



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

AR5BXB112 3x3 802.11n PCIe MODULE

MODEL NUMBER: AR5BXB112

**FCC ID: PPD-AR5BXB112
IC: 4104A-AR5BXB112**

REPORT NUMBER: 10U13467-1

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ATHEROS COMMUNICATION, INC
1700 TECHNOLOGY DRIVE
SAN JOSE, CA 95110

EUT DESCRIPTION: AR5BXB112 3x3 802.11n PCIe MODULE

MODEL: AR5BXB112

SERIAL NUMBER: CUS152-053-F0760

DATE TESTED: NOVEMBER 03-19, 2010

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

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

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

Approved & Released For UL CCS By:



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ENGINEERING MANAGER
UL CCS

Tested By:



CHIN PANG
EMC ENGINEER
UL CCS

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 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11abgn 3x3 product with the option of Beam Forming.

The radio module is manufactured by Atheros.

5.2. MAXIMUM OUTPUT POWER

The measurements were based on the use of RMS averaging over a time interval.
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)	Peak Power Chain 2 (dBm)	Total Peak Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.29	18.72	17.94	23.46	221.62
2412 - 2462	802.11g	19.25	18.89	18.18	23.57	227.35
2412 - 2462	802.11n 20MHz (Worst Case With Beam-Forming ON)	19.41	18.92	18.88	23.85	242.55

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Peak Power Chain 2 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5745 - 5825	802.11a Legacy	17.72	16.31	16.28	21.59	144.37
5745 - 5825	802.11n 20MHz (Worst Case With Beam-Forming ON)	17.84	16.60	16.46	21.78	150.78
5755 - 5795	802.11n 40MHz (Worst Case With Beam-Forming ON)	17.02	15.88	15.76	21.03	126.75

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Atheros AR93 Anwi Diagnostic Kernel Driver.

The test utility software used during testing was Atheros artgui ver_2.5.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

For 2.4GHz Band:

All final tests in the 802.11b Mode (Legacy) were made at 1 Mb/s.

All final tests in the 802.11g Mode were made at 9 Mb/s.

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

For 5.8GHz Band:

All final tests in the 802.11a Mode (Legacy) were made at 9 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

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

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

For Legacy and MIMO PSD measurement, each individual chain is measured and total sum of three chains are calculated using the formula,

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

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

Freq [GHz]	WiFi 1	WiFi 2	WiFi 3	Max Gain [dBi]	Array Gain [dBi]
	631-1330 (Black) Peak Gain dBi	631-1331 (Logo) Peak Gain dBi	631-1332 (Brown) Peak Gain dBi		
2.4-2.484	4.84	2.9	4.02	4.84	8.76
5.15 - 5.25	5.28	5.97	5.25	5.97	10.28
5.25 - 5.35	5.21	6.07	4.82	6.07	10.17
5.47-5.725	4.02	4.78	4.51	4.78	9.22
5.725-5.85	3.12	4.73	4.87	4.87	9.08

Freq [GHz]	WiFi 1	WiFi 2	WiFi 3	Max Gain [dBi]	Array Gain [dBi]
	631-1359 (Black) Peak Gain dBi	631-1357 (Logo) Peak Gain dBi	631-1358 (Brown) Peak Gain dBi		
2.4-2.484	1.98	1.68	3.44	3.44	7.21
5.15 - 5.25	5.44	5.17	4.89	5.44	9.94
5.25 - 5.35	5.54	5.65	5.19	5.65	10.24
5.47-5.725	4.88	3.62	4.43	4.88	9.11
5.725-5.85	2.37	3.21	3.79	3.79	7.93

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	IBM Lenovo	T400	R8-NCKY4	DoC
AC Adapter	IBM Lenovo	DCWP CM-2	11S92P1156Z1ZDXN99HDSS	DoC

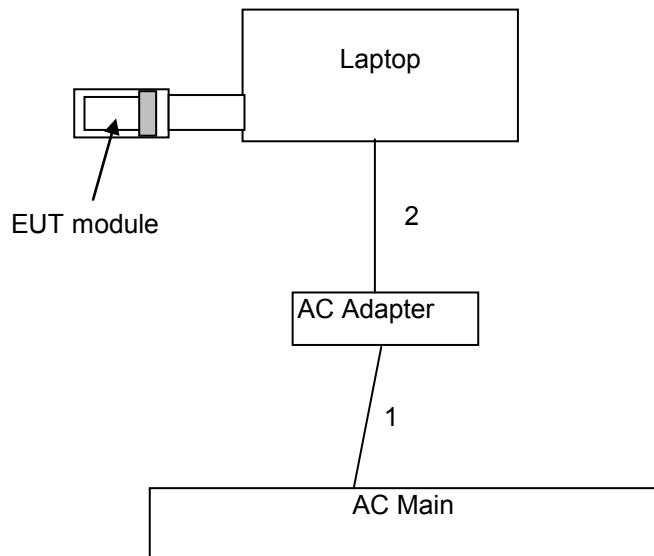
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115V	Unshielded	1m	N/A
2	DC	1	DC	Unshielded	2m	Ferrite on laptop's end

TEST SETUP

The EUT is connected to a host laptop computer via a MiniPCI-E adapter board during the test. Test software exercised the radio card.

SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	04/29/10	10/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	01/14/09	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/29/10	06/29/11
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	06/25/10	06/25/11
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/08/10	06/08/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	01/06/10	07/06/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/14/10	07/14/11
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	07/15/10	07/15/11
Peak Power Meter	Boonton	4541	C01186	03/01/10	03/01/11
Peak Power Sensor	Boonton	57318	0	02/24/10	02/24/11
EMI Receiver, 6.5 GHz	Agilent / HP	8546A	1963	05/19/10	08/19/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09	05/06/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/09	02/06/11
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	01/00/00	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02601	CNR	CNR

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b 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.

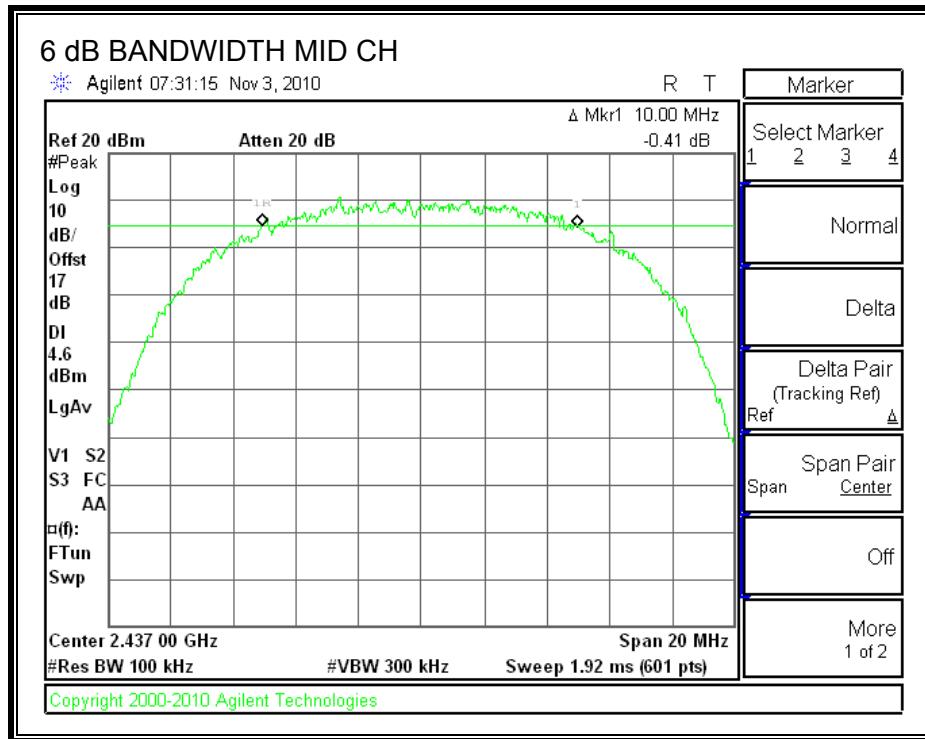
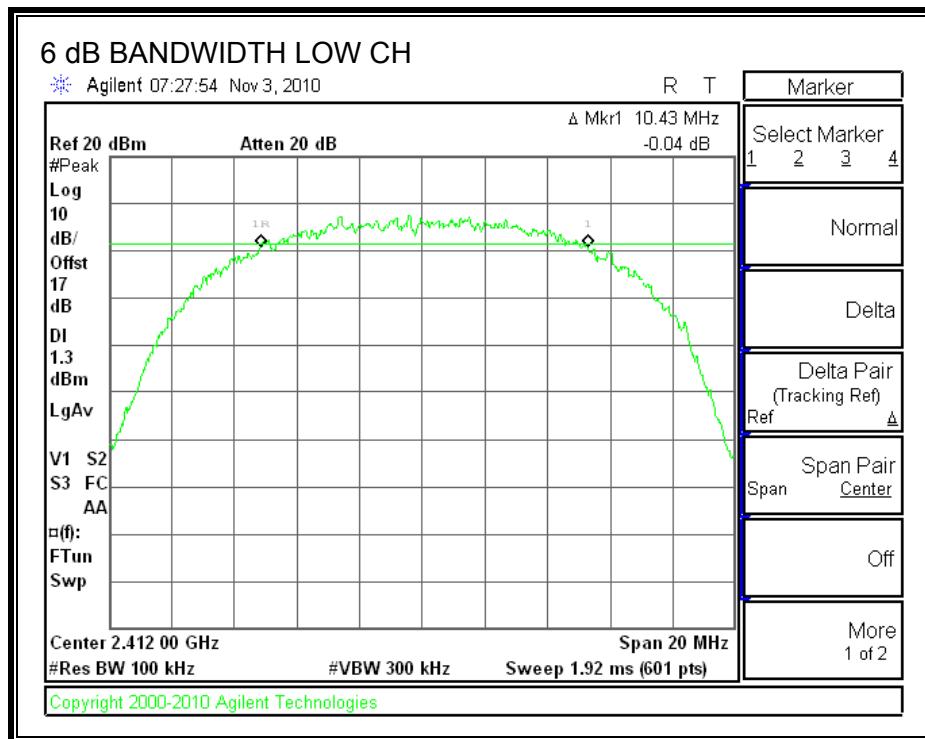
TEST PROCEDURE

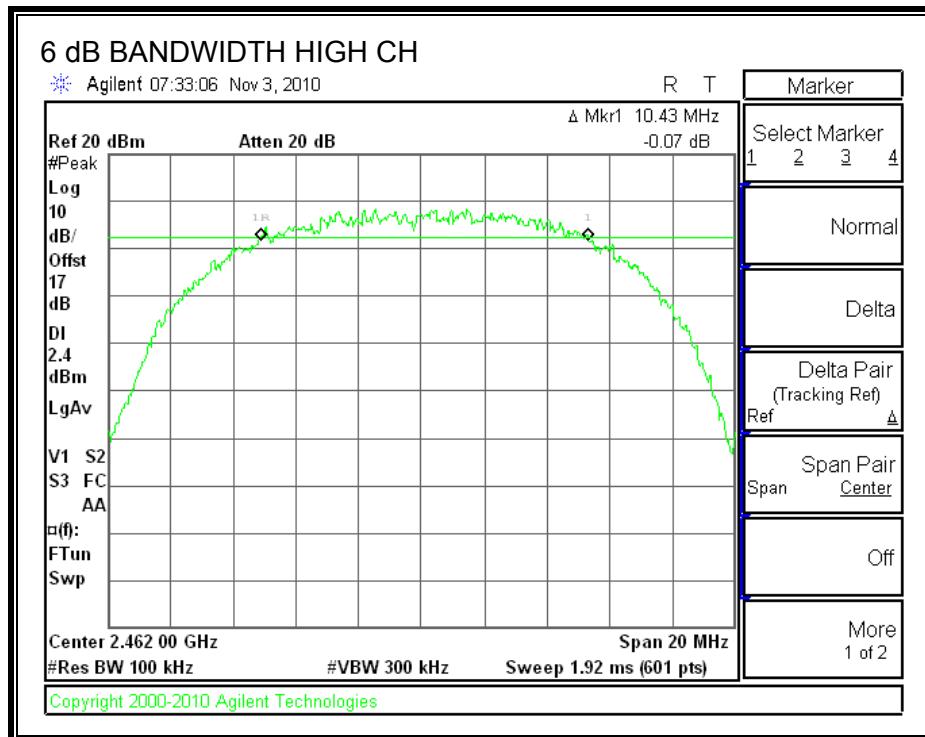
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

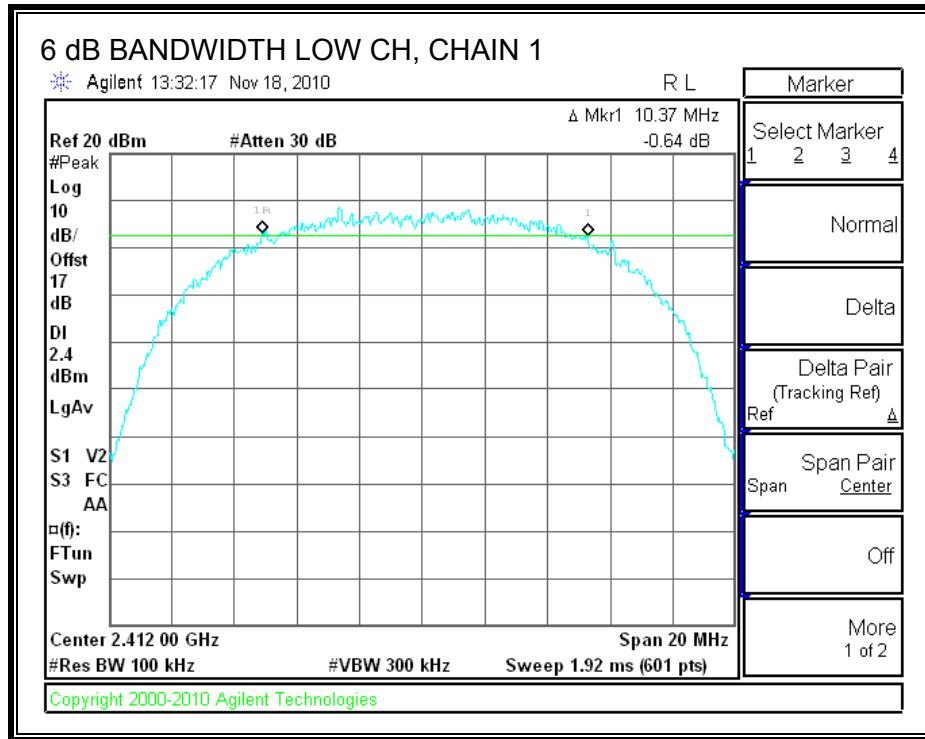
Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	10.43	10.37	10.27	0.5
Middle	2437	10.00	10.00	10.43	0.5
High	2462	10.43	10.33	10.03	0.5

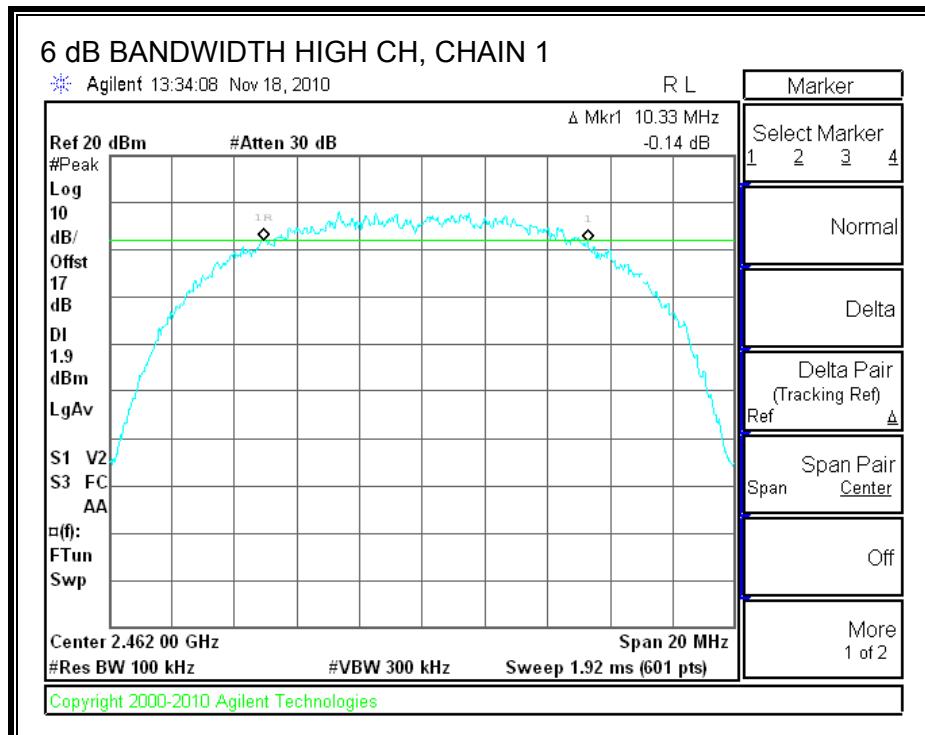
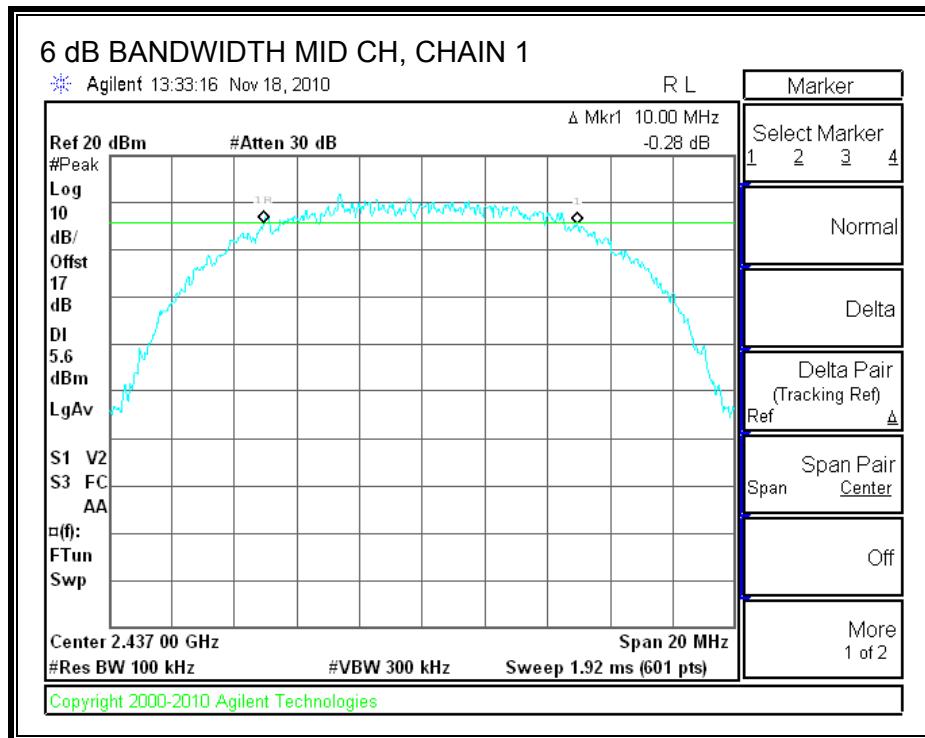
6 dB BANDWIDTH, CHAIN 0



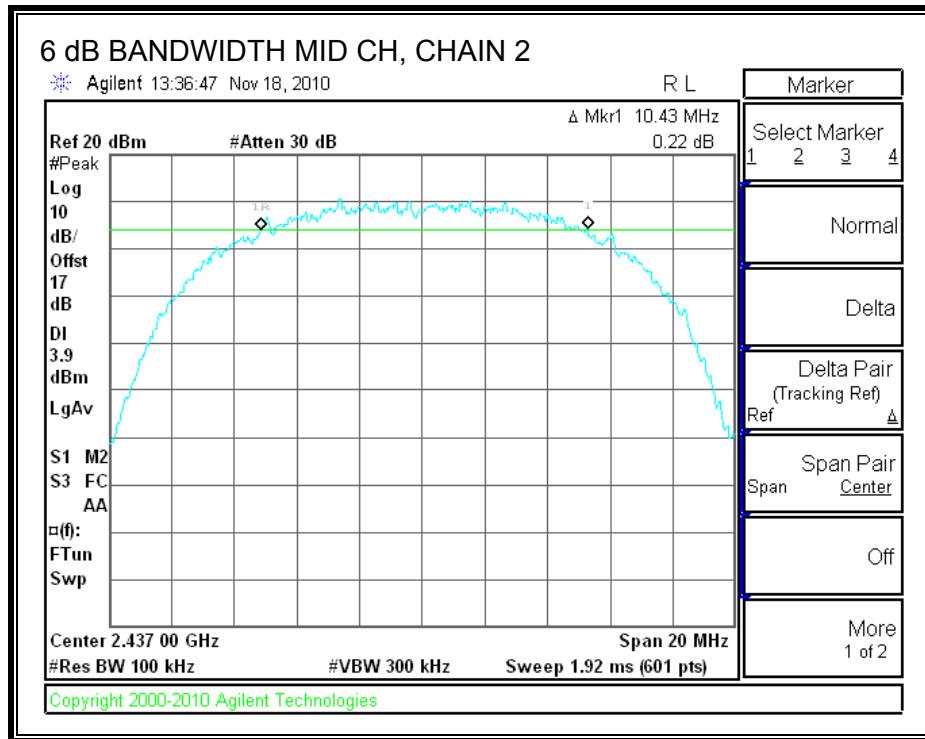
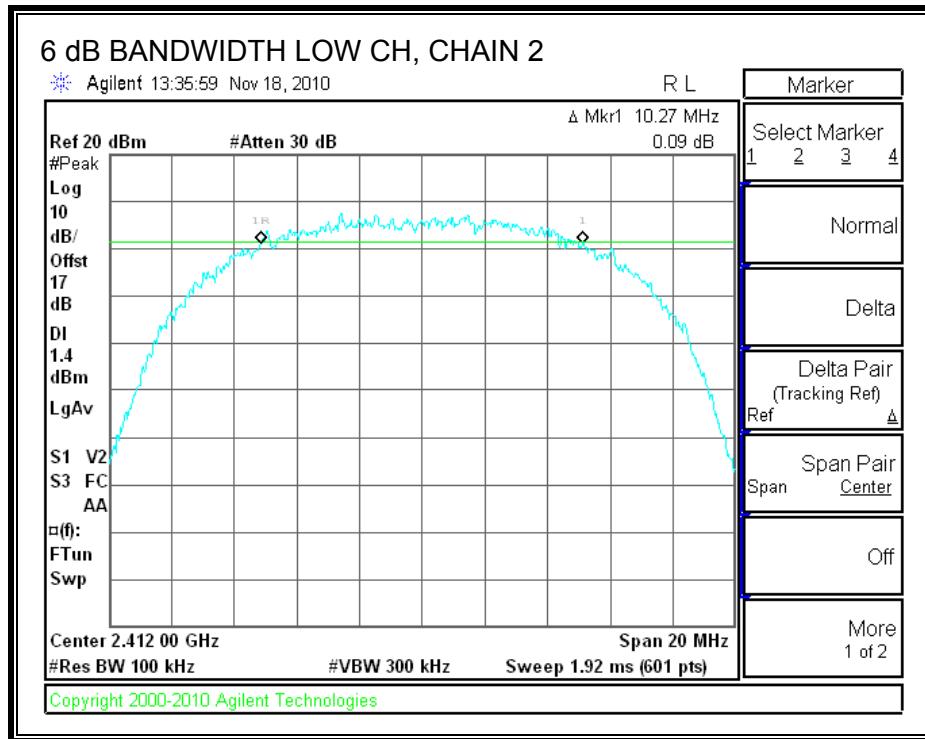


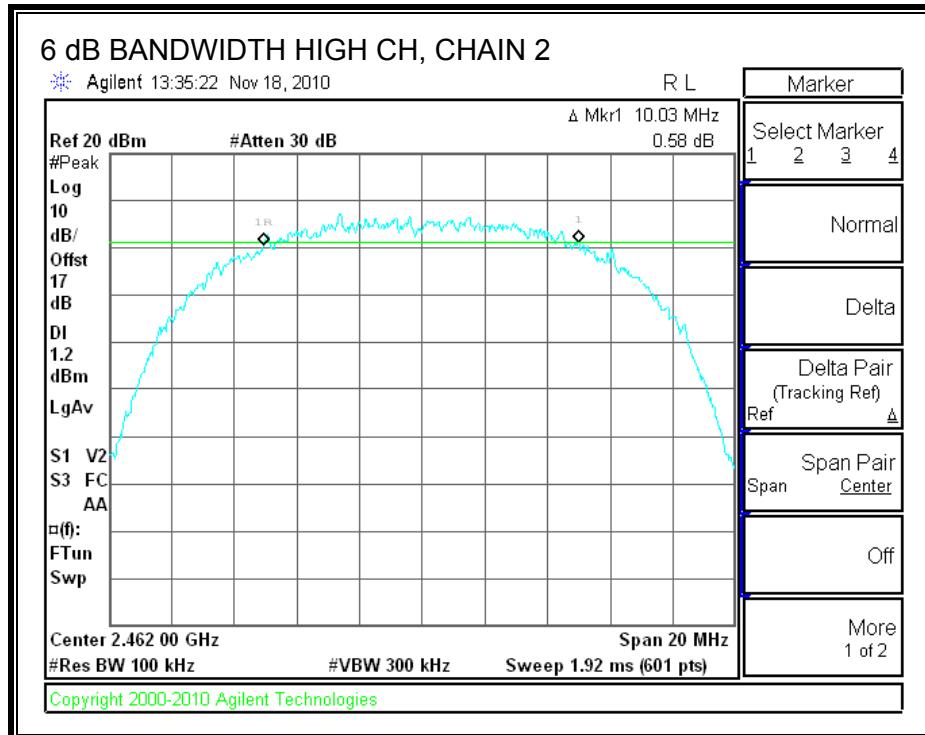
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

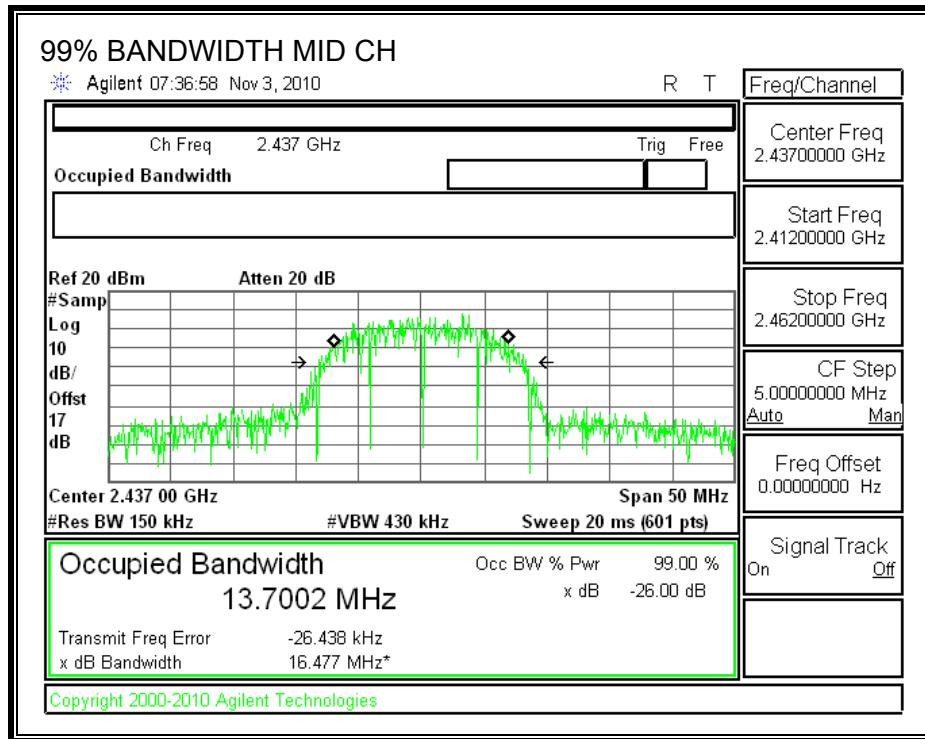
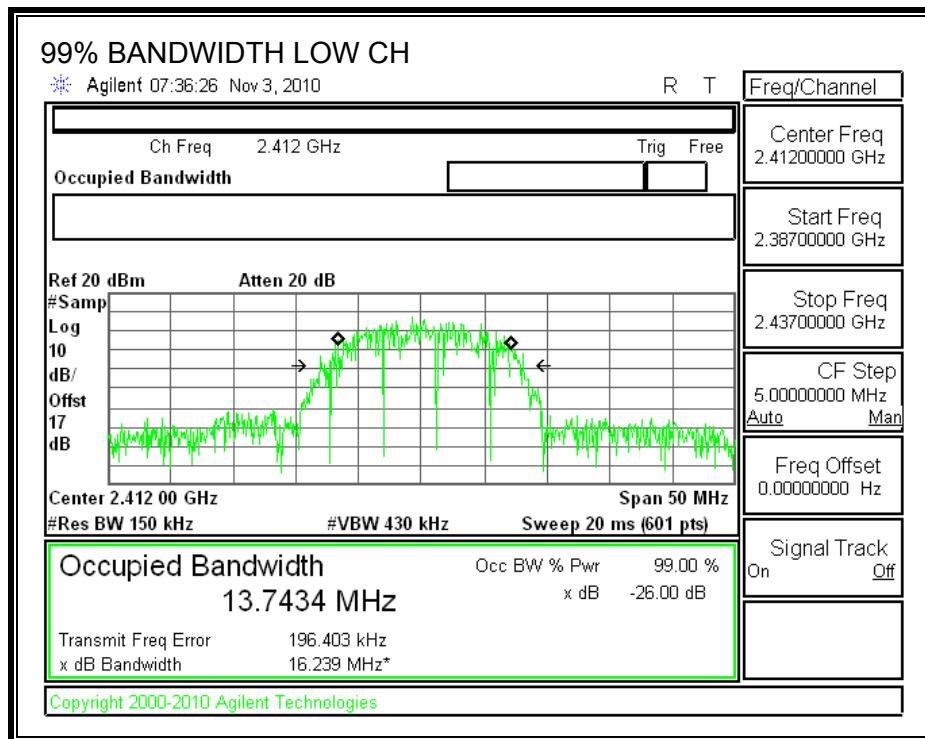
TEST PROCEDURE

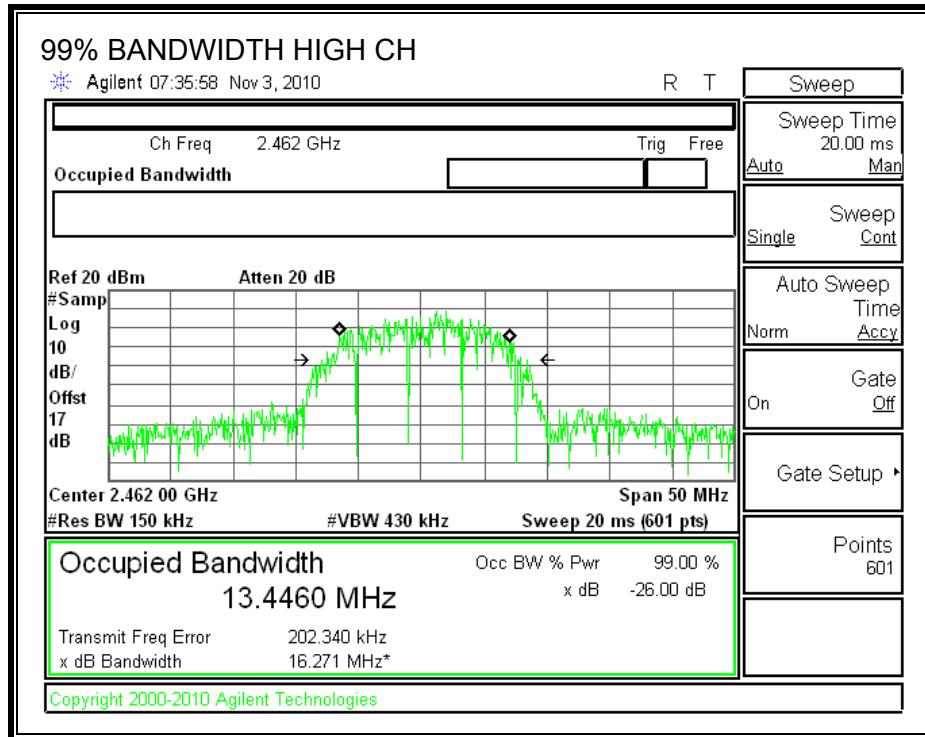
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

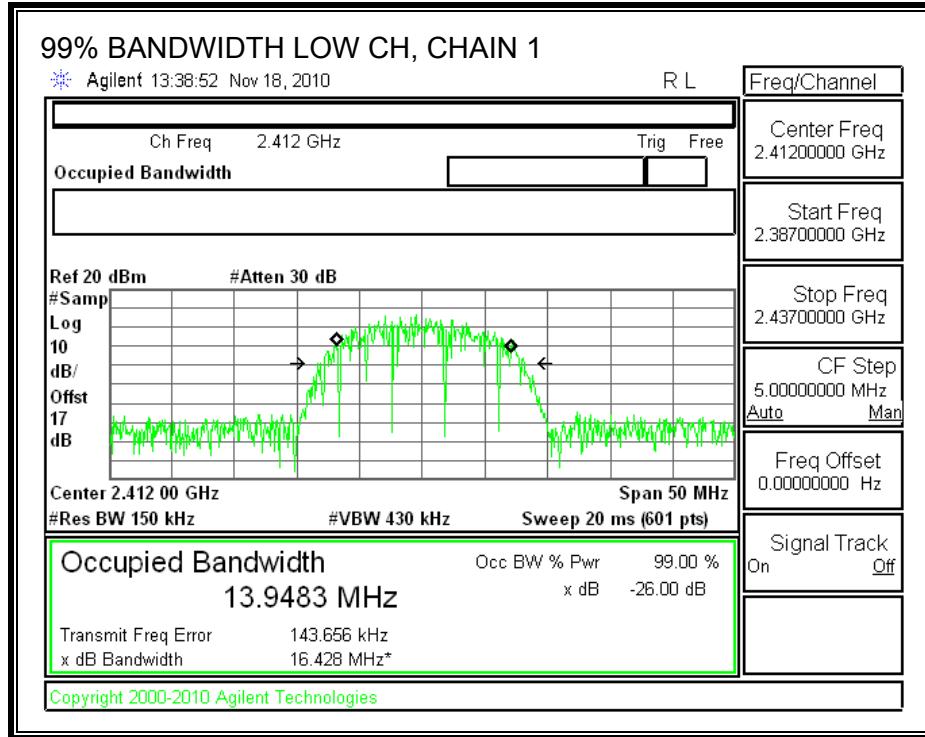
Channel	Frequency (MHz)	Chain 0 99% Bandwidth (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	13.7434	13.9483	13.5032
Middle	2437	13.7002	13.6521	13.4406
High	2462	13.4460	13.4433	13.5200

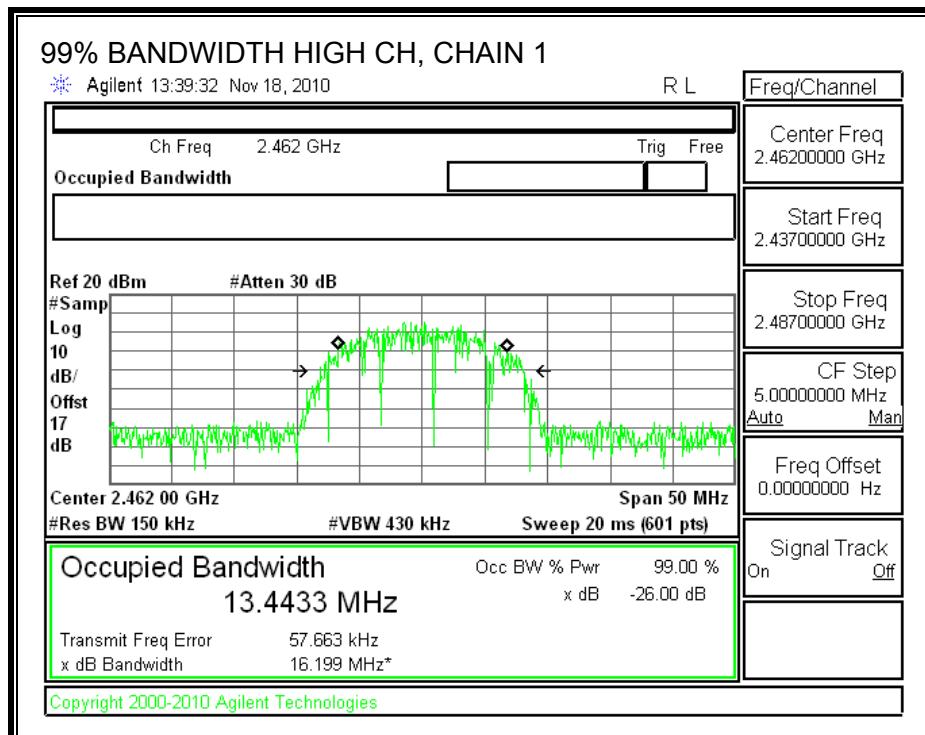
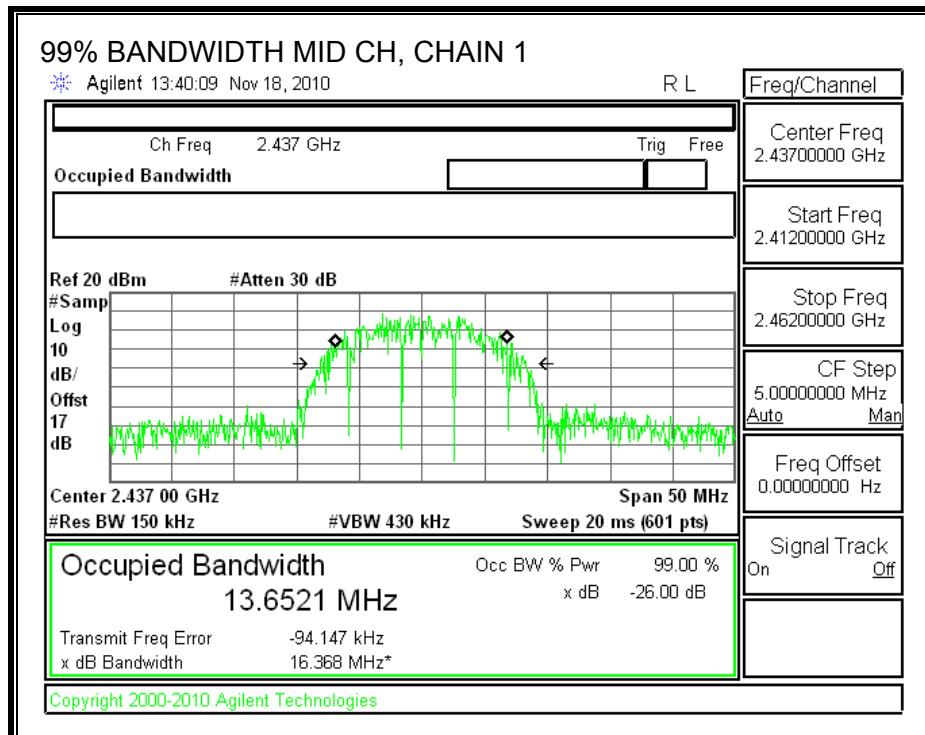
99% BANDWIDTH, CHAIN 0



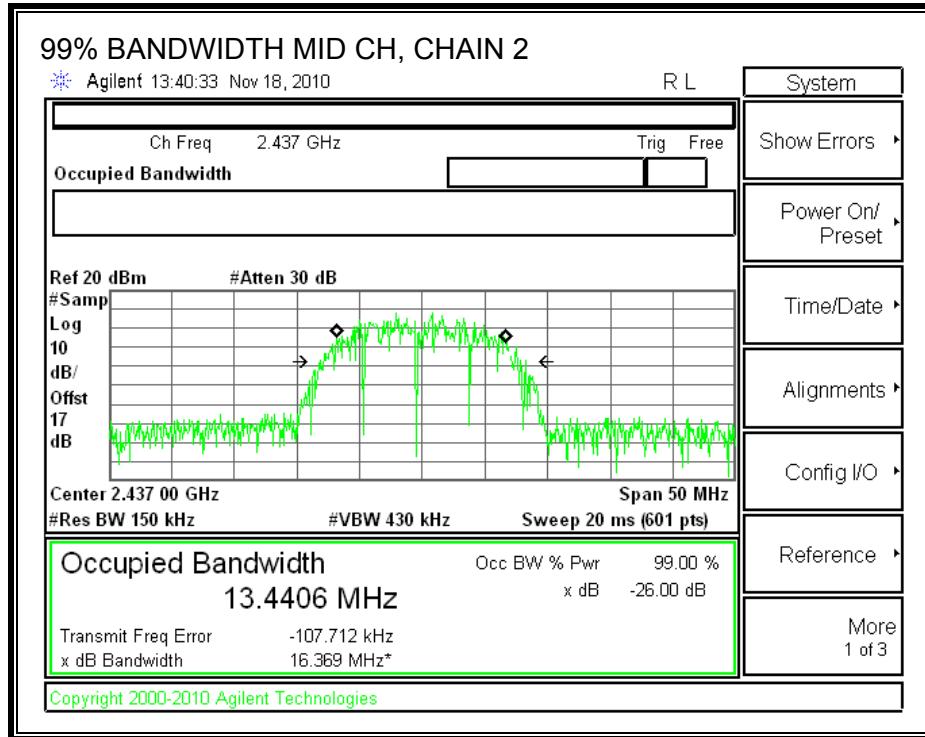
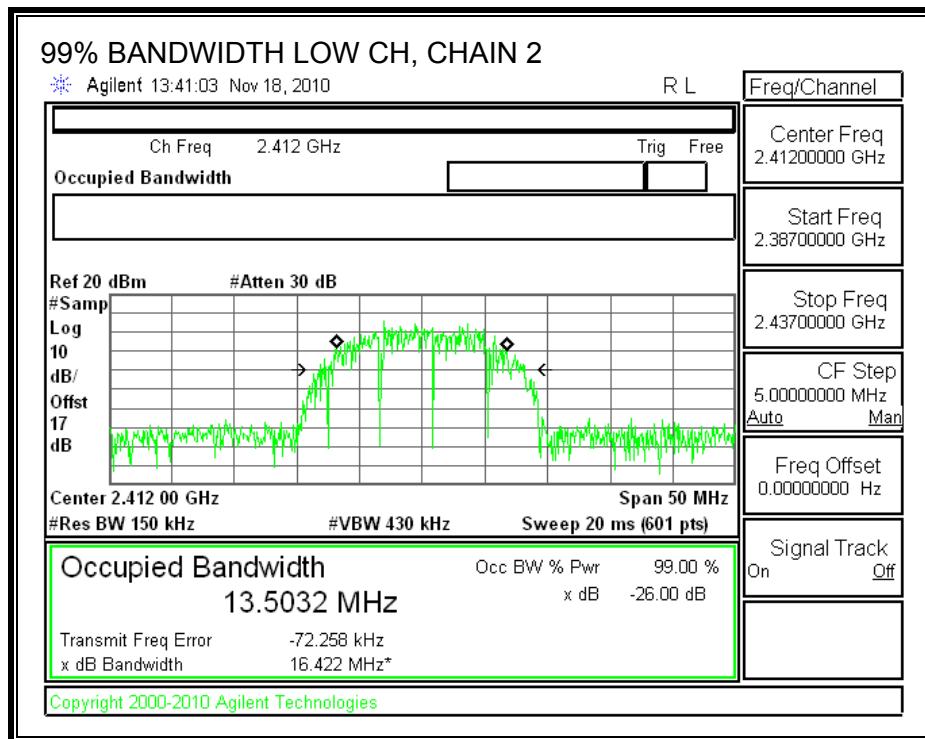


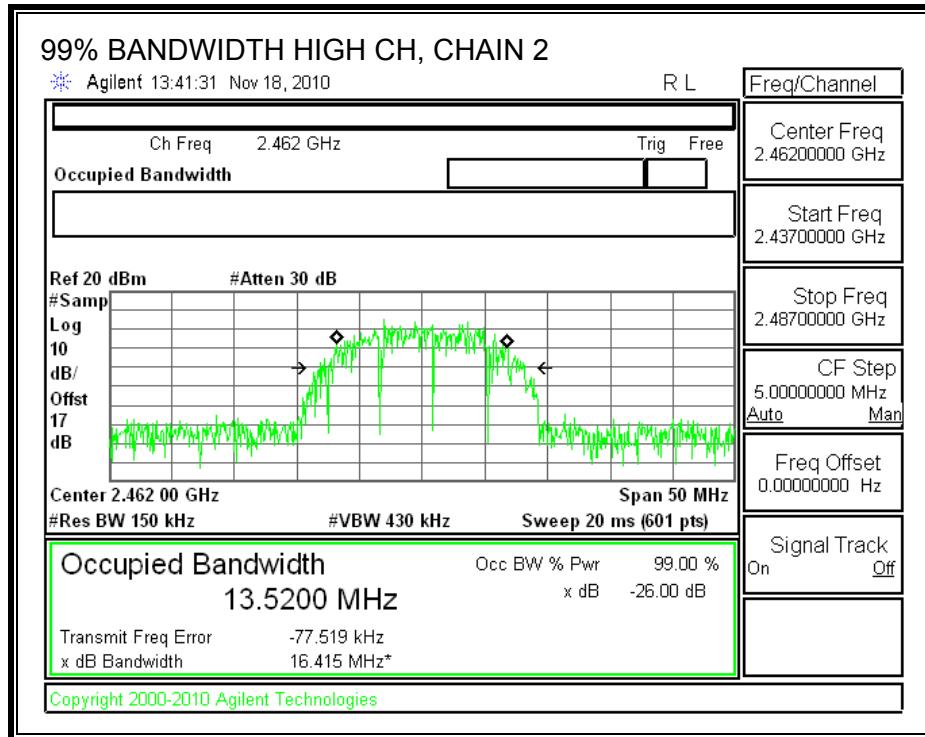
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum a Combine Antenna Gain is 8.76 dBi, therefore the limit is 27.24dBm.

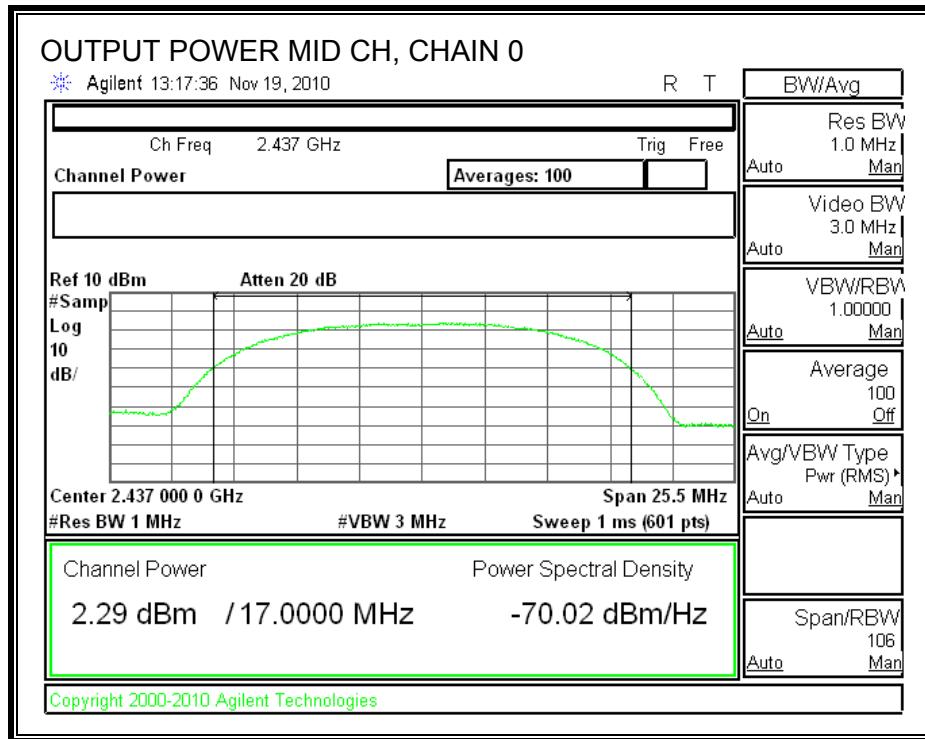
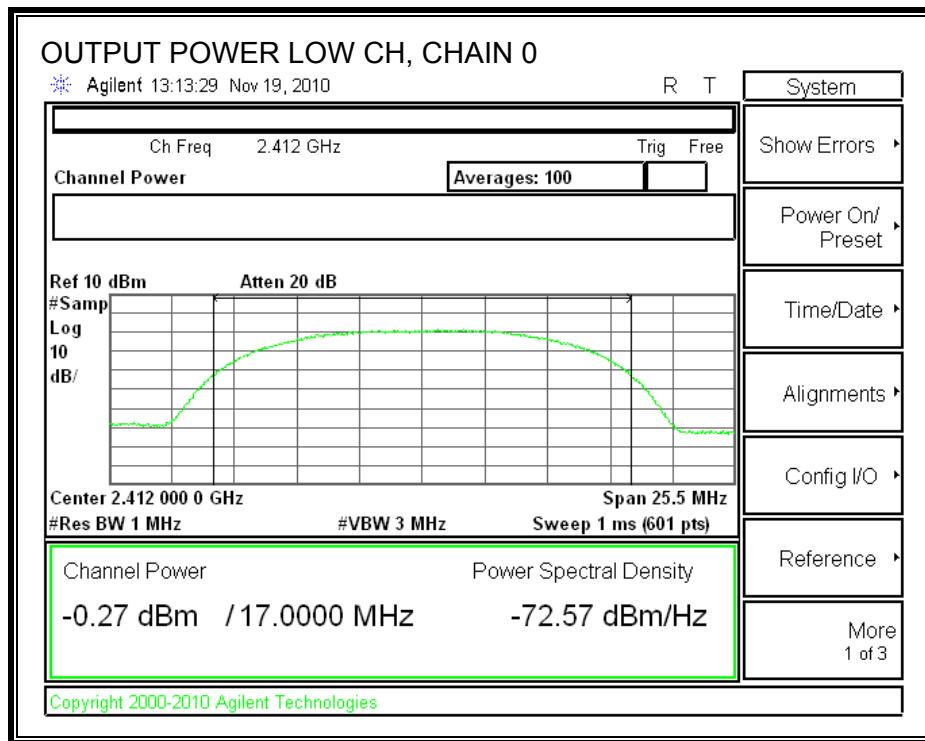
TEST PROCEDURE

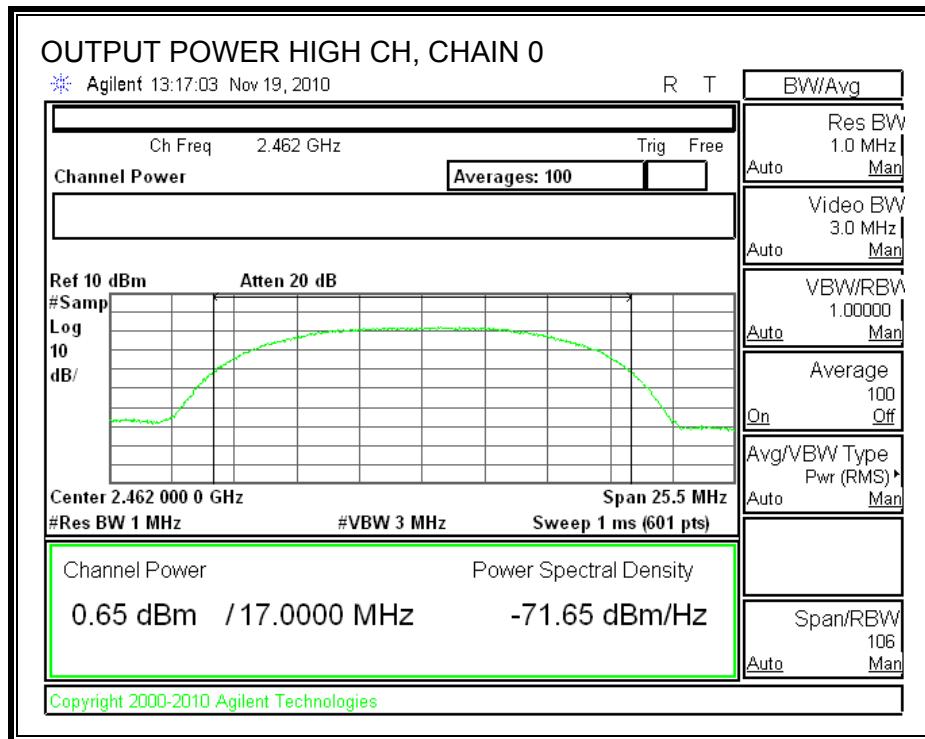
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

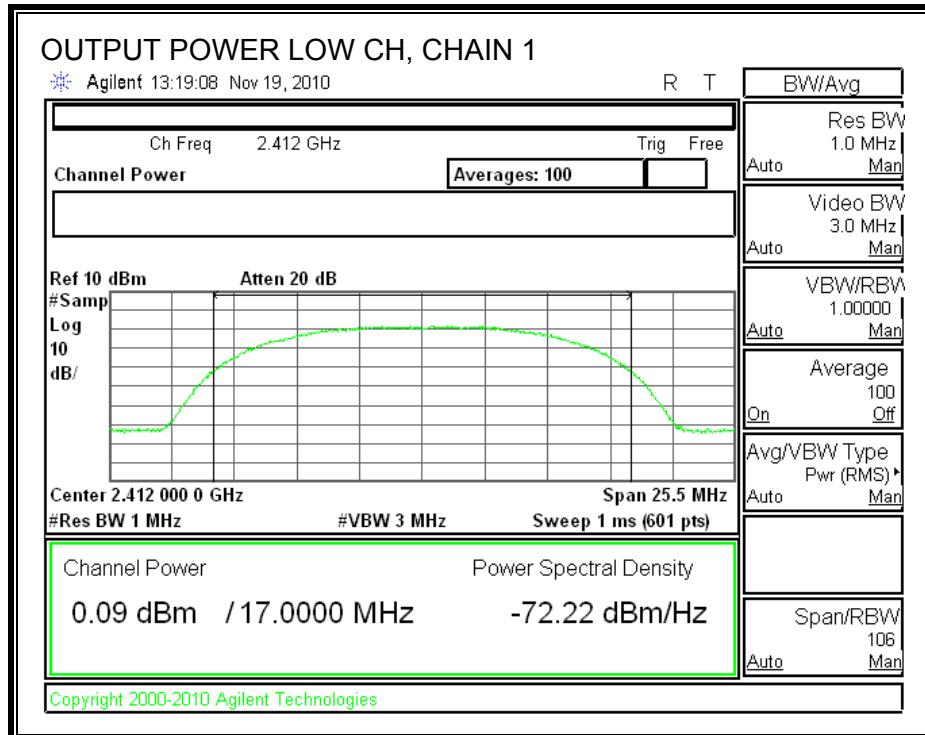
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-0.27	0.09	-0.35	17.00	21.60	27.24	-5.64
Mid	2437	2.29	1.72	0.94	17.00	23.46	27.24	-3.78
High	2462	0.65	-0.35	-1.40	17.00	21.48	27.24	-5.76

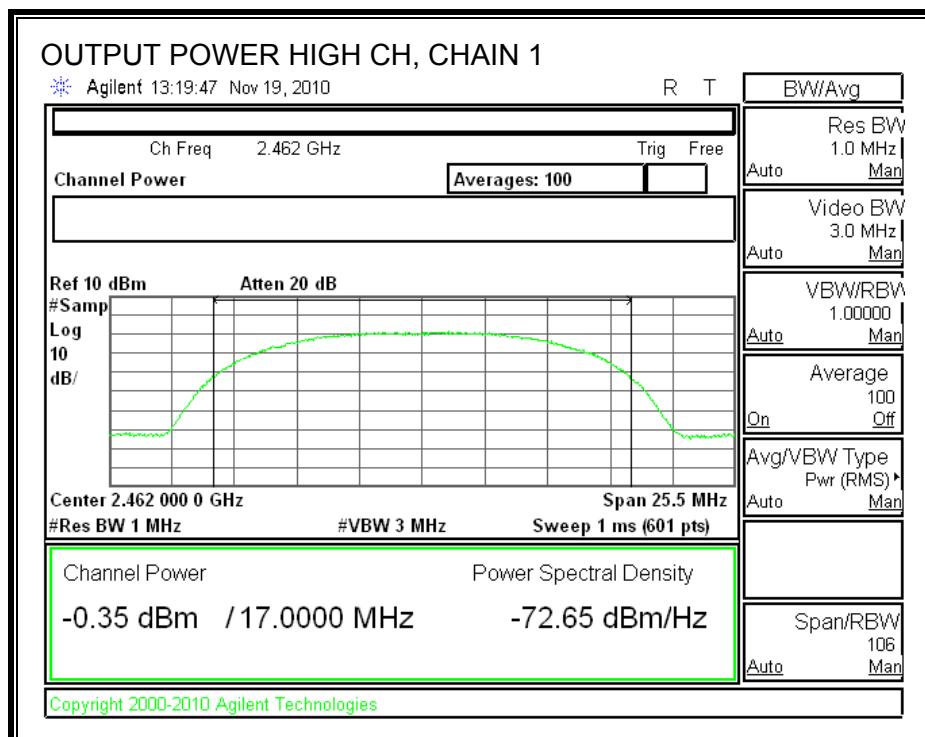
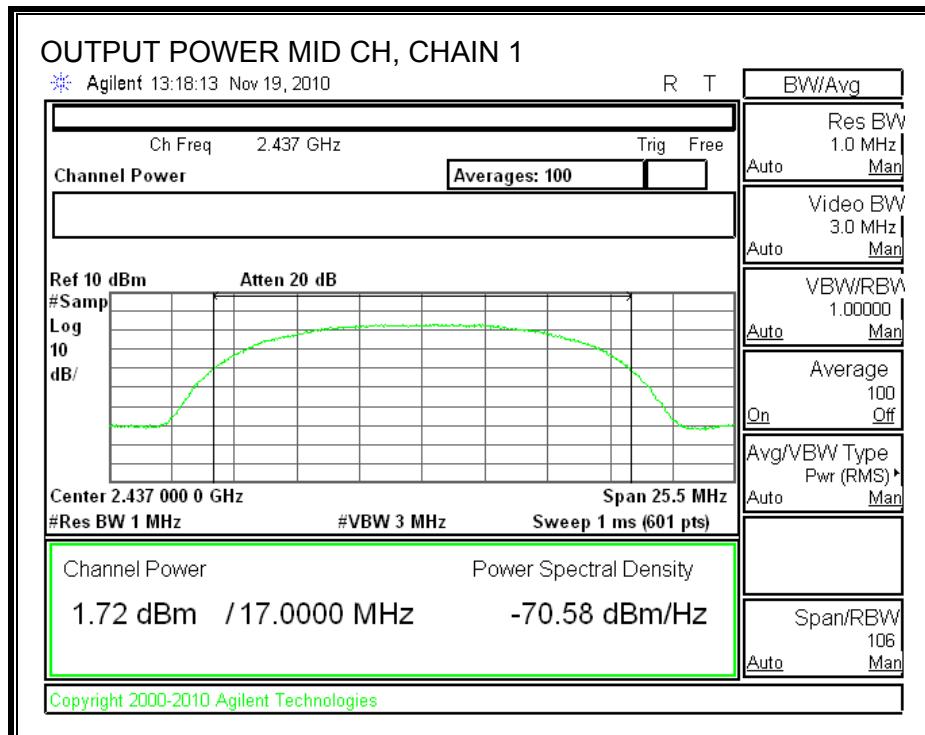
CHAIN 0 OUTPUT POWER



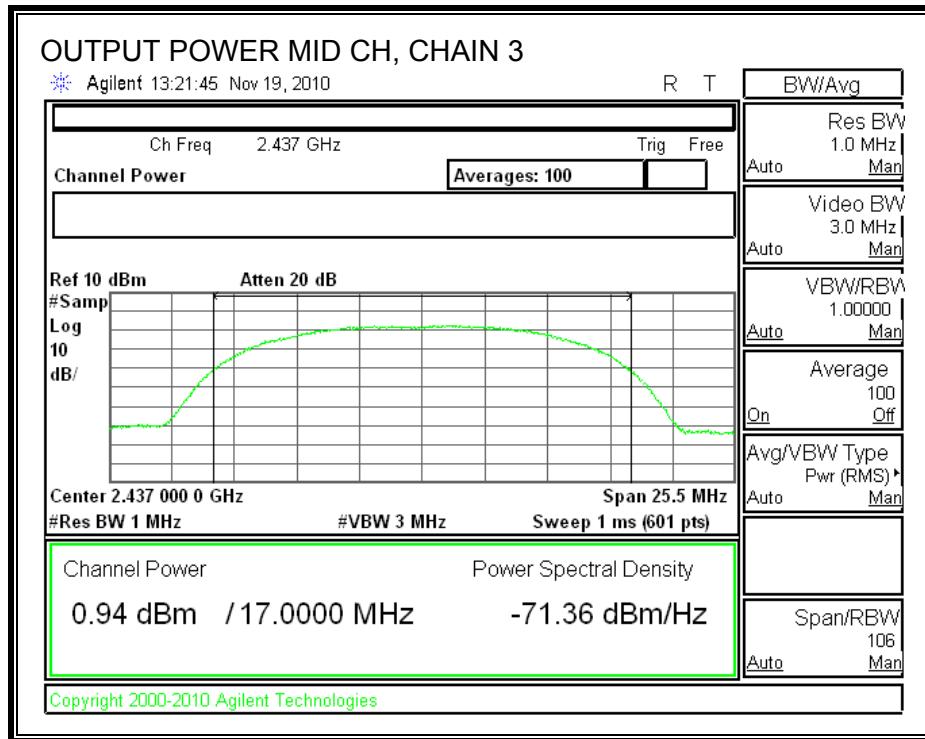
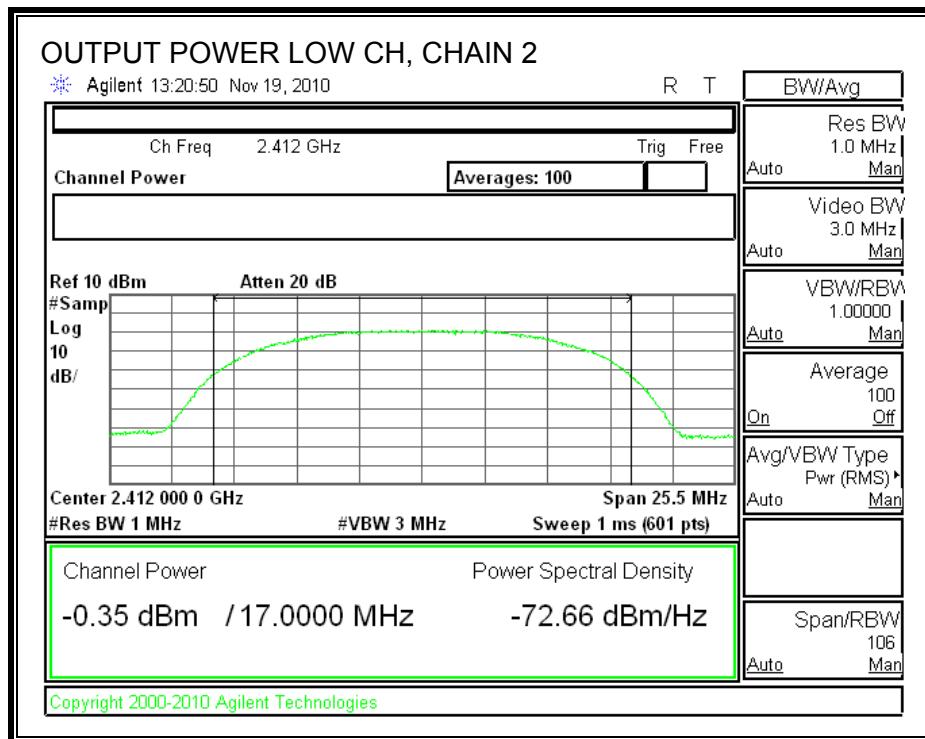


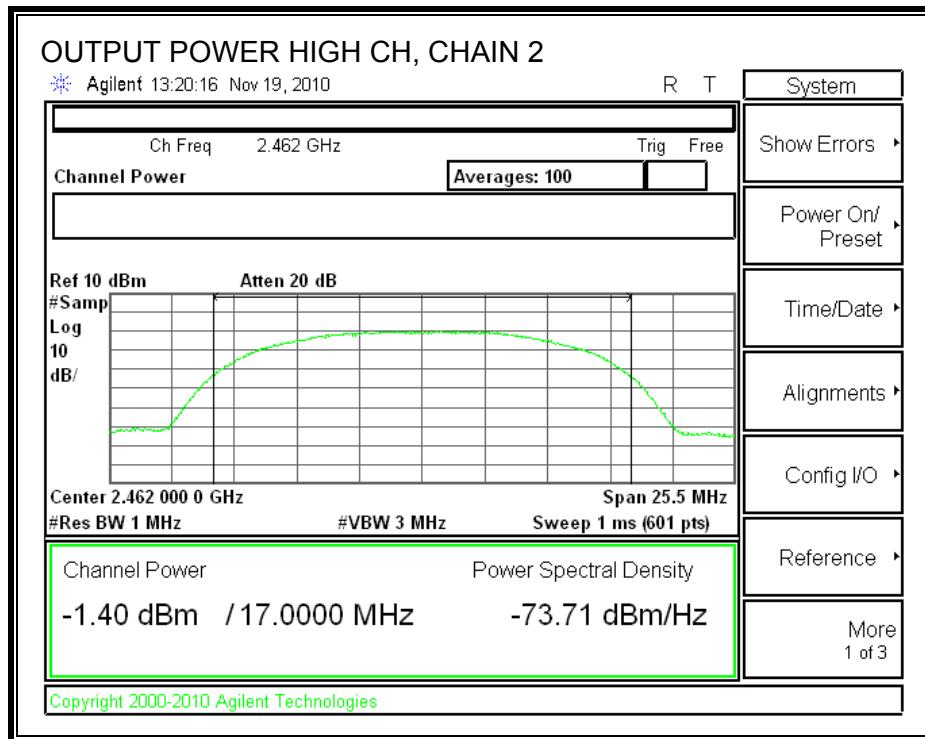
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2412	16.70	16.90	16.60	21.51
Middle	2437	19.00	18.50	17.50	23.15
High	2462	17.25	16.60	15.50	21.28

7.1.5. 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

The combination of antenna gain is equal to 8.76 dBi, therefore the limit is 5.24 dBm.

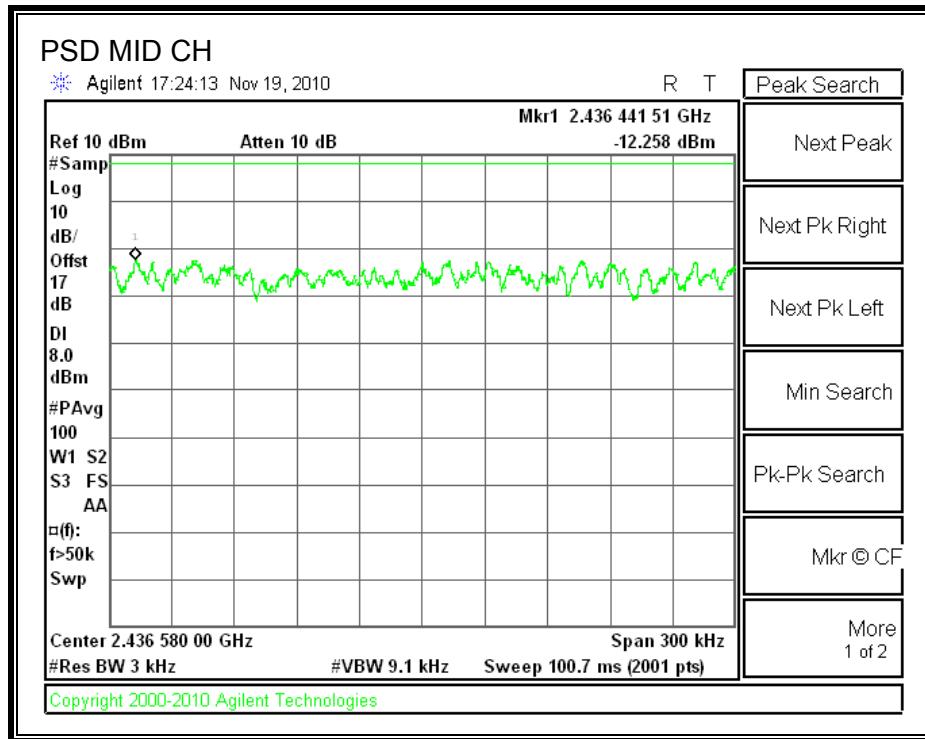
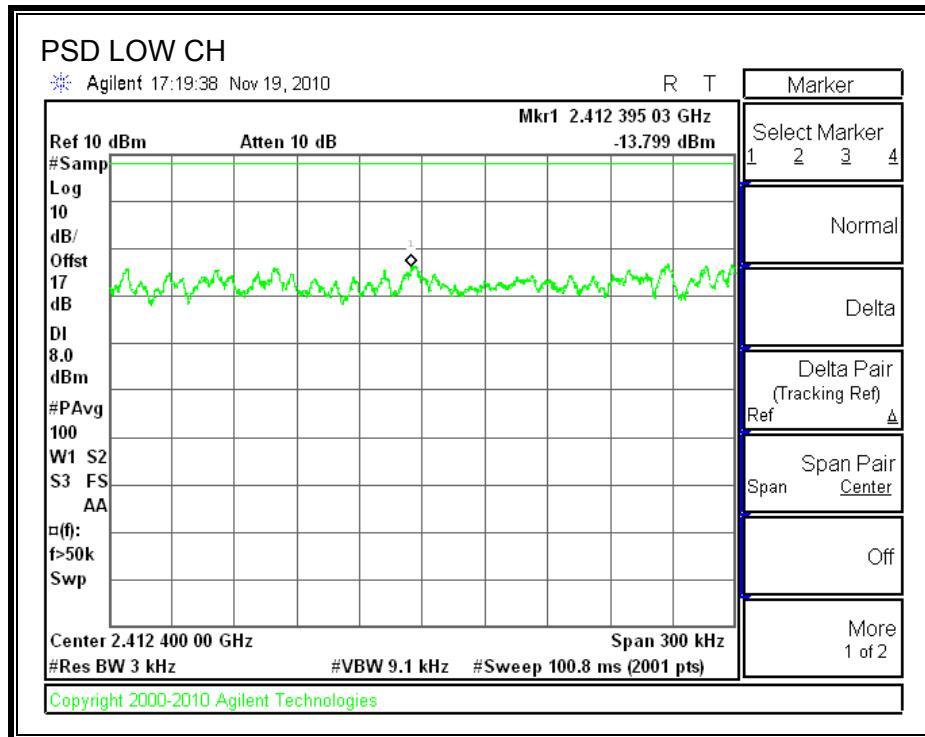
TEST PROCEDURE

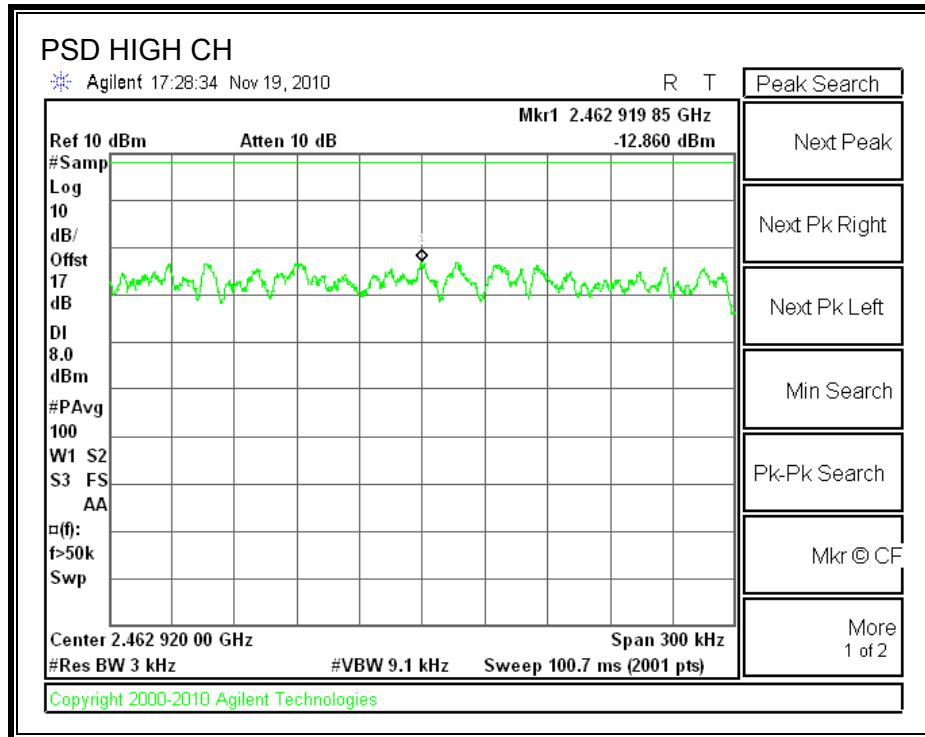
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

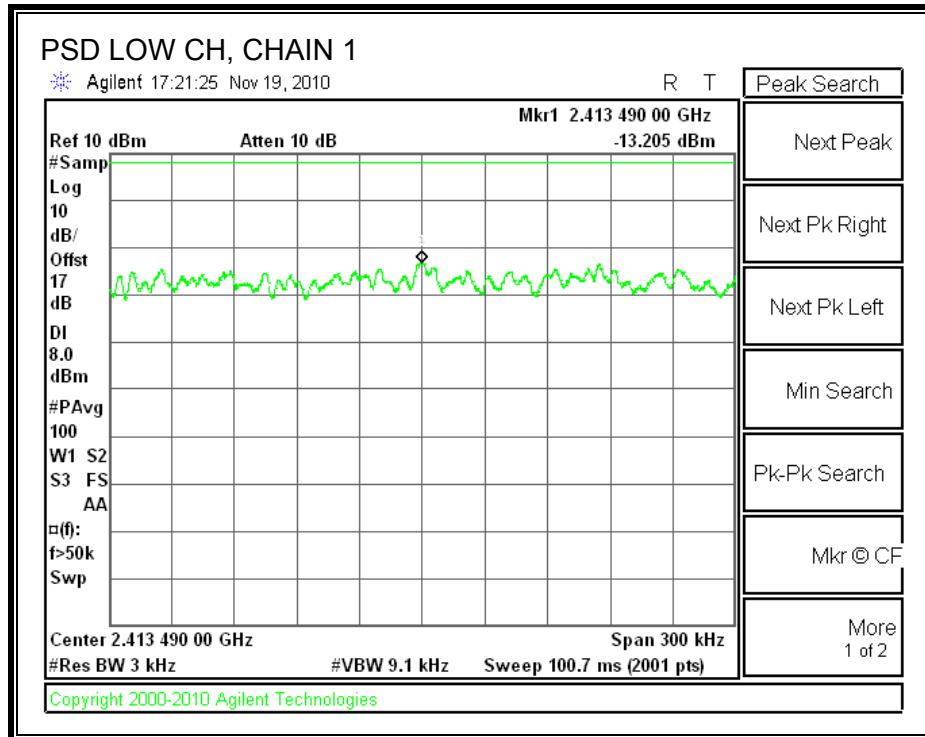
Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-13.80	-13.21	-13.58	-8.8	5.24	-13.99
Middle	2437	-12.26	-11.30	-11.94	-7.0	5.24	-12.28
High	2462	-12.86	-13.57	-14.54	-8.8	5.24	-14.07

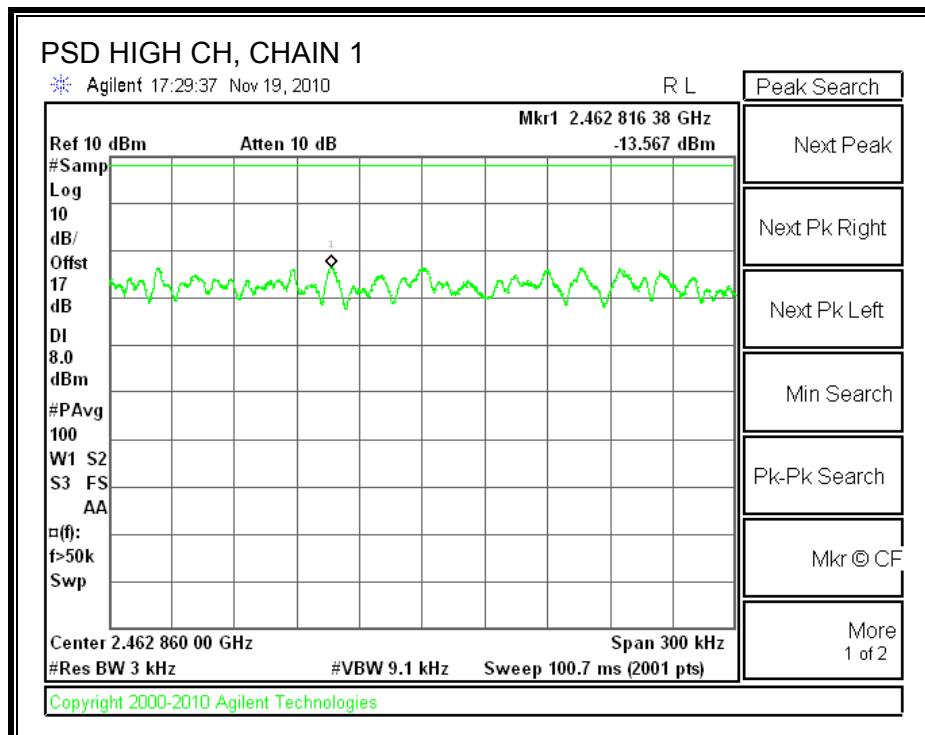
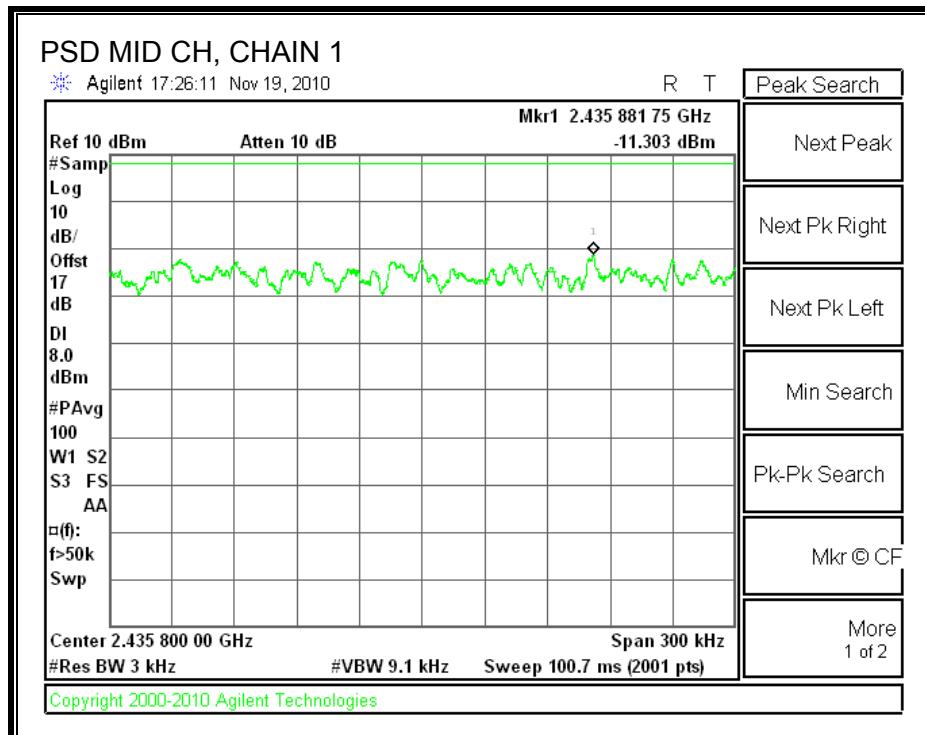
POWER SPECTRAL DENSITY, CHAIN 0



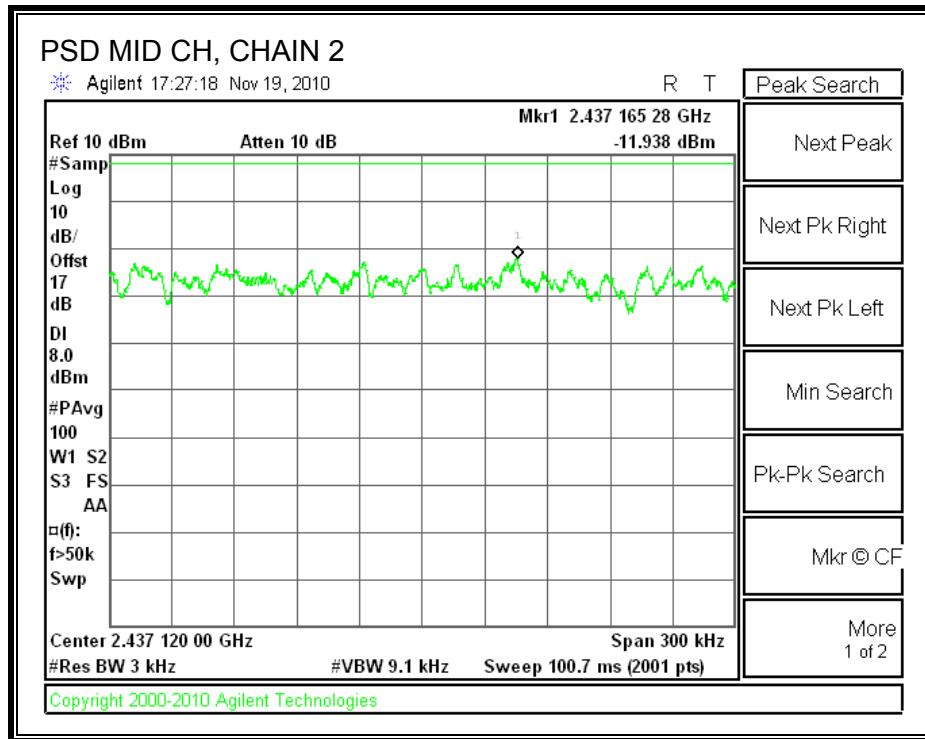
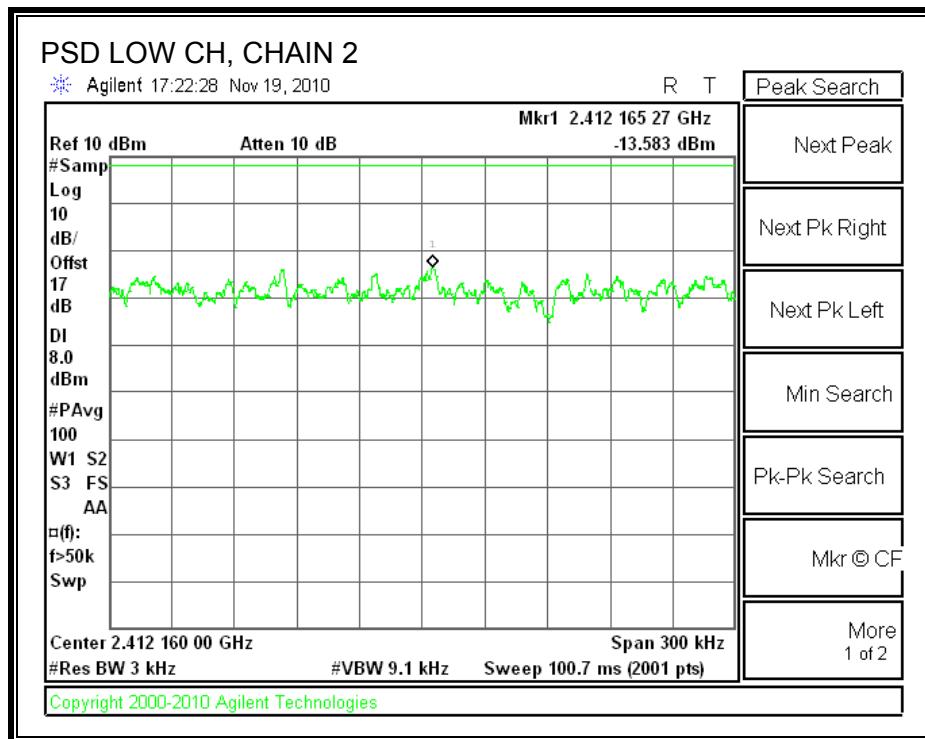


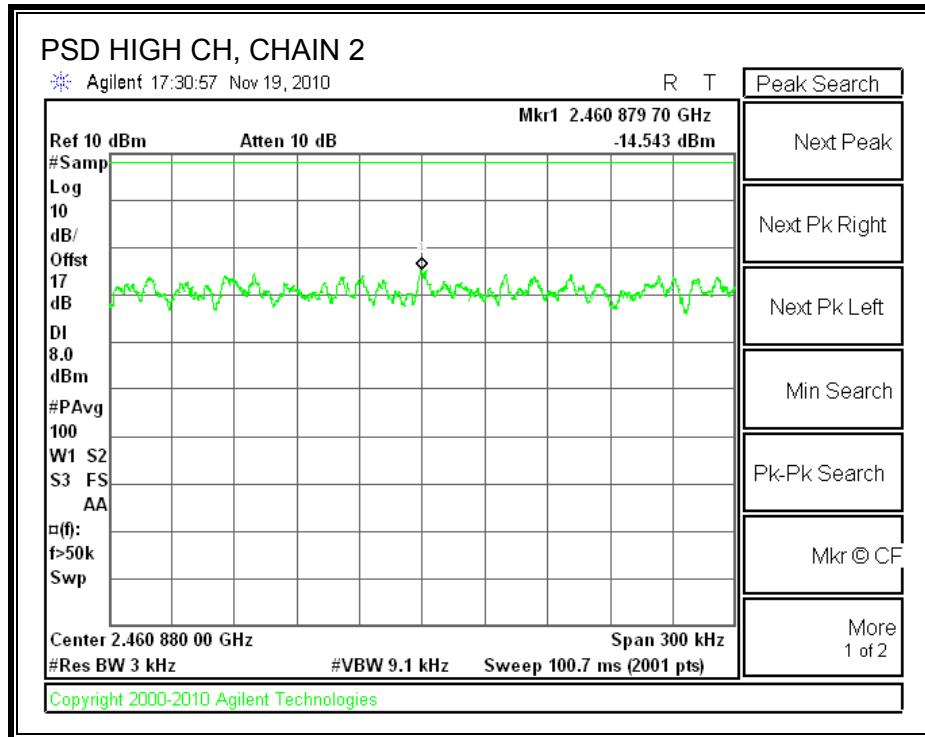
POWER SPECTRAL DENSITY, CHAIN 1





POWER SPECTRAL DENSITY, CHAIN 2





7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

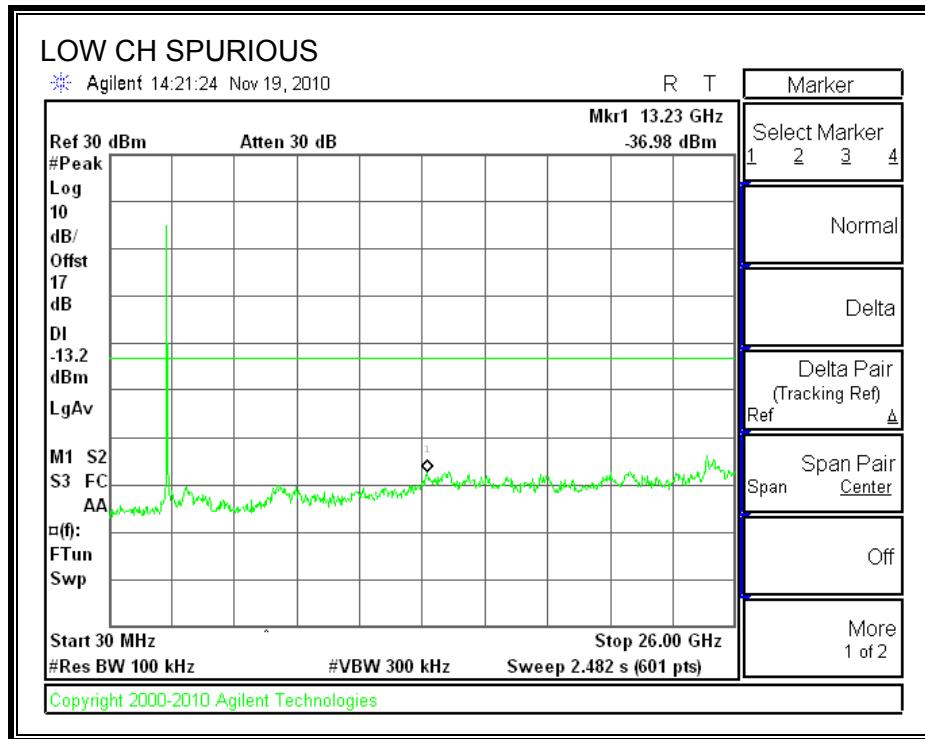
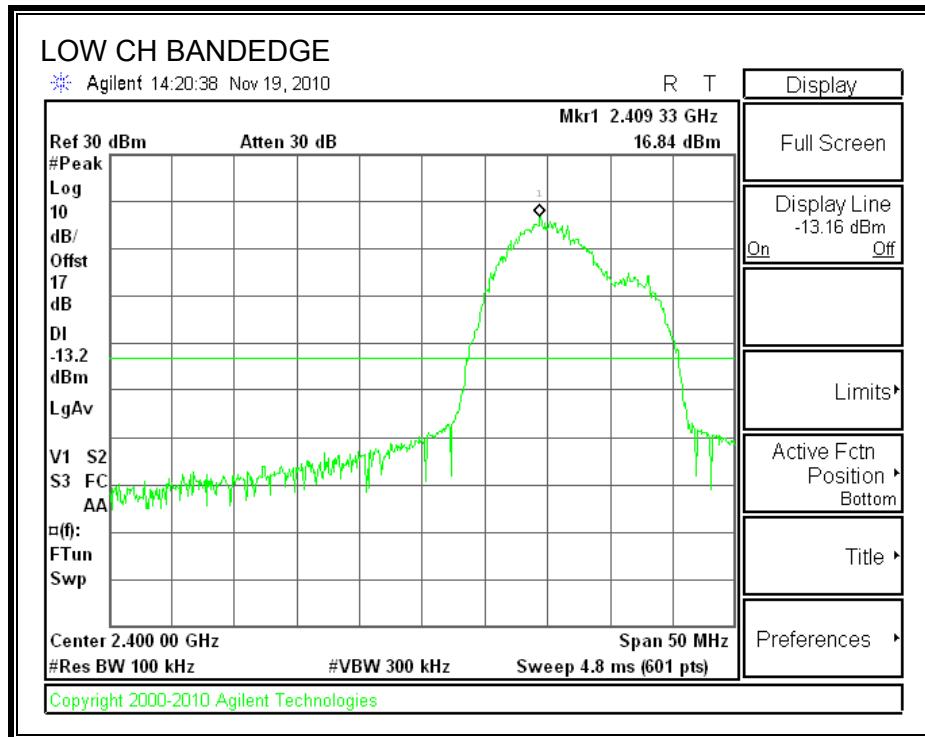
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

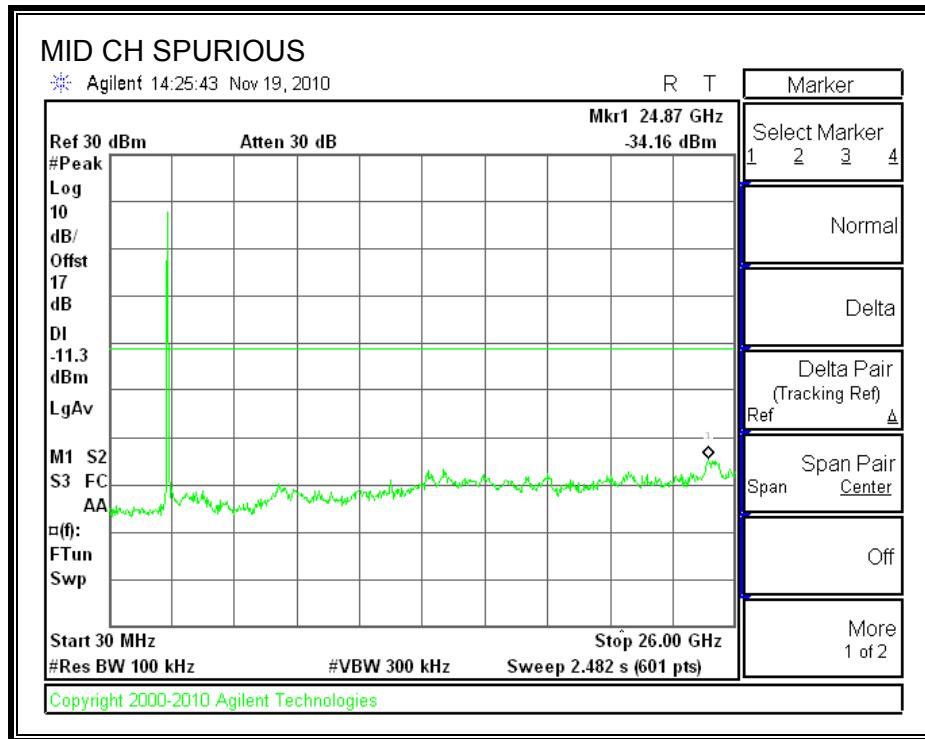
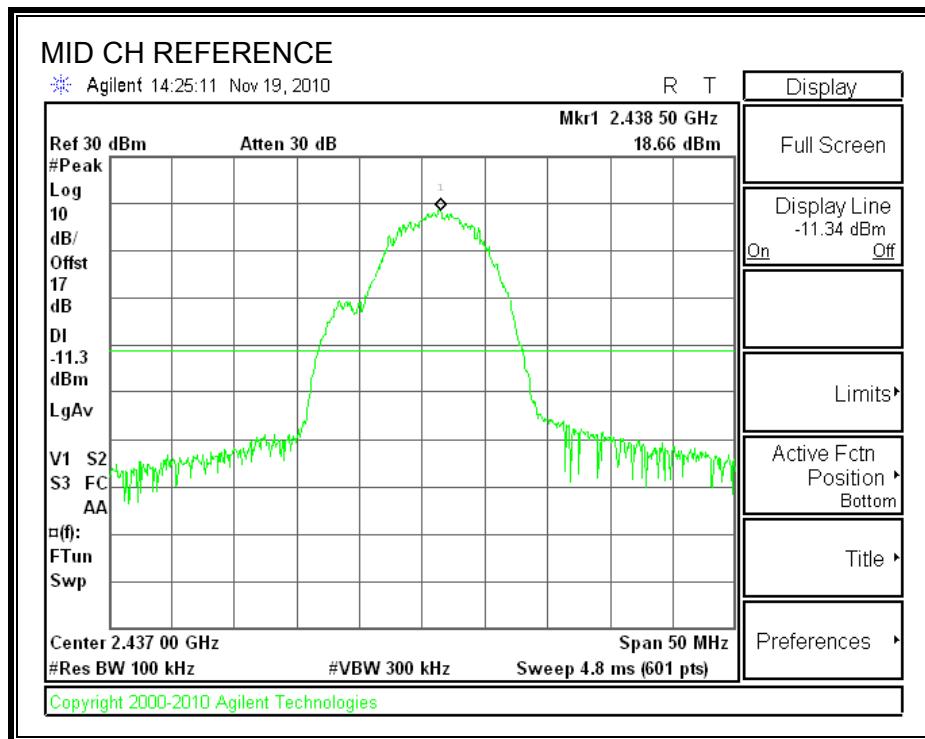
The EUT was set to transmit at each channel, so 30dBc display line was set with reference to each channel level.

RESULTS

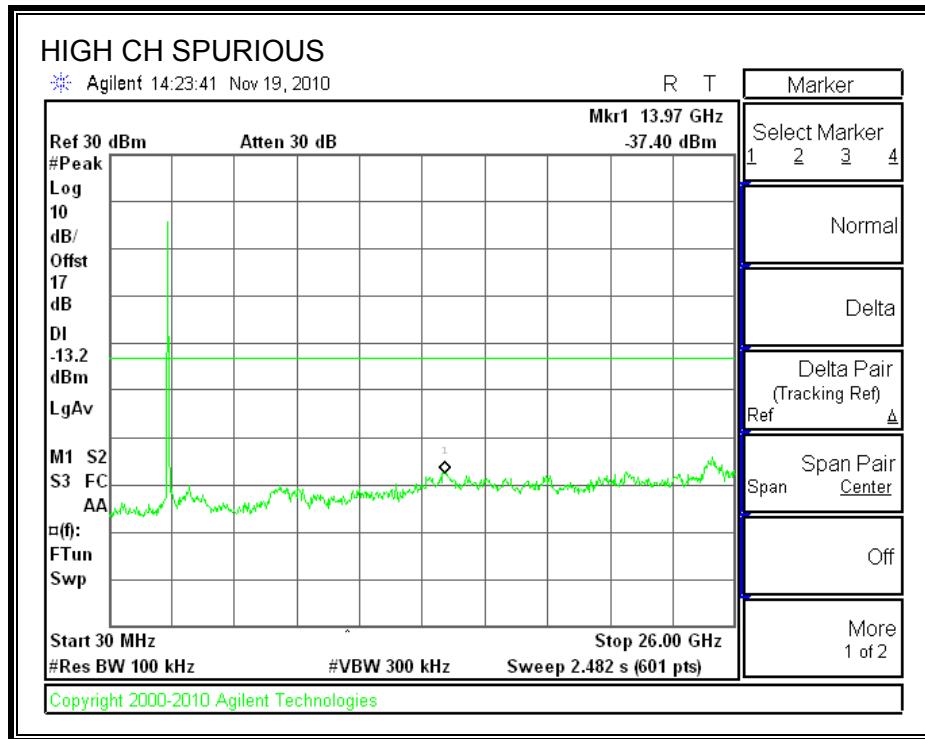
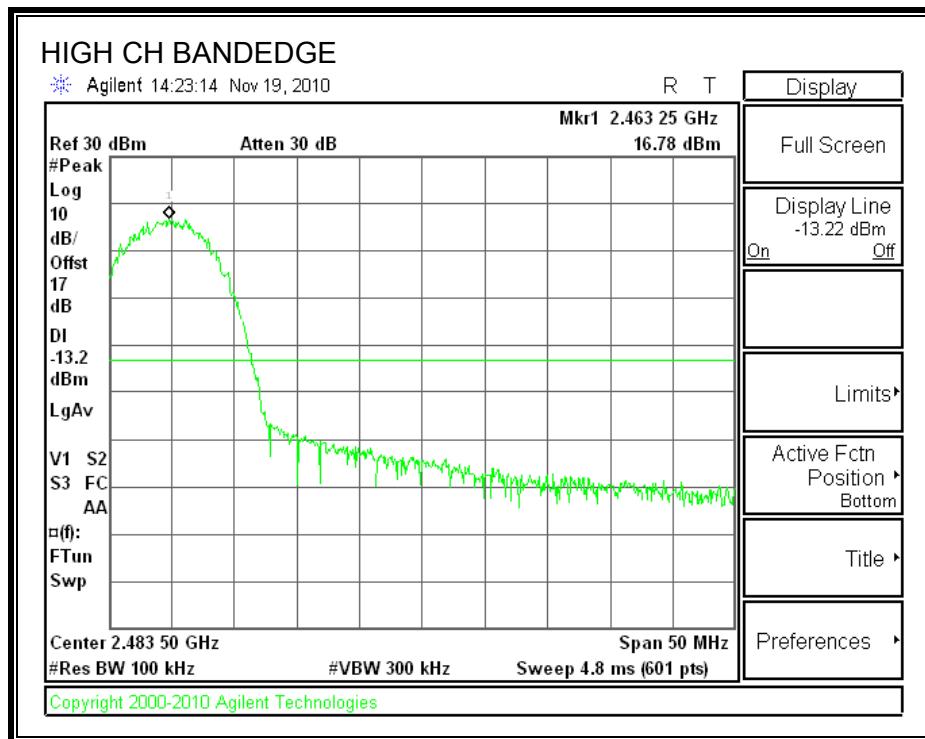
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



7.2. 802.11g 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.

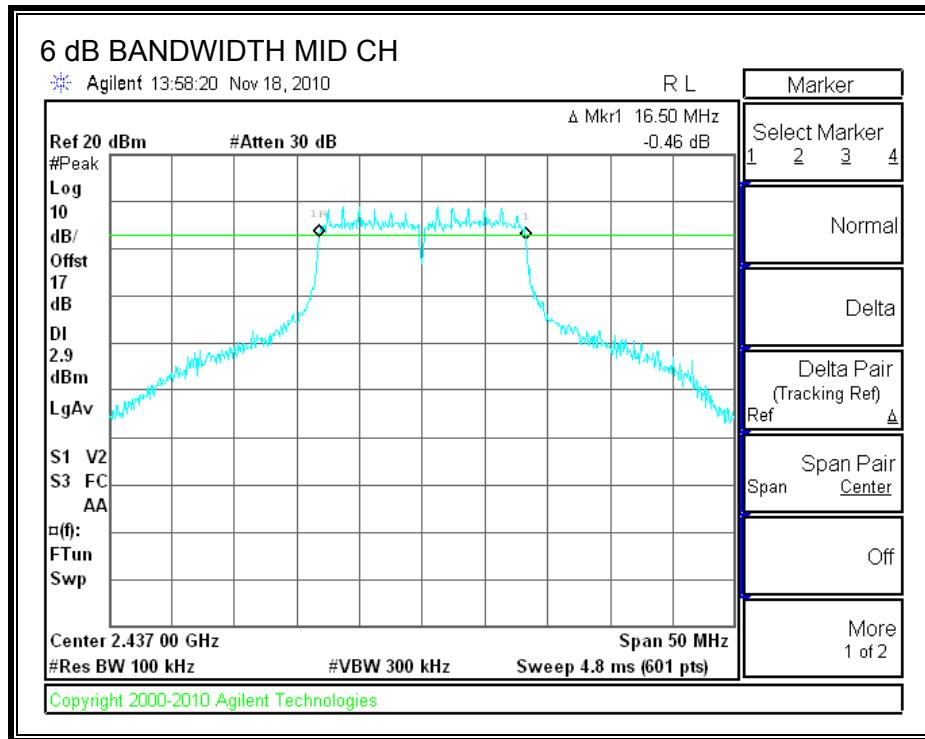
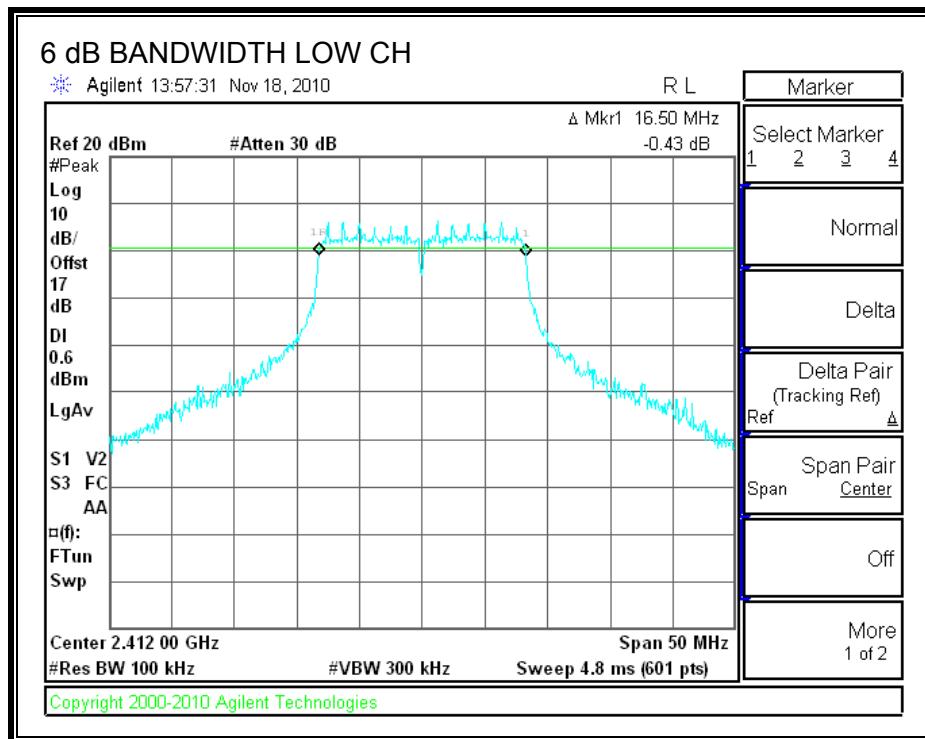
TEST PROCEDURE

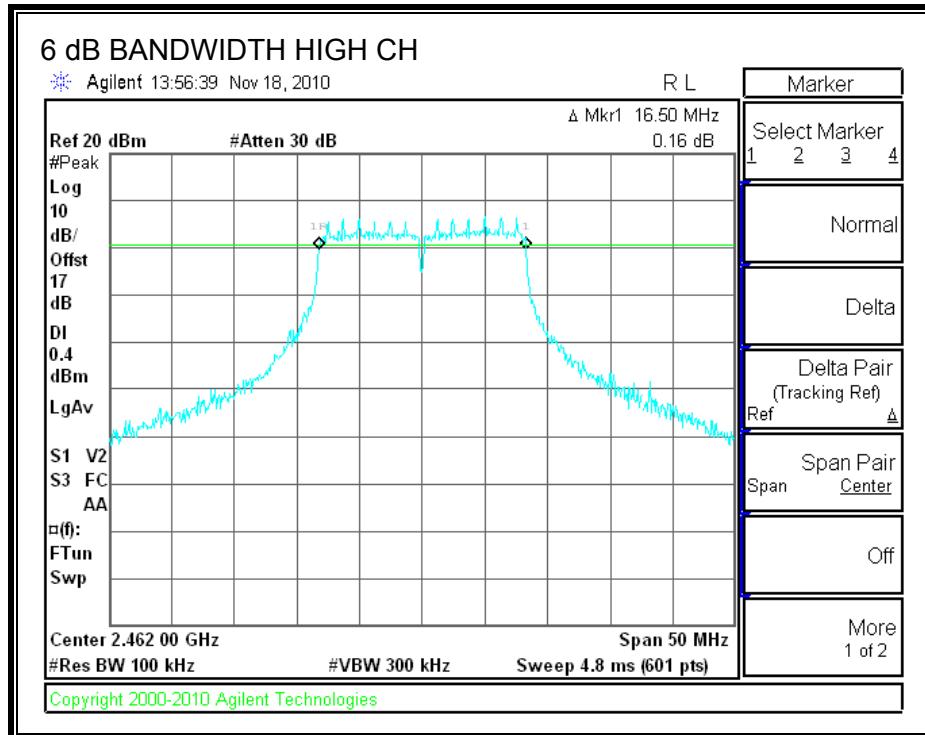
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

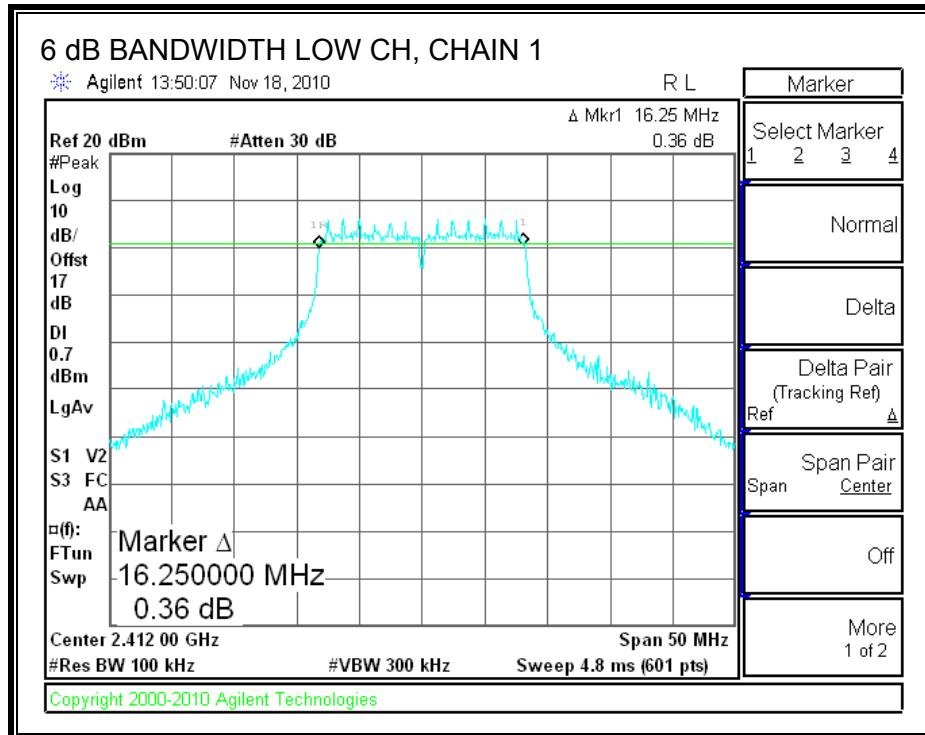
Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	16.50	16.25	16.50	0.5
Middle	2437	16.50	16.50	16.50	0.5
High	2462	16.50	16.50	16.58	0.5

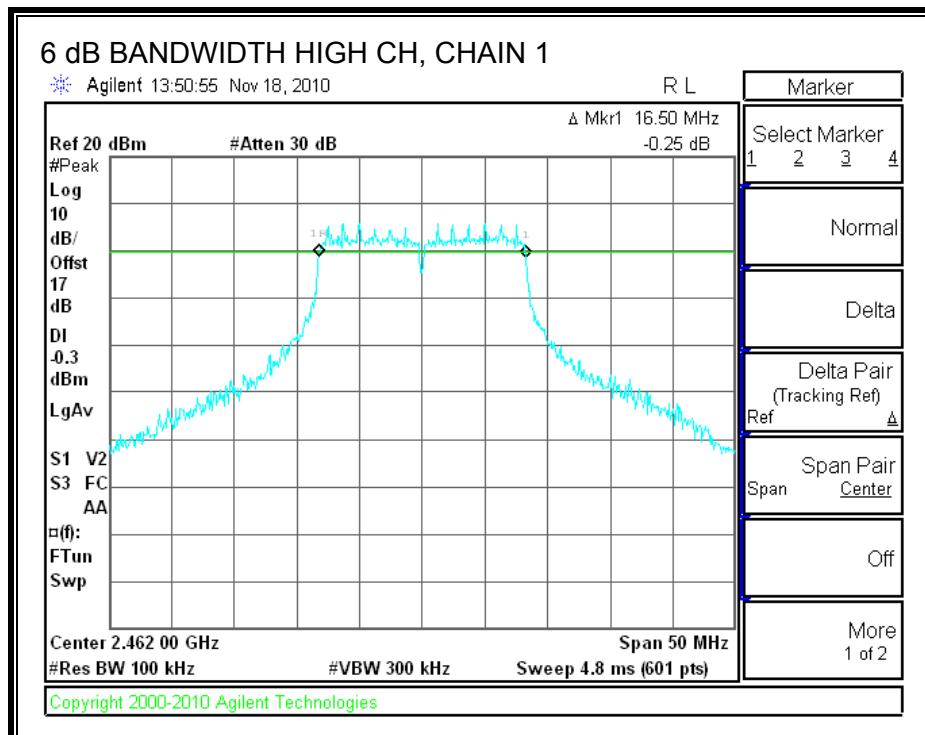
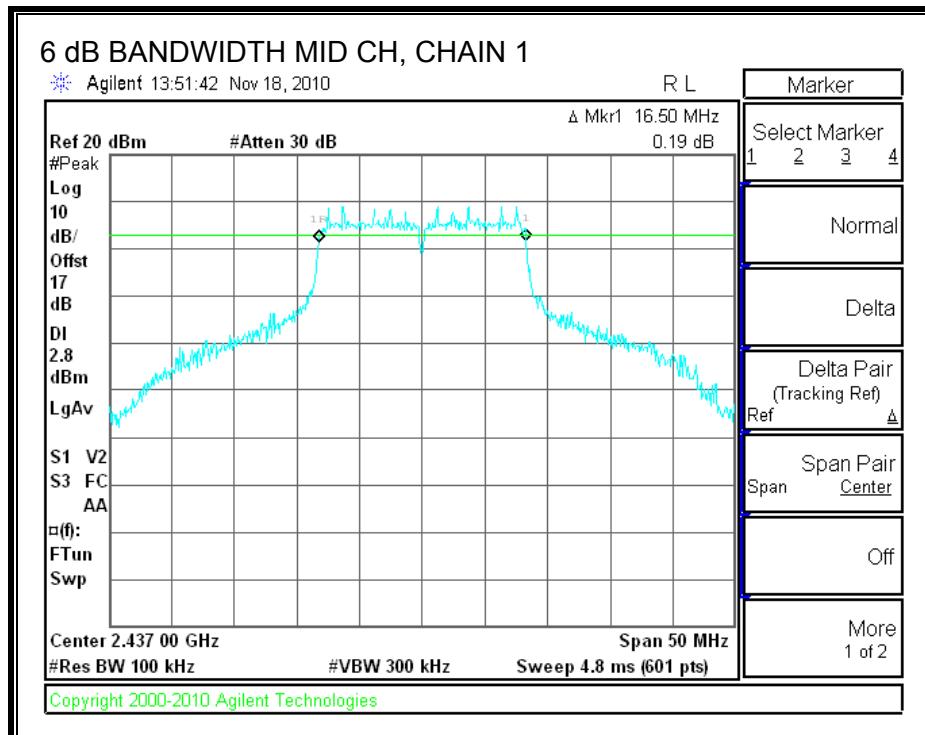
6 dB BANDWIDTH, CHAIN 0



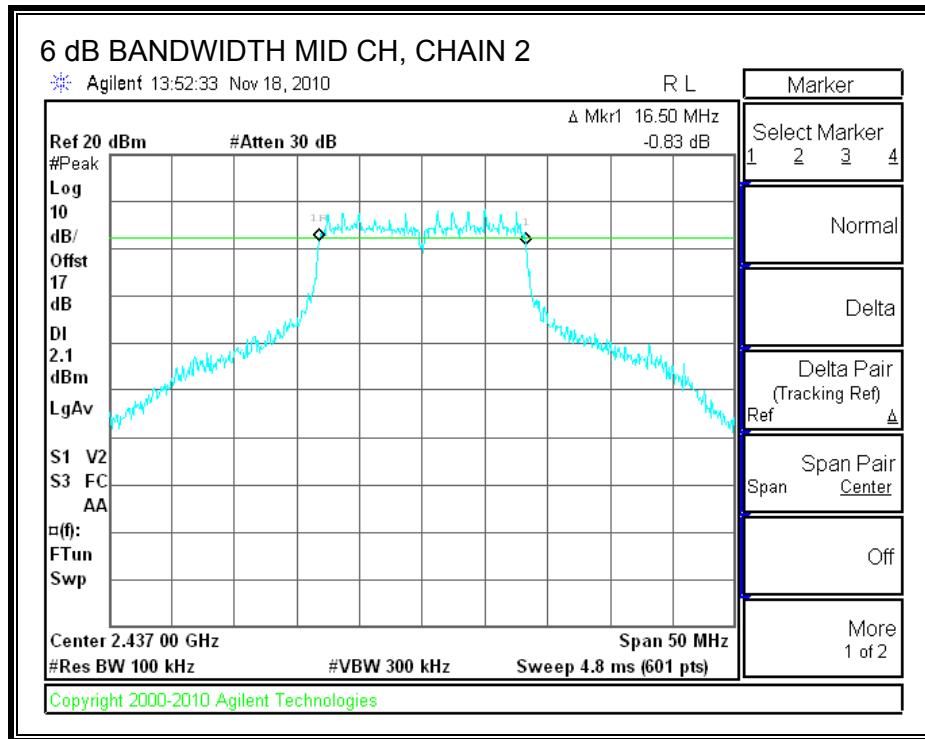
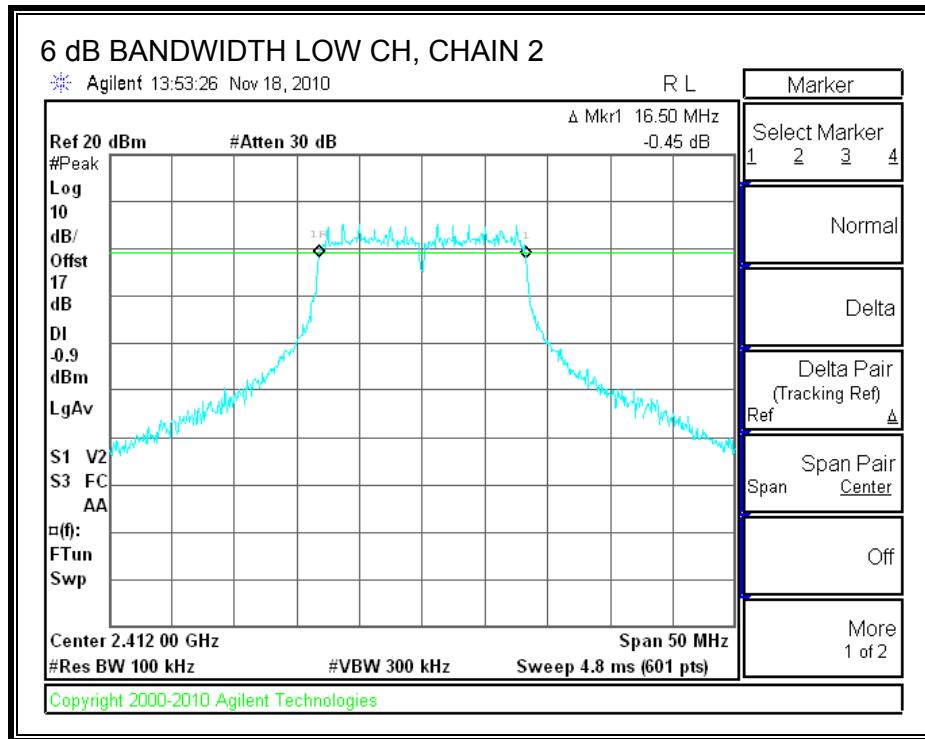


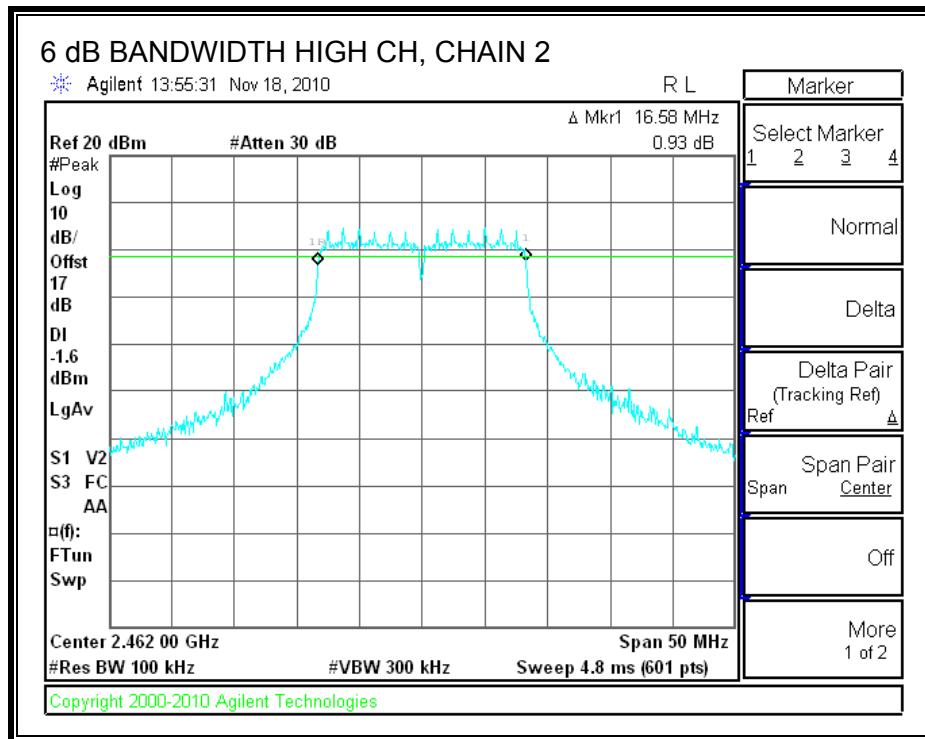
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

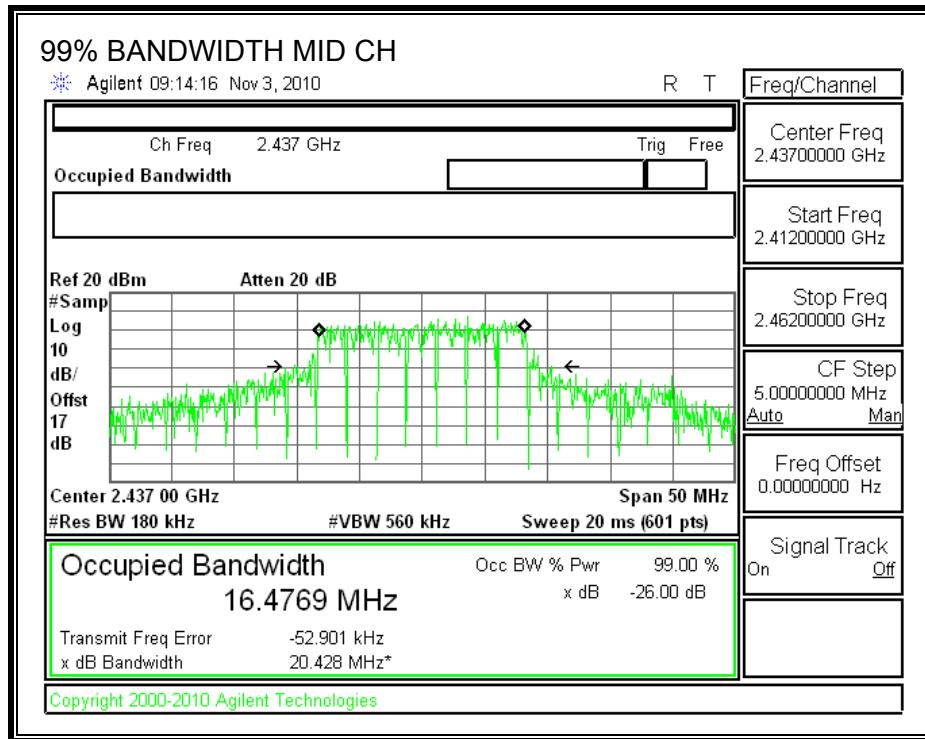
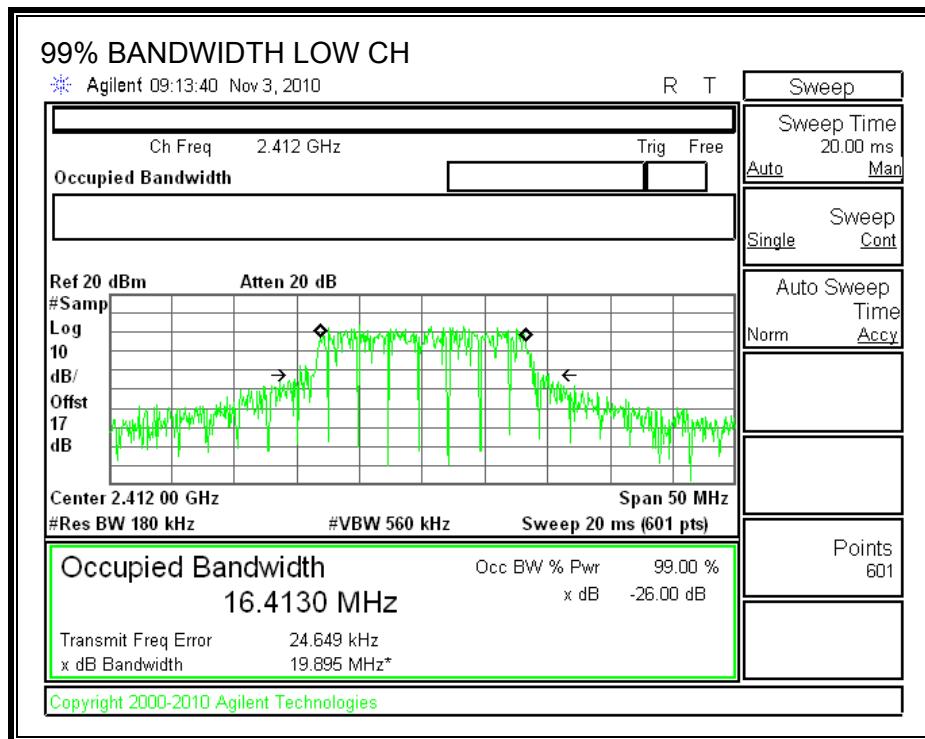
TEST PROCEDURE

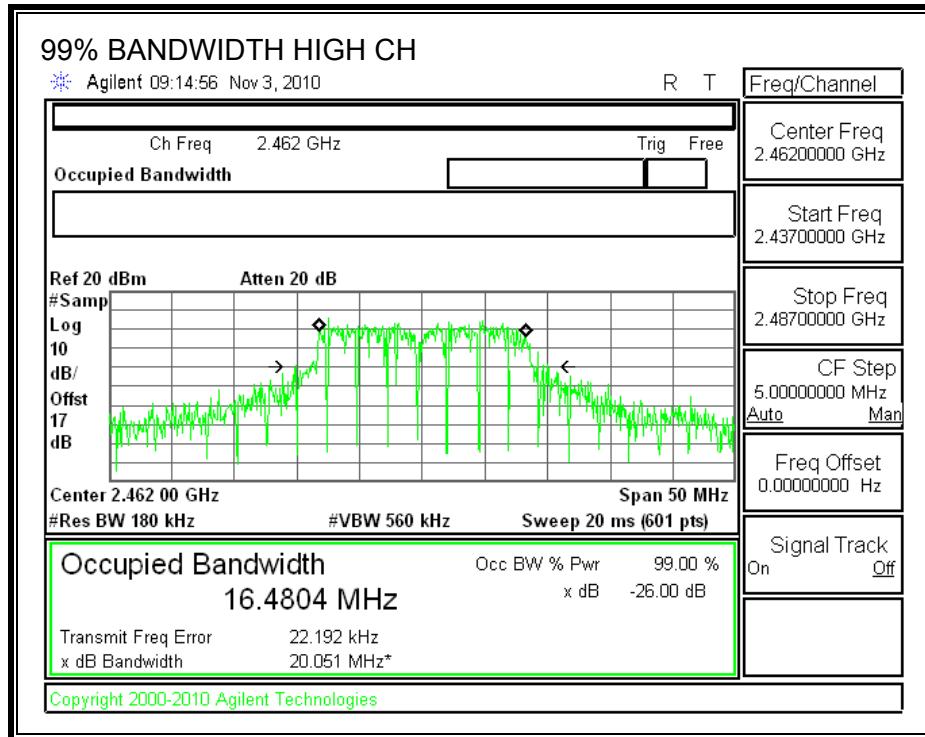
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

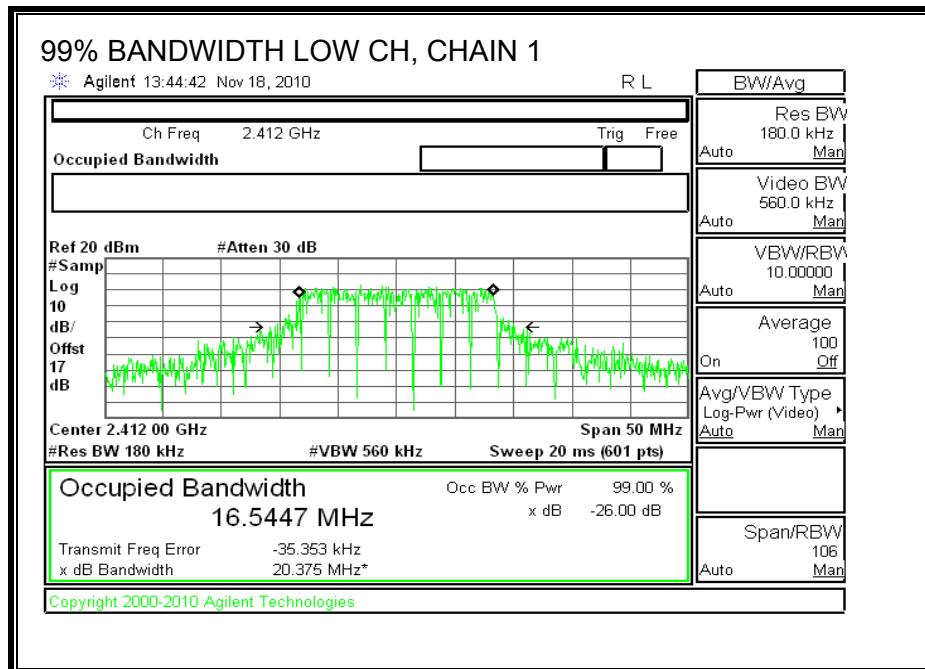
Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)	Chain 3 99% Bandwidth (MHz)
Low	2412	16.4130	16.5447	16.4712
Middle	2437	16.4769	16.4018	16.3448
High	2462	16.4804	16.5094	16.4241

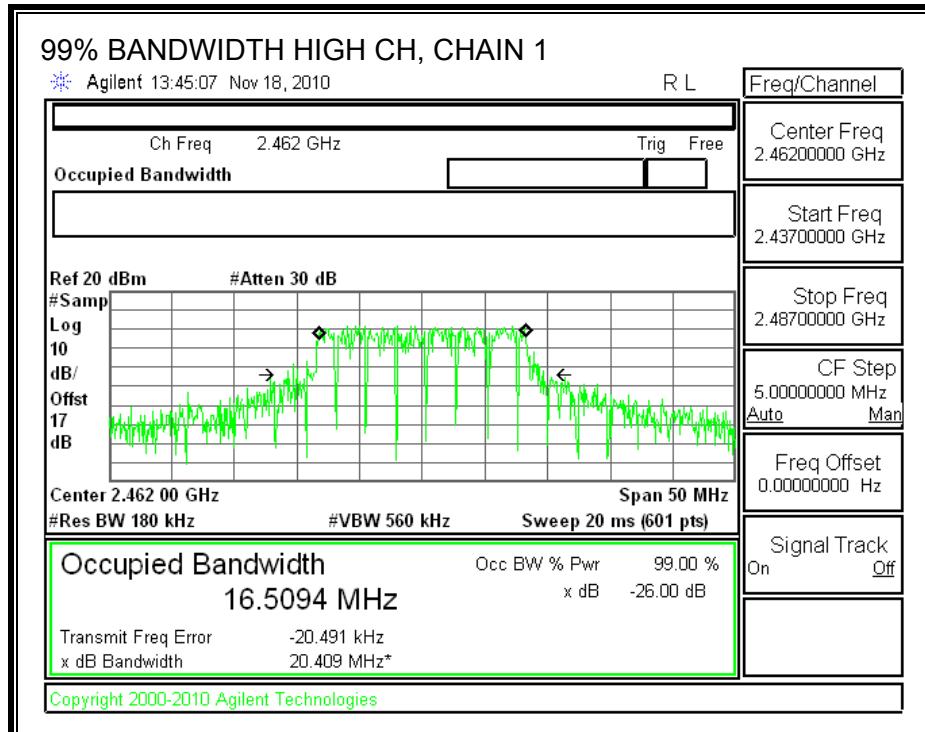
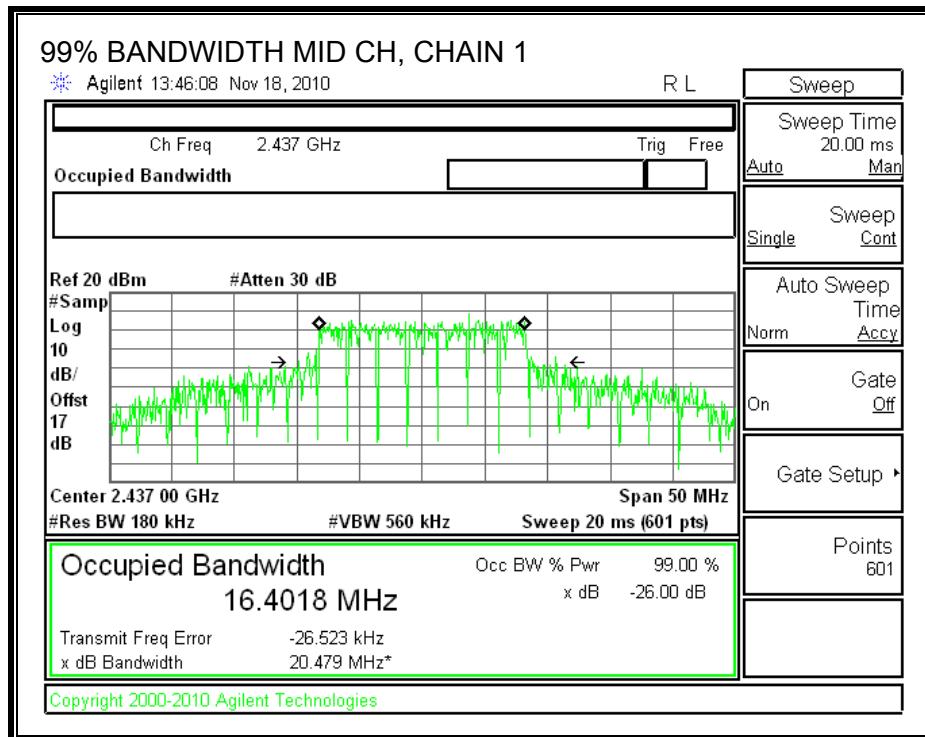
99% BANDWIDTH, CHAIN 0



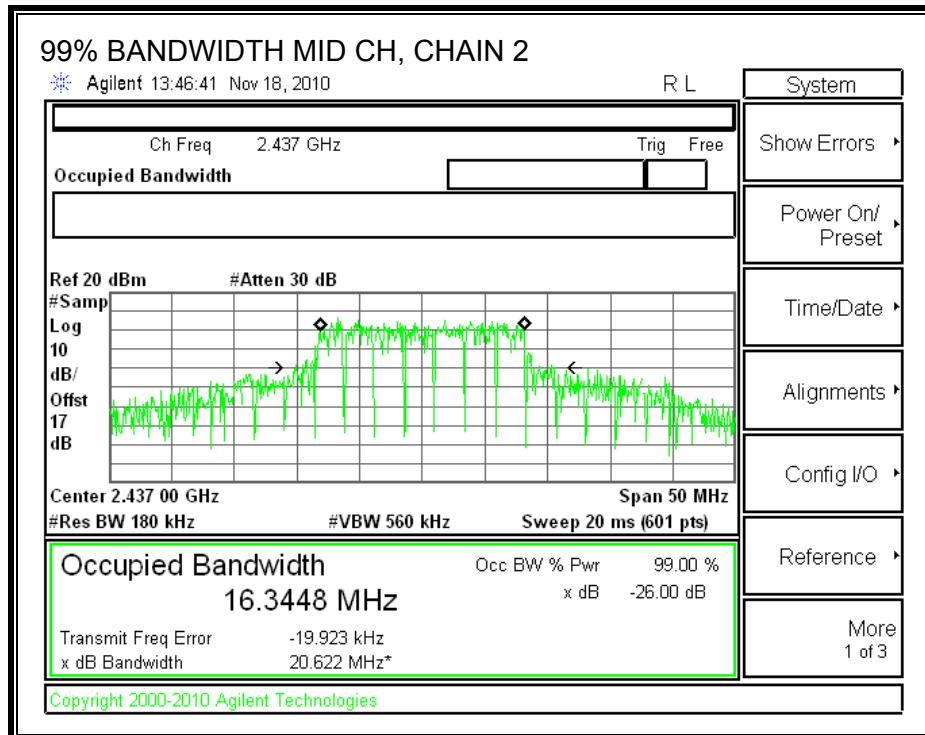
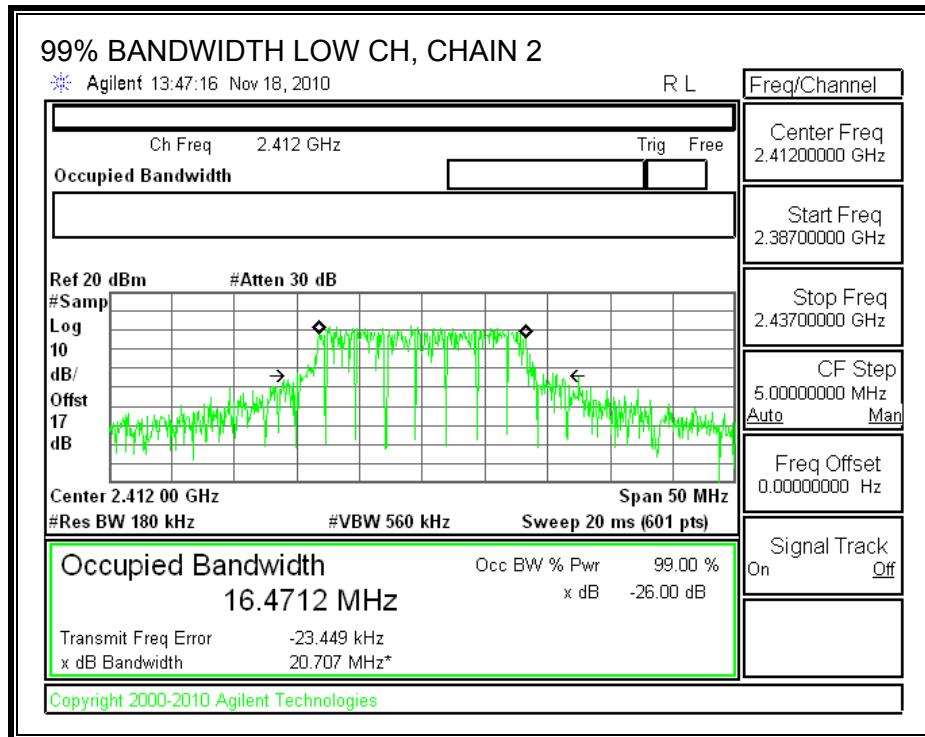


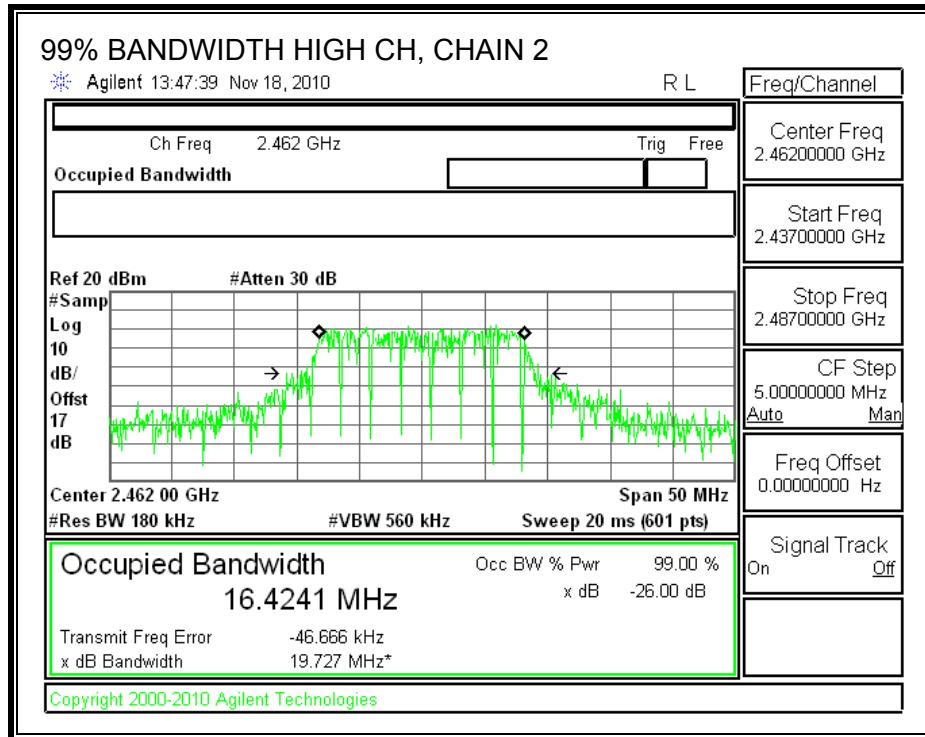
CHAIN 1





99% BANDWIDTH, CHAIN 2





7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The combined antenna gain is 8.76 dBi, therefore the limit is 27.24dBm.

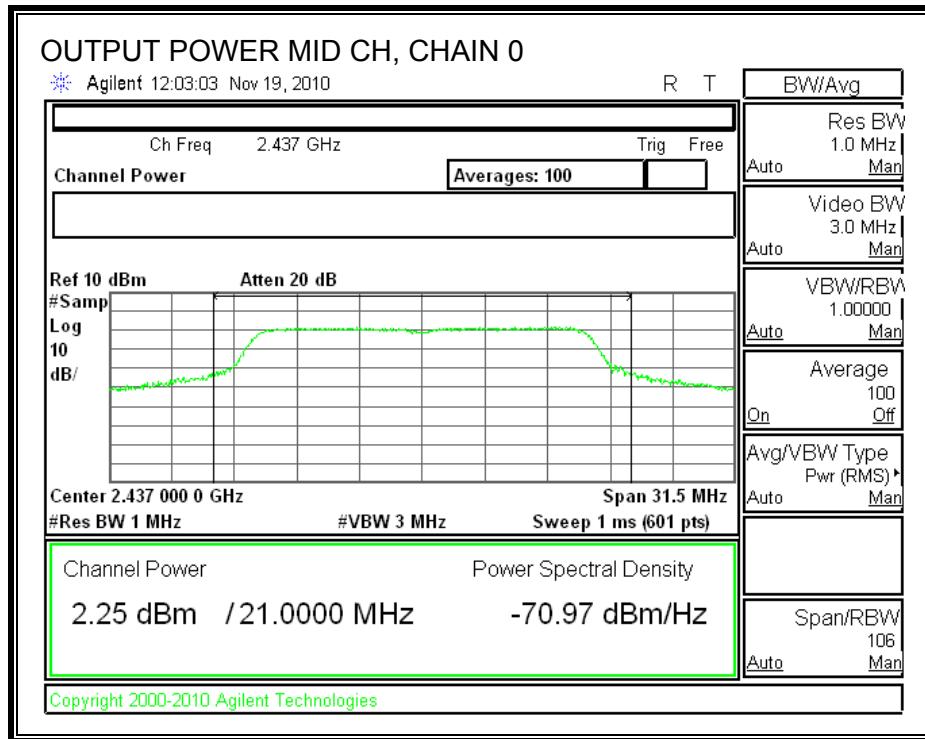
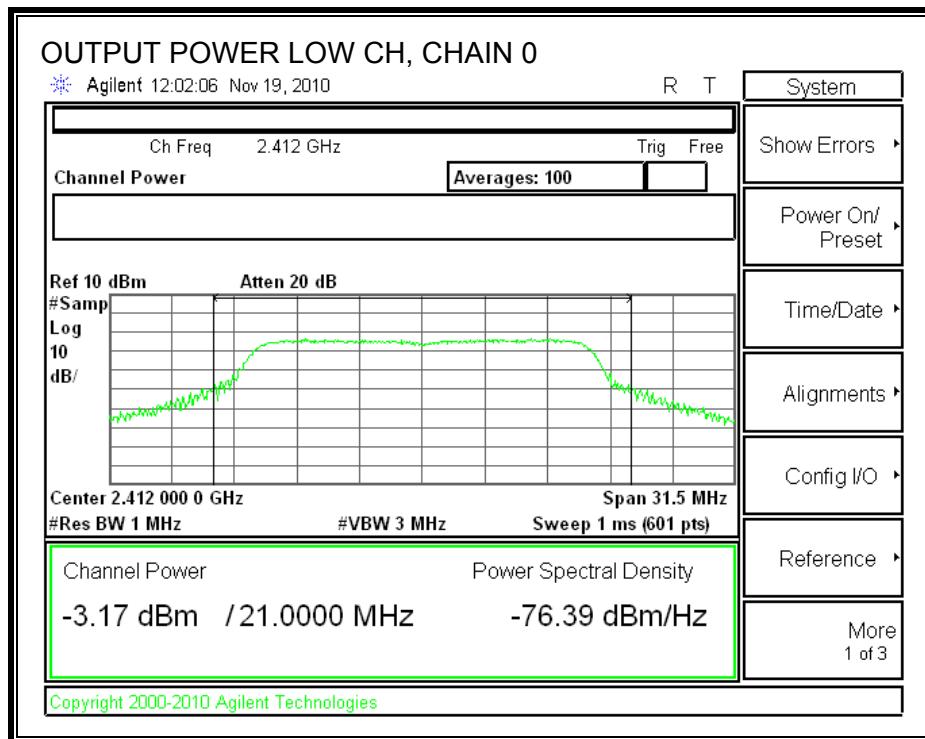
TEST PROCEDURE

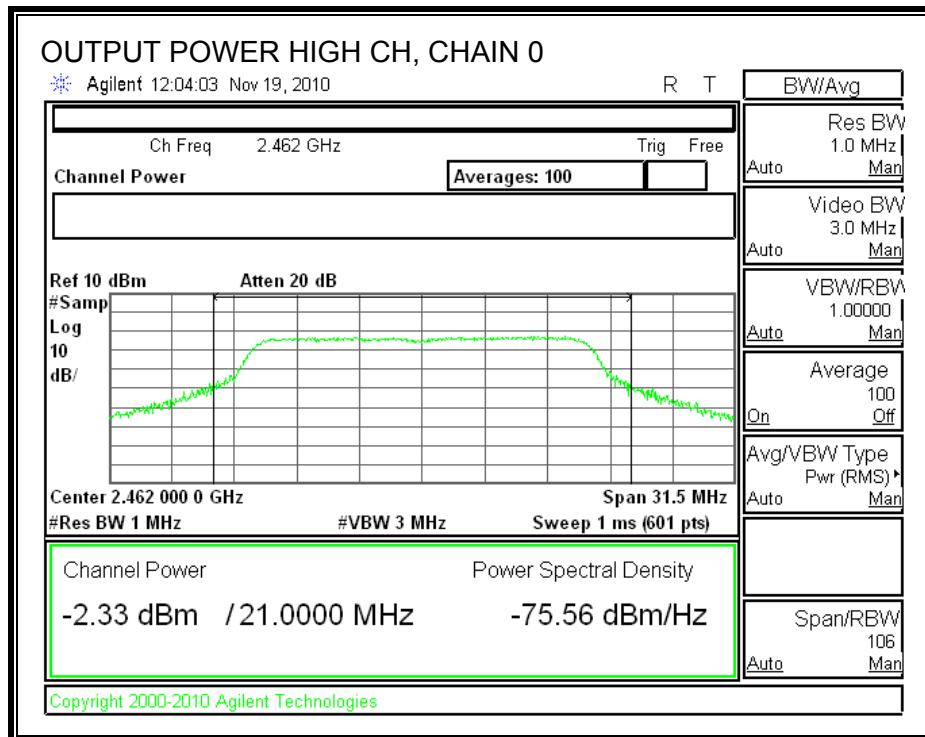
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

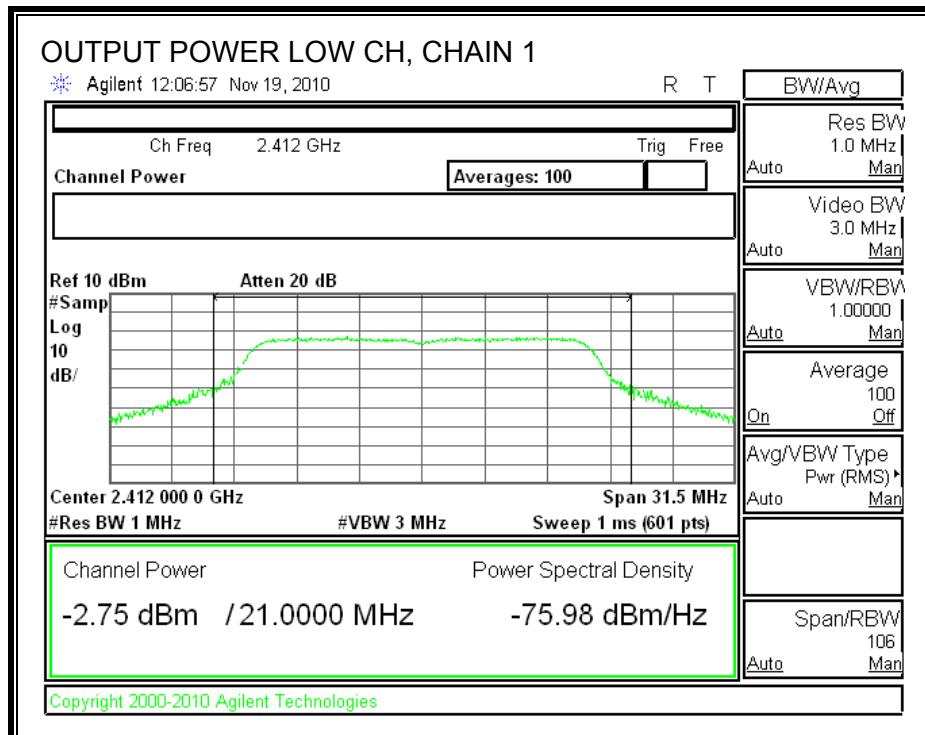
Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.17	-2.75	-3.28	17.00	18.71	27.24	-8.53
Mid	2437	2.25	1.89	1.18	17.00	23.57	27.24	-3.67
High	2462	-2.33	-3.24	-4.40	17.00	18.53	27.24	-8.71

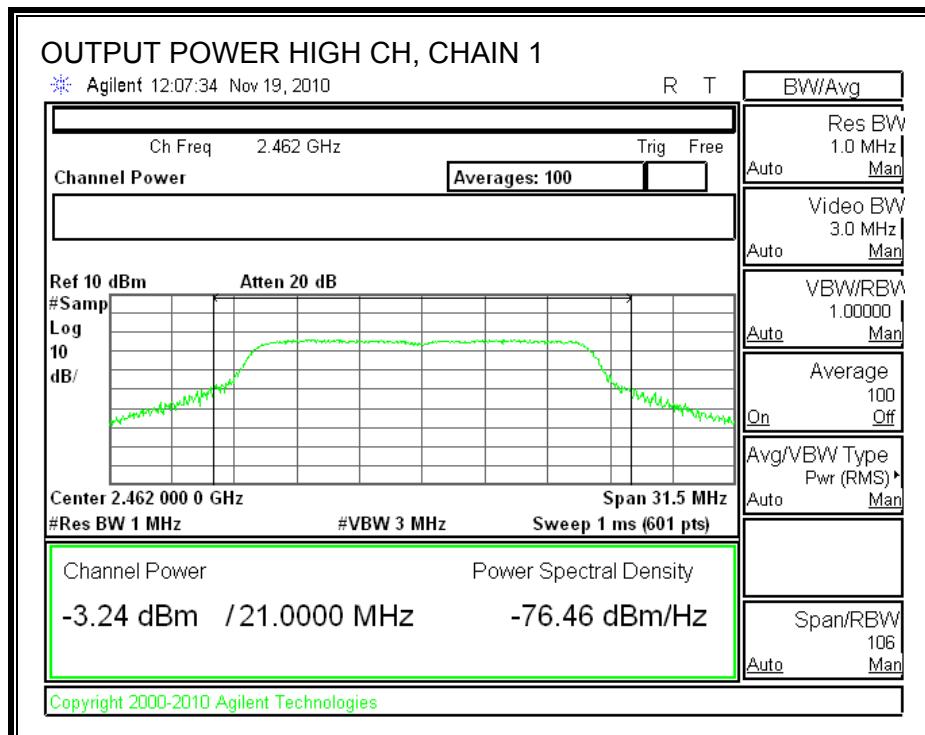
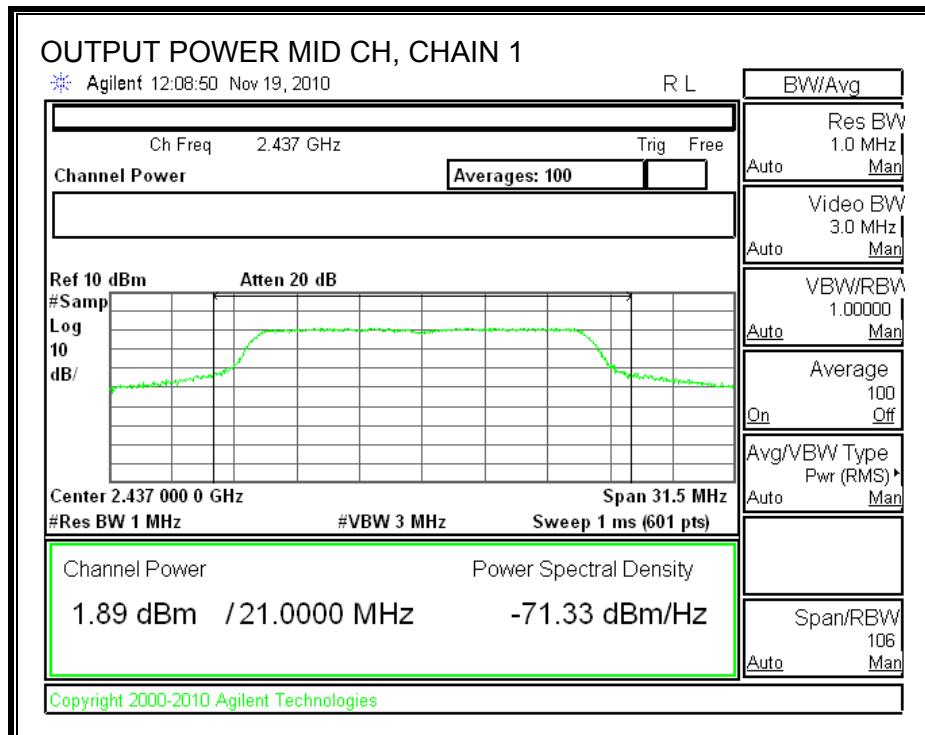
CHAIN 0 OUTPUT POWER



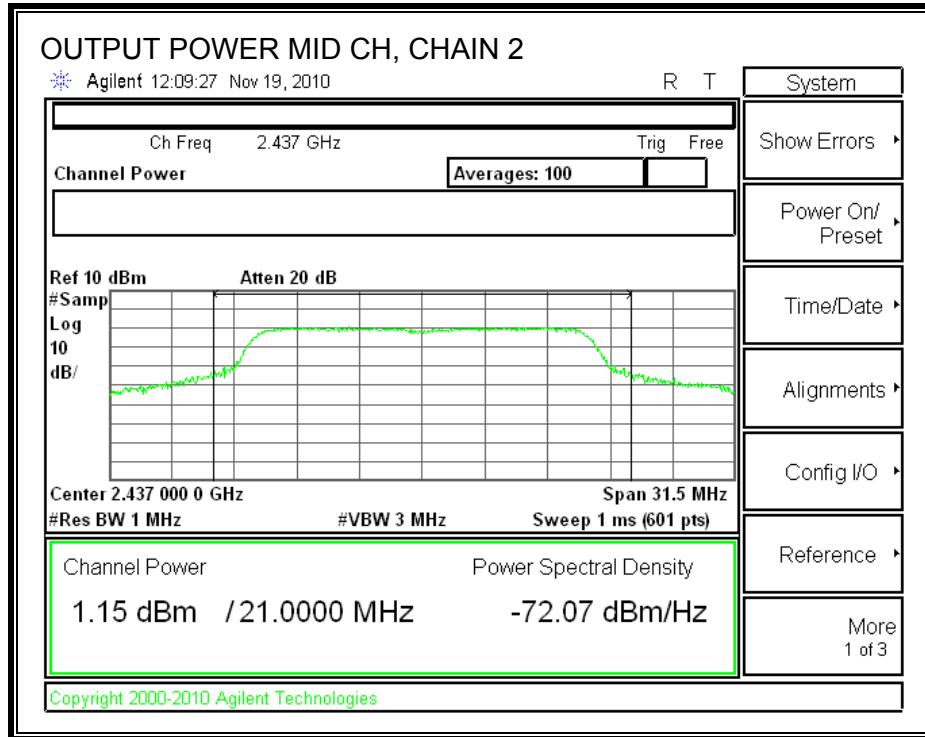
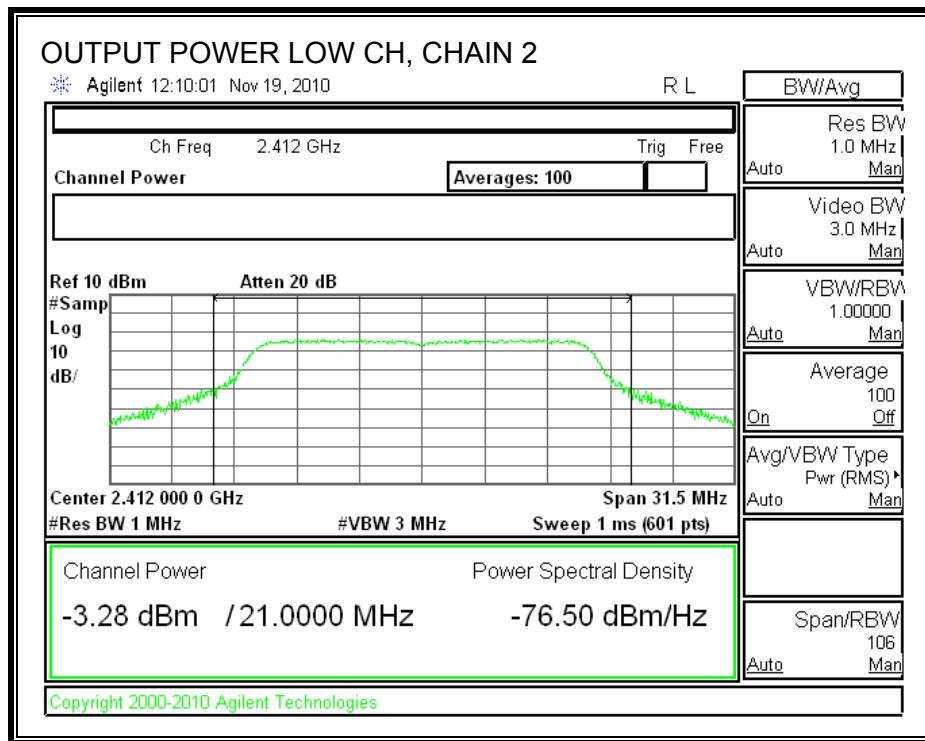


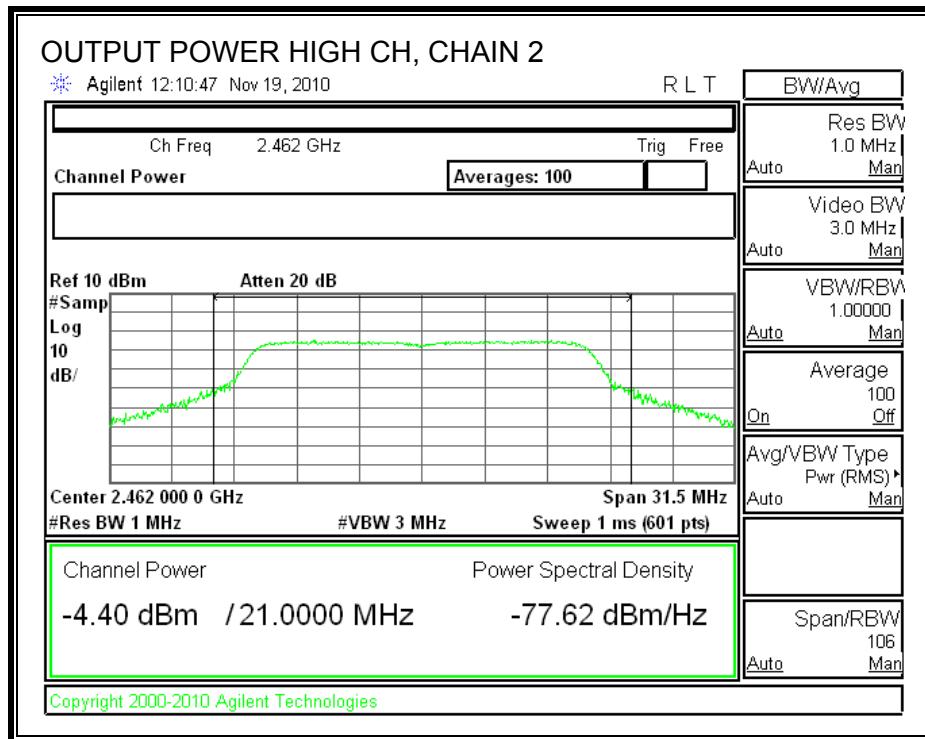
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	2 Power (dBm)	Total Power (dBm)
Low	2412	13.50	13.65	13.60	18.35
Middle	2437	19.00	18.50	18.50	23.44
High	2462	13.60	12.50	15.50	18.82

7.2.5. 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.

The combination of antenna gain is equal to 8.76 dBi, therefore the limit is 5.24 dBm.

TEST PROCEDURE

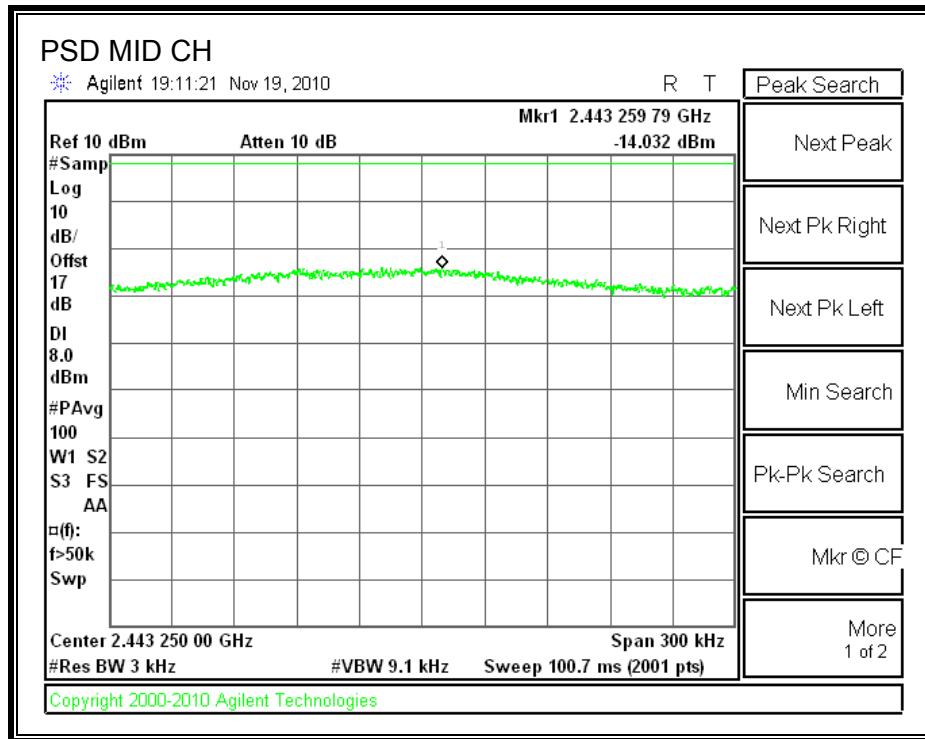
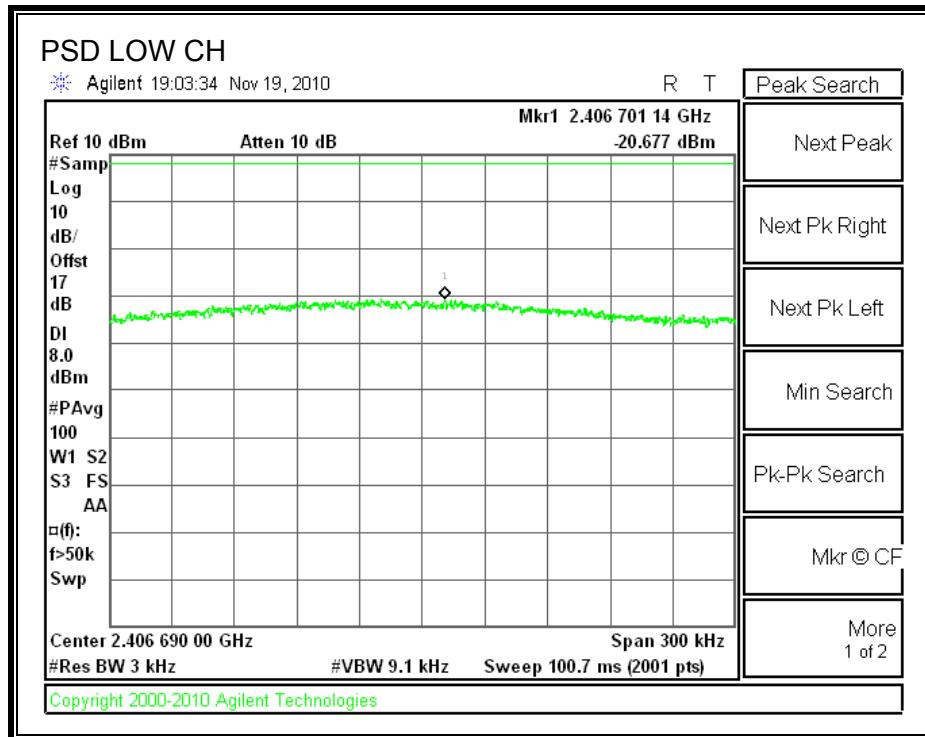
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005

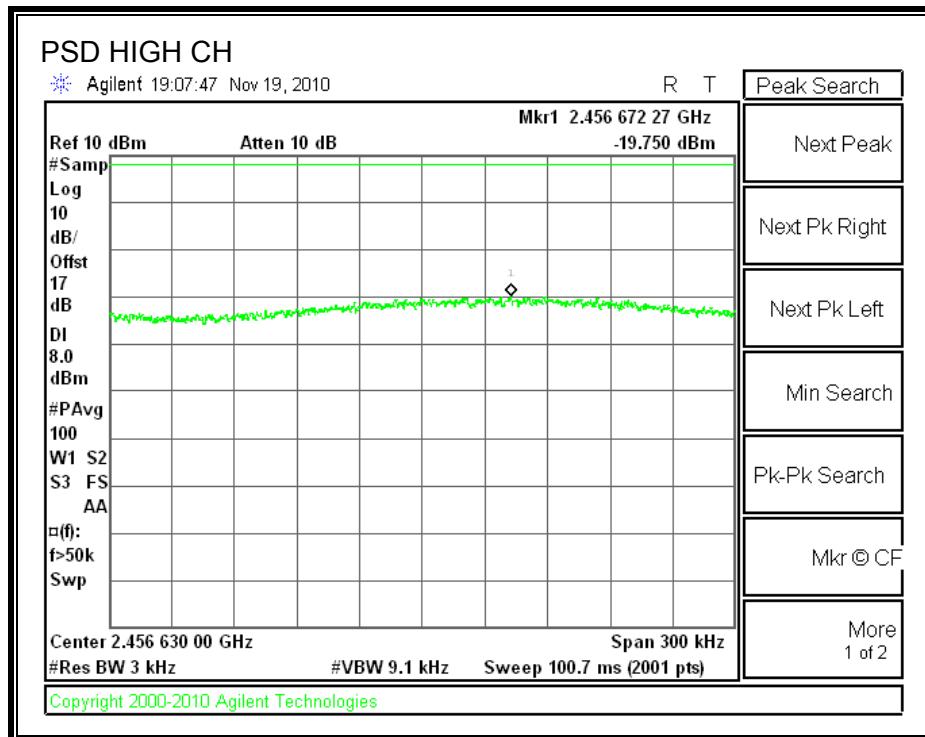
RESULTS

Combine antenna gain, 8.76dBi

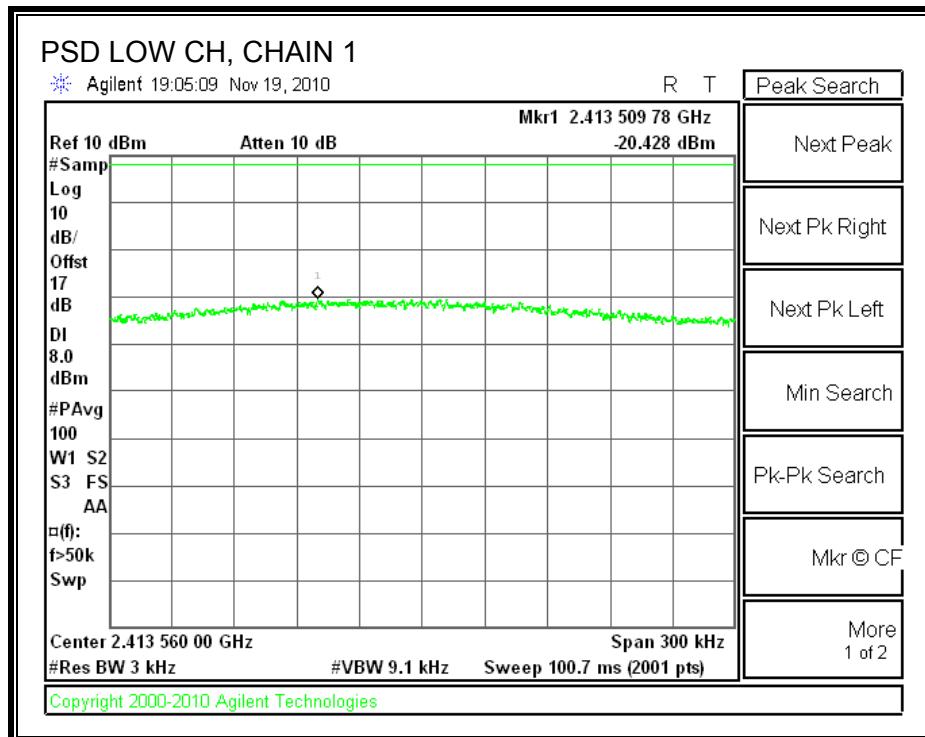
Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	TOTAL (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-20.68	-20.43	-20.41	-15.7	5.24	-20.97
Middle	2437	-14.03	-14.84	-15.06	-9.8	5.24	-15.09
High	2462	-19.75	-20.42	-21.46	-15.7	5.24	-20.95

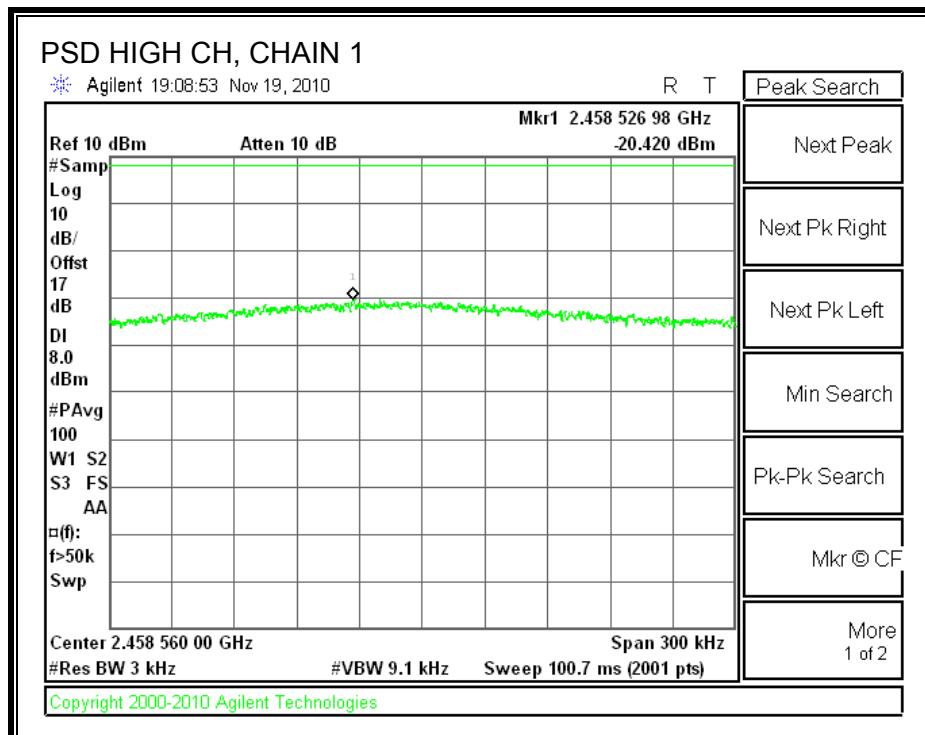
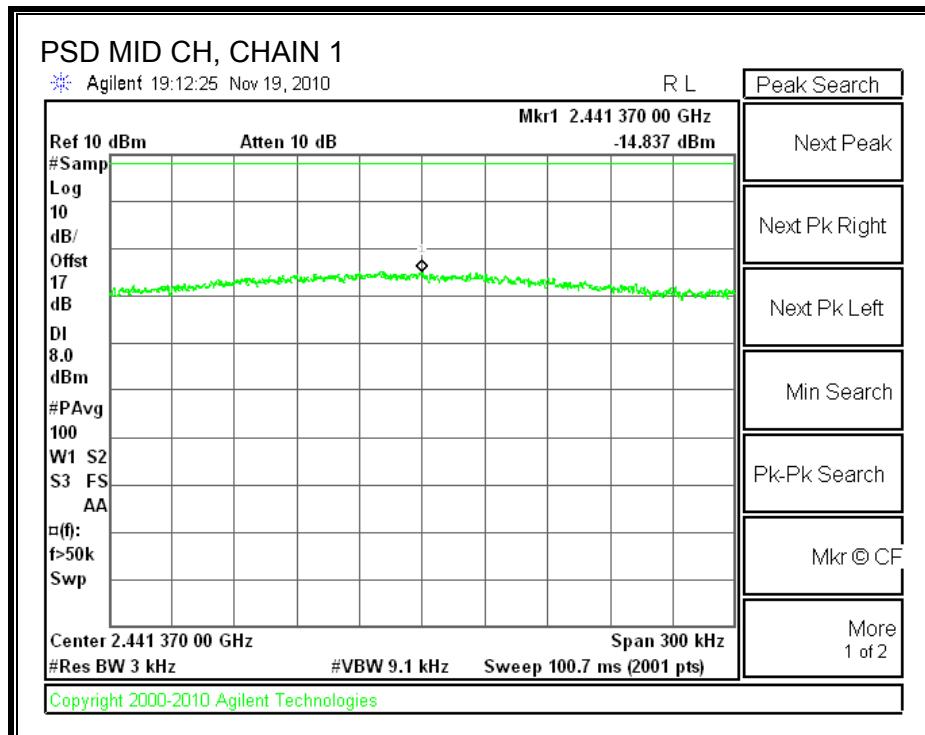
POWER SPECTRAL DENSITY, CHAIN 0



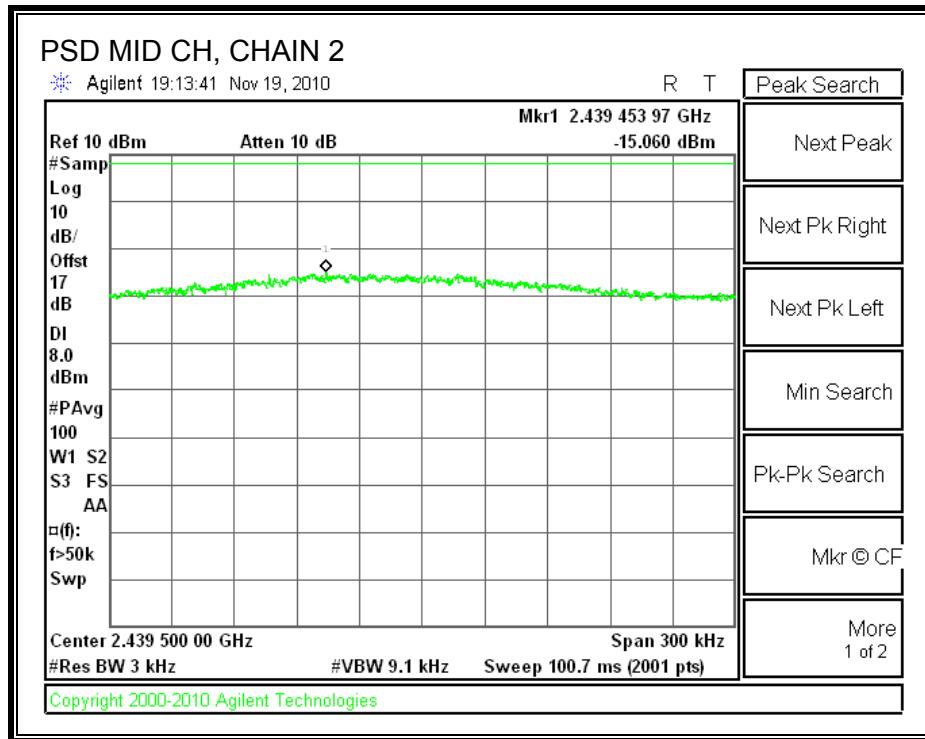
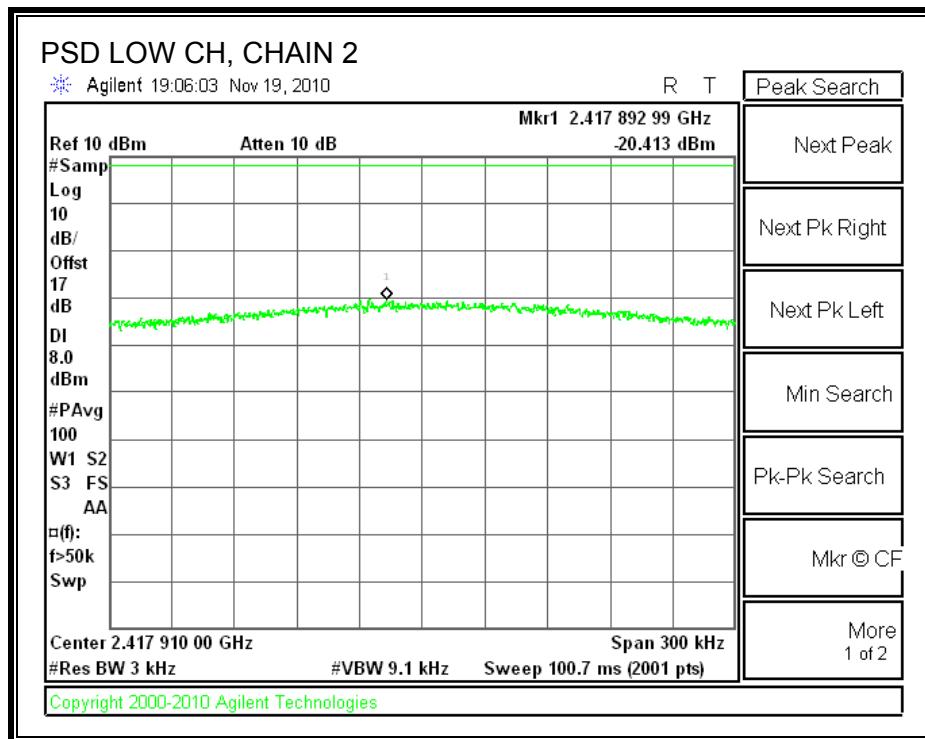


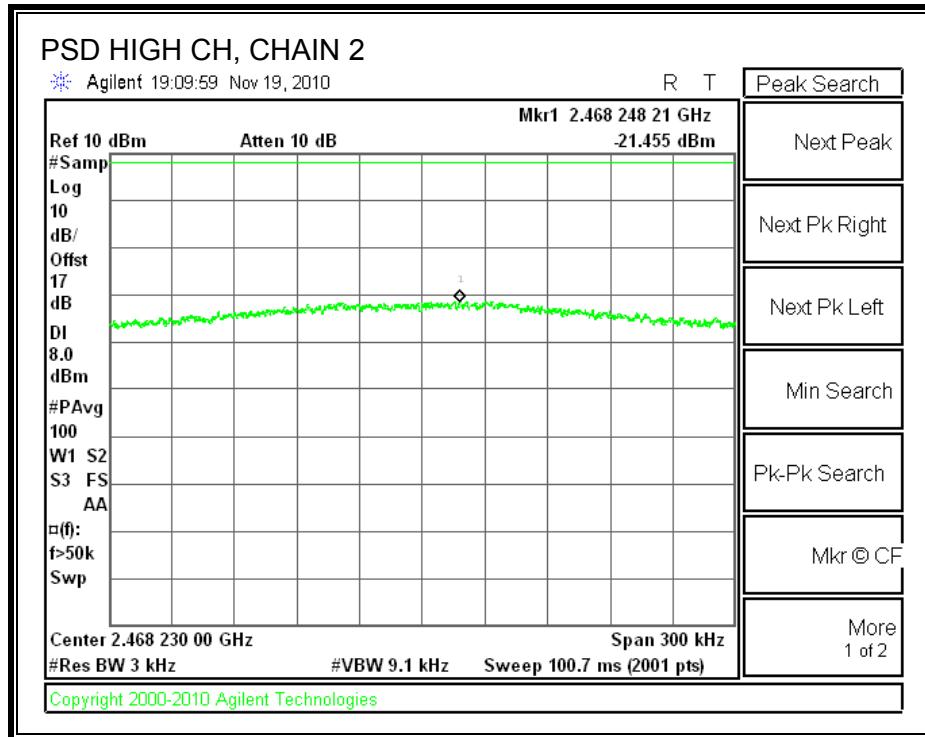
POWER SPECTRAL DENSITY, CHAIN 1





POWER SPECTRAL DENSITY, CHAIN 2





7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

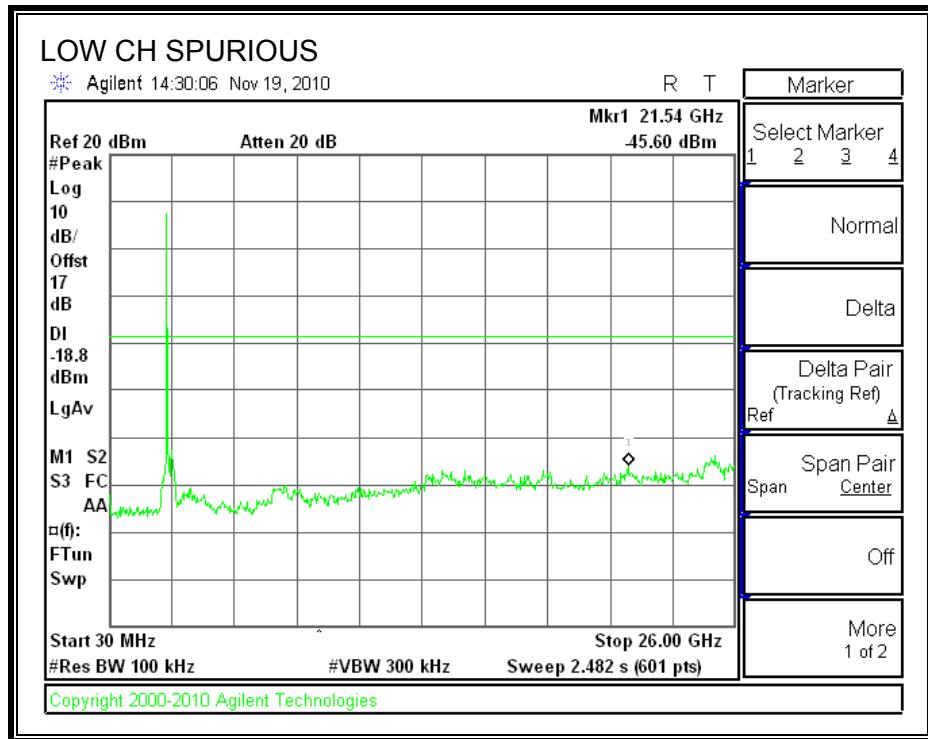
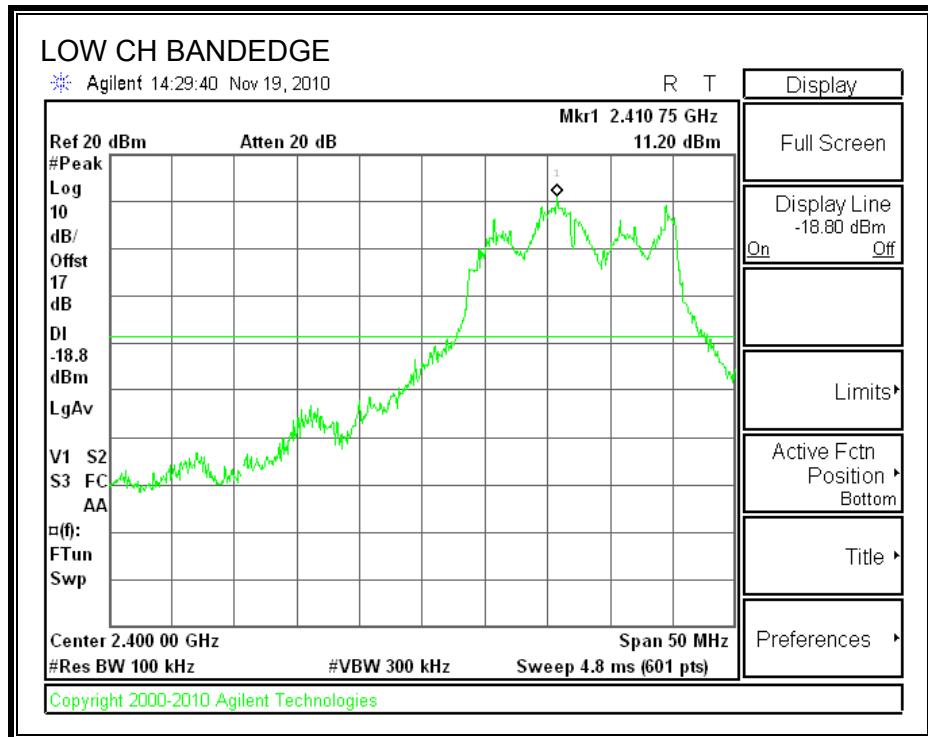
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The EUT was set to transmit at low, mid and channel, 30dBc display line was set with each channel level

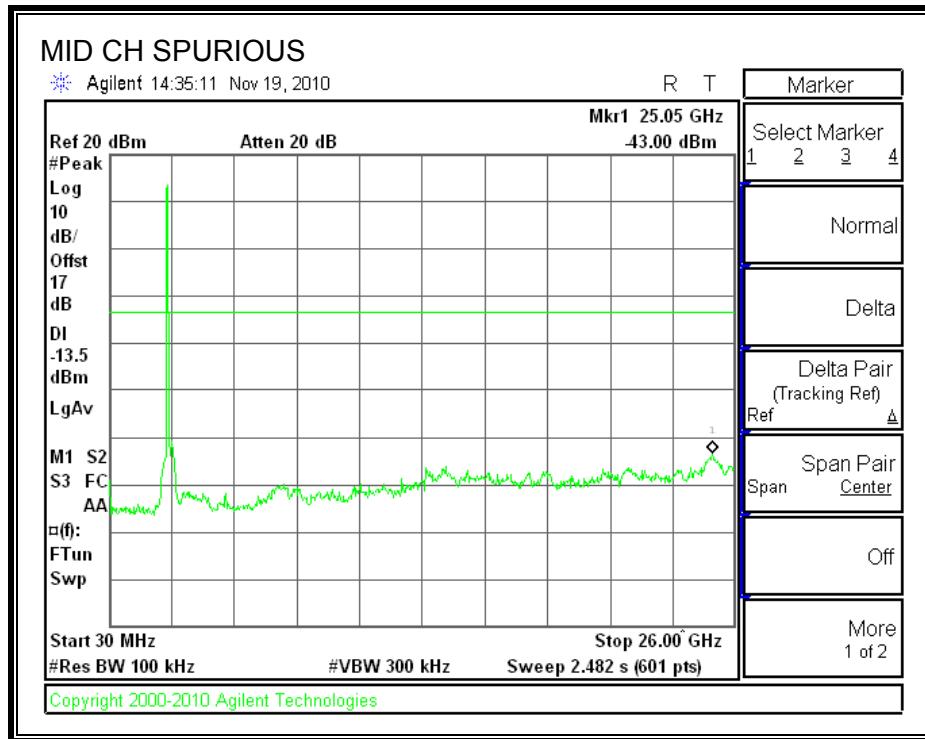
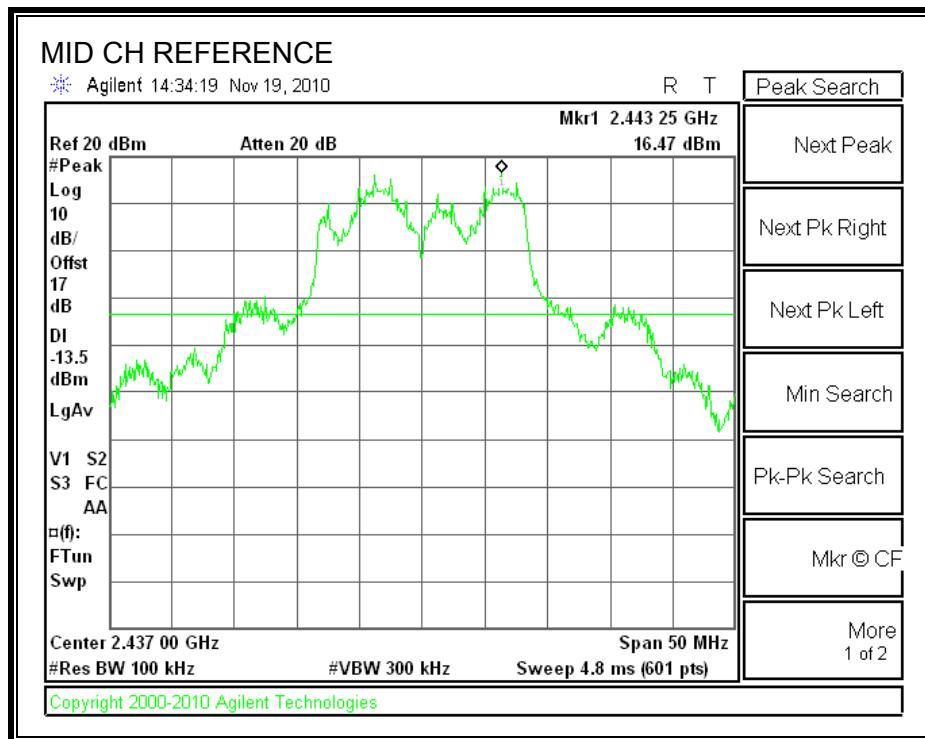
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

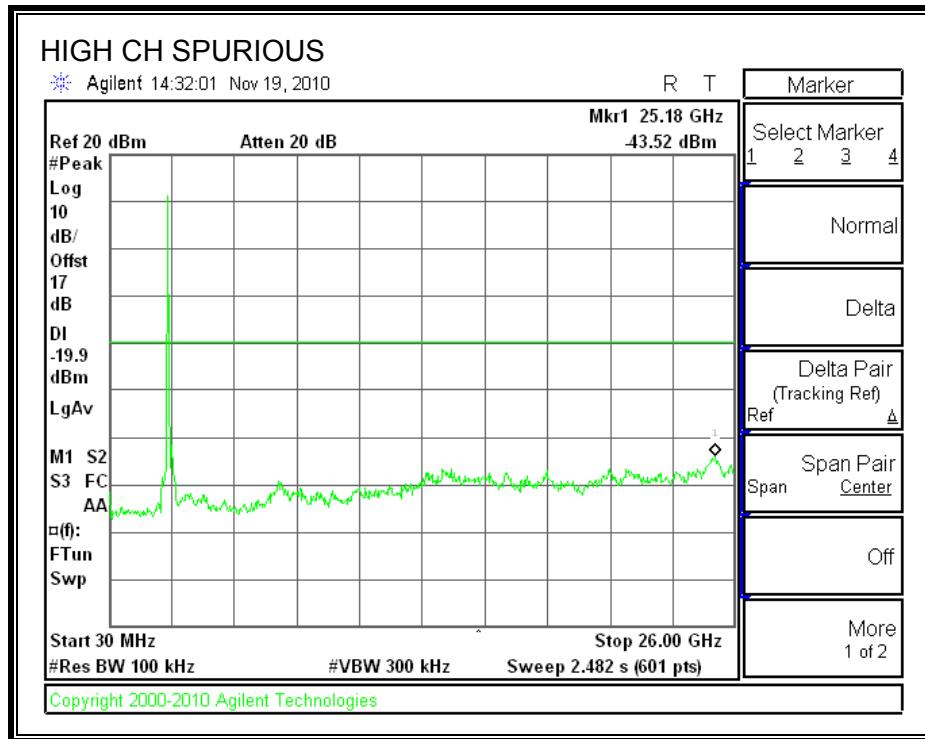
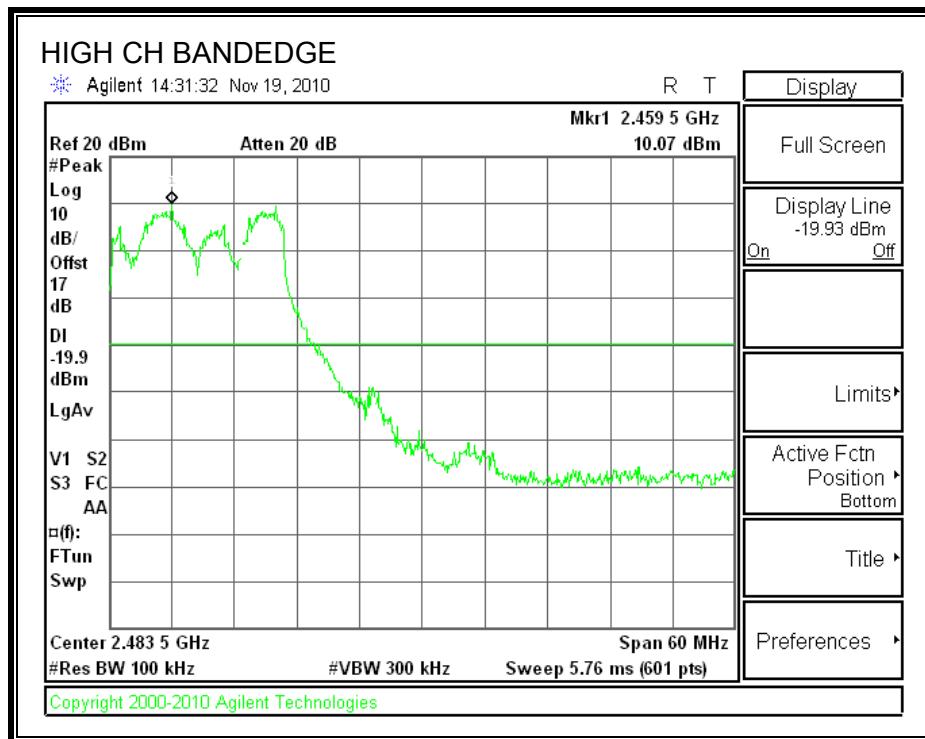
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



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.

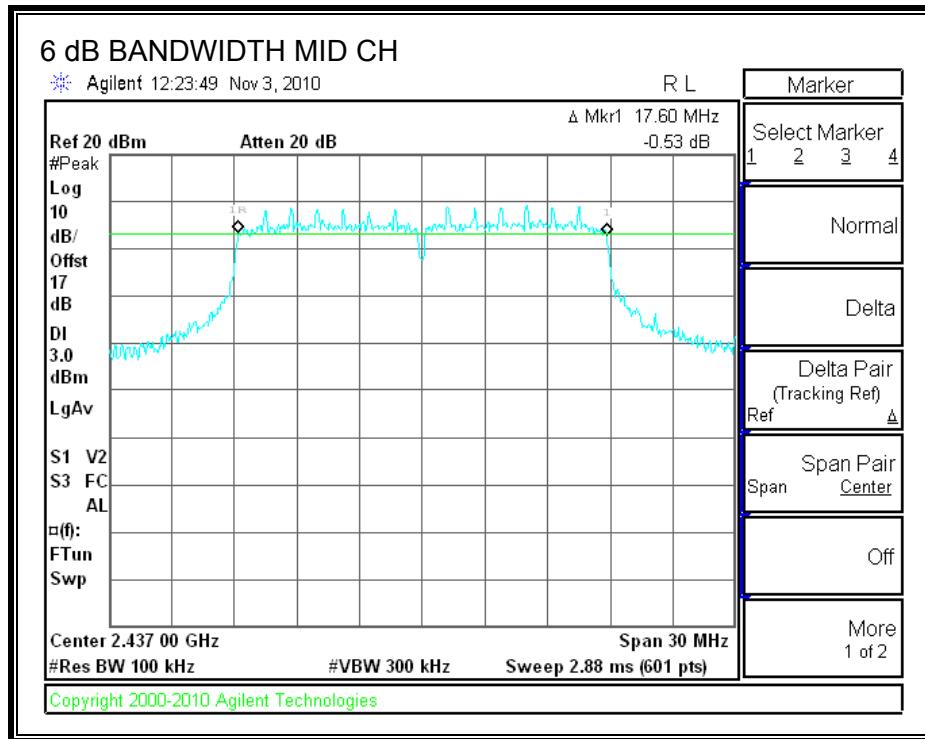
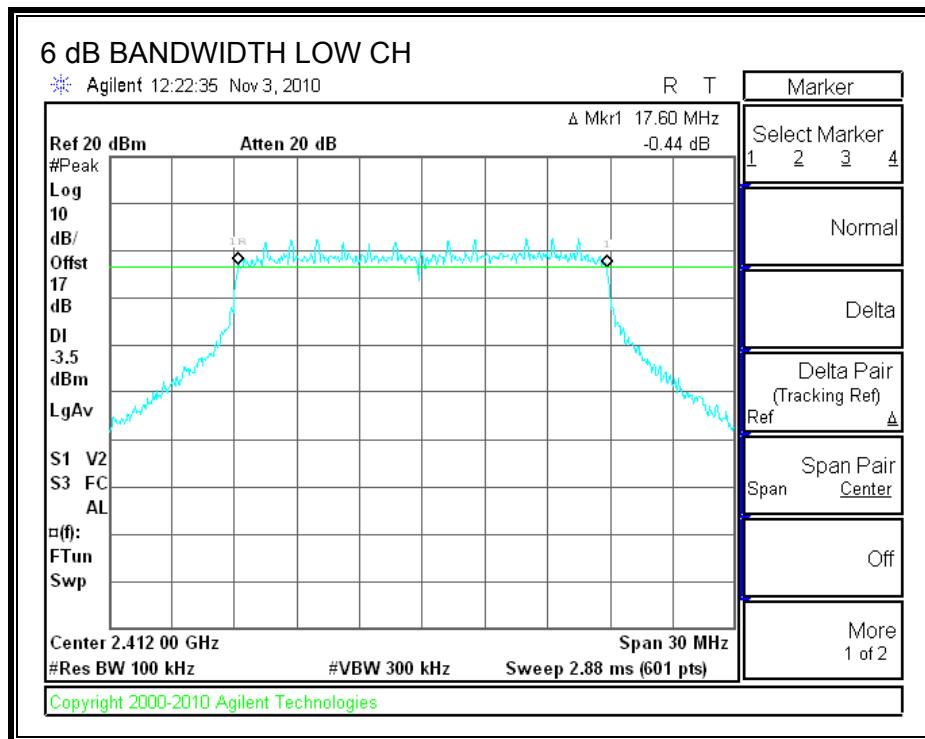
TEST PROCEDURE

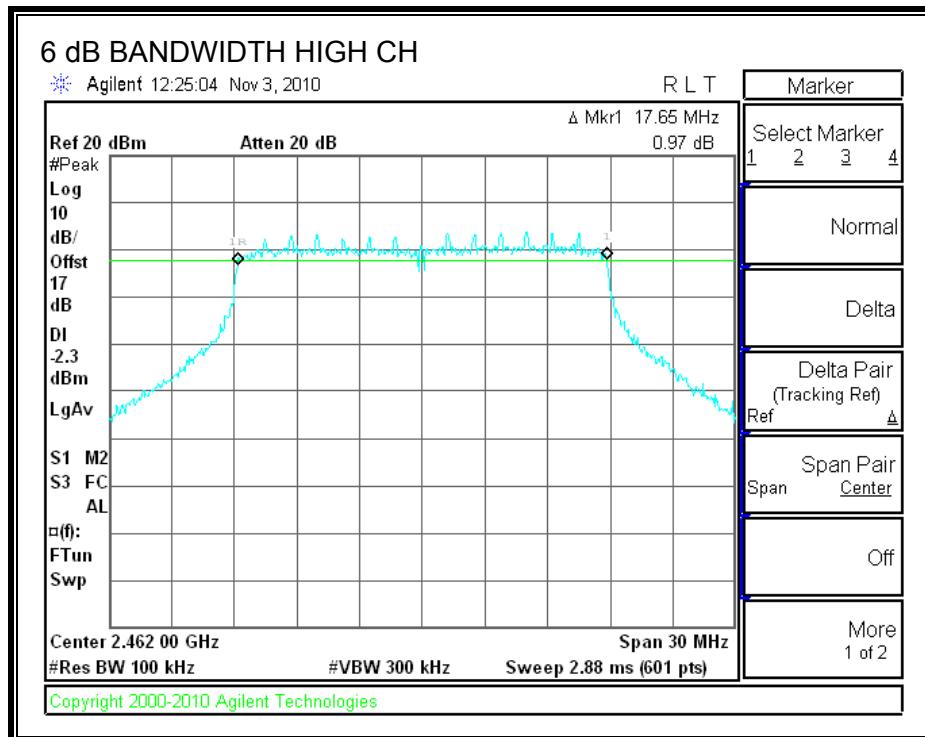
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

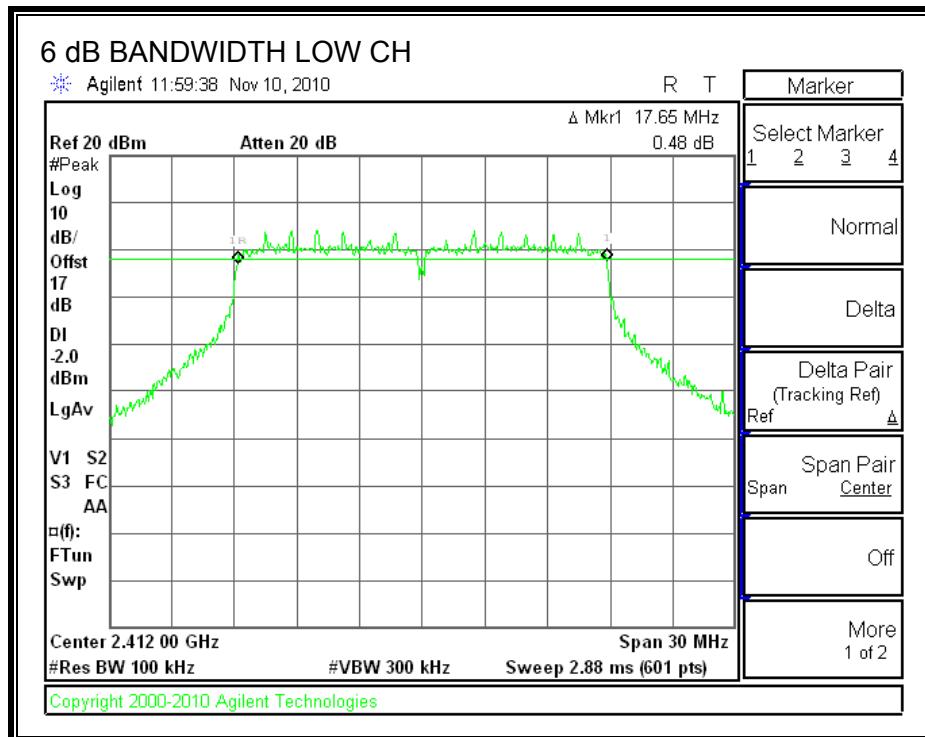
Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	17.60	17.65	17.55	0.5
Middle	2437	17.60	17.65	17.65	0.5
High	2462	17.65	17.65	17.65	0.5

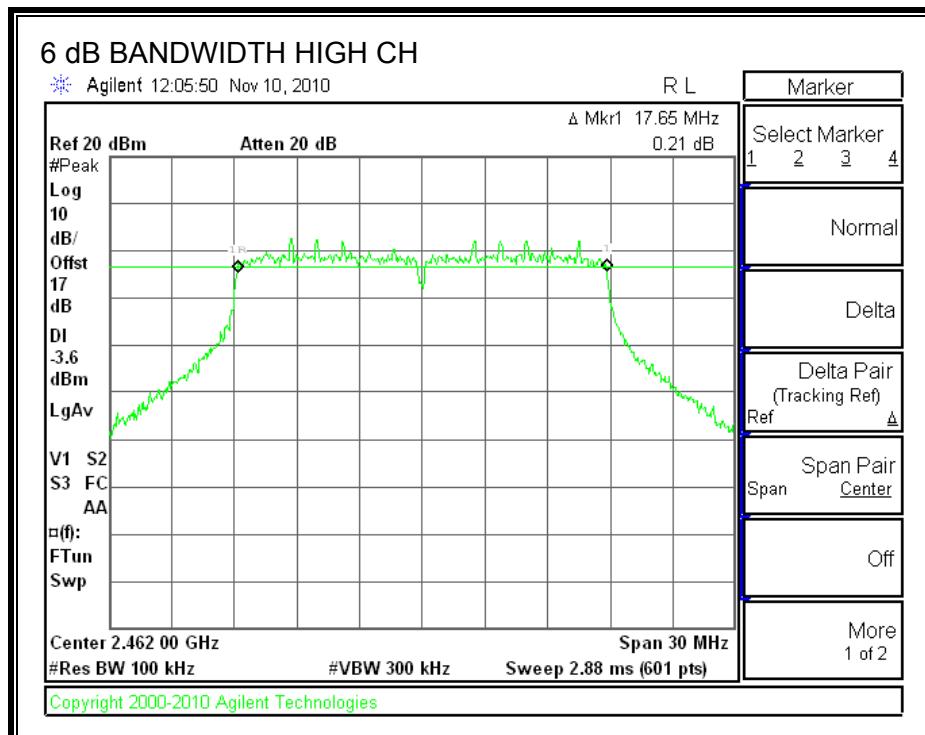
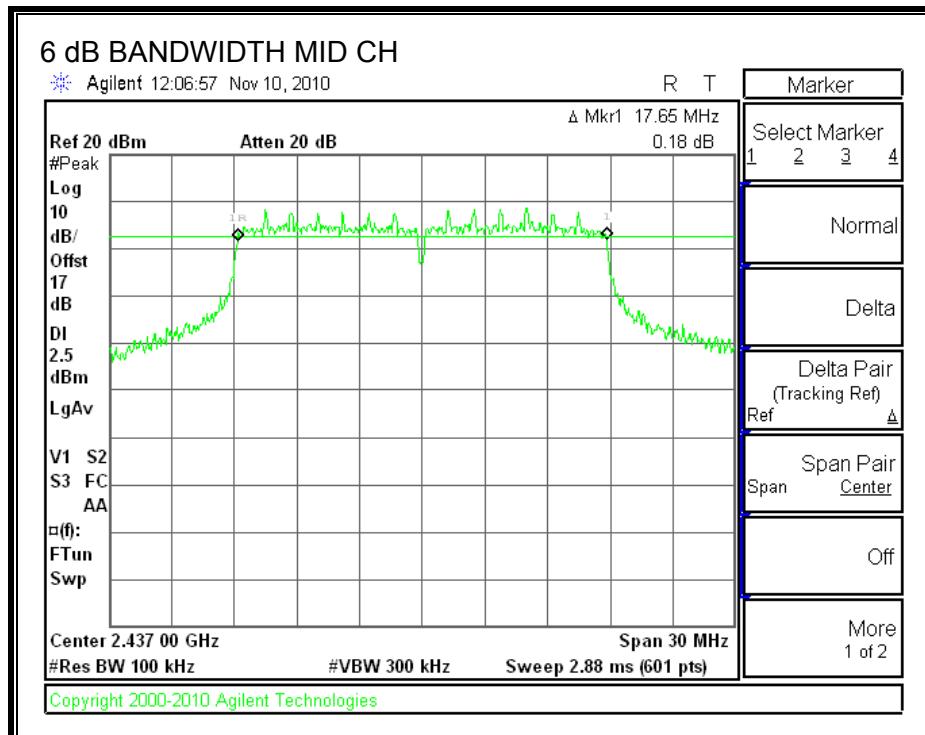
6 dB BANDWIDTH, CHAIN 0



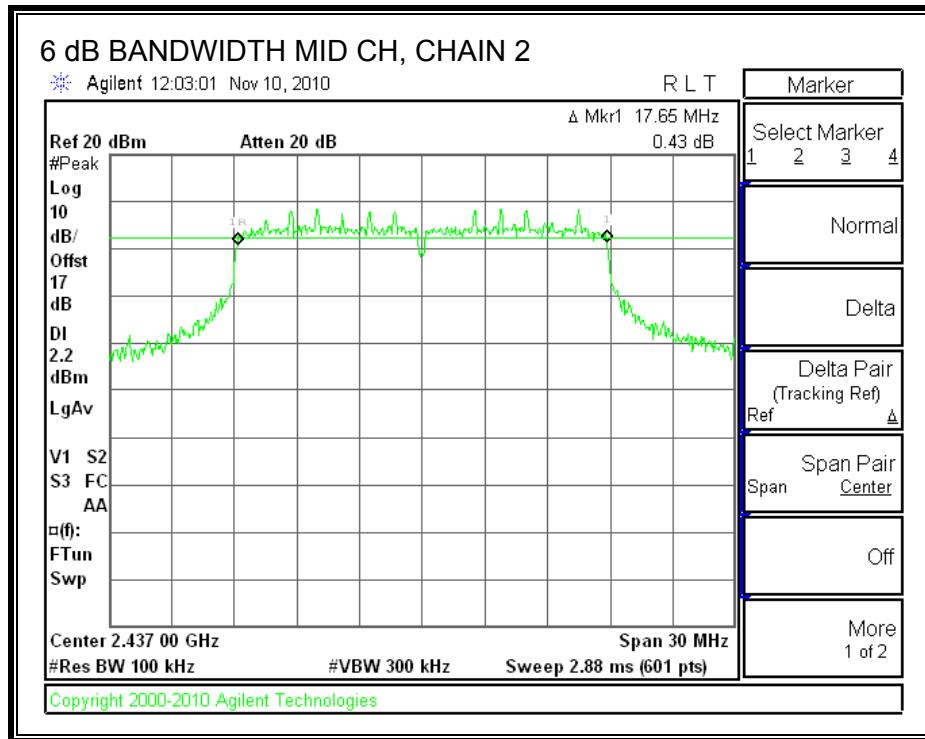
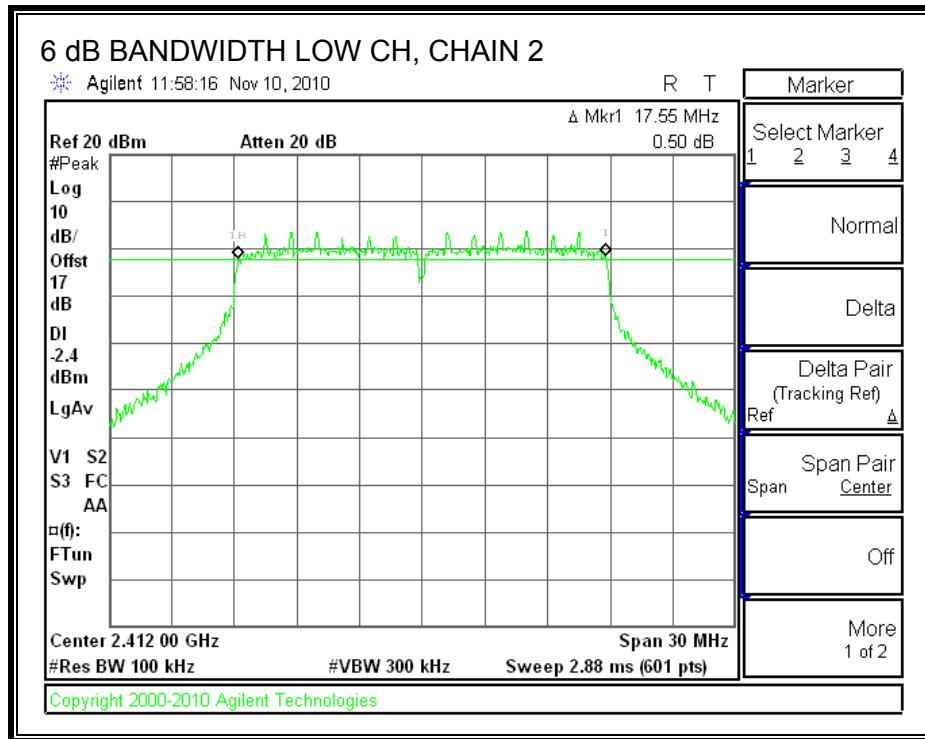


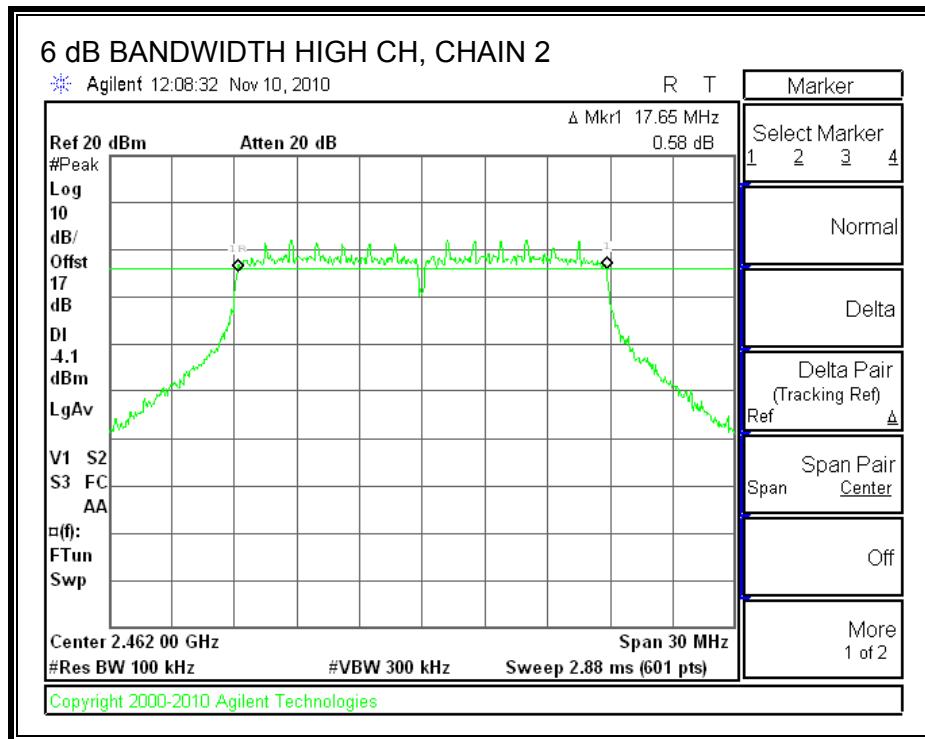
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

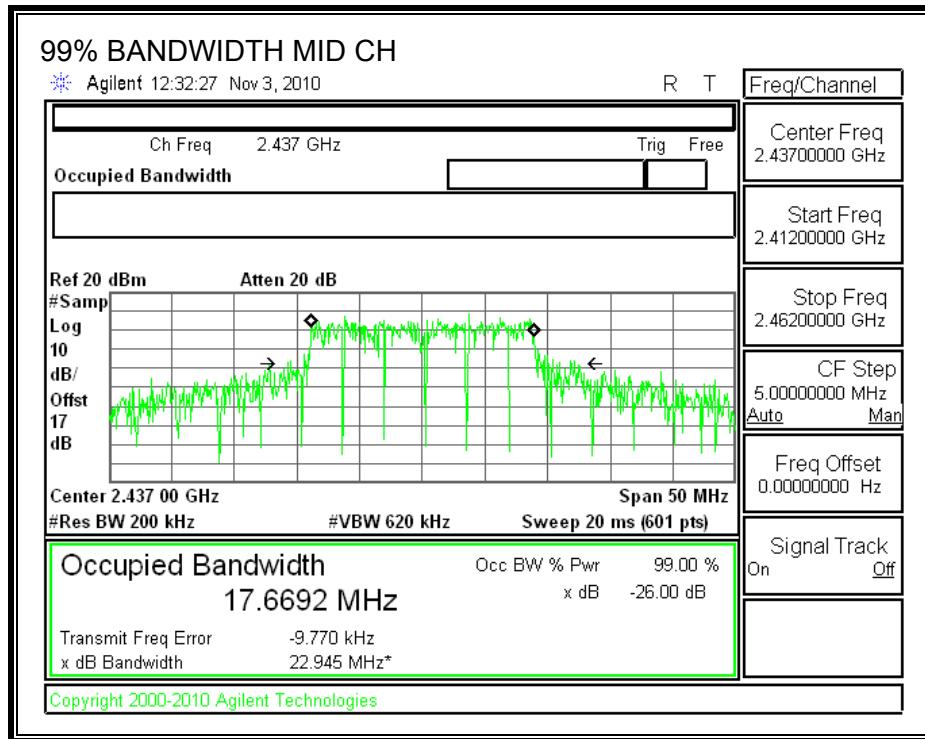
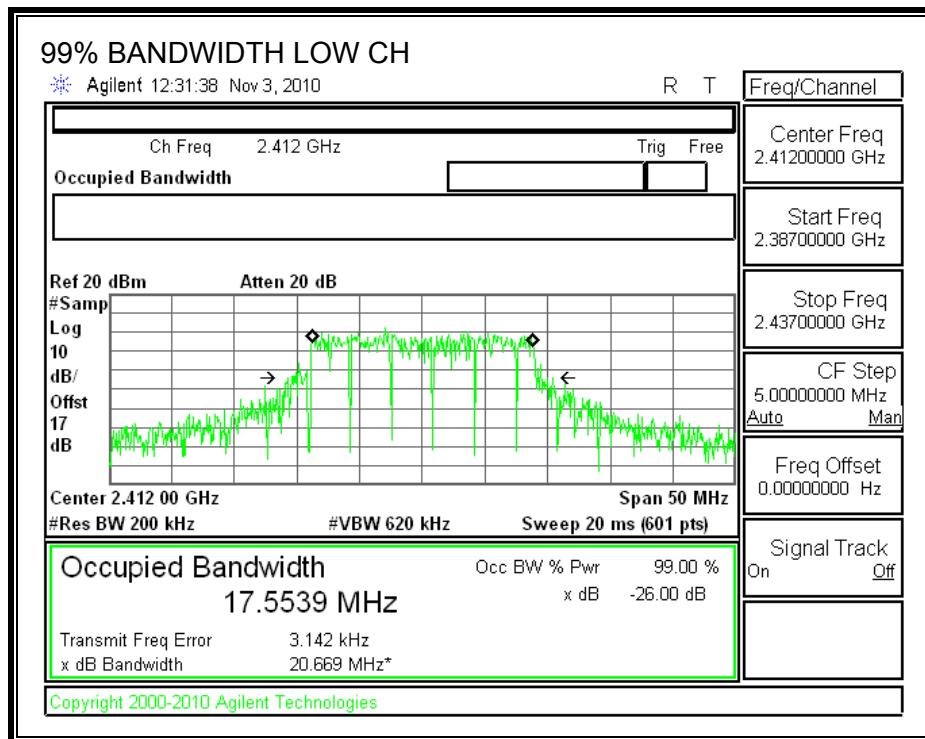
TEST PROCEDURE

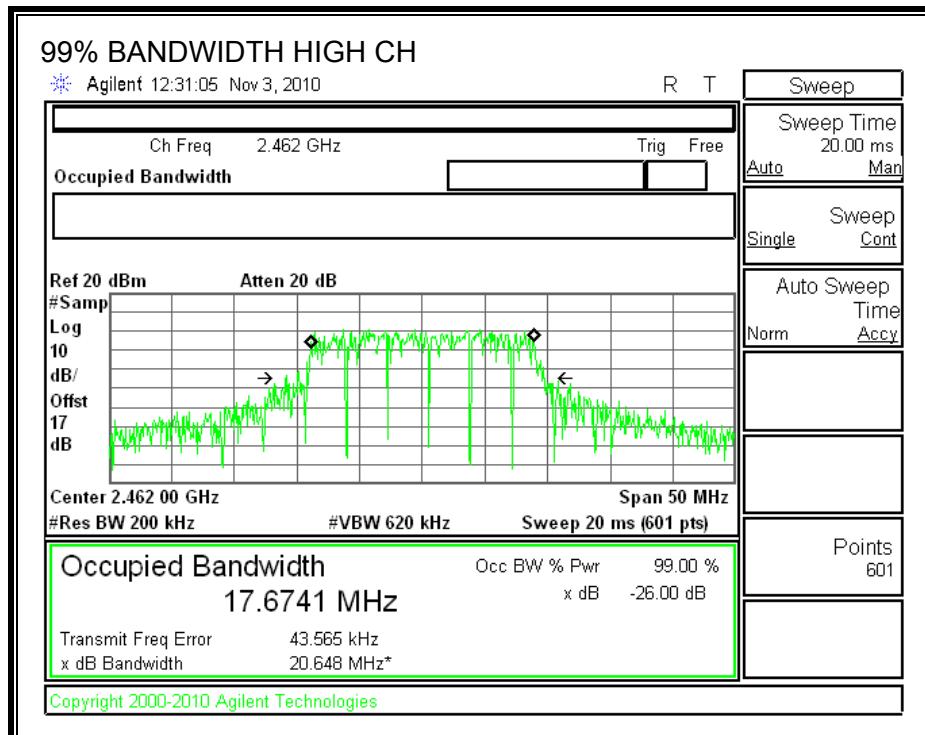
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

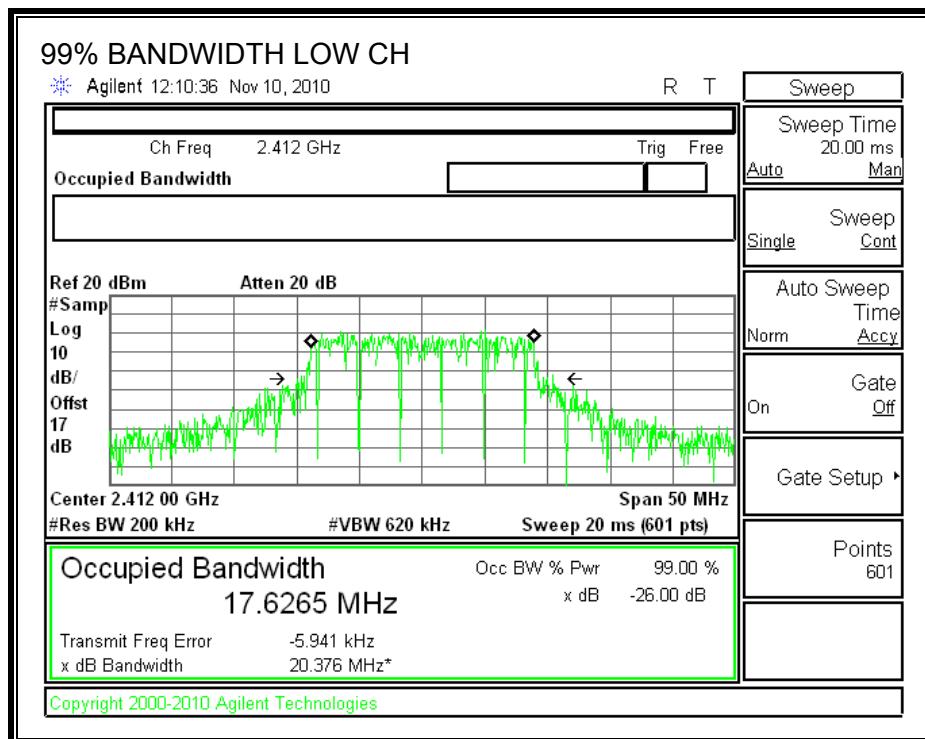
Channel	Frequency (MHz)	Chain 0 99% Bandwidth (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	17.5539	17.6265	17.6414
Middle	2437	17.6692	17.6528	17.7243
High	2462	17.6741	17.6427	17.7504

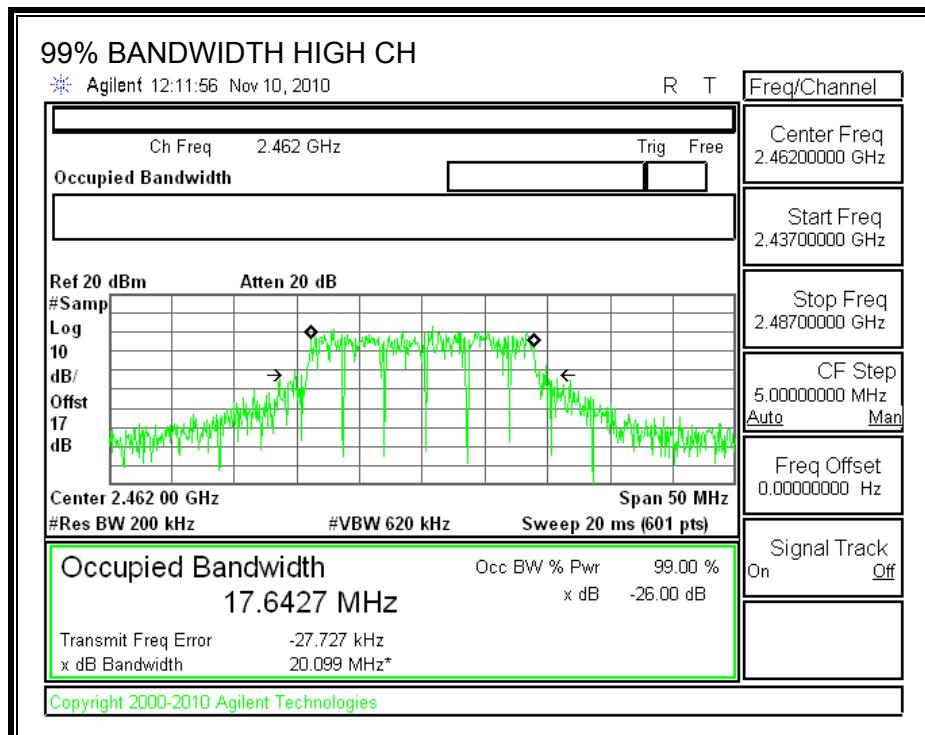
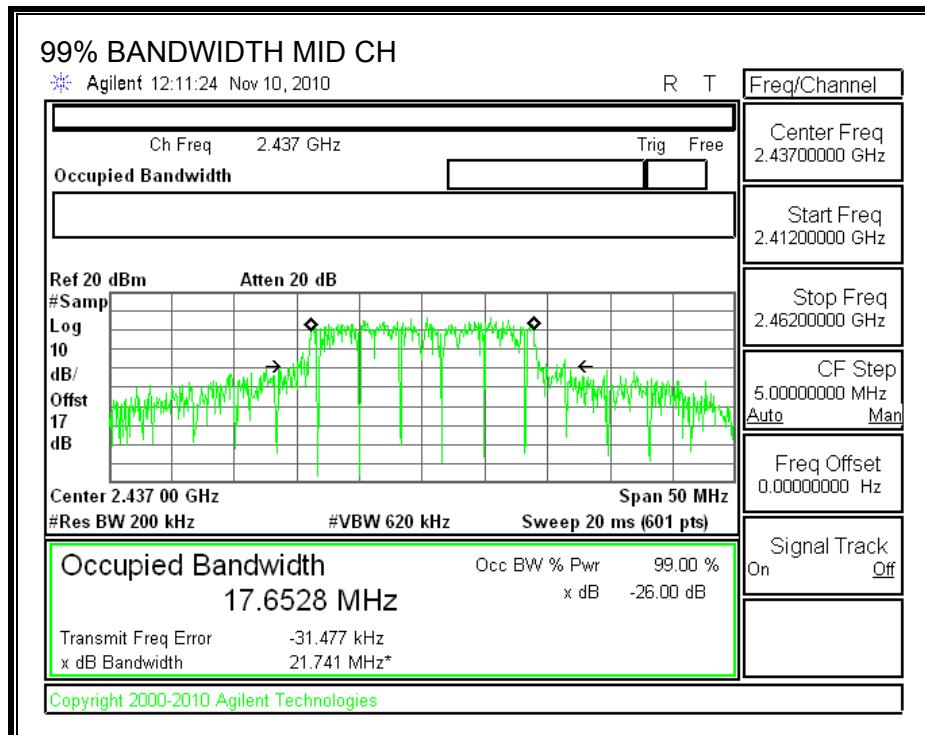
99% BANDWIDTH, CHAIN 0



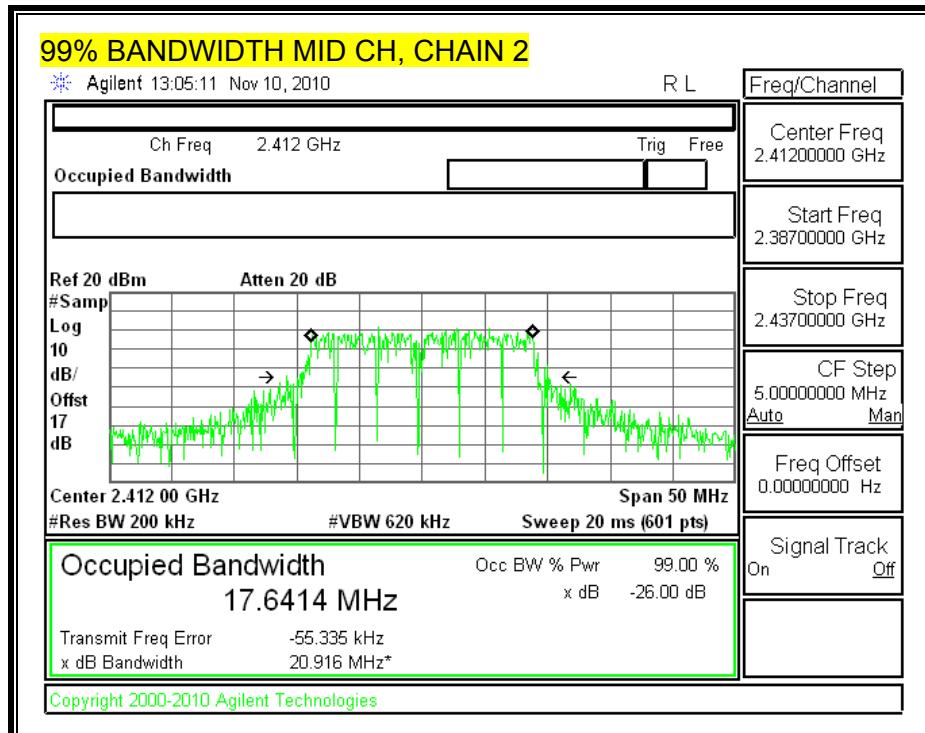
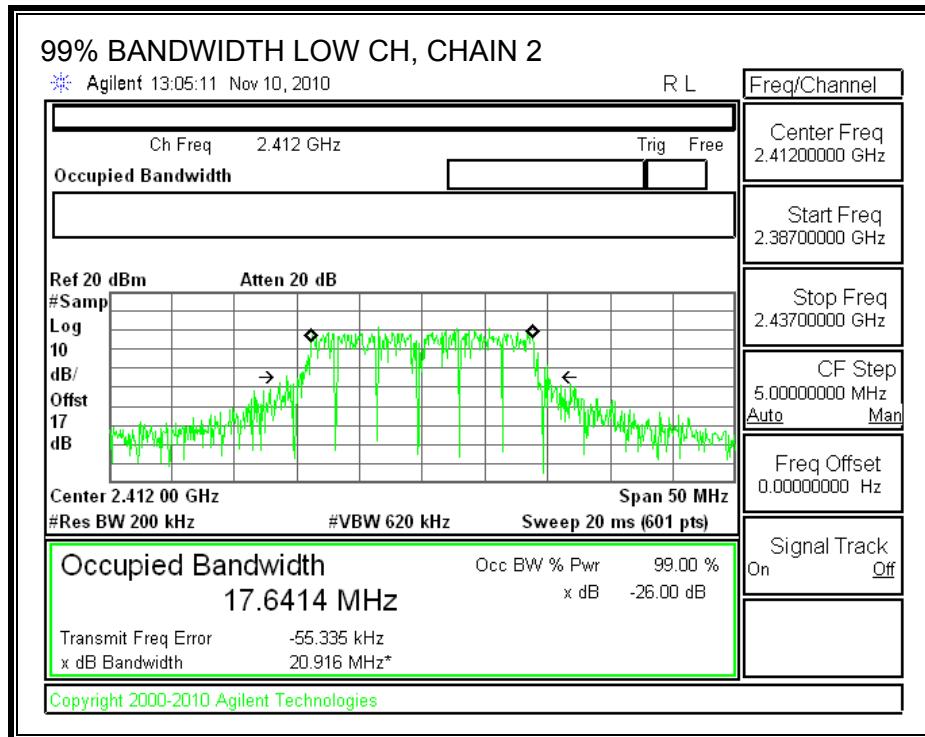


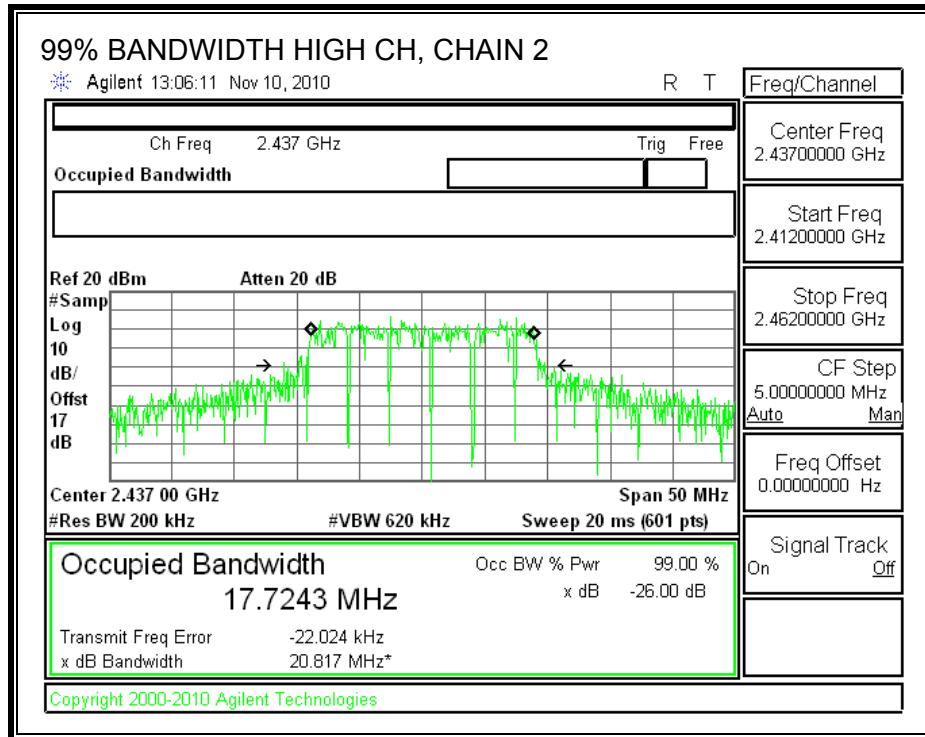
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 8.76 dBi, therefore the limit is 27.24 dBm.
The highest antenna gains is equal to 4.84 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005

RESULTS

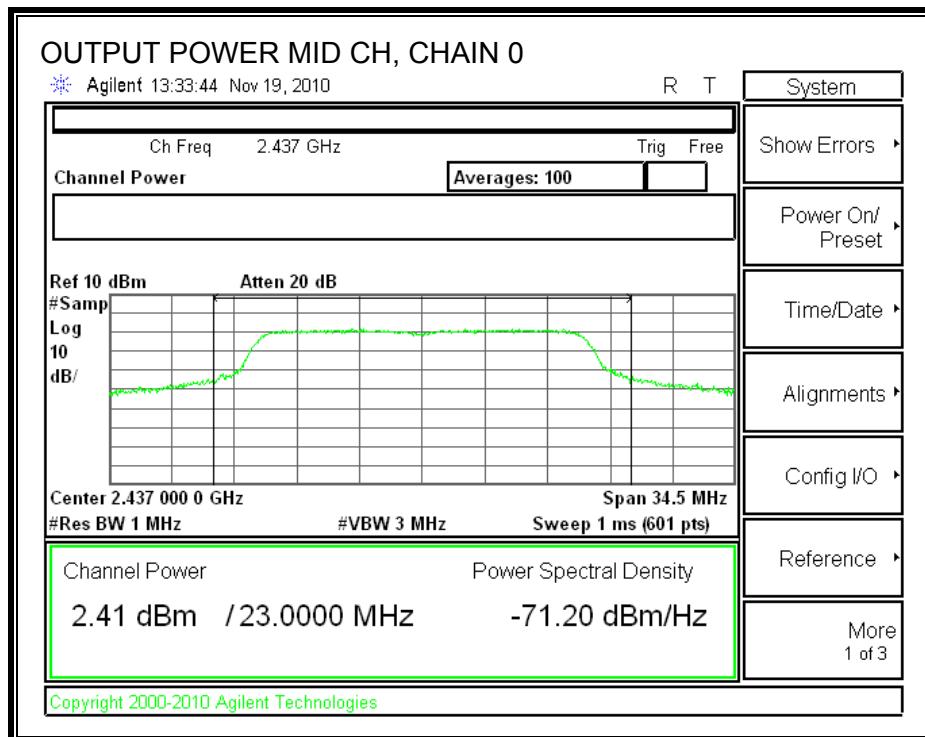
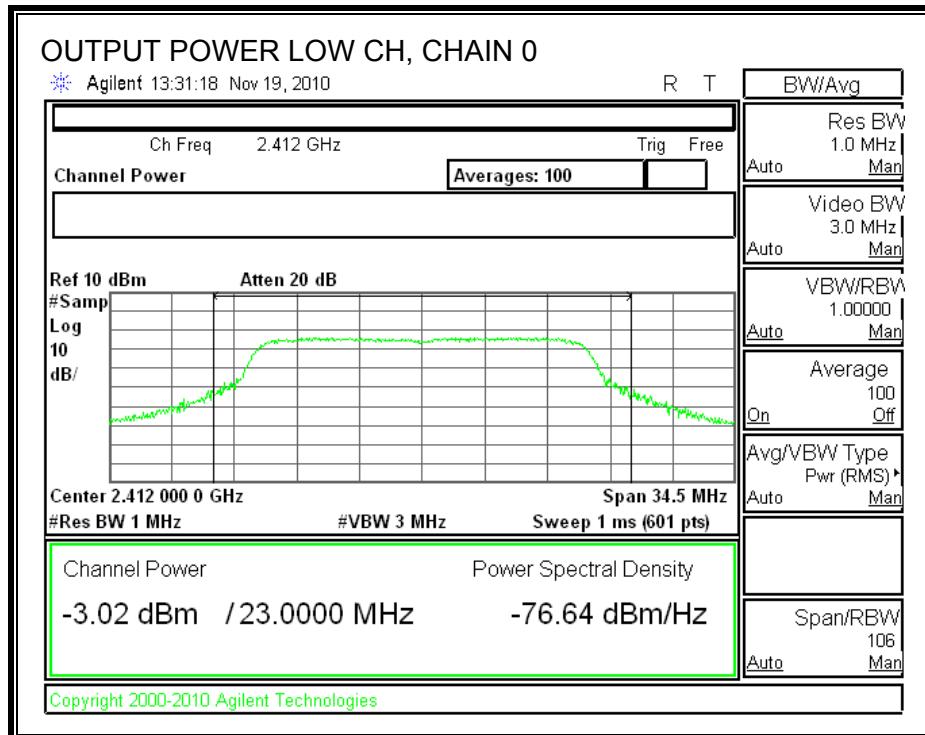
Non Beam-Forming

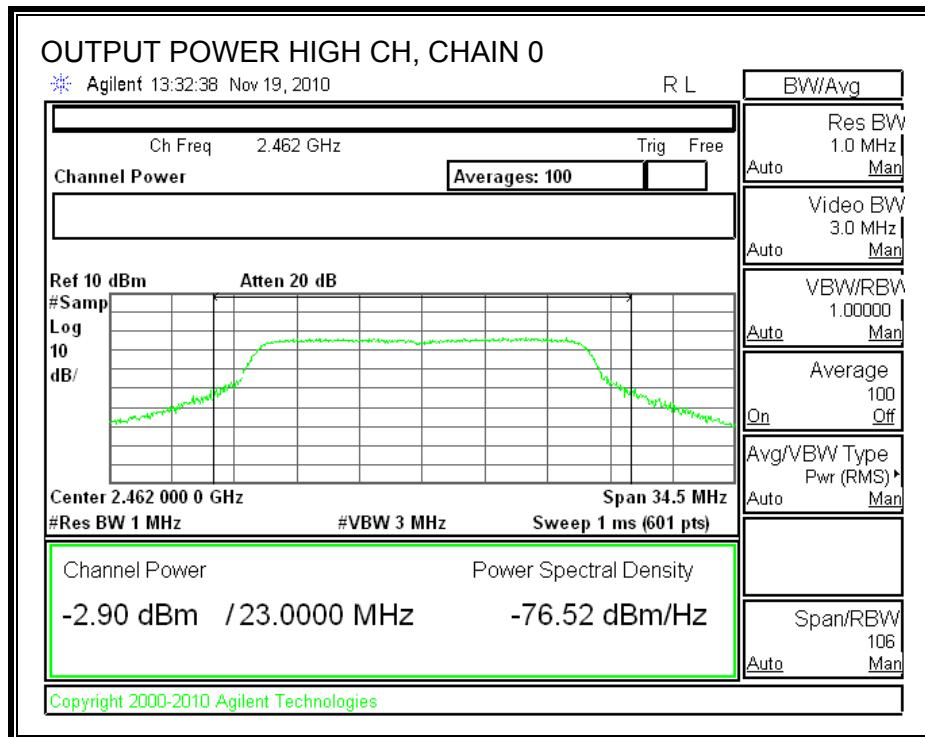
Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.02	-2.67	-3.55	17.00	18.71	30.00	-11.29
Mid	2437	2.41	1.92	1.04	17.00	23.60	30.00	-6.40
High	2462	-2.90	-3.49	-4.90	17.00	18.09	30.00	-11.91

Beam Forming

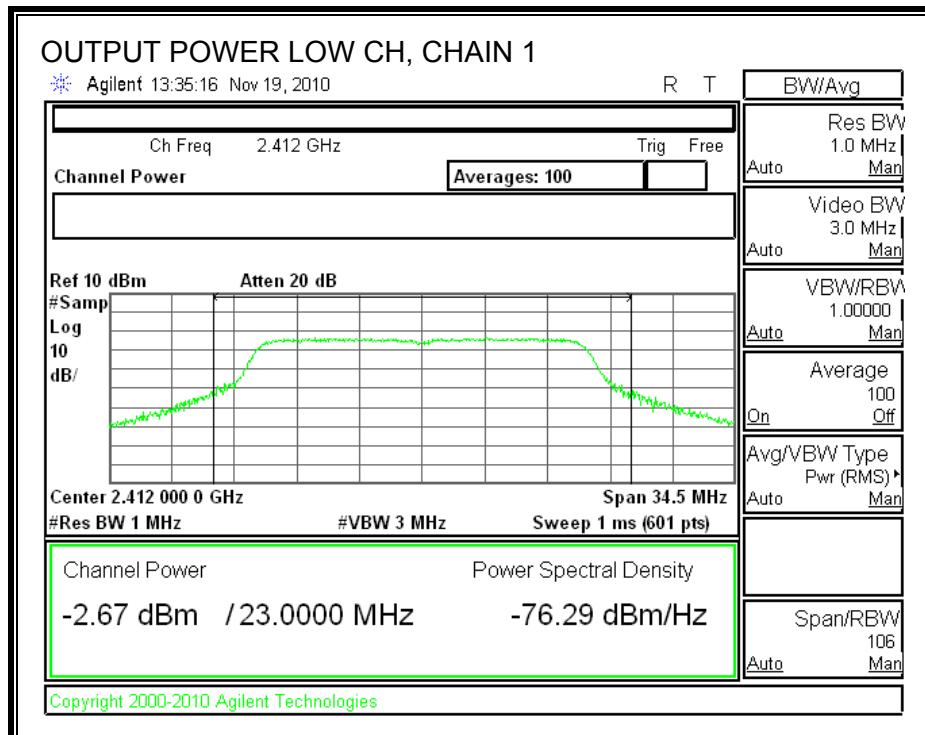
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.02	-2.67	-3.55	17.00	18.71	27.24	-8.53
Mid	2437	2.41	1.92	1.04	17.00	23.60	27.24	-3.64
High	2462	-2.90	-3.49	-4.90	17.00	18.09	27.24	-9.15

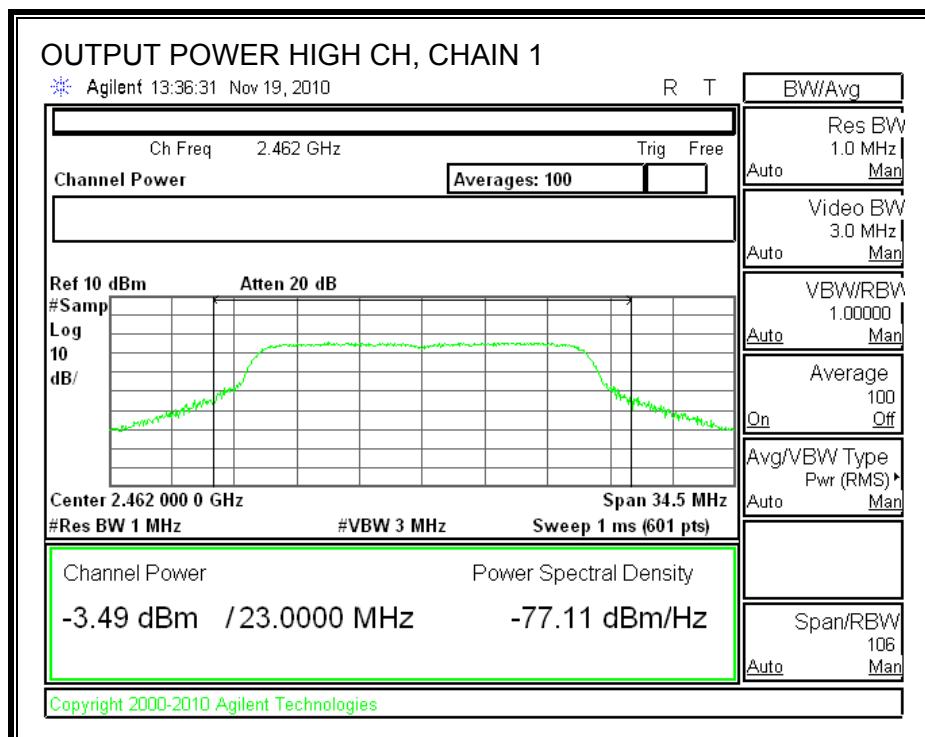
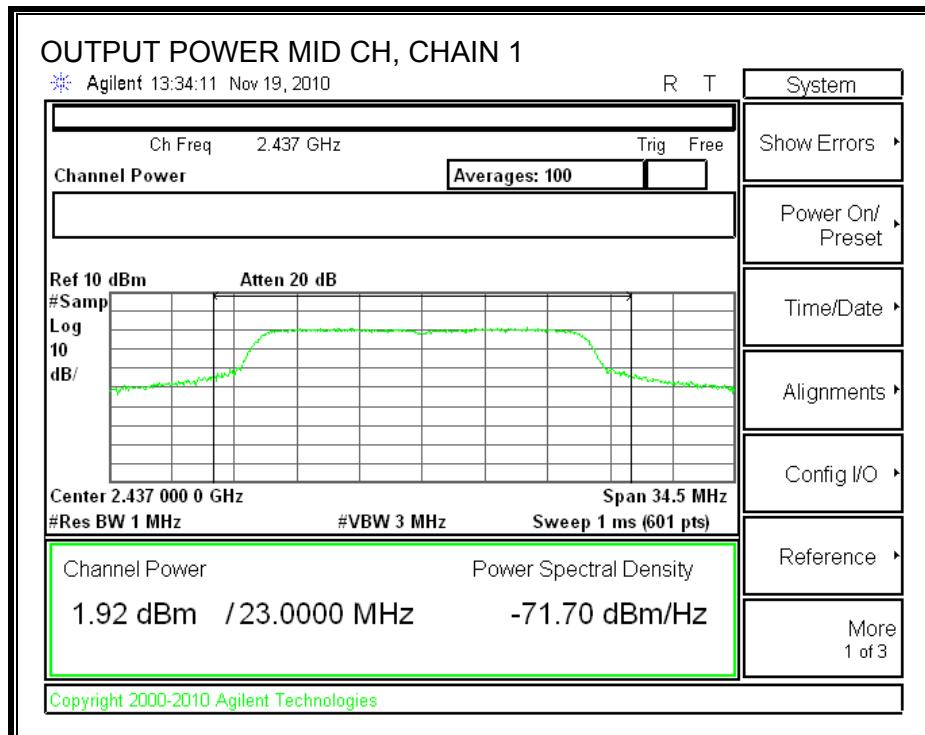
CHAIN 0 OUTPUT POWER



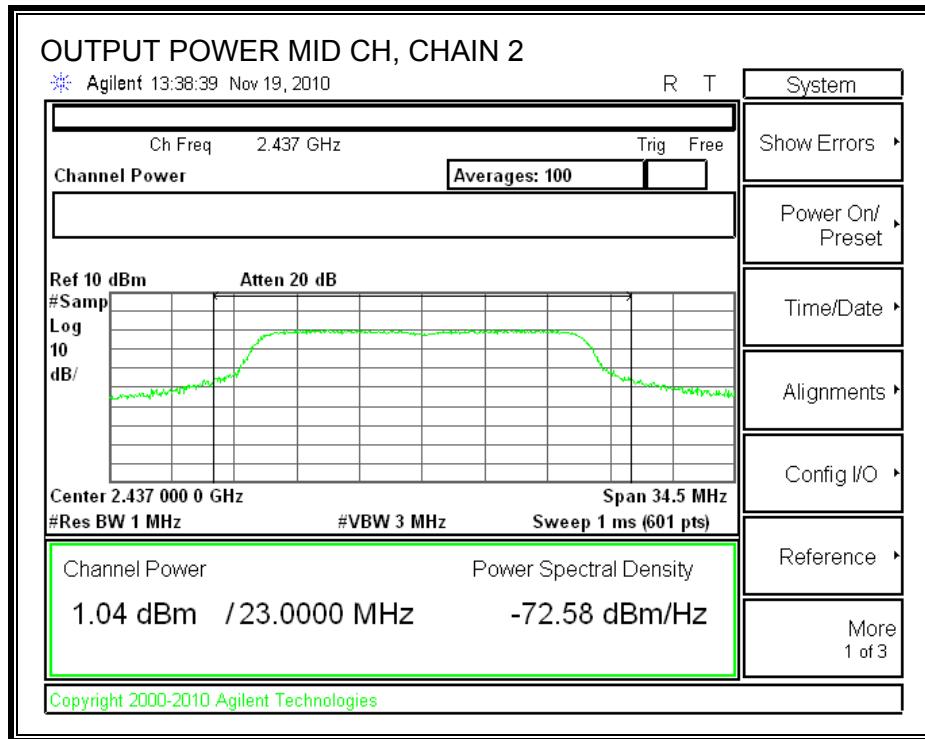
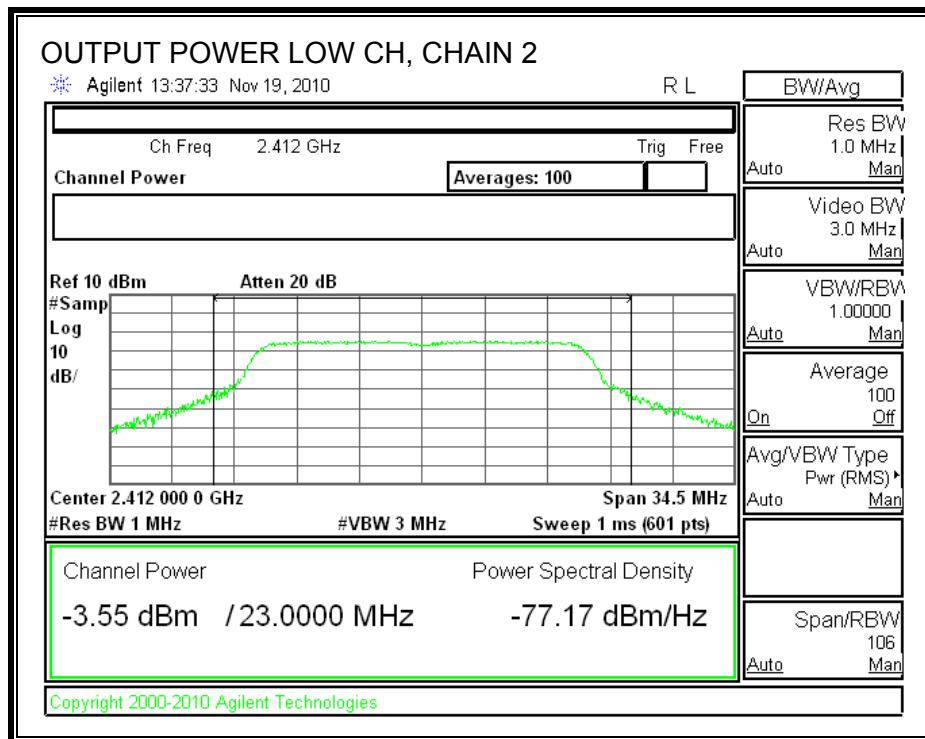


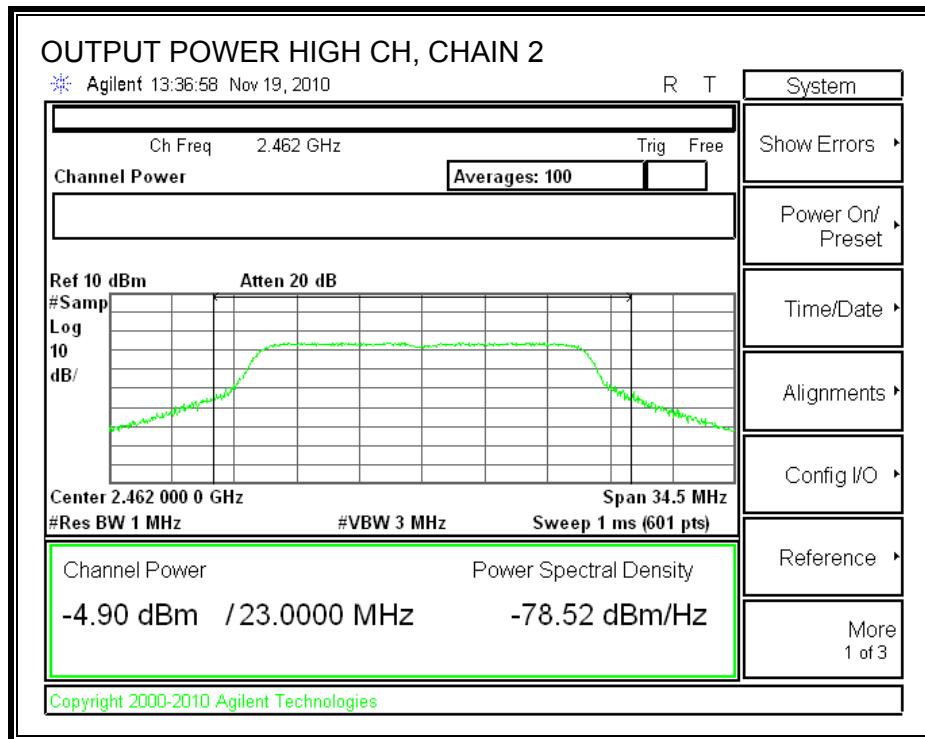
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	0 (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2412	13.75	13.30	13.60	18.33
Middle	2437	18.50	17.80	18.00	22.88
High	2462	13.40	12.10	12.00	17.32

7.3.5. 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.

The combination of antenna gains is equal to 8.76 dBi, therefore the limit is 5.24 dBm.

TEST PROCEDURE

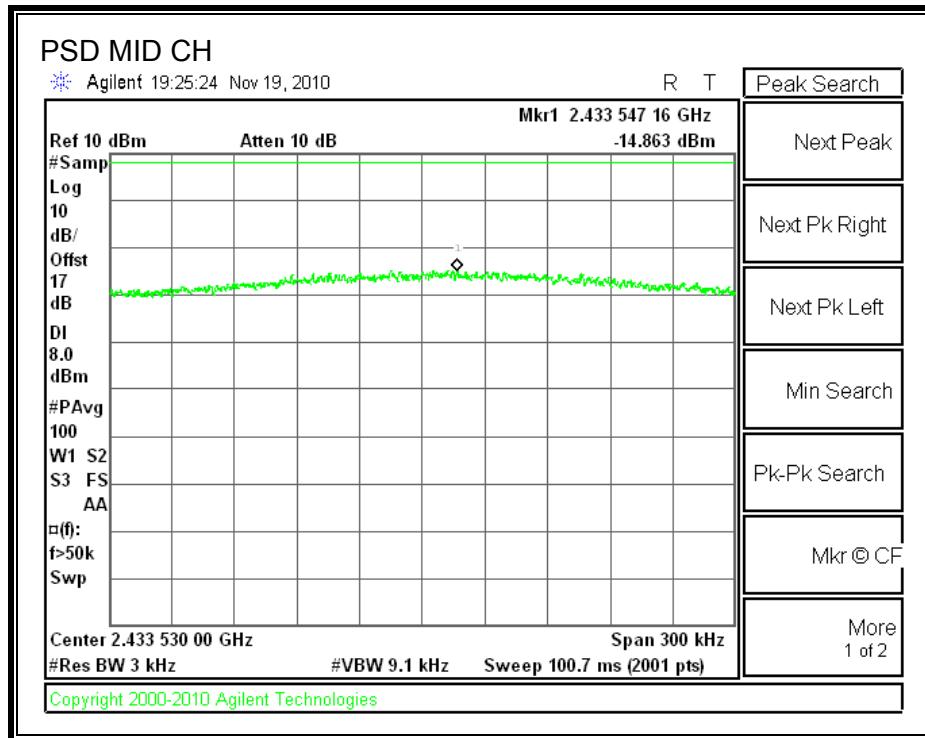
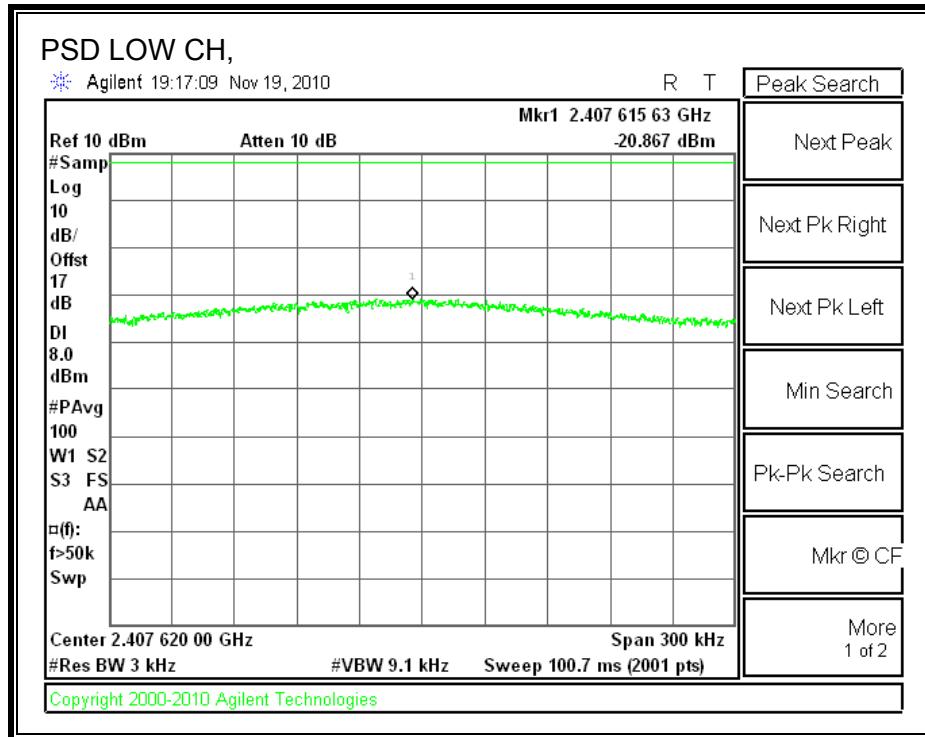
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

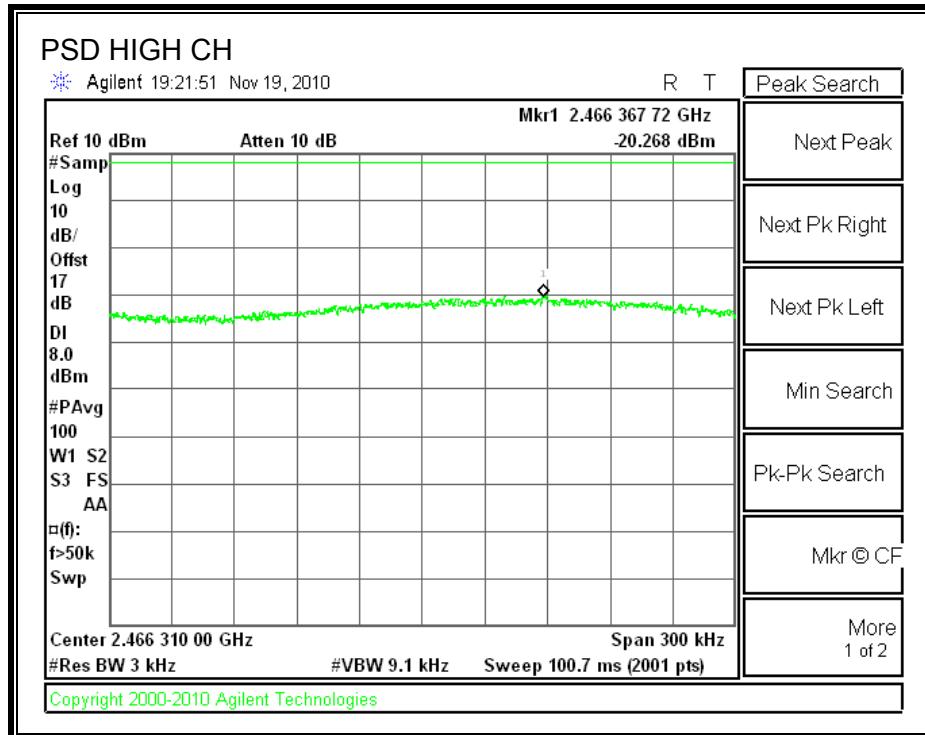
RESULTS

Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-20.87	-20.64	-21.22	-16.1	5.24	-21.37
Middle	2437	-14.86	-14.93	-15.72	-10.4	5.24	-15.62
High	2462	-20.27	-21.46	-22.10	-16.4	5.24	-21.68

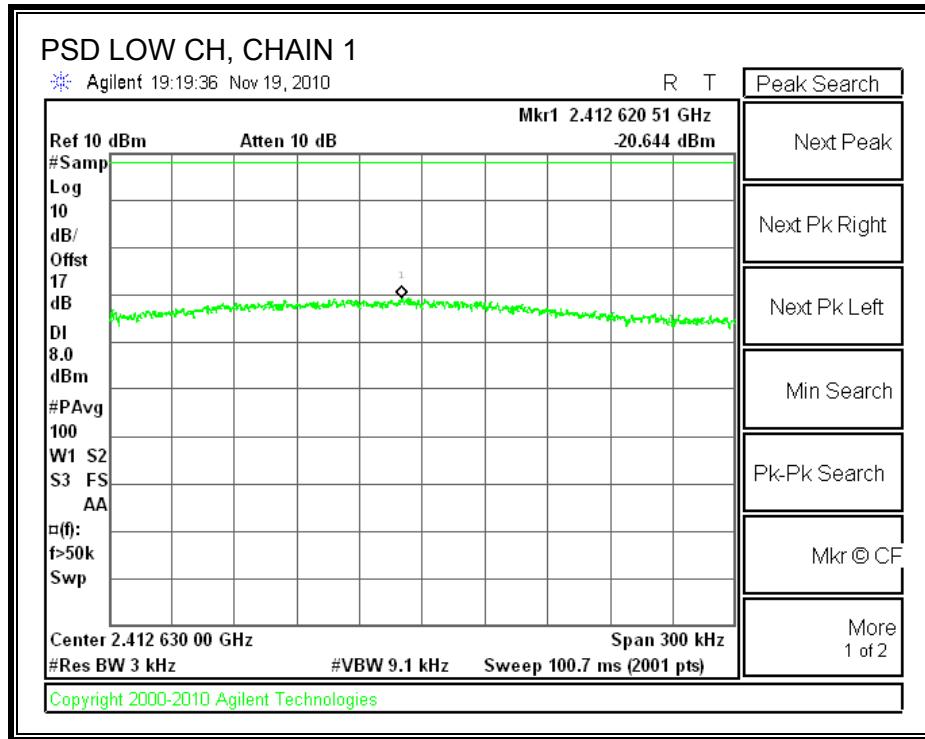
CHAIN 0

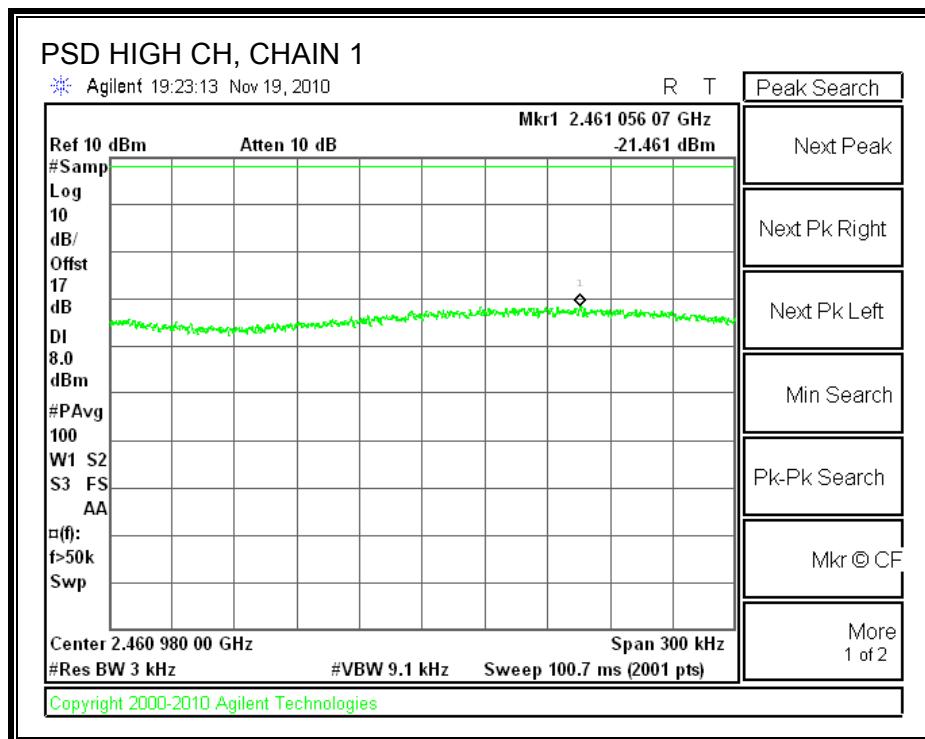
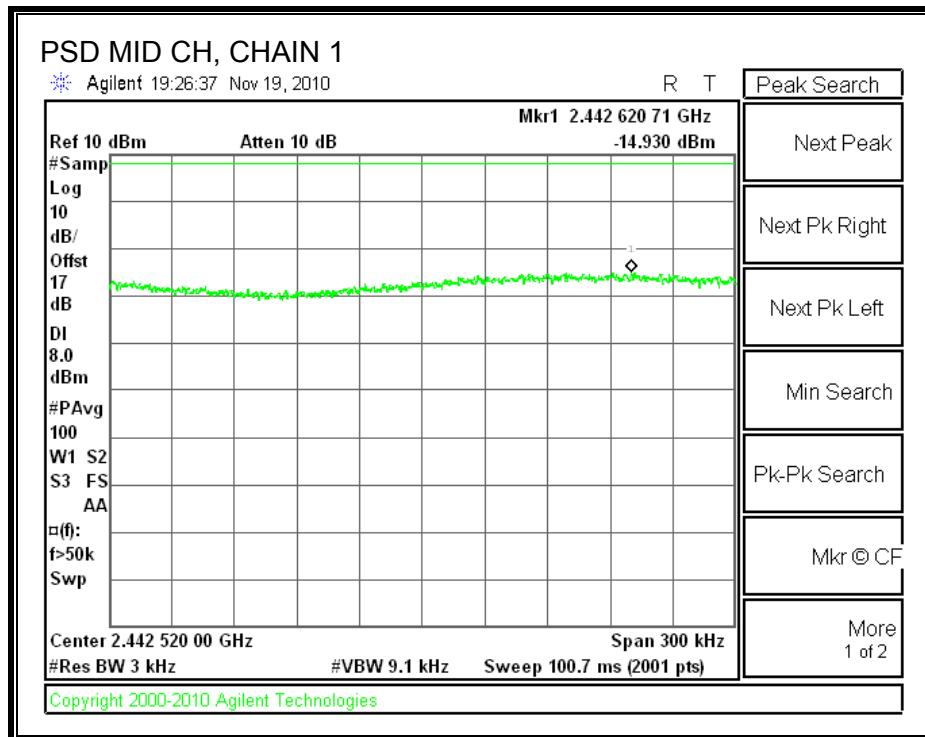
POWER SPECTRAL DENSITY



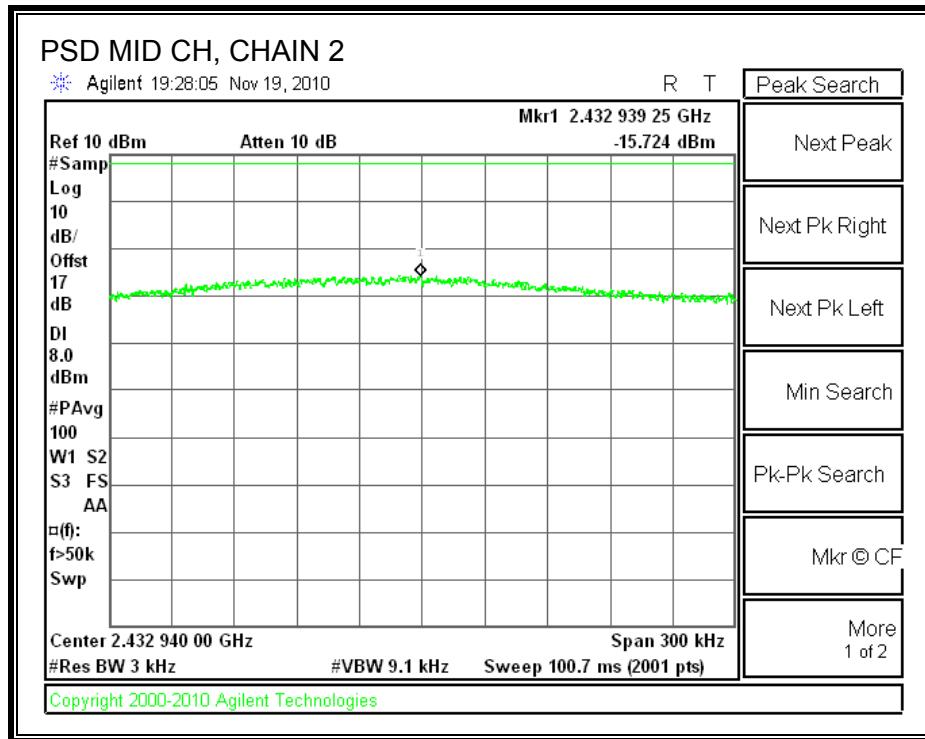
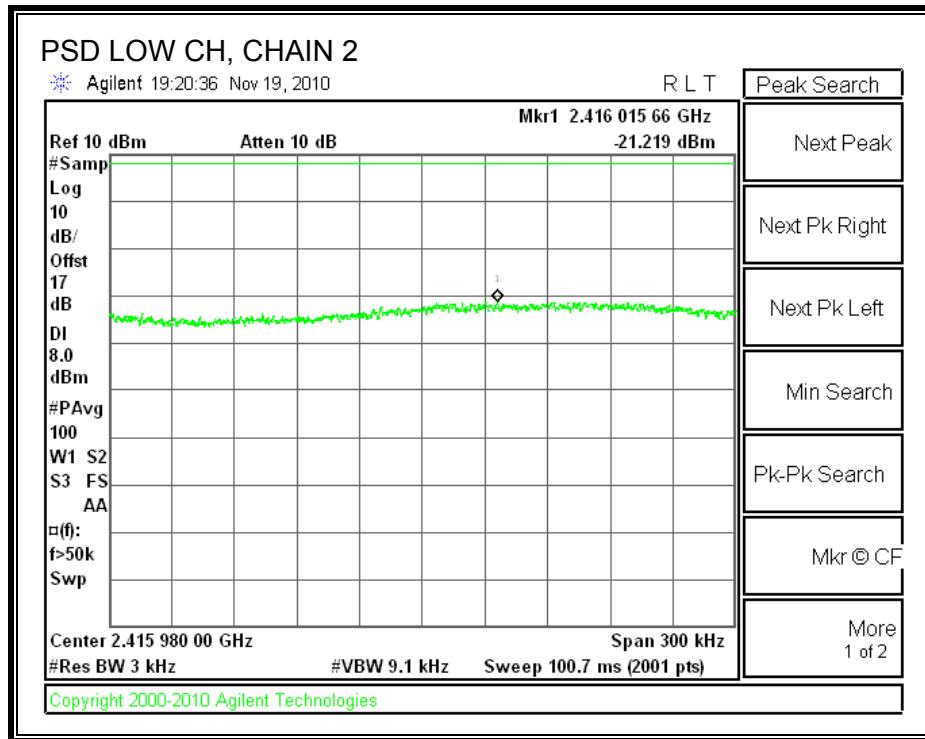


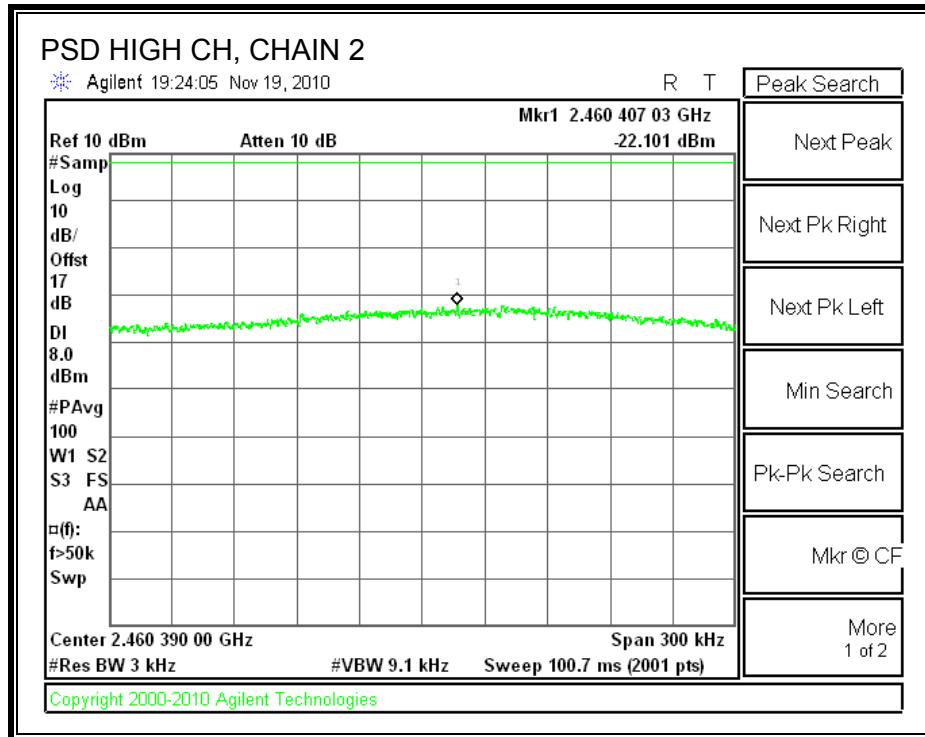
POWER SPECTRAL DENSITY, CHAIN 1





POWER SPECTRAL DENSITY, CHAIN 2





7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

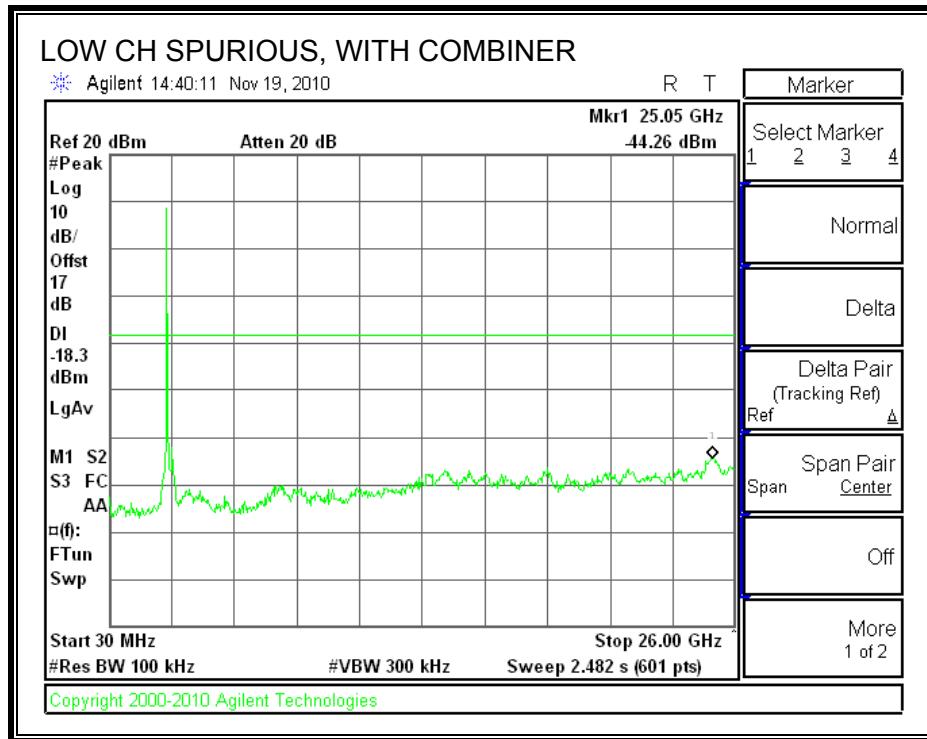
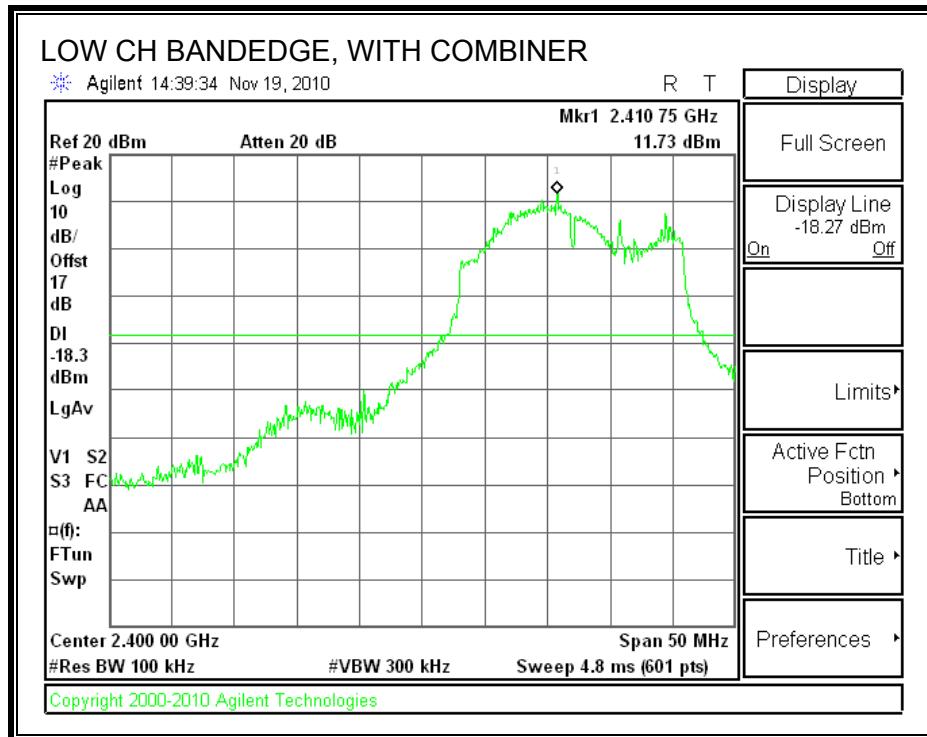
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

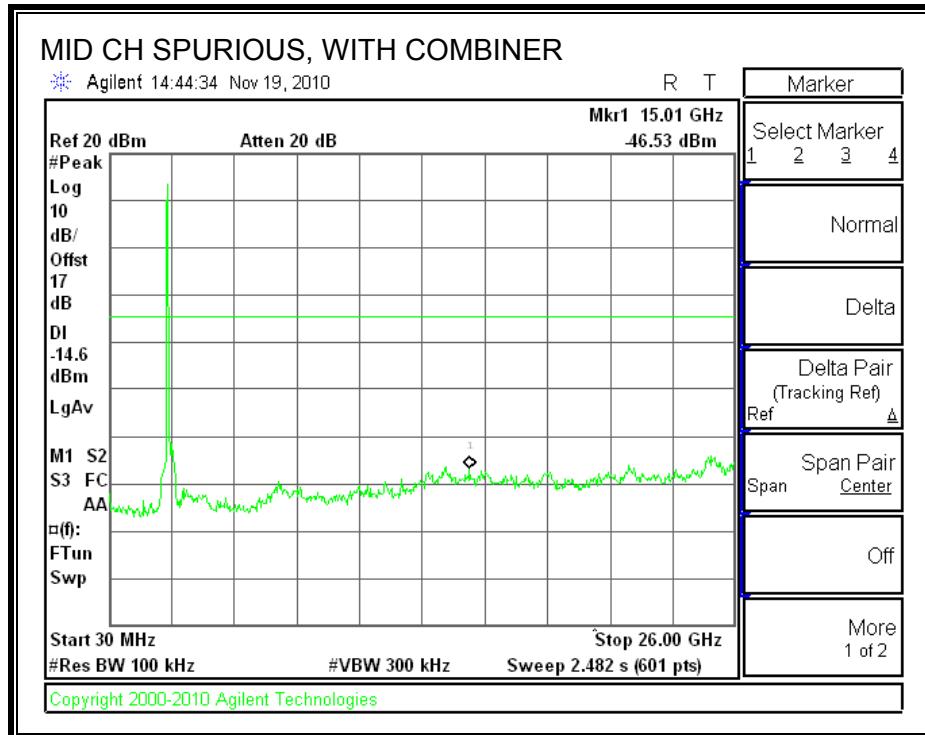
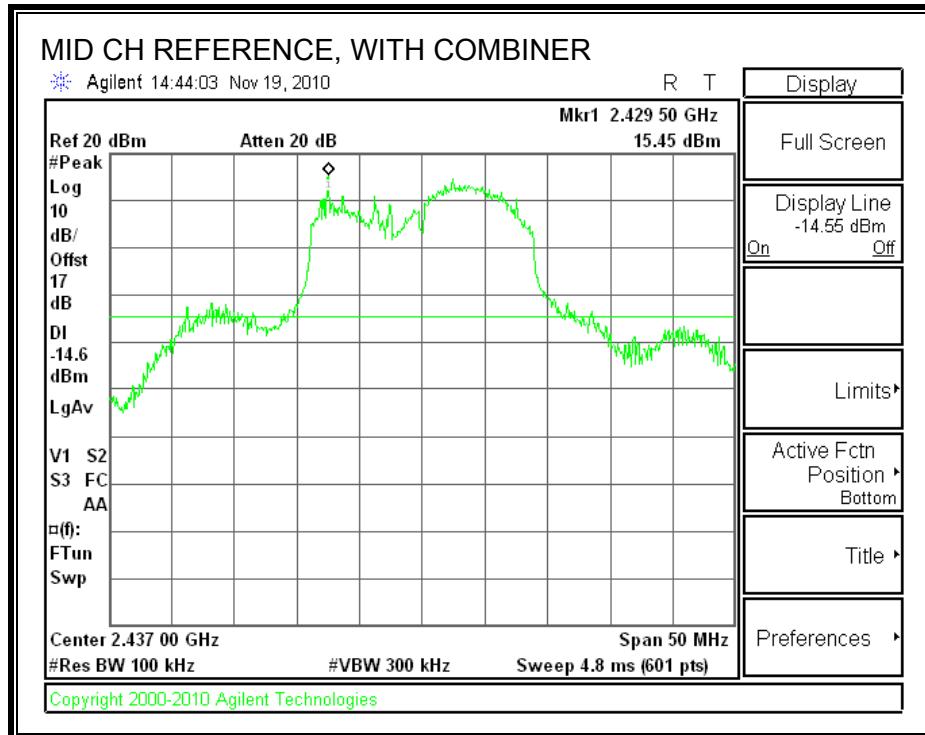
The EUT was set to transmit at low, mid and channel, 30 dBc display line was set with each channel level

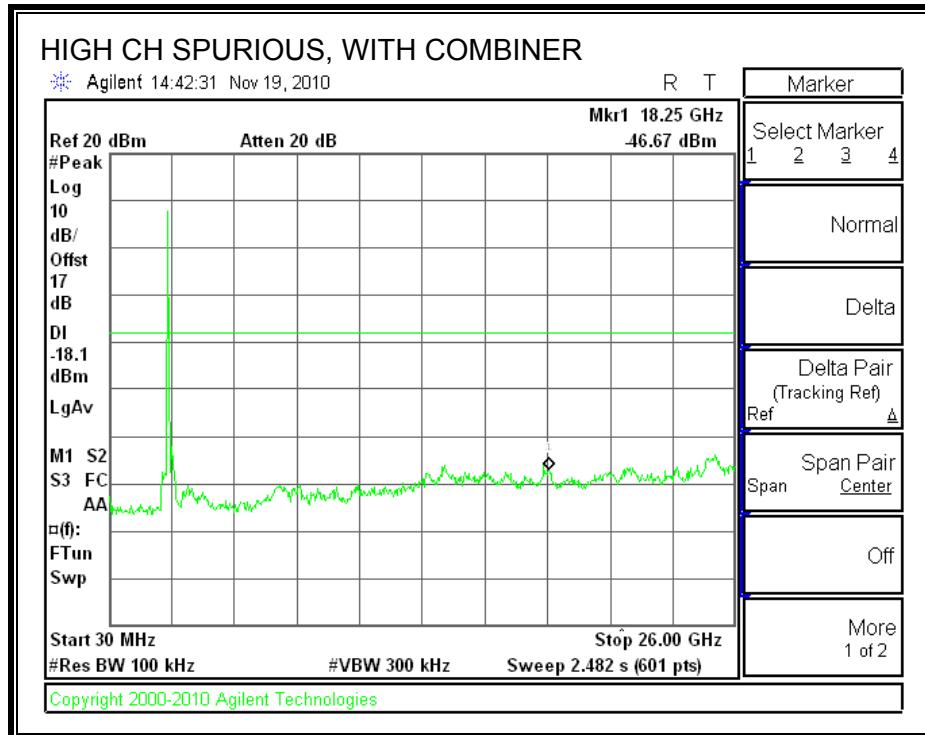
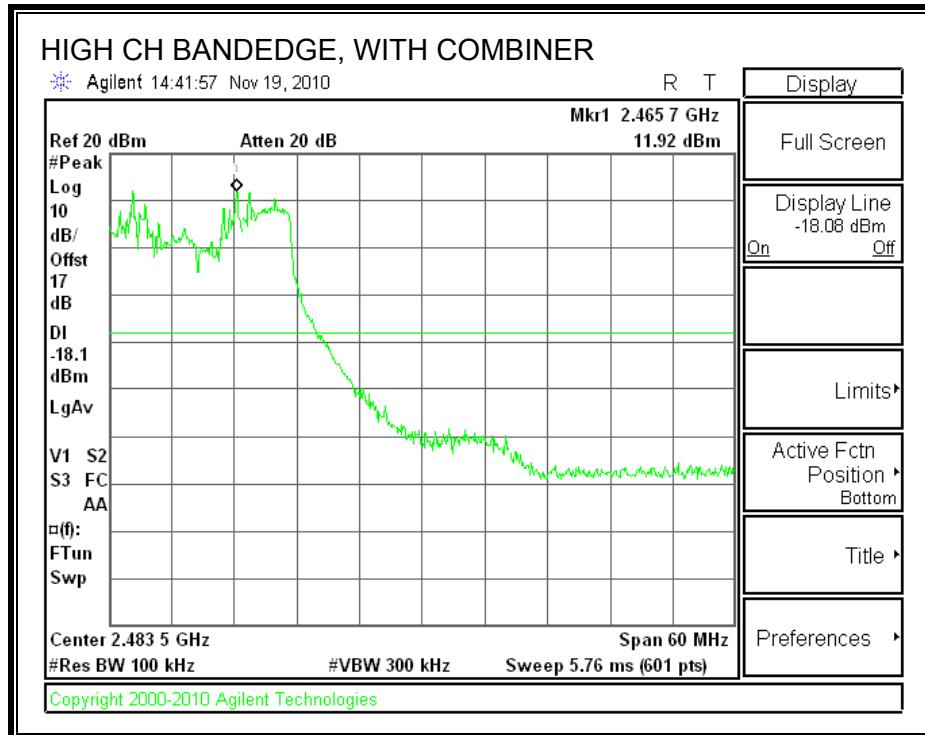
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channel

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







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

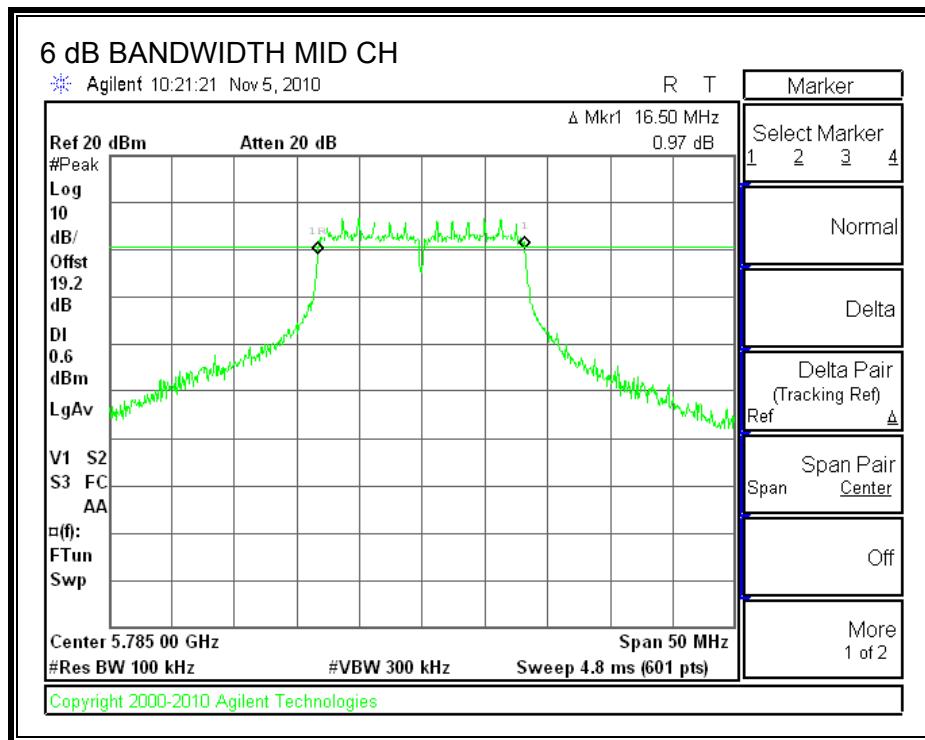
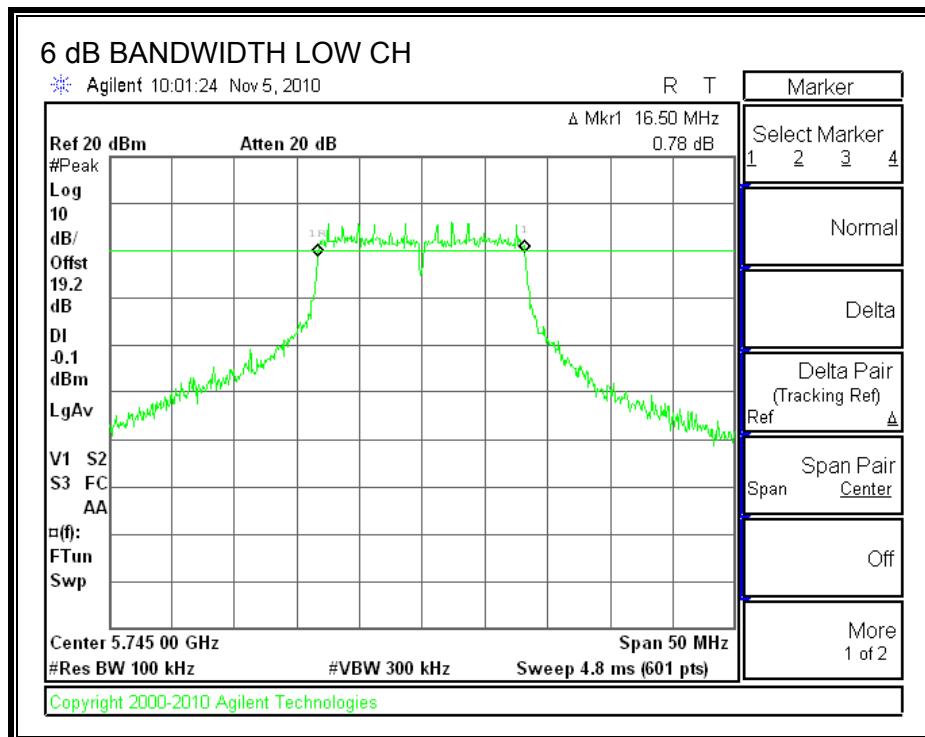
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

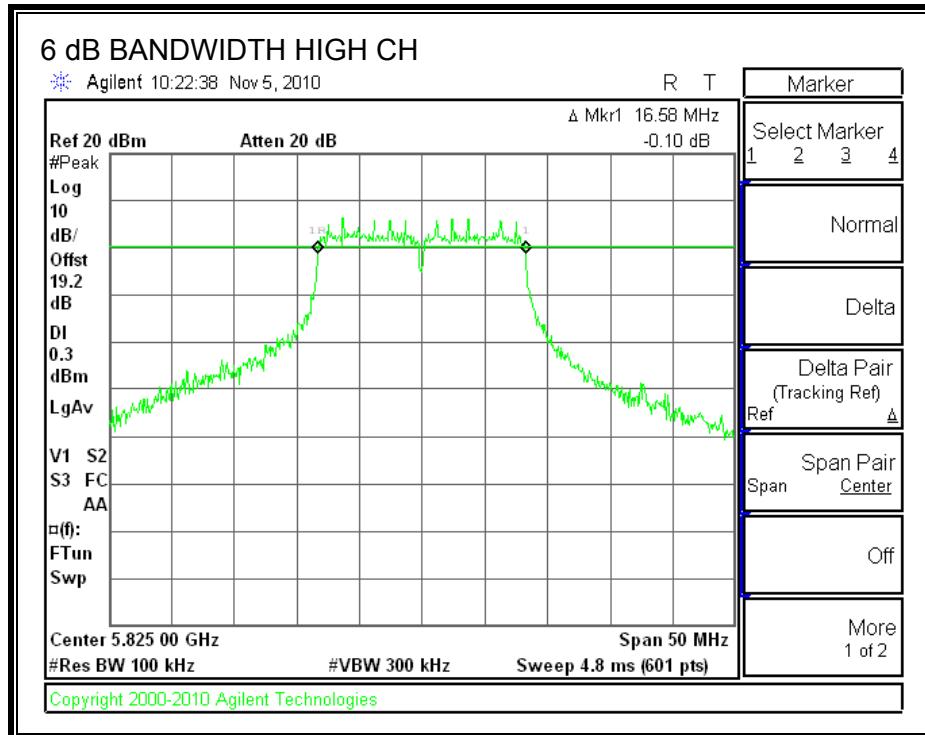
RESULTS

Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5745	16.50	16.50	16.25	0.5
Middle	5785	16.50	16.33	16.58	0.5
High	5825	16.58	16.25	16.58	0.5

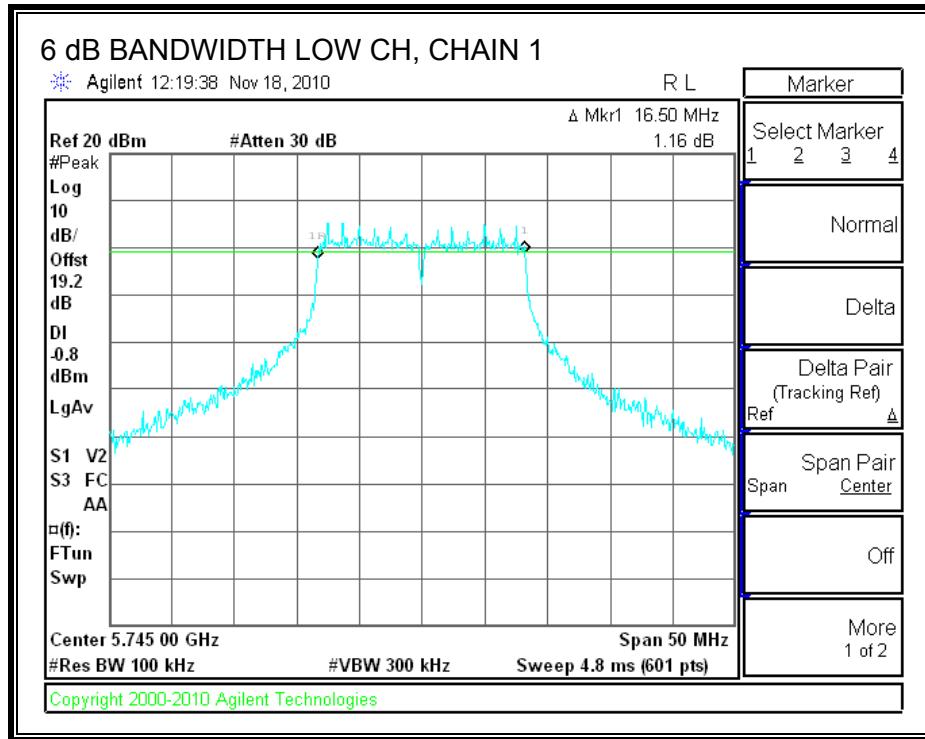
CHAIN 0

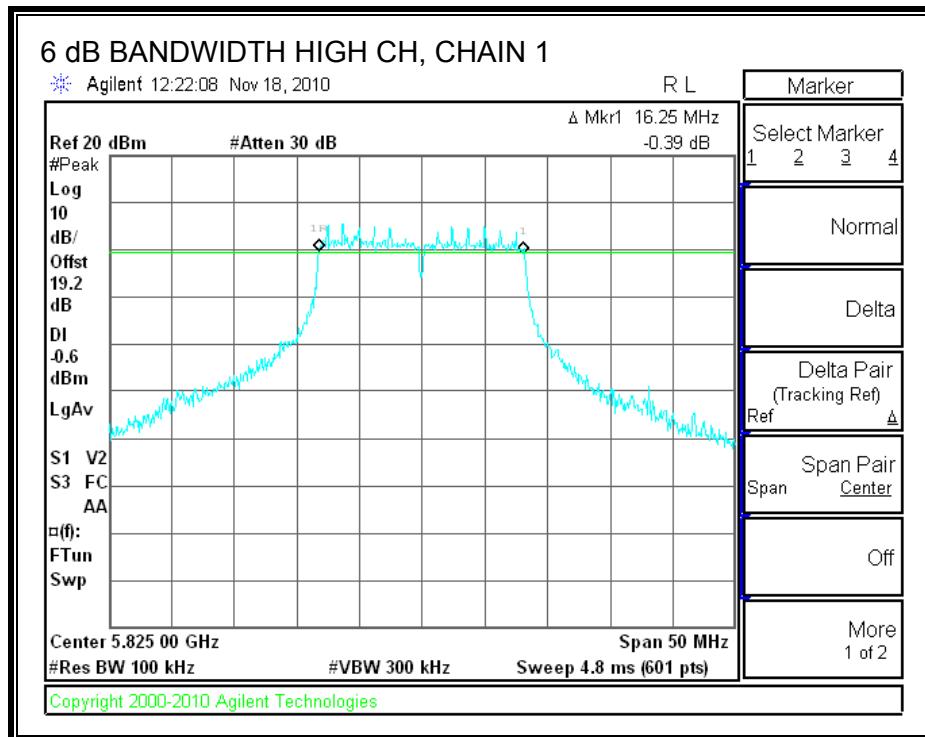
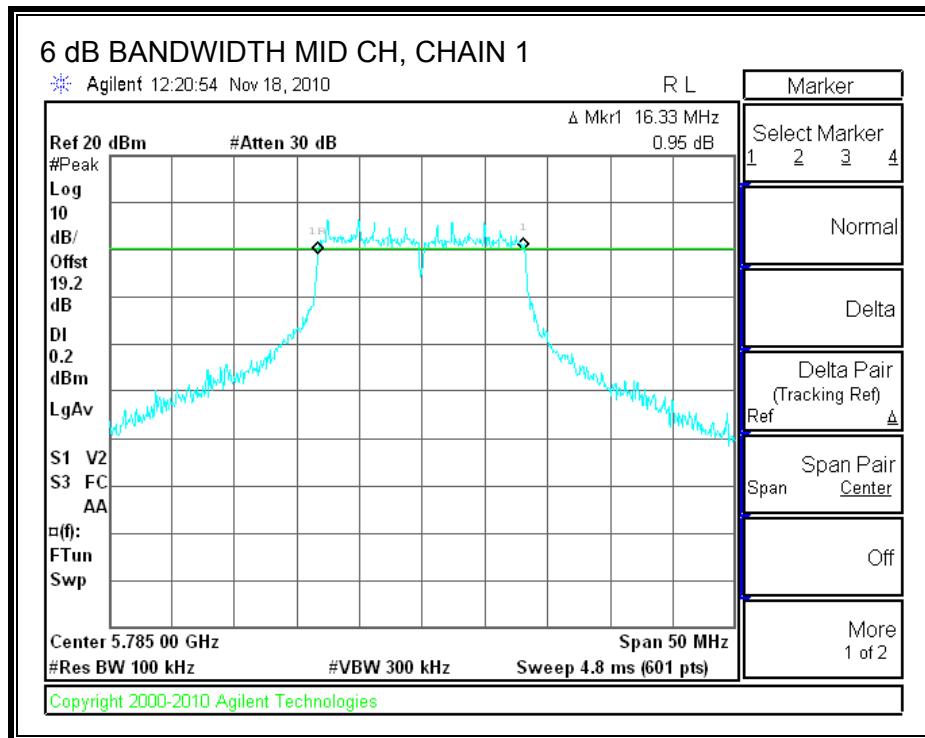
6 dB BANDWIDTH



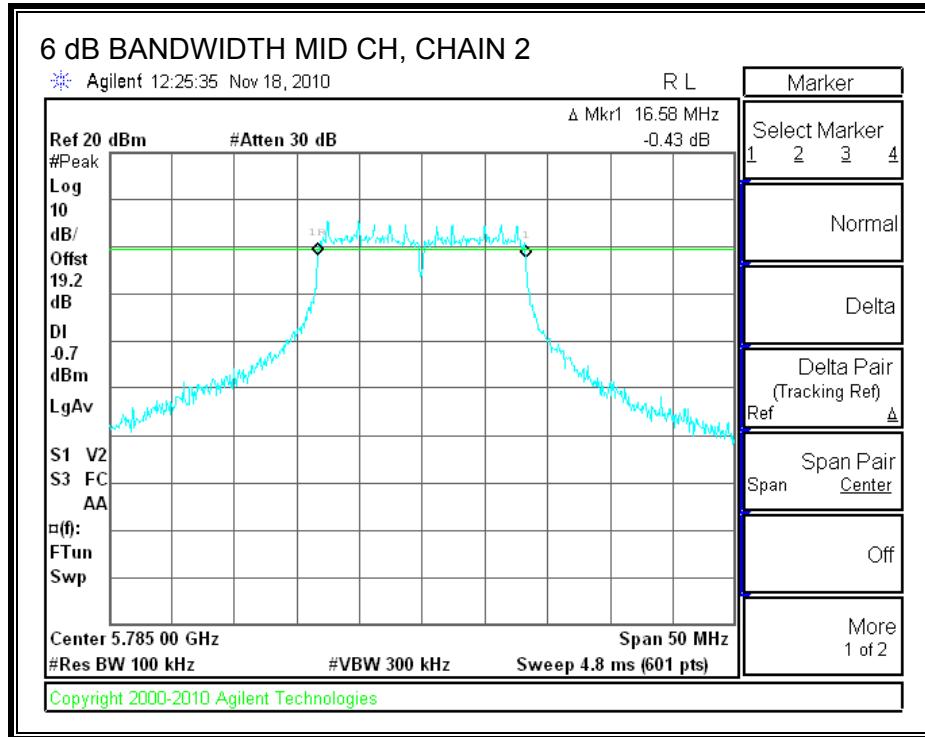
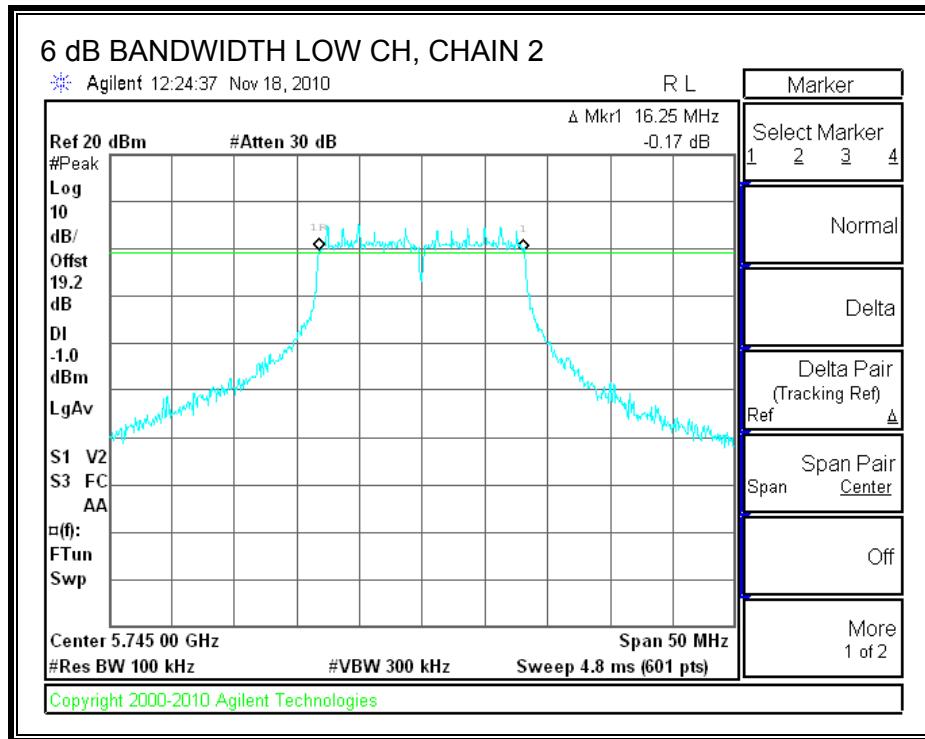


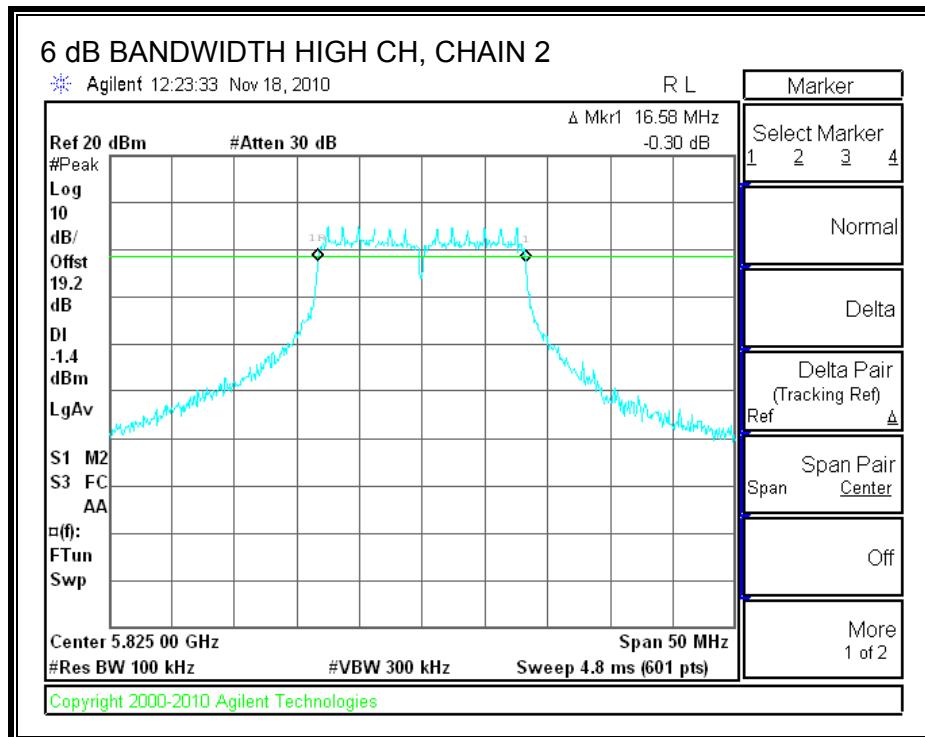
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

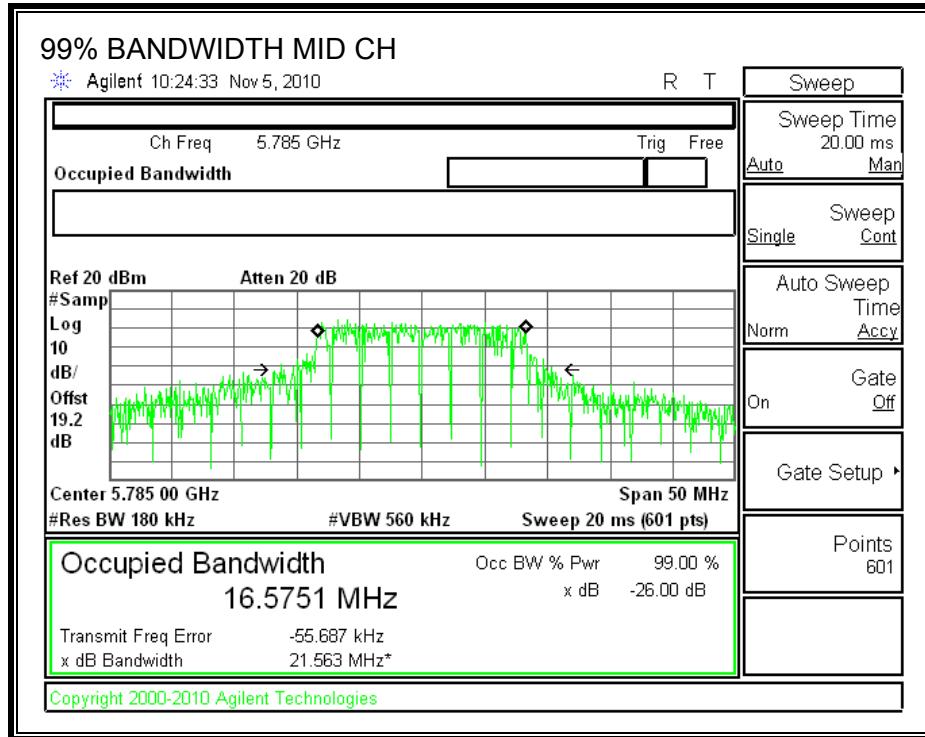
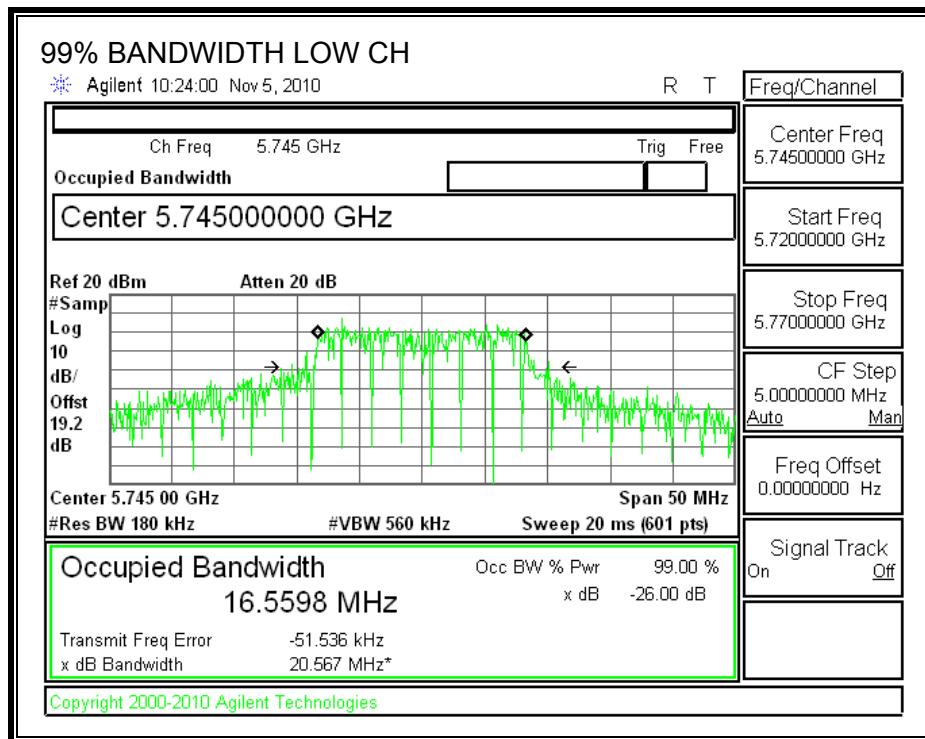
TEST PROCEDURE

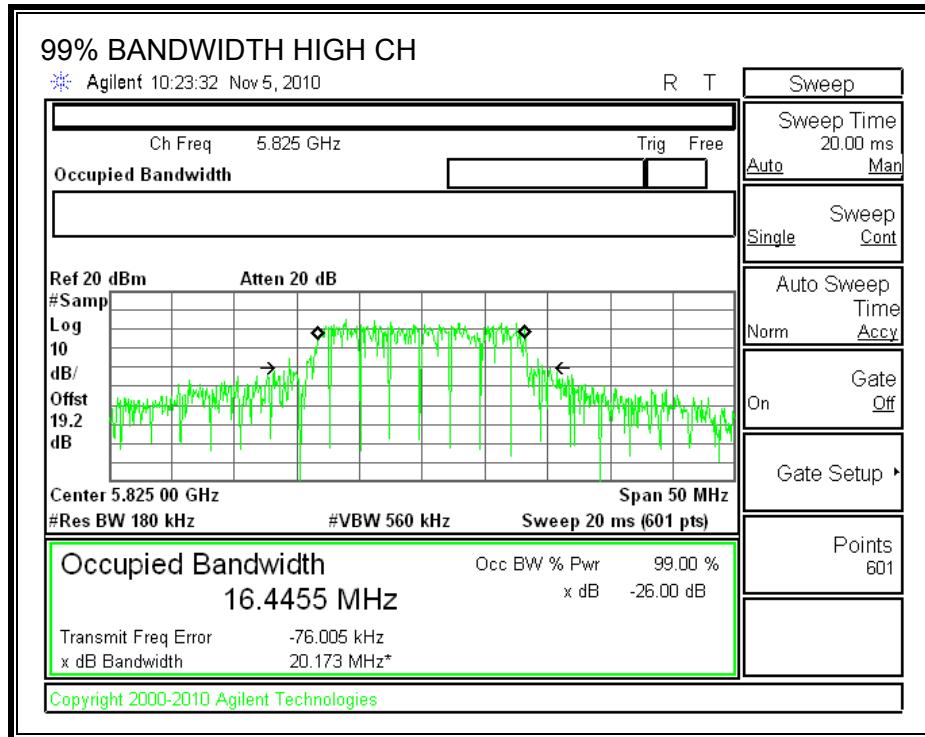
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

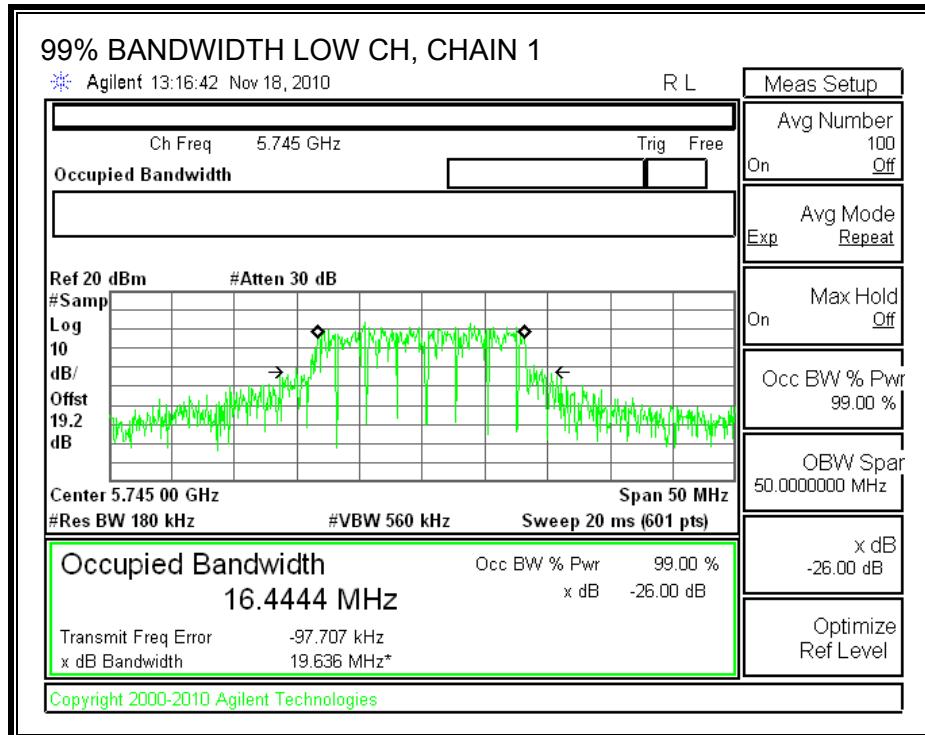
Channel	Frequency (MHz)	Chain 0 99% Bandwidth (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	5745	16.5598	16.4444	16.4490
Middle	5785	16.5751	16.4691	16.5430
High	5825	16.4455	16.4620	16.4576

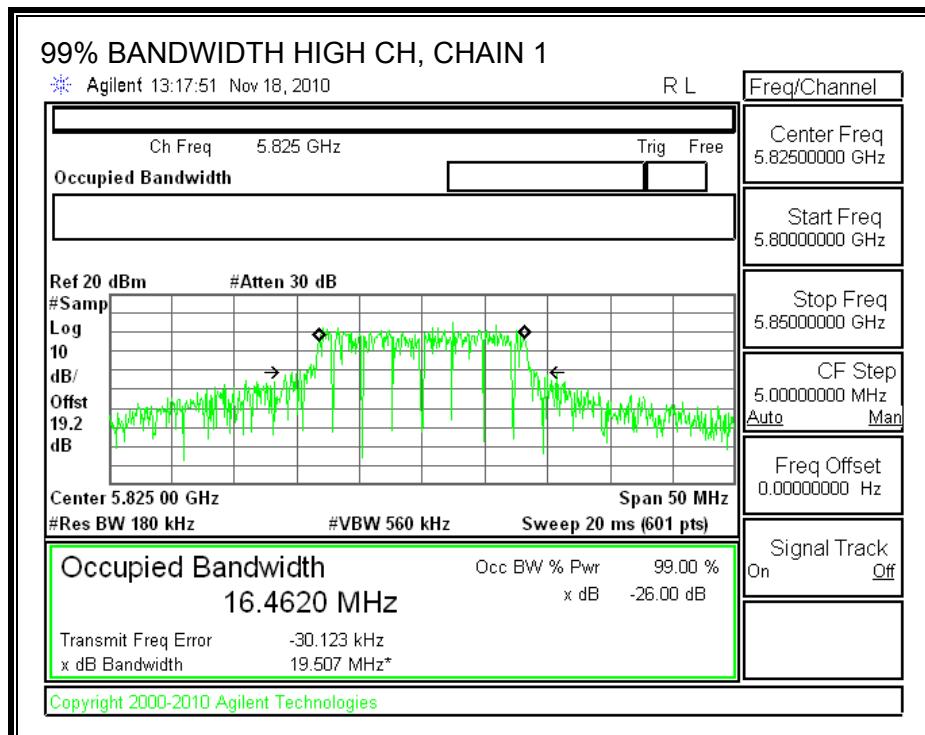
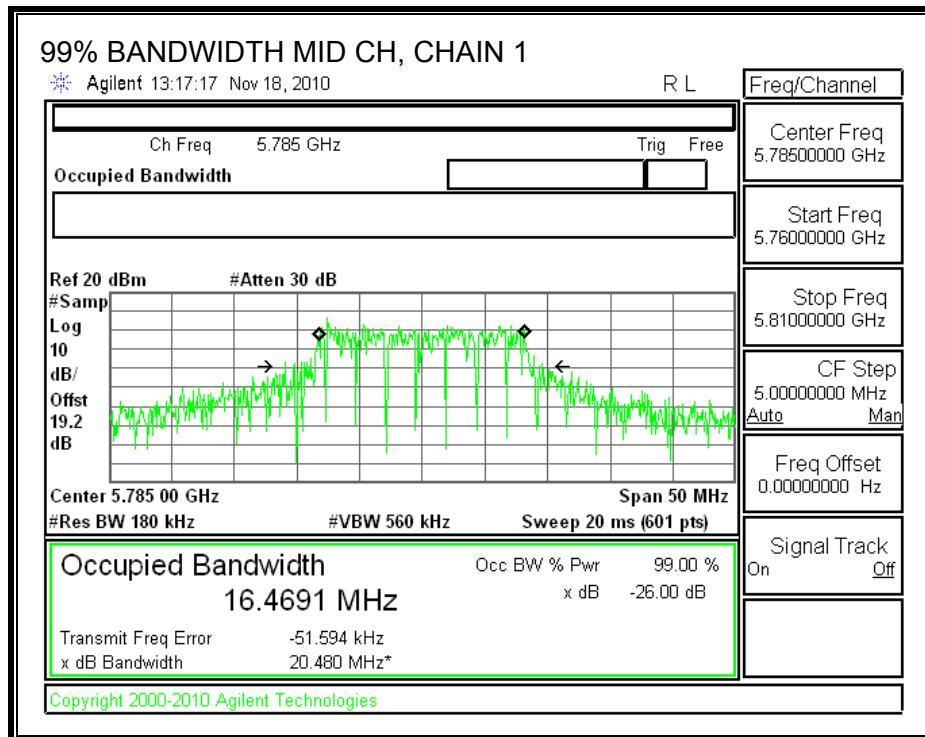
99% BANDWIDTH, CHAIN 0



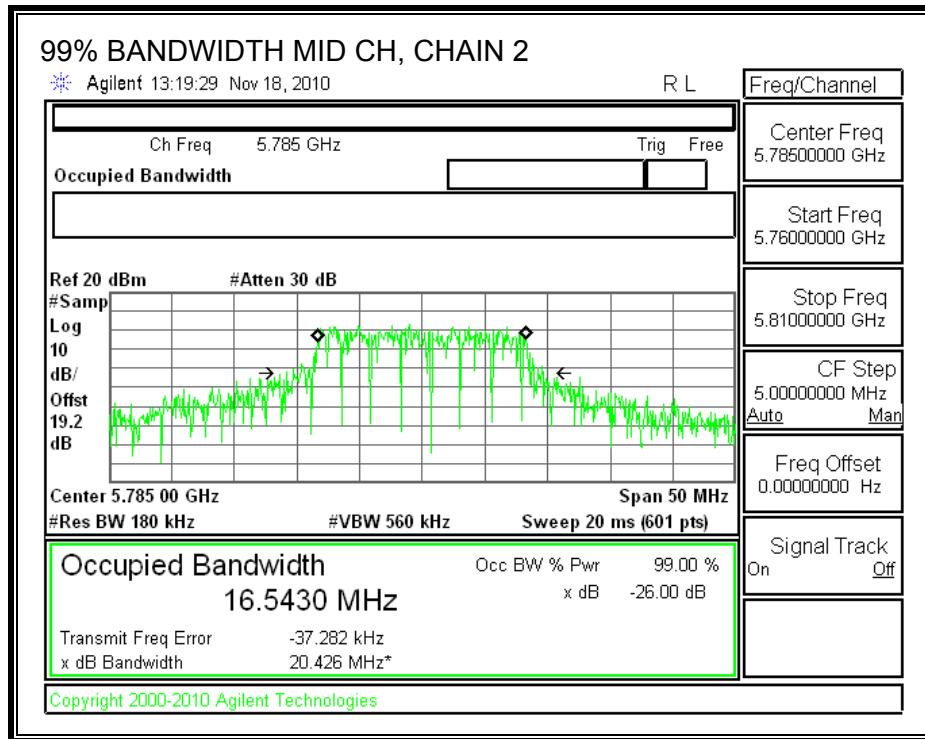
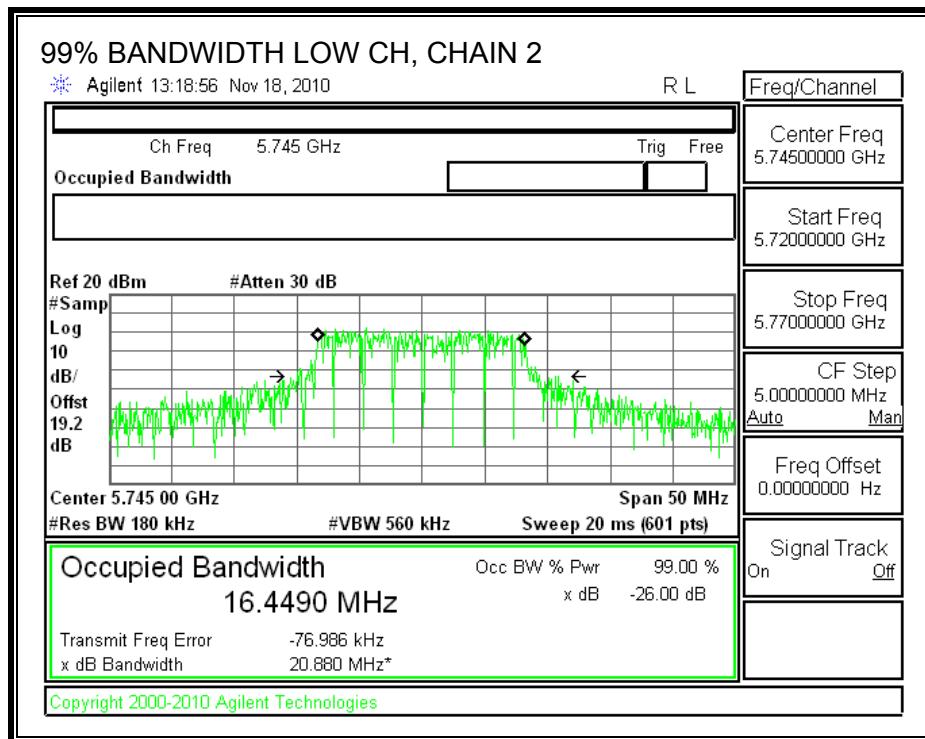


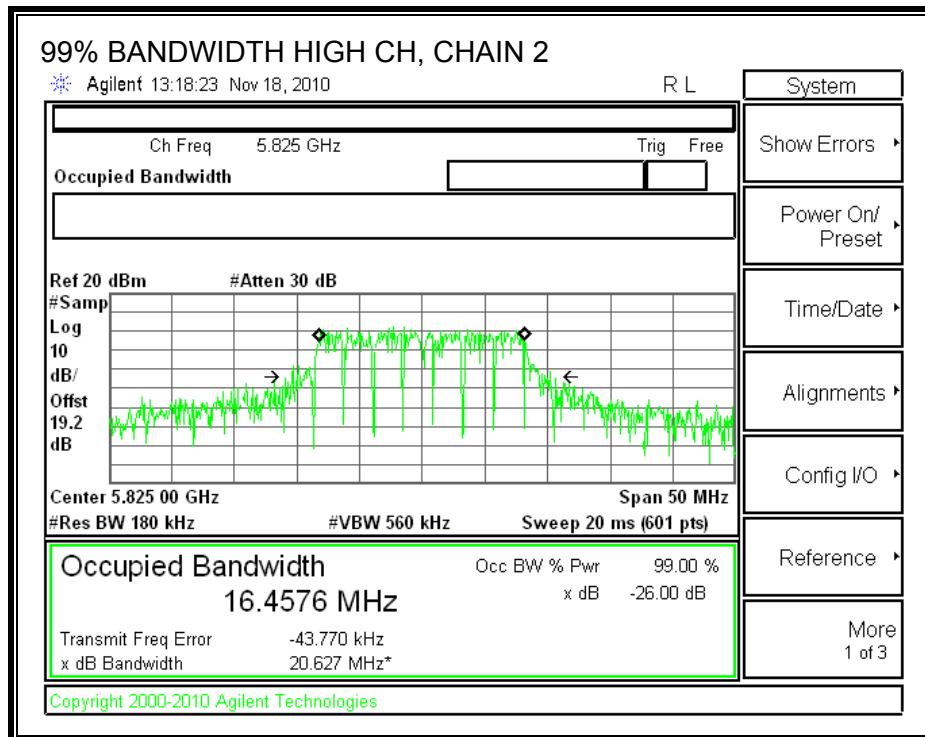
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 9.08 dBi, therefore the limit is 26.92 dBm.

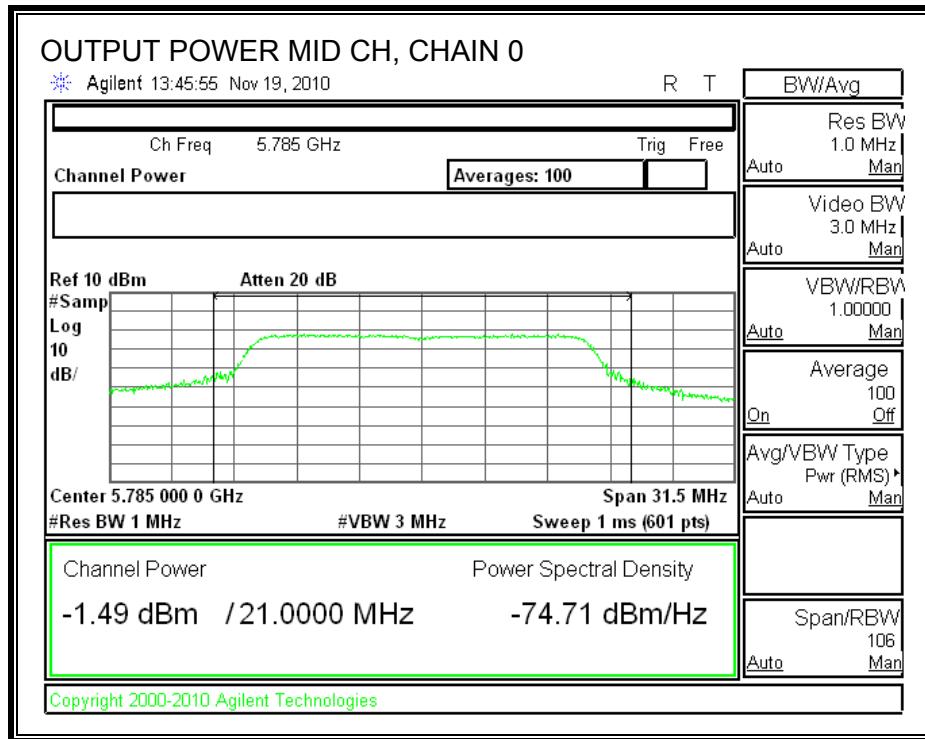
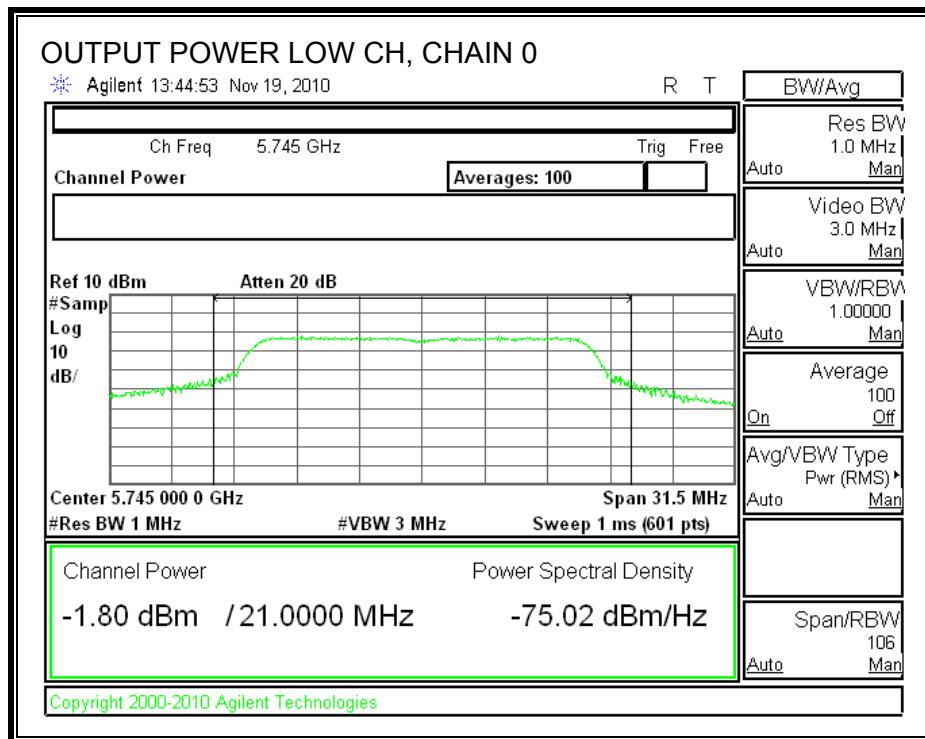
TEST PROCEDURE

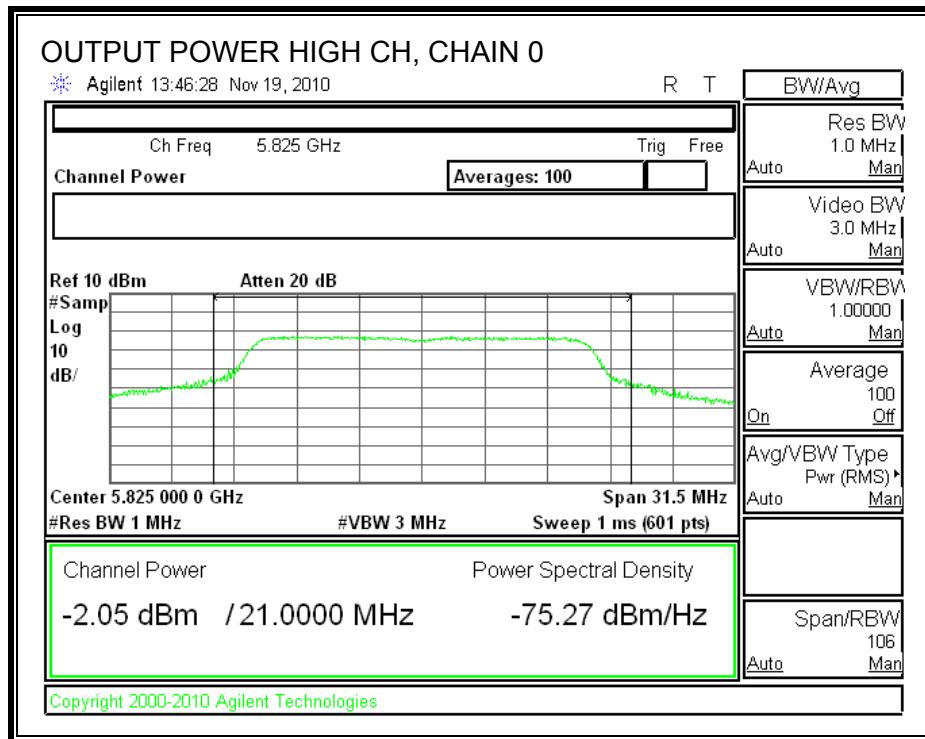
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

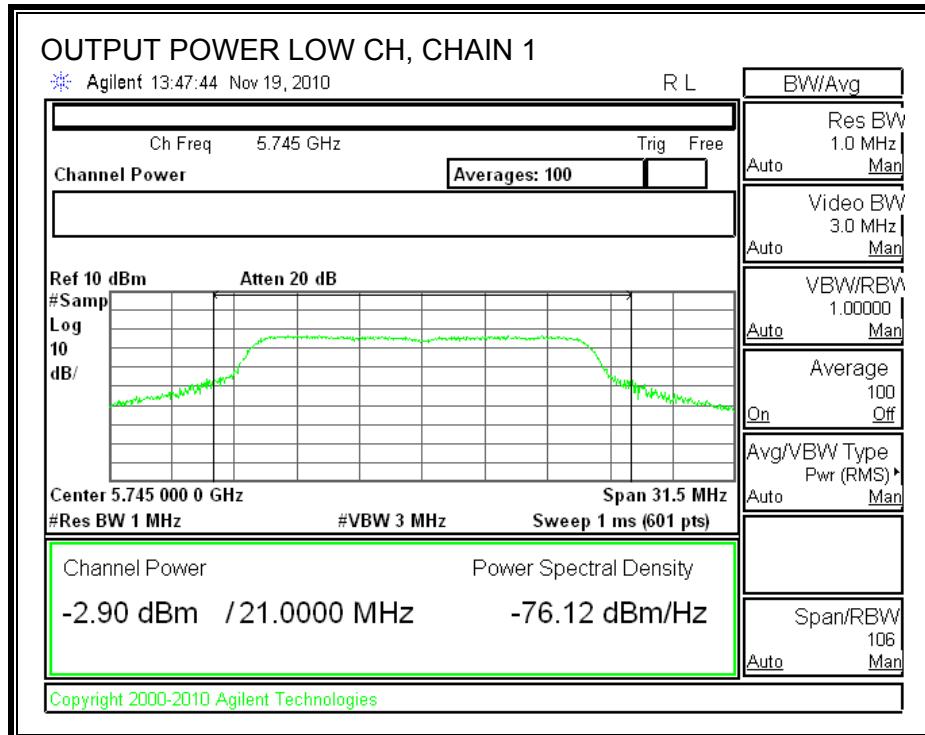
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-1.80	-2.90	-2.72	19.20	21.53	26.92	-5.39
Mid	5785	-1.49	-2.89	-2.92	19.20	21.59	26.92	-5.33
High	5825	-2.05	-3.06	-3.17	19.20	21.24	26.92	-5.68

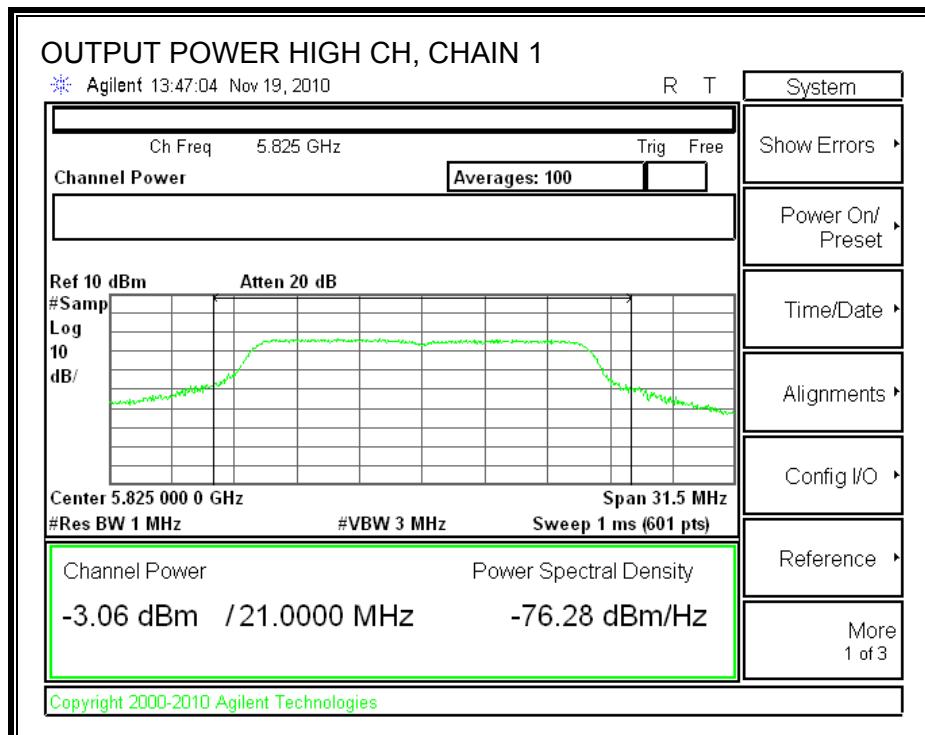
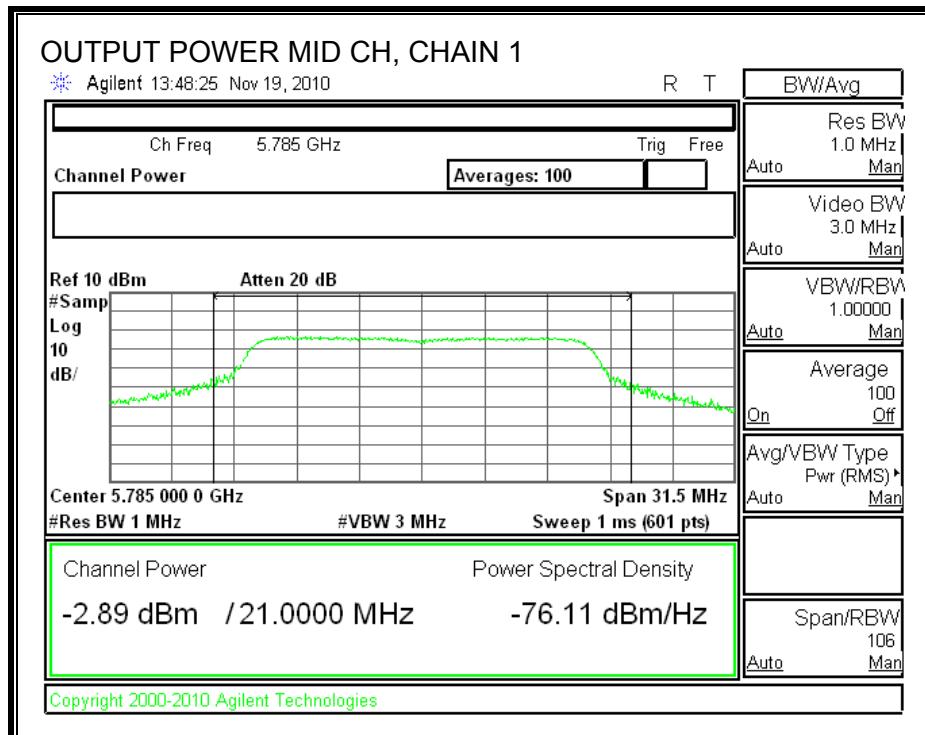
CHAIN 0 OUTPUT POWER



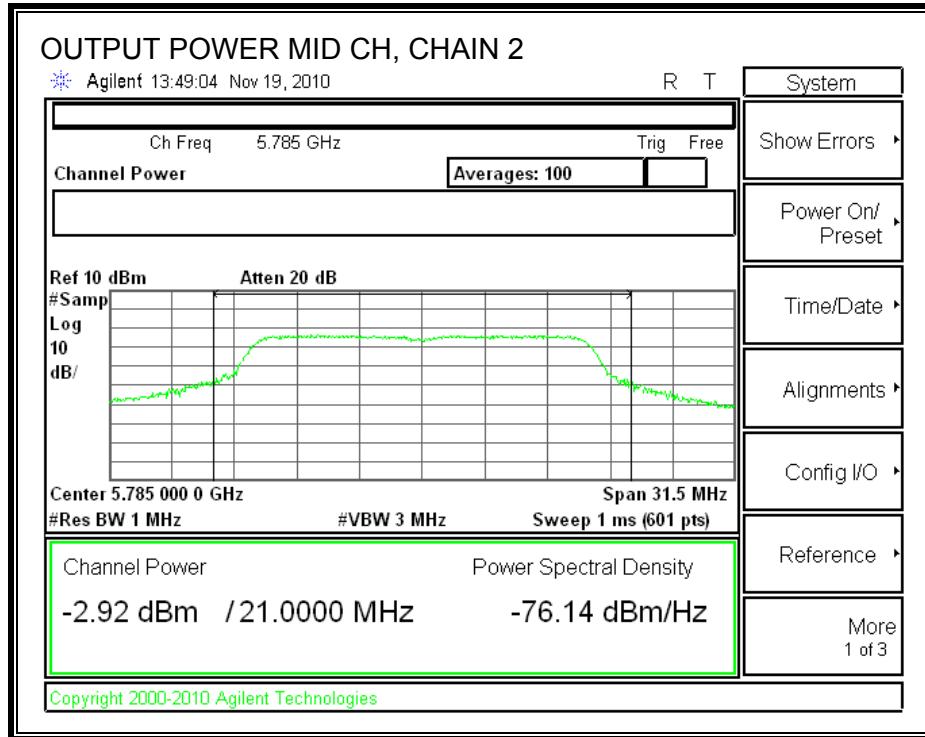
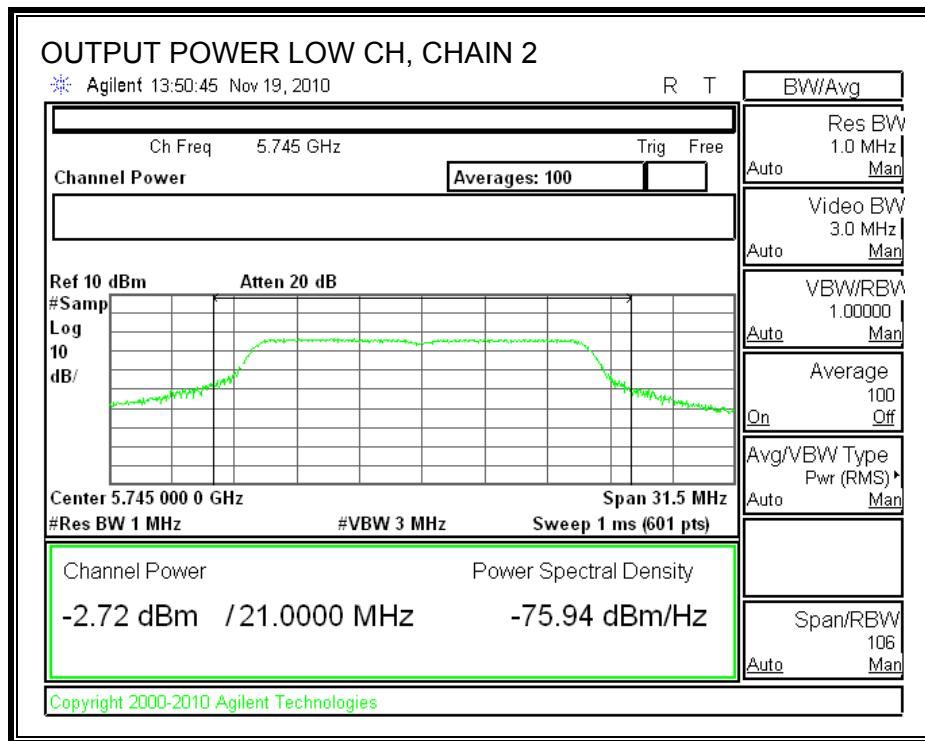


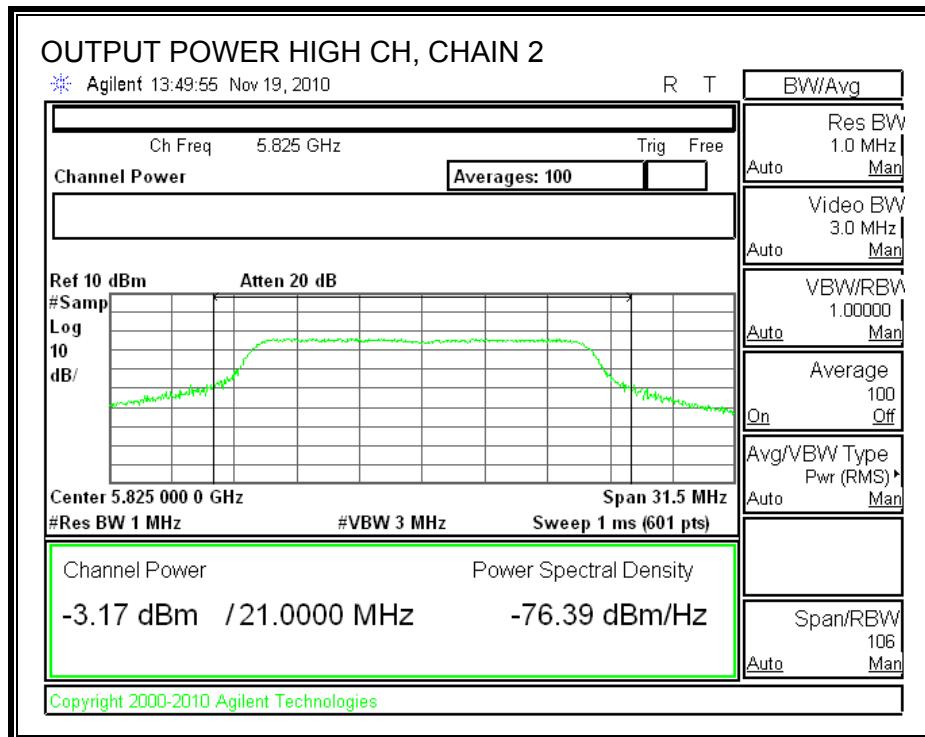
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5745	17.40	16.20	16.40	21.47
Middle	5785	17.50	16.10	16.20	21.42
High	5825	17.00	16.00	16.00	21.13

7.4.5. POWER SPECTRAL DENSITY

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.

The combination of antenna gain is equal to 9.08 dBi, therefore the limit is 4.92 dBm.

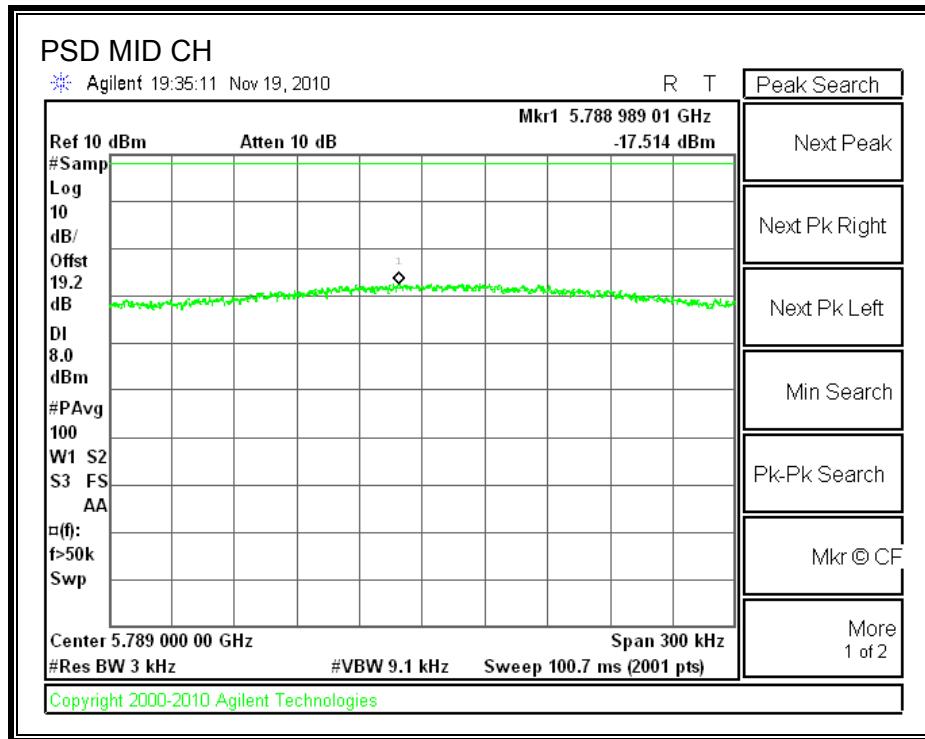
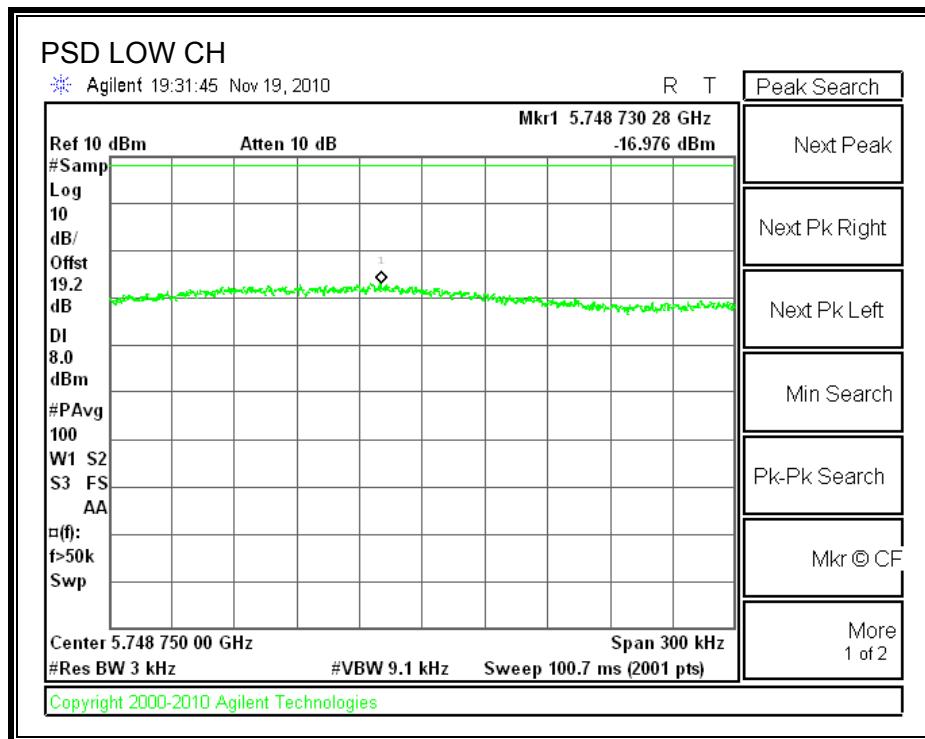
TEST PROCEDURE

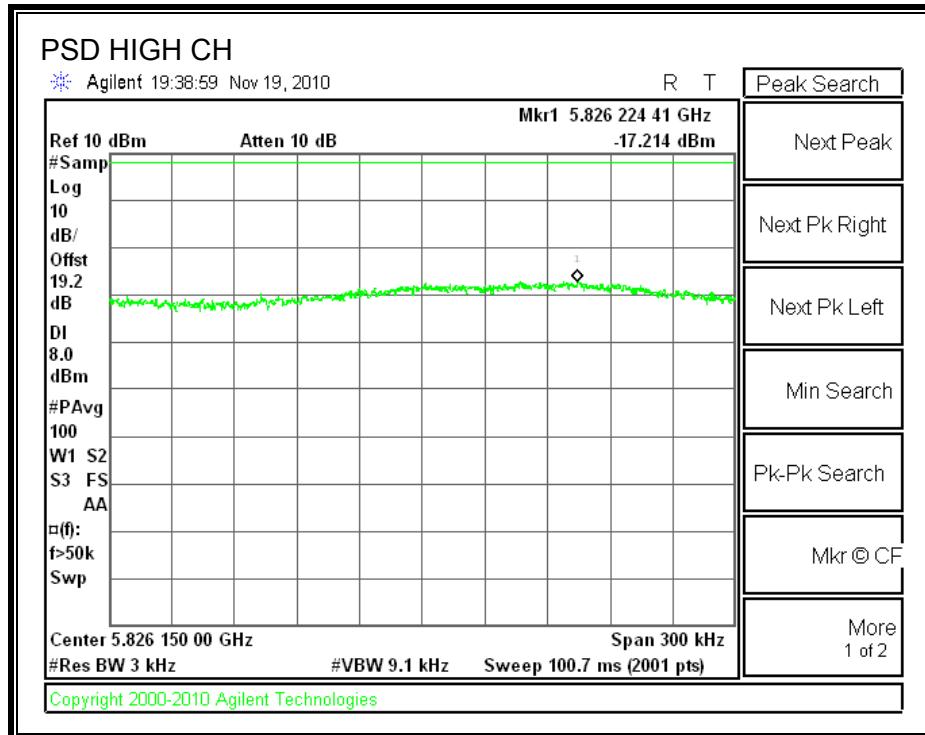
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

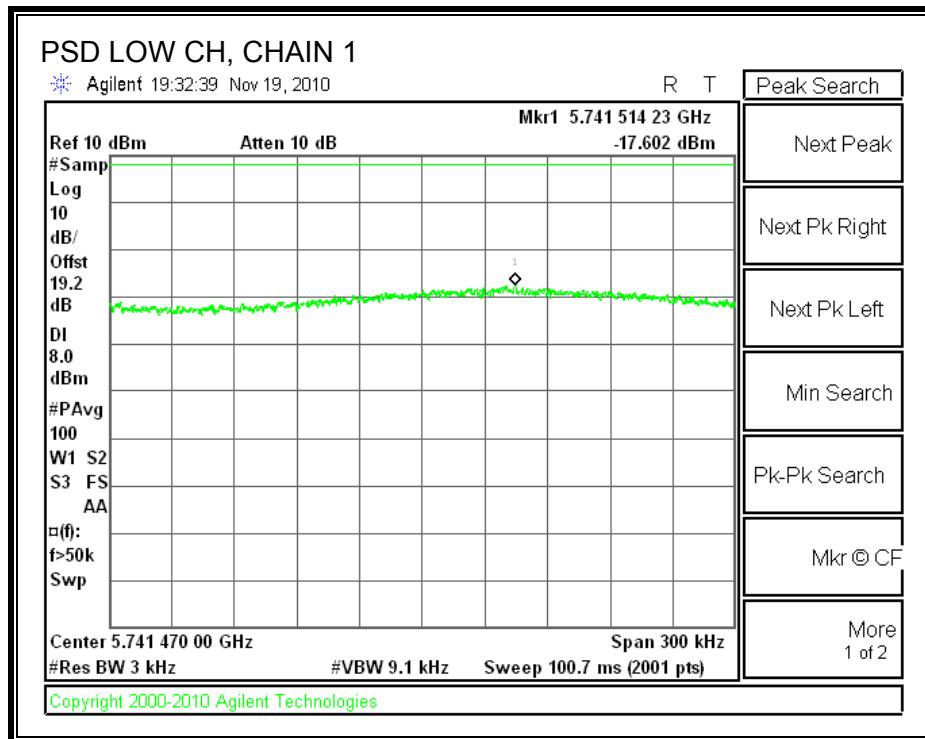
Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-16.98	-17.60	-17.81	-12.7	4.92	-17.60
Middle	5785	-17.51	-17.98	-18.83	-13.3	4.92	-18.22
High	5825	-17.21	-18.02	-18.71	-13.2	4.92	-18.09

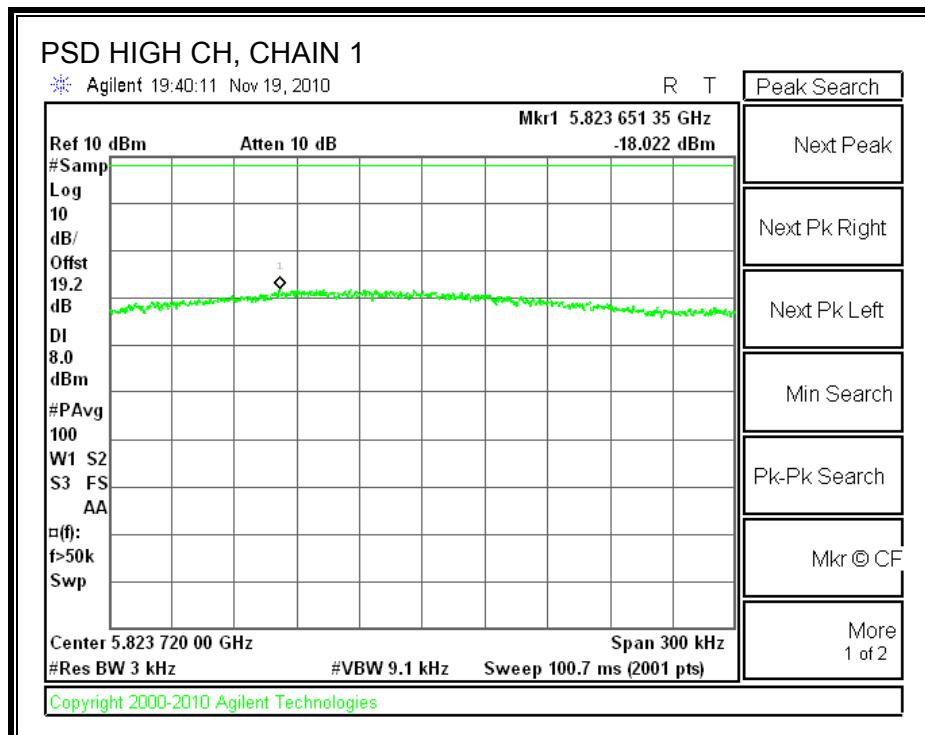
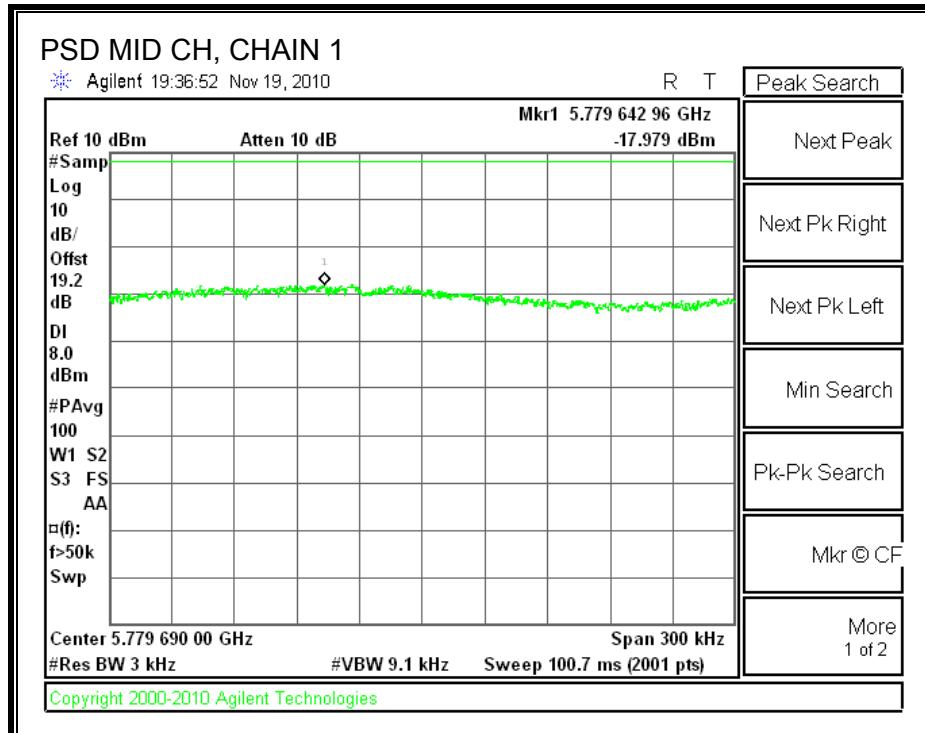
POWER SPECTRAL DENSITY, CHAIN 0



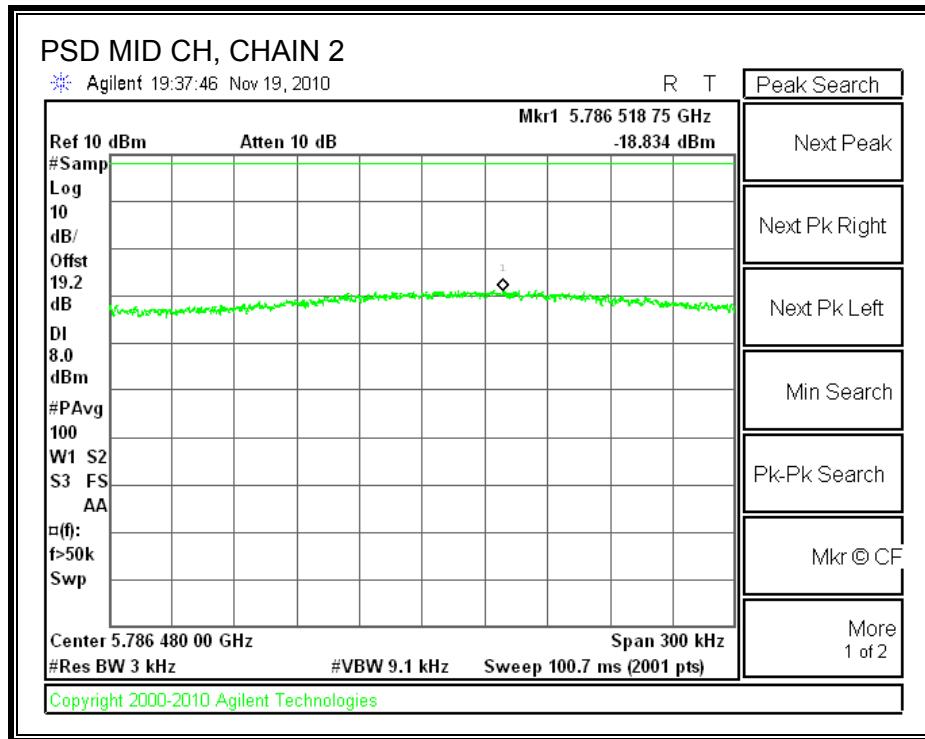
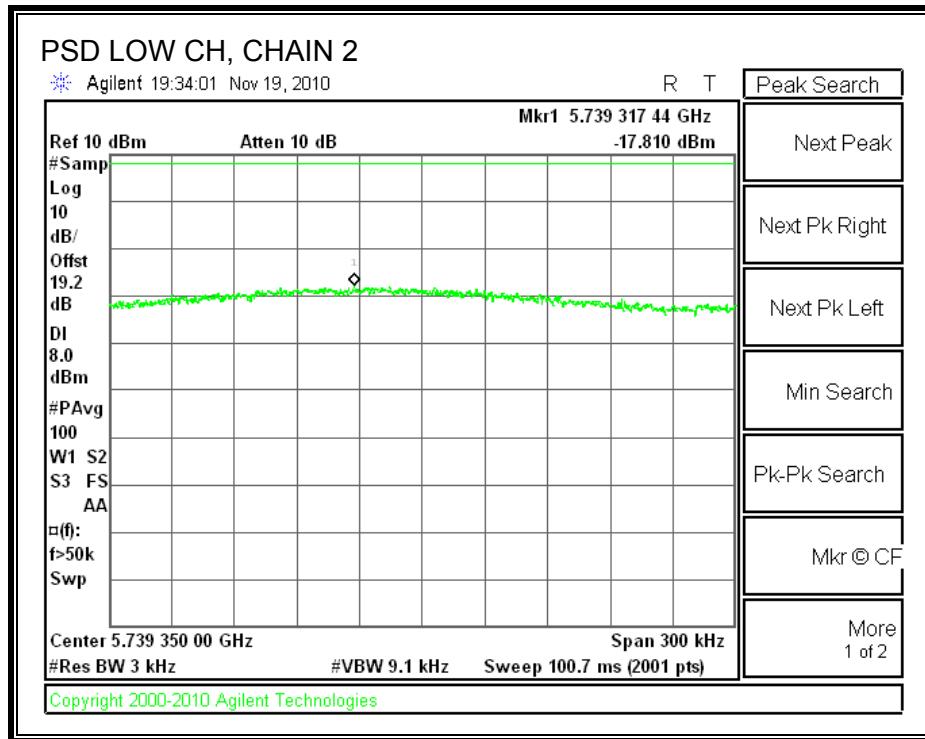


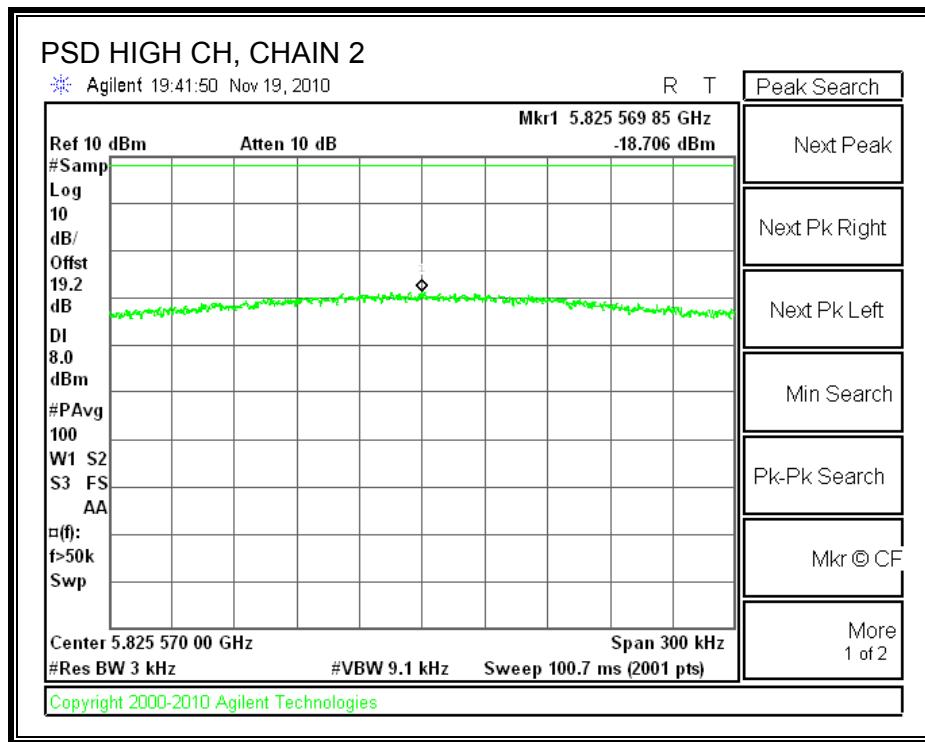
POWER SPECTRAL DENSITY, CHAIN 1





POWER SPECTRAL DENSITY, CHAIN 2





7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

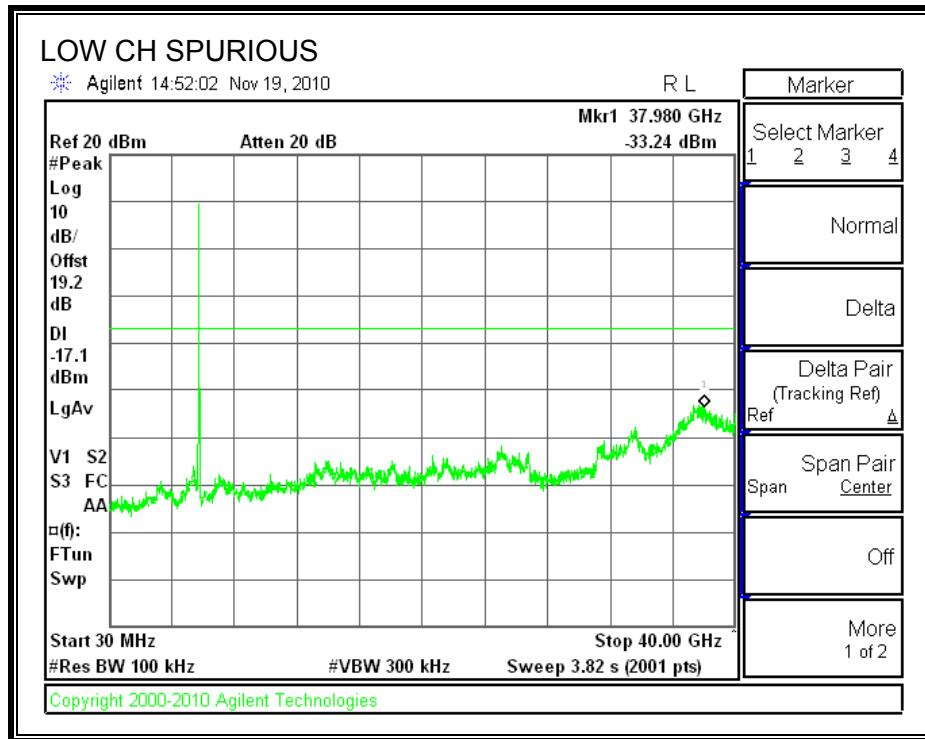
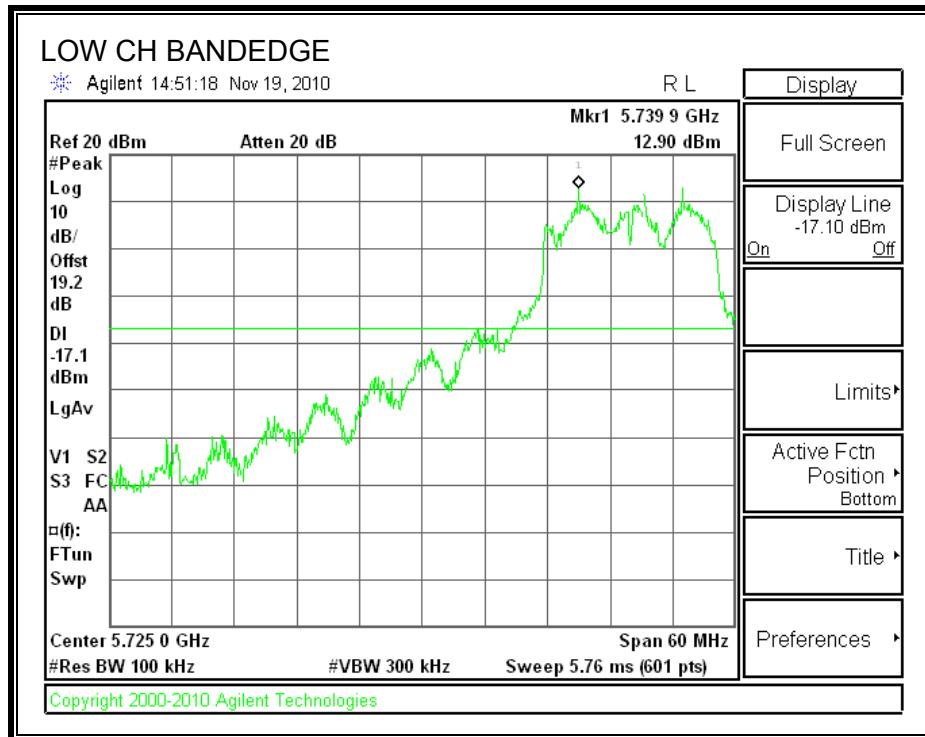
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The EUT was set to transmit at low, mid and channel, 30dBc display line was set with each channel level

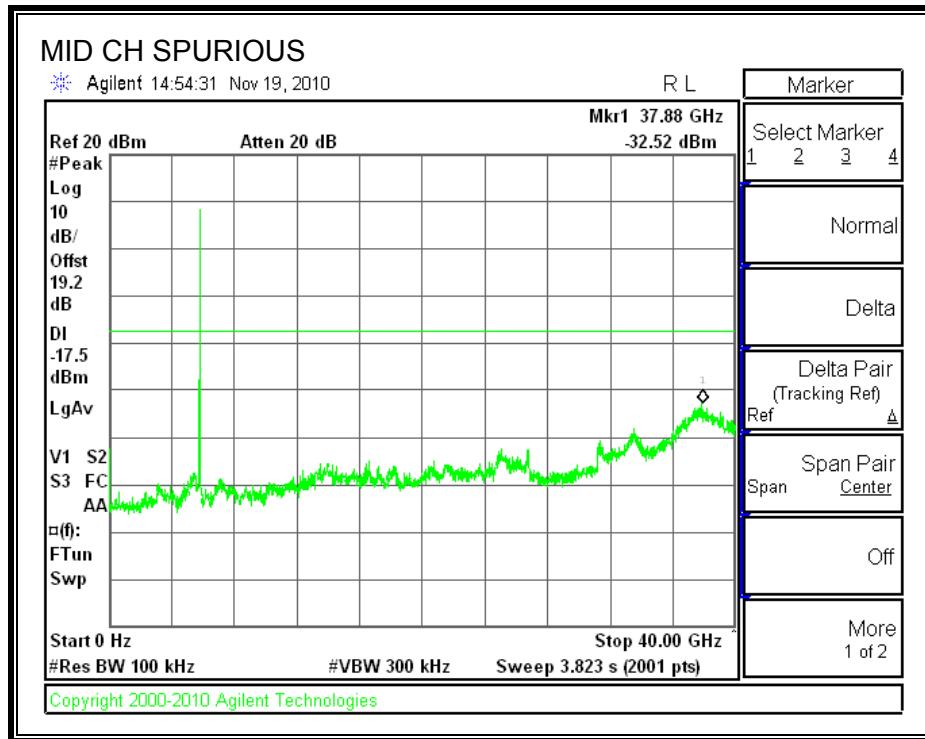
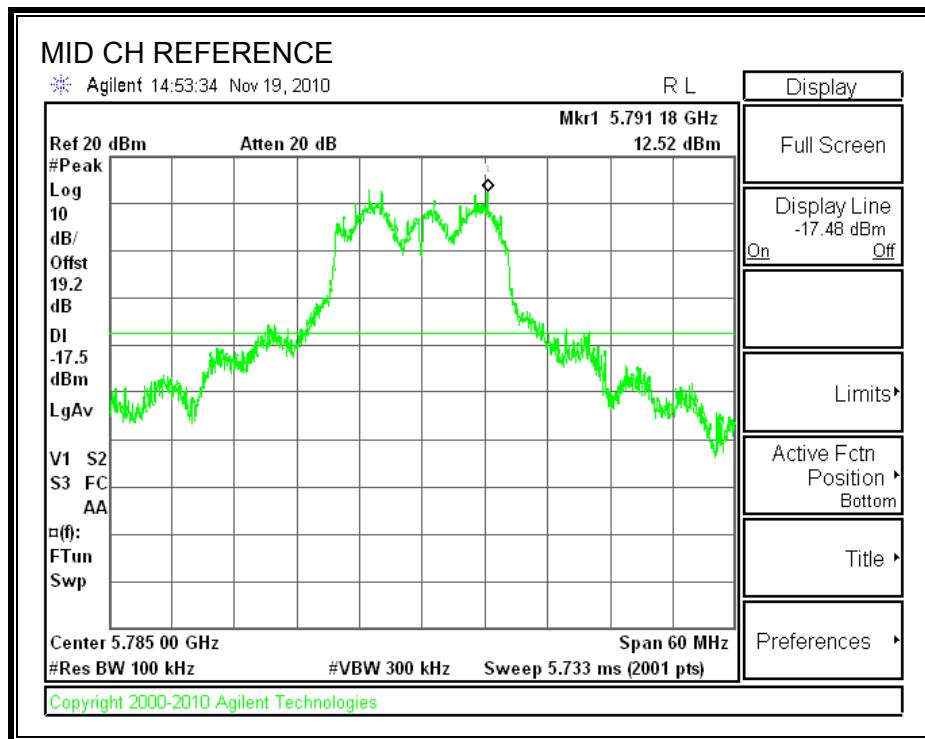
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

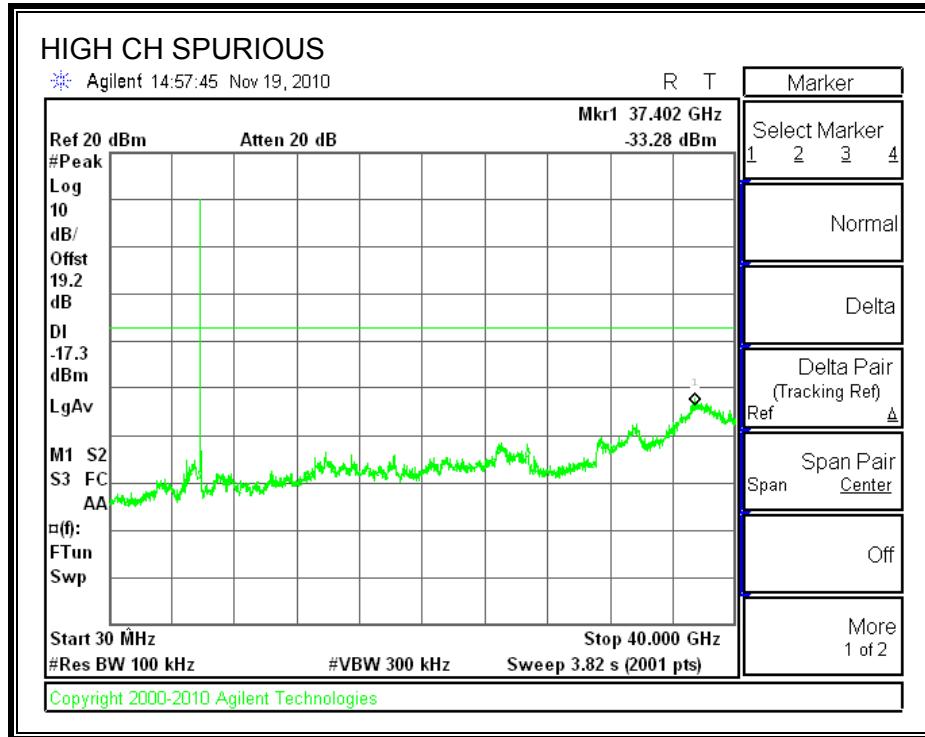
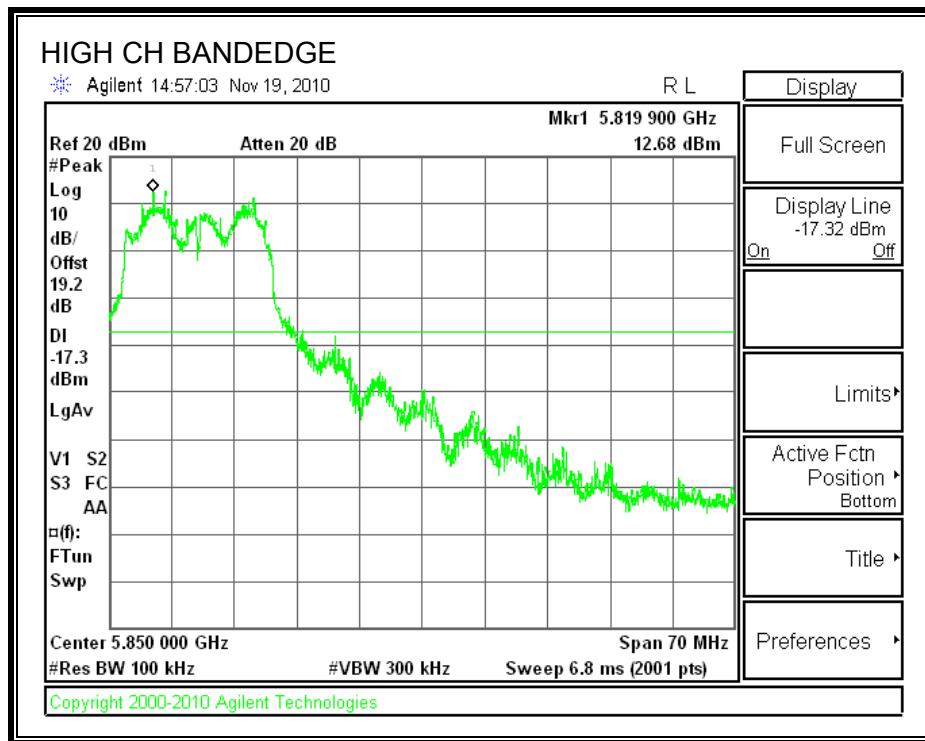
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



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.

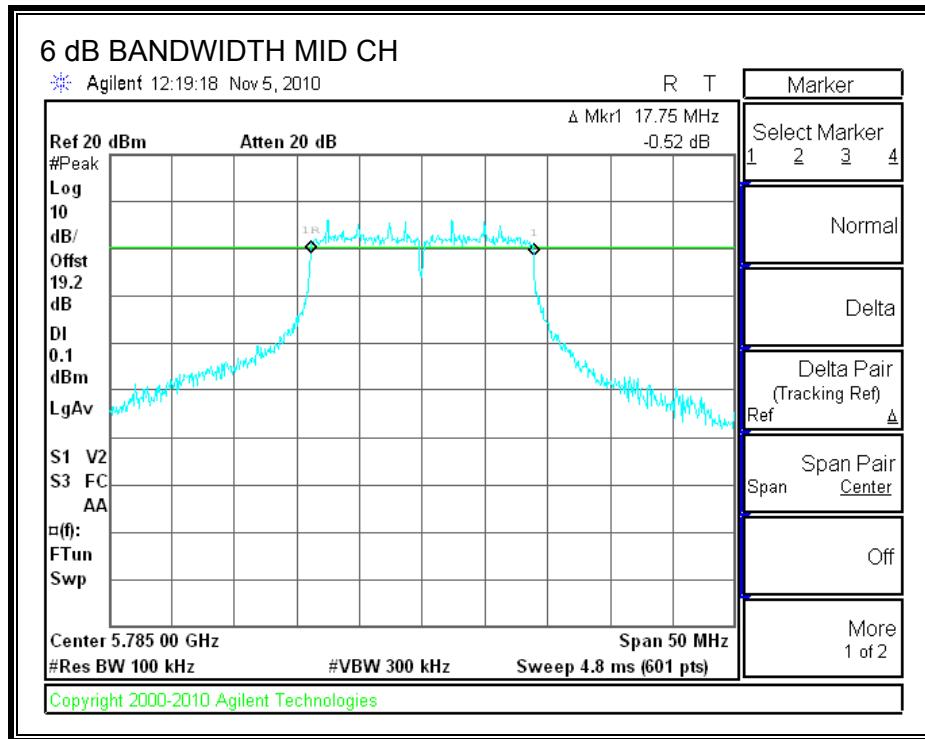
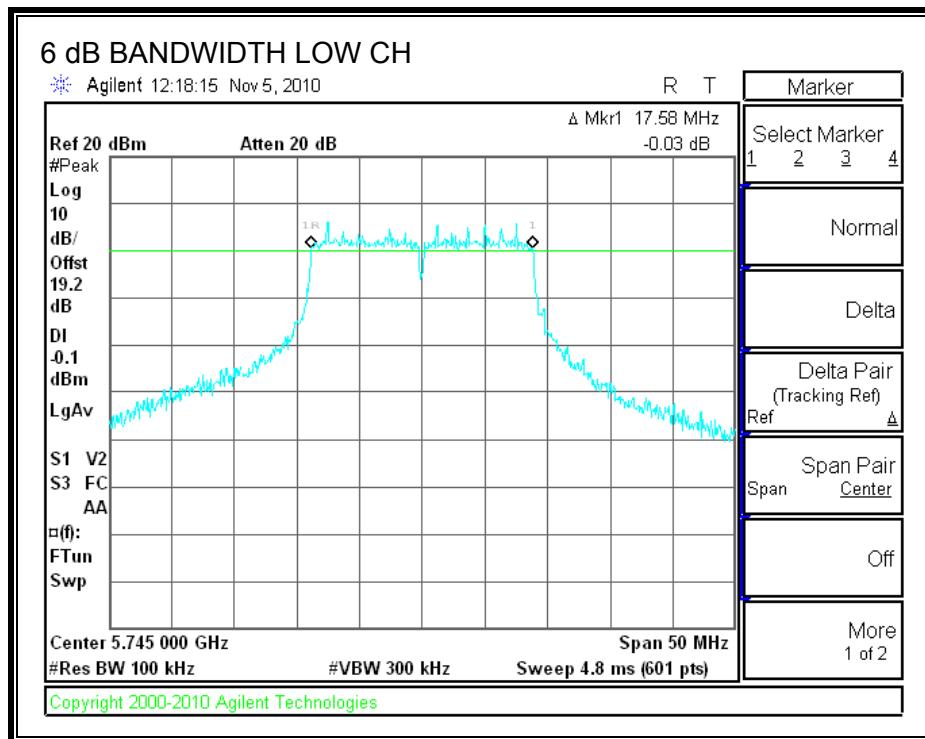
TEST PROCEDURE

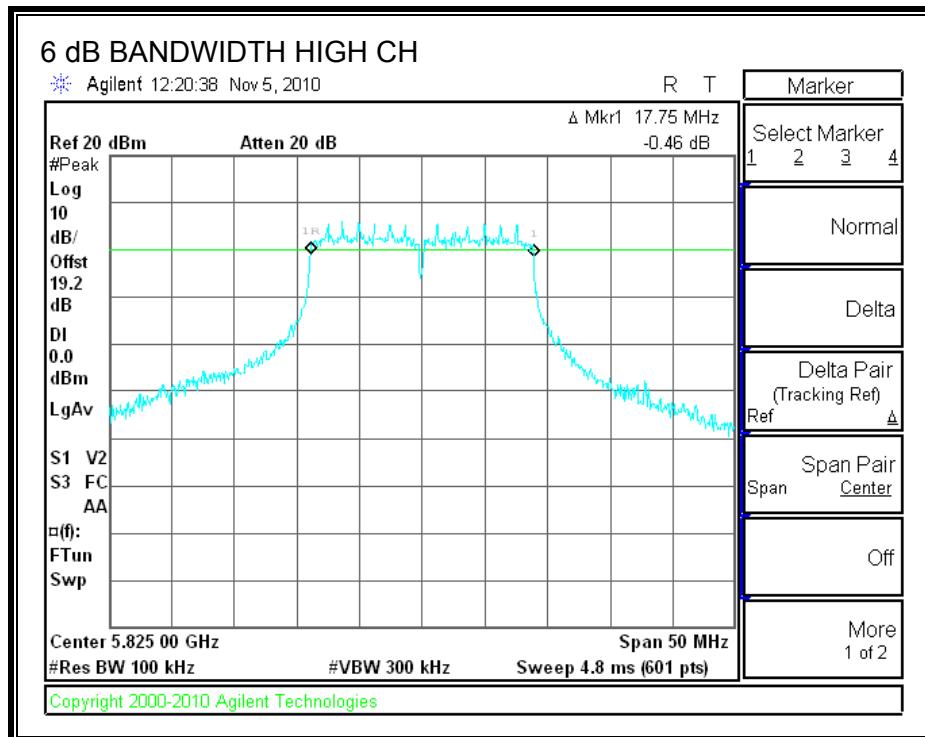
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

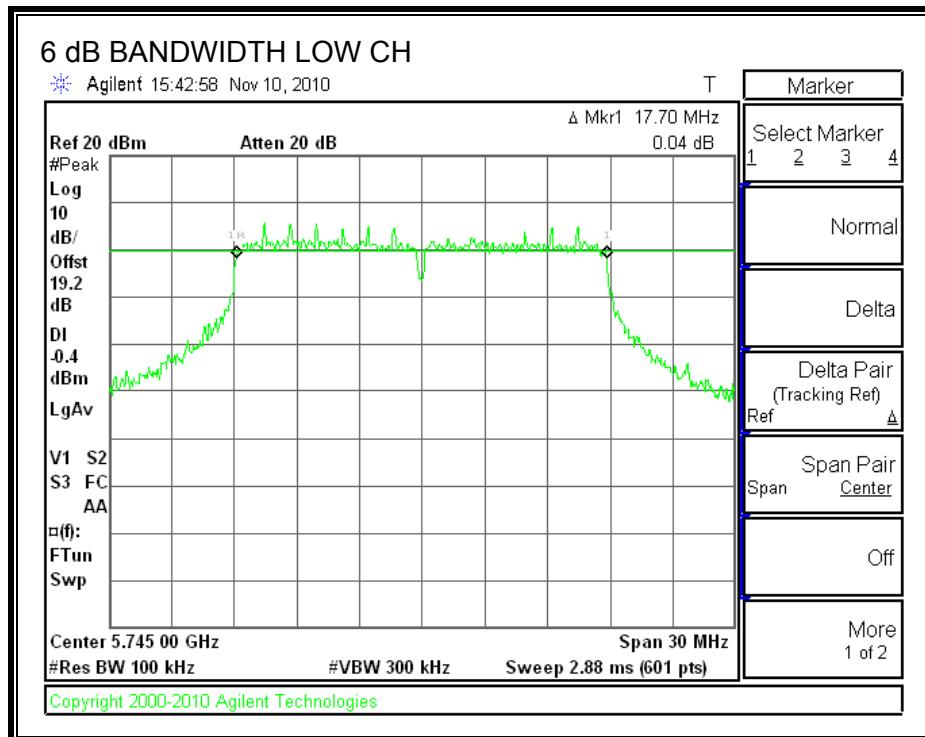
Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5745	17.58	17.7	17.65	0.5
Middle	5785	17.75	17.55	17.70	0.5
High	5825	17.75	17.55	17.70	0.5

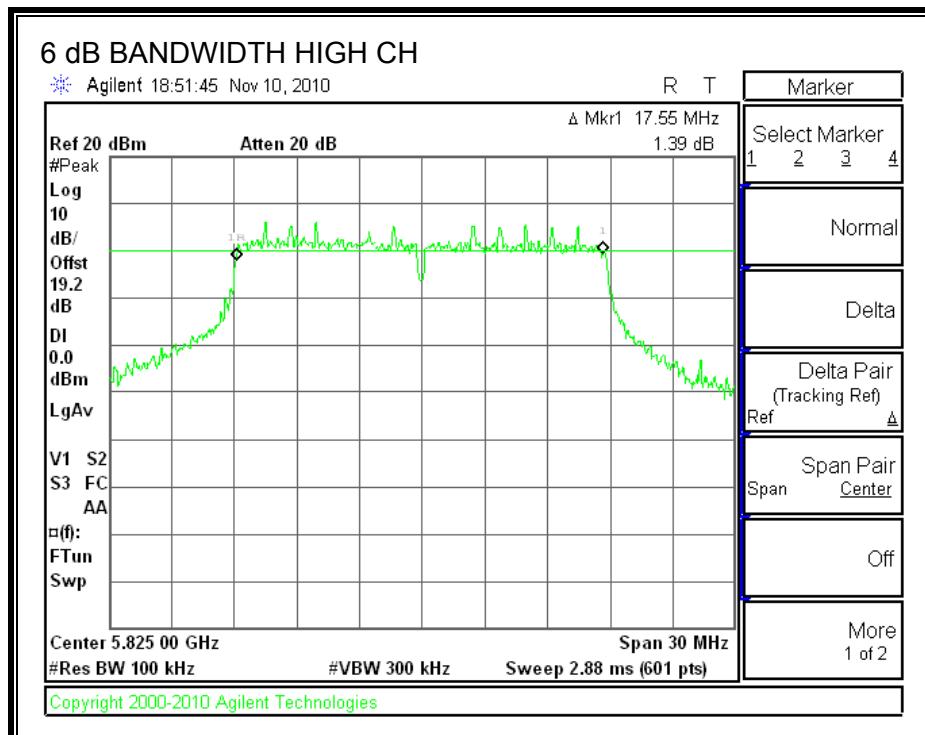
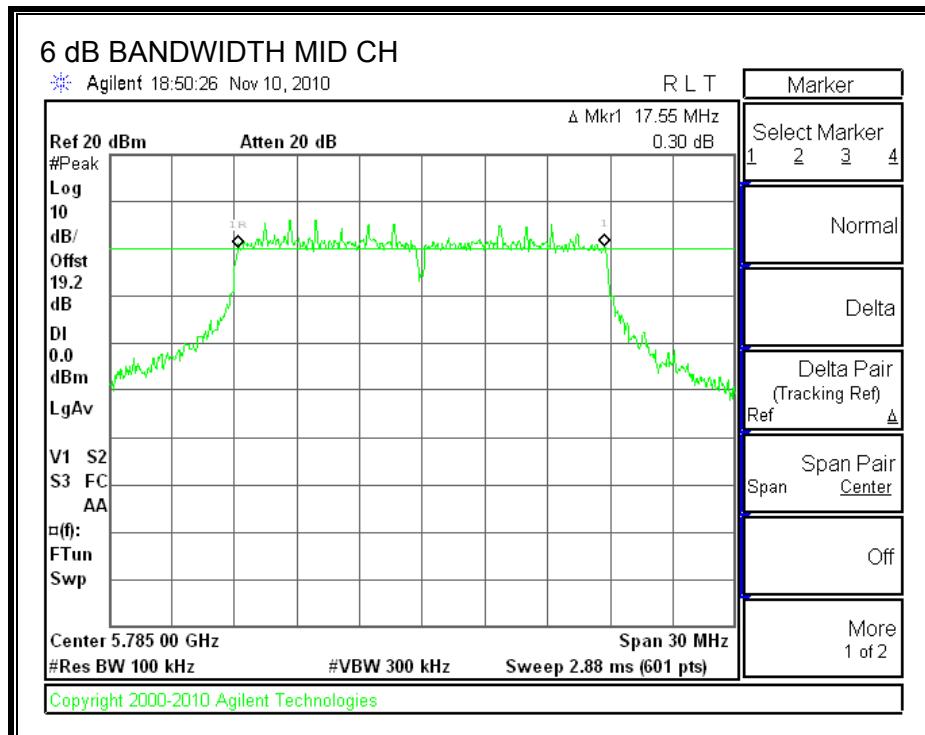
6 dB BANDWIDTH, CHAIN 0



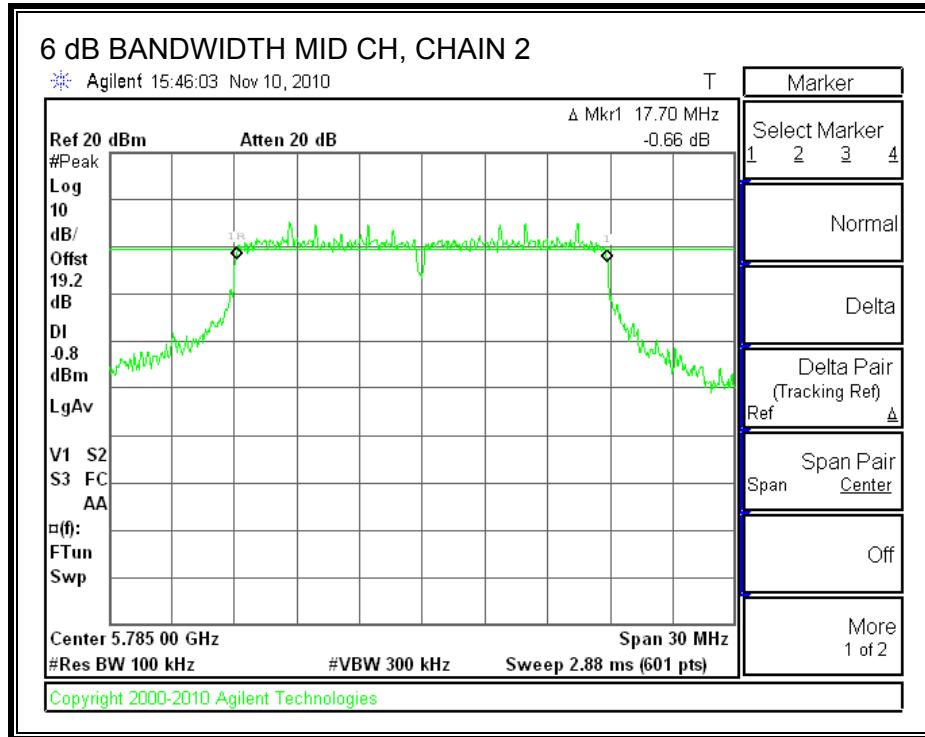
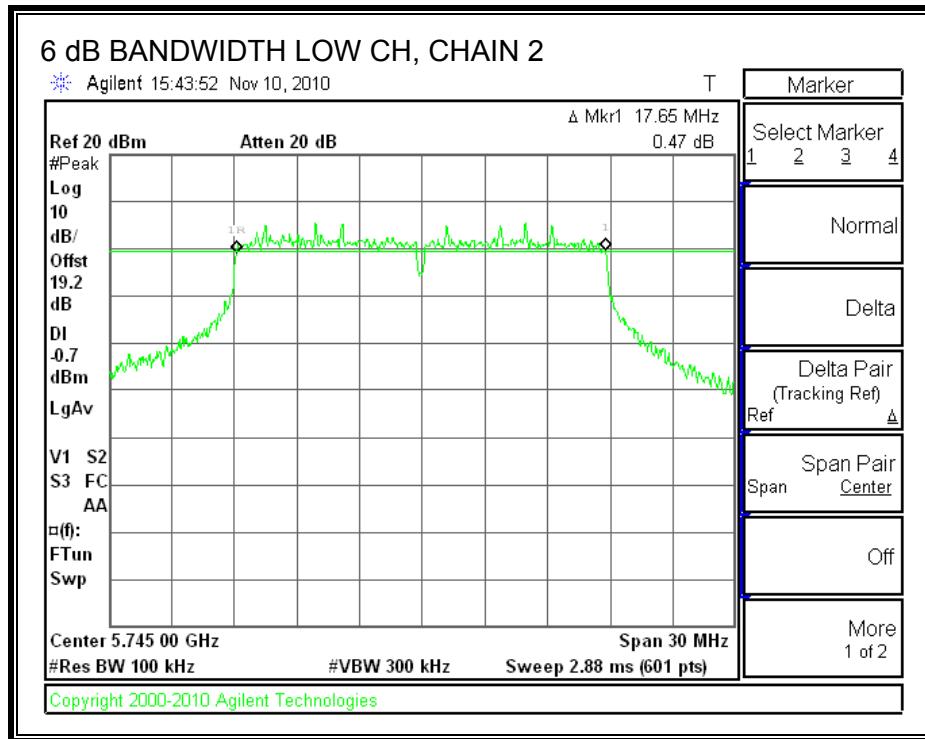


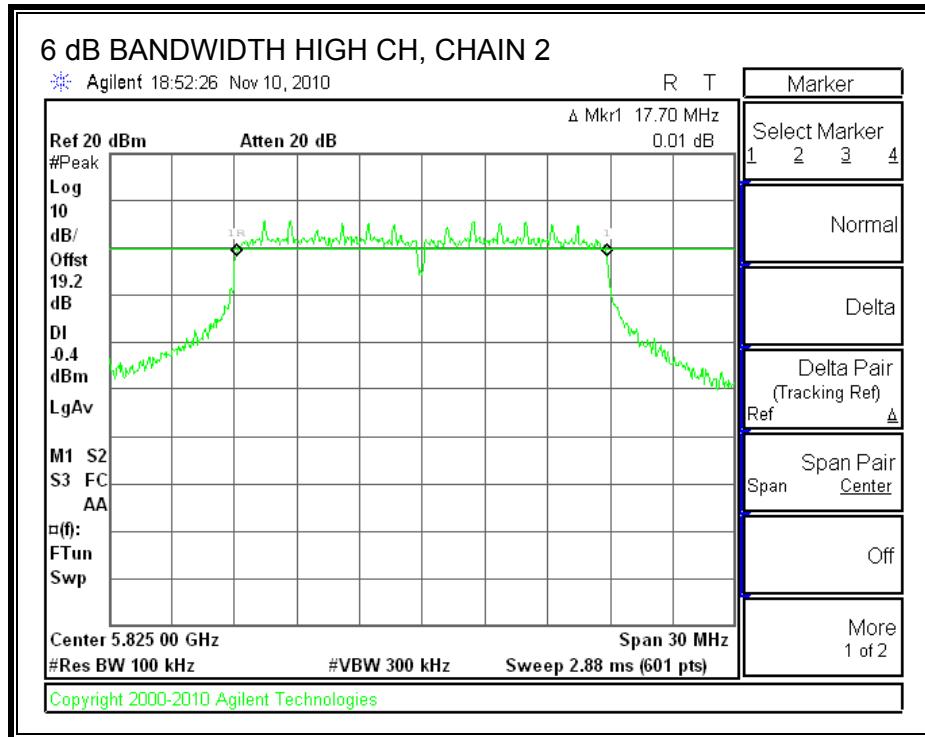
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

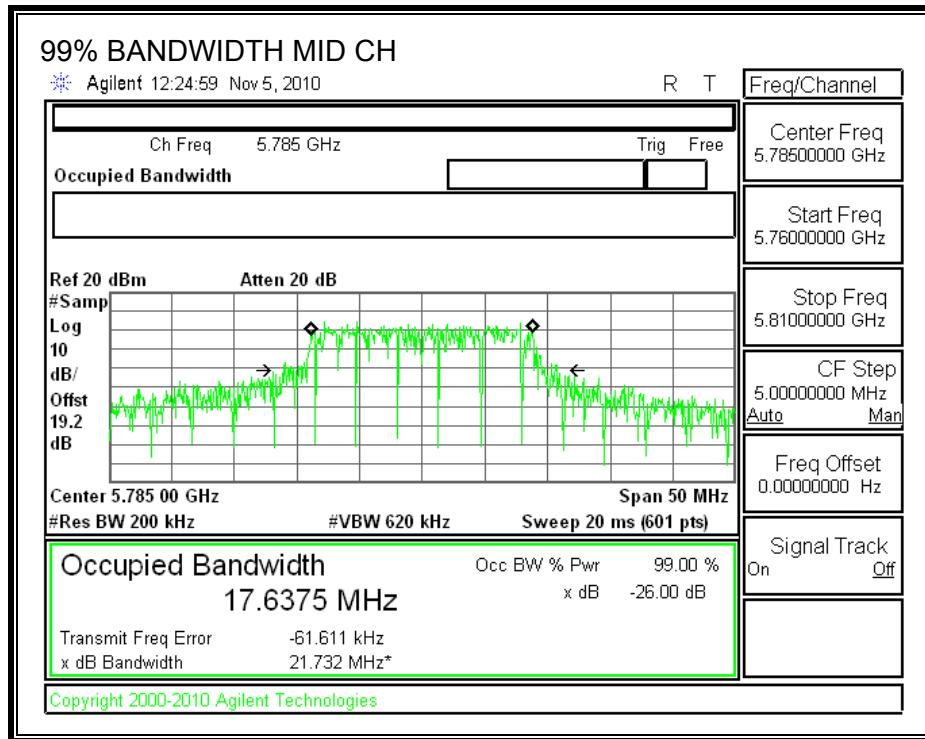
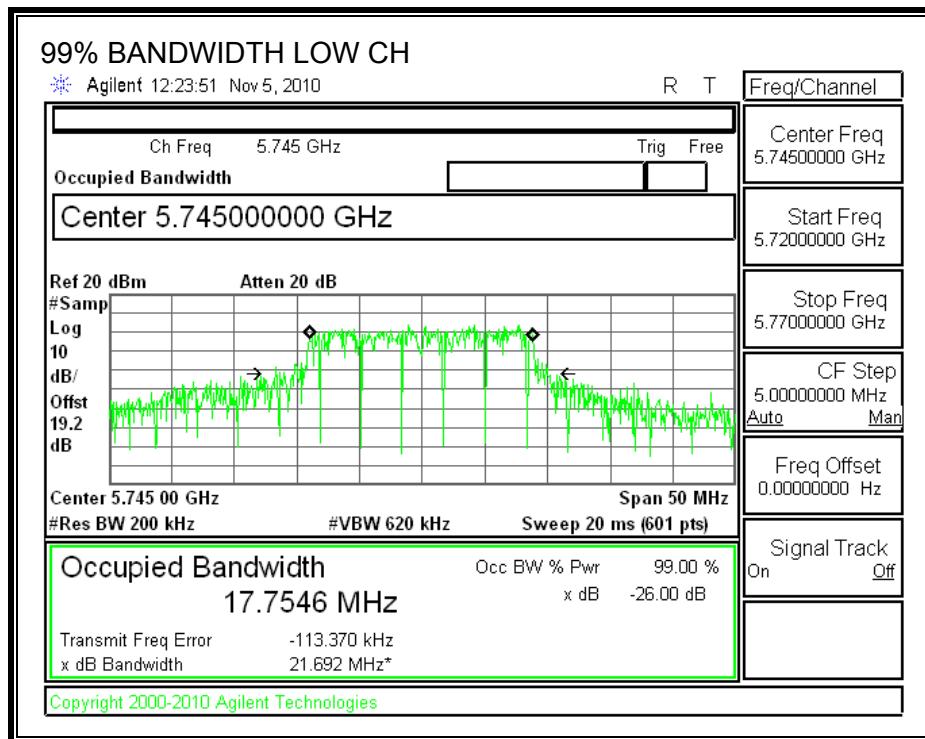
TEST PROCEDURE

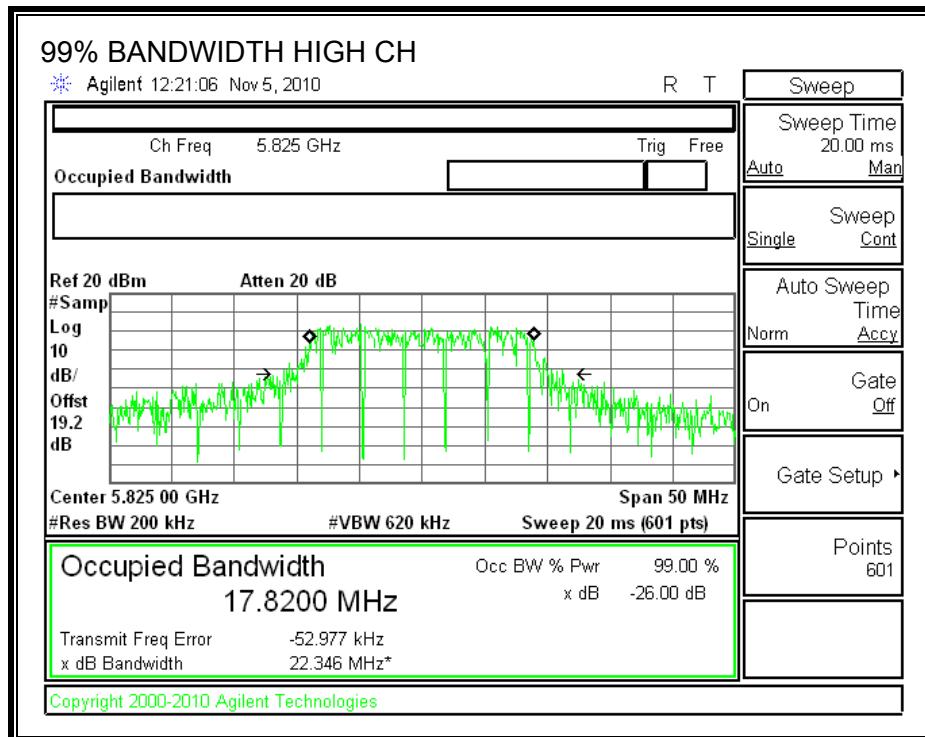
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

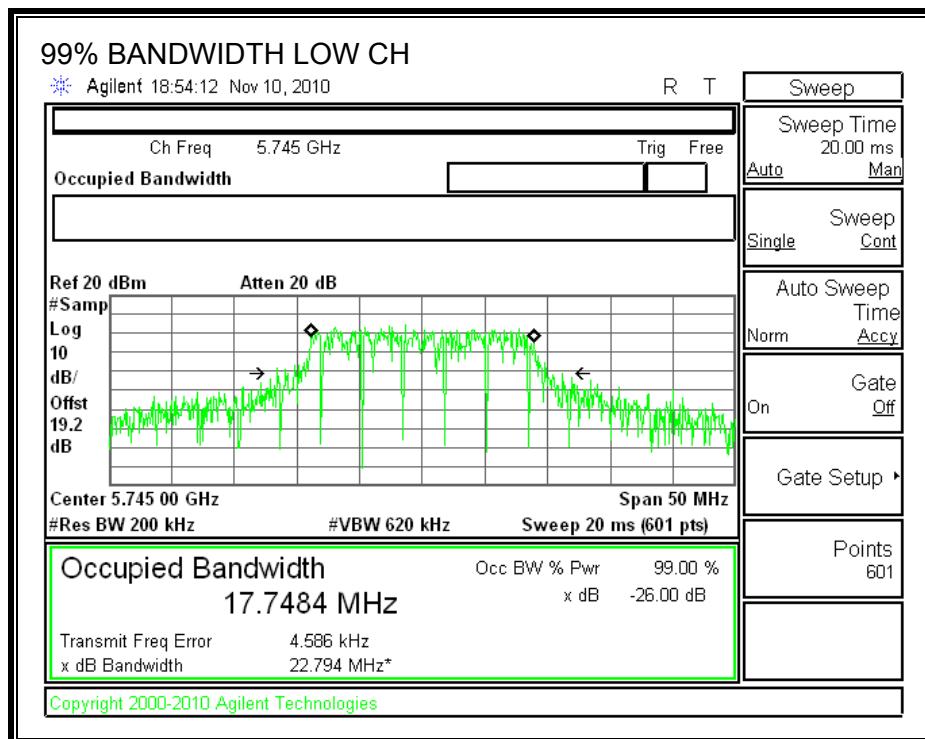
Channel	Frequency (MHz)	Chain 0 99% Bandwidth (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	5745	17.7546	17.7484	17.7435
Middle	5785	17.6375	17.6209	17.6471
High	5825	17.8200	17.6447	17.7036

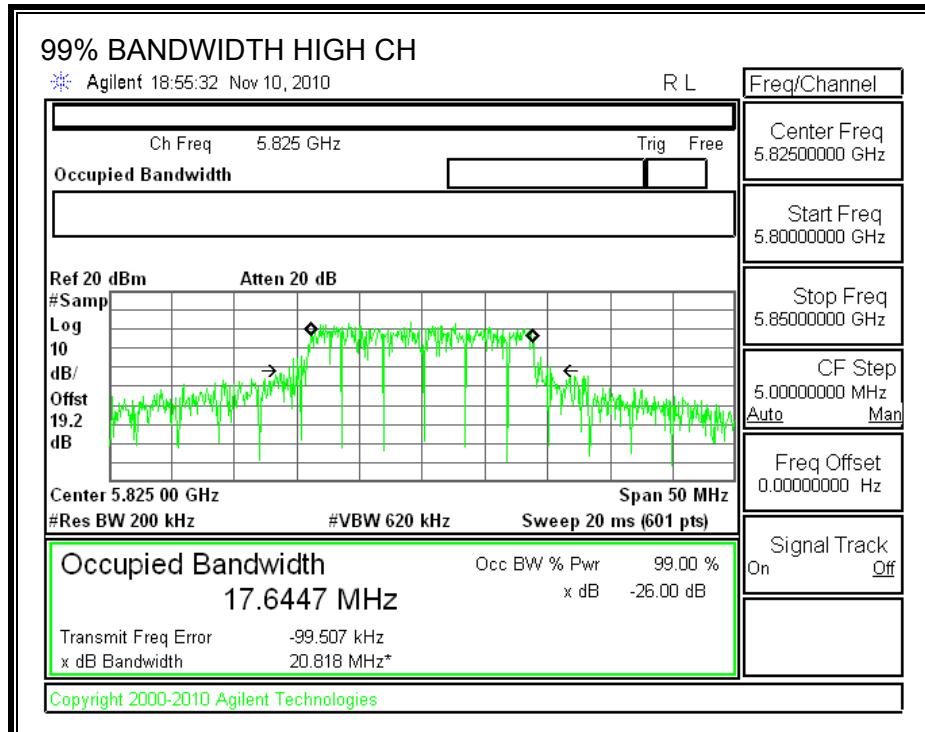
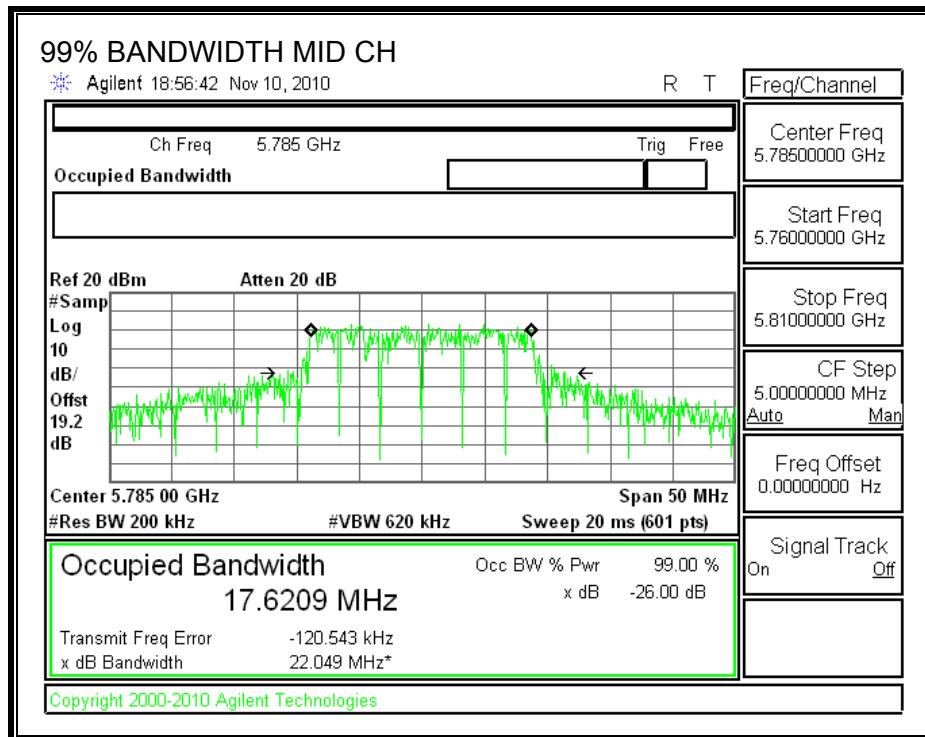
99% BANDWIDTH, CHAIN 0



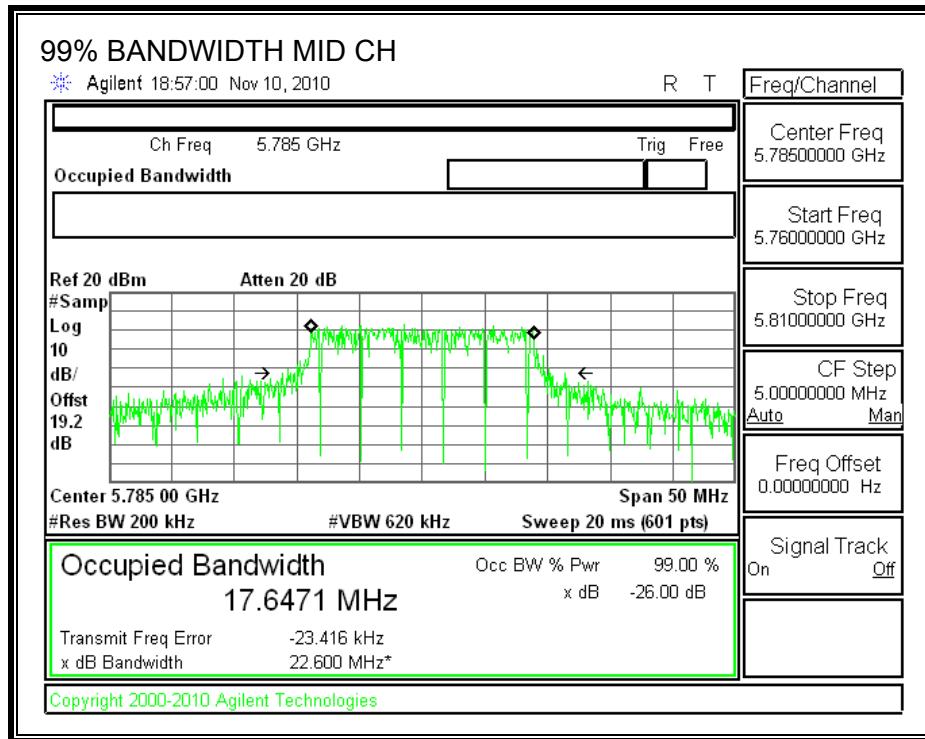
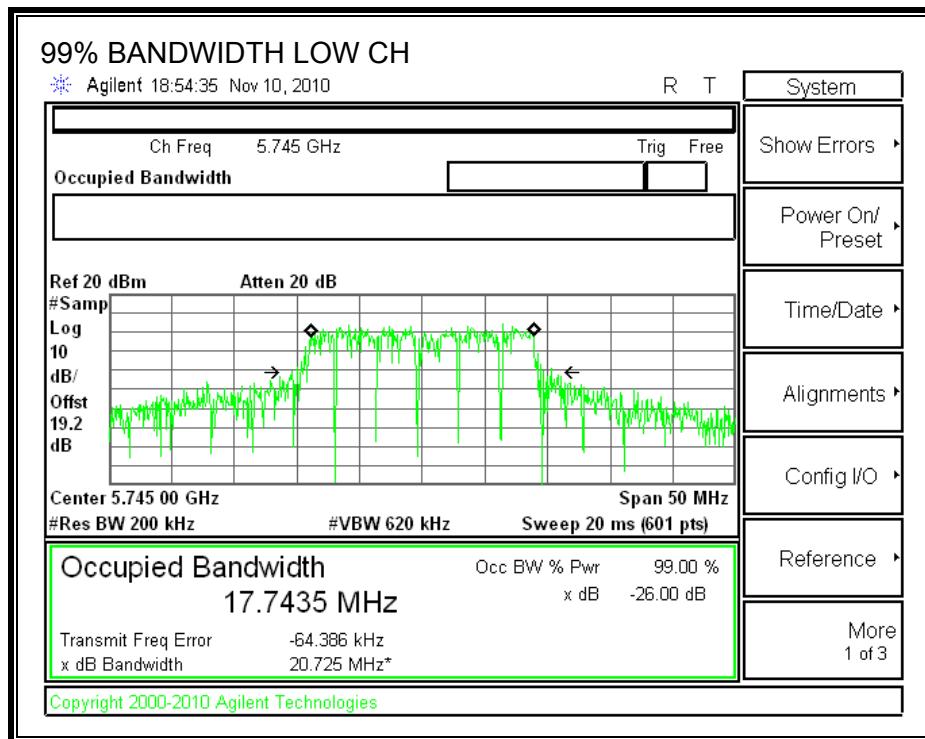


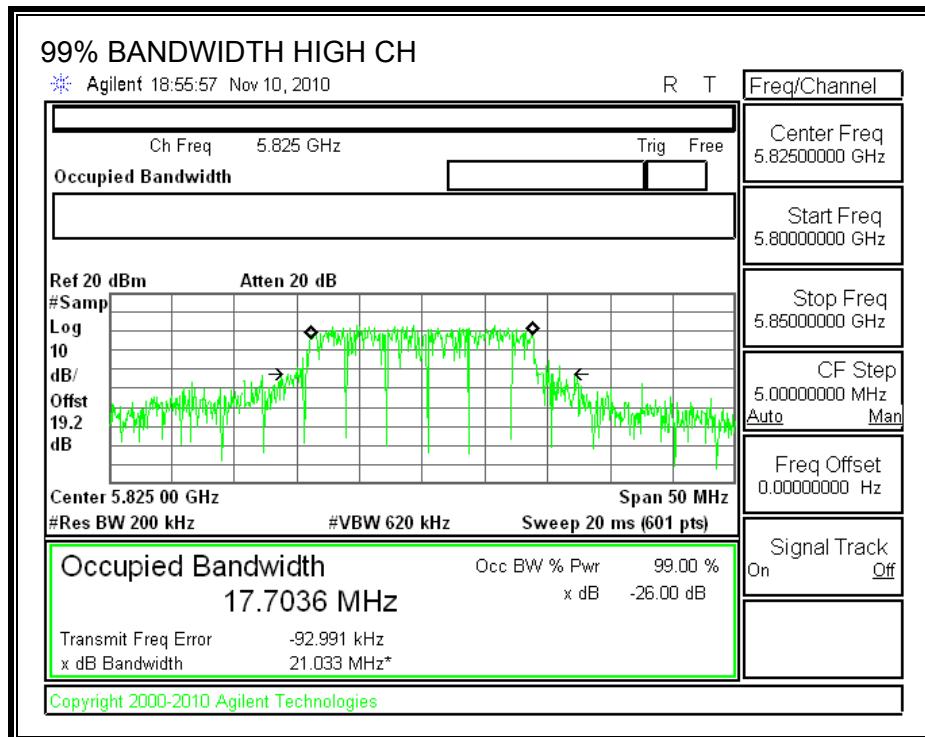
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The combination of antenna gains is equal to 9.08 dBi, therefore the limit is 26.92 dBm.

The highest of antenna gains is equal to 4.87 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

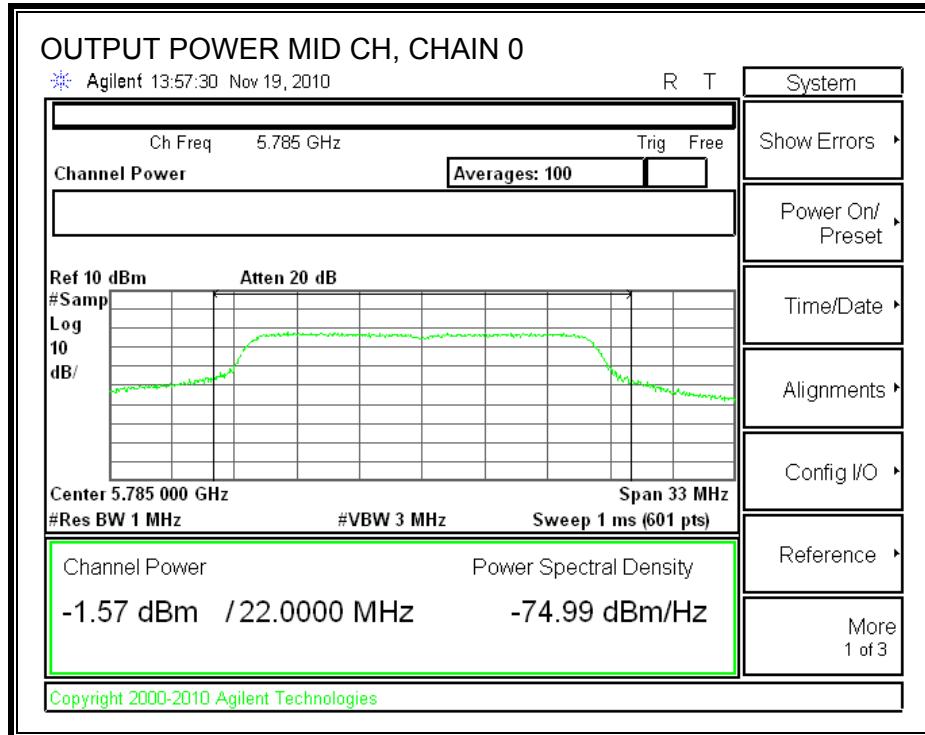
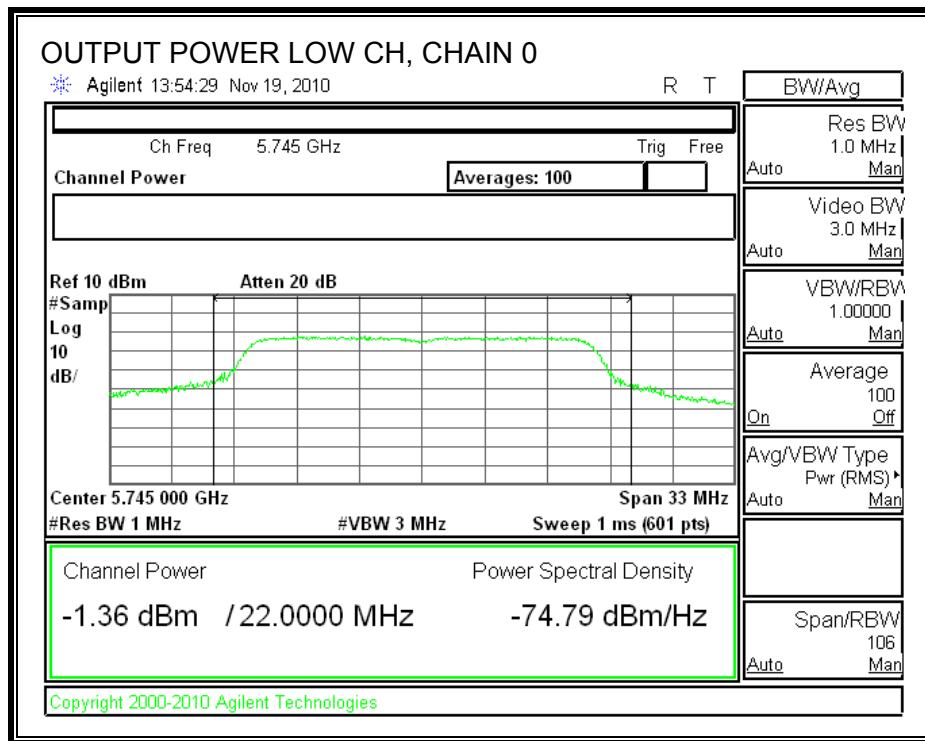
Non Beam-Forming

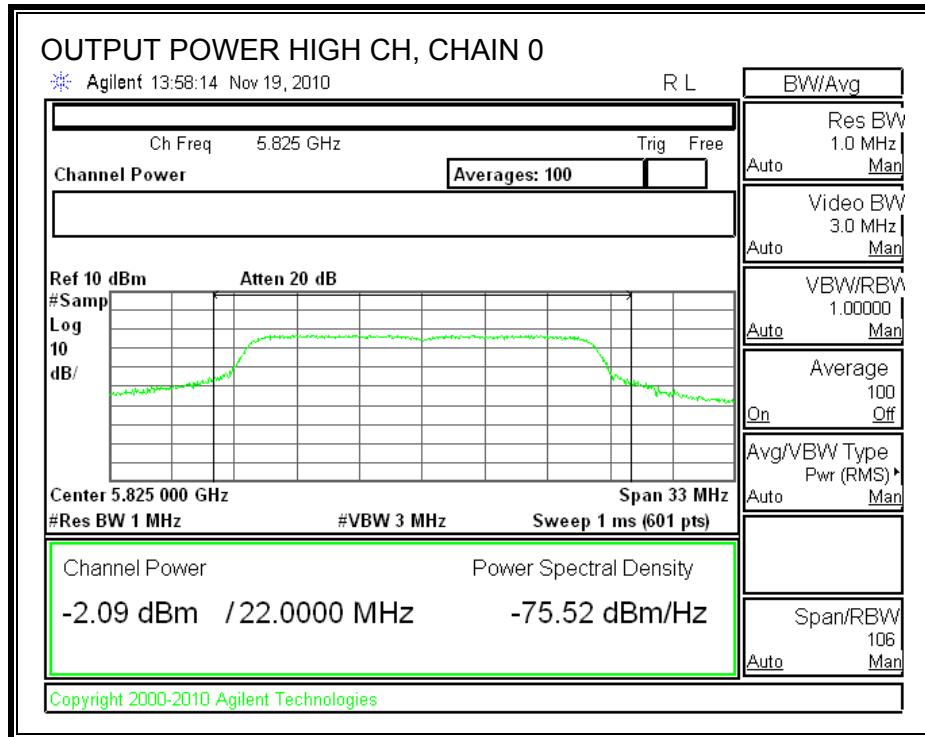
Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-1.36	-2.60	-2.74	19.20	21.78	30.00	-8.22
Mid	5785	-1.57	-2.94	-2.93	19.20	21.54	30.00	-8.46
High	5825	-2.09	-3.06	-3.18	19.20	21.22	30.00	-8.78

Beam-Forming

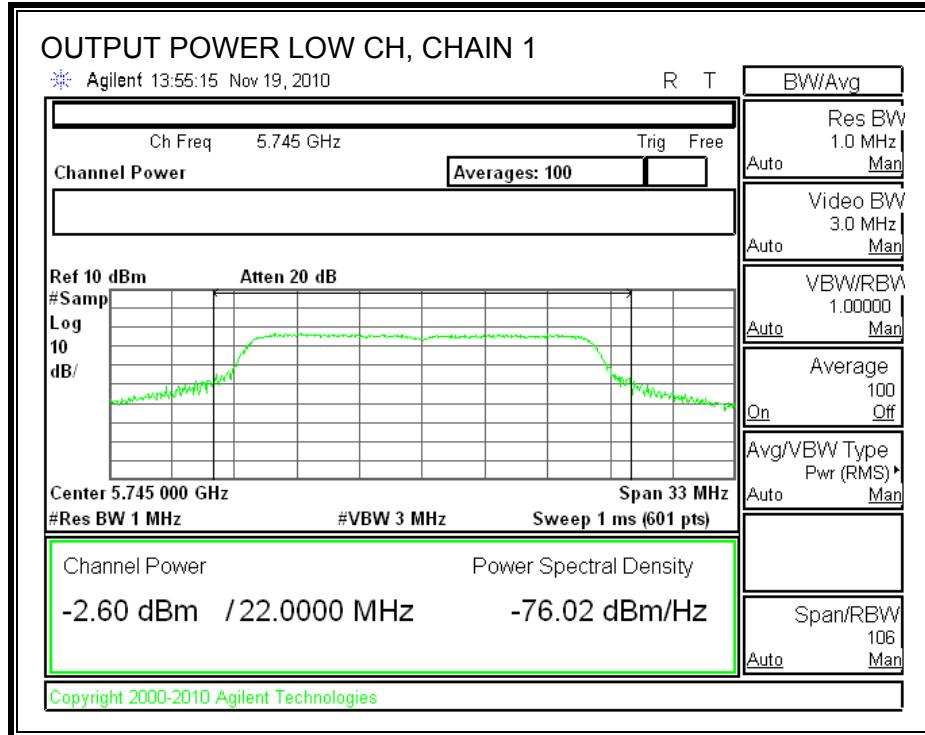
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-1.36	-2.60	-2.74	19.20	21.78	26.92	-5.14
Mid	5785	-1.57	-2.94	-2.93	19.20	21.54	26.92	-5.38
High	5825	-2.09	-3.06	-3.18	19.20	21.22	26.92	-5.70

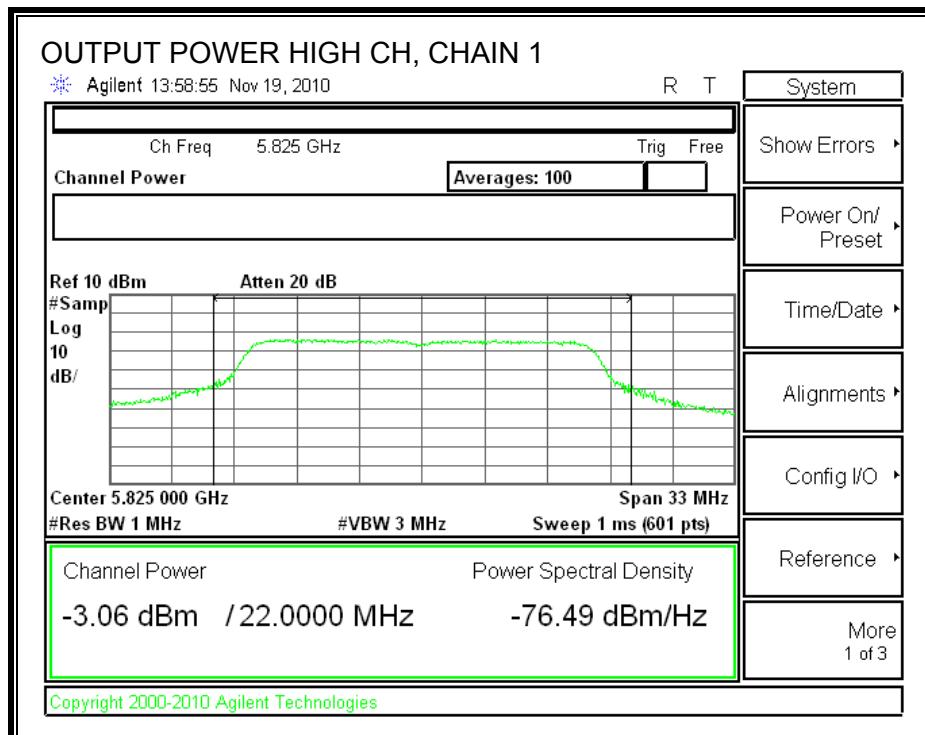
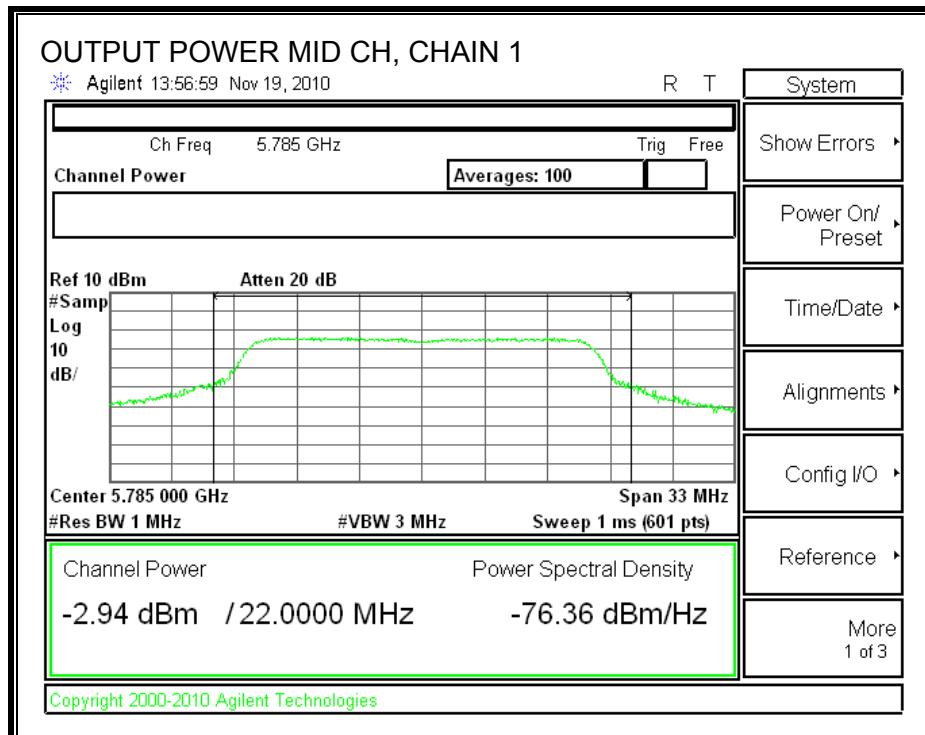
CHAIN 0 OUTPUT POWER



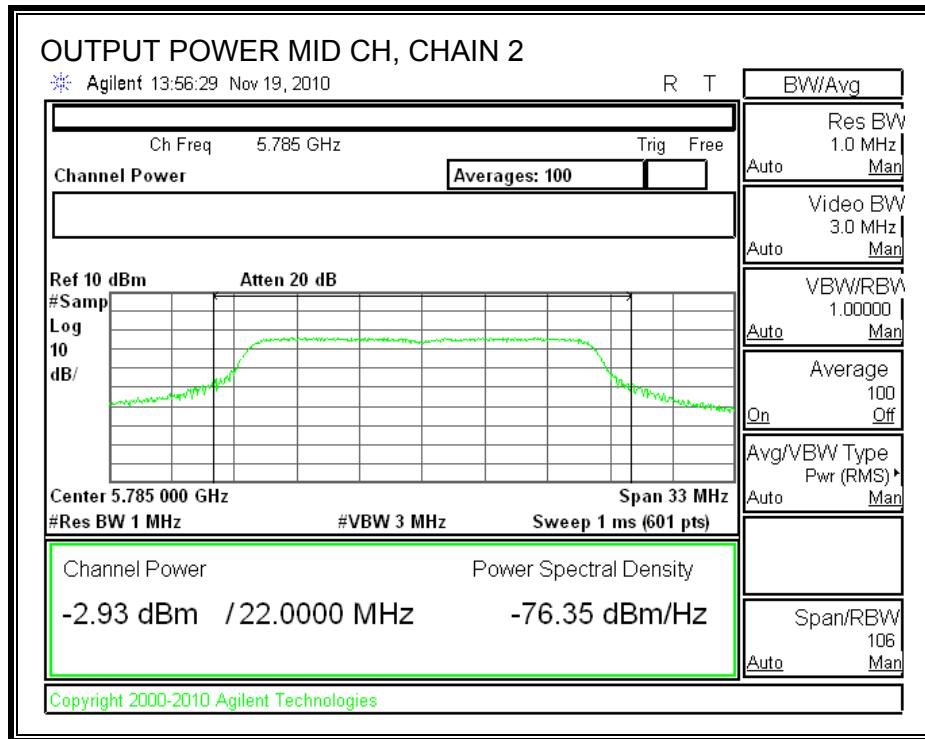
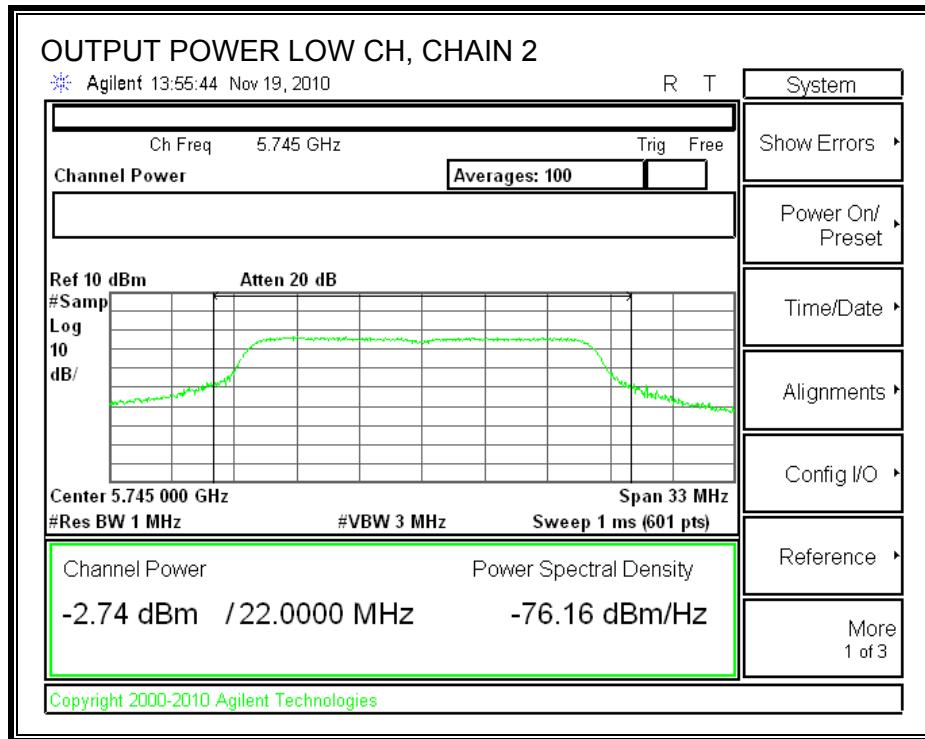


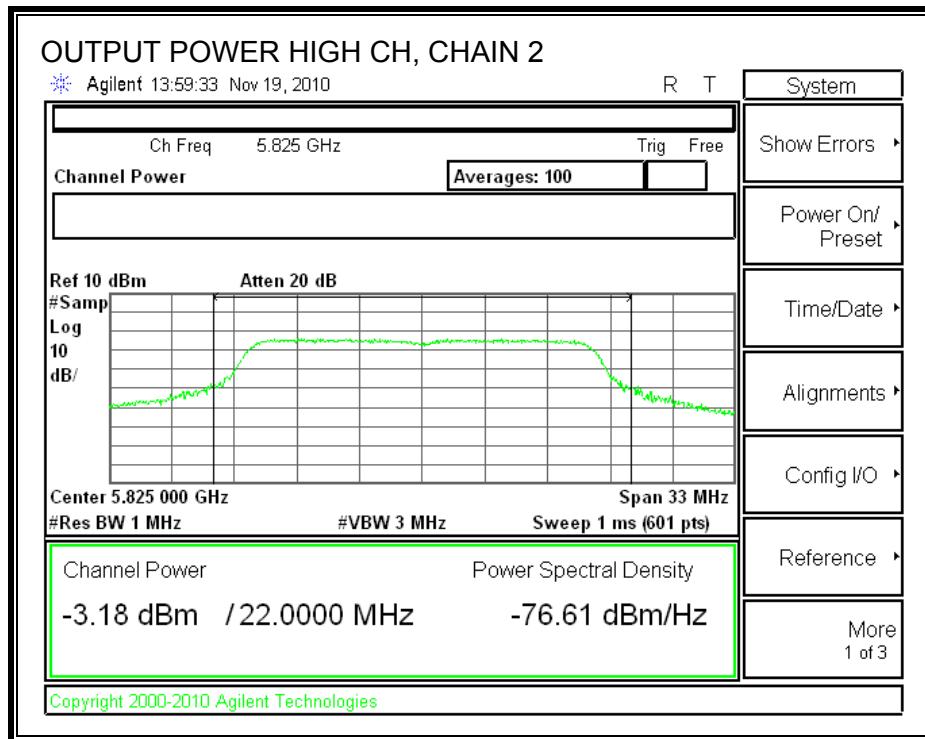
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5745	17.50	16.40	16.20	21.51
Middle	5785	17.50	16.00	16.20	21.39
High	5825	17.00	16.10	15.90	21.13

7.5.5. 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.

The combination of antenna gain is equal to 9.08 dBi, therefore the limit is 4.92 dBm.

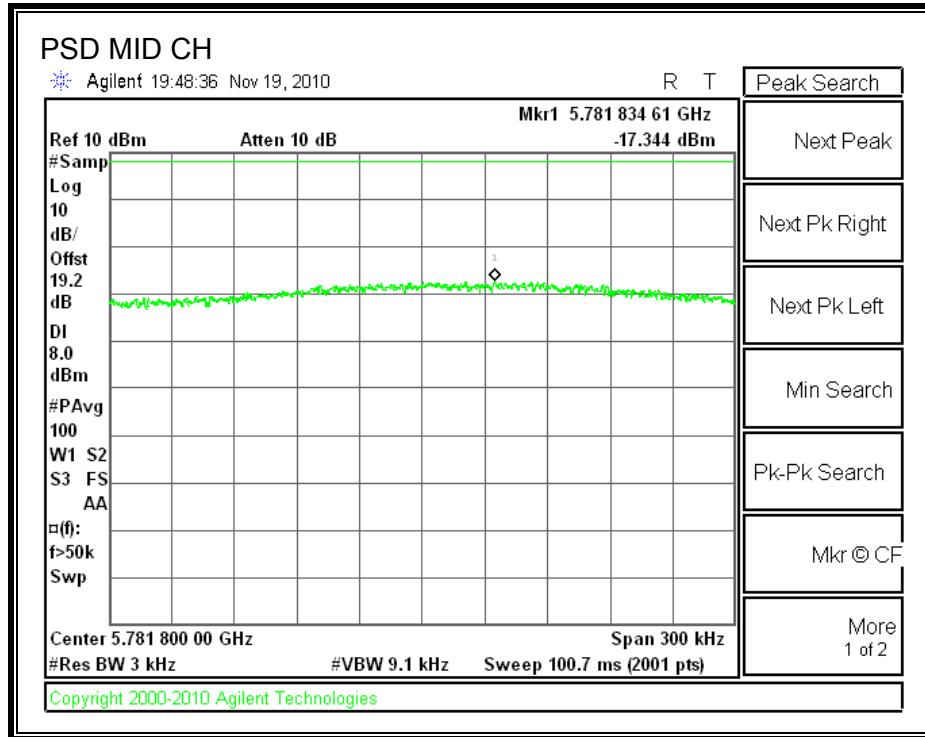
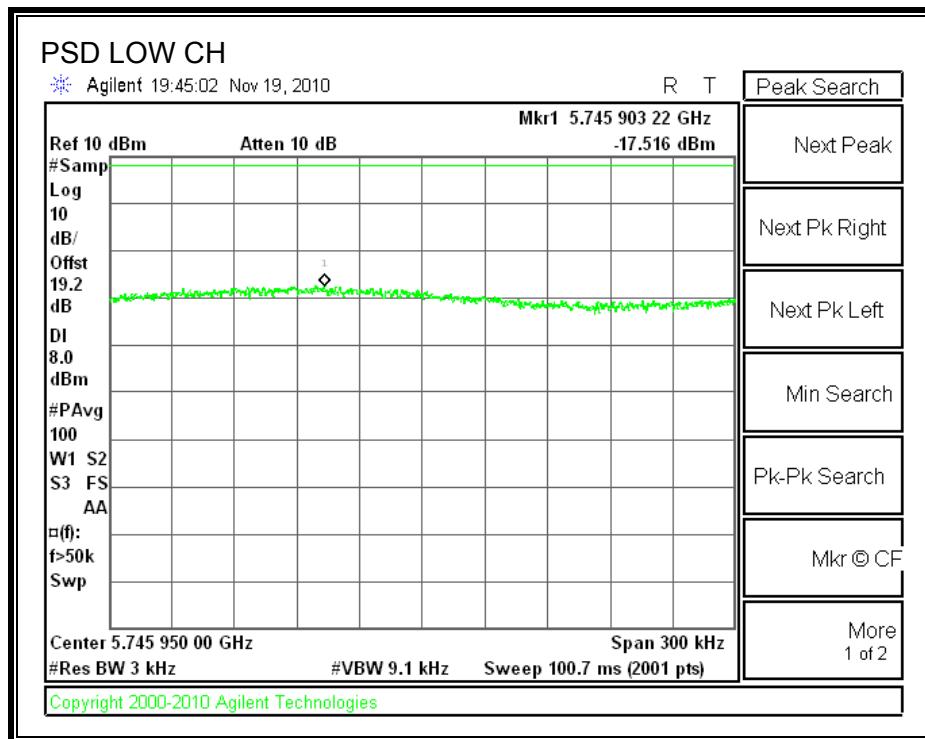
TEST PROCEDURE

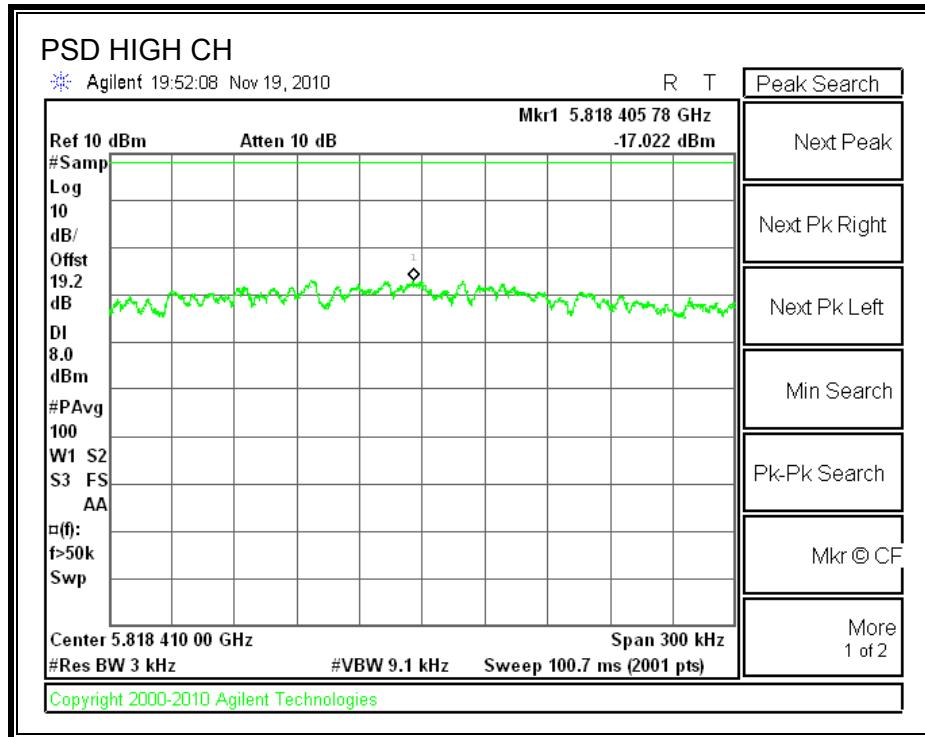
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

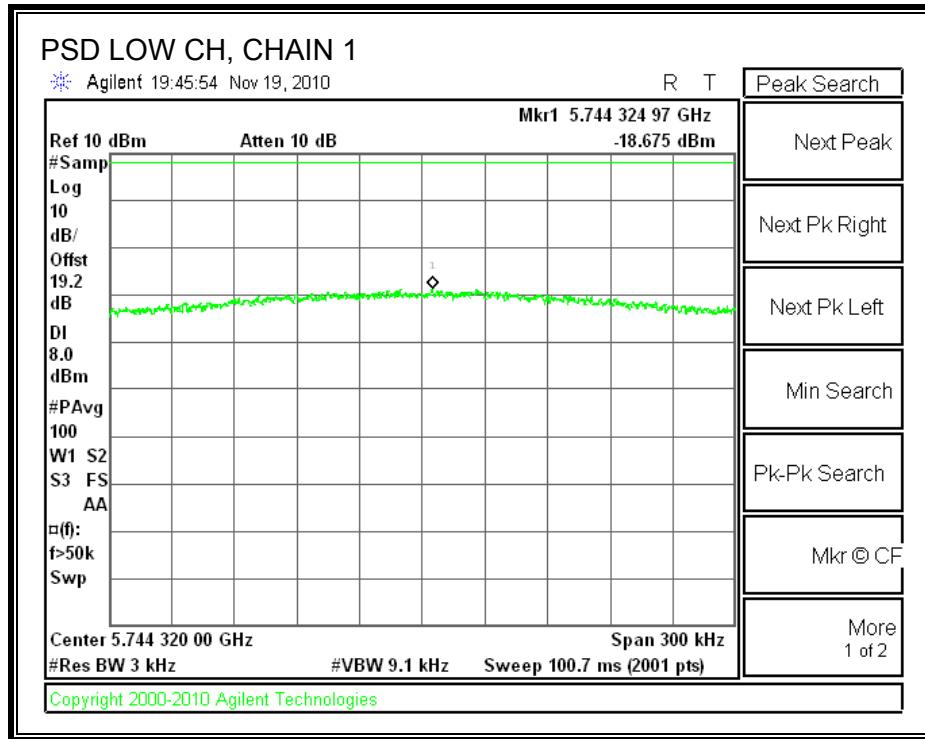
Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-17.52	-18.68	-17.97	-13.3	4.92	-18.17
Middle	5785	-17.34	-18.38	-17.83	-13.1	4.92	-17.98
High	5825	-17.02	-19.13	-19.70	-13.7	4.92	-18.61

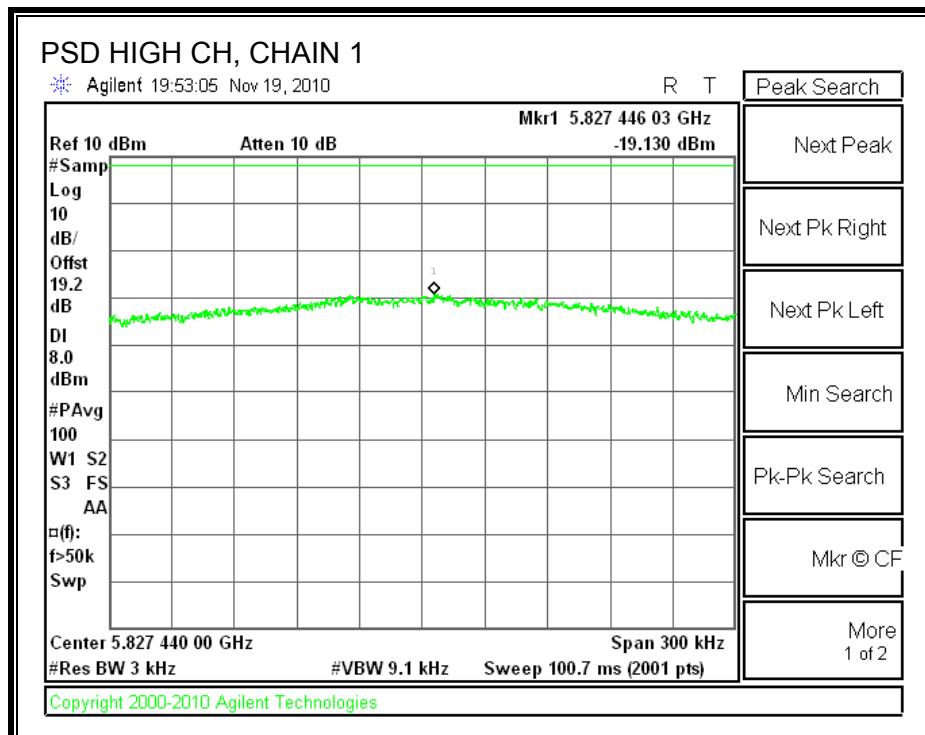
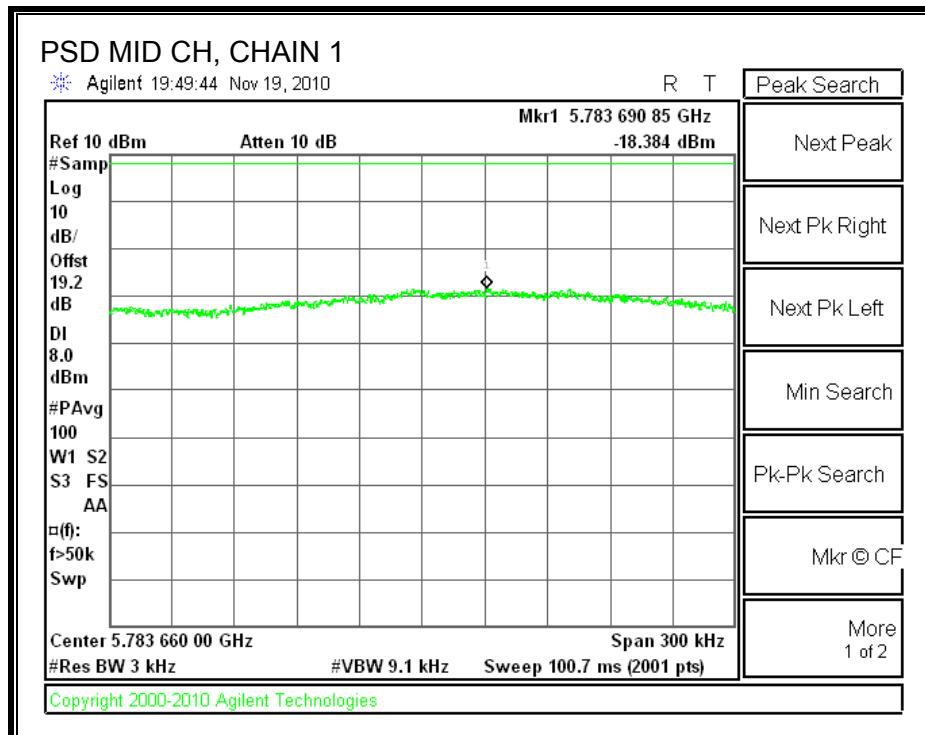
POWER SPECTRAL DENSITY, CHAIN 0



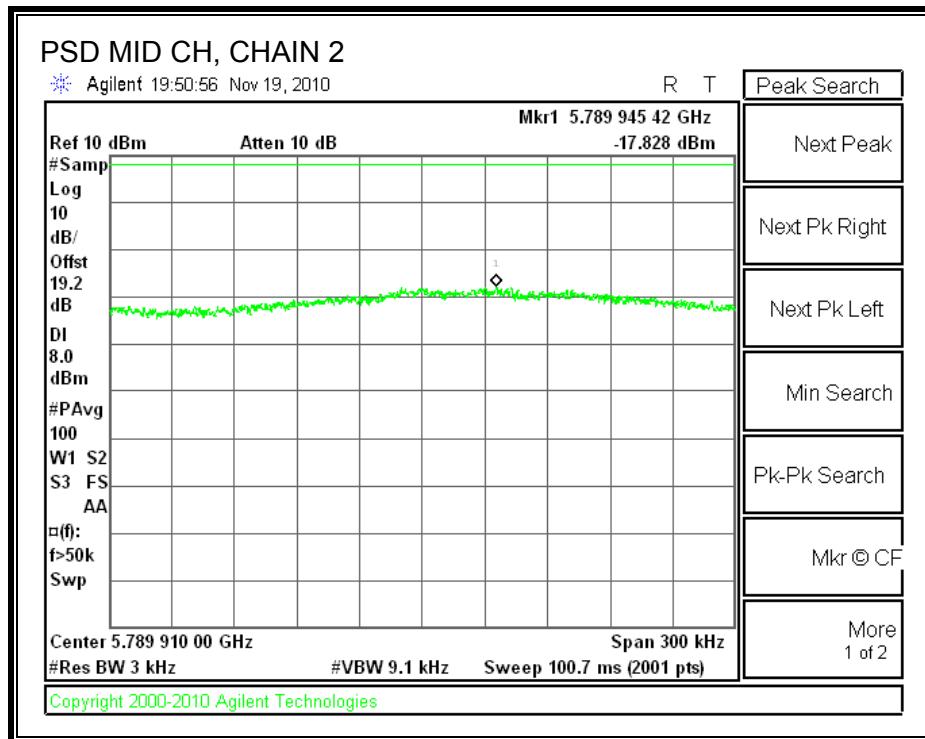
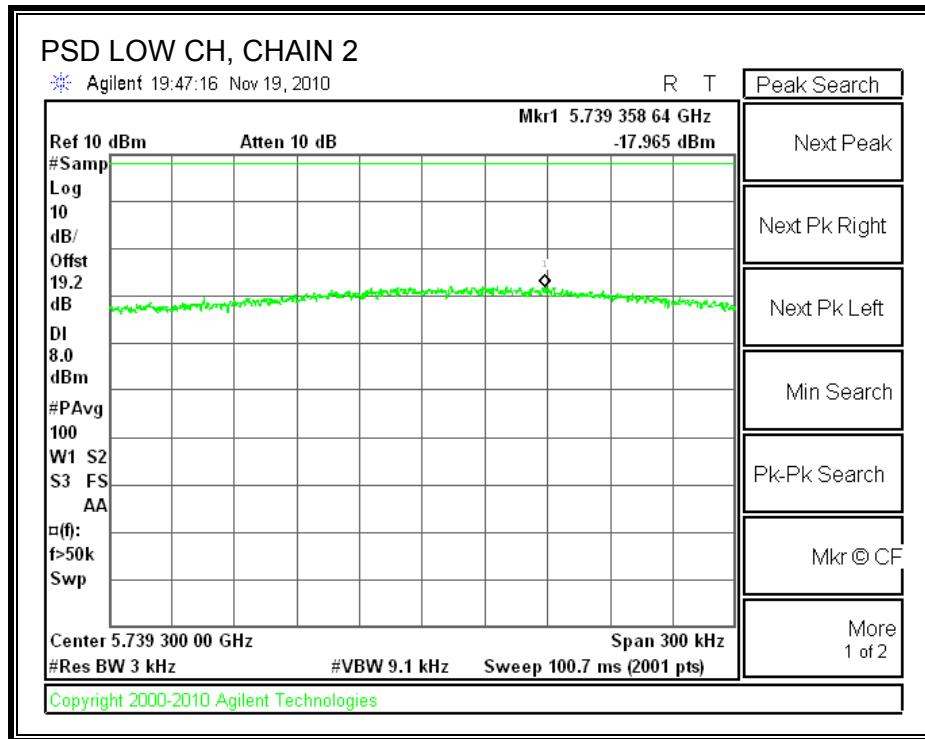


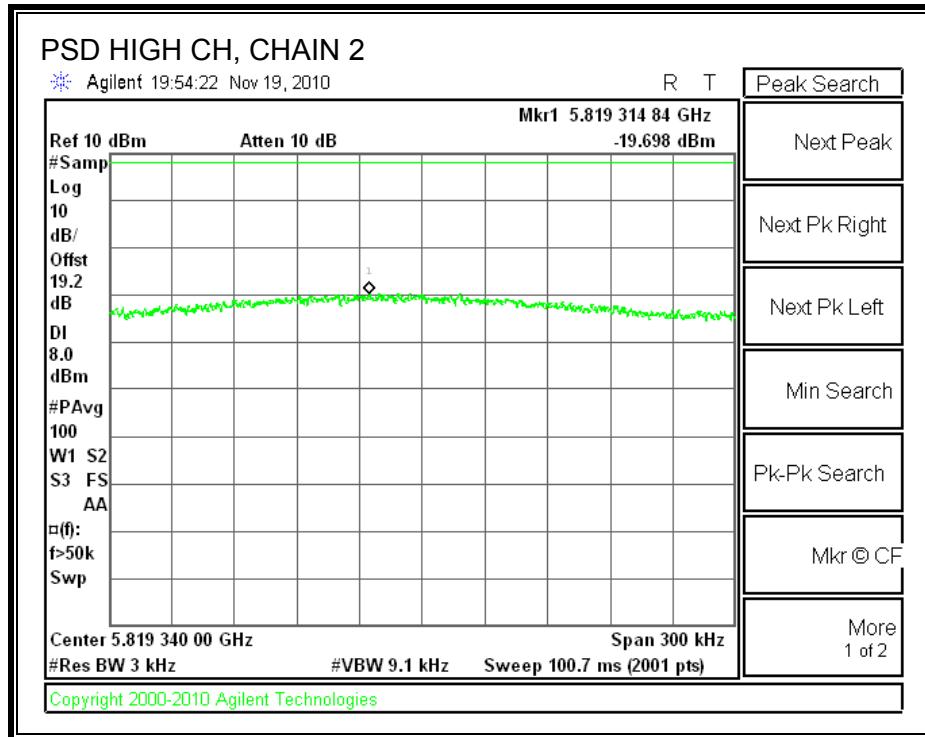
POWER SPECTRAL DENSITY, CHAIN 1





POWER SPECTRAL DENSITY, CHAIN 2





7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

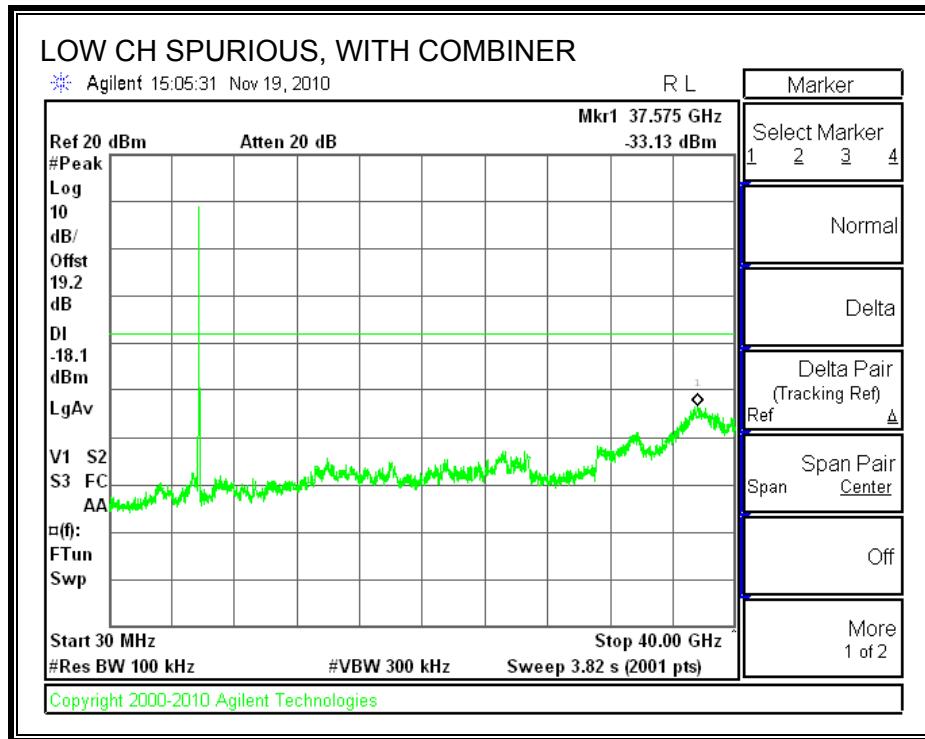
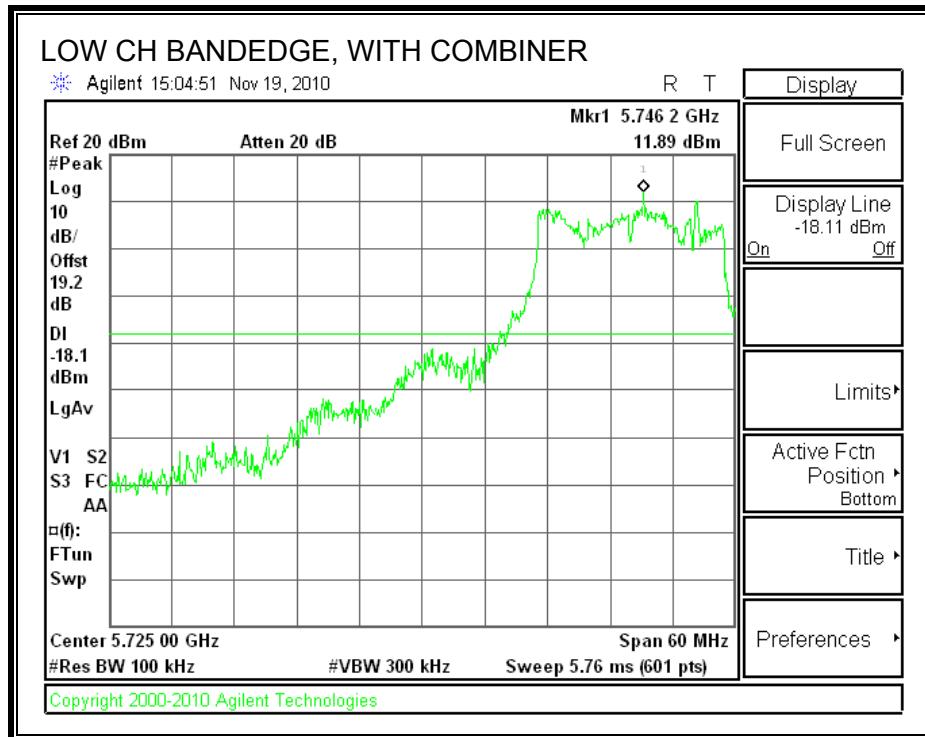
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

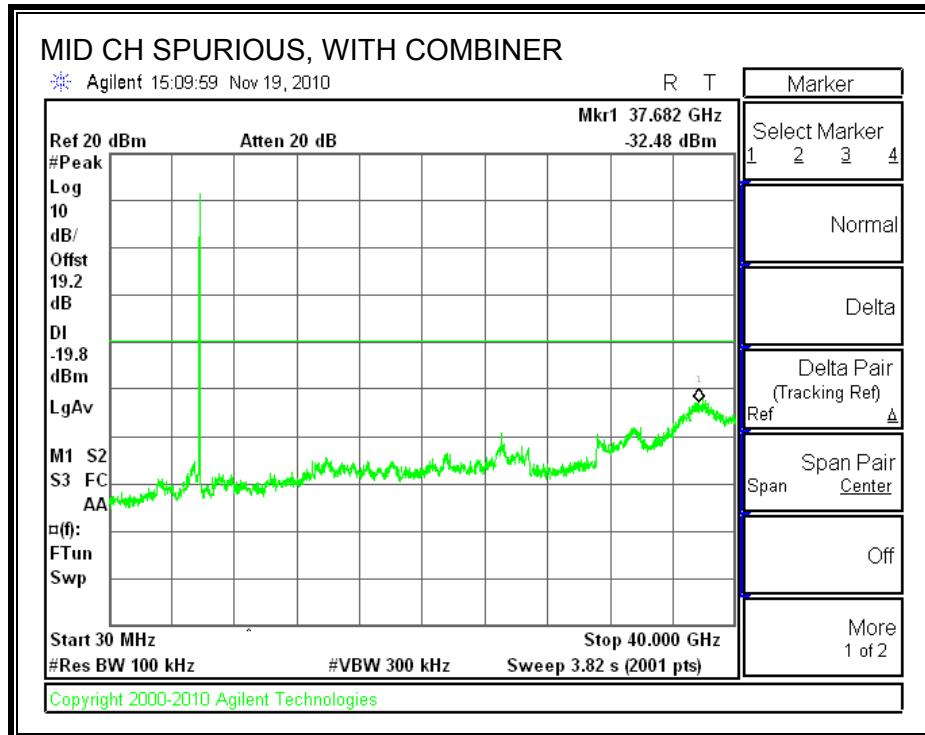
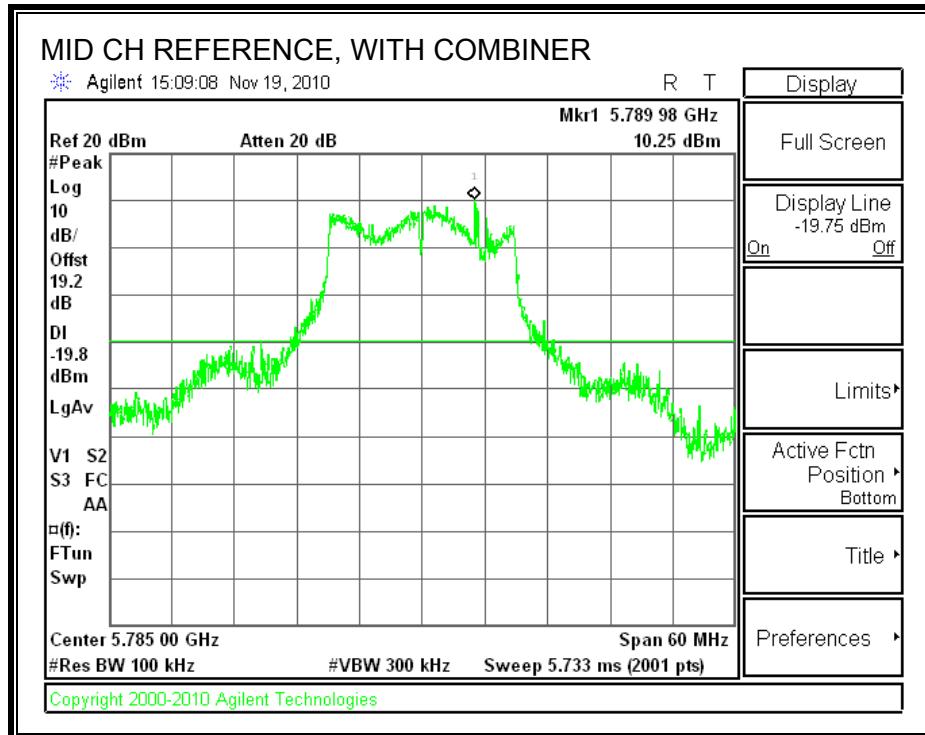
The EUT was set to transmit at low, mid and channel, 30dBc display line was set with each channel level

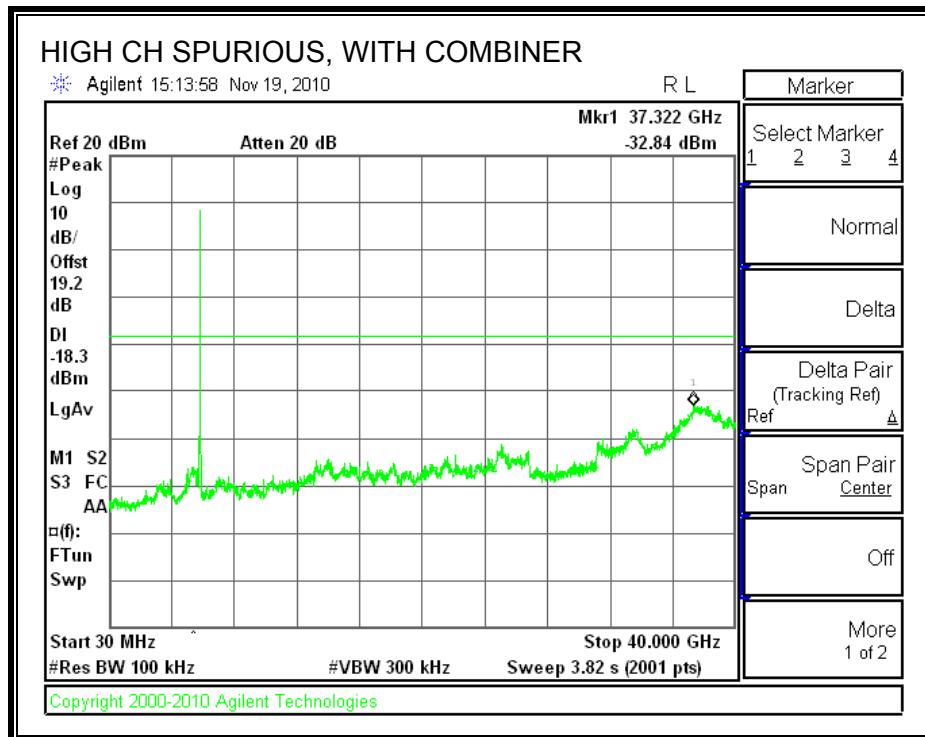
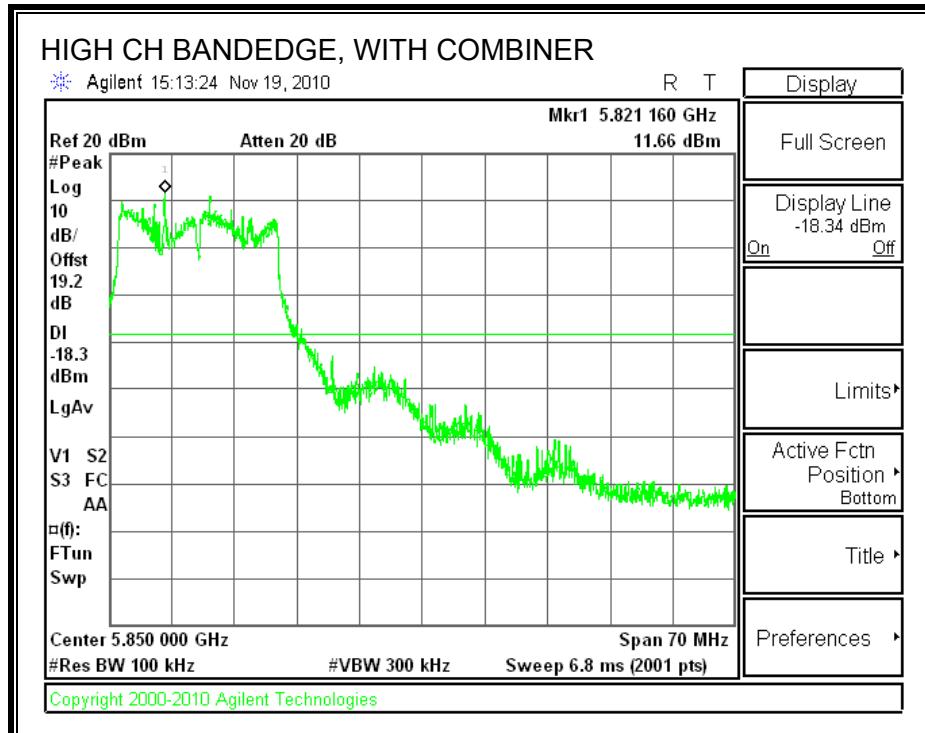
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







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.

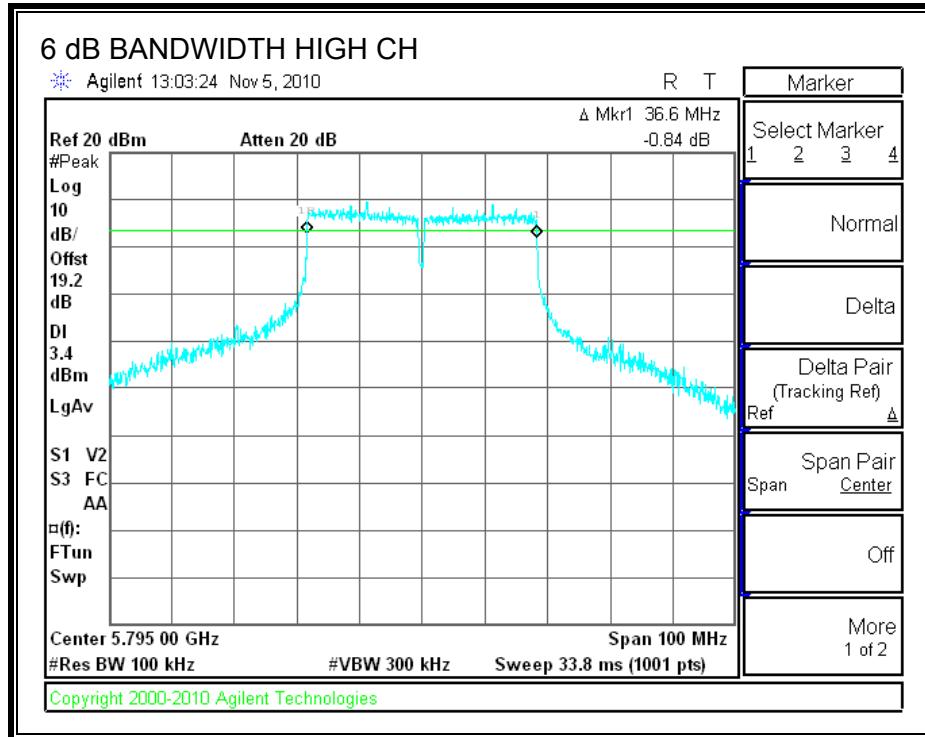
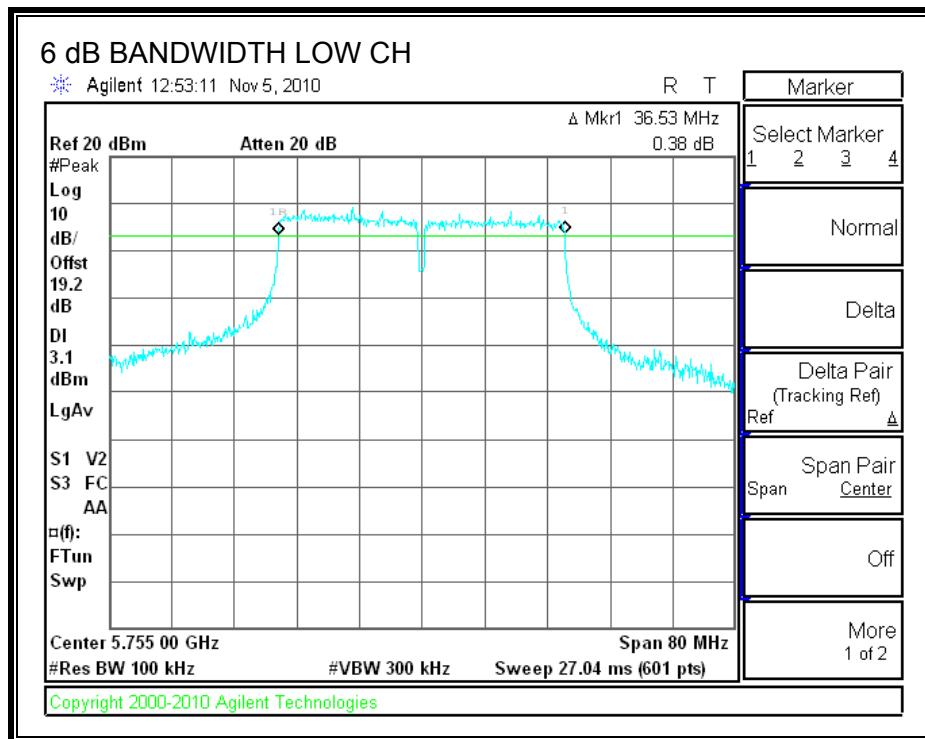
TEST PROCEDURE

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.

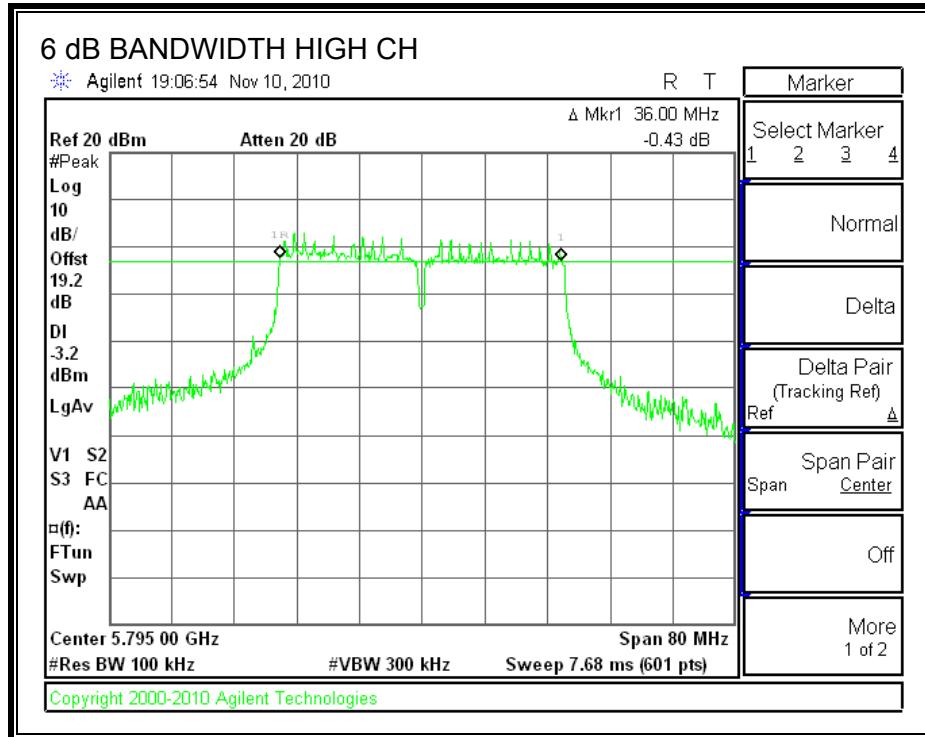
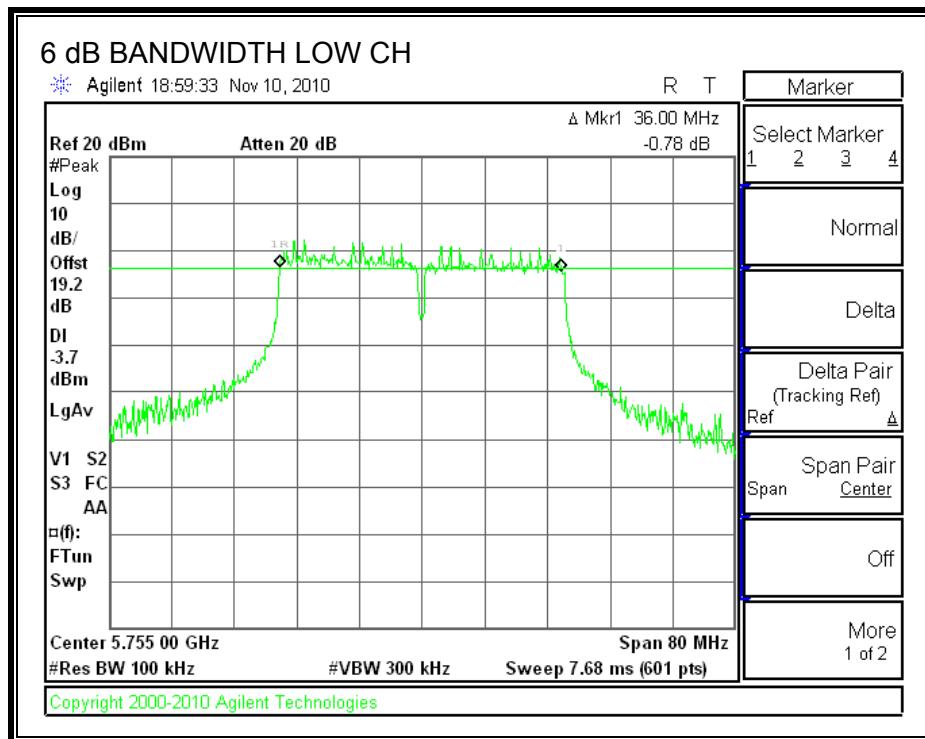
RESULTS

Channel	Frequency (MHz)	Chain 0 6 dB BW (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5755	36.53	36.00	36.40	0.5
High	5795	36.60	36.00	36.40	0.5

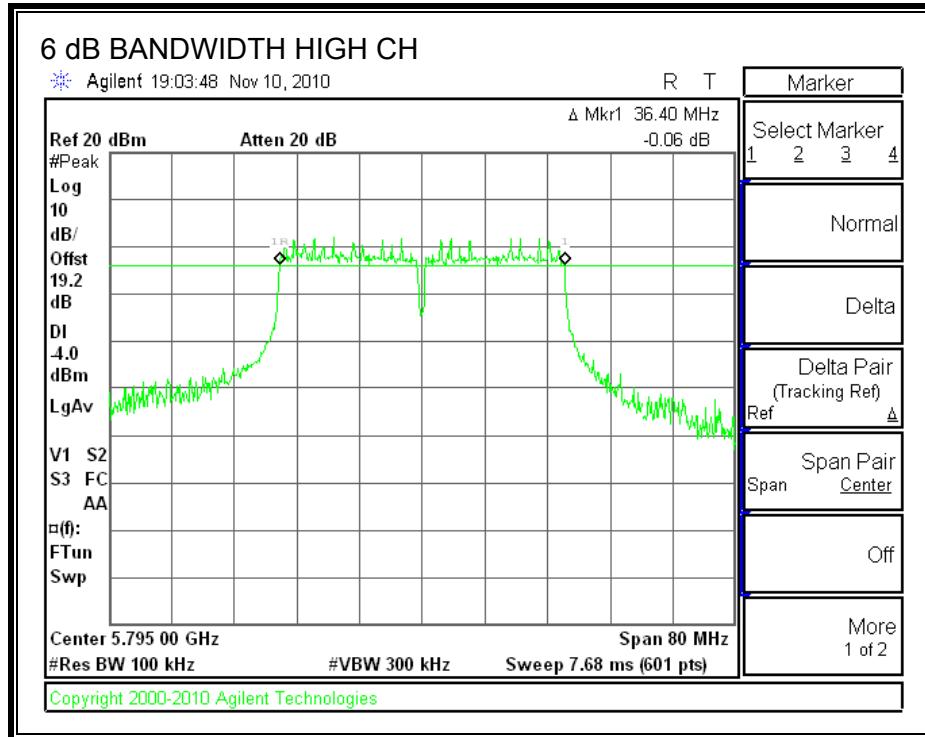
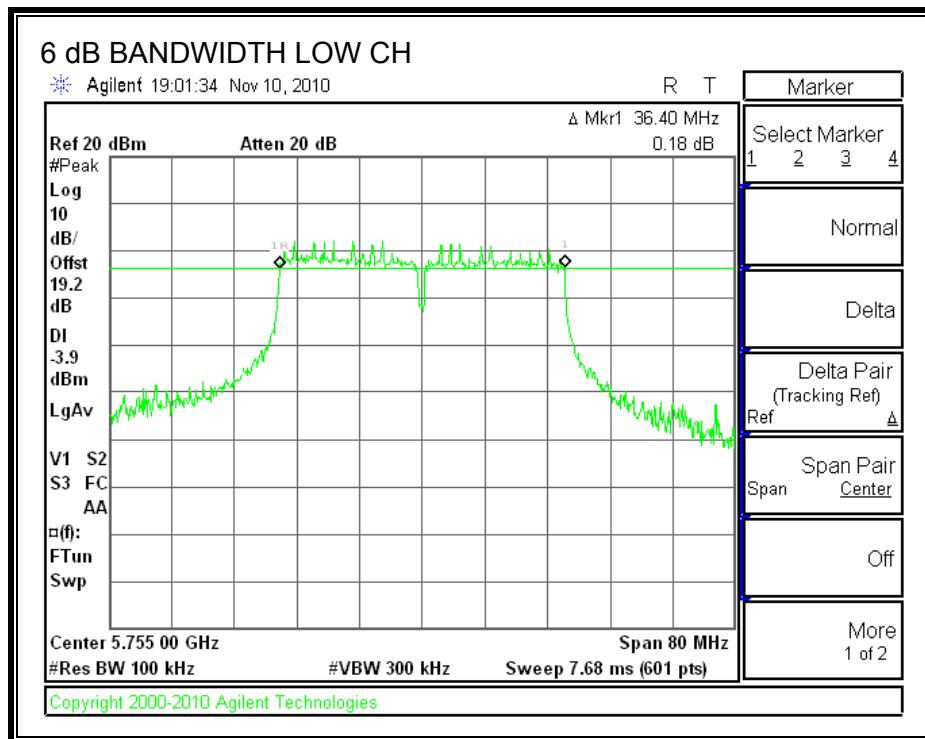
6 dB BANDWIDTH, CHAIN 0



6 dB BANDWIDTH, CHAIN 1



6 dB BANDWIDTH, CHAIN 2



7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

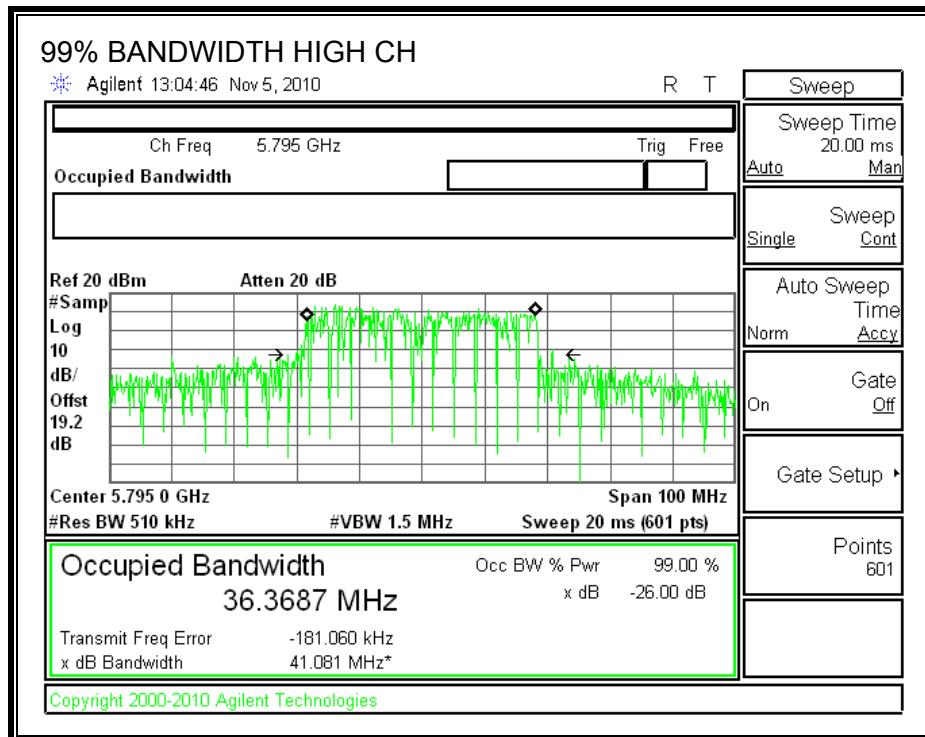
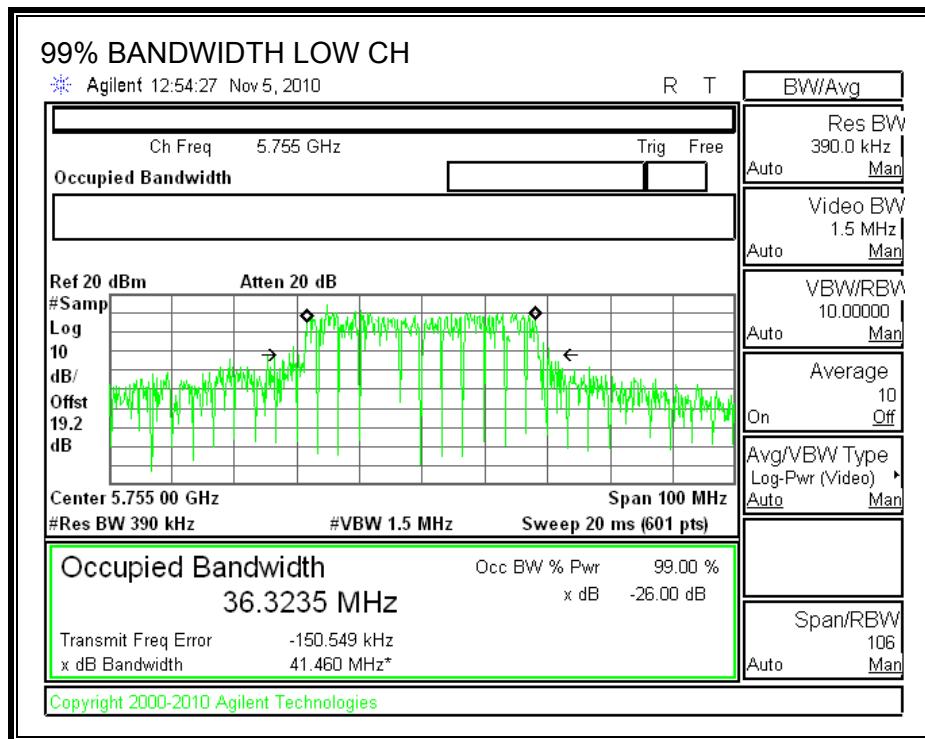
TEST PROCEDURE

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.

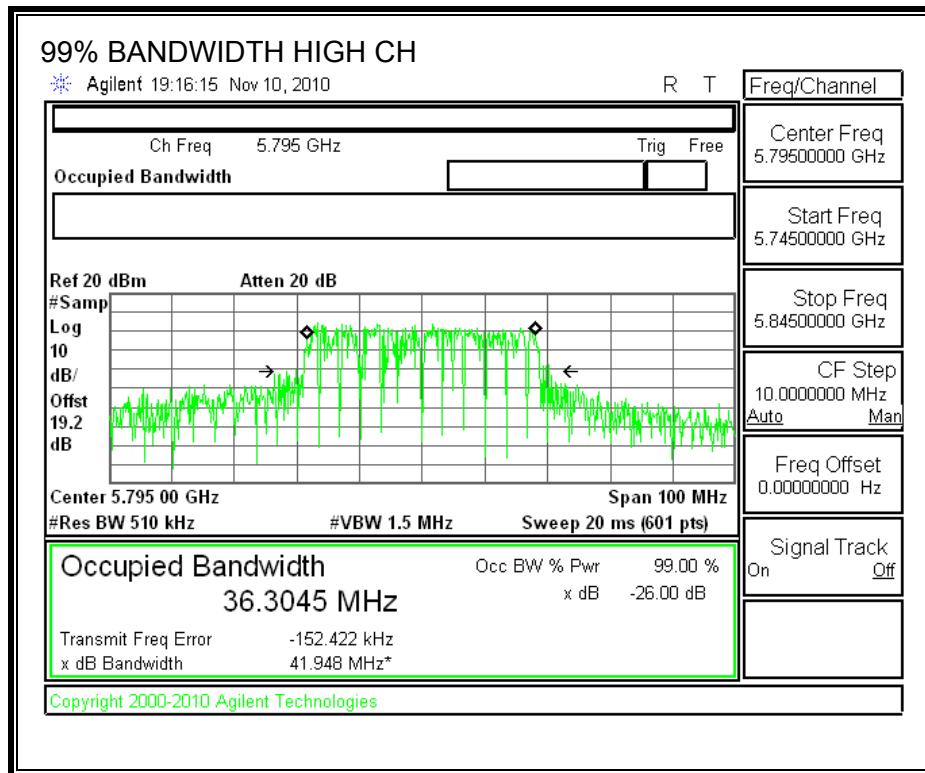
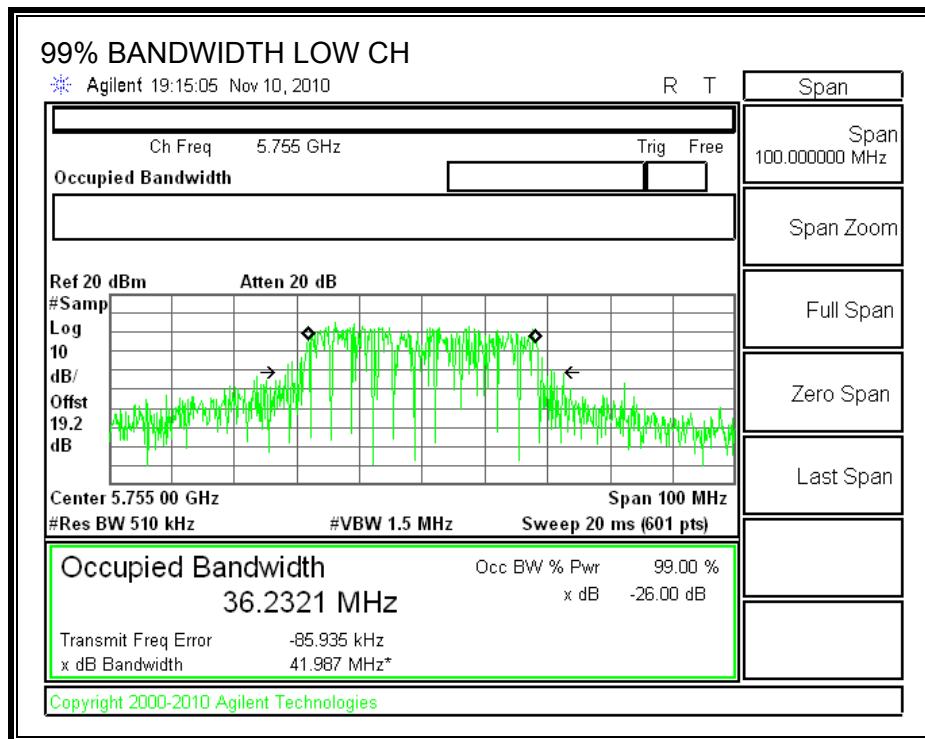
RESULTS

Channel	Frequency (MHz)	Chain 0 99% Bandwidth (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	5755	36.3235	36.2321	36.5191
High	5795	36.3687	36.3045	36.4652

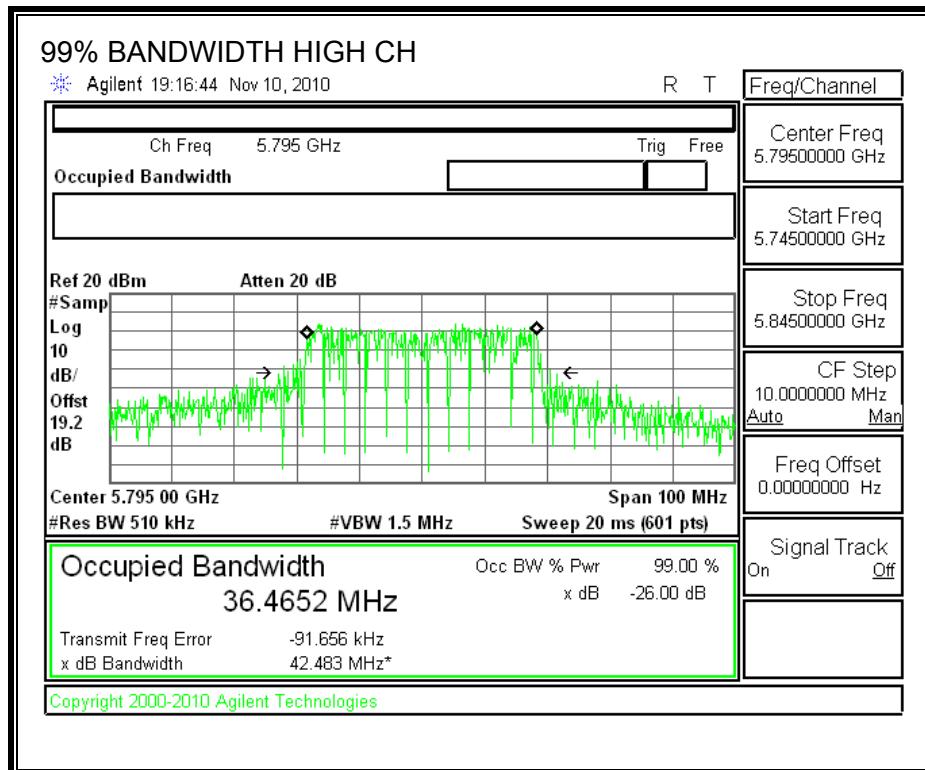
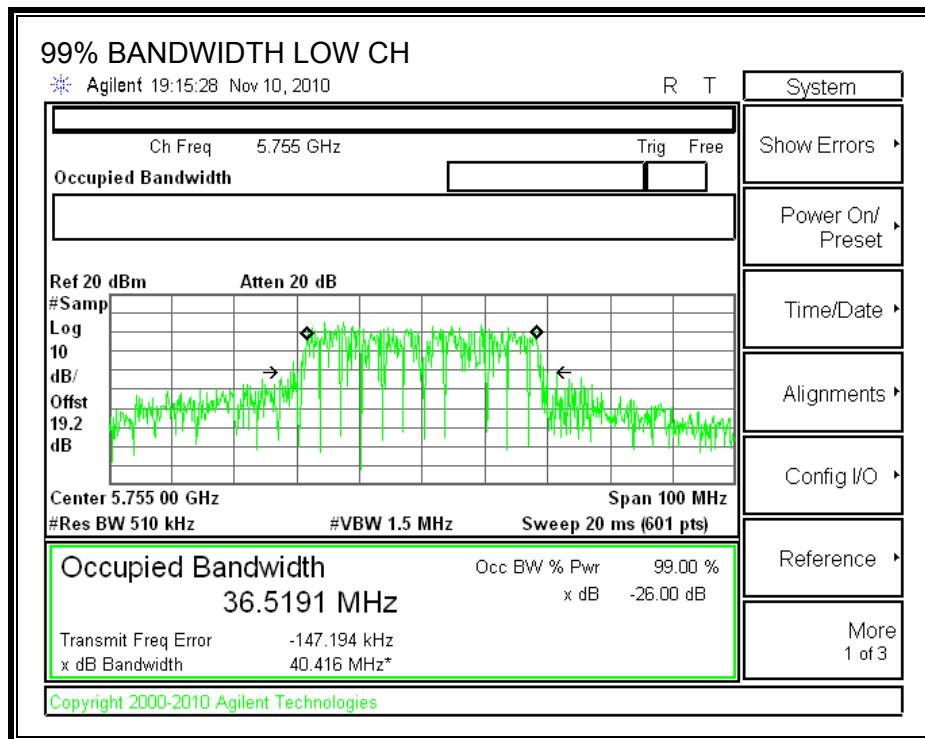
99% BANDWIDTH, CHAIN 0



99% BANDWIDTH, CHAIN 1



99% BANDWIDTH, CHAIN 1



7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The combination of antenna gains is equal to 9.08 dBi, therefore the limit is 26.92 dBm.

The highest of antenna gains is equal to 4.87 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

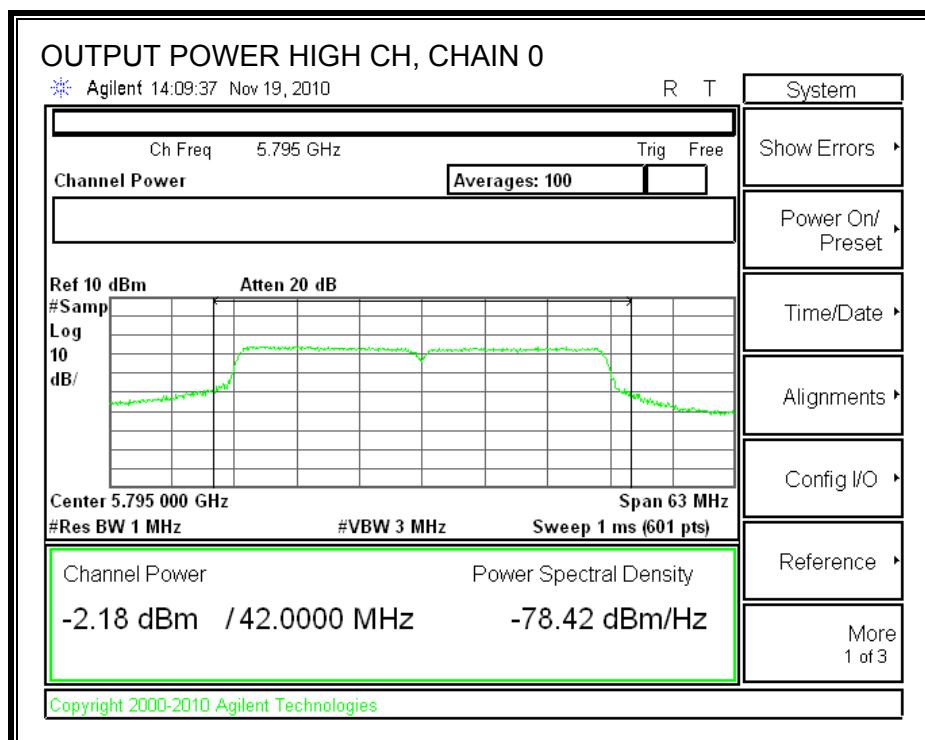
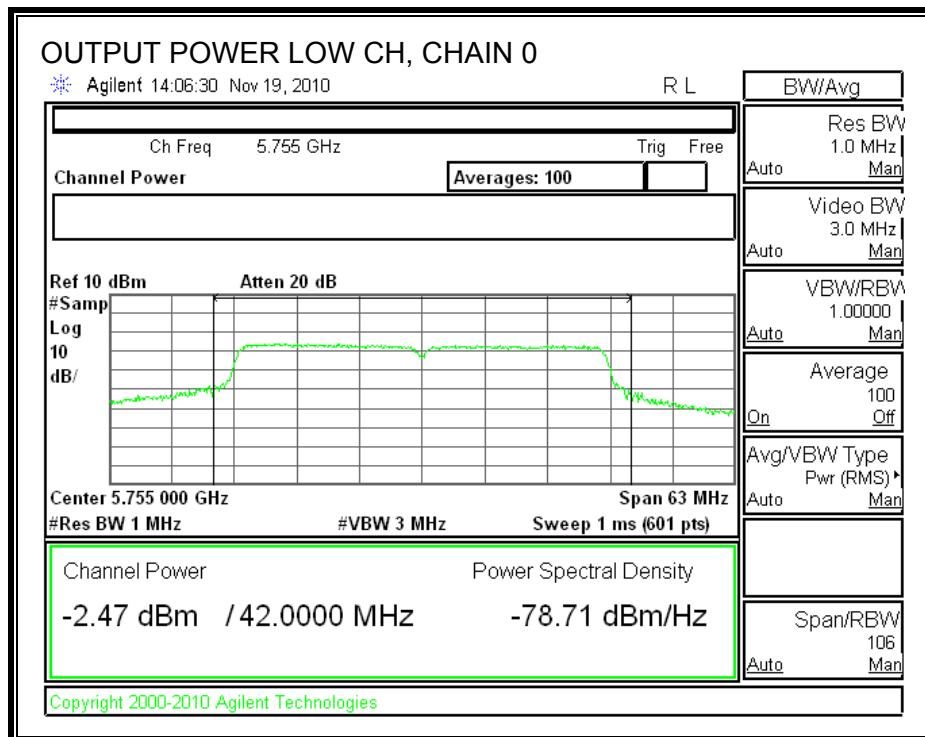
Non Beam-Forming

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-2.47	-3.69	-3.51	19.20	20.78	30.00	-9.22
High	5795	-2.22	-3.32	-3.44	19.20	21.01	30.00	-8.99

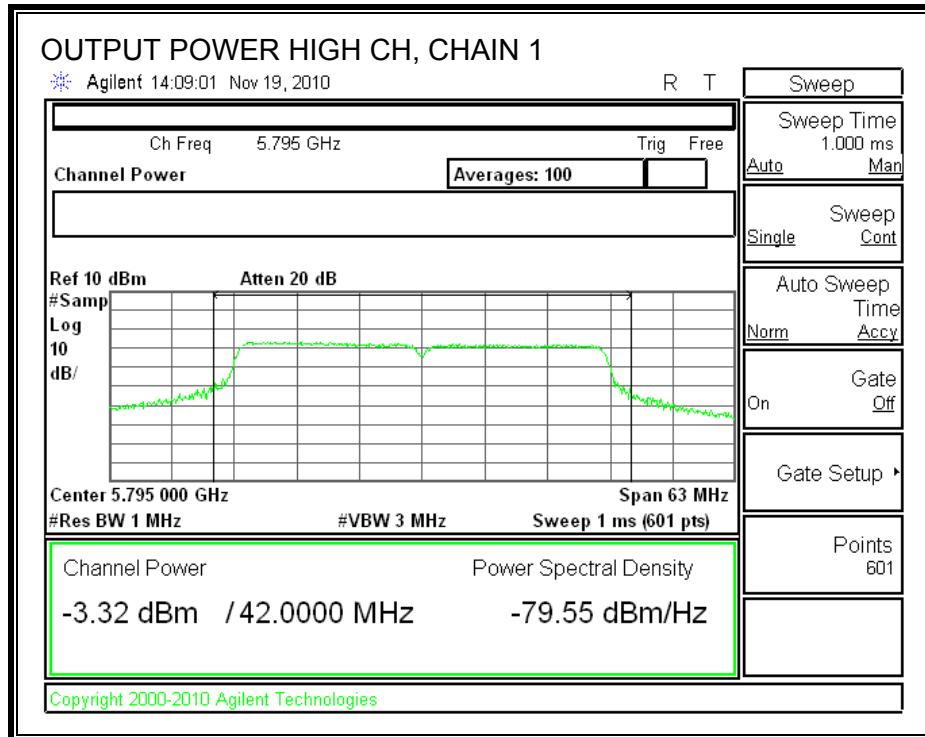
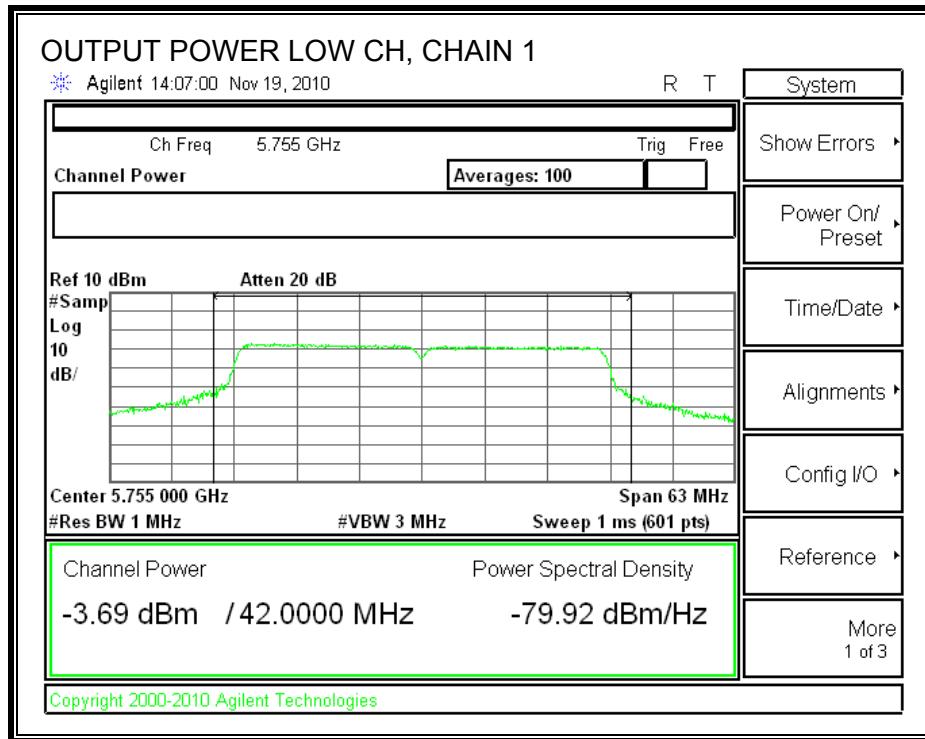
Beam-Forming

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Chain 3 Power (dBm)	Attenuator + Cable Loss (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-2.47	-3.69	-3.51	19.20	20.78	26.92	-6.14
High	5795	-2.18	-3.32	-3.44	19.20	21.03	26.92	-5.89

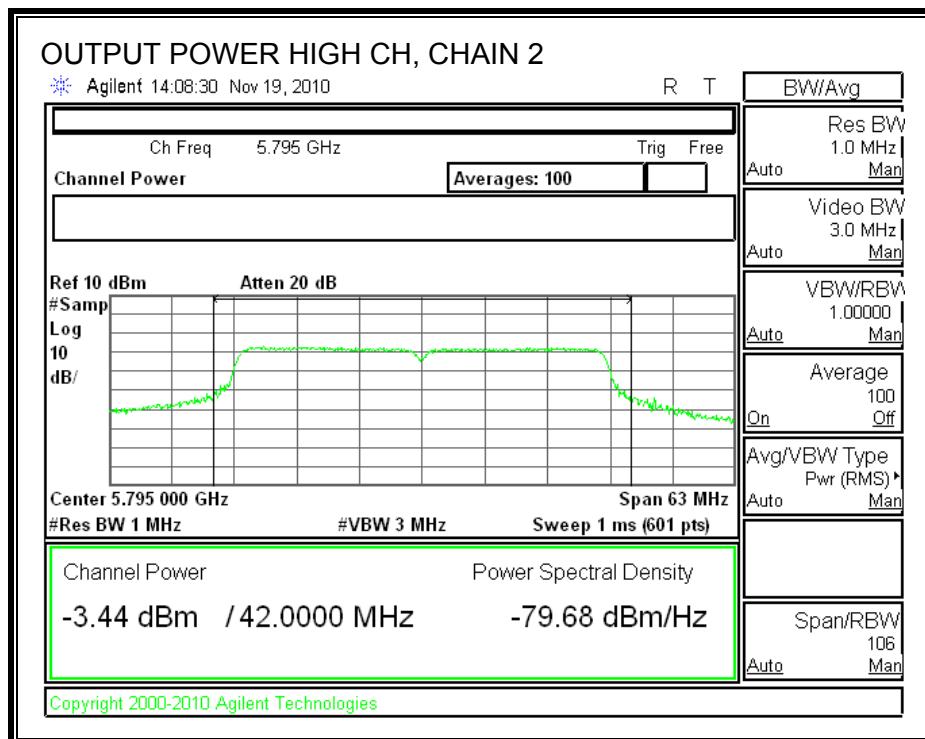
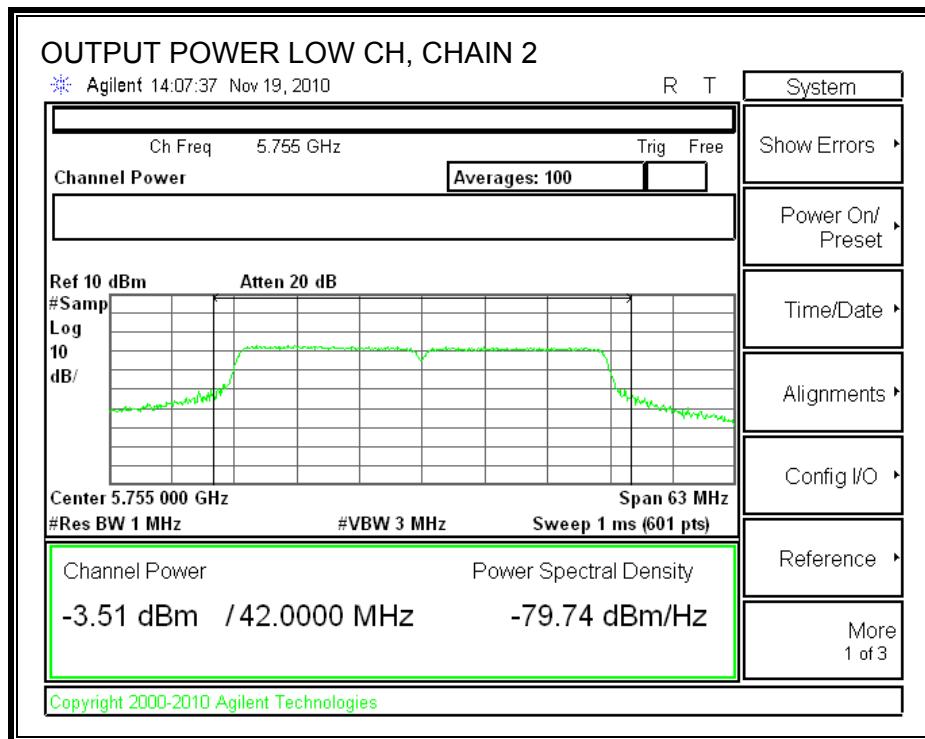
CHAIN 0 OUTPUT POWER



CHAIN 1 OUTPUT POWER



CHAIN 2 OUTPUT POWER



7.6.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5755	15.30	15.40	15.50	20.17
High	5795	15.70	15.80	15.70	20.50

7.6.5. 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.

The combination of antenna gains is equal to 9.08 dBi, therefore the limit is 4.92 dBm.

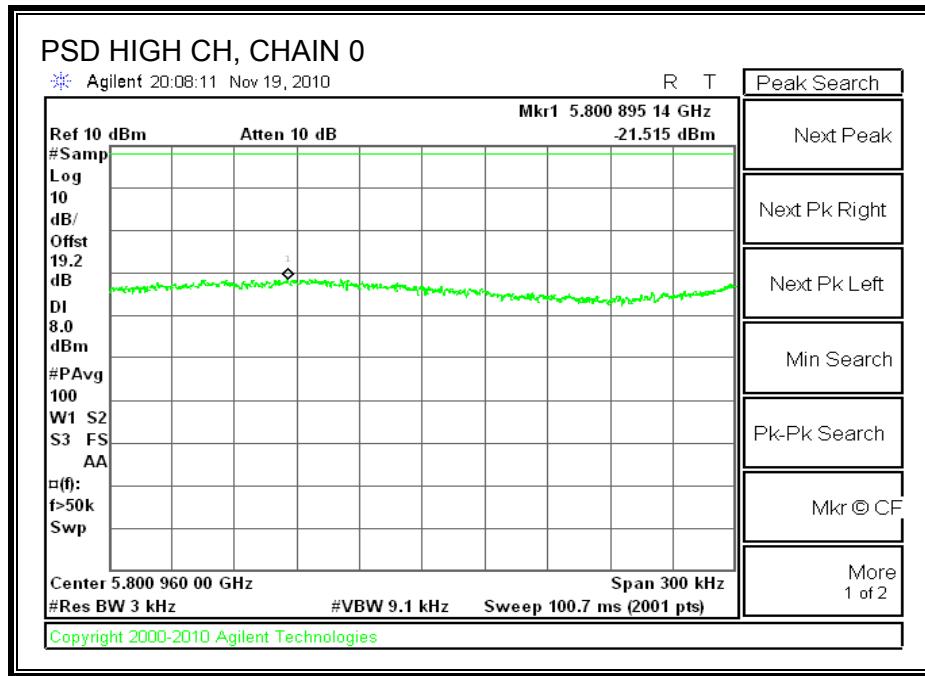
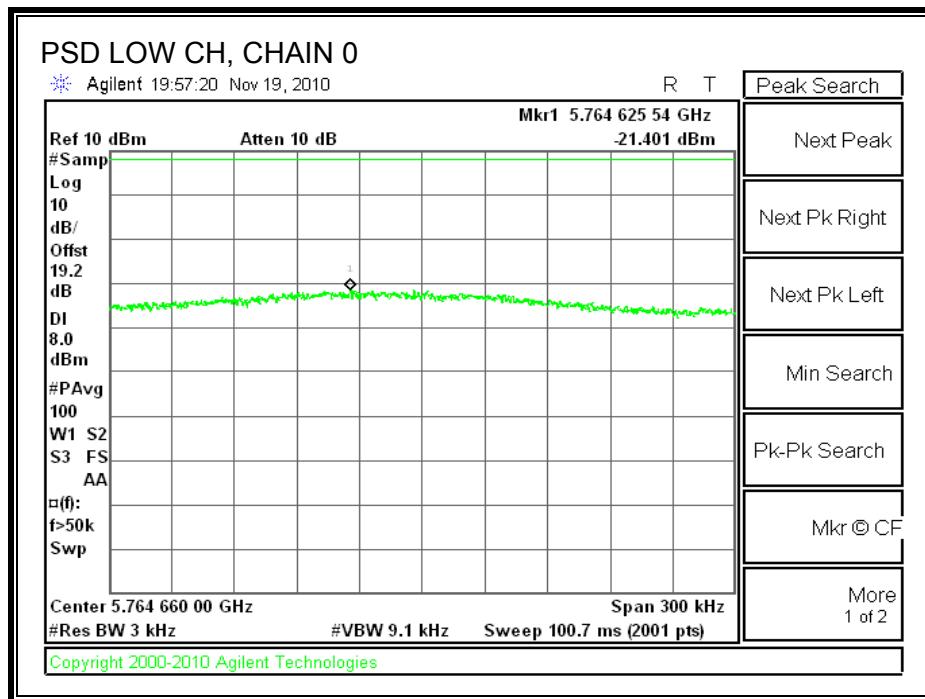
TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

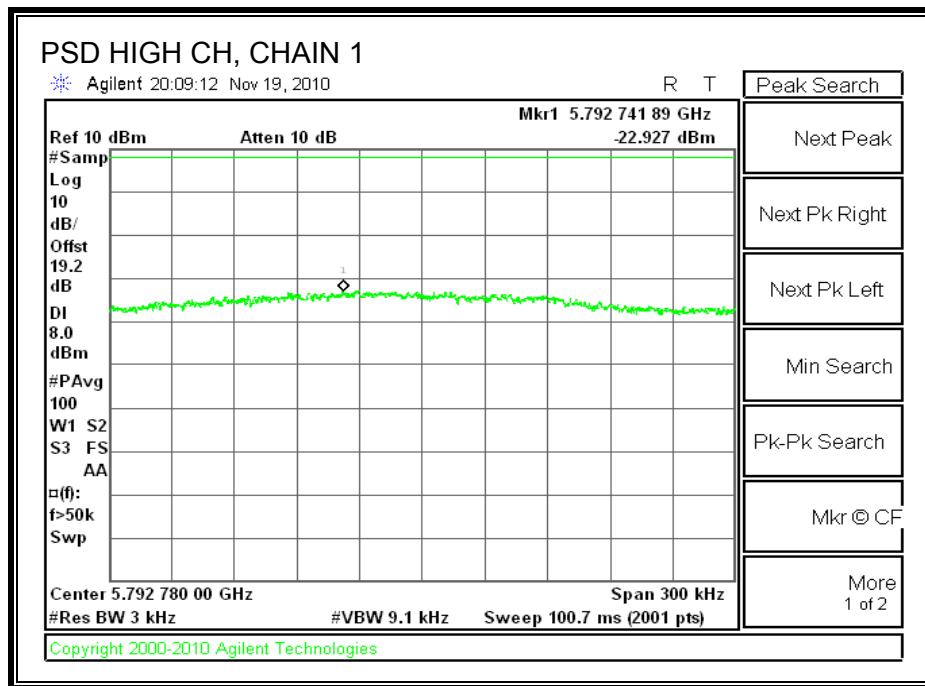
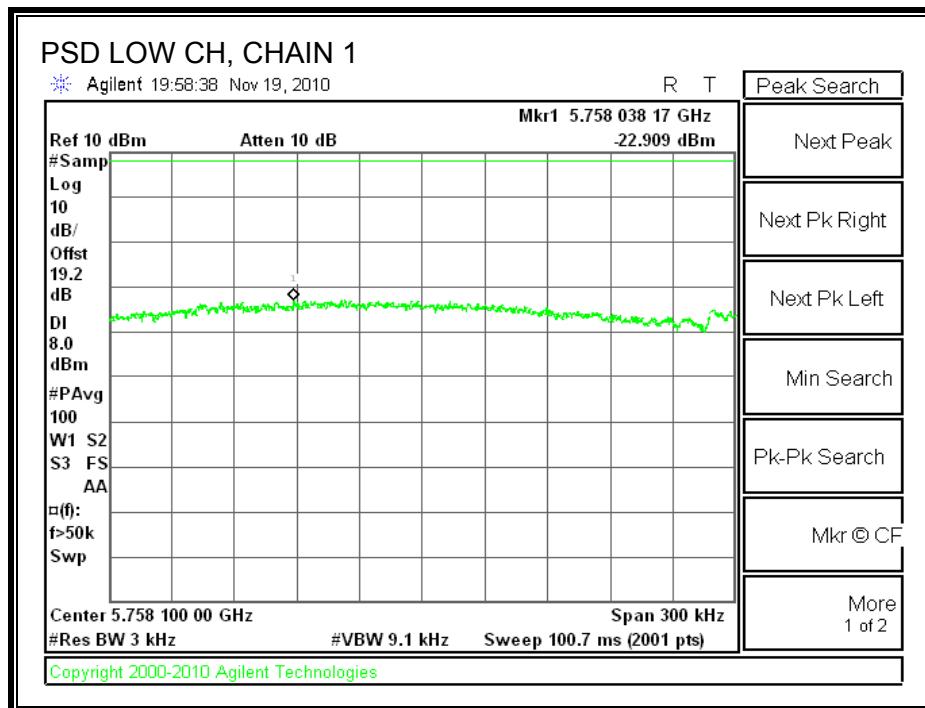
RESULTS:

Channel	Frequency (MHz)	Chain 0 PSD (dBm)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-21.40	-22.91	-21.92	-17.3	4.92	-22.18
High	5795	-21.52	-22.93	-22.06	-17.4	4.92	-22.28

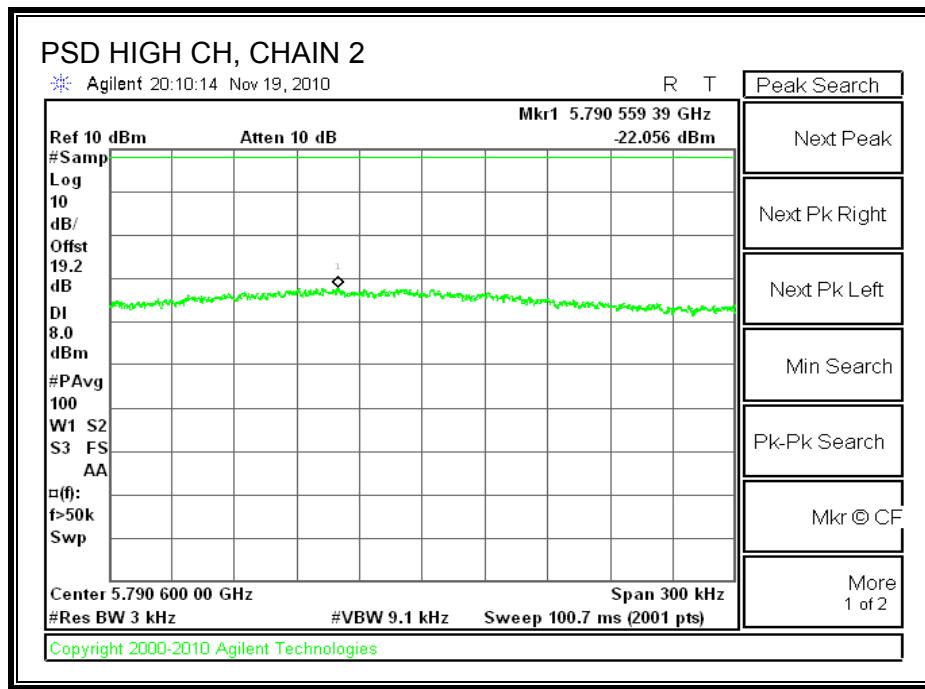
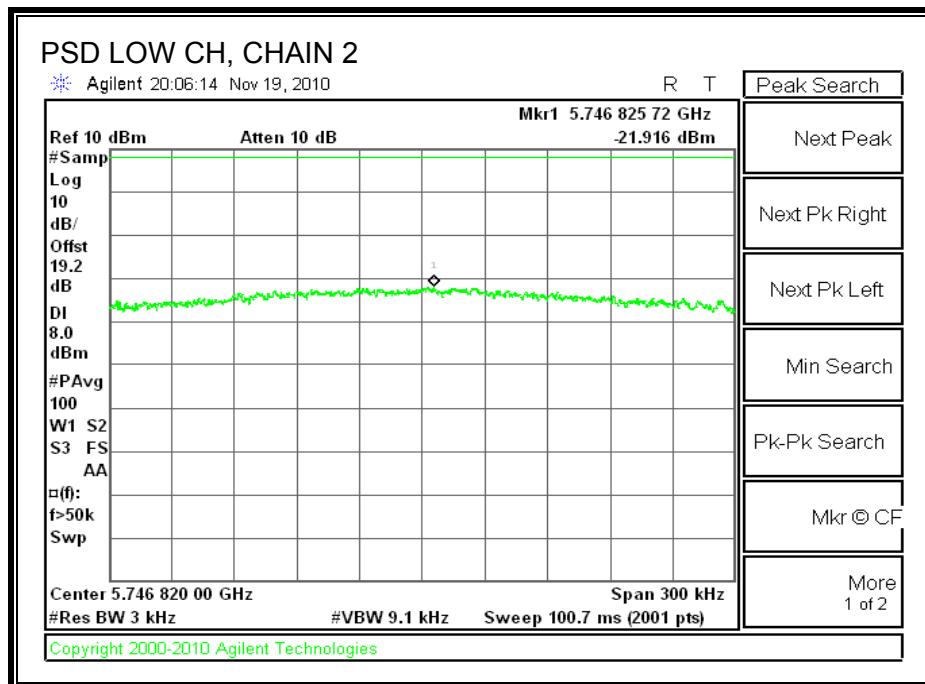
POWER SPECTRAL DENSITY, CHAIN 0



POWER SPECTRAL DENSITY, CHAIN 1



POWER SPECTRAL DENSITY, CHAIN 2



7.6.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

TEST PROCEDURE

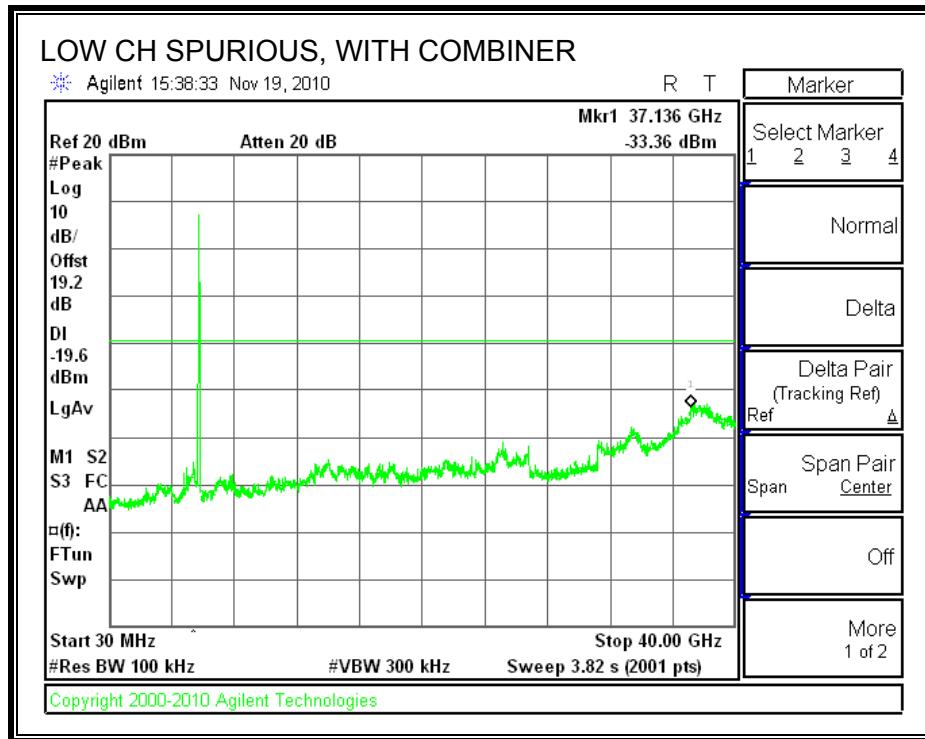
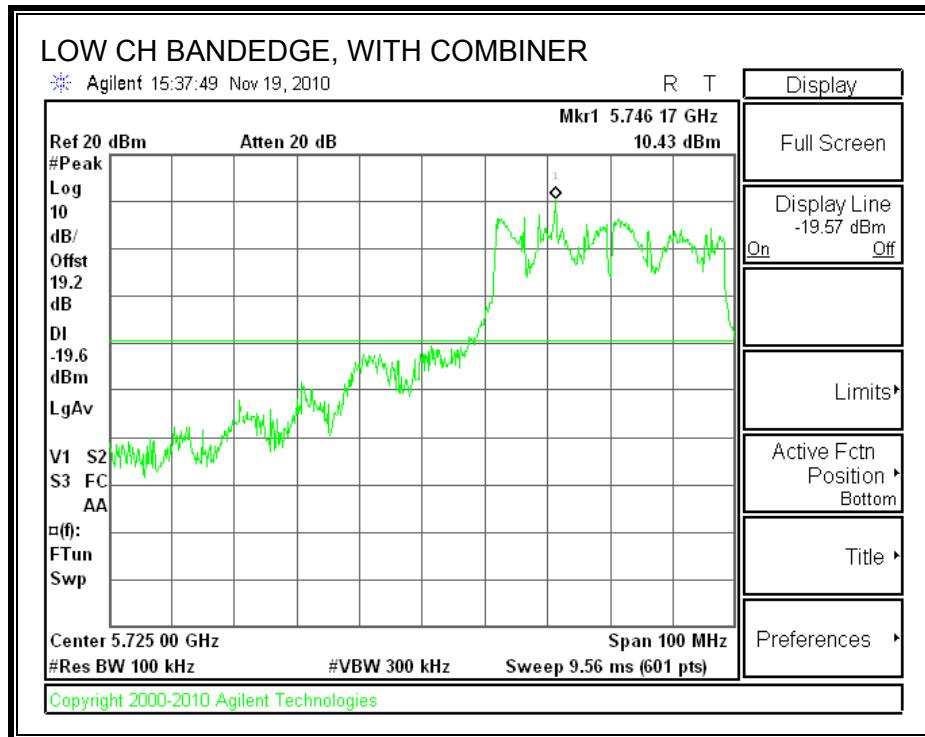
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

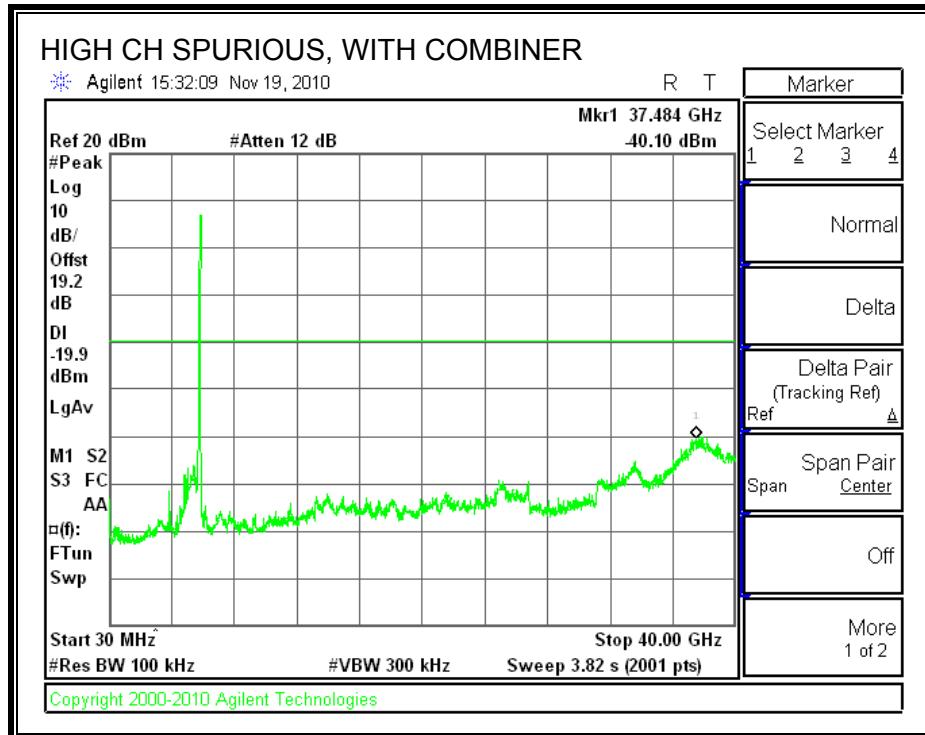
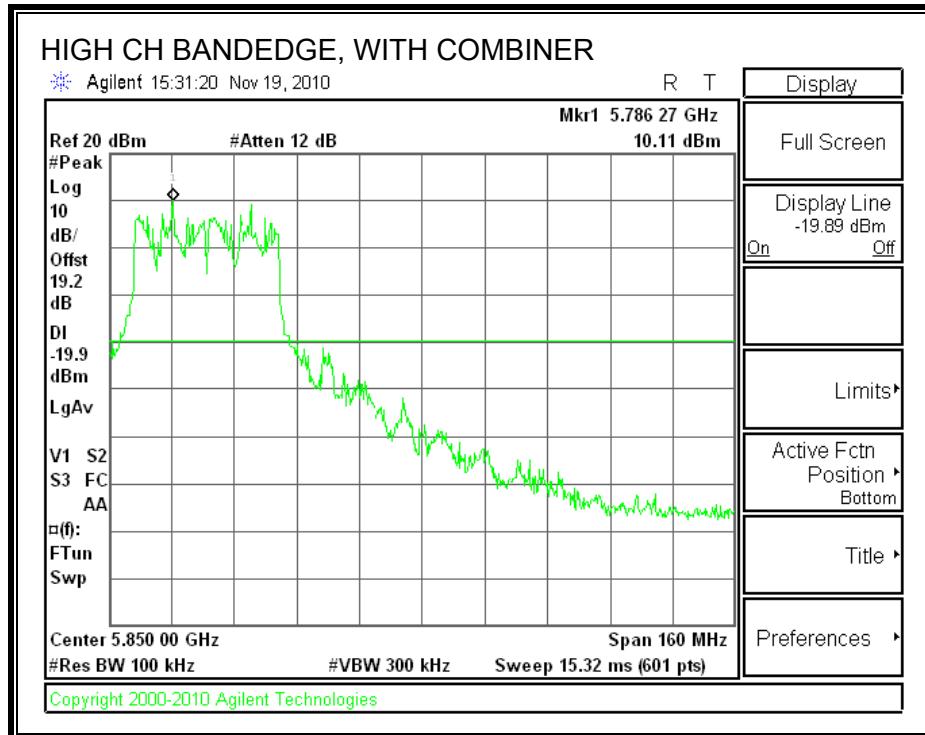
The EUT was set to transmit at low, mid and channel, 30dBc display line was set with each channel level

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





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

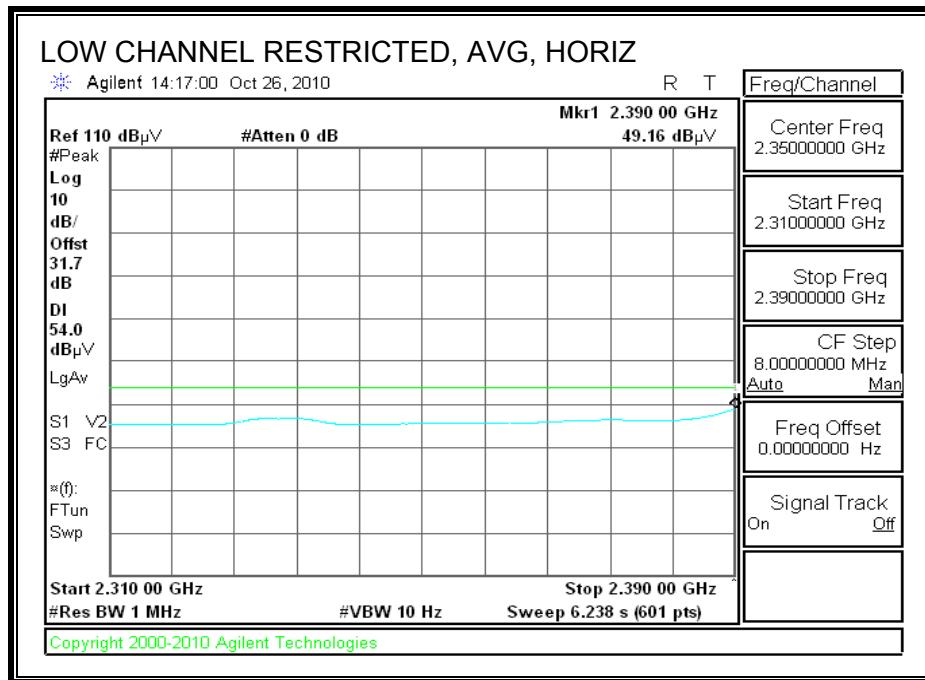
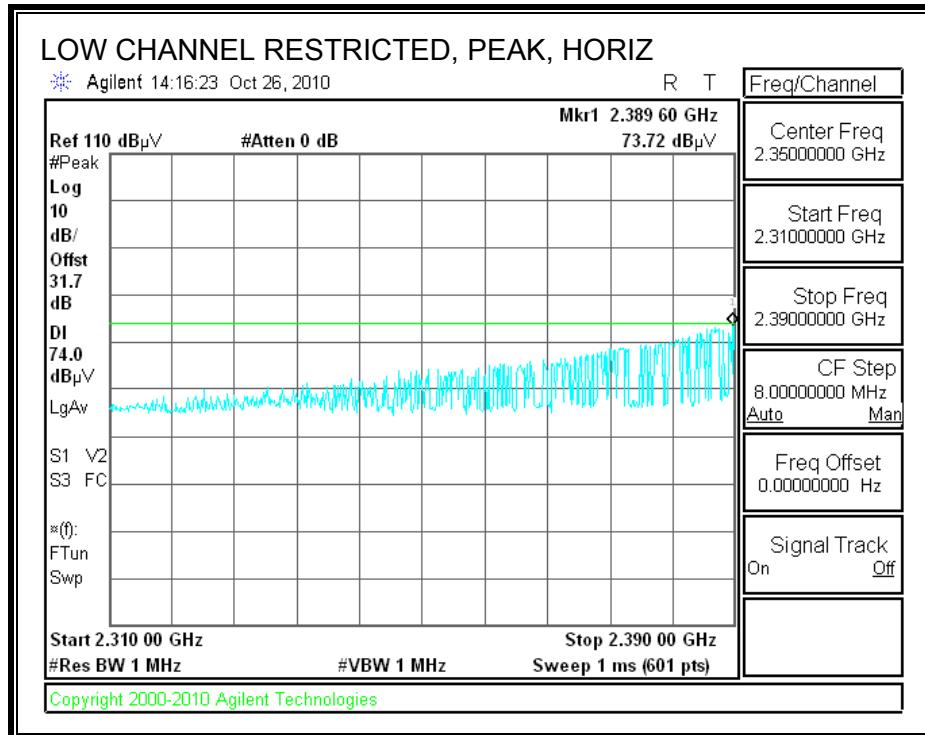
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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

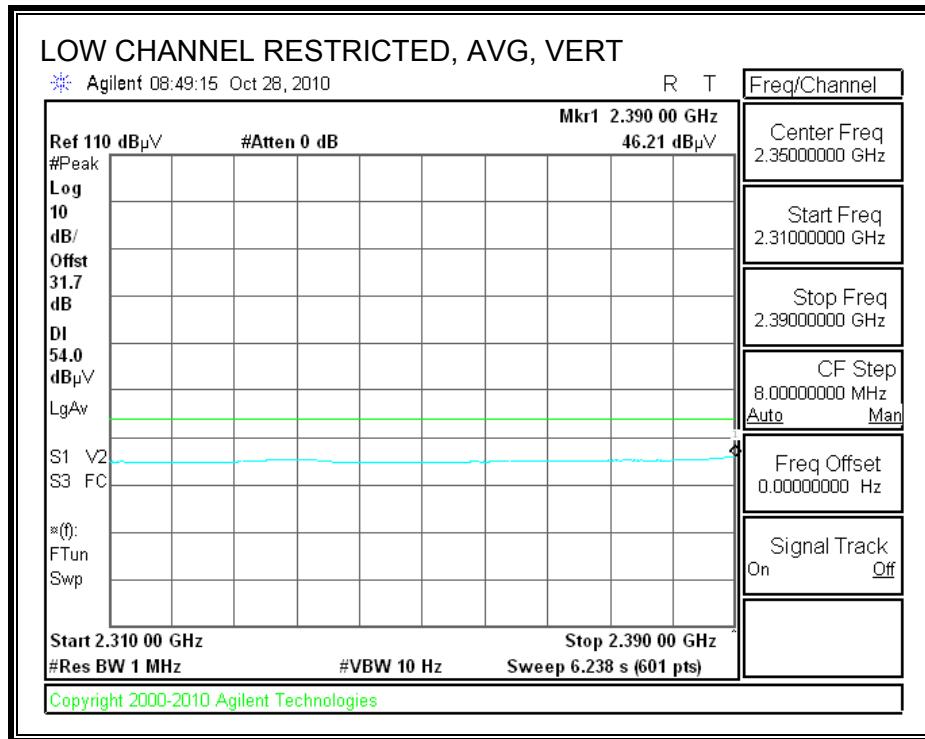
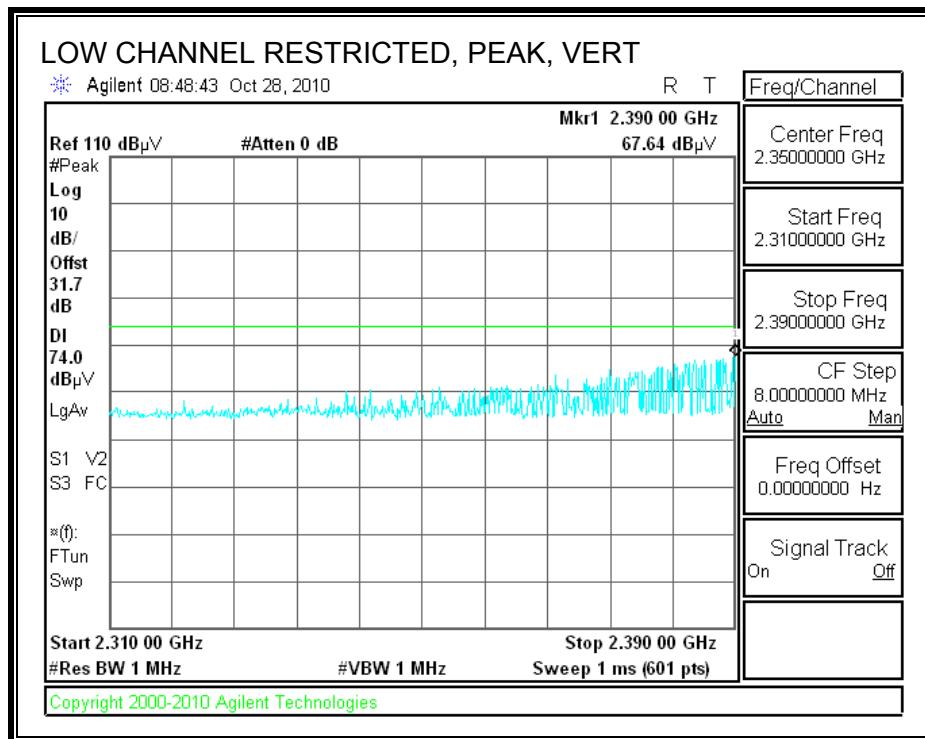
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. 802.11b MODE IN THE 2.4 GHz BAND

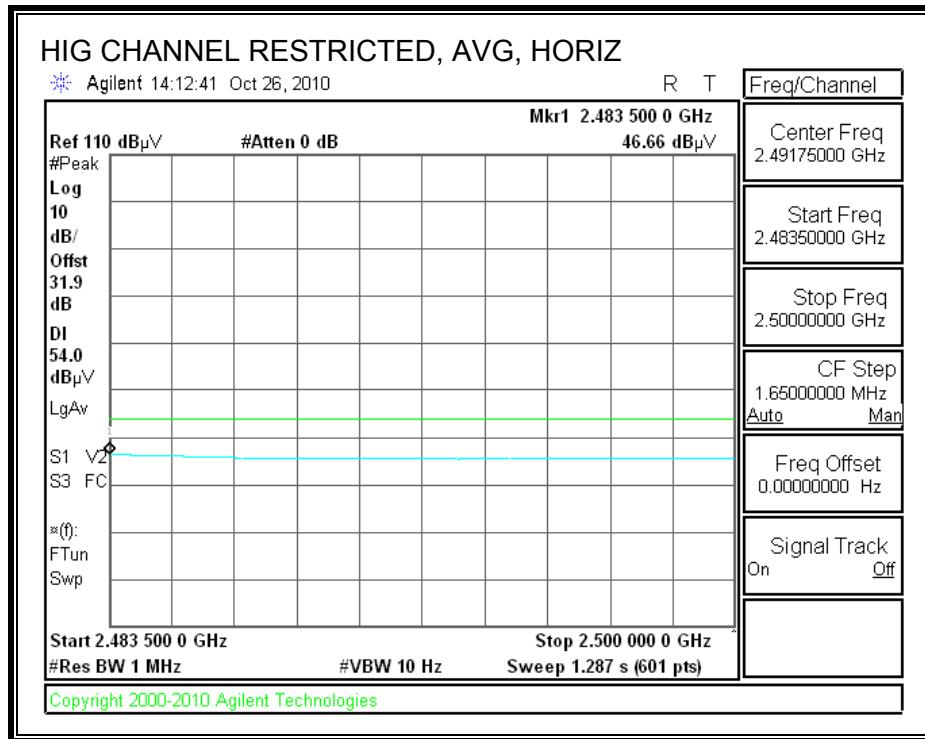
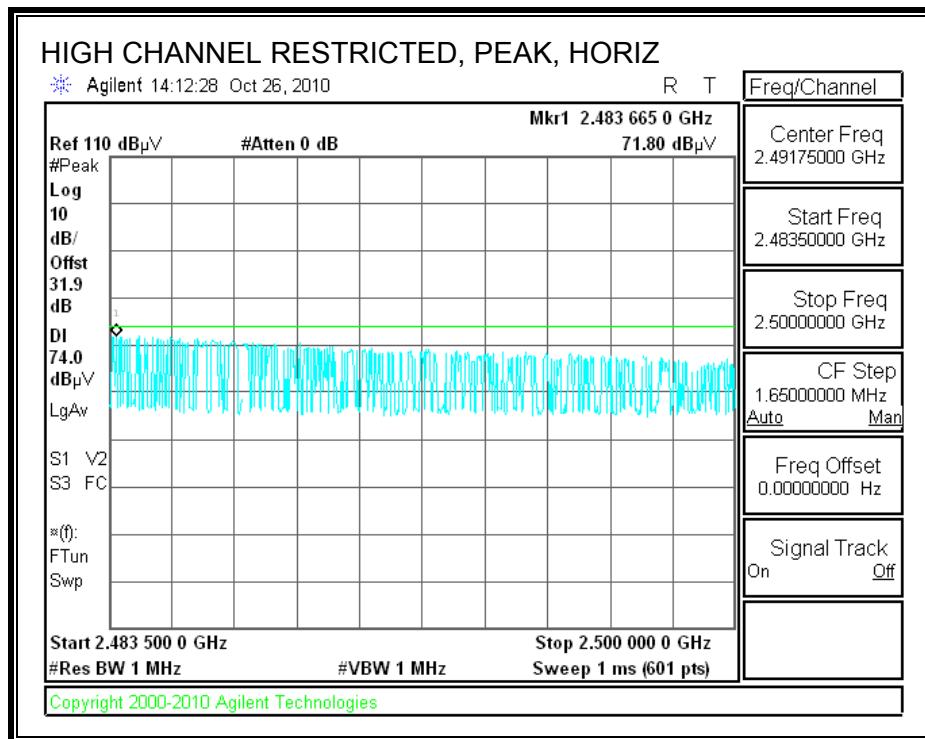
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



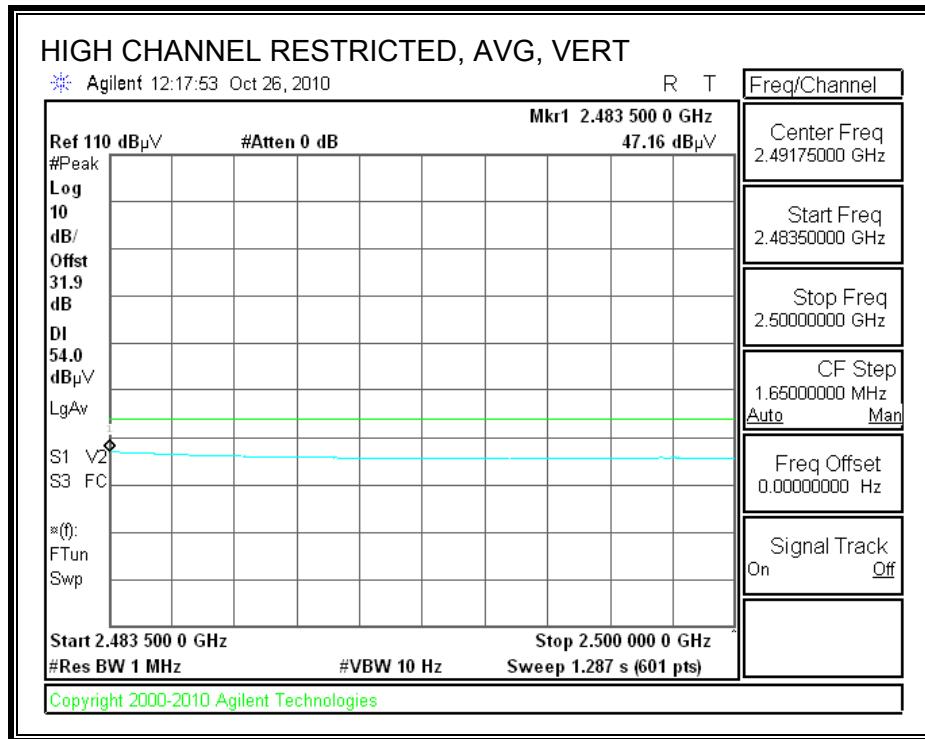
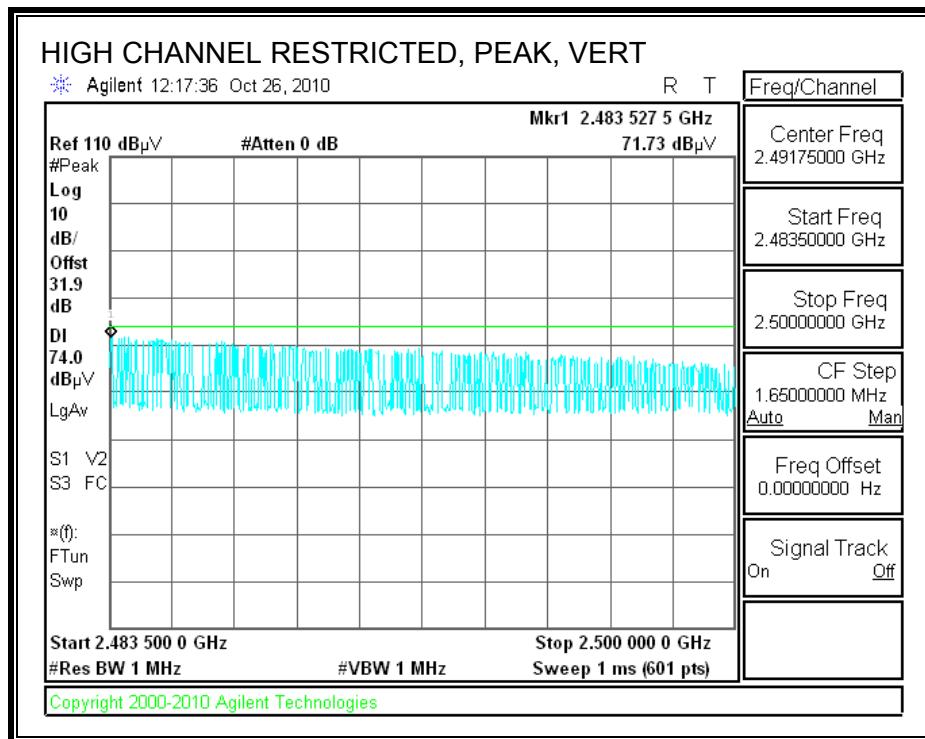
RESTRICTED BANDEDGE (LOW CH CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 10/26/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, b mode

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

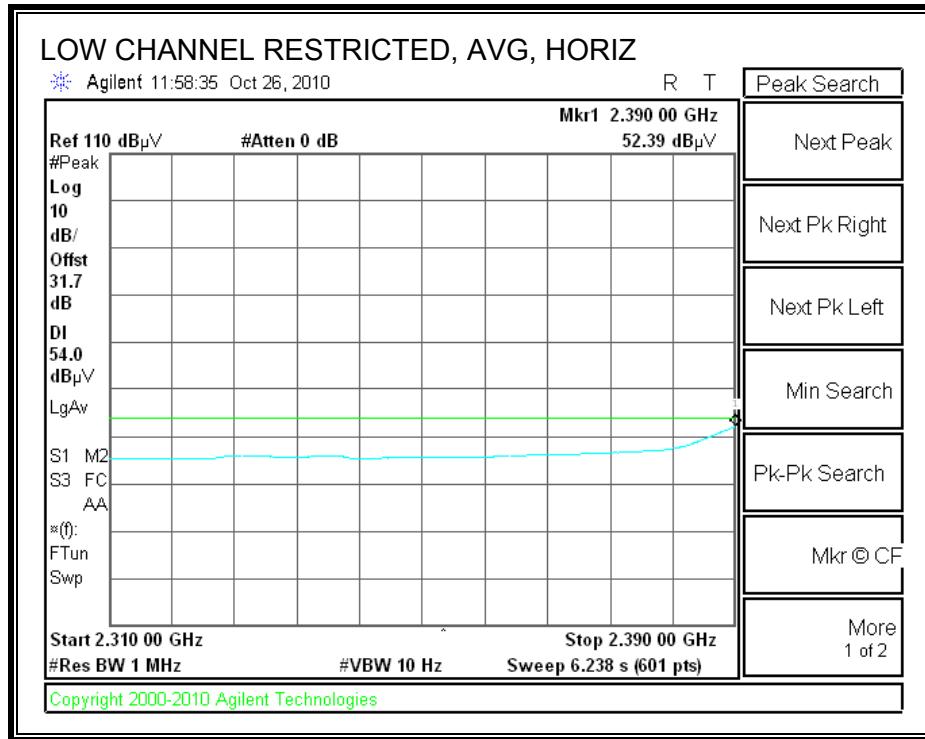
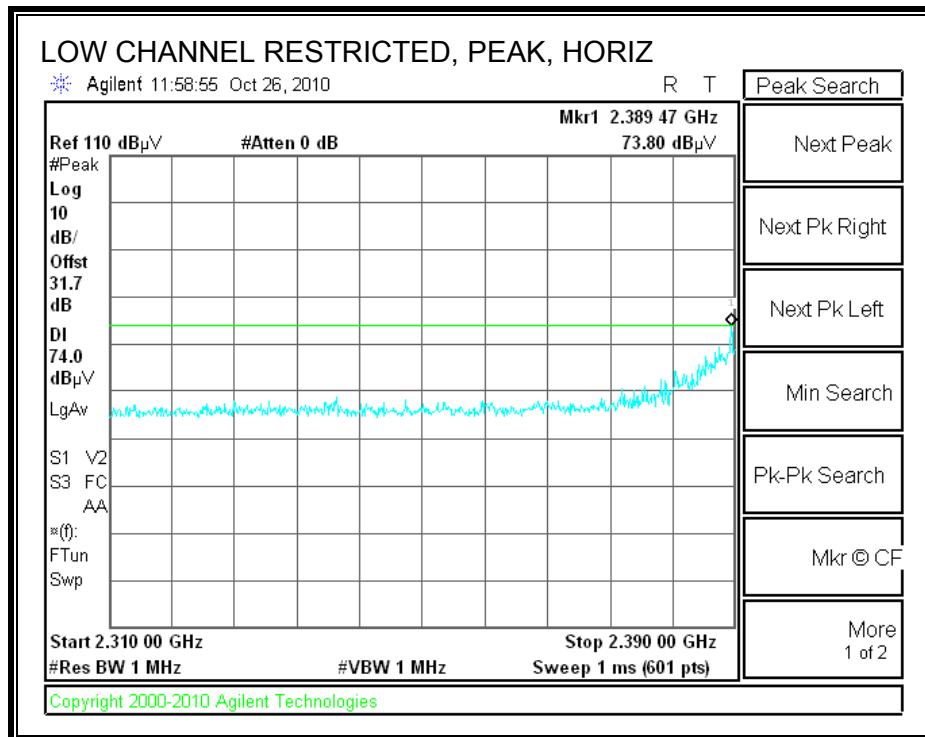
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	52.3	32.8	5.8	-34.8	0.0	0.0	56.1	74.0	-17.9	H	P	
4.824	3.0	42.7	32.8	5.8	-34.8	0.0	0.0	46.5	54.0	-7.5	H	A	
4.824	3.0	54.6	32.8	5.8	-34.8	0.0	0.0	58.3	74.0	-15.7	V	P	
4.824	3.0	37.0	32.8	5.8	-34.8	0.0	0.0	40.7	54.0	-13.3	V	A	
Mid Ch, 2437MHz													
4.874	3.0	49.9	32.8	5.8	-34.9	0.0	0.0	53.7	74.0	-20.3	H	P	
4.874	3.0	31.0	32.8	5.8	-34.9	0.0	0.0	34.8	54.0	-19.2	H	A	
7.311	3.0	36.8	35.2	7.3	-34.7	0.0	0.0	44.6	74.0	-29.4	H	P	
7.311	3.0	25.0	35.2	7.3	-34.7	0.0	0.0	32.8	54.0	-21.2	H	A	
4.874	3.0	54.3	32.8	5.8	-34.9	0.0	0.0	58.1	74.0	-15.9	V	P	
4.874	3.0	38.5	32.8	5.8	-34.9	0.0	0.0	42.3	54.0	-11.7	V	A	
7.311	3.0	37.9	35.2	7.3	-34.7	0.0	0.0	45.7	74.0	-28.3	V	P	
7.311	3.0	25.7	35.2	7.3	-34.7	0.0	0.0	33.5	54.0	-20.5	V	A	
High Ch, 2462MHz													
4.924	3.0	48.7	32.8	5.9	-34.9	0.0	0.0	52.6	74.0	-21.4	H	P	
4.924	3.0	33.6	32.8	5.9	-34.9	0.0	0.0	37.5	54.0	-16.5	H	A	
7.386	3.0	37.8	35.3	7.3	-34.6	0.0	0.0	45.8	74.0	-28.2	H	P	
7.386	3.0	25.5	35.3	7.3	-34.6	0.0	0.0	33.4	54.0	-20.6	H	A	
4.924	3.0	53.5	32.8	5.9	-34.9	0.0	0.0	57.4	74.0	-16.6	V	P	
4.924	3.0	40.9	32.8	5.9	-34.9	0.0	0.0	44.8	54.0	-9.2	V	A	
7.386	3.0	37.4	35.3	7.3	-34.6	0.0	0.0	45.4	74.0	-28.6	V	P	
7.386	3.0	25.1	35.3	7.3	-34.6	0.0	0.0	33.1	54.0	-20.9	V	A	

Rev. 4.1.2.7

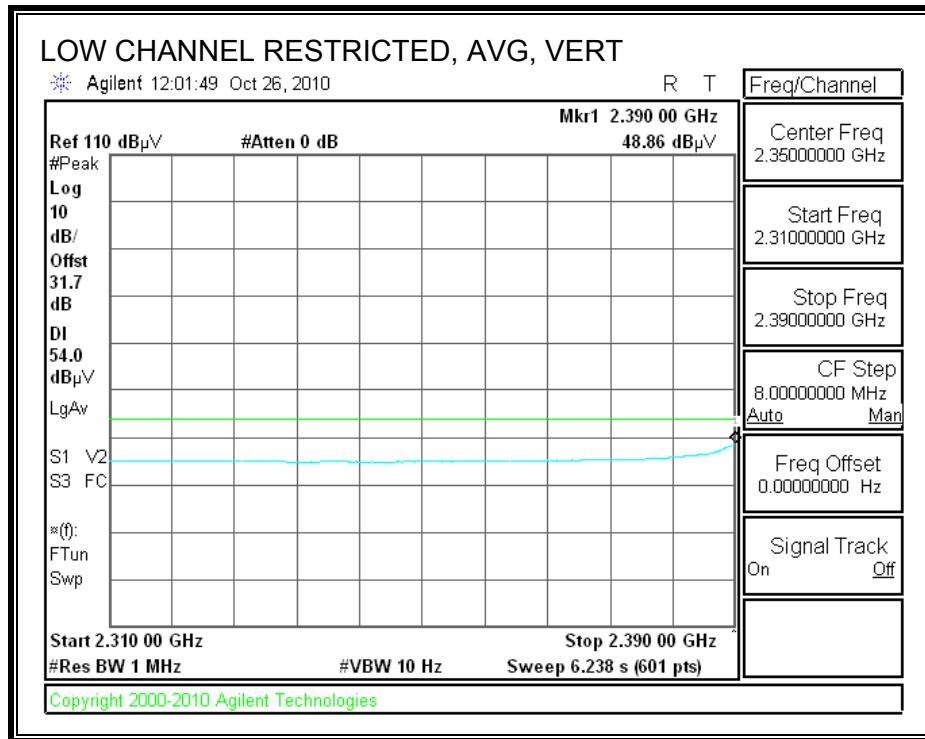
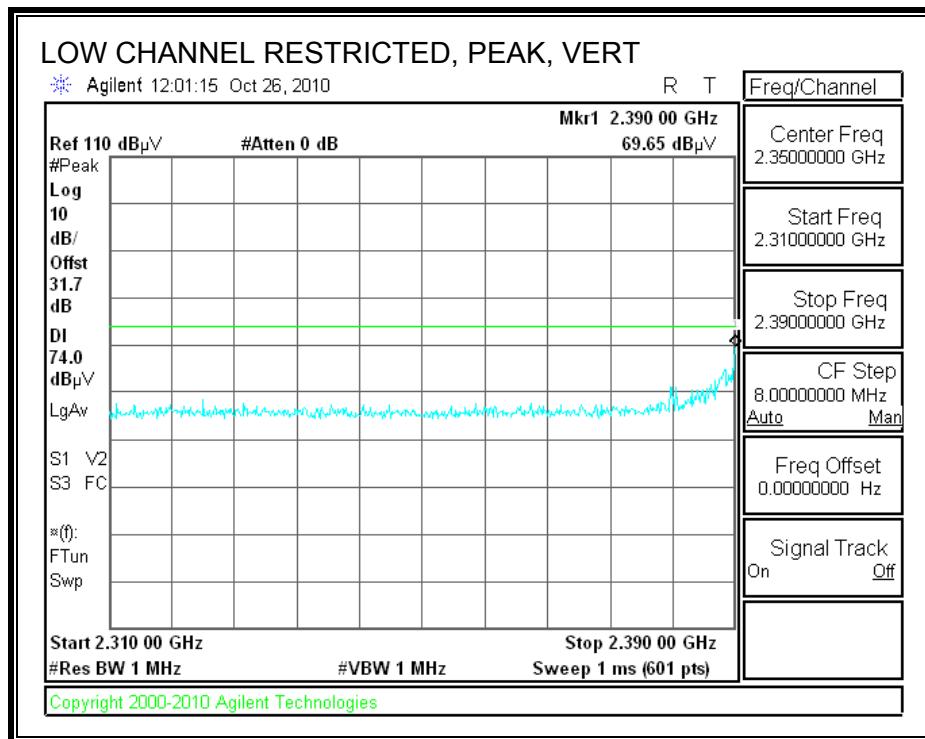
Note: No other emissions were detected above the system noise floor.

8.2.2. 802.11g MODE IN THE 2.4 GHz BAND

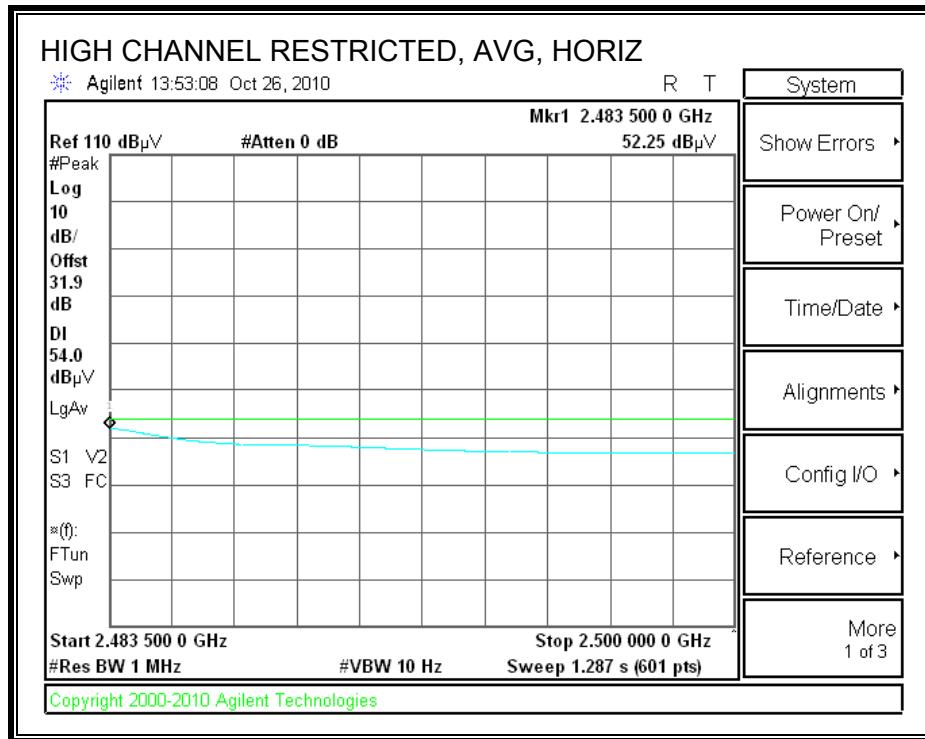
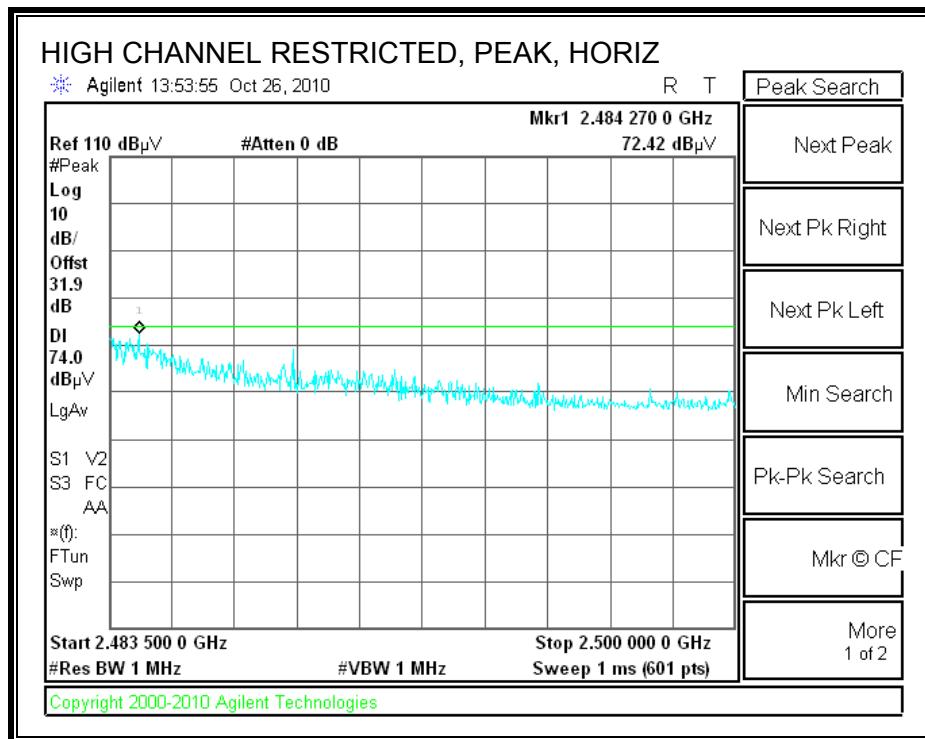
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



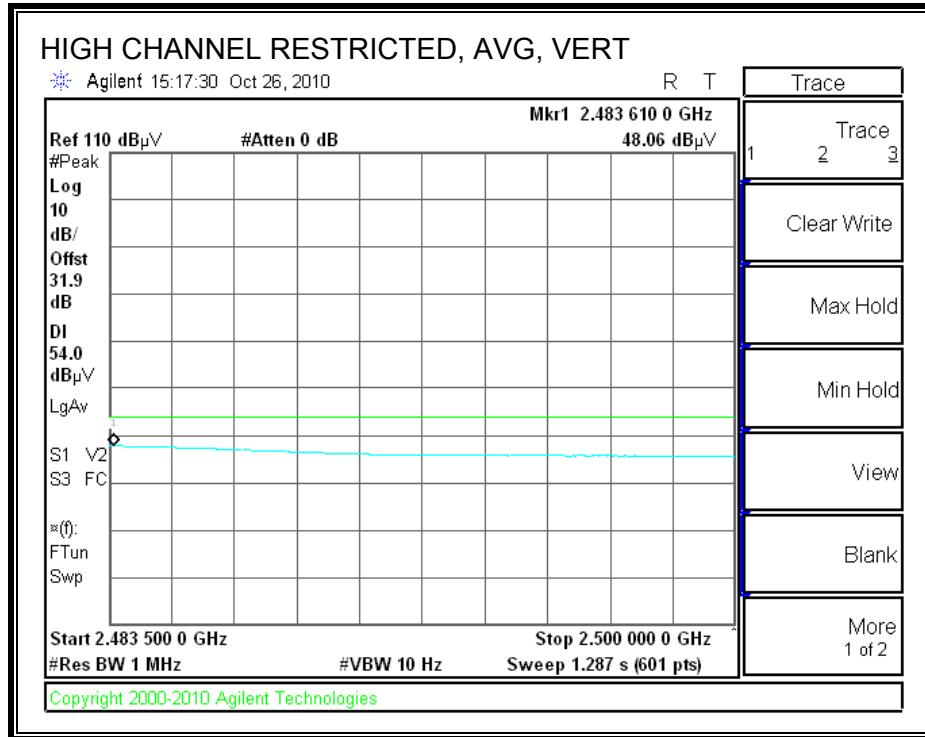
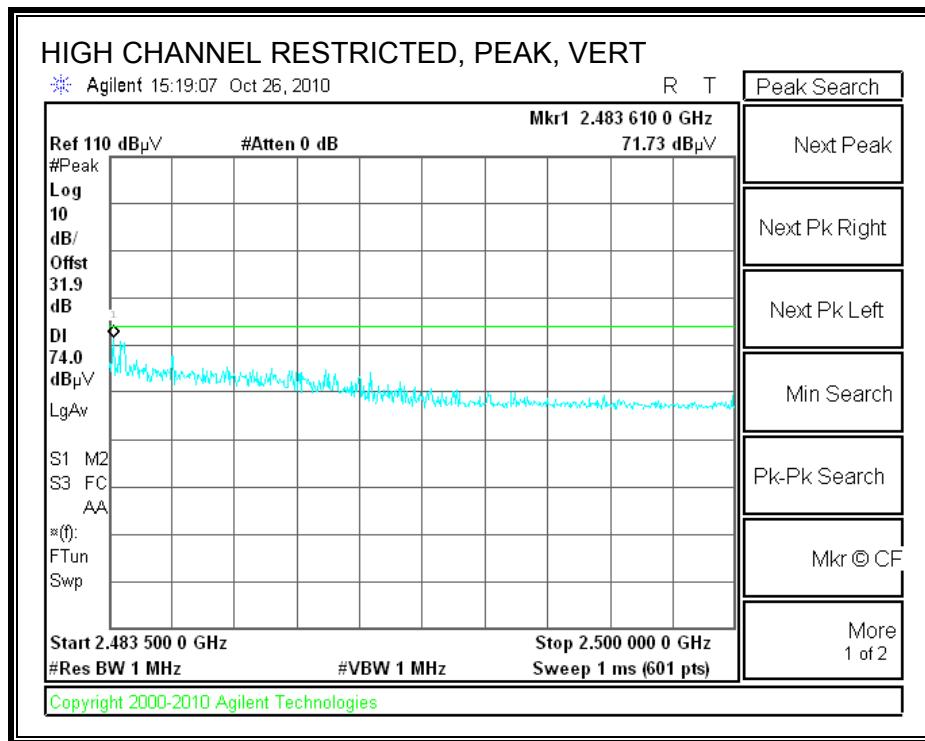
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE HIGH CHANNEL, HORIZONTAL



RESTRICTED BANDEDGE HIGH CHANNEL, VERTICAL



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 10/26/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, g mode

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

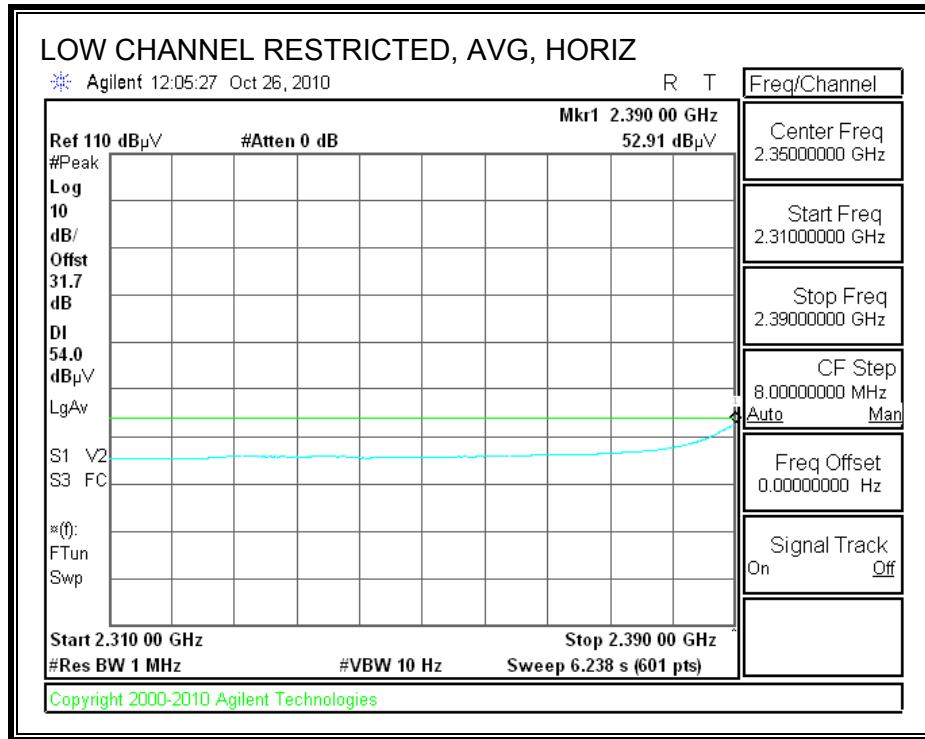
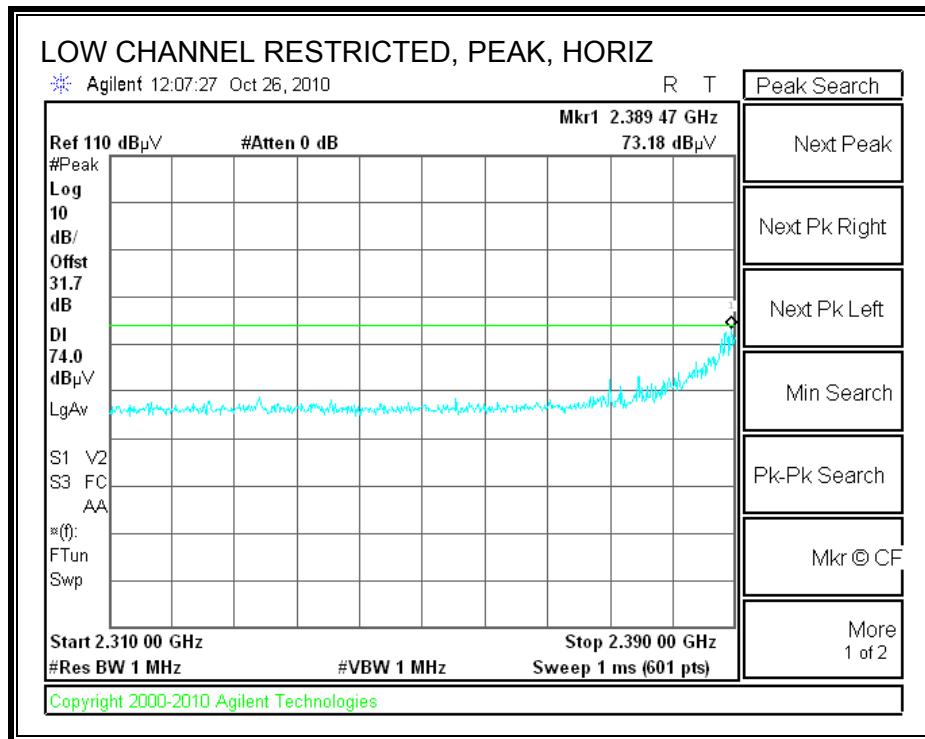
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. V/H	Pol. P/A/QP	Det.	Notes
Low Ch, 2412MHz														
4.824	3.0	51.8	32.8	5.8	-34.8	0.0	0.0	55.5	74.0	-18.5	V	P		
4.824	3.0	38.1	32.8	5.8	-34.8	0.0	0.0	41.8	54.0	-12.2	V	A		
4.824	3.0	46.0	32.8	5.8	-34.8	0.0	0.0	49.8	74.0	-24.2	H	P		
4.824	3.0	32.6	32.8	5.8	-34.8	0.0	0.0	36.3	54.0	-17.7	H	A		
Mid Ch, 2437MHz														
4.874	3.0	51.6	32.8	5.8	-34.9	0.0	0.0	55.4	74.0	-18.6	V	P		
4.874	3.0	37.7	32.8	5.8	-34.9	0.0	0.0	41.5	54.0	-12.5	V	A		
7.311	3.0	38.3	35.2	7.3	-34.7	0.0	0.0	46.1	74.0	-27.9	V	P		
7.311	3.0	25.1	35.2	7.3	-34.7	0.0	0.0	32.9	54.0	-21.1	V	A		
4.874	3.0	47.3	32.8	5.8	-34.9	0.0	0.0	51.1	74.0	-22.9	H	P		
4.874	3.0	34.0	32.8	5.8	-34.9	0.0	0.0	37.8	54.0	-16.2	H	A		
7.311	3.0	37.7	35.2	7.3	-34.7	0.0	0.0	45.5	74.0	-28.5	H	P		
7.311	3.0	25.1	35.2	7.3	-34.7	0.0	0.0	33.0	54.0	-21.0	H	A		
High Ch, 2462MHz														
4.924	3.0	50.6	32.8	5.9	-34.9	0.0	0.0	54.5	74.0	-19.5	V	P		
4.924	3.0	36.2	32.8	5.9	-34.9	0.0	0.0	40.1	54.0	-13.9	V	A		
7.386	3.0	37.5	35.3	7.3	-34.6	0.0	0.0	45.5	74.0	-28.5	V	P		
7.386	3.0	25.3	35.3	7.3	-34.6	0.0	0.0	33.3	54.0	-20.7	V	A		
4.924	3.0	50.3	32.8	5.9	-34.9	0.0	0.0	54.2	74.0	-19.8	H	P		
4.924	3.0	34.9	32.8	5.9	-34.9	0.0	0.0	38.7	54.0	-15.3	H	A		
7.386	3.0	37.5	35.3	7.3	-34.6	0.0	0.0	45.5	74.0	-28.5	H	P		
7.386	3.0	24.9	35.3	7.3	-34.6	0.0	0.0	32.9	54.0	-21.1	H	A		

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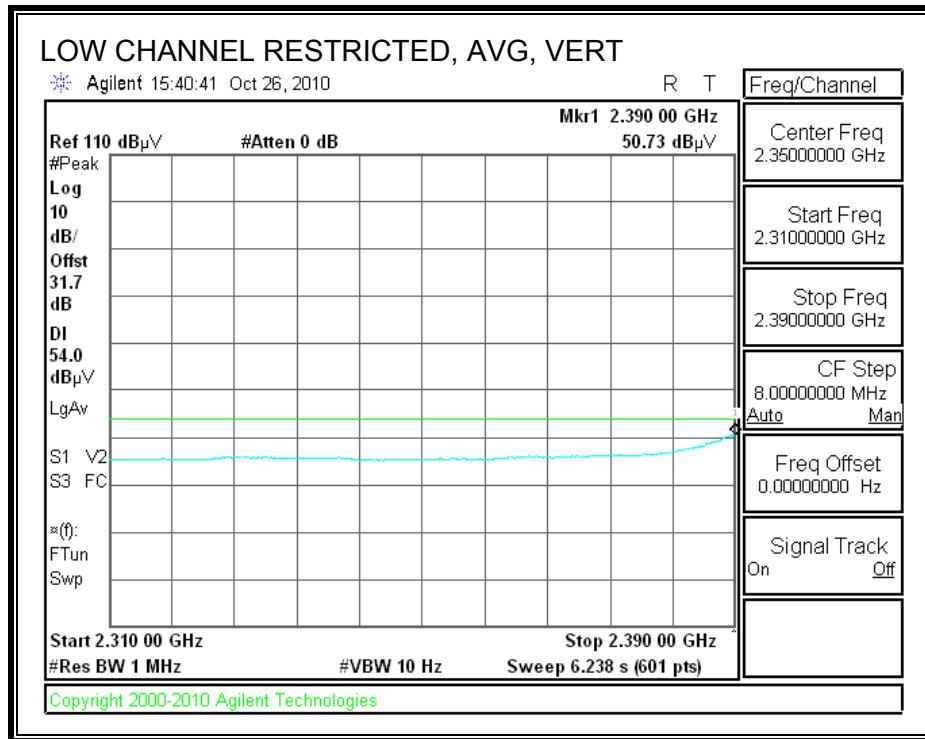
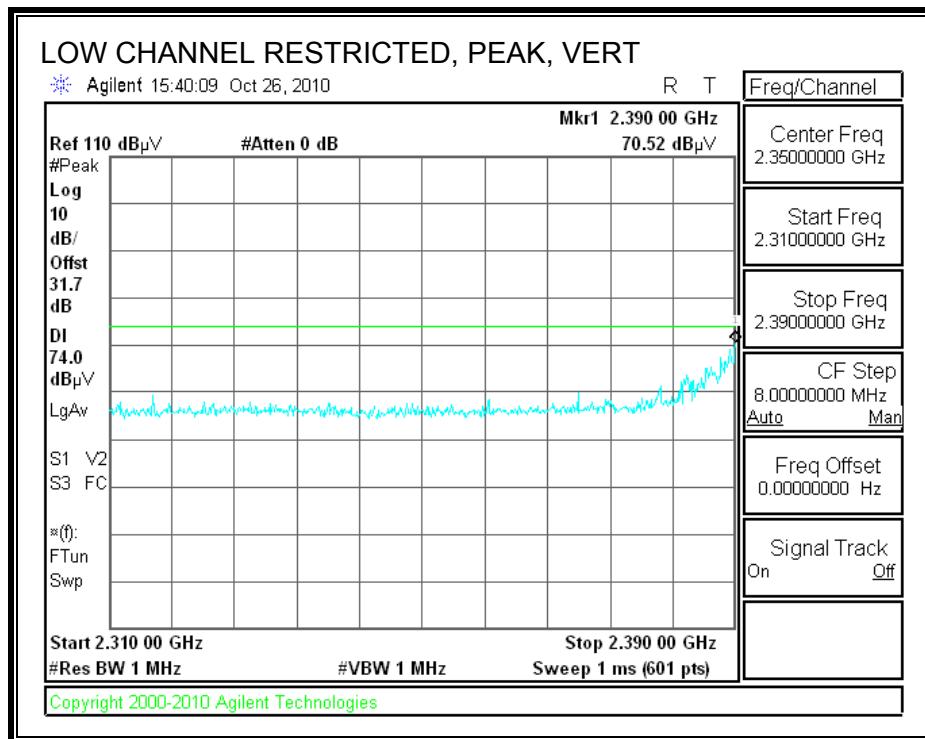
Note: No other emissions were detected above the system noise floor.

8.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

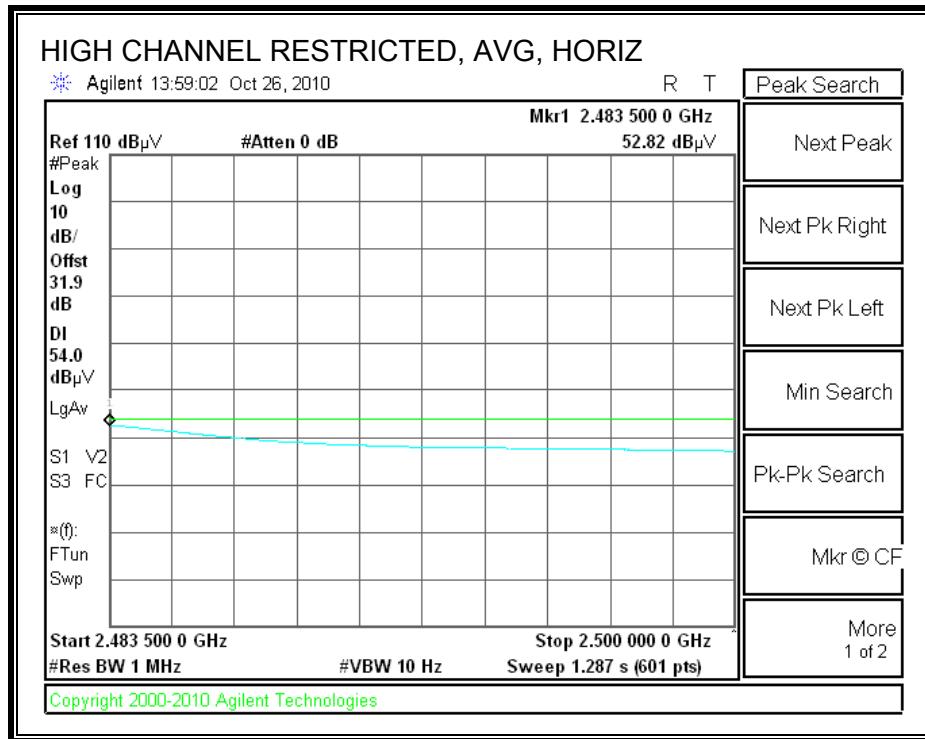
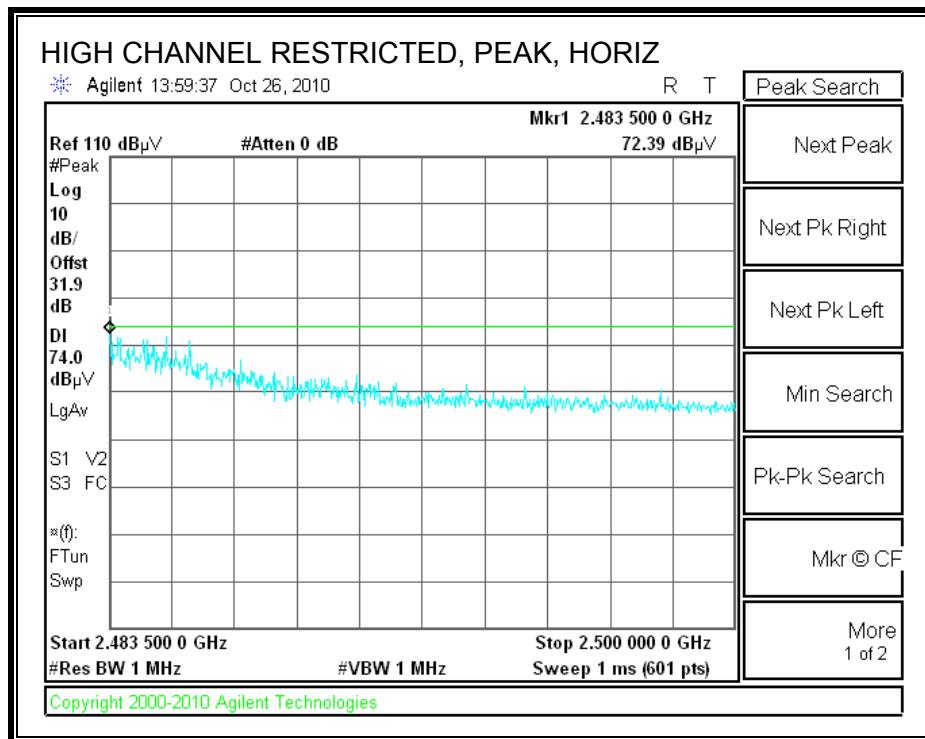
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



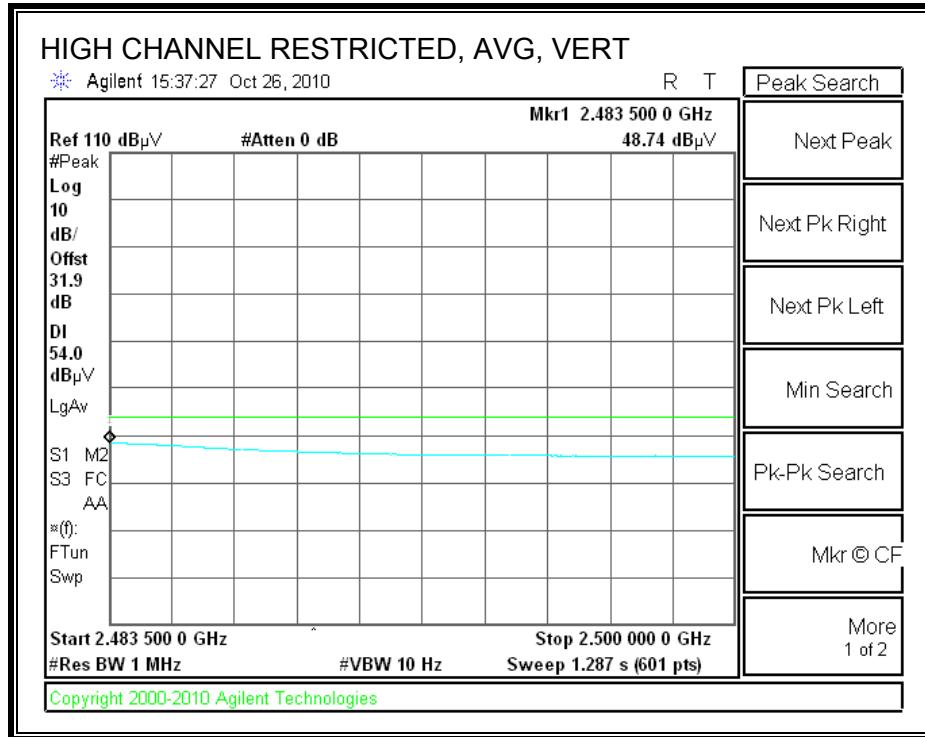
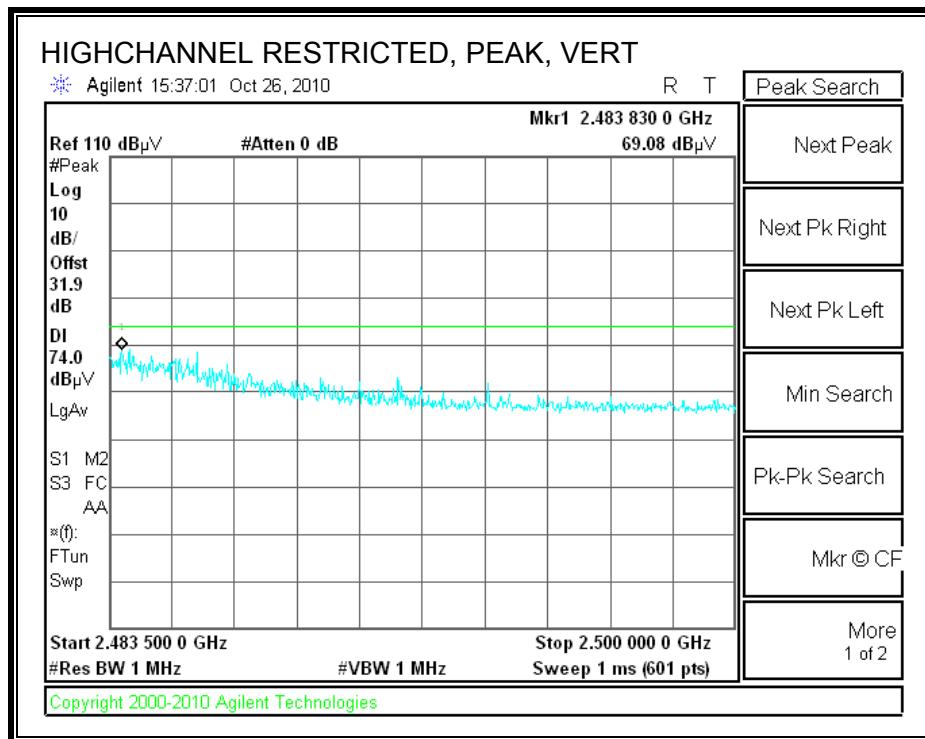
RESTRICTED BANDEDGE LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE HIGH CHANNEL, HORIZONTAL



RESTRICTED BANDEDGE HIGH CHANNEL, VERTICAL



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 10/26/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, HT20 Mode

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	47.7	32.8	5.8	-34.8	0.0	0.0	51.4	74.0	-22.6	H	P	
4.824	3.0	33.6	32.8	5.8	-34.8	0.0	0.0	37.3	54.0	-16.7	H	A	
4.824	3.0	49.4	32.8	5.8	-34.8	0.0	0.0	53.2	74.0	-20.8	V	P	
4.824	3.0	35.3	32.8	5.8	-34.8	0.0	0.0	39.0	54.0	-15.0	V	A	
Mid Ch, 2437MHz													
4.874	3.0	46.3	32.8	5.8	-34.9	0.0	0.0	50.1	74.0	-23.9	H	P	
4.874	3.0	31.8	32.8	5.8	-34.9	0.0	0.0	35.6	54.0	-18.4	H	A	
7.311	3.0	37.5	35.2	7.3	-34.7	0.0	0.0	45.3	74.0	-28.7	H	P	
7.311	3.0	24.8	35.2	7.3	-34.7	0.0	0.0	32.6	54.0	-21.4	H	A	
4.874	3.0	51.2	32.8	5.8	-34.9	0.0	0.0	55.0	74.0	-19.0	V	P	
4.874	3.0	35.6	32.8	5.8	-34.9	0.0	0.0	39.4	54.0	-14.6	V	A	
7.311	3.0	37.5	35.2	7.3	-34.7	0.0	0.0	45.3	74.0	-28.7	V	P	
7.311	3.0	24.9	35.2	7.3	-34.7	0.0	0.0	32.7	54.0	-21.3	V	A	
High Ch, 2462MHz													
4.924	3.0	47.3	32.8	5.9	-34.9	0.0	0.0	51.2	74.0	-22.8	H	P	
4.924	3.0	31.7	32.8	5.9	-34.9	0.0	0.0	35.5	54.0	-18.5	H	A	
7.386	3.0	37.4	35.3	7.3	-34.6	0.0	0.0	45.4	74.0	-28.6	H	P	
7.386	3.0	25.0	35.3	7.3	-34.6	0.0	0.0	33.0	54.0	-21.0	H	A	
4.924	3.0	49.9	32.8	5.9	-34.9	0.0	0.0	53.8	74.0	-20.2	V	P	
4.924	3.0	35.2	32.8	5.9	-34.9	0.0	0.0	39.1	54.0	-14.9	V	A	
7.386	3.0	37.0	35.3	7.3	-34.6	0.0	0.0	45.0	74.0	-29.0	V	P	
7.386	3.0	24.8	35.3	7.3	-34.6	0.0	0.0	32.8	54.0	-21.2	V	A	

Rev. 4.1.2.7

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

8.2.4. 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 10/29/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz Band, Legacy

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
Low Ch, 5745MHz													
11.490	3.0	47.8	38.1	9.5	-33.1	0.0	0.7	63.0	74.0	-11.0	H	P	
11.490	3.0	33.4	38.1	9.5	-33.1	0.0	0.7	48.5	54.0	-5.5	H	A	
11.490	3.0	47.0	38.1	9.5	-33.1	0.0	0.7	62.1	74.0	-11.9	V	P	
11.490	3.0	34.1	38.1	9.5	-33.1	0.0	0.7	49.2	54.0	-4.8	V	A	
Mid Ch, 5785MHz													
11.570	3.0	49.7	38.1	9.5	-33.0	0.0	0.7	65.1	74.0	-8.9	H	P	
11.570	3.0	34.6	38.1	9.5	-33.0	0.0	0.7	50.0	54.0	-4.0	H	A	
11.570	3.0	46.8	38.1	9.5	-33.0	0.0	0.7	62.2	74.0	-11.8	V	P	
11.570	3.0	32.6	38.1	9.5	-33.0	0.0	0.7	47.9	54.0	-6.1	V	A	
High Ch, 5825MHz													
11.650	3.0	48.7	38.2	9.6	-32.9	0.0	0.7	64.3	74.0	-9.7	H	P	
11.650	3.0	34.0	38.2	9.6	-32.9	0.0	0.7	49.5	54.0	-4.5	H	A	
11.650	3.0	46.6	38.2	9.6	-32.9	0.0	0.7	62.2	74.0	-11.8	V	P	
11.650	3.0	32.4	38.2	9.6	-32.9	0.0	0.7	48.0	54.0	-6.0	V	A	

Rev. 4.1.2.7

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

8.2.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin pang
Date: 10/29/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz Band, HT20 Mode

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant Pol V/H	Det. P/A/QP	Notes
Low Ch, 5745MHz													
11.490	3.0	48.3	38.1	9.5	-33.1	0.0	0.7	63.5	74.0	-10.5	H	P	
11.490	3.0	34.2	38.1	9.5	-33.1	0.0	0.7	49.4	54.0	-4.6	H	A	
11.490	3.0	45.9	38.1	9.5	-33.1	0.0	0.7	61.1	74.0	-12.9	V	P	
11.490	3.0	32.2	38.1	9.5	-33.1	0.0	0.7	47.4	54.0	-6.6	V	A	
Mid Ch, 5785MHz													
11.570	3.0	47.0	38.1	9.5	-33.0	0.0	0.7	62.4	74.0	-11.6	H	P	
11.570	3.0	32.9	38.1	9.5	-33.0	0.0	0.7	48.3	54.0	-5.7	H	A	
11.570	3.0	46.8	38.1	9.5	-33.0	0.0	0.7	62.2	74.0	-11.8	V	P	
11.570	3.0	32.2	38.1	9.5	-33.0	0.0	0.7	47.5	54.0	-6.5	V	A	
High Ch, 5825MHz													
11.650	3.0	47.3	38.2	9.6	-32.9	0.0	0.7	62.9	74.0	-11.1	H	P	
11.650	3.0	33.7	38.2	9.6	-32.9	0.0	0.7	49.2	54.0	-4.8	H	A	
11.650	3.0	48.1	38.2	9.6	-32.9	0.0	0.7	63.7	74.0	-10.3	V	P	
11.650	3.0	33.9	38.2	9.6	-32.9	0.0	0.7	49.5	54.0	-4.5	V	A	

Rev. 4.1.2.7

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

8.2.6. 802.11n HT40 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 10/29/10
Project #: 10U13467
Company: Atheros
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz Band, HT40 Mode

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
Low Ch, 5755MHz													
11.510	3.0	44.7	38.1	9.5	-33.1	0.0	0.7	59.9	74.0	-14.1	V	P	
11.510	3.0	30.0	38.1	9.5	-33.1	0.0	0.7	45.2	54.0	-8.8	V	A	
11.510	3.0	43.7	38.1	9.5	-33.1	0.0	0.7	58.9	74.0	-15.1	H	P	
11.510	3.0	30.4	38.1	9.5	-33.1	0.0	0.7	45.6	54.0	-8.4	H	A	
High Ch, 5795MHz													
11.590	3.0	41.5	38.2	9.5	-33.0	0.0	0.7	56.9	74.0	-17.1	V	P	
11.590	3.0	28.1	38.2	9.5	-33.0	0.0	0.7	43.5	54.0	-10.5	V	A	
11.590	3.0	43.5	38.2	9.5	-33.0	0.0	0.7	58.9	74.0	-15.1	H	P	
11.590	3.0	29.7	38.2	9.5	-33.0	0.0	0.7	45.1	54.0	-8.9	H	A	

Rev. 4.1.2.7

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

8.3. RECEIVER ABOVE 1 GHz

8.3.1. FOR 20 MHz BANDWIDTH

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																	
Company: Atheros Project #: 10U13467 Date: 11/18/2010 Test Engineer: Chin Pang Configuration: EUT with Antenna / Laptop Mode: RX mode, 20MHz BW																	
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T59; S/N: 3245 @3m			T145 Agilent 3008A0056									FCC 15.209					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz		
3' cable 22807700			12' cable 22807600			20' cable 22807500									Average Measurements RBW=1MHz; VBW=10Hz		
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
1.193	3.0	53.9	39.8	24.6	2.6	-36.0	0.0	0.0	45.1	31.0	74	54	-28.9	-23.0	H		
2.130	3.0	53.8	35.4	27.8	3.6	-35.3	0.0	0.0	49.9	31.5	74	54	-24.1	-22.5	H		
4.983	3.0	42.5	28.3	32.9	5.9	-34.9	0.0	0.0	46.4	32.2	74	54	-27.6	-21.8	H		
1.193	3.0	54.8	40.7	24.6	2.6	-36.0	0.0	0.0	46.0	31.9	74	54	-28.0	-22.1	V		
2.130	3.0	54.7	35.6	27.8	3.6	-35.3	0.0	0.0	50.8	31.7	74	54	-23.2	-22.3	V		
4.983	3.0	43.0	28.5	32.9	5.9	-34.9	0.0	0.0	46.9	32.4	74	54	-27.1	-21.6	V		
Rev. 07.22.09																	
f	Measurement Frequency			Amp	Preamp Gain						Avg Lim	Average Field Strength Limit					
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters						Pk Lim	Peak Field Strength Limit					
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m						Avg Mar	Margin vs. Average Limit					
AF	Antenna Factor			Peak	Calculated Peak Field Strength						Pk Mar	Margin vs. Peak Limit					
CL	Cable Loss			HPF	High Pass Filter												

8.3.2. FOR 40 MHz BANDWIDTH

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																																																																																																																																																																																																					
<p>Test Engineer: Chin Pang Company: Atheros Project #: 10U13467 Date: 11/12/2010 Configuration: EUT with Antenna /Laptop Mode: RX mode, 40MHz BW</p> <p><u>Test Equipment:</u></p> <table border="1"> <tr> <td>Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td colspan="3">Horn > 18GHz</td> <td>Limit</td> </tr> <tr> <td>T59; S/N: 3245 @3m</td> <td>T145 Agilent 3008A0056</td> <td></td> <td colspan="3"></td> <td>FCC 15.209</td> </tr> <tr> <td colspan="7">Hi Frequency Cables</td> </tr> <tr> <td>3' cable 22807700</td> <td>12' cable 22807600</td> <td>20' cable 22807500</td> <td colspan="3">HPF</td> <td>Reject Filter</td> <td colspan="3">Peak Measurements RBW=VBW=1MHz</td> </tr> <tr> <td>3' cable 22807700</td> <td>12' cable 22807600</td> <td>20' cable 22807500</td> <td colspan="3"></td> <td></td> <td colspan="3">Average Measurements RBW=1MHz ; VBW=10Hz</td> </tr> <tr> <th>f GHz</th> <th>Dist (m)</th> <th>Read Pk dBuV</th> <th>Read Avg. dBuV</th> <th>AF</th> <th>CL</th> <th>Amp dB</th> <th>D Corr dB</th> <th>Fltr dB</th> <th>Peak dBuV/m</th> <th>Avg dBuV/m</th> <th>Pk Lim dBuV/m</th> <th>Avg Lim dBuV/m</th> <th>Pk Mar dB</th> <th>Avg Mar dB</th> <th>Notes (V/H)</th> </tr> <tr> <td>1.297</td> <td>3.0</td> <td>52.0</td> <td>35.7</td> <td>25.0</td> <td>2.7</td> <td>-35.9</td> <td>0.0</td> <td>0.0</td> <td>43.8</td> <td>27.5</td> <td>74</td> <td>54</td> <td>-30.2</td> <td>-26.5</td> <td>H</td> </tr> <tr> <td>2.127</td> <td>3.0</td> <td>56.0</td> <td>37.0</td> <td>27.8</td> <td>3.6</td> <td>-35.3</td> <td>0.0</td> <td>0.0</td> <td>52.1</td> <td>33.1</td> <td>74</td> <td>54</td> <td>-21.9</td> <td>-20.9</td> <td>H</td> </tr> <tr> <td>4.995</td> <td>3.0</td> <td>45.0</td> <td>30.0</td> <td>32.9</td> <td>5.9</td> <td>-34.9</td> <td>0.0</td> <td>0.0</td> <td>49.0</td> <td>34.0</td> <td>74</td> <td>54</td> <td>-25.0</td> <td>-20.0</td> <td>H</td> </tr> <tr> <td>1.193</td> <td>3.0</td> <td>54.5</td> <td>36.0</td> <td>24.6</td> <td>2.6</td> <td>-36.0</td> <td>0.0</td> <td>0.0</td> <td>45.7</td> <td>27.2</td> <td>74</td> <td>54</td> <td>-28.3</td> <td>-26.8</td> <td>V</td> </tr> <tr> <td>2.127</td> <td>3.0</td> <td>55.0</td> <td>36.5</td> <td>27.8</td> <td>3.6</td> <td>-35.3</td> <td>0.0</td> <td>0.0</td> <td>51.1</td> <td>32.6</td> <td>74</td> <td>54</td> <td>-22.9</td> <td>-21.4</td> <td>V</td> </tr> <tr> <td>4.995</td> <td>3.0</td> <td>43.7</td> <td>28.6</td> <td>32.9</td> <td>5.9</td> <td>-34.9</td> <td>0.0</td> <td>0.0</td> <td>47.7</td> <td>32.6</td> <td>74</td> <td>54</td> <td>-26.3</td> <td>-21.4</td> <td>V</td> </tr> <tr> <td colspan="15">Rev. 07.22.09 Note: No other emissions were detected above the system noise floor.</td> </tr> <tr> <td colspan="5"> f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss </td> <td colspan="5"> Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter </td> <td colspan="5"> Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit </td> </tr> </table>															Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz			Limit	T59; S/N: 3245 @3m	T145 Agilent 3008A0056					FCC 15.209	Hi Frequency Cables							3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF			Reject Filter	Peak Measurements RBW=VBW=1MHz			3' cable 22807700	12' cable 22807600	20' cable 22807500					Average Measurements RBW=1MHz ; VBW=10Hz			f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF	CL	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	1.297	3.0	52.0	35.7	25.0	2.7	-35.9	0.0	0.0	43.8	27.5	74	54	-30.2	-26.5	H	2.127	3.0	56.0	37.0	27.8	3.6	-35.3	0.0	0.0	52.1	33.1	74	54	-21.9	-20.9	H	4.995	3.0	45.0	30.0	32.9	5.9	-34.9	0.0	0.0	49.0	34.0	74	54	-25.0	-20.0	H	1.193	3.0	54.5	36.0	24.6	2.6	-36.0	0.0	0.0	45.7	27.2	74	54	-28.3	-26.8	V	2.127	3.0	55.0	36.5	27.8	3.6	-35.3	0.0	0.0	51.1	32.6	74	54	-22.9	-21.4	V	4.995	3.0	43.7	28.6	32.9	5.9	-34.9	0.0	0.0	47.7	32.6	74	54	-26.3	-21.4	V	Rev. 07.22.09 Note: No other emissions were detected above the system noise floor.															f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss					Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter					Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit				
Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz			Limit																																																																																																																																																																																															
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f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF	CL	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																																																																																																																																																																																						
1.297	3.0	52.0	35.7	25.0	2.7	-35.9	0.0	0.0	43.8	27.5	74	54	-30.2	-26.5	H																																																																																																																																																																																						
2.127	3.0	56.0	37.0	27.8	3.6	-35.3	0.0	0.0	52.1	33.1	74	54	-21.9	-20.9	H																																																																																																																																																																																						
4.995	3.0	45.0	30.0	32.9	5.9	-34.9	0.0	0.0	49.0	34.0	74	54	-25.0	-20.0	H																																																																																																																																																																																						
1.193	3.0	54.5	36.0	24.6	2.6	-36.0	0.0	0.0	45.7	27.2	74	54	-28.3	-26.8	V																																																																																																																																																																																						
2.127	3.0	55.0	36.5	27.8	3.6	-35.3	0.0	0.0	51.1	32.6	74	54	-22.9	-21.4	V																																																																																																																																																																																						
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8.4. WORST-CASE BELOW 1 GHz

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

30-1000MHz Frequency Measurement Compliance Certification Services, Fremont 5m Chamber													
f	Measurement Frequency	Amp	Preamp Gain			Margin	Margin vs. Limit						
Dist	Distance to Antenna	D	Corr	Distance	Correct to 3 meters								
Read	Analyzer Reading	Filter		Filter	Insert Loss								
AF	Antenna Factor	Corr.		Calculated	Field Strength								
CL	Cable Loss	Limit		Field	Strength Limit								
horiz 2.4													
150.485	3.0	49.0	12.5	1.1	29.3	0.0	0.0	33.3	40.0	-6.7	H	P	
192.007	3.0	48.7	11.4	1.2	29.0	0.0	0.0	32.3	40.0	-7.7	H	P	
216.008	3.0	38.5	11.9	1.3	28.9	0.0	0.0	22.9	40.0	-17.1	H	P	
432.017	3.0	39.1	15.6	2.0	29.4	0.0	0.0	27.2	47.0	-19.8	H	P	
56.401	3.0	53.5	7.9	0.6	29.6	0.0	0.0	32.4	40.0	-7.6	V	P	
152.285	3.0	41.6	12.2	1.1	29.3	0.0	0.0	25.6	40.0	-14.4	V	P	
192.007	3.0	43.3	11.4	1.2	29.0	0.0	0.0	26.9	40.0	-13.1	V	P	
432.017	3.0	40.1	15.6	2.0	29.4	0.0	0.0	28.3	47.0	-18.7	V	P	

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

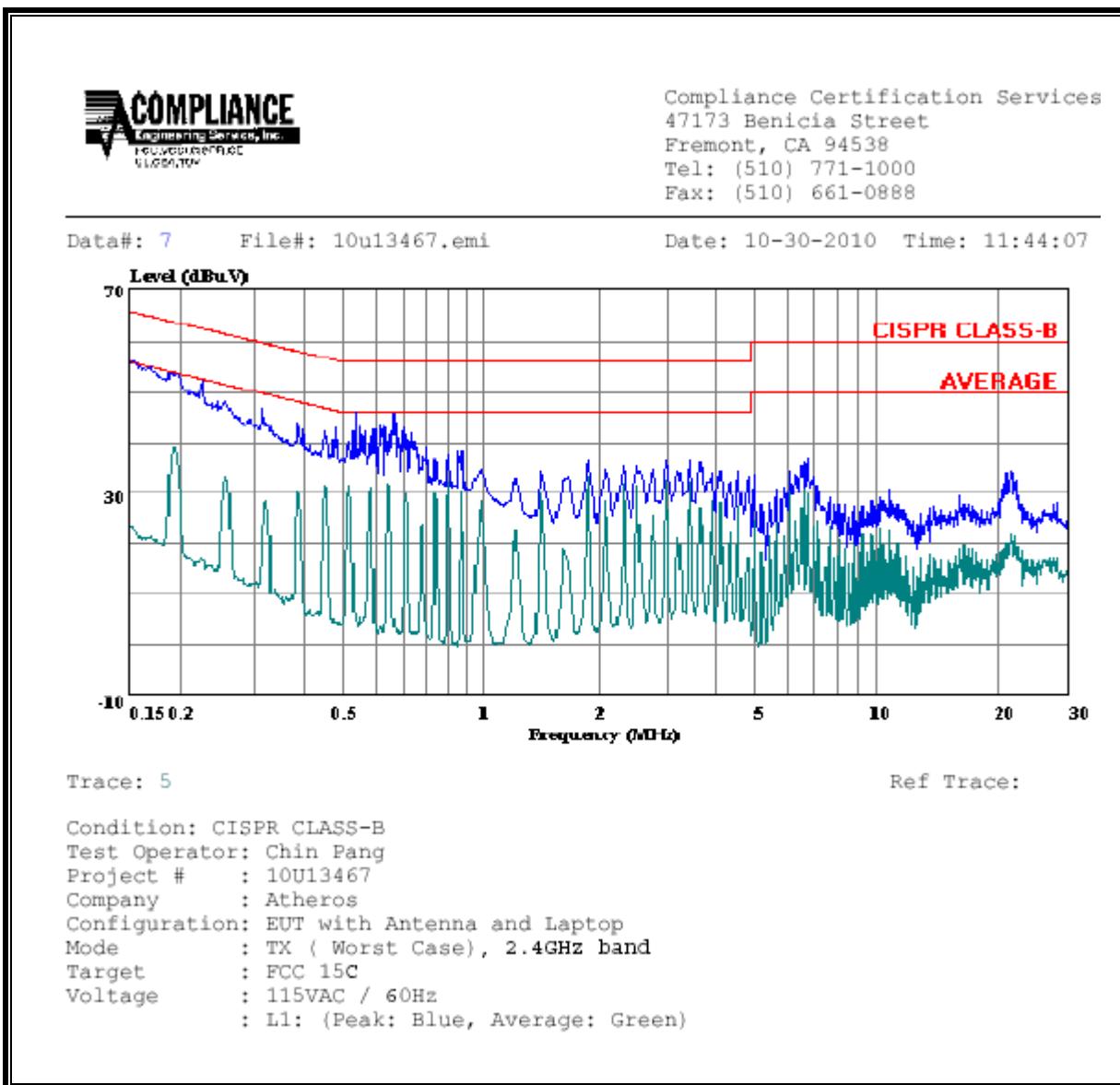
ANSI C63.4

RESULTS

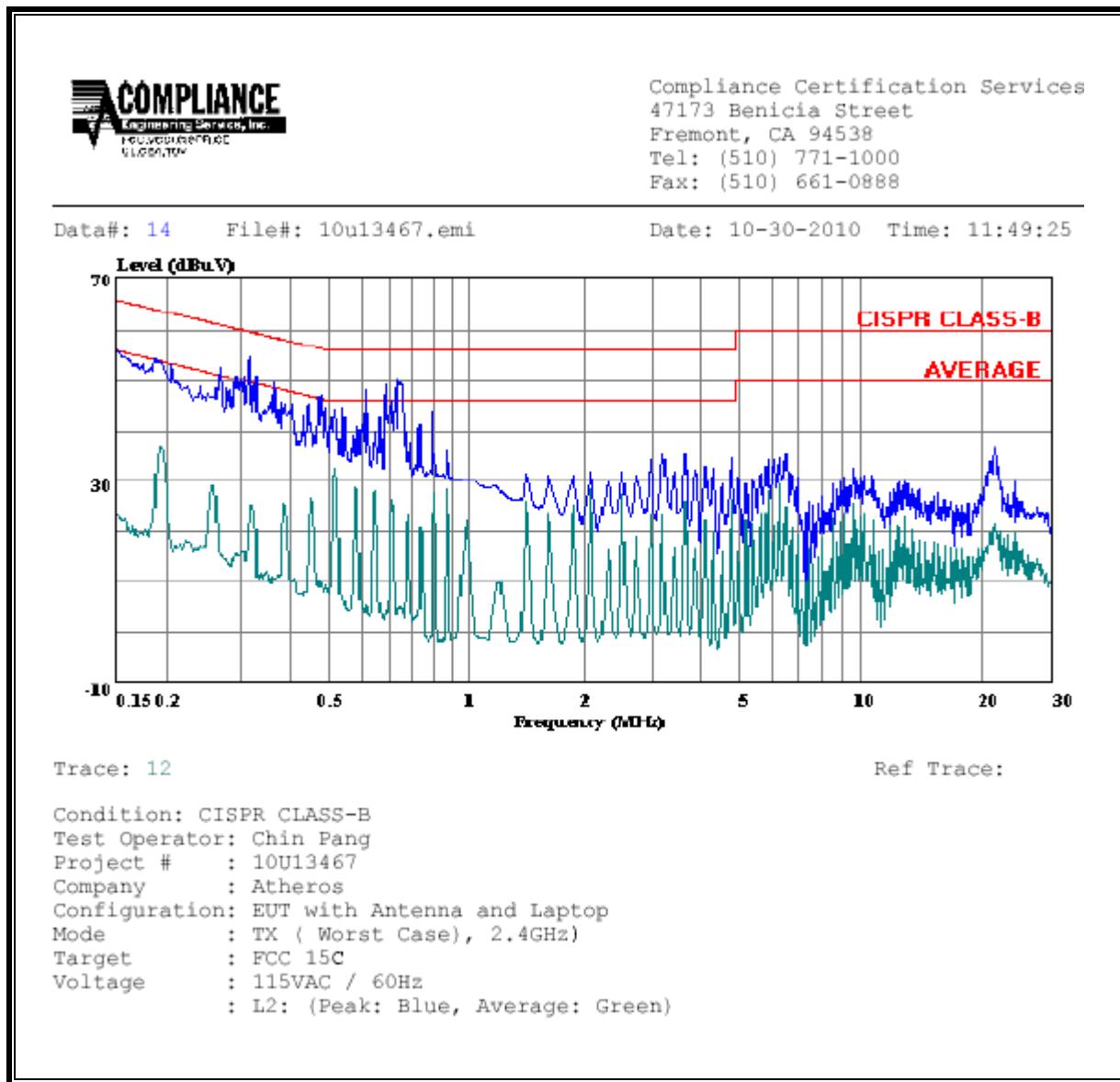
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN_B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.19	53.75	--	38.90	0.00	63.91	53.91	-10.16	-15.01	L1
0.65	45.93	--	31.46	0.00	56.00	46.00	-10.07	-14.54	L1
1.99	36.33	--	33.31	0.00	56.00	46.00	-19.67	-12.69	L1
0.19	54.11	--	36.74	0.00	63.91	53.91	-9.80	-17.17	L2
0.52	50.23	--	32.60	0.00	56.00	46.00	-5.77	-13.40	L2
2.19	31.87	--	28.33	0.00	56.00	46.00	-24.13	-17.67	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS



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/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μ T) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band (MHz)	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m ²)	FCC Power Density (mW/cm ²)
2400 to 2483.5 MHz Authorized Band						
2412 - 2462	b-mode	0.20	23.46	8.76	3.32	0.332
2412 - 2462	g-mode	0.20	23.57	8.76	3.40	0.340
2412 - 2462	HT20	0.20	23.85	8.76	3.63	0.363
5725 to 5850 MHz Authorized Band						
5745 - 5825	a-mode Legacy	0.20	21.59	9.08	2.32	0.232
5745 - 5825	HT20	0.20	21.78	9.08	2.43	0.243
5755 - 5795	HT40	0.20	21.03	9.08	2.04	0.204