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

CERTIFICATION TEST REPORT

FOR

ACCESS POINT

MODEL NUMBER: A1301

FCC ID: BCGA1301
IC: 579C-A1301

REPORT NUMBER: 08U12079-1, Revision A

ISSUE DATE: FEBRUARY 06, 2009

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

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

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/11/08	Initial Issue	F. Ibrahim
A	02/06/09	Revised antenna gains throughout the report, Test Equipment List and MPE section.	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITY LOOP
CUPERTINO, CALIFORNIA 95014, U.S.A

EUT DESCRIPTION: ACCESS POINT

MODEL: A1301

SERIAL NUMBER: 6F83403J31S

DATE TESTED: SETEMBER 9 – DECEMBER 3, 2008

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

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
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, 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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n transceiver Access Point.

The radio module is manufactured by Ambit subsidiary of Foxconn, which is located in Hon Hai.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	26.39	435.51
2412 - 2462	802.11g	28.11	647.14
2412 - 2462	802.11n HT20	28.29	674.53
5745 - 5825	802.11a	26.98	498.88
5745 - 5805	802.11n HT20	26.99	500.03
5755 - 5795	802.11n HT40	26.56	452.90

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PIFA antennas, with a maximum gain of 1.21 dBi in the 2.4 GHz band, and with a maximum gain of 2.18 dBi in the 5.8 GHz band.

5.4. SOFTWARE AND FIRMWARE

Firmware: k10_7.4d4auto20080826T0200

EUT Driver Software: ARTR07B13

The test utility software used during testing was ART Build #13, rev. 0.79

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 11b mode: 1Mbps
For 11g mode: 6Mbps
For 11n HT20 (2.4 GHz band): MCS1
For 11a mode: 6Mbps
For 11n HT20 (5.8 GHz band): MCS1
For 11n HT40 (5.8 GHz band): MCS0

Peak Power Spectral Density was investigated in the 11b mode at Low Channel, for individual chains versus combiner, and it was determined that combiner is worst-case; therefore, all other measurements of PPSD in other channels and modes were performed using a combiner.

RF Conducted Spurious was investigated in the 11b mode for Low Channel, for individual chains versus combiner, and it was determined that the individual chains are worst-case; therefore, all other measurements of RF conducted spurious were performed on individual chains in the 2.4 GHz band.

RF Conducted Spurious was investigated in the 11a mode for Low Channel, for individual chains versus combiner, and it was determined that combiner is worst-case; therefore, all other measurements of RF conducted spurious were performed with combiner in the 5.8 GHz band.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC/DC Adapter	Delta Elect. Inc	KIO	MV833303WZ8REVT	N/A
Apple MacBook	Apple	M42	AOU258368	DoC

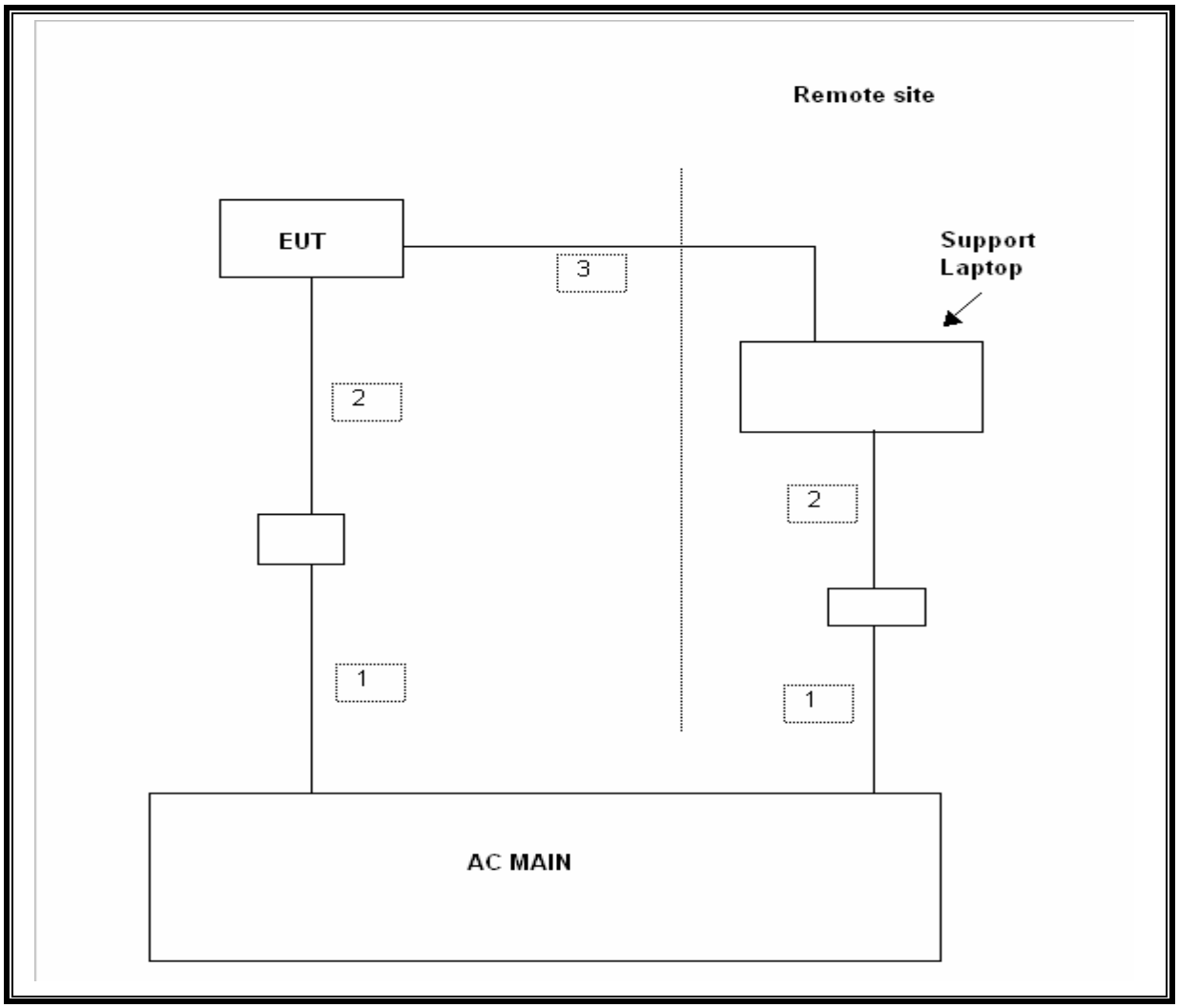
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	US 115V	Un-shielded	2m	N/A
2	DC	2	DC Plug	Un-shielded	2m	N/A
3	WLAN	1	RJ45	Un-shielded	2m	N/A

TEST SETUP

The EUT is connected to a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	02/06/07	09/19/09
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	02/06/07	09/19/09
30-2.9GHz Bilog Antenna	Sunol Sciences	JB1	C01011	09/28/07	01/14/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/08	03/31/09
Antenna, Horn, 18 GHz	ETS	3117	C01006	04/22/08	04/22/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	09/27/07	02/04/09
Highpass Filter, 4.0 GHz	Micro-Tronics	HPM13351	N02708	01/00/00	CNR
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	01/00/00	CNR
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	01/00/00	CNR
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/07	10/29/09
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/25/07	10/29/09
EMI Receiver	R & S	ESHS 20	N02396	02/06/08	08/06/09
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/07	02/04/10
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	09/29/07	01/29/09
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	04/29/08	04/29/09

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b DUAL CHAIN LEGACY MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

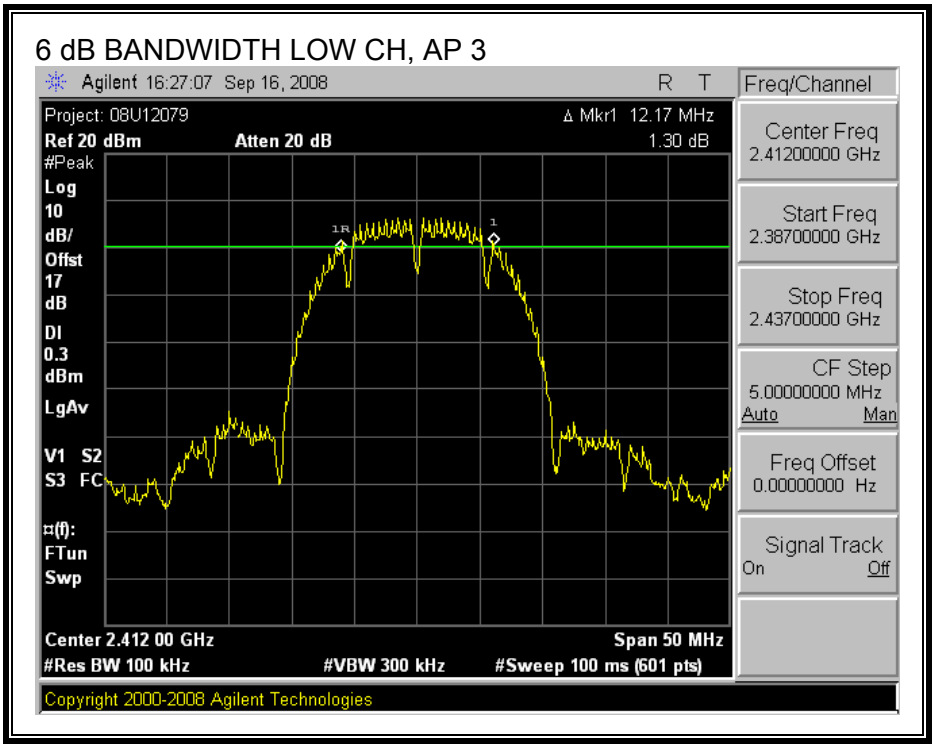
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

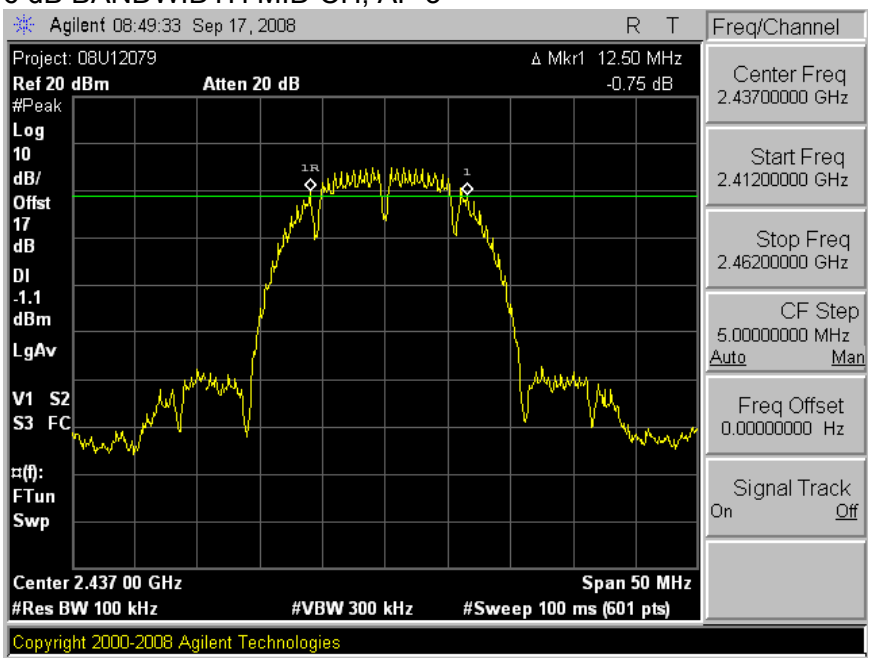
RESULTS

Channel	Frequency (MHz)	AP3 6 dB BW (MHz)	AP1 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	12.17	12.08	0.5
Middle	2437	12.50	12.08	0.5
High	2462	12.08	12.58	0.5

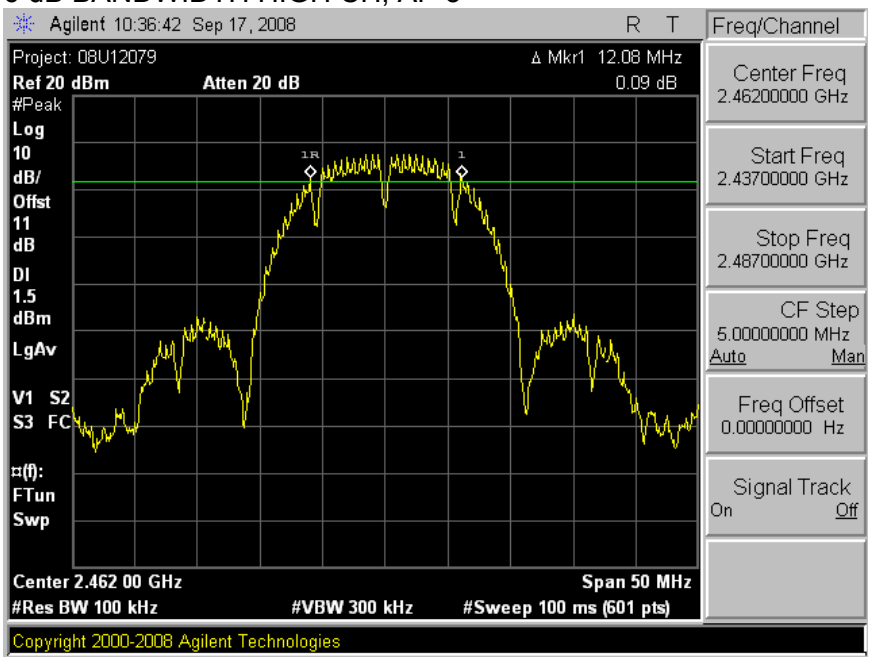
6 dB BANDWIDTH, CHAIN AP3



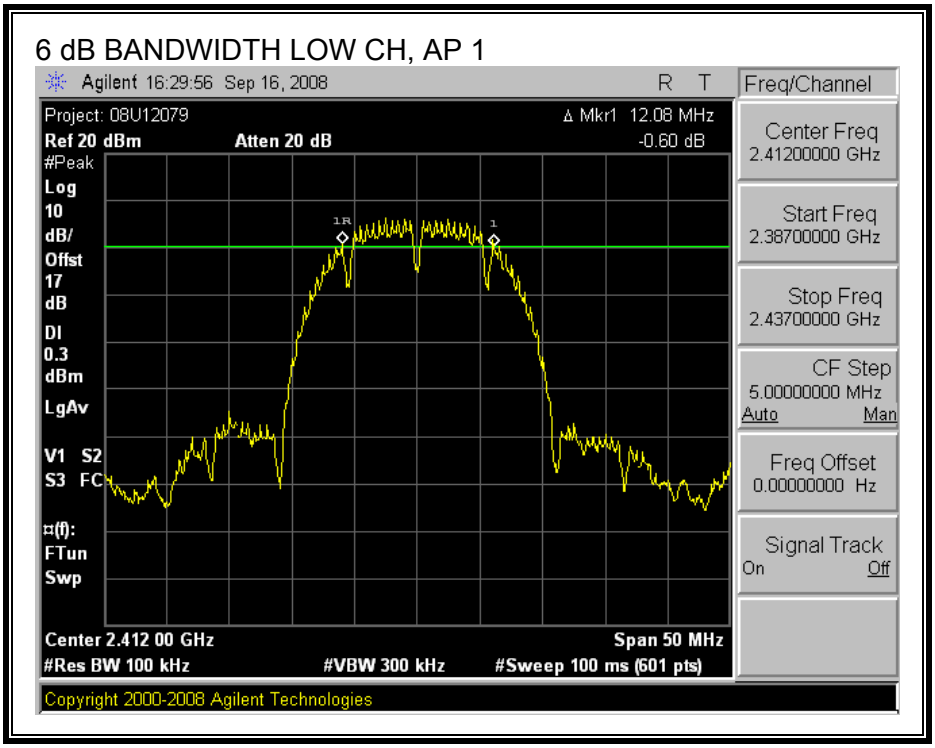
6 dB BANDWIDTH MID CH, AP 3



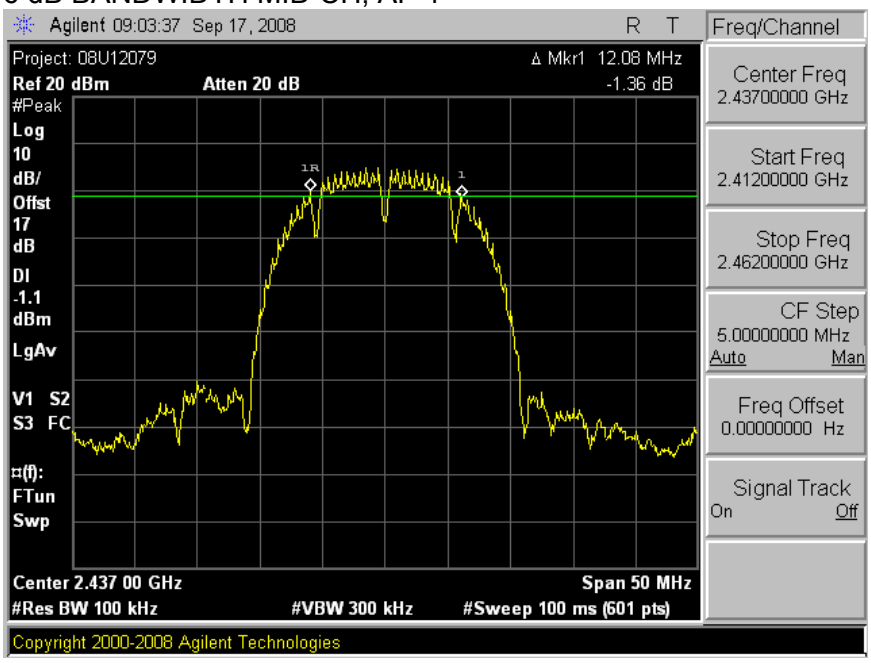
6 dB BANDWIDTH HIGH CH, AP 3



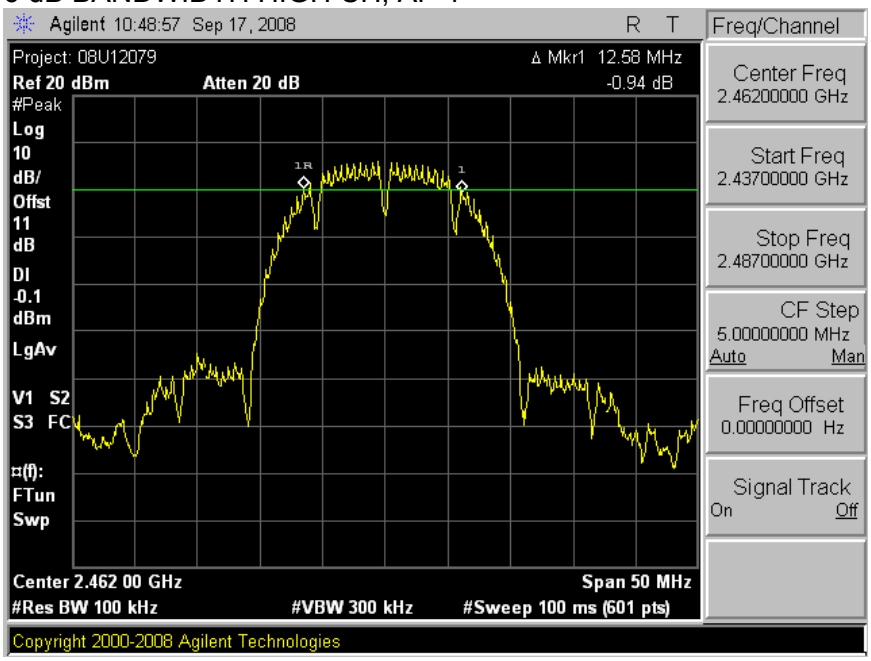
6 dB BANDWIDTH, CHAIN AP1



6 dB BANDWIDTH MID CH, AP 1



6 dB BANDWIDTH HIGH CH, AP 1



7.1.2. 99% AND 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

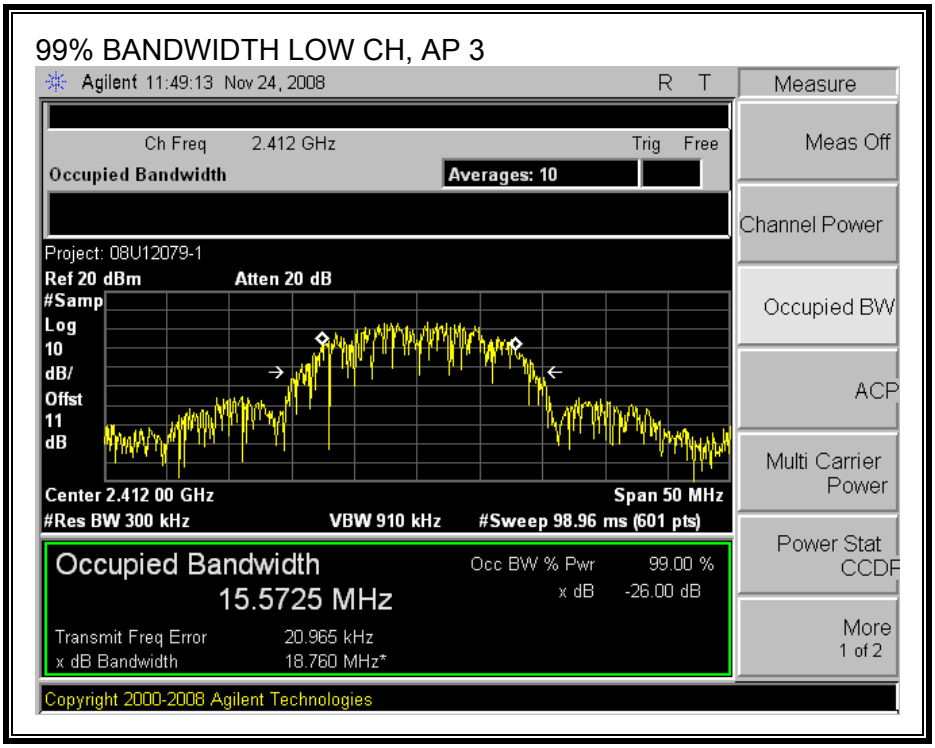
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

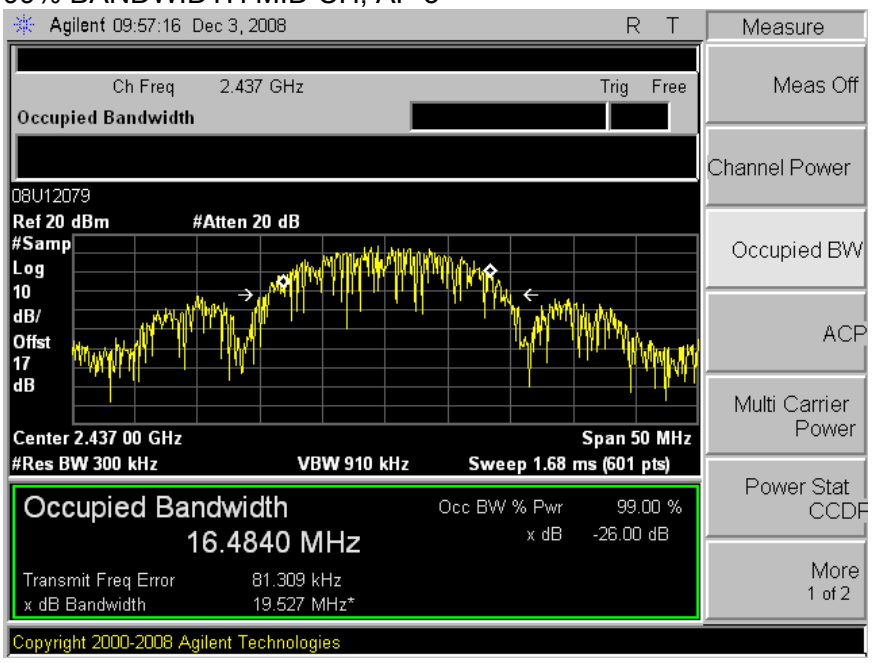
Channel	Frequency (MHz)	AP 3 99% Bandwidth (MHz)	AP 1 99% Bandwidth (MHz)
Low	2412	15.5725	15.5603
Middle	2437	16.3375	15.6731
High	2462	15.6368	15.6562

Channel	Frequency (MHz)	AP 3 26 dB Bandwidth (MHz)	AP 1 26 dB Bandwidth (MHz)
Low	2412	18.760	18.918
Middle	2437	19.527	19.096
High	2462	18.786	18.898

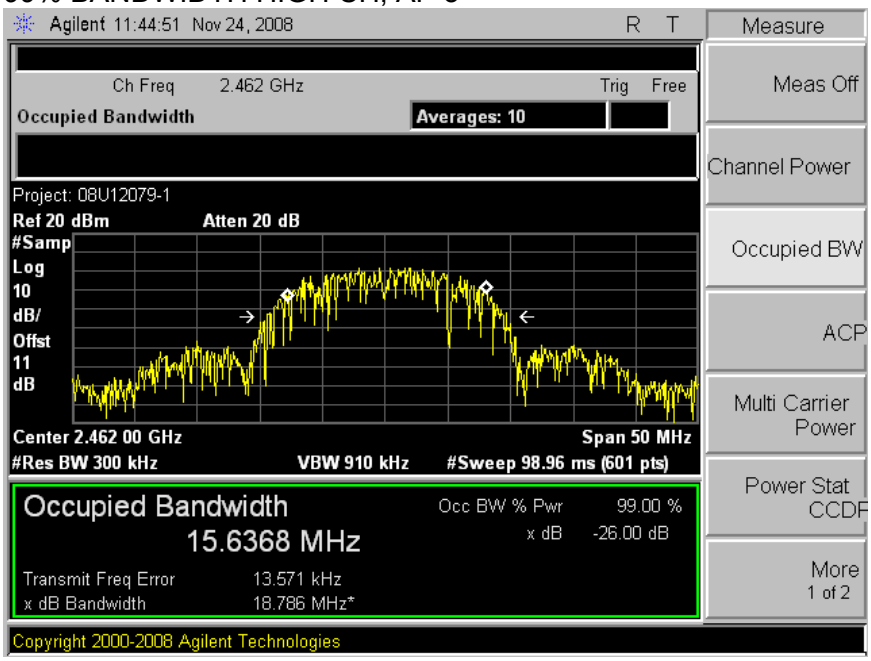
99% BANDWIDTH, CHAIN AP3



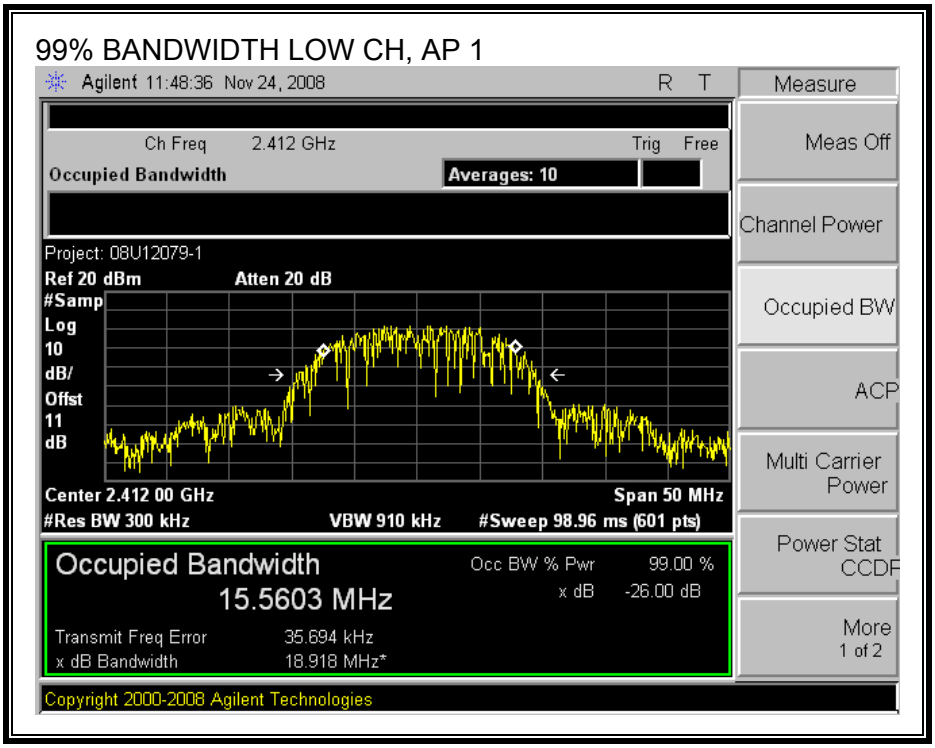
99% BANDWIDTH MID CH, AP 3



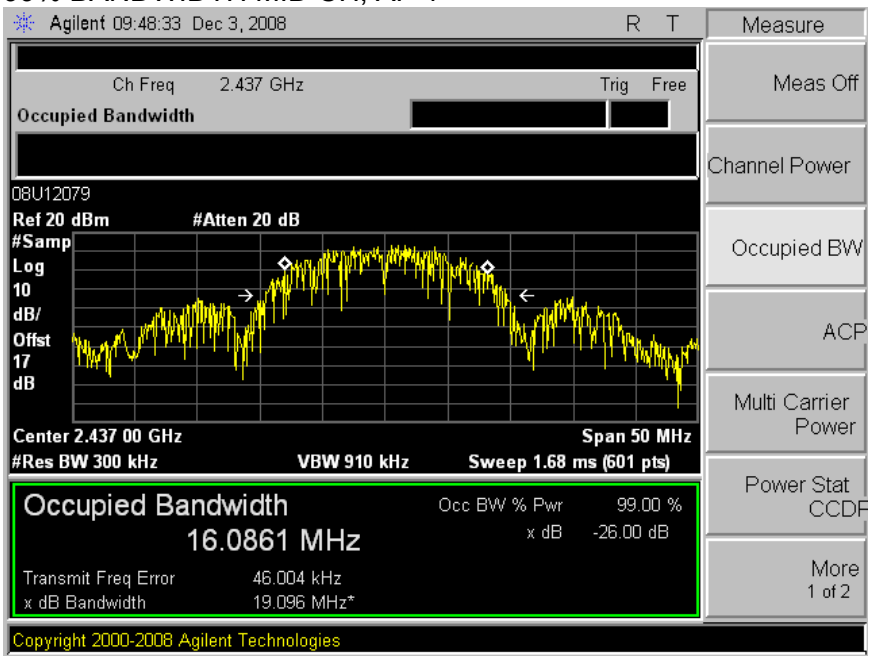
99% BANDWIDTH HIGH CH, AP 3



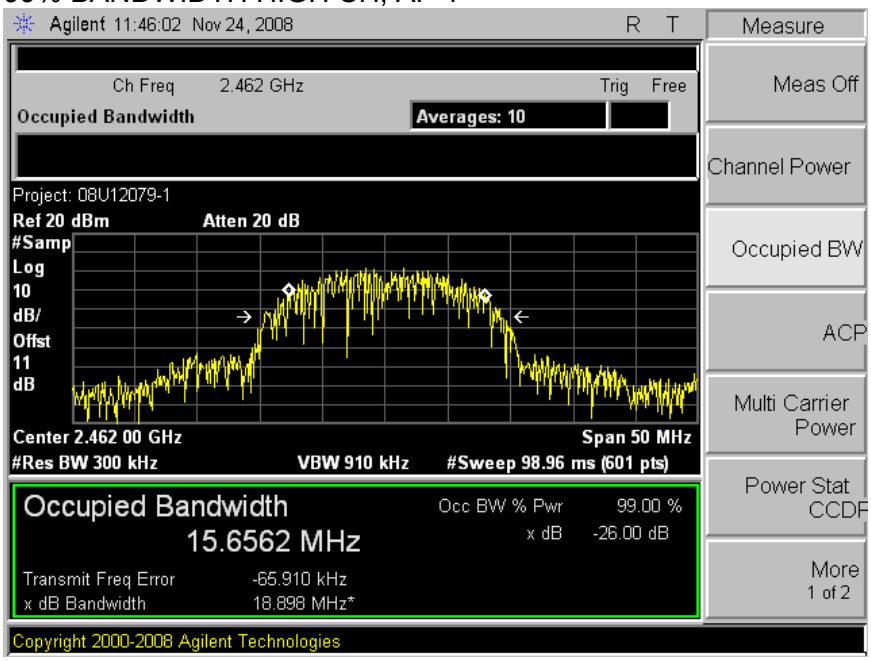
99% BANDWIDTH, CHAIN AP1



99% BANDWIDTH MID CH, AP 1



99% BANDWIDTH HIGH CH, AP 1



7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (dBi)	10 Log (# Tx Chains) (dB)	Effective Legacy Gain (dBi)
1.21	3.01	4.22

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 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.

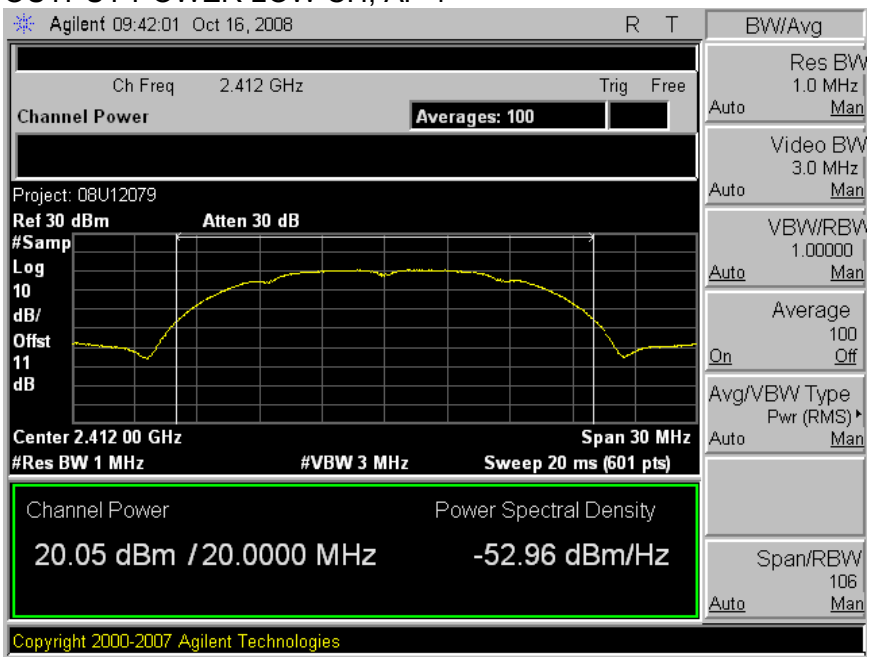
The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

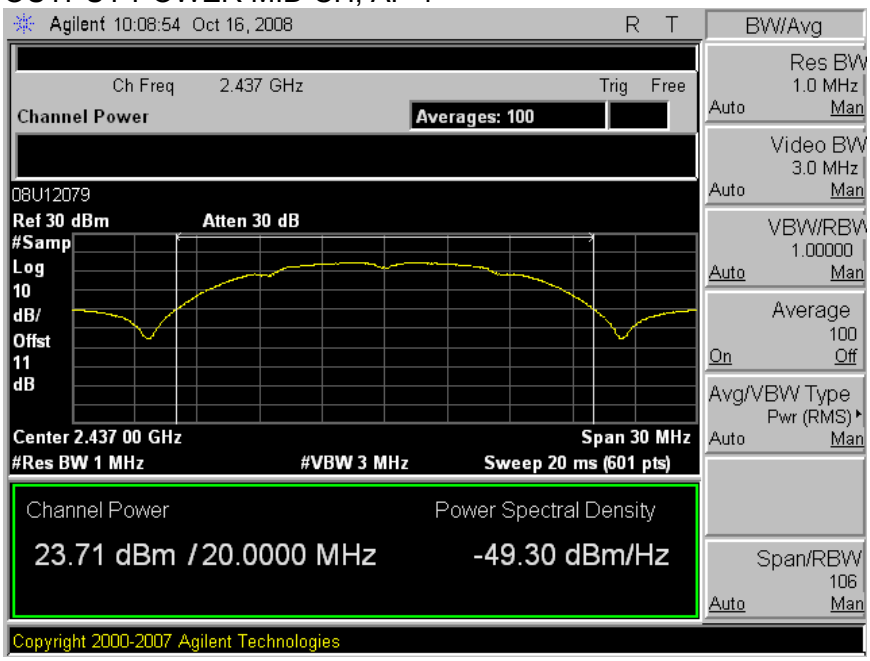
Channel	Frequency (MHz)	Limit (dBm)	AP 1 Power (dBm)	AP 3 Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	20.05	19.32	0.00	22.71	-7.29
Mid	2437	30.00	23.71	23.03	0.00	26.39	-3.61
High	2462	30.00	19.03	18.39	0.00	21.73	-8.27

OUTPUT POWER, AP1

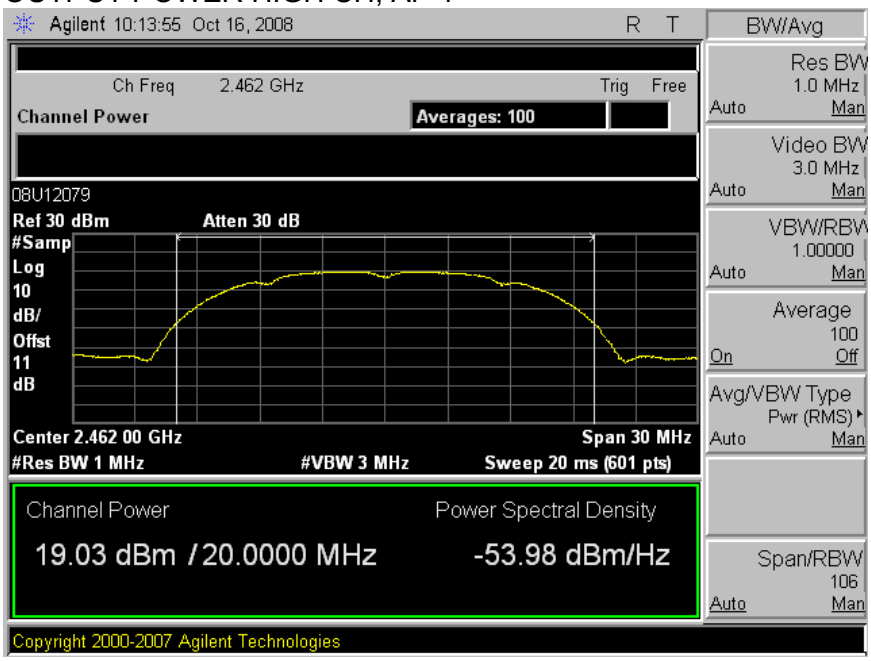
OUTPUT POWER LOW CH, AP 1



OUTPUT POWER MID CH, AP 1

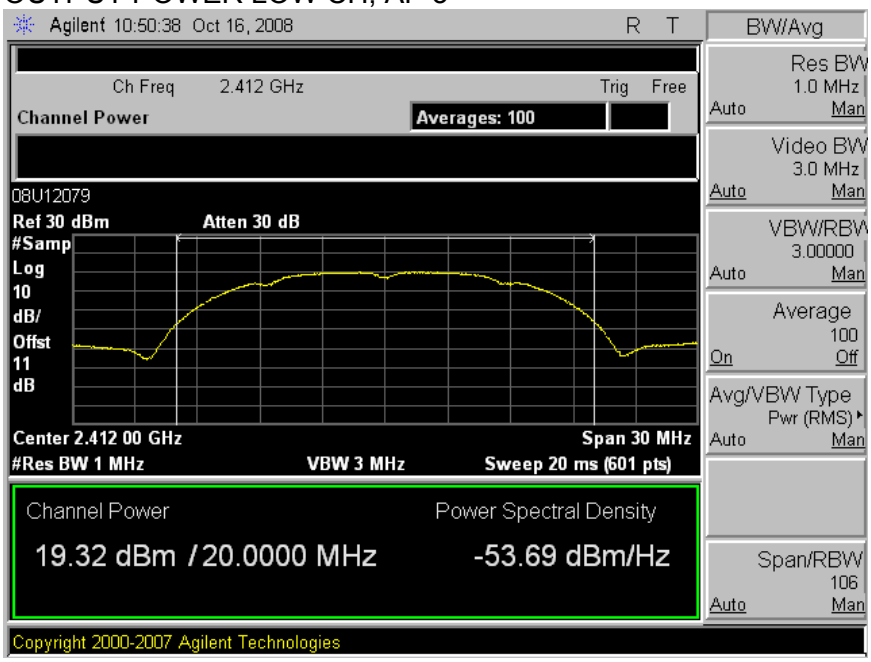


OUTPUT POWER HIGH CH, AP 1

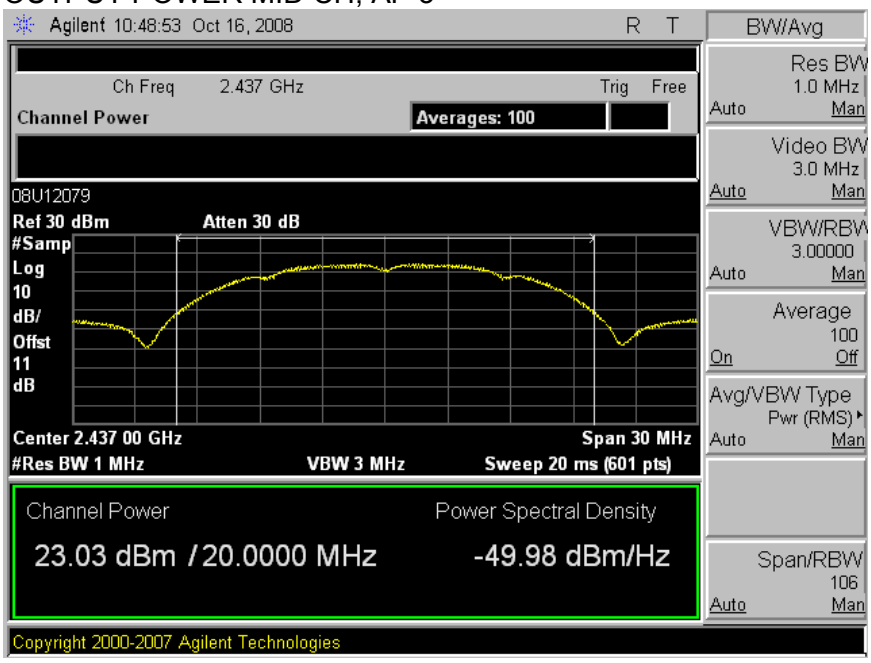


OUTPUT POWER, AP3

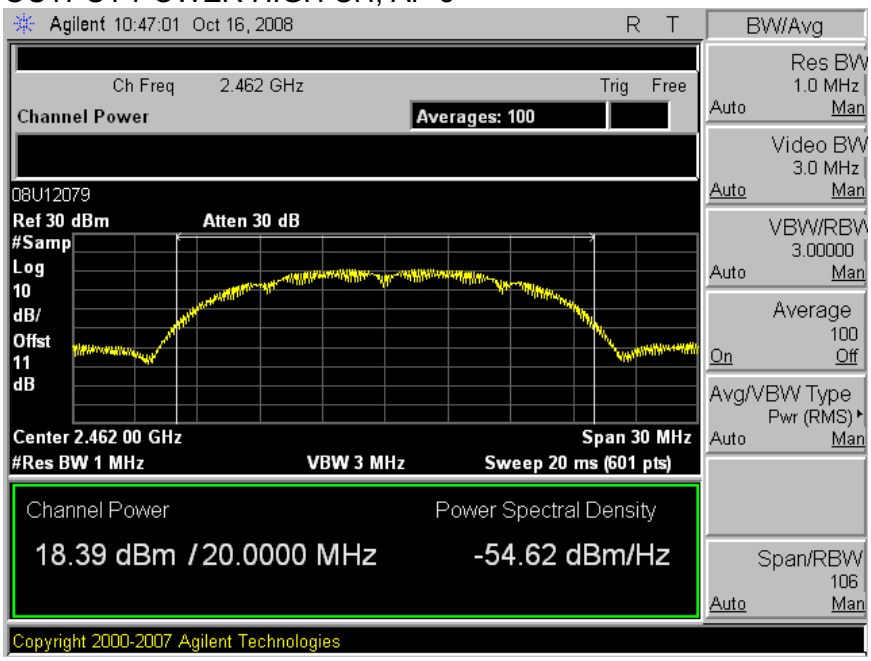
OUTPUT POWER LOW CH, AP 3



OUTPUT POWER MID CH, AP 3



OUTPUT POWER HIGH CH, AP 3



7.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

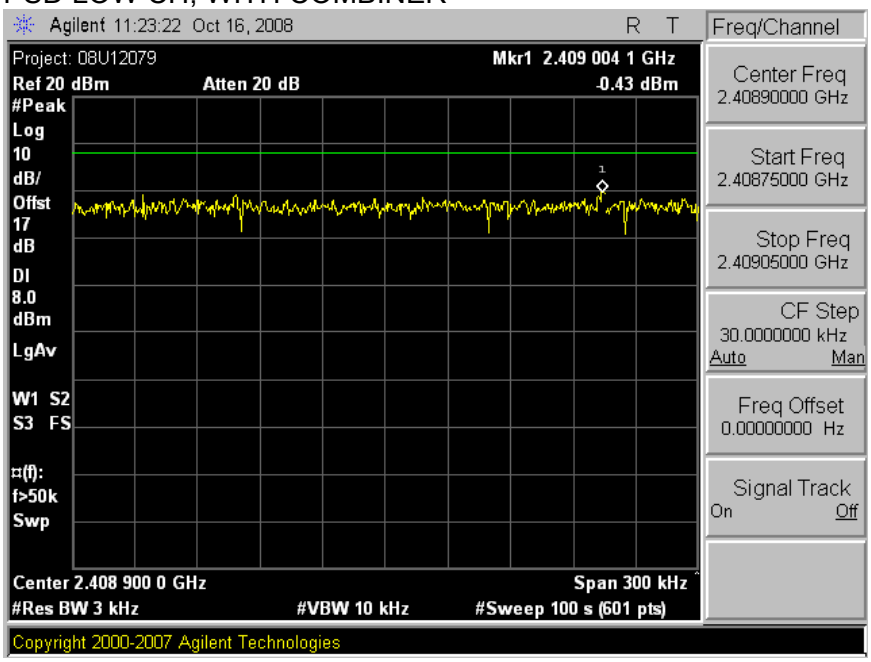
Power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

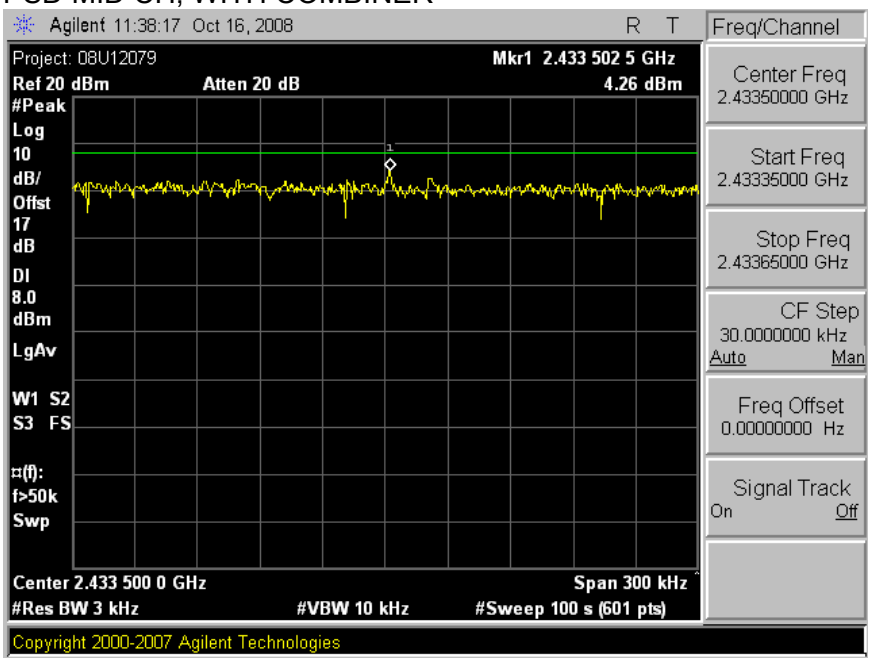
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-0.43	8	-8.43
Middle	2437	4.26	8	-3.74
High	2462	-1.08	8	-9.08

POWER SPECTRAL DENSITY, WITH COMBINER

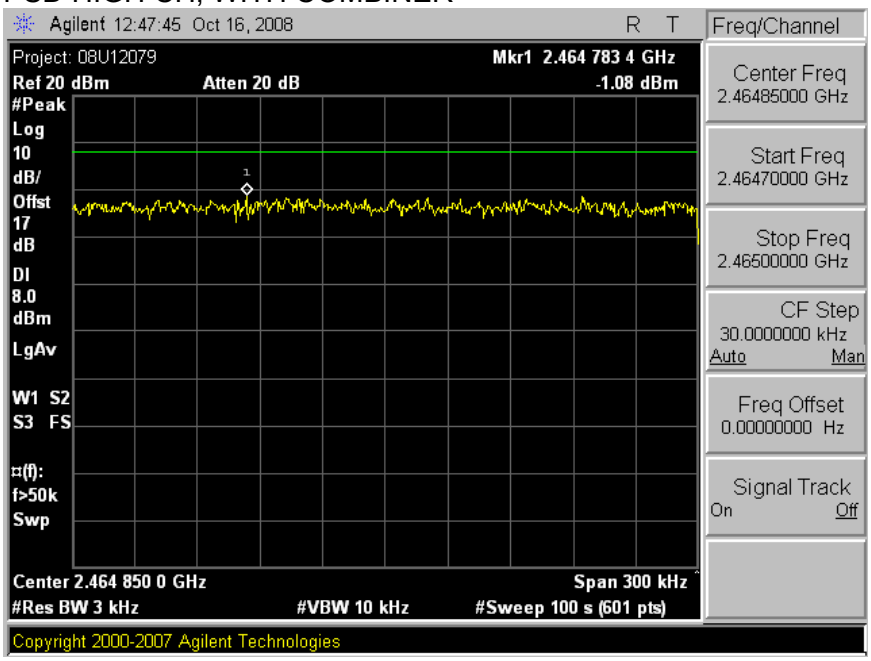
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003, therefore the required attenuation for conducted spurious is 30 dBc.

TEST PROCEDURE

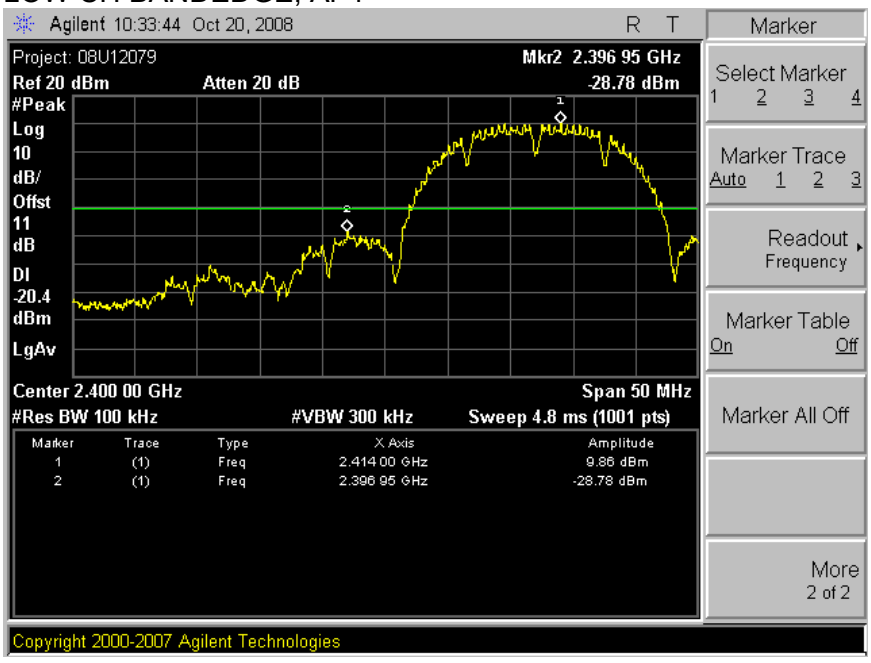
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

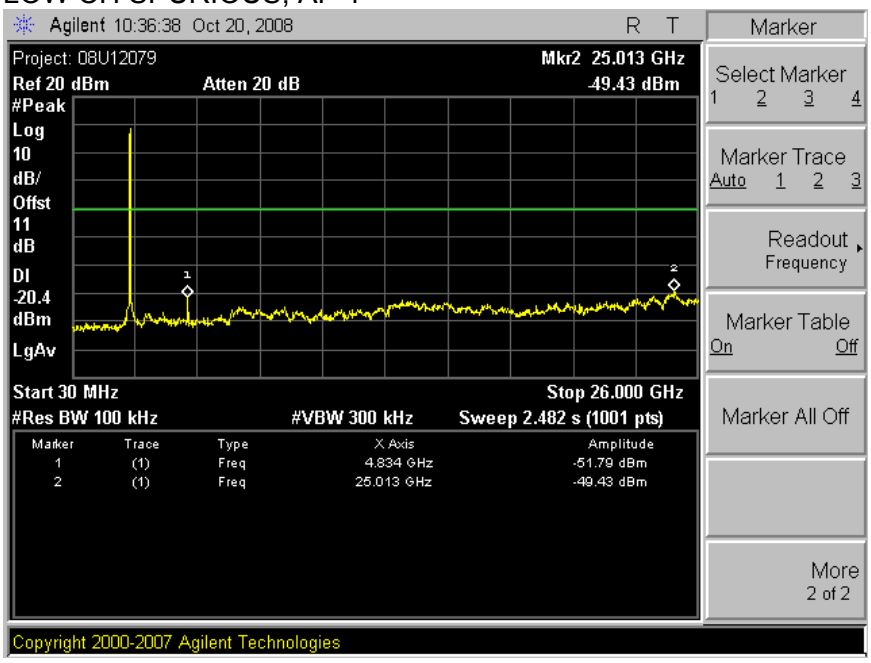
RESULTS

SPURIOUS EMISSIONS, AP1

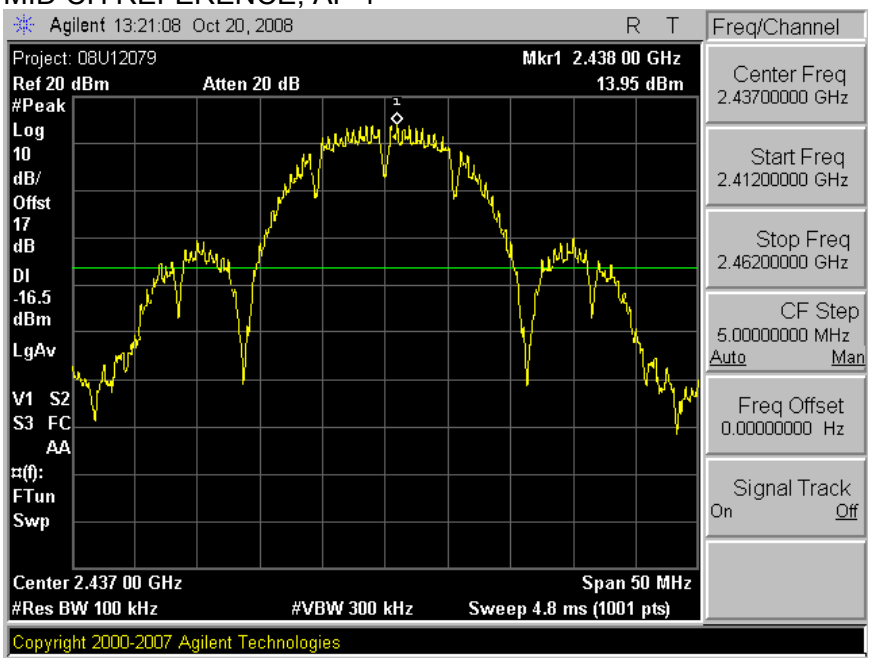
LOW CH BANDEDGE, AP1



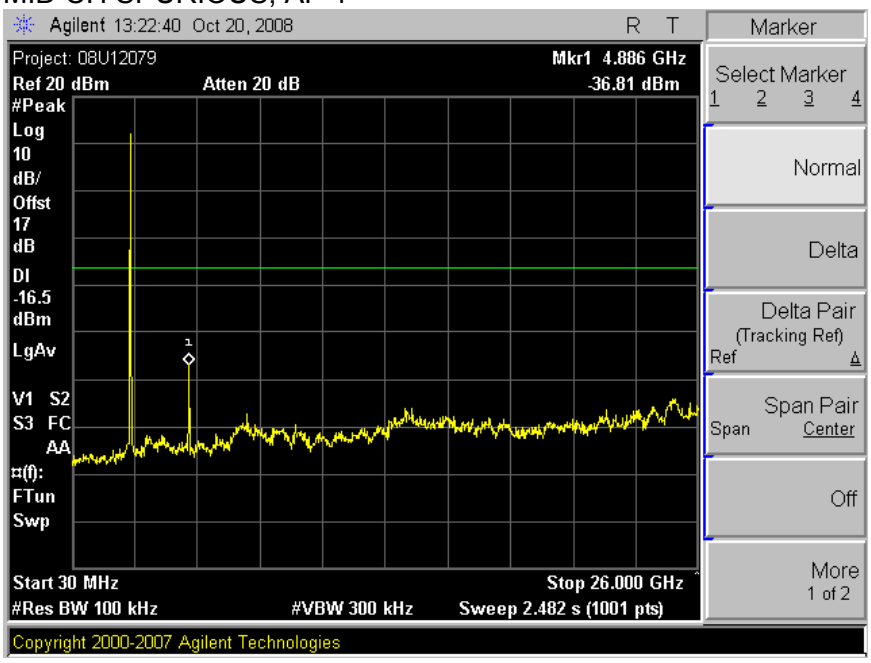
LOW CH SPURIOUS, AP 1



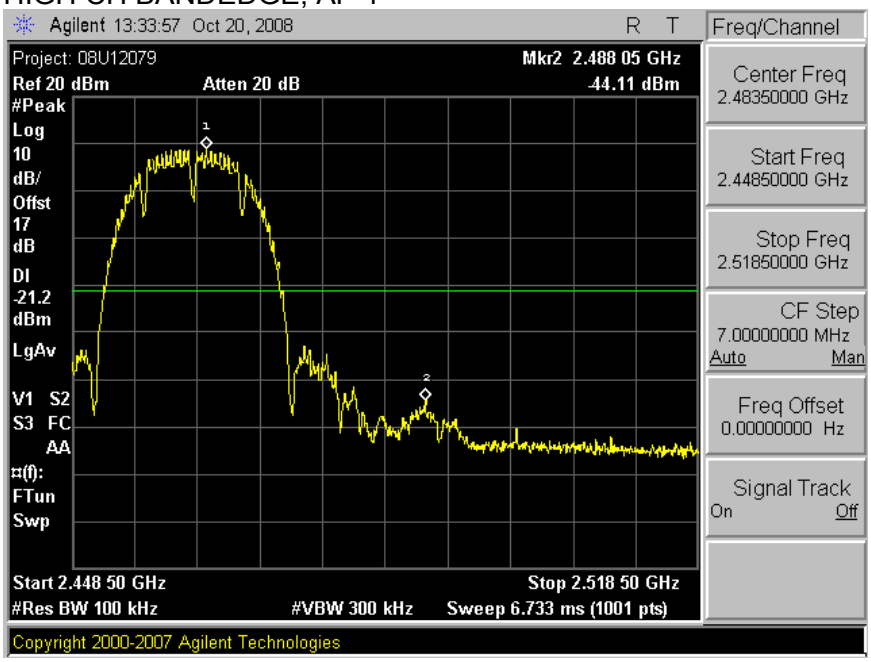
MID CH REFERENCE, AP 1



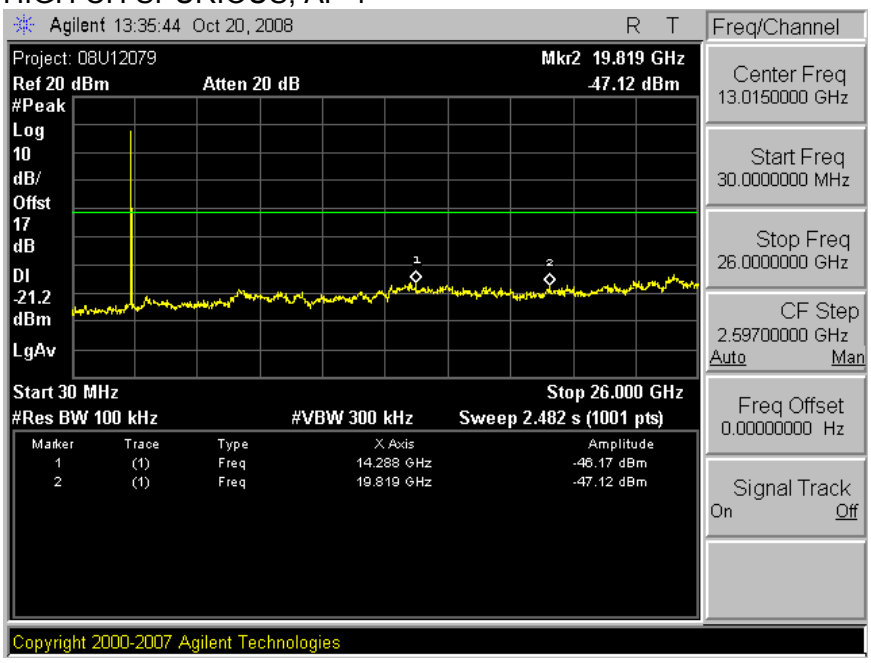
MID CH SPURIOUS, AP 1



HIGH CH BANDEDGE, AP 1

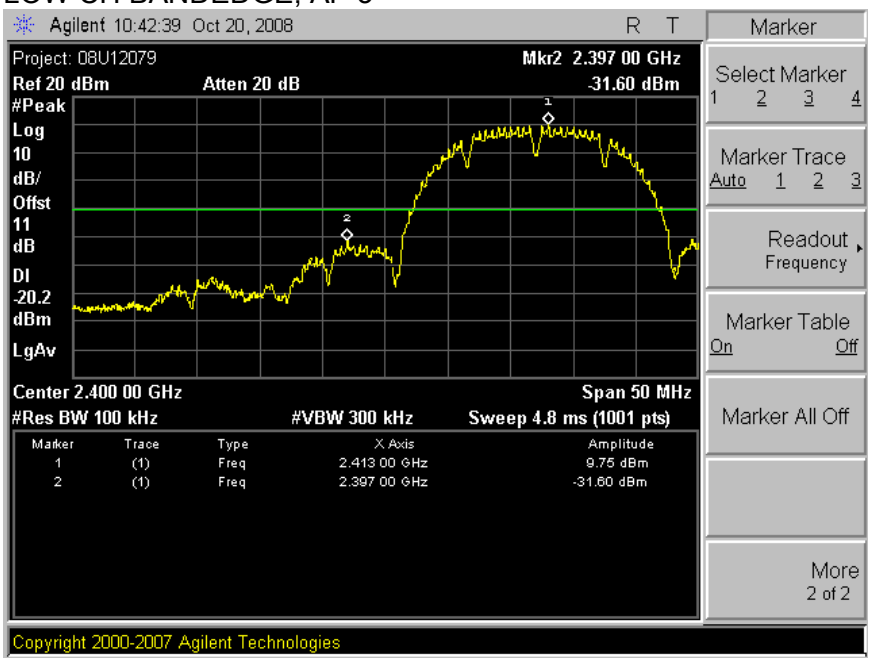


HIGH CH SPURIOUS, AP 1

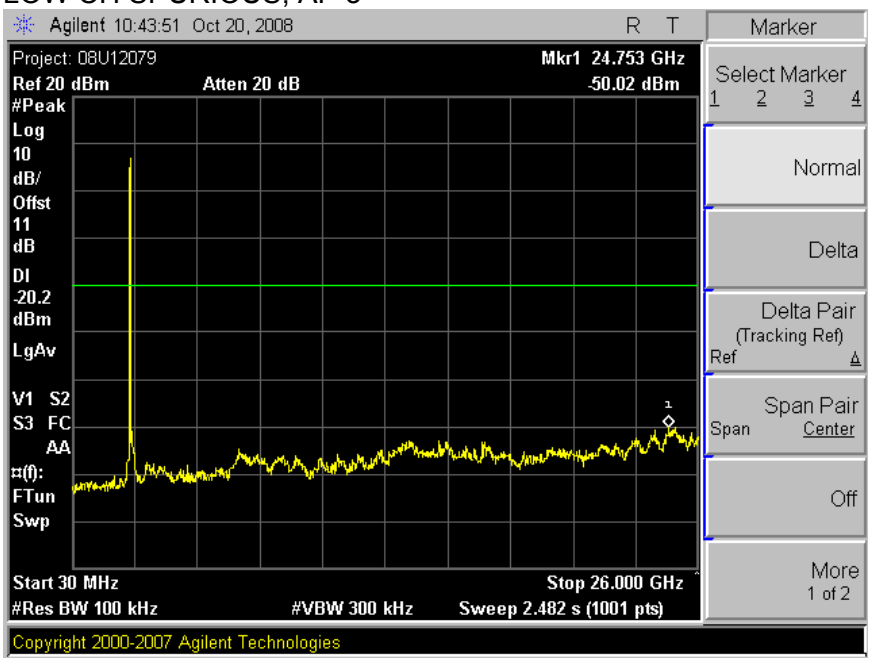


SPURIOUS EMISSIONS, AP3

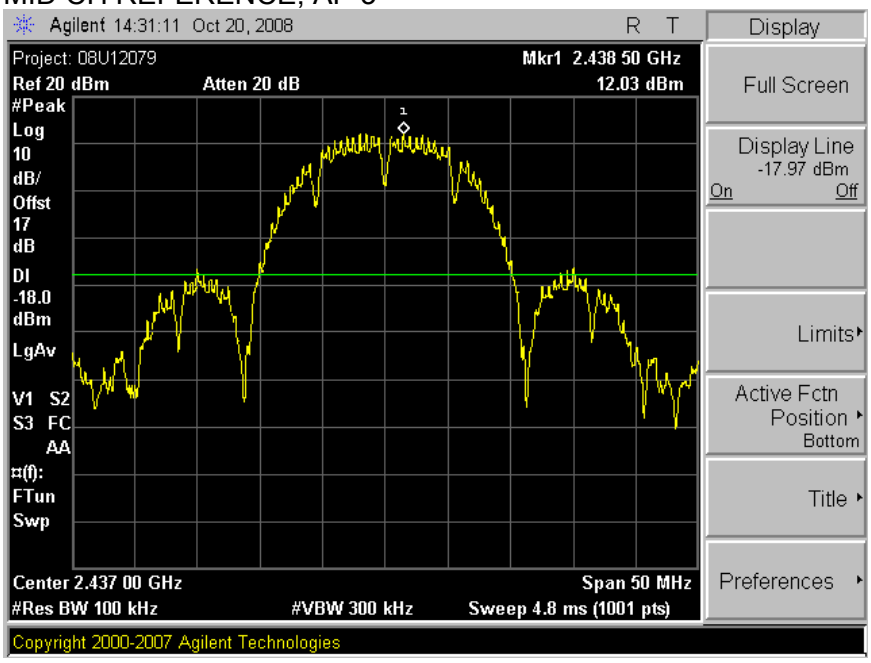
LOW CH BANDEDGE, AP 3



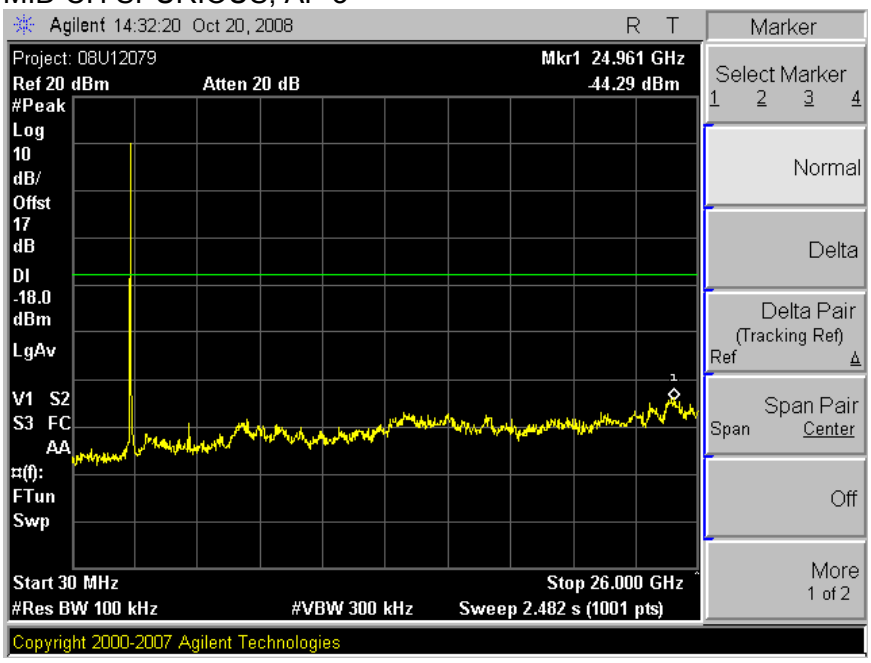
LOW CH SPURIOUS, AP 3



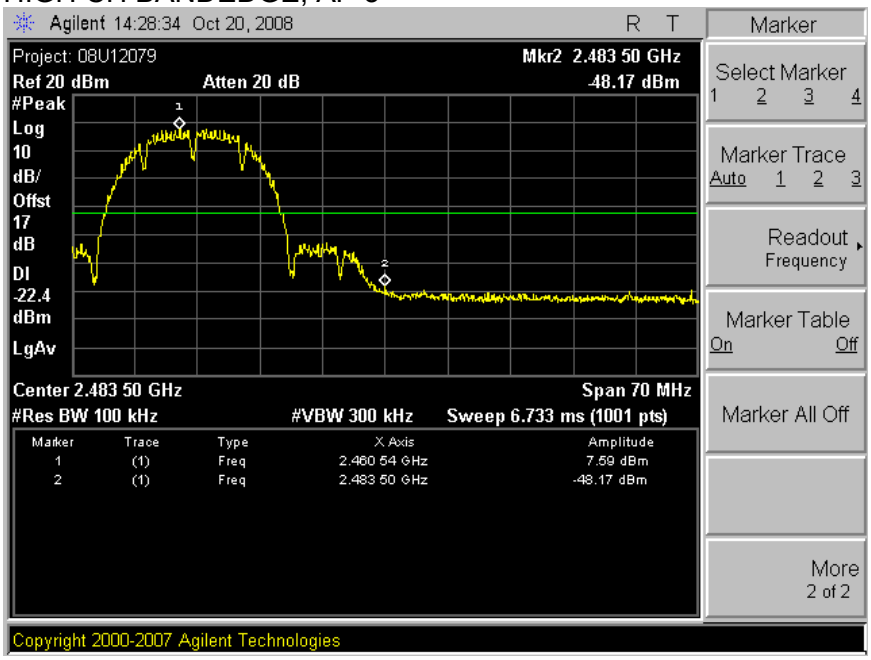
MID CH REFERENCE, AP 3



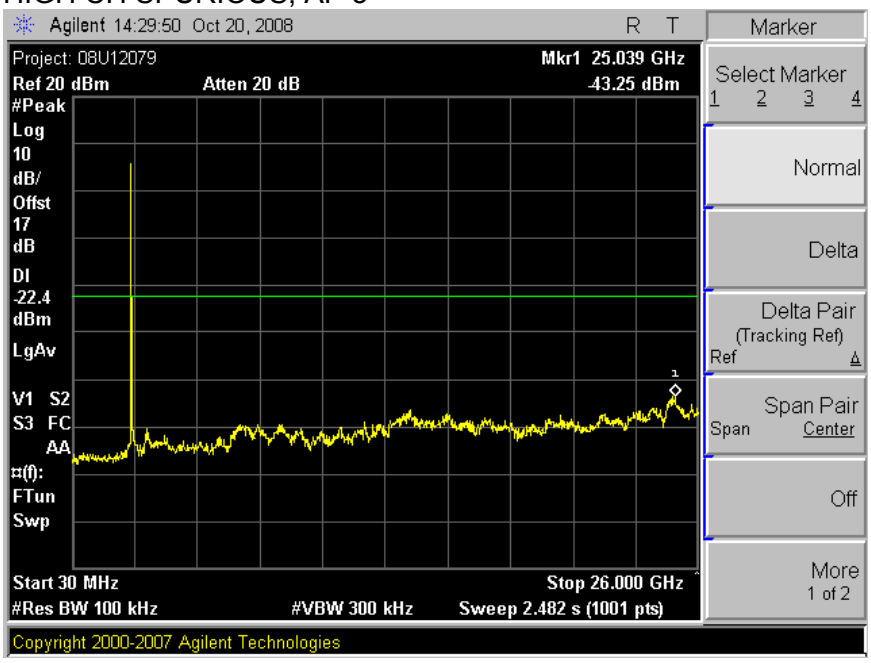
MID CH SPURIOUS, AP 3



HIGH CH BANDEDGE, AP 3



HIGH CH SPURIOUS, AP 3



7.2. 802.11g DUAL CHAIN LEGACY MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

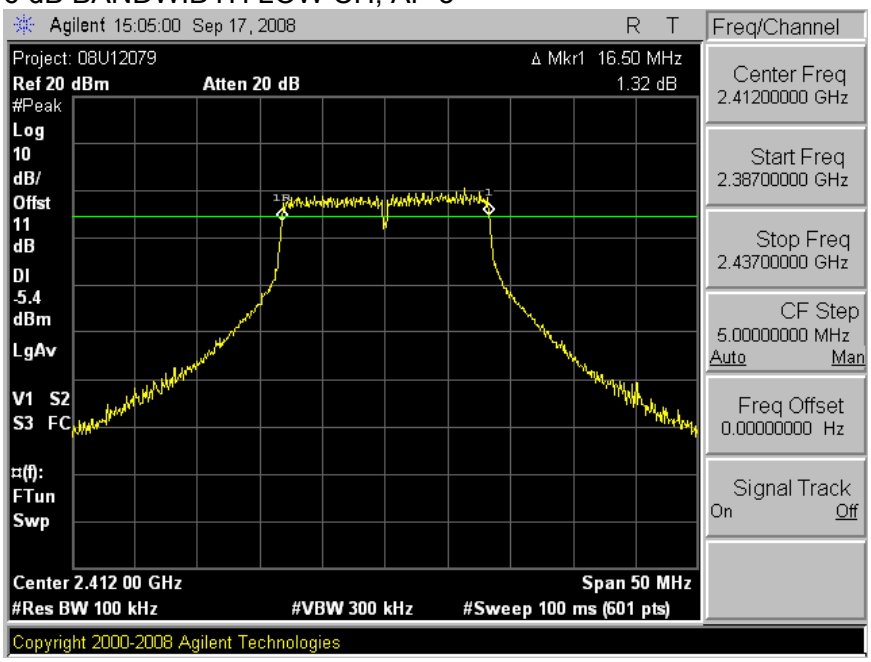
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

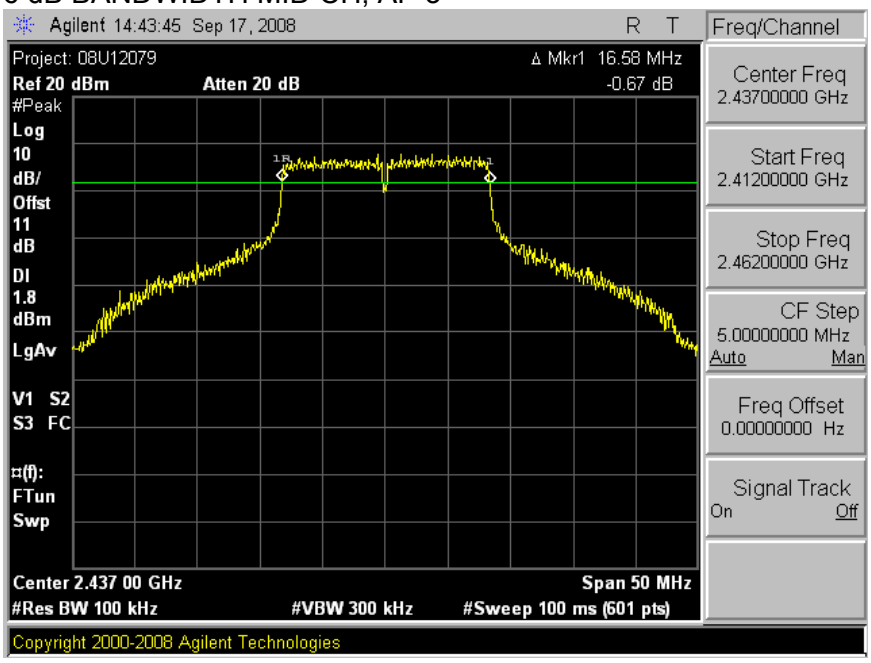
Channel	Frequency (MHz)	AP 3 6 dB BW (MHz)	AP 1 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	16.50	16.67	0.5
Middle	2437	16.58	16.67	0.5
High	2462	16.67	16.58	0.5

6 dB BANDWIDTH, AP 3

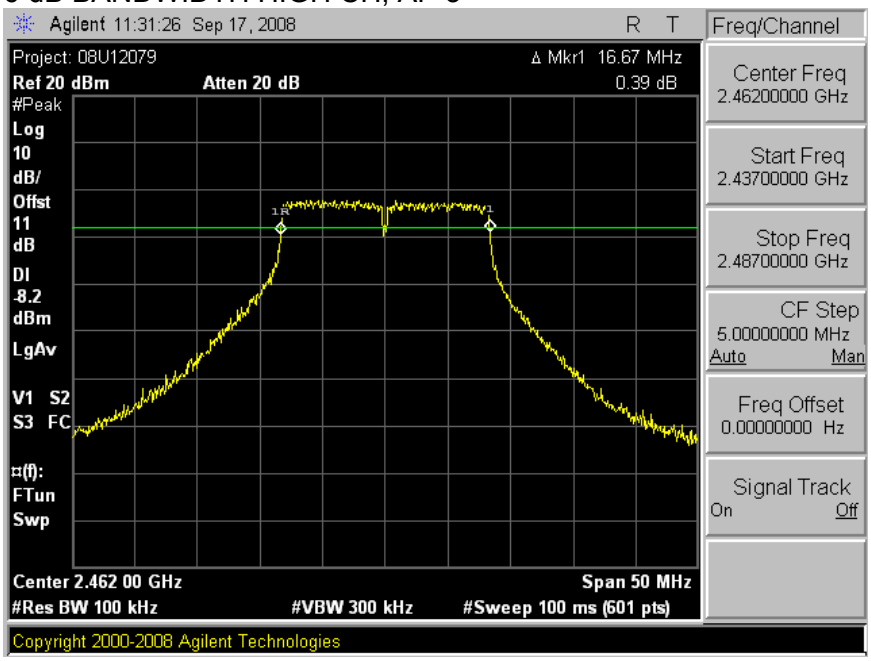
6 dB BANDWIDTH LOW CH, AP 3



6 dB BANDWIDTH MID CH, AP 3

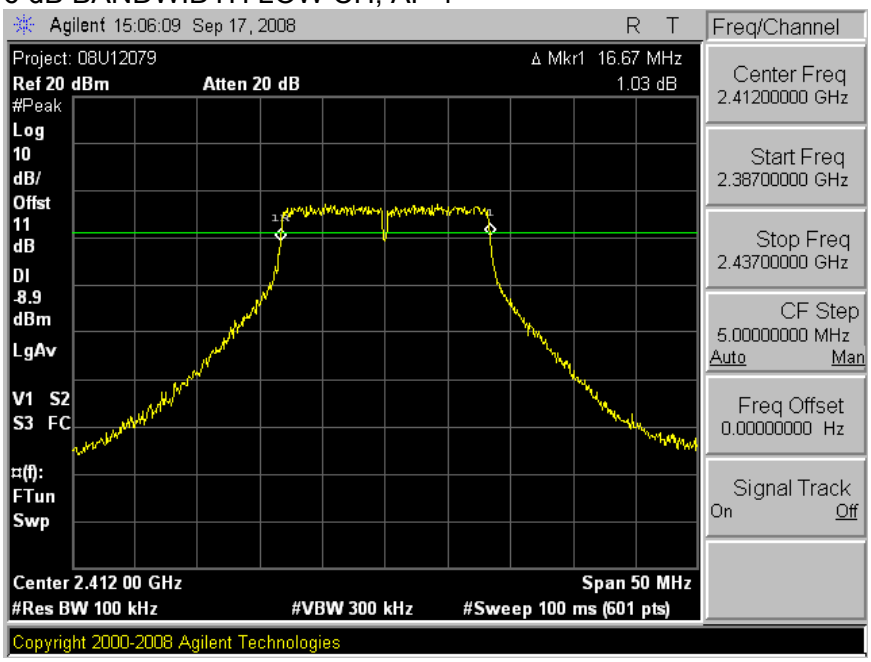


6 dB BANDWIDTH HIGH CH, AP 3

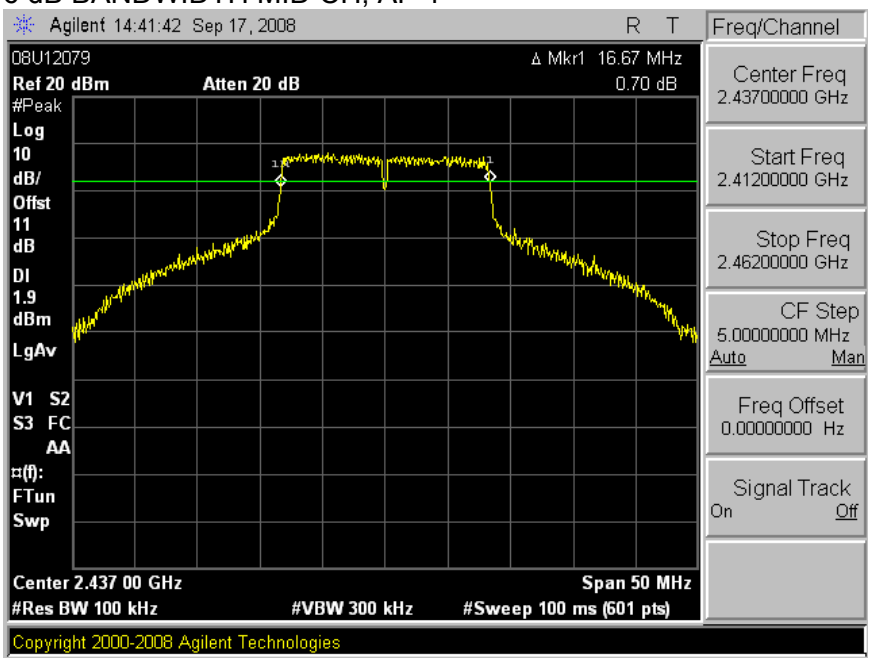


6 dB BANDWIDTH, AP 1

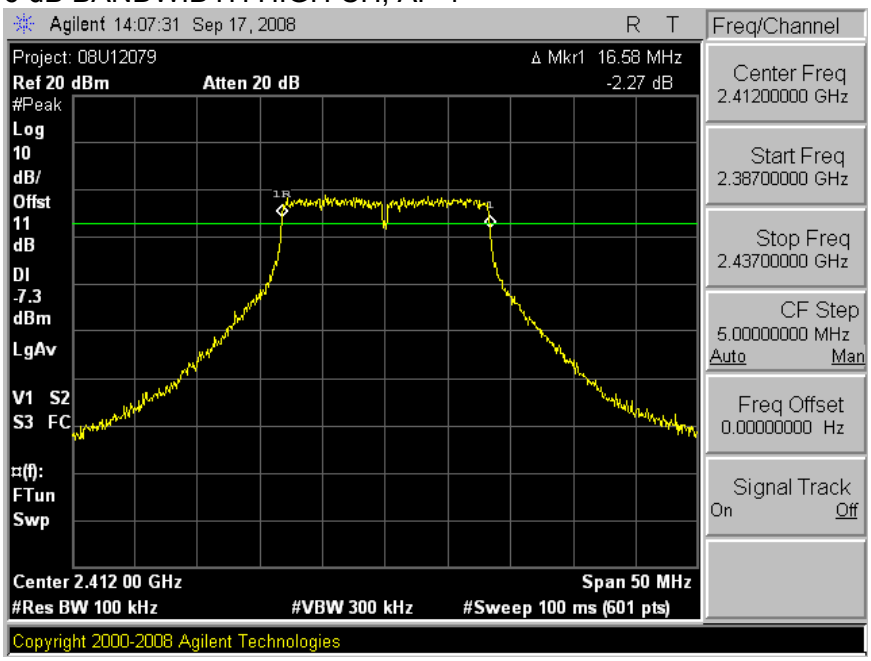
6 dB BANDWIDTH LOW CH, AP 1



6 dB BANDWIDTH MID CH, AP 1



6 dB BANDWIDTH HIGH CH, AP 1



7.2.2. 99% AND 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

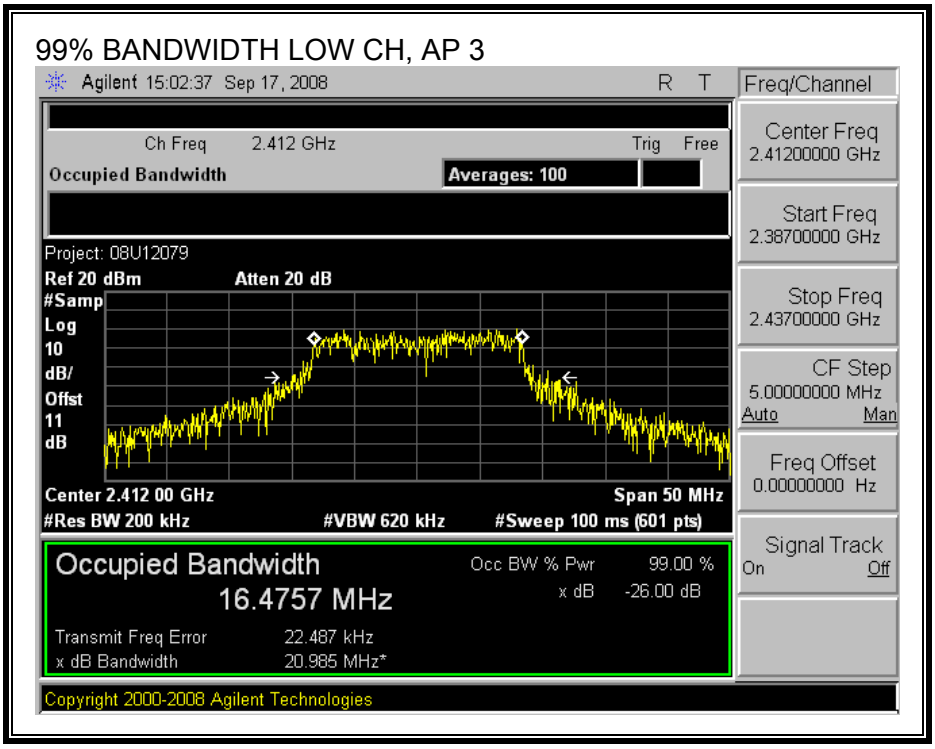
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

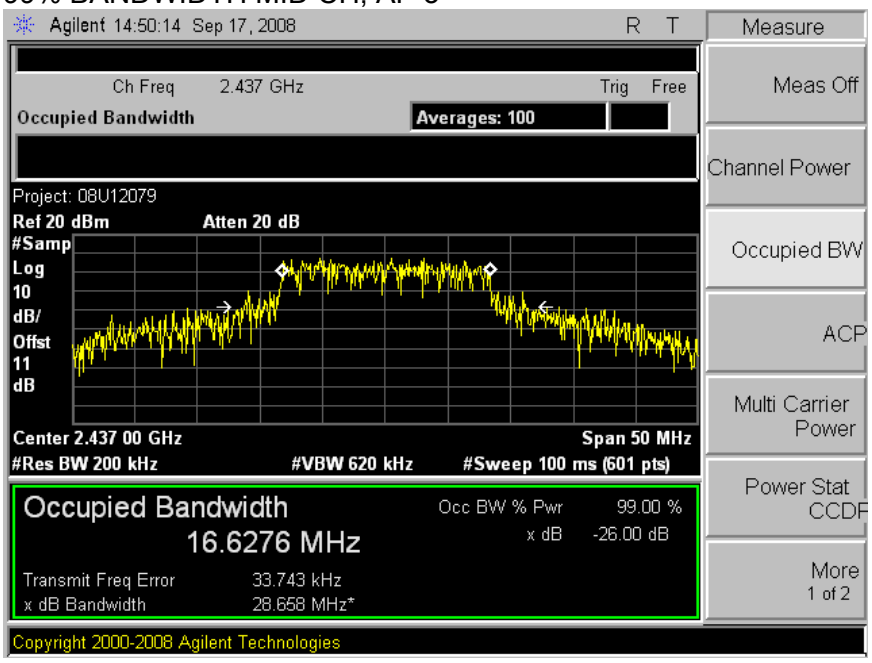
Channel	Frequency (MHz)	AP 3 99% Bandwidth (MHz)	AP 1 99% Bandwidth (MHz)
Low	2412	16.4757	16.4859
Middle	2437	16.6276	16.9279
High	2462	16.4899	16.4718

Channel	Frequency (MHz)	AP 3 26 dB Bandwidth (MHz)	AP 1 26 dB Bandwidth (MHz)
Low	2412	21.436	21.436
Middle	2437	21.656	21.679
High	2462	20.651	21.231

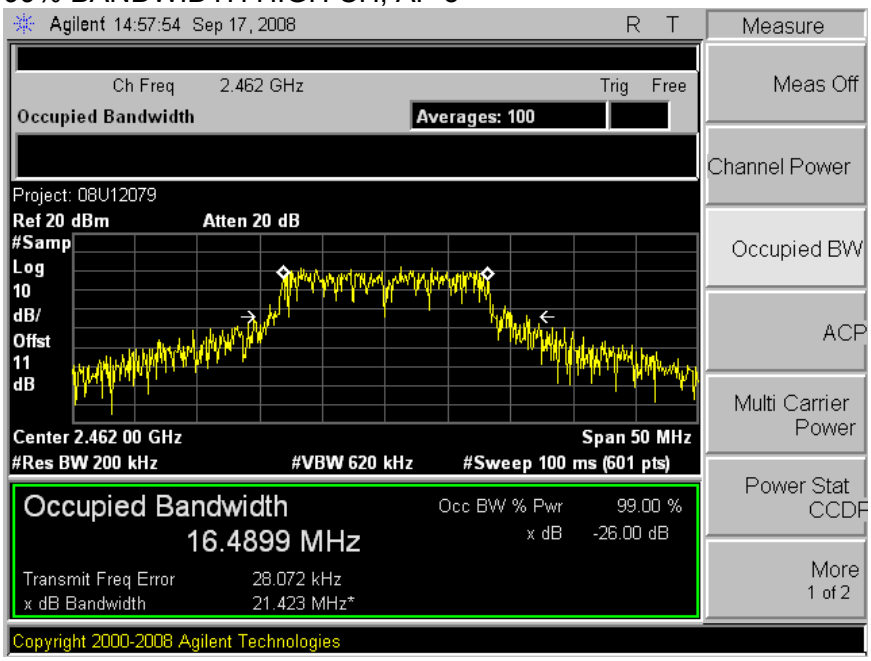
99% BANDWIDTH, AP 3



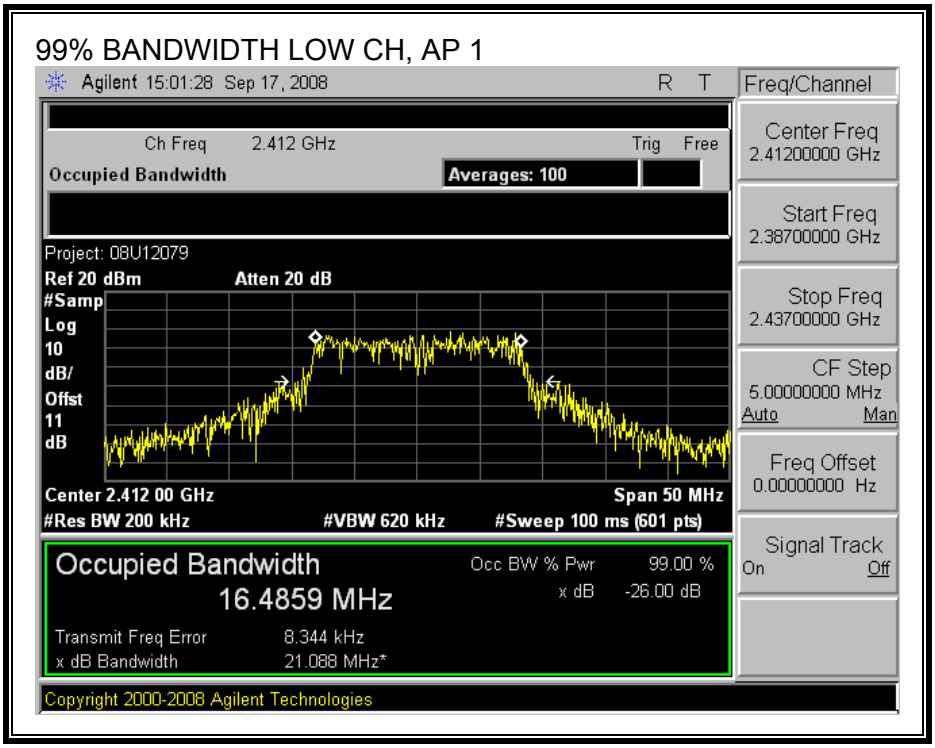
99% BANDWIDTH MID CH, AP 3



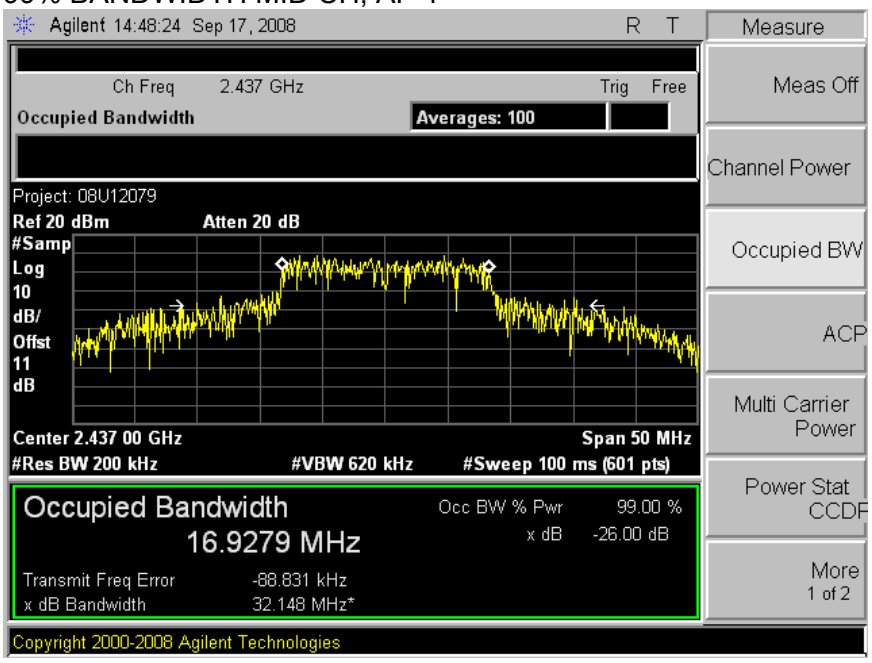
99% BANDWIDTH HIGH CH, AP 3



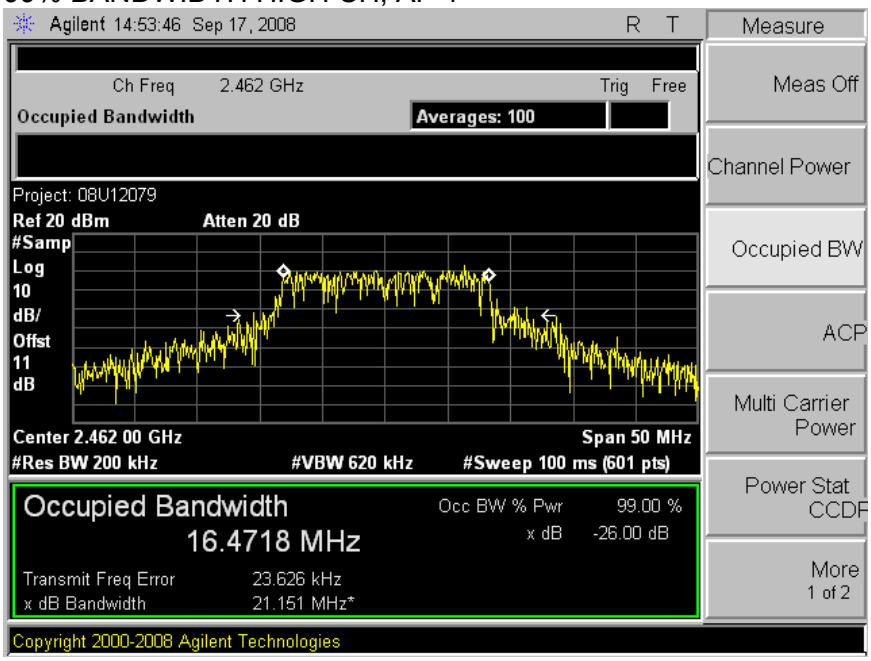
99% BANDWIDTH, AP 1



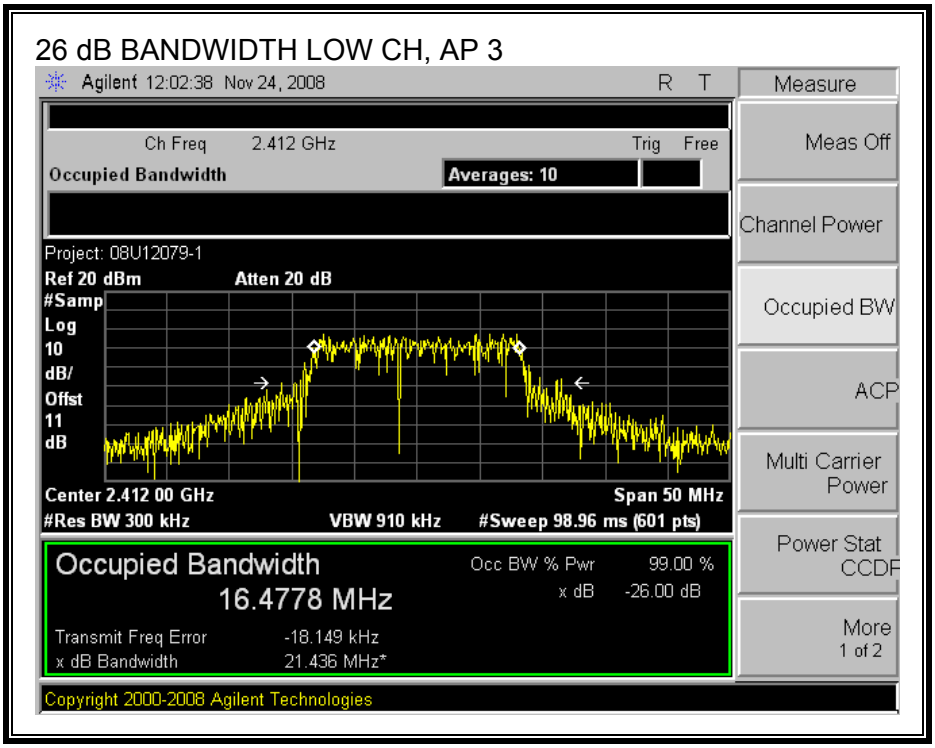
99% BANDWIDTH MID CH, AP 1



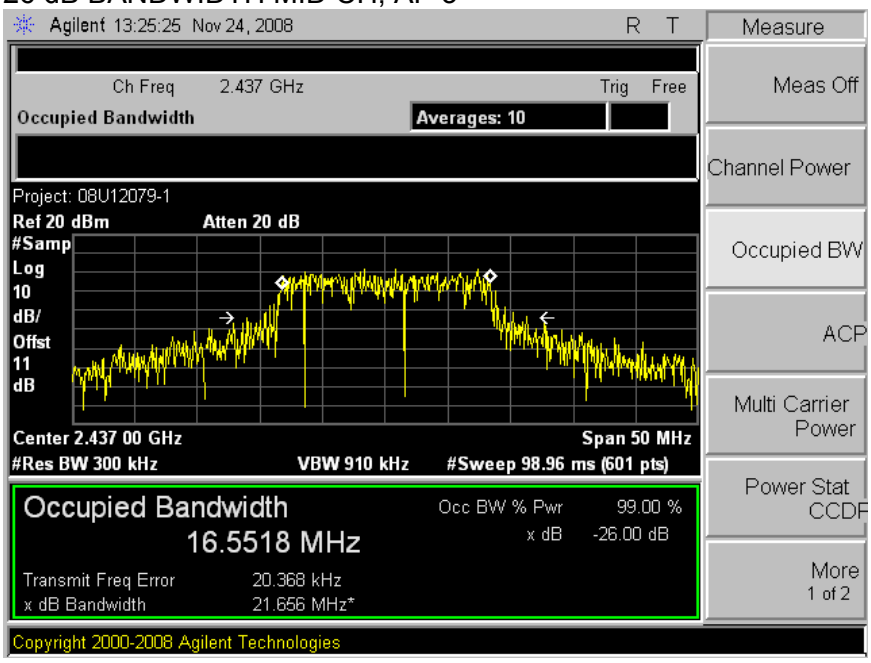
99% BANDWIDTH HIGH CH, AP 1



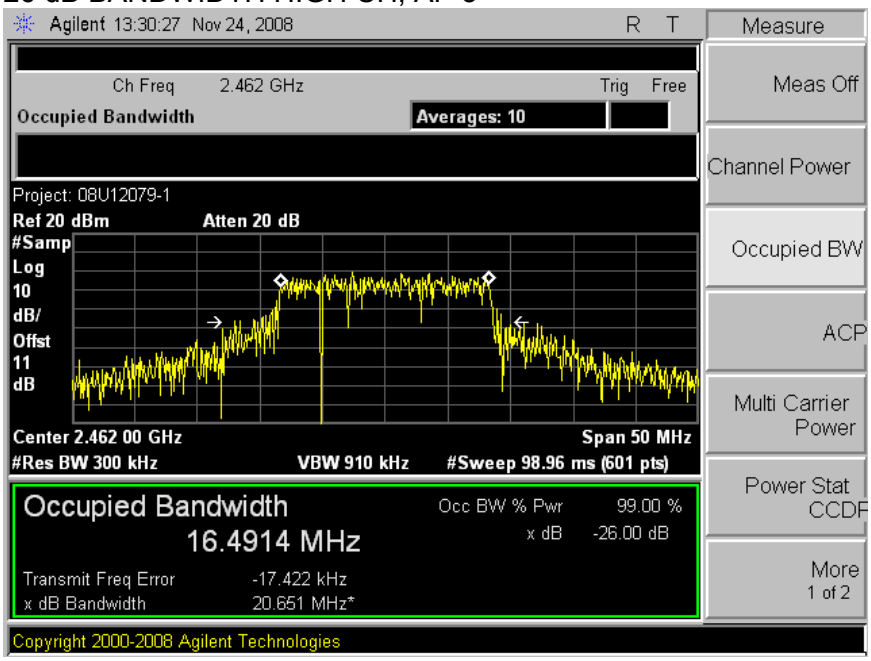
26 dB BANDWIDTH, AP3



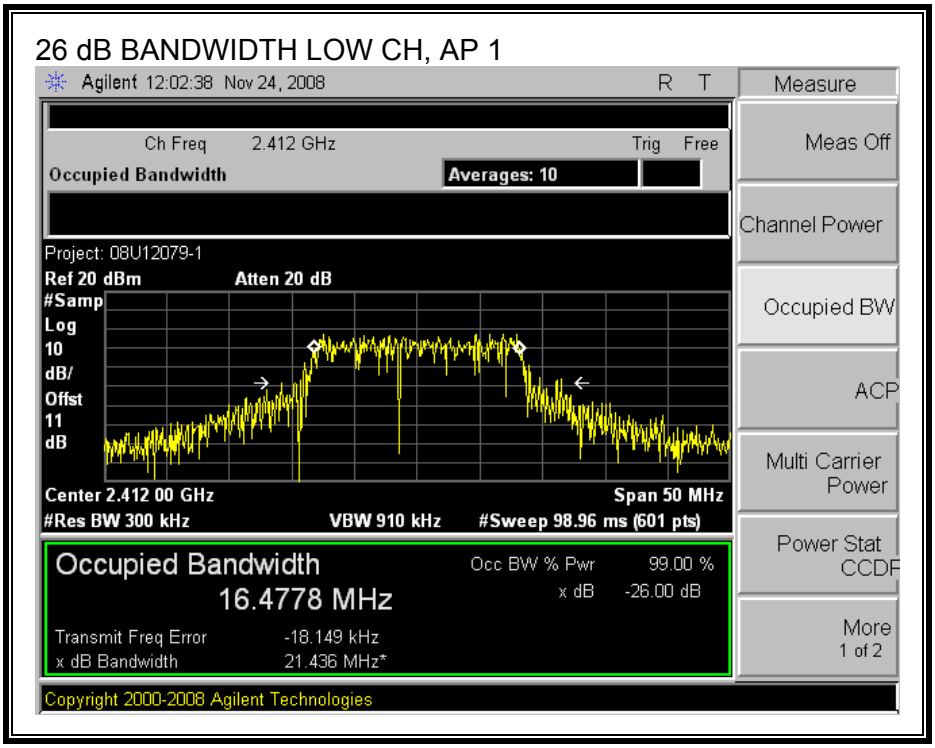
26 dB BANDWIDTH MID CH, AP 3



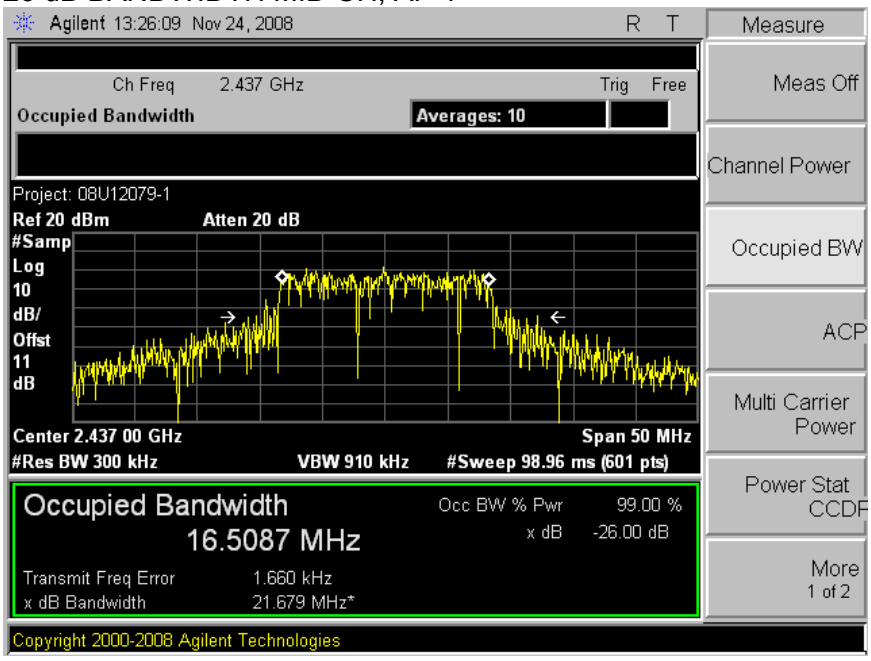
26 dB BANDWIDTH HIGH CH, AP 3



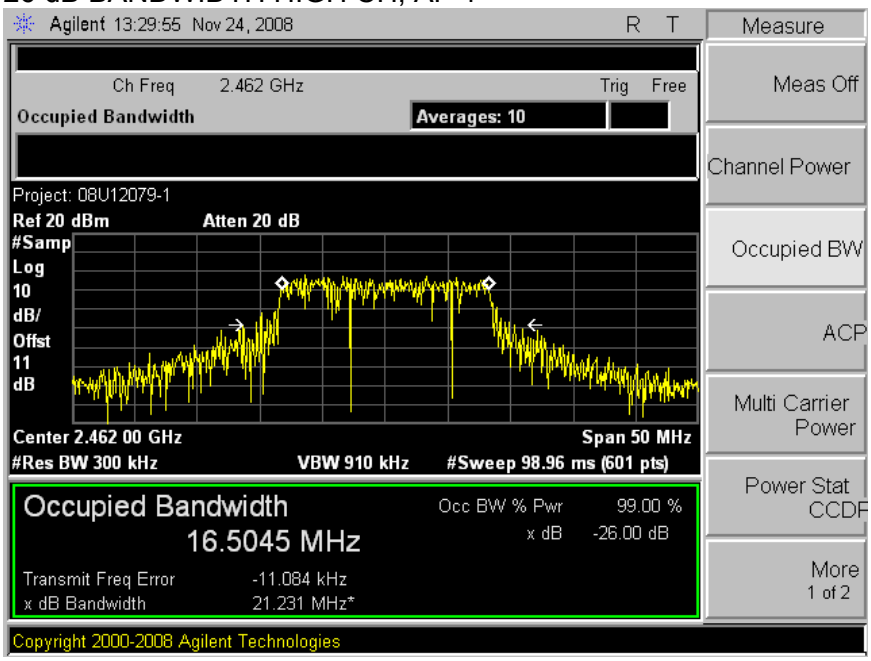
26 dB BANDWIDTH, AP1



26 dB BANDWIDTH MID CH, AP 1



26 dB BANDWIDTH HIGH CH, AP 1



7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (dBi)	10 Log (# Tx Chains) (dB)	Effective Legacy Gain (dBi)
1.21	3.01	4.22

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 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.

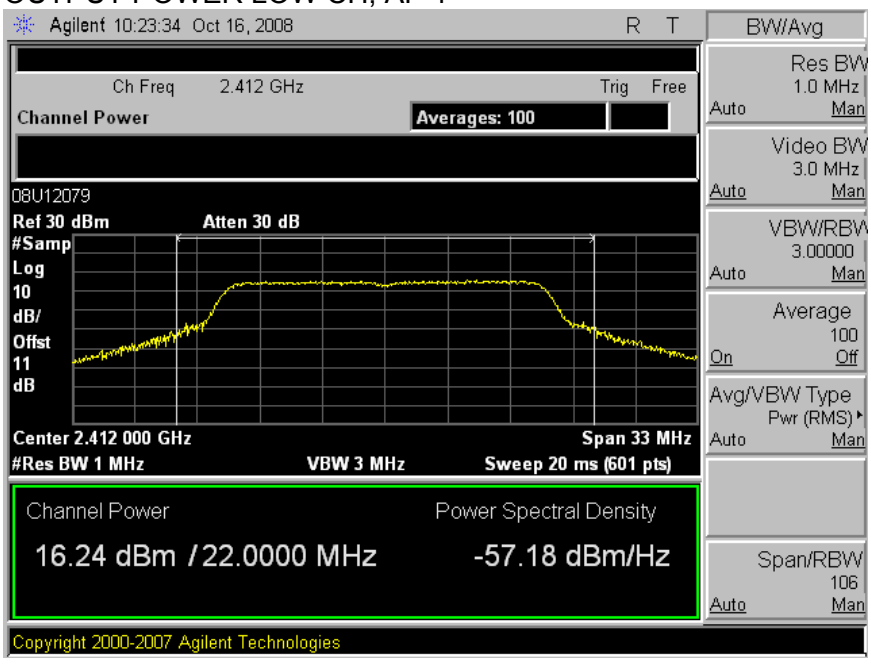
The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

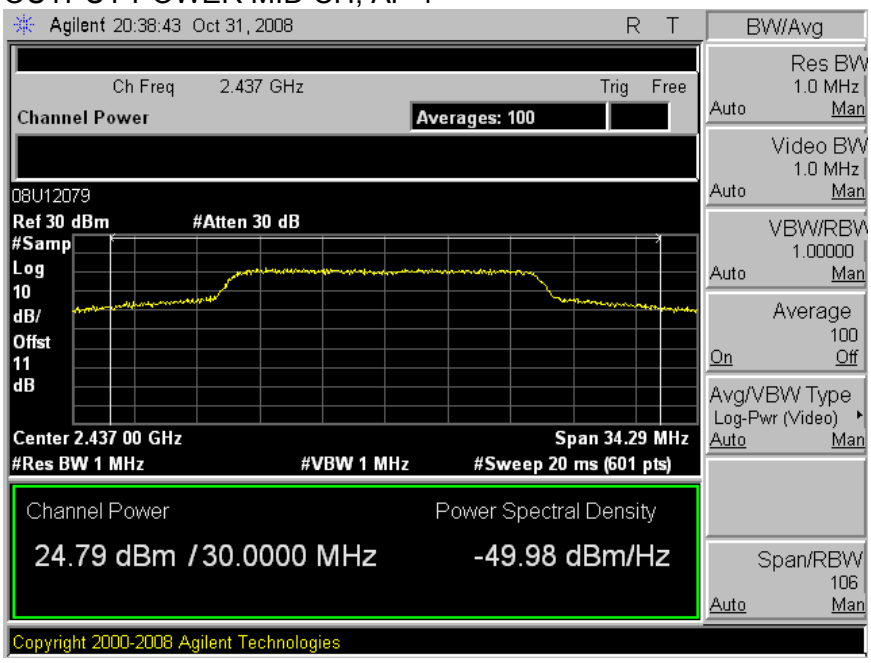
Channel	Frequency (MHz)	Limit (dBm)	AP 1 Power (dBm)	AP 3 Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	16.24	14.73	0.00	18.56	-11.44
Mid	2437	30.00	24.79	25.39	0.00	28.11	-1.89
High	2462	30.00	17.19	16.26	0.00	19.76	-10.24

OUTPUT POWER, AP1

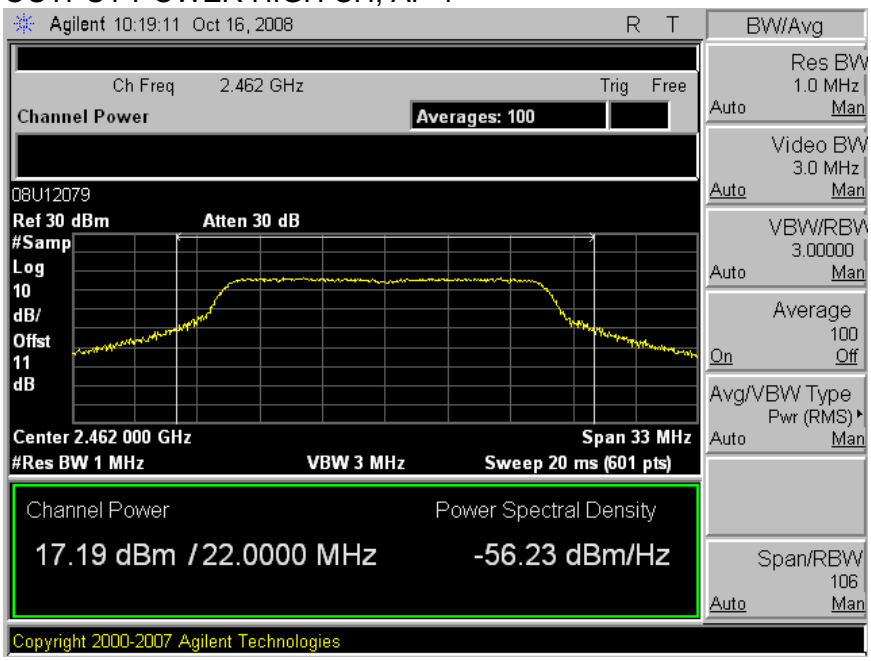
OUTPUT POWER LOW CH, AP 1



OUTPUT POWER MID CH, AP 1

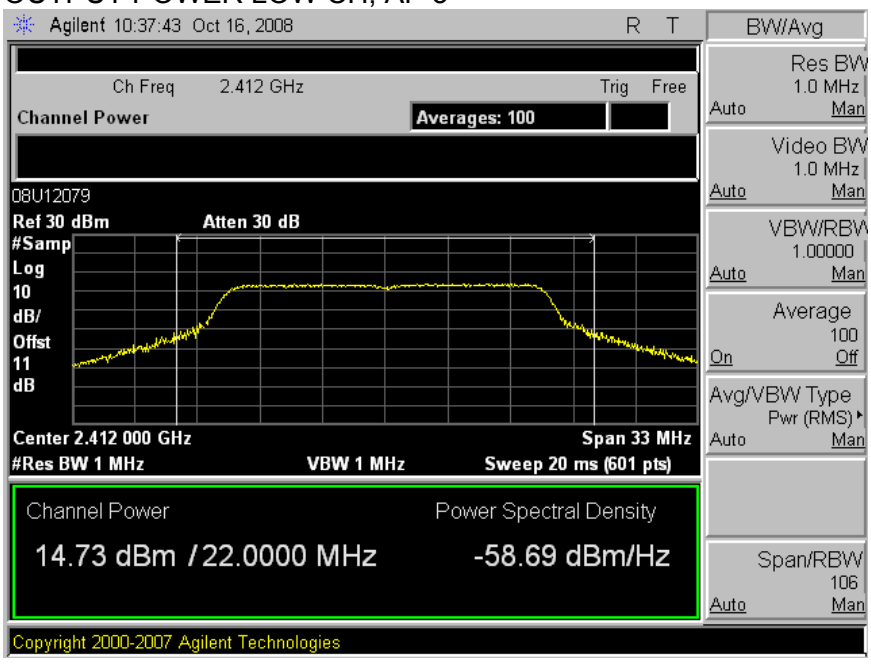


OUTPUT POWER HIGH CH, AP 1

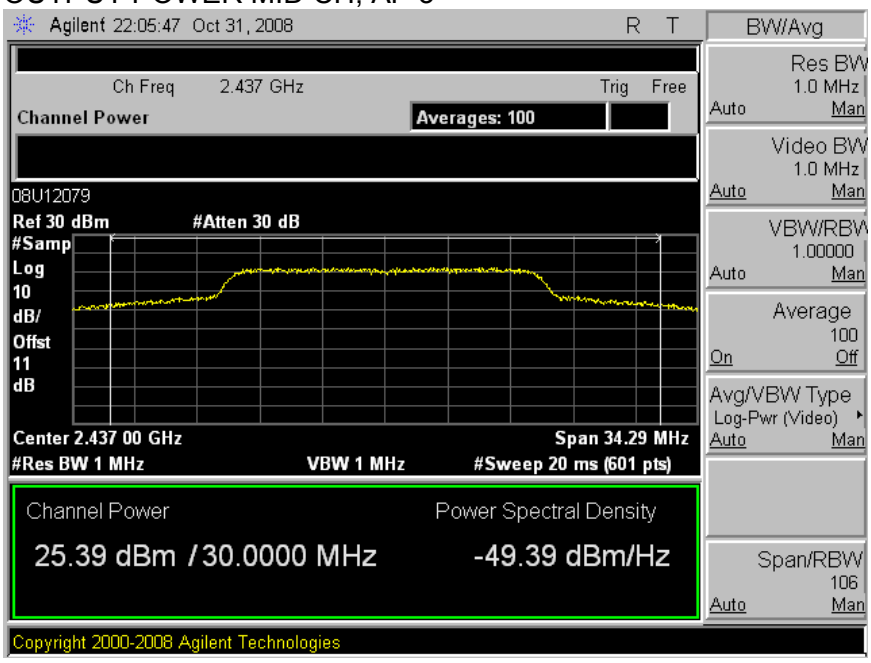


OUTPUT POWER, AP3

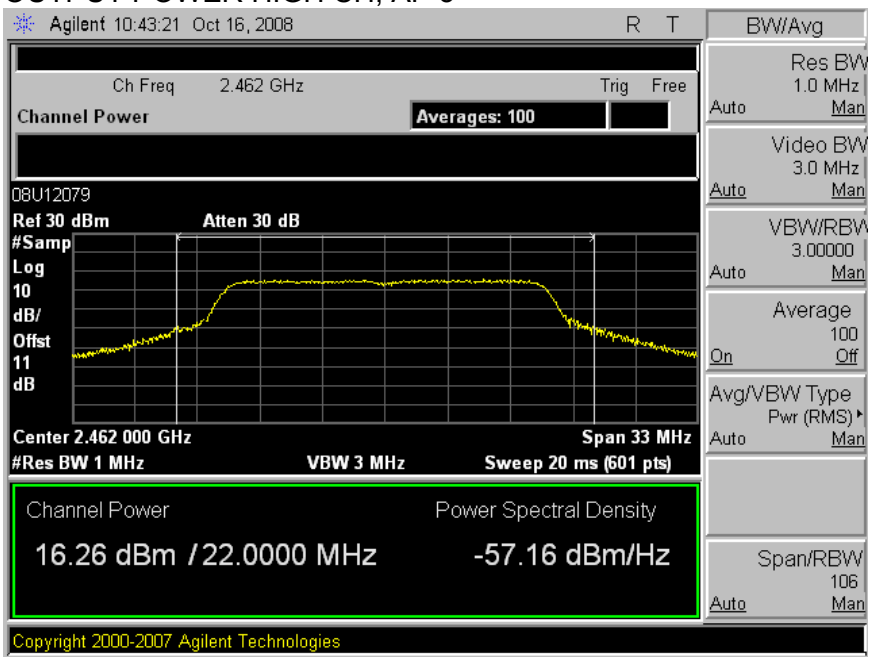
OUTPUT POWER LOW CH, AP 3



OUTPUT POWER MID CH, AP 3



OUTPUT POWER HIGH CH, AP 3



7.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

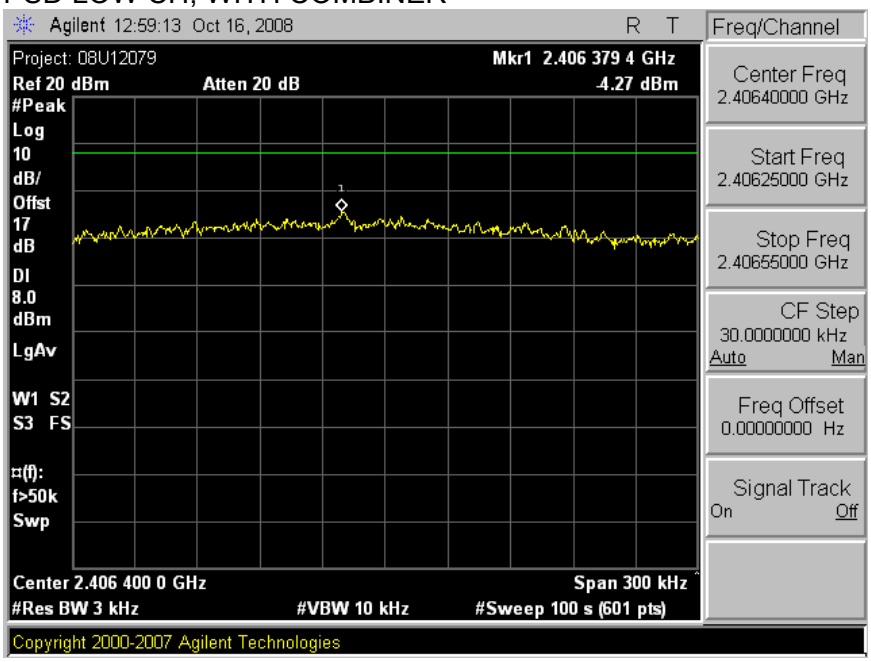
Power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

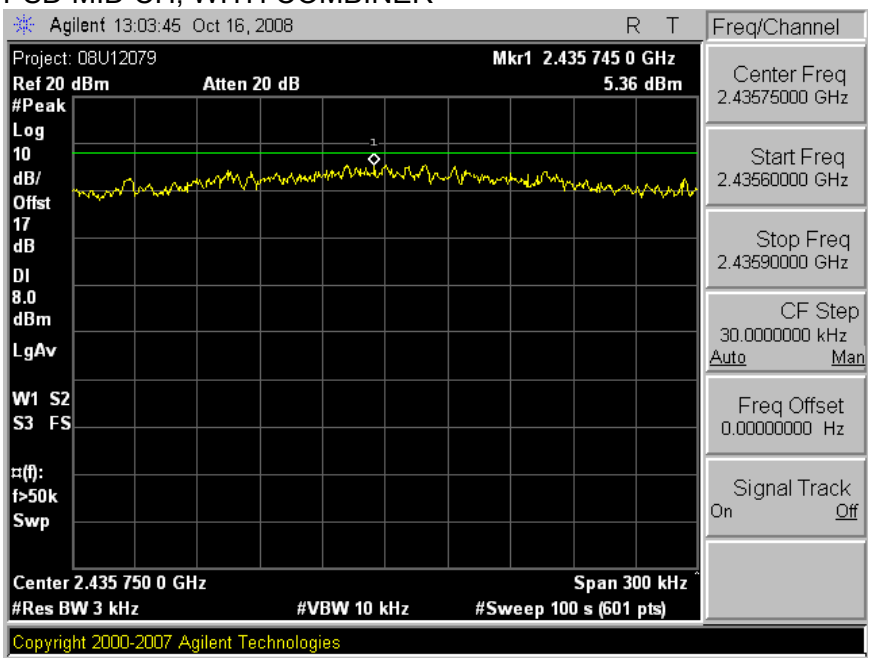
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.27	8	-12.27
Middle	2437	5.36	8	-2.64
High	2462	-3.52	8	-11.52

POWER SPECTRAL DENSITY, WITH COMBINER

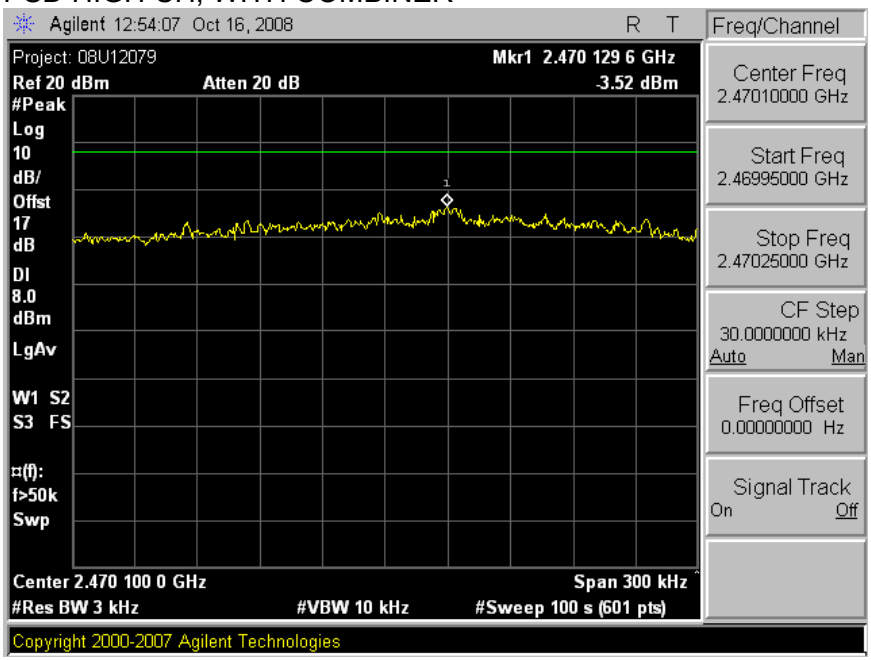
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003, therefore the required attenuation for conducted spurious is 30 dBc.

TEST PROCEDURE

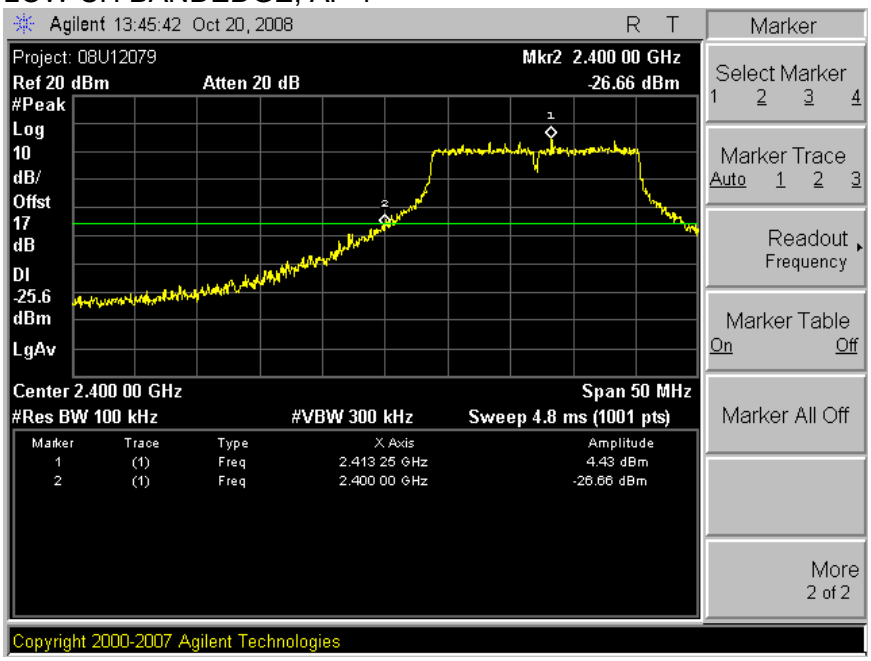
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

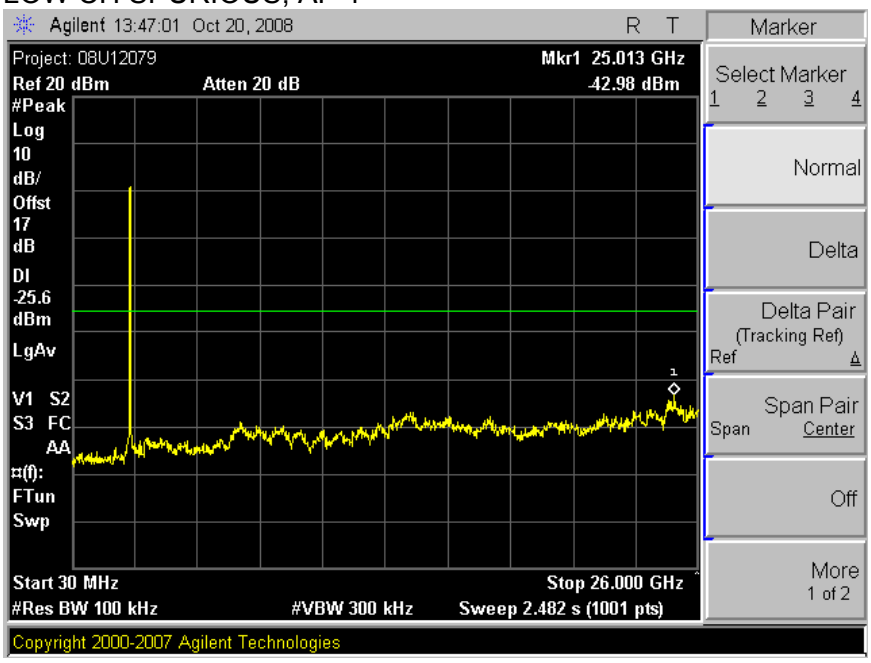
RESULTS

AP 1 SPURIOUS EMISSIONS

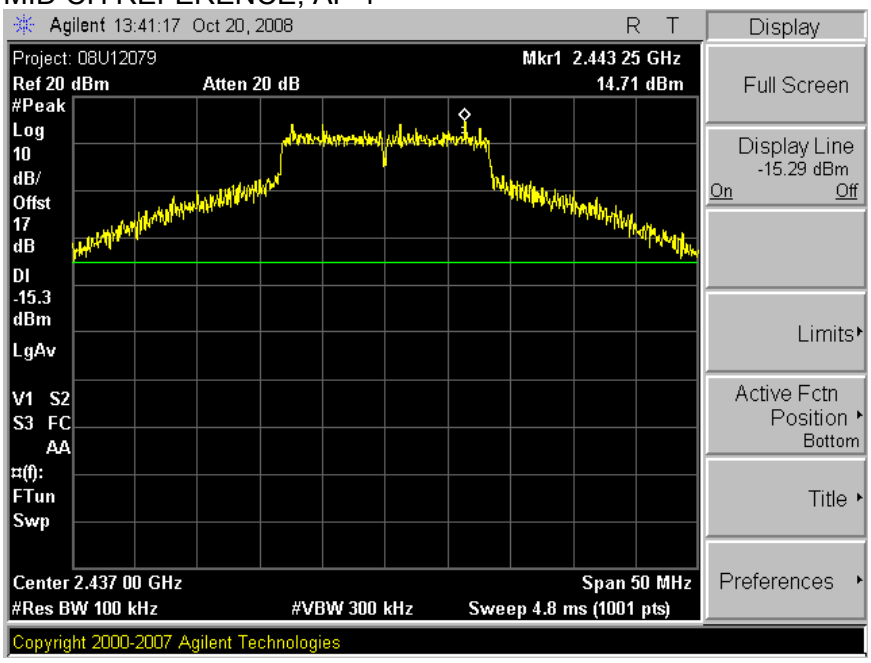
LOW CH BANDEDGE, AP 1



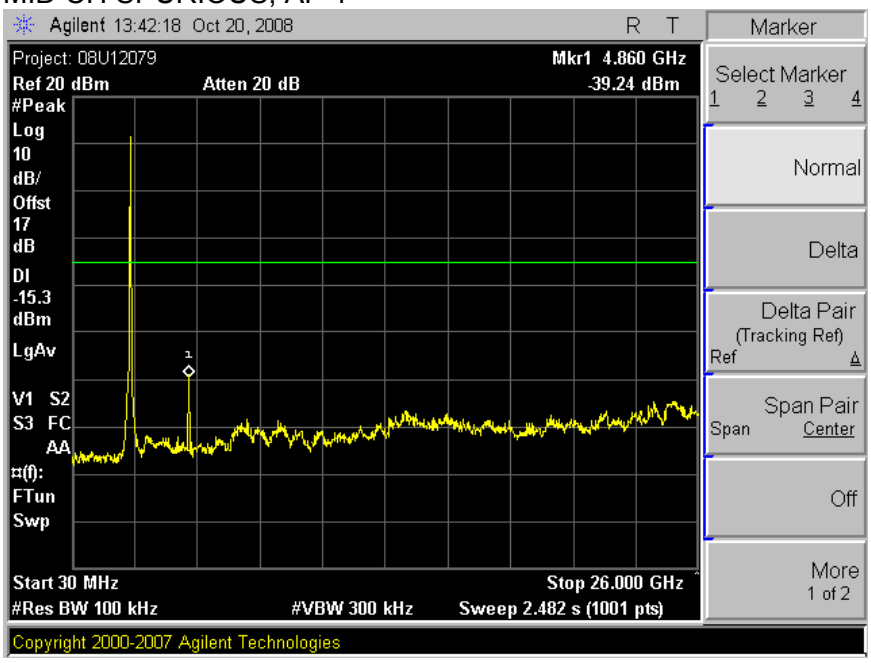
LOW CH SPURIOUS, AP 1



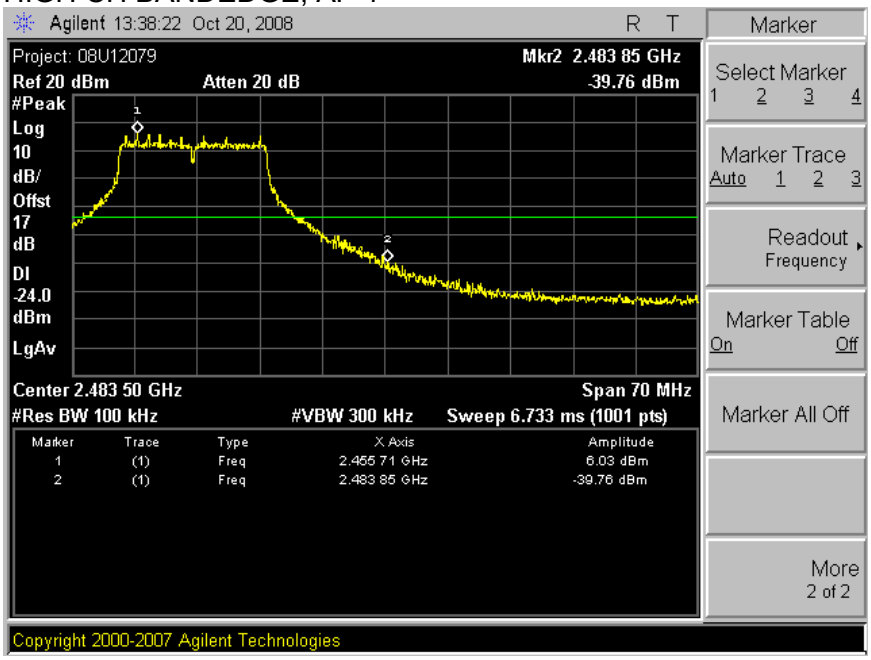
MID CH REFERENCE, AP 1



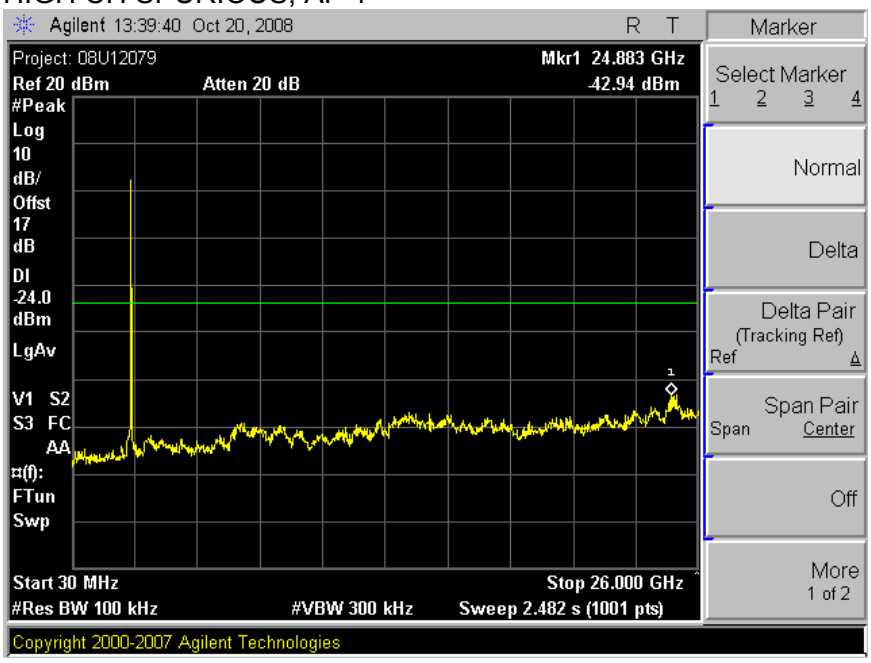
MID CH SPURIOUS, AP 1



HIGH CH BANDEDGE, AP 1

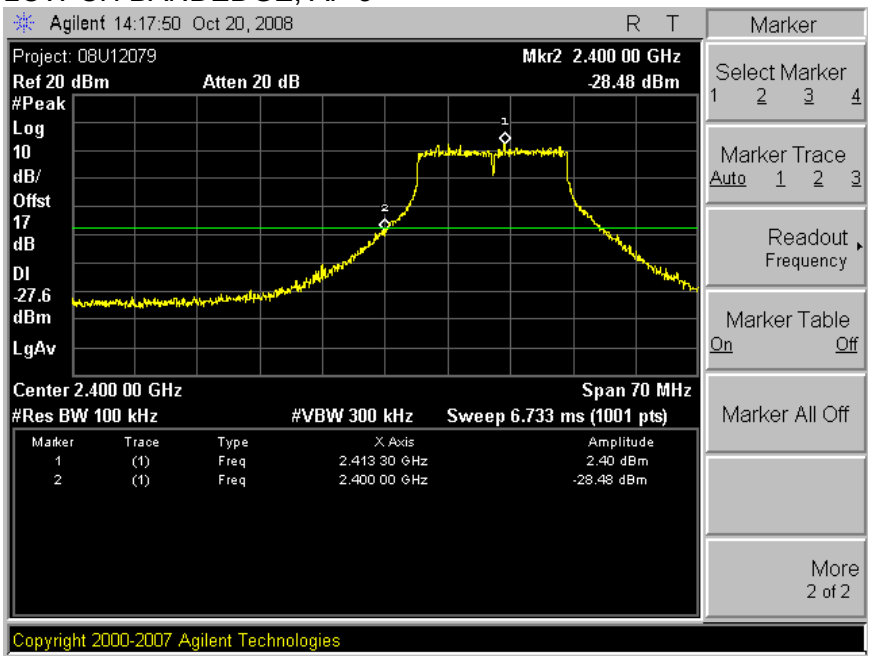


HIGH CH SPURIOUS, AP 1

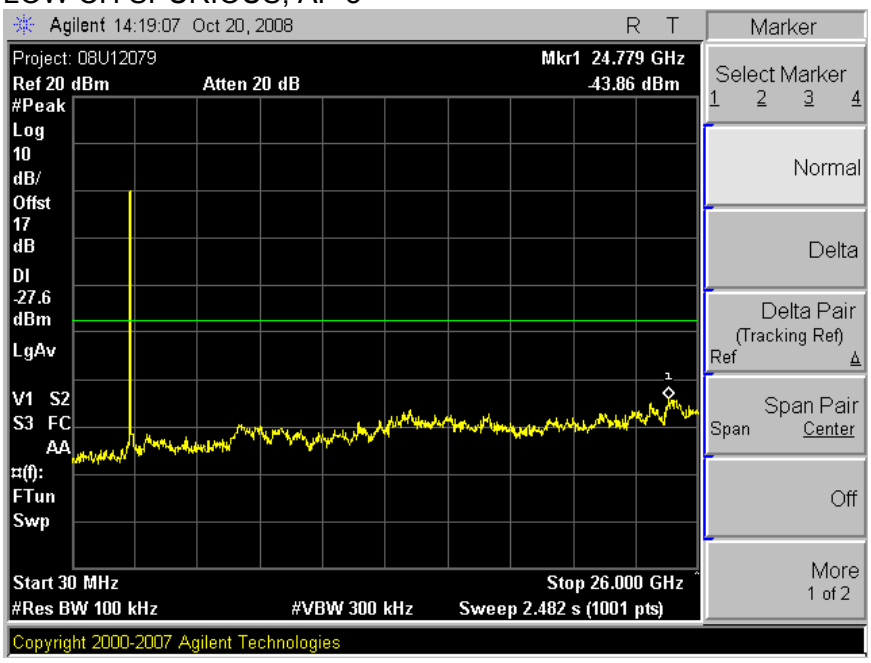


AP 3 SPURIOUS EMISSIONS

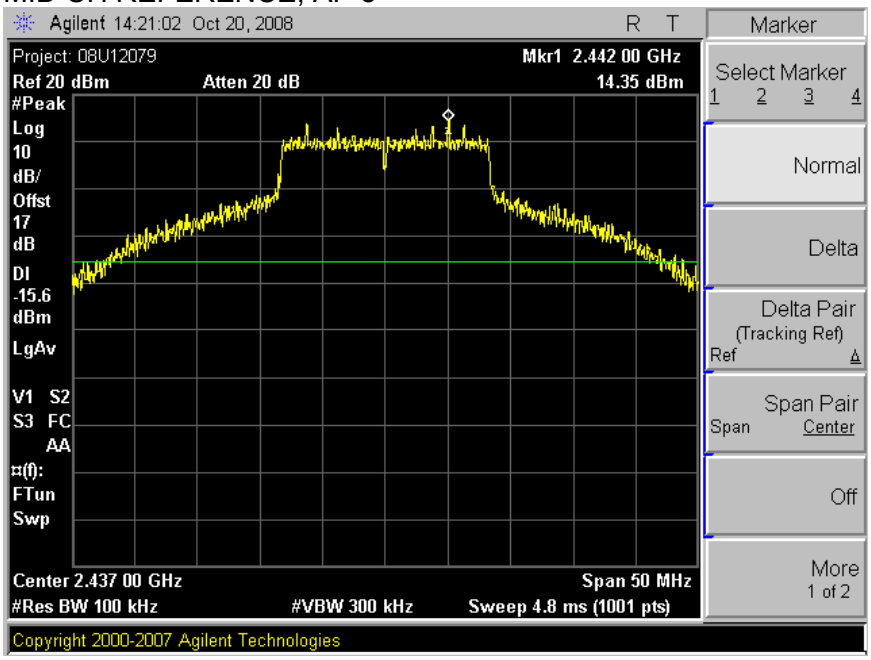
LOW CH BANDEDGE, AP 3



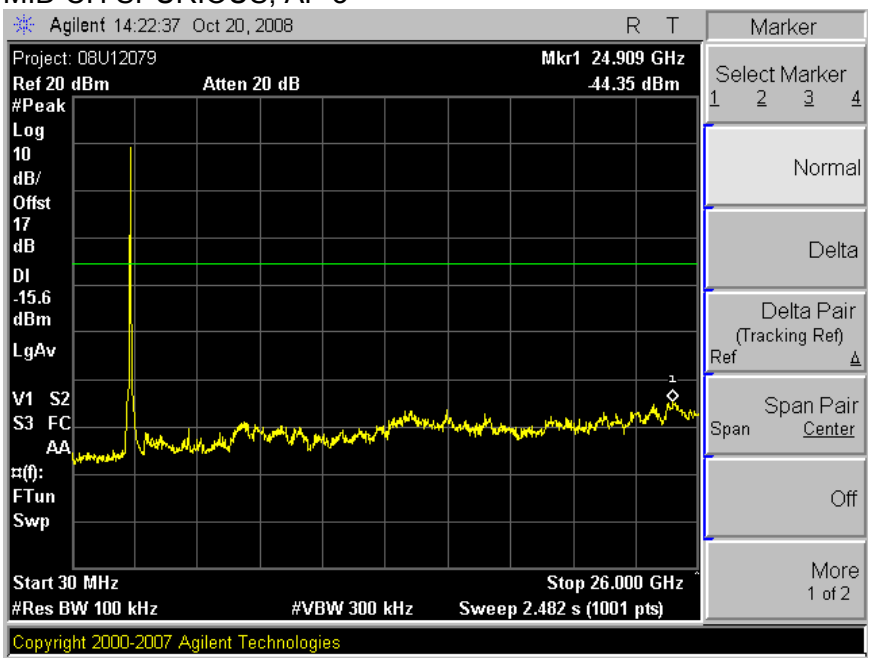
LOW CH SPURIOUS, AP 3



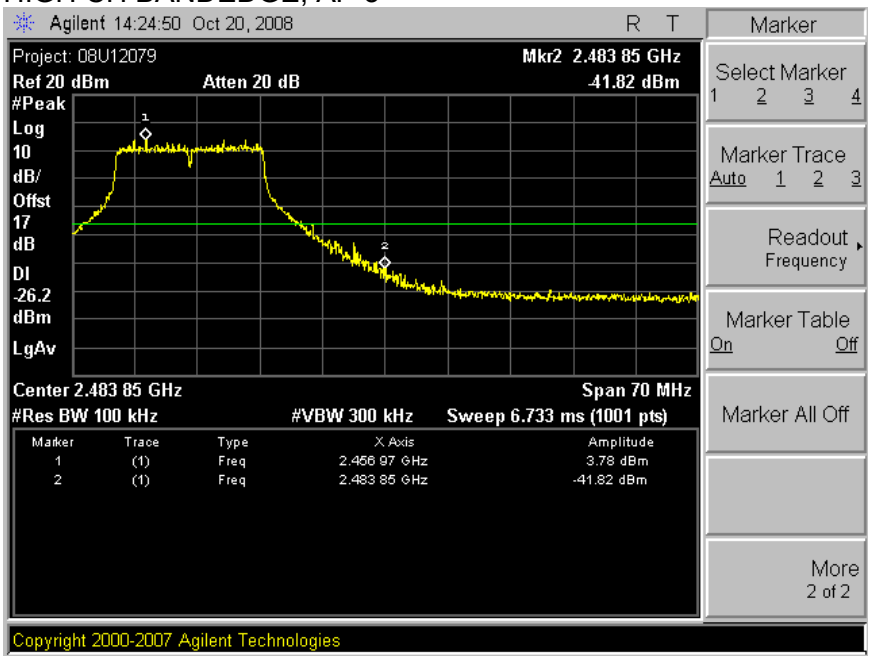
MID CH REFERENCE, AP 3



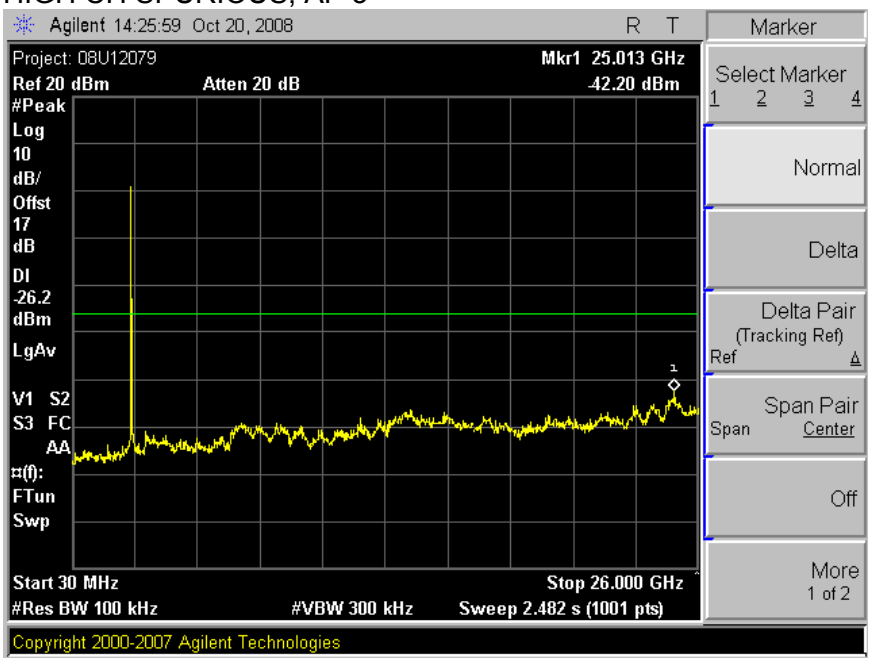
MID CH SPURIOUS, AP 3



HIGH CH BANDEDGE, AP 3



HIGH CH SPURIOUS, AP 3



7.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

7.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

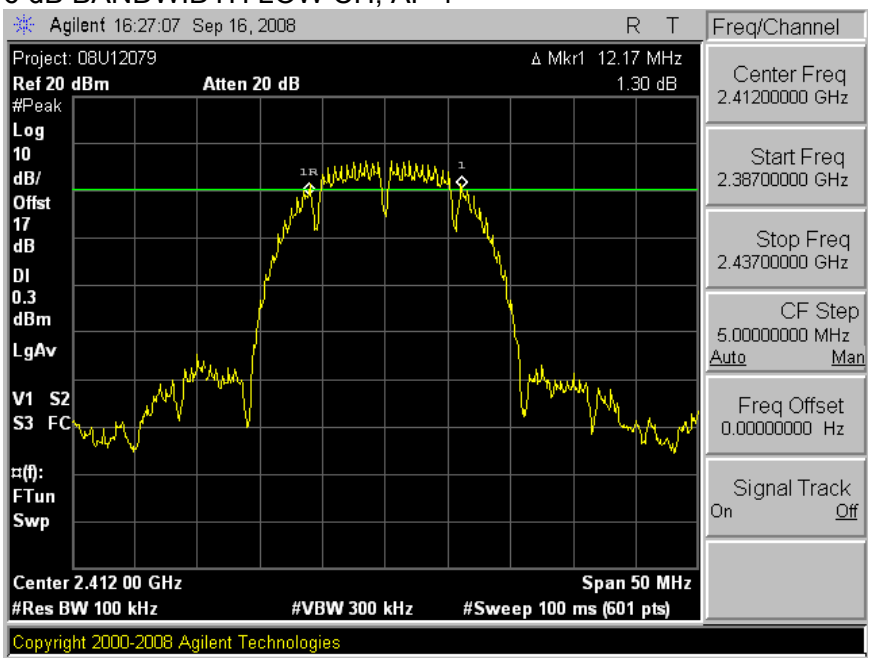
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

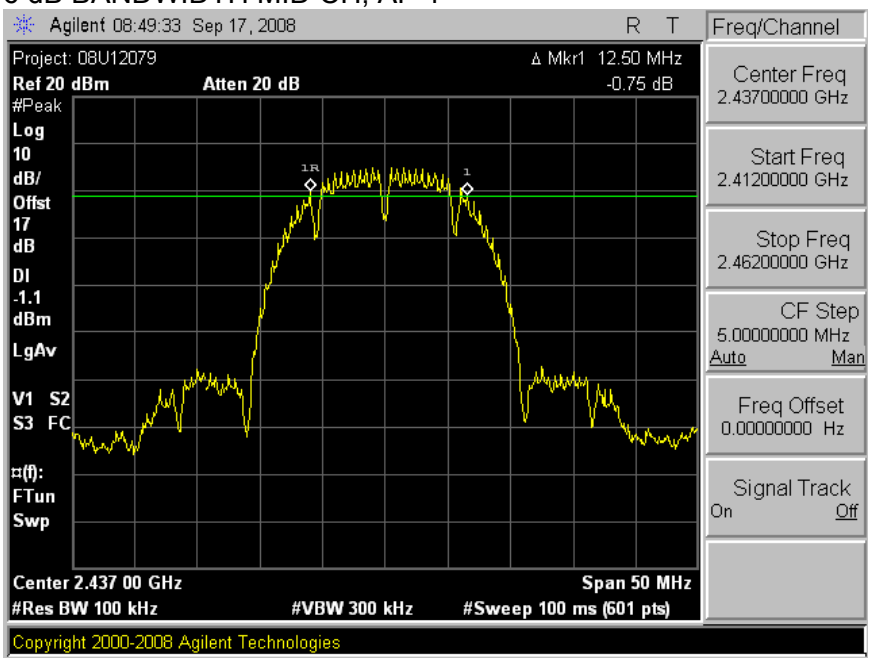
Channel	Frequency (MHz)	AP1 6 dB BW (MHz)	AP3 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	12.17	12.08	0.5
Middle	2437	12.50	12.08	0.5
High	2462	12.50	12.58	0.5

6 dB BANDWIDTH, AP 1

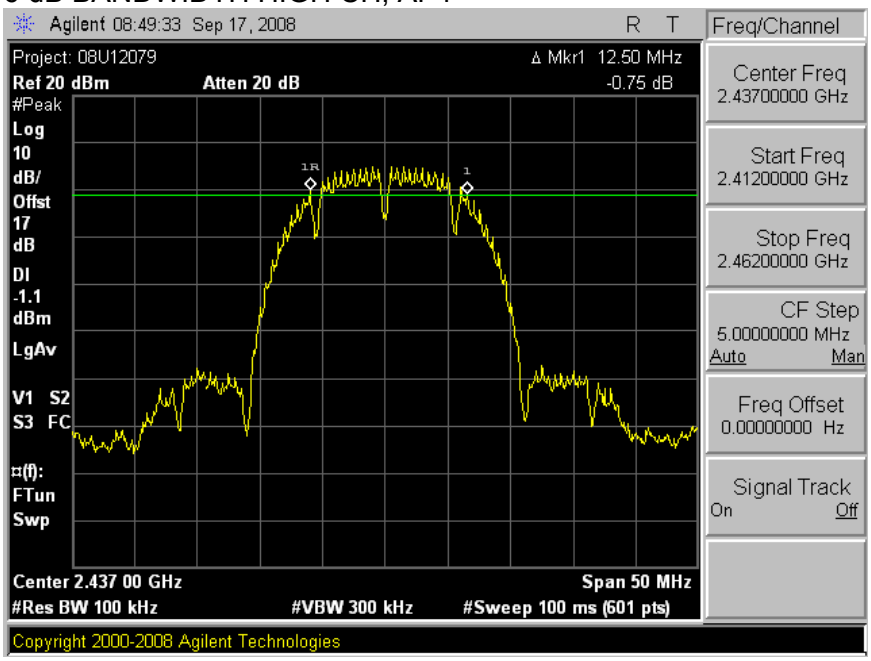
6 dB BANDWIDTH LOW CH, AP 1



6 dB BANDWIDTH MID CH, AP 1

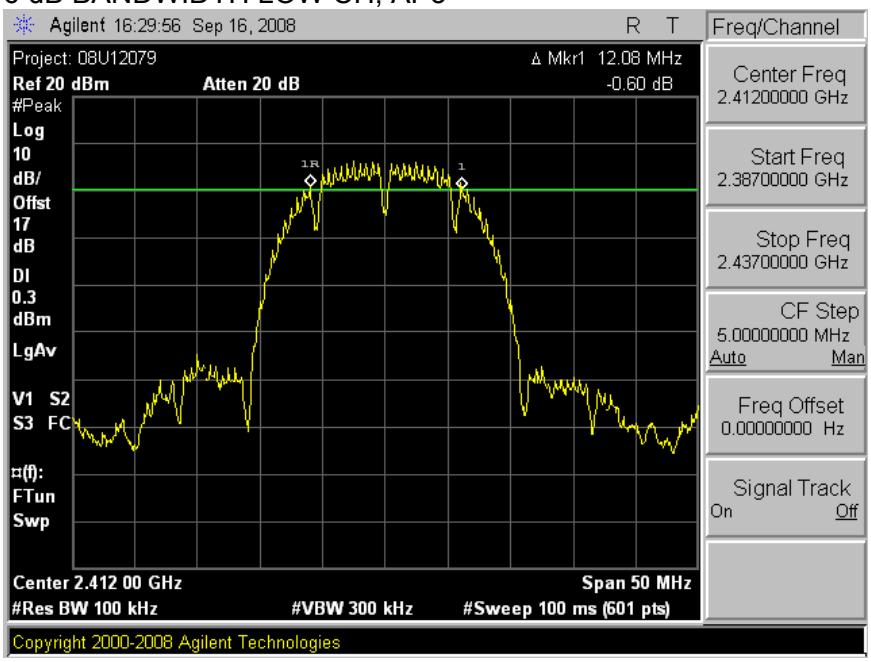


6 dB BANDWIDTH HIGH CH, AP1

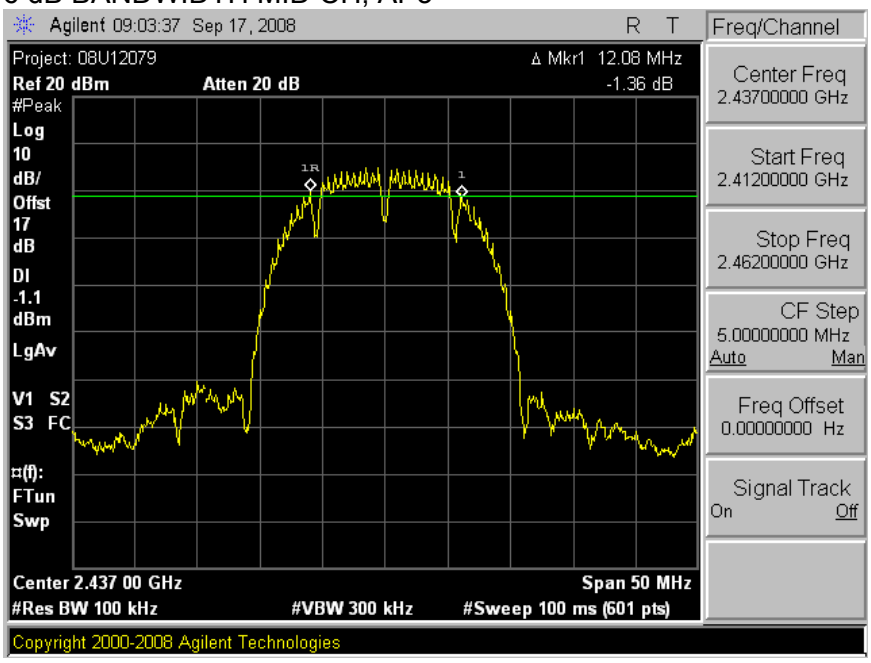


6 dB BANDWIDTH, AP 3

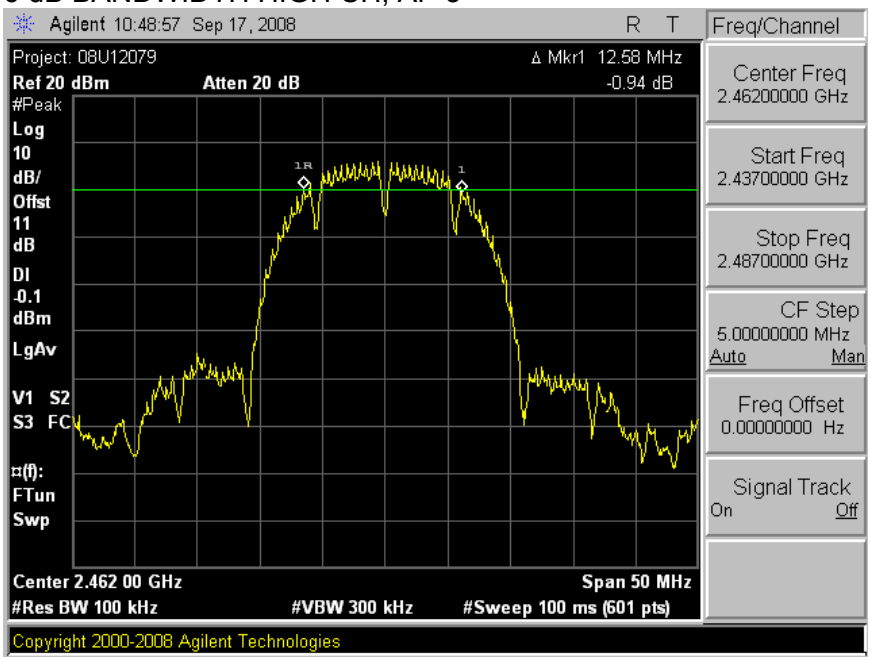
6 dB BANDWIDTH LOW CH, AP3



6 dB BANDWIDTH MID CH, AP3



6 dB BANDWIDTH HIGH CH, AP 3



7.3.2. 99% and 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

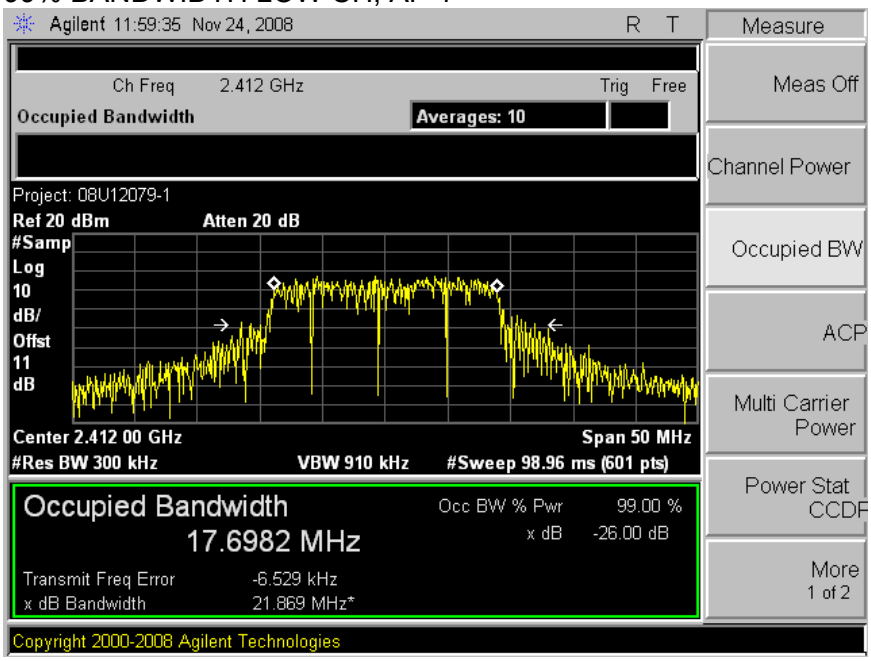
Channel	Frequency (MHz)	AP 1 99% Bandwidth (MHz)	AP 3 99% Bandwidth (MHz)
Low	2412	17.6982	17.6599
Middle	2437	28.3245	29.0889
High	2462	17.735	17.7013

RESULTS

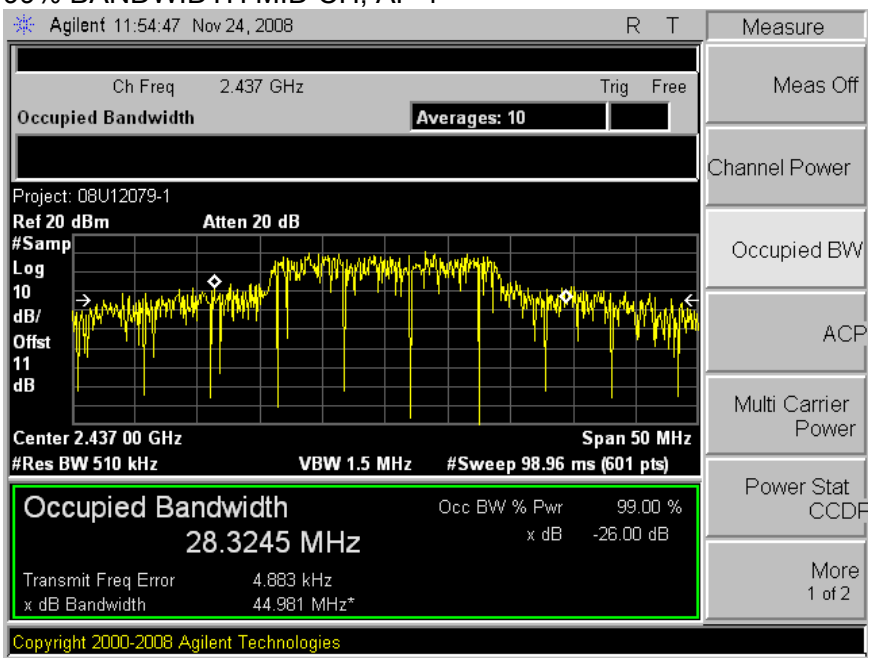
Channel	Frequency (MHz)	AP 1 26 dB Bandwidth (MHz)	AP 3 26 dB Bandwidth (MHz)
Low	2412	21.869	22.114
Middle	2437	44.981	45.143
High	2462	22.271	22.155

99% BANDWIDTH, AP1

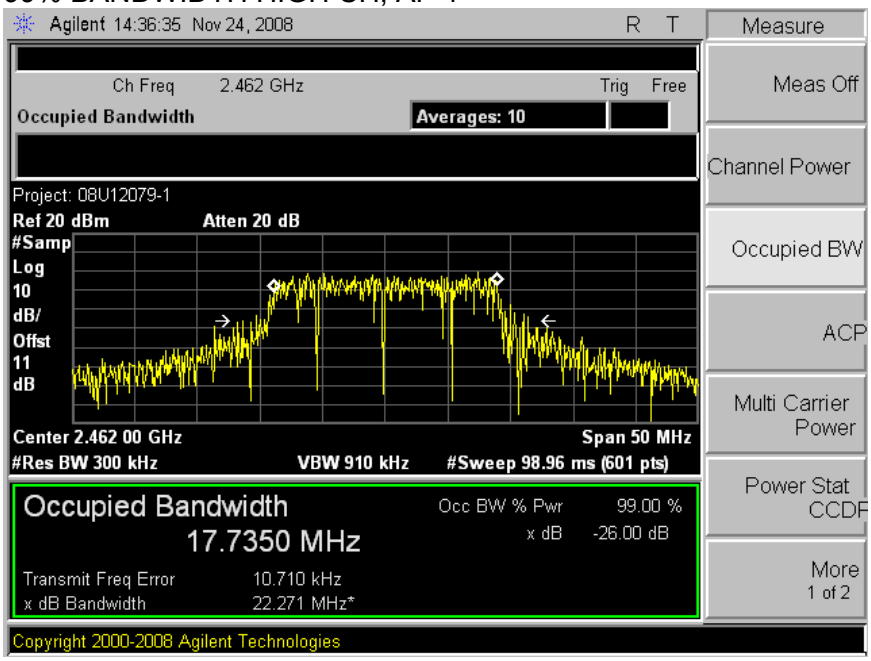
99% BANDWIDTH LOW CH, AP 1



99% BANDWIDTH MID CH, AP 1

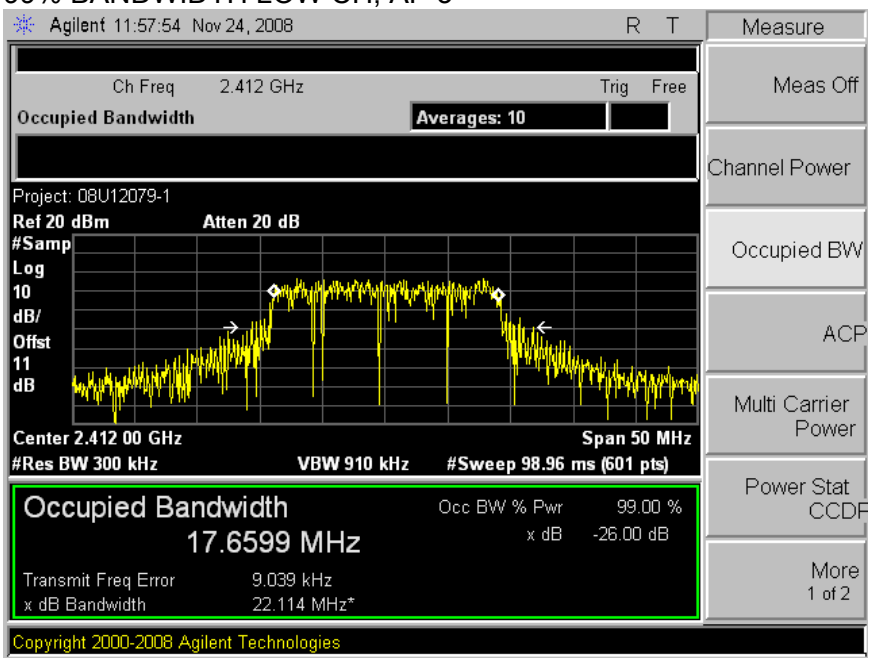


99% BANDWIDTH HIGH CH, AP 1

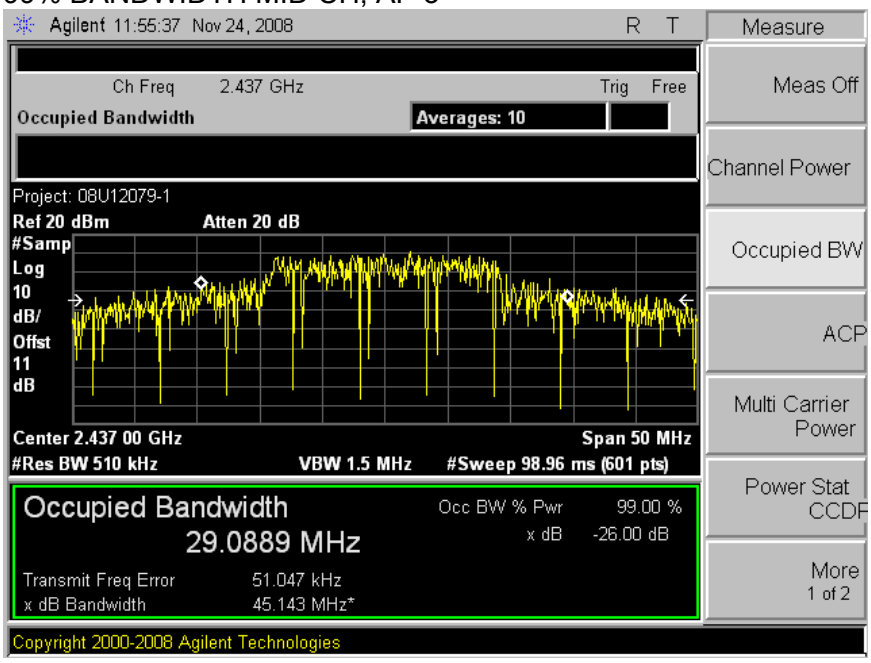


99% BANDWIDTH, AP 3

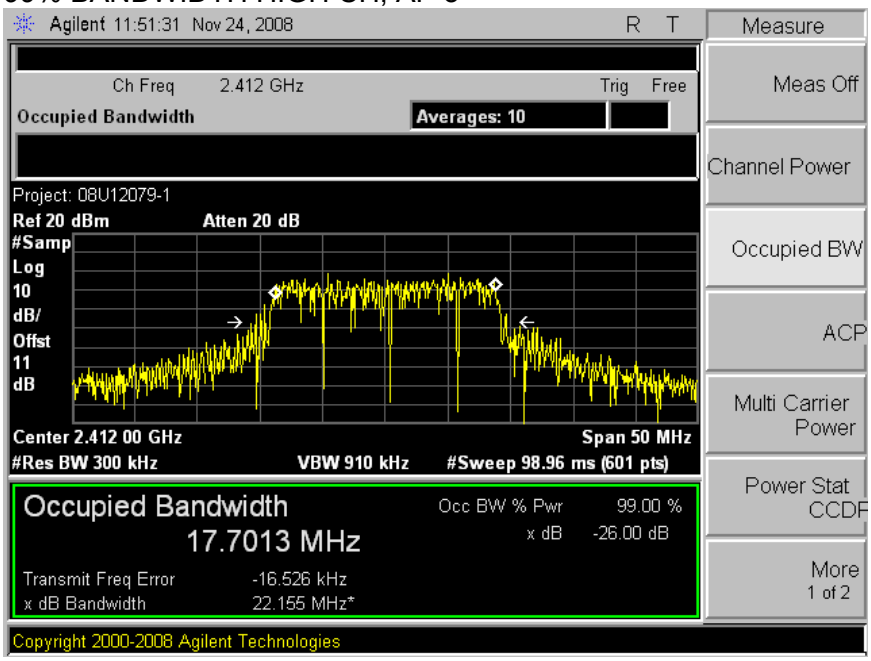
99% BANDWIDTH LOW CH, AP 3



99% BANDWIDTH MID CH, AP 3



99% BANDWIDTH HIGH CH, AP 3



7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

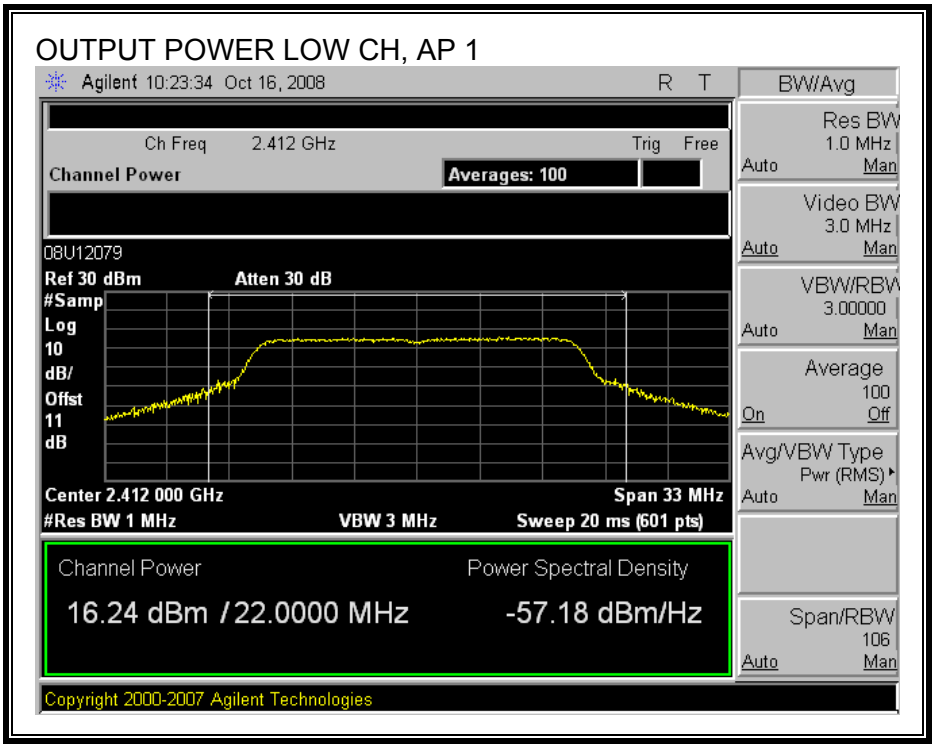
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

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

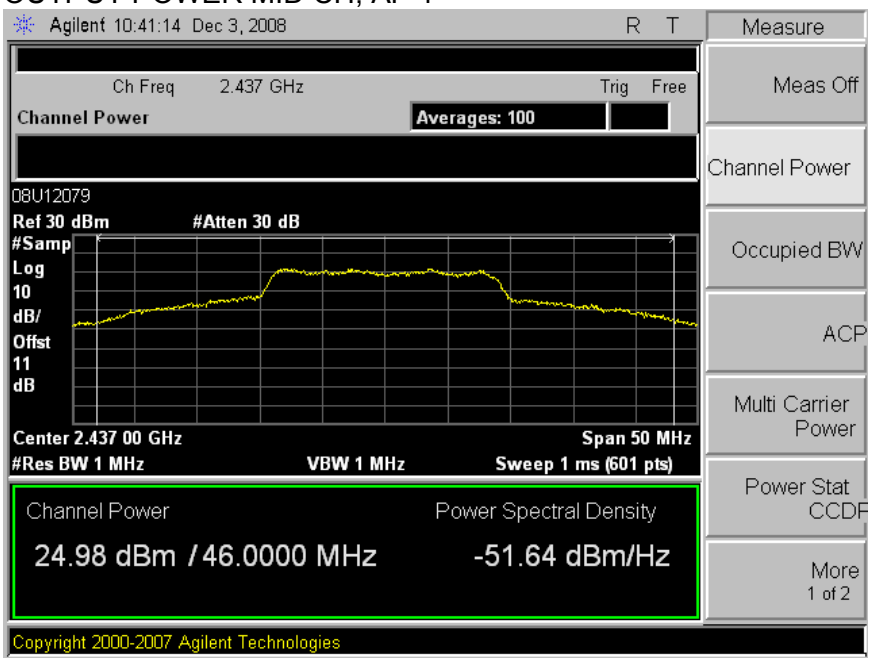
RESULTS

Channel	Frequency (MHz)	Limit (dBm)	AP 1 Power (dBm)	AP 3 Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	16.24	14.83	0.00	18.60	-11.40
Mid	2437	30.00	24.98	25.56	0.00	28.29	-1.71
High	2462	30.00	17.47	17.09	0.00	20.29	-9.71

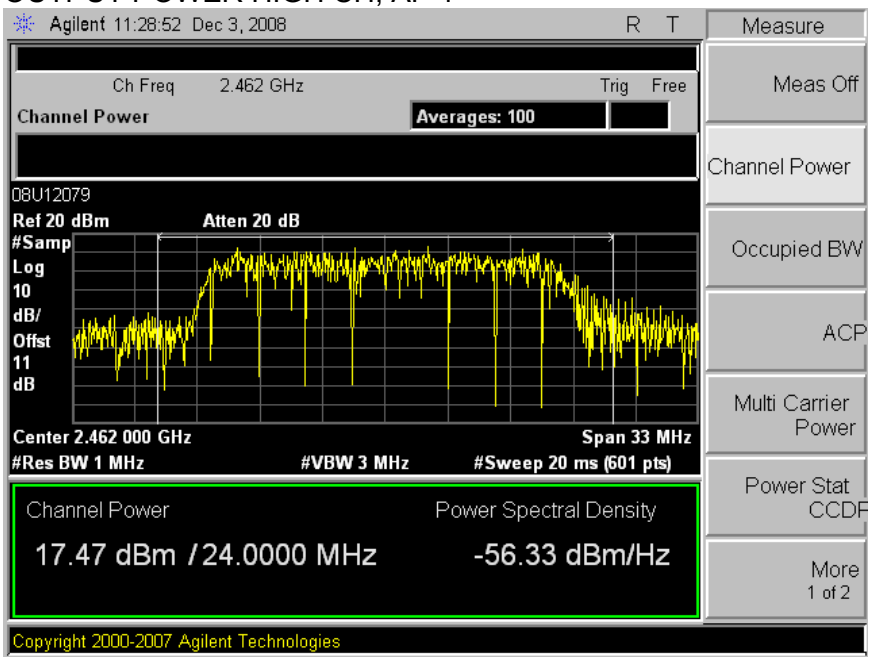
OUTPUT POWER, AP1



OUTPUT POWER MID CH, AP 1

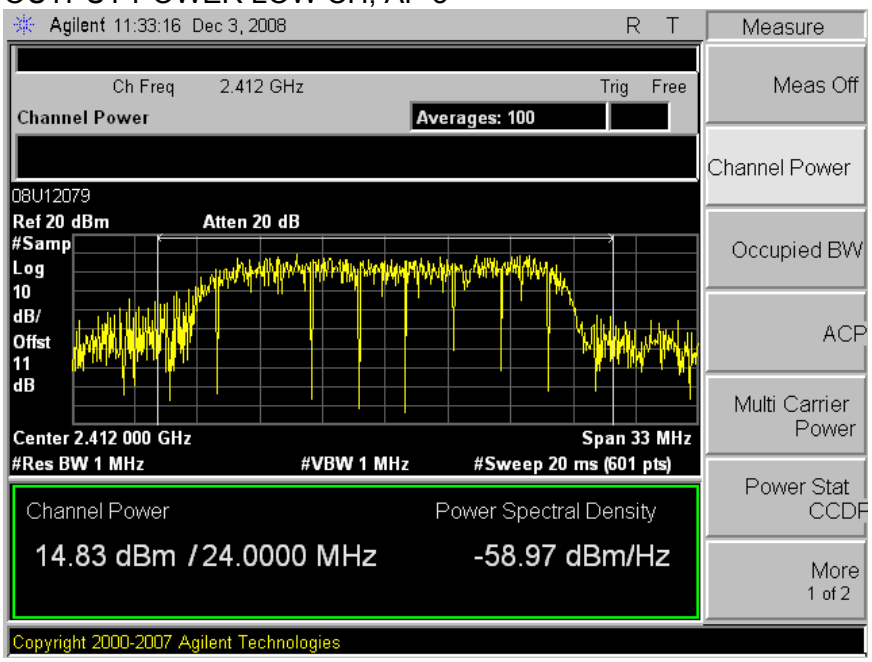


OUTPUT POWER HIGH CH, AP 1

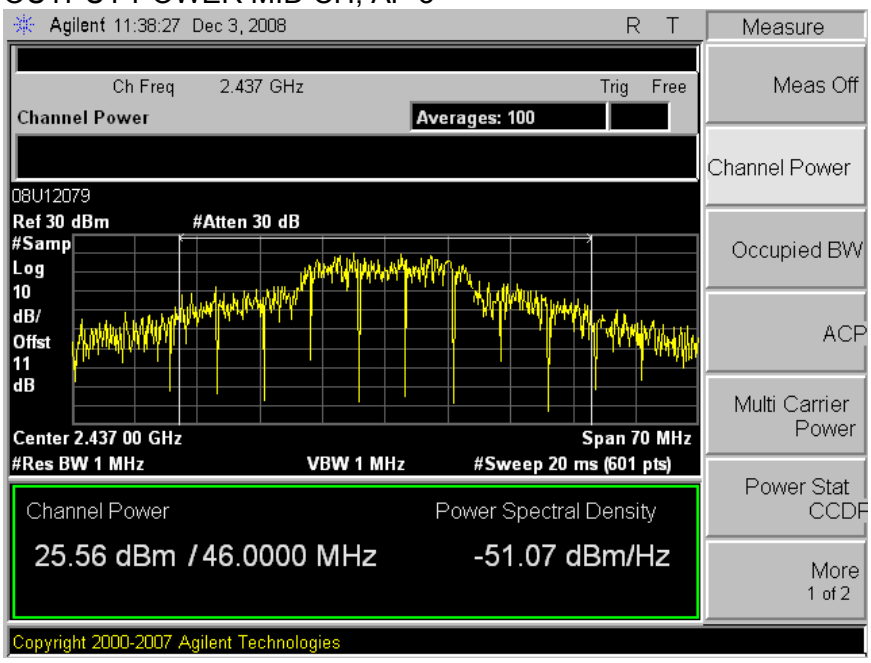


OUTPUT POWER, AP3

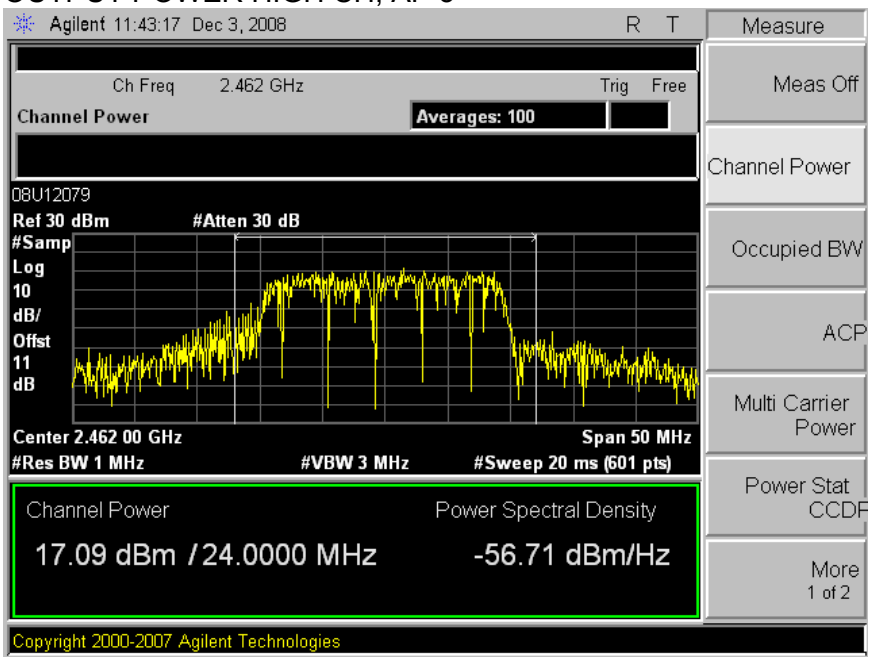
OUTPUT POWER LOW CH, AP 3



OUTPUT POWER MID CH, AP 3



OUTPUT POWER HIGH CH, AP 3



7.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

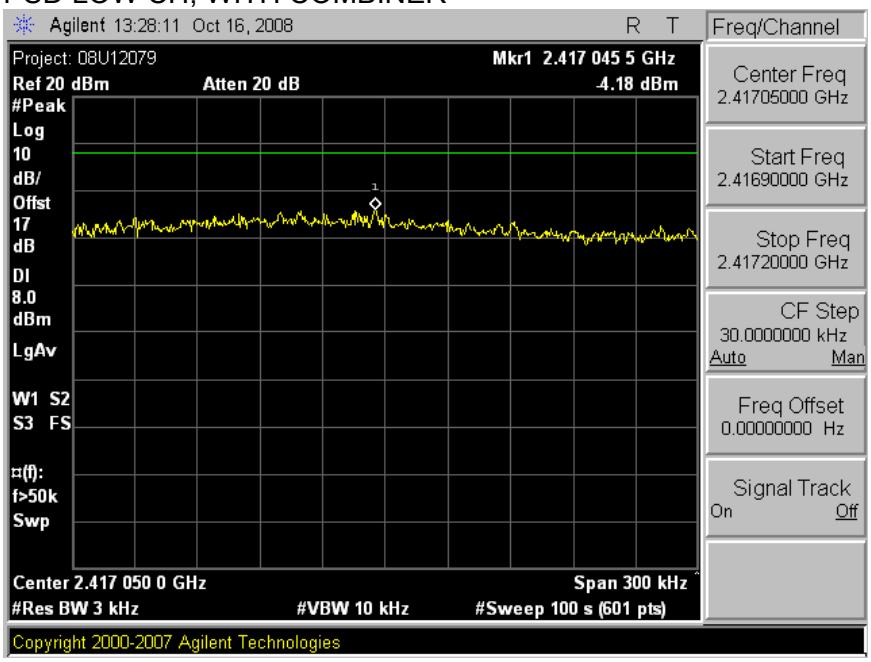
Power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

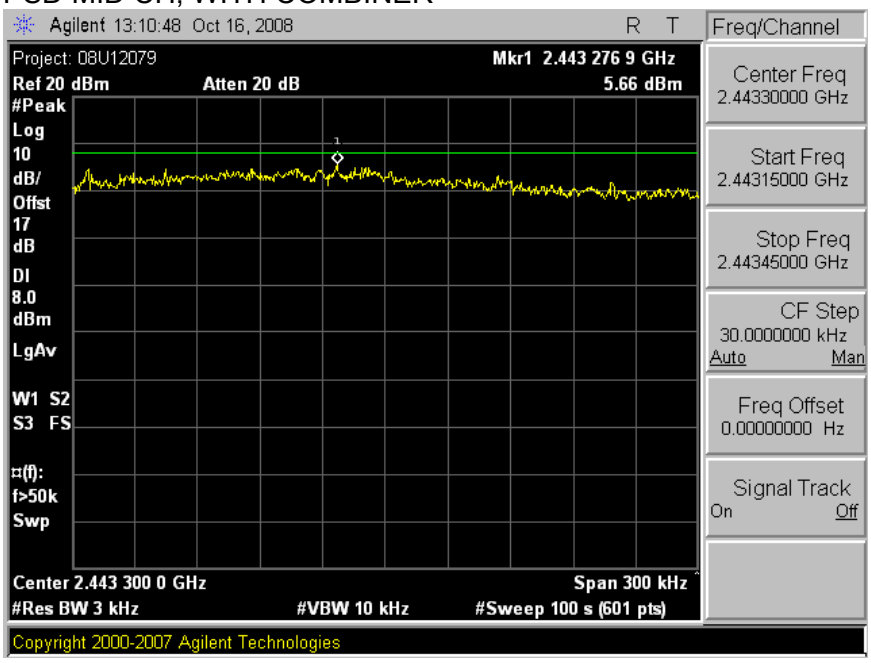
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.18	8	-12.18
Middle	2437	5.66	8	-2.34
High	2462	-2.57	8	-10.57

POWER SPECTRAL DENSITY, WITH COMBINER

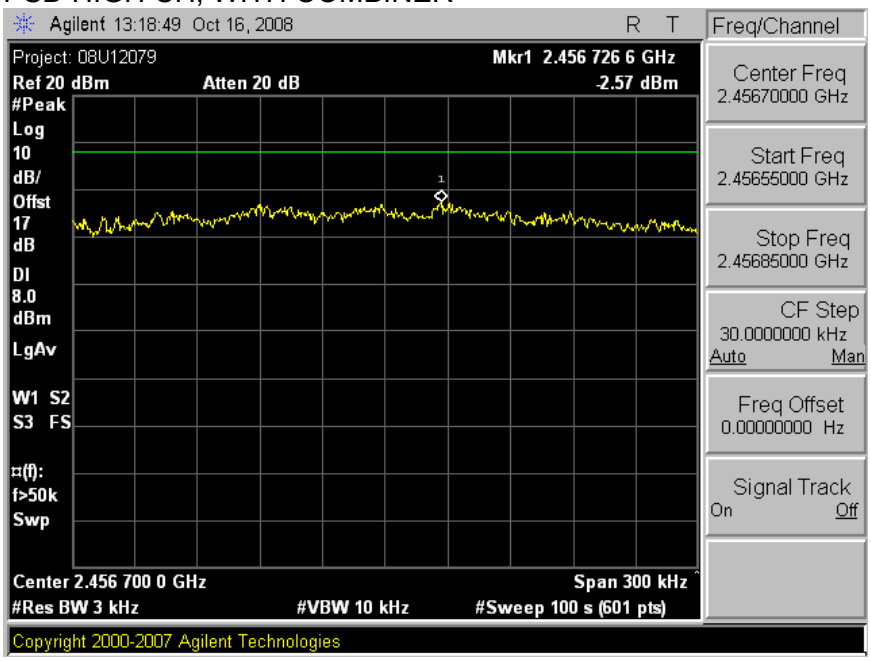
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003, therefore the required attenuation for conducted spurious is 30 dBc.

TEST PROCEDURE

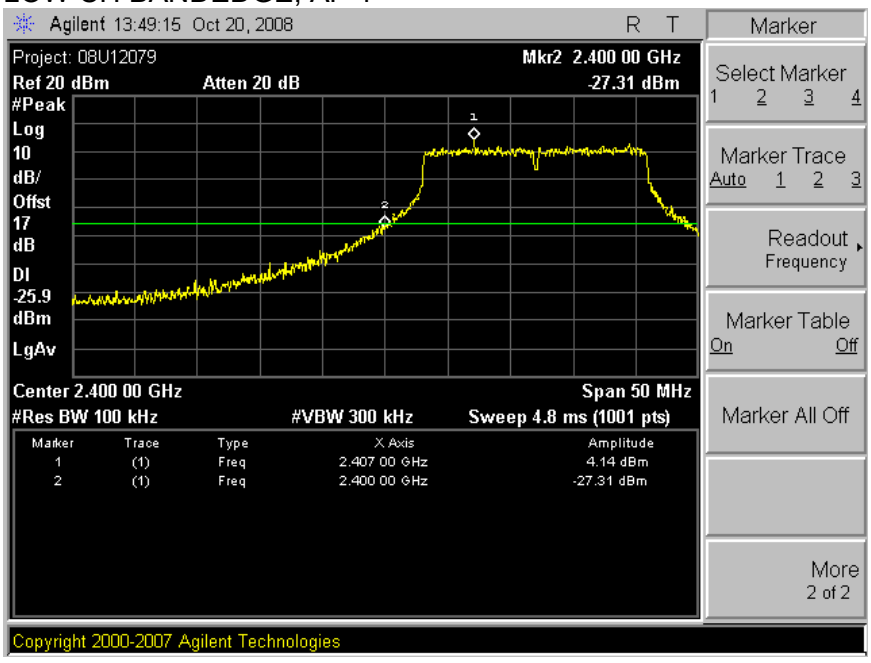
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

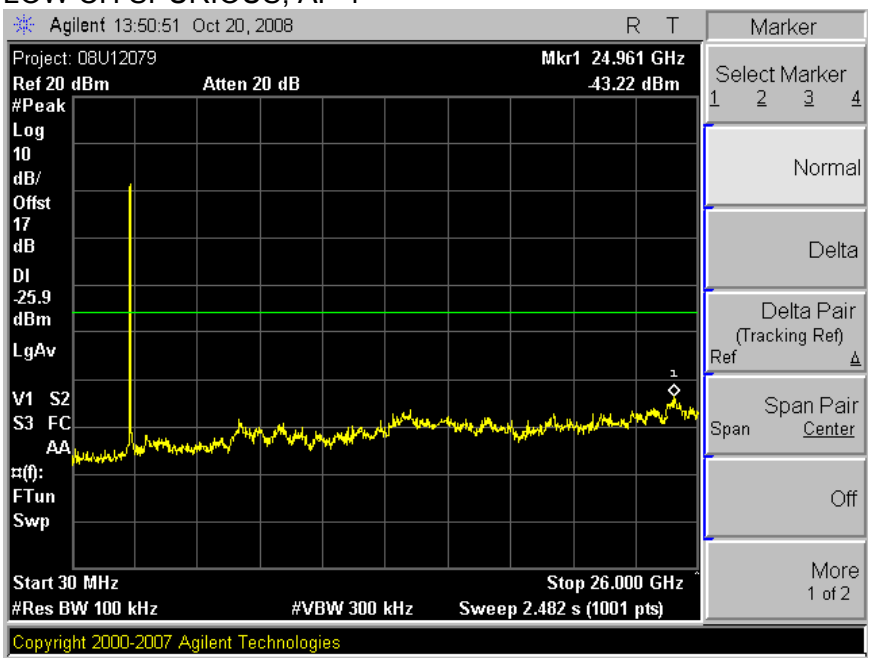
RESULTS

SPURIOUS EMISSIONS, AP1

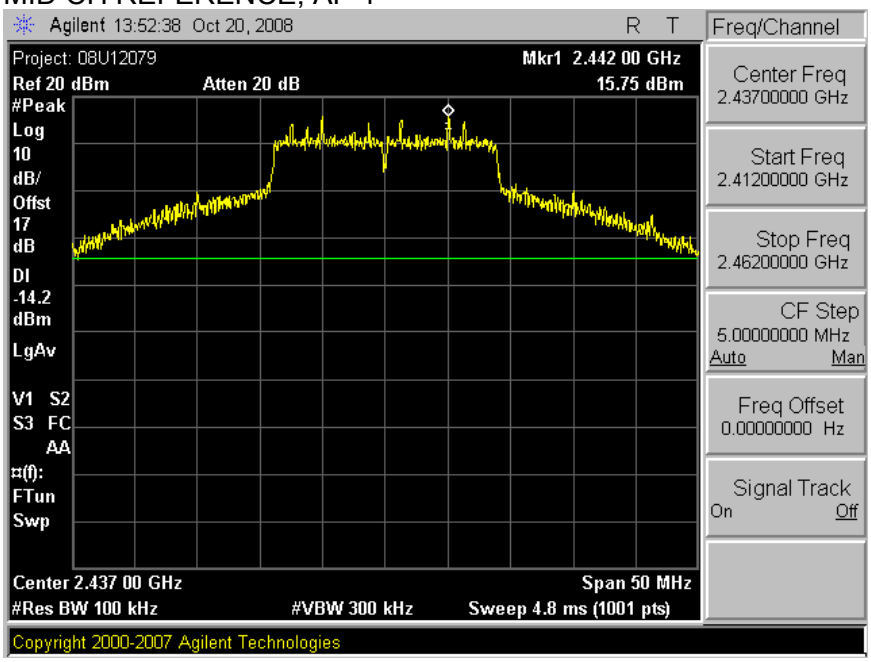
LOW CH BANDEDGE, AP 1



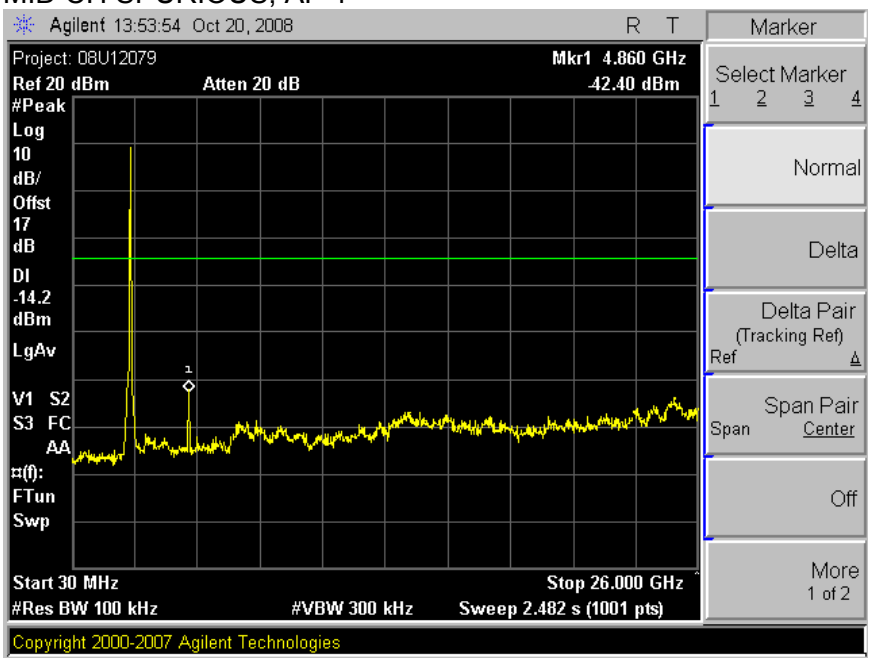
LOW CH SPURIOUS, AP 1



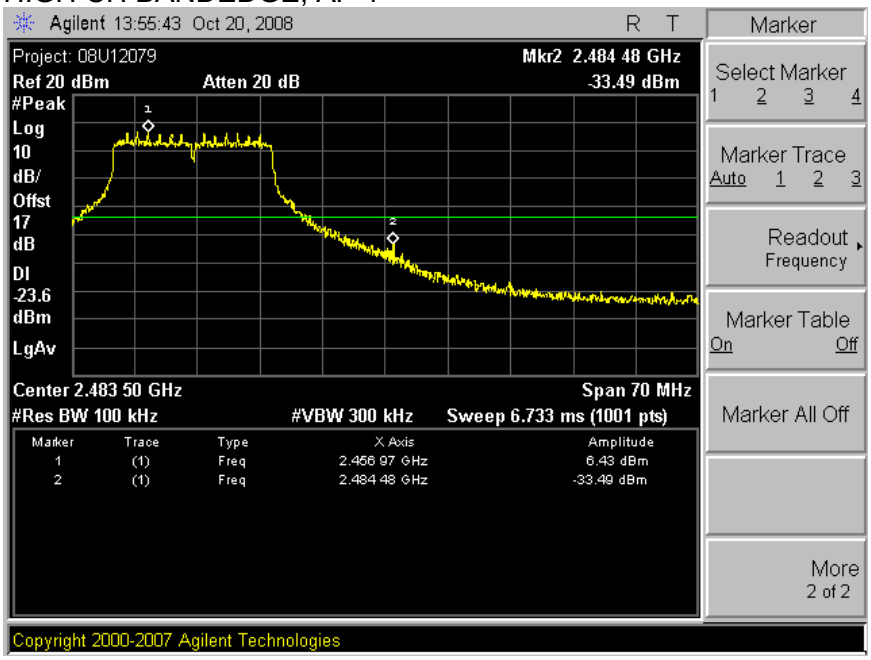
MID CH REFERENCE, AP 1



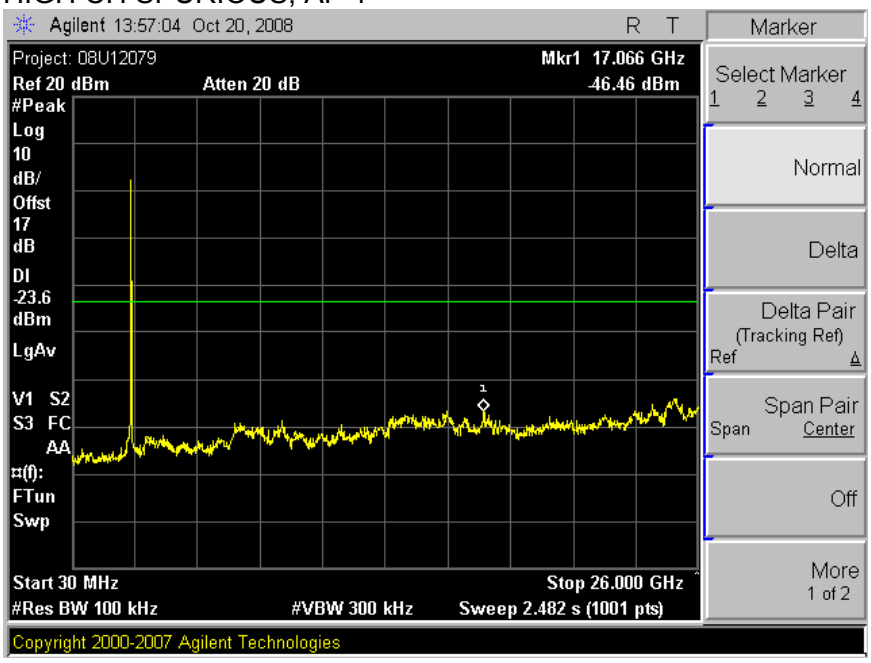
MID CH SPURIOUS, AP 1



HIGH CH BANDEDGE, AP 1

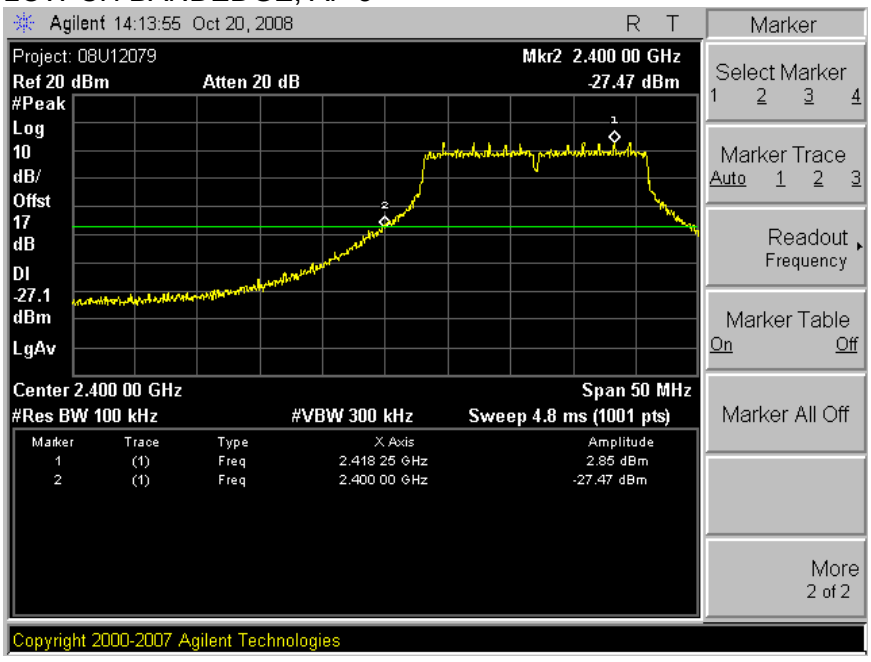


HIGH CH SPURIOUS, AP 1

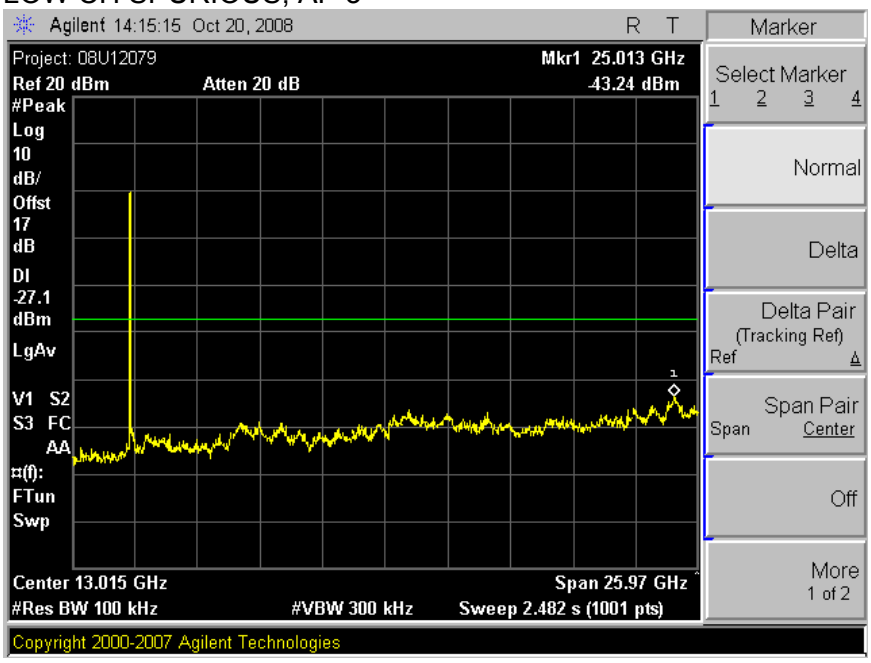


SPURIOUS EMISSIONS, AP3

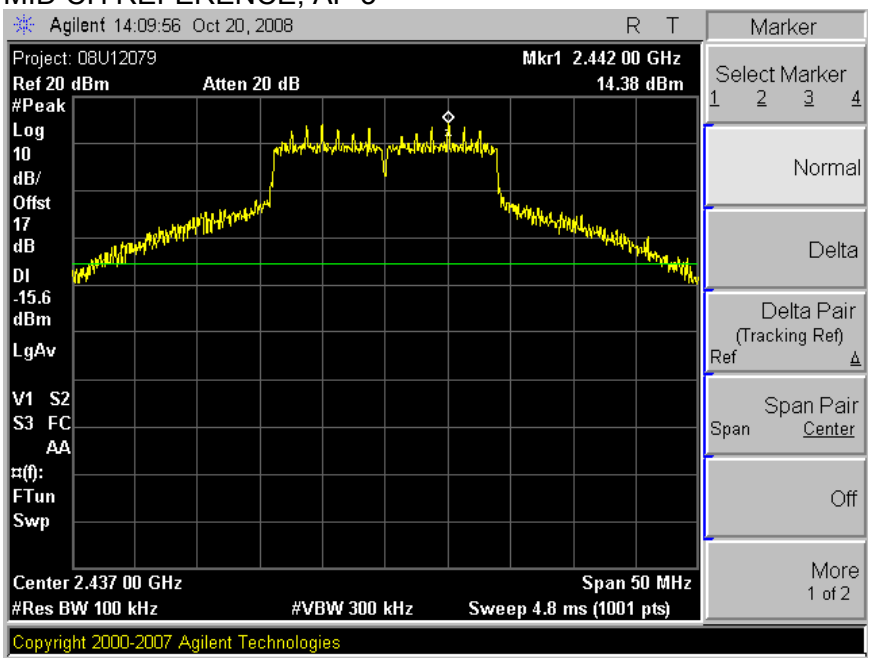
LOW CH BANDEDGE, AP 3



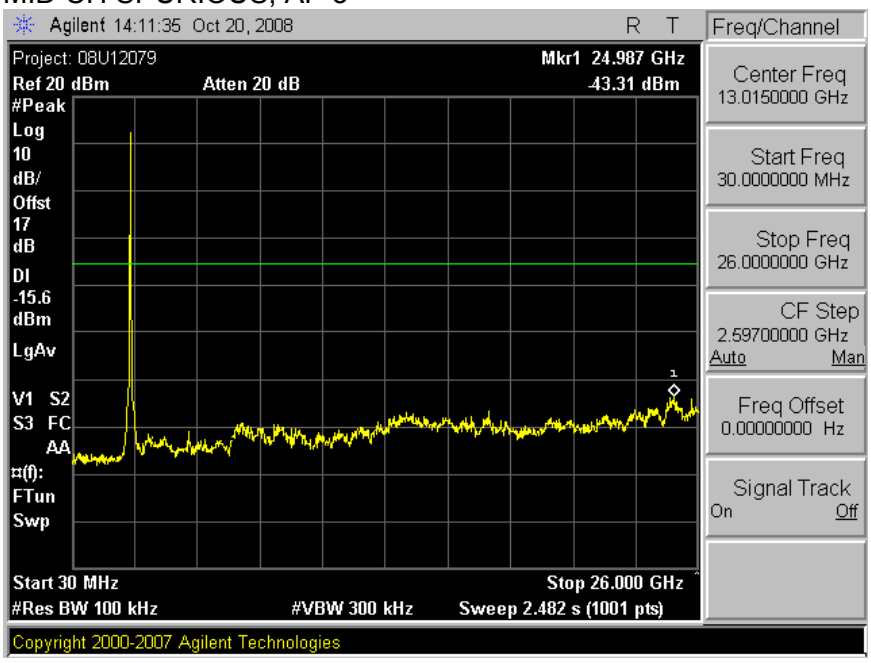
LOW CH SPURIOUS, AP 3



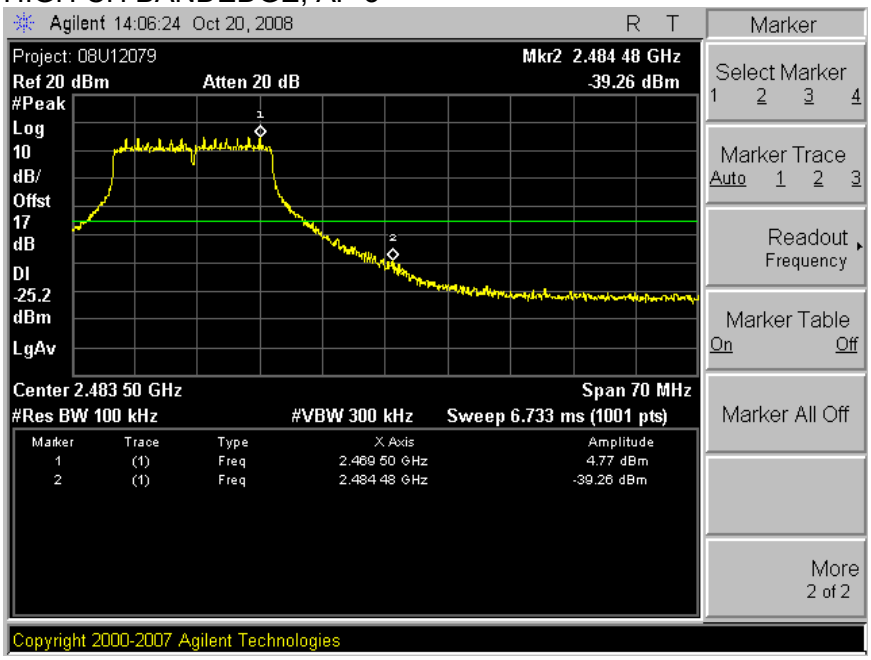
MID CH REFERENCE, AP 3



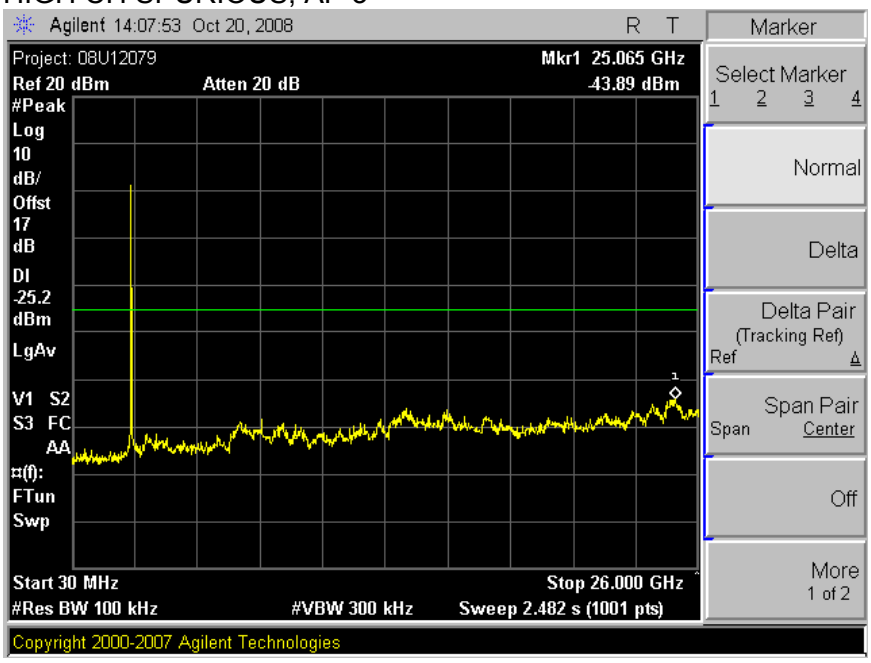
MID CH SPURIOUS, AP 3



HIGH CH BANDEDGE, AP 3



HIGH CH SPURIOUS, AP 3



7.4. 802.11a MODE IN THE 5.8 GHz BAND

7.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

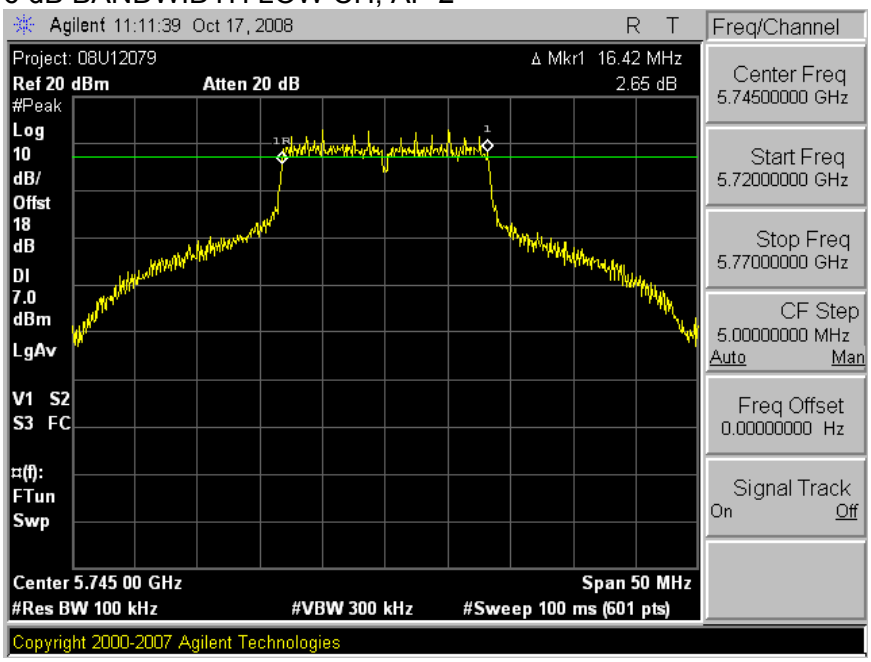
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

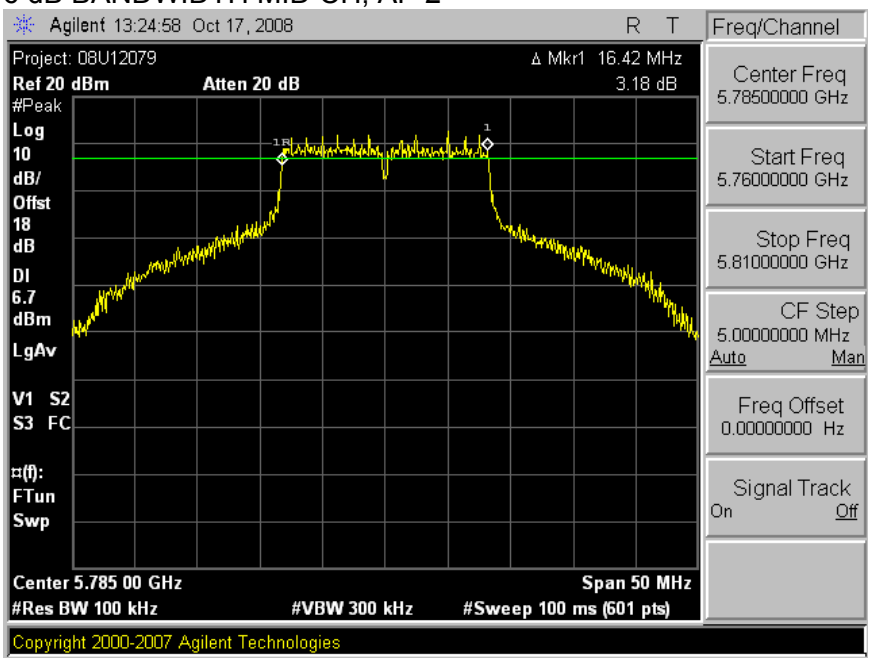
Channel	Frequency (MHz)	AP 2 6 dB BW (MHz)	AP 4 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5745	16.42	16.42	0.5
Middle	5785	16.42	16.33	0.5
High	5825	16.50	16.42	0.5

6 dB BANDWIDTH, AP 2

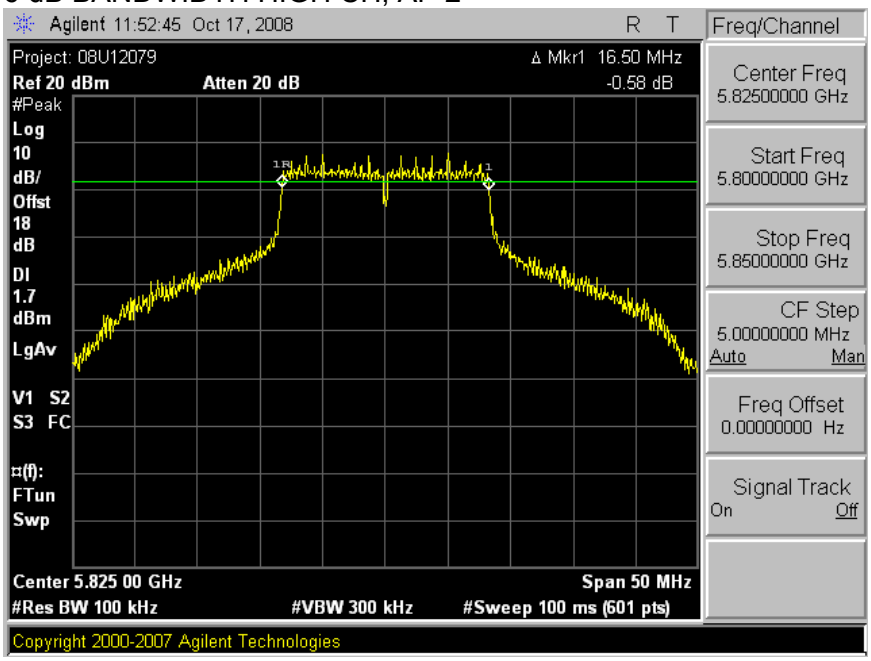
6 dB BANDWIDTH LOW CH, AP 2



6 dB BANDWIDTH MID CH, AP 2

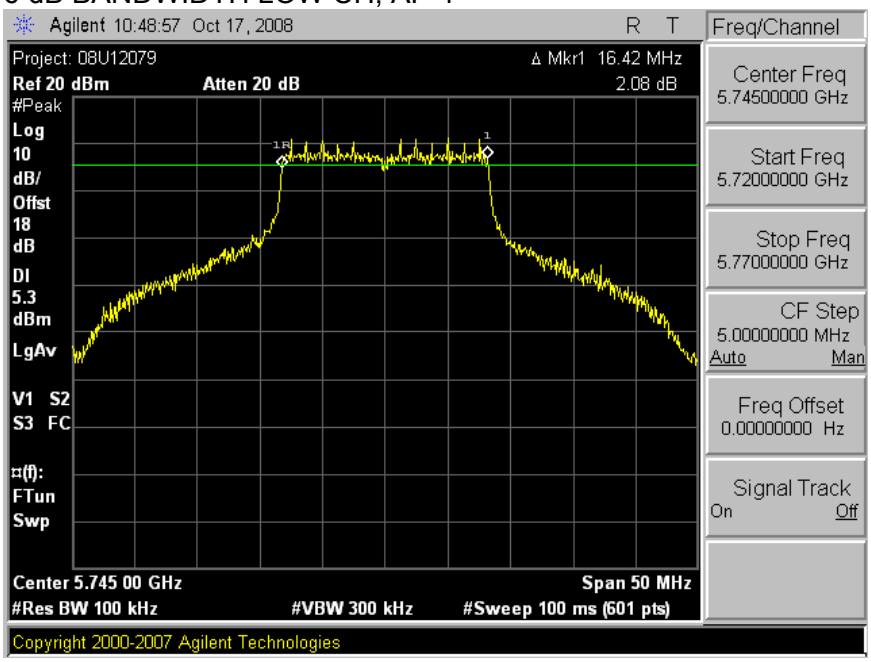


6 dB BANDWIDTH HIGH CH, AP 2

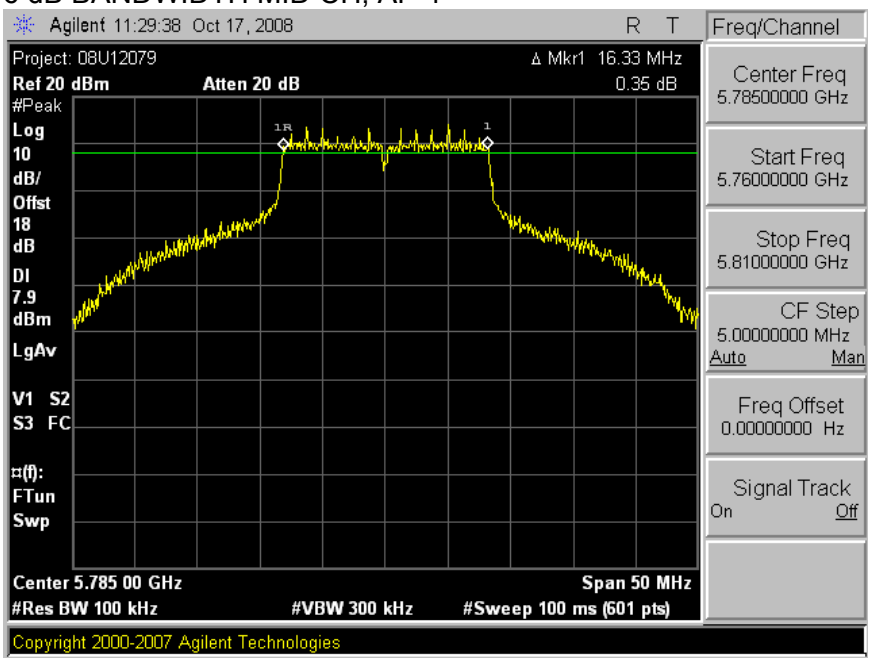


6 dB BANDWIDTH, AP 4

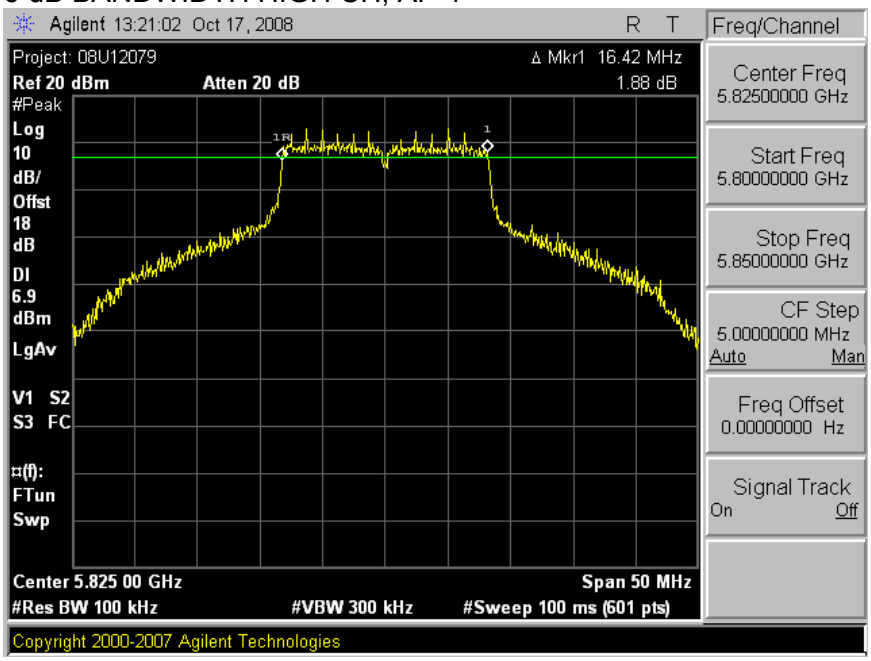
6 dB BANDWIDTH LOW CH, AP 4



6 dB BANDWIDTH MID CH, AP 4



6 dB BANDWIDTH HIGH CH, AP 4



7.4.2. 99% AND 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

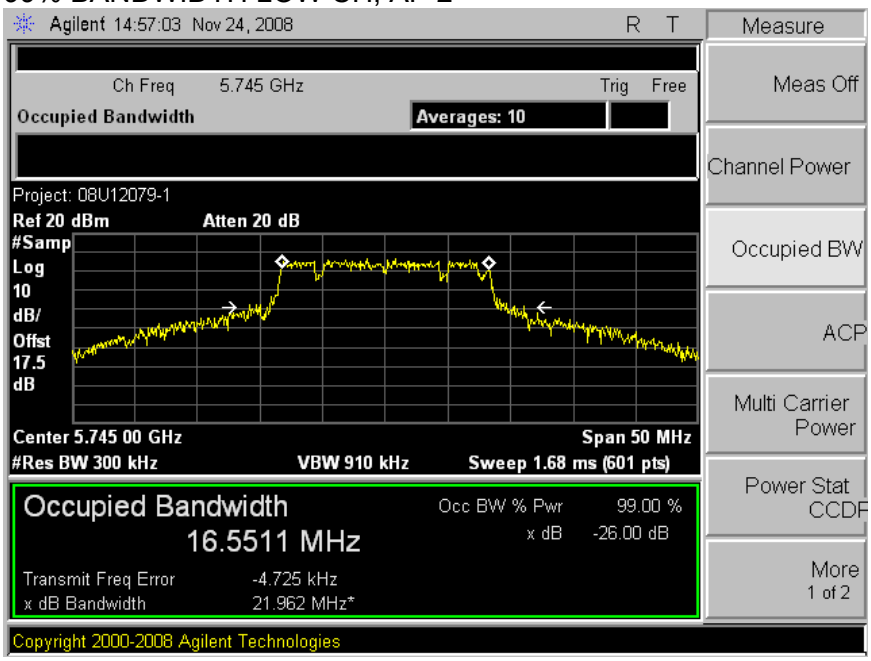
RESULTS

Channel	Frequency (MHz)	AP 2 99% Bandwidth (MHz)	AP 4 99% Bandwidth (MHz)
Low	5745	16.5511	16.5660
Middle	5785	16.2656	16.5594
High	5825	16.5424	16.5283

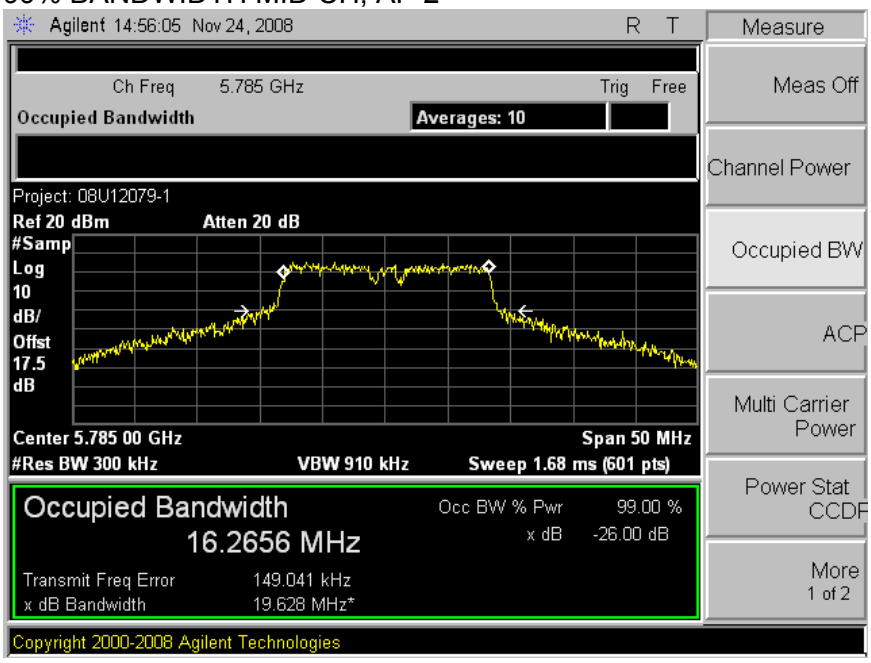
Channel	Frequency (MHz)	AP 2 26 dB Bandwidth (MHz)	AP 4 26 dB Bandwidth (MHz)
Low	5745	21.962	22.278
Middle	5785	19.628	20.343
High	5825	20.691	20.886

99% BANDWIDTH, AP2

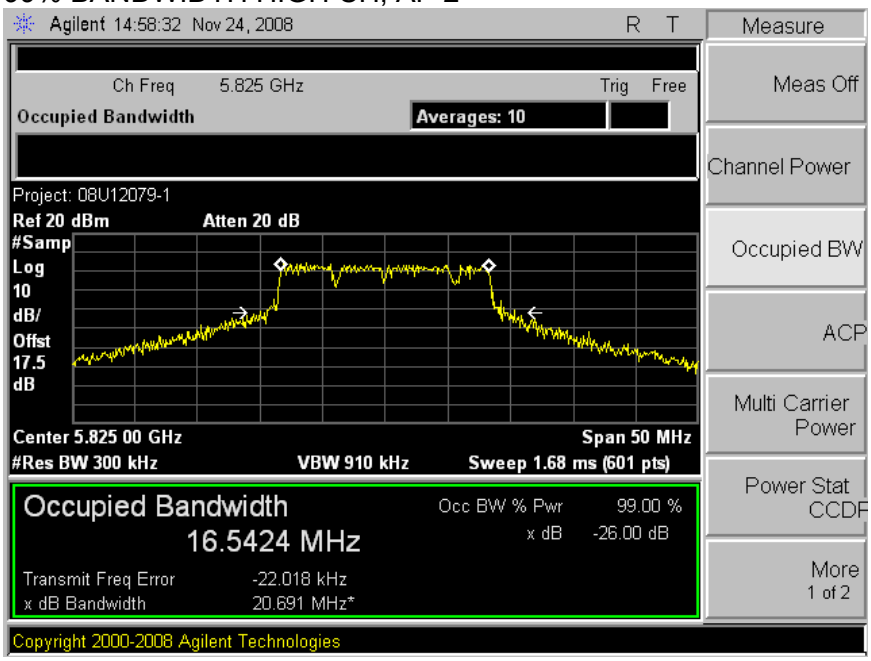
99% BANDWIDTH LOW CH, AP 2



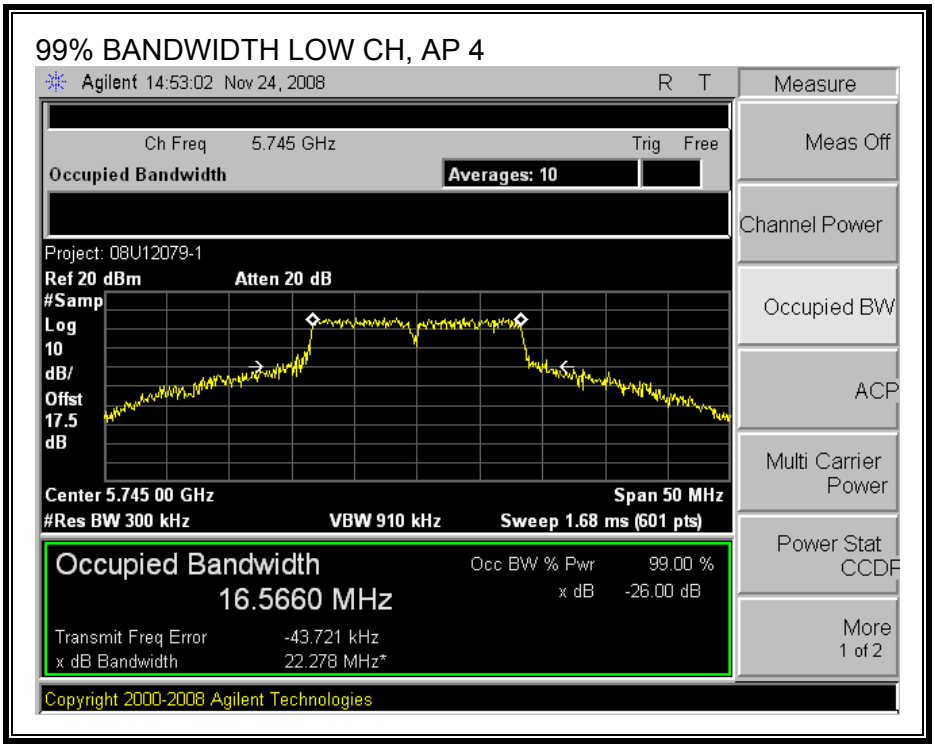
99% BANDWIDTH MID CH, AP 2



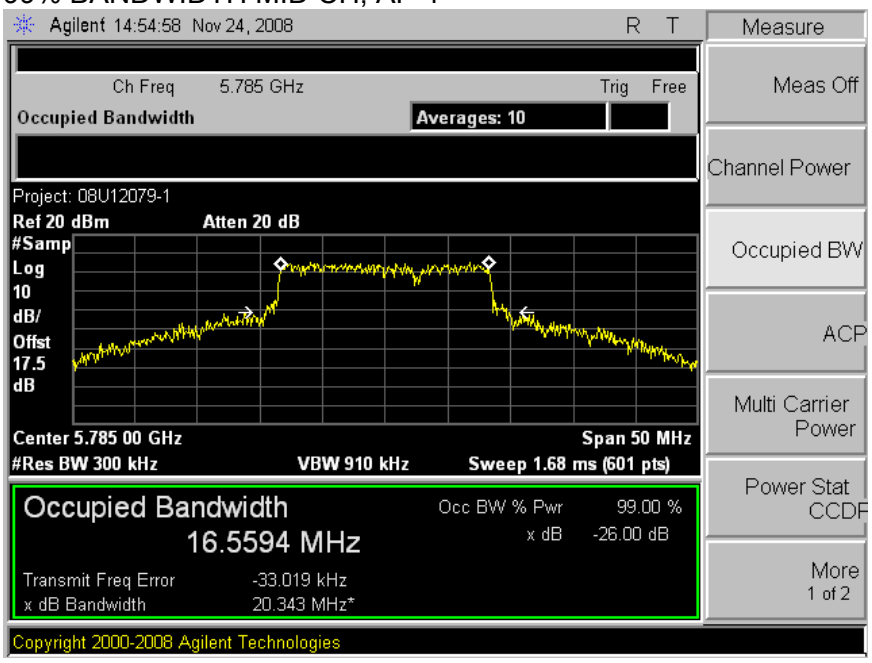
99% BANDWIDTH HIGH CH, AP 2



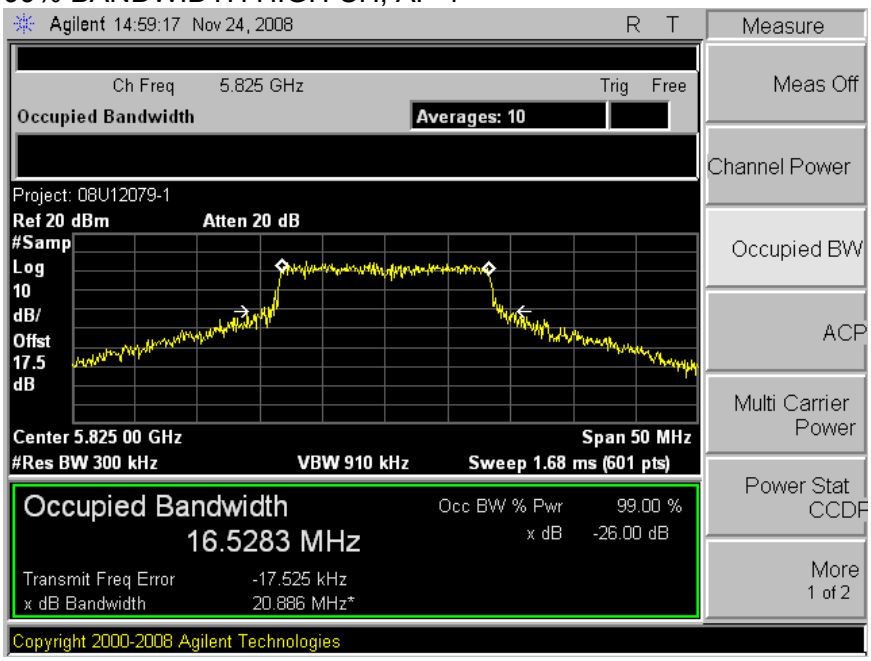
99% BANDWIDTH, AP 4



99% BANDWIDTH MID CH, AP 4



99% BANDWIDTH HIGH CH, AP 4



7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (dBi)	10 Log (# Tx Chains) (dB)	Effective Legacy Gain (dBi)
2.18	3.01	5.19

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 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.

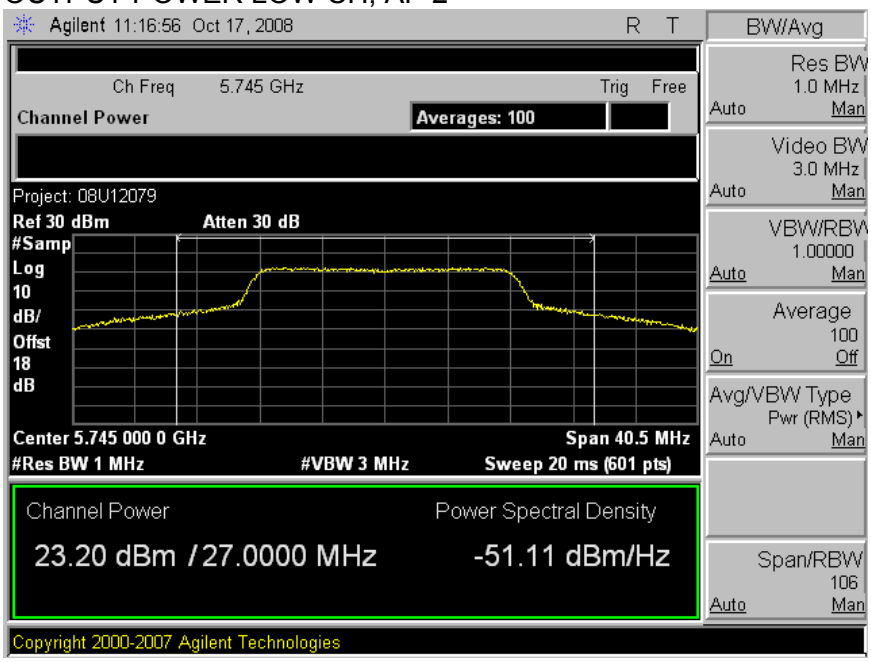
The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

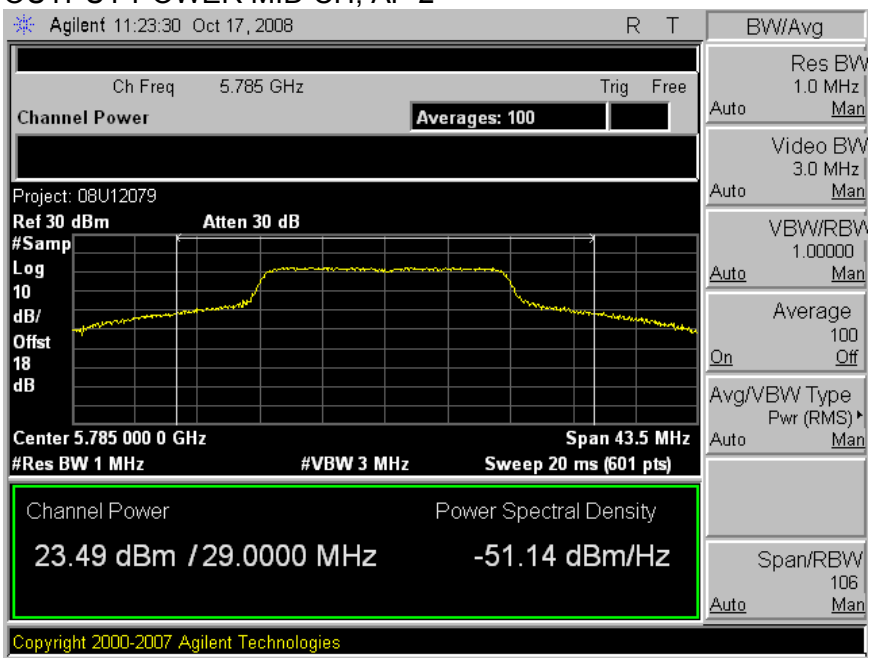
Channel	Frequency (MHz)	Limit (dBm)	AP 2 Power (dBm)	AP 4 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	5745	30.00	23.20	22.19	25.73	-4.27
Mid	5785	30.00	23.49	24.41	26.98	-3.02
High	5825	30.00	22.51	23.97	26.31	-3.69

OUTPUT POWER, AP2

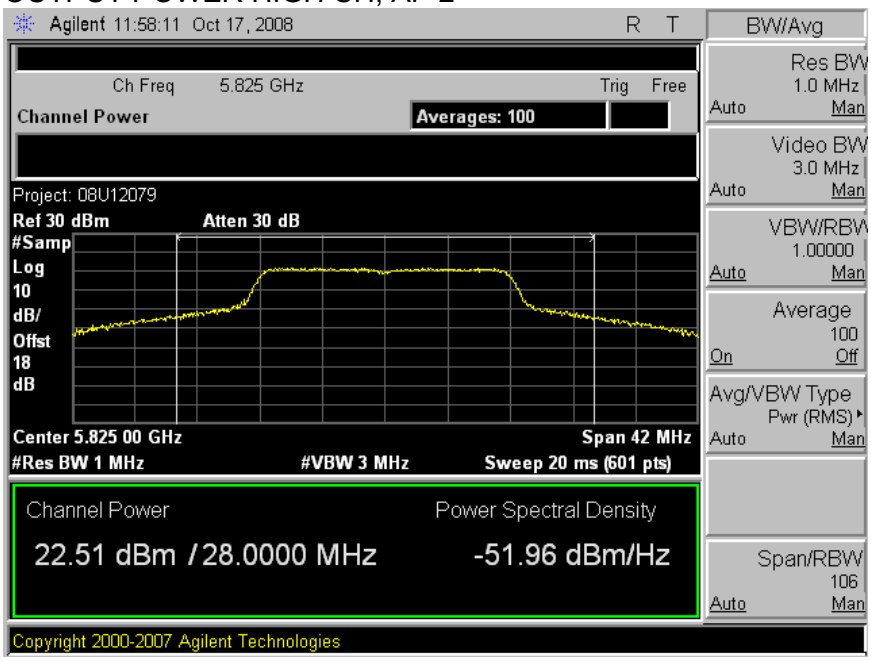
OUTPUT POWER LOW CH, AP 2



OUTPUT POWER MID CH, AP 2

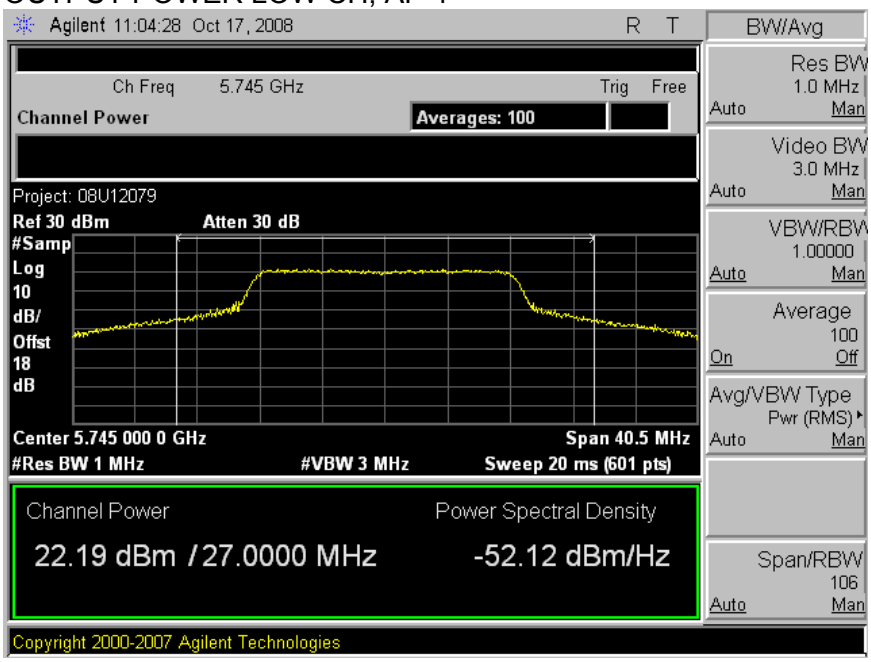


OUTPUT POWER HIGH CH, AP 2

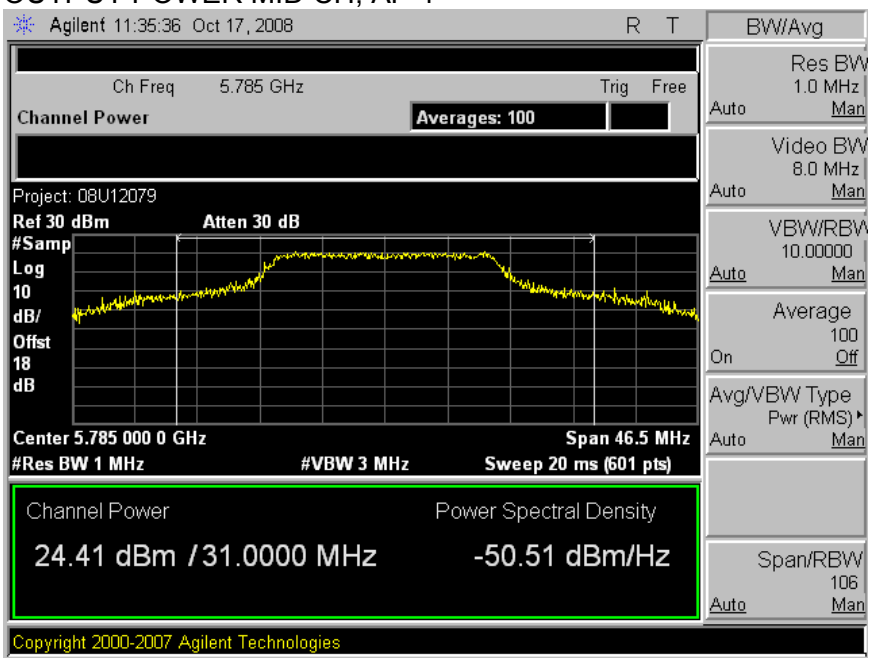


OUTPUT POWER, AP4

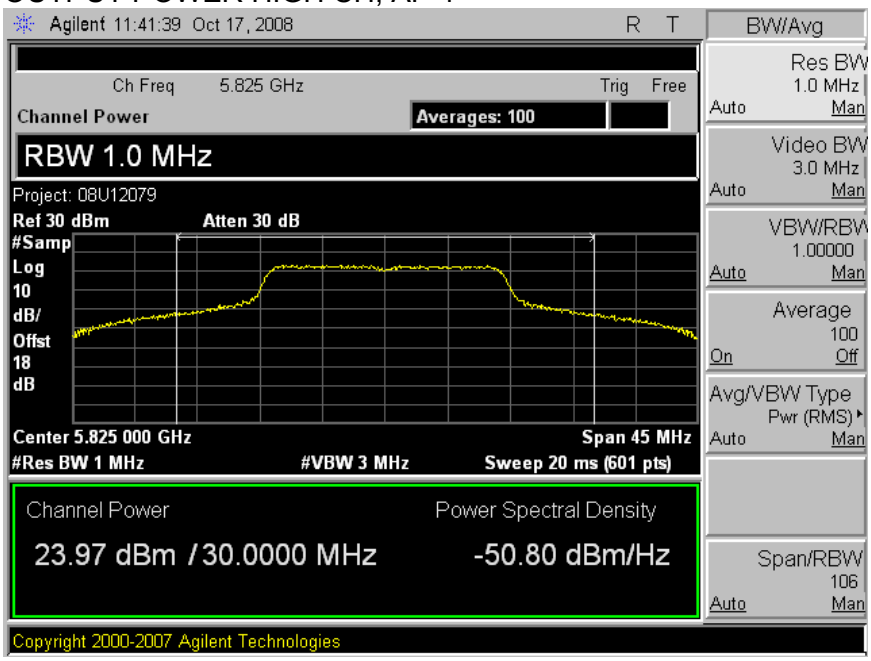
OUTPUT POWER LOW CH, AP 4



OUTPUT POWER MID CH, AP 4



OUTPUT POWER HIGH CH, AP 4



7.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

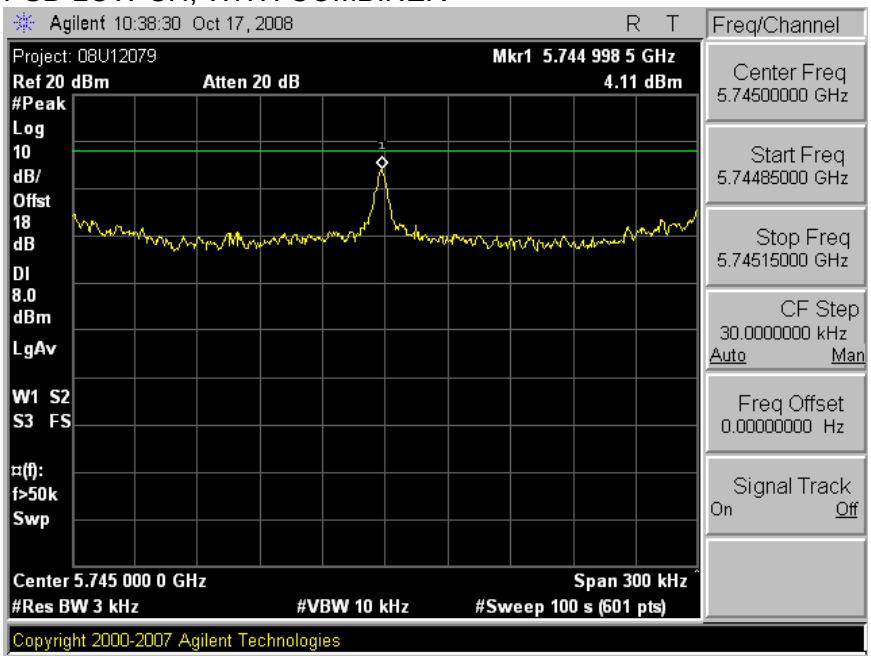
Power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS:

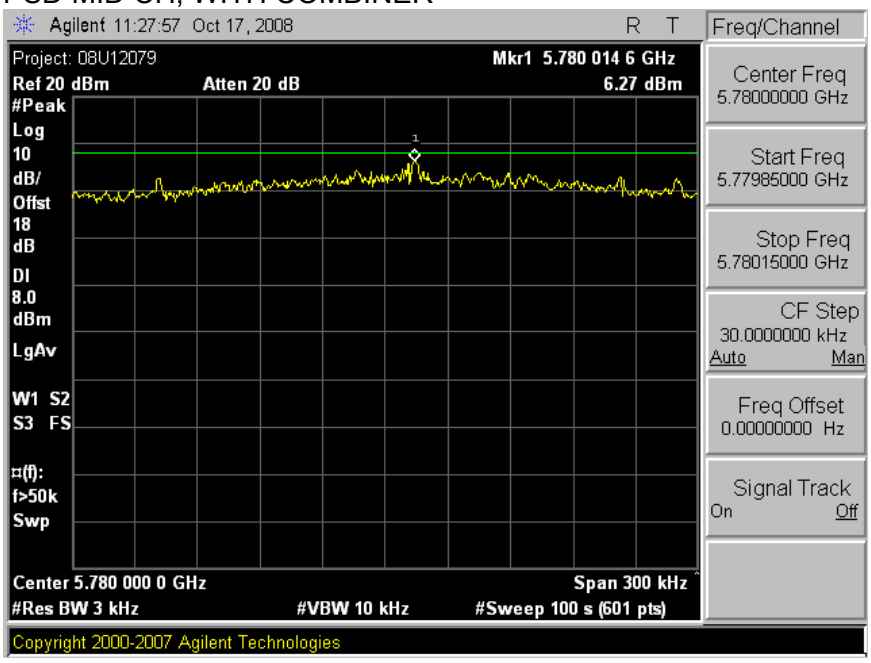
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5745	4.11	8	-3.89
Middle	5785	6.27	8	-1.73
High	5825	-2.31	8	-10.31

POWER SPECTRAL DENSITY, WITH COMBINER

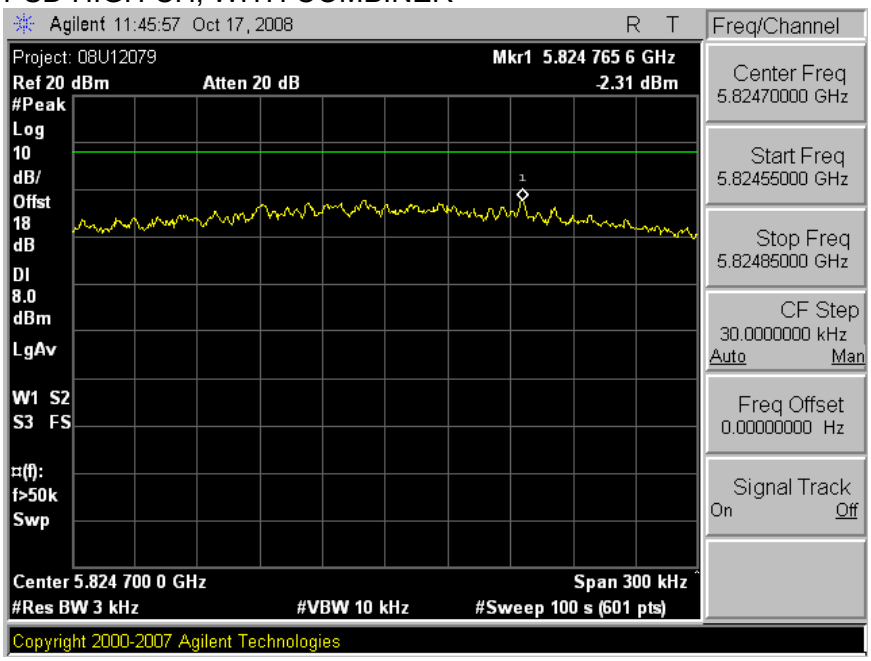
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



7.4.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003, therefore the required attenuation for conducted spurious is 30 dBc.

TEST PROCEDURE

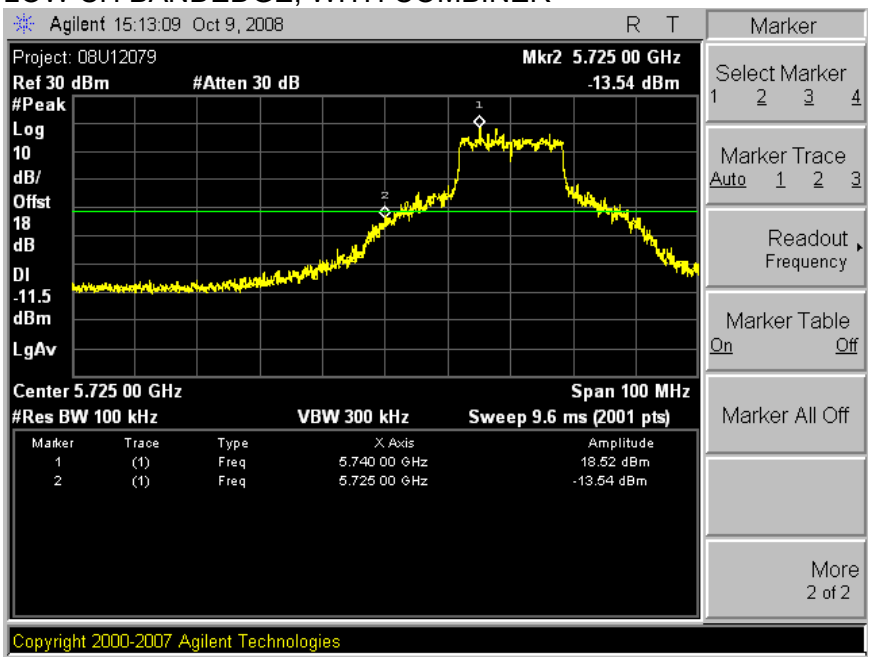
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

RESULTS

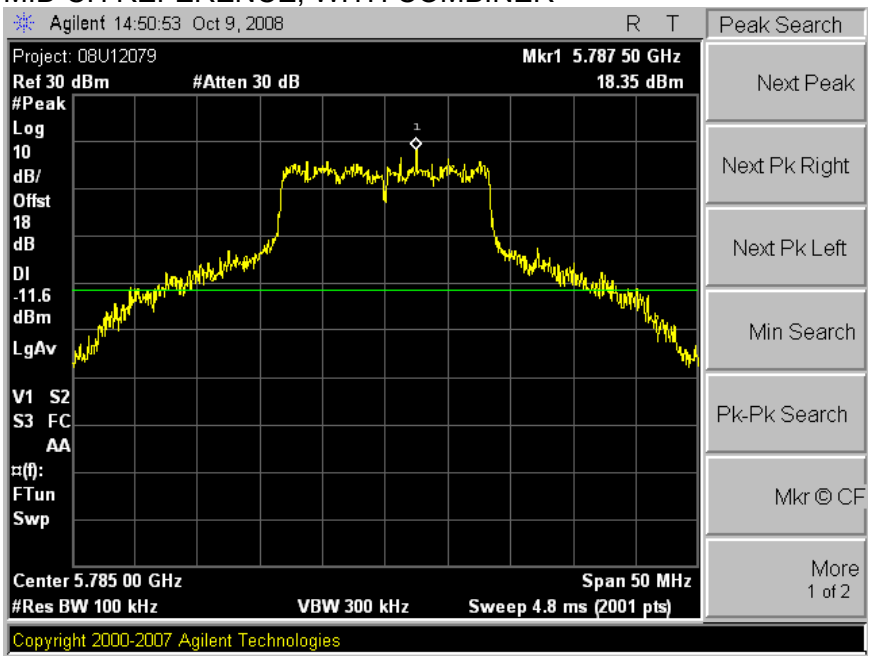
SPURIOUS EMISSIONS WITH COMBINER

LOW CH BANDEDGE, WITH COMBINER

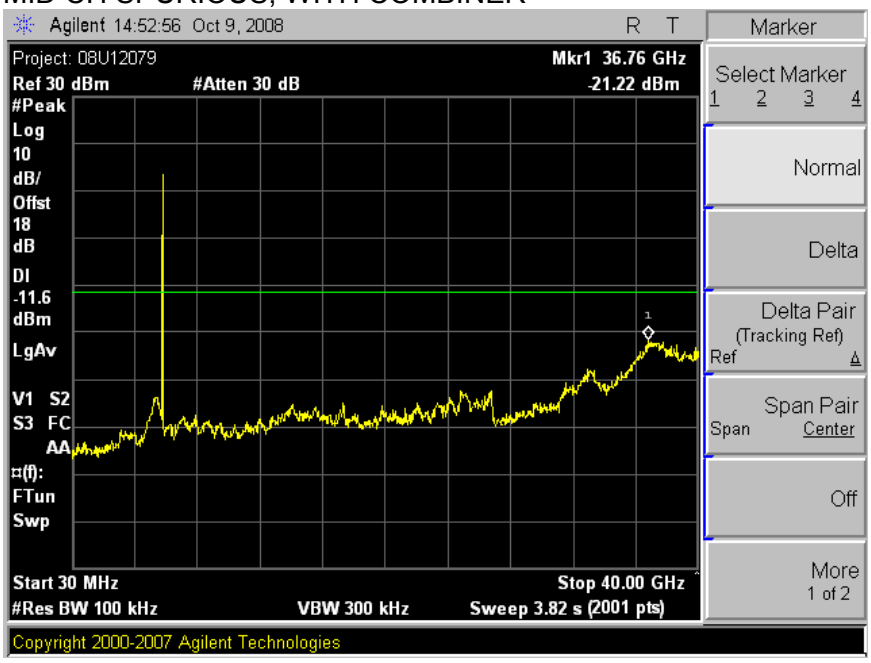


LOW CH SPURIOUS, WITH COMBINER

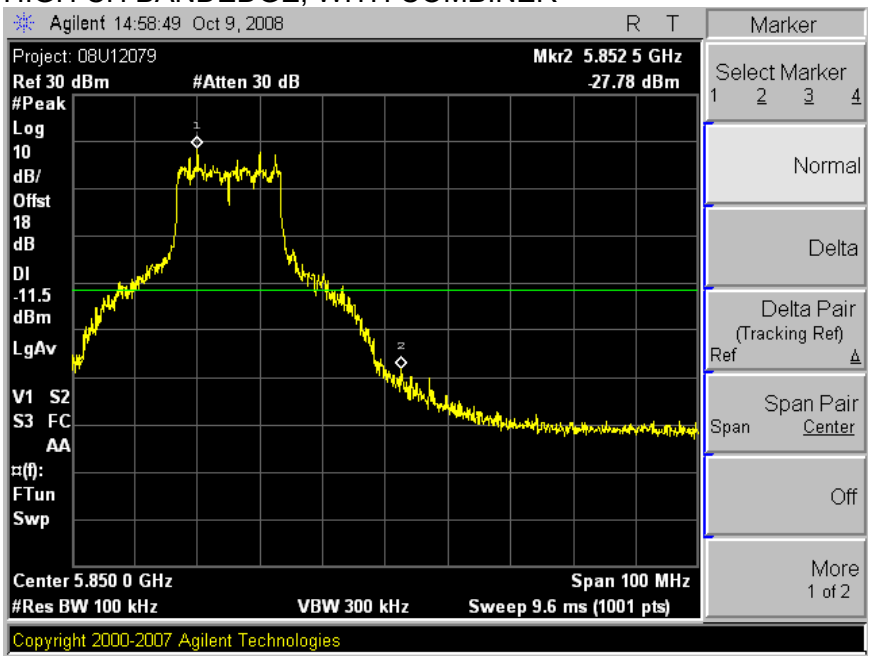
MID CH REFERENCE, WITH COMBINER



MID CH SPURIOUS, WITH COMBINER



HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, WITH COMBINER

7.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

7.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

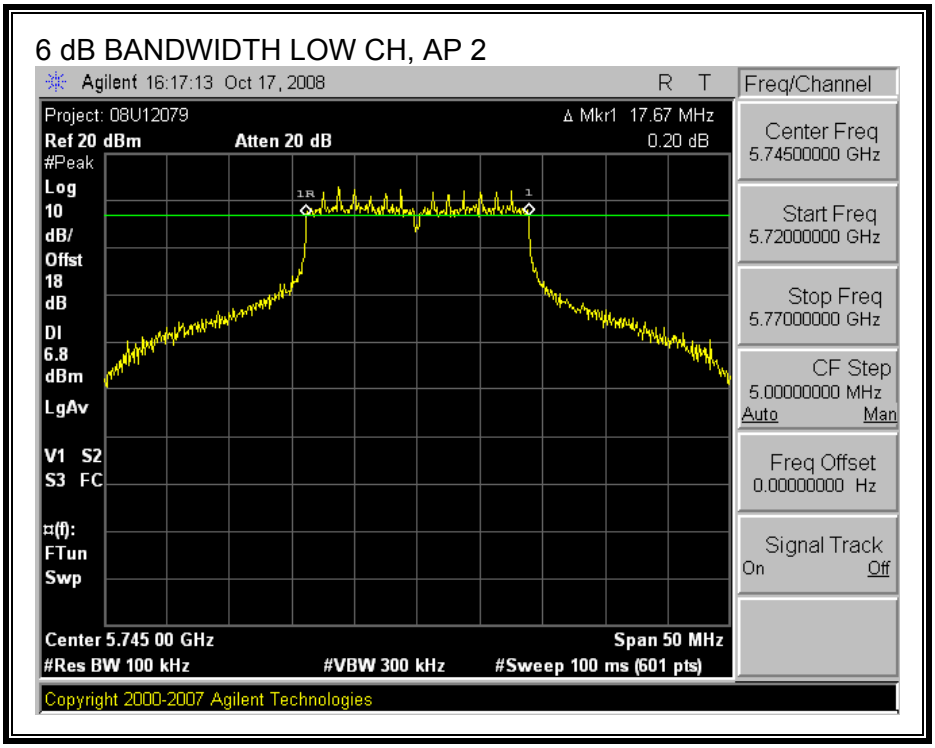
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

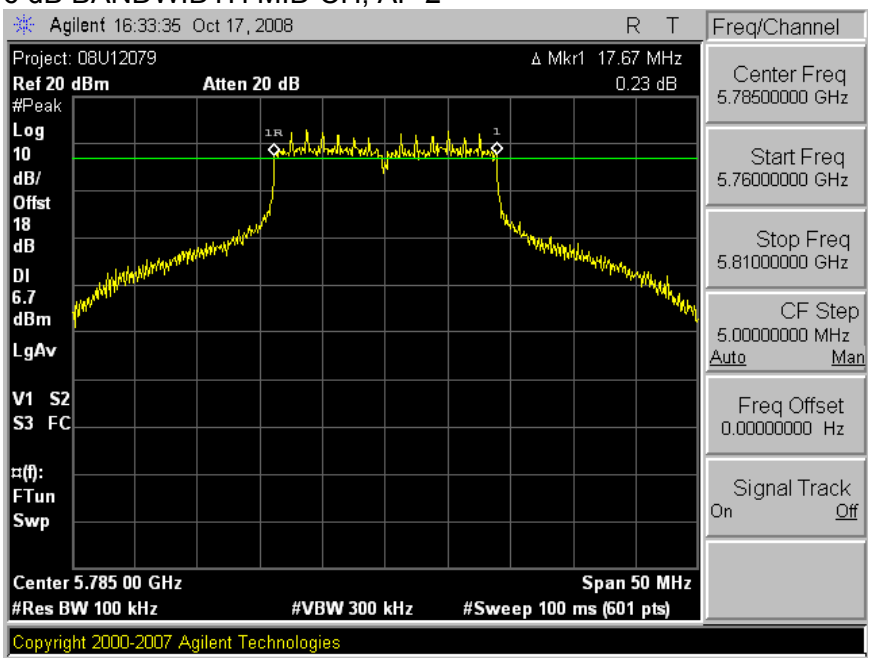
RESULTS

Channel	Frequency (MHz)	AP 2 6 dB BW (MHz)	AP 4 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5745	17.67	17.67	0.5
Middle	5785	17.67	17.67	0.5
High	5805	17.67	17.67	0.5

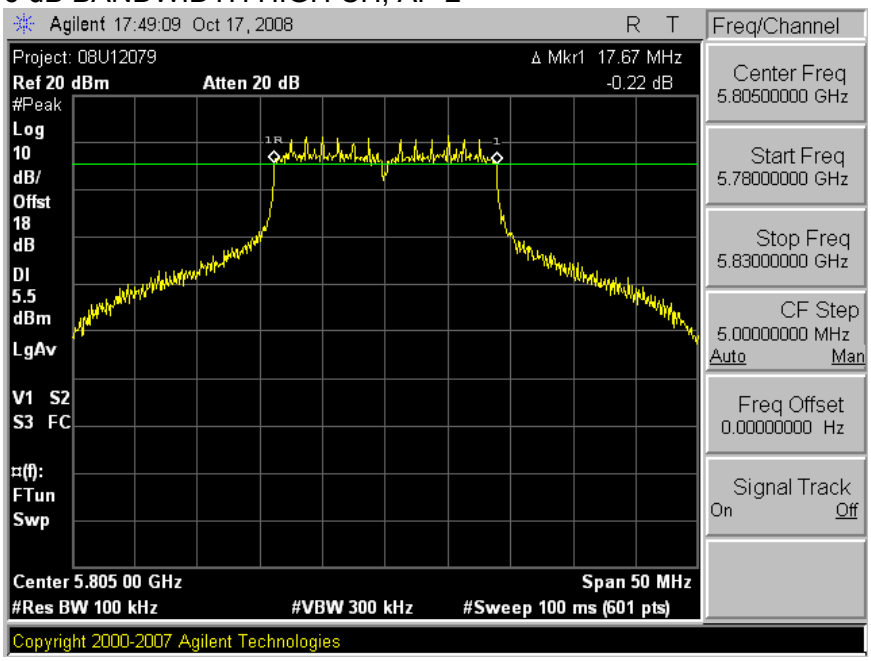
6 dB BANDWIDTH, AP 2



6 dB BANDWIDTH MID CH, AP 2

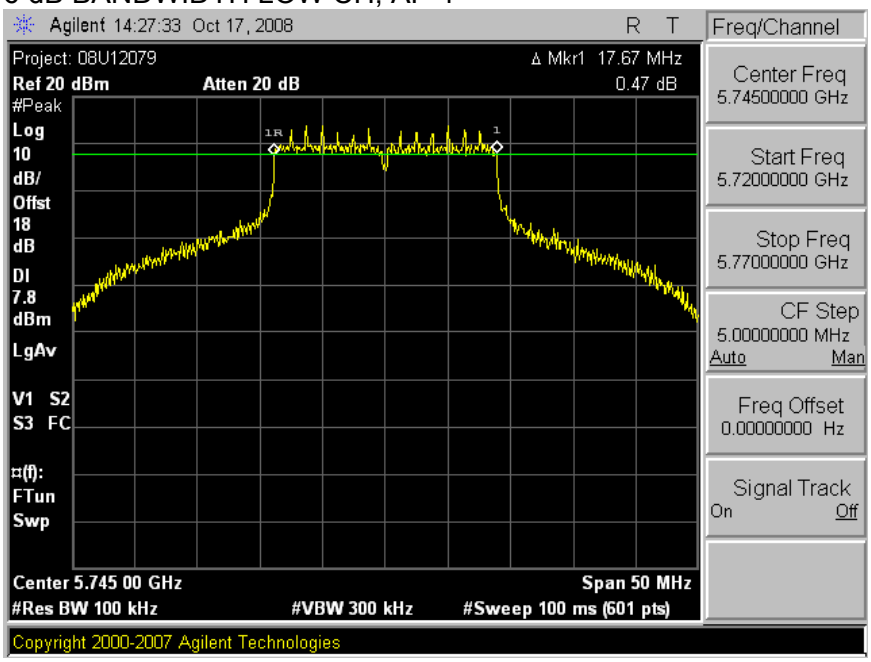


6 dB BANDWIDTH HIGH CH, AP 2

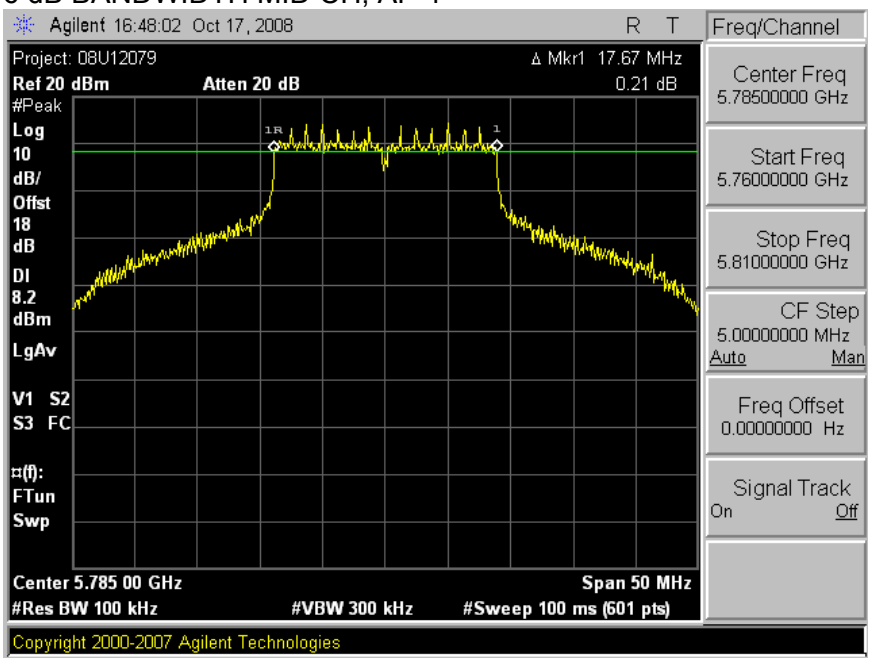


6 dB BANDWIDTH, AP 4

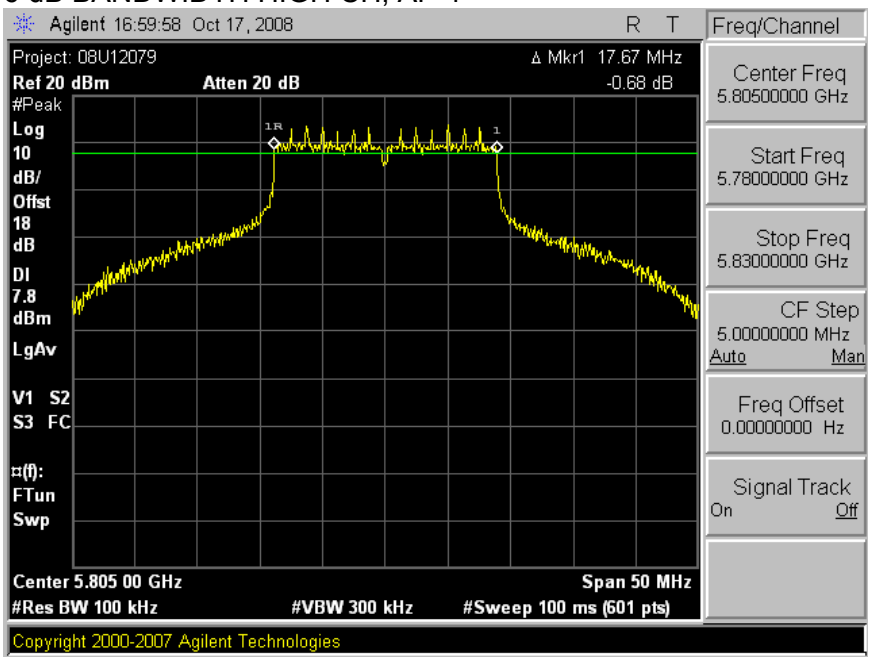
6 dB BANDWIDTH LOW CH, AP 4



6 dB BANDWIDTH MID CH, AP 4



6 dB BANDWIDTH HIGH CH, AP 4



7.5.2. 99% AND 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

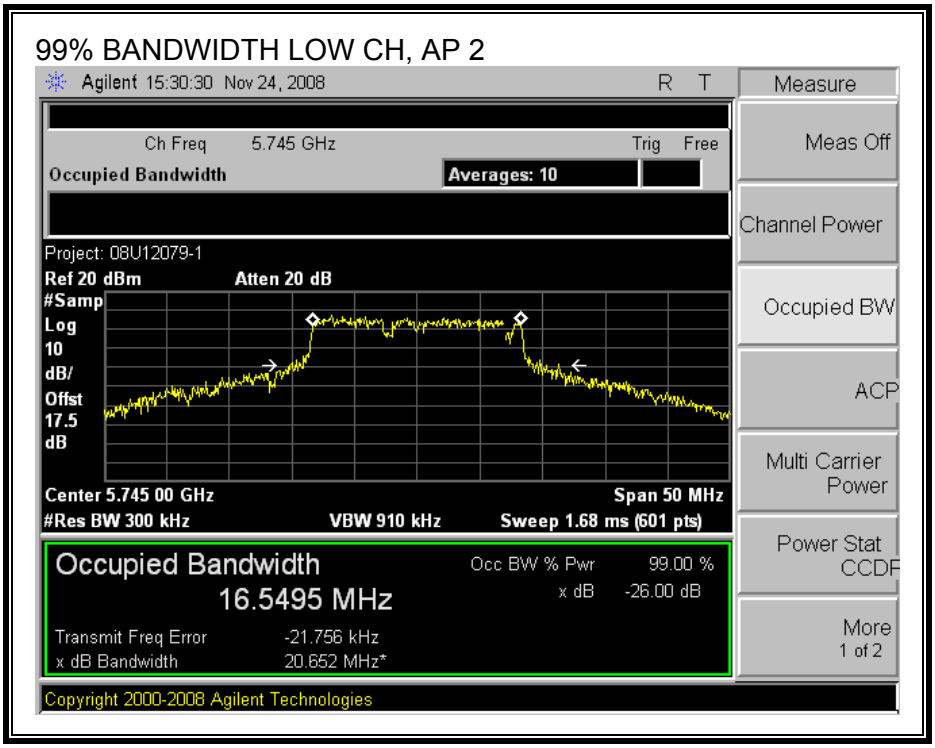
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

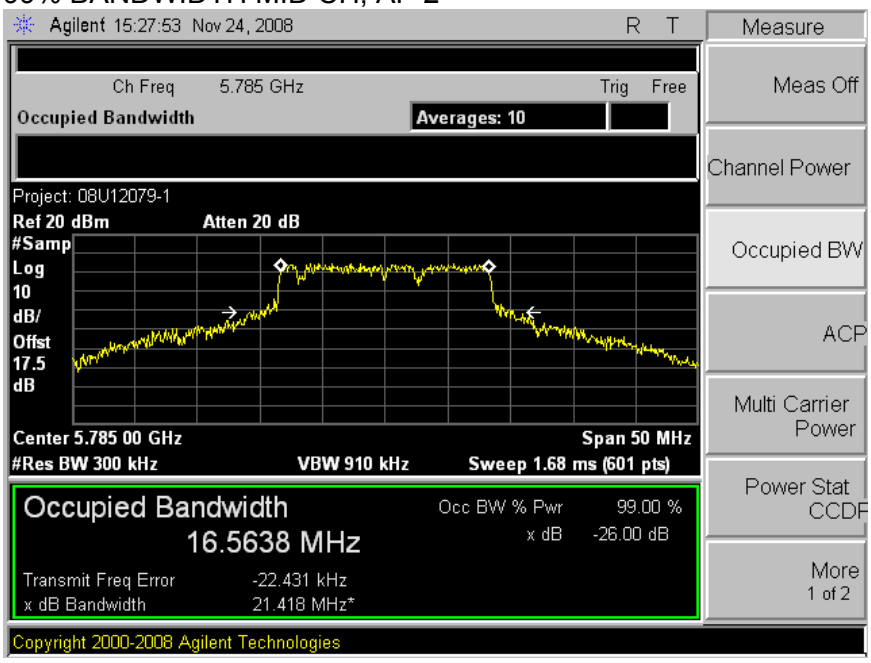
Channel	Frequency (MHz)	AP2 99% Bandwidth (MHz)	AP4 99% Bandwidth (MHz)
Low	5745	16.5495	16.5244
Middle	5785	16.5638	19.4531
High	5805	16.6036	18.9632

Channel	Frequency (MHz)	AP2 26 dB Bandwidth (MHz)	AP4 26 dB Bandwidth (MHz)
Low	5745	20.652	21.399
Middle	5785	21.418	34.405
High	5805	20.728	29.768

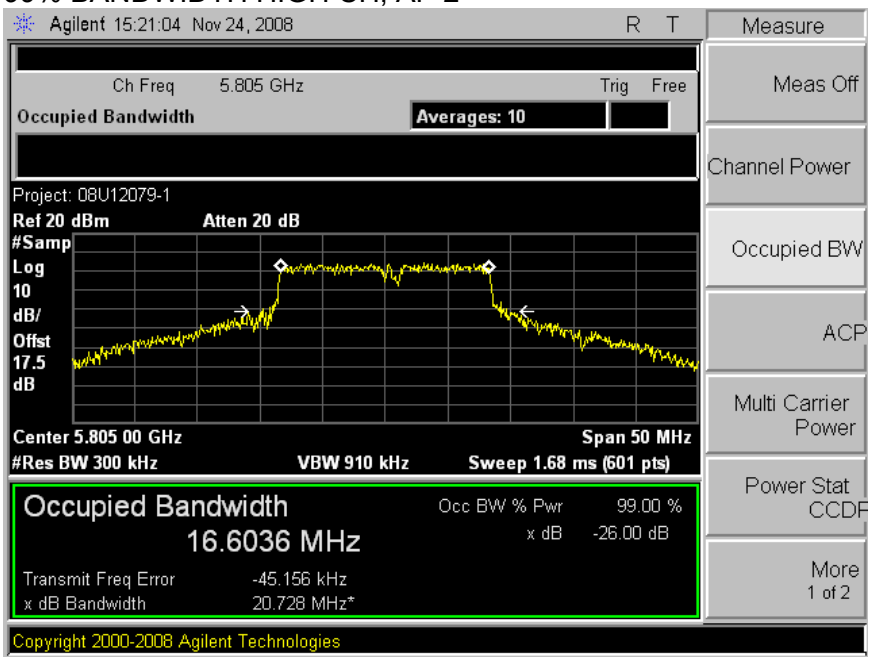
99% BANDWIDTH, AP 2



99% BANDWIDTH MID CH, AP 2

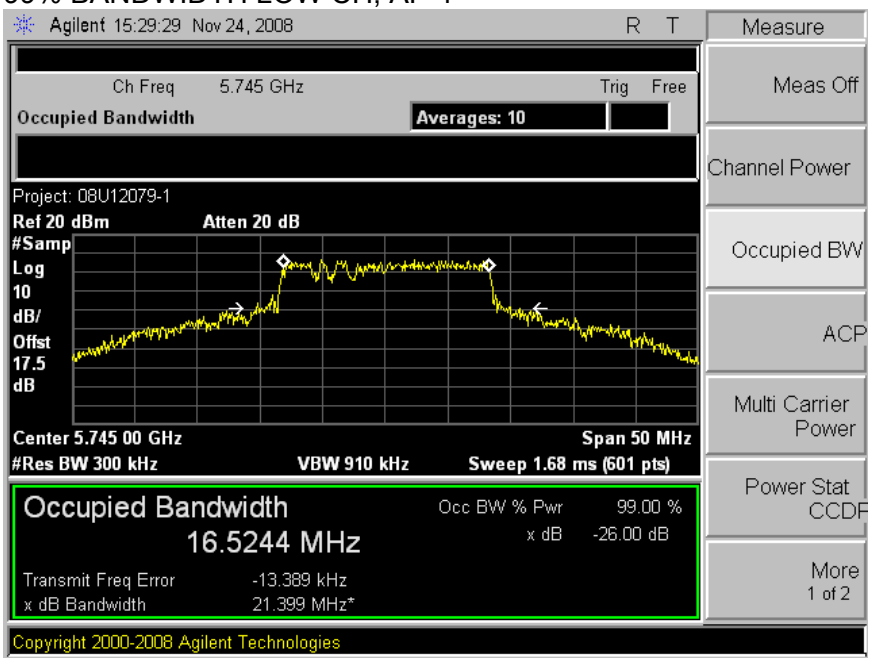


99% BANDWIDTH HIGH CH, AP 2

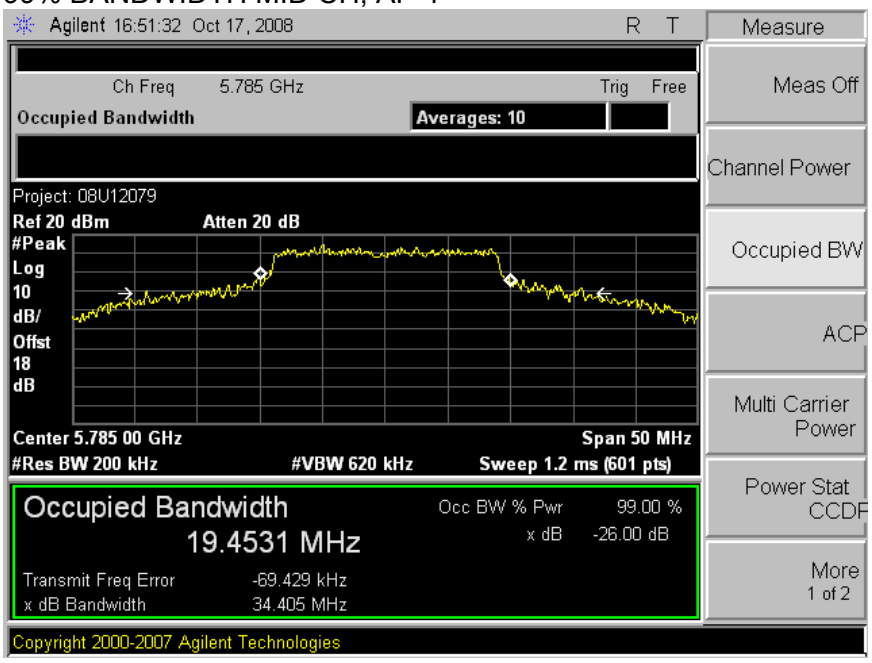


99% BANDWIDTH, AP 4

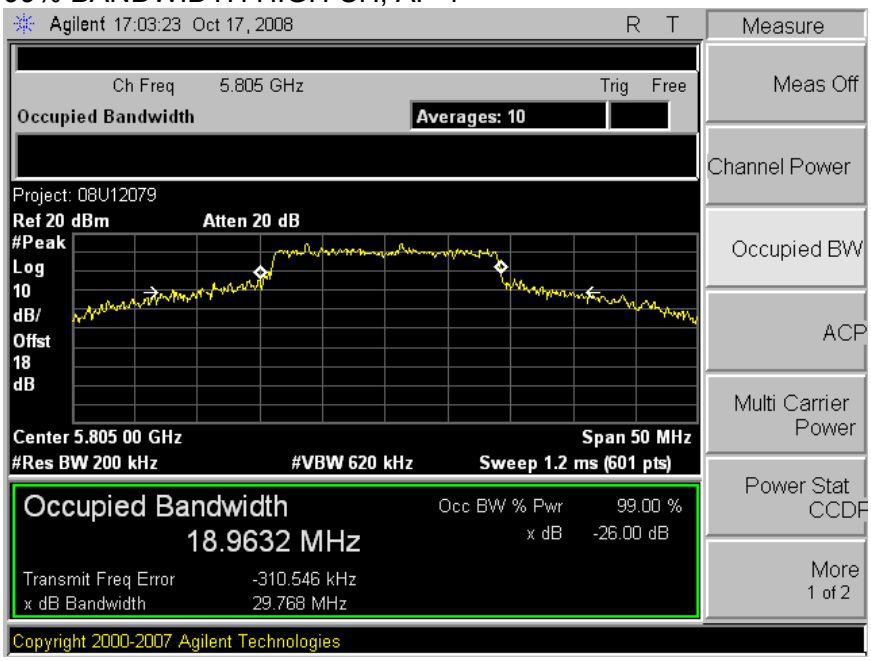
99% BANDWIDTH LOW CH, AP 4



99% BANDWIDTH MID CH, AP 4



99% BANDWIDTH HIGH CH, AP 4



7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 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.

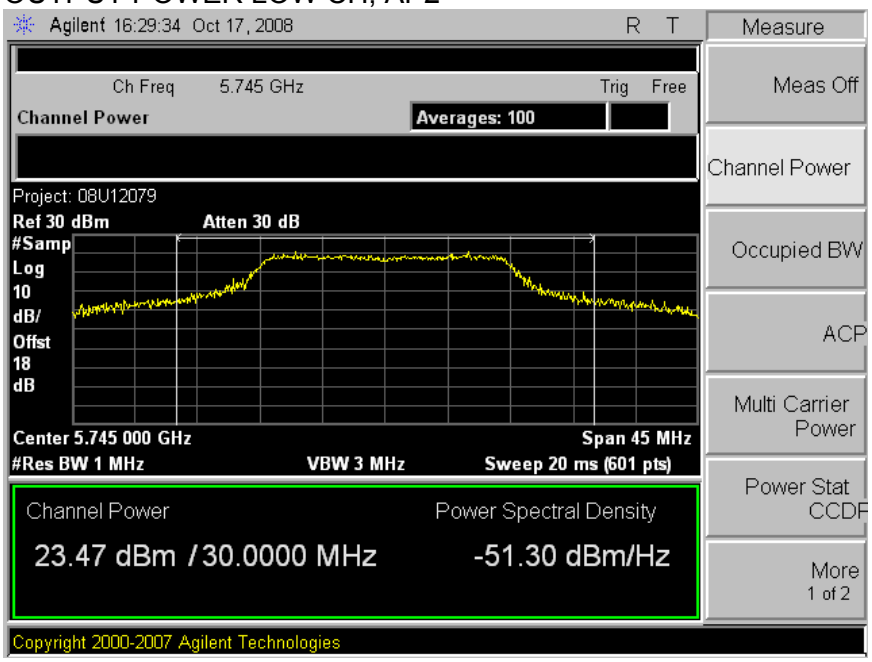
The transmitter output operates continuously therefore Method # 1 is used.

RESULTS

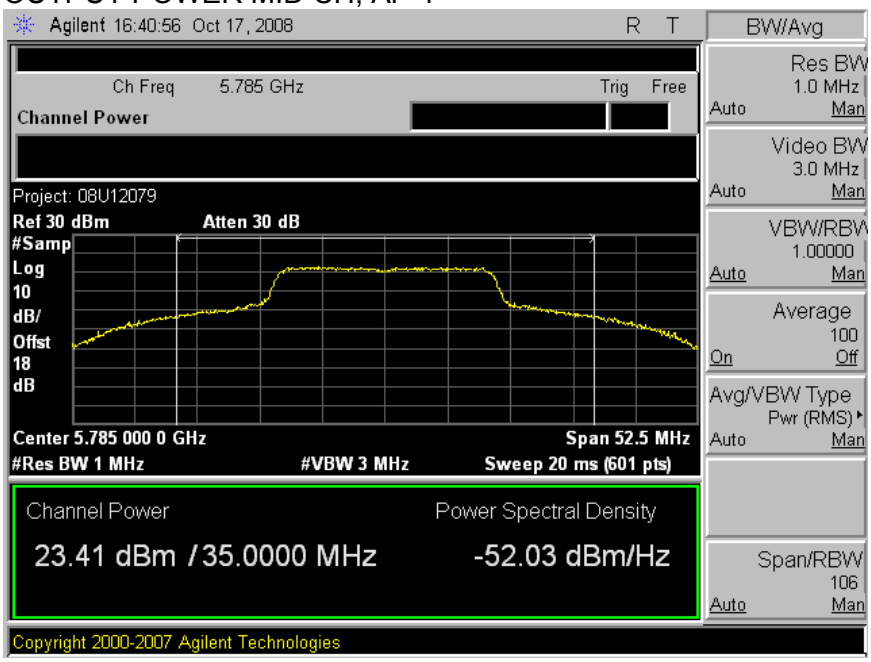
Channel	Frequency (MHz)	Limit (dBm)	AP2 Power (dBm)	AP4 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	5745	30.00	23.47	24.05	26.78	-3.22
Mid	5785	30.00	23.41	24.49	26.99	-3.01
High	5805	30.00	22.61	24.30	26.55	-3.45

AP 2 OUTPUT POWER

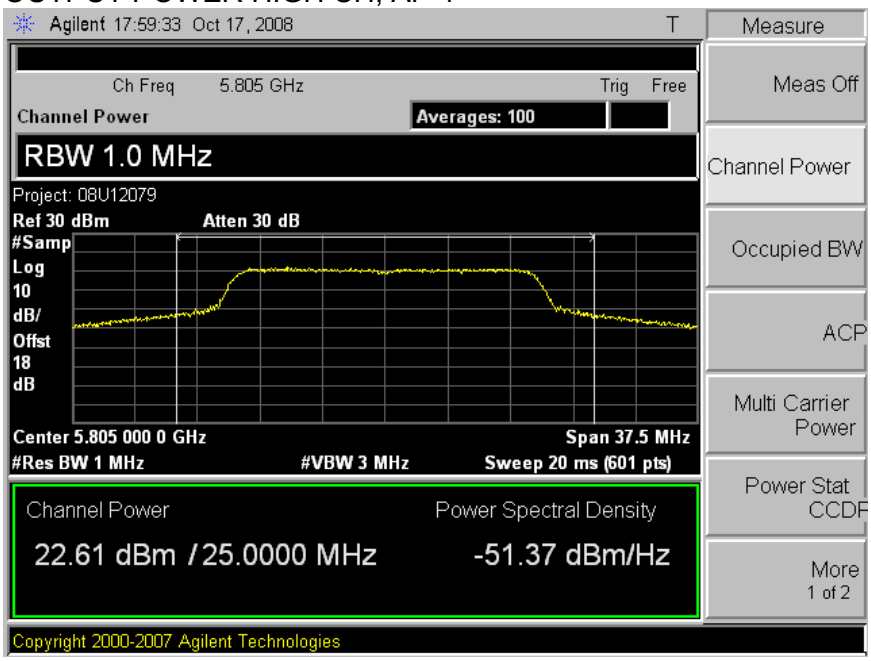
OUTPUT POWER LOW CH, AP2



OUTPUT POWER MID CH, AP 4

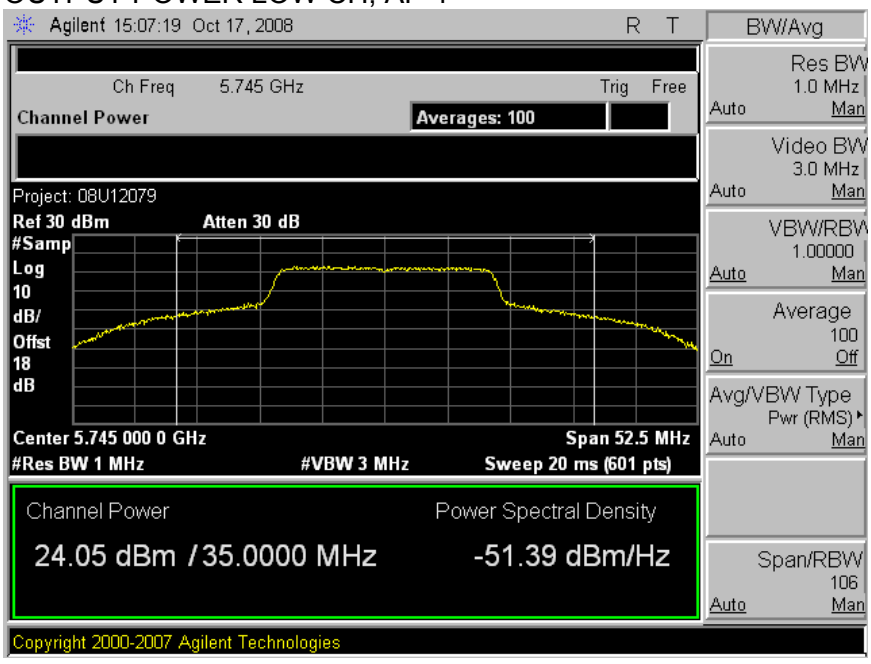


OUTPUT POWER HIGH CH, AP 4

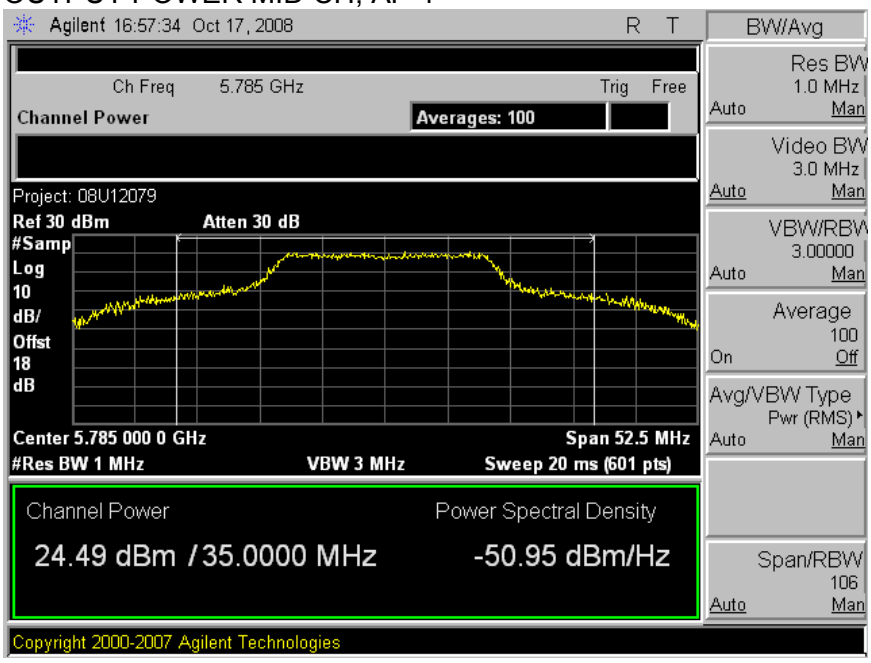


AP4 OUTPUT POWER

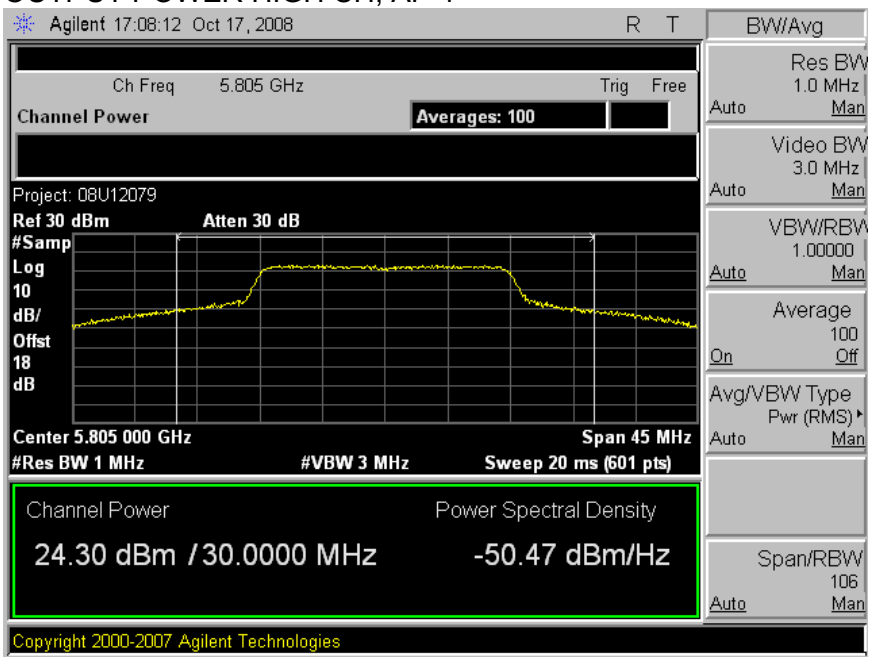
OUTPUT POWER LOW CH, AP 4



OUTPUT POWER MID CH, AP 4



OUTPUT POWER HIGH CH, AP 4



7.5.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

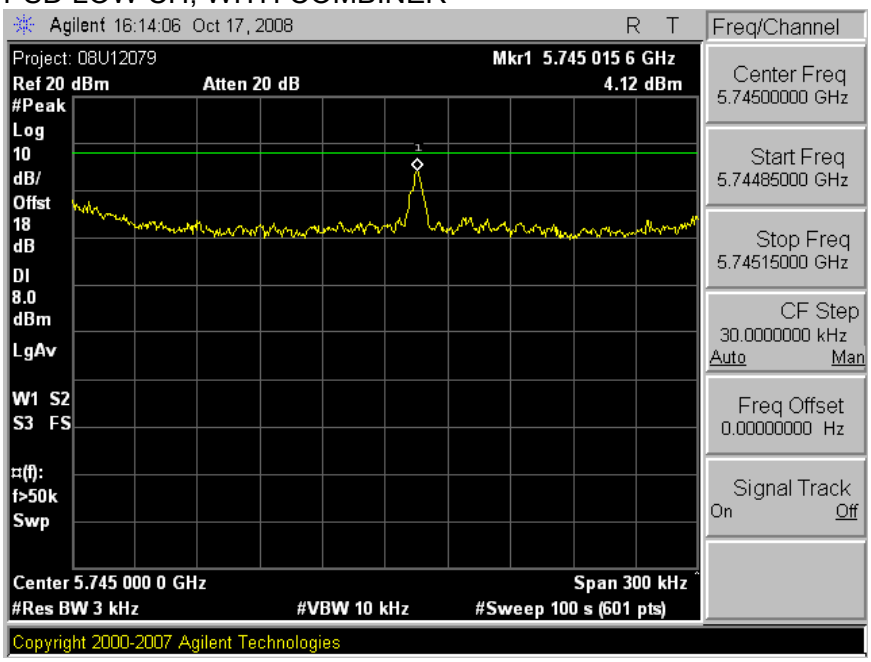
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS:

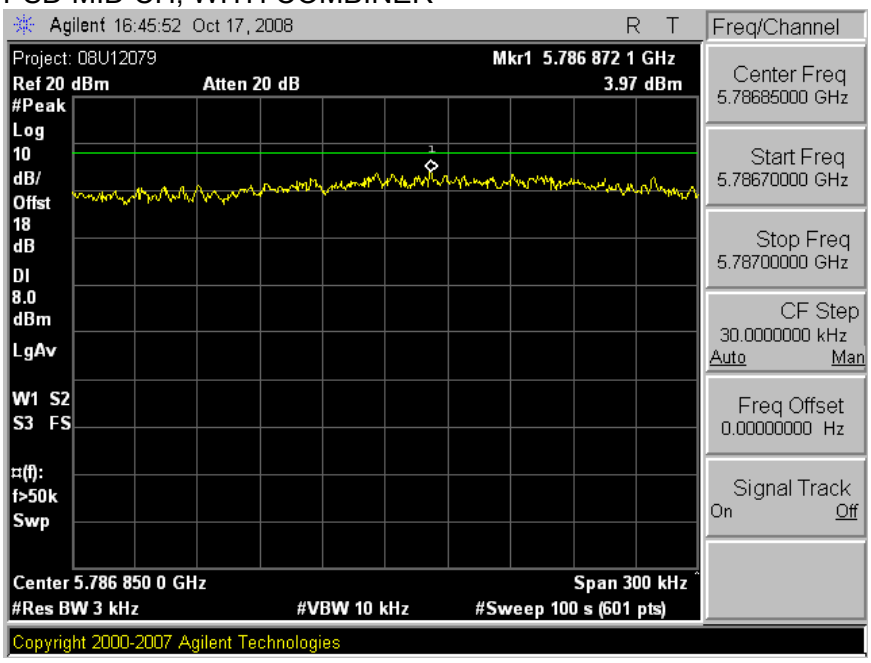
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5745	4.12	8	-3.88
Middle	5785	3.97	8	-4.03
High	5805	4.49	8	-3.51

POWER SPECTRAL DENSITY, WITH COMBINER

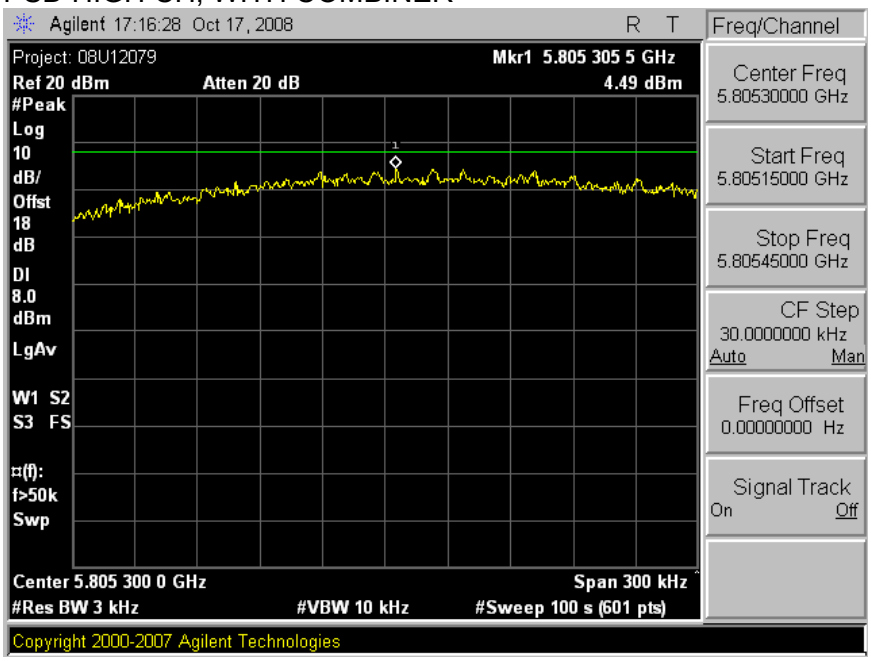
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



7.5.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

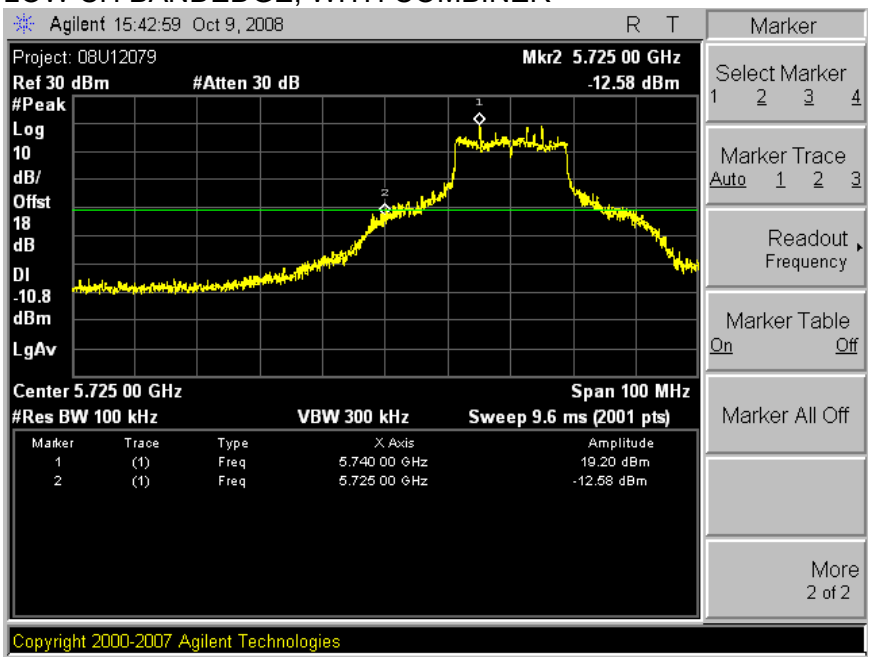
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

RESULTS

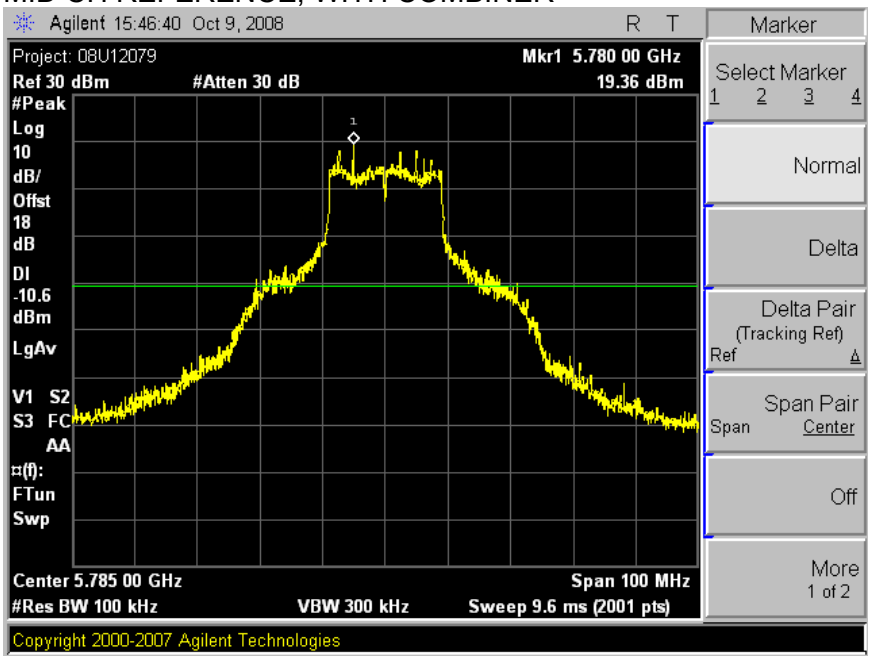
SPURIOUS EMISSIONS WITH COMBINER

LOW CH BANDEDGE, WITH COMBINER



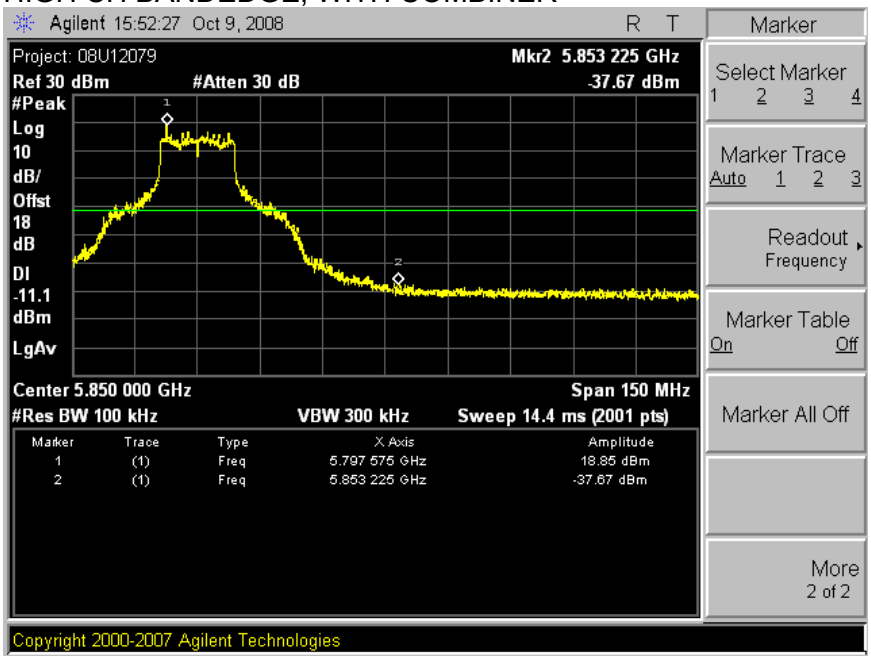
LOW CH SPURIOUS, WITH COMBINER

MID CH REFERENCE, WITH COMBINER

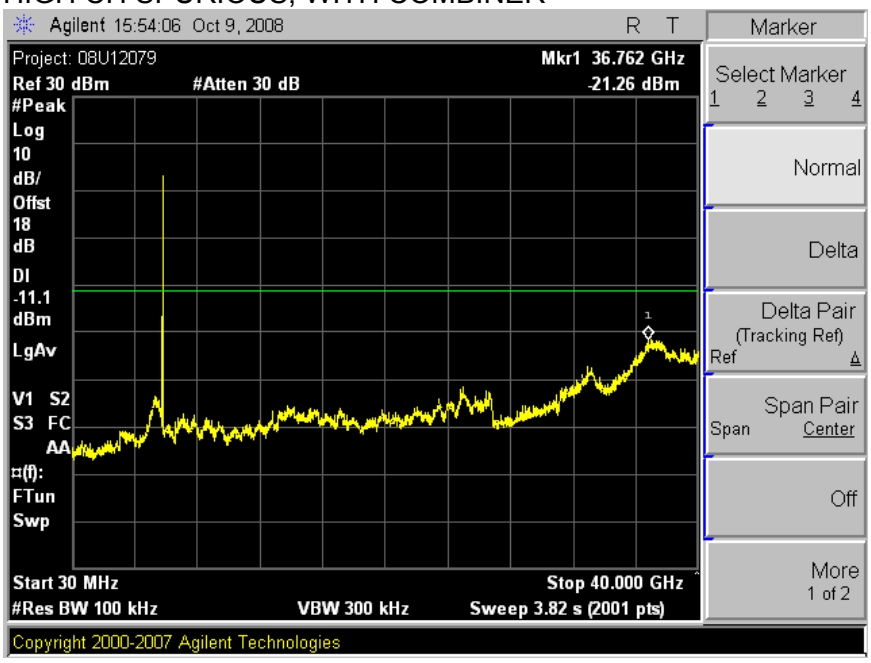


MID CH SPURIOUS, WITH COMBINER

HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, WITH COMBINER



7.6. 802.11n HT40 MODE IN THE 5.8 GHz BAND

7.6.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

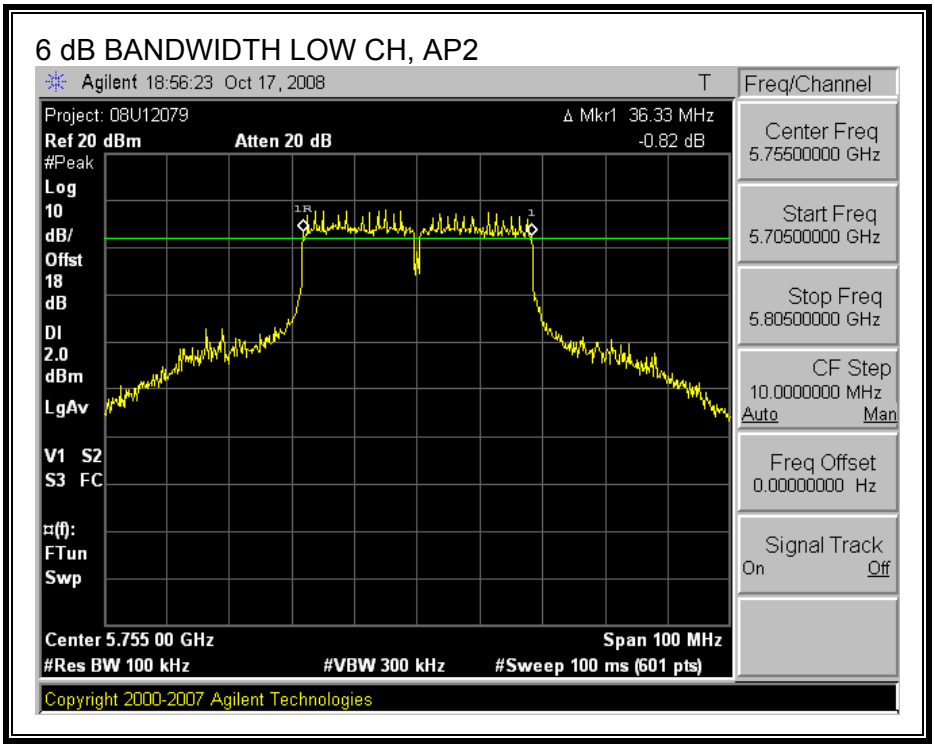
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

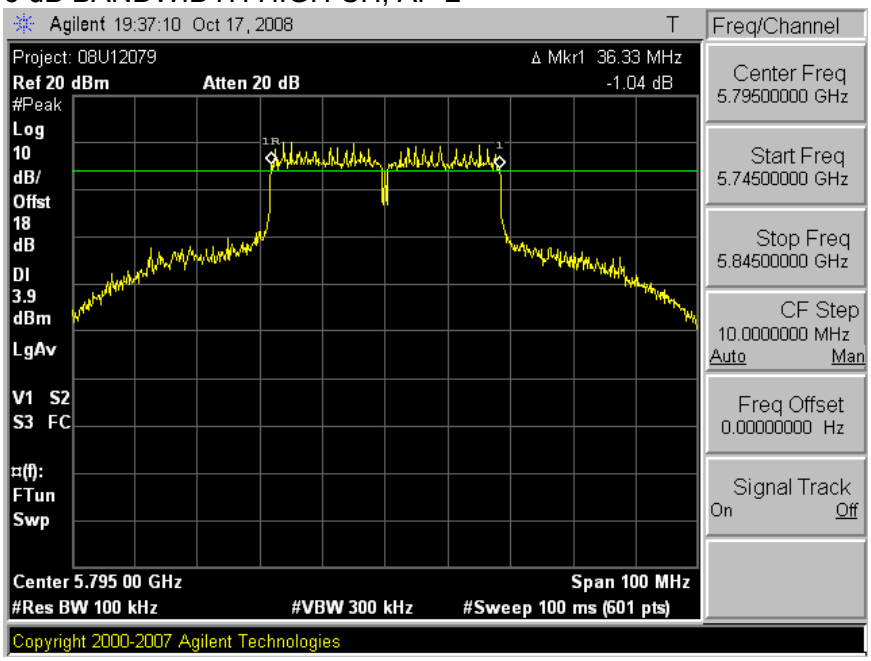
RESULTS

Channel	Frequency (MHz)	AP2 6 dB BW (MHz)	AP4 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5755	36.33	36.33	0.5
High	5795	36.33	36.33	0.5

6 dB BANDWIDTH, AP2

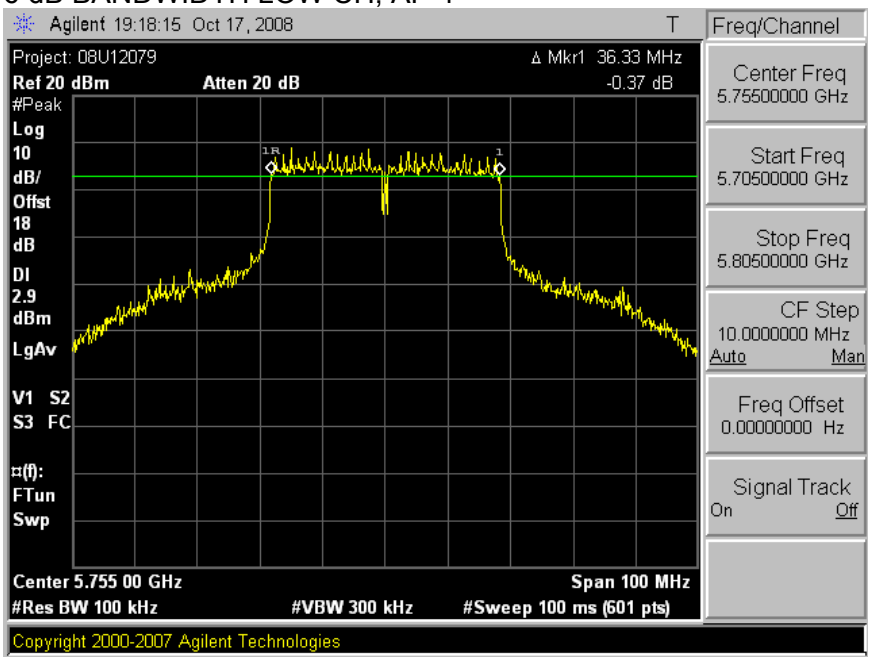


6 dB BANDWIDTH HIGH CH, AP 2

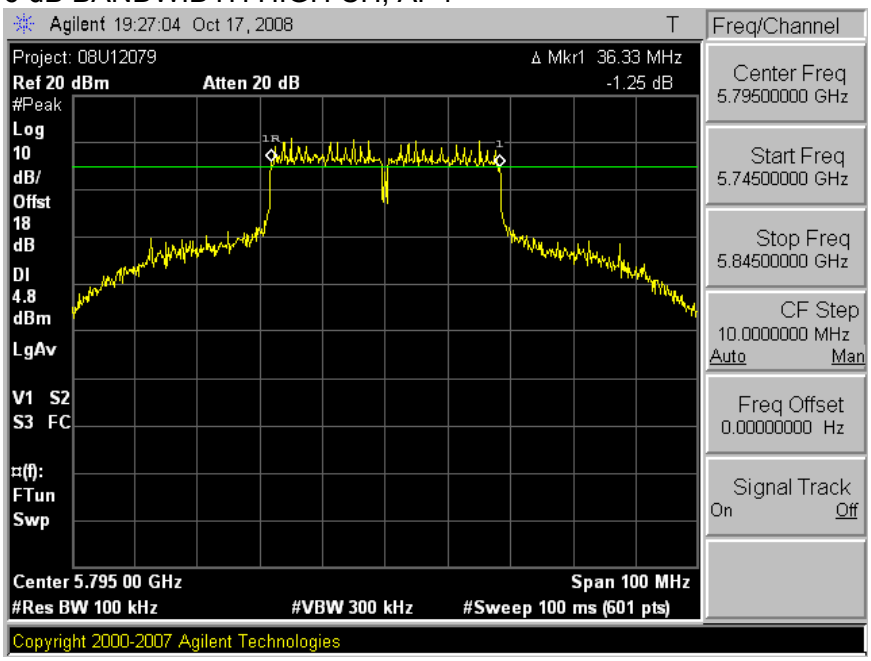


6 dB BANDWIDTH, AP 4

6 dB BANDWIDTH LOW CH, AP 4



6 dB BANDWIDTH HIGH CH, AP4



7.6.2. 99% and 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

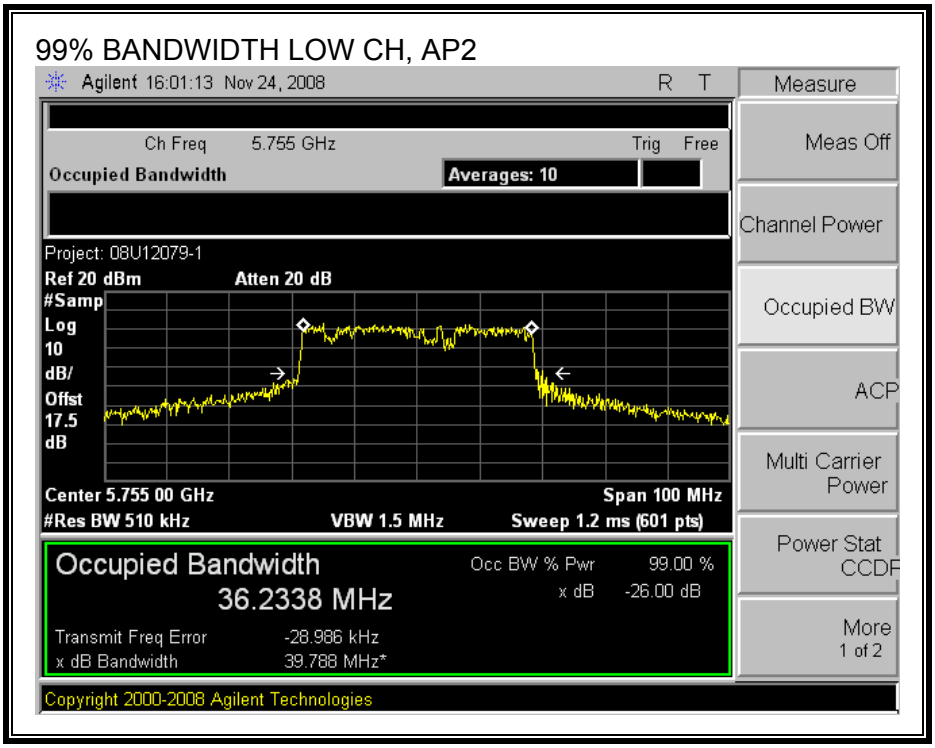
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

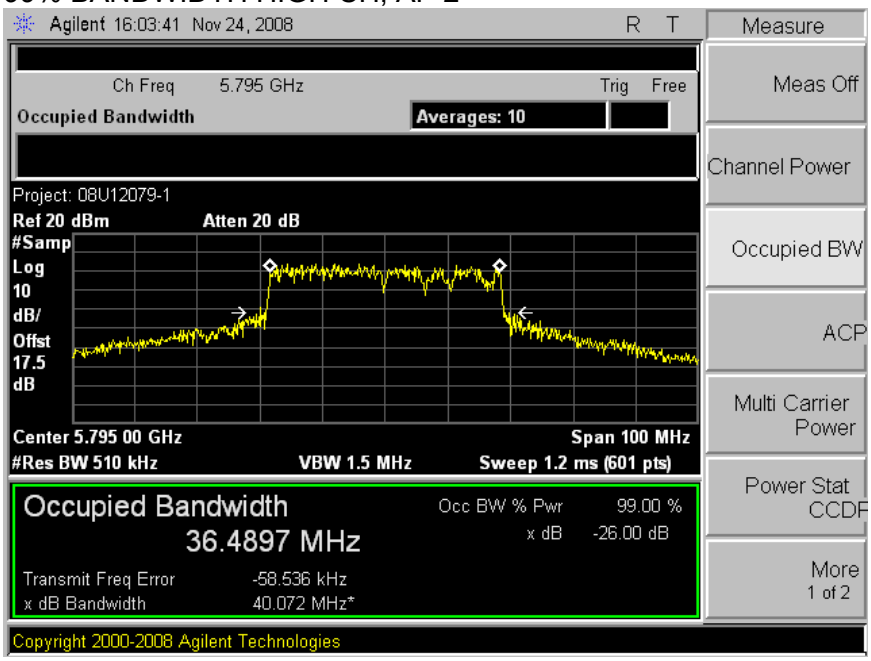
Channel	Frequency (MHz)	AP2 99% Bandwidth (MHz)	AP4 99% Bandwidth (MHz)
Low	5755	36.2338	36.3163
High	5795	36.4897	36.2228

Channel	Frequency (MHz)	AP2 26 dB Bandwidth (MHz)	AP4 26 dB Bandwidth (MHz)
Low	5755	39.788	41.791
High	5795	40.072	39.369

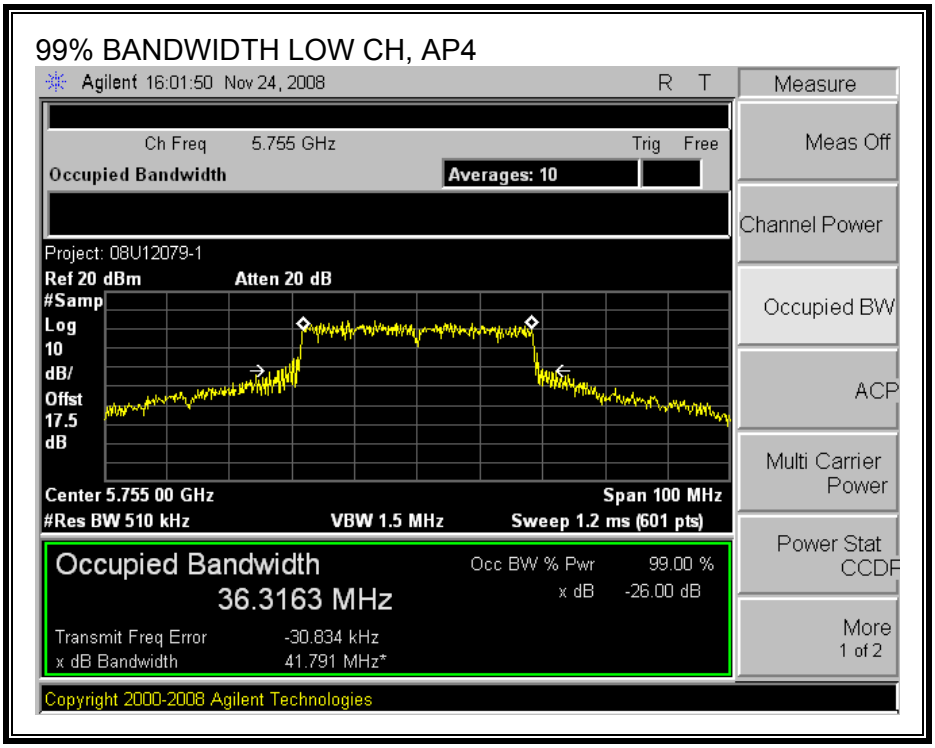
99% BANDWIDTH, AP2



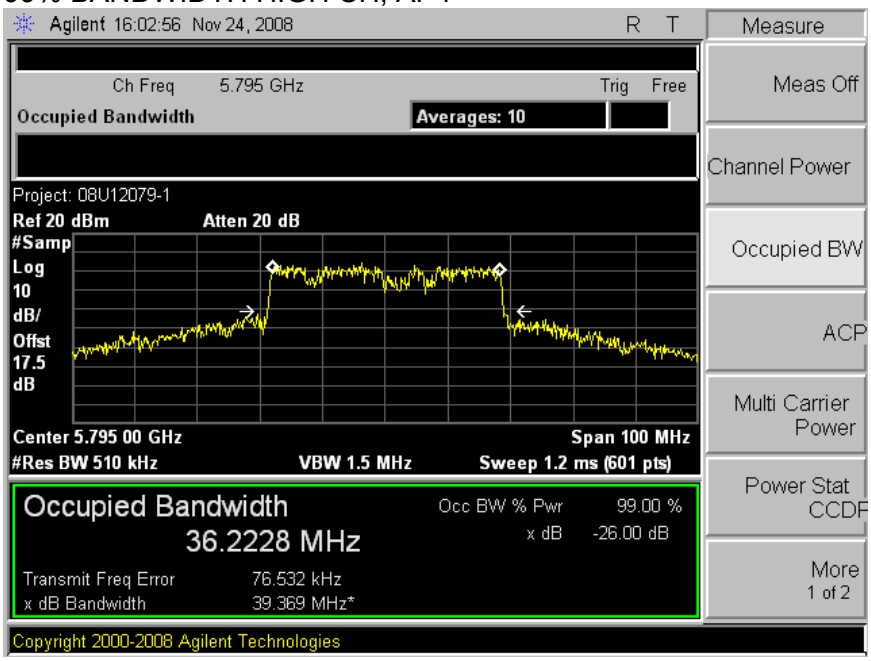
99% BANDWIDTH HIGH CH, AP 2



99% BANDWIDTH, AP4



99% BANDWIDTH HIGH CH, AP4



7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

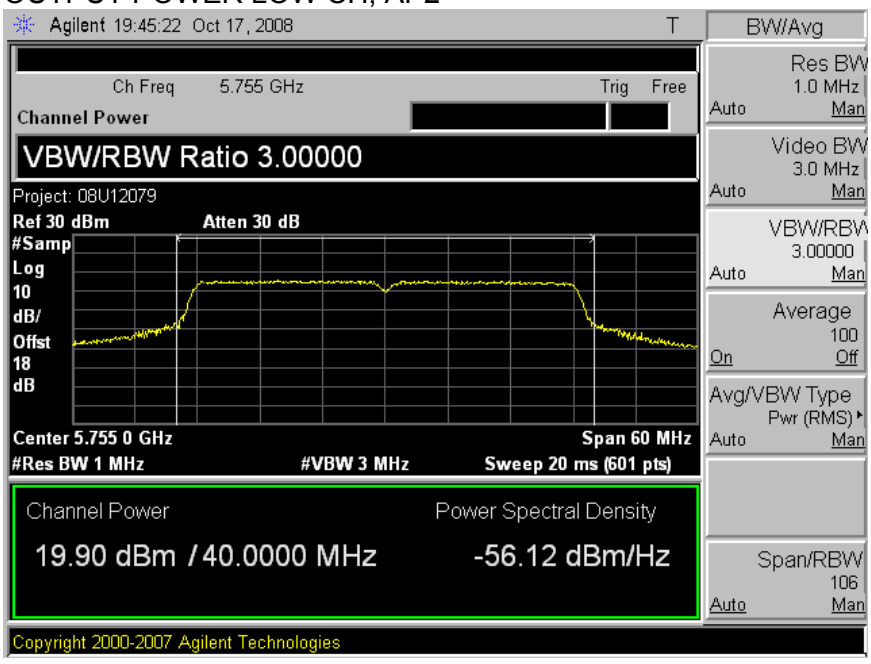
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

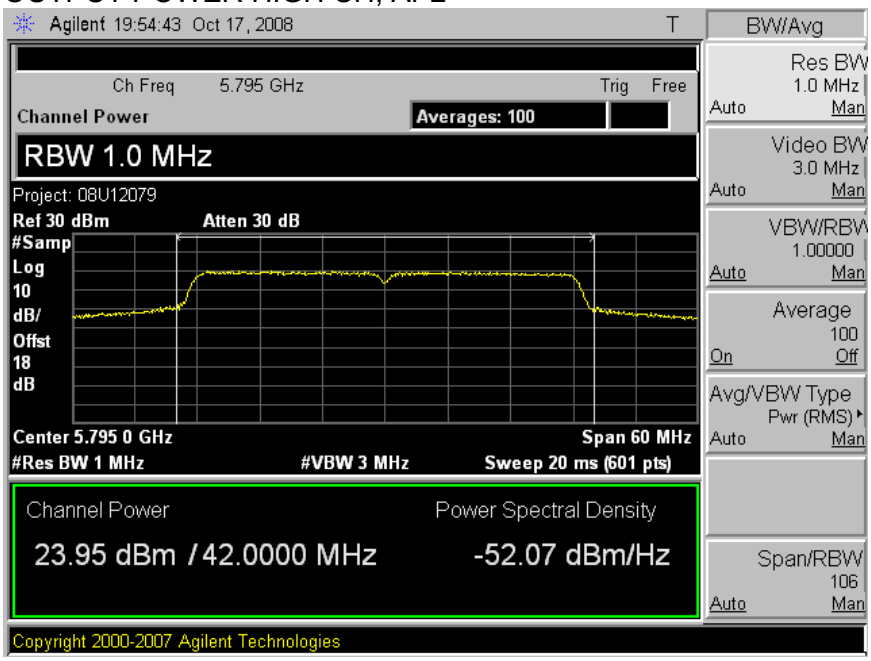
Channel	Frequency (MHz)	Limit (dBm)	AP2 Power (dBm)	AP4 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	5755	30.00	19.90	21.06	23.53	-6.47
High	5795	30.00	23.95	23.11	26.56	-3.44

AP2 OUTPUT POWER

OUTPUT POWER LOW CH, AP2

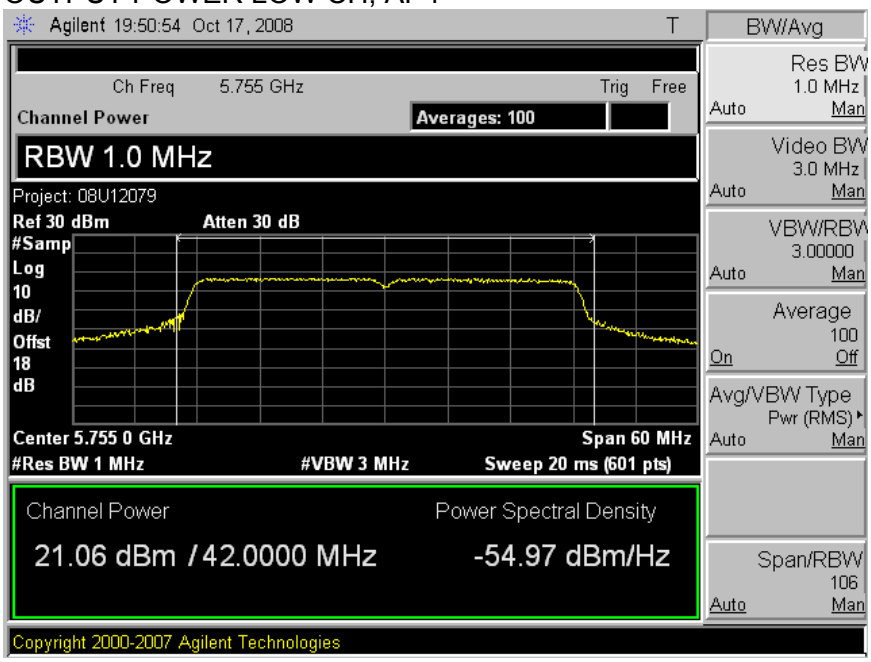


OUTPUT POWER HIGH CH, AP2

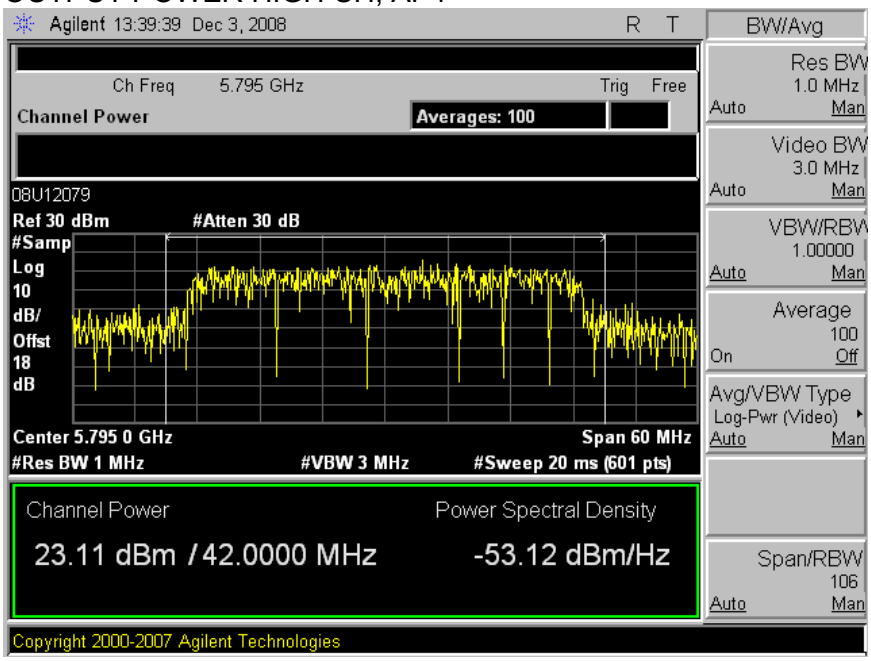


AP4 OUTPUT POWER

OUTPUT POWER LOW CH, AP4



OUTPUT POWER HIGH CH, AP4



7.6.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

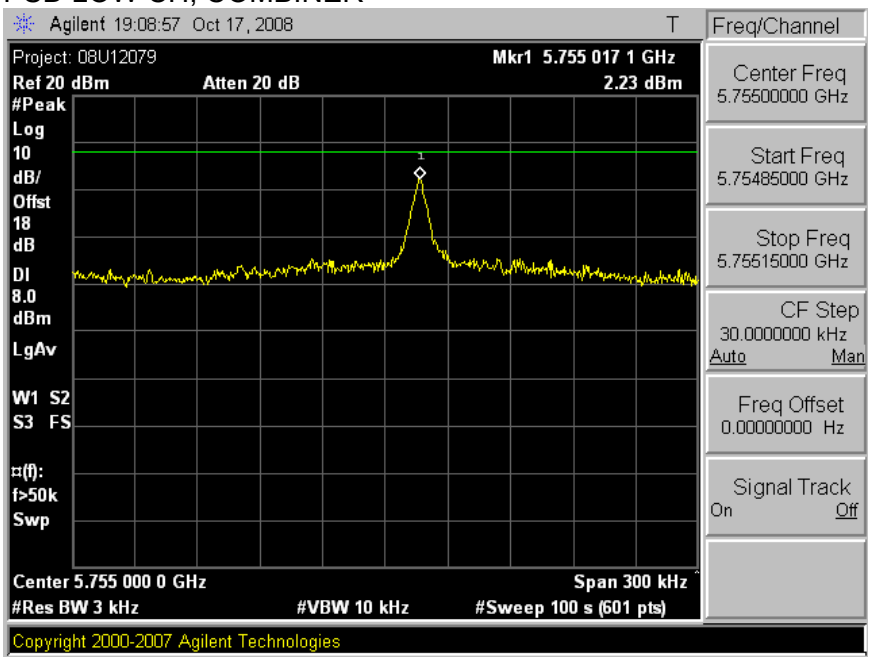
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS:

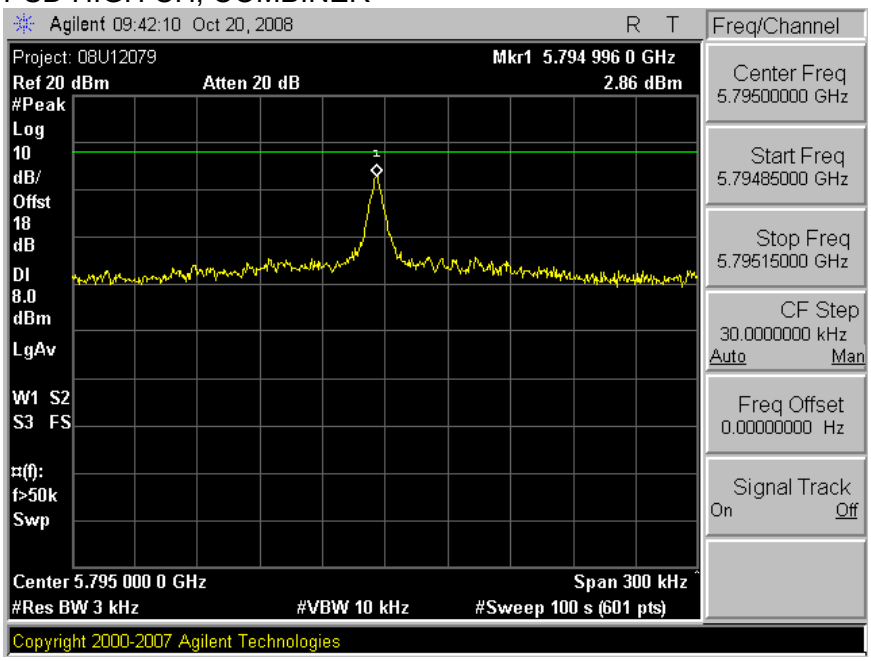
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5755	2.23	8	-5.77
High	5795	2.86	8	-5.14

POWER SPECTRAL DENSITY, COMBINER

PSD LOW CH, COMBINER



PSD HIGH CH, COMBINER



7.6.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

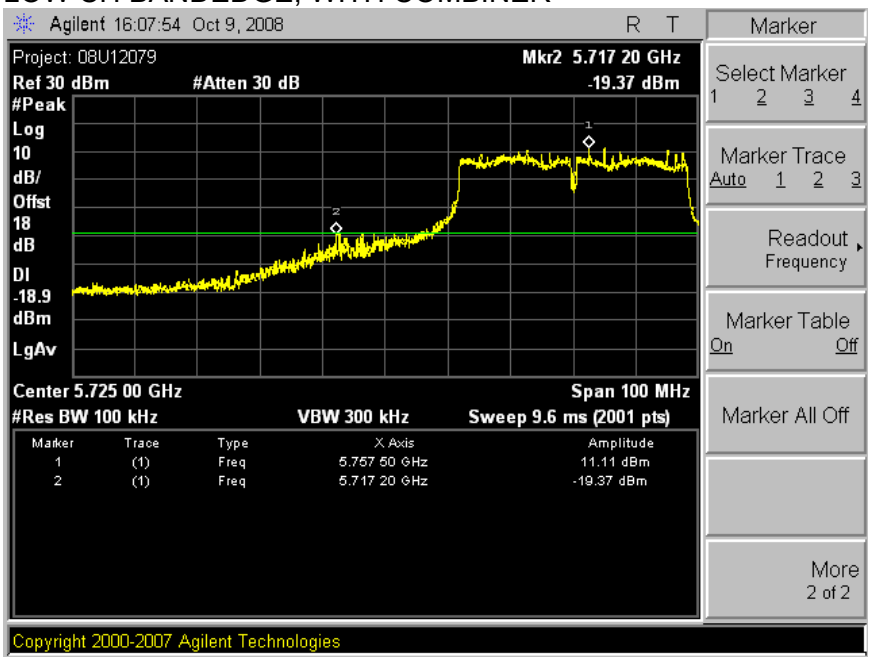
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest and highest channels.

RESULTS

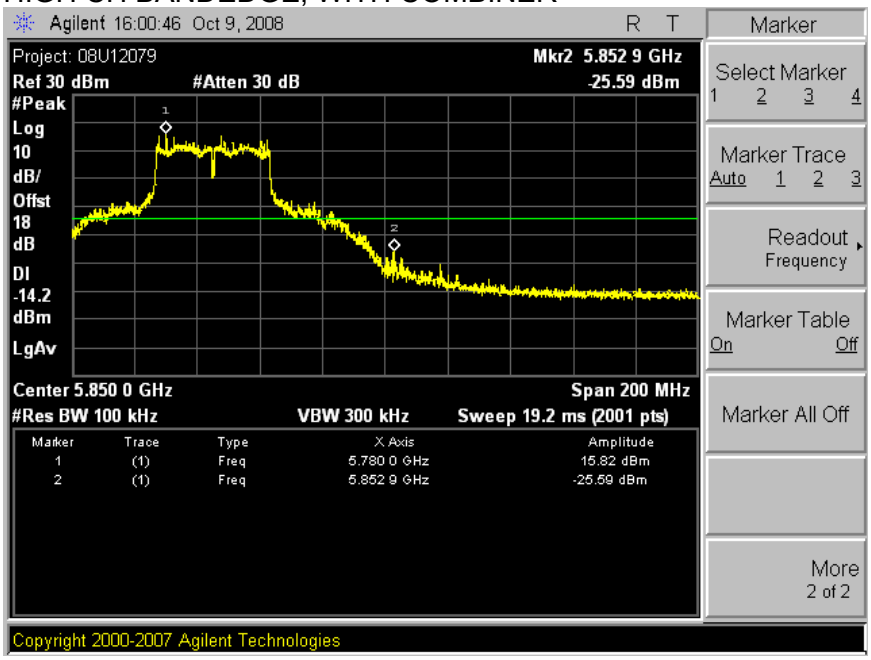
SPURIOUS EMISSIONS WITH COMBINER

LOW CH BANDEDGE, WITH COMBINER



LOW CH SPURIOUS, WITH COMBINER

HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, WITH COMBINER

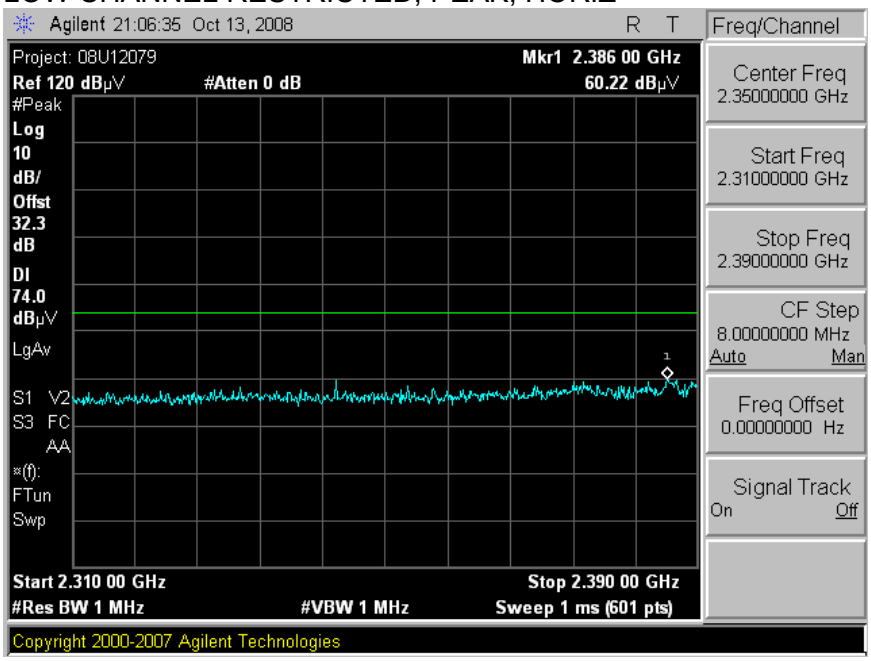
8. RADIATED EMISSIONS TEST RESULTS

8.1. TX ABOVE 1 GHz FOR 802.11b DUAL CHAIN LEGACY MODE

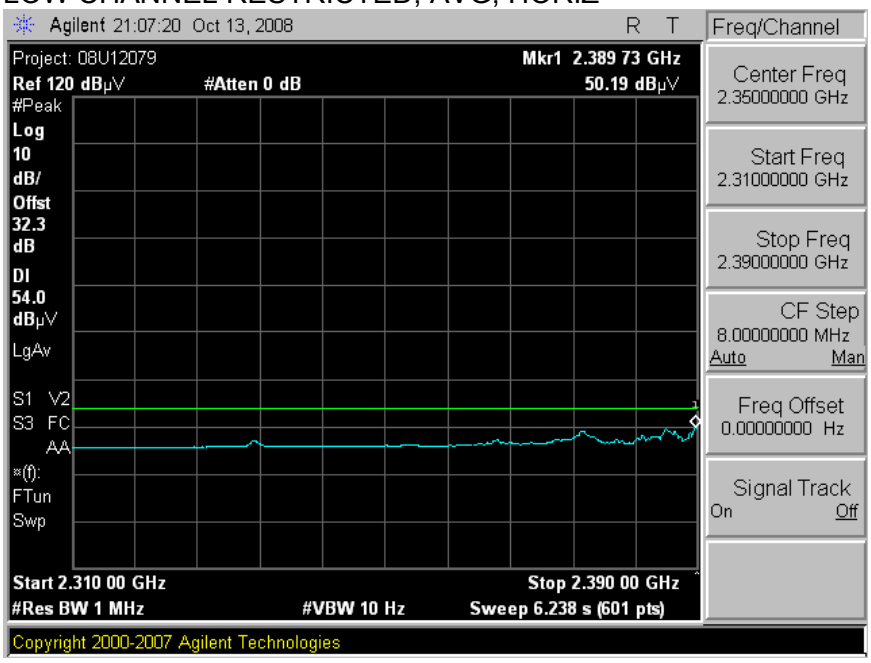
CHANNEL 1:

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ

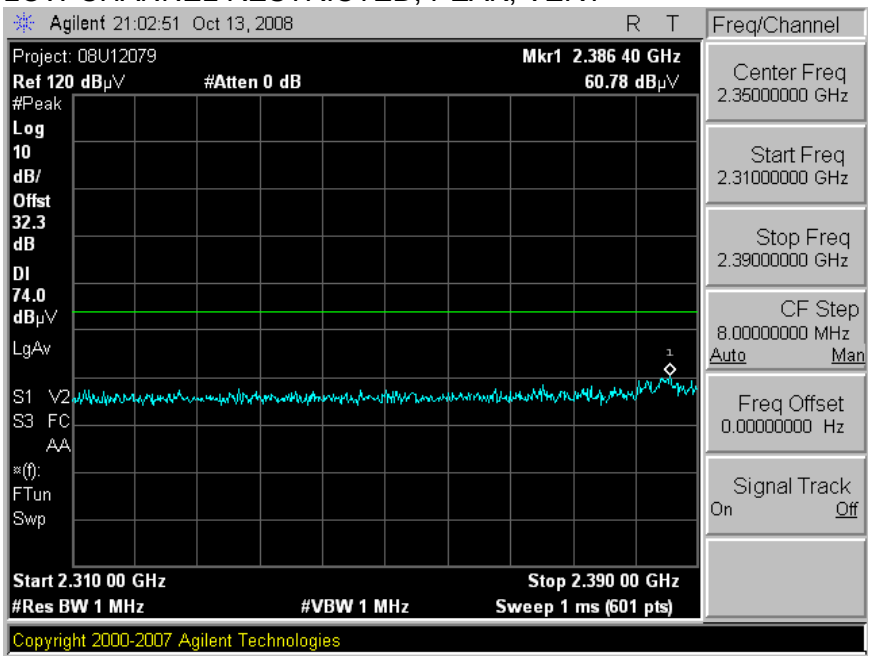


LOW CHANNEL RESTRICTED, AVG, HORIZ

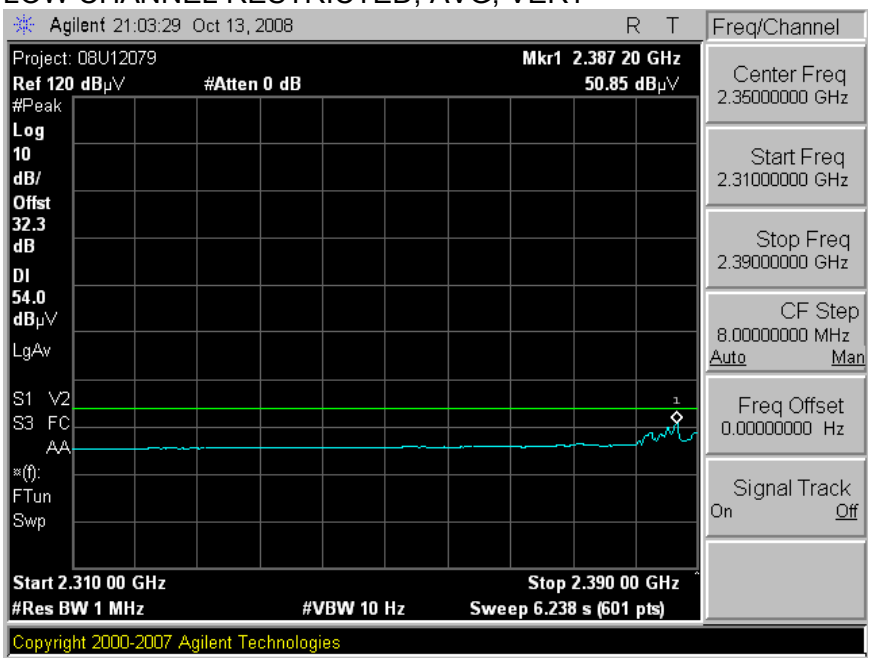


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

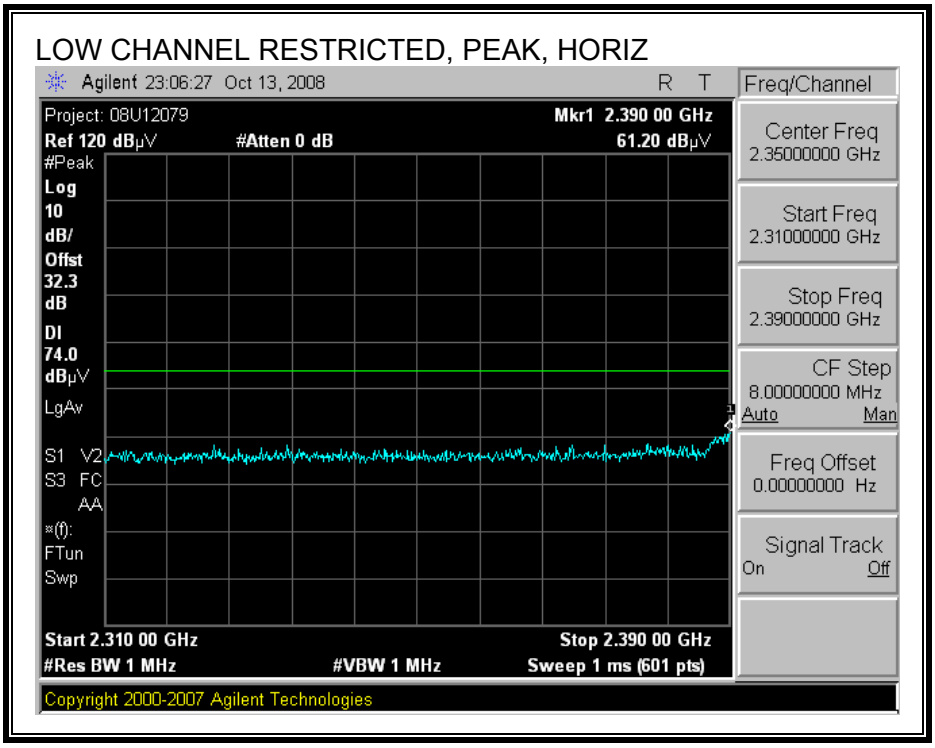


LOW CHANNEL RESTRICTED, AVG, VERT

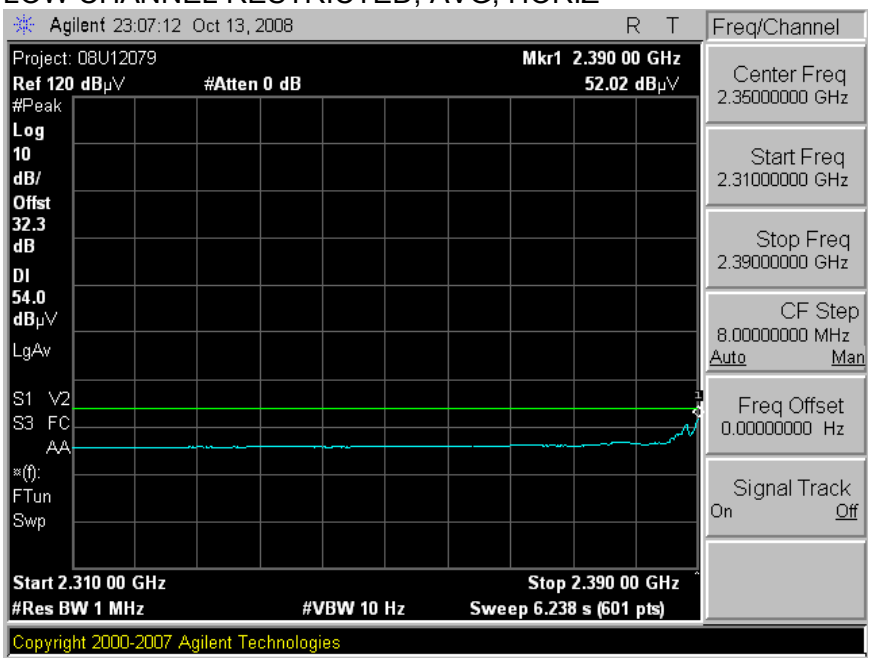


CHANNEL 2:

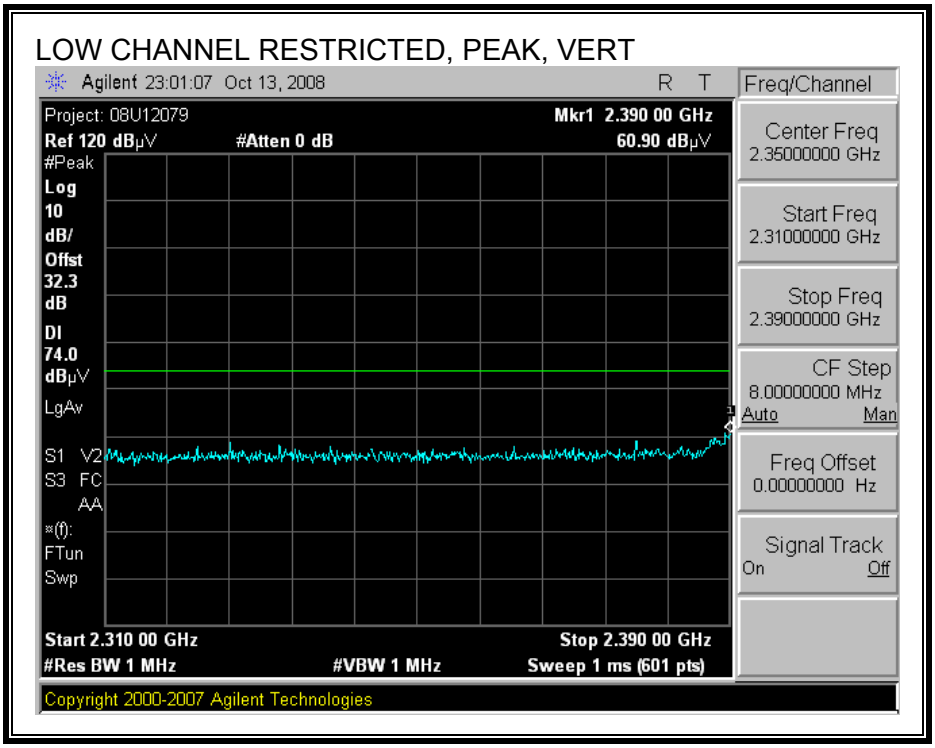
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



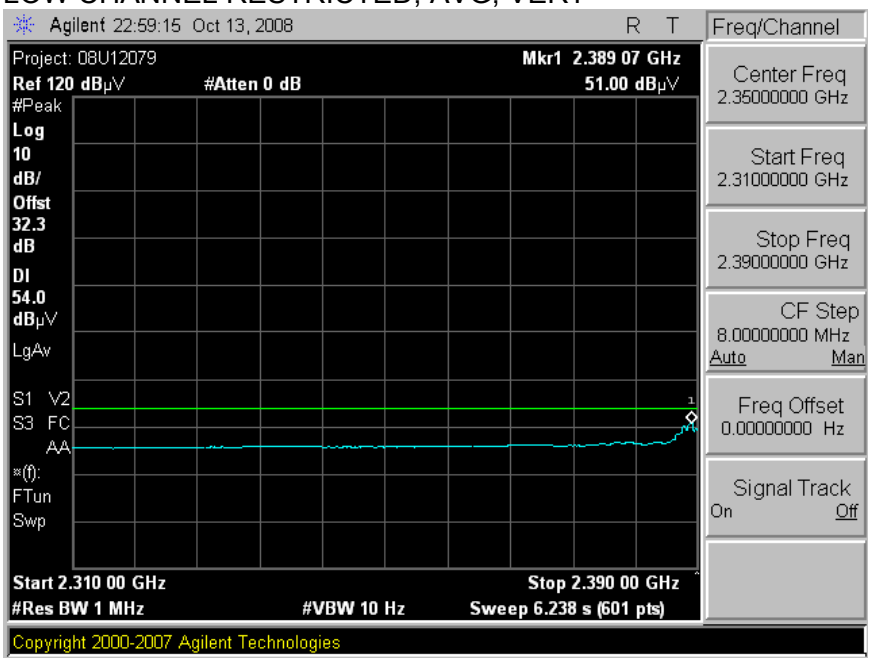
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

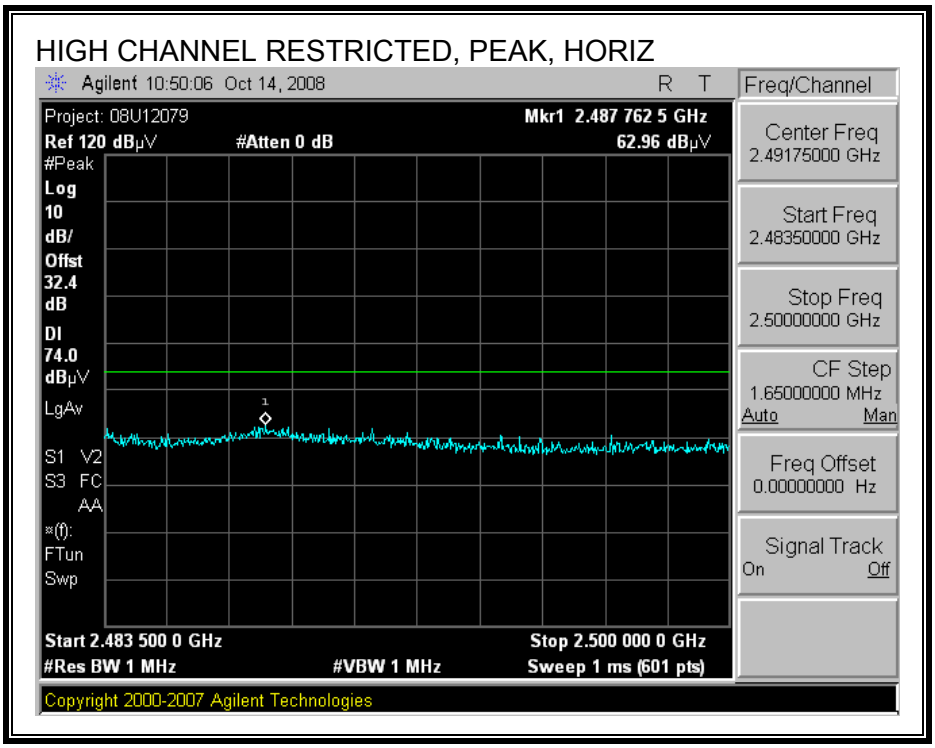


LOW CHANNEL RESTRICTED, AVG, VERT

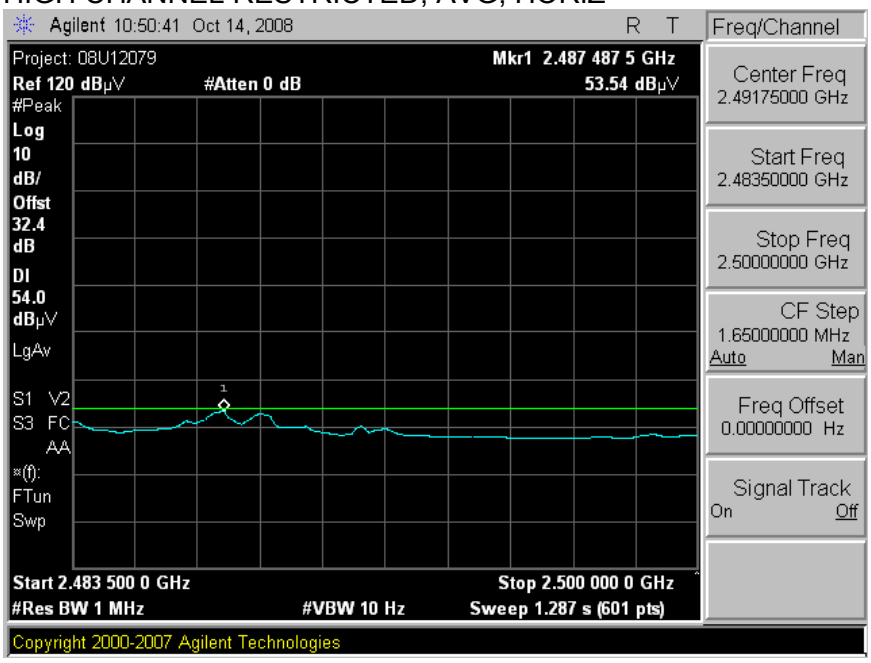


Channel 11:

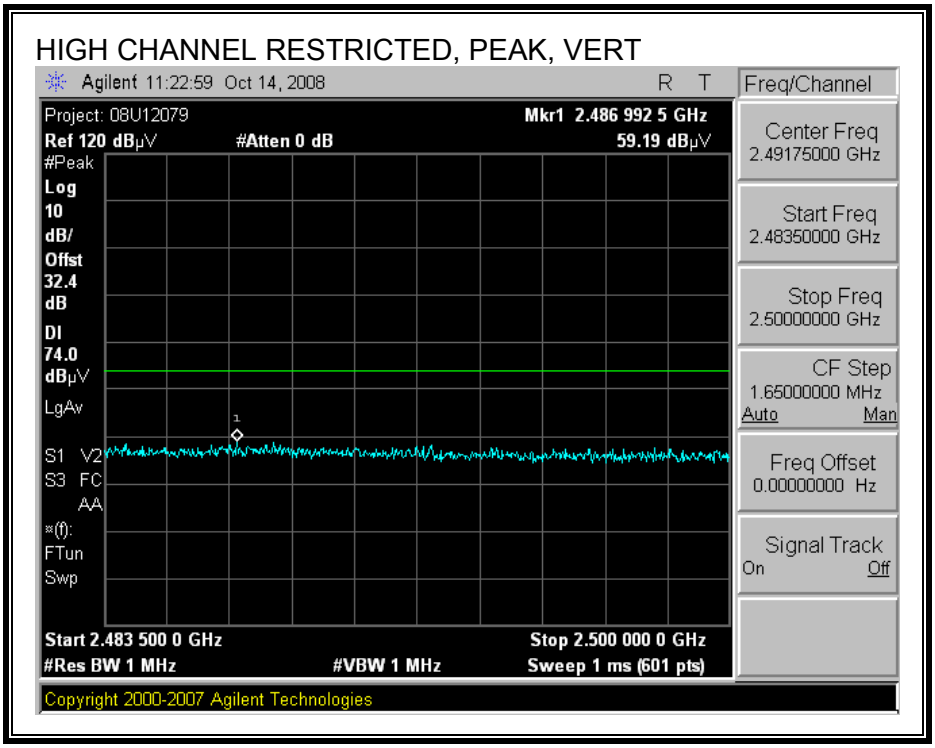
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



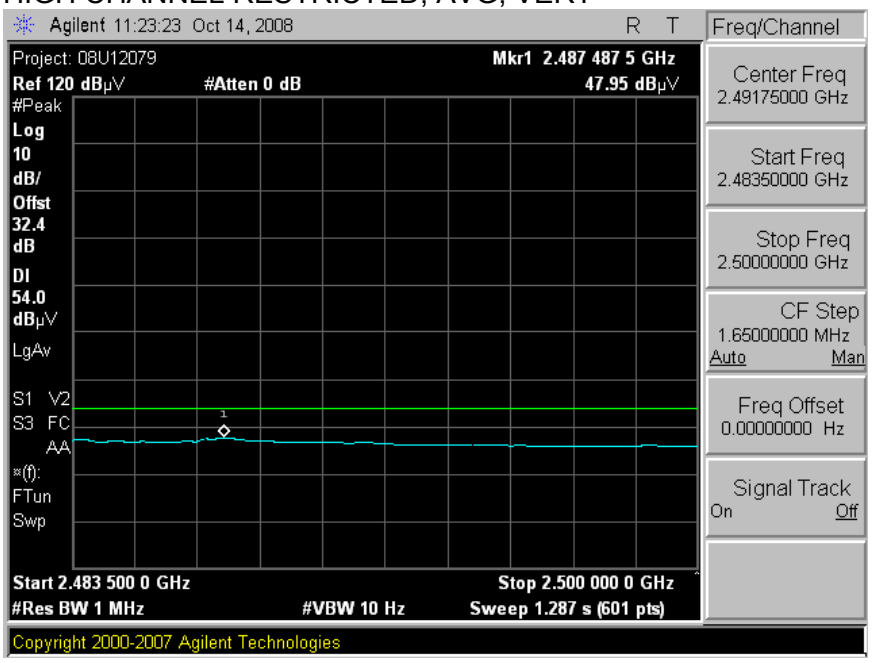
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

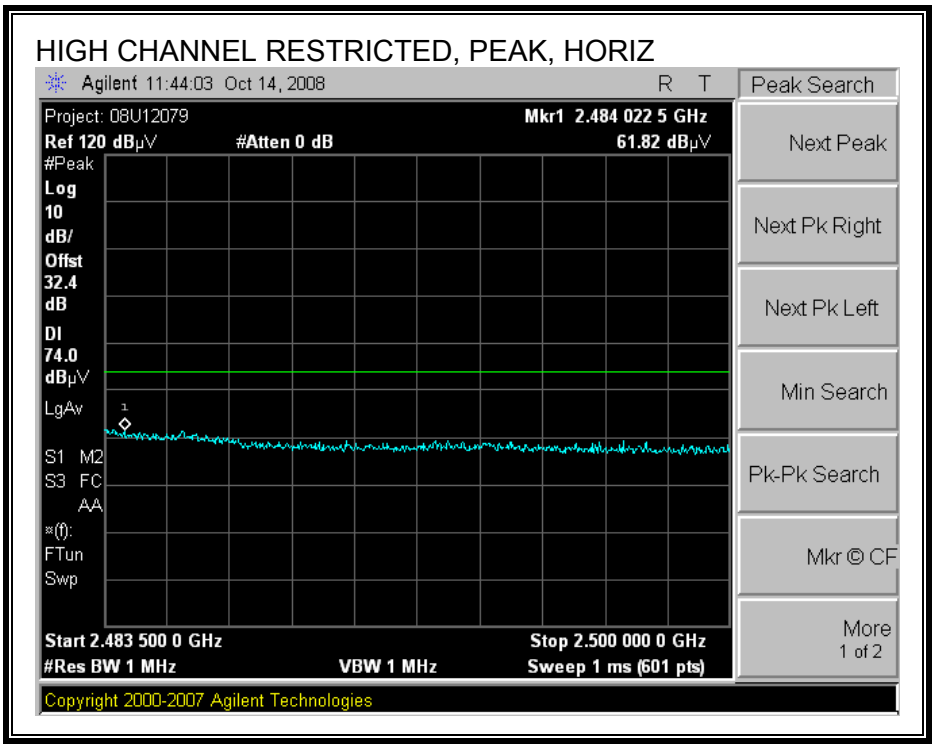


HIGH CHANNEL RESTRICTED, AVG, VERT

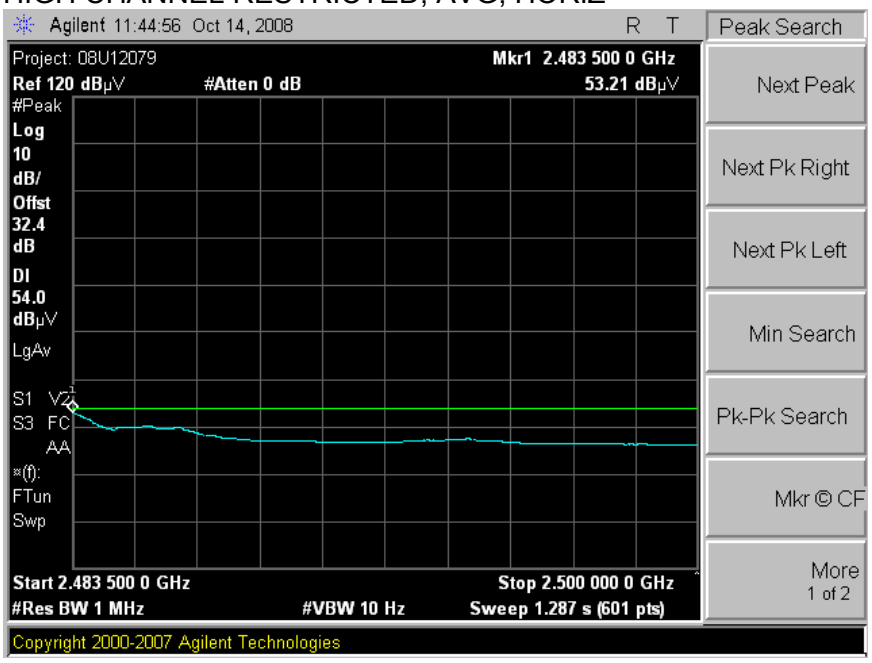


Channel 10:

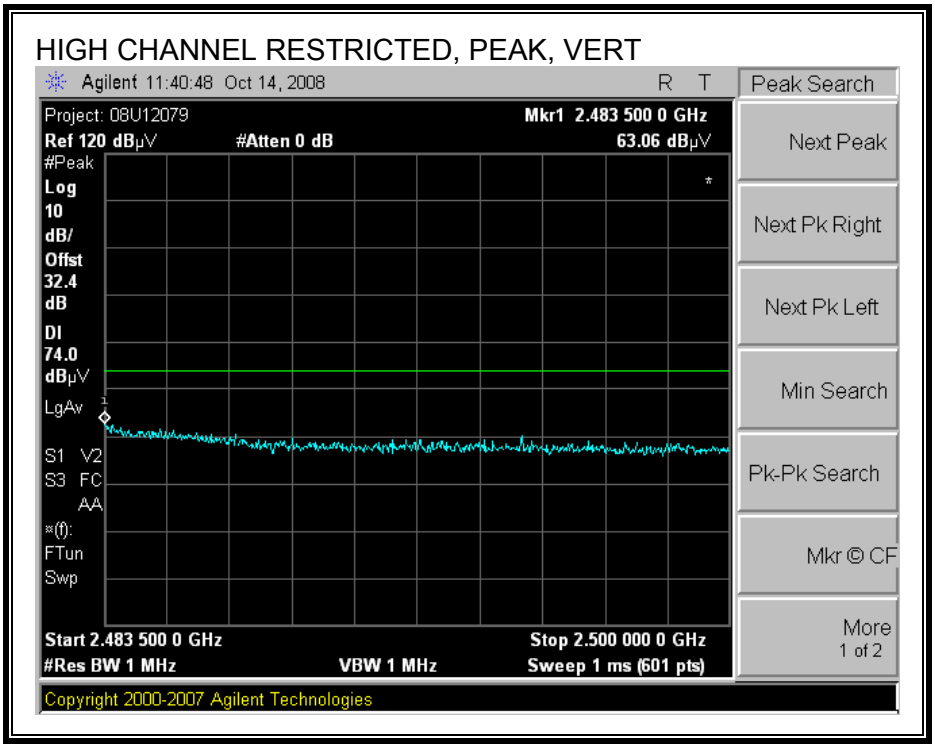
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



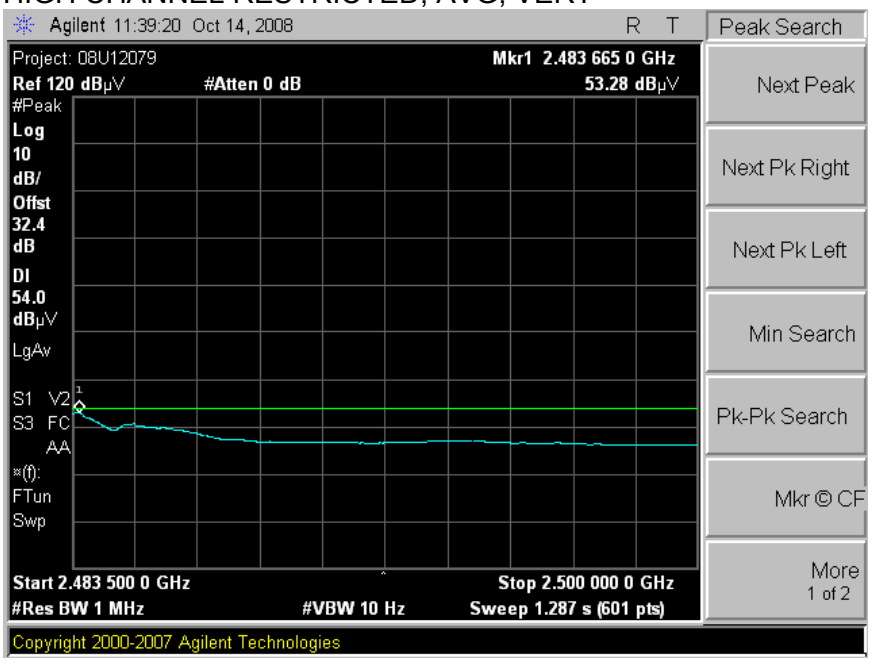
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Inc
Project #: 08U12079
Date: 10/14/08
Test Engineer: Thanh Nguyen
Configuration: EUT and remote support Laptop
Mode: Transmit b mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	Chamber Cables	HPF	Reject Filter
		C-5m Chamber		R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid channel Art= 21.5															
4.874	3.0	47.18	44.61	33.8	5.4	-34.8	0.0	0.0	51.6	49.0	74	54	-22.4	-5.0	H/with shield
7.311	3.0	48.30	44.16	36.2	7.5	-34.1	0.0	0.0	57.9	53.8	74	54	-16.1	-0.2	H
12.184	3.0	34.41	22.08	39.1	9.0	-32.5	0.0	0.0	50.0	37.7	74	54	-24.0	-16.3	Noise floor
4.874	3.0	48.25	46.30	33.8	5.4	-34.8	0.0	0.0	52.6	50.7	74	54	-21.4	-3.3	V
7.311	3.0	44.62	40.46	36.2	7.5	-34.1	0.0	0.0	54.2	50.1	74	54	-19.8	-3.9	V
12.184	3.0	34.24	23.51	39.1	9.0	-32.5	0.0	0.0	49.9	39.1	74	54	-24.1	-14.9	Noise floor
Low Channel Art=18															
4.824	3.0	43.07	38.35	33.7	5.3	-34.8	0.0	0.0	47.3	42.6	74	54	-26.7	-11.4	V
12.060	3.0	33.87	22.10	39.0	9.0	-32.5	0.0	0.0	49.4	37.6	74	54	-24.6	-16.4	Noise floor
4.824	3.0	43.67	39.23	33.7	5.3	-34.8	0.0	0.0	47.9	43.5	74	54	-26.1	-10.5	H
12.060	3.0	34.62	23.57	39.0	9.0	-32.5	0.0	0.0	50.1	39.1	74	54	-23.9	-14.9	Noise floor
High Channel Art=17															
4.924	3.0	41.01	31.87	33.9	5.5	-34.8	0.0	0.0	45.5	36.4	74	54	-28.5	-17.6	V
7.386	3.0	38.38	28.90	36.3	7.6	-34.1	0.0	0.0	48.1	38.7	74	54	-25.9	-15.3	V
12.310	3.0	33.41	21.99	39.2	9.1	-32.5	0.0	0.0	49.2	37.7	74	54	-24.8	-16.3	Noise floor
4.924	3.0	41.11	35.91	33.9	5.5	-34.8	0.0	0.0	45.6	40.4	74	54	-28.4	-13.6	H
7.386	3.0	39.37	31.35	36.3	7.6	-34.1	0.0	0.0	49.1	41.1	74	54	-24.9	-12.9	H
12.310	3.0	33.88	21.97	39.2	9.1	-32.5	0.0	0.0	49.6	37.7	74	54	-24.4	-16.3	Noise floor

Rev. 4.12.7

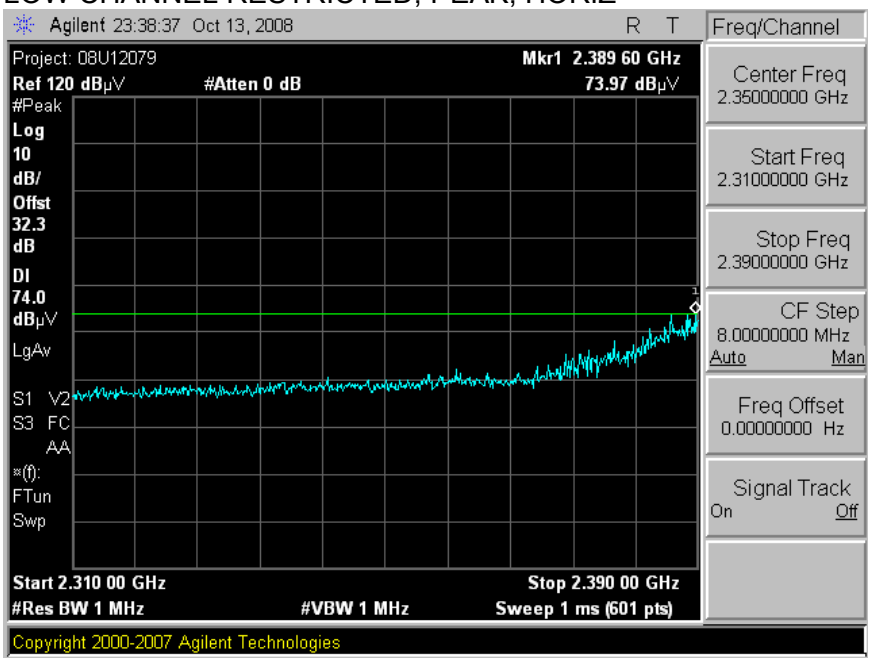
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

8.2. TX ABOVE 1 GHz FOR 802.11g DUAL CHAIN LEGACY MODE

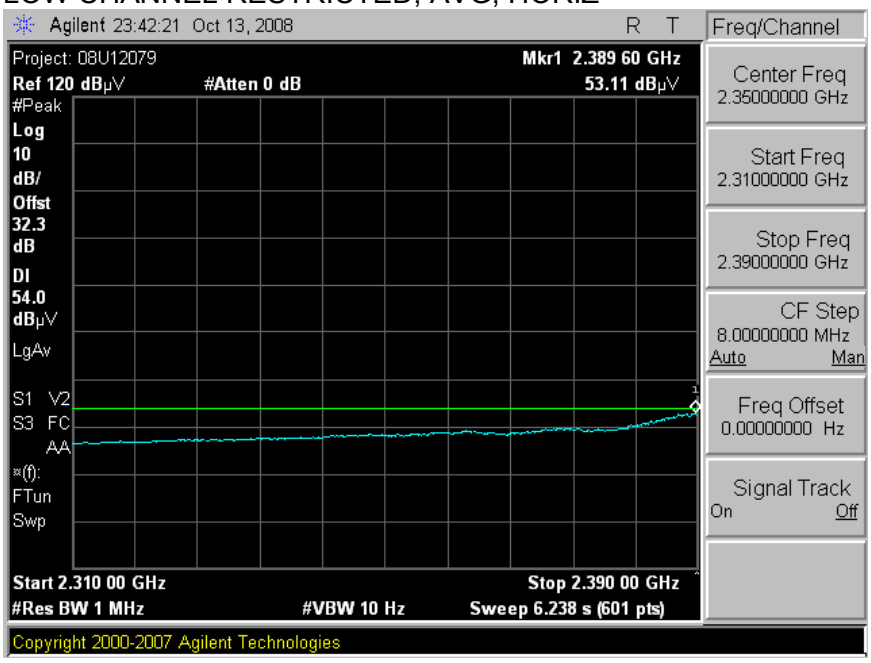
CHANNEL 1:

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

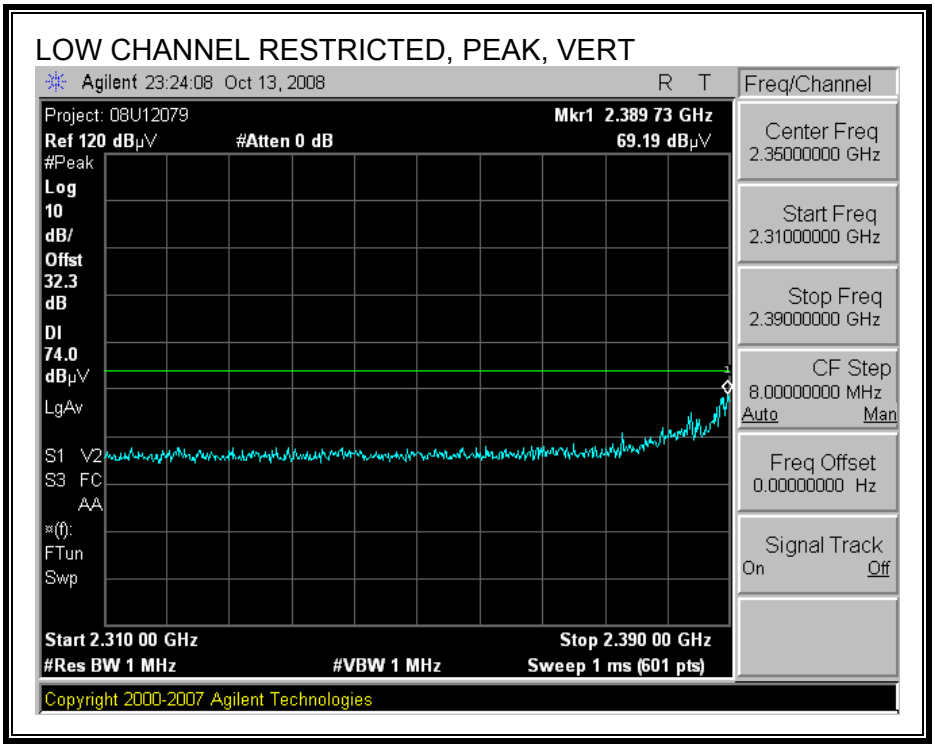
LOW CHANNEL RESTRICTED, PEAK, HORIZ



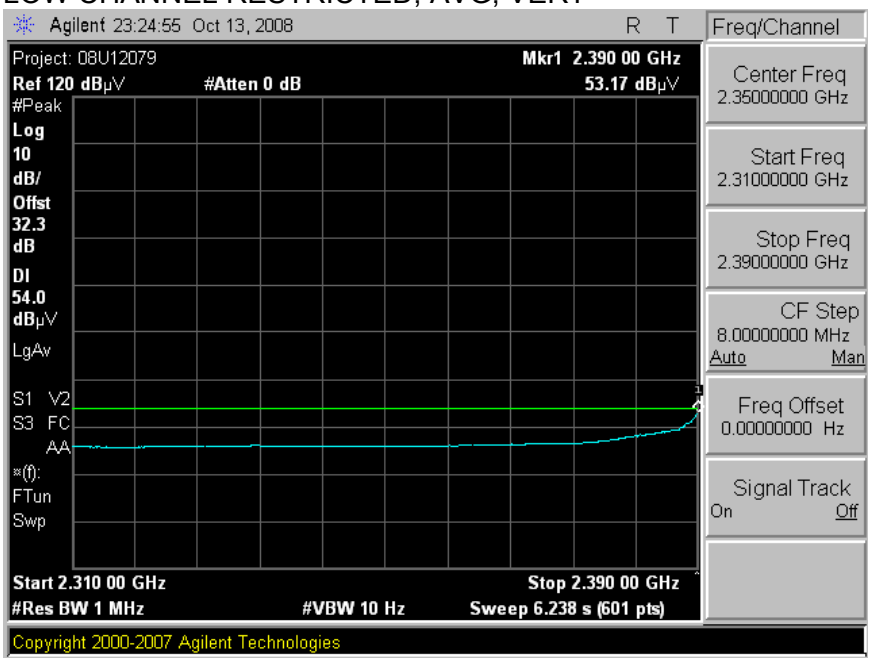
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

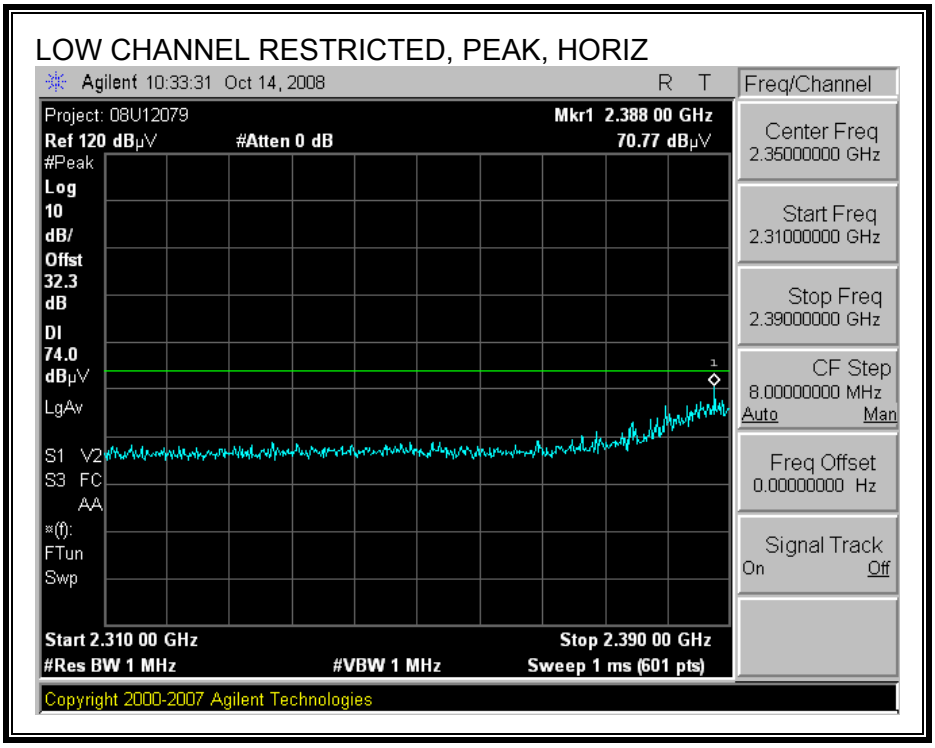


LOW CHANNEL RESTRICTED, AVG, VERT

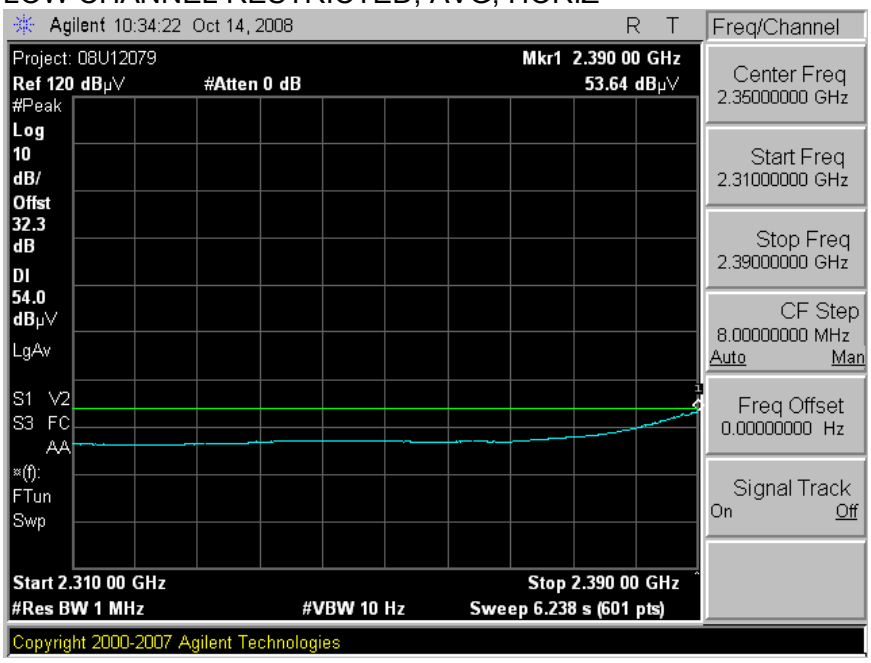


CHANNEL 2:

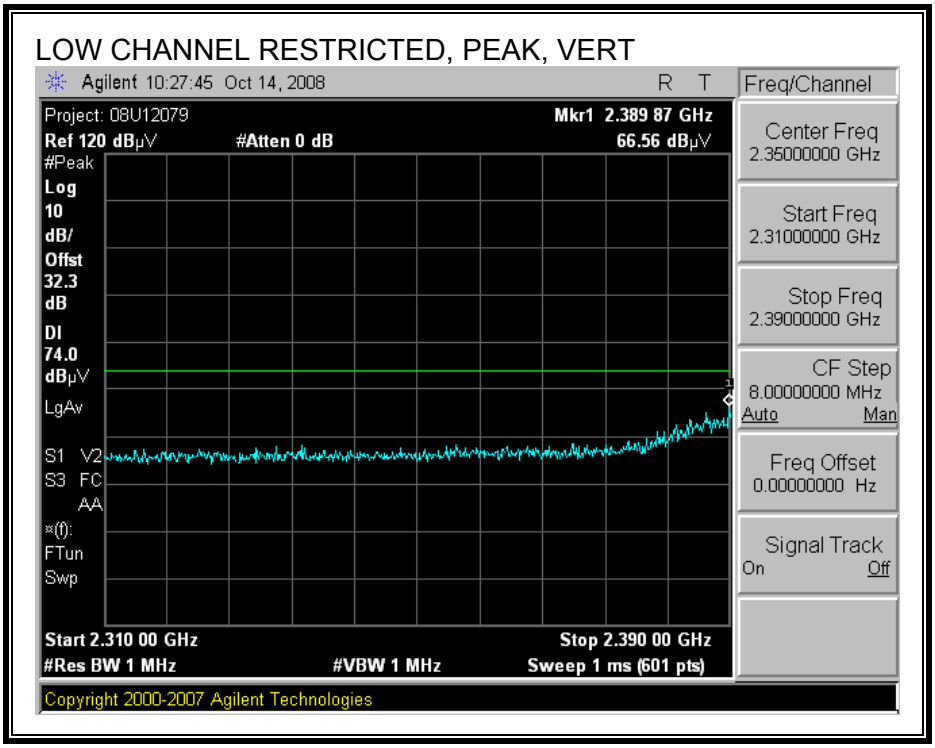
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



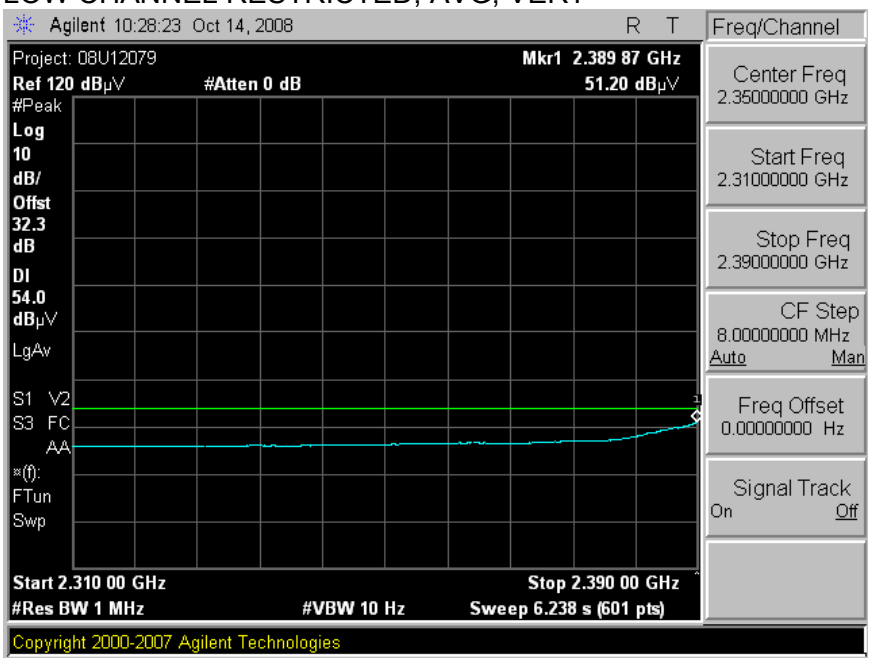
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

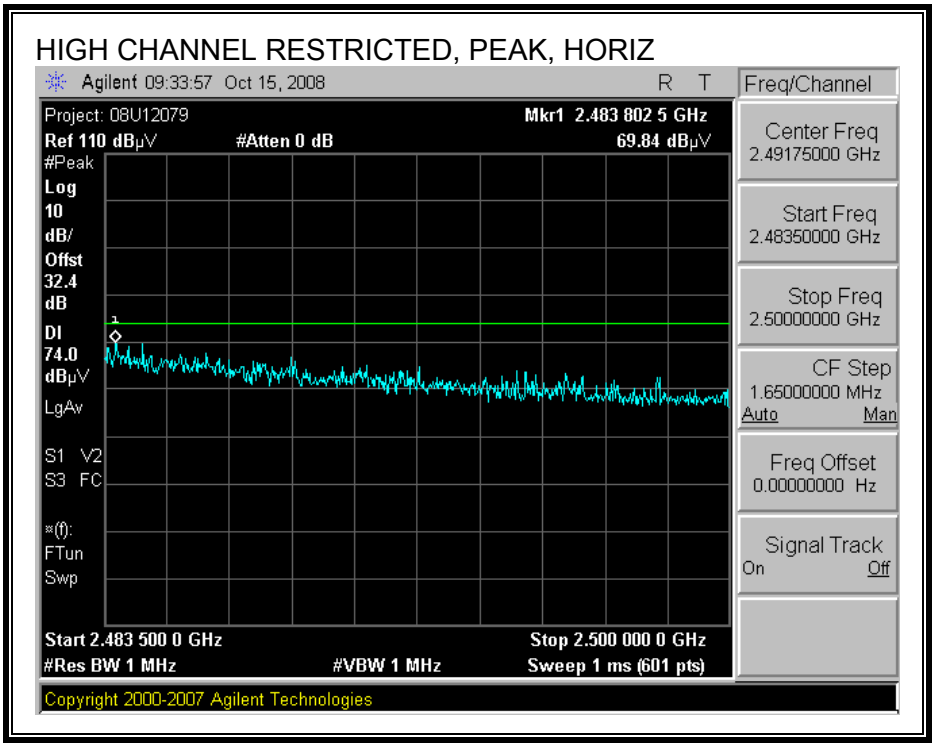


LOW CHANNEL RESTRICTED, AVG, VERT

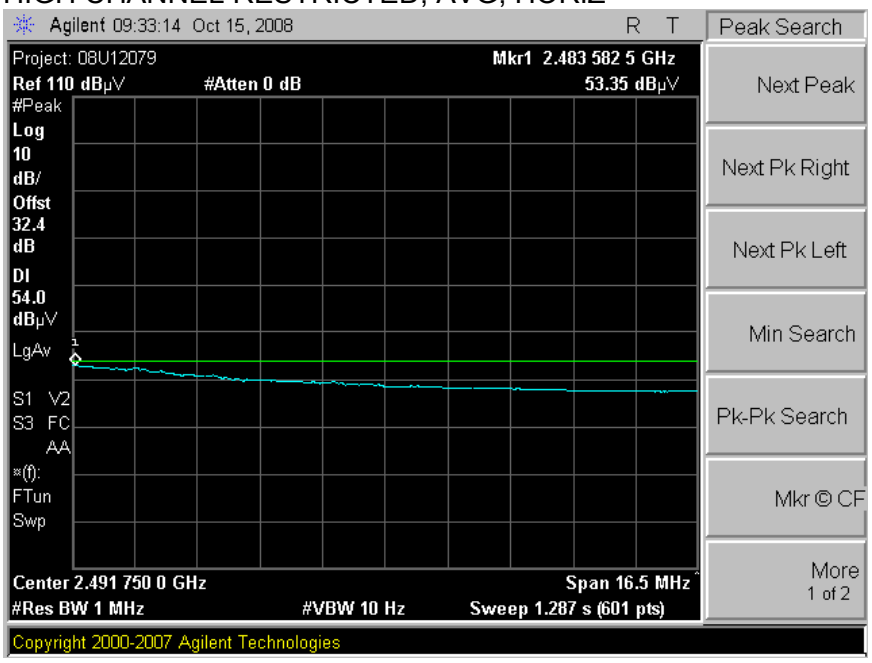


Channel 10:

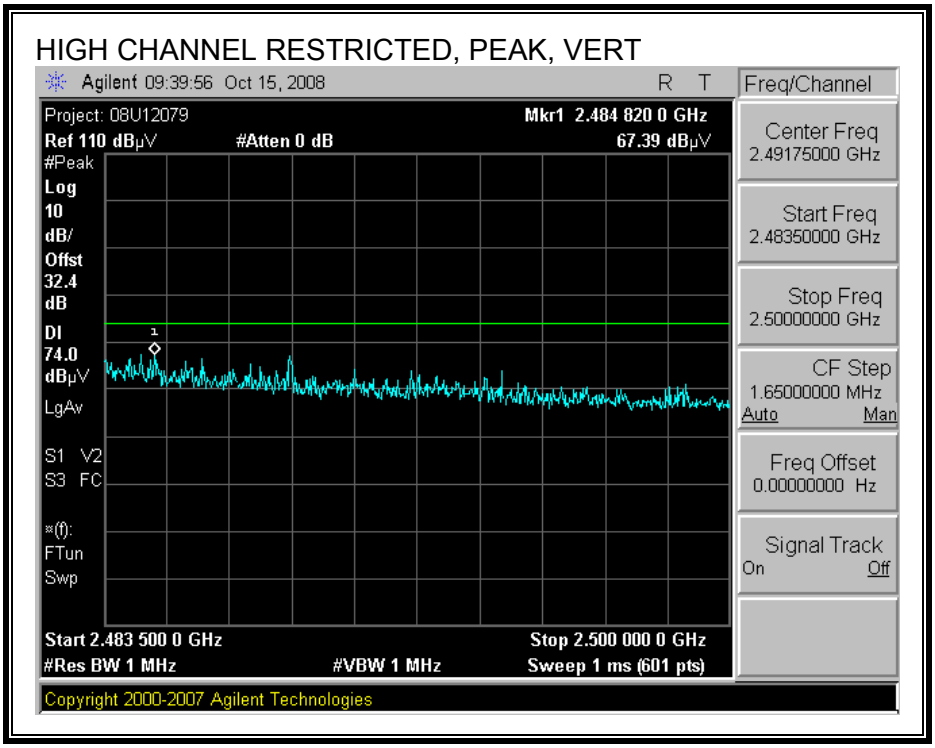
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



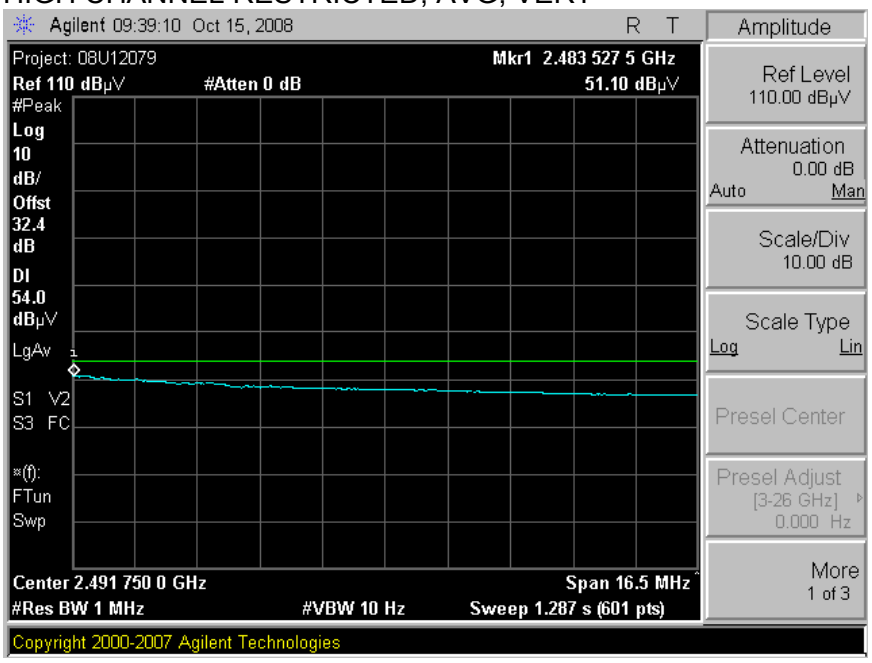
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

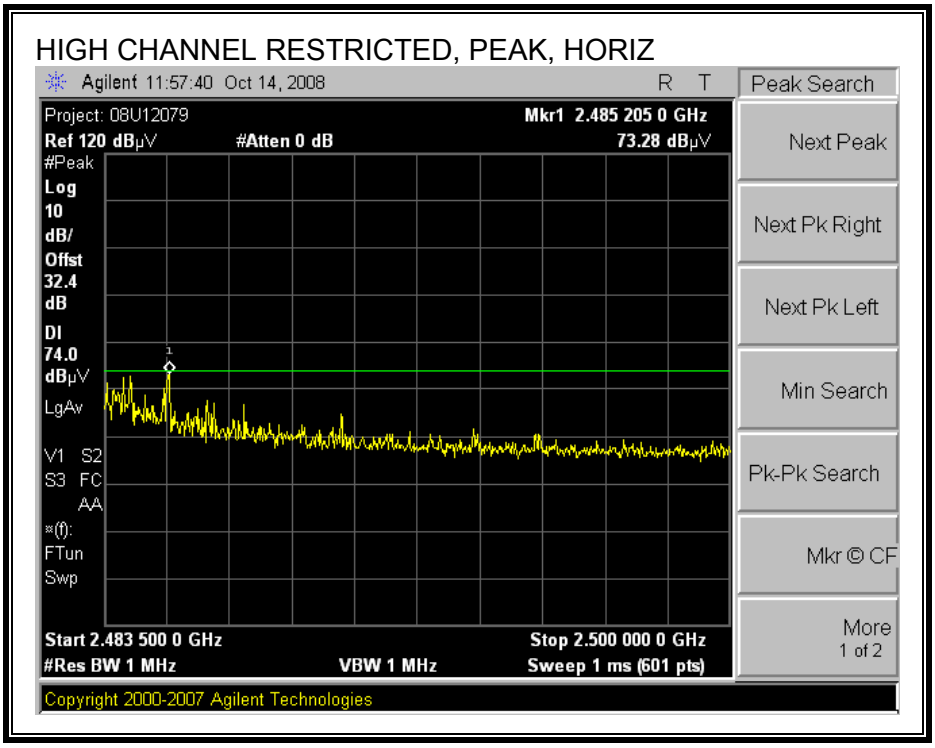


HIGH CHANNEL RESTRICTED, AVG, VERT

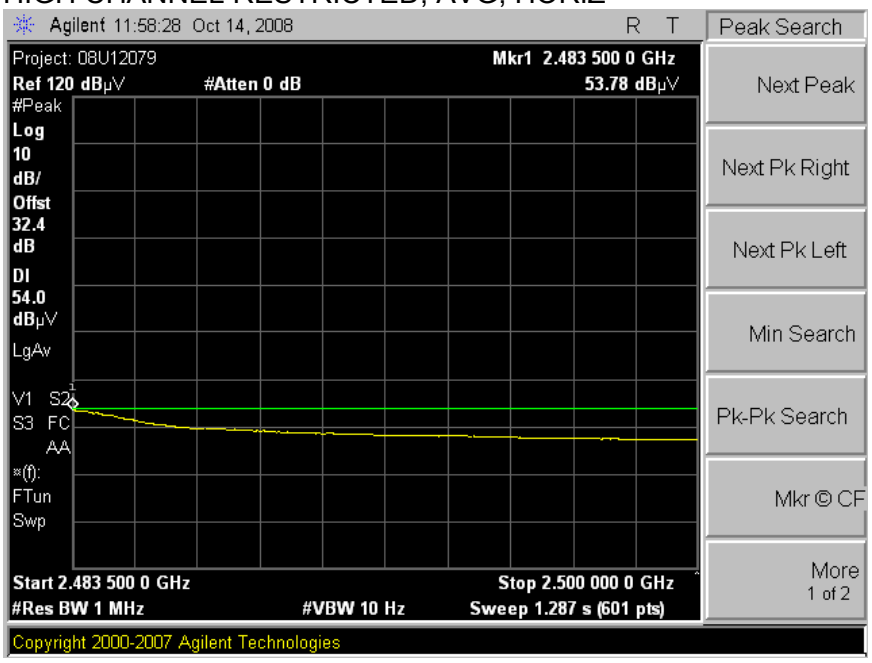


Channel 11:

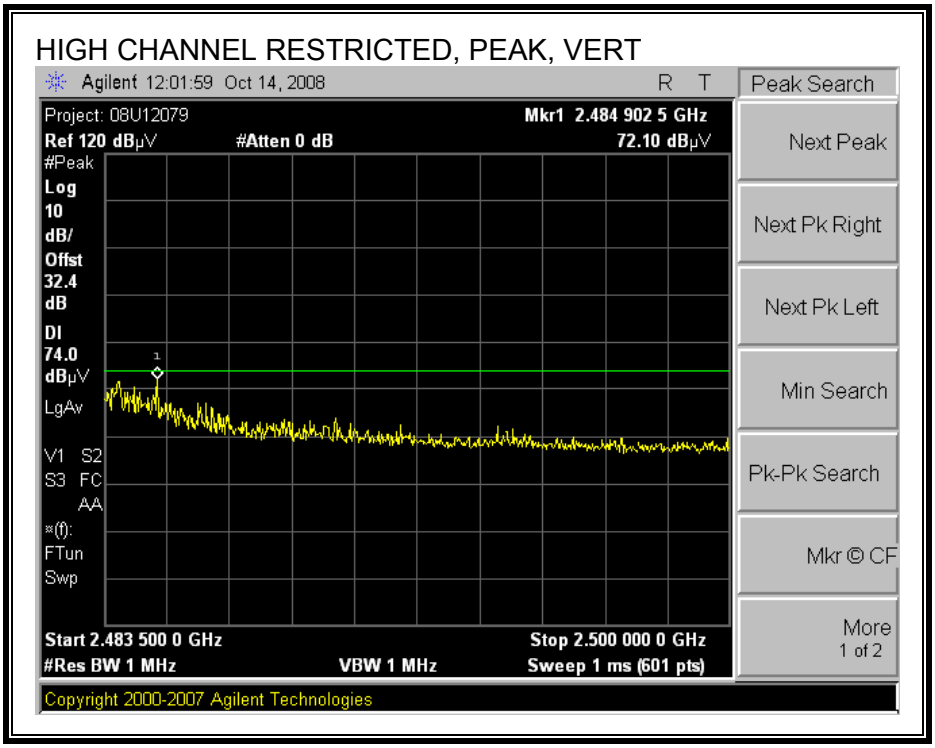
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



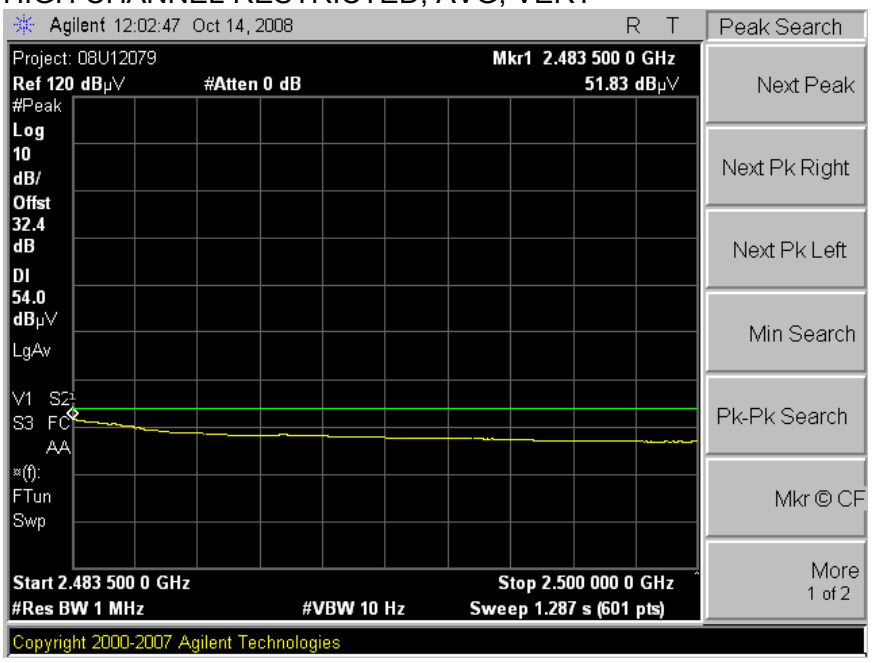
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Inc
Project #: 08U12079
Date: 10/15/08
Test Engineer: Thanh Nguyen
Configuration: EUT and remote support Laptop
Mode: Transmit g mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	Chamber Cables	HPF	Reject Filter
		C-5m Chamber		R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low channel Art= 14															
4.824	3.0	38.11	25.24	33.7	5.3	-34.8	0.0	0.0	42.4	29.5	74	54	-31.6	-24.5	H
12.184	3.0	34.51	22.23	39.1	9.0	-32.5	0.0	0.0	50.1	37.9	74	54	-23.9	-16.1	Noise floor
4.824	3.0	38.69	25.19	33.7	5.3	-34.8	0.0	0.0	42.9	29.4	74	54	-31.1	-24.6	V
Mid channel Art= 23.5															
4.874	3.0	49.68	37.61	33.8	5.4	-34.8	0.0	0.0	54.1	42.0	74	54	-19.9	-12.0	V
7.311	3.0	53.79	41.69	36.2	7.5	-34.1	0.0	0.0	63.4	51.3	74	54	-10.6	-2.7	V
12.184	3.0	37.01	25.27	39.1	9.0	-32.5	0.0	0.0	52.6	40.9	74	54	-21.4	-13.1	Noise floor
4.874	3.0	53.21	39.62	33.8	5.4	-34.8	0.0	0.0	57.6	44.0	74	54	-16.4	-10.0	H
7.311	3.0	55.27	43.11	36.2	7.5	-34.1	0.0	0.0	64.9	52.7	74	54	-9.1	-1.3	H
12.184	3.0	39.86	26.70	39.1	9.0	-32.5	0.0	0.0	55.5	42.3	74	54	-18.5	-11.7	H
High Channel Art=15															
4.924	3.0	37.74	25.52	33.9	5.5	-34.8	0.0	0.0	42.3	30.0	74	54	-31.7	-24.0	V
7.386	3.0	37.54	25.06	36.3	7.6	-34.1	0.0	0.0	47.3	34.8	74	54	-26.7	-19.2	V
12.311	3.0	34.19	22.13	39.2	9.1	-32.5	0.0	0.0	49.9	37.9	74	54	-24.1	-16.1	Noise floor
4.924	3.0	37.73	25.42	33.9	5.5	-34.8	0.0	0.0	42.2	29.9	74	54	-31.8	-24.1	H
7.386	3.0	42.24	27.15	36.3	7.6	-34.1	0.0	0.0	52.0	36.9	74	54	-22.0	-17.1	H
12.311	3.0	33.10	22.00	39.2	9.1	-32.5	0.0	0.0	48.9	37.8	74	54	-25.1	-16.2	Noise floor

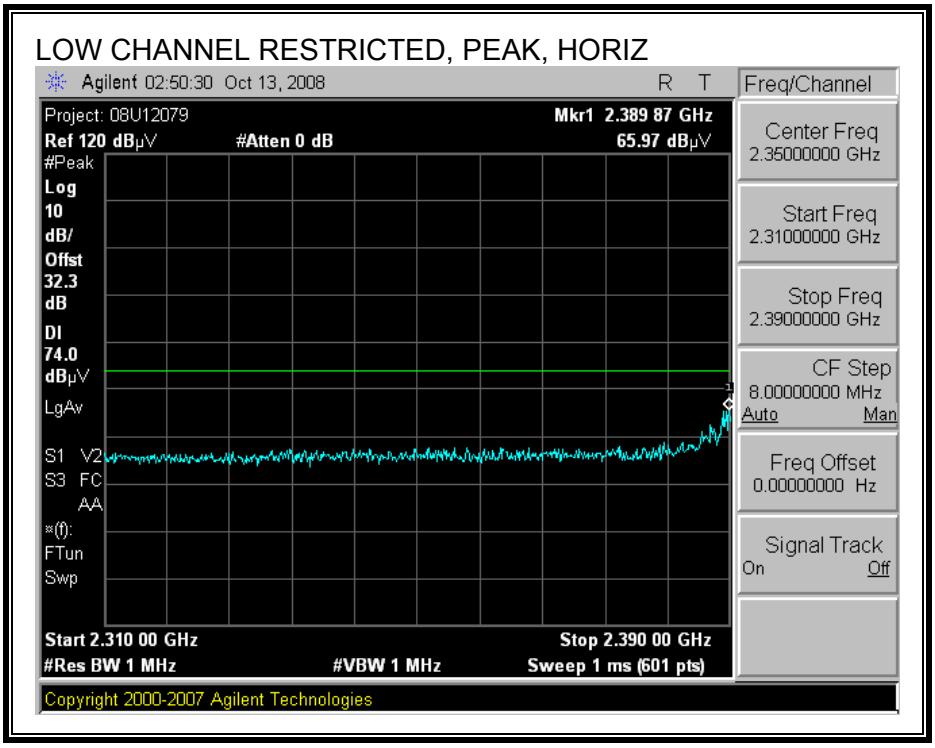
Rev. 4.12.7

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

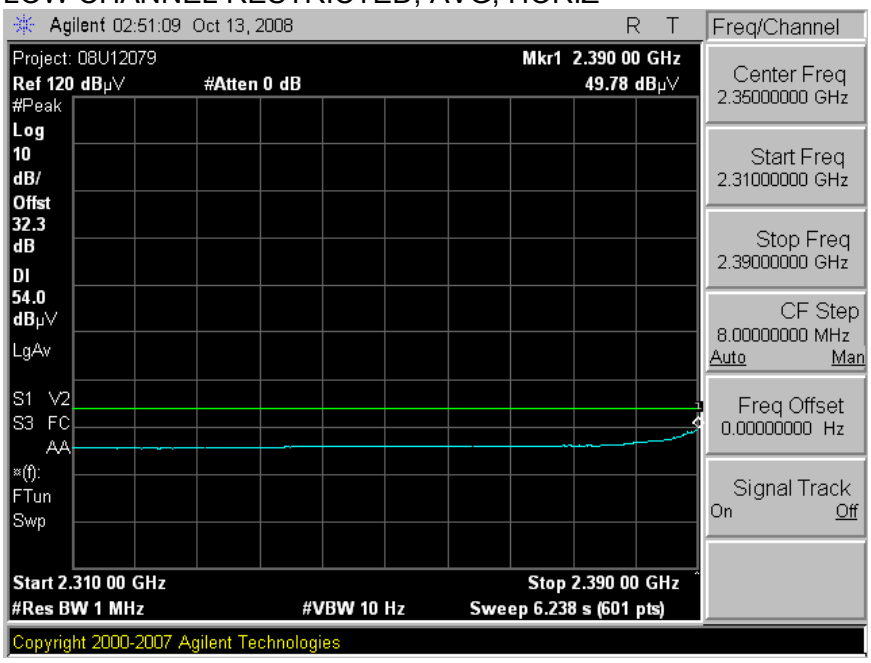
8.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel 1:

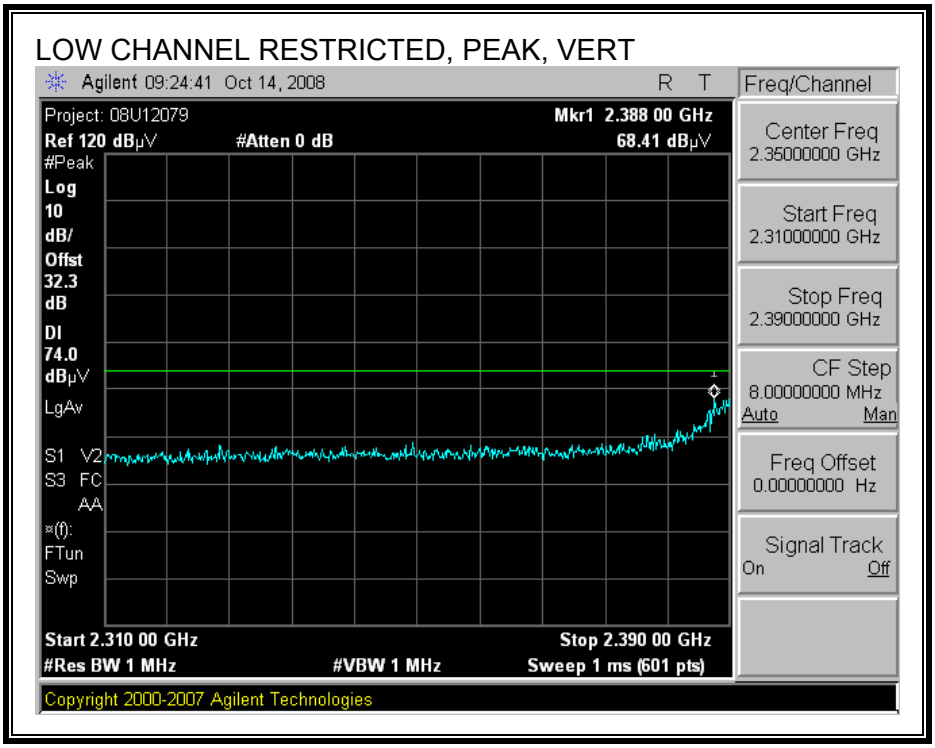
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



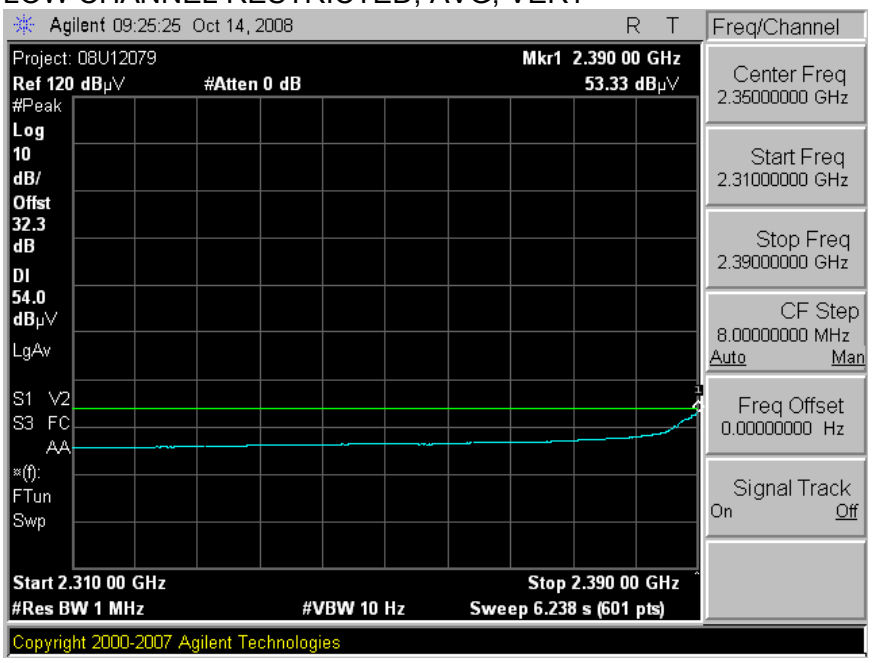
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

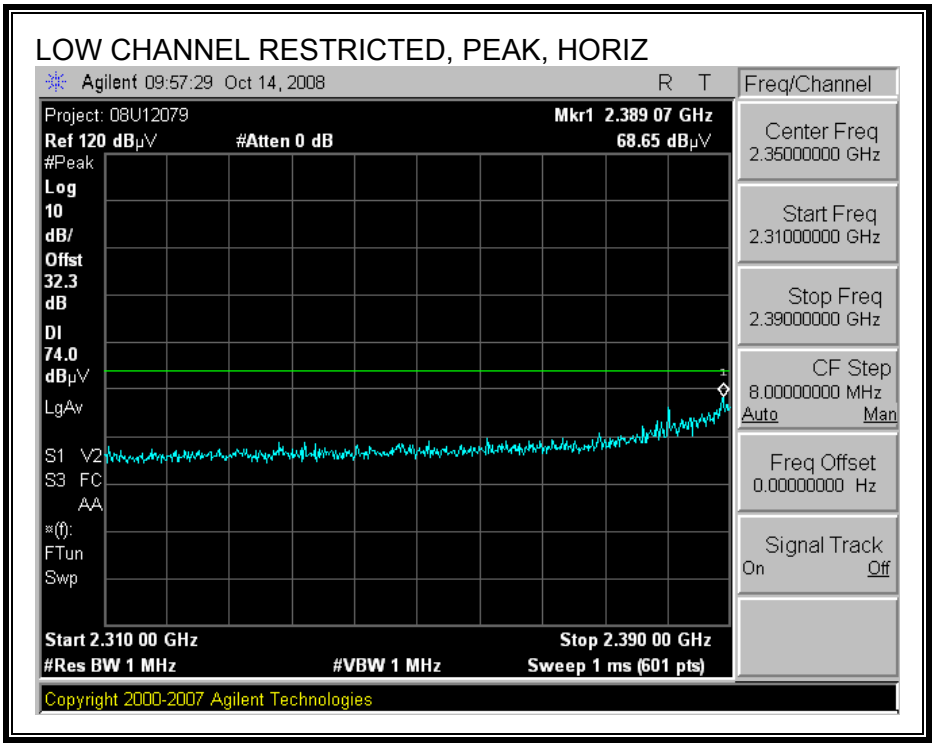


LOW CHANNEL RESTRICTED, AVG, VERT

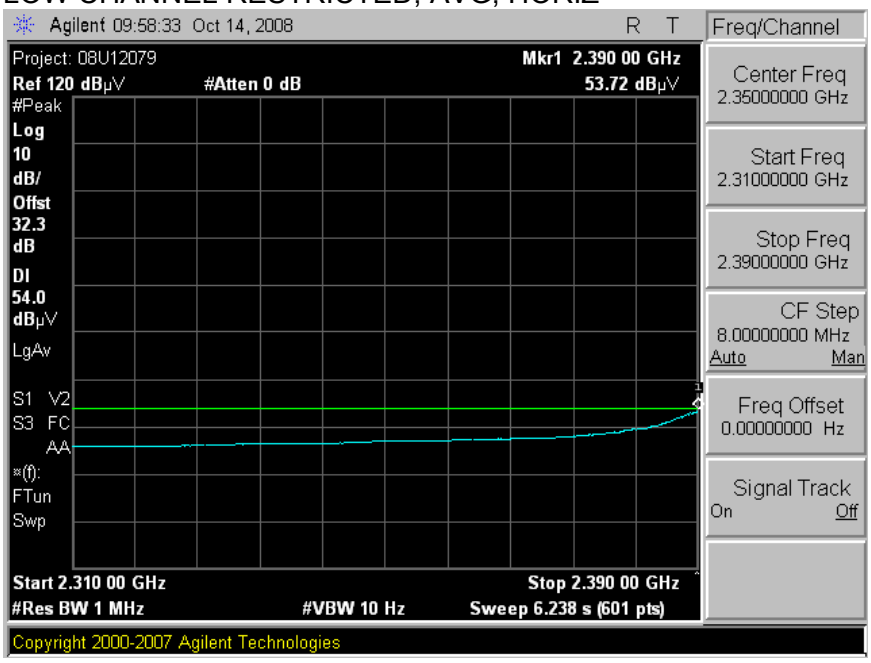


Channel 2:

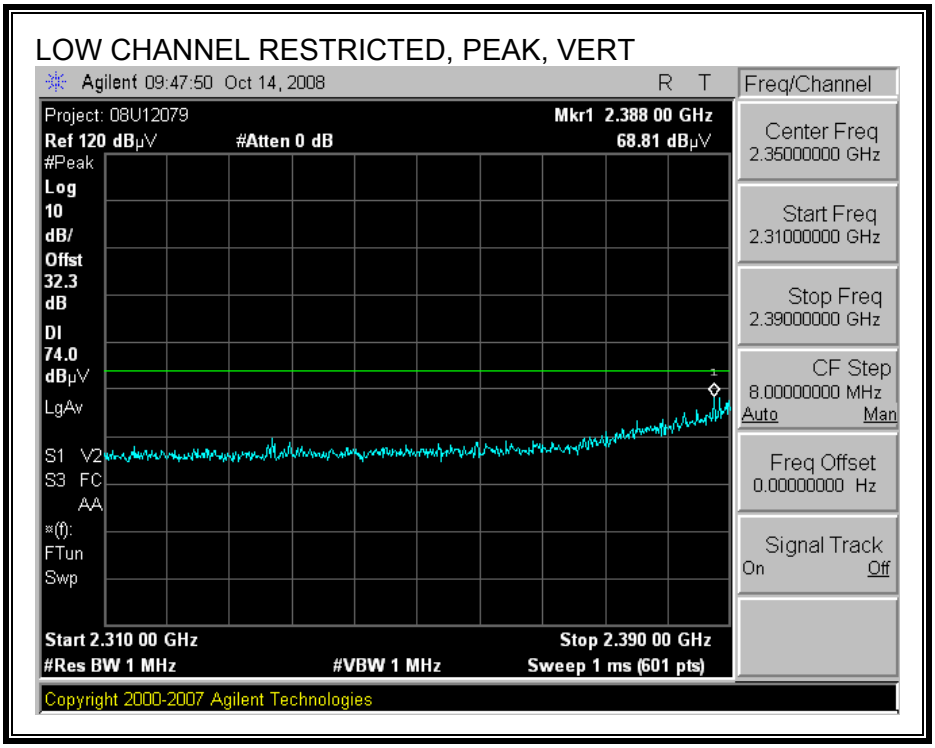
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



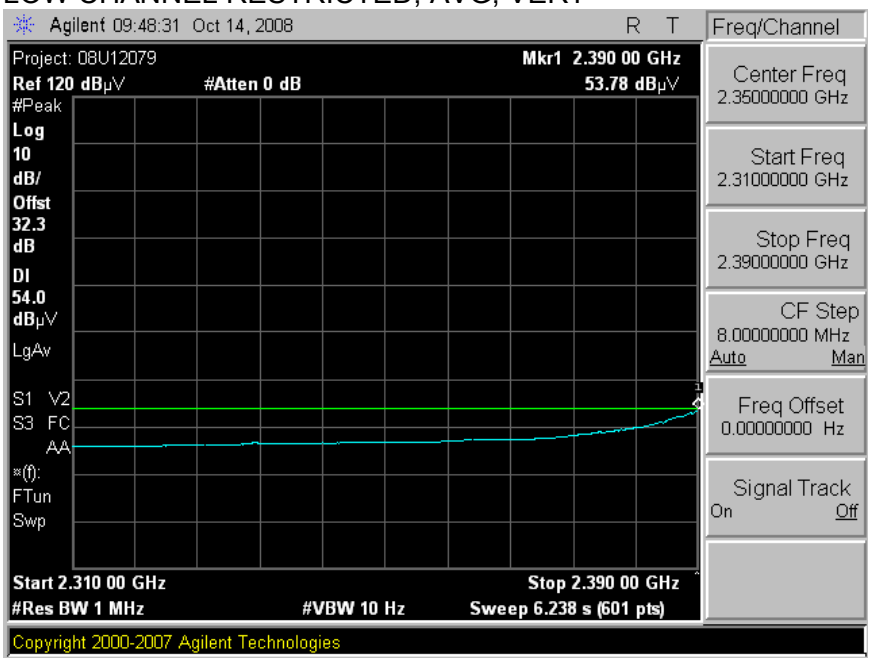
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



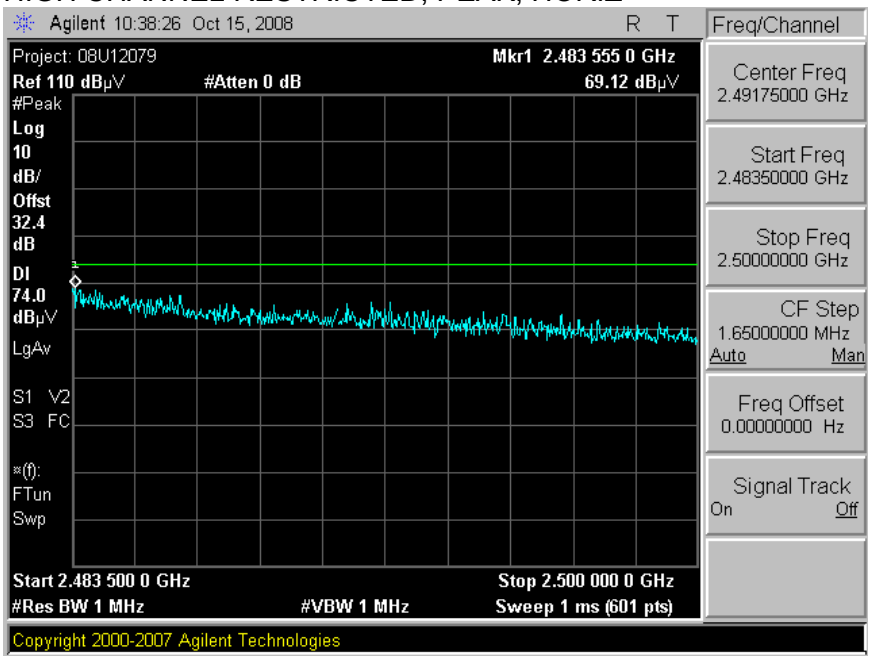
LOW CHANNEL RESTRICTED, AVG, VERT



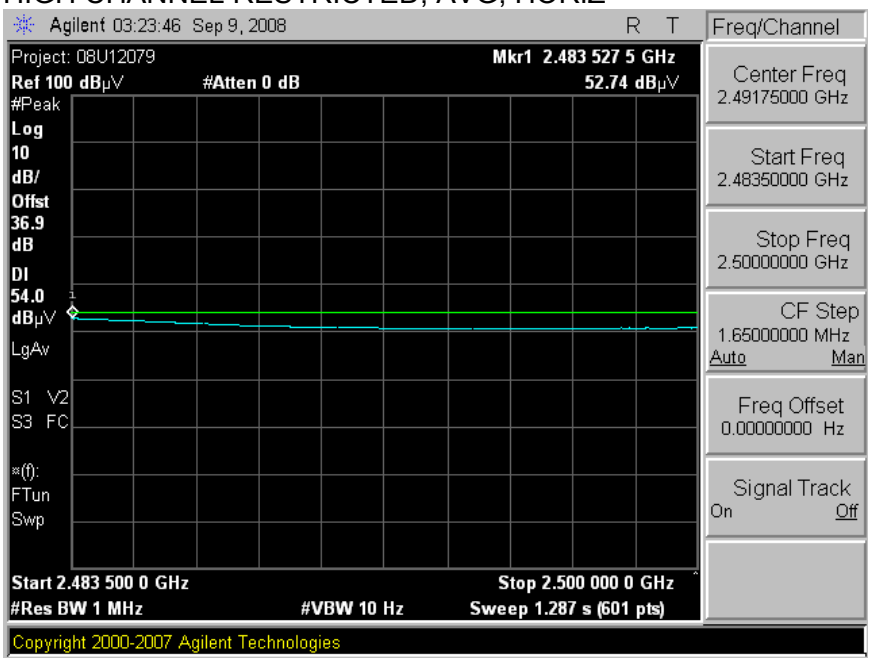
Channel 10:

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

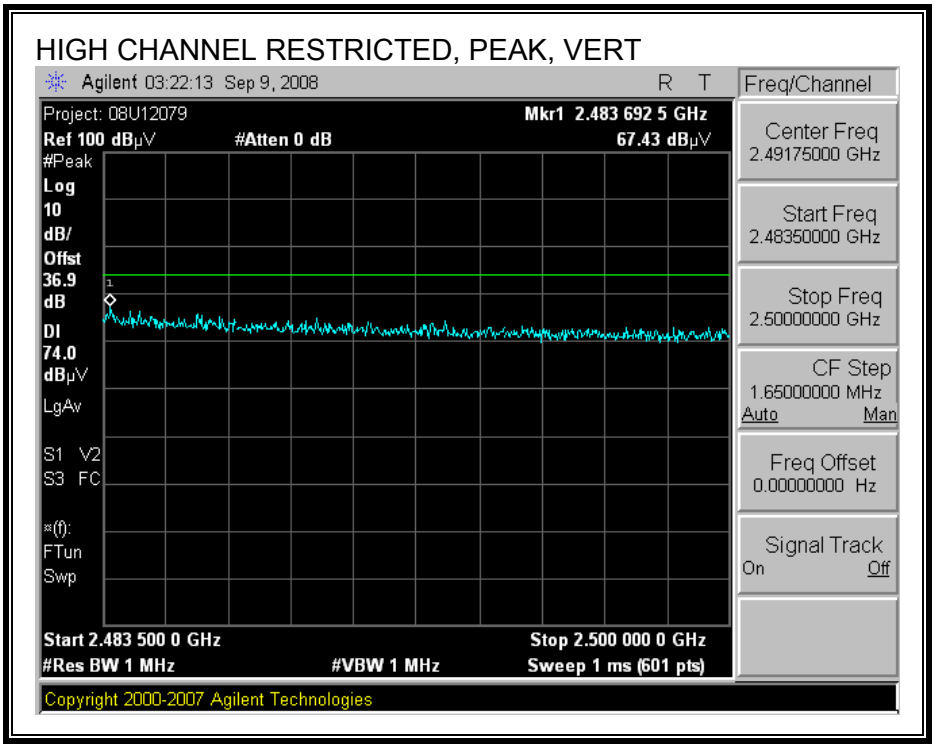
HIGH CHANNEL RESTRICTED, PEAK, HORIZ



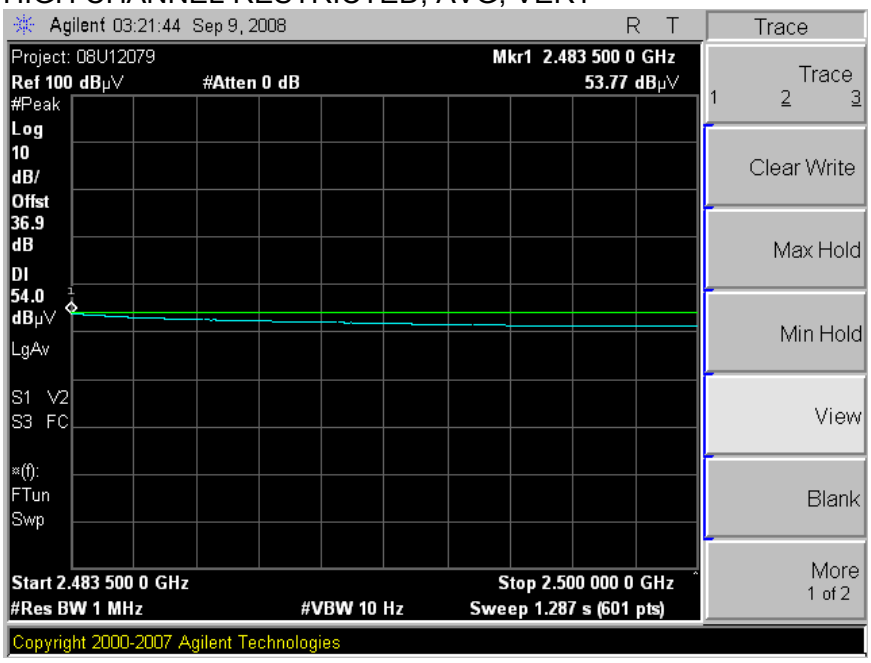
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

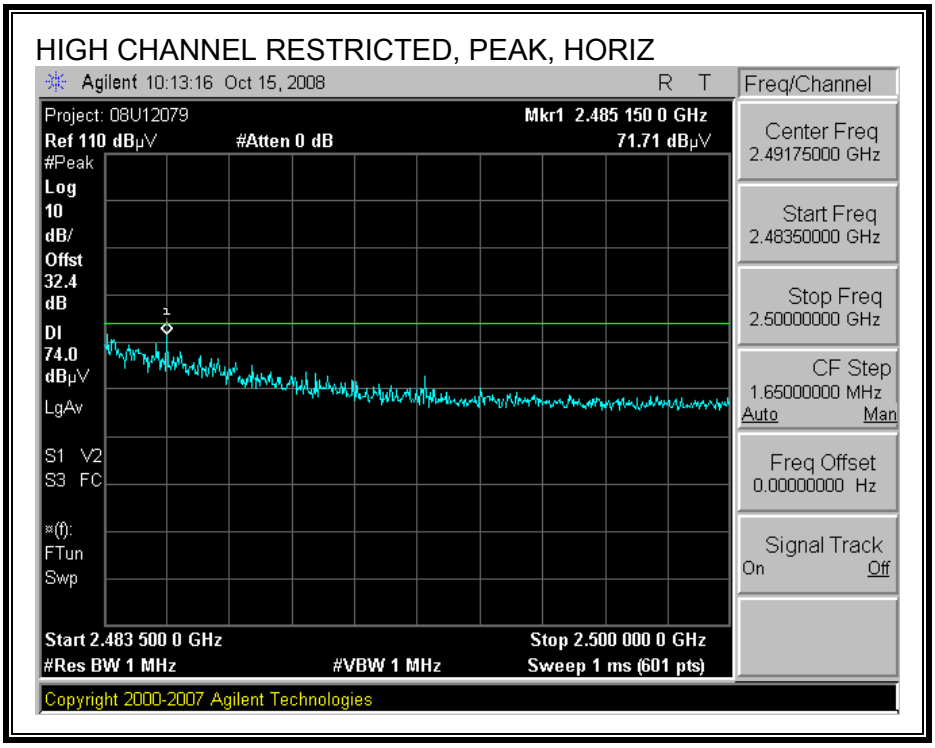


HIGH CHANNEL RESTRICTED, AVG, VERT

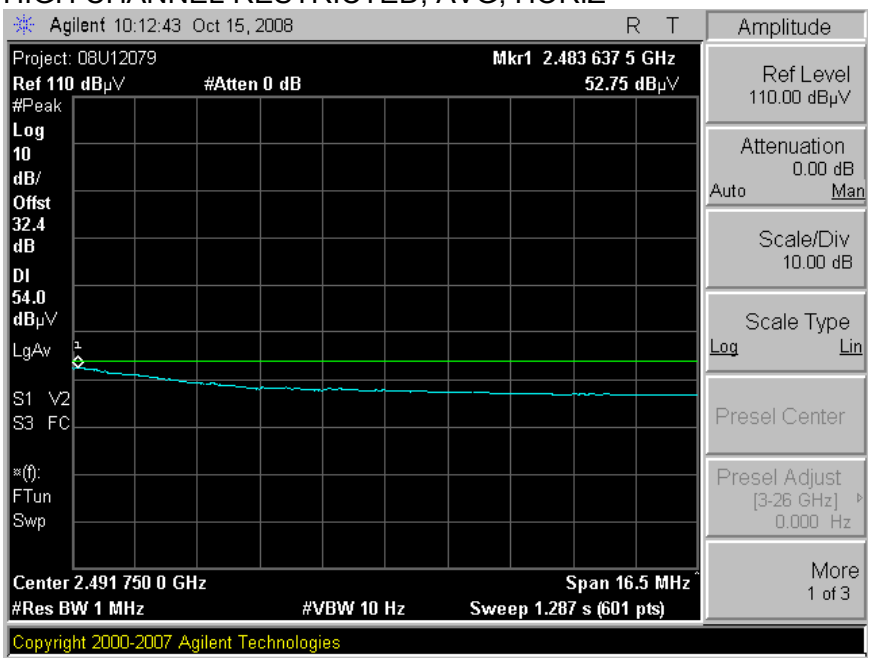


Channel 11:

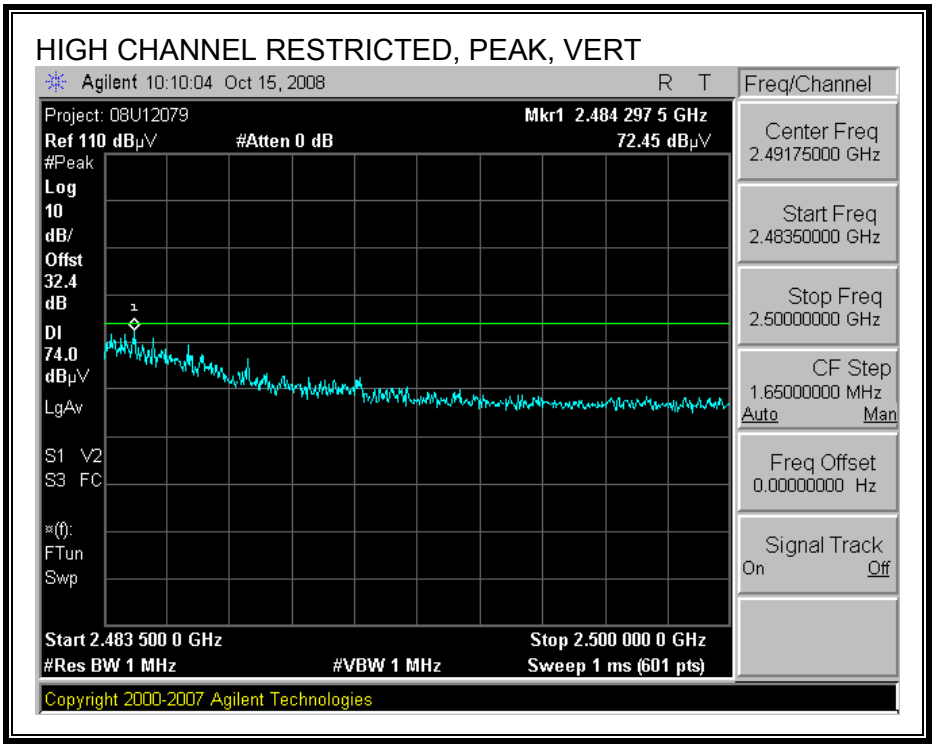
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



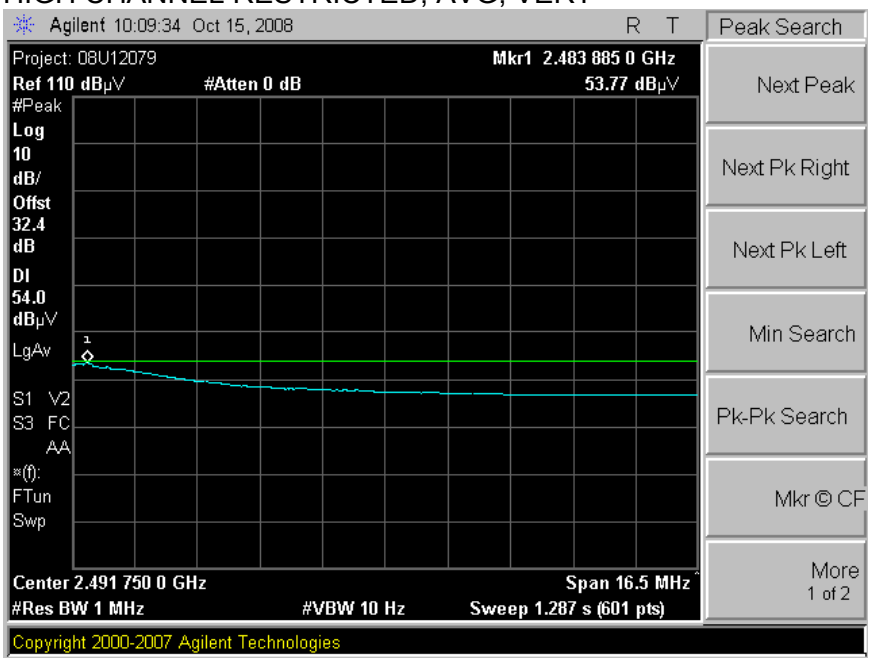
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Inc
Project #: 08U12079
Date: 10/15/08
Test Engineer: Thanh Nguyen
Configuration: EUT and remote support Laptop
Mode: Transmit HT20 mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	Chamber Cables	HPF	Reject Filter
		C-5m Chamber		R_001

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low channel Art= 14															
4.824	3.0	35.89	24.93	33.7	5.3	-34.8	0.0	0.0	40.1	29.2	74	54	-33.9	-24.8	H/with shield
12.184	3.0	33.57	22.24	39.1	9.0	-32.5	0.0	0.0	49.2	37.9	74	54	-24.8	-16.1	Noise floor
4.874	3.0	37.56	25.28	33.8	5.4	-34.8	0.0	0.0	41.9	29.7	74	54	-32.1	-24.3	V
7.311	3.0	37.22	32.81	36.2	7.5	-34.1	0.0	0.0	46.8	42.4	74	54	-27.2	-11.6	V
Mid channel Art= 23.5															
4.874	3.0	49.68	38.27	33.8	5.4	-34.8	0.0	0.0	54.1	42.6	74	54	-19.9	-11.4	V
7.311	3.0	56.37	42.75	36.2	7.5	-34.1	0.0	0.0	66.0	52.4	74	54	-8.0	-1.6	V
12.184	3.0	34.78	23.19	39.1	9.0	-32.5	0.0	0.0	50.4	38.8	74	54	-23.6	-15.2	Noise floor
4.874	3.0	51.33	39.75	33.8	5.4	-34.8	0.0	0.0	55.7	44.1	74	54	-18.3	-9.9	H
7.311	3.0	55.72	43.23	36.2	7.5	-34.1	0.0	0.0	65.3	52.9	74	54	-8.7	-1.1	H
12.184	3.0	42.23	29.14	39.1	9.0	-32.5	0.0	0.0	57.9	44.8	74	54	-16.1	-9.2	H
High channel Art= 15.5															
4.924	3.0	37.46	24.95	33.9	5.5	-34.8	0.0	0.0	42.0	29.5	74	54	-32.0	-24.5	H/with shield
7.386	3.0	35.16	22.84	36.3	7.6	-34.1	0.0	0.0	44.9	32.6	74	54	-29.1	-21.4	H
12.310	3.0	34.12	22.07	39.2	9.1	-32.5	0.0	0.0	49.9	37.8	74	54	-24.1	-16.2	Noise floor
4.924	3.0	37.52	25.09	33.9	5.5	-34.8	0.0	0.0	42.0	29.6	74	54	-32.0	-24.4	V
7.386	3.0	38.18	24.35	36.3	7.6	-34.1	0.0	0.0	47.9	34.1	74	54	-26.1	-19.9	V
12.310	3.0	33.58	23.56	39.2	9.1	-32.5	0.0	0.0	49.3	39.3	74	54	-24.7	-14.7	Noise floor

Rev. 4.12.7

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

8.4. TX ABOVE 1 GHz FOR 802.11a DUAL CHAIN LEGACY MODE

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 08U12079
Date: Sept. 10, 2008
Test Engineer: Thanh Nguyen
Configuration: EUT with remote support laptop
Mode: Transmit a Mode 5.8 GHz Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		R_002

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5745 MHz, setting ART =21.5															
11.490	3.0	49.9	37.3	37.2	11.8	-33.1	0.0	0.0	65.8	53.2	74	54	-8.2	-0.8	V
11.490	3.0	49.3	37.9	37.2	11.8	-33.1	0.0	0.0	65.2	53.8	74	54	-8.8	-0.2	H
Mid Ch. 5785 MHz, setting ART = 18.5															
11.570	3.0	51.37	37.77	37.2	11.9	-33.0	0.0	0.0	67.5	53.9	74	54	-6.5	-0.1	V
11.570	3.0	48.5	35.8	37.2	11.9	-33.0	0.0	0.0	64.6	51.9	74	54	-9.4	-2.1	H
High Ch. 5825 MHz, setting ART=21															
11.650	3.0	49.0	36.4	37.2	12.0	-32.9	0.0	0.0	65.3	52.8	74	54	-8.7	-1.2	V
11.650	3.0	49.2	37.3	37.2	12.0	-32.9	0.0	0.0	65.5	53.6	74	54	-8.5	-0.35	H
No other emissions were detected above noise floor.															

Rev. 4.12.7

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

8.5. TX ABOVE 1 GHz (802.11n HT20 MODE IN THE 5.8 GHz BAND)

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 08U12079
Date: Sept. 10, 2008
Test Engineer: Thanh Nguyen
Configuration: EUT with remote support laptop
Mode: Transmit HT 20, 5.8 GHz Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		R_002

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5745 MHz, setting ART =21.5															
11.490	3.0	46.8	36.3	37.2	11.8	-33.1	0.0	0.0	62.7	52.2	74	54	-11.3	-1.8	V
11.490	3.0	47.7	36.9	37.2	11.8	-33.1	0.0	0.0	63.6	52.8	74	54	-10.4	-1.2	H
Mid Ch. 5785 MHz, setting ART = 21															
11.570	3.0	47.96	36.40	37.2	11.9	-33.0	0.0	0.0	64.1	52.5	74	54	-9.9	-1.5	V
11.570	3.0	46.7	34.8	37.2	11.9	-33.0	0.0	0.0	62.8	50.9	74	54	-11.2	-3.1	H
High Ch. 5805 MHz, setting ART=21															
11.650	3.0	48.3	36.9	37.2	12.0	-32.9	0.0	0.0	64.7	53.3	74	54	-9.3	-0.73	V
11.650	3.0	48.3	36.7	37.2	12.0	-32.9	0.0	0.0	64.7	53.1	74	54	-9.3	-0.92	H
No other emissions were detected above noise floor.															

Rev. 4.12.7

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

8.6. TX ABOVE 1 GHz (802.11n HT40 MODE IN THE 5.8 GHz BAND)

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Apple Computer Inc.
Project #: 08U12079
Date: Sept. 10, 2008
Test Engineer: Thanh Nguyen
Configuration: EUT with remote support laptop
Mode: Transmit HT 40, MCS 0, 5.8 GHz Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		R_002

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5755 MHz, setting ART =21.5															
11.510	3.0	45.0	32.8	37.2	11.9	-33.1	0.0	0.0	60.9	48.8	74	54	-13.1	-5.2	V
11.510	3.0	45.5	33.2	37.2	11.9	-33.1	0.0	0.0	61.5	49.1	74	54	-12.5	-4.9	H
Low Ch. 5755 MHz, setting ART =23(MAX)															
11.510	3.0	45.6	34.5	37.2	11.9	-33.1	0.0	0.0	61.5	50.5	74	54	-12.5	-3.5	V
11.510	3.0	45.9	34.0	37.2	11.9	-33.1	0.0	0.0	61.9	50.0	74	54	-12.1	-4.0	H
High Ch. 5795 MHz, setting ART=23															
11.590	3.0	49.4	37.4	37.2	12.0	-33.0	0.0	0.0	65.6	53.6	74	54	-8.4	-0.4	V
11.590	3.0	47.9	36.4	37.2	12.0	-33.0	0.0	0.0	64.1	52.6	74	54	-9.9	-1.42	H
No other emissions were detected above noise floor.															

Rev. 4.12.7

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

8.7. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Apple
Project #:	08U12079
Date:	9/10/2008
Test Engineer:	Thanh Nguyen
Configuration:	EUT and remote support laptop
Mode:	Receive mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Spurious emissions															
1.000	3.0	52.8	43.0	28.0	3.2	-36.2	0.0	0.0	47.9	38.0	74	54	-26.1	-16.0	V
1.066	3.0	50.2	42.4	28.2	3.3	-36.1	0.0	0.0	45.6	37.8	74	54	-28.4	-16.2	V
1.330	3.0	47.3	42.1	29.0	3.7	-35.9	0.0	0.0	44.1	38.9	74	54	-29.9	-15.1	V
1.375	3.0	46.8	40.1	29.2	3.7	-35.9	0.0	0.0	43.8	37.1	74	54	-30.2	-16.9	V
2.817	3.0	47.2	40.1	31.8	5.4	-35.2	0.0	0.0	49.2	42.1	74	54	-24.8	-11.9	V
1.375	3.0	48.2	40.1	29.2	3.7	-35.9	0.0	0.0	45.3	37.1	74	54	-28.7	-16.9	H
No other emissions were detected above system noise floor															

Rev. 4.12.7

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

8.8. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Apple
Project #:	08U12079
Date:	11/10/2008
Test Engineer:	Thanh Nguyen
Configuration:	EUT and remote support laptop
Mode:	Receive mode 20MHz at 5.8GHz band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Spurious emissions															
1.023	3.0	51.4	42.6	28.0	3.3	-36.1	0.0	0.0	46.5	37.7	74	54	-27.5	-16.3	V
1.100	3.0	48.6	39.5	28.3	3.4	-36.1	0.0	0.0	44.1	35.0	74	54	-29.9	-19.0	V
1.332	3.0	47.9	42.7	29.0	3.7	-35.9	0.0	0.0	44.7	39.5	74	54	-29.3	-14.5	V
2.817	3.0	47.2	37.6	31.8	5.4	-35.2	0.0	0.0	49.2	39.6	74	54	-24.8	-14.4	V
1.110	3.0	48.6	38.4	28.3	3.4	-36.1	0.0	0.0	44.2	34.1	74	54	-29.8	-19.9	H
1.375	3.0	47.7	40.1	29.2	3.7	-35.9	0.0	0.0	44.7	37.1	74	54	-29.3	-16.9	H
No other emissions were detected above system noise floor															

Rev. 4.12.7

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

8.9. RX ABOVE 1 GHz FOR 40 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Apple
Project #:	08U12079
Date:	11/10/2008
Test Engineer:	Thanh Nguyen
Configuration:	EUT and remote support laptop
Mode:	Receive mode 40MHz at 5.8GHz band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Spurious emissions															
1.110	3.0	51.5	41.5	28.3	3.4	-36.1	0.0	0.0	47.1	37.1	74	54	-26.9	-16.9	V
1.100	3.0	48.6	39.4	28.3	3.4	-36.1	0.0	0.0	44.1	34.9	74	54	-29.9	-19.1	V
1.330	3.0	48.8	42.5	29.0	3.7	-35.9	0.0	0.0	45.6	39.3	74	54	-28.4	-14.7	V
2.810	3.0	46.7	38.6	31.8	5.4	-35.2	0.0	0.0	48.7	40.6	74	54	-25.3	-13.4	V
1.100	3.0	49.9	40.1	28.3	3.4	-36.1	0.0	0.0	45.4	35.7	74	54	-28.6	-18.3	V
1.110	3.0	50.2	39.2	28.3	3.4	-36.1	0.0	0.0	45.9	34.9	74	54	-28.1	-19.1	H
1.375	3.0	48.6	40.3	29.2	3.7	-35.9	0.0	0.0	45.6	37.3	74	54	-28.4	-16.7	H
No other emissions were detected above system noise floor															

Rev. 4.12.7

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

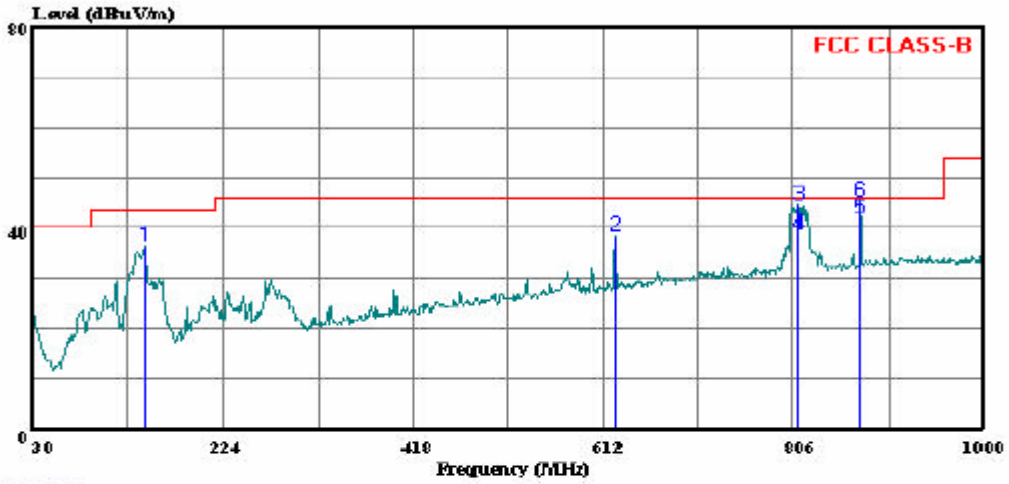
8.10. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT& DATA

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

Data#: 45 File#: 08U12079EMI.EMI Date: 09-11-2008 Time: 16:33:12



Trace: 42 Ref Trace:

Condition: FCC CLASS-B 3m ANTENNA B_5M 021109 HORIZONTAL
Test Operator:: Thanh Nguyen
Project #: : 08U12079
Company: : Apple Inc.
Configuration:: EUT only
Mode : : Transmit worst case
Target: : FCC class B

Page: 1

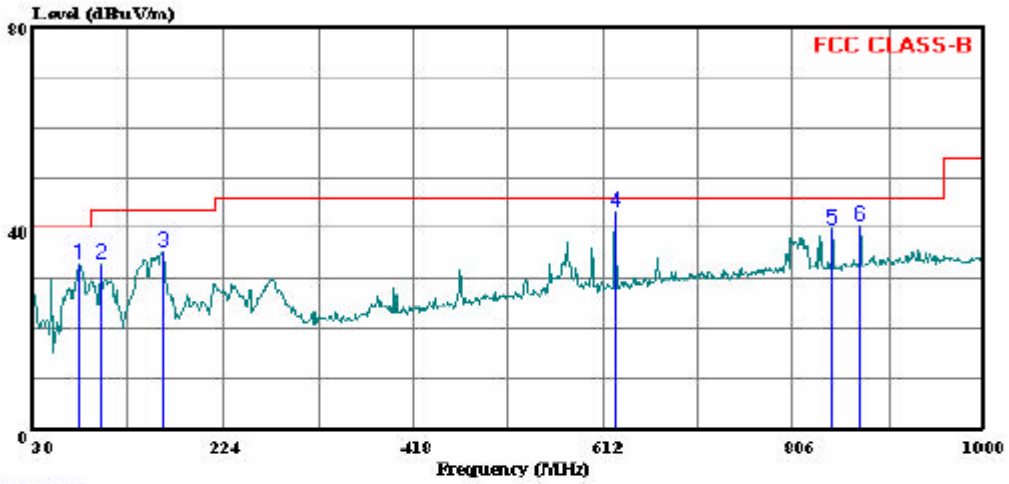
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	144.460	49.83	-13.61	36.22	43.50	-7.28	Peak
2	624.610	40.67	-2.21	38.45	46.00	-7.55	Peak
3	811.820	43.33	1.35	44.68	46.00	-1.32	Peak
4	811.820	37.48	1.35	38.83	46.00	-7.17	QP
5	874.870	39.60	2.33	41.93	46.00	-4.07	QP
6	874.870	43.17	2.33	45.49	46.00	-0.51	Peak

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

VERTICAL PLOT& DATA

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

Data#: 40 File#: 08U12079EMI.EMI Date: 09-11-2008 Time: 15:25:14



Trace: 39 Ref Trace:

Condition: FCC CLASS-B 3m ANTENNA B_5M 021109 VERTICAL
Test Operator:: Thanh Nguyen
Project #: : 08U12079
Company: : Apple Inc.
Configuration:: EUT only
Mode : : Transmit worst case
Target: : FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	76.560	51.70	-18.88	32.82	40.00	-7.18	Peak
2	98.870	49.67	-16.66	33.01	43.50	-10.49	Peak
3	160.950	49.67	-14.41	35.26	43.50	-8.24	Peak
4	624.610	45.50	-2.21	43.29	46.00	-2.71	Peak
5	845.770	37.83	1.83	39.67	46.00	-6.33	Peak
6	874.870	38.17	2.33	40.49	46.00	-5.51	Peak

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

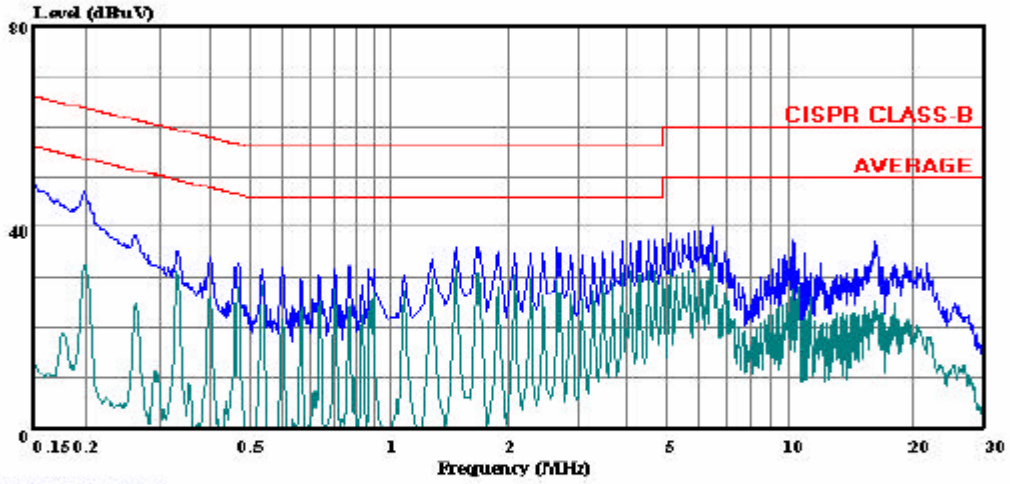
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	46.99	--	--	0.00	63.69	53.69	-16.70	-6.70	L1
1.58	35.99	--	--	0.00	56.00	46.00	-20.01	-10.01	L1
6.59	40.30	--	--	0.00	60.00	50.00	-19.70	-9.70	L1
0.20	47.33	--	--	0.00	63.69	53.69	-16.36	-6.36	L2
2.78	39.87	--	--	0.00	56.00	46.00	-16.13	-6.13	L2
6.59	39.40	--	--	0.00	60.00	50.00	-20.60	-10.60	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 7 File#: 08U12079LC.EMI Date: 09-09-2008 Time: 14:52:44



(Line Conduction)

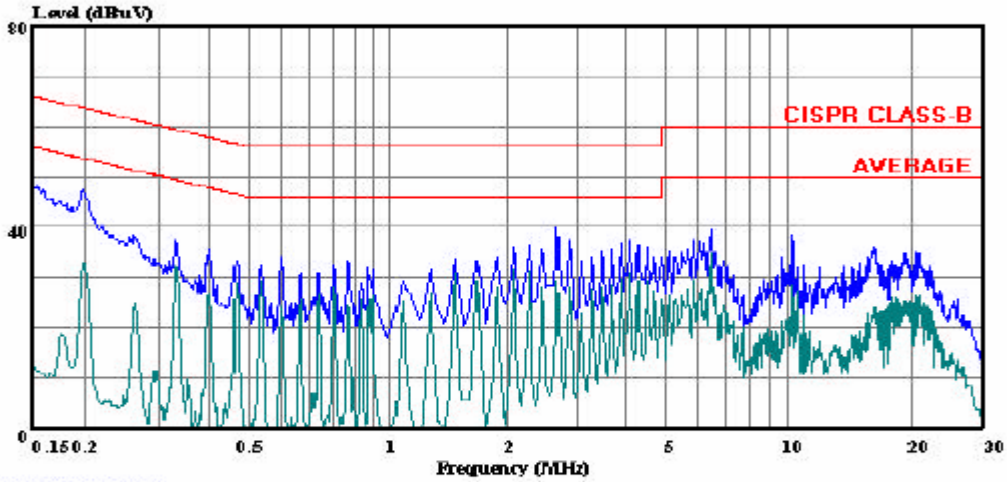
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Thanh Nguyen
Project #: : 08U12079
Company: : Apple Inc.
Configuration:: EUT , support equipment
Mode: : wireless link, play video from rem. serv
Target: : CISPR Class B
Voltage: : 115VAC / 60Hz
: L1: Peak(Blue), Avg (Green)

LINE 2 RESULTS

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

Data#: 14 File#: 08U12079LC.EMI Date: 09-09-2008 Time: 14:58:43



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Thanh Nguyen
Project #: : 08U12079
Company: : Apple Inc.
Configuration:: EUT , support equipment
Mode: : wireless link, play video from rem. serv
Target: : CISPR Class B
Voltage: : 115VAC / 60Hz
: L2: Peak(Blue), Avg (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).

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

The power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by a factor of 10.

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, 11b	2.4 GHz	20.0	26.39	4.22	0.23	2.29
WLAN, 11g	2.4 GHz	20.0	28.11	4.22	0.34	3.40
WLAN, HT20	2.4 GHz	20.0	28.29	1.21	0.18	1.77
WLAN, 11a	5.8 GHz	20.0	26.98	5.19	0.33	3.28
WLAN, HT20	5.8 GHz	20.0	26.99	2.18	0.16	1.64
WLAN, HT40	5.8 GHz	20.0	26.56	2.18	0.15	1.49
WLAN, 11a	5.2 GHz	20.0	15.84	5.73	0.03	0.29
WLAN, HT20	5.2 GHz	20.0	15.35	2.72	0.01	0.13
WLAN, HT40	5.2 GHz	20.0	16.86	2.72	0.02	0.18

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

CO-LOCATED MPE CALCULATIONS

For multiple colocated transmitters operating simultaneously the total power density can be calculated by summing the Power * Gain product (in linear units) of each transmitter.

yields

$$d = 0.282 * \sqrt{((P1 * G1) + (P2 * G2) + ... + (Pn * Pn)) / S)}$$

where

d = distance in cm
Px = Power of transmitter x in mW
Gx = Numeric gain of antenna x
S = Power Density in mW/cm^2

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then converted to their linear forms for the purpose of 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	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
WLAN, 11g	2.4 GHz	28.11	4.22			
WLAN, 11a	5.8 GHz	26.98	5.19			
Combined				20.0	0.67	6.67