FCC CFR47 PART 15 SUBPART C
FCC CFR47 PART 15 SUBPART B
INDUSTRY CANADA RSS-210 ISSUE 7
INDUSTRY CANADA ICES-003 ISSUE 4

CERTIFICATION TEST REPORT

FOR

802.11 a/b/g/n 3X3 ACCESS POINT

MODEL NUMBER: A1355

FCC ID: BCGA1355
IC: 579C-A1355

REPORT NUMBER: 09U12759-2

ISSUE DATE: OCTOBER 12, 2009

Prepared for
APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA, 95014, U.S.A.

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/12/09	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11 a/b/g/n 3X3 ACCESS POINT

MODEL: A1355

SERIAL NUMBER: 6F92701YACG

DATE TESTED: AUGUST 25 – OCTOBER 02, 2009

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
CFR 47 Part 15 Subpart B	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass
INDUSTRY CANADA ICES-003 ISSUE 4	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:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

MENGISTU MEKURIA
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, RSS-GEN Issue 2, ICES-003 ISSUE 4, 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 802.11 a/b/g/n transceiver Access Point.

The radio module is manufactured by Marvell.

5.2. MAXIMUM OUTPUT POWER

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

DUAL CHAIN CONFIGURATION

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	14.16	26.06
5180 - 5240	802.11n HT20	15.78	37.84
5190 - 5230	802.11n HT40	16.97	49.77

THREE CHAIN CONFIGURATION

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	13.07	20.28
5180 - 5240	802.11n HT20	13.32	21.48
5190 - 5230	802.11n HT40	13.74	23.66

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 3 IFA integrated antennas, with the following peak gains:

Frequency Range (MHz)	AP1 Peak gain (dBi)	AP2 Peak gain (dBi)	AP3 Peak gain (dBi)
5.15 - 5.25	5.03	2.5	5.69

5.4. SOFTWARE AND FIRMWARE

The firmware version is 7.5d11auto20090904T0200-TOT_develop.

The test utility software is m4Tool_CL_OL_k10a_PPSD.

5.5. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions and Power line Conducted Emissions, the channel with the highest conducted output power was selected.

Worst-case data rates as provided by the manufacturer are:
For 11a mode: 6Mbps
For 11n HT20 (5.8 GHz band): MCS0
For 11n HT40 (5.8 GHz band): MCS0

For the digital configuration the EUT was connected to a laptop PC with minimum configuration, all ports of the EUT were connected to laptop PC and Ethernet switch, EUT was transmitting at the channel with highest output power and was being pinged by the laptop PC.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop	Apple	Mac Book	PT358810
AC Adaptor	Apple	A1222	N/A

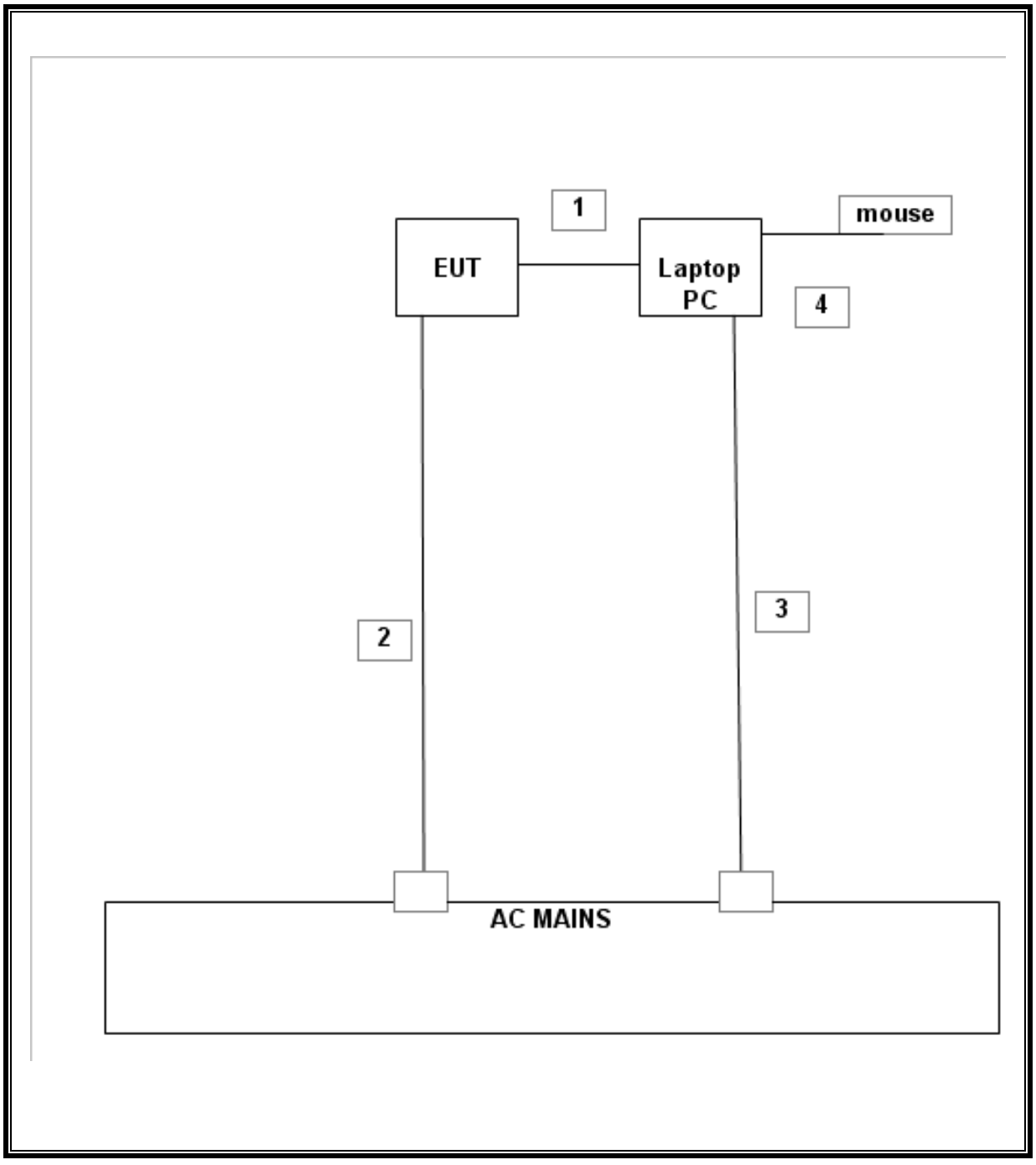
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	Ethernet	4	RJ43	unshielded	0.5m	N/A
2	DC	1	DC	unshielded	1m	N/A
3	DC	1	DC	unshielded	1m	N/A

TEST SETUP

The Access Point EUT is controlled externally with a laptop, via Ethernet.

SETUP DIAGRAM FOR TESTS



SETUP FOR DIGITAL DEVICE TESTS:

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC	Apple	A1286	W891700599H	DoC
AC Adapter 1	Apple	A1290	02327	DoC
Printer	HP	7850	MY56K1304B	DoC
AC Adapter 2	HP	0957-2084	5715480604	DoC
Mouse	Apple	N/A	097	N/A
5 Port 10/100 Switch	Linksys	SD205	REF0043003586	DoC

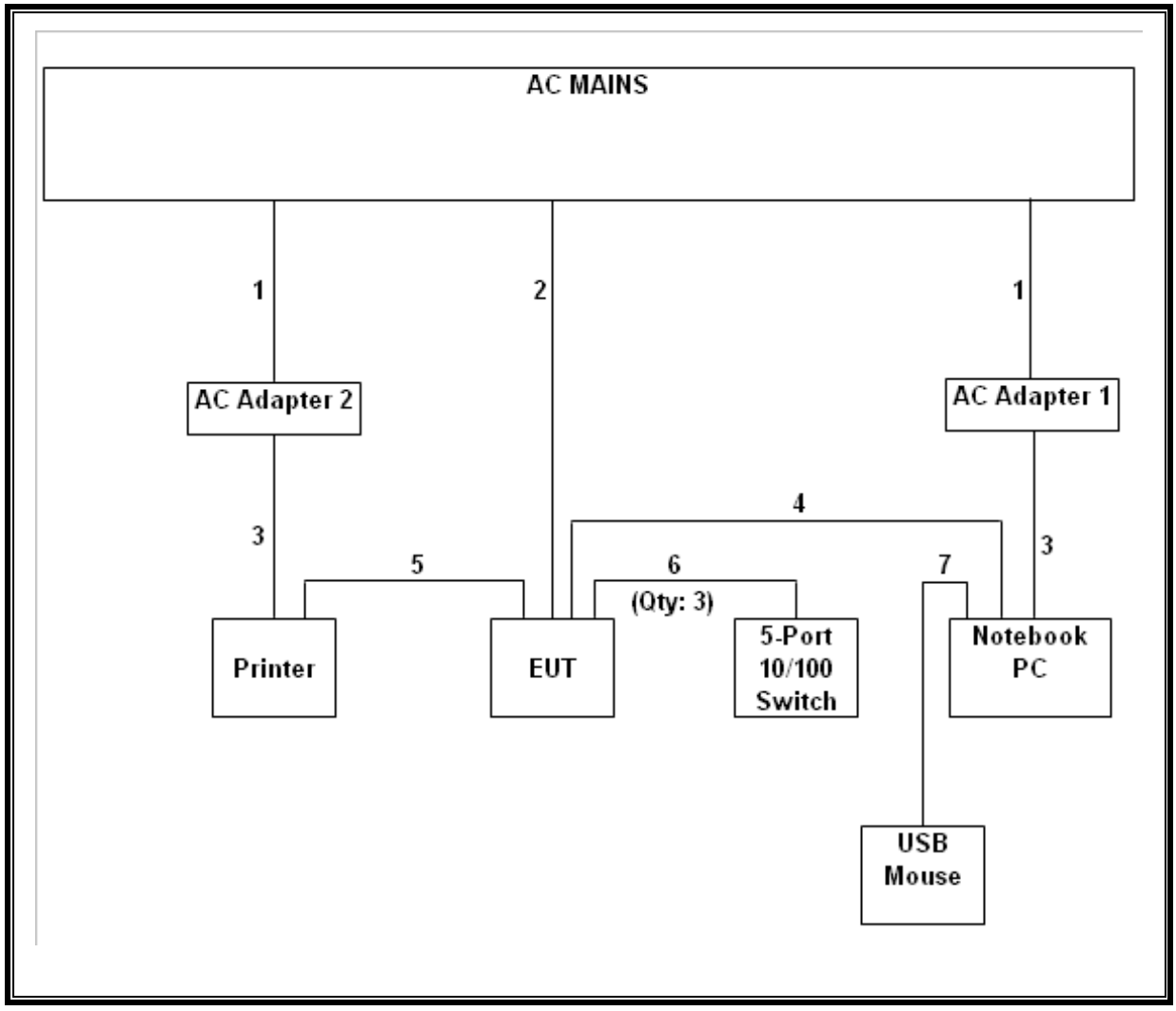
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC Input	2	3-Prong	Un-Shielded	1.5m	N/A
2	AC Input	1	2-Prong	Un-Shielded	2m	N/A
3	DC Input	2	Mini-Jack	Un-Shielded	2m	N/A
4	LAN	1	RJ-45	Un-Shielded	1m	N/A
5	USB	1	USB	Shielded	1.5m	N/A
6	LAN	3	RJ-45	Shielded	1m	Quantity: 3 Cables
7	USB	1	USB	Shielded	1m	N/A

TEST SETUP

The Access Point EUT ports were connected with support equipment. The data transfer between the laptop and the EUT was taking place during the test.

SETUP DIAGRAM FOR DIGITAL DEVICE TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Power Meter	Agilent	N1911A	AOU254846	3/4/2010
Power Meter	Agilent	E4417A	AOU286038	21/7/2010
Power Sensor	Agilent	N1921A	2346	2/4/2010
Power Sensor	Agilent	E9323A	3562	21/7/2010
Power Sensor	Agilent	E9323A	3563	21/7/2010
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	2/3/2010
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	8/24/2010
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/16/2009
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	2/4/2010
Antenna, Horn, 18 GHz	EMCO	3115	C00945	1/29/2010
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	1/14/2010
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02680	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	5/6/2011
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/2009
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/2009

7. ANTENNA PORT TEST RESULTS

7.1. 802.11a DUAL CHAIN LEGACY MODE IN THE 5.2 GHz BAND

7.1.1. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain (Chain AP1) (dBi)	Antenna Gain (Chain AP3) (dBi)	Effective Legacy Gain (dBi)
5.03	5.69	8.38

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 effective legacy gain is **8.38 dBi** for other than fixed, point-to-point operations, therefore the limit shall be lowered by **2.38 dB**.

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

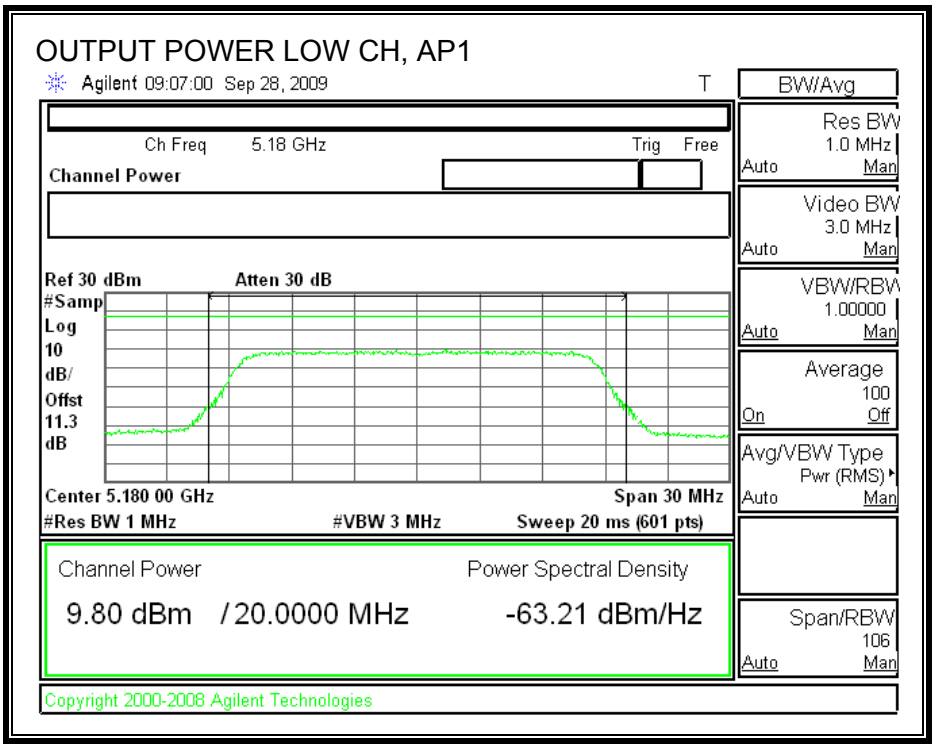
Limit

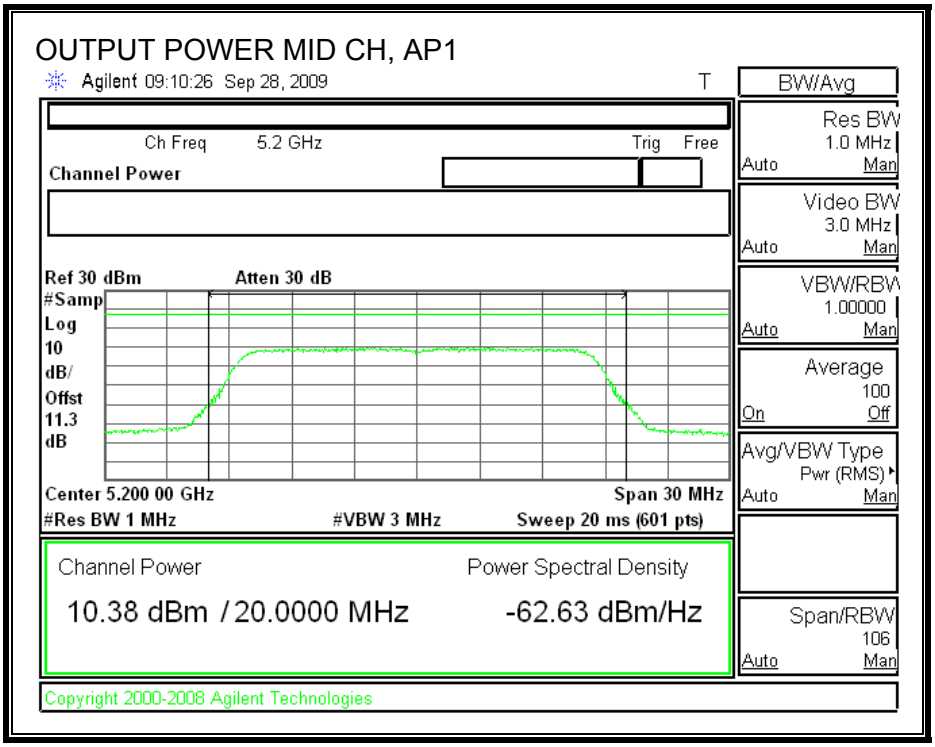
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Effective Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	19.707	16.95	8.38	14.57
Mid	5200	17	19.539	16.91	8.38	14.53
High	5240	17	19.67	16.94	8.38	14.56

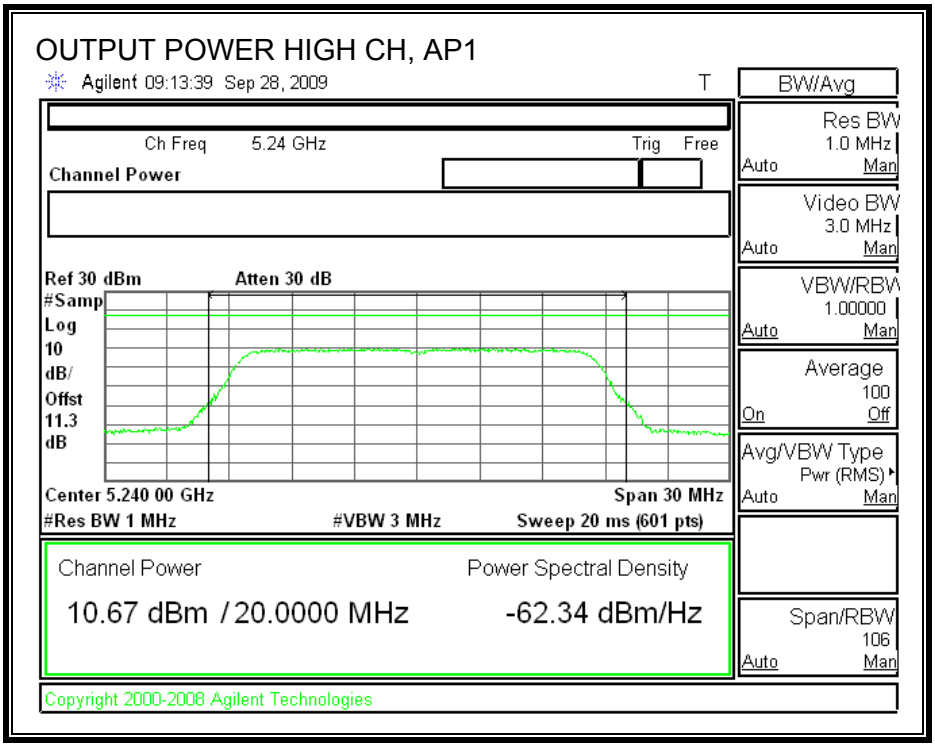
Individual Chain Results

Channel	Frequency (MHz)	AP1 Power (dBm)	AP3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	9.80	10.72	13.29	14.57	-1.27
Mid	5200	10.38	11.32	13.89	14.53	-0.64
High	5240	10.67	11.58	14.16	14.56	-0.40

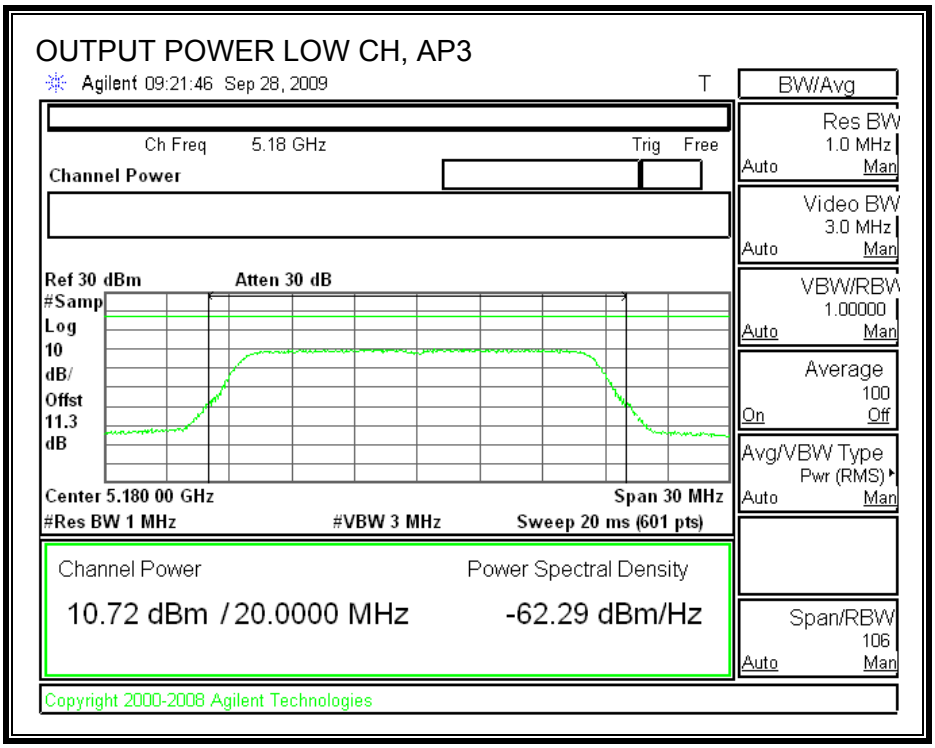
AP1 OUTPUT POWER

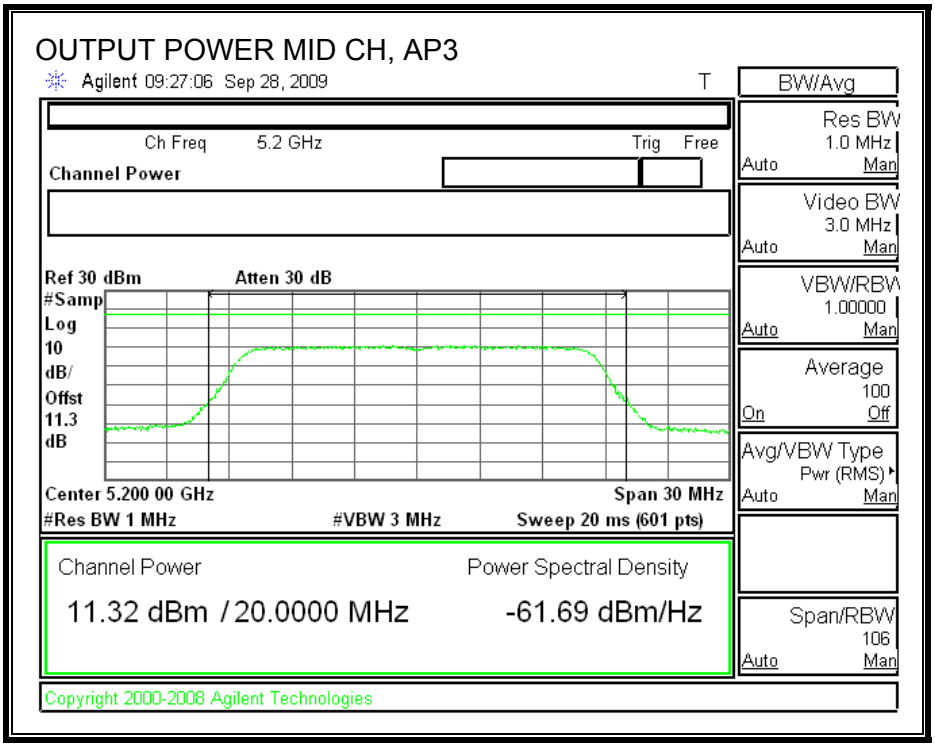


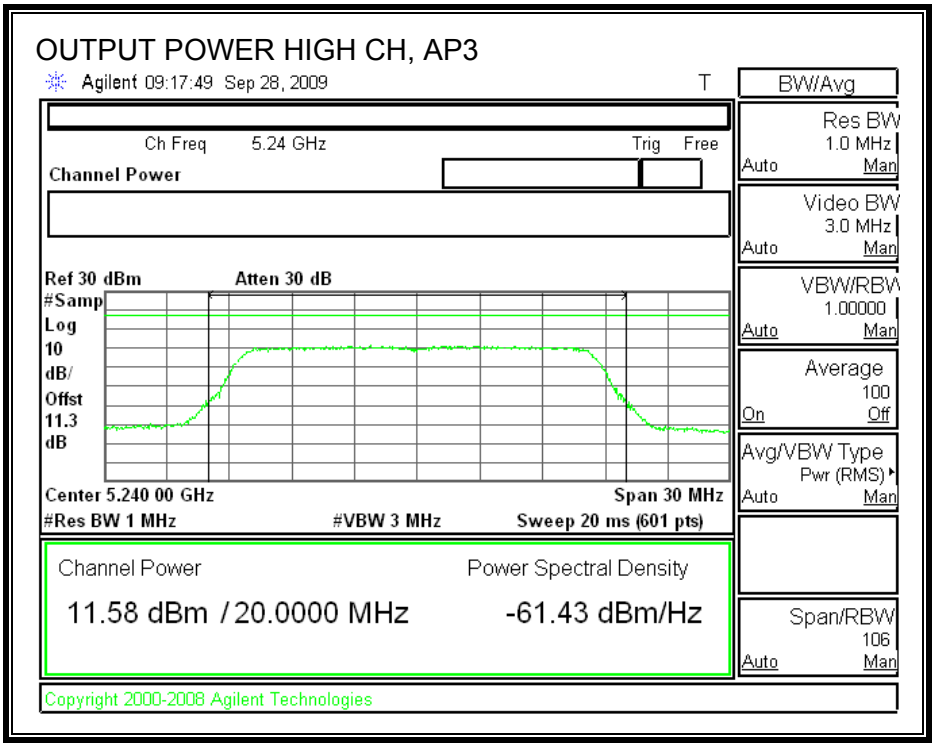




AP3 OUTPUT POWER







7.1.2. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain (Chain 1) (dBi)	Antenna Gain (Chain 2) (dBi)	Effective Legacy Gain (dBi)
5.03	5.69	8.38

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

The maximum effective antenna gain is **8.38 dBi**, therefore the limit is **1.62 dBm**.

TEST PROCEDURE

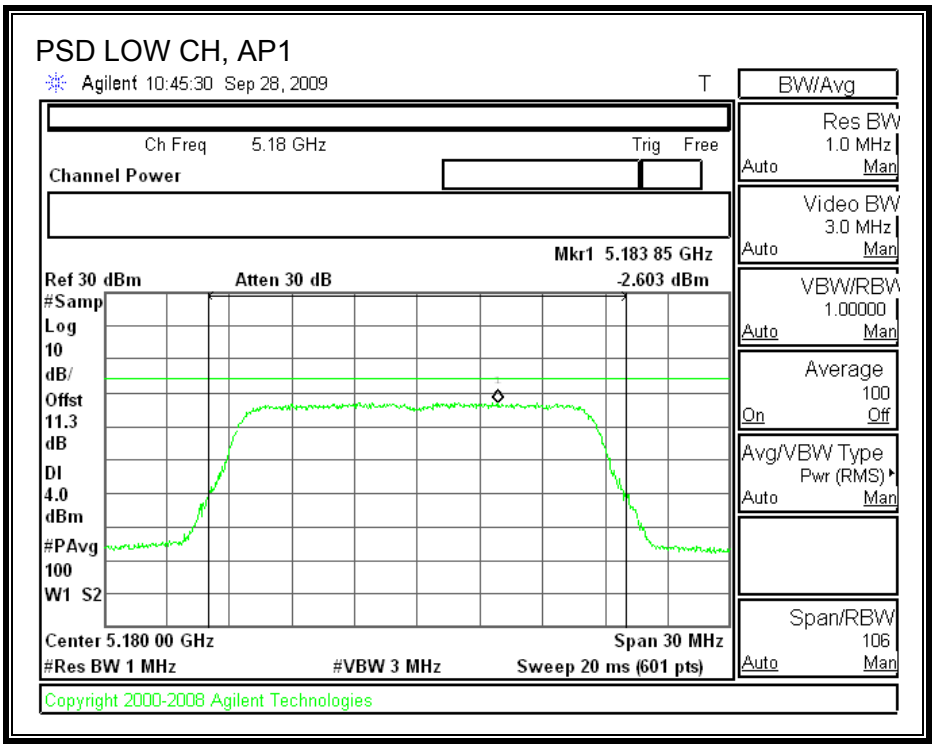
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

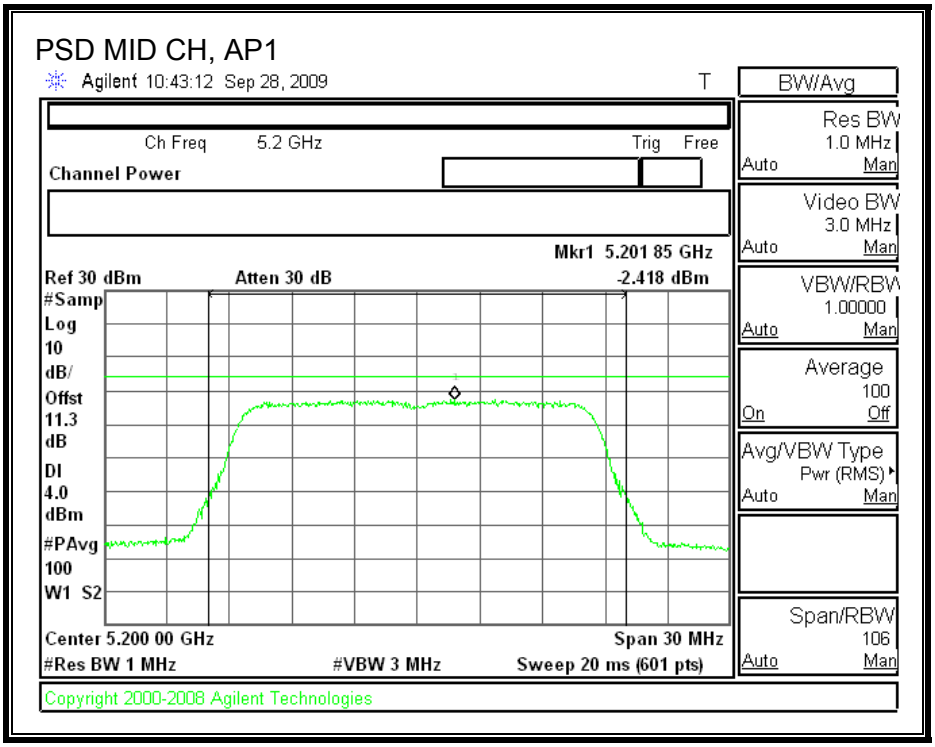
RESULTS

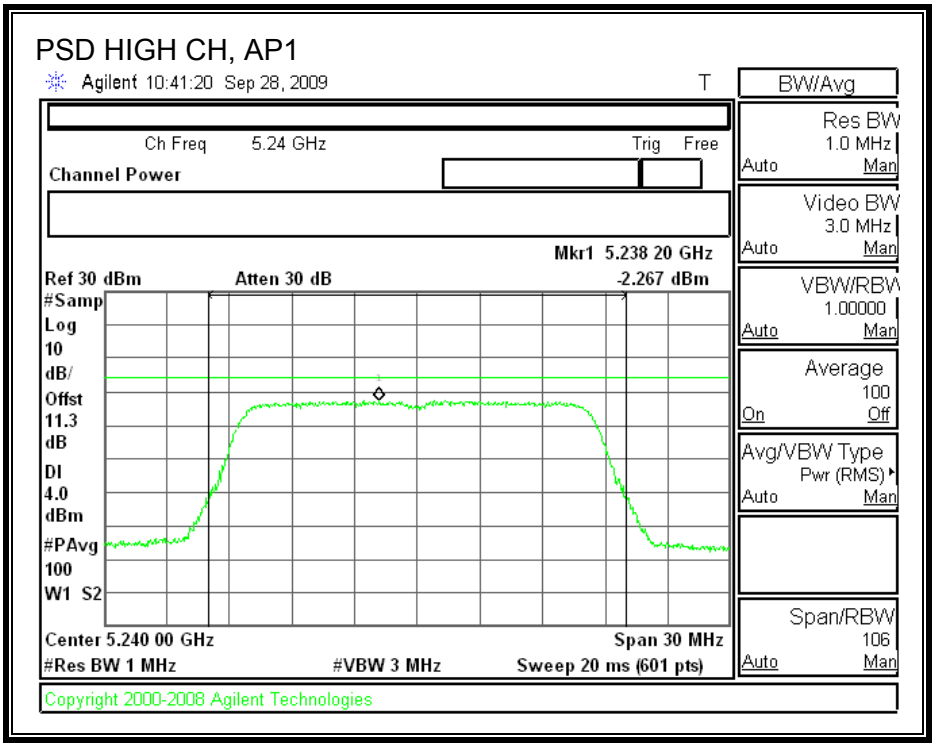
Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-2.603	-2.886	0.27	1.62	-1.35
Middle	5200	-2.418	-2.149	0.73	1.62	-0.89
High	5240	-2.267	-1.305	1.25	1.62	-0.37

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-2.694	1.62	-4.31
Middle	5200	-3.351	1.62	-4.97
High	5240	-3.582	1.62	-5.20

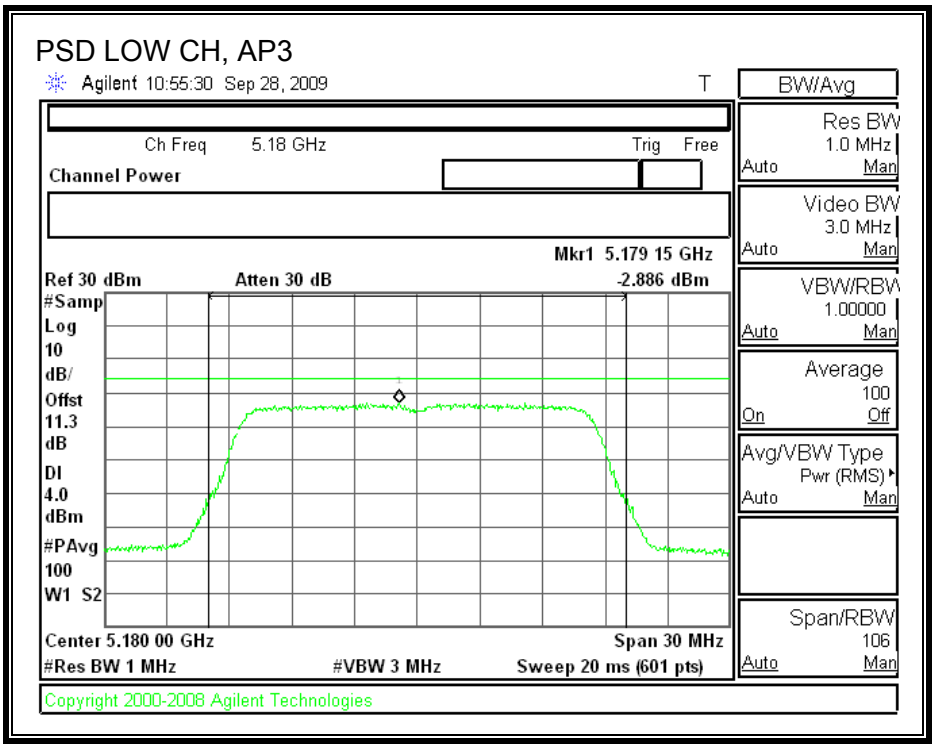
AP1 POWER SPECTRAL DENSITY

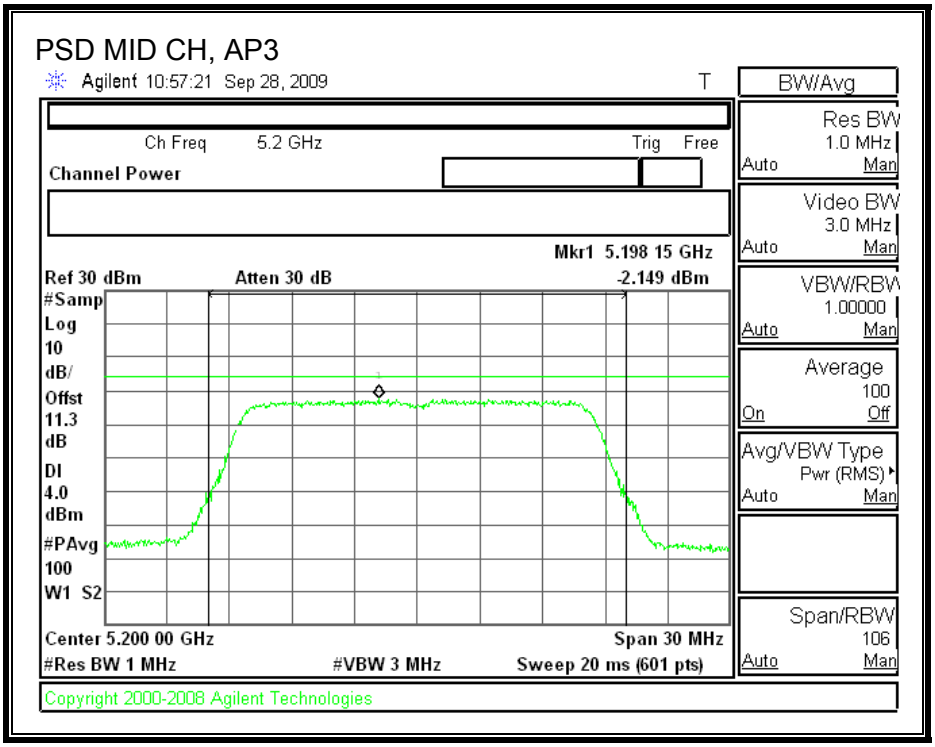


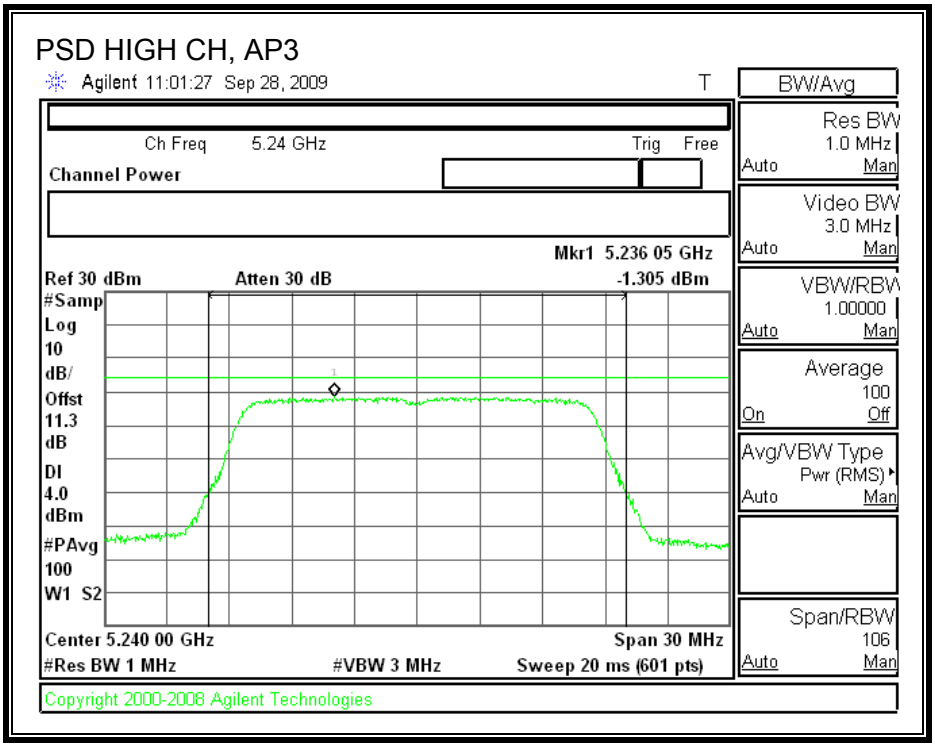




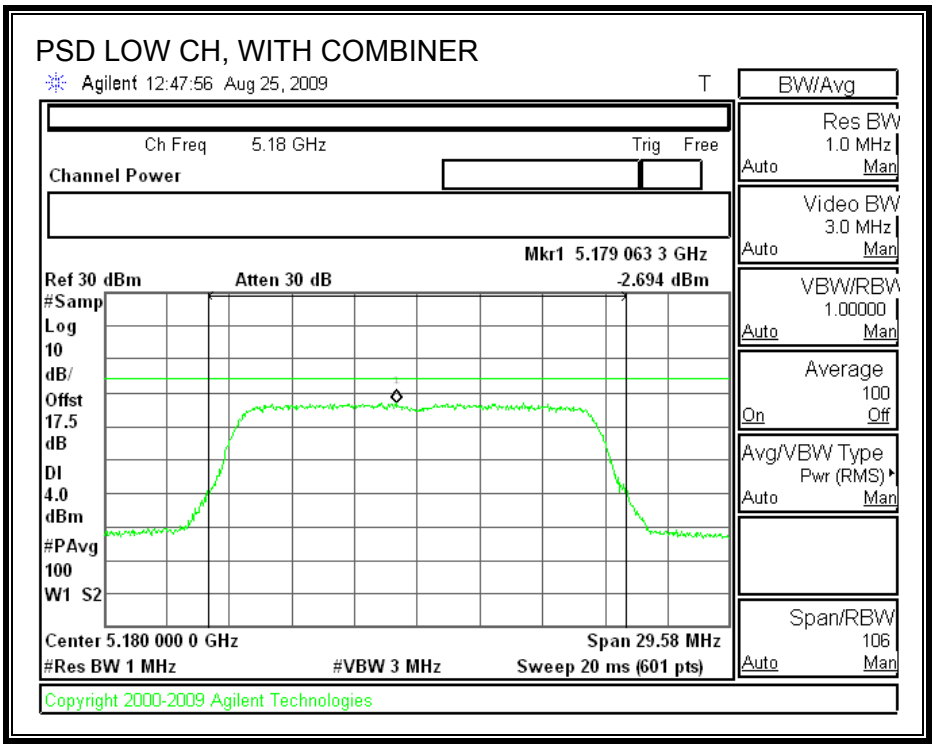
AP3 POWER SPECTRAL DENSITY

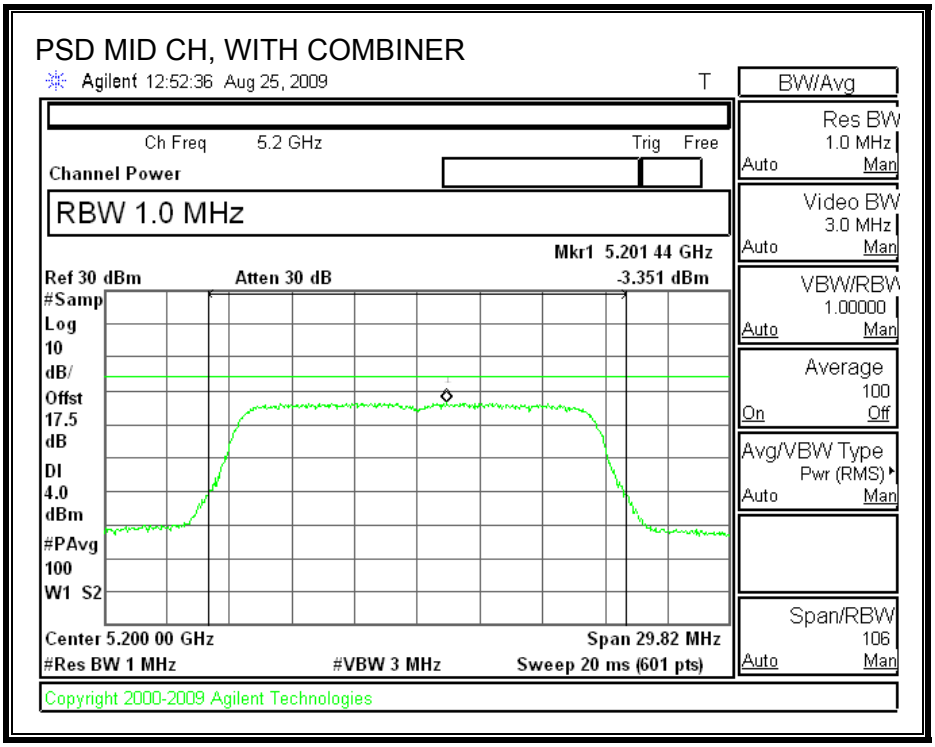


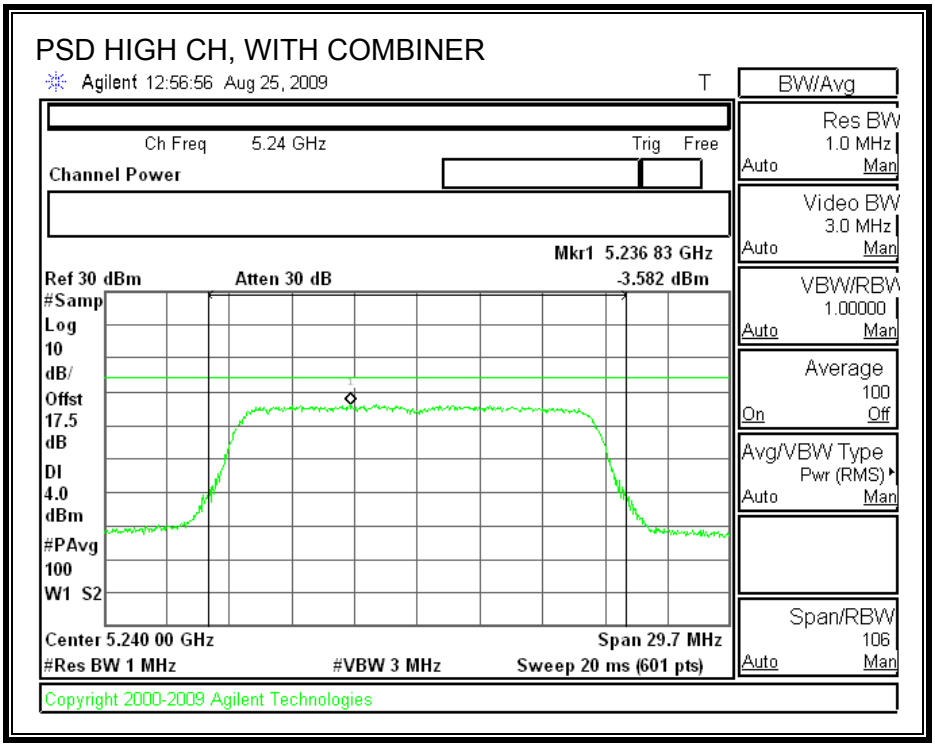




POWER SPECTRAL DENSITY WITH COMBINER







7.1.3. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

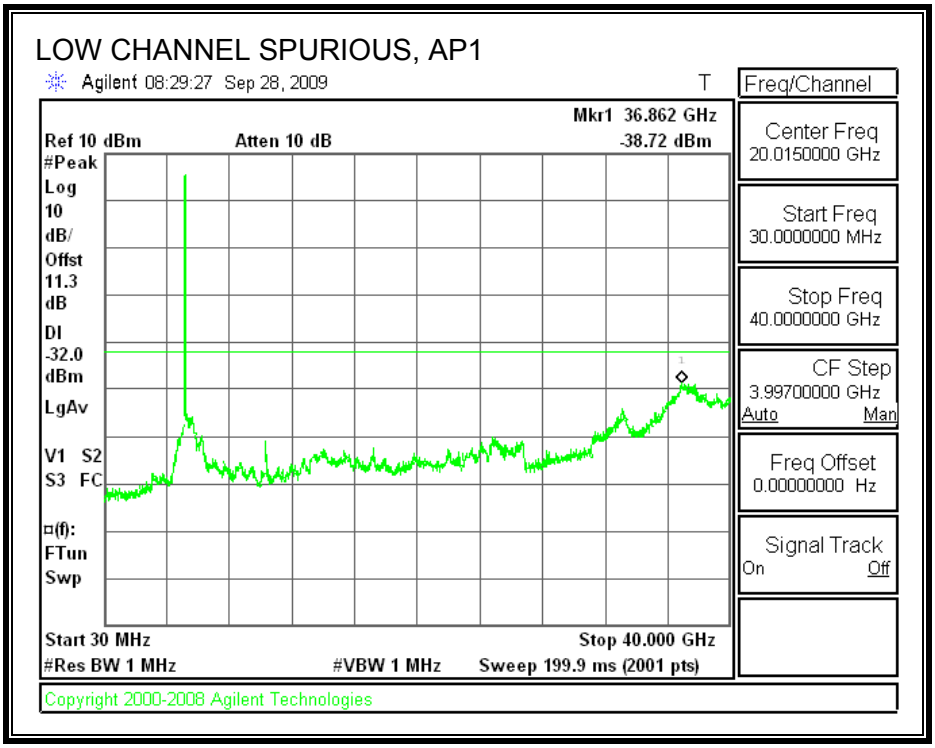
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

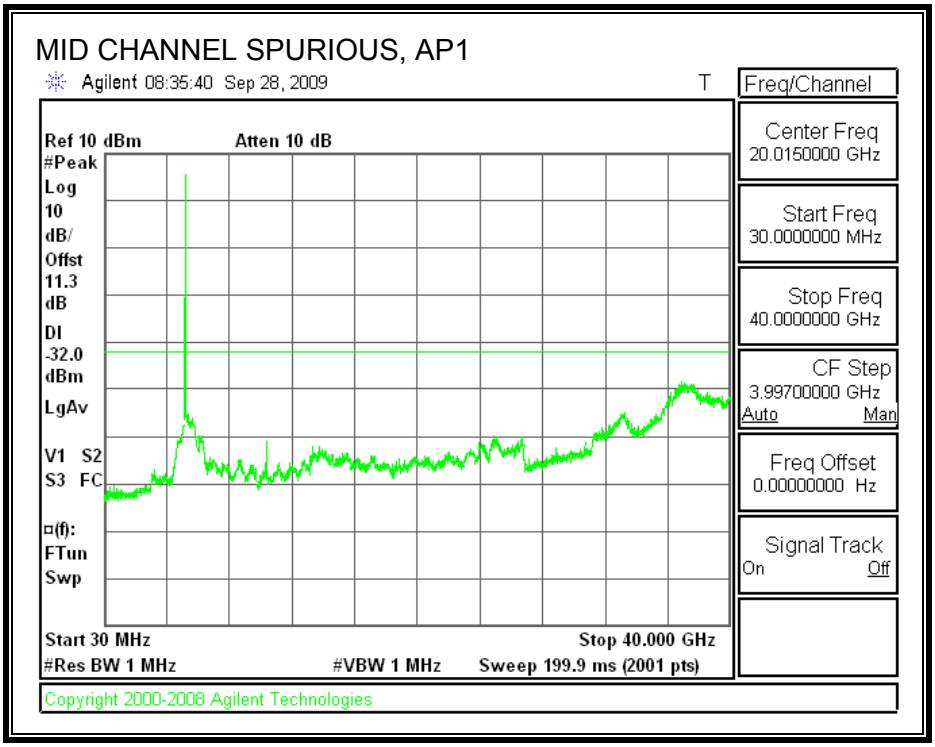
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

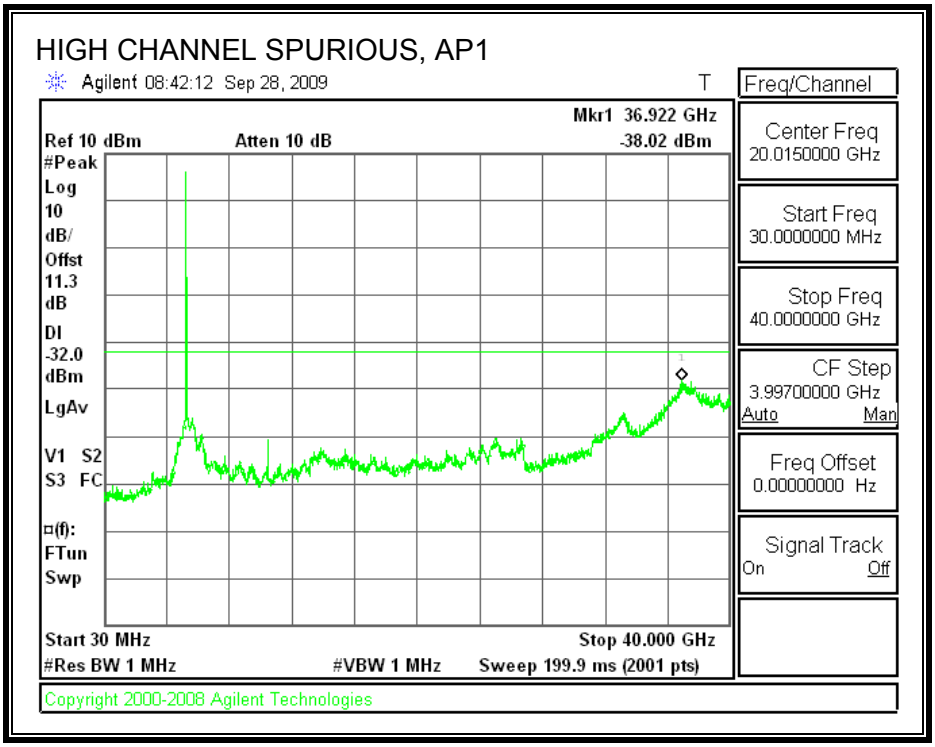
RESULTS

AP1 SPURIOUS EMISSIONS

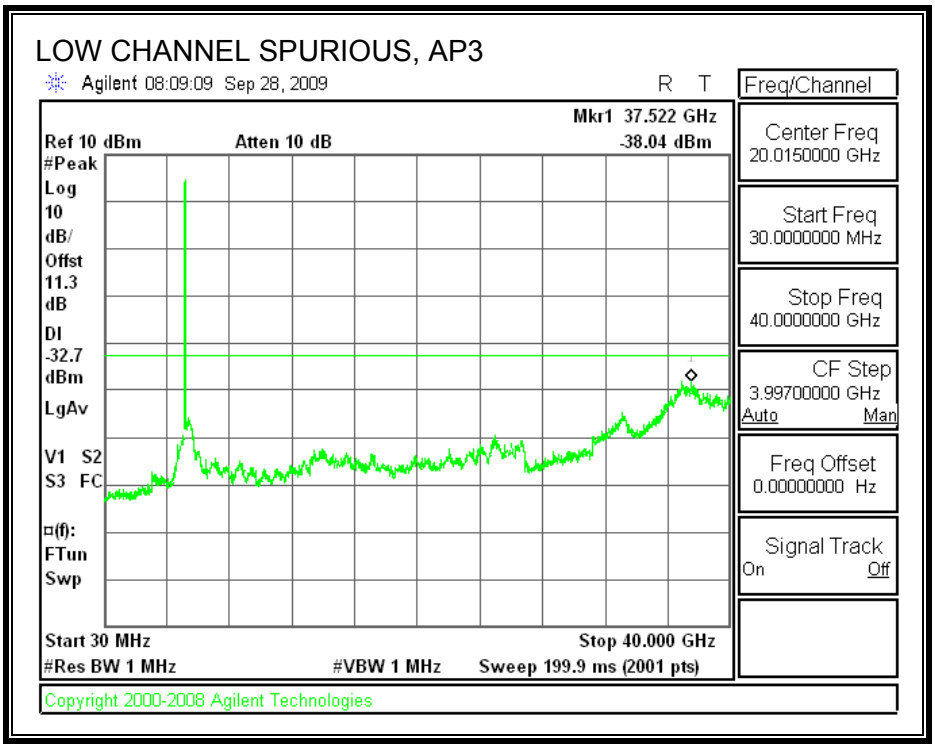




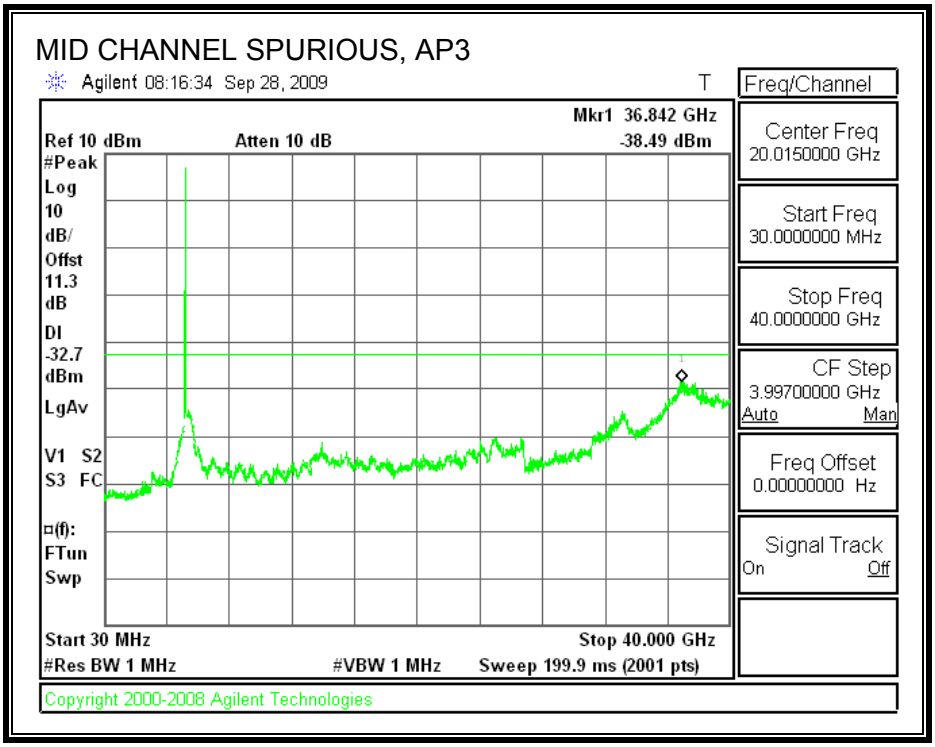
HIGH CHANNEL SPURIOUS, AP1



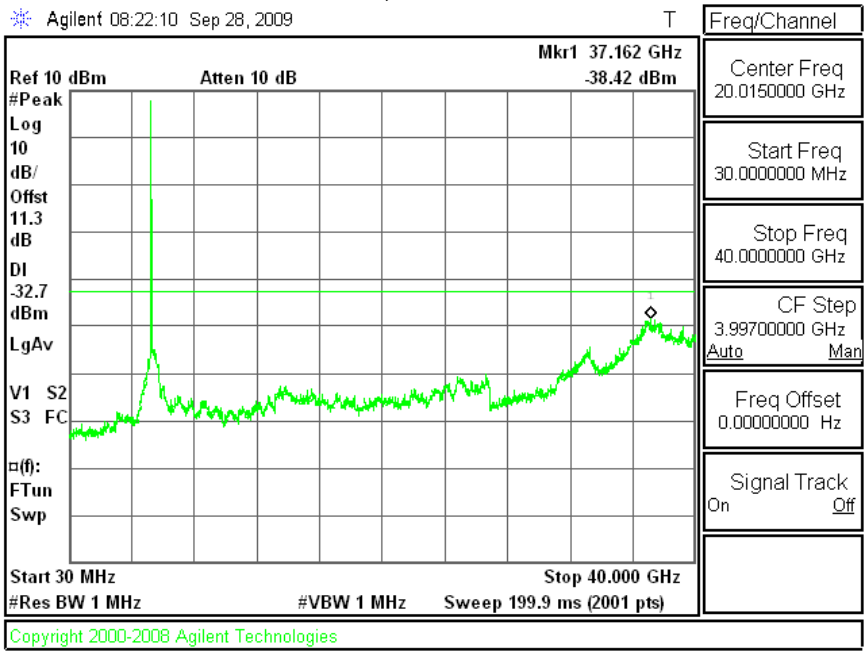
AP3 SPURIOUS EMISSIONS



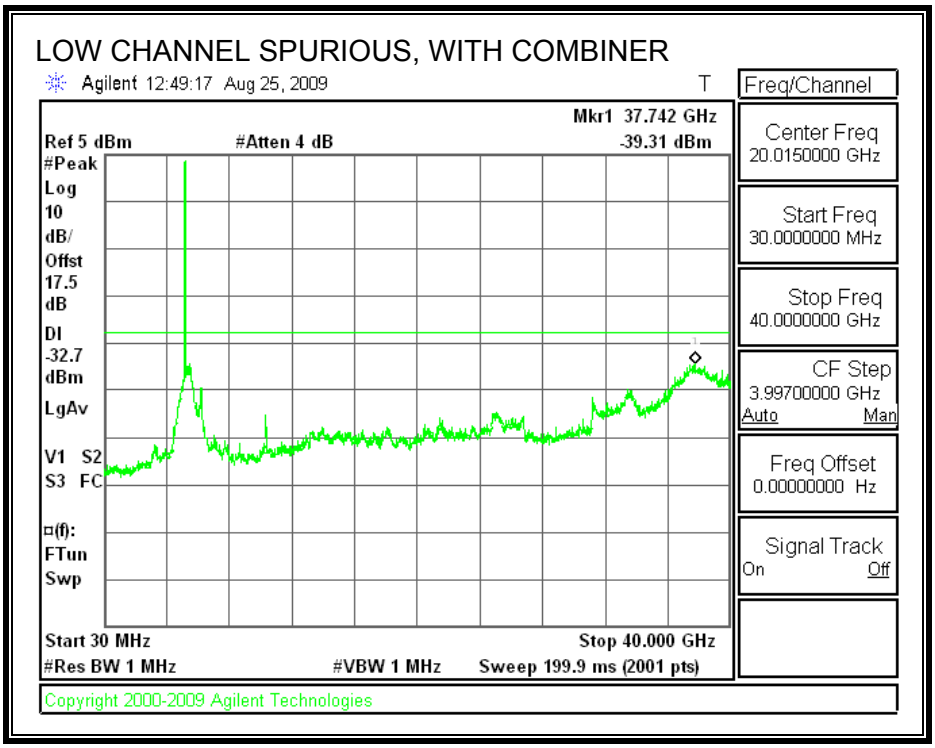
MID CHANNEL SPURIOUS, AP3



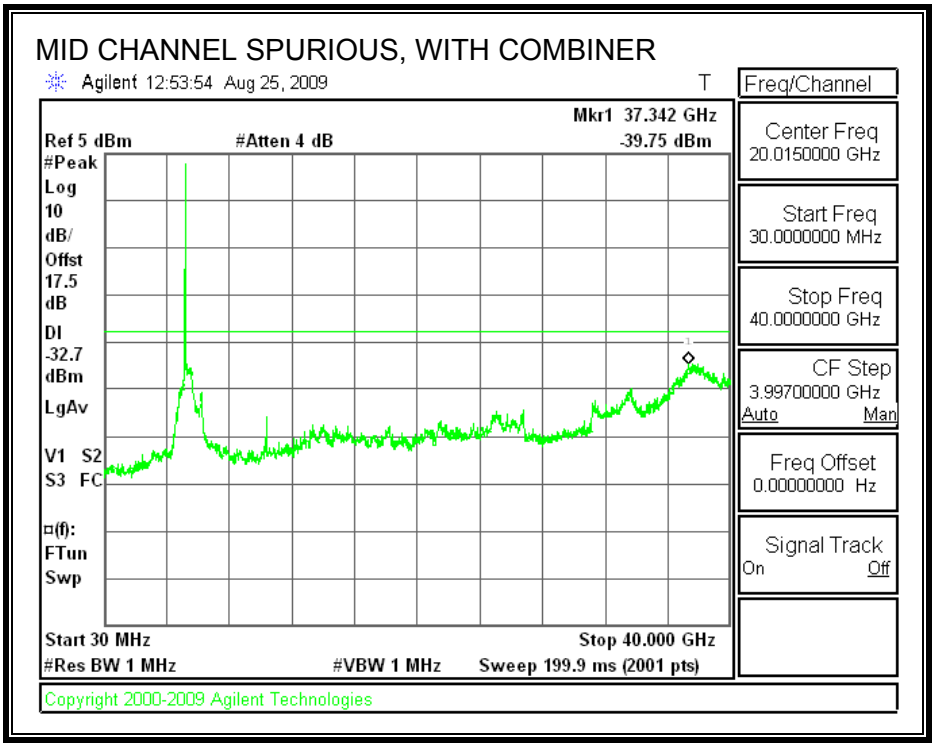
HIGH CHANNEL SPURIOUS, AP3



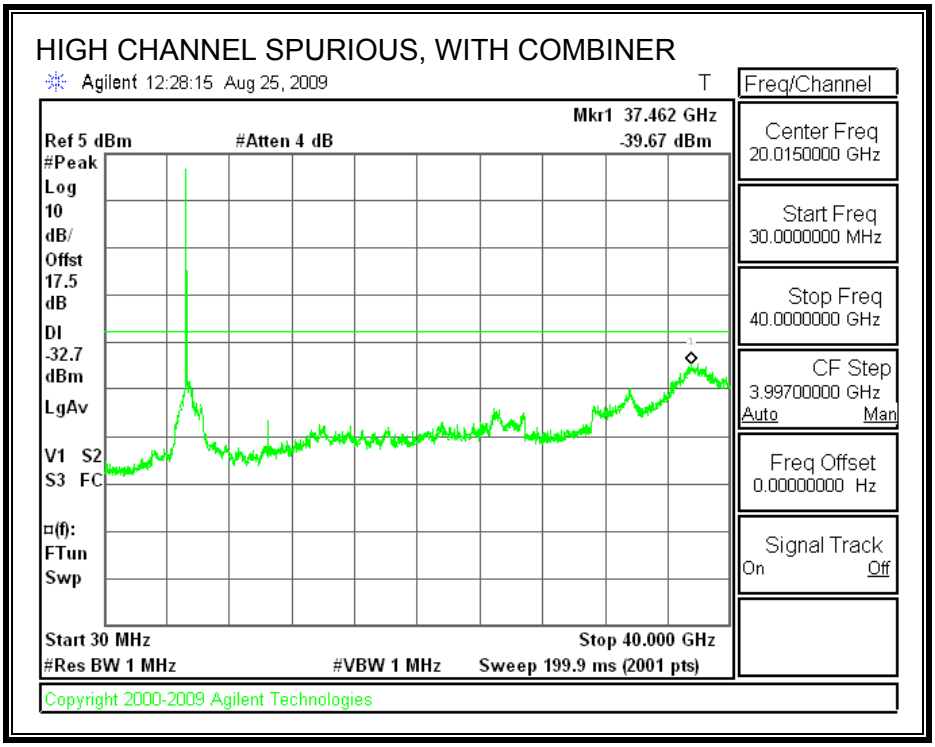
SPURIOUS EMISSIONS WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.2. 802.11a THREE CHAINS LEGACY MODE IN THE LOWER 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

AP1

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.83	16.5605
Middle	5200	19.593	16.5008
High	5240	19.715	16.5404

AP2

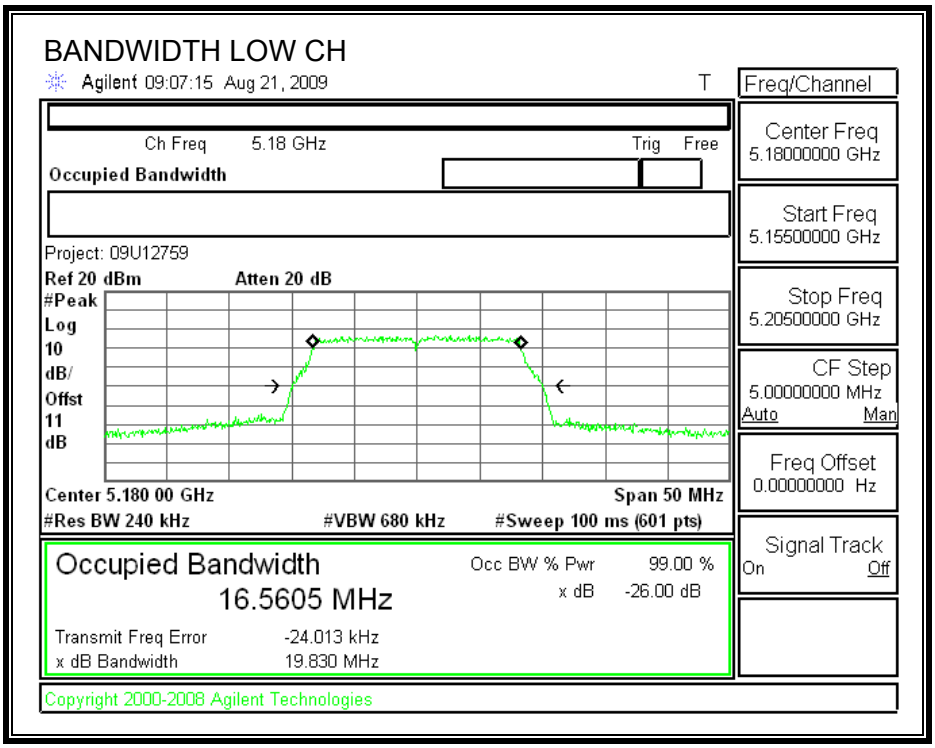
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.882	16.5547
Middle	5200	19.652	16.5147
High	5240	19.876	16.5148

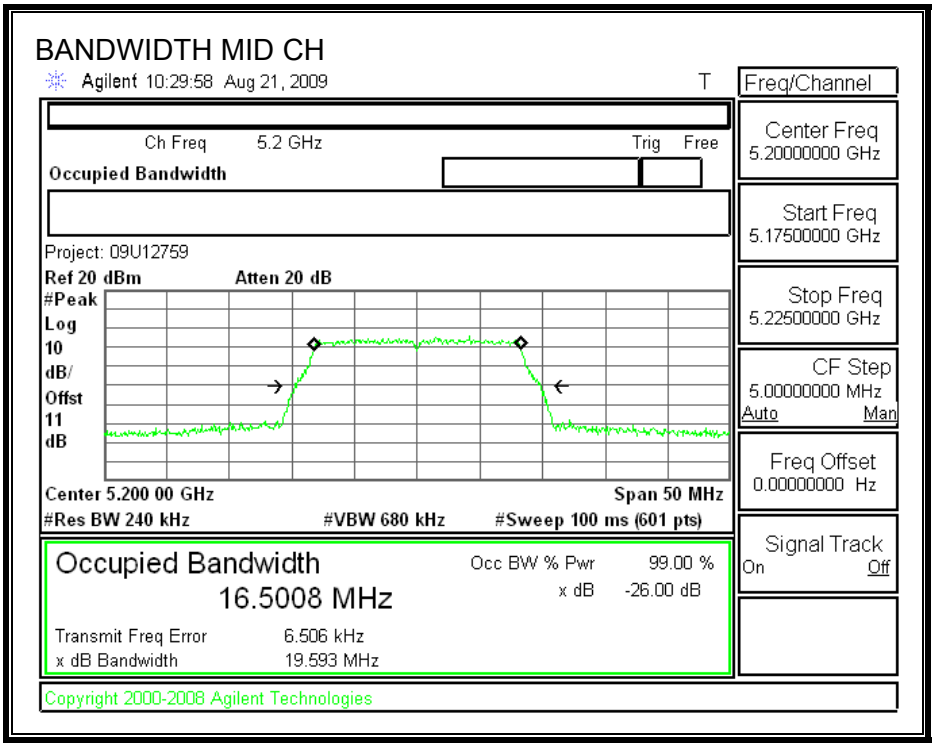
AP3

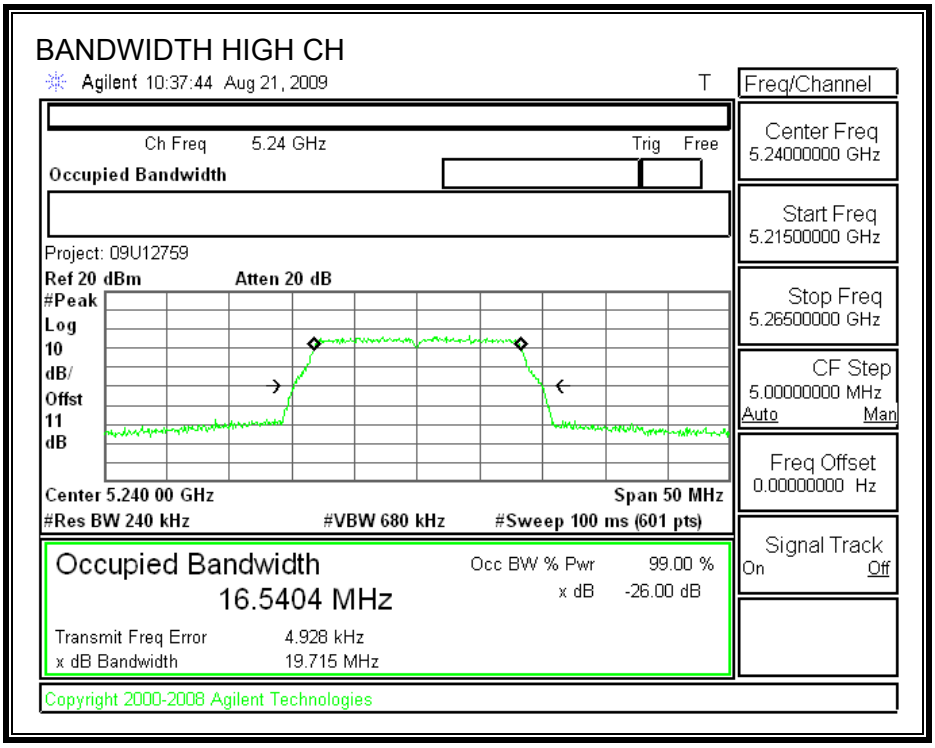
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.707	16.5487
Middle	5200	19.539	16.526
High	5240	19.56	16.5758

AP1

26 dB and 99% BANDWIDTH

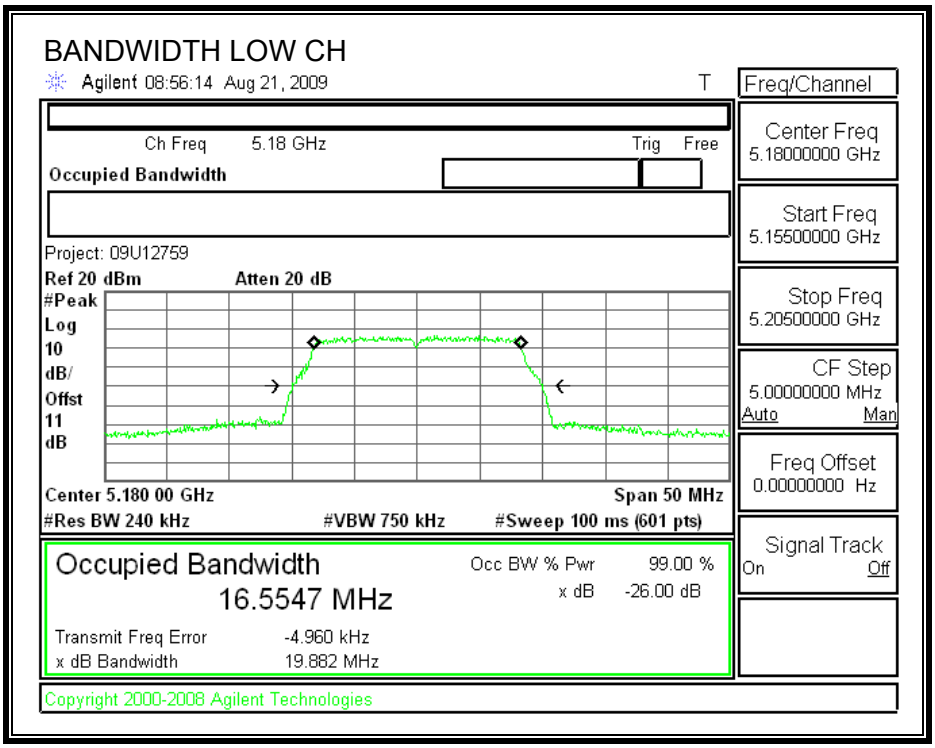


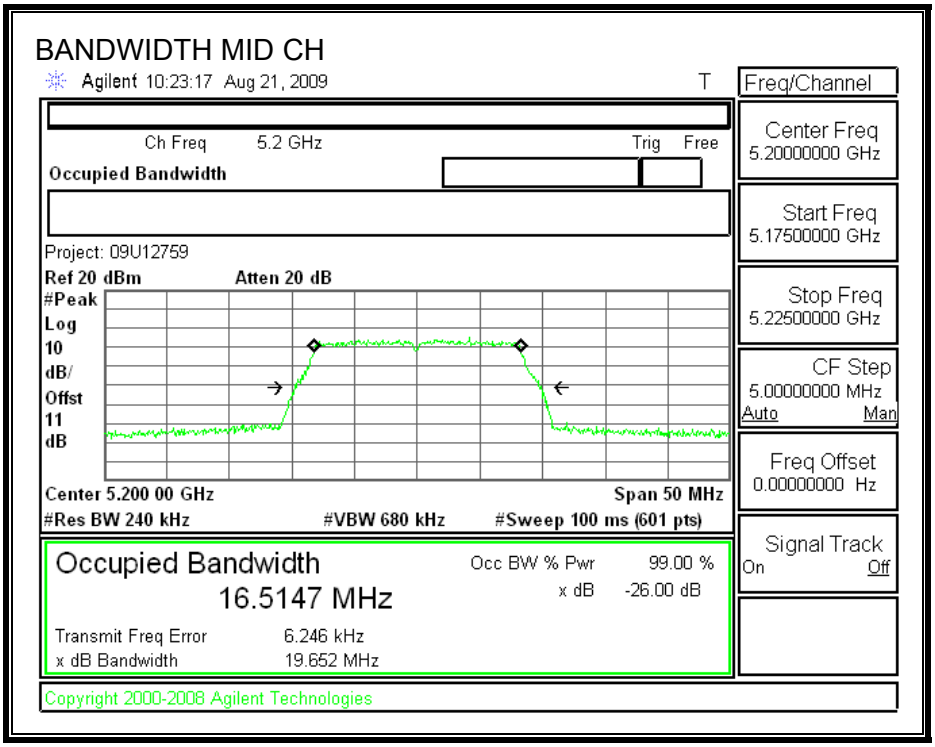


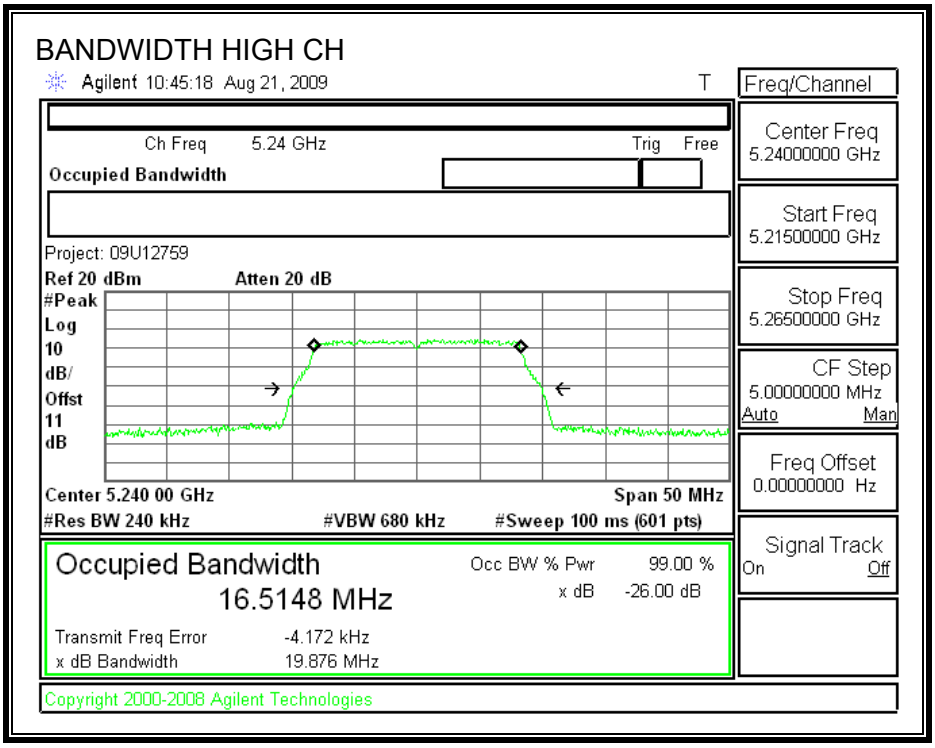


AP2

26 dB and 99% BANDWIDTH

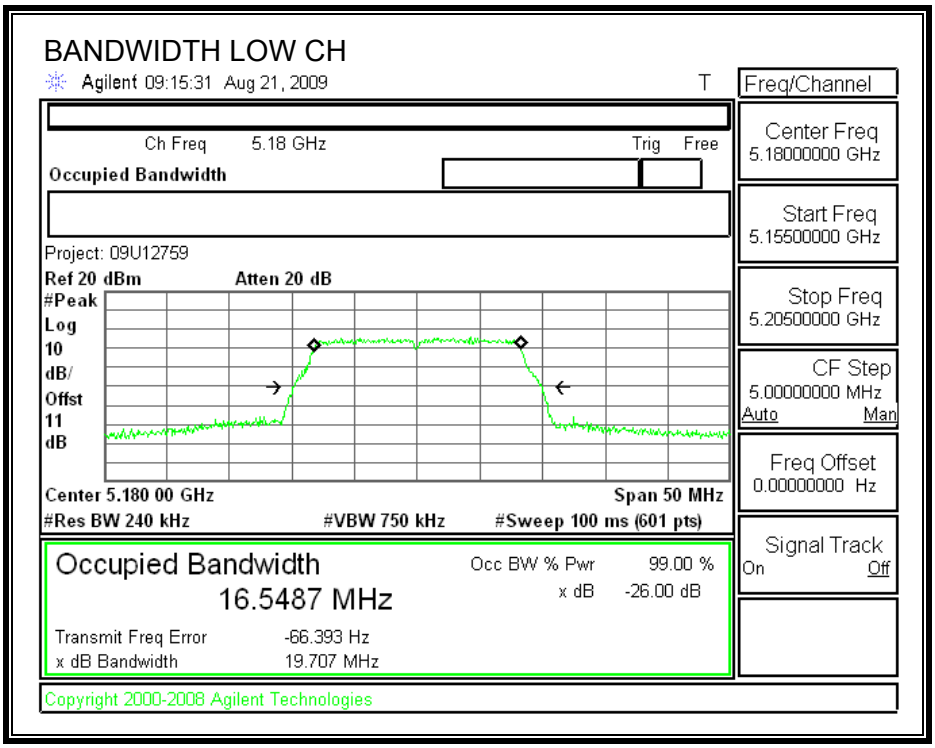




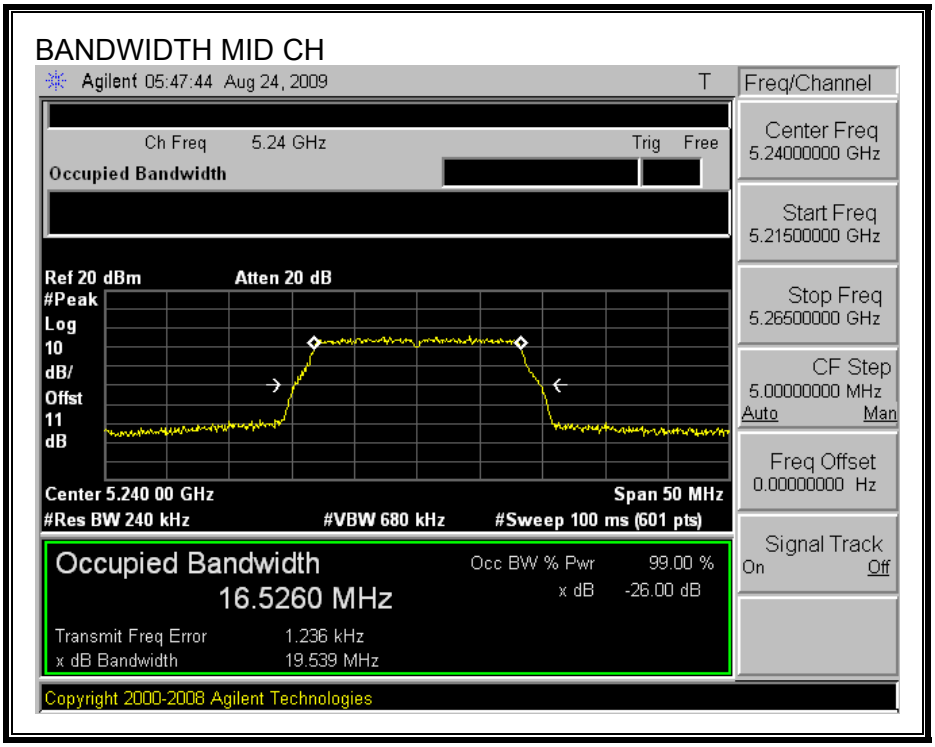


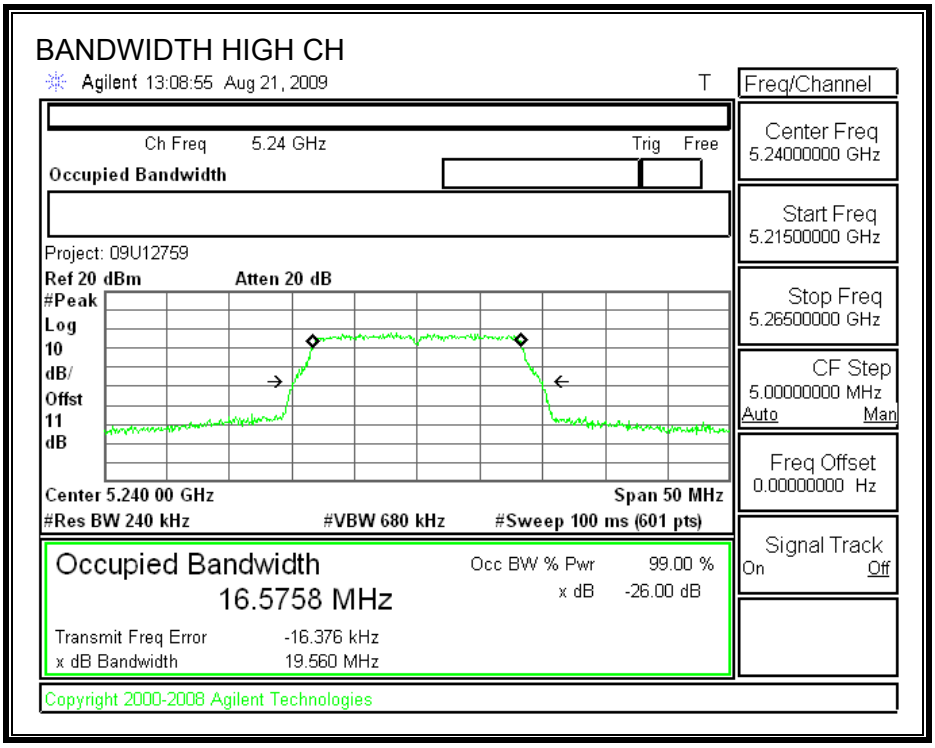
AP3

26 dB and 99% BANDWIDTH



BANDWIDTH MID CH





7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain (AP1) (dBi)	Antenna Gain (AP2) (dBi)	Antenna Gain (AP3) (dBi)	Effective Legacy Gain (dBi)
5.03	2.5	5.69	9.38

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 effective legacy gain is **9.38 dBi** for other than fixed, point-to-point operations, therefore the limit shall be lowered by **3.38 dB**.

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

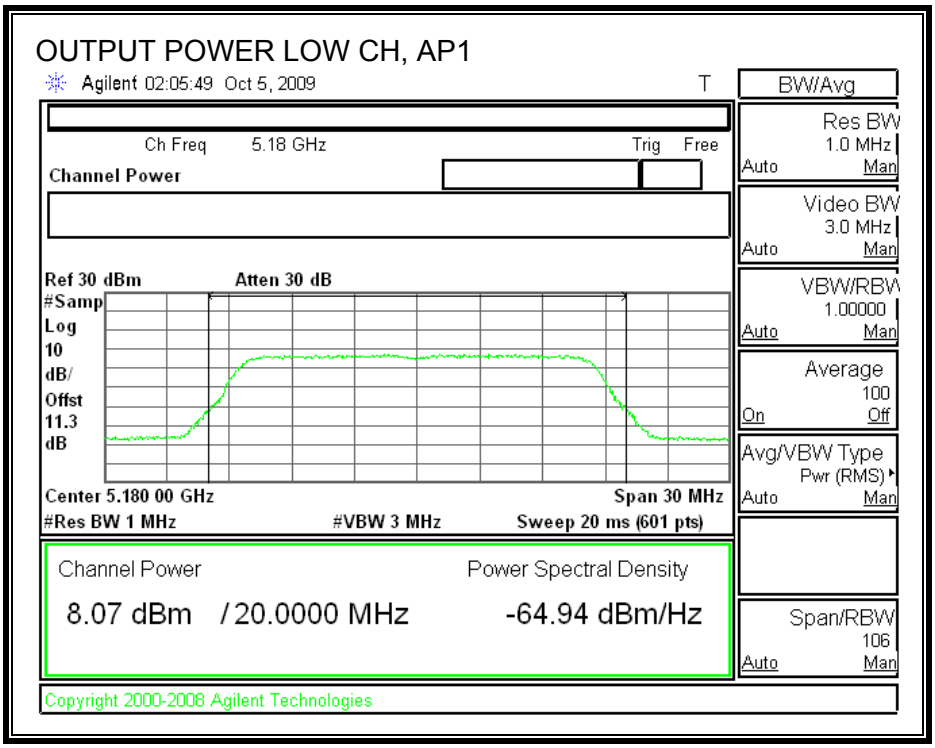
Limit

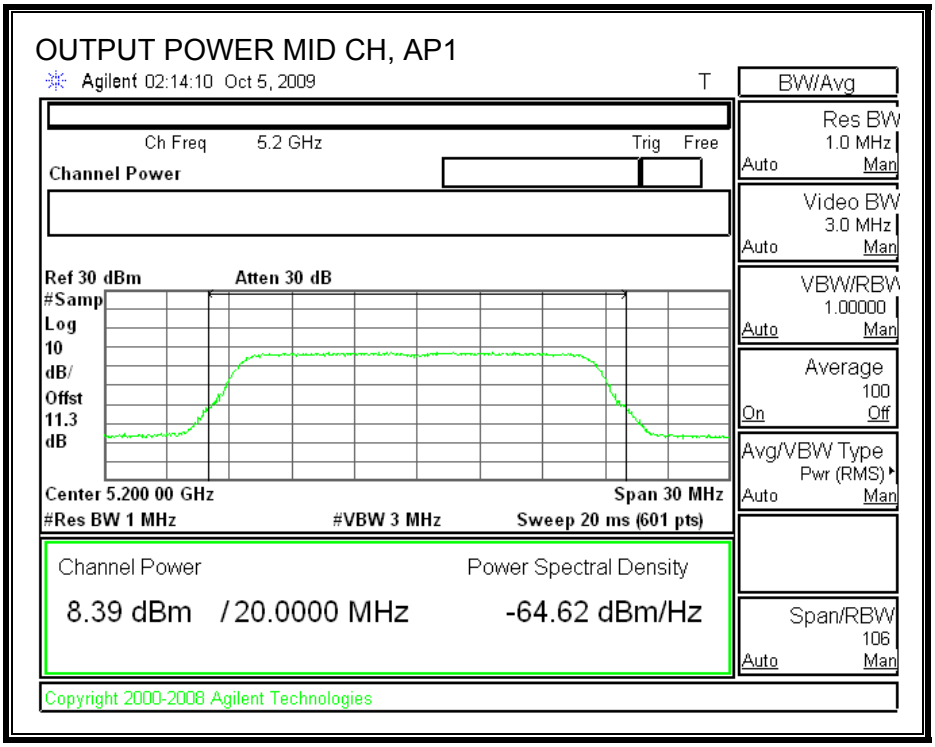
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Effective Ant. Gain (dBi)	Limit (dBm)
Low	5180	17.00	19.707	16.95	9.38	13.57
Mid	5200	17.00	19.539	16.91	9.38	13.53
High	5240	17.00	19.67	16.94	9.38	16.94

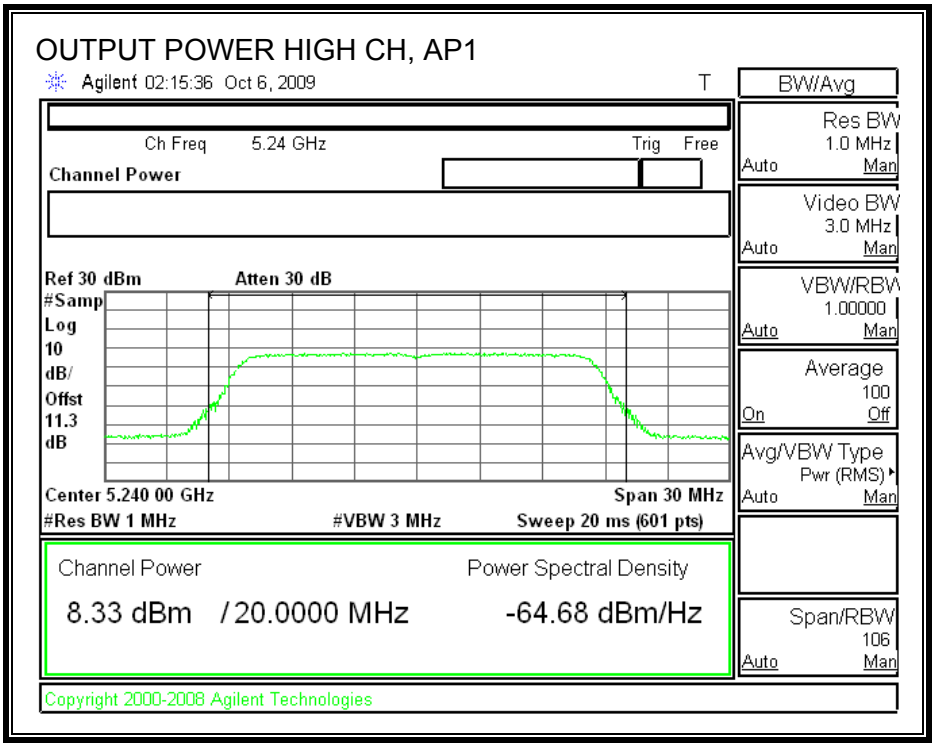
Individual Chain Results

Channel	Frequency (MHz)	AP1 Power (dBm)	AP2 Power (dBm)	AP3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	8.07	8.90	7.56	12.98	13.57	-0.58
Mid	5200	8.39	8.28	7.75	12.92	13.53	-0.61
High	5240	8.33	8.39	8.16	13.07	16.94	-3.87

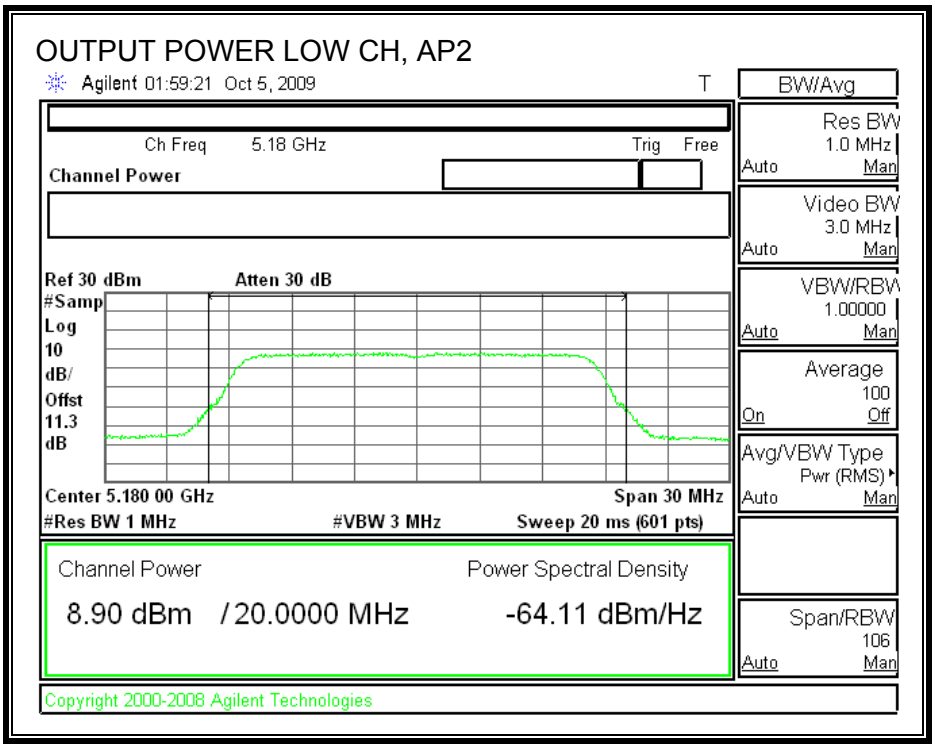
AP1 OUTPUT POWER

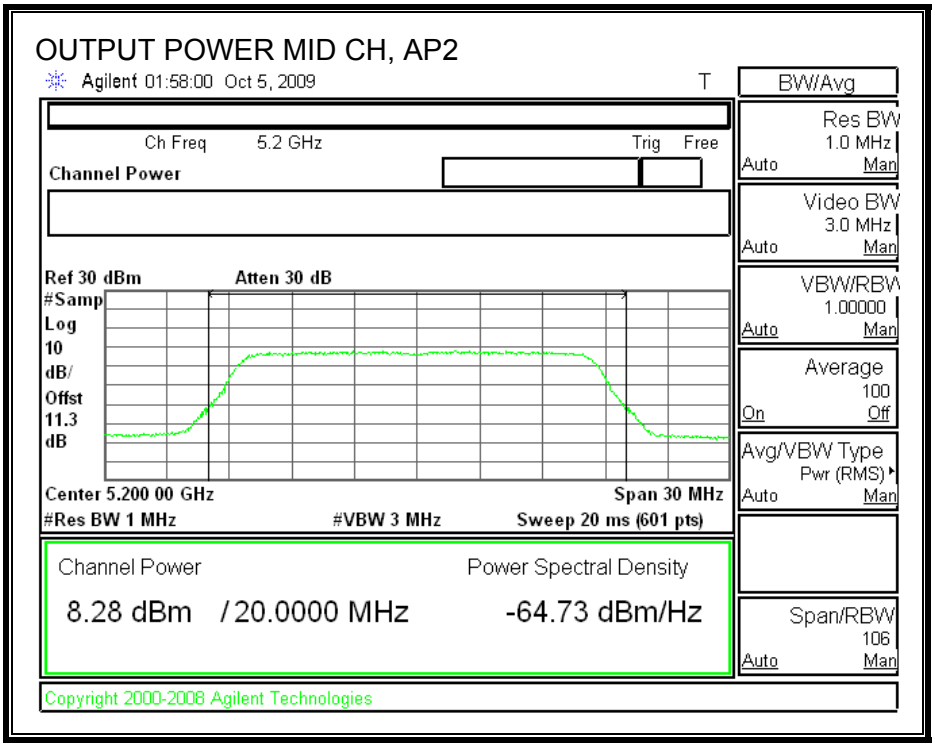


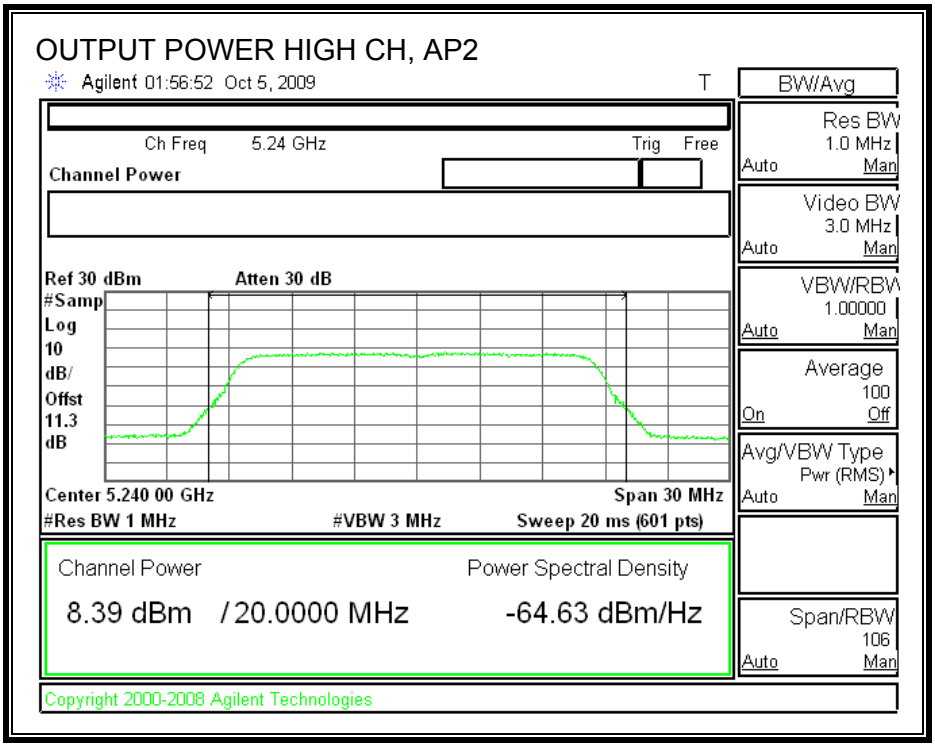




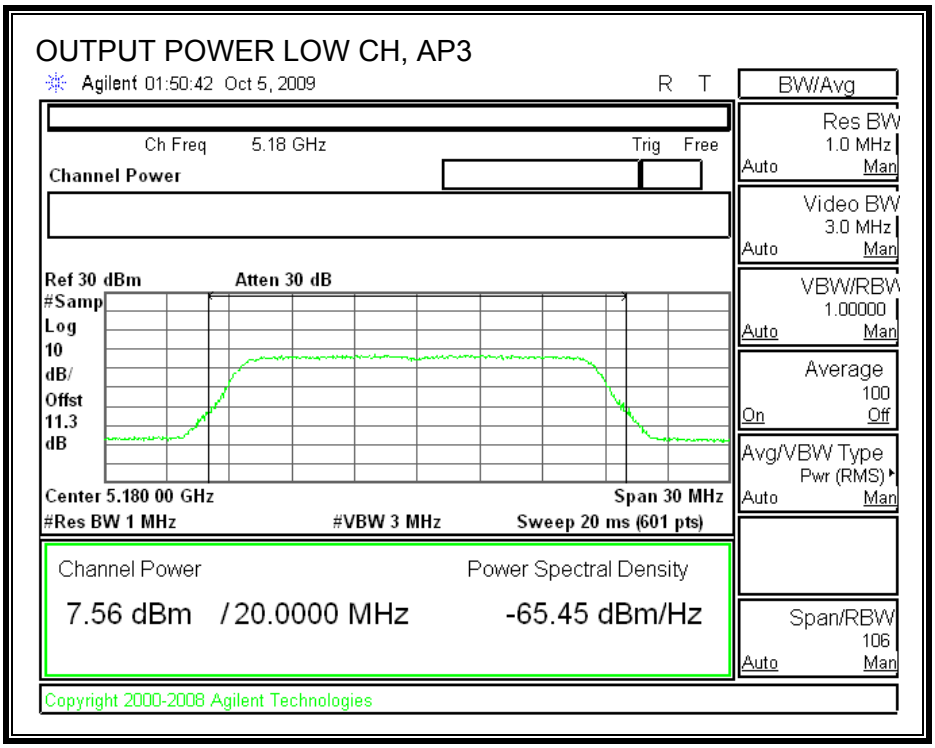
AP2 OUTPUT POWER

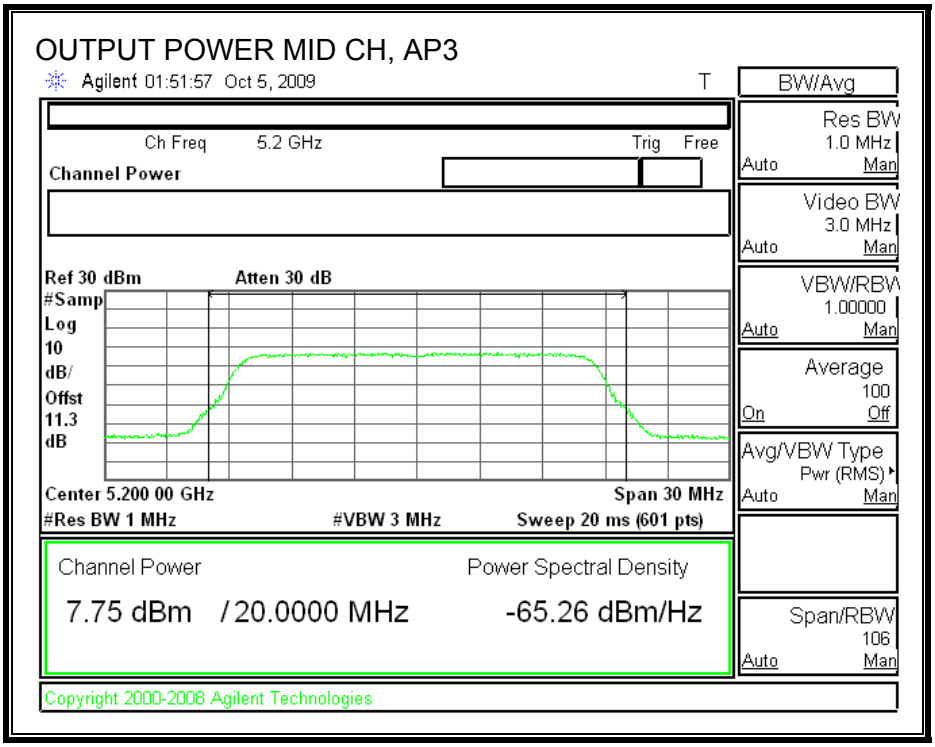


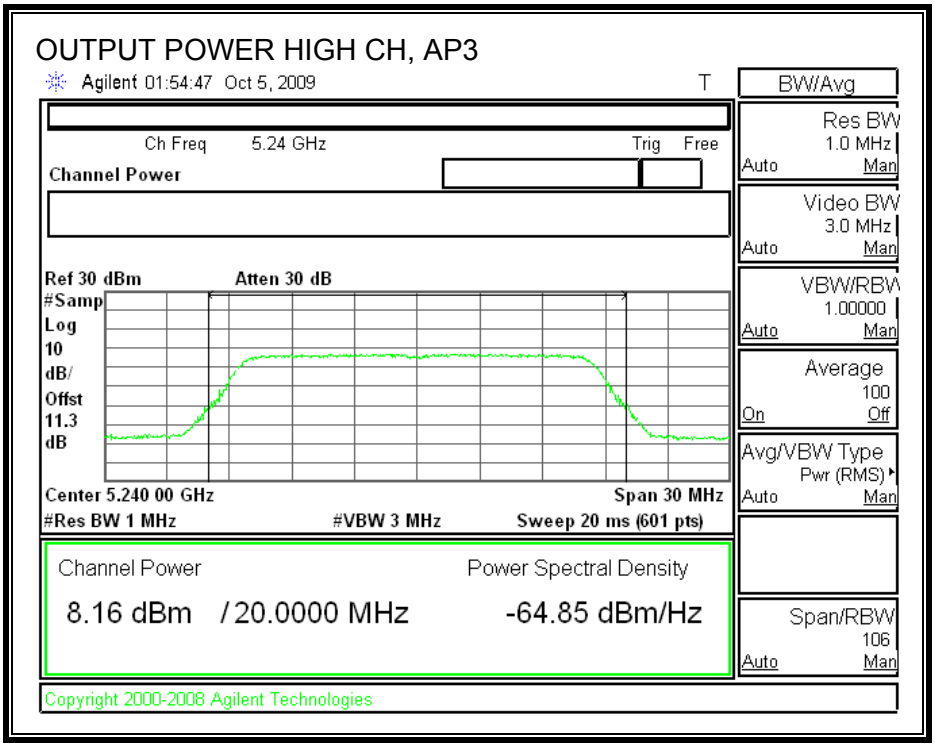




AP3 OUTPUT POWER







7.2.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain (AP1) (dBi)	Antenna Gain (AP2) (dBi)	Antenna Gain (AP3) (dBi)	Effective Legacy Gain (dBi)
5.03	2.5	5.69	9.38

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

The maximum effective antenna gain is 9.38 dBi, therefore the limit is 0.62 dBm.

TEST PROCEDURE

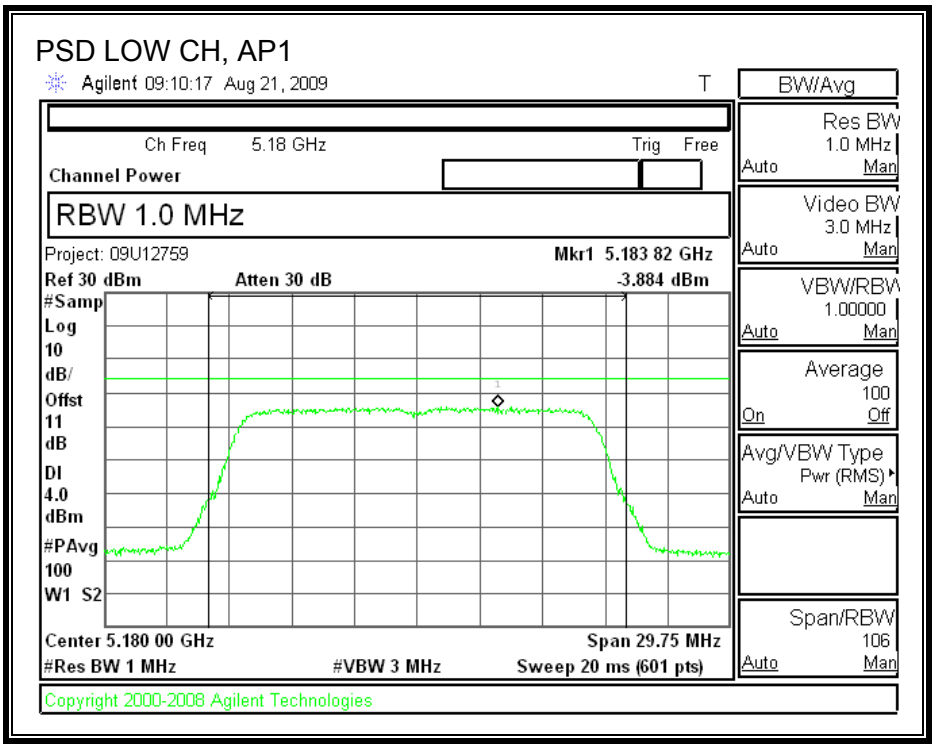
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

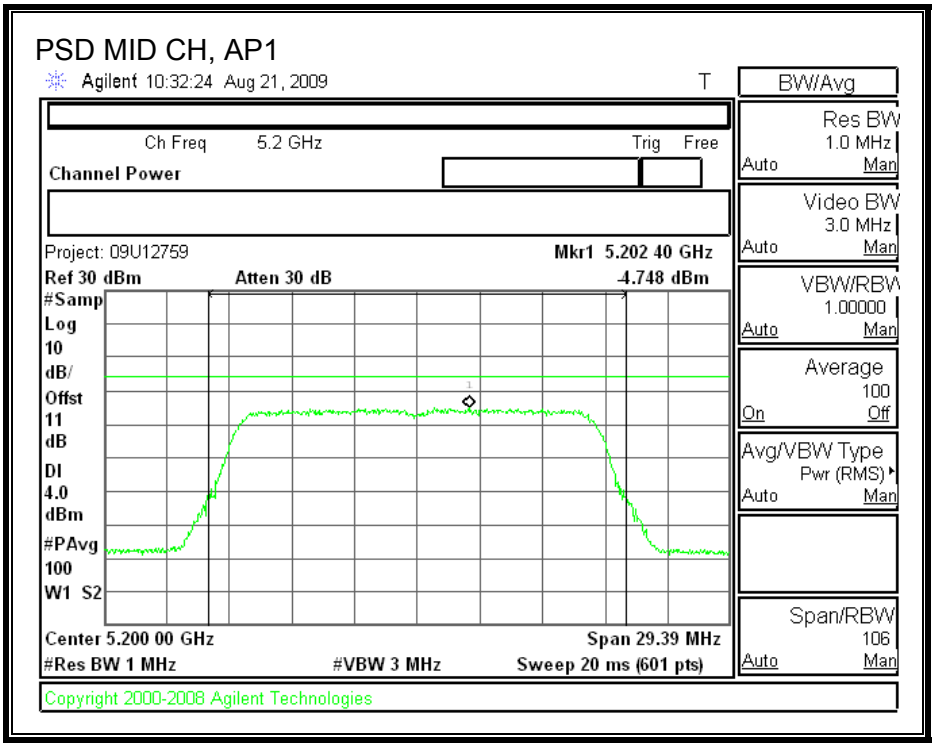
RESULTS

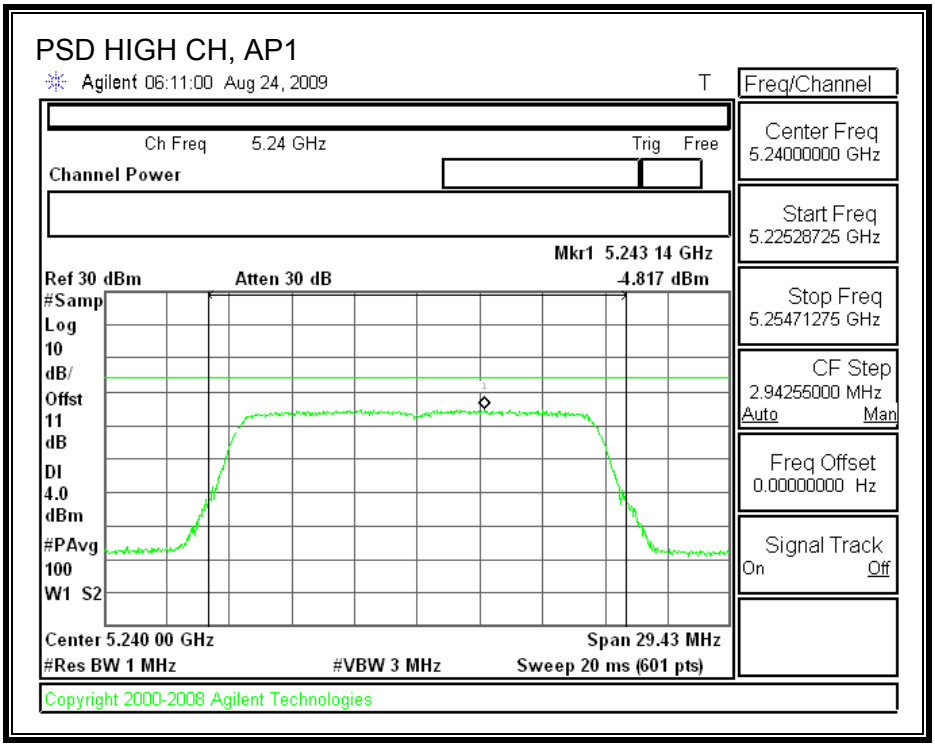
Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP2 PPSD (dBm)	AP3 PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-3.884	-3.778	-4.879	0.62	-4.40
Middle	5200	-4.748	-6.348	-5.133	0.62	-5.37
High	5240	-4.817	-5.541	-2.781	0.62	-3.40

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-5.263	0.62	-5.88
Middle	5200	-4.484	0.62	-5.10
High	5240	-4.103	0.62	-4.72

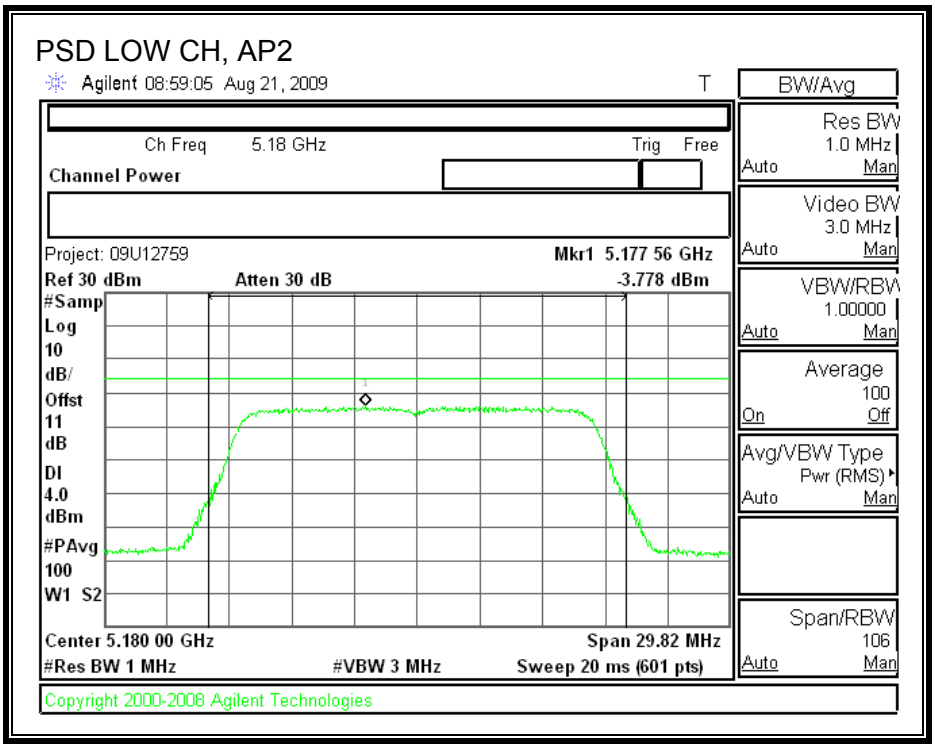
AP1 POWER SPECTRAL DENSITY

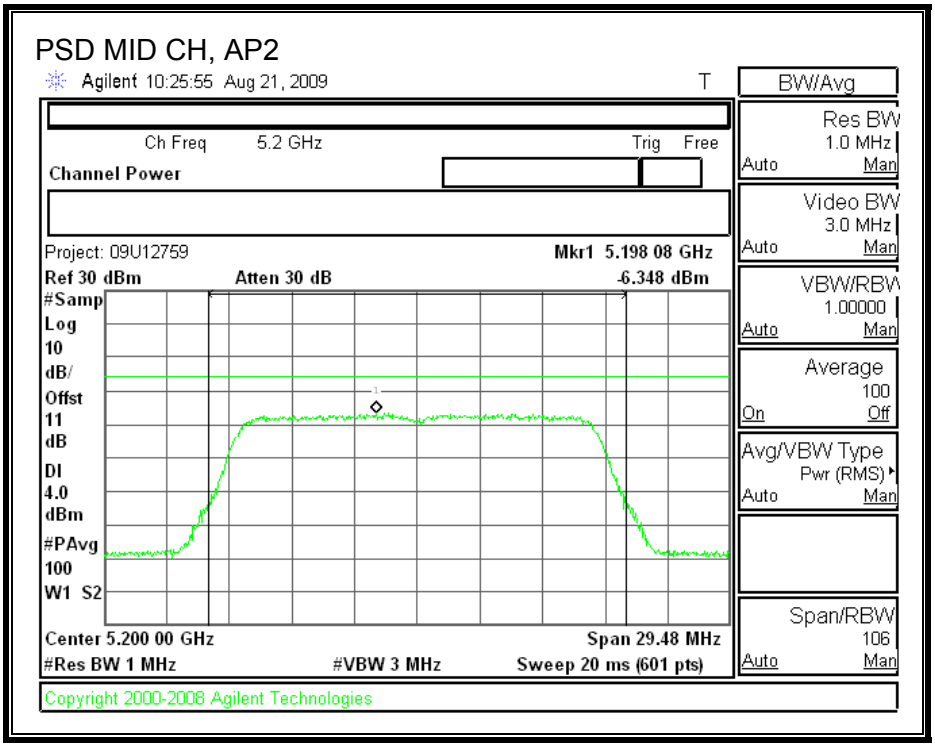




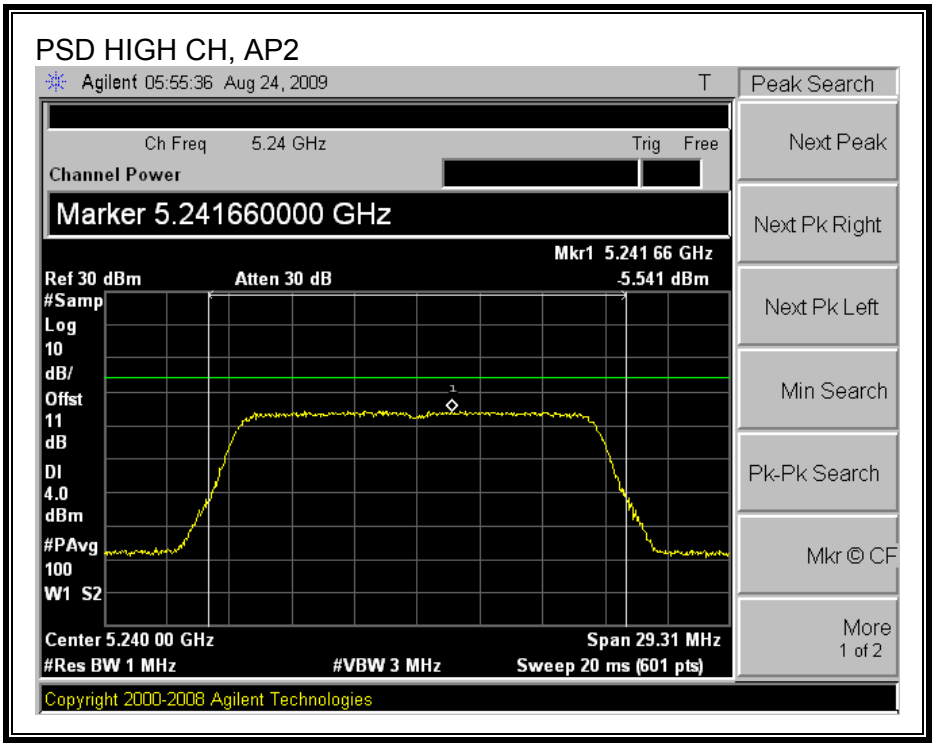


AP2 POWER SPECTRAL DENSITY

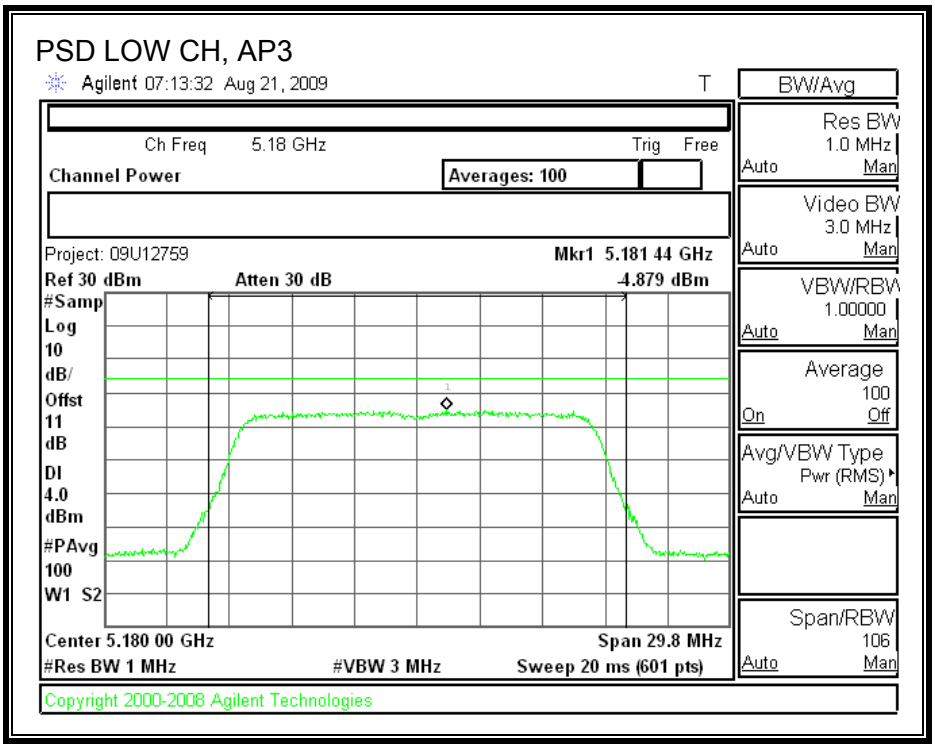


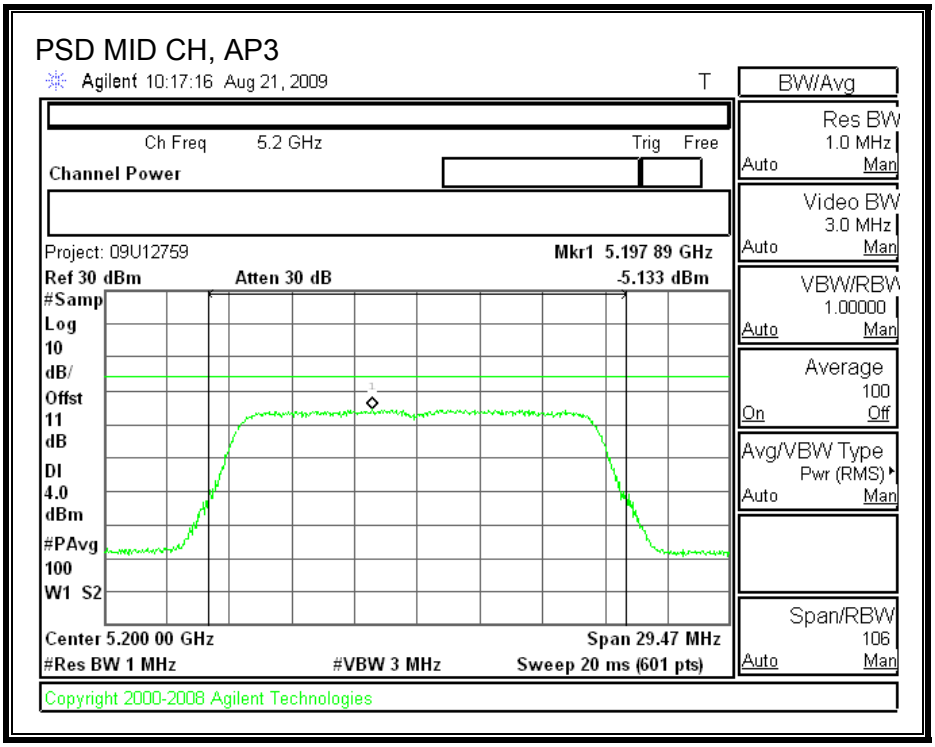


PSD HIGH CH, AP2

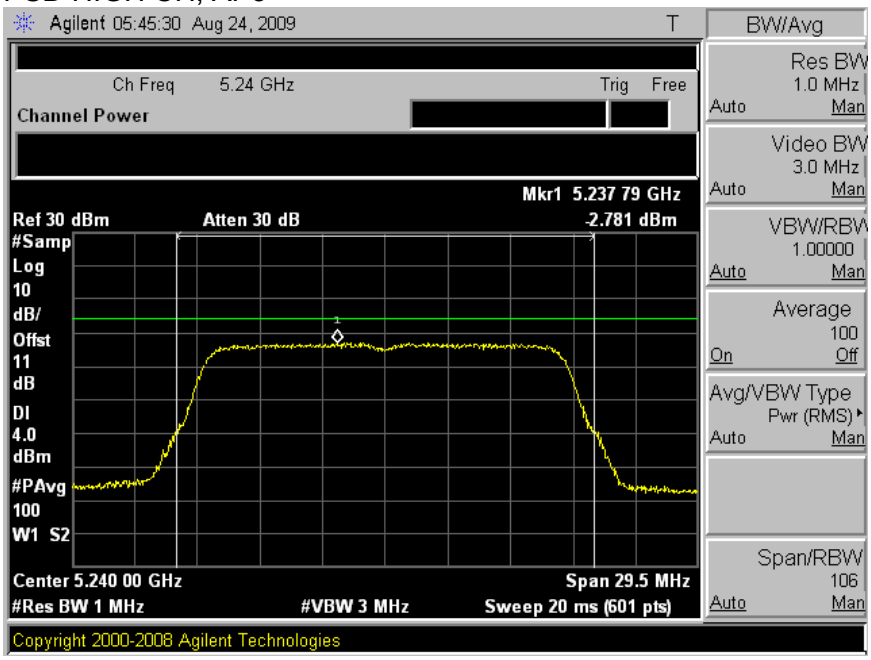


AP3 POWER SPECTRAL DENSITY

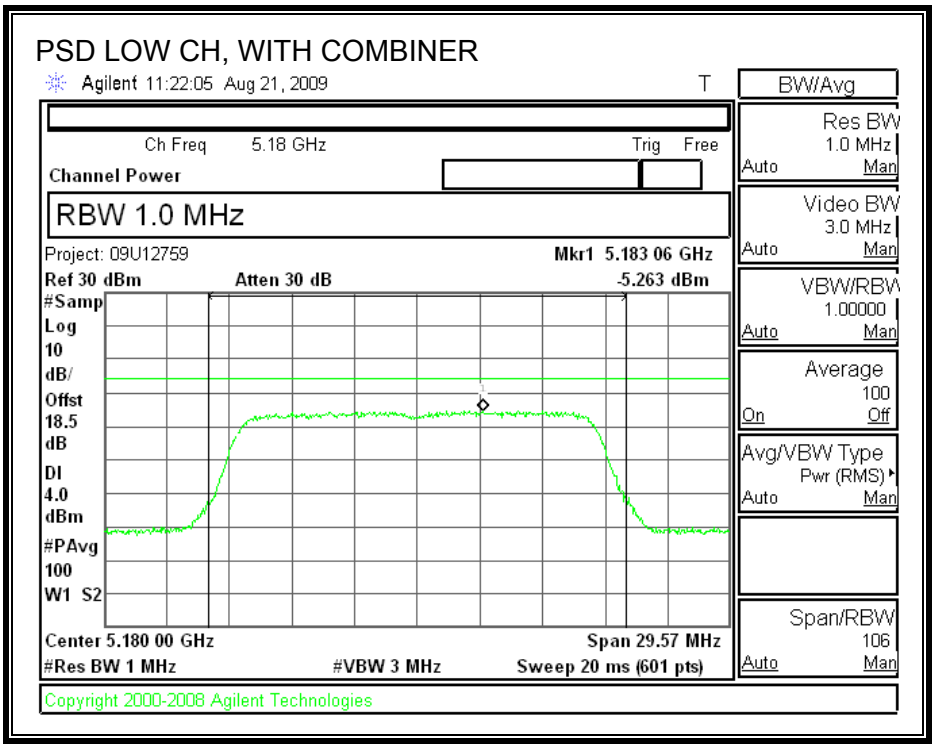


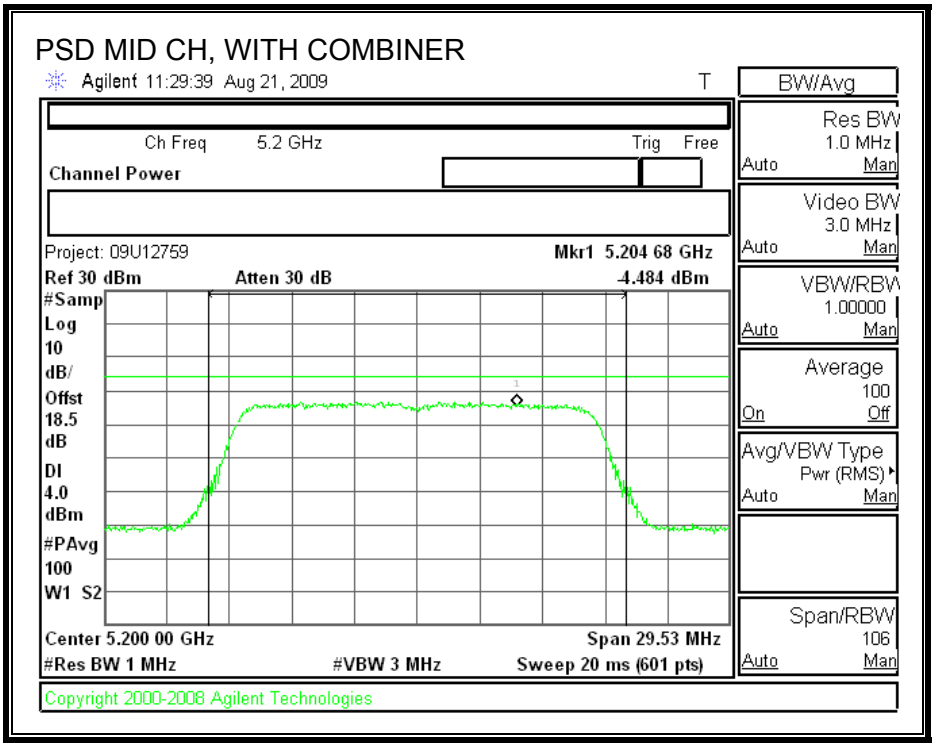


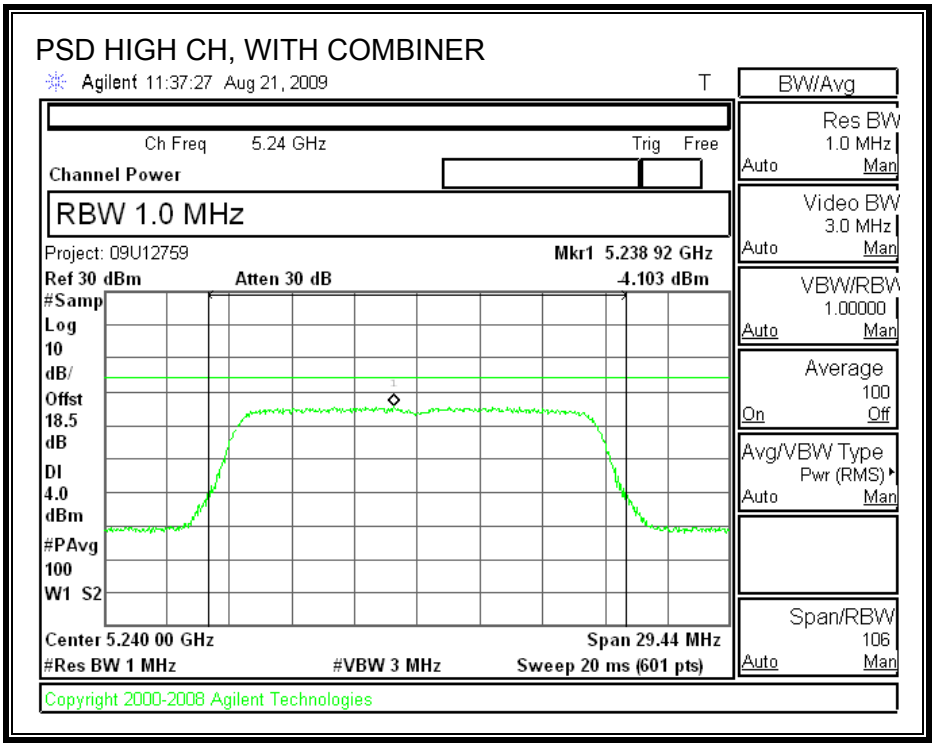
PSD HIGH CH, AP3



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

AP1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.060	13	-4.94
Middle	5200	8.619	13	-4.38
High	5240	7.793	13	-5.21

AP2

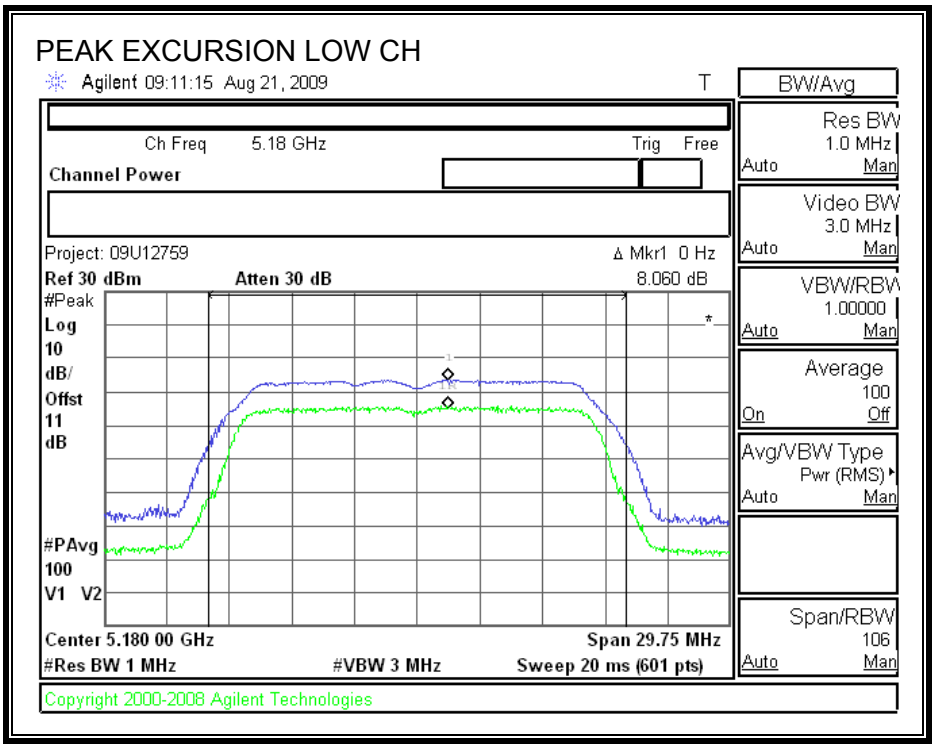
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.107	13	-4.89
Middle	5200	8.604	13	-4.40
High	5240	8.711	13	-4.29

AP3

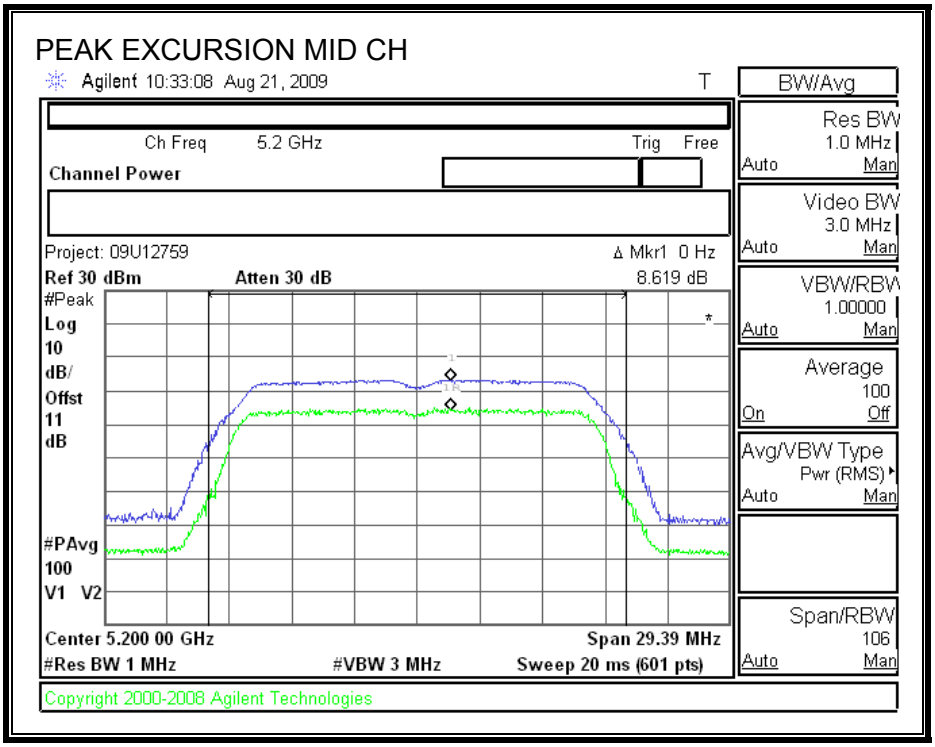
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.055	13	-4.95
Middle	5200	7.981	13	-5.02
High	5240	7.996	13	-5.00

AP1

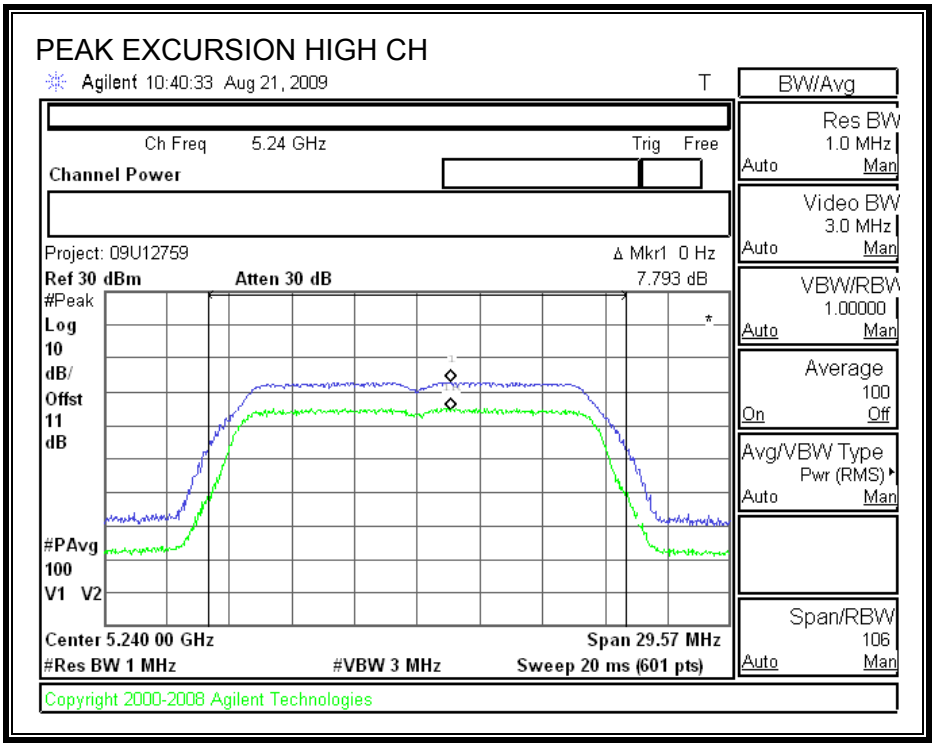
PEAK EXCURSION



PEAK EXCURSION MID CH

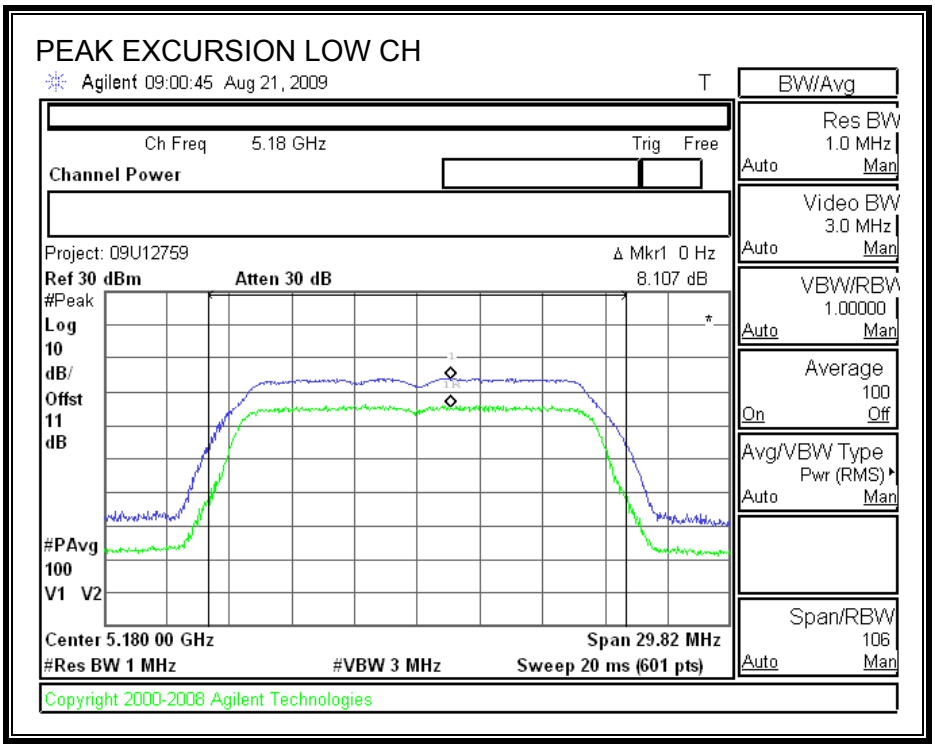


PEAK EXCURSION HIGH CH

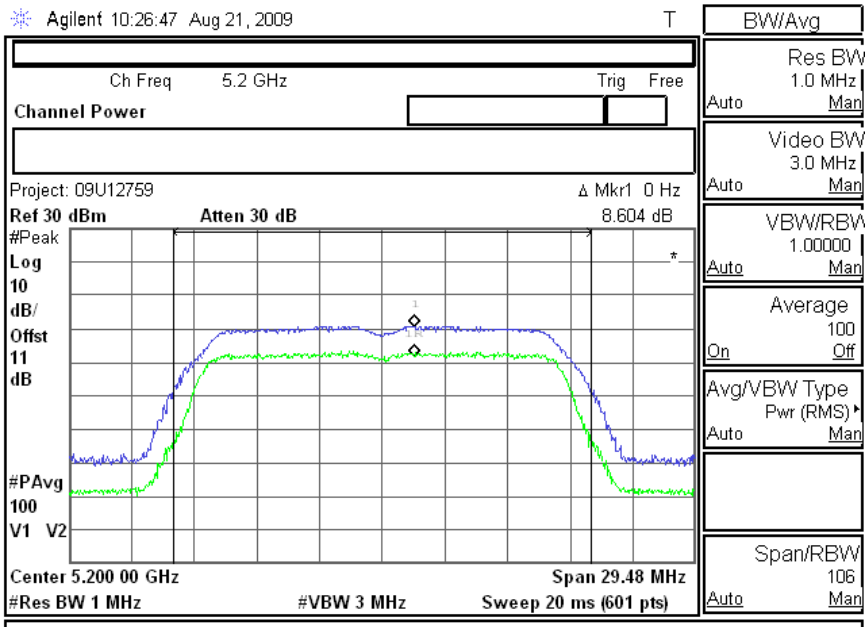


AP2

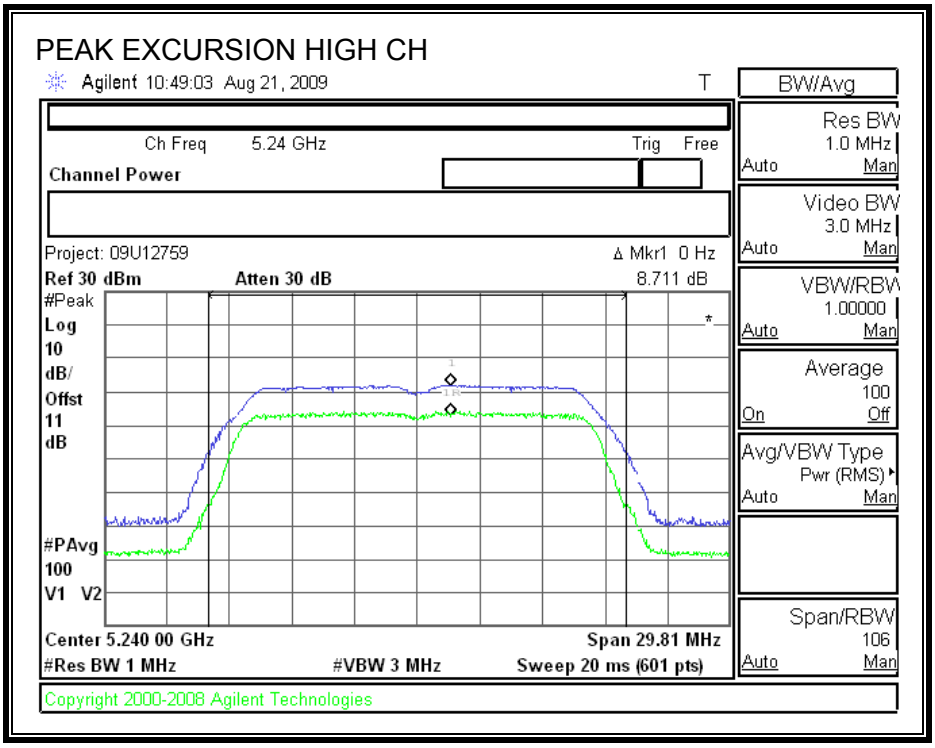
PEAK EXCURSION



PEAK EXCURSION MID CH

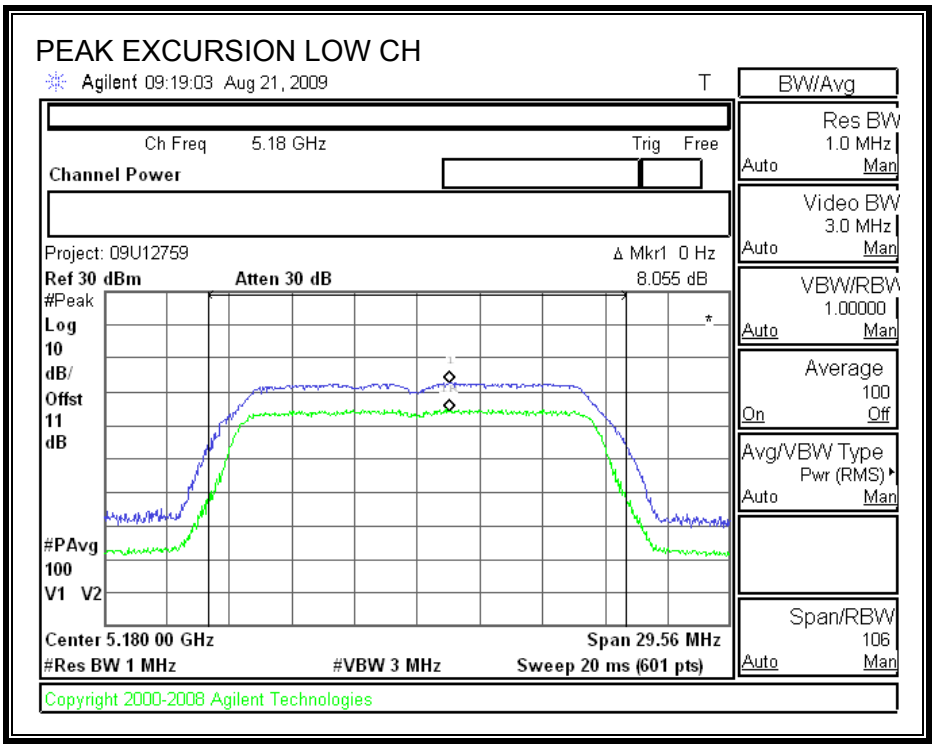


PEAK EXCURSION HIGH CH

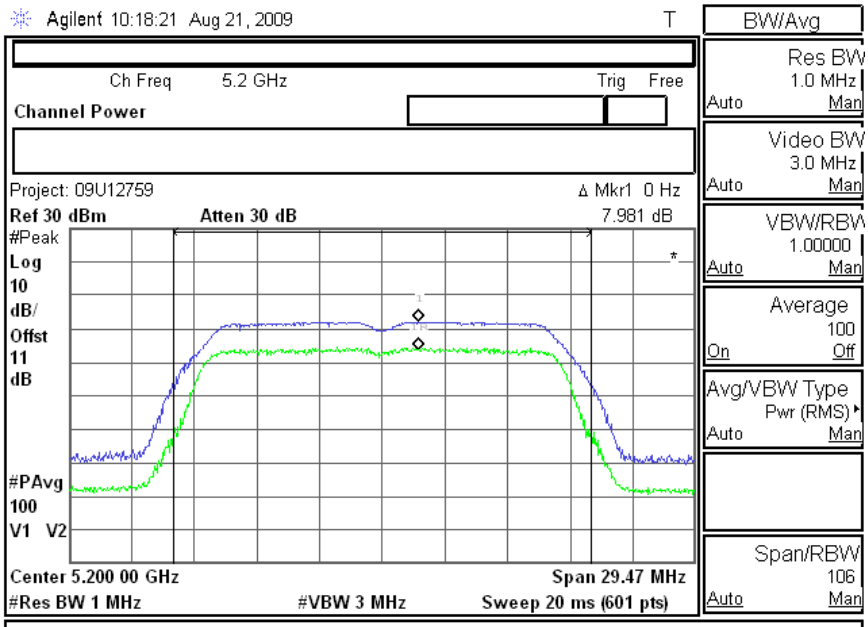


AP3

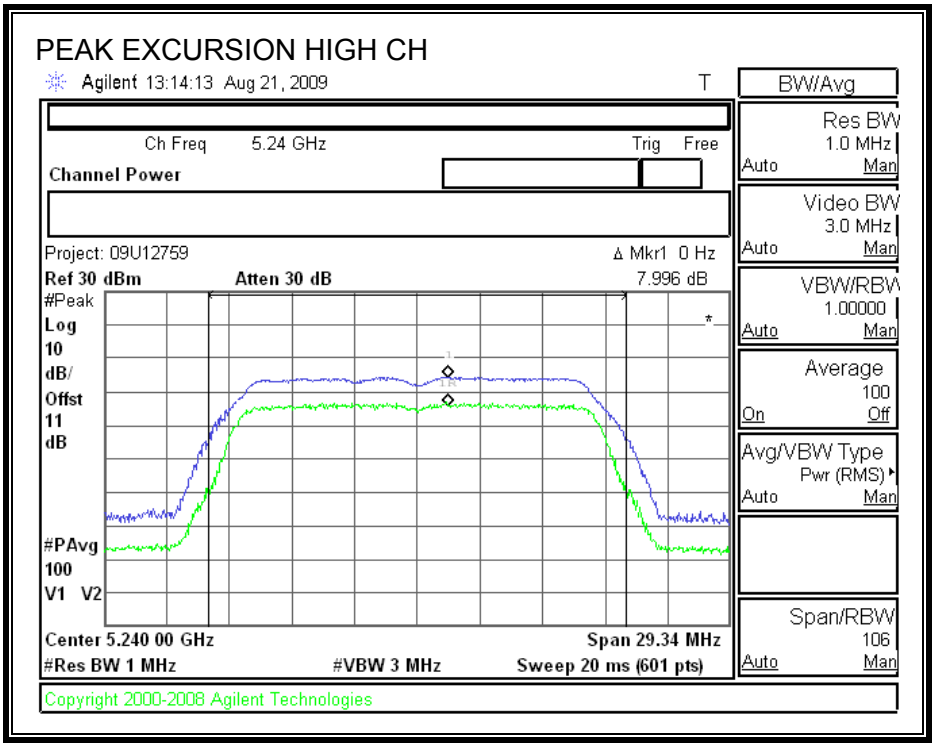
PEAK EXCURSION



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

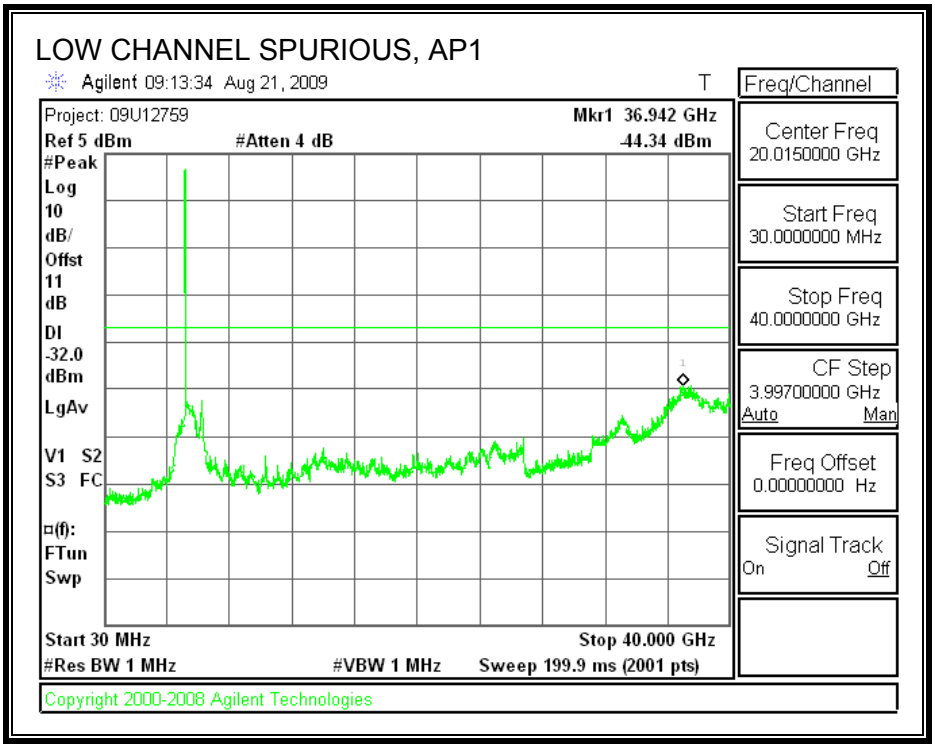
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

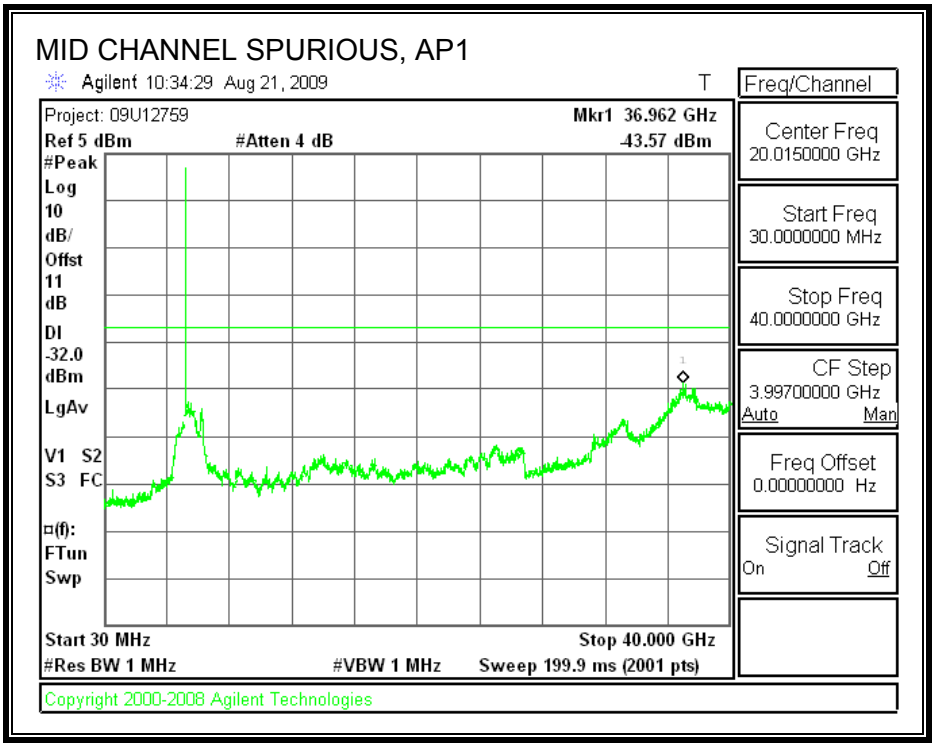
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

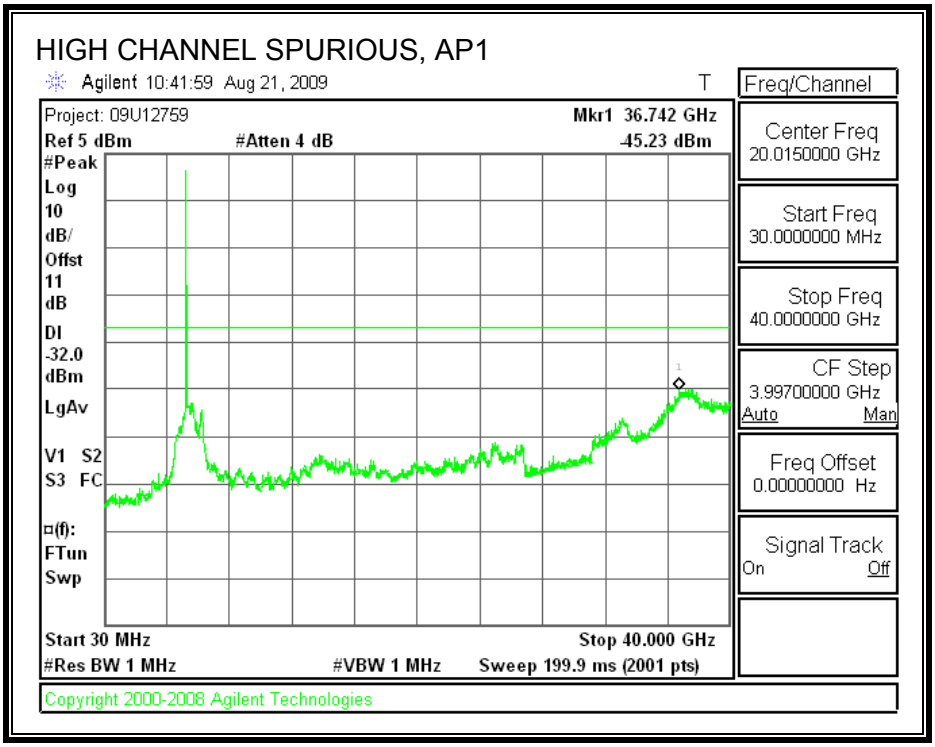
AP1 SPURIOUS EMISSIONS



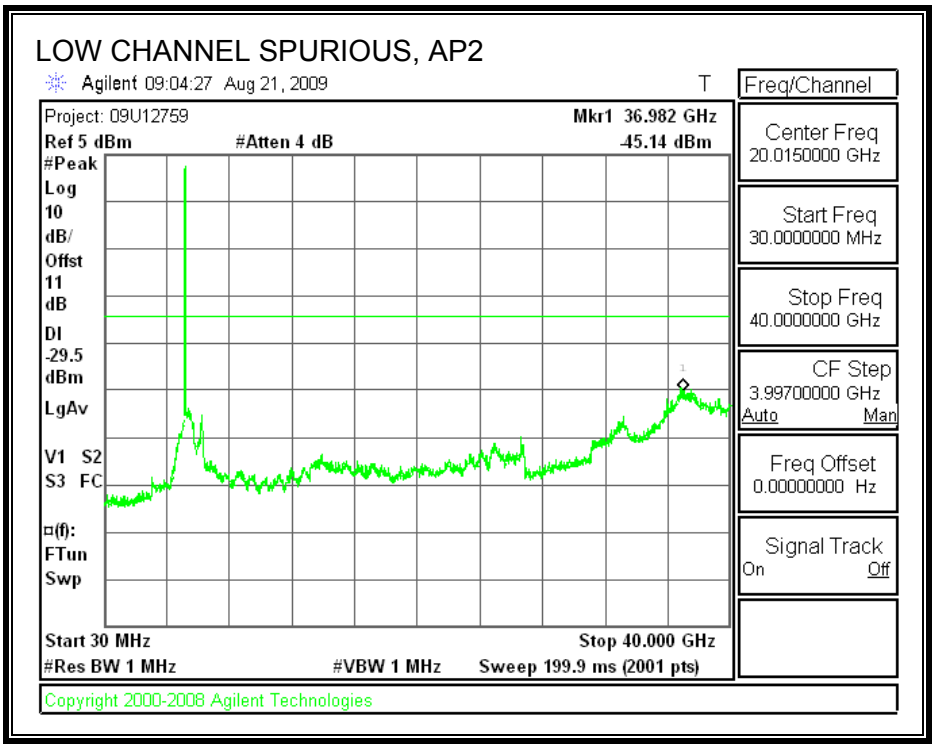
MID CHANNEL SPURIOUS, AP1



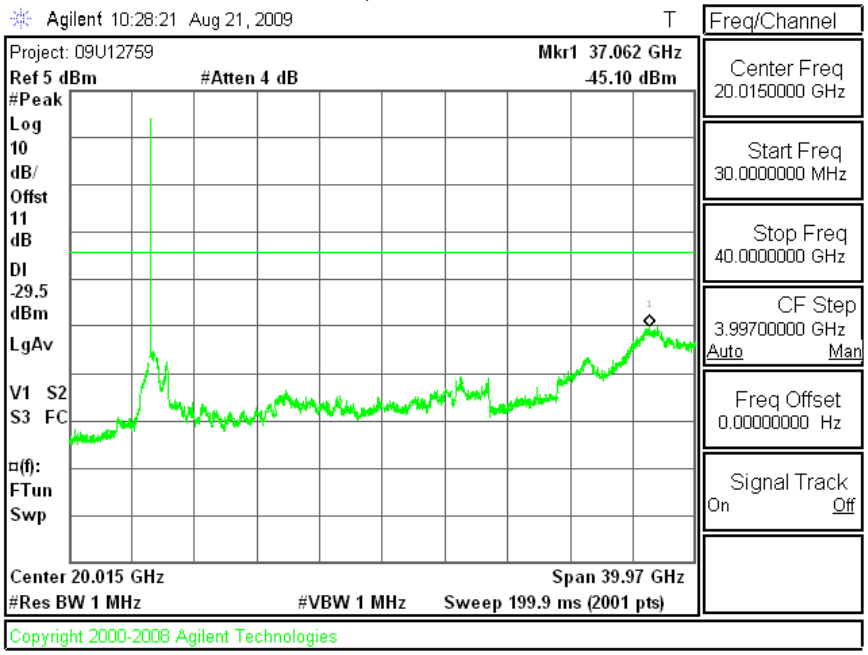
HIGH CHANNEL SPURIOUS, AP1



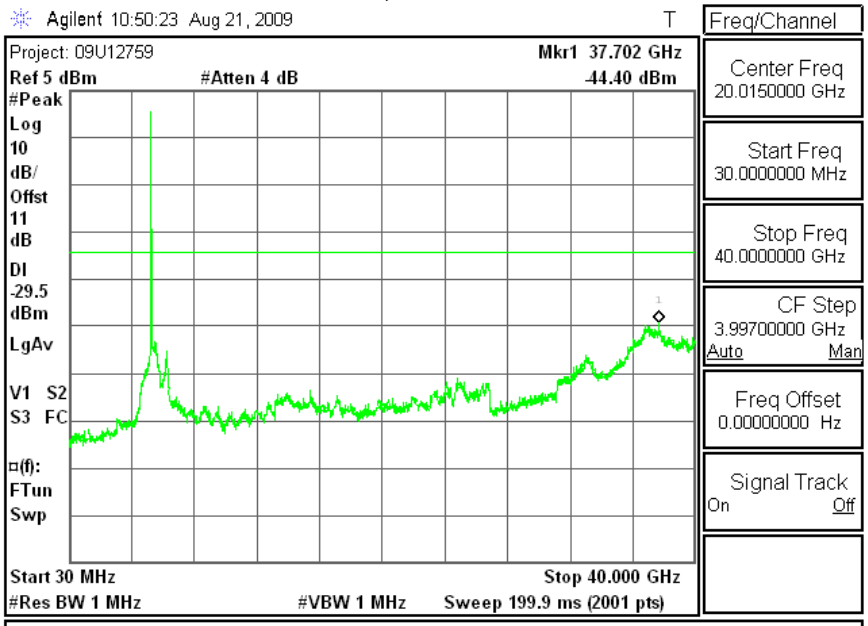
AP2 SPURIOUS EMISSIONS



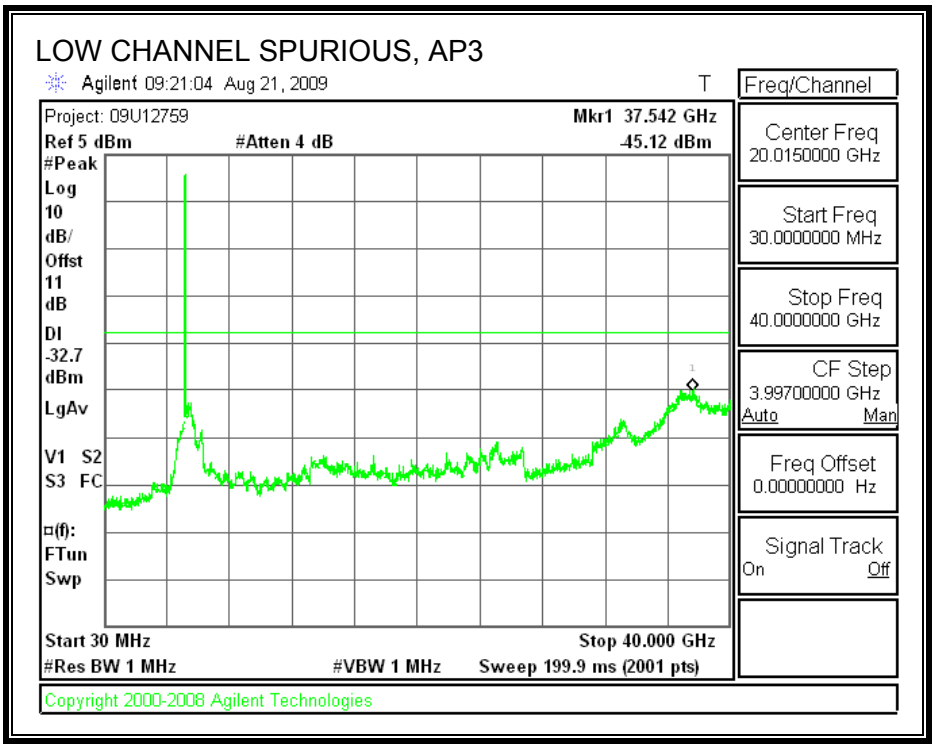
MID CHANNEL SPURIOUS, AP2



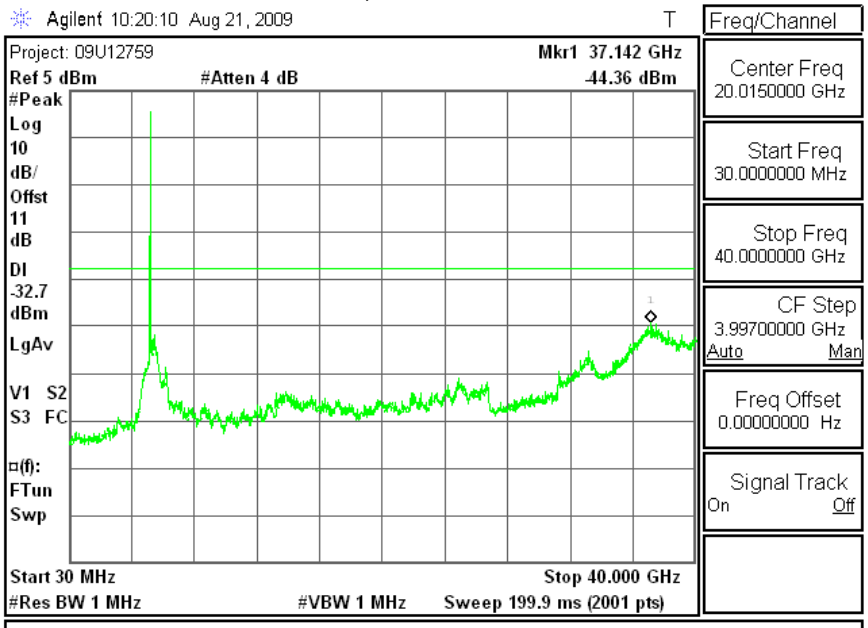
HIGH CHANNEL SPURIOUS, AP2



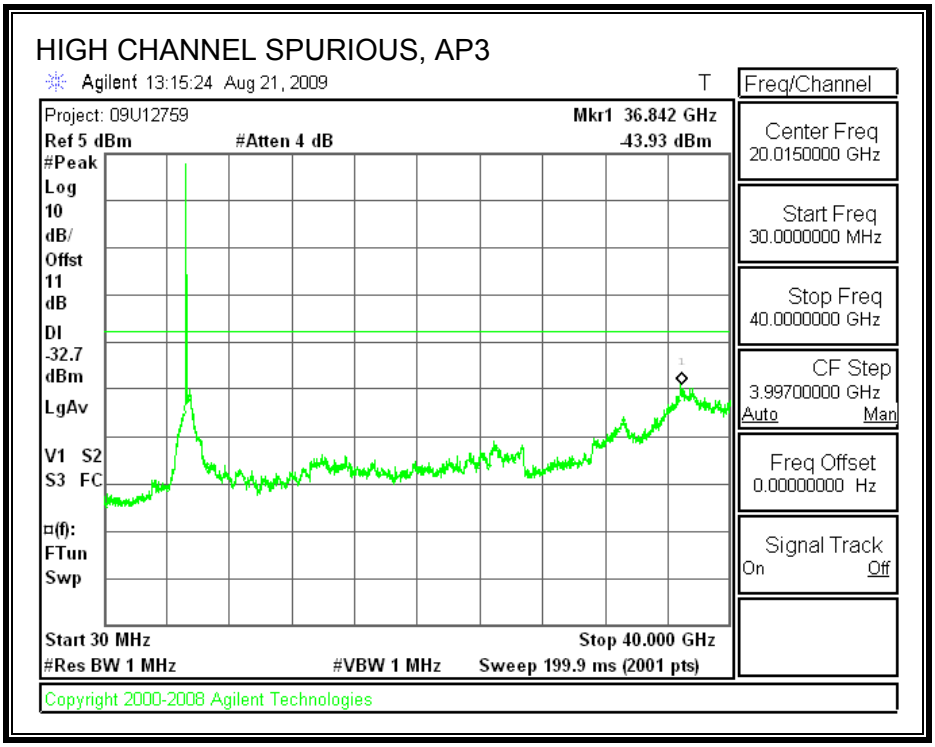
AP3 SPURIOUS EMISSIONS



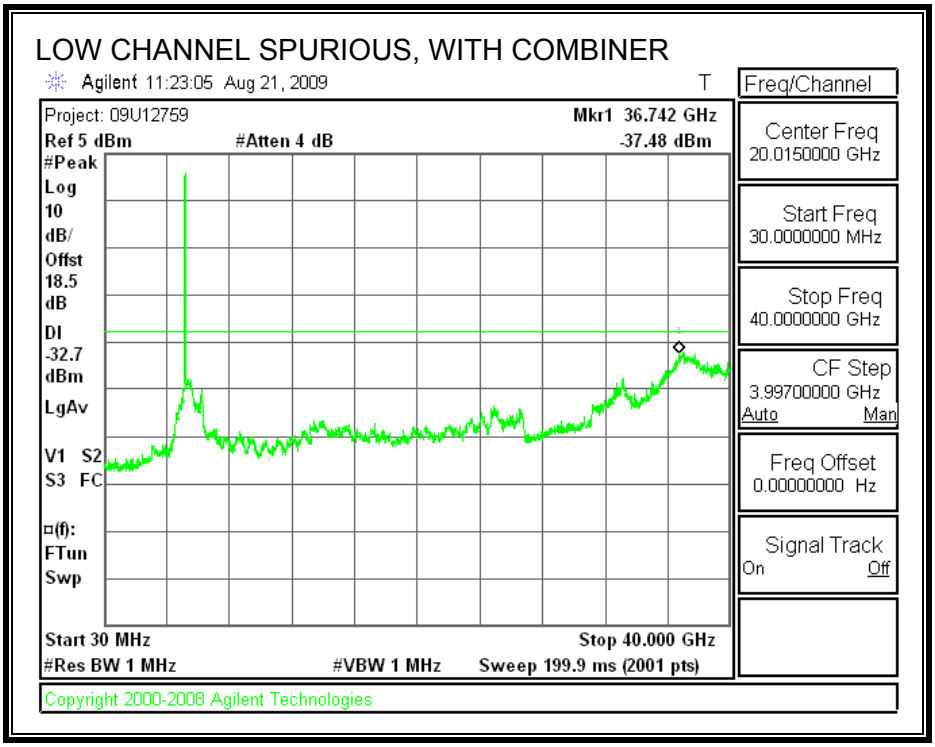
MID CHANNEL SPURIOUS, AP3



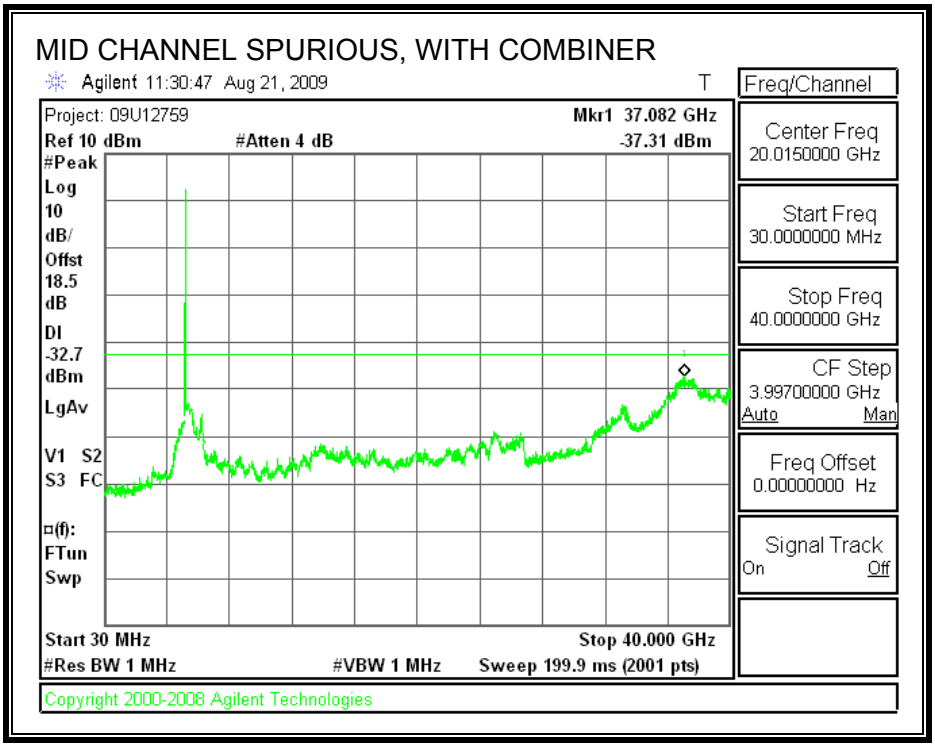
HIGH CHANNEL SPURIOUS, AP3



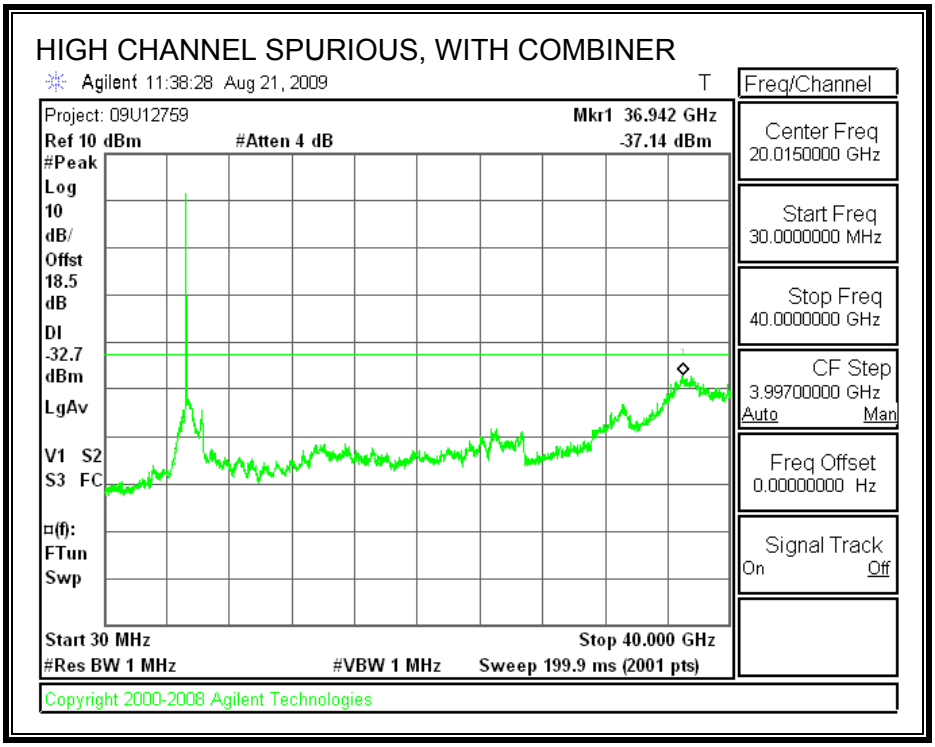
SPURIOUS EMISSIONS WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



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

7.3.1. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

TEST PROCEDURE

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

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

RESULTS

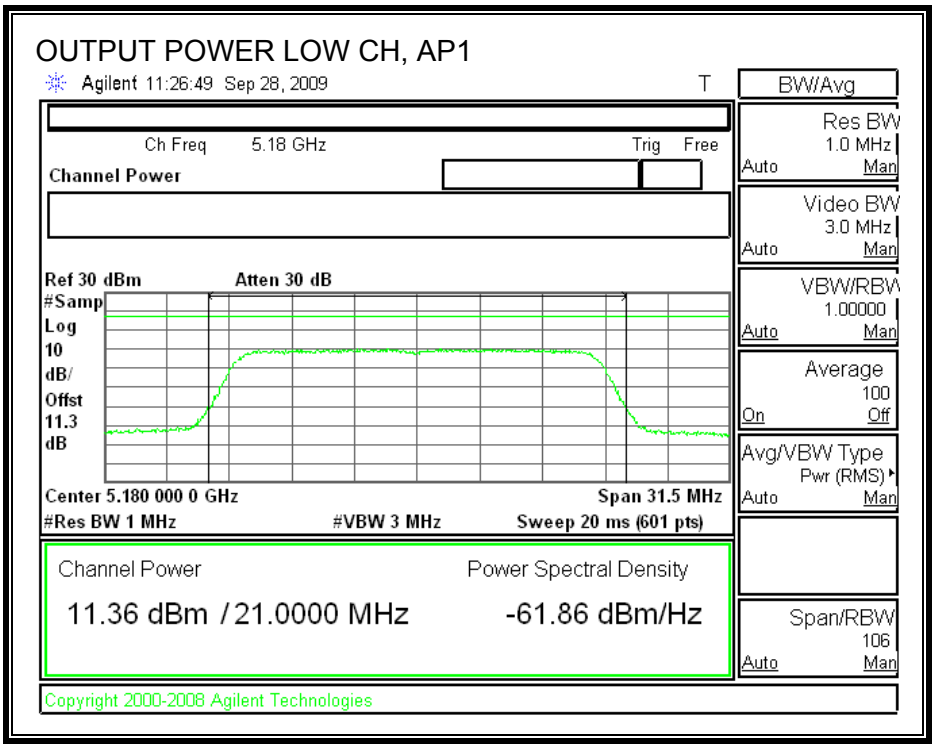
Limit

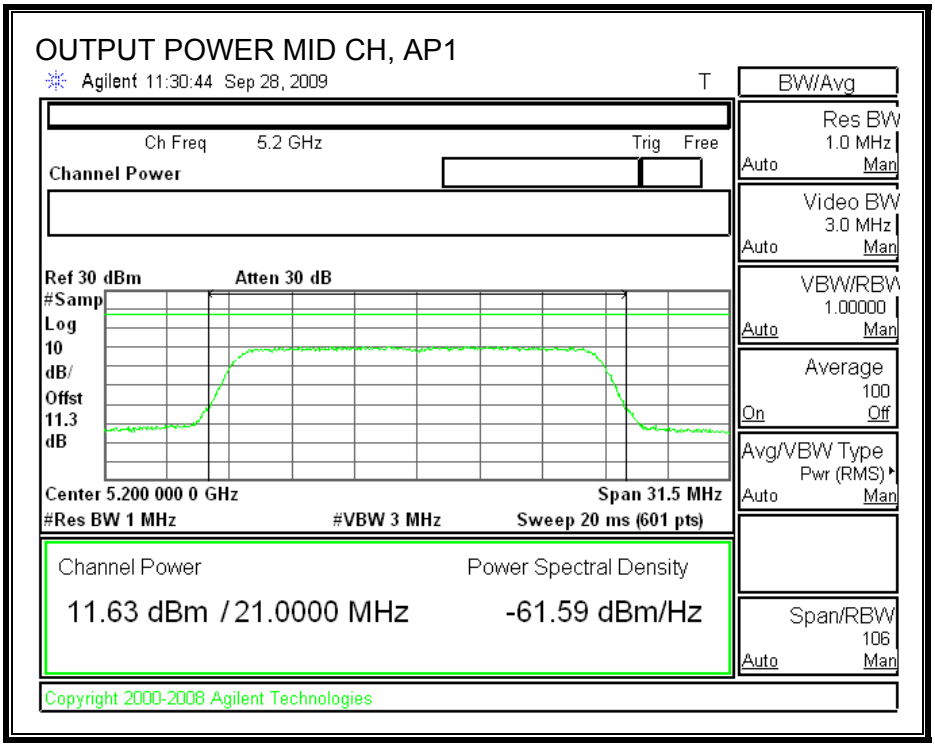
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	19.353	16.87	5.69	16.87
Mid	5200	17	19.263	16.85	5.69	16.85
High	5240	17	19.455	16.89	5.69	16.89

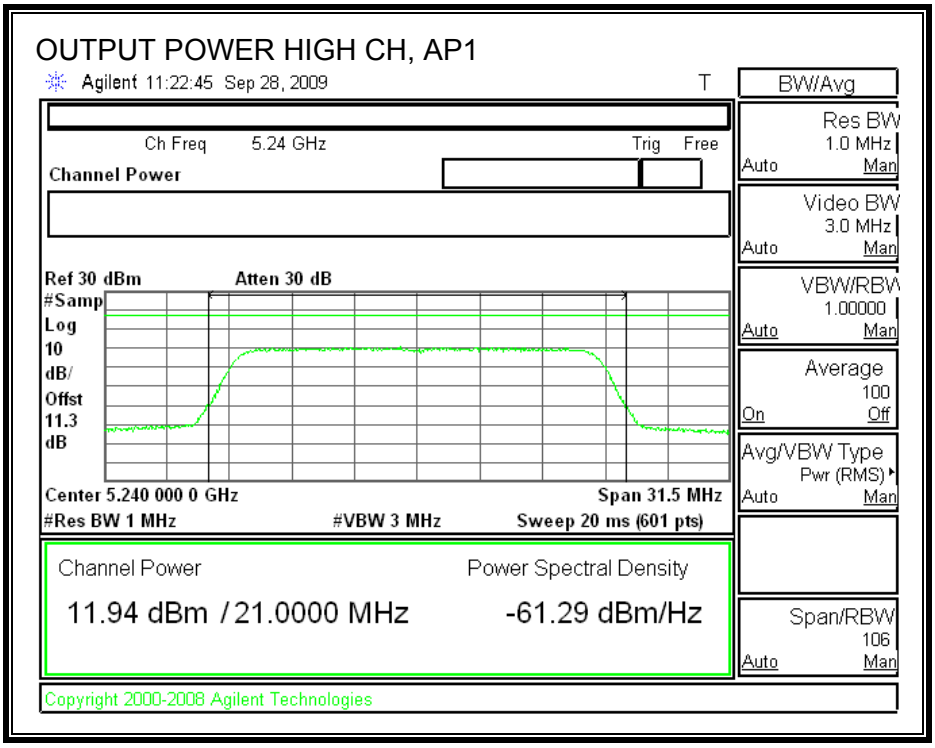
Individual Chain Results

Channel	Frequency (MHz)	AP1 Power (dBm)	AP3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.36	12.35	14.89	16.87	-1.97
Mid	5200	11.63	13.21	15.50	16.85	-5.22
High	5240	11.94	13.47	15.78	16.89	-4.95

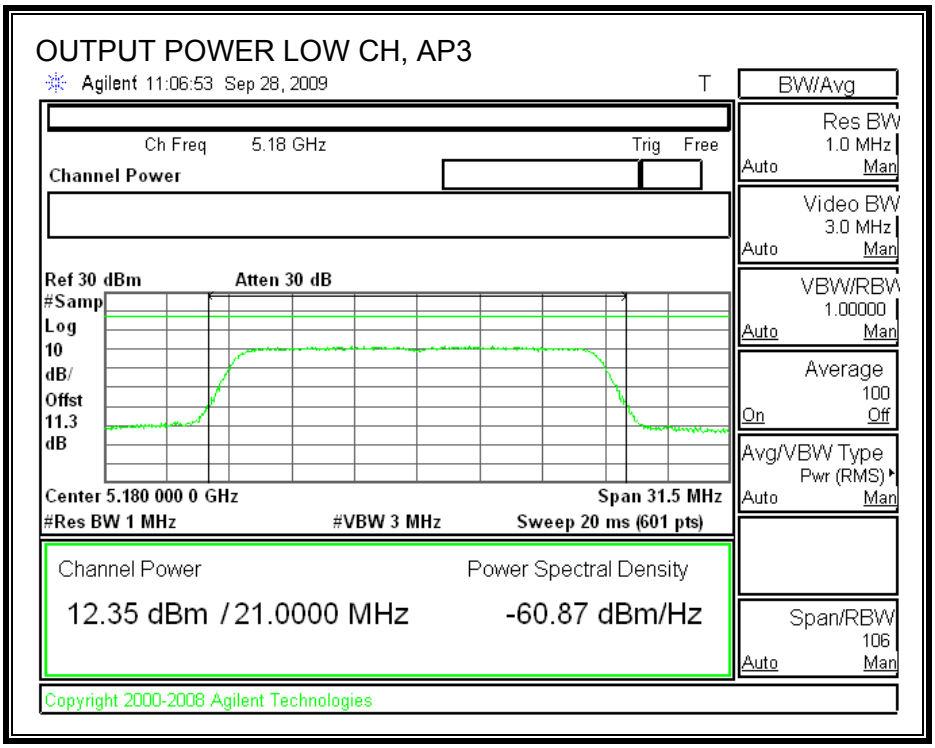
AP1 OUTPUT POWER

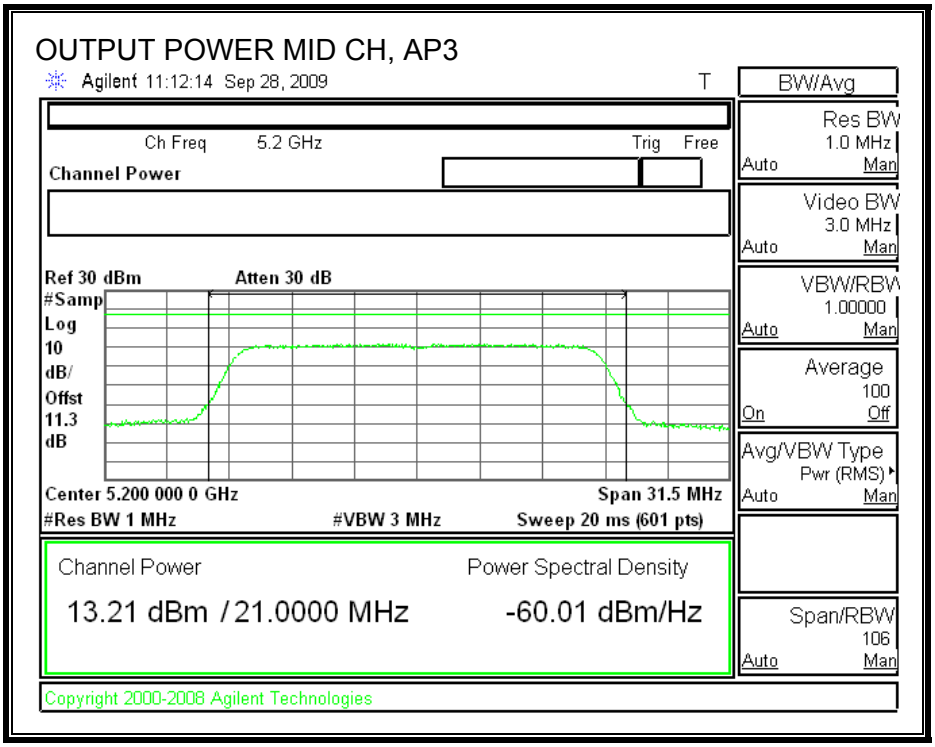


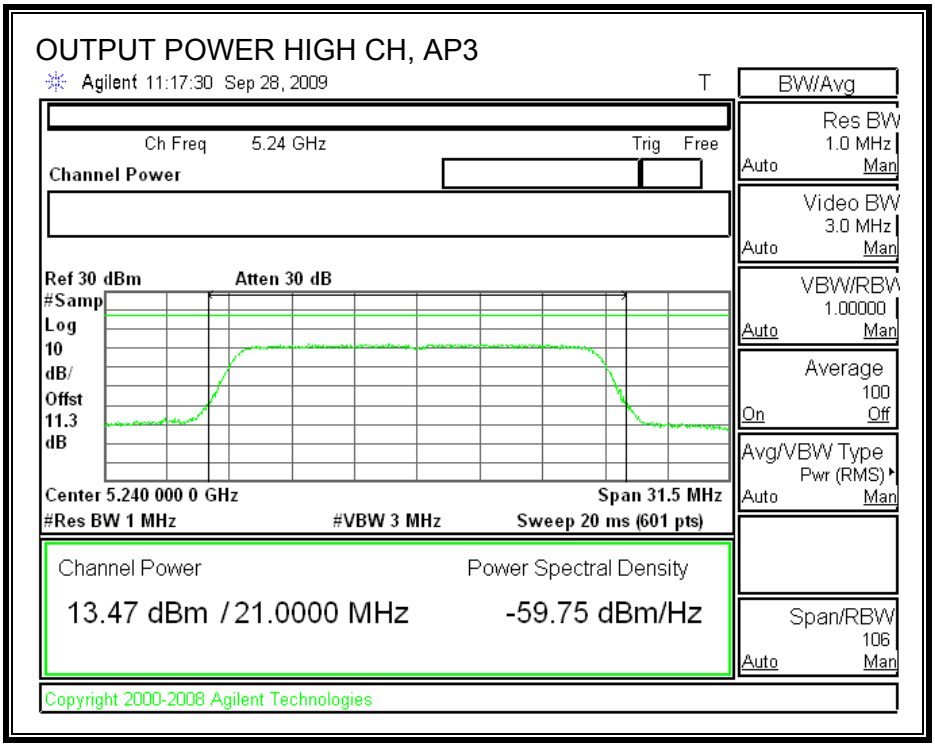




AP3 OUTPUT POWER







7.3.2. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

TEST PROCEDURE

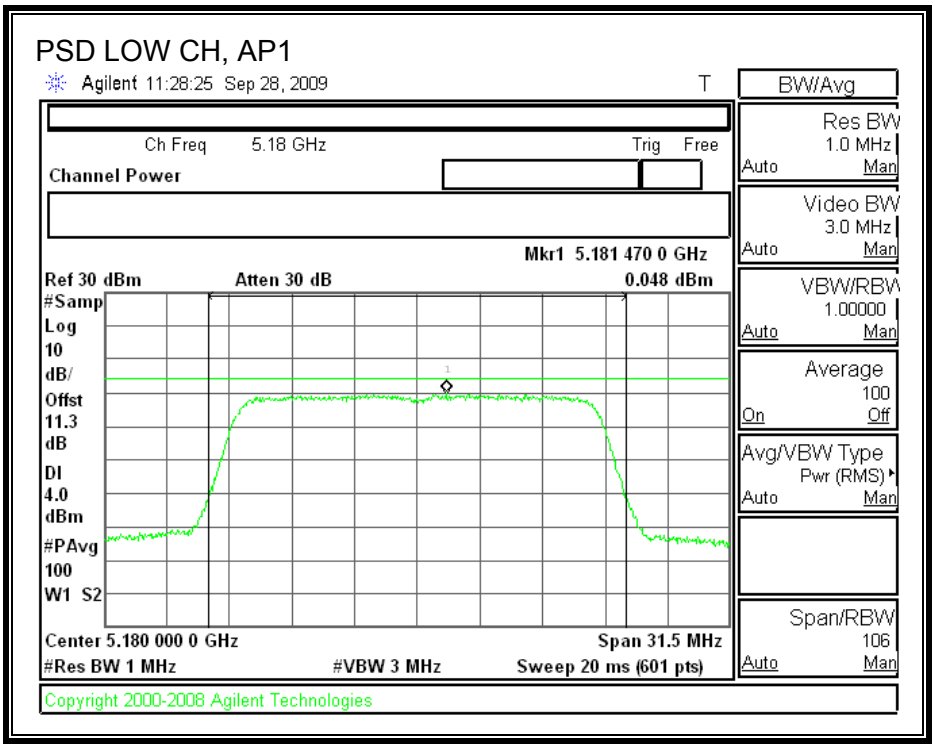
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

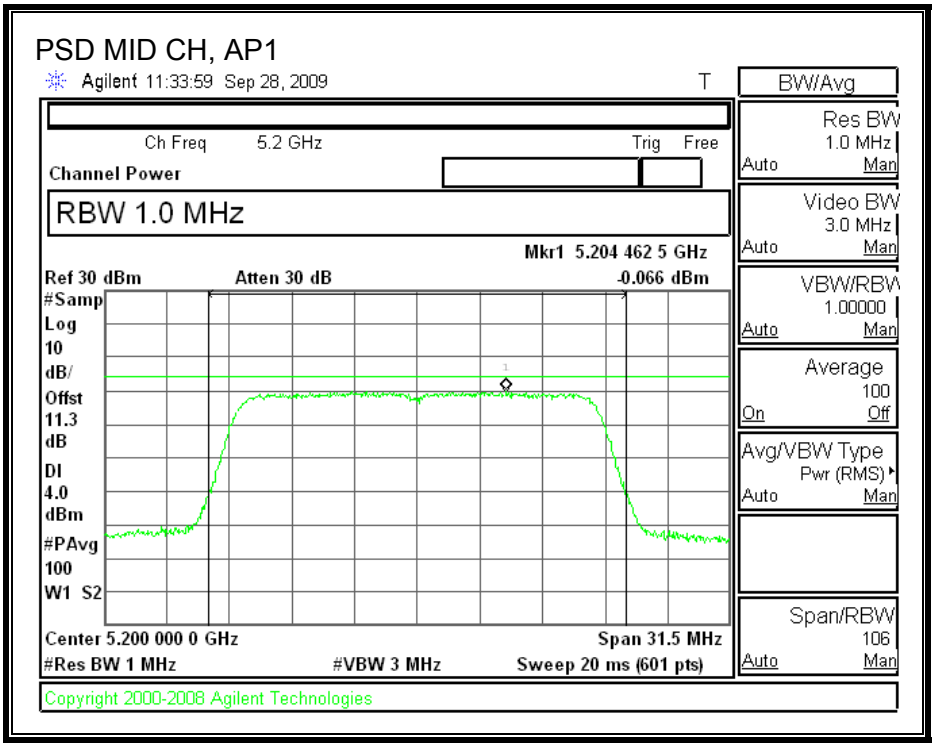
RESULTS

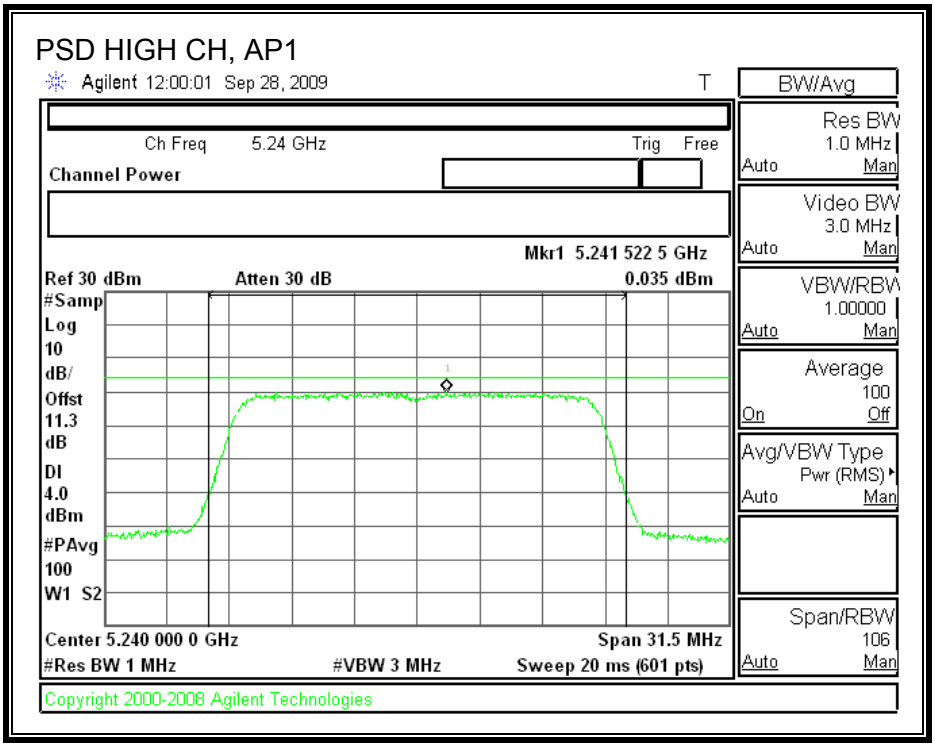
Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP3 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.048	1.169	3.65	4	-0.35
Middle	5200	-0.066	1.356	3.71	4	-0.29
High	5240	0.035	1.597	3.90	4	-0.10

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-1.970	4	-5.97
Middle	5200	-2.622	4	-6.62
High	5240	-2.849	4	-6.85

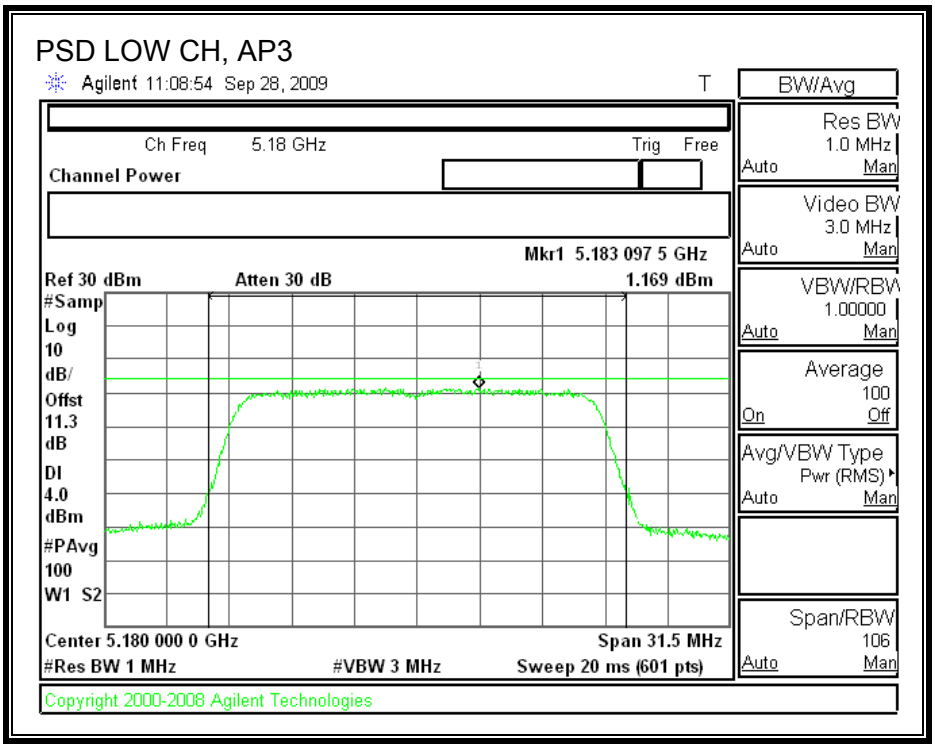
AP1 POWER SPECTRAL DENSITY

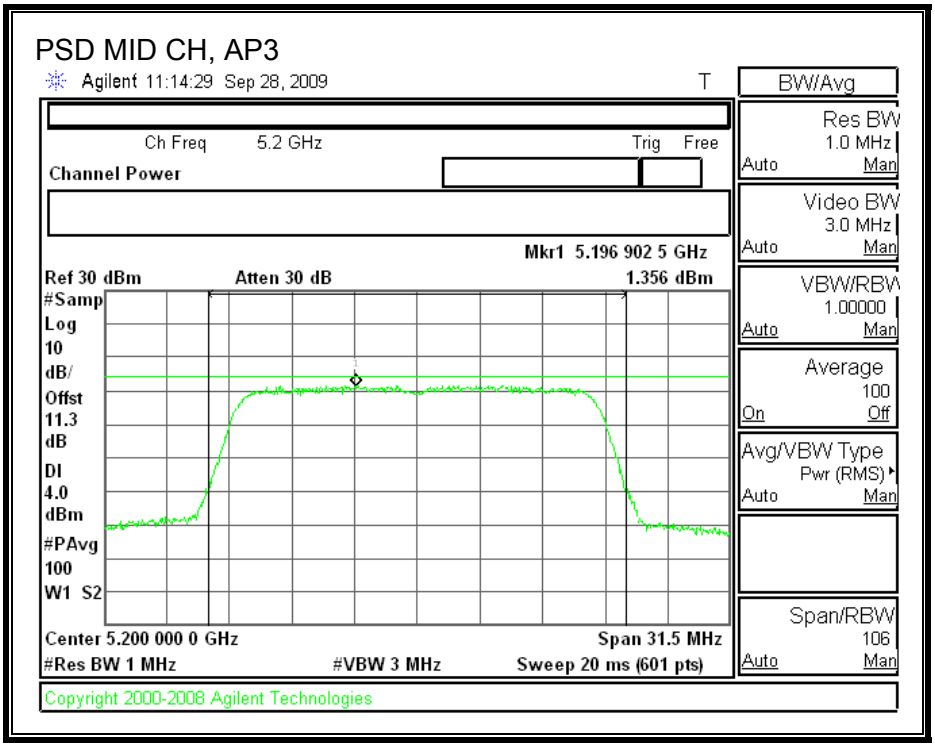


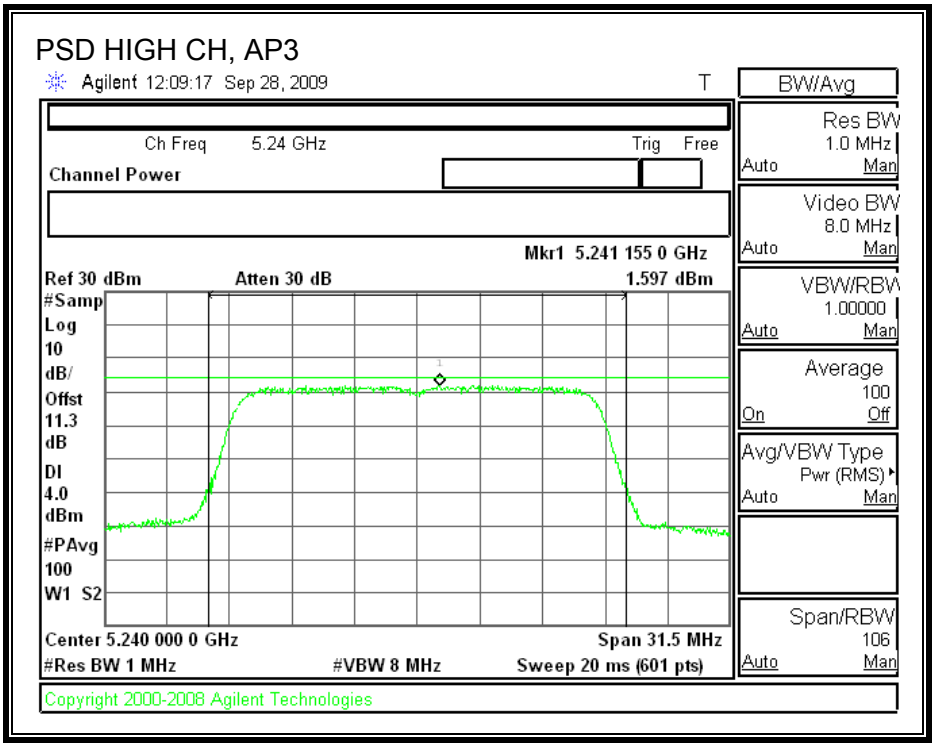




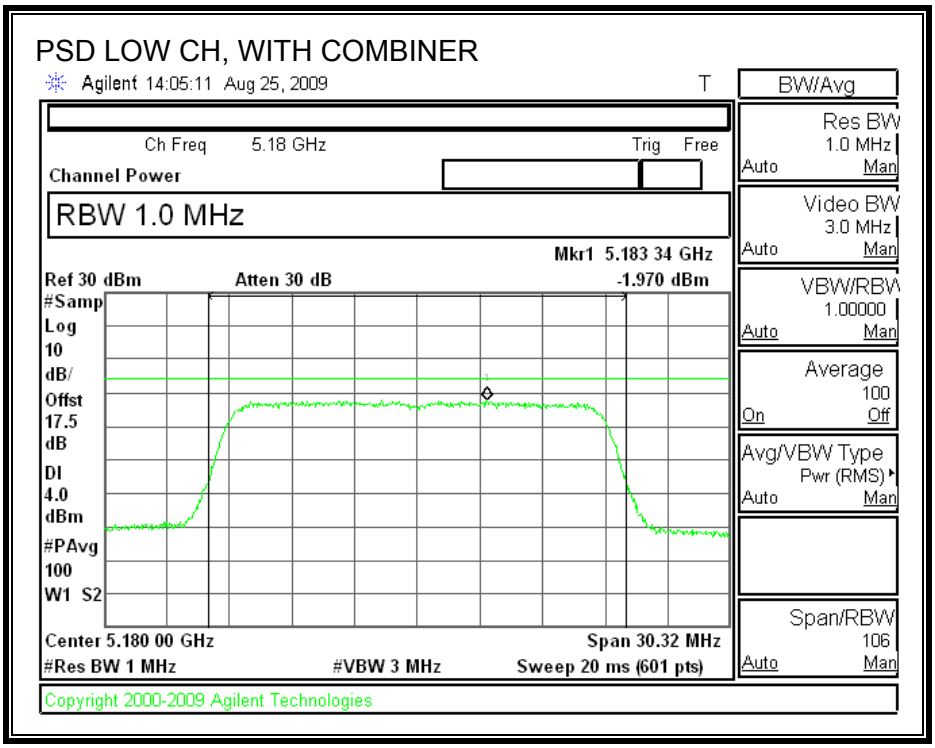
AP3 POWER SPECTRAL DENSITY

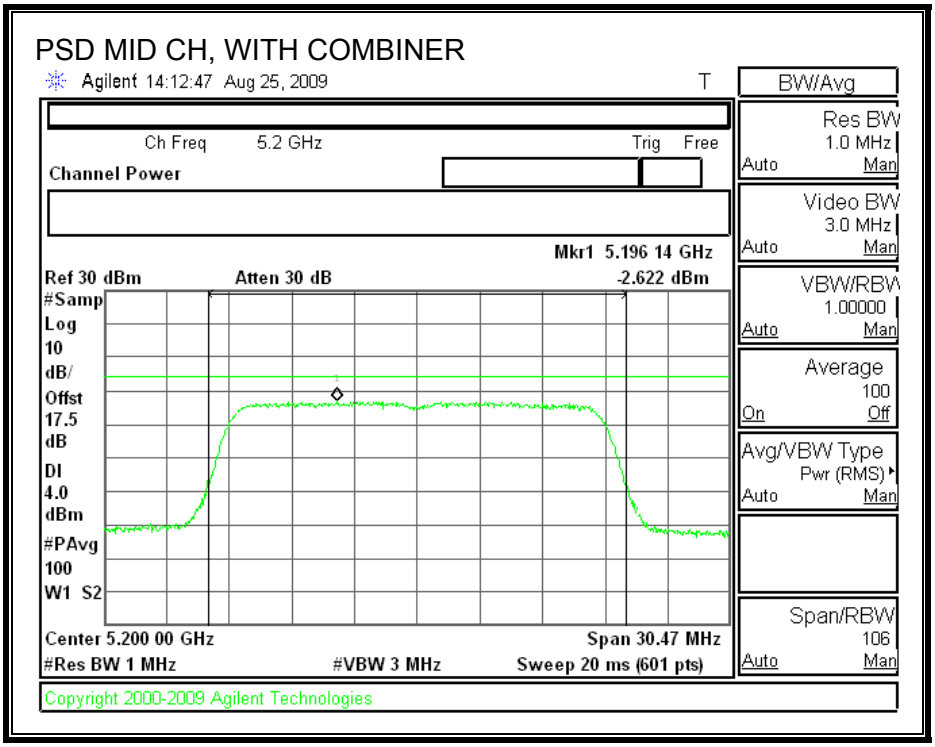


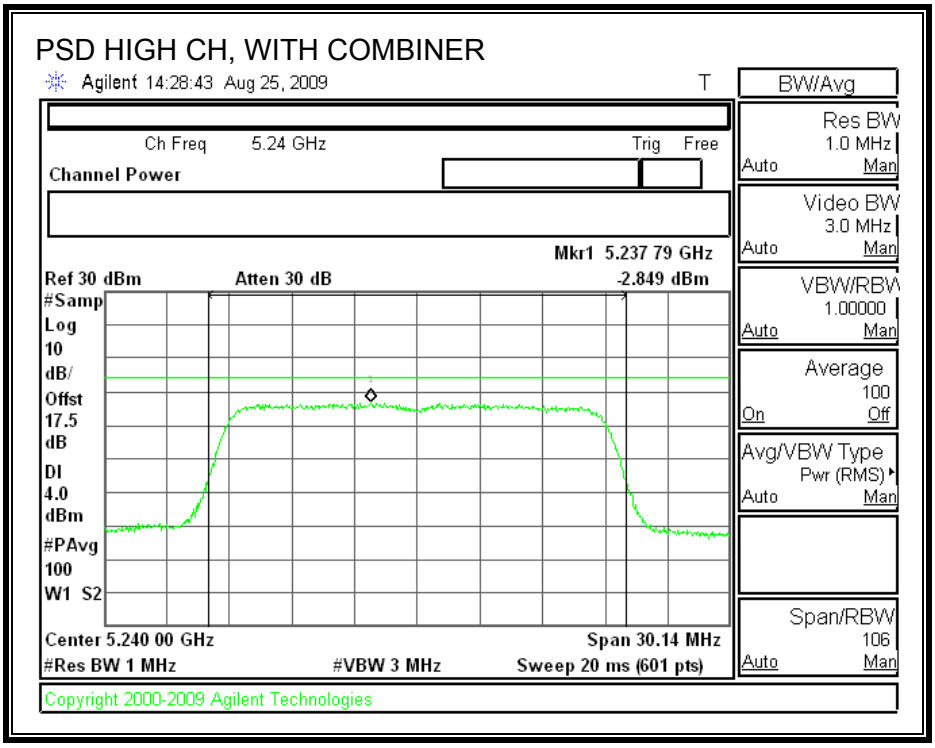




POWER SPECTRAL DENSITY WITH COMBINER







7.3.3. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

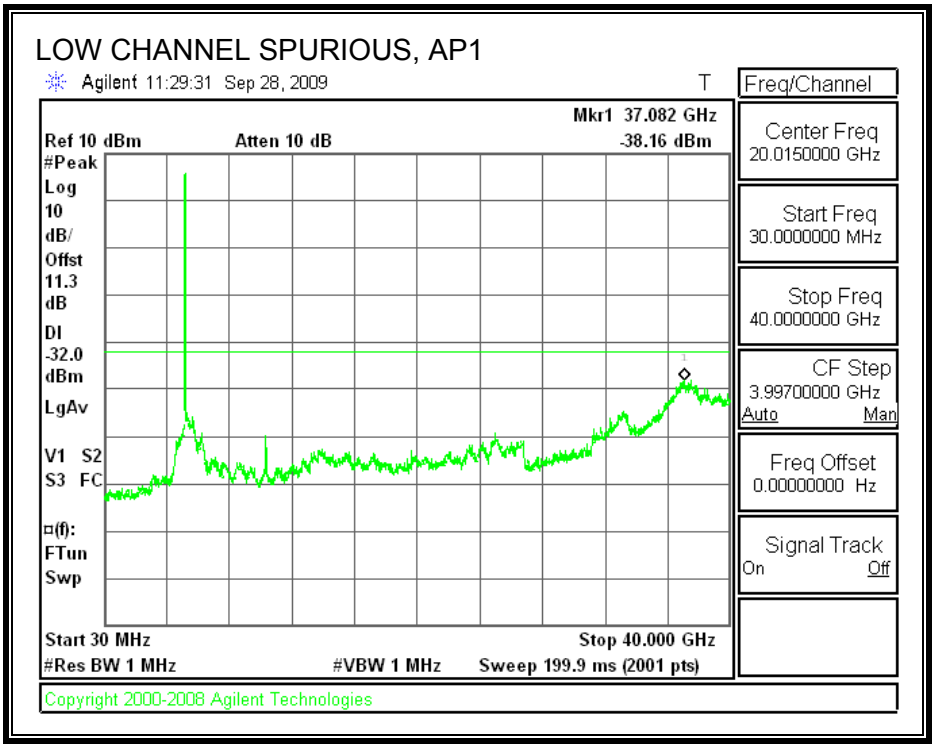
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

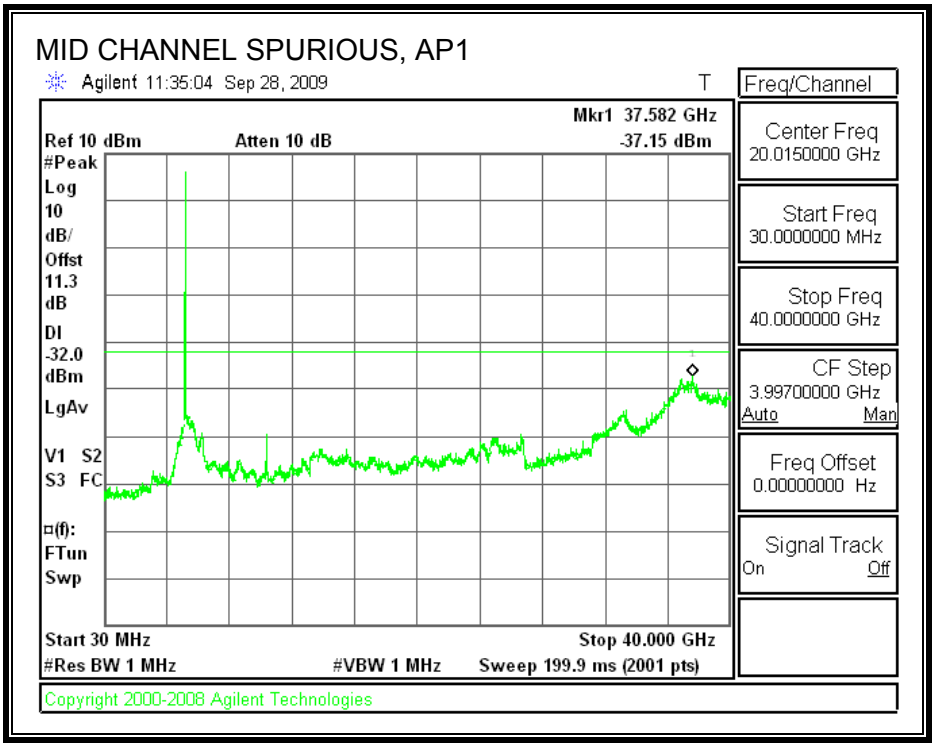
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

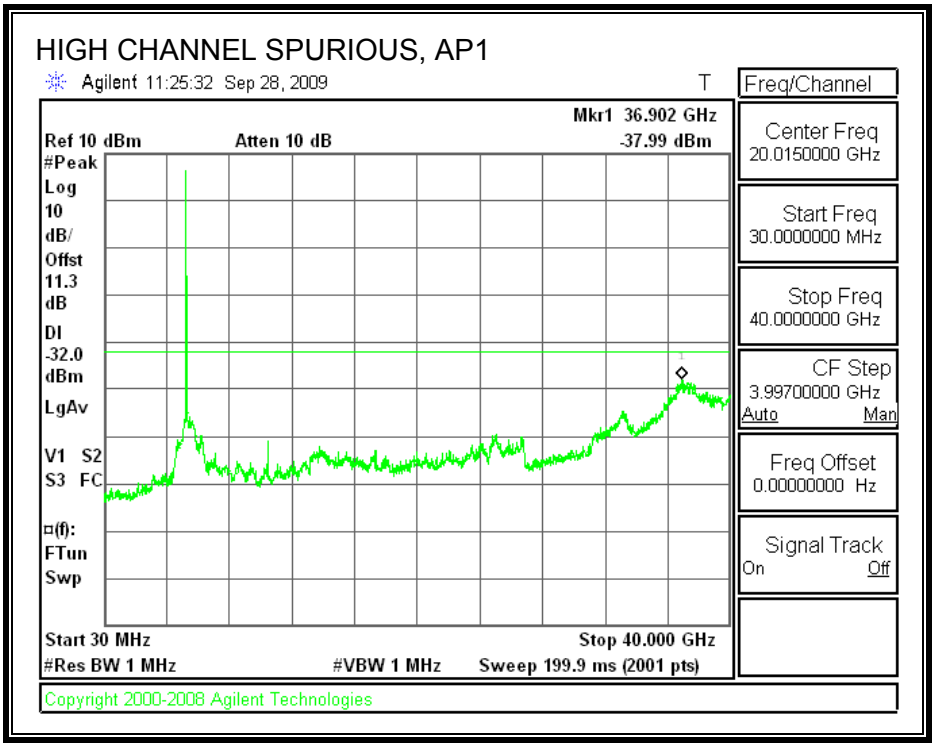
AP1 SPURIOUS EMISSIONS



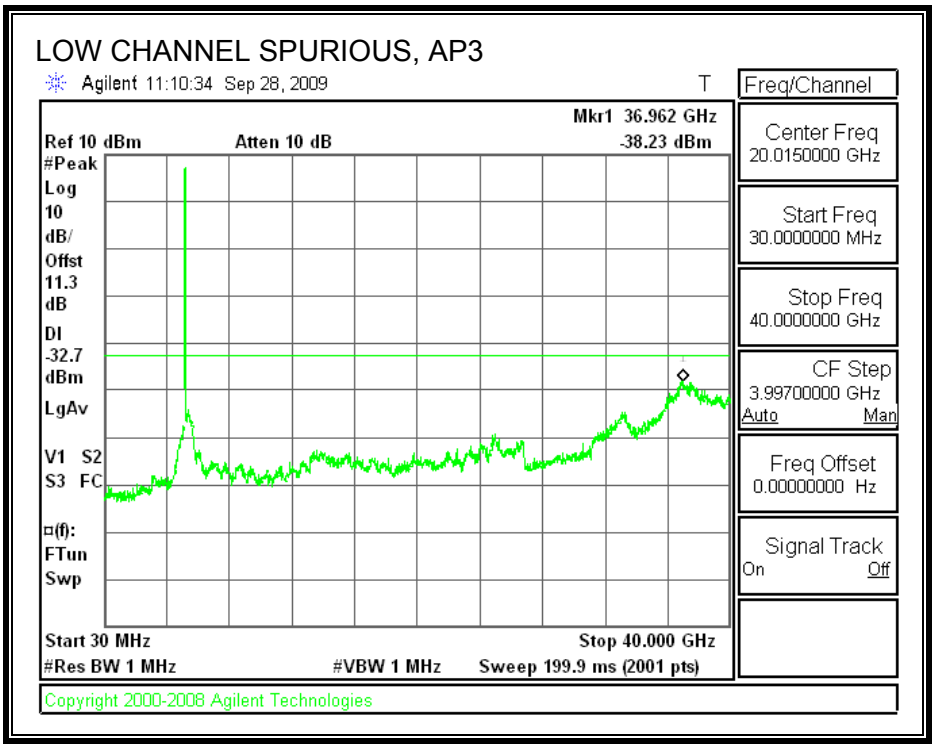
MID CHANNEL SPURIOUS, AP1



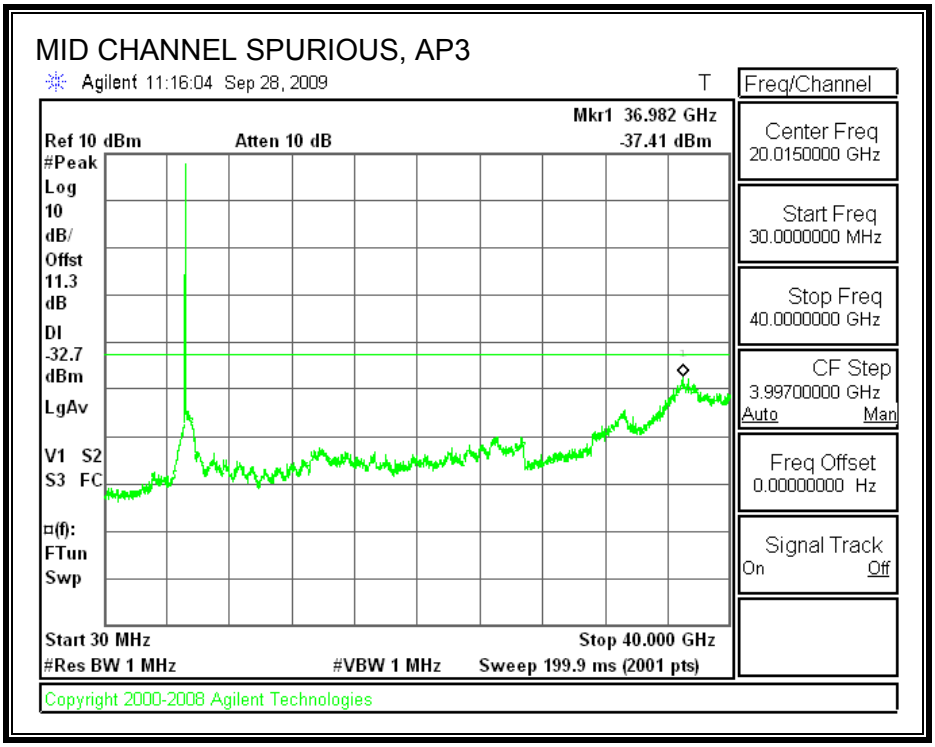
HIGH CHANNEL SPURIOUS, AP1



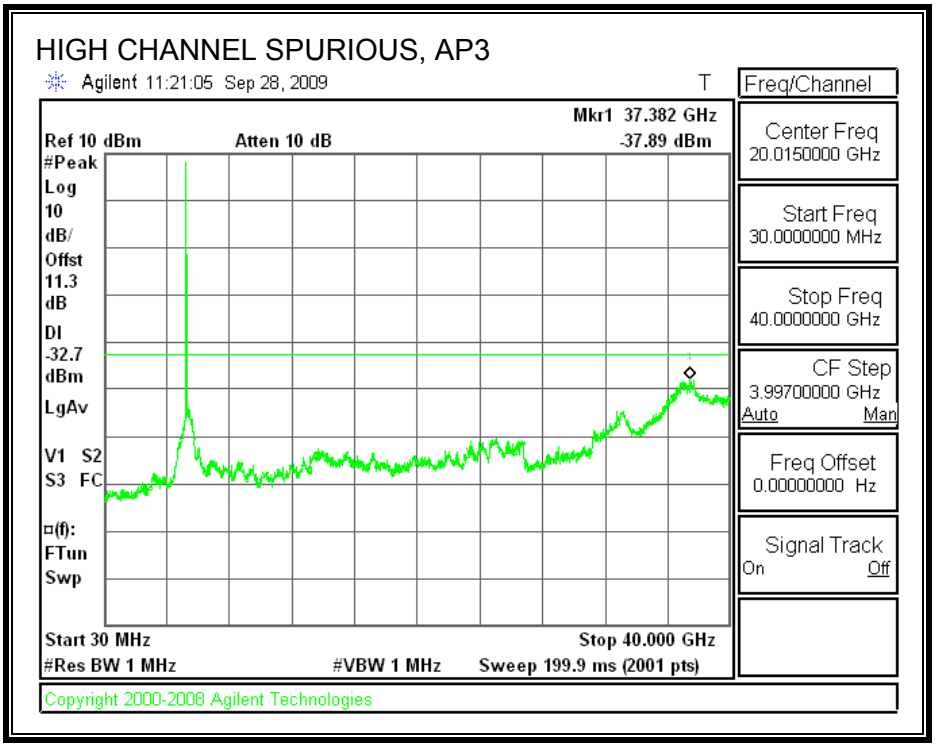
AP3 SPURIOUS EMISSIONS



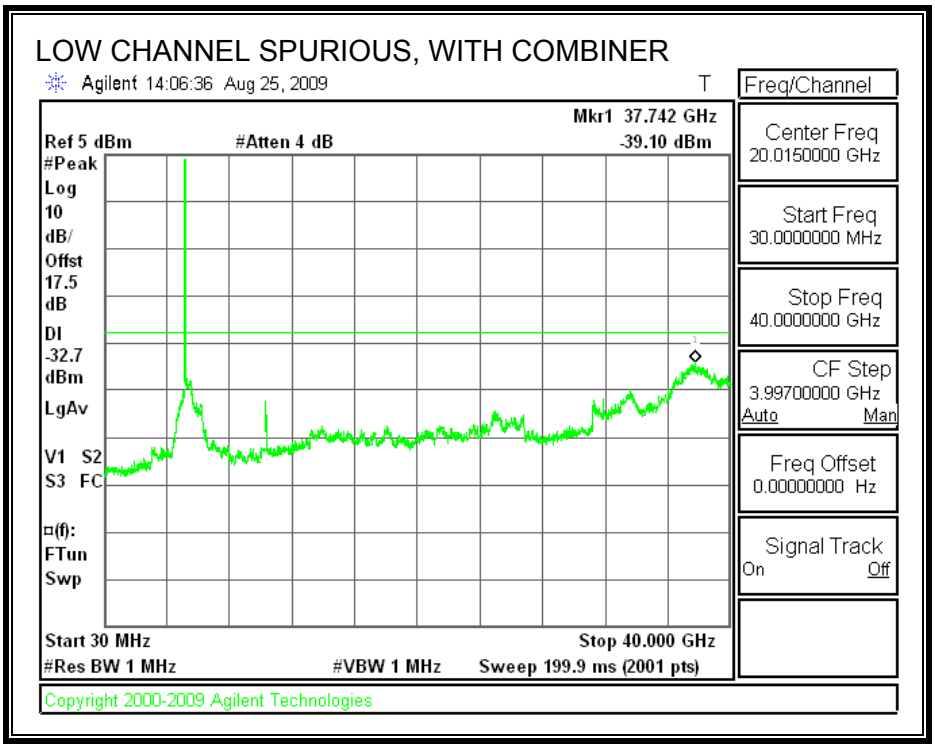
MID CHANNEL SPURIOUS, AP3



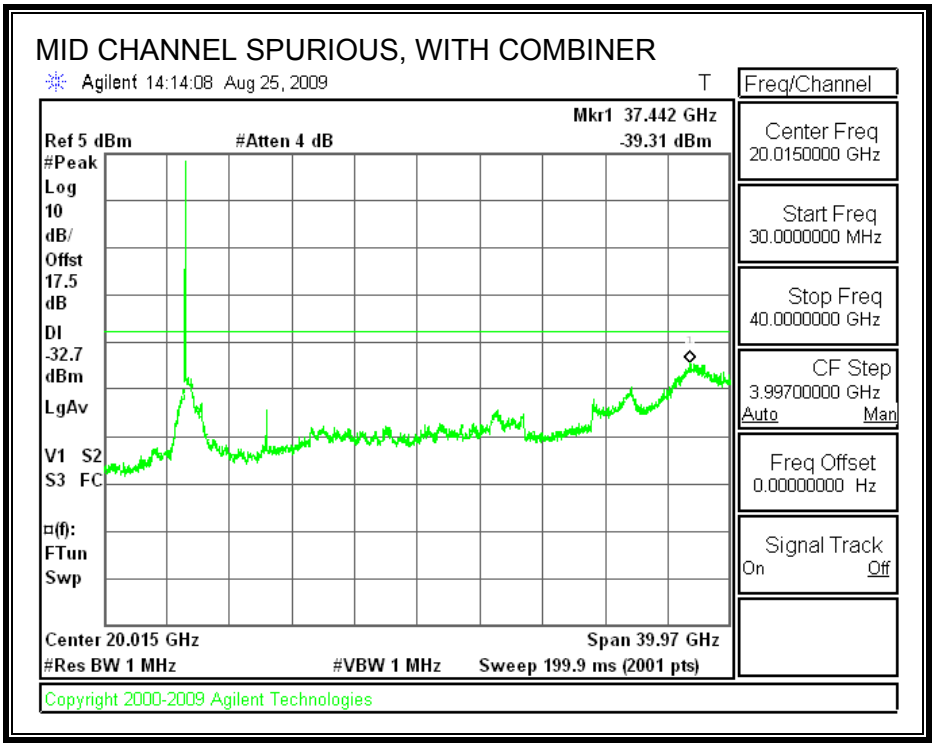
HIGH CHANNEL SPURIOUS, AP3



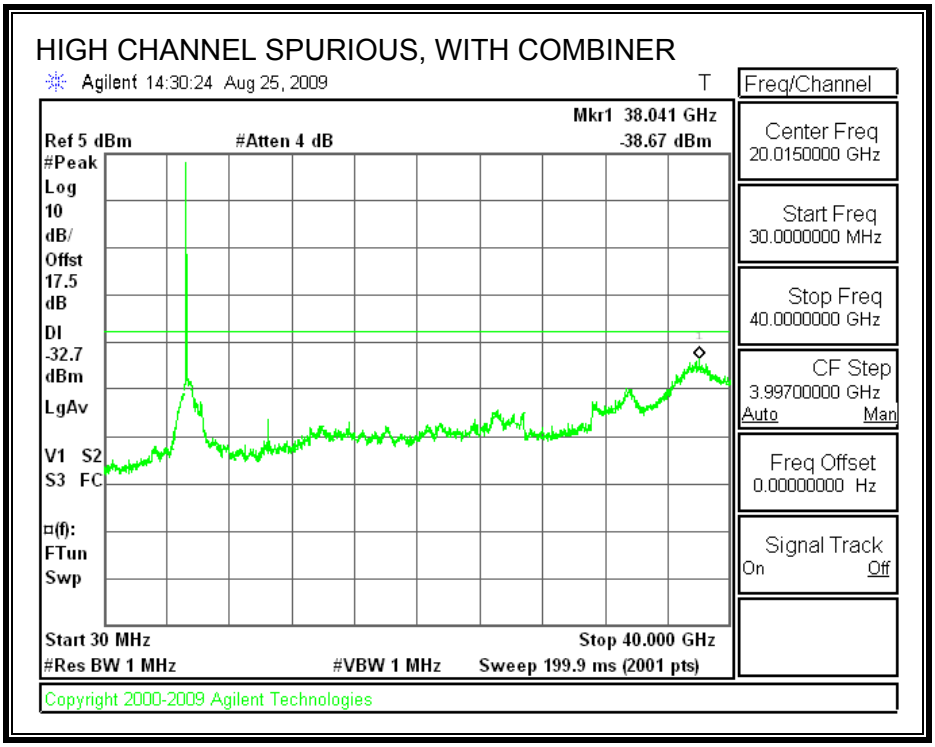
SPURIOUS EMISSIONS WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.4. 802.11n THREE CHAINS HT20 MODE IN THE LOWER 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

AP1

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.86	17.6984
Middle	5200	19.263	17.6789
High	5240	19.455	17.7096

AP2

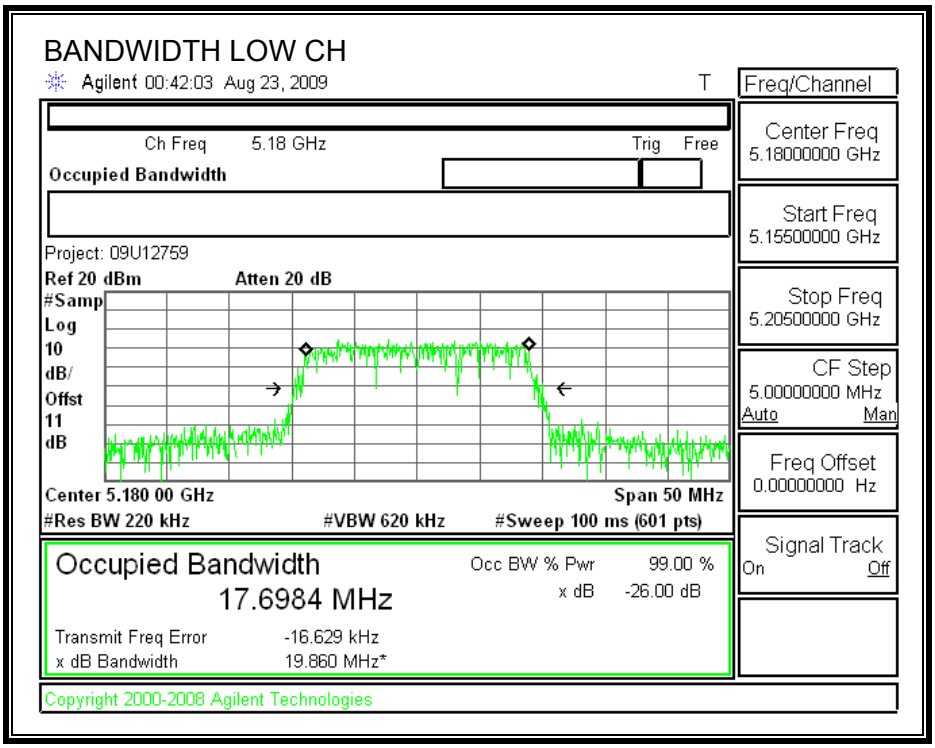
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.353	17.6214
Middle	5200	19.809	17.7062
High	5240	19.762	17.4658

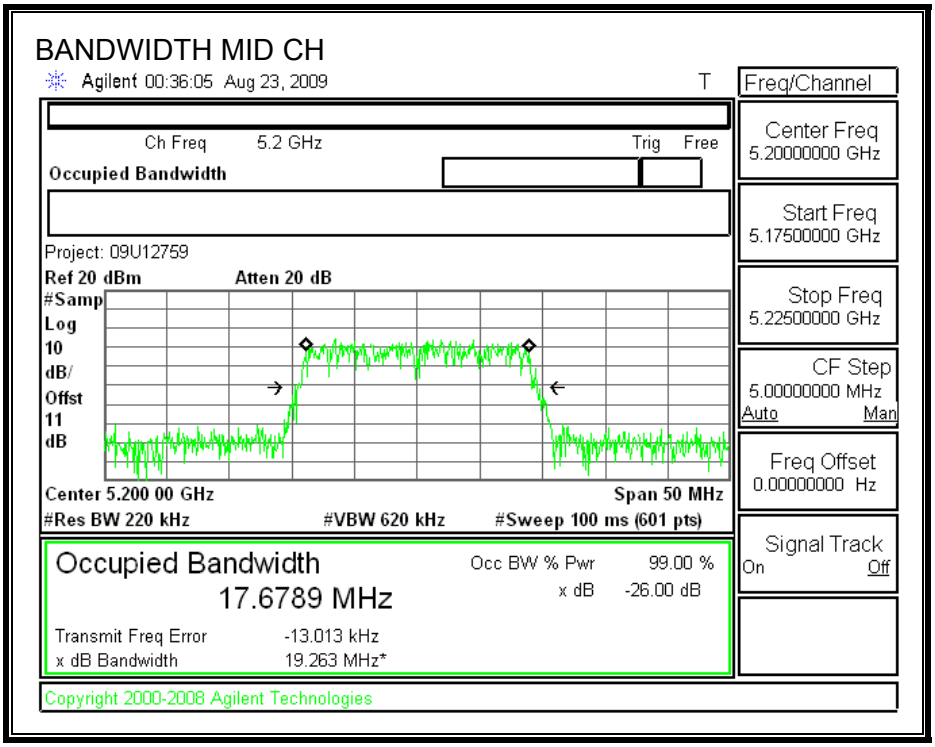
AP3

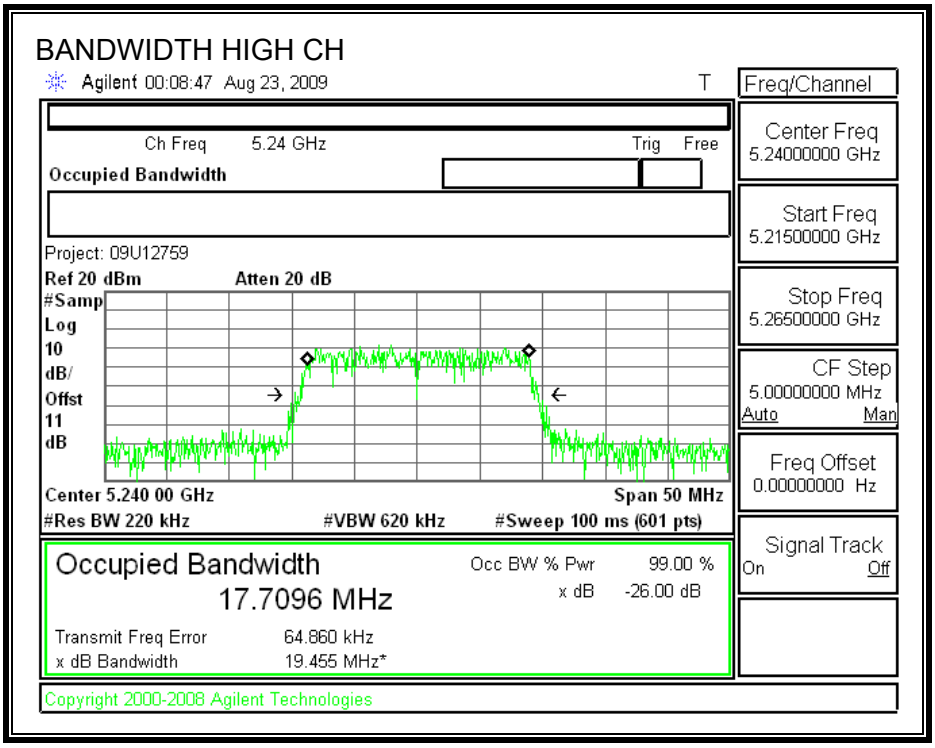
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.389	17.6193
Middle	5200	19.776	17.63
High	5240	19.587	17.6757

AP1

26 dB and 99% BANDWIDTH

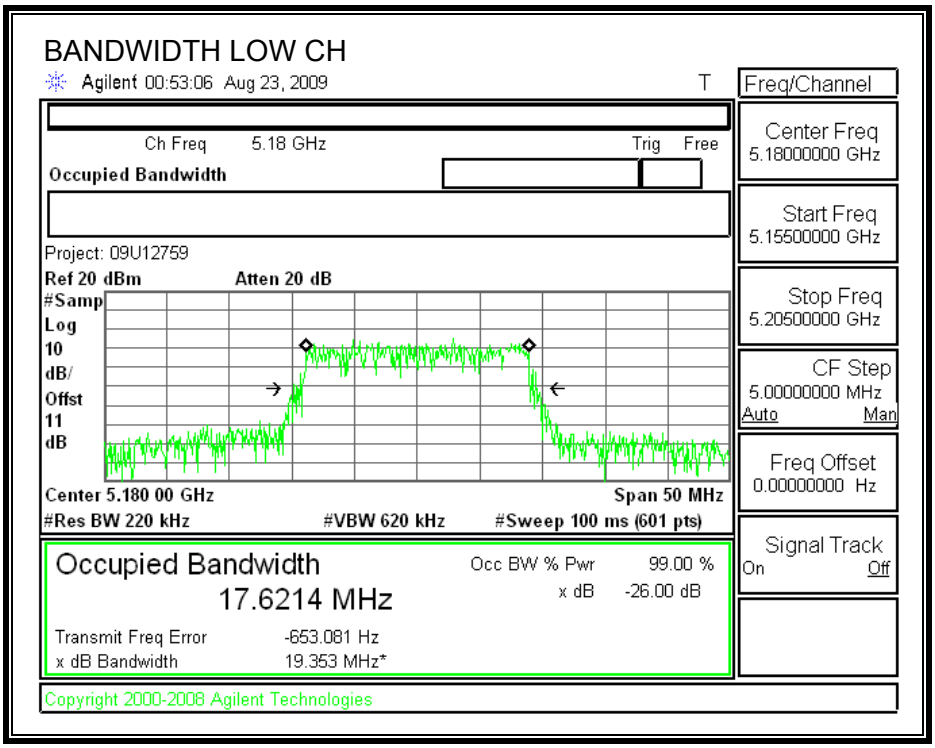


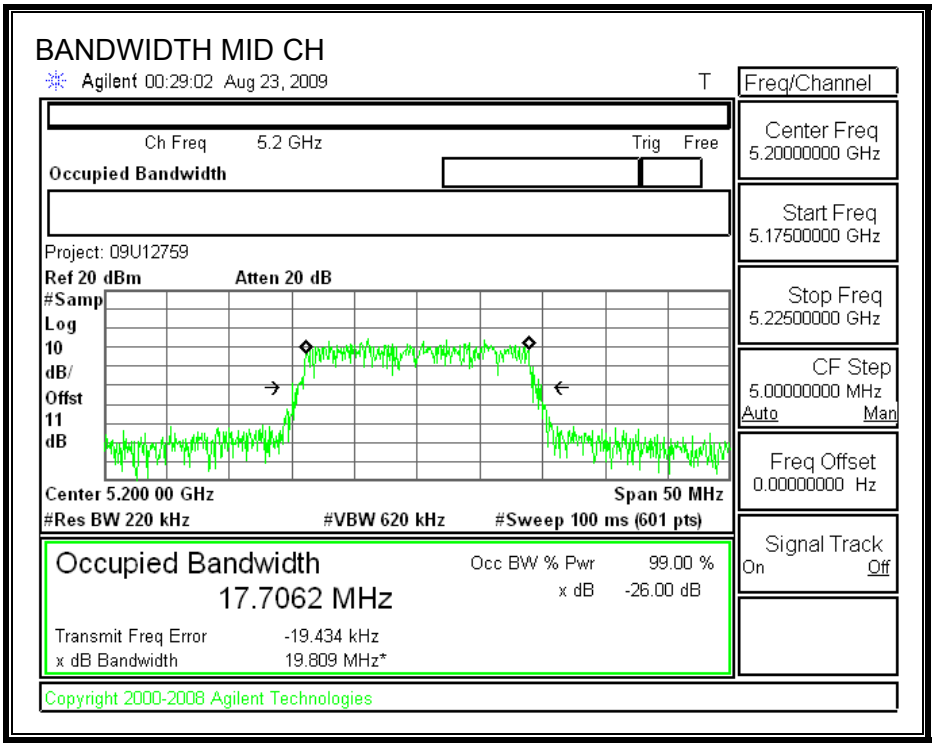


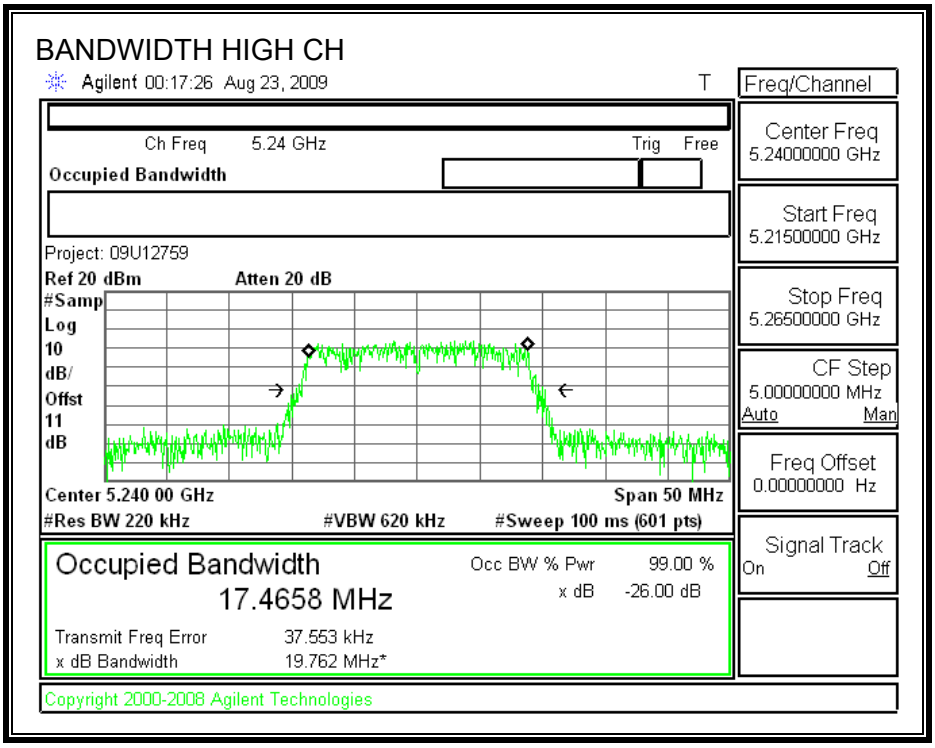


AP2

26 dB and 99% BANDWIDTH

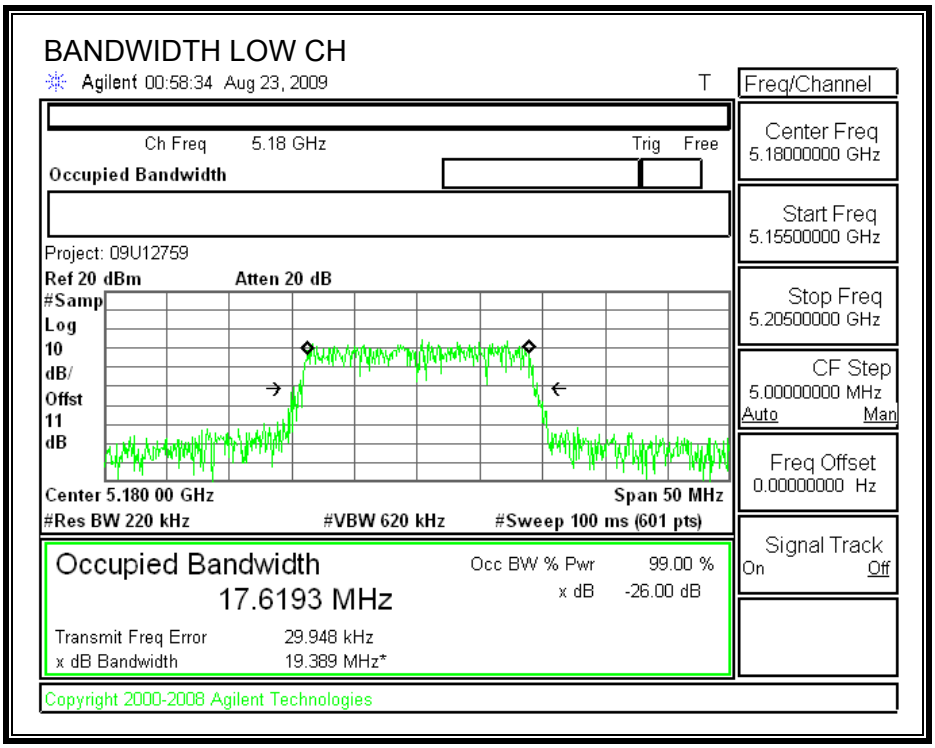


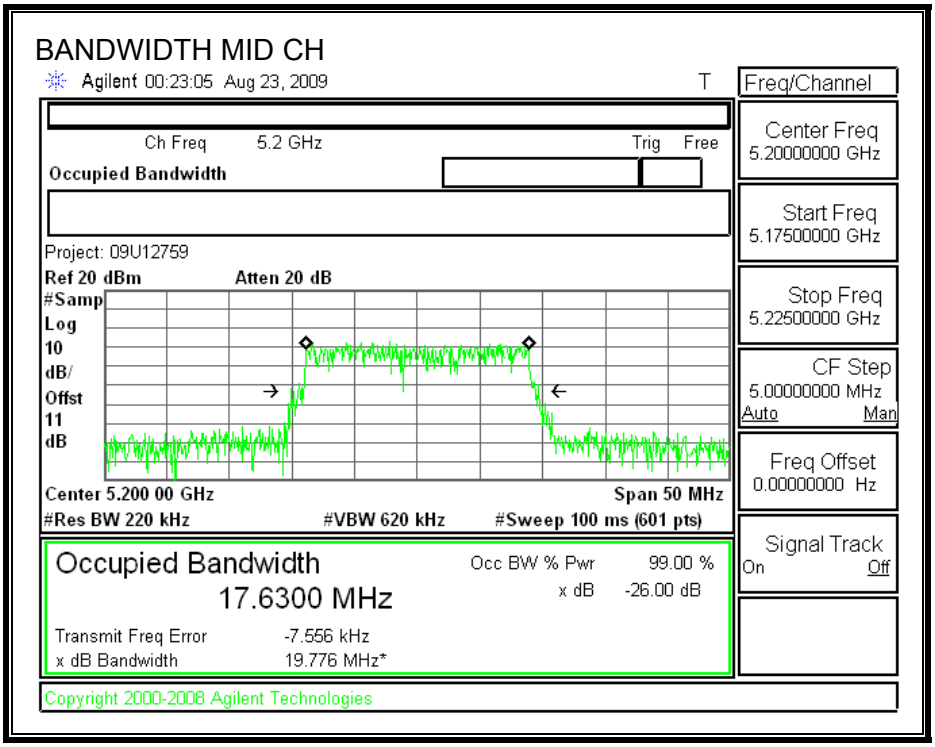


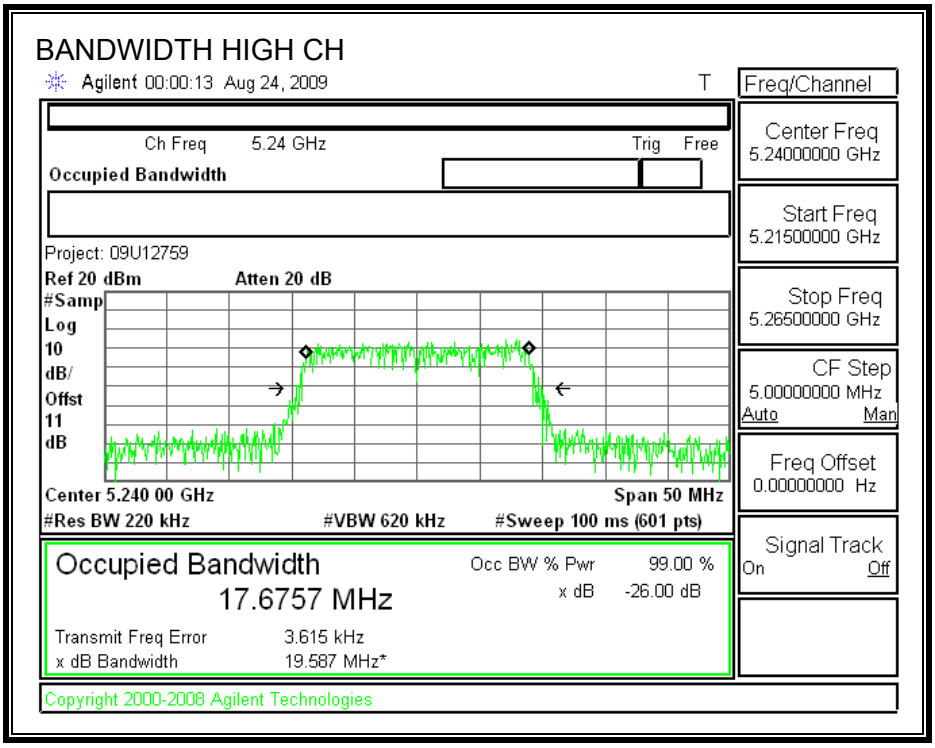


AP3

26 dB and 99% BANDWIDTH







7.4.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

TEST PROCEDURE

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

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

RESULTS

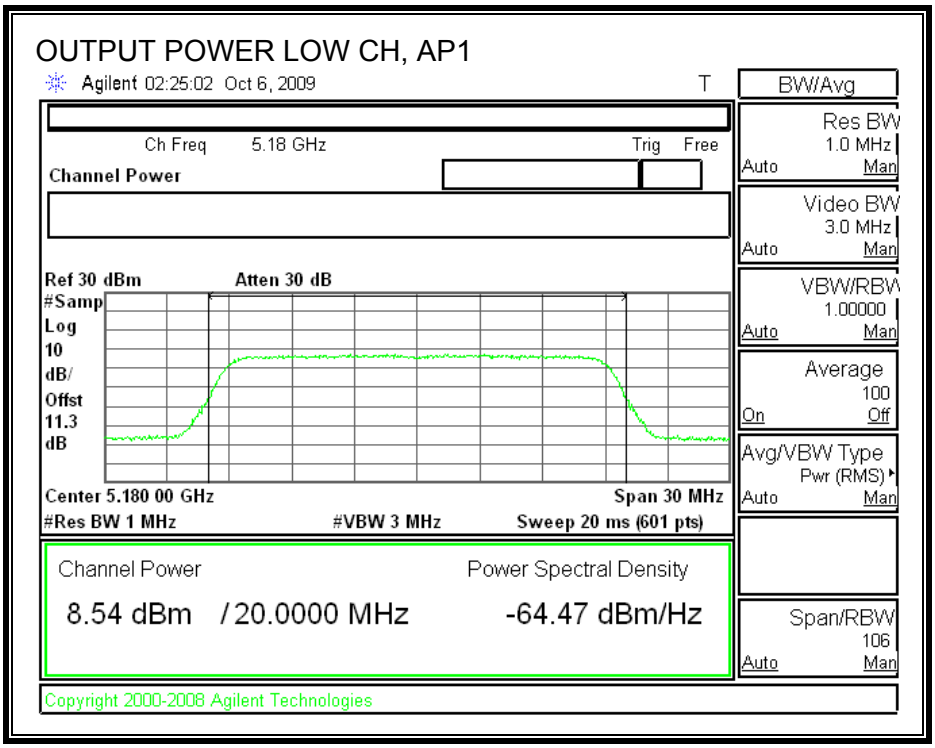
Limit

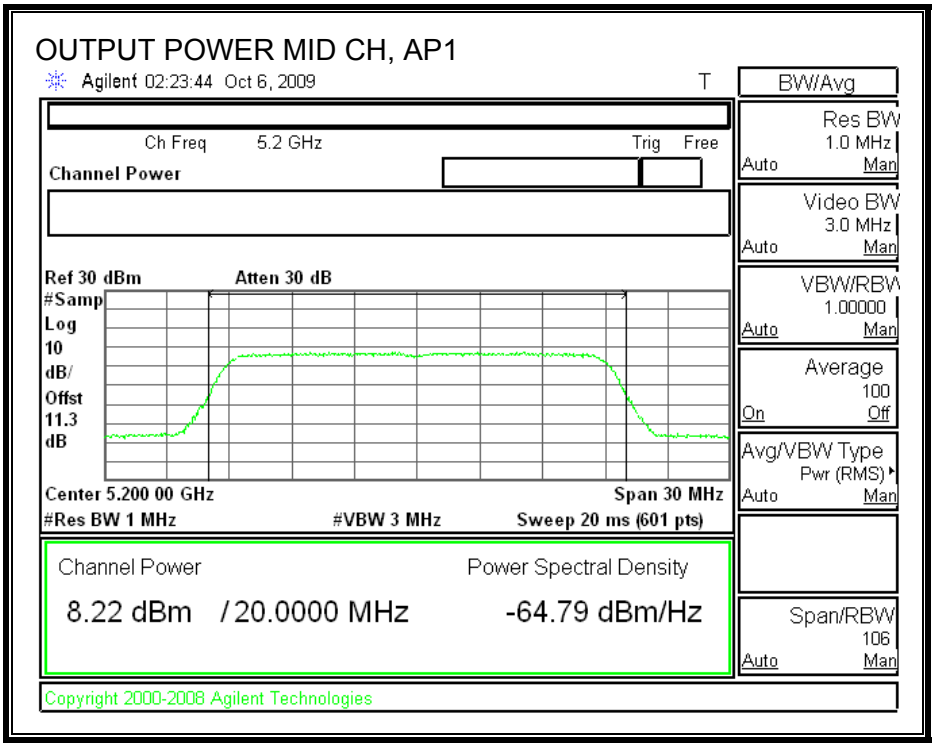
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17.00	19.353	16.87	5.69	16.87
Mid	5200	17.00	19.263	16.85	5.69	16.85
High	5240	17.00	19.455	16.89	5.69	16.89

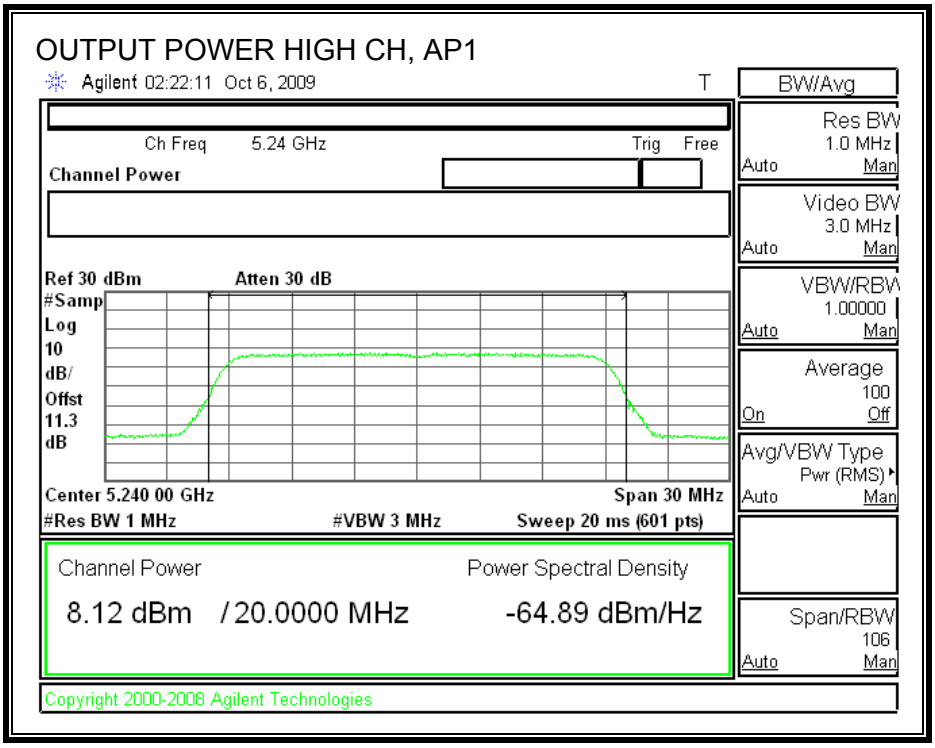
Individual Chain Results

Channel	Frequency (MHz)	AP1 Power (dBm)	AP2 Power (dBm)	AP3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	8.54	9.00	8.05	13.32	16.87	-3.55
Mid	5200	8.22	9.06	7.92	13.20	16.85	-3.65
High	5240	8.12	9.04	8.26	13.26	16.89	-3.63

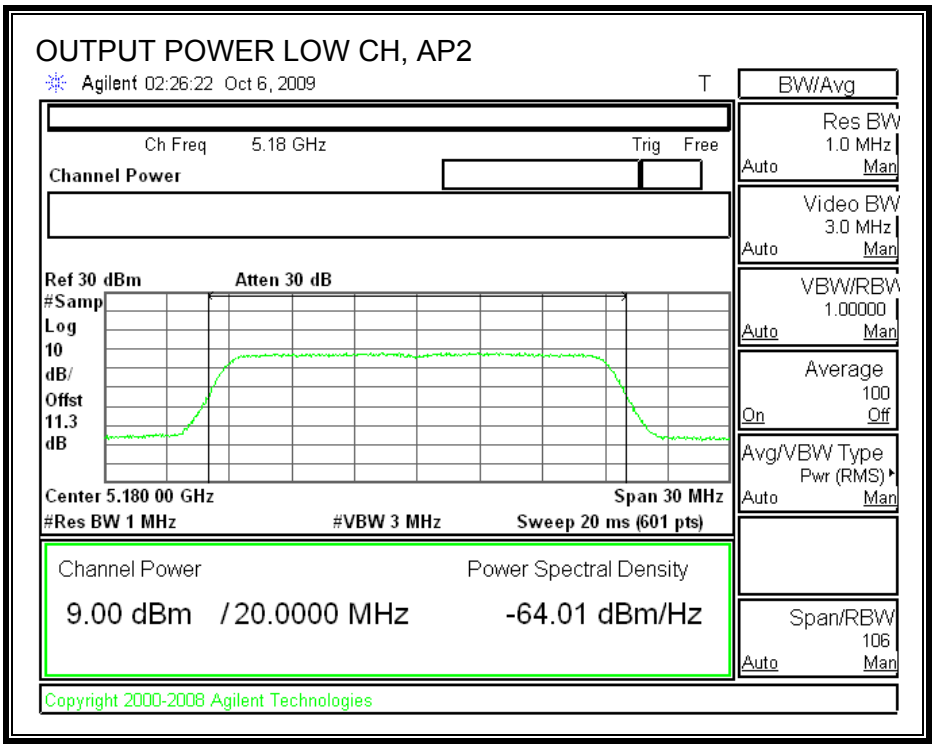
AP1 OUTPUT POWER

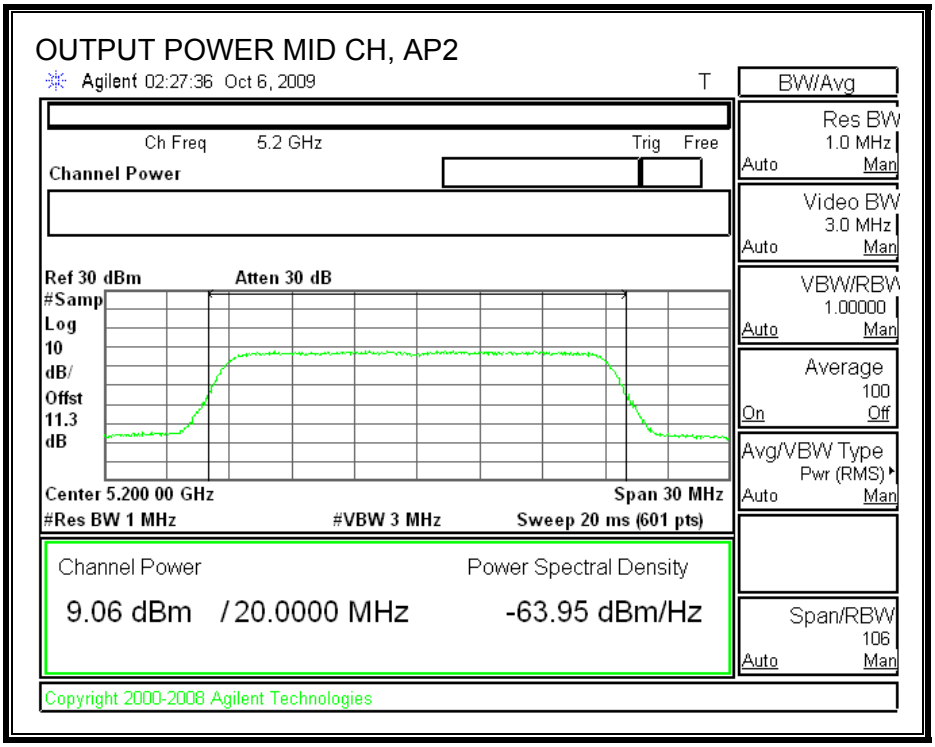


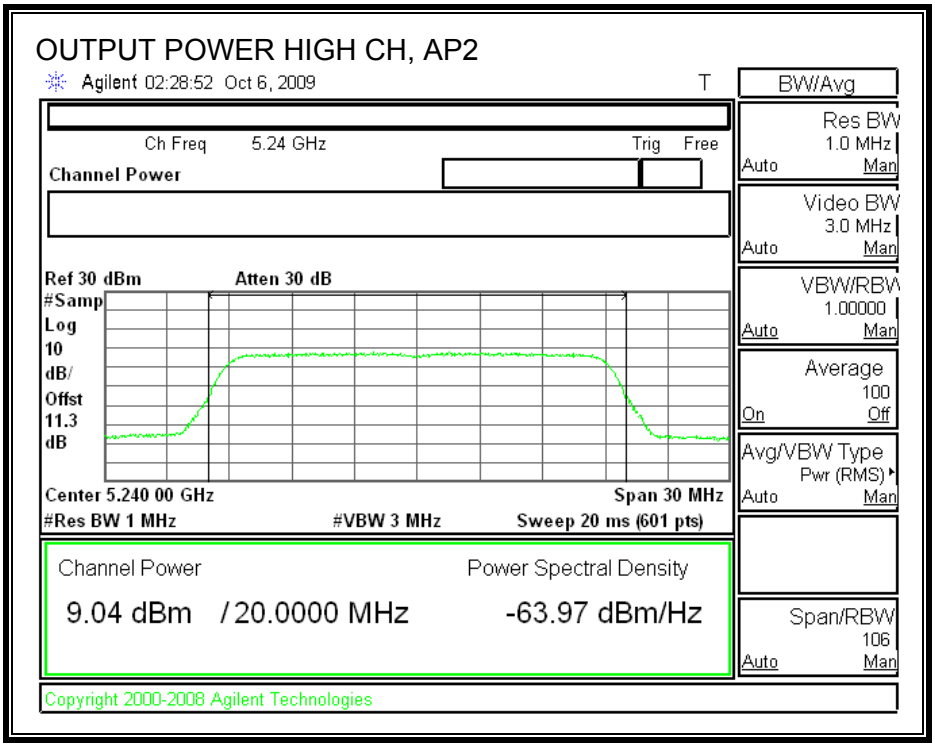




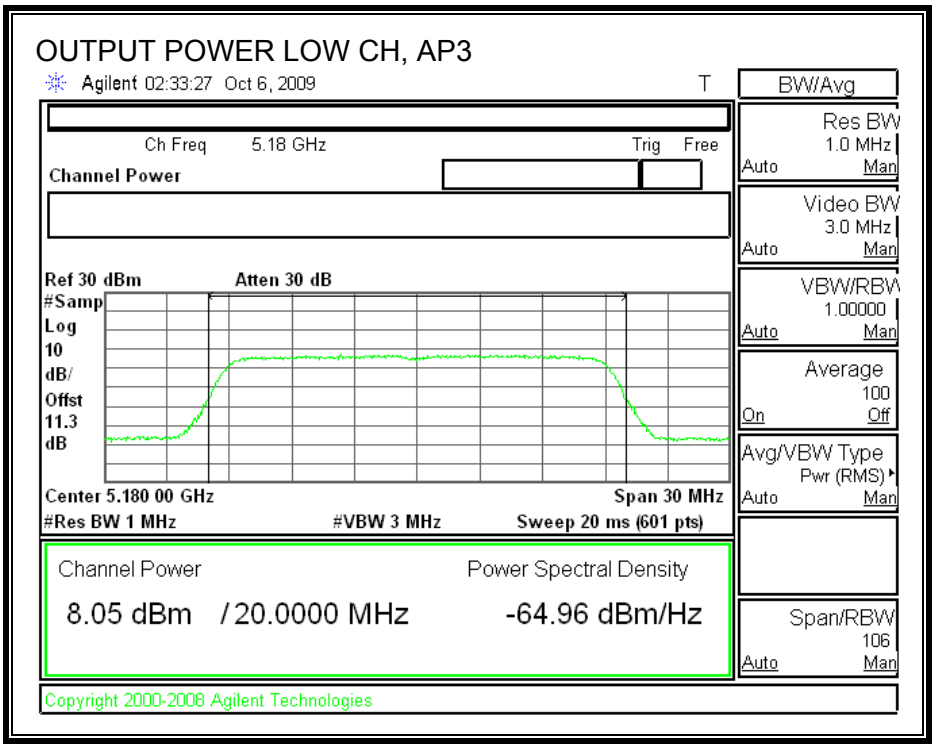
AP2 OUTPUT POWER

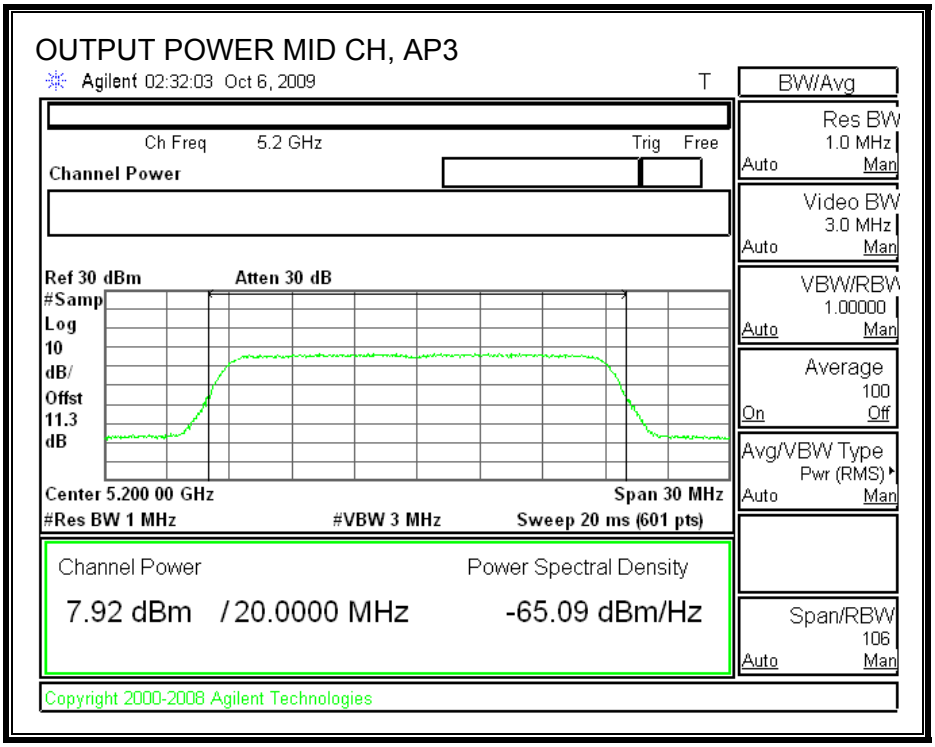


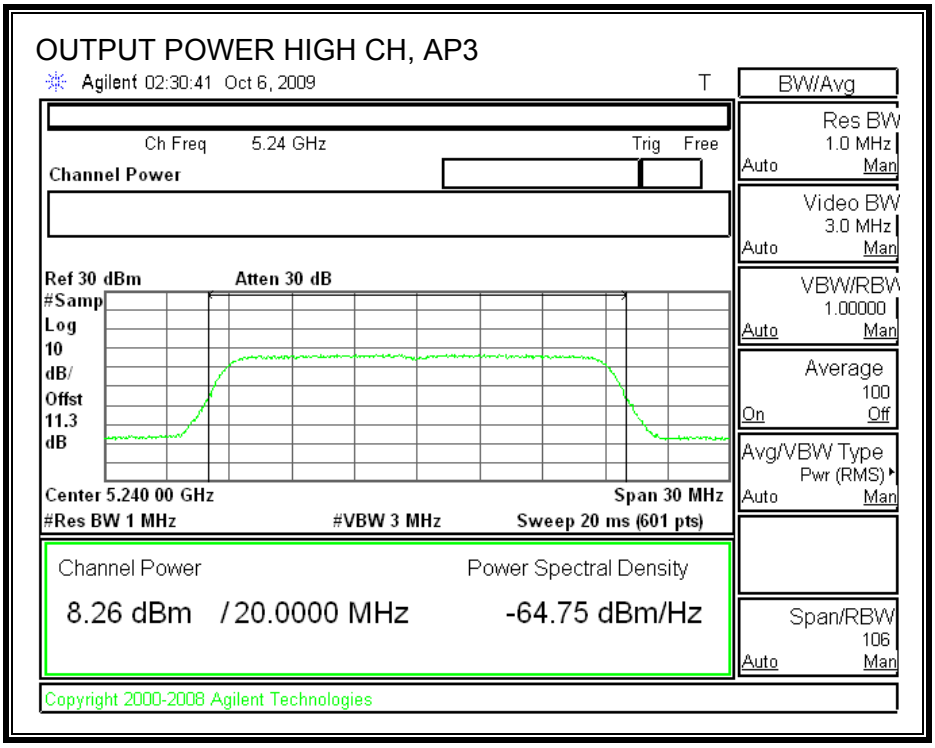




AP3 OUTPUT POWER







7.4.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

TEST PROCEDURE

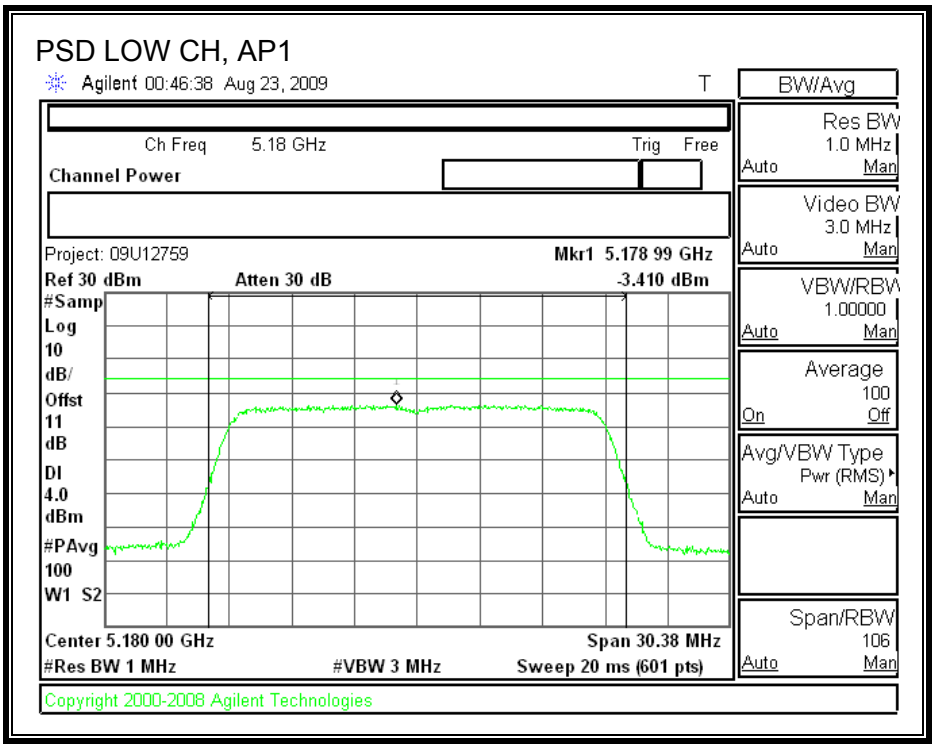
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

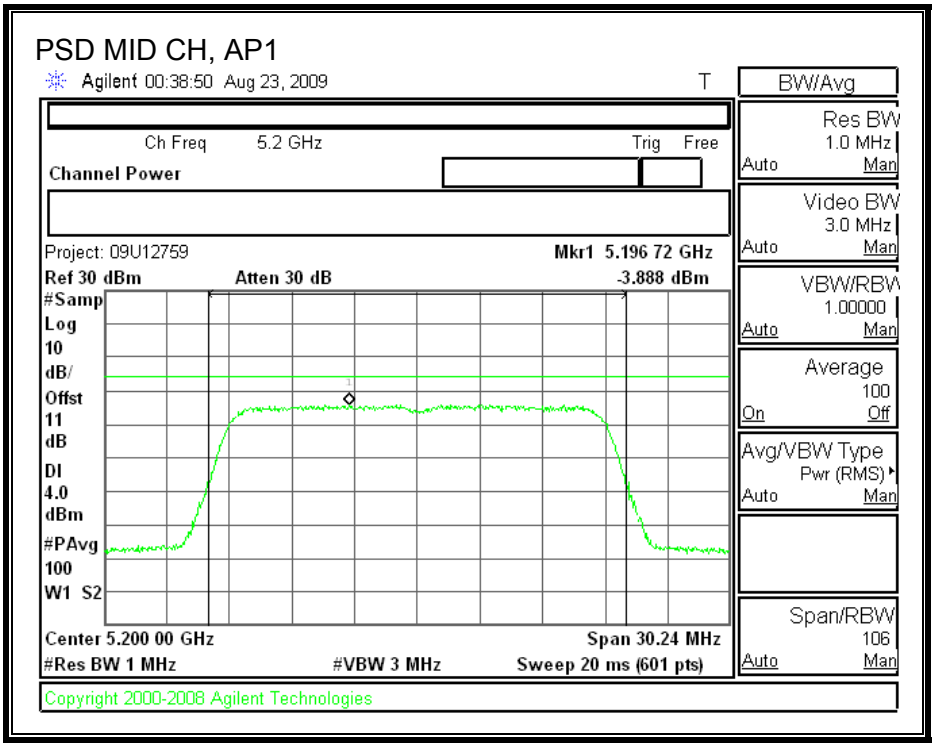
RESULTS

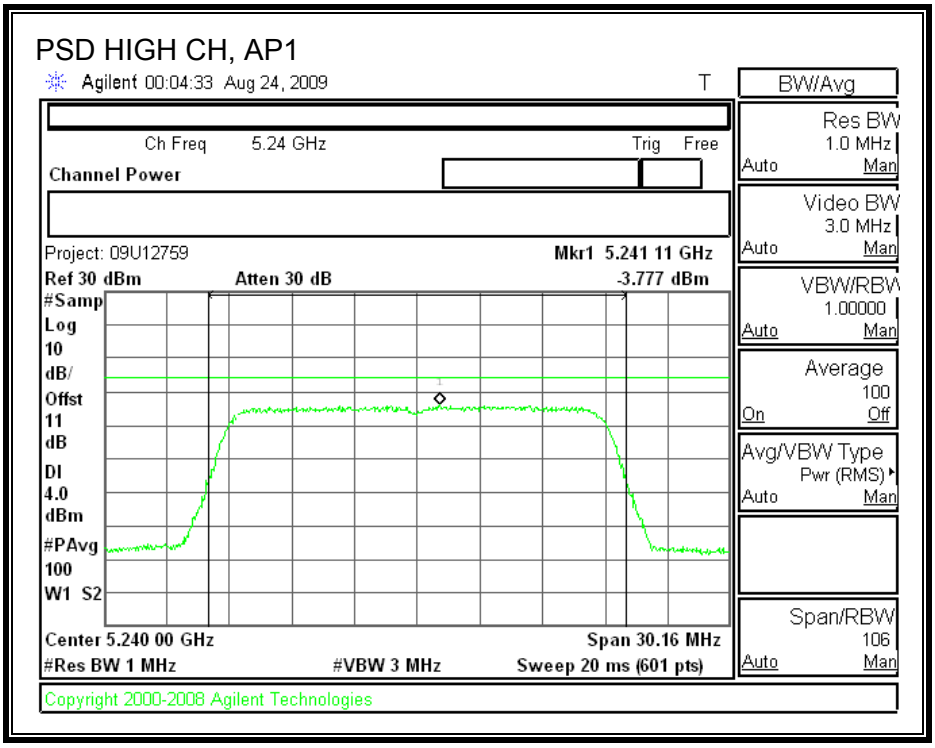
Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP2 PPSD (dBm)	AP3 PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-3.410	-3.468	-4.347	4	-7.41
Middle	5200	-3.888	-3.534	-4.343	4	-7.53
High	5240	-3.777	-5.902	-3.152	4	-7.15

Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5180	-5.623	4	-9.62
Middle	5200	-5.488	4	-9.49
High	5240	-3.788	4	-7.79

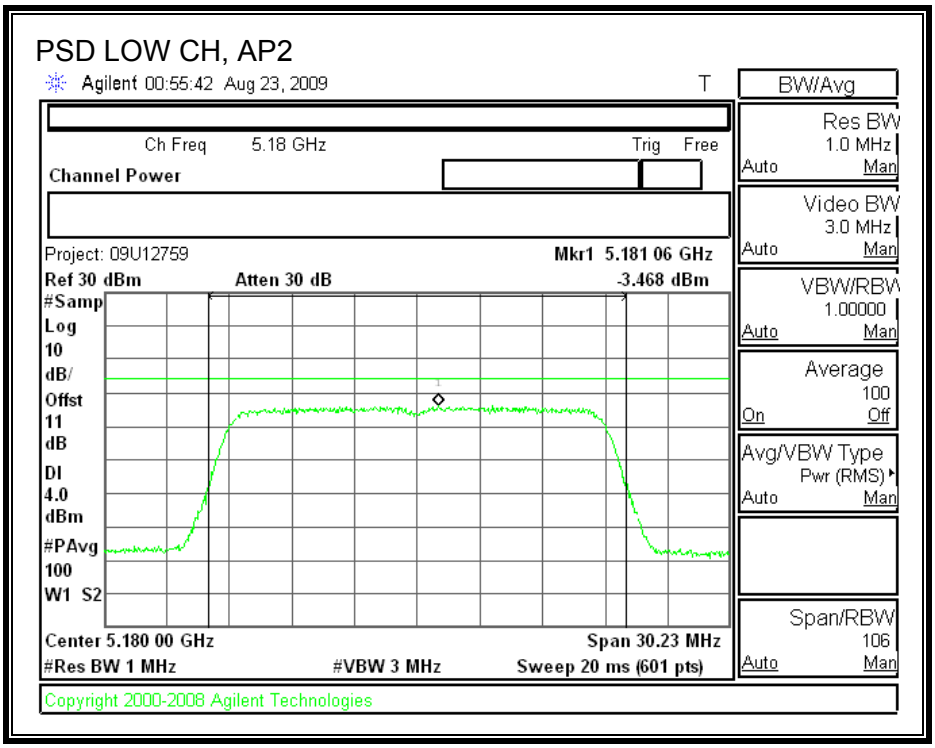
AP1 POWER SPECTRAL DENSITY

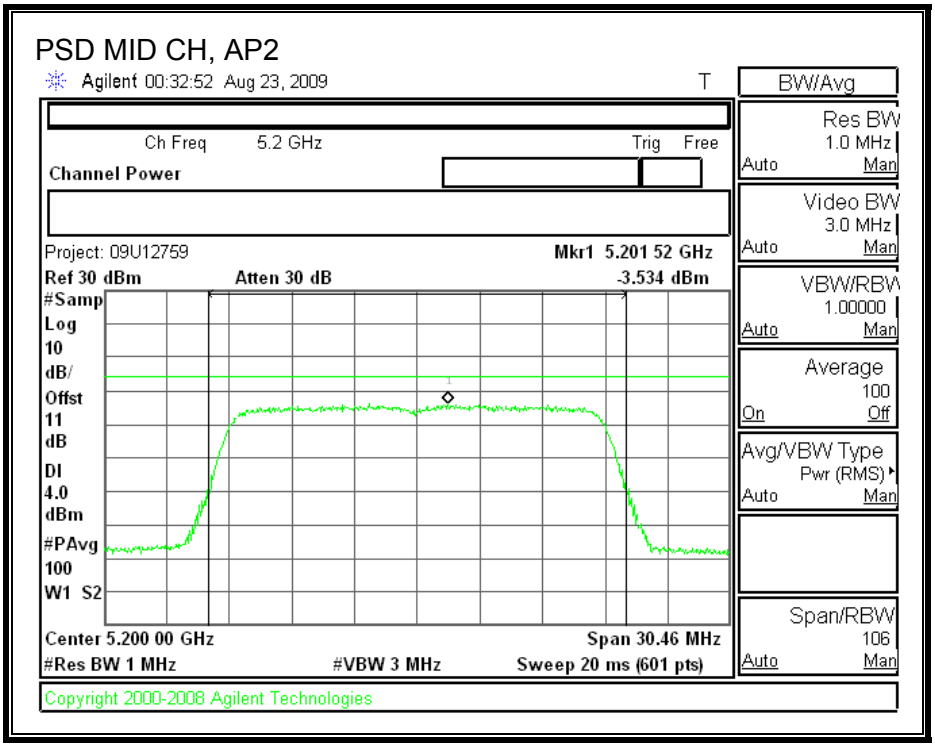


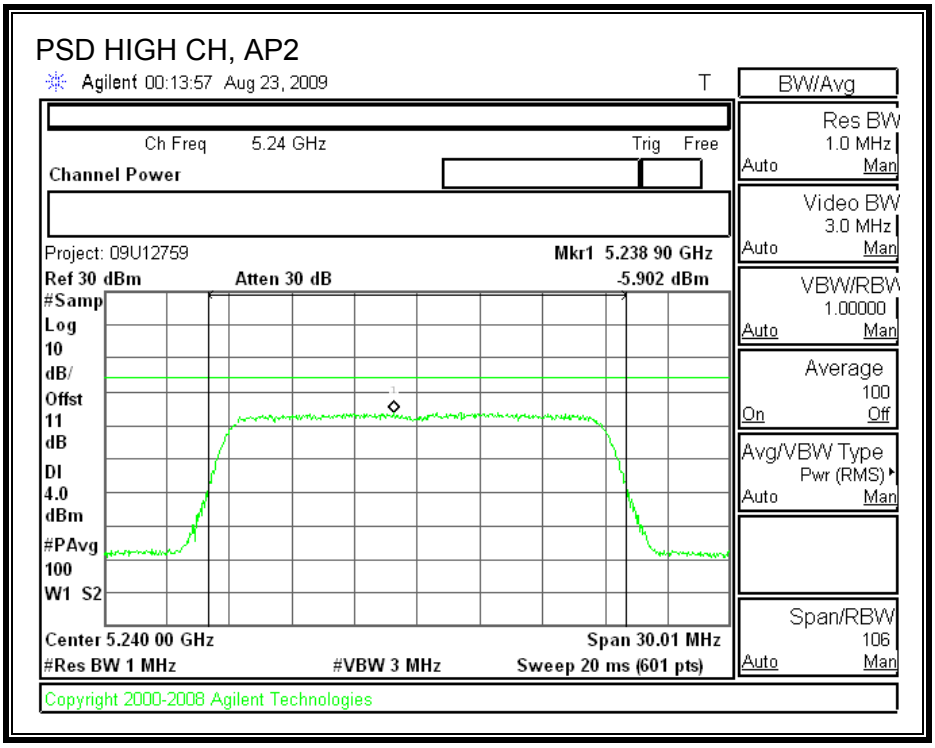




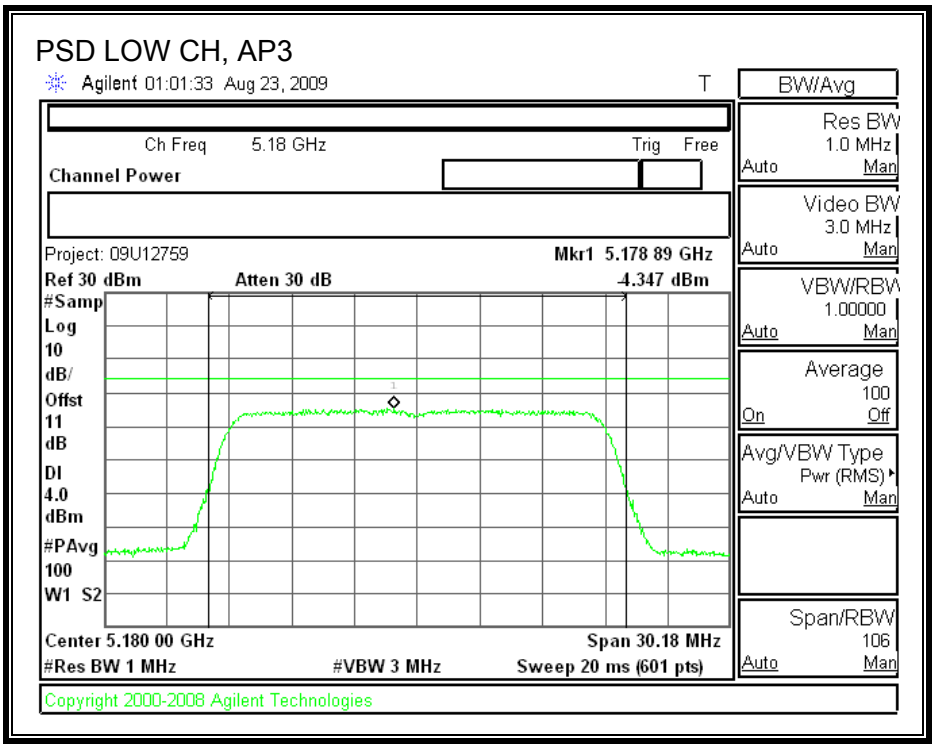
AP2 POWER SPECTRAL DENSITY

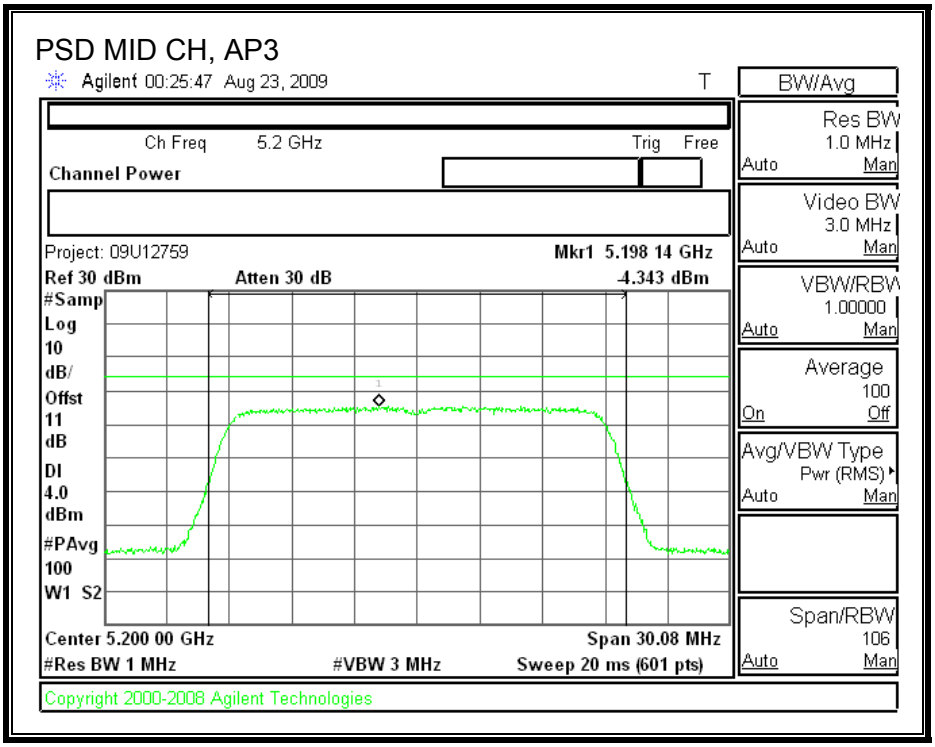


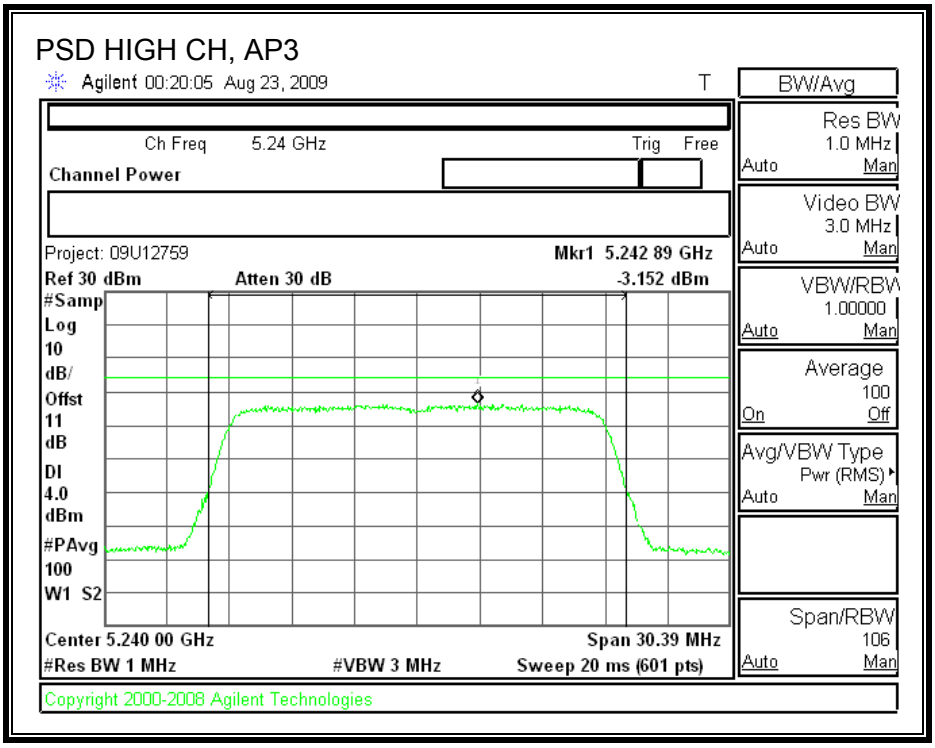




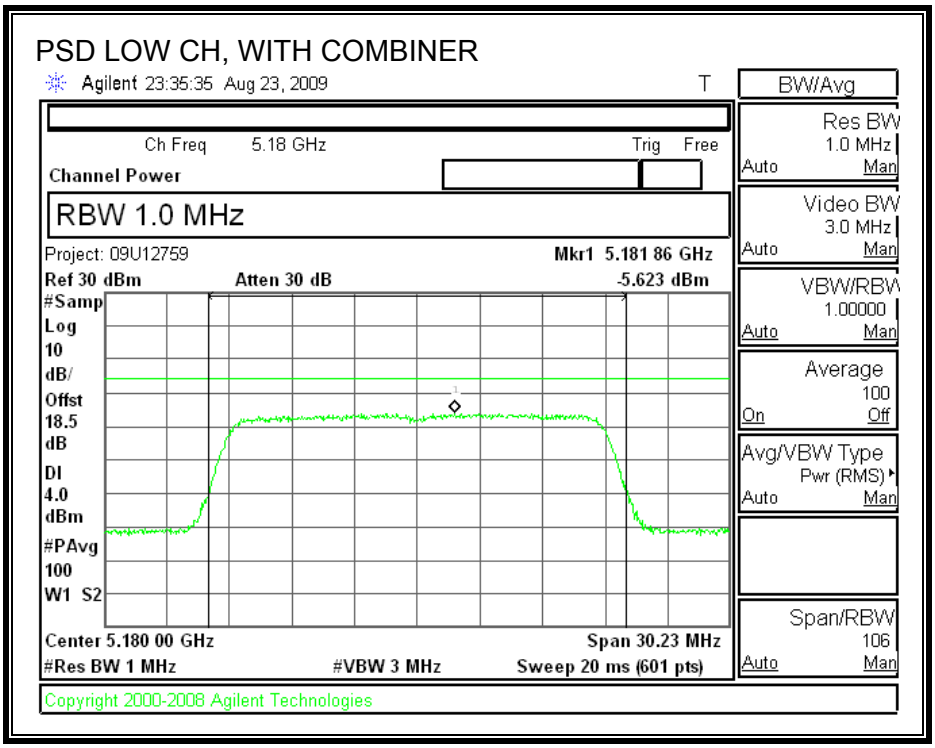
AP3 POWER SPECTRAL DENSITY

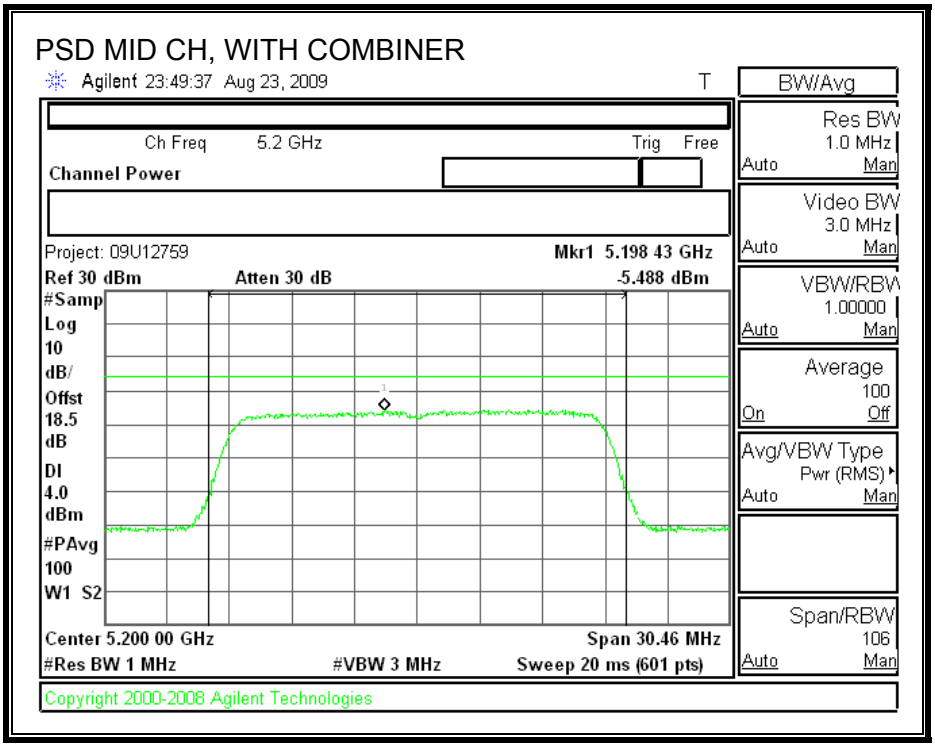


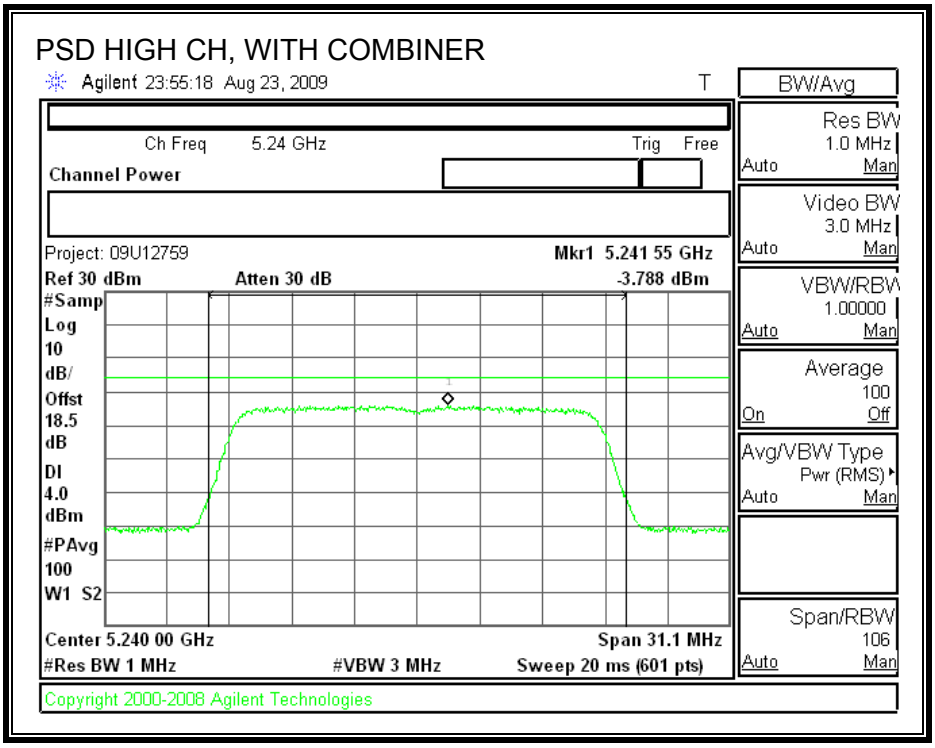




POWER SPECTRAL DENSITY WITH COMBINER







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

AP1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.223	13	-4.78
Middle	5200	8.140	13	-4.86
High	5240	8.426	13	-4.57

AP2

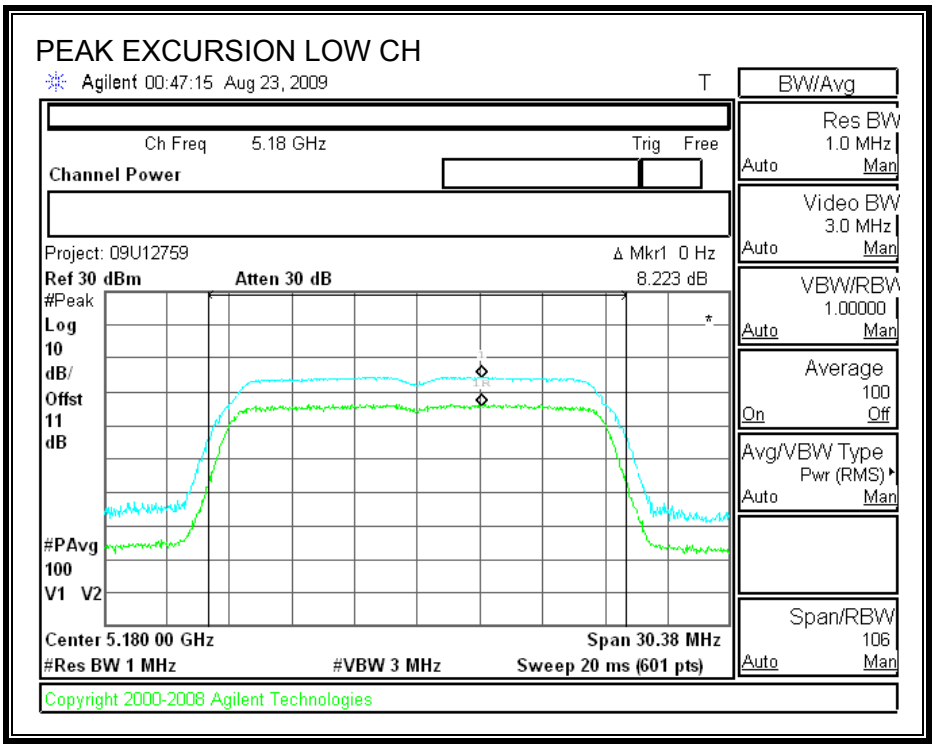
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	7.906	13	-5.09
Middle	5200	8.140	13	-4.86
High	5240	7.994	13	-5.01

AP3

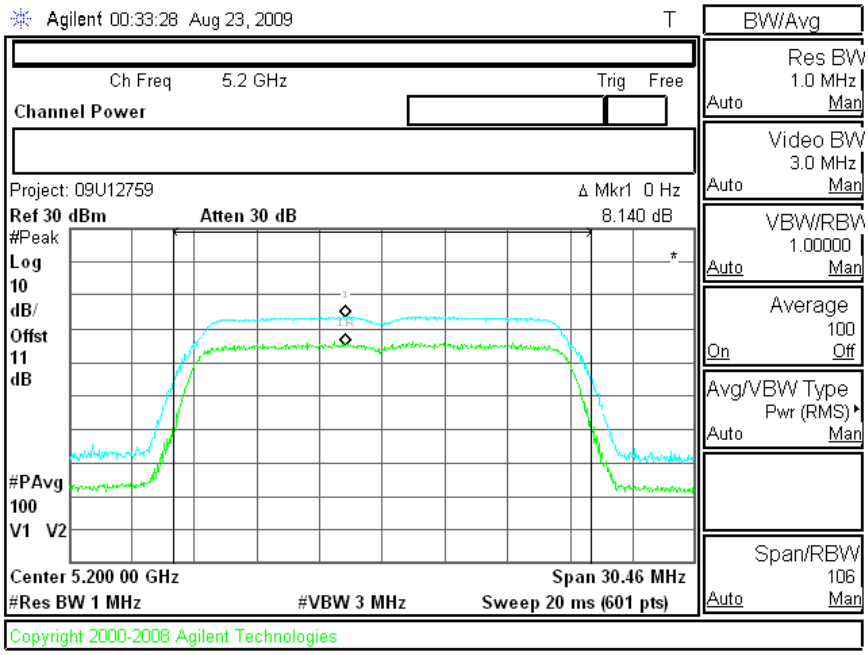
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.070	13	-3.93
Middle	5200	7.685	13	-5.32
High	5240	7.989	13	-5.01

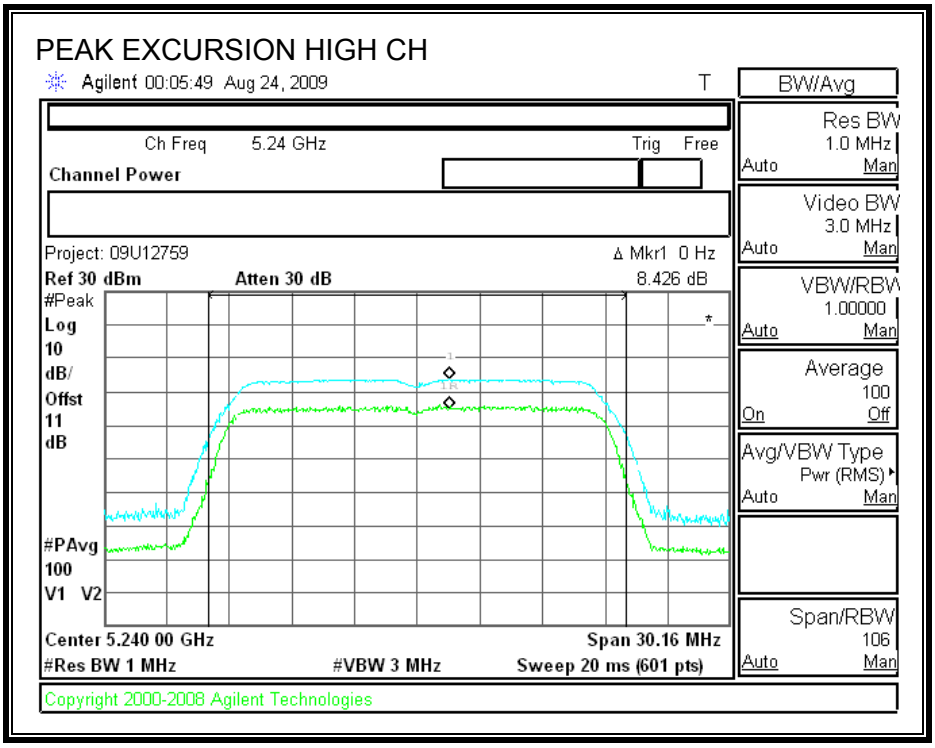
AP1

PEAK EXCURSION



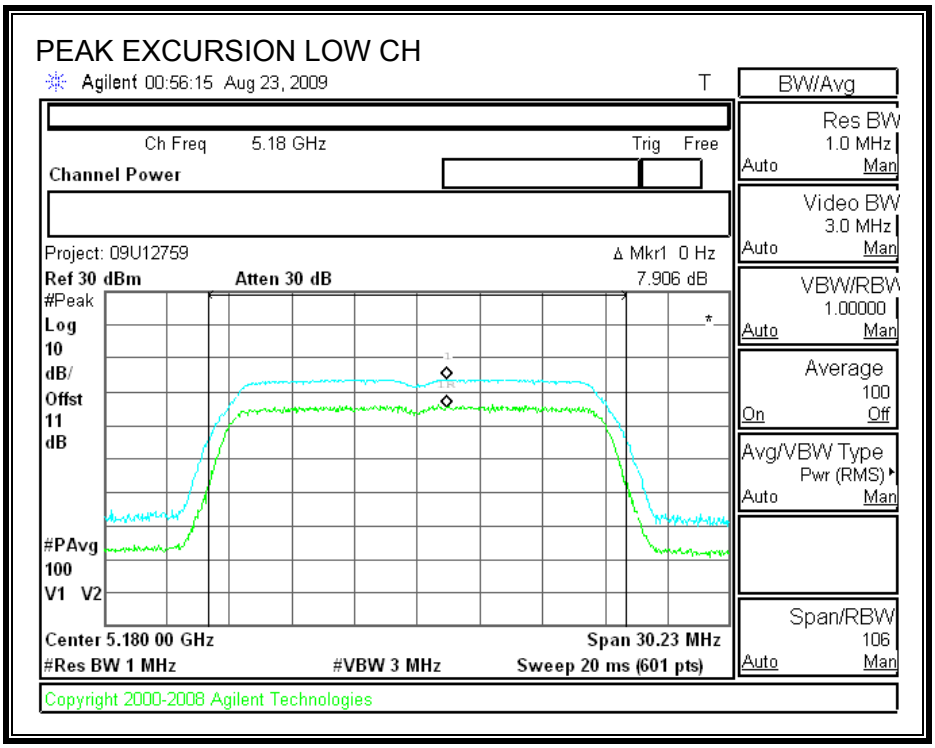
PEAK EXCURSION MID CH

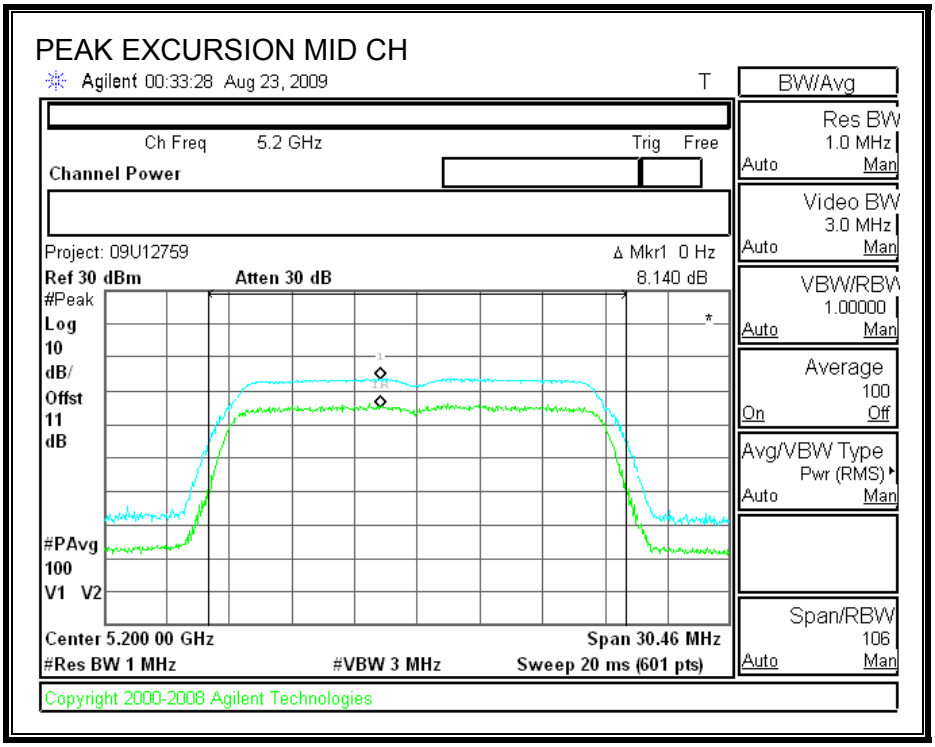


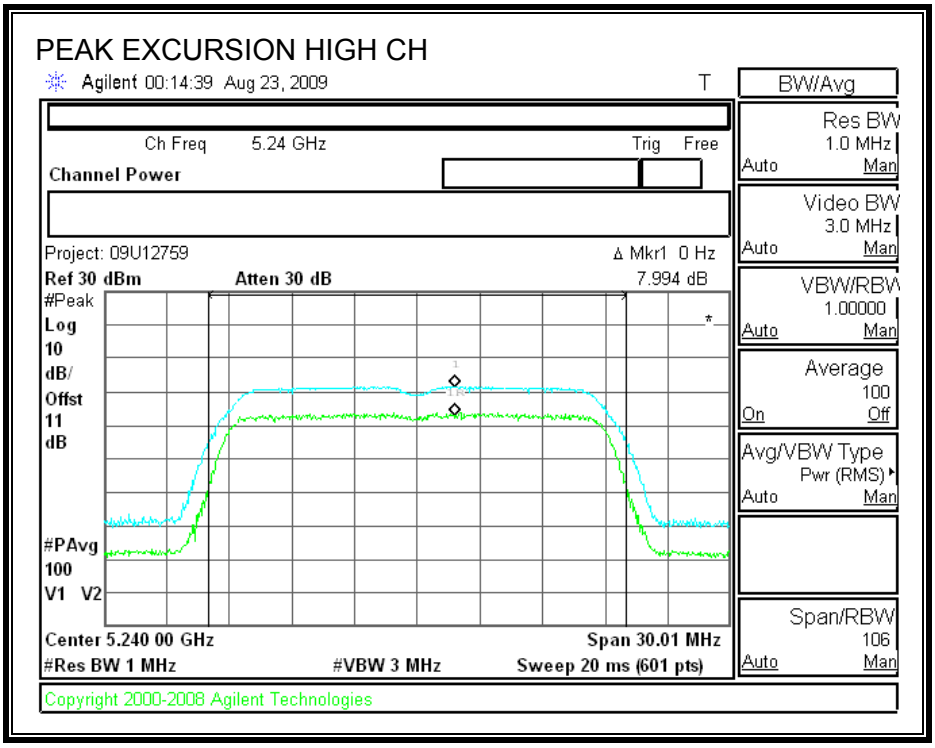


AP2

PEAK EXCURSION

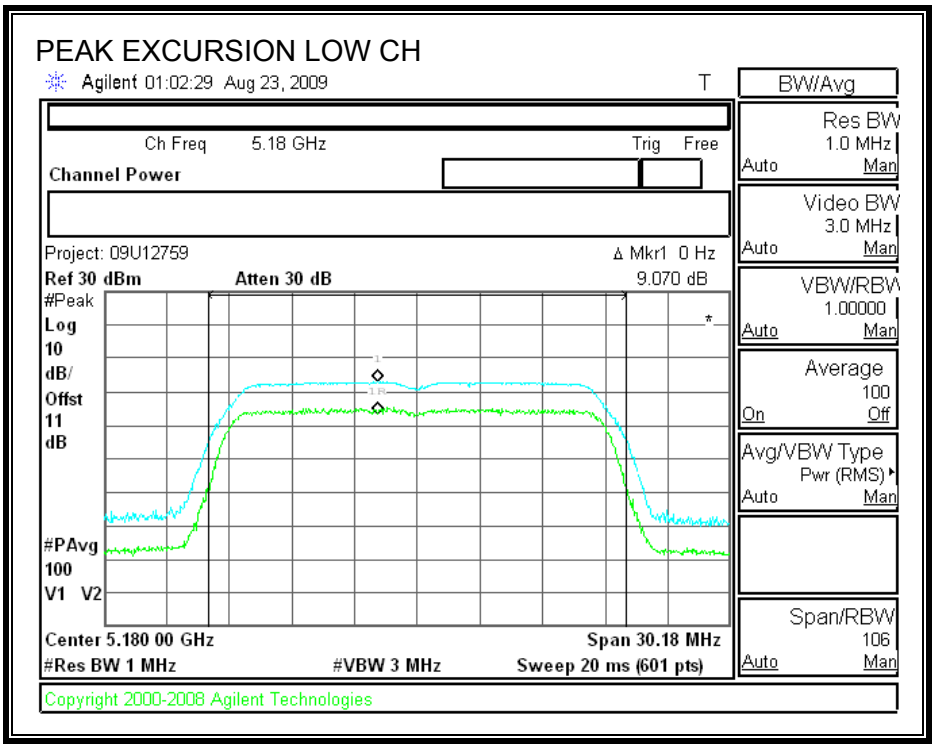




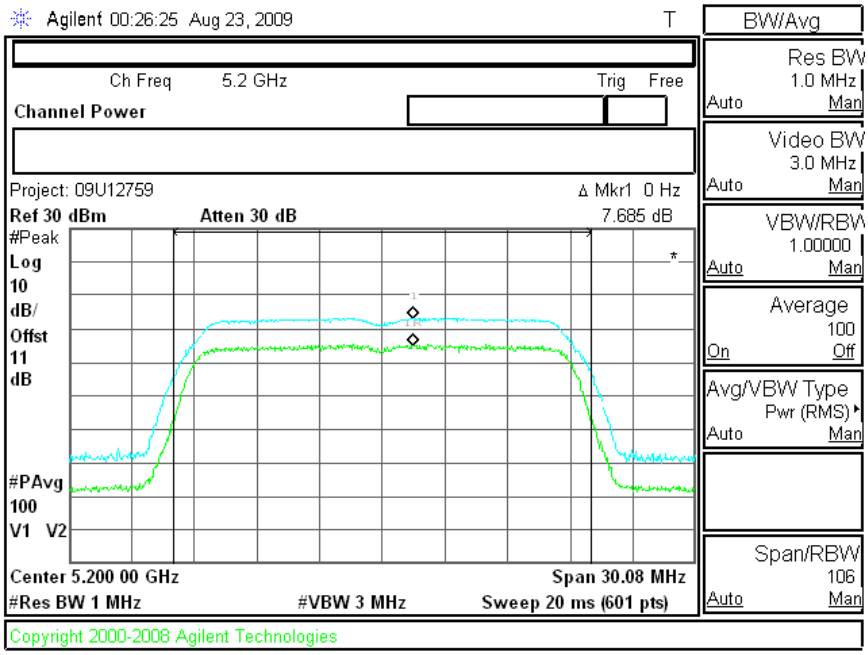


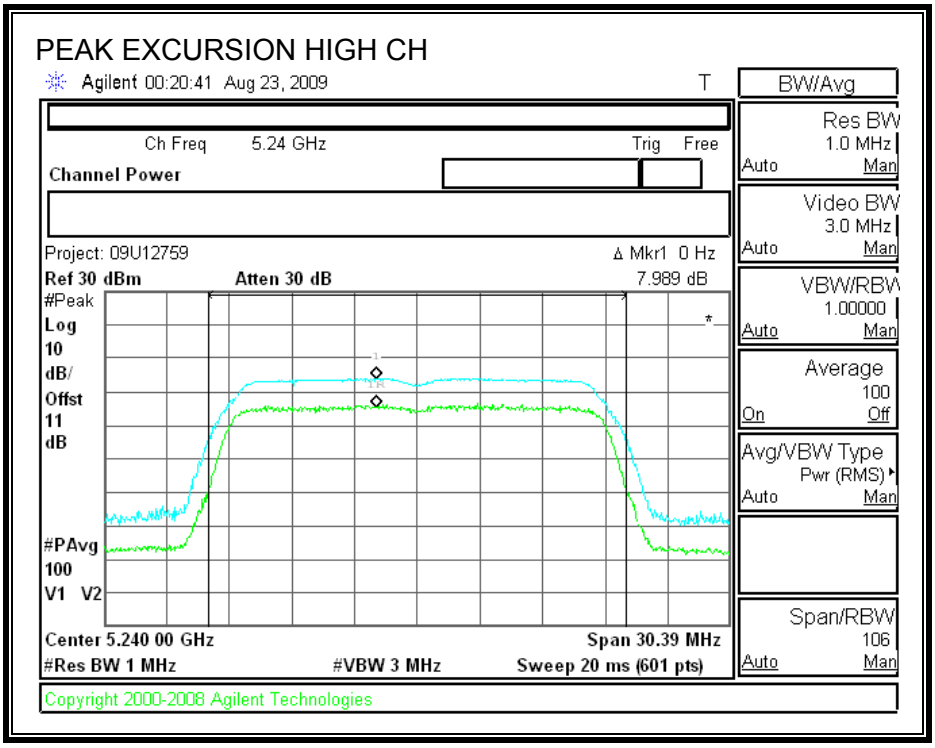
AP3

PEAK EXCURSION



PEAK EXCURSION MID CH





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

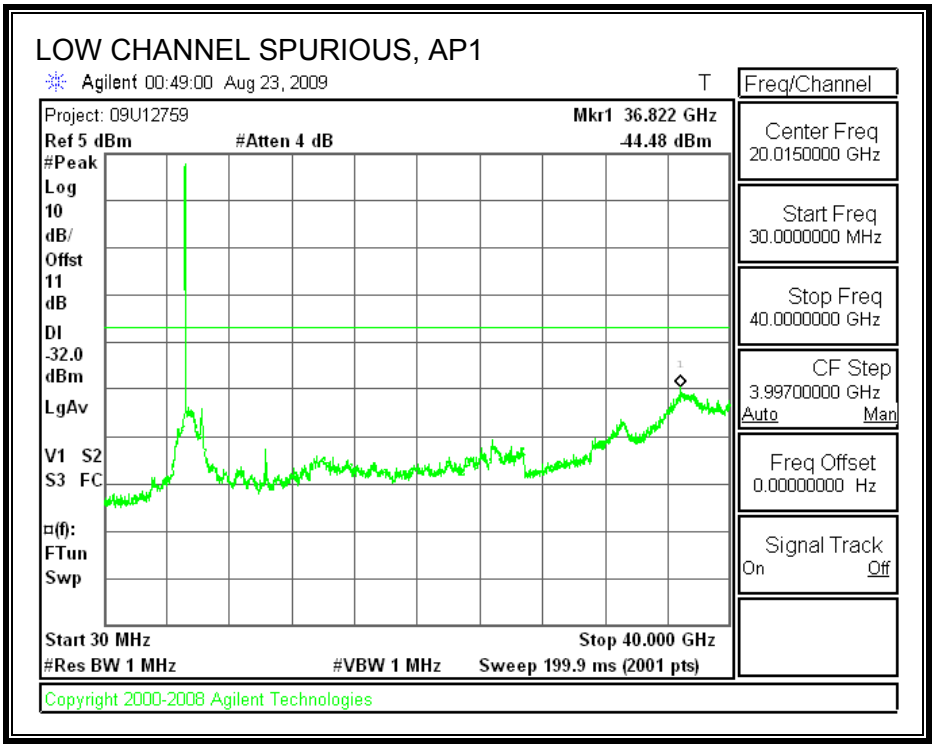
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

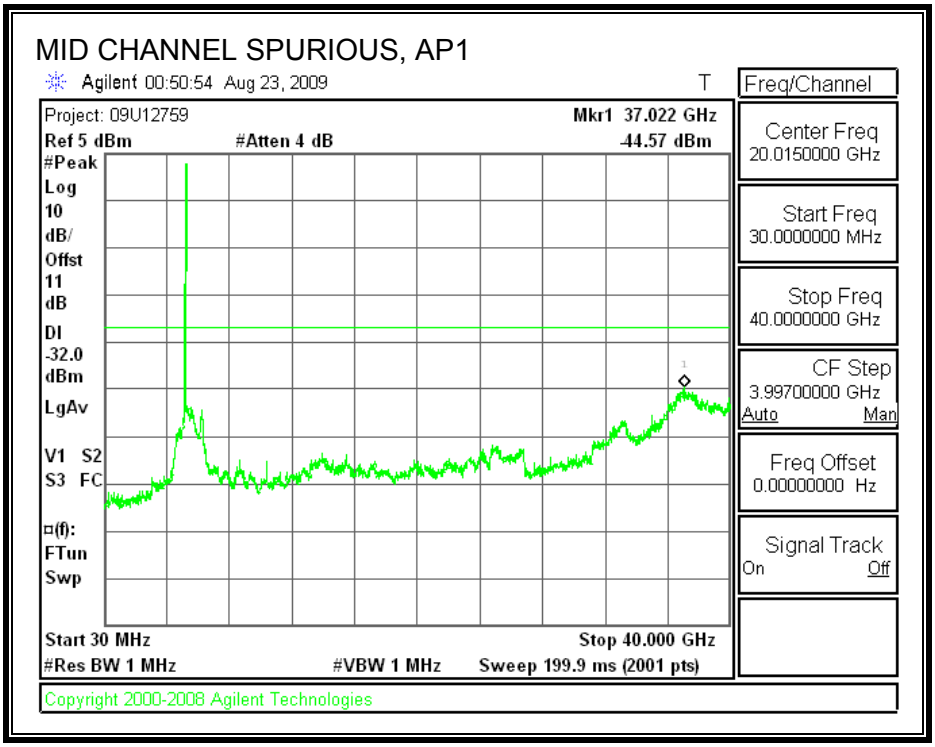
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

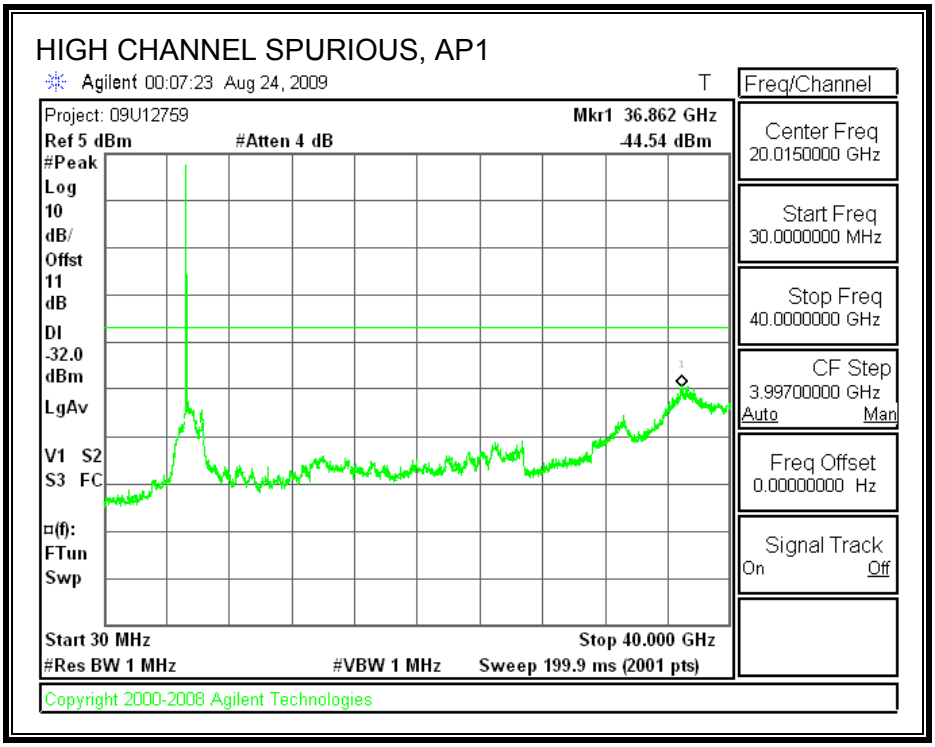
AP1 SPURIOUS EMISSIONS



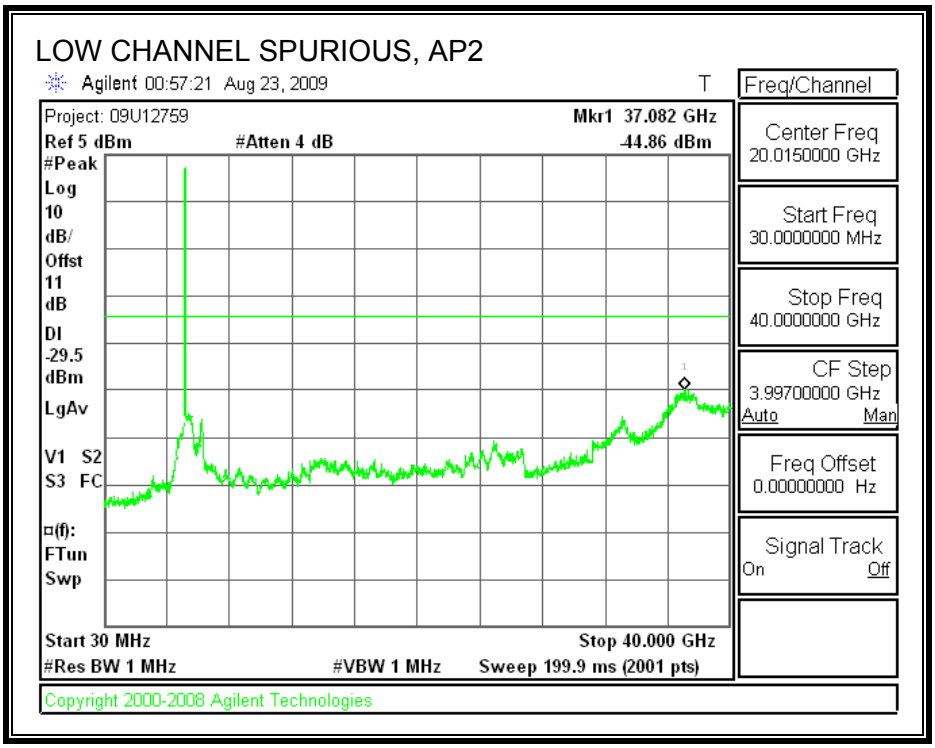
MID CHANNEL SPURIOUS, AP1



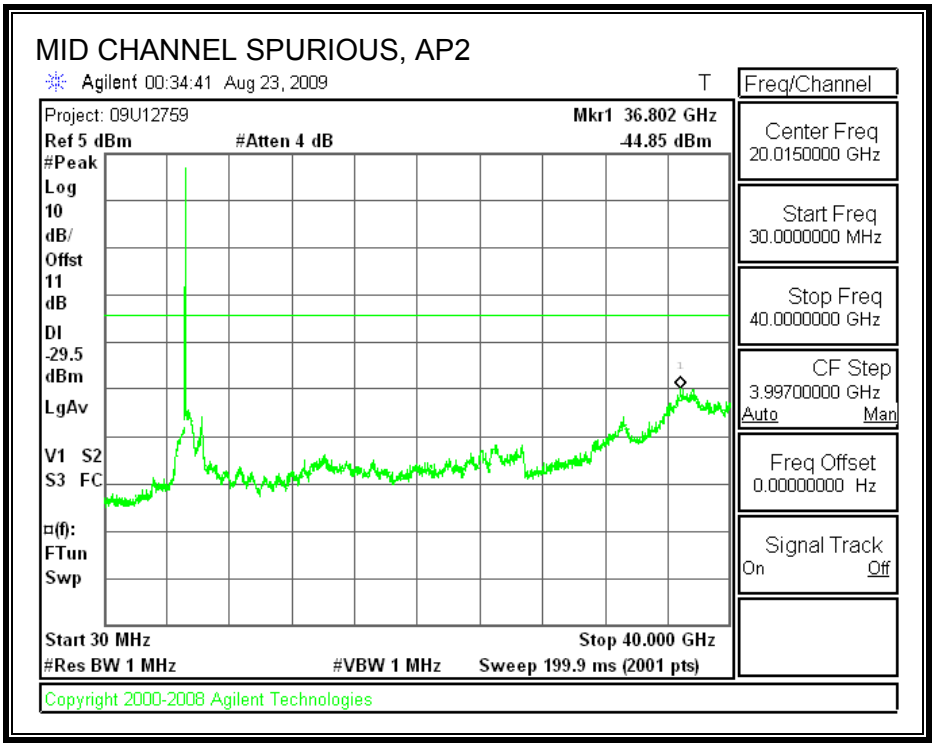
HIGH CHANNEL SPURIOUS, AP1



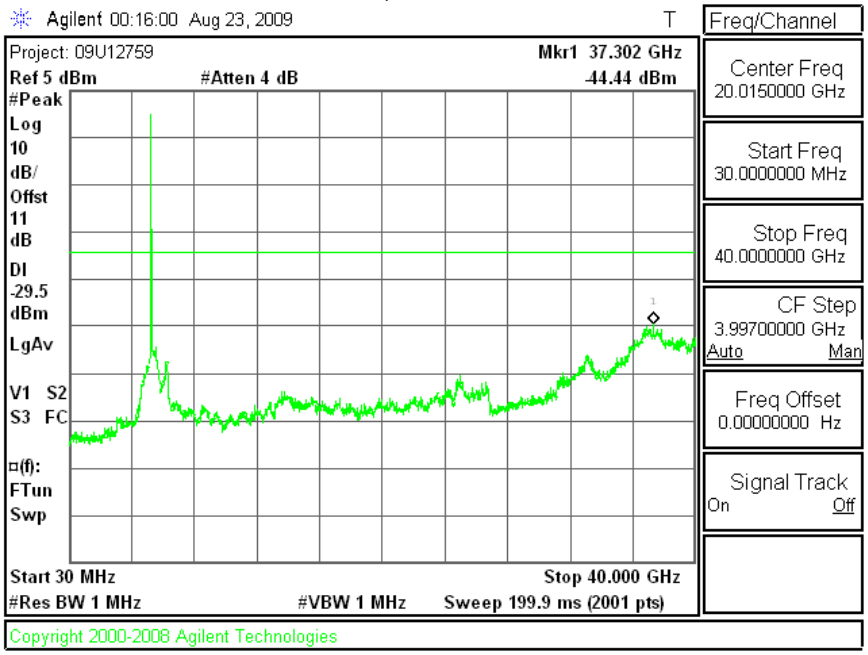
AP2 SPURIOUS EMISSIONS



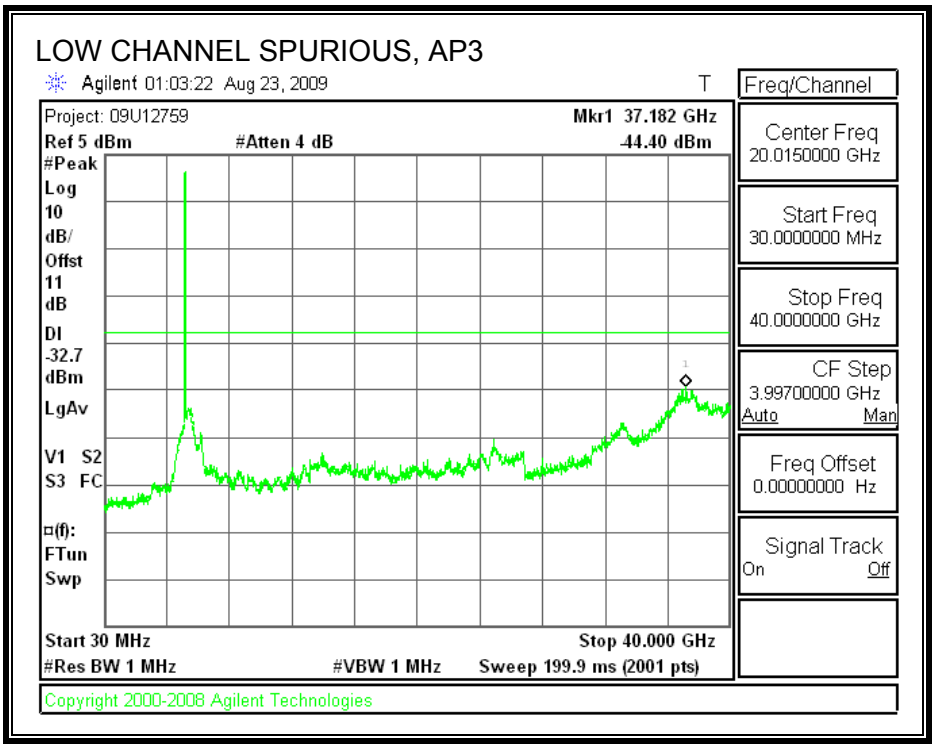
MID CHANNEL SPURIOUS, AP2



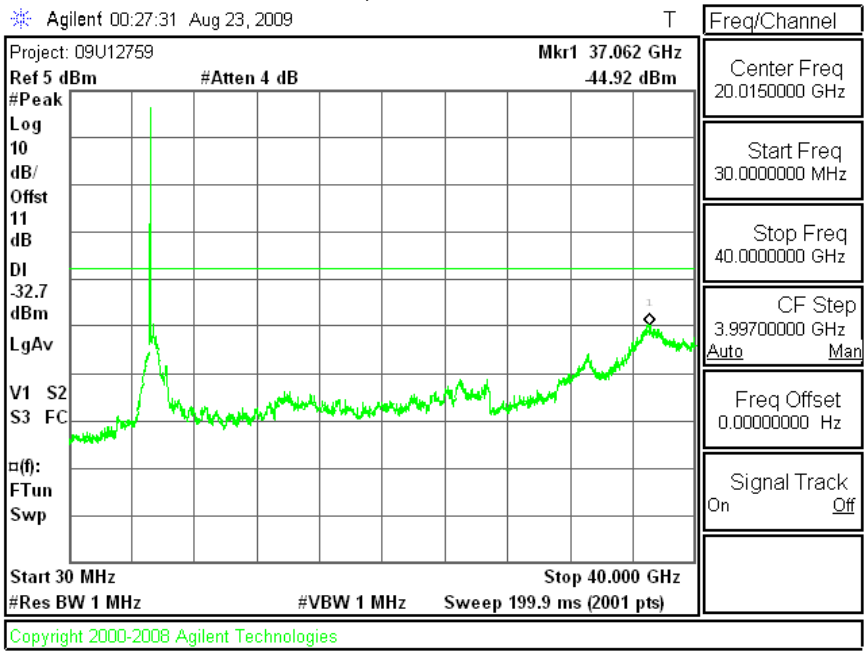
HIGH CHANNEL SPURIOUS, AP2



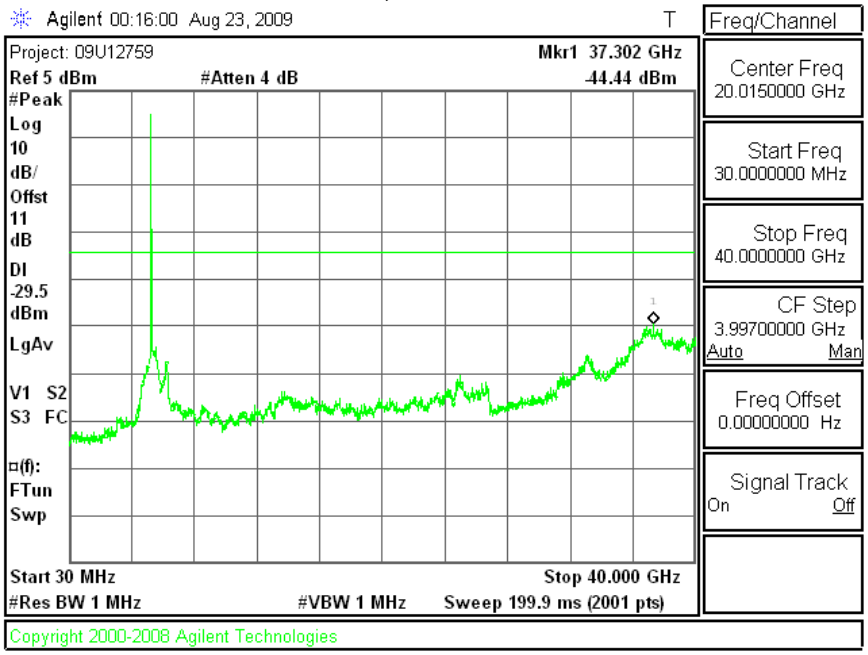
AP3 SPURIOUS EMISSIONS



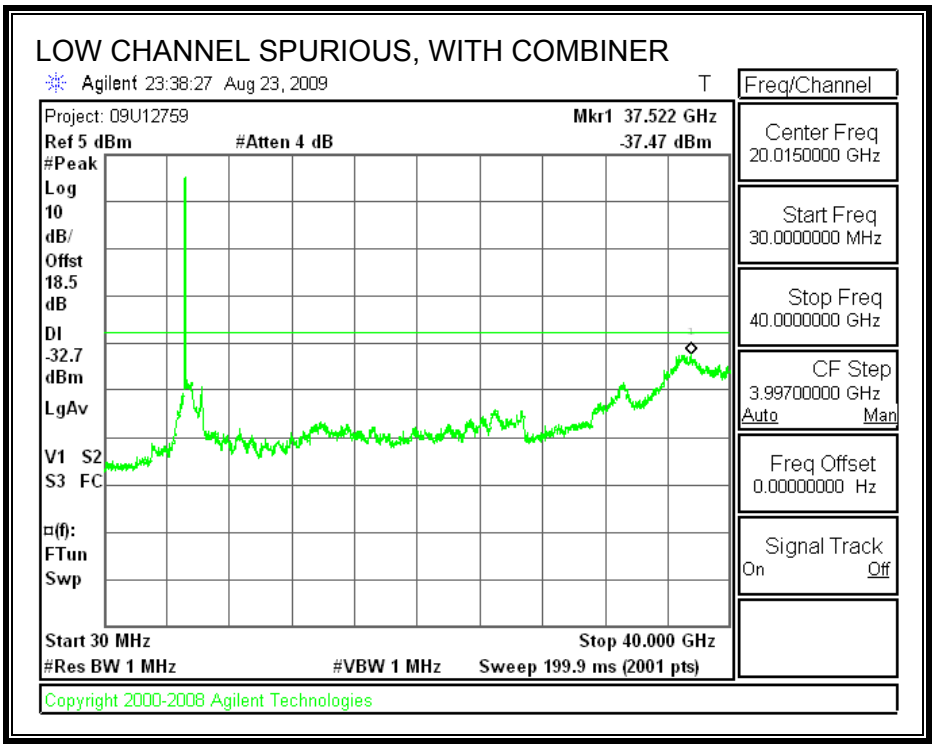
MID CHANNEL SPURIOUS, AP3



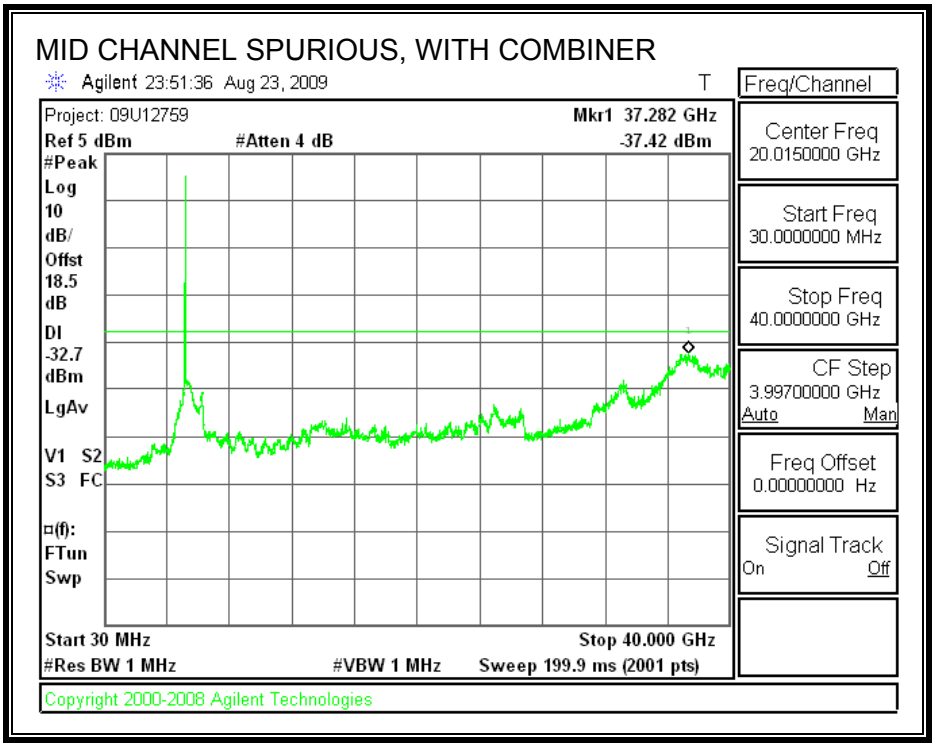
HIGH CHANNEL SPURIOUS, AP3



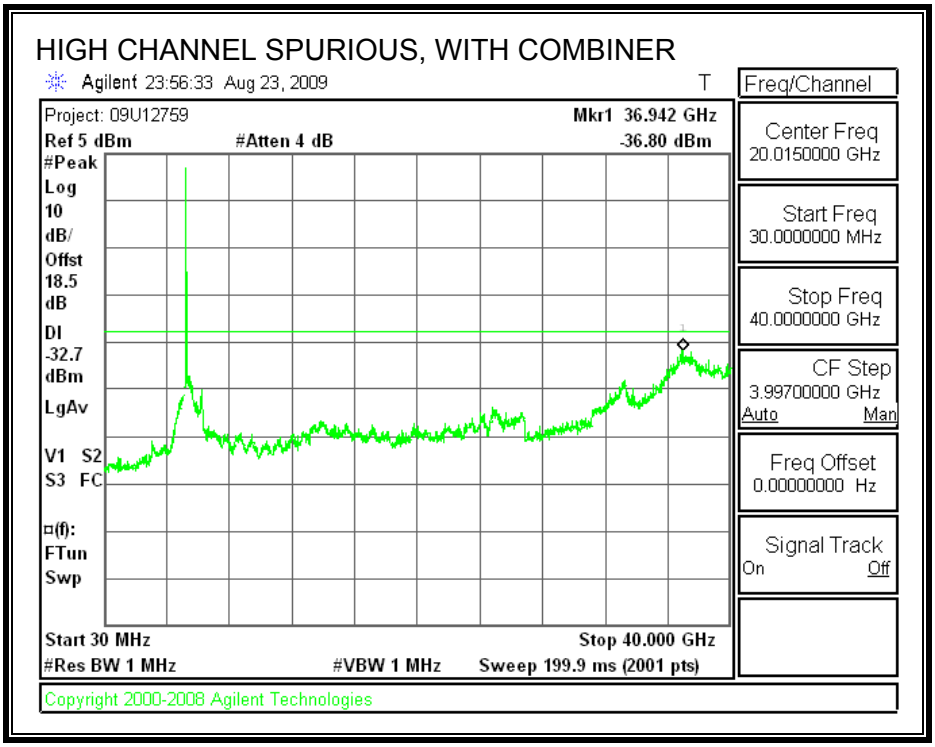
SPURIOUS EMISSIONS WITH COMBINER



MID CHANNEL SPURIOUS, WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



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

7.5.1. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

TEST PROCEDURE

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

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

RESULTS

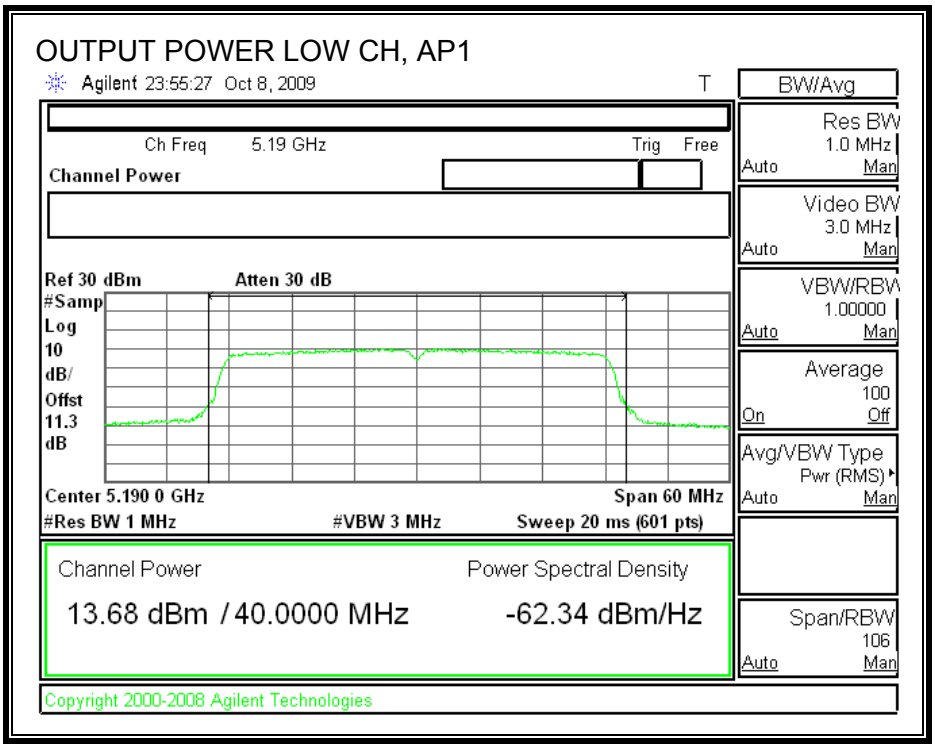
Limit

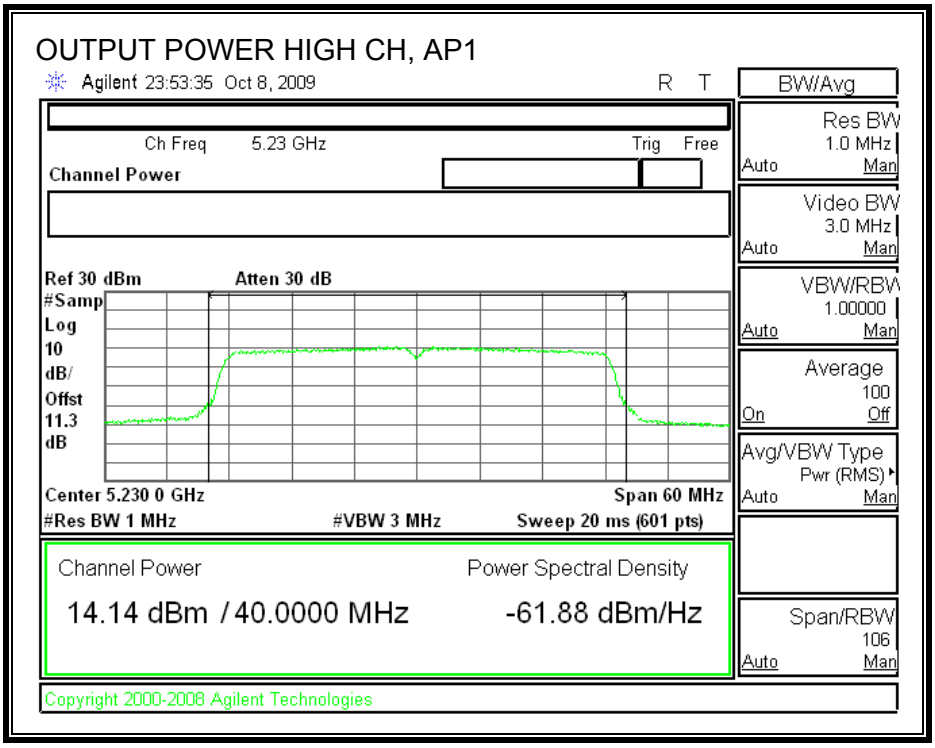
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	40	20.02	5.69	17.00
High	5230	17	40	20.02	5.69	17.00

Individual Chain Results

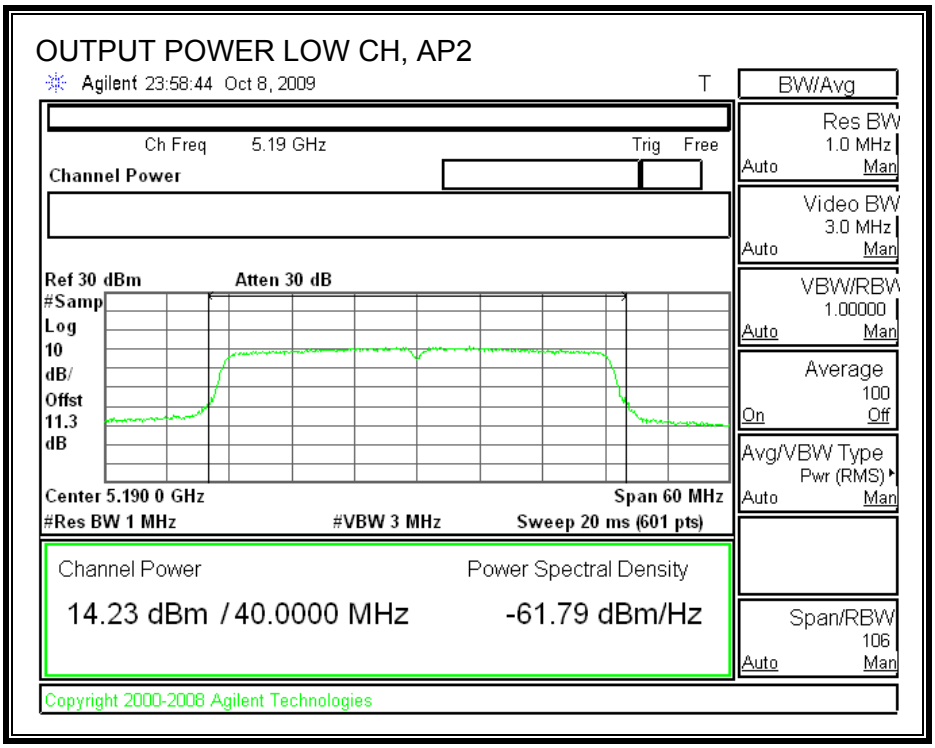
Channel	Frequency (MHz)	AP1 Power (dBm)	AP2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	13.68	14.23	16.97	17.00	-0.03
High	5230	14.14	13.71	16.94	17.00	-0.06

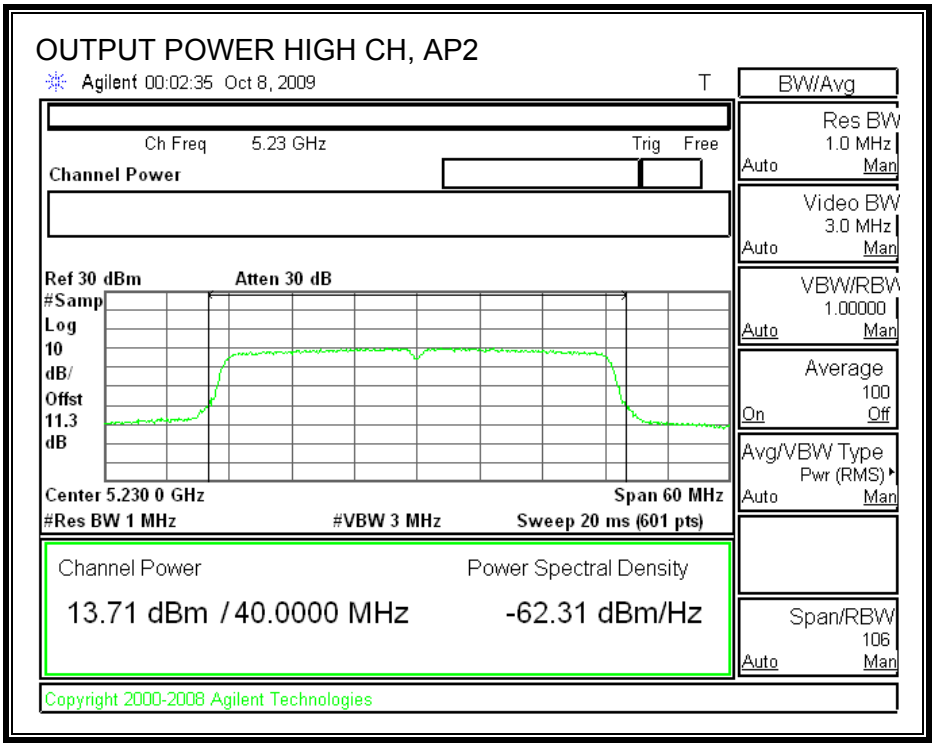
AP1 OUTPUT POWER





AP2 OUTPUT POWER





7.5.2. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

TEST PROCEDURE

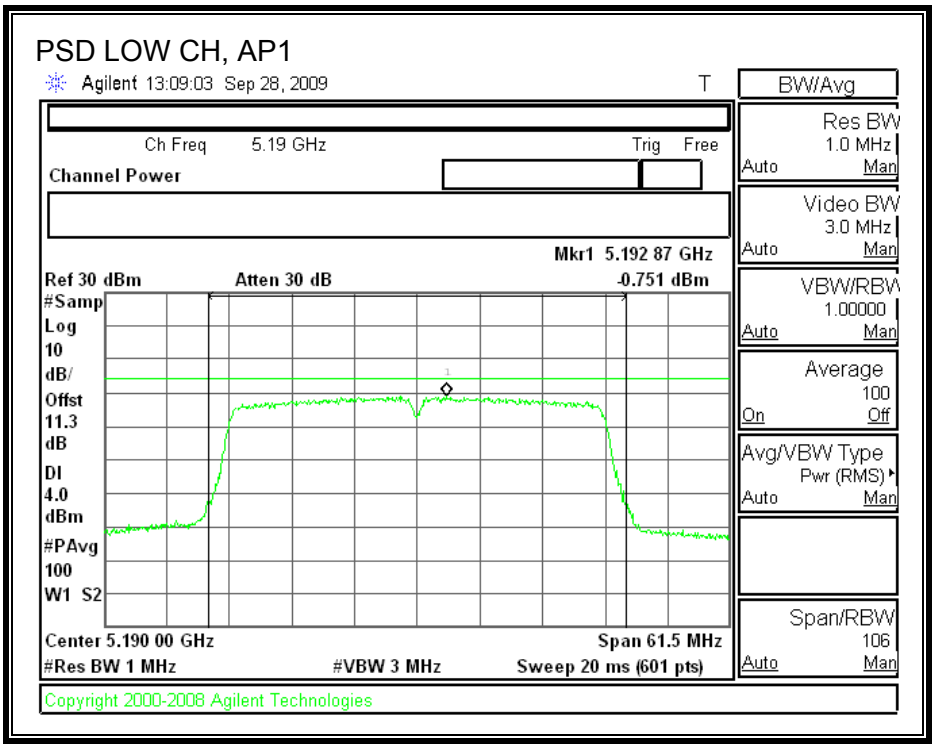
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

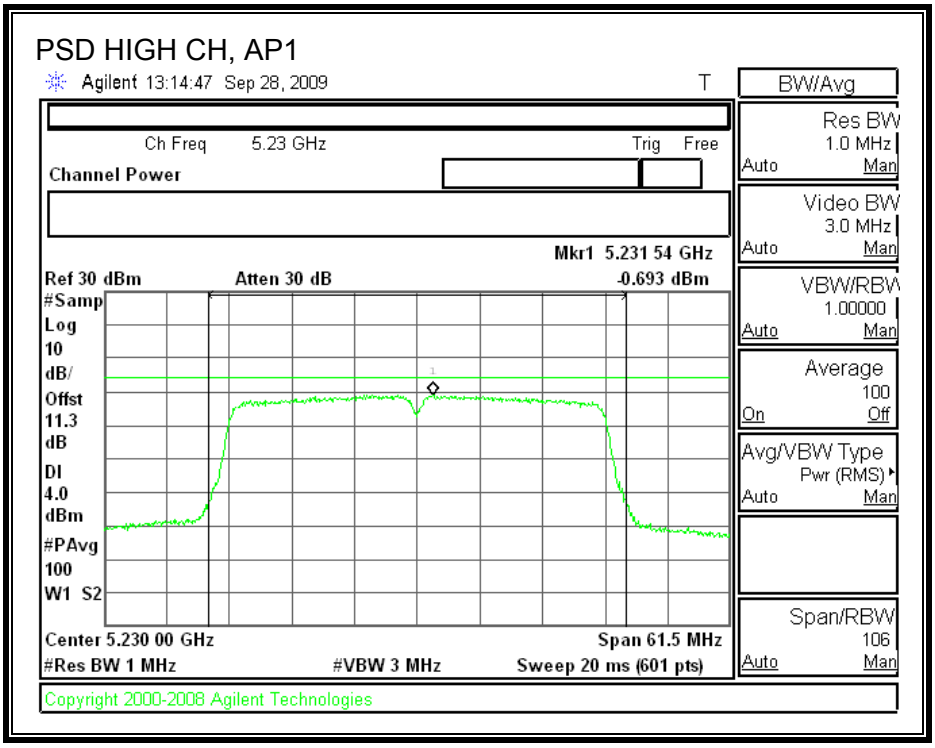
RESULTS

Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-0.751	0.254	2.79	4	-1.21
High	5230	-0.693	1.374	3.47	4	-0.53

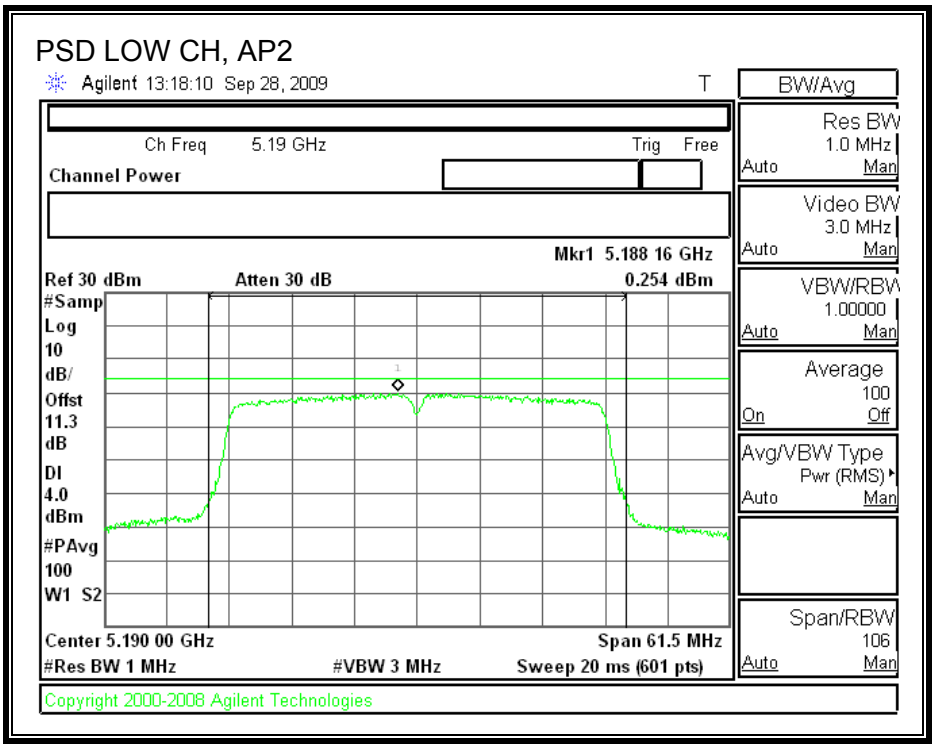
Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-1.842	4	-5.84
High	5230	-2.900	4	-6.90

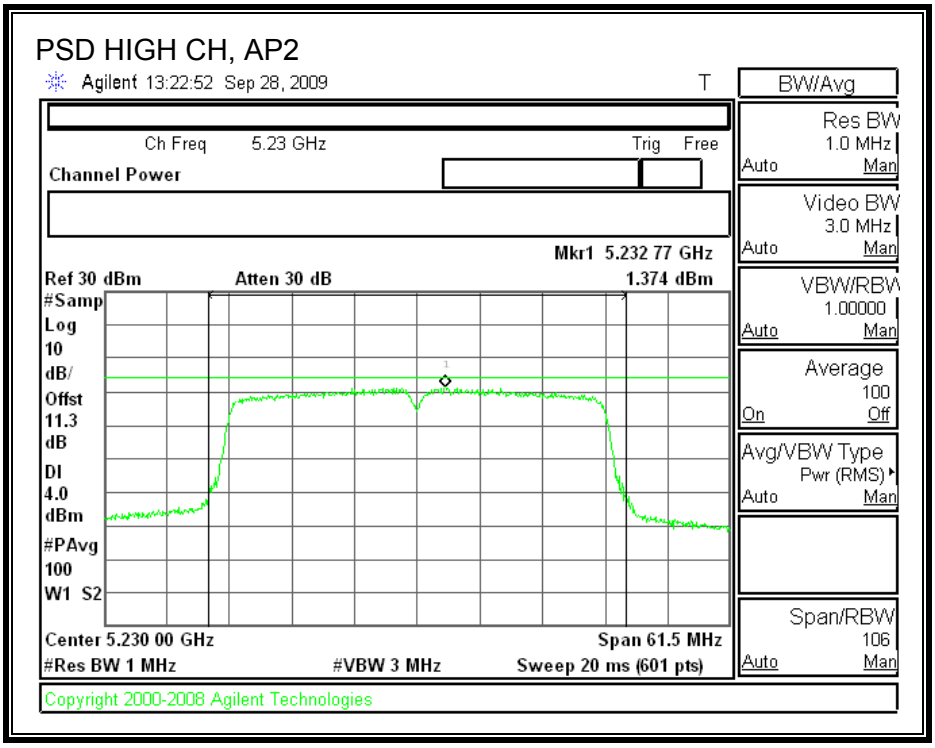
AP1 POWER SPECTRAL DENSITY



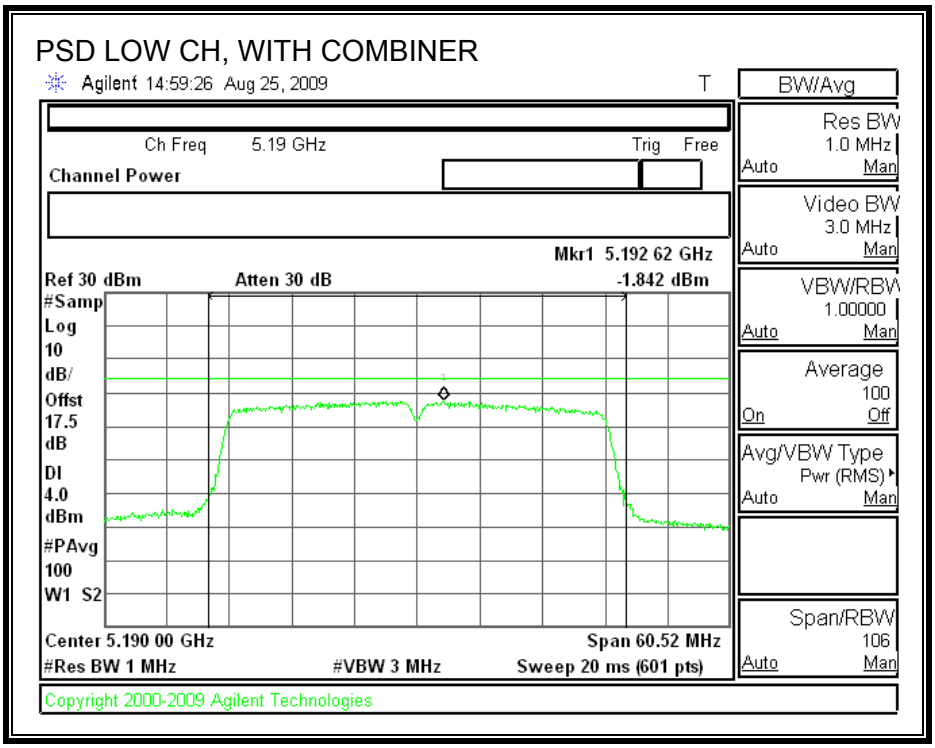


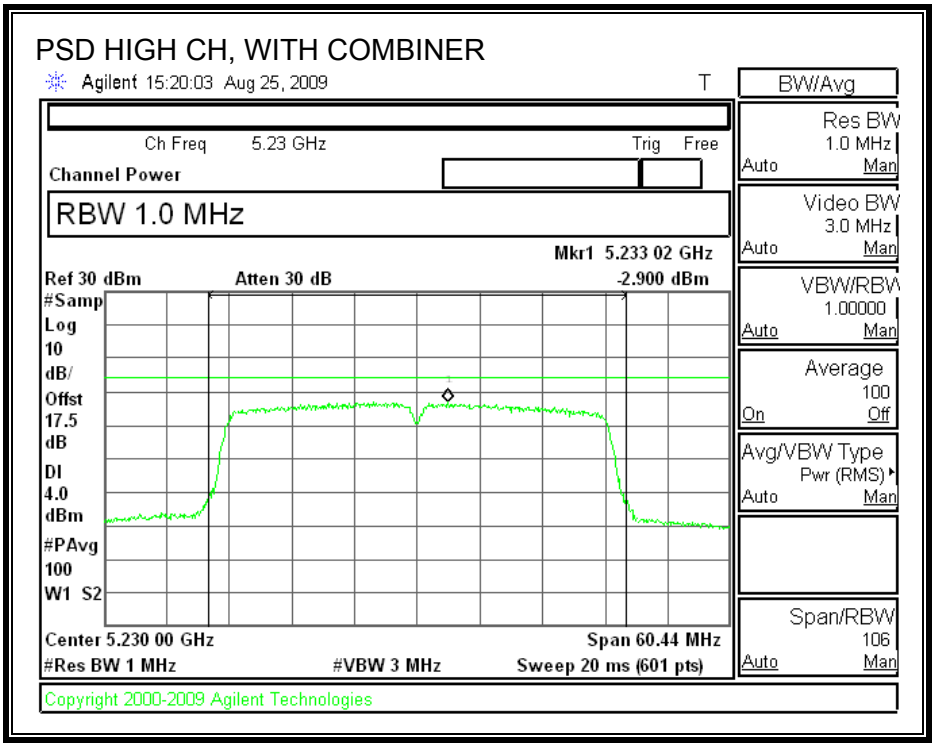
AP2 POWER SPECTRAL DENSITY





POWER SPECTRAL DENSITY WITH COMBINER





7.5.3. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

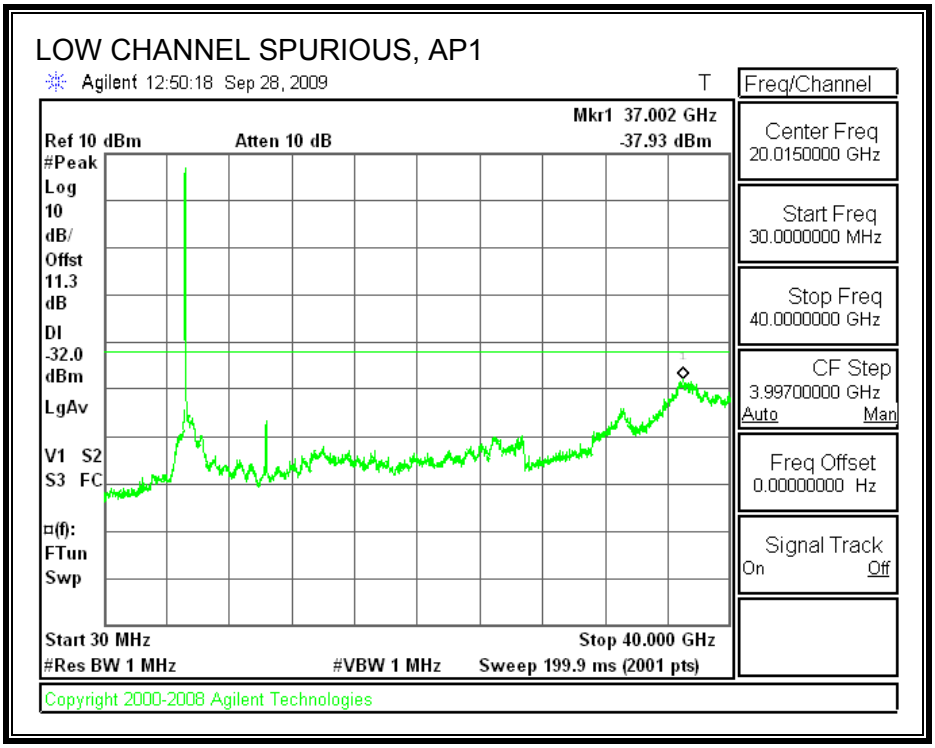
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

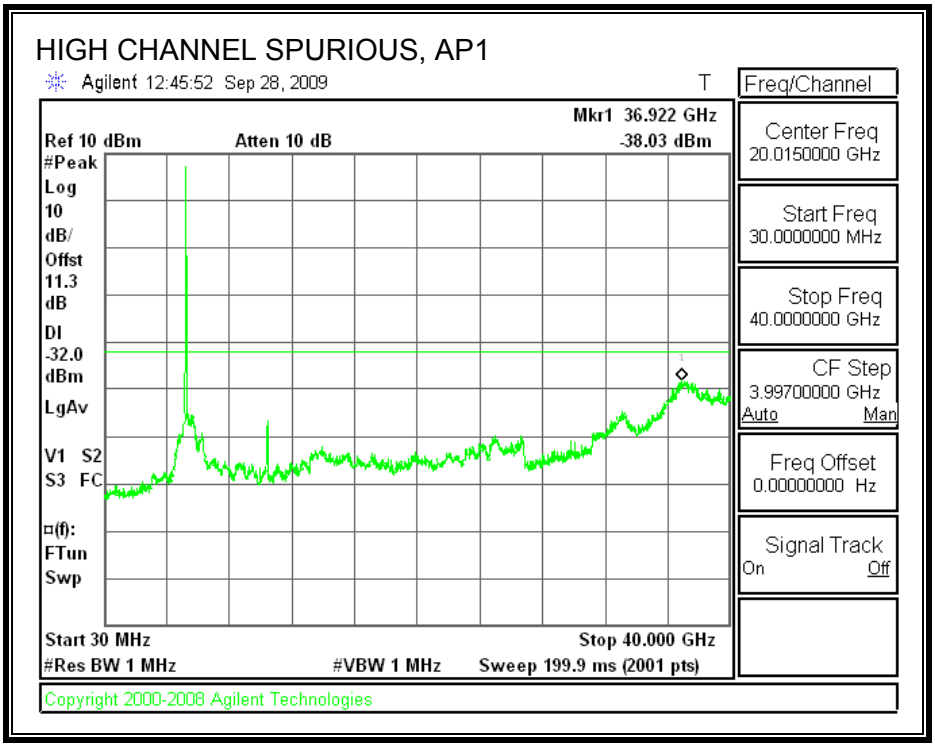
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

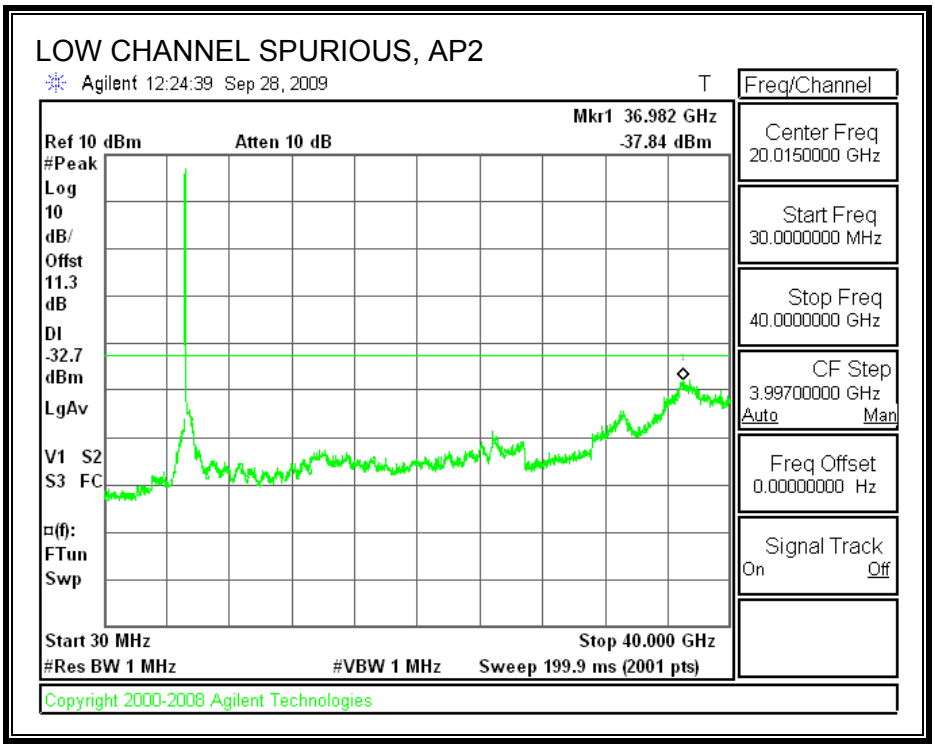
AP1 SPURIOUS EMISSIONS



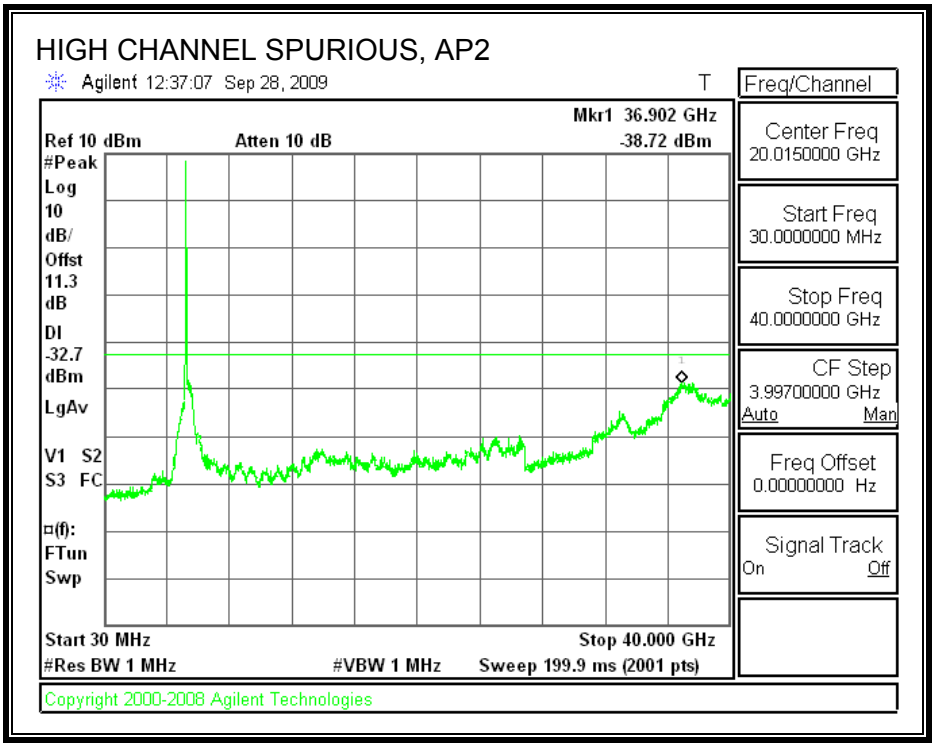
HIGH CHANNEL SPURIOUS, AP1



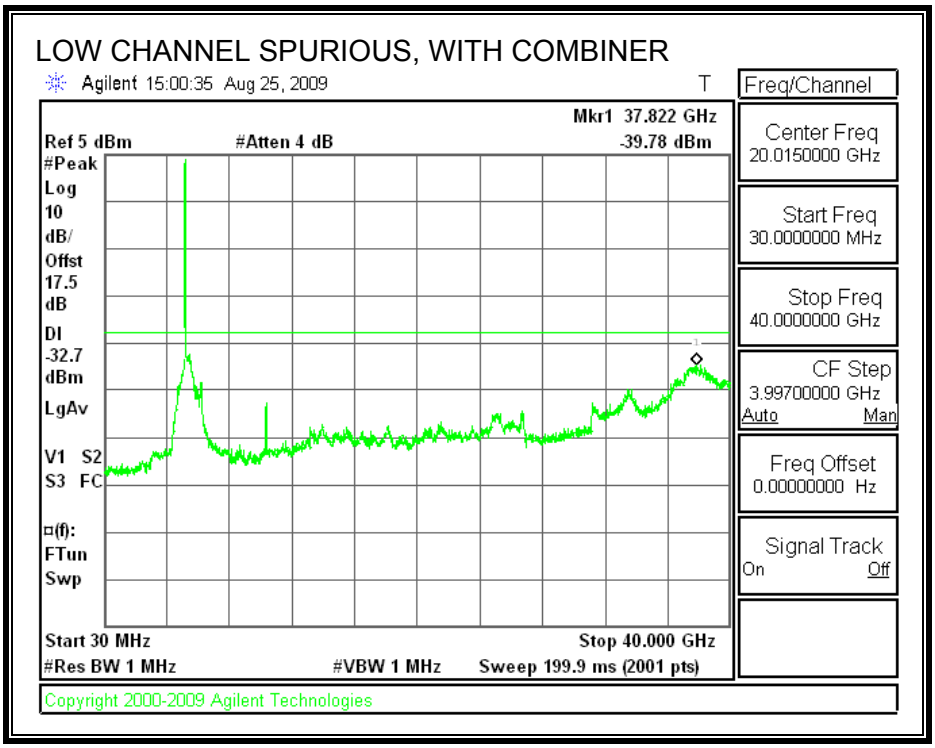
AP2 SPURIOUS EMISSIONS



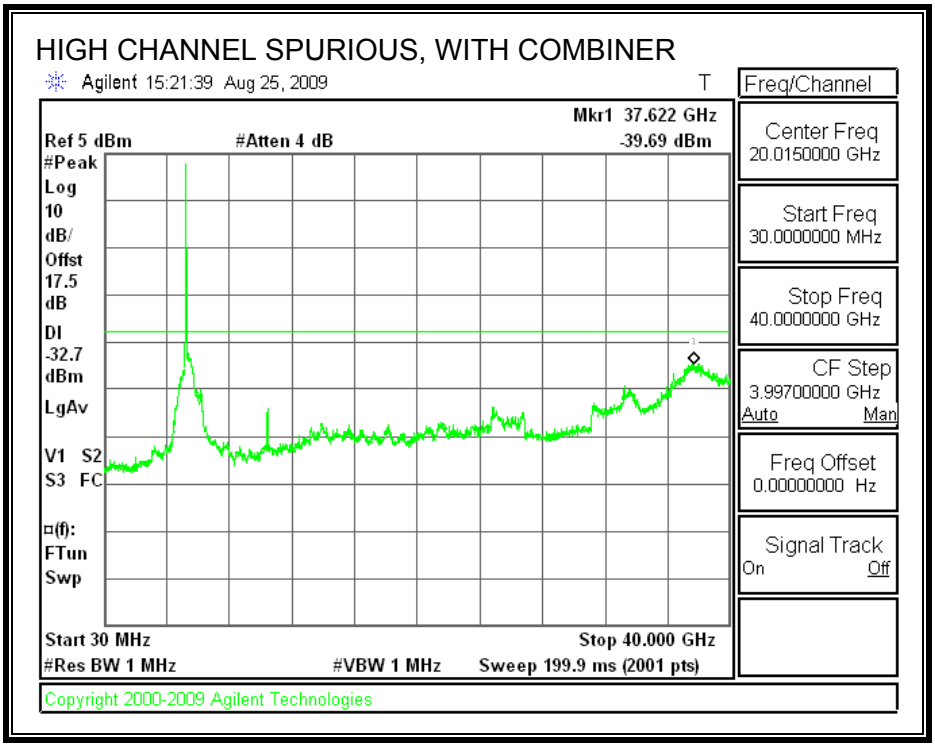
HIGH CHANNEL SPURIOUS, AP2



SPURIOUS EMISSIONS WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



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

AP1

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	39.312	36.147
High	5230	39.327	36.0531

AP2

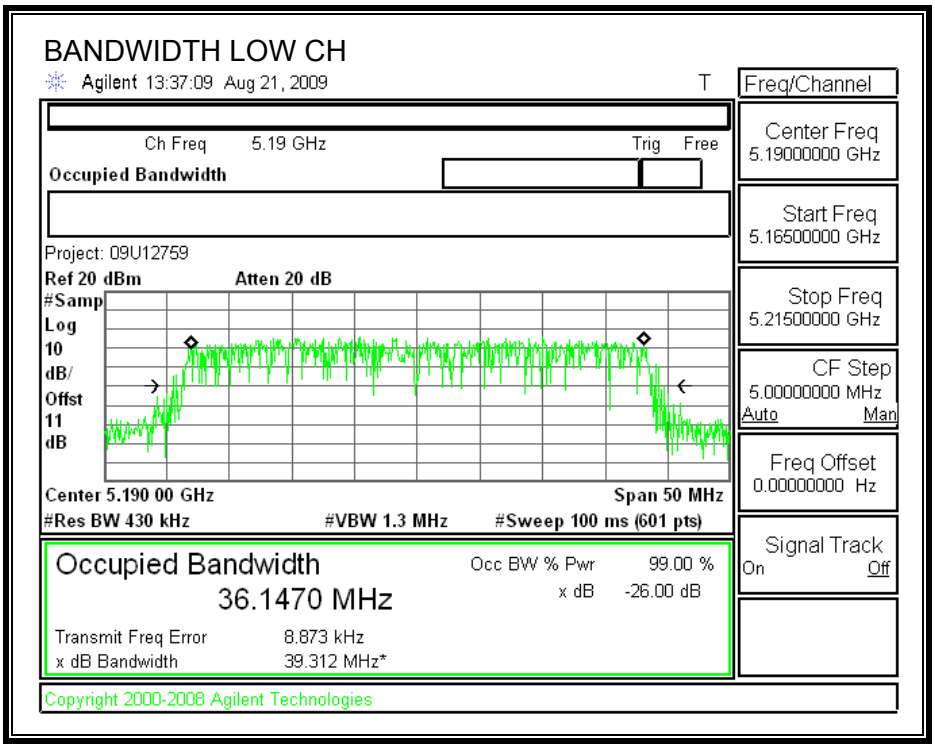
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	39.078	35.8739
High	5230	39.532	36.158

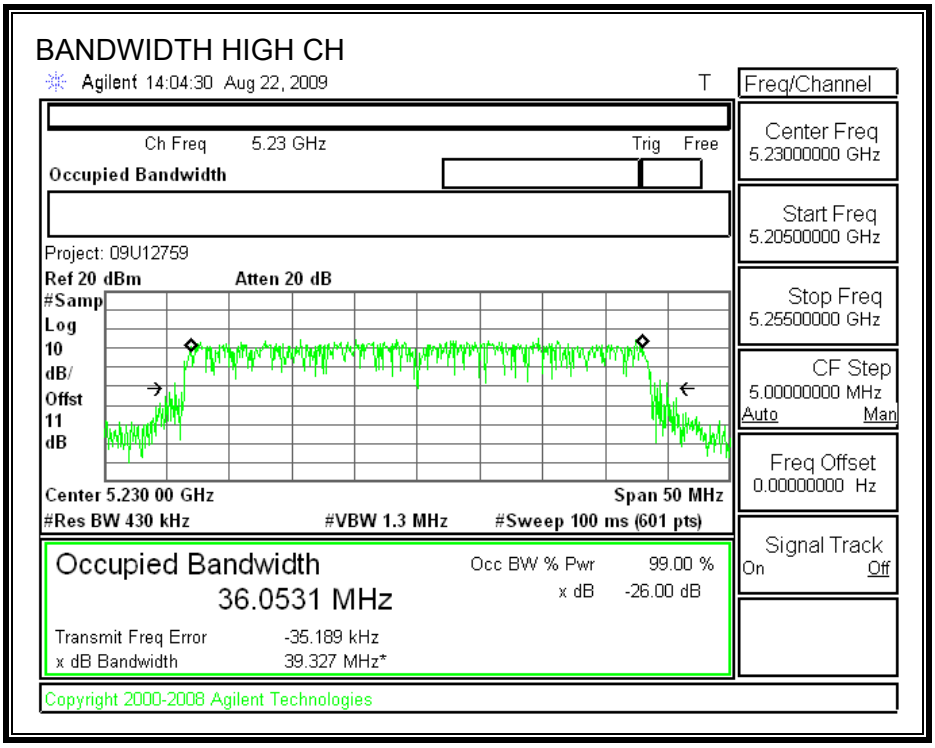
AP3

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	38.291	36.0634
High	5230	39.332	35.8255

AP1

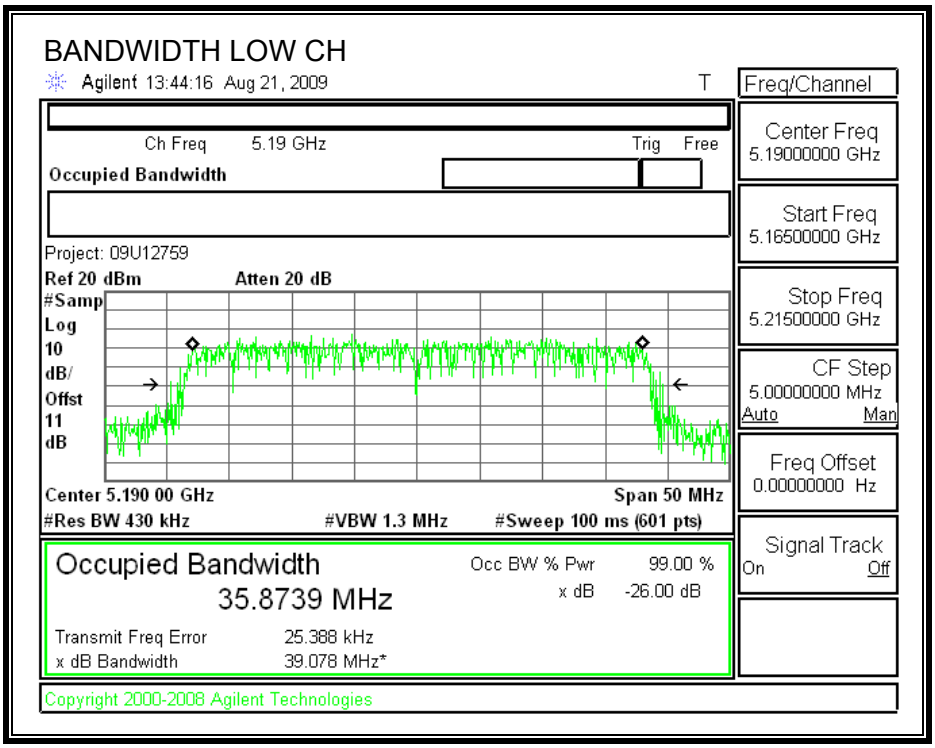
26 dB and 99% BANDWIDTH

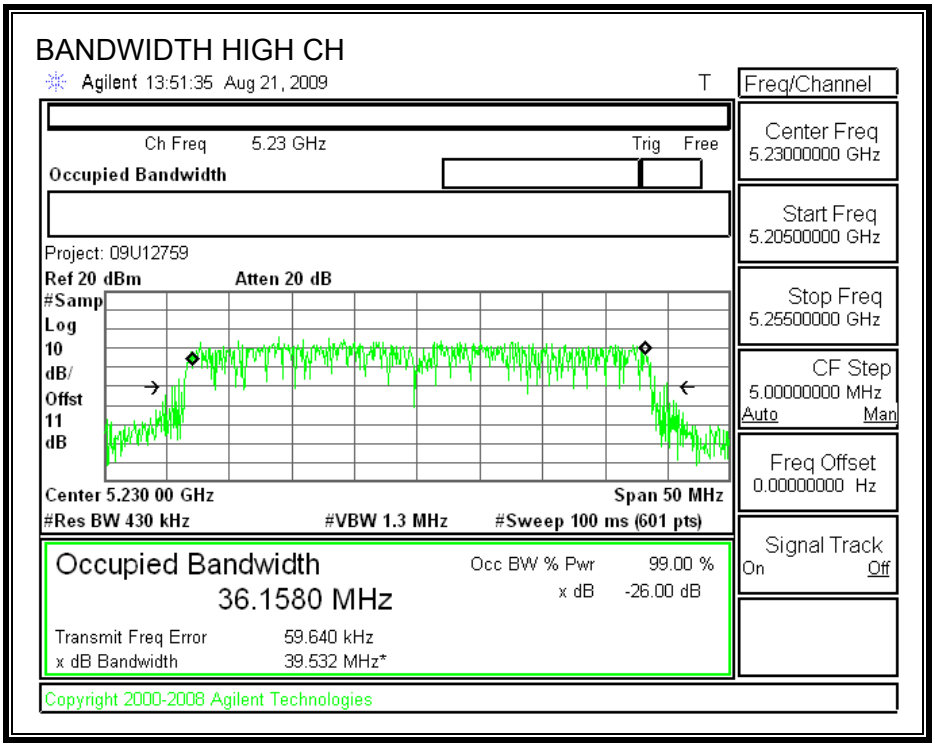




AP2

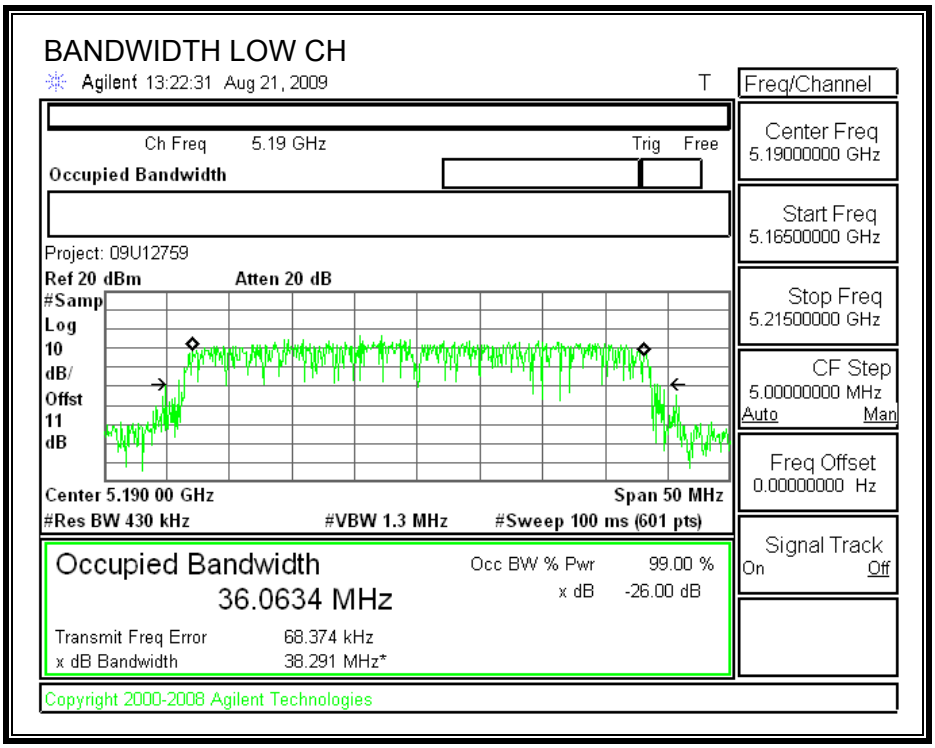
26 dB and 99% BANDWIDTH

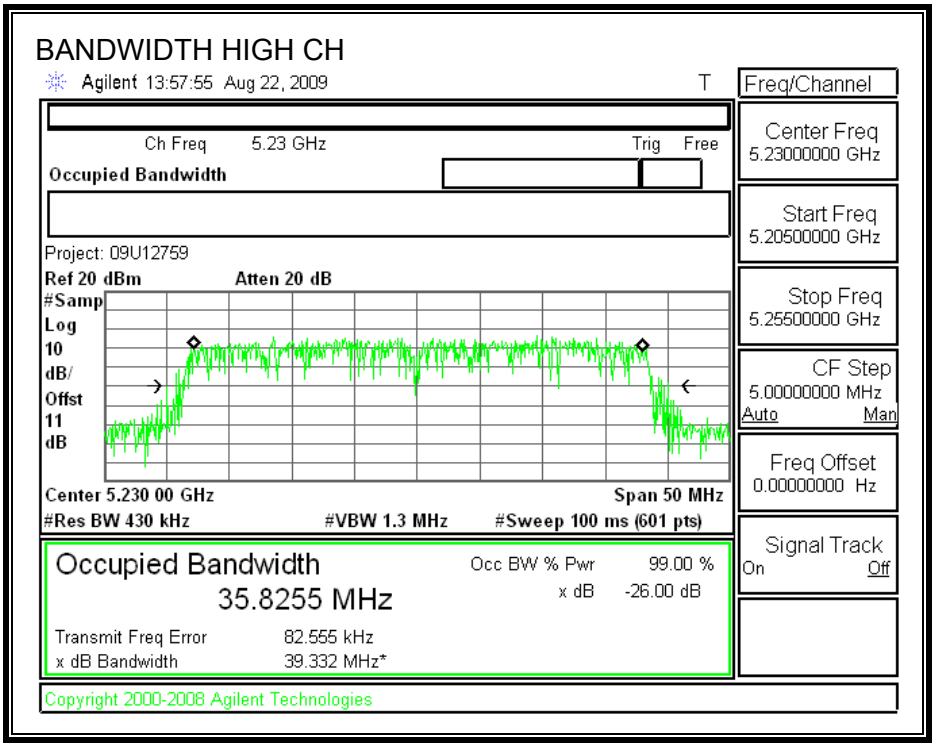




AP3

26 dB and 99% BANDWIDTH





7.6.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

TEST PROCEDURE

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

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

RESULTS

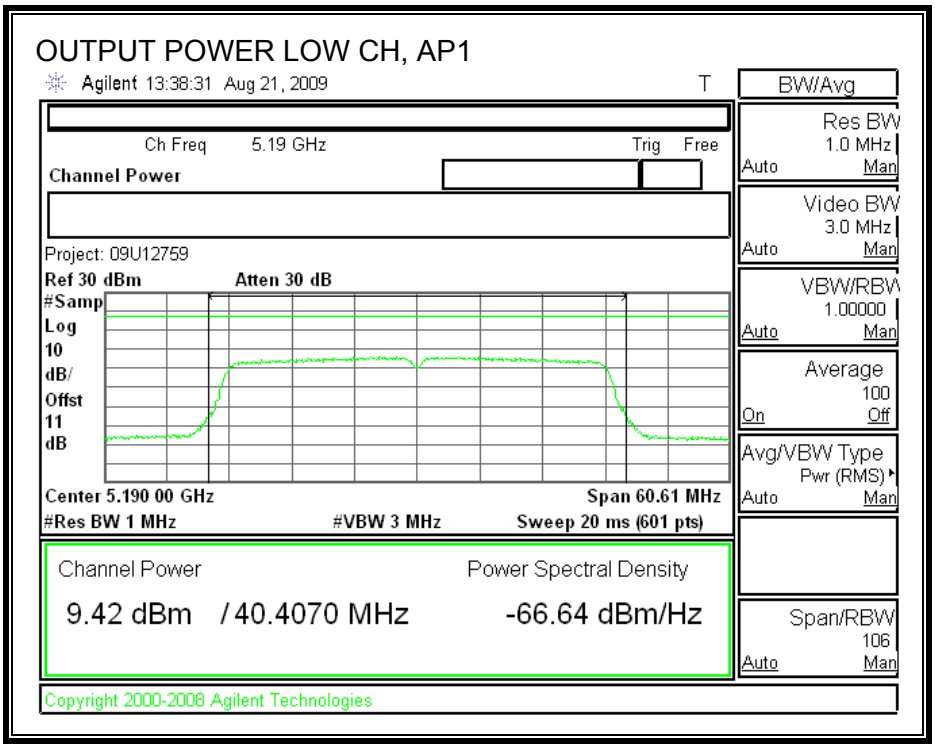
Limit

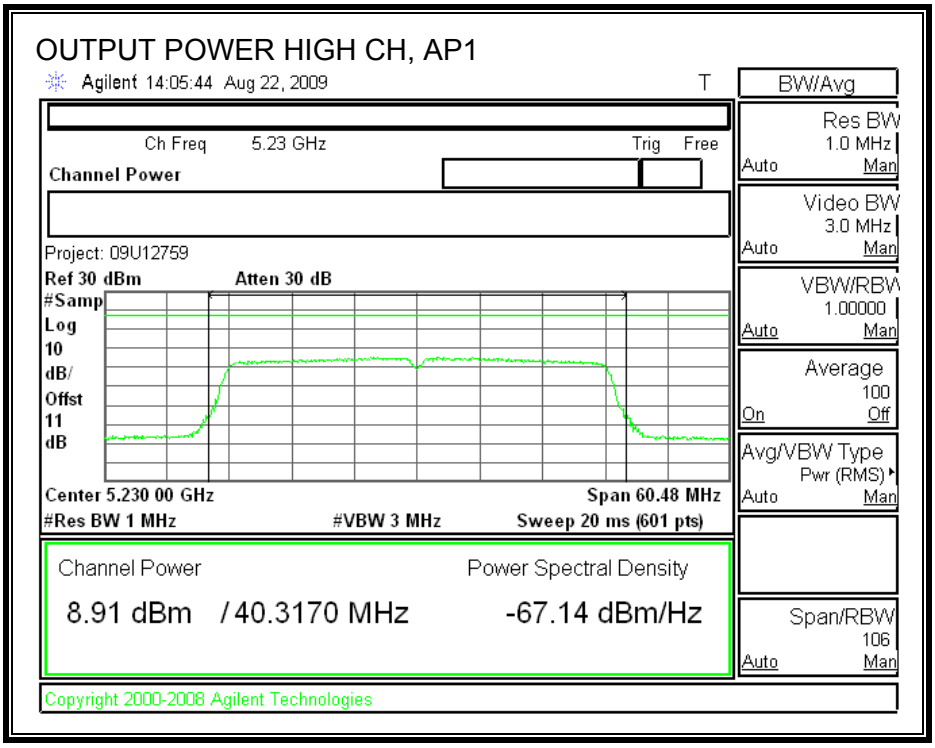
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17.00	38.291	19.83	5.69	17.00
High	5230	17.00	39.327	19.95	5.69	17.00

Individual Chain Results

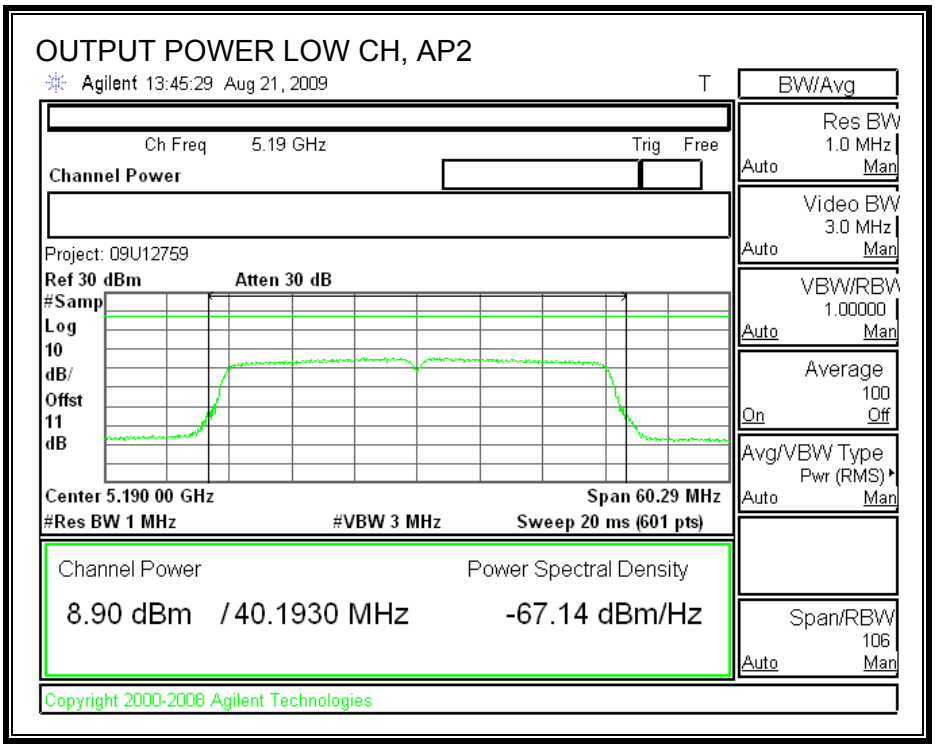
Channel	Frequency (MHz)	AP1 Power (dBm)	AP2 Power (dBm)	AP3 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	9.42	8.90	8.05	13.60	17.00	-3.40
High	5230	8.91	8.49	9.46	13.74	17.00	-3.26

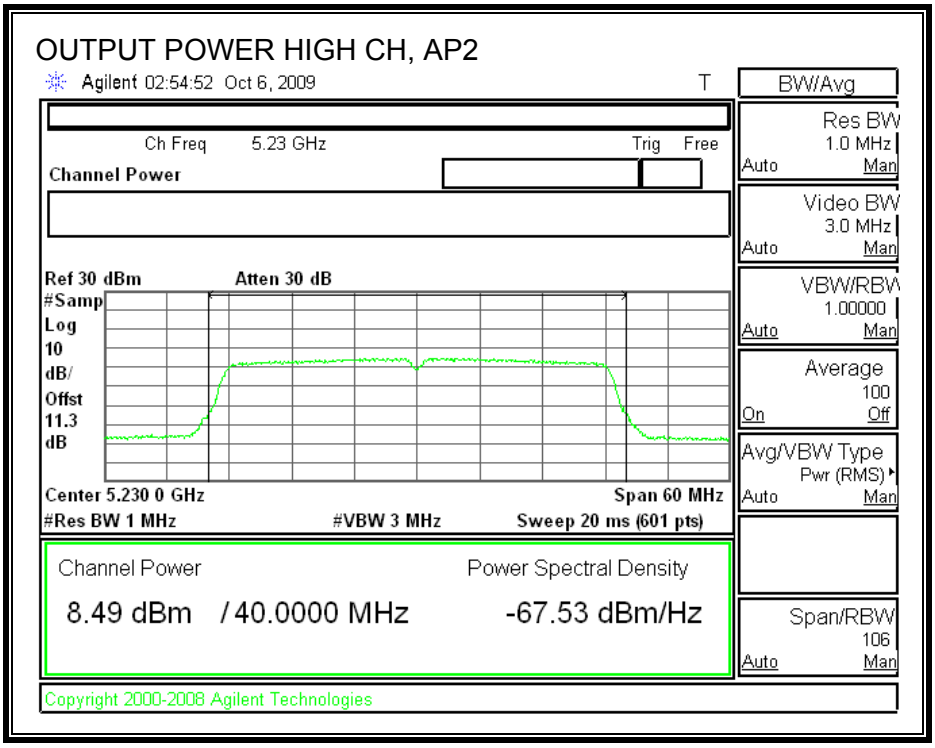
AP1 OUTPUT POWER



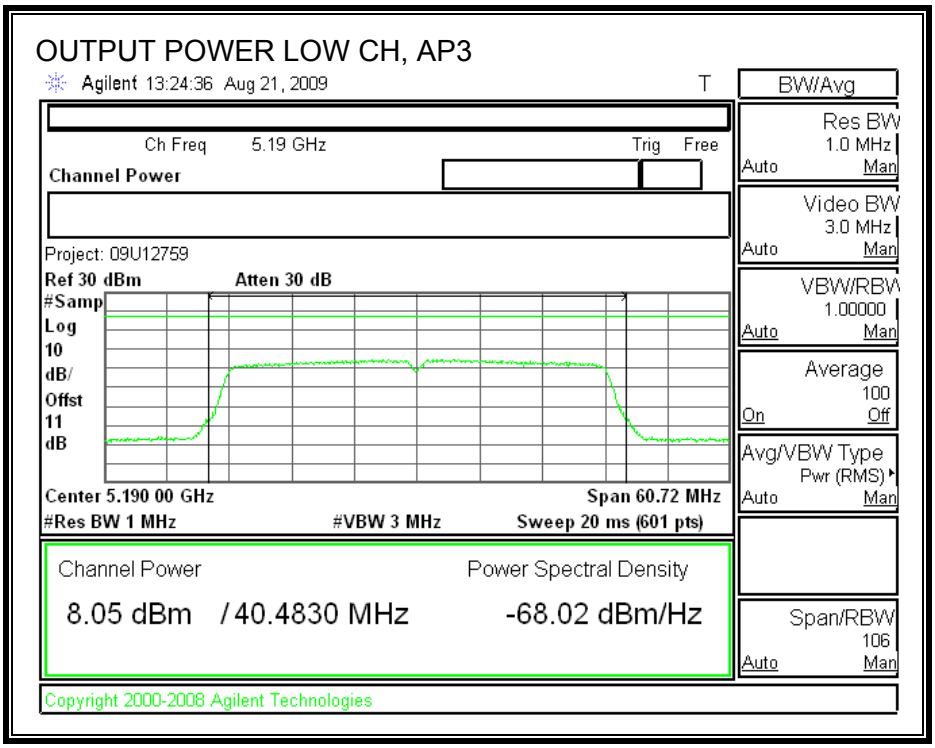


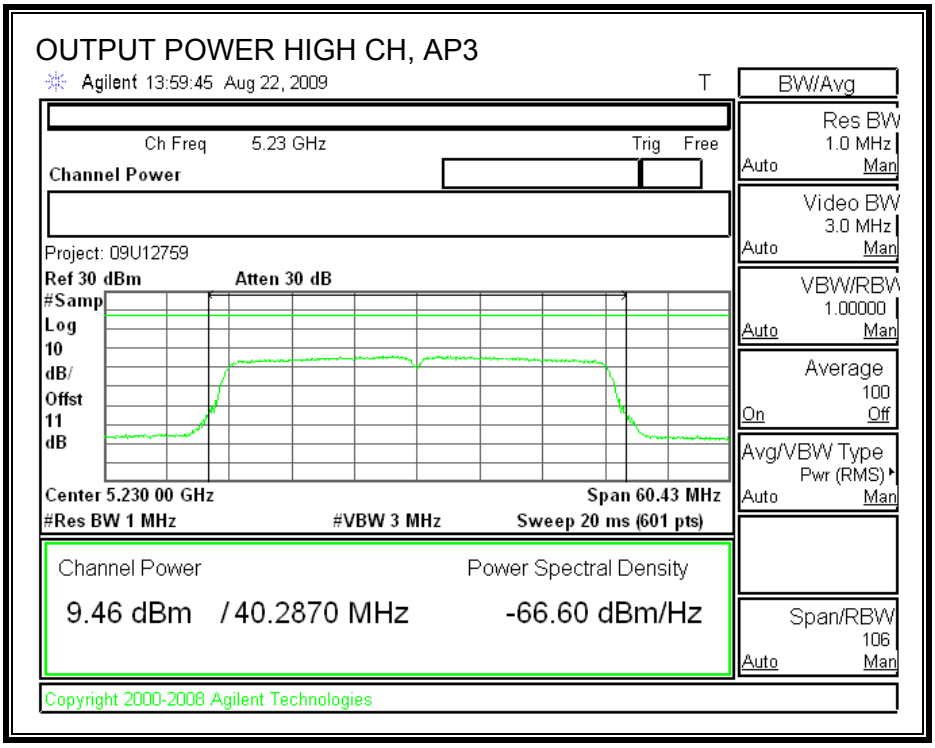
AP2 OUTPUT POWER





AP3 OUTPUT POWER





7.6.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

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

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

TEST PROCEDURE

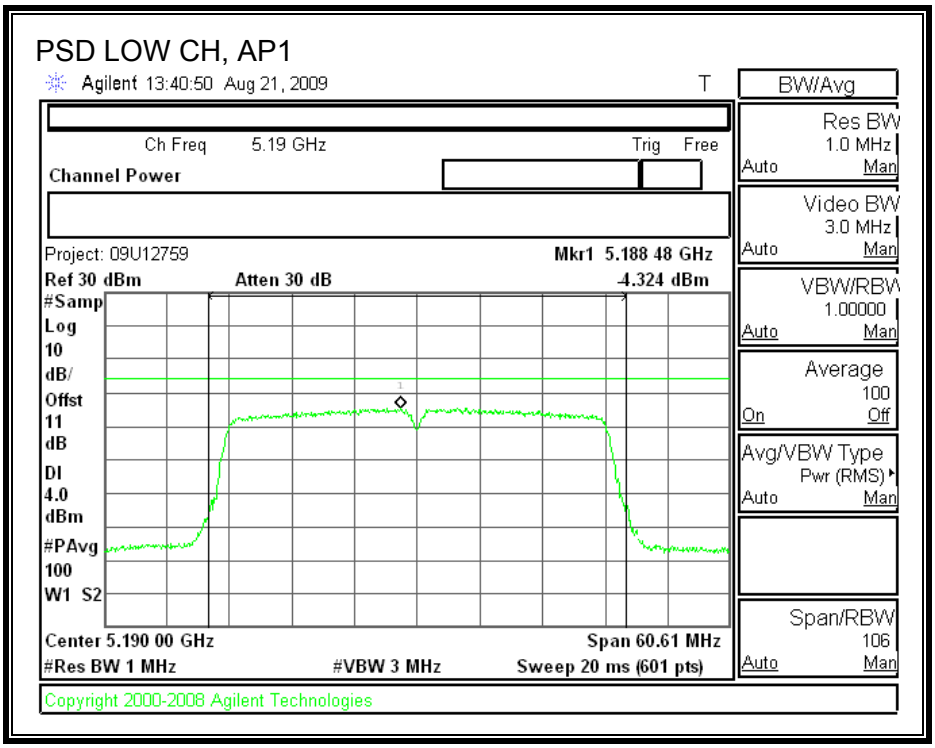
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

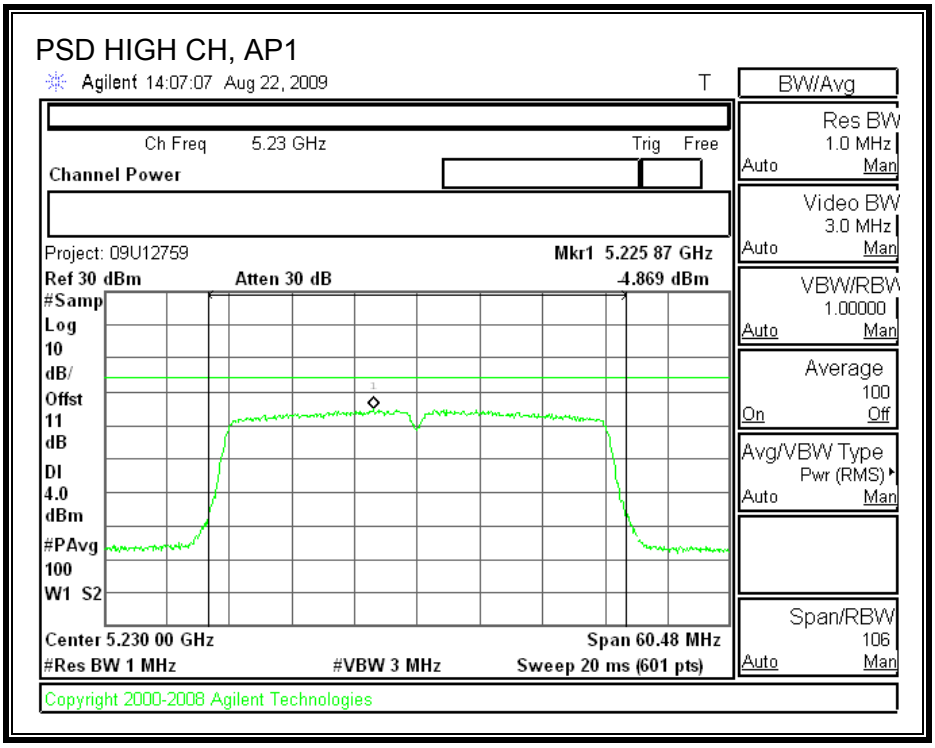
RESULTS

Channel	Frequency (MHz)	AP1 PPSD (dBm)	AP2 PPSD (dBm)	AP3 PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-4.324	-4.864	-5.718	4	-8.32
High	5230	-4.869	-5.820	-4.412	4	-8.41

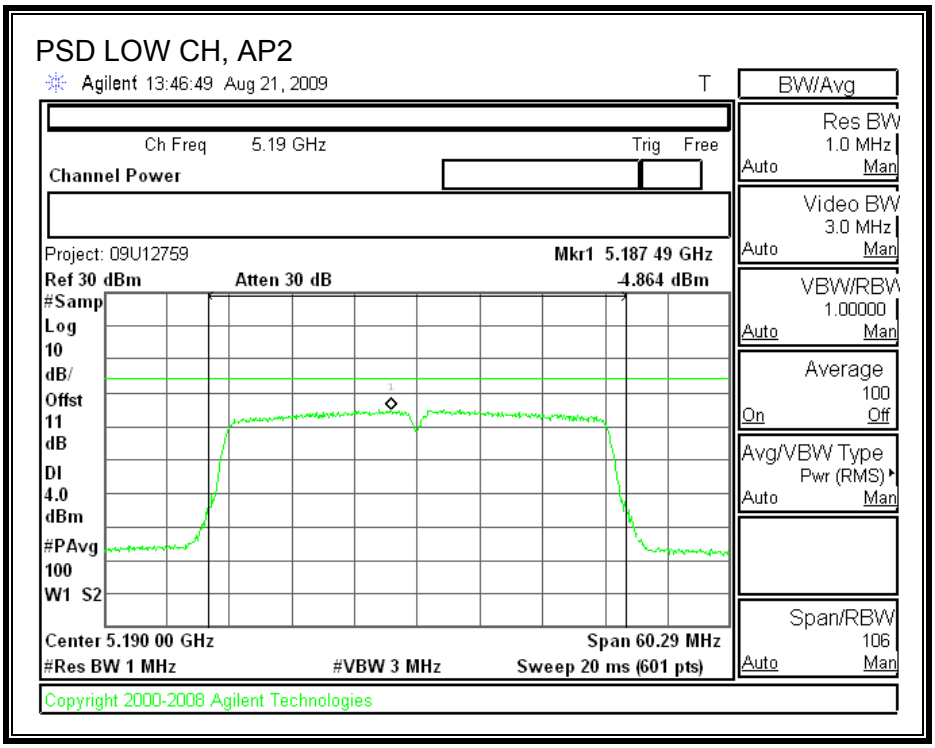
Channel	Frequency (MHz)	PPSD With Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-5.763	4	-9.76
High	5230	-4.179	4	-8.18

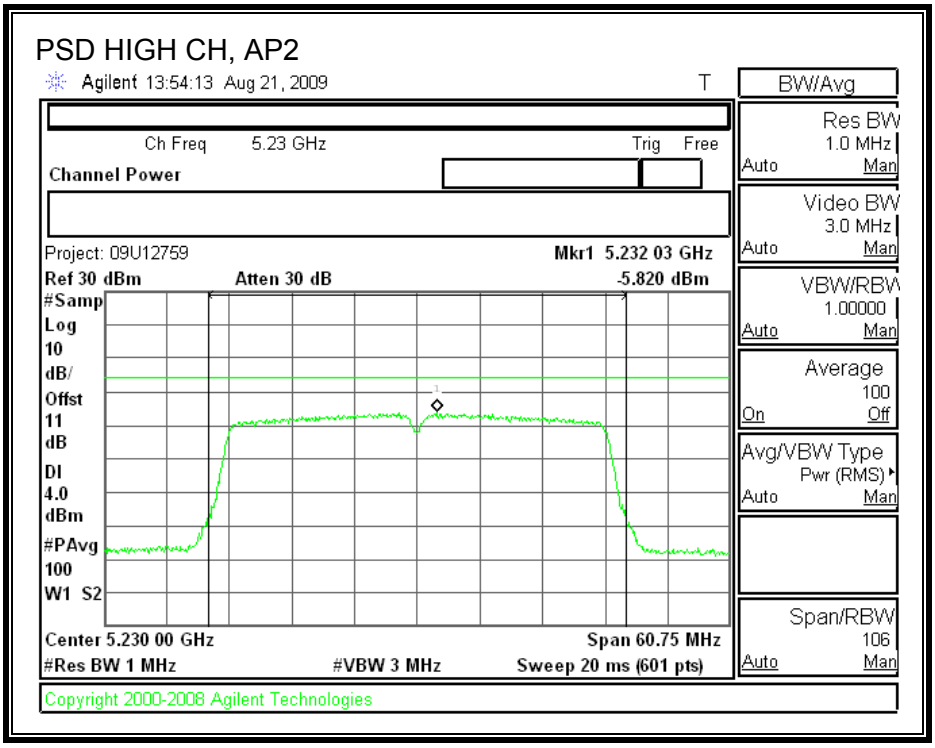
AP1 POWER SPECTRAL DENSITY



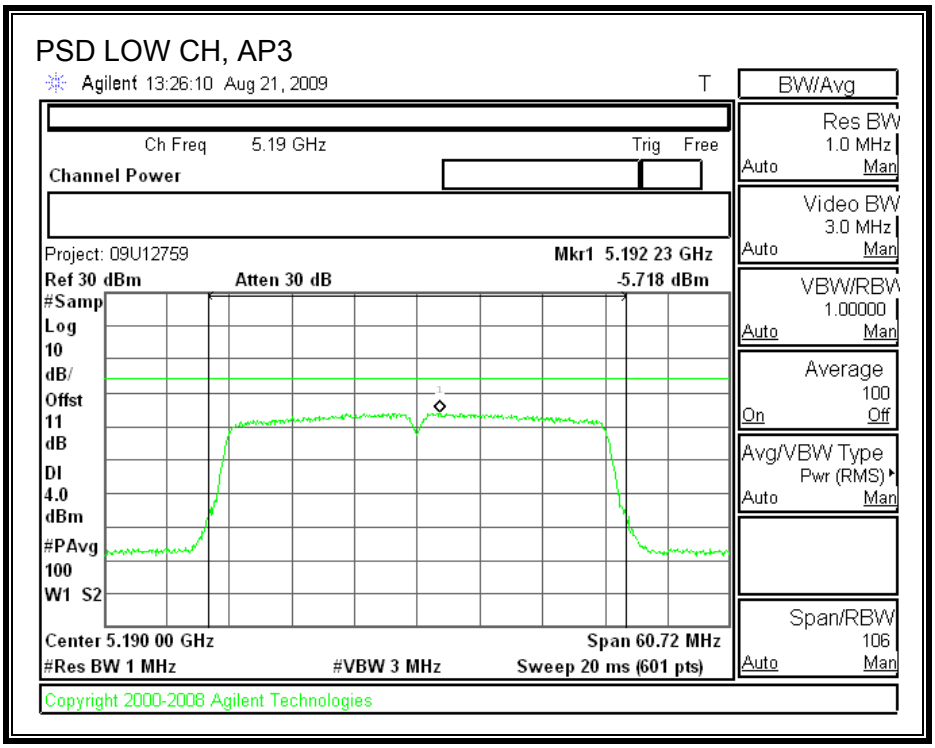


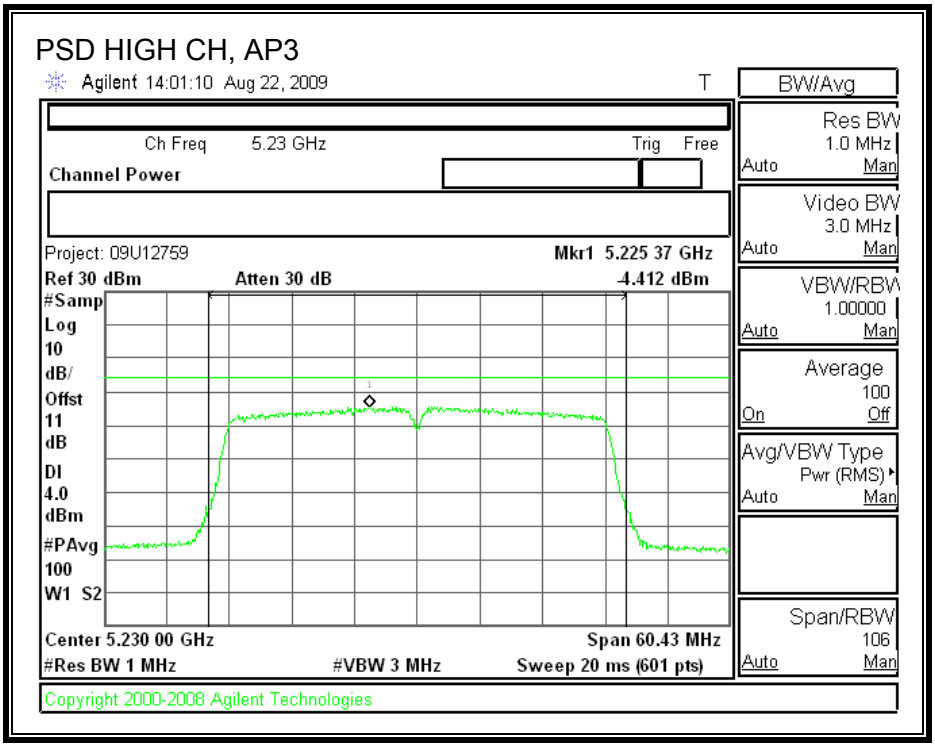
AP2 POWER SPECTRAL DENSITY



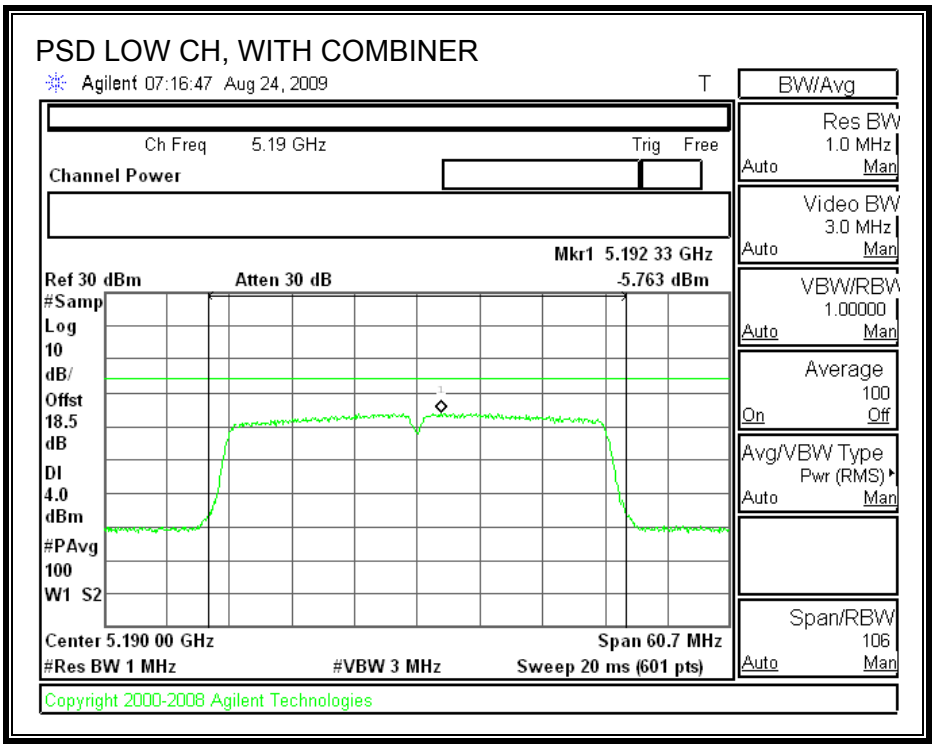


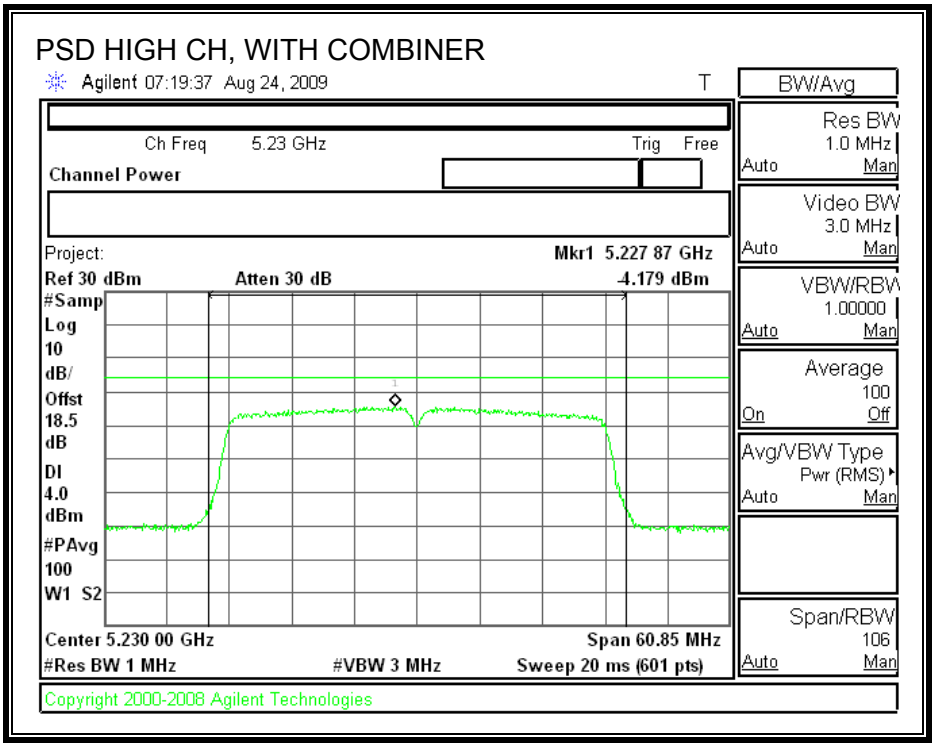
AP3 POWER SPECTRAL DENSITY





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

AP1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	7.810	13	-5.19
High	5230	7.275	13	-5.73

AP2

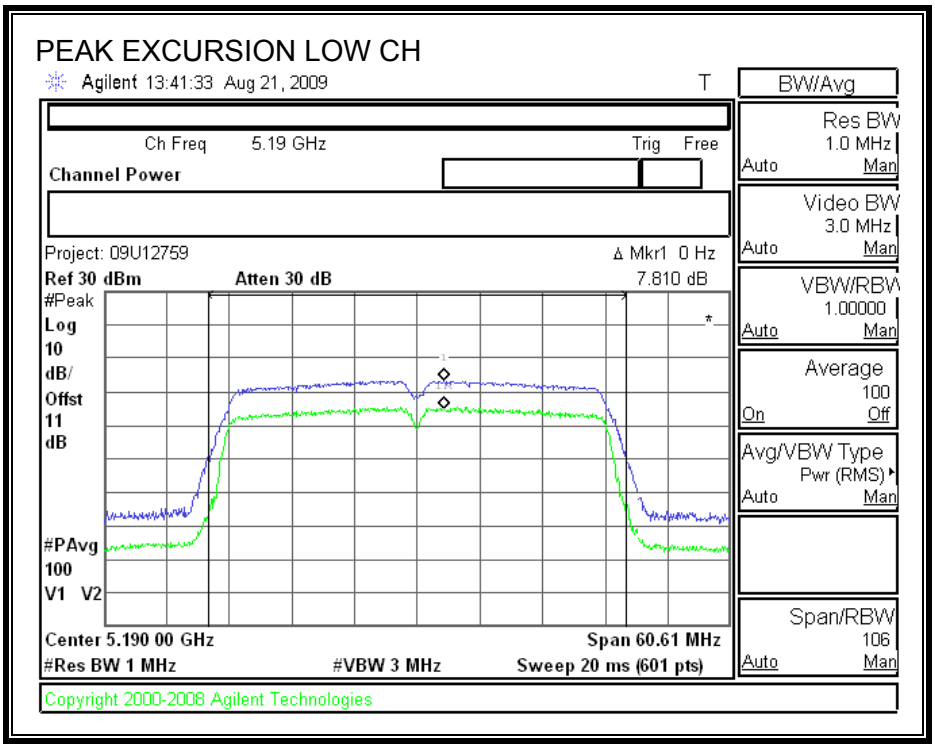
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	7.412	13	-5.59
High	5230	7.929	13	-5.07

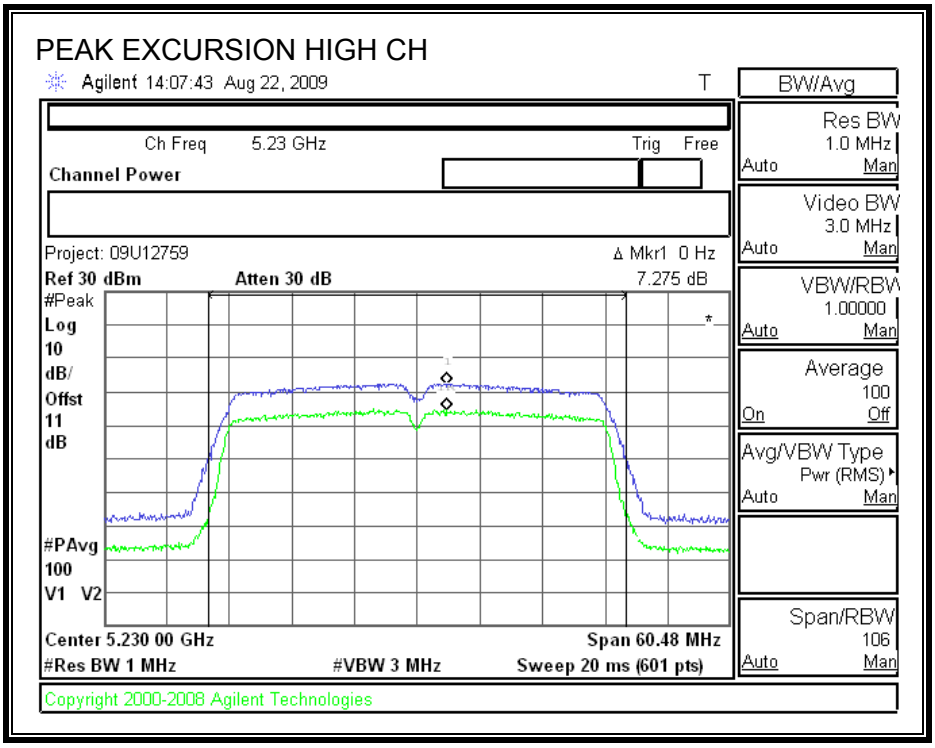
AP3

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	8.142	13	-4.86
High	5230	8.371	13	-4.63

AP1

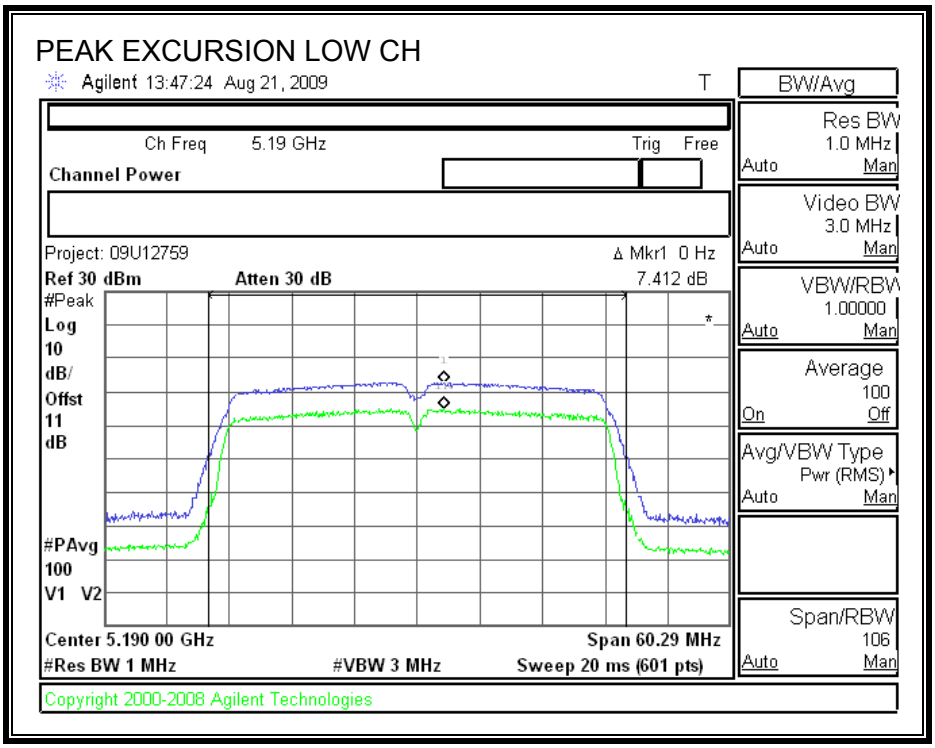
PEAK EXCURSION

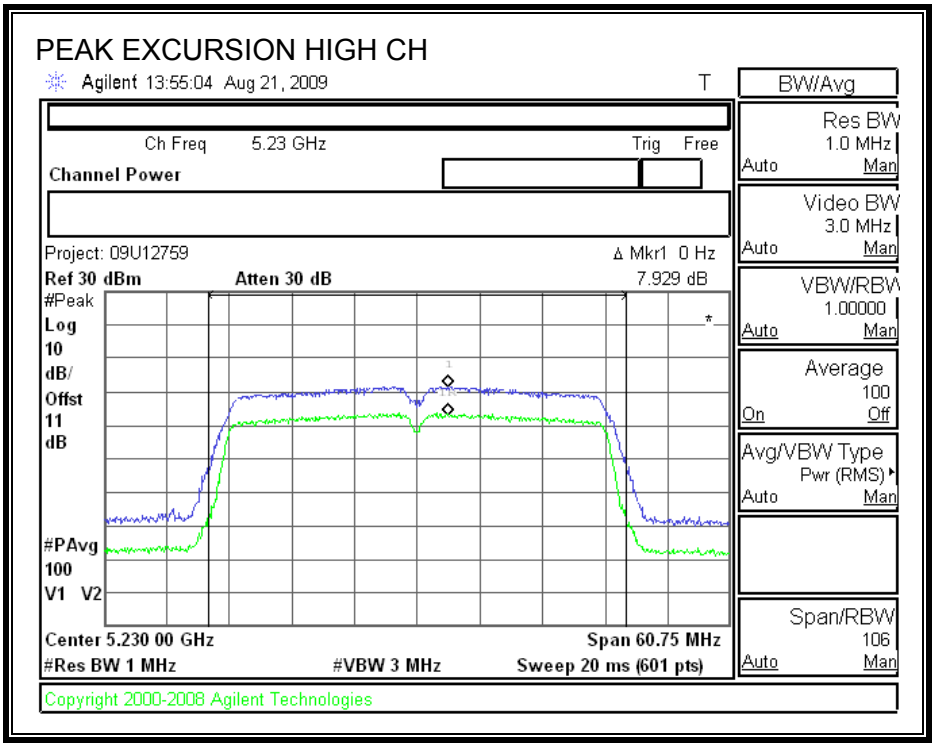




AP2

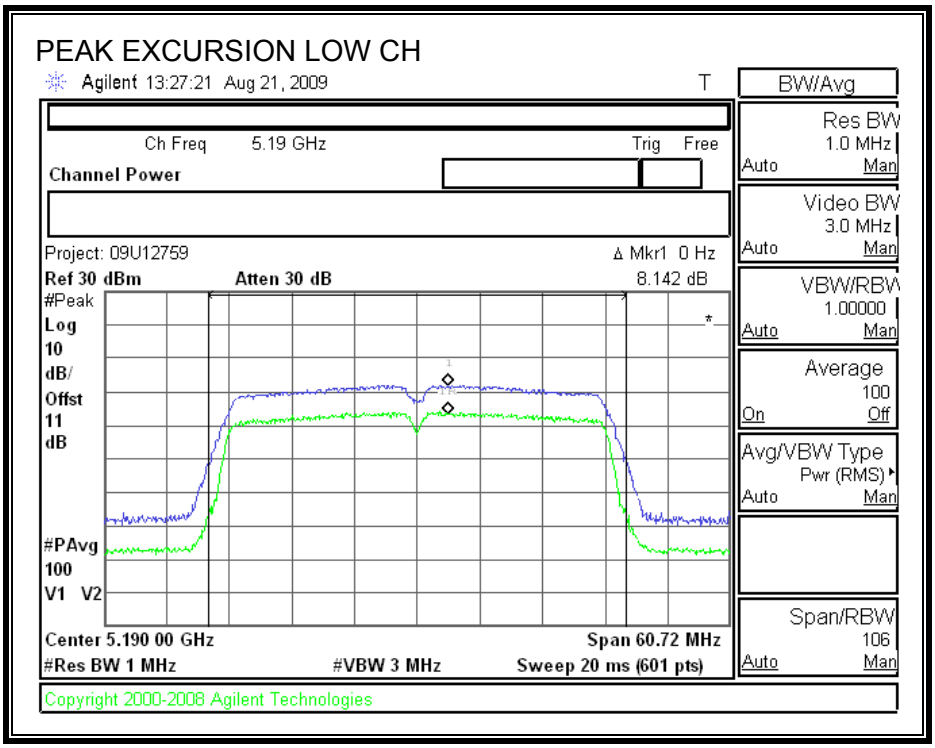
PEAK EXCURSION



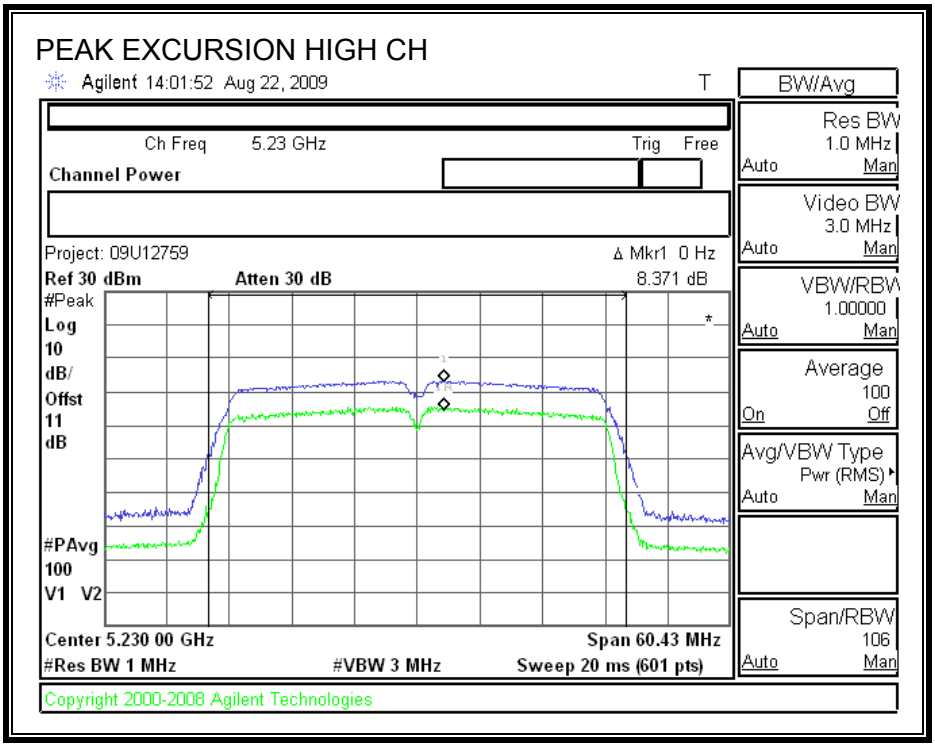


AP3

PEAK EXCURSION



PEAK EXCURSION HIGH CH



7.6.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

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

TEST PROCEDURE

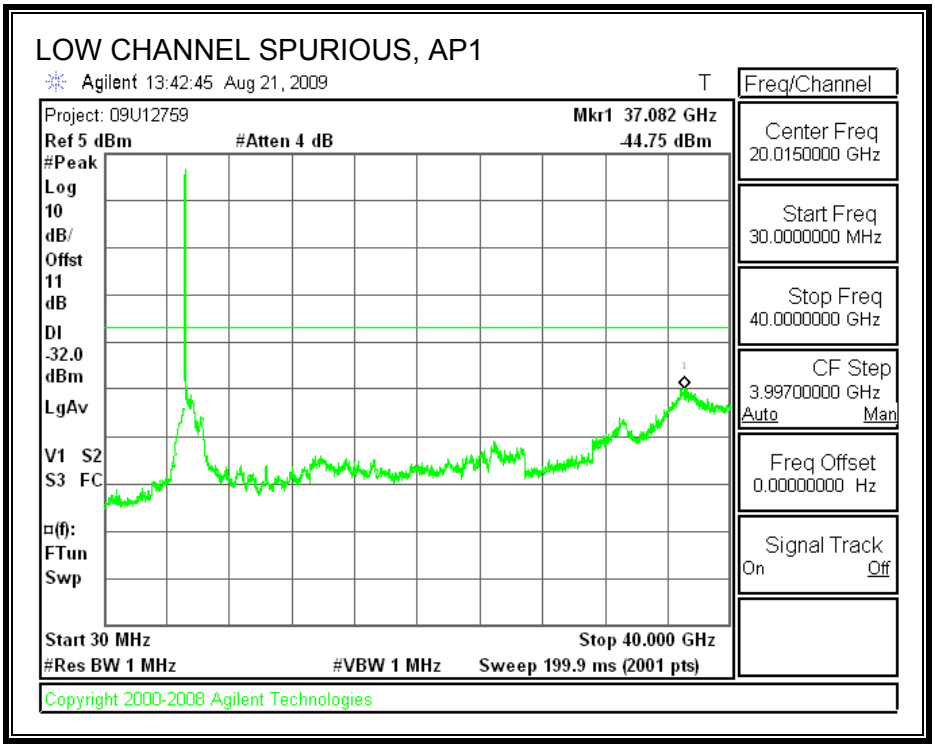
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

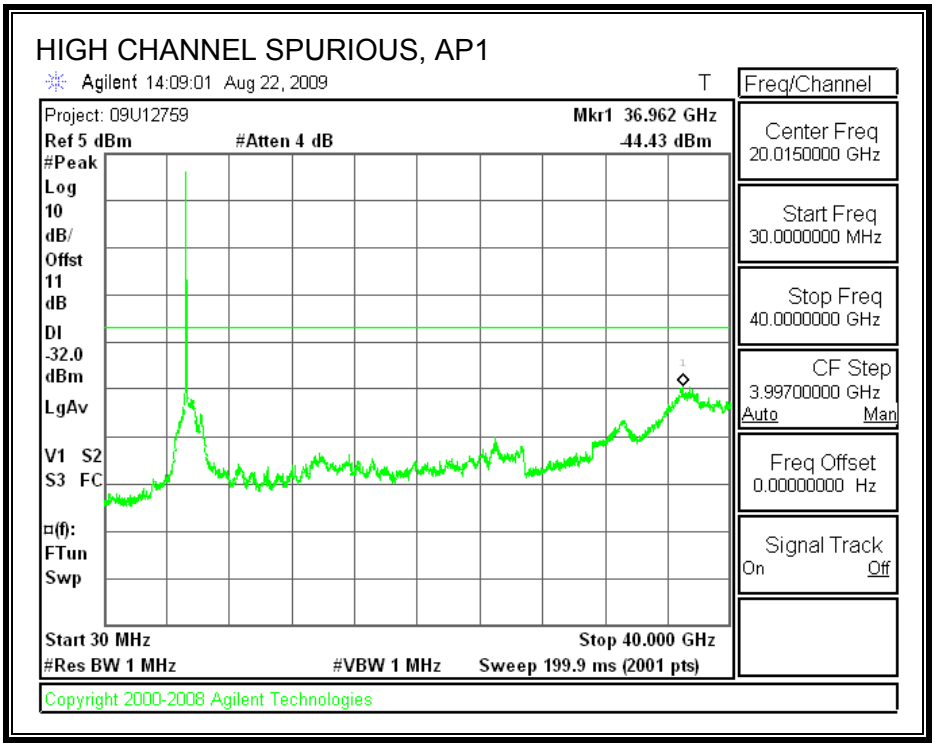
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

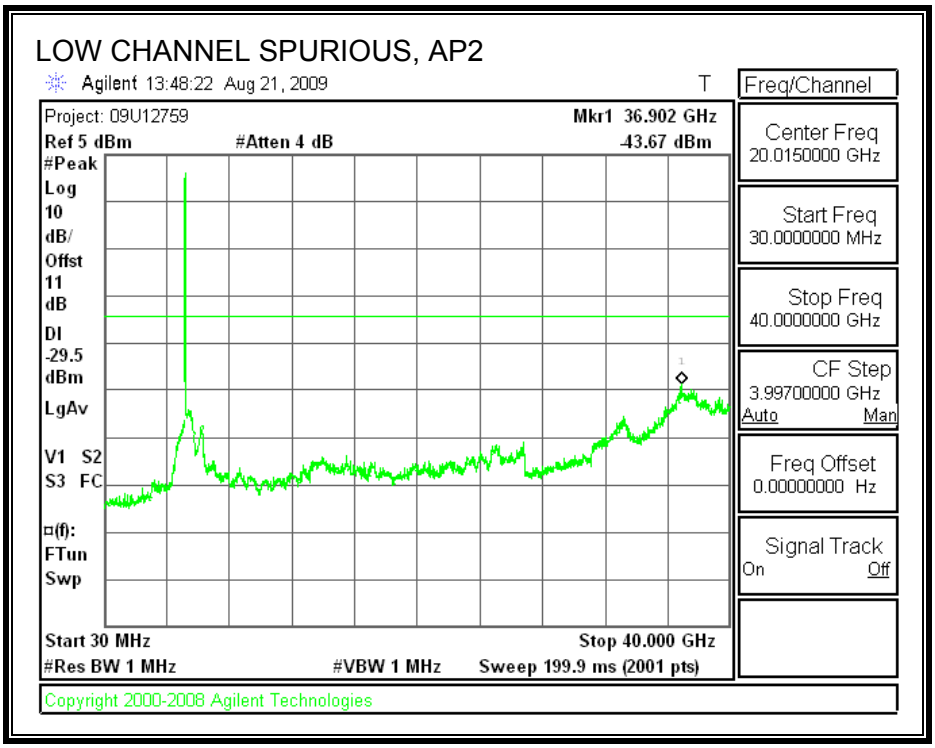
AP1 SPURIOUS EMISSIONS



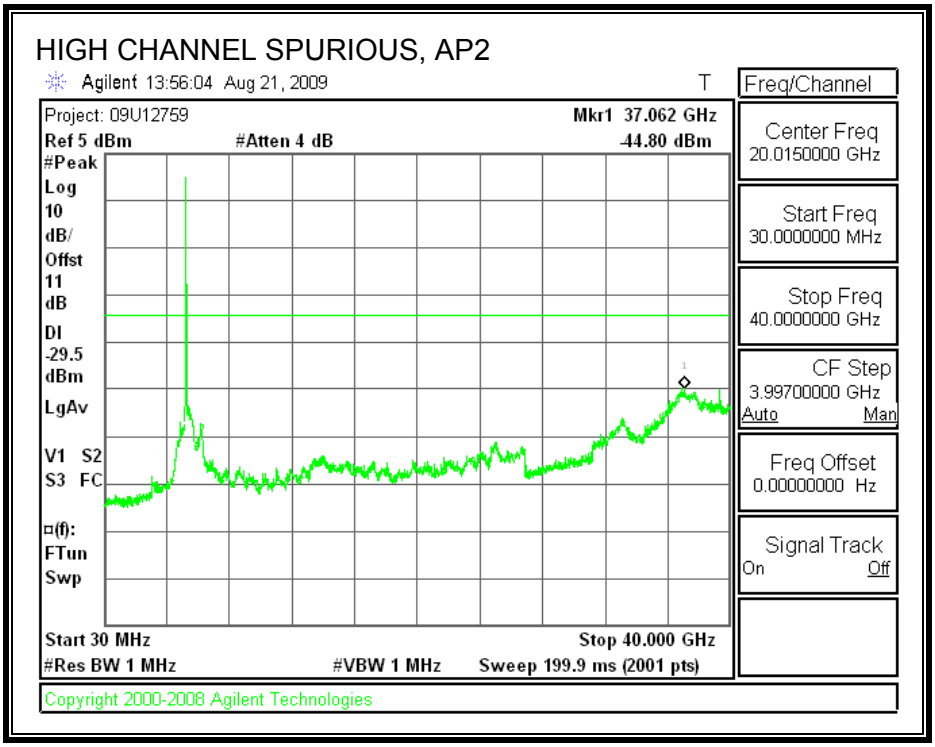
HIGH CHANNEL SPURIOUS, AP1



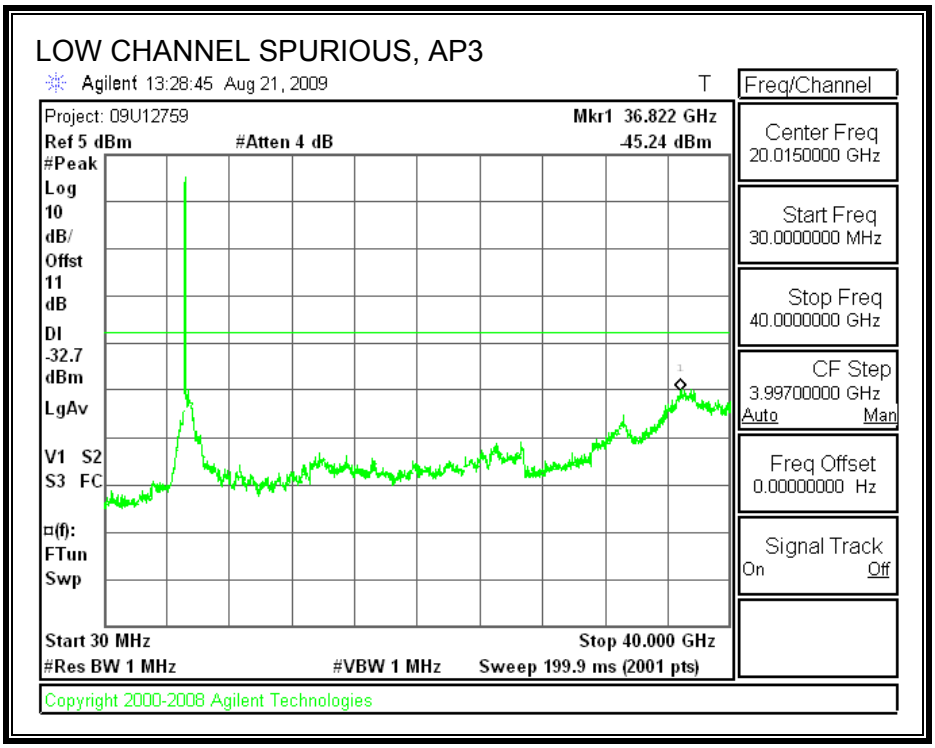
AP2 SPURIOUS EMISSIONS



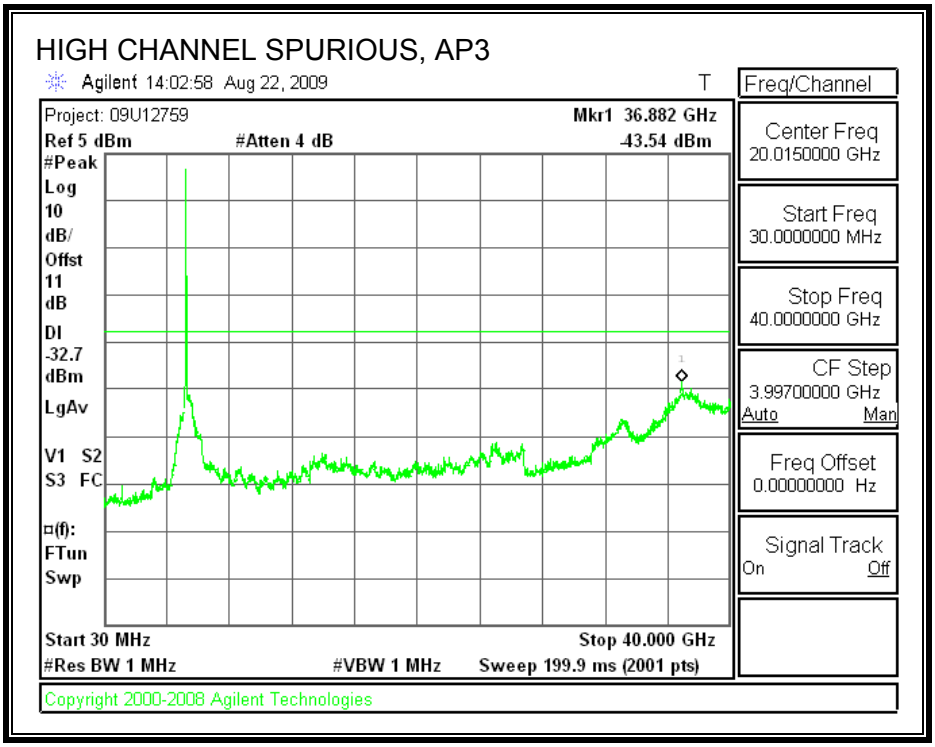
HIGH CHANNEL SPURIOUS, AP2



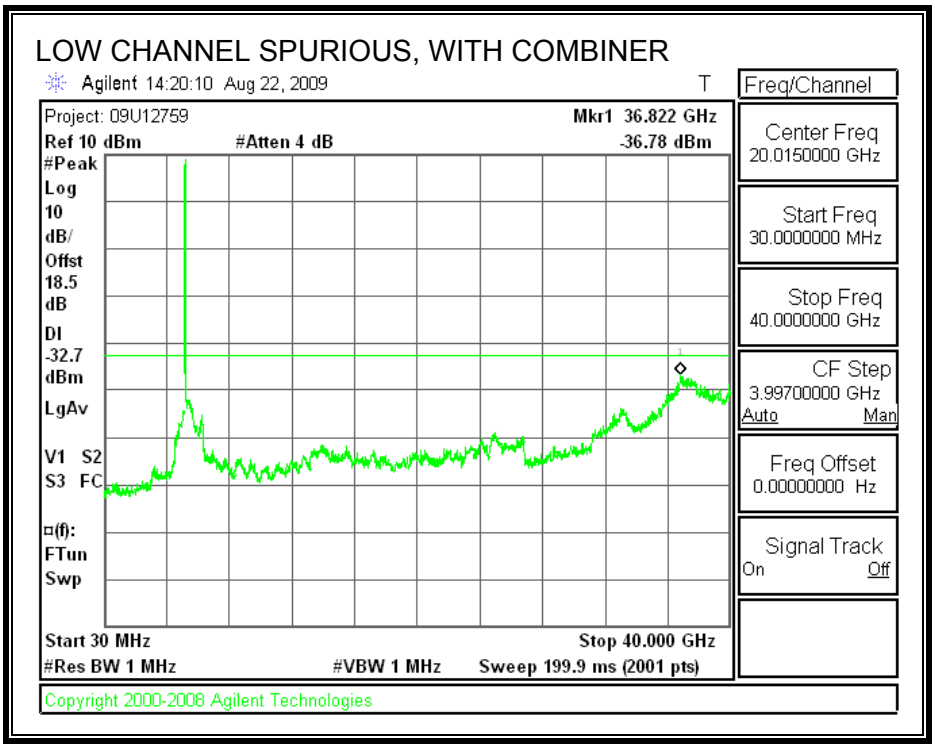
AP3 SPURIOUS EMISSIONS



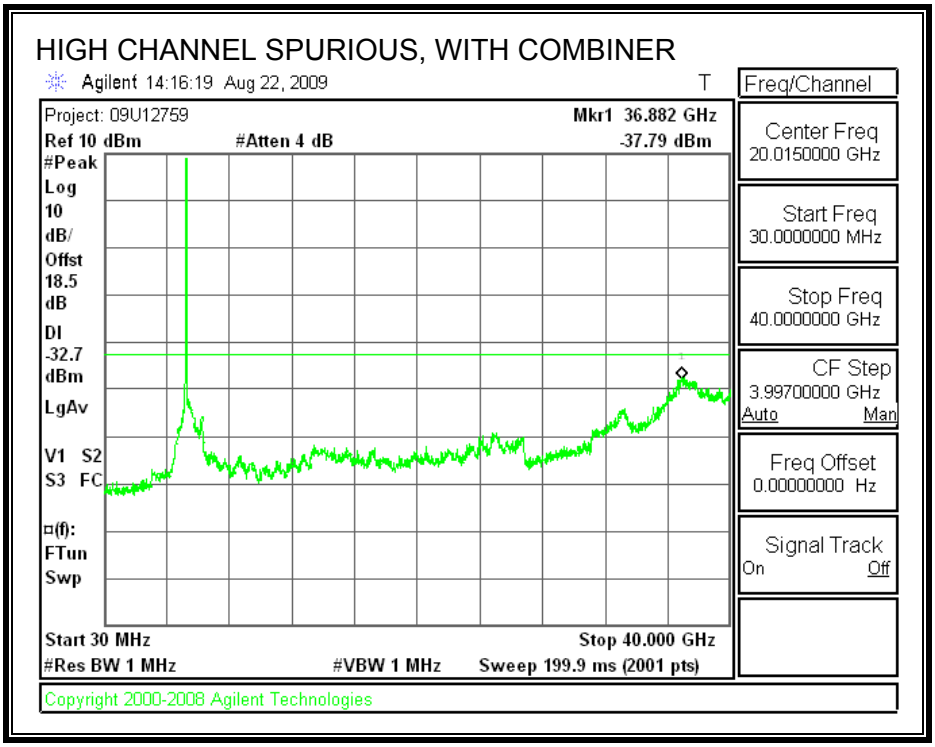
HIGH CHANNEL SPURIOUS, AP3



SPURIOUS EMISSIONS WITH COMBINER



HIGH CHANNEL SPURIOUS, WITH COMBINER



7.7. 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

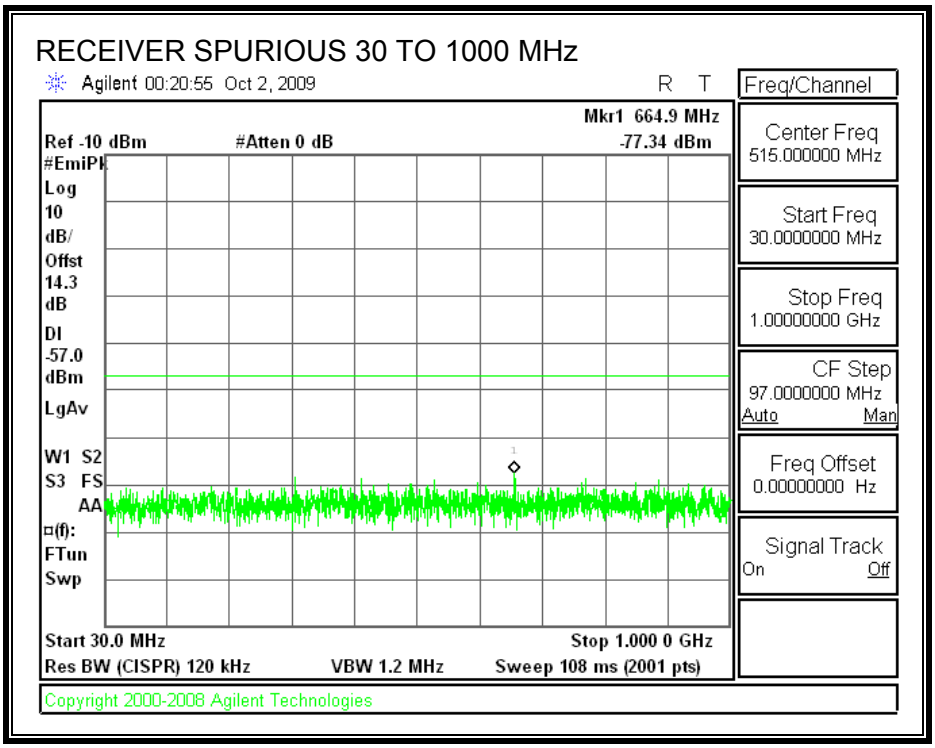
IC RSS-GEN 4.10, Conducted Method

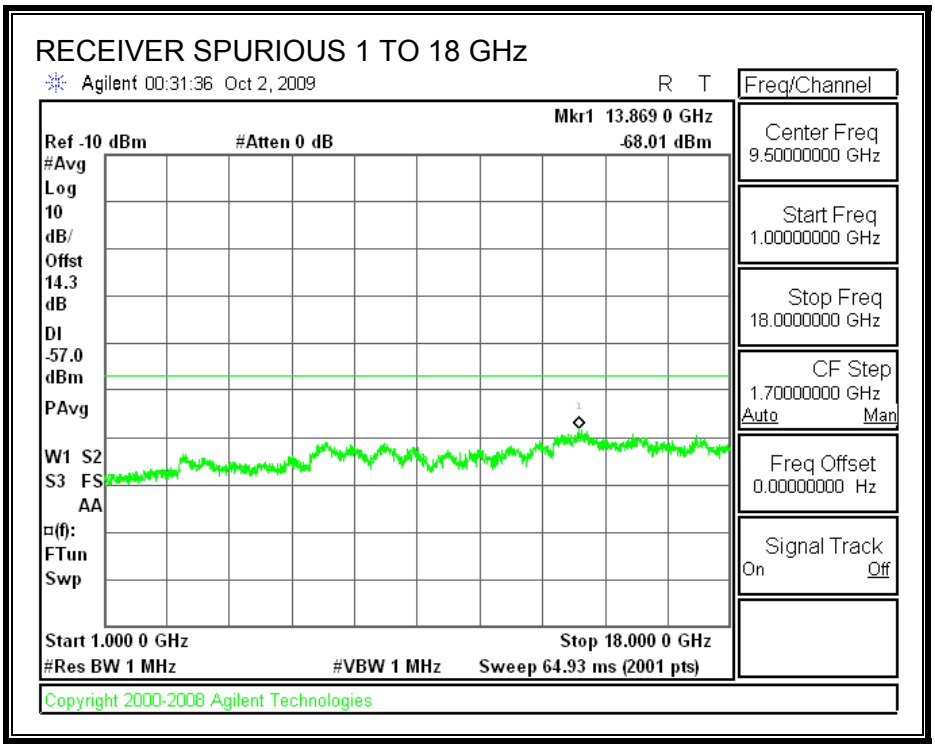
The receiver antenna port is connected to a spectrum analyzer.

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

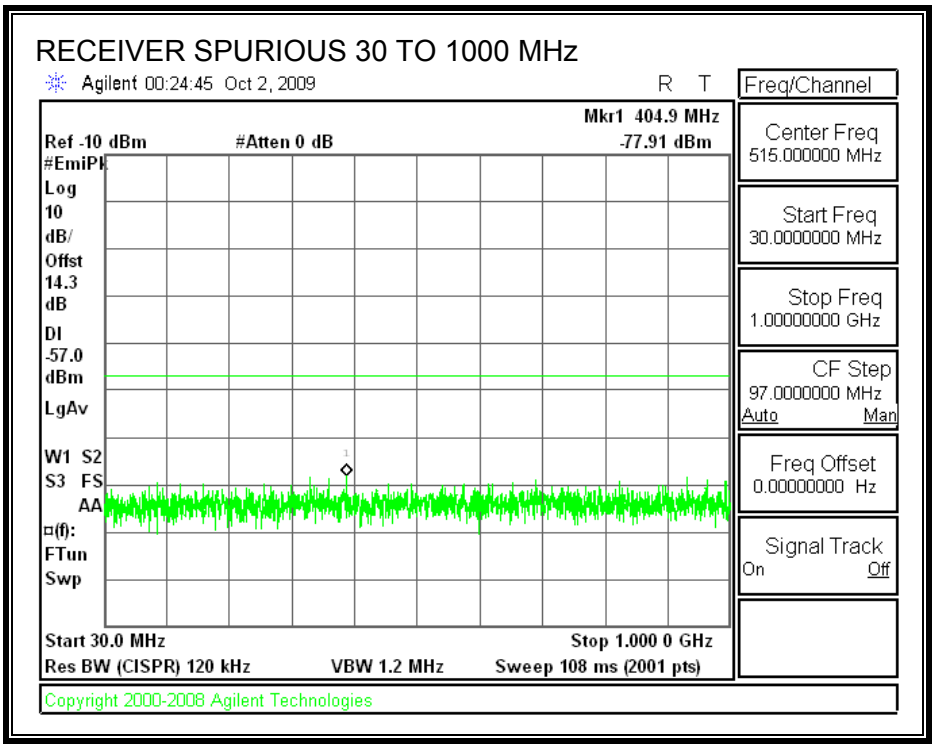
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

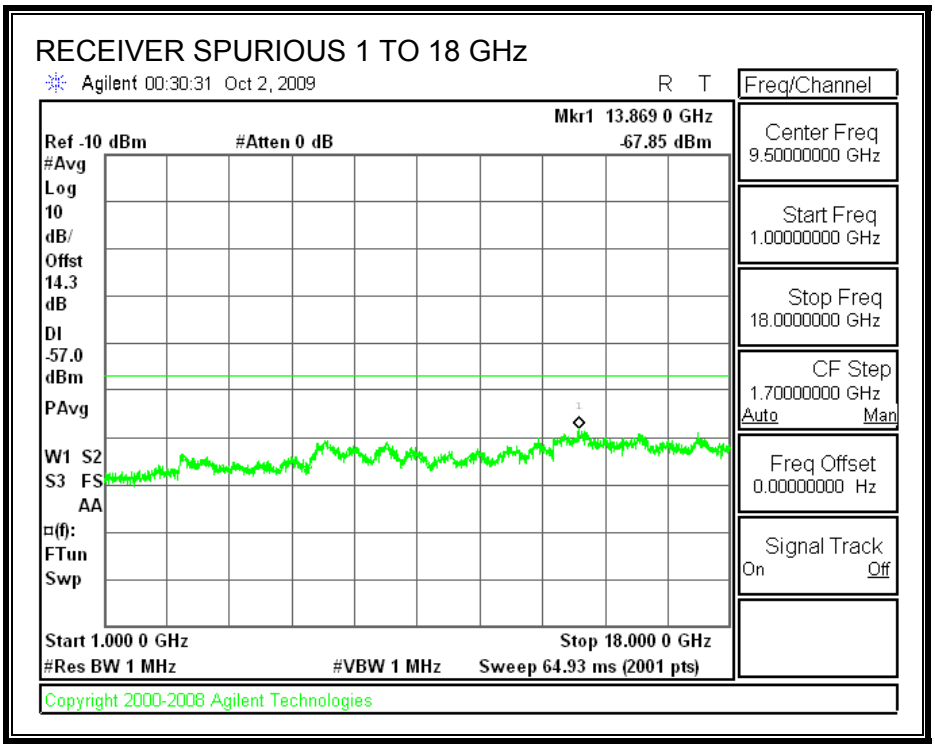
RECEIVER SPURIOUS EMISSIONS FOR 802.11a MODE IN THE 5.2 GHz BAND



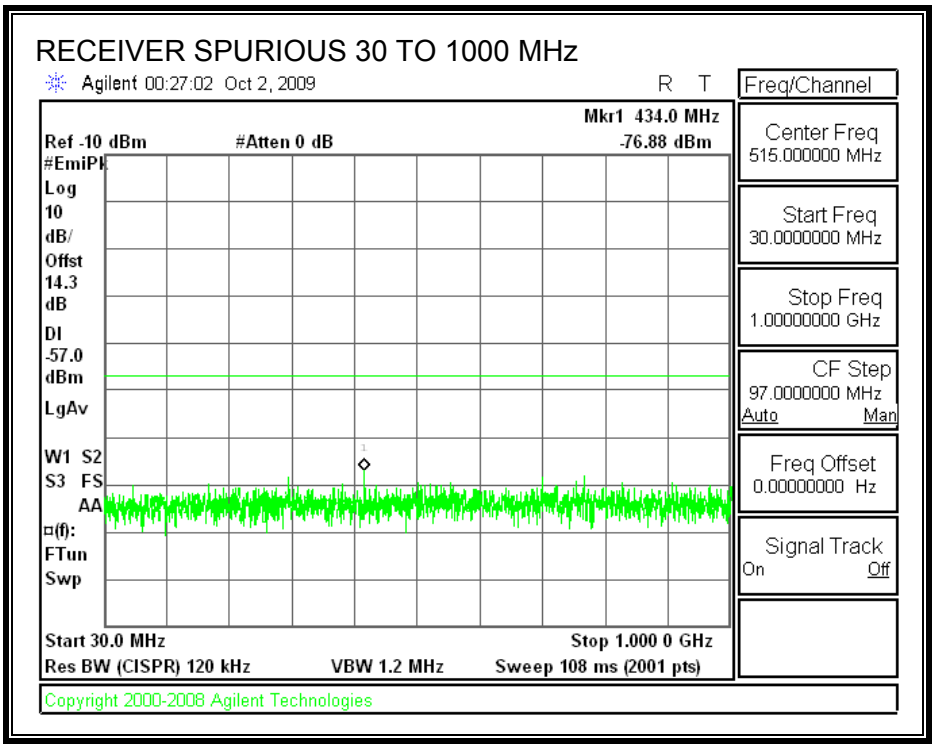


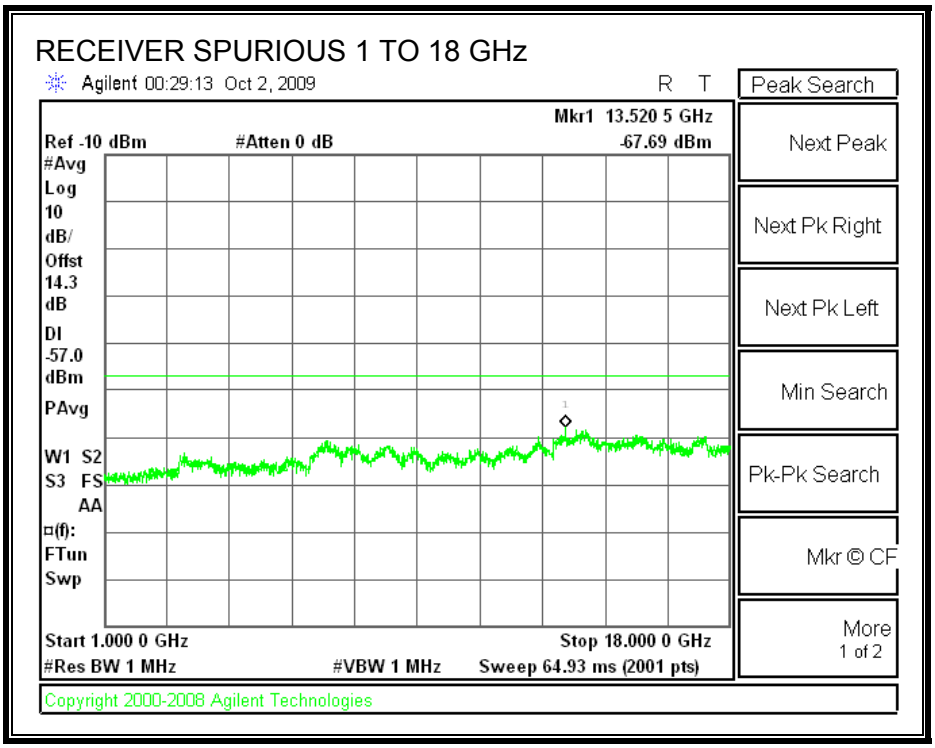
RECEIVER SPURIOUS EMISSIONS FOR 802.11n HT20 MODE IN THE 5.2 GHz BAND





RECEIVER SPURIOUS EMISSIONS FOR 802.11n HT40 MODE IN THE 5.2 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.

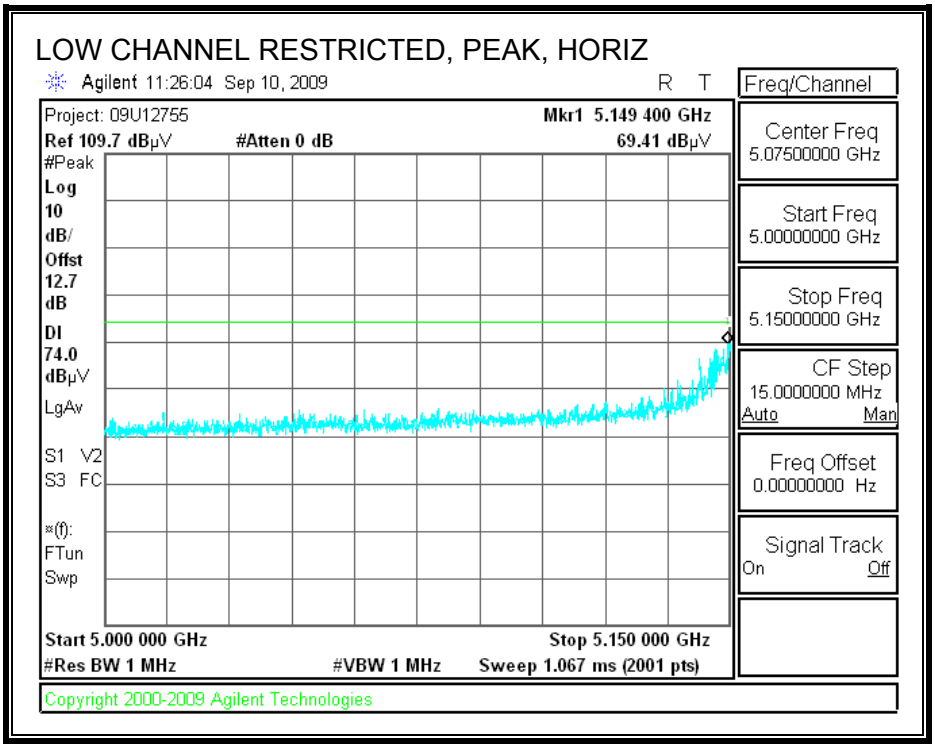
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

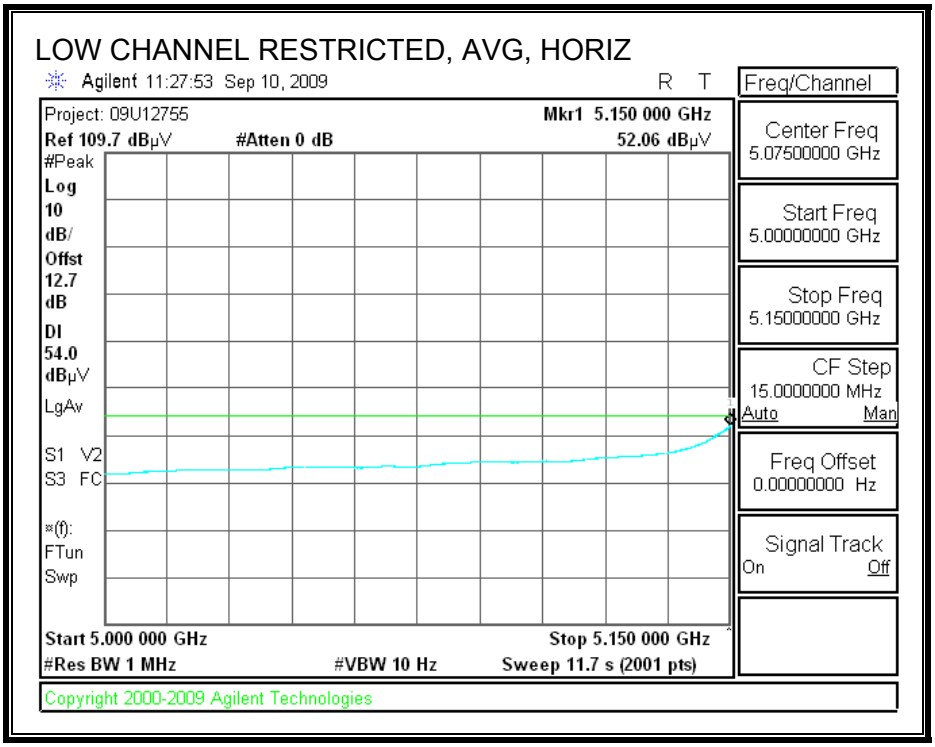
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

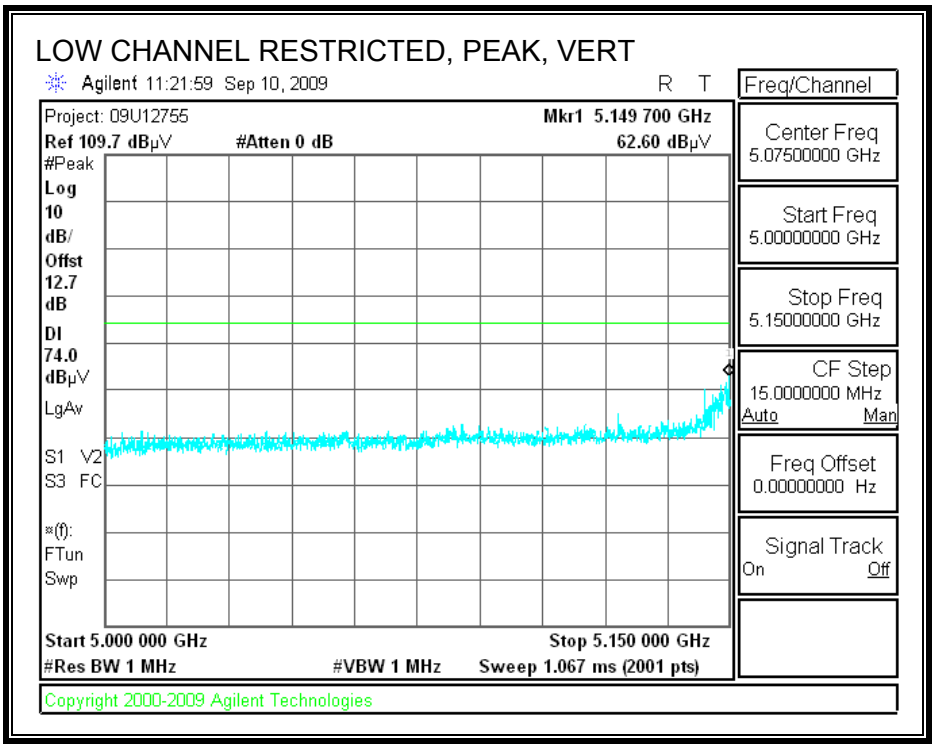
8.2.1. TX ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND

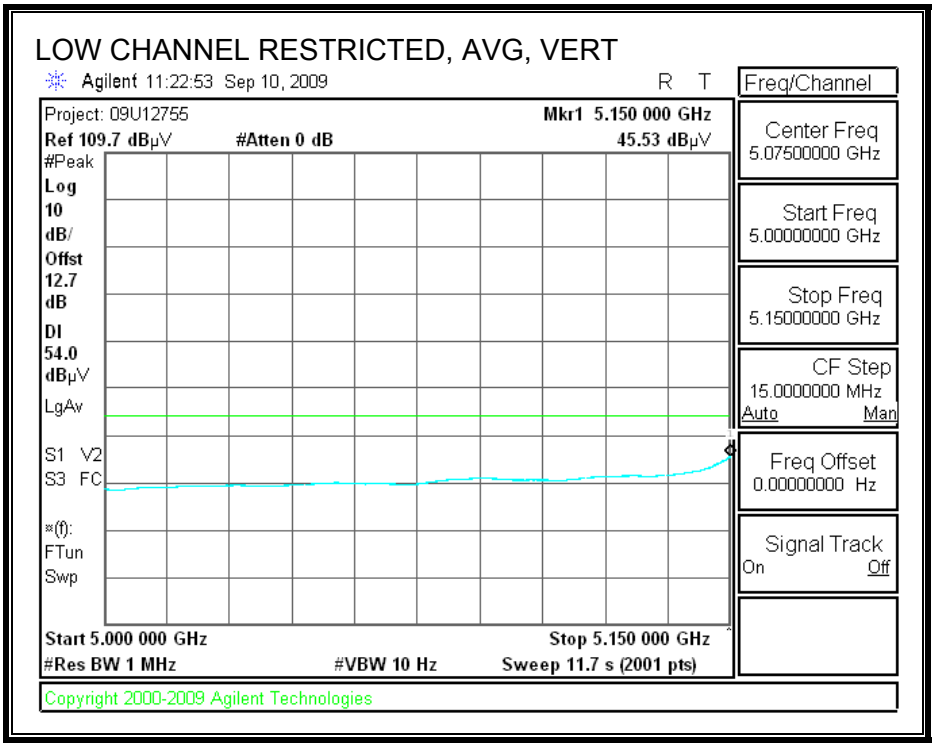
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: MENGISTU MEKURIA
Date: 9/11/2009
Project #: 09U12755
Company: APPLE INC.
EUT Description: 3x3 WIRELESS ACCESS POINT
EUT M/N: A1355
Test Target: FCC CFR47 PART 15
Mode Oper: TX, 11a MODE

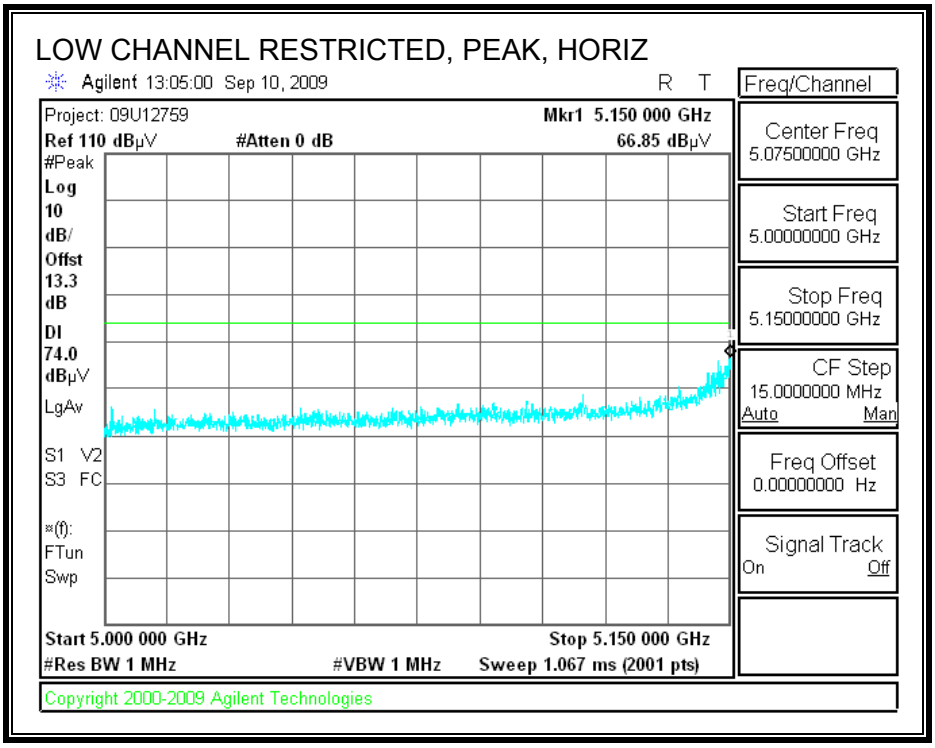
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

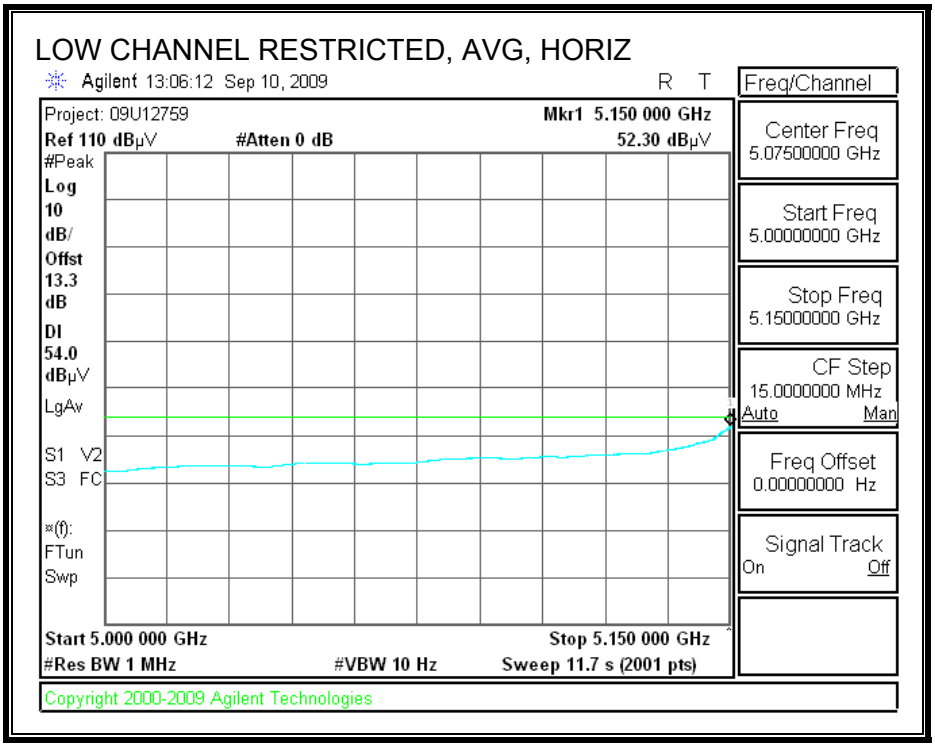
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel (5180.00 MHz)															
10.360	3.0	40.8	37.7	8.9	-36.8	0.0	0.0	50.5	74.0	-23.5	H	P	138.4	29.3	
10.360	3.0	29.0	37.7	8.9	-36.8	0.0	0.0	38.8	54.0	-15.2	H	A	138.4	29.3	
15.540	3.0	42.1	38.7	11.3	-34.8	0.0	0.0	57.3	74.0	-16.7	H	P	143.3	342.0	
15.540	3.0	29.6	38.7	11.3	-34.8	0.0	0.0	44.8	54.0	-9.2	H	A	143.3	342.0	
10.360	3.0	38.1	37.7	8.9	-36.8	0.0	0.0	47.9	74.0	-26.1	V	P	143.6	231.6	
10.360	3.0	26.7	37.7	8.9	-36.8	0.0	0.0	36.4	54.0	-17.6	V	A	143.6	231.6	
15.540	3.0	43.9	38.7	11.3	-34.8	0.0	0.0	59.1	74.0	-14.9	V	P	129.5	295.9	
15.540	3.0	31.3	38.7	11.3	-34.8	0.0	0.0	46.5	54.0	-7.5	V	A	129.5	295.9	
Mid Channel (5200.00 MHz)															
10.400	3.0	39.3	37.7	8.9	-36.8	0.0	0.0	49.2	74.0	-24.8	V	P	135.5	224.4	
10.400	3.0	27.1	37.7	8.9	-36.8	0.0	0.0	37.0	54.0	-17.0	V	A	135.5	224.4	
15.600	3.0	41.0	38.5	11.4	-34.8	0.0	0.0	56.1	74.0	-17.9	V	P	123.0	267.9	
15.600	3.0	28.2	38.5	11.4	-34.8	0.0	0.0	43.3	54.0	-10.7	V	A	123.0	267.9	
10.400	3.0	41.9	37.7	8.9	-36.8	0.0	0.0	51.8	74.0	-22.2	H	P	141.0	26.5	
10.400	3.0	29.8	37.7	8.9	-36.8	0.0	0.0	39.6	54.0	-14.4	H	A	141.0	26.5	
15.600	3.0	41.5	38.5	11.4	-34.8	0.0	0.0	56.6	74.0	-17.4	H	P	150.3	1.0	
15.600	3.0	28.5	38.5	11.4	-34.8	0.0	0.0	43.6	54.0	-10.4	H	A	150.3	1.0	
Hi Channel (5240.00 MHz)															
10.480	3.0	38.2	37.7	9.0	-36.7	0.0	0.0	48.2	74.0	-25.8	V	P	100.0	221.2	
10.480	3.0	25.7	37.7	9.0	-36.7	0.0	0.0	35.6	54.0	-18.4	V	A	100.0	221.2	
15.720	3.0	39.0	38.2	11.4	-34.7	0.0	0.0	54.0	74.0	-20.0	V	P	109.3	247.4	
15.720	3.0	25.9	38.2	11.4	-34.7	0.0	0.0	40.8	54.0	-13.2	V	A	109.3	247.4	
10.480	3.0	39.0	37.7	9.0	-36.7	0.0	0.0	49.0	74.0	-25.0	H	P	123.2	92.0	
10.480	3.0	27.3	37.7	9.0	-36.7	0.0	0.0	37.3	54.0	-16.7	H	A	123.2	92.0	
15.720	3.0	38.5	38.2	11.4	-34.7	0.0	0.0	53.4	74.0	-20.6	H	P	142.3	358.3	
15.720	3.0	26.4	38.2	11.4	-34.7	0.0	0.0	41.3	54.0	-12.7	H	A	142.3	358.3	

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

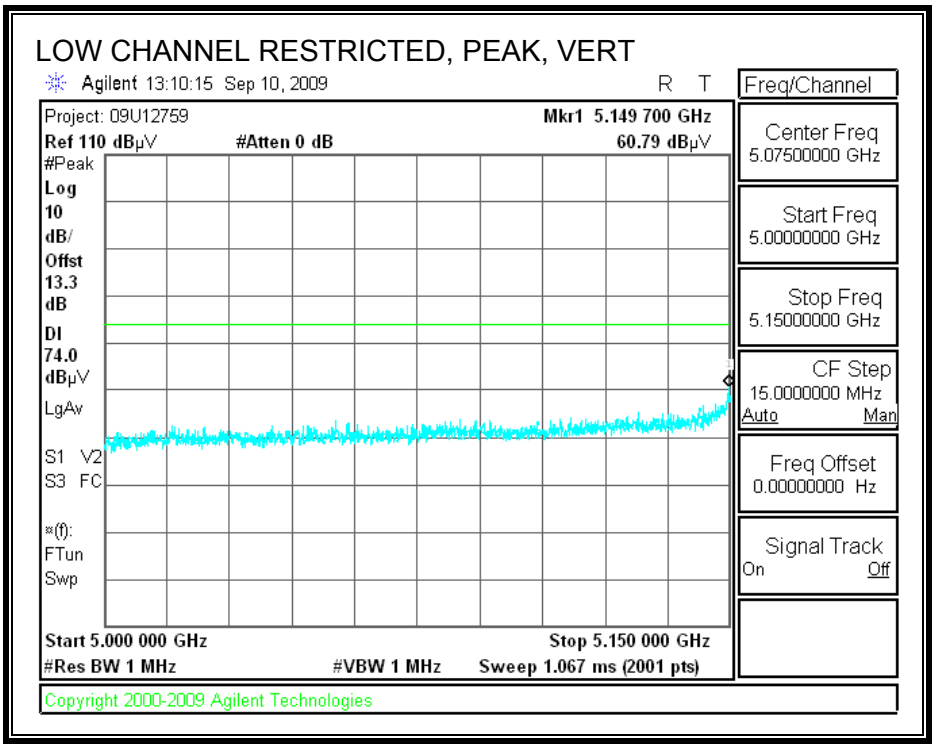
8.2.2. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN LOWER 5.2 GHz BAND

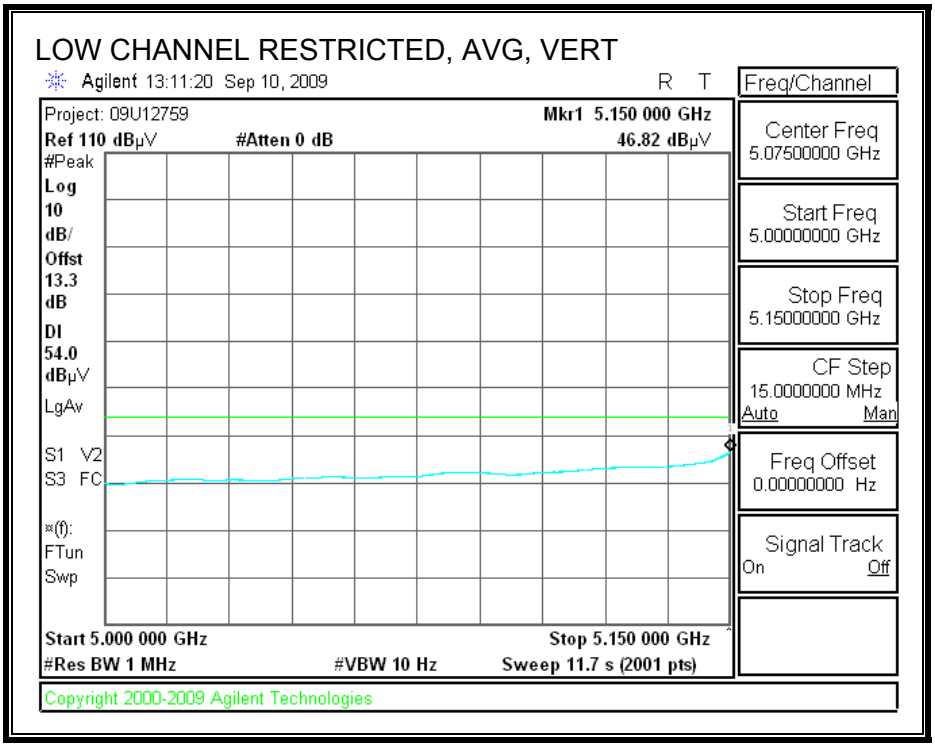
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: MENGISTU MEKURIA
Date: 9/11/2009
Project #: 09U12755
Company: APPLE INC.
EUT Description: 3x3 WIRELESS ACCESS POINT
EUT M/N: A1355
Test Target: FCC CFR47 PART 15
Mode Oper: TX, HT20 MODE

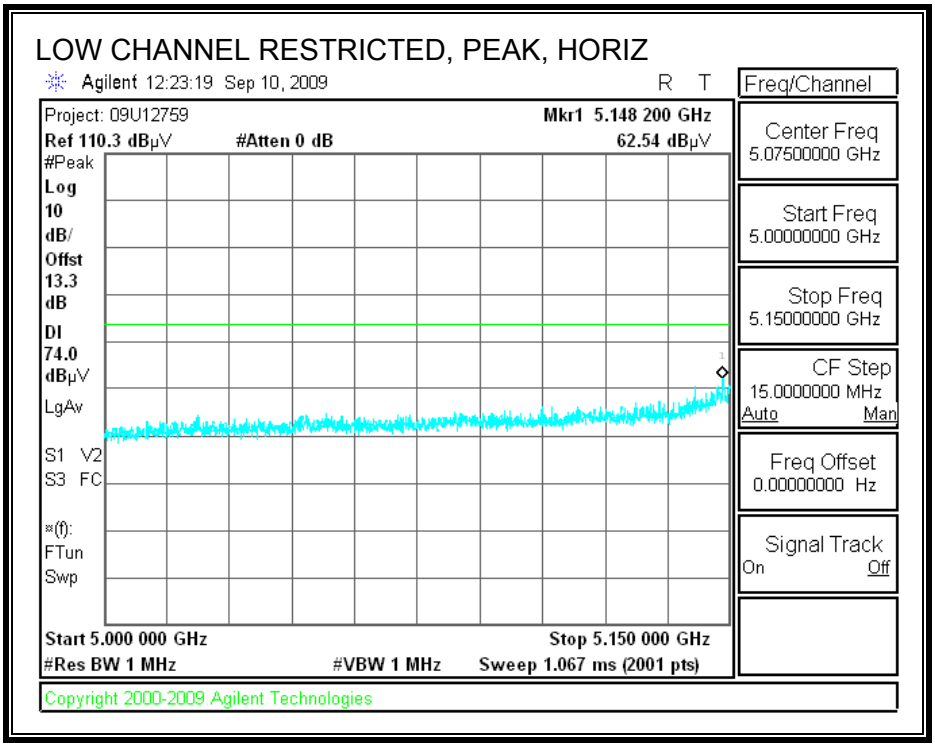
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

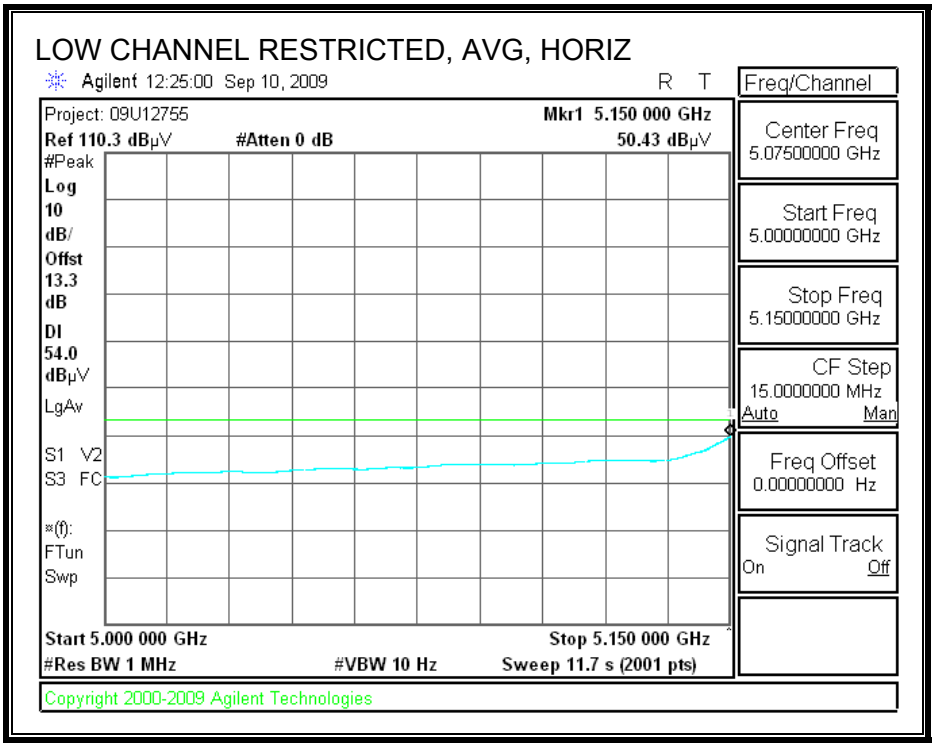
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel (5180.00 MHz)															
10.360	3.0	38.2	37.7	8.9	-36.8	0.0	0.0	48.0	74.0	-26.0	V	P	131.6	336.3	
10.360	3.0	26.6	37.7	8.9	-36.8	0.0	0.0	36.3	54.0	-17.7	V	A	131.6	336.3	
15.540	3.0	43.5	38.7	11.3	-34.8	0.0	0.0	58.6	74.0	-15.4	V	P	124.0	301.9	
15.540	3.0	28.9	38.7	11.3	-34.8	0.0	0.0	44.1	54.0	-9.9	V	A	124.0	301.9	
10.360	3.0	41.1	37.7	8.9	-36.8	0.0	0.0	50.8	74.0	-23.2	H	P	140.7	31.6	
10.360	3.0	28.9	37.7	8.9	-36.8	0.0	0.0	38.6	54.0	-15.4	H	A	140.7	31.6	
15.540	3.0	43.2	38.7	11.3	-34.8	0.0	0.0	58.4	74.0	-15.6	H	P	158.3	350.0	
15.540	3.0	29.1	38.7	11.3	-34.8	0.0	0.0	44.3	54.0	-9.7	H	A	158.3	350.0	
Mid Channel (5200.00 MHz)															
10.400	3.0	41.1	37.7	8.9	-36.8	0.0	0.0	50.9	74.0	-23.1	V	P	136.0	231.7	
10.400	3.0	27.8	37.7	8.9	-36.8	0.0	0.0	37.7	54.0	-16.3	V	A	136.0	231.7	
15.600	3.0	39.8	38.5	11.4	-34.8	0.0	0.0	54.9	74.0	-19.1	V	P	118.5	268.1	
15.600	3.0	27.0	38.5	11.4	-34.8	0.0	0.0	42.1	54.0	-11.9	V	A	118.5	268.1	
10.400	3.0	40.5	37.7	8.9	-36.8	0.0	0.0	50.4	74.0	-23.6	H	P	147.8	70.9	
10.400	3.0	28.9	37.7	8.9	-36.8	0.0	0.0	38.7	54.0	-15.3	H	A	147.8	70.9	
15.600	3.0	40.7	38.5	11.4	-34.8	0.0	0.0	55.8	74.0	-18.2	H	P	156.0	359.8	
15.600	3.0	27.6	38.5	11.4	-34.8	0.0	0.0	42.7	54.0	-11.3	H	A	156.0	359.8	
Hi Channel (5240.00 MHz)															
10.480	3.0	37.7	37.7	9.0	-36.7	0.0	0.0	47.7	74.0	-26.3	V	P	133.7	220.4	
10.480	3.0	25.4	37.7	9.0	-36.7	0.0	0.0	35.4	54.0	-18.6	V	A	133.7	220.4	
15.720	3.0	41.7	38.2	11.4	-34.7	0.0	0.0	56.6	74.0	-17.4	V	P	123.2	255.0	
15.720	3.0	27.4	38.2	11.4	-34.7	0.0	0.0	42.3	54.0	-11.7	V	A	123.2	255.0	
10.480	3.0	39.0	37.7	9.0	-36.7	0.0	0.0	49.0	74.0	-25.0	H	P	143.6	0.0	
10.480	3.0	26.2	37.7	9.0	-36.7	0.0	0.0	36.1	54.0	-17.9	H	A	143.6	0.0	
15.720	3.0	37.3	38.2	11.4	-34.7	0.0	0.0	52.2	74.0	-21.8	H	P	105.6	322.3	
15.720	3.0	24.5	38.2	11.4	-34.7	0.0	0.0	39.4	54.0	-14.6	H	A	105.6	322.3	

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

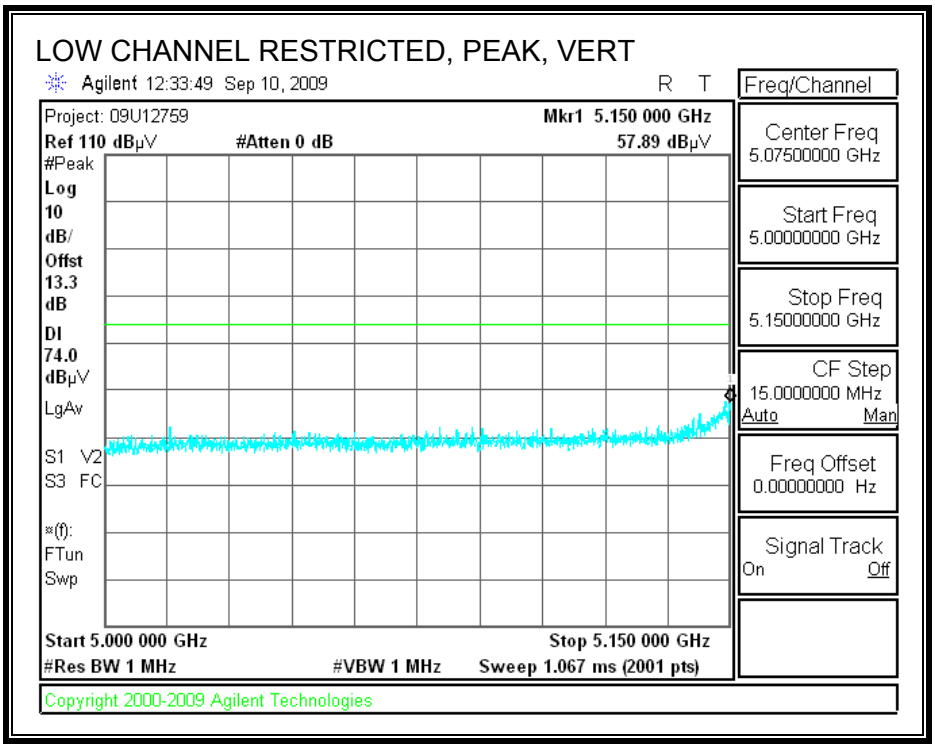
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN LOWER 5.2 GHz BAND

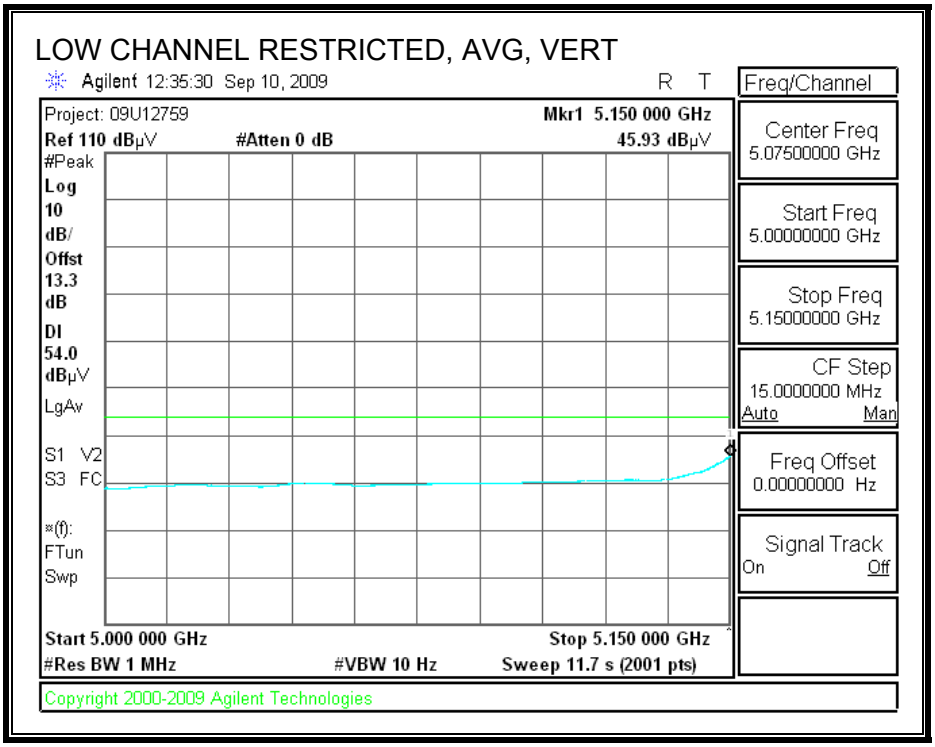
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: MENGISTU MEKURIA
Date: 9/11/2009
Project #: 09U12755
Company: APPLE INC.
EUT Description: 3x3 WIRELESS ACCESS POINT
EUT M/N: A1355
Test Target: FCC CFR47 PART 15
Mode Oper: TX, HT40 MODE

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		

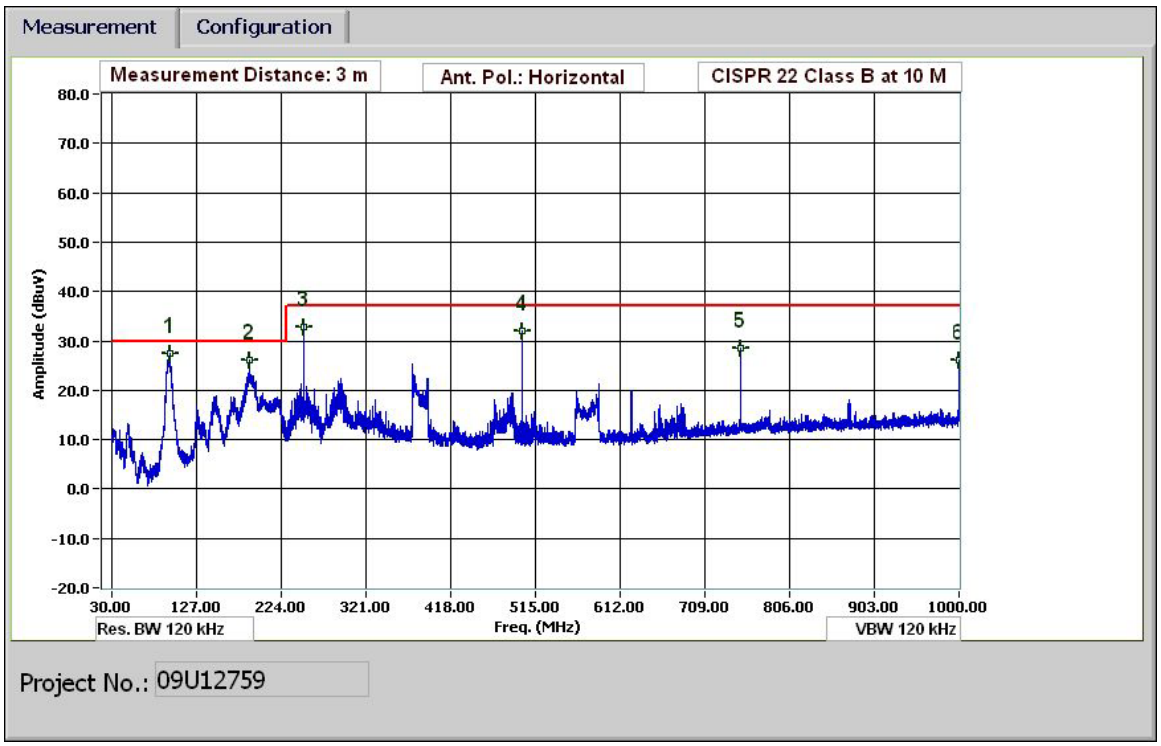
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel (5190.00 MHz)															
10.380	3.0	37.1	37.7	8.9	-36.8	0.0	0.0	46.9	74.0	-27.1	V	P	144.4	33.0	
10.380	3.0	25.7	37.7	8.9	-36.8	0.0	0.0	35.5	54.0	-18.5	V	A	144.4	33.0	
15.570	3.0	39.6	38.6	11.4	-34.8	0.0	0.0	54.7	74.0	-19.3	V	P	129.4	296.5	
15.570	3.0	26.9	38.6	11.4	-34.8	0.0	0.0	42.1	54.0	-11.9	V	A	129.4	296.5	
10.380	3.0	37.2	37.7	8.9	-36.8	0.0	0.0	47.0	74.0	-27.0	H	P	155.7	59.3	
10.380	3.0	26.1	37.7	8.9	-36.8	0.0	0.0	35.9	54.0	-18.1	H	A	155.7	59.3	
15.570	3.0	38.7	38.6	11.4	-34.8	0.0	0.0	53.8	74.0	-20.2	H	P	153.4	359.6	
15.570	3.0	26.7	38.6	11.4	-34.8	0.0	0.0	41.9	54.0	-12.1	H	A	153.4	359.6	
Hi Channel (5230.00 MHz)															
10.460	3.0	38.8	37.7	9.0	-36.7	0.0	0.0	48.7	74.0	-25.3	H	P	137.6	97.3	
10.460	3.0	27.3	37.7	9.0	-36.7	0.0	0.0	37.2	54.0	-16.8	H	A	137.6	97.3	
15.690	3.0	36.2	38.3	11.4	-34.7	0.0	0.0	51.1	74.0	-22.9	H	P	107.3	9.6	
15.690	3.0	24.1	38.3	11.4	-34.7	0.0	0.0	39.1	54.0	-14.9	H	A	107.3	9.6	
10.460	3.0	36.7	37.7	9.0	-36.7	0.0	0.0	46.6	74.0	-27.4	V	P	197.0	282.1	
10.460	3.0	25.4	37.7	9.0	-36.7	0.0	0.0	35.3	54.0	-18.7	V	A	197.0	282.1	
15.690	3.0	35.8	38.3	11.4	-34.7	0.0	0.0	50.8	74.0	-23.2	V	P	100.6	119.8	
15.690	3.0	23.4	38.3	11.4	-34.7	0.0	0.0	38.4	54.0	-15.6	V	A	100.6	119.8	

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

8.3. RADIO AND DIGITAL DEVICE BELOW 1 GHz

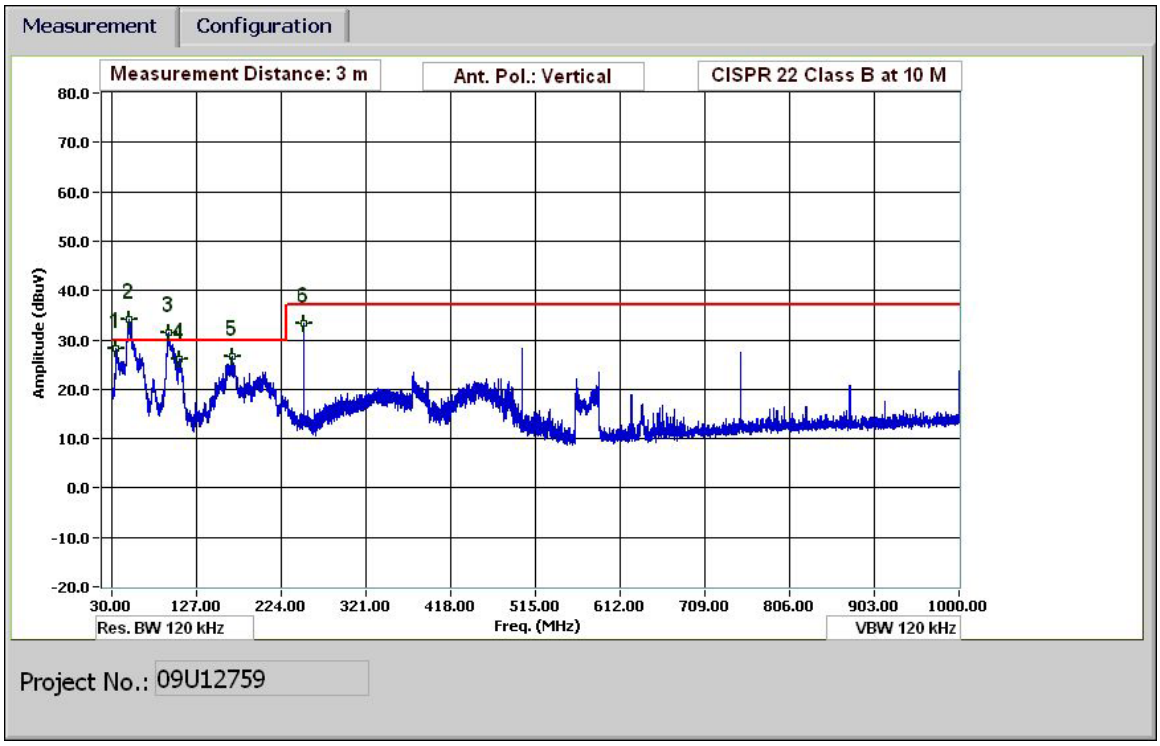
SPURIOUS EMISSIONS 30 TO 1000 MHz (DIGITAL DEVICE, HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (DIGITAL DEVICE, VERTICAL)

VERTICAL PLOT



TABULATED DATA

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

Test Engr: Doug Anderson
Date: 08/11/09 02/12/09
Project #: 09U12759 09U12759
Company: Apple
EUT Description: A/B/G/N Access Point
EUT M/N: 2357
Test Target: EN55022 Class B
Mode Oper: Continuous Tx and Pinging Data to Host PC

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	Ant. High cm	Table Angle Degree	Notes
Continuous Tx / 2437 / HT20 / 20dBm: Vertical															
35.280	3.0	49.0	17.7	0.6	28.4	-10.5	0.0	28.4	30.0	-1.6	V	P	110.0	181.7	
49.801	3.0	64.0	8.5	0.6	28.4	-10.5	0.0	34.3	30.0	4.3	V	P	100.0	75.5	
49.801	3.0	59.3	8.5	0.6	28.4	-10.5	0.0	34.3	30.0	-0.4	V	QP	100.0	75.5	
95.403	3.0	60.5	8.8	0.9	28.3	-10.5	0.0	31.4	30.0	1.4	V	P	100.0	75.1	
95.403	3.0	55.5	8.8	0.9	28.3	-10.5	0.0	31.4	30.0	-3.6	V	QP	100.0	75.1	
107.763	3.0	52.5	11.4	1.0	28.3	-10.5	0.0	26.1	30.0	-3.9	V	P	100.0	45.4	
168.126	3.0	53.3	11.0	1.2	28.2	-10.5	0.0	26.7	30.0	-3.3	V	P	108.4	163.7	
249.969	3.0	58.8	11.8	1.4	28.2	-10.5	0.0	33.3	37.0	-3.7	V	P	100.0	43.6	
Continuous Tx / 2437 / HT20 / 20dBm: Horizontal															
96.243	3.0	56.3	9.0	0.9	28.3	-10.5	0.0	27.4	30.0	-2.6	H	P	250.0	360.0	
187.446	3.0	52.2	11.3	1.2	28.2	-10.5	0.0	26.0	30.0	-4.0	H	P	181.4	114.9	
250.089	3.0	58.2	11.8	1.4	28.2	-10.5	0.0	32.7	37.0	-4.3	H	P	165.9	200.7	
500.059	3.0	51.5	16.7	2.0	27.8	-10.5	0.0	32.0	37.0	-5.0	H	P	100.0	213.1	
750.030	3.0	43.4	20.3	2.5	27.3	-10.5	0.0	28.4	37.0	-8.6	H	P	134.4	97.9	
1000.000	3.0	39.1	22.5	3.0	27.9	-10.5	0.0	26.1	37.0	-10.9	H	P	180.6	101.7	

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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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

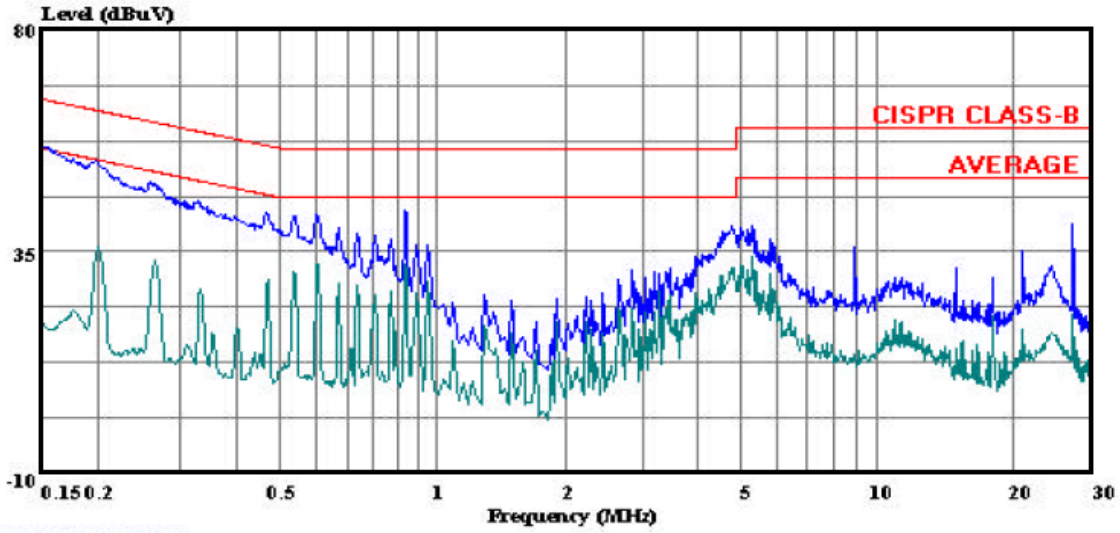
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	53.53	--	36.05	0.00	63.69	53.69	-10.16	-17.64	L1
0.26	49.05	--	33.15	0.00	61.34	51.34	-12.29	-18.19	L1
0.94	43.20	--	32.41	0.00	56.00	46.00	-12.80	-13.59	L1
0.20	53.73	--	37.84	0.00	63.69	53.69	-9.96	-15.85	L2
0.26	49.95	--	35.15	0.00	61.34	51.34	-11.39	-16.19	L2
0.94	42.97	--	32.45	0.00	56.00	46.00	-13.03	-13.55	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#: 09U12759 LC.EMI Date: 09-23-2009 Time: 15:35:37



(Line Conduction)

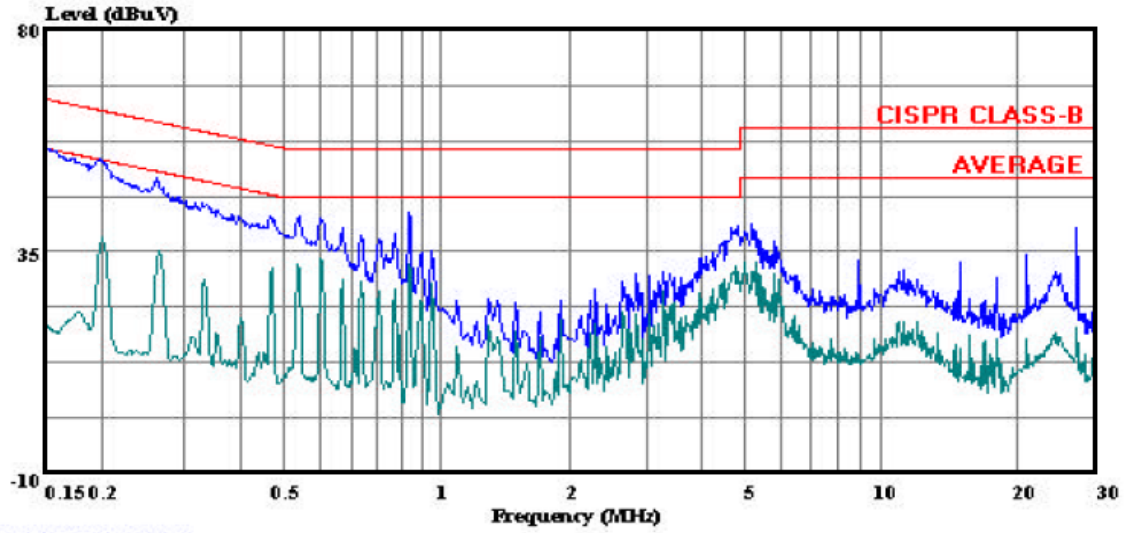
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Mengistu Mekuria
Project #: : 09U12759
Company: : Apple Inc
EUT Description:: EUT with Minimum Configuration
Mode: : Tx worst-case, Ping b/n EUT and Laptop
Target: : FCC Class B
Voltage: : 115VAC/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#: 14 File#: 09U12759 LC.EMI Date: 09-23-2009 Time: 15:26:46



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Mengistu Mekuria
Project #: : 09U12759
Company: : Apple Inc.
EUT Description:: EUT with Minimum Configuration
Mode: : Tx worst-case, Ping b/n EUT and Laptop
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L2: Peak (Blue) , Average (Green)

10. 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

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
WLAN, 11a (2 chains)	5.2 GHz	20.0	14.16	8.38	0.04	0.36
WLAN, 11a (3 chains)	5.2 GHz	20.0	13.07	9.38	0.03	0.35
WLAN, 11n HT20 (2 chains)	5.2 GHz	20.0	15.78	5.69	0.03	0.28
WLAN, 11n HT20 (3 chains)	5.2 GHz	20.0	13.32	5.69	0.02	0.16
WLAN, 11n HT40 (2 chains)	5.2 GHz	20.0	16.97	5.69	0.04	0.37
WLAN, 11n HT40 (3 chains)	5.2 GHz	20.0	13.74	5.69	0.02	0.17

Notes:
Antenna Gain for 11a is the combined antenna gain for multiple chains.
Antenna gain for HT20 and HT40 is the maximum antenna gain of multiple chains.
Output power is the combined output power for multiple chains.