FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7
NCC LOW POWER 0002 (LP0002)

CERTIFICATION TEST REPORT

FOR

802.11ag/Draft 802.11n WLAN PCI-E Mini Card

MODEL NUMBER: BCM94322USA
FCC ID: QDS-BRCM1038
IC: 4324A-BRCM1038

REPORT NUMBER: 08U11756-1A

ISSUE DATE: JULY 11, 2008

Prepared for
BROADCOM CORPORATION
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	July 8, 2008	Initial Issue	Sunny Shih
A	July 11, 2008	Clarified antenna description, antenna combinations used for test purposes, MPE.	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11ag / Draft 802n WLAN PCI-E Mini Card

MODEL: BCM94322USA

SERIAL NUMBER: EUT #1 (2.4GHz): 39670851A0036
EUT #2 (5GHz): 973 (P405)

DATE TESTED: May 20 – July 08, 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
Low Power 0002 (LP0002): August 29, 2007 revised	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:

SUNNY SHIH
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, 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 802.11ag/Draft 802.11n Wireless LAN Transceiver module and manufactured by Broadcom. Model number is BCM94322USA.

5.2. MAXIMUM OUTPUT POWER

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

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
2412 - 2462	802.11b Legacy			21.53	142.23
2412 - 2462	802.11g Legacy			27.84	608.14
2412 - 2462	802.11n 20MHz SISO	Covered by the worst case 802.11g Mode Legacy testing			
2412 - 2462	802.11g CDD	Covered by the worst case 802.11n 20MHz CDD			
2412 - 2462	802.11n 20MHz CDD	26.19	27.15	29.71	934.71
2422 - 2452	802.11n 40MHz SISO			24.6	288.40
2422 - 2452	802.11n 40MHz CDD MCS0	20.09	21.76	24.02	252.06
2422 - 2452	802.11n 40MHz CDD MCS15	22.7	23.53	26.15	411.63

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5745 - 5825	802.11a Legacy			25.13	325.84
5745 - 5825	802.11n 20MHz SISO	Covered by the worst case 802.11a Mode Legacy testing			
5745 - 5825	802.11a Mode CDD	Covered by the worst case 802.11n 20MHz CDD			
5745 - 5825	802.11n 20MHz CDD	24.04	25.01	27.56	570.47
5755 - 5795	802.11n 40MHz SISO			25.56	359.75
5755 - 5795	802.11n 40MHz CDD	25.04	27.41	29.40	869.96

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Antenna Manufacturer	Antenna Type	Model	Peak gain (dBi)	
			2440MHz	5800MHz
Tyco	PIFA	M97PIFA	**3.18**	**7.18**
Foxconn	PIFA	WDAN-HQAT80-03-DF	2.17	1.05
Tyco	Slot antenna	M97SLTAP1	**3.20**	0.56
Tyco	Slot antenna	K5SLT	1.83	**3.08**

Antennas combinations for 2x2 (CCD) modes test

Frequency Band	Antennas conbination	SLOT Antenna Gain	PIFA Antenna gain	10^(Ant Main /10)	10^(Ant Aux/10)	10^(ant main/10)+ 10^(ant aux/10)	10*log[10^(ant main/10)+ 10^(ant aux/10)] (dBm)
2.4 GHz HT20 & HT40	SLOT Hi / PIFA Hi	**3.20**	**3.18**	2.089	2.080	4.169	**6.20**
5.8 GHz HT20	SLOT Hi / PIFA Hi	**3.08**	**7.18**	2.032	5.224	7.256	**8.61**
5.8 GHz HT40	SLOT Low / PIFA Hi	**0.56**	**7.18**	1.138	5.224	6.362	**8.04**
	SLOT Hi / PIFA Low	**3.08**	**1.05**	2.032	1.274	3.306	**5.19**

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

Band	SLOT Ant Gain	PIFA Ant Gain
2.4 GHz	**3.20**	**3.18**
5.8 GHz	**3.08**	**7.18**

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BCMWL5, rev. 4.170.83.0.

The test utility software used during testing was wl_tool, rev. 4.170. RC83.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

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

All final tests in the 802.11n HT20 mode were made at MCS0.

All final tests in the 802.11n HT40 mode were made at MCS0 & MCS15

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

Radiated emissions tests were performed with the following antenna configurations:

All legacy/SISO modes were measured with the highest gain for each type of antenna (PIFA and Slot).

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

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT for 2.4 GHz BAND

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	Dell	Inspiron 630m	454778	DOC
AC Adapter	Dell	PA-1900-01D3	CN-ODF266-71615-59T-0091	DOC

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	1.2 m	N/A
2	DC	1	DC	Unshielded	1.2 m	N/A

TEST SETUP

The EUT is installed in a host laptop computer via Express card to MiniPCI-E adapter boards during the tests. Test software exercised the radio card.

SUPPORT EQUIPMENT for 5 GHz BAND

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Desktop	Dell			DoC
USB Mouse	Logitech	90.00026.7730	HCA55002169	DoC
Keyboard	Microsoft	KC-0405	7619801926504	DoC
Monitor	LG	L1750S	512MXWE0A753	DoC
Ribbon Cable	N/A	N/A	N/A	N/A

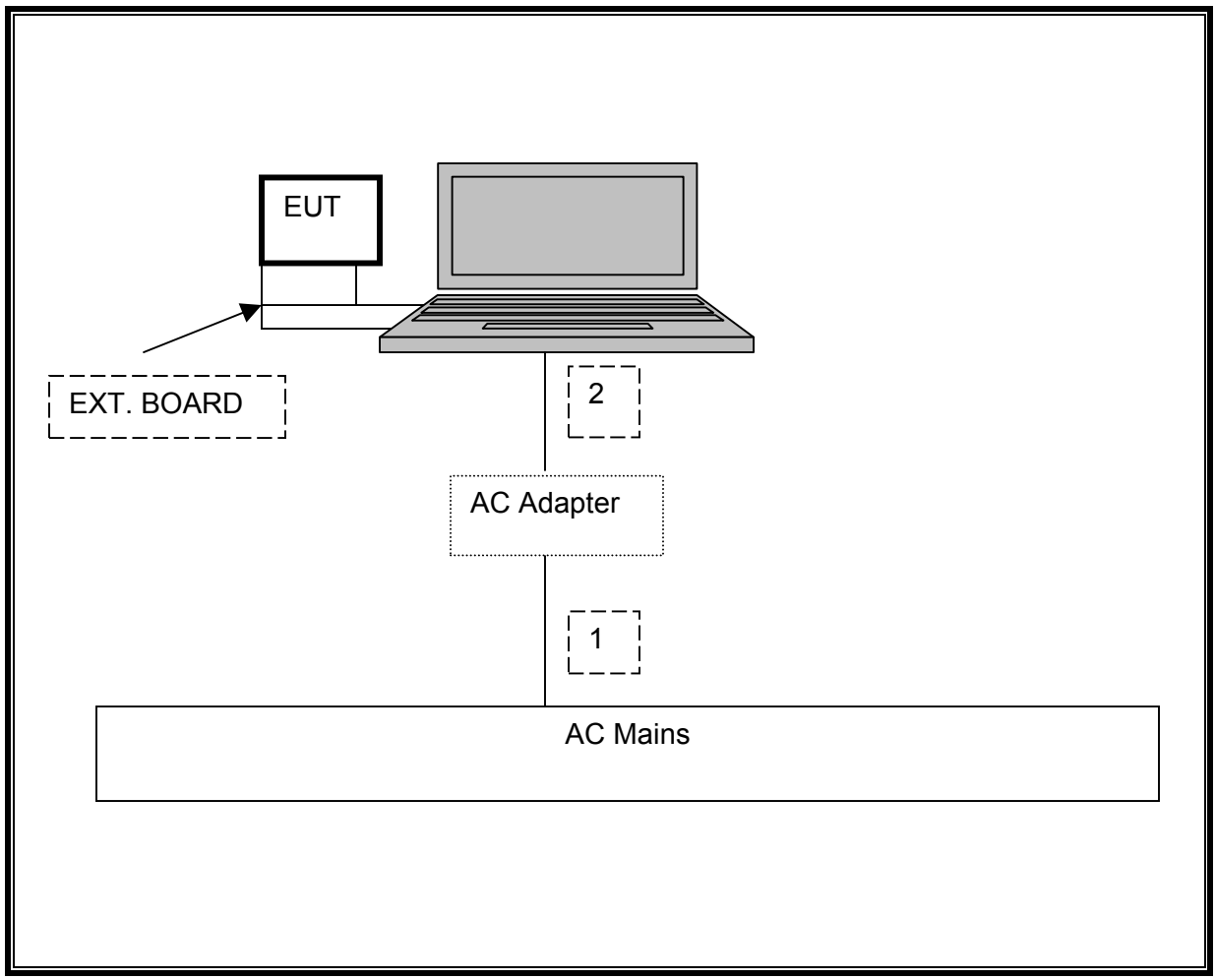
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC Input	2	US115	Un-Shielded	2m	
2	USB Keyboard	1	USB	Shielded	2m	
3	USB Mouse	1	USB	Shielded	2m	
4	SVGA	1	DB-15	Shielded	1.5m	Ferrites on both Ends
5	Ribbon Cable	1	Ribbon	Un-Shielded	0.3	

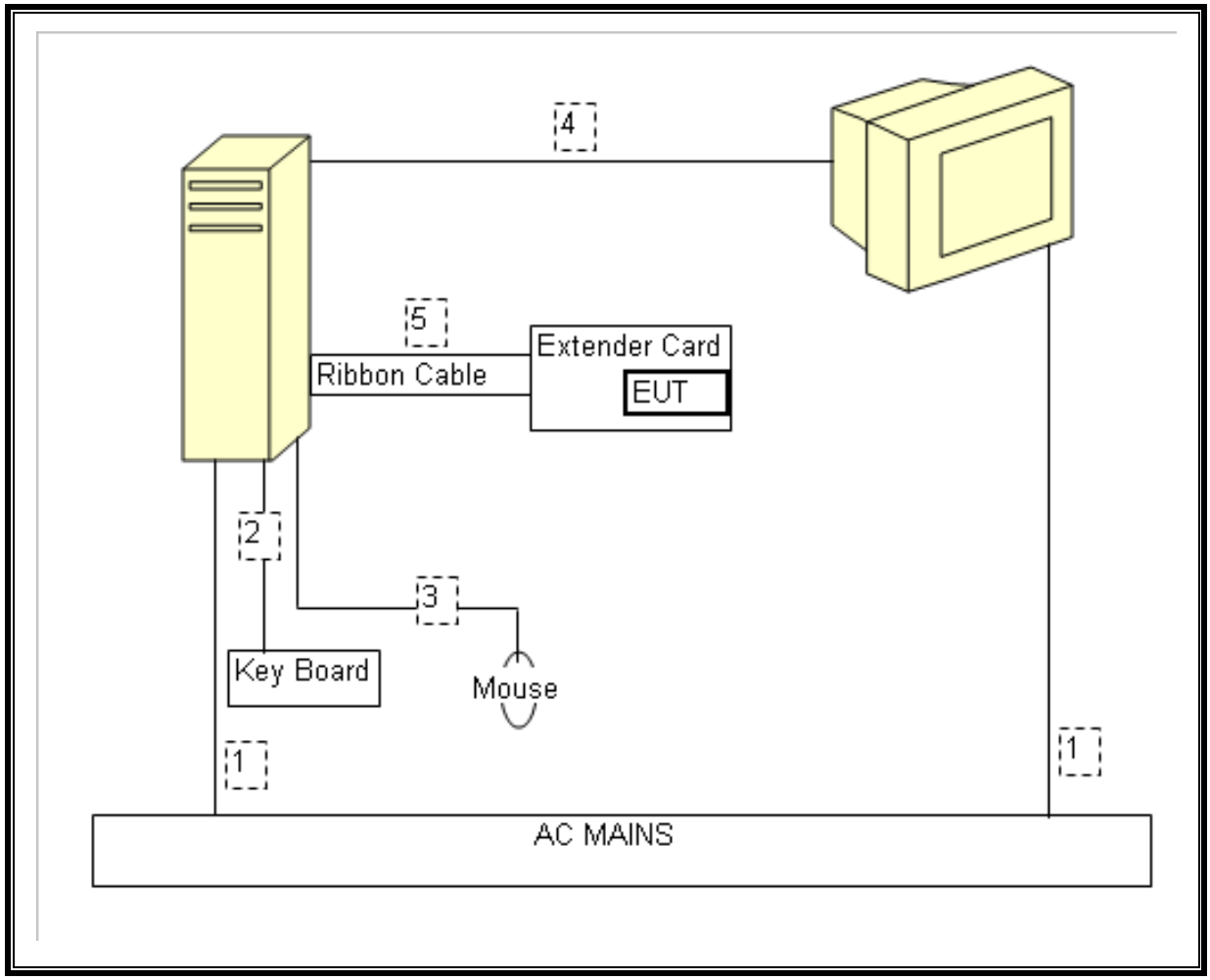
TEST SETUP

The EUT is installed in a host desktop computer via a ribbon cable & an express card to MiniPCI-E adapter boards during the tests. Test software exercised the radio card.

SETUP DIAGRAM for 2.4 GHz BNAD



SETUP DIAGRAM for 5 GHz BAND



7. 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	2/6/2008	6/12/2009
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	2/6/2008	6/12/2009
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	5/9/2008	5/9/2009
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/2007	10/25/2008
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/25/2007	10/25/2008
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	10/16/2007	1/27/2009
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	5/2/2006	8/7/2008
Antenna, Horn, 18 GHz	ETS	3117	C01006	4/15/2008	4/15/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	8/3/2007	8/3/08
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	10/13/2007	10/13/08
Peak Power Meter	Agilent / HP	E4416A	C00963	02/14/07	12/02/08
Peak / Average Power Sensor	Agilent	E9327A	C00964	02/14/07	12/02/08
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	C01009	4/13/2007	4/13/2009
4.0 GHz High Pass Filter	Micro Tronics	HPM13351	N/A	N/A	N/A
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	N/A	N/A	N/A
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	N/A	N/A	N/A
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	N/A	N/A	N/A

8. ANTENNA PORT TEST RESULTS

8.1. 802.11b MODE

8.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

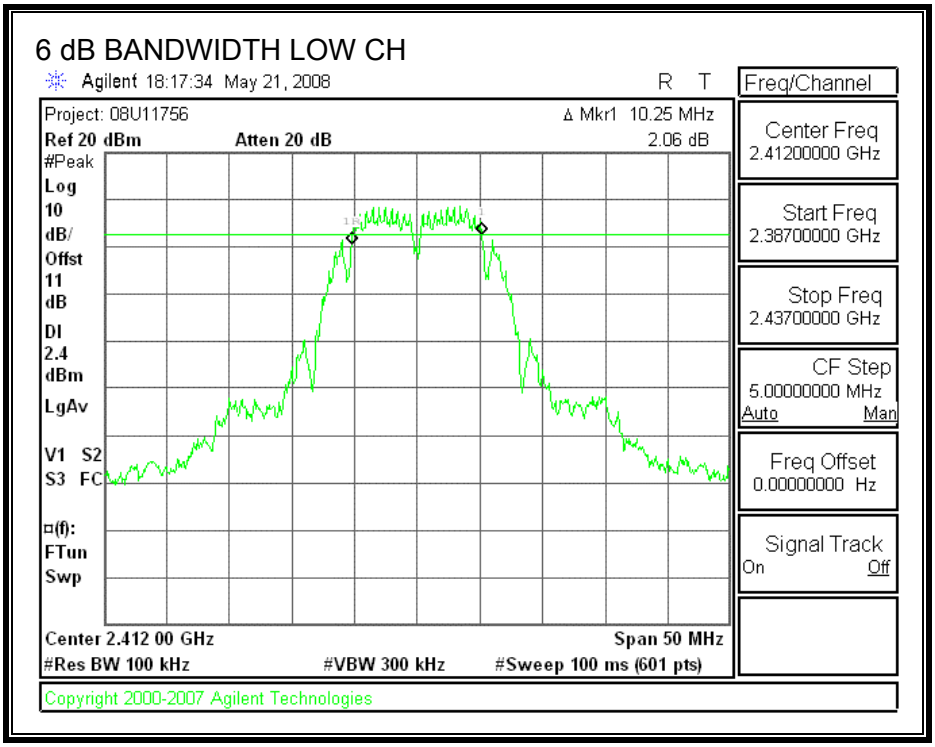
TEST PROCEDURE

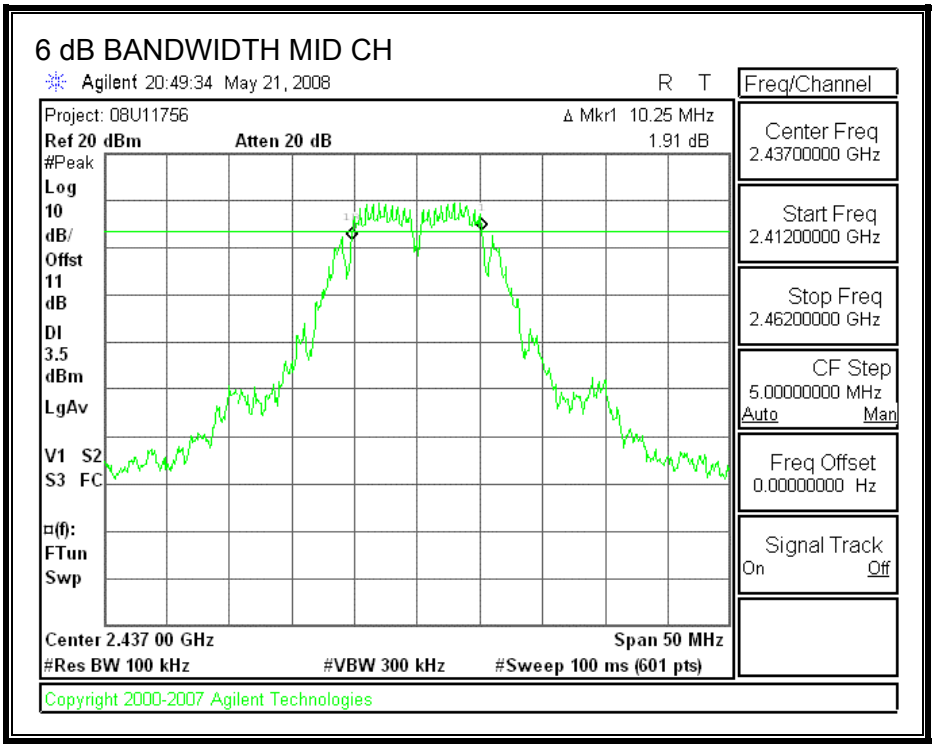
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

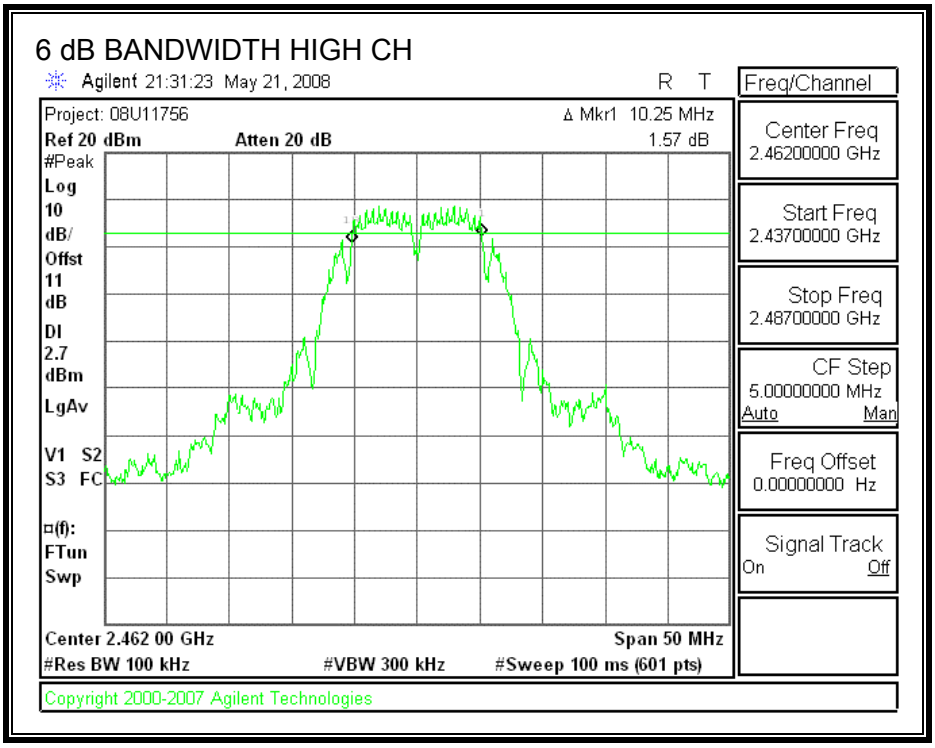
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	10.25	0.5
Middle	2437	10.25	0.5
High	2462	10.25	0.5

6 dB BANDWIDTH







8.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

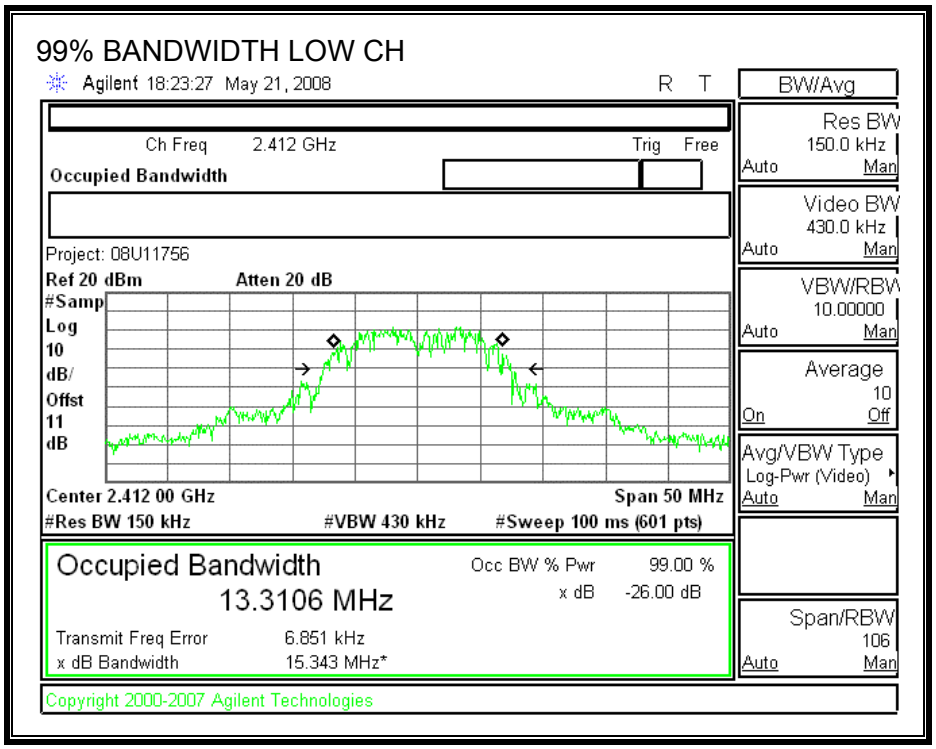
TEST PROCEDURE

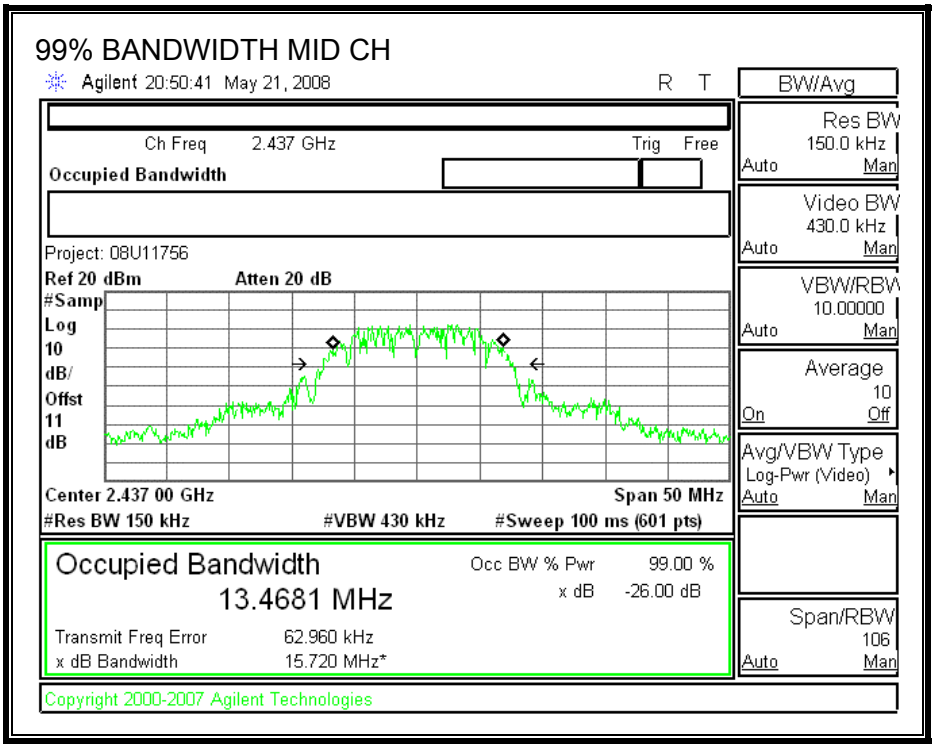
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

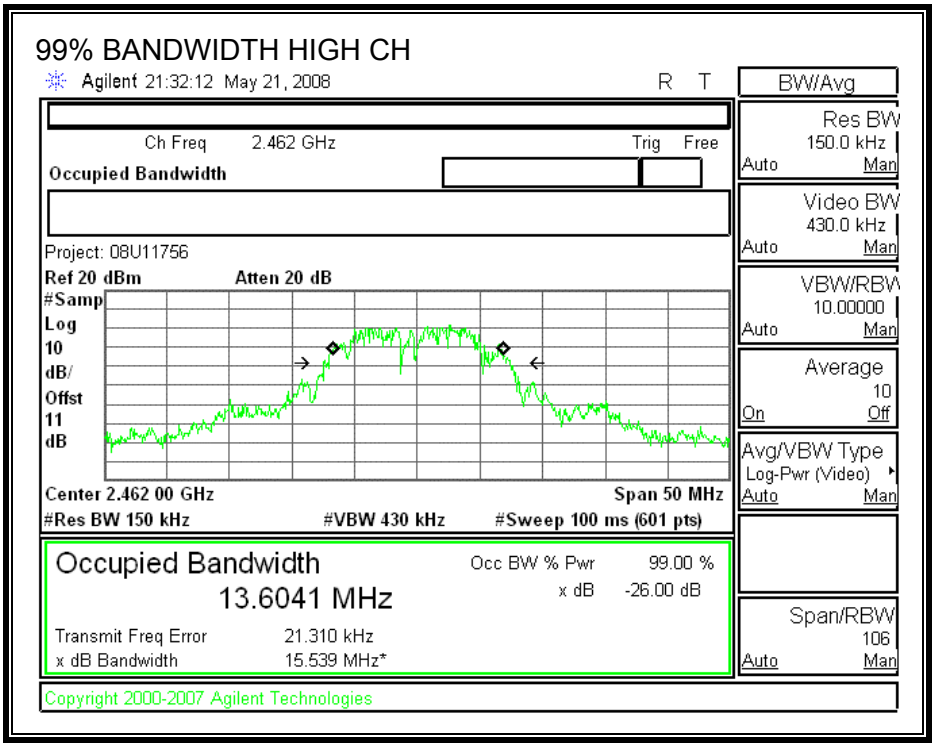
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	13.3106
Middle	2437	13.4681
High	2462	13.6041

99% BANDWIDTH







8.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

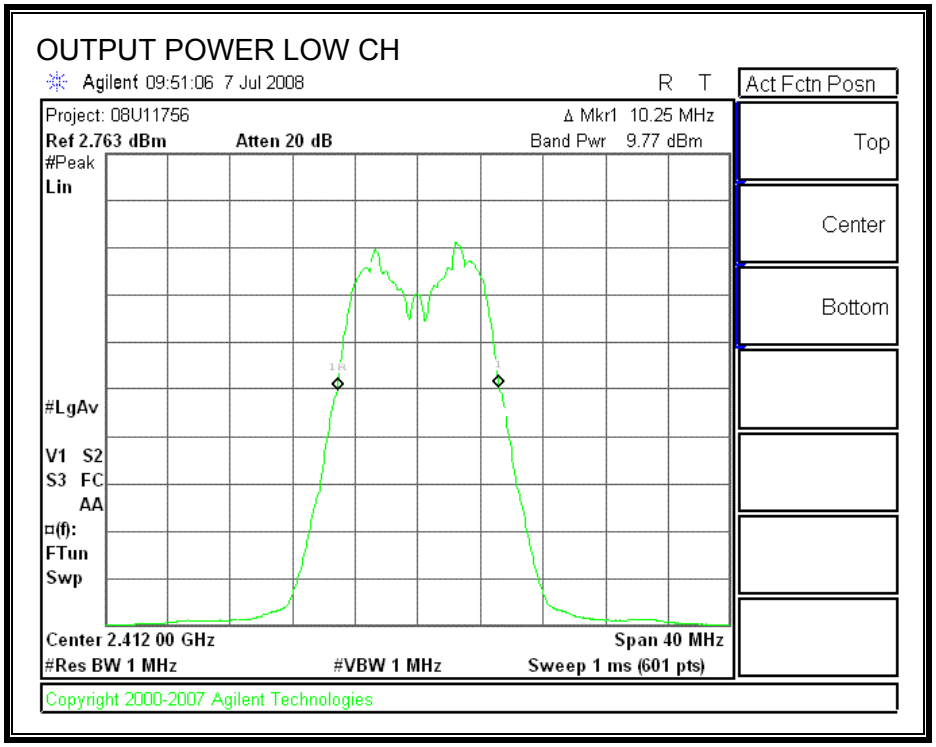
Peak power is measured using the Channel bandwidth Alternative peak output power procedure

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	9.77	11	20.77	30	-9.23
Middle	2437	10.53	11	21.53	30	-8.47
High	2462	9.86	11	20.86	30	-9.14

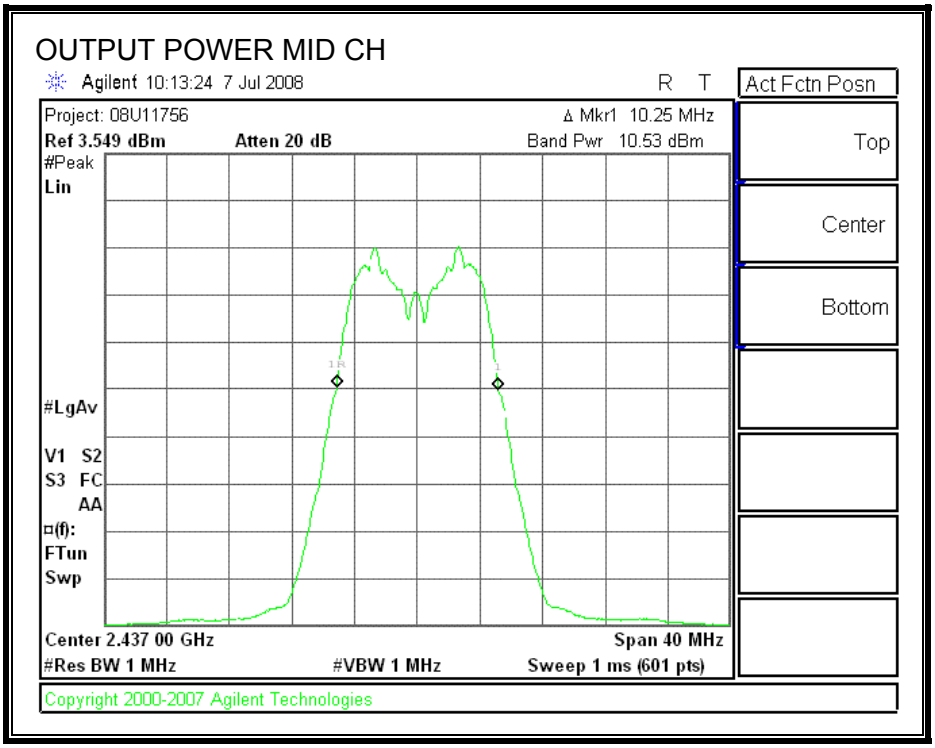
specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003

RESULTS

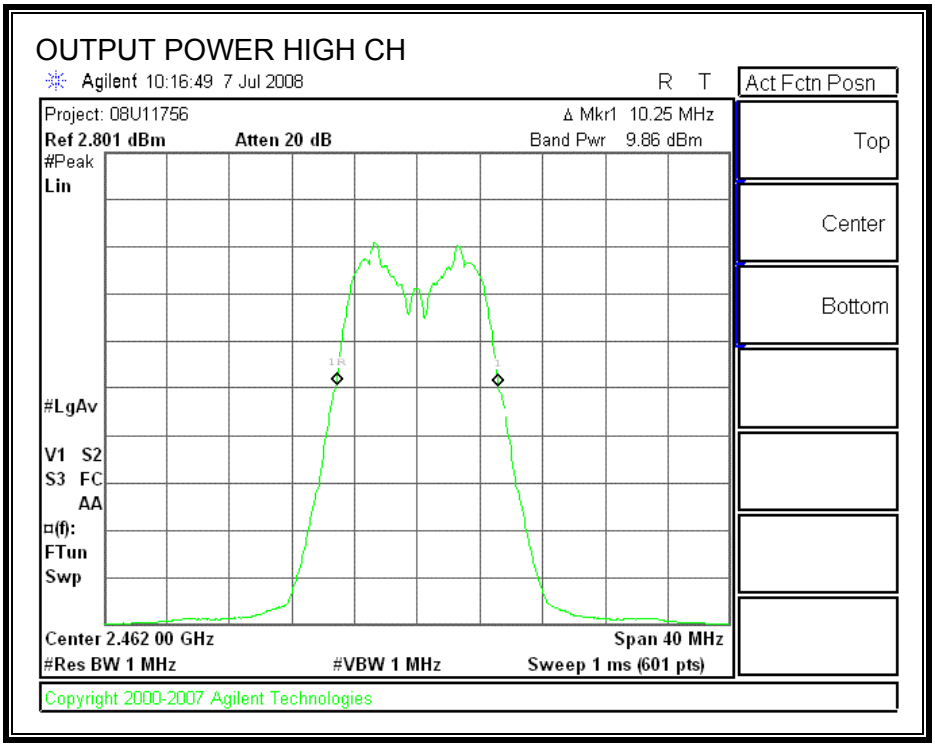
OUTPUT POWER



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



8.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e), IC RSS-210 A8.2 (b), 3.10.1 (6) (6.2.2)
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.

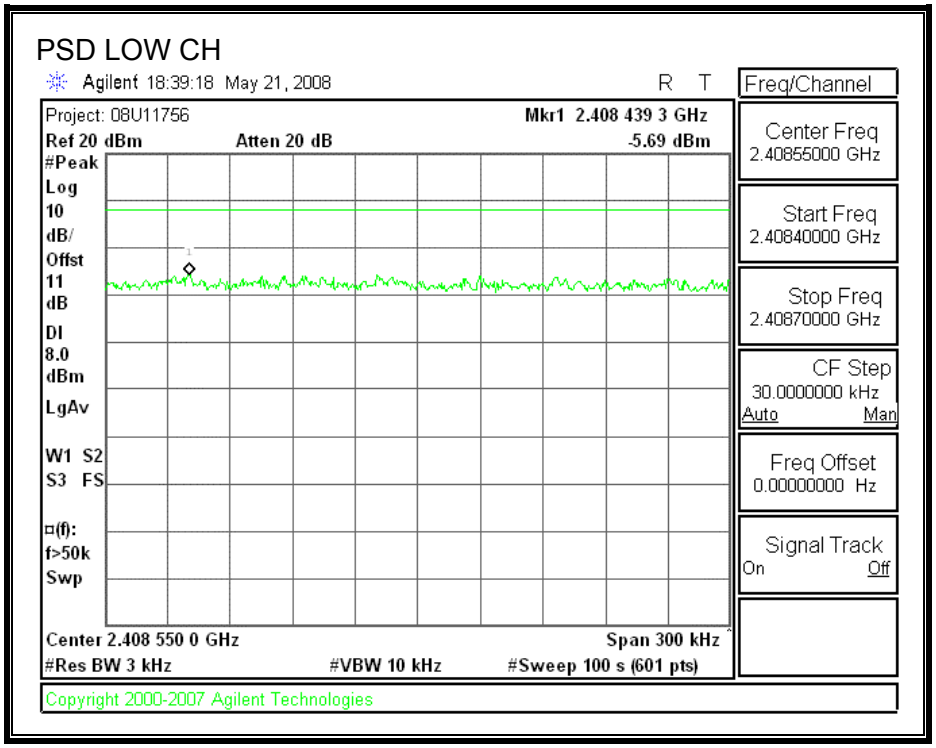
TEST PROCEDURE

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.

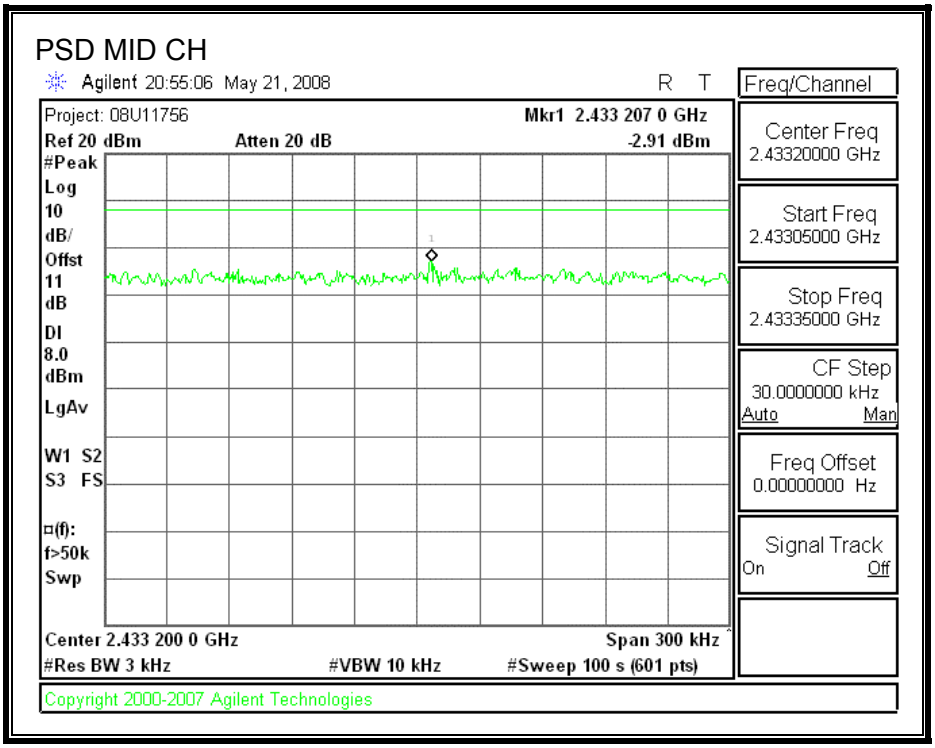
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.69	8	-13.69
Middle	2437	-2.91	8	-10.91
High	2462	-4.23	8	-12.23

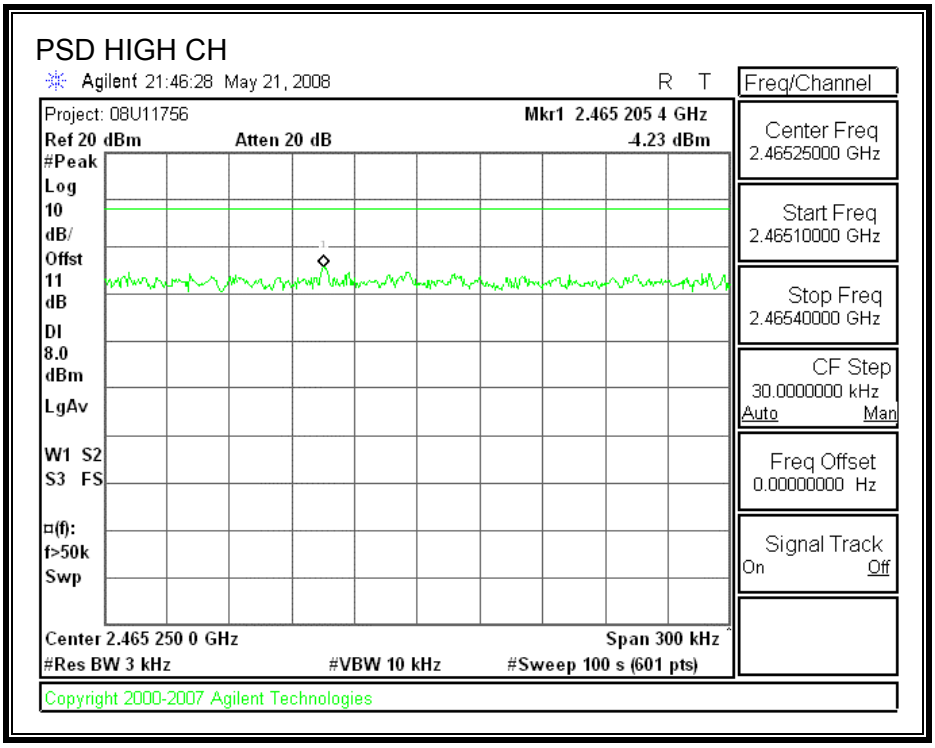
POWER SPECTRAL DENSITY



PSD MID CH



PSD HIGH CH



8.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

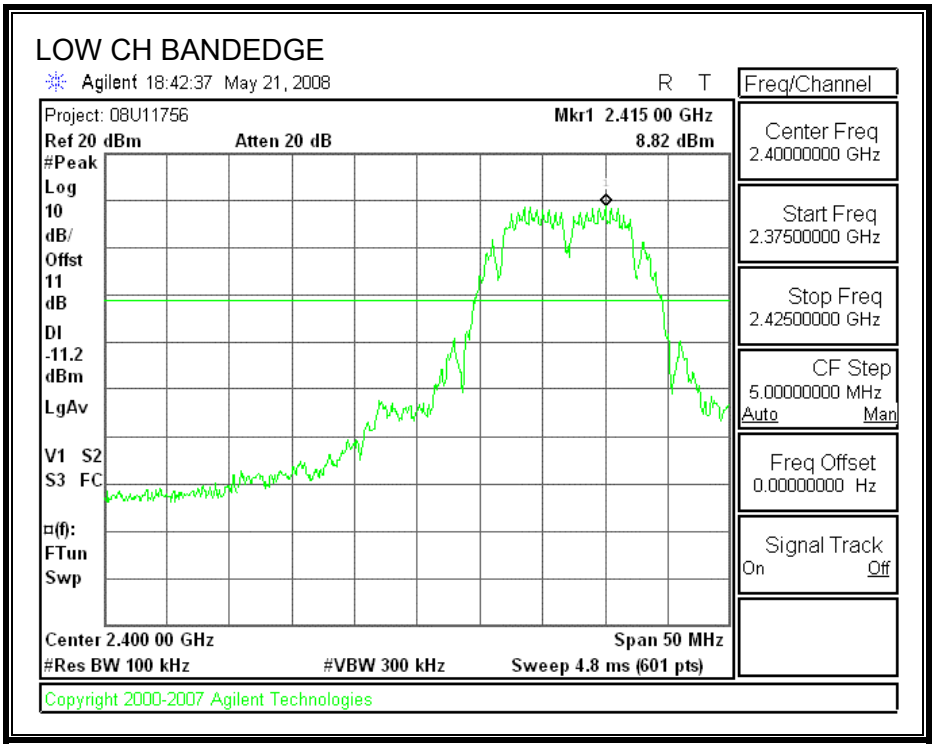
FCC §15.247 (d), IC RSS-210 A8.5, LP0002 § 3.10.1 (5)
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

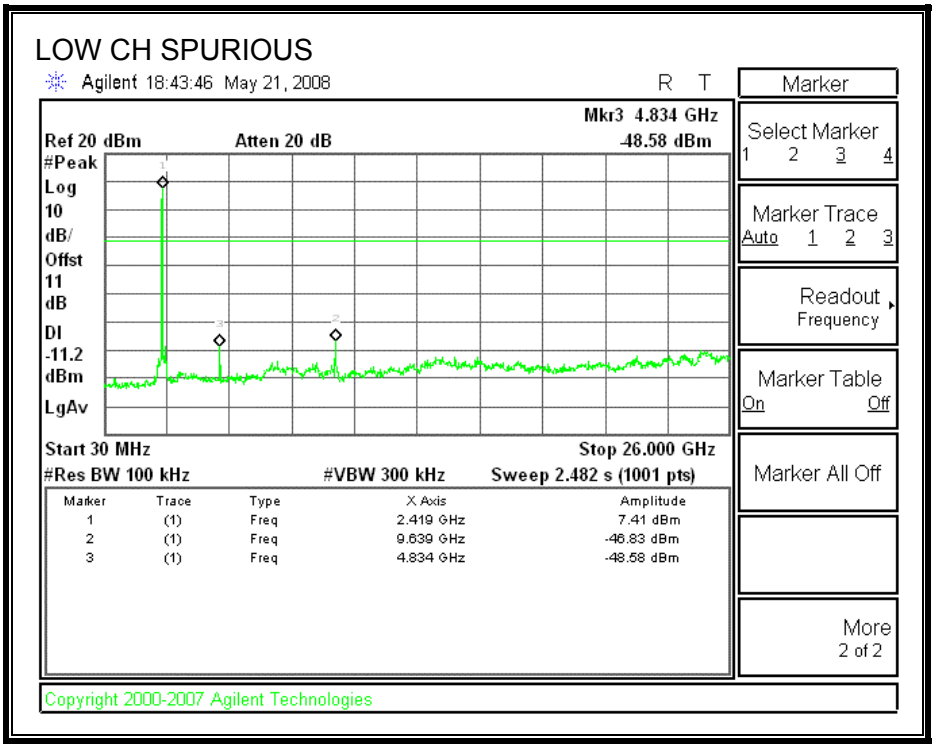
TEST PROCEDURE

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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

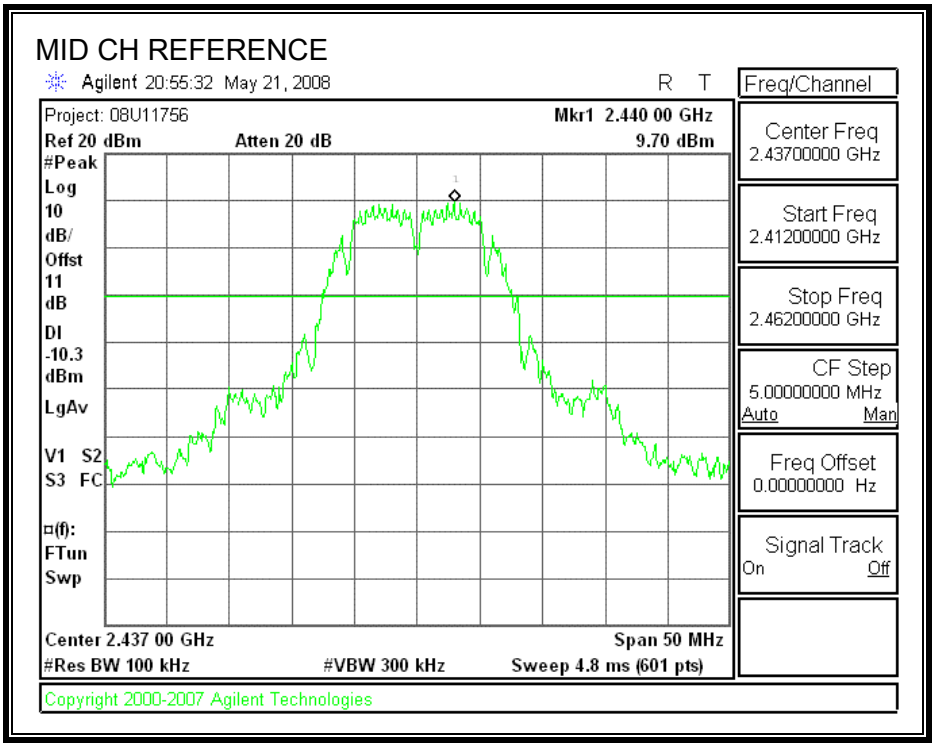
RESULTS

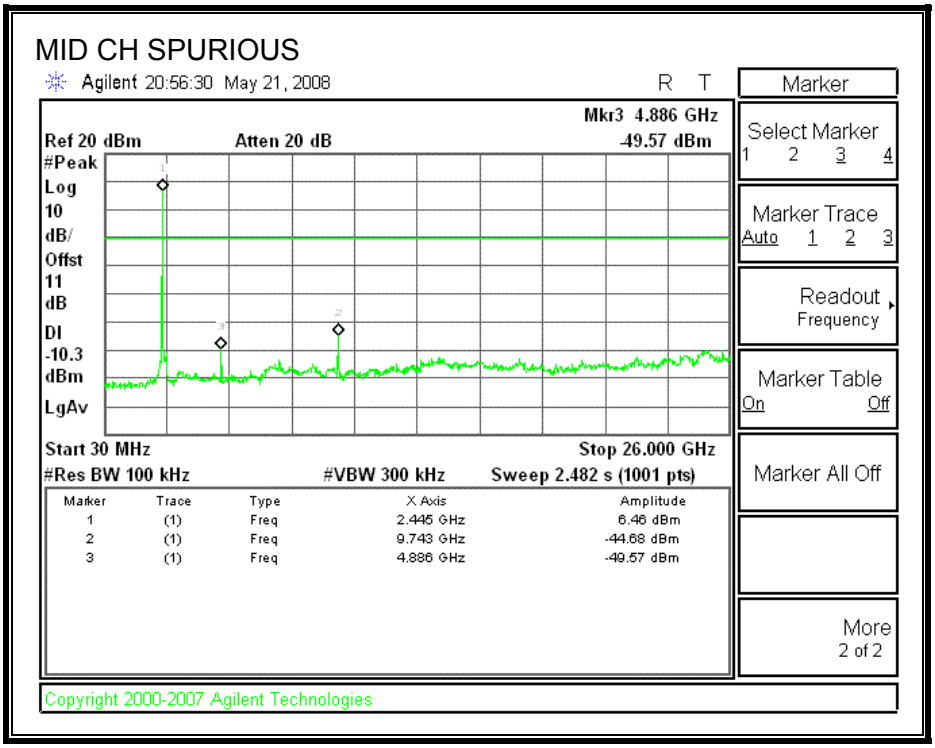
SPURIOUS EMISSIONS, LOW CHANNEL



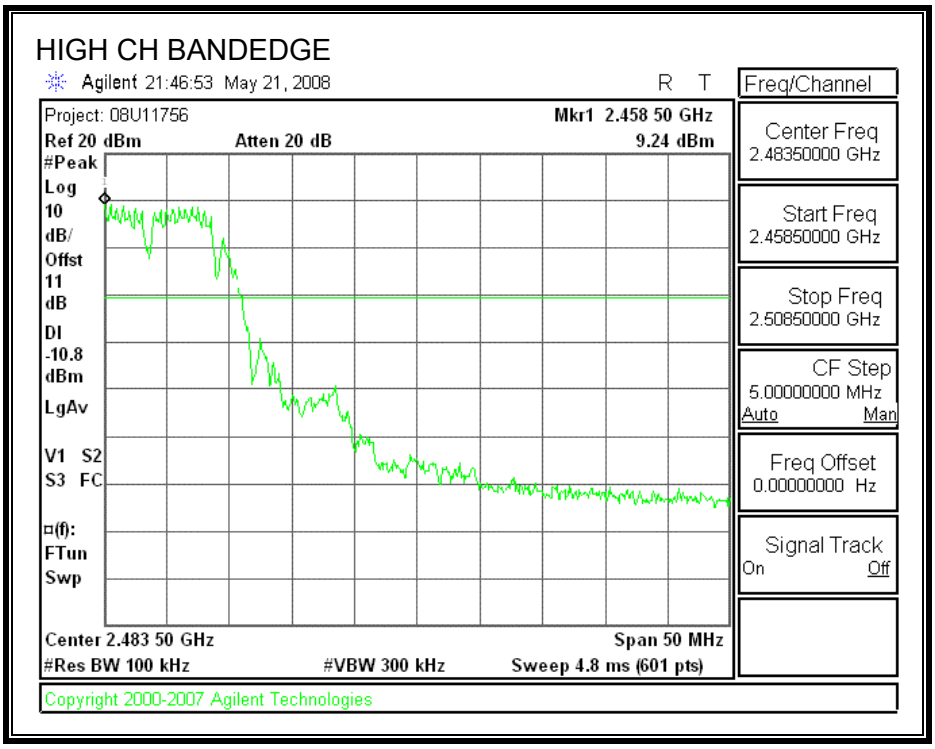


SPURIOUS EMISSIONS, MID CHANNEL

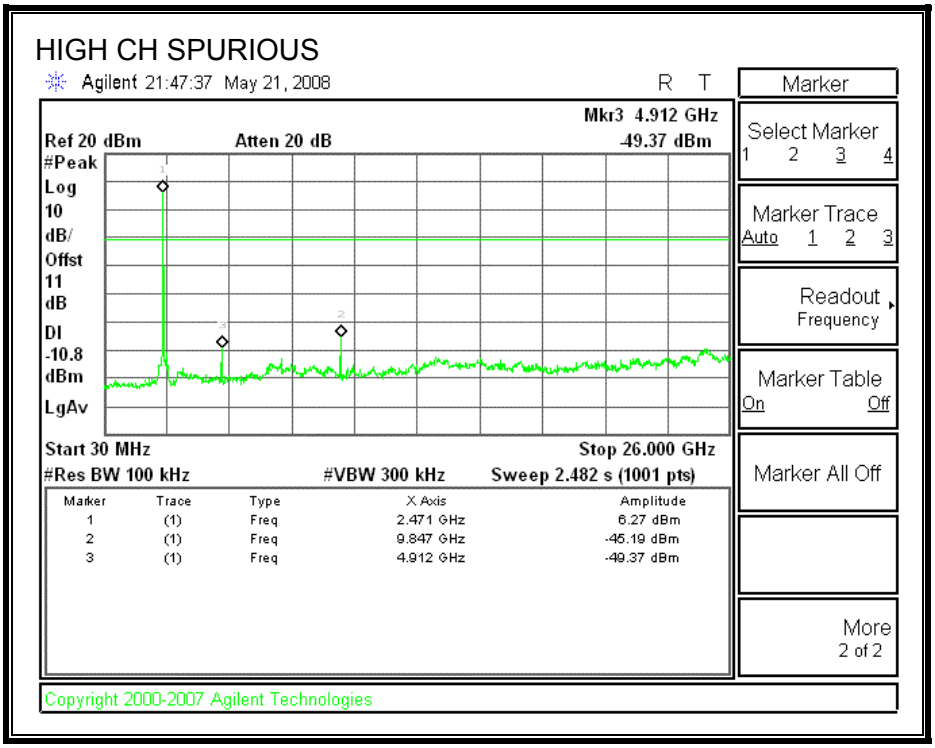




SPURIOUS EMISSIONS, HIGH CHANNEL



HIGH CH SPURIOUS



8.2. 802.11g MODE

8.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

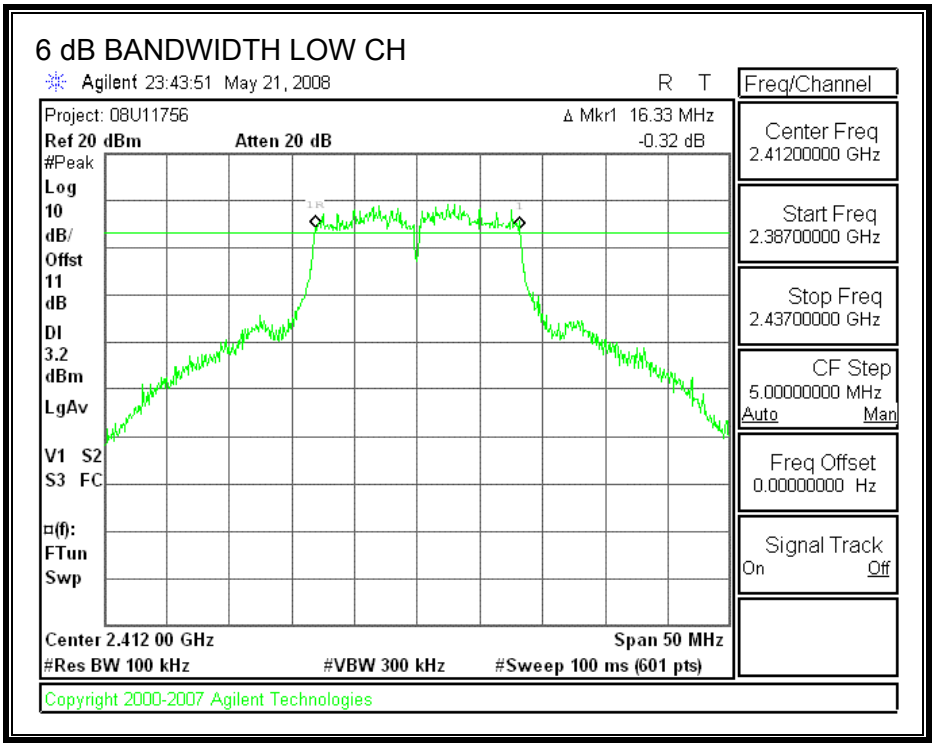
TEST PROCEDURE

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.

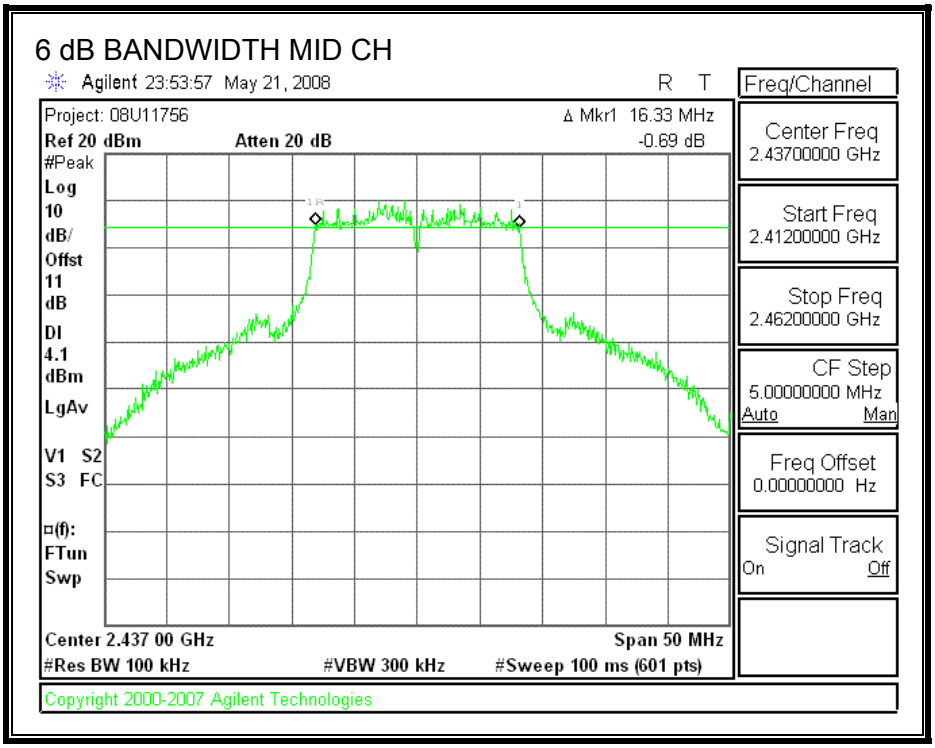
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.33	0.5
Middle	2437	16.33	0.5
High	2462	15.67	0.5

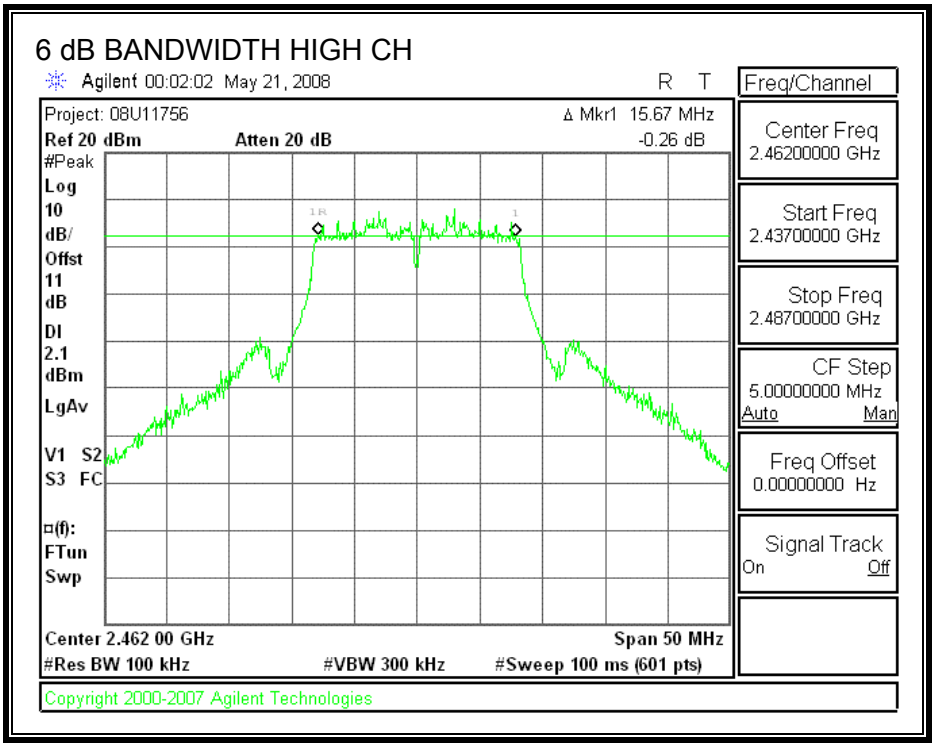
6 dB BANDWIDTH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



8.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

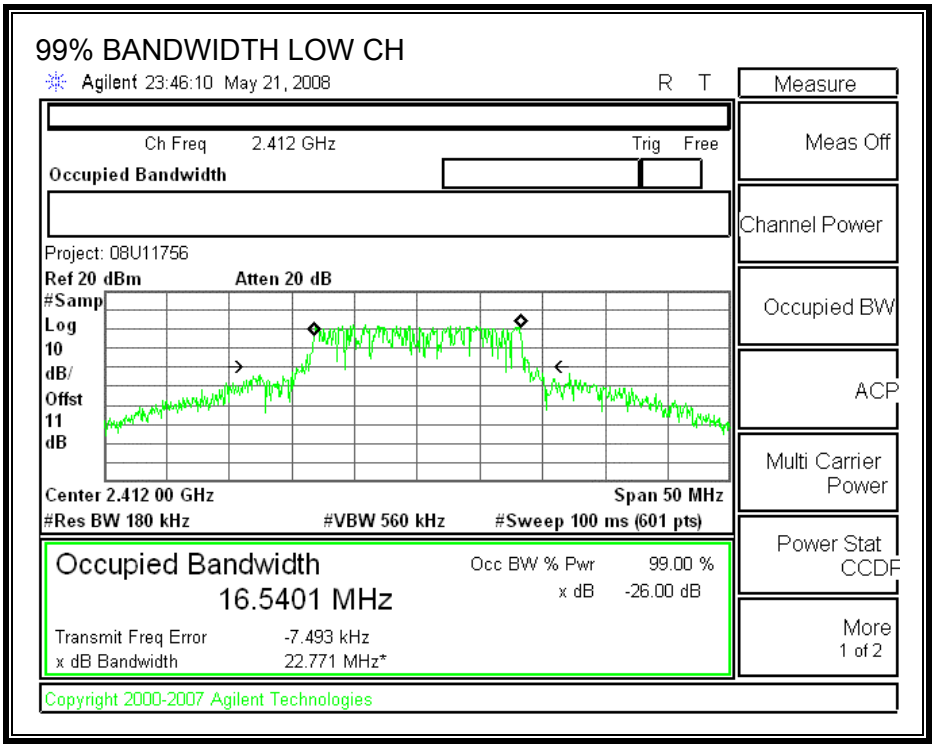
TEST PROCEDURE

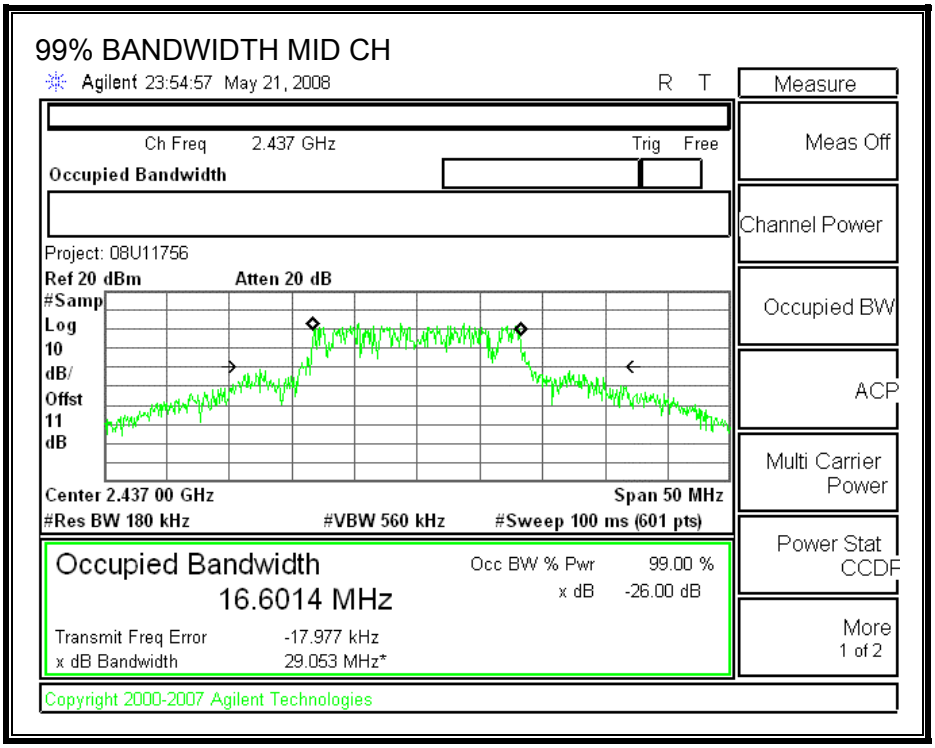
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

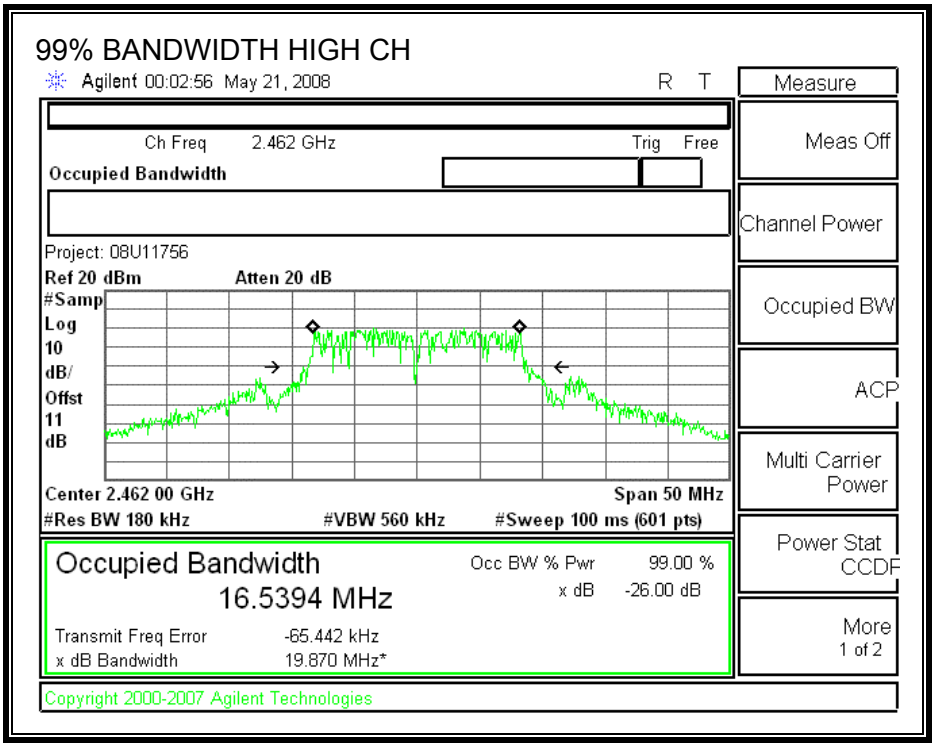
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5401
Middle	2437	16.6014
High	2462	16.5394

99% BANDWIDTH







8.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

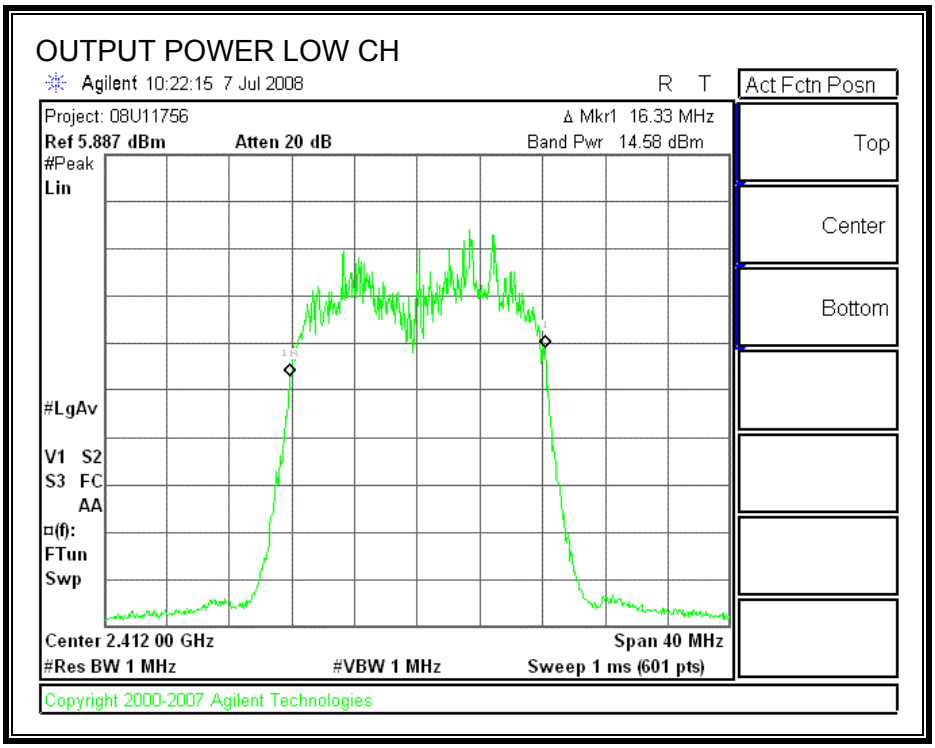
TEST PROCEDURE

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.

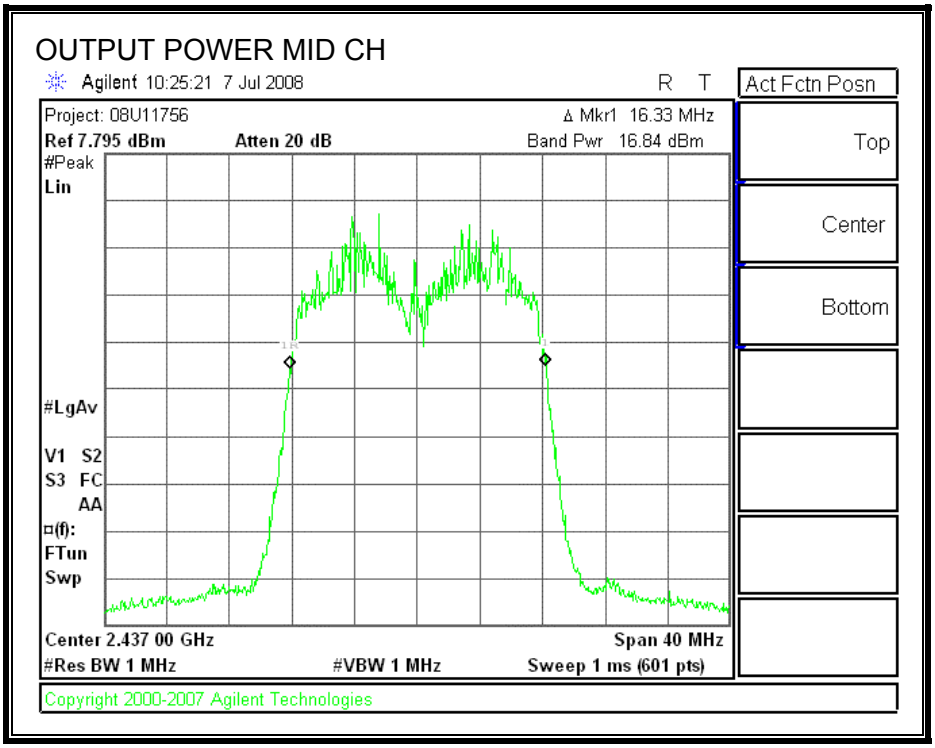
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	14.58	11	25.58	30	-4.42
Middle	2437	16.84	11	27.84	30	-2.16
High	2462	13.50	11	24.50	30	-5.50

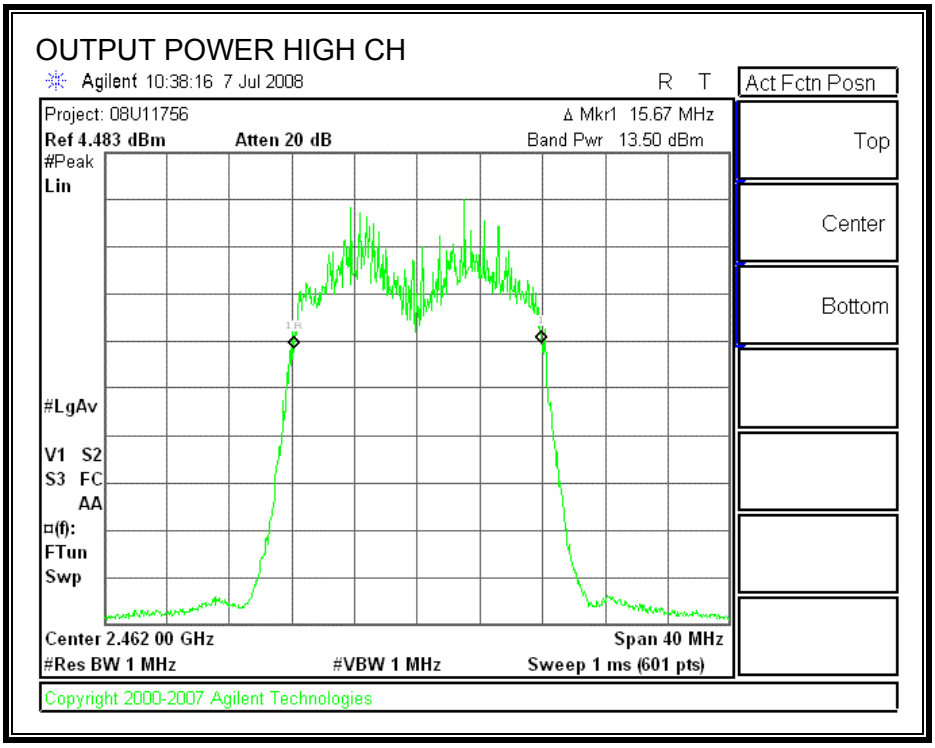
OUTPUT POWER



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



8.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e), IC RSS-210 A8.2 (b), 3.10.1 (6) (6.2.2)
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.

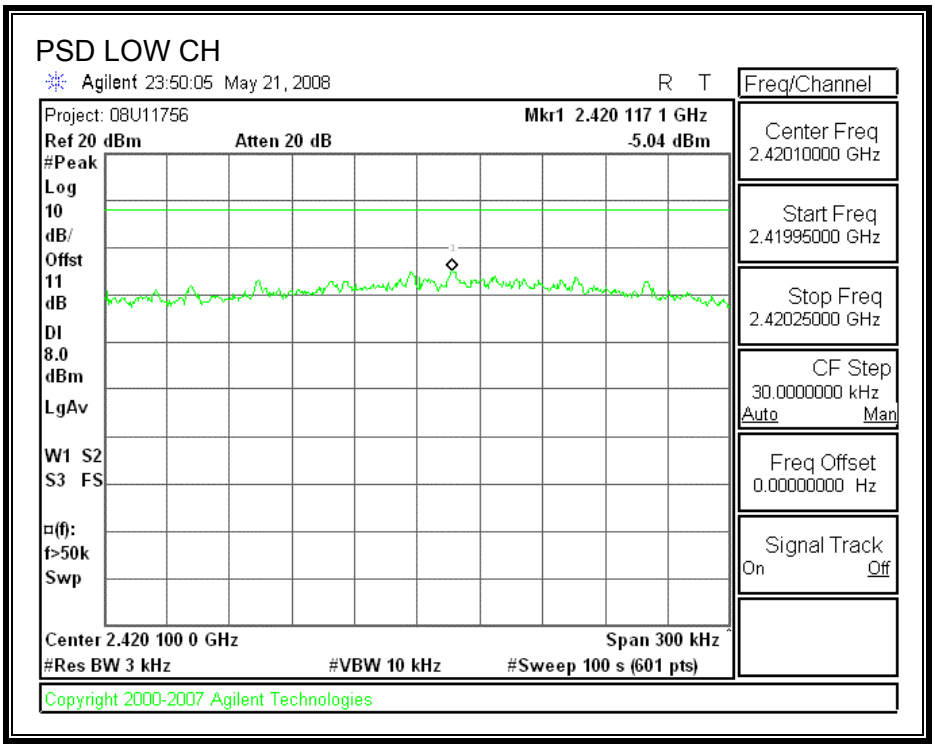
TEST PROCEDURE

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.

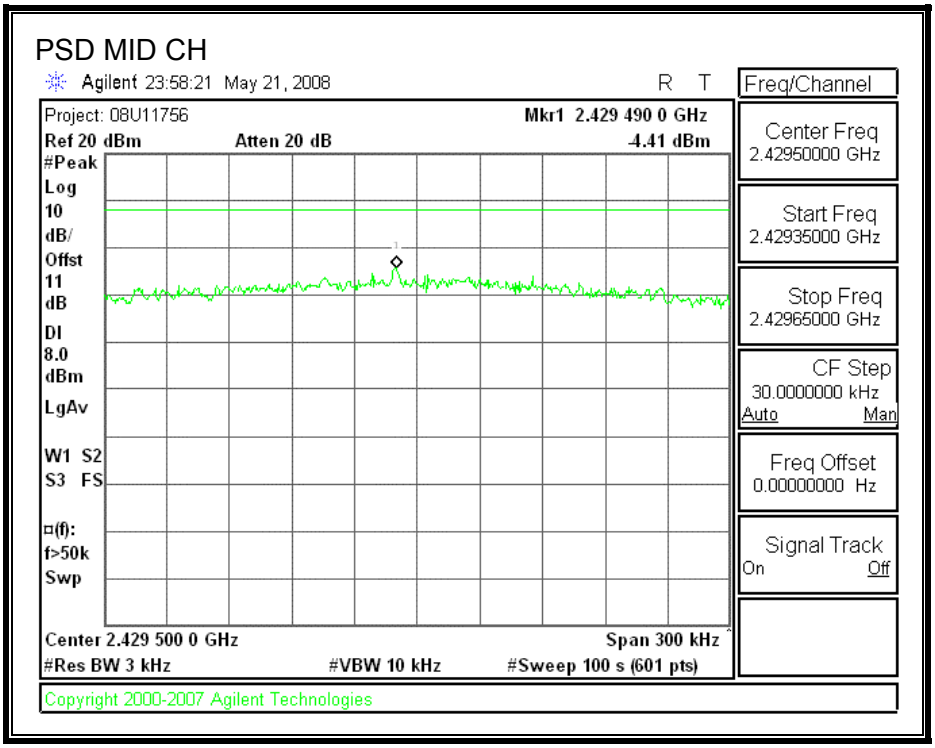
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.04	8	-13.04
Middle	2437	-4.41	8	-12.41
High	2462	-6.92	8	-14.92

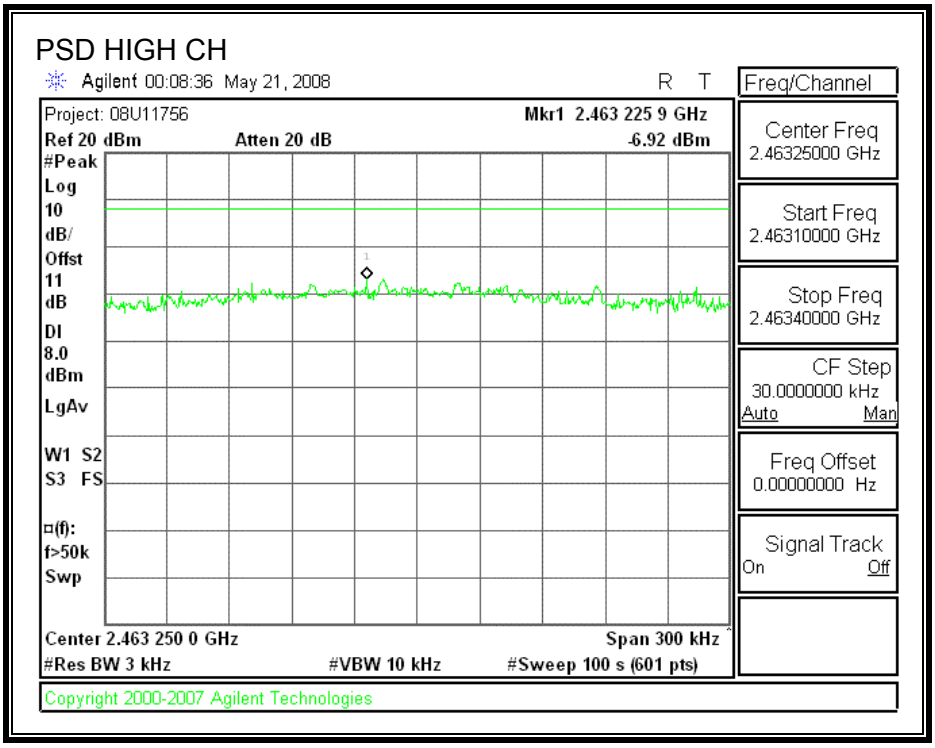
POWER SPECTRAL DENSITY



PSD MID CH



PSD HIGH CH



8.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

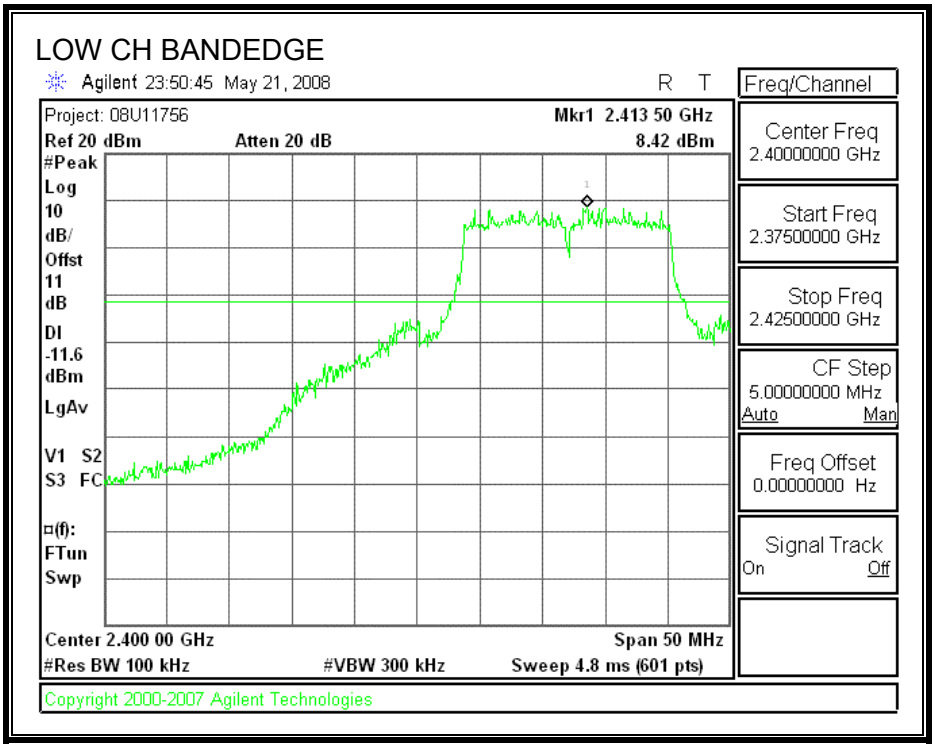
FCC §15.247 (d), IC RSS-210 A8.5, LP0002 § 3.10.1 (5)
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

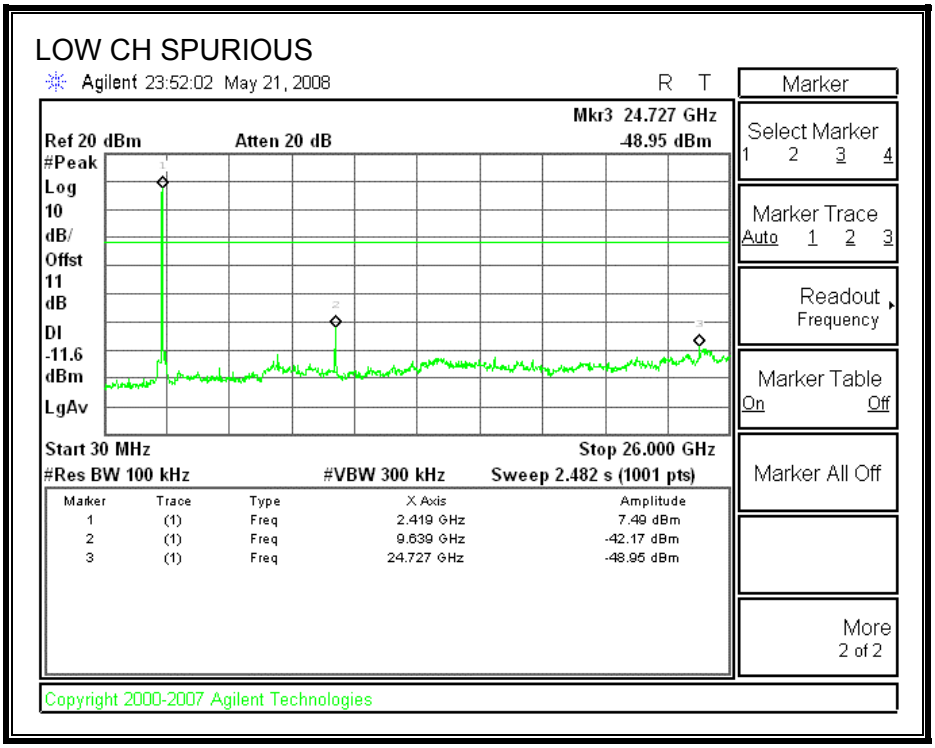
TEST PROCEDURE

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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

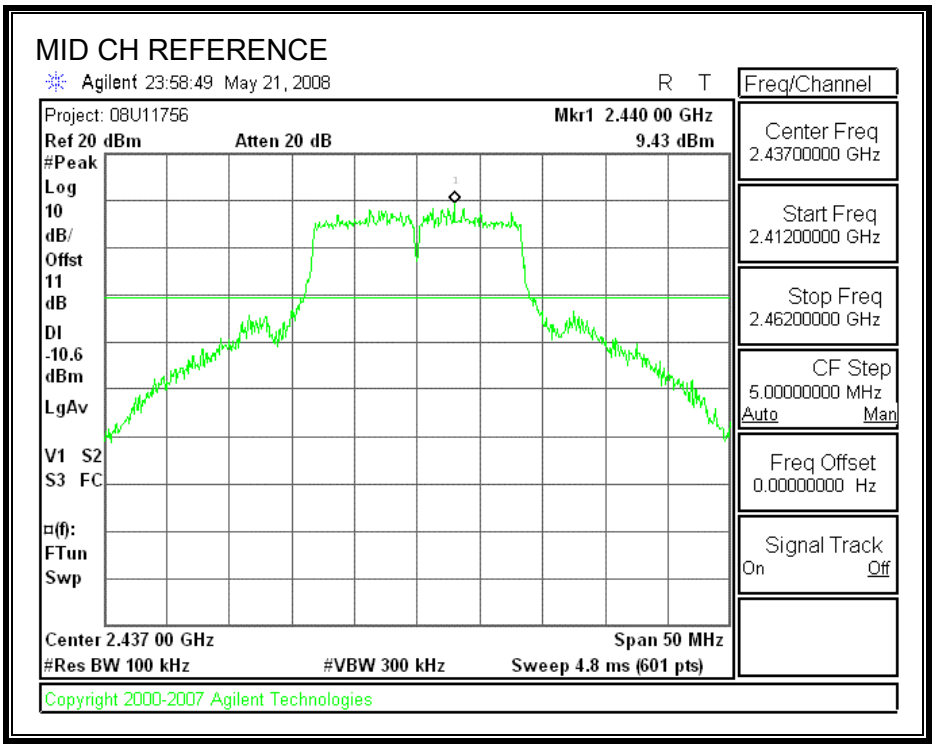
RESULTS

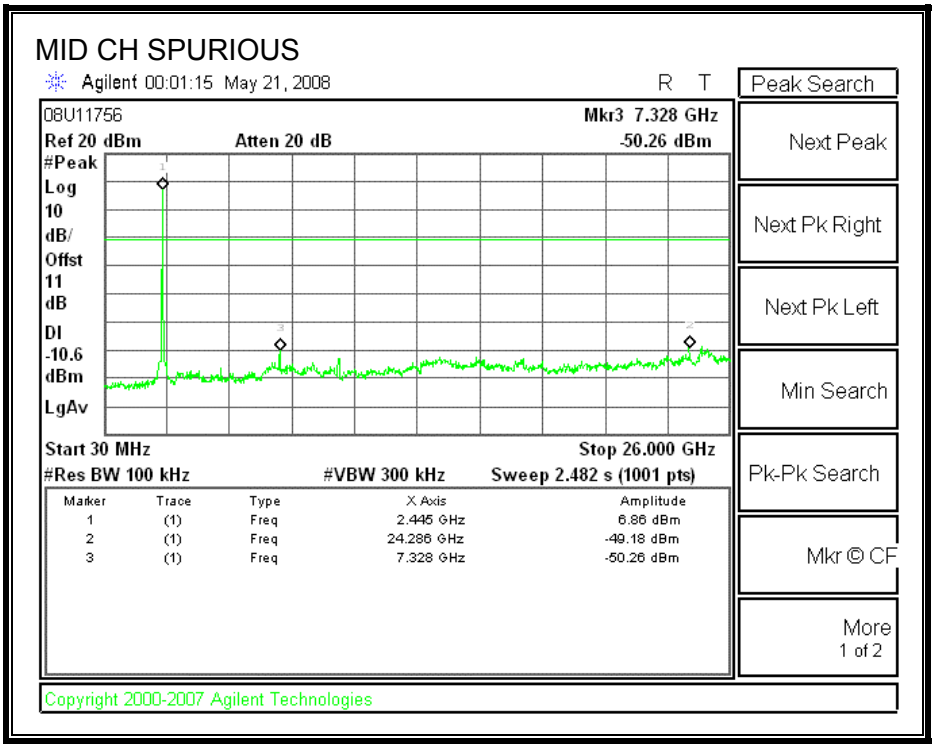
SPURIOUS EMISSIONS, LOW CHANNEL



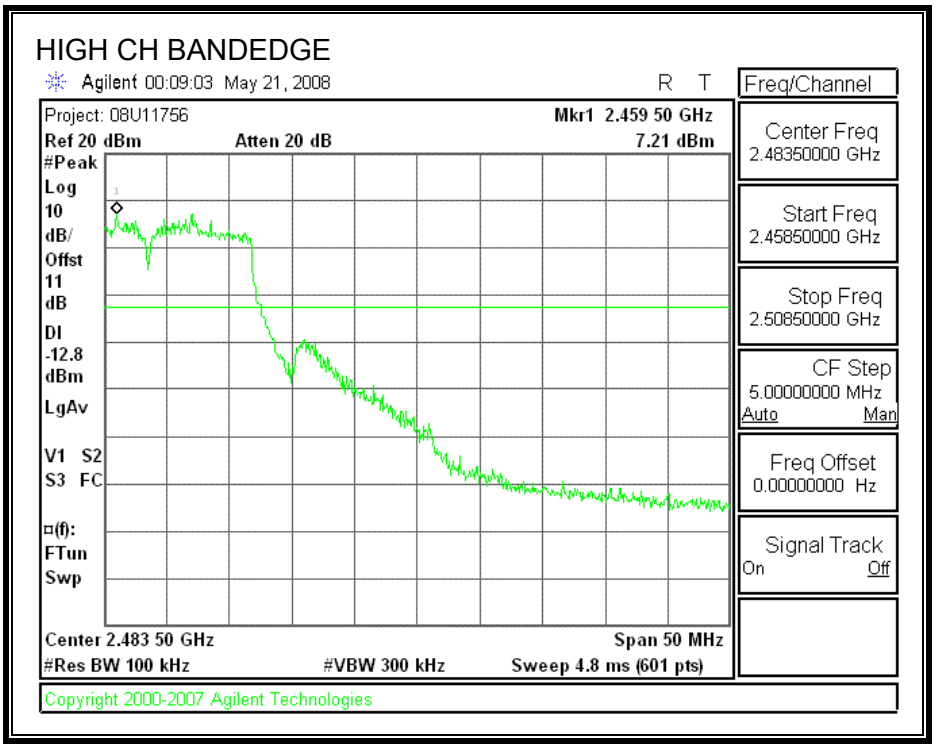


SPURIOUS EMISSIONS, MID CHANNEL

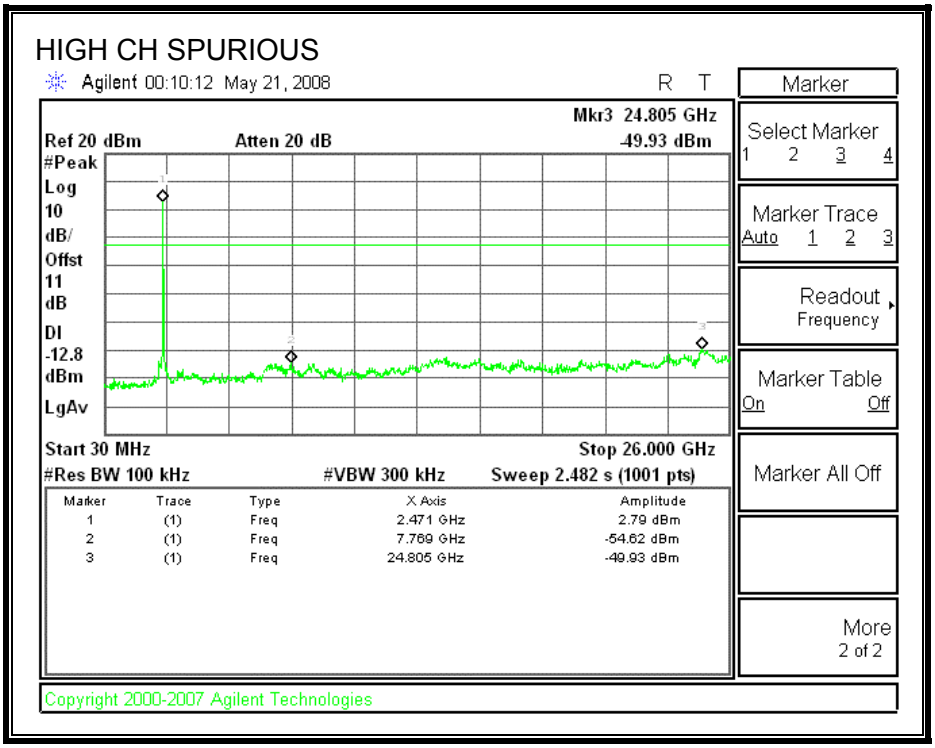




SPURIOUS EMISSIONS, HIGH CHANNEL



HIGH CH SPURIOUS



8.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

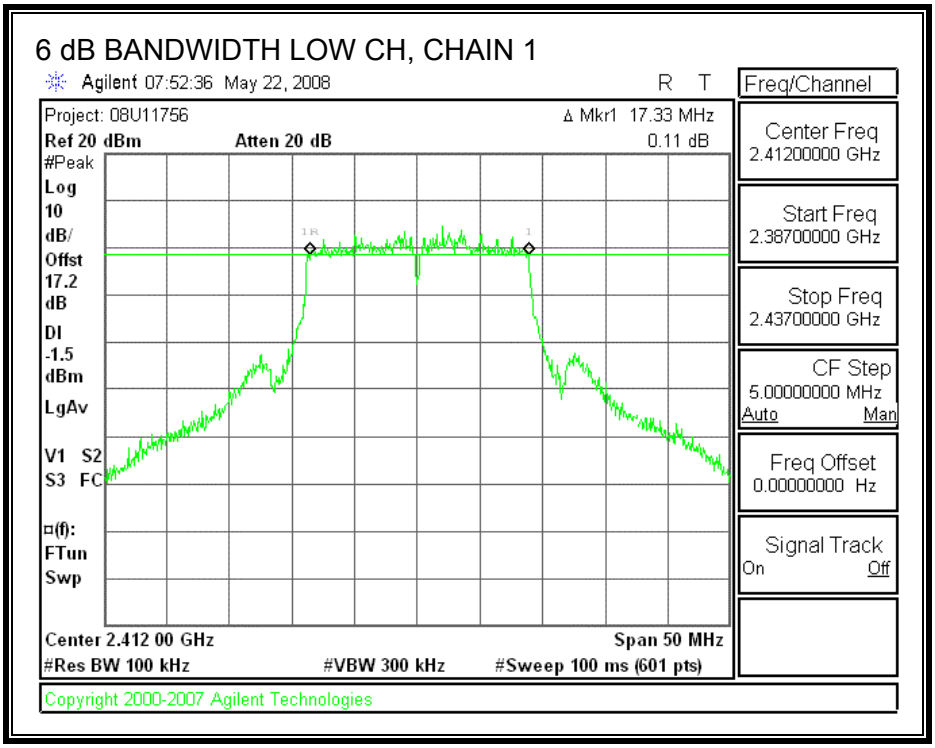
TEST PROCEDURE

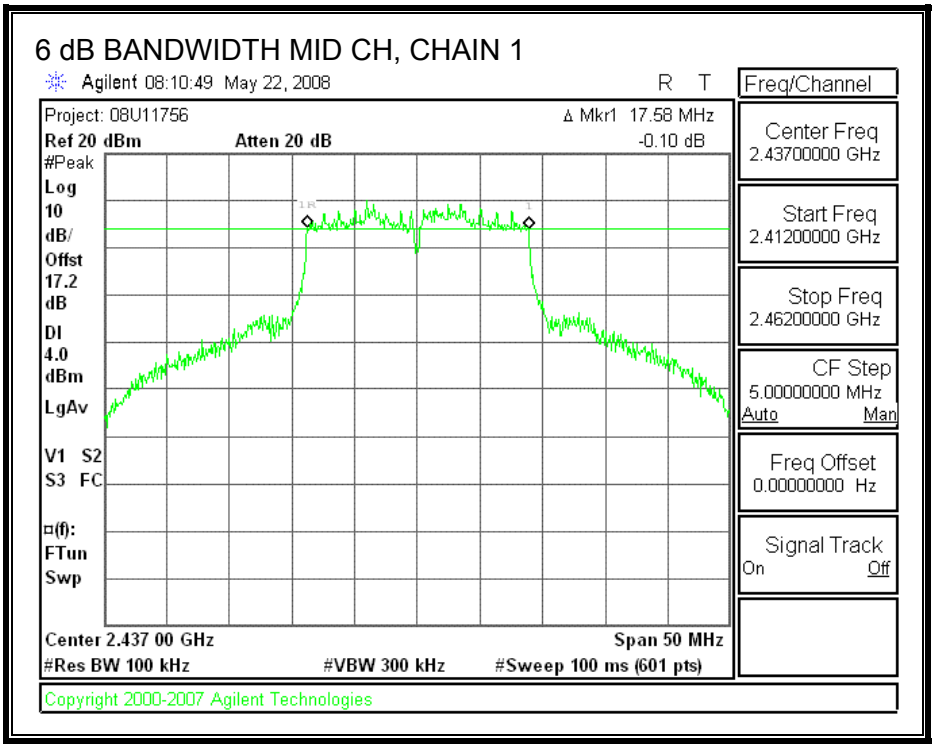
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

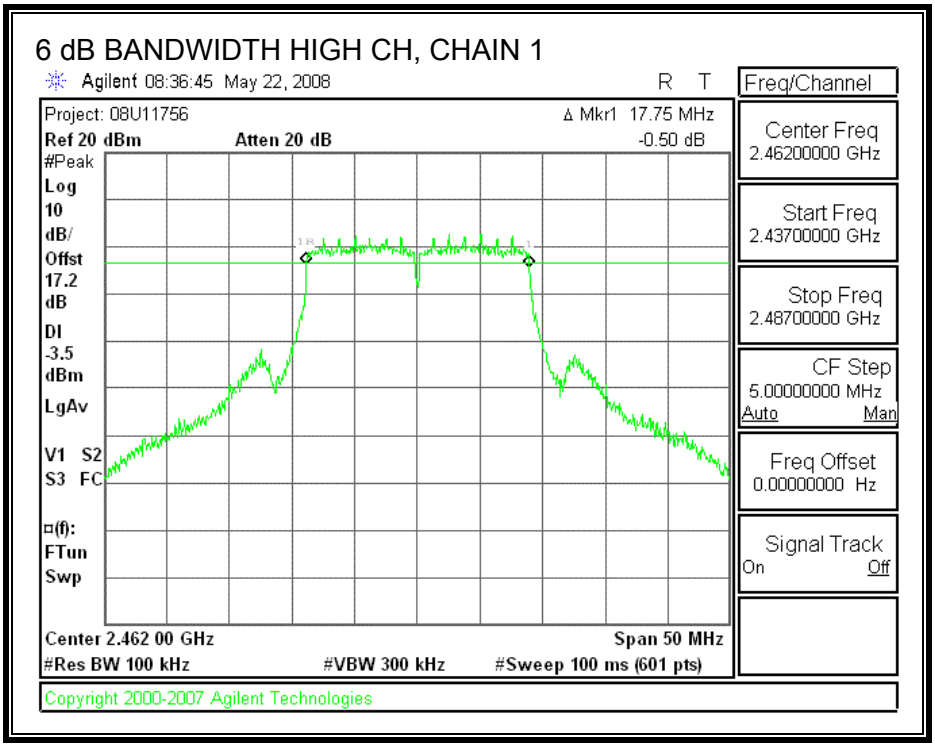
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	17.33	17.75	0.5
Middle	2437	17.58	17.67	0.5
High	2462	17.75	17.58	0.5

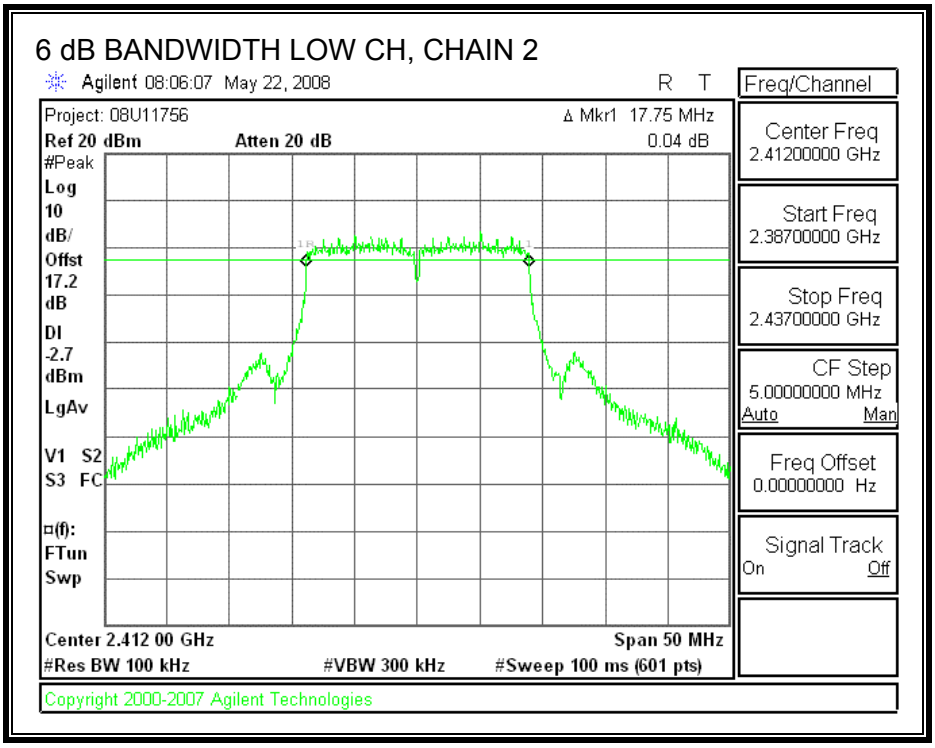
6 dB BANDWIDTH, CHAIN 1

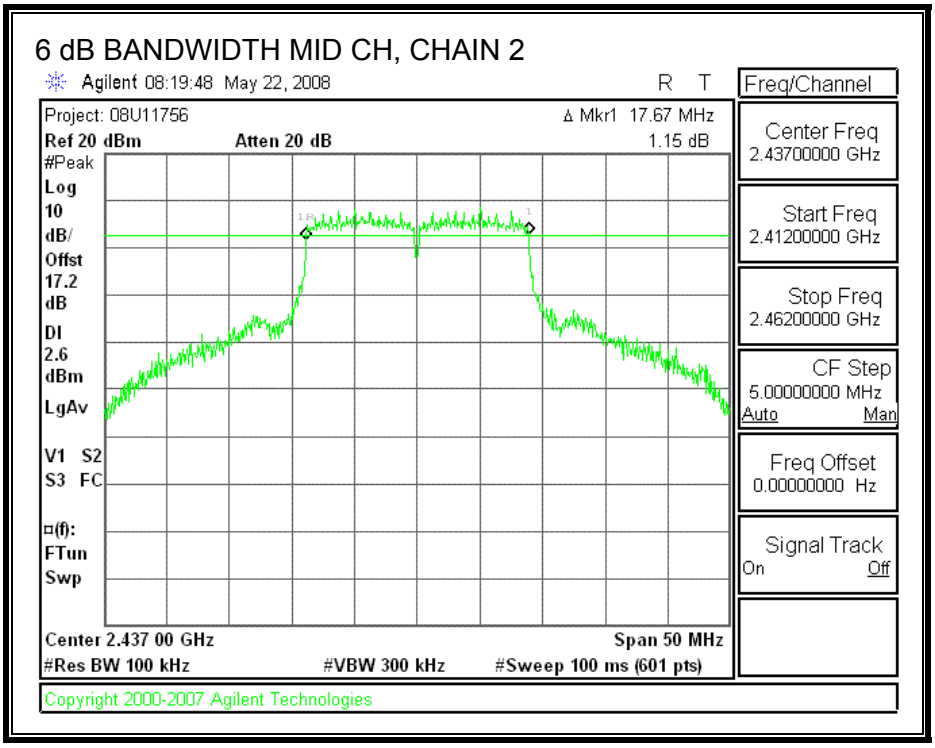


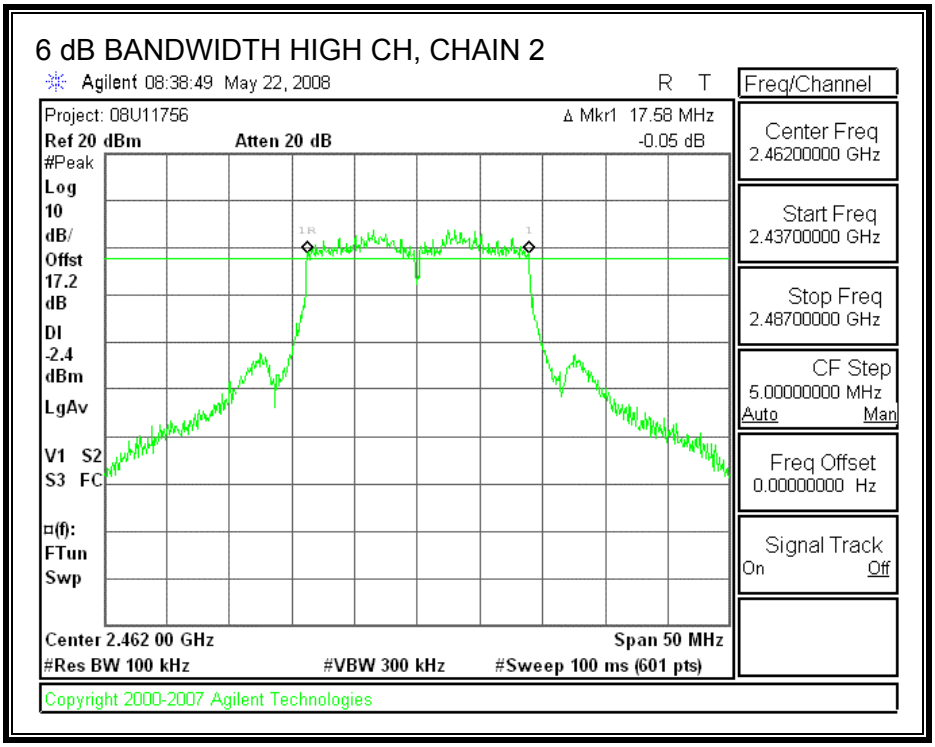




6 dB BANDWIDTH, CHAIN 2







8.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

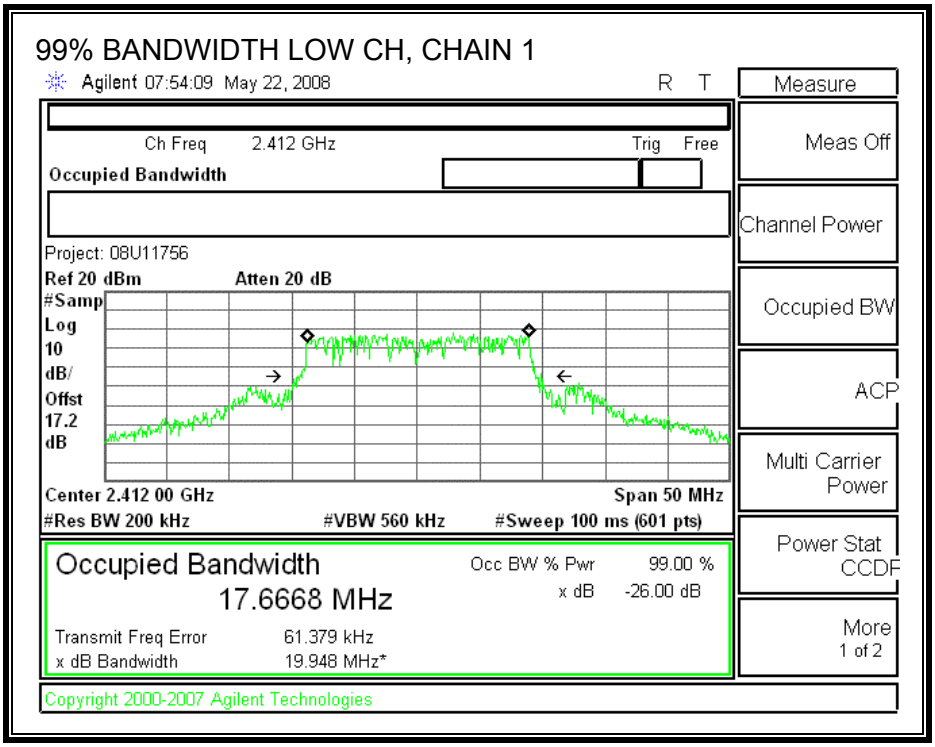
TEST PROCEDURE

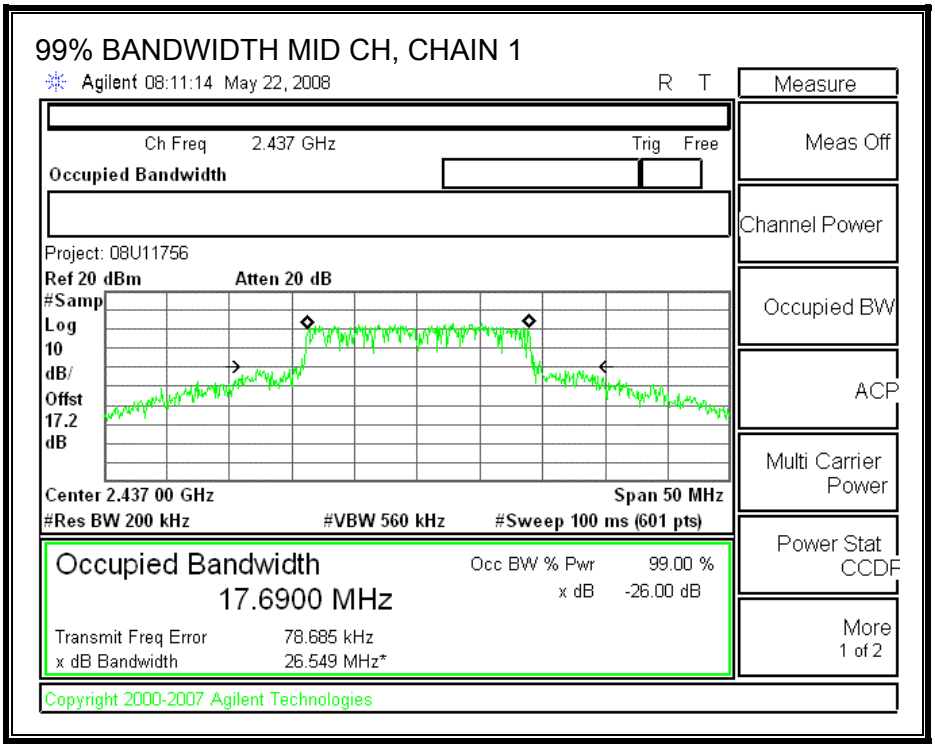
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

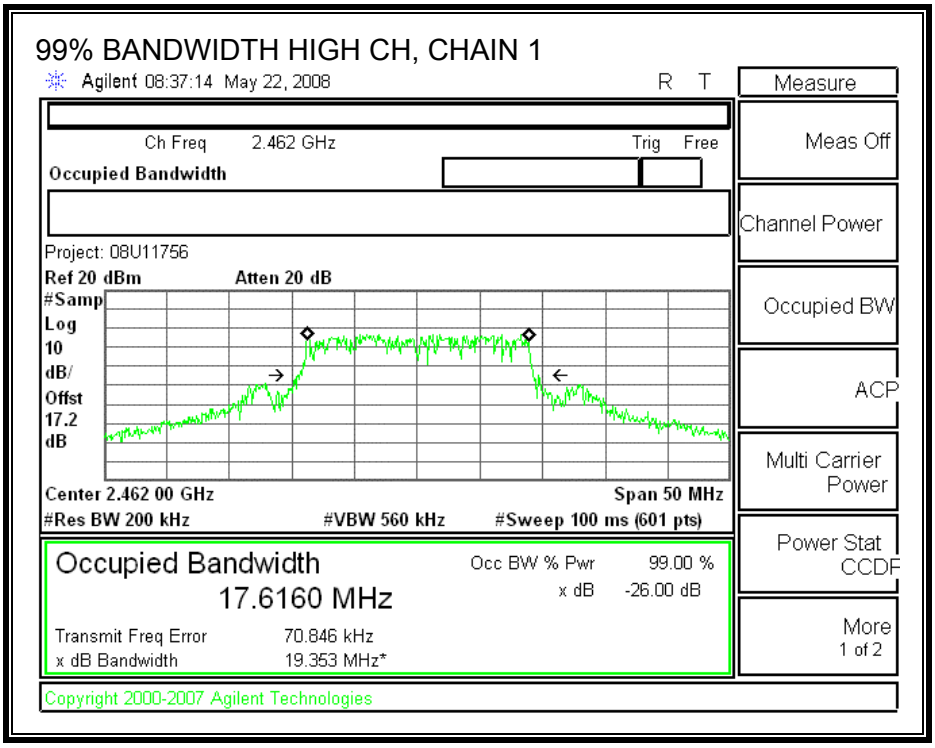
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	17.6668	17.6314
Middle	2437	17.69	17.7108
High	2462	17.616	17.5446

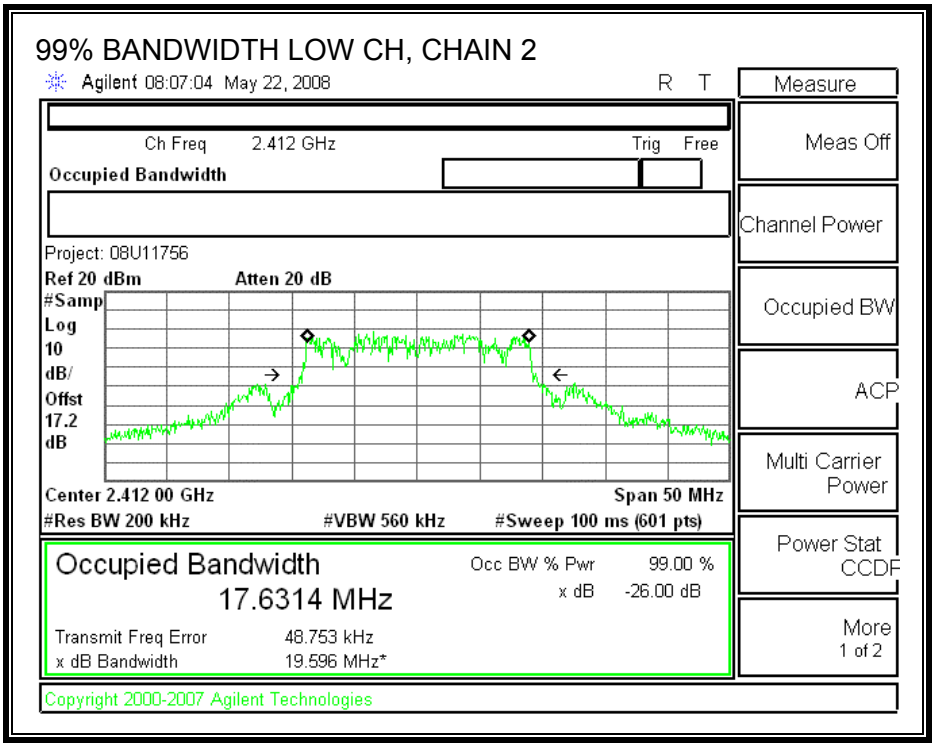
99% BANDWIDTH, CHAIN 1

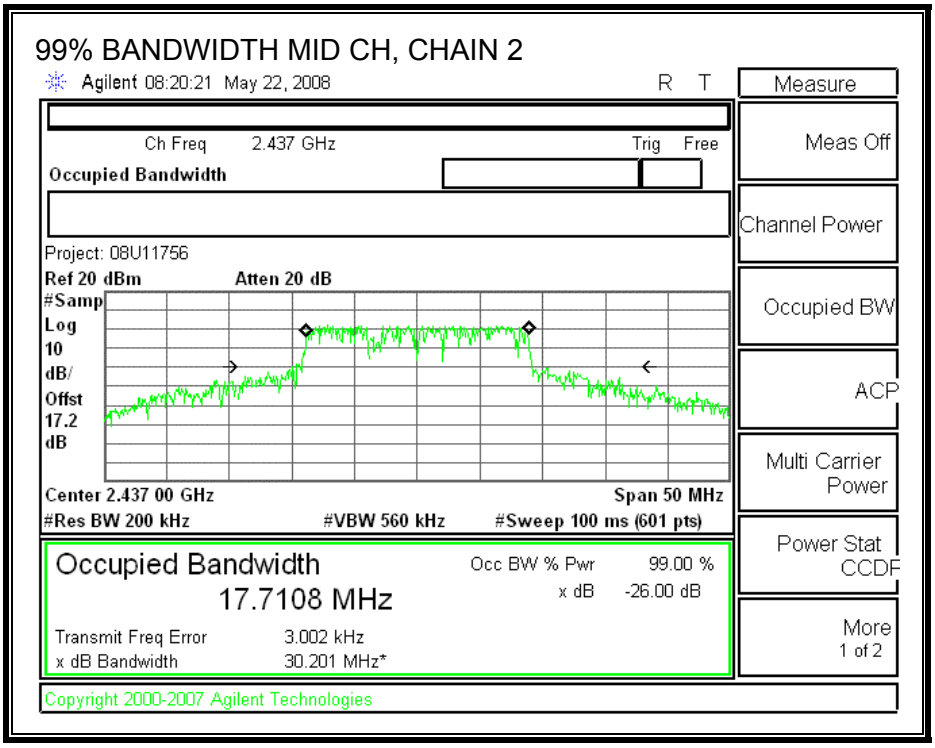


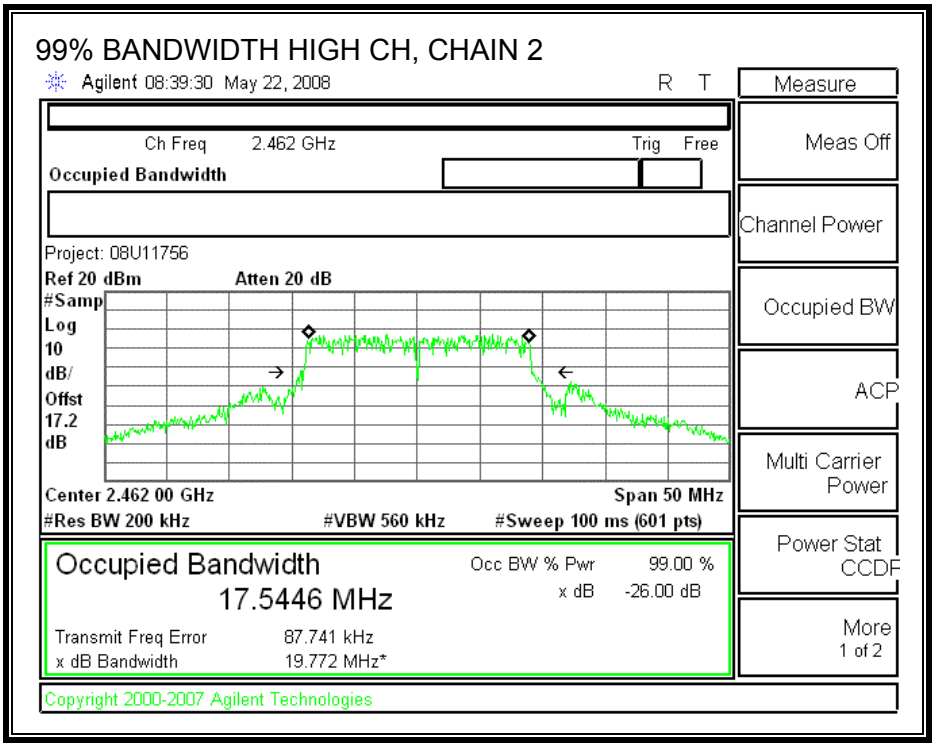




99% BANDWIDTH, CHAIN 2







8.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)

The maximum antenna gain is 6.2 dBi, therefore the limit is 29.8 dBm.

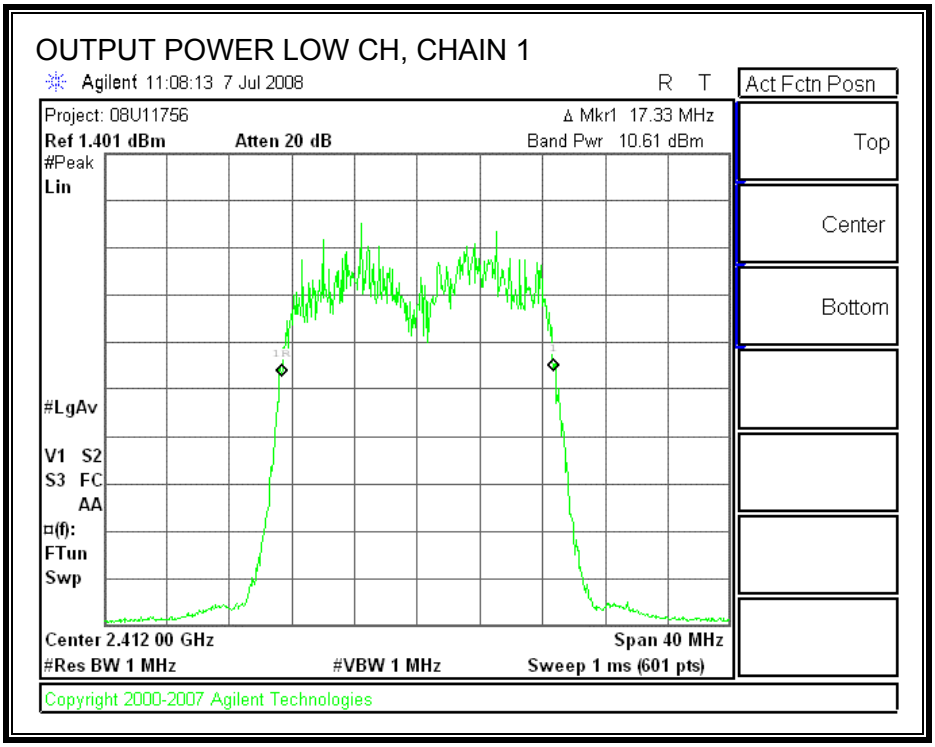
TEST PROCEDURE

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

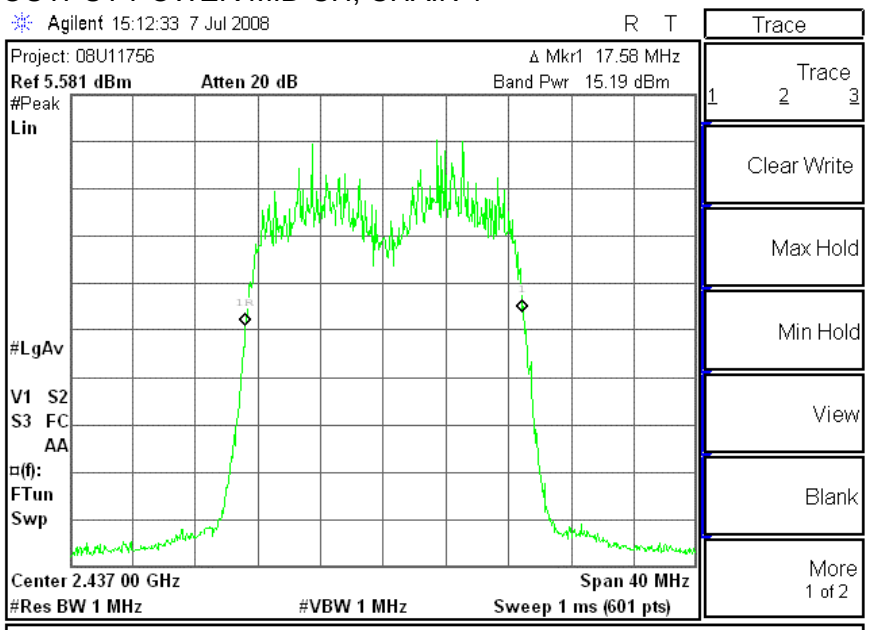
RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator - Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2412	29.80	10.61	11.90	11	25.31	-4.49
Mid	2437	29.80	15.19	16.15	11	29.71	-0.09
High	2462	29.80	10.13	11.45	11	24.85	-4.95

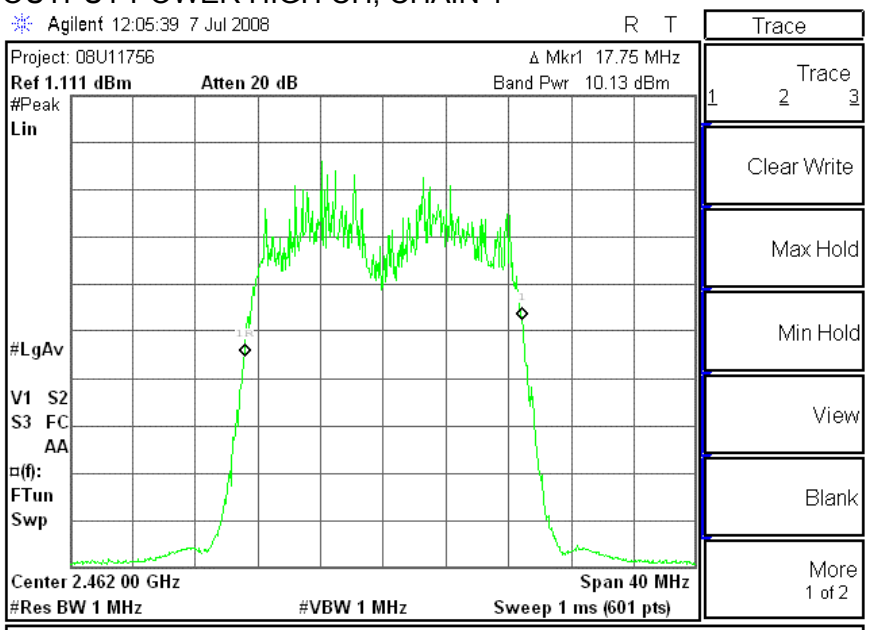
CHAIN 1 OUTPUT POWER



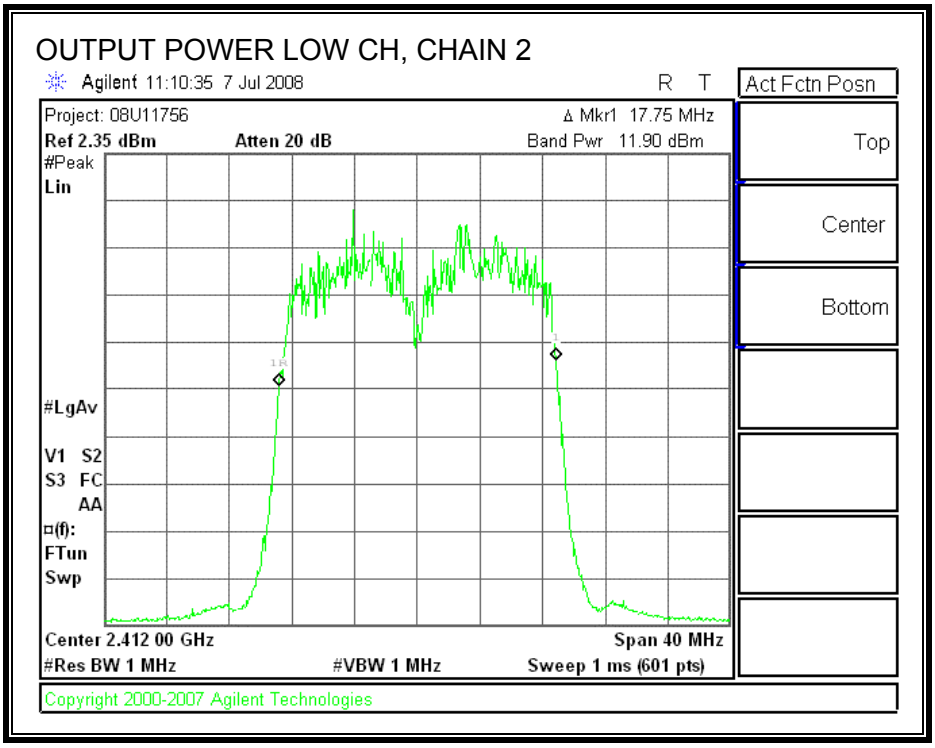
OUTPUT POWER MID CH, CHAIN 1

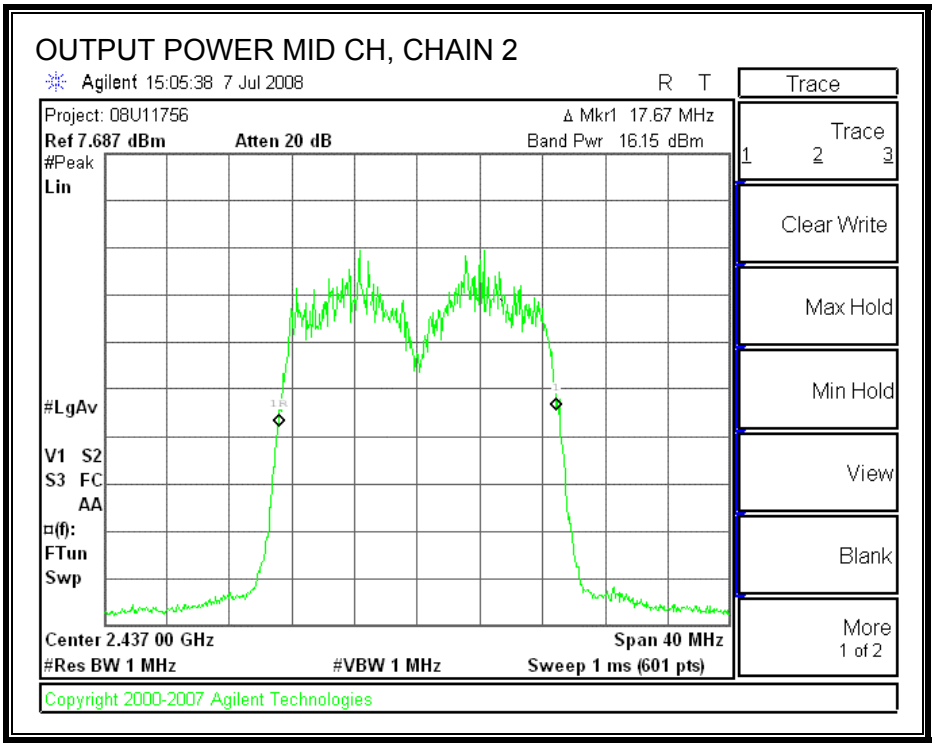


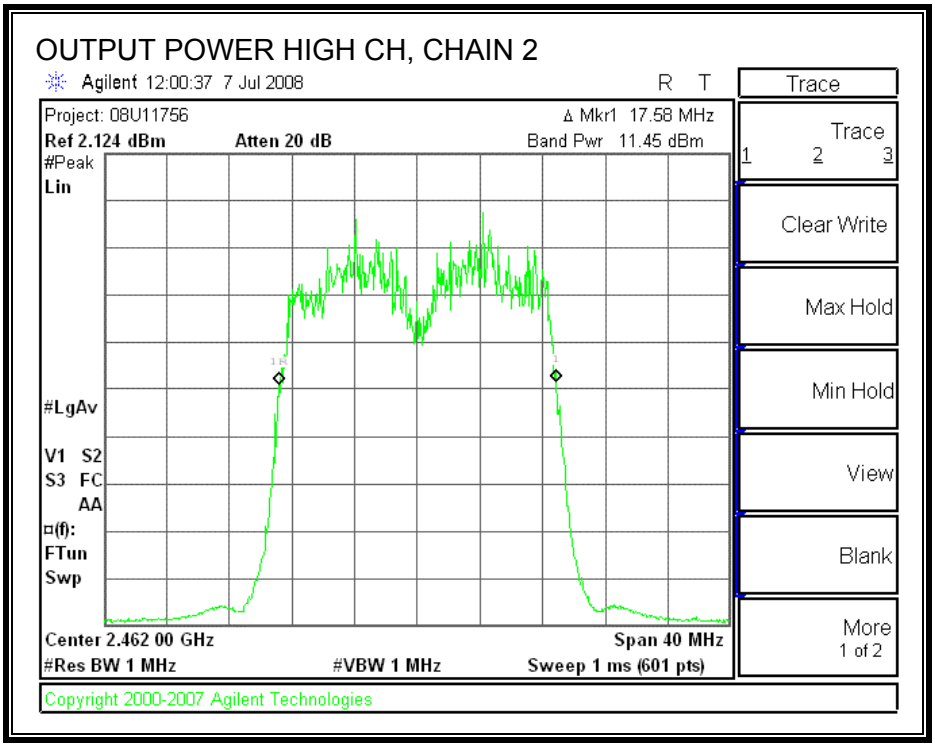
OUTPUT POWER HIGH CH, CHAIN 1



CHAIN 2 OUTPUT POWER







8.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e), IC RSS-210 A8.2 (b), 3.10.1 (6) (6.2.2)
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.

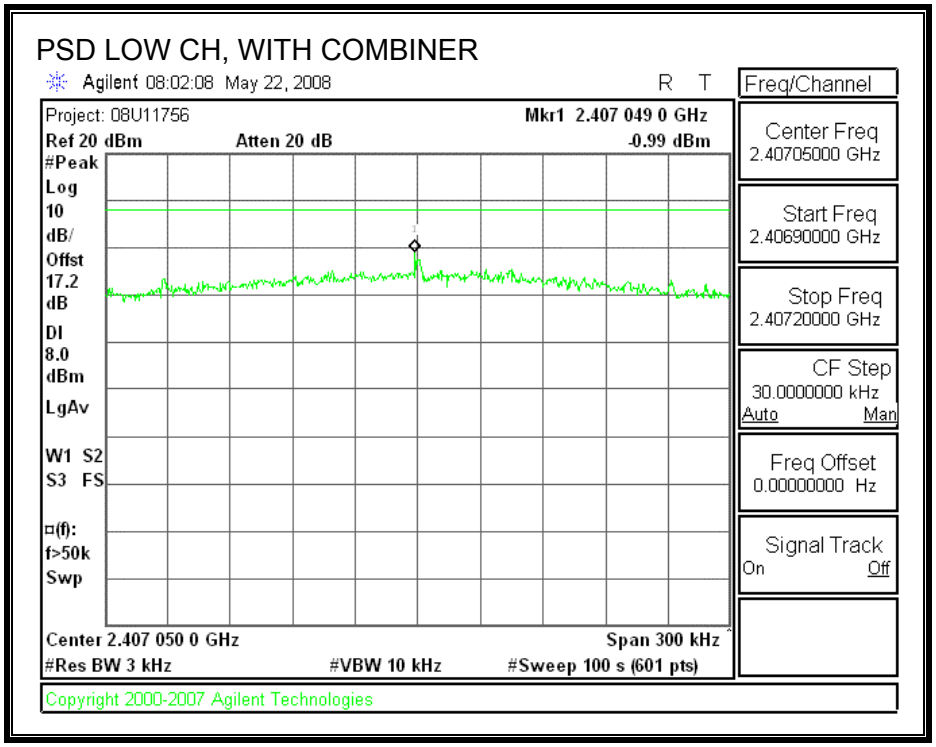
TEST PROCEDURE

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.

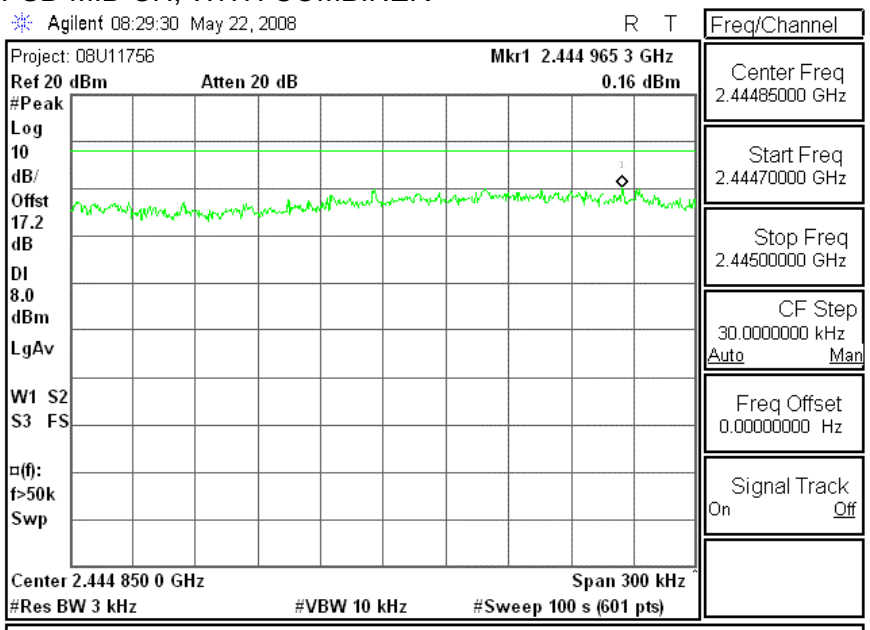
RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-0.99	8	-8.99
Middle	2437	0.16	8	-7.84
High	2462	-4.05	8	-12.05

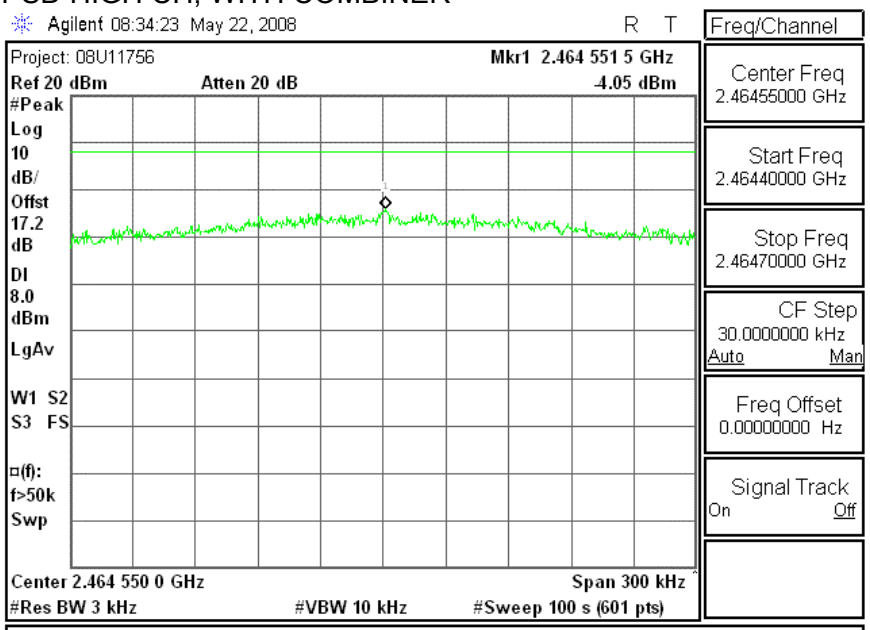
POWER SPECTRAL DENSITY, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



8.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

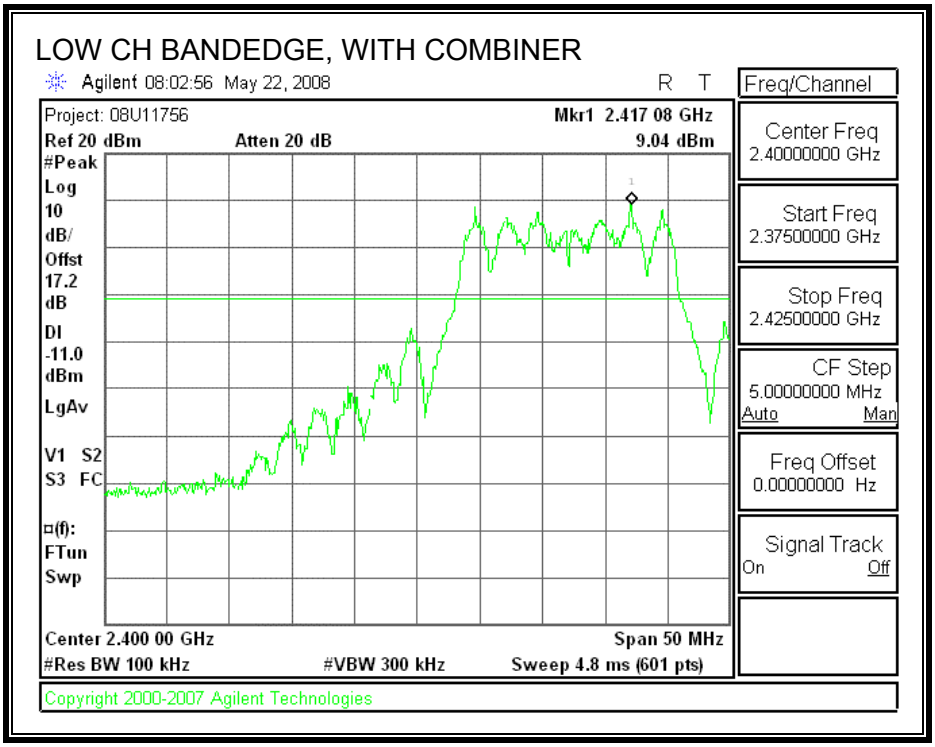
FCC §15.247 (d), IC RSS-210 A8.5, LP0002 § 3.10.1 (5)
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

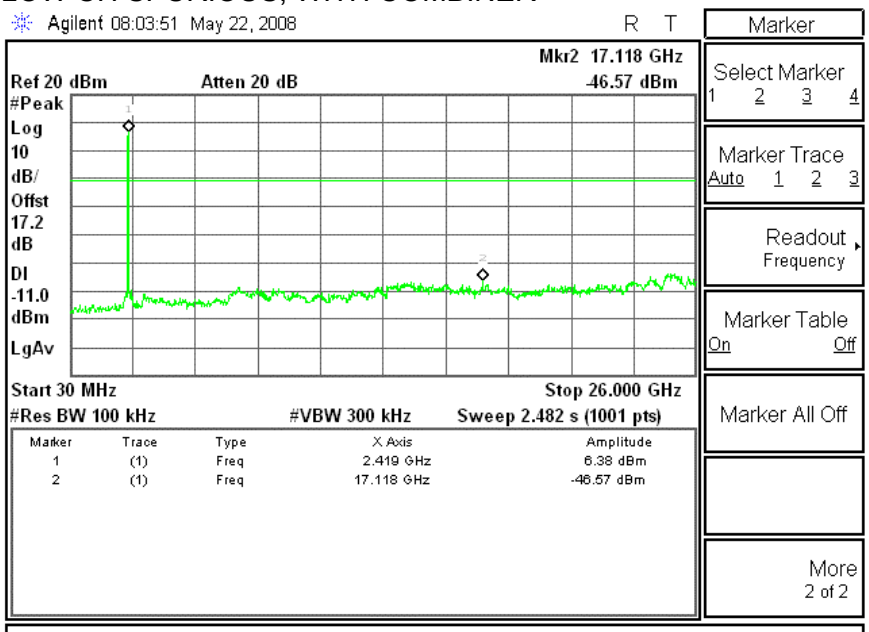
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

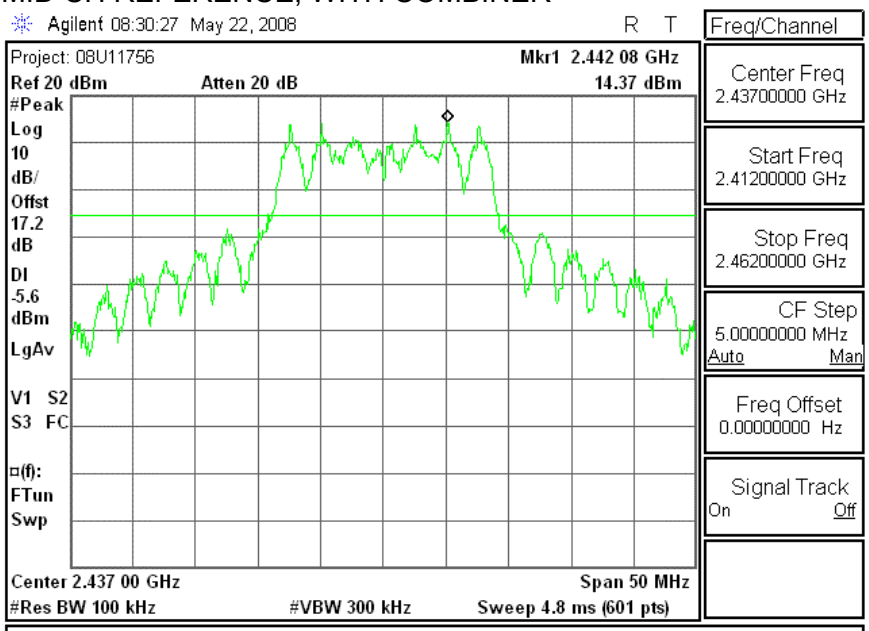
SPURIOUS EMISSIONS WITH COMBINER



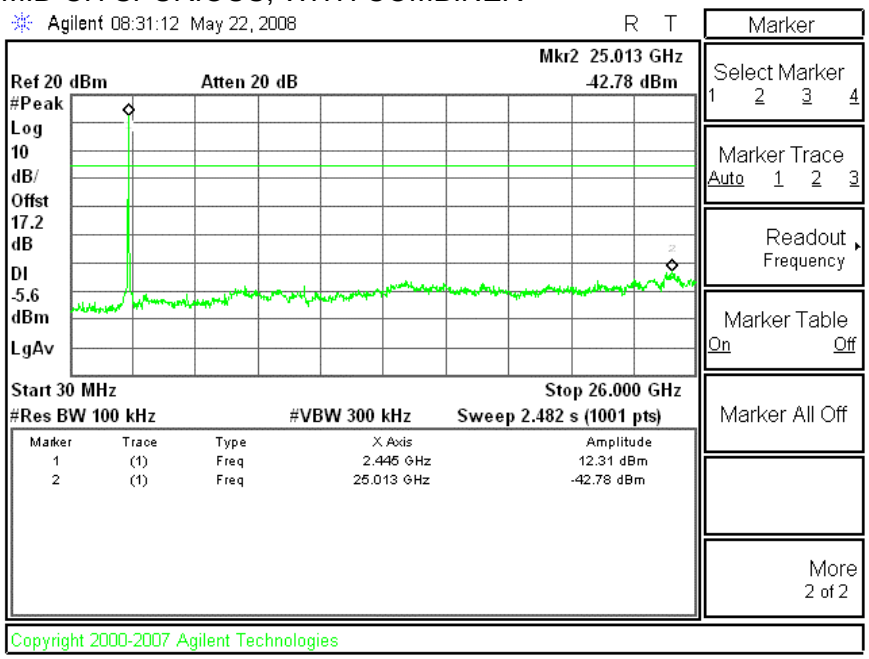
LOW CH SPURIOUS, WITH COMBINER



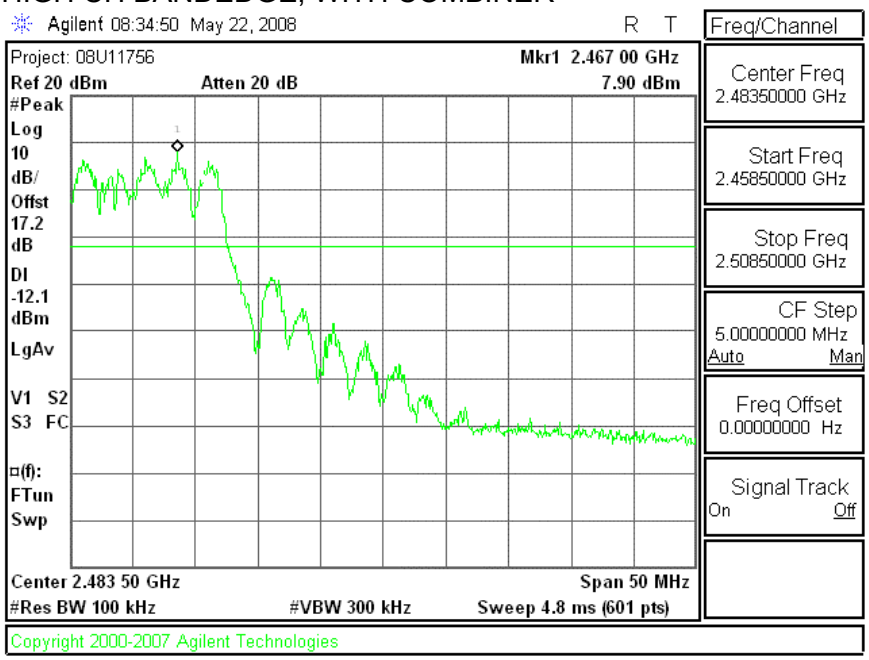
MID CH REFERENCE, WITH COMBINER



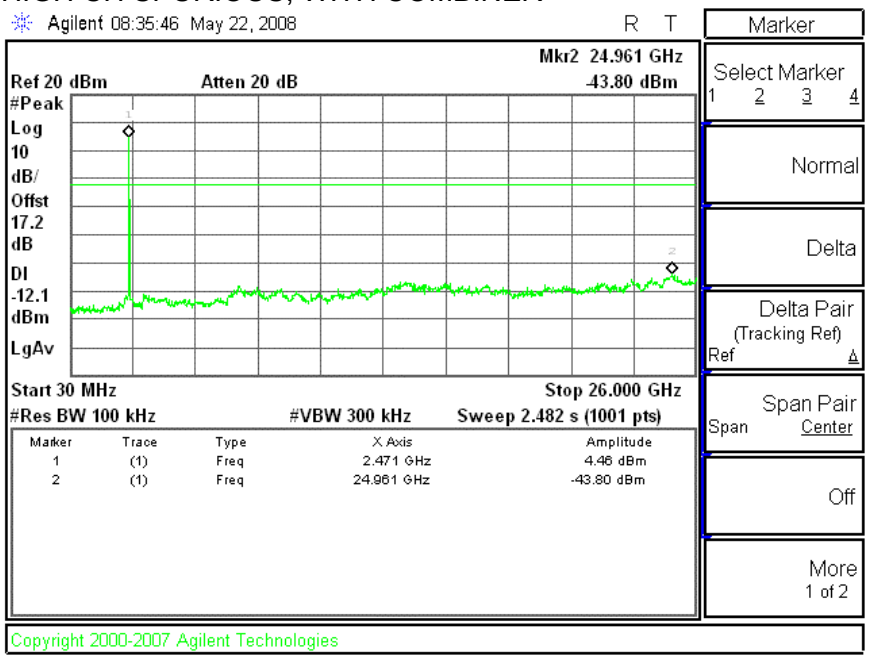
MID CH SPURIOUS, WITH COMBINER



HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, WITH COMBINER



8.4. 802.11n HT40 SISO MODE IN THE 2.4 GHz BAND

8.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

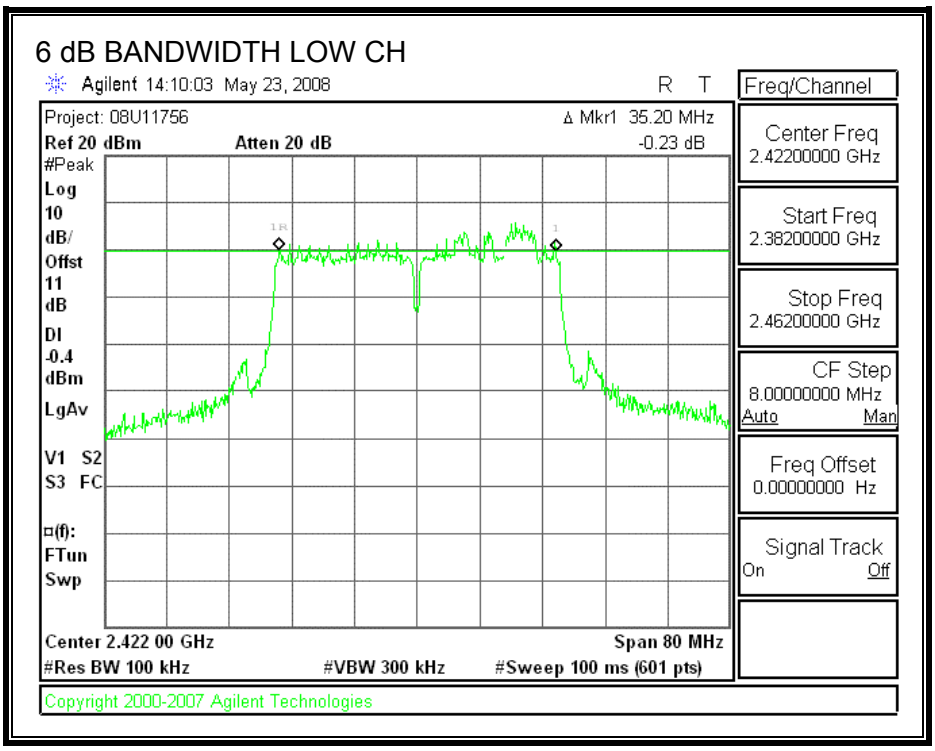
TEST PROCEDURE

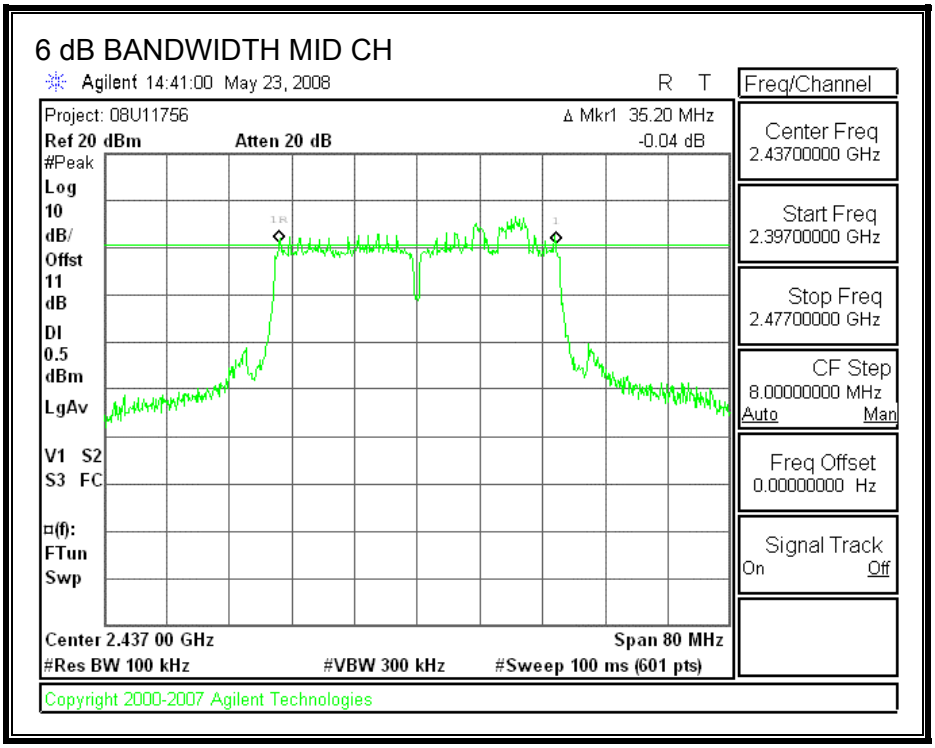
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

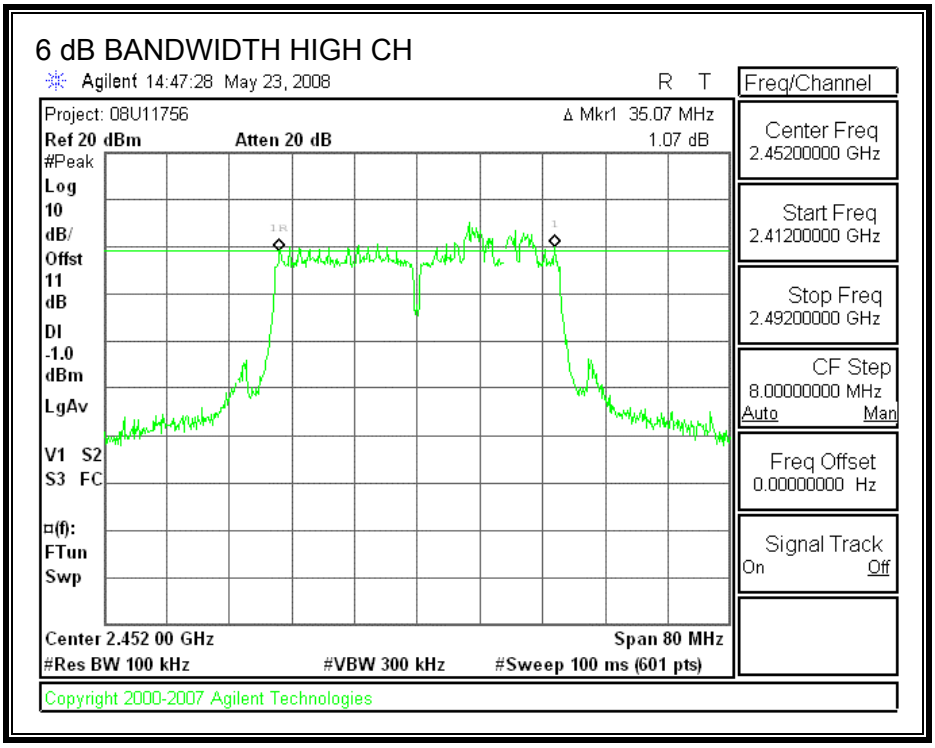
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2422	35.20	0.5
Middle	2437	35.20	0.5
High	2452	35.07	0.5

6 dB BANDWIDTH







8.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

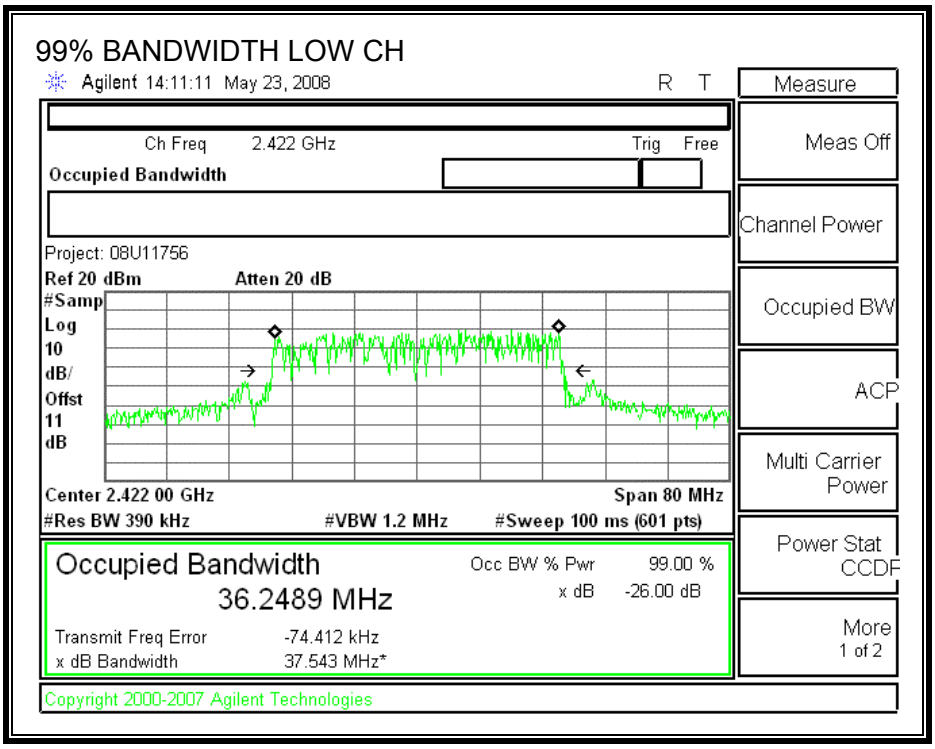
TEST PROCEDURE

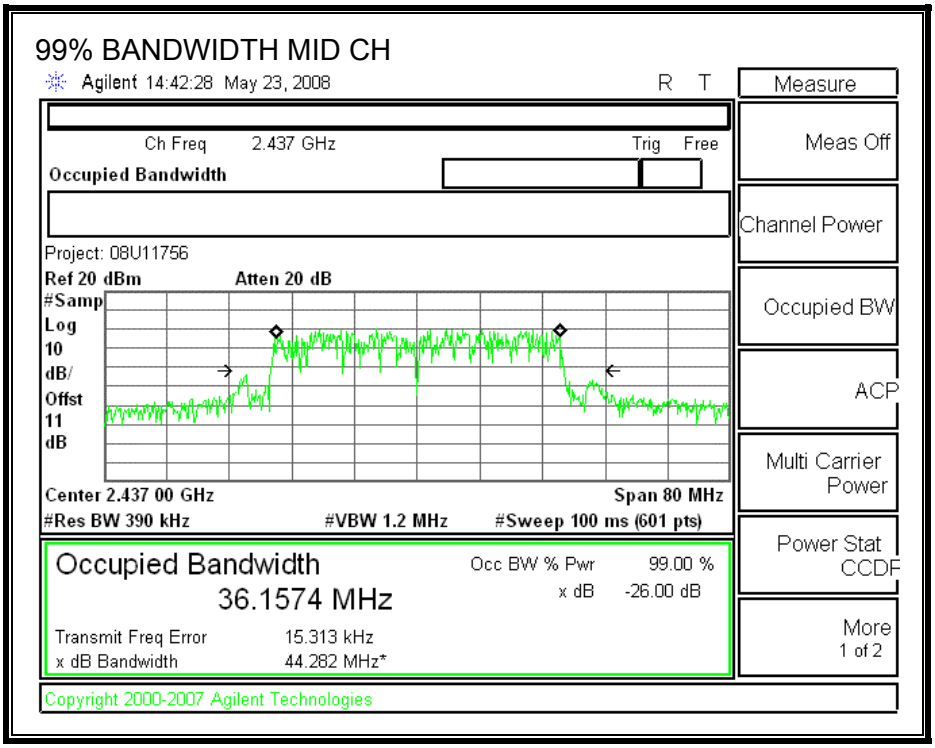
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

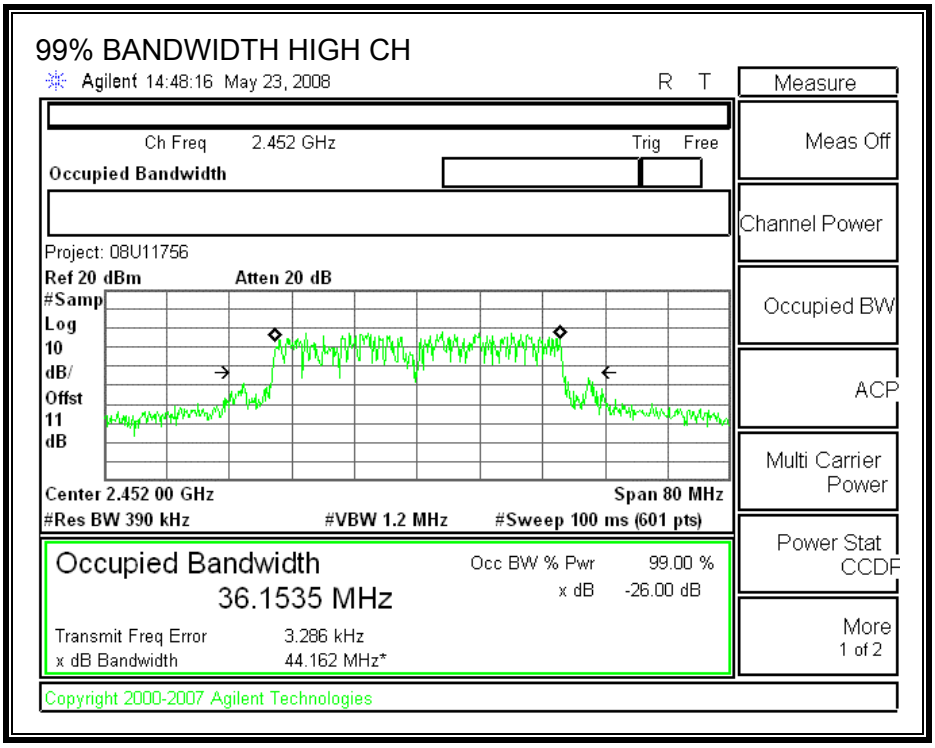
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	36.2489
Middle	2437	36.1574
High	2452	36.1535

99% BANDWIDTH







8.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is 6.2 dBi, therefore the limit is 29.8 dBm.

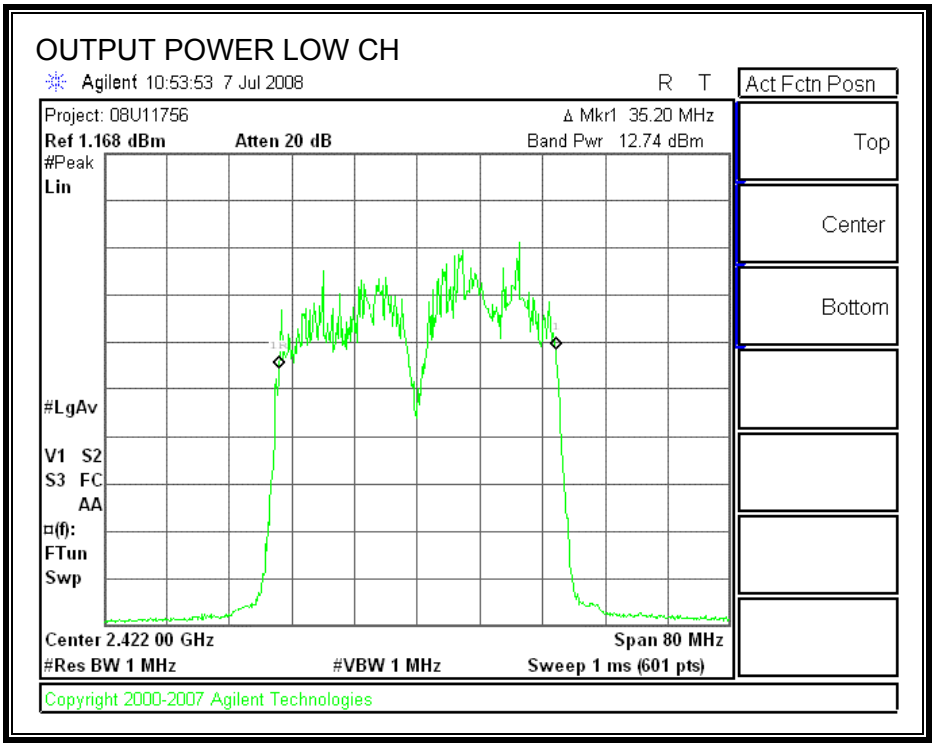
TEST PROCEDURE

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.

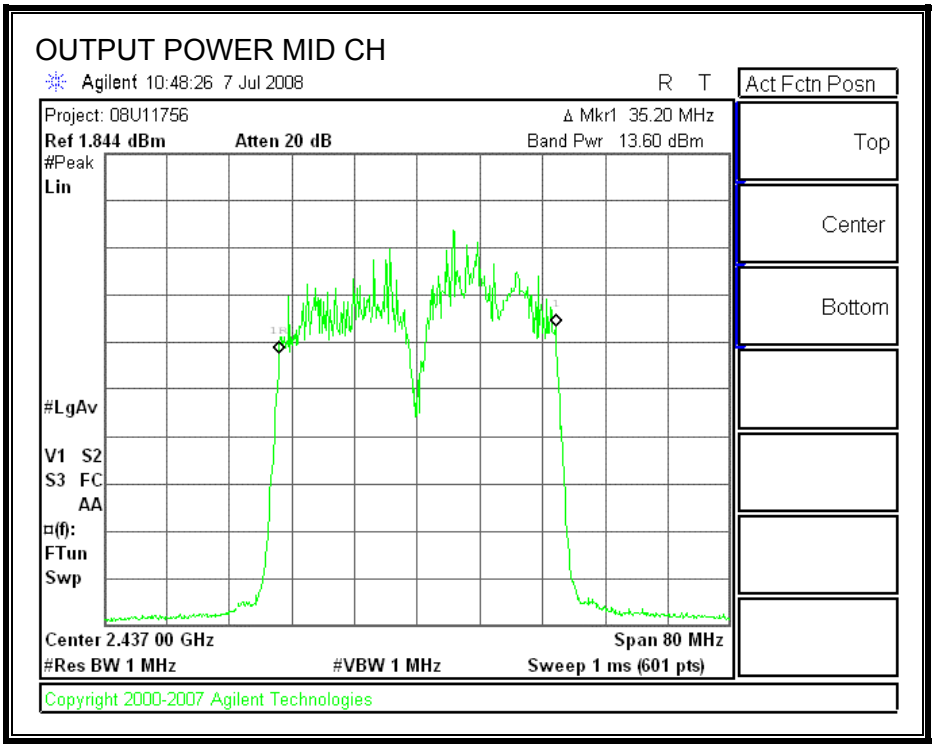
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	12.74	11	23.74	29.80	-6.06
Middle	2437	13.60	11	24.60	29.80	-5.20
High	2452	11.20	11	22.20	29.80	-7.60

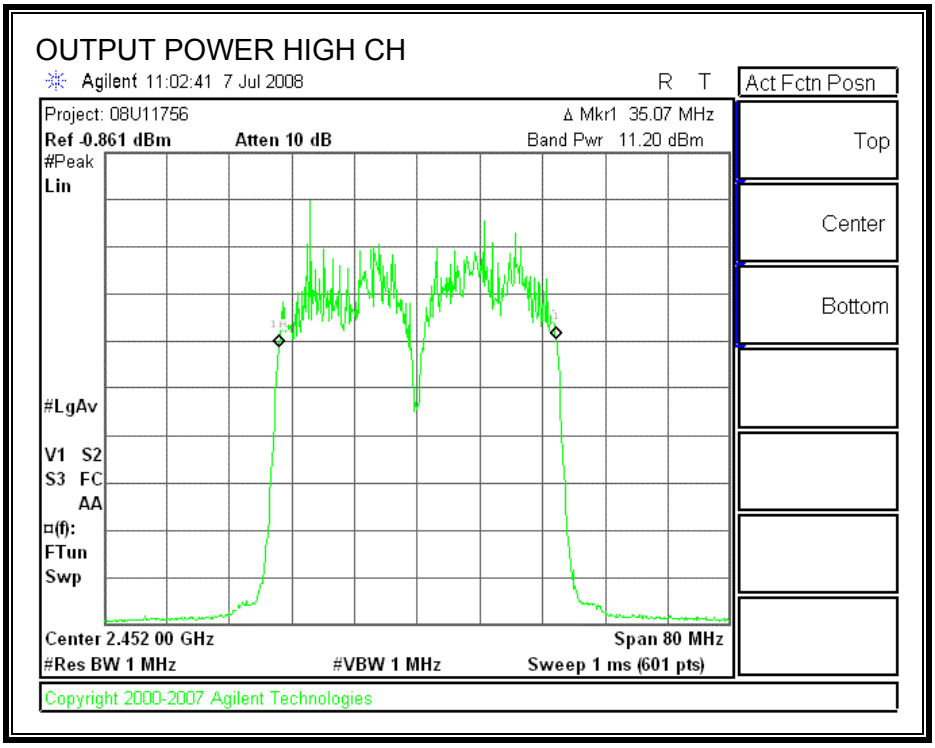
OUTPUT POWER



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



8.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e), IC RSS-210 A8.2 (b), 3.10.1 (6) (6.2.2)
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.

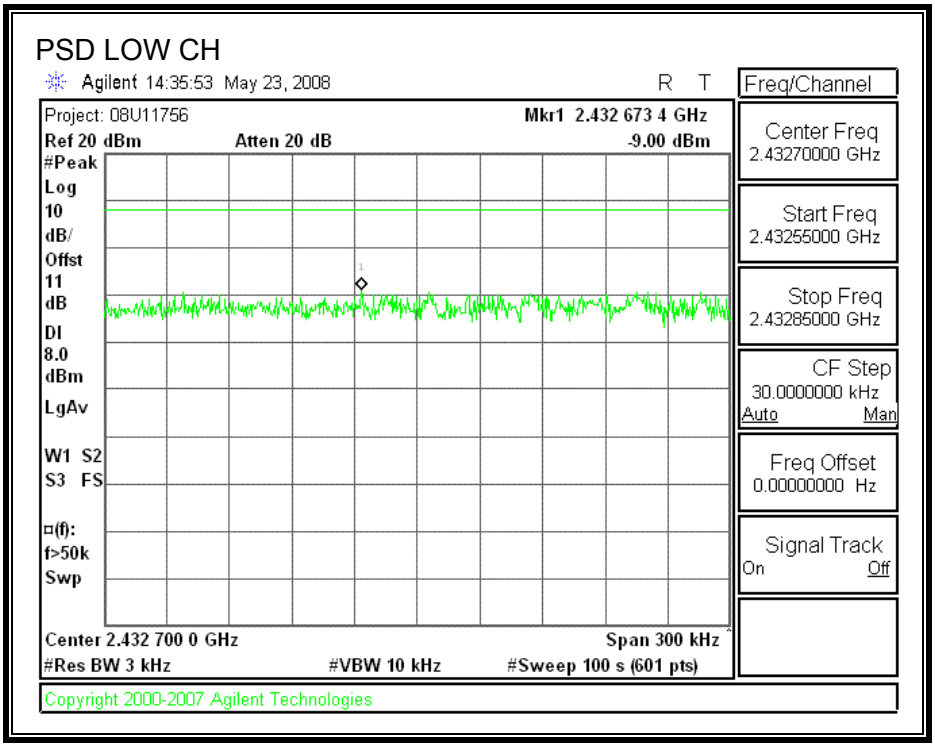
TEST PROCEDURE

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.

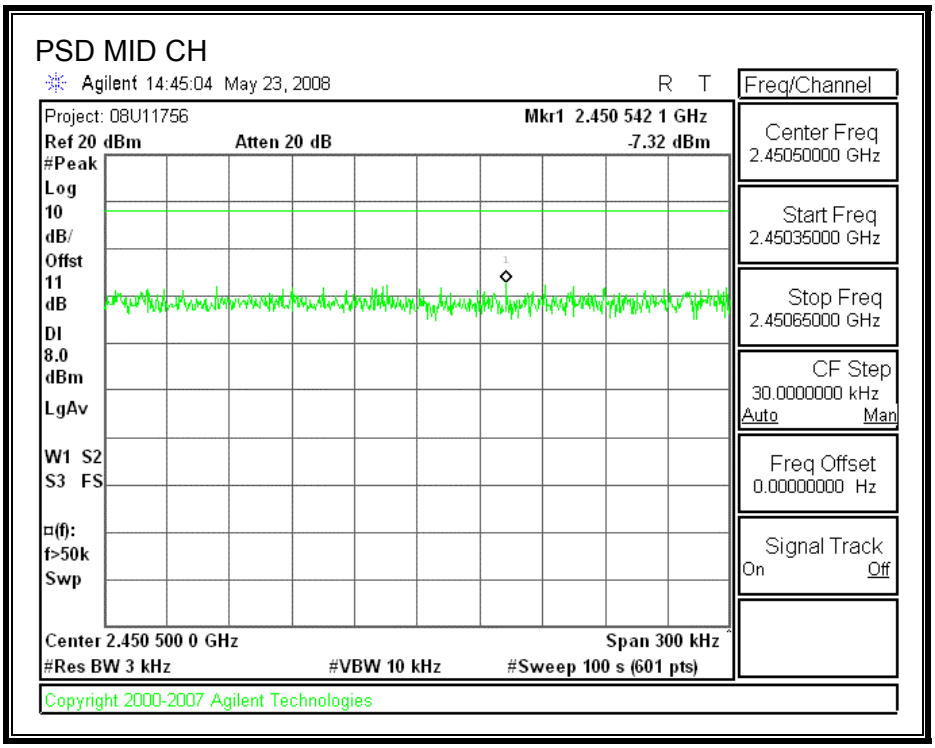
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-9.00	8	-17.00
Middle	2437	-7.32	8	-15.32
High	2462	-9.74	8	-17.74

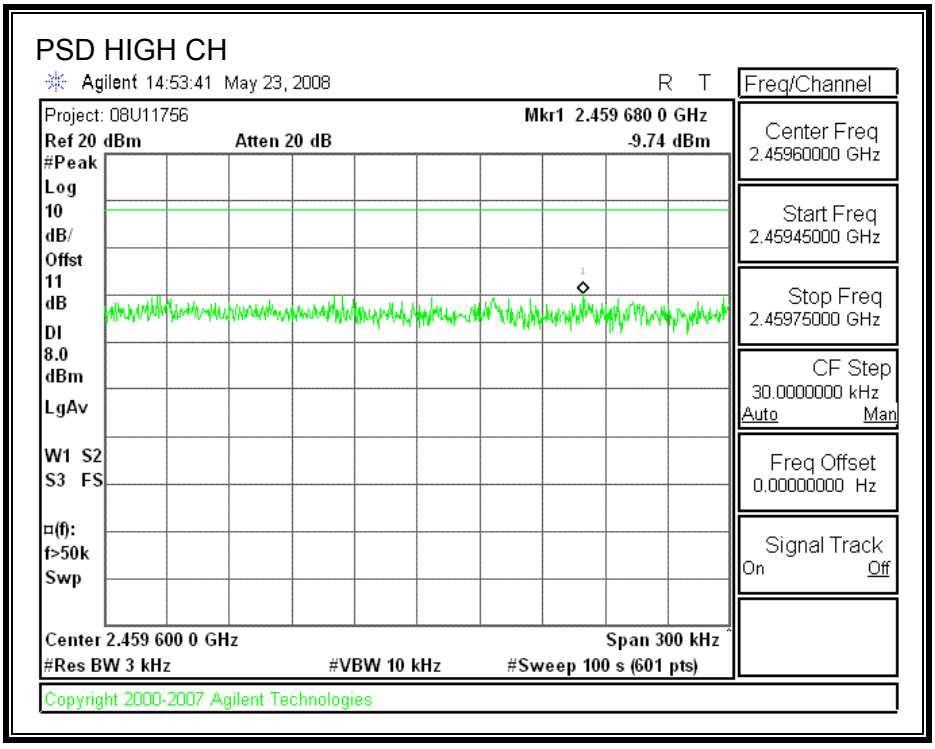
POWER SPECTRAL DENSITY



PSD MID CH



PSD HIGH CH



8.4.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

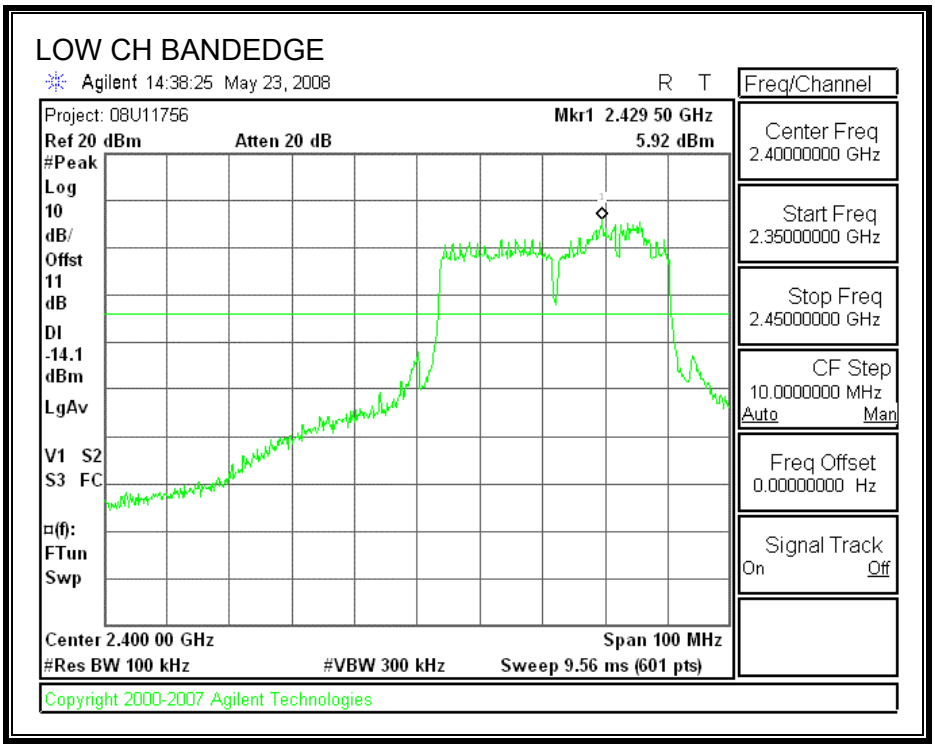
FCC §15.247 (d), IC RSS-210 A8.5, LP0002 § 3.10.1 (5)
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

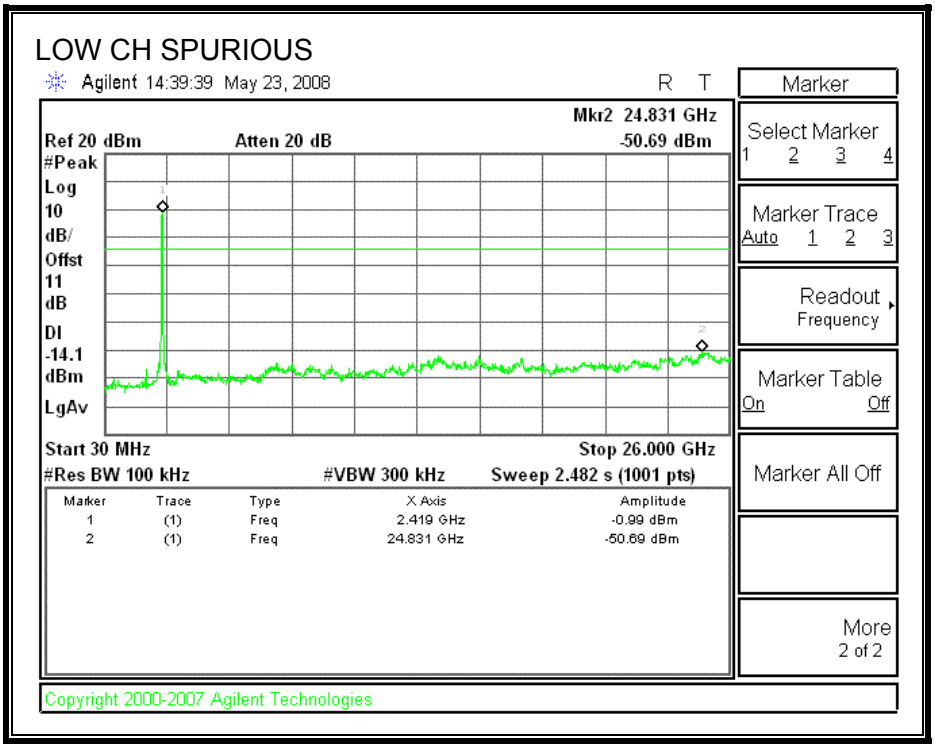
TEST PROCEDURE

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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

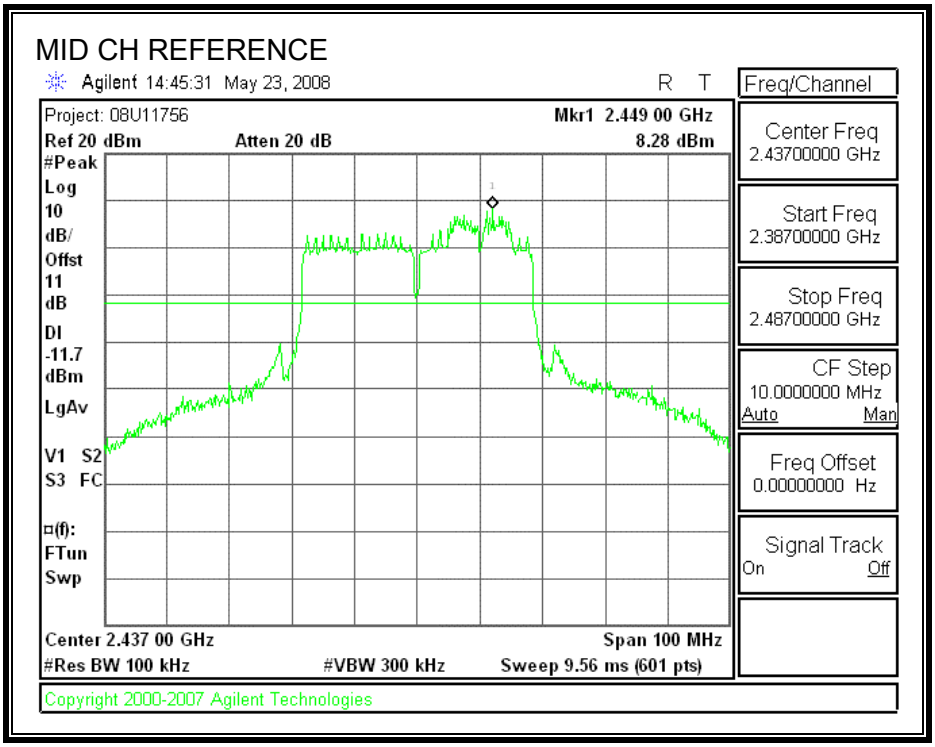
RESULTS

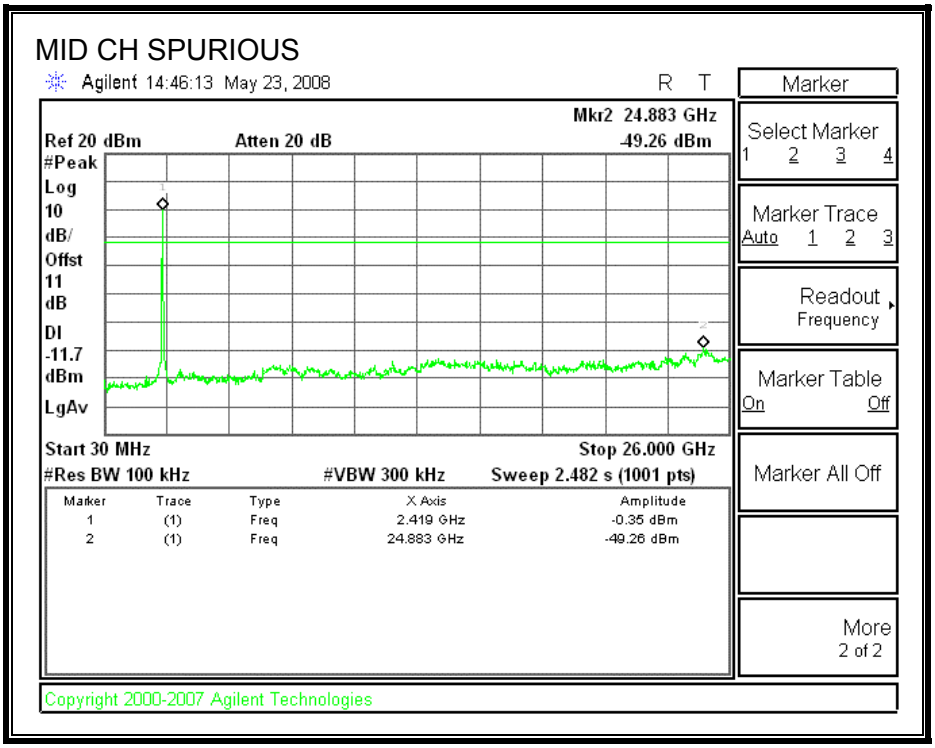
SPURIOUS EMISSIONS, LOW CHANNEL



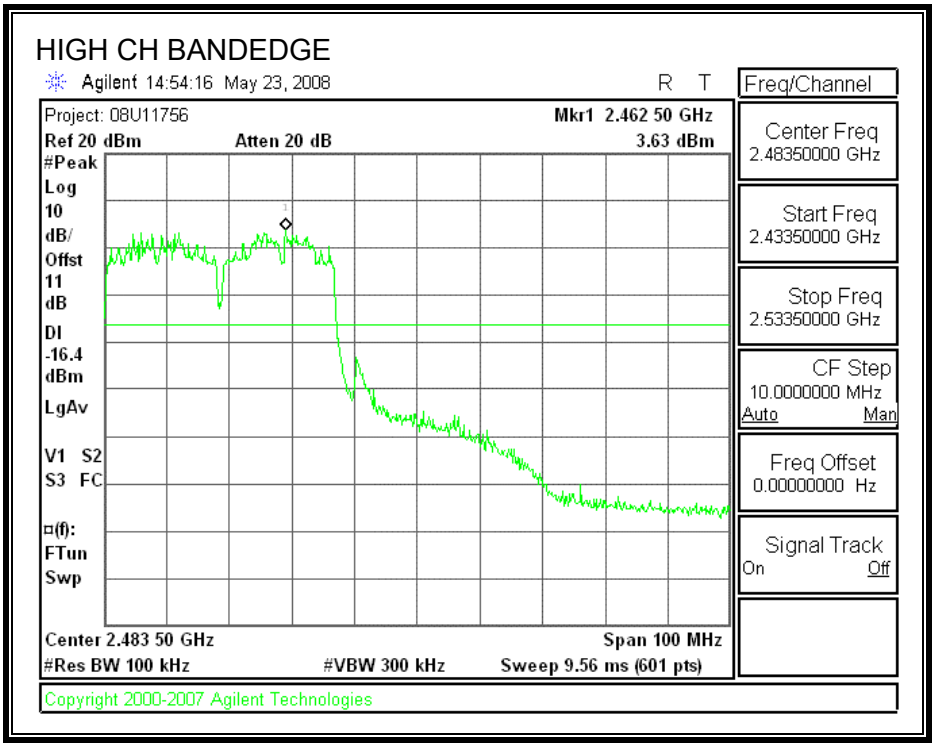


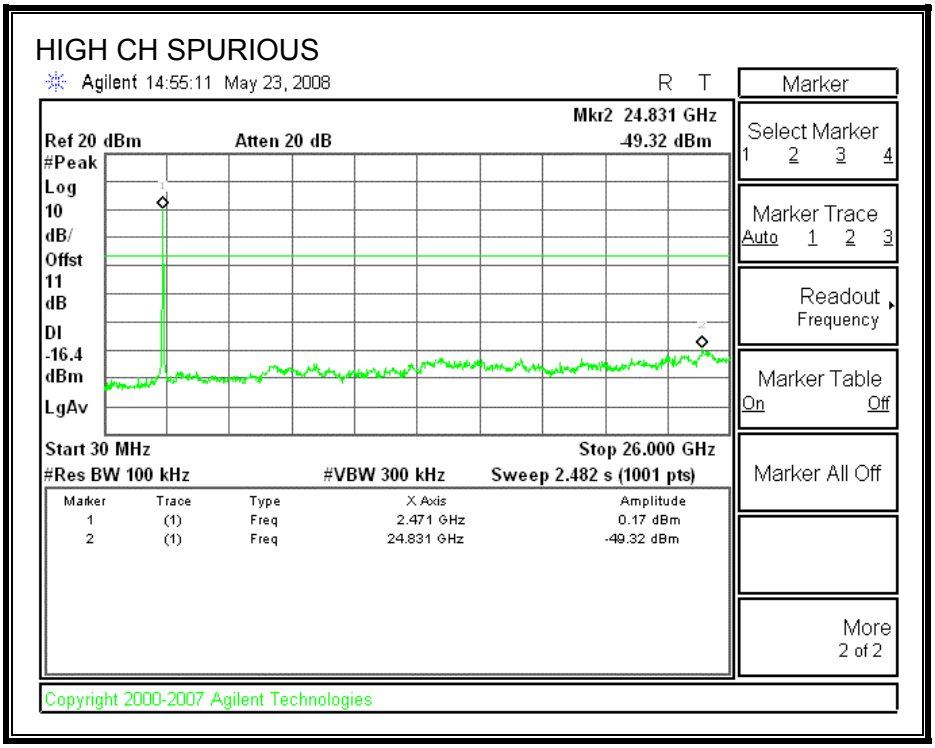
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





8.5. 802.11n HT40 MCS0 MODE IN THE 2.4 GHz BAND

8.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

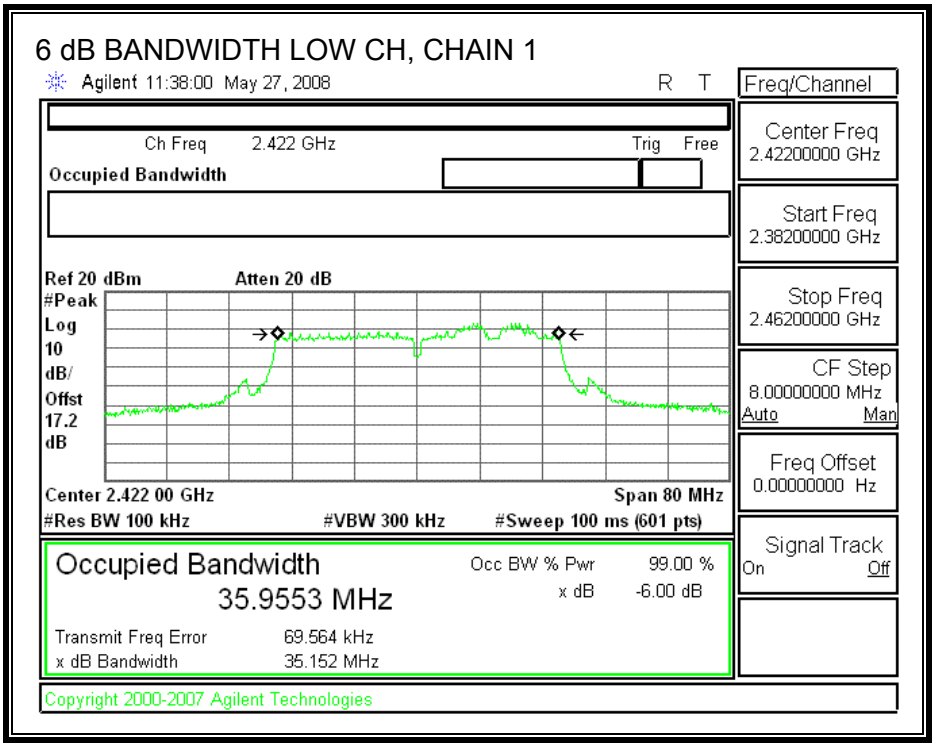
TEST PROCEDURE

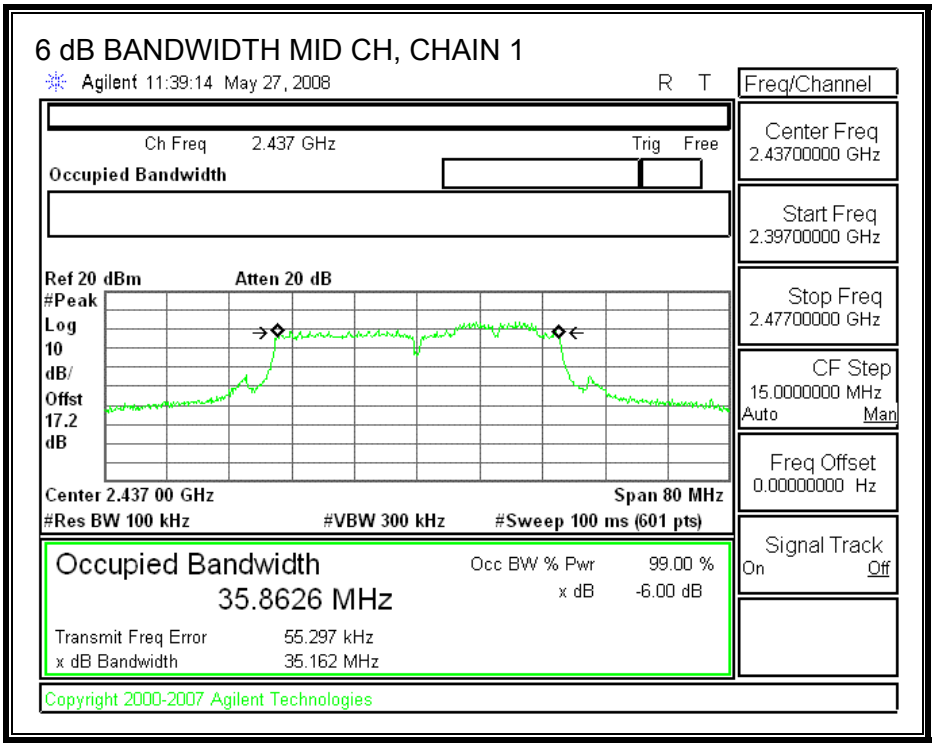
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

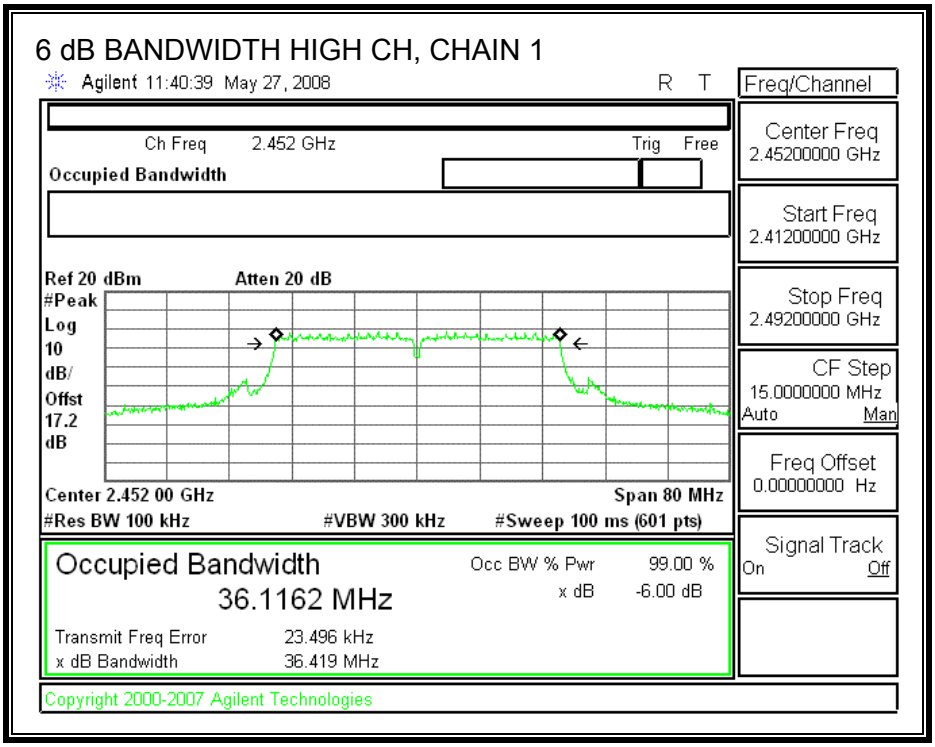
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2422	35.9553	36.0087	0.5
Middle	2437	35.8626	36.1312	0.5
High	2452	36.1162	36.0653	0.5

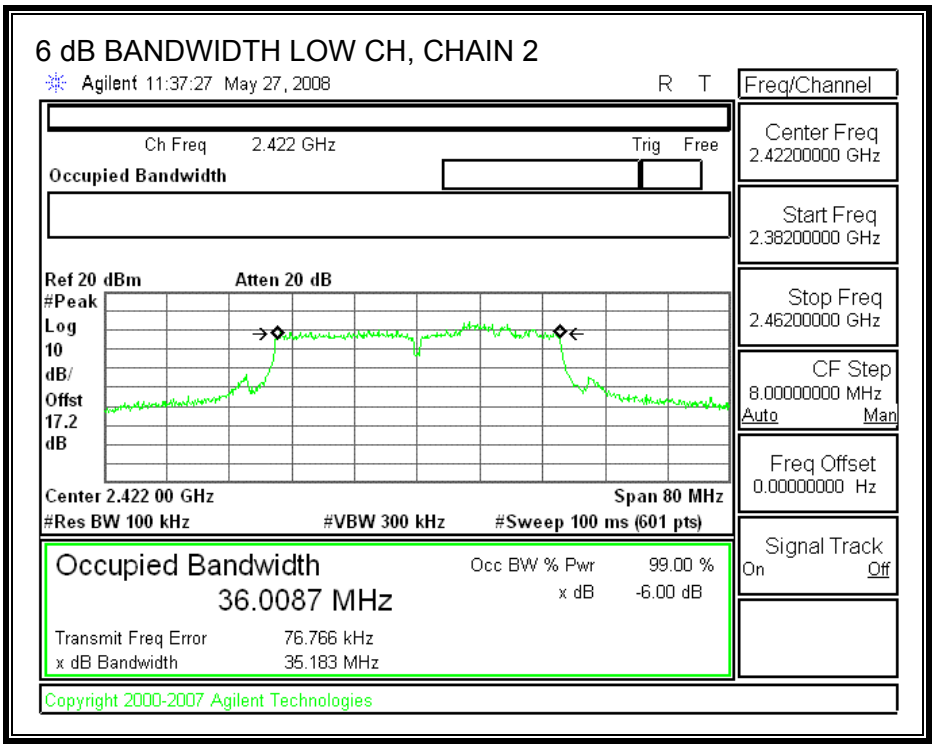
6 dB BANDWIDTH, CHAIN 1

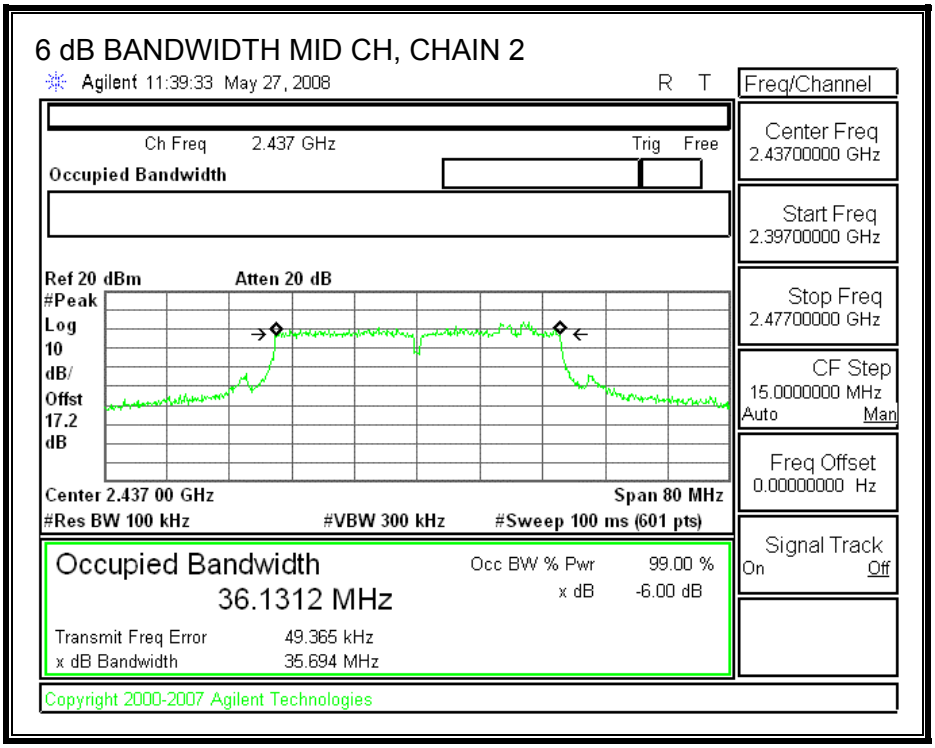


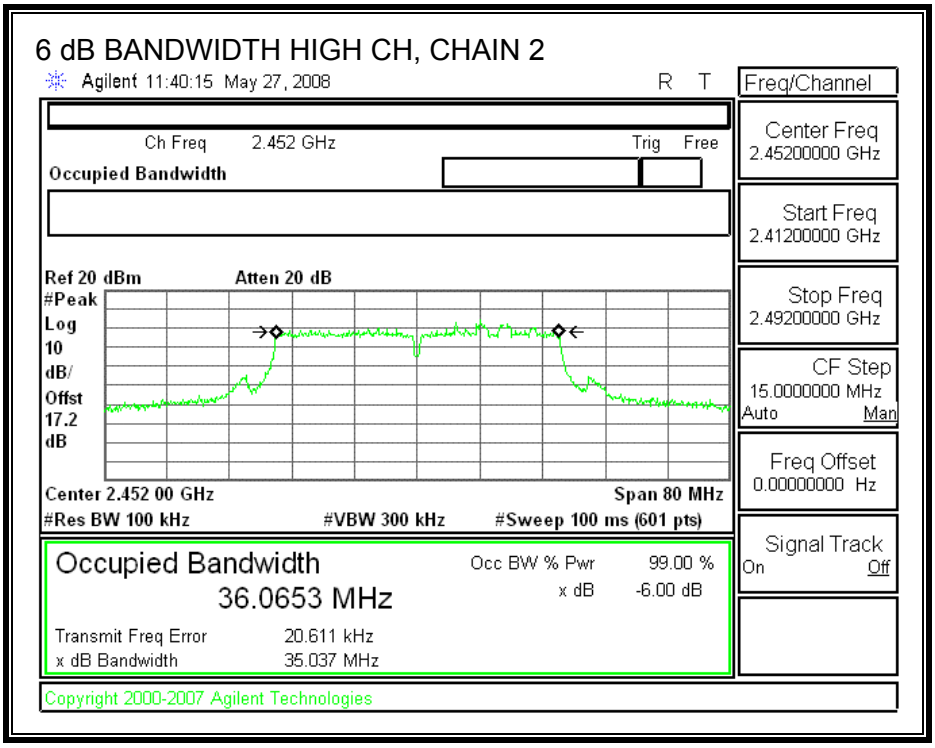




6 dB BANDWIDTH, CHAIN 2







8.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

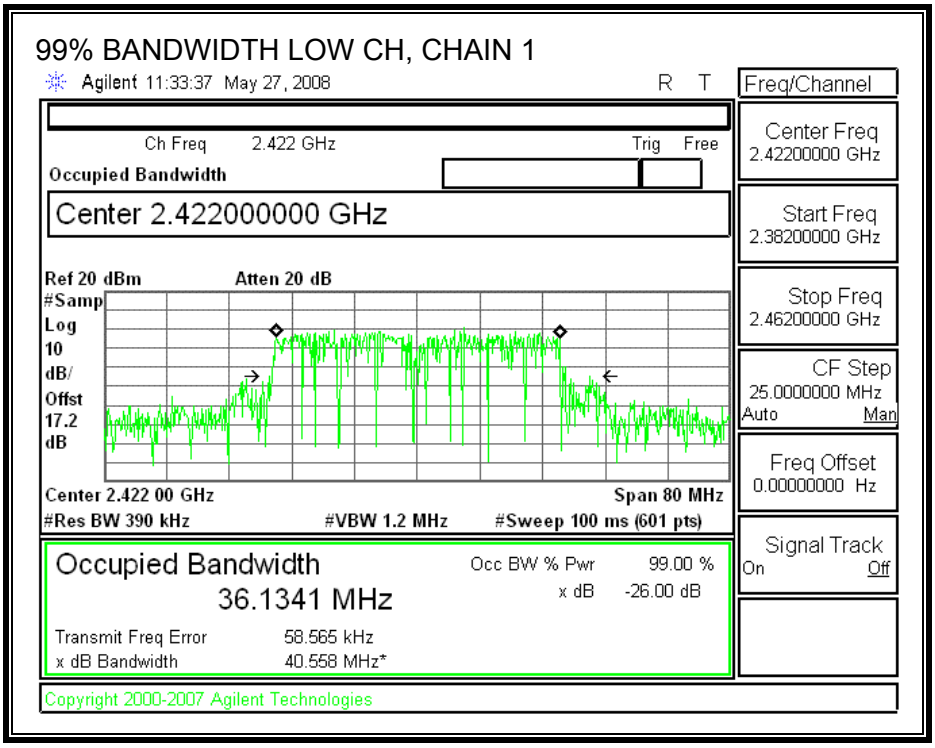
TEST PROCEDURE

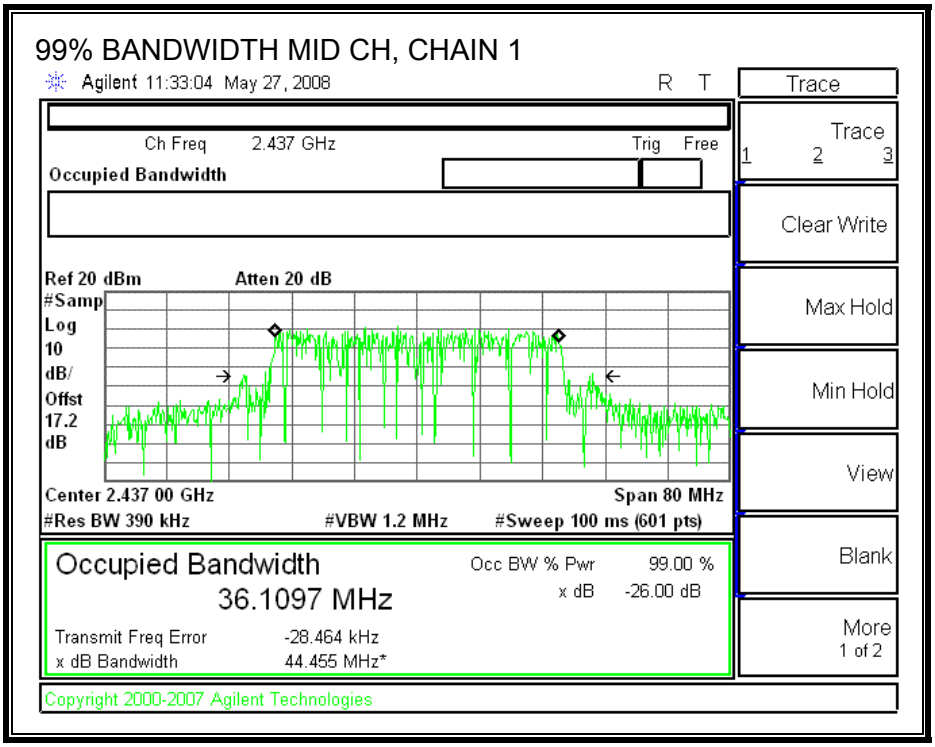
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

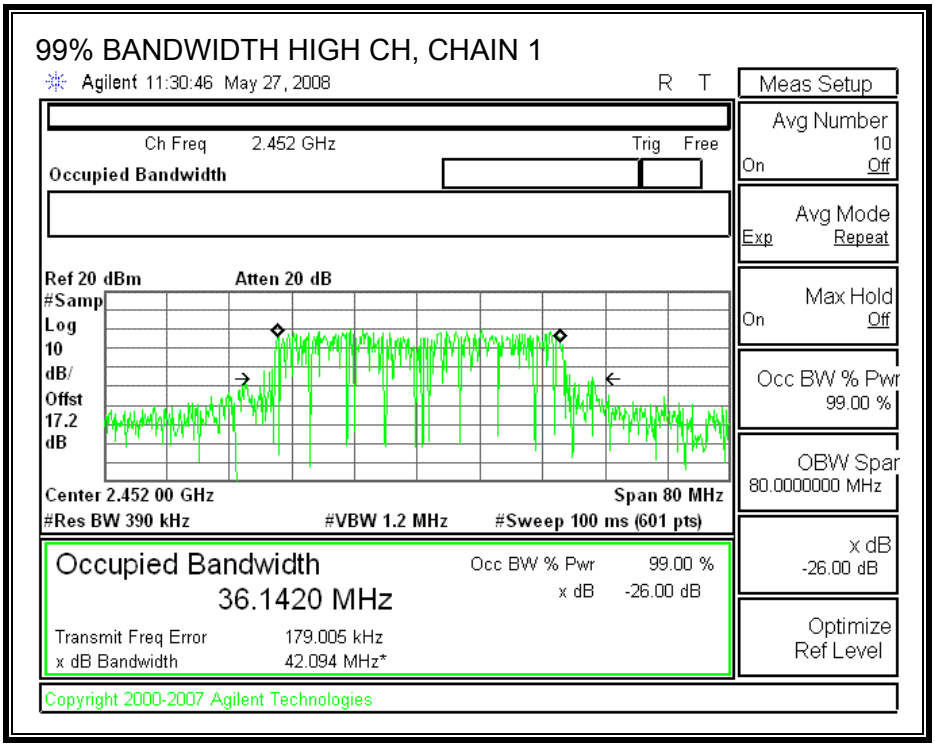
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2422	36.1341	36.1895
Middle	2437	36.1097	36.1698
High	2457	36.142	36.1645

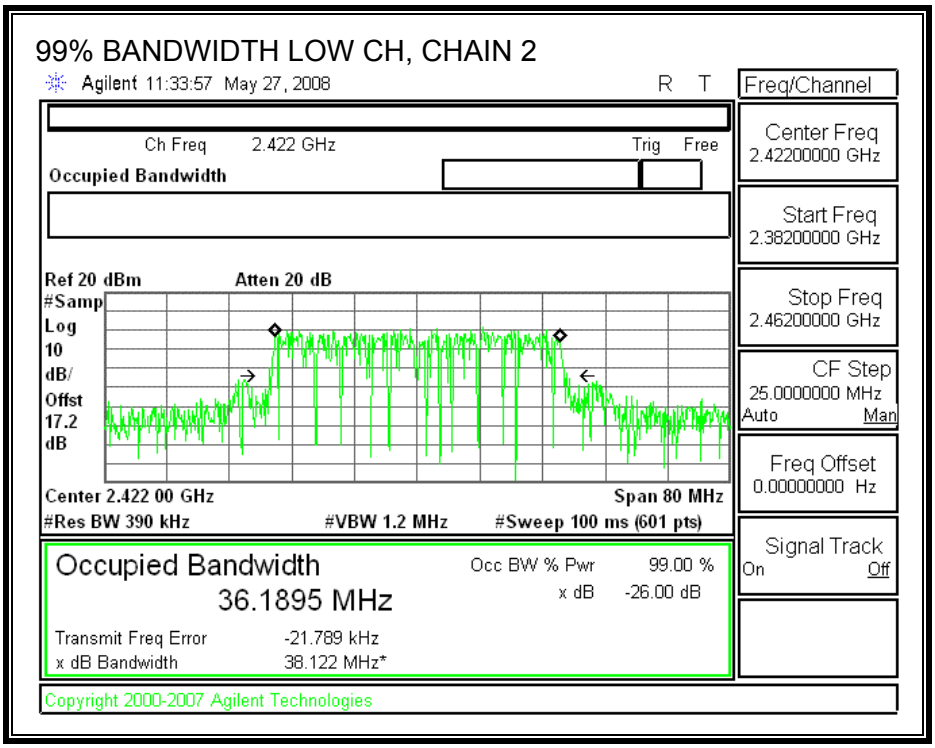
99% BANDWIDTH, CHAIN 1

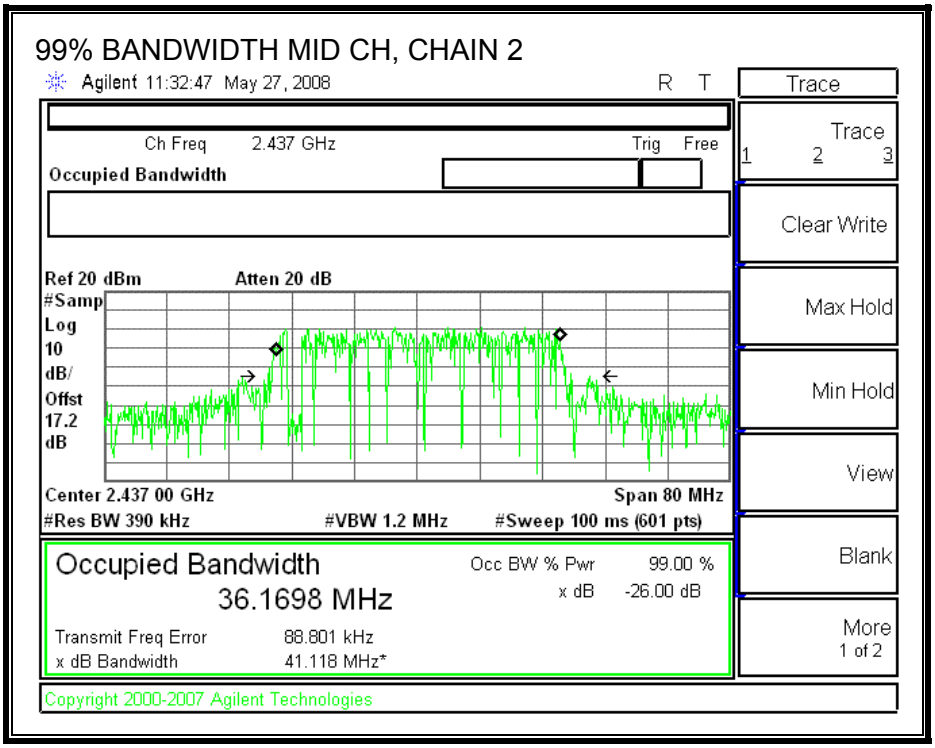


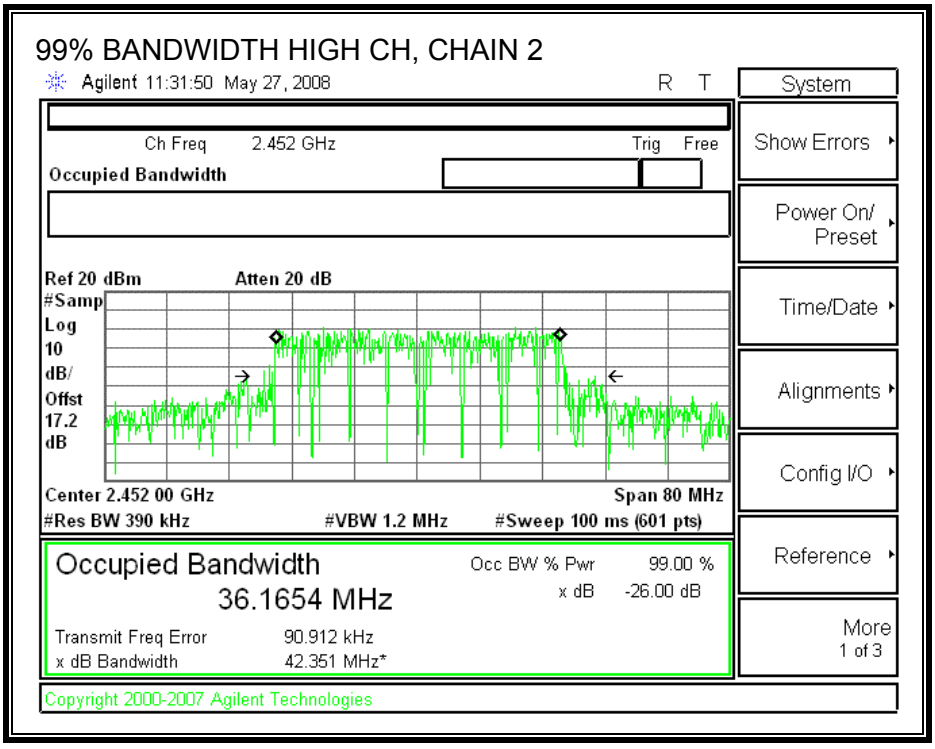




99% BANDWIDTH, CHAIN 2







8.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

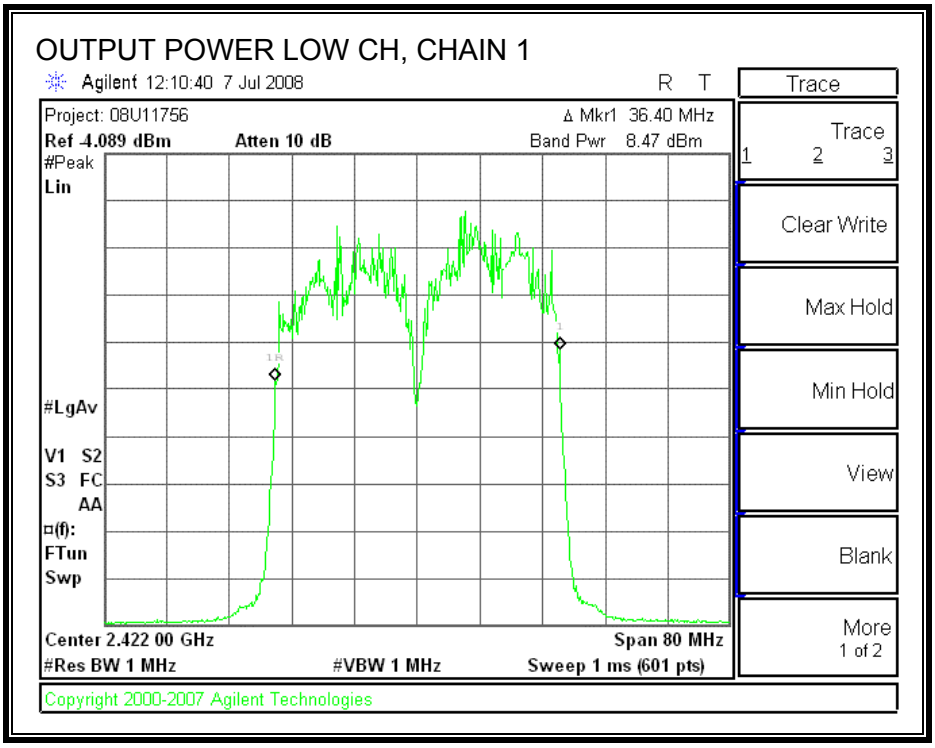
TEST PROCEDURE

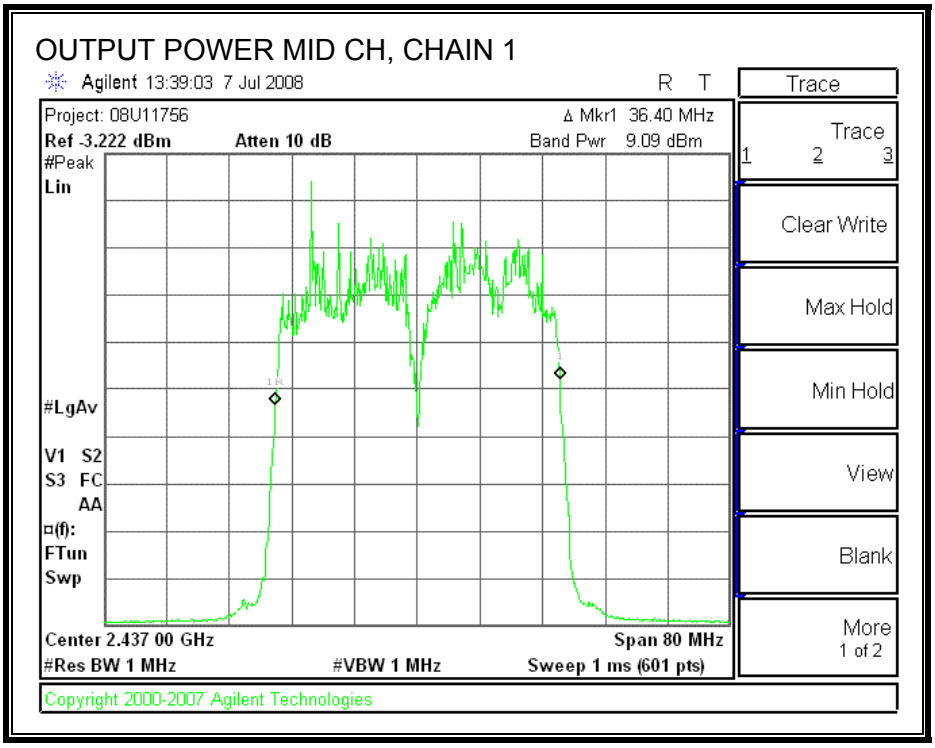
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

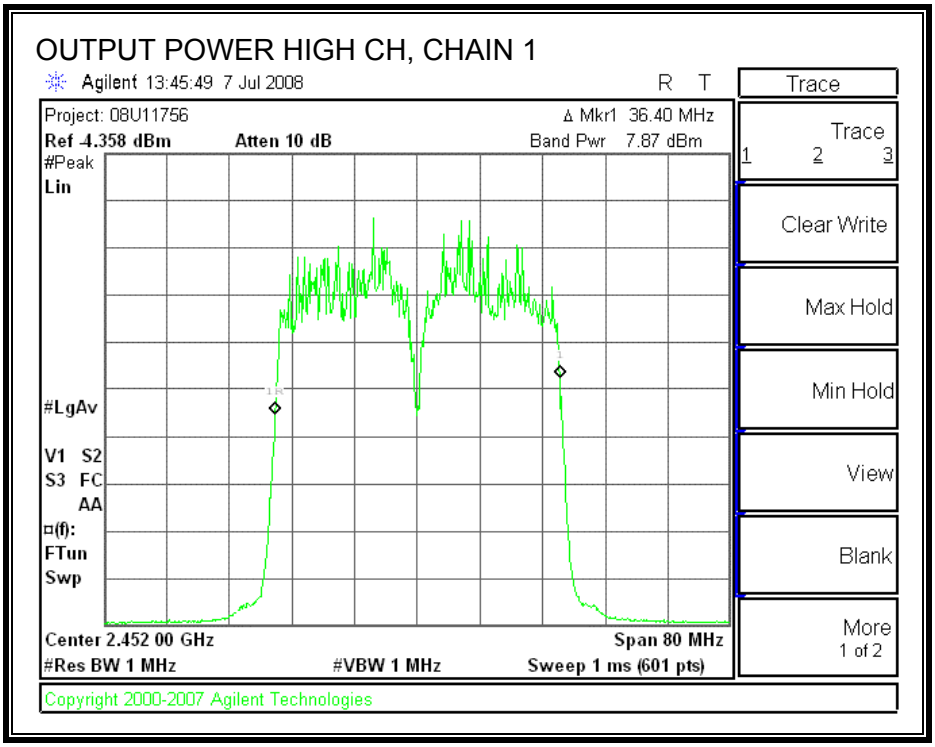
RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator - Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2422	30.00	8.47	10.44	11	23.58	-6.42
Mid	2437	30.00	9.09	10.76	11	24.02	-5.98
High	2452	30.00	7.87	10.10	11	23.14	-6.86

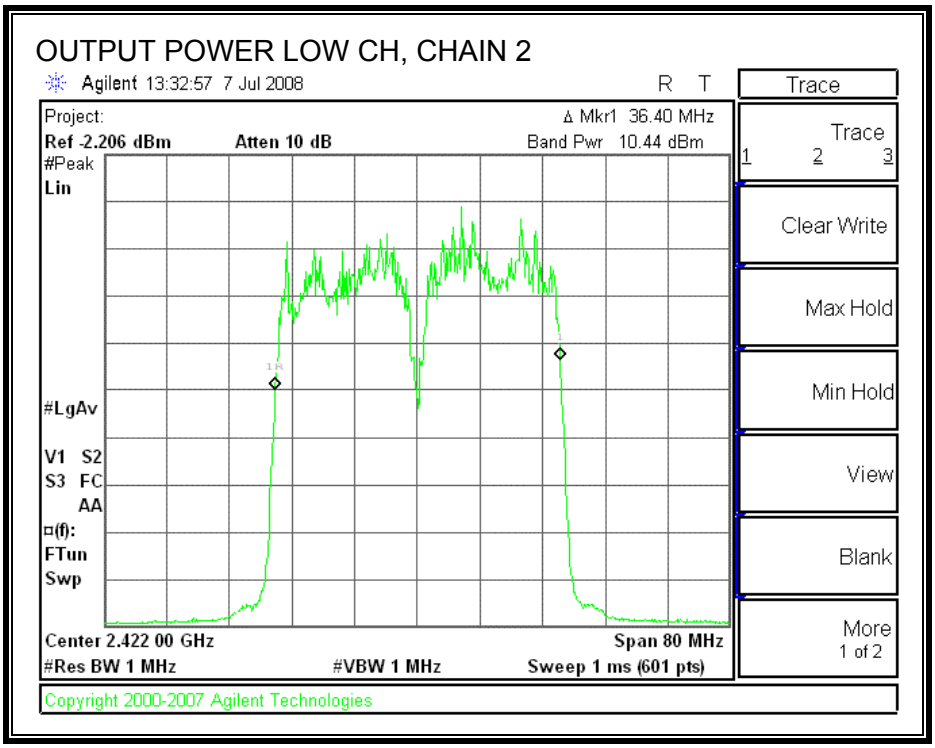
CHAIN 1 OUTPUT POWER



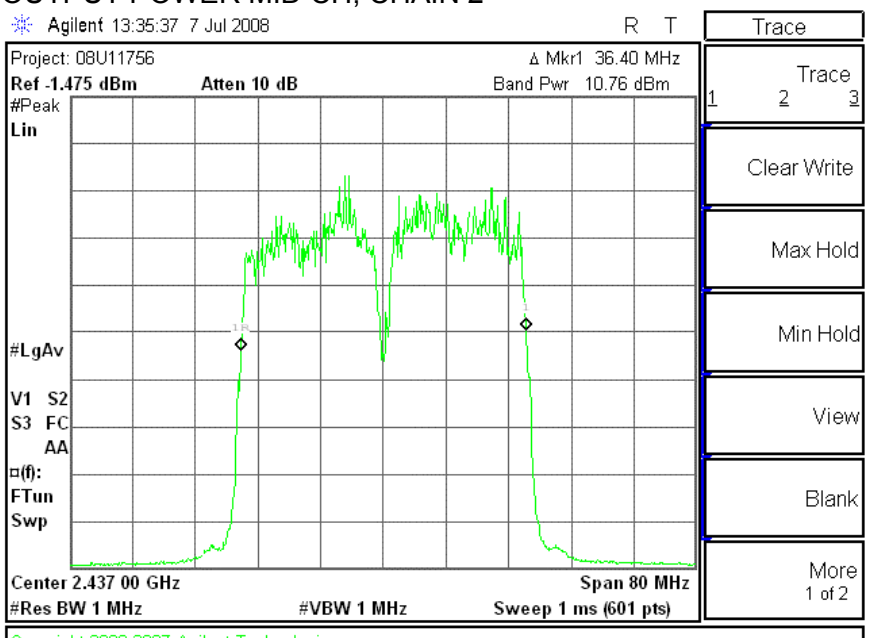




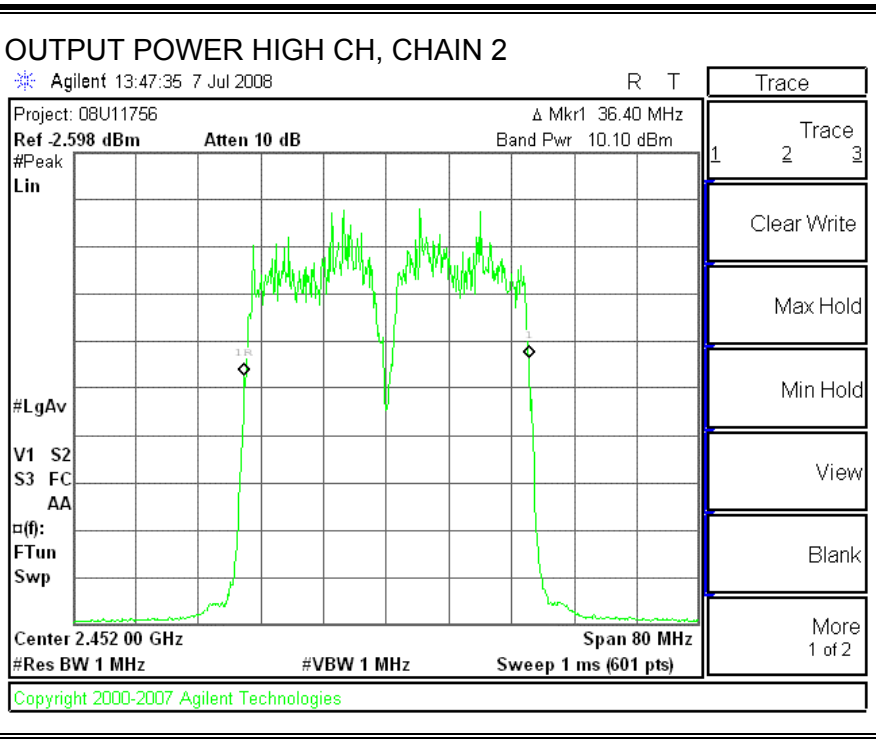
CHAIN 2 OUTPUT POWER



OUTPUT POWER MID CH, CHAIN 2



OUTPUT POWER HIGH CH, CHAIN 2



8.5.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e), IC RSS-210 A8.2 (b), 3.10.1 (6) (6.2.2)

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

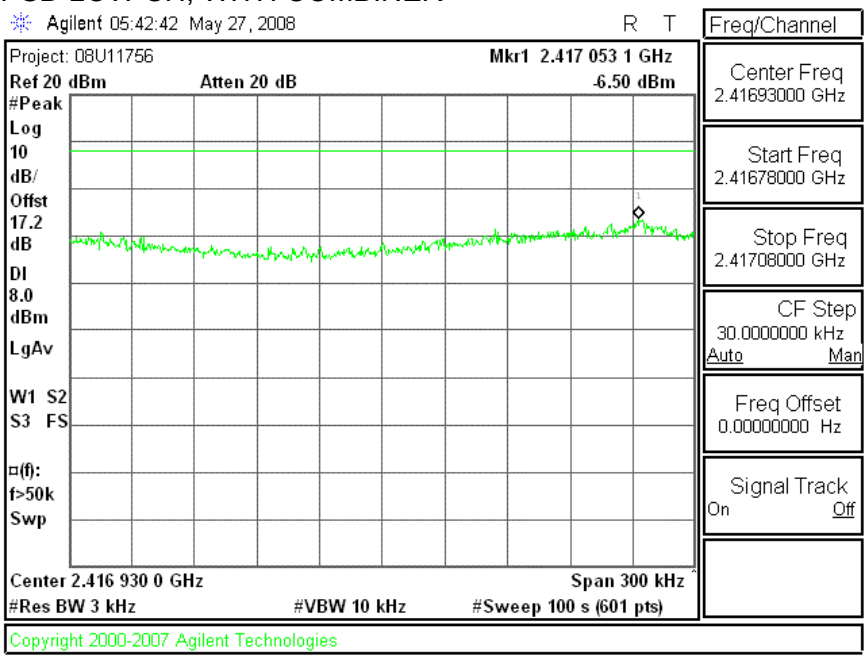
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

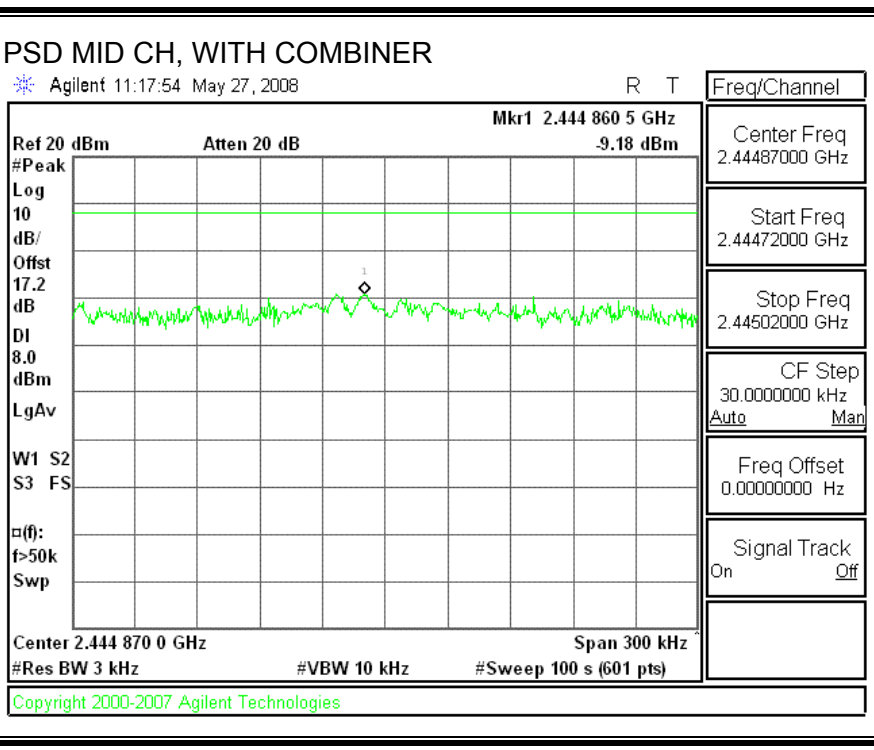
Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-6.50	8	-14.50
Middle	2437	-9.18	8	-17.18
High	2452	-8.38	8	-16.38

POWER SPECTRAL DENSITY, WITH COMBINER

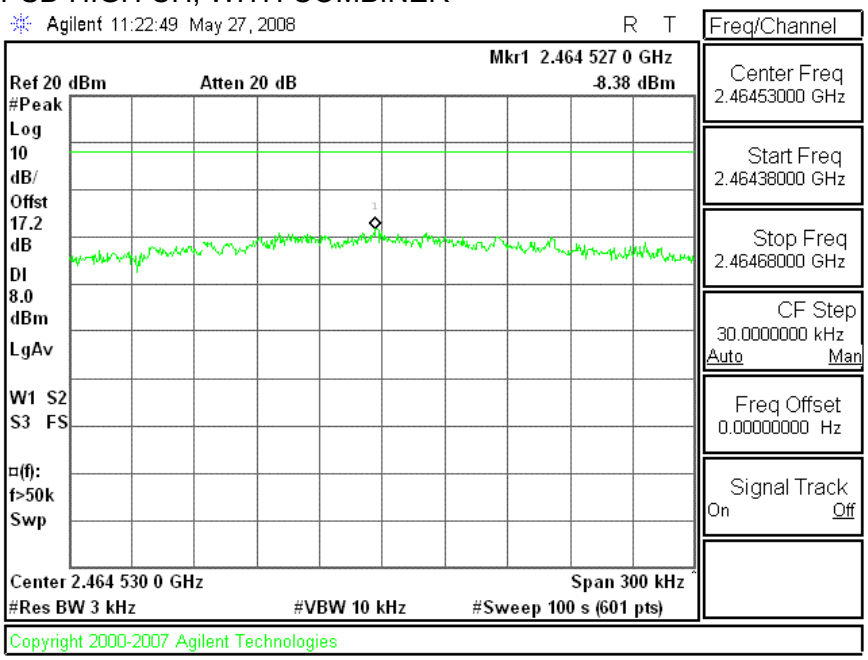
PSD LOW CH, WITH COMBINER



PSD MID CH, WITH COMBINER



PSD HIGH CH, WITH COMBINER



8.5.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d), IC RSS-210 A8.5, LP0002 § 3.10.1 (5)

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

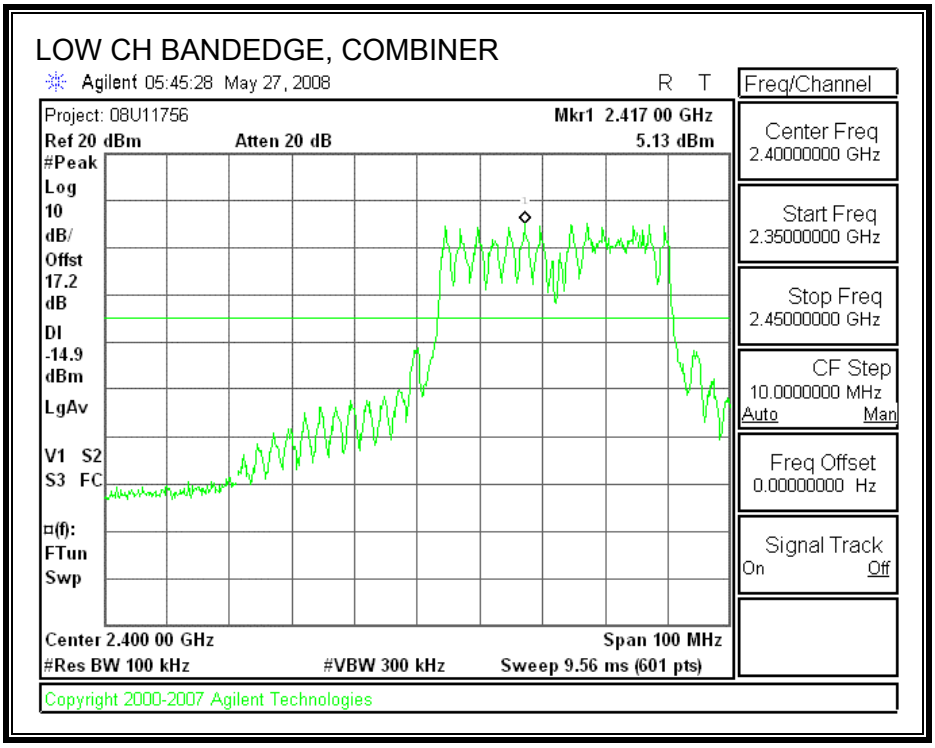
TEST PROCEDURE

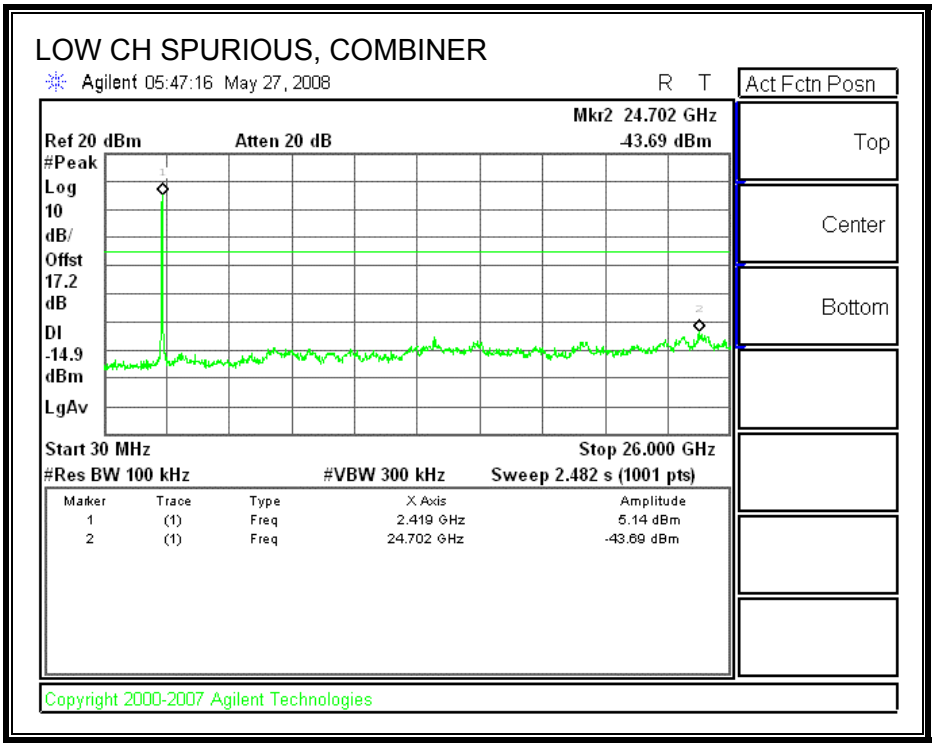
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

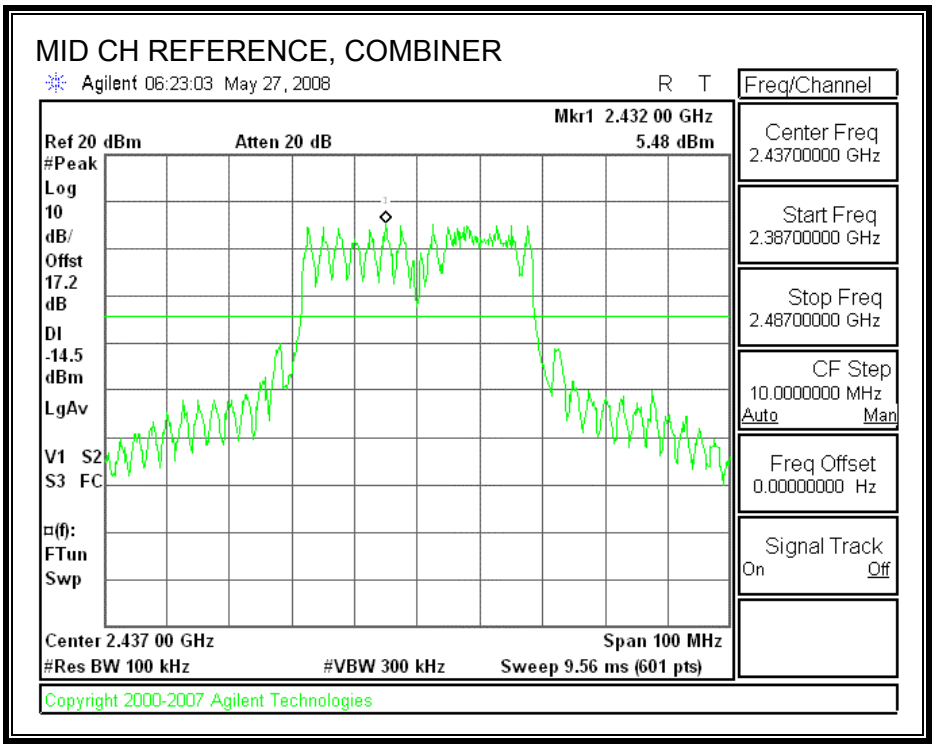
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

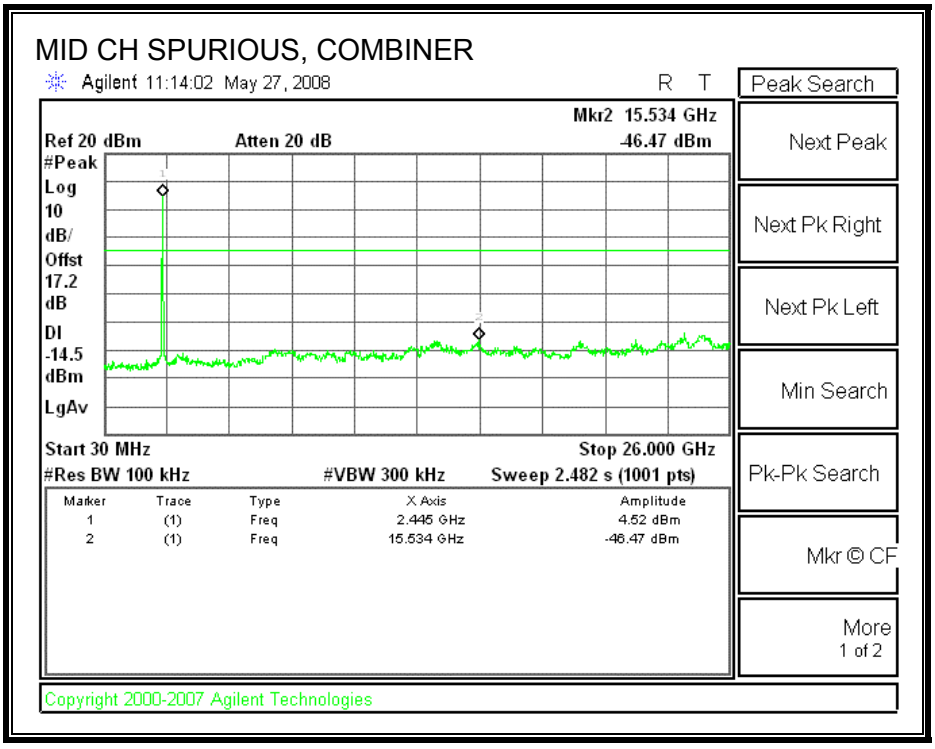
RESULTS

COMBINER SPURIOUS EMISSIONS

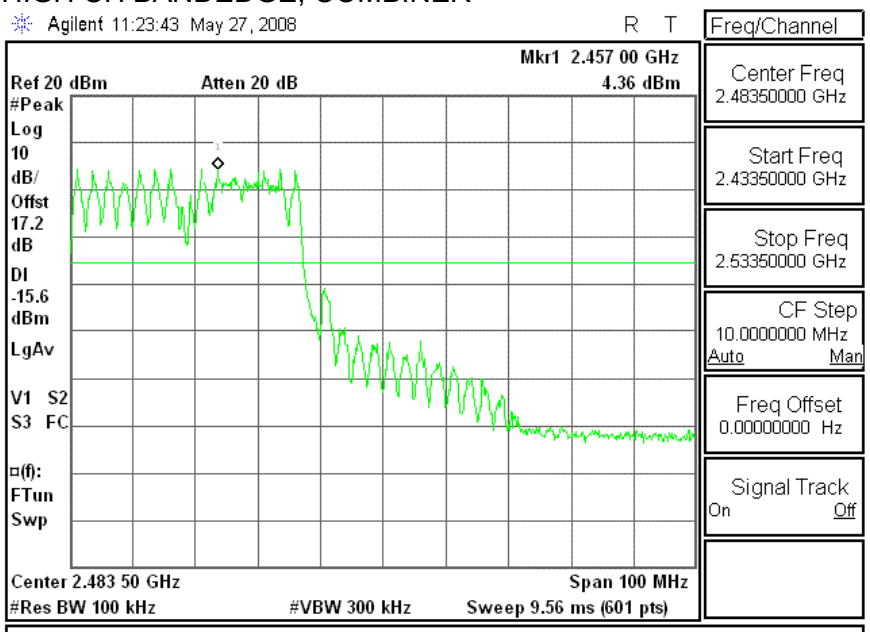




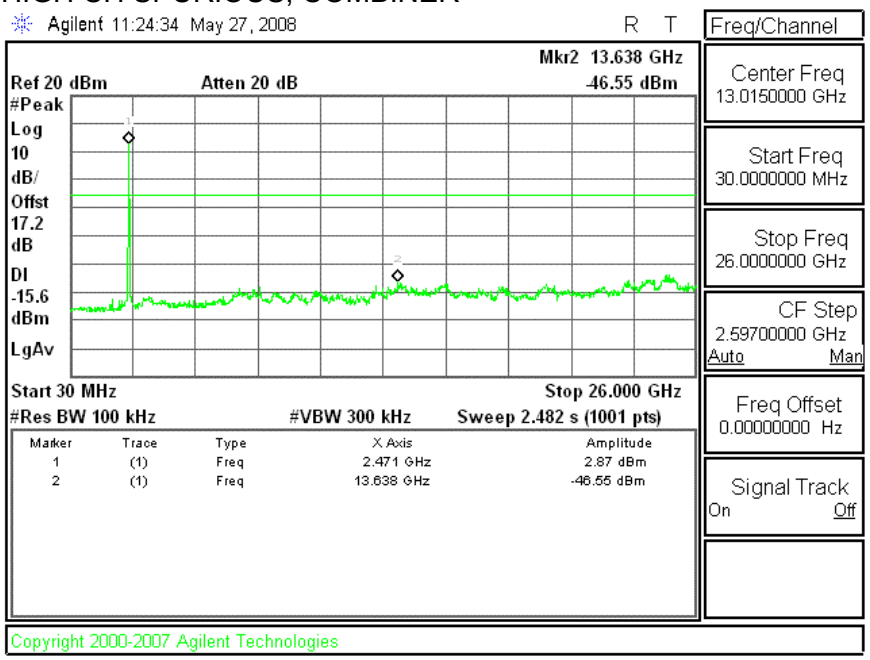




HIGH CH BANDEDGE, COMBINER



HIGH CH SPURIOUS, COMBINER



8.6. 802.11n HT40 MCS15 MODE IN THE 2.4 GHz BAND

8.6.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2), IC RSS-210 A8.2 (a) & LP0002 §3.10.1 (6) (6.2.1)

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

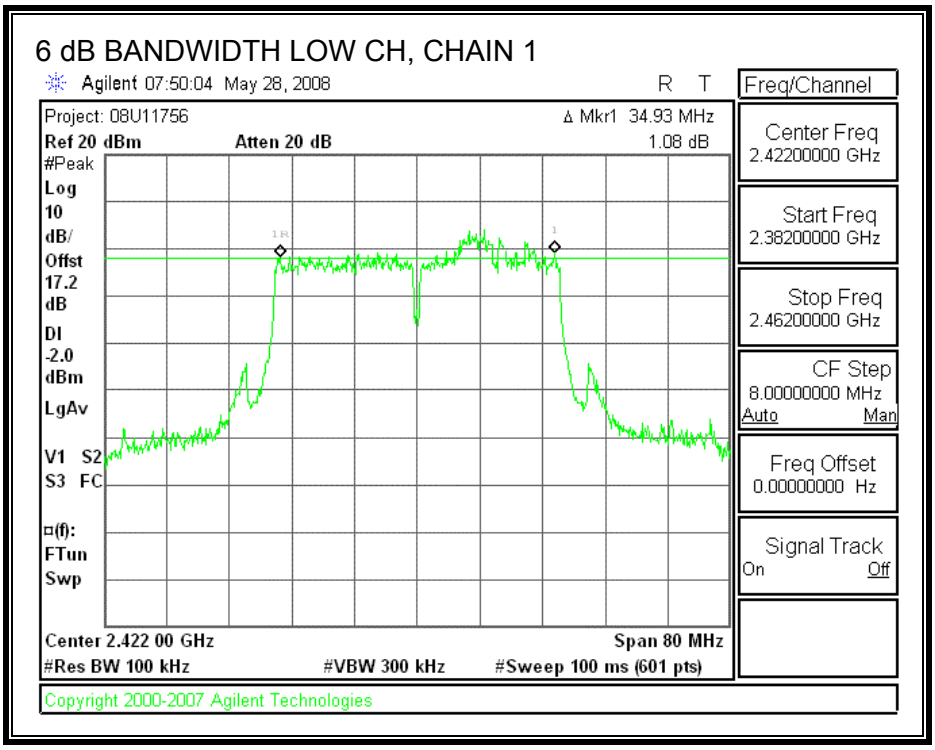
TEST PROCEDURE

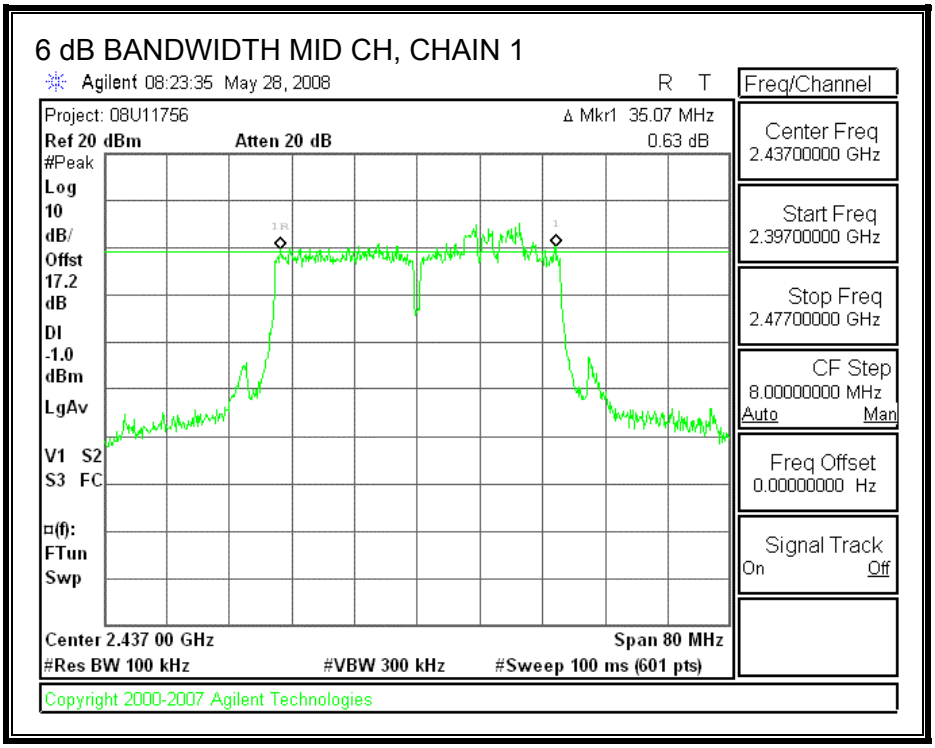
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

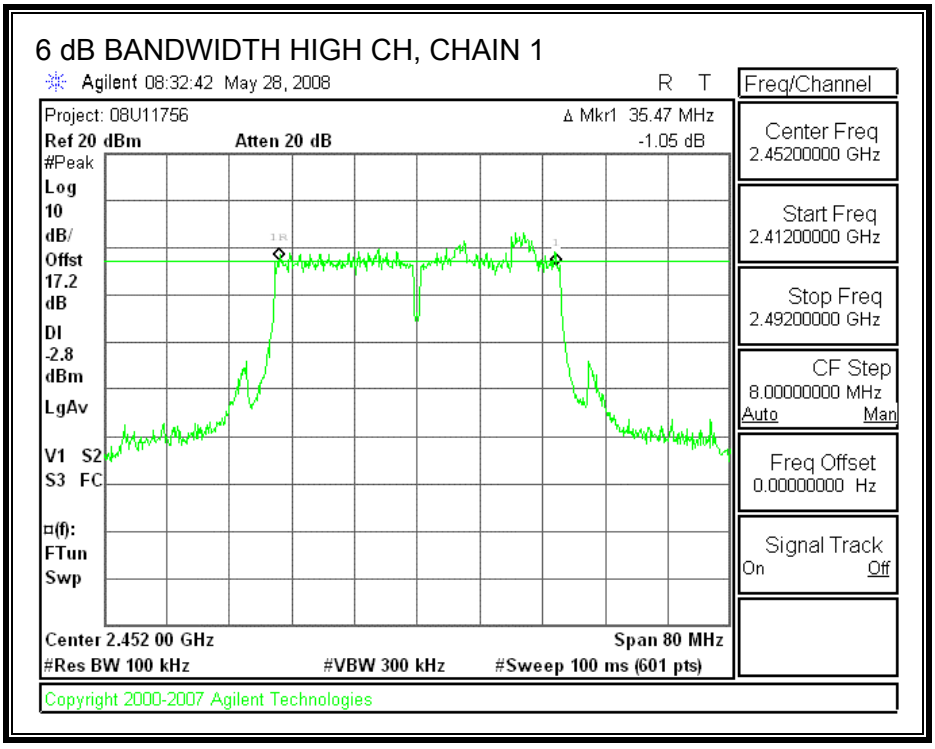
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2422	34.93	35.07	0.5
Middle	2437	35.07	35.47	0.5
High	2452	35.47	35.47	0.5

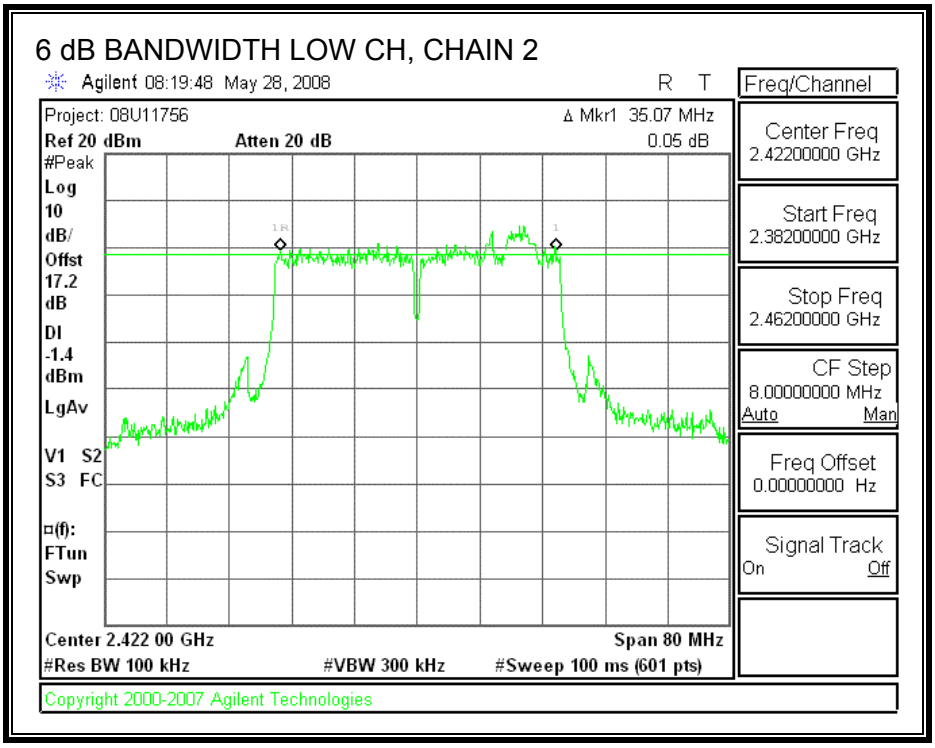
6 dB BANDWIDTH, CHAIN 1

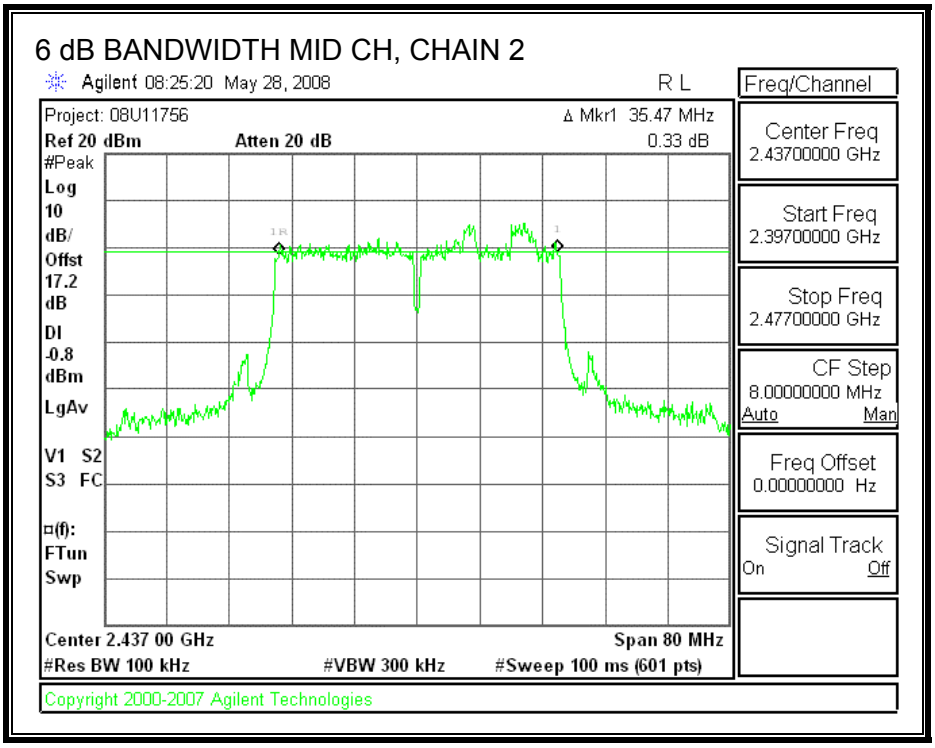




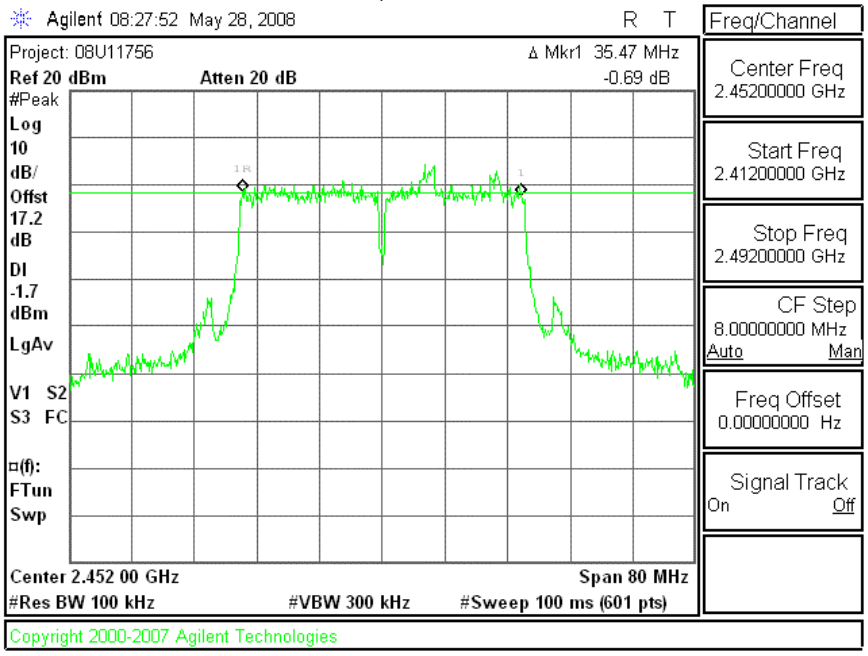


6 dB BANDWIDTH, CHAIN 2





6 dB BANDWIDTH HIGH CH, CHAIN 2



8.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

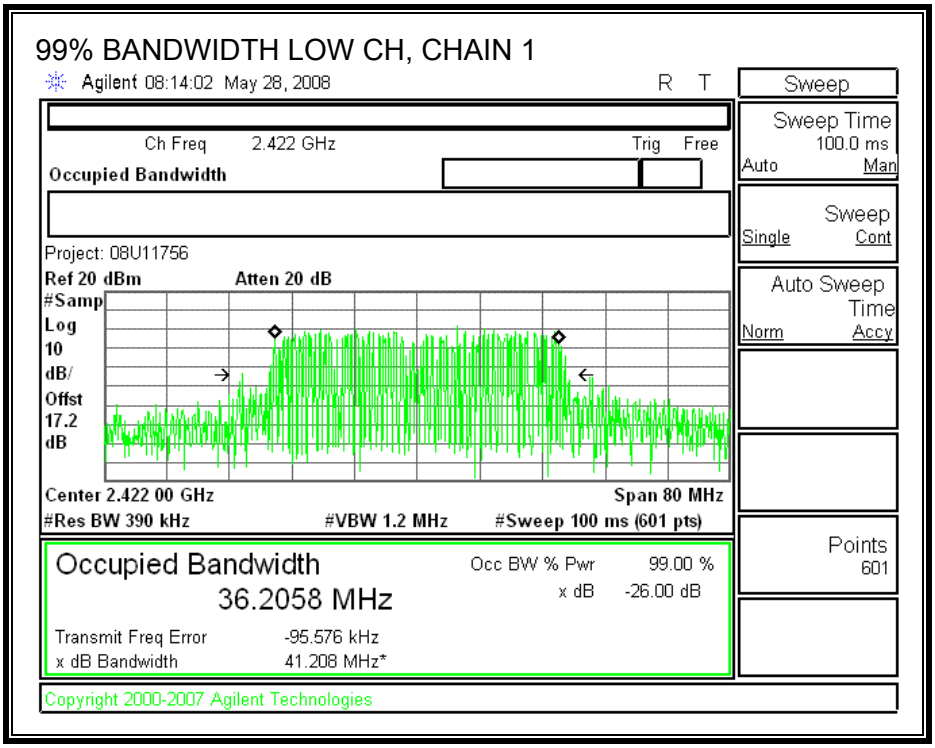
TEST PROCEDURE

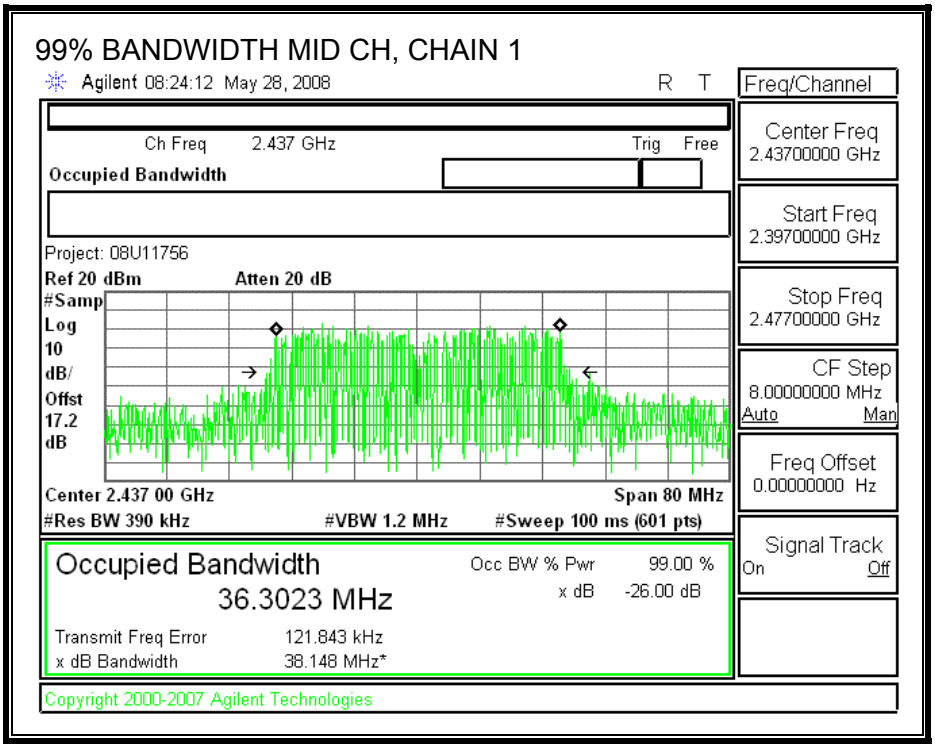
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

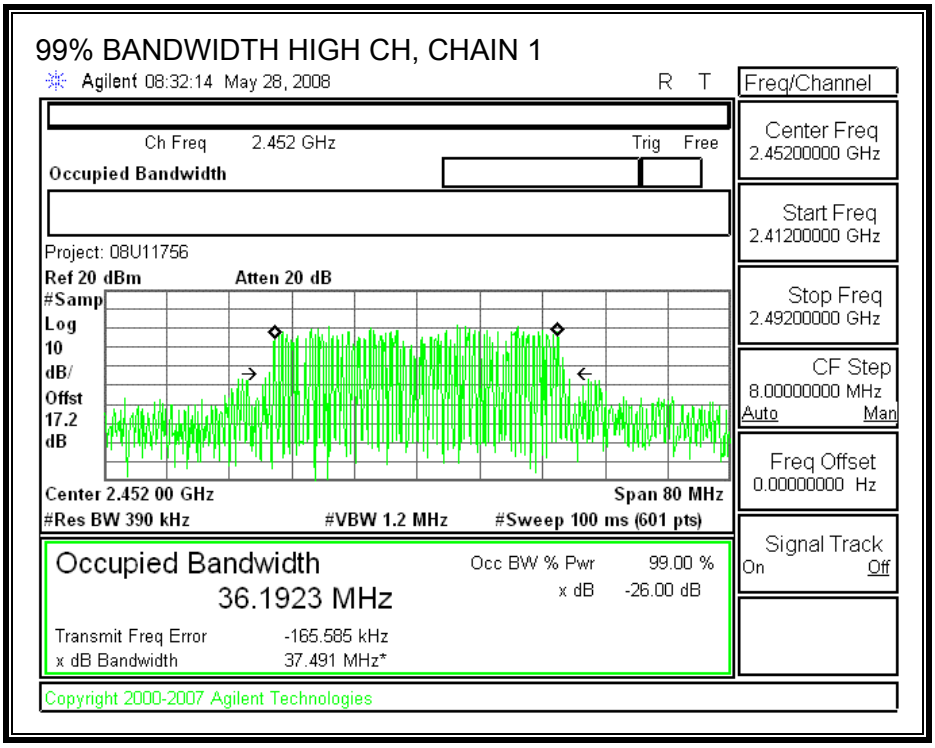
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2422	36.2058	36.1384
Middle	2437	36.3023	36.278
High	2452	36.1923	36.1161

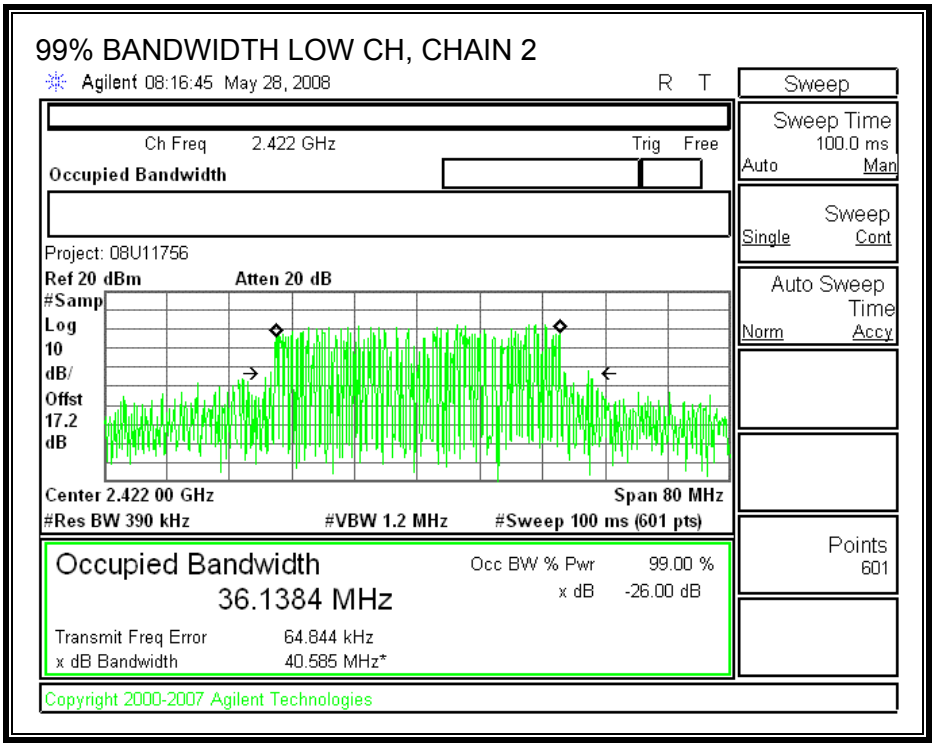
99% BANDWIDTH, CHAIN 1

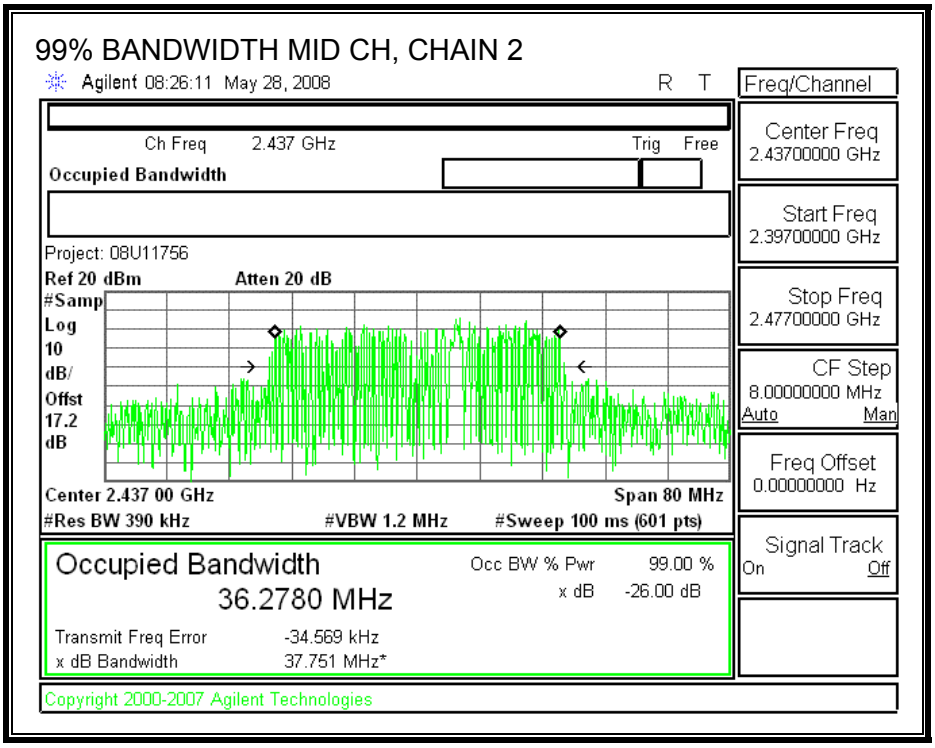


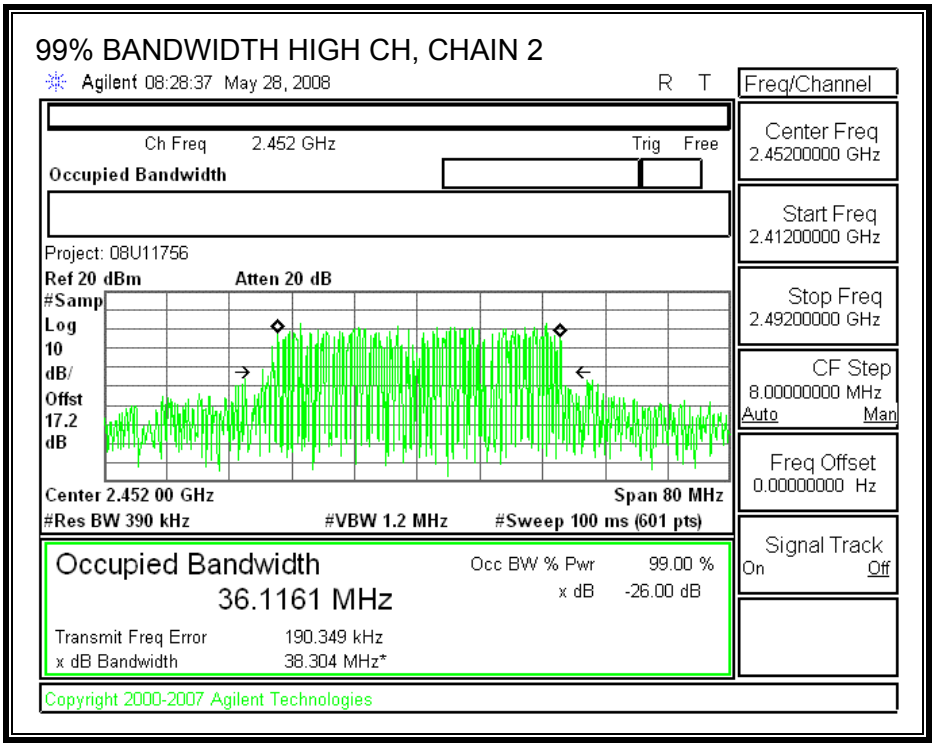




99% BANDWIDTH, CHAIN 2







8.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b), IC RSS-210 A8.4, LP0002 § 3.10.1 (2) (2.3); (3) (3.1.1)
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

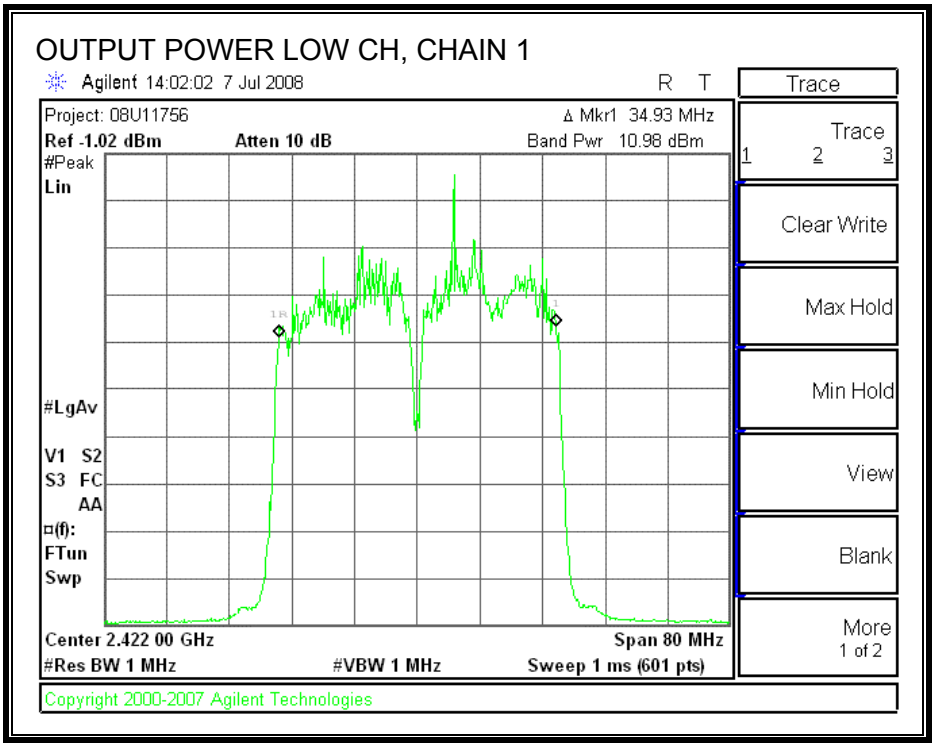
TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003

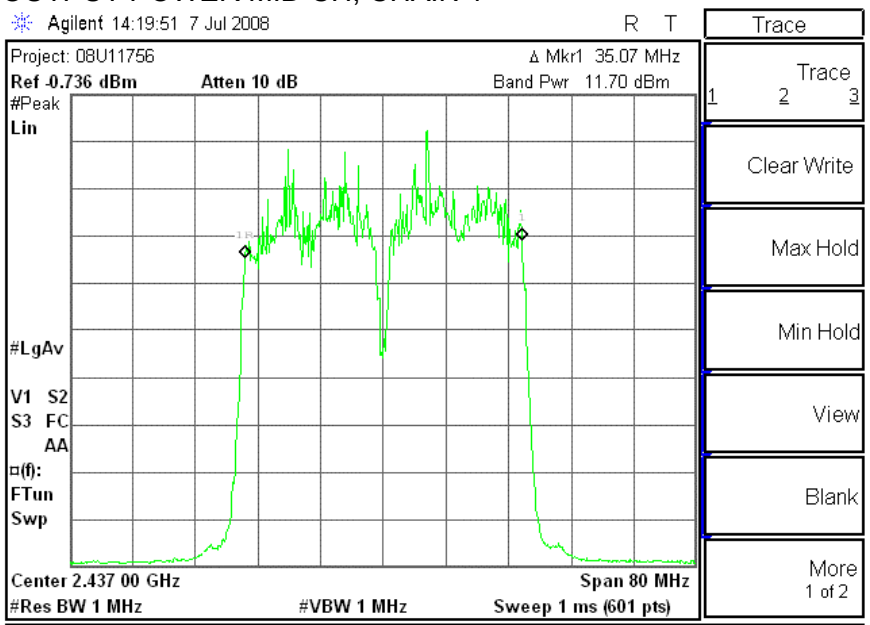
RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	2422	30.00	10.98	11.88	11	25.46	-4.54
Mid	2437	30.00	11.70	12.53	11	26.15	-3.85
High	2452	30.00	11.36	12.22	11	25.82	-4.18

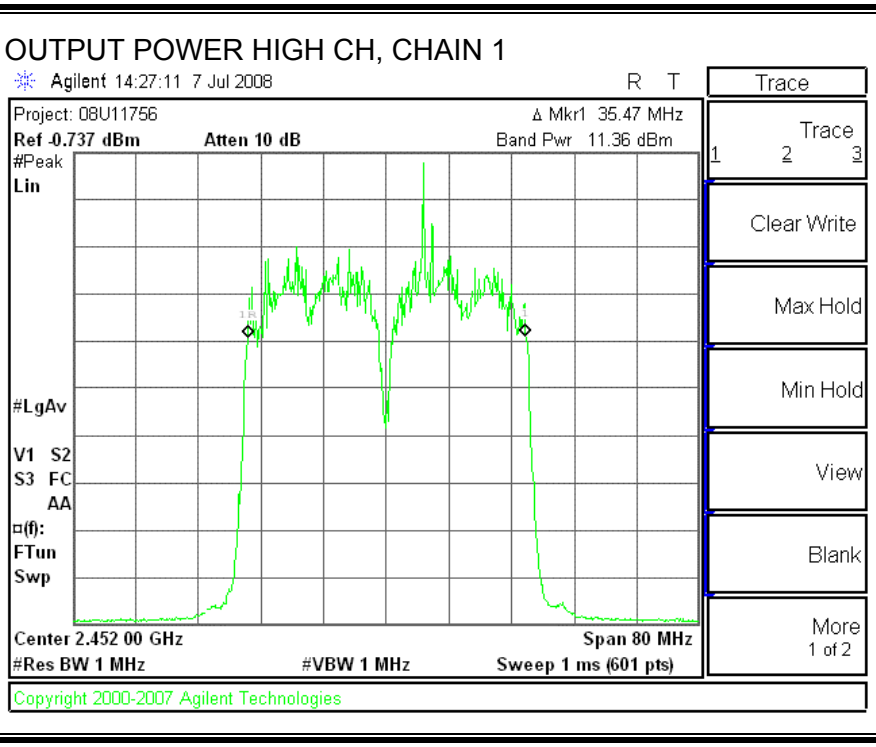
CHAIN 1 OUTPUT POWER



OUTPUT POWER MID CH, CHAIN 1



OUTPUT POWER HIGH CH, CHAIN 1



CHAIN 2 OUTPUT POWER