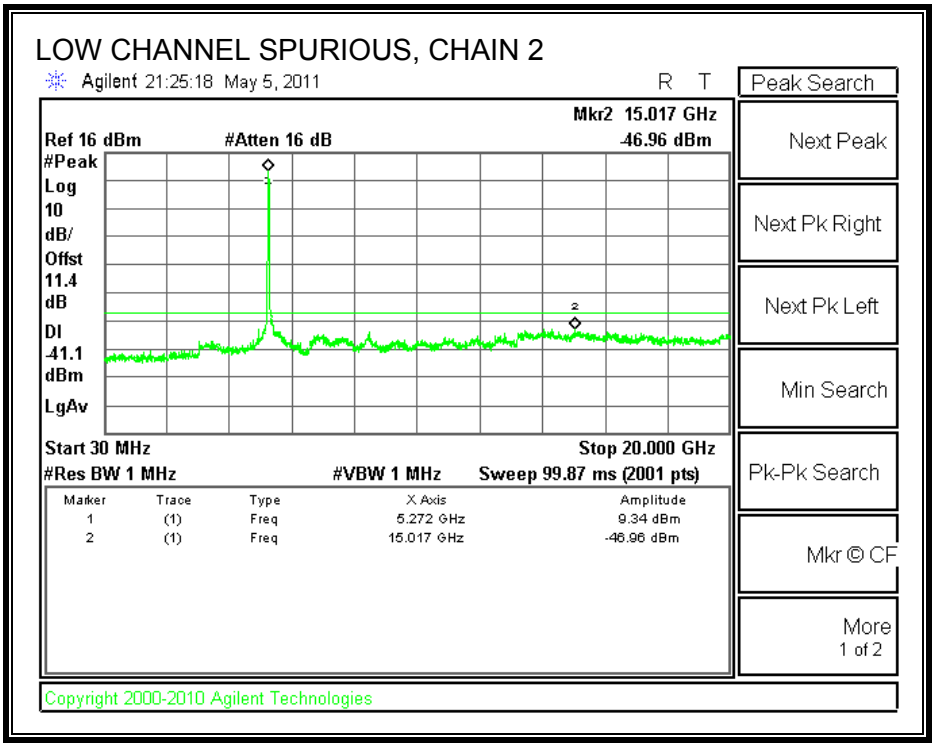


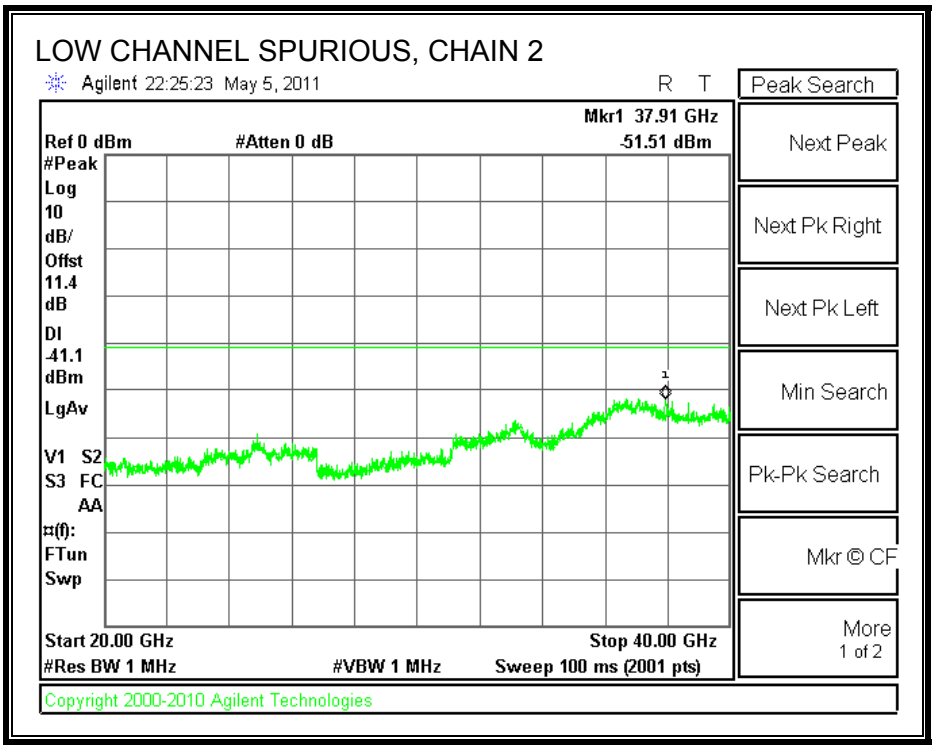


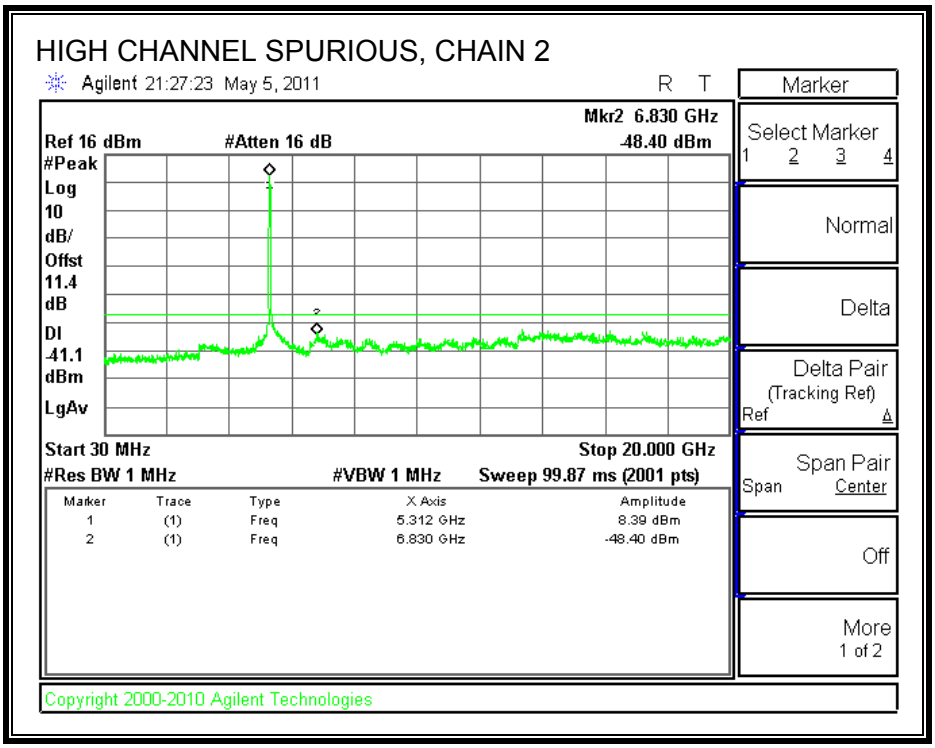


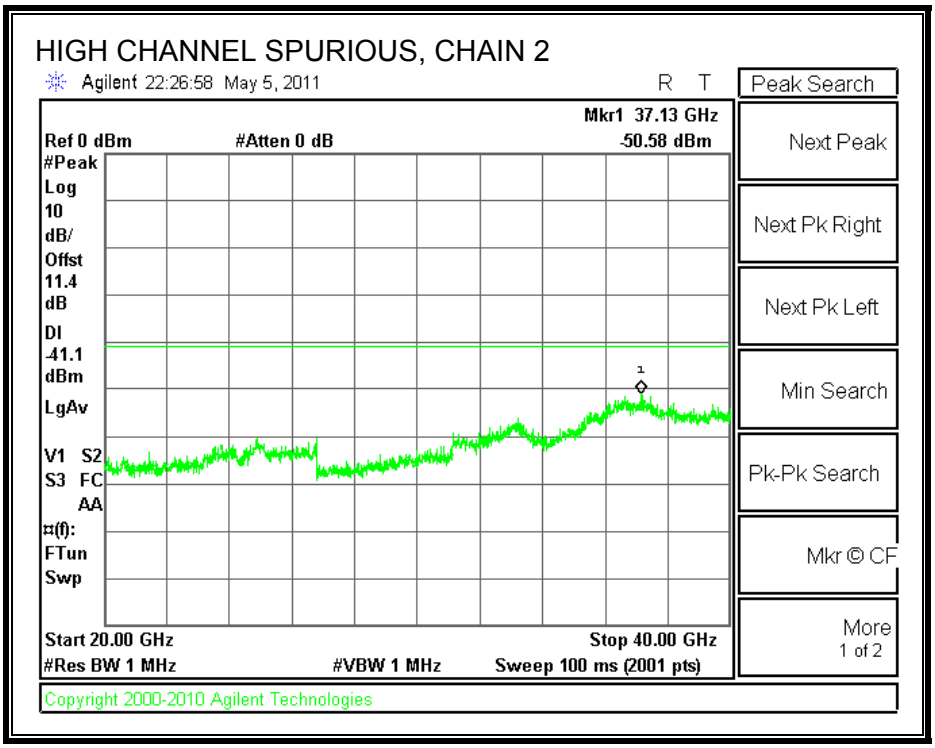


CHAIN 2 SPURIOUS EMISSIONS

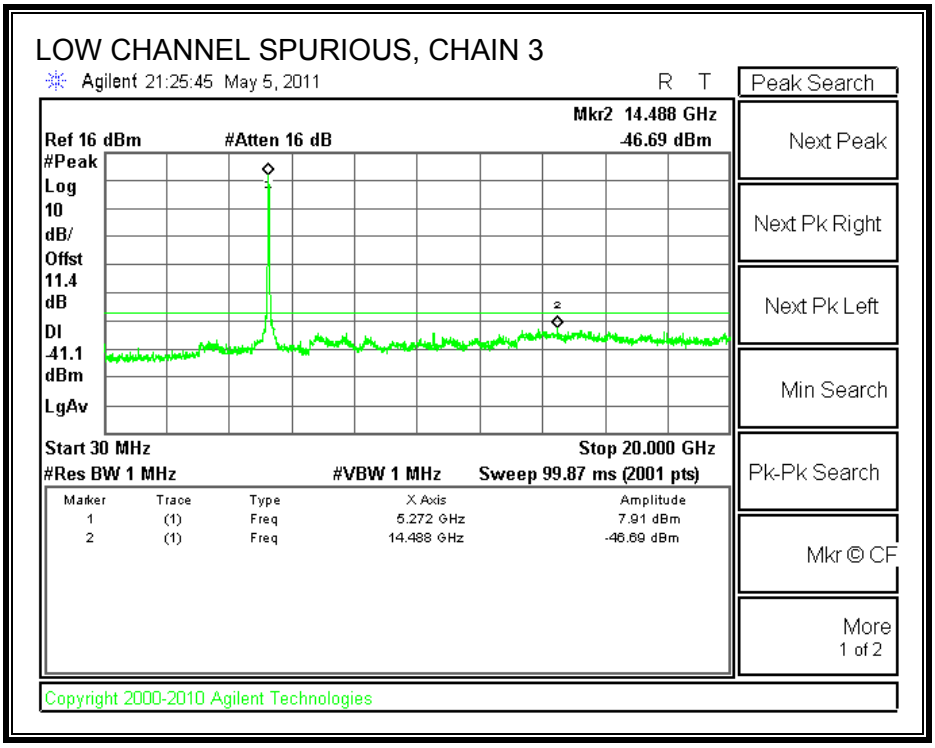


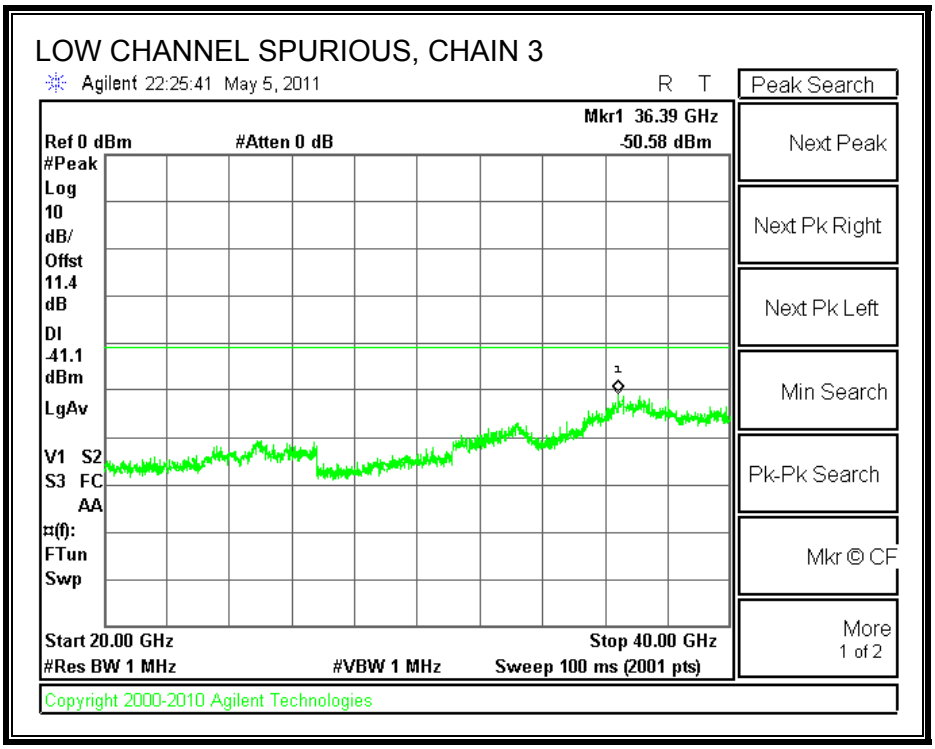


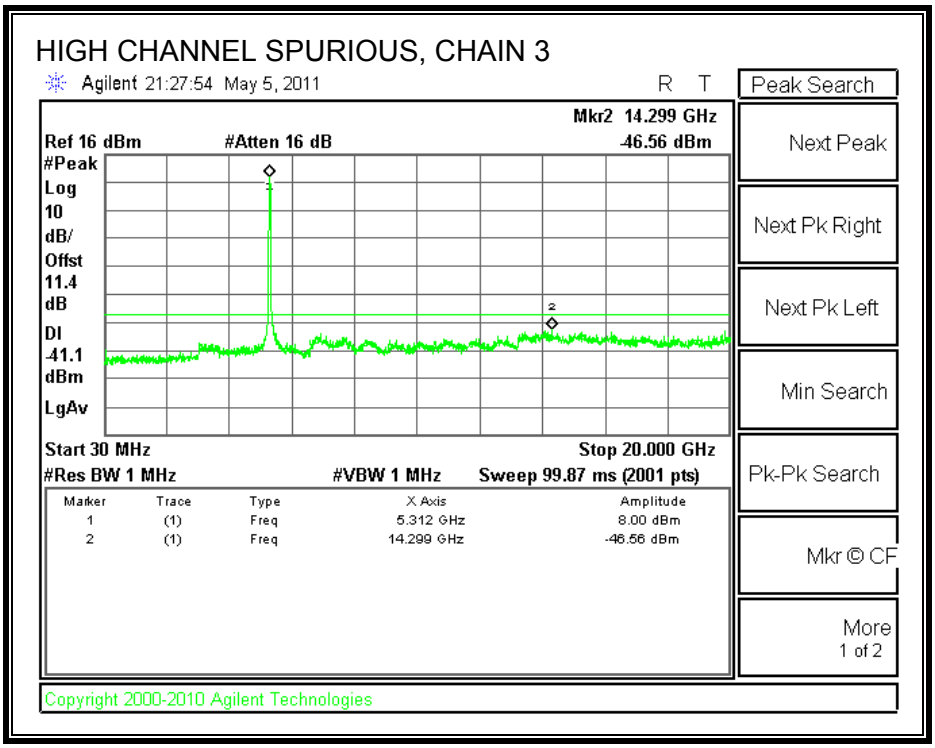


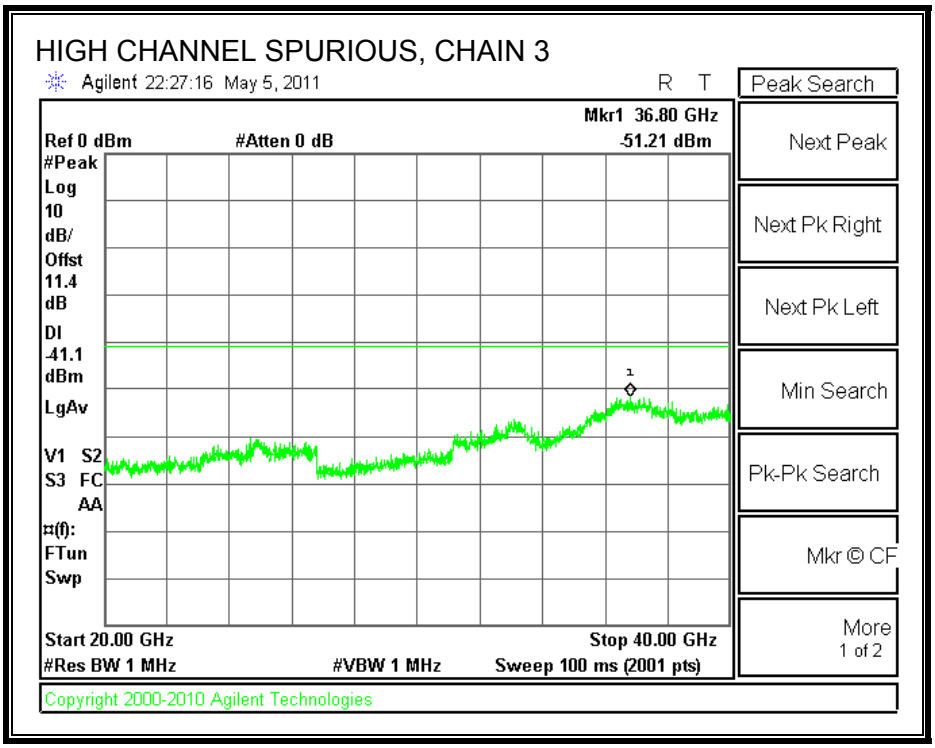


CHAIN 3 SPURIOUS EMISSIONS









SDM MCS21

7.12.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

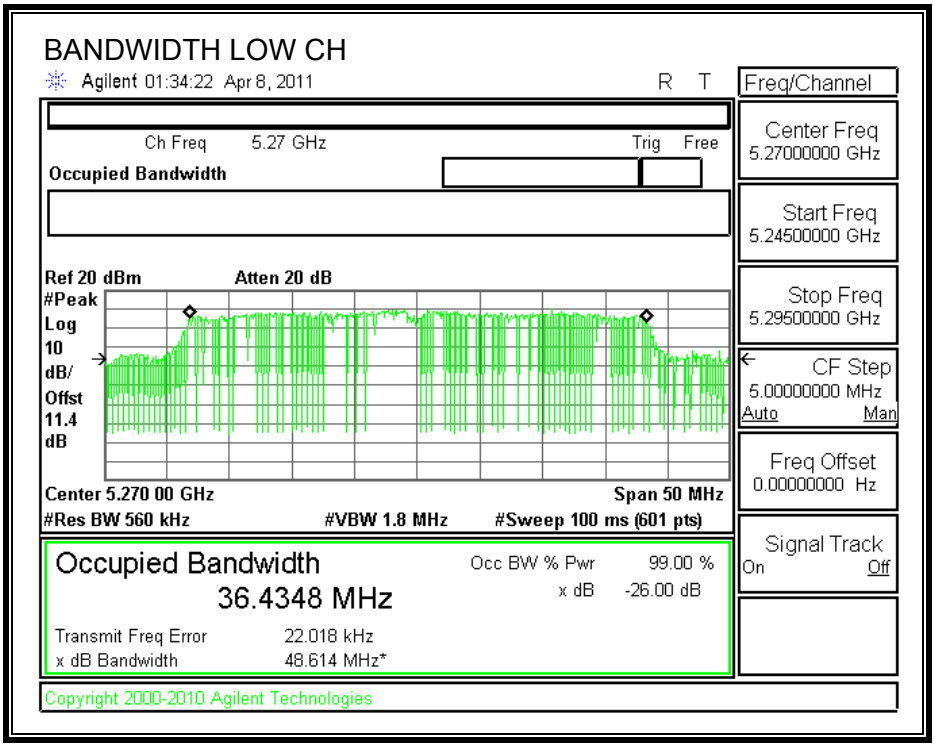
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

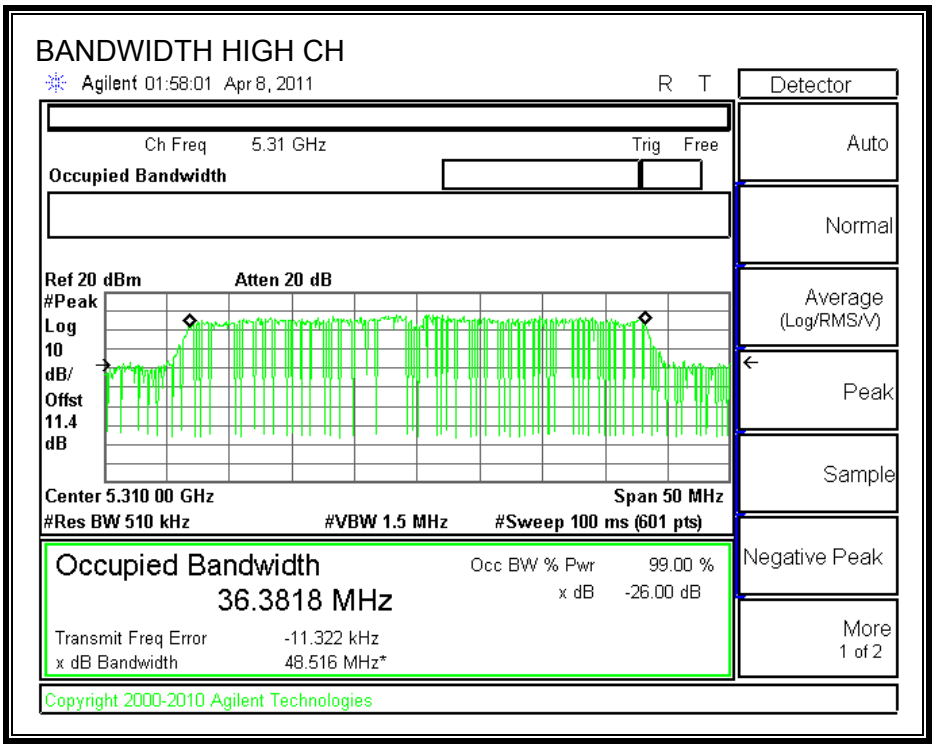
RESULTS

CHAIN 1

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	48.614	36.4348
High	5310	48.516	36.3818

26 dB and 99% BANDWIDTH





7.12.2. 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 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

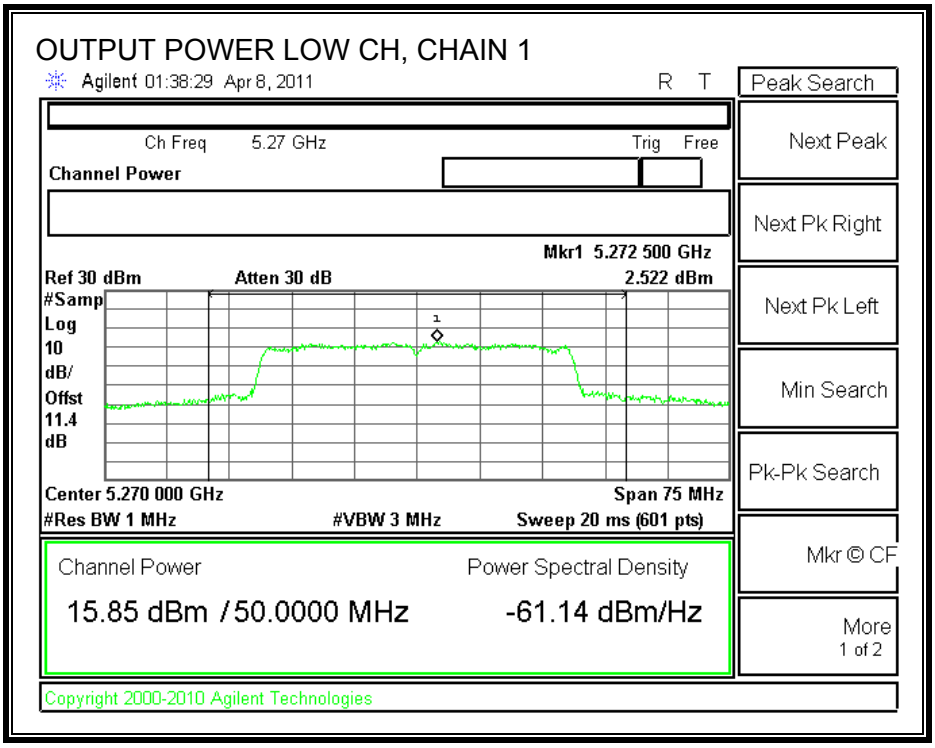
Limit

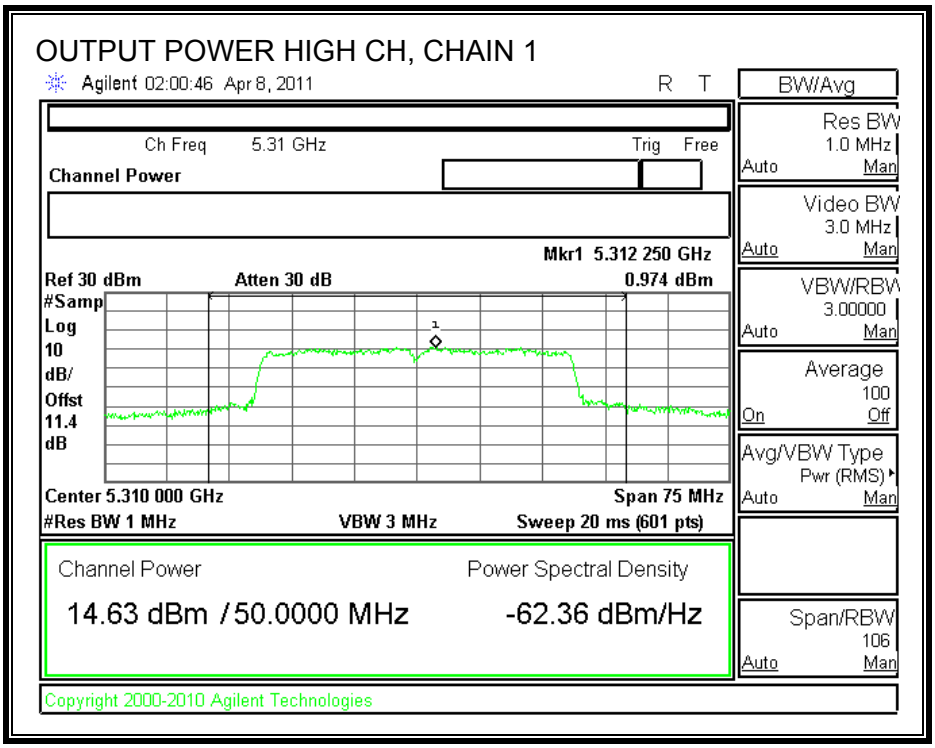
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5270	23.98	48.614	27.87	5.61	23.98
High	5310	23.98	48.516	27.86	5.61	23.98

Individual Chain Results

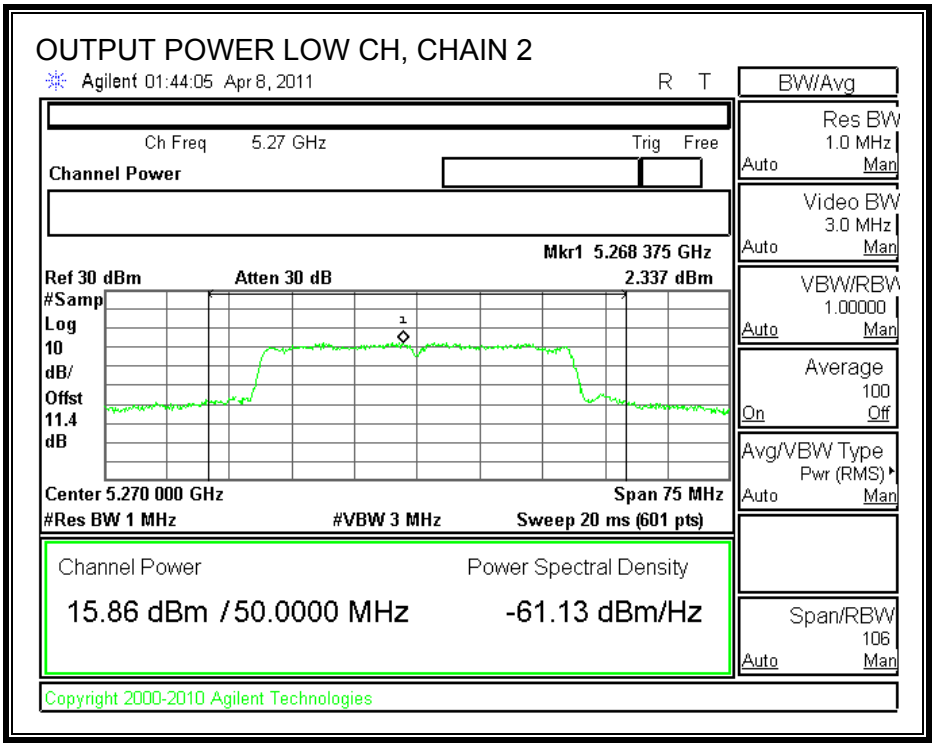
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	15.85	15.86	15.89	20.64	23.98	-3.34
High	5310	14.63	14.68	14.62	19.41	23.98	-4.57

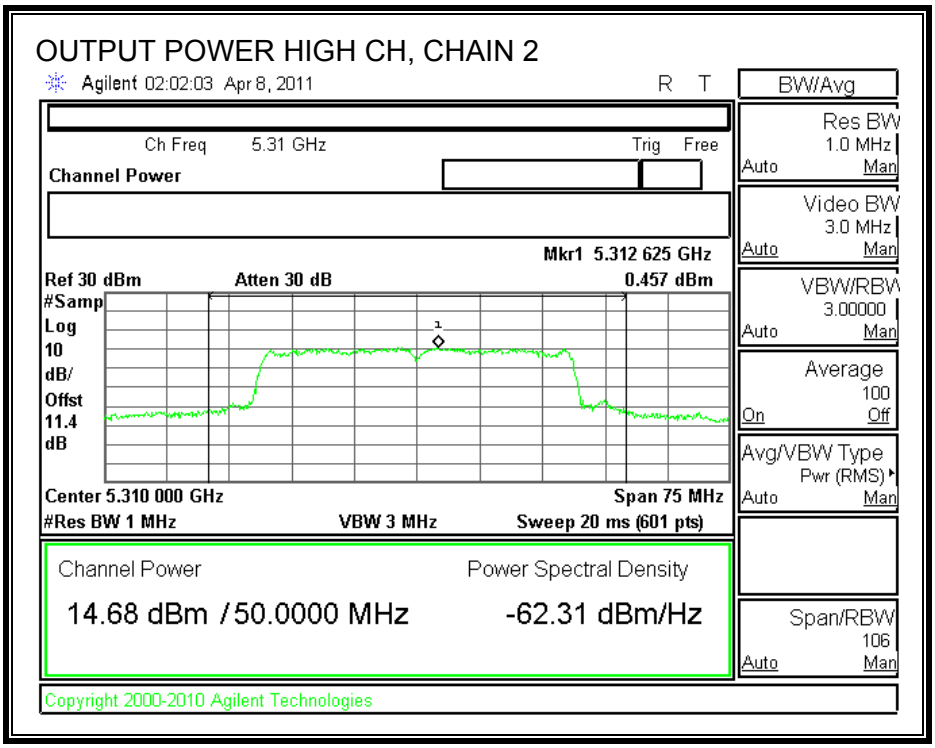
CHAIN 1 OUTPUT POWER



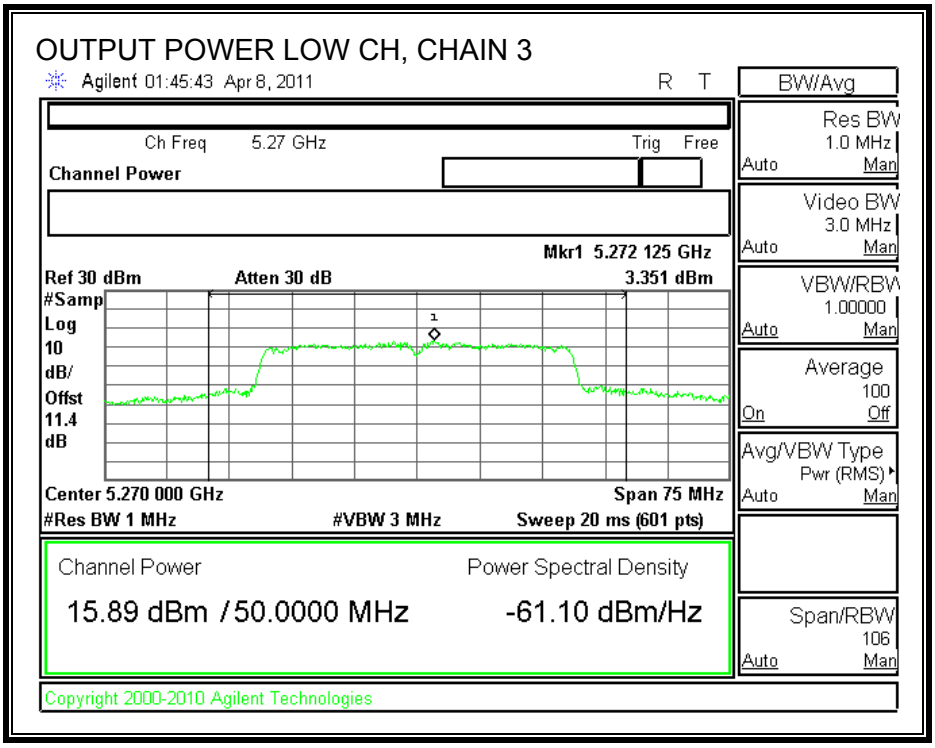


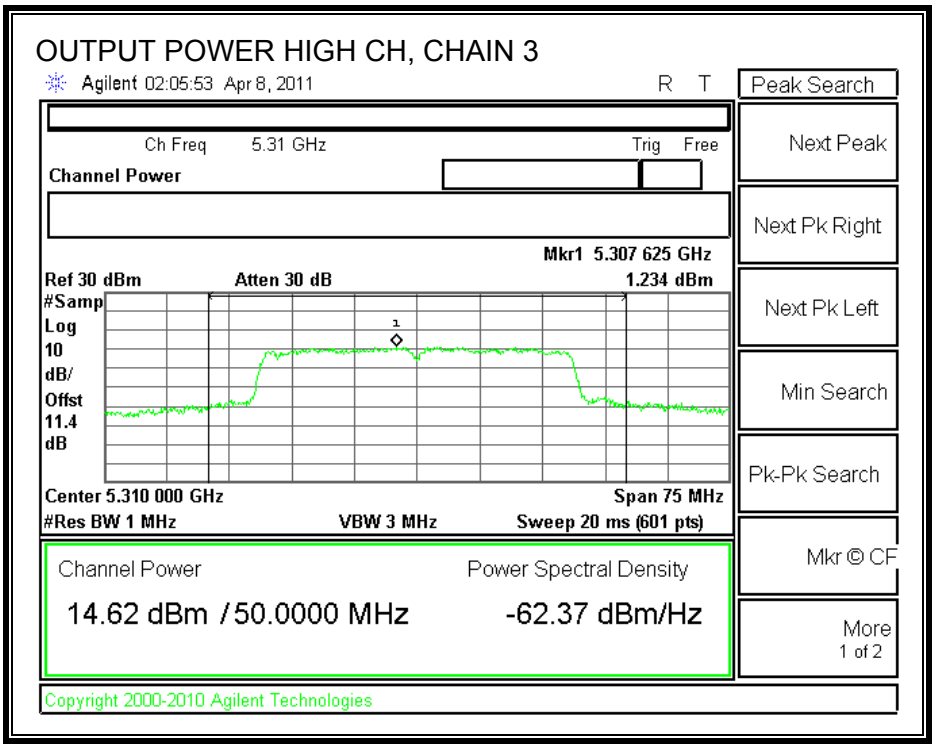
CHAIN 2 OUTPUT POWER





CHAIN 3 OUTPUT POWER





7.12.3. 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 effective antenna gain is 5.61 dBi, therefore the limit is 11 dBm.

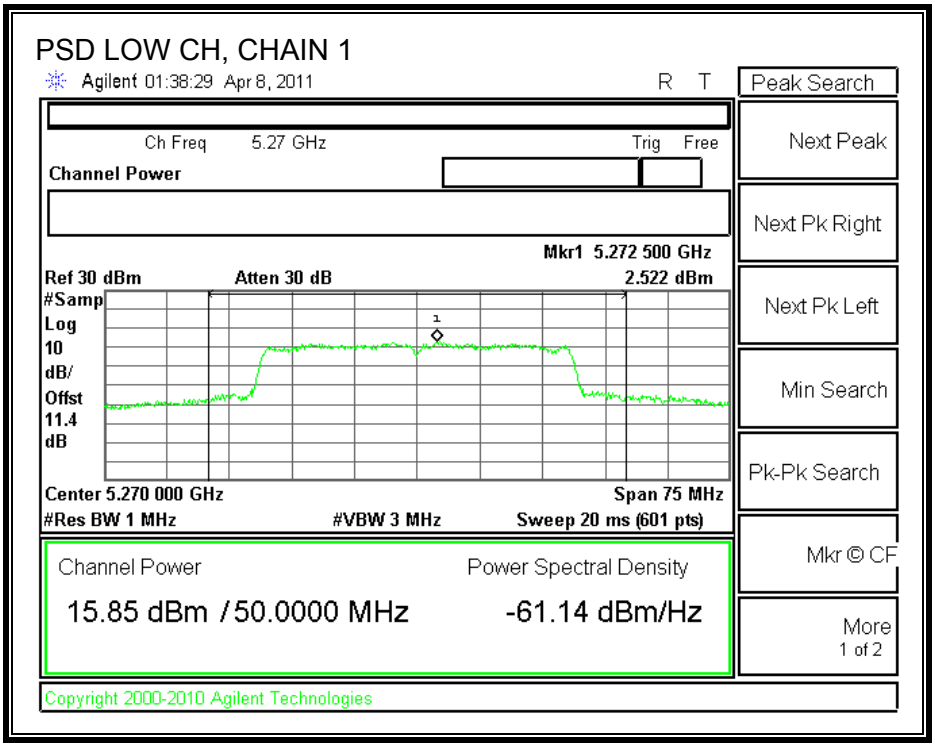
TEST PROCEDURE

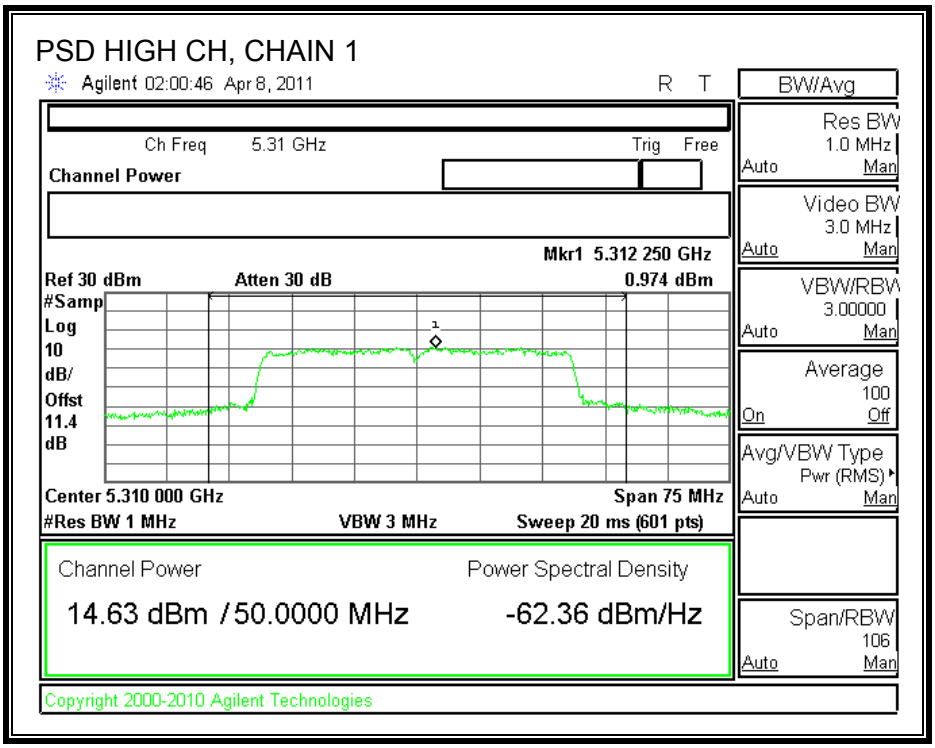
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

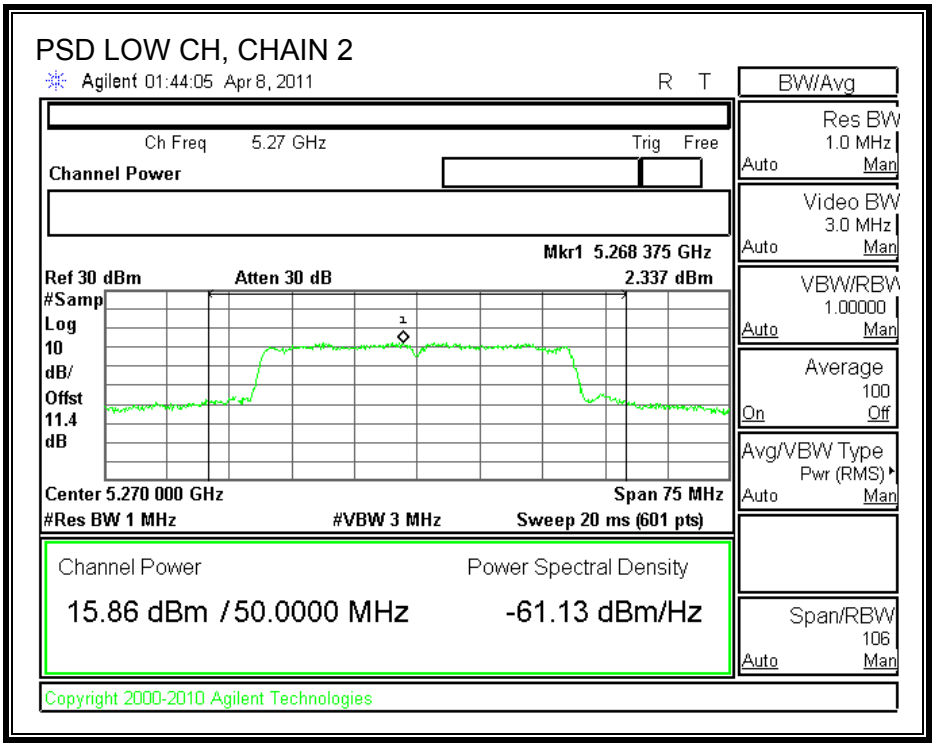
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5270	2.522	2.337	3.351	7.53	11.00	-3.47
High	5310	0.974	0.457	1.234	5.67	11.00	-5.33

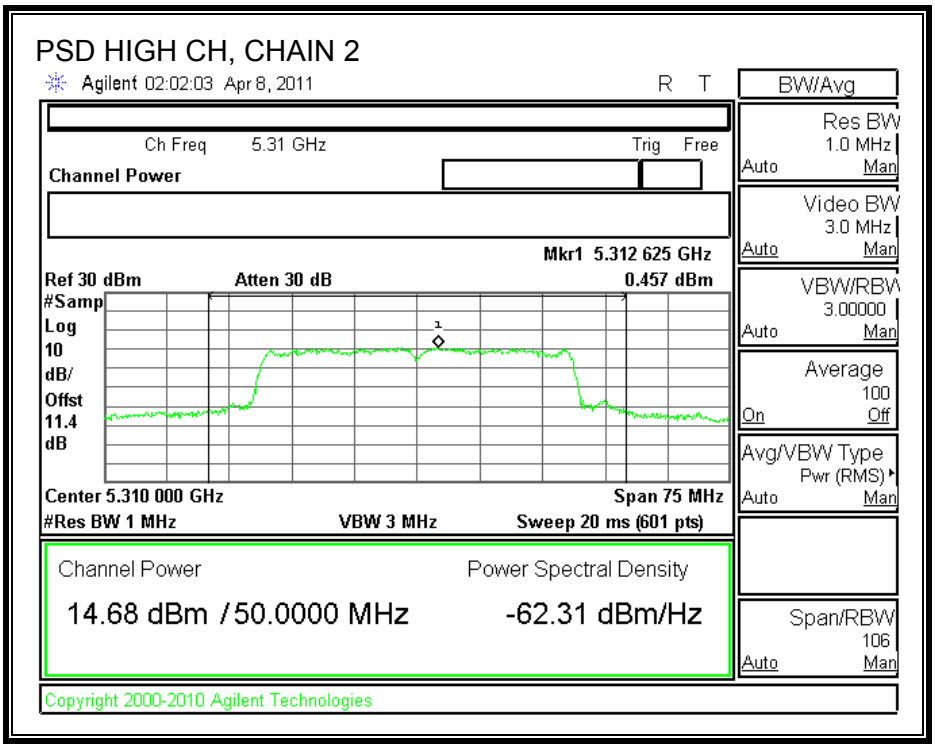
CHAIN 1 POWER SPECTRAL DENSITY



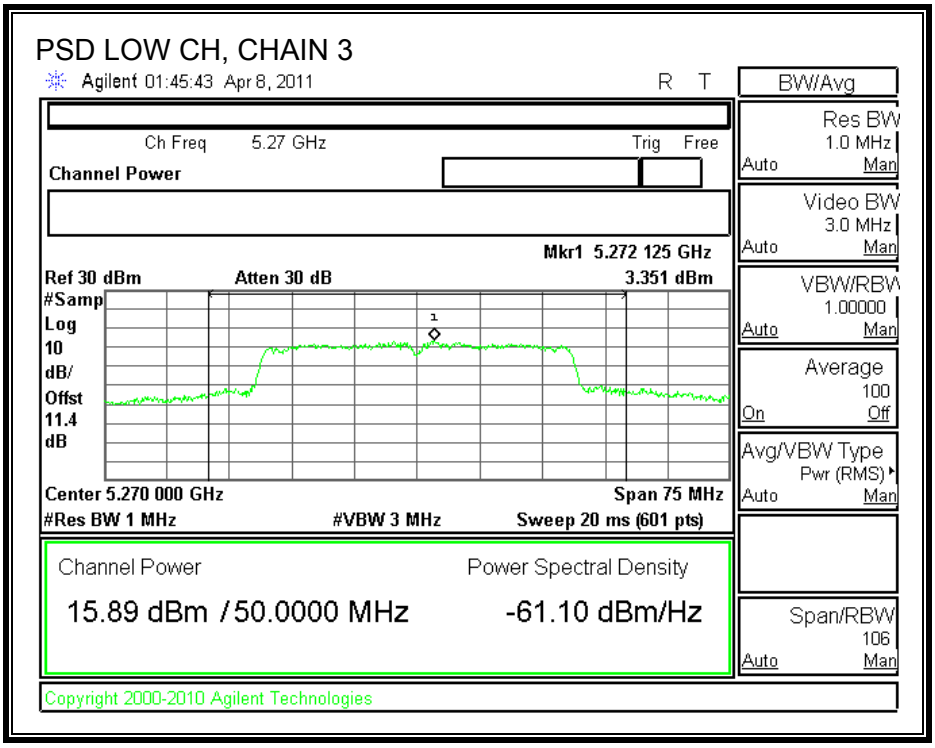


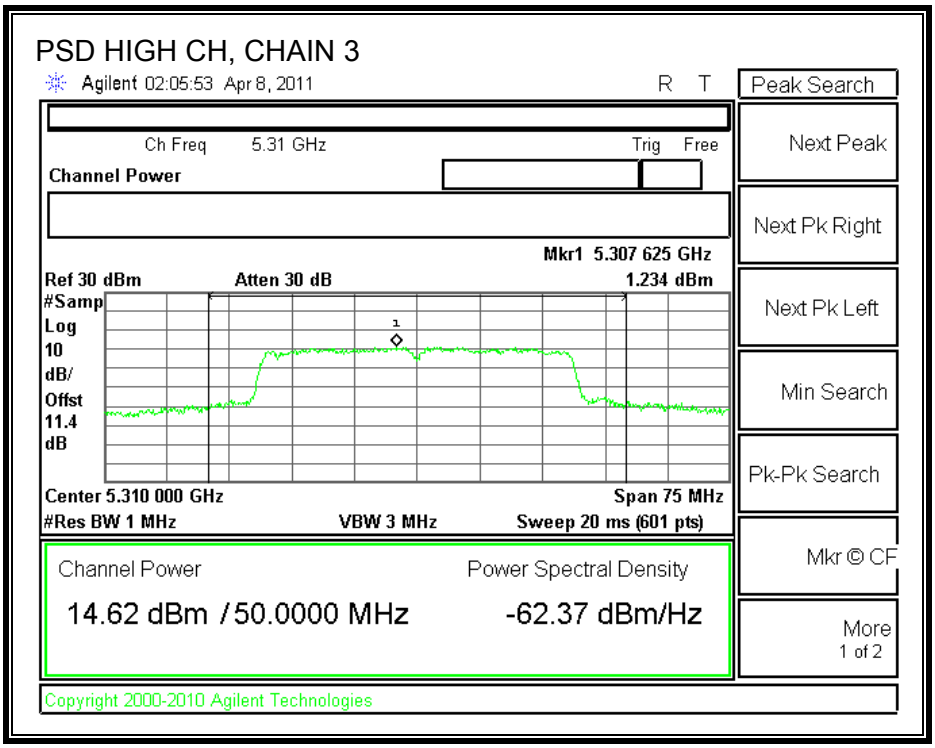
CHAIN 2 POWER SPECTRAL DENSITY





CHAIN 3 POWER SPECTRAL DENSITY





7.12.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

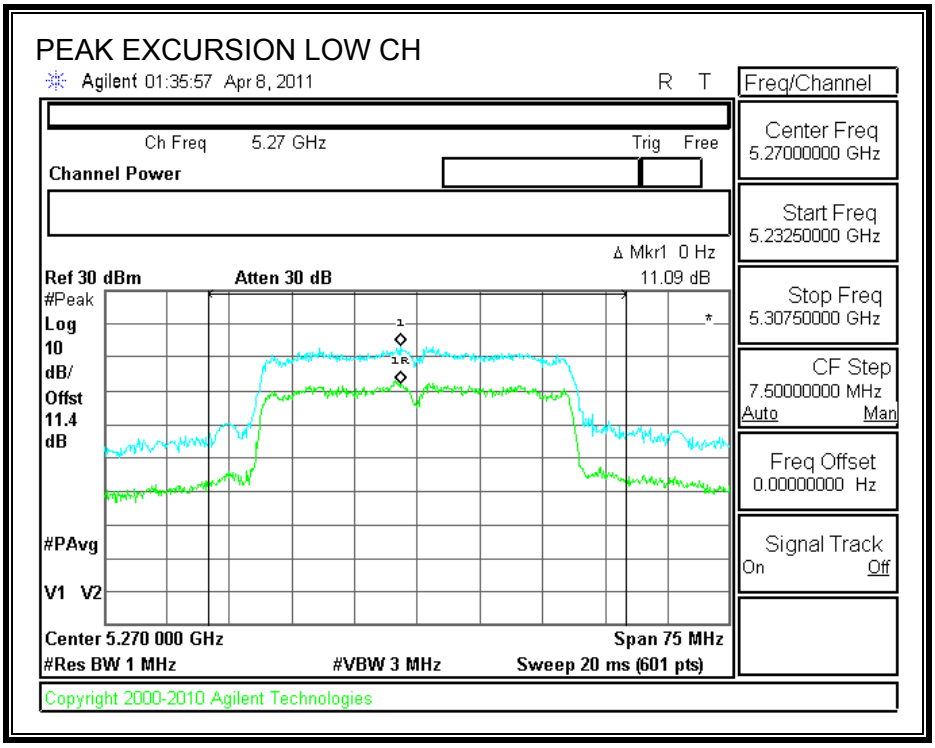
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

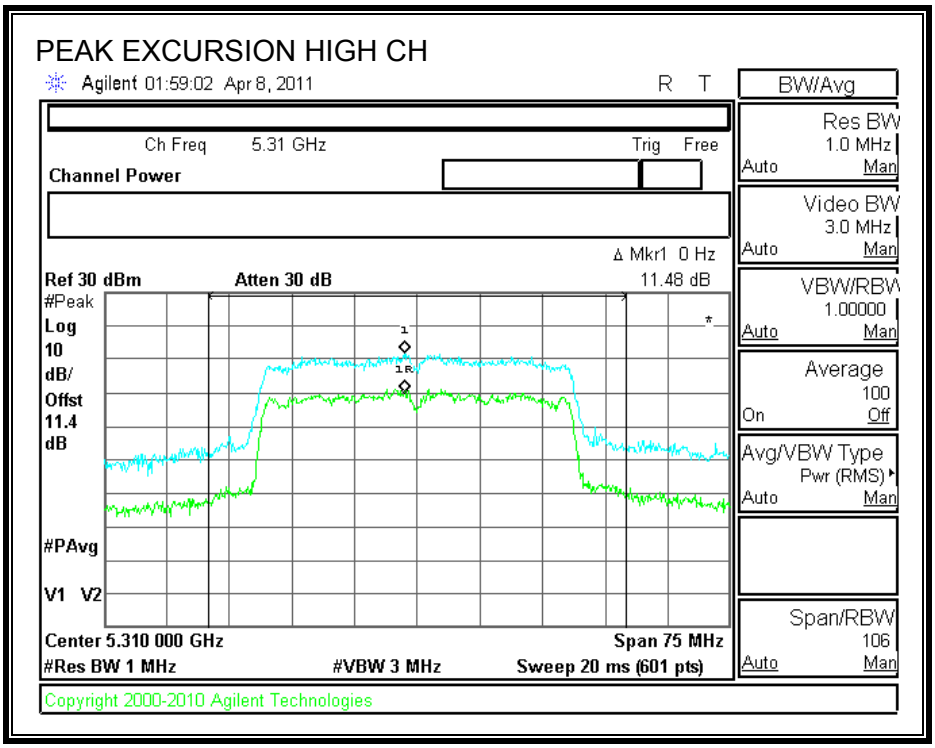
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	11.09	13	-1.91
High	5310	11.48	13	-1.52

PEAK EXCURSION





7.12.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0

7.13. 802.11a MODE IN THE 5.6 GHz BAND

LEGACY

7.13.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

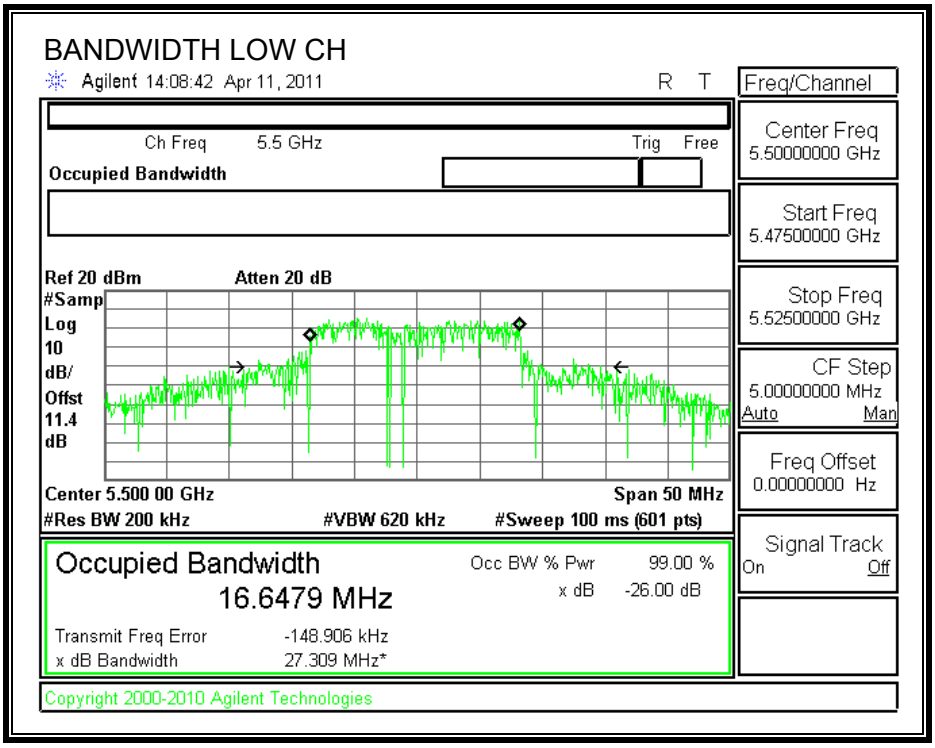
TEST PROCEDURE

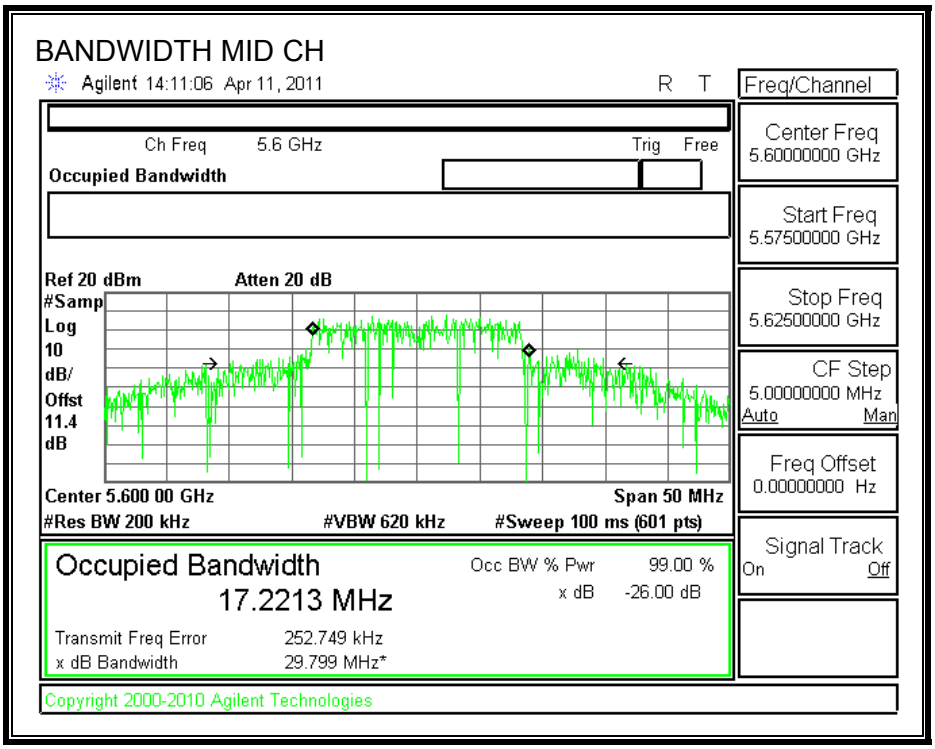
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

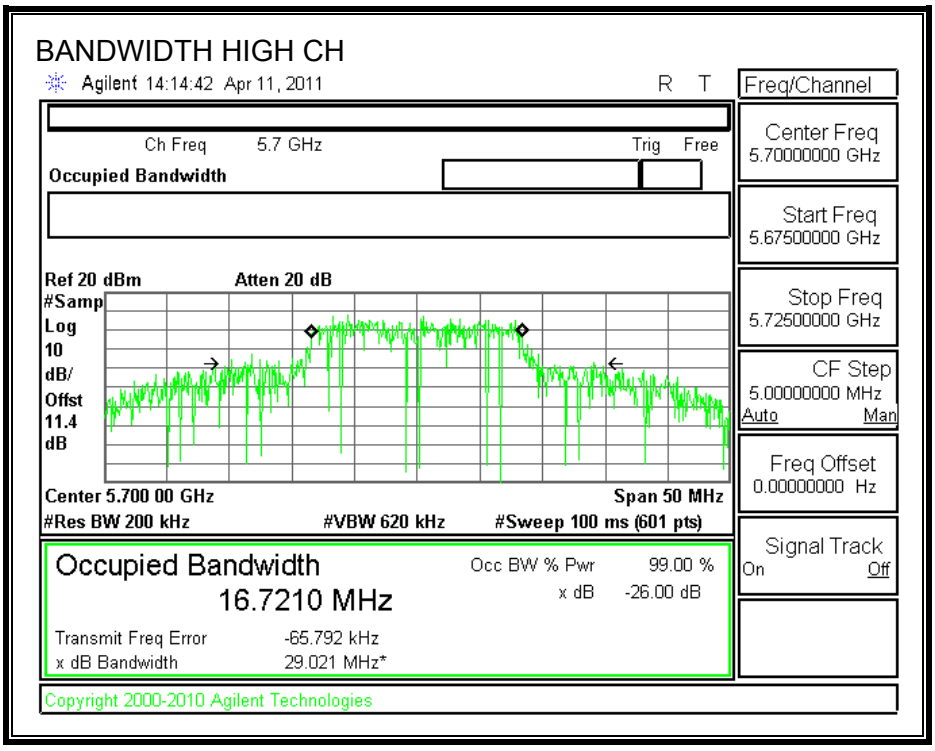
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	27.752	16.6479
Middle	5600	29.030	17.2213
High	5700	27.088	16.721

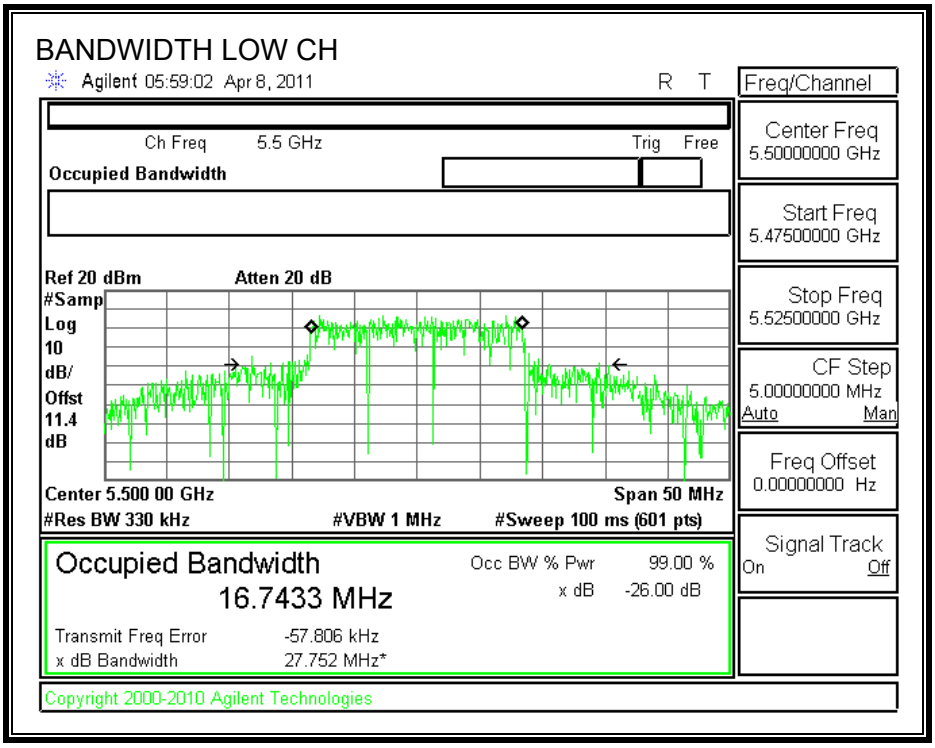
99% BANDWIDTH

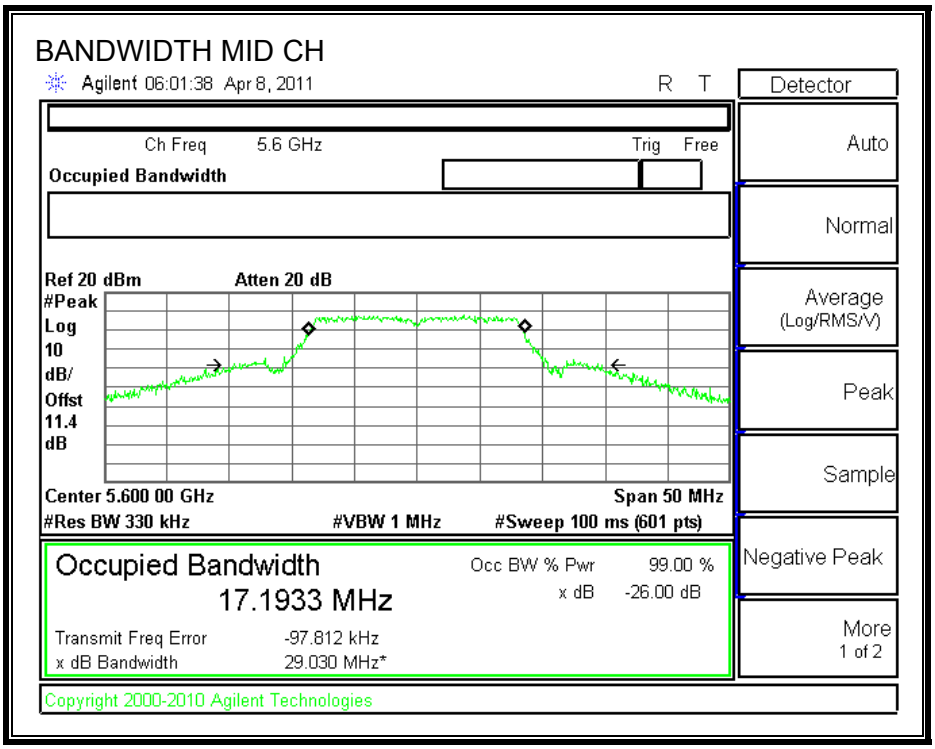


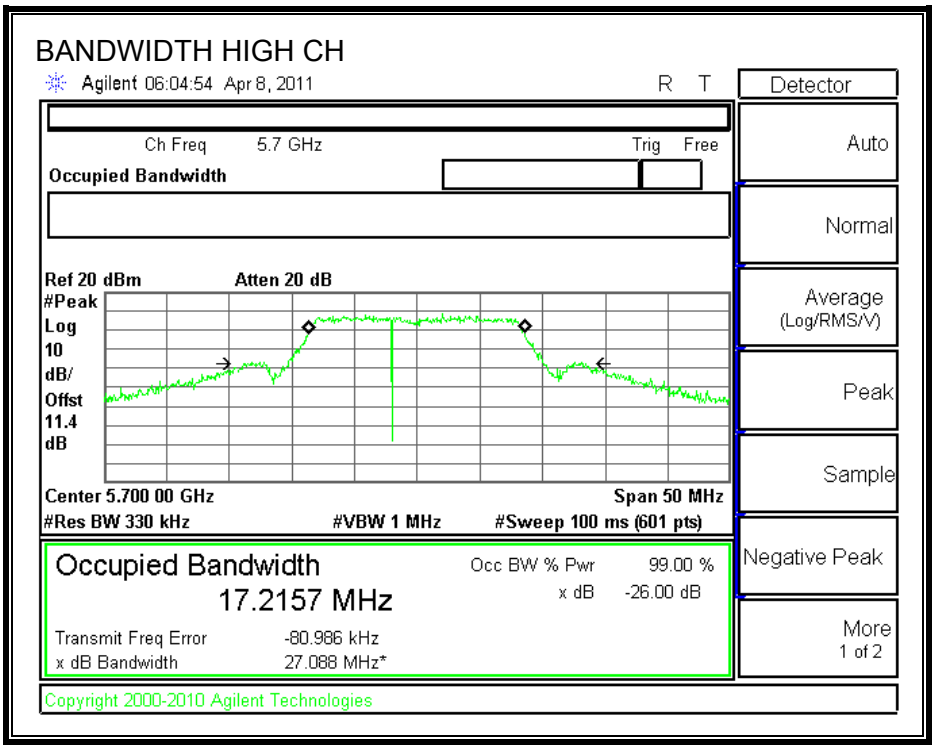




26 dB BANDWIDTH







7.13.2. 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 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

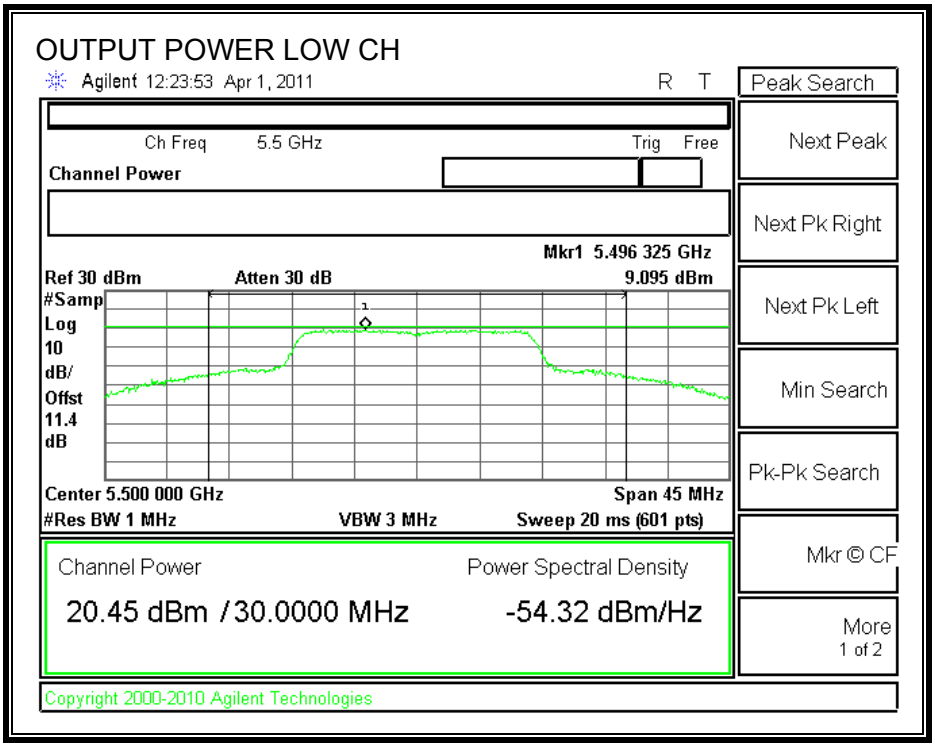
Limit

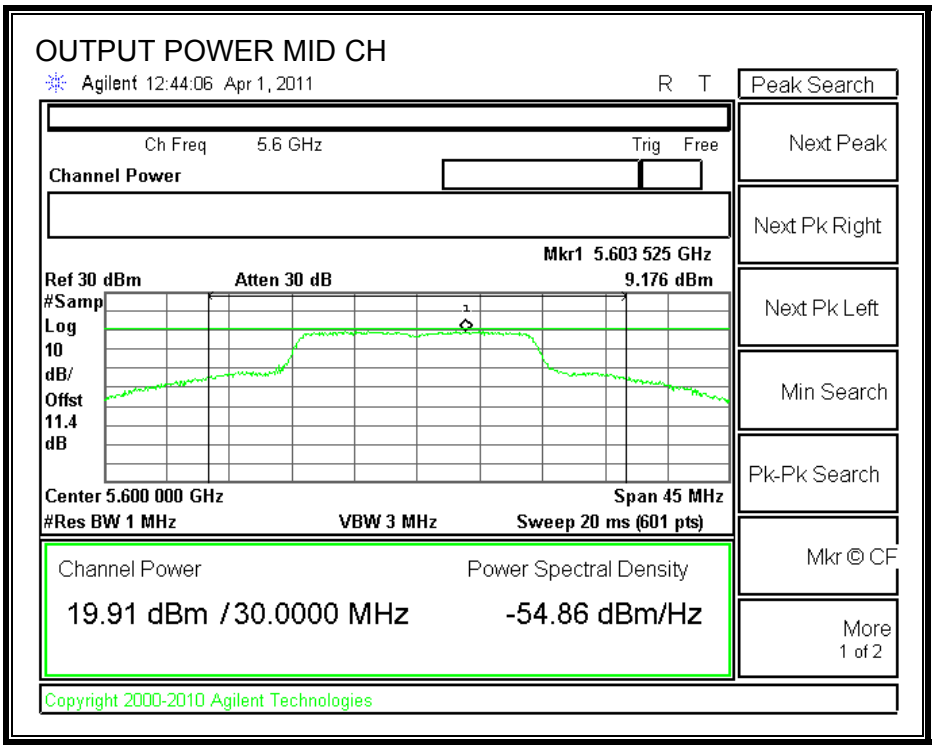
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	27.752	25.43	5.35	24.00
Mid	5600	24	29.030	25.63	5.35	24.00
High	5700	24	27.088	25.33	5.35	24.00

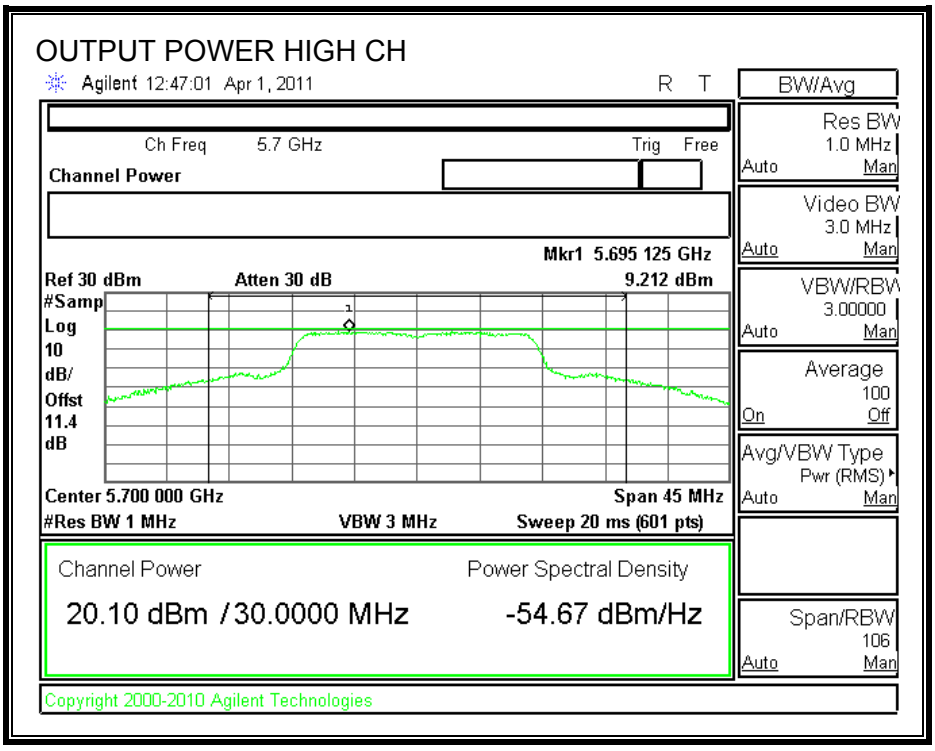
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	20.45	24.00	-3.55
Mid	5600	19.91	24.00	-4.09
High	5700	20.10	24.00	-3.90

OUTPUT POWER







7.13.3. 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

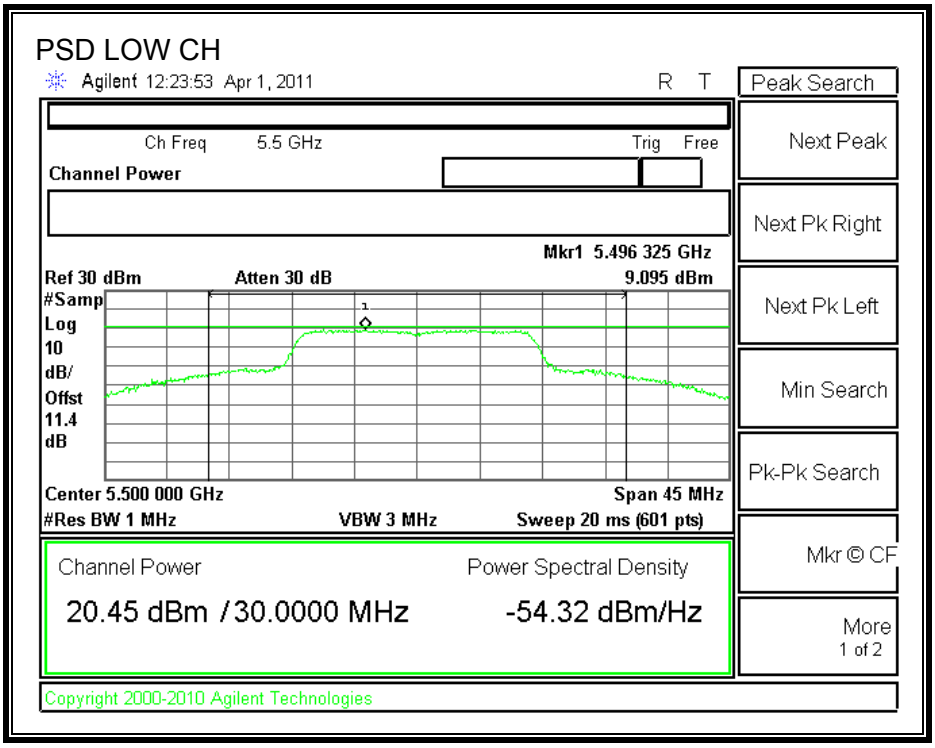
TEST PROCEDURE

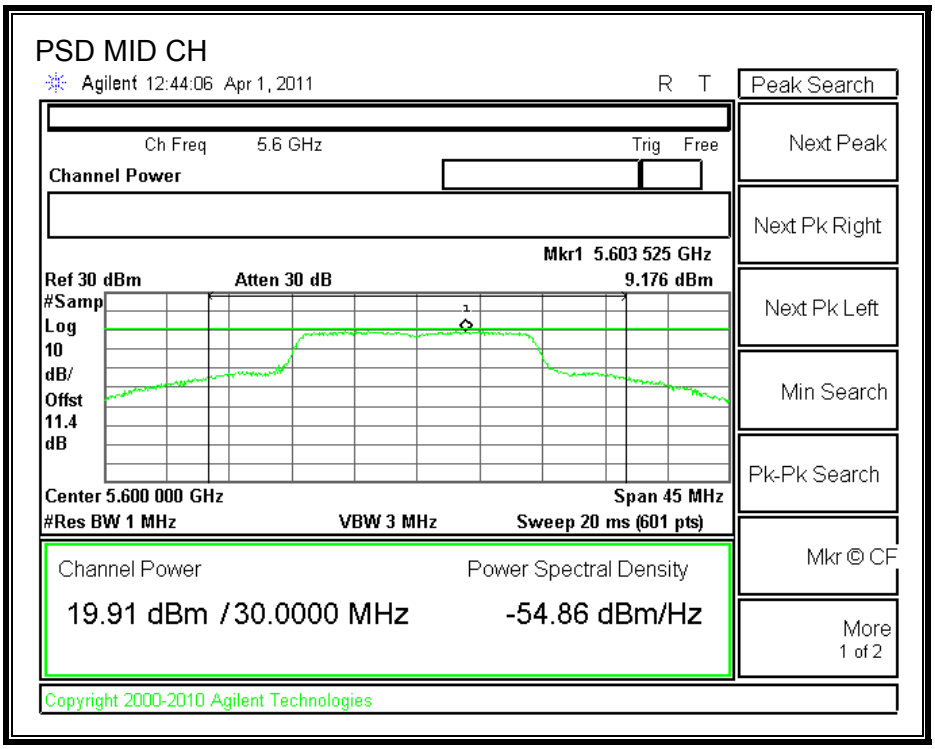
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

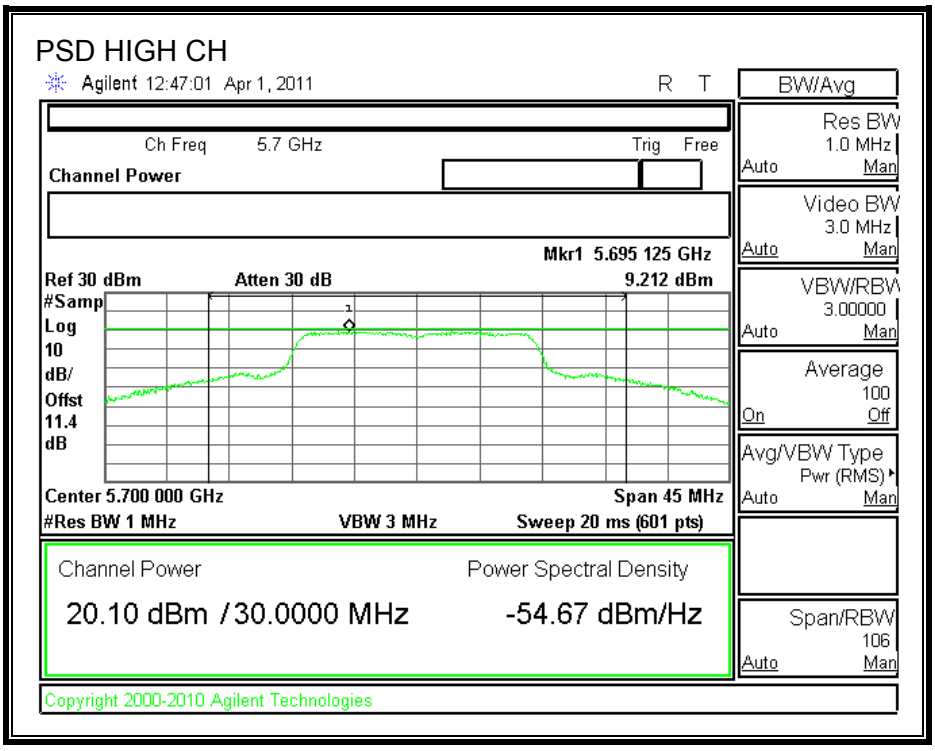
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	9.095	11	-1.91
Middle	5600	9.176	11	-1.82
High	5700	9.212	11	-1.79

POWER SPECTRAL DENSITY







7.13.4. 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

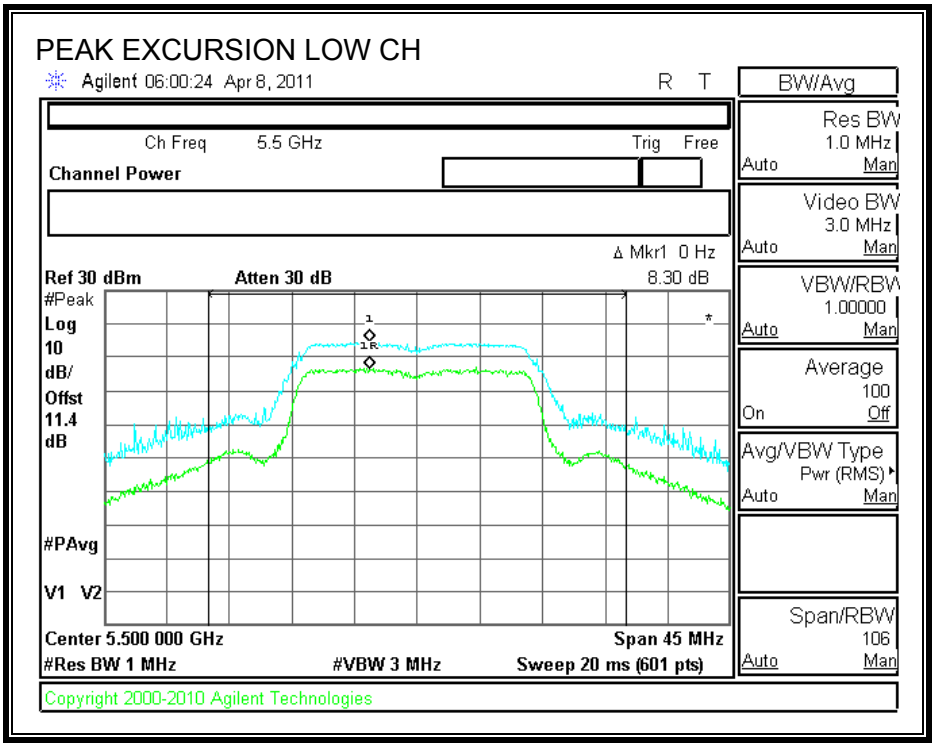
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

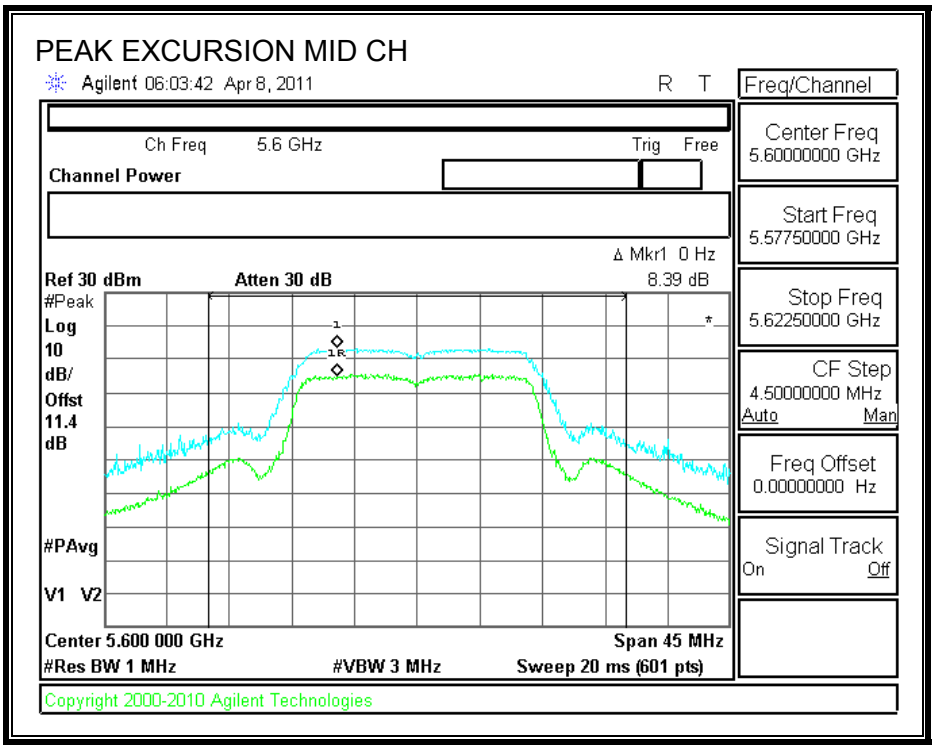
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

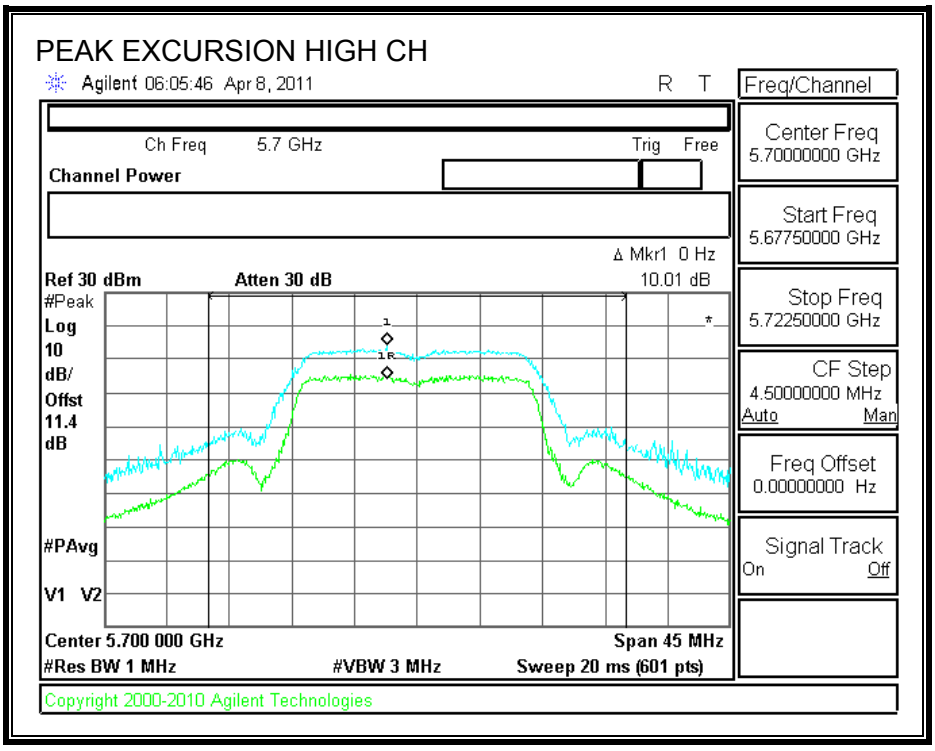
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	8.30	13	-4.70
Middle	5600	8.39	13	-4.61
High	5700	10.01	13	-2.99

PEAK EXCURSION







7.13.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CDD MCS0

7.14. 802.11n DUAL CHAIN HT20 MODE IN THE 5.6 GHz BAND

CDD MCS0

7.14.1. 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 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

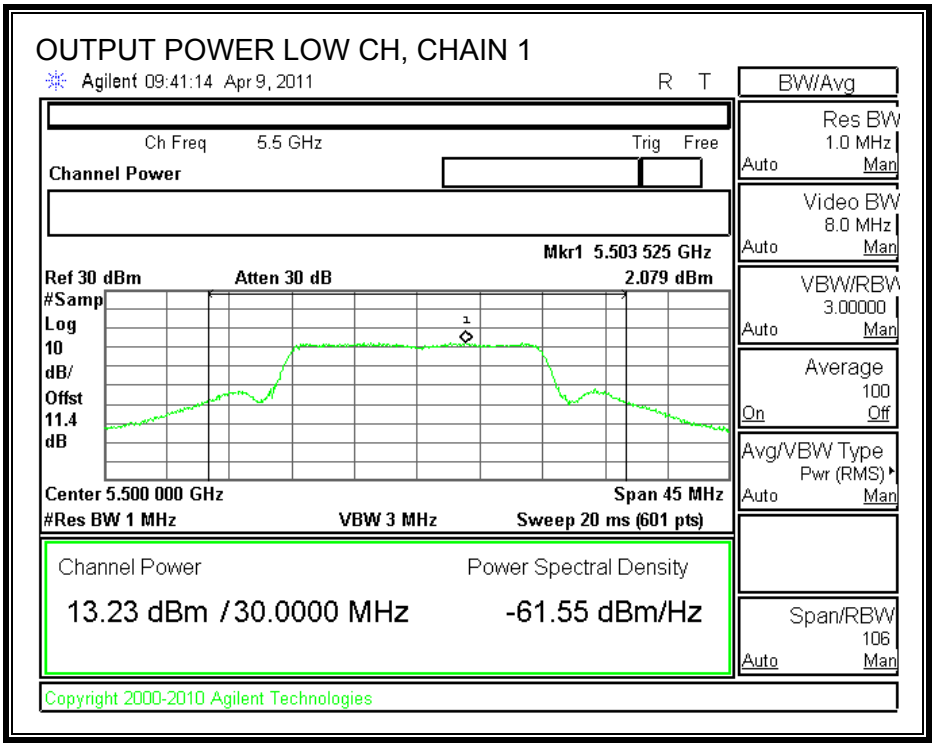
Limit

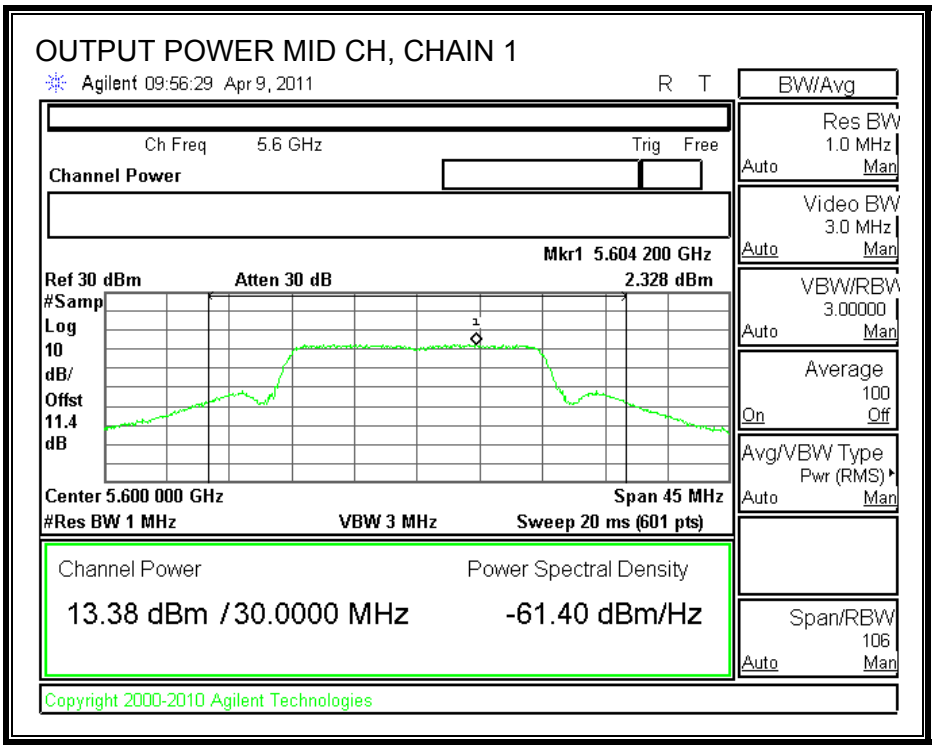
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	28.704	25.58	9.21	20.79
Mid	5300	24	29.019	25.63	9.21	20.79
High	5320	24	27.235	25.35	9.21	20.79

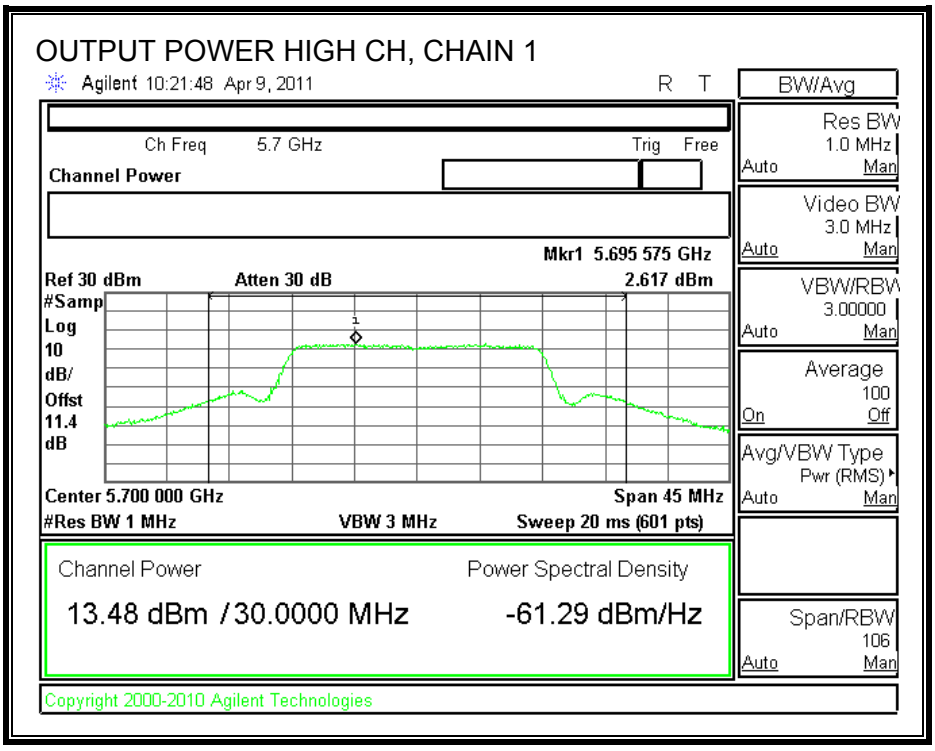
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	13.23	13.82	16.55	20.79	-4.24
Mid	5300	13.38	13.80	16.61	20.79	-4.18
High	5320	13.48	13.86	16.68	20.79	-4.11

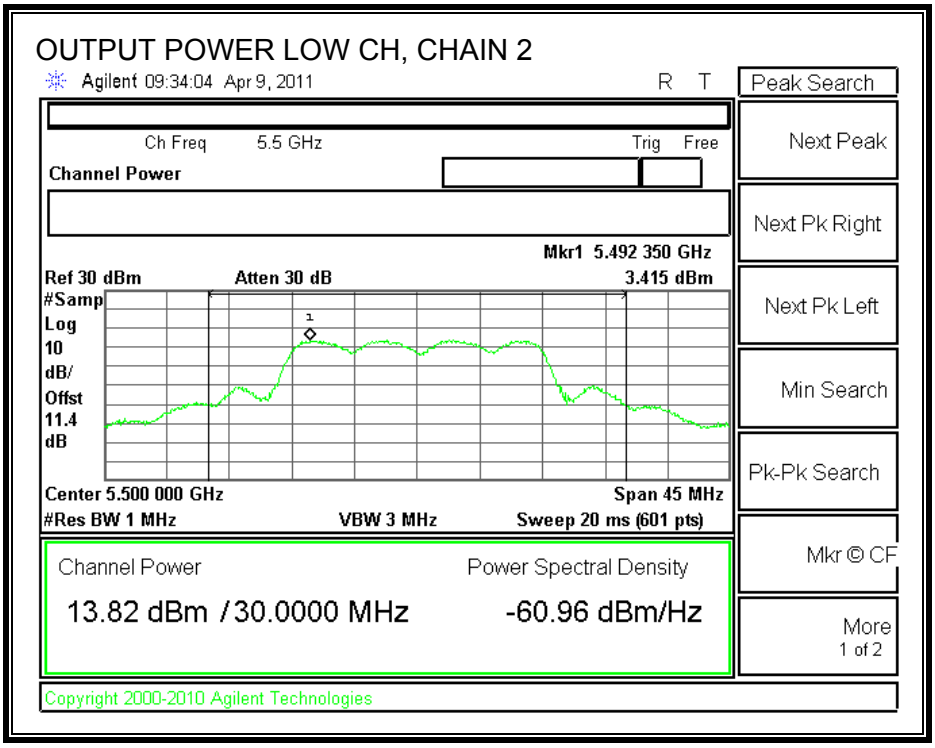
CHAIN 1 OUTPUT POWER

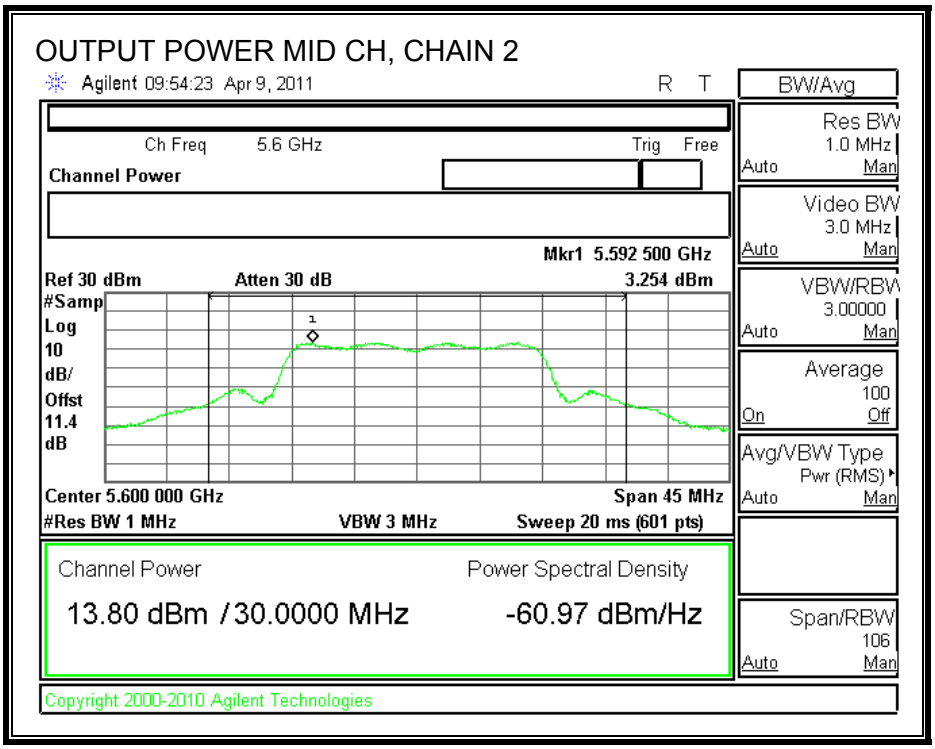


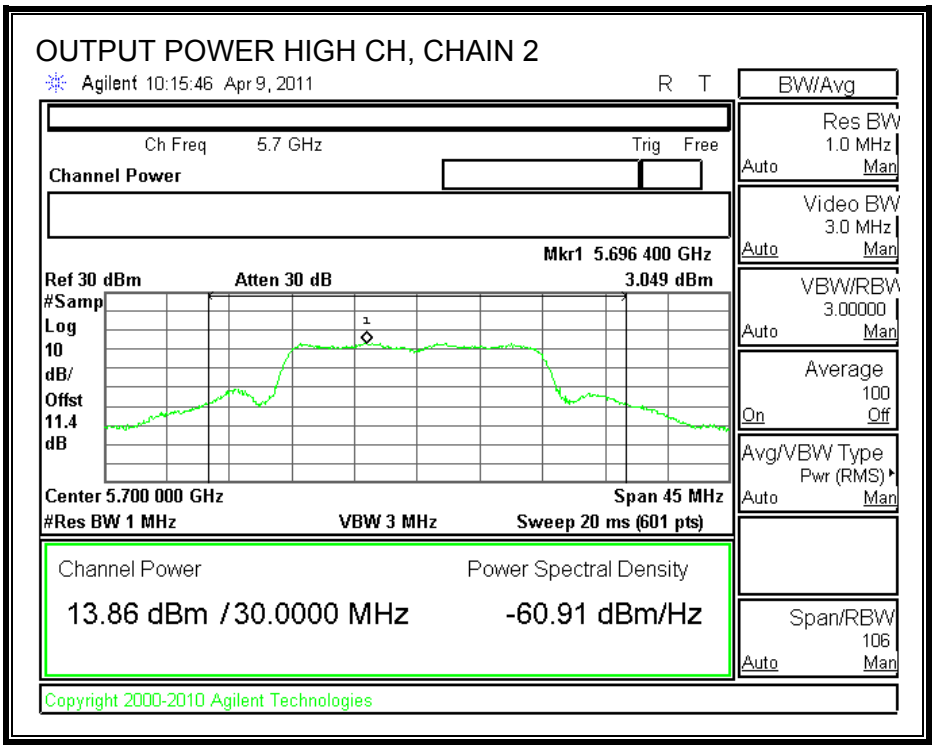




CHAIN 2 OUTPUT POWER







7.15. 802.11n THREE CHAINS HT20 MODE IN THE 5.6 GHz BAND

CDD MCS0

7.15.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

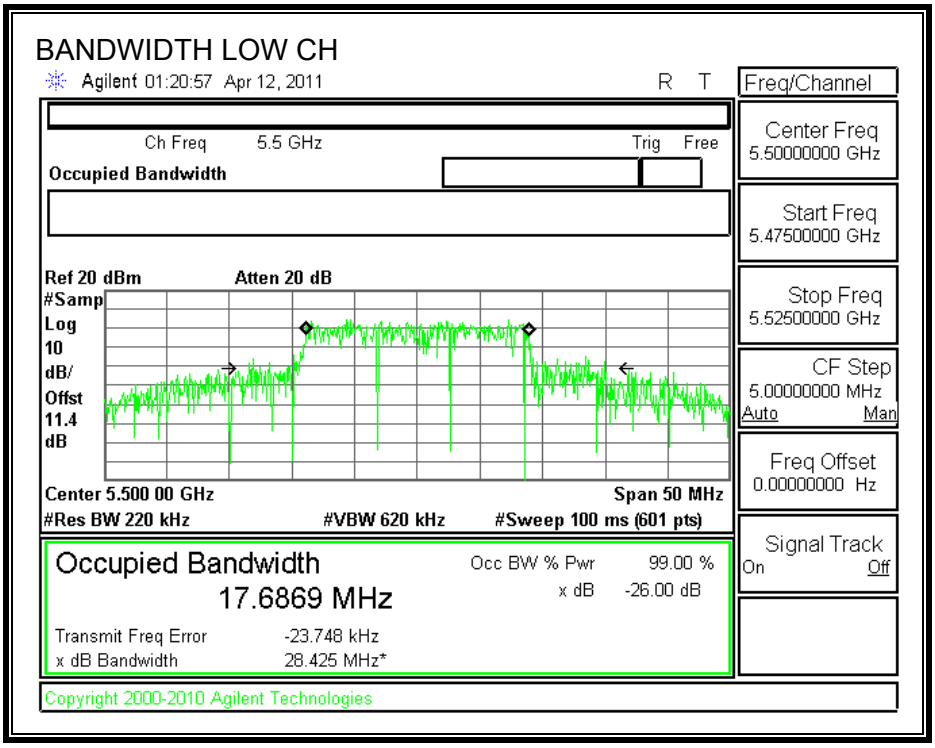
TEST PROCEDURE

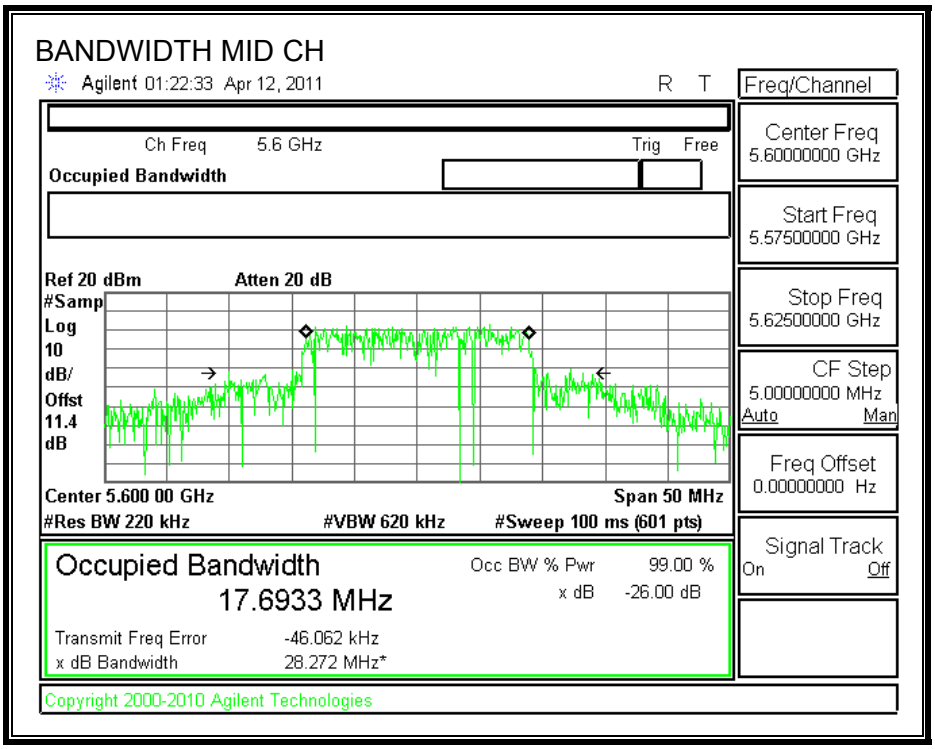
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

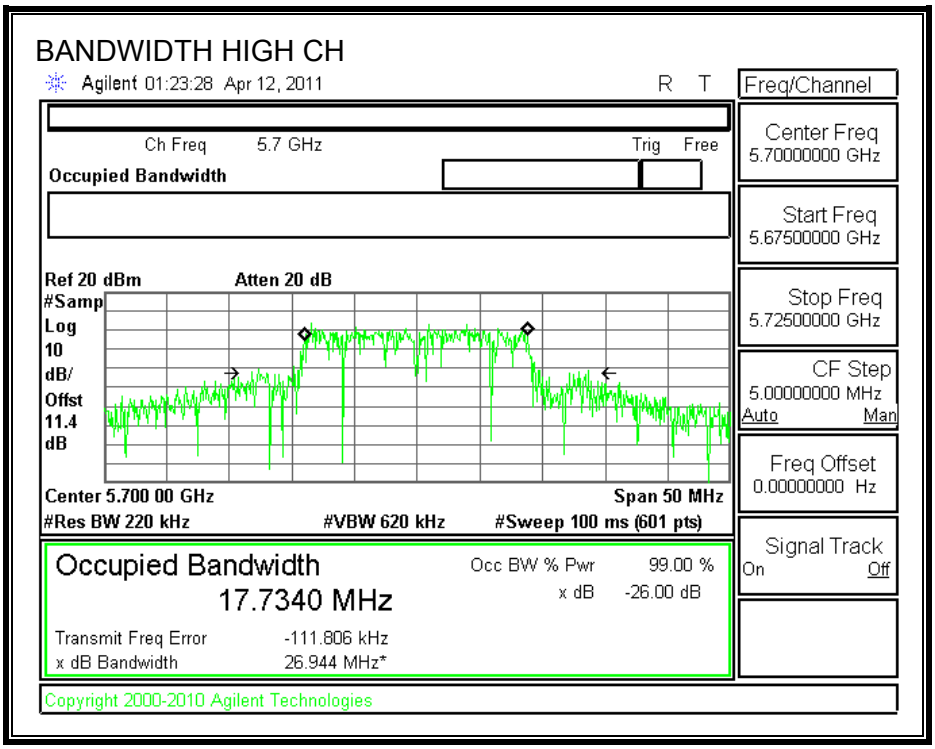
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	28.704	17.6869
Middle	5600	29.019	17.6933
High	5700	27.235	17.7340

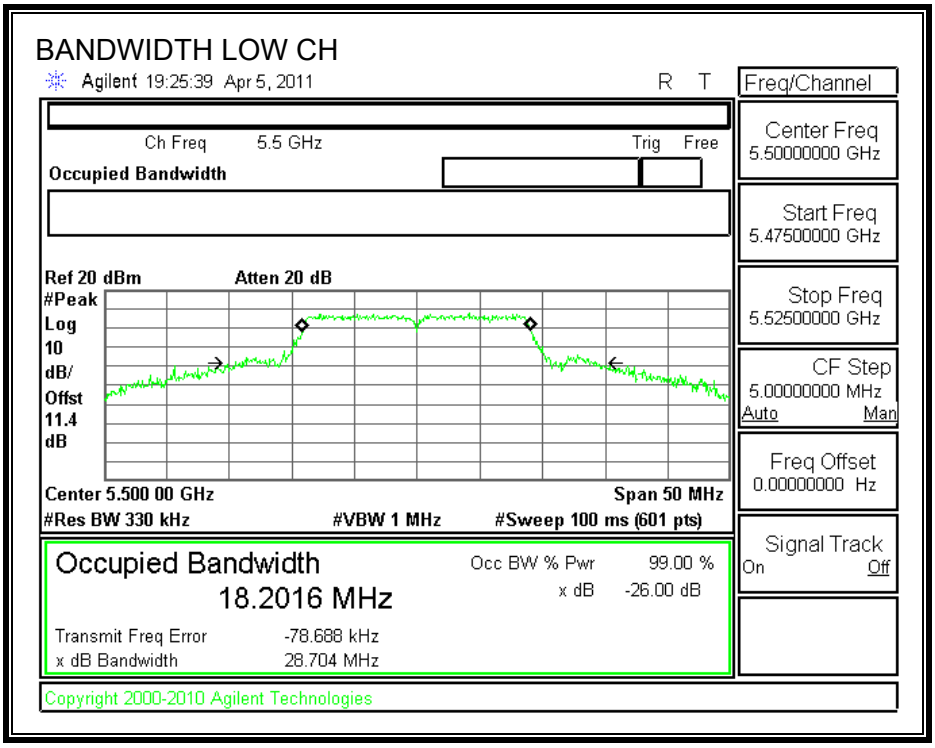
99% BANDWIDTH

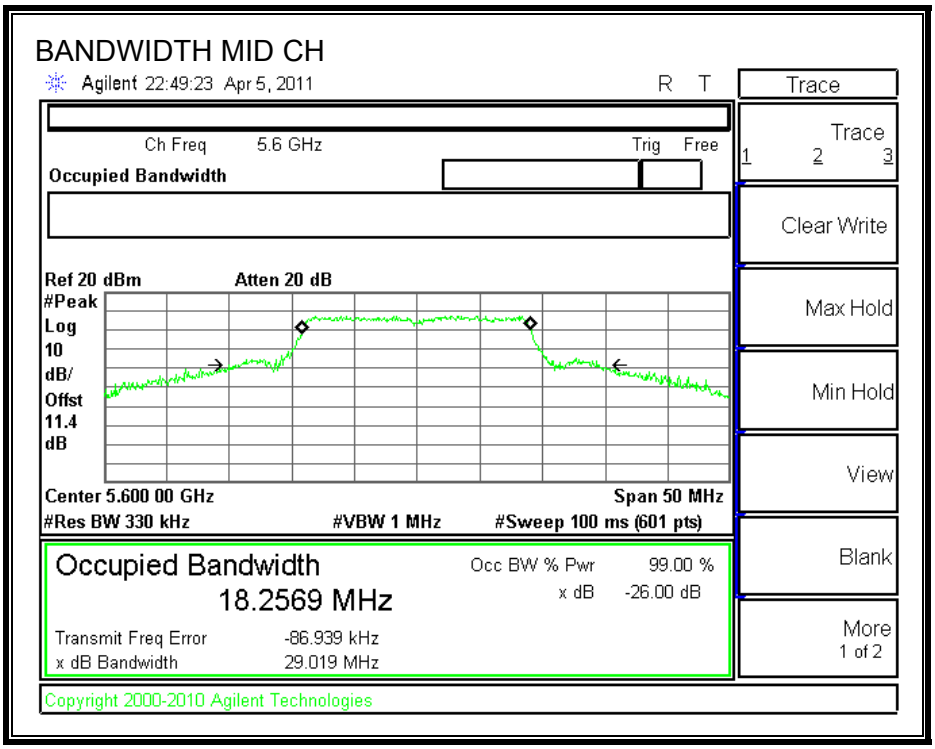


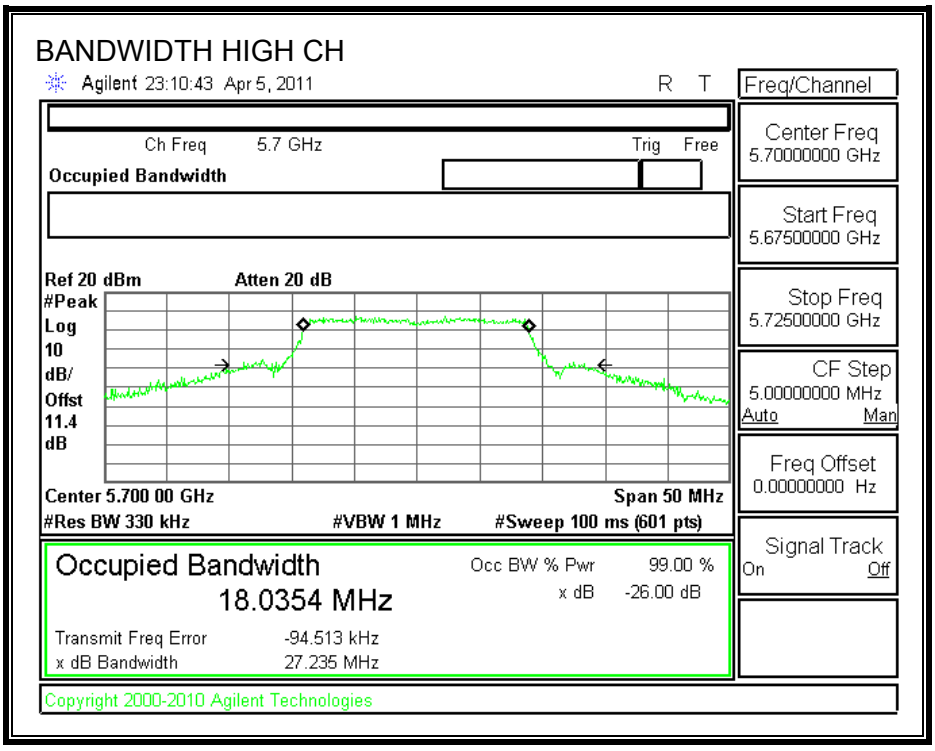




26 dB BANDWIDTH







7.15.2. 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 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	28.704	25.58	9.21	20.79
Mid	5600	24	29.019	25.63	9.21	20.79
High	5700	24	27.235	25.35	9.21	20.79

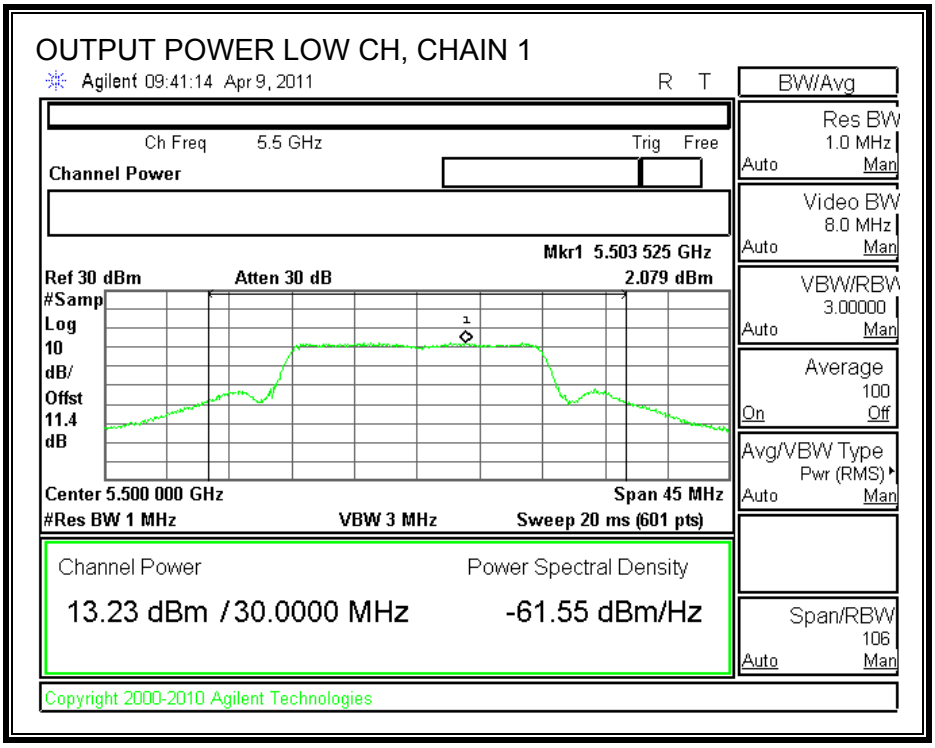
Individual Chain Results

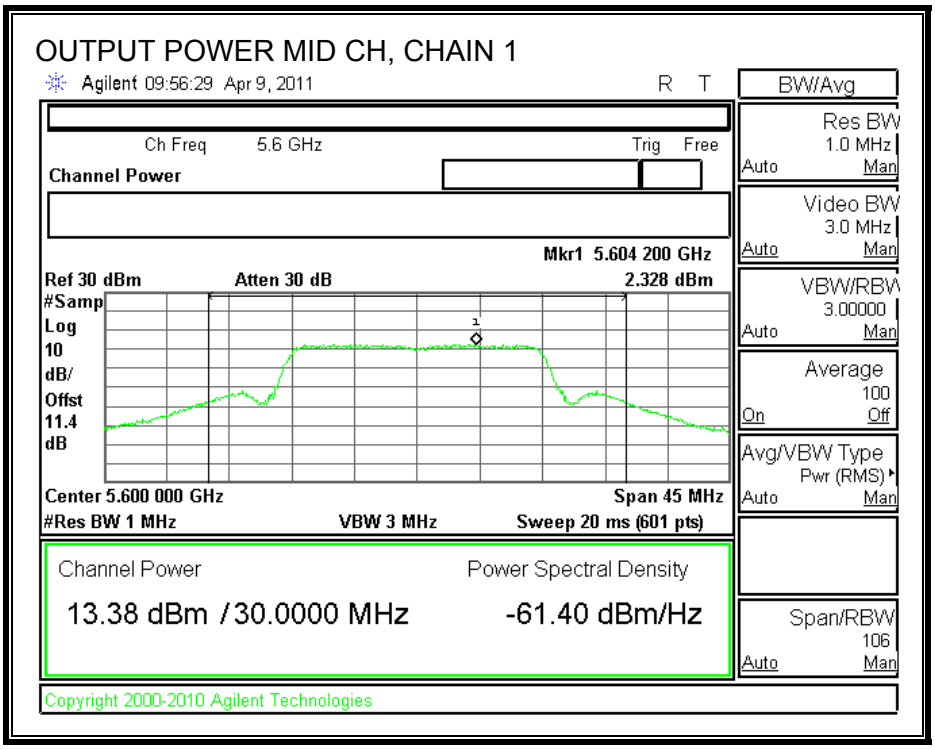
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	13.23	13.82	13.16	18.18	20.79	-2.61
Mid	5600	13.38	13.80	13.35	18.29	20.79	-2.50
High	5700	13.48	13.86	13.46	18.38	20.79	-2.41

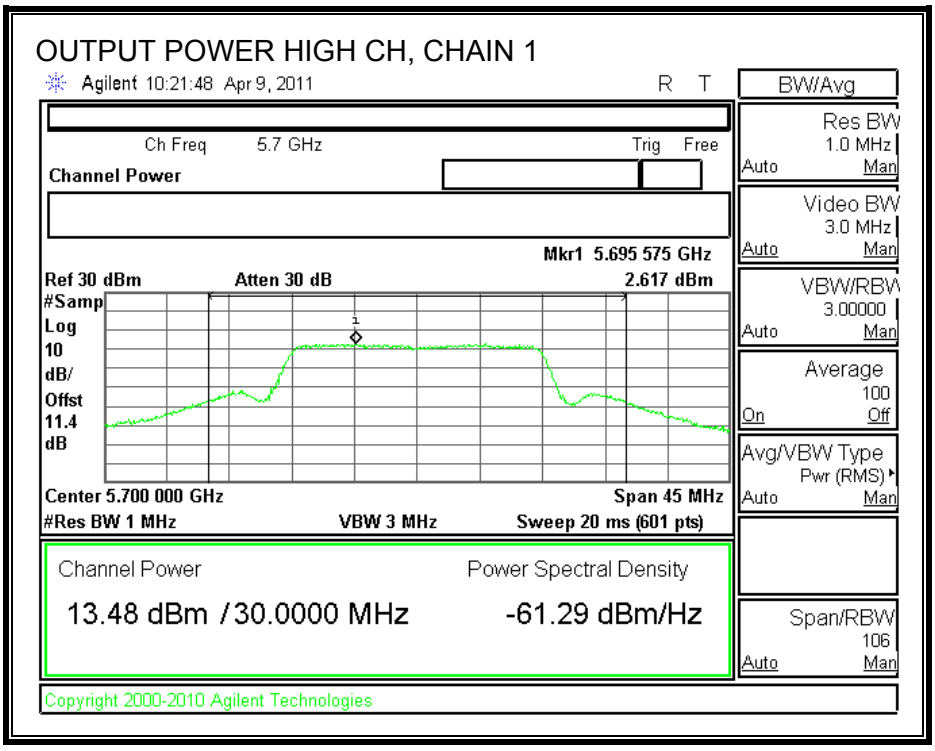
TPC Results

TPC Delta Power		Chain 1	Chain 2	Chain 3			
		3.65	4.06	3.80			
Worst-case TPC Power		Chain 1	Chain 2	Chain 3	Total Power	Ant Gain	EIRP
Low	5700	9.83	9.80	9.66	14.54	9.21	23.75
						TPC Limit (dBm)	24
						Margin (dB)	-0.25

CHAIN 1 OUTPUT POWER







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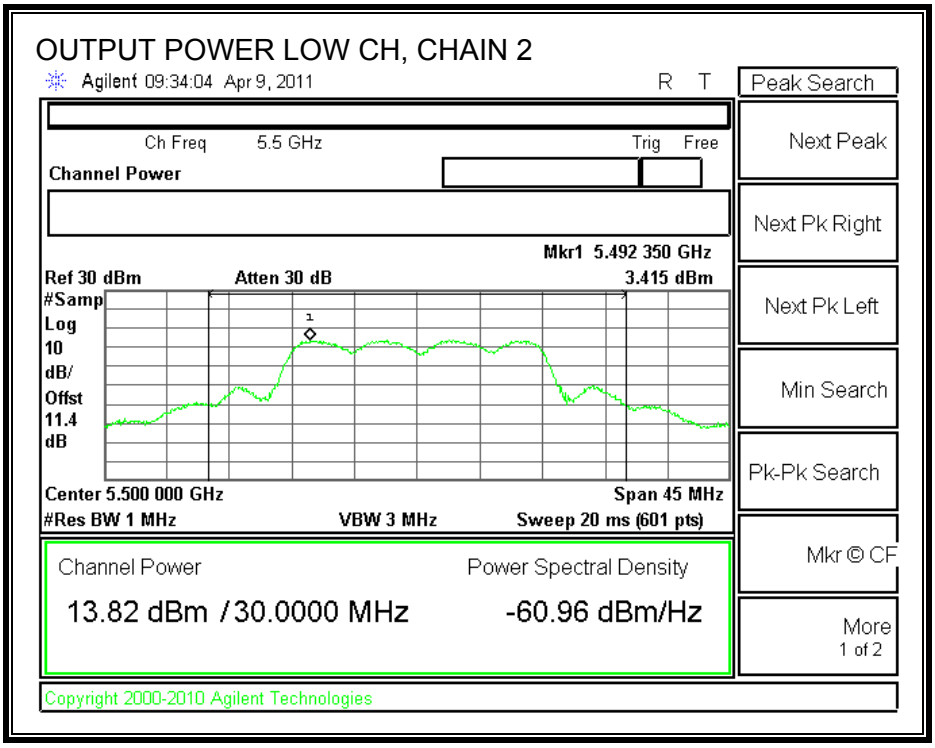

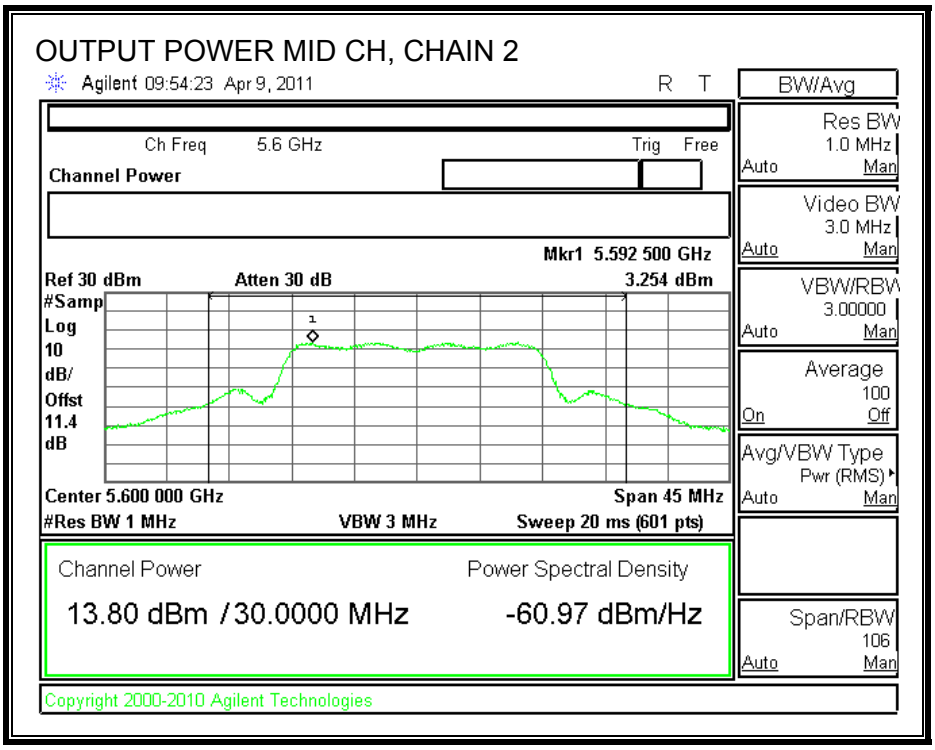

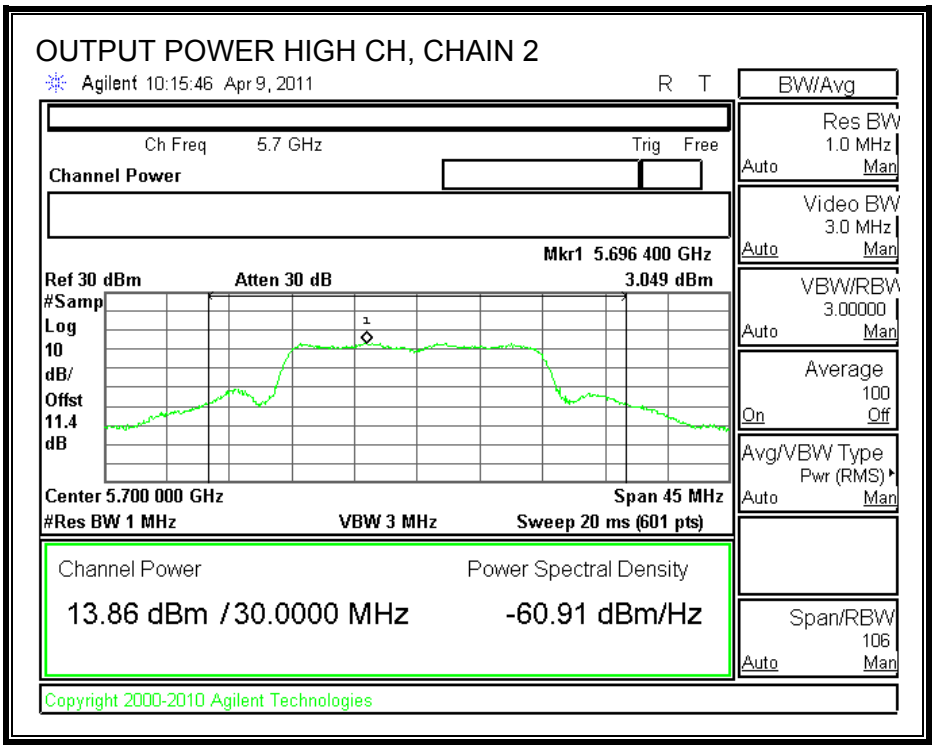

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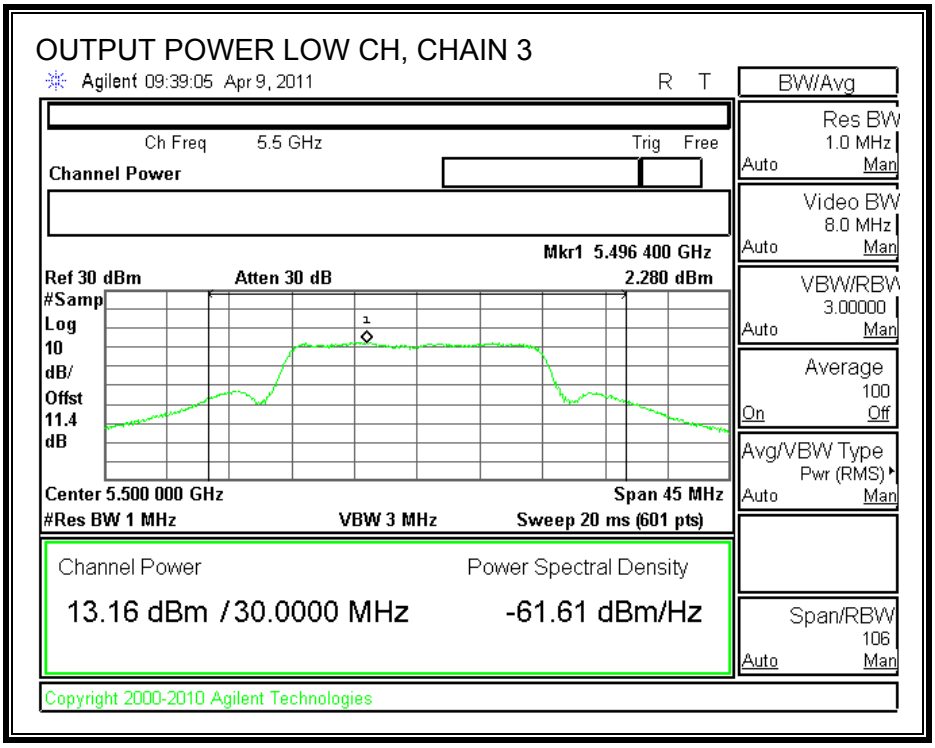
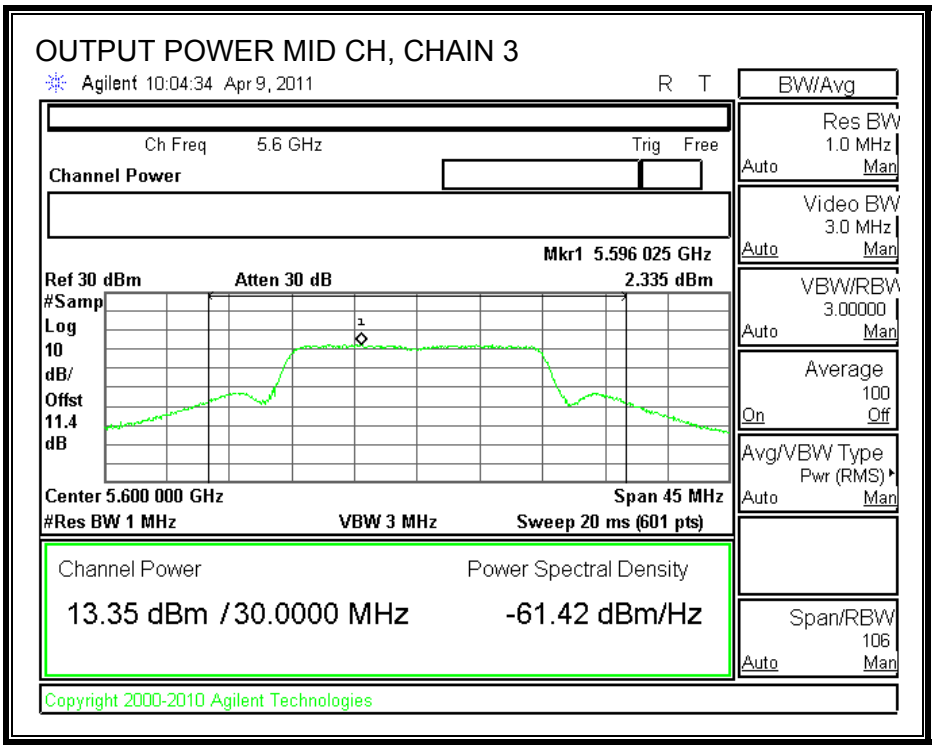
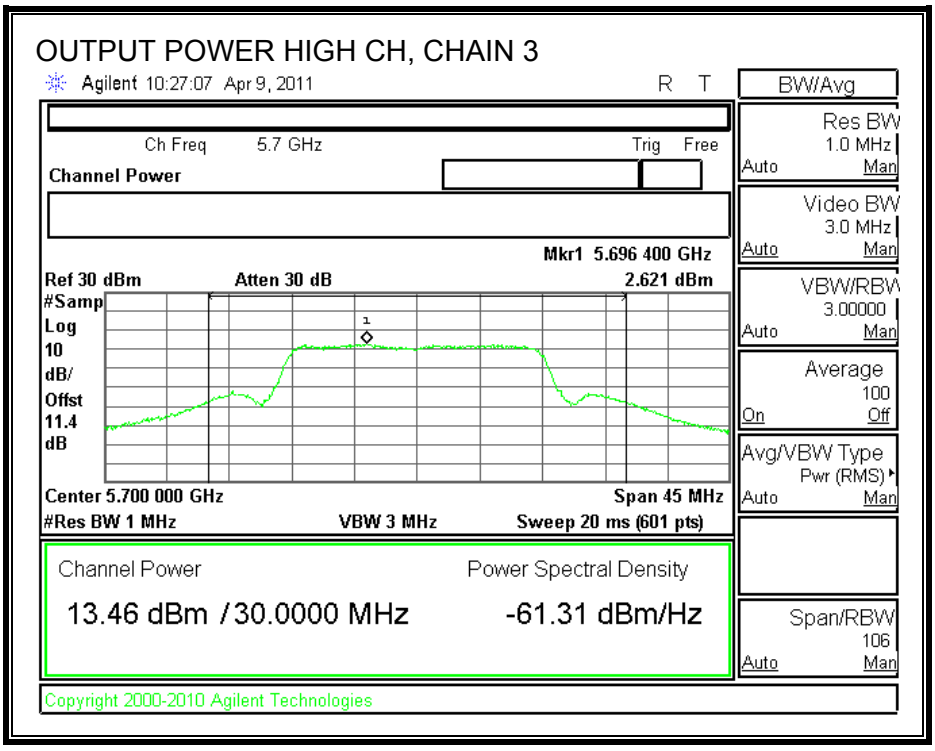
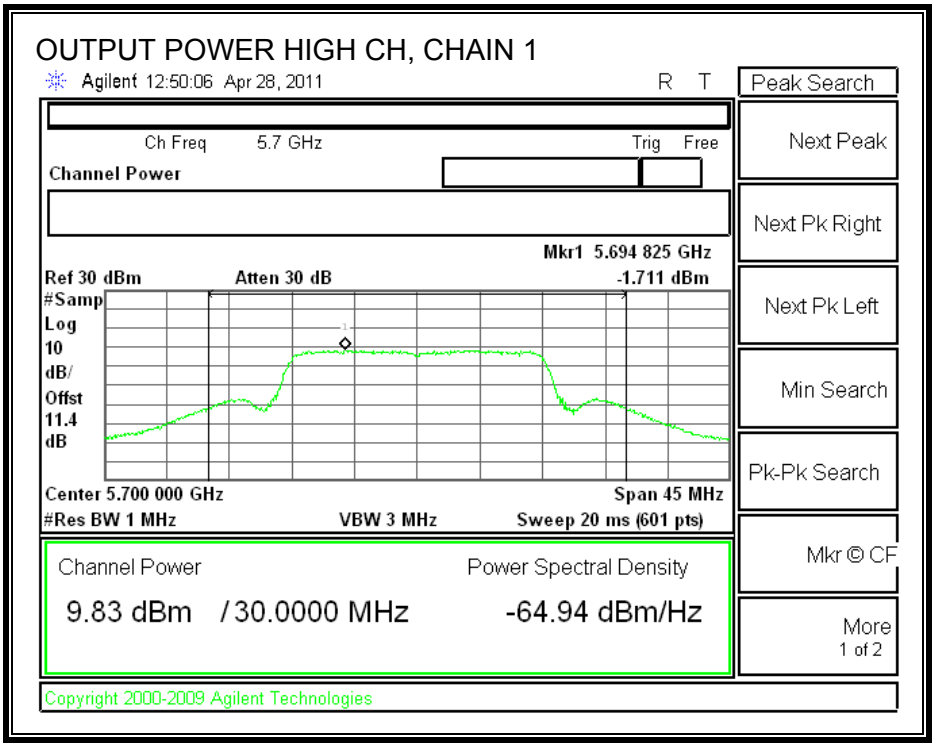
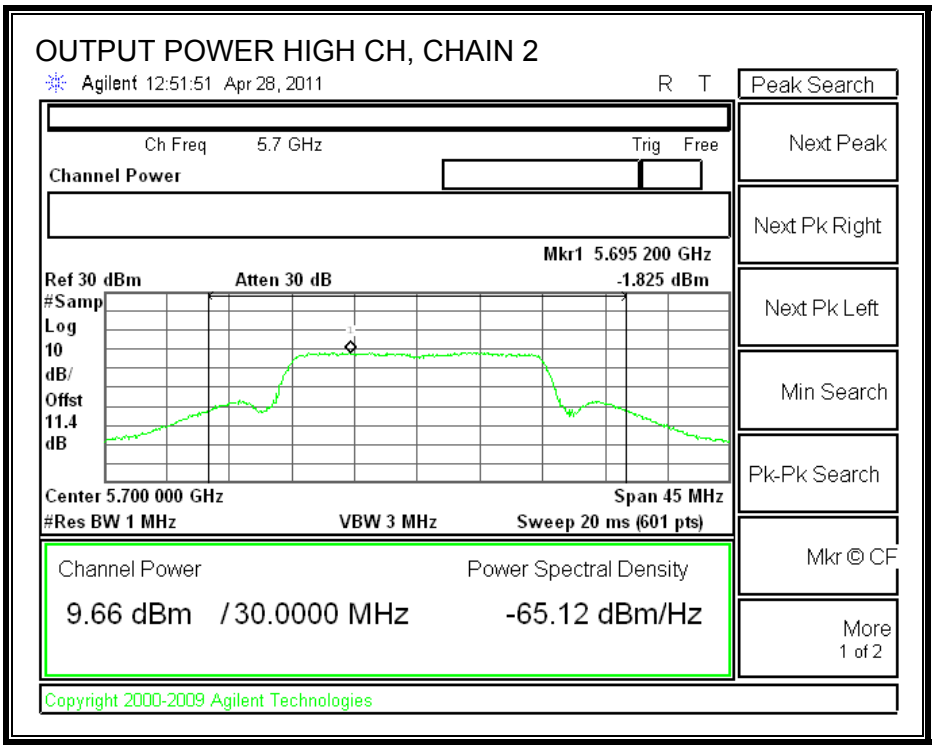


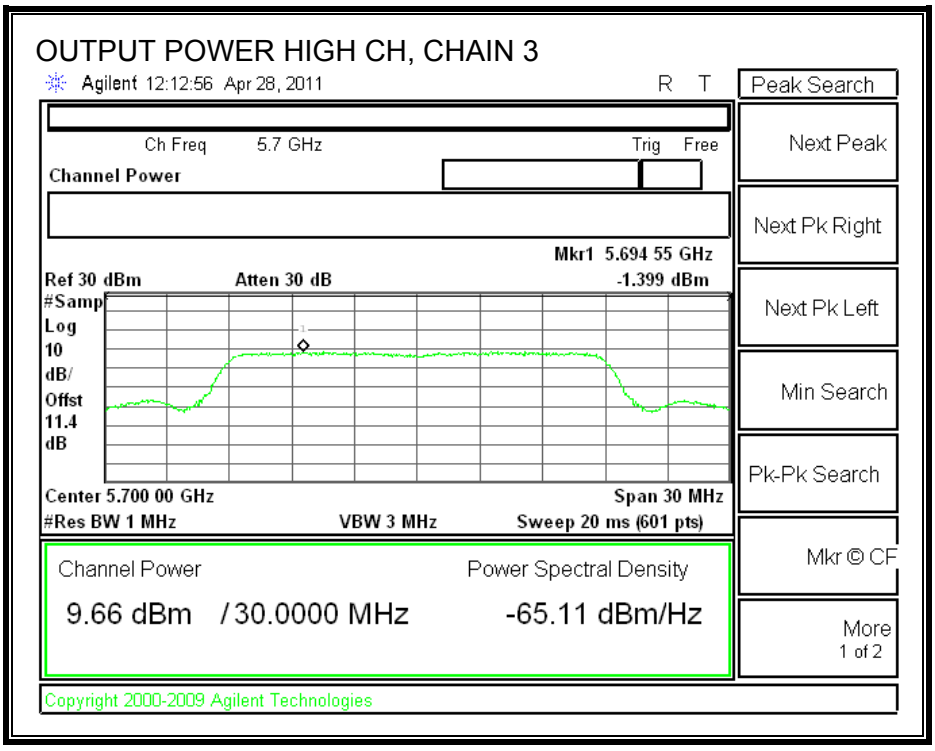




TPC OUTPUT POWER







7.15.3. 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 composite antenna gain is equal to 9.21 dBi, therefore the limit is 7.79 dBm.

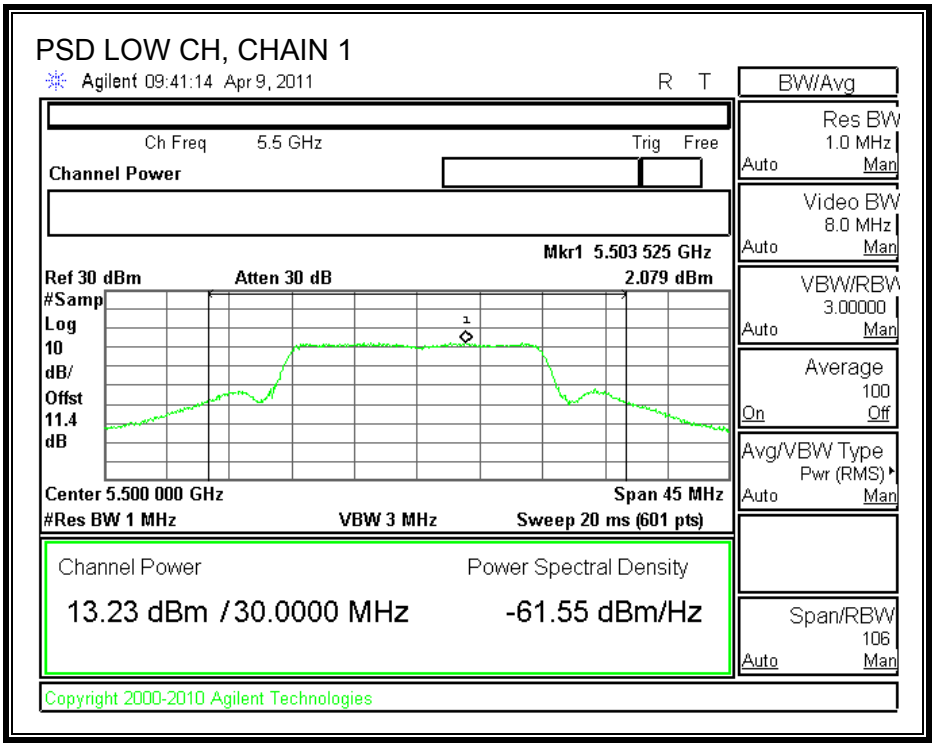
TEST PROCEDURE

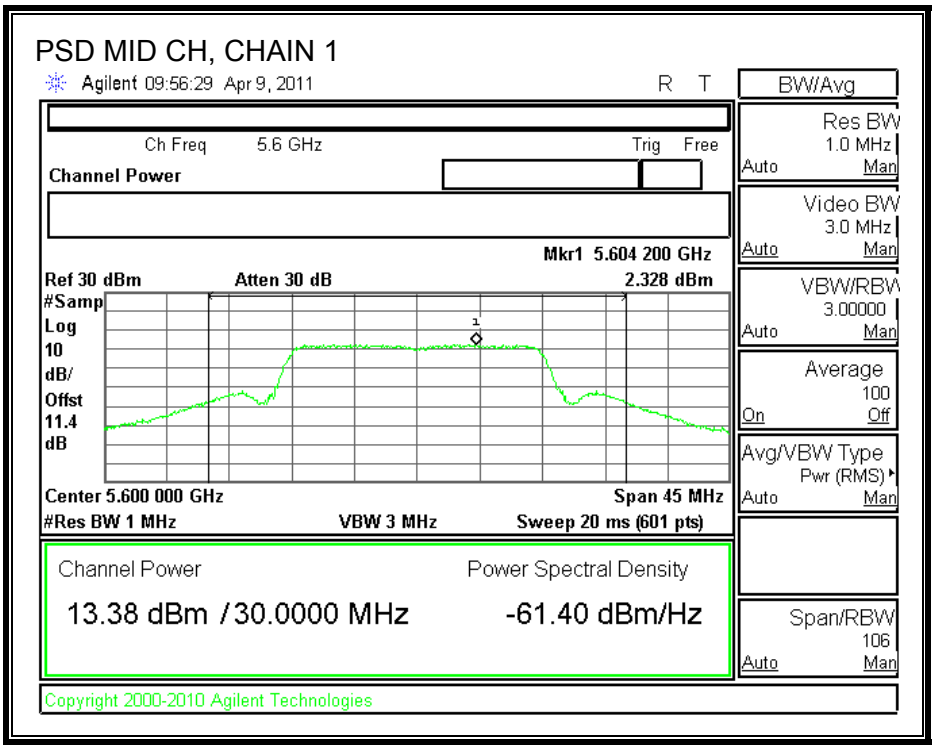
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

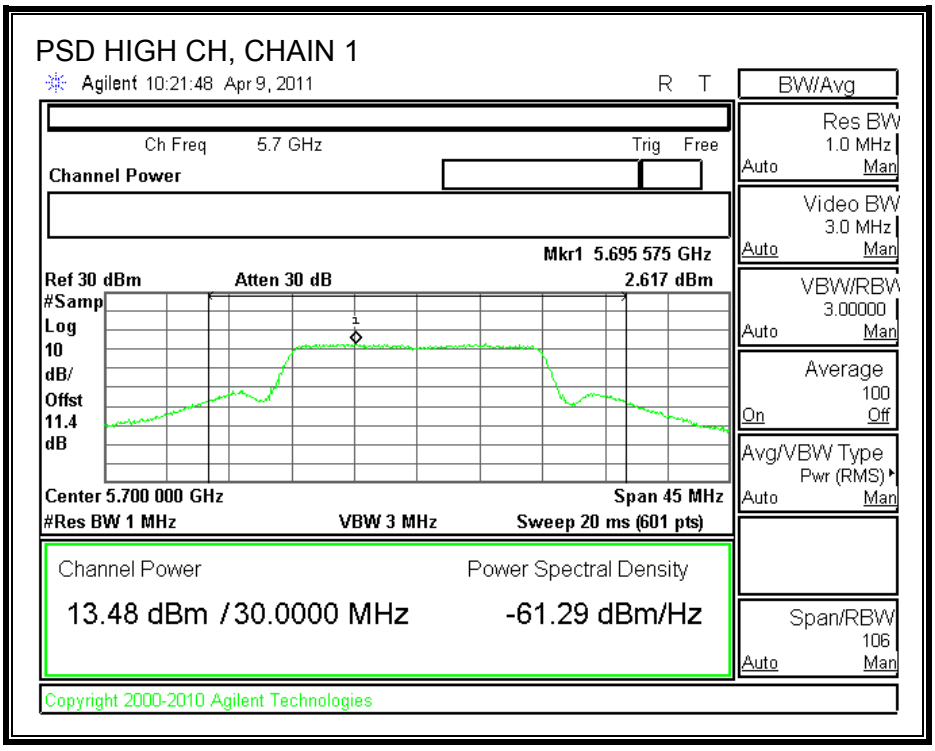
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	2.079	3.415	2.28	7.40	7.79	-0.39
Mid	5600	2.328	3.245	2.335	7.43	7.79	-0.36
High	5700	2.617	3.049	2.621	7.54	7.79	-0.25

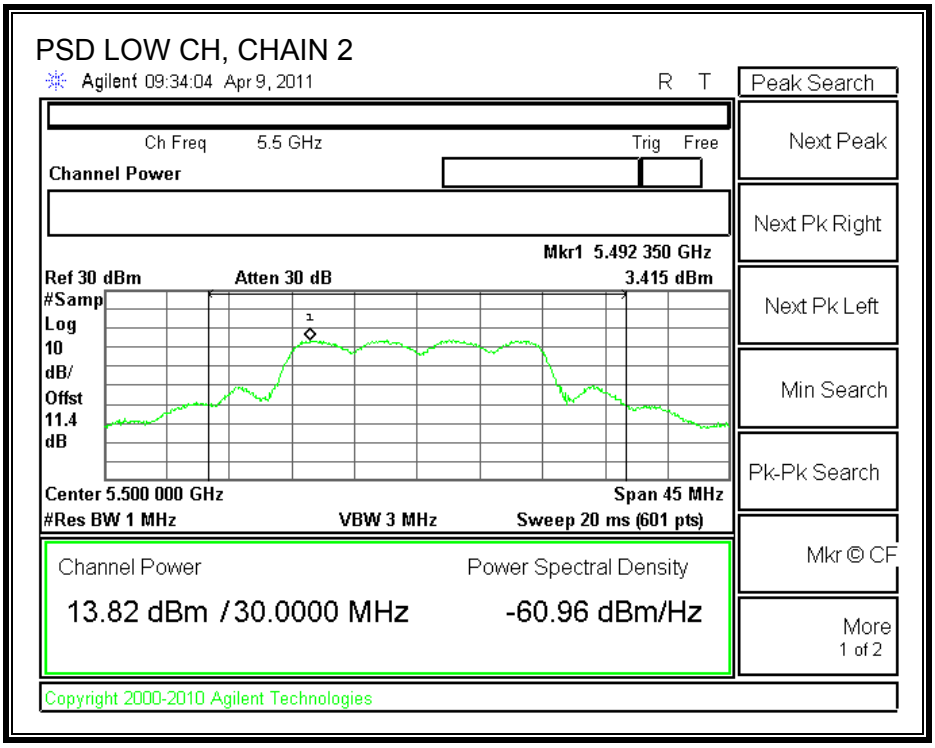
CHAIN 1 POWER SPECTRAL DENSITY

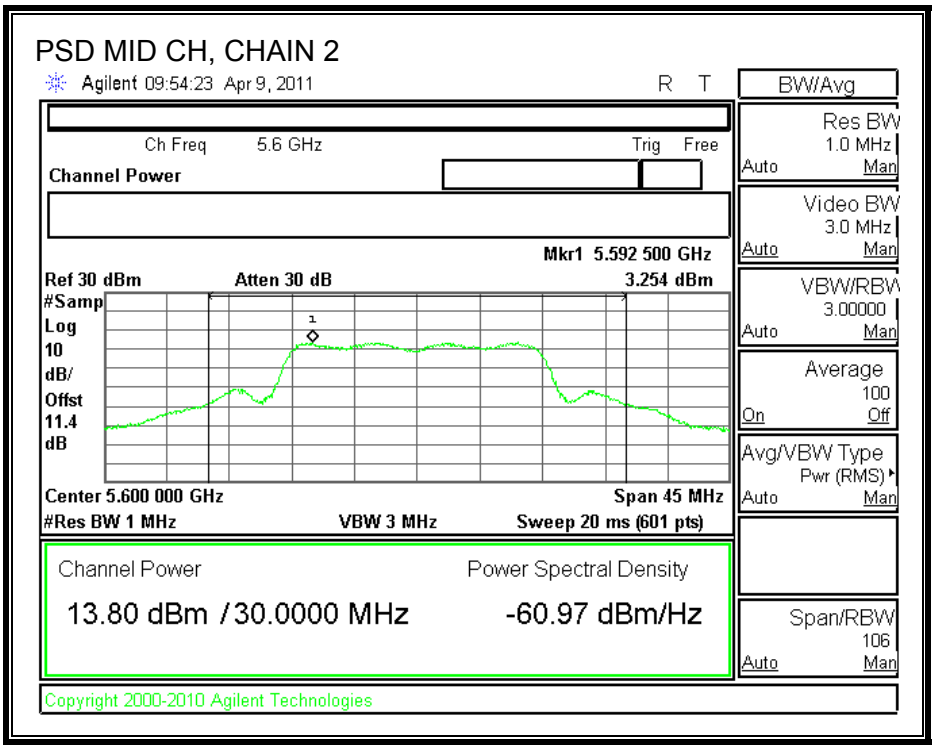


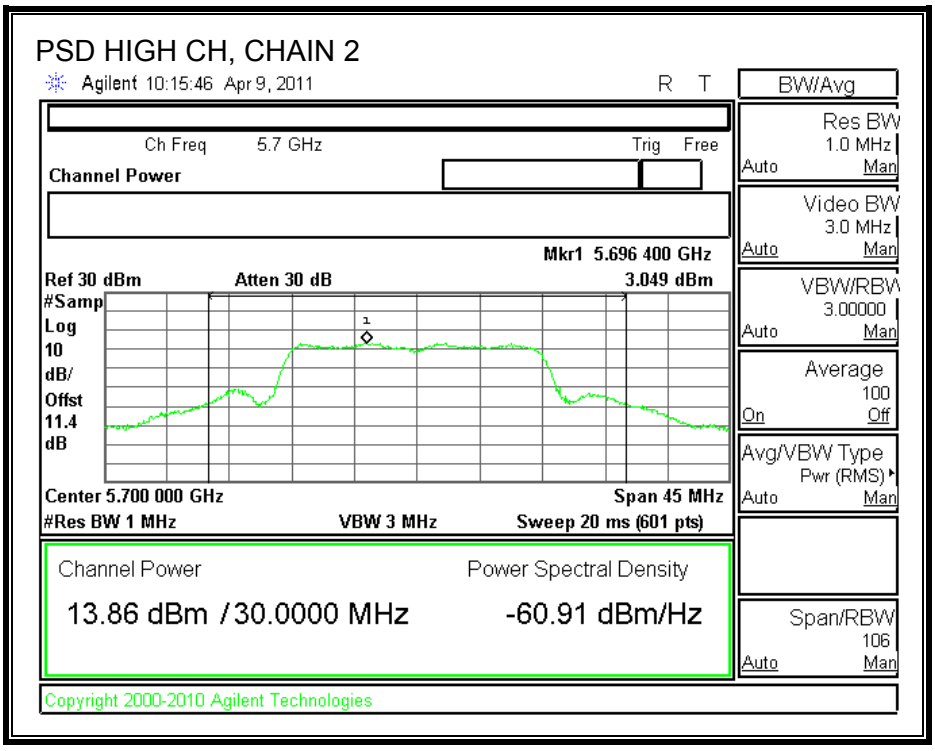




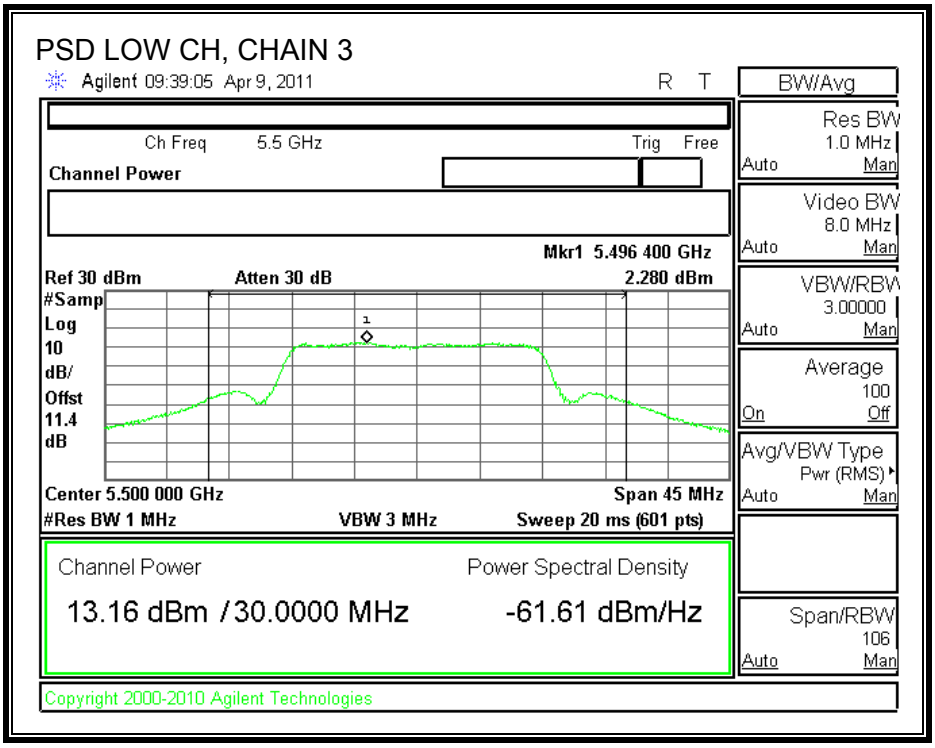
CHAIN 2 POWER SPECTRAL DENSITY

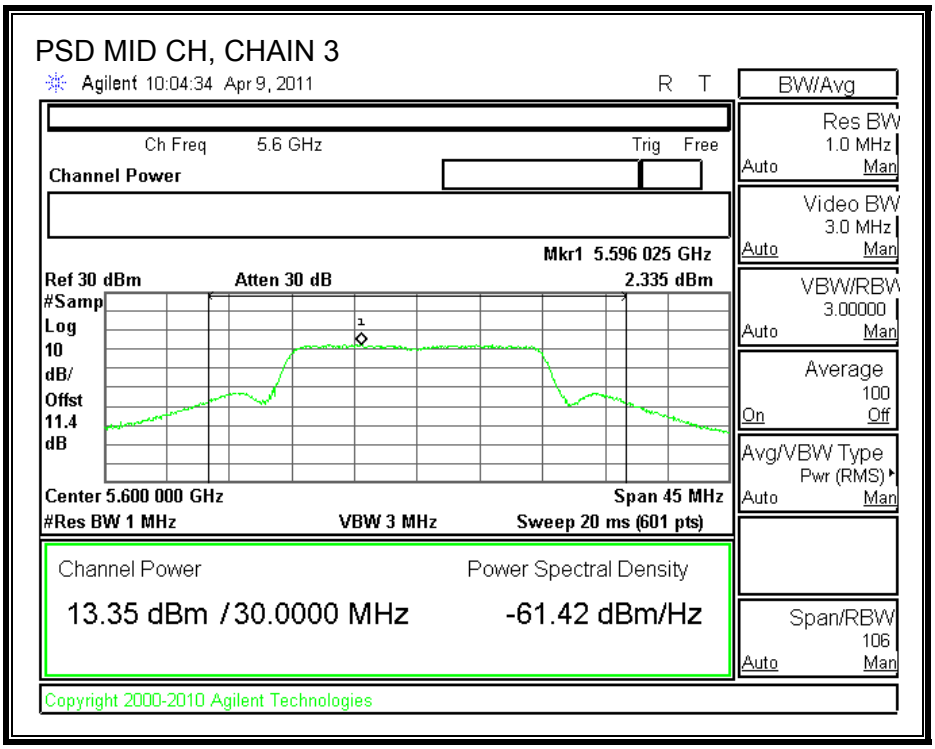


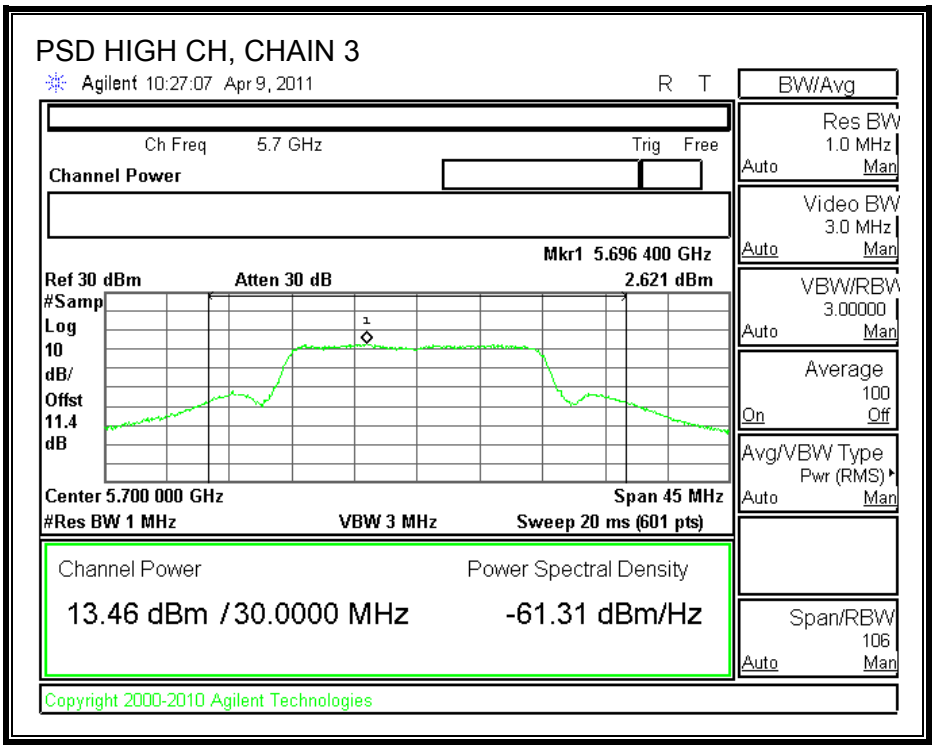




CHAIN 3 POWER SPECTRAL DENSITY







7.15.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

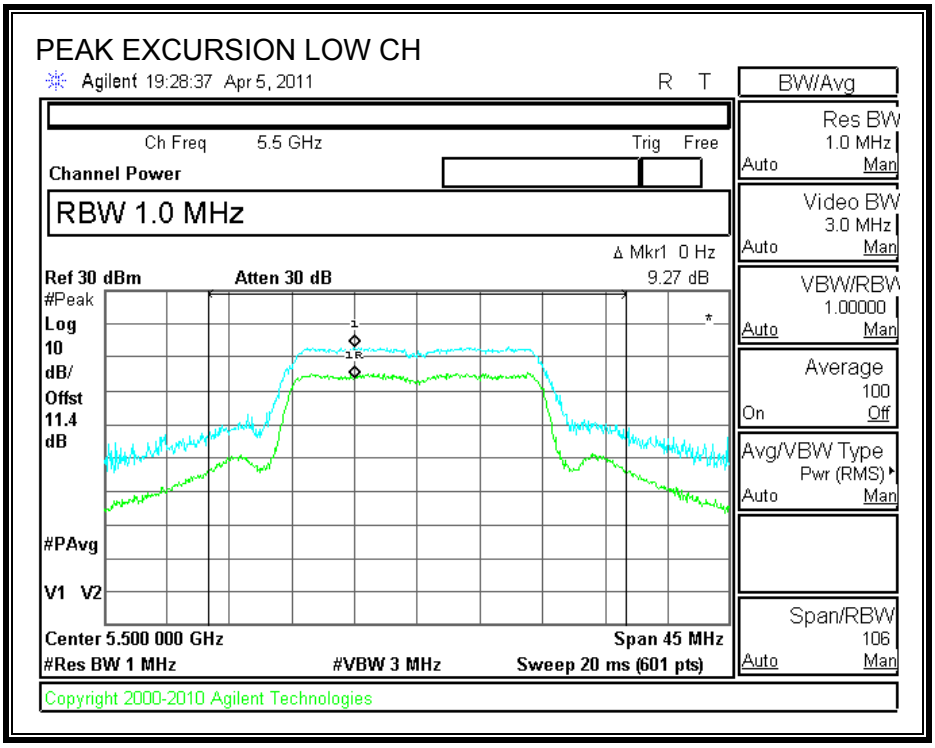
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

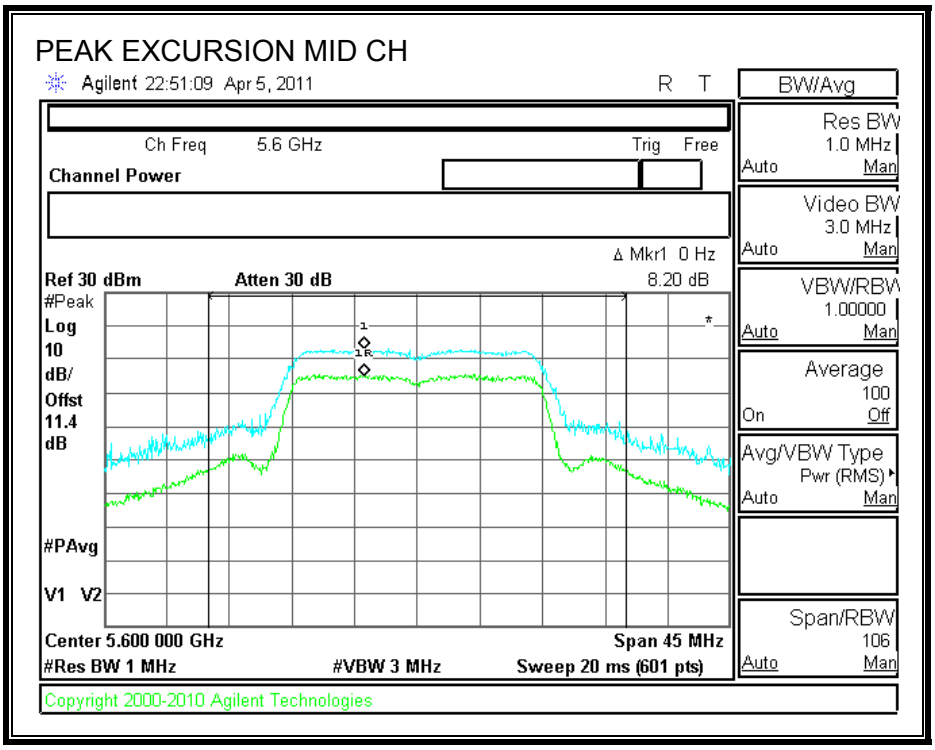
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

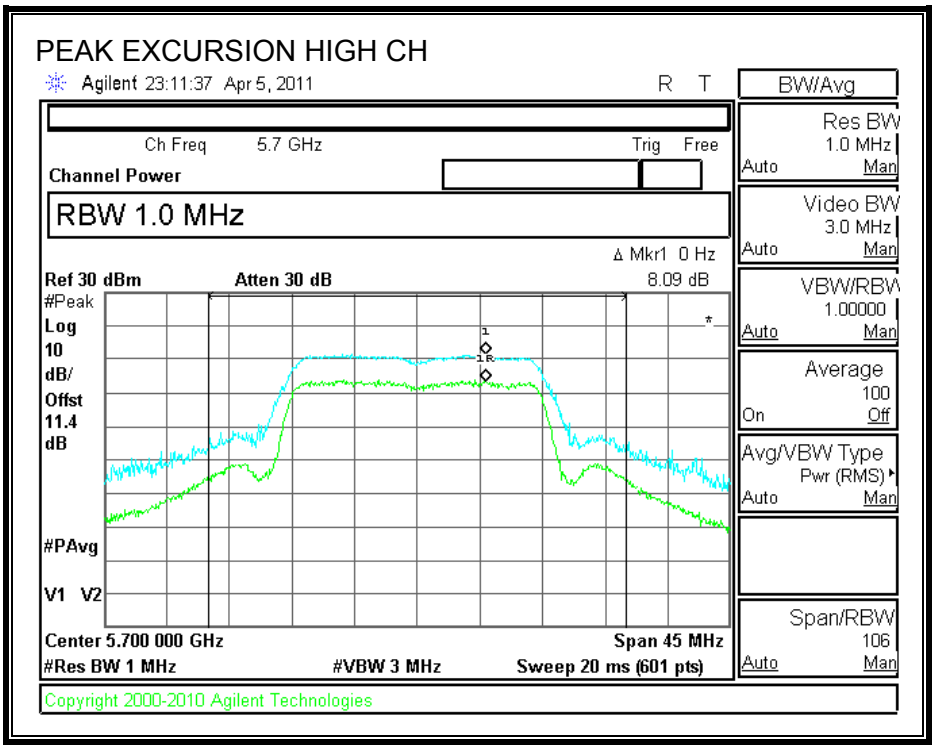
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	9.27	13	-3.73
Middle	5600	8.20	13	-4.80
High	5700	8.09	13	-4.91

PEAK EXCURSION







7.15.6. 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.

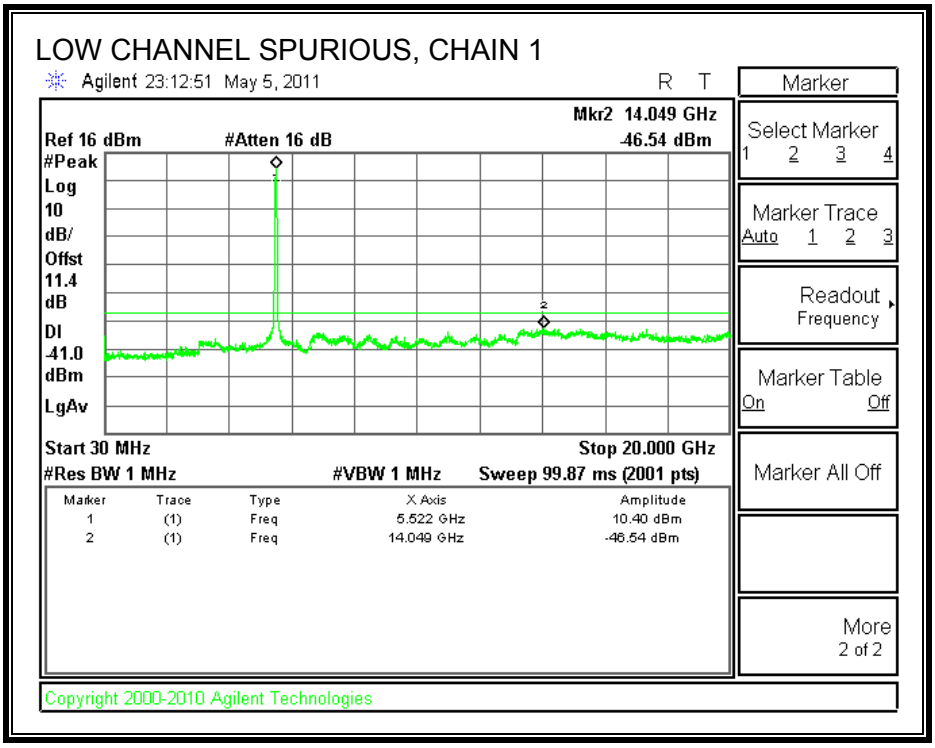
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

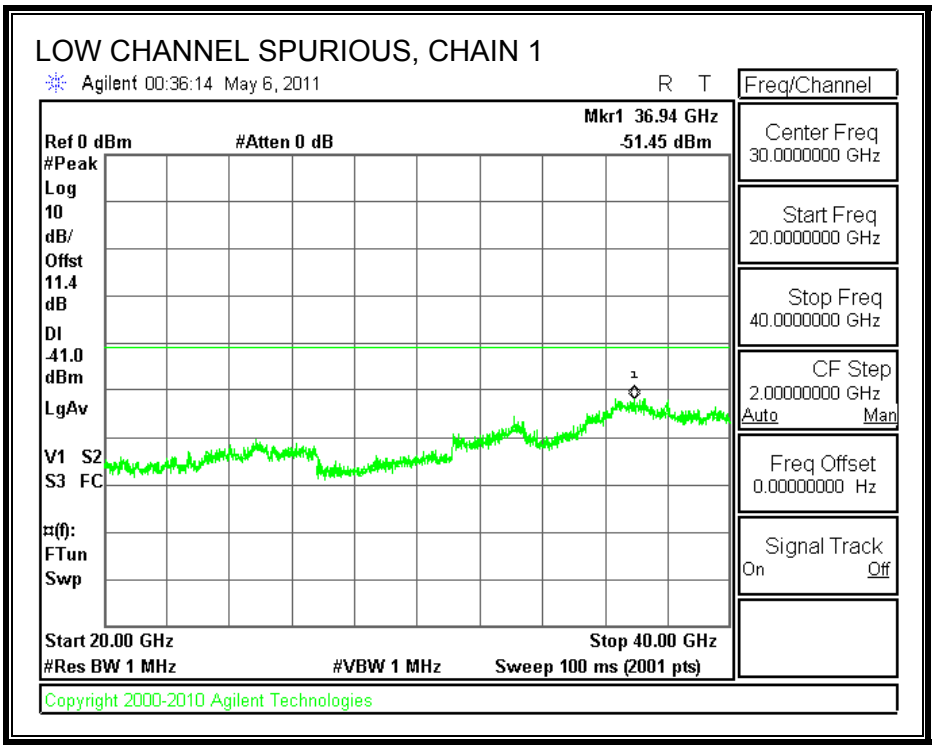
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

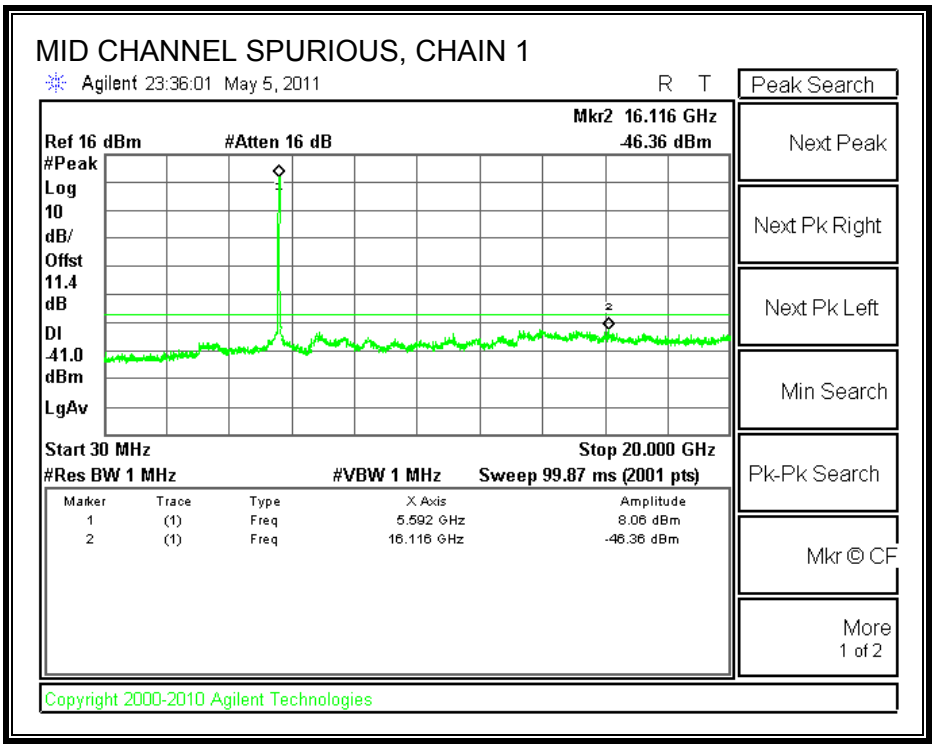
RESULTS

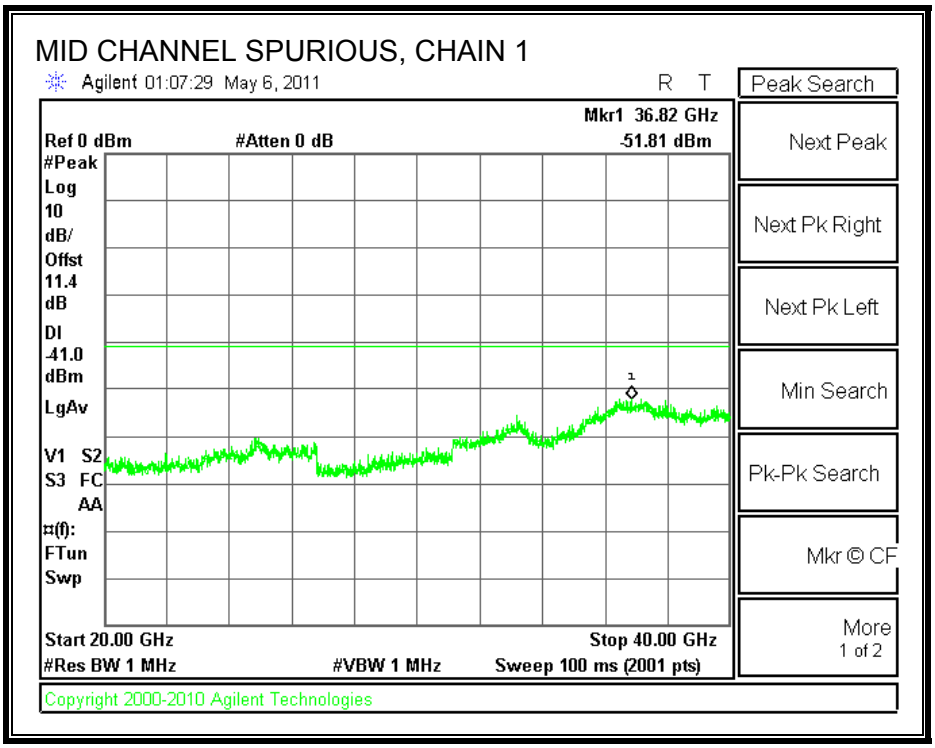
Limit = -27 dBm + Antenna Gain + 10log (N) dB

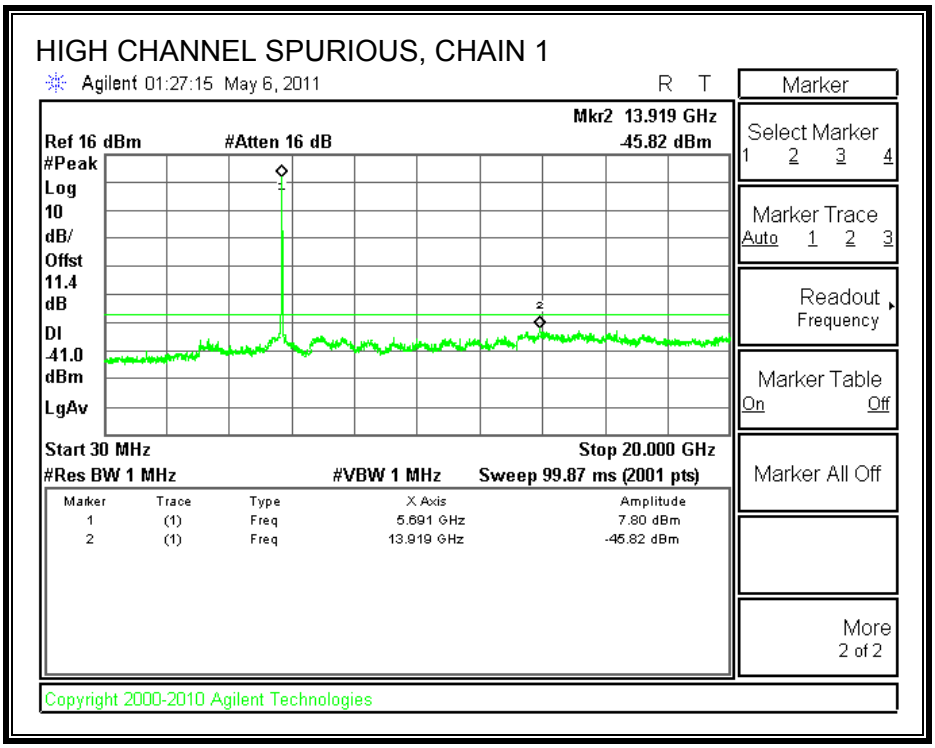
CHAIN 1 SPURIOUS EMISSIONS

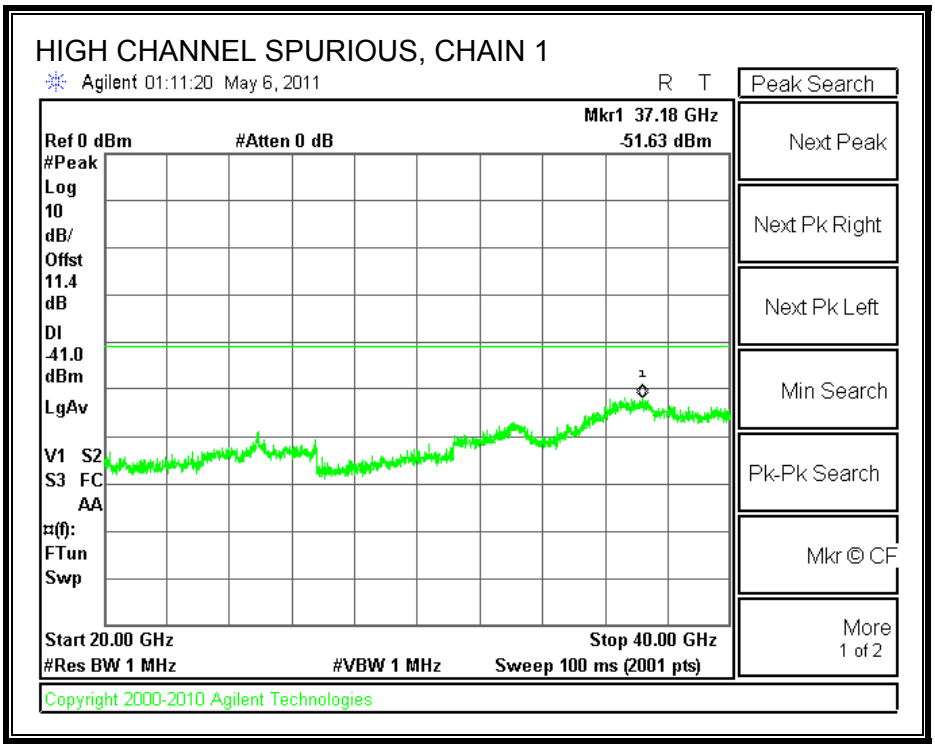




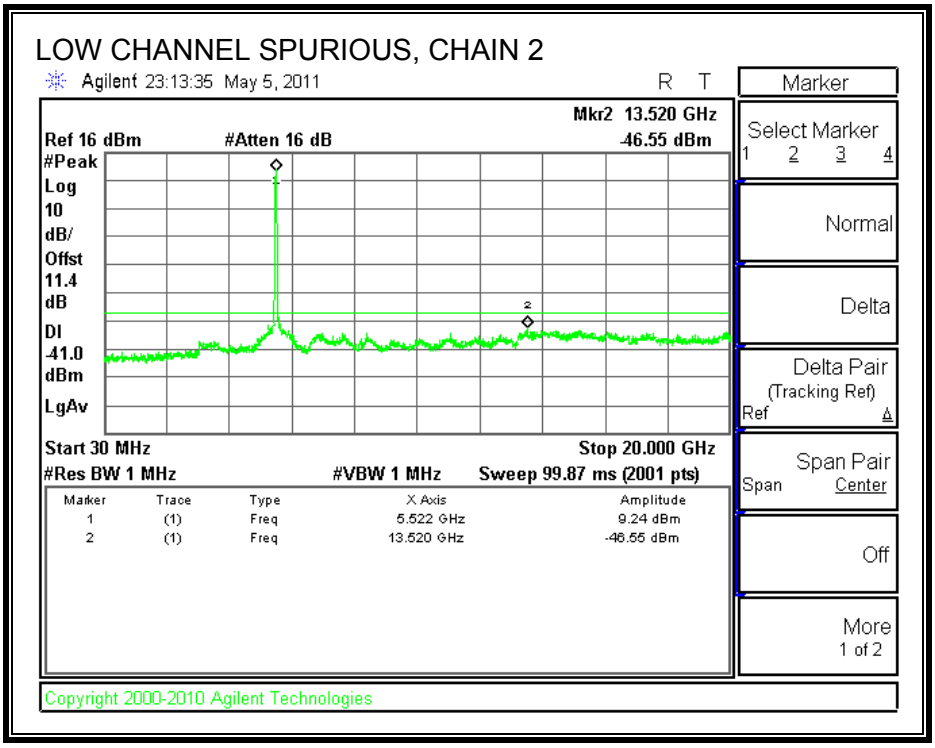


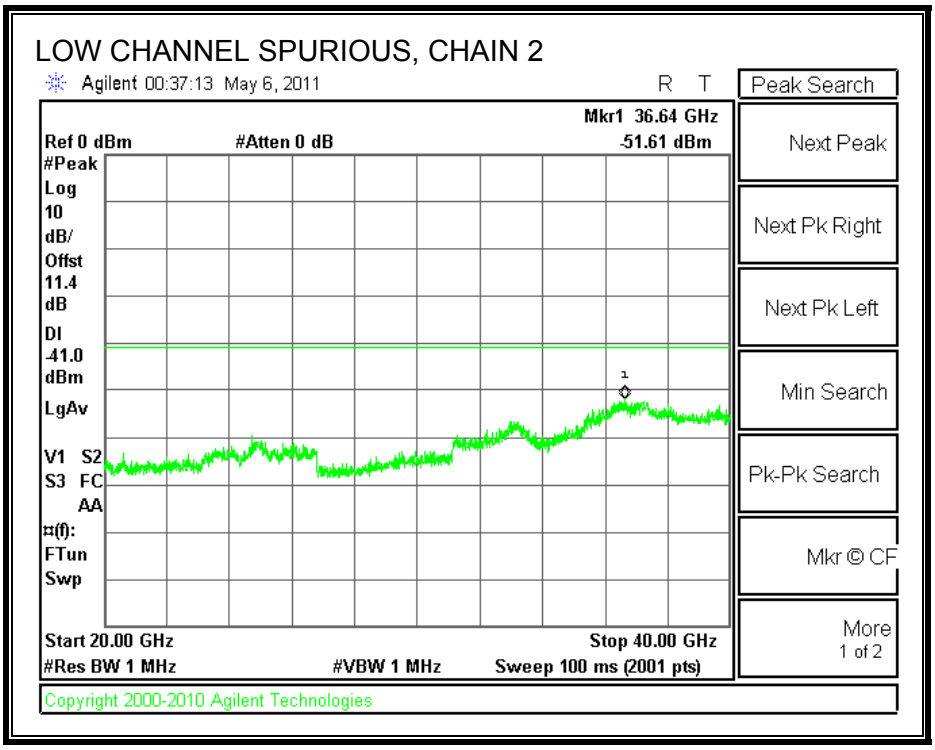


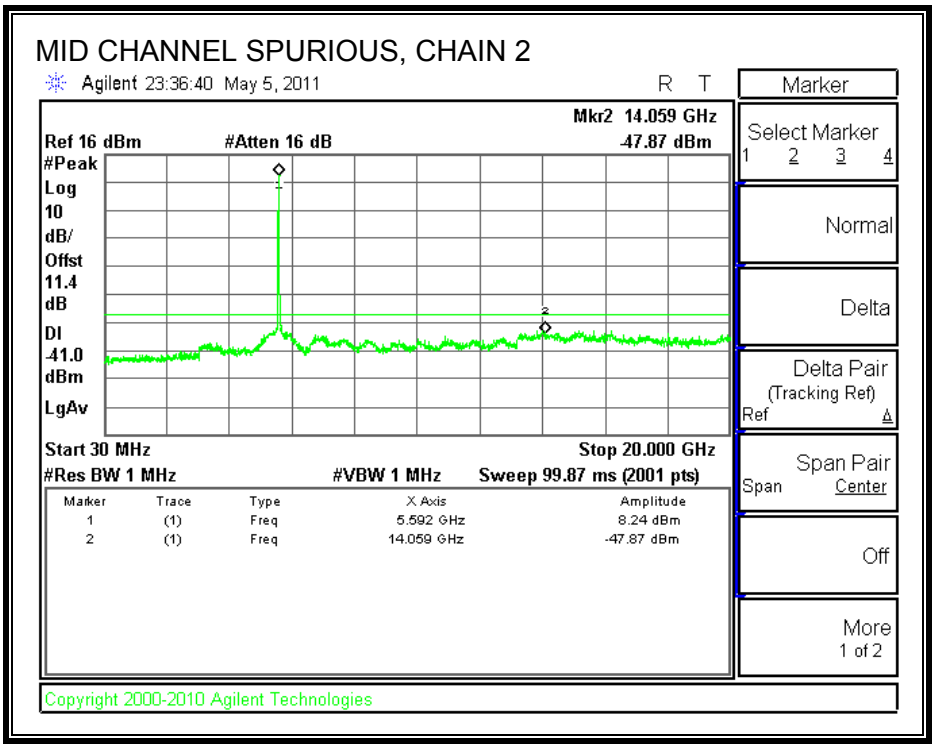


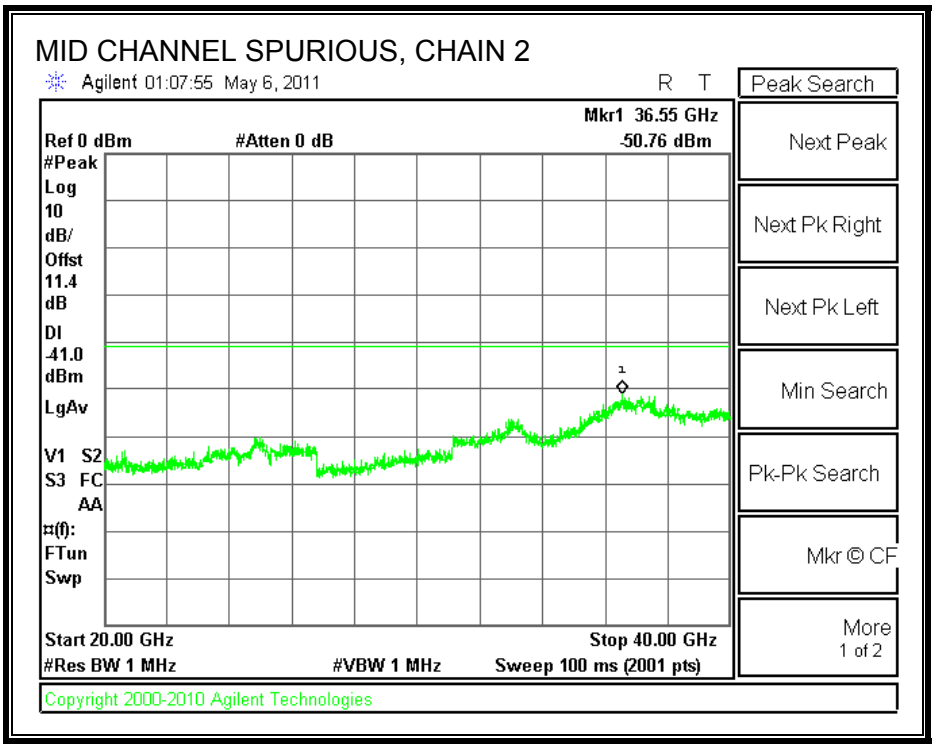


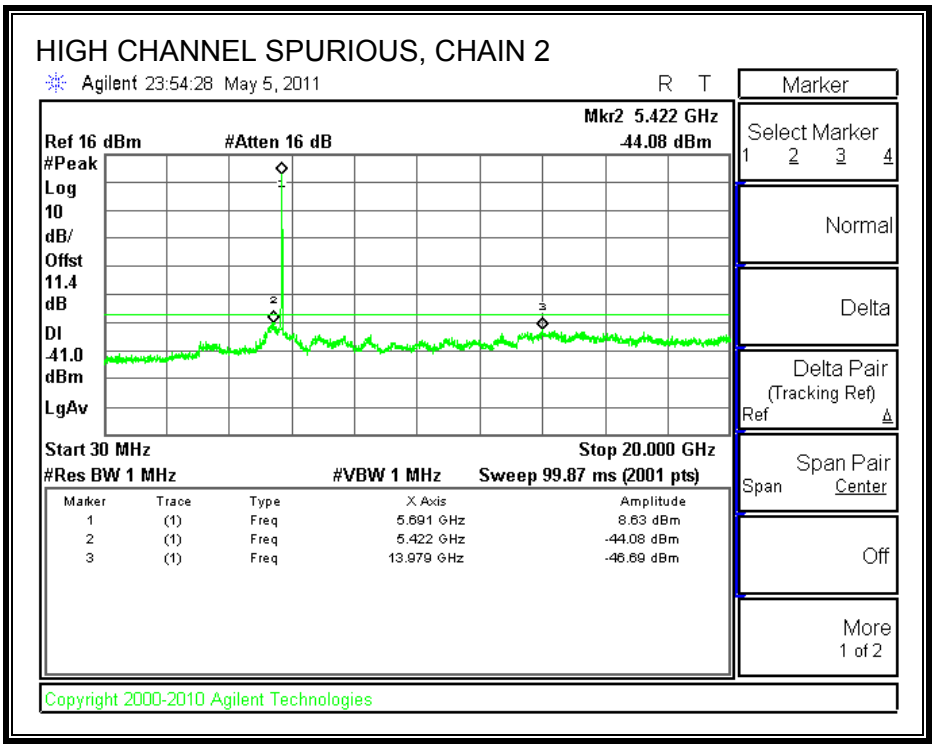
CHAIN 2 SPURIOUS EMISSIONS

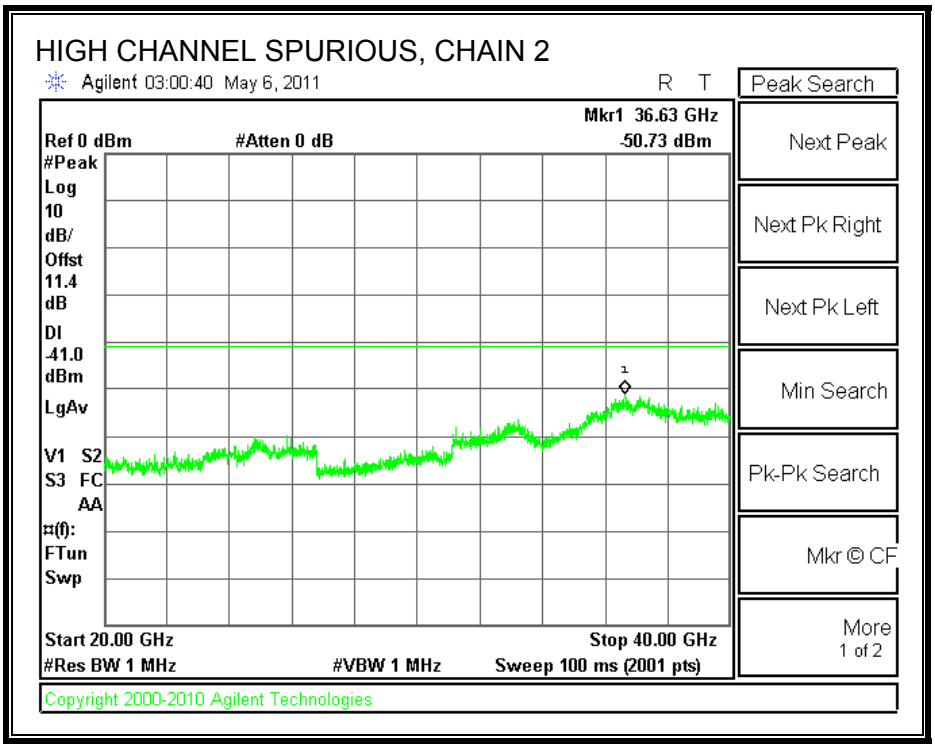




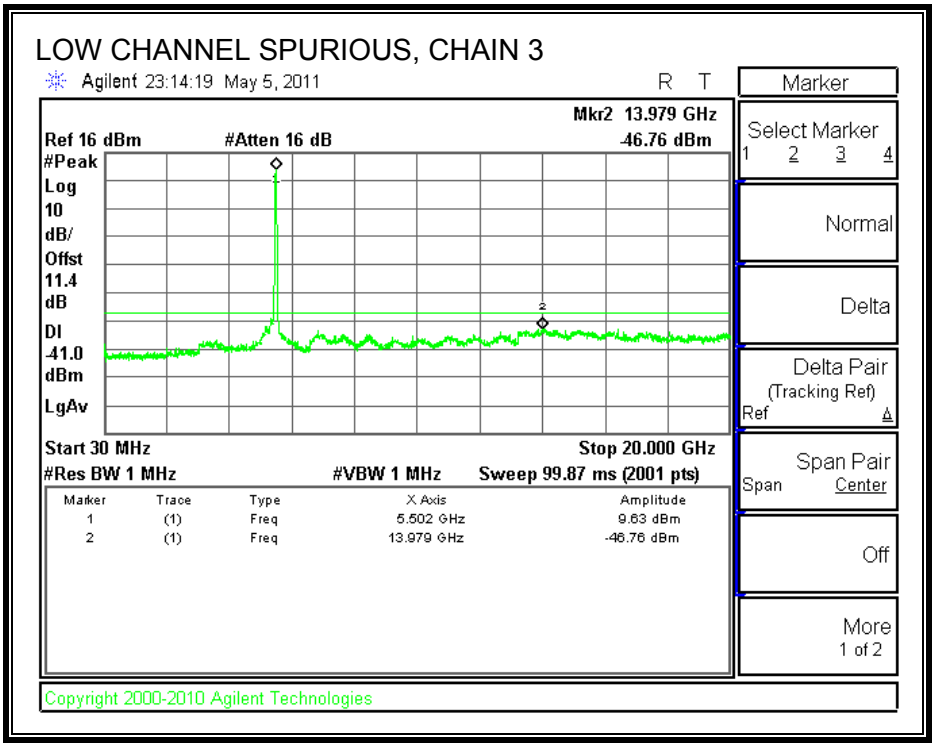


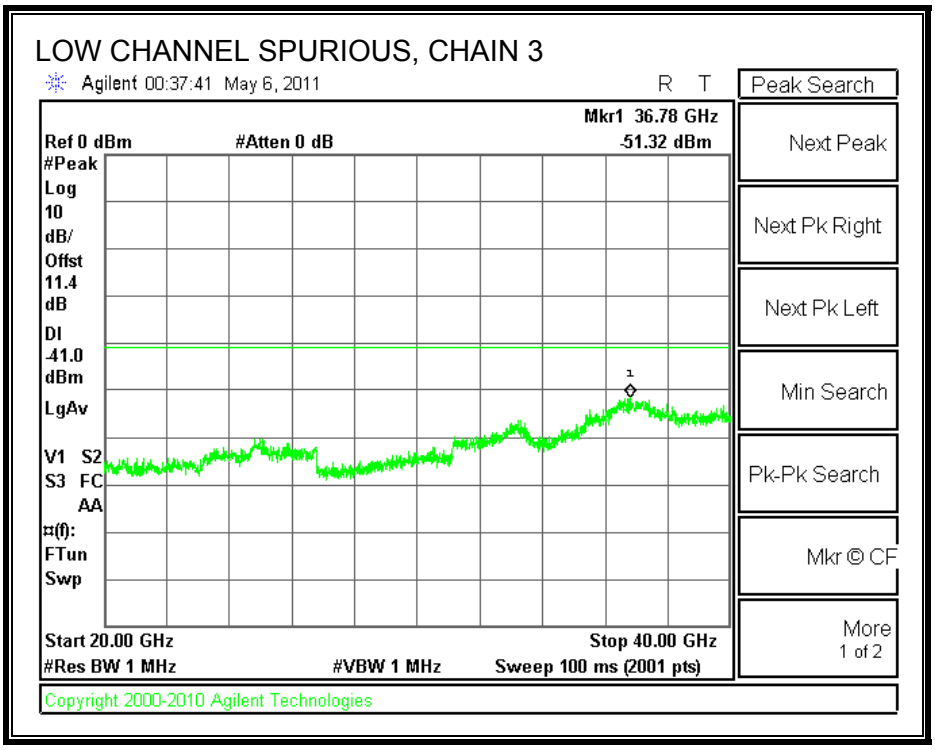


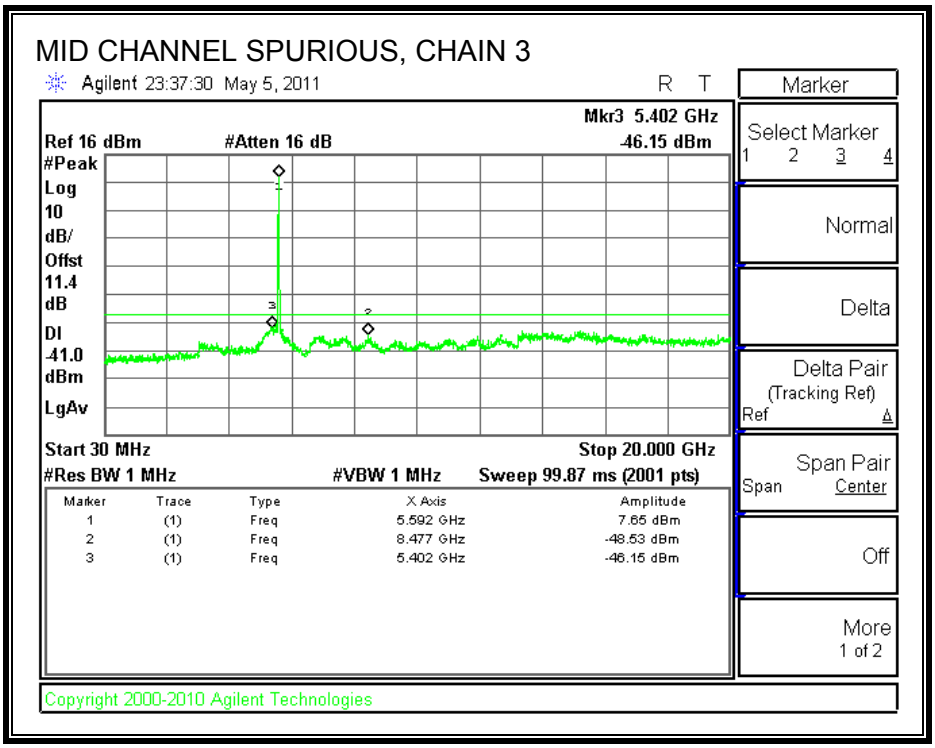


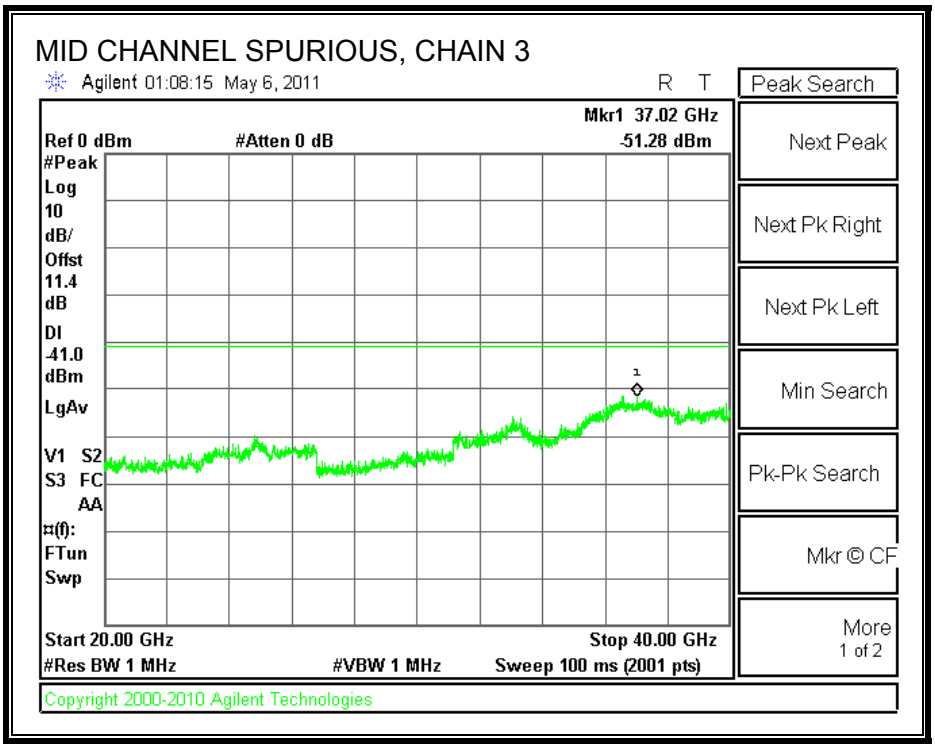


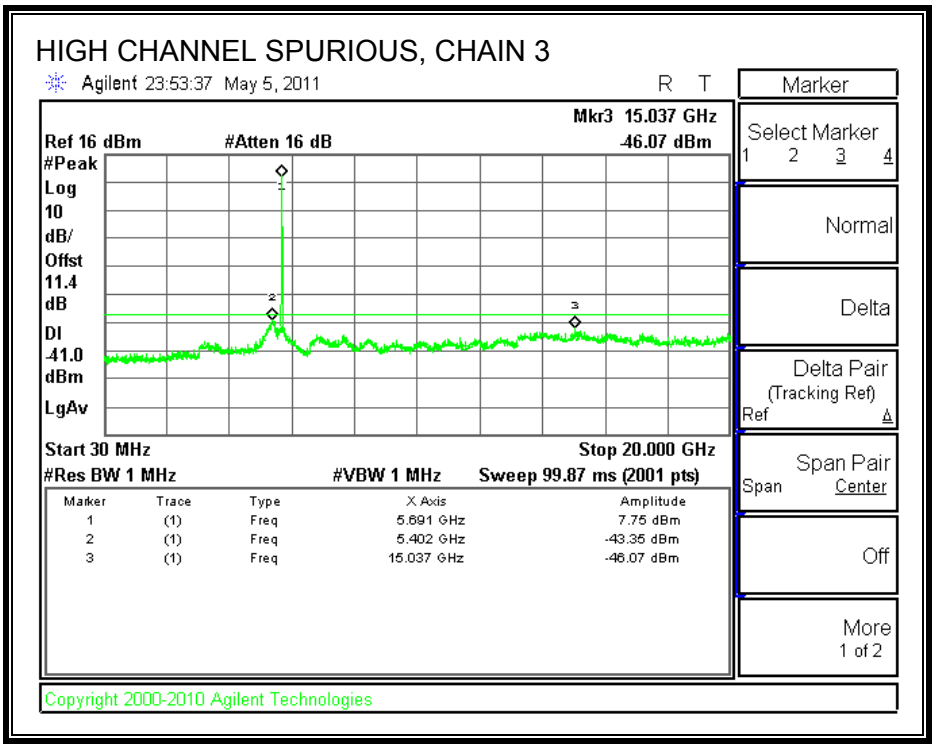
CHAIN 3 SPURIOUS EMISSIONS

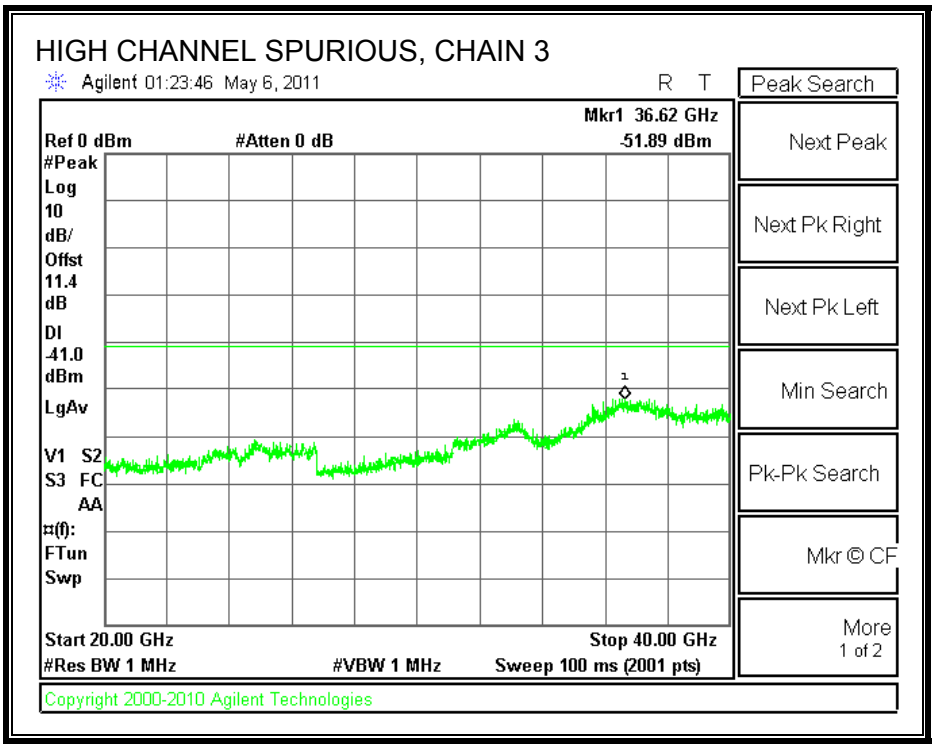












SDM MCS21

7.15.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

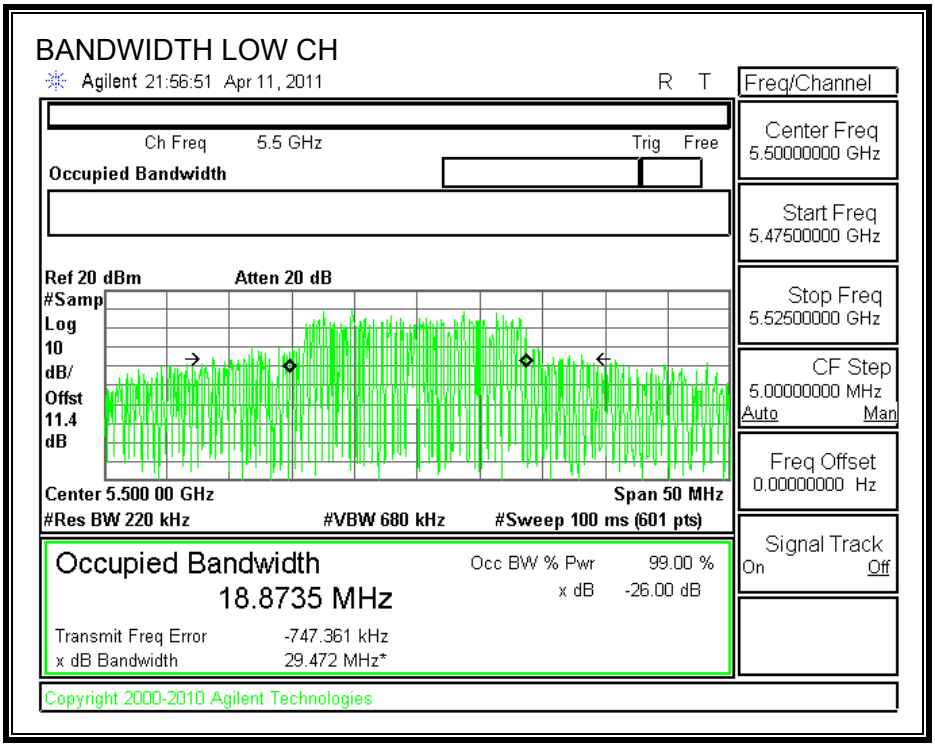
TEST PROCEDURE

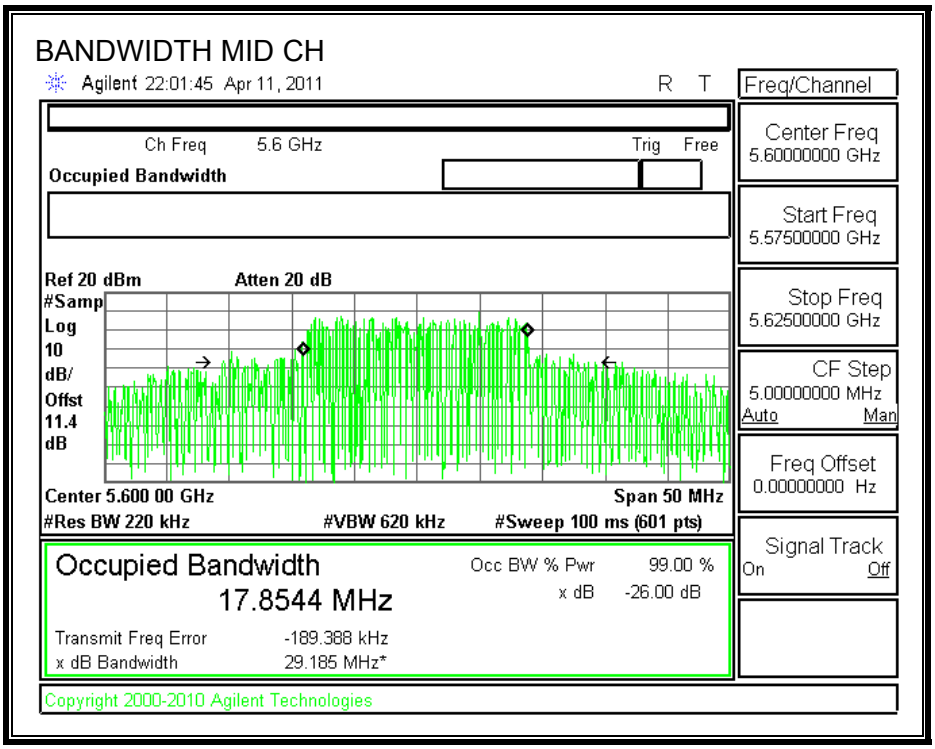
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

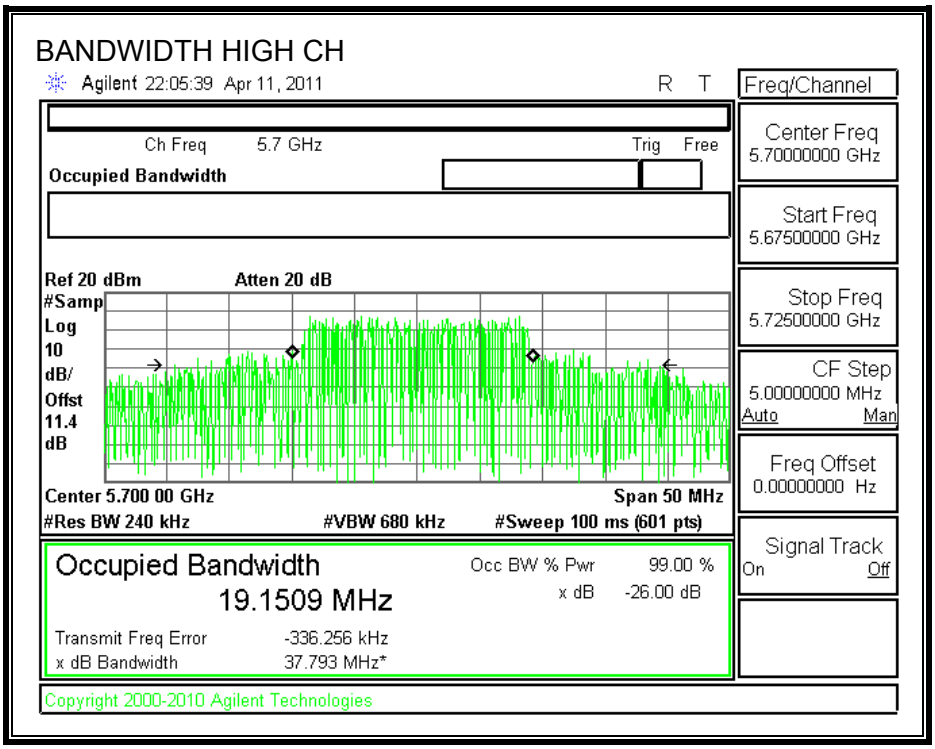
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	35.633	18.8735
Middle	5600	44.231	17.8544
High	5700	40.042	19.1509

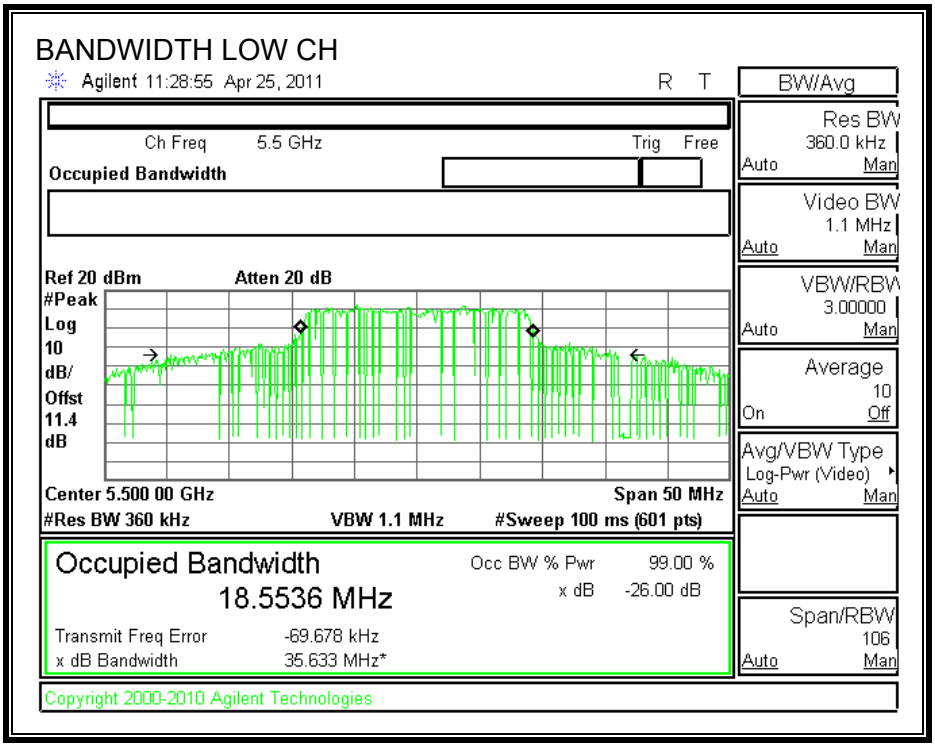
99% BANDWIDTH

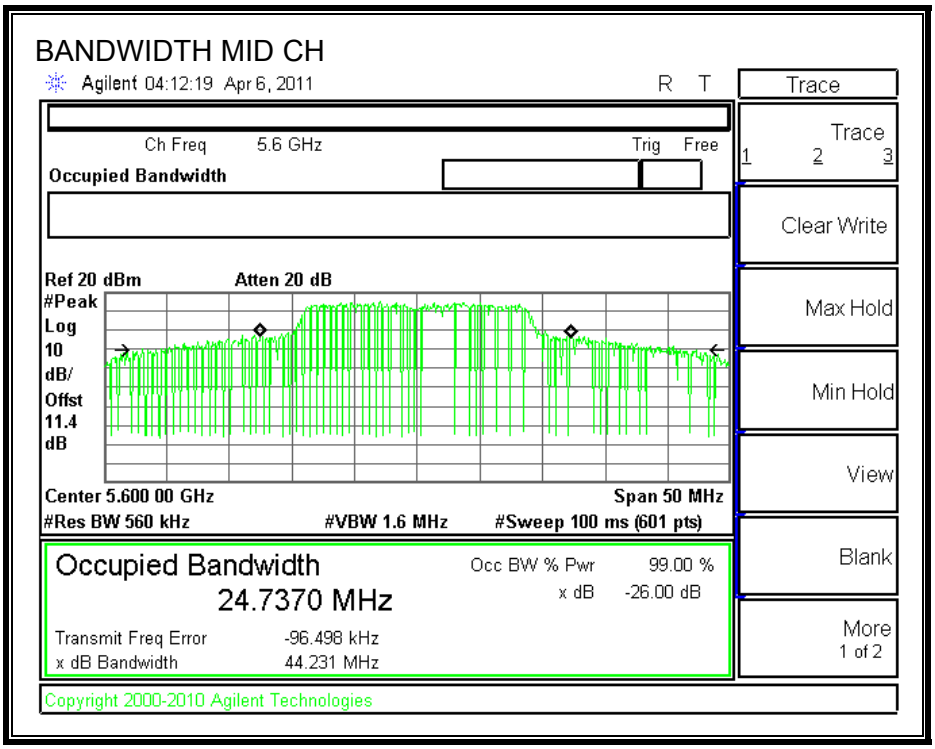


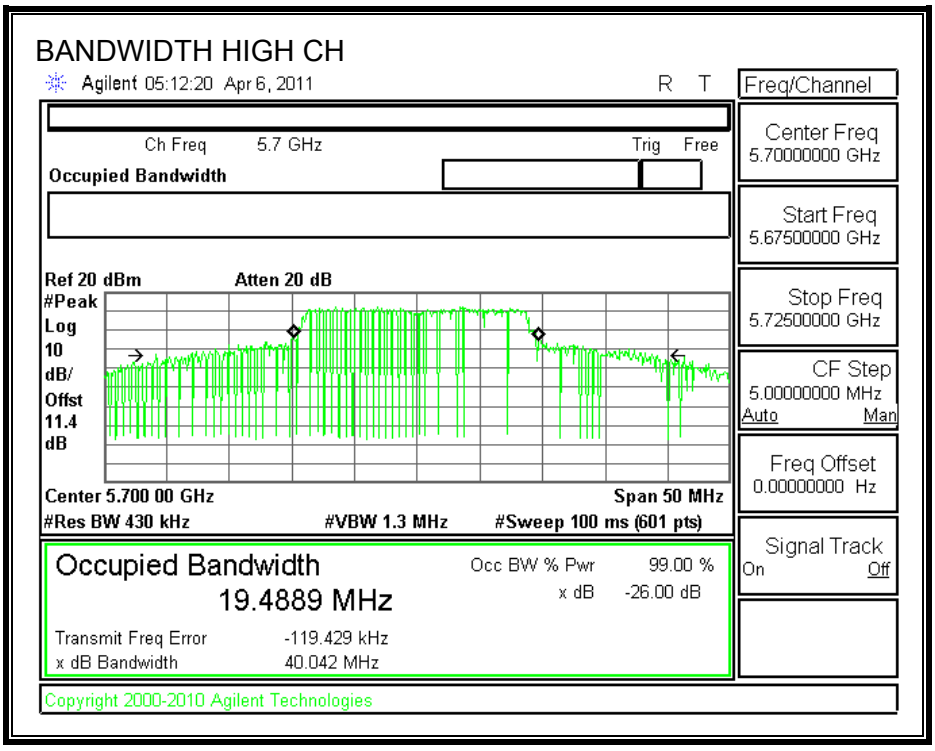




26 dB BANDWIDTH







7.15.2. 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 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

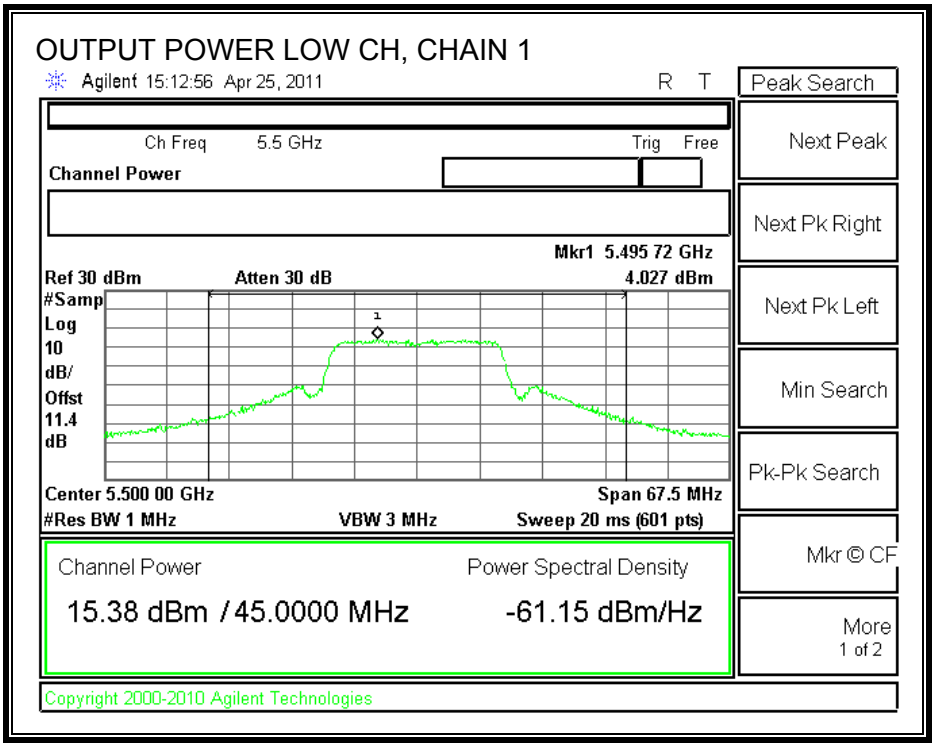
Limit

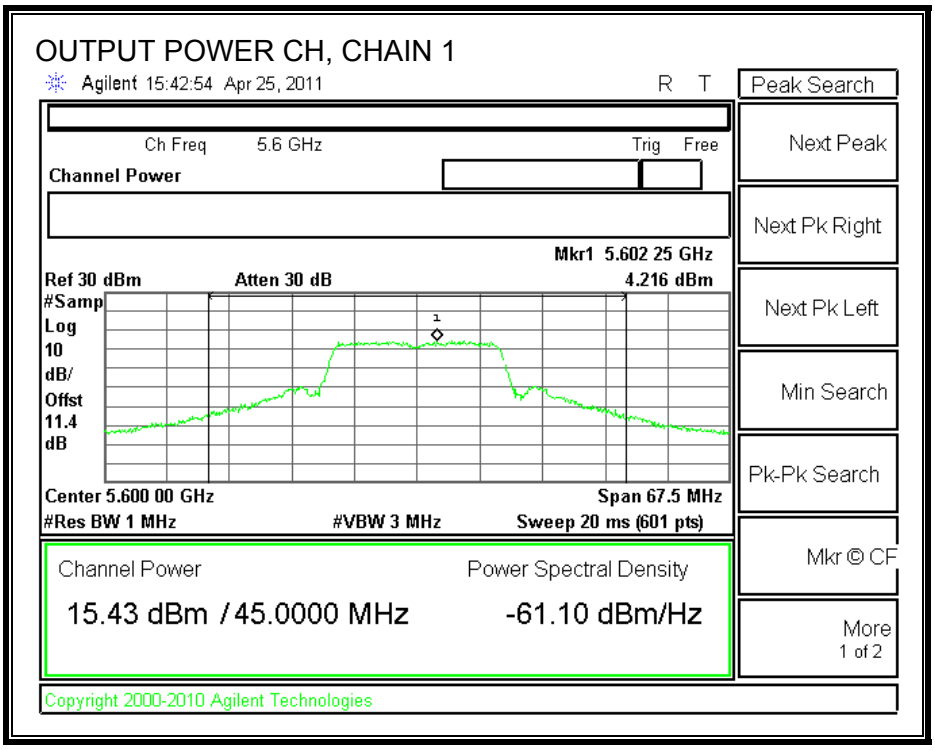
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	35.633	26.52	5.35	24.00
Mid	5600	24	44.231	27.46	5.35	24.00
High	5700	24	40.042	27.03	5.35	24.00

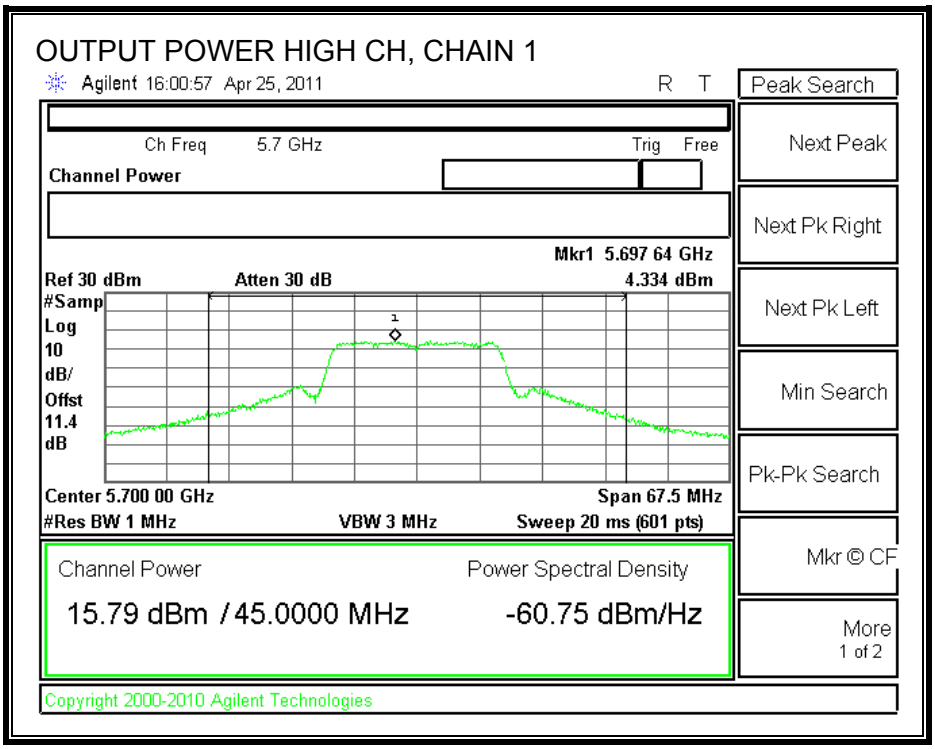
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	15.38	17.39	17.49	21.63	24.00	-2.37
Mid	5600	15.43	17.34	17.49	21.62	24.00	-2.38
High	5700	15.79	17.04	17.51	21.61	24.00	-2.39

CHAIN 1 OUTPUT POWER







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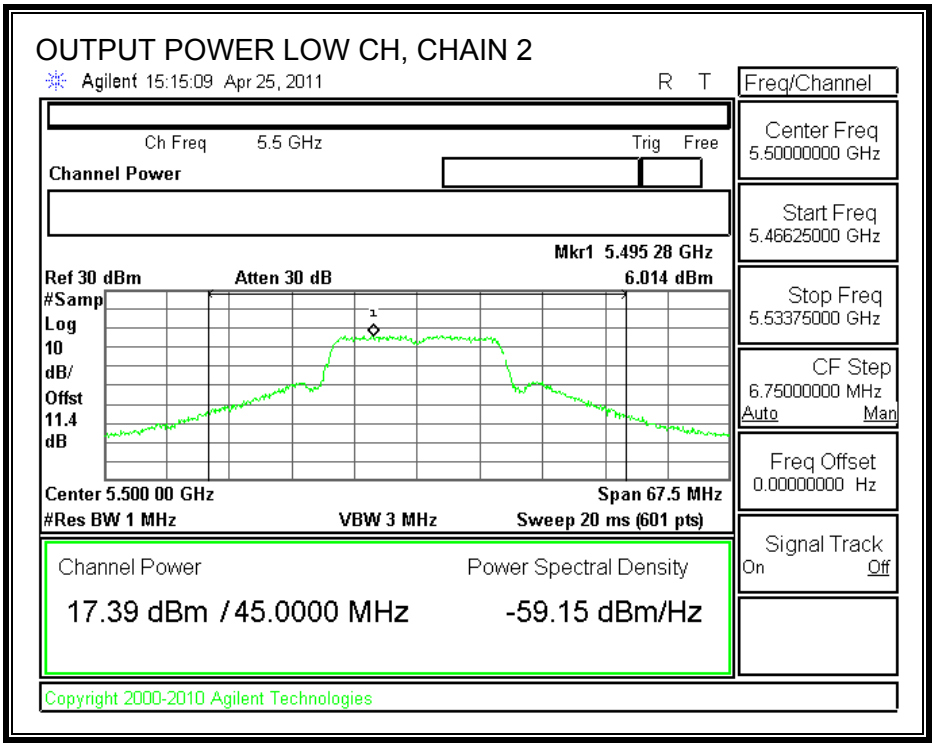

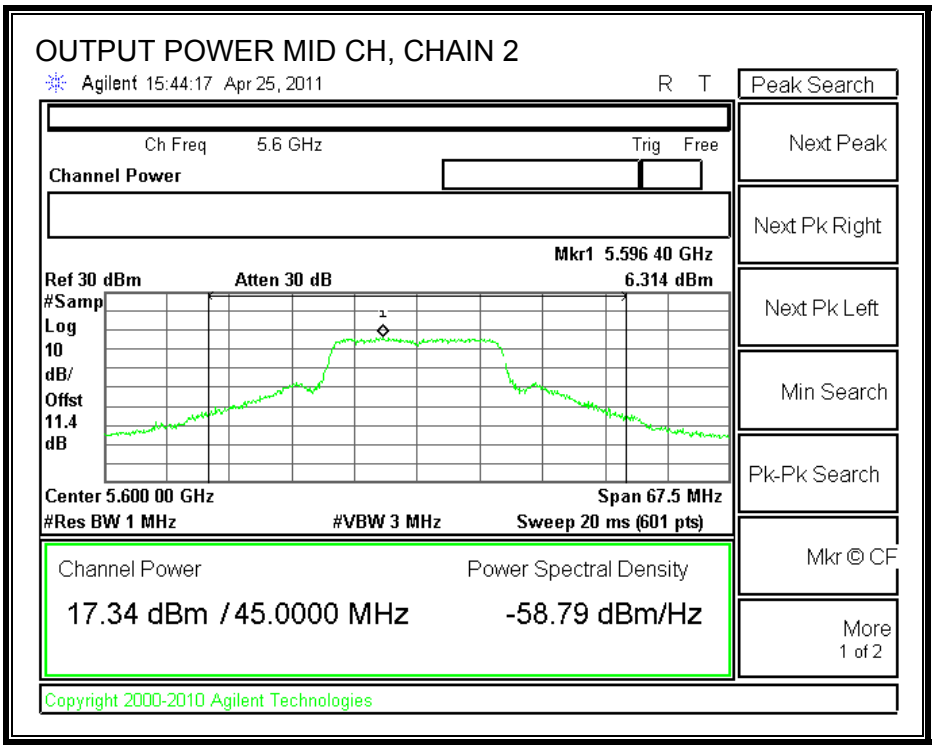

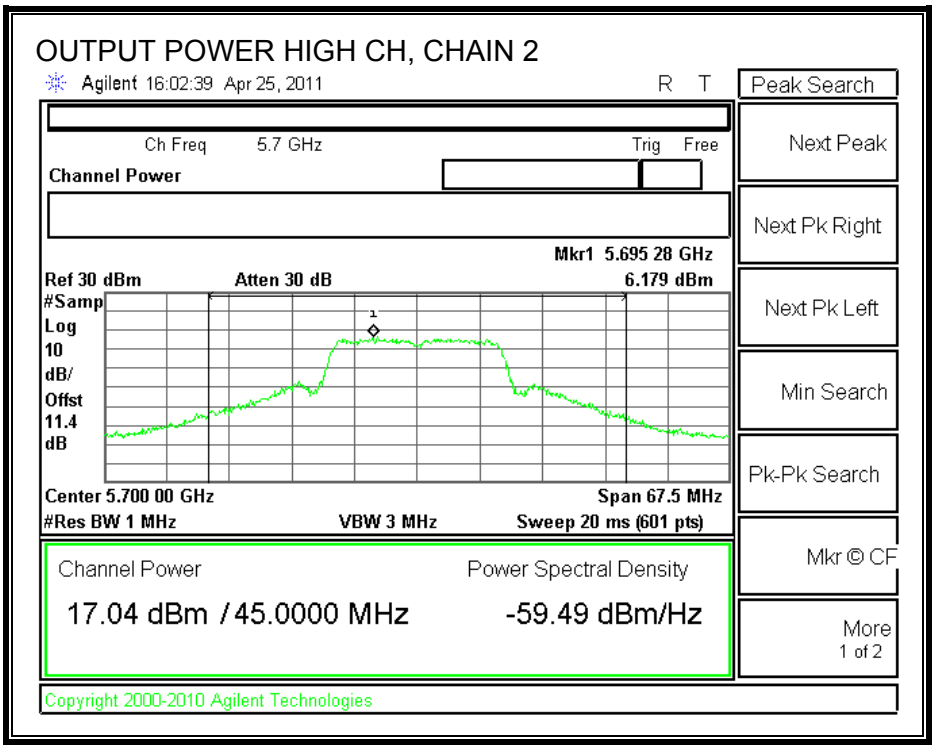

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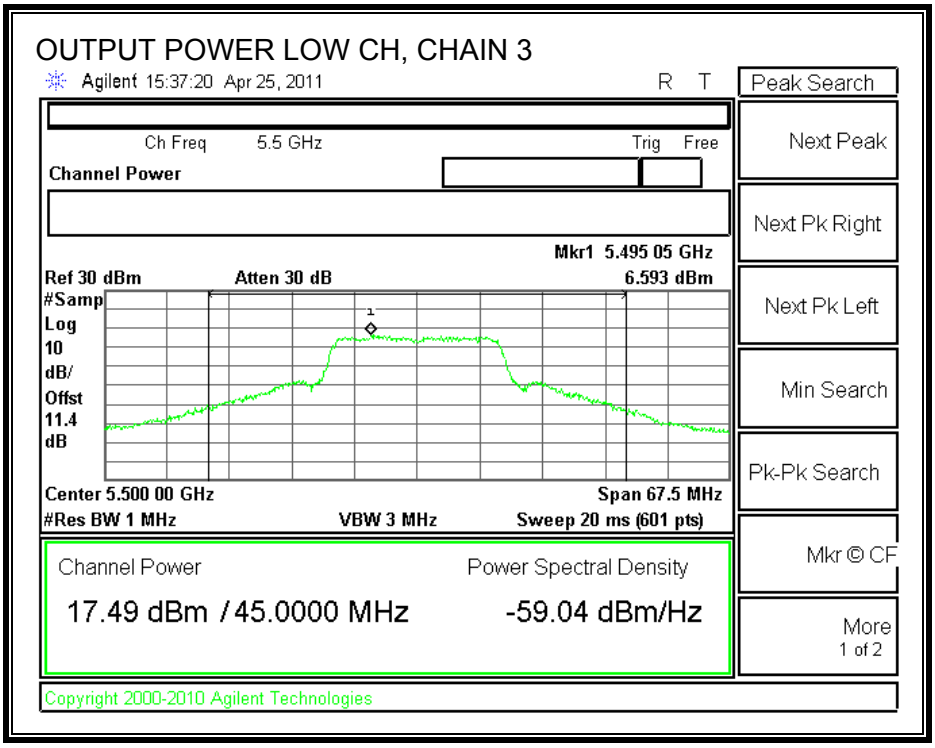
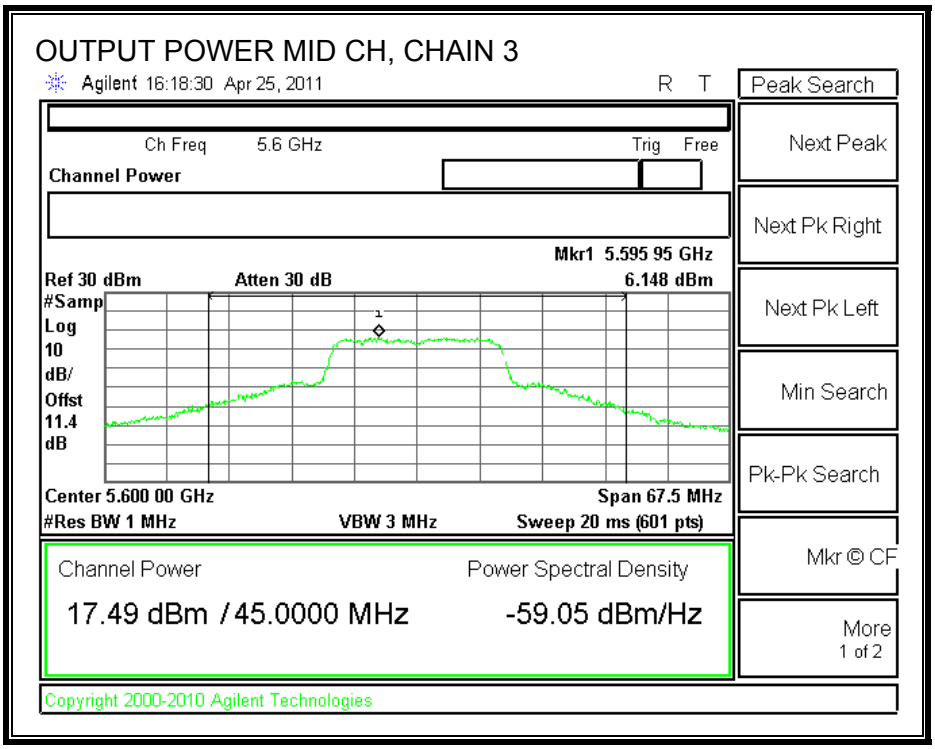
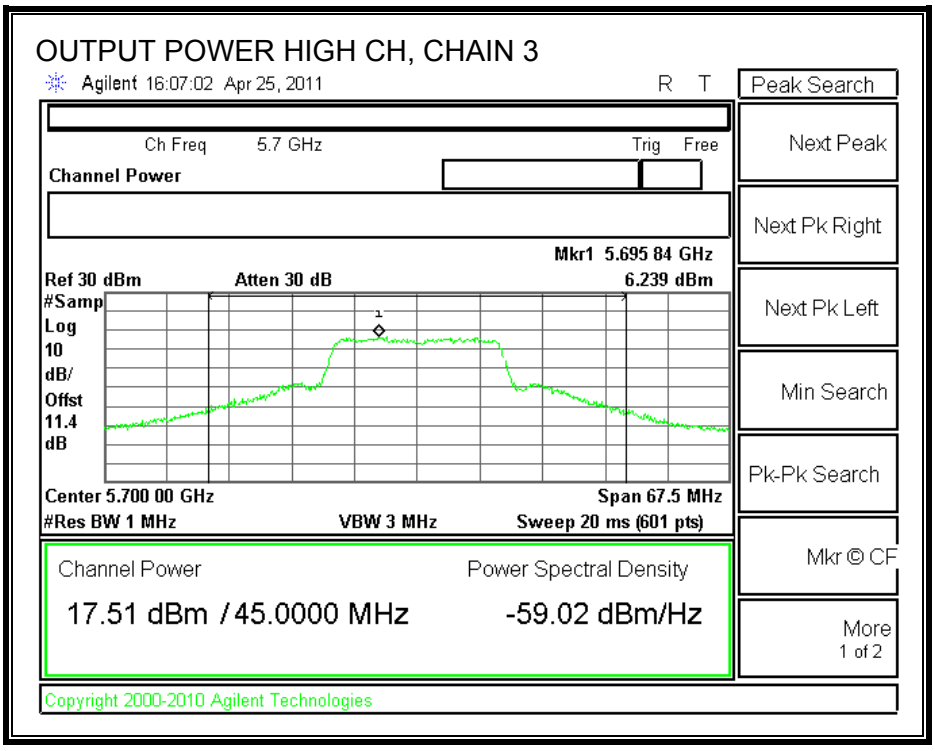






7.15.3. PEAK POWER SPECTRAL DENSITY

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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

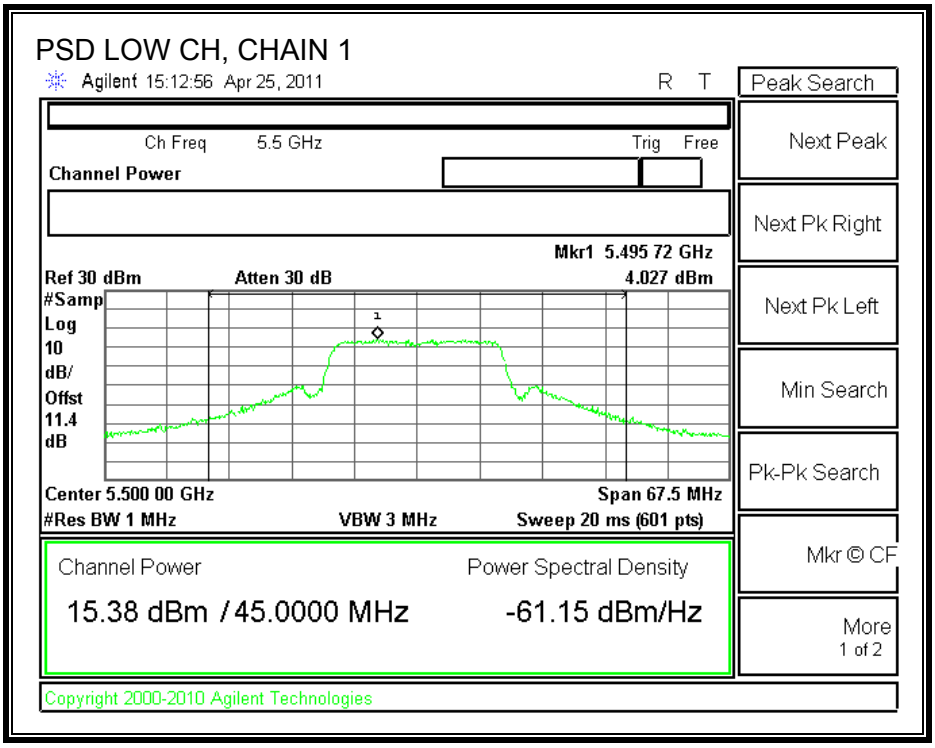
TEST PROCEDURE

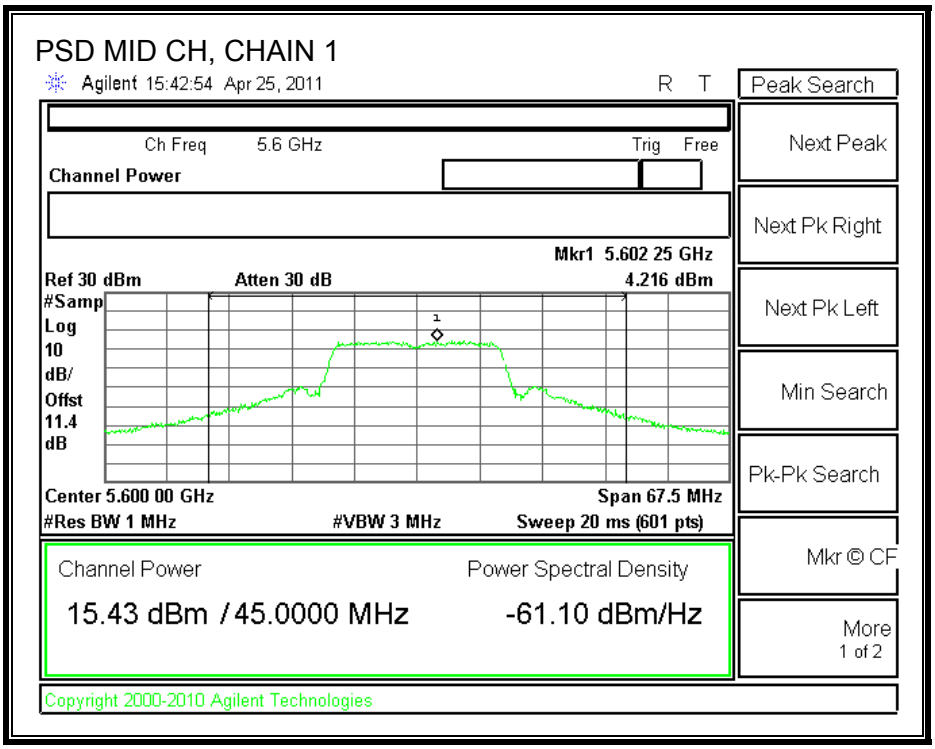
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

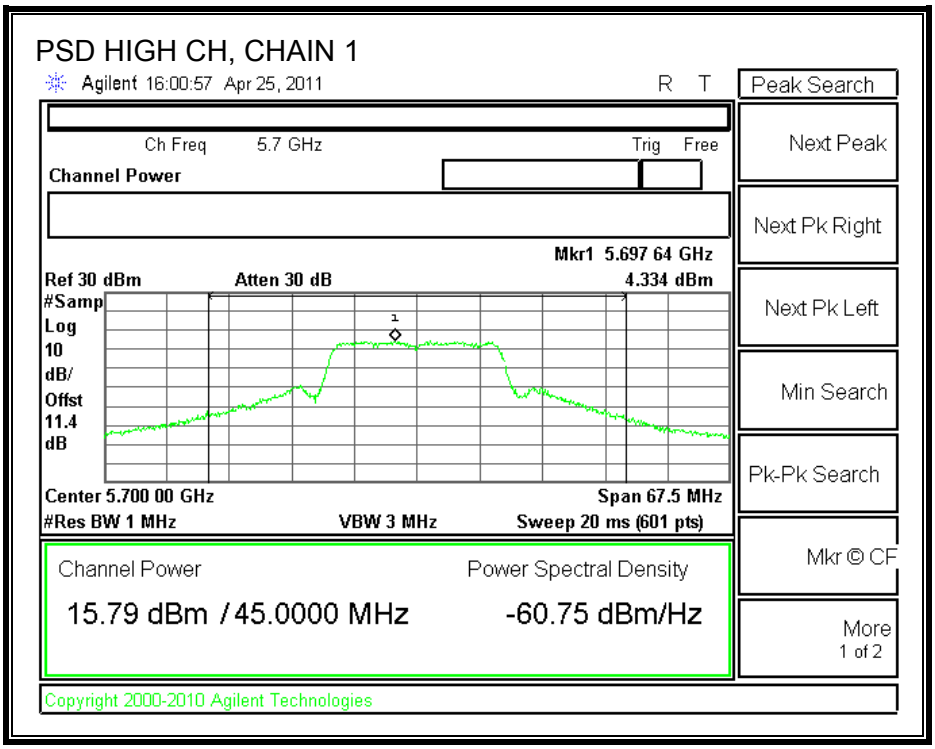
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	4.027	6.014	6.593	10.447	11.00	-0.55
Middle	5600	4.216	6.314	6.148	10.429	11.00	-0.57
High	5700	4.334	6.179	6.239	10.441	11.00	-0.56

CHAIN 1 POWER SPECTRAL DENSITY







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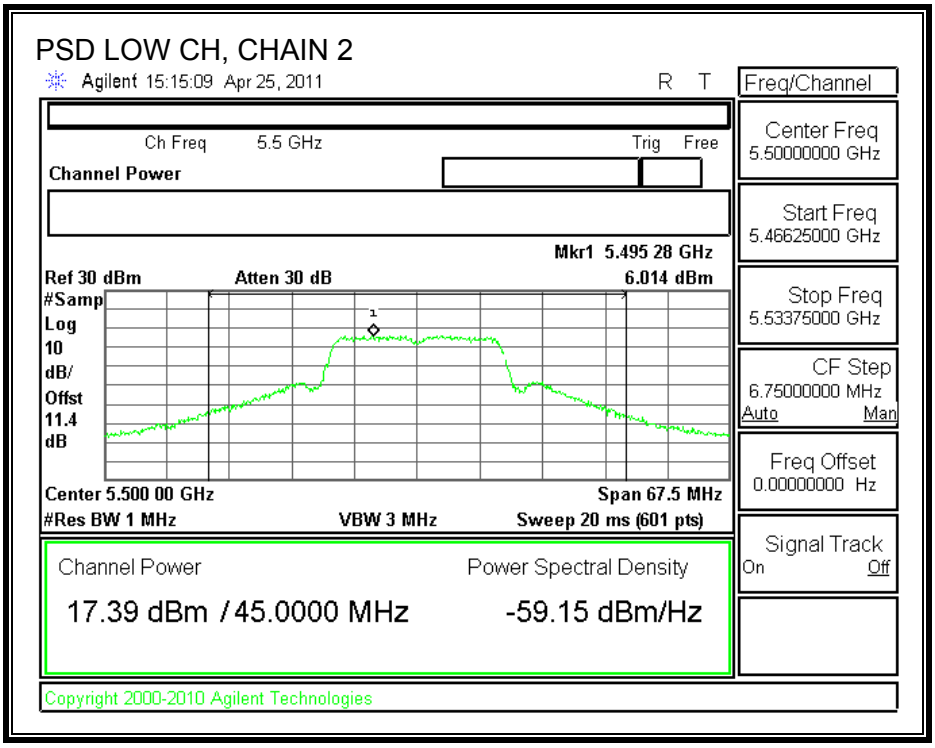
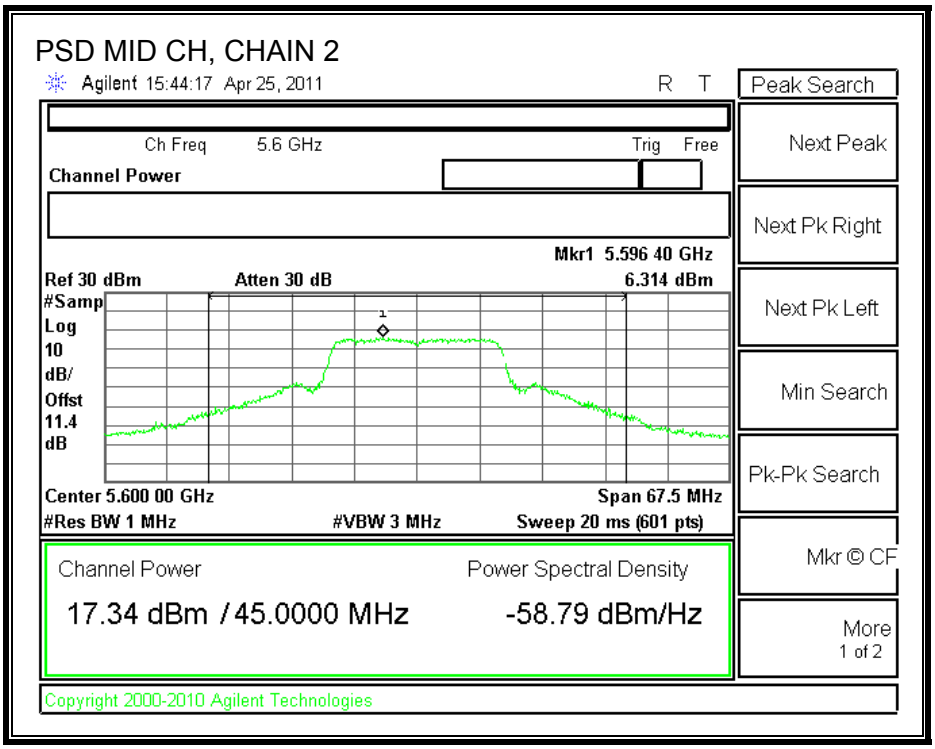
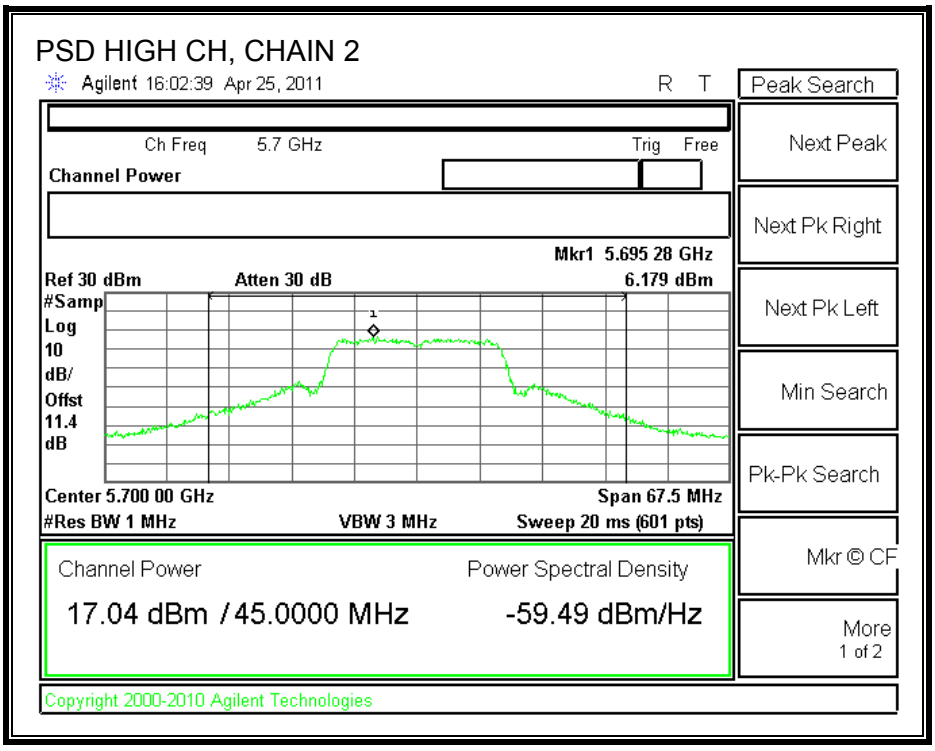
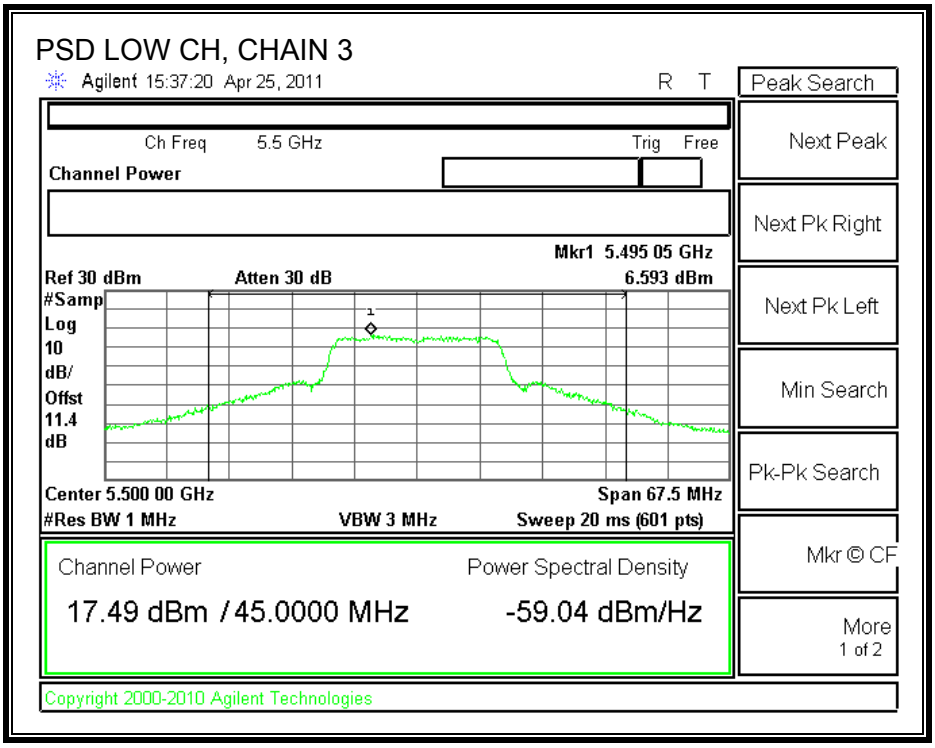
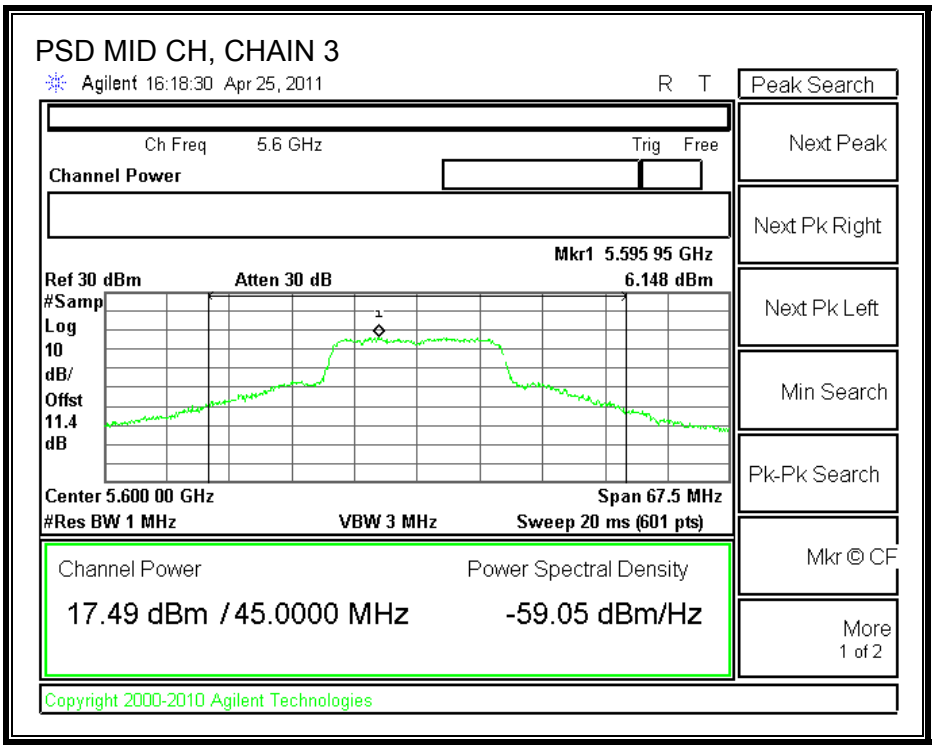


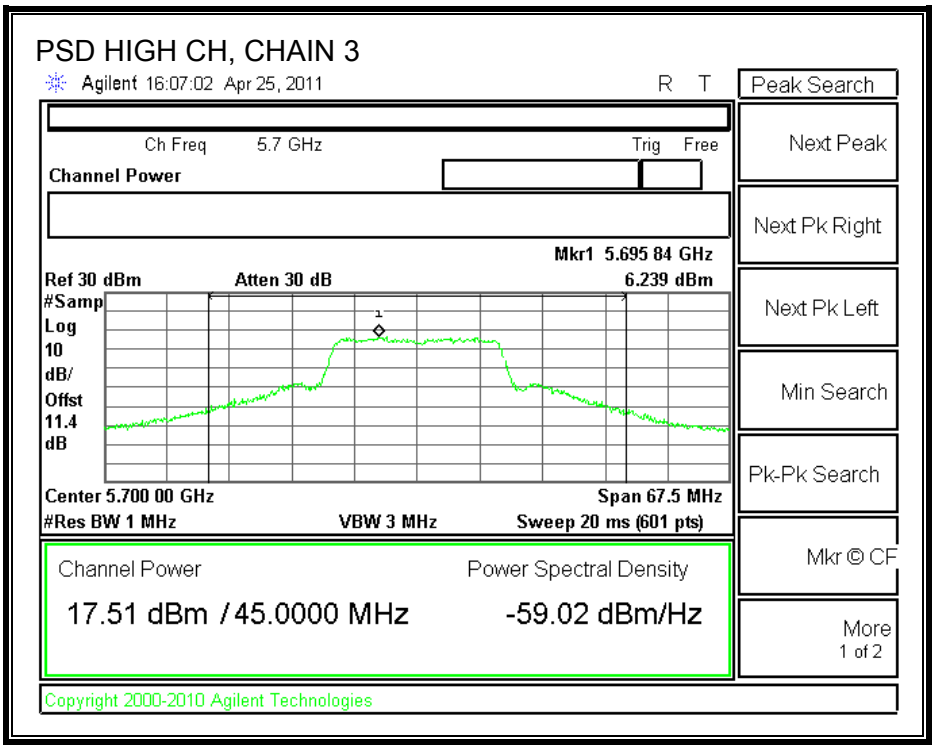




CHAIN 3 POWER SPECTRAL DENSITY







7.15.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

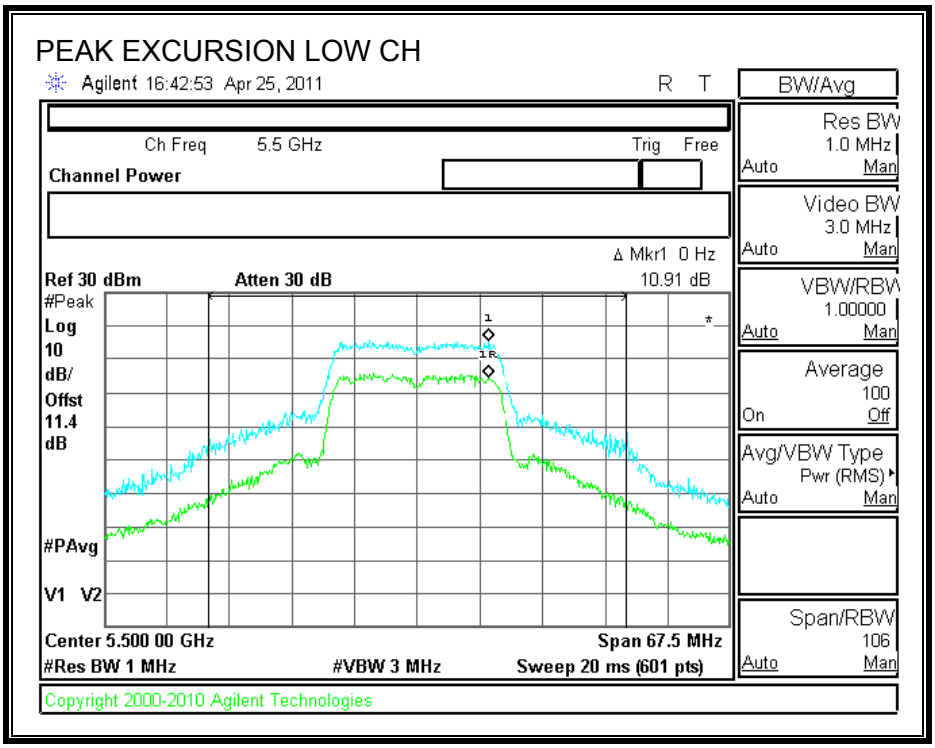
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

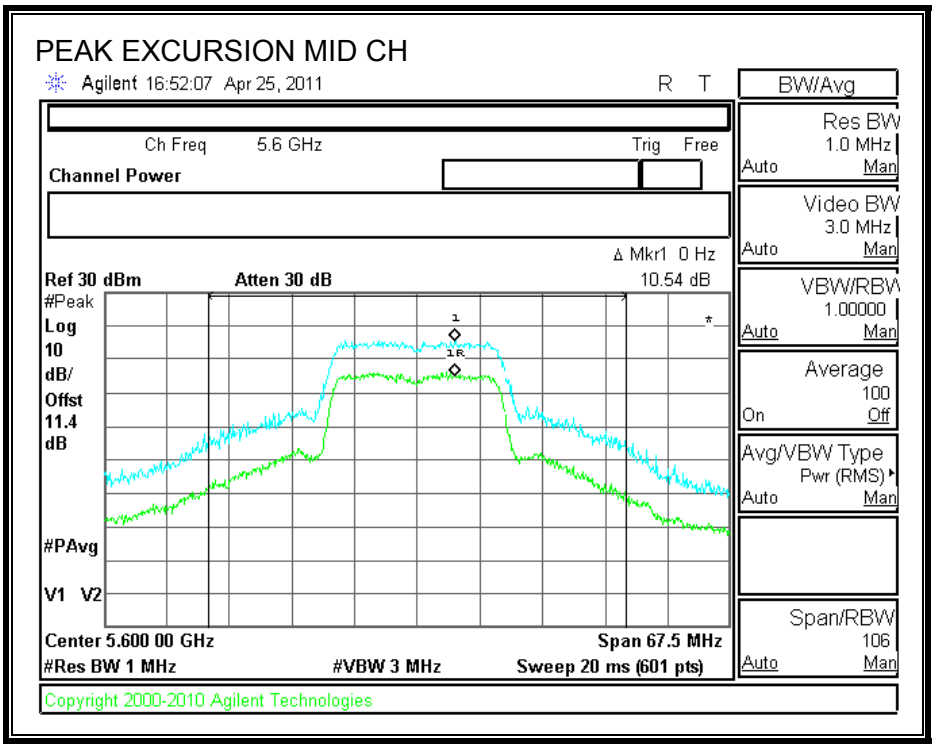
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

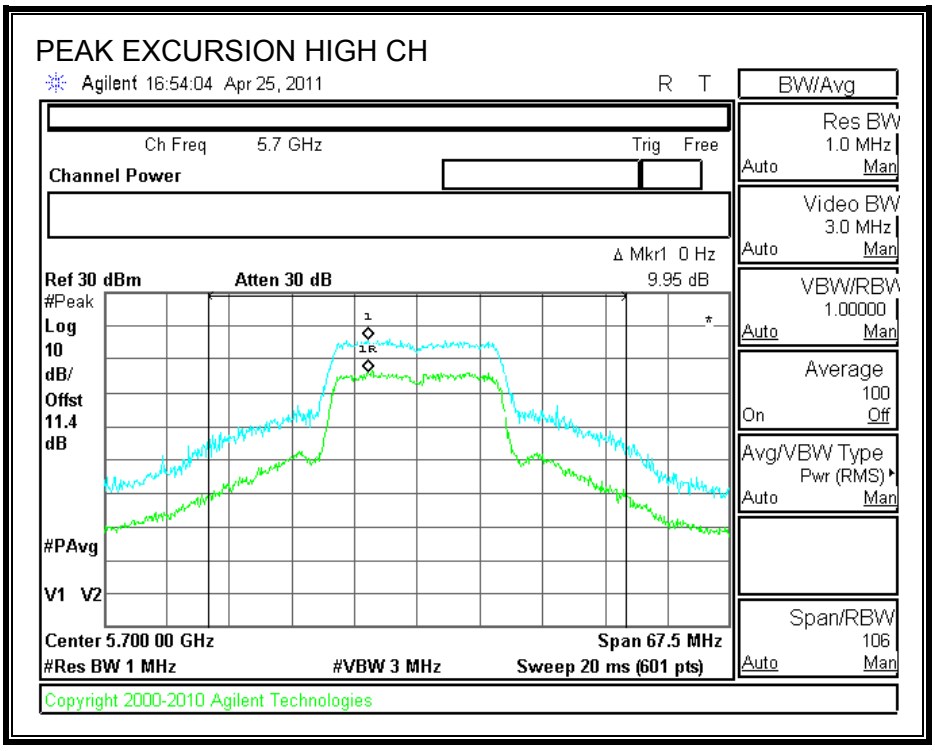
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	10.91	13	-2.09
Middle	5600	10.54	13	-2.46
High	5700	9.95	13	-3.05

PEAK EXCURSION







7.15.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CDD MCS0

7.16. 802.11n HT40 SISO MODE IN THE 5.6 GHz BAND

CDD MCS0

7.16.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

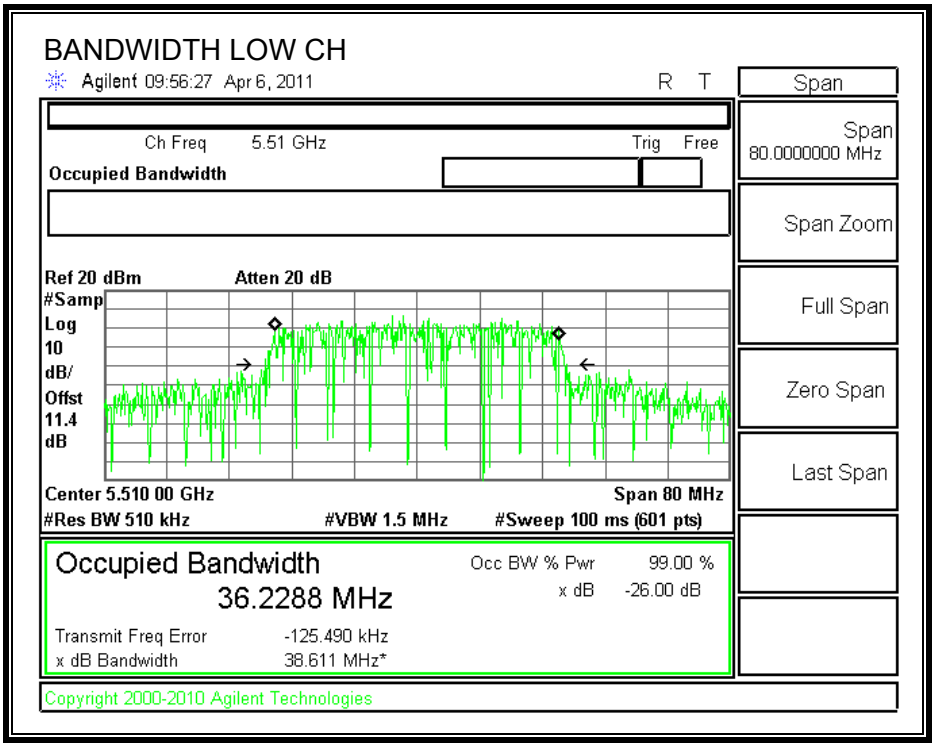
TEST PROCEDURE

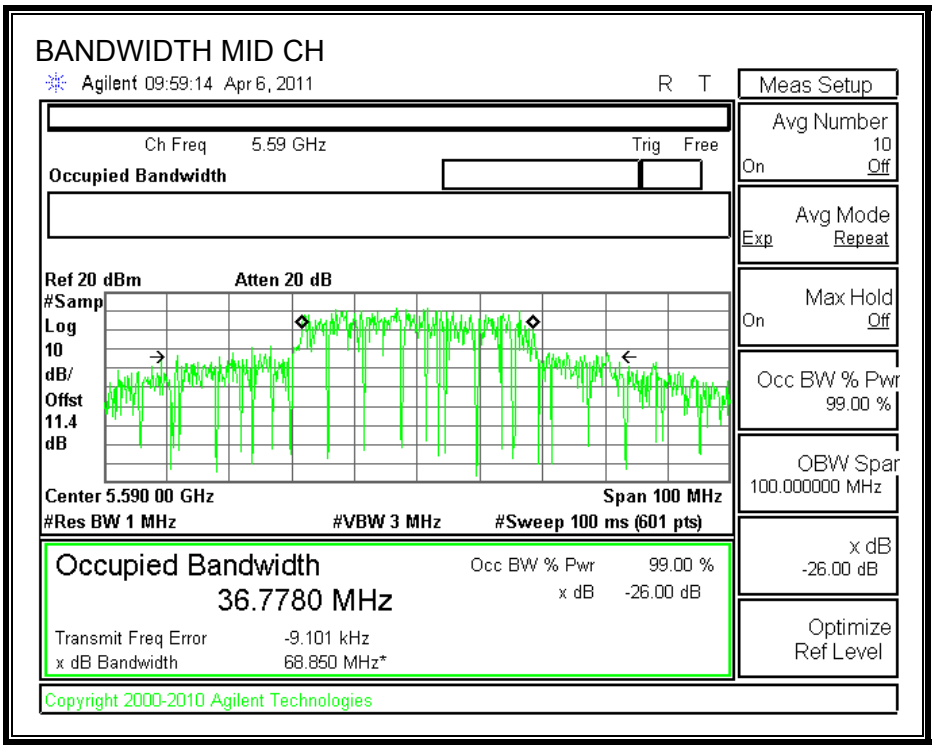
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

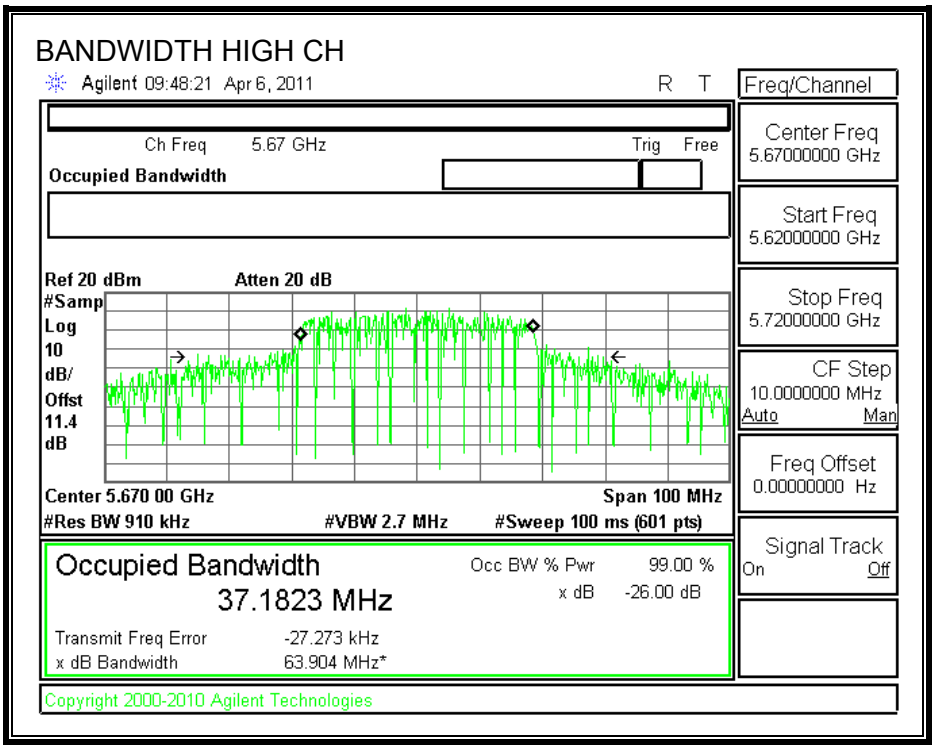
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	38.611	36.2288
Middle	5590	68.858	36.7780
High	5670	63.904	37.1823

26 dB and 99% BANDWIDTH







7.16.2. 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 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

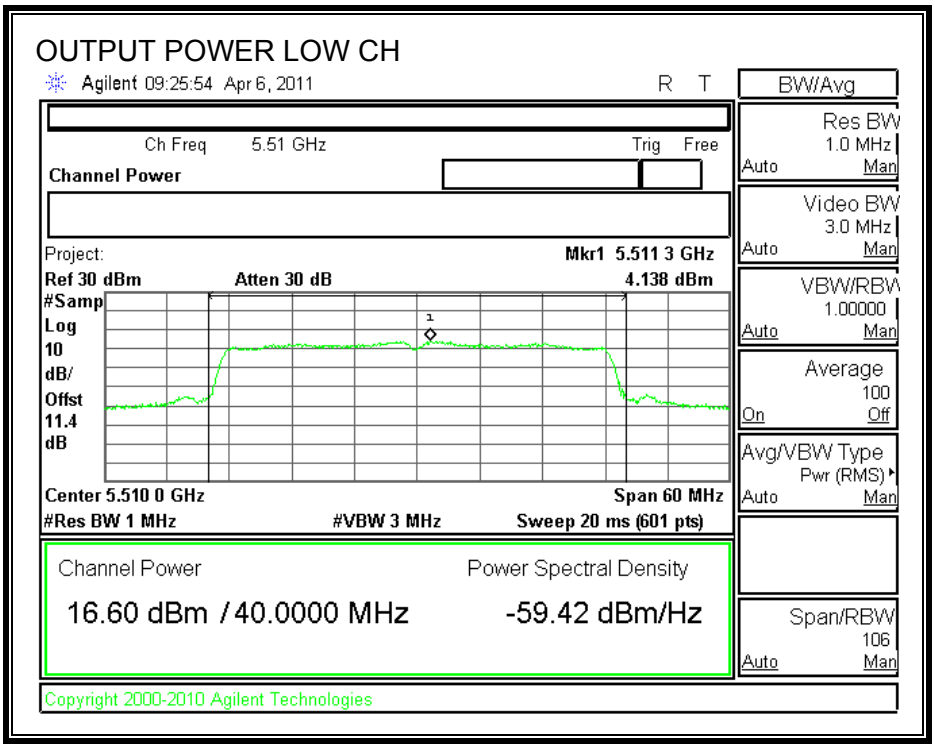
Limit

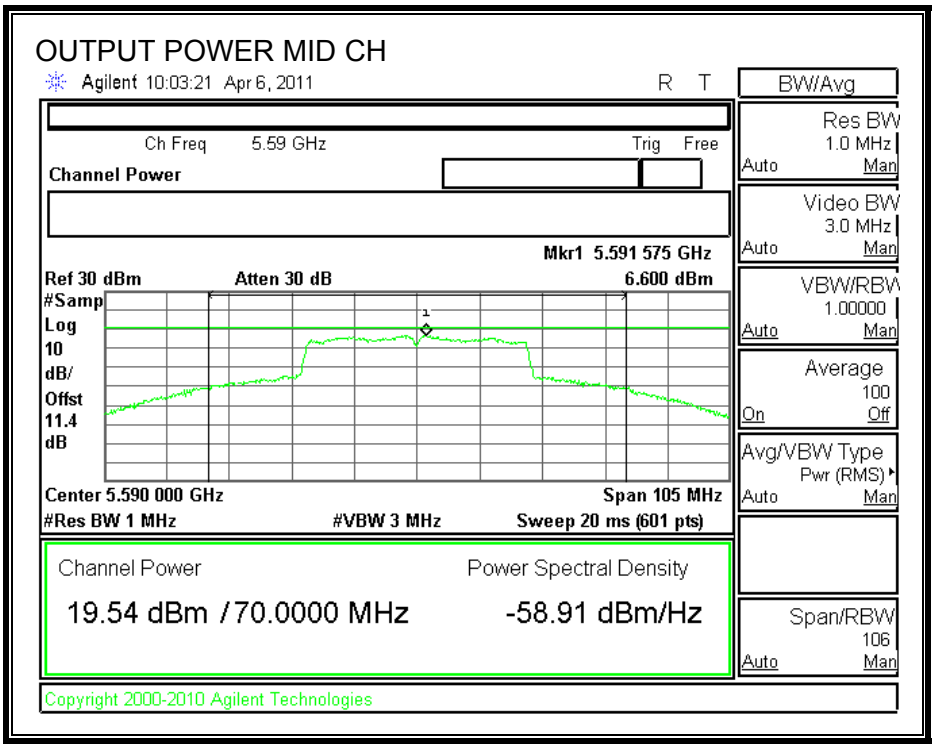
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5510	24	38.611	26.87	5.35	24.00
Mid	5590	24	68.858	29.38	5.35	24.00
High	5670	24	63.904	29.06	5.35	24.00

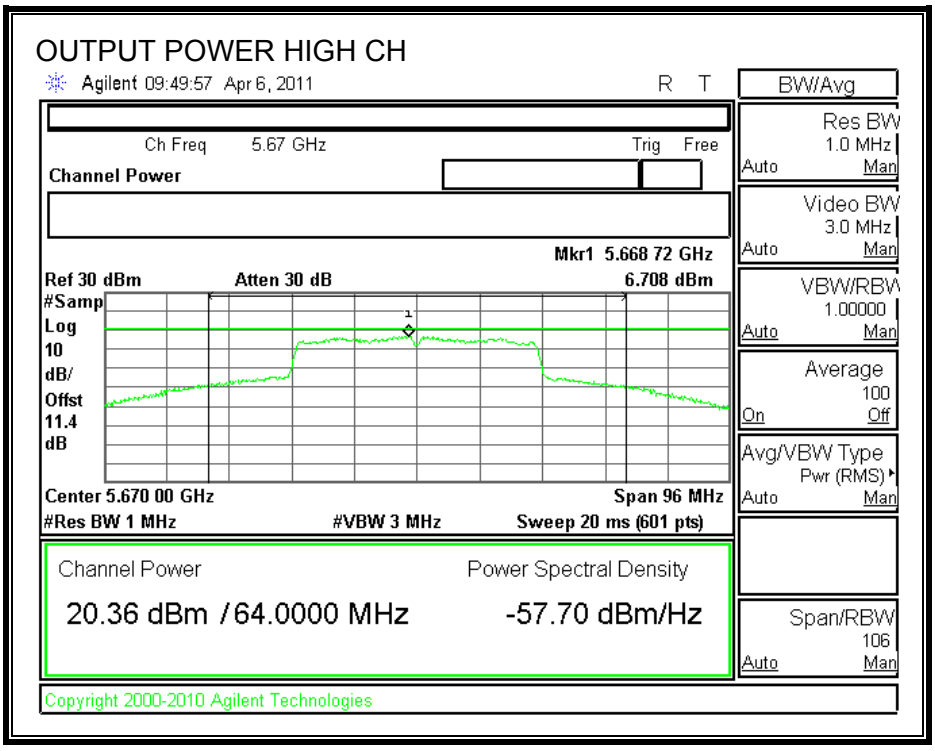
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	16.60	24.00	-7.40
Mid	5590	19.54	24.00	-4.46
High	5670	20.36	24.00	-3.64

OUTPUT POWER







7.16.3. 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

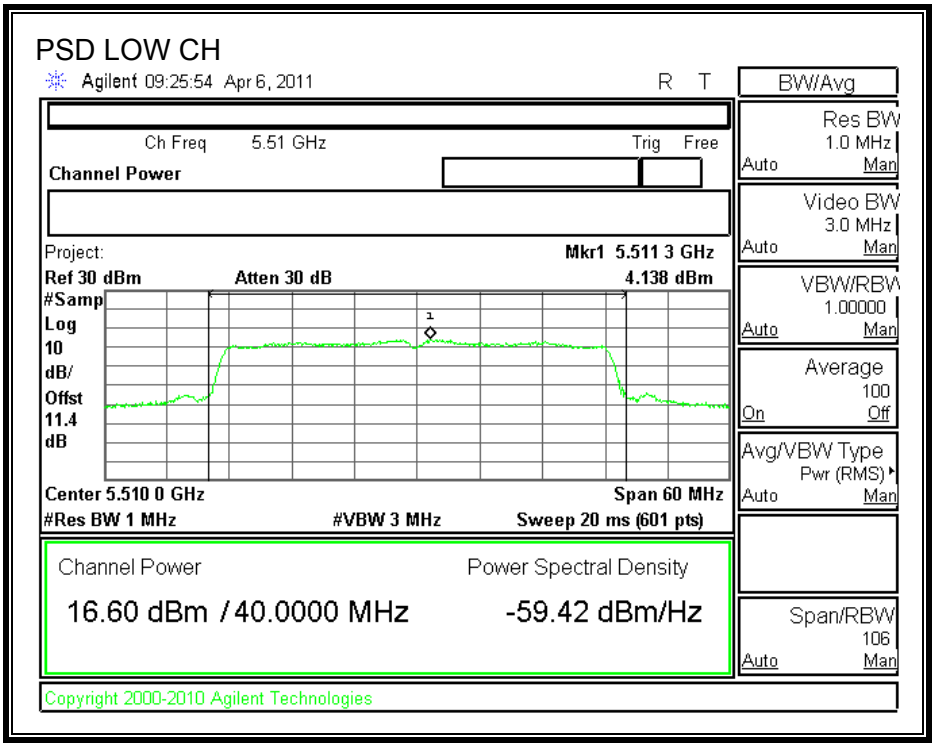
TEST PROCEDURE

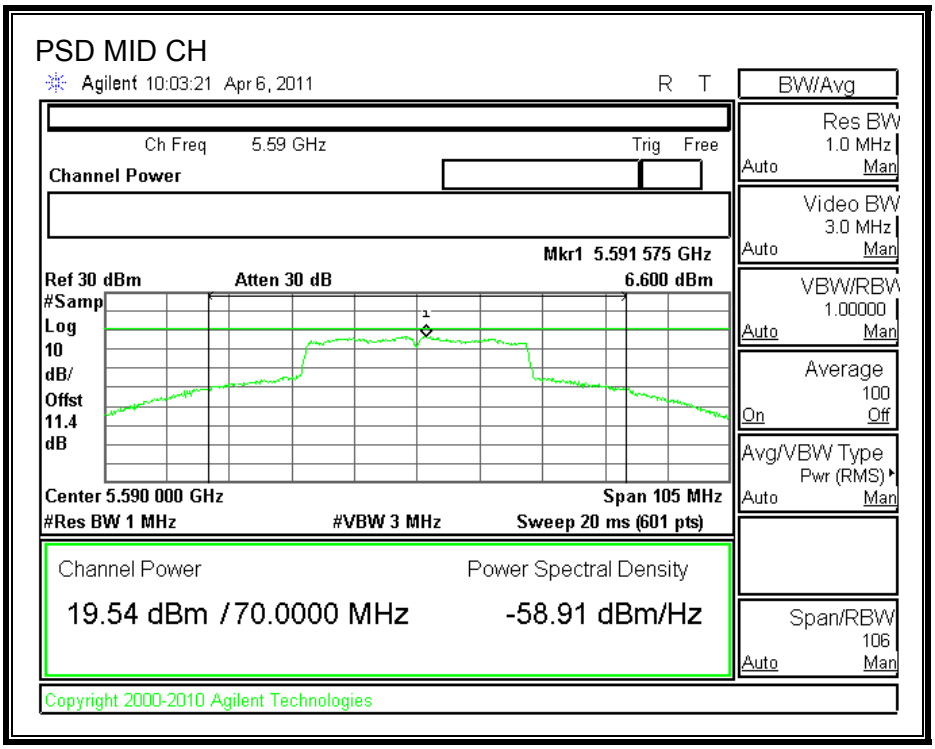
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

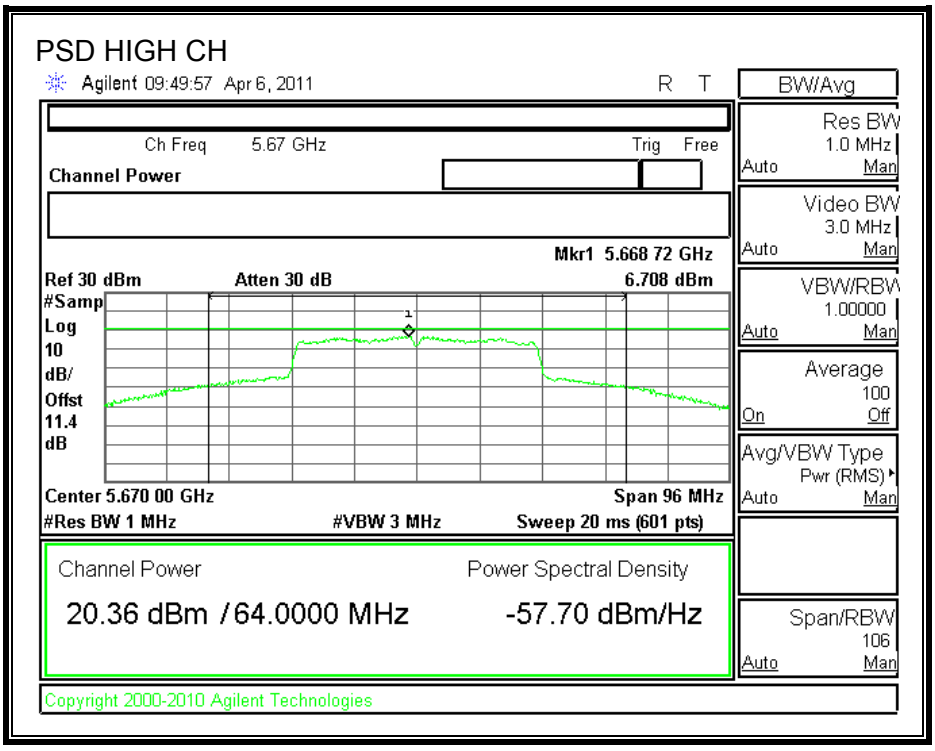
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	4.14	11	-6.86
Middle	5590	6.60	11	-4.40
High	5670	6.71	11	-4.29

POWER SPECTRAL DENSITY







7.16.4. 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

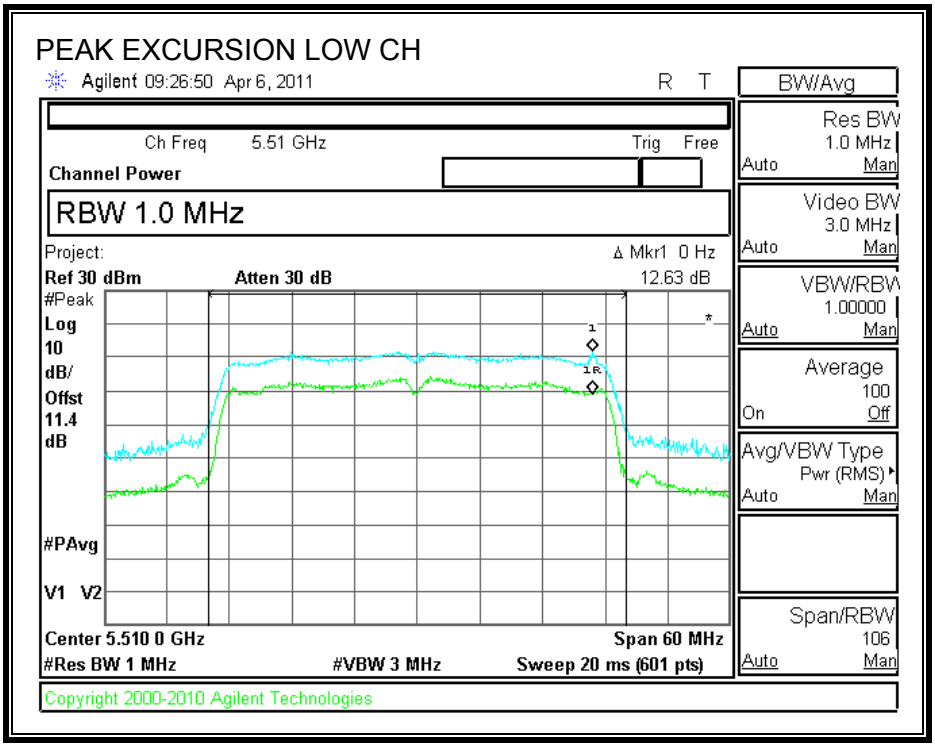
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

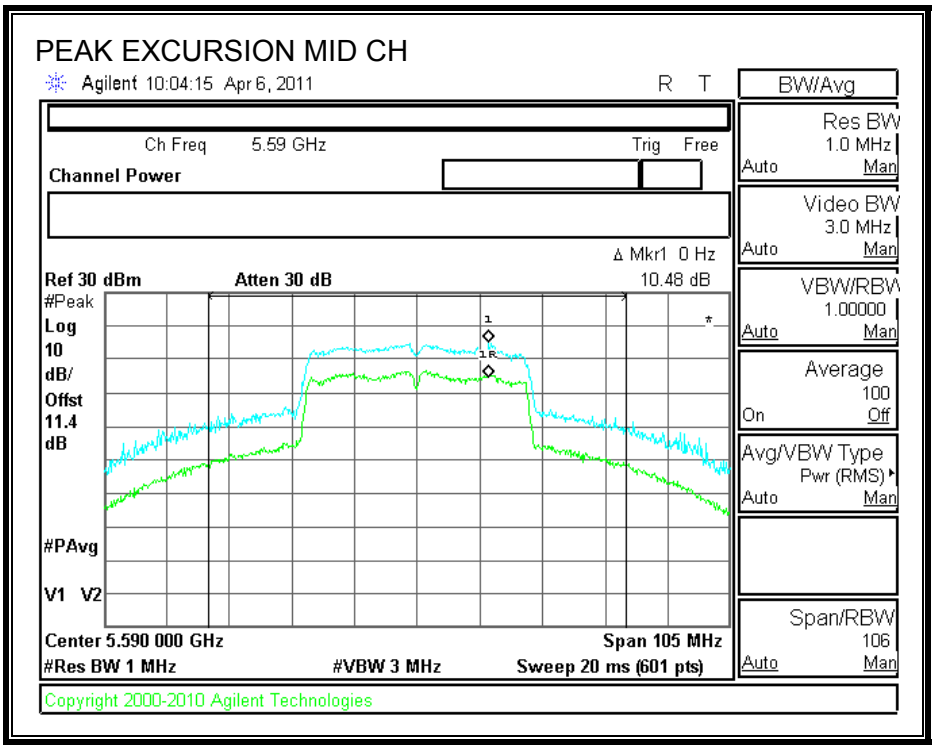
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

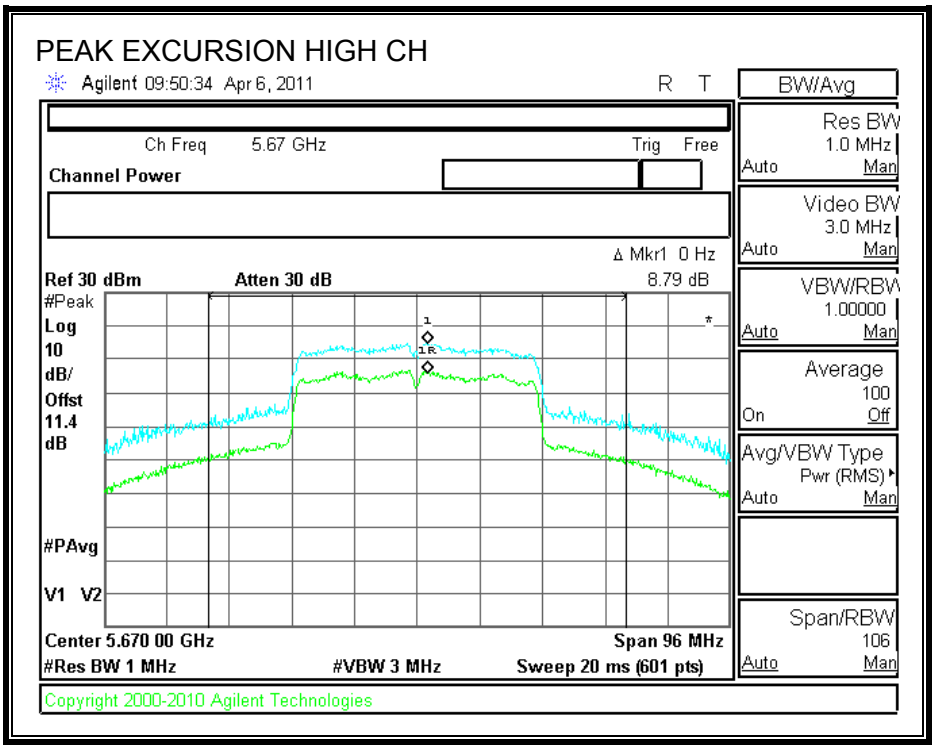
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	12.63	13	-0.37
Middle	5590	10.48	13	-2.52
High	5670	8.79	13	-4.21

PEAK EXCURSION







7.16.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0.

7.17. 802.11n DUAL CHAIN HT40 MODE IN THE 5.6 GHz BAND

CDD MCS0

7.17.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

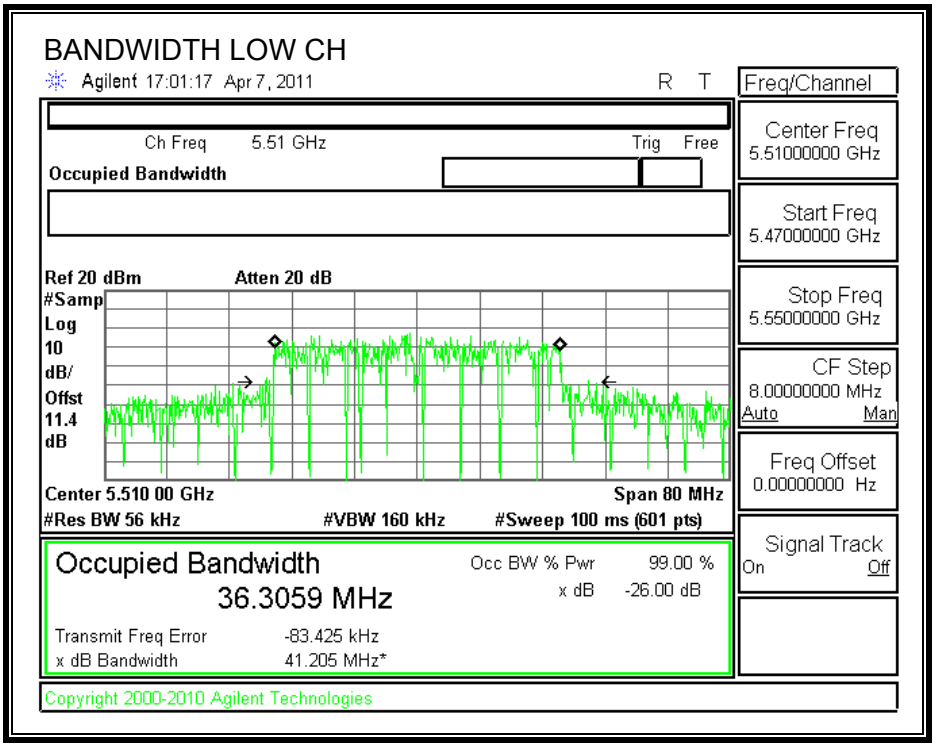
TEST PROCEDURE

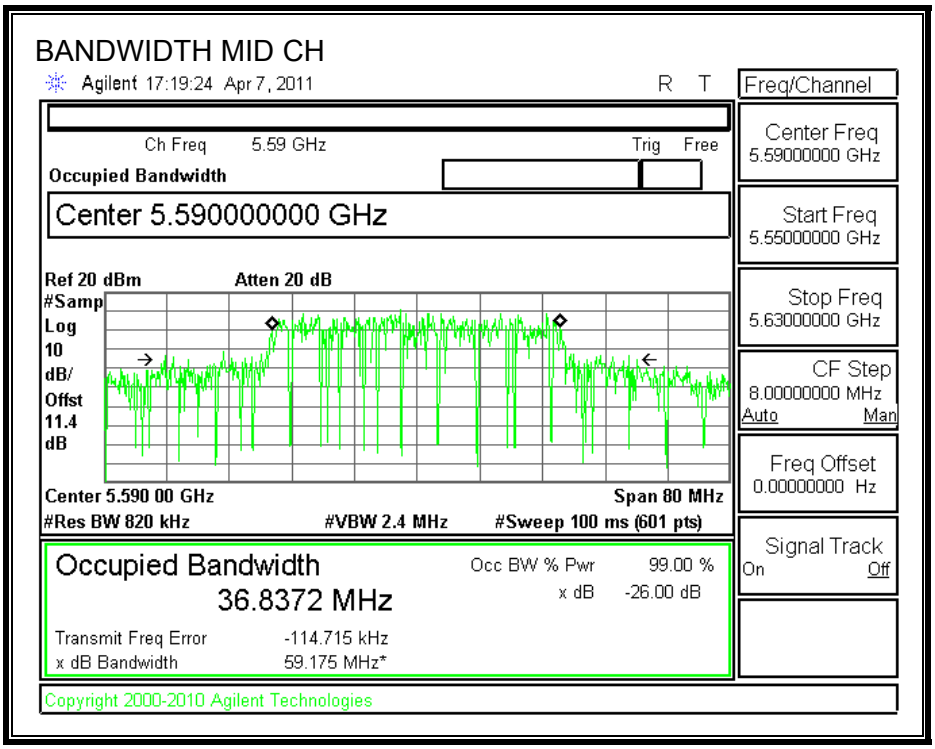
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

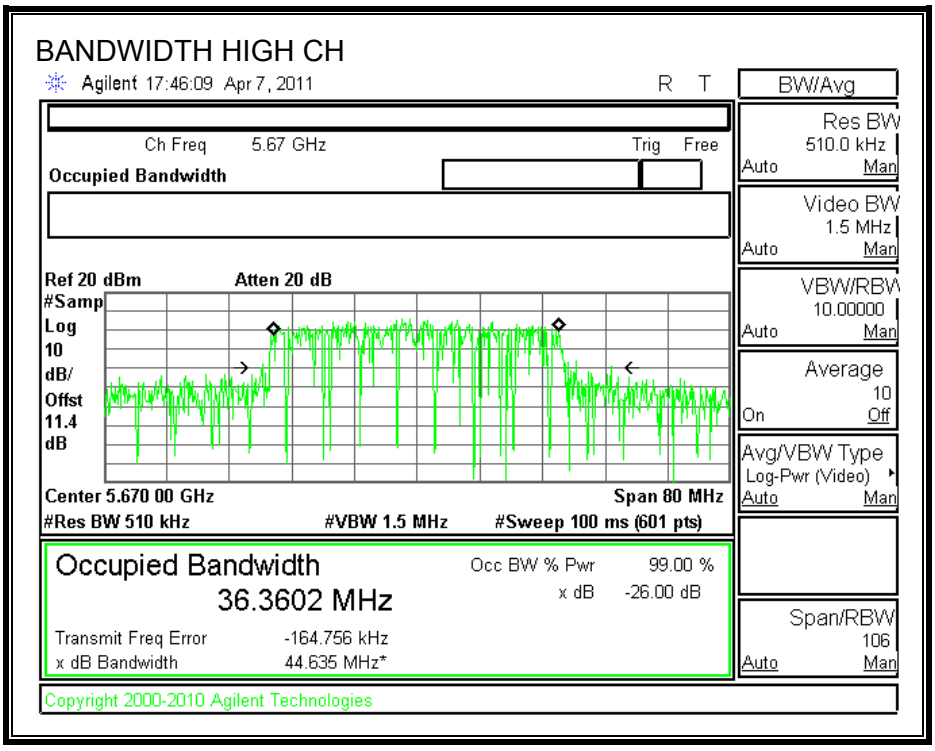
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	41.205	36.3059
Middle	5590	59.175	36.8372
High	5670	44.635	36.3602

26 dB and 99% BANDWIDTH







7.17.2. 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 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	41.205	27.15	8.05	21.95
Mid	5590	24	59.175	28.72	8.05	21.95
High	5670	24	44.635	27.50	8.05	21.95

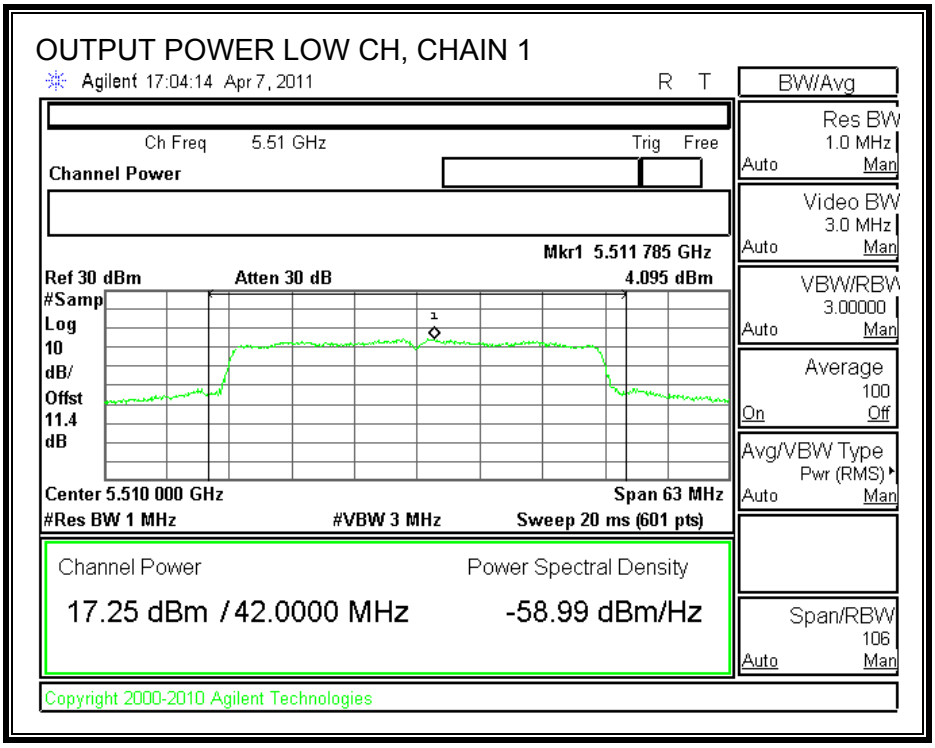
Individual Chain Results

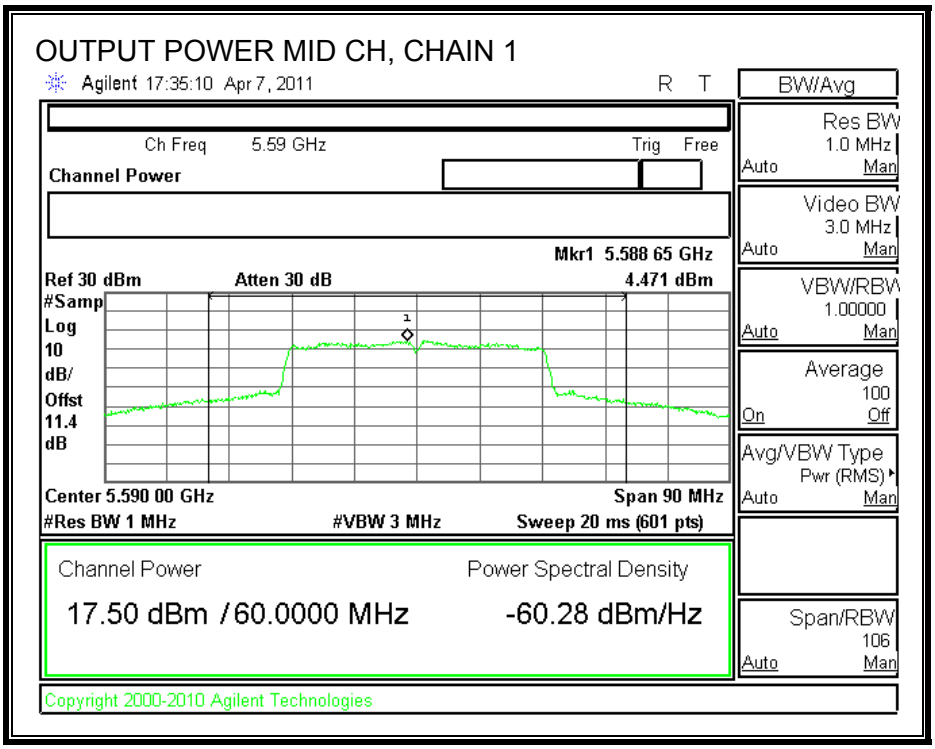
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	17.25	16.95	20.11	21.95	-1.84
Mid	5590	17.50	17.48	20.50	21.95	-1.45
High	5670	17.72	17.58	20.66	21.95	-1.29

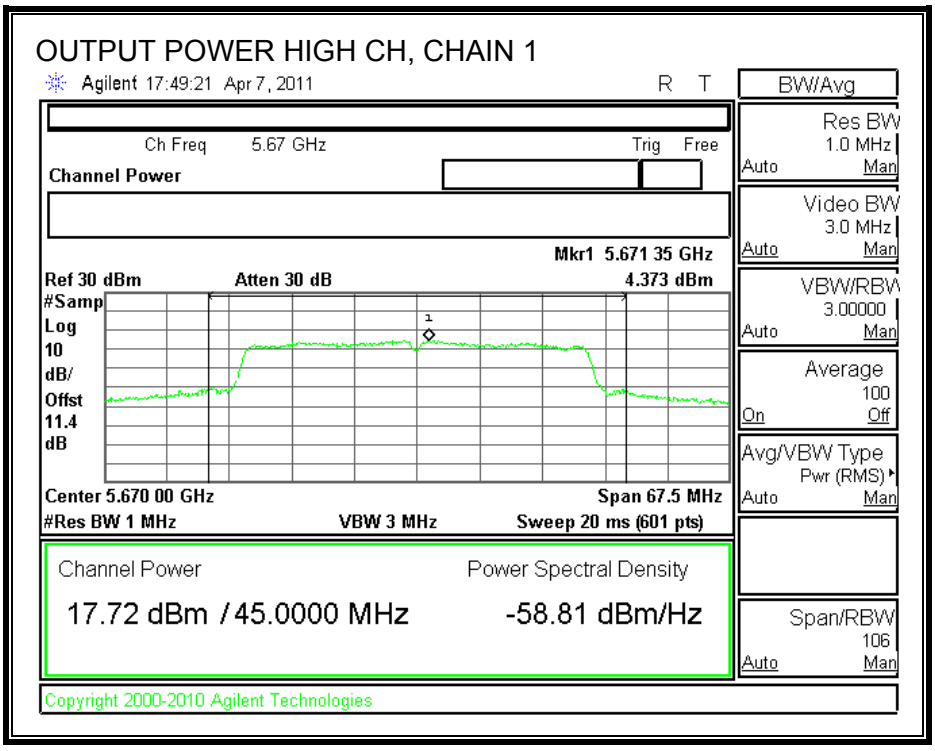
TPC Results

TPC Delta Power		Chain 1	Chain 2			
		5.06	5.01			
Worst-case TPC Power		Chain 1	Chain 2	Total Power	Ant Gain	EIRP
Low	5670	12.66	12.57	15.63	8.05	23.68
					TPC Limit (dBm)	24
					Margin (dB)	-0.32

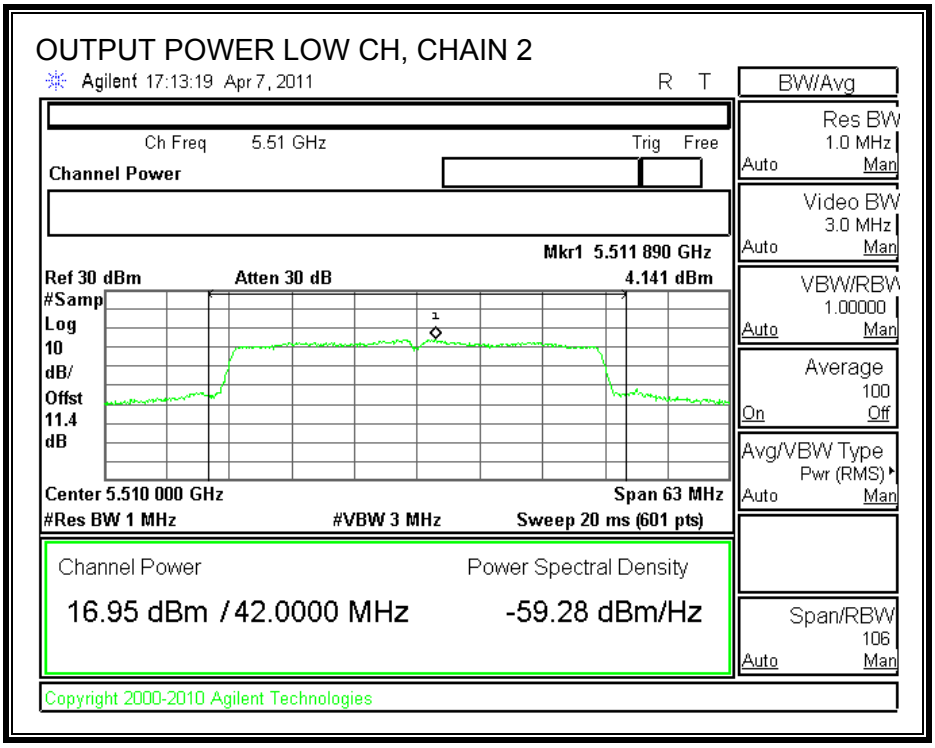
CHAIN 1 OUTPUT POWER

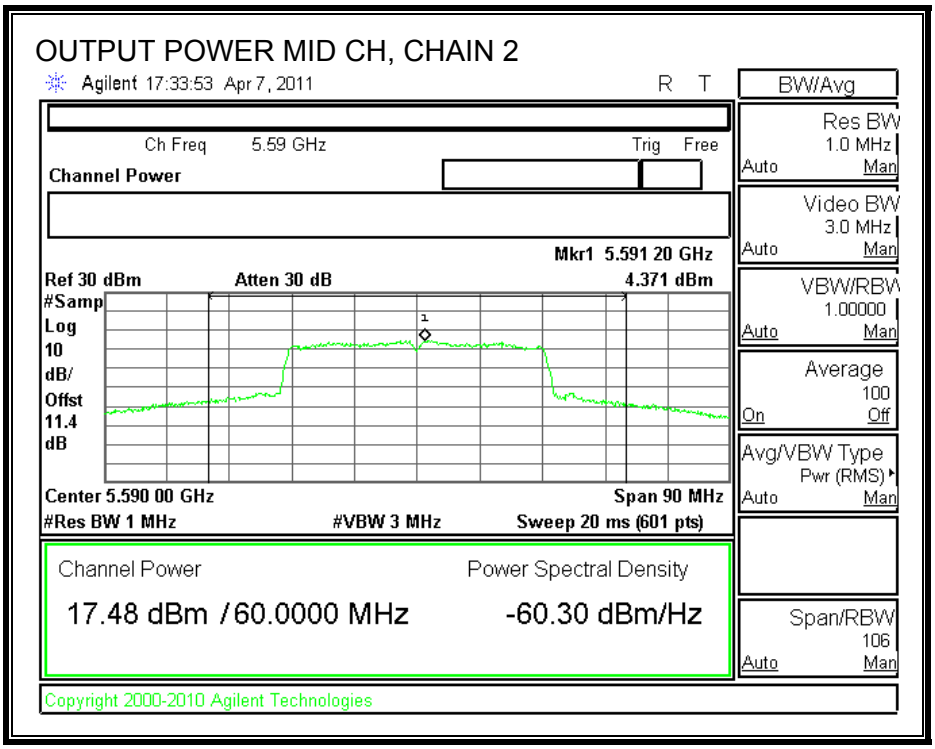


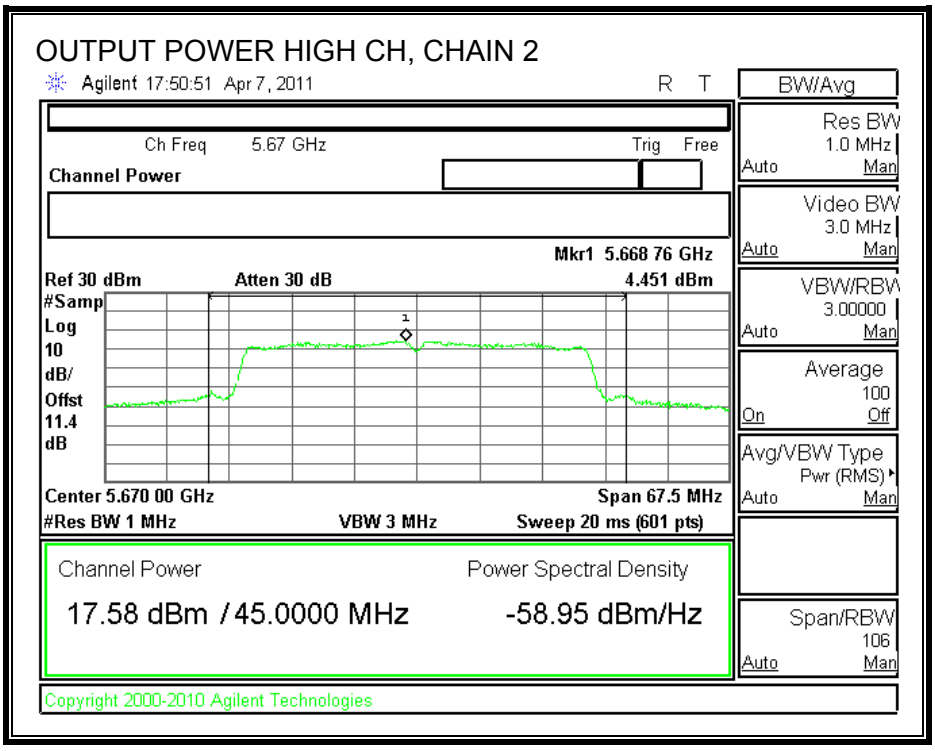




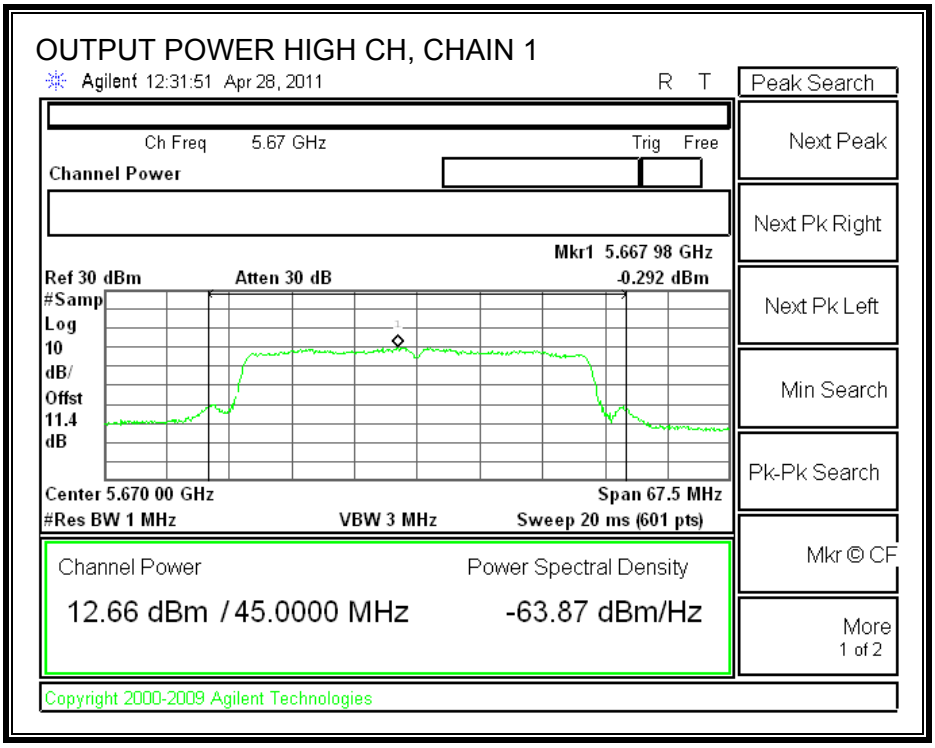
CHAIN 2 OUTPUT POWER

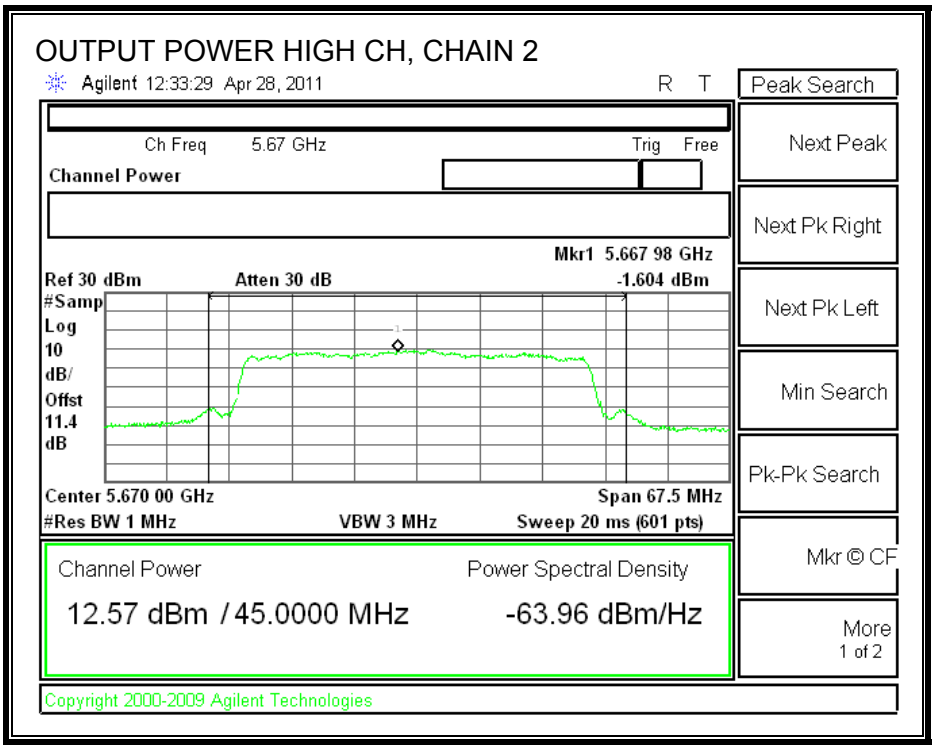






TPC OUTPUT POWER





7.17.3. 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 composite antenna gain is equal to 8.05 dBi, therefore the limit is 8.95 dBm.

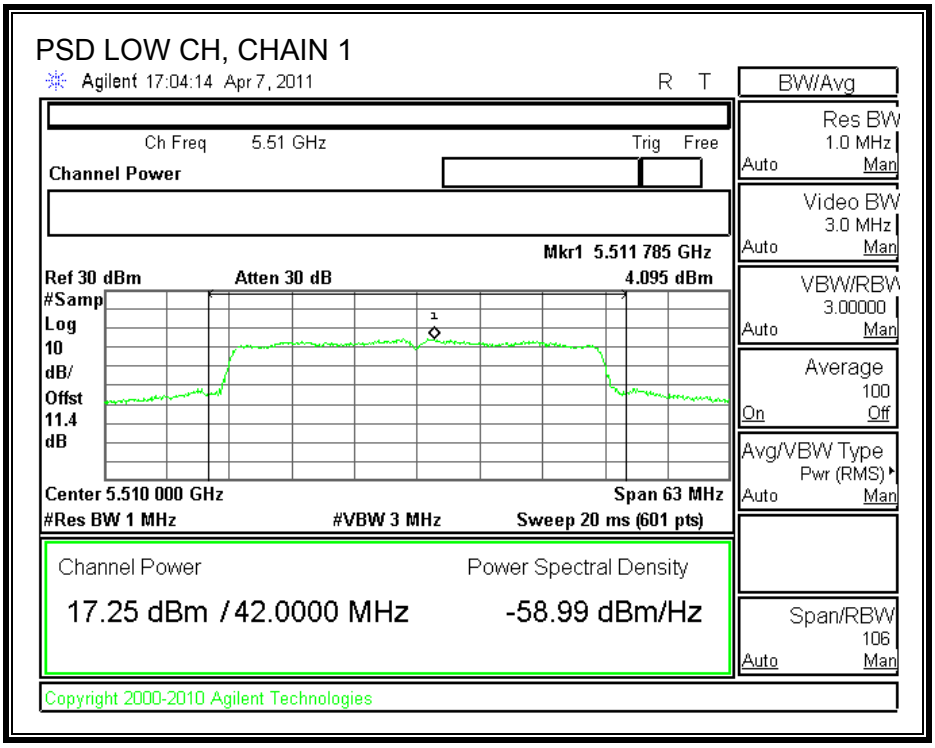
TEST PROCEDURE

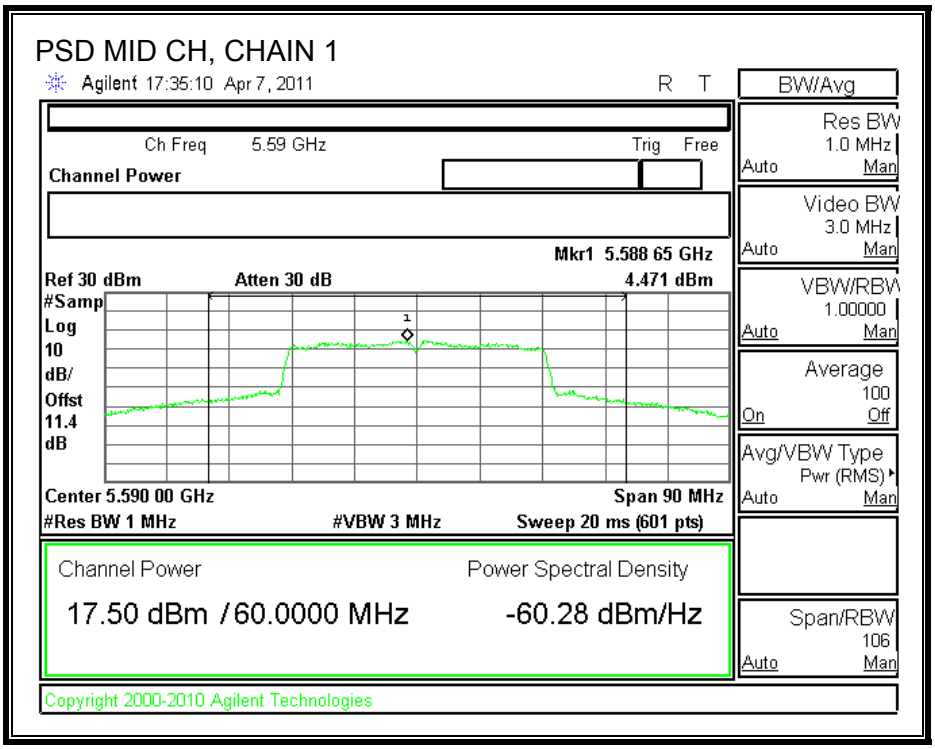
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

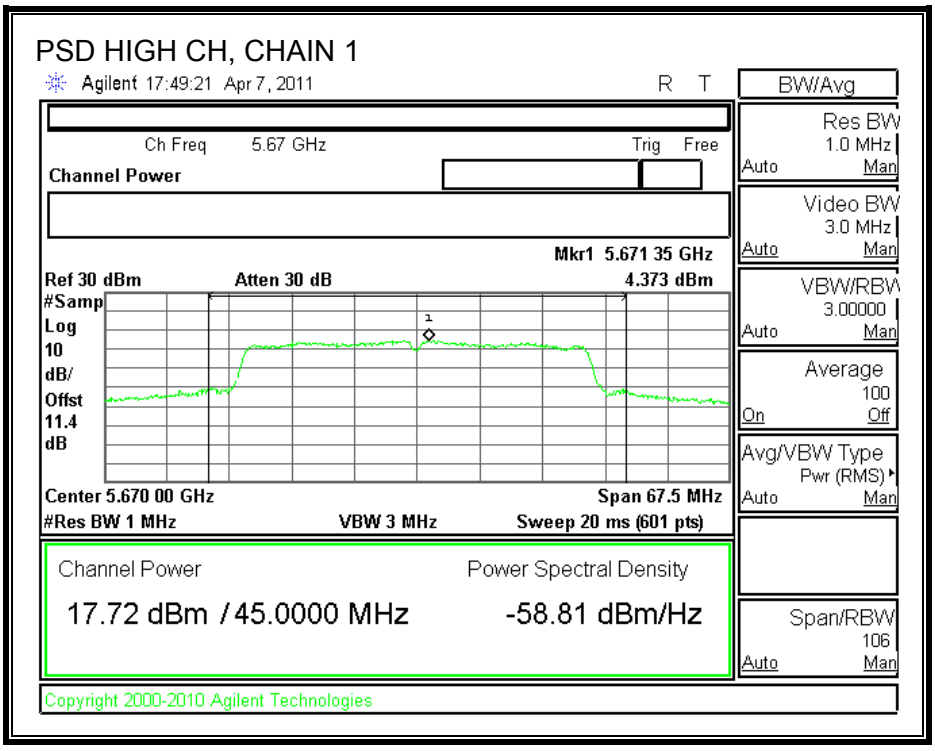
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	4.095	4.141	7.13	8.95	-1.82
Middle	5550	4.471	4.371	7.43	8.95	-1.52
High	5670	4.373	4.451	7.42	8.95	-1.53

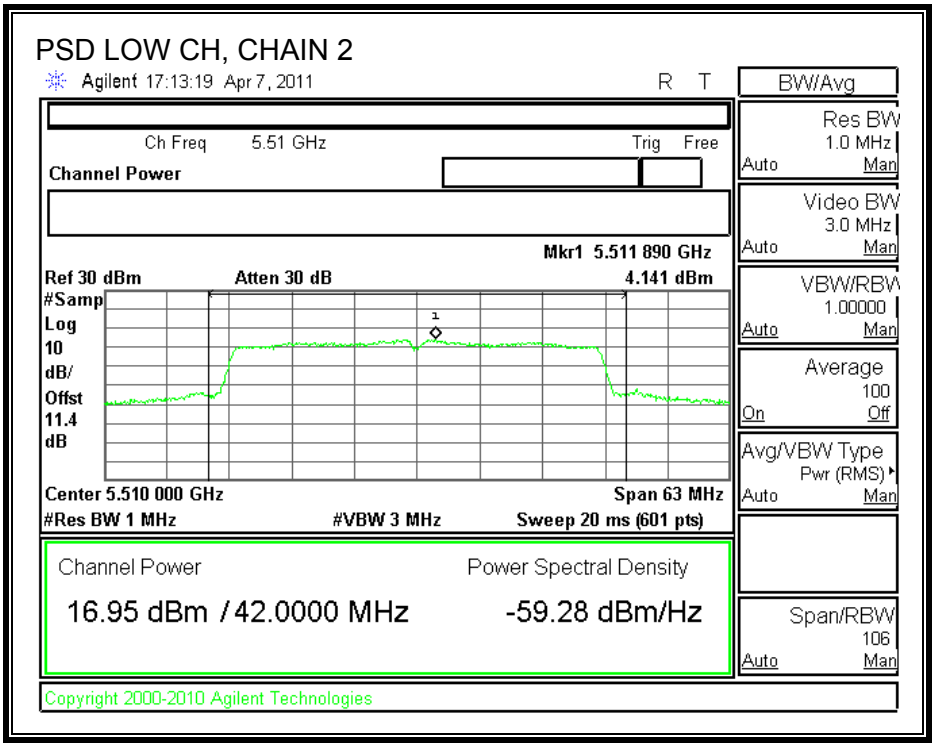
CHAIN 1 POWER SPECTRAL DENSITY

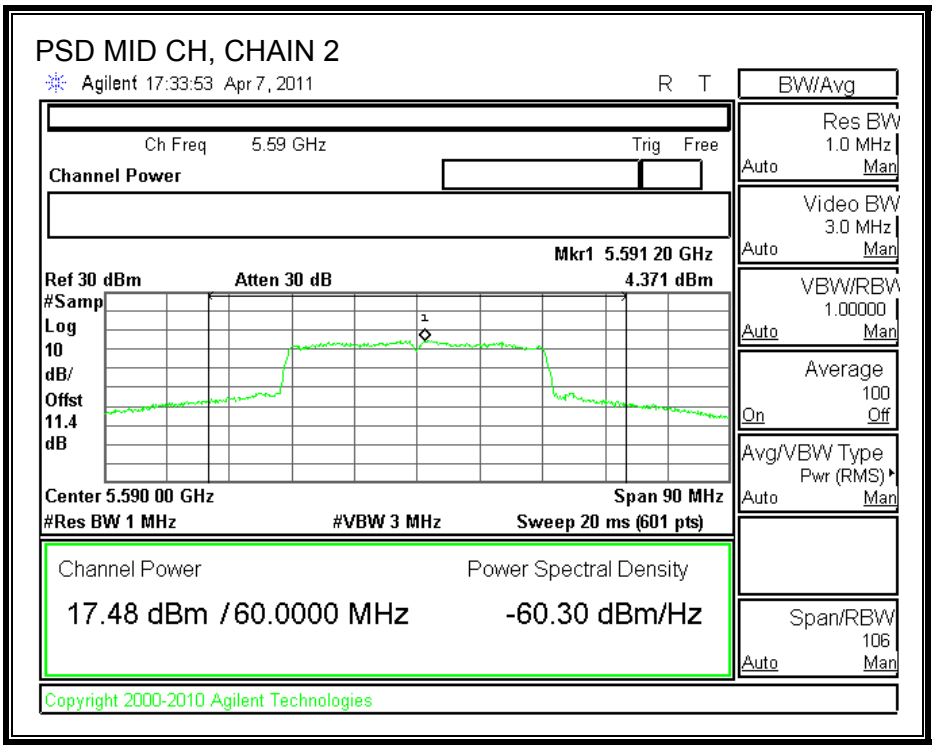


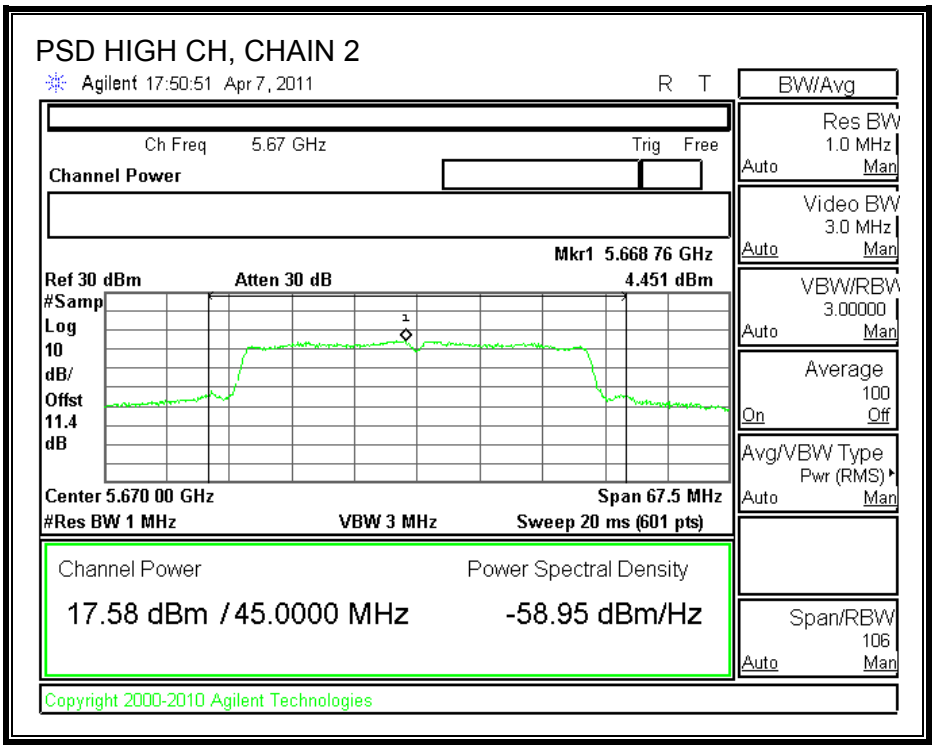




CHAIN 2 POWER SPECTRAL DENSITY







7.17.4. 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.

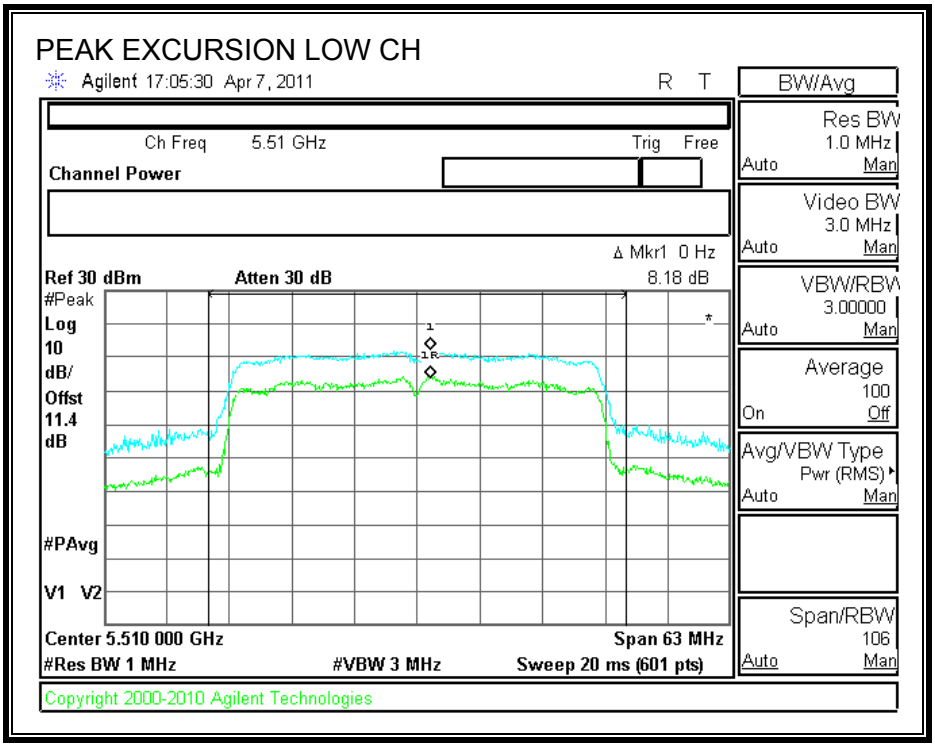
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

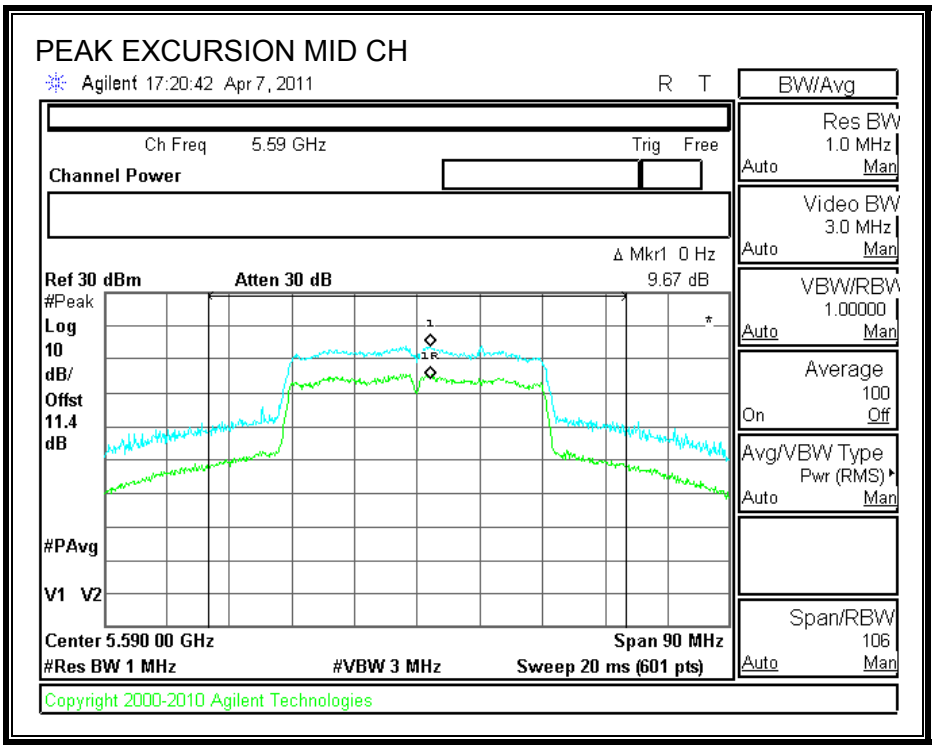
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

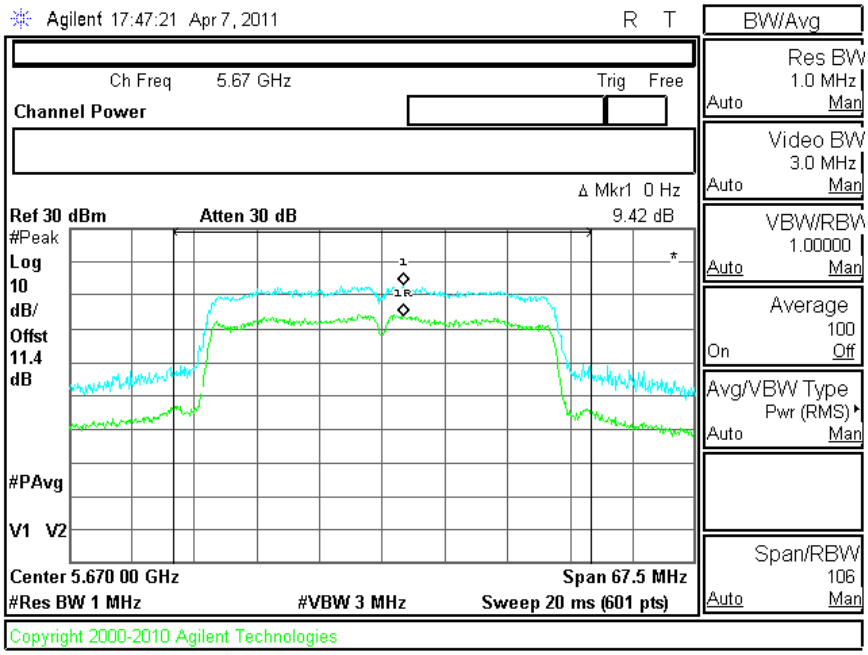
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	8.18	13	-4.82
Middle	5590	9.67	13	-3.33
High	5670	9.42	13	-3.58

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.17.5. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0

7.18. 802.11n THREE CHAINS HT40 MODE IN THE 5.6 GHz BAND

CDD MCS0

7.18.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

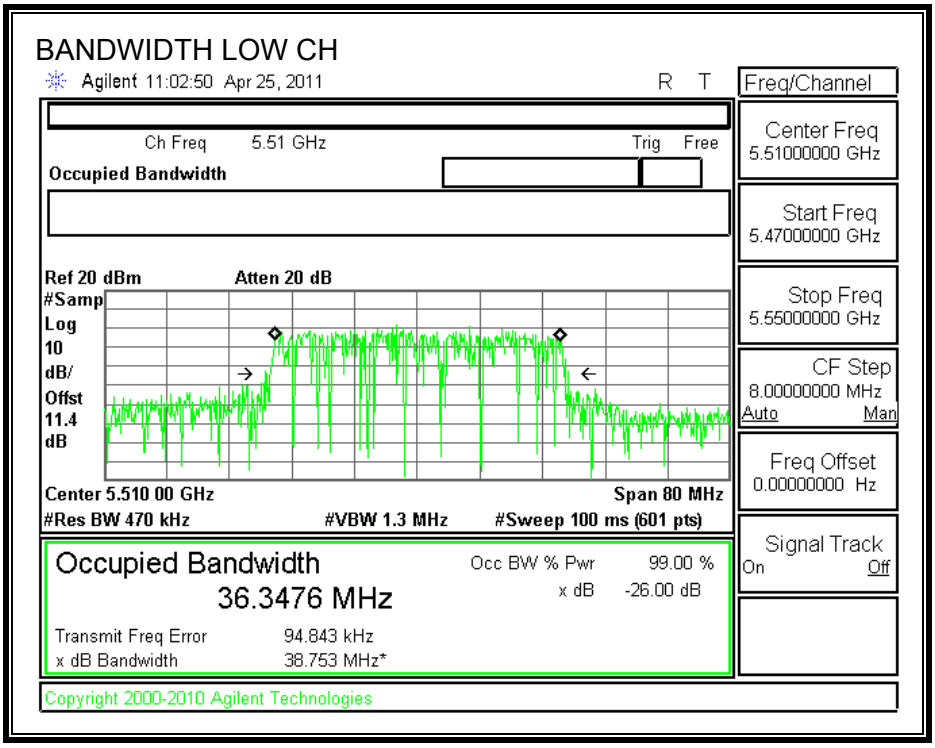
TEST PROCEDURE

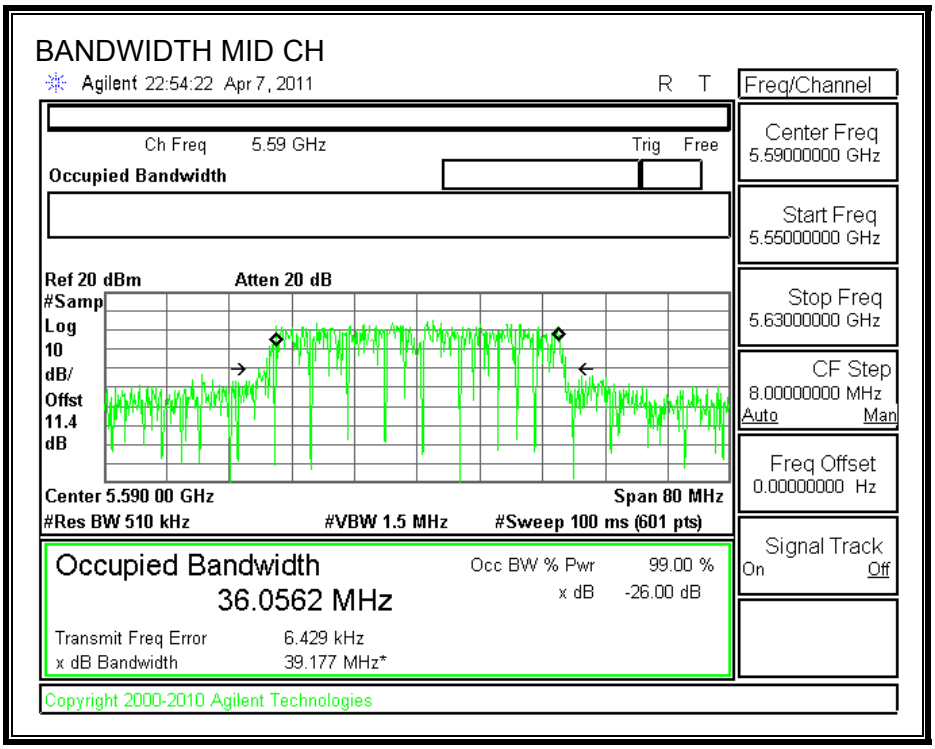
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

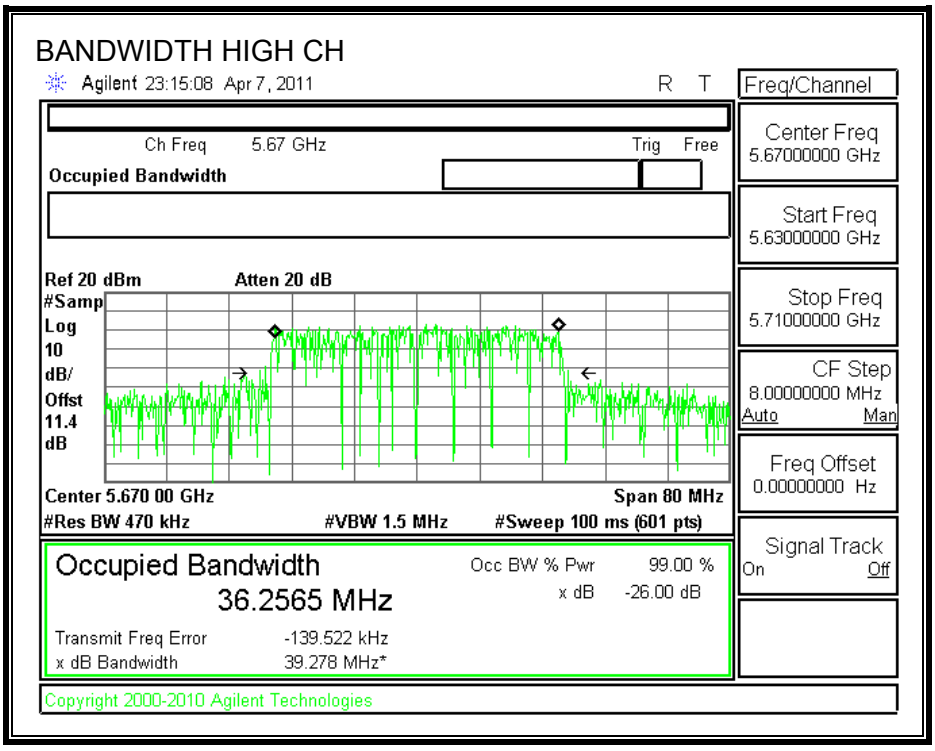
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	38.753	36.3476
Middle	5590	39.177	36.0562
High	5670	39.278	36.2565

26 dB and 99% BANDWIDTH







7.18.2. 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 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	23.98	38.753	26.88	9.21	20.77
Mid	5590	23.98	39.177	26.93	9.21	20.77
High	5670	23.98	39.278	26.94	9.21	20.77

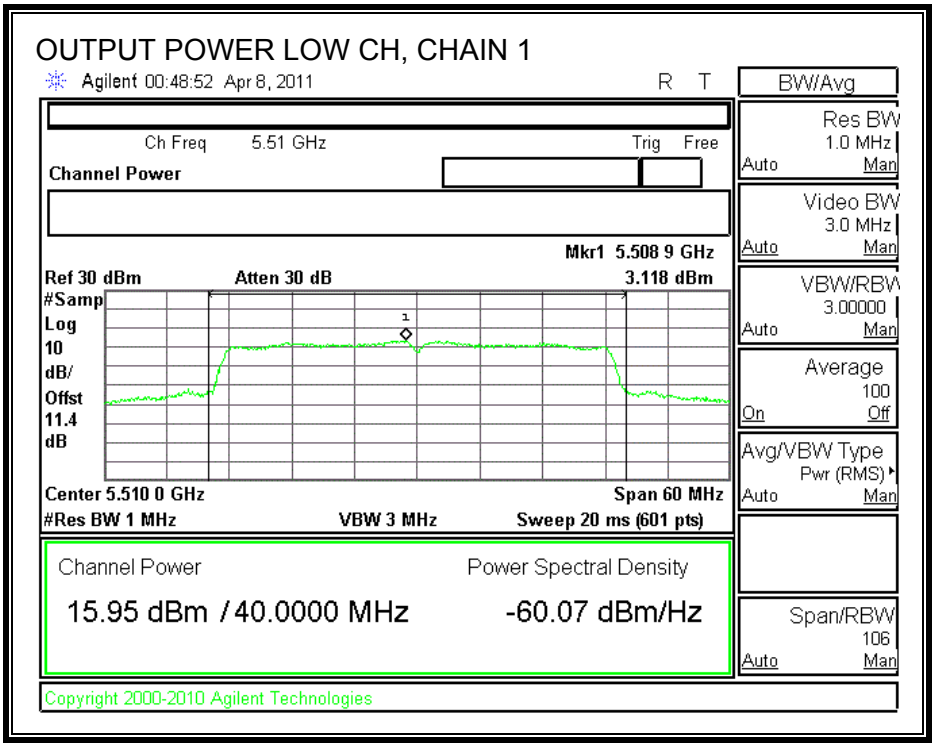
Individual Chain Results

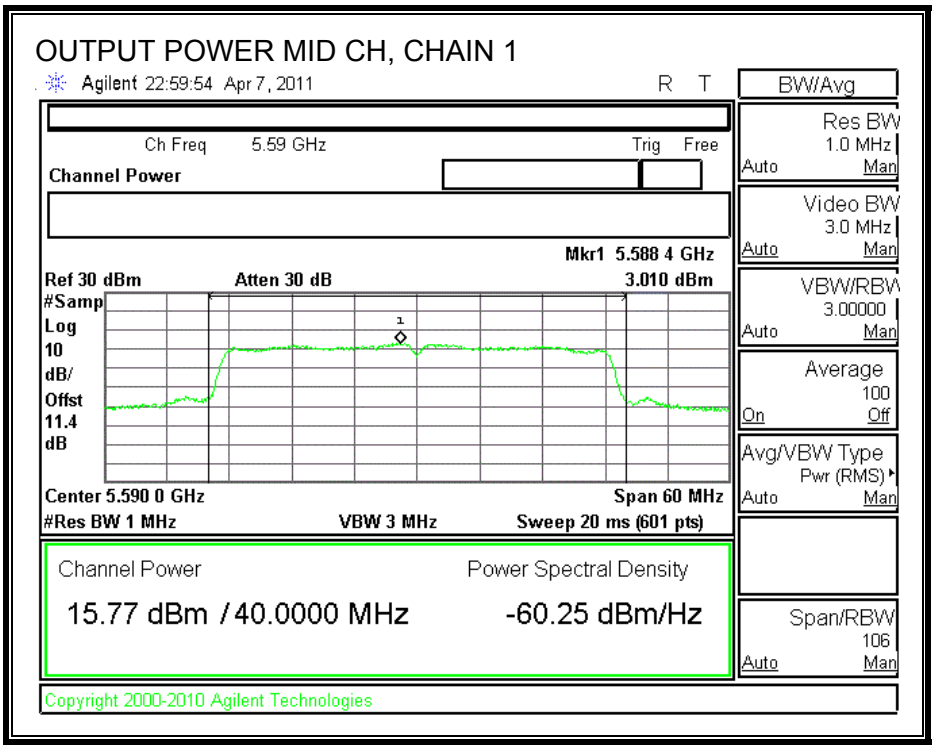
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	15.95	15.98	15.97	20.74	20.77	-0.03
Mid	5590	15.77	15.82	15.84	20.58	20.77	-0.19
High	5670	15.72	15.85	15.63	20.51	20.77	-0.26

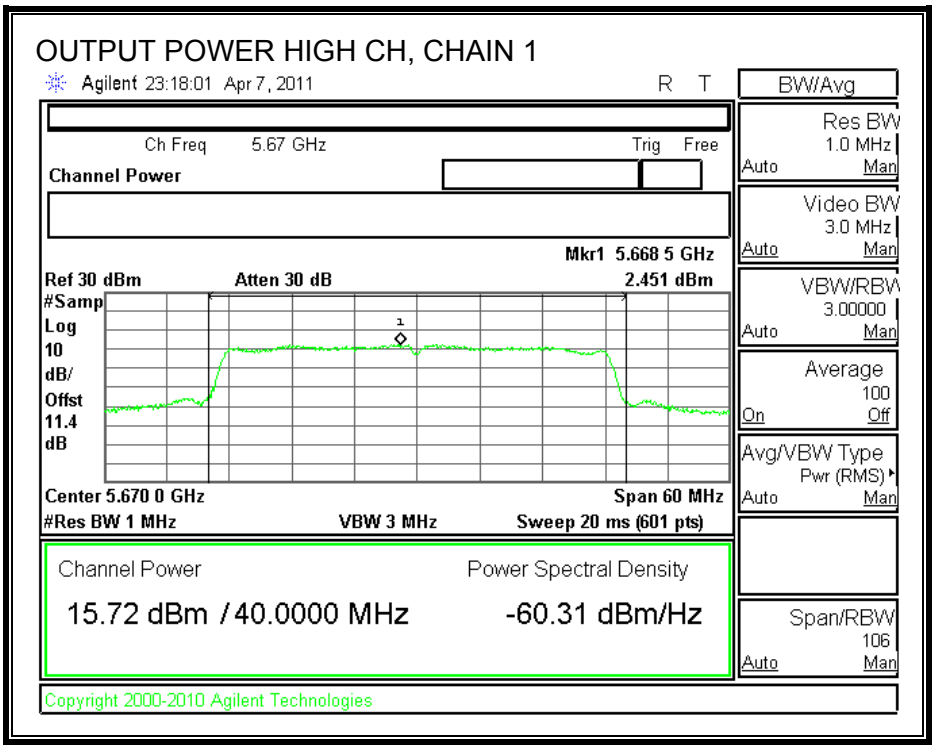
TPC Results

TPC Delta Power		Chain 1	Chain 2	Chain 3			
		6.12	6.14	6.26			
Worst-case TPC Power		Chain 1	Chain 2	Chain 3	Total Power	Ant Gain	EIRP
Low	5510	9.83	9.84	9.71	14.56	9.21	23.77
						TPC Limit (dBm)	24
						Margin (dB)	-0.23

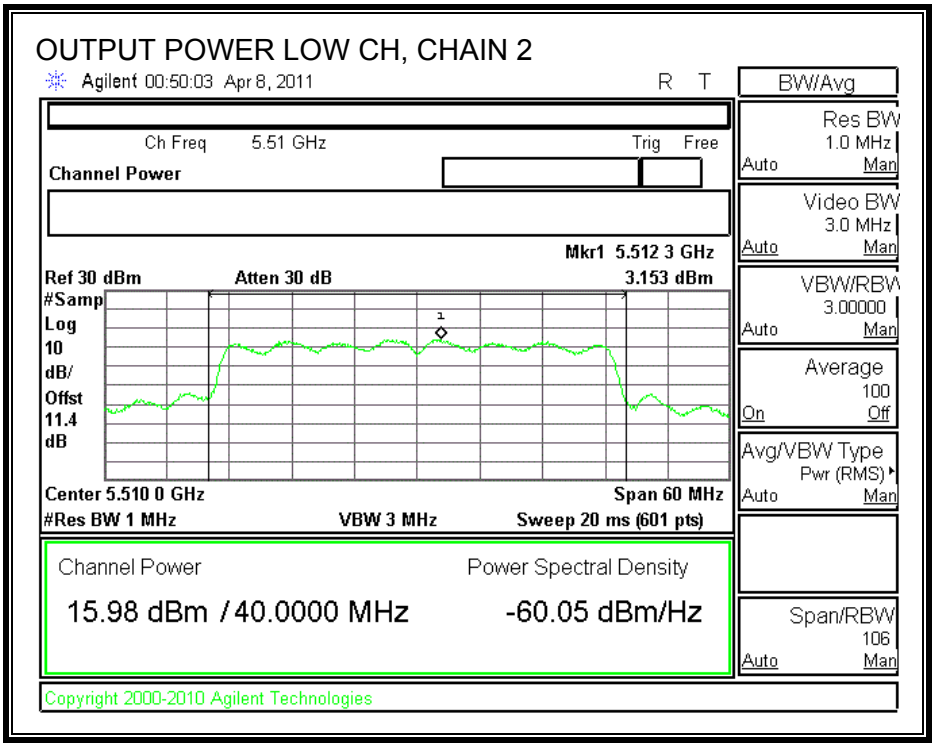
CHAIN 1 OUTPUT POWER

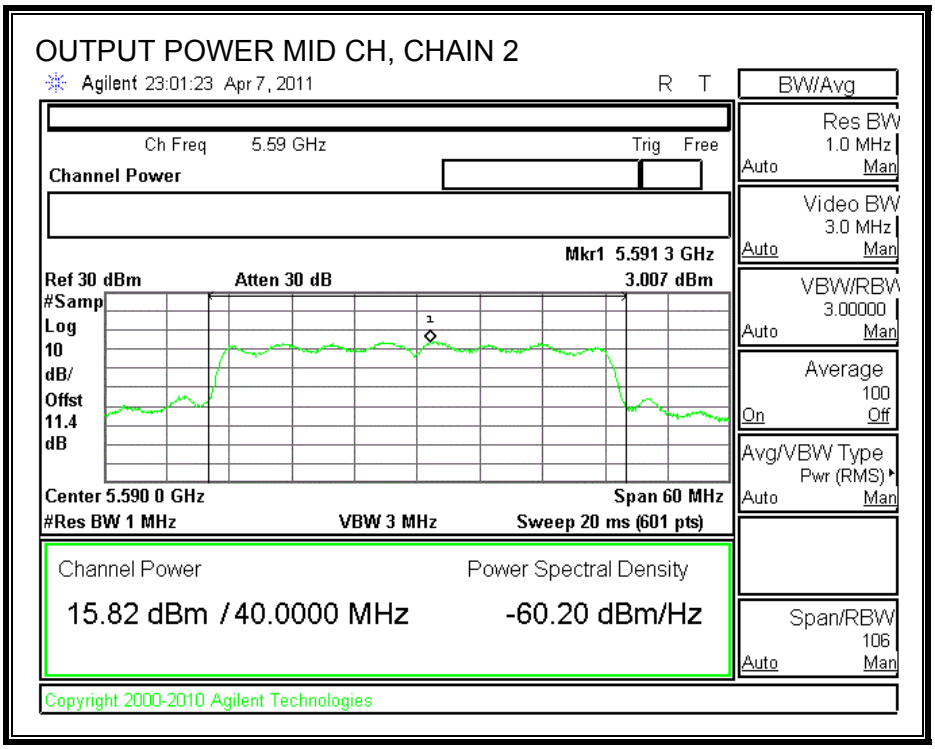


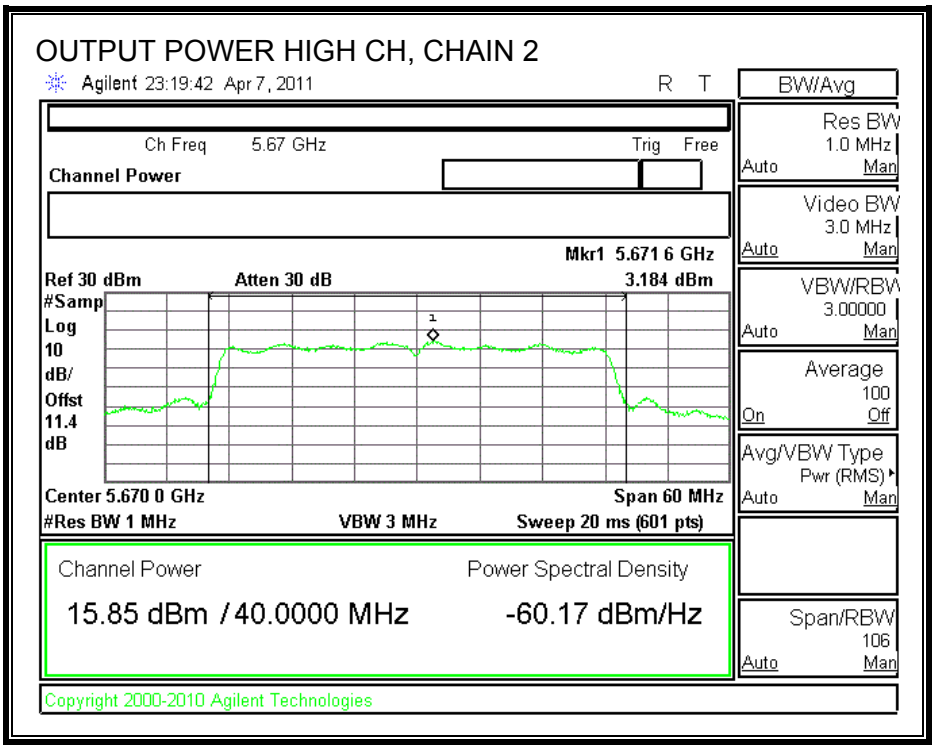




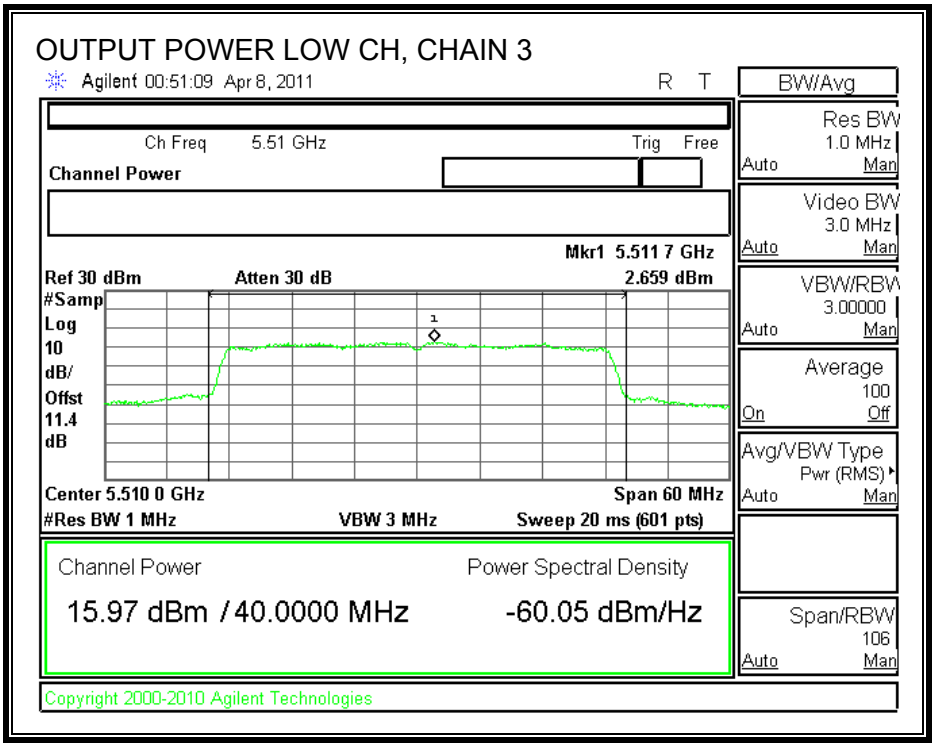
CHAIN 2 OUTPUT POWER

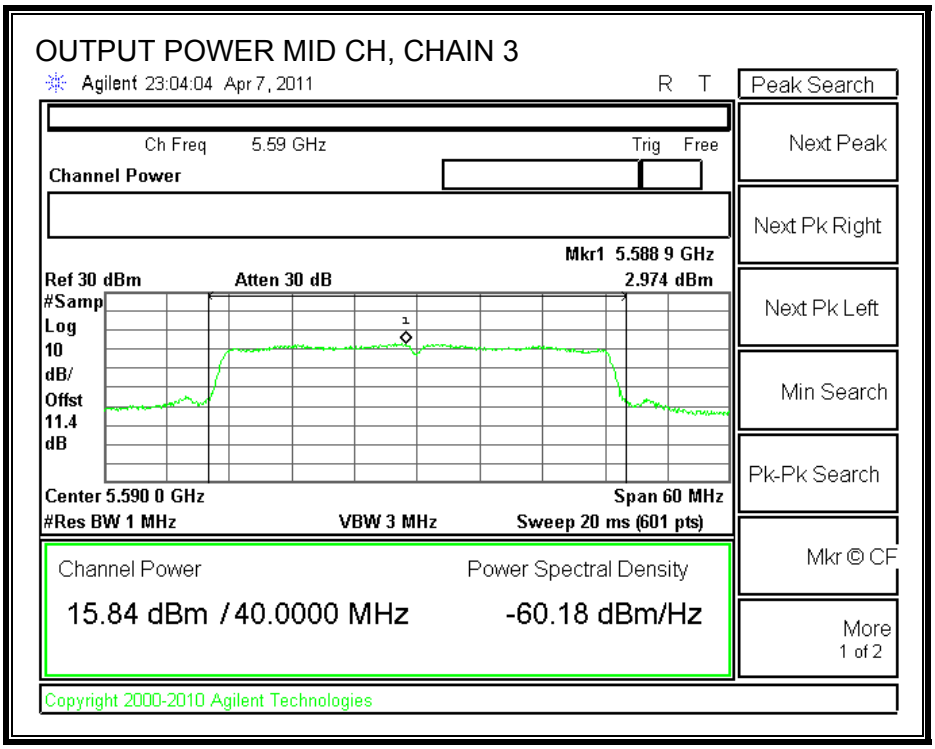


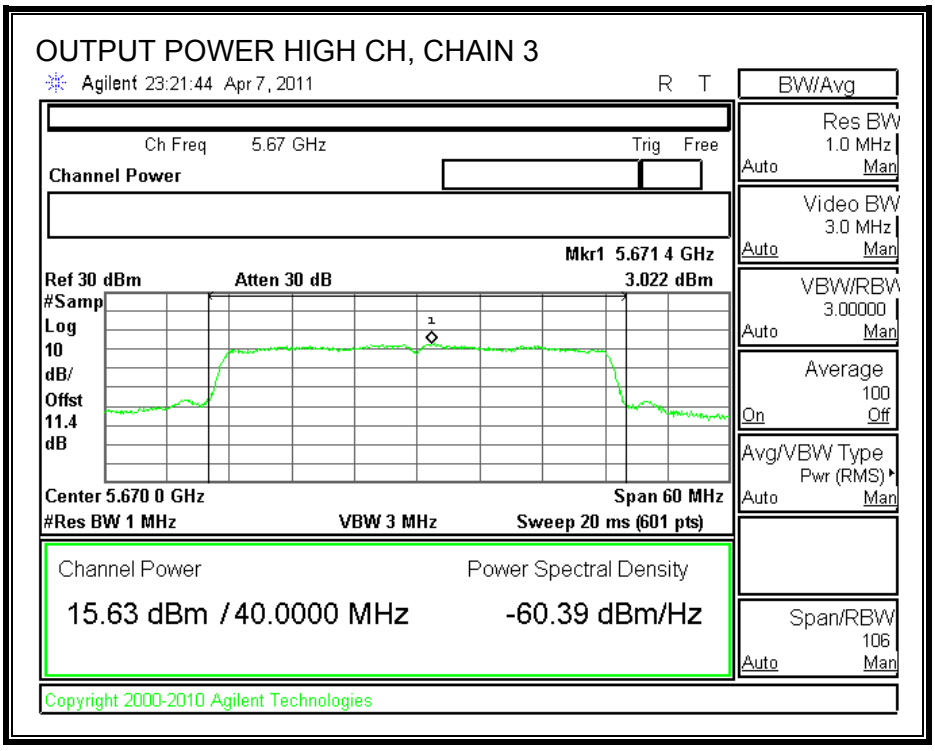




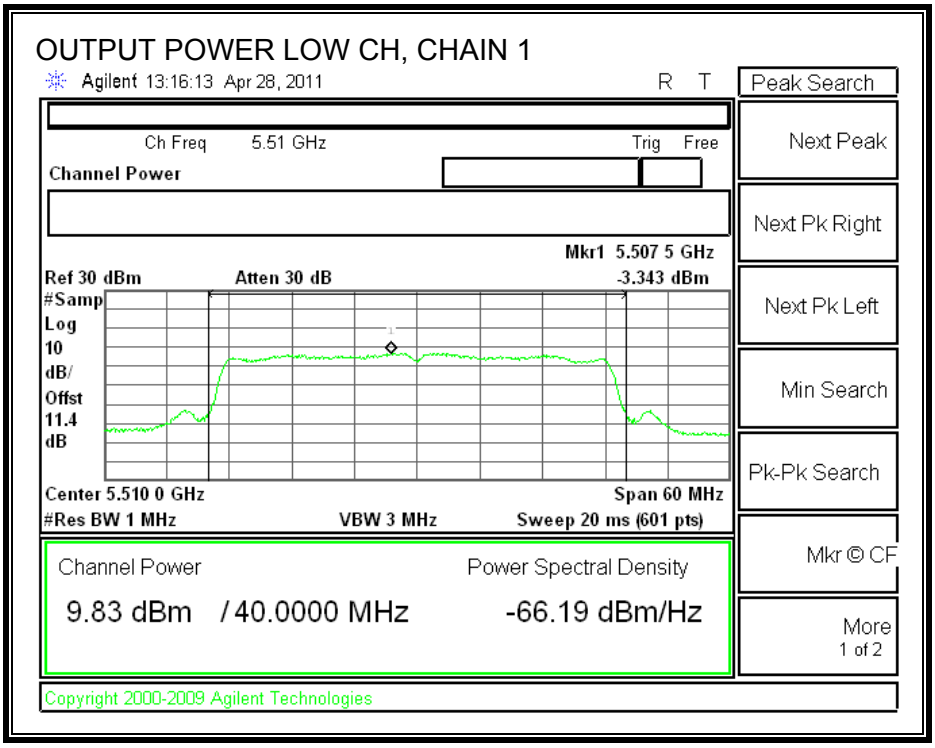
CHAIN 3 OUTPUT POWER

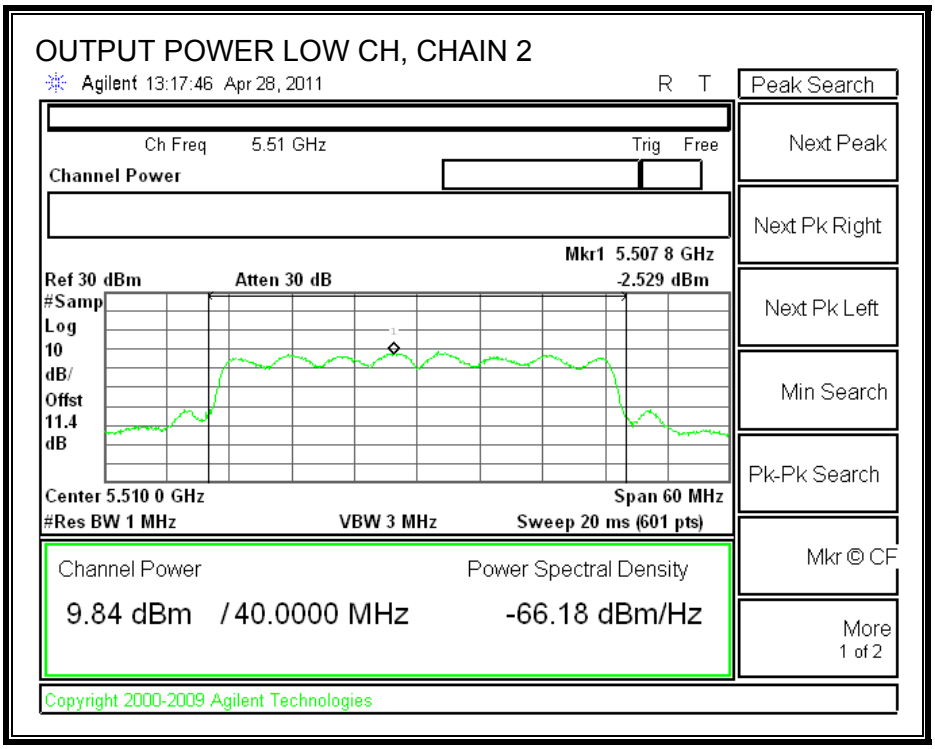


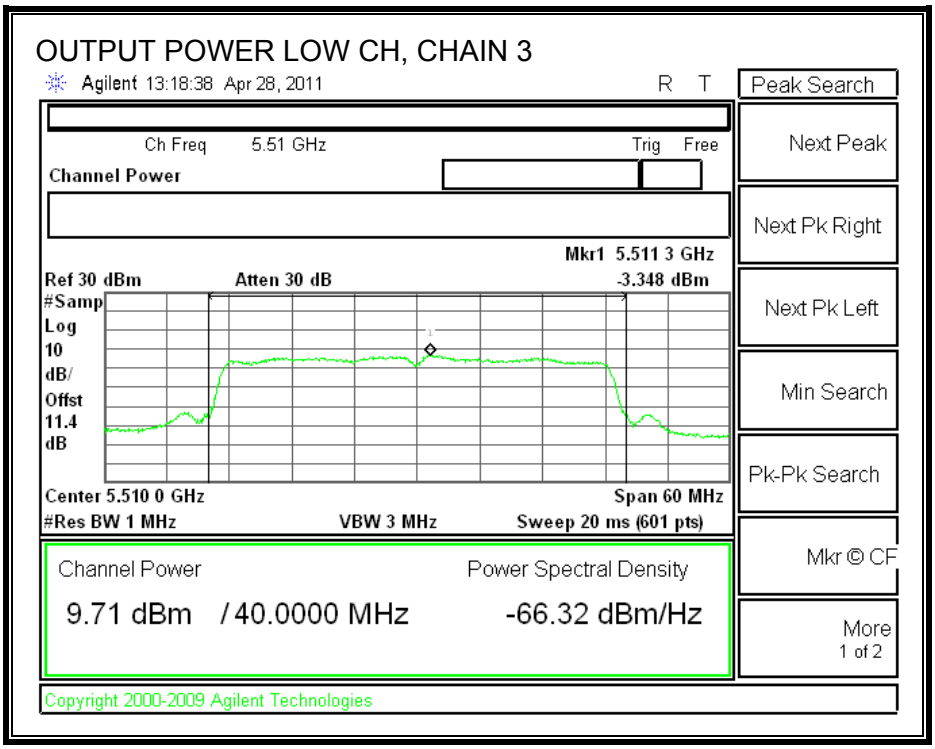




TPC OUTPUT POWER







7.18.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.4 dB (including 10 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)
Low	5510	15.15	15.23	15.06	19.92
Middle	5590	15.11	15.19	15.08	19.90
High	5670	15.10	15.22	14.90	19.85

7.18.4. 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 equal to 9.21 dBi, therefore the limit is 7.79 dBm.

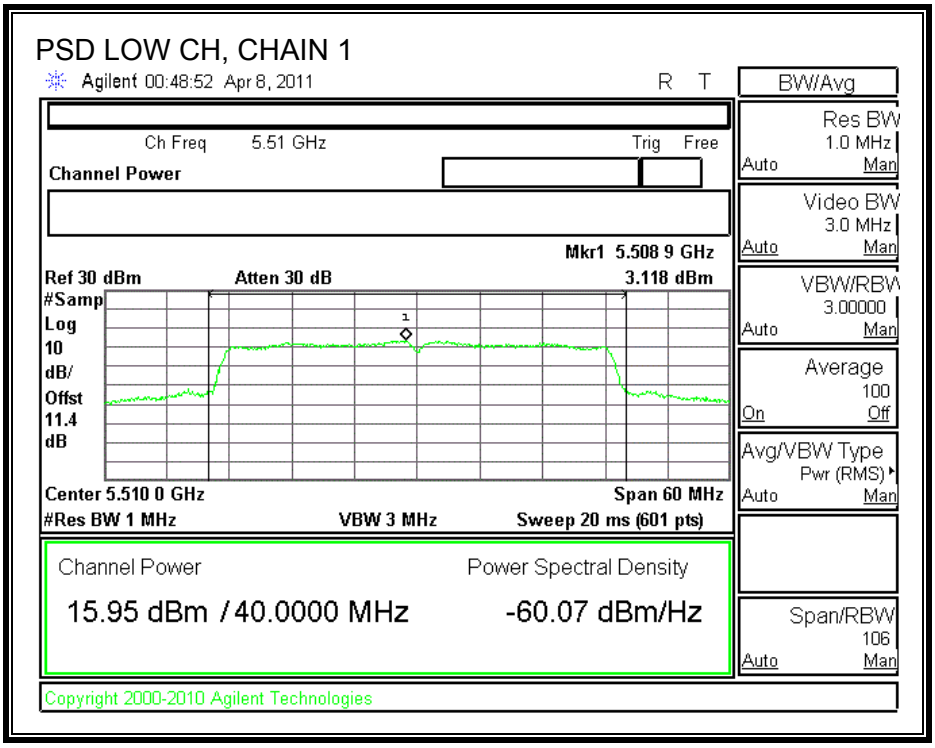
TEST PROCEDURE

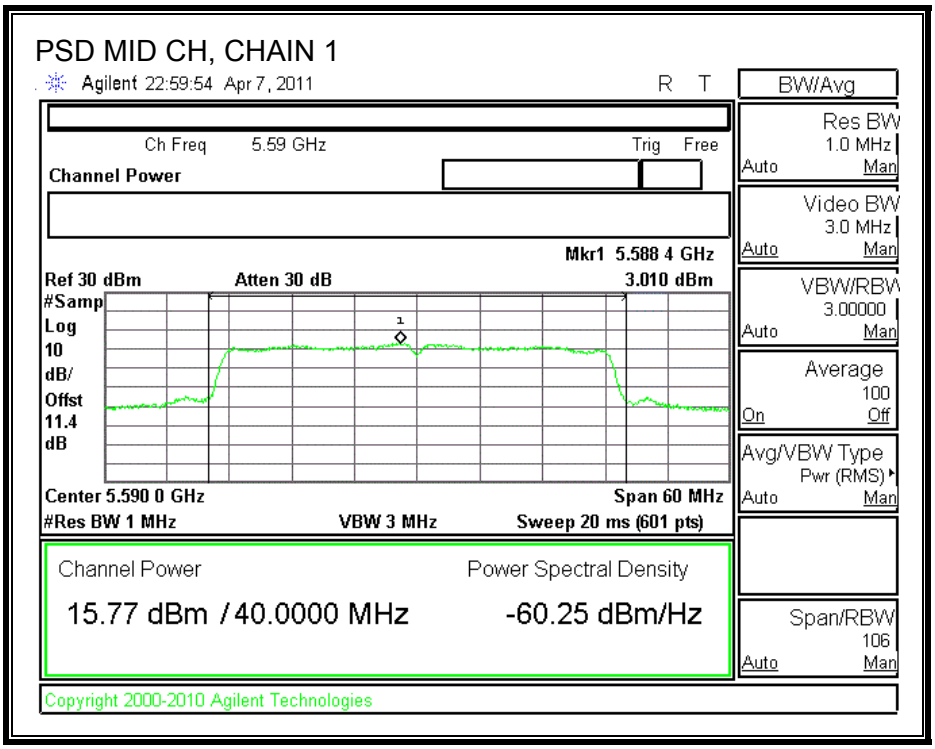
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

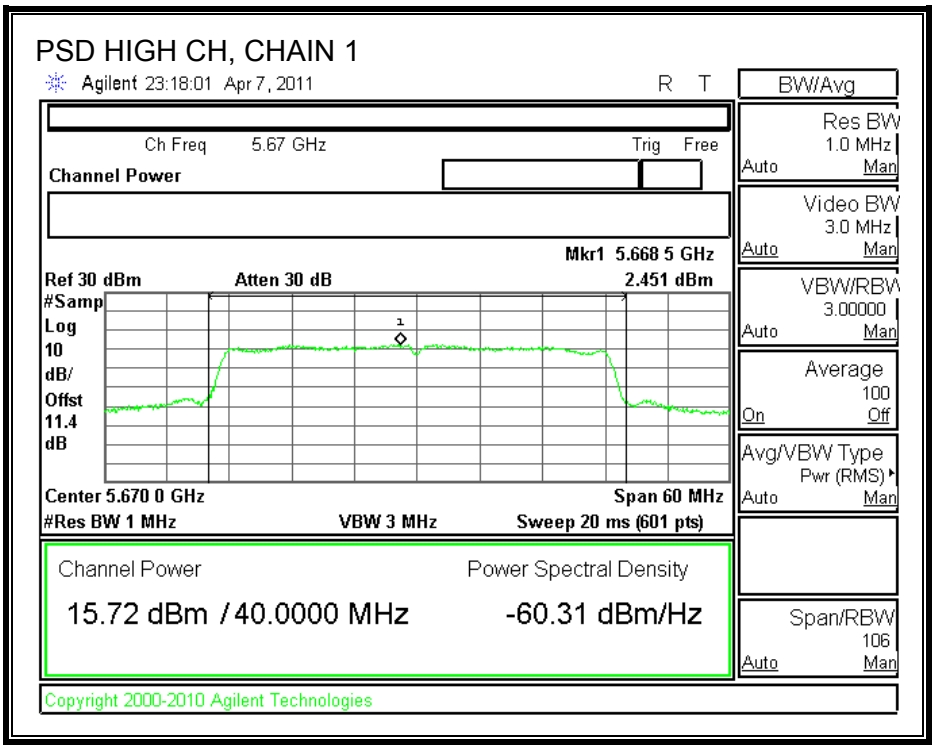
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	3.118	3.153	2.659	7.75	7.79	-0.04
Middle	5590	3.01	3.007	2.974	7.77	7.79	-0.02
High	5670	2.451	3.184	3.022	7.67	7.79	-0.12

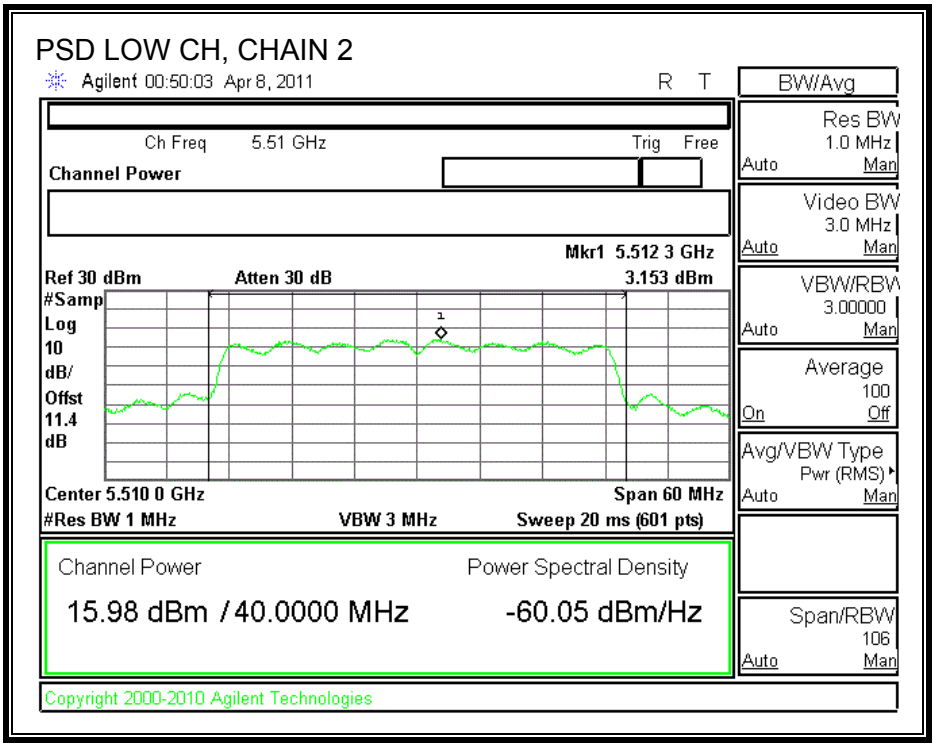
CHAIN 1 POWER SPECTRAL DENSITY

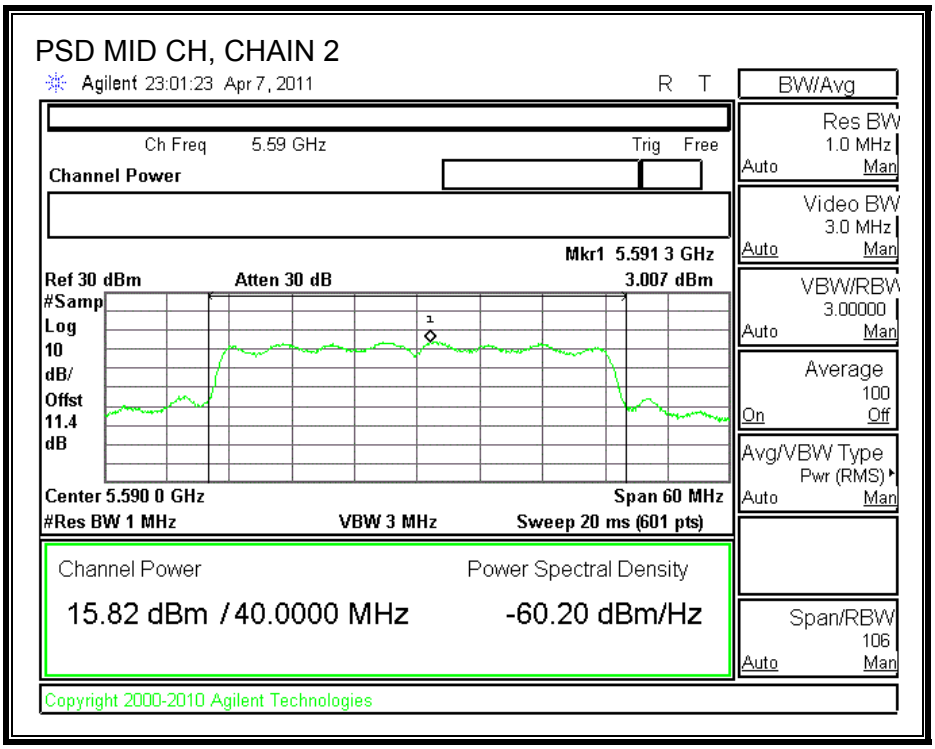


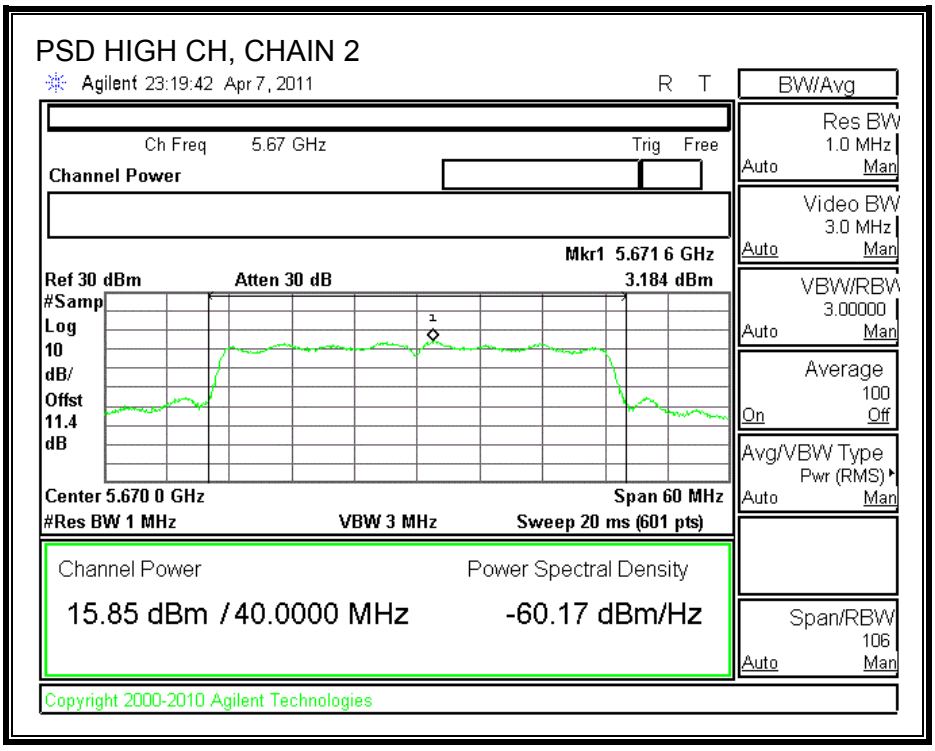




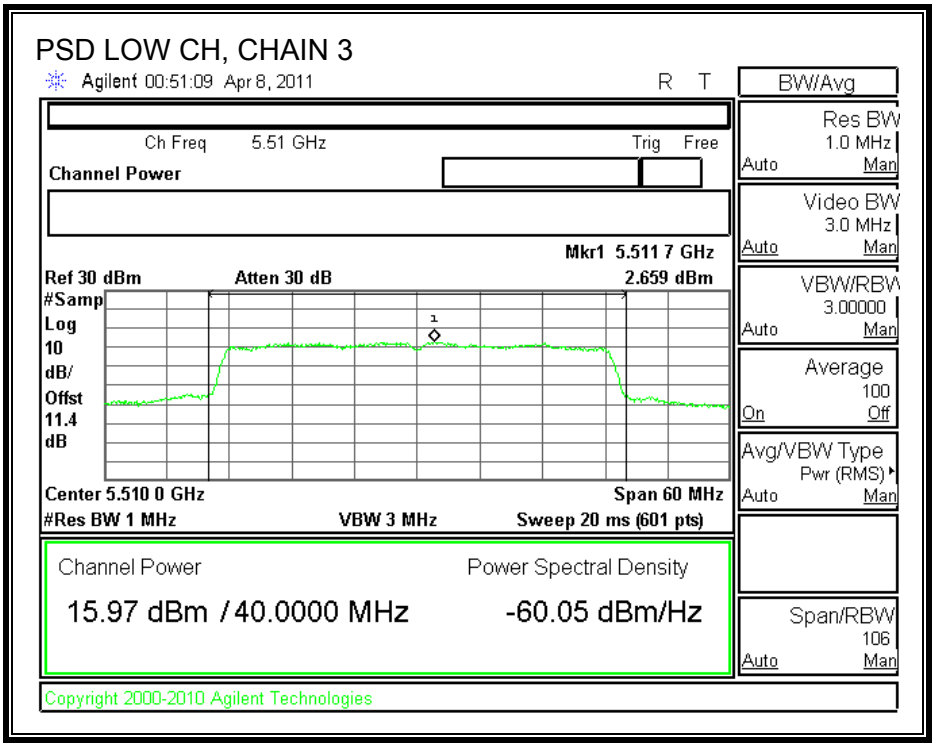
CHAIN 2 POWER SPECTRAL DENSITY

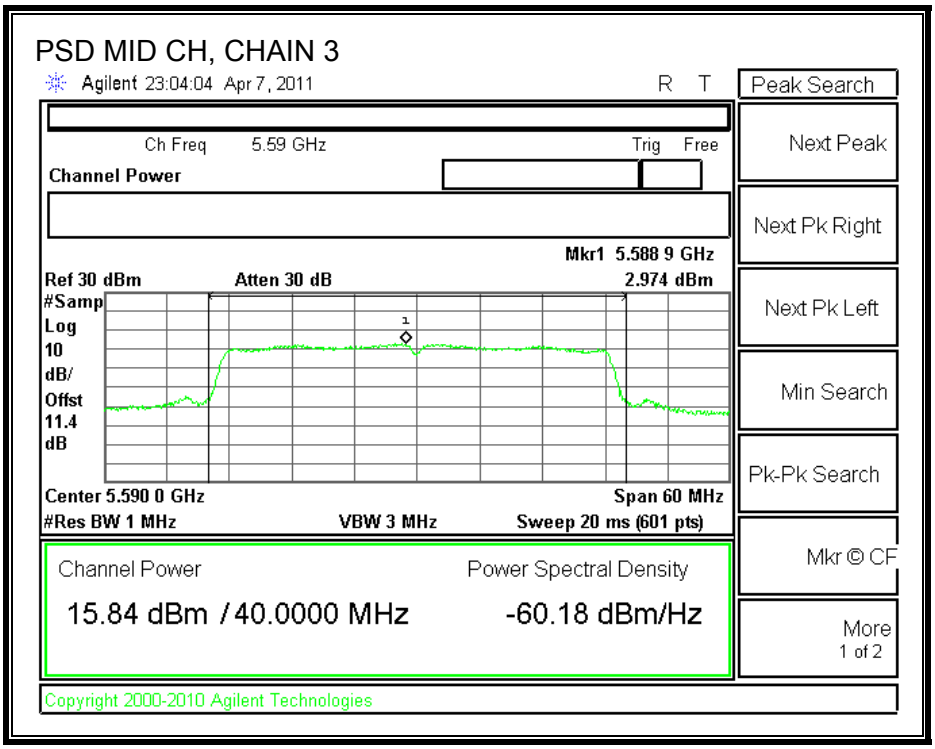


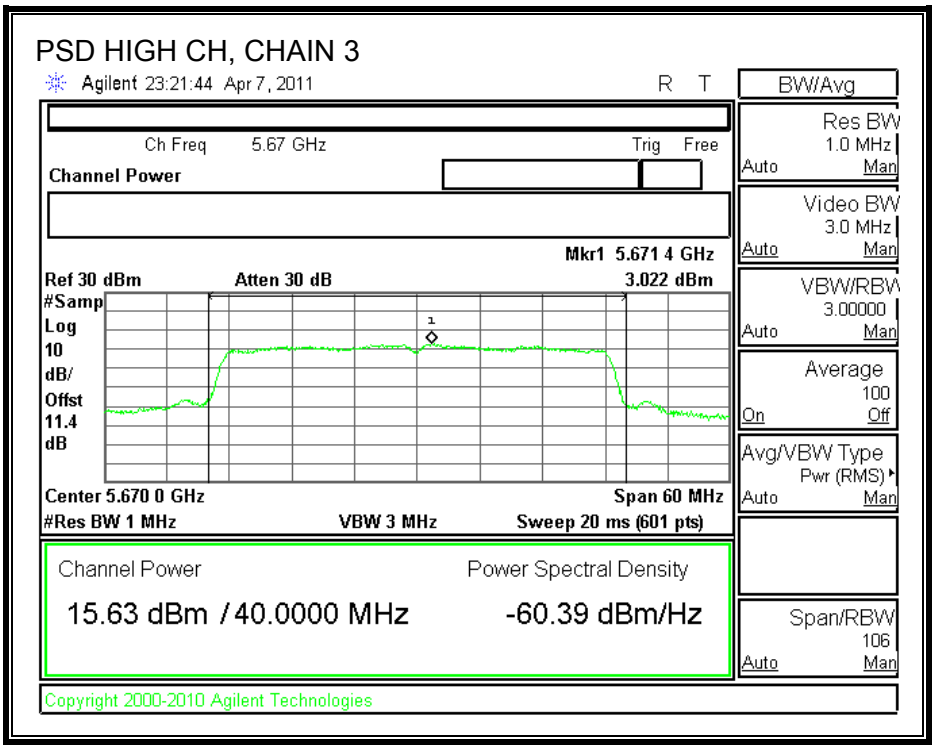




CHAIN 3 POWER SPECTRAL DENSITY







7.18.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

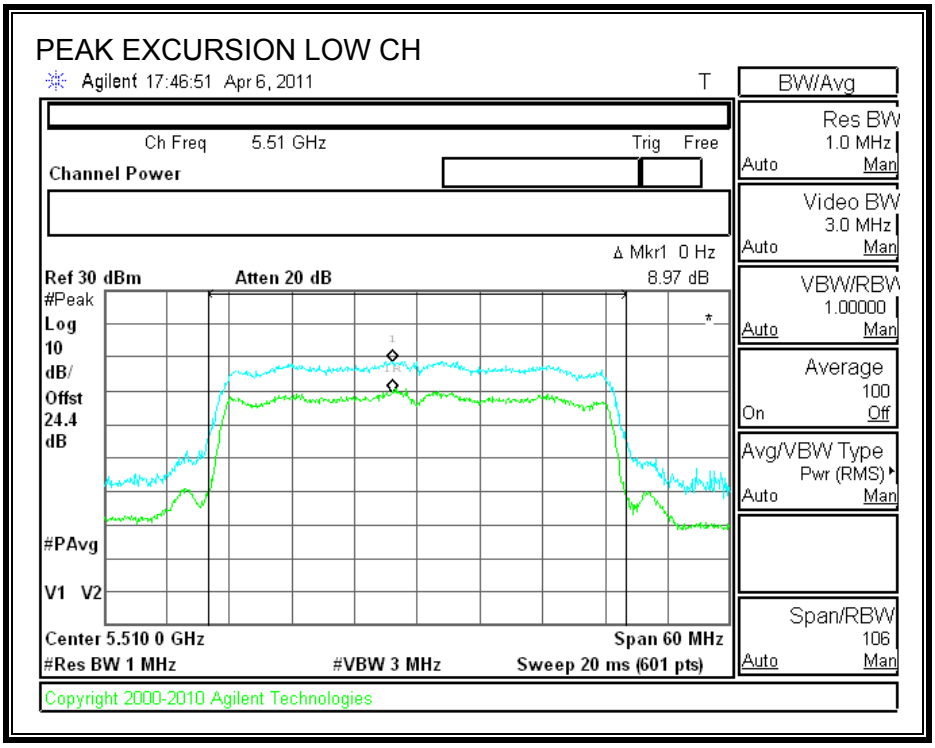
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

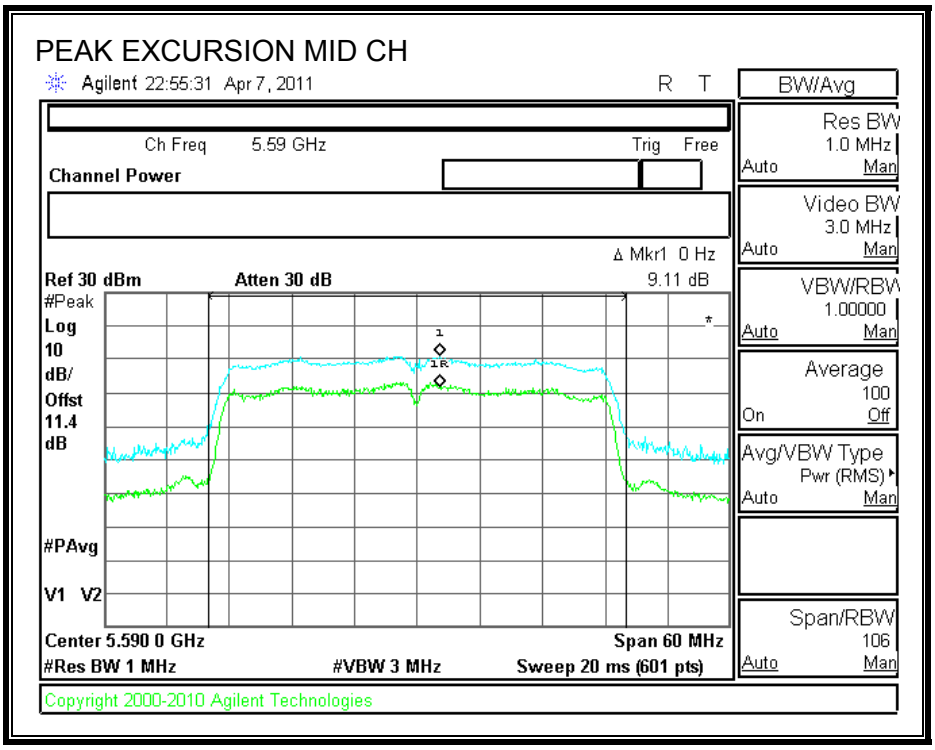
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

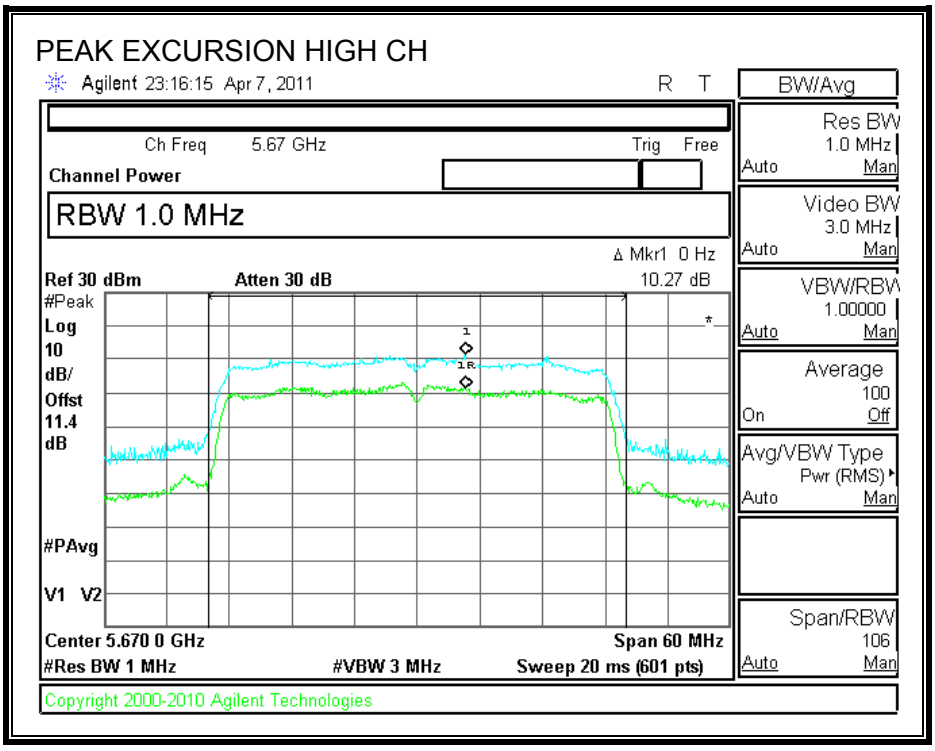
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	8.97	13	-4.03
Middle	5590	9.11	13	-3.89
High	5670	10.27	13	-2.73

PEAK EXCURSION







7.18.6. 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.

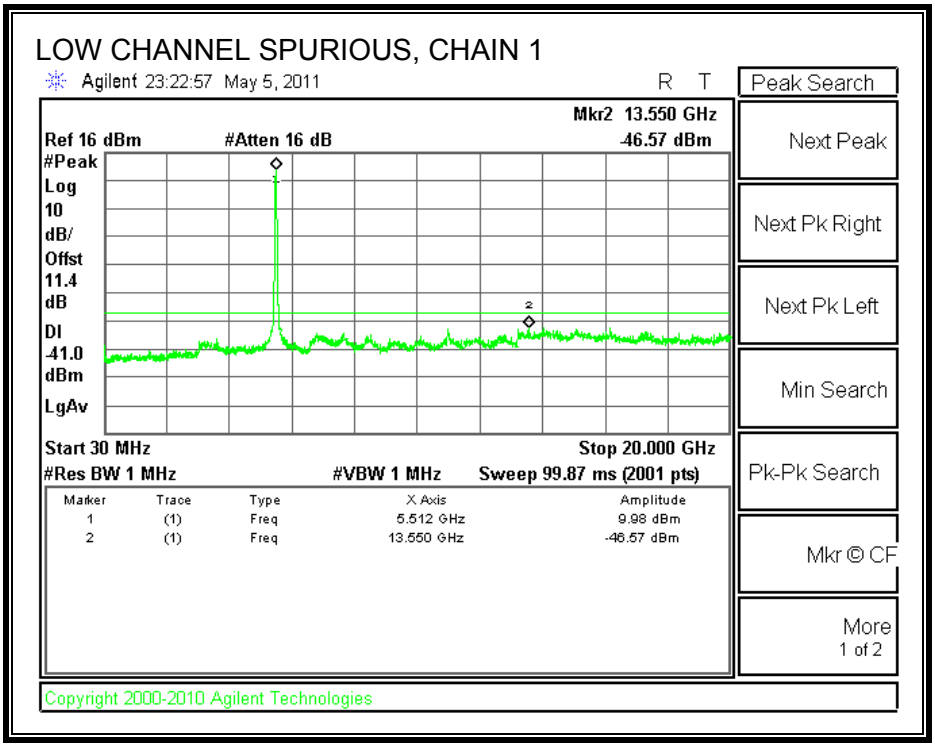
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

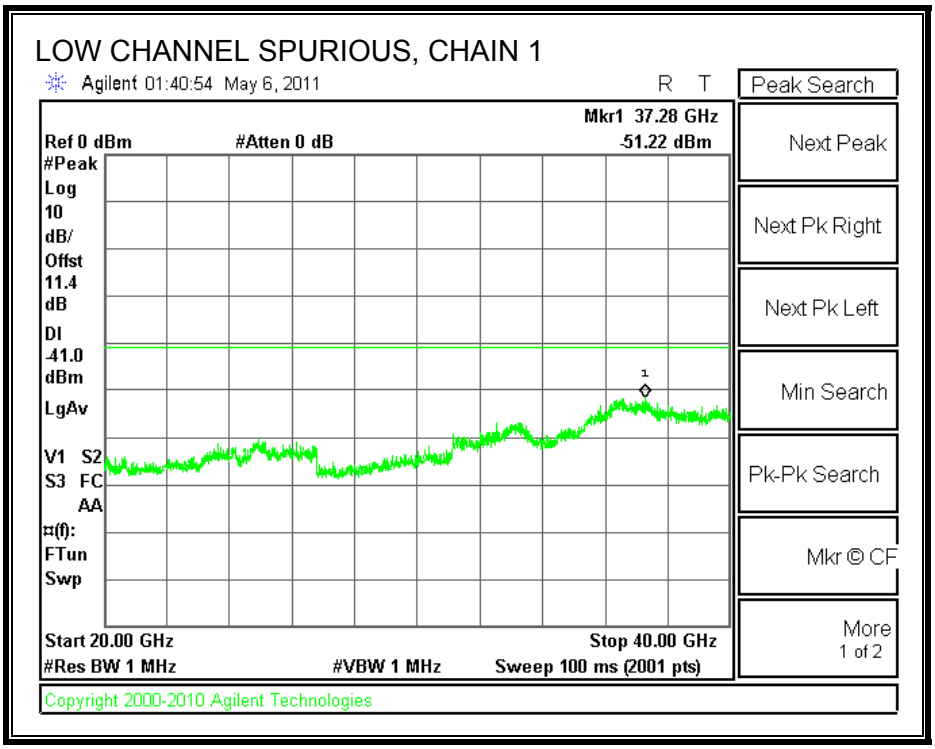
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

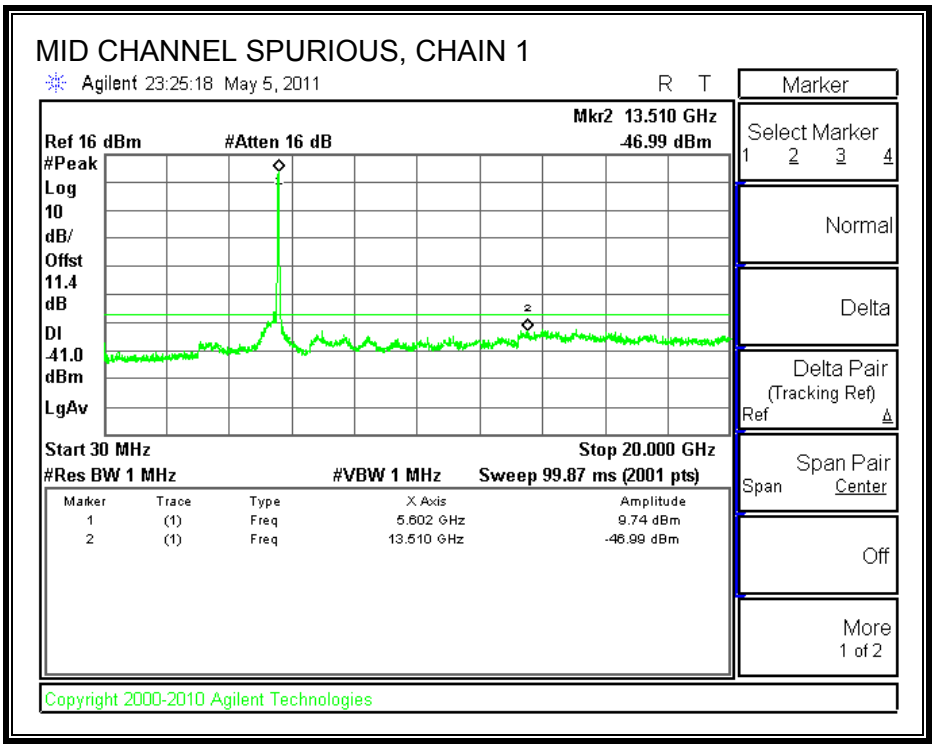
RESULTS

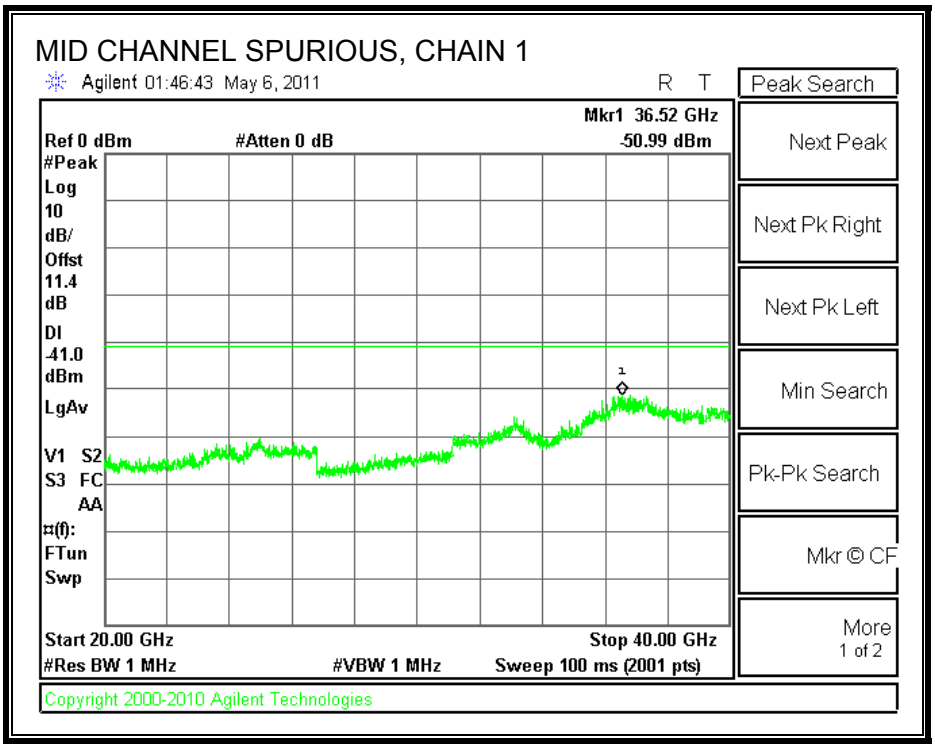
Limit = -27 dBm + Antenna Gain + 10log (N) dB

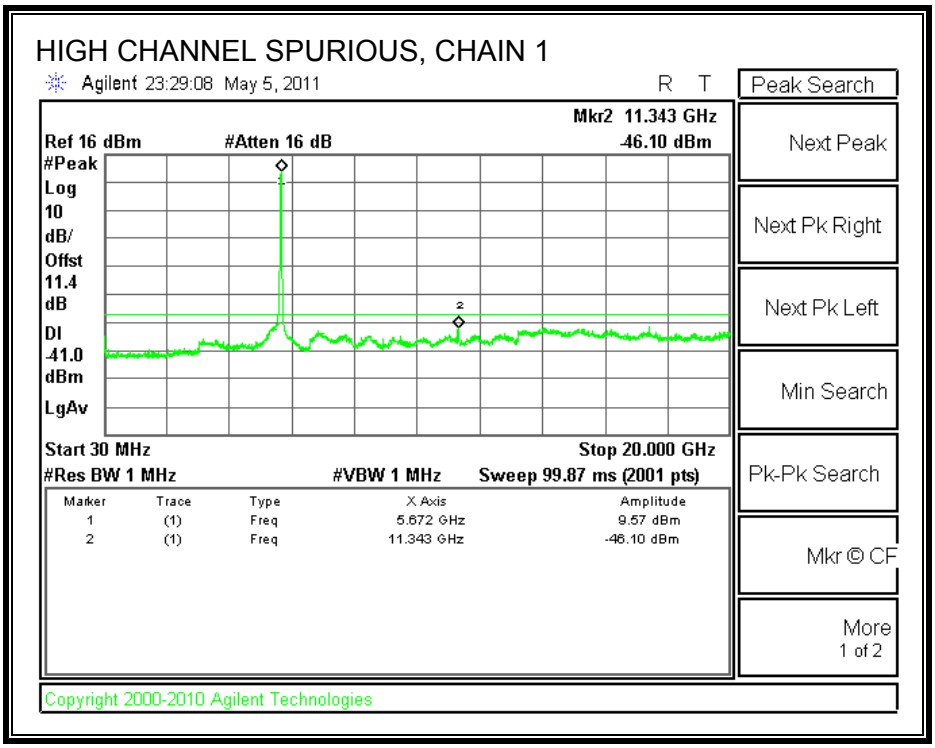
CHAIN 1 SPURIOUS EMISSIONS

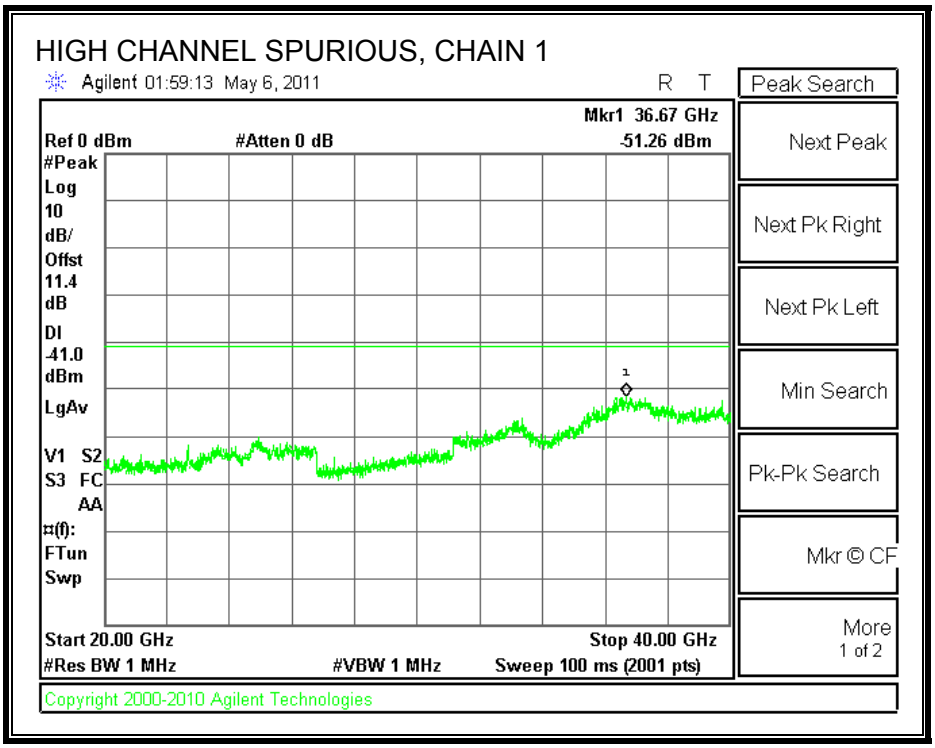












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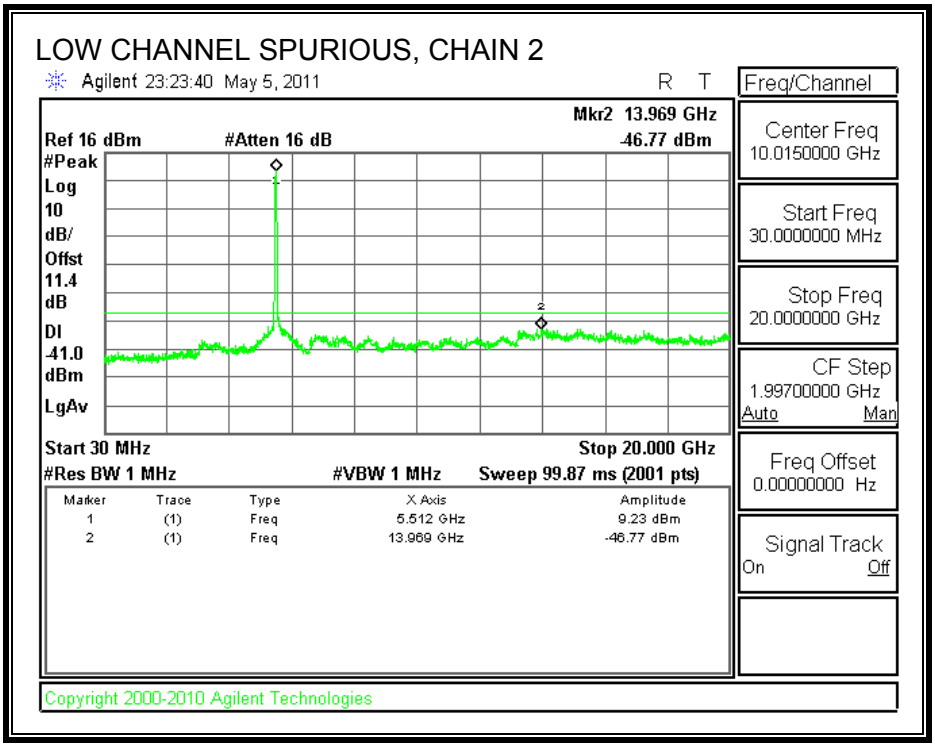

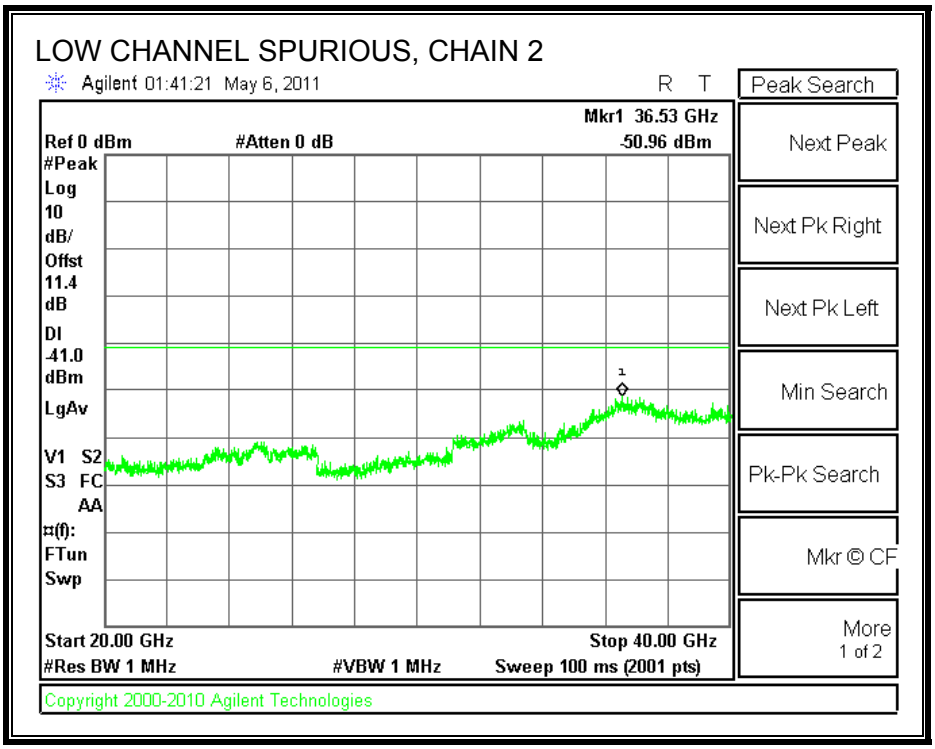

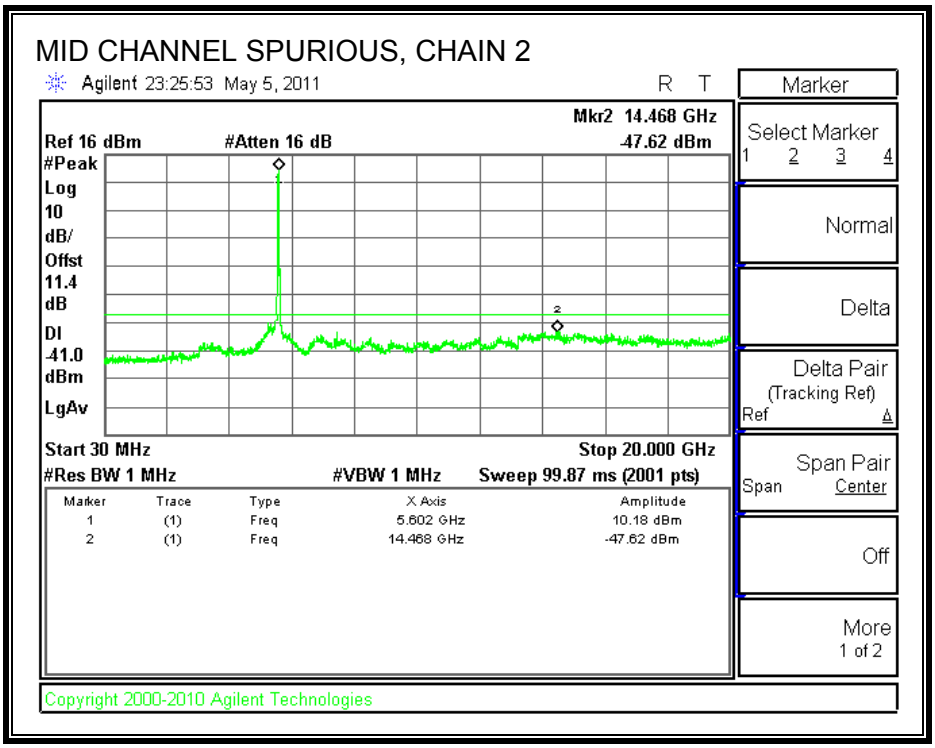

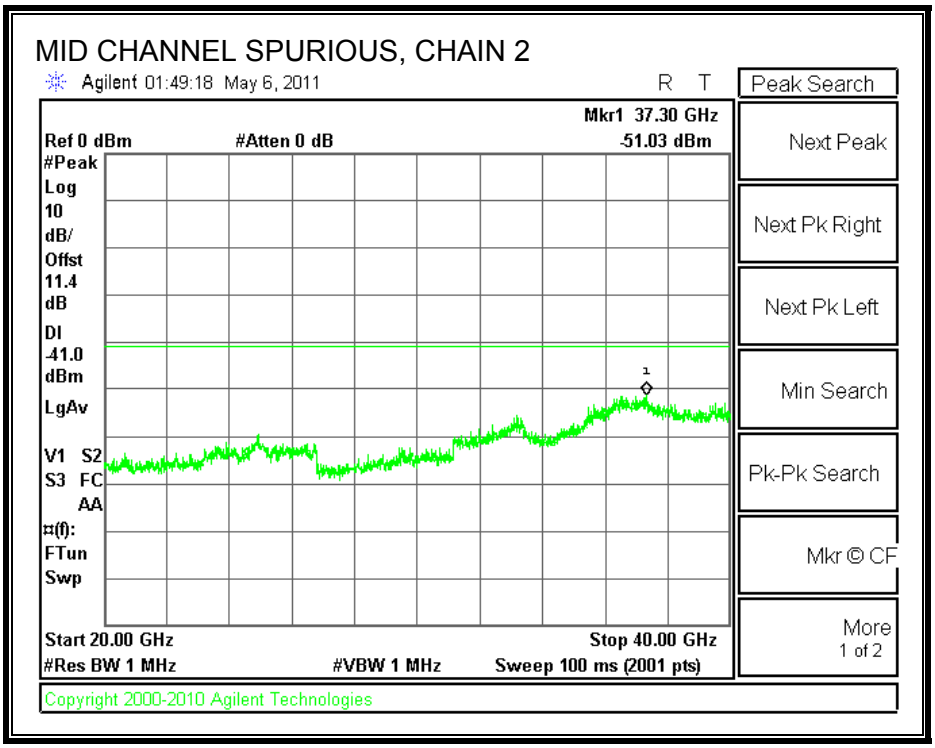

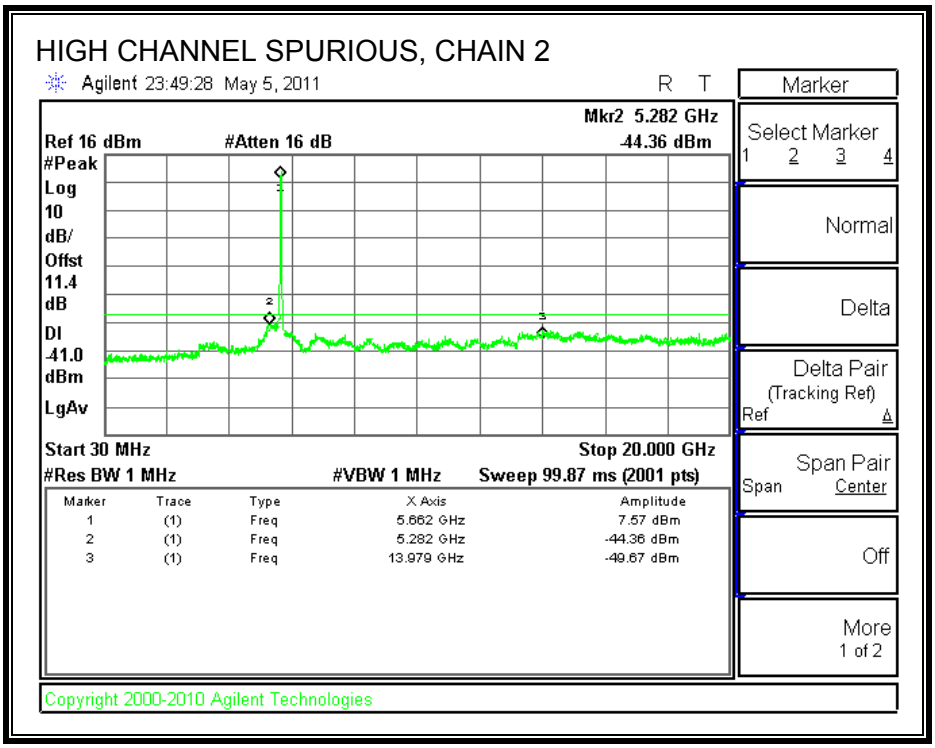

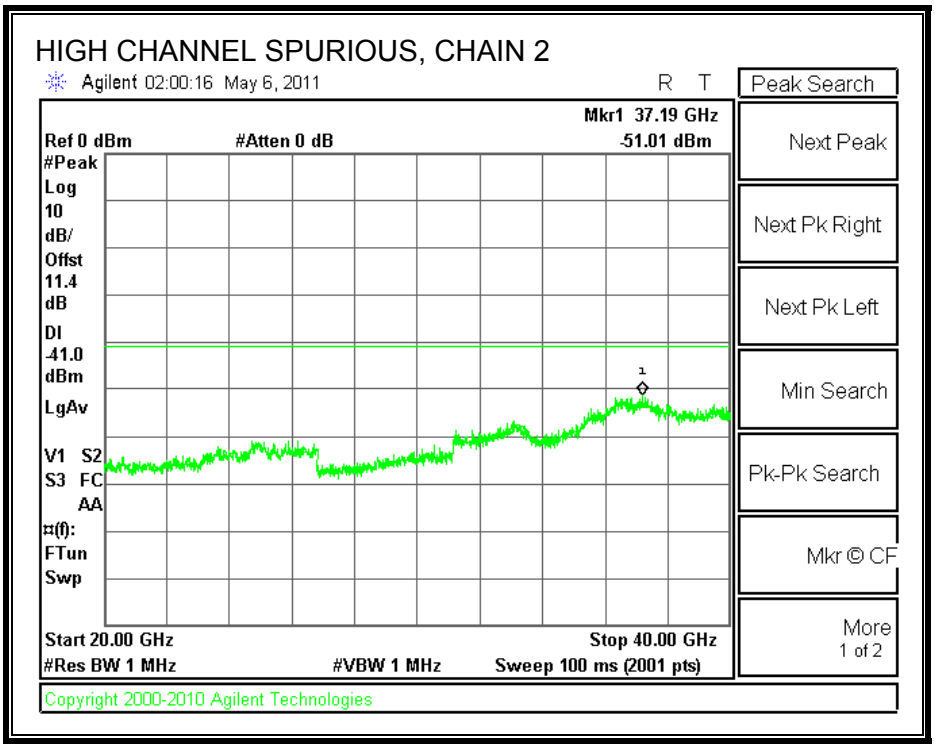

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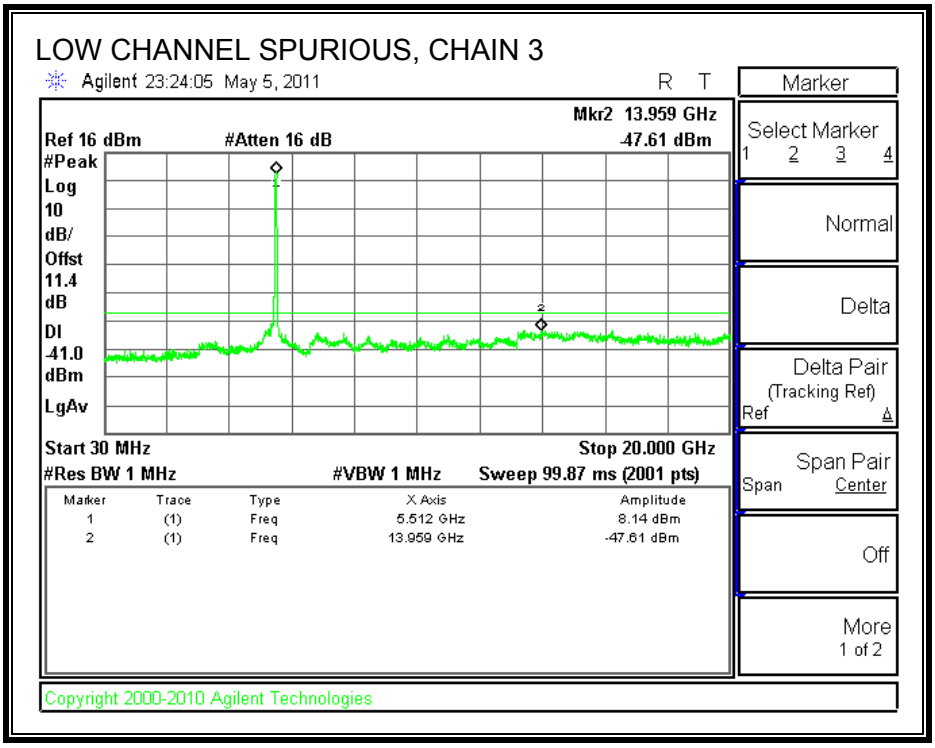
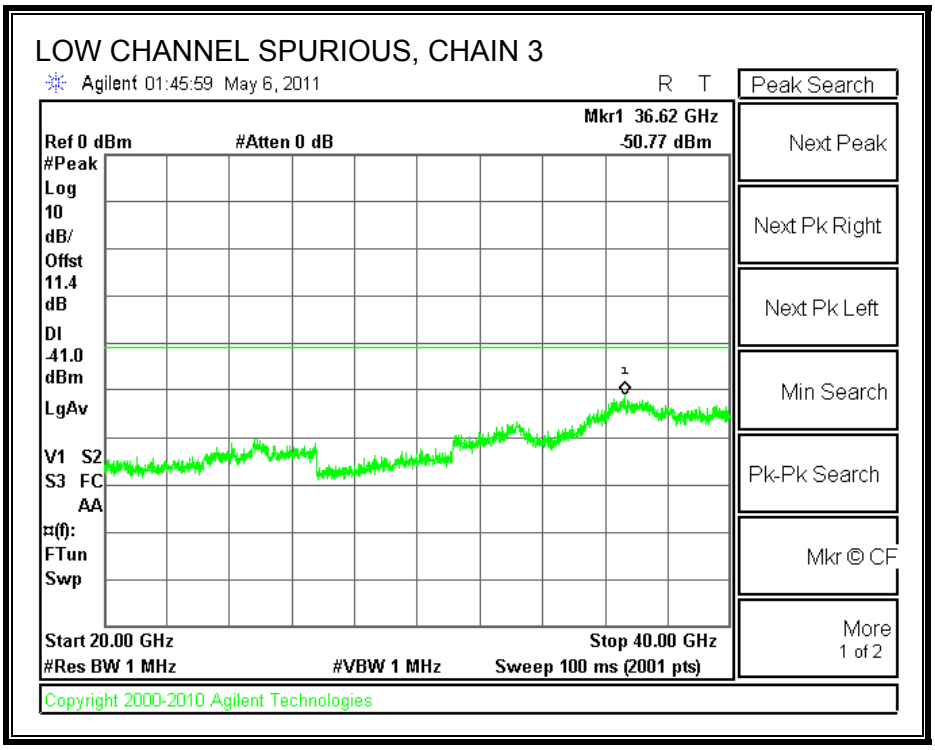
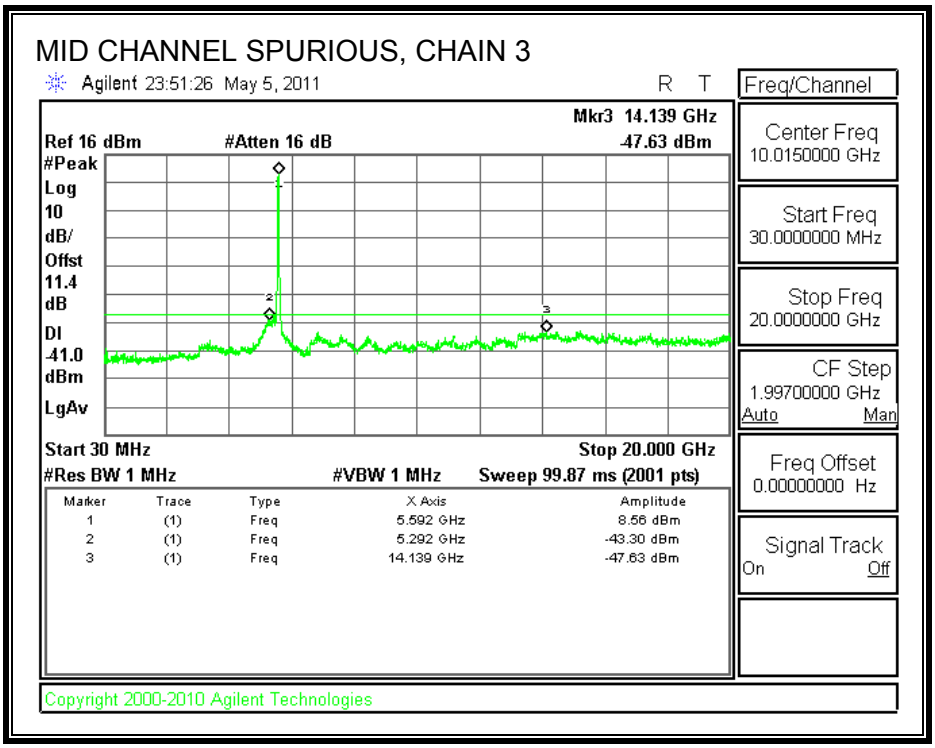
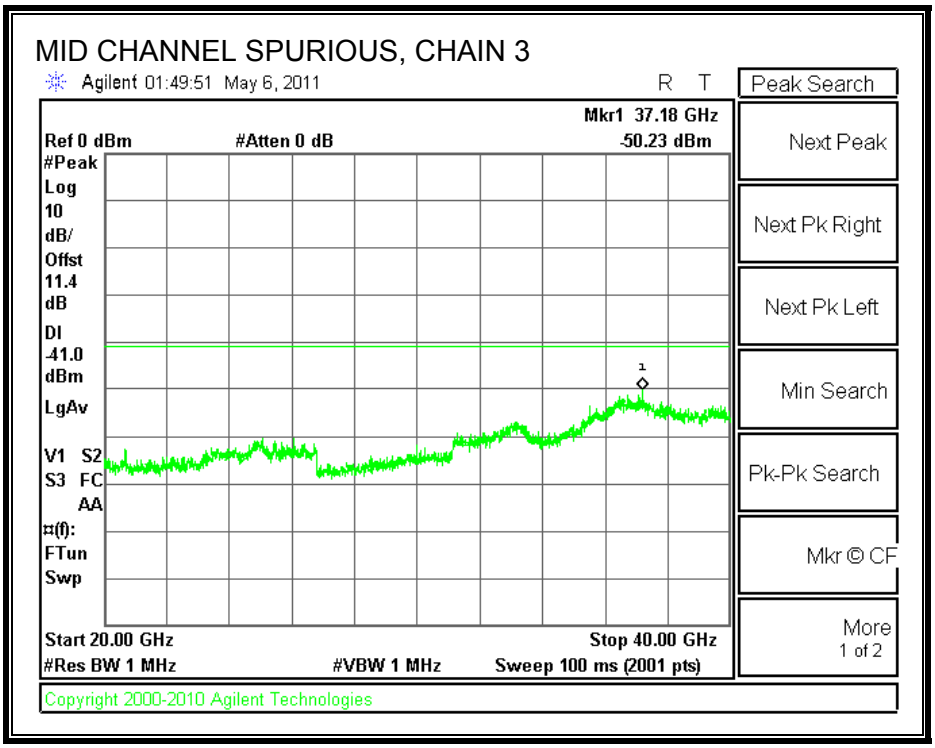
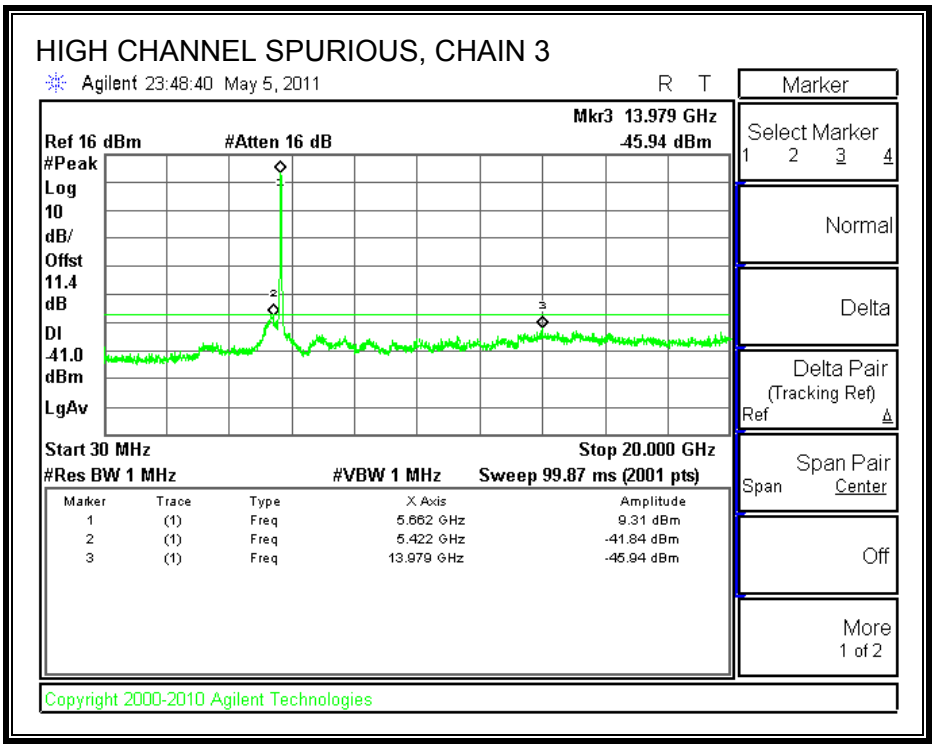
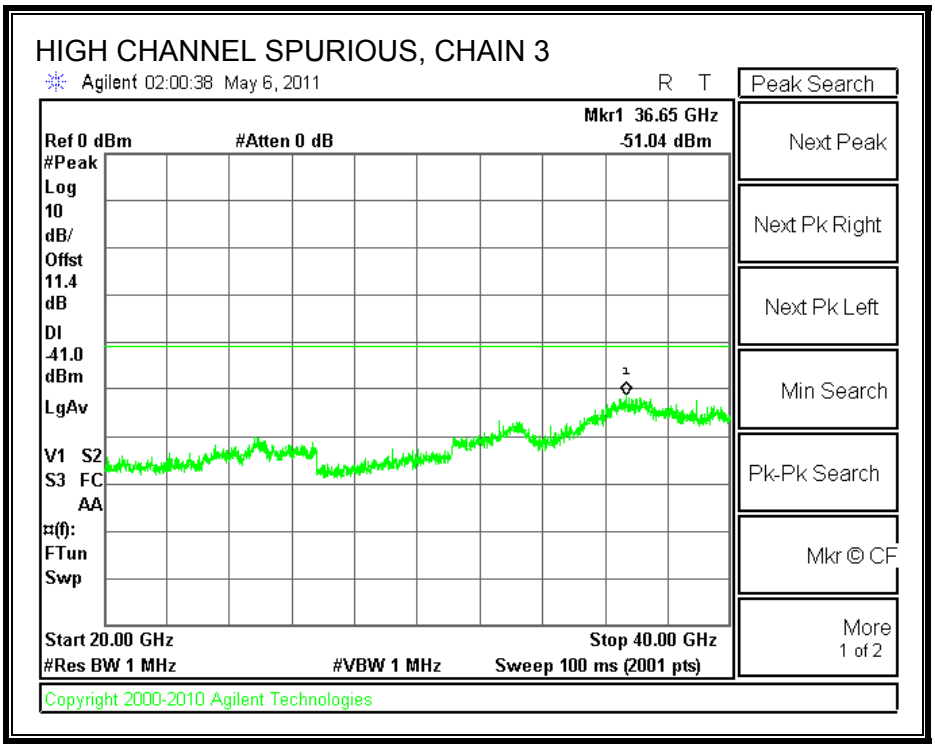












SDM MCS21

7.18.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

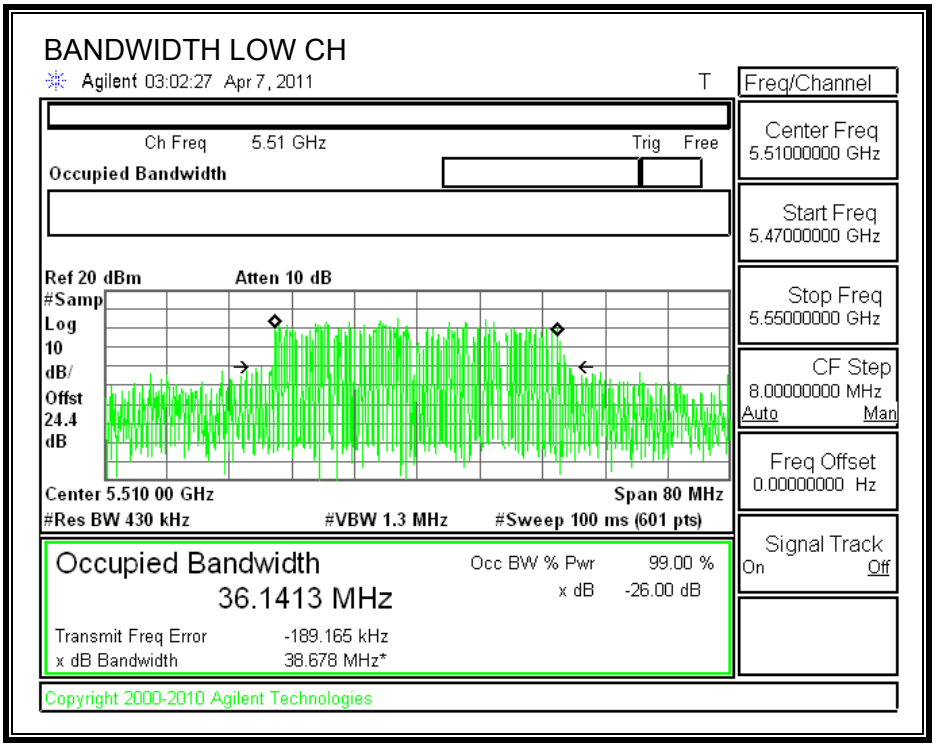
TEST PROCEDURE

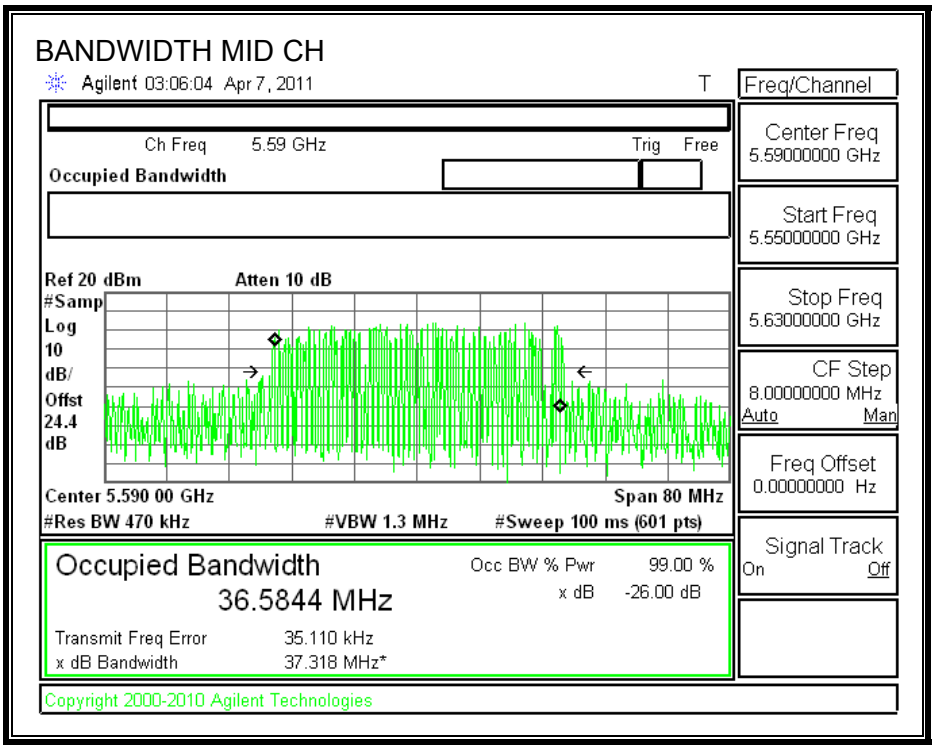
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

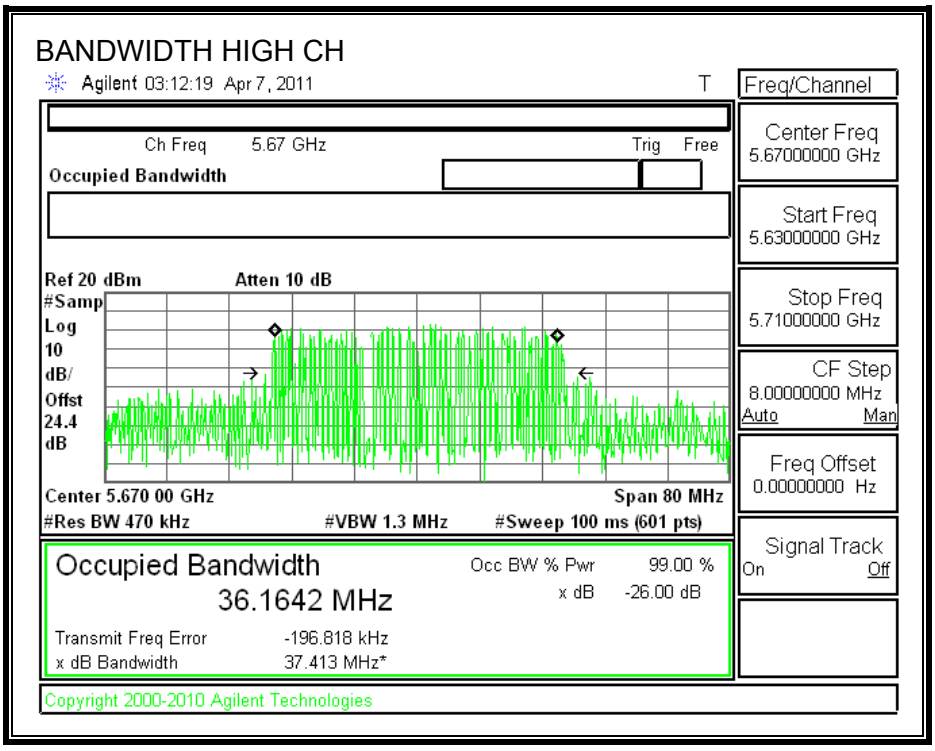
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	38.678	36.1413
Middle	5590	37.318	36.5844
High	5670	37.413	36.1642

26 dB and 99% BANDWIDTH







7.18.2. 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 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	23.98	38.678	26.87	5.35	23.98
Mid	5590	23.98	37.318	26.72	5.35	23.98
High	5670	23.98	37.413	26.73	5.35	23.98

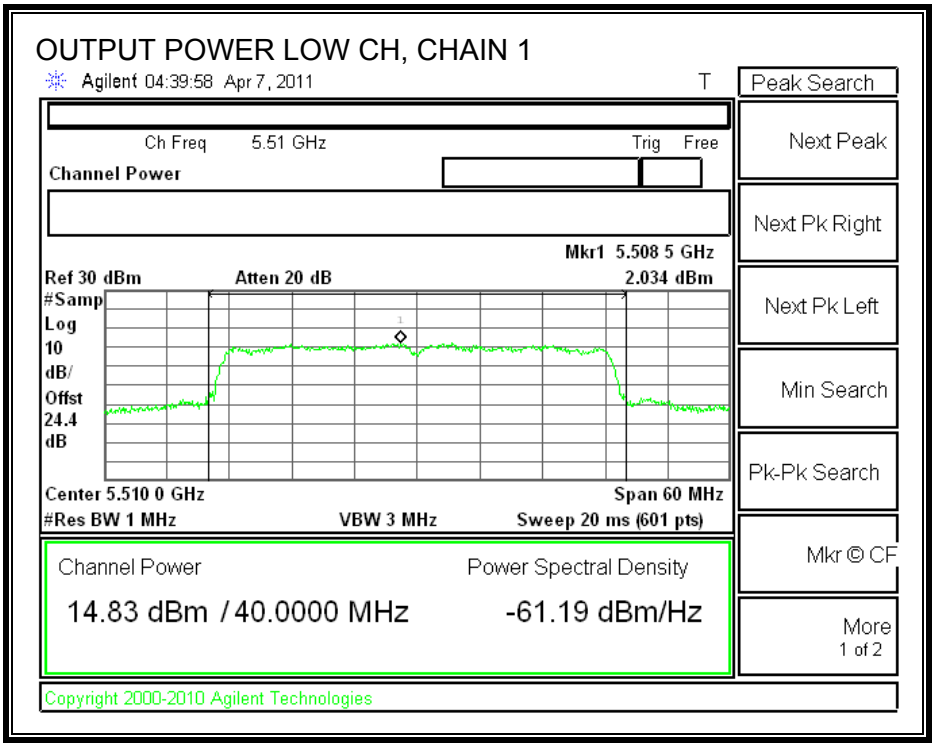
Individual Chain Results

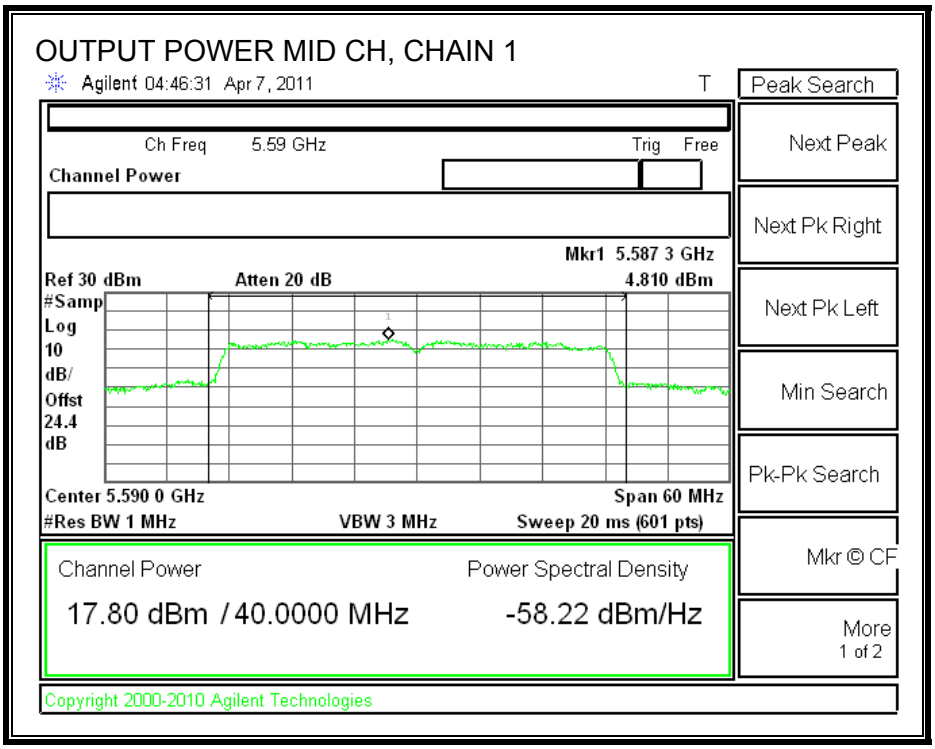
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	14.83	14.79	14.74	19.56	23.98	-4.42
Mid	5590	17.80	17.81	17.91	22.61	23.98	-1.37
High	5670	17.83	18.02	17.81	22.66	23.98	-1.32

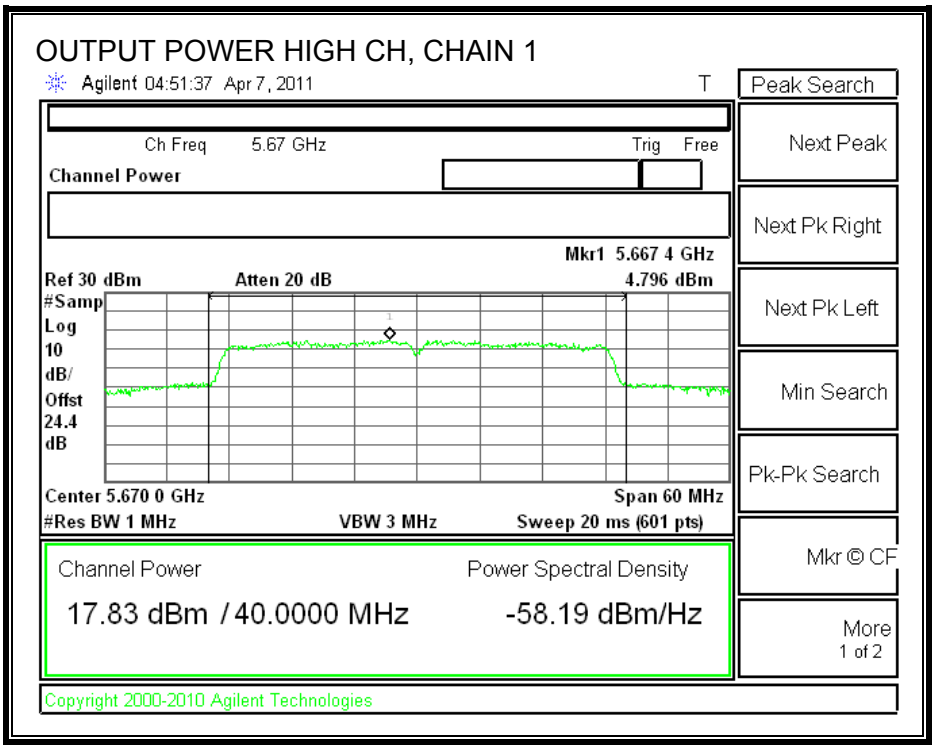
TPC Results

TPC Delta Power		Chain 1	Chain 2	Chain 3			
		4.33	4.43	4.35			
Worst-case TPC Power		Chain 1	Chain 2	Chain 3	Total Power	Ant Gain	EIRP
Low	5670	13.50	13.59	13.46	18.29	5.35	23.64
						TPC Limit (dBm)	24
						Margin (dB)	-0.36

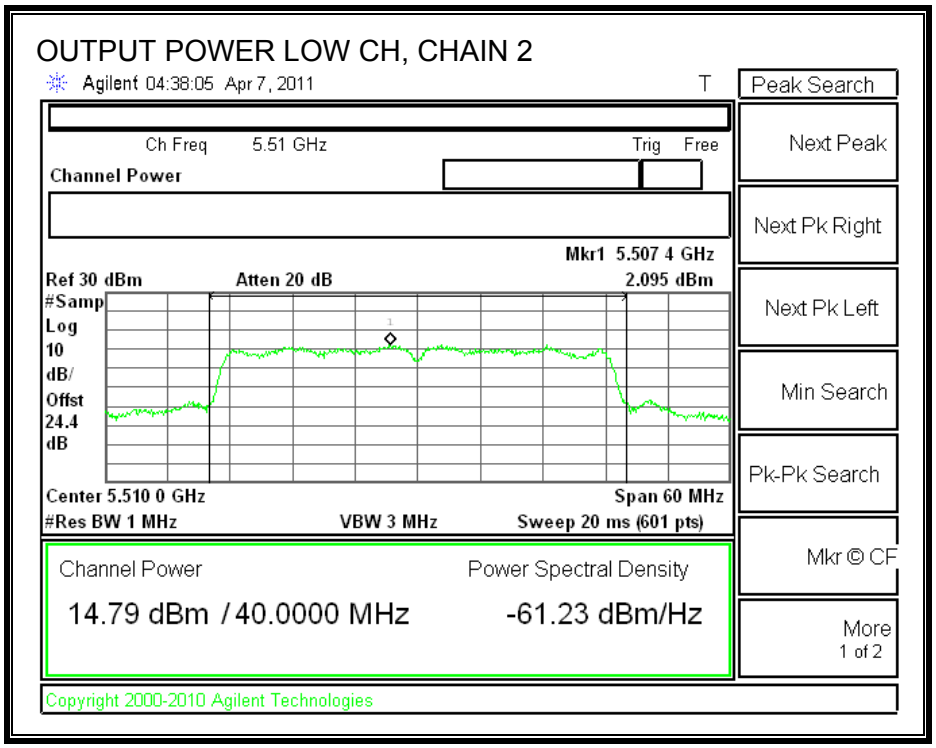
CHAIN 1 OUTPUT POWER

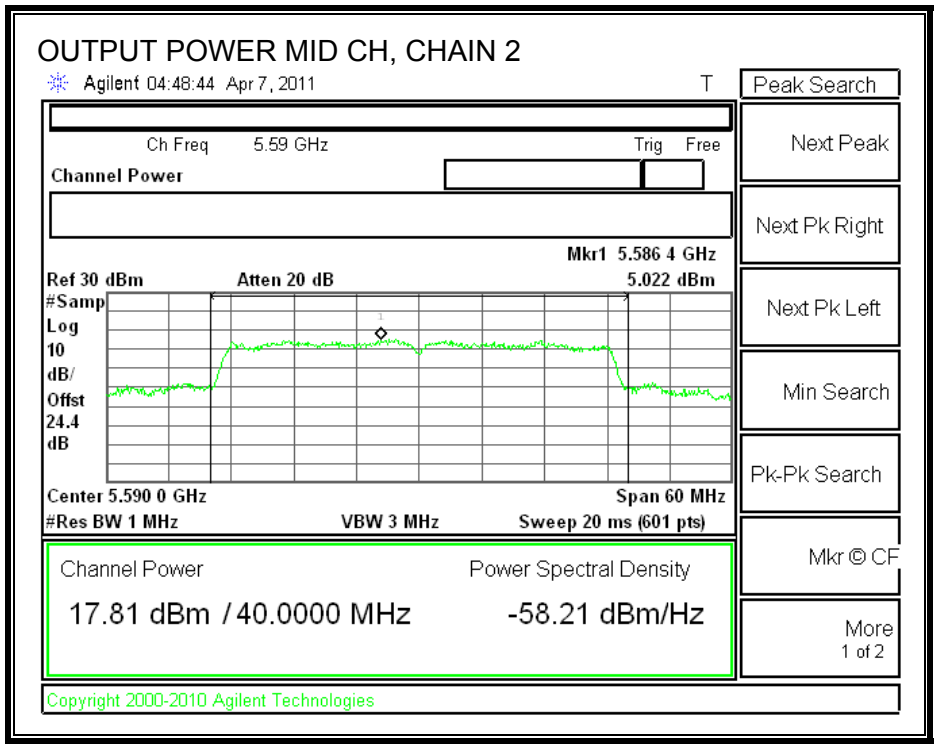




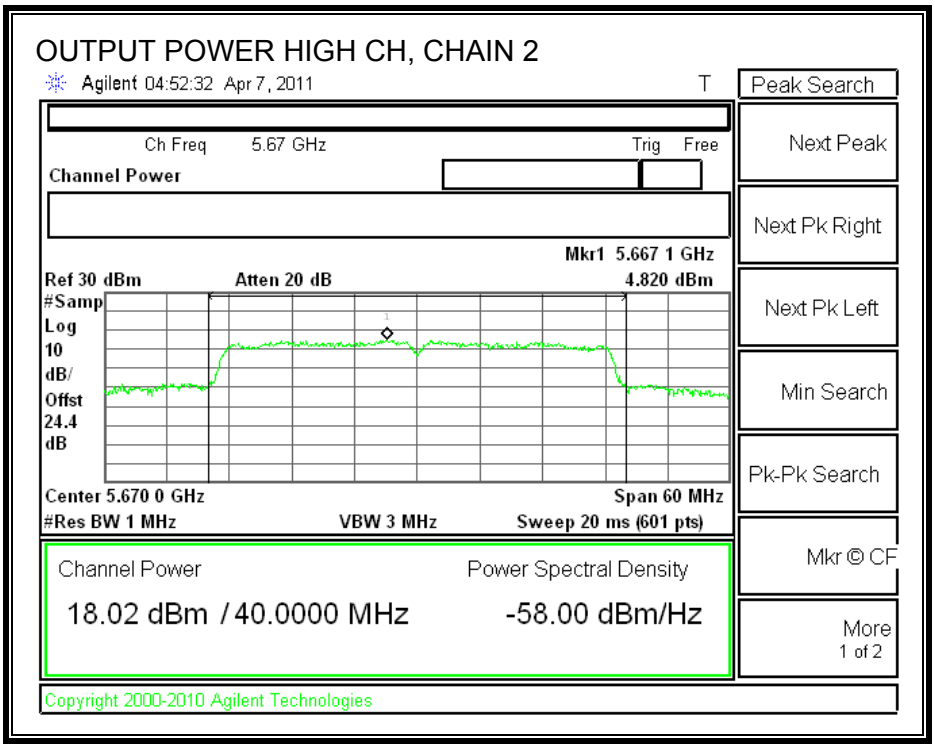


CHAIN 2 OUTPUT POWER

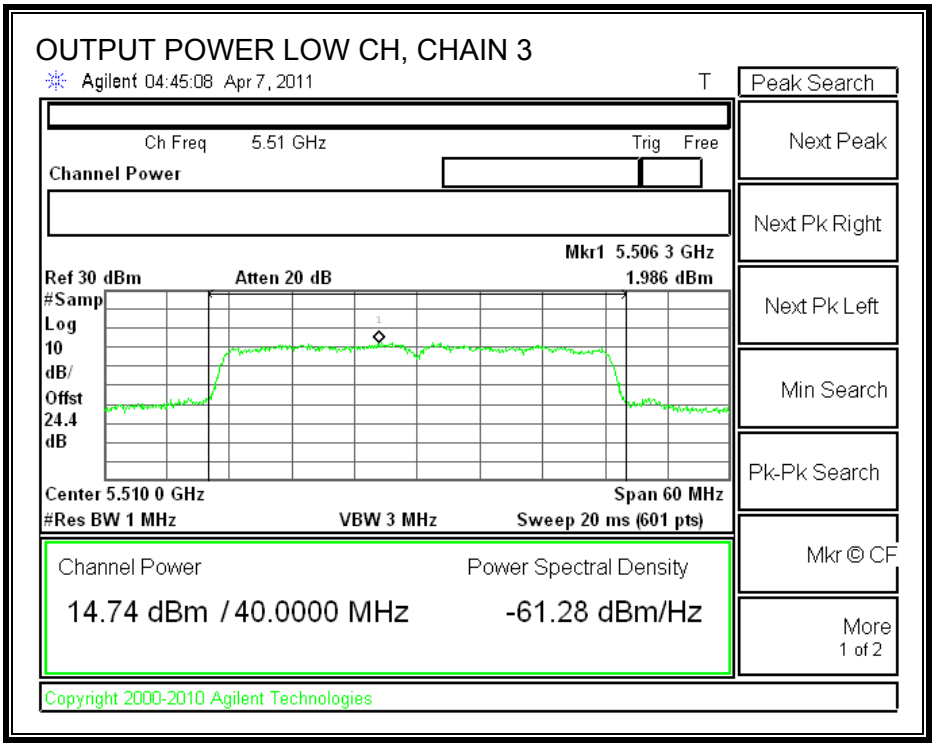


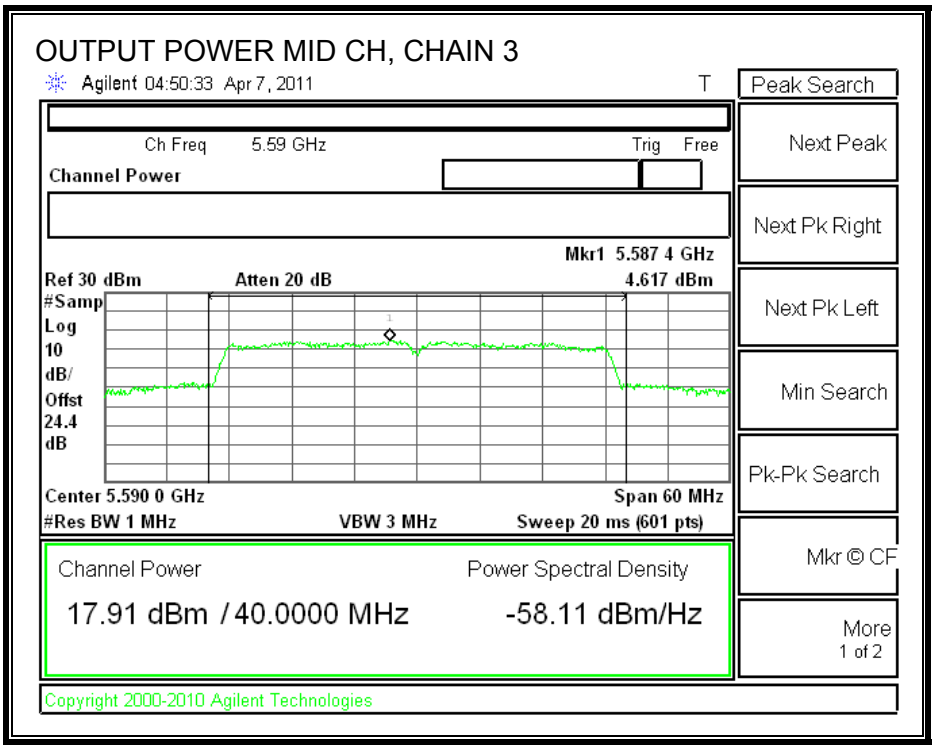


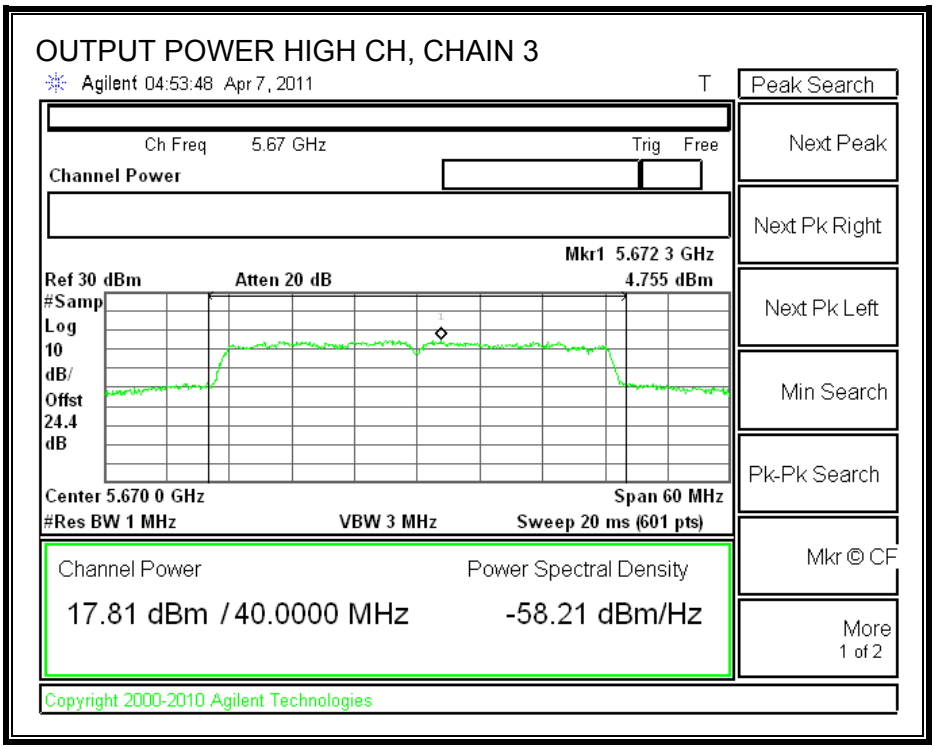
OUTPUT POWER HIGH CH, CHAIN 2



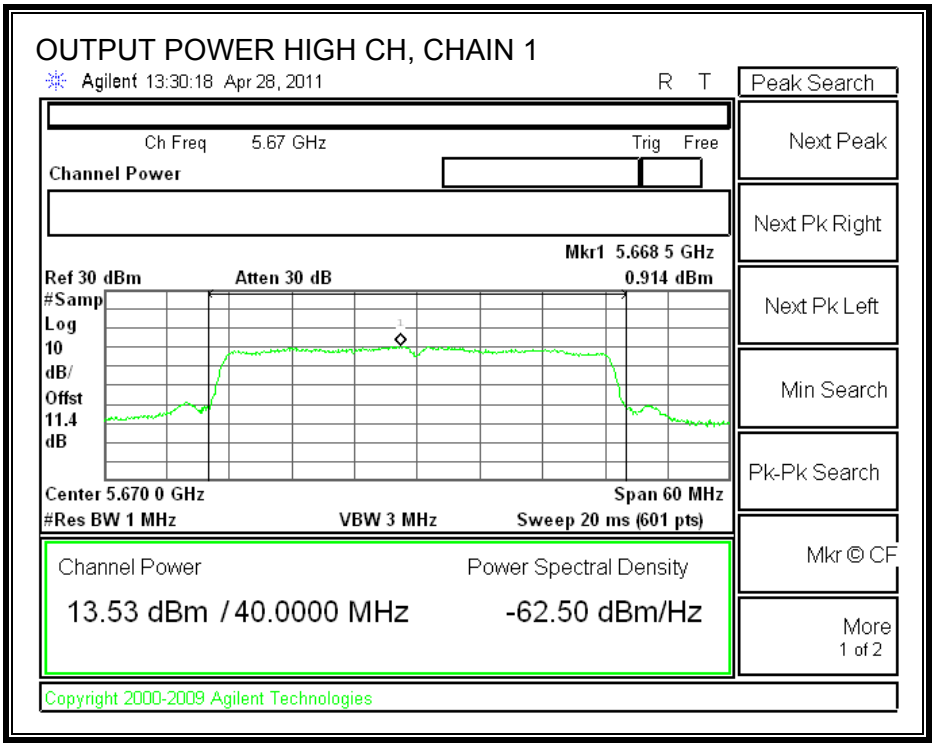
CHAIN 3 OUTPUT POWER

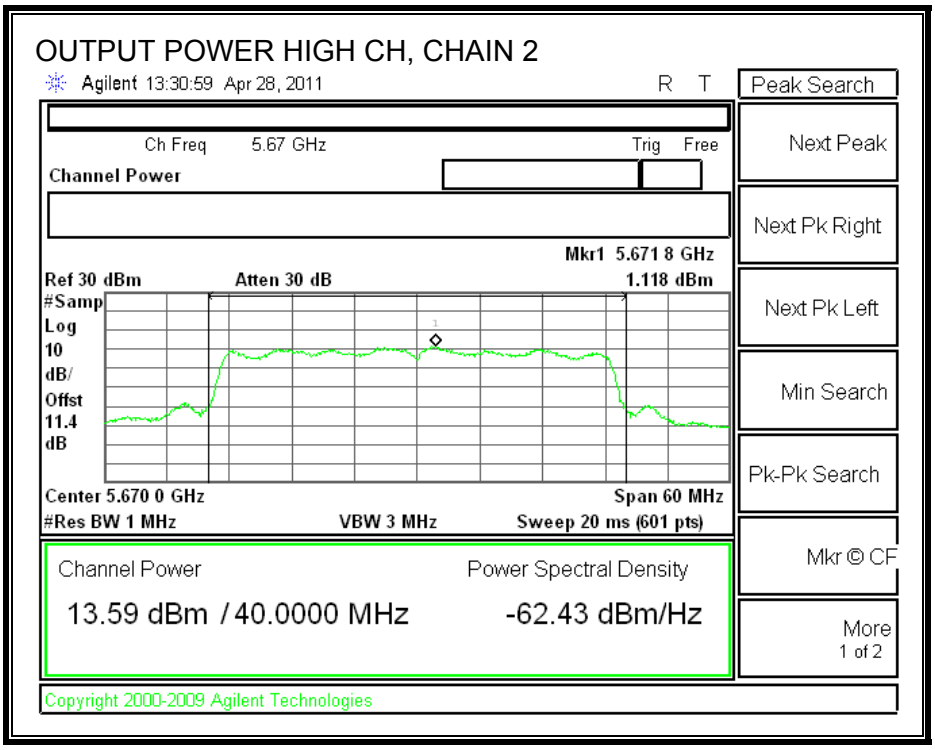


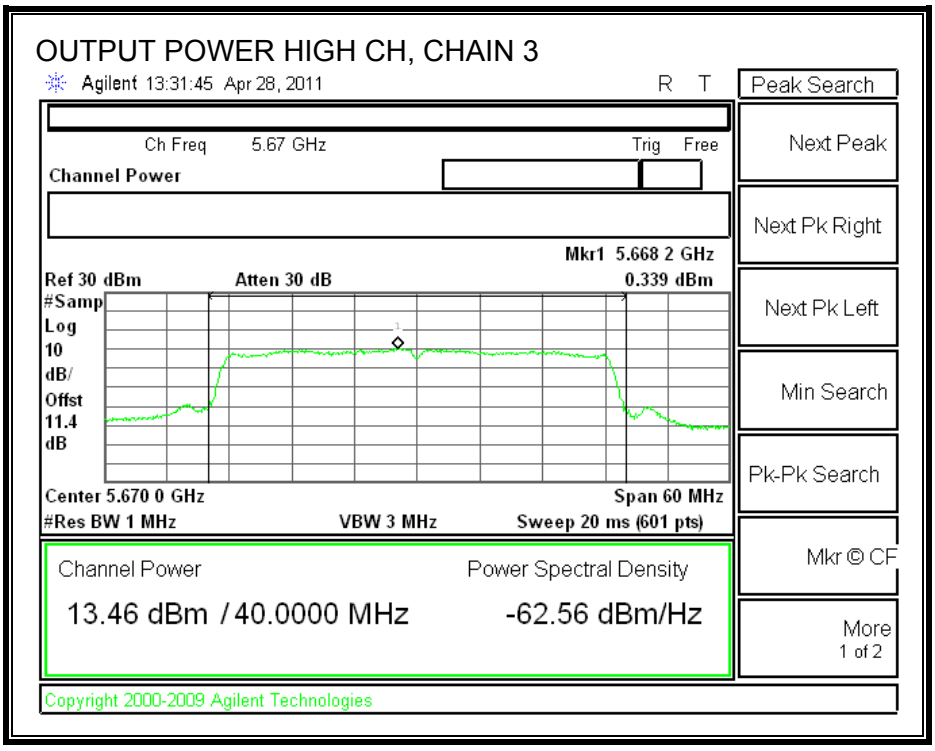




TPC OUTPUT POWER







7.18.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.40 dB (including 10 dB pad and 1.40 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Total Power (dBm)
Low	5510	15.55	15.61	15.58	20.35
Low	5590	19.02	19.23	19.14	23.90
High	5670	19.03	19.19	19.18	23.91

7.18.4. 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 5.35 dBi, therefore the limit is 11 dBm.

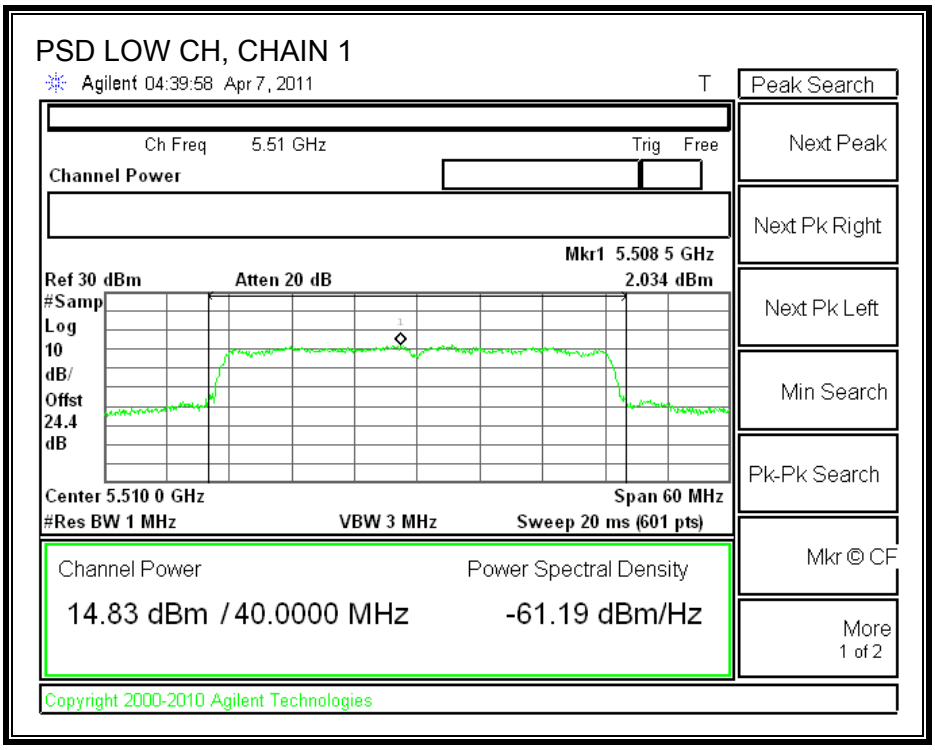
TEST PROCEDURE

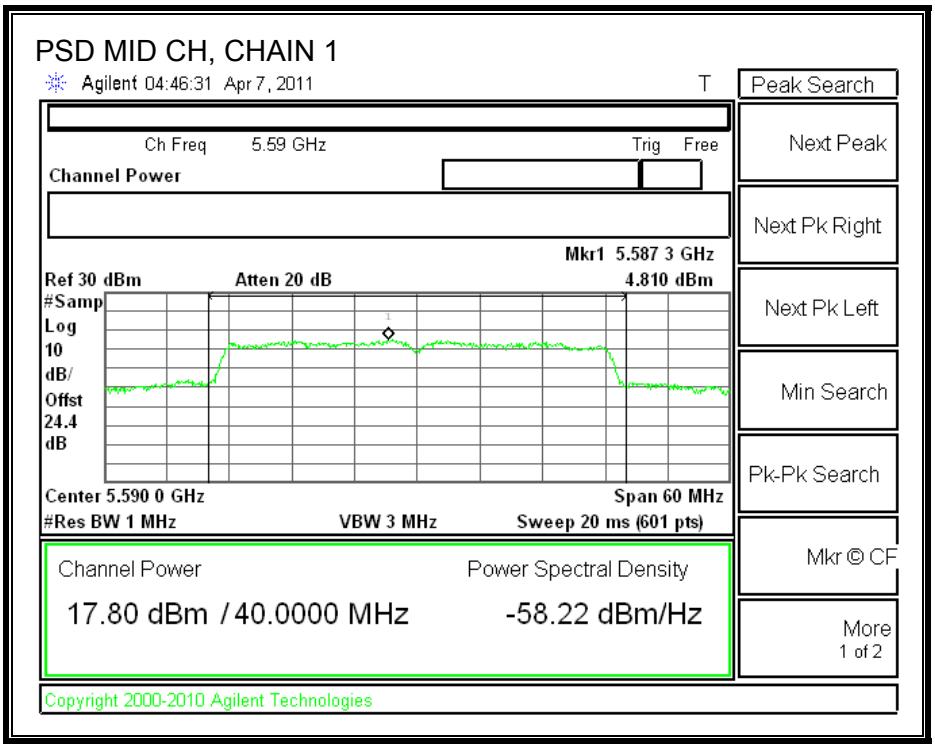
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

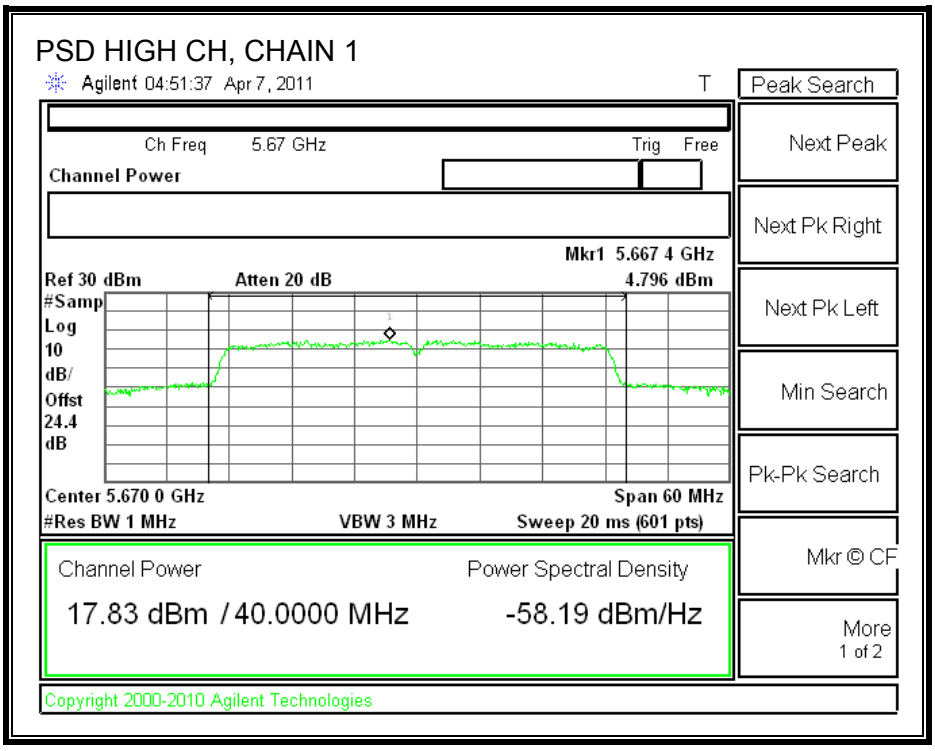
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Chain 3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	2.034	2.095	1.986	6.81	11.00	-4.19
Middle	5590	4.810	5.022	4.617	9.59	11.00	-1.41
High	5670	4.796	4.820	4.775	9.57	11.00	-1.43

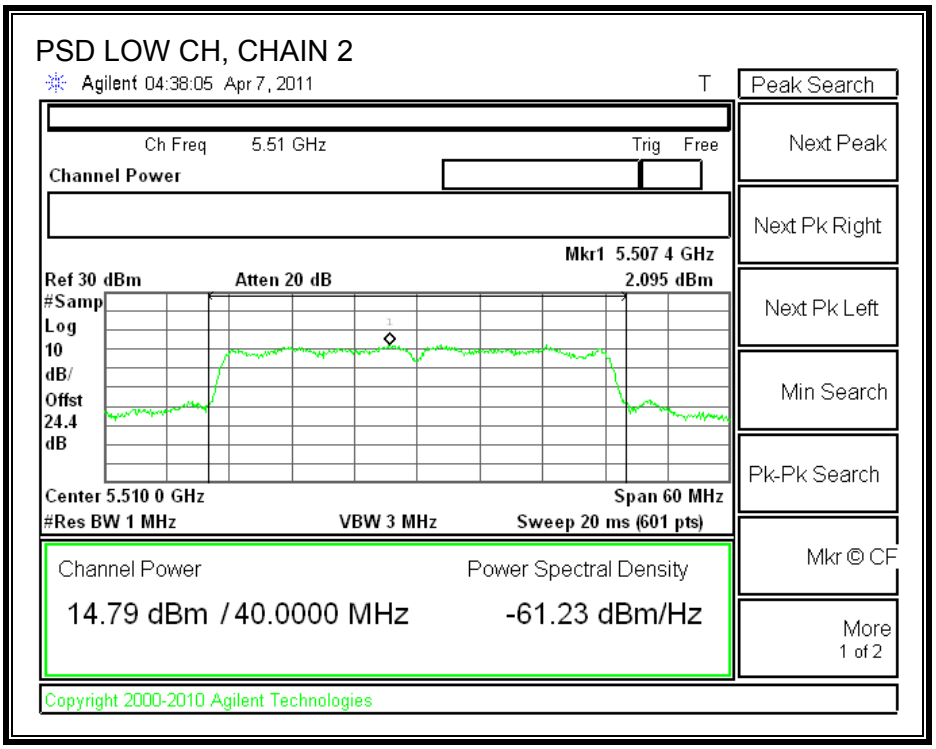
CHAIN 1 POWER SPECTRAL DENSITY

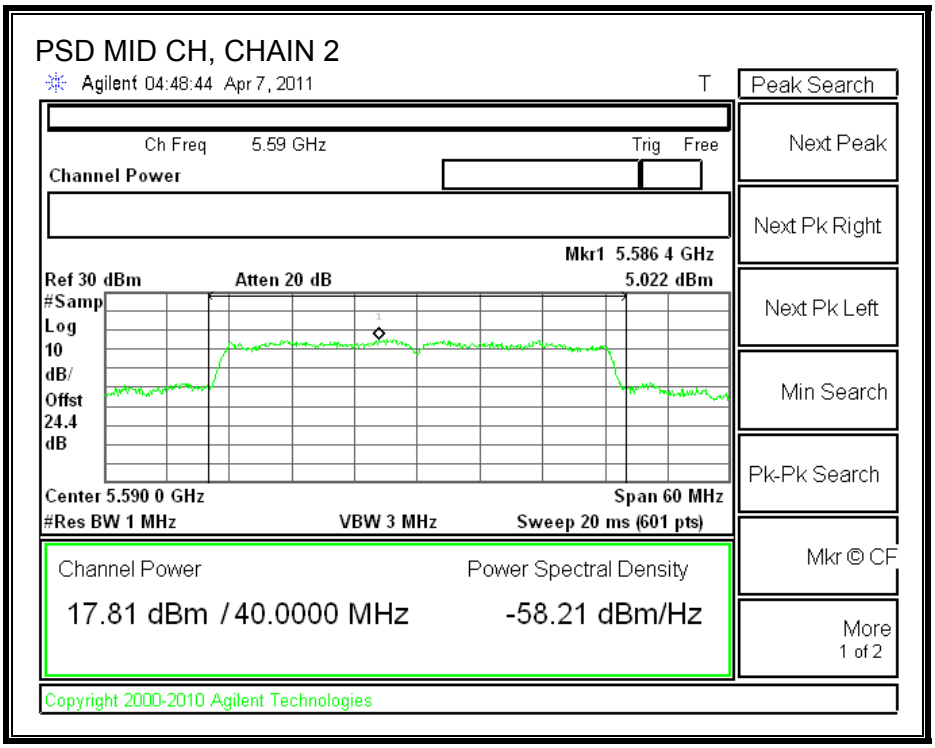




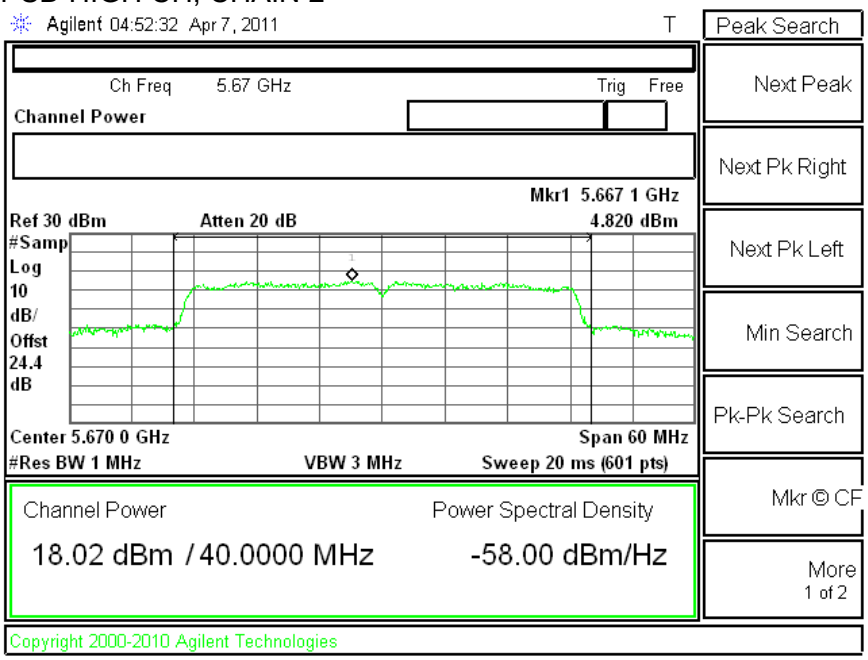


CHAIN 2 POWER SPECTRAL DENSITY

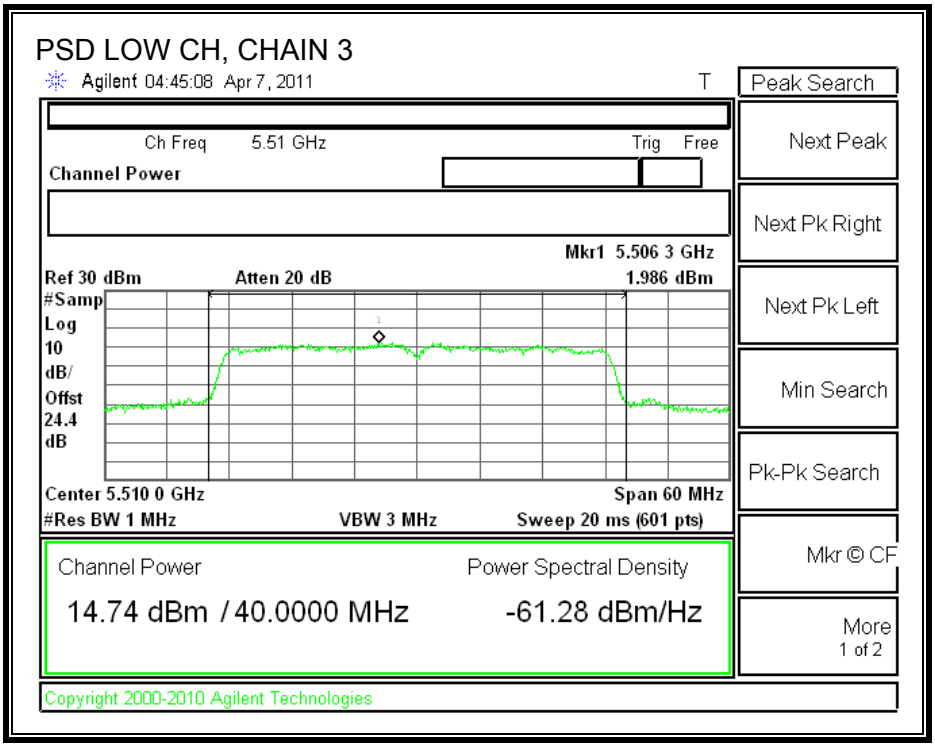


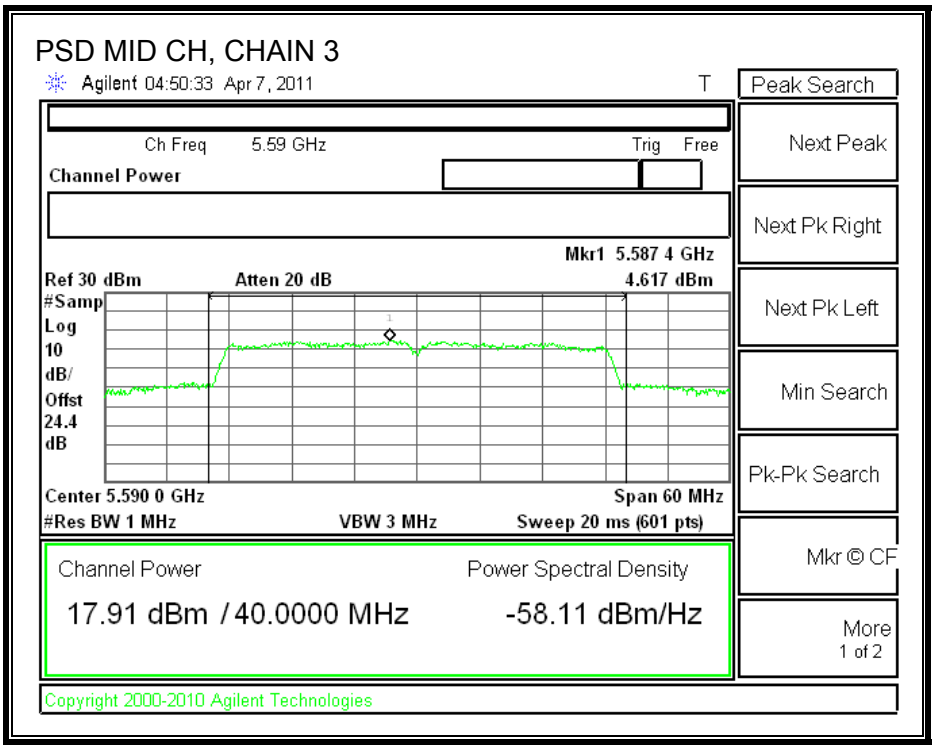


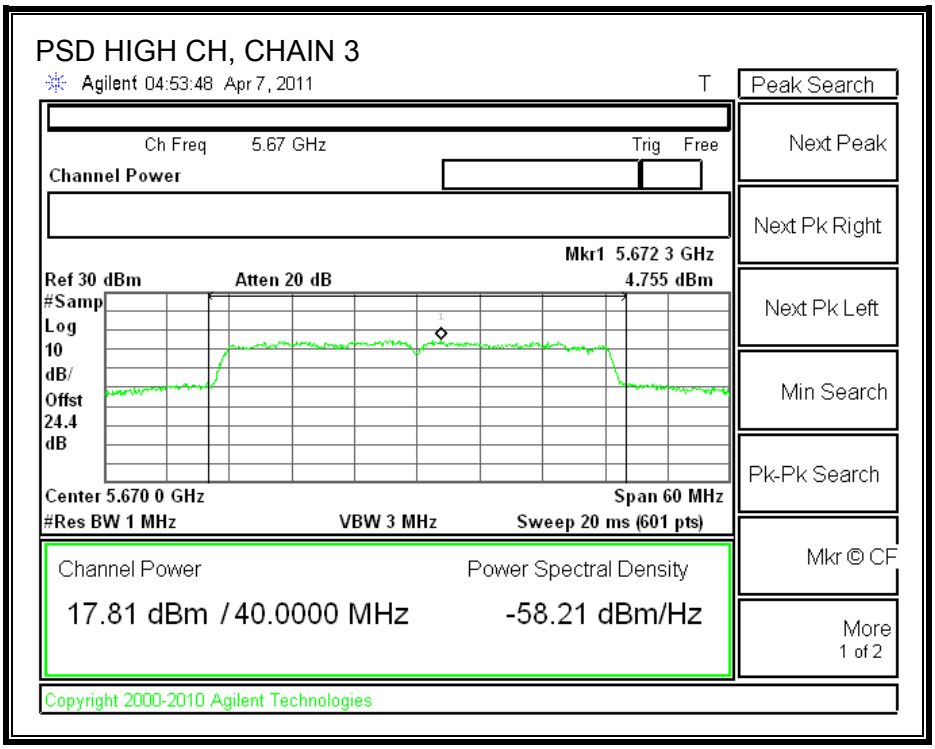
PSD HIGH CH, CHAIN 2



CHAIN 3 POWER SPECTRAL DENSITY







7.18.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

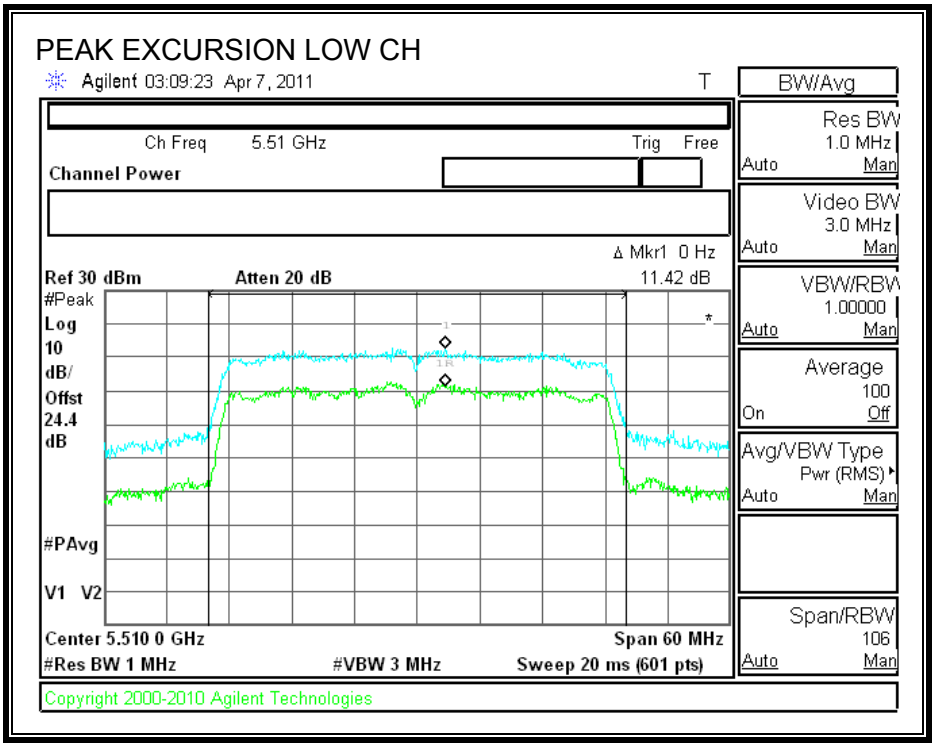
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

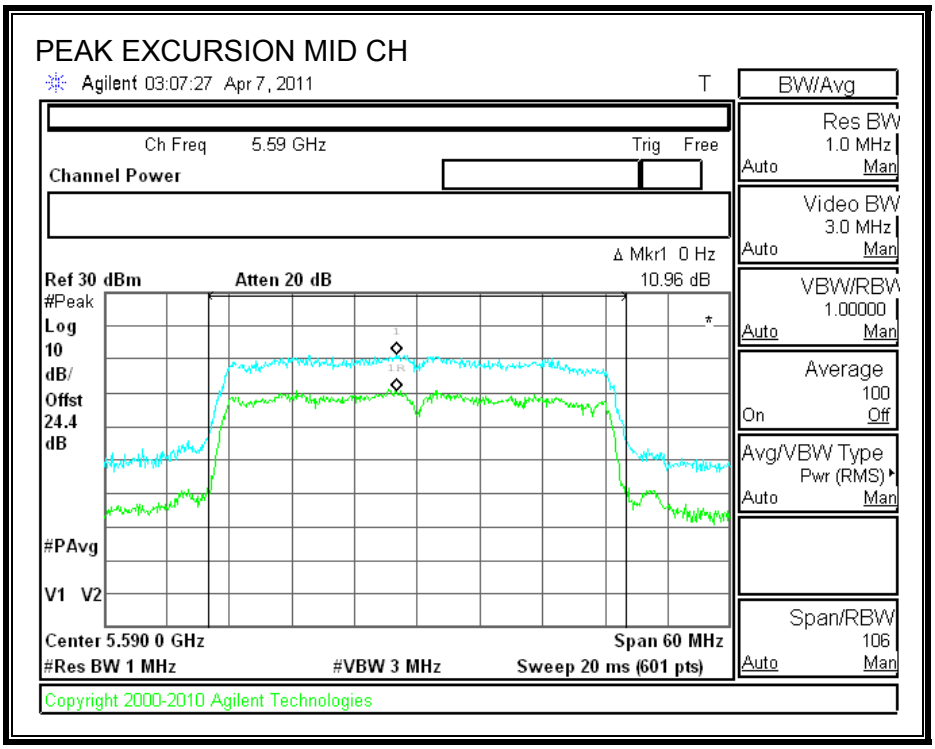
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

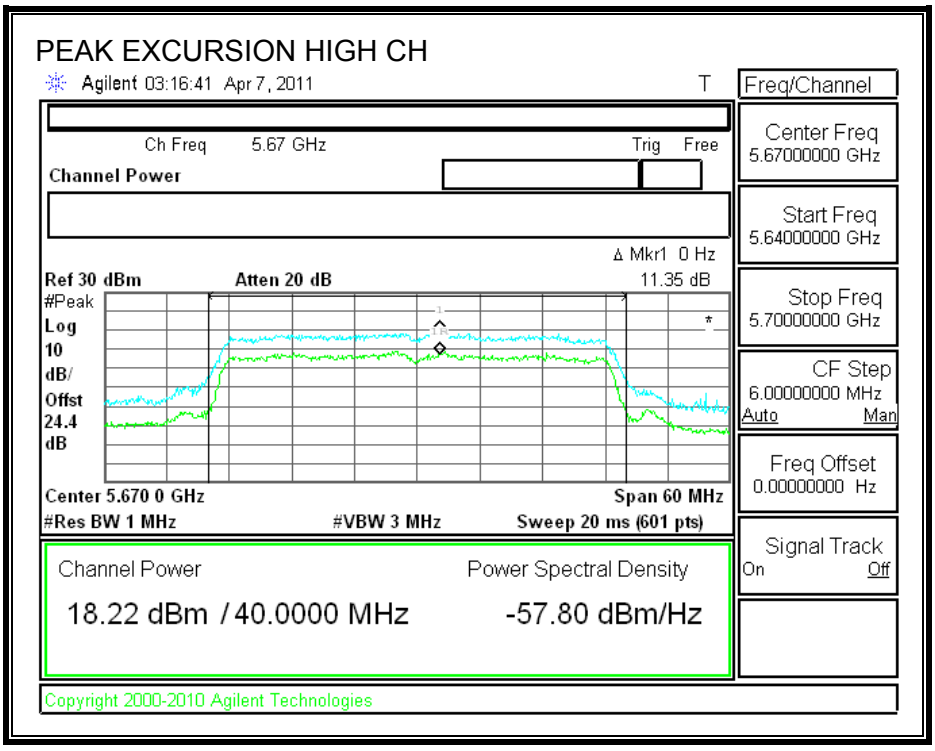
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	11.42	13	-1.58
Middle	5590	10.96	13	-2.04
High	5670	11.35	13	-1.65

PEAK EXCURSION







7.18.6. CONDUCTED SPURIOUS EMISSIONS

Covered by testing to 11n 3x3 CDD MCS0

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 appplicable band.

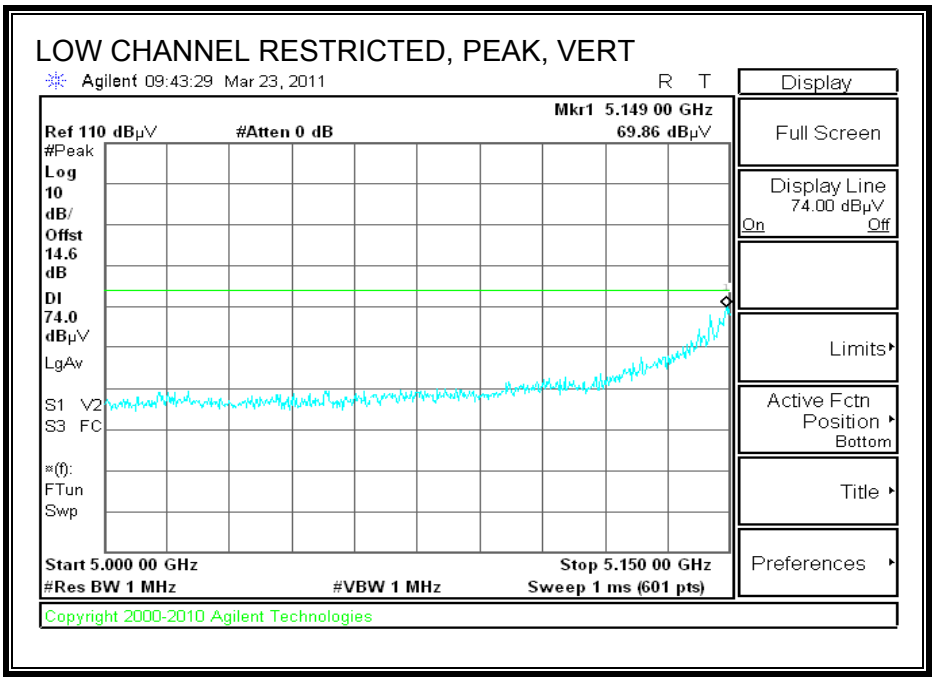
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

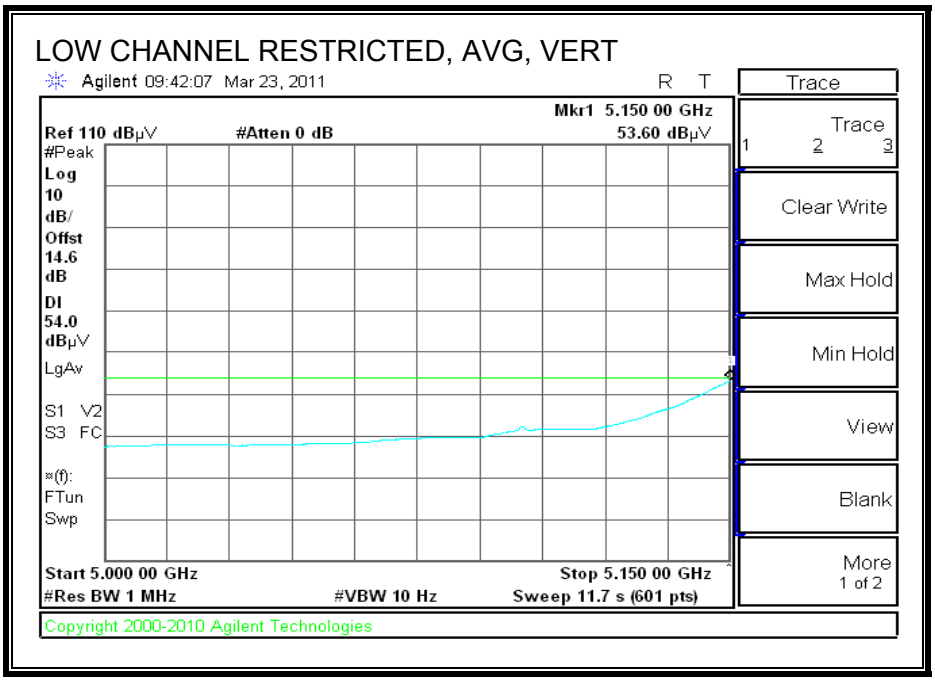
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. 802.11a MODE IN THE LOWER 5.2 GHz BAND

LEGACY

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CCD MCS0

8.2.2. 802.11n DUAL CHAIN HT20 MODE IN THE LOWER 5.2 GHz BAND

CDD MCS0, STBC MCS0

Covered by testing to 11n HT20 3x3 CDD MCS0

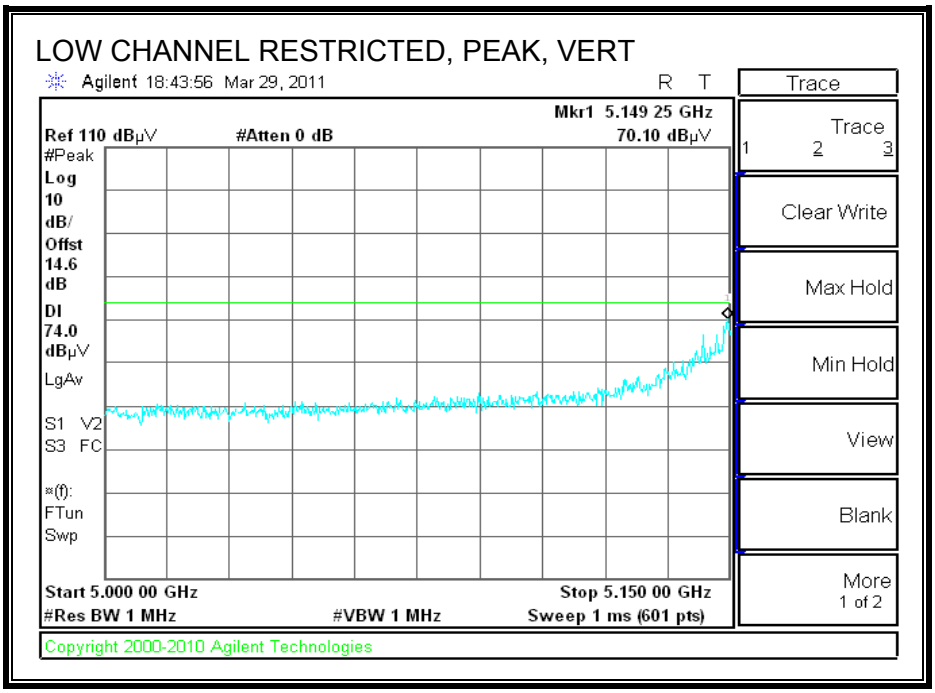
8.2.3. 802.11n THREE CHAINS HT20 MODE IN THE LOWER 5.2 GHz BAND

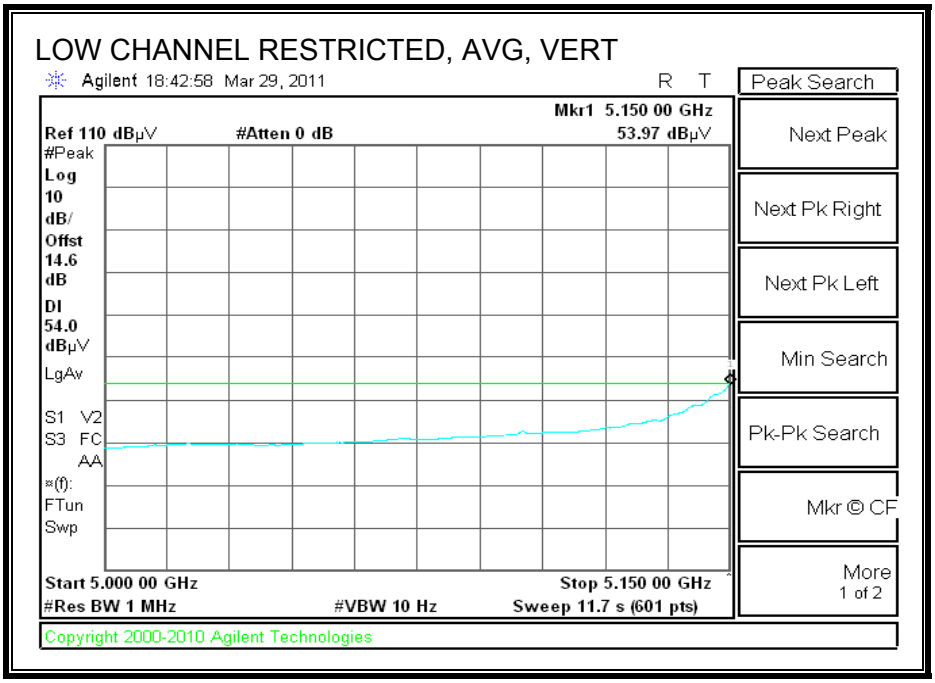
CDD MCS0:

This mode is not implemented in the 5.2 GHz band and will be disabled in production devices.

This mode is tested for harmonic / band edge / spurious emissions @ 18dBm average power per chain at worst case mode / power to cover all 1x3 & 2x2 modes.

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom
Project #: 11U13734
Date: 3/21/2011
Test Engineer: Vien Tran
Configuration: EUT / Laptop / Antenna
Mode: Tx 5.2GHz_HT20 3x3 CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.109

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5180MHz															
10.360	3.0	41.9	29.2	37.6	8.9	-32.6	0.0	0.8	56.6	43.8	74	54	-17.4	-10.2	H
15.540	3.0	40.1	26.8	38.5	11.3	-32.2	0.0	0.7	58.5	45.2	74	54	-15.5	-8.8	H
10.360	3.0	44.6	32.0	37.6	8.9	-32.6	0.0	0.8	59.3	46.6	74	54	-14.7	-7.4	V
15.540	3.0	38.9	26.7	38.5	11.3	-32.2	0.0	0.7	57.2	45.1	74	54	-16.8	-8.9	V
MID CHANNEL, 5200MHz															
15.600	3.0	38.8	26.7	38.3	11.4	-32.2	0.0	0.7	57.0	44.9	74	54	-17.0	-9.1	H
15.600	3.0	39.9	26.1	38.3	11.4	-32.2	0.0	0.7	58.1	44.3	74	54	-15.9	-9.7	V
HIGH CHANNEL, 5240MHz															
15.720	3.0	39.6	27.0	38.0	11.4	-32.2	0.0	0.7	57.6	44.9	74	54	-16.4	-9.1	H
15.720	3.0	38.1	26.5	38.0	11.4	-32.2	0.0	0.7	56.1	44.5	74	54	-17.9	-9.5	V

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		

Note: tested with highest output powers at 18 dBm.

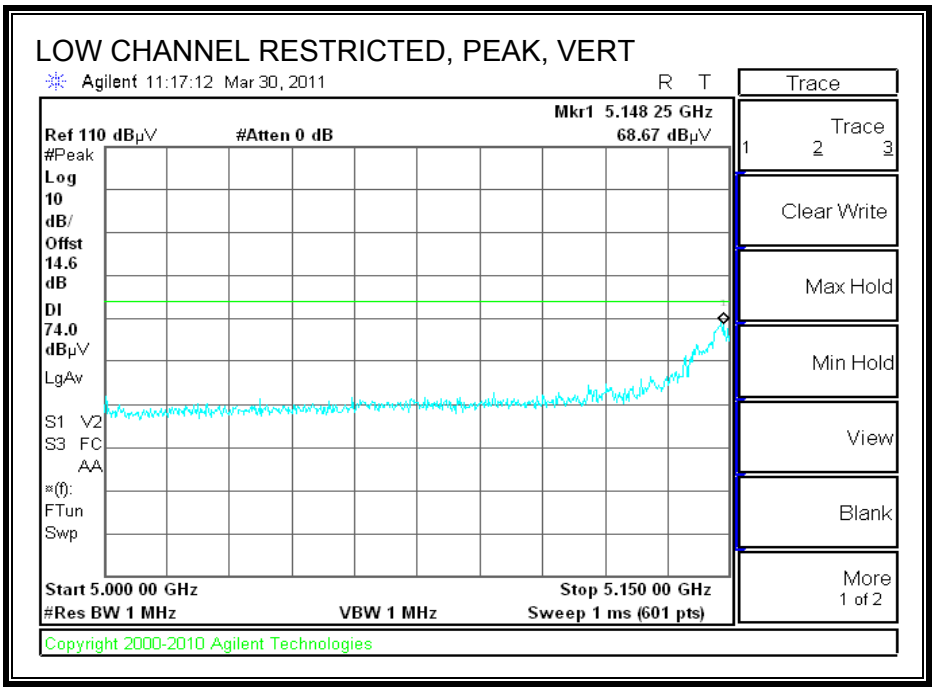
STBC MCS0 & SDM MCS21

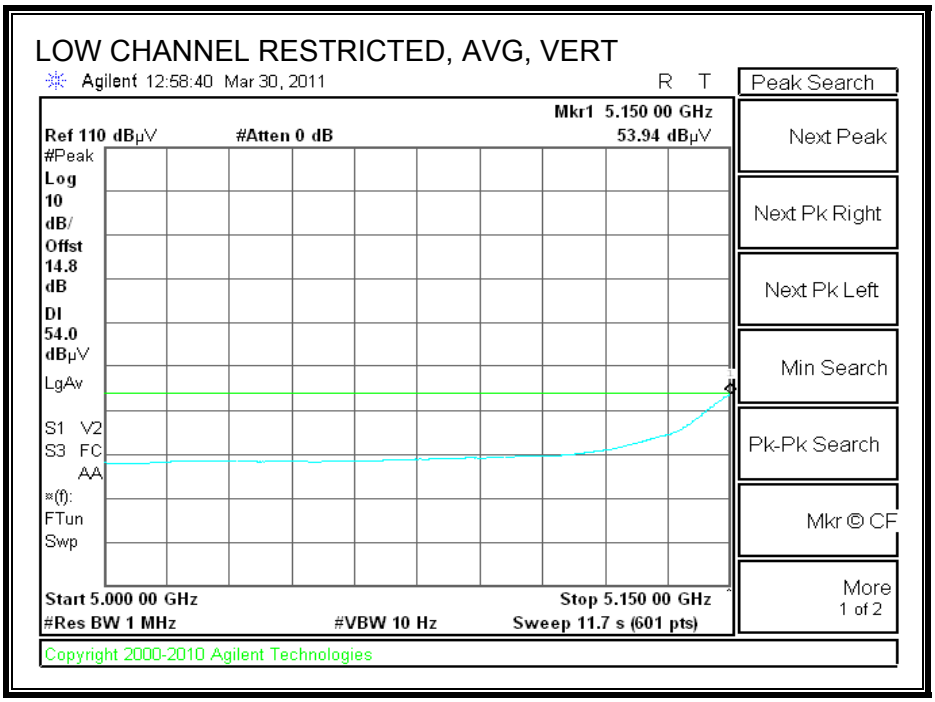
Covered by testing to 11n 3x3 CDD MCS0

8.2.4. 802.11n HT40 SISO MODE IN THE LOWER 5.2 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





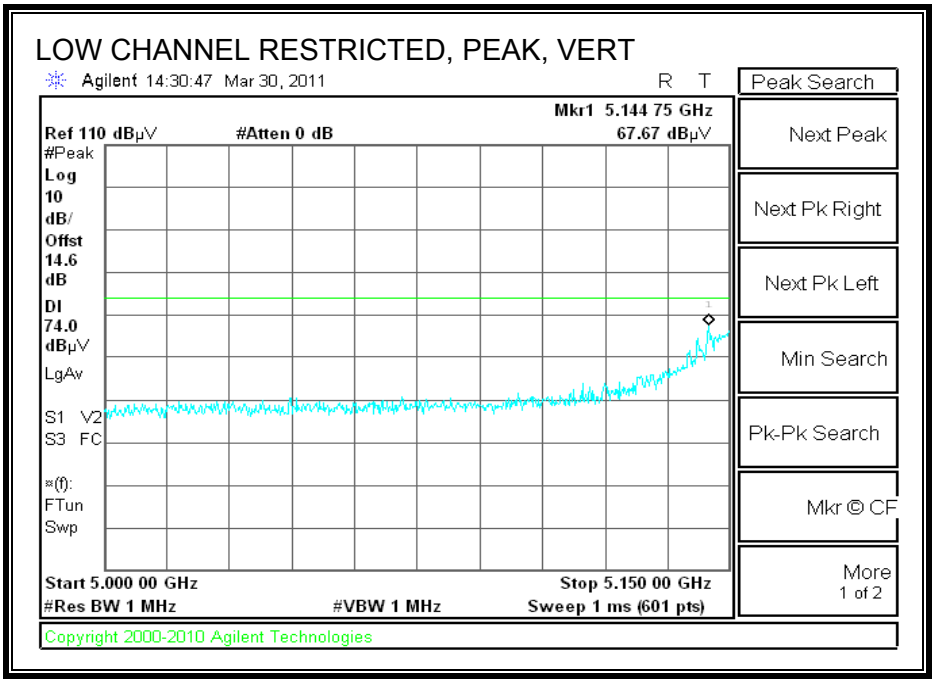
HARMONICS AND SPURIOUS EMISSIONS

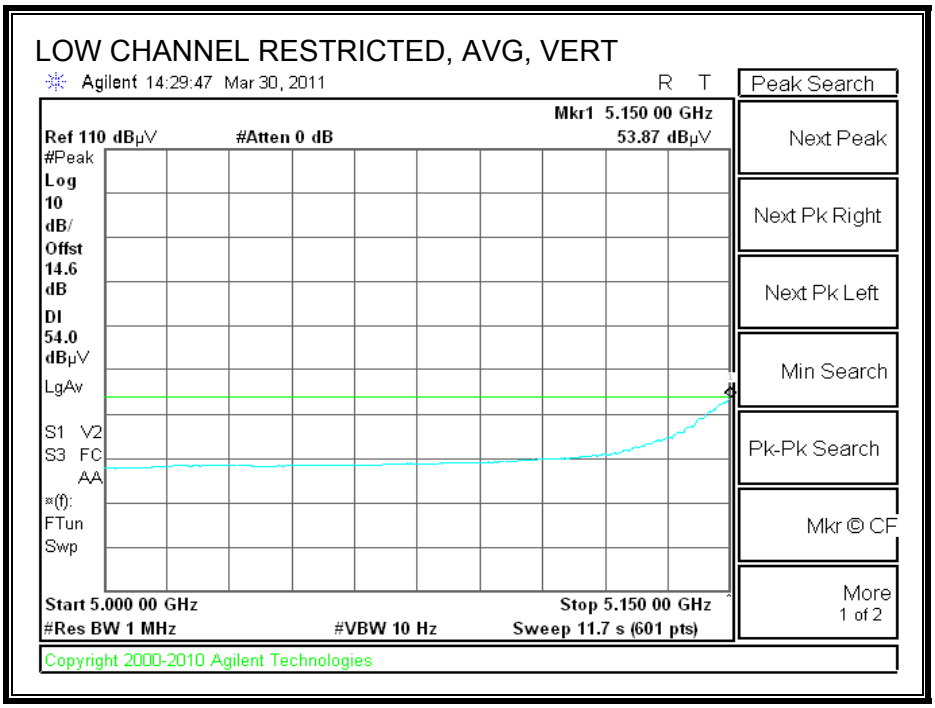
Covered by testing to 11n HT40 CDD MCS0

8.2.5. 802.11n DUAL CHAIN HT40 MODE IN THE LOWER 5.2 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



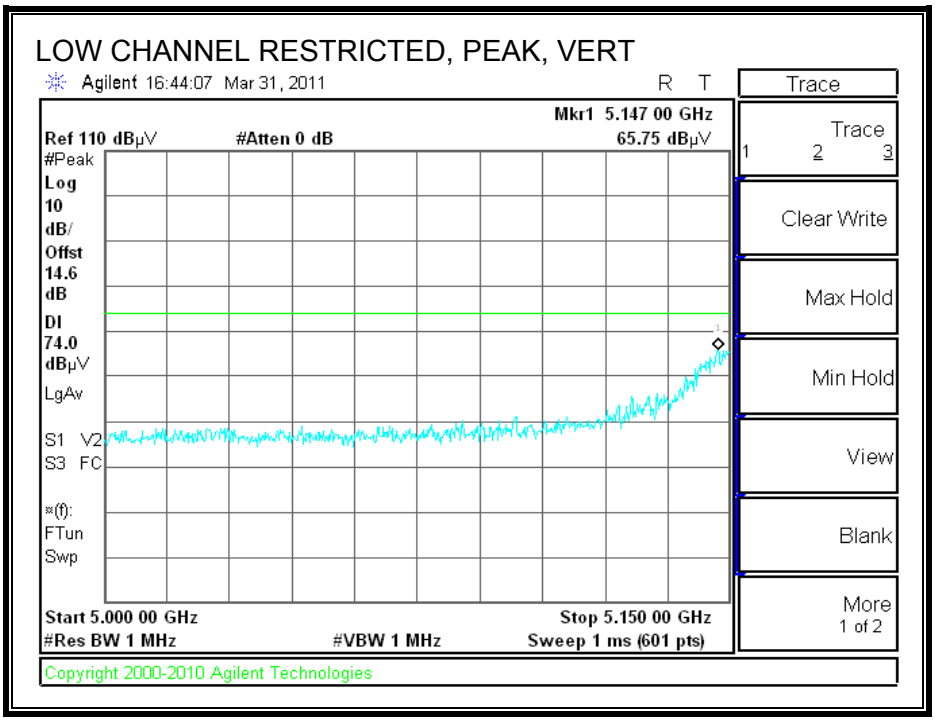


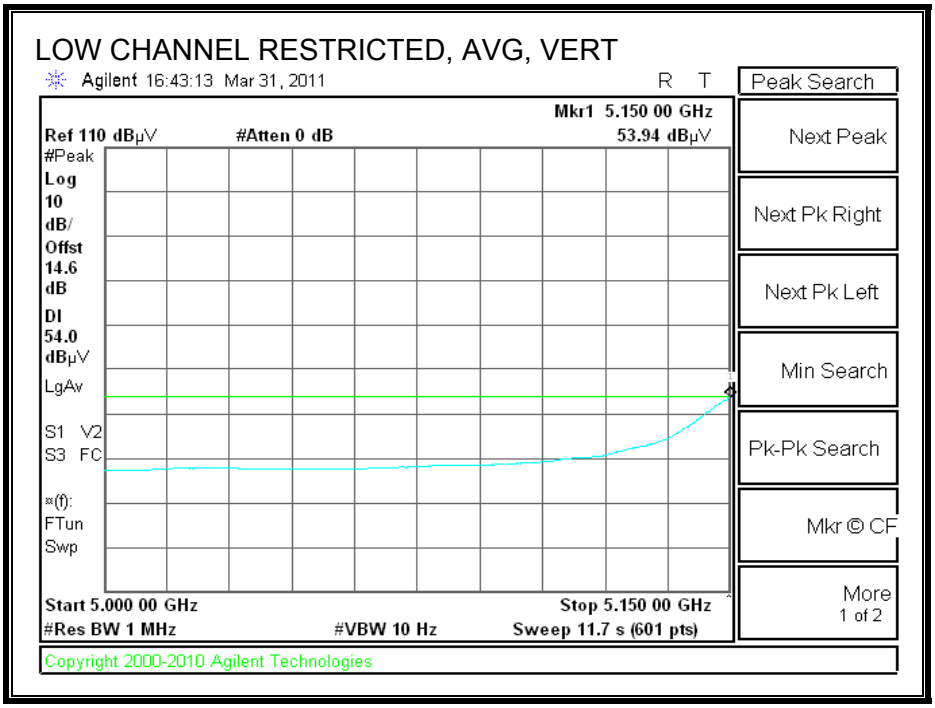
HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n 3x3 HT40 CDD MCS0

STBC MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n 3x3 HT40 CDD MCS0

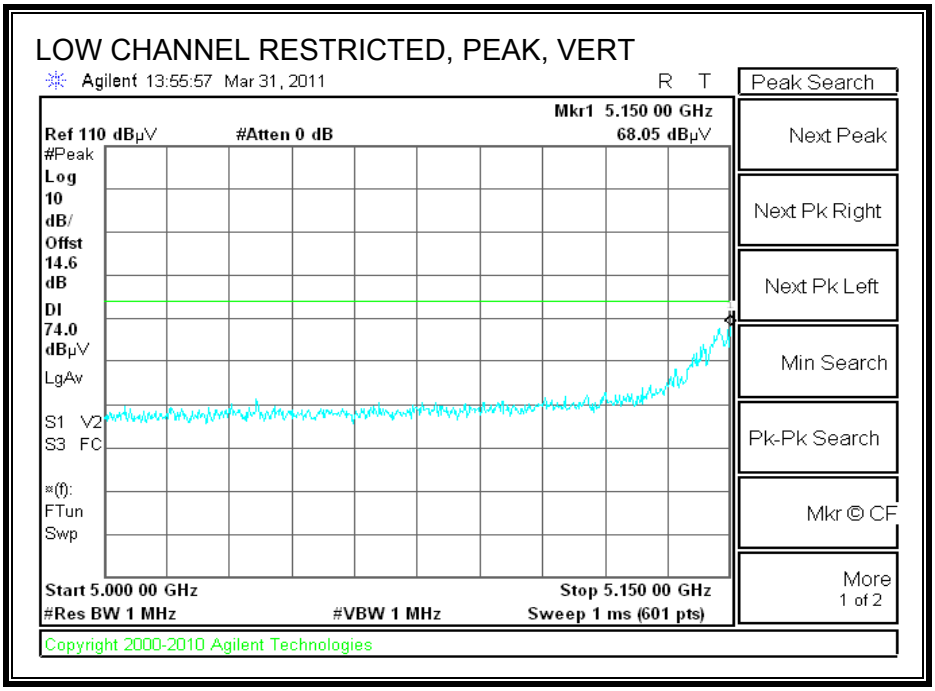
8.2.6. 802.11n THREE CHAIN HT40 MODE IN THE LOWER 5.2 GHz BAND

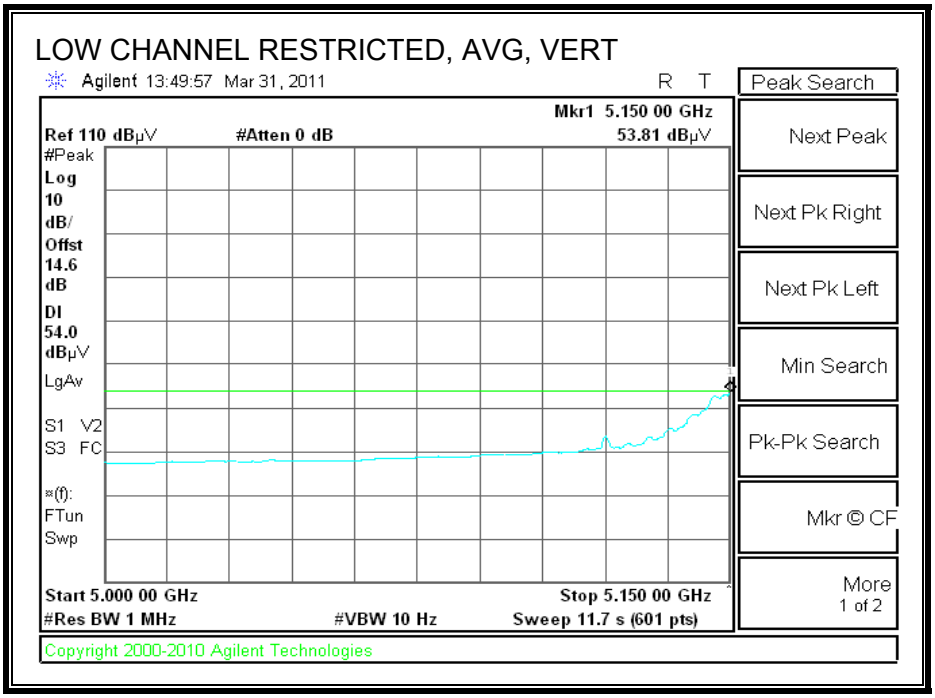
CDD MCS0:

This mode is not implemented in the 5.2 GHz band and will be disabled in production devices.

This mode is tested for harmonic / spurious emissions @ 18dBm average power per chain at worst case mode / power to cover all 1x3 & 2x2 modes.

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 3/21/2011
Test Engineer: Vien Tran
Configuration: EUT / Laptop / Antenna
Mode: Tx 5.2GHz_HT40 3x3 CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

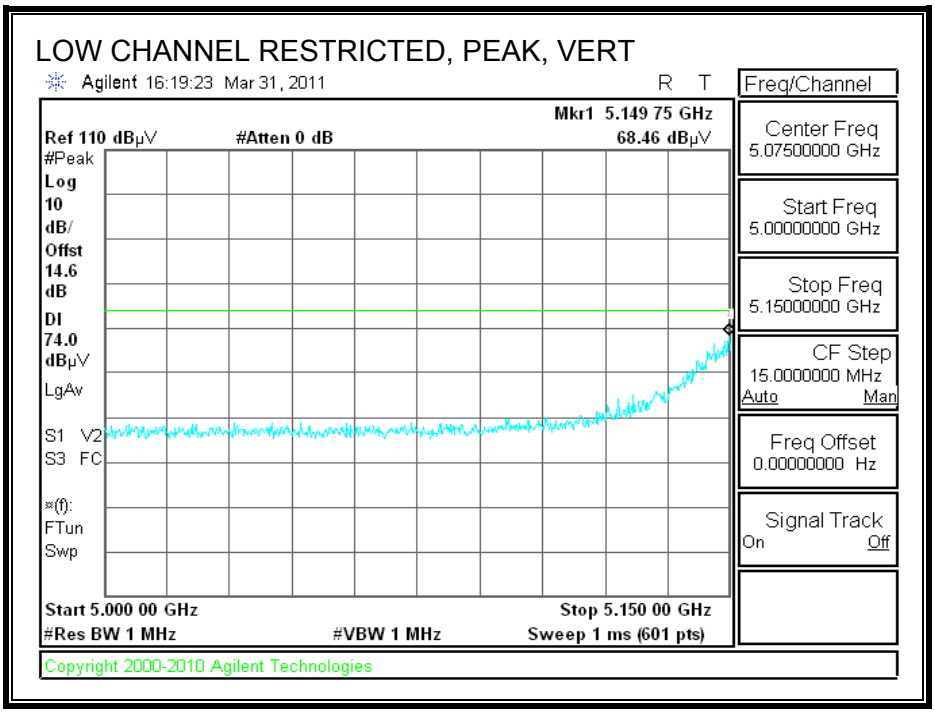
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5190MHz															
15.570	3.0	38.8	26.7	38.4	11.4	-32.2	0.0	0.7	57.1	45.0	74	54	-16.9	-9.0	H
15.570	3.0	39.3	26.3	38.4	11.4	-32.2	0.0	0.7	57.6	44.6	74	54	-16.4	-9.4	V
HIGH CHANNEL, 5230MHz															
15.690	3.0	38.1	26.5	38.1	11.4	-32.2	0.0	0.7	56.1	44.5	74	54	-17.9	-9.5	H
15.690	3.0	39.2	26.8	38.1	11.4	-32.2	0.0	0.7	57.2	44.8	74	54	-16.8	-9.2	V

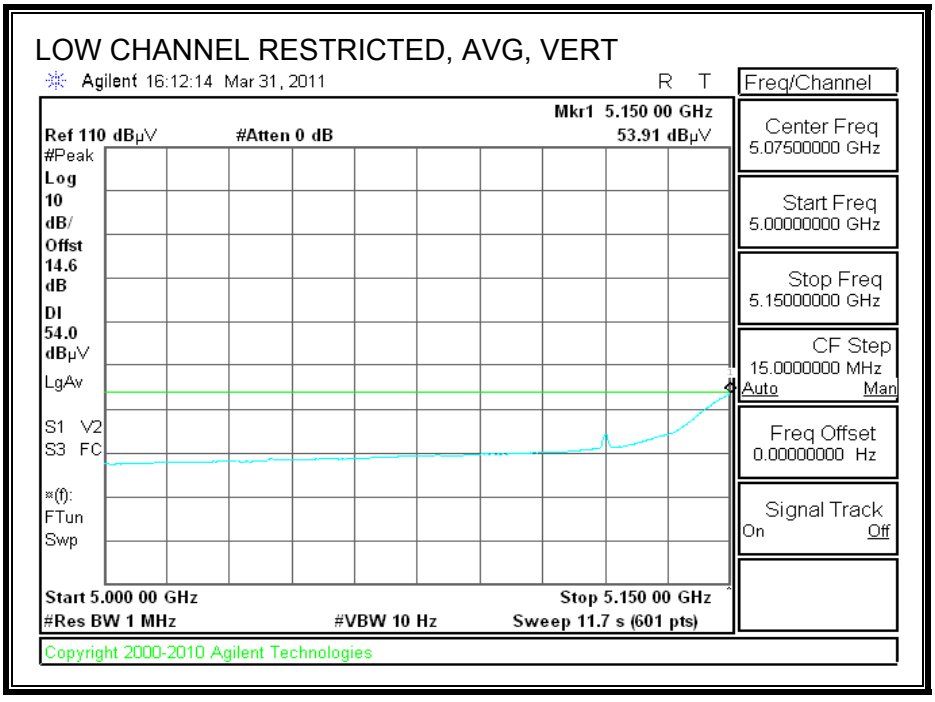
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

Note: tested with highest output powers at 18 dBm.

STBC MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



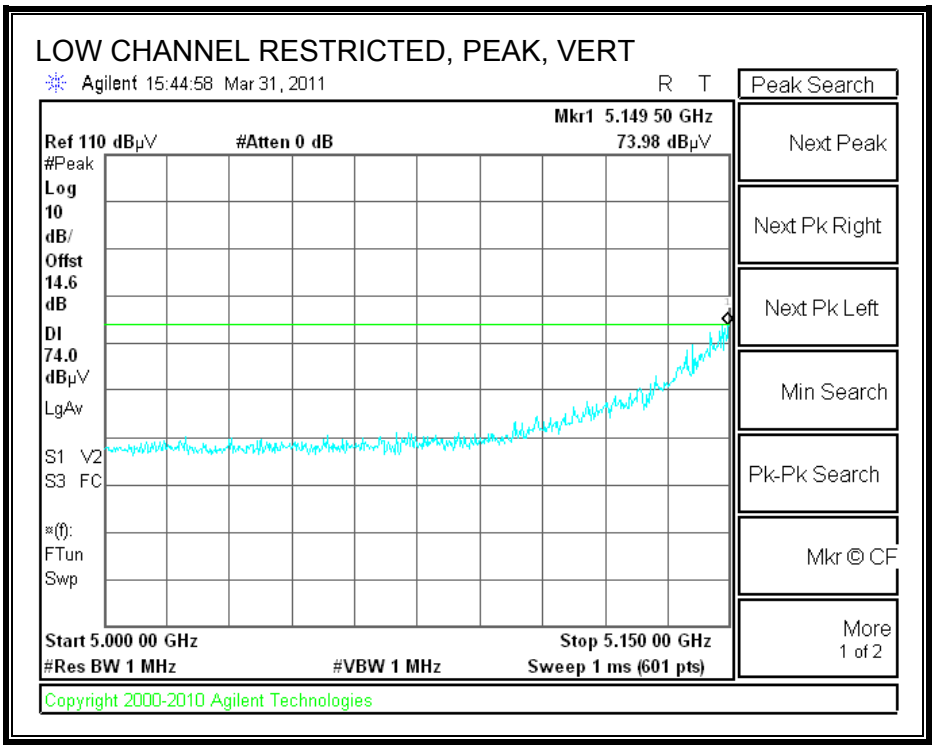


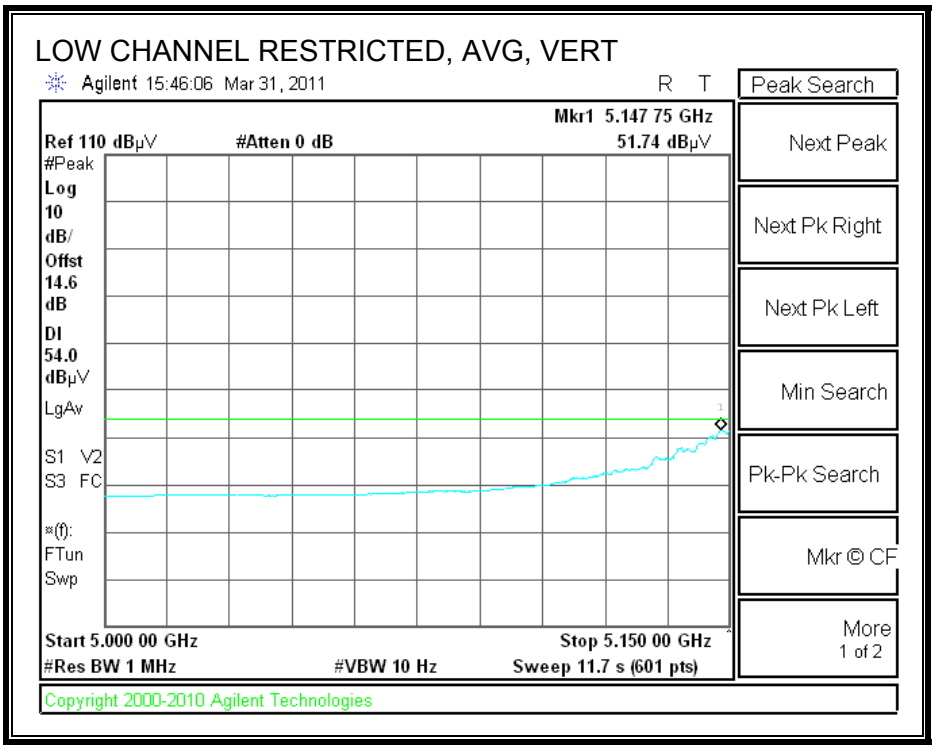
HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n 3x3 HT40 CDD MCS0

SDM MCS21

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





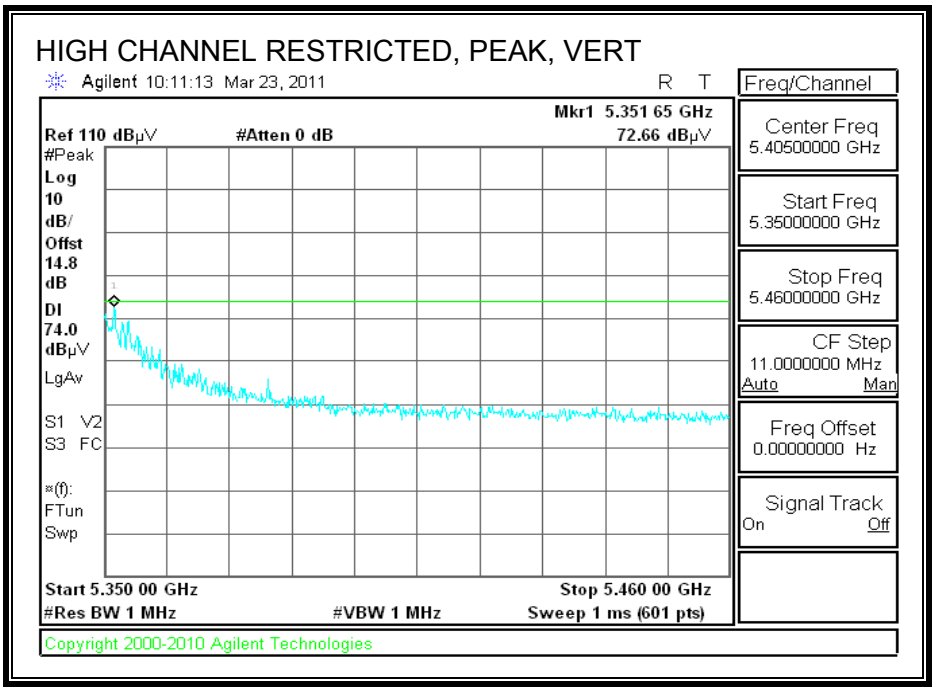
HARMONICS AND SPURIOUS EMISSIONS

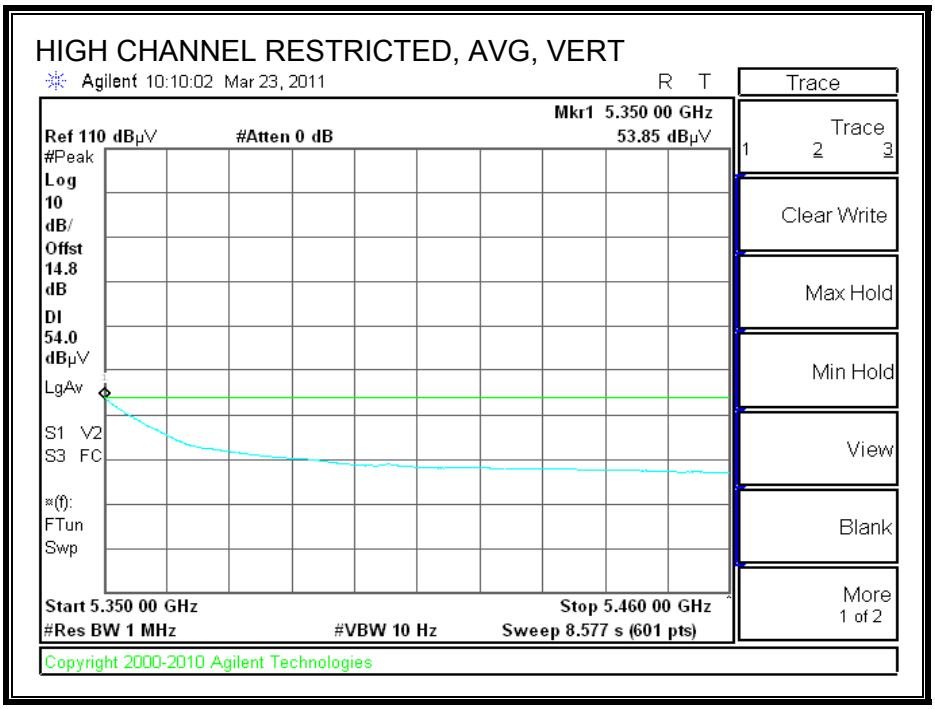
Covered by testing to 11n 3x3 HT40 CDD MCS0

8.2.7. FOR 802.11a MODE IN THE UPPER 5.3 GHz BAND

LEGACY

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n 3x3 HT20 CDD MCS0

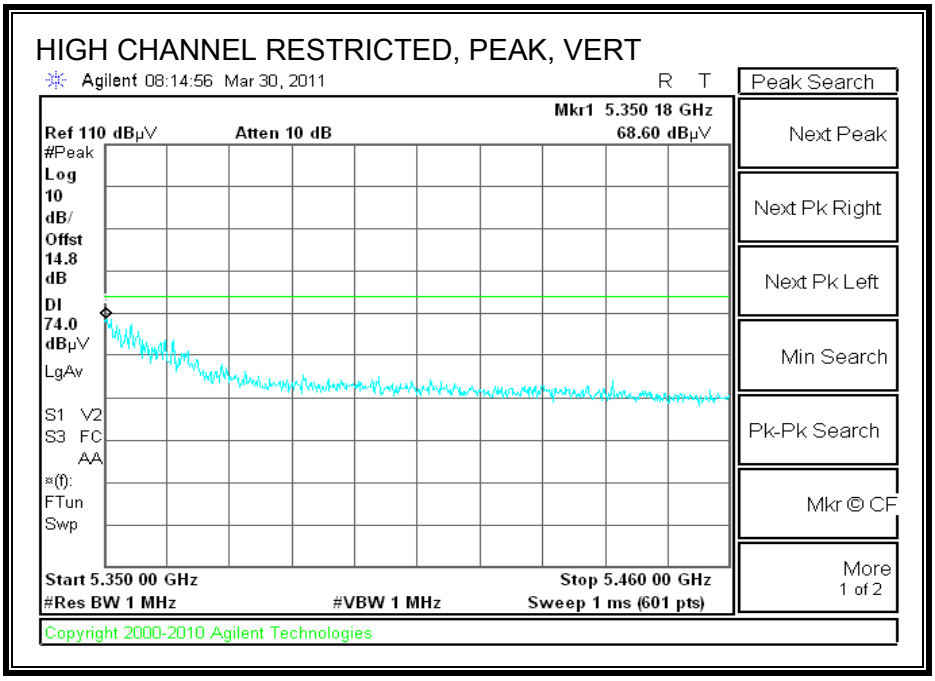
8.2.8. 802.11n DUAL CHAINS HT20 MODE IN THE UPPER 5.3 GHz BAND

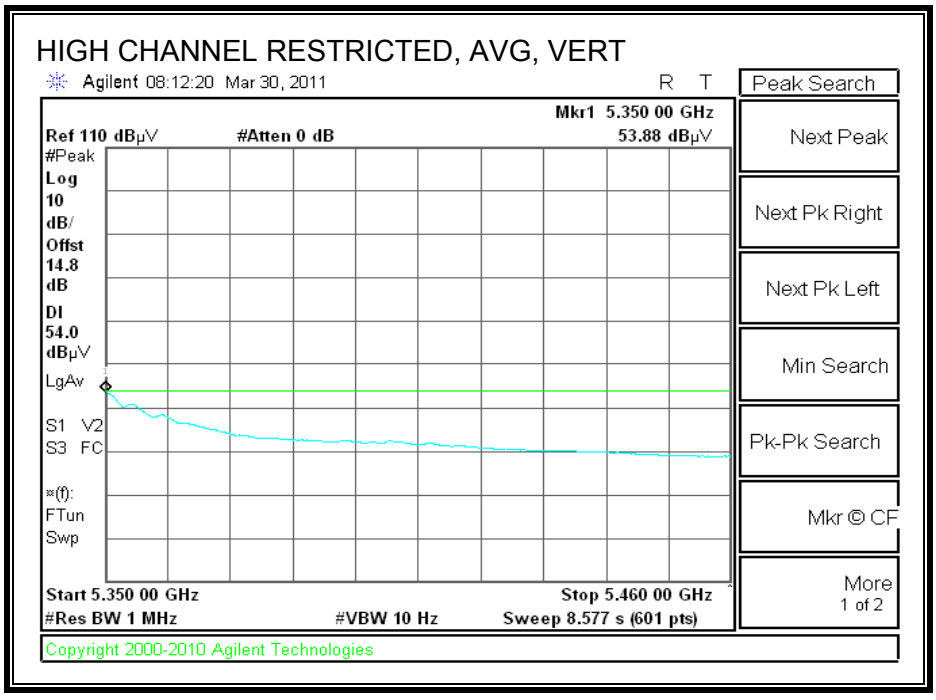
This mode is not implemented in the 5.3 GHz band and will be disabled in production devices.

8.2.9. 802.11n THREE CHAINS HT20 MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company:	**Broadcom**
Project #:	**11U13734**
Date:	**3/21/2011**
Test Engineer:	**Vien Tran**
Configuration:	**EUT / Laptop / Antenna**
Mode:	**Tx 5.3GHz_HT20 3x3 CDD MCS0**

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.109

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

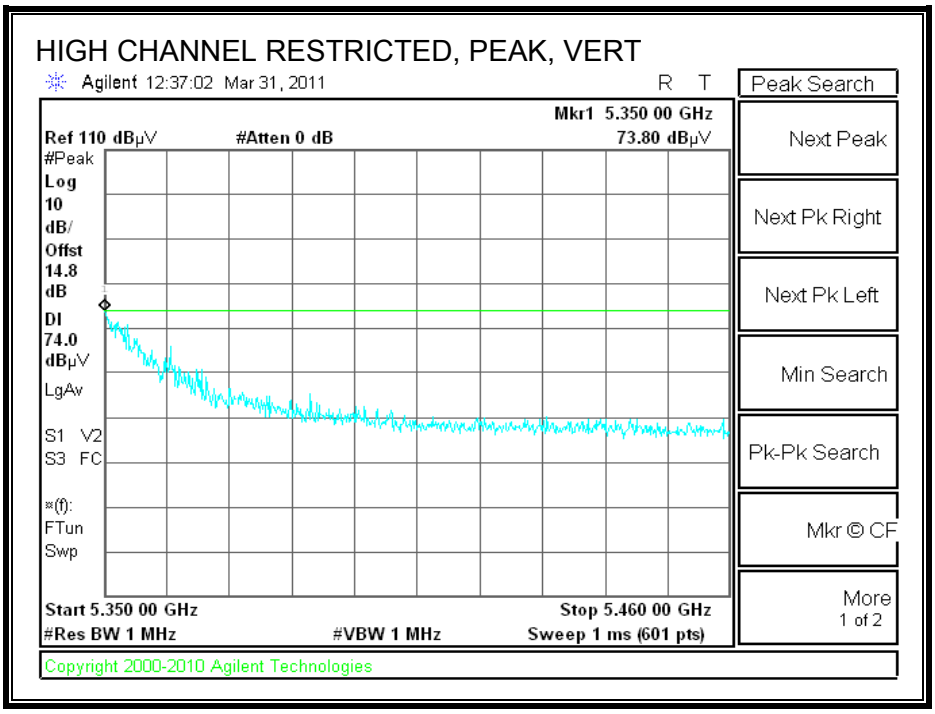
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5260MHz															
15.780	3.0	39.3	26.6	37.8	11.5	-32.2	0.0	0.7	57.1	44.4	74	54	-16.9	-9.6	H
15.780	3.0	38.9	26.8	37.8	11.5	-32.2	0.0	0.7	56.7	44.6	74	54	-17.3	-9.4	V
MID CHANNEL, 5300MHz															
10.600	3.0	42.3	31.1	37.6	9.0	-32.6	0.0	0.8	57.1	45.9	74	54	-16.9	-8.1	H
15.900	3.0	39.7	28.7	37.5	11.5	-32.1	0.0	0.7	57.3	46.3	74	54	-16.7	-7.7	H
10.600	3.0	45.3	34.7	37.6	9.0	-32.6	0.0	0.8	60.1	49.5	74	54	-13.9	-4.5	V
15.900	3.0	38.7	26.9	37.5	11.5	-32.1	0.0	0.7	56.3	44.5	74	54	-17.7	-9.5	V
HIGH CHANNEL, 5320MHz															
10.640	3.0	42.6	30.2	37.6	9.1	-32.6	0.0	0.8	57.4	45.0	74	54	-16.6	-9.0	H
15.960	3.0	40.2	29.2	37.3	11.5	-32.1	0.0	0.7	57.6	46.6	74	54	-16.4	-7.4	H
10.640	3.0	45.9	34.8	37.6	9.1	-32.6	0.0	0.8	60.7	49.6	74	54	-13.3	-4.4	V
15.960	3.0	39.2	27.3	37.3	11.5	-32.1	0.0	0.7	56.6	44.7	74	54	-17.4	-9.3	V

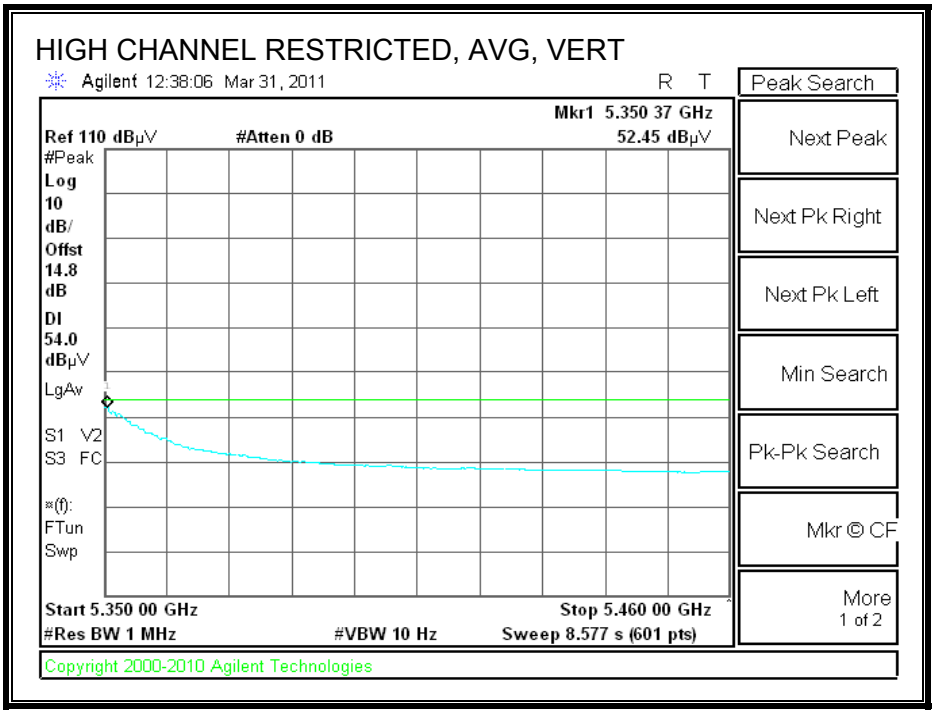
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

Note: tested with highest output powers at 18 dBm.

SDM MCS21

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





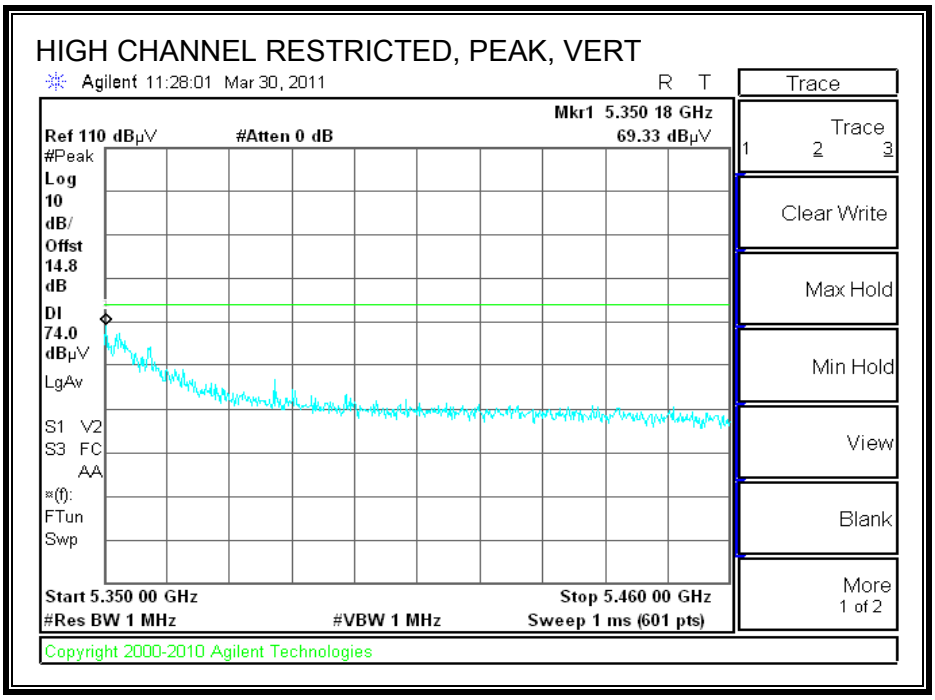
HARMONICS AND SPURIOUS EMISSIONS

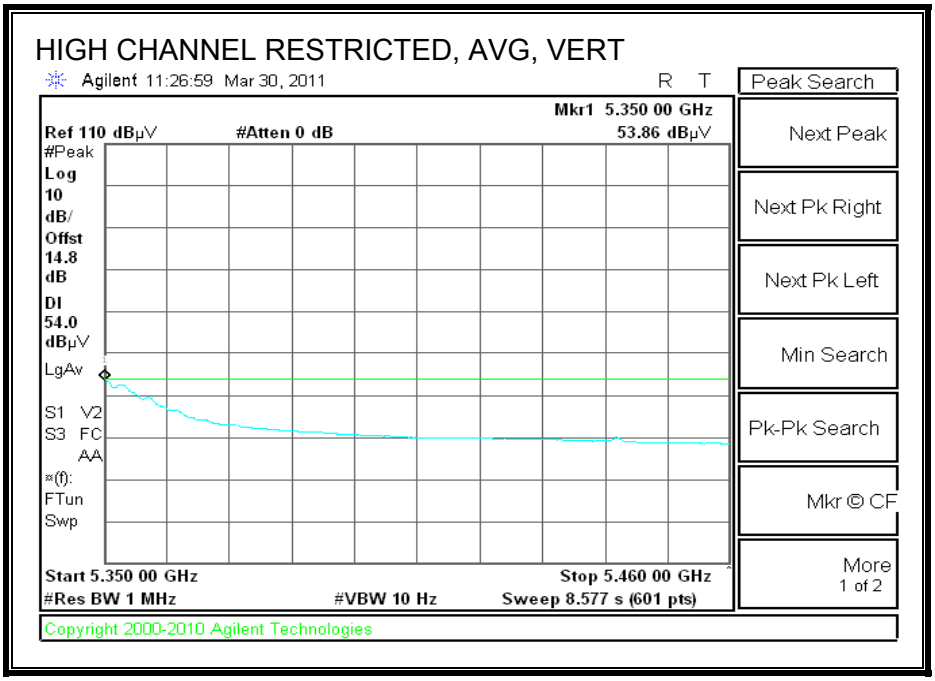
Covered by testing to 11n HT 20 3x3 CDD MCS0

8.2.10. 802.11n HT40 SISO MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





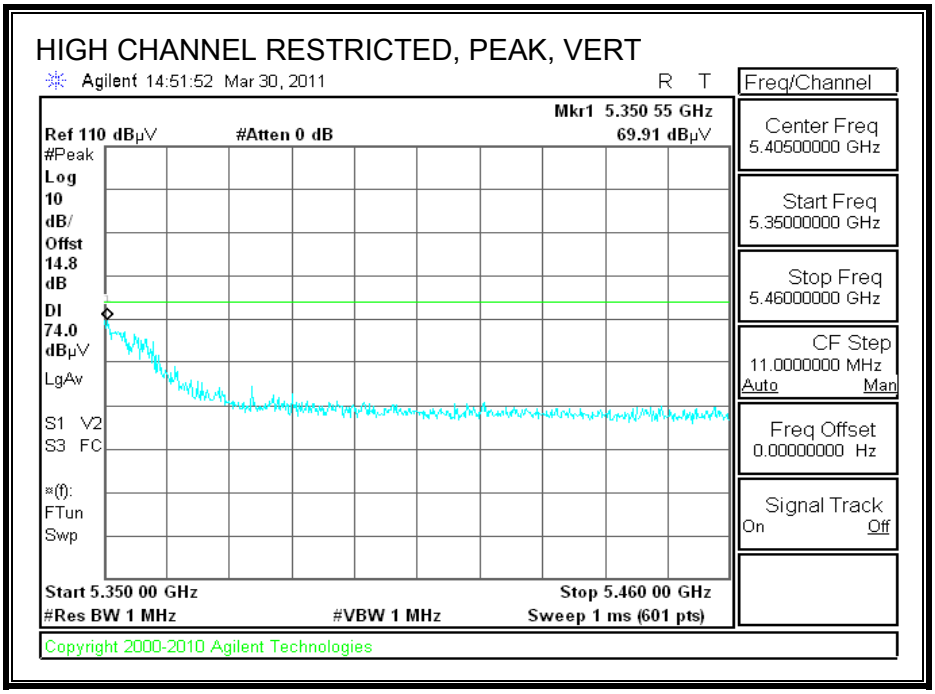
HARMONICS AND SPURIOUS EMISSIONS

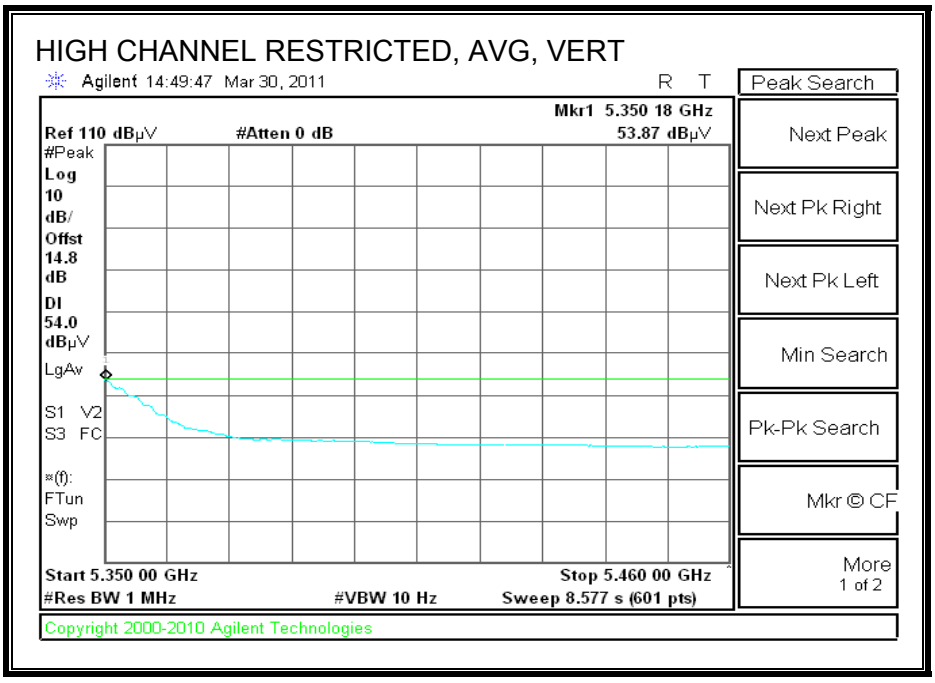
Covered by testing to 11n HT 40 3x3 CDD MCS0

8.2.11. 802.11n DUAL CHAIN HT40 MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





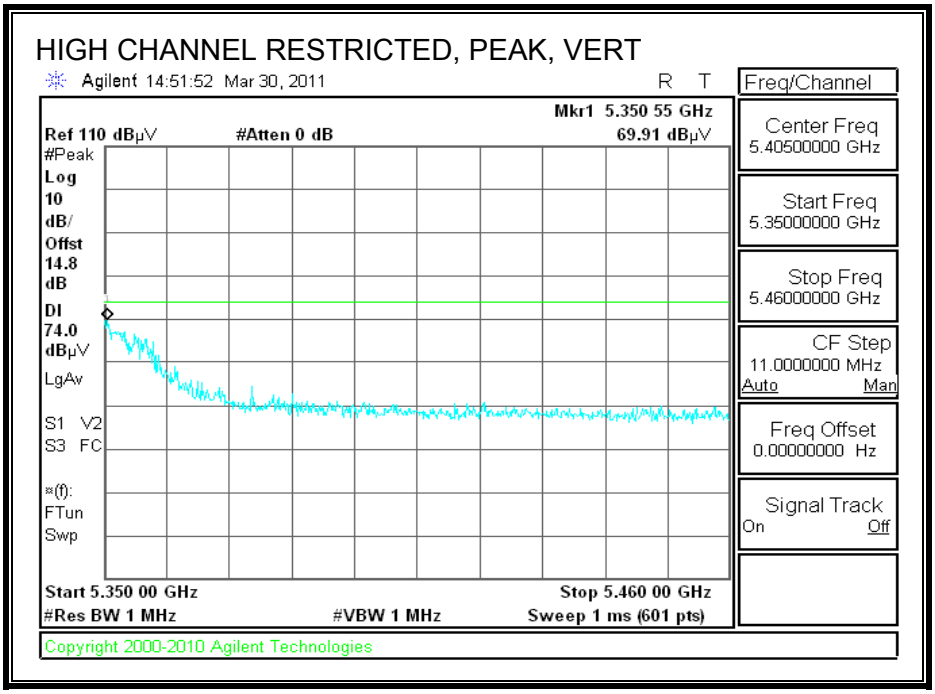
HARMONICS AND SPURIOUS EMISSIONS

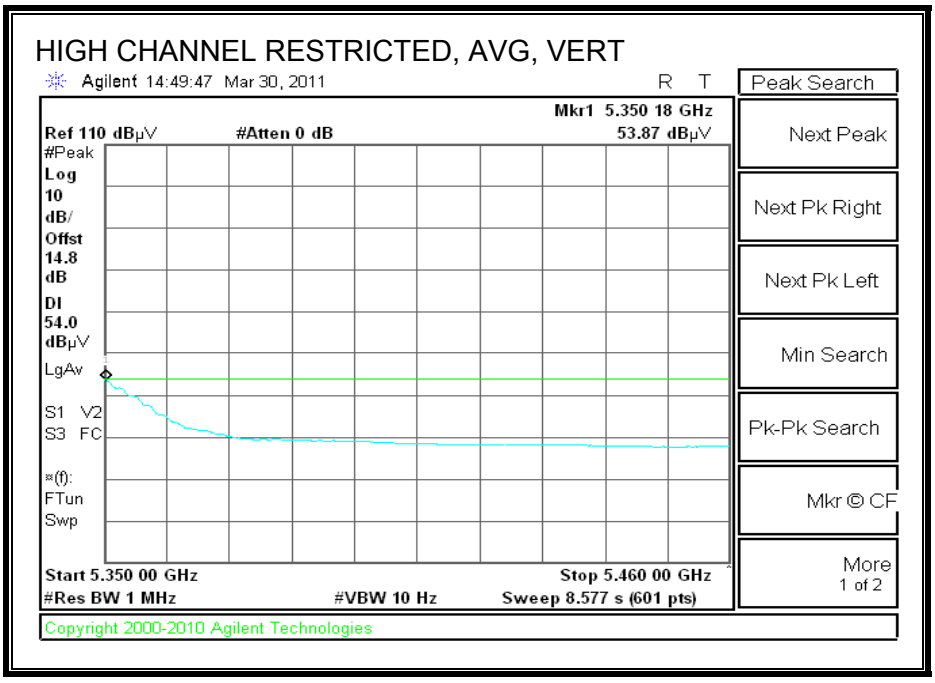
Covered by testing to 11n HT 40 3x3 CDD MCS0

8.2.12. 802.11n THREE CHAINS HT40 MODE IN THE UPPER 5.3 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 3/22/2011
Test Engineer: Vien Tran
Configuration: EUT / Laptop / Antenna
Mode: Tx 5.3GHz_HT403x3 CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

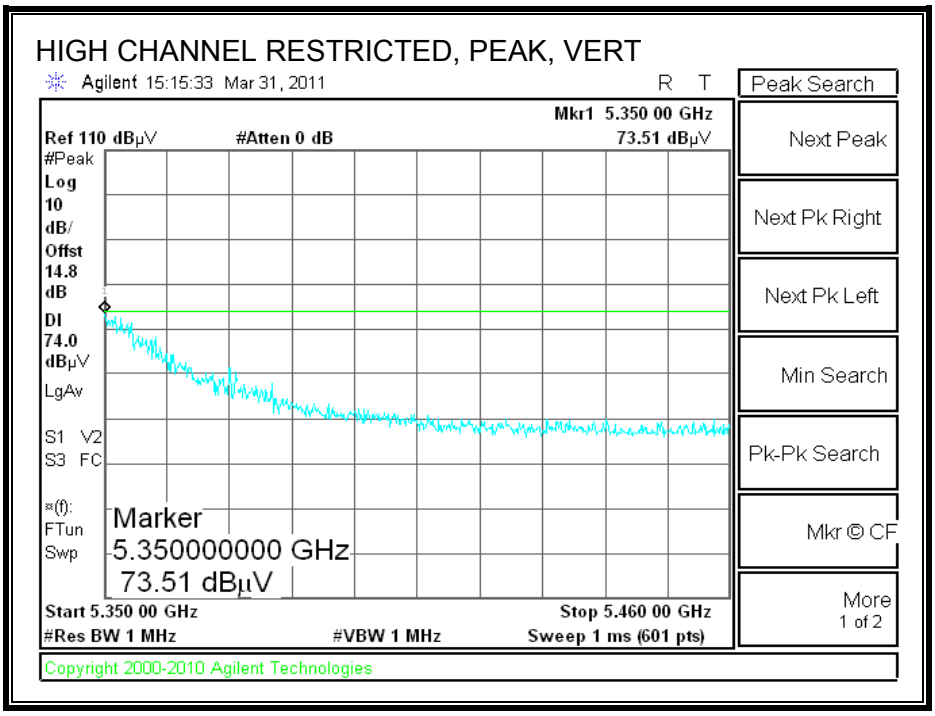
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5270MHz															
15.810	3.0	38.0	26.6	37.7	11.5	-32.2	0.0	0.7	55.8	44.4	74	54	-18.2	-9.6	H
15.810	3.0	39.2	26.9	37.7	11.5	-32.2	0.0	0.7	56.9	44.7	74	54	-17.1	-9.3	V
HIGH CHANNEL, 5310MHz															
15.690	3.0	38.1	26.4	38.1	11.4	-32.2	0.0	0.7	56.1	44.4	74	54	-17.9	-9.6	H
15.690	3.0	38.8	26.9	38.1	11.4	-32.2	0.0	0.7	56.8	44.9	74	54	-17.2	-9.1	V

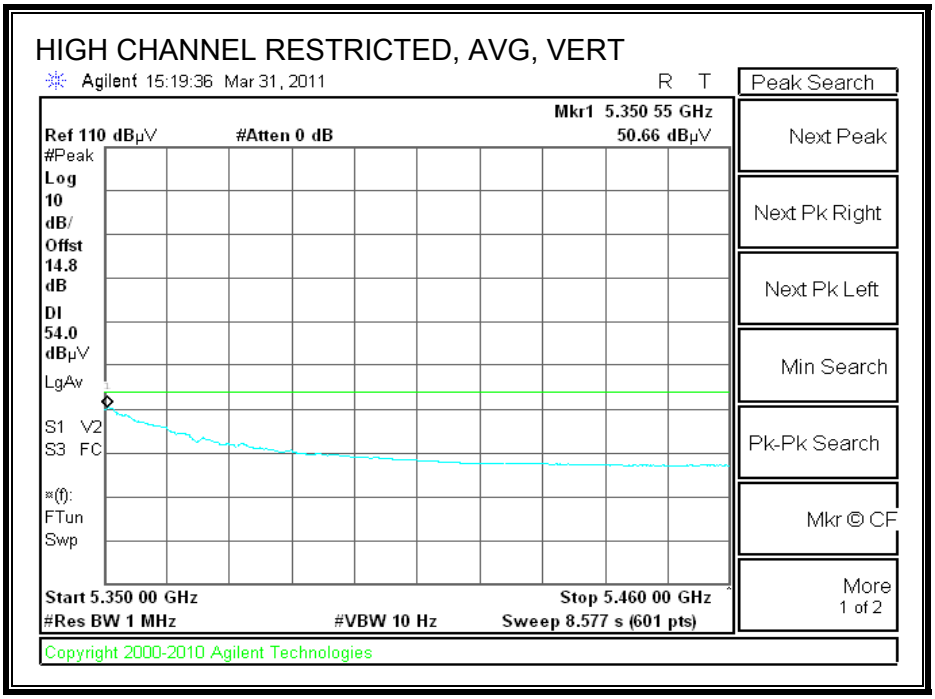
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

Note: tested with highest output powers at 18 dBm.

SDM MCS21

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





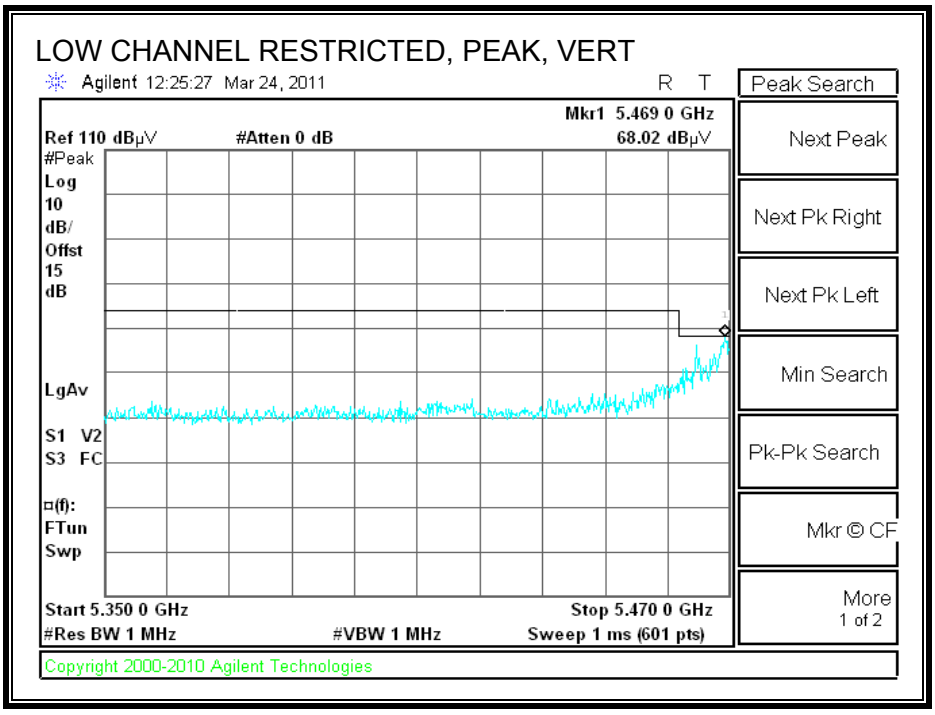
HARMONICS AND SPURIOUS EMISSIONS

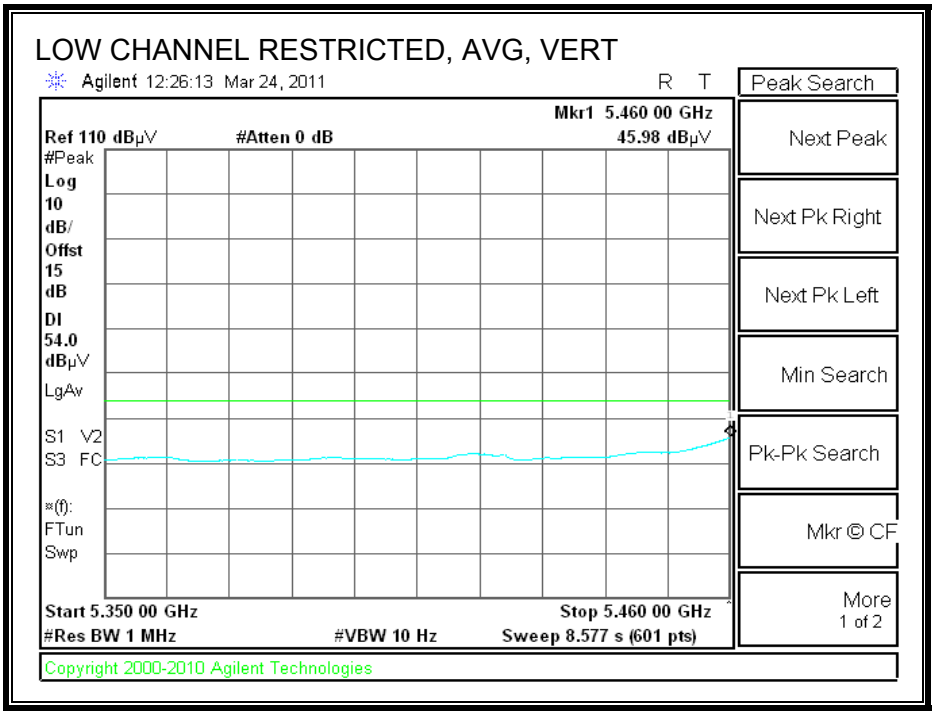
Covered by testing to 11n HT 40 3x3 CDD MCS0

8.2.13. 802.11a MODE IN THE 5.6 GHz BAND

LEGACY

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





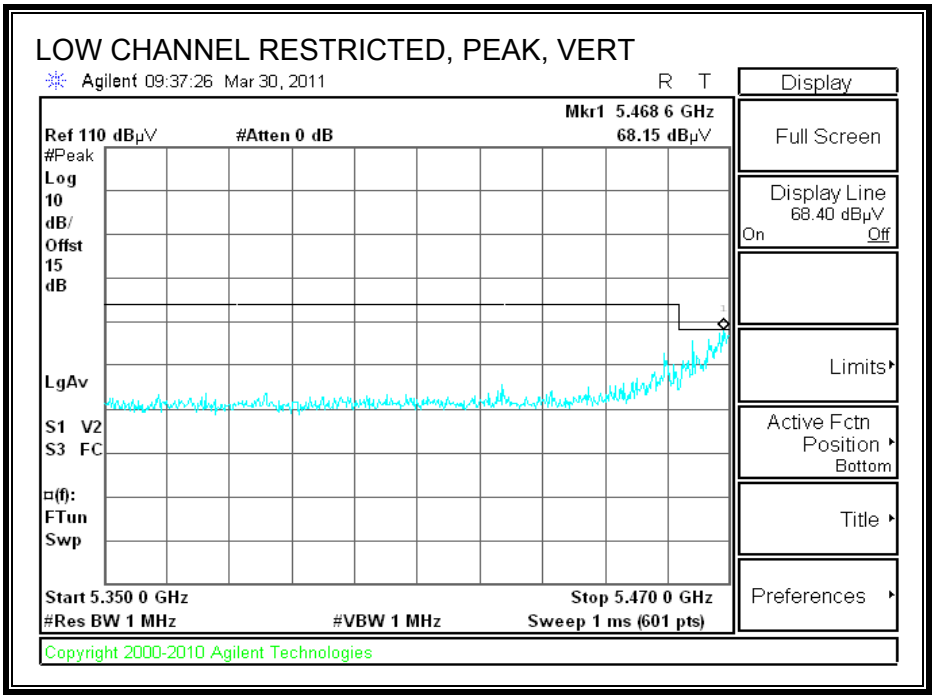
HARMONICS AND SPURIOUS EMISSIONS

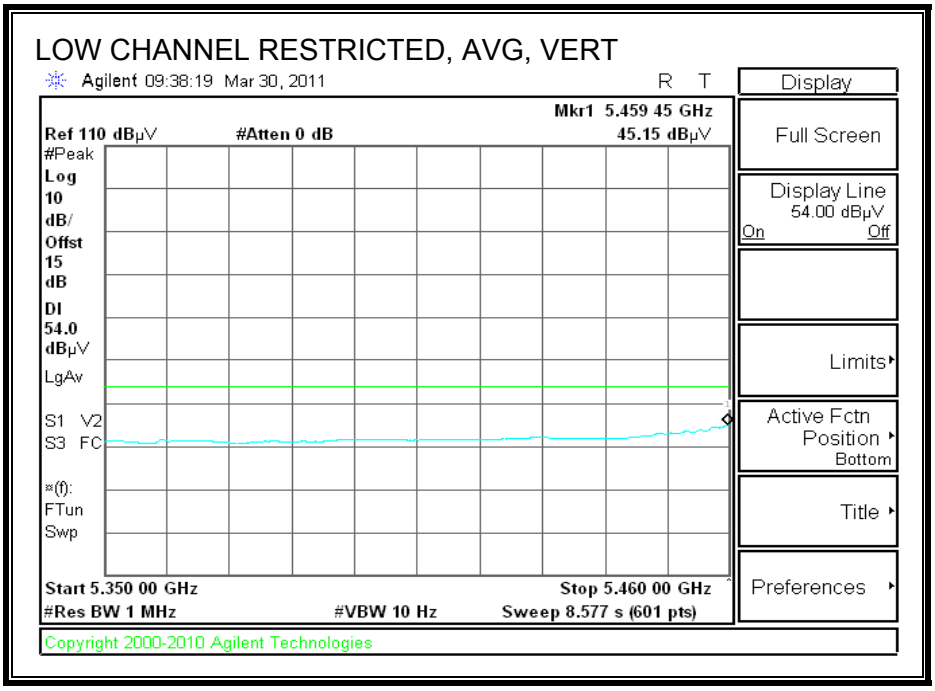
Covered by testing to 11n HT20 3x3 CDD MCS0

8.2.14. 802.11n THREE CHAINS HT20 MODE IN THE 5.6 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 3/21/2011
Test Engineer: Vien Tran
Configuration: EUT / Laptop / Antenna
Mode: Tx 5.5GHz_HT20 3x3 CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

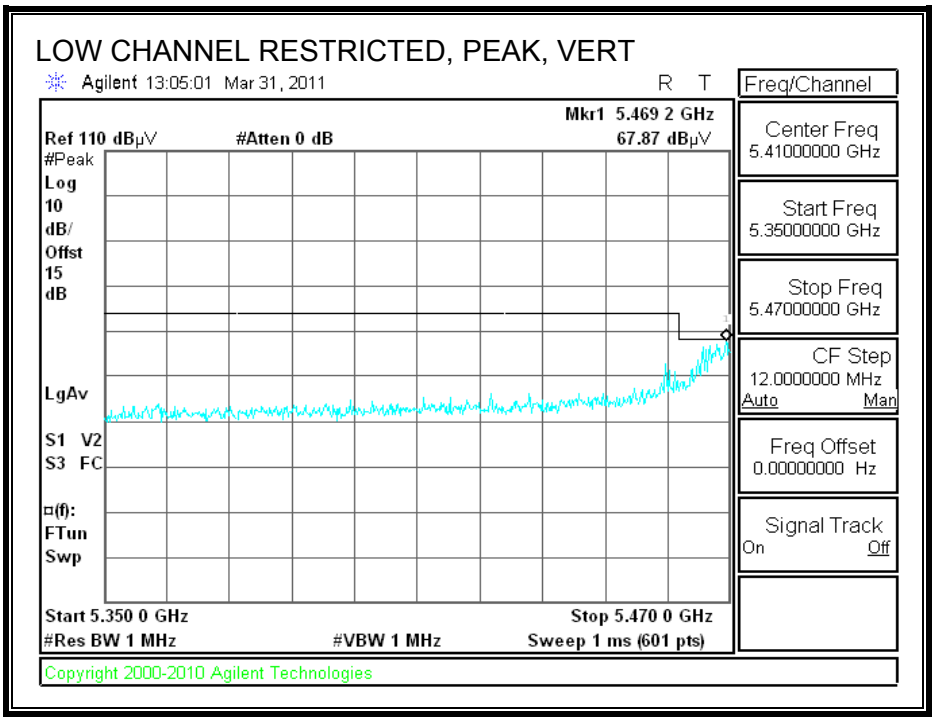
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5500MHz															
11.000	3.0	43.4	31.8	37.6	9.2	-32.6	0.0	0.7	58.4	46.8	74	54	-15.6	-7.2	H
11.000	3.0	48.7	37.7	37.6	9.2	-32.6	0.0	0.7	63.7	52.6	74	54	-10.3	-1.4	V
MID CHANNEL, 5600MHz															
11.200	3.0	45.3	34.8	37.8	9.3	-32.6	0.0	0.7	60.6	50.1	74	54	-13.4	-3.9	H
11.200	3.0	47.4	35.1	37.8	9.3	-32.6	0.0	0.7	62.7	50.4	74	54	-11.3	-3.6	V
HIGH CHANNEL, 5700MHz															
11.400	3.0	38.9	28.1	38.0	9.4	-32.5	0.0	0.7	54.5	43.7	74	54	-19.5	-10.3	H
11.400	3.0	39.8	28.9	38.0	9.4	-32.5	0.0	0.7	55.4	44.5	74	54	-18.6	-9.5	V

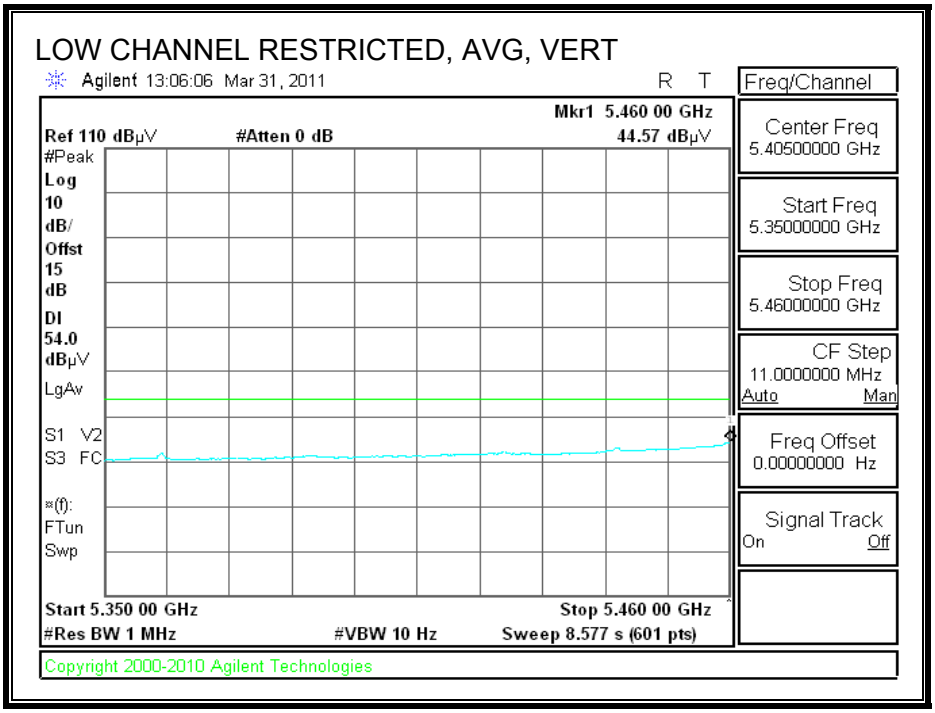
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

Note: tested with highest output powers at 19 dBm.

SDM MCS21

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



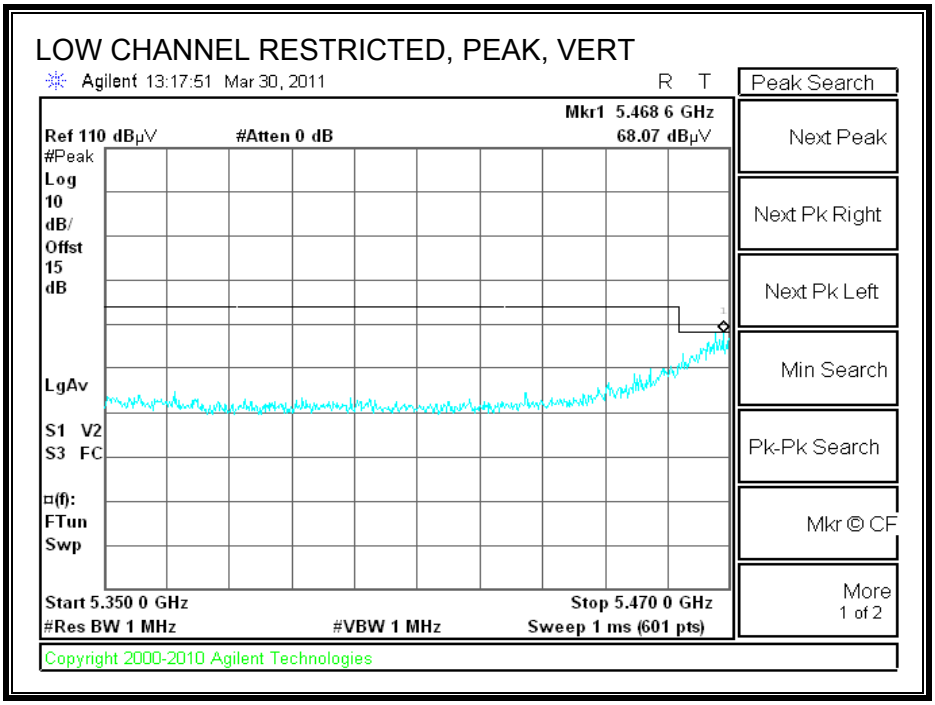


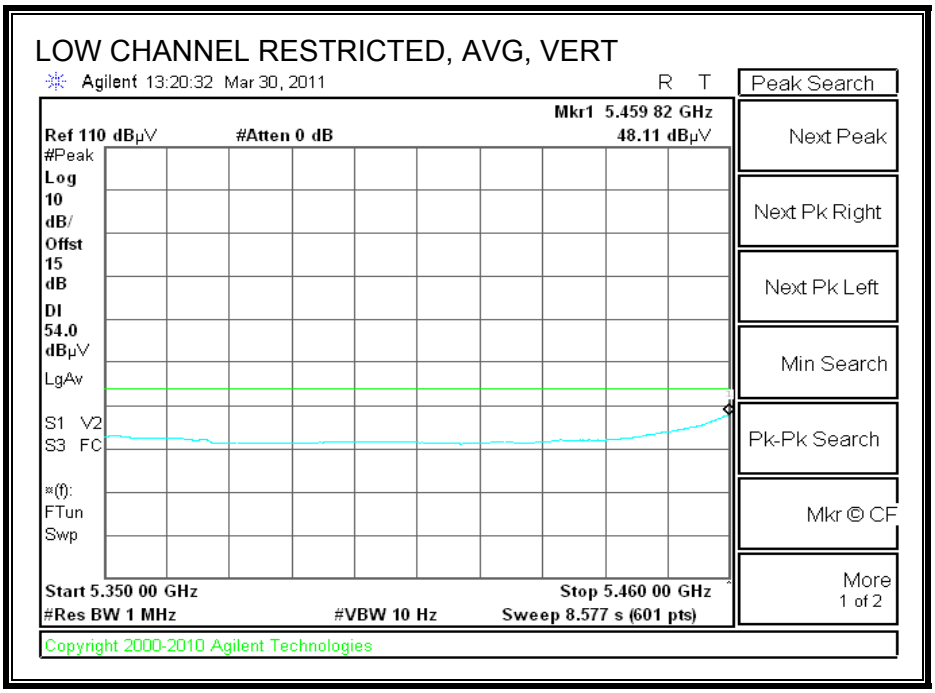
HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n HT20 3x3 CDD MCS0

8.2.15. 802.11n HT40 SISO MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





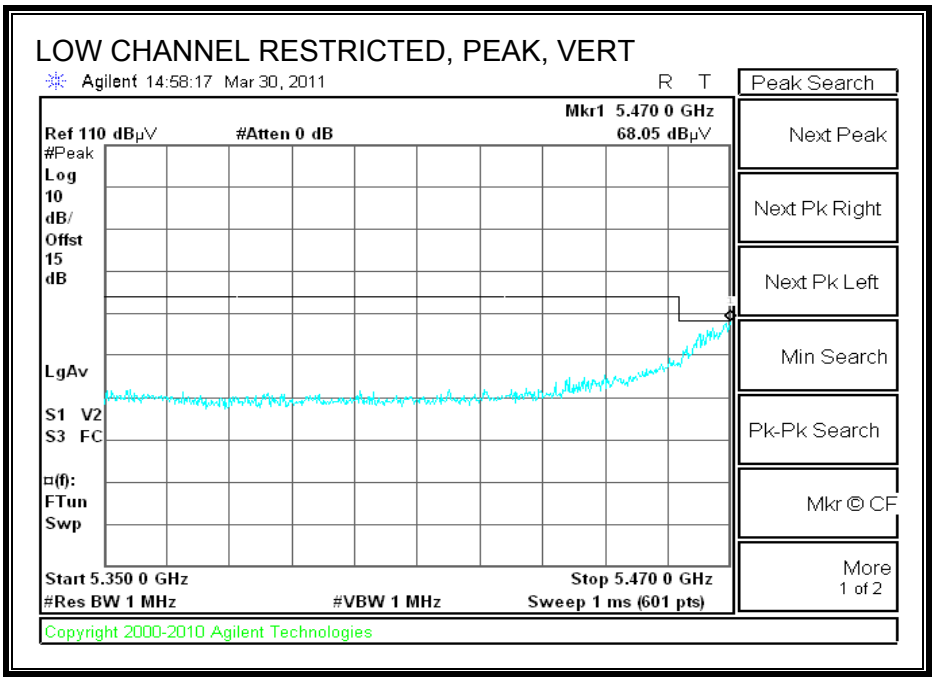
HARMONICS AND SPURIOUS EMISSIONS

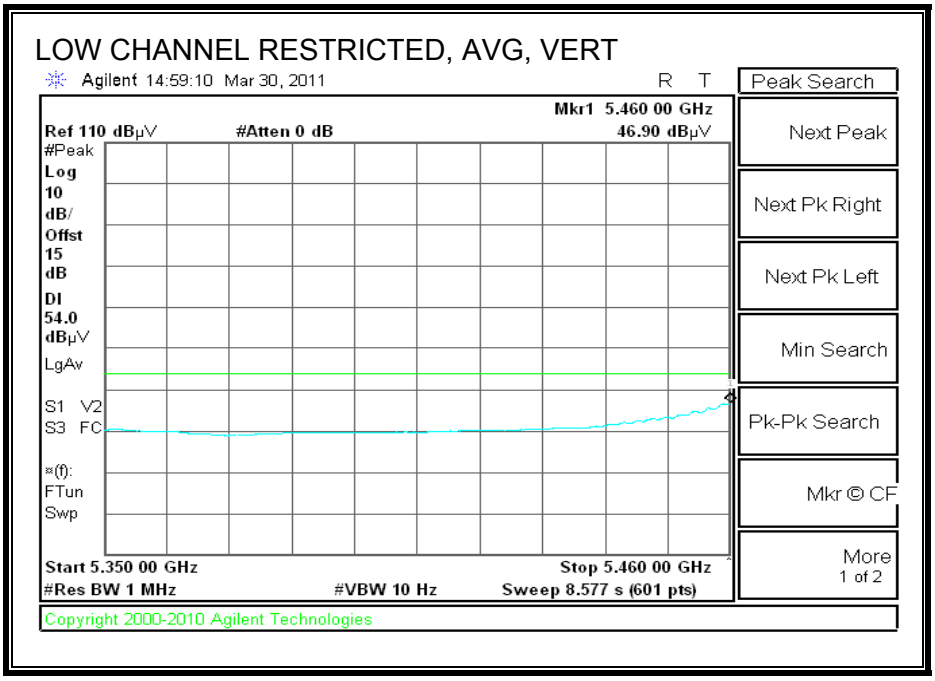
Covered by testing 11n HT40 3x3 CDD MCS0

8.2.16. 802.11n DUAL CHAIN HT40 MODE IN THE 5.6 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





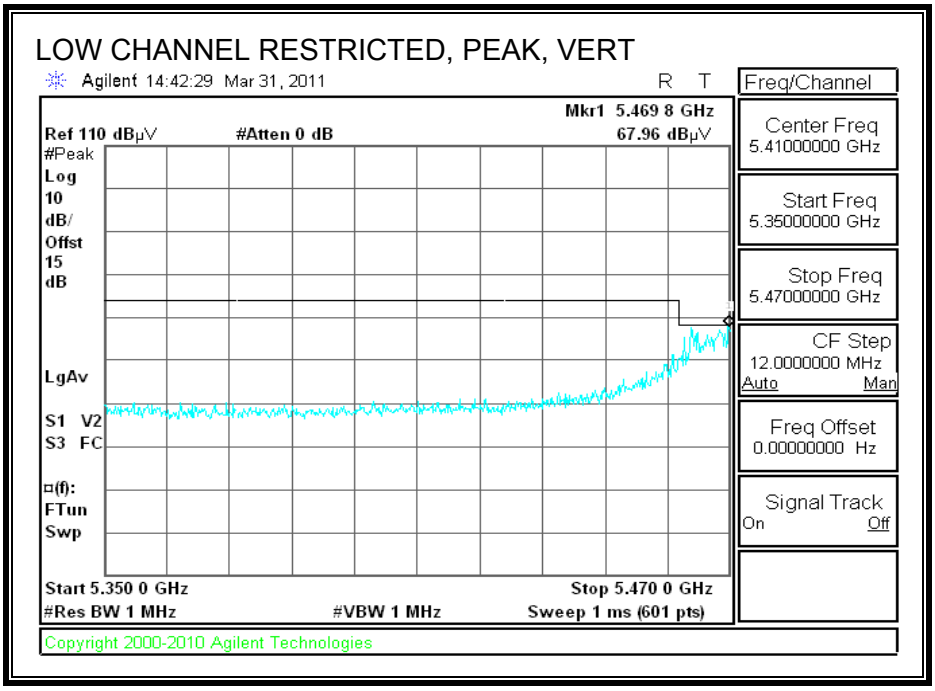
HARMONICS AND SPURIOUS EMISSIONS

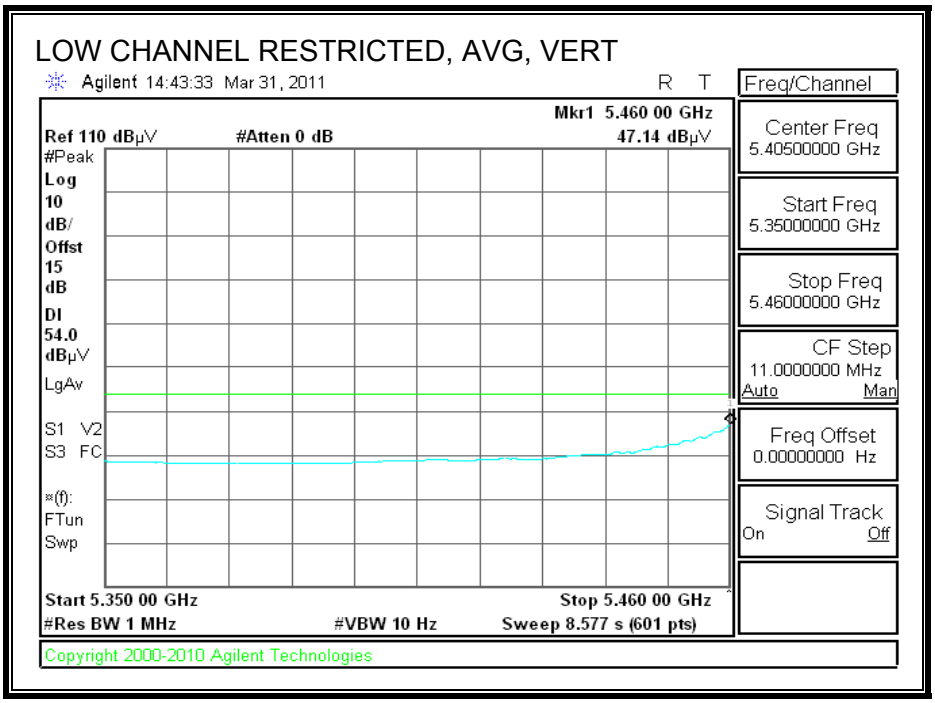
Covered by testing 11n HT40 3x3 CDD MCS0

8.2.17. 802.11n THREE CHAINS HT40 MODE IN THE 5.6 GHz BAND

CDD MCS0

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 3/22/2011
Test Engineer: Vien Tran
Configuration: EUT / Laptop / Antenna
Mode: Tx 5.5GHz_HT40 3x3 CDD MCS0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements RBW=VBW=1MHz
Average Measurements RBW=1MHz ; VBW=10Hz

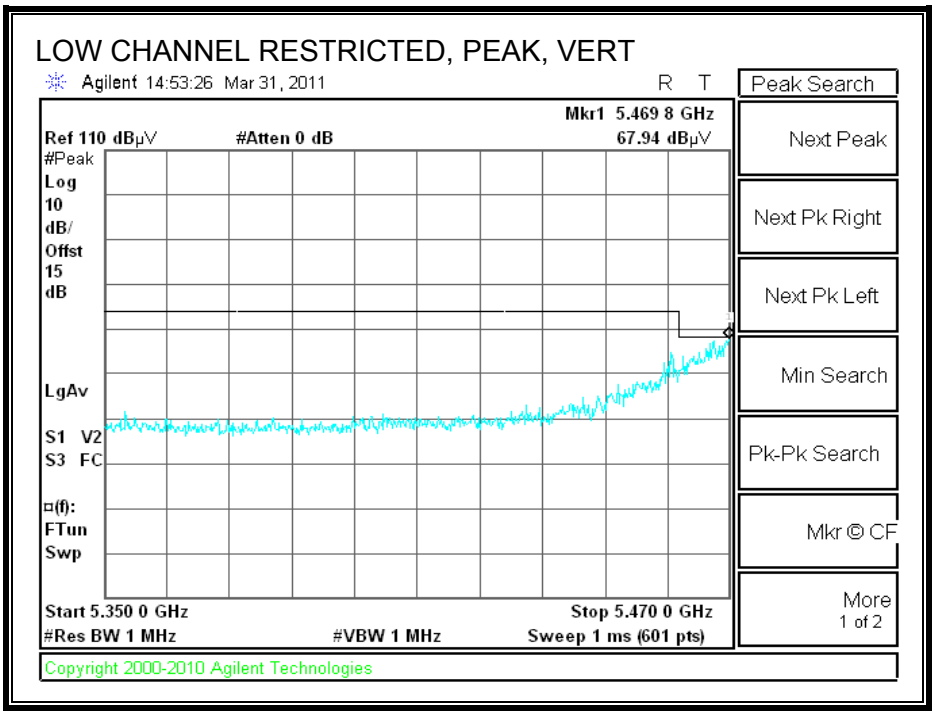
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5510MHz															
11.020	3.0	41.8	30.1	37.6	9.2	-32.6	0.0	0.7	56.8	45.1	74	54	-17.2	-8.9	H
11.020	3.0	45.1	36.1	37.6	9.2	-32.6	0.0	0.7	60.0	51.1	74	54	-14.0	-2.9	V
MID CHANNEL, 5590MHz															
11.180	3.0	45.8	33.5	37.7	9.3	-32.6	0.0	0.7	61.0	48.7	74	54	-13.0	-5.3	H
11.180	3.0	45.8	35.3	37.7	9.3	-32.6	0.0	0.7	61.0	50.5	74	54	-13.0	-3.5	V
HIGH CHANNEL, 5670MHz															
11.340	3.0	41.5	31.8	37.9	9.4	-32.6	0.0	0.7	57.0	47.3	74	54	-17.0	-6.7	H
11.340	3.0	42.6	32.9	37.9	9.4	-32.6	0.0	0.7	58.1	48.4	74	54	-15.9	-5.6	V
		No other emissions were detected above system noise floor													

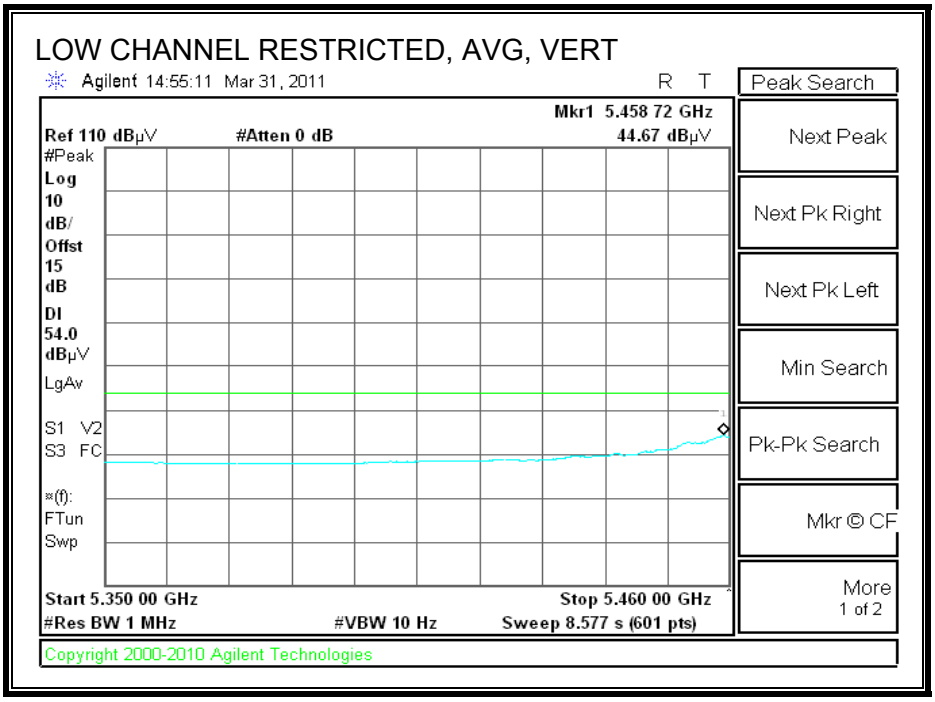
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

Note: tested with highest output powers at 18 dBm.

SDM MCS21

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

Covered by testing to 11n HT40 3x3 CDD MCS0

8.3. RECEIVER ABOVE 1 GHz

8.3.1. 20 MHz BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 04/19/11
Test Engineer: Vien Tran
Configuration: EUT / Laptop
Mode: Rx Mode_20MHz Bandwidth in 5 GHz Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 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
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.620	3.0	55.7	40.1	26.5	3.1	-37.4	0.0	0.0	47.9	32.3	74	54	-26.1	-21.7	H
1.795	3.0	55.2	37.4	27.1	3.2	-37.2	0.0	0.0	48.4	30.6	74	54	-25.6	-23.4	H
2.495	3.0	56.1	35.4	28.3	3.9	-36.3	0.0	0.0	52.1	31.3	74	54	-21.9	-22.7	H
5.000	3.0	50.6	29.6	32.8	5.9	-34.8	0.0	0.0	54.6	33.6	74	54	-19.4	-20.4	H
1.120	3.0	59.7	43.8	24.9	2.5	-38.1	0.0	0.0	49.0	33.1	74	54	-25.0	-20.9	V
1.795	3.0	55.6	37.2	27.1	3.2	-37.2	0.0	0.0	48.8	30.4	74	54	-25.2	-23.6	V
2.495	3.0	57.5	35.8	28.3	3.9	-36.3	0.0	0.0	53.5	31.8	74	54	-20.5	-22.2	V
5.000	3.0	53.8	30.3	32.8	5.9	-34.8	0.0	0.0	57.7	34.2	74	54	-16.3	-19.8	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. 40 MHz BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 11U13734
Date: 04/19/11
Test Engineer: Vien Tran
Configuration: EUT / Laptop
Mode: Rx Mode_40MHz Bandwidth in 5GHz Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 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
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.600	3.0	57.4	41.6	26.5	3.0	-37.4	0.0	0.0	49.5	33.7	74	54	-24.5	-20.3	H
1.795	3.0	57.0	38.8	27.1	3.2	-37.2	0.0	0.0	50.2	32.0	74	54	-23.8	-22.0	H
2.490	3.0	57.4	37.1	28.3	3.9	-36.3	0.0	0.0	53.3	33.1	74	54	-20.7	-20.9	H
5.000	3.0	50.3	31.2	32.8	5.9	-34.8	0.0	0.0	54.3	35.2	74	54	-19.7	-18.8	H
1.655	3.0	58.5	41.3	26.7	3.1	-37.4	0.0	0.0	50.9	33.7	74	54	-23.1	-20.3	V
2.125	3.0	59.8	39.4	27.9	3.6	-36.7	0.0	0.0	54.6	34.2	74	54	-19.4	-19.8	V
2.490	3.0	59.0	37.3	28.3	3.9	-36.3	0.0	0.0	54.9	33.2	74	54	-19.1	-20.8	V
5.000	3.0	55.2	37.5	32.8	5.9	-34.8	0.0	0.0	59.2	41.5	74	54	-14.8	-12.5	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)

HORIZONTAL AND VERTICAL DATA

30 - 1000 MHz Measurement	
Compliance Certification Services, Fremont_ Chamber B	
Test Engr:	Vien Tran
Date:	04/19/11
Project #:	11U13734
Company:	Broadcom
Test Target:	FCC Class B
Mode Oper:	Tx Worst-Case

30 - 1000MHz - HORIZONTAL

Test Frequency	Meter Reading	Detector	Chamber 5B Below 1GHz Cable.TX [dB]	T10 Below 1 GHz PreAmp. TXT [dB]	T130 Bilog Factors. TXT [dB]	dB[uVolts/ meter]	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
215.7229	54.84	QP	2	-28.9	11.9	37.6	43.5	-5.90	200	Horz
266.3558	53.00	PK	2.3	-28.7	12.3	38.9	46	-7.10	100	Horz
296.7355	54.97	QP	2.4	-28.5	13.2	39.8	46	-6.20	100	Horz
499.8001	57.73	QP	3.1	-29.4	16.8	41.40	46	-4.60	200	Horz
896.0693	51.73	QP	4.1	-28.6	21.5	41.73	46	-4.27	100	Horz
952.8314	50.17	QP	4.3	-28.4	22.1	41.02	46	-4.98	100	Horz
995.2032	52.87	QP	4.5	-28.2	22.5	47.9	54	-6.10	100	Horz

30 - 1000MHz - VERTICAL

Test Frequency	Meter Reading	Detector	Chamber 5B Below 1GHz Cable.TX [dB]	T10 Below 1 GHz PreAmp. TXT [dB]	T130 Bilog Factors. TXT [dB]	dB[uVolts/ meter]	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
30.8496	40.61	PK	0.9	-29.5	20	32.01	40	-7.99	109	Vert
200.00	50.43	PK	2	-28.9	12	35.53	43.5	-7.97	200	Vert
497.9347	54.53	QP	3.1	-29.4	16.8	41.12	46	-4.88	100	Vert
715.1233	45.42	PK	3.7	-29.2	19.5	39.42	46	-6.58	100	Vert
896.0693	43.41	PK	4.1	-28.6	21.5	40.41	46	-5.59	100	Vert
996.8021	44.48	PK	4.5	-28.2	22.6	43.38	54	-10.62	100	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection
File: RE 30-1000 MHz 3m FCC Class B Full Scan.TST

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 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

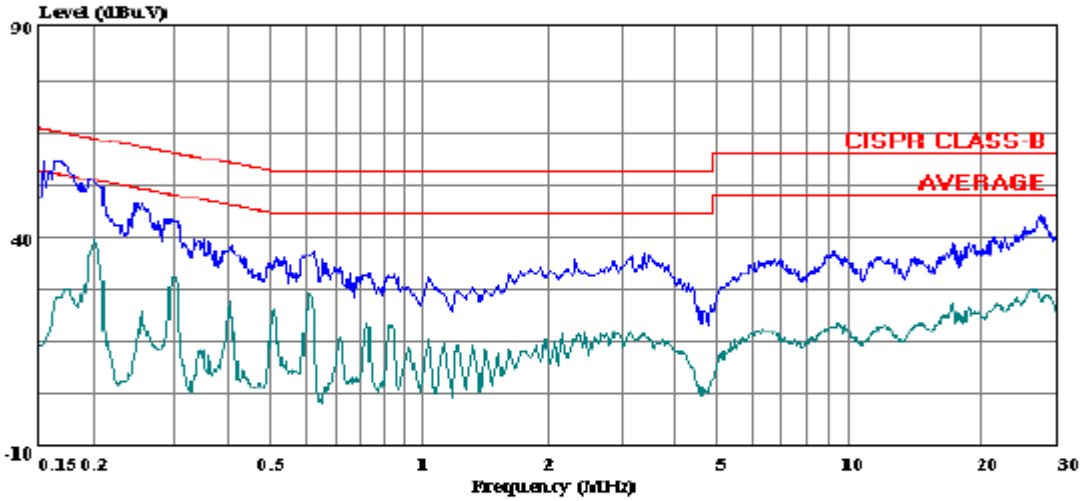
6 WORST EMISSIONS

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
0.17	57.95	--	27.53	0.00	65.16	55.16	-7.21	-27.63	L1
0.20	53.71	--	38.66	0.00	63.82	53.82	-10.11	-15.16	L1
27.13	44.27	--	27.47	0.00	60.00	50.00	-15.73	-22.53	L1
0.15	57.16	--	26.23	0.00	65.84	55.84	-8.68	-29.61	L2
0.23	47.98	--	38.74	0.00	62.38	52.38	-14.40	-13.64	L2
27.13	43.00	--	26.62	0.00	60.00	50.00	-17.00	-23.38	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: AC Line Conduction_3x3 (x28).EMI
Date: 03-17-2011 Time: 13:55:28



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 11U13734
Company : Broadcom
Configuration : EUT with Laptop
EUT Description: 802.11agn MIMO WLAN+Bluetooth Combo
Mode : Tx Worst-case
Target : FCC Class B
Voltage : 115V / 60Hz
: L1: Blue (Peak), Green (Average)

LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 21 File#: AC Line Conduction_3x3 (x28).EMI
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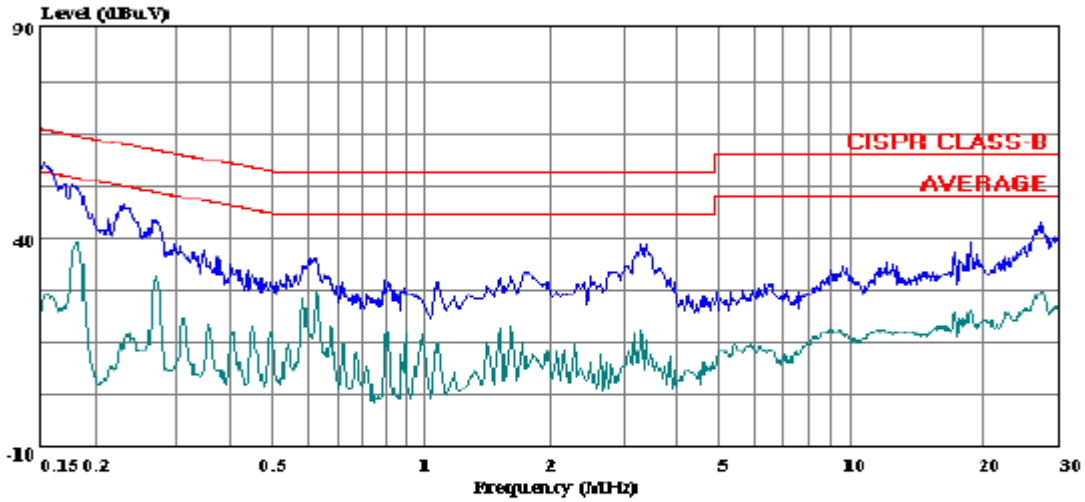


Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 11U13734
Company : Broadcom
Configuration : EUT with Laptop
EUT Description: 802.11agn MIMO WLAN + Bluetooth Combo
Mode : Tx Worst-Case
Target : FCC Class B
Voltage : 115V / 60Hz
: L2: Blue (Peak), Green (Average)

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
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna 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.		

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period

The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:
For the Short pulse radar Test Signals this instant is the end of the *Burst*.
For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.
For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.
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.

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

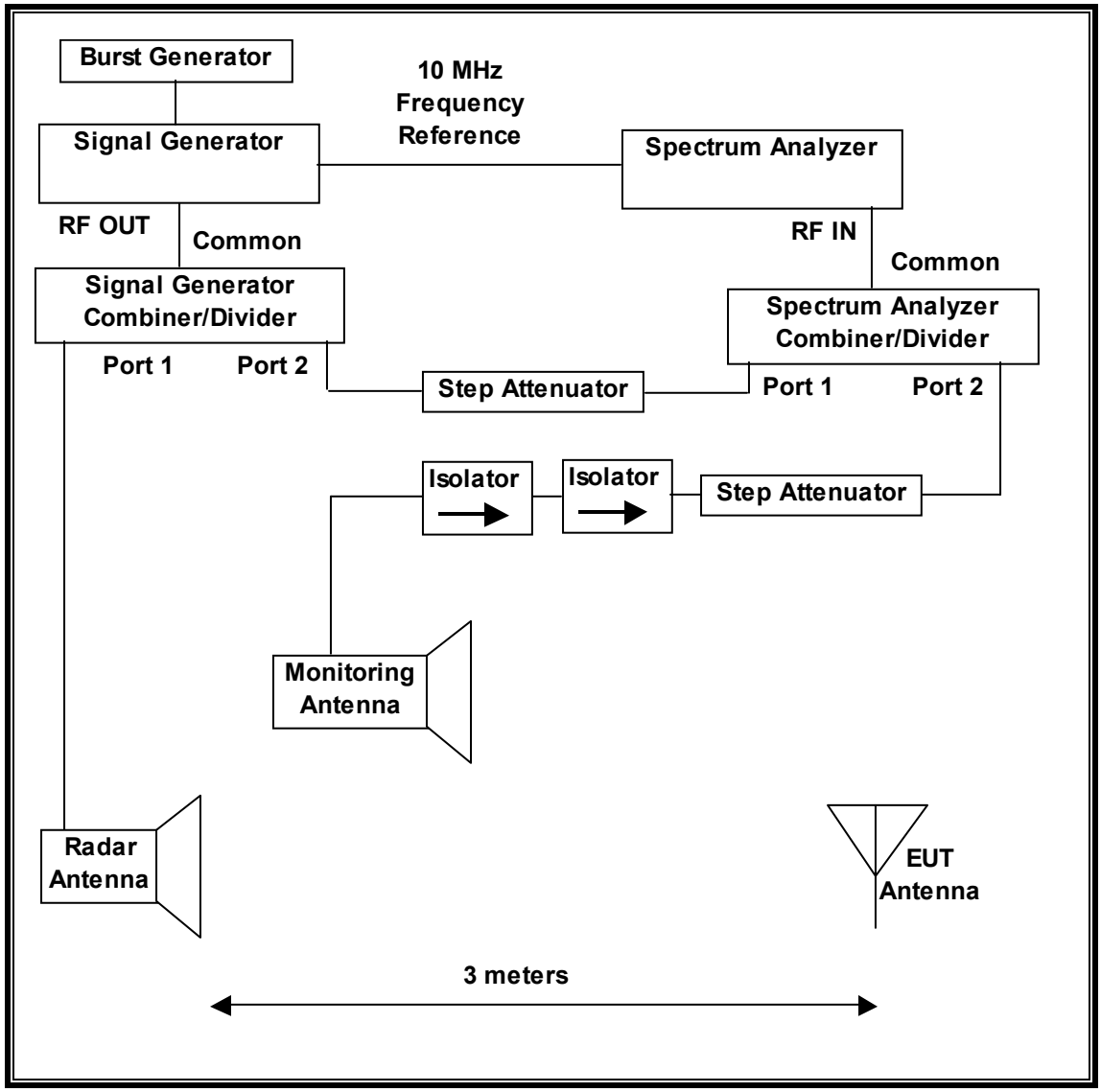
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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 Freqeuncy 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.

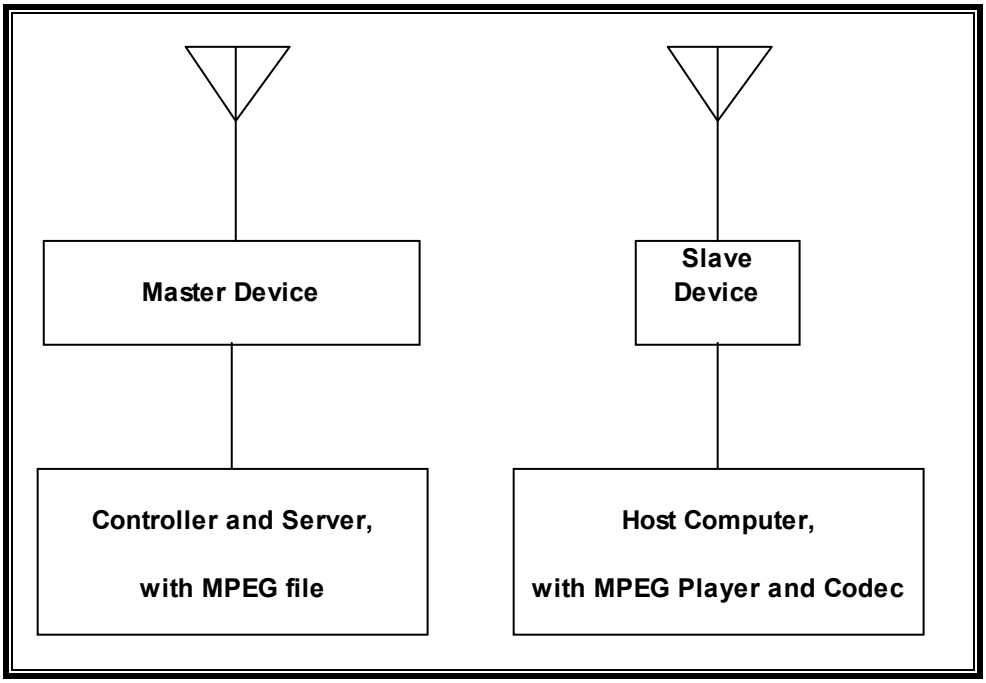
TEST AND MEASUREMENT EQUIPMENT

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	C00169	04/07/12
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**
N600 Wireless Dual Band Router (Master Device)	Netgear	WNDR3400	2BK311730FF6B	PY309300116
AC Adapter (AP)	Netgear	FA-1201500SJA / FA-1201500SUA	4F105116T10209045B	DoC
Notebook PC (Host)	HP	Pavilion zv6000	CND5290401	DoC
AC Adapter (Host PC)	HP	PA-1121-12HD	58B240ALLRK0HU	DoC
Notebook PC (Client)	Lenove	0679	CBU4495773	DoC
AC Adapter(Client PC)	Delta Electronics	ADP-65KH B	11S36001646ZZ1000AD9WJ	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 29.87 dBm EIRP in the 5250-5350 MHz band and 29.95 dBm EIRP in the 5470-5725 MHz band.

The lowest antenna gain utilized with the EUT has a gain of 3.81 dBi in the 5250-5350 MHz band and 2.92 dBi in the 5470-5725 MHz band. The highest antenna gain neglecting legacy mode array gain factor, utilized with the EUT has a gain of 5.61 dBi in the 5250-5350 MHz band and 5.35 dBi in the 5470-5725 MHz band.

Three antennas are utilized to meet the diversity and MIMO operational requirements.

The EUT uses three 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 required since the maximum EIRP is greater than 500 mW (27 dBm).

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

The software installed in the access point is Linux revision 5.22.84.0.

MANUFACTURER’S STATEMENT REGARDING UNIFORM CHANNEL SPREADING

This is not applicable to a Slave device.

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

The Master Device is a Netgear N600 Dual Band Router, FCC ID: 4054A-09300116. The DFS software installed in the Master Device is Linux revision 5.22.84.0. The minimum antenna gain for the Master Device is 2.73 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

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

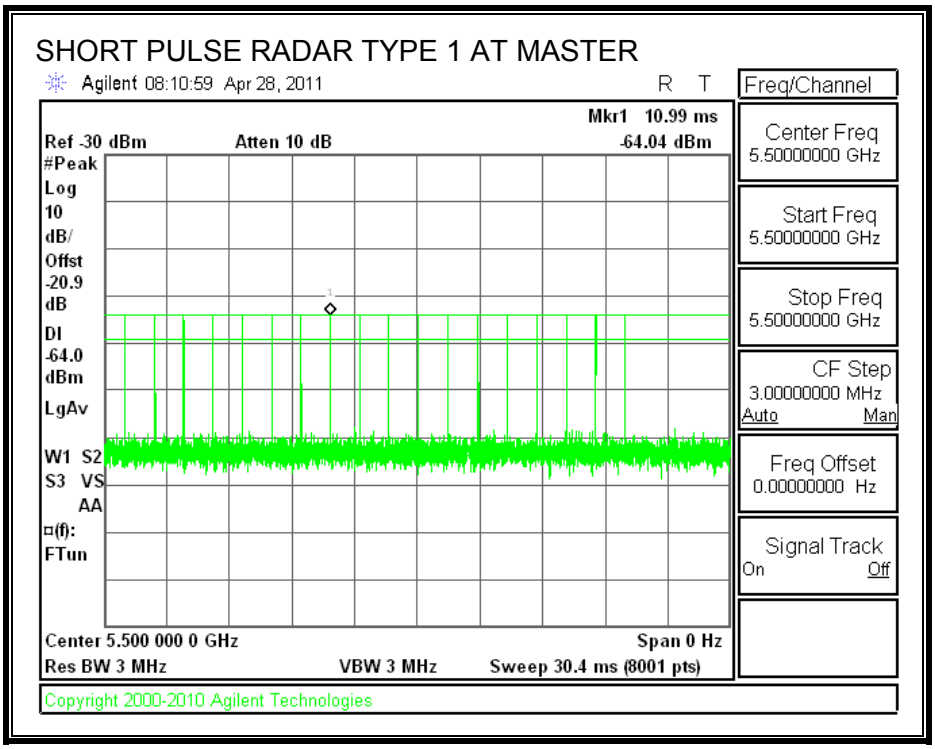
10.2. RESULTS FOR 20 MHz BANDWIDTH

10.2.1. TEST CHANNEL

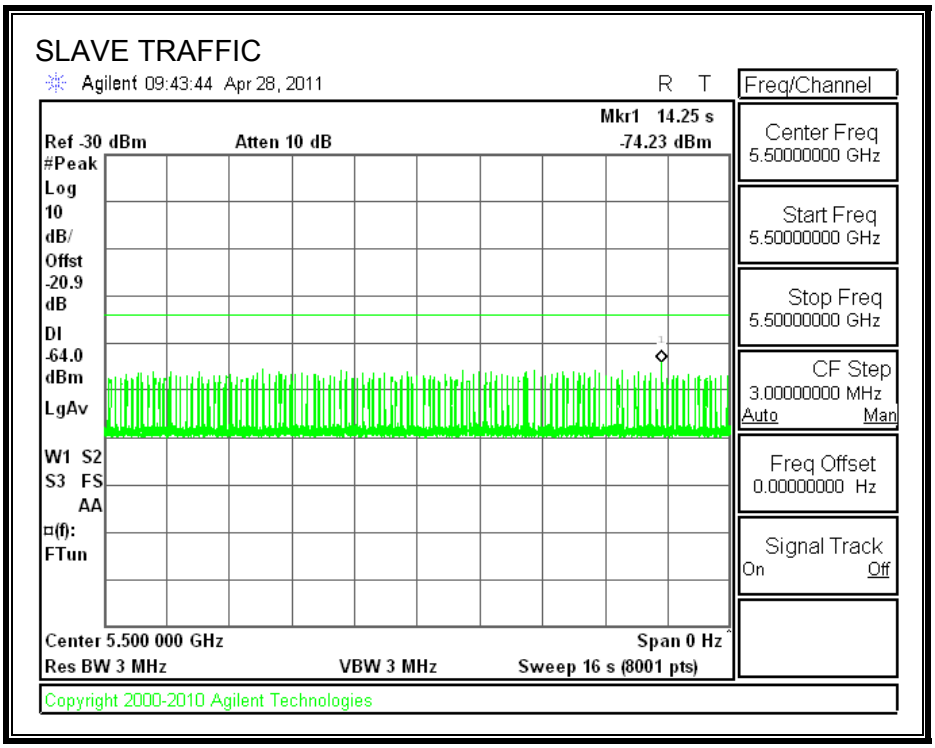
All tests were performed at a channel center frequency of 5500 MHz.

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).

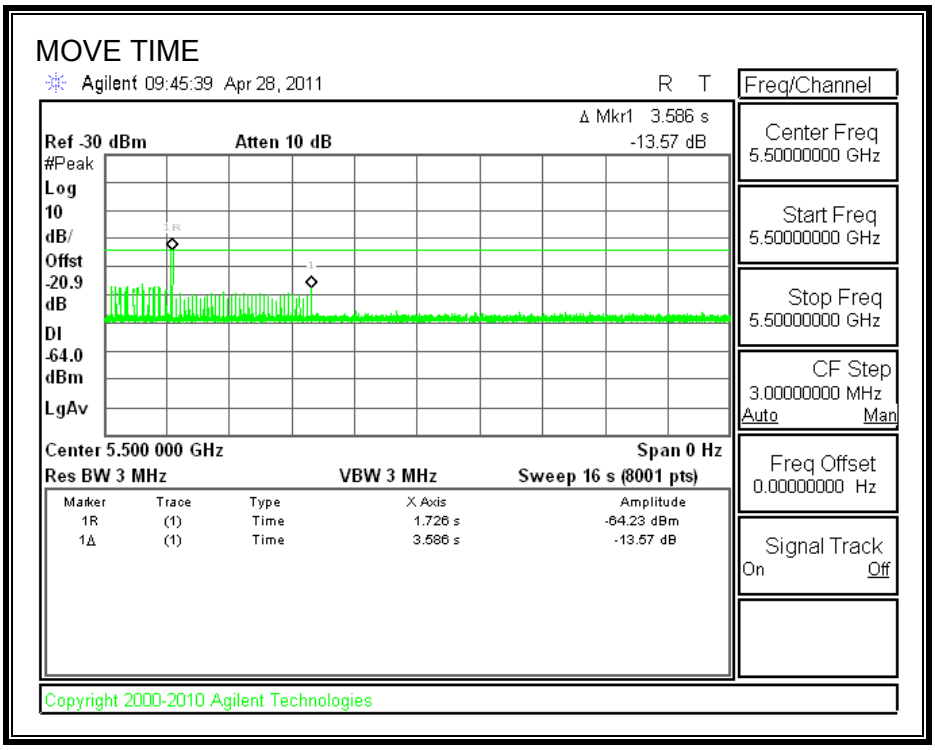
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

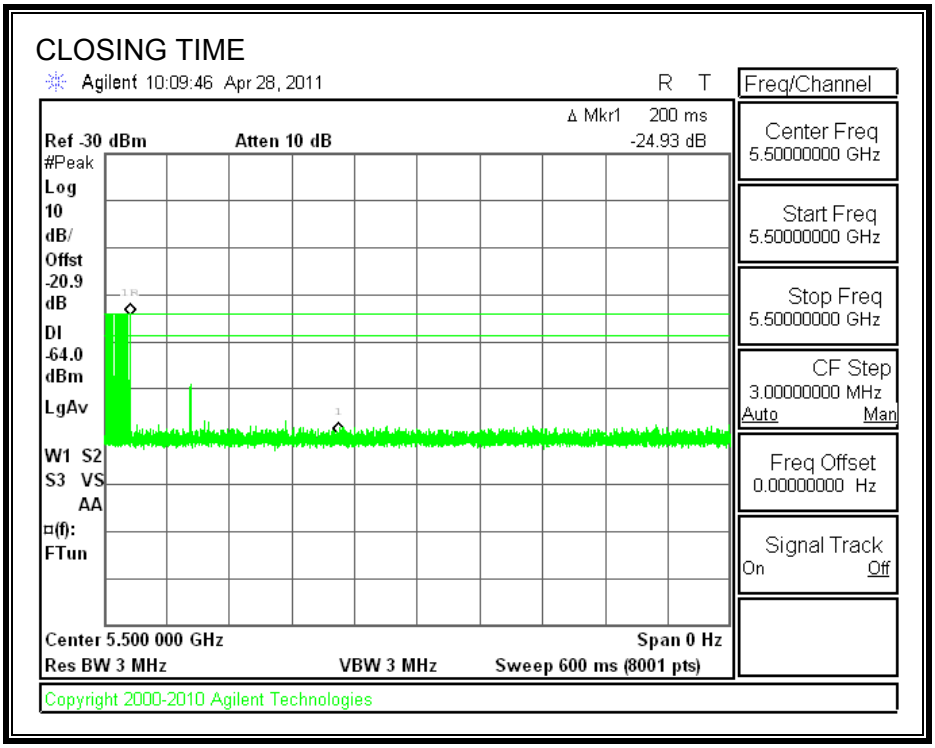
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	3.586	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	19.4	60
IC	19.4	260

MOVE TIME



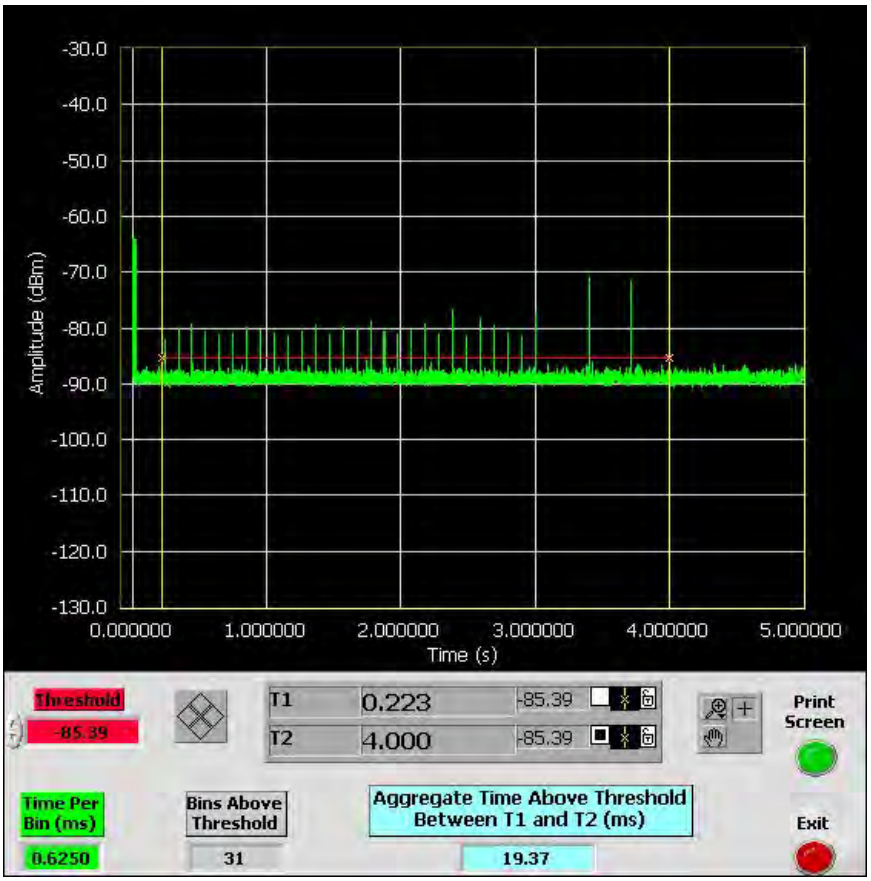
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

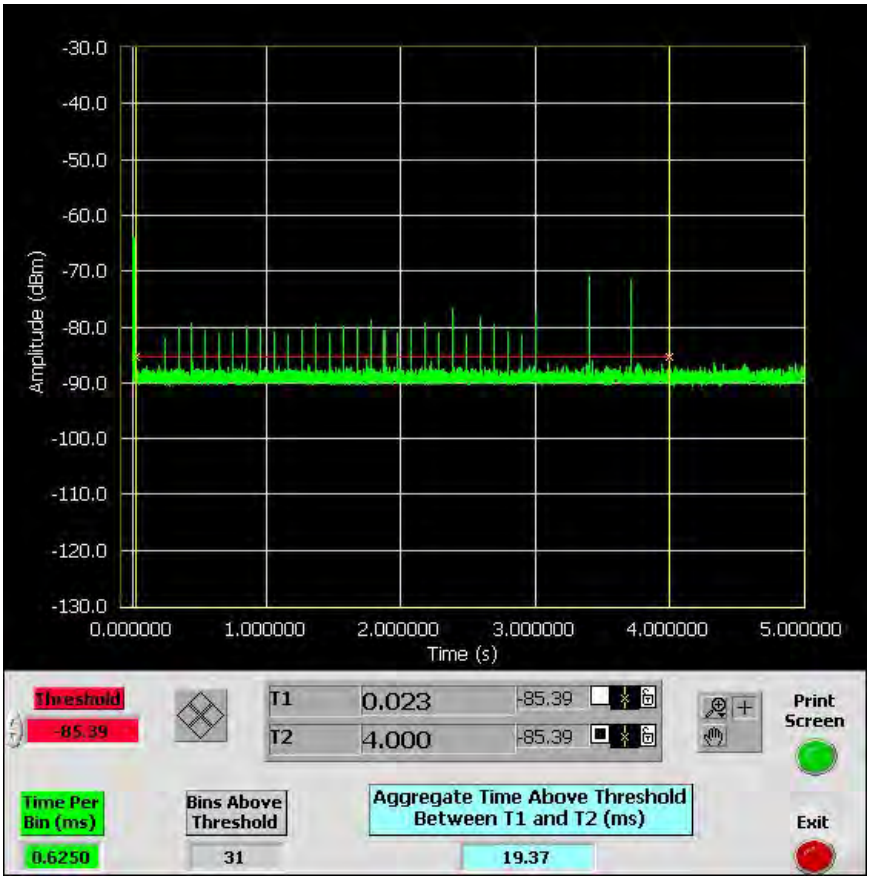
Only intermittent transmissions are observed during the FCC aggregate monitoring period.

FCC AGGREGATE CLOSING TIME



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

IC AGGREGATE CLOSING TIME



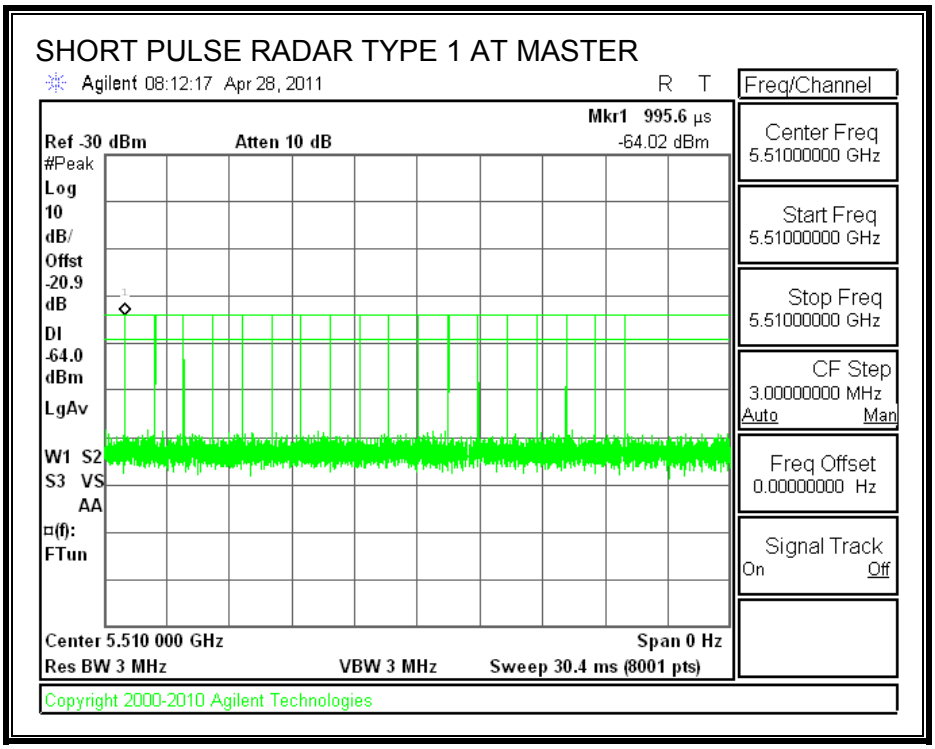
10.3. RESULTS FOR 40 MHz BANDWIDTH

10.3.1. TEST CHANNEL

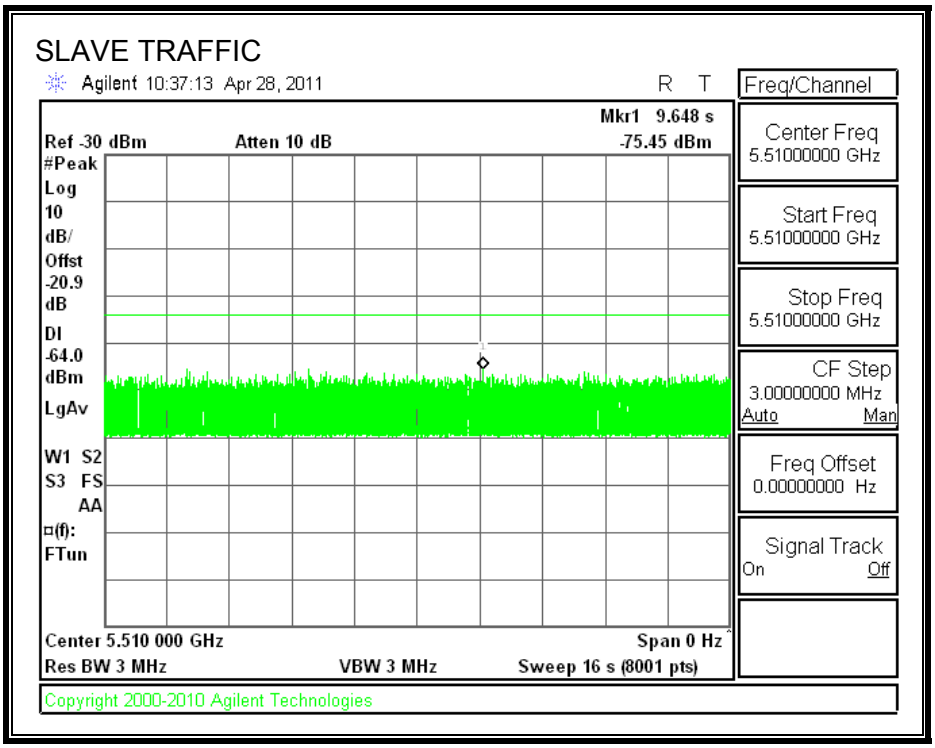
All tests were performed at a channel center frequency of 5510 MHz.

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).

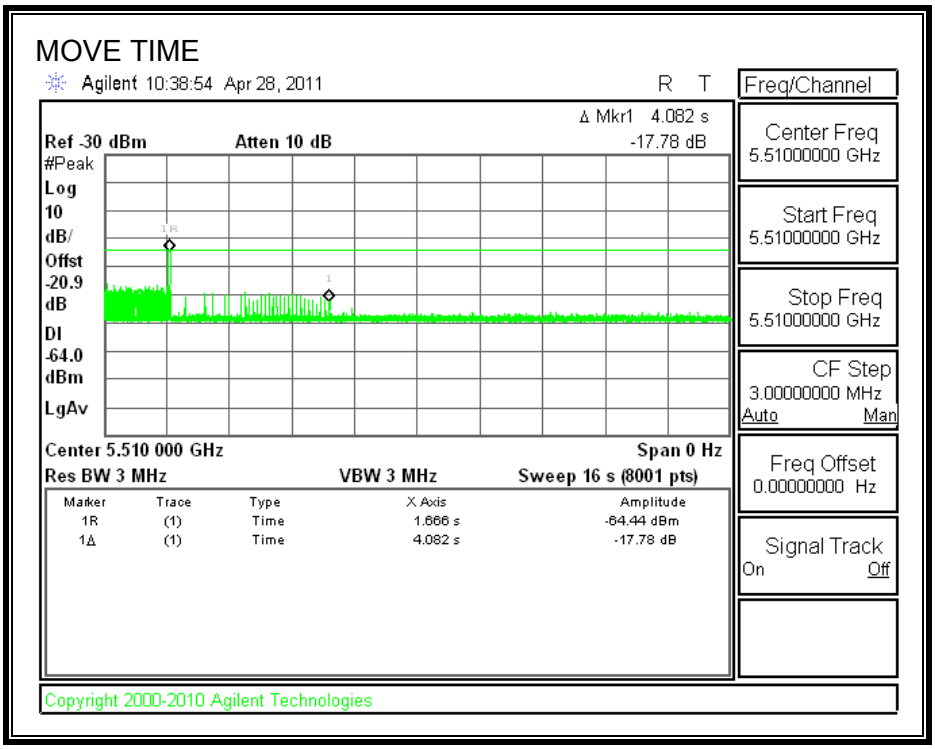
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

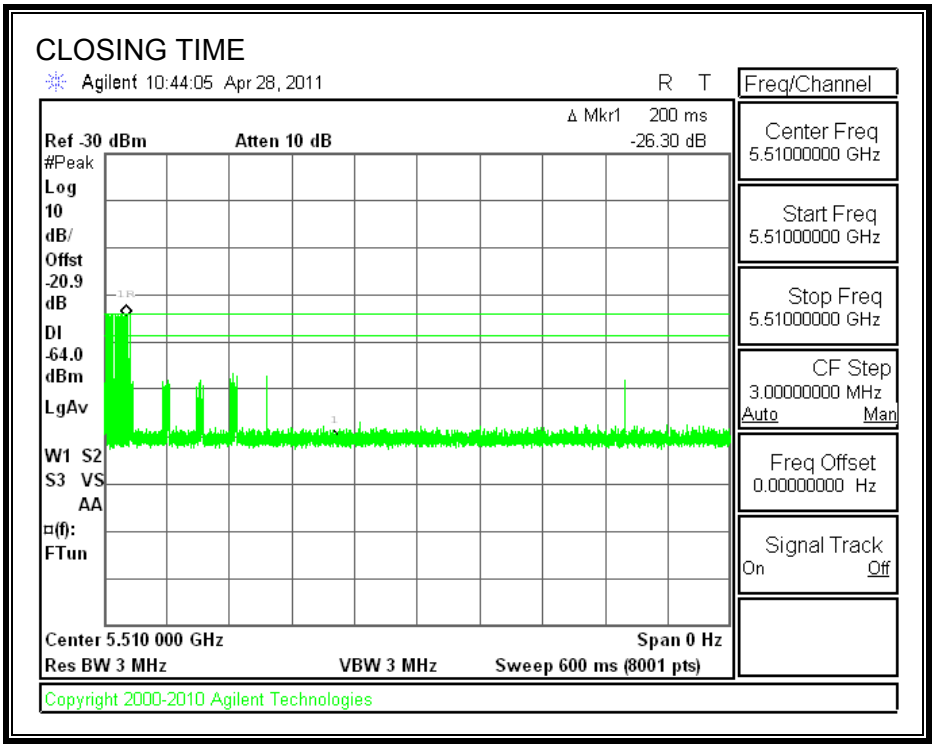
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	4.082	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	58.0	60
IC	68.0	260

MOVE TIME



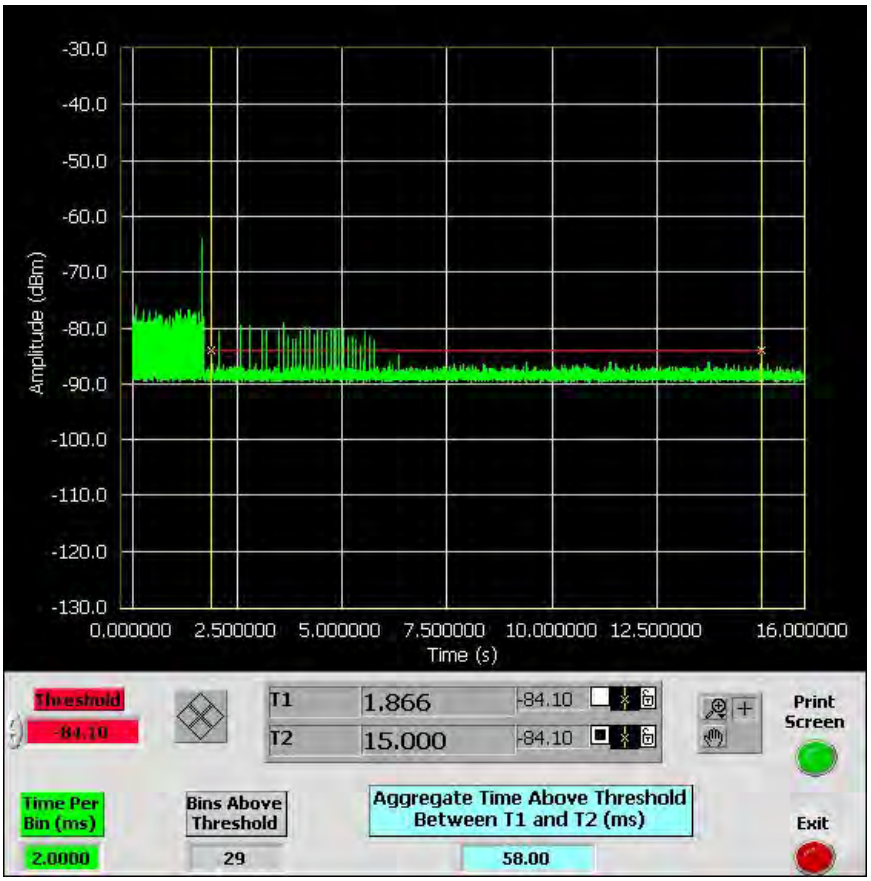
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

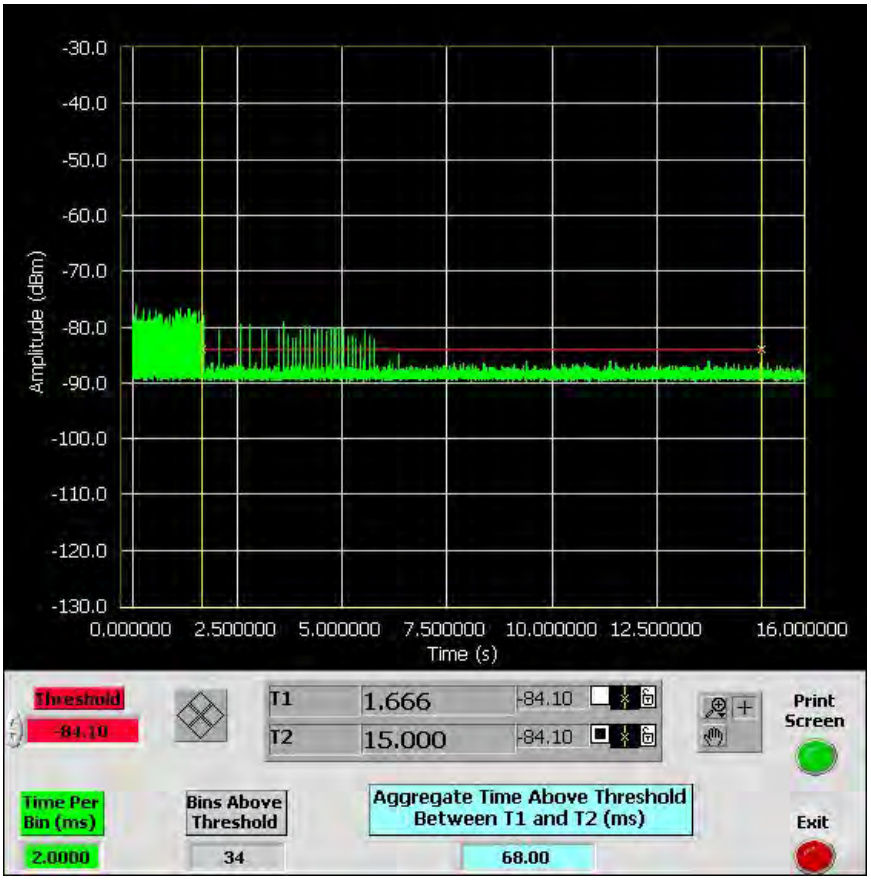
Only intermittent transmissions are observed during the FCC aggregate monitoring period.

FCC AGGREGATE CLOSING TIME



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

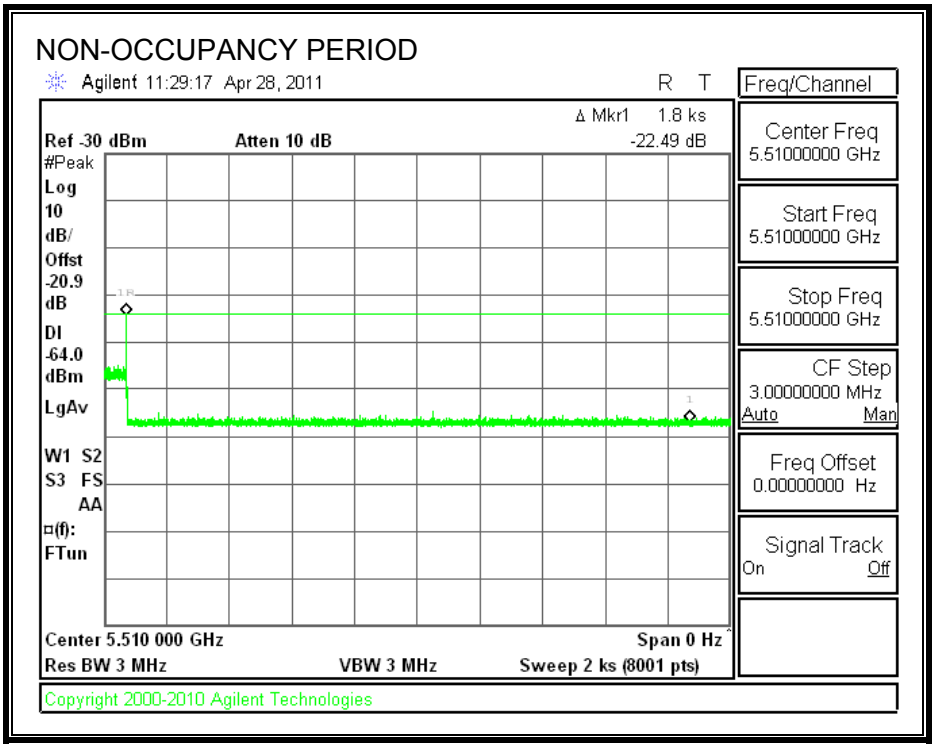
IC AGGREGATE CLOSING TIME



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^2)	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^2)	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^2)	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^2)	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^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* 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^2 is equivalent to 1 mW/cm^2.
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 = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

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

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

Source-based time-averaged EIRP = (DC / 100) * EIRP

where

DC = Duty Cycle in %, as applicable
EIRP = Equivalent Isotropic Radiated Power in W

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.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply, a fraction of the exposure limit is established for each band, such that the sum of the fractions is less than or equal to one.

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 mW/cm^2

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

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
5250 - 5350	CDD MCS 0	0.20	19.92	9.32	1.67	0.167
5470 - 5725	3x3 HT40 SDM MCS21	0.20	23.91	5.35	1.68	0.168