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

CERTIFICATION TEST REPORT

FOR

802.11ag / Draft 802.11n WLAN + BLUETOOTH PCI-E MINICARD

MODEL NUMBER: BCM943224PCIEBT

FCC ID: QDS-BRCM1047
IC: 4324A-BRCM1047

REPORT NUMBER: 09U12658-2B

ISSUE DATE: AUGUST 24, 2009

Prepared for

BROADCOM CORPORATION
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/20/09	Initial Issue	T. Chan
B	08/24/09	Increased 5.2GHz_HT40 SISO Channel 38 Output Power	T. Chan

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11ag / Draft 802.11n WLAN + Bluetooth PCI-E Minicard

MODEL: BCM943224PCIEBT

SERIAL NUMBER: 509

DATE TESTED: JULY 20 – AUGUST 13, 2009

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

Compliance Certification Services, Inc. (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 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:

THU CHAN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

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 802.11ag / Draft 802.11n WLAN + Bluetooth PCI-E Minicard.
The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5150 to 5250 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5180 - 5240	802.11a Legacy			14.33	27.10
5180 - 5240	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5180 - 5240	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5180 - 5240	802.11n 20MHz CDD	10.26	10.22	13.25	21.14
5190 - 5230	802.11n 40MHz SISO			16.57	45.39
5190 - 5230	802.11n 40MHz CDD	12.11	12.5	15.32	34.04

5250 - 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5260 - 5320	802.11a Legacy			17.69	58.75
5260 - 5320	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5260 - 5320	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5260 - 5320	802.11n 20MHz CDD	16.14	15.99	19.08	80.83
5270 -5310	802.11n 40MHz SISO			17.14	51.76
5270 -5310	802.11n 40MHz CDD	15.43	15.66	18.56	71.73

5470 - 5725 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5500 - 5700	802.11a Legacy			16.60	45.71
5500 - 5700	802.11n 20MHz SISO	Covered by the worst case 802.11a Legacy testing			
5500 - 5700	802.11a CDD Mode	Covered by the worst case 802.11n 20 MHz CDD			
5500 - 5700	802.11n 20MHz CDD	16.18	16.06	19.13	81.86
5510 - 5670	802.11n 40MHz SISO			17.23	52.84
5510 - 5670	802.11n 40MHz CDD	16.75	17.41	20.10	102.40

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.10.122.0.
The test utility software used during testing was BCM Internal, rev. 5.10.RC122.0.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

802.11a Mode (20 MHz BW operation): 6 Mbps, OFDM.
802.11n MIMO HT20 Mode: MCS0, 6.5 Mbps, 2 Spatial Streams.
802.11n SISO HT40 Mode: MCS0, 13.5 Mbps, 2 Spatial Streams.
802.11n MIMO HT40 Mode: MCS15, 270 Mbps, 2 Spatial Streams.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power, that was determined to be 11n HT20 mode, mid channel..

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

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

For Radiated Band Edge measurements preliminary testing showed that the worst case was horizontal polarization, so final measurements were performed with horizontal polarization.

All legacy/SISO 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.
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5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes with two different types of antenna, with the maximum gain as table below:

Antenna Type	Model	Peak gain (dBi)		
		5150-5250MHz	5250-5350MHz	5740-5725MHz
802.11abgn WLAN Antenna	K84WIFI1	2.34 H	2.99 H	3.94 H
802.11abgn WLAN Antenna	K84WIFI2	3.72 H	3.29 H	3.38 H

The highest gains of each type of antennas for all legacy / SISO modes test.

Band	WIFI1 Ant Gain (dBi)	WIF2 Ant Gain (dBi)
5150 – 5250 MHz	2.34	***3.72***
5250 – 5350 MHz	2.99	***3.29***
5470 – 5725 MHz	***3.94***	3.38

The antennas combinations for 2x2 (CCD) modes test.

Frequency Band	Antennas conbination	WIFI1 Antenna Gain	WIFI2 Antenna gain	10^(Ant Main /10)	10^(Ant Aux/10)	10^(ant main/10)+ 10^(ant aux/10)	10*log[10^(ant main/10)+ 10^(ant aux/10)] (dBi)
5.2 GHz HT20 & HT40	802.11abgn WLAN Antennas	2.34	3.72	1.714	2.355	4.069	6.09
5.3 GHz HT20 & HT40	802.11abgn WLAN Antennas	2.99	3.29	1.991	2.133	4.124	6.15
5.5 GHz HT20 & HT40	802.11abgn WLAN Antennas	3.94	3.38	2.477	2.178	4.655	6.68

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

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

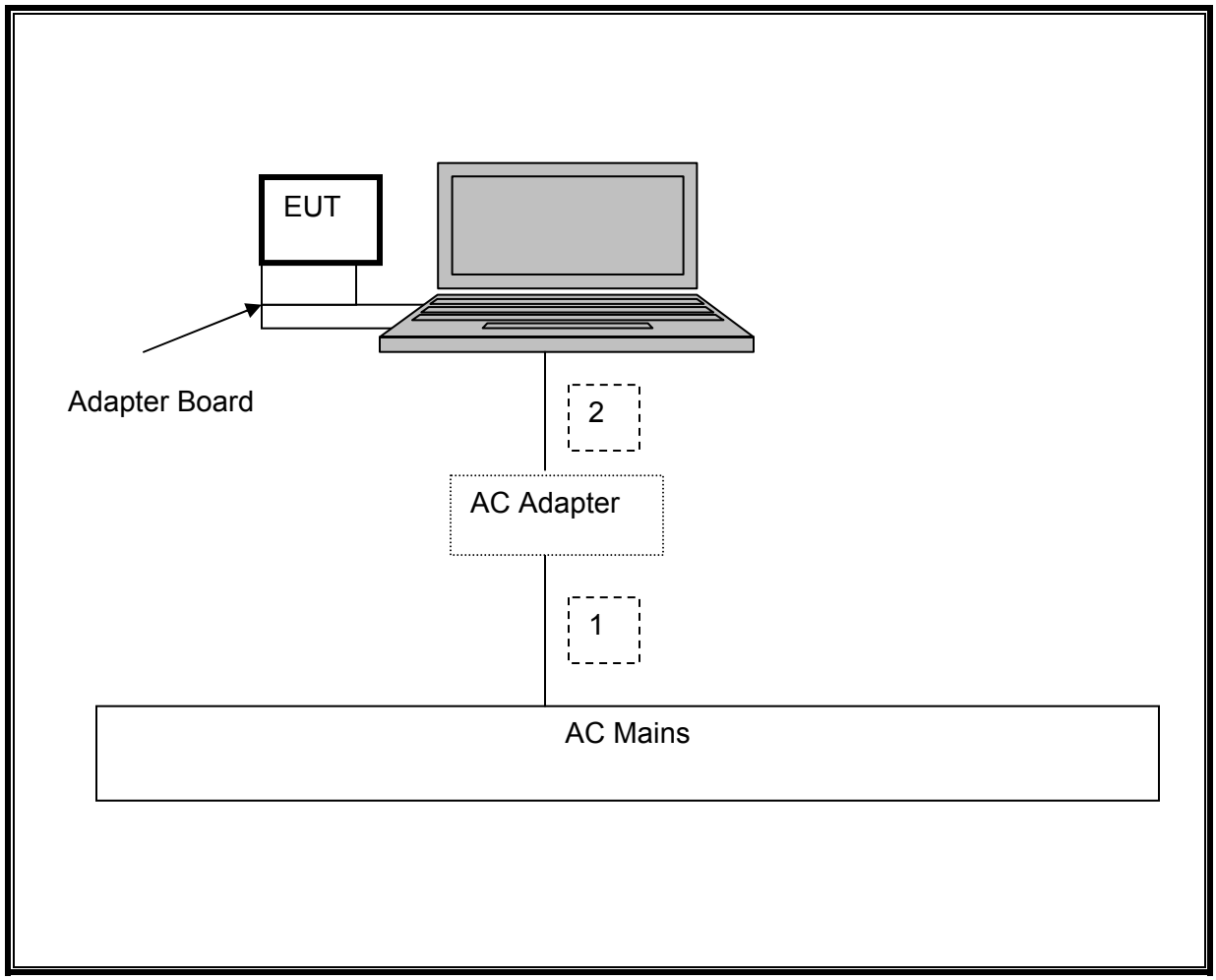
I/O CABLES

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

TEST SETUP

The EUT is connected to a host laptop computer via Express card to MiniPCI-E adapter board during the test. 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	C01069	01/05/10
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	01/14/10
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/10
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	11/28/09
Antenna, Horn, 40 GHz	ARA	MWH-2640B	C00981	05/21/10
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/09
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/10
Preamplifier, 1-26GHz	Agilent / HP	8449B	C01052	08/05/10
Peak Power Meter	Boonton	4541	C01186	01/19/10
Peak Power Sensor	Boonton	4541	C01189	01/15/10
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/09
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/10

7. ANTENNA PORT TEST RESULTS

7.1. 802.11a MODE IN THE 5.2 GHz BAND

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

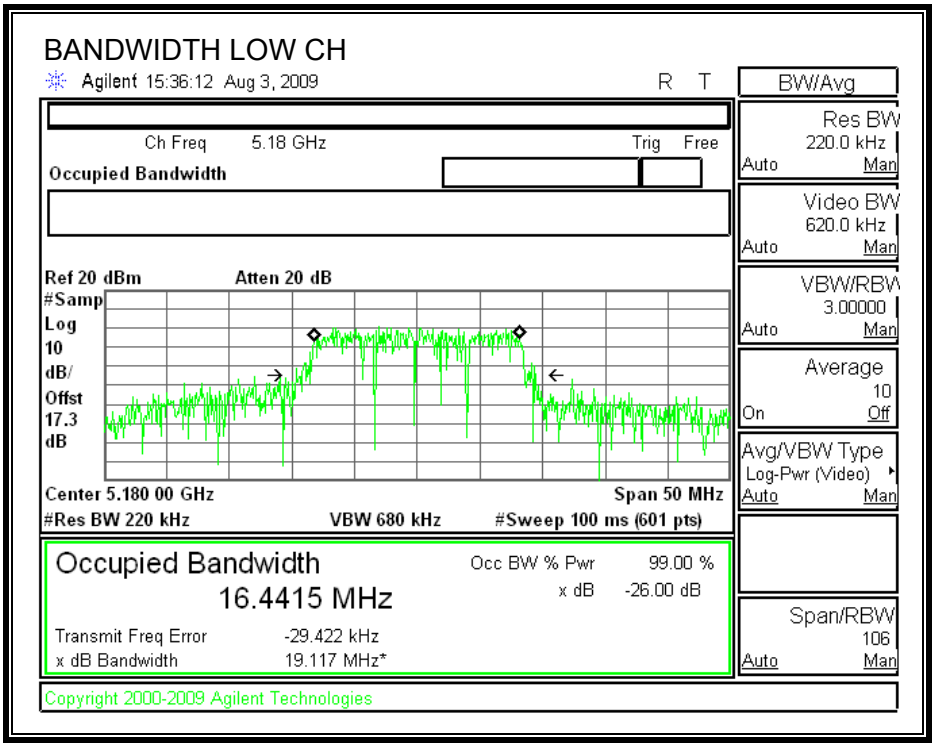
TEST PROCEDURE

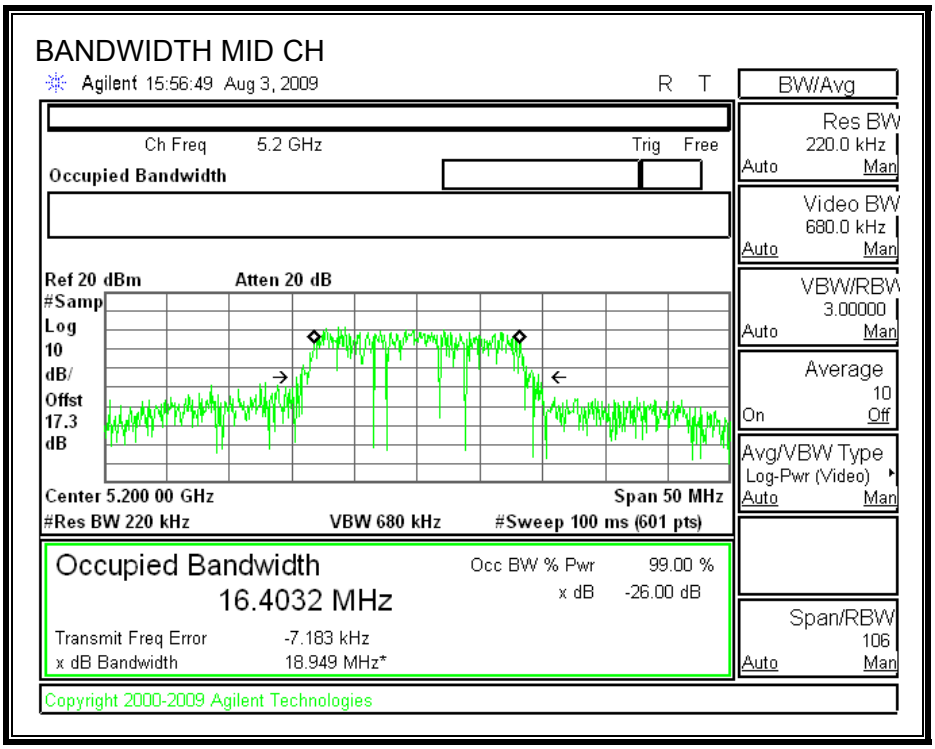
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

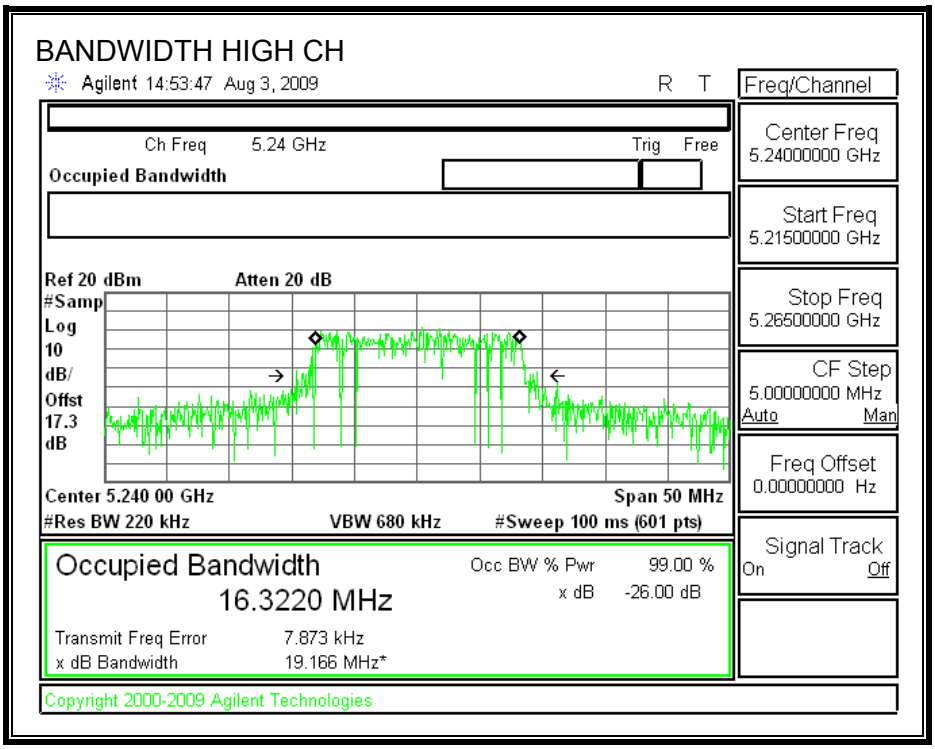
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.117	16.4415
Middle	5200	18.949	16.4032
High	5240	19.166	16.3220

26 dB and 99% BANDWIDTH







7.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is 3.72 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

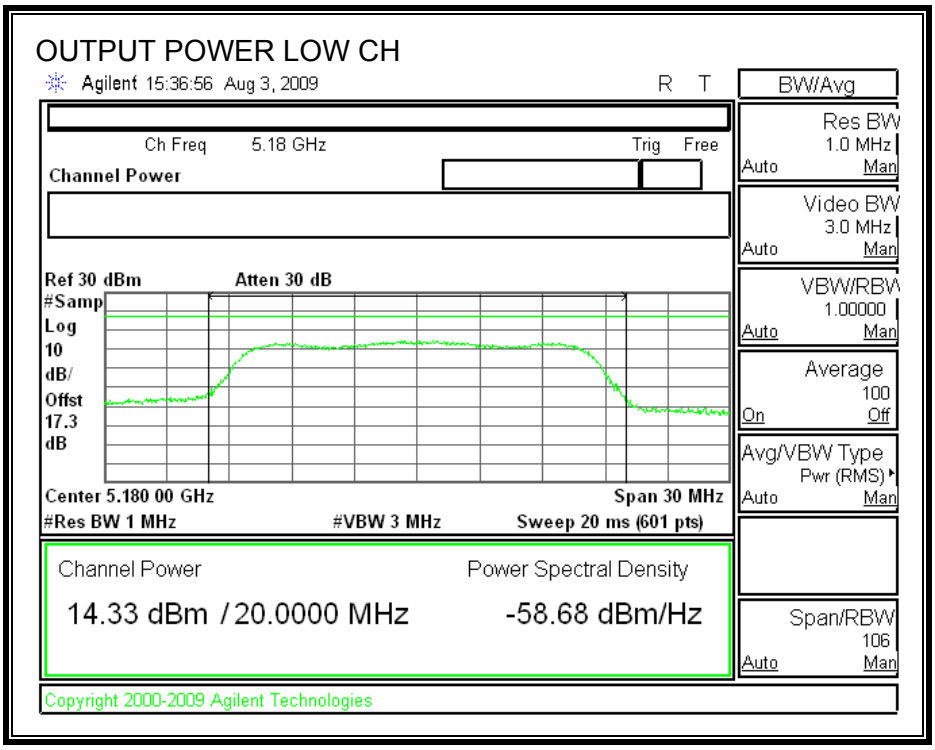
Limit

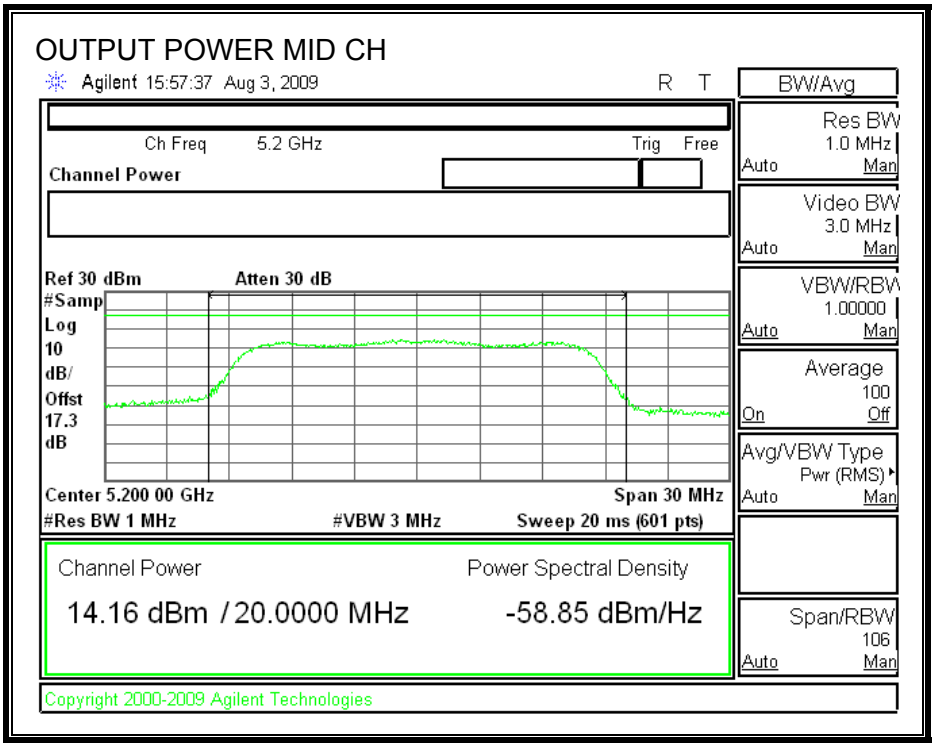
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	19.117	16.81	3.72	16.81
Mid	5200	17	18.949	16.78	3.72	16.78
High	5240	17	19.116	16.81	3.72	16.81

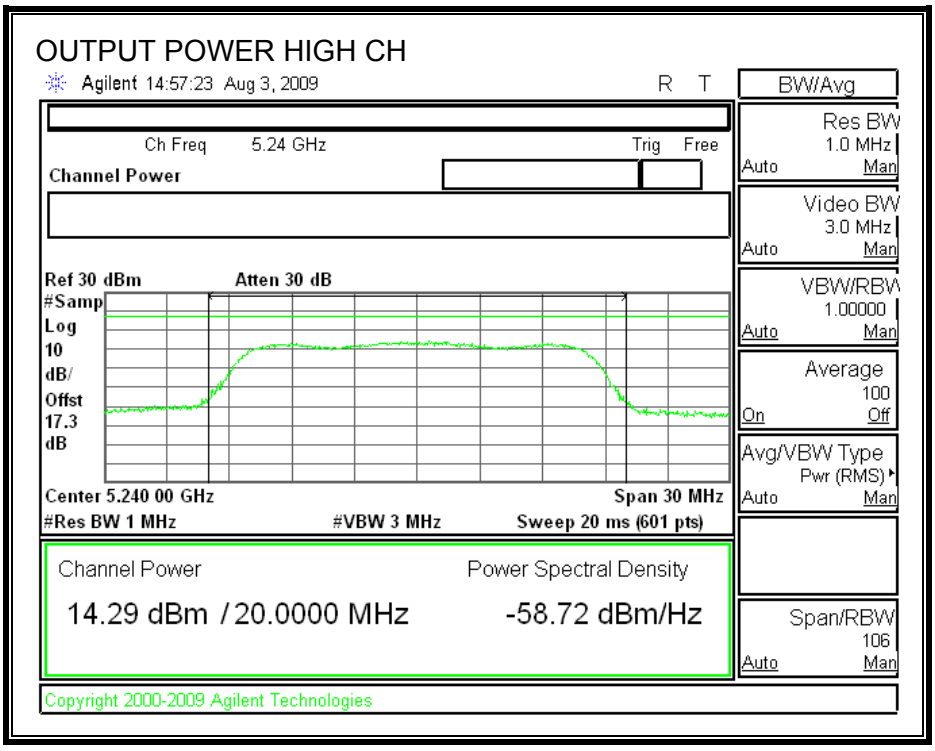
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	14.33	16.81	-2.48
Mid	5200	14.16	16.78	-2.62
High	5240	14.29	16.81	-2.52

OUTPUT POWER







7.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is equal to 3.72 dBi, therefore the limit is 4 dBm.

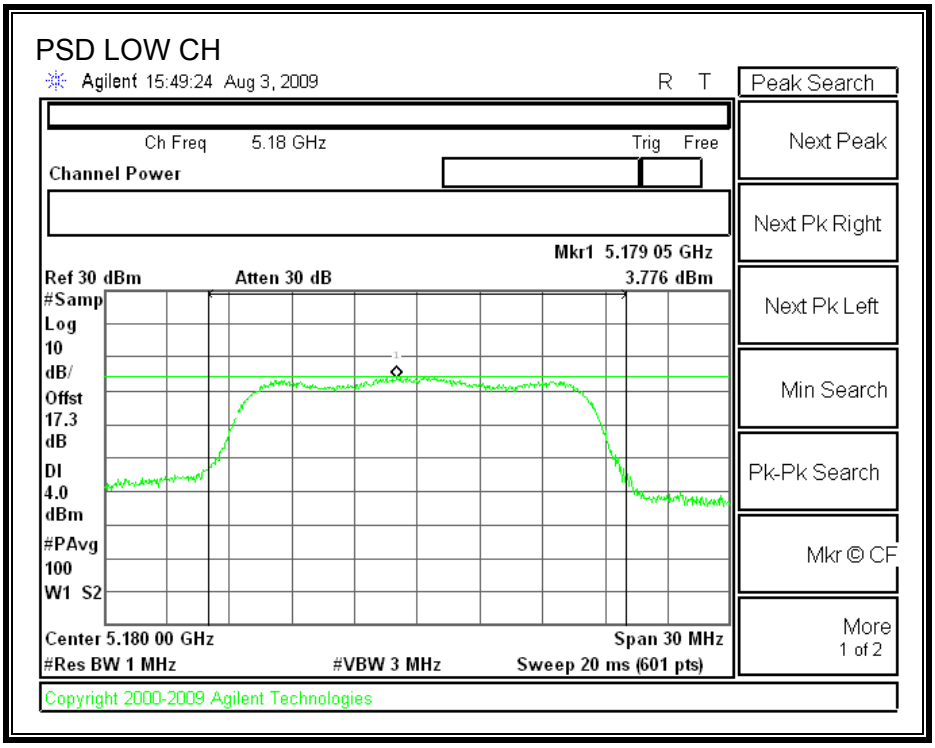
TEST PROCEDURE

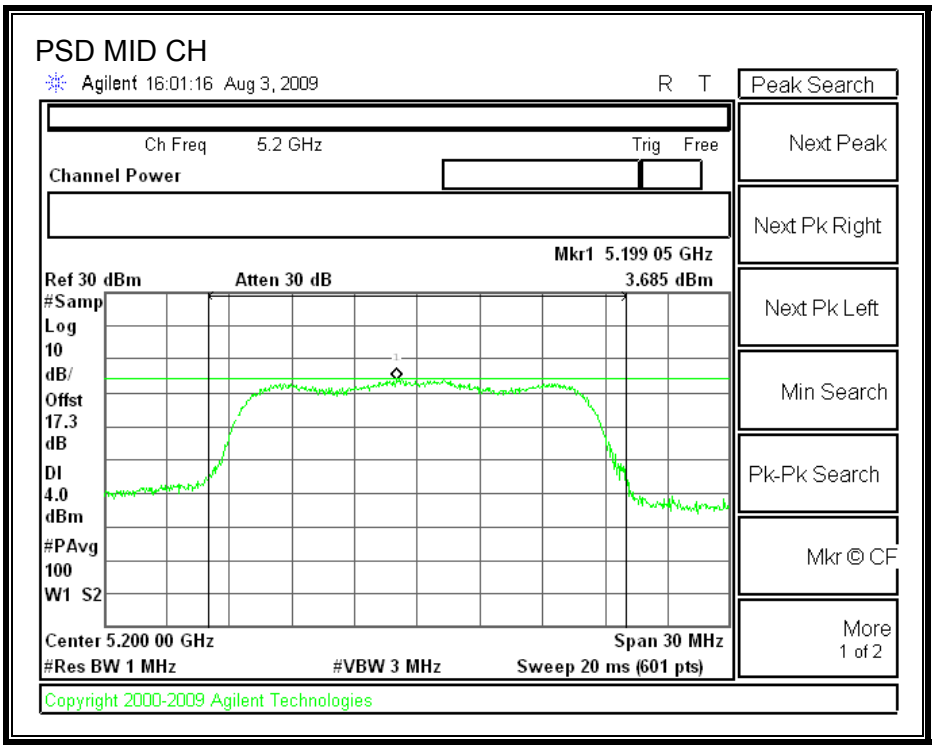
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

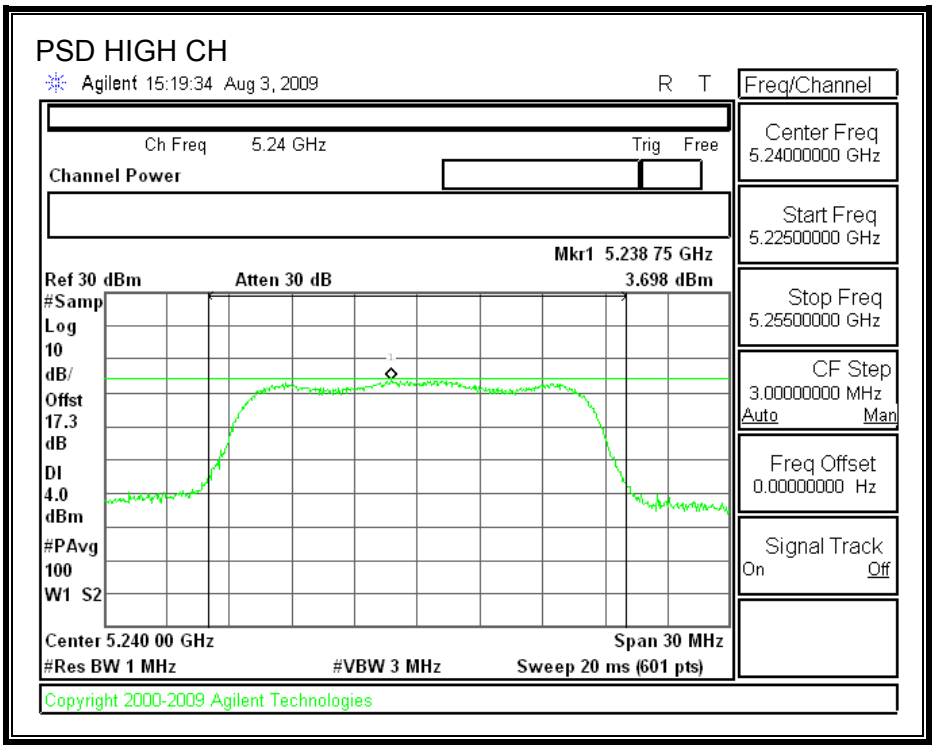
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.78	4	-0.22
Middle	5200	3.69	4	-0.32
High	5240	3.70	4	-0.30

POWER SPECTRAL DENSITY







7.1.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

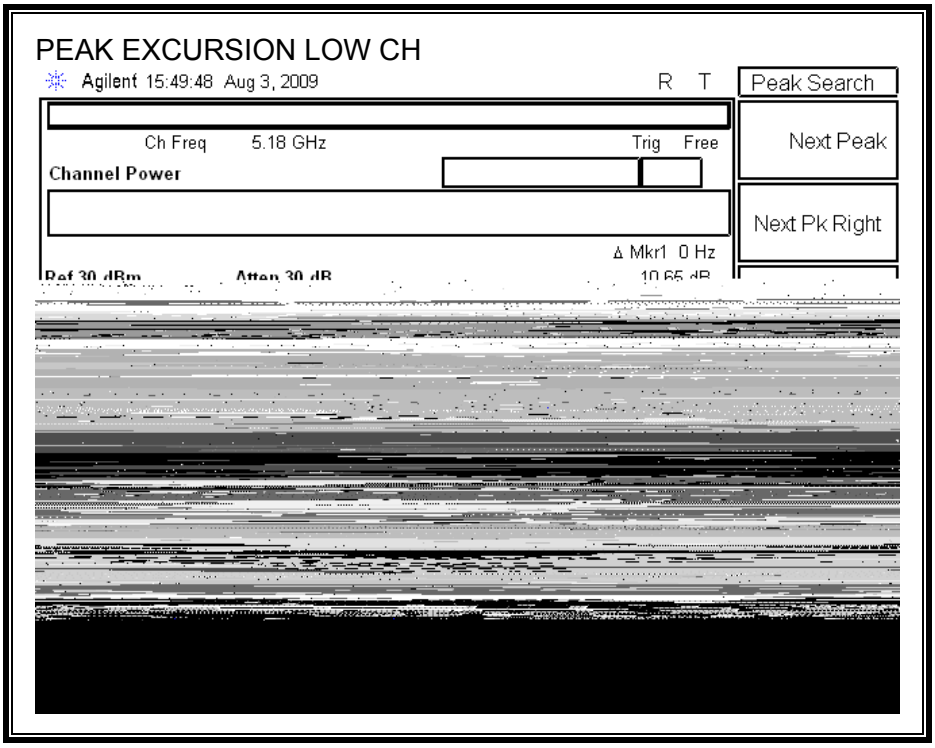
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

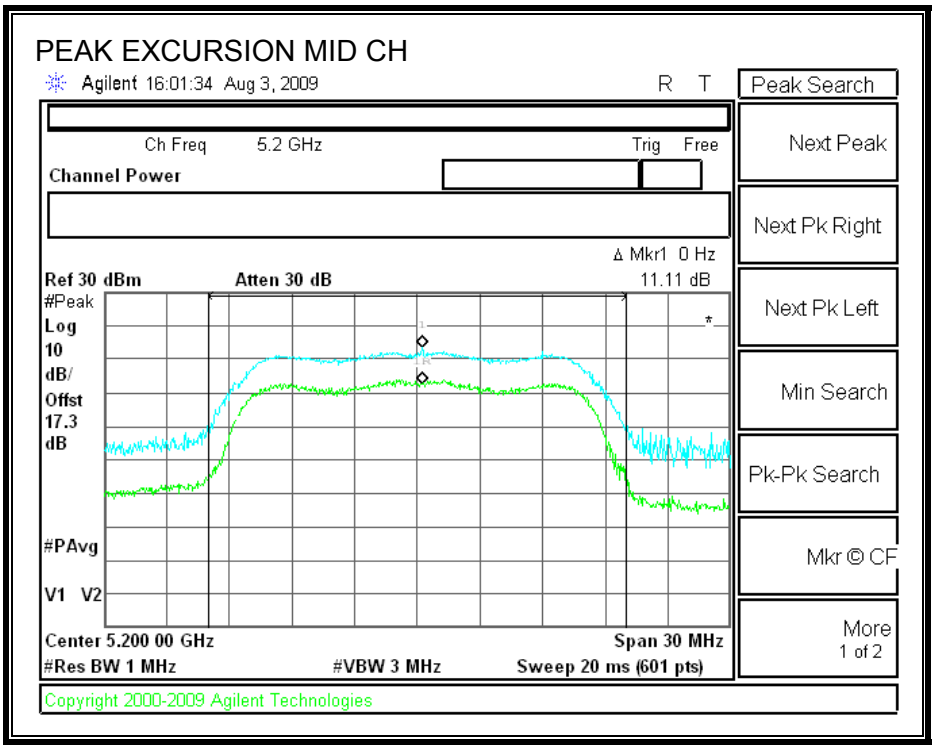
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

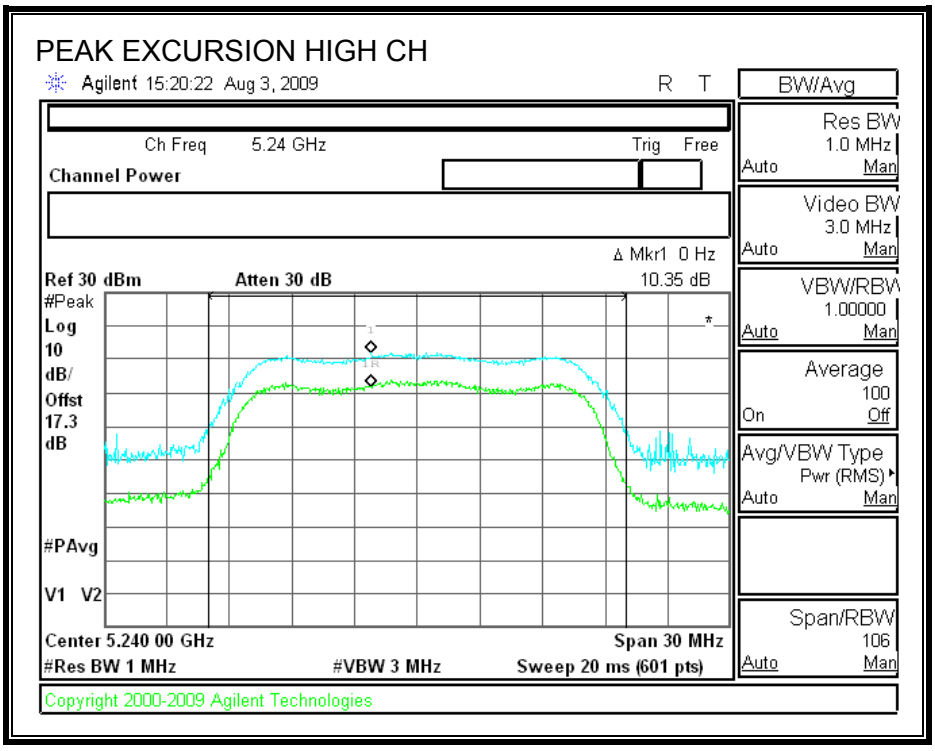
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.65	13	-2.35
Middle	5200	11.11	13	-1.89
High	5240	10.35	13	-2.65

PEAK EXCURSION







7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

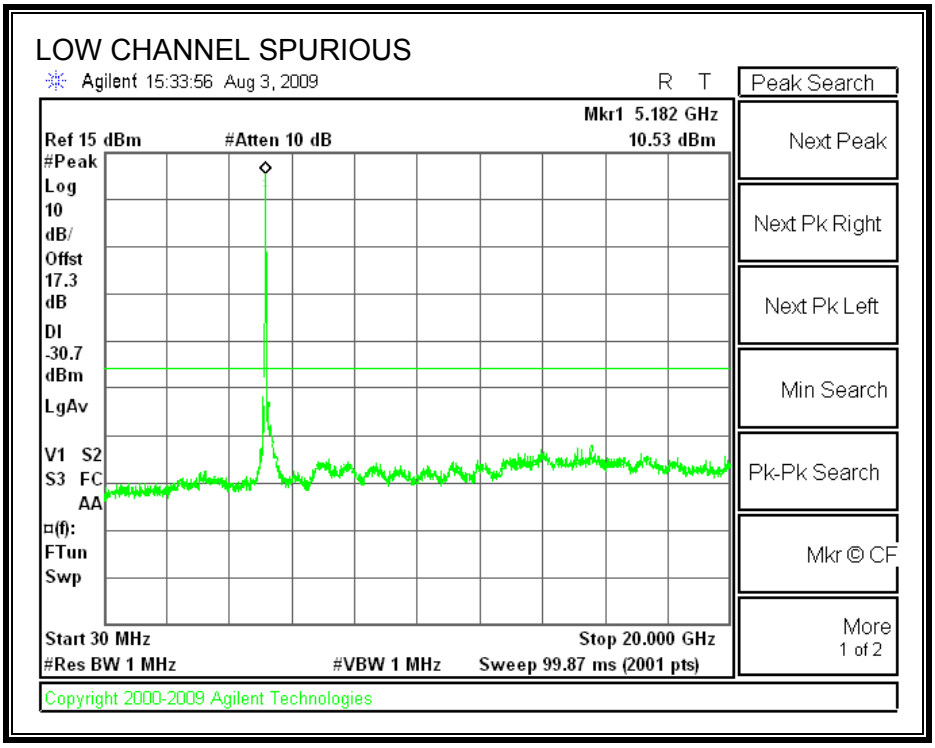
TEST PROCEDURE

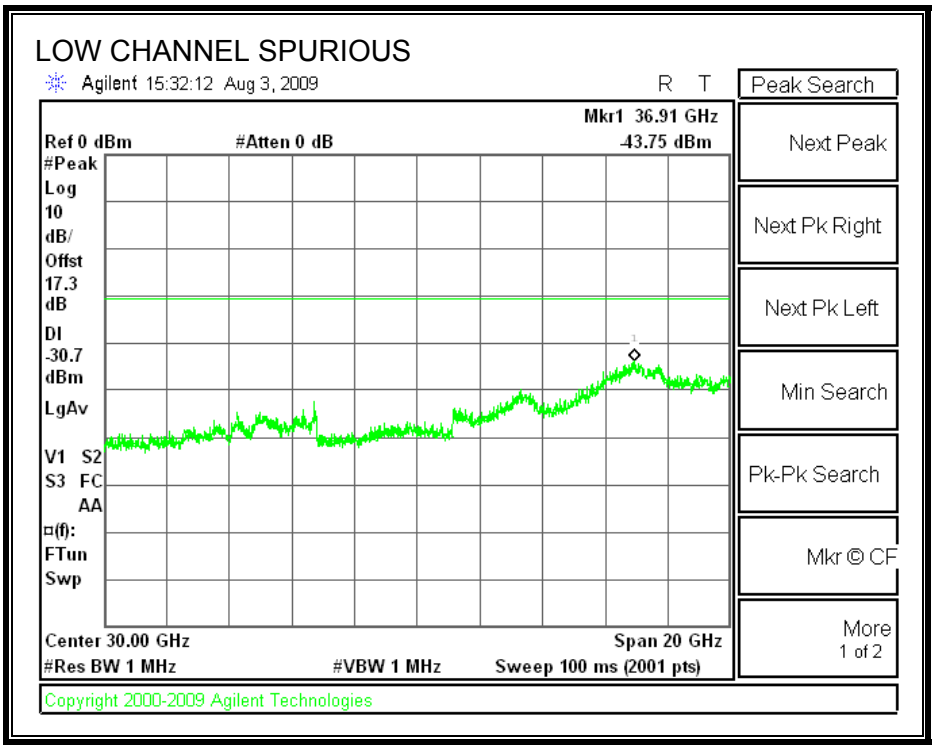
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

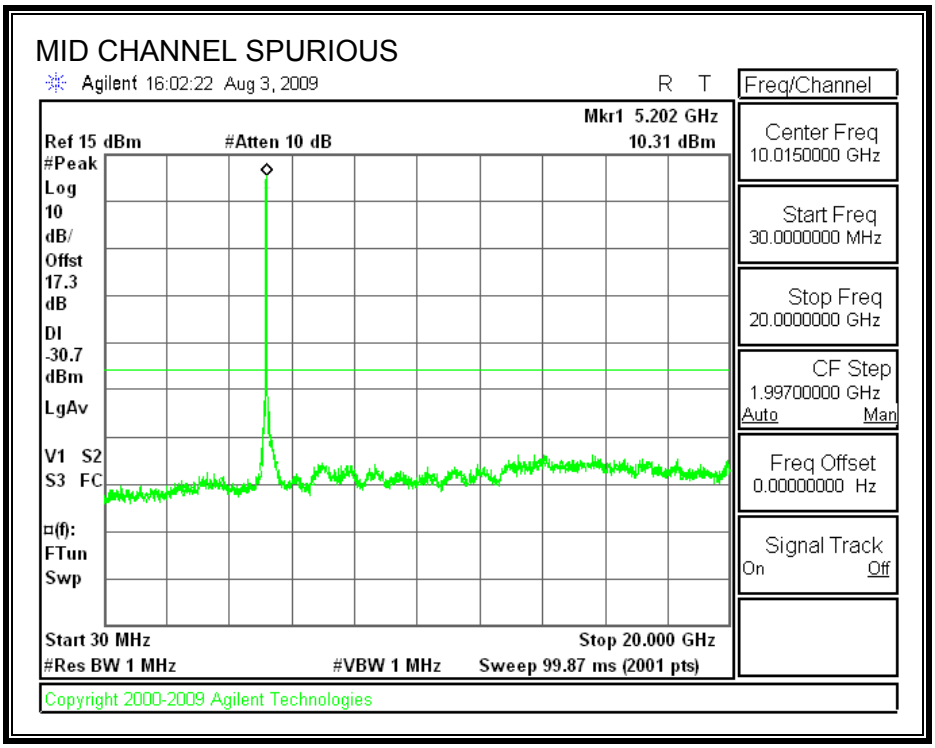
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

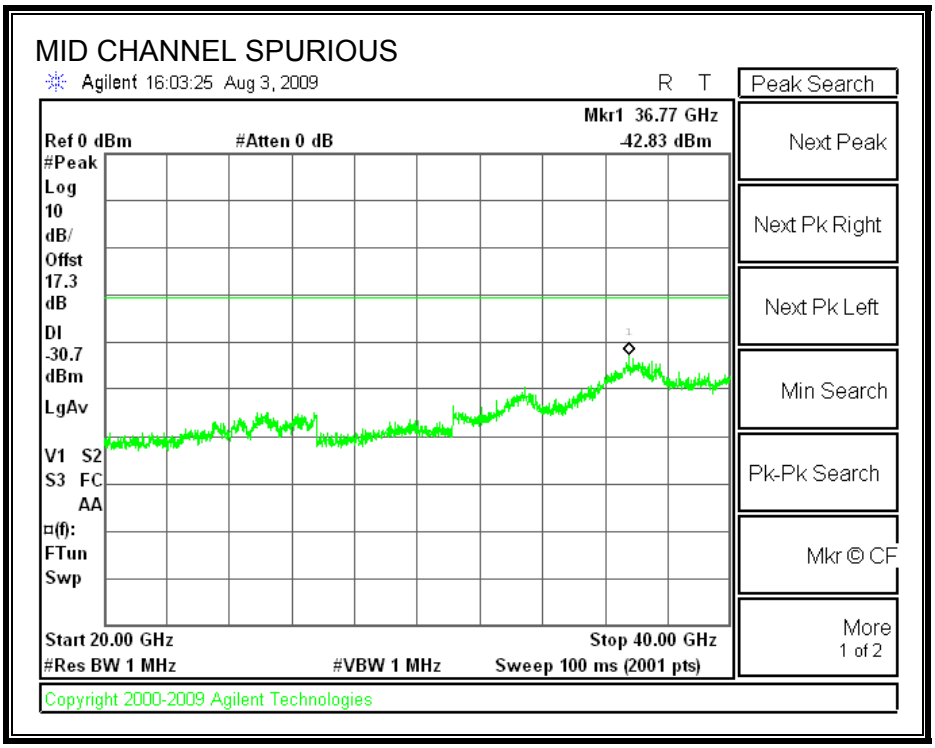
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

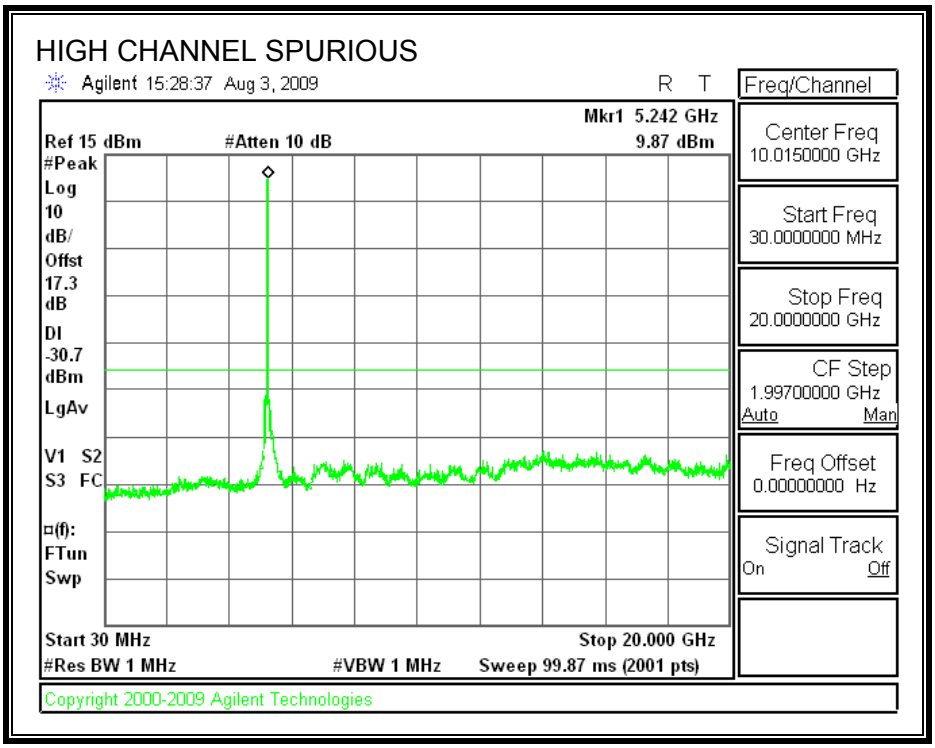
SPURIOUS EMISSIONS

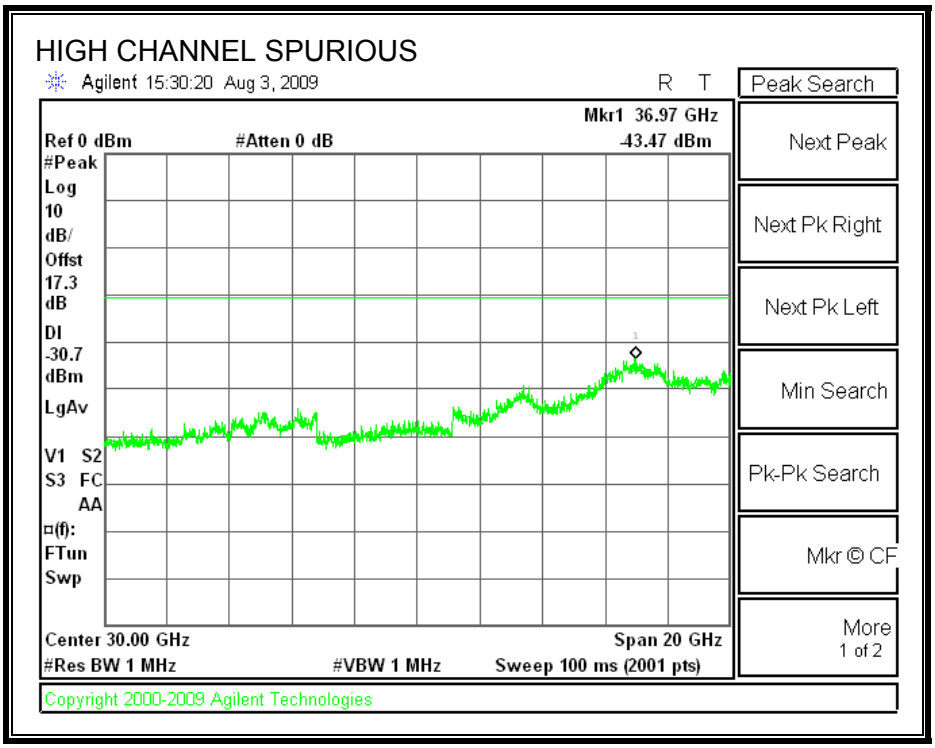












7.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

CHAIN 1

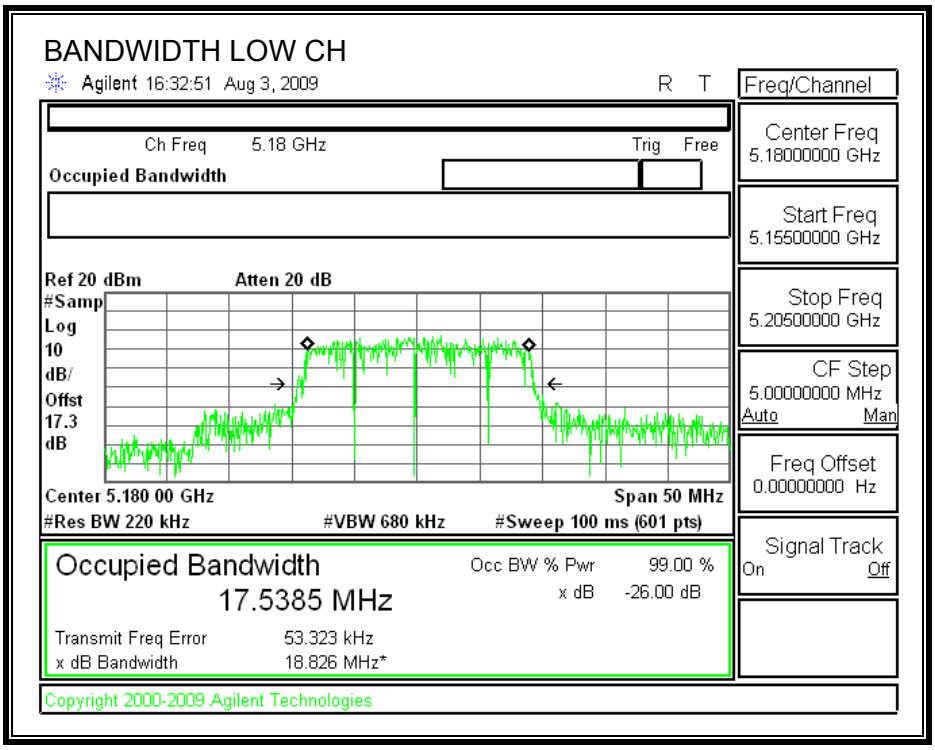
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	18.826	17.5385
Middle	5200	19.162	17.6013
High	5240	18.914	17.5584

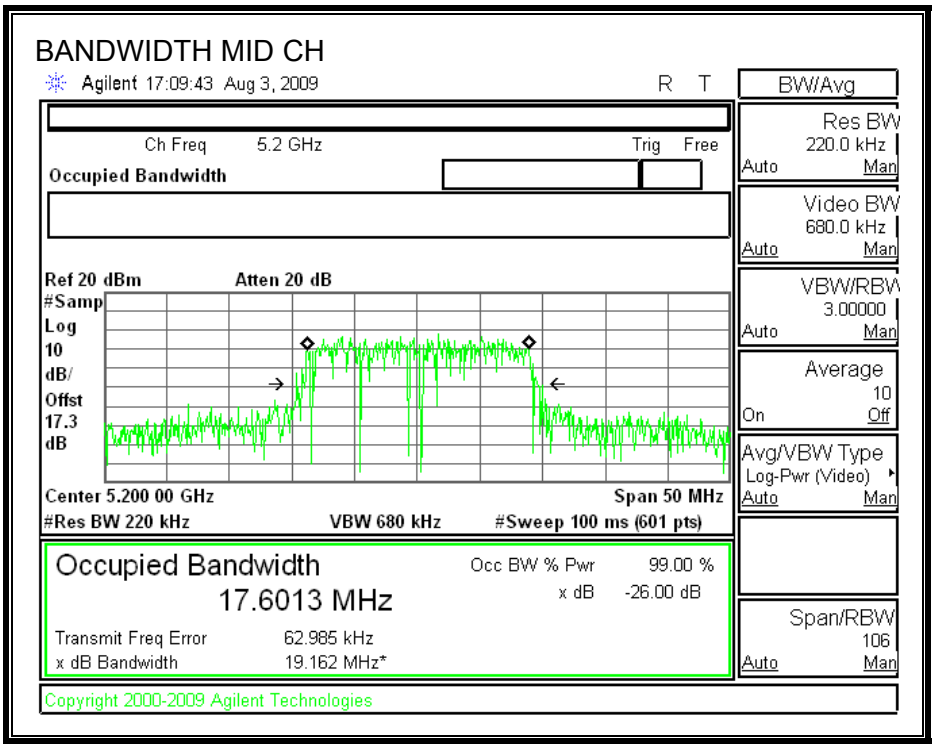
CHAIN 2

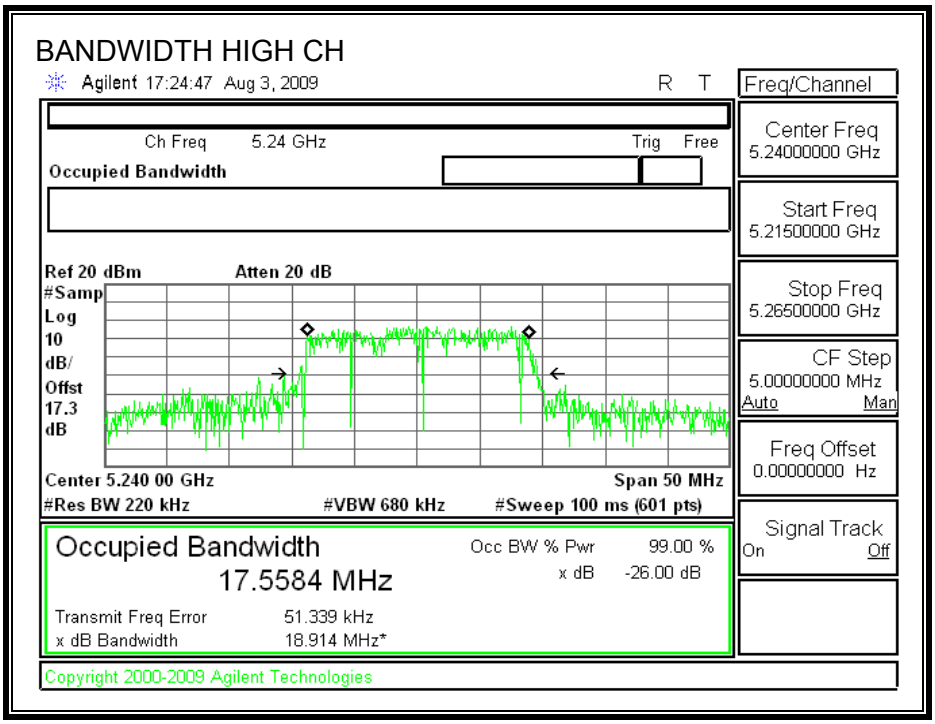
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.786	17.5257
Middle	5200	19.041	17.4998
High	5240	19.016	17.3305

CHAIN 1

26 dB and 99% BANDWIDTH

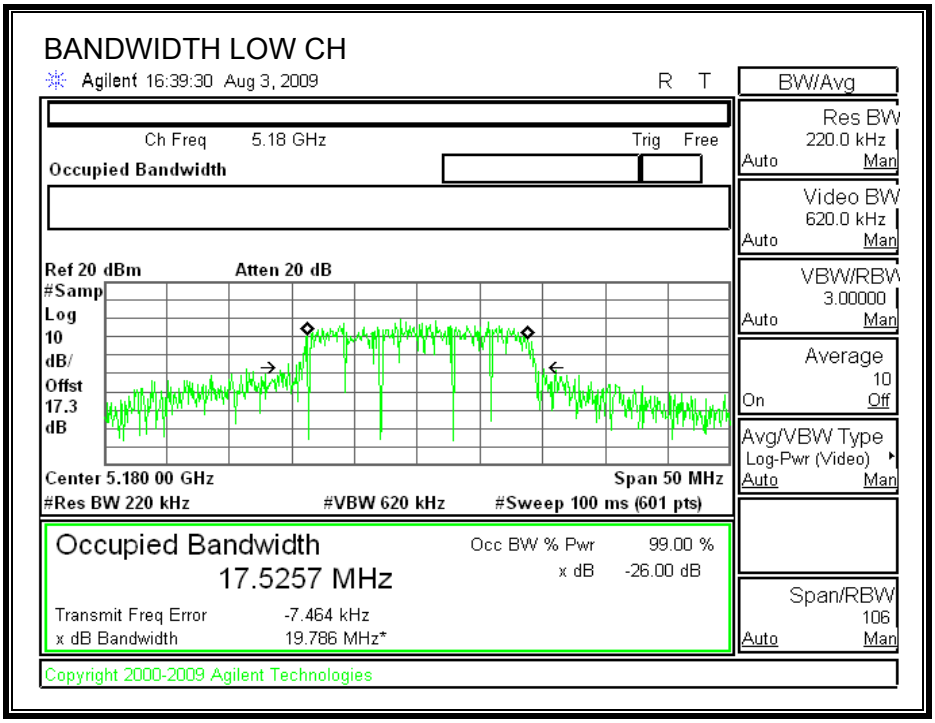


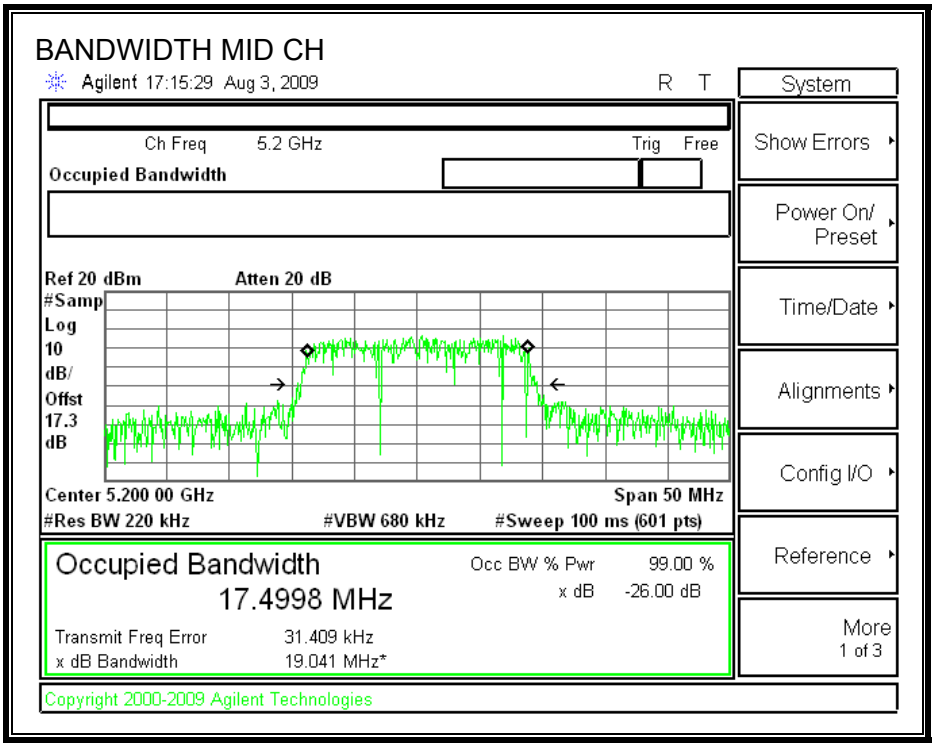


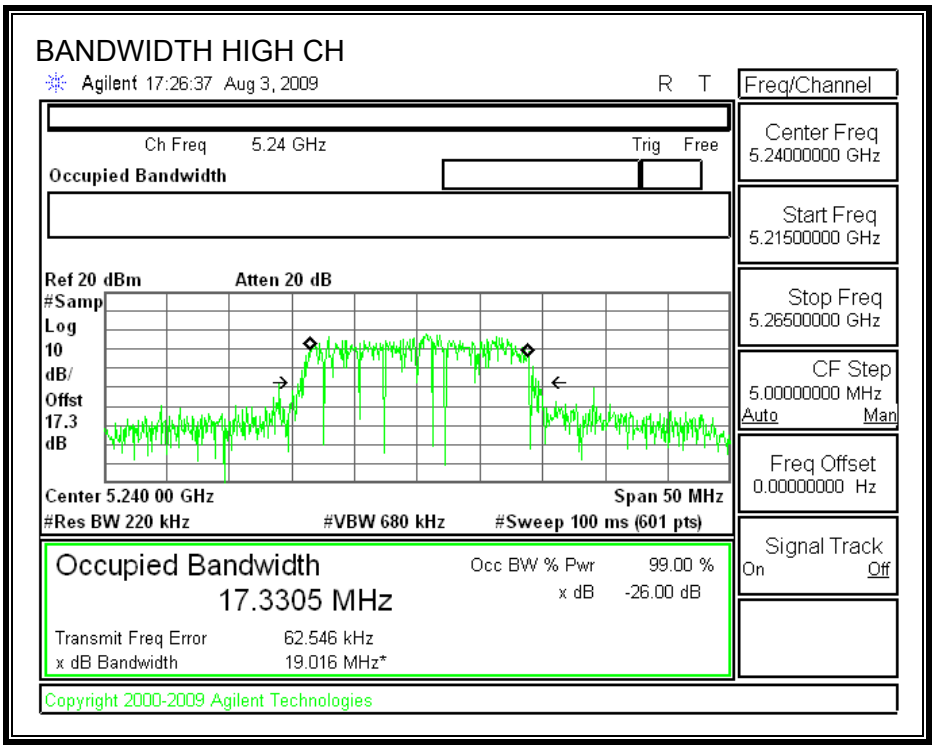


CHAIN 2

26 dB and 99% BANDWIDTH







7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The composite antenna gain is 6.09 dBi.

TEST PROCEDURE

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

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

RESULTS

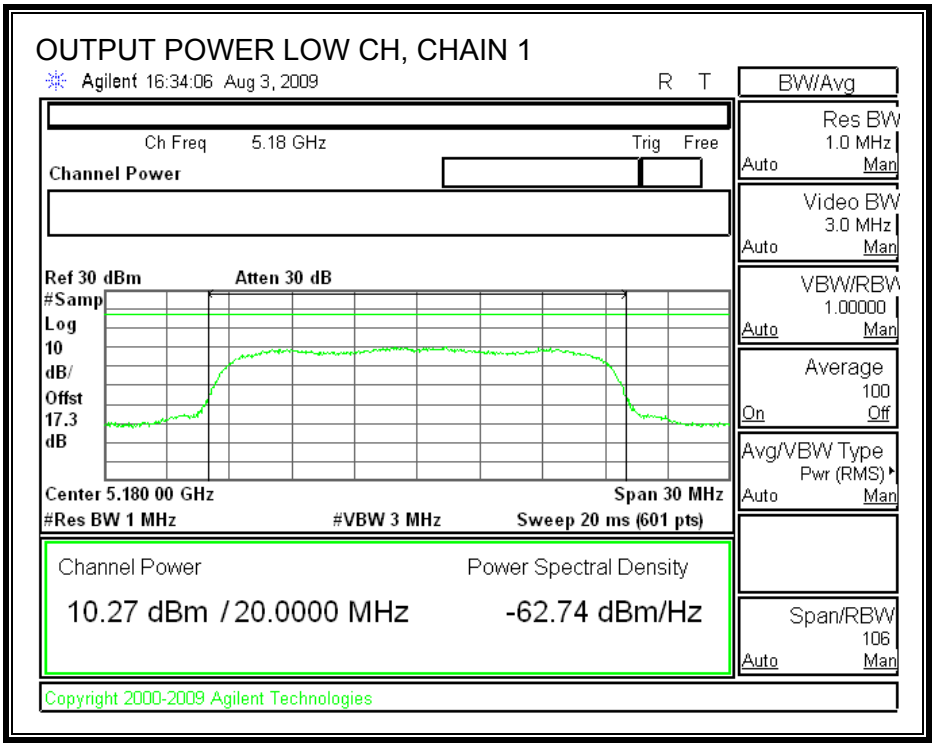
Limit

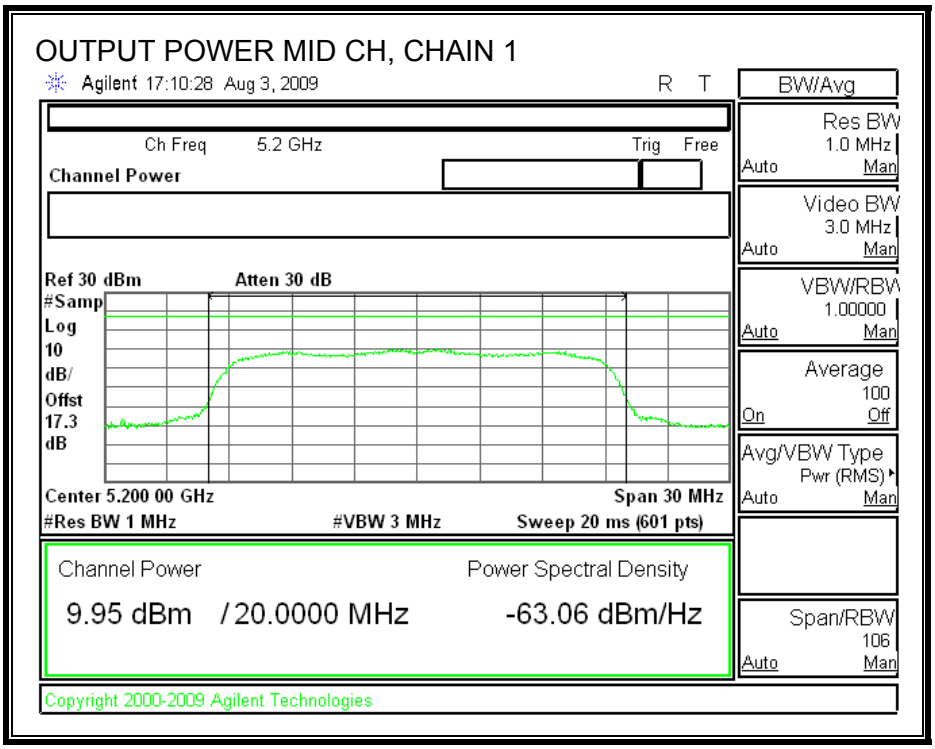
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	18.826	16.75	6.09	16.66
Mid	5200	17	19.162	16.82	6.09	16.73
High	5240	17	18.914	16.77	6.09	16.68

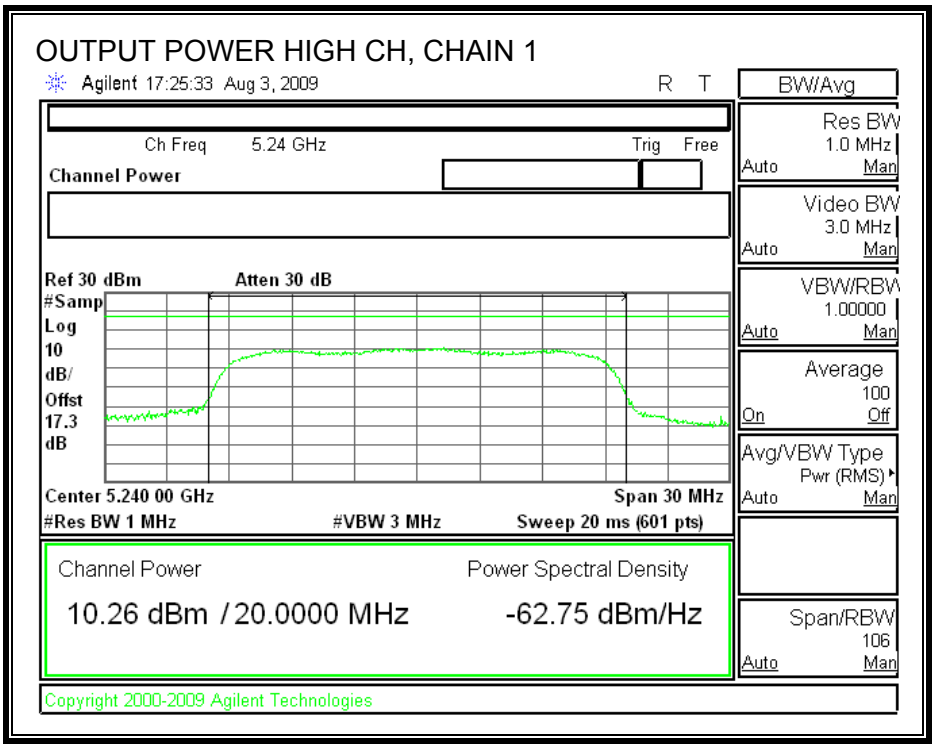
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.27	10.15	13.22	16.66	-3.44
Mid	5200	9.95	10.48	13.23	16.73	-6.78
High	5240	10.26	10.22	13.25	16.68	-6.42

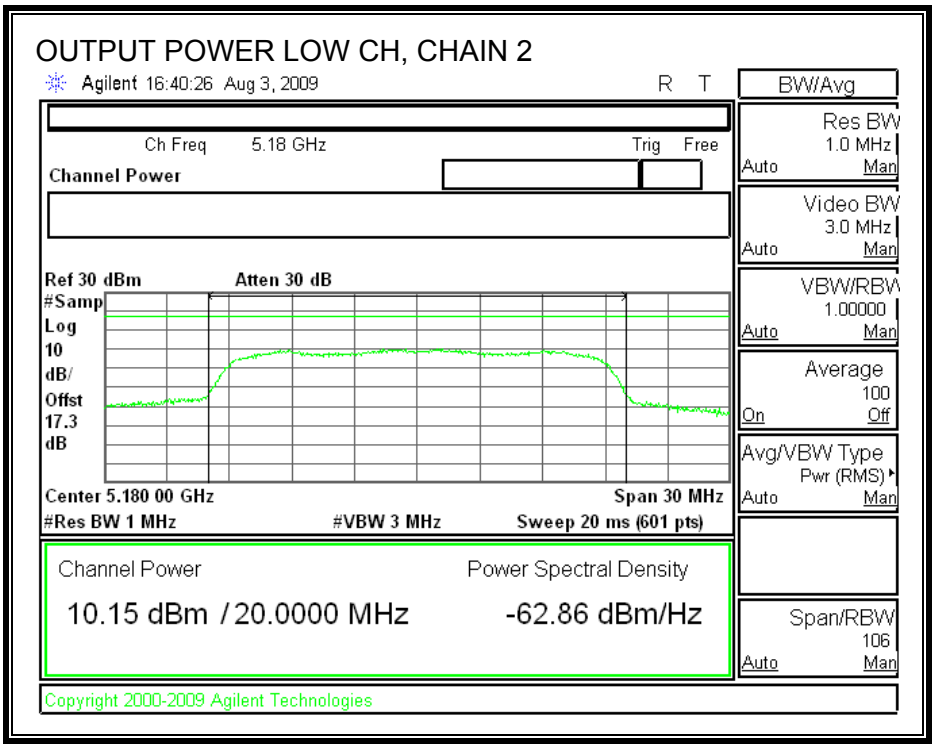
CHAIN 1 OUTPUT POWER

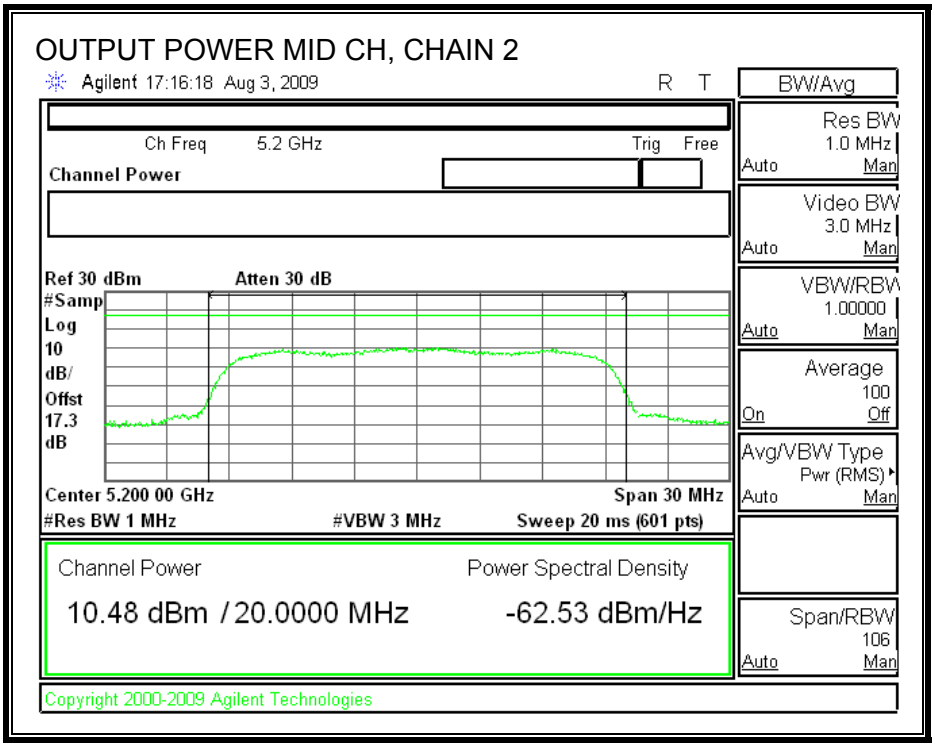


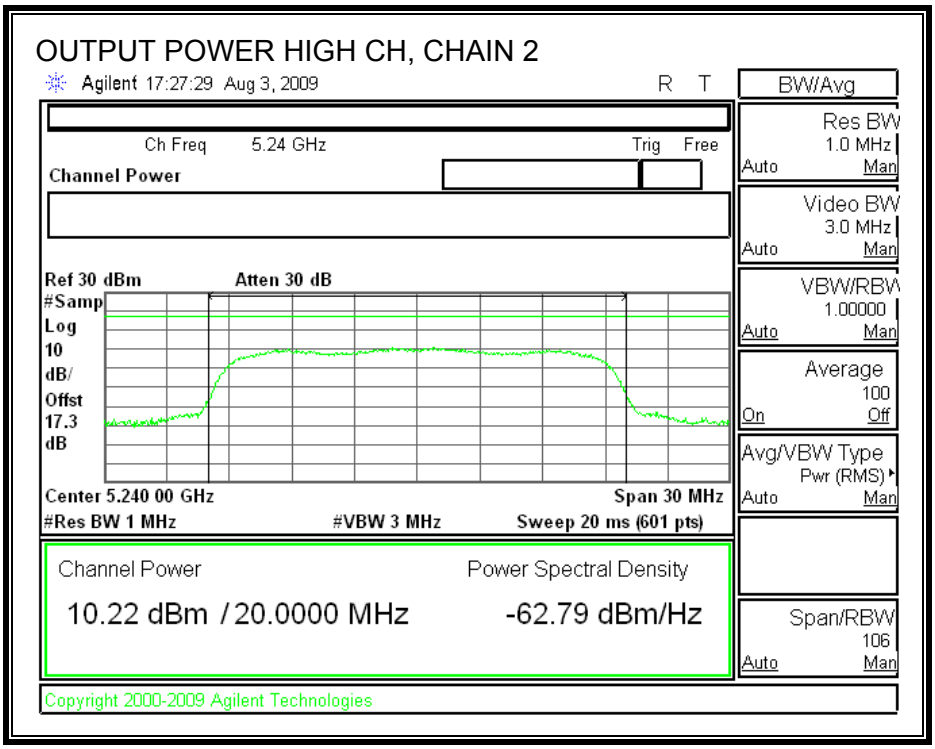




CHAIN 2 OUTPUT POWER







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 composite antenna gain is 6.09 dBi, therefore the limit is 3.91 dBm.

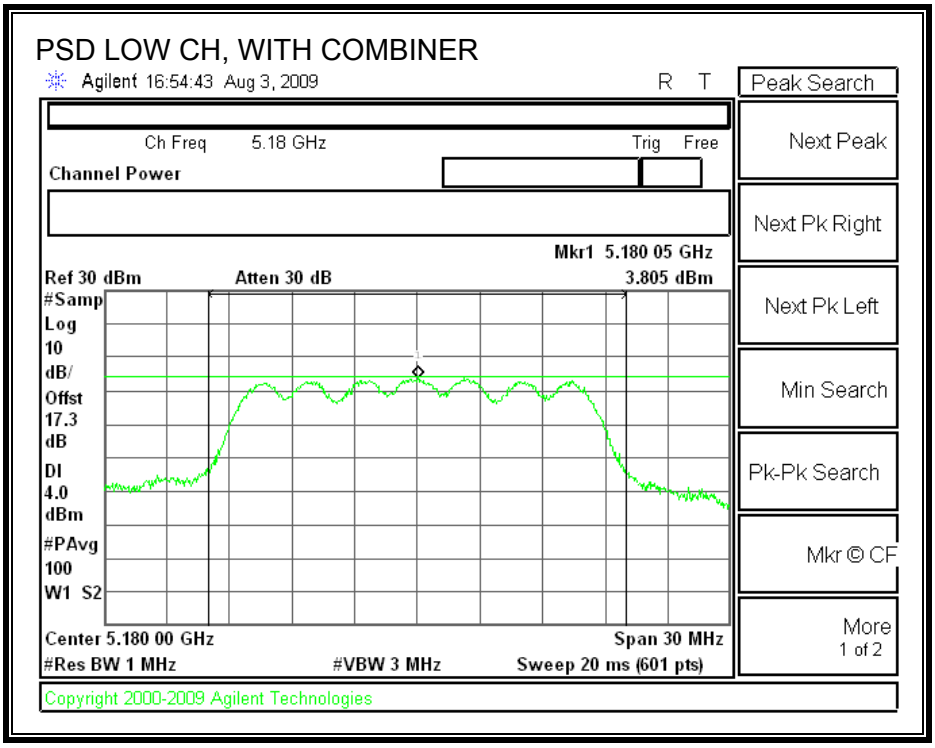
TEST PROCEDURE

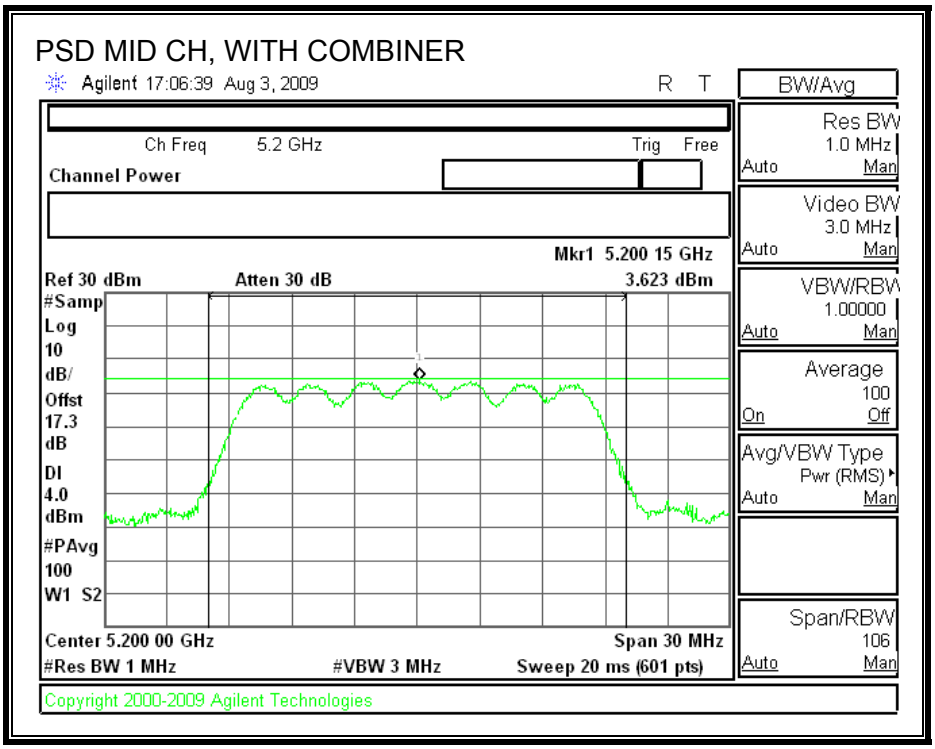
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

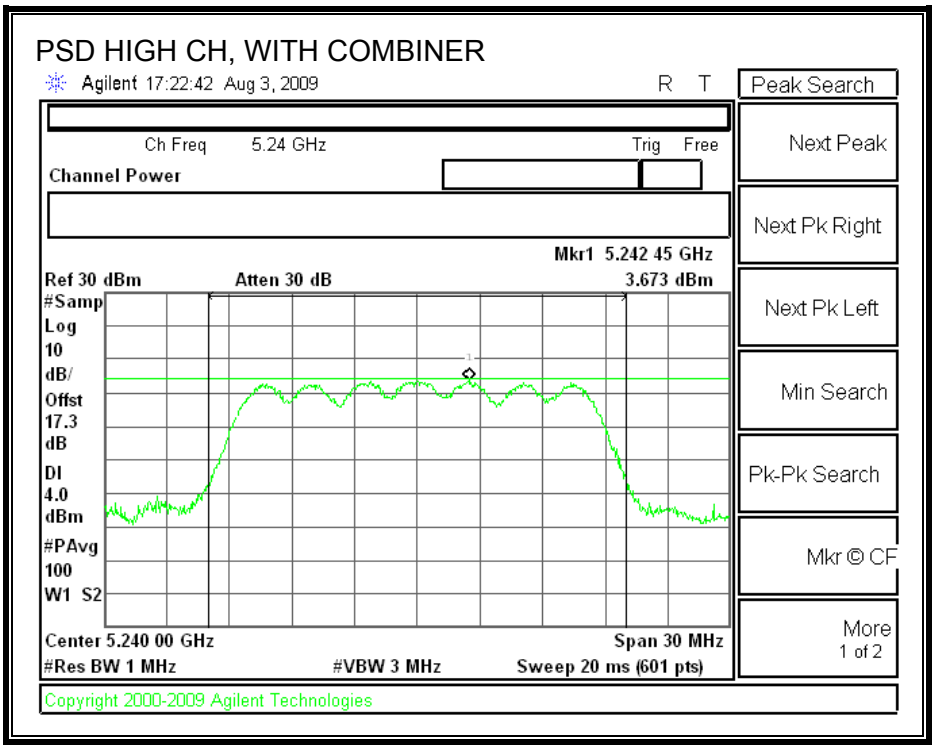
RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.81	3.91	-0.11
Middle	5200	3.62	3.91	-0.29
High	5240	3.67	3.91	-0.24

POWER SPECTRAL DENSITY WITH COMBINER







7.2.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

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

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

RESULTS

CHAIN 1

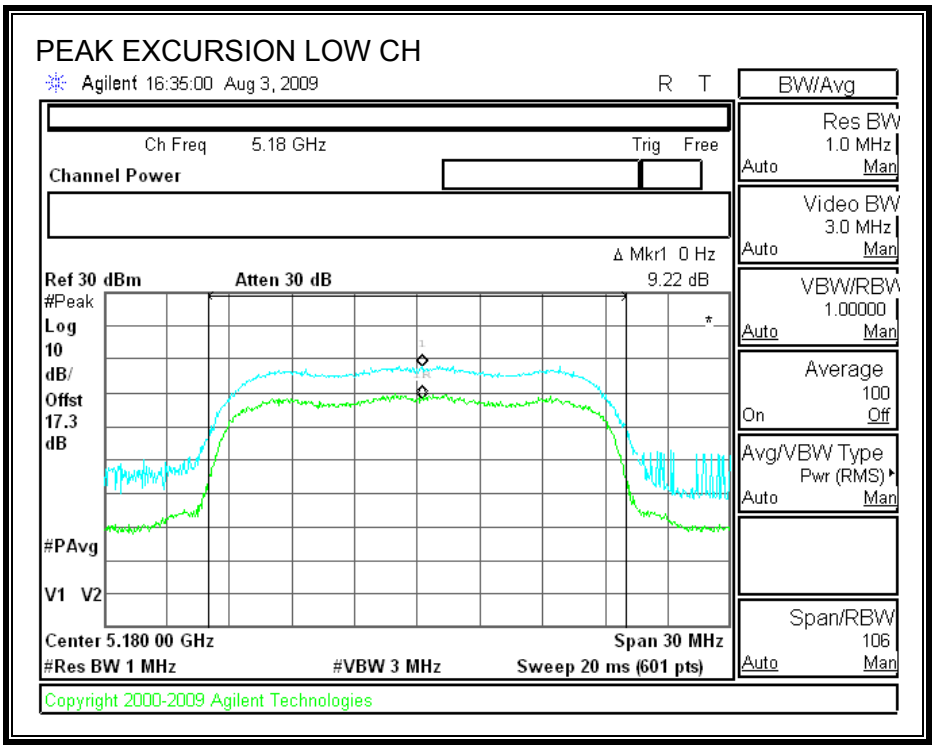
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.22	13	-3.78
Middle	5200	9.07	13	-3.93
High	5240	9.16	13	-3.84

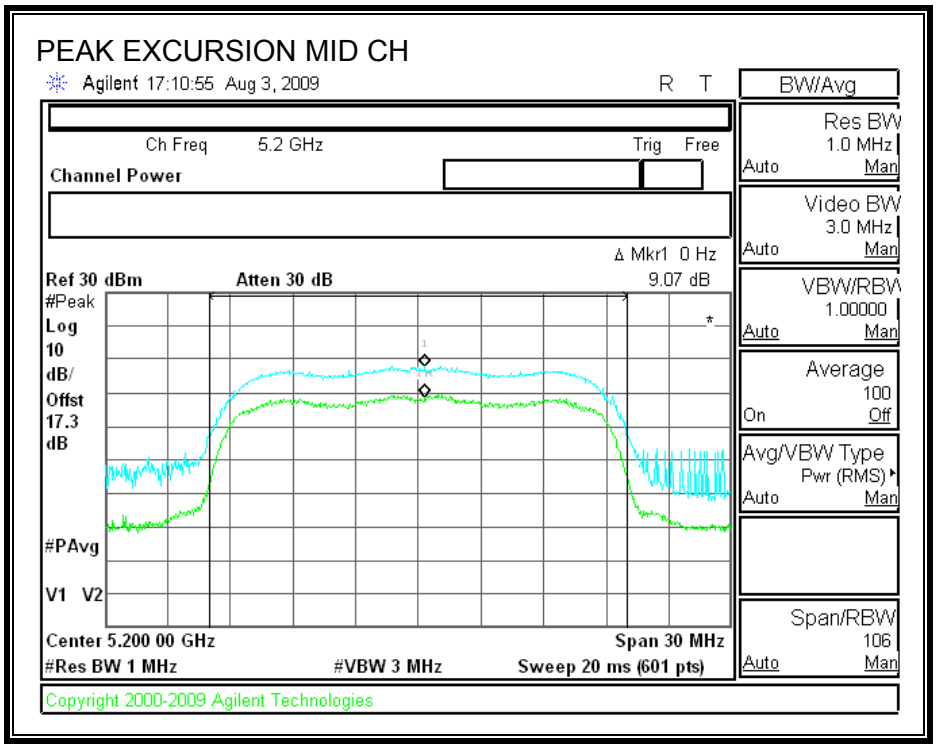
CHAIN 2

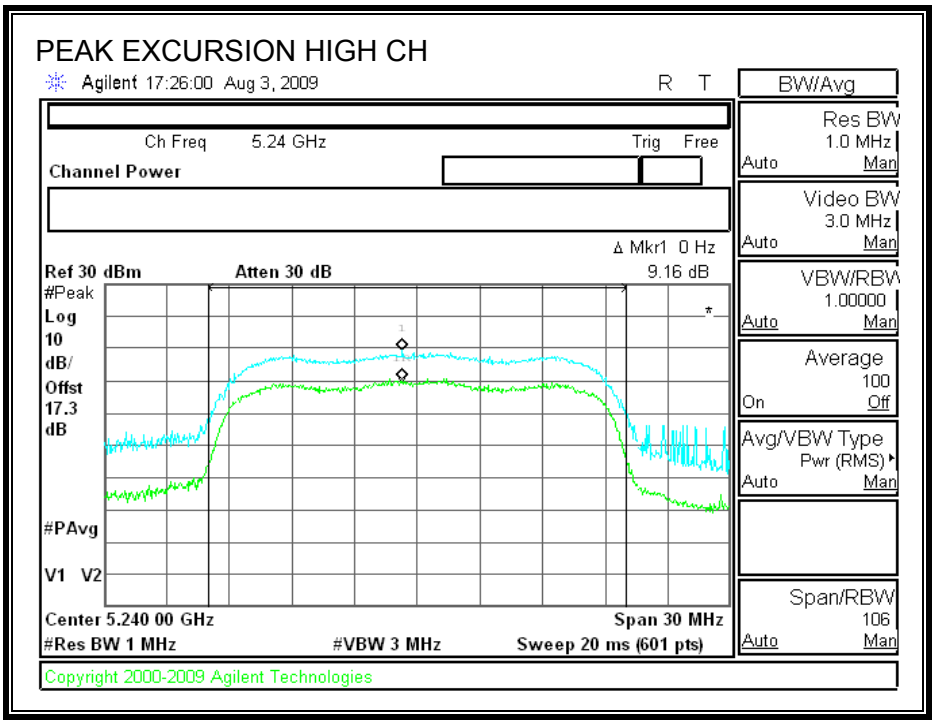
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.27	13	-2.73
Middle	5200	10.88	13	-2.12
High	5240	9.94	13	-3.06

CHAIN 1

PEAK EXCURSION

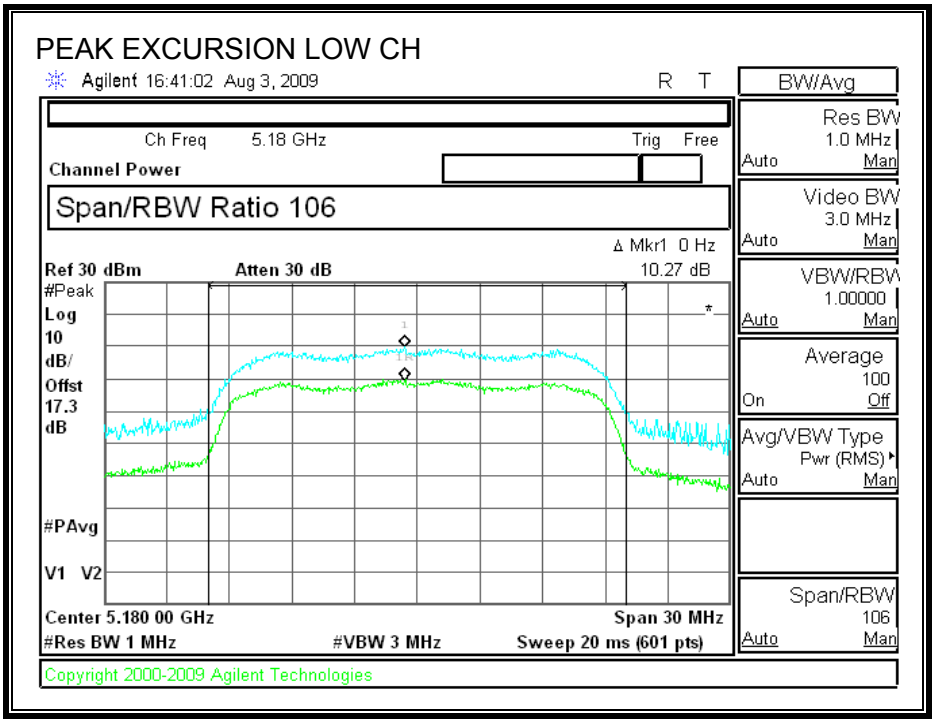




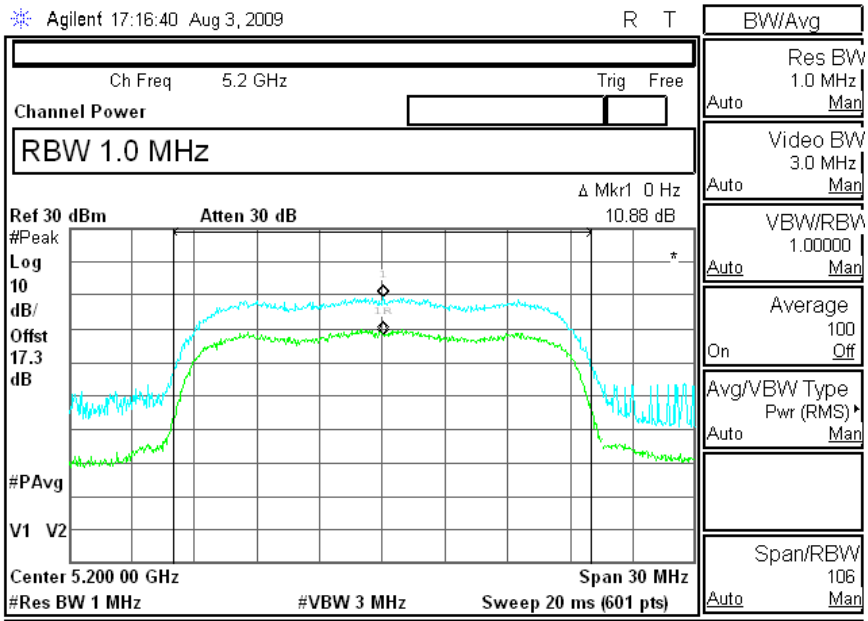


CHAIN 2

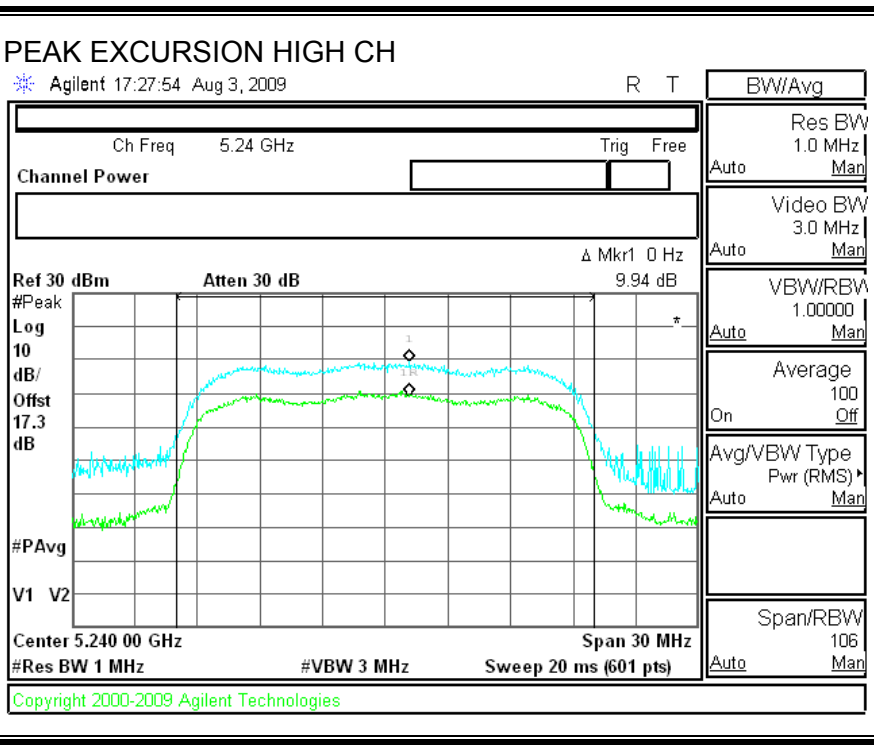
PEAK EXCURSION



PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

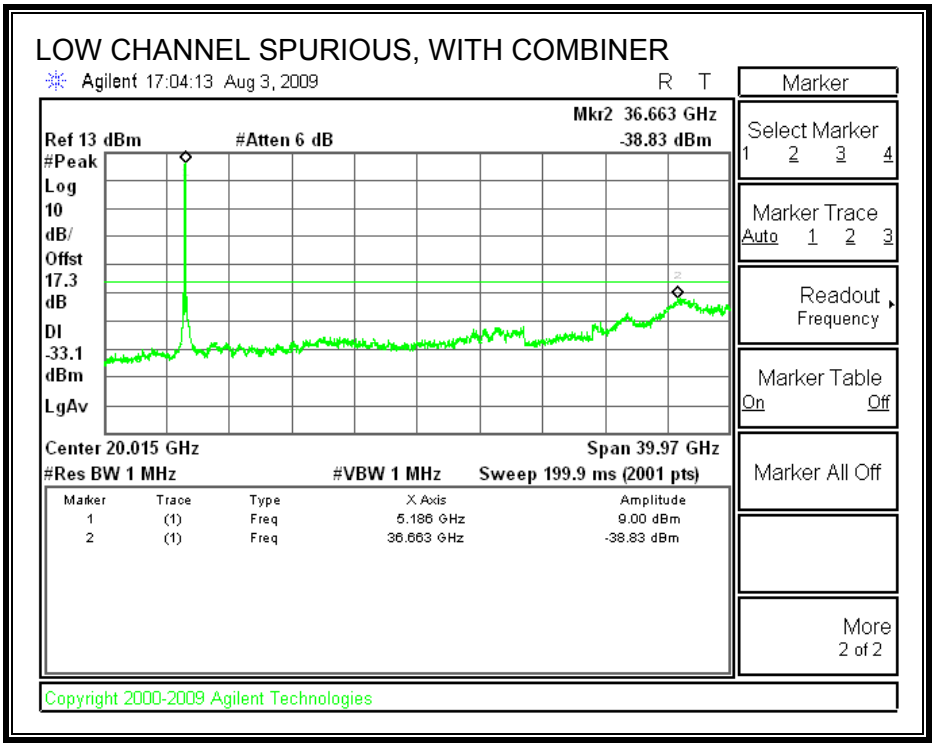
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

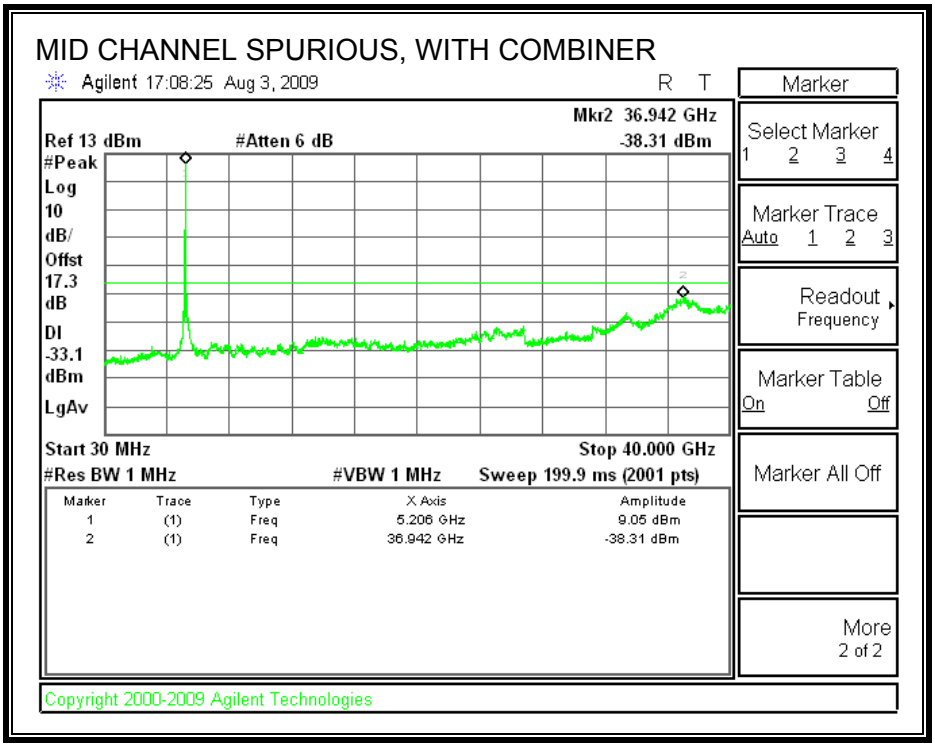
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS WITH COMBINER

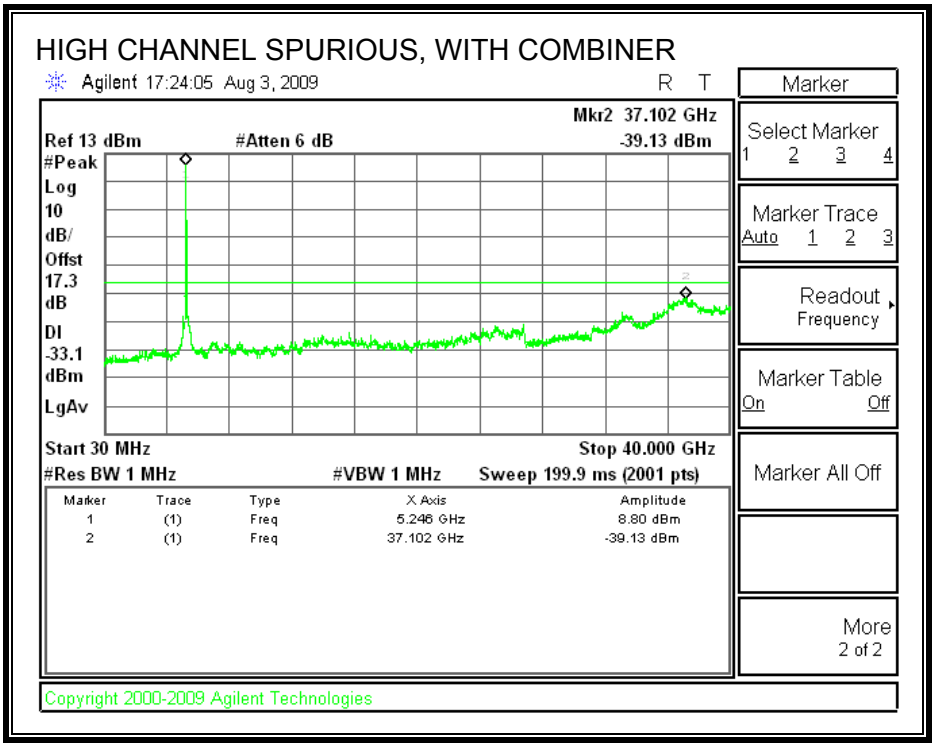
LOW CHANNEL SPURIOUS, WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



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

7.3.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

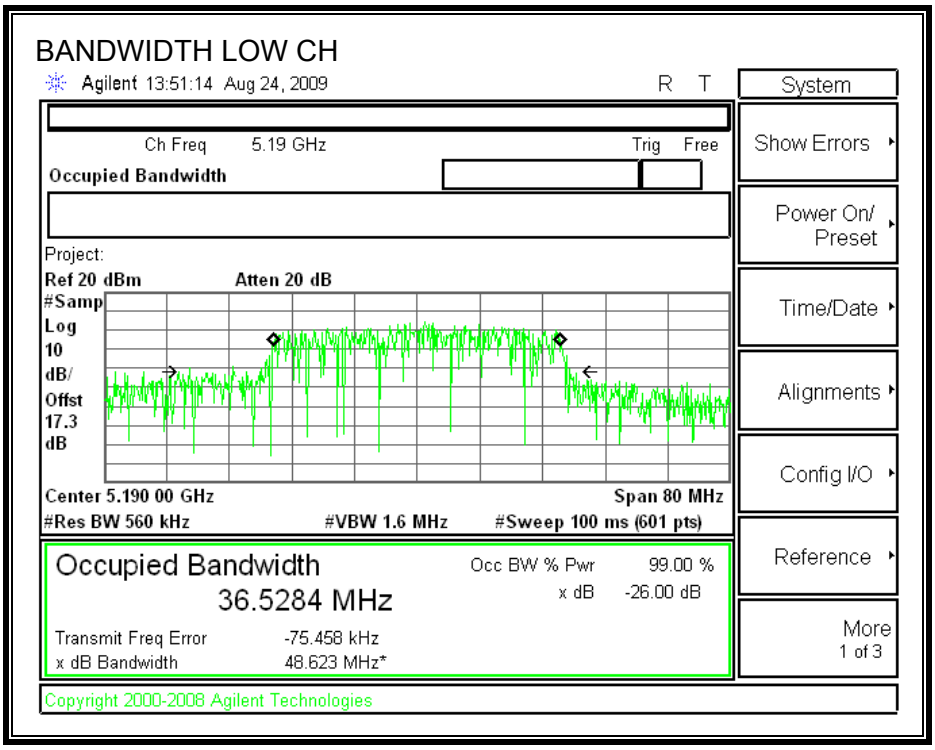
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

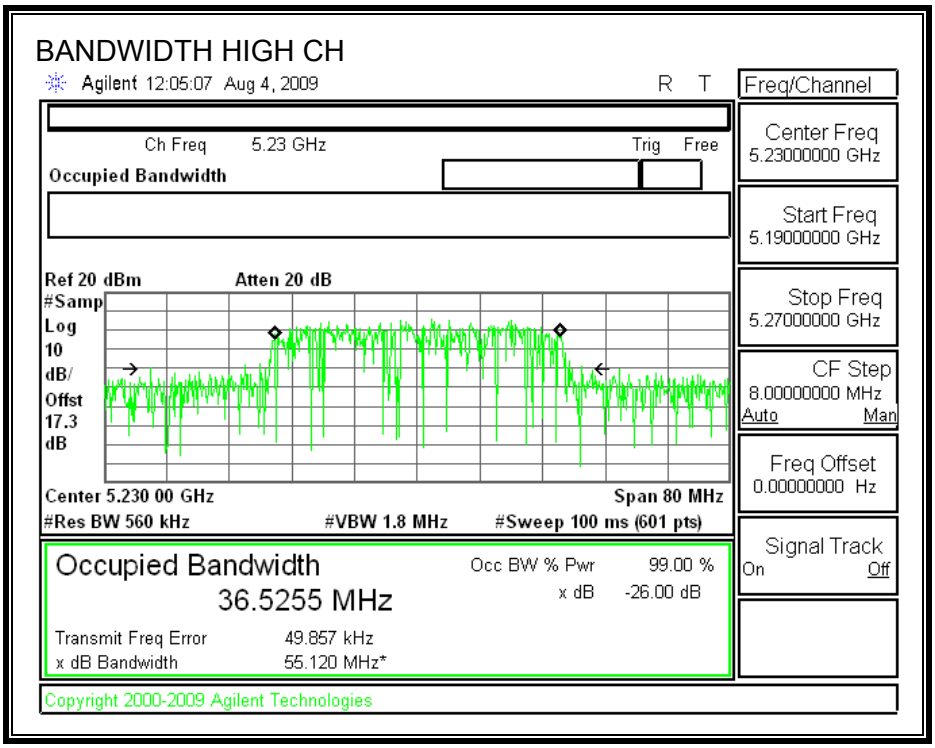
RESULTS

CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	48.623	36.5284
High	5230	55.120	36.5255

26 dB and 99% BANDWIDTH





7.3.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is 3.72 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

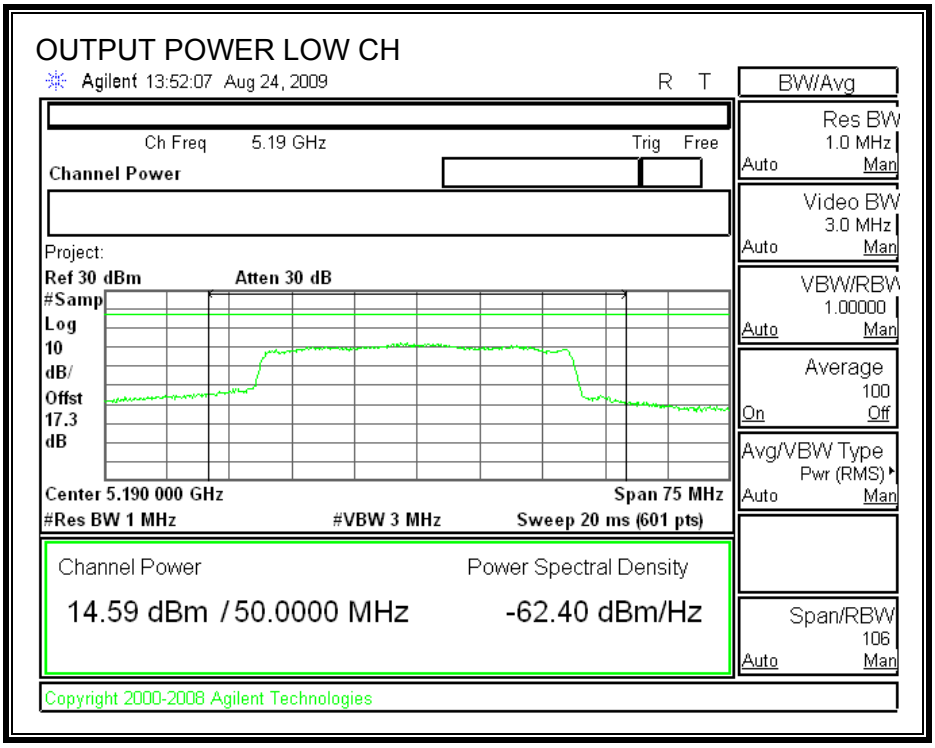
Limit

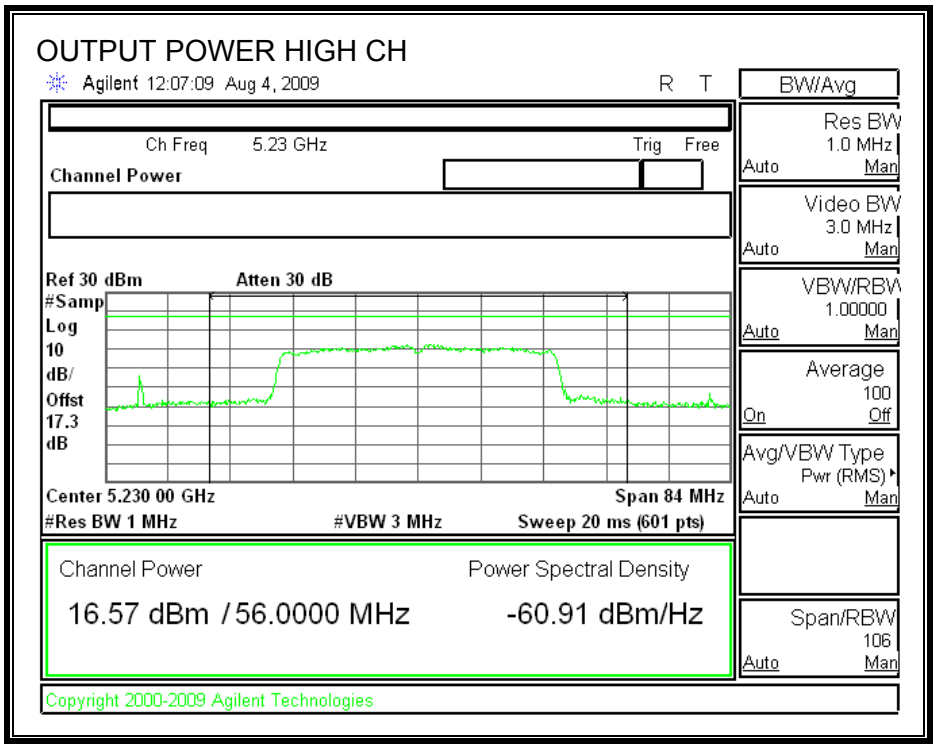
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	48.623	20.87	3.72	17.00
High	5230	17	55.120	21.41	3.72	17.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	14.59	17.00	-2.41
High	5230	16.57	17.00	-0.43

OUTPUT POWER





7.3.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The composite antenna gain is 3.72 dBi, therefore the limit is 4 dBm.

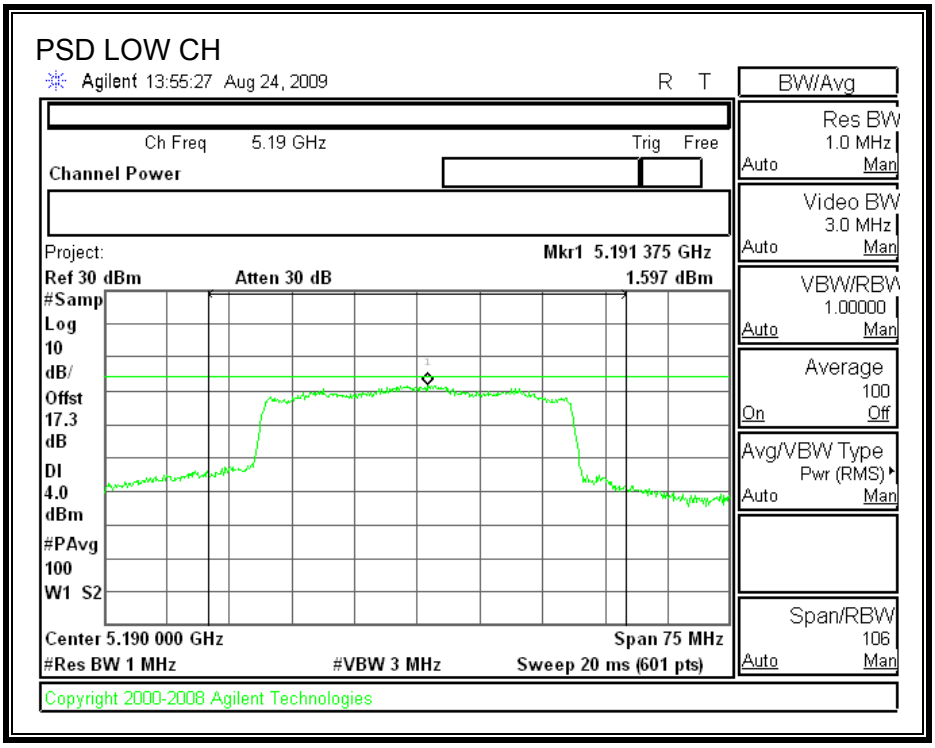
TEST PROCEDURE

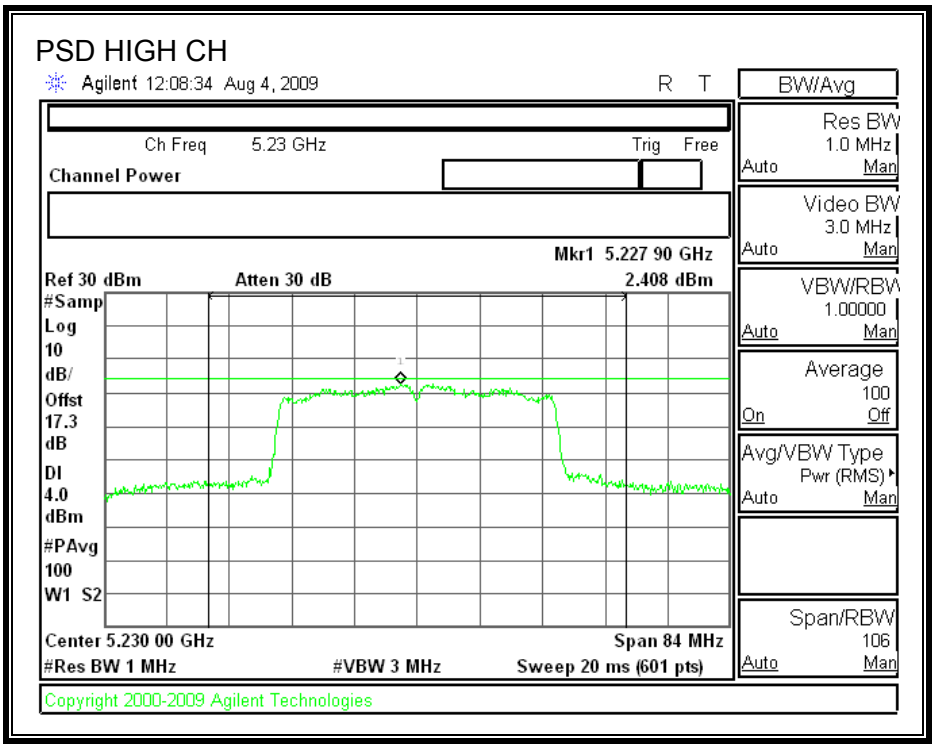
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	1.60	4.00	-2.40
High	5230	2.41	4.00	-1.59

POWER SPECTRAL DENSITY





7.3.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

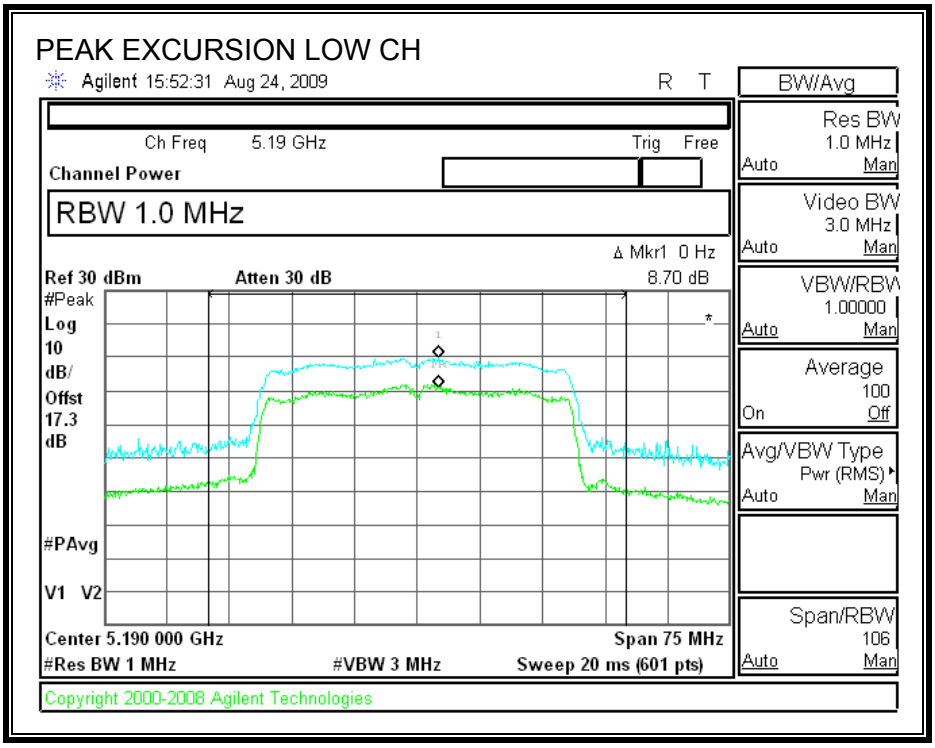
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

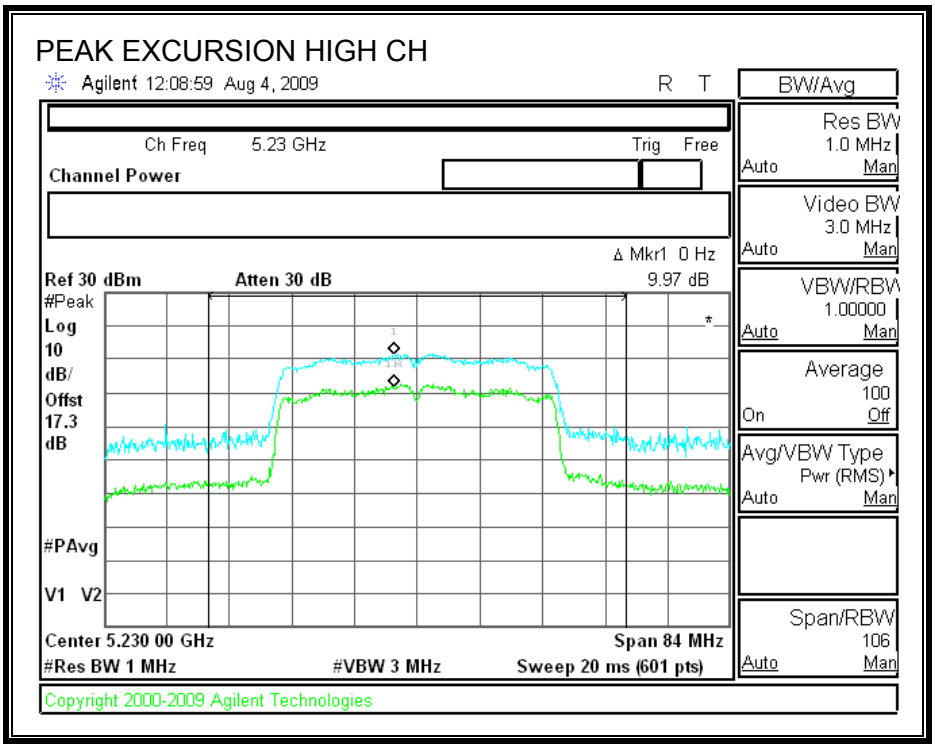
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	8.70	13	-4.30
High	5230	9.97	13	-3.03

PEAK EXCURSION





7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

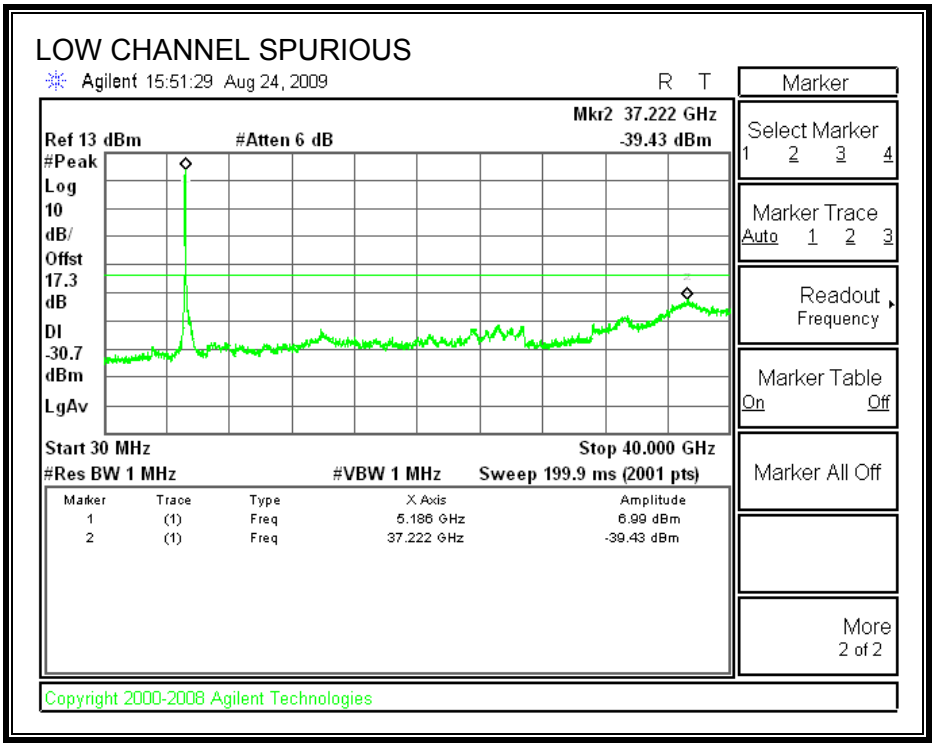
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

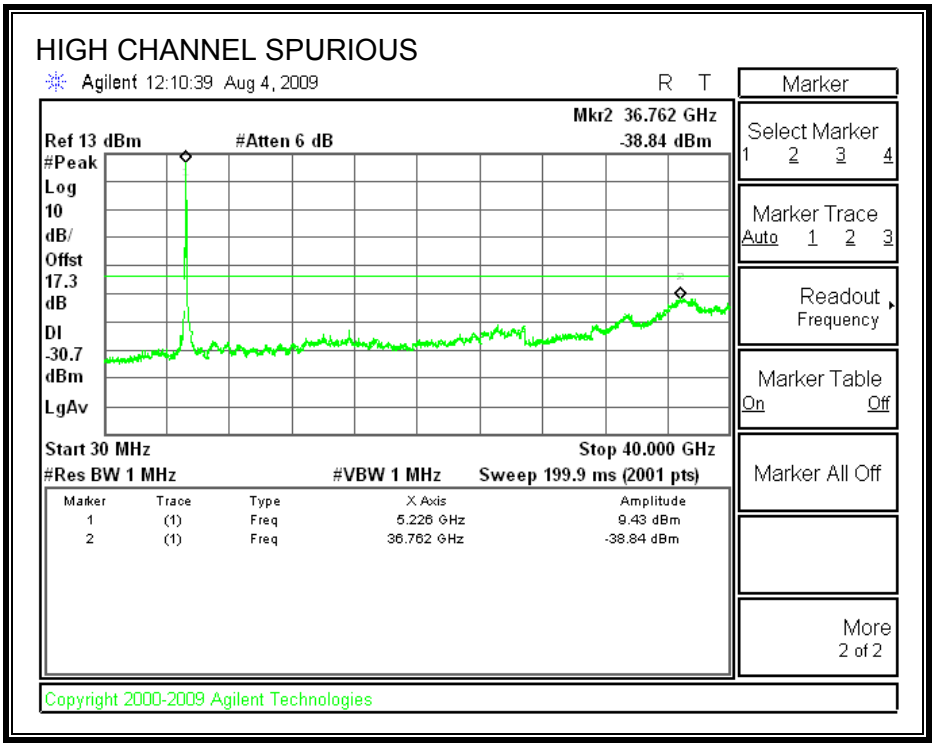
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS

LOW CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



7.4. 802.11n HT40 MODE IN THE 5.2 GHz BAND

7.4.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

CHAIN 1

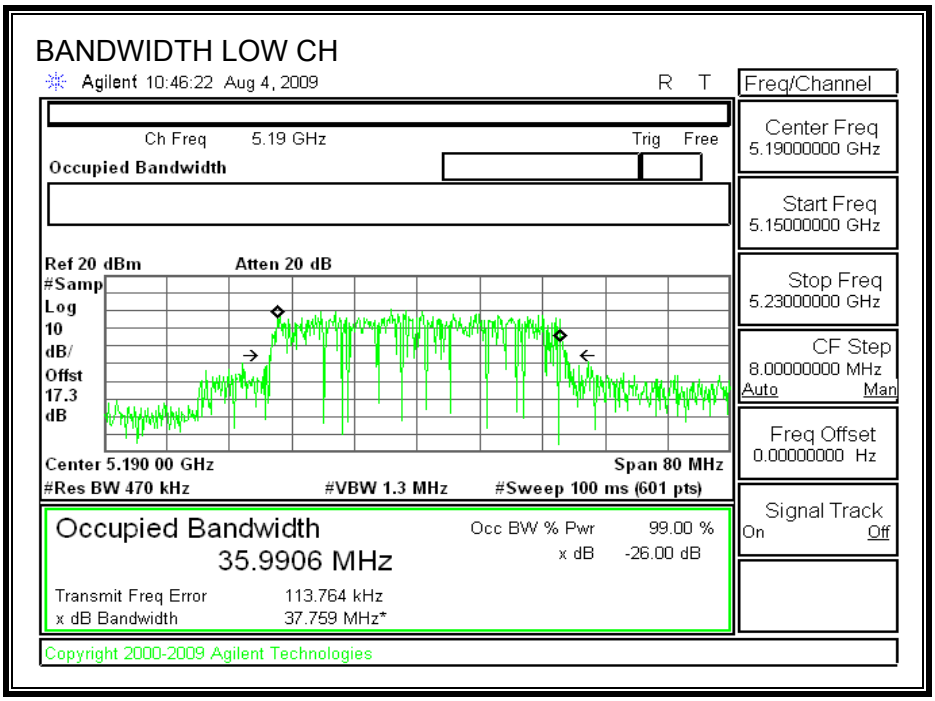
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	37.759	35.9906
High	5230	37.678	36.1734

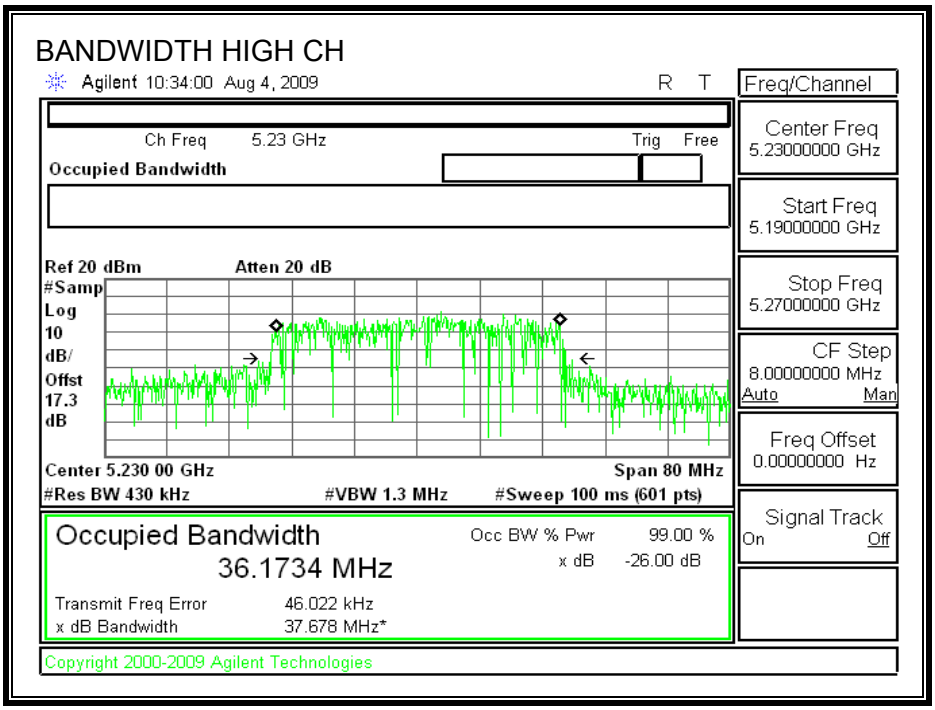
CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	37.906	35.9693
High	5230	37.686	36.2336

CHAIN 1

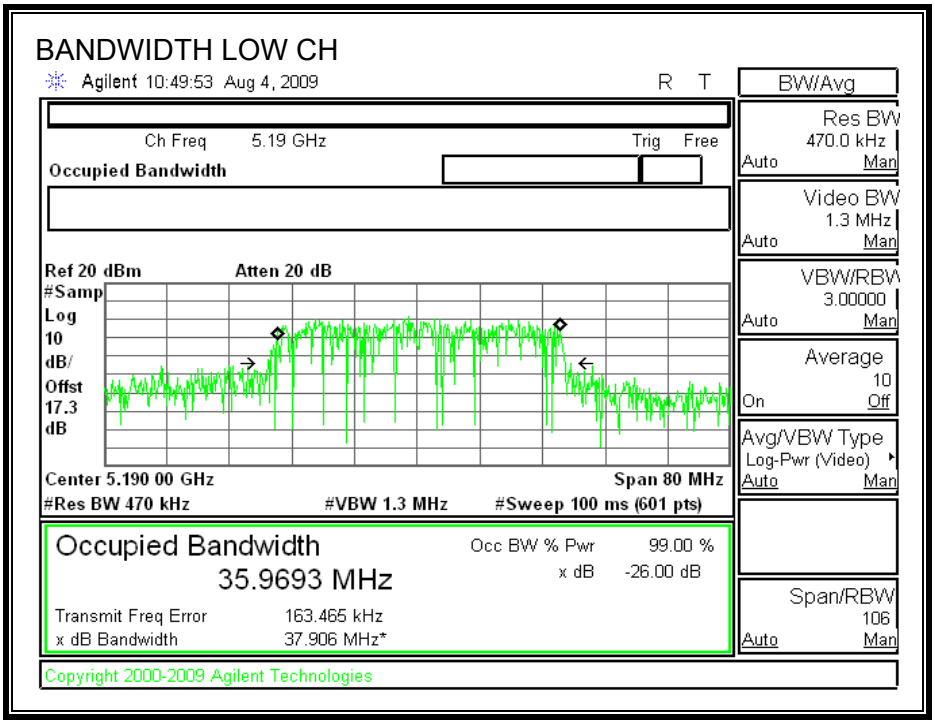
26 dB and 99% BANDWIDTH

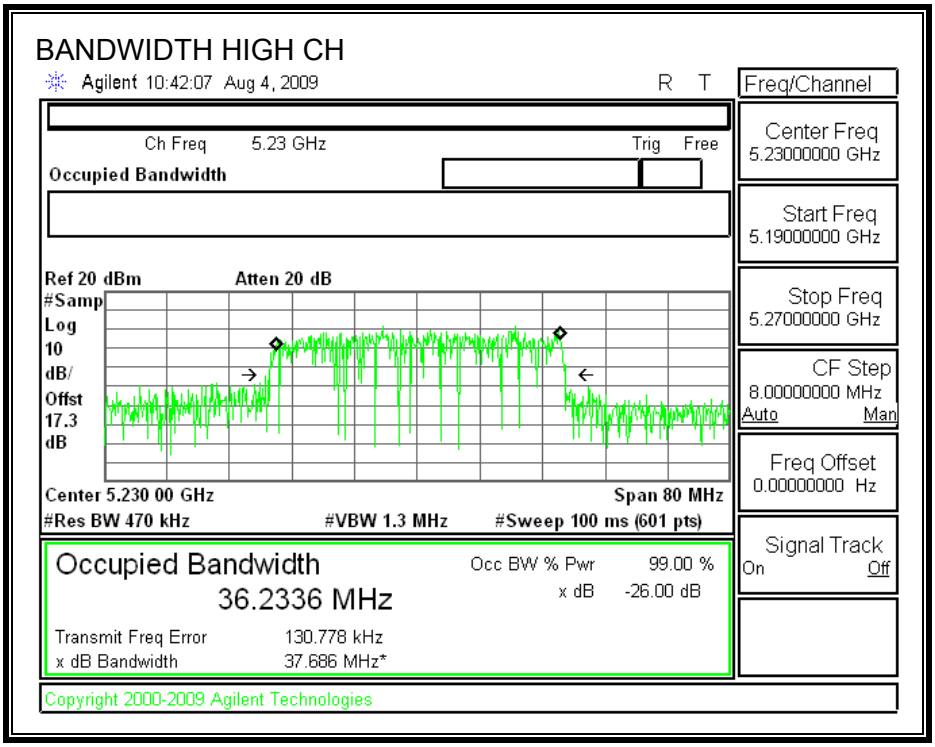




CHAIN 2

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.

The composite antenna gain is 6.09 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

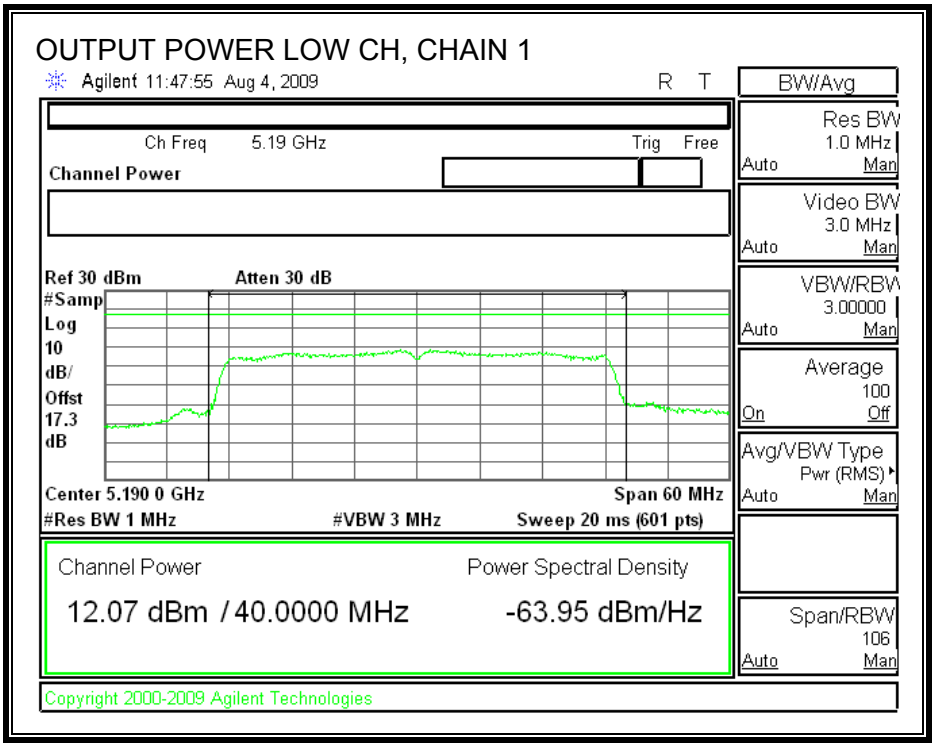
Limit

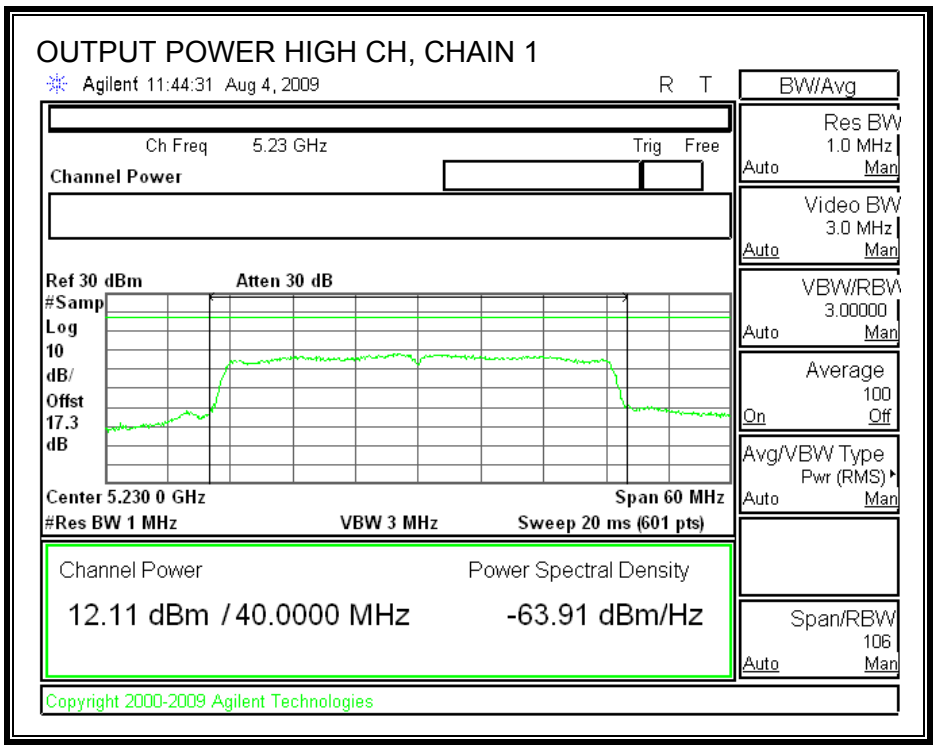
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	37.759	19.77	6.09	16.91
High	5230	17	37.678	19.76	6.09	16.91

Individual Chain Results

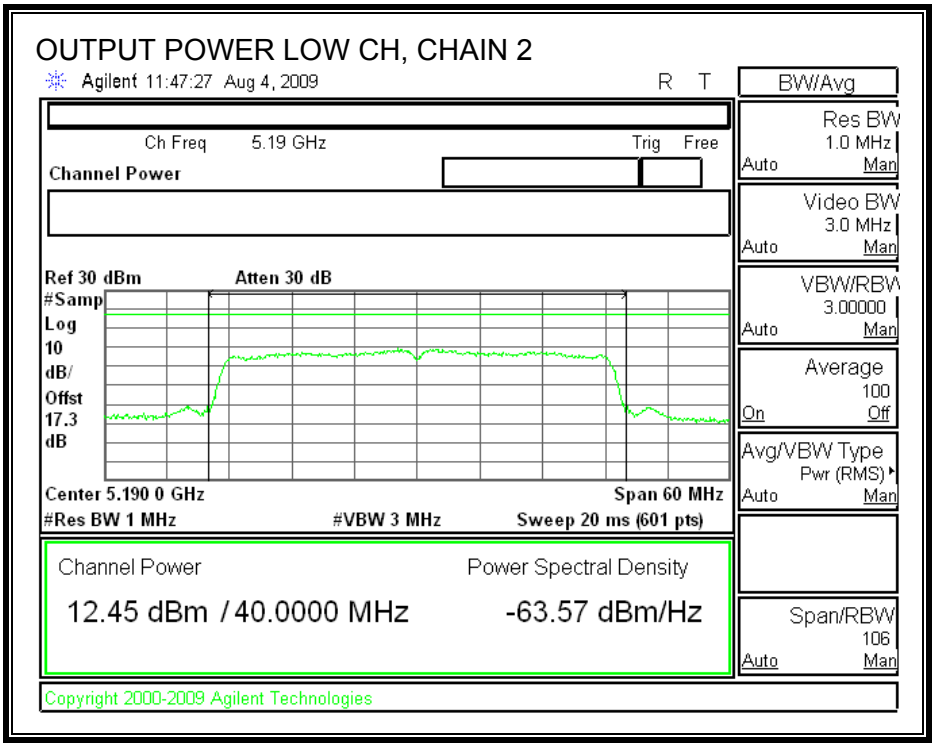
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	12.07	12.45	15.27	16.91	-1.64
High	5230	12.11	12.50	15.32	16.91	-1.59

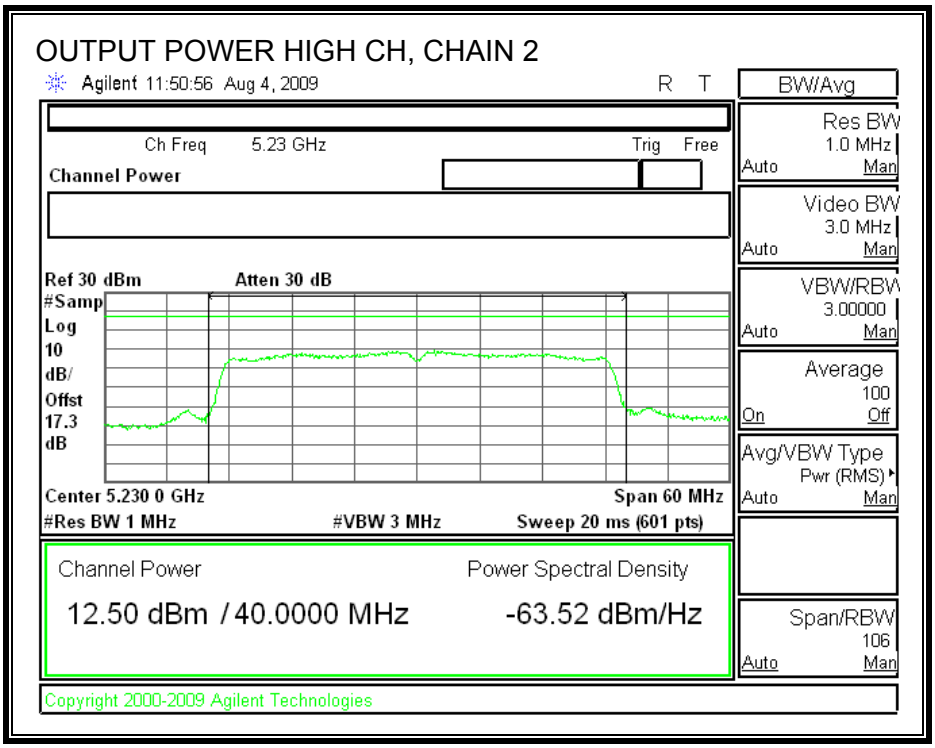
CHAIN 1 OUTPUT POWER





CHAIN 2 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 3.72 dBi, therefore the limit is 4 dBm.

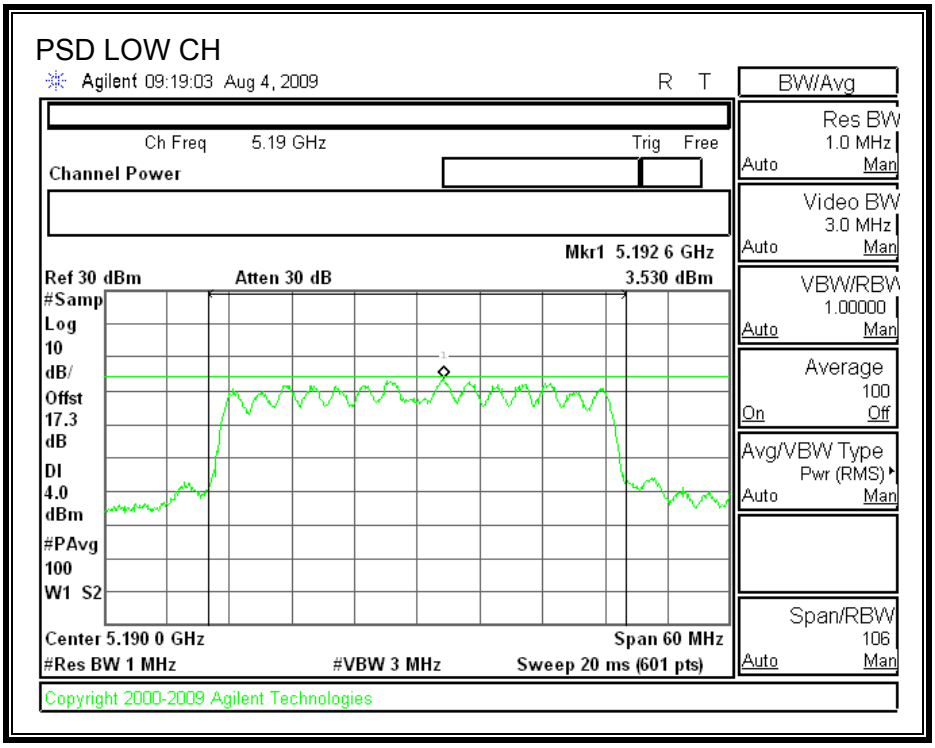
TEST PROCEDURE

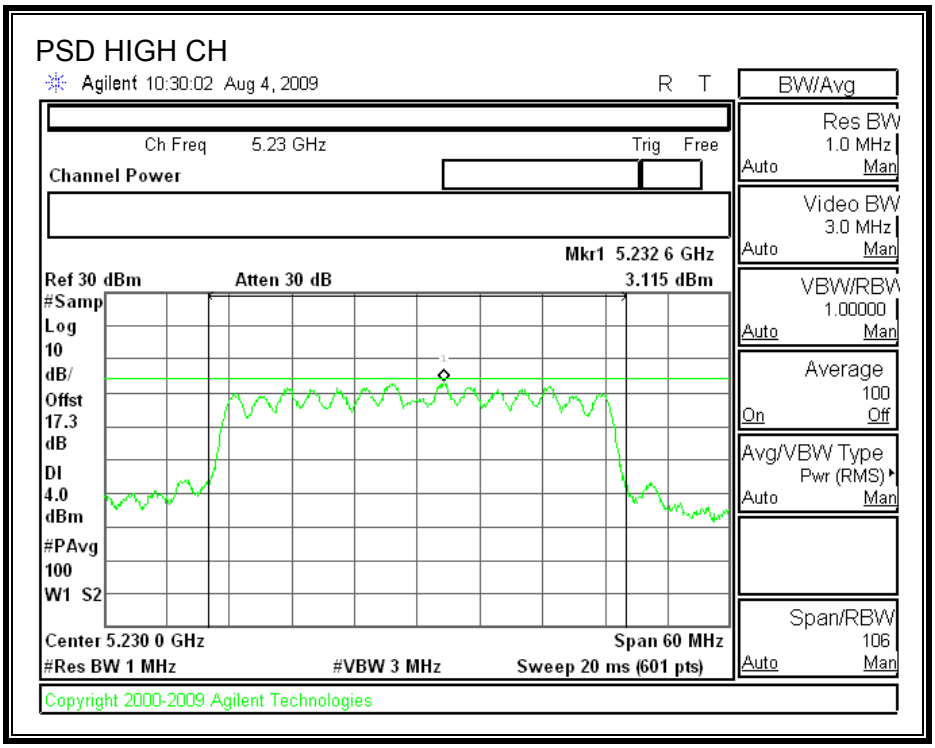
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5190	3.53	3.91	-0.38
High	5230	3.12	3.91	-0.80

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

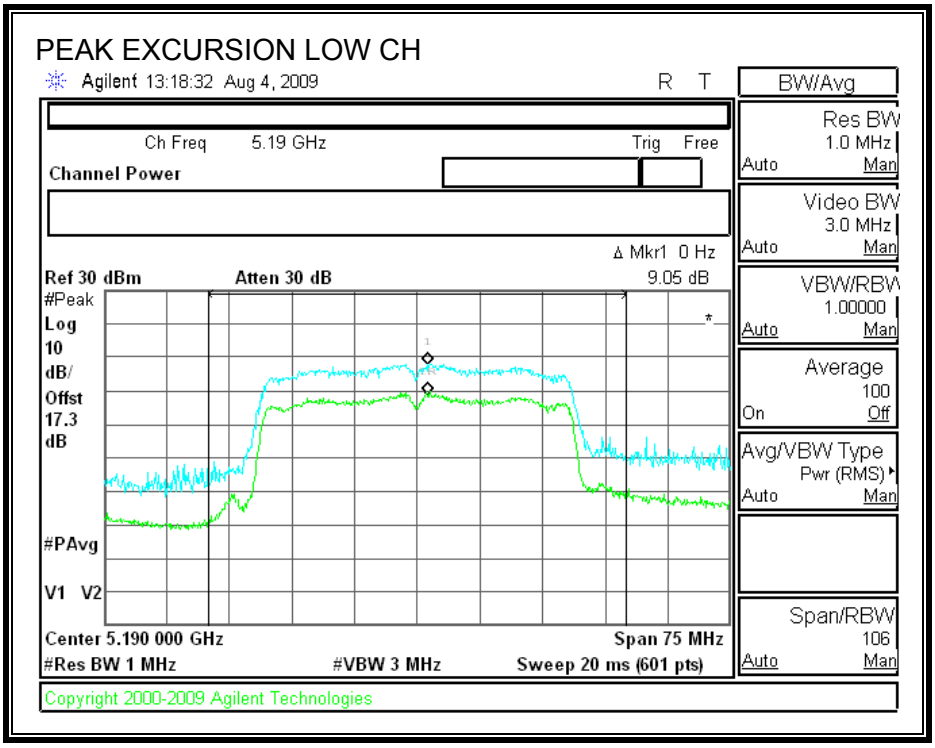
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

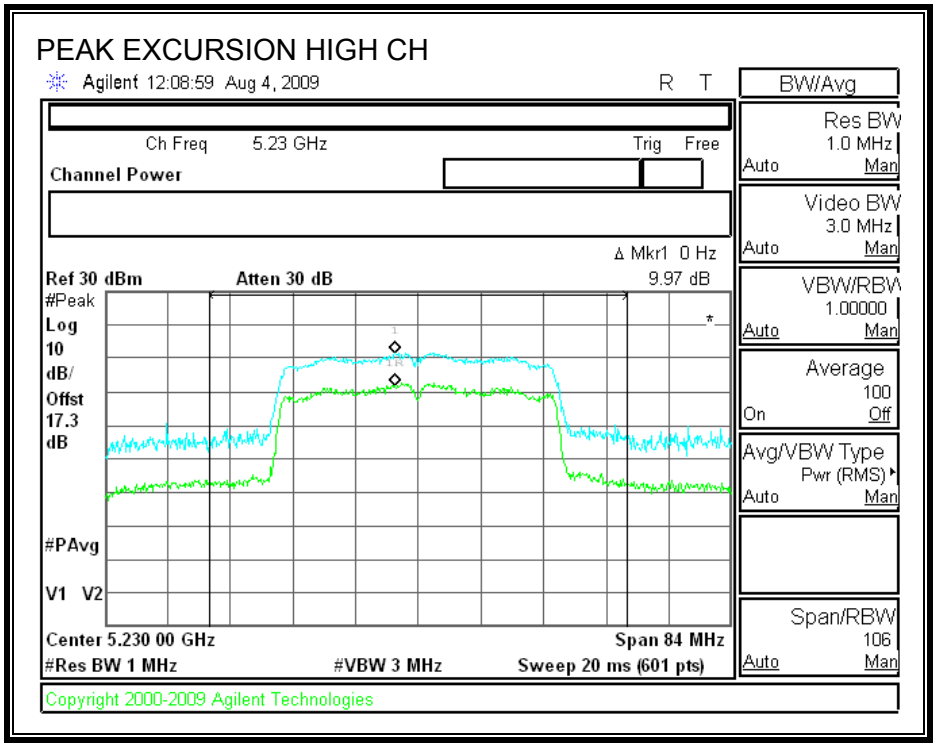
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	9.05	13	-3.95
High	5230	9.97	13	-3.03

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

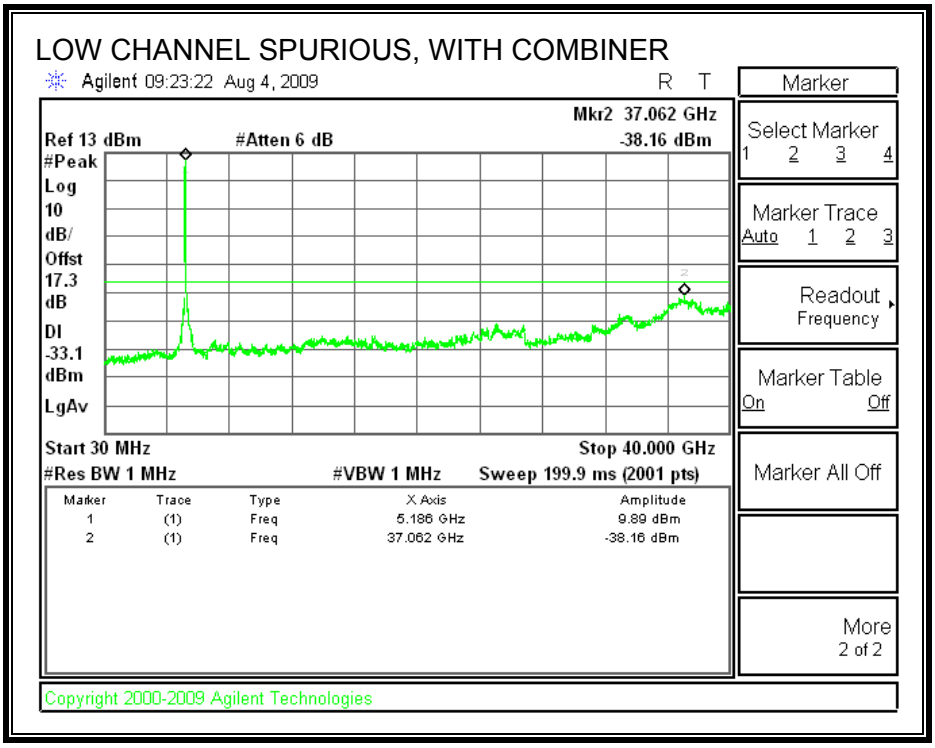
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

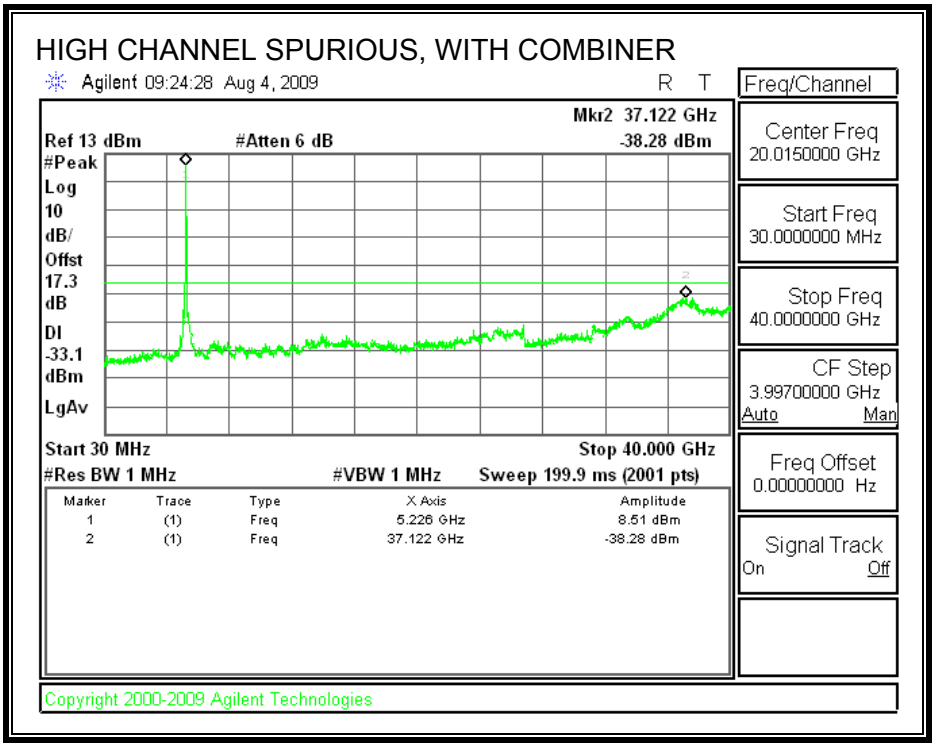
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS WITH COMBINER

LOW CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.5. 802.11a MODE IN THE 5.3 GHz BAND

7.5.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

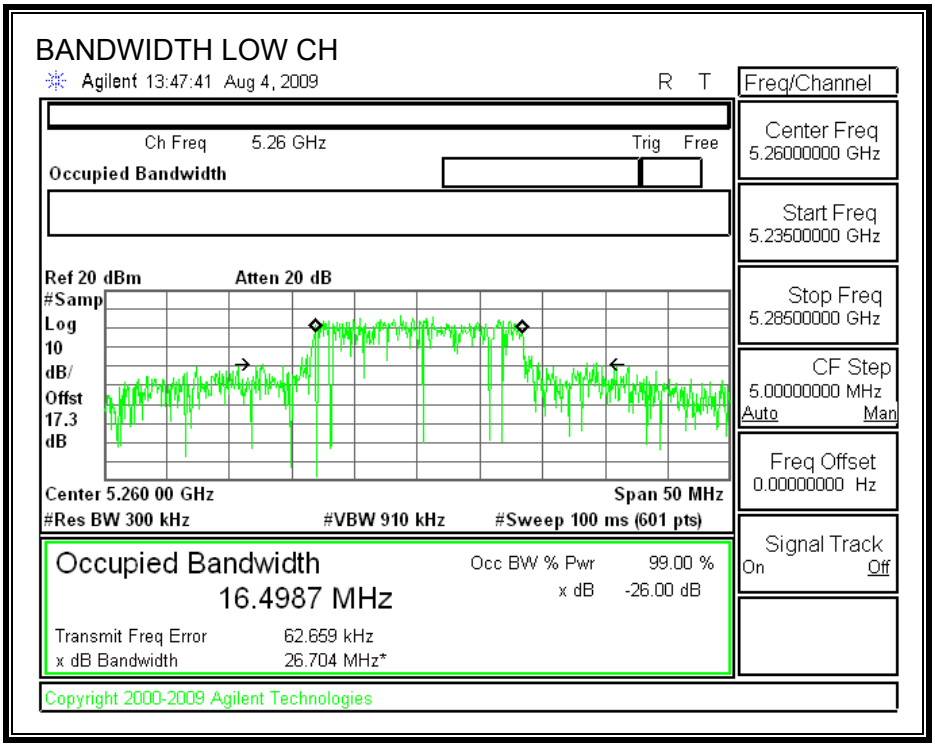
TEST PROCEDURE

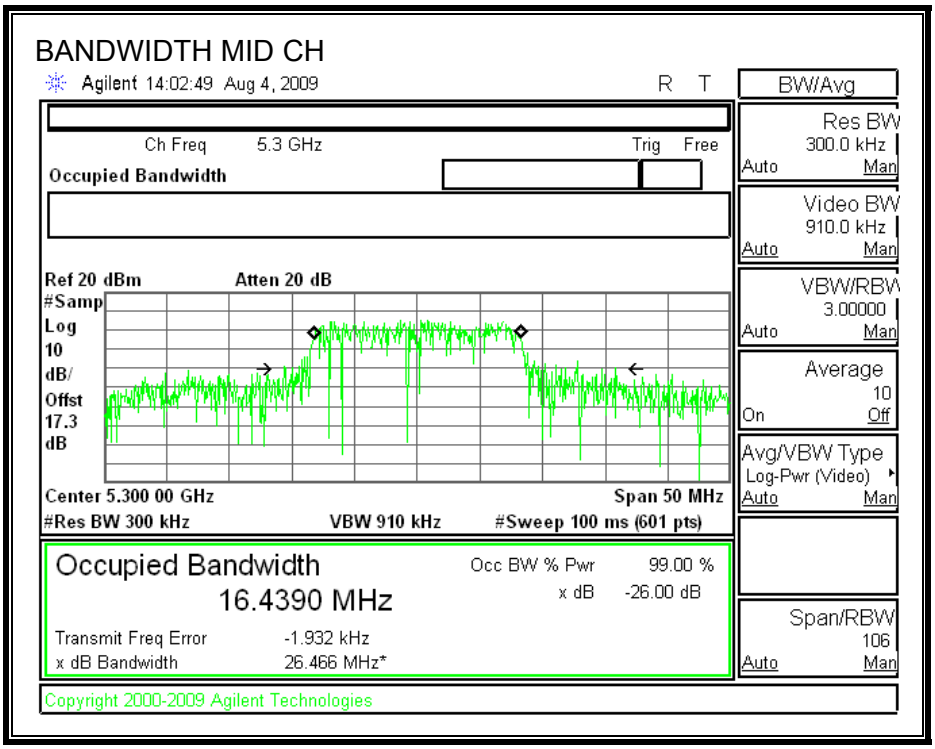
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

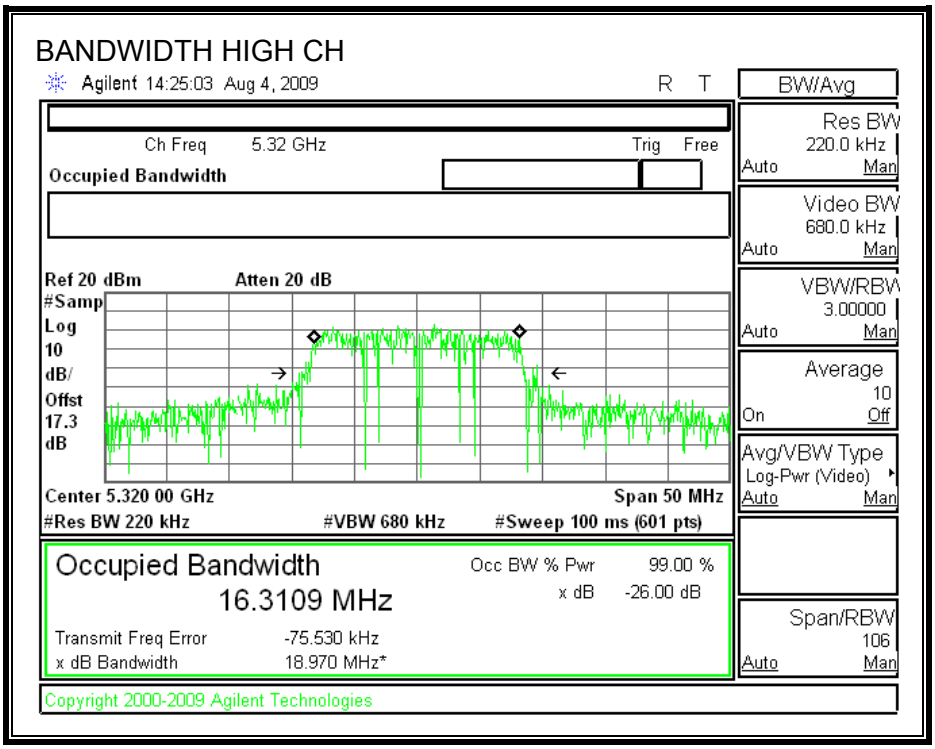
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	26.704	16.4987
Middle	5300	26.466	16.4390
High	5320	18.970	16.3109

26 dB and 99% BANDWIDTH







7.5.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The maximum antenna gain is 3.29dBi

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

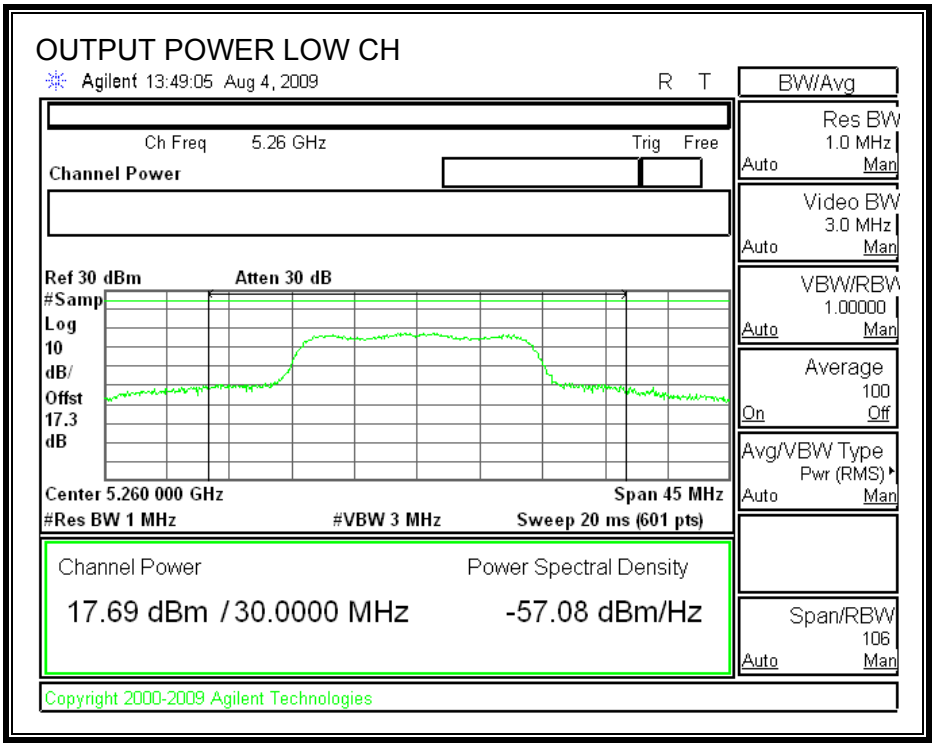
Limit

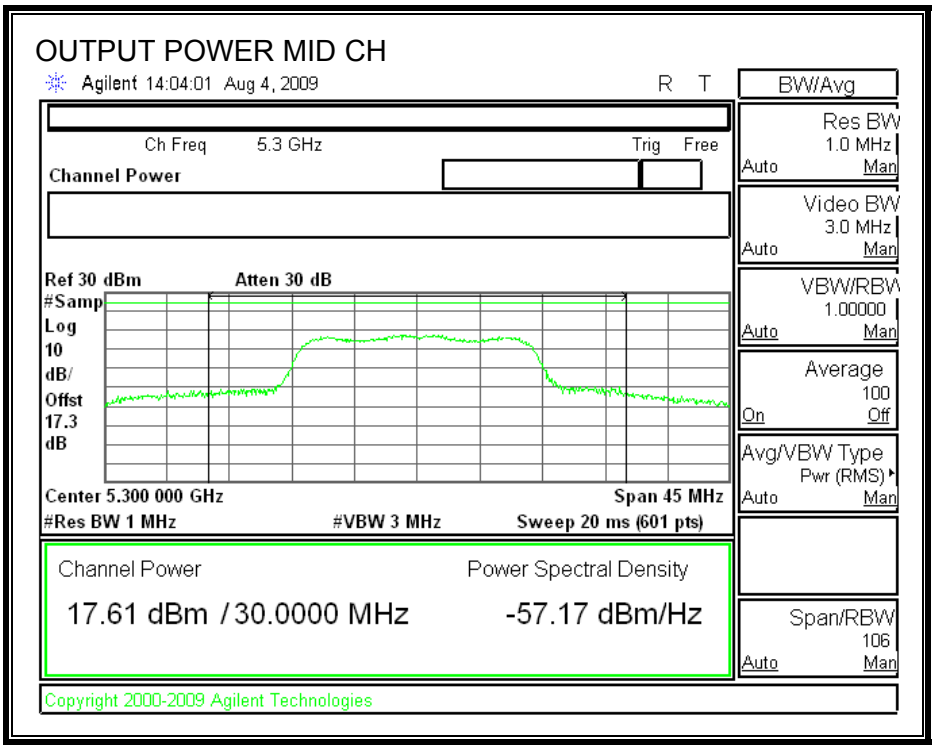
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	26.704	25.27	3.29	24.00
Mid	5300	24	26.466	25.23	3.29	24.00
High	5320	24	18.970	23.78	3.29	23.78

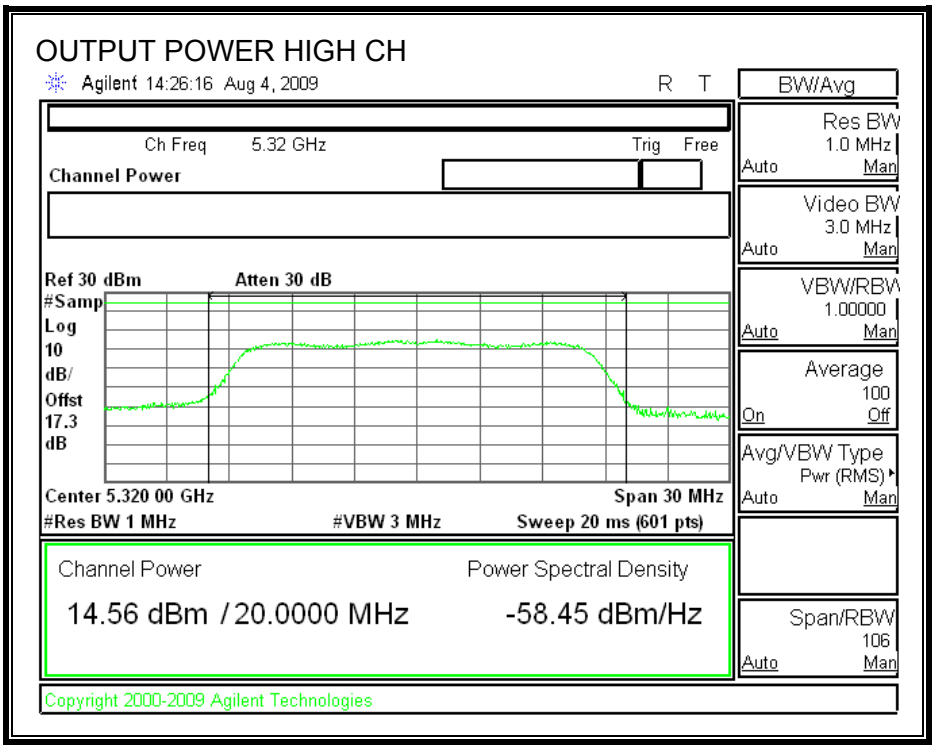
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	17.69	24.00	-6.31
Mid	5300	17.61	24.00	-6.39
High	5320	14.56	23.78	-9.22

OUTPUT POWER







7.5.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The maximum antenna gain is equal to 3.29 dBi, therefore the limit is 11 dBm.

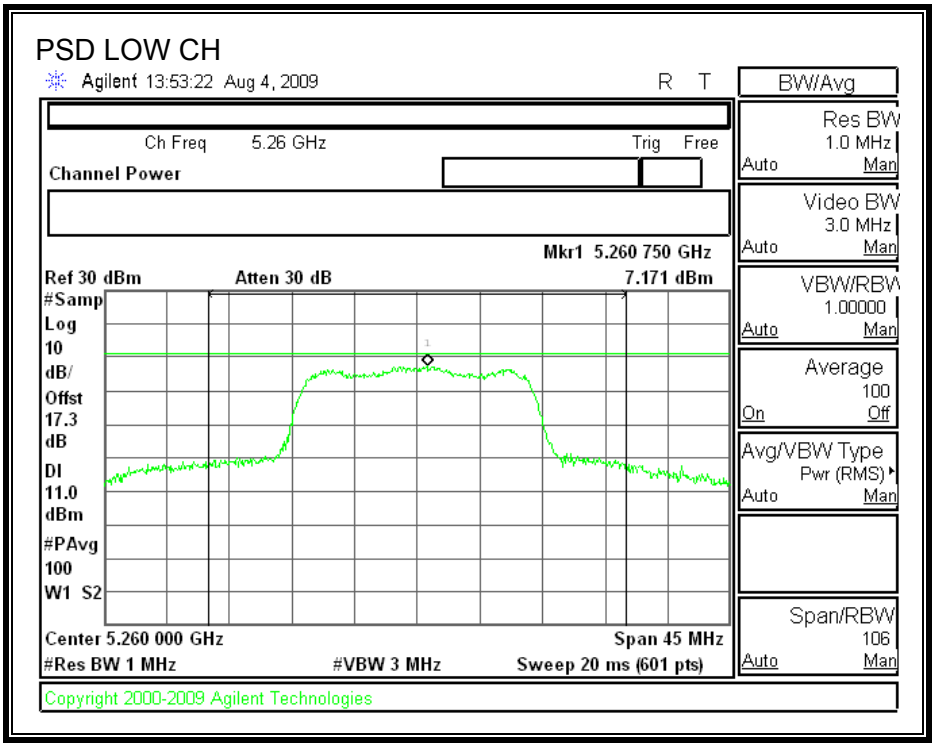
TEST PROCEDURE

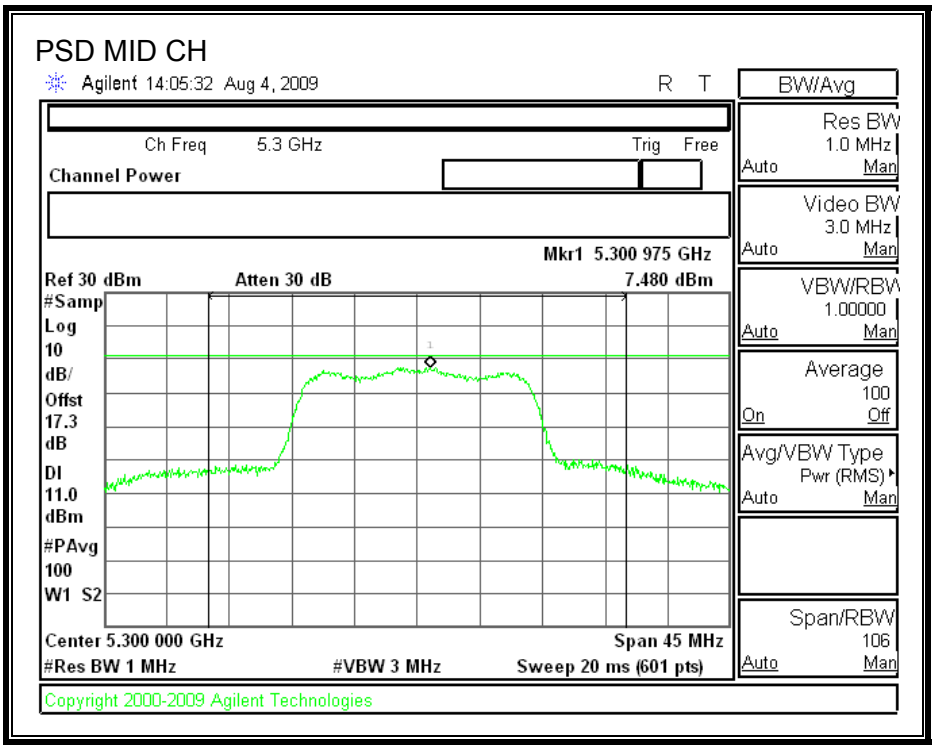
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

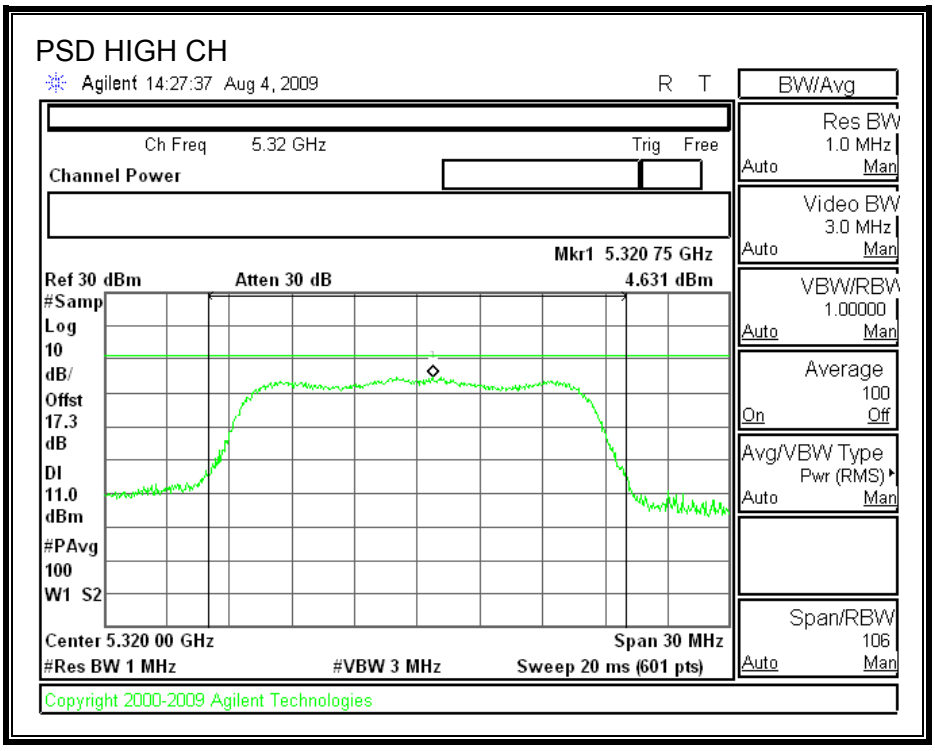
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	7.17	11	-3.83
Middle	5300	7.48	11	-3.52
High	5320	4.63	11	-6.37

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

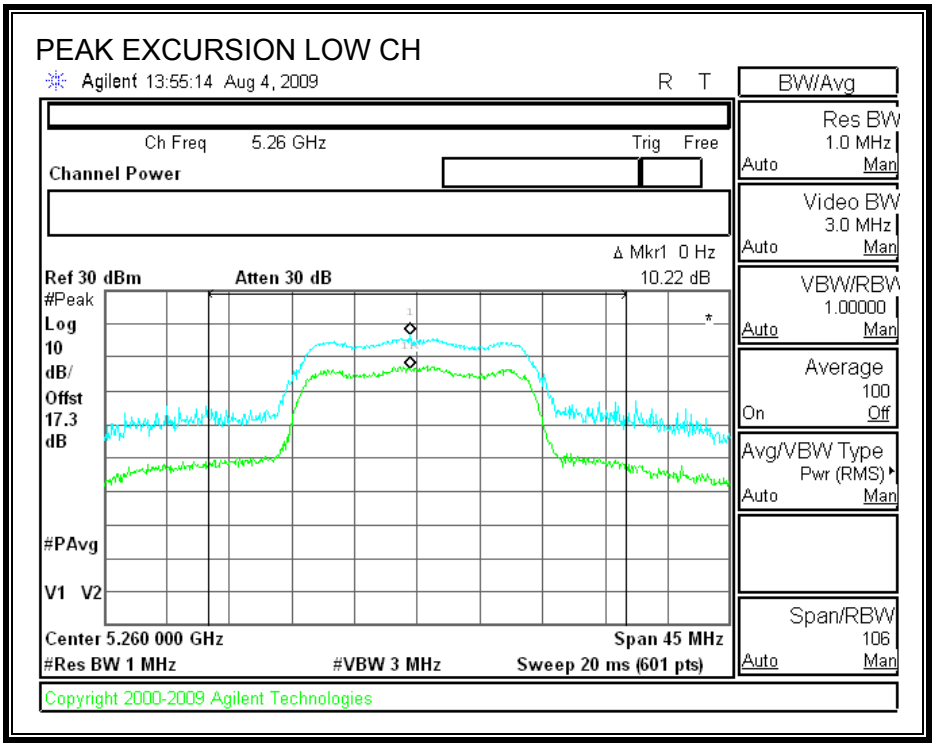
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

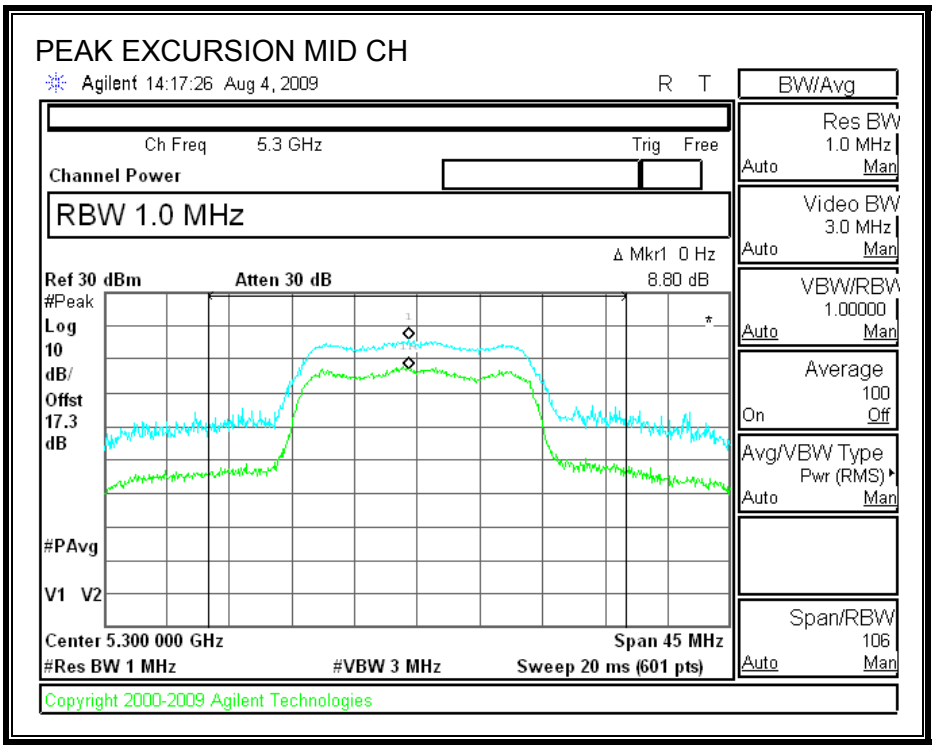
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	10.22	13	-2.78
Middle	5300	8.80	13	-4.20
High	5320	9.71	13	-3.29

PEAK EXCURSION





7.5.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

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

TEST PROCEDURE

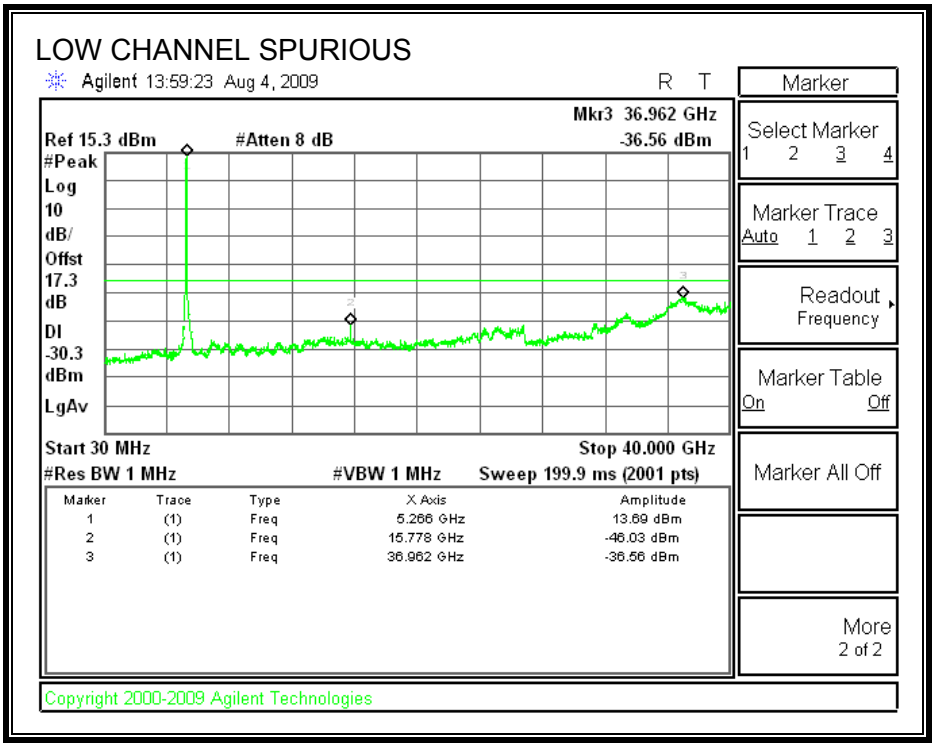
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

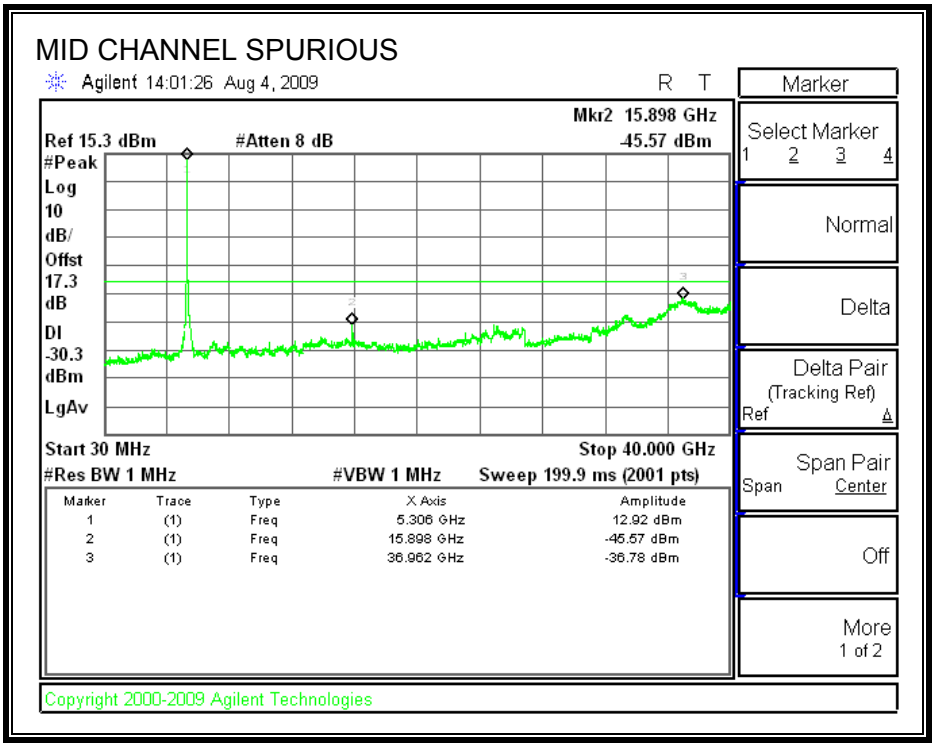
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS

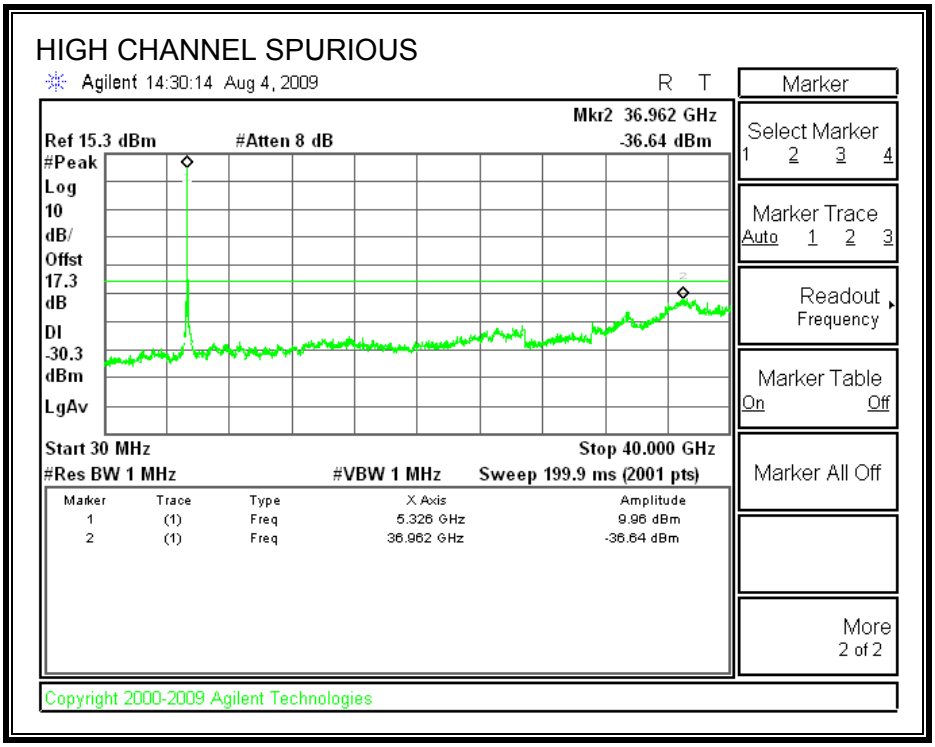
LOW CHANNEL SPURIOUS



MID CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



7.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

7.6.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

CHAIN 1

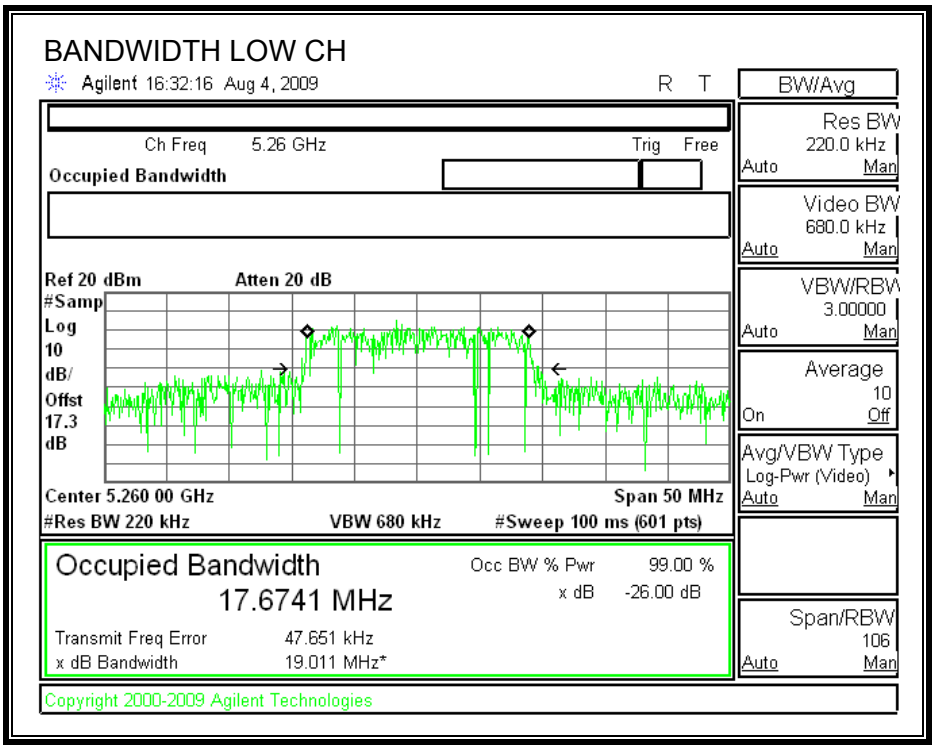
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	19.011	17.6741
Middle	5300	19.162	17.6013
High	5320	19.105	17.5195

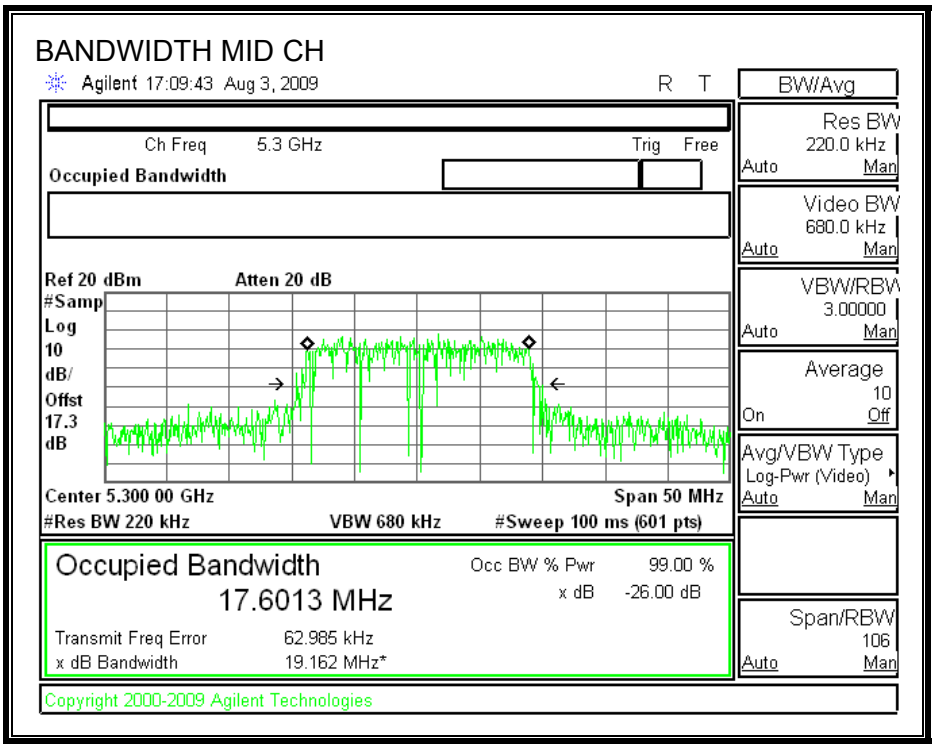
CHAIN 2

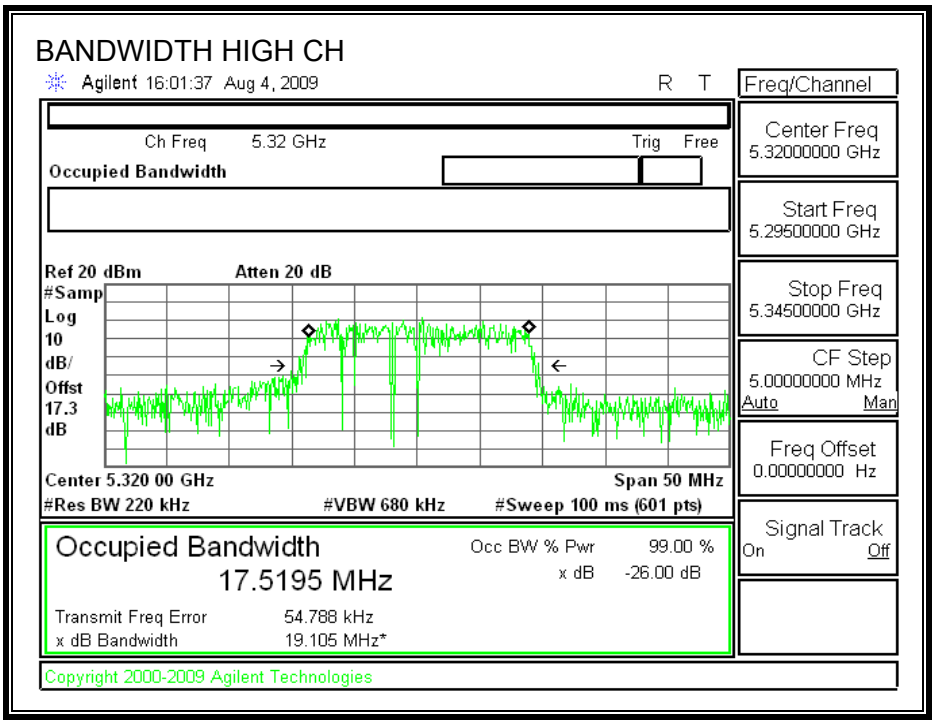
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5260	19.275	17.4861
Middle	5300	19.066	17.5824
High	5320	18.843	17.5579

CHAIN 1

26 dB and 99% BANDWIDTH

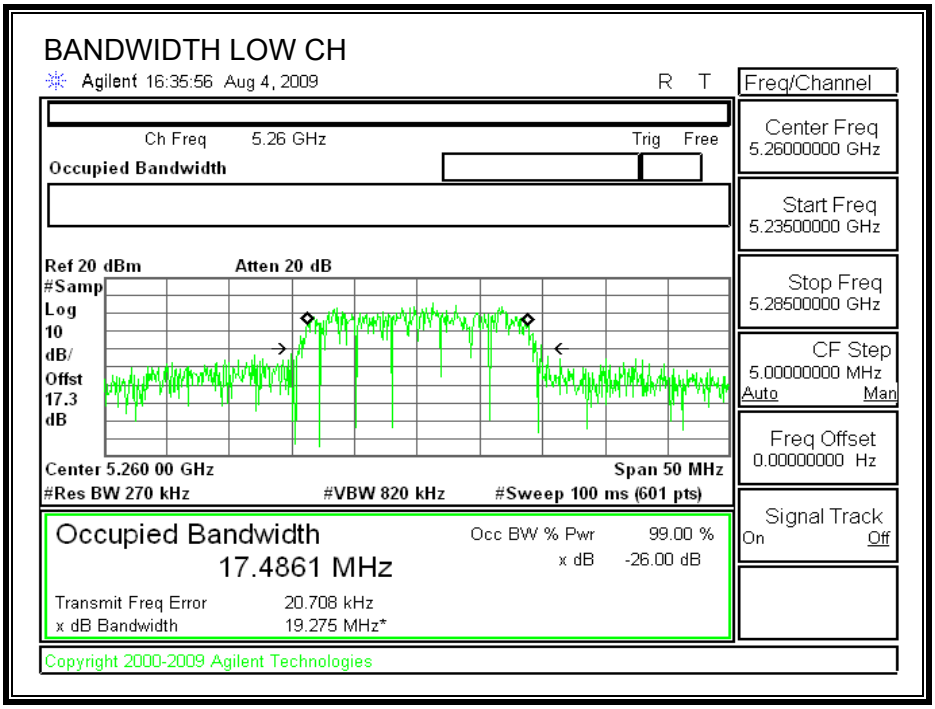


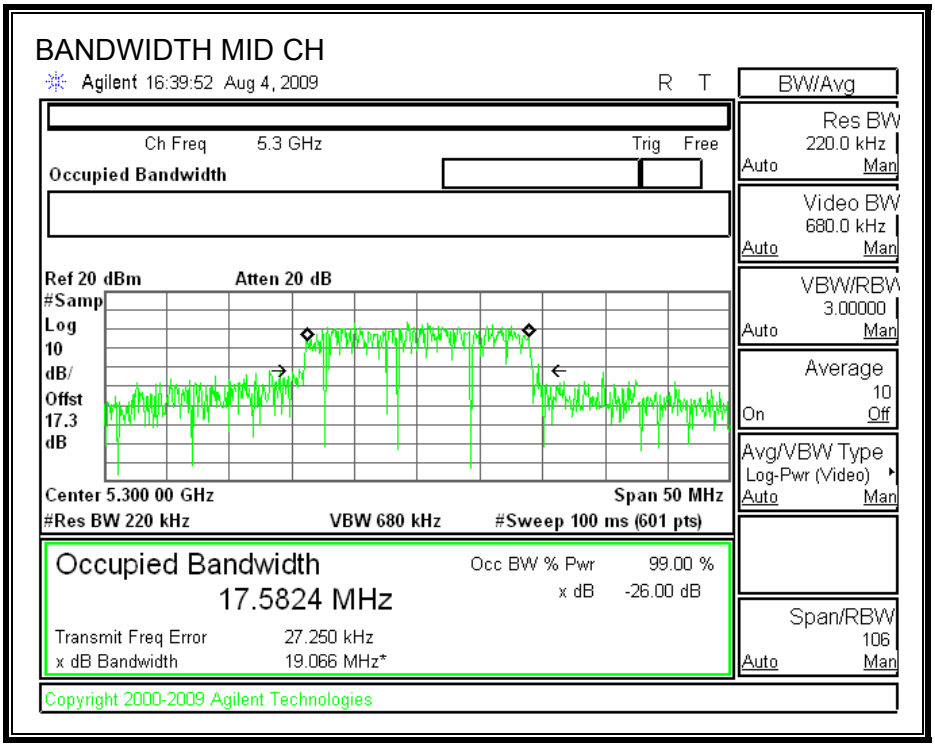


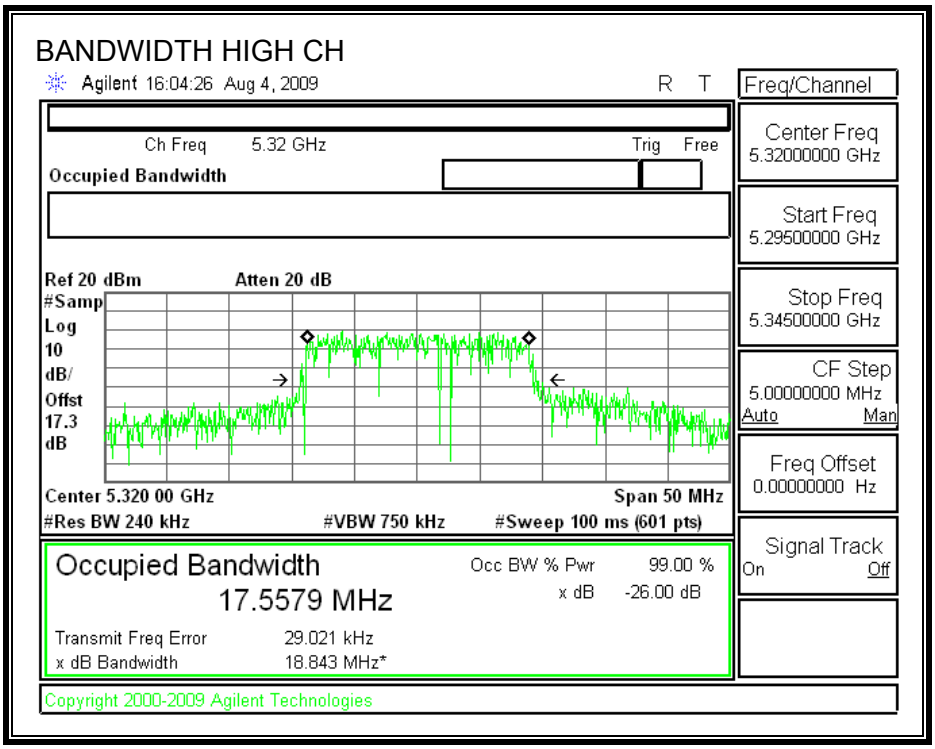


CHAIN 2

26 dB and 99% BANDWIDTH







7.6.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The composite antenna gain is 6.15 dBi.

TEST PROCEDURE

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

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

RESULTS

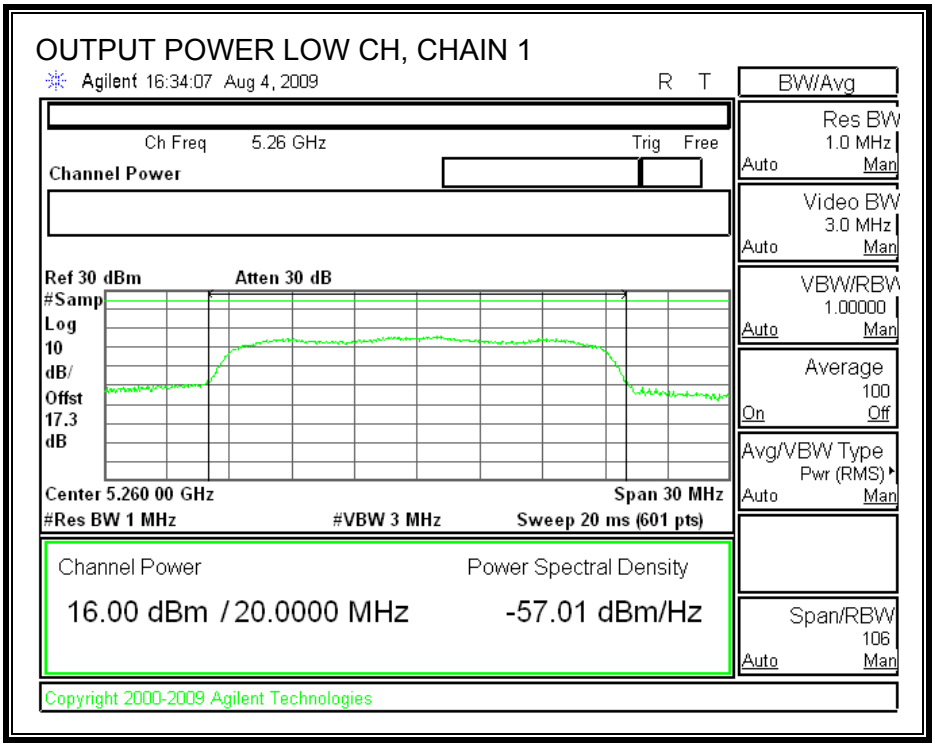
Limit

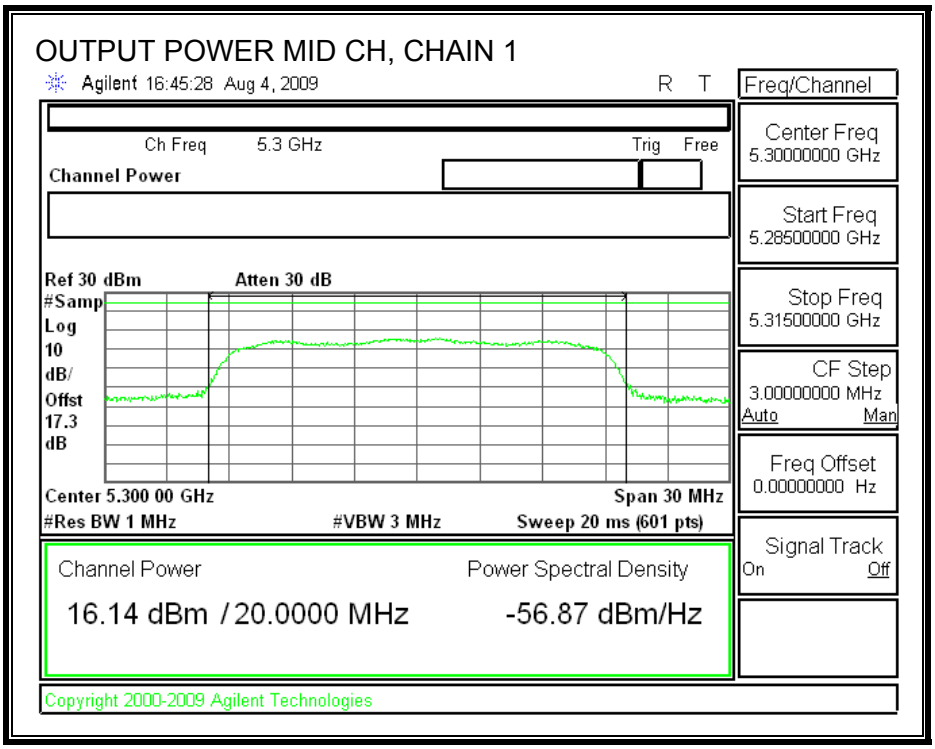
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5260	24	19.011	23.79	6.15	23.64
Mid	5300	24	19.162	23.82	6.15	23.67
High	5320	24	19.105	23.81	6.15	23.66

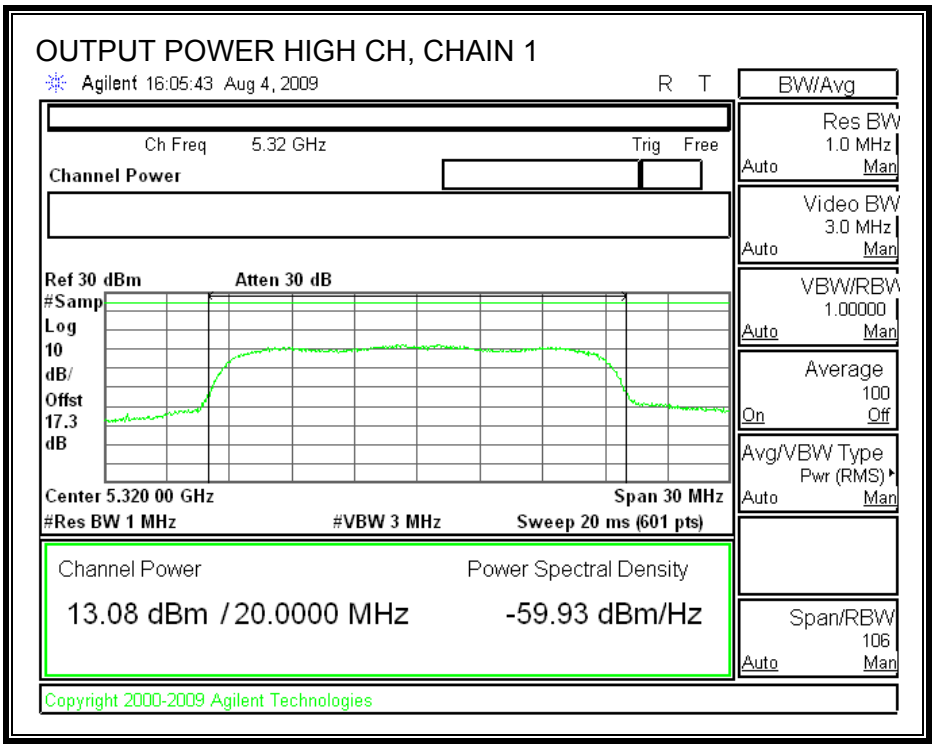
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	16.00	16.12	19.07	23.64	-4.57
Mid	5300	16.14	15.99	19.08	23.67	-4.60
High	5320	13.08	12.93	16.02	23.66	-7.65

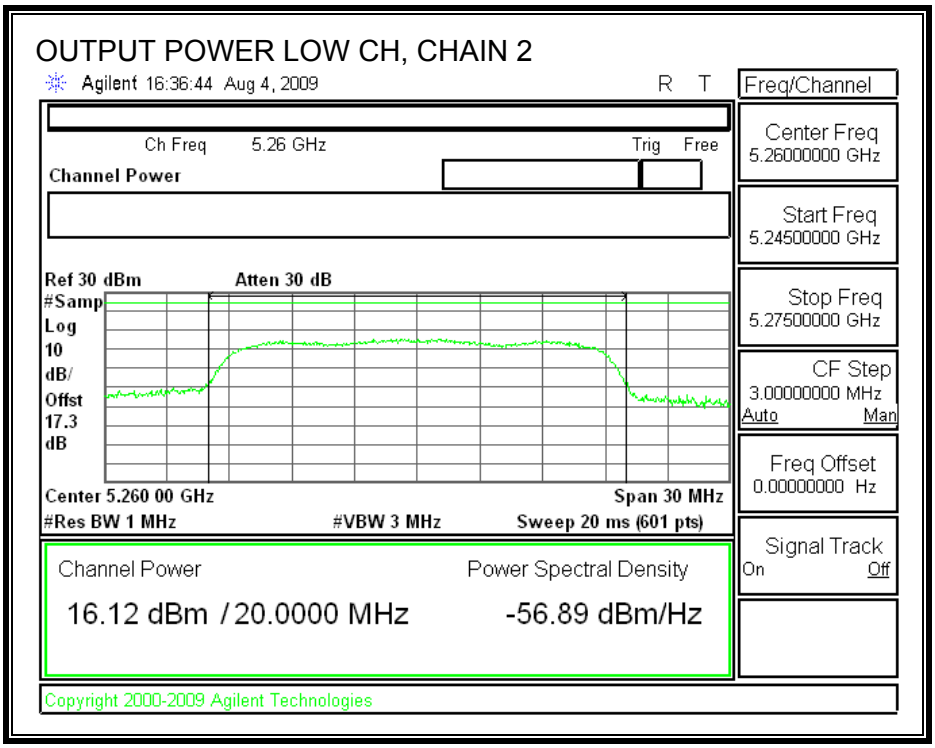
CHAIN 1 OUTPUT POWER

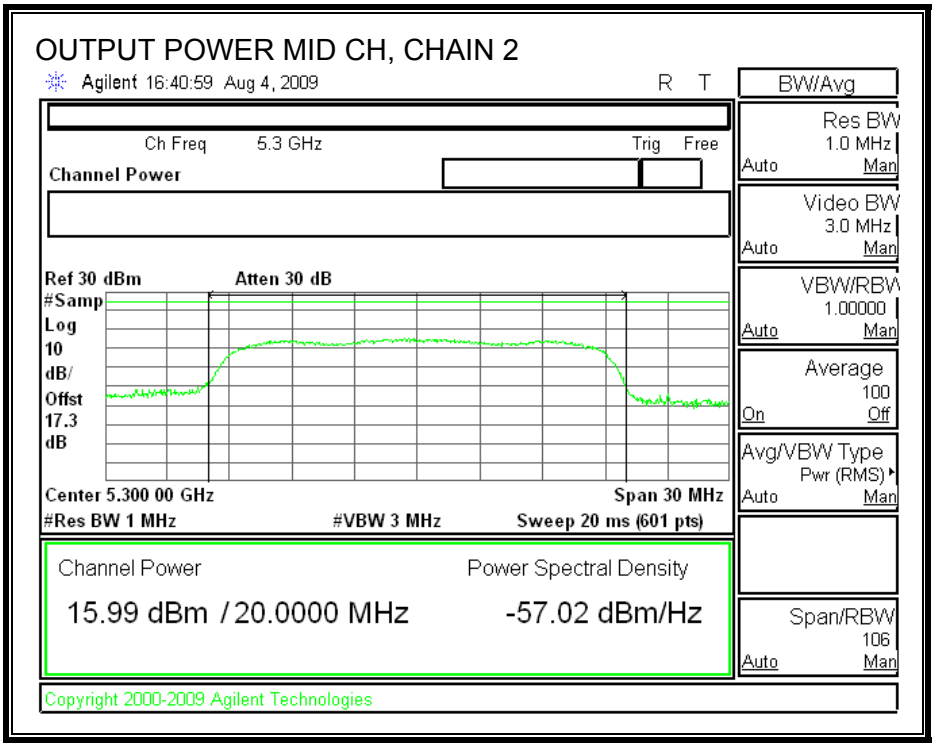


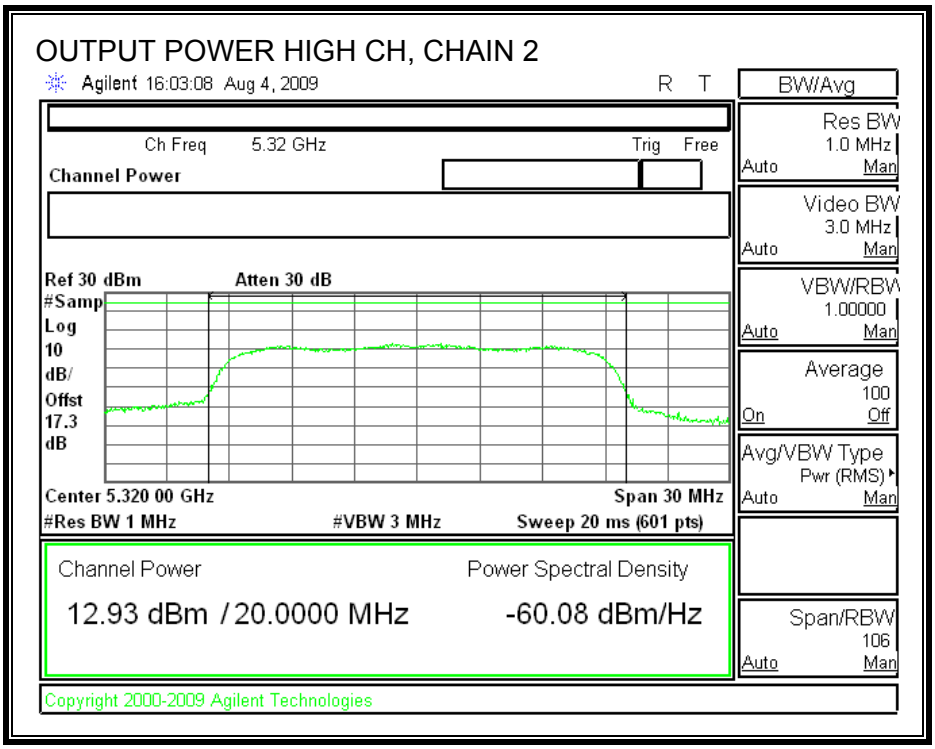




CHAIN 2 OUTPUT POWER







7.6.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The composite antenna gain is equal to 6.15 dBi, therefore the limit is 10.85 dBm.

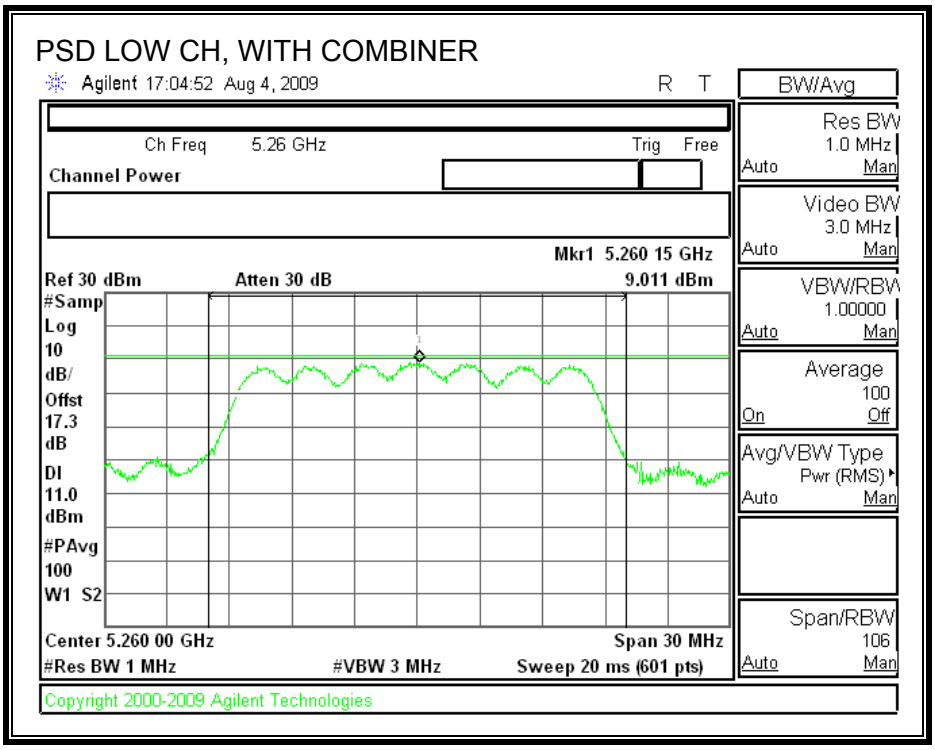
TEST PROCEDURE

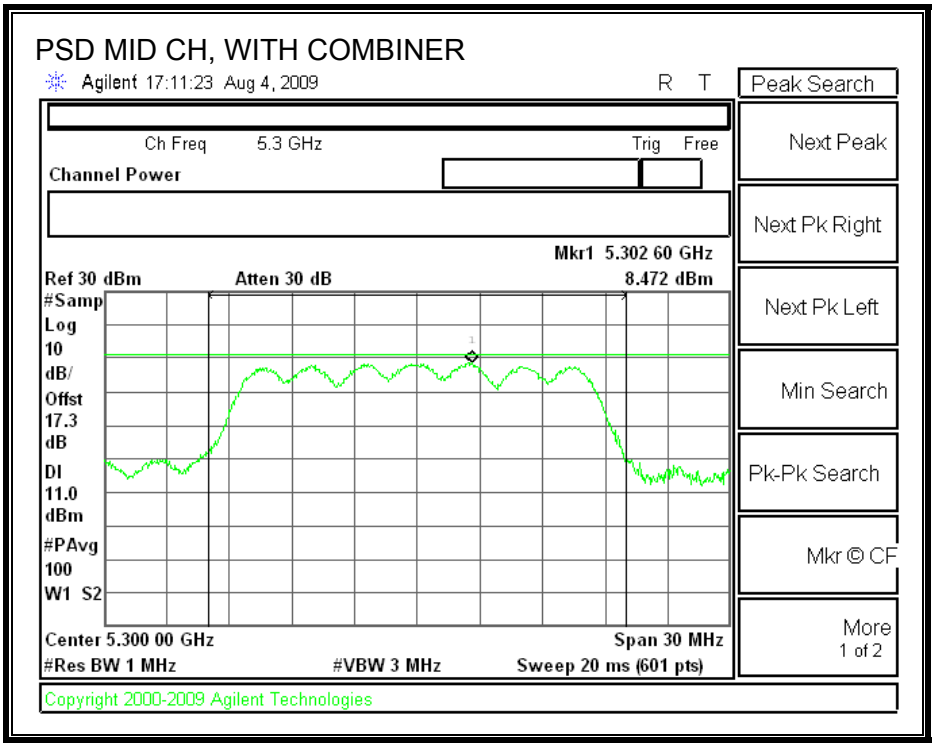
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

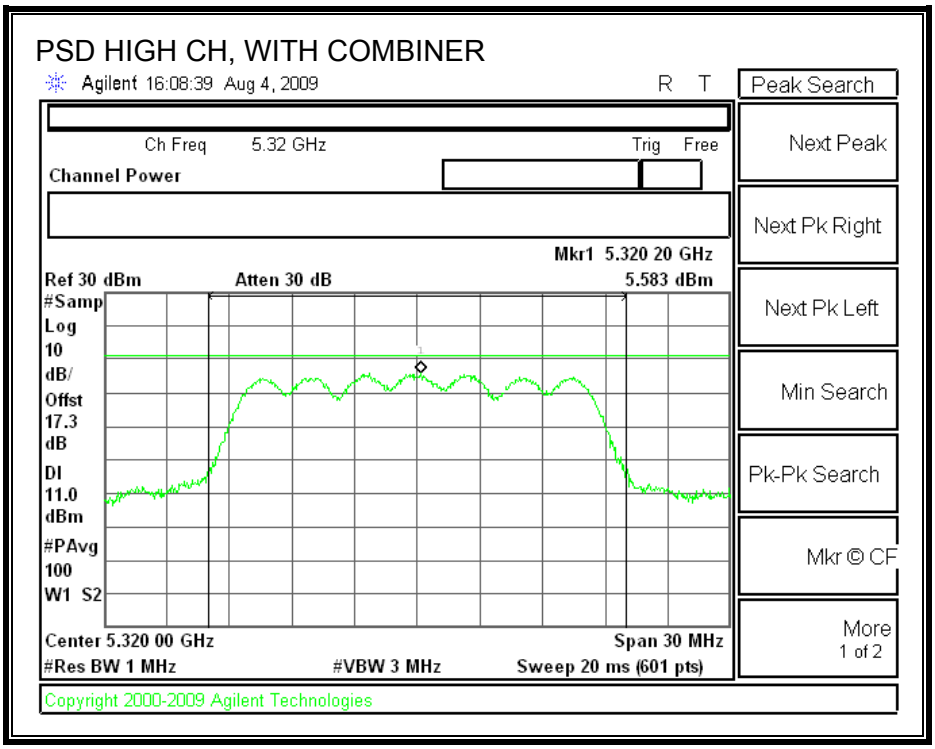
RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5260	9.01	10.85	-1.84
Middle	5300	8.47	10.85	-2.38
High	5320	5.58	10.85	-5.27

POWER SPECTRAL DENSITY WITH COMBINER







7.6.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

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

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

RESULTS

CHAIN 1

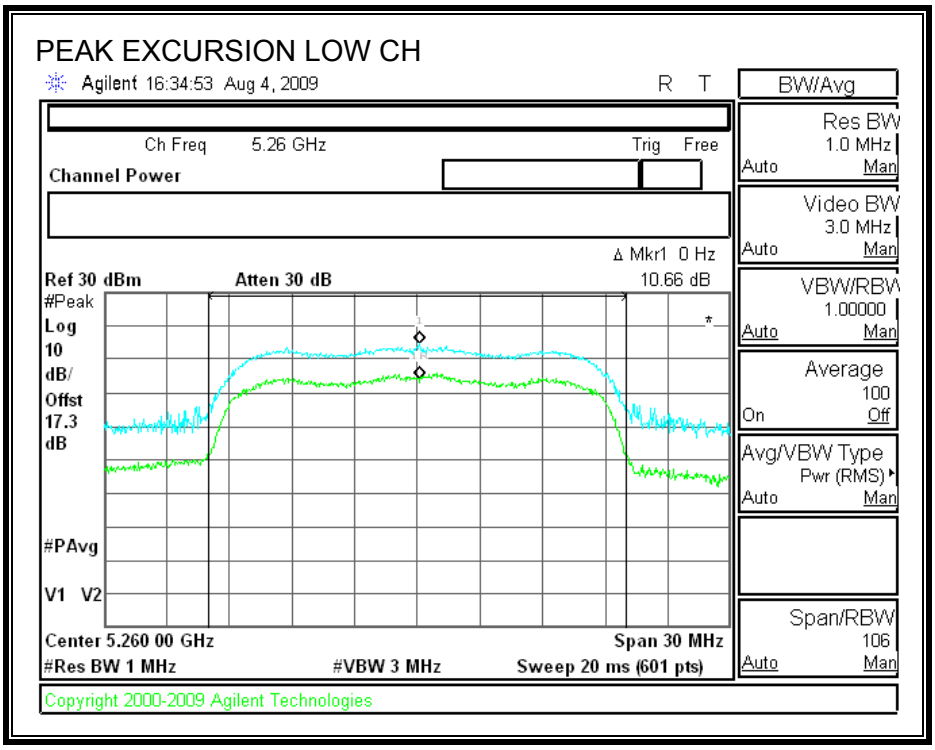
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	10.66	13	-2.34
Middle	5300	9.37	13	-3.63
High	5320	10.09	13	-2.91

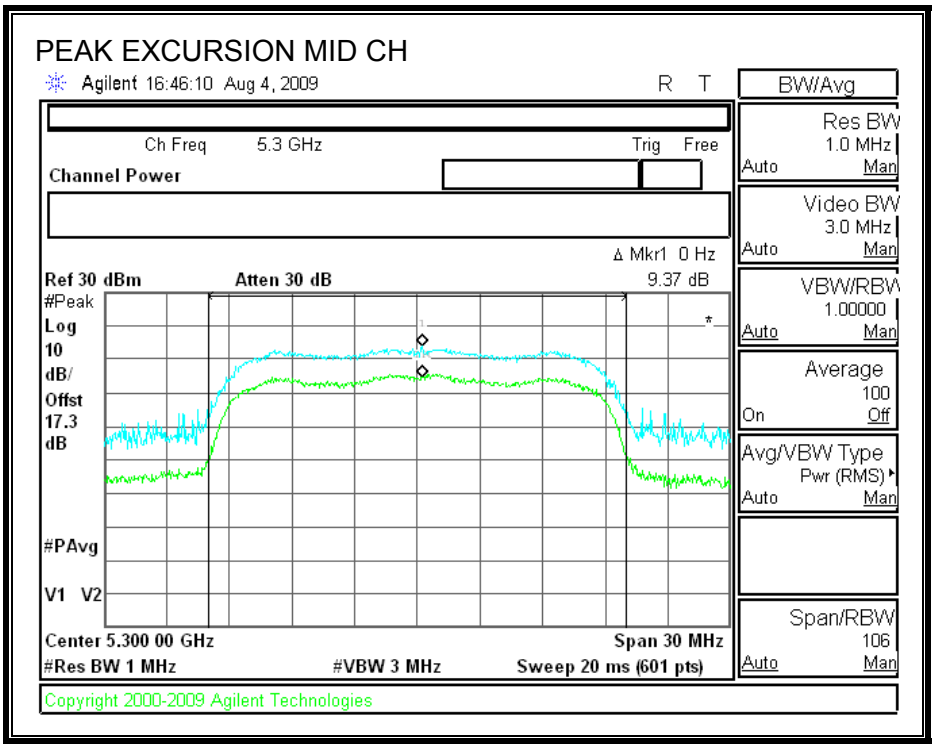
CHAIN 2

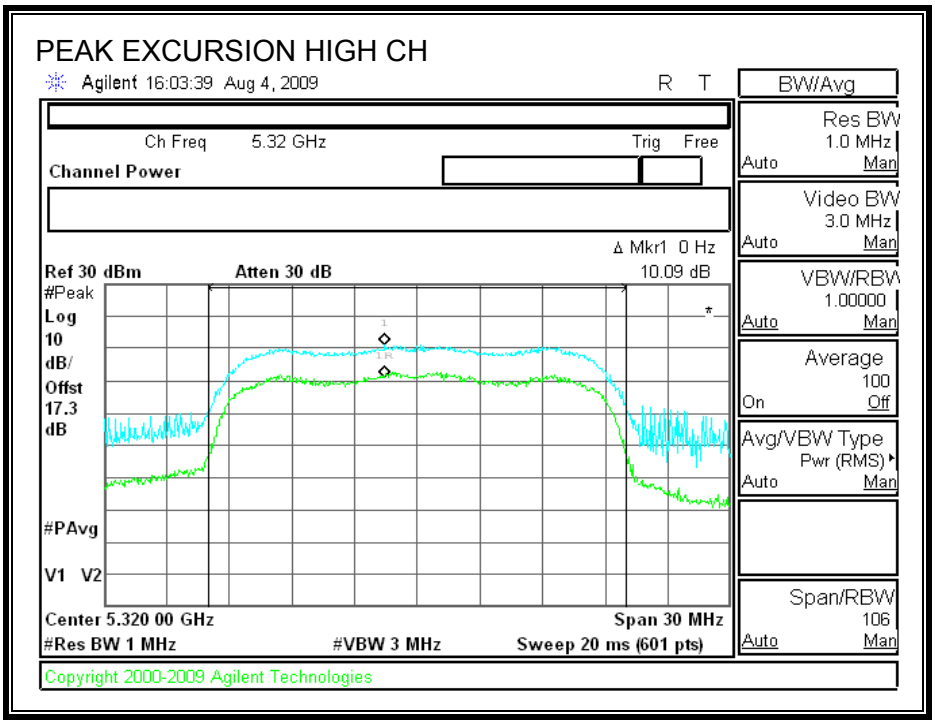
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5260	10.85	13	-2.15
Middle	5300	10.86	13	-2.14
High	5320	8.75	13	-4.25

CHAIN 1

PEAK EXCURSION

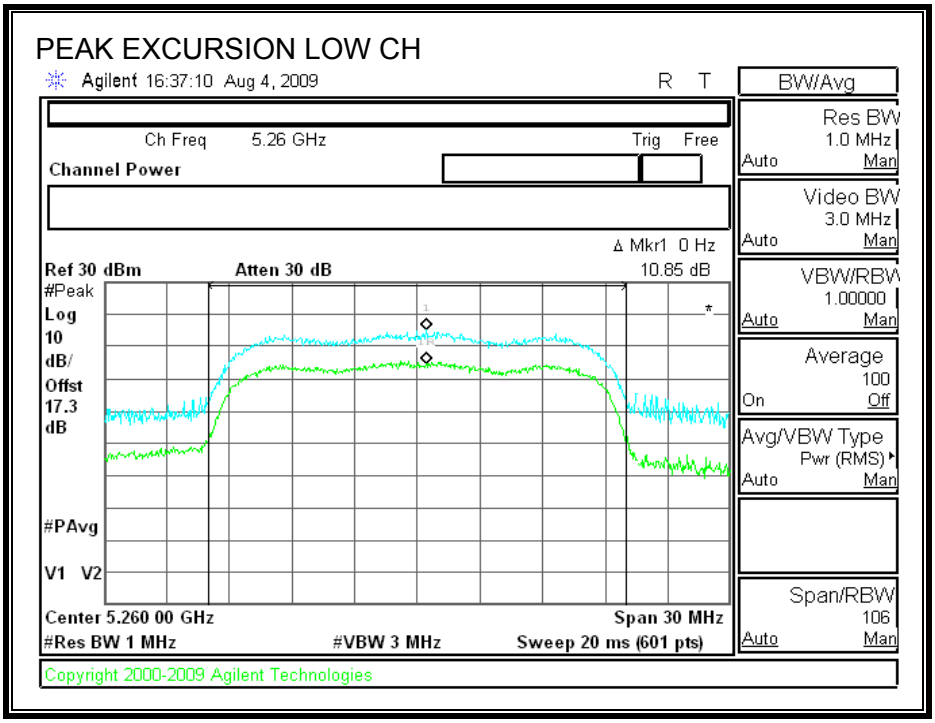




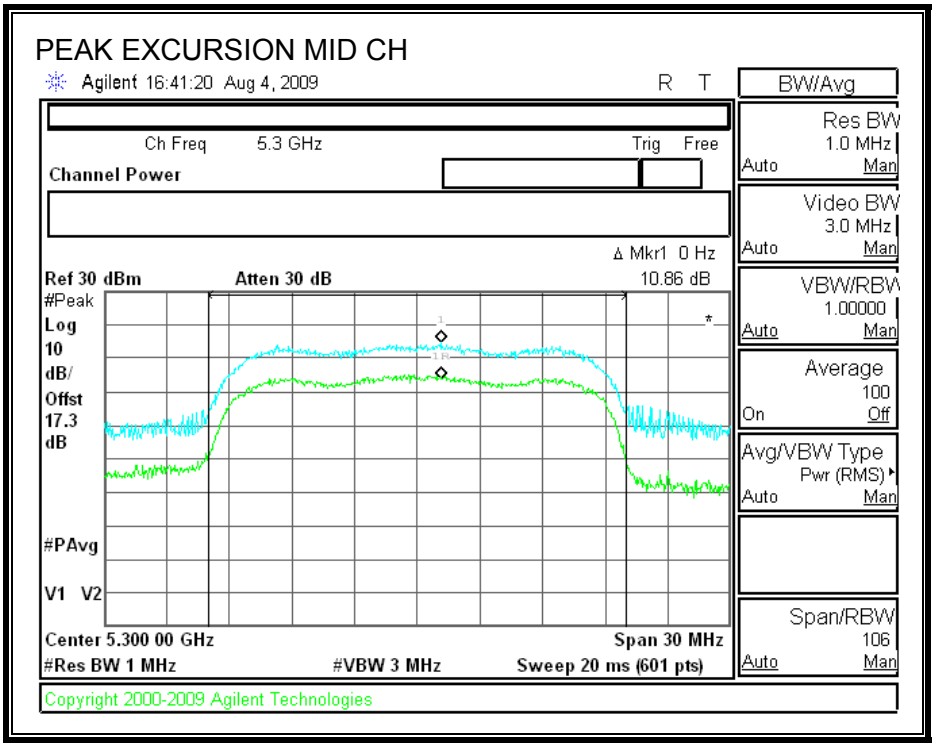


CHAIN 2

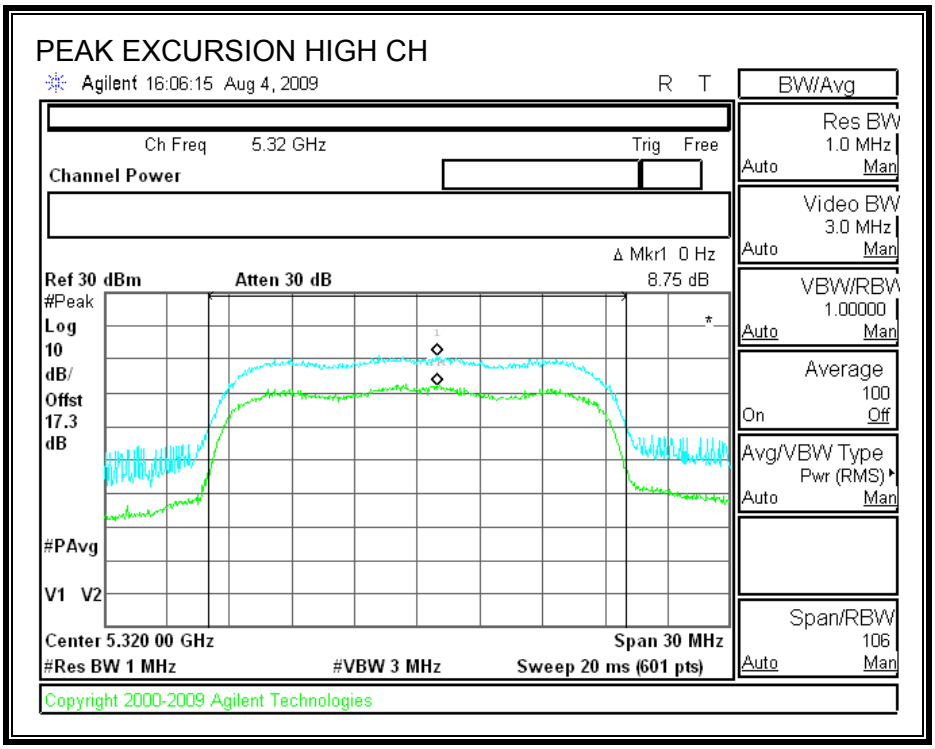
PEAK EXCURSION



PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



7.6.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

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

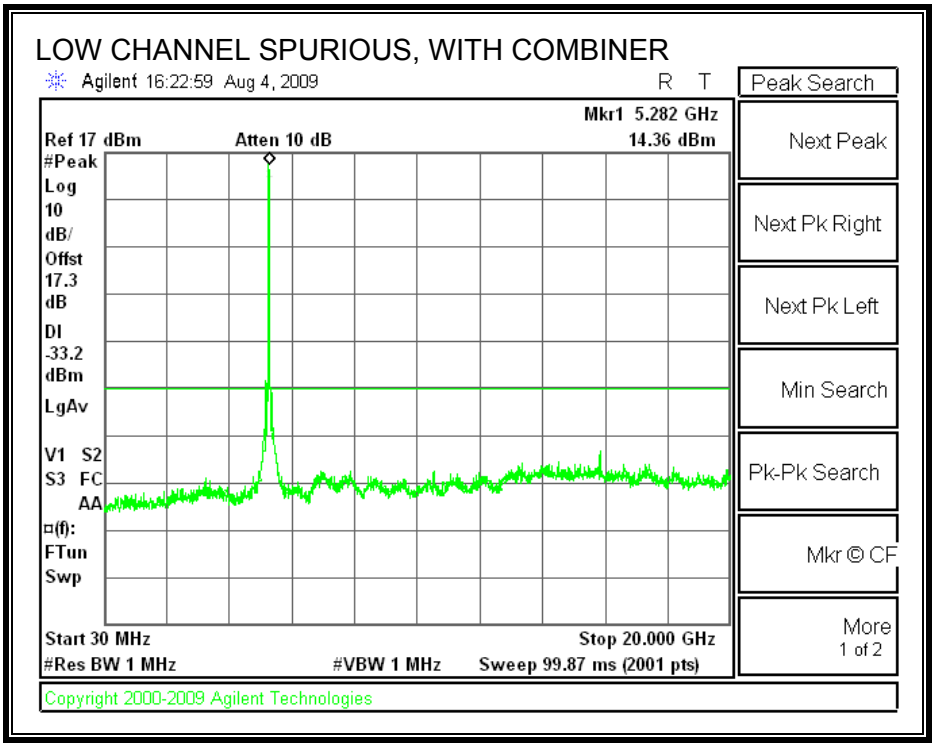
TEST PROCEDURE

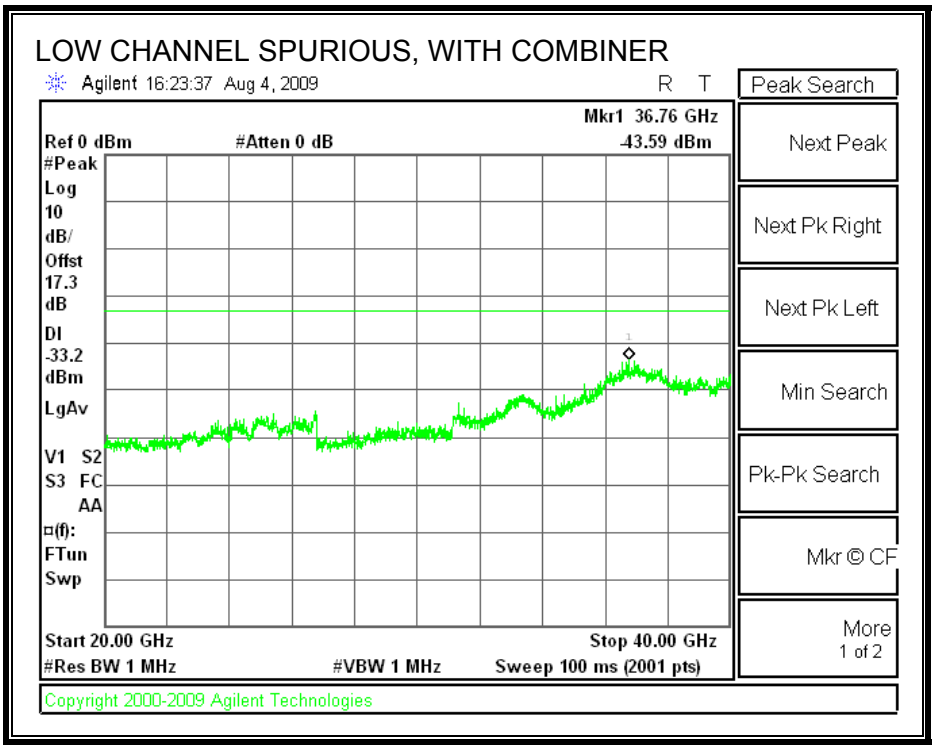
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

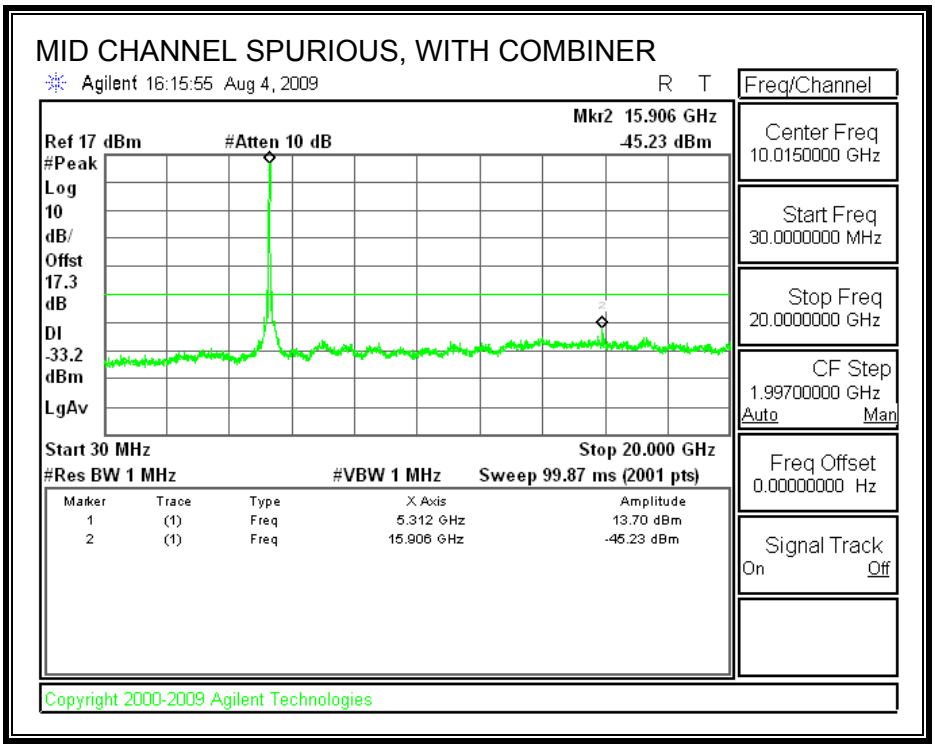
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

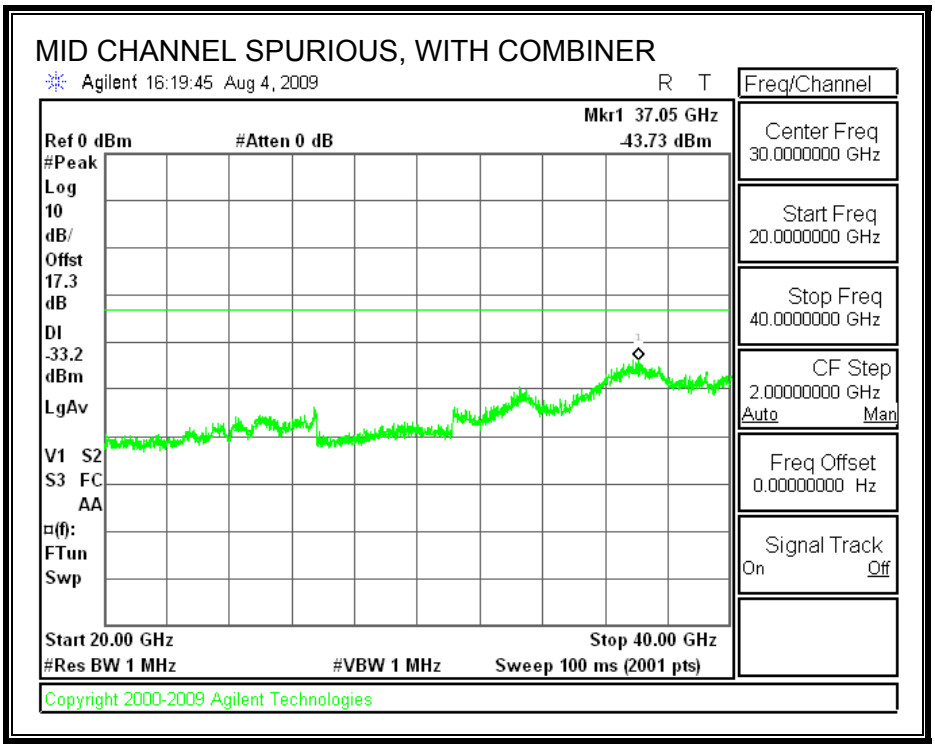
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS WITH COMBINER

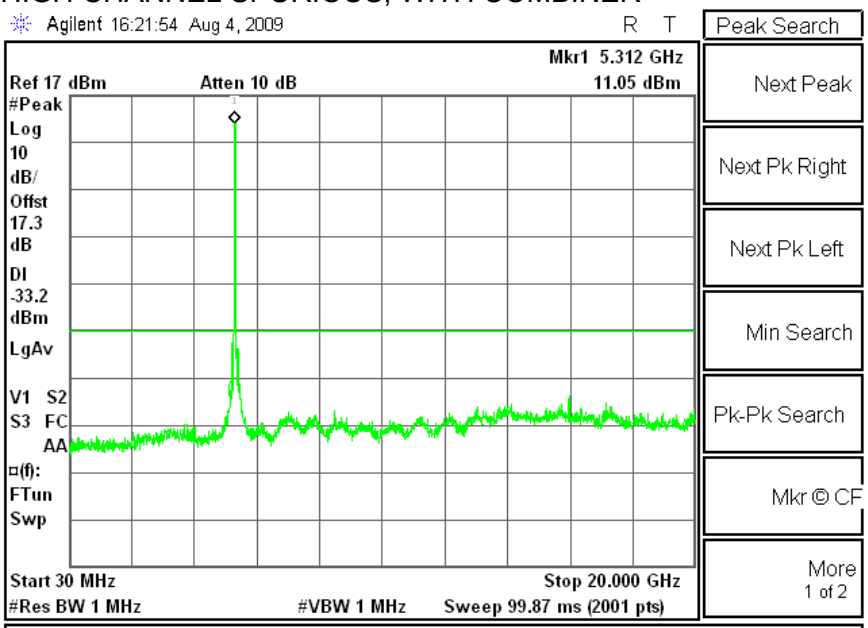




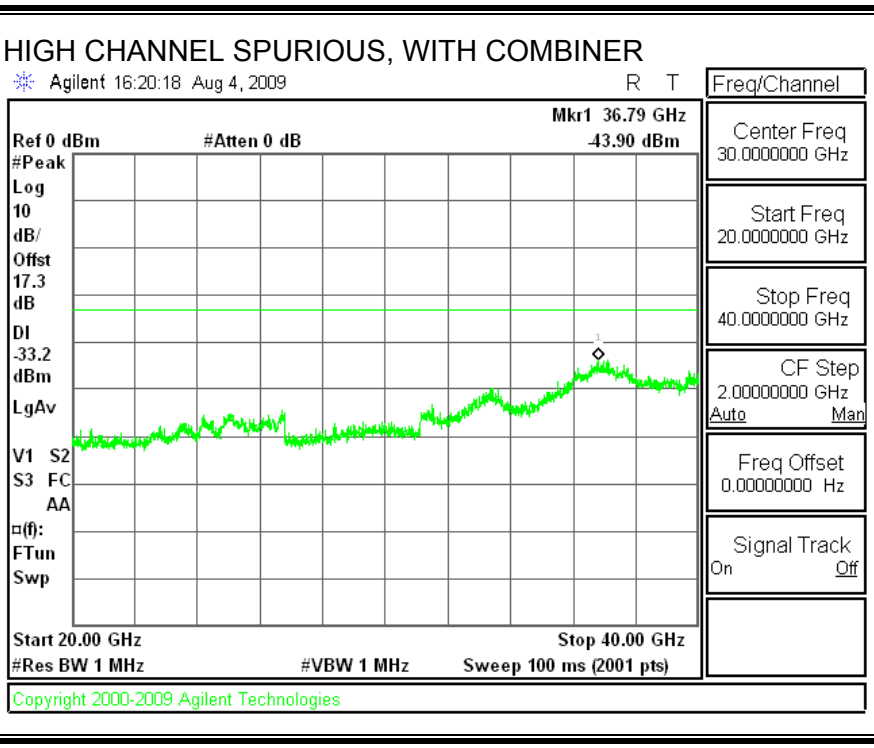




HIGH CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.7. 802.11n HT40 SISO MODE IN THE 5.3 GHz BAND

7.7.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

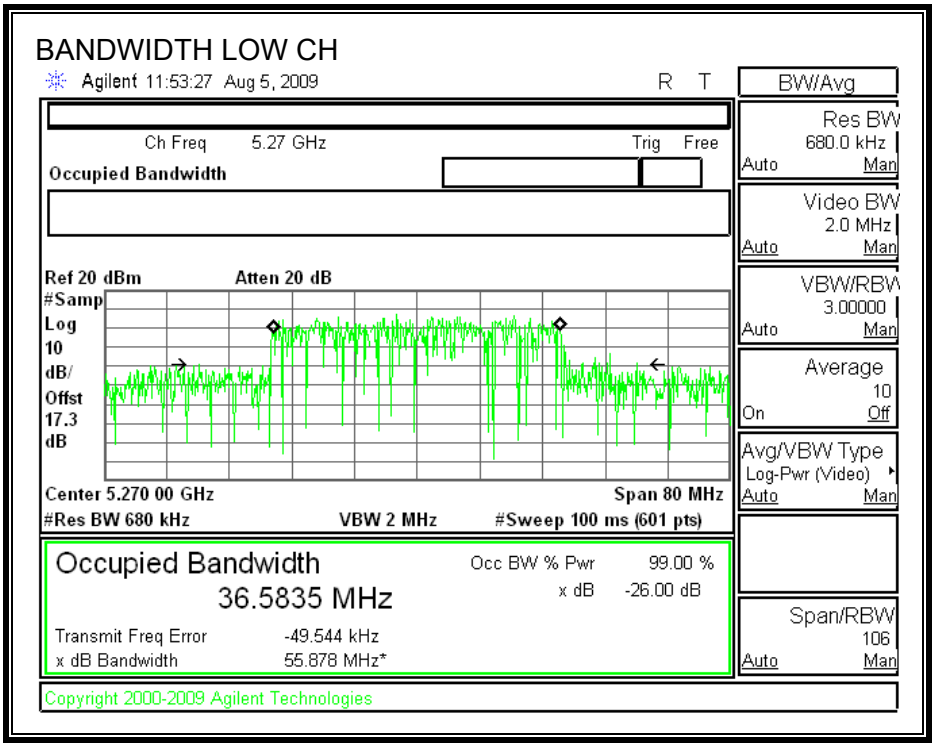
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

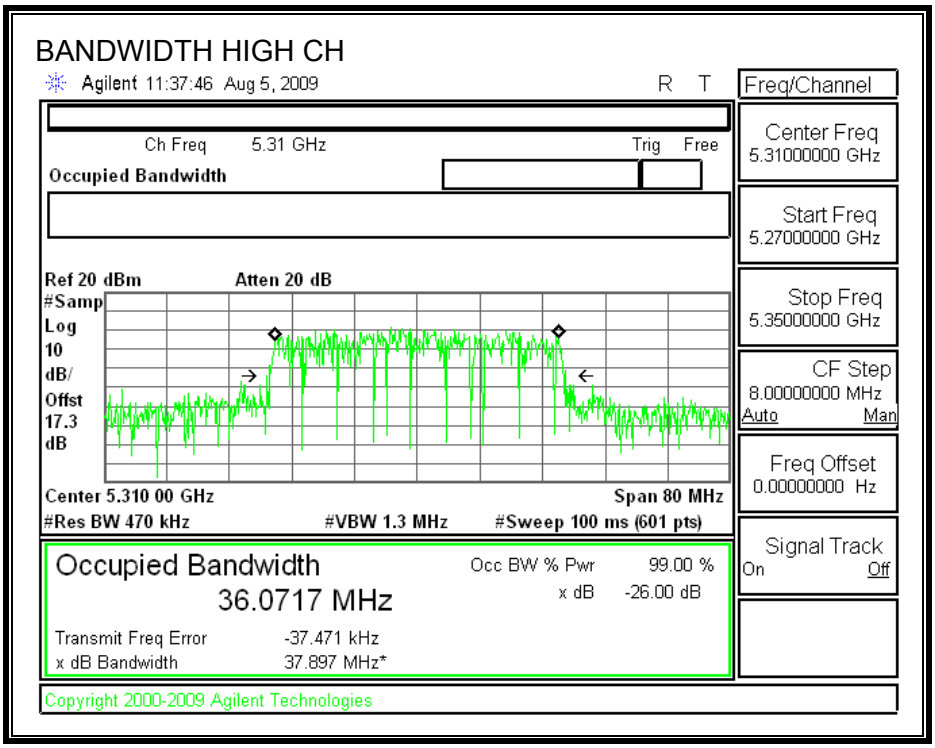
RESULTS

CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	55.878	36.5835
High	5310	37.897	36.0717

26 dB and 99% BANDWIDTH





7.7.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.25-5.35 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.

The maximum antenna gain is 3.29 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

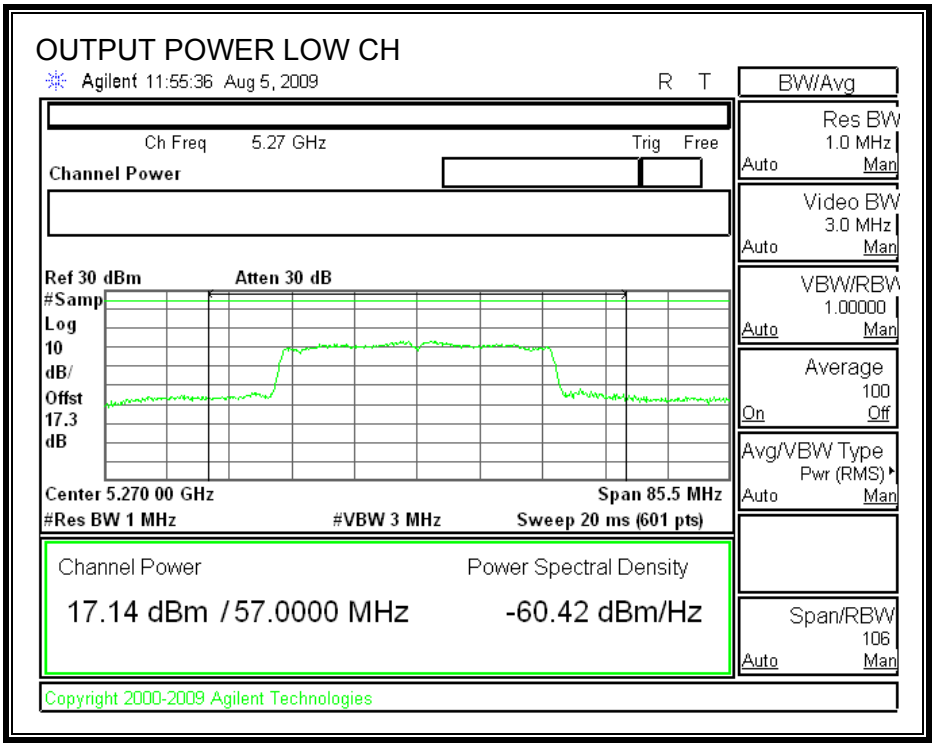
Limit

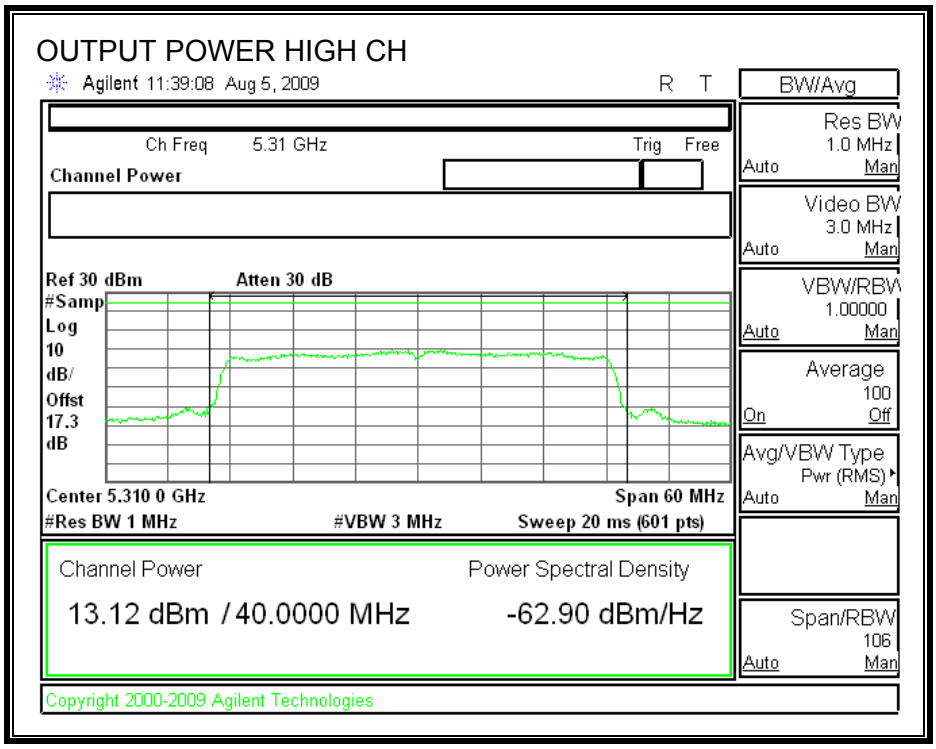
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5270	24	55.878	21.47	3.29	21.47
High	5310	24	37.897	19.79	3.29	19.79

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	17.14	21.47	-4.33
High	5310	13.12	19.79	-6.67

OUTPUT POWER





7.7.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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 3.29 dBi, therefore the limit is 4 dBm.

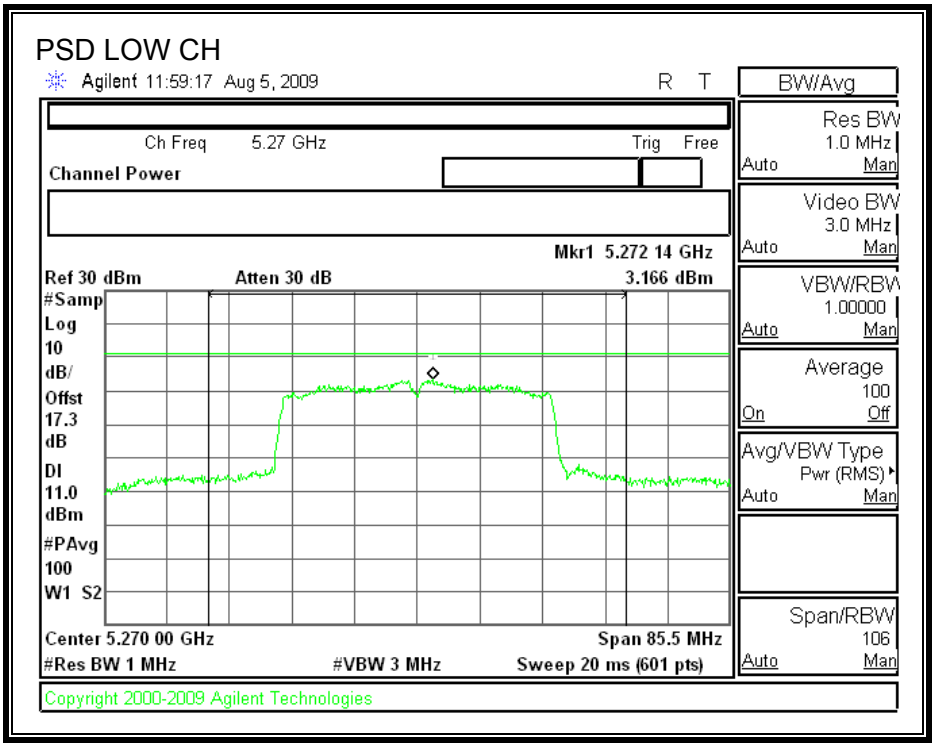
TEST PROCEDURE

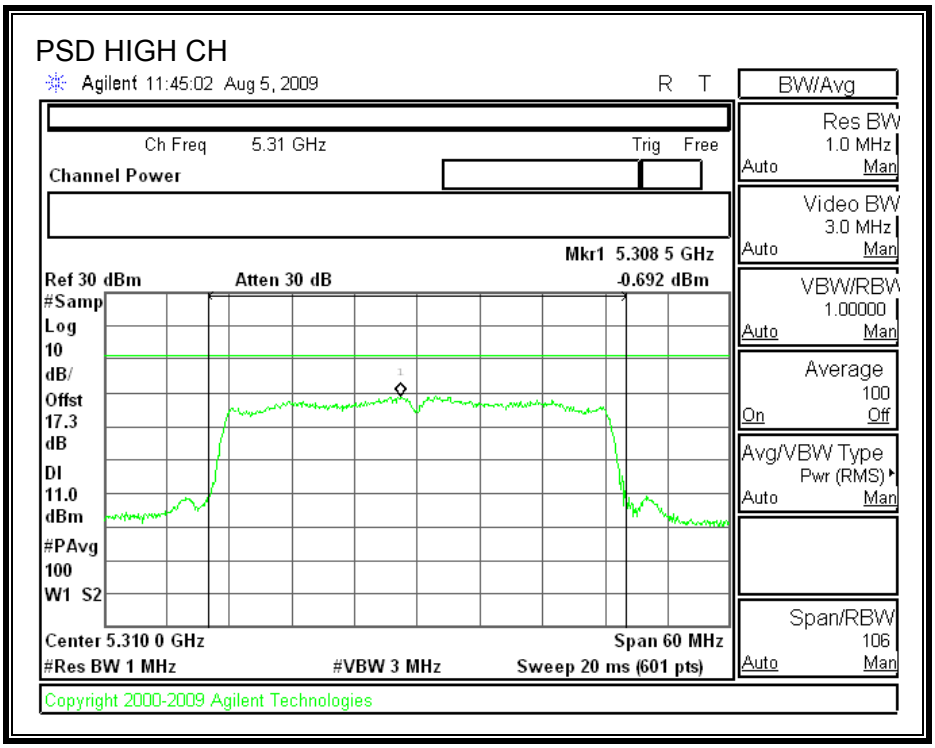
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5270	3.17	11.00	-7.83
High	5310	-0.69	11.00	-11.69

POWER SPECTRAL DENSITY





7.7.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

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

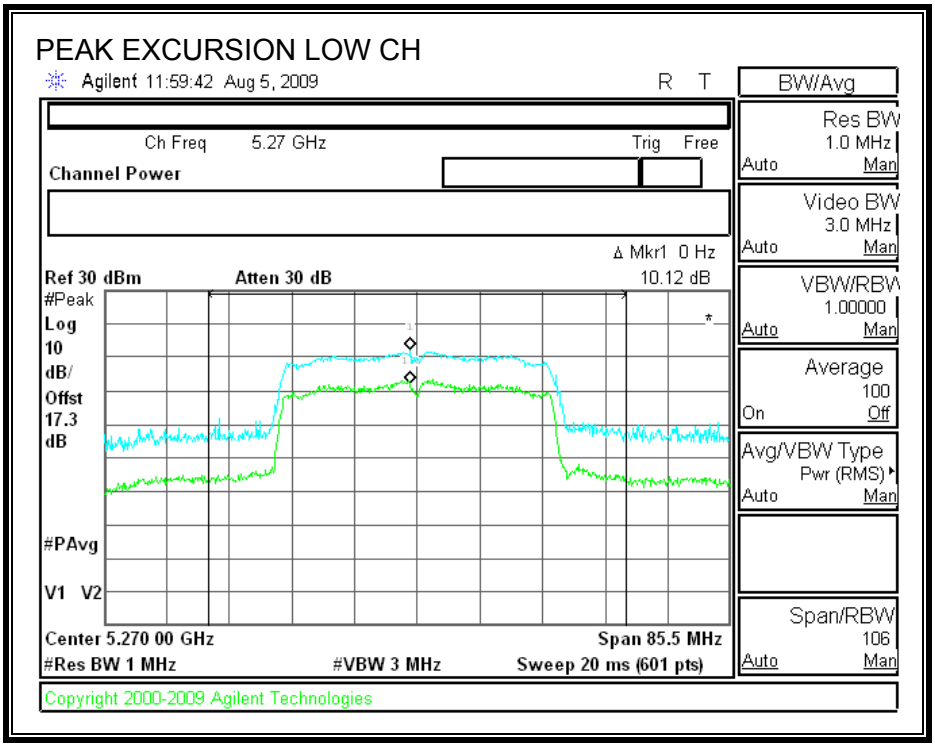
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

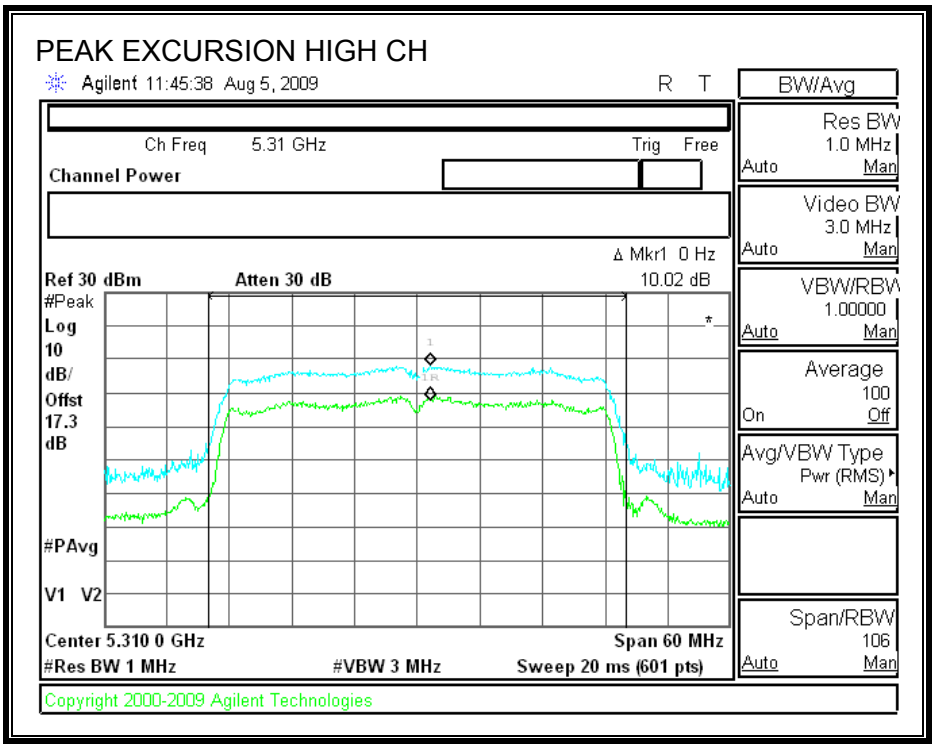
RESULTS

CHAIN 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	10.12	13	-2.88
High	5230	10.02	13	-2.98

PEAK EXCURSION





7.7.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

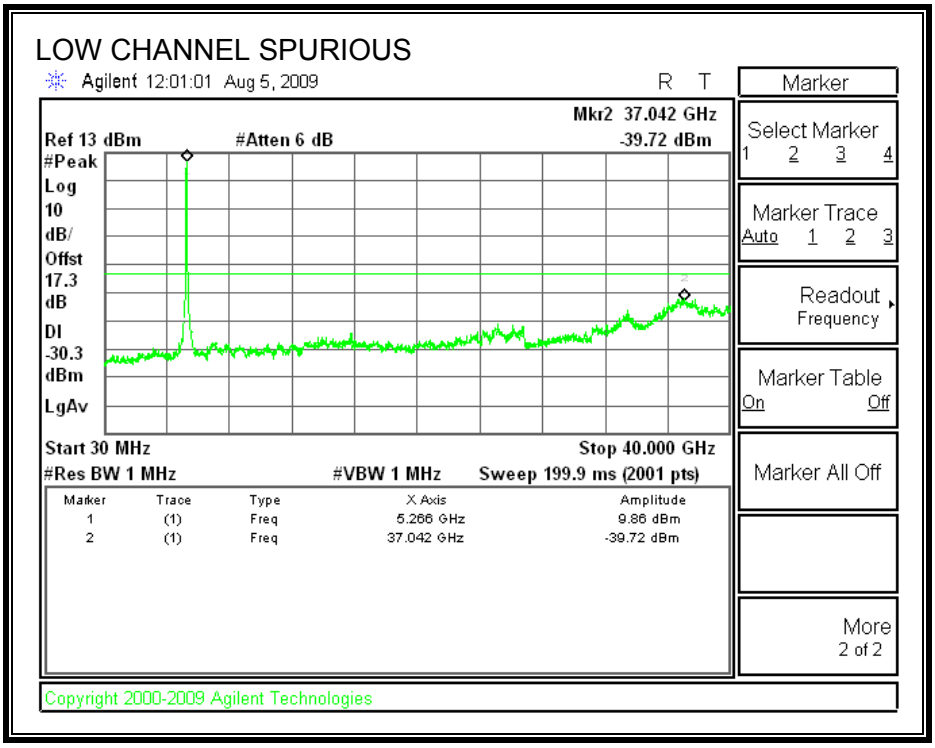
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

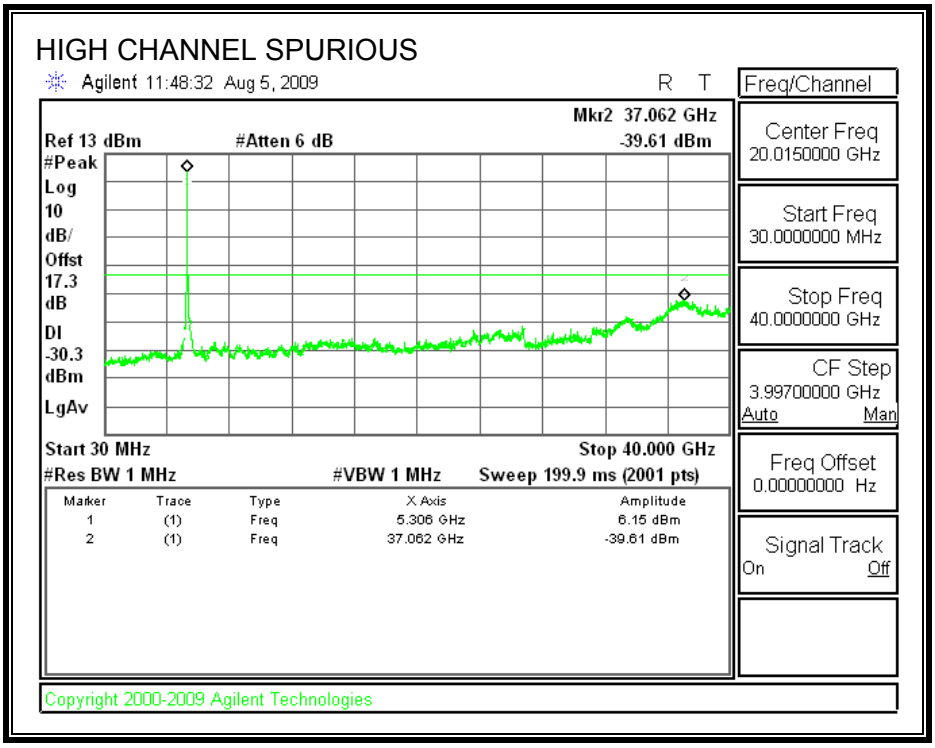
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS

LOW CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



7.8. 802.11n HT40 MODE IN THE 5.3 GHz BAND

7.8.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

CHAIN 1

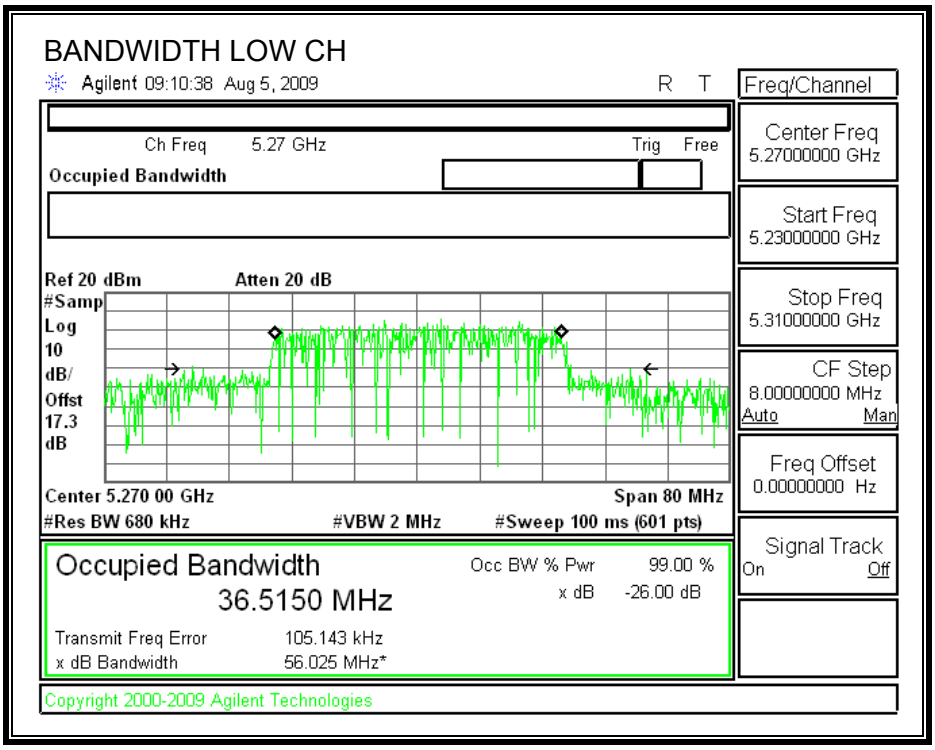
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	56.025	36.515
High	5310	38.499	36.2483

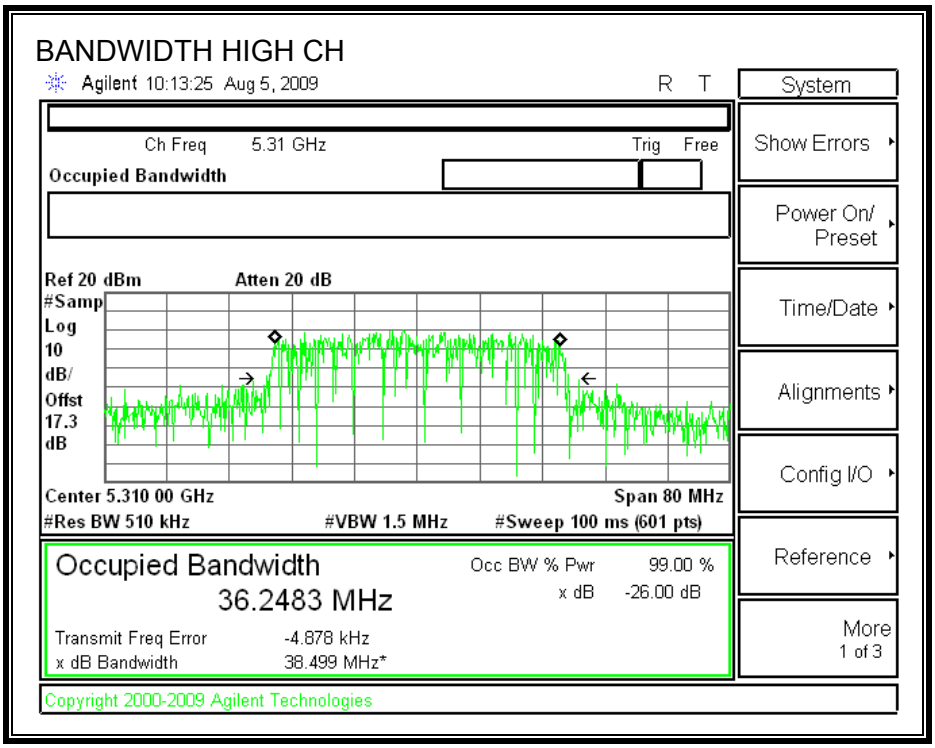
CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5270	55.168	36.2400
High	5310	38.316	36.1305

CHAIN 1

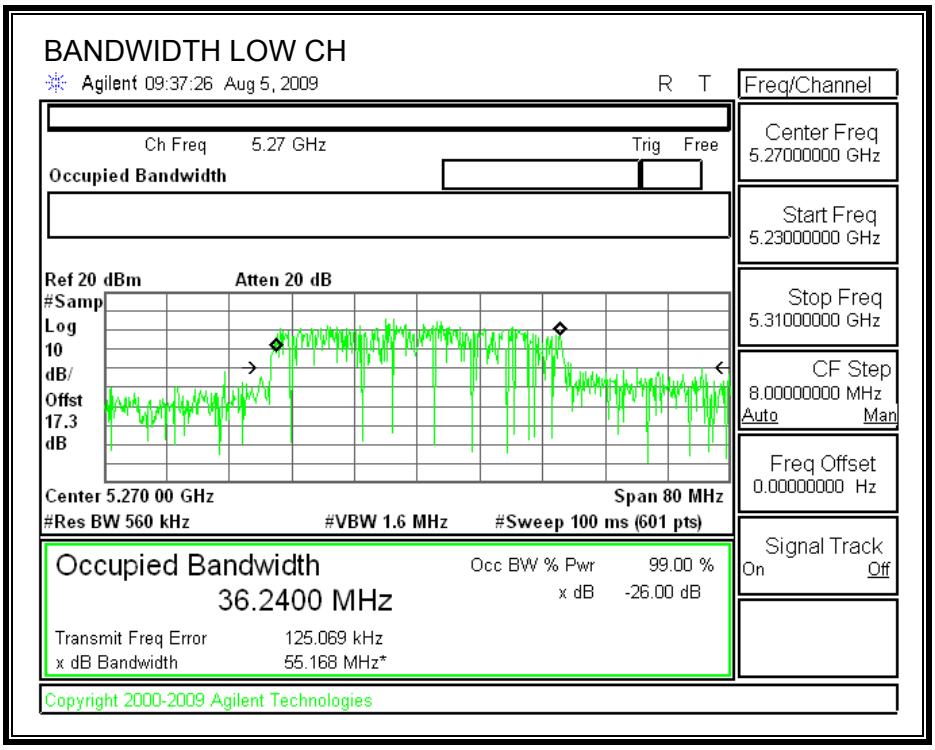
26 dB and 99% BANDWIDTH

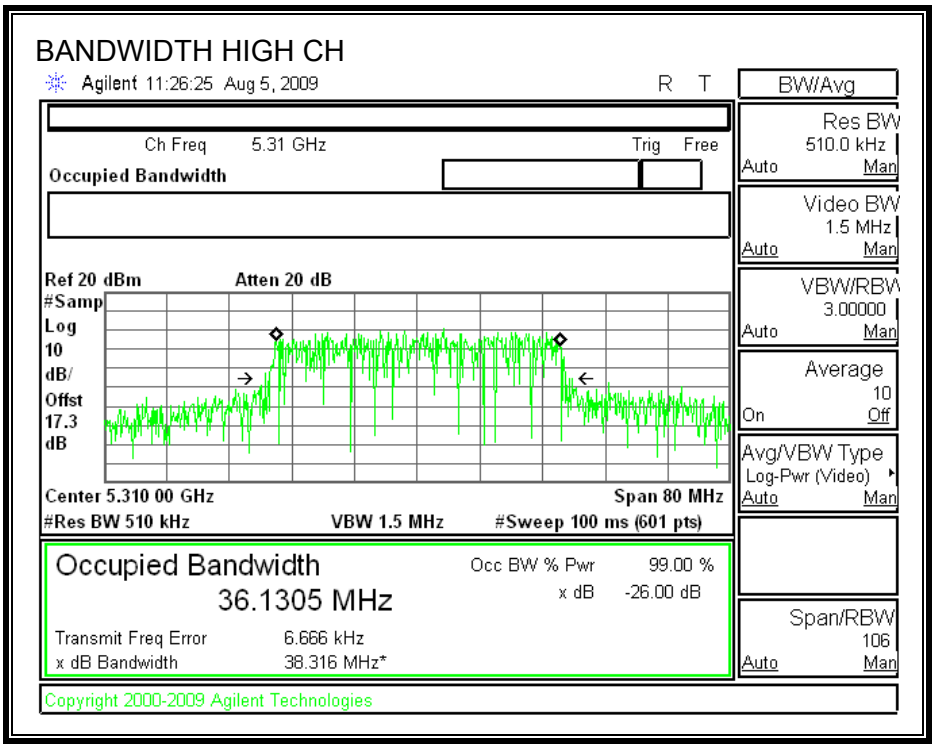




CHAIN 2

26 dB and 99% BANDWIDTH





7.8.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 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.

The composite antenna is 6.15dBi.

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

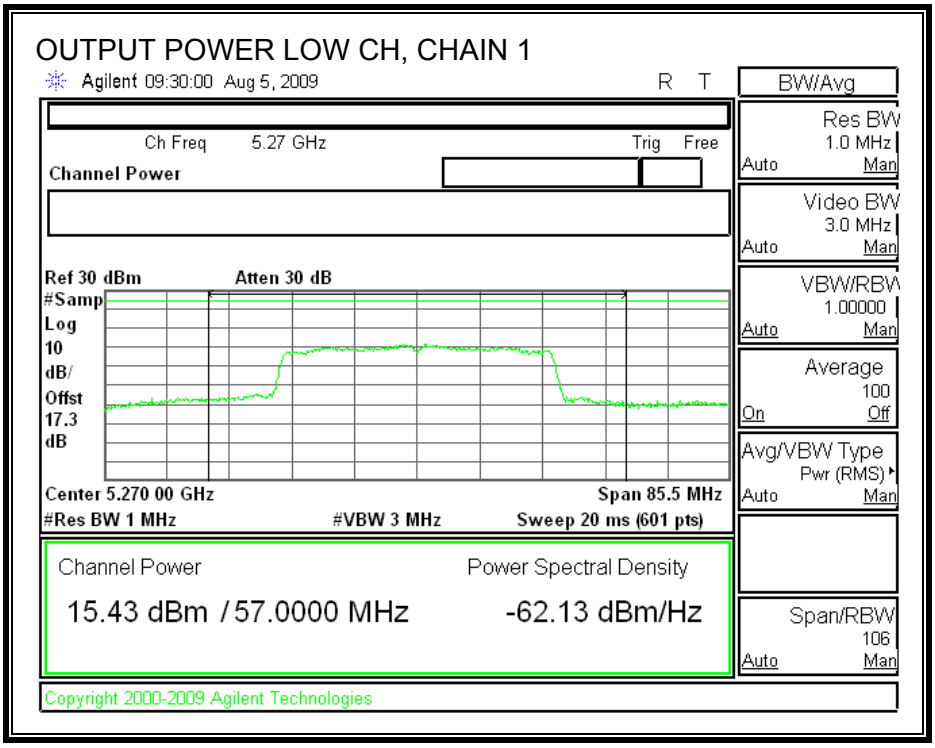
Limit

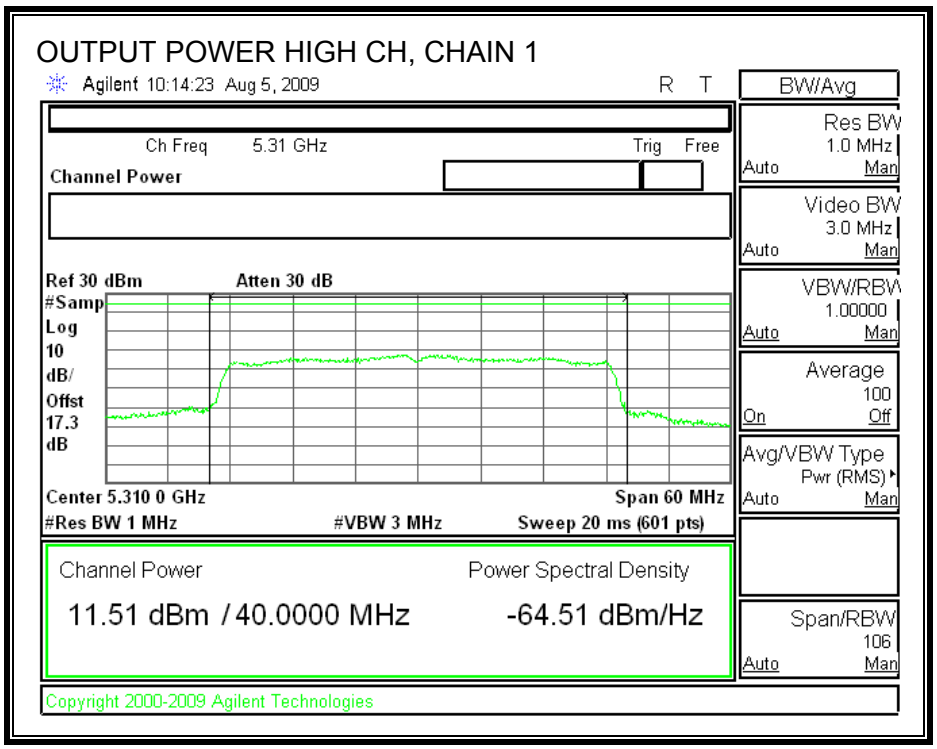
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5270	24	56.025	28.48	6.15	23.85
High	5310	24	38.499	26.85	6.15	23.85

Individual Chain Results

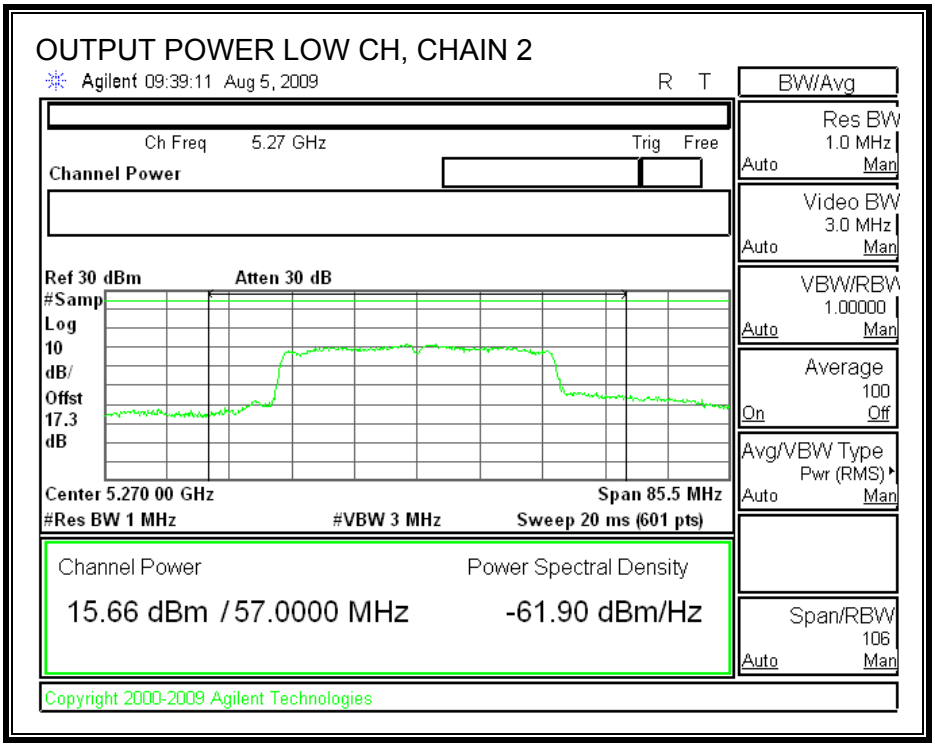
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	15.43	15.66	18.56	23.85	-5.29
High	5310	11.51	11.64	14.59	23.85	-9.26

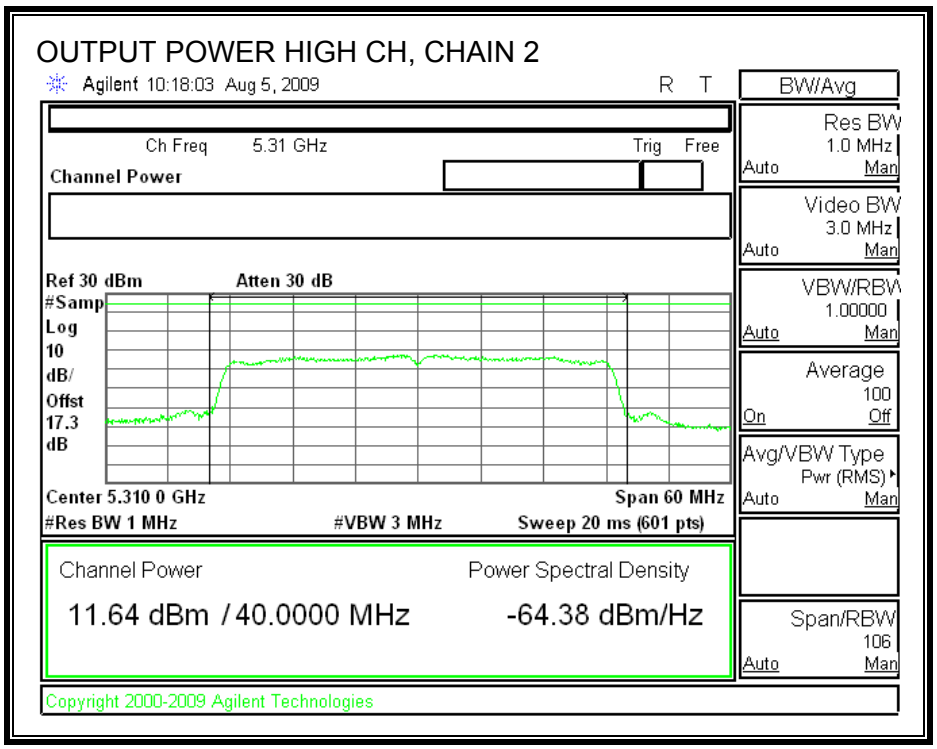
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.8.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 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 6.15 dBi, therefore the limit is 10.85 dBm.

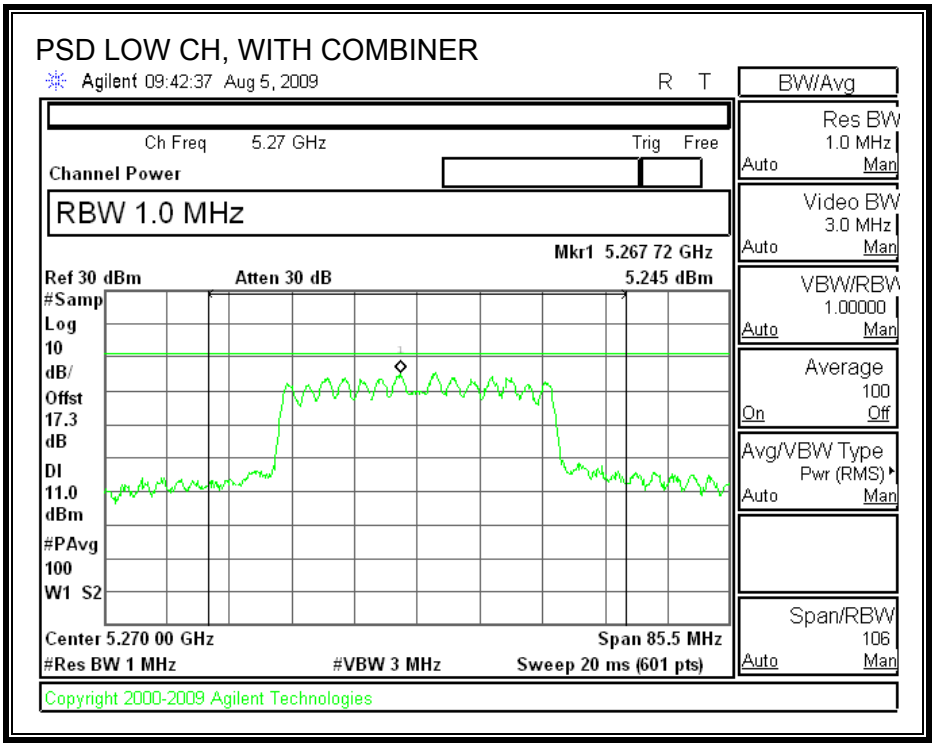
TEST PROCEDURE

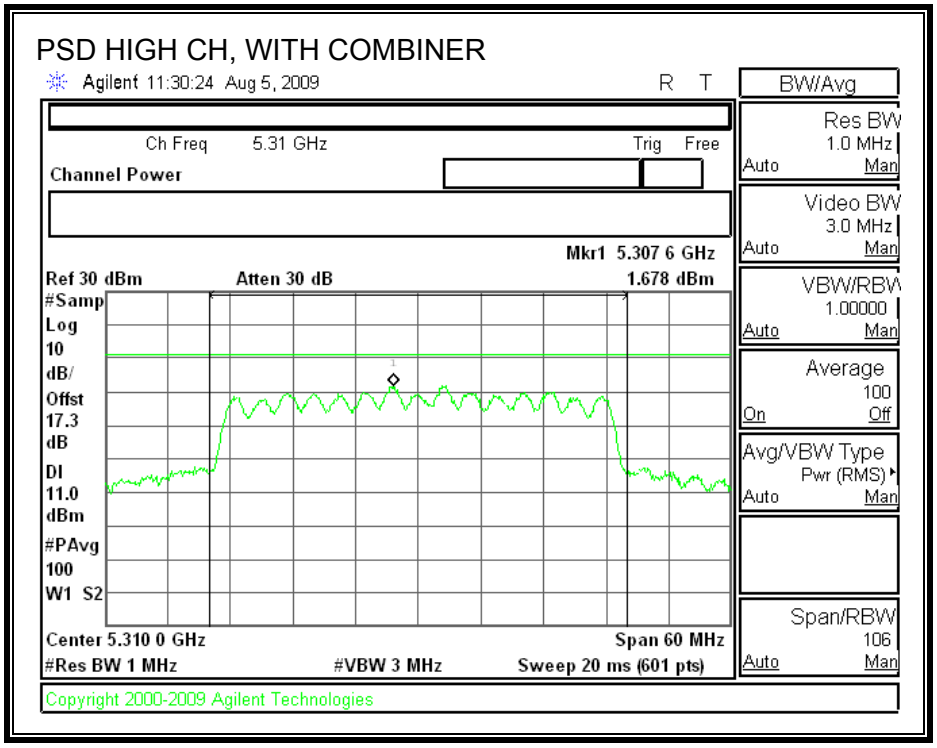
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5270	5.25	10.85	-5.61
High	5310	1.68	10.85	-9.17

POWER SPECTRAL DENSITY WITH COMBINER





7.8.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

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

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

RESULTS

CHAIN 1

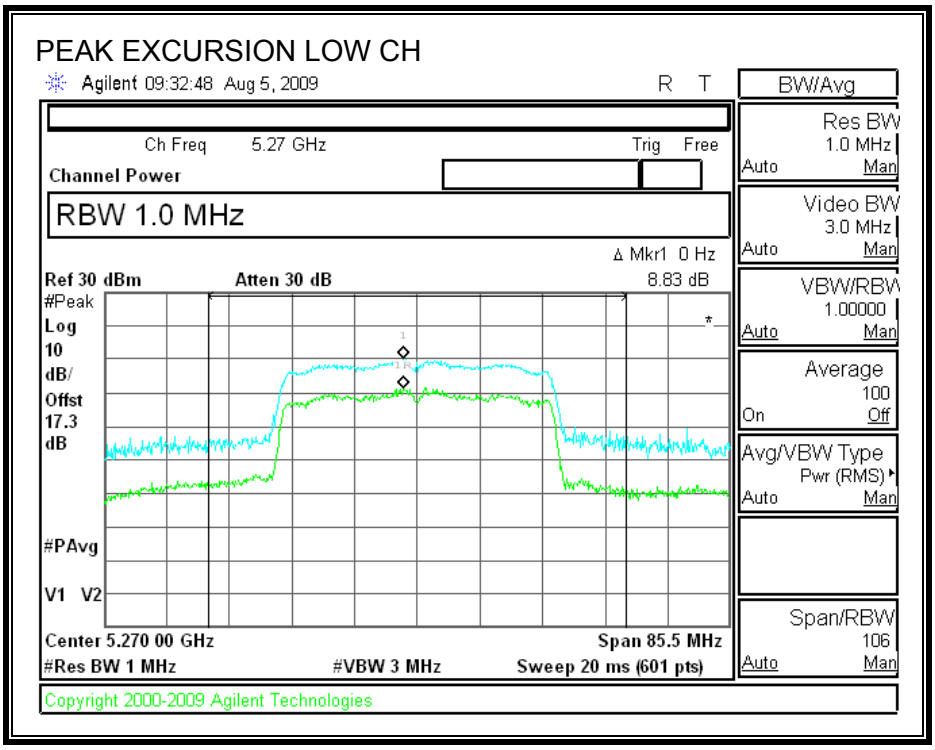
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	8.83	13	-4.17
High	5310	8.77	13	-4.23

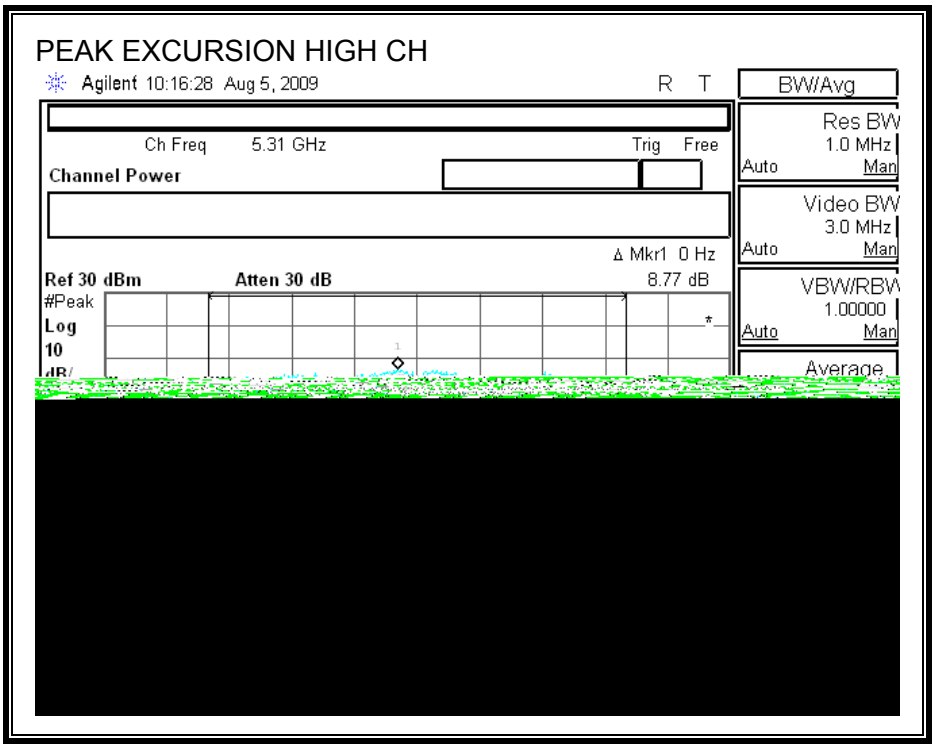
CHAIN 2

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5270	11.04	13	-1.96
High	5310	10.60	13	-2.40

CHAIN 1

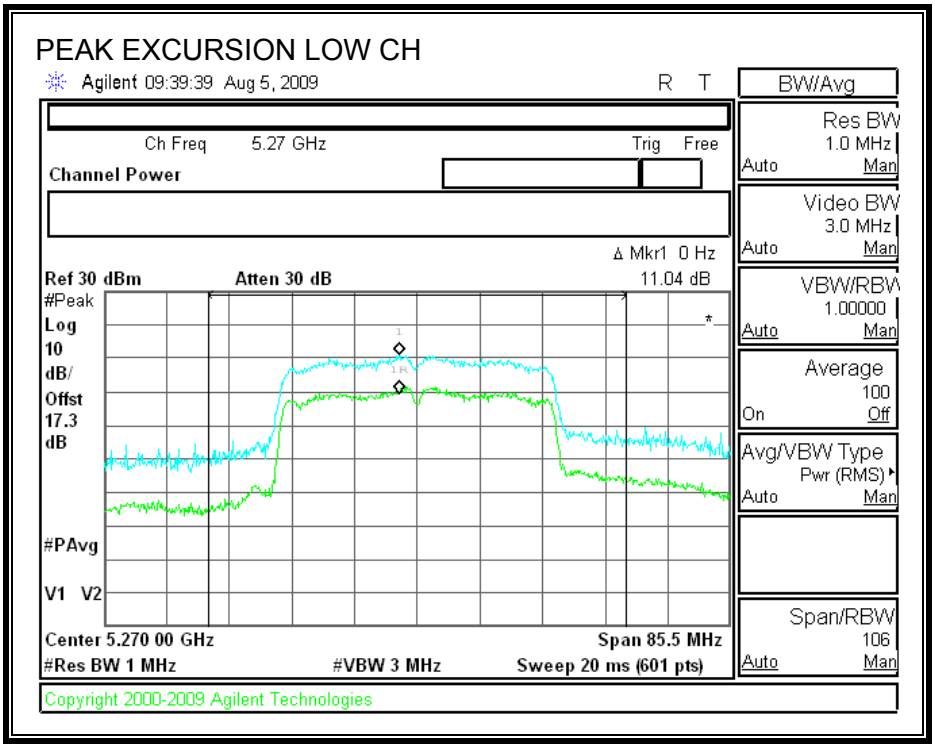
PEAK EXCURSION

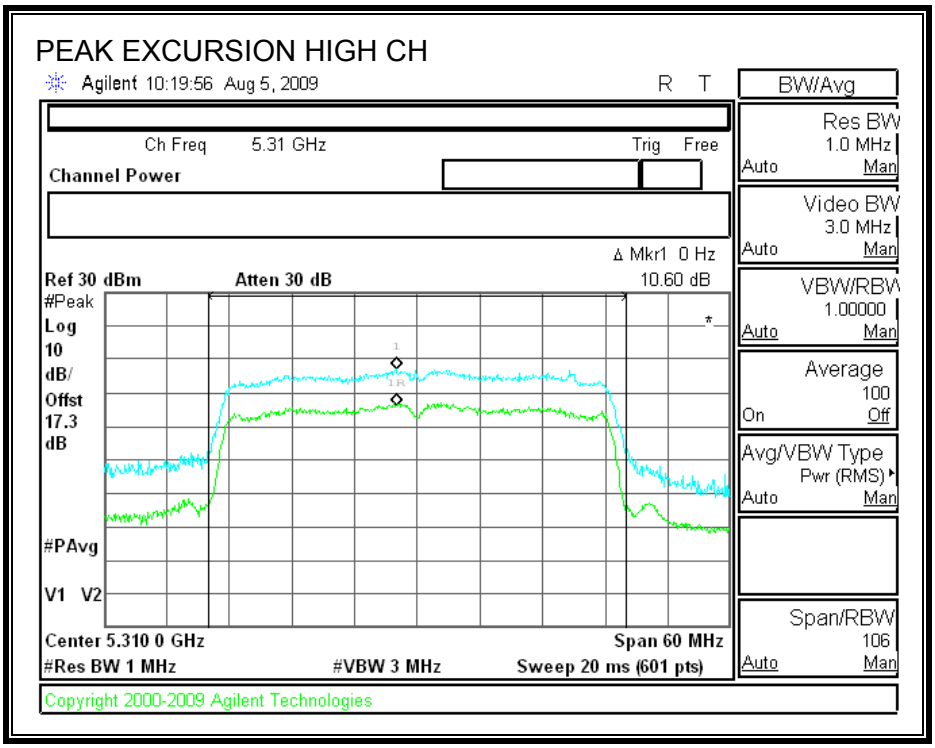




CHAIN 2

PEAK EXCURSION





7.8.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

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

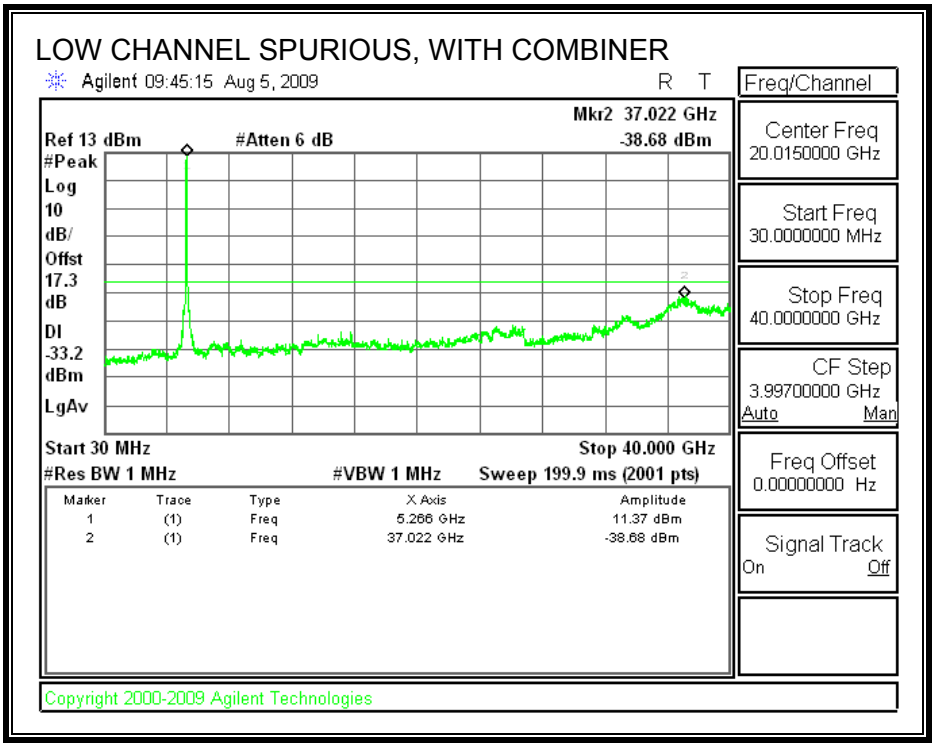
TEST PROCEDURE

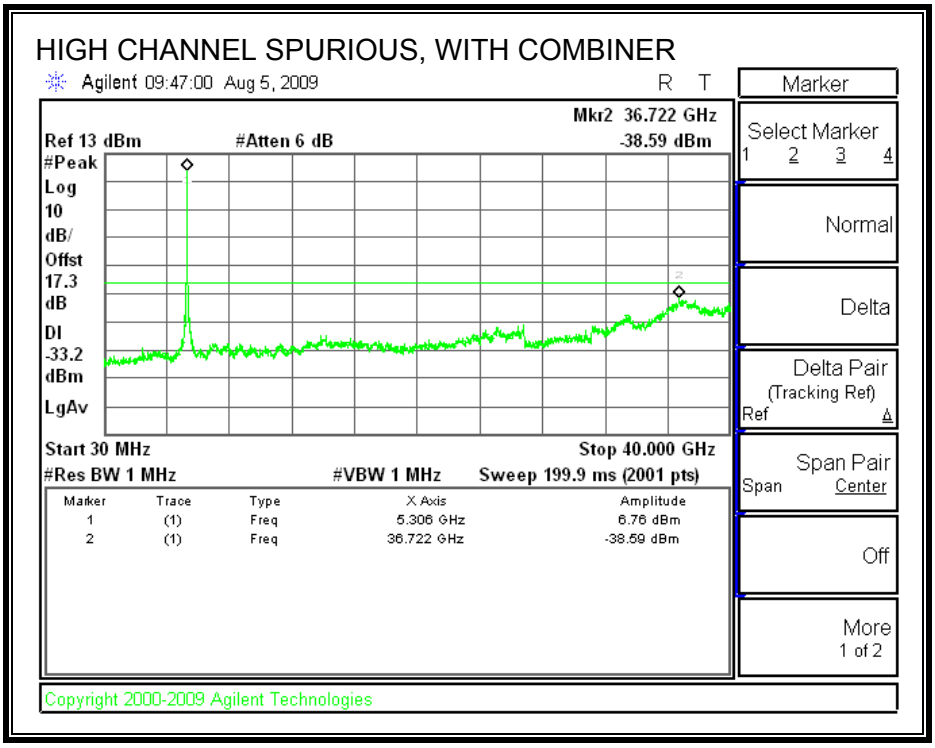
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

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

SPURIOUS EMISSIONS WITH COMBINER





7.9. 802.11a MODE IN THE 5.6 GHz BAND

7.9.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

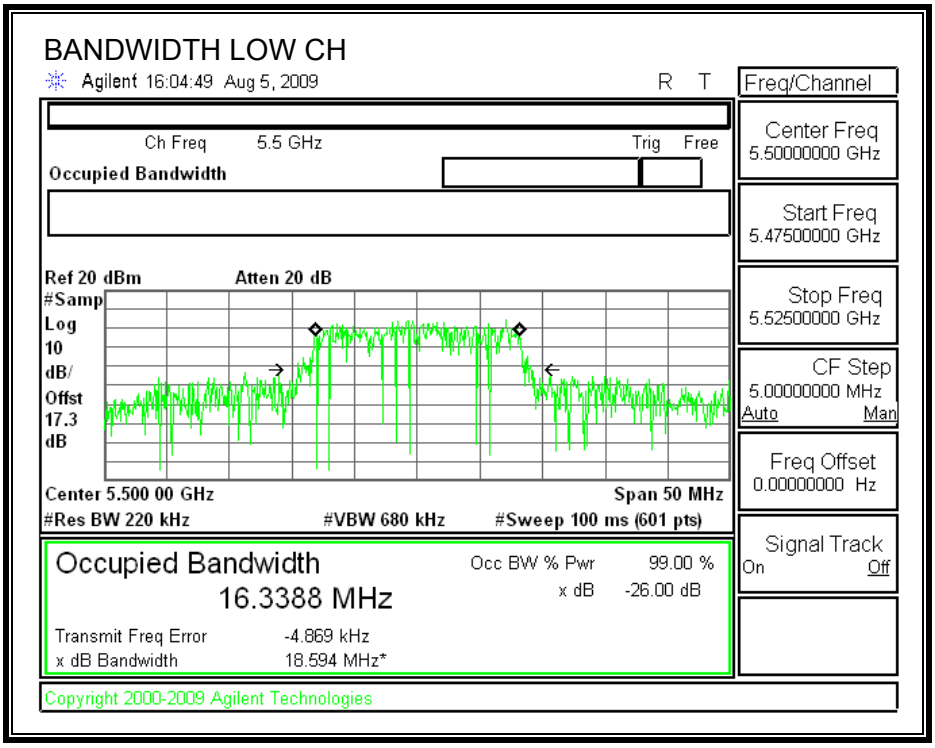
TEST PROCEDURE

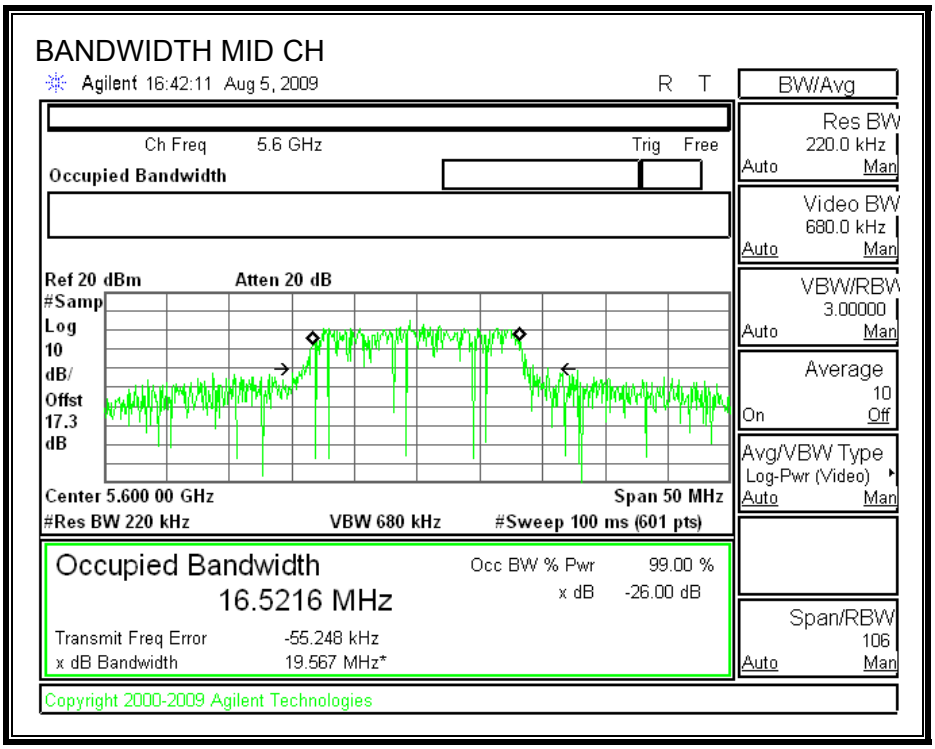
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

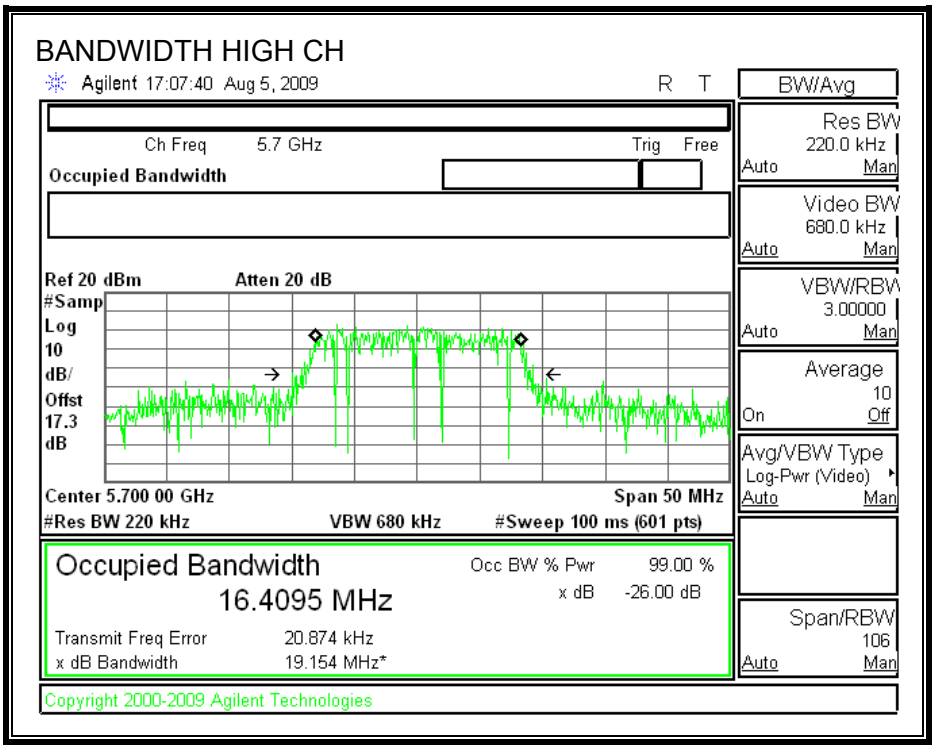
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	18.594	16.3380
Middle	5600	19.567	16.5216
High	5700	19.154	16.4095

26 dB and 99% BANDWIDTH







7.9.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The maximum antenna gain is 3.94dBi

TEST PROCEDURE

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

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

RESULTS

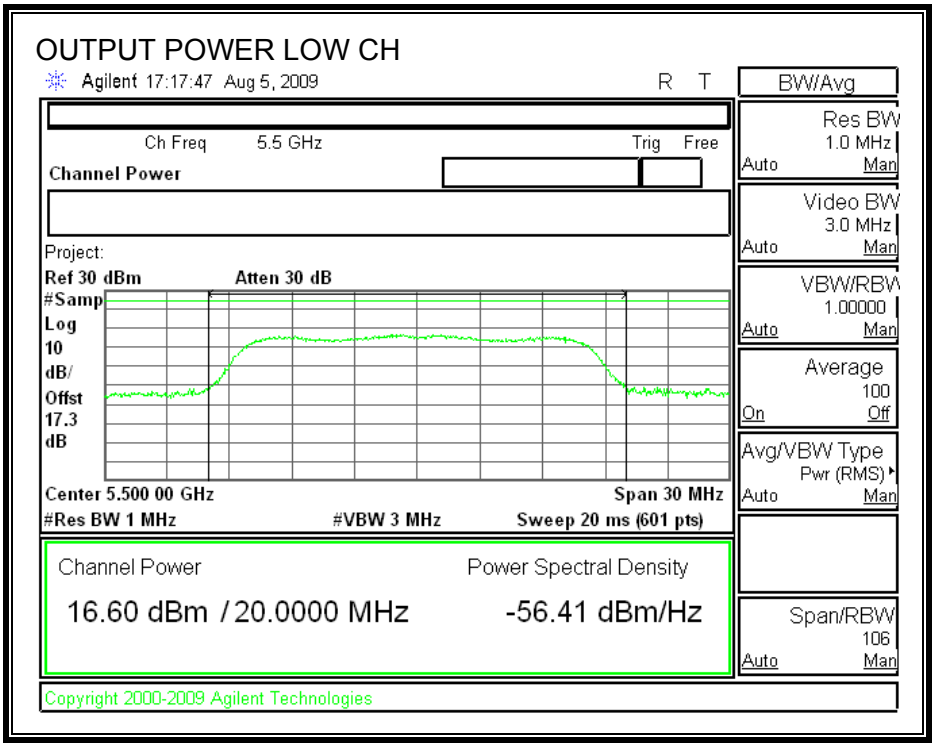
Limit

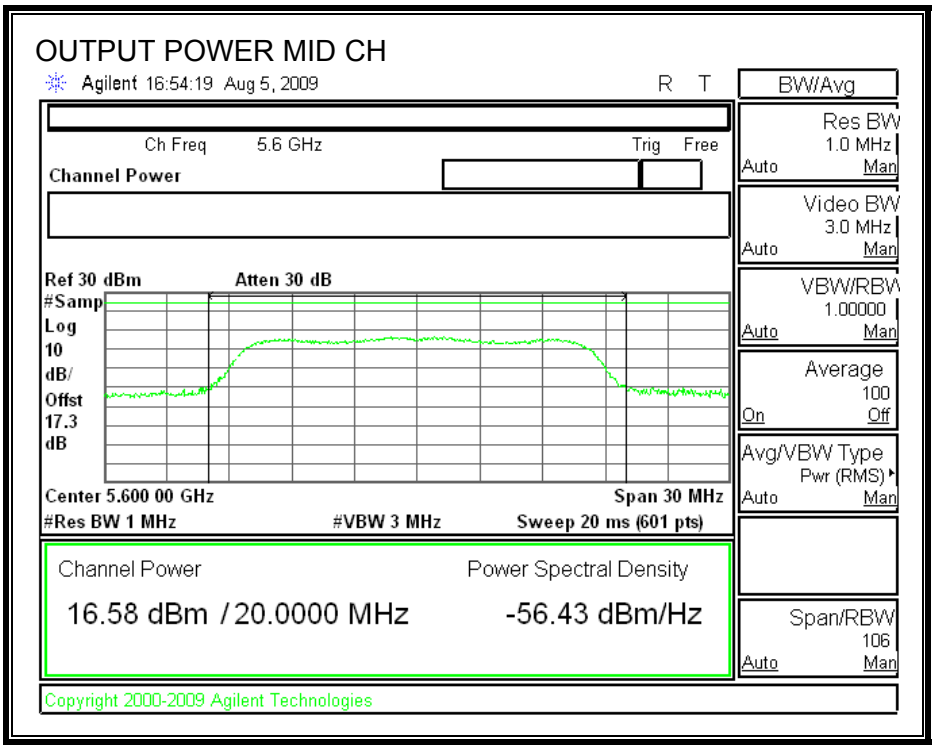
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	18.594	23.69	3.94	23.69
Mid	5600	24	19.567	23.92	3.94	23.92
High	5700	24	19.154	23.82	3.94	23.82

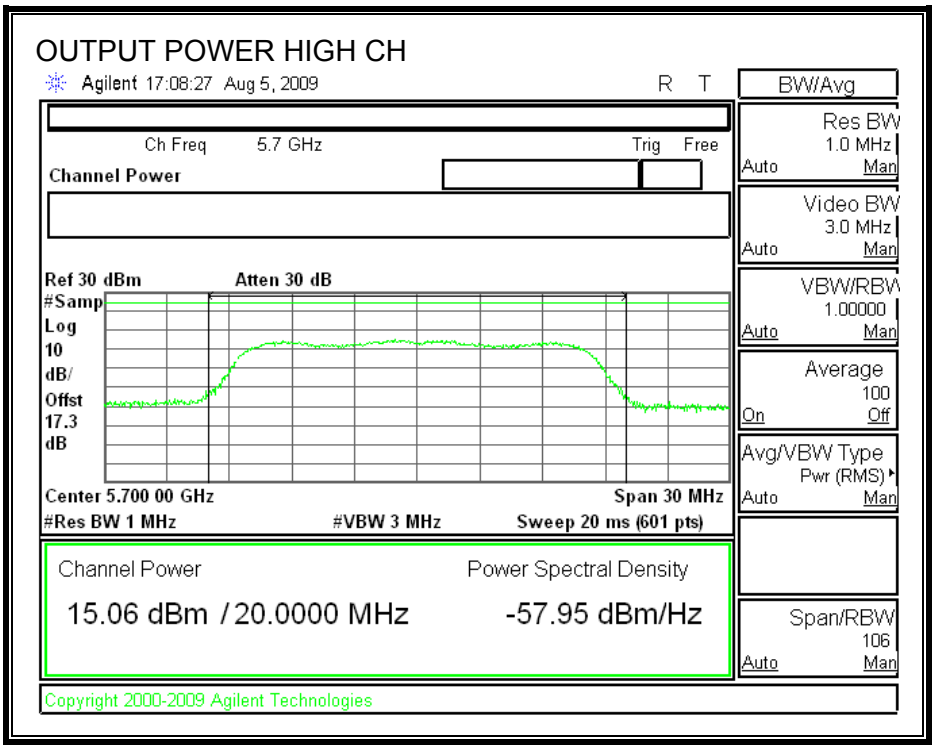
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	16.60	23.69	-7.09
Mid	5600	16.58	23.92	-7.34
High	5700	15.06	23.82	-8.76

OUTPUT POWER







7.9.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

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

The maximum antenna gain is equal to 3.94 dBi, therefore the limit is 11 dBm.

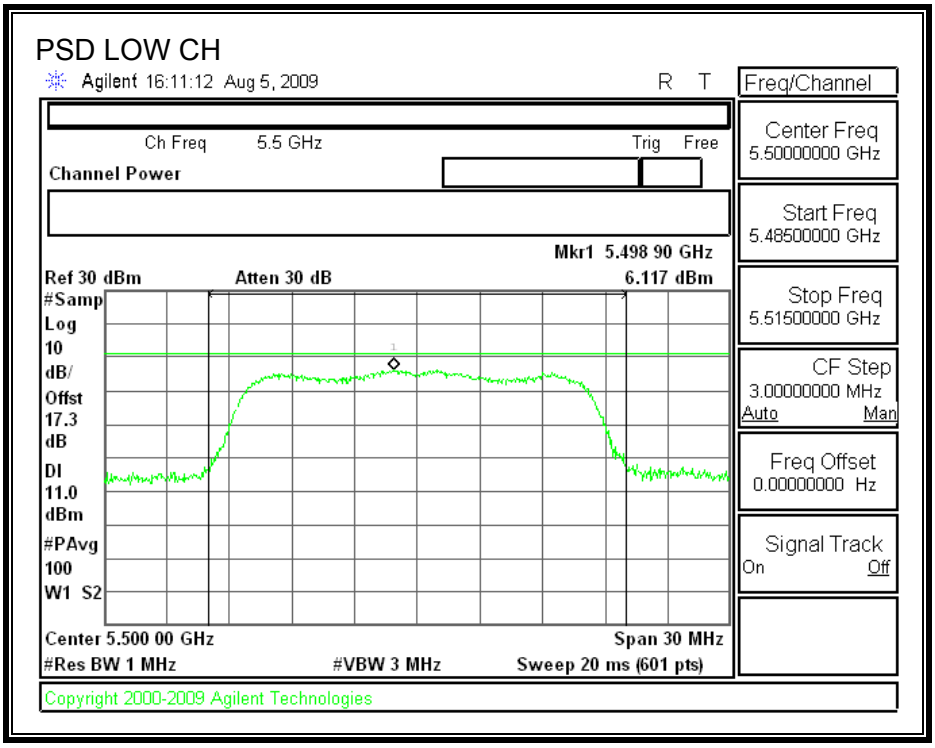
TEST PROCEDURE

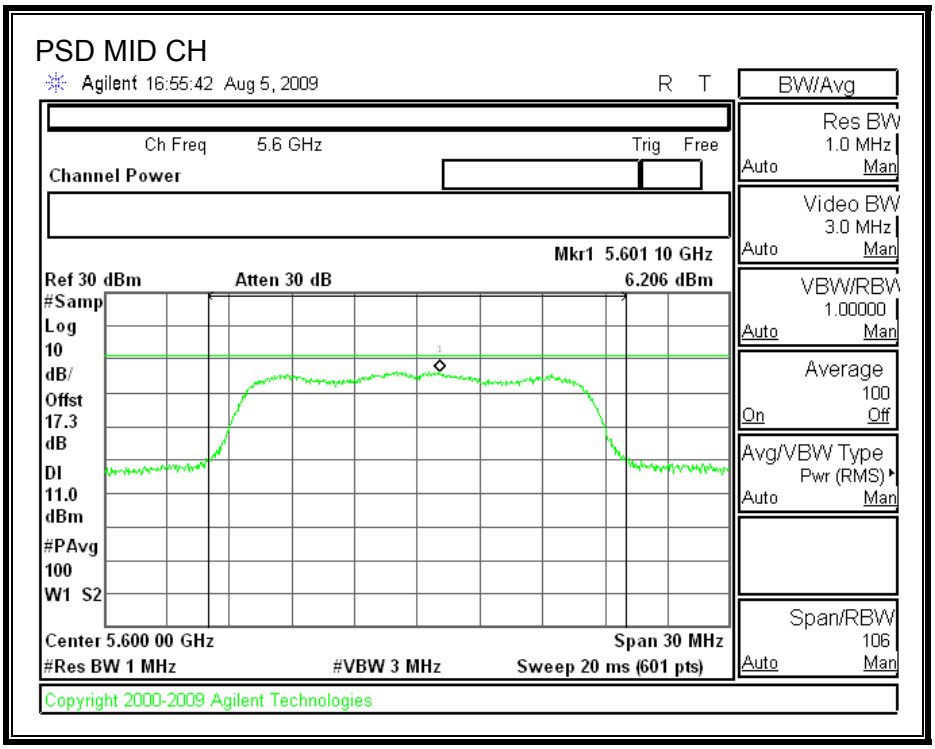
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

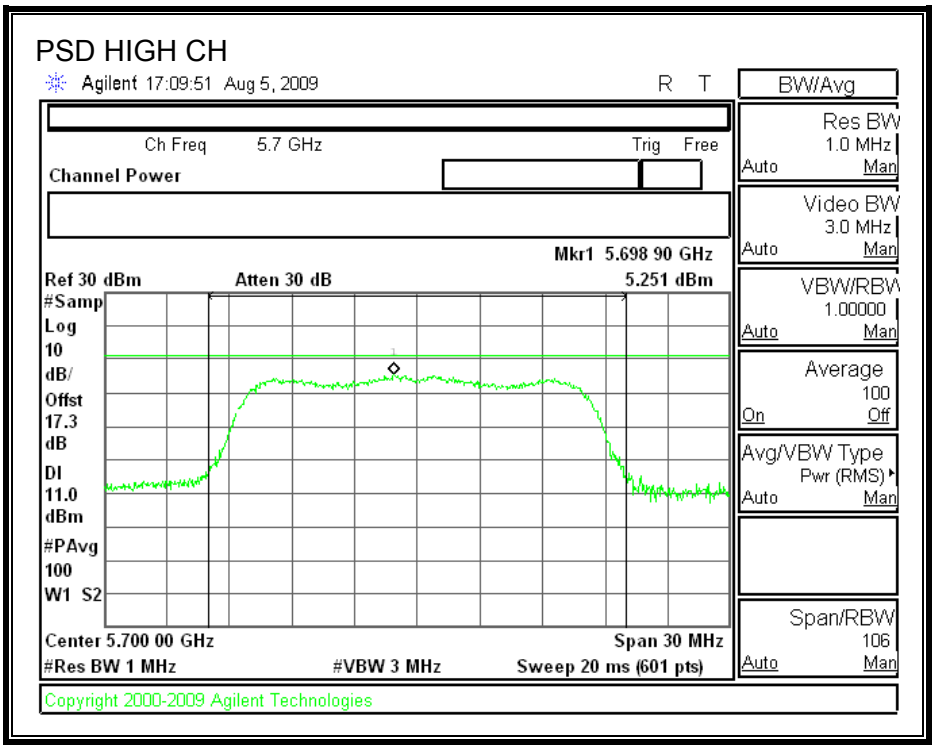
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	6.12	11	-4.88
Middle	5600	6.21	11	-4.79
High	5700	5.25	11	-5.75

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

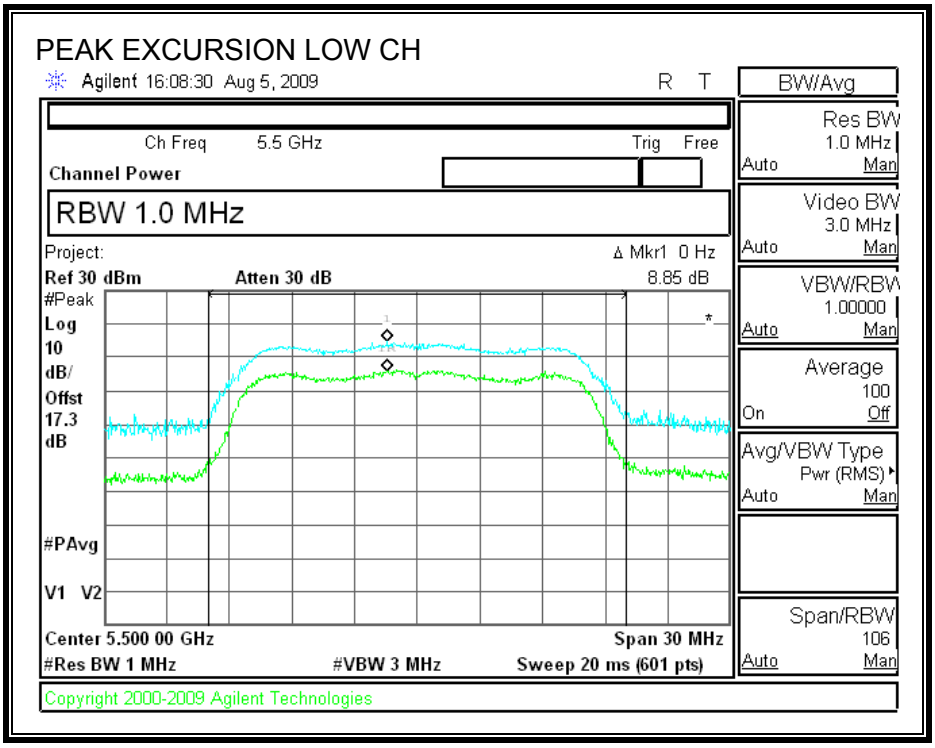
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

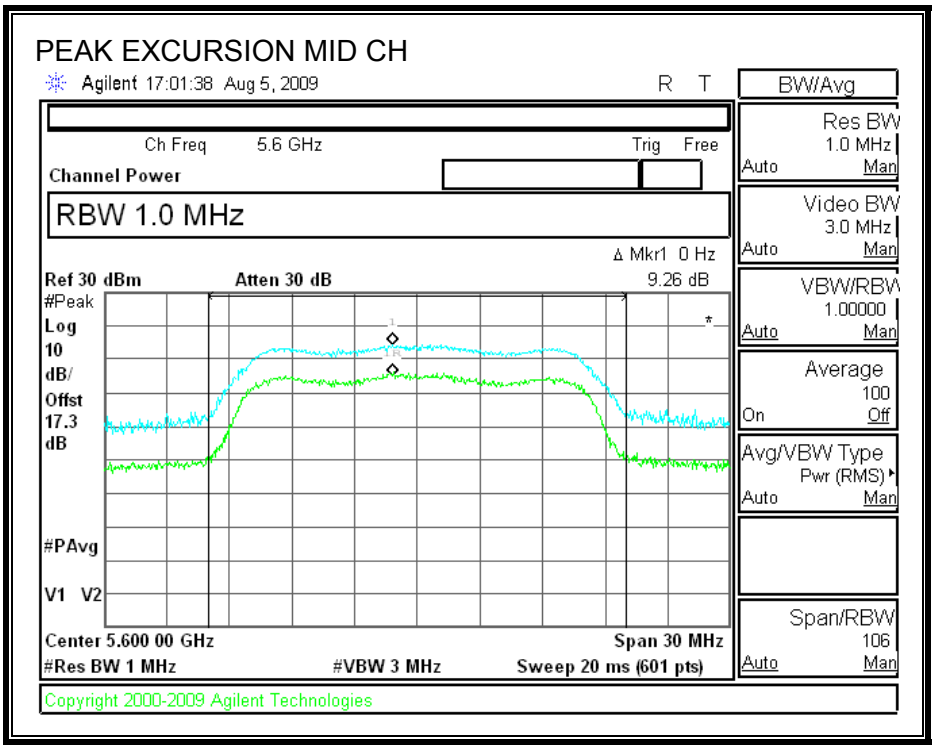
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

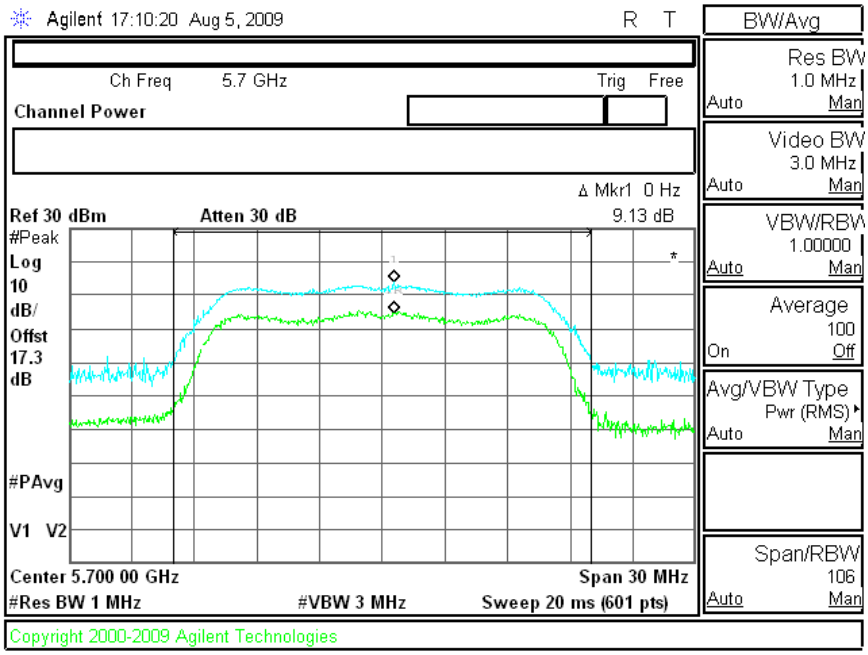
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	8.85	13	-4.15
Middle	5600	9.26	13	-3.74
High	5700	9.13	13	-3.87

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.9.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

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

TEST PROCEDURE

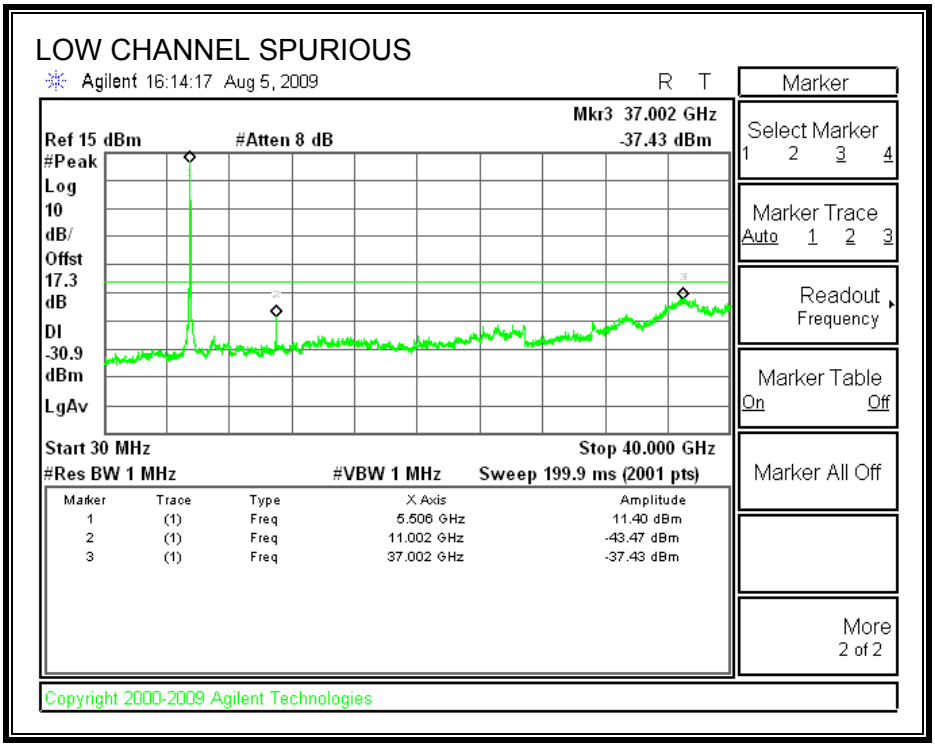
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

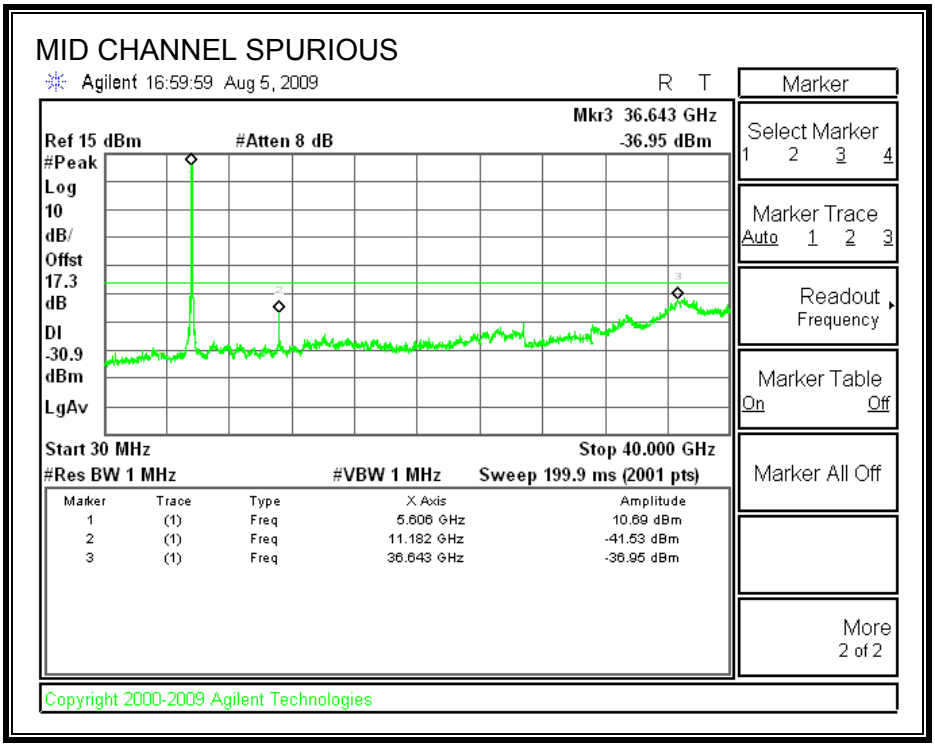
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS

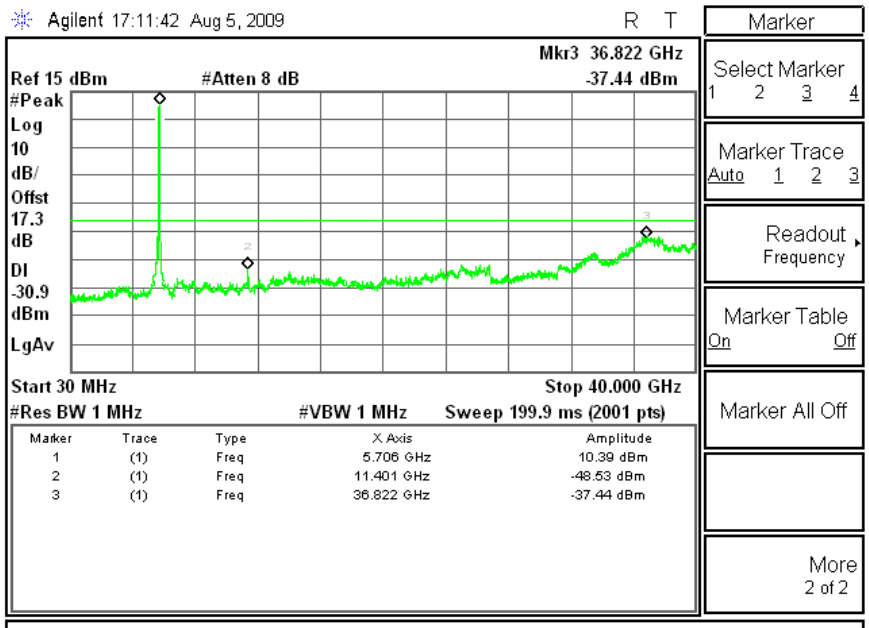
LOW CHANNEL SPURIOUS



MID CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



7.10. 802.11n HT20 MODE IN THE 5.6 GHz BAND

7.10.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

CHAIN 1

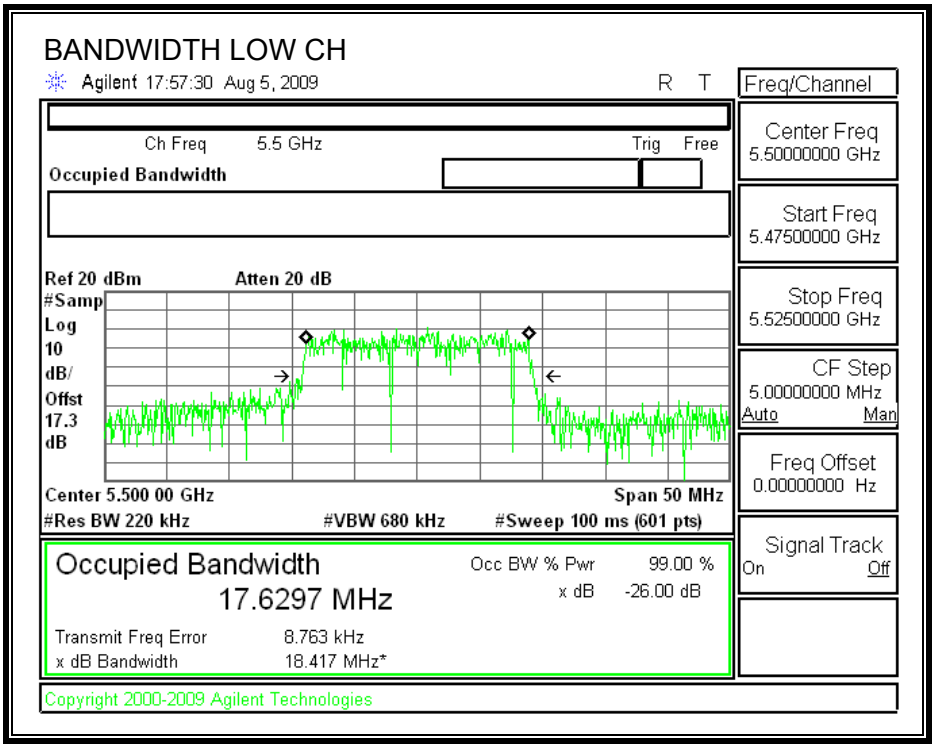
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	18.417	17.629
Middle	5600	19.436	17.5985
High	5700	18.566	17.4711

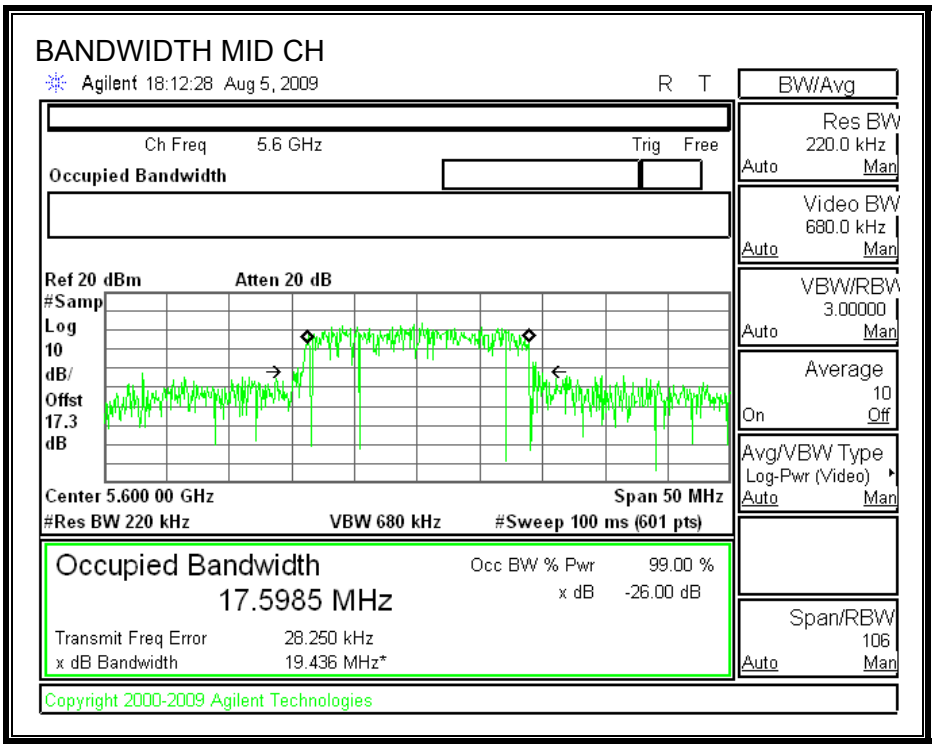
CHAIN 2

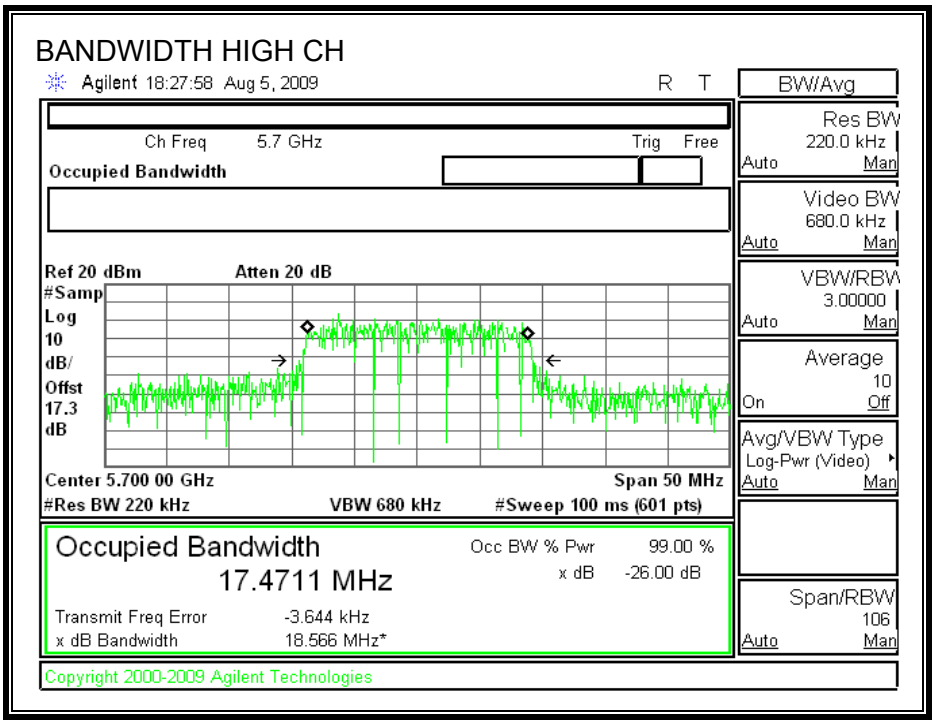
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5500	19.406	17.5811
Middle	5600	19.792	17.7154
High	5700	18.519	17.5042

CHAIN 1

26 dB and 99% BANDWIDTH

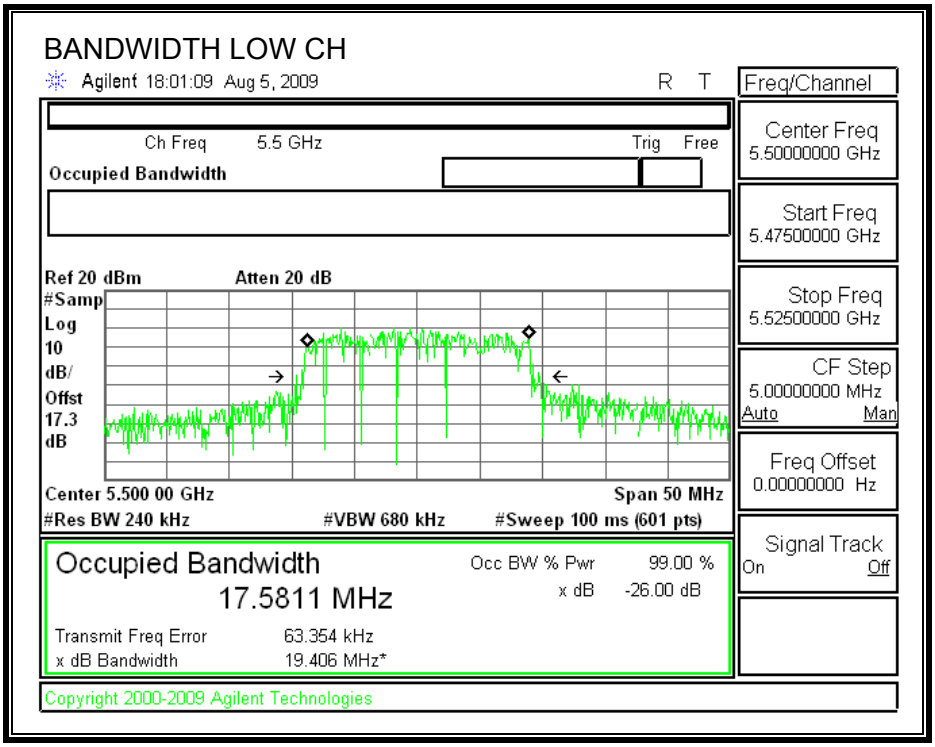




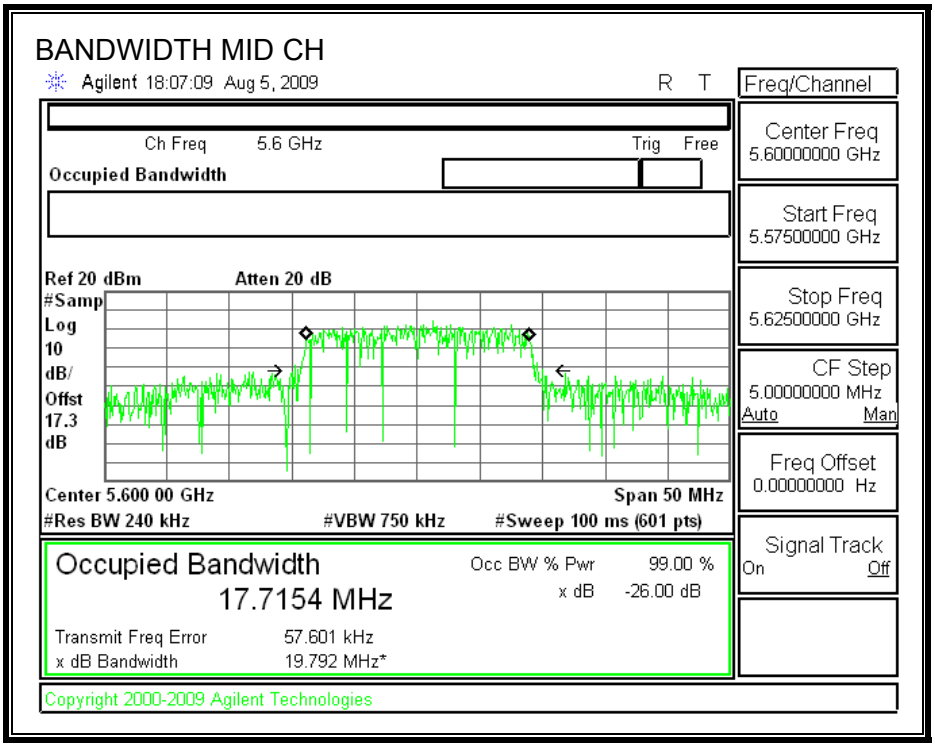


CHAIN 2

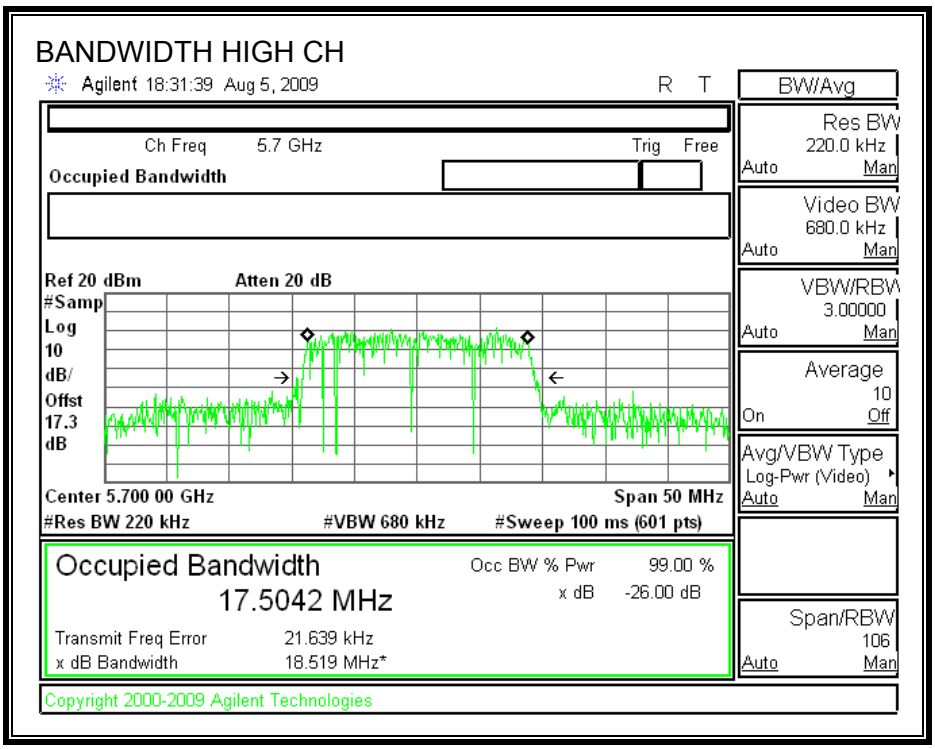
26 dB and 99% BANDWIDTH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.10.2. 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.

The composite antenna gain is 6.68dBi.

TEST PROCEDURE

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

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

RESULTS

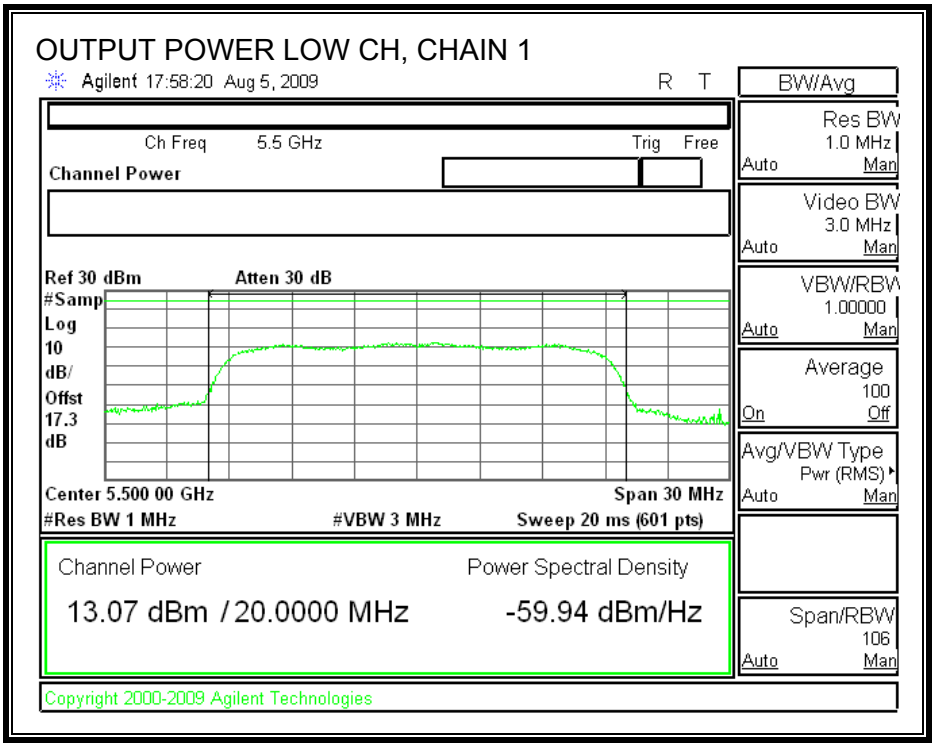
Limit

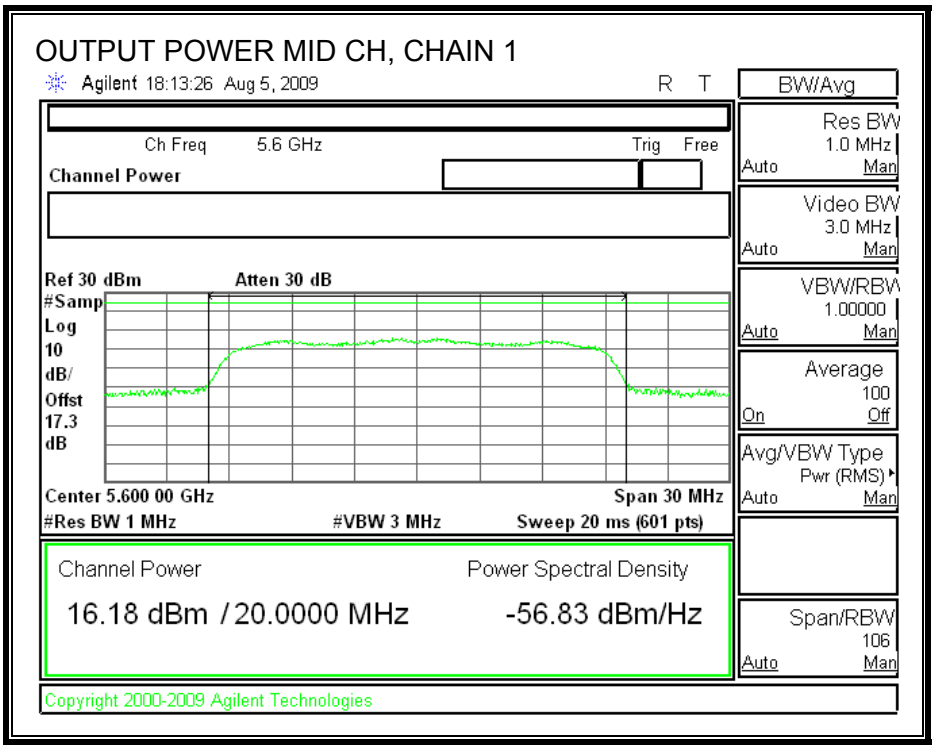
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	19.406	23.88	6.68	23.20
Mid	5600	24	19.792	23.96	6.68	23.28
High	5700	24	18.519	23.68	6.68	23.00

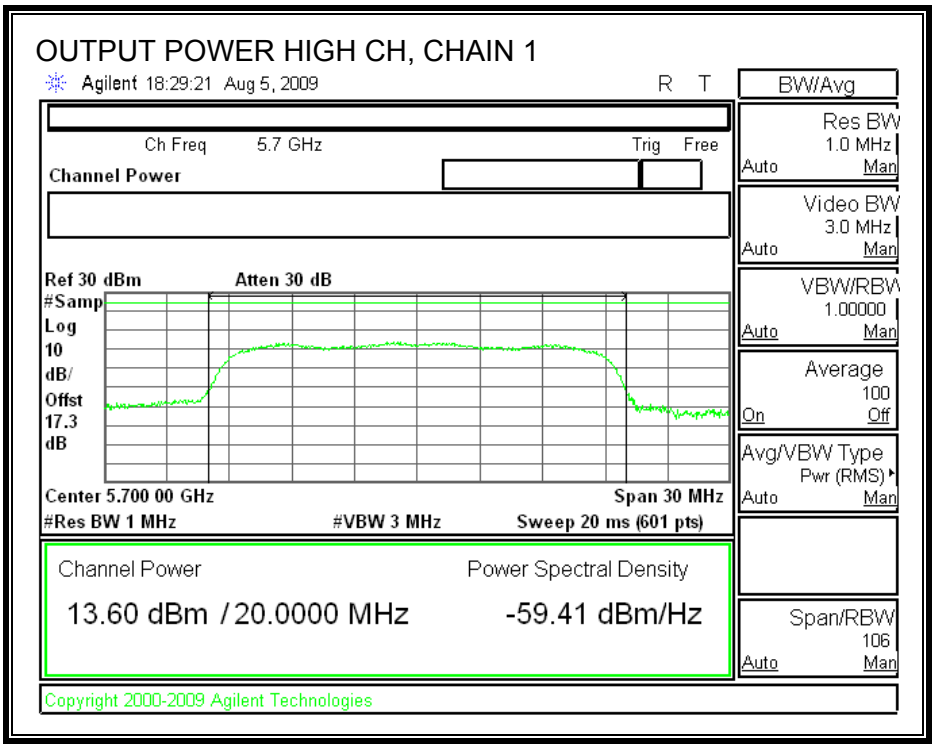
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	13.07	13.07	16.08	23.20	-10.13
Mid	5600	16.18	16.06	19.13	23.28	-7.10
High	5700	13.60	13.47	16.55	23.00	-9.40

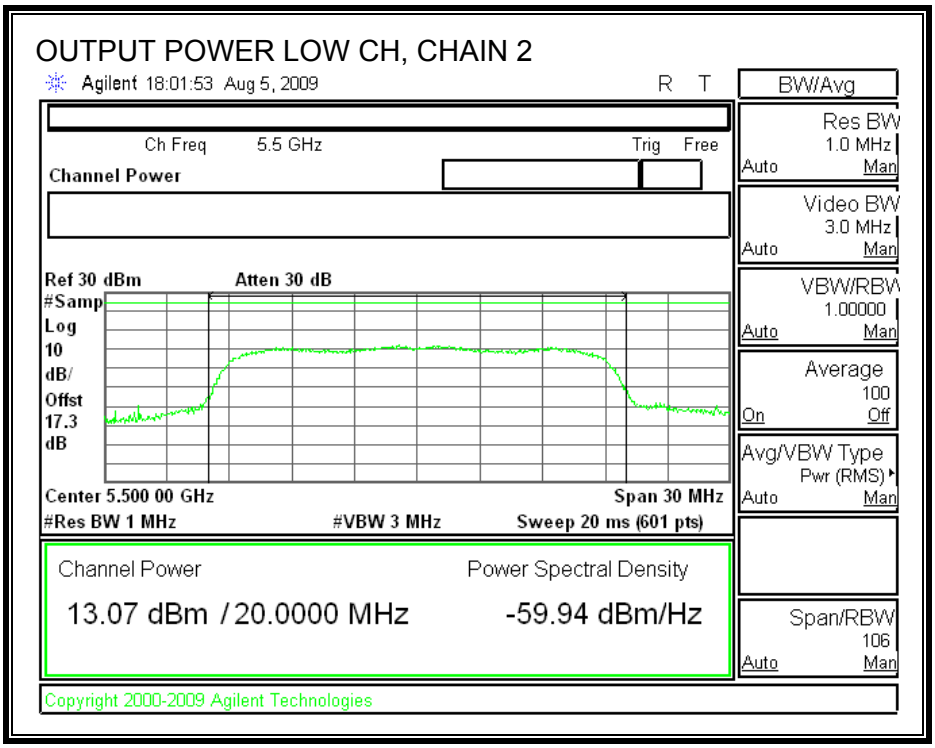
CHAIN 1 OUTPUT POWER

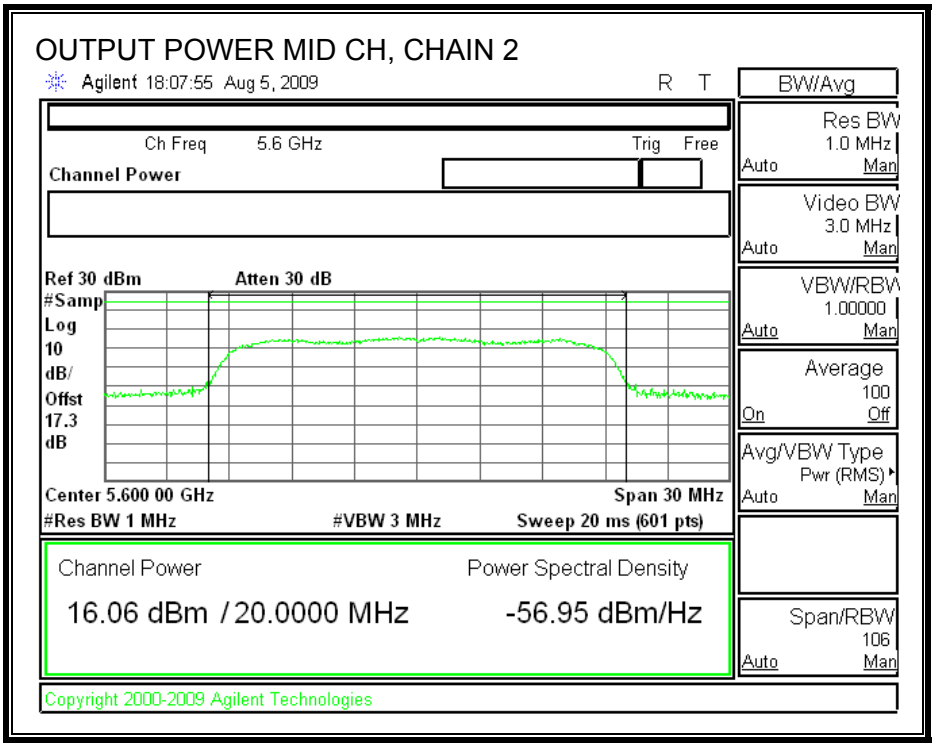


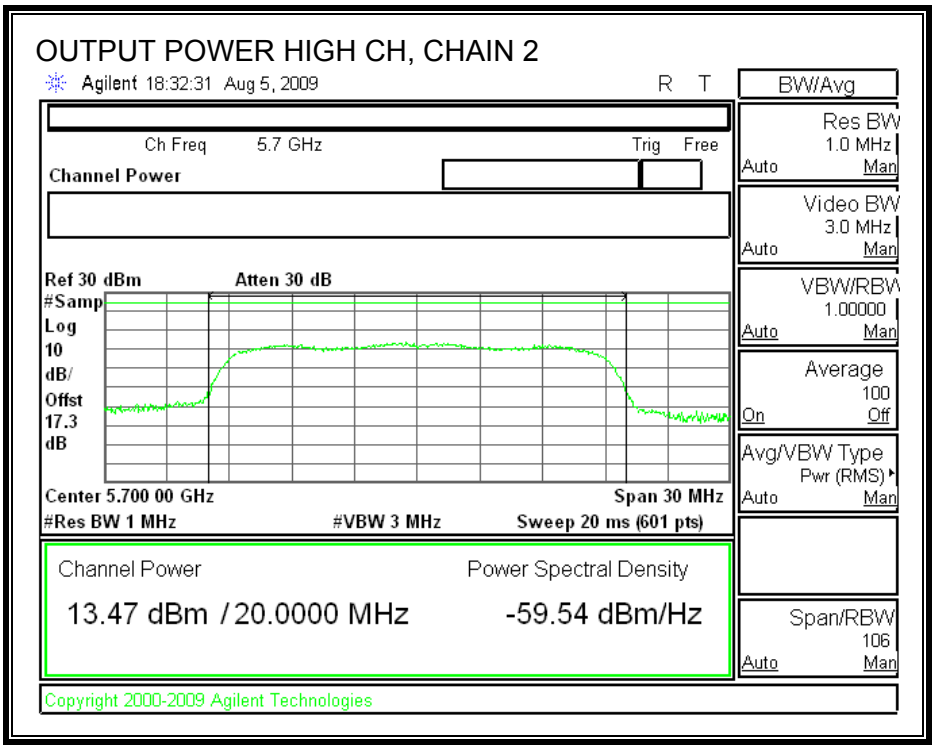




CHAIN 2 OUTPUT POWER







7.10.3. 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 equal to 6.68 dBi, therefore the limit is 10.32 dBm.

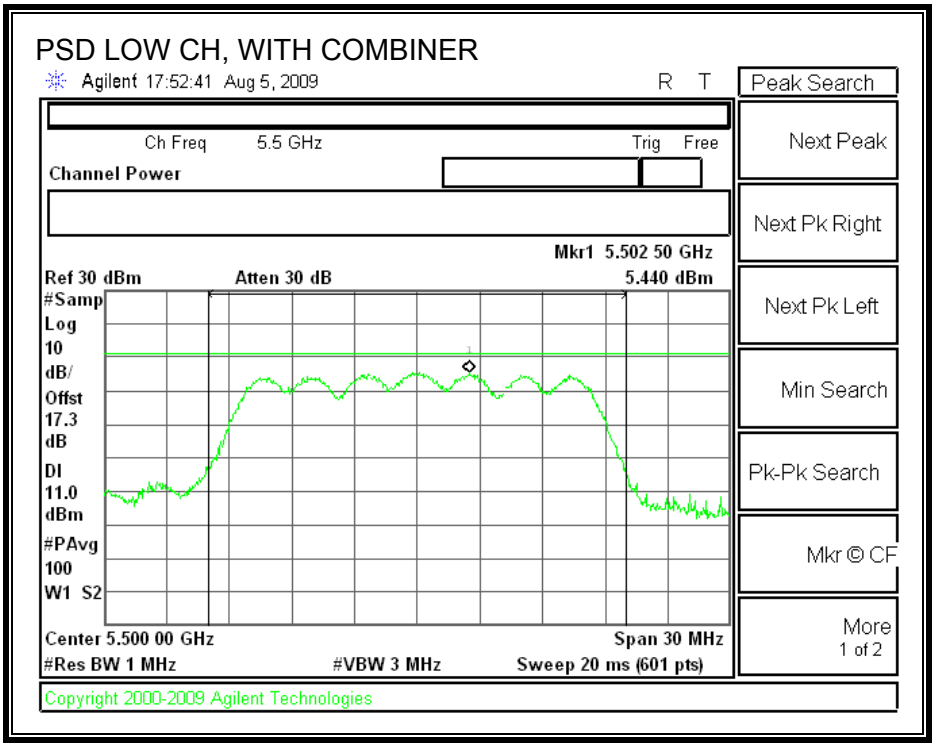
TEST PROCEDURE

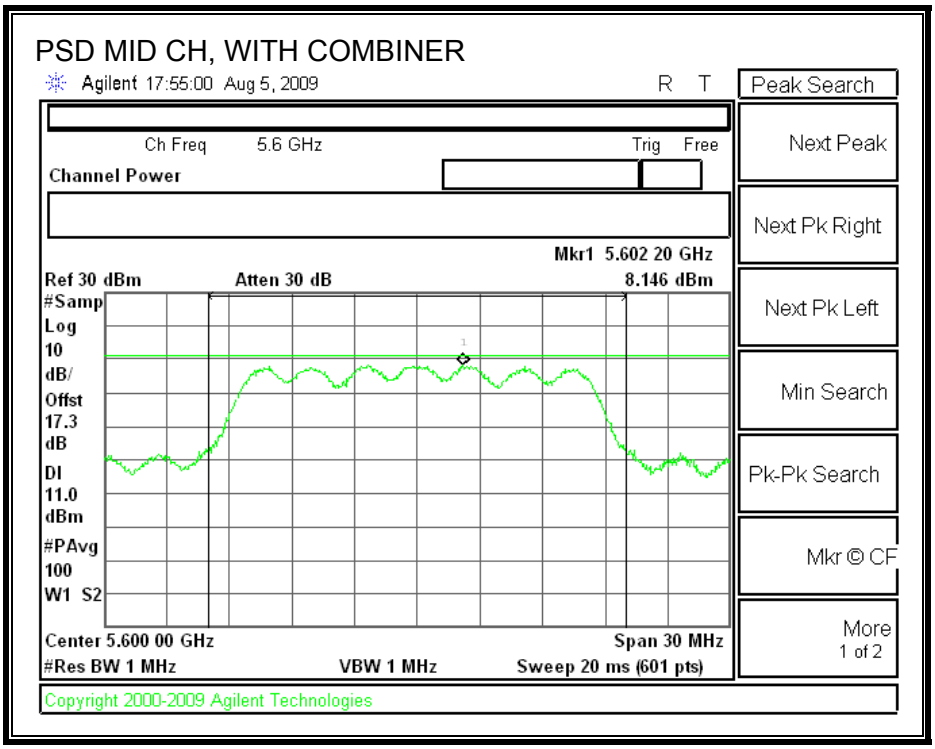
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

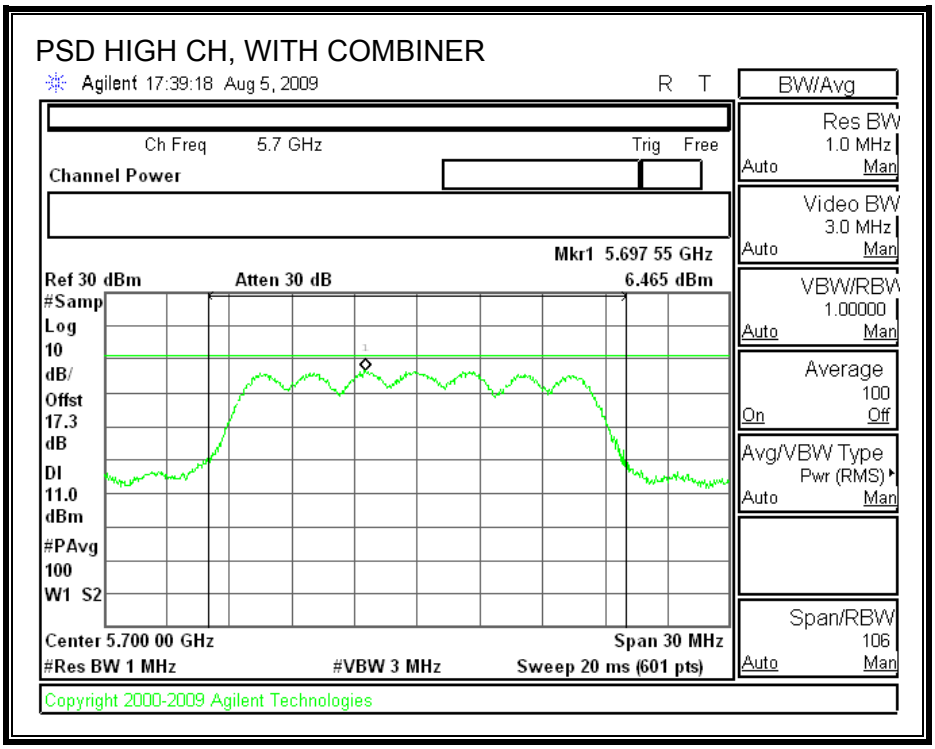
RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5500	5.44	10.32	-4.88
Middle	5600	8.15	10.32	-2.17
High	5700	6.46	10.32	-3.86

POWER SPECTRAL DENSITY WITH COMBINER







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

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

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

RESULTS

CHAIN 1

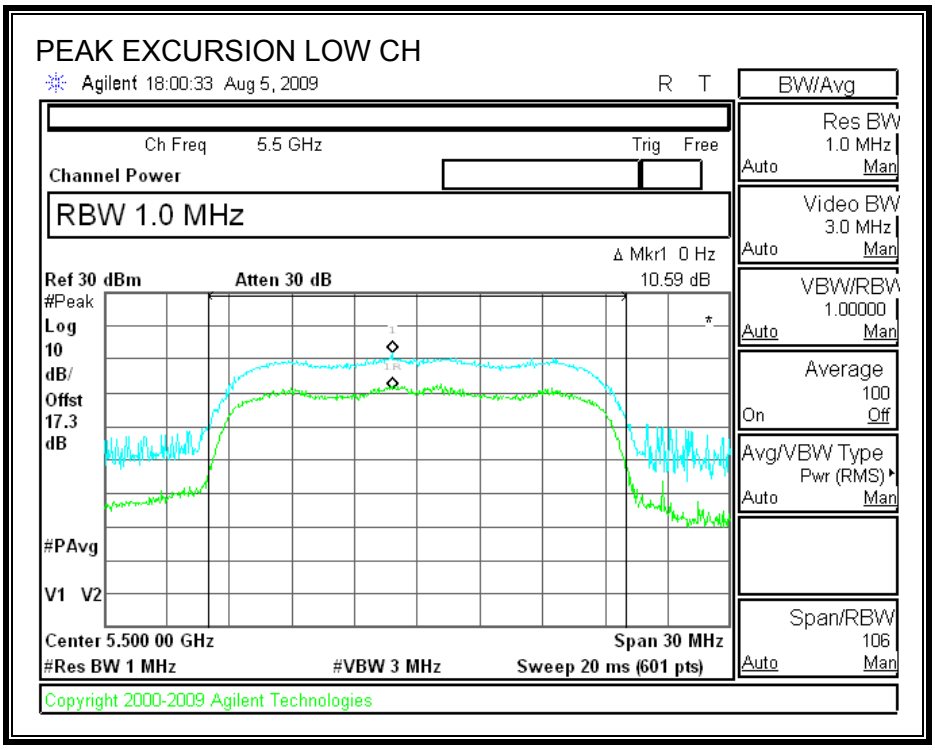
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	10.59	13	-2.41
Middle	5600	9.96	13	-3.04
High	5700	10.08	13	-2.92

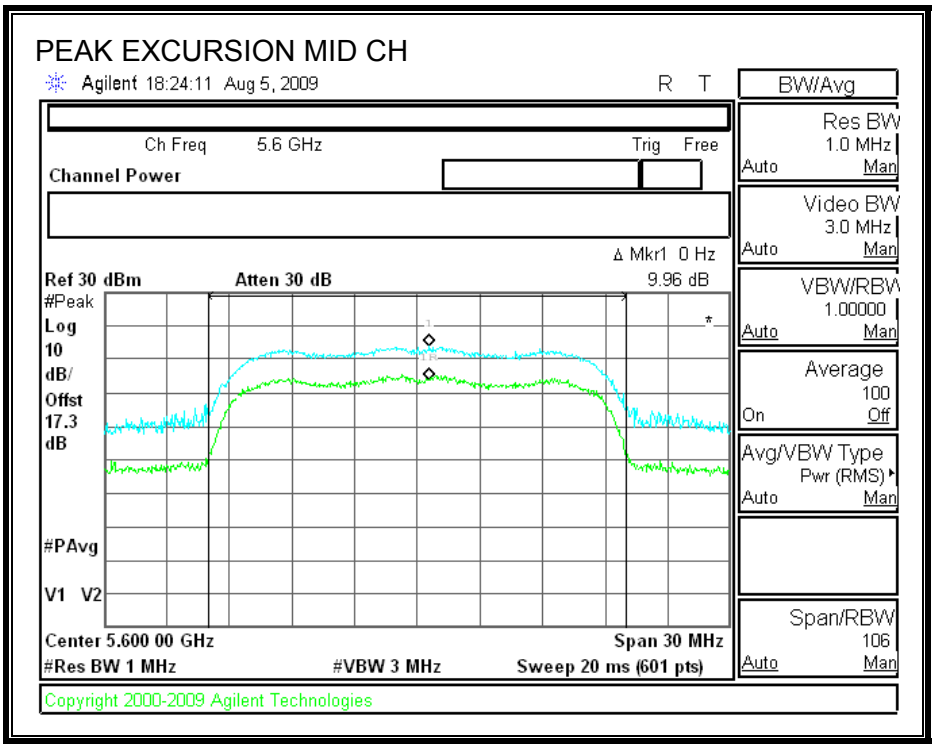
CHAIN 2

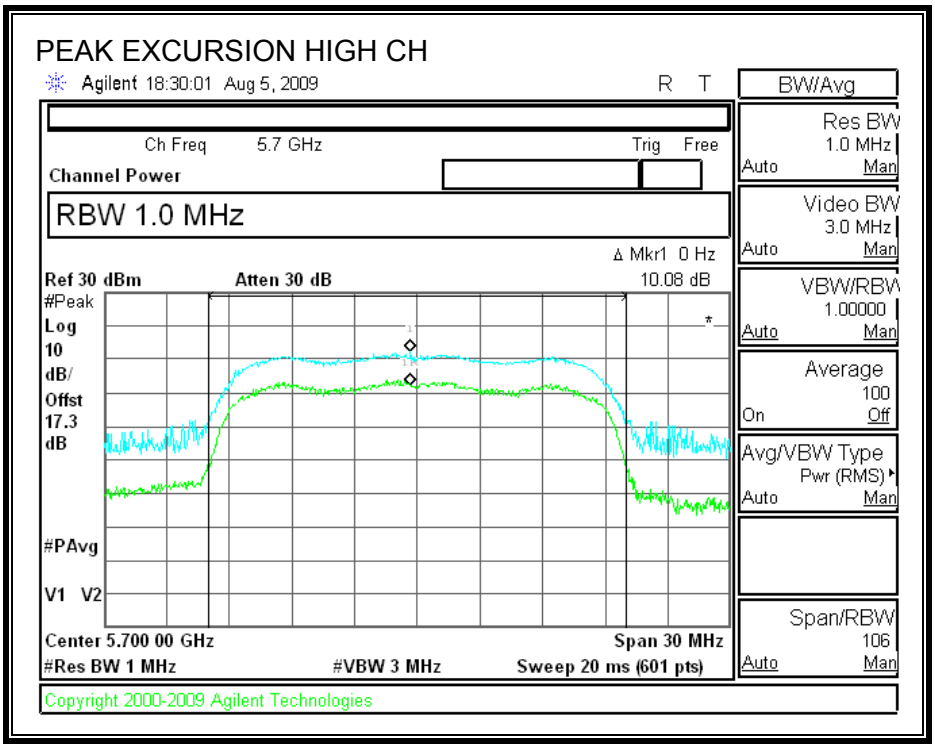
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	10.51	13	-2.49
Middle	5600	9.93	13	-3.07
High	5700	10.97	13	-2.03

CHAIN 1

PEAK EXCURSION

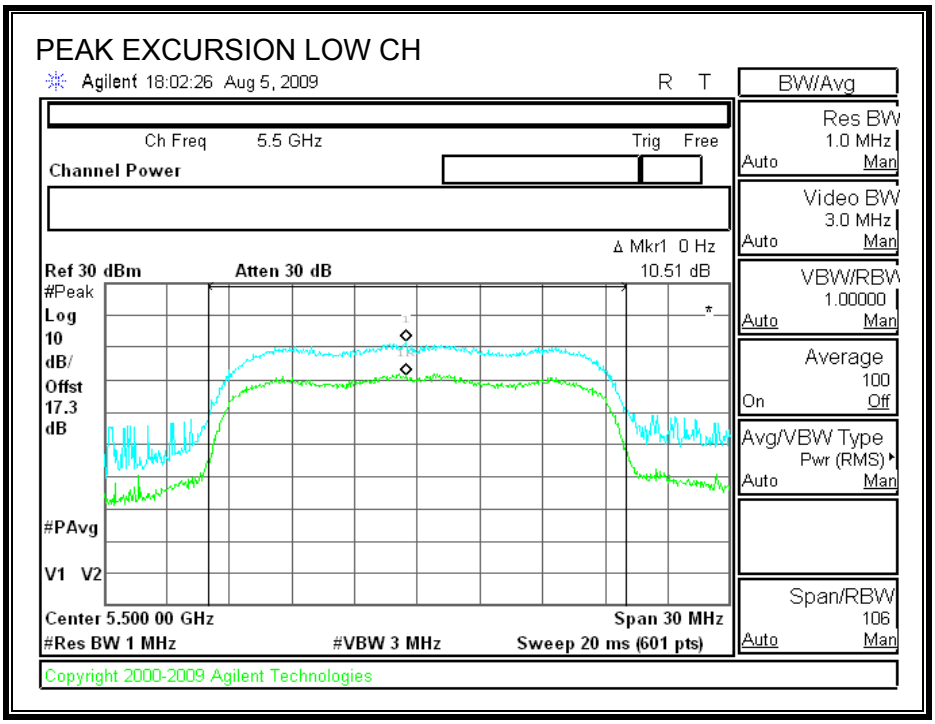




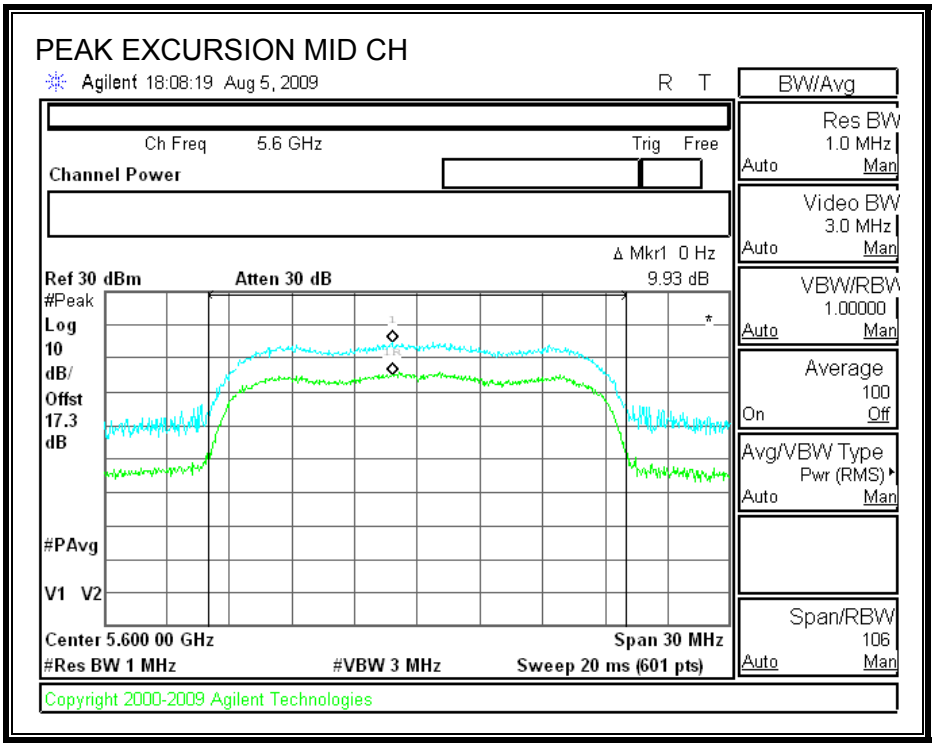


CHAIN 2

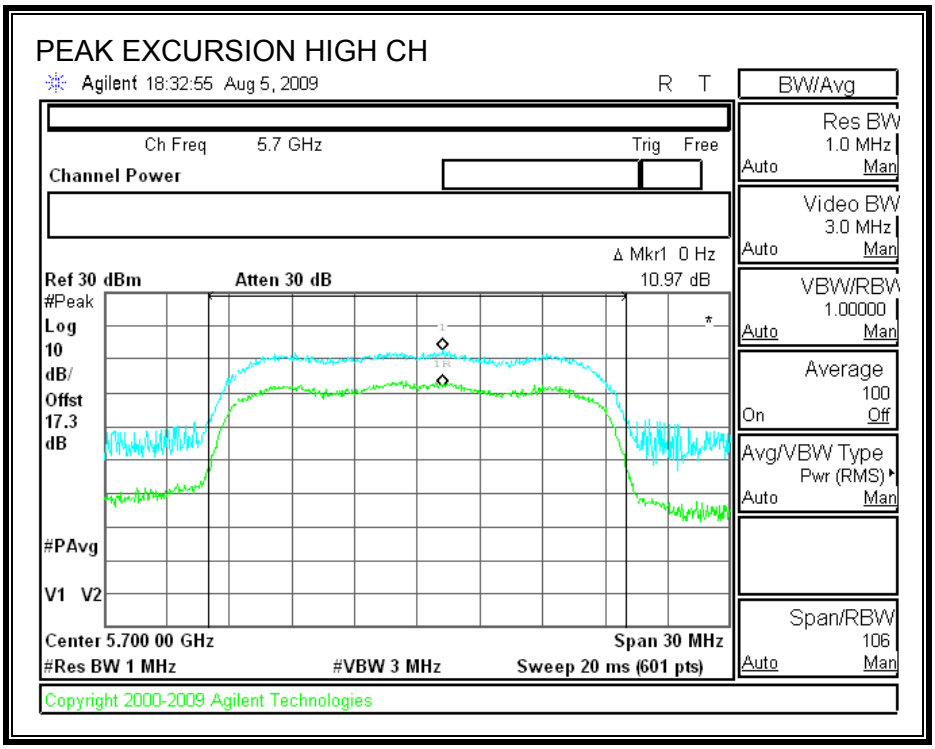
PEAK EXCURSION



PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



7.10.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

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

TEST PROCEDURE

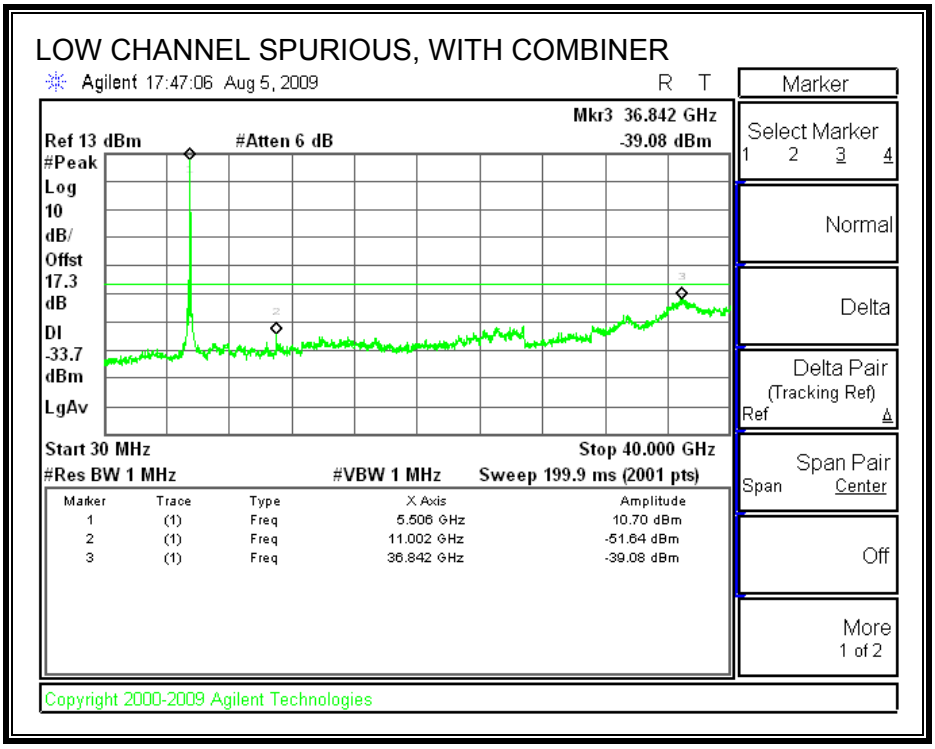
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

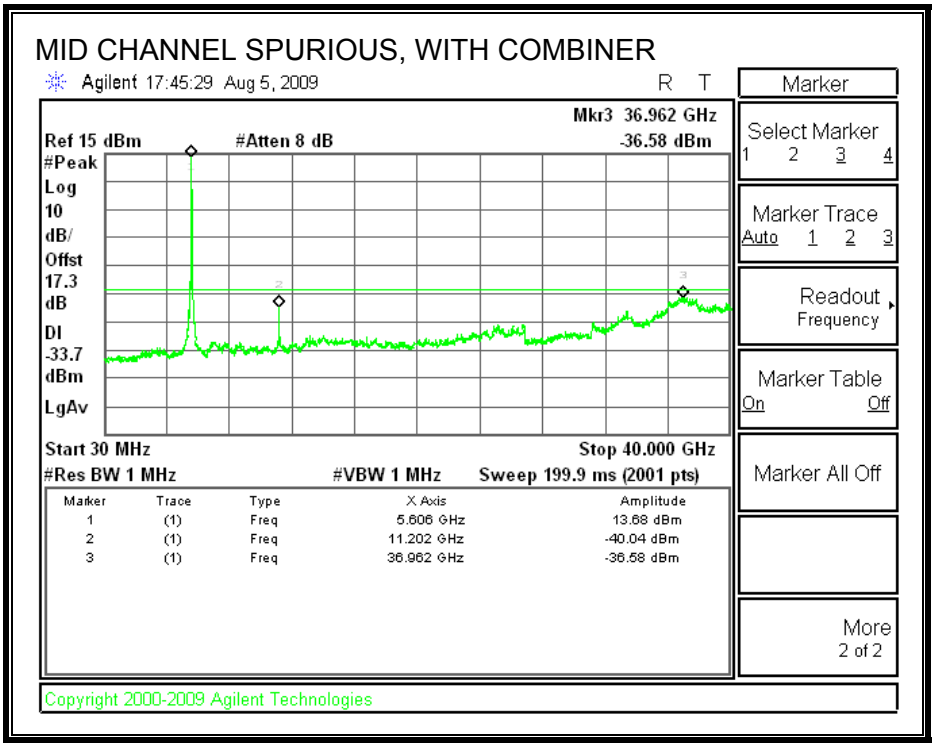
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS WITH COMBINER

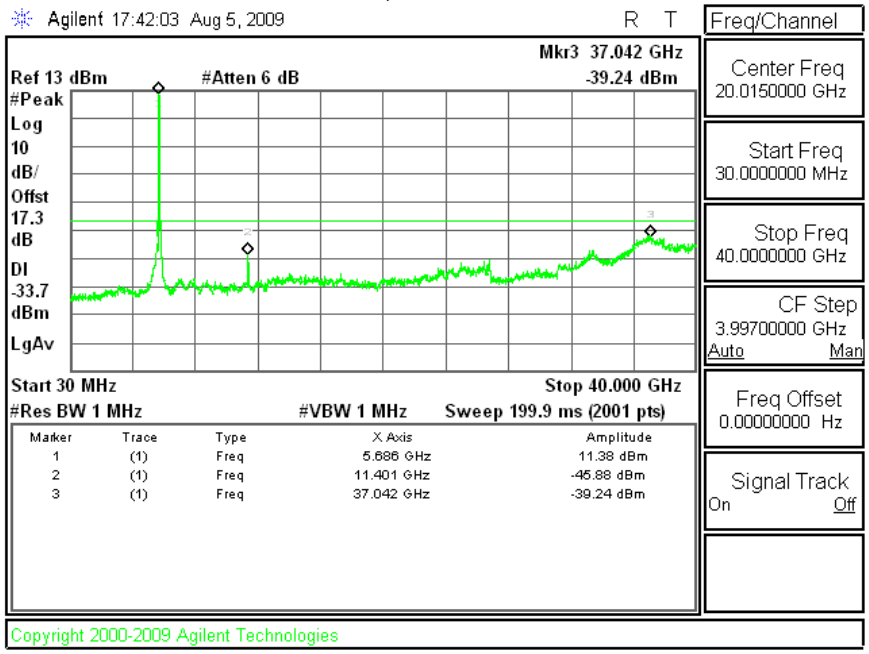
LOW CHANNEL SPURIOUS, WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.11. 802.11n HT40 SISO MODE IN THE 5.6 GHz BAND

7.11.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

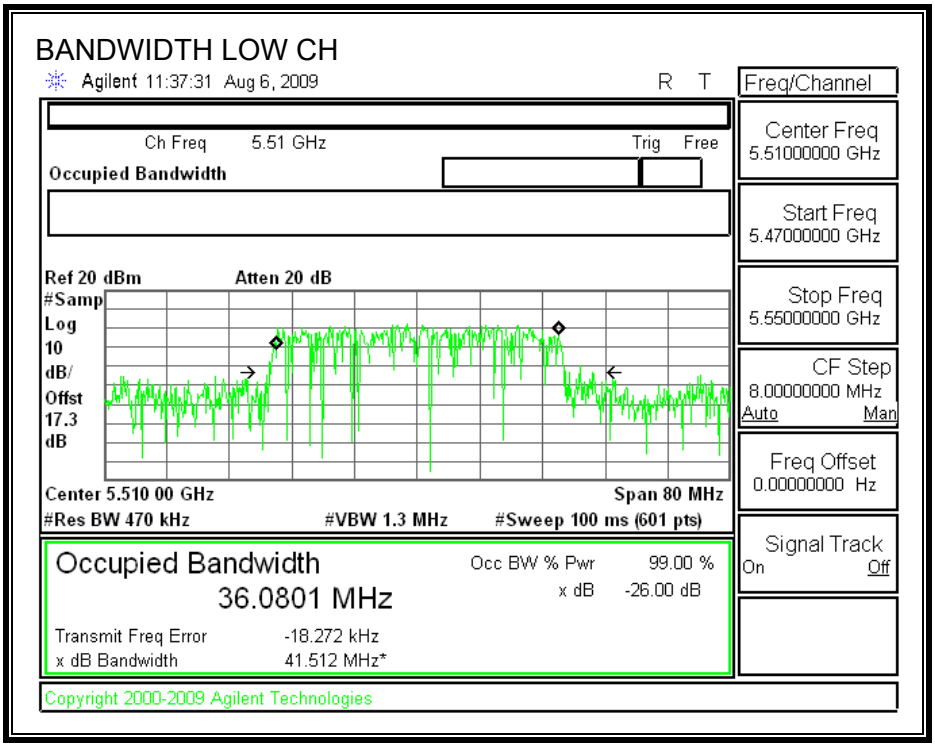
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

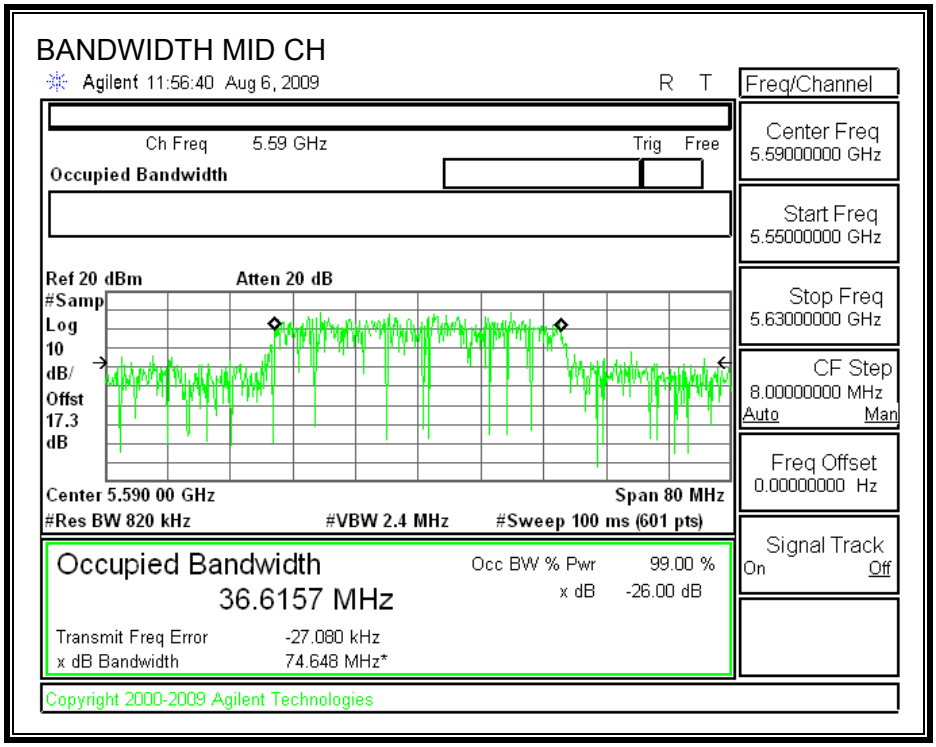
RESULTS

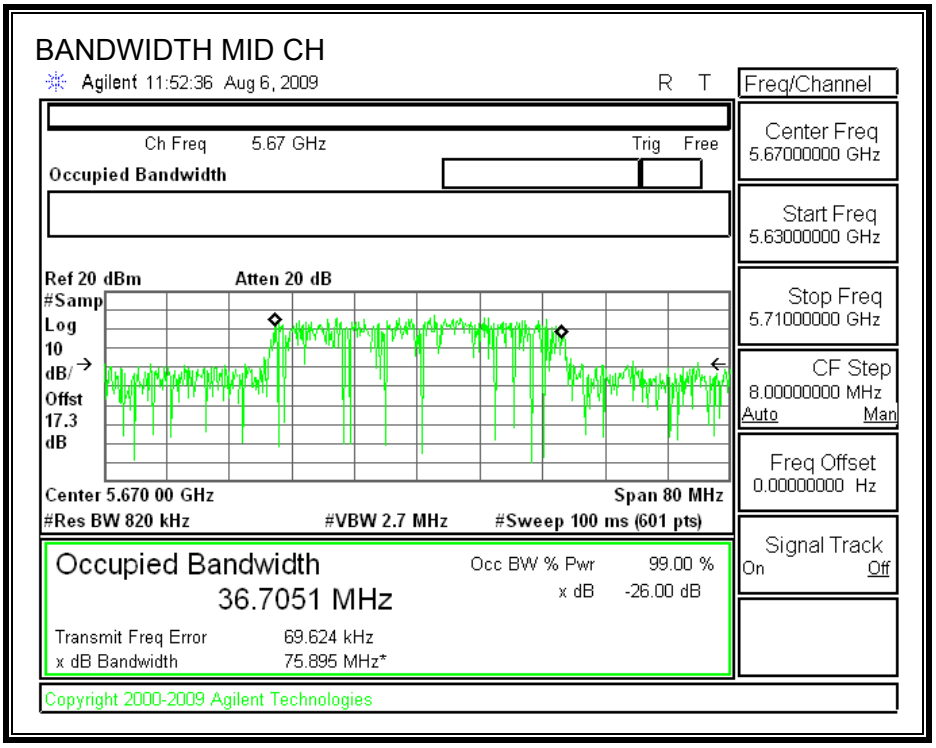
CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	41.512	36.0801
Mid	5590	74.648	36.615
High	5670	75.895	36.7051

26 dB and 99% BANDWIDTH







7.11.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is 3.94 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

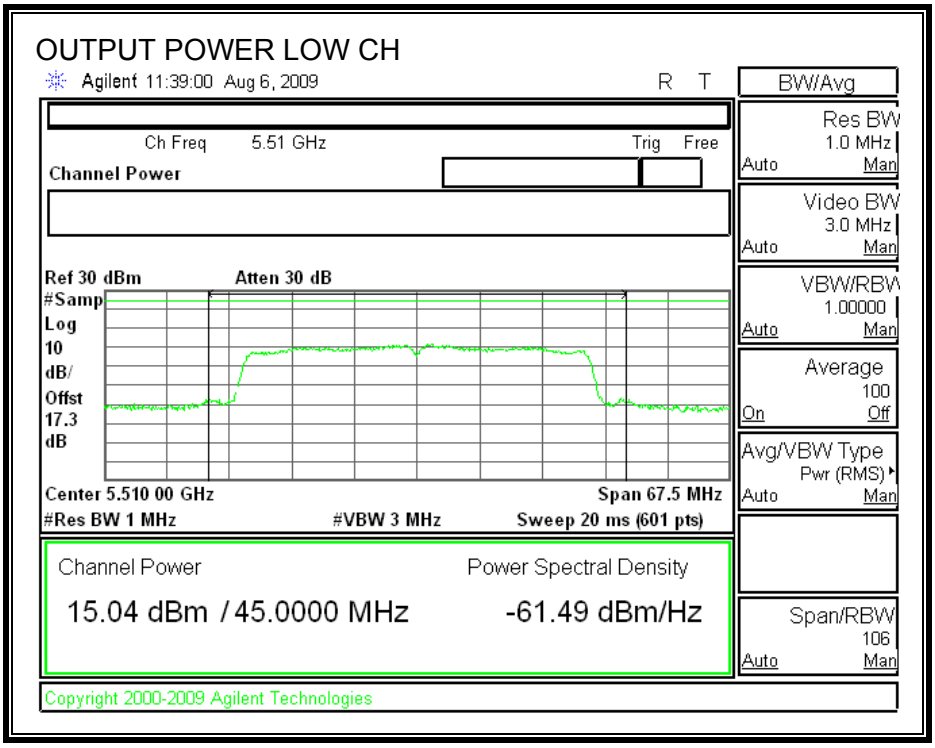
Limit

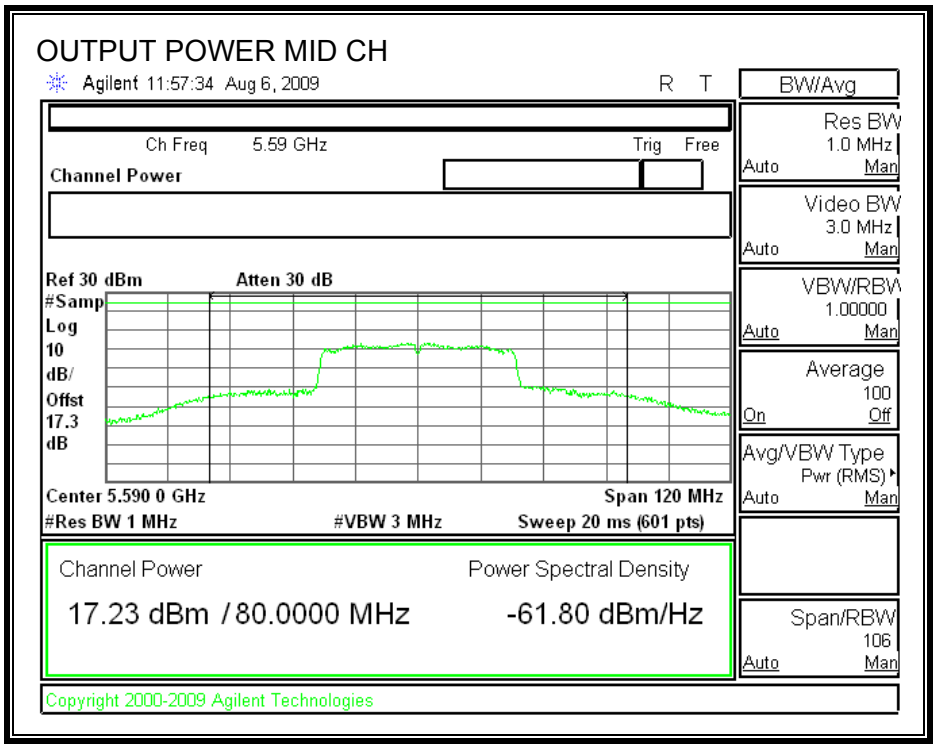
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5510	24	41.512	20.18	3.94	20.18
Low	5590	24	74.648	22.73	3.94	22.73
High	5670	24	75.895	22.80	3.94	22.80

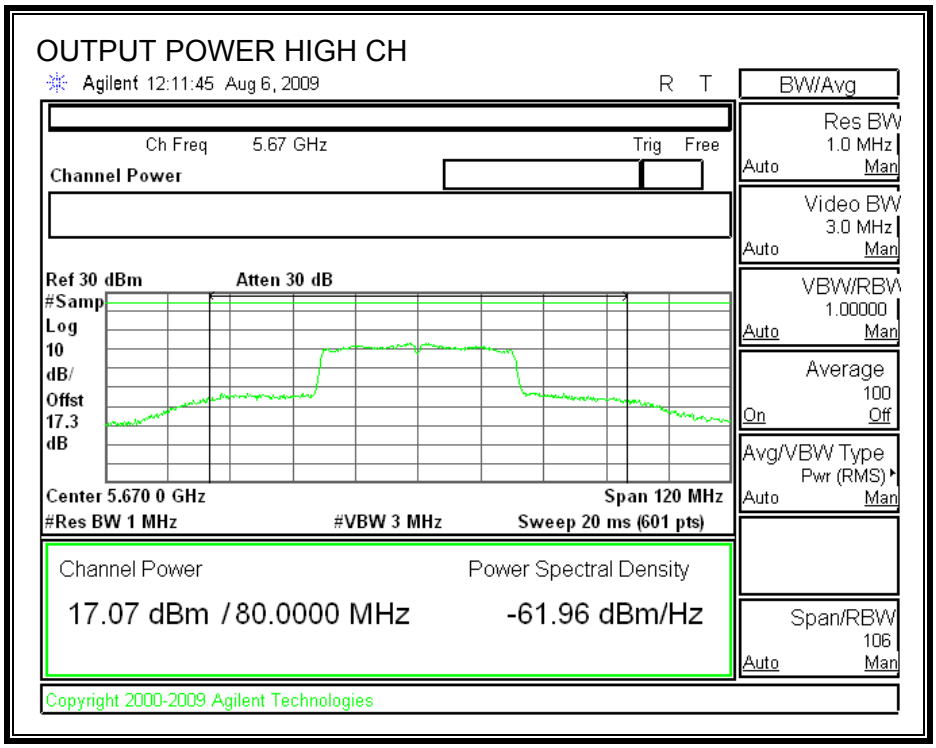
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	15.04	20.18	-5.14
Low	5590	17.23	22.73	-5.50
High	5670	17.07	22.80	-5.73

OUTPUT POWER







7.11.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The composite antenna gain is 3.29 dBi, therefore the limit is 11 dBm.

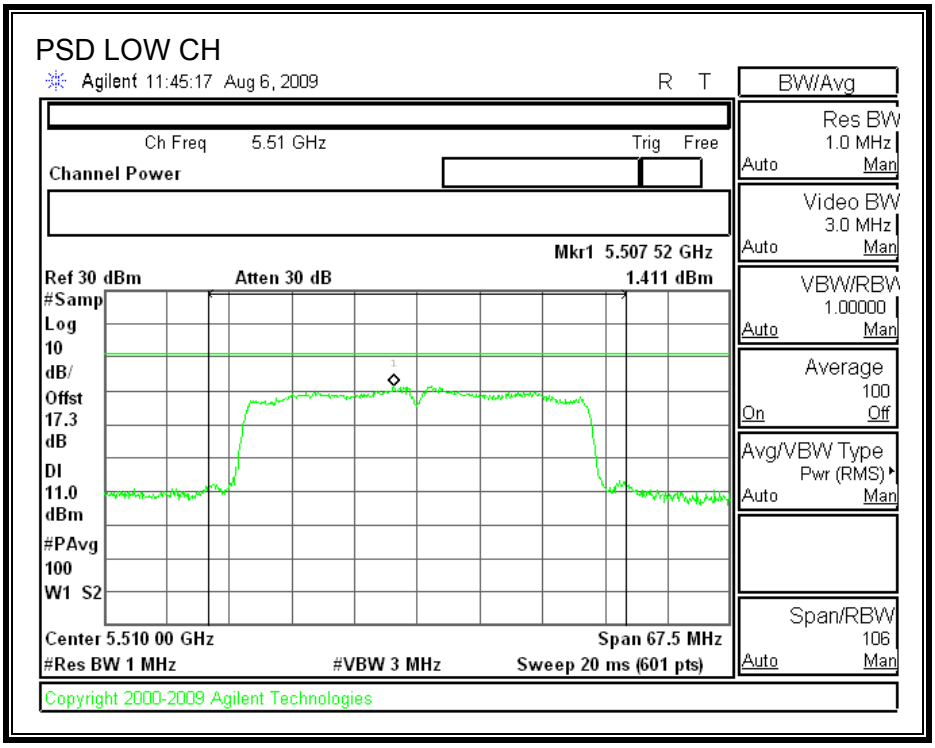
TEST PROCEDURE

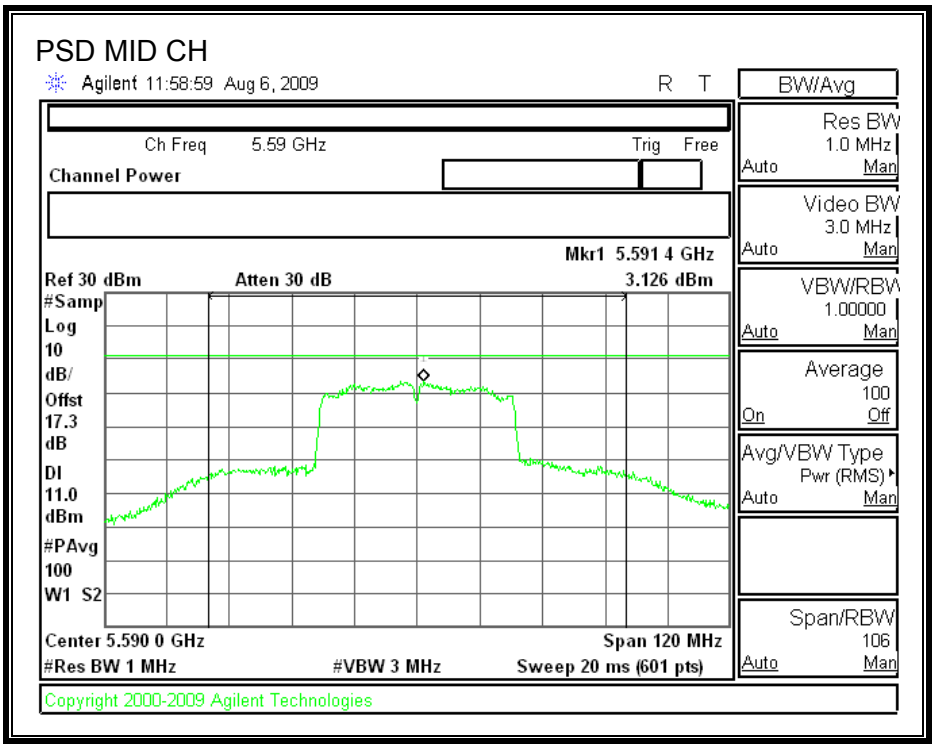
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

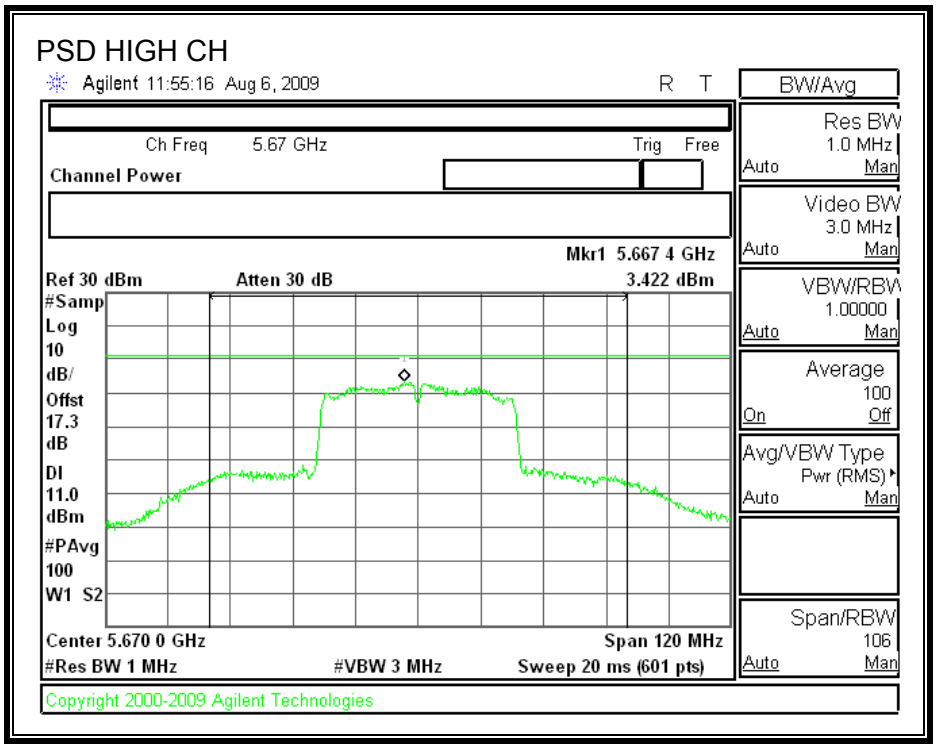
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	1.41	11.00	-9.59
Mid	5590	3.13	11.00	-7.87
High	5670	3.42	11.00	-7.58

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.

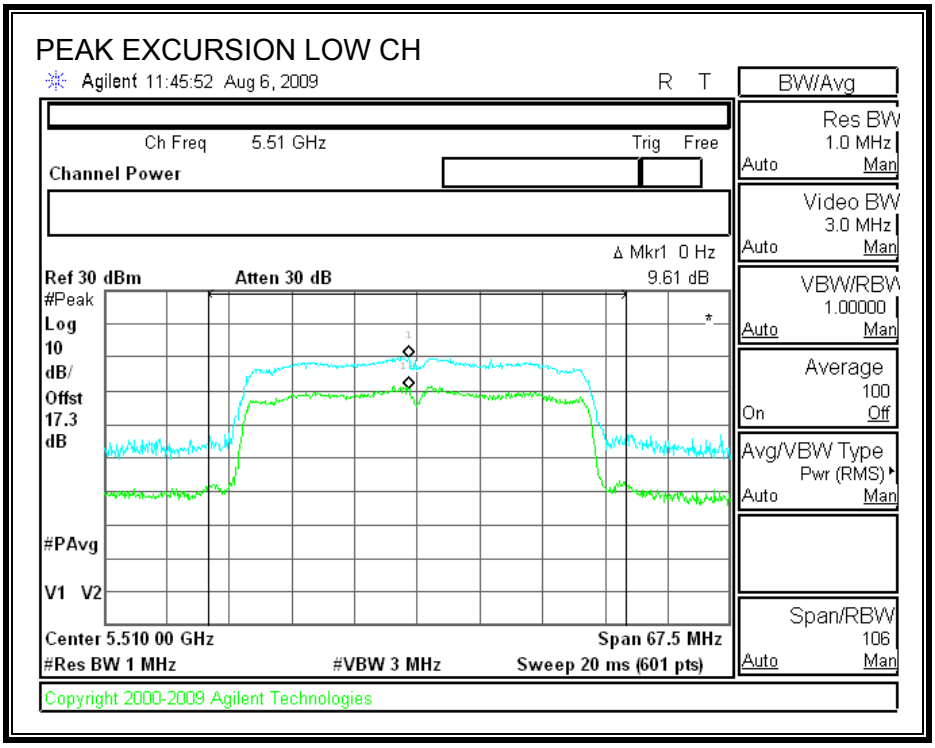
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

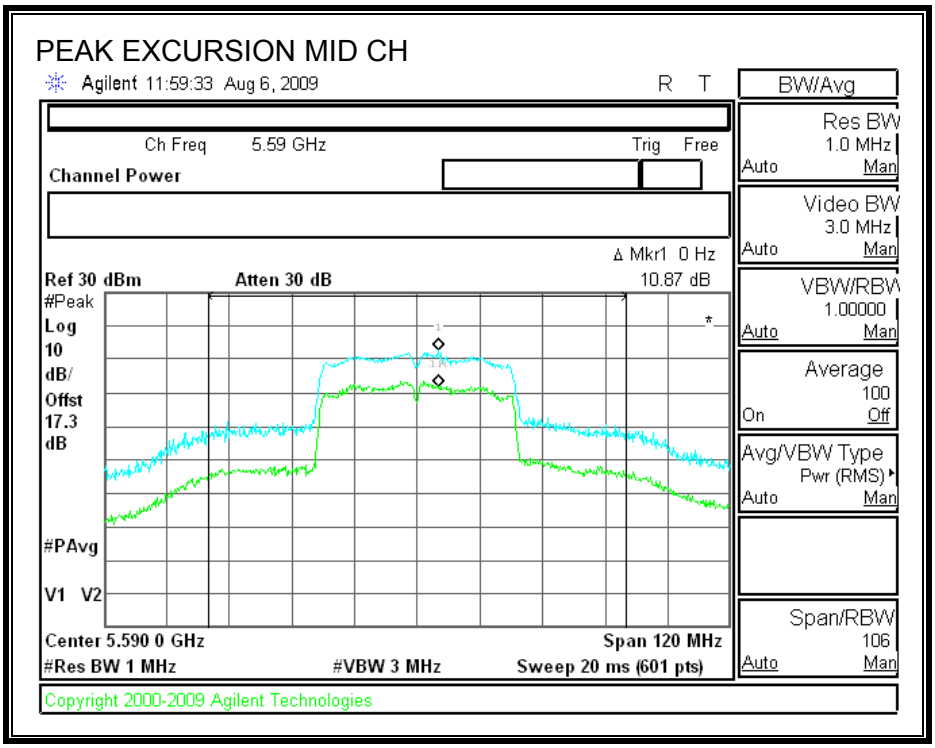
RESULTS

CHAIN 1

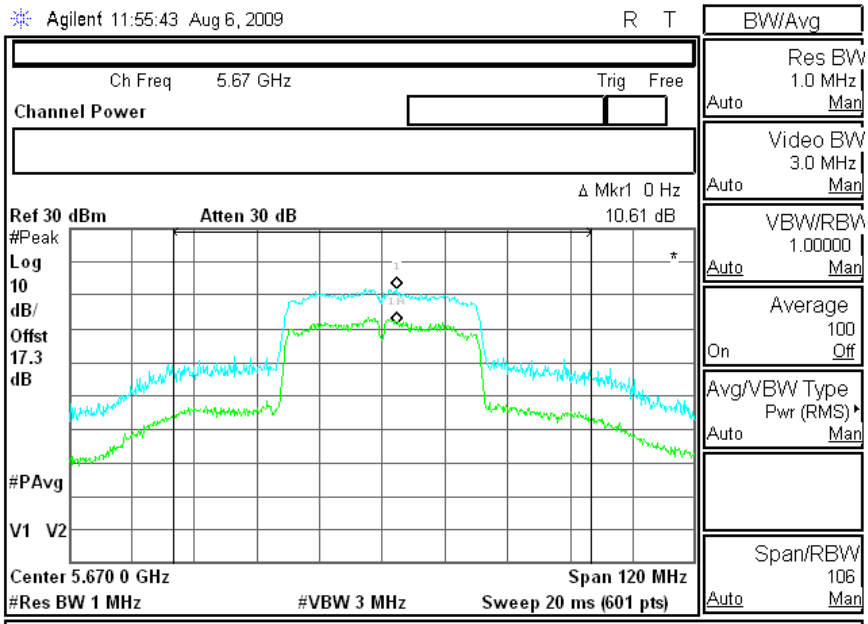
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	9.61	13	-3.39
Mid	5590	10.87	13	-2.13
High	5670	10.61	13	-2.39

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.11.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

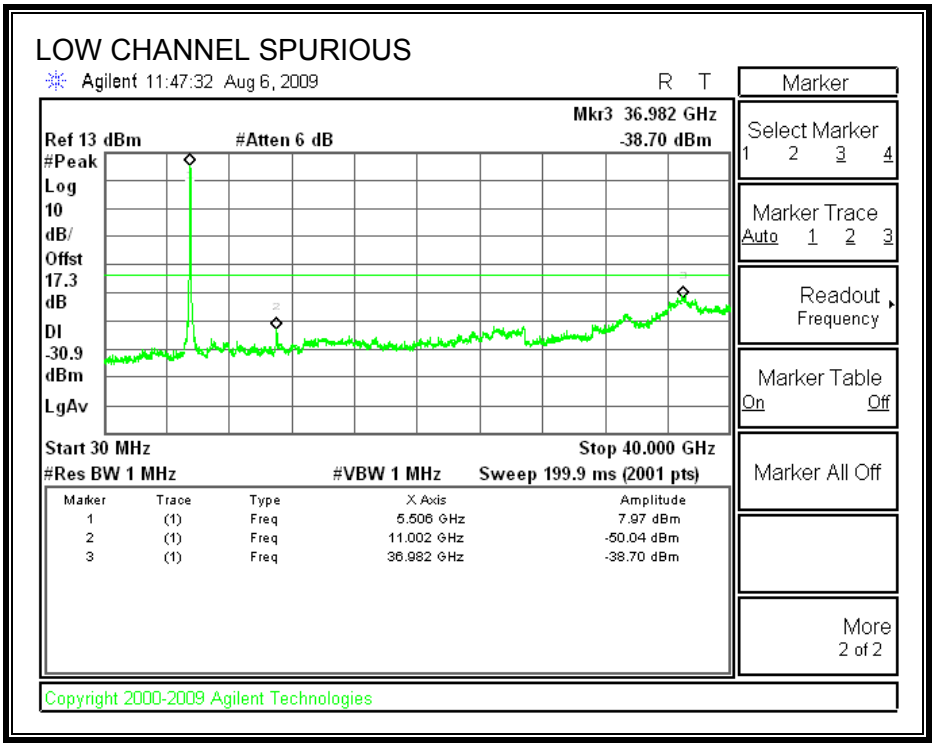
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

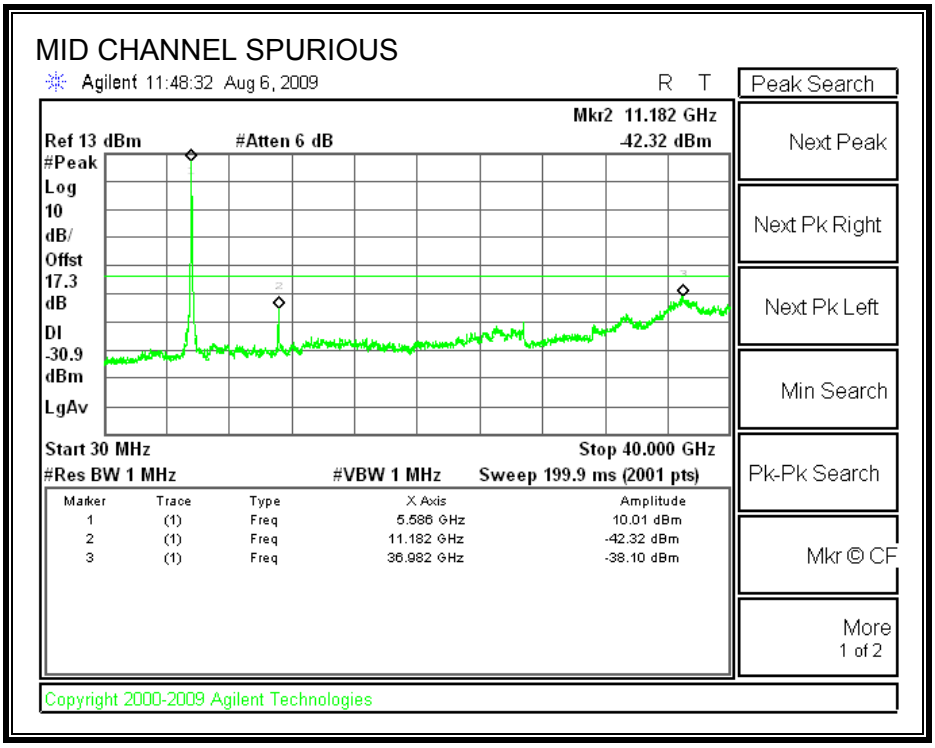
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS

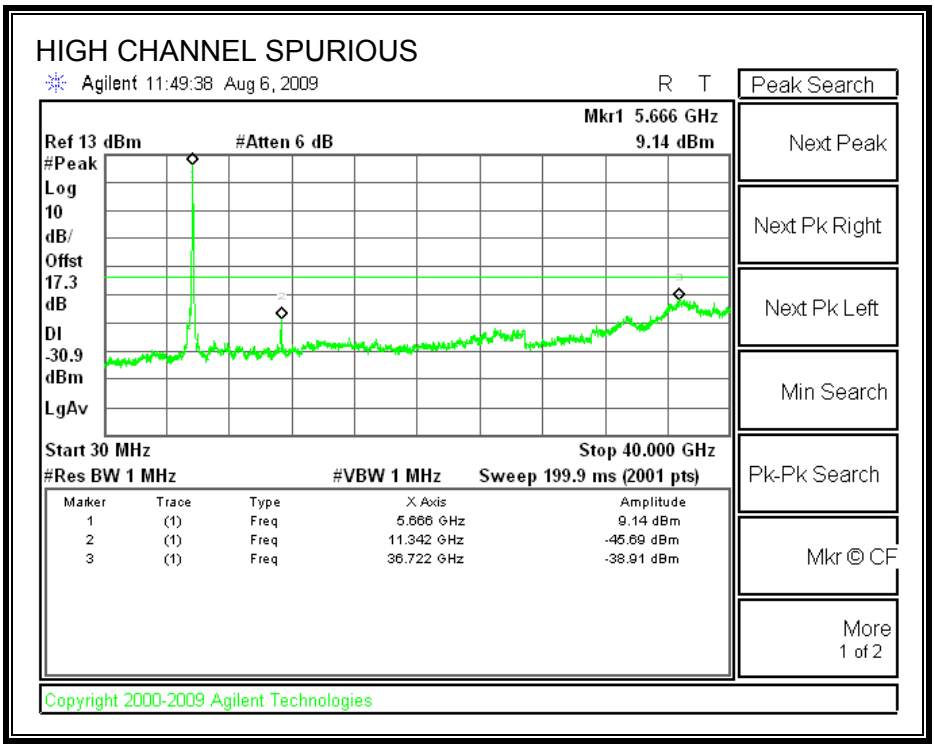
LOW CHANNEL SPURIOUS



MID CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



7.12. 802.11n HT40 MODE IN THE 5.6 GHz BAND

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

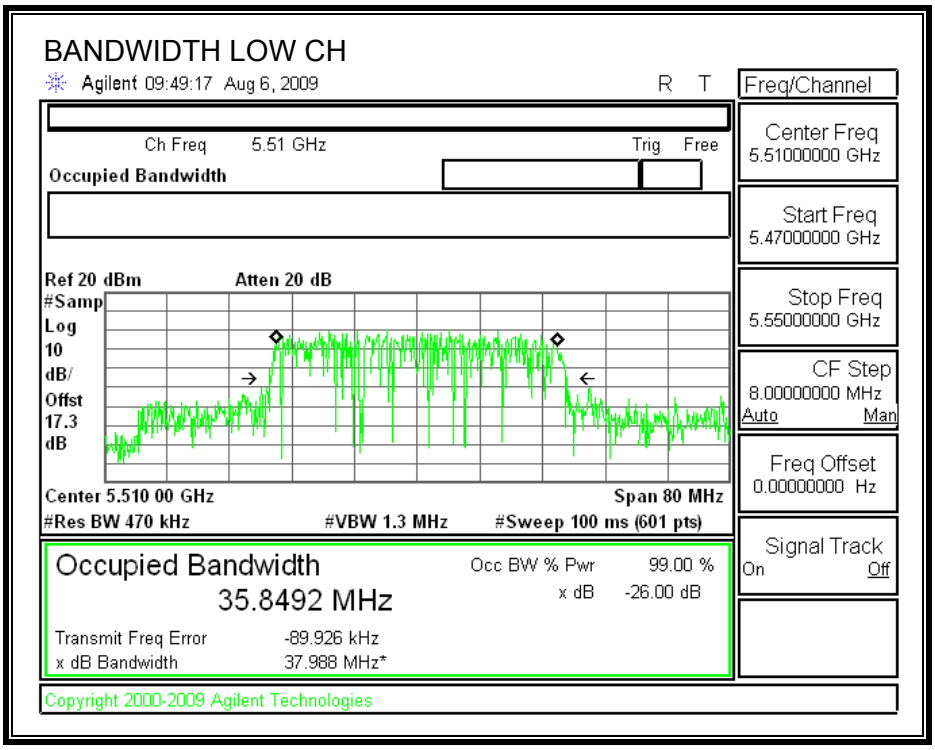
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	37.988	35.8492
Middle	5590	78.714	37.6894
High	5670	55.719	36.4249

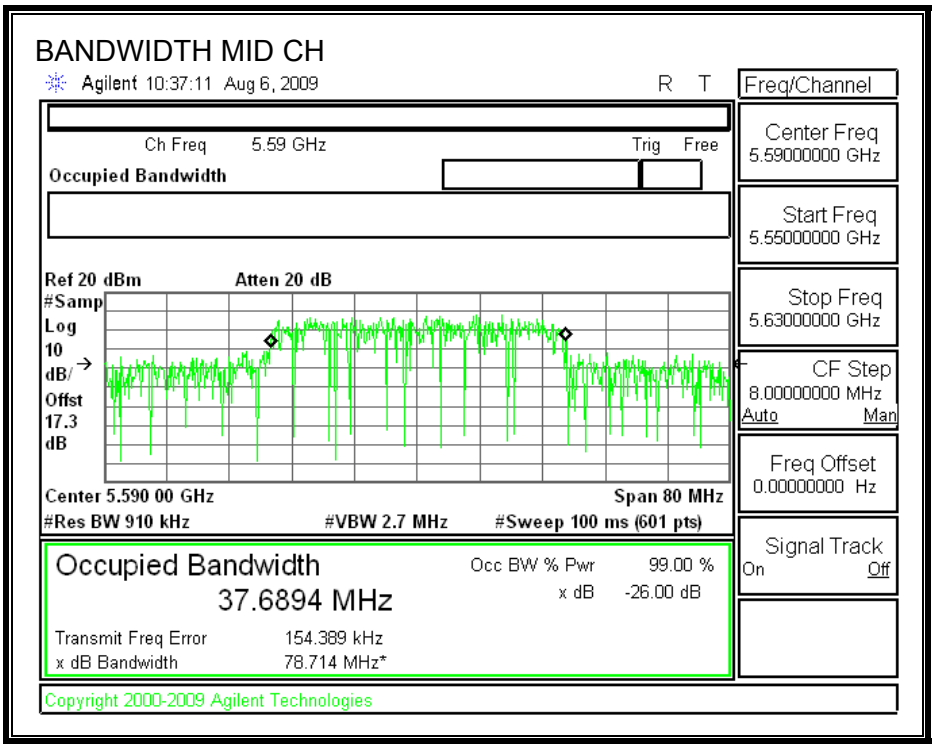
CHAIN 2

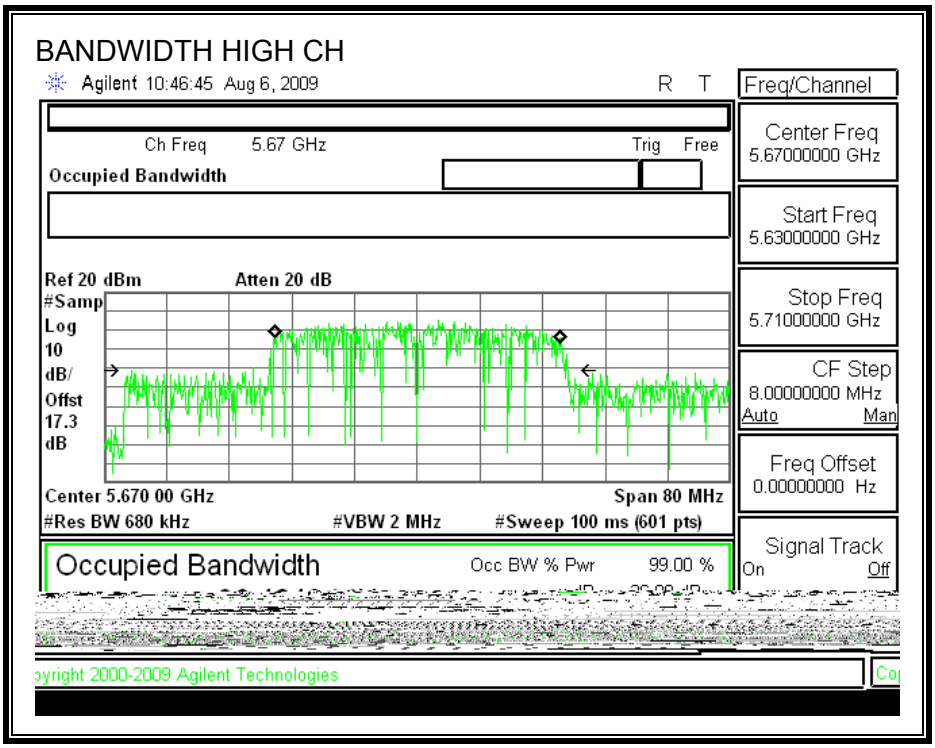
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5510	37.827	36.2845
Middle	5590	77.044	37.1337
High	5670	73.592	37.2712

CHAIN 1

26 dB and 99% BANDWIDTH

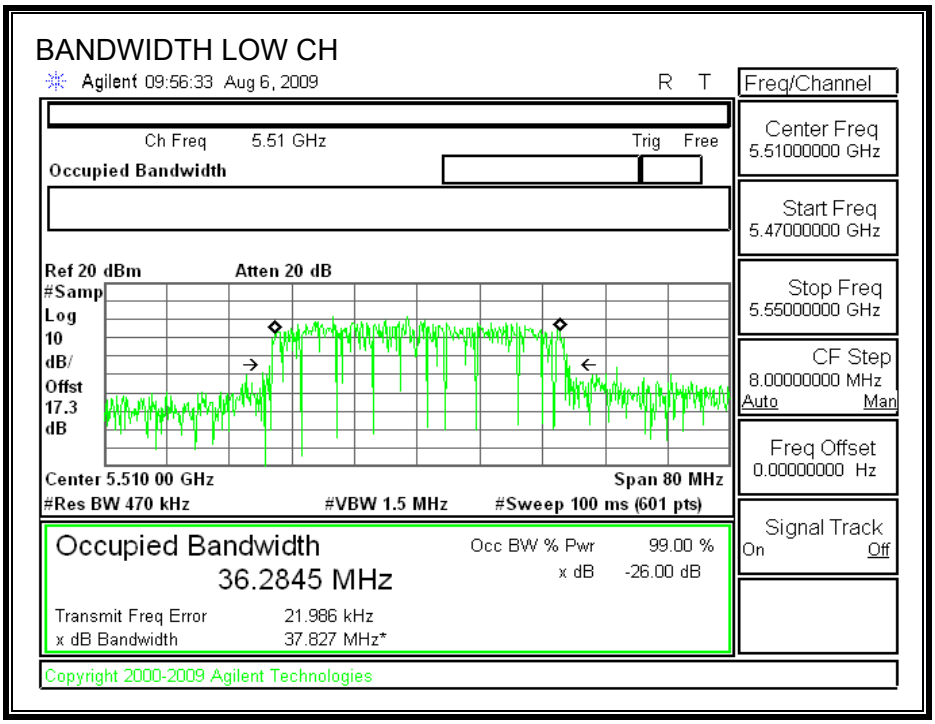


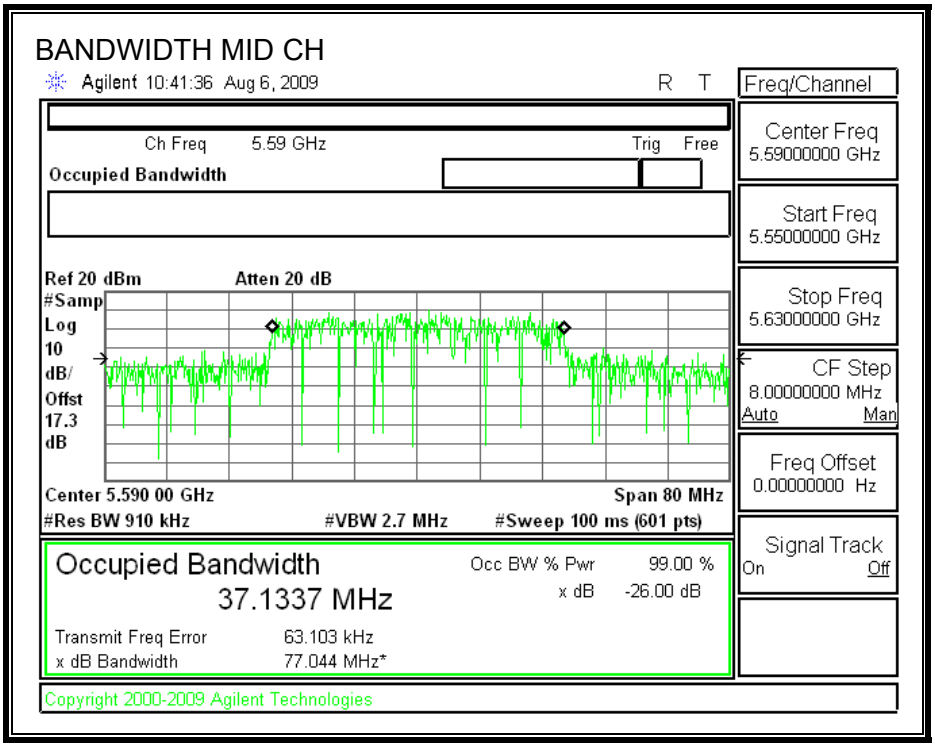


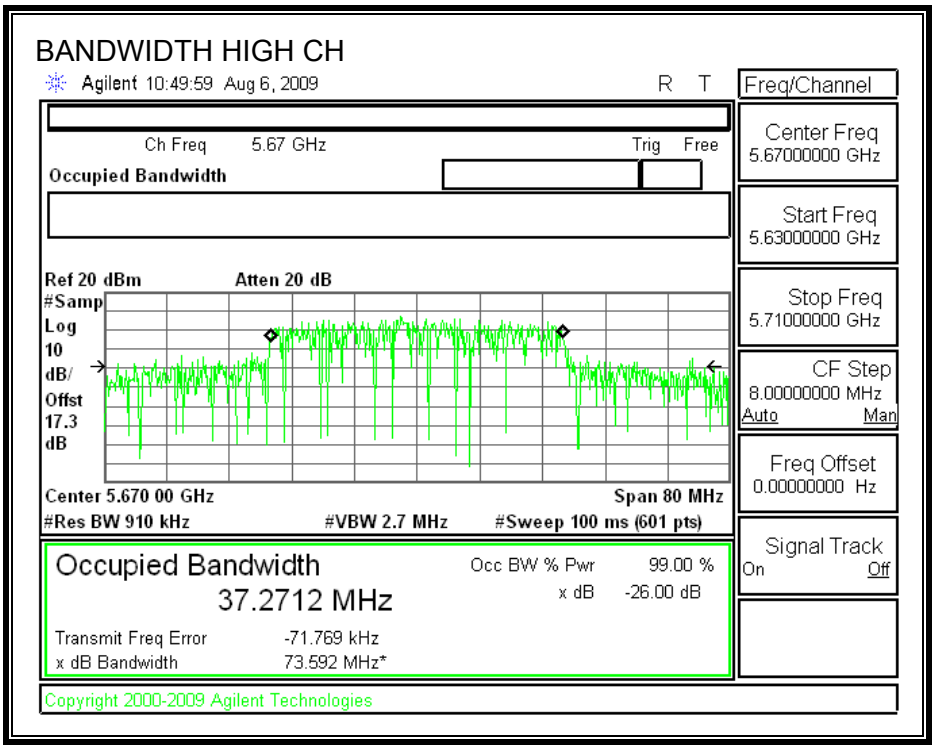


CHAIN 2

26 dB and 99% BANDWIDTH







7.12.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 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.

The composite antenna gain is 6.68dBi

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

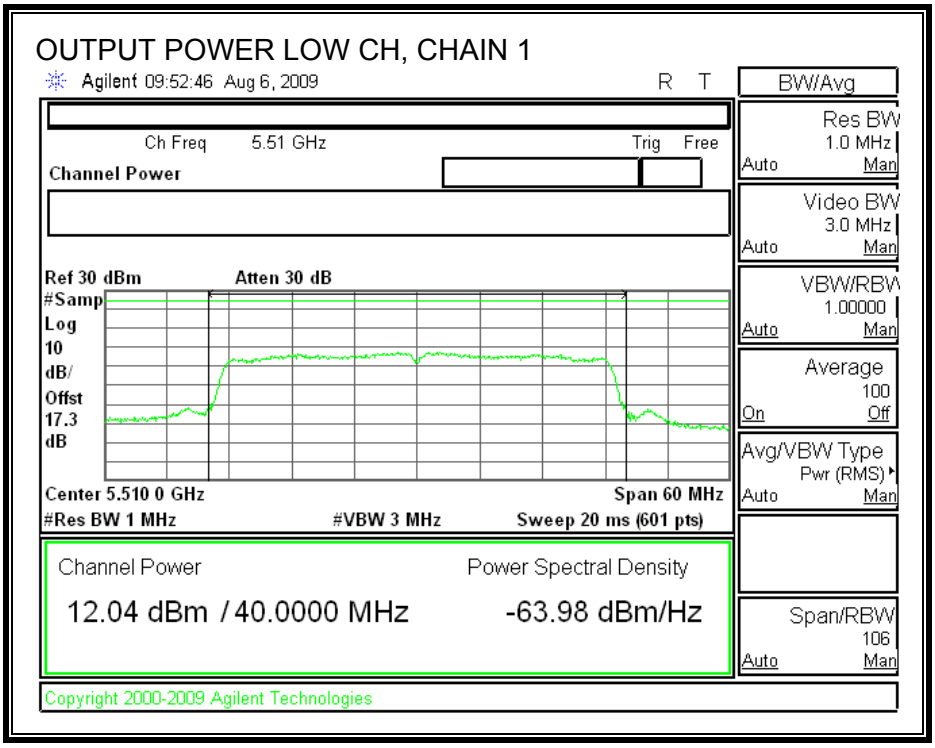
Limit

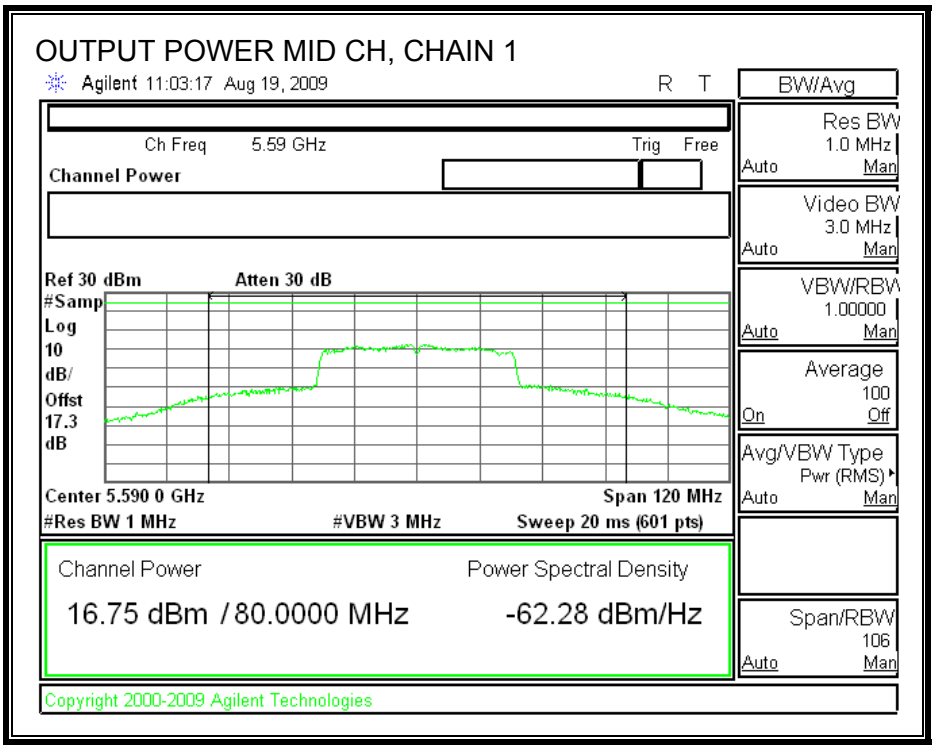
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5510	24	37.827	26.78	6.68	23.32
Mid	5590	24	77.044	29.87	6.68	23.32
High	5670	24	73.592	29.67	6.68	23.32

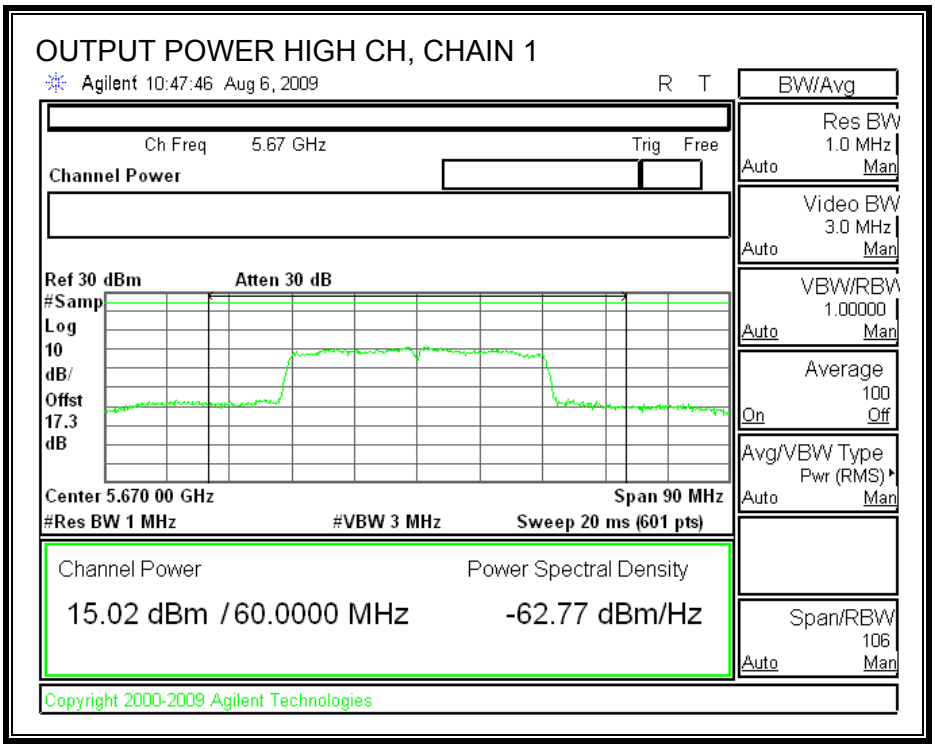
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	12.04	12.26	15.16	23.32	-11.28
Mid	5590	16.75	17.41	20.10	23.32	-6.57
High	5670	15.02	15.82	18.45	23.32	-8.30

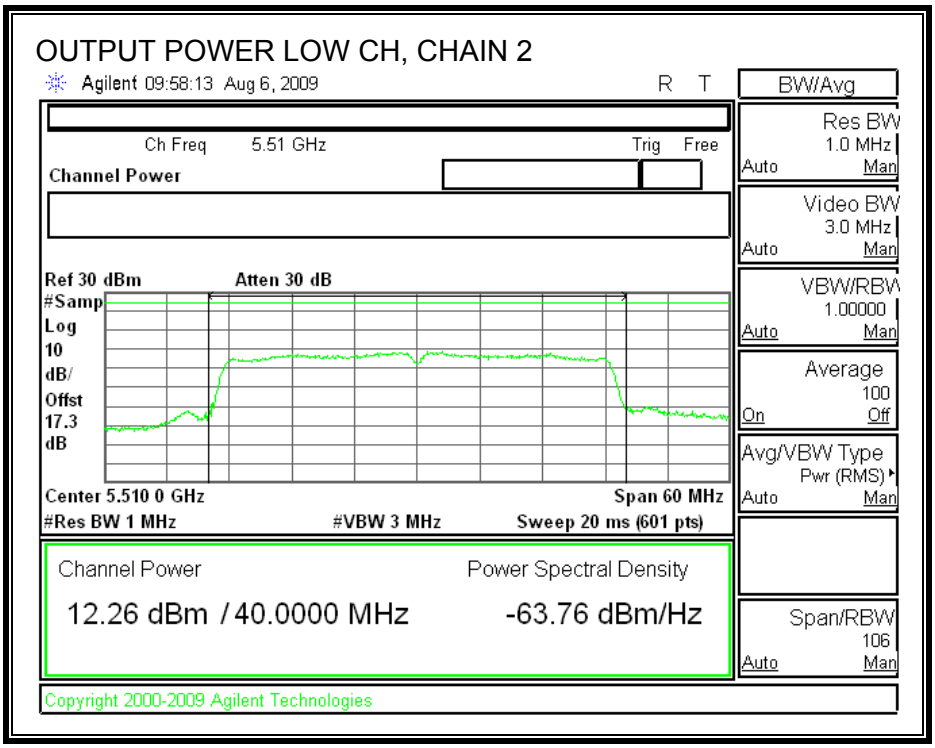
CHAIN 1 OUTPUT POWER

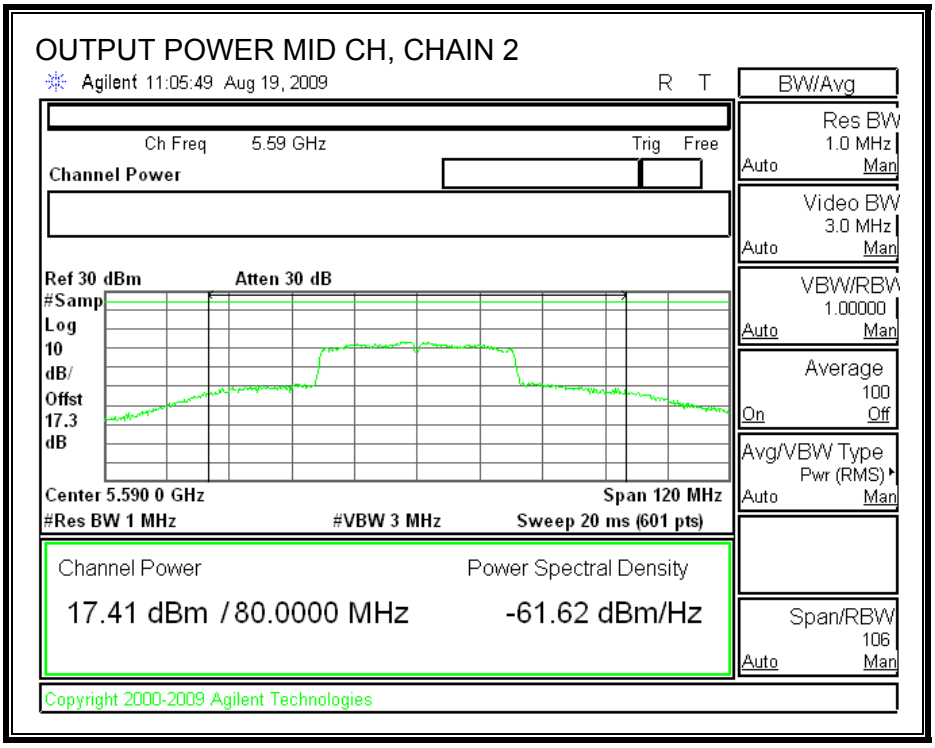


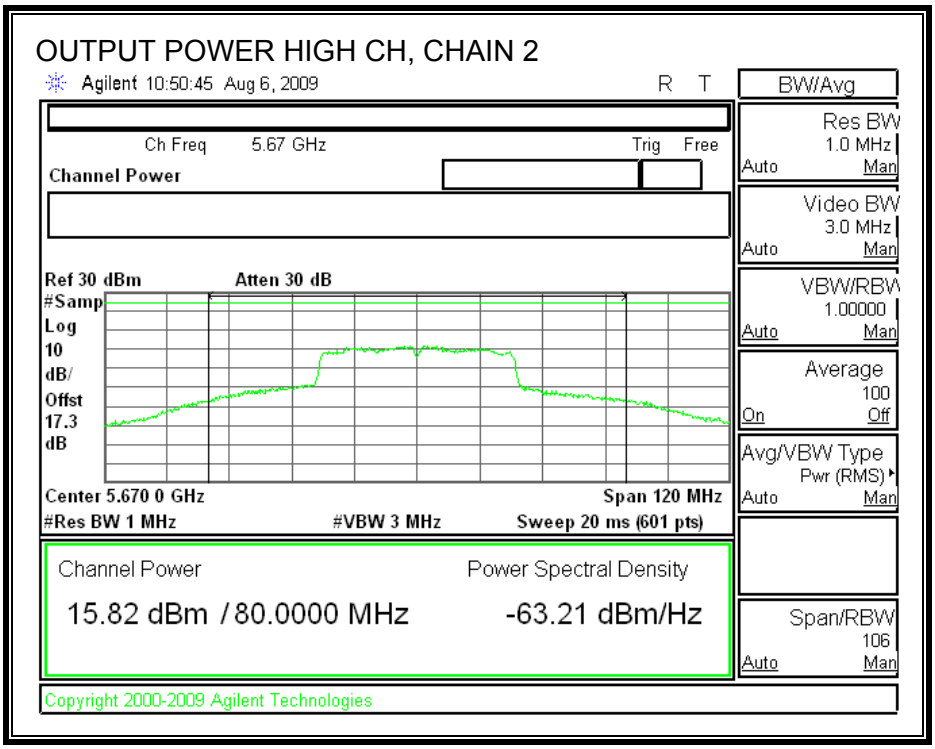




CHAIN 2 OUTPUT POWER







7.12.3. 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 equal to 6.68 dBi, therefore the limit is 10.32 dBm.

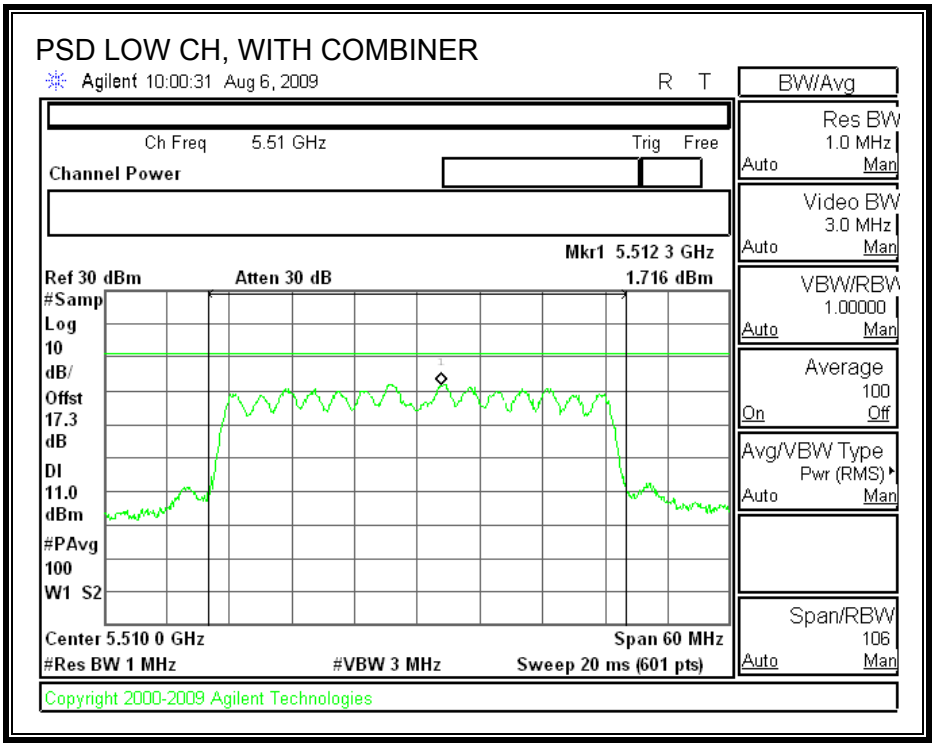
TEST PROCEDURE

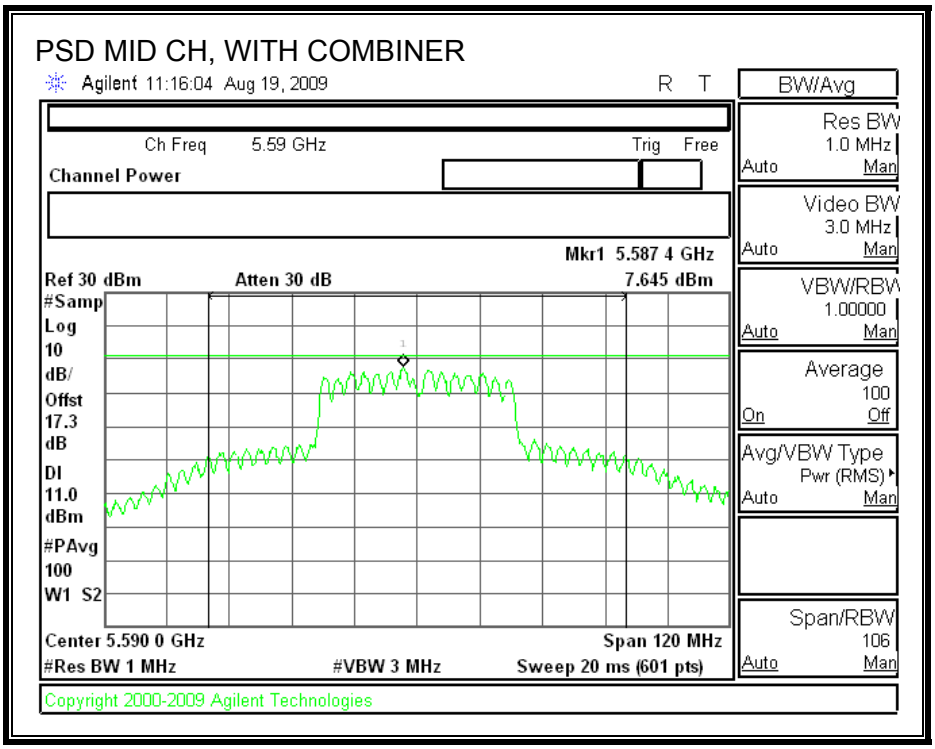
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

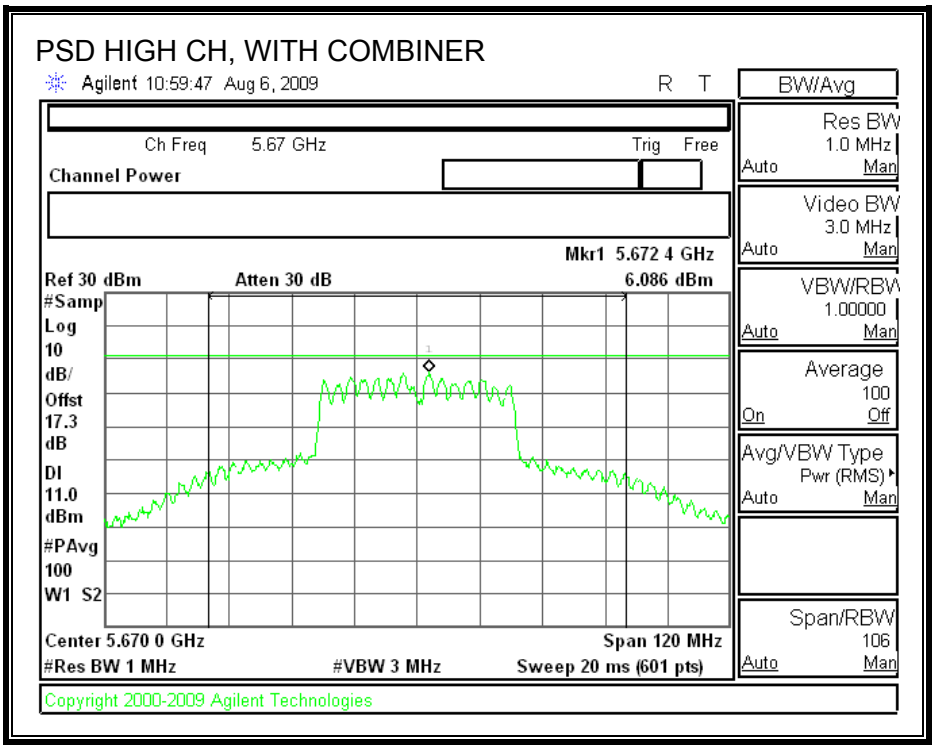
RESULTS

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5510	1.72	10.32	-8.60
Middle	5590	7.65	10.32	-2.68
High	5670	6.09	10.32	-4.23

POWER SPECTRAL DENSITY WITH COMBINER







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

CHAIN 1

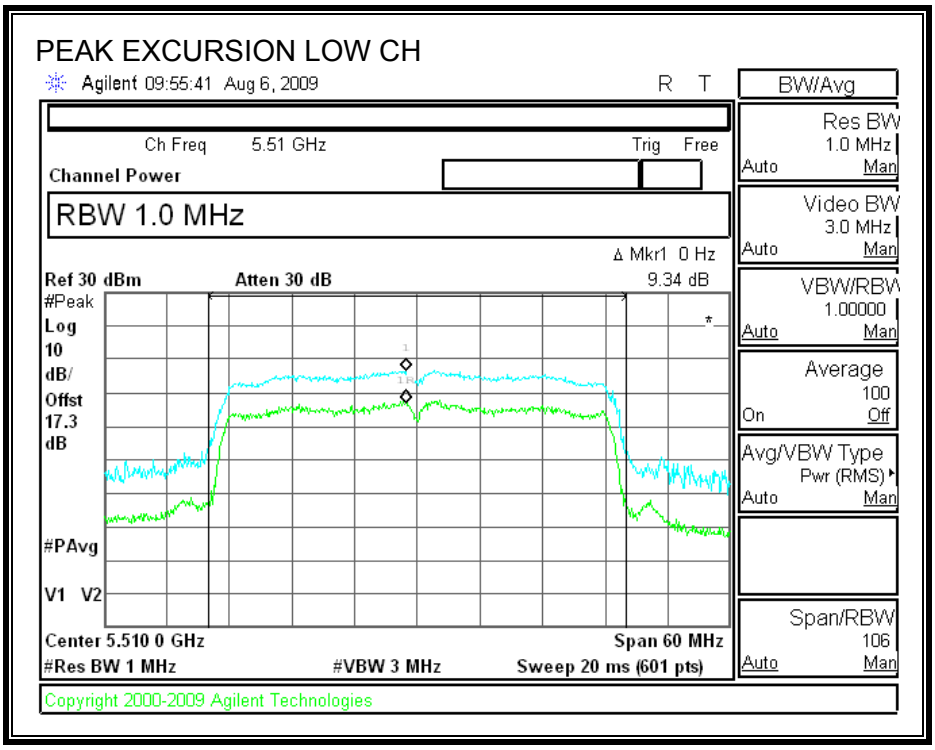
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	9.34	13	-3.66
Middle	5590	10.19	13	-2.81
High	5670	9.25	13	-3.75

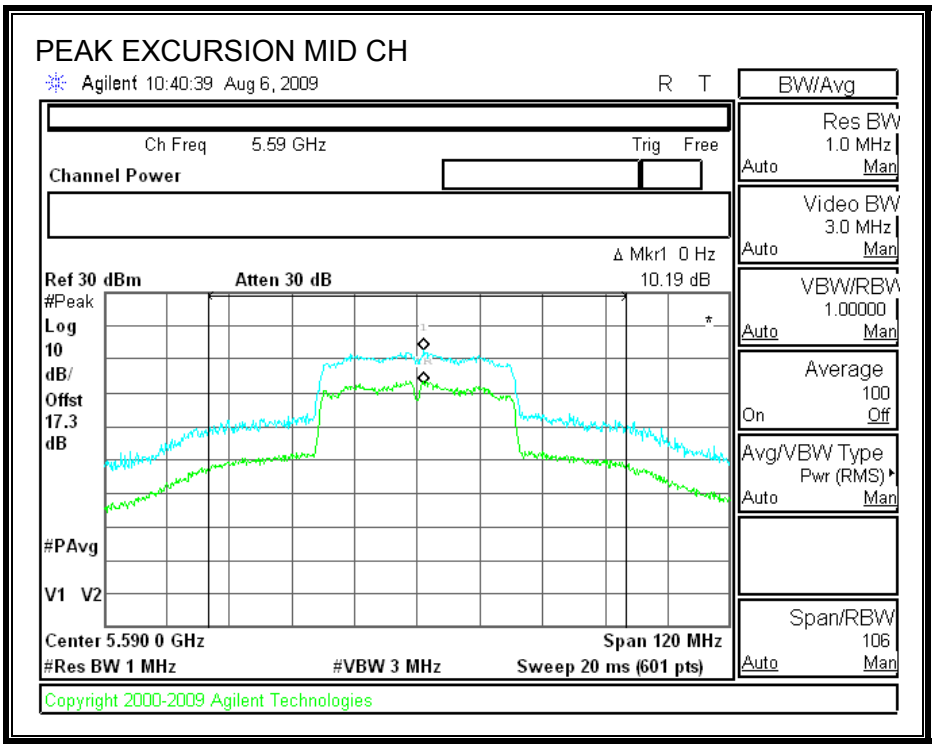
CHAIN 2

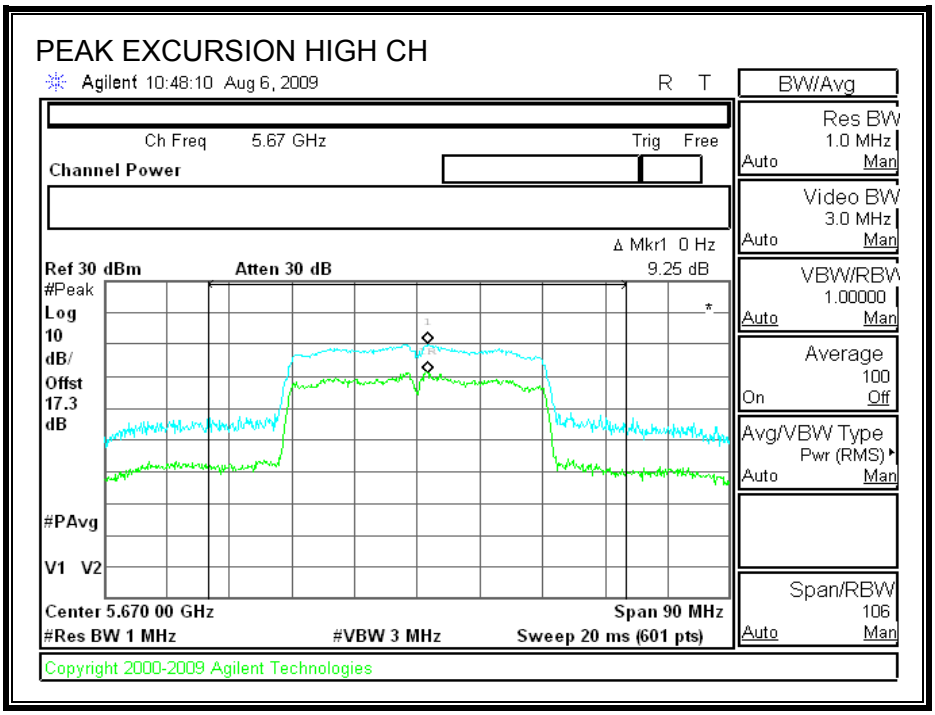
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	9.59	13	-3.41
Middle	5590	11.04	13	-1.96
High	5670	10.90	13	-2.10

CHAIN 1

PEAK EXCURSION

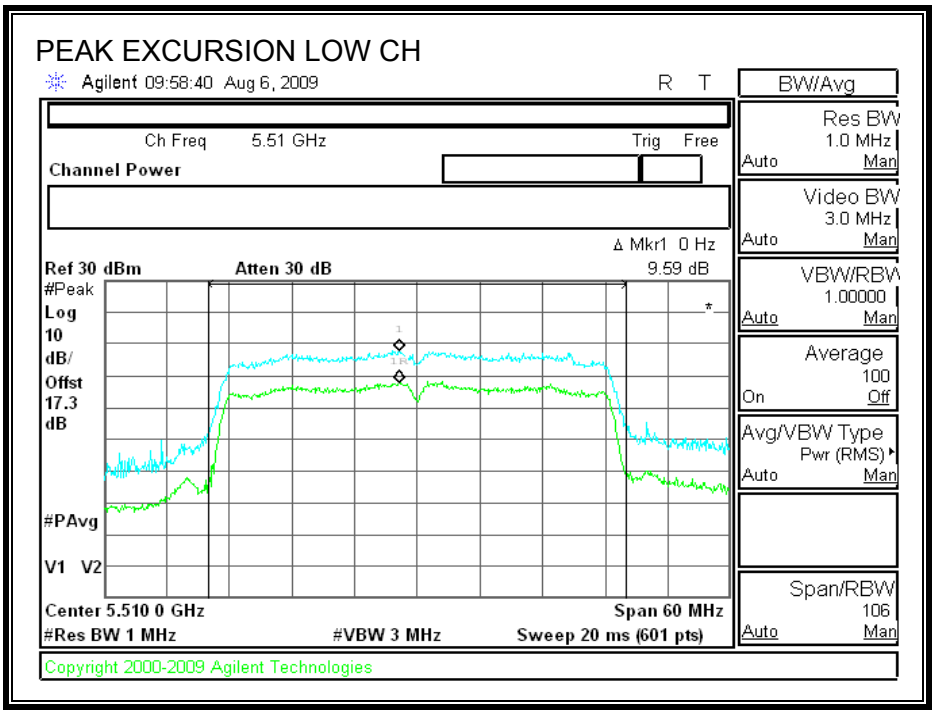




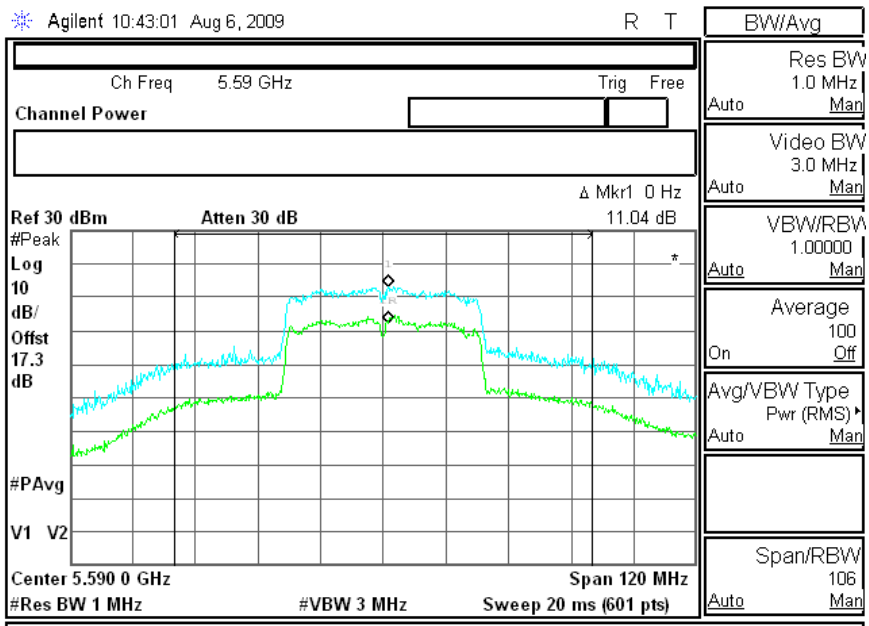


CHAIN 2

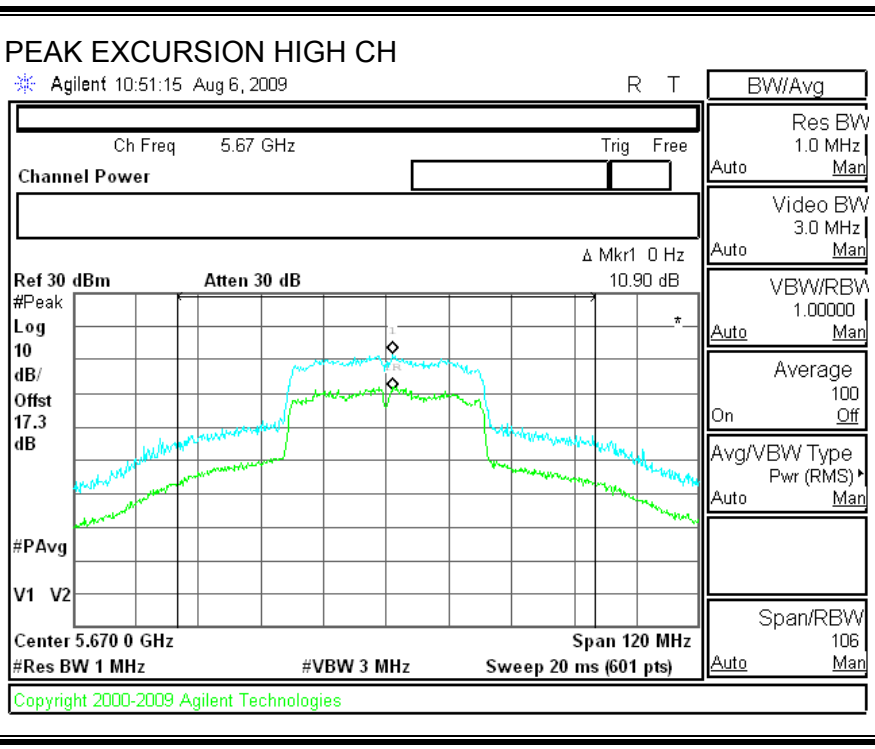
PEAK EXCURSION



PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



7.12.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

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

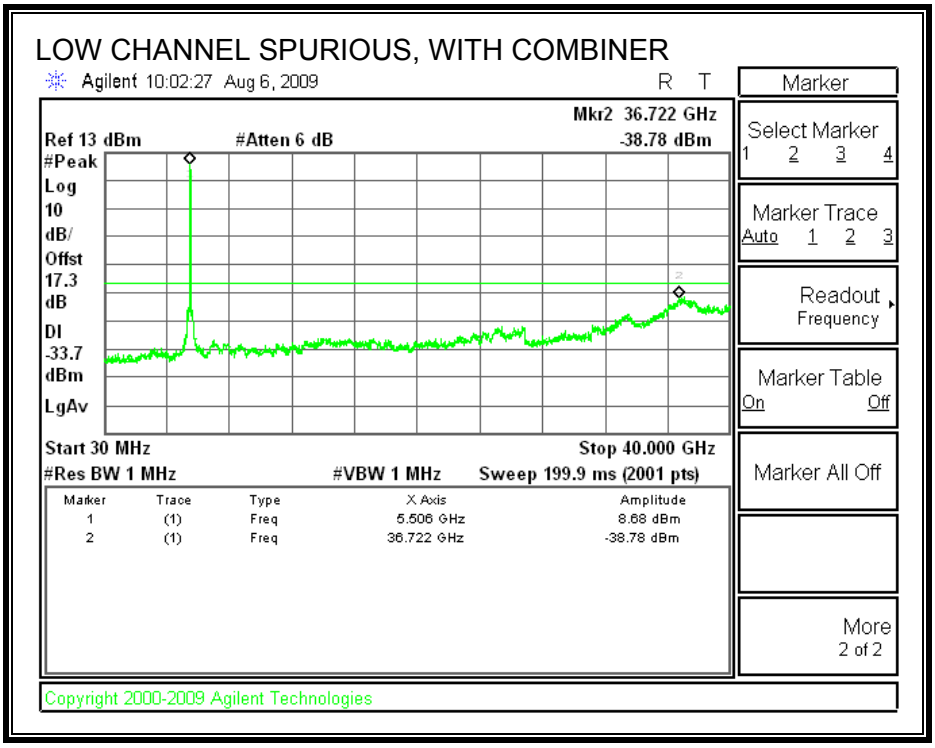
TEST PROCEDURE

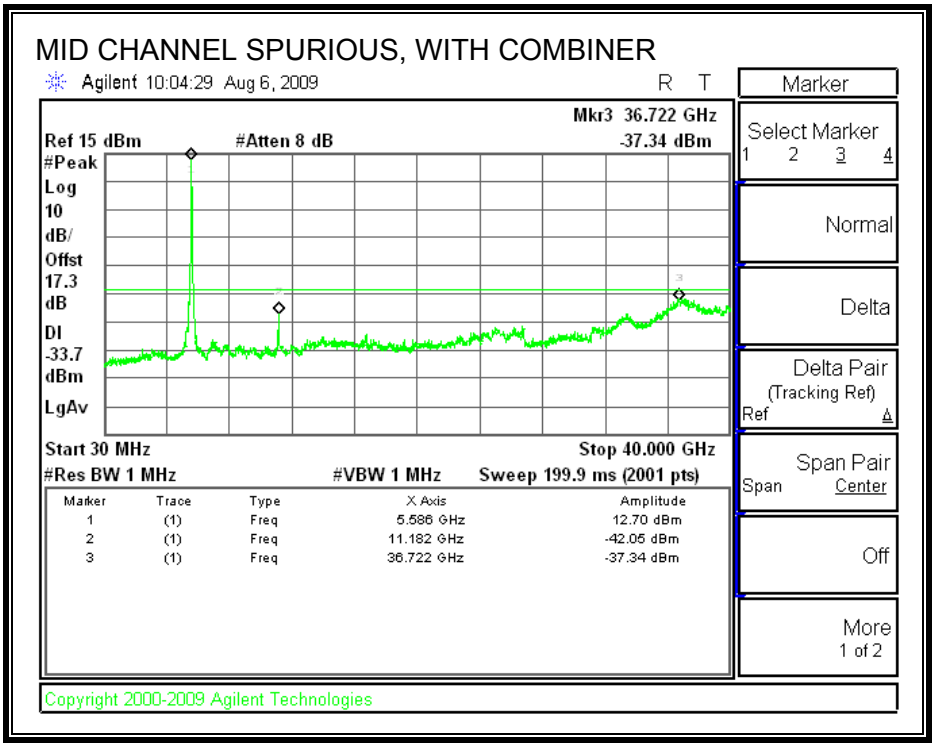
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

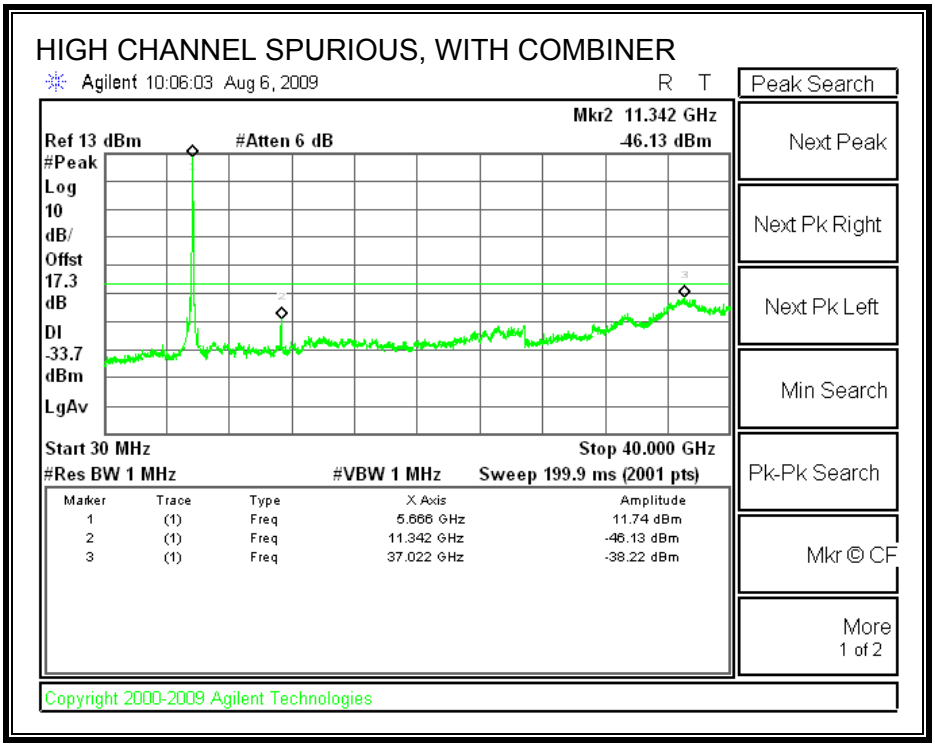
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

SPURIOUS EMISSIONS WITH COMBINER





HIGH CHANNEL SPURIOUS, WITH COMBINER



7.13. RECEIVER CONDUCTED SPURIOUS EMISSIONS

LIMITS

IC RSS-GEN 7.2.3.1

Antenna Conducted Measurement: Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

TEST PROCEDURE

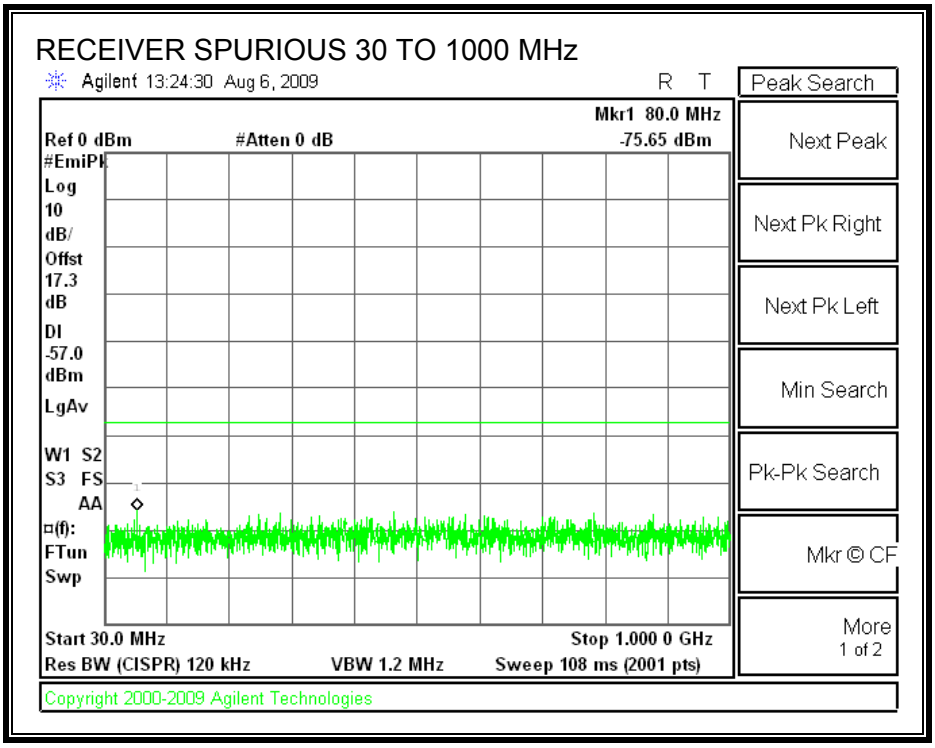
IC RSS-GEN 4.10, Conducted Method

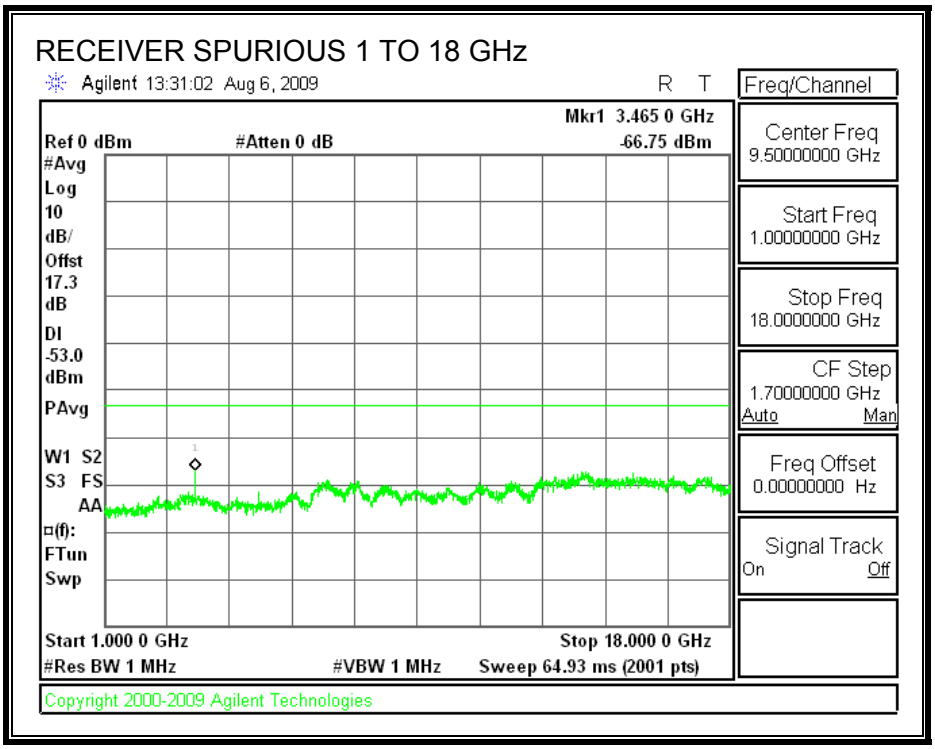
The receiver antenna port is connected to a spectrum analyzer.

The spectrum from 30 MHz to 18 GHz is investigated with the receiver set to the middle channel of each 5 GHz band.

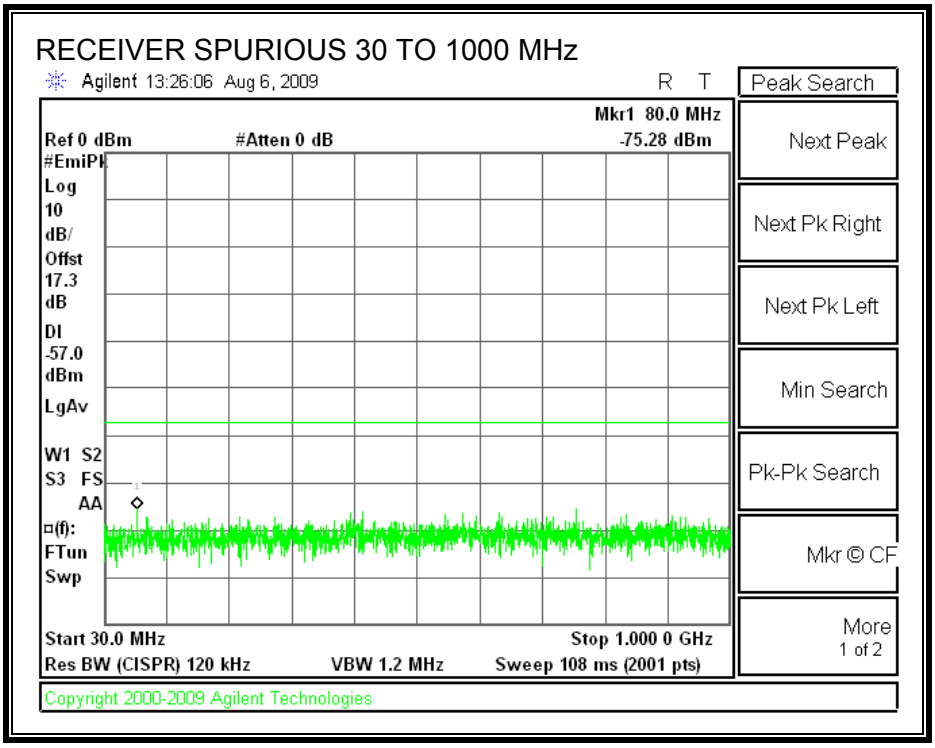
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

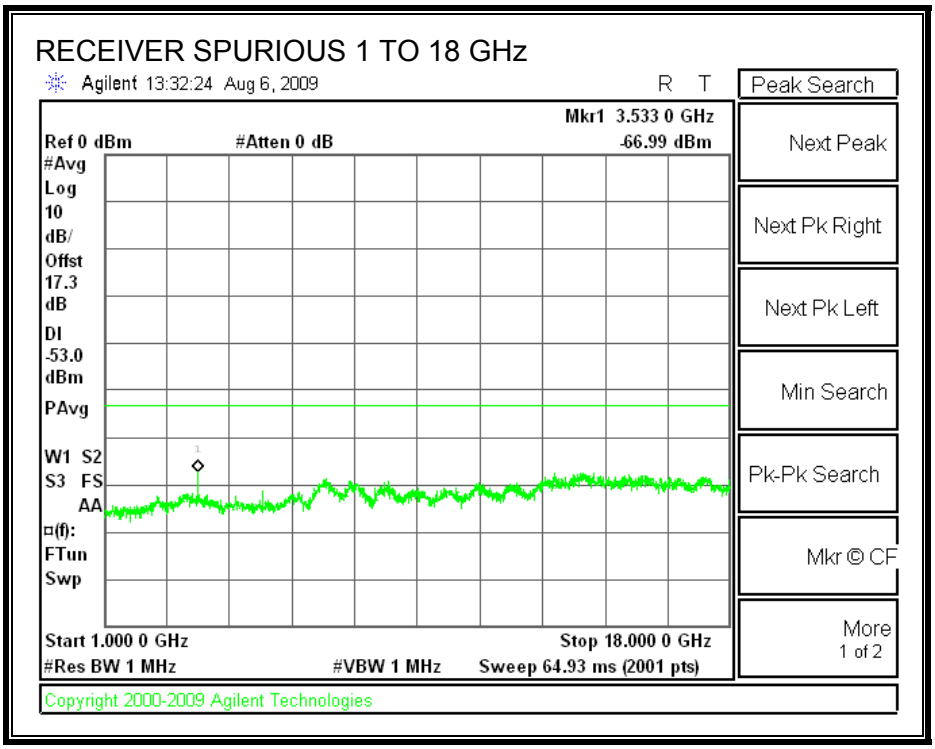
RECEIVER SPURIOUS EMISSIONS IN THE 5.2 GHz BAND



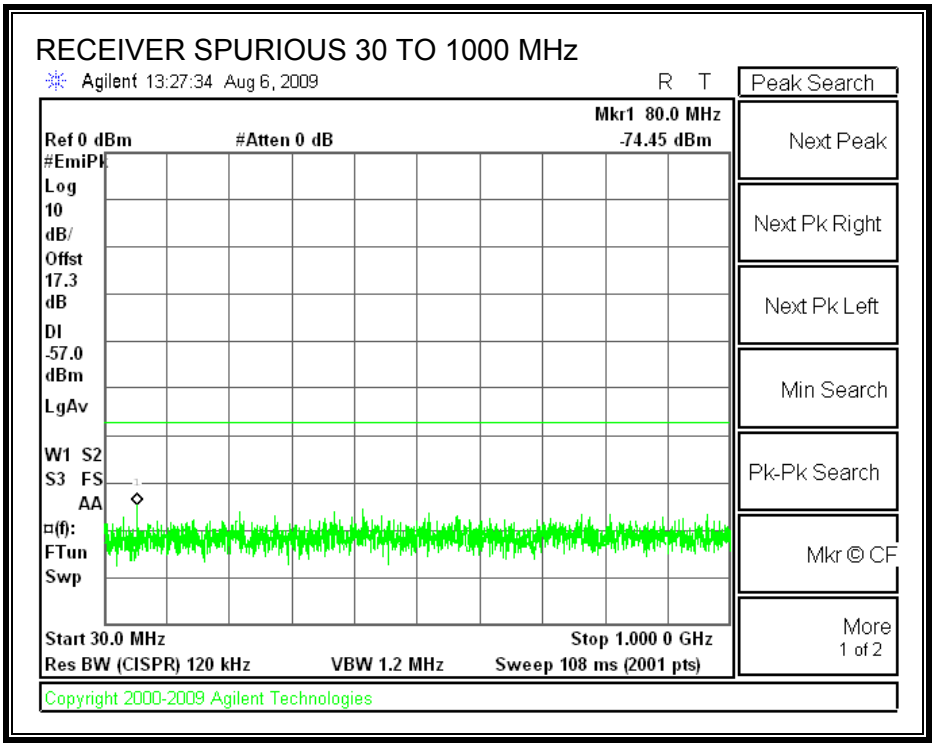


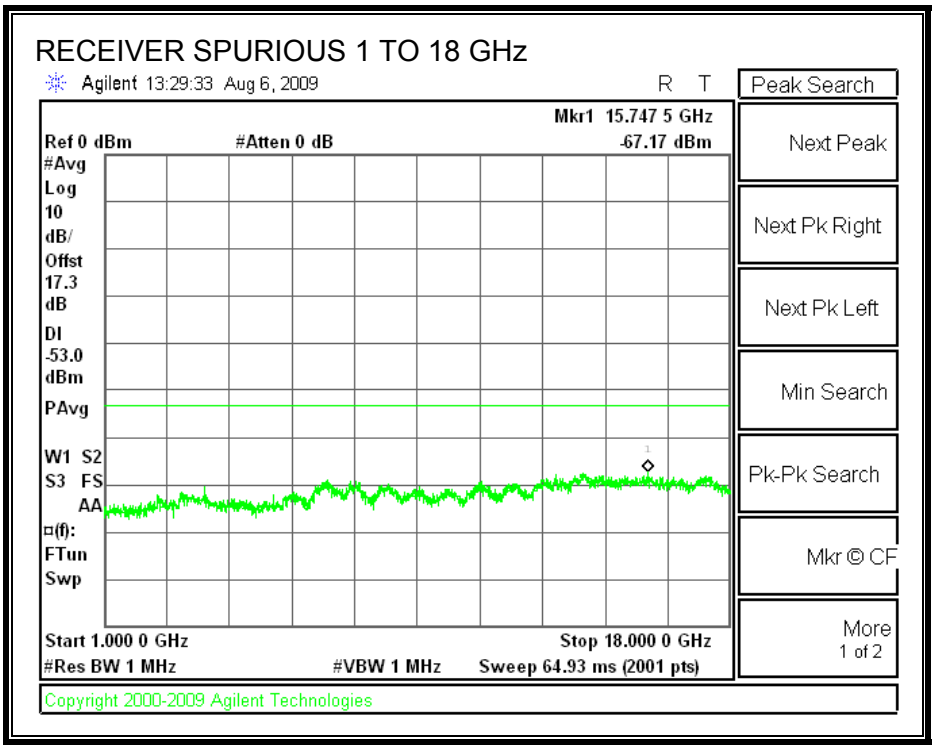
RECEIVER SPURIOUS EMISSIONS IN THE 5.3 GHz BAND





RECEIVER SPURIOUS EMISSIONS IN THE 5.5 GHz BAND





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.

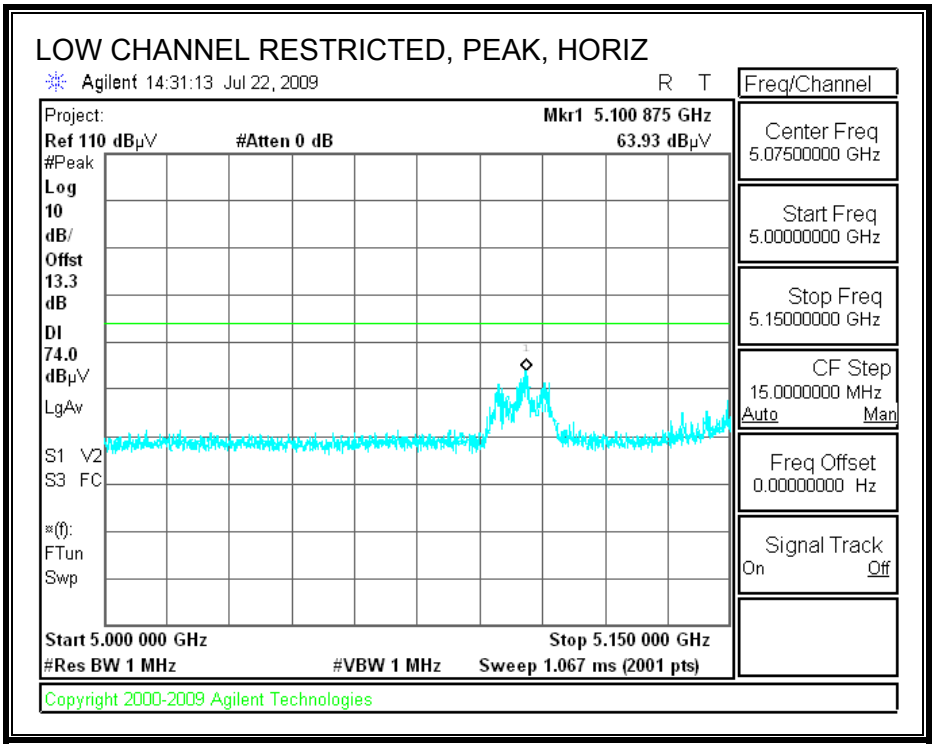
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each appplicable band.

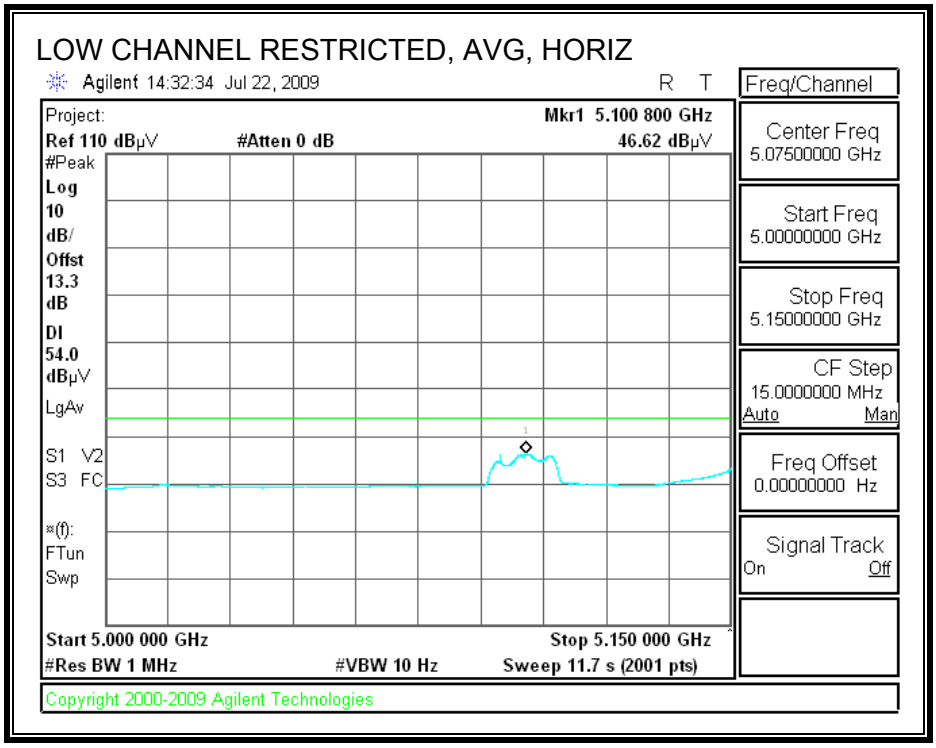
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/23/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx 11a Mode_5.2 GHz Band

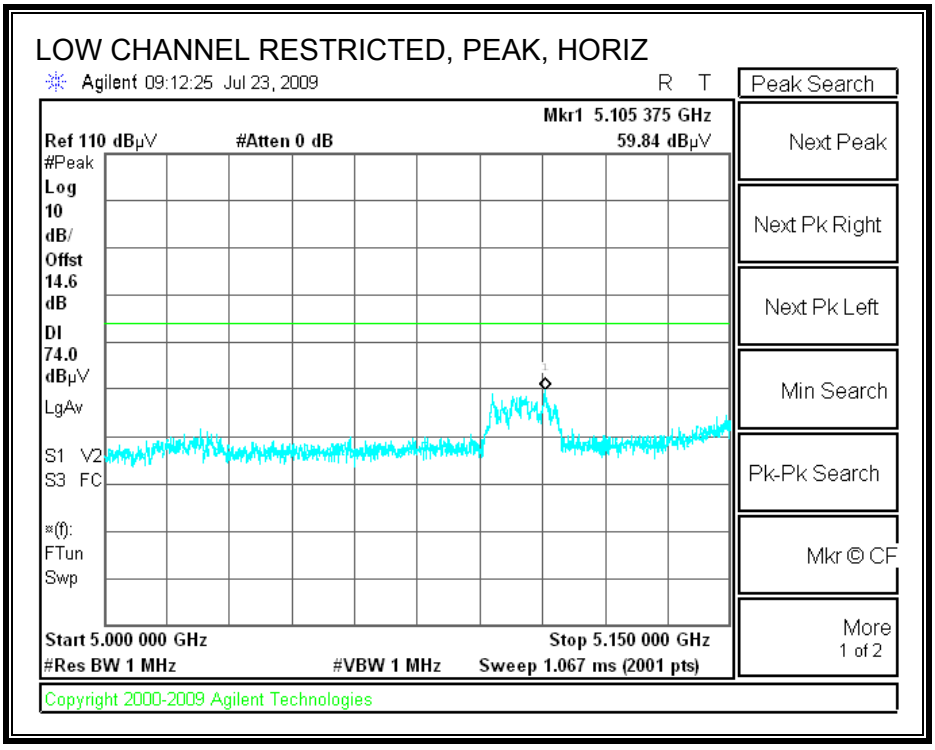
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

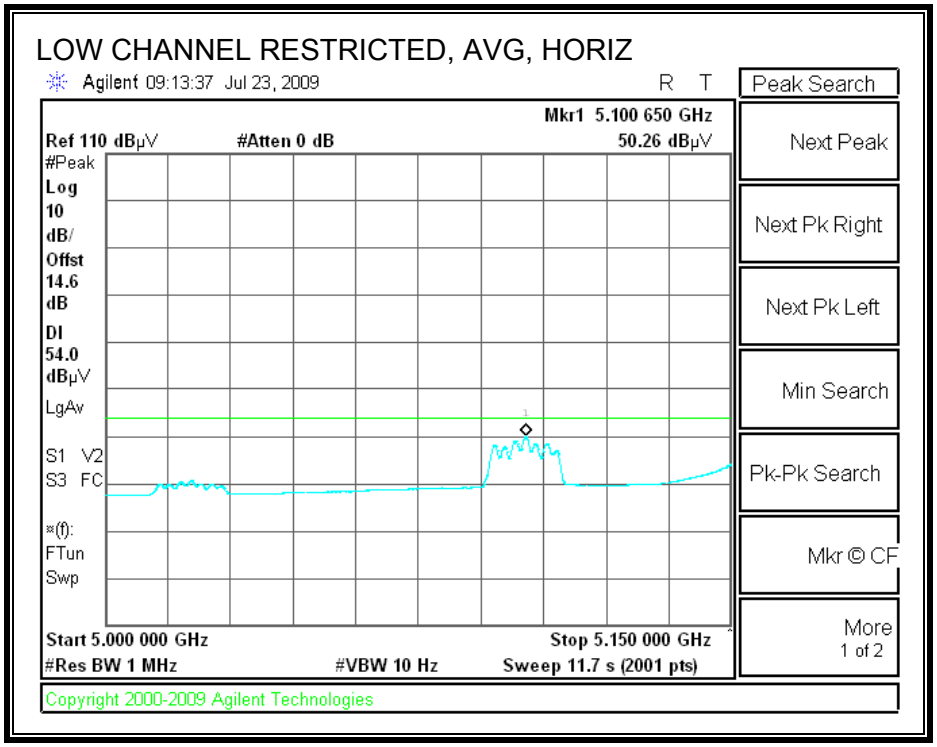
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel 5180 MHz													
15.540	3.0	37.8	38.5	11.3	-32.2	0.0	0.7	56.1	74.0	-17.9	H	P	
15.540	3.0	21.9	38.5	11.3	-32.2	0.0	0.7	40.2	54.0	-13.8	H	A	
15.540	3.0	32.7	38.5	11.3	-32.2	0.0	0.7	51.0	74.0	-23.0	V	P	
15.540	3.0	20.2	38.5	11.3	-32.2	0.0	0.7	38.6	54.0	-15.4	V	A	
Mid Channel 5200 MHz													
15.600	3.0	42.8	38.3	11.4	-32.2	0.0	0.7	61.0	74.0	-13.0	H	P	
15.600	3.0	29.5	38.3	11.4	-32.2	0.0	0.7	47.7	54.0	-6.3	H	A	
15.600	3.0	38.9	38.3	11.4	-32.2	0.0	0.7	57.1	74.0	-16.9	V	P	
15.600	3.0	26.0	38.3	11.4	-32.2	0.0	0.7	44.2	54.0	-9.8	V	A	
High Channel 5240 MHz													
15.720	3.0	43.5	38.0	11.4	-32.2	0.0	0.7	61.5	74.0	-12.5	V	P	
15.720	3.0	28.9	38.0	11.4	-32.2	0.0	0.7	46.9	54.0	-7.1	V	A	
15.720	3.0	41.9	38.0	11.4	-32.2	0.0	0.7	59.9	74.0	-14.1	H	P	
15.720	3.0	28.7	38.0	11.4	-32.2	0.0	0.7	46.7	54.0	-7.3	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

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

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT20 Mode_5.2 GHz Band

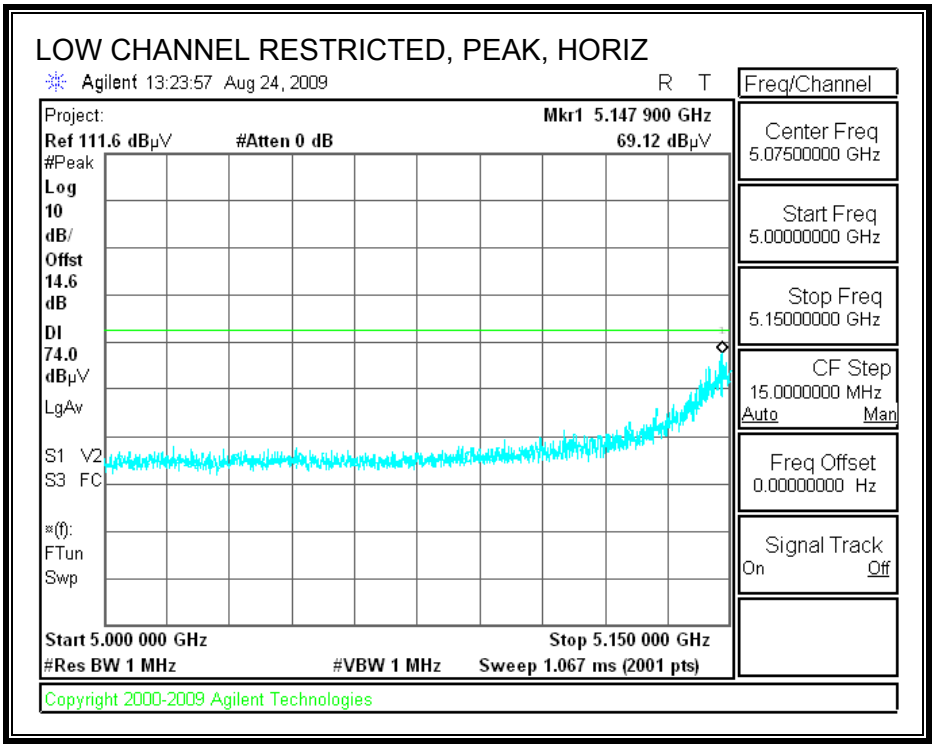
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

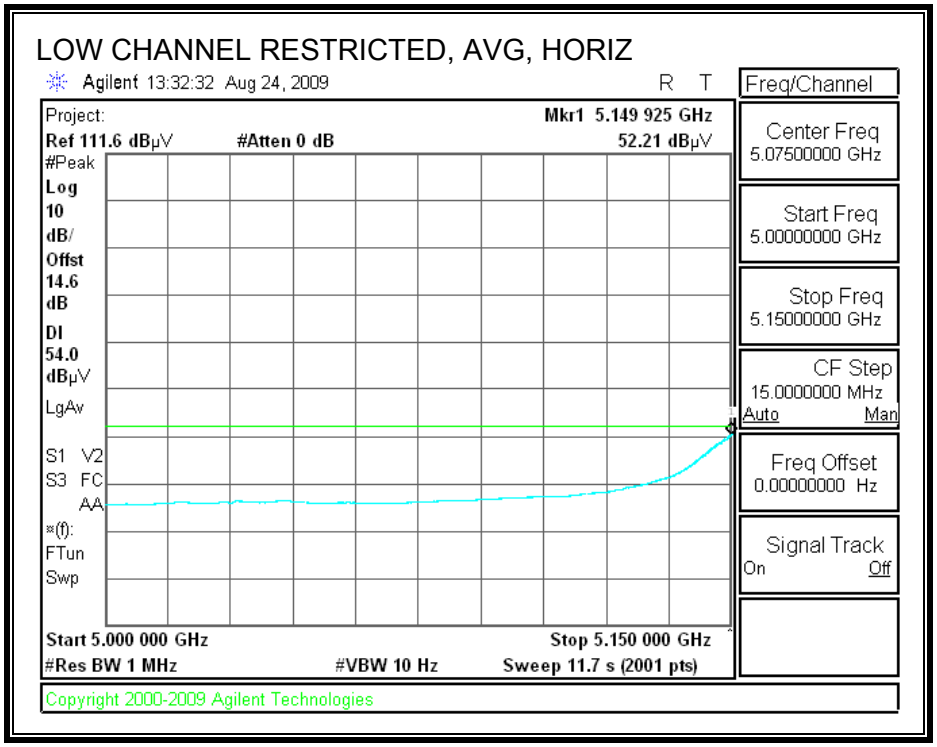
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5180MHz															
15.540	3.0	32.2	38.5	11.3	-32.2	0.0	0.7	50.5	74.0	-23.5	H	P	137.0	150.0	
15.540	3.0	20.0	38.5	11.3	-32.2	0.0	0.7	38.4	54.0	-15.6	H	A	137.0	150.0	
15.540	3.0	32.3	38.5	11.3	-32.2	0.0	0.7	50.7	74.0	-23.3	V	P	172.0	159.0	
15.540	3.0	20.1	38.5	11.3	-32.2	0.0	0.7	38.5	54.0	-15.5	V	A	172.0	159.0	
Mid Channel 5200MHz															
15.600	3.0	32.3	38.3	11.4	-32.2	0.0	0.7	50.5	74.0	-23.5	H	P	173.0	339.0	
15.600	3.0	20.2	38.3	11.4	-32.2	0.0	0.7	38.5	54.0	-15.6	H	A	173.0	339.0	
15.600	3.0	32.1	38.3	11.4	-32.2	0.0	0.7	50.4	74.0	-23.6	V	P	194.0	125.0	
15.600	3.0	20.1	38.3	11.4	-32.2	0.0	0.7	38.3	54.0	-15.7	V	A	194.0	125.0	
Hi Channel 5240MHz															
15.720	3.0	32.2	38.0	11.4	-32.2	0.0	0.7	50.2	74.0	-23.8	H	P	123.0	6.0	
15.720	3.0	20.4	38.0	11.4	-32.2	0.0	0.7	38.3	54.0	-15.7	H	A	123.0	6.0	
15.720	3.0	32.6	38.0	11.4	-32.2	0.0	0.7	50.6	74.0	-23.4	V	P	117.0	20.0	
15.720	3.0	20.5	38.0	11.4	-32.2	0.0	0.7	38.5	54.0	-15.5	V	A	117.0	20.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.3. 802.11n HT40 SISO MODE IN THE LOWER 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 08/24/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 SISO Mode_5.2 GHz Band

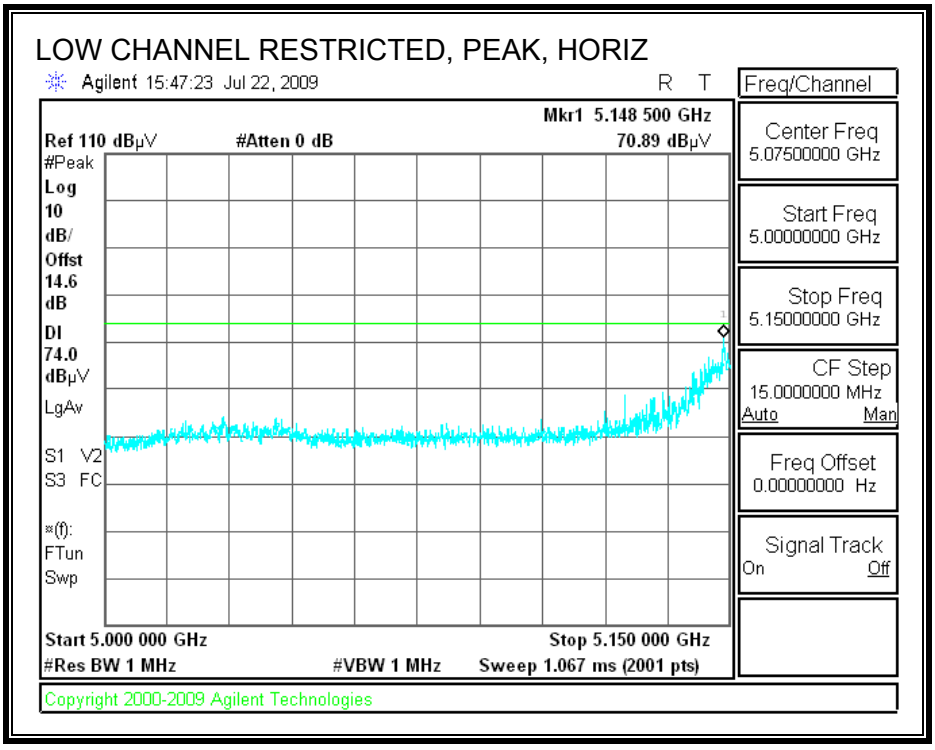
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

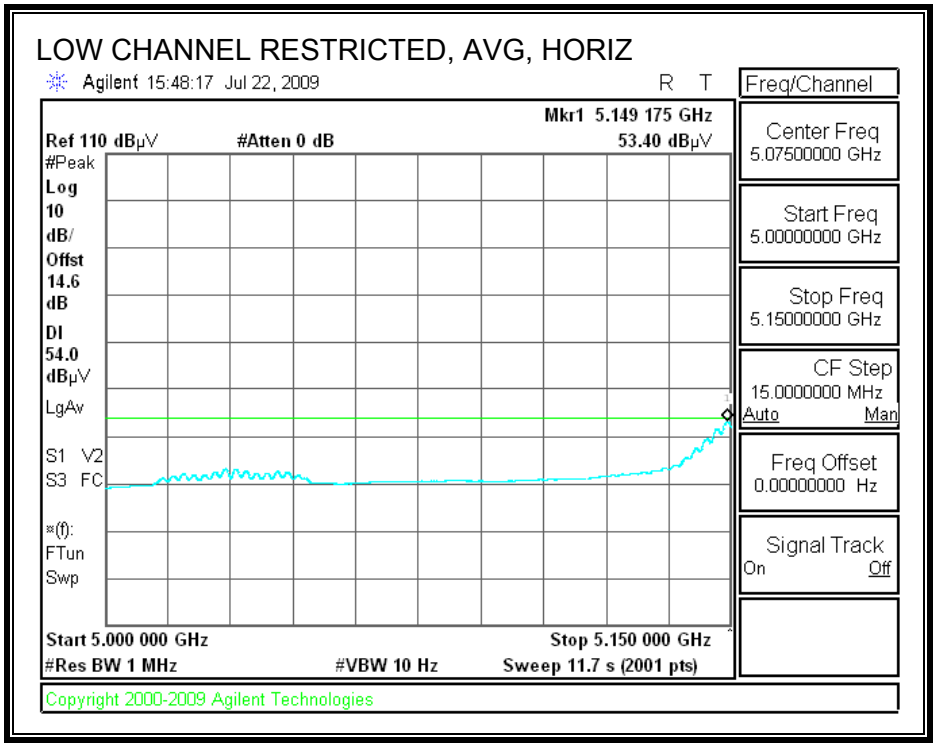
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5190MHz															
15.570	3.0	36.6	38.4	11.4	-32.2	0.0	0.7	54.9	74.0	-19.1	H	P	100.0	258.0	
15.570	3.0	23.1	38.4	11.4	-32.2	0.0	0.7	41.4	54.0	-12.6	H	A	100.0	258.0	
15.570	3.0	34.5	38.4	11.4	-32.2	0.0	0.7	52.8	74.0	-21.2	V	P	144.0	226.0	
15.570	3.0	22.3	38.4	11.4	-32.2	0.0	0.7	40.6	54.0	-13.4	V	A	144.0	226.0	
High Channel 5230MHz															
15.690	3.0	42.9	38.1	11.4	-32.2	0.0	0.7	60.9	74.0	-13.1	H	P	104.0	259.0	
15.690	3.0	28.1	38.1	11.4	-32.2	0.0	0.7	46.1	54.0	-7.9	H	A	104.0	259.0	
15.690	3.0	38.8	38.1	11.4	-32.2	0.0	0.7	56.9	74.0	-17.1	V	P	100.0	288.0	
15.690	3.0	24.4	38.1	11.4	-32.2	0.0	0.7	42.4	54.0	-11.6	V	A	100.0	288.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.4. 802.11n HT40 MIMO MCS0 MODE IN THE LOWER 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 MIMO MCS 0 Mode_5.2 GHz Band

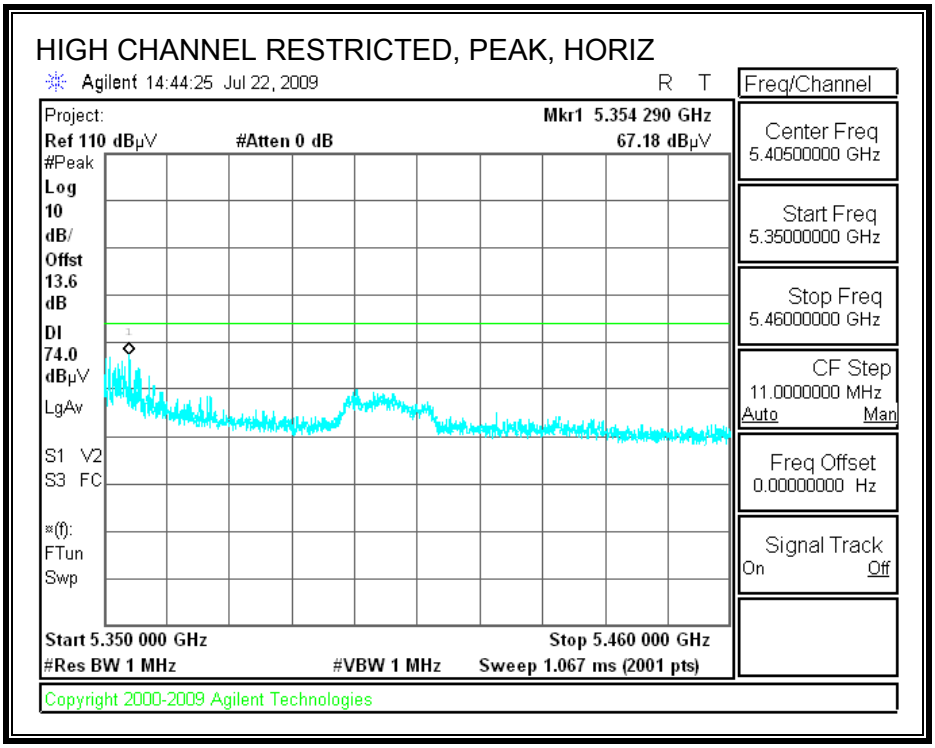
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

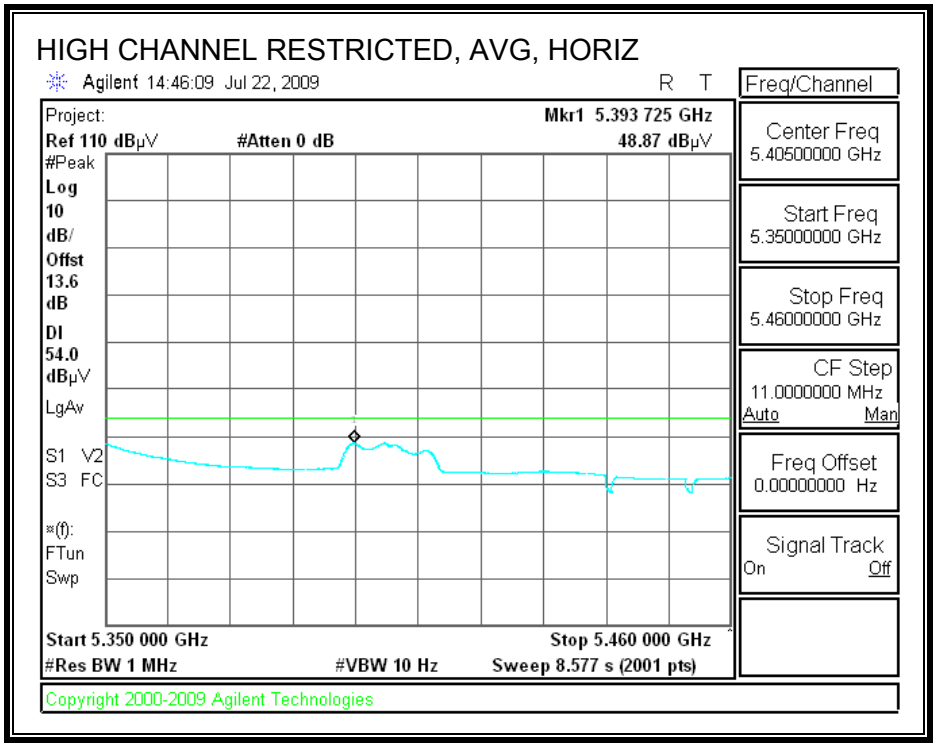
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5190MHz															
15.570	3.0	36.7	38.4	11.4	-32.2	0.0	0.7	55.0	74.0	-19.0	H	P	100.0	261.0	
15.570	3.0	22.1	38.4	11.4	-32.2	0.0	0.7	40.4	54.0	-13.6	H	A	100.0	261.0	
15.570	3.0	32.4	38.4	11.4	-32.2	0.0	0.7	50.7	74.0	-23.3	V	P	101.0	360.0	
15.570	3.0	20.0	38.4	11.4	-32.2	0.0	0.7	38.3	54.0	-15.7	V	A	101.0	360.0	
High Channel 5230MHz															
15.690	3.0	43.4	38.1	11.4	-32.2	0.0	0.7	61.4	74.0	-12.6	H	P	99.0	260.0	
15.690	3.0	29.2	38.1	11.4	-32.2	0.0	0.7	47.2	54.0	-6.8	H	A	99.0	260.0	
15.690	3.0	38.2	38.1	11.4	-32.2	0.0	0.7	56.3	74.0	-17.7	V	P	99.0	287.0	
15.690	3.0	25.8	38.1	11.4	-32.2	0.0	0.7	43.8	54.0	-10.2	V	A	99.0	287.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.5. 802.11a MODE IN THE UPPER 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/24/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx 11a Mode_5.3 GHz Band

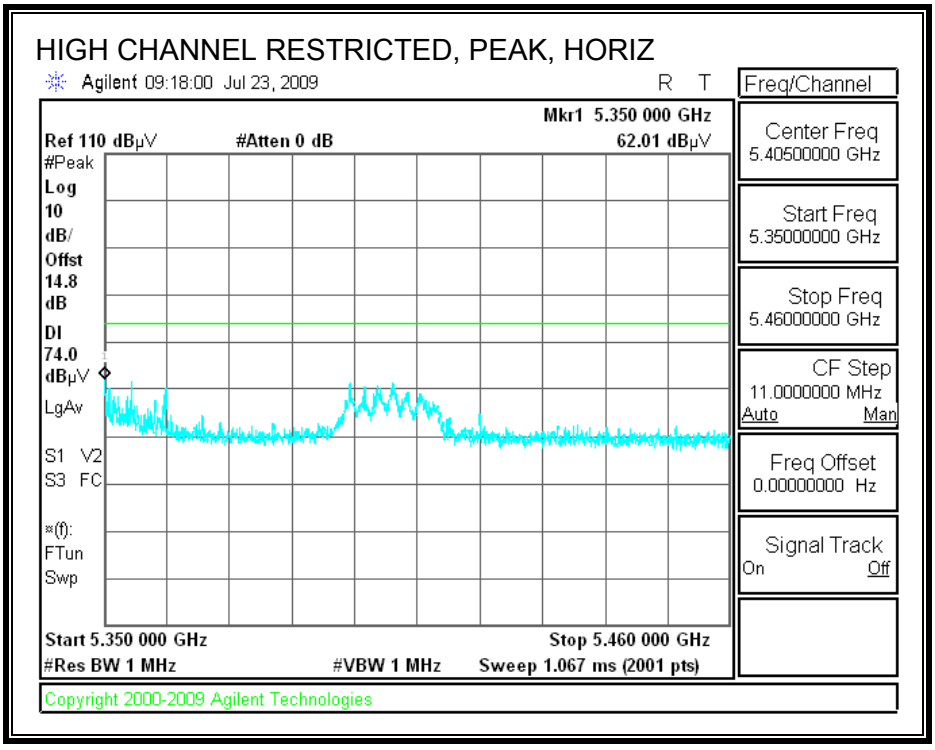
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

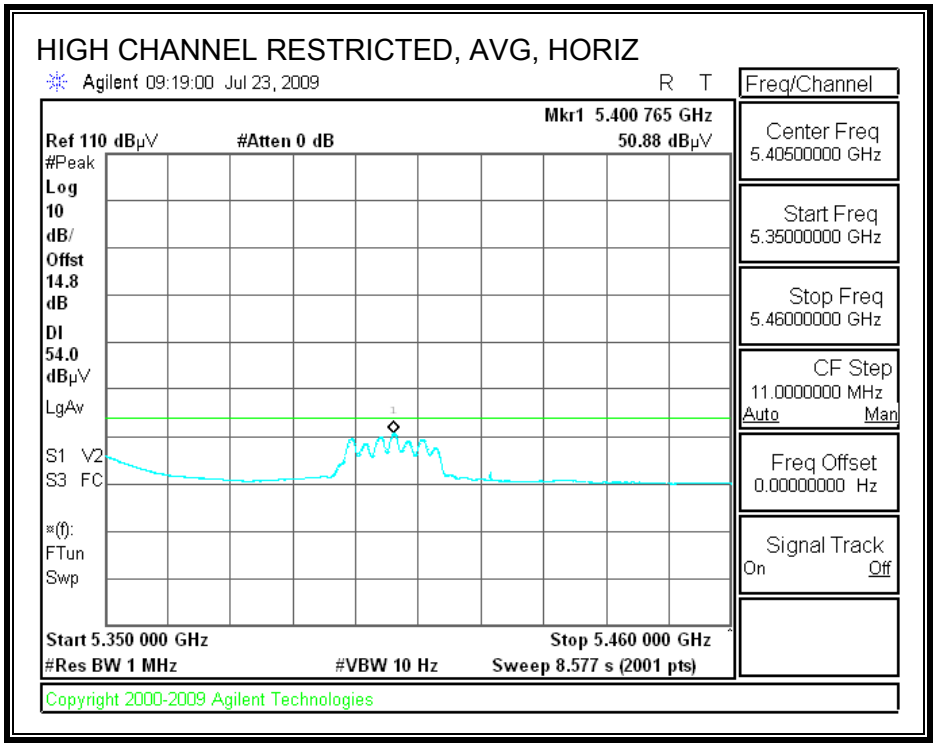
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5260 MHz															
15.780	3.0	42.7	37.8	11.5	-32.2	0.0	0.7	60.5	74.0	-13.5	H	P	100.0	277.0	
15.780	3.0	27.9	37.8	11.5	-32.2	0.0	0.7	45.7	54.0	-8.3	H	A	100.0	277.0	
15.780	3.0	46.0	37.8	11.5	-32.2	0.0	0.7	63.9	74.0	-10.1	V	P	100.0	288.0	
15.780	3.0	30.8	37.8	11.5	-32.2	0.0	0.7	48.6	54.0	-5.4	V	A	100.0	288.0	
Mid Channel 5300 MHz															
10.600	3.0	34.9	37.6	9.0	-32.6	0.0	0.8	49.6	74.0	-24.4	H	P	100.0	280.0	
10.600	3.0	22.6	37.6	9.0	-32.6	0.0	0.8	37.3	54.0	-16.7	H	A	100.0	280.0	
15.900	3.0	38.7	37.5	11.5	-32.1	0.0	0.7	56.2	74.0	-17.8	H	P	100.0	114.0	
15.900	3.0	25.9	37.5	11.5	-32.1	0.0	0.7	43.5	54.0	-10.5	H	A	100.0	114.0	
10.600	3.0	33.8	37.6	9.0	-32.6	0.0	0.8	48.6	74.0	-25.4	V	P	101.0	307.0	
10.600	3.0	21.2	37.6	9.0	-32.6	0.0	0.8	36.0	54.0	-18.0	V	A	101.0	307.0	
15.900	3.0	42.6	37.5	11.5	-32.1	0.0	0.7	60.1	74.0	-13.9	V	P	100.0	287.0	
15.900	3.0	29.1	37.5	11.5	-32.1	0.0	0.7	46.6	54.0	-7.4	V	A	100.0	287.0	
High Channel 5320MHz															
10.640	3.0	34.6	37.6	9.1	-32.6	0.0	0.8	49.4	74.0	-24.6	H	P	98.0	297.0	
10.640	3.0	22.6	37.6	9.1	-32.6	0.0	0.8	37.4	54.0	-16.6	H	A	98.0	297.0	
15.960	3.0	36.2	37.3	11.5	-32.1	0.0	0.7	53.6	74.0	-20.4	H	P	101.0	259.0	
15.960	3.0	22.9	37.3	11.5	-32.1	0.0	0.7	40.3	54.0	-13.7	H	A	101.0	259.0	
10.640	3.0	33.4	37.6	9.1	-32.6	0.0	0.8	48.2	74.0	-25.8	V	P	195.0	54.0	
10.640	3.0	21.0	37.6	9.1	-32.6	0.0	0.8	35.8	54.0	-18.2	V	A	195.0	54.0	
15.960	3.0	36.8	37.3	11.5	-32.1	0.0	0.7	54.2	74.0	-19.8	V	P	100.0	297.0	
15.960	3.0	23.3	37.3	11.5	-32.1	0.0	0.7	40.7	54.0	-13.3	V	A	100.0	297.0	
15.960	3.0	36.3	37.3	11.5	-32.1	0.0	0.7	53.7	74.0	-20.3	V	P	112.0	70.0	
15.960	3.0	22.5	37.3	11.5	-32.1	0.0	0.7	39.9	54.0	-14.1	V	A	112.0	70.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.6. 802.11n HT20 MODE IN THE UPPER 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/23/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT20 Mode_5.3 GHz Band

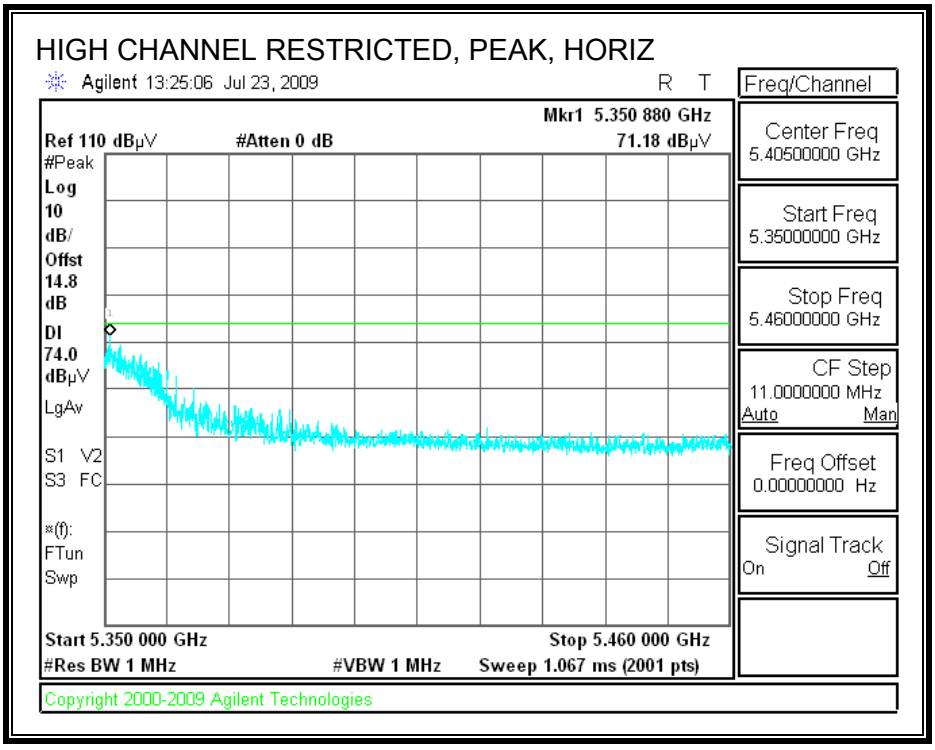
					Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass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

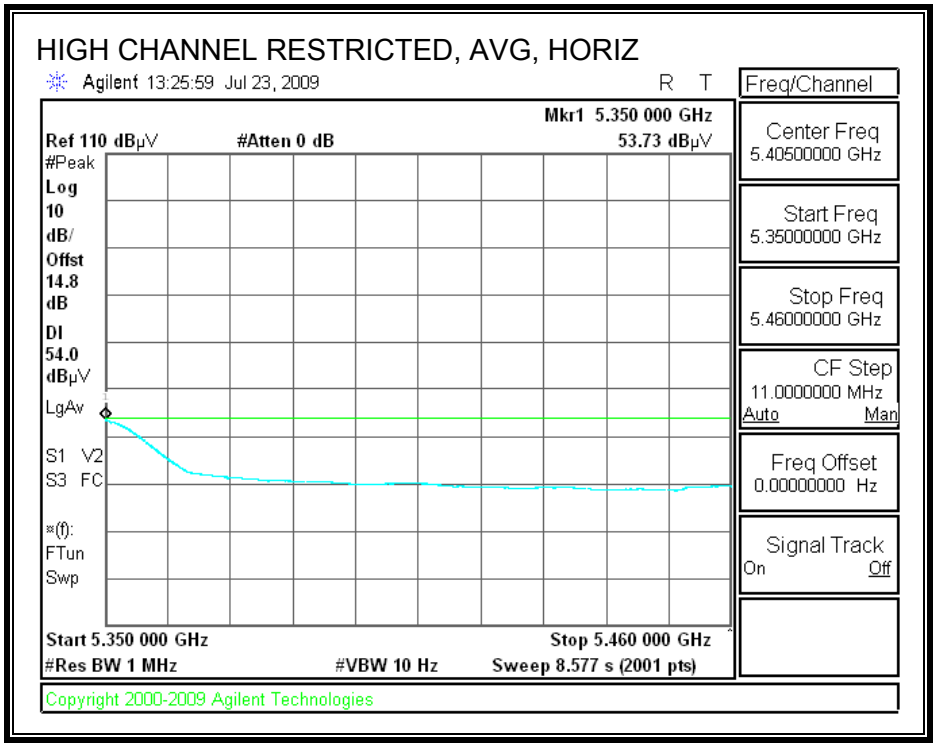
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5260MHz															
15.780	3.0	46.5	37.8	11.5	-32.2	0.0	0.7	64.3	74.0	-9.7	H	P	100.0	260.0	
15.780	3.0	32.0	37.8	11.5	-32.2	0.0	0.7	49.8	54.0	-4.2	H	A	100.0	260.0	
15.780	3.0	44.0	37.8	11.5	-32.2	0.0	0.7	61.8	74.0	-12.2	V	P	100.0	291.0	
15.780	3.0	28.6	37.8	11.5	-32.2	0.0	0.7	46.4	54.0	-7.6	V	A	100.0	291.0	
Mid Channel 5300MHz															
10.600	3.0	35.8	37.6	9.0	-32.6	0.0	0.8	50.6	74.0	-23.4	H	P	116.0	253.0	
10.600	3.0	23.9	37.6	9.0	-32.6	0.0	0.8	38.7	54.0	-15.3	H	A	116.0	253.0	
15.900	3.0	45.0	37.5	11.5	-32.1	0.0	0.7	62.6	74.0	-11.4	H	P	100.0	268.0	
15.900	3.0	30.2	37.5	11.5	-32.1	0.0	0.7	47.7	54.0	-6.3	H	A	100.0	268.0	
10.600	3.0	32.8	37.6	9.0	-32.6	0.0	0.8	47.6	74.0	-26.4	V	P	168.0	174.0	
10.600	3.0	20.4	37.6	9.0	-32.6	0.0	0.8	35.1	54.0	-18.9	V	A	168.0	174.0	
15.900	3.0	40.7	37.5	11.5	-32.1	0.0	0.7	58.2	74.0	-15.8	V	P	105.0	284.0	
15.900	3.0	26.8	37.5	11.5	-32.1	0.0	0.7	44.4	54.0	-9.6	V	A	105.0	284.0	
High Channel 5320MHz															
10.640	3.0	32.9	37.6	9.1	-32.6	0.0	0.8	47.7	74.0	-26.3	H	P	100.0	252.0	
10.640	3.0	21.8	37.6	9.1	-32.6	0.0	0.8	36.6	54.0	-17.4	H	A	100.0	252.0	
15.960	3.0	36.1	37.3	11.5	-32.1	0.0	0.7	53.6	74.0	-20.4	H	P	100.0	282.0	
15.960	3.0	22.5	37.3	11.5	-32.1	0.0	0.7	40.0	54.0	-14.0	H	A	100.0	282.0	
10.640	3.0	32.8	37.6	9.1	-32.6	0.0	0.8	47.6	74.0	-26.4	V	P	147.0	143.0	
10.640	3.0	20.3	37.6	9.1	-32.6	0.0	0.8	35.1	54.0	-18.9	V	A	147.0	143.0	
15.960	3.0	37.1	37.3	11.5	-32.1	0.0	0.7	54.5	74.0	-19.5	V	P	106.0	283.0	
15.960	3.0	22.2	37.3	11.5	-32.1	0.0	0.7	39.6	54.0	-14.4	V	A	106.0	283.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.7. 802.11n HT40 SISO MODE IN THE UPPER 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 SISO Mode_5.3 GHz Band

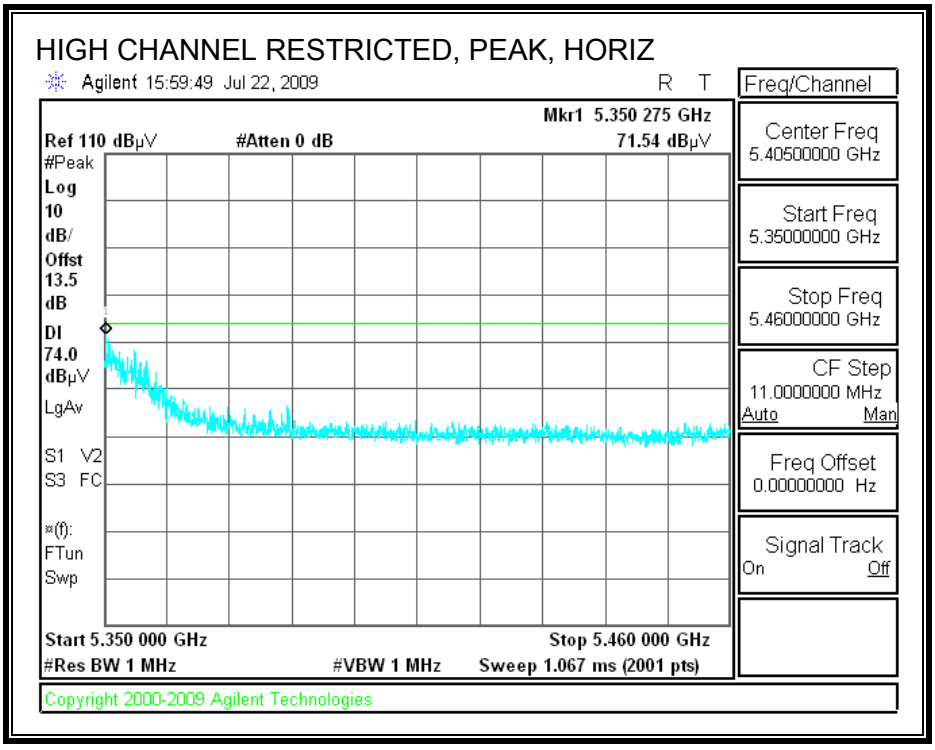
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

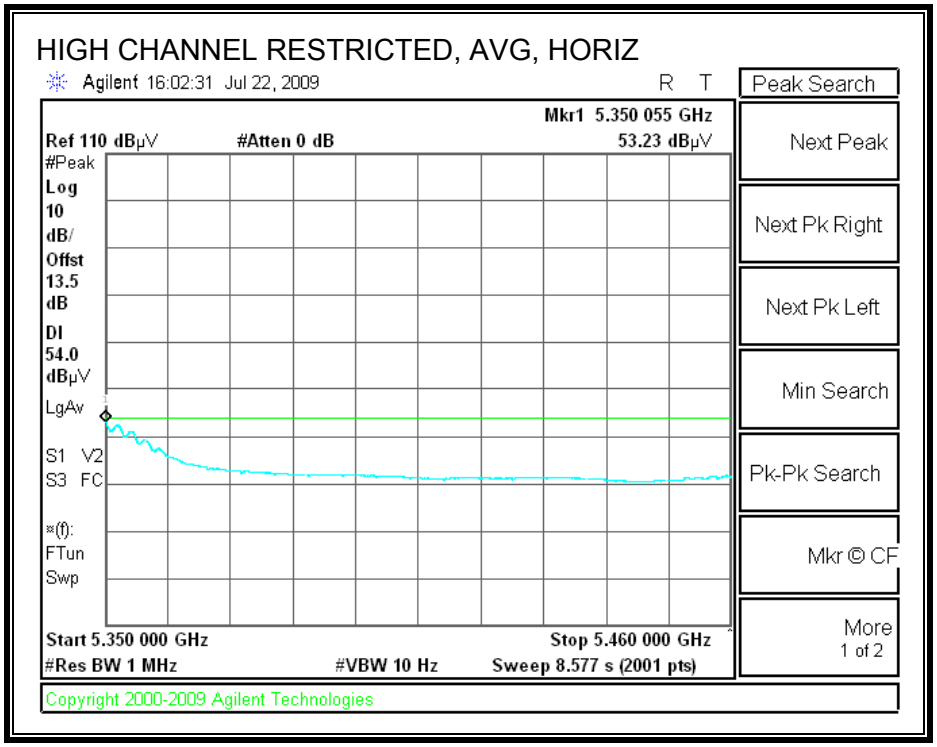
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5270MHz															
15.810	3.0	42.0	37.7	11.5	-32.2	0.0	0.7	59.7	74.0	-14.3	H	P	99.0	270.0	
15.810	3.0	28.3	37.7	11.5	-32.2	0.0	0.7	46.1	54.0	-8.0	H	A	99.0	270.0	
15.810	3.0	41.7	37.7	11.5	-32.2	0.0	0.7	59.5	74.0	-14.5	V	P	100.0	271.0	
15.810	3.0	28.5	37.7	11.5	-32.2	0.0	0.7	46.2	54.0	-7.8	V	A	100.0	271.0	
High Channel 5310MHz															
10.620	3.0	32.4	37.6	9.1	-32.6	0.0	0.8	47.2	74.0	-26.8	H	P	100.0	8.0	
10.620	3.0	20.2	37.6	9.1	-32.6	0.0	0.8	35.0	54.0	-19.0	H	A	100.0	8.0	
15.930	3.0	32.2	37.4	11.5	-32.1	0.0	0.7	49.6	74.0	-24.4	H	P	100.0	307.0	
15.930	3.0	20.2	37.4	11.5	-32.1	0.0	0.7	37.7	54.0	-16.3	H	A	100.0	307.0	
10.620	3.0	32.9	37.6	9.1	-32.6	0.0	0.8	47.7	74.0	-26.3	V	P	146.0	325.0	
10.620	3.0	20.6	37.6	9.1	-32.6	0.0	0.8	35.4	54.0	-18.6	V	A	146.0	325.0	
15.930	3.0	32.8	37.4	11.5	-32.1	0.0	0.7	50.2	74.0	-23.8	V	P	188.0	62.0	
15.930	3.0	20.2	37.4	11.5	-32.1	0.0	0.7	37.7	54.0	-16.3	V	A	188.0	62.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.8. 802.11n HT40 MIMO MCS0 MODE IN THE UPPER 5.3 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 MIMO MCS0 Mode_5.3 GHz Band

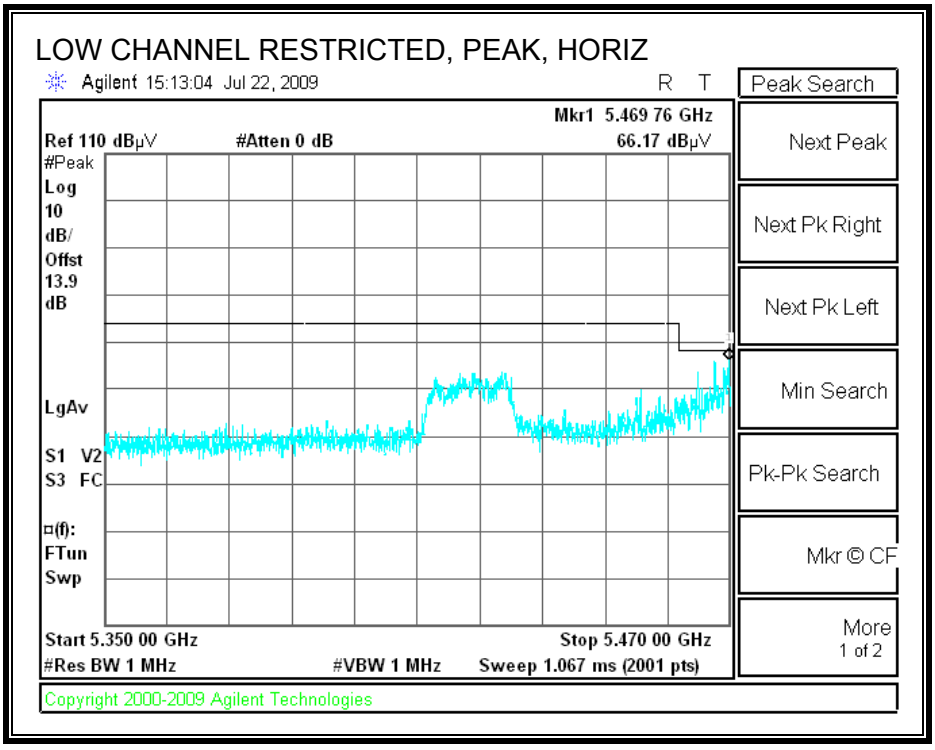
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

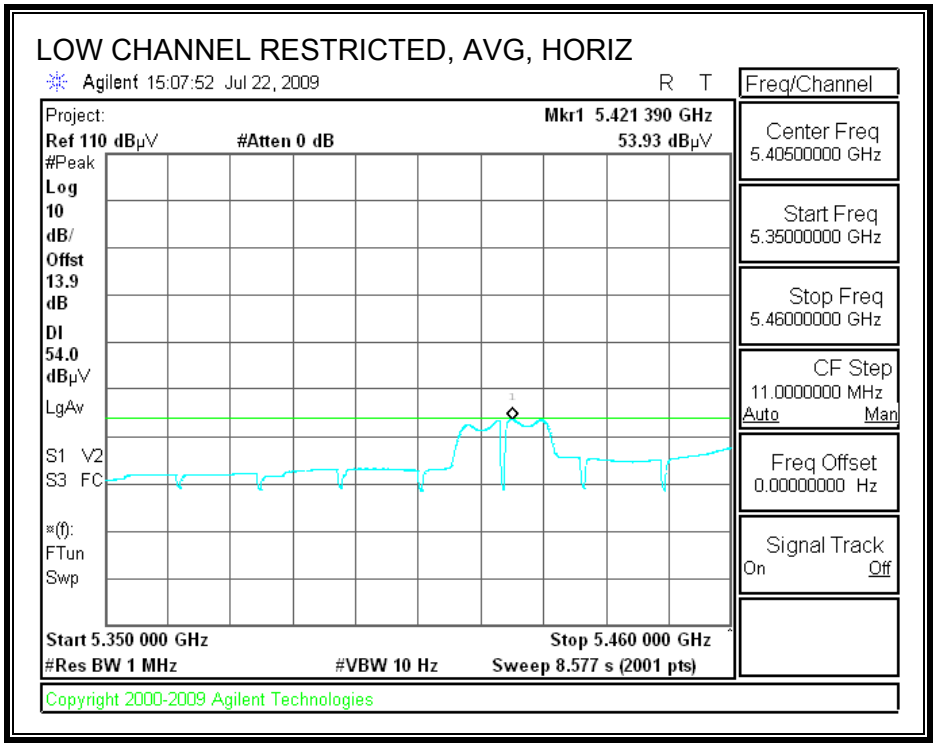
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5270MHz															
15.810	3.0	39.6	37.7	11.5	-32.2	0.0	0.7	57.3	74.0	-16.7	H	P	100.0	261.0	
15.810	3.0	26.7	37.7	11.5	-32.2	0.0	0.7	44.5	54.0	-9.5	H	A	100.0	261.0	
15.810	3.0	37.2	37.7	11.5	-32.2	0.0	0.7	55.0	74.0	-19.0	V	P	104.0	288.0	
15.810	3.0	25.1	37.7	11.5	-32.2	0.0	0.7	42.9	54.0	-11.1	V	A	104.0	288.0	
High Channel 5310MHz															
10.620	3.0	32.3	37.6	9.1	-32.6	0.0	0.8	47.0	74.0	-27.0	H	P	171.0	265.0	
10.620	3.0	20.4	37.6	9.1	-32.6	0.0	0.8	35.2	54.0	-18.8	H	A	171.0	265.0	
15.930	3.0	33.3	37.4	11.5	-32.1	0.0	0.7	50.8	74.0	-23.2	H	P	99.0	105.0	
15.930	3.0	20.4	37.4	11.5	-32.1	0.0	0.7	37.9	54.0	-16.1	H	A	99.0	105.0	
10.620	3.0	31.5	37.6	9.1	-32.6	0.0	0.8	46.3	74.0	-27.7	V	P	98.0	53.0	
10.620	3.0	19.8	37.6	9.1	-32.6	0.0	0.8	34.5	54.0	-19.5	V	A	98.0	53.0	
15.930	3.0	32.9	37.4	11.5	-32.1	0.0	0.7	50.4	74.0	-23.6	V	P	169.0	145.0	
15.930	3.0	20.3	37.4	11.5	-32.1	0.0	0.7	37.7	54.0	-16.3	V	A	169.0	145.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

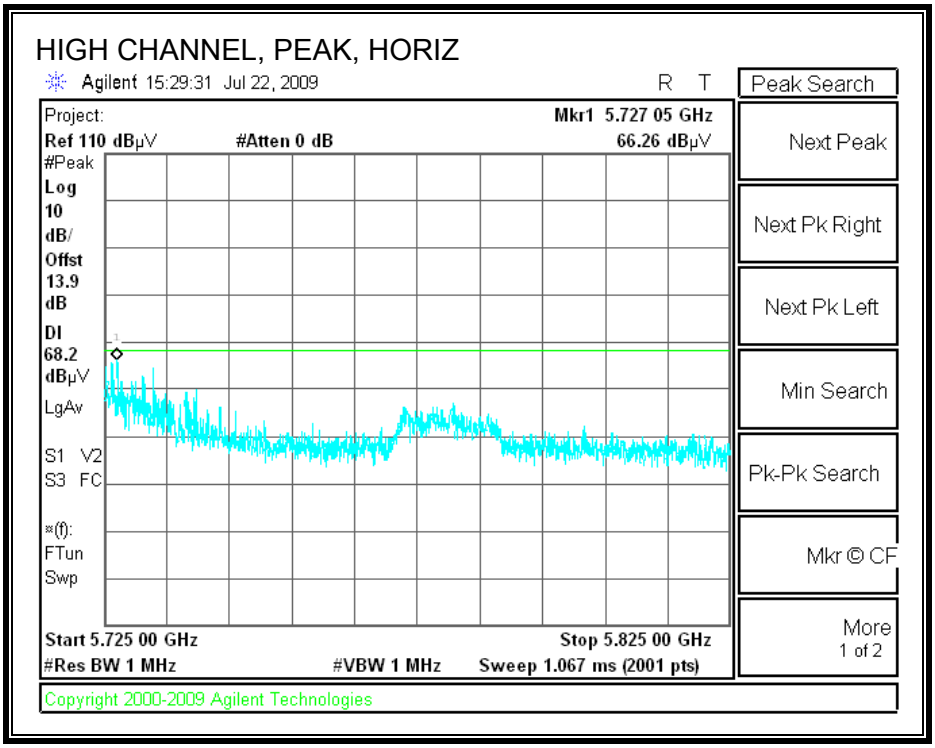
8.2.9. 802.11a MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/24/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx 11a Mode_5.6 GHz Band

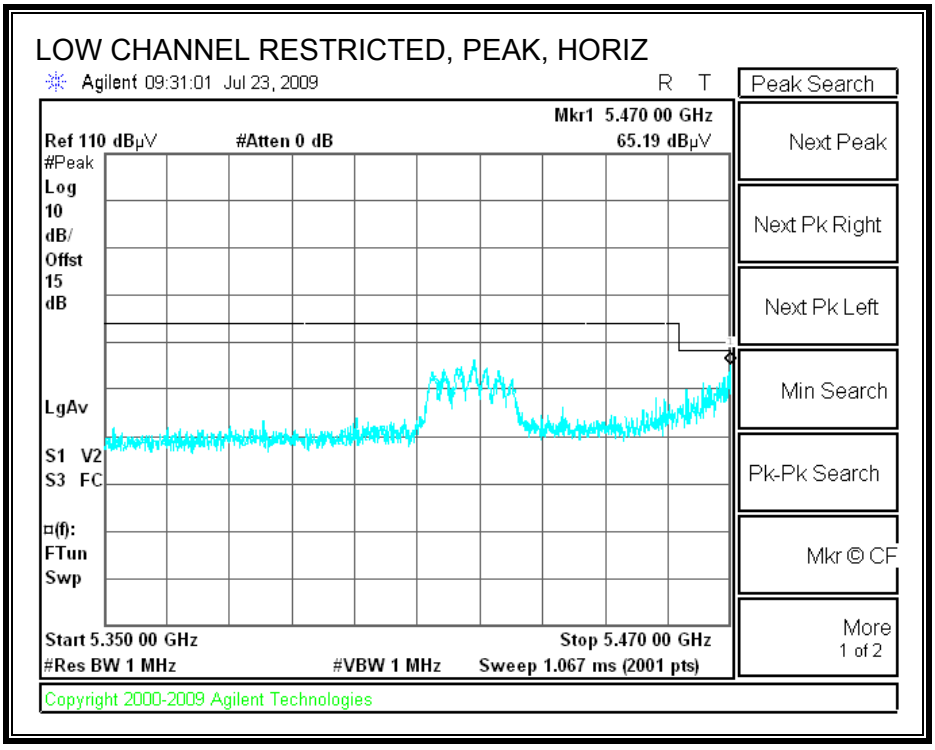
f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

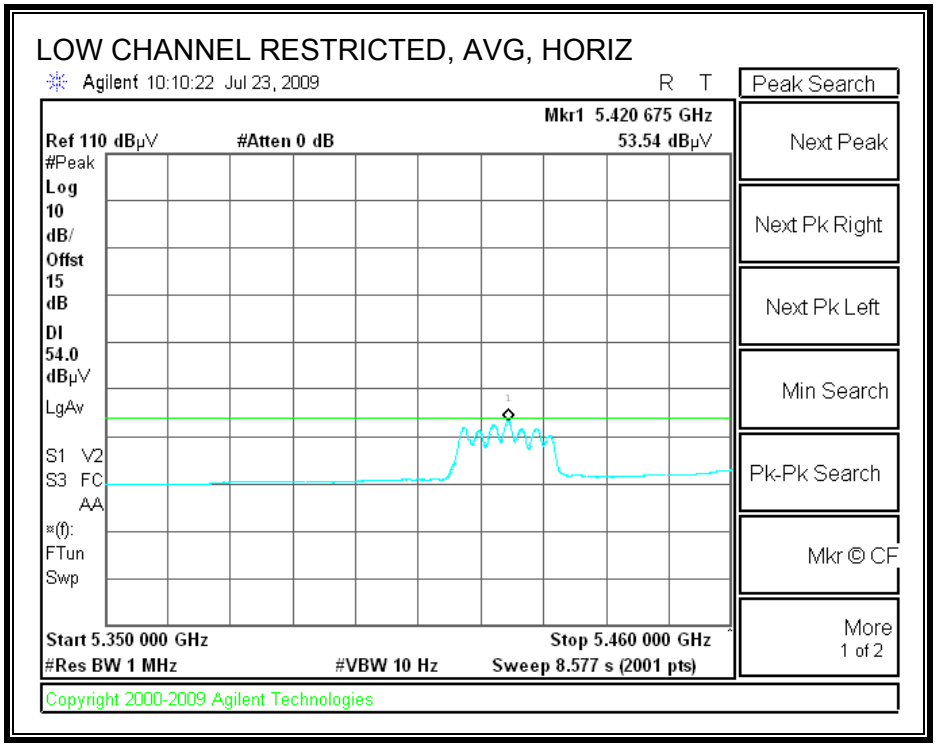
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5500MHz															
11.000	3.0	34.8	37.6	9.2	-32.6	0.0	0.7	49.8	74.0	-24.2	H	P	100.0	261.0	
11.000	3.0	22.6	37.6	9.2	-32.6	0.0	0.7	37.6	54.0	-16.4	H	A	100.0	261.0	
11.000	3.0	36.7	37.6	9.2	-32.6	0.0	0.7	51.7	74.0	-22.3	V	P	100.0	74.0	
11.000	3.0	23.2	37.6	9.2	-32.6	0.0	0.7	38.1	54.0	-15.9	V	A	100.0	74.0	
Mid Channel 5600MHz															
11.200	3.0	36.6	37.8	9.3	-32.6	0.0	0.7	51.8	74.0	-22.2	H	P	100.0	21.0	
11.200	3.0	23.3	37.8	9.3	-32.6	0.0	0.7	38.5	54.0	-15.5	H	A	100.0	21.0	
11.200	3.0	41.9	37.8	9.3	-32.6	0.0	0.7	57.2	74.0	-16.8	V	P	99.0	292.0	
11.200	3.0	28.5	37.8	9.3	-32.6	0.0	0.7	43.7	54.0	-10.3	V	A	99.0	292.0	
High Channel 5700MHz															
11.400	3.0	32.4	38.0	9.4	-32.5	0.0	0.7	47.9	74.0	-26.1	H	P	174.0	266.0	
11.400	3.0	20.6	38.0	9.4	-32.5	0.0	0.7	36.1	54.0	-17.9	H	A	174.0	266.0	
11.400	3.0	37.4	38.0	9.4	-32.5	0.0	0.7	52.9	74.0	-21.1	V	P	99.0	73.0	
11.400	3.0	22.9	38.0	9.4	-32.5	0.0	0.7	38.4	54.0	-15.6	V	A	99.0	73.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

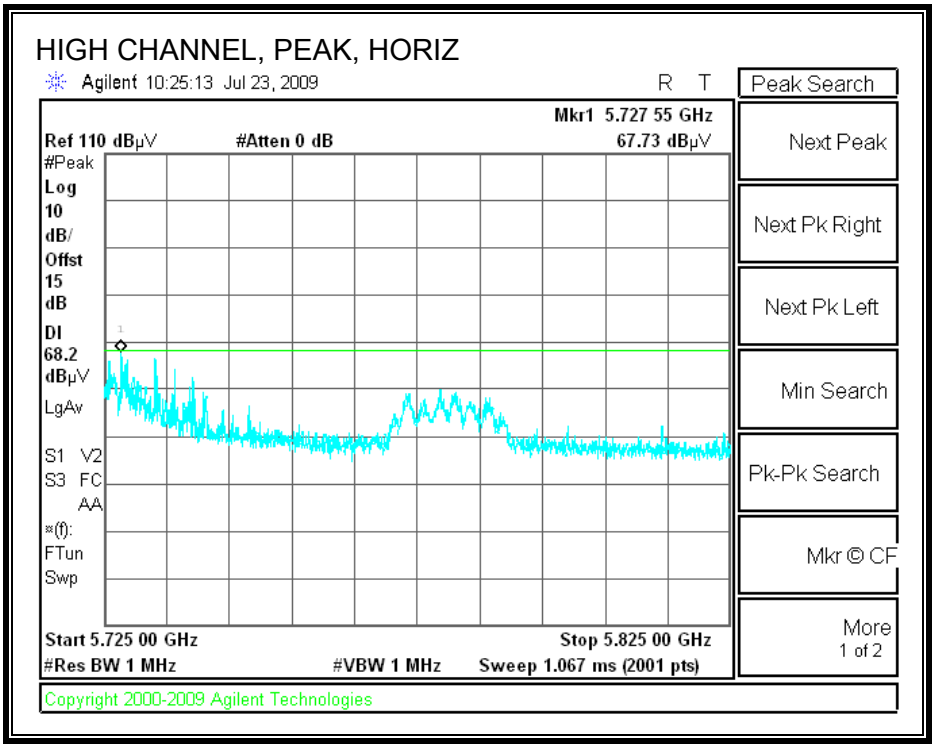
8.2.10. 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/23/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT20 Mode_5.6 GHz Band

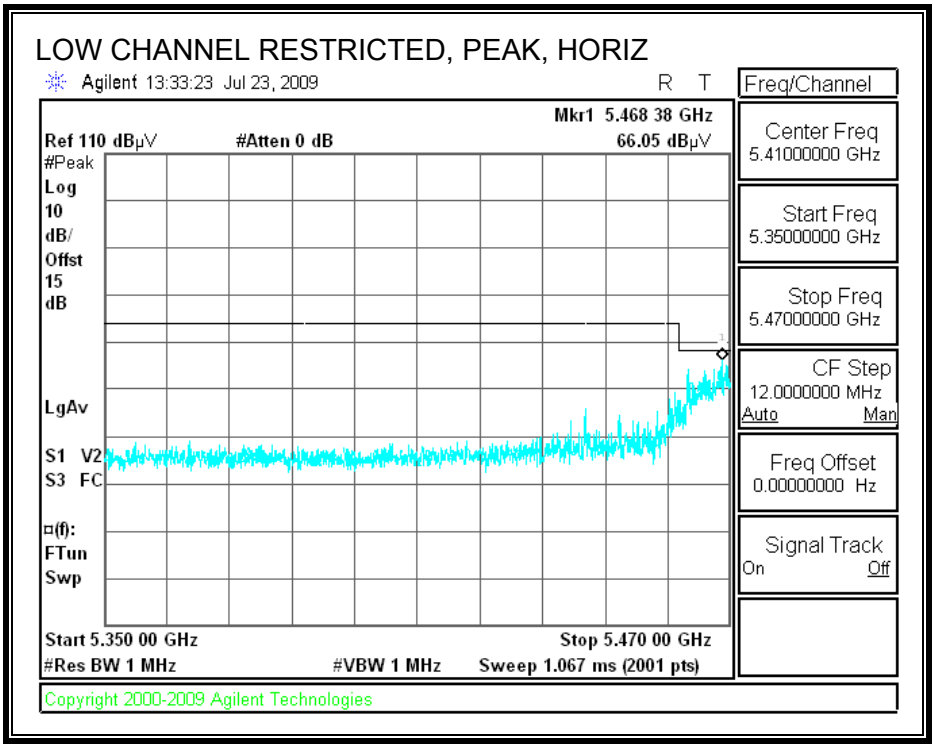
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

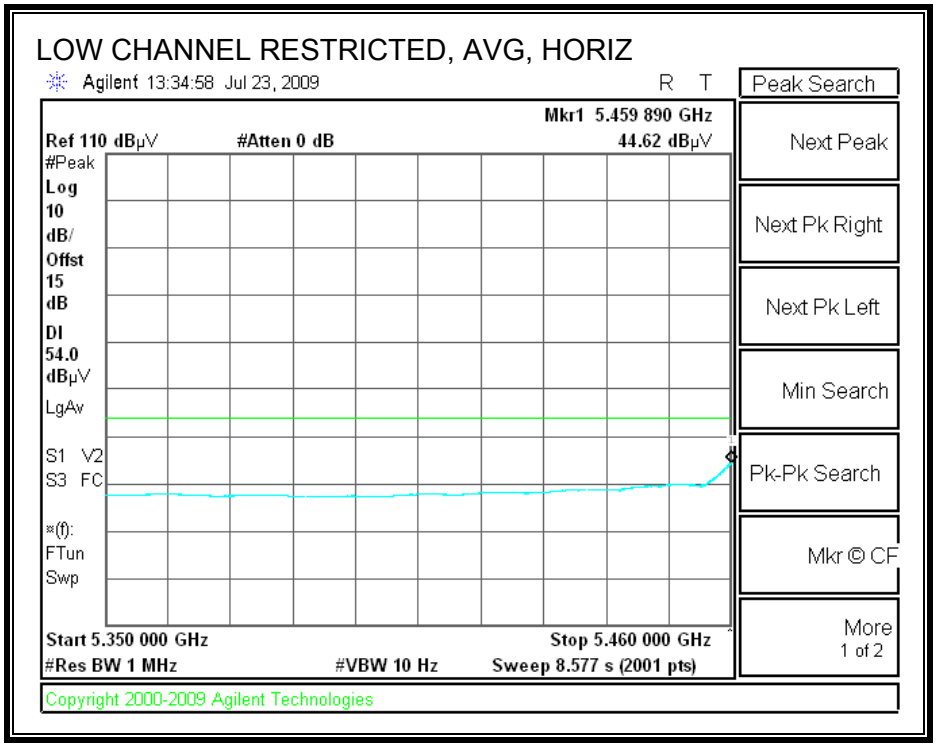
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel 5500 MHz_Setting=66													
11.000	3.0	36.0	37.6	9.2	-32.6	0.0	0.7	51.0	74.0	-23.0	V	P	
11.000	3.0	23.8	37.6	9.2	-32.6	0.0	0.7	38.7	54.0	-15.3	V	A	
11.000	3.0	36.8	37.6	9.2	-32.6	0.0	0.7	51.8	74.0	-22.2	H	P	
11.000	3.0	23.6	37.6	9.2	-32.6	0.0	0.7	38.5	54.0	-15.5	H	A	
Mid Channel 5600 MHz_Setting=66													
11.200	3.0	38.7	37.8	9.3	-32.6	0.0	0.7	53.9	74.0	-20.1	V	P	
11.200	3.0	26.0	37.8	9.3	-32.6	0.0	0.7	41.2	54.0	-12.8	V	A	
11.200	3.0	37.7	37.8	9.3	-32.6	0.0	0.7	53.0	74.0	-21.0	H	P	
11.200	3.0	25.4	37.8	9.3	-32.6	0.0	0.7	40.6	54.0	-13.4	H	A	
High Channel 5700 MHz_Setting=66													
11.400	3.0	41.5	38.0	9.4	-32.5	0.0	0.7	57.0	74.0	-17.0	V	P	
11.400	3.0	28.8	38.0	9.4	-32.5	0.0	0.7	44.4	54.0	-9.6	V	A	
11.400	3.0	39.0	38.0	9.4	-32.5	0.0	0.7	54.5	74.0	-19.5	H	P	
11.400	3.0	25.2	38.0	9.4	-32.5	0.0	0.7	40.8	54.0	-13.2	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

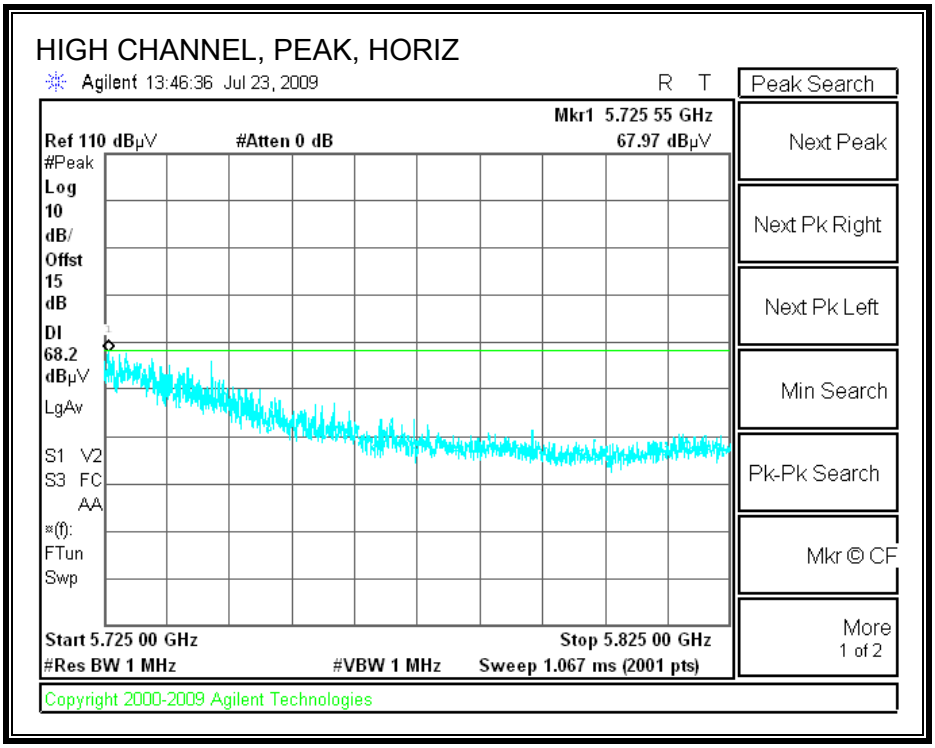
8.2.11. 802.11n HT40 SISO MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 SISO Mode_5.6 GHz Band

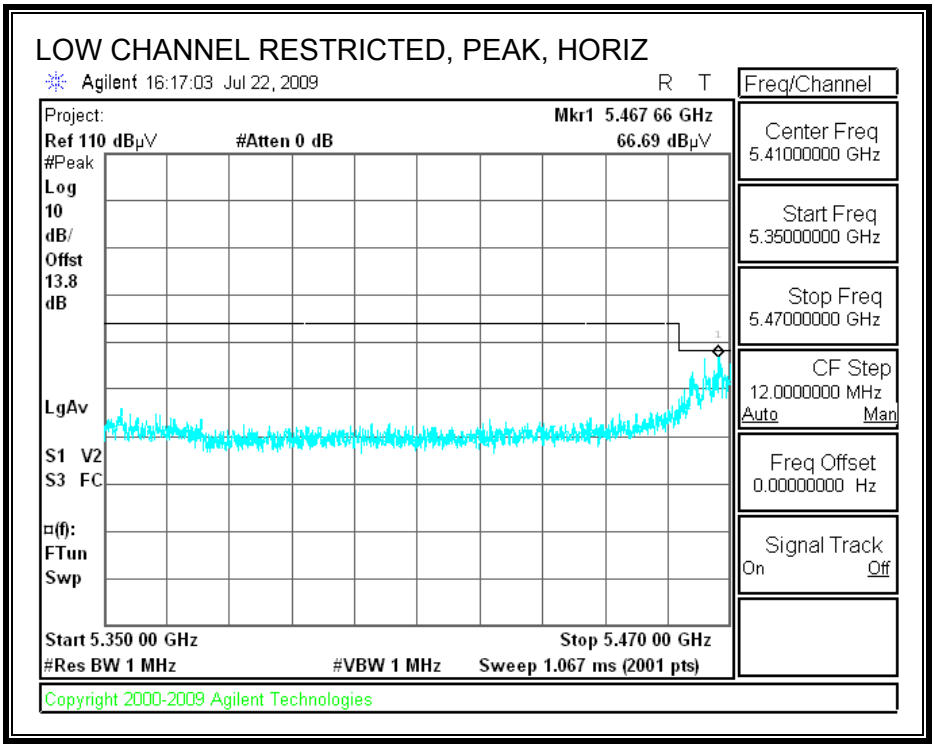
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

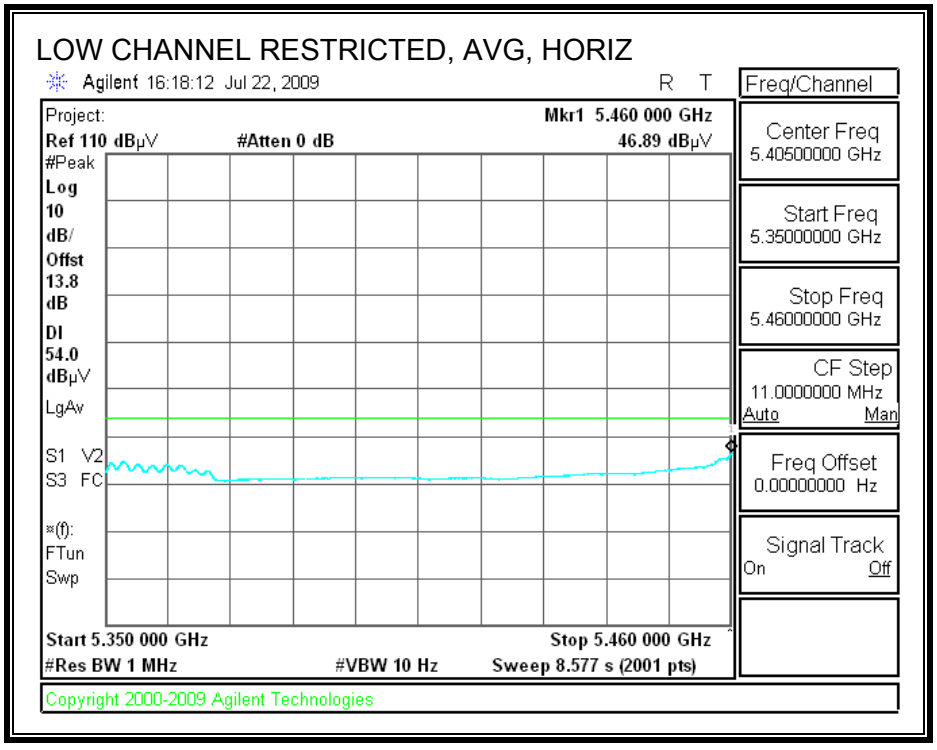
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5510MHz															
11.020	3.0	32.7	37.6	9.2	-32.6	0.0	0.7	47.7	74.0	-26.3	H	P	188.0	269.0	
11.020	3.0	20.2	37.6	9.2	-32.6	0.0	0.7	35.2	54.0	-18.8	H	A	188.0	269.0	
11.020	3.0	32.4	37.6	9.2	-32.6	0.0	0.7	47.4	74.0	-26.6	V	P	191.0	315.0	
11.020	3.0	20.7	37.6	9.2	-32.6	0.0	0.7	35.7	54.0	-18.3	V	A	191.0	315.0	
Mid Channel 5590MHz															
11.180	3.0	35.8	37.7	9.3	-32.6	0.0	0.7	51.1	74.0	-22.9	H	P	107.0	152.0	
11.180	3.0	23.9	37.7	9.3	-32.6	0.0	0.7	39.1	54.0	-14.9	H	A	107.0	152.0	
11.180	3.0	37.4	37.7	9.3	-32.6	0.0	0.7	52.6	74.0	-21.4	V	P	99.0	70.0	
11.180	3.0	25.3	37.7	9.3	-32.6	0.0	0.7	40.5	54.0	-13.5	V	A	99.0	70.0	
High Channel 5670MHz															
11.340	3.0	33.1	37.9	9.4	-32.6	0.0	0.7	48.6	74.0	-25.4	H	P	98.0	331.0	
11.340	3.0	20.1	37.9	9.4	-32.6	0.0	0.7	35.5	54.0	-18.5	H	A	98.0	331.0	
11.340	3.0	36.2	37.9	9.4	-32.6	0.0	0.7	51.7	74.0	-22.3	V	P	100.0	286.0	
11.340	3.0	24.0	37.9	9.4	-32.6	0.0	0.7	39.4	54.0	-14.6	V	A	100.0	286.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

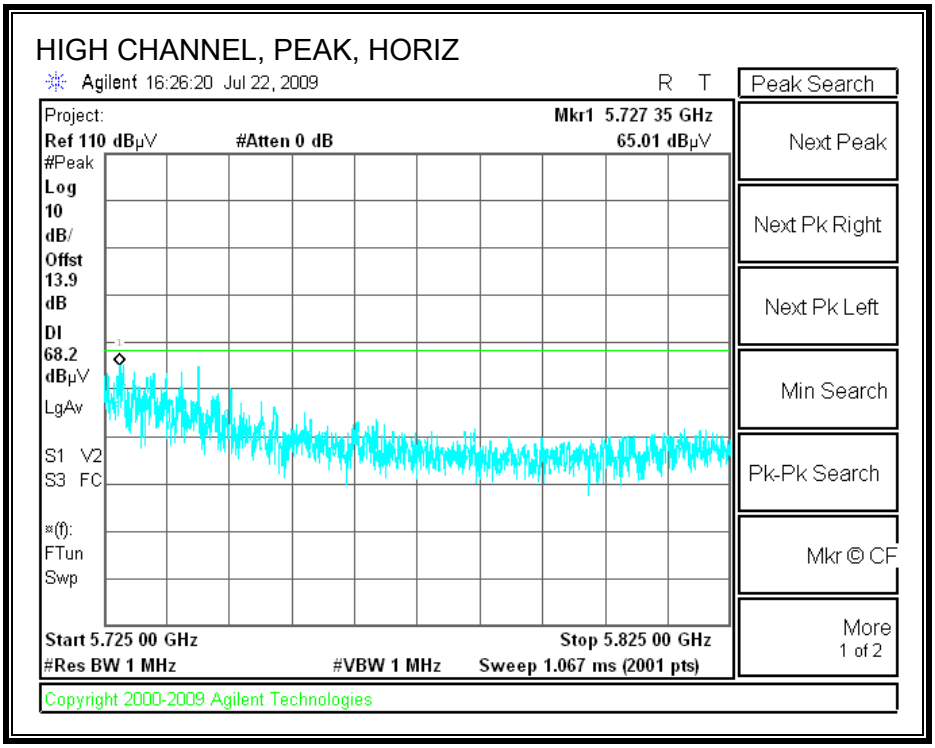
8.2.12. 802.11n HT40 MIMO MCS0 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/27/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx HT40 MIMO MCS0 Mode_5.6 GHz Band

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel 5510MHz															
11.020	3.0	32.0	37.6	9.2	-32.6	0.0	0.7	47.0	74.0	-27.0	H	P	100.0	236.0	
11.020	3.0	20.2	37.6	9.2	-32.6	0.0	0.7	35.2	54.0	-18.8	H	A	100.0	236.0	
11.020	3.0	31.6	37.6	9.2	-32.6	0.0	0.7	46.6	74.0	-27.4	V	P	111.0	360.0	
11.020	3.0	19.7	37.6	9.2	-32.6	0.0	0.7	34.7	54.0	-19.3	V	A	111.0	360.0	
Mid Channel 5590MHz															
11.180	3.0	37.6	37.7	9.3	-32.6	0.0	0.7	52.9	74.0	-21.1	H	P	103.0	290.0	
11.180	3.0	25.2	37.7	9.3	-32.6	0.0	0.7	40.5	54.0	-13.5	H	A	103.0	290.0	
11.180	3.0	36.8	37.7	9.3	-32.6	0.0	0.7	52.1	74.0	-21.9	V	P	100.0	66.0	
11.180	3.0	25.5	37.7	9.3	-32.6	0.0	0.7	40.7	54.0	-13.3	V	A	100.0	66.0	
High Channel 5670MHz															
11.340	3.0	37.1	37.9	9.4	-32.6	0.0	0.7	52.6	74.0	-21.4	H	P	107.0	257.0	
11.340	3.0	24.5	37.9	9.4	-32.6	0.0	0.7	39.9	54.0	-14.1	H	A	107.0	257.0	
11.340	3.0	34.6	37.9	9.4	-32.6	0.0	0.7	50.0	74.0	-24.0	V	P	100.0	70.0	
11.340	3.0	22.3	37.9	9.4	-32.6	0.0	0.7	37.7	54.0	-16.3	V	A	100.0	70.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. WORST-CASE BELOW 1 GHz

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

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
Date: 07/29/09
Project #: 09U12658
Company: Broadcom
EUT Description: 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MIMI CARD
EUT M/N: BCM943224PCIEBT
Test Target: FCC B
Mode Oper: Tx Below 1GHz_Worst-Case 5GHz Band

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
HORIZONTAL													
99.723	3.0	54.9	9.9	0.9	28.3	0.0	0.0	37.4	43.5	-6.1	H	EP	
644.425	3.0	43.7	18.9	2.3	27.4	0.0	0.0	37.6	46.0	-8.4	H	EP	
720.028	3.0	46.7	19.9	2.5	27.2	0.0	0.0	41.8	46.0	-4.2	H	EP	
844.834	3.0	42.9	21.4	2.7	27.6	0.0	0.0	39.4	46.0	-6.6	H	EP	
973.719	3.0	39.9	22.3	2.9	27.9	0.0	0.0	37.3	54.0	-16.7	H	EP	
997.480	3.0	44.8	22.4	3.0	27.9	0.0	0.0	42.3	54.0	-11.7	H	EP	
VERTICAL													
120.004	3.0	45.1	13.6	1.0	28.3	0.0	0.0	31.5	43.5	-12.0	V	EP	
240.009	3.0	53.3	11.8	1.3	28.2	0.0	0.0	38.2	46.0	-7.8	V	EP	
336.013	3.0	51.4	14.0	1.6	28.1	0.0	0.0	38.9	46.0	-7.1	V	EP	
730.229	3.0	44.2	20.0	2.5	27.3	0.0	0.0	39.4	46.0	-6.6	V	EP	
896.316	3.0	43.4	21.8	2.8	27.8	0.0	0.0	40.3	46.0	-5.7	V	EP	
998.080	3.0	41.7	22.4	3.0	27.9	0.0	0.0	39.2	54.0	-14.8	V	EP	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	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

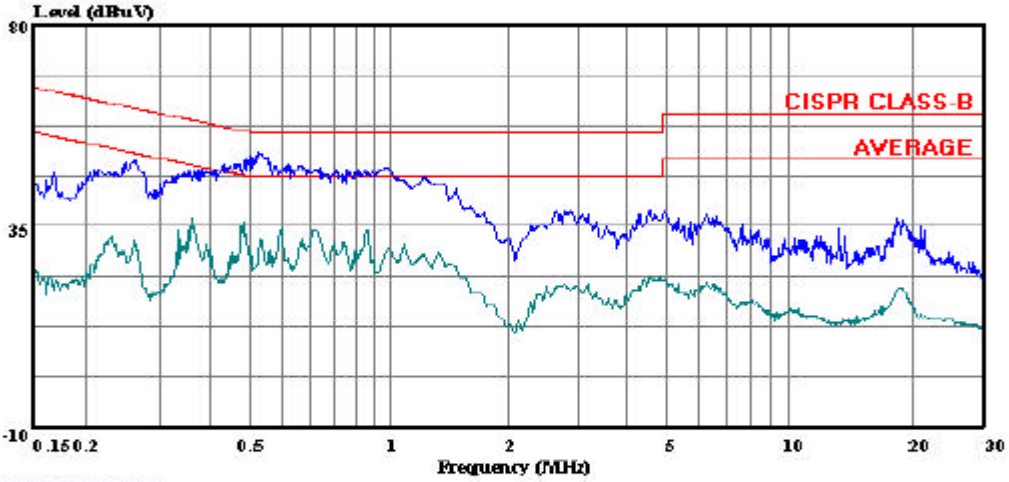
6 WORST EMISSIONS

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
0.27	49.44	--	29.43	0.00	61.24	51.24	-11.80	-21.81	L1
0.53	51.19	--	32.16	0.00	56.00	46.00	-4.81	-13.84	L1
6.39	37.69	--	22.62	0.00	60.00	50.00	-22.31	-27.38	L1
0.39	47.13	--	27.10	0.00	58.00	48.00	-10.87	-20.90	L2
0.67	46.26	--	24.80	0.00	56.00	46.00	-9.74	-21.20	L2
20.92	38.94	--	23.42	0.00	60.00	50.00	-21.06	-26.58	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#: 21 File#: 09u12658.emi Date: 07-29-2009 Time: 09:27:50



(Line Conduction)

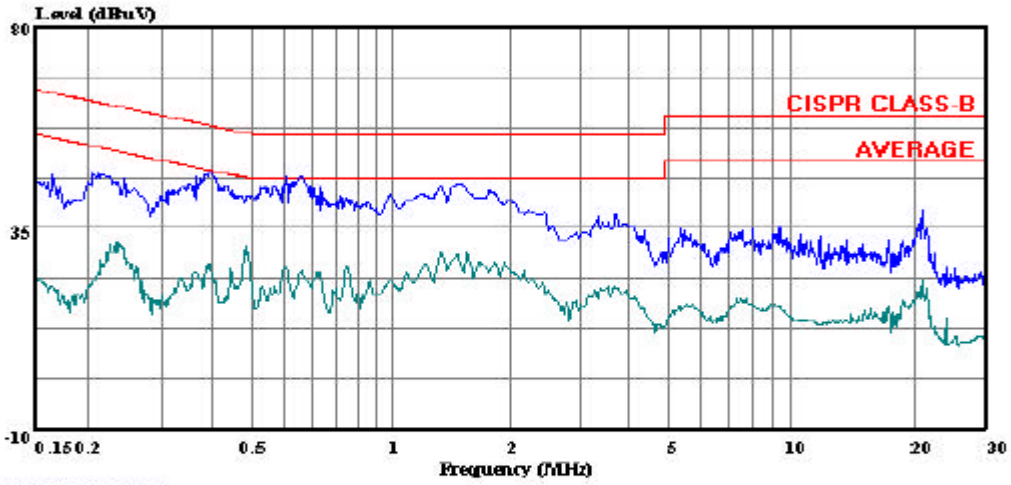
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Vien Tran
Project #: : 09U12658
Company: : Broadcom
EUT Description:: 802.11a/b/g/n WLAN + Bluetooth
: PCIE Mini Card
Mode: : Tx Worst-Case_5 GHz Band
Target: : FCC Class B
Voltage: : 115 VAC / 60Hz
: L1: Peak (Blue) , Average (Green)

LINE 2 RESULTS

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

Data#: 28 File#: 09u12658.emi Date: 07-29-2009 Time: 09:53:14



(Line Conduction)

Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Vien Tran
Project #: : 09U12658
Company: : Broadcom
EUT Description:: 802.11a/b/g/n WLAN + Bluetooth
: PCIE Mini Card
Mode: : Tx Worst-Case_5 GHz Band
Target: : FCC Class B
Voltage: : 115 VAC / 60Hz
: L2: Peak (Blue) , Average (Green)

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

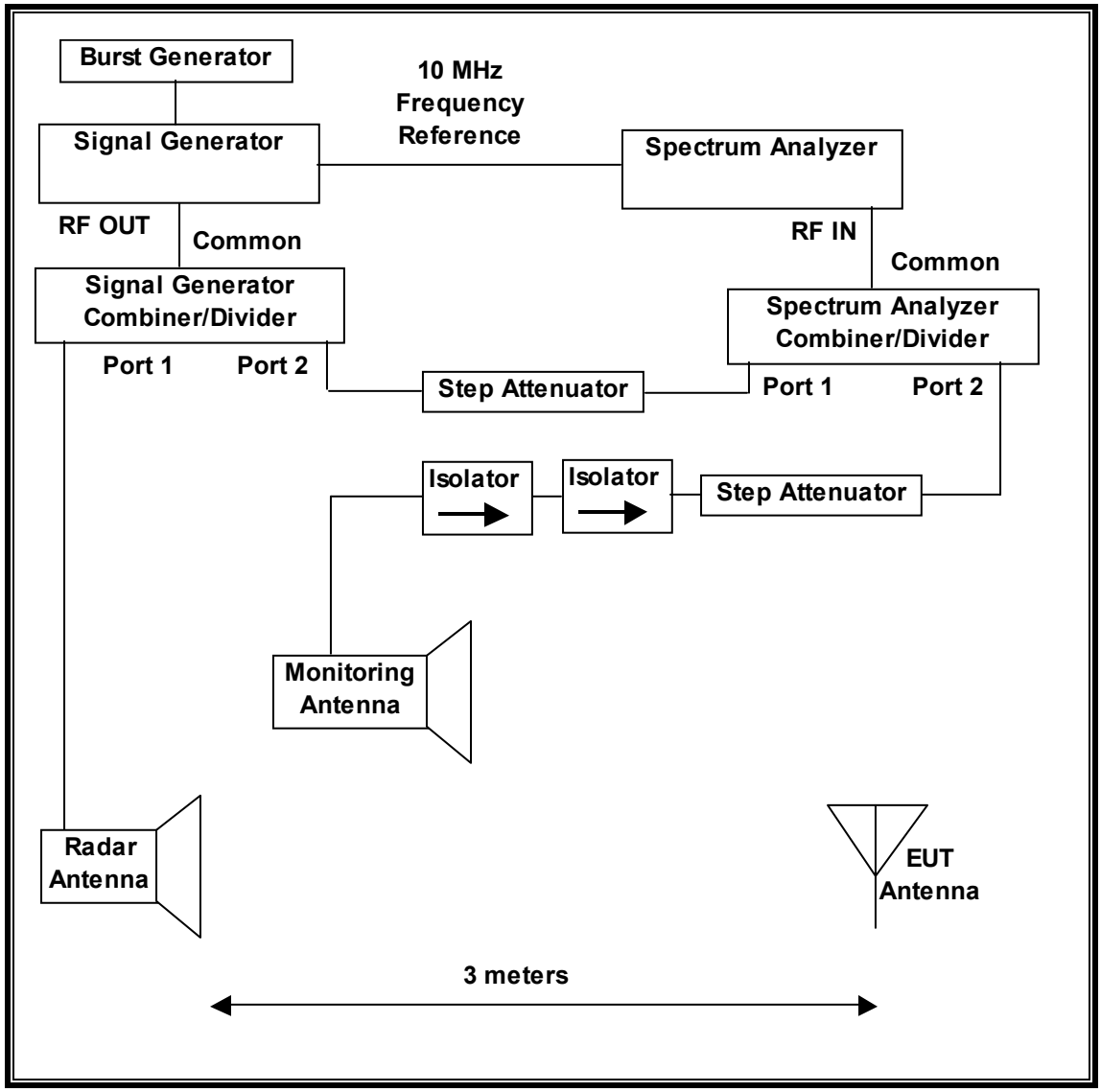
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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 signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. 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 analyer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. Measure the amplitude and calculate the difference from –64 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference.

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.

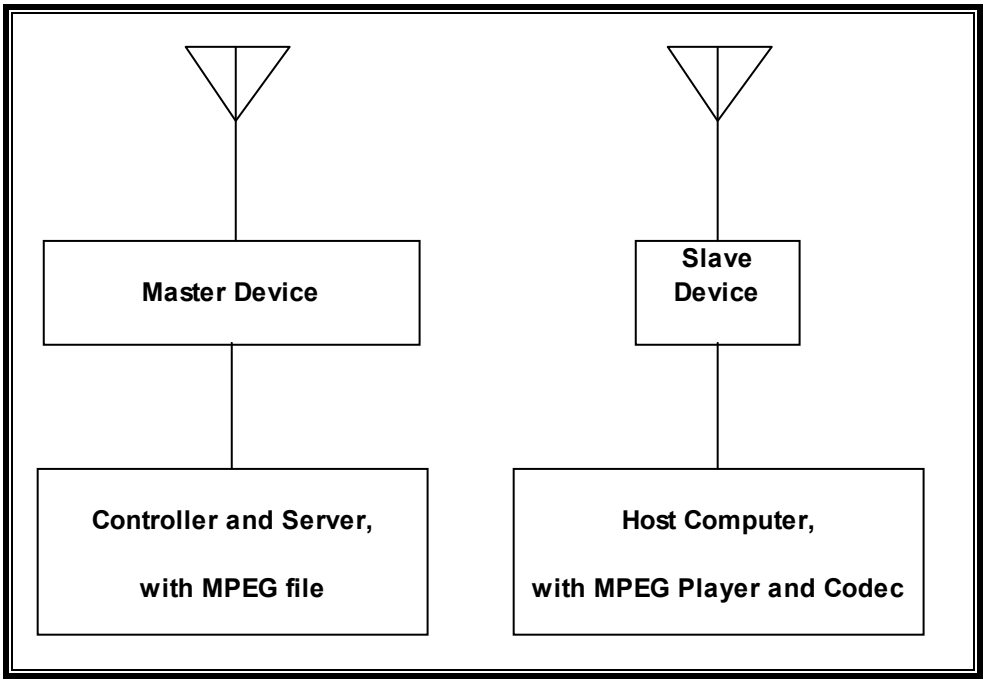
TEST AND MEASUREMENT EQUIPMENT

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**	**MY43360112**	**6/1/2010**
Vector Signal Generator, 20GHz	**Agilent / HP**	**E8267C**	**US43320336**	**11/16/2009**

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
AC Adapter	Dell	PPP017L	CN-06G356-71615-3AR-19C5	N/A
Laptop AP Server w/MPEG File	Dell	Inspiron 4150	CN-04P449-48643-2CH1848	DoC
AC Adapter	HP	RS232	58B240ALLRKOHU	N/A
Laptop AP Controller	HP	Pavilion ZV6000	CND529016Y	DoC
AC Adapter	Linkys	LS12V2A	1196723	N/A
Acess Point	Linkys	WRT600N	MNR007800466	Q87-WRT600NV11
AC Adapter	Dell	DA65NS0-00	CN-0CF745-48661-741-2P2E	N/A
Laptop w/DUT	Dell	Inspiron 1526	CN-0SE2C2-70166-77L-001M	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 26.78 dBm EIRP.

The highest gain antennas assembly utilized with the EUT has a gain 3.29 dBi in the 5250-5350 MHz band and 3.94 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 2.99 dBi in the 5250-5350 MHz band and 3.38 dBi in the 5470-5725 MHz band.

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

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

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

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

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

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

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

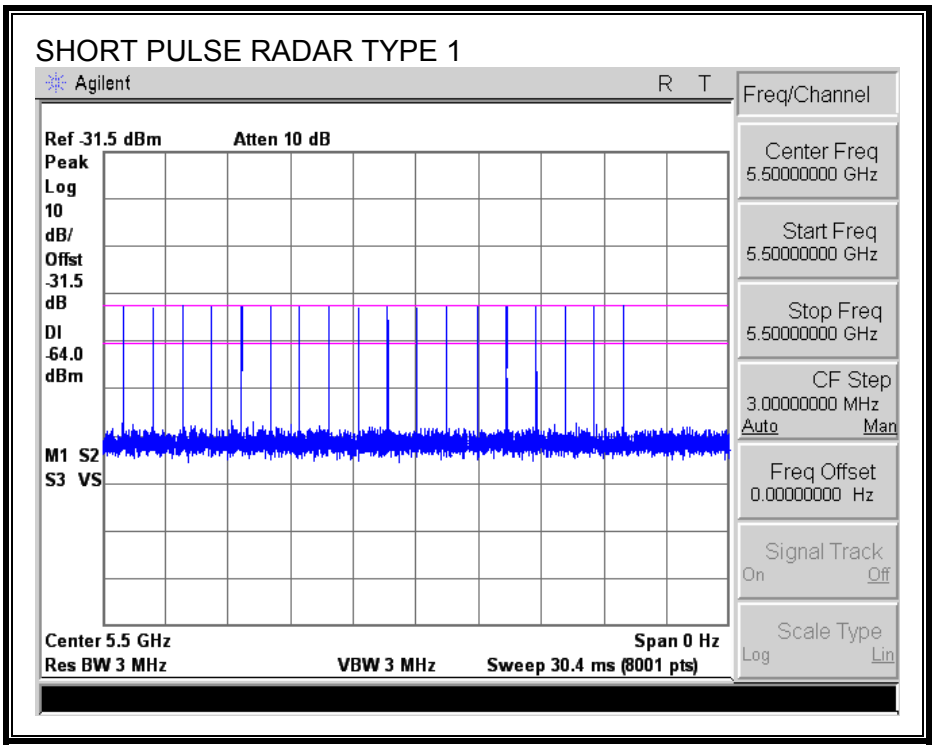
10.2. RESULTS FOR 20 MHz BANDWIDTH

10.2.1. TEST CHANNEL

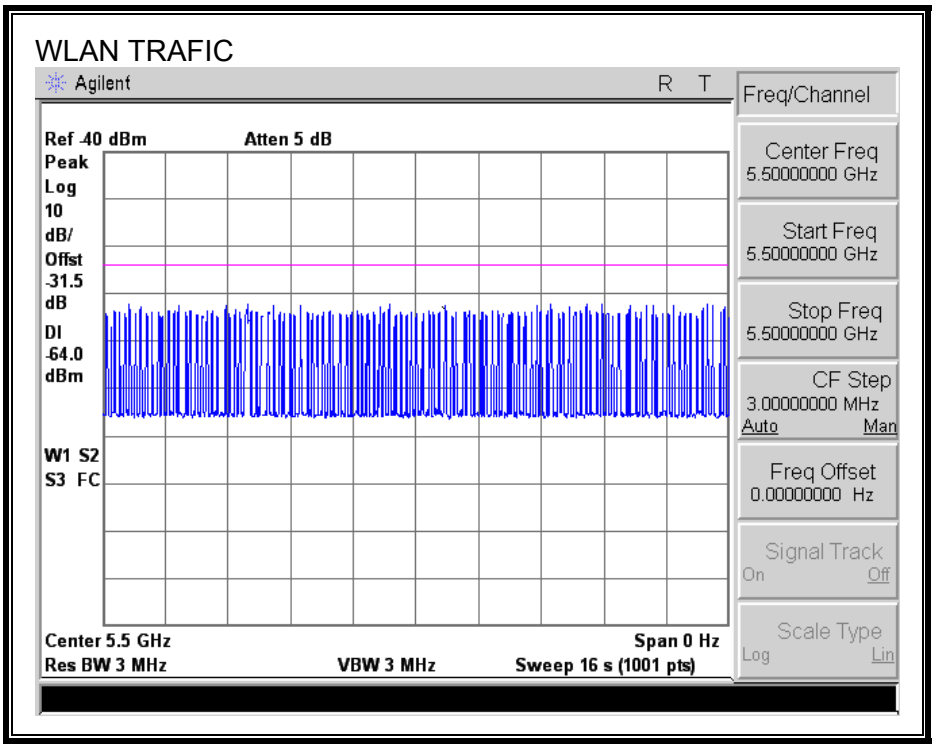
All tests were performed at a channel center frequency of 5500 MHz. Measurements were performed using radiated test methods.

10.2.2. PLOTS OF RADAR WAVEFORM AND WLAN TRAFFIC

PLOTS OF RADAR WAVEFORM



PLOT OF WLAN TRAFFIC



10.2.3. 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).

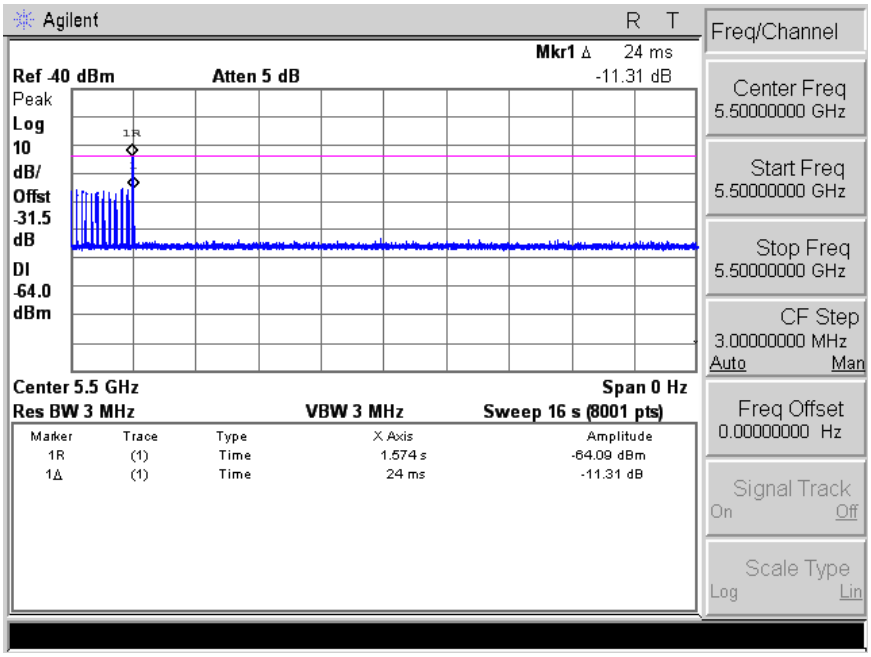
RESULTS

Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.024	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	4.0	60
IC	0.0	260

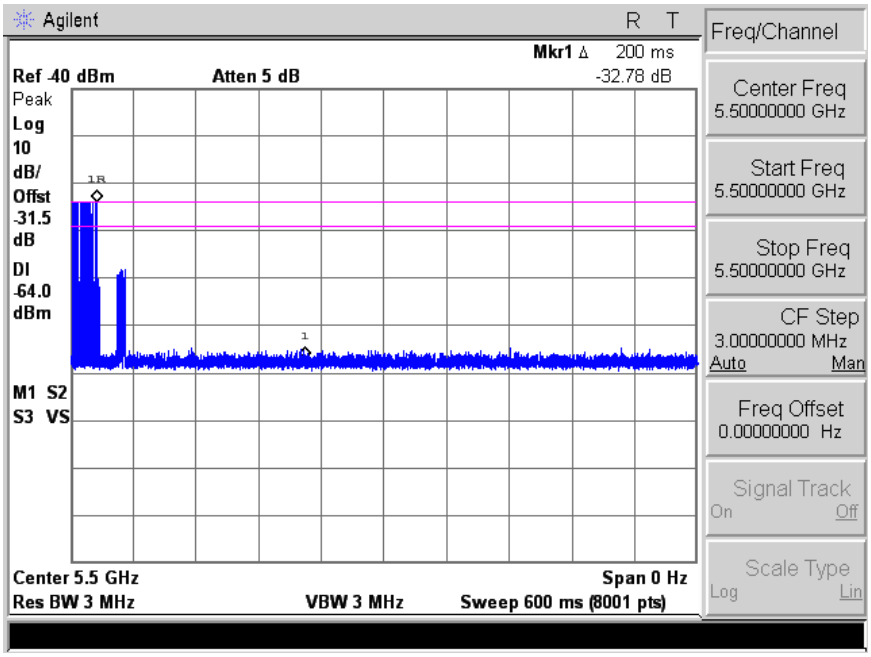
MOVE TIME

MOVE TIME PLOT



CHANNEL CLOSING TIME

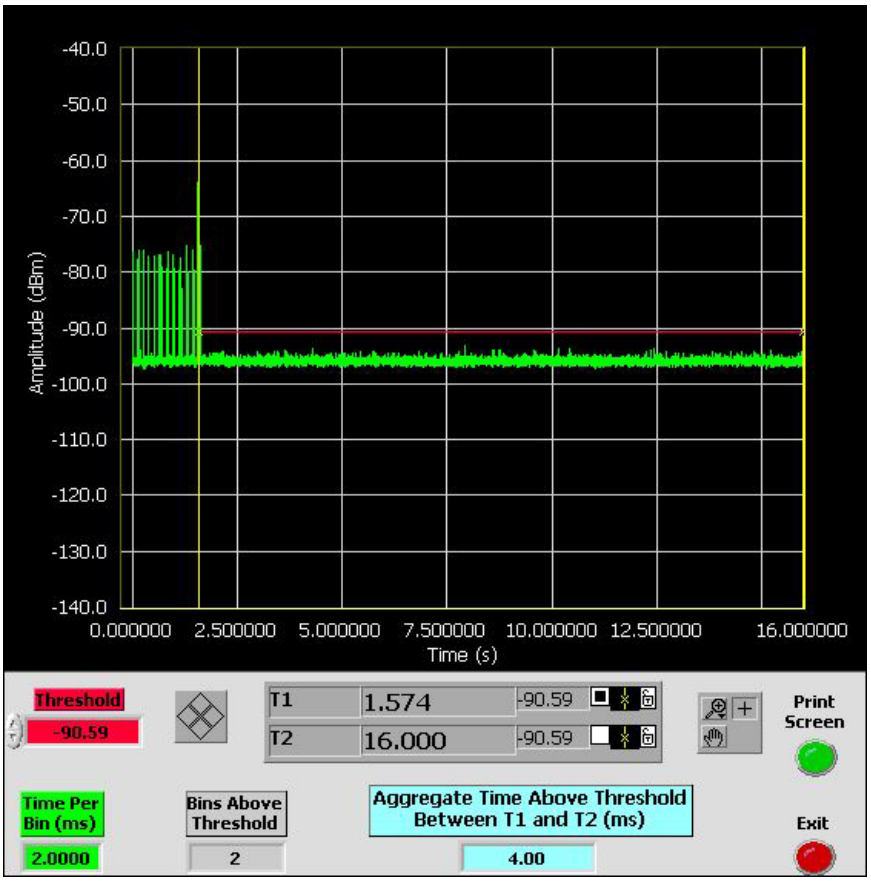
CLOSING TIME PLOT



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

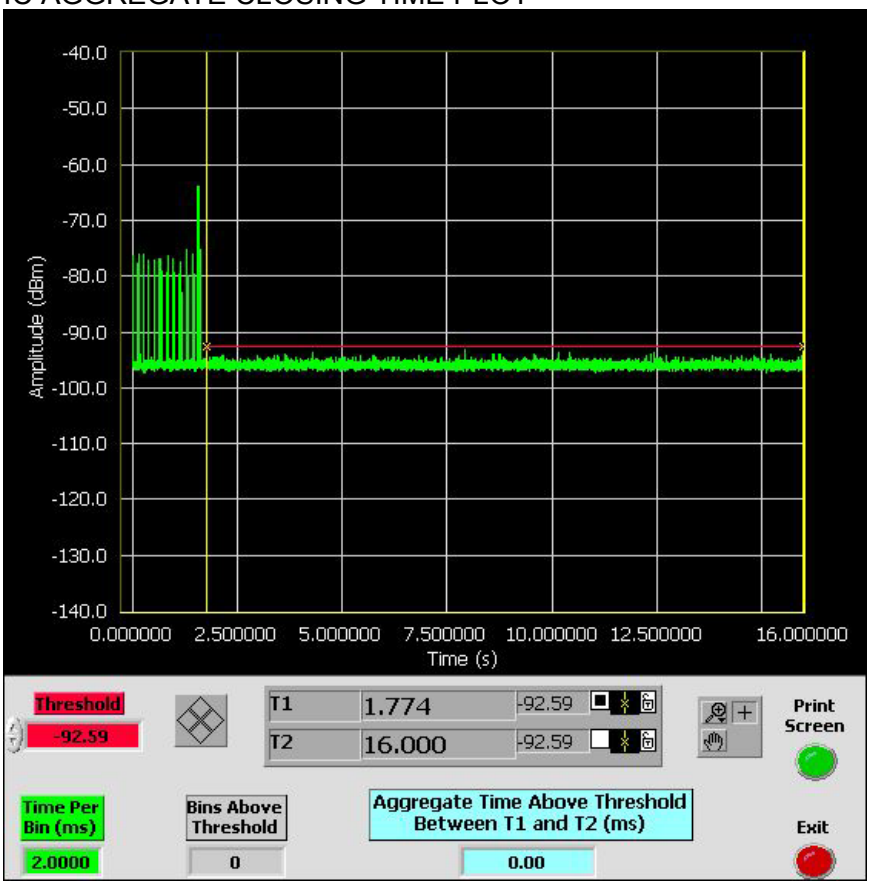
Only intermittent transmissions are observed during the FCC aggregate monitoring period.

FCC AGGREGATE CLOSING TIME PLOT



No transmissions are observed during the IC aggregate monitoring period.

IC AGGREGATE CLOSING TIME PLOT



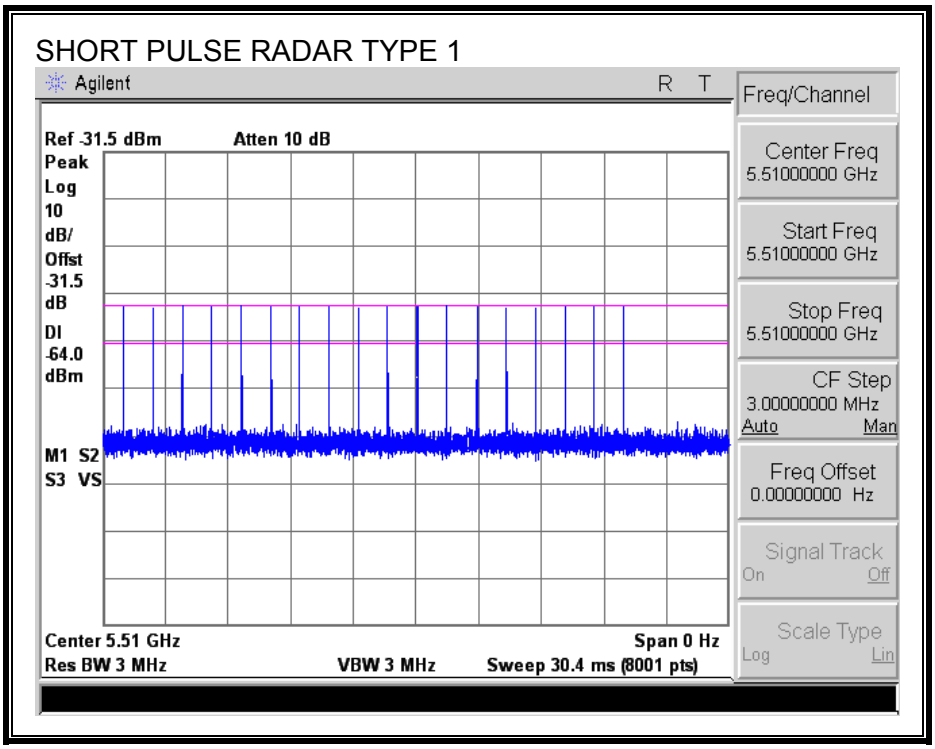
10.3. RESULTS FOR 40 MHz BANDWIDTH

10.3.1. TEST CHANNEL

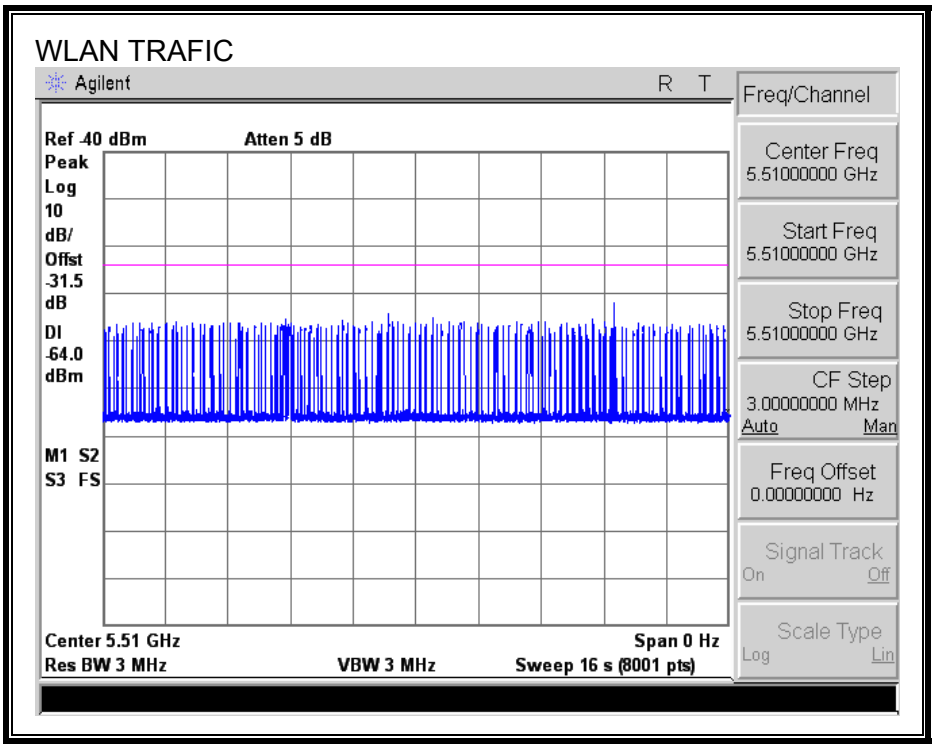
All tests were performed at a channel center frequency of 5510 MHz. Measurements were performed using radiated test methods.

10.3.2. PLOTS OF RADAR WAVEFORM AND WLAN TRAFFIC

PLOTS OF RADAR WAVEFORM



PLOT OF WLAN TRAFFIC



10.3.3. 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).

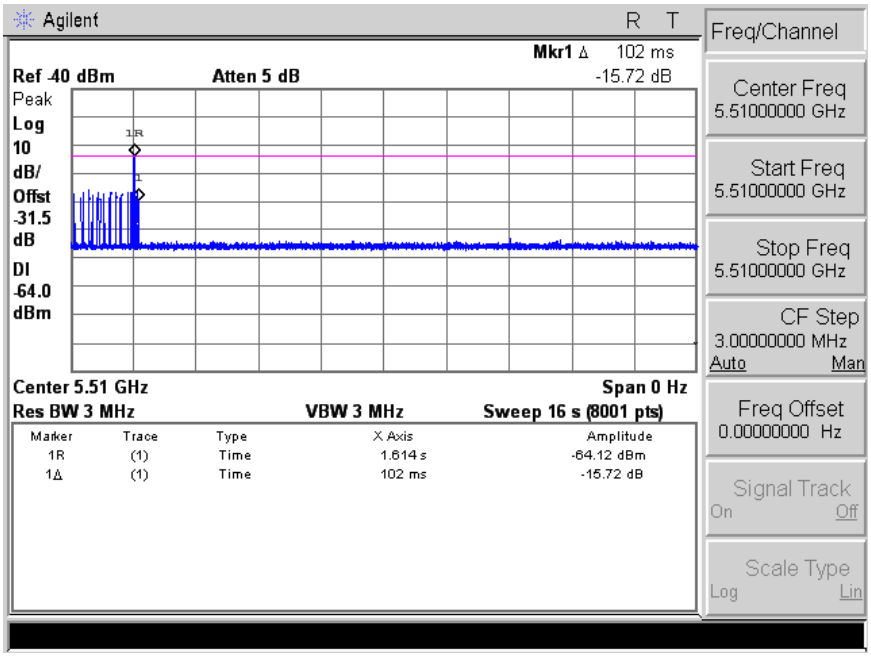
RESULTS

Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.102	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	14.0	60
IC	0.0	260

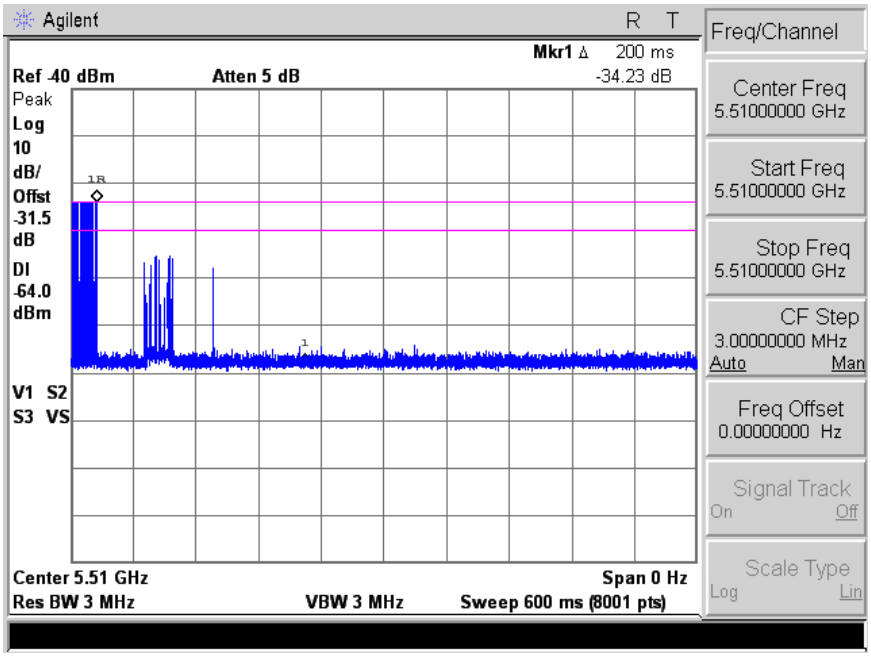
MOVE TIME

MOVE TIME PLOT



CHANNEL CLOSING TIME

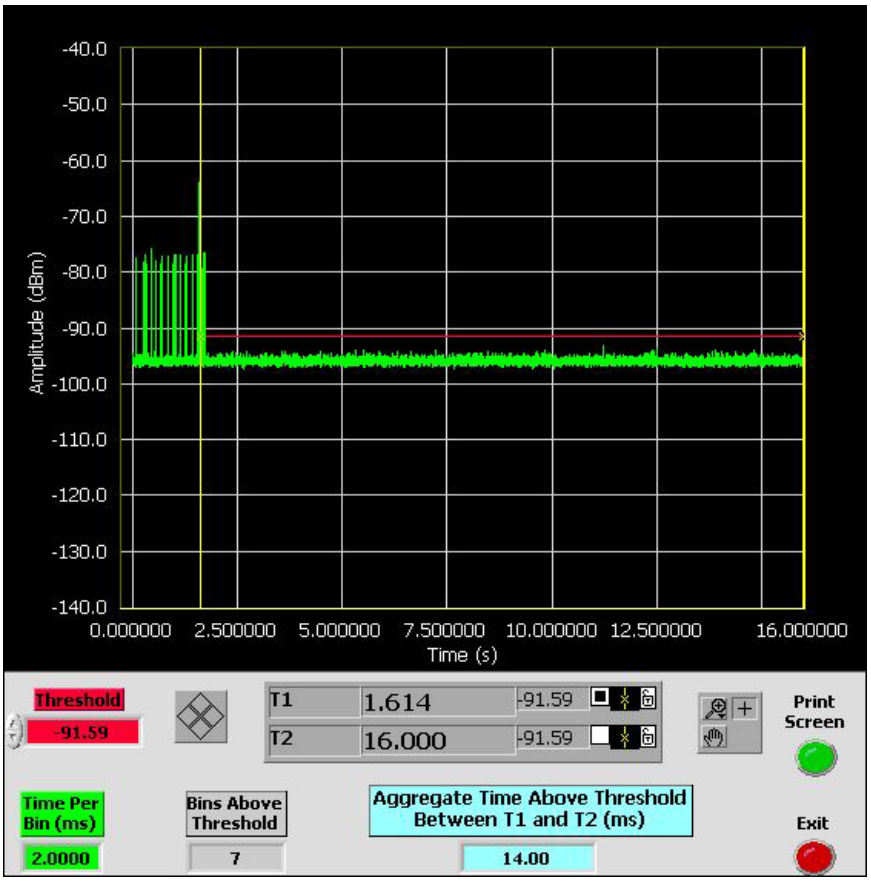
CLOSING TIME PLOT



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

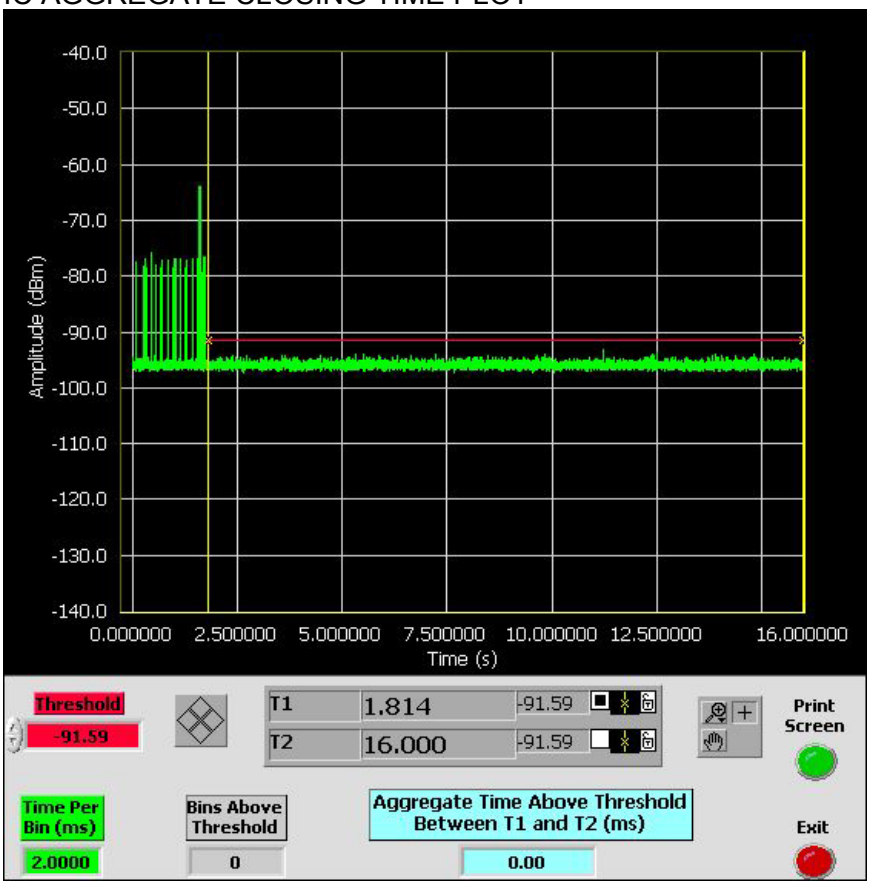
Only intermittent transmissions are observed during the FCC aggregate monitoring period.

FCC AGGREGATE CLOSING TIME PLOT



No transmissions are observed during the IC aggregate monitoring period.

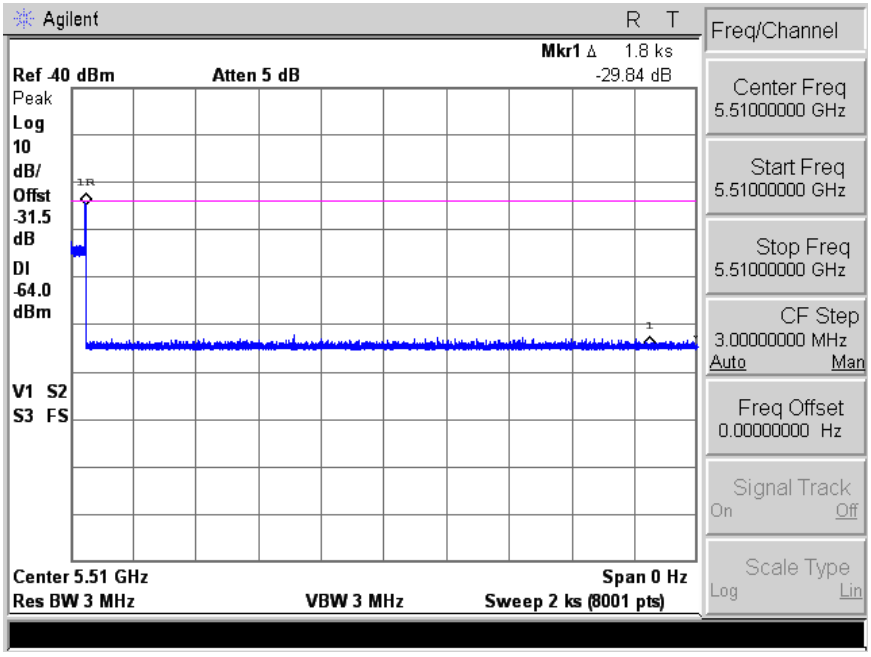
IC AGGREGATE CLOSING TIME PLOT



10.3.4. NON-OCCUPANCY

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

NON-OCCUPANCY PERIOD



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

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

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

(MPE distance equals 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
WLAN	5 GHz	20.0	20.10	6.68	0.09	0.95