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

CERTIFICATION TEST REPORT

FOR

802.11agn WLAN + BLUETOOTH PCI-E MINICARD

MODEL NUMBER: BCM943224PCIEBT2

FCC ID: QDS-BRCM1052
IC: 4324A-BRCM1052

REPORT NUMBER: 10U13263-1, Revision A

ISSUE DATE: AUGUST 20, 2010

Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	08/02/10	Initial Issue	T. Chan
A	08/20/10	Corrected Typos	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11agn WLAN + Bluetooth PCI-E Minicard

MODEL: BCM943224PCIEBT2

SERIAL NUMBER: 489

DATE TESTED: JUNE 17-24, 2010

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

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

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

Approved & Released For CCS By:

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ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11agn WLAN + Bluetooth PCI-E Minicard.
The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

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

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
2412 - 2462	802.11b Legacy			23.00	199.53
2412 - 2462	802.11g Legacy			24.20	263.03
2412 - 2462	802.11n 20MHz SISO	Covered by the worst case 802.11g Mode Legacy testing			
2412 - 2462	802.11g CDD	Covered by the worst case 802.11n 20MHz CDD			
2412 - 2462	802.11n 20MHz CDD	23.26	23.525	26.40	436.90

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5745 - 5825	802.11a Legacy			22.00	158.49
5745 - 5825	802.11n 20MHz SISO	Covered by the worst case 802.11a Mode Legacy testing			
5745 - 5825	802.11a Mode CDD	Covered by the worst case 802.11n 20MHz CDD			
5745 - 5825	802.11n 20MHz CDD	21.40	21.37	24.40	275.13
5755 - 5795	802.11n 40MHz SISO			22.60	181.97
5755 - 5795	802.11n 40MHz CDD	21.20	20.40	23.83	241.47

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.10.131.31
The test utility software used during testing was BCM Internal, rev. 5.10.RC131.31

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 6 Mb/s.
All final tests in the 802.11n Mode (20 MHz CDD/SDM) were made at MCS0.

For 5.8GHz Band:
All final tests in the 802.11a Mode (Legacy) were made at 6 Mb/s.
All final tests in the 802.11n Mode (20 MHz CDD/SDM) were made at MCS0
All final tests in the 802.11n Mode (40 MHz SISO) were made at MCS0
All final tests in the 802.11n Mode (40 MHz CDD/SDM) 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 11n HT20 mode, mid channel..

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

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

All legacy/SISO modes were measured with the highest gain for each type of antenna.

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

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

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

	System 16 WiFi 1 (Main) Short Cable	System 16 WiFi 2 (Aux.) Long Cable			System 99 WiFi 1 (Main) Short Cable	System 99 WiFi 2 (Aux.) Long Cable	
GHz	Horizontal	Horizontal	combined log	GHz	Horizontal	Horizontal	combined log
2.4	1.67	**5.98**	7.35	2.4	4.97	4.87	**7.93**
5.2	**5.93**	5.75	8.85	5.5	5.77	**6.61**	**9.22**
5.3	**6.12**	5.57	8.86	5.8	4.90	**6.28**	**8.65**

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	4446	R8-CAD03	DoC
AC Adapter	Lenovo	ADP-65YBB	11S42T4458Z1ZF4K96B09D	DoC

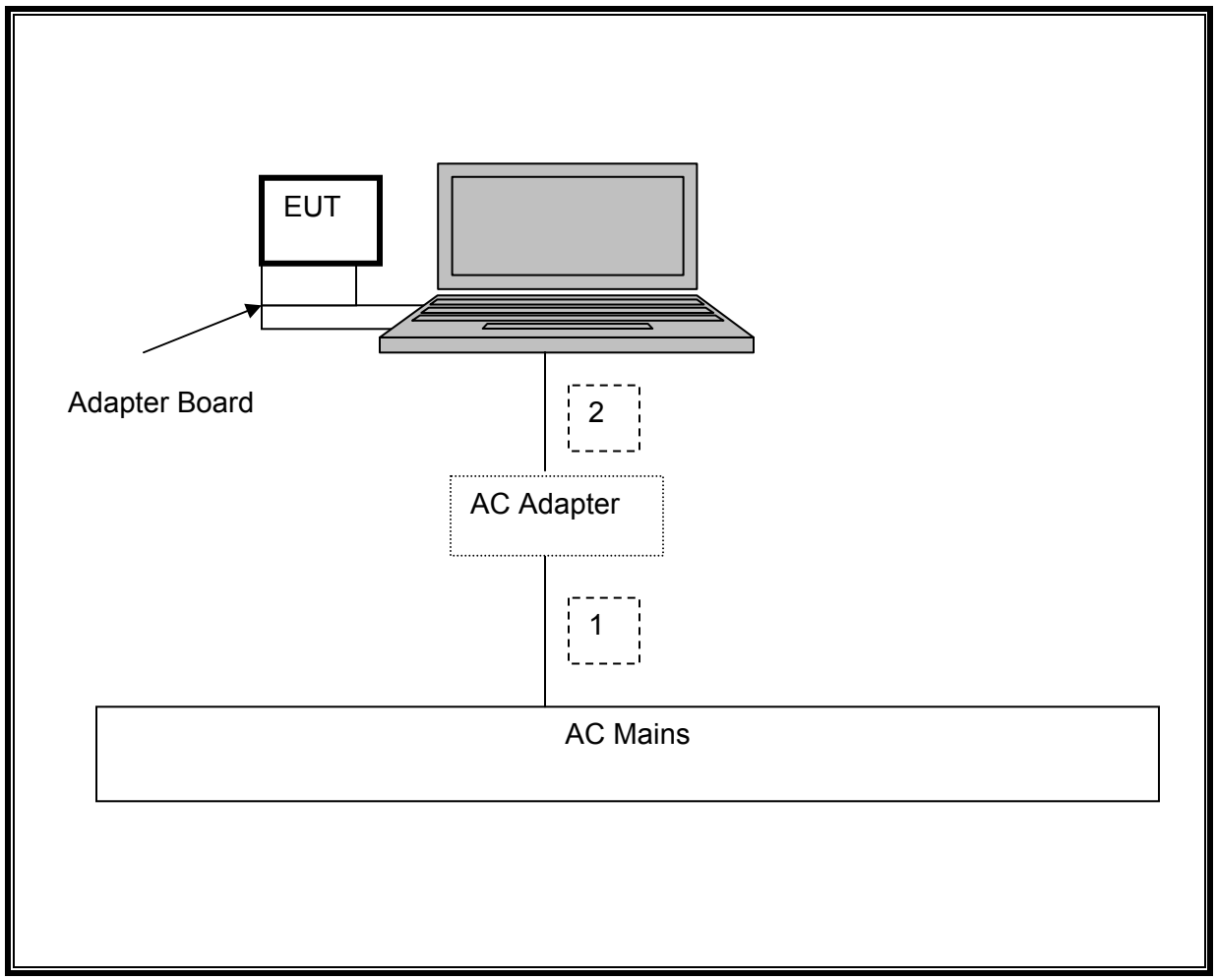
I/O CABLES

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

TEST SETUP

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

SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	04/29/10	10/29/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	08/24/09	08/24/10
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	01/14/09	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	01/29/09	07/29/10
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	01/29/09	07/29/10
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	02/04/09	08/04/10
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	02/03/09	08/03/10
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	11/06/10
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.

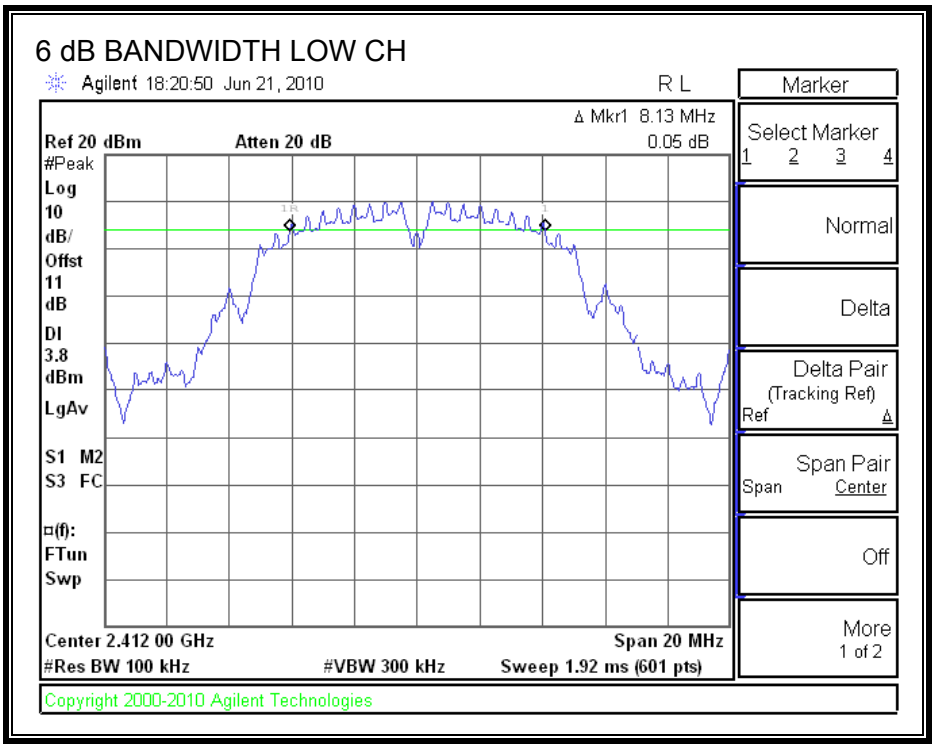
TEST PROCEDURE

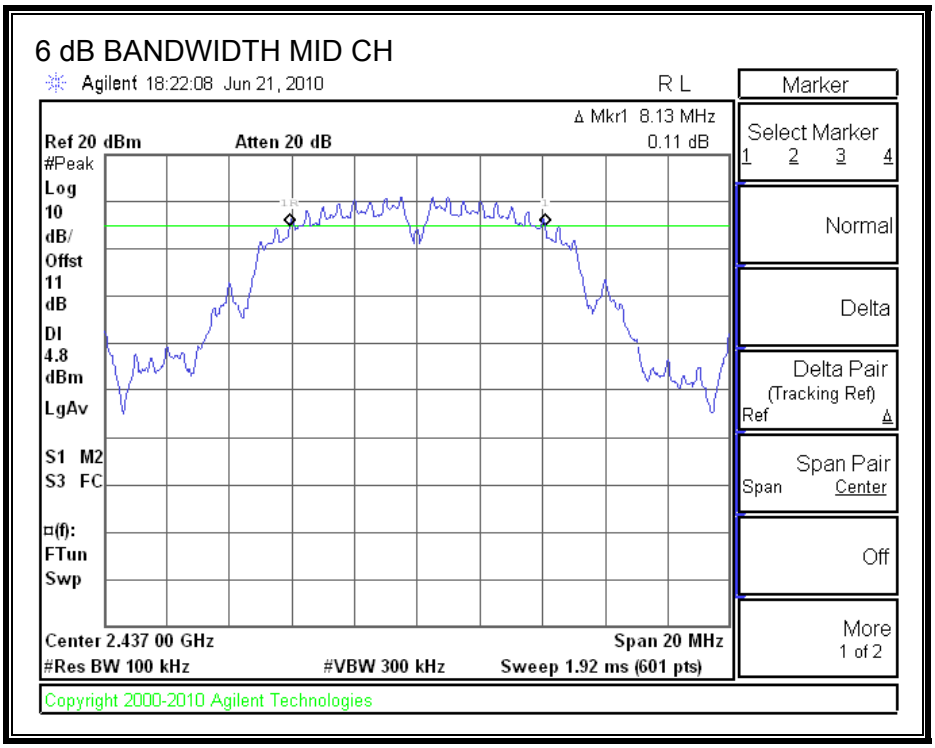
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

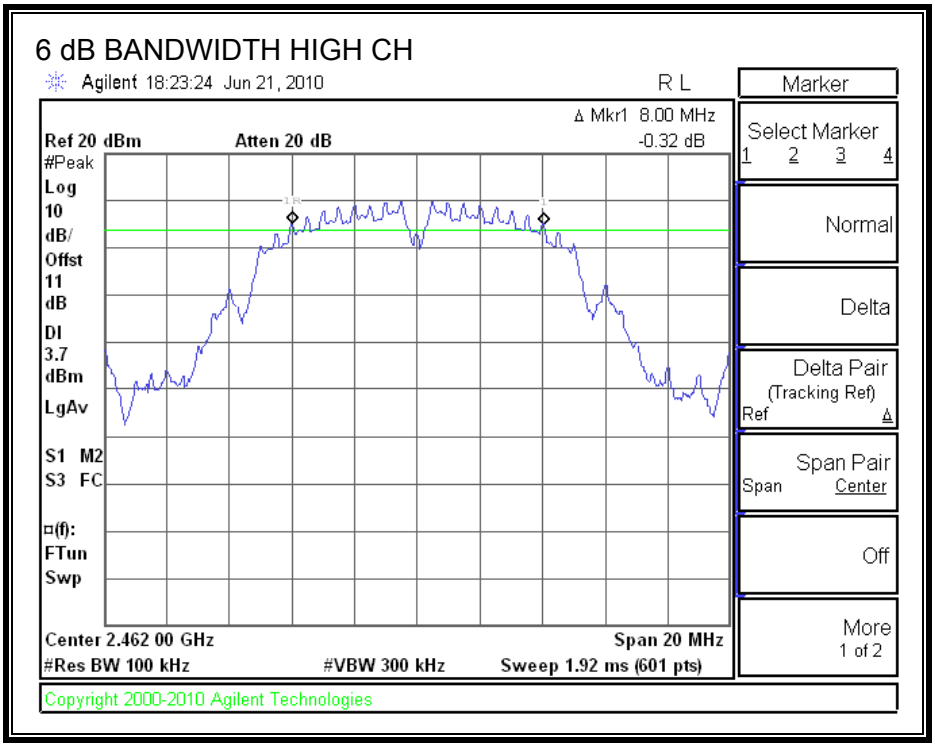
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.13	0.5
Middle	2437	8.13	0.5
High	2462	8.00	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

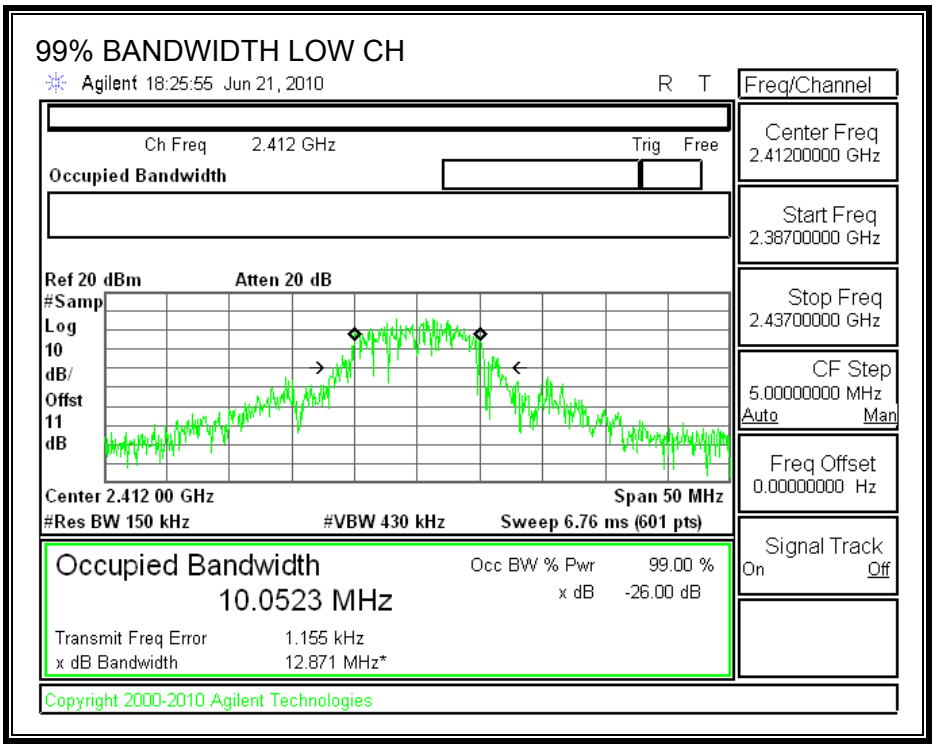
TEST PROCEDURE

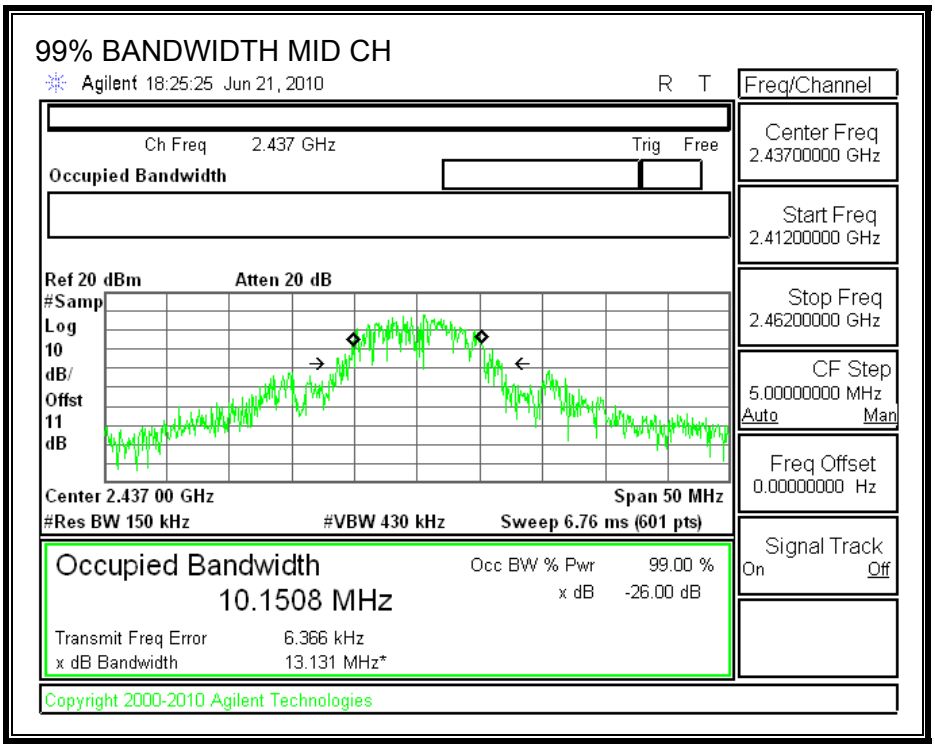
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

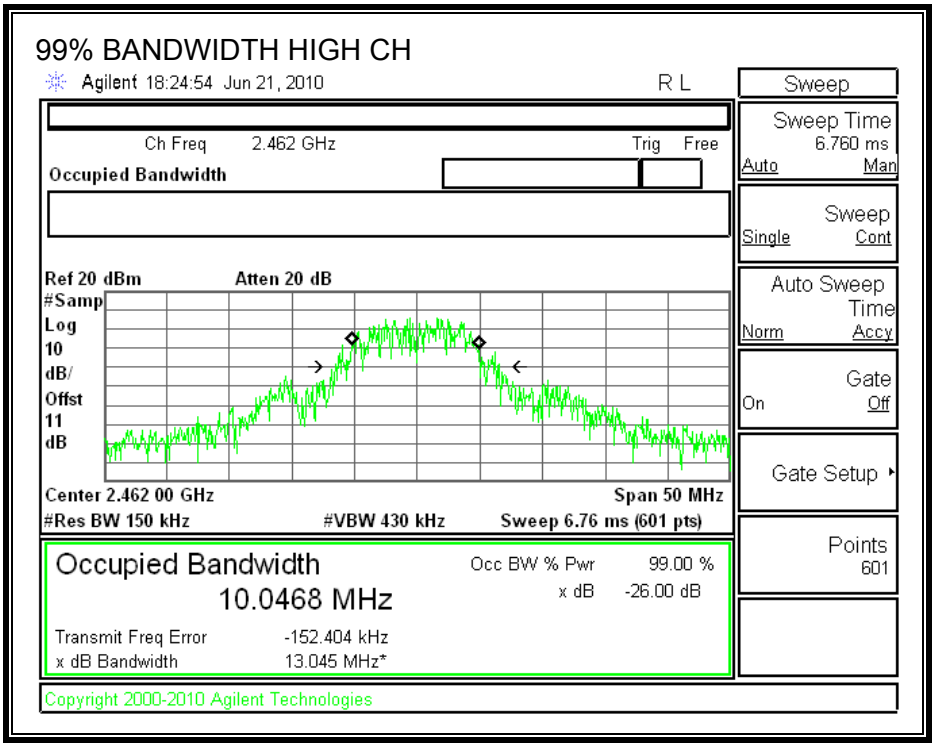
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	10.0523
Middle	2437	10.1508
High	2462	10.0468

99% BANDWIDTH







7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Peak Power Meter Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	21.80	30	-8.20
Middle	2437	23.00	30	-7.00
High	2462	21.50	30	-8.50

7.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

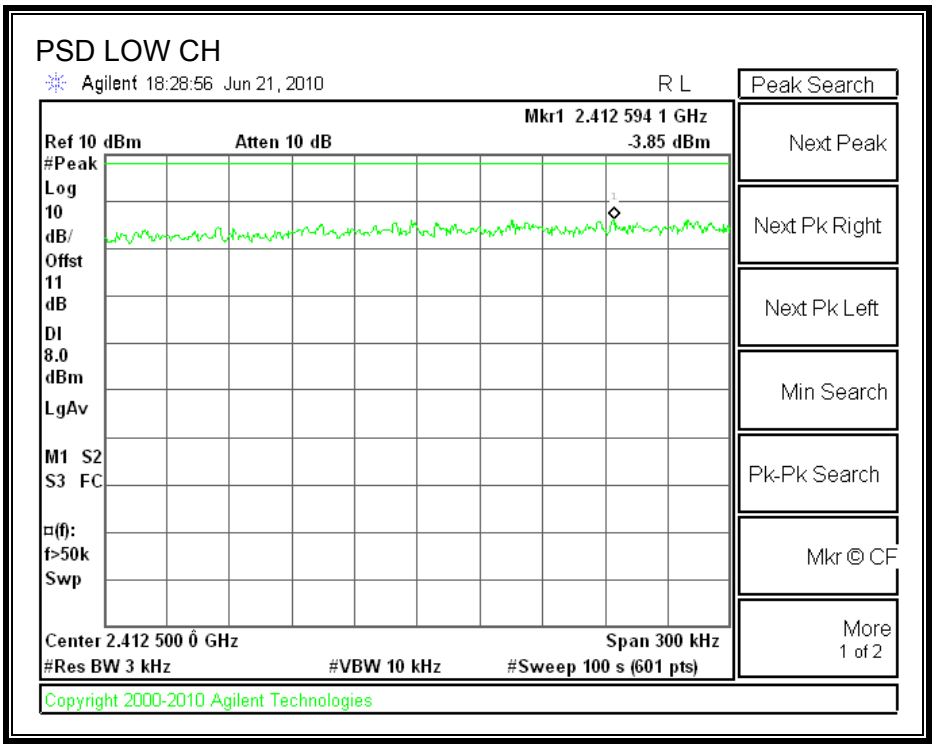
TEST PROCEDURE

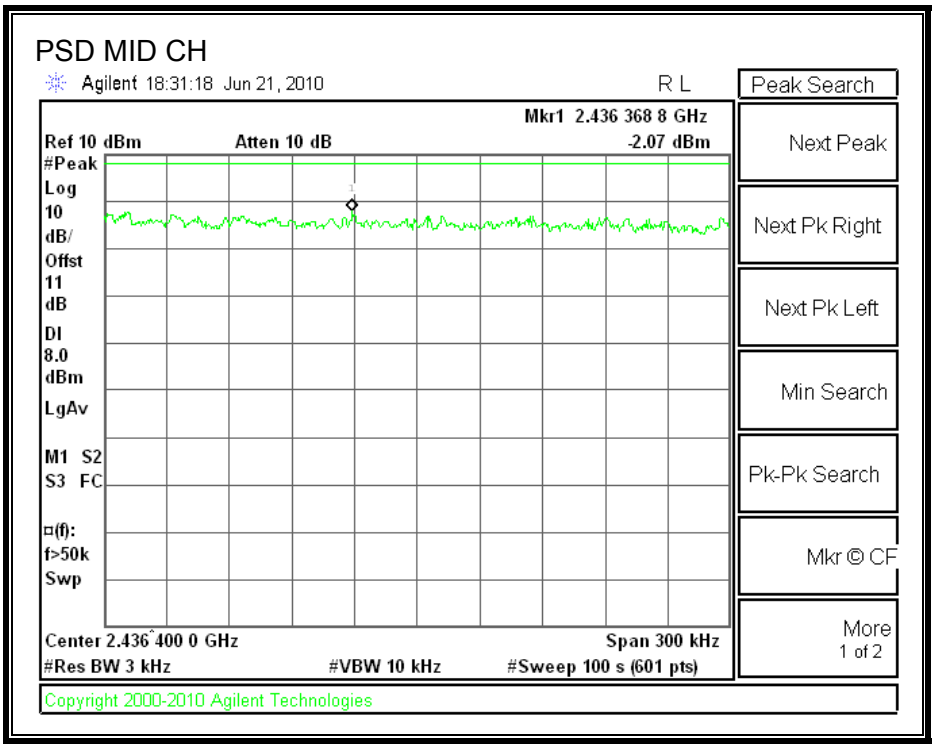
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

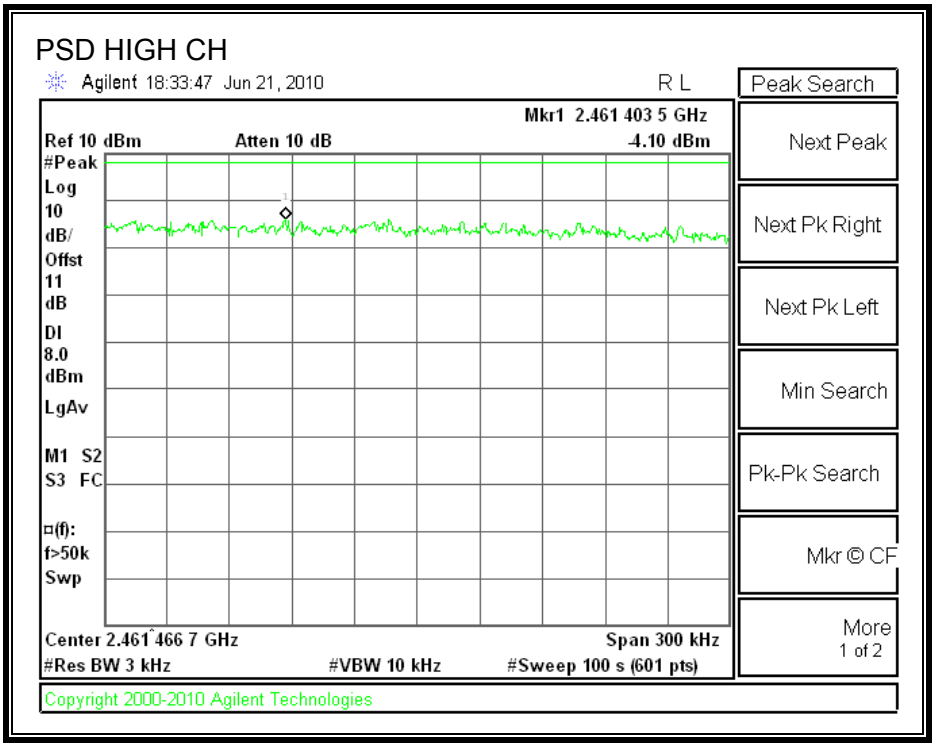
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.85	8	-11.85
Middle	2437	-2.07	8	-10.07
High	2462	-4.10	8	-12.10

POWER SPECTRAL DENSITY







7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

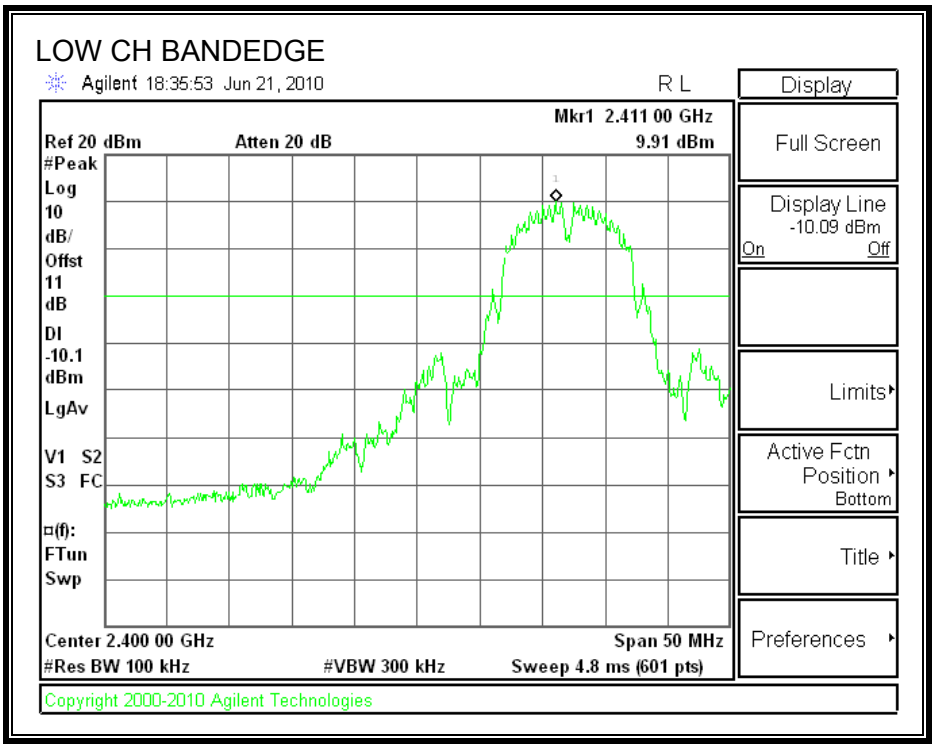
TEST PROCEDURE

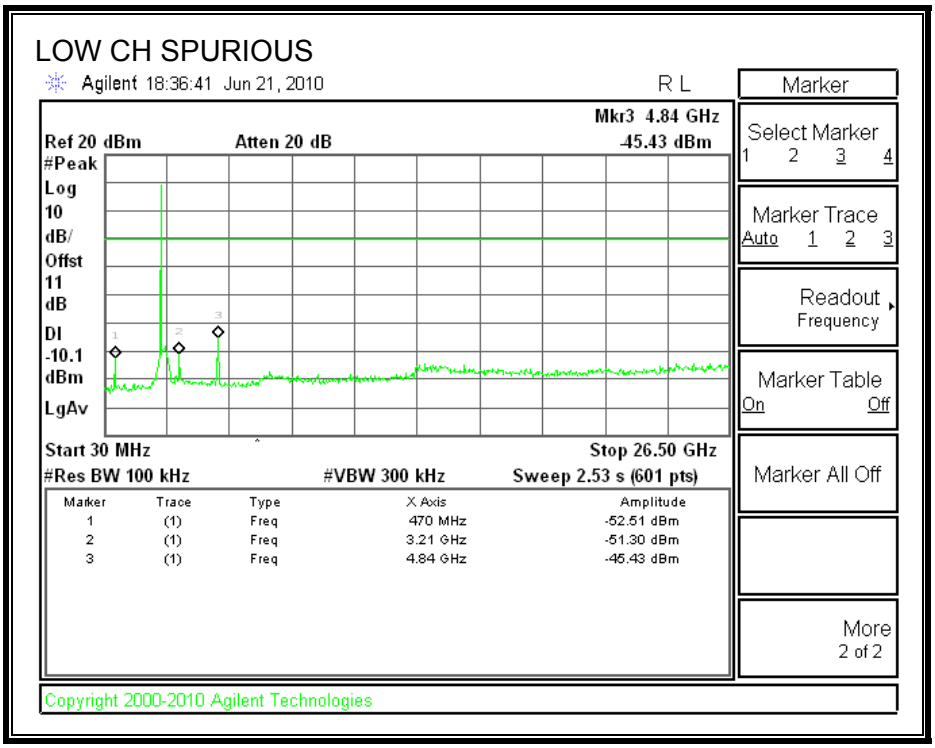
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

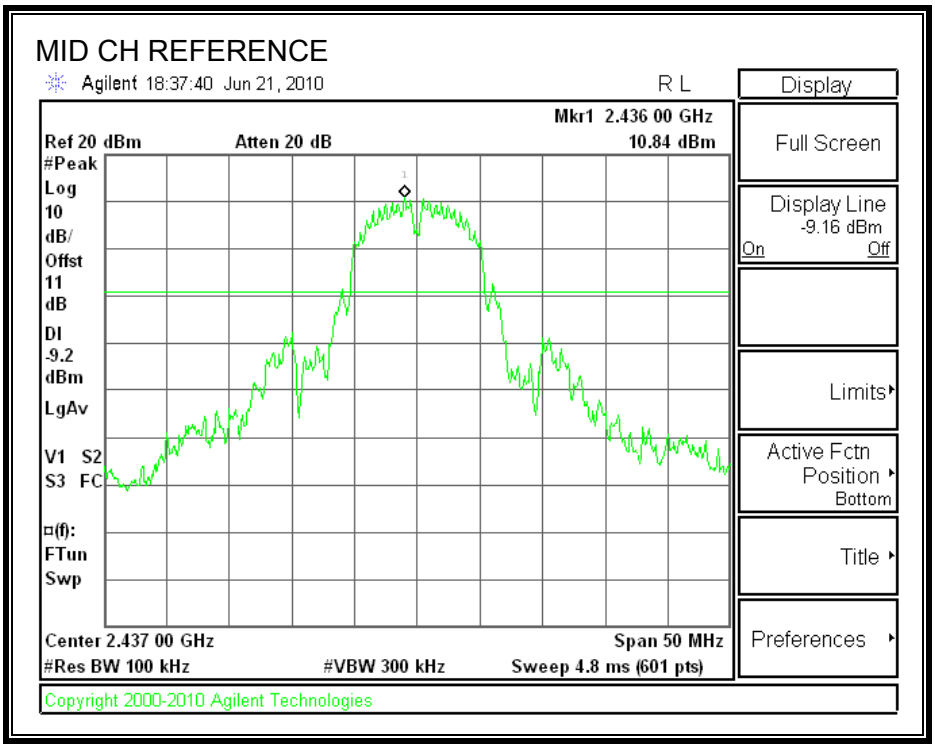
RESULTS

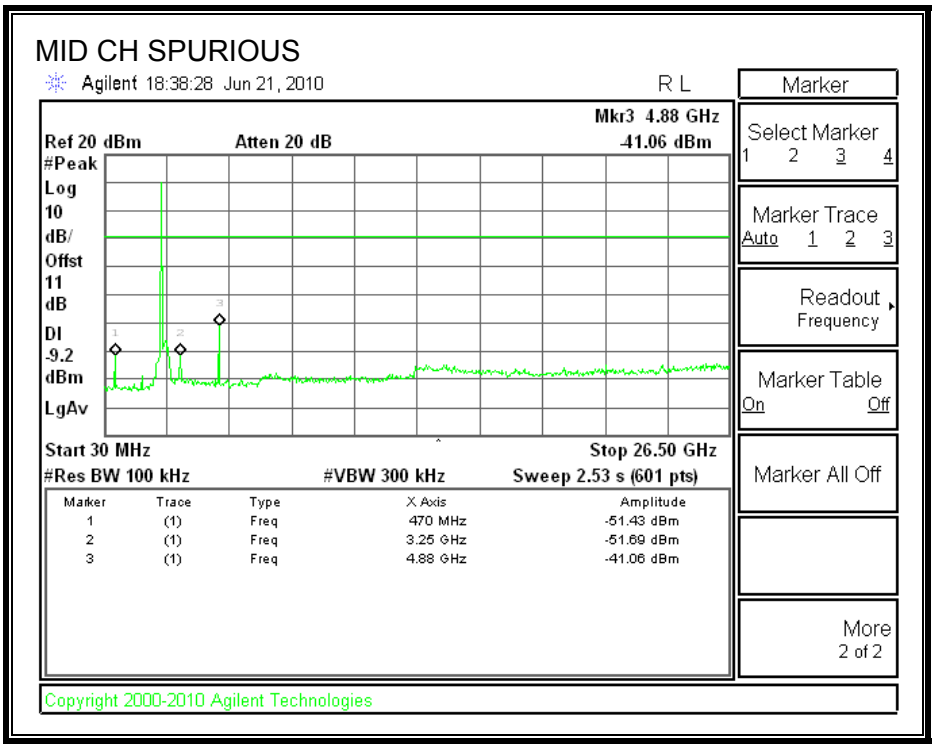
SPURIOUS EMISSIONS, LOW CHANNEL



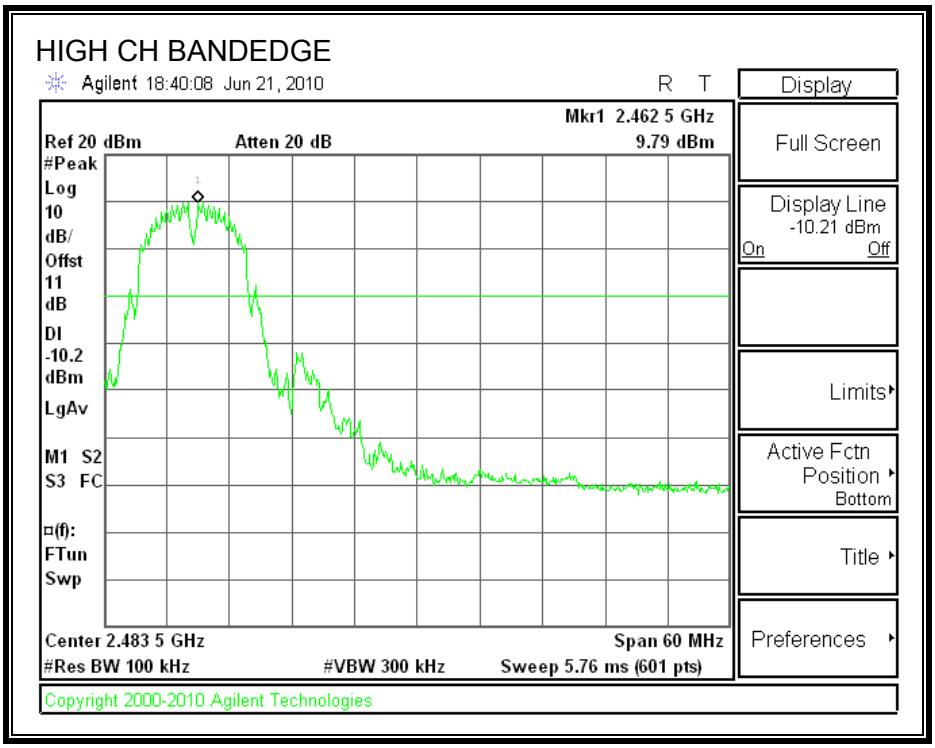


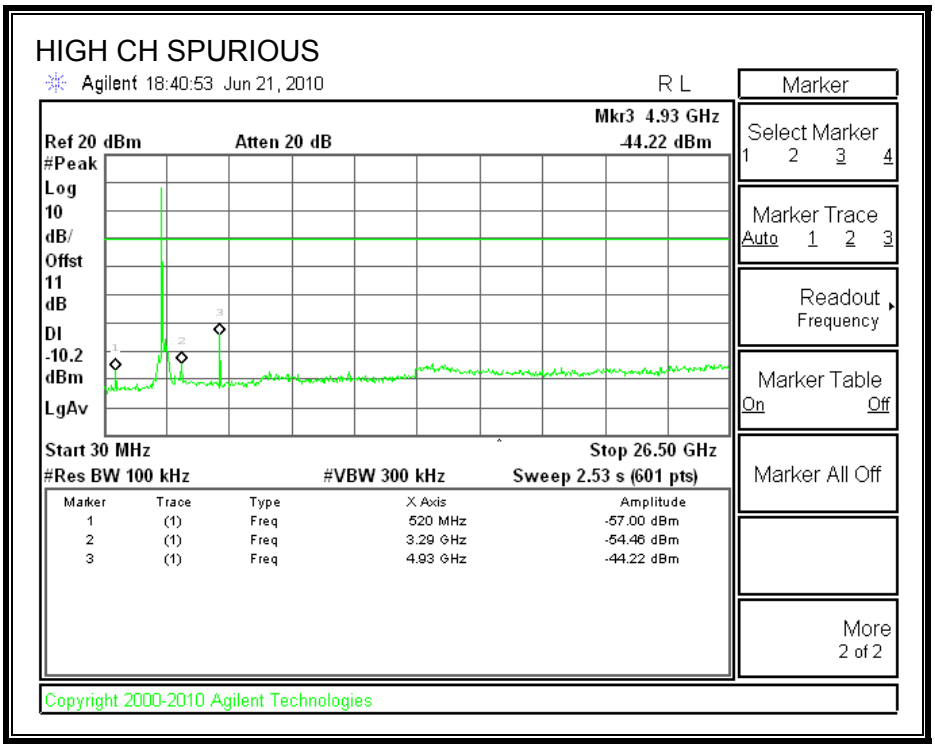
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. 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.

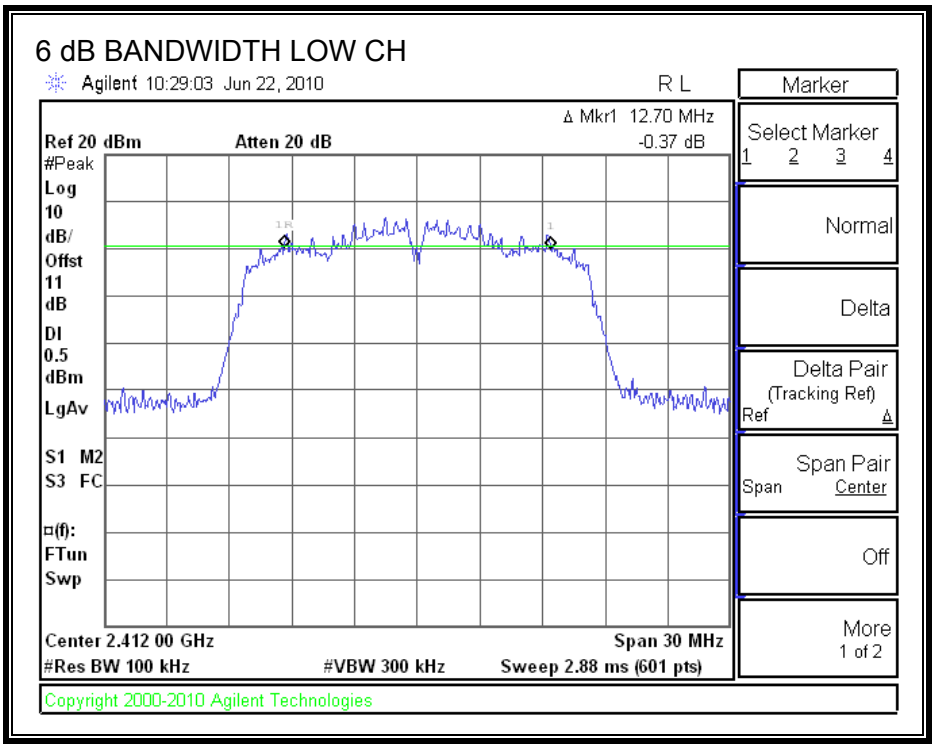
TEST PROCEDURE

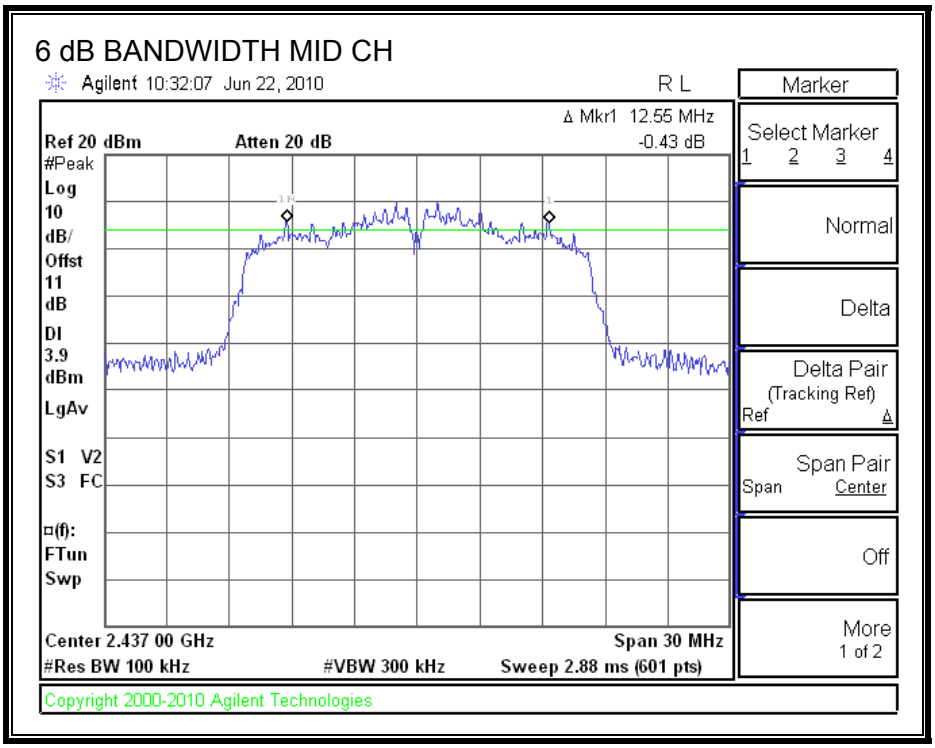
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

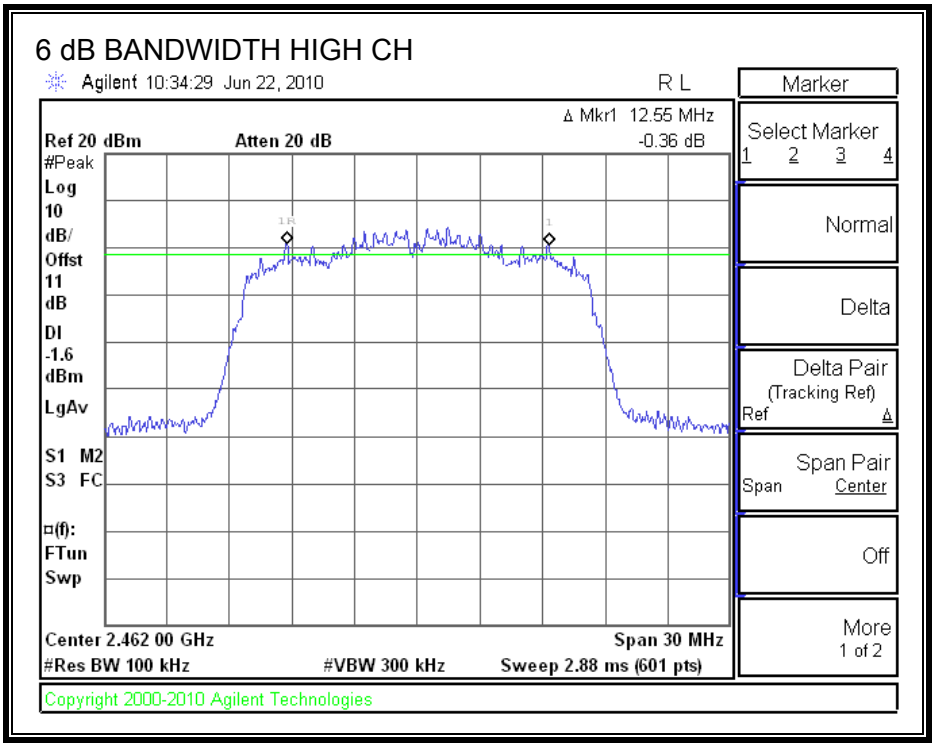
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	12.70	0.5
Middle	2437	12.55	0.5
High	2462	12.55	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

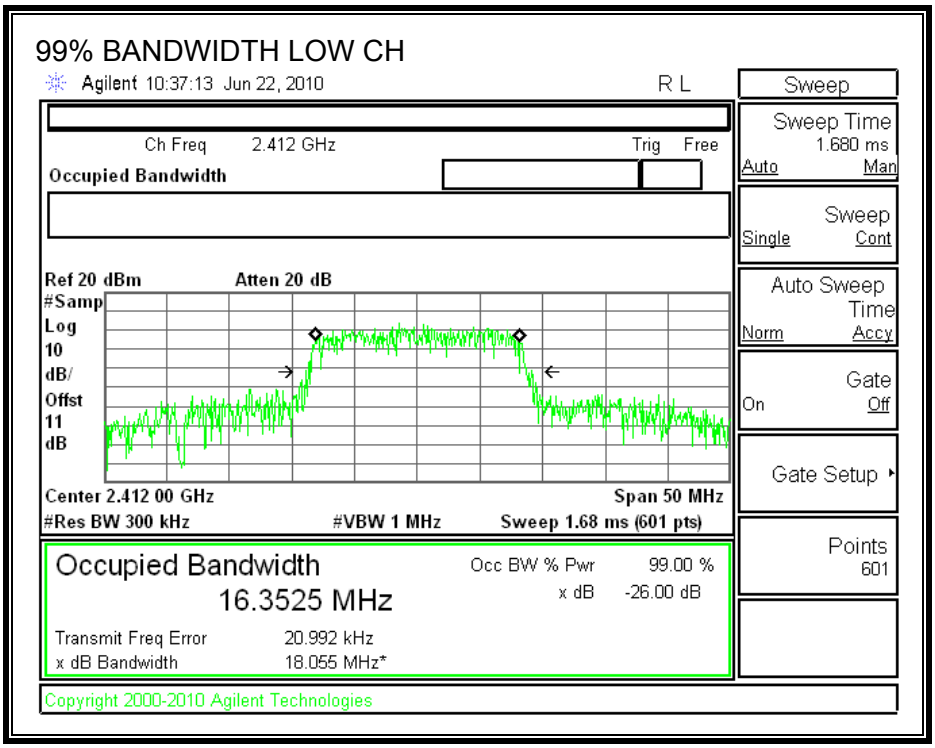
TEST PROCEDURE

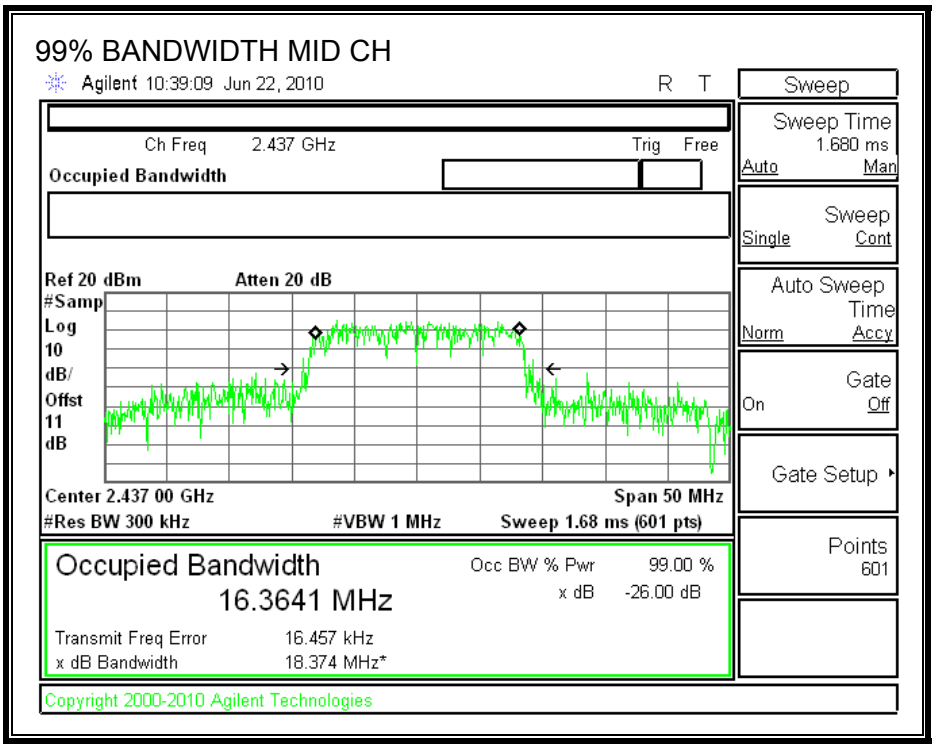
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

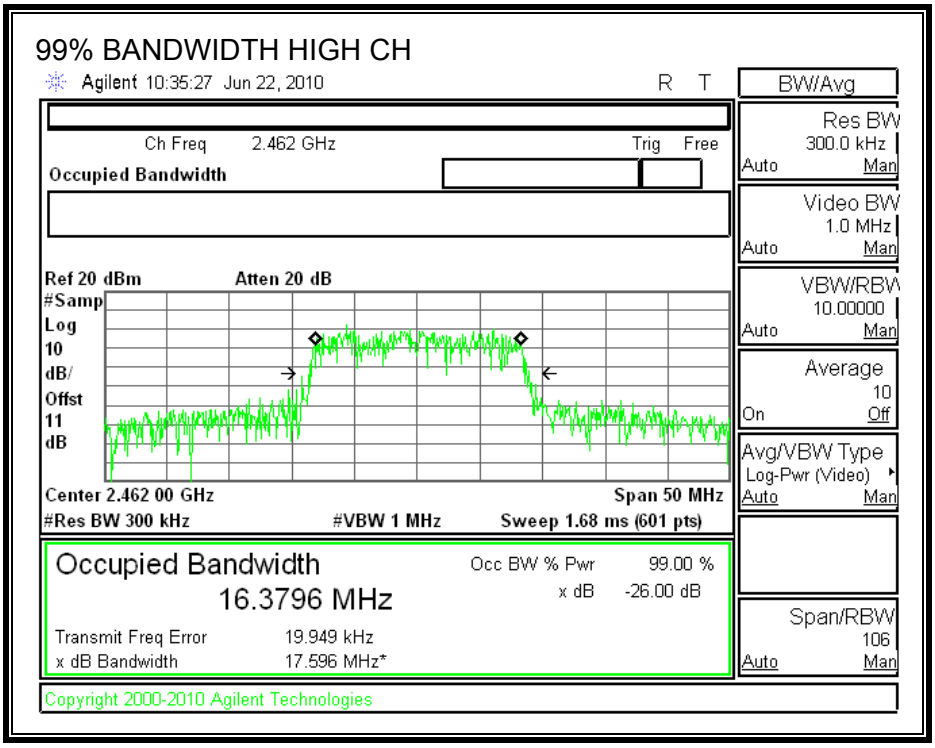
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.3525
Middle	2437	16.3641
High	2462	16.3796

99% BANDWIDTH







7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

TEST PROCEDURE

The 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)	Peak Power Meter Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.20	30	-6.80
Middle	2437	24.20	30	-5.80
High	2462	20.80	30	-9.20

7.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

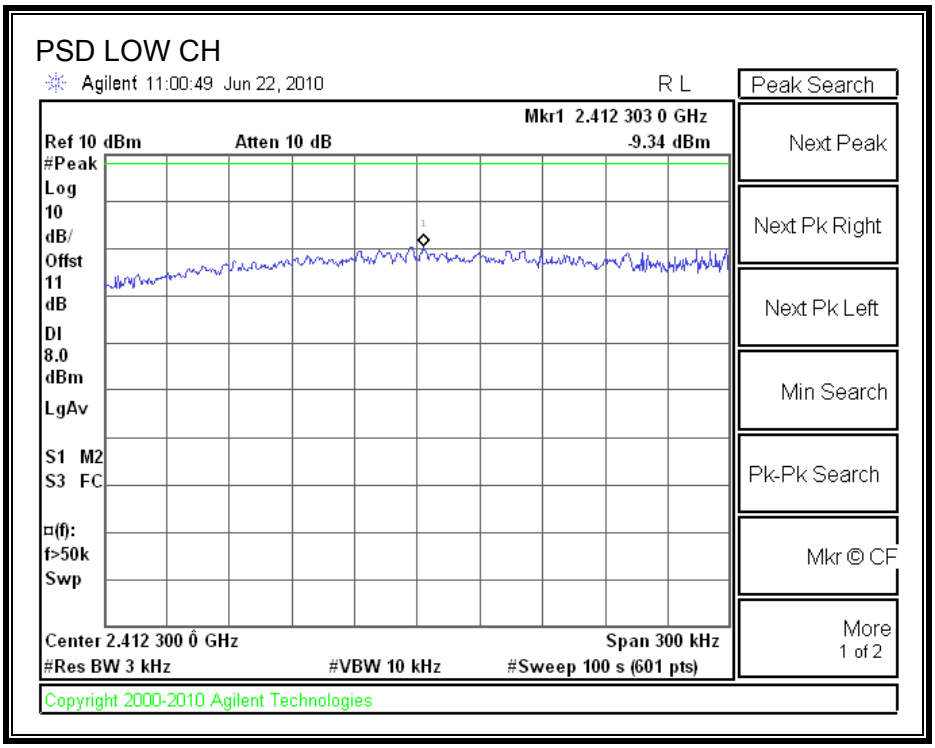
TEST PROCEDURE

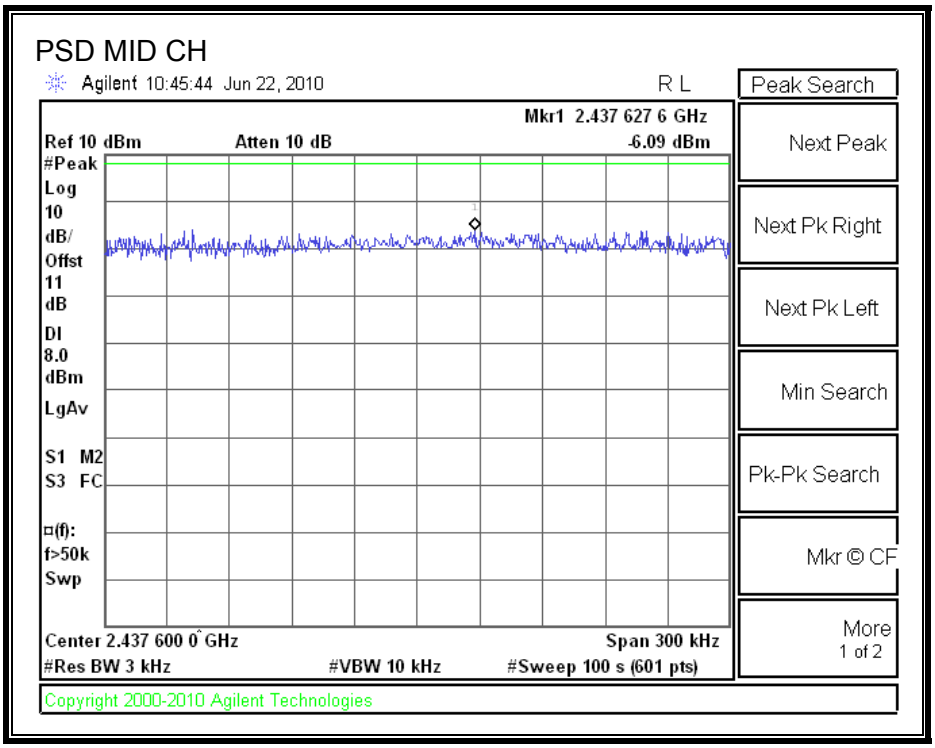
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

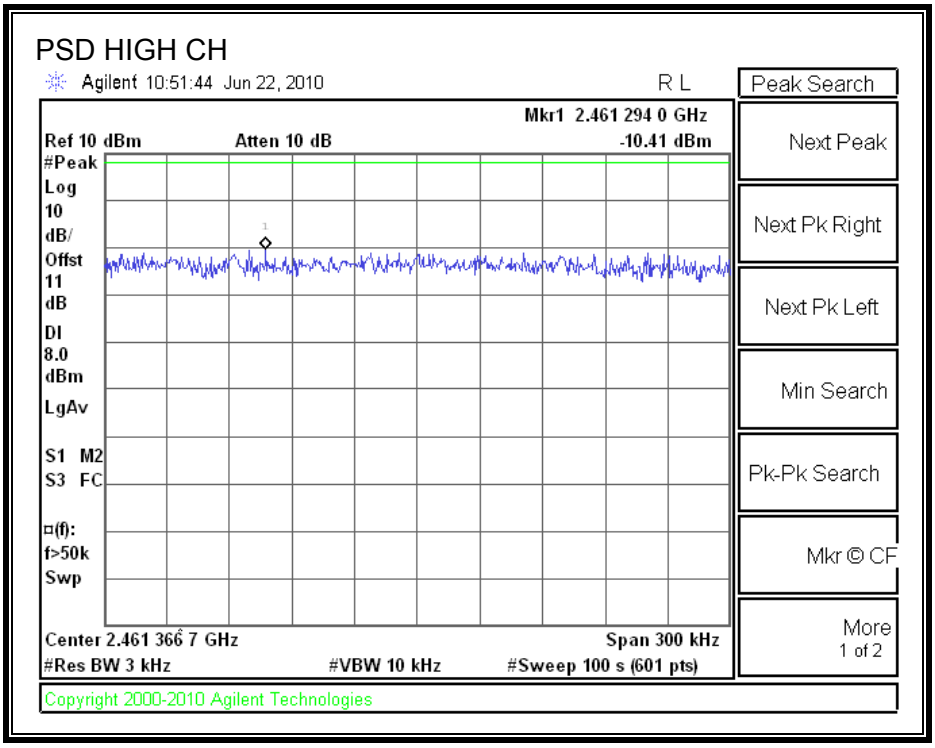
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.34	8	-17.34
Middle	2437	-6.09	8	-14.09
High	2462	-10.41	8	-18.41

POWER SPECTRAL DENSITY





PSD HIGH CH



7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

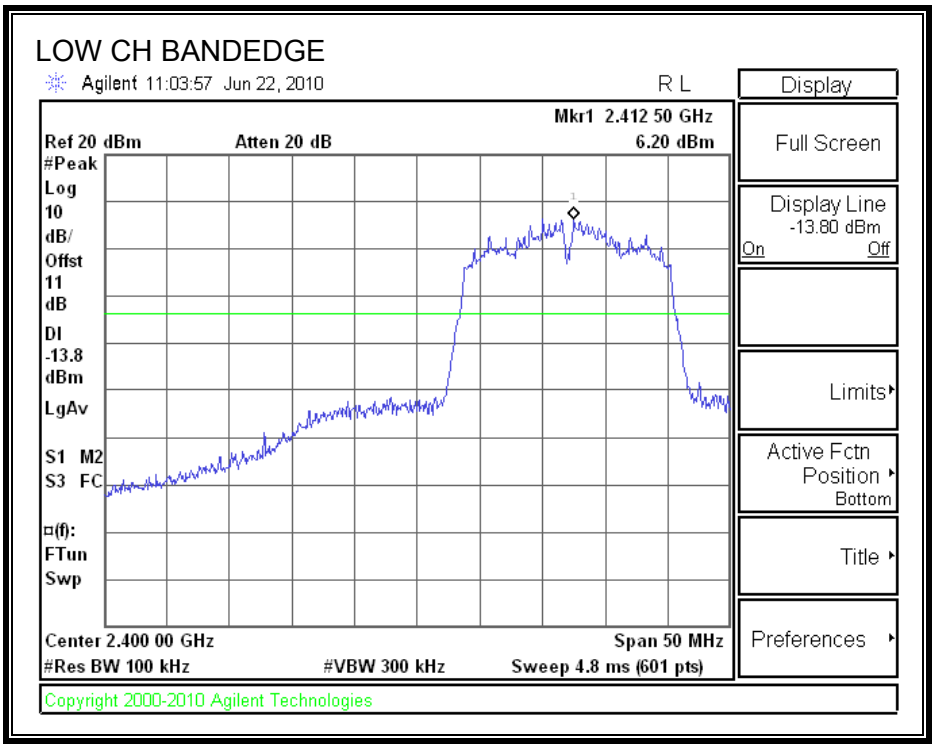
TEST PROCEDURE

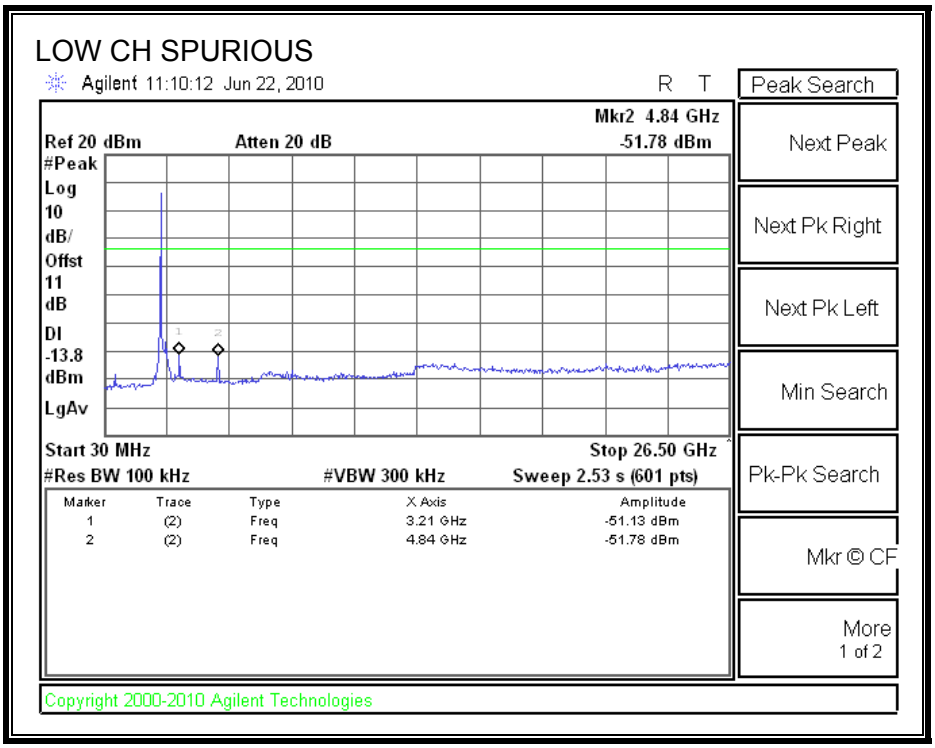
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

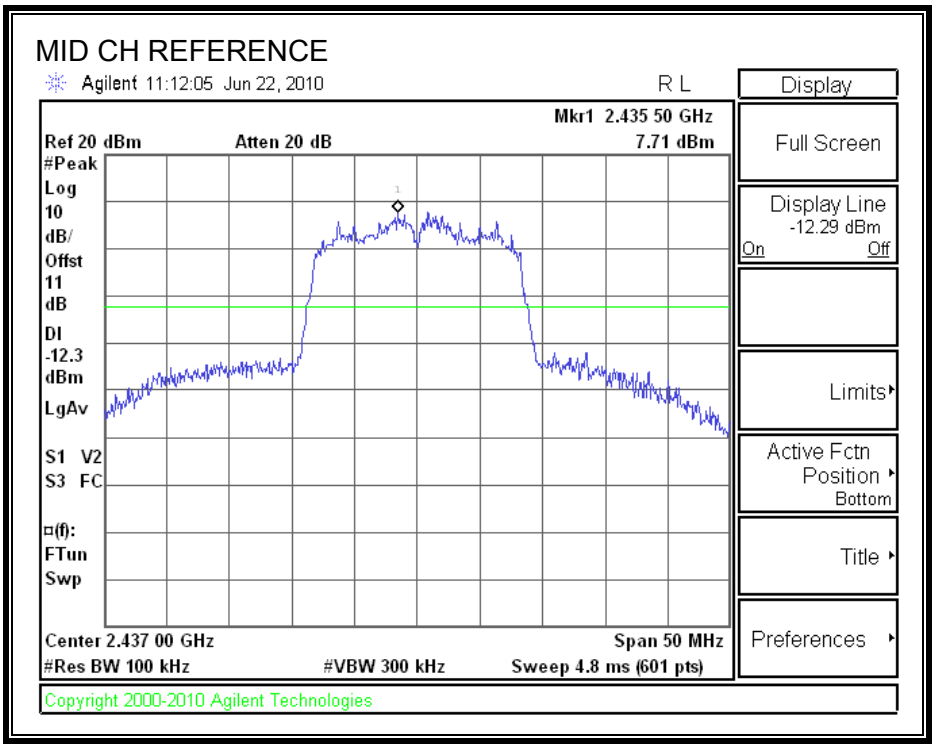
RESULTS

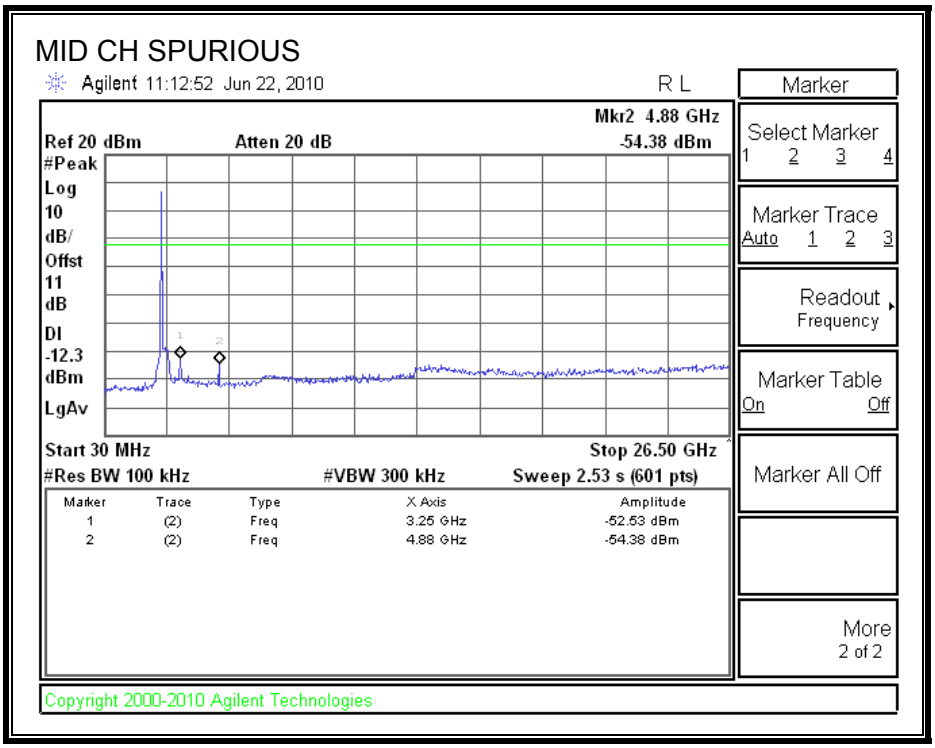
SPURIOUS EMISSIONS, LOW CHANNEL



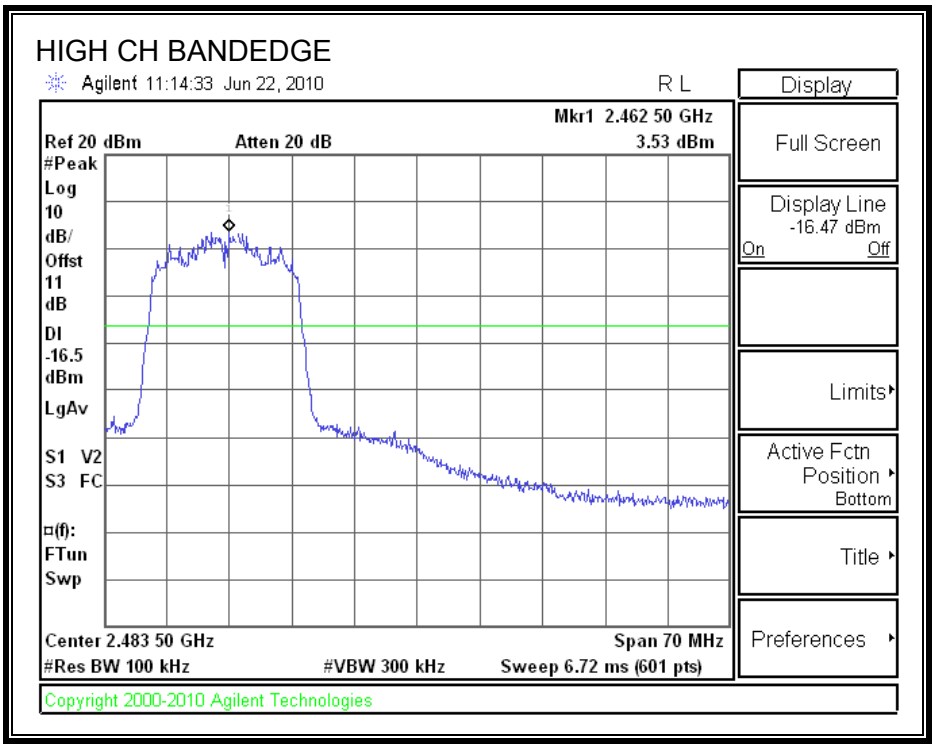


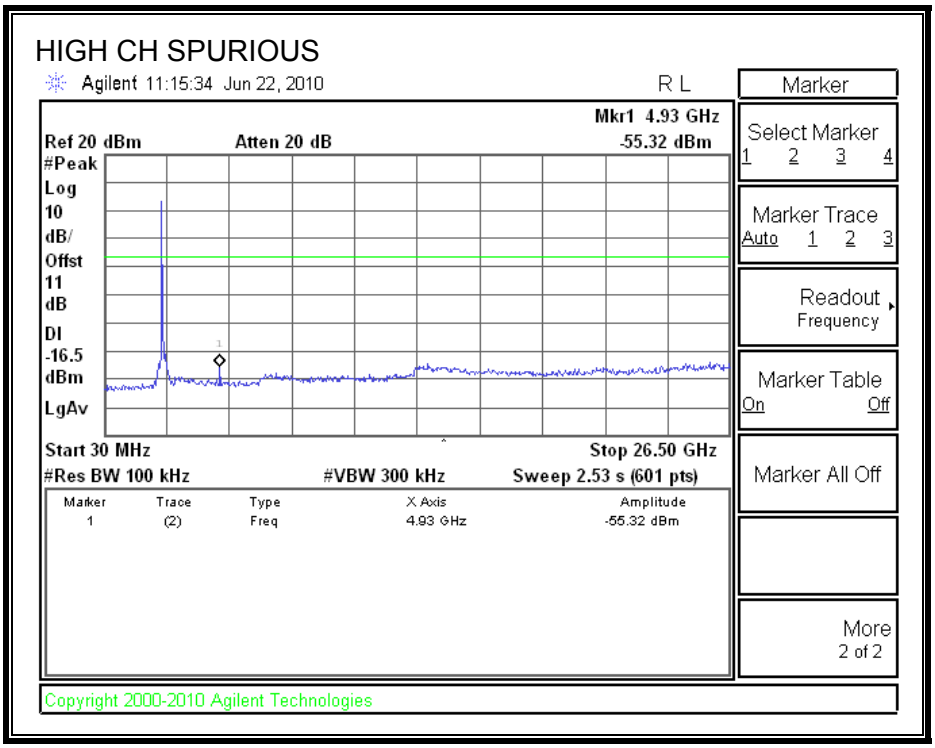
SPURIOUS EMISSIONS, MID CHANNEL





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.

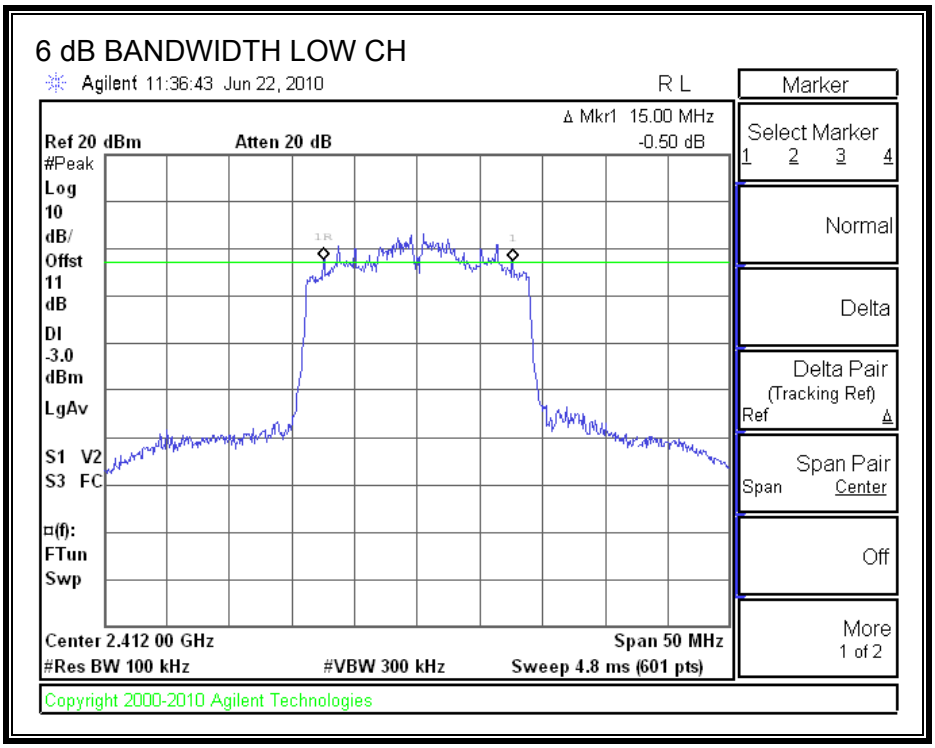
TEST PROCEDURE

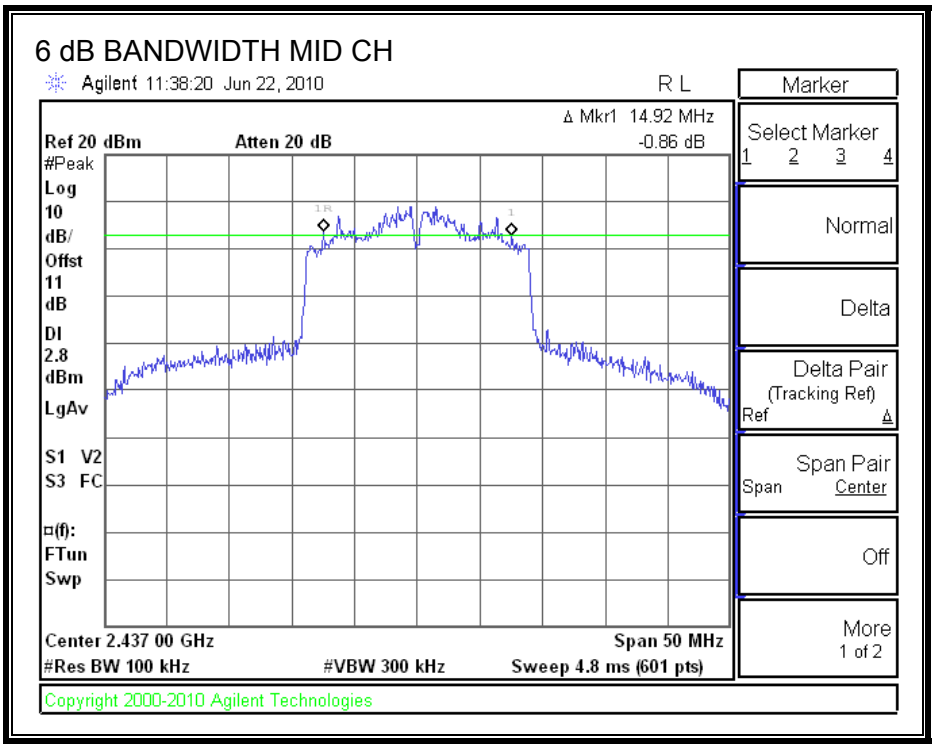
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

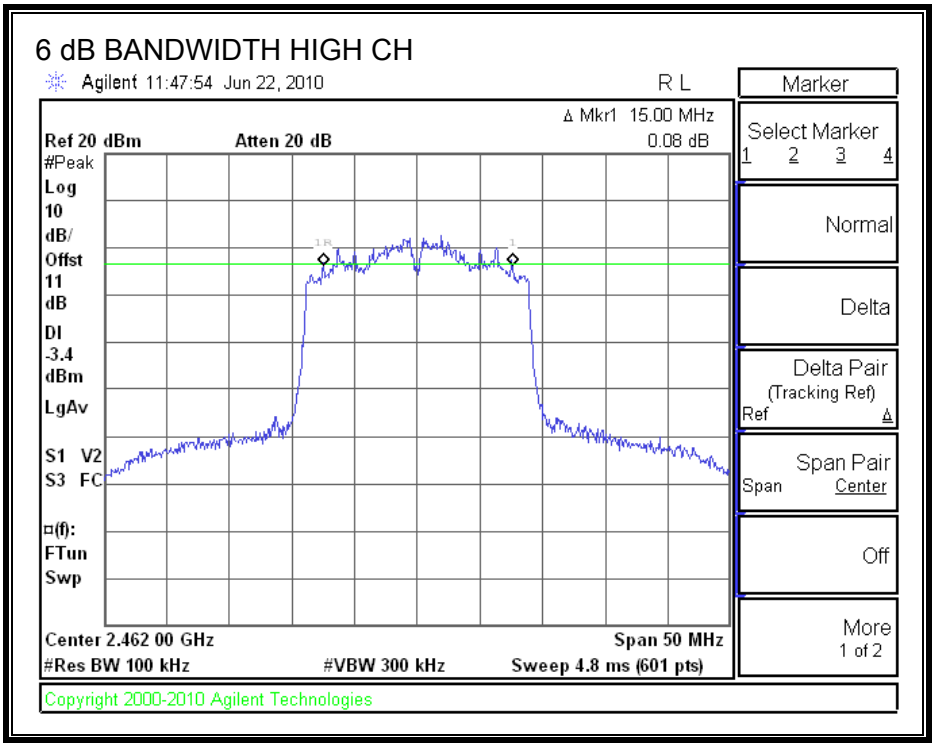
RESULTS

Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	15.00	14.92	0.5
Middle	2437	14.92	16.25	0.5
High	2462	15.00	15.08	0.5

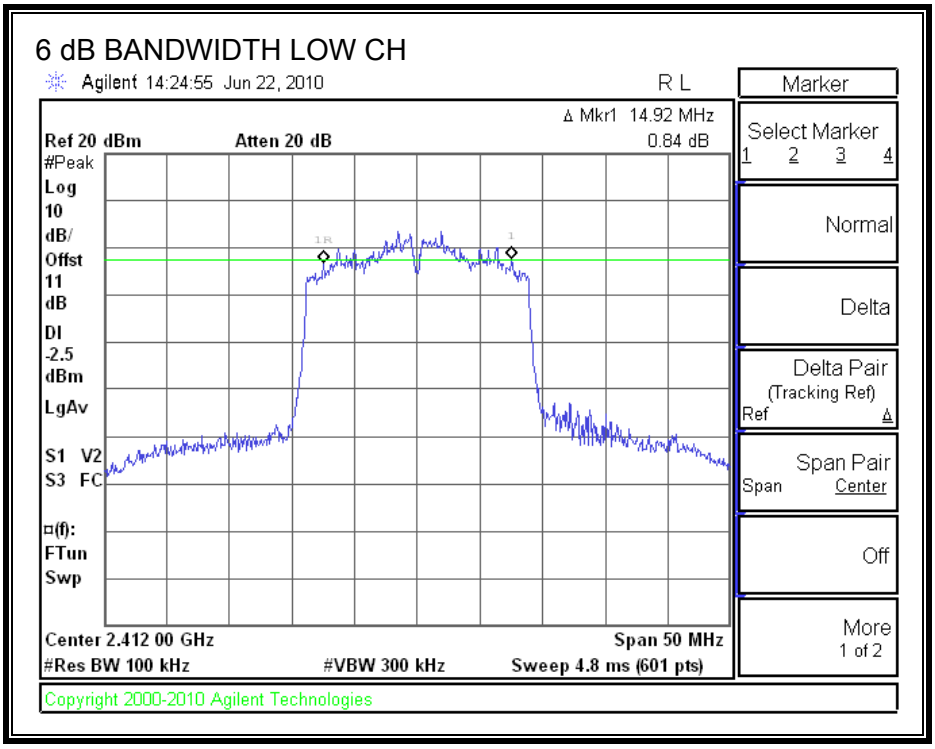
6 dB BANDWIDTH, CHAIN 0

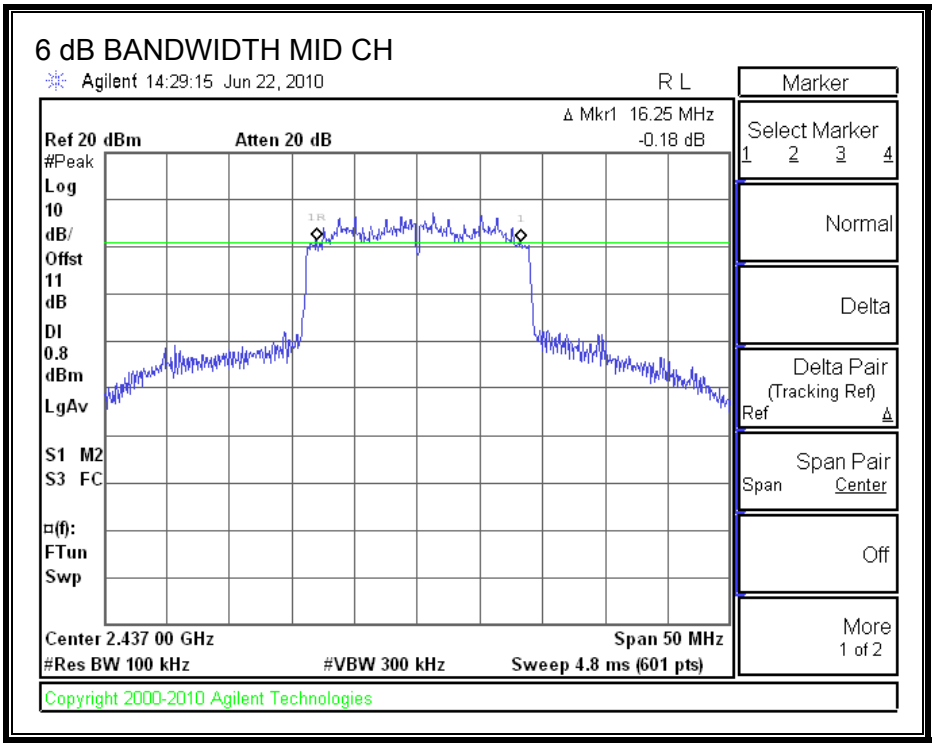


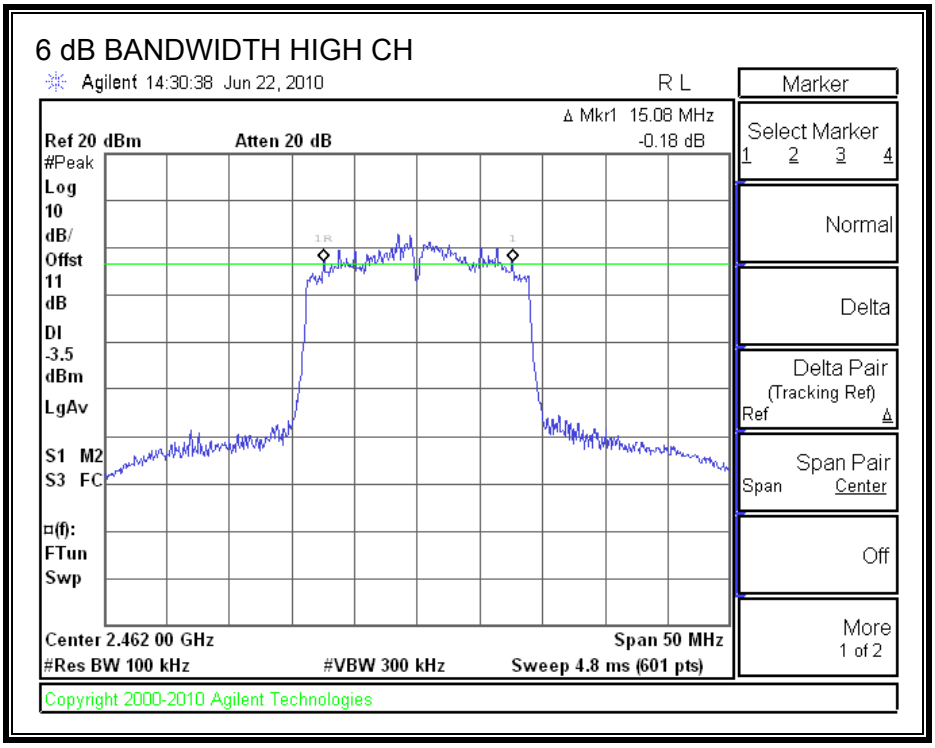




6 dB BANDWIDTH, CHAIN 1







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

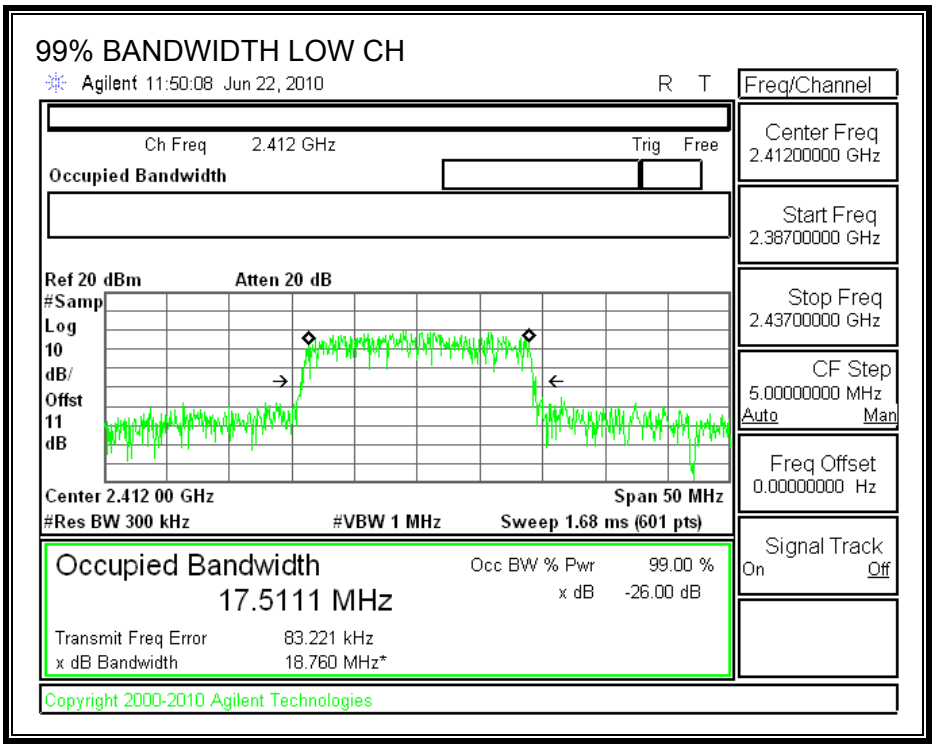
TEST PROCEDURE

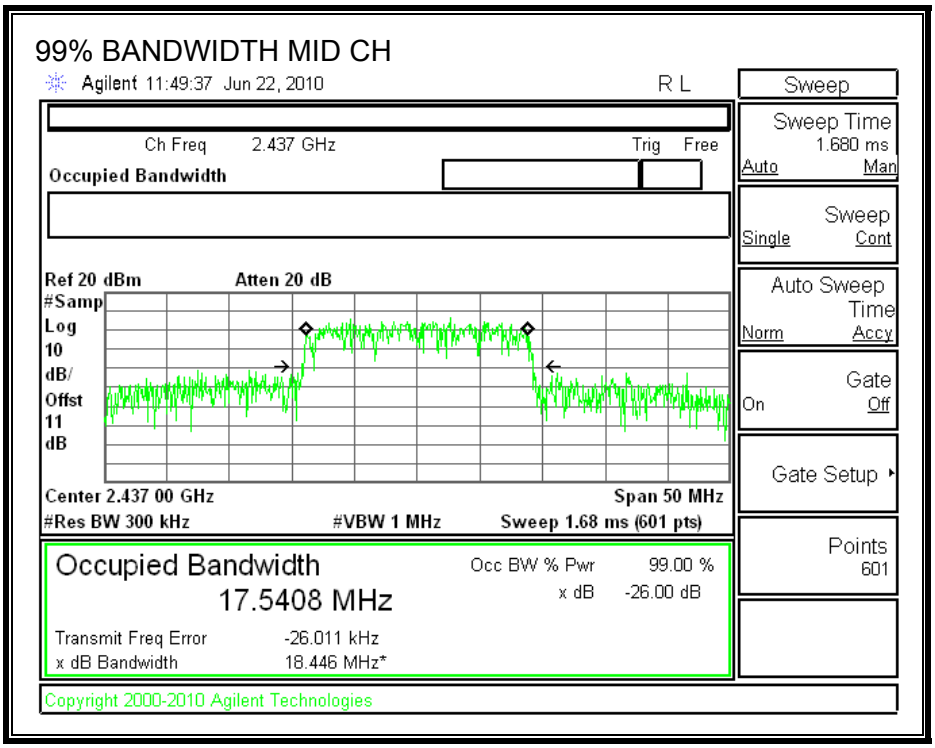
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

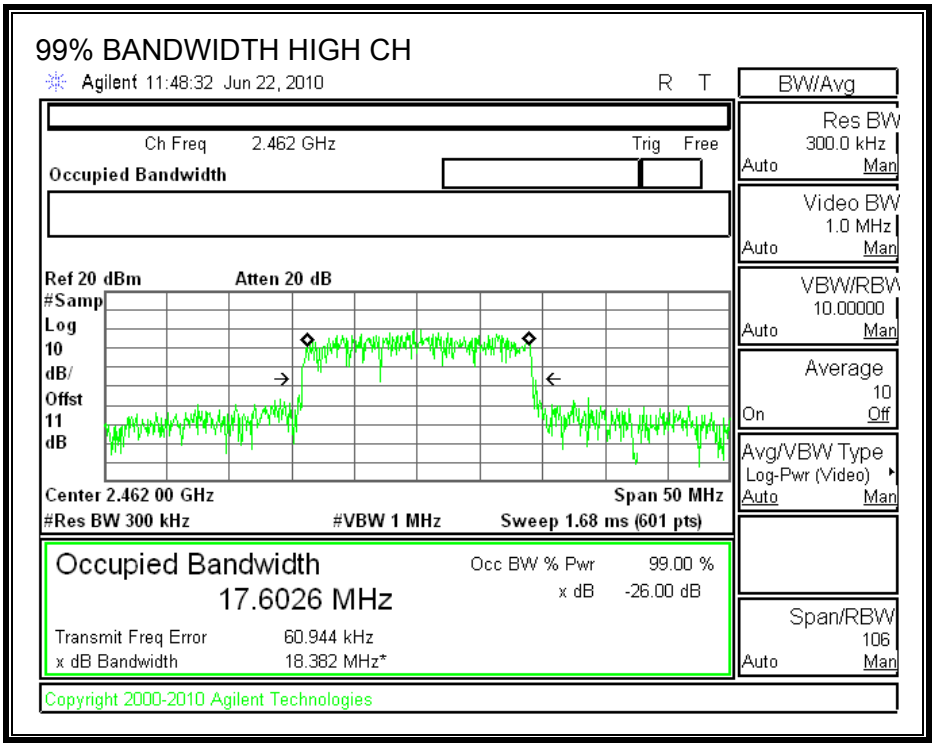
RESULTS

Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (kHz)
Low	2412	17.5111	17.5253
Middle	2437	17.5408	17.5522
High	2462	17.6026	17.5601

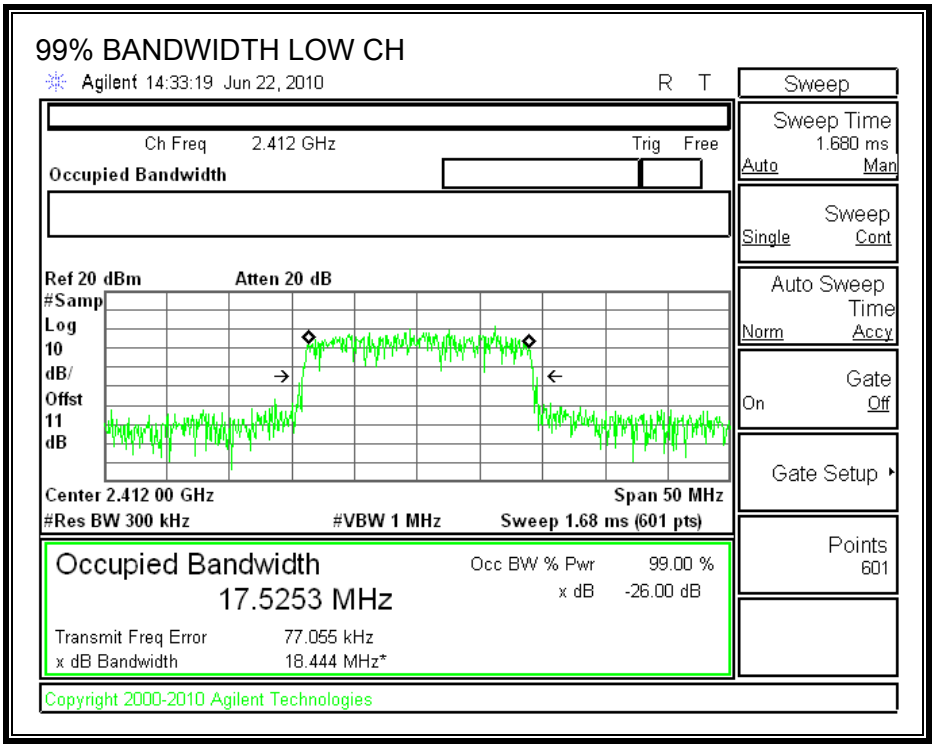
99% BANDWIDTH, CHAIN 0

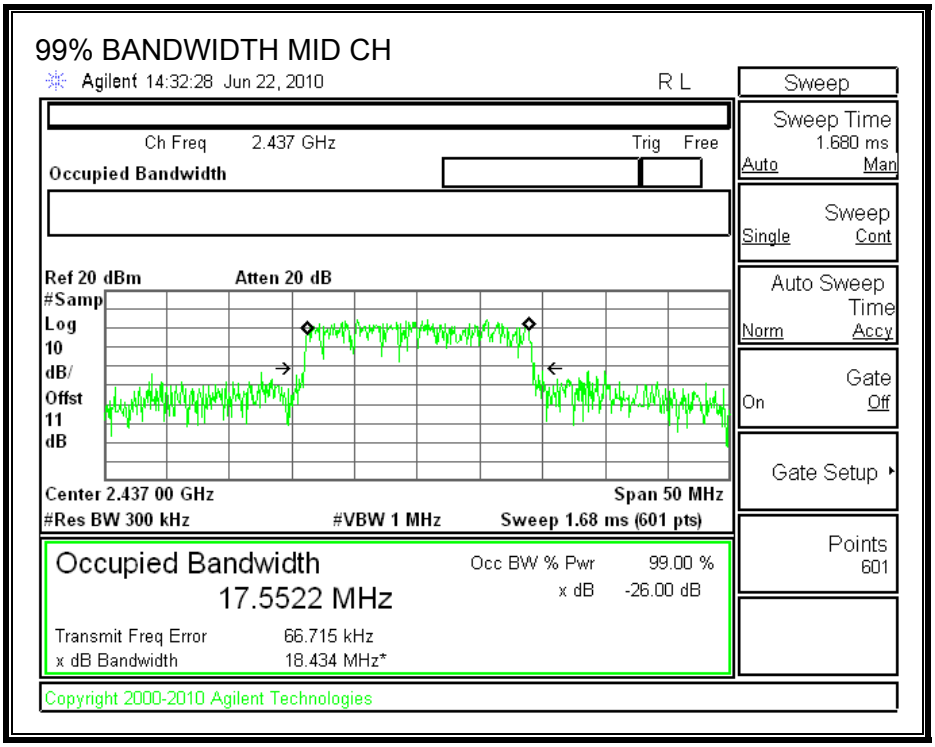


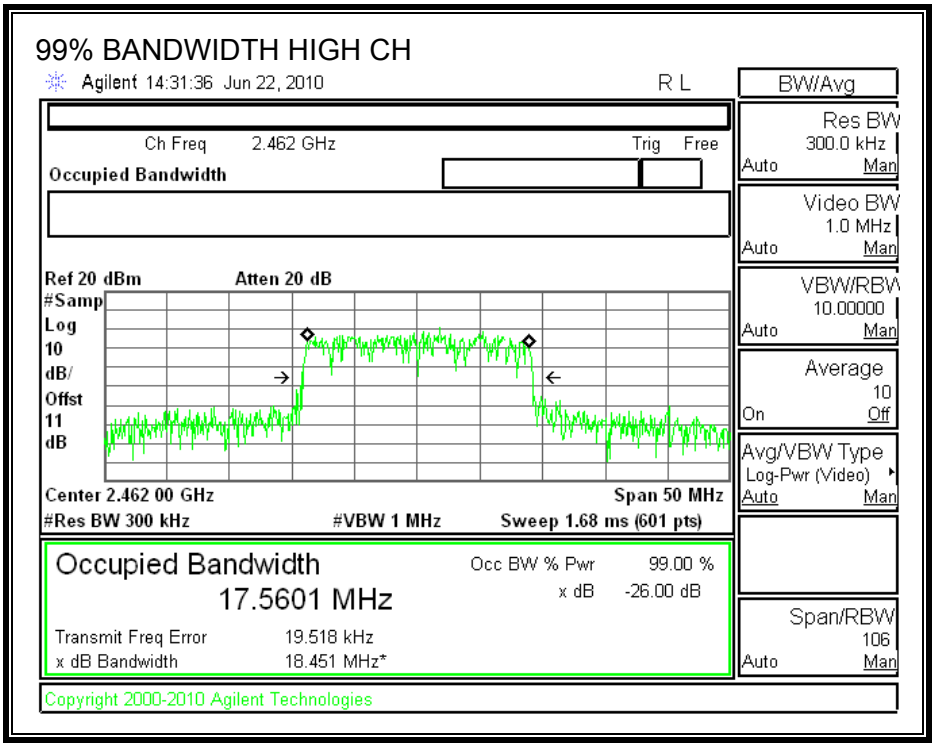




99% BANDWIDTH, CHAIN 1







7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 7.93 dBi, therefore the limit is 28.07 dBm.

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)	Limit (dBm)	Chain 0 (dBm)	Chain 1 (dBm)	Total (dBm)	Margin (dB)
Low	2412	28.07	18.35	18.59	21.48	-6.59
Low	2437	28.07	23.26	23.53	26.40	-1.67
High	2462	28.07	17.80	17.65	20.74	-7.33

7.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

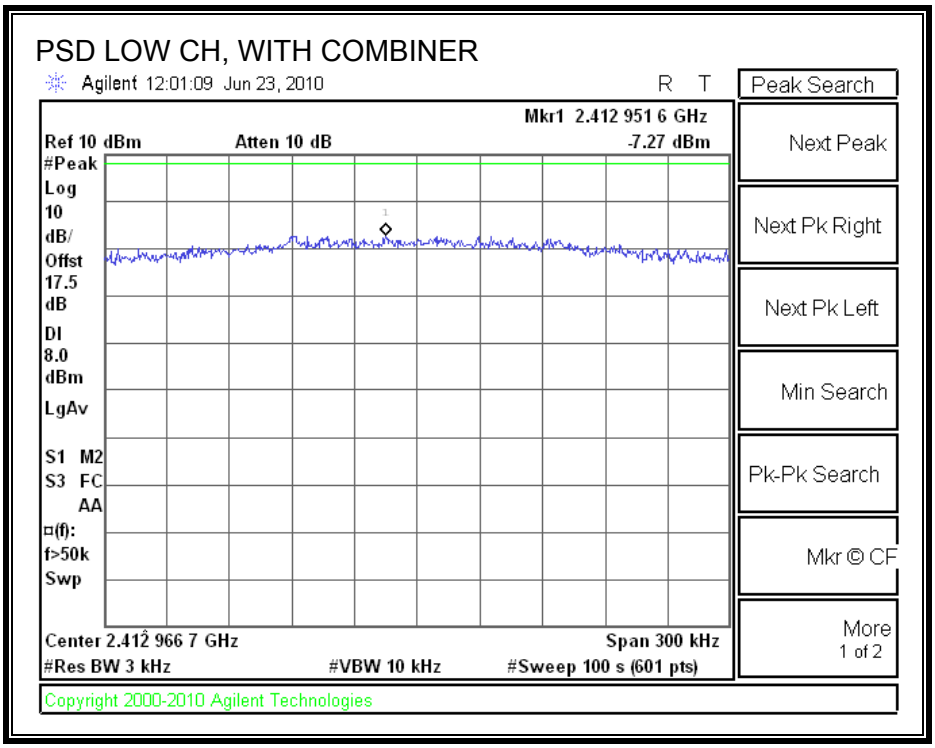
TEST PROCEDURE

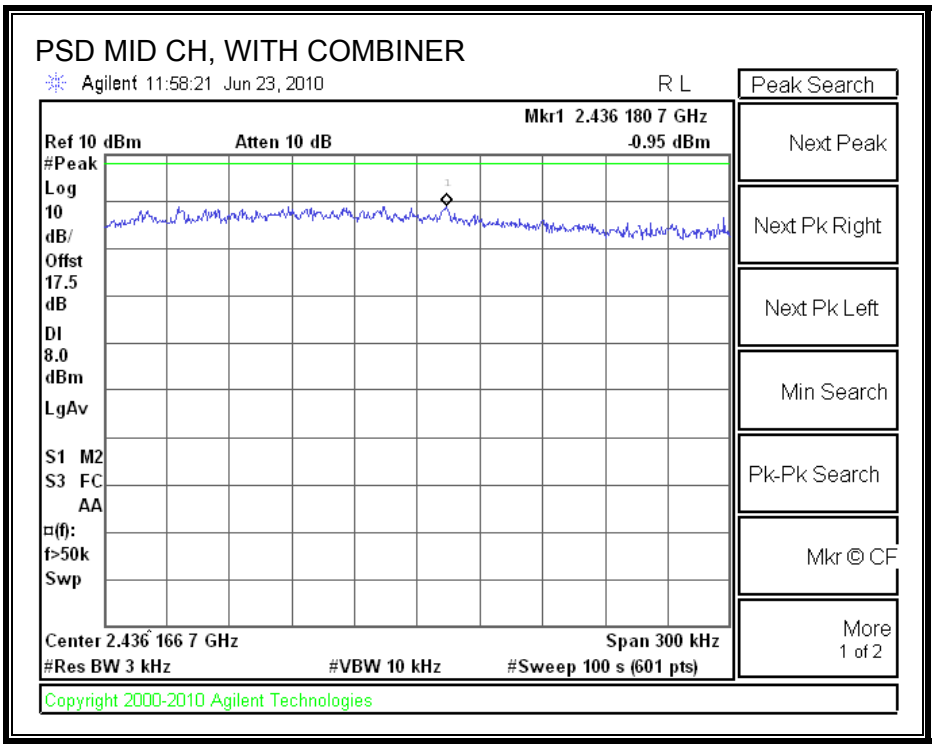
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

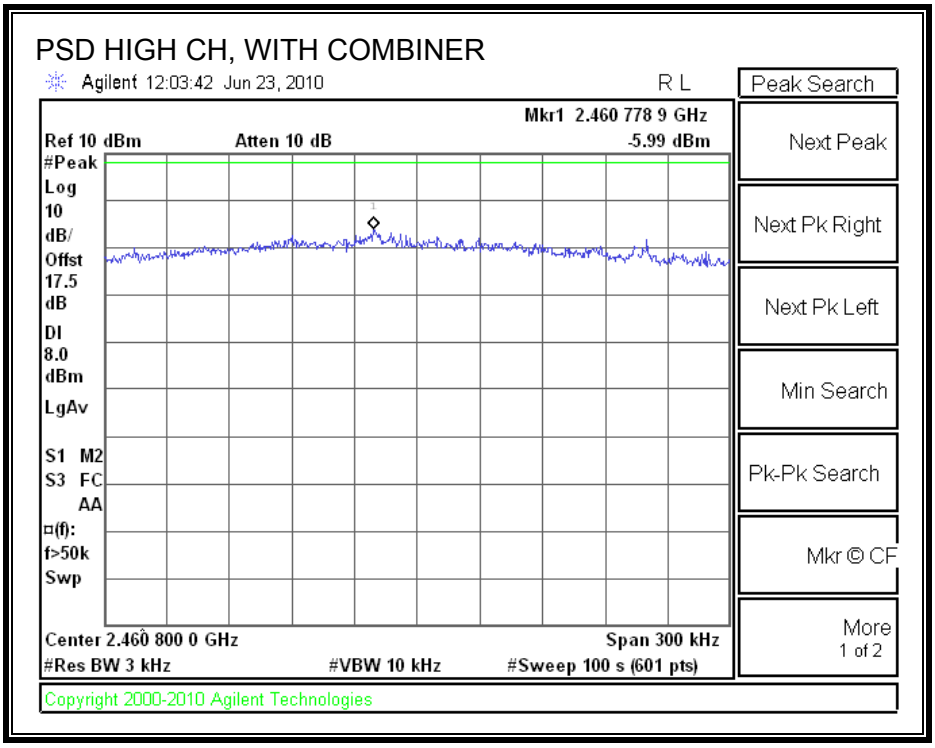
RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.27	6.07	-13.34
Middle	2437	-0.95	6.07	-7.02
High	2462	-5.99	6.07	-12.06

POWER SPECTRAL DENSITY, WITH COMBINER







7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

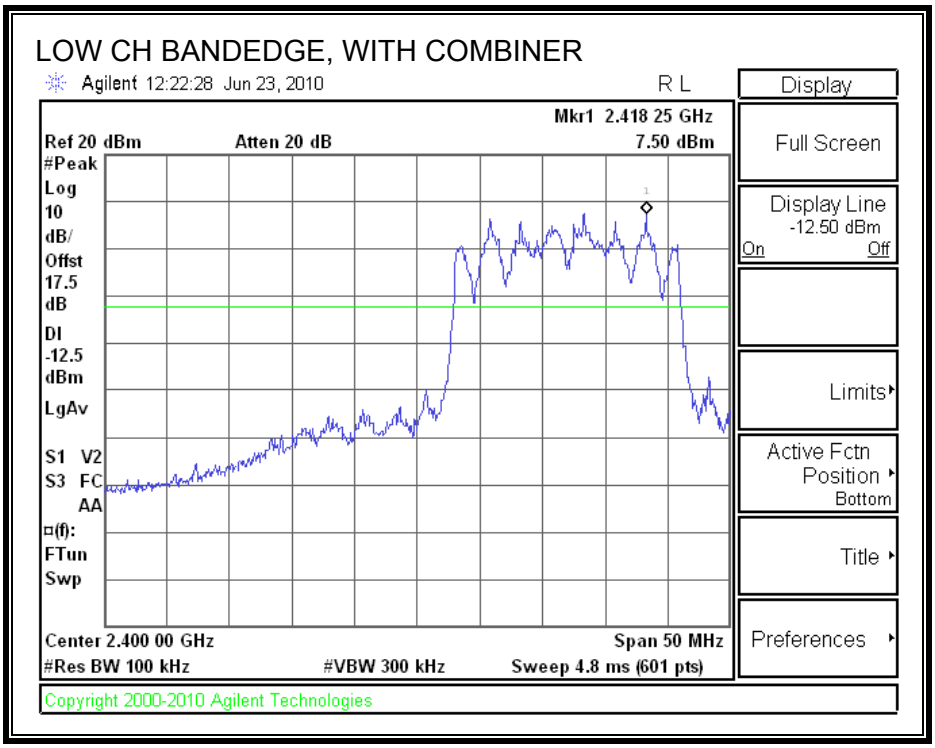
TEST PROCEDURE

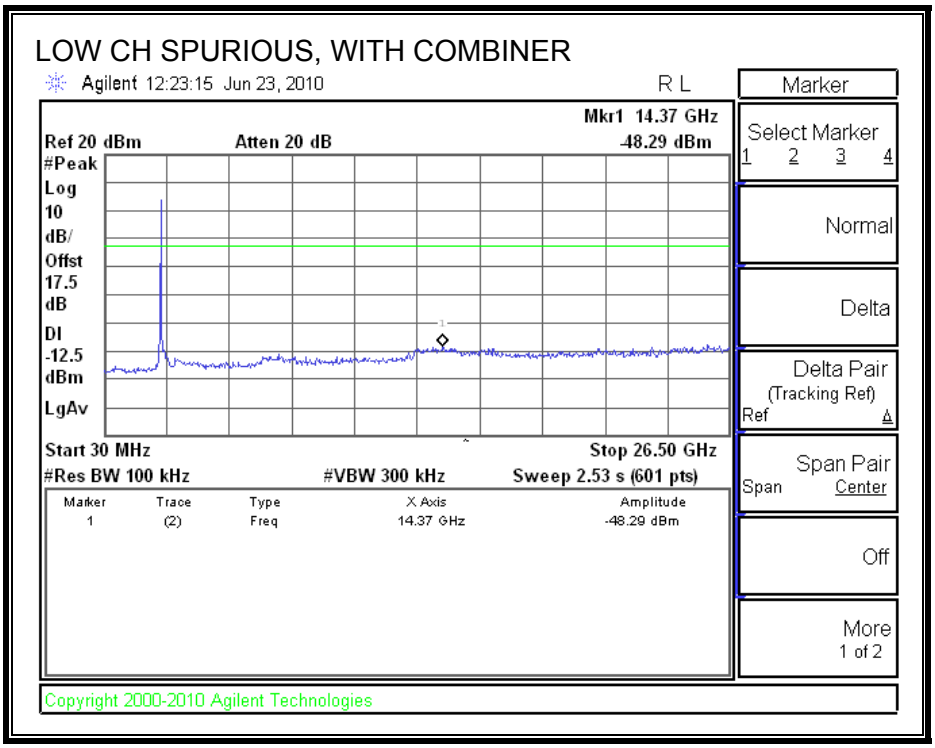
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

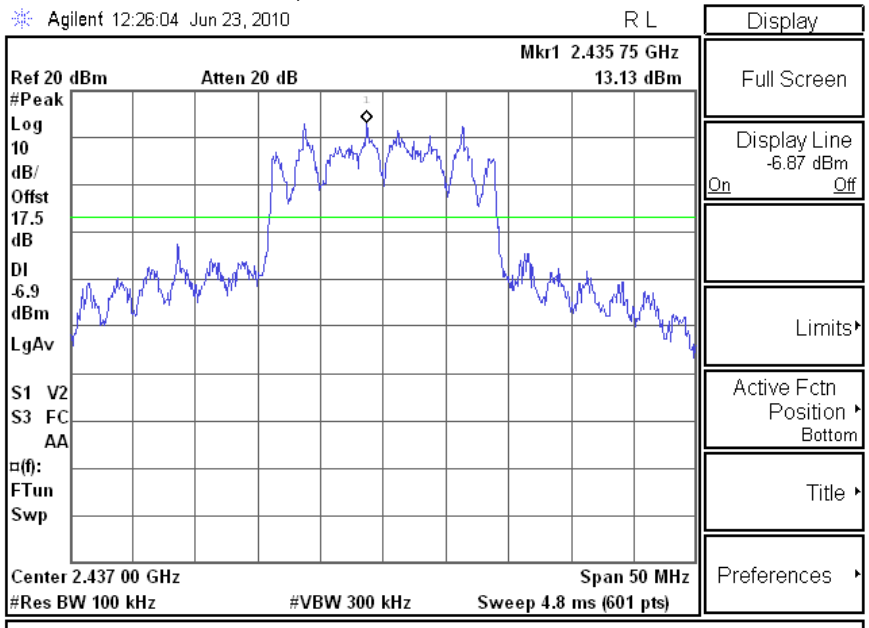
RESULTS

SPURIOUS EMISSIONS WITH COMBINER

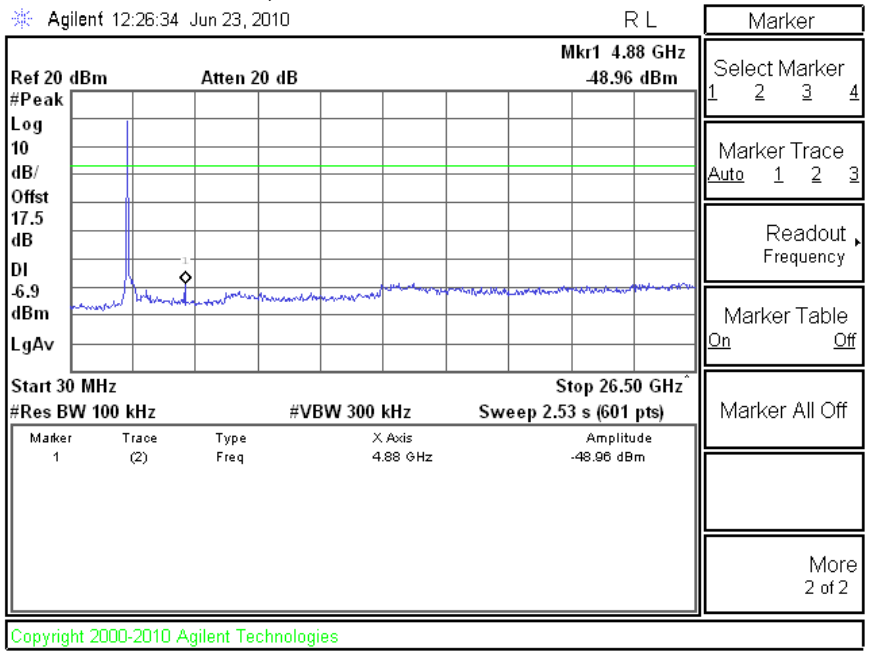




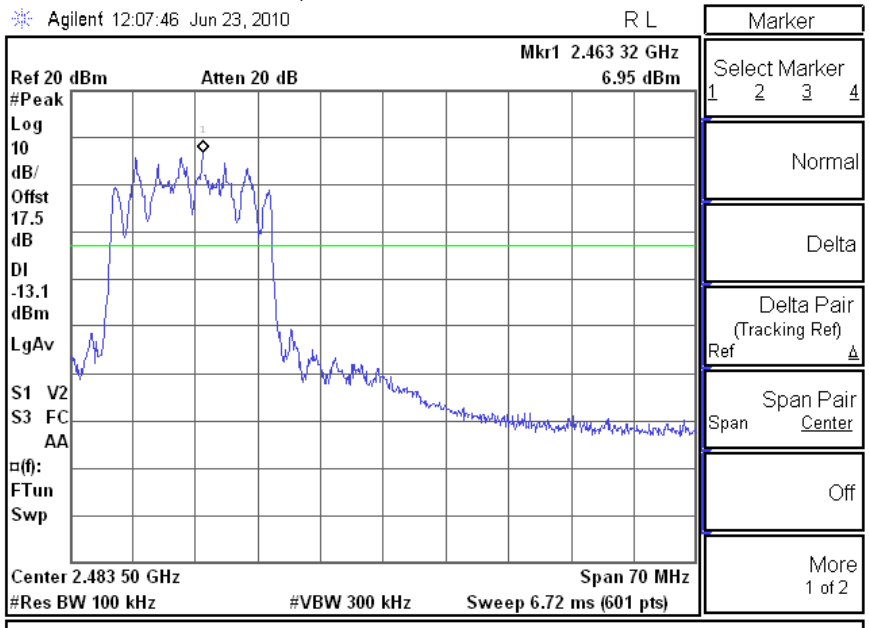
MID CH REFERENCE, WITH COMBINER



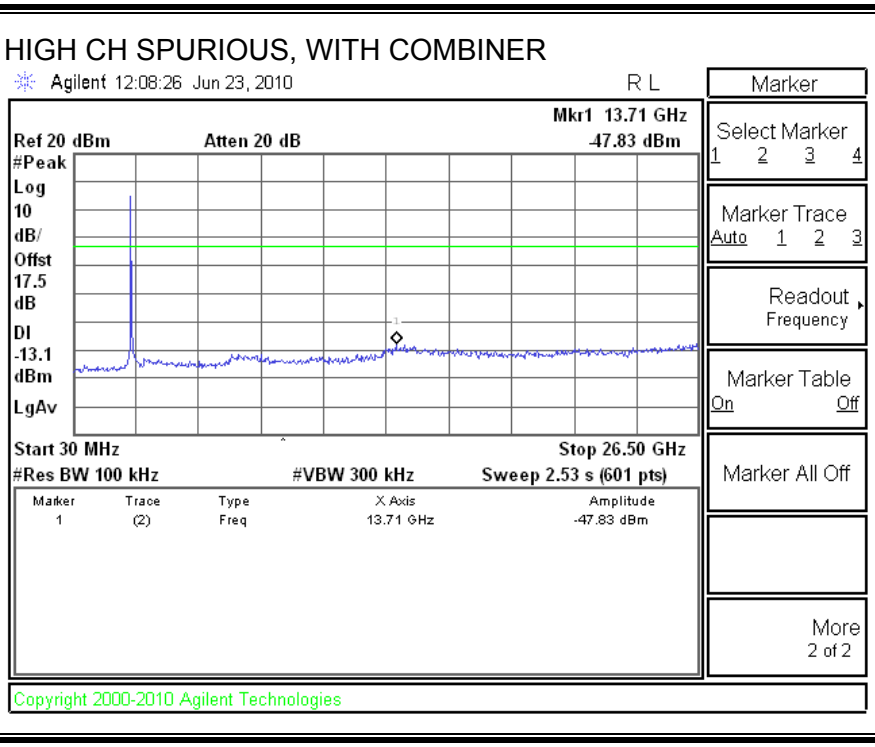
MID CH SPURIOUS, WITH COMBINER



HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, 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.

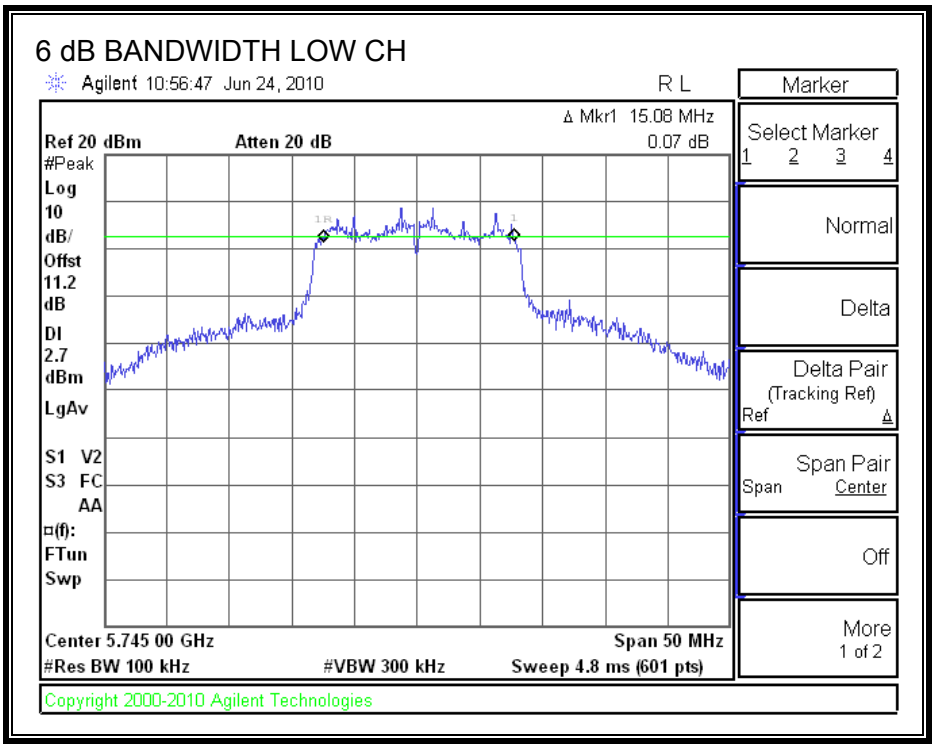
TEST PROCEDURE

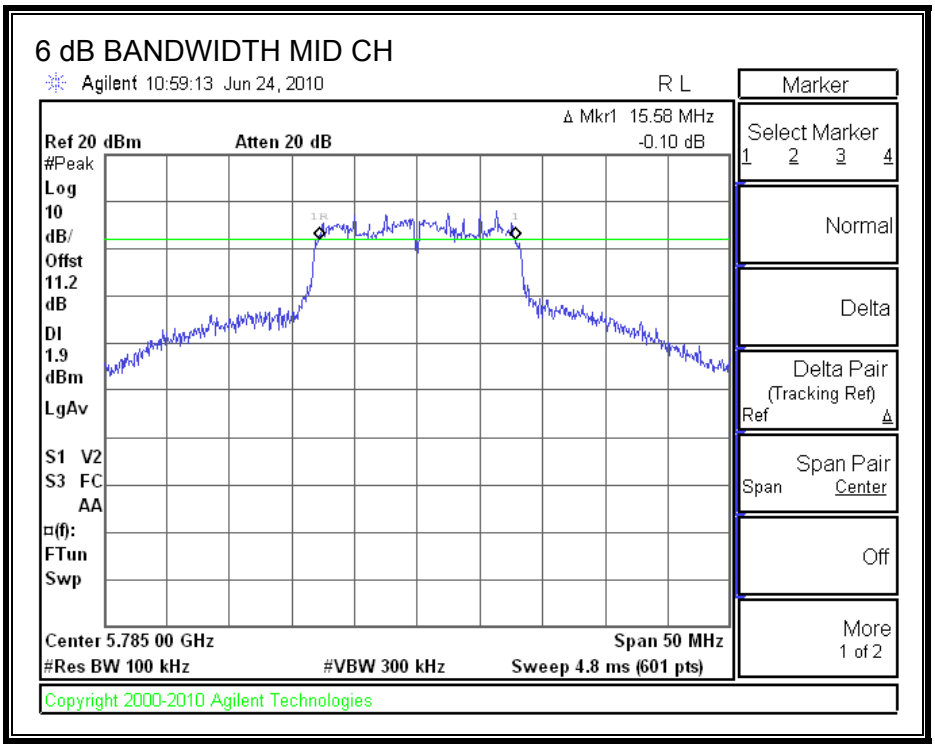
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

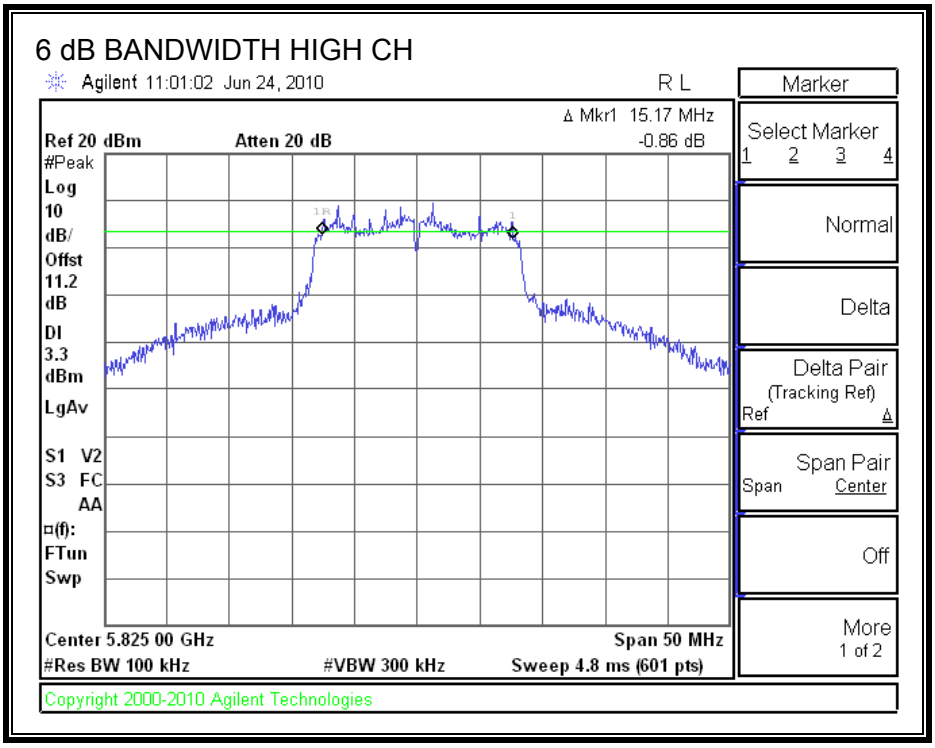
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	15.08	0.5
Middle	5785	15.58	0.5
High	5825	15.17	0.5

6 dB BANDWIDTH







7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

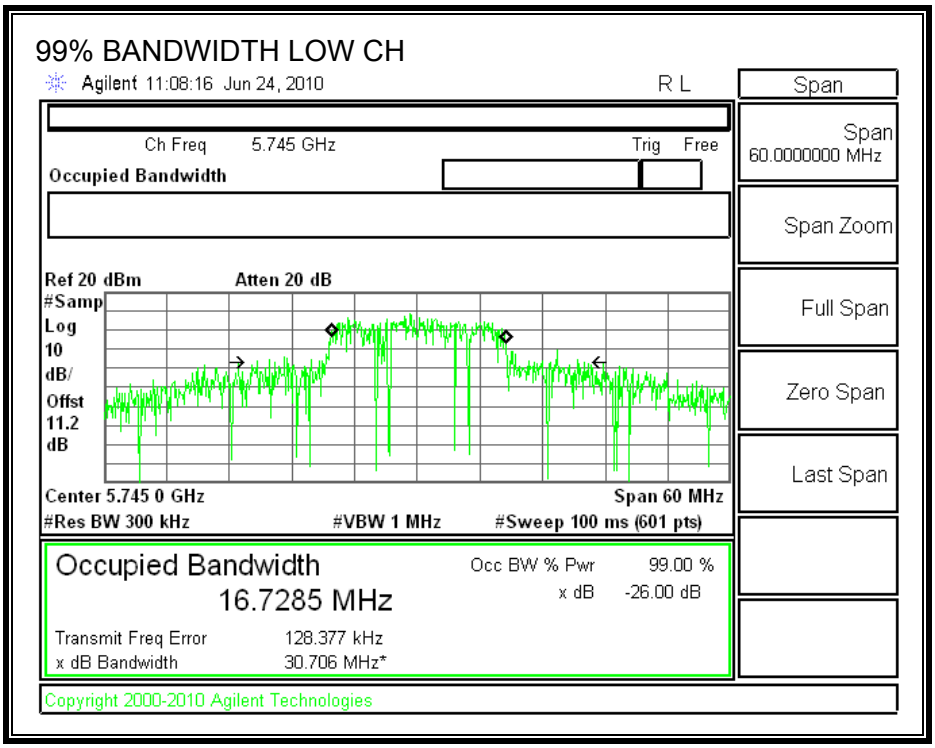
TEST PROCEDURE

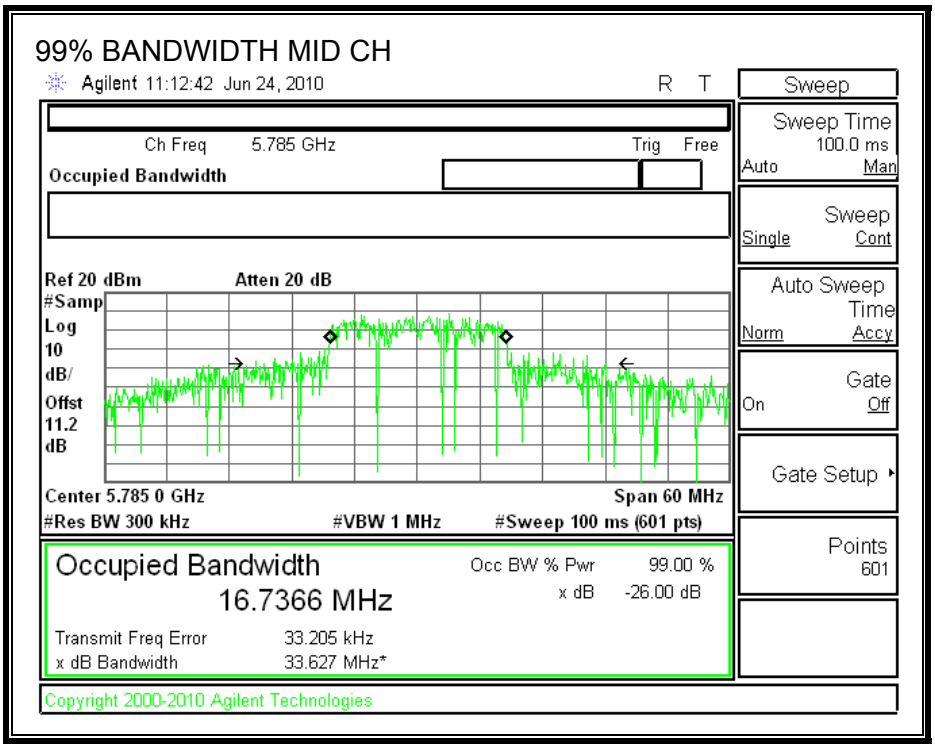
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

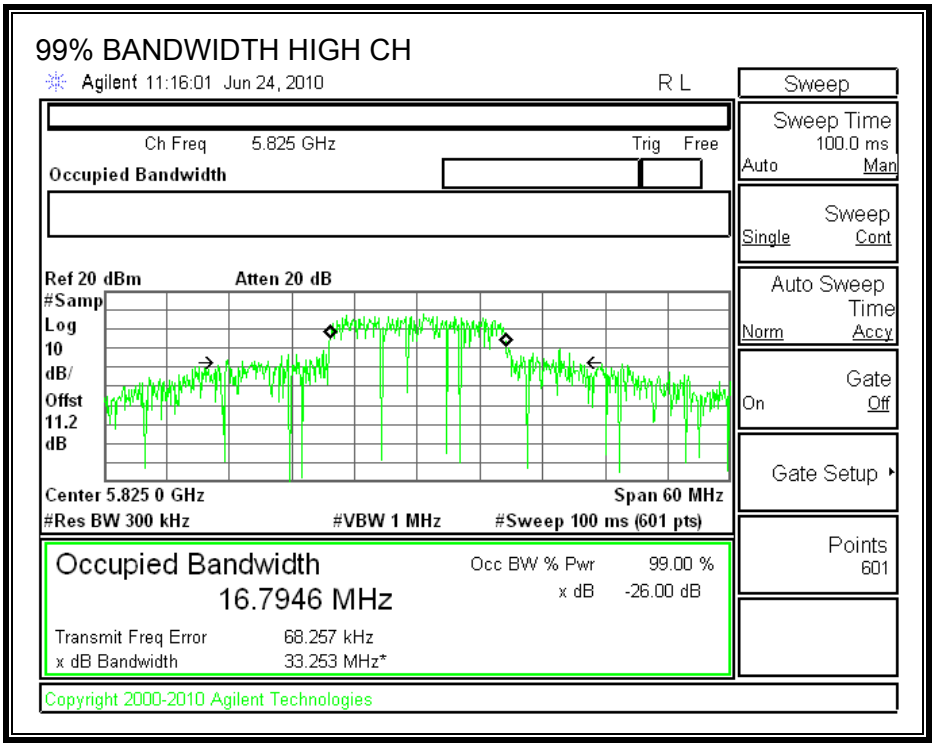
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.7285
Middle	5785	16.7366
High	5825	16.7946

99% BANDWIDTH







7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is equal to 6.28 dBi, therefore the limit is 29.72 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Peak Power Meter Reading (dBm)	Limit (dBm)	Margin (dB)
Low	5745	21.70	29.72	-8.02
Middle	5785	21.90	29.72	-7.82
High	5825	22.00	29.72	-7.72

7.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

The maximum antenna gain is equal to 6.28 dBi, therefore the limit is 7.72 dBm.

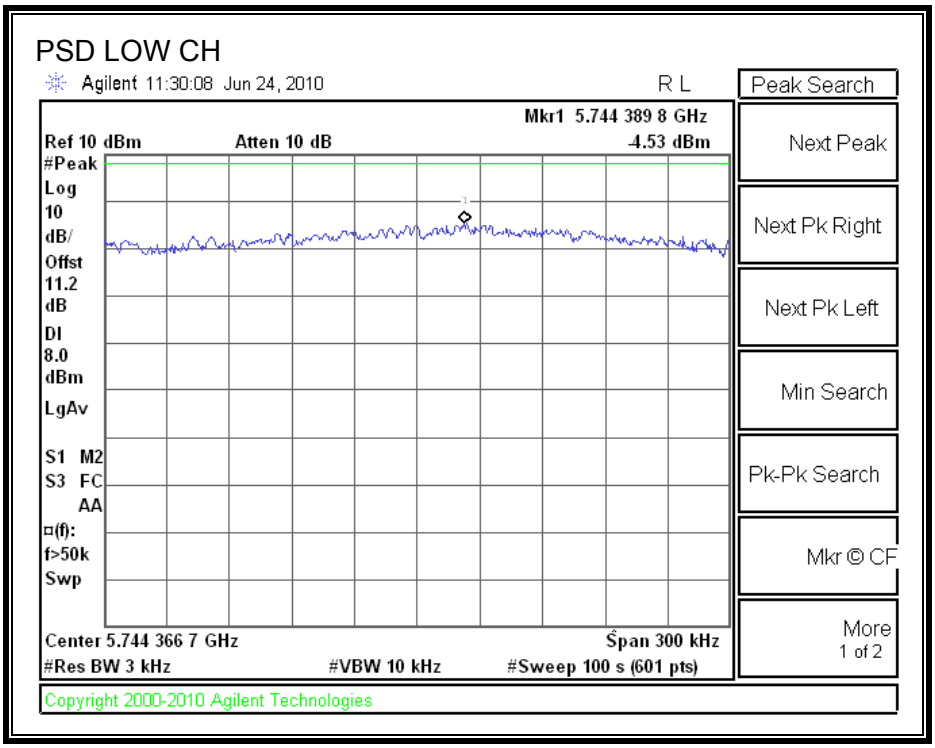
TEST PROCEDURE

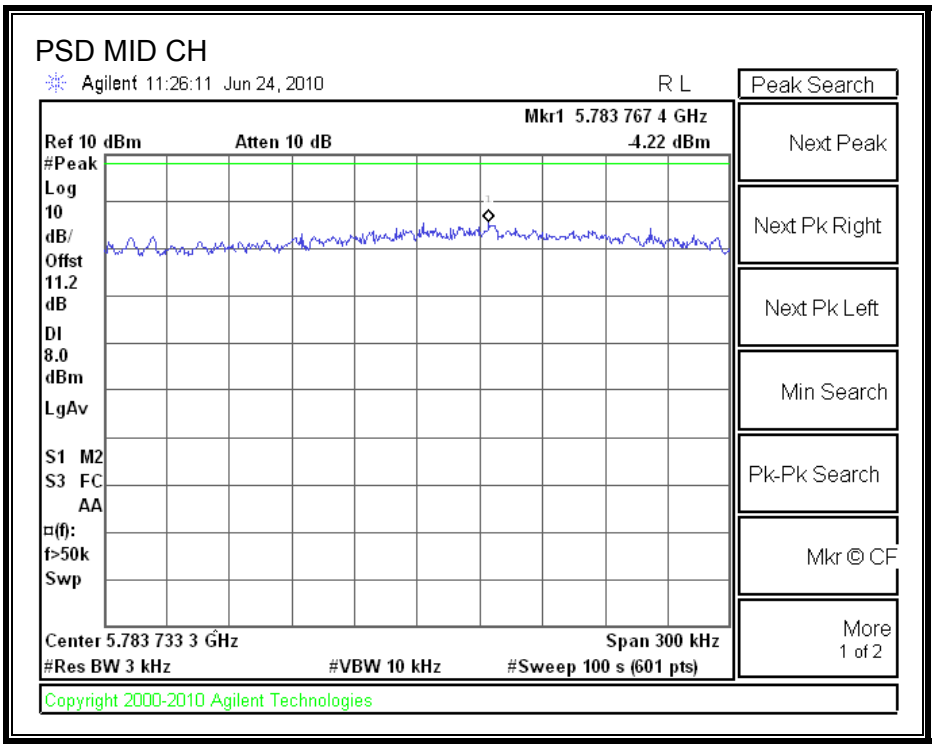
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

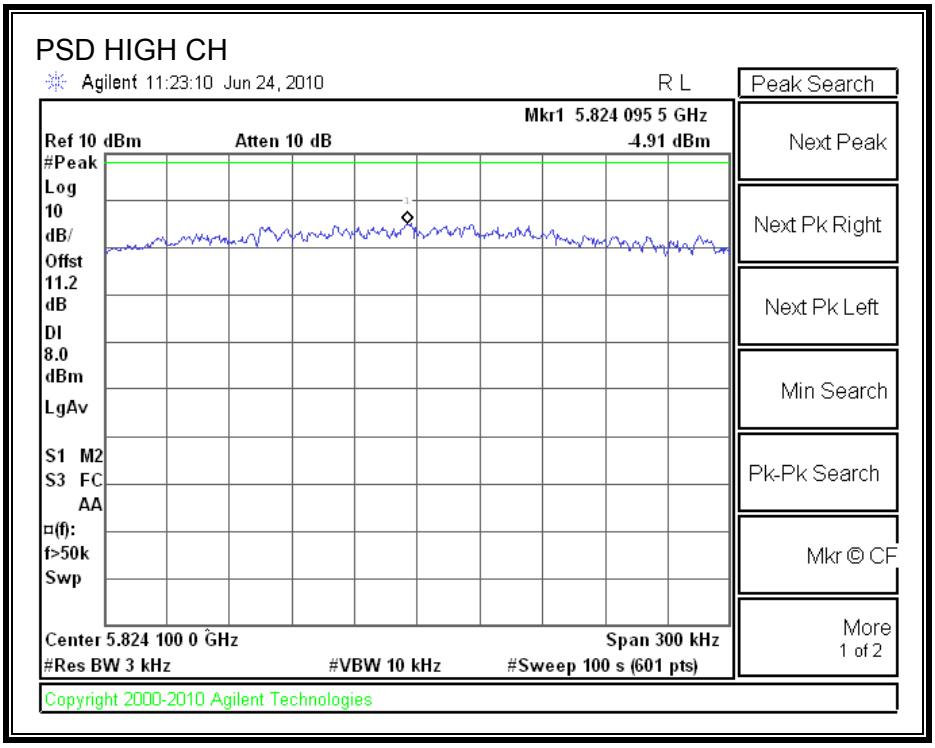
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-5.47	7.72	-13.19
Middle	5785	-5.78	7.72	-13.50
High	5825	-4.91	7.72	-12.63

POWER SPECTRAL DENSITY







7.4.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

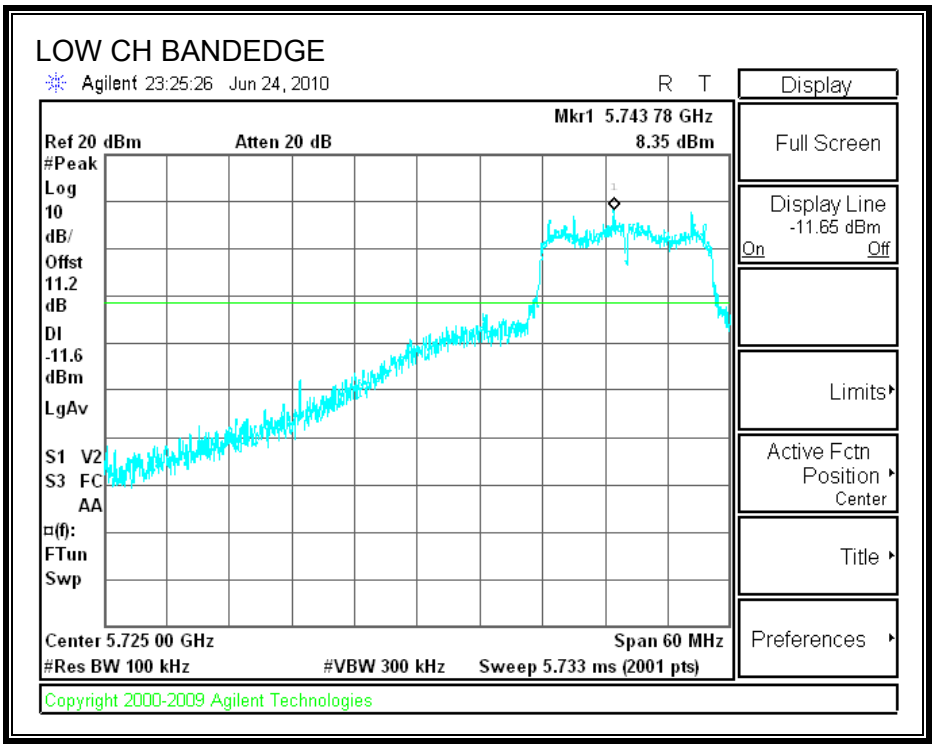
TEST PROCEDURE

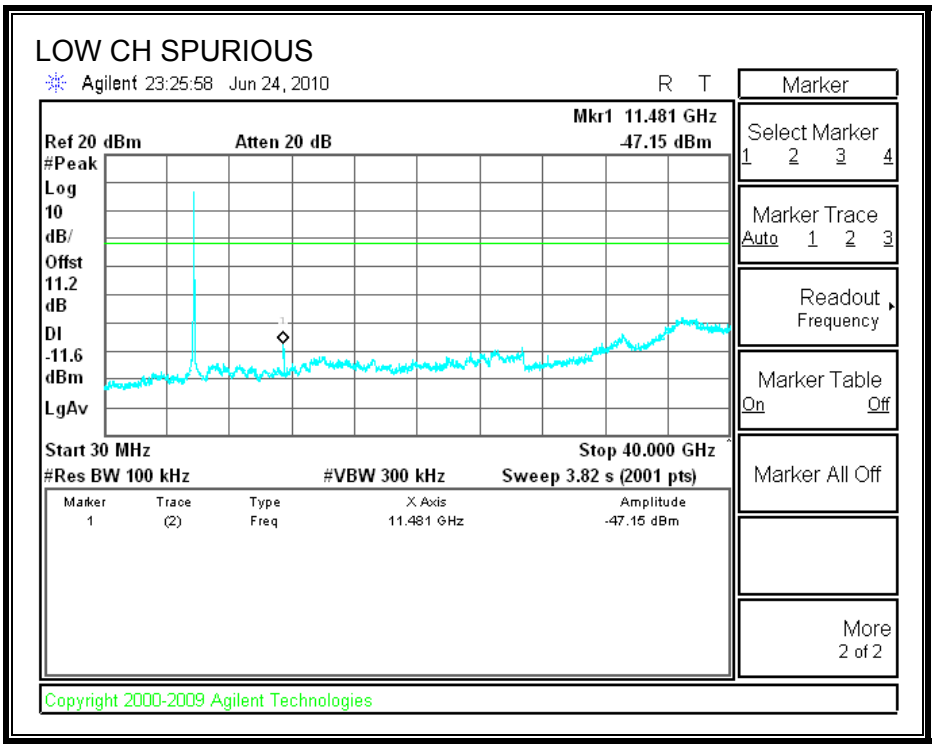
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

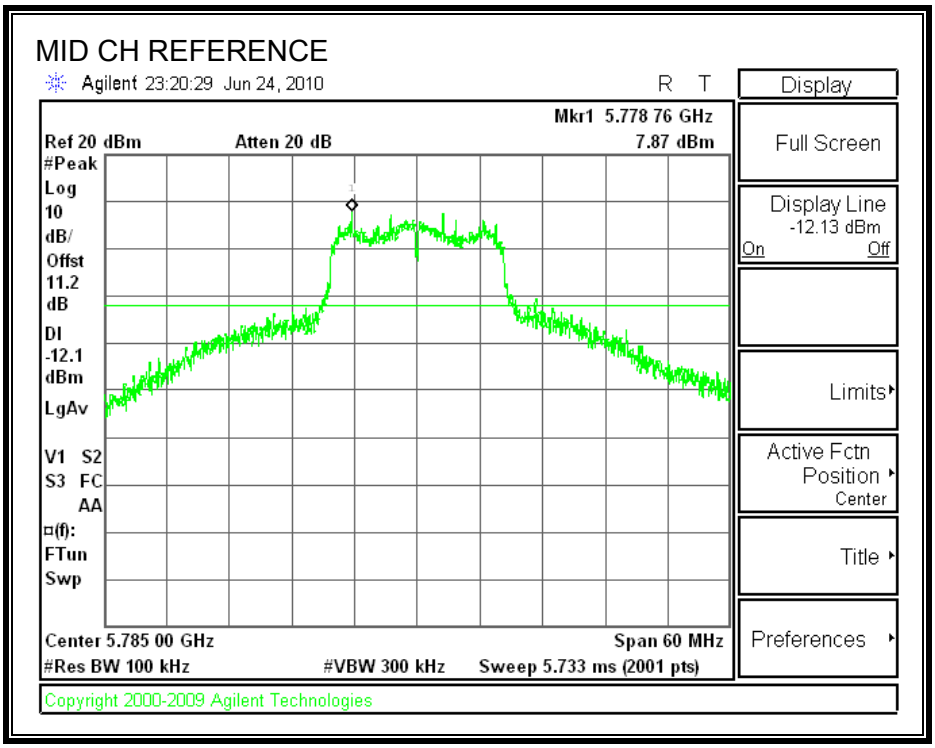
RESULTS

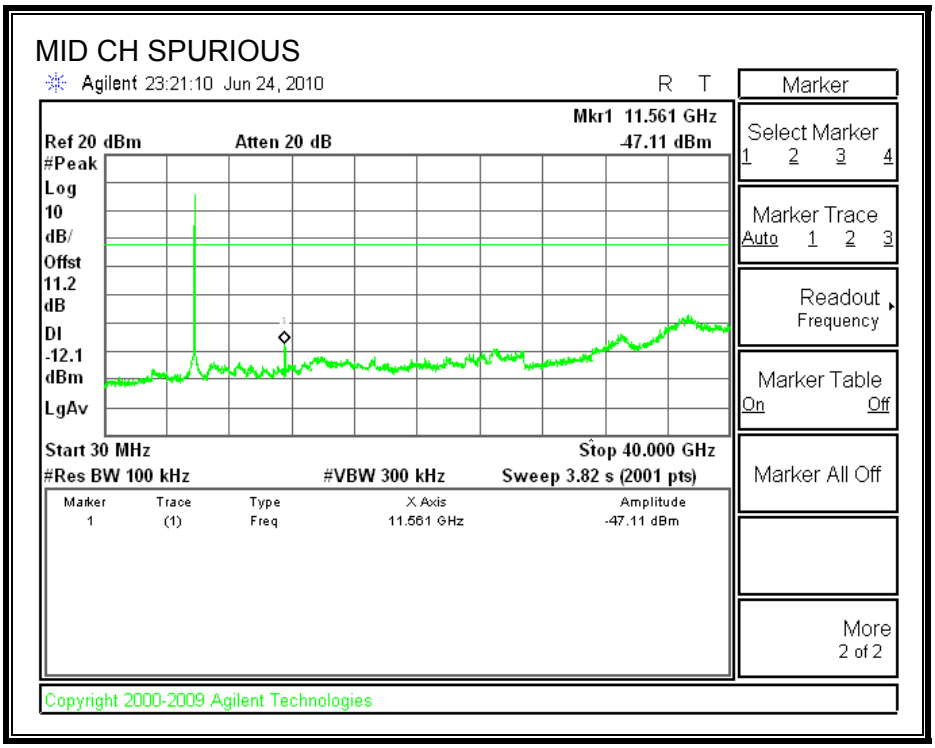
SPURIOUS EMISSIONS, LOW CHANNEL



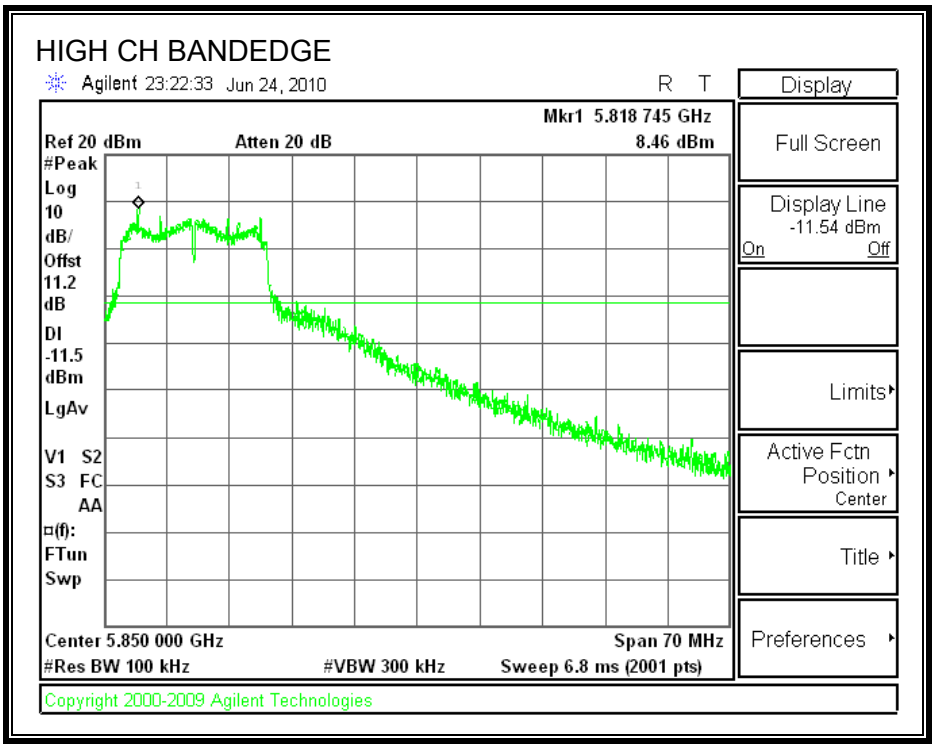


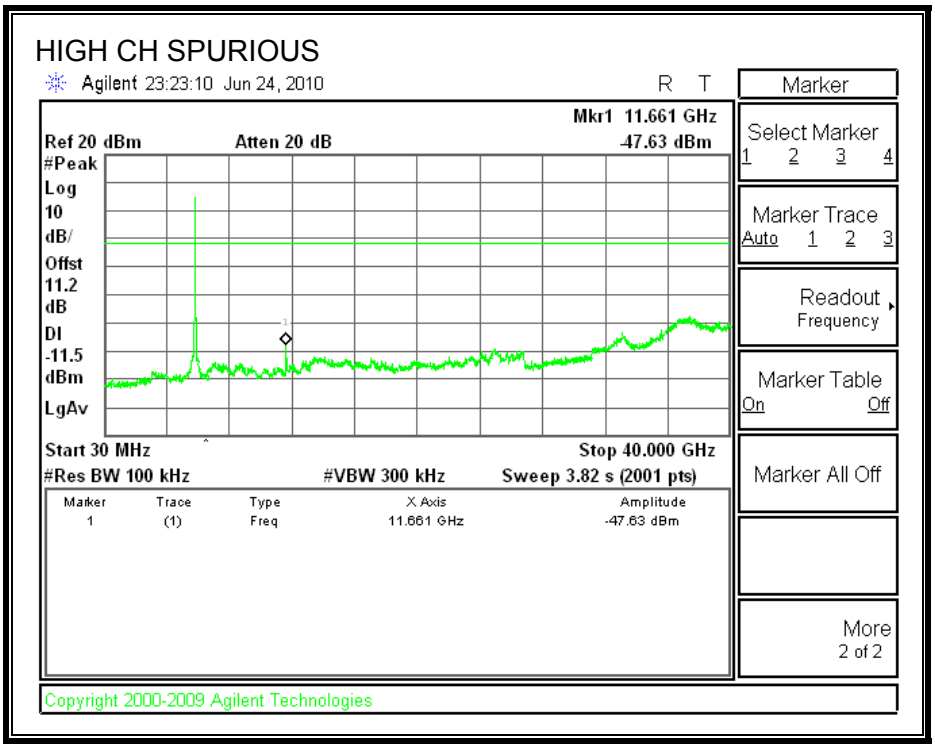
SPURIOUS EMISSIONS, MID CHANNEL





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.

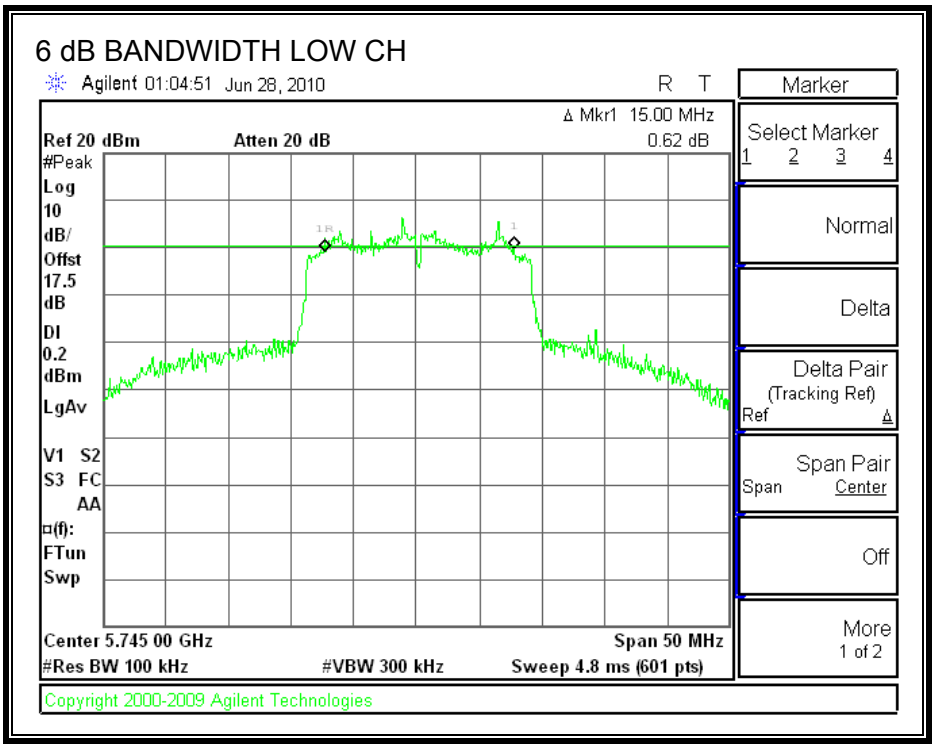
TEST PROCEDURE

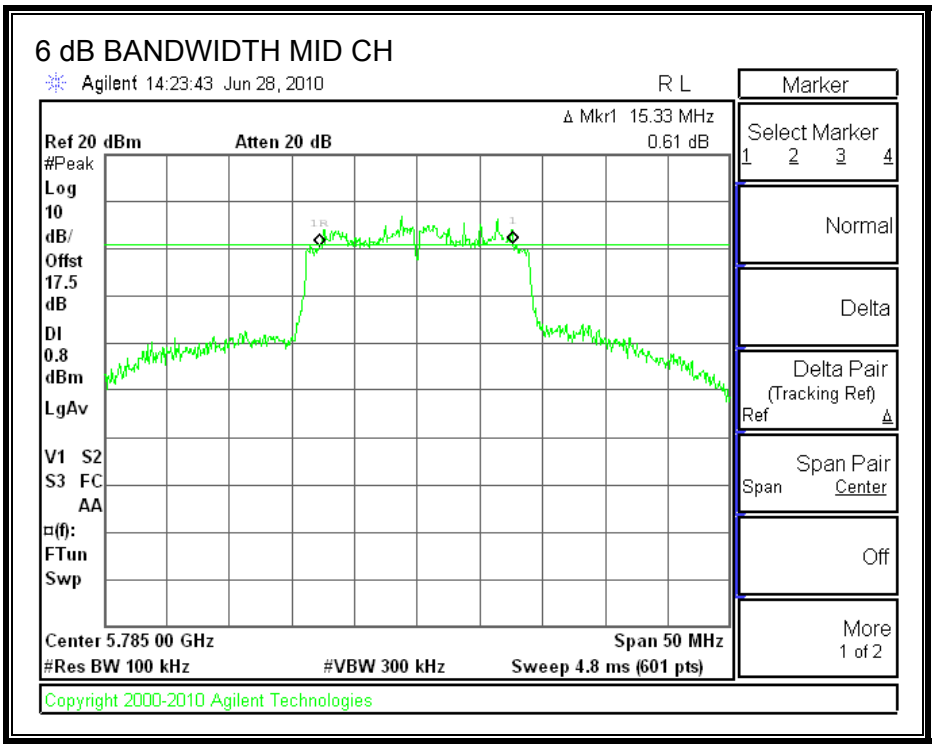
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

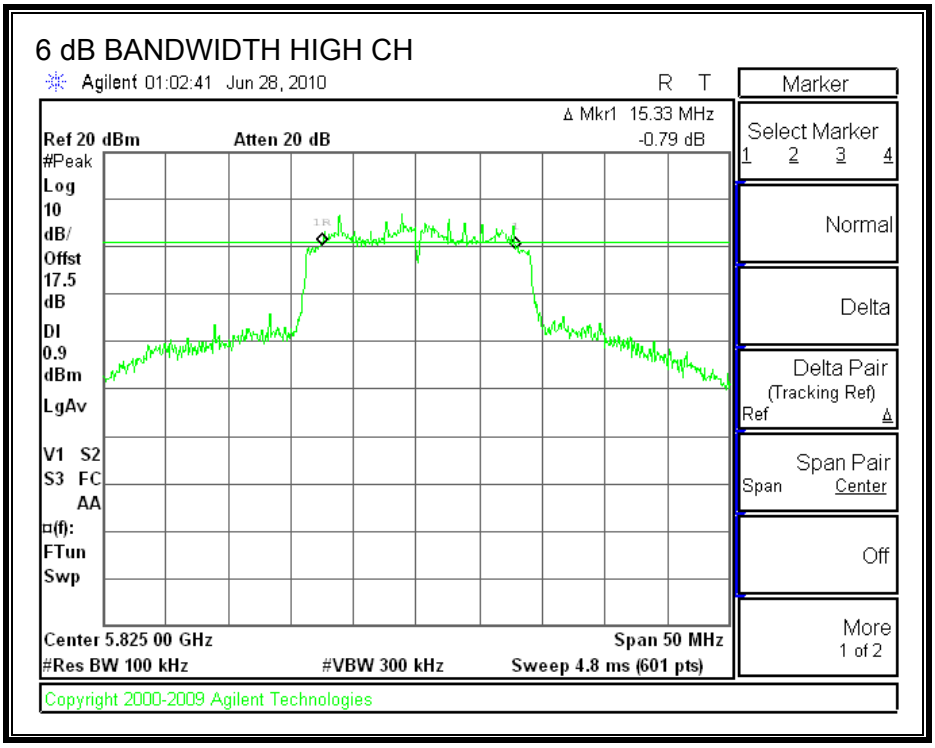
RESULTS

Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (MHz)	Minimum Limit (MHz)
Low	5745	15.00	15.25	0.5
Middle	5785	15.33	15.92	0.5
High	5825	15.33	15.83	0.5

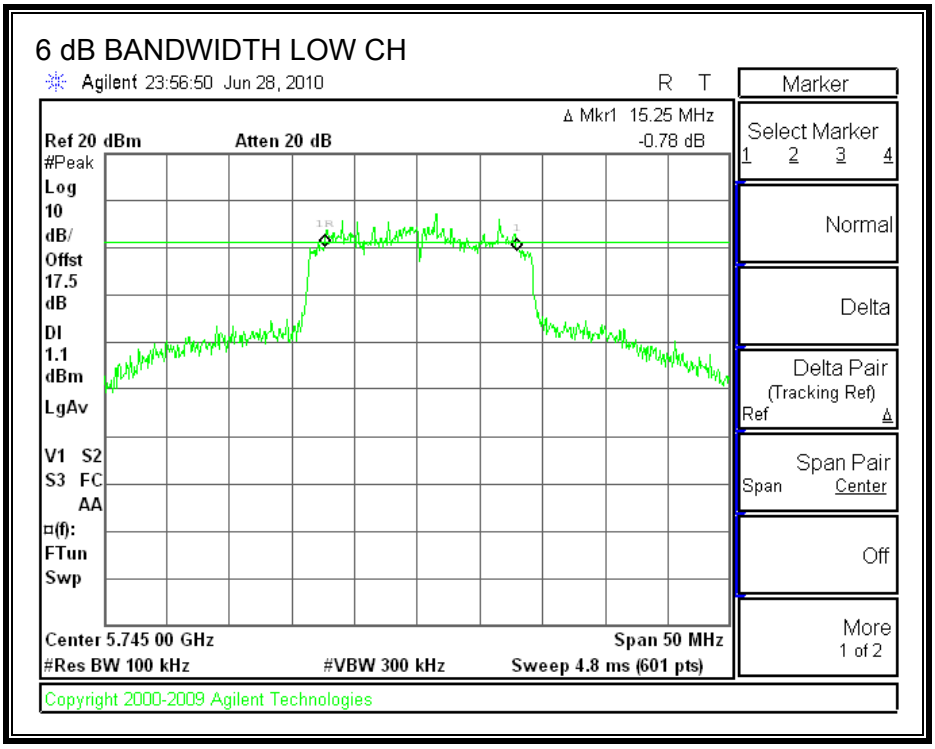
6 dB BANDWIDTH, CHAIN 0

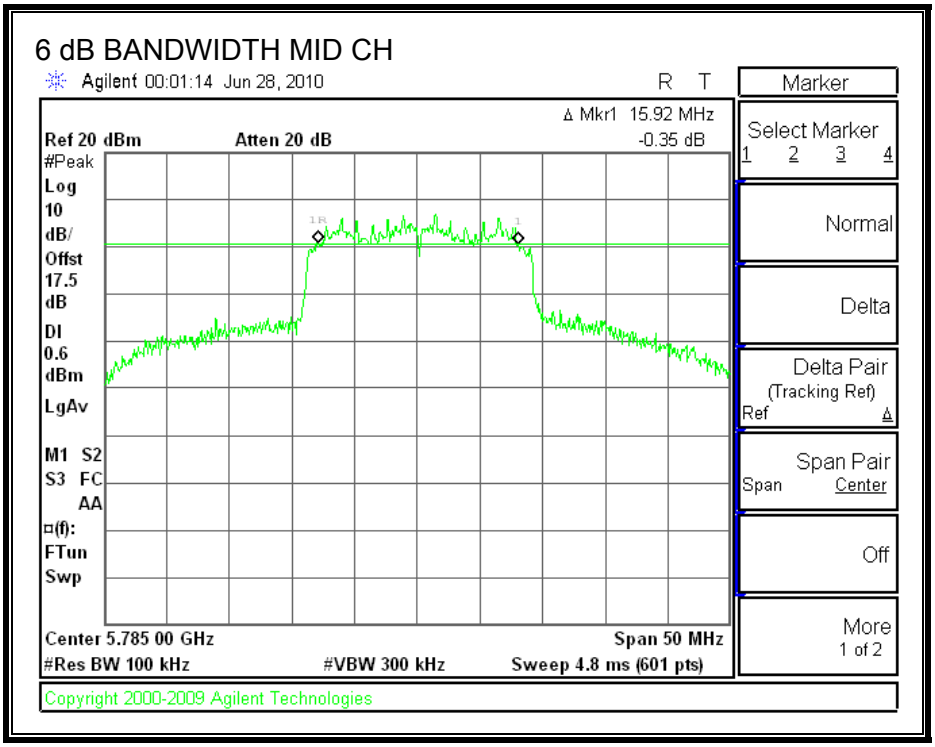


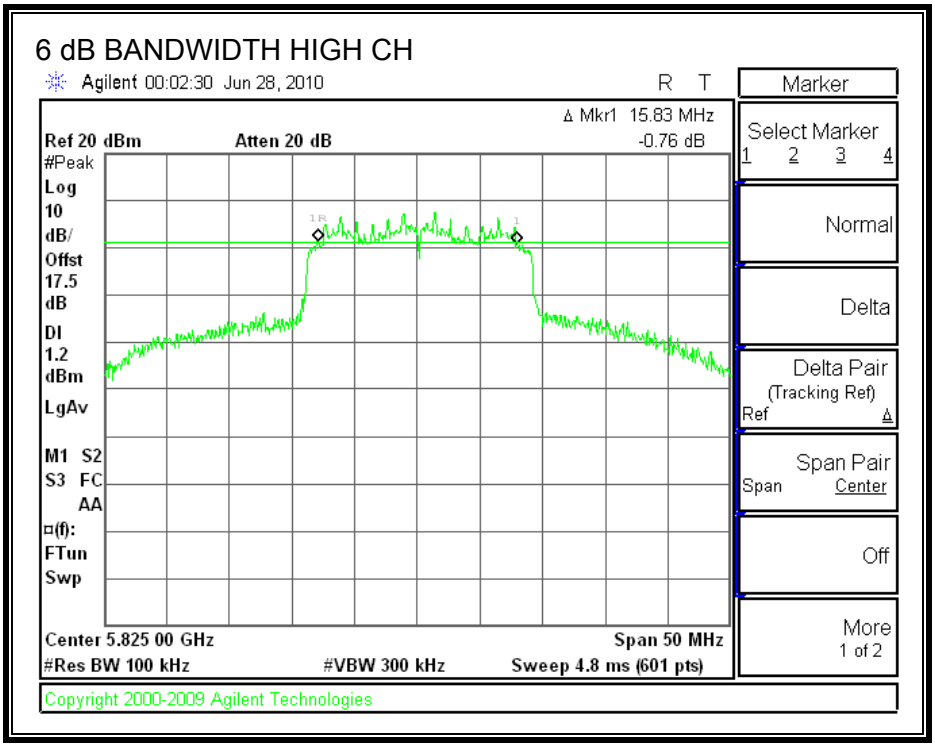




6 dB BANDWIDTH, CHAIN 1







7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

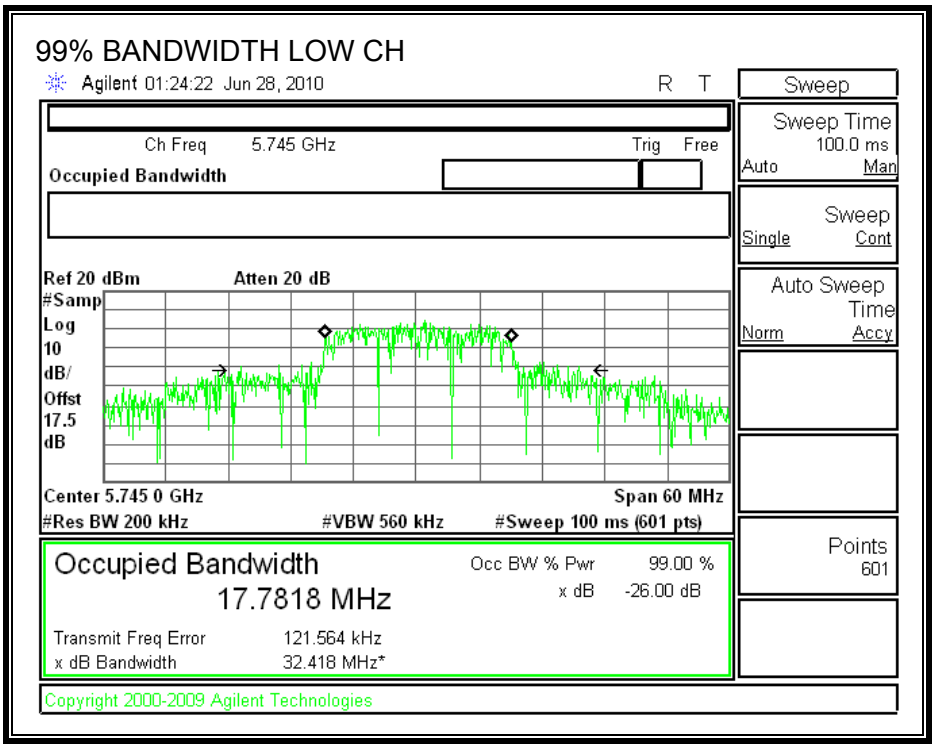
TEST PROCEDURE

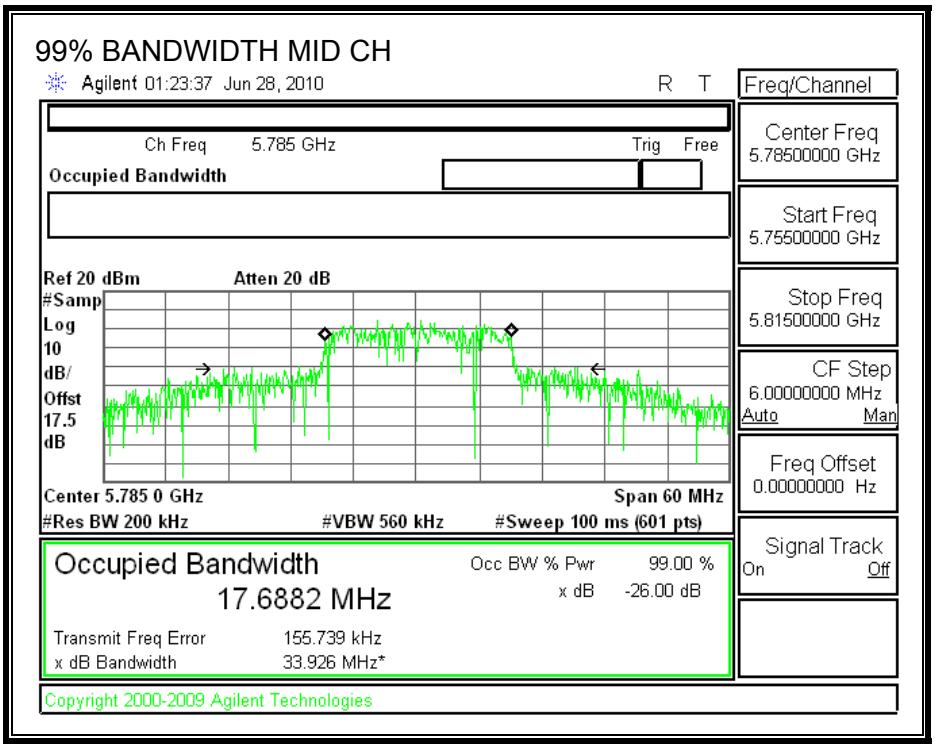
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

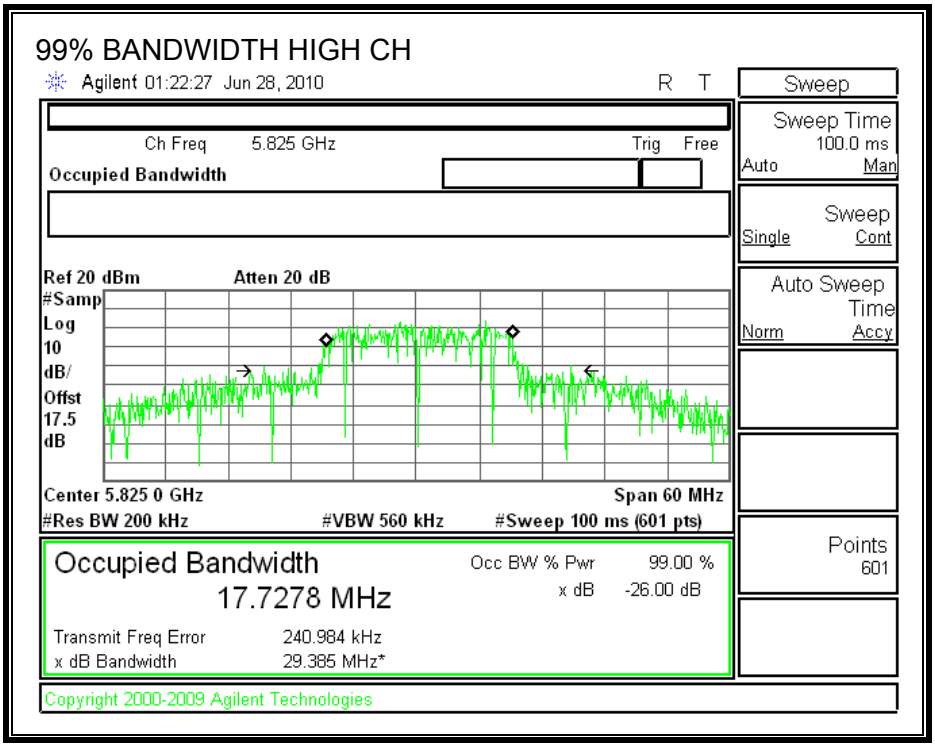
RESULTS

Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (MHz)
Low	5745	17.7818	17.7682
Middle	5785	17.6882	17.7616
High	5825	17.7278	17.8154

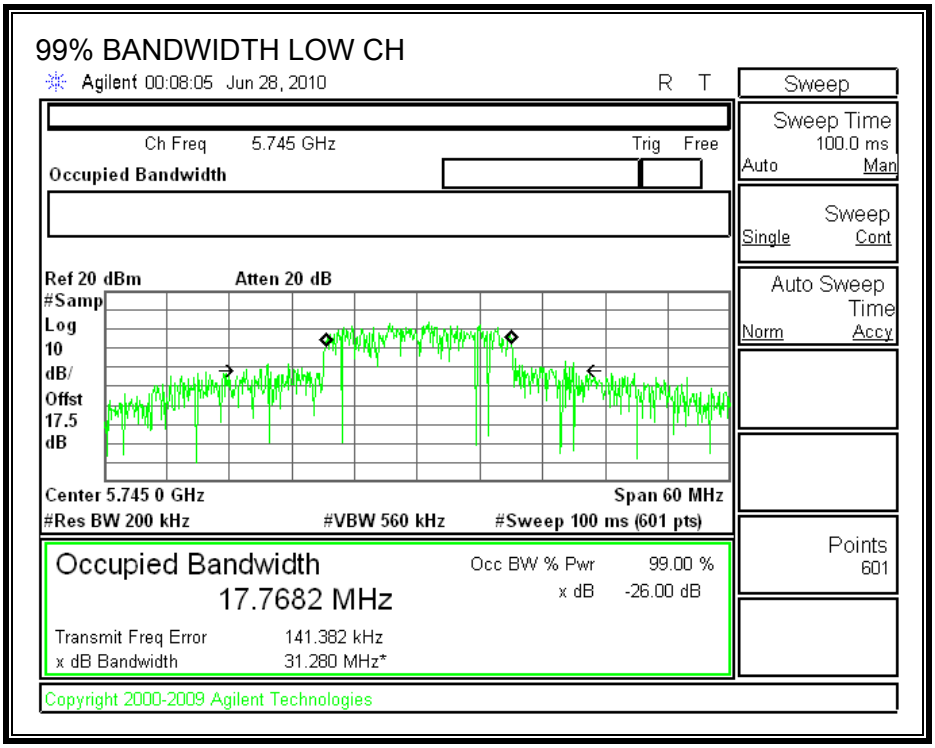
99% BANDWIDTH, CHAIN 0

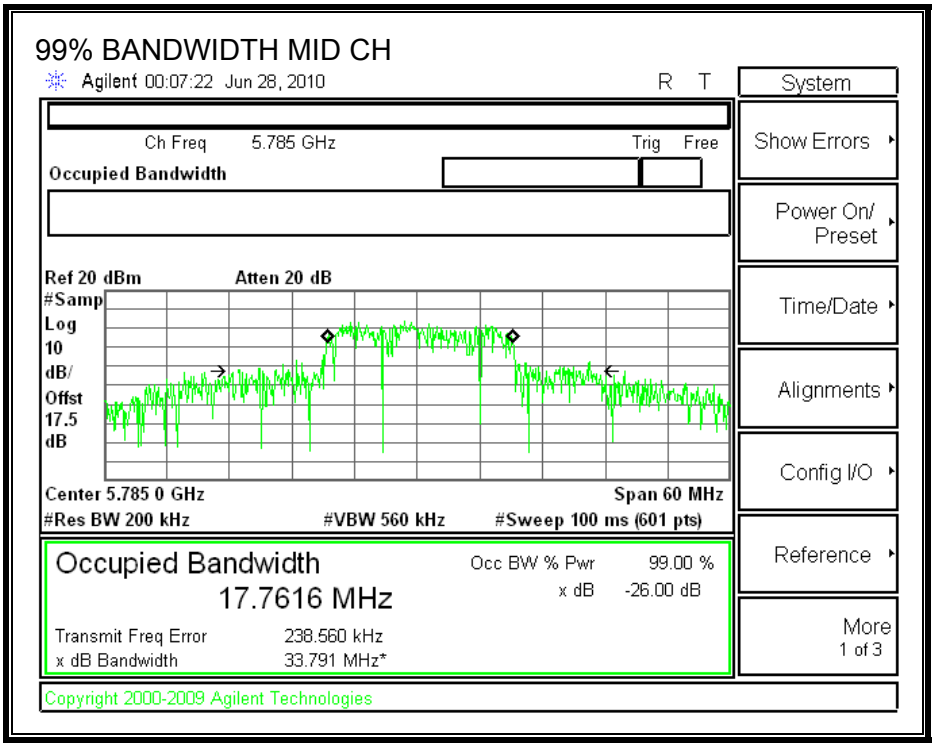


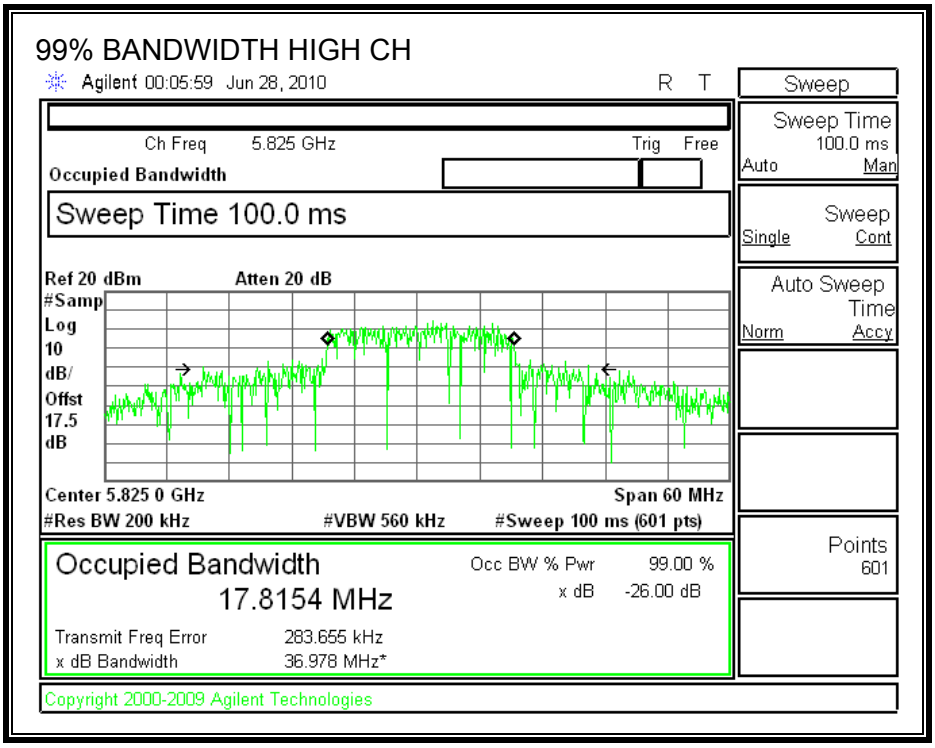




99% BANDWIDTH, CHAIN 1







7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 8.65 dBi, therefore the limit is 27.35 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Limit (dBm)	Chain 0 (dBm)	Chain 1 (dBm)	Total (dBm)	Margin (dB)
Low	5745	27.35	21.32	21.27	24.31	-3.04
Mid	5785	27.35	21.40	21.37	24.40	-2.95
High	5825	27.35	21.37	21.39	24.39	-2.96

7.5.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

The highest combination of antenna gains is equal to 8.65 dBi, therefore the limit is 5.35 dBm.

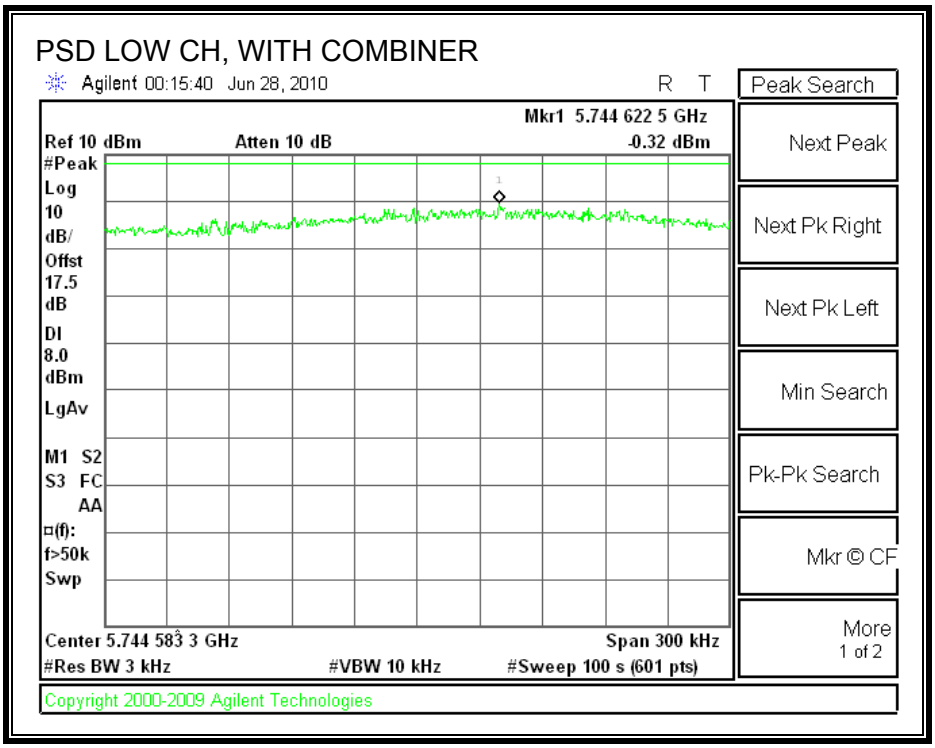
TEST PROCEDURE

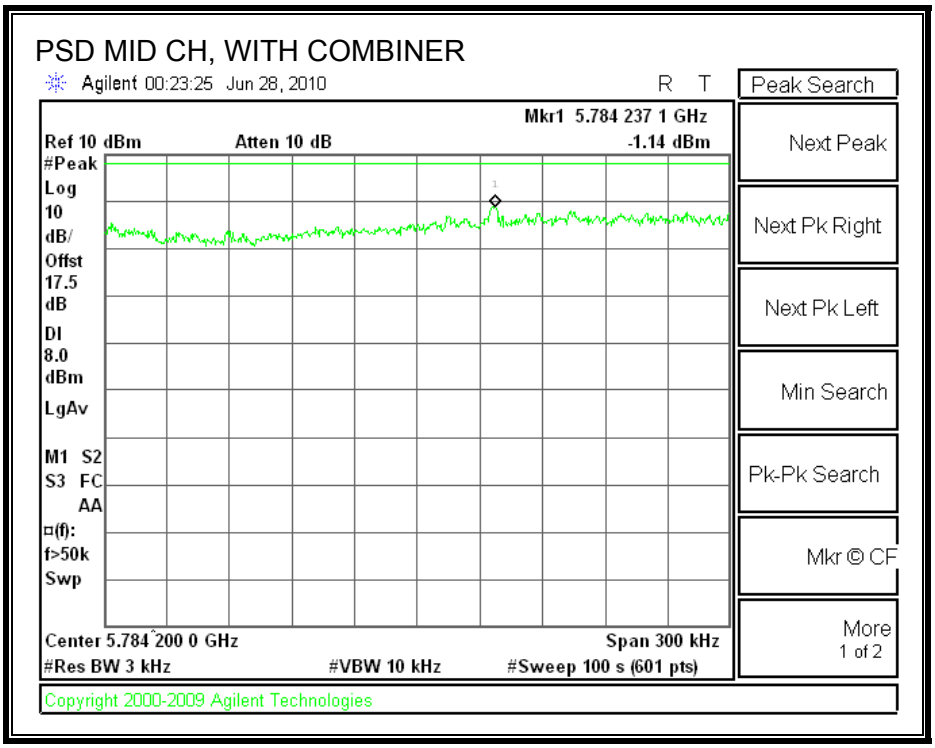
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

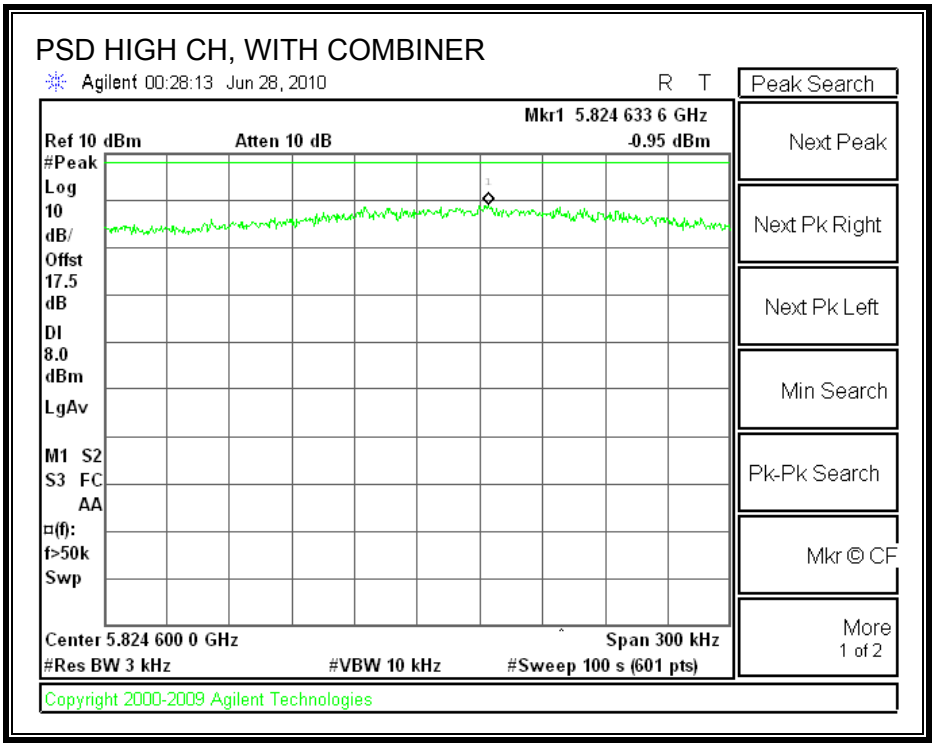
RESULTS

Channel	Frequency (MHz)	PPSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-0.32	5.35	-5.67
Middle	5785	-1.14	5.35	-6.49
High	5825	-4.91	5.35	-10.26

POWER SPECTRAL DENSITY, WITH COMBINER







7.5.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

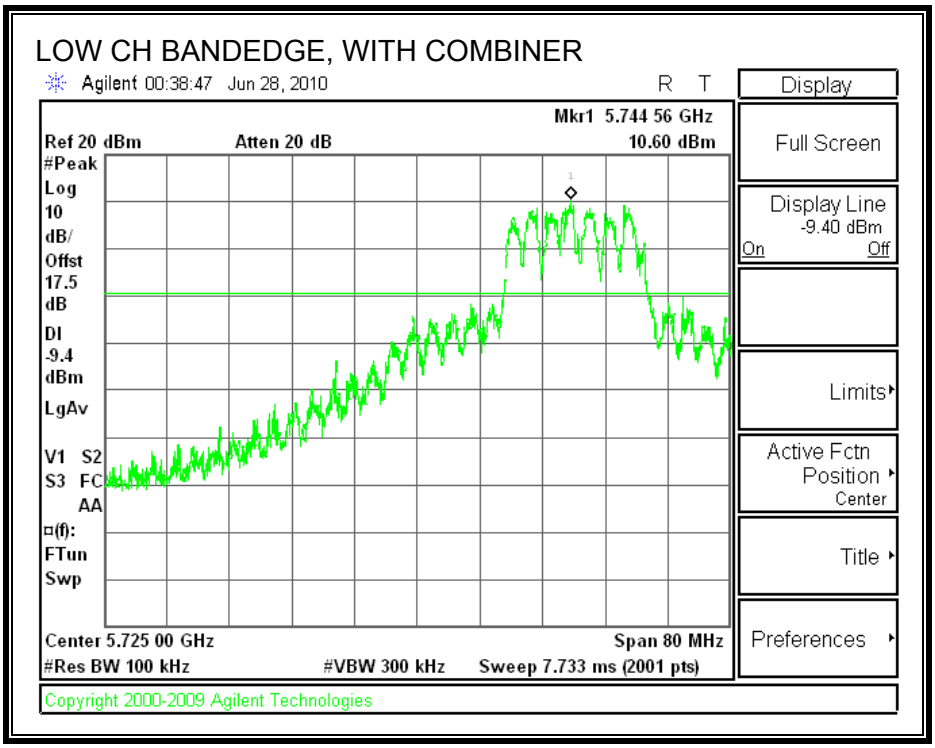
TEST PROCEDURE

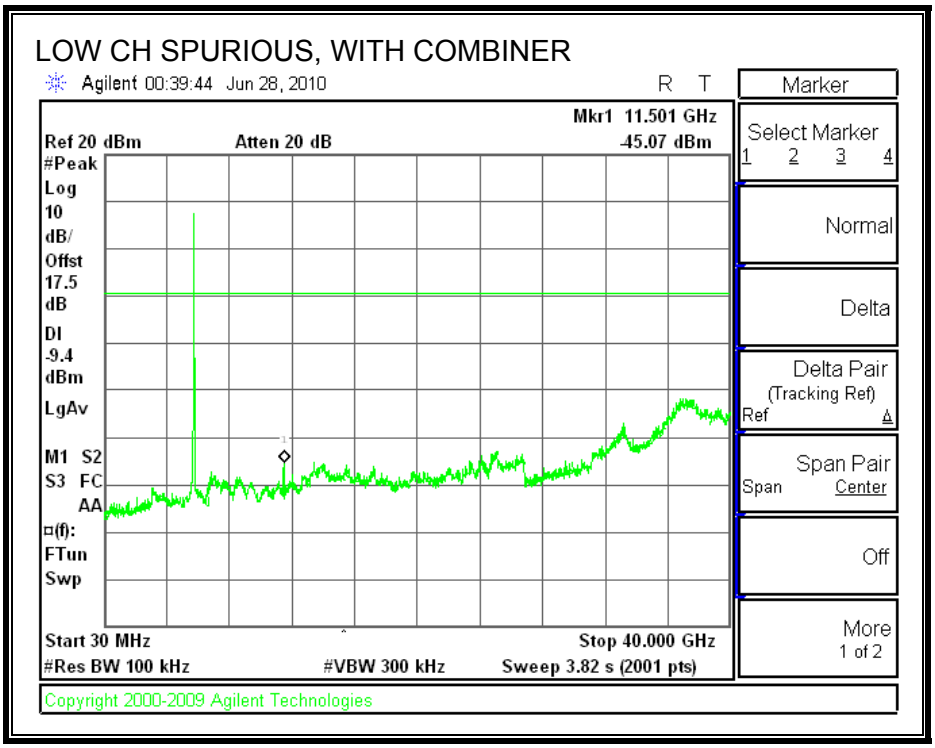
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

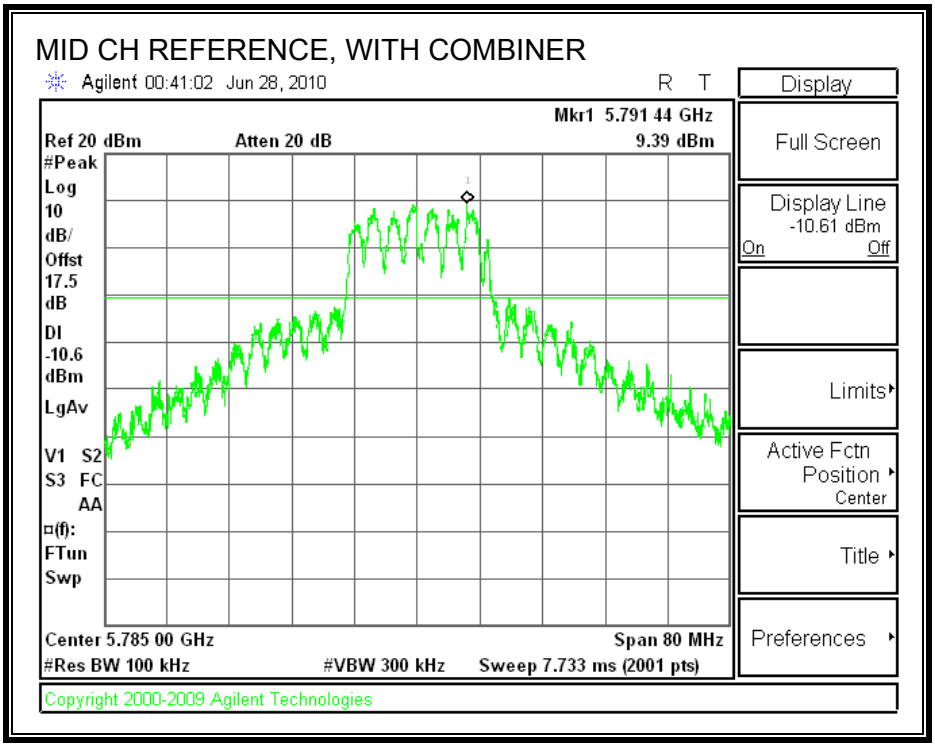
RESULTS

SPURIOUS EMISSIONS WITH COMBINER

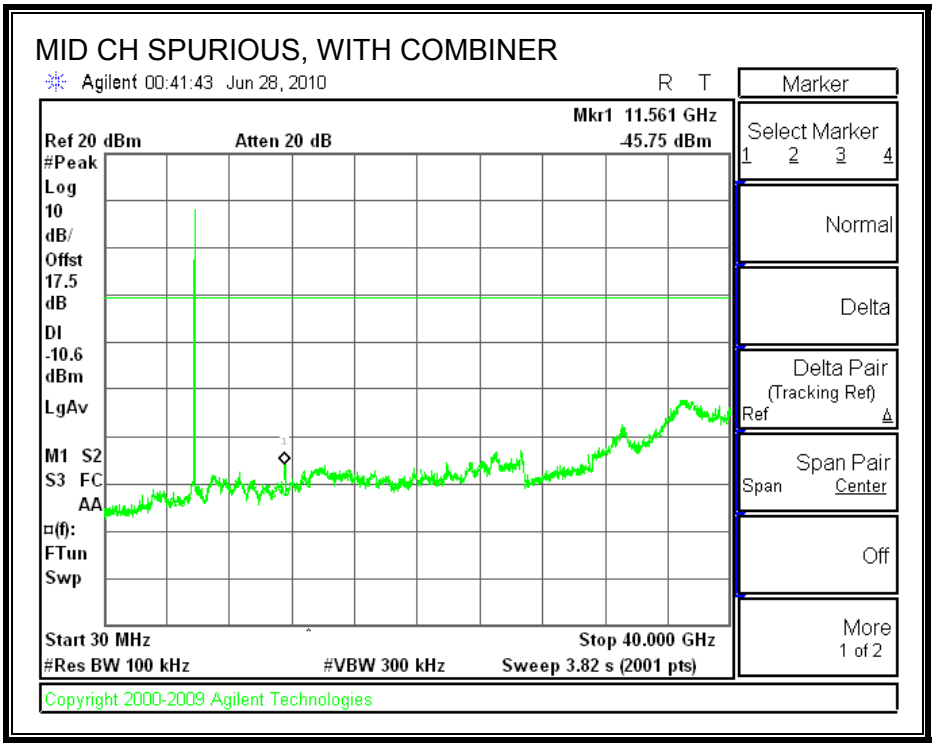




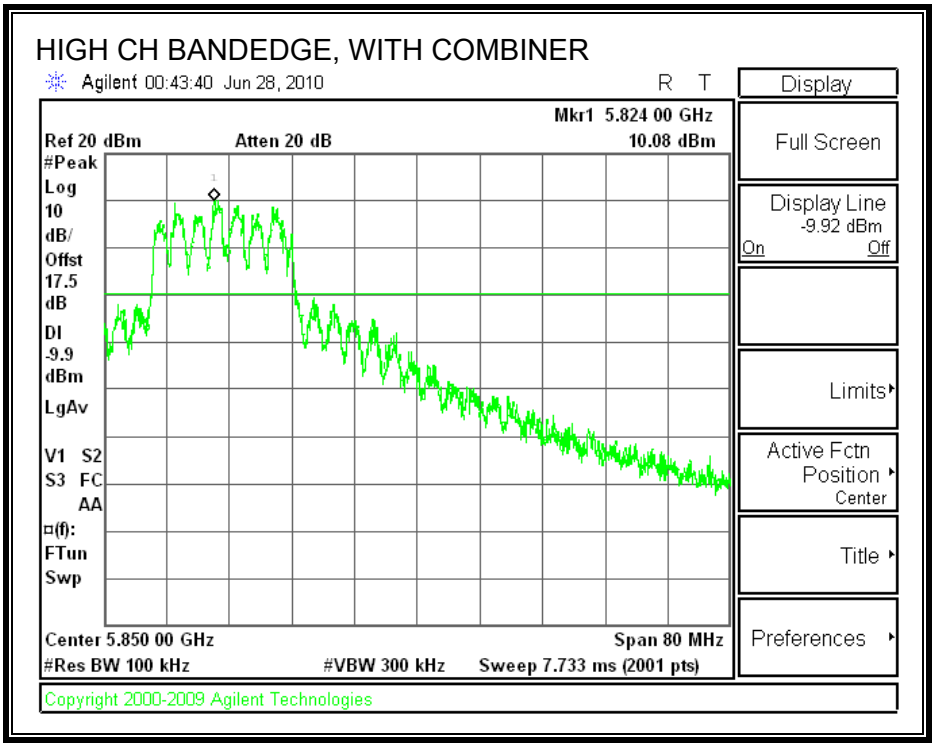
MID CH REFERENCE, WITH COMBINER



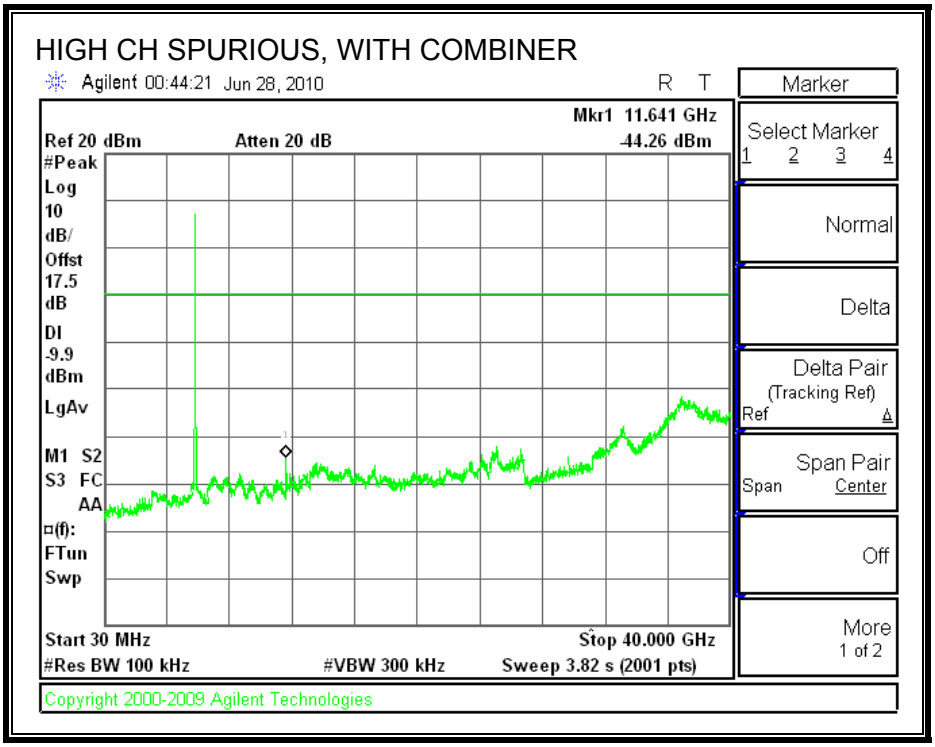
MID CH SPURIOUS, WITH COMBINER



HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, WITH COMBINER



7.6. 802.11n HT40 SISO 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.

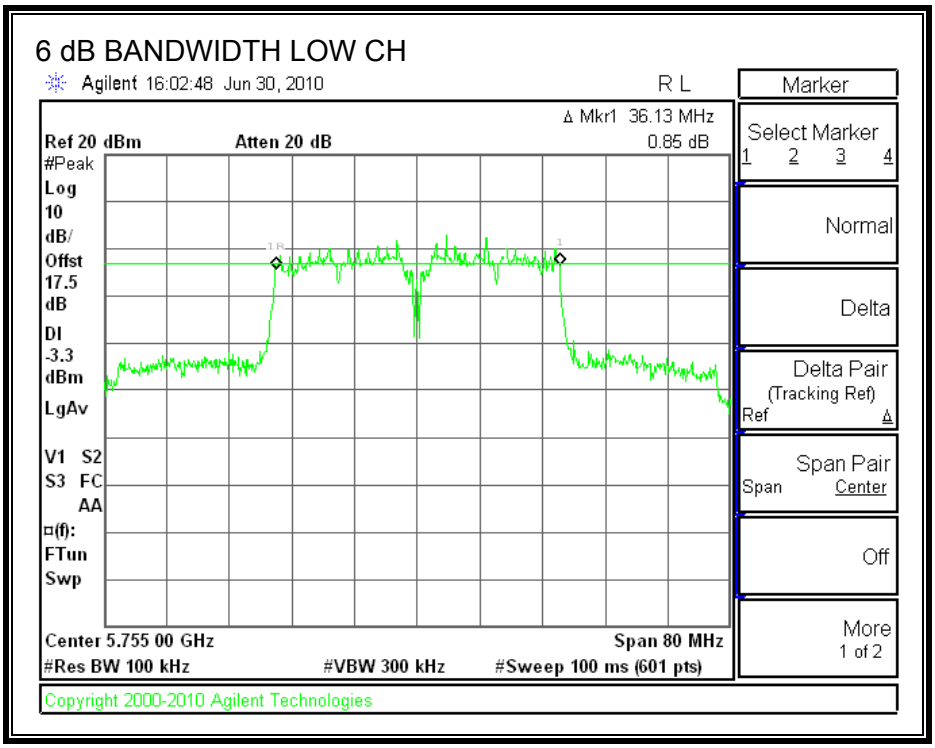
TEST PROCEDURE

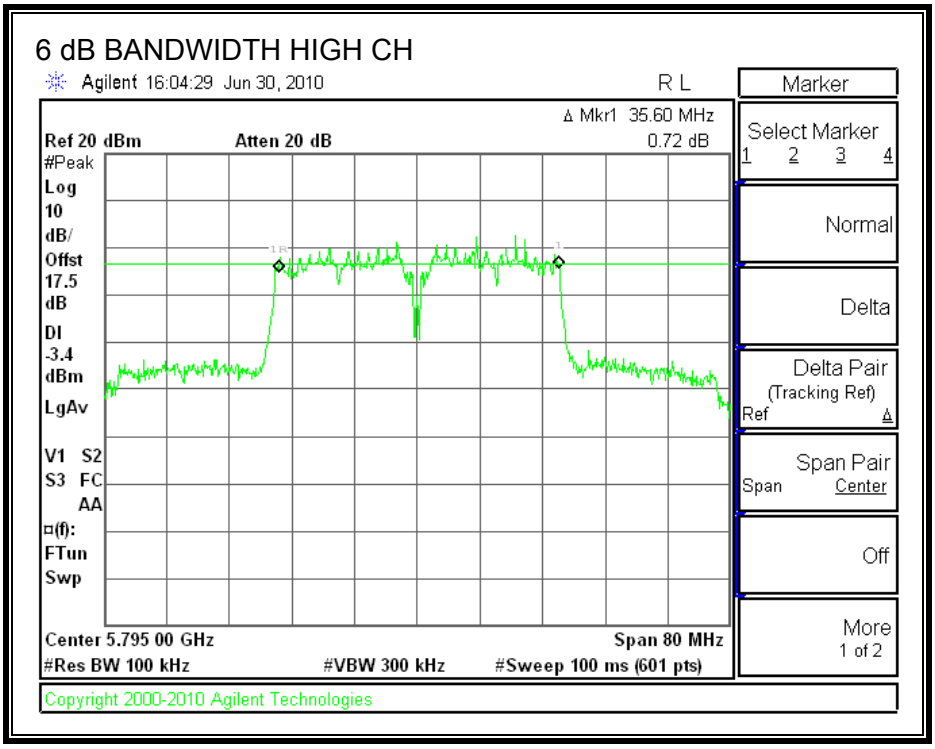
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5755	36.13	0.5
High	5795	35.60	0.5

6 dB BANDWIDTH





7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

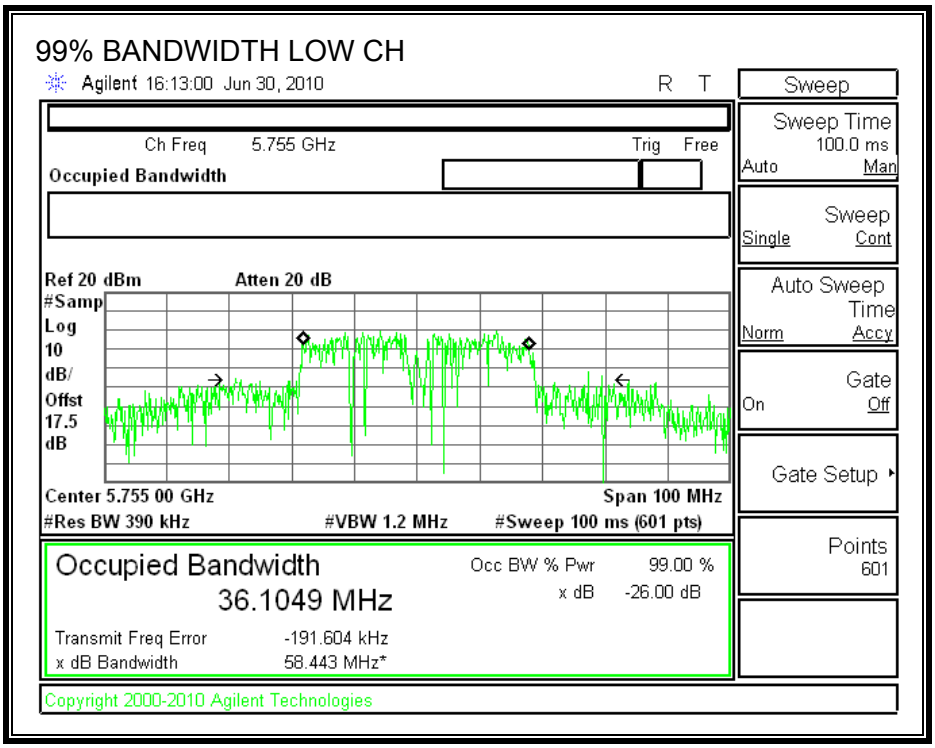
TEST PROCEDURE

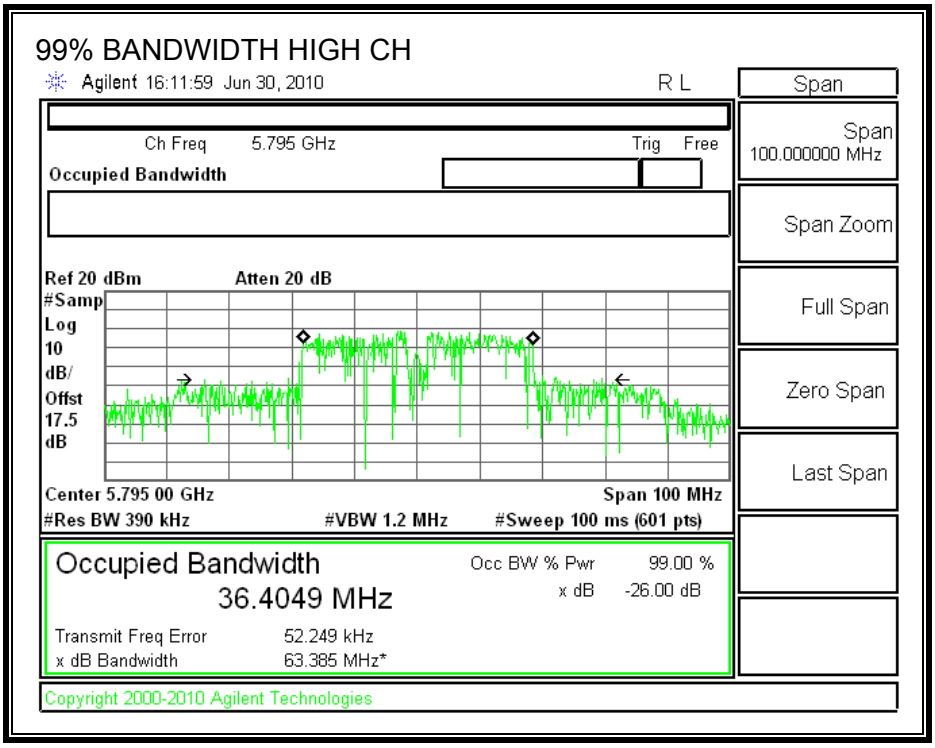
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.1049
High	5795	36.4049

99% BANDWIDTH





7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is equal to 6.28 dBi, therefore the limit is 29.72 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Peak Power Meter Reading (dBm)	Limit (dBm)	Margin (dB)
Low	5755	22.60	29.72	-7.12
High	5795	22.30	29.72	-7.42

7.6.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

The maximum antenna gain is equal to 6.28 dBi, therefore the limit is 7.72 dBm.

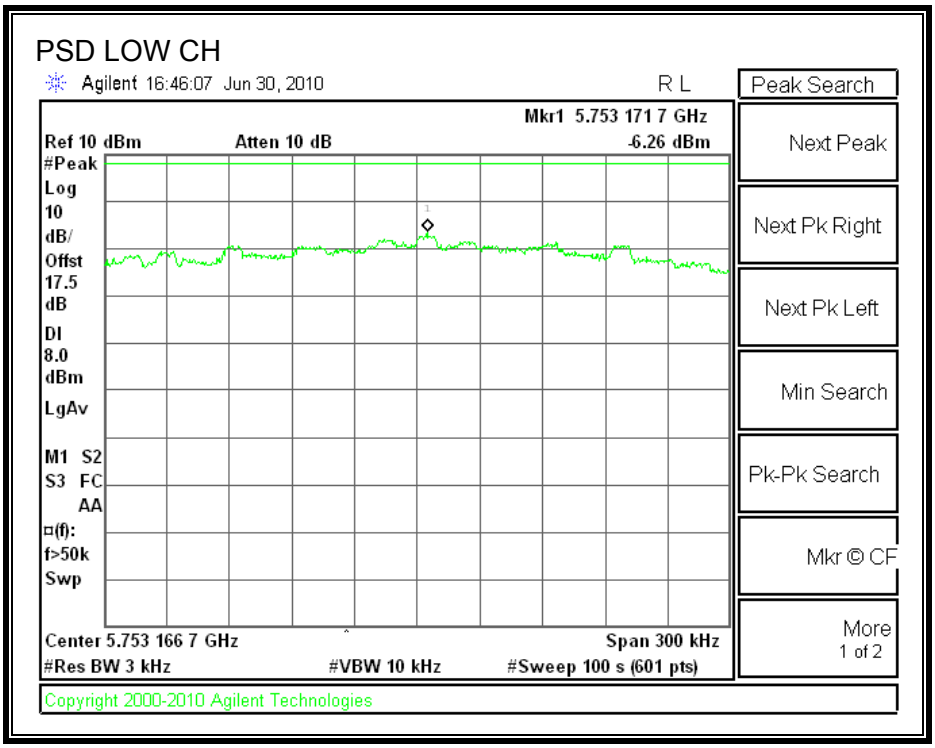
TEST PROCEDURE

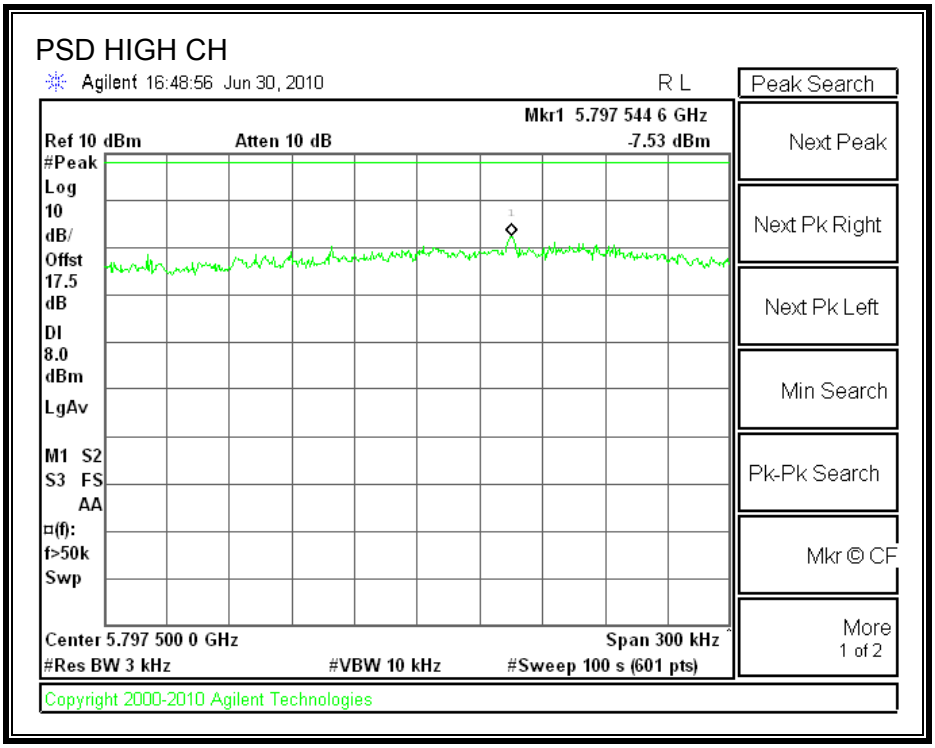
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS:

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-6.26	7.72	-13.98
High	5795	-7.53	7.72	-15.25

POWER SPECTRAL DENSITY





7.6.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

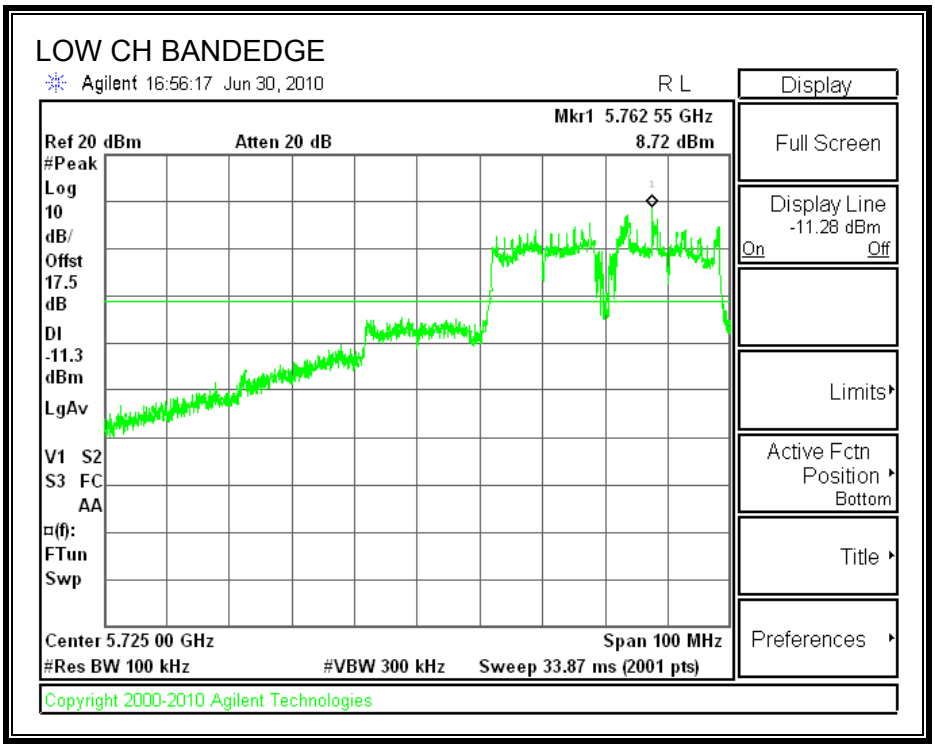
TEST PROCEDURE

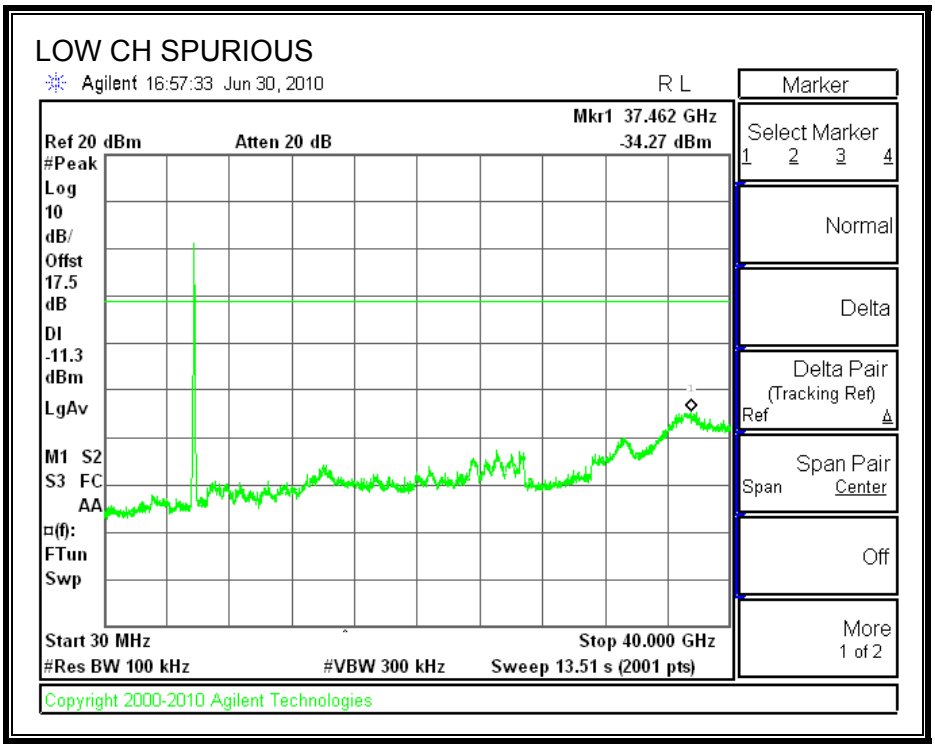
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

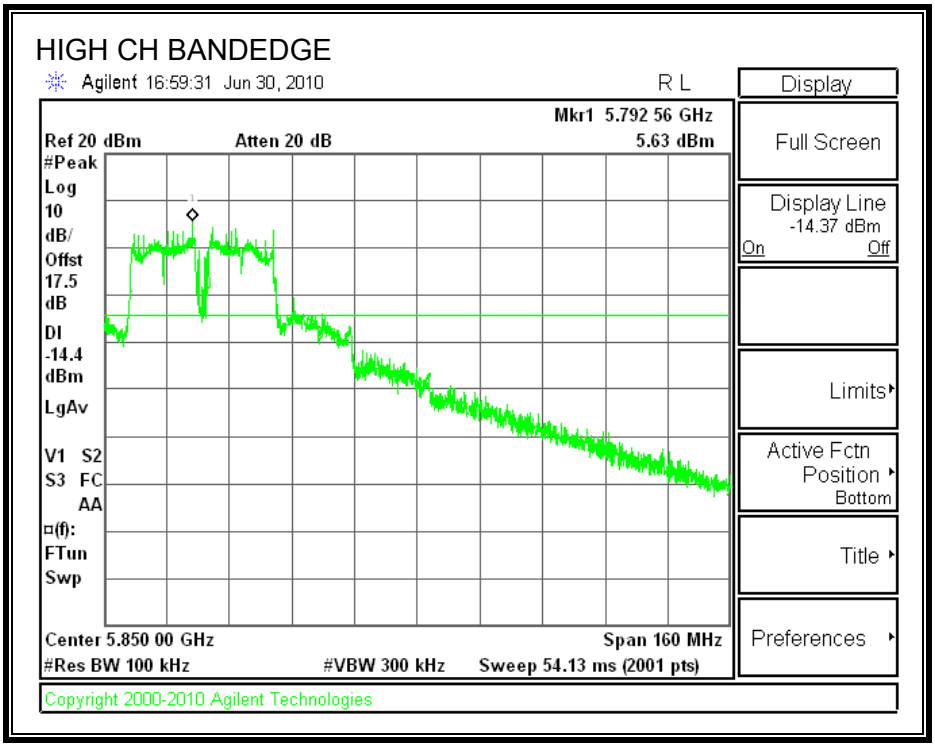
RESULTS

SPURIOUS EMISSIONS

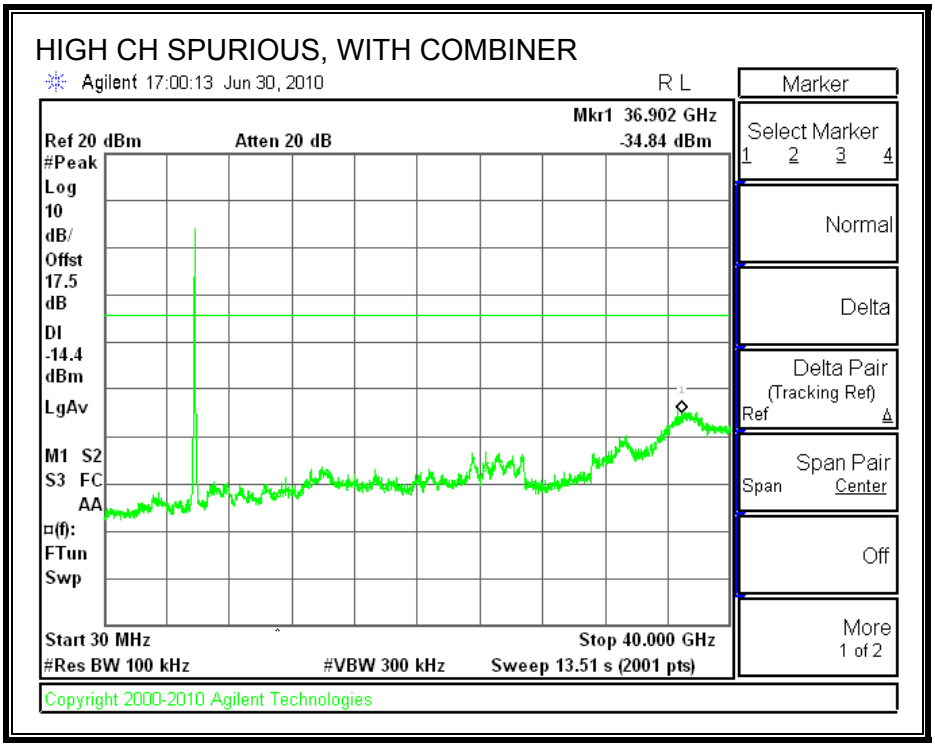




HIGH CH BANDEDGE



HIGH CH SPURIOUS, WITH COMBINER



7.7. 802.11n HT40 CDD/SDM MODE IN THE 5.8 GHz BAND

7.7.1. 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.

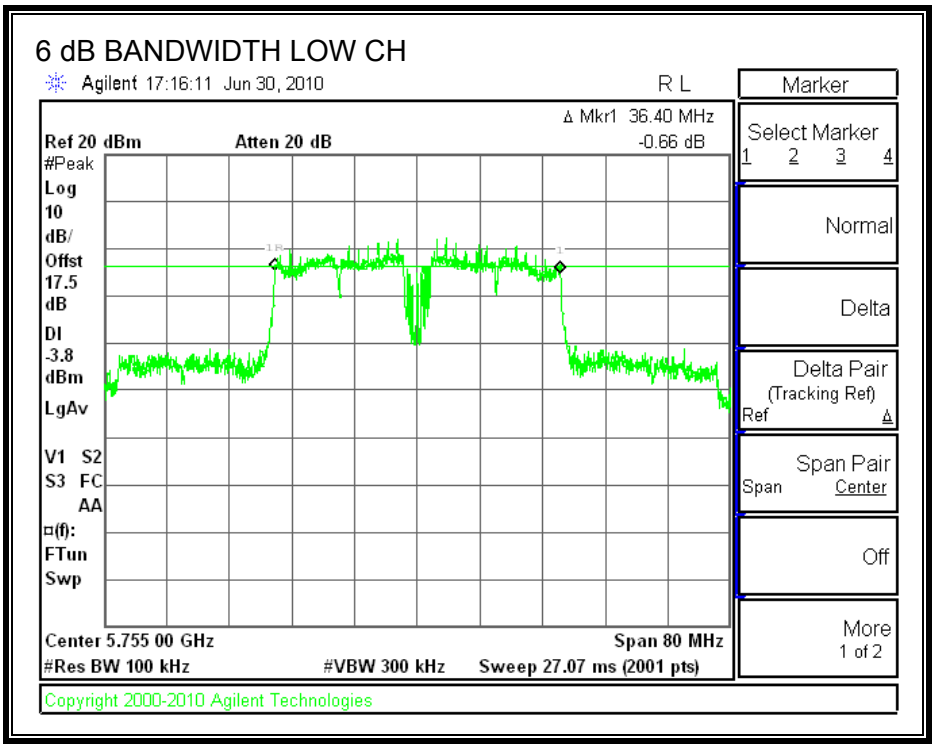
TEST PROCEDURE

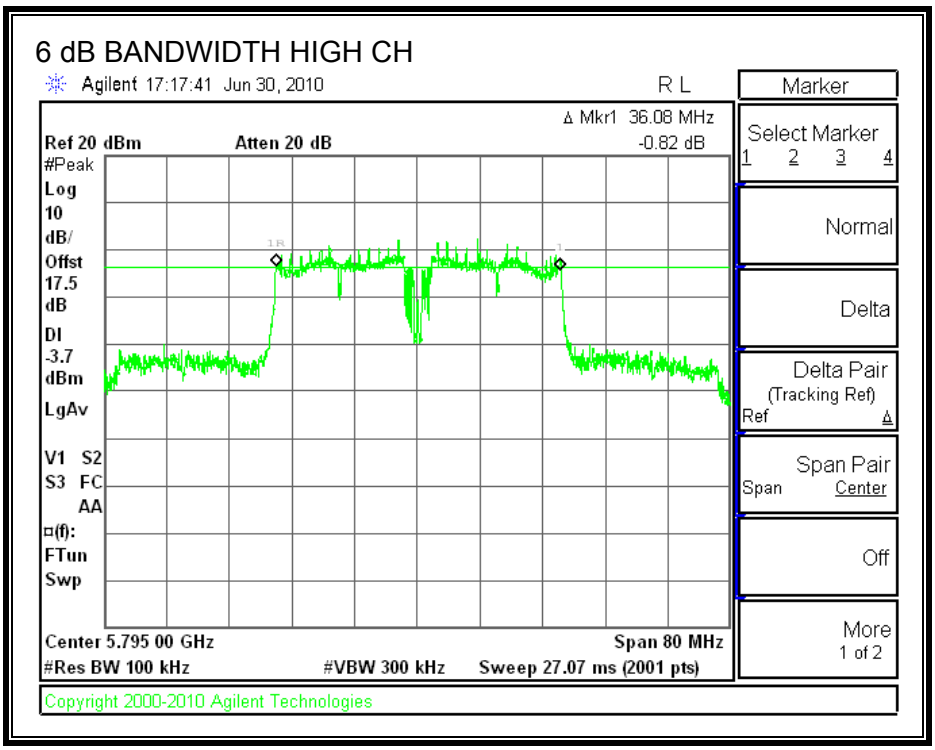
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

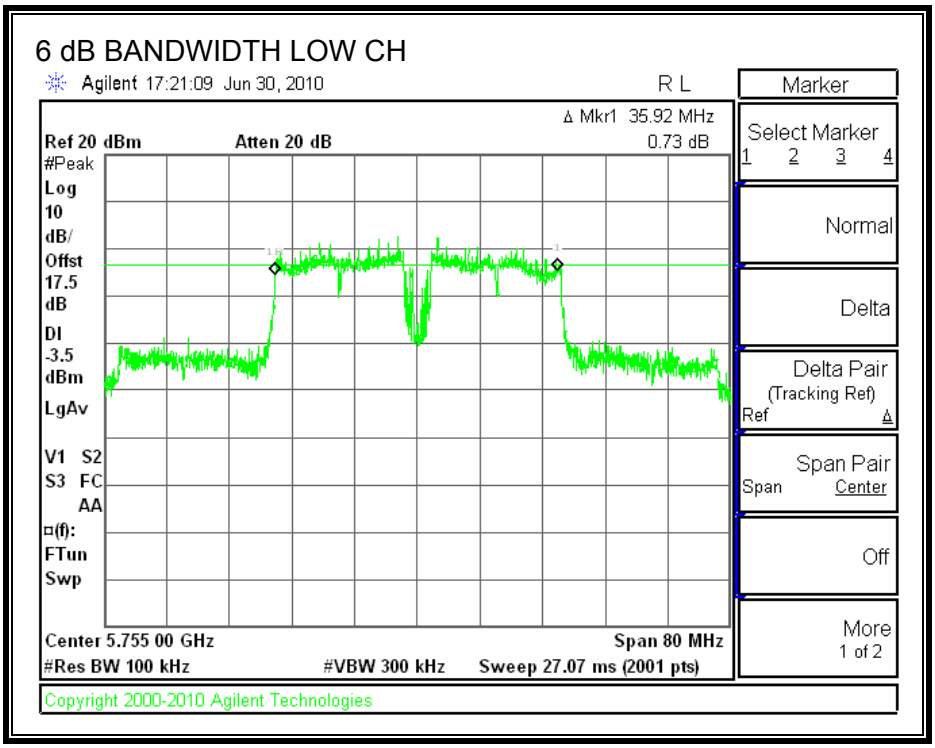
Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (MHz)	Minimum Limit (MHz)
Low	5755	36.40	35.92	0.5
High	5795	36.08	36.20	0.5

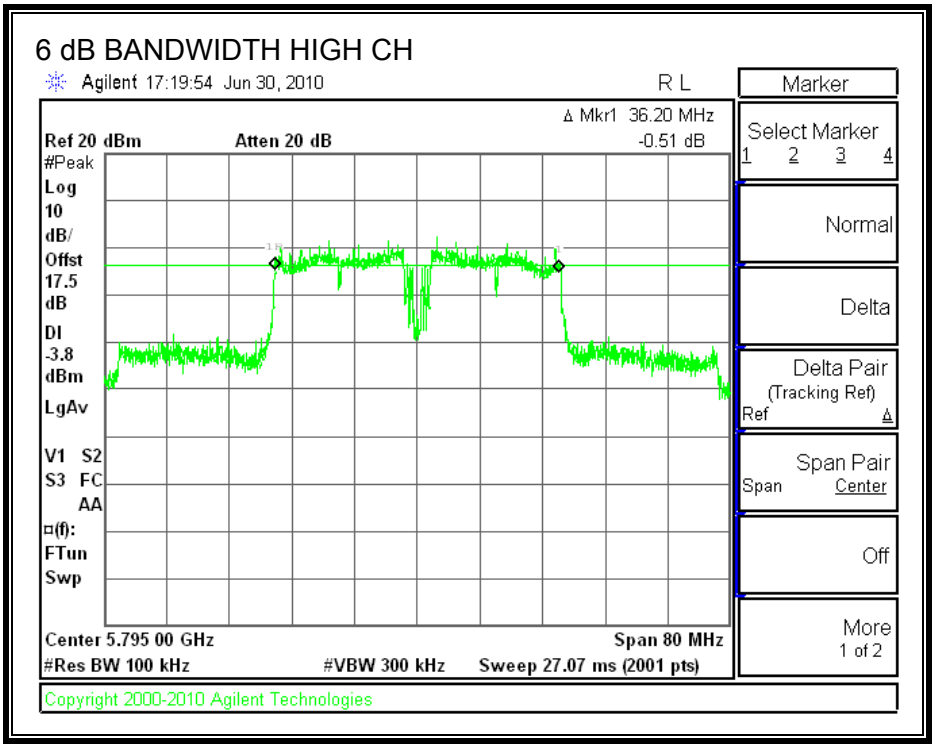
6 dB BANDWIDTH, CHAIN 0





6 dB BANDWIDTH, CHAIN 1





7.7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

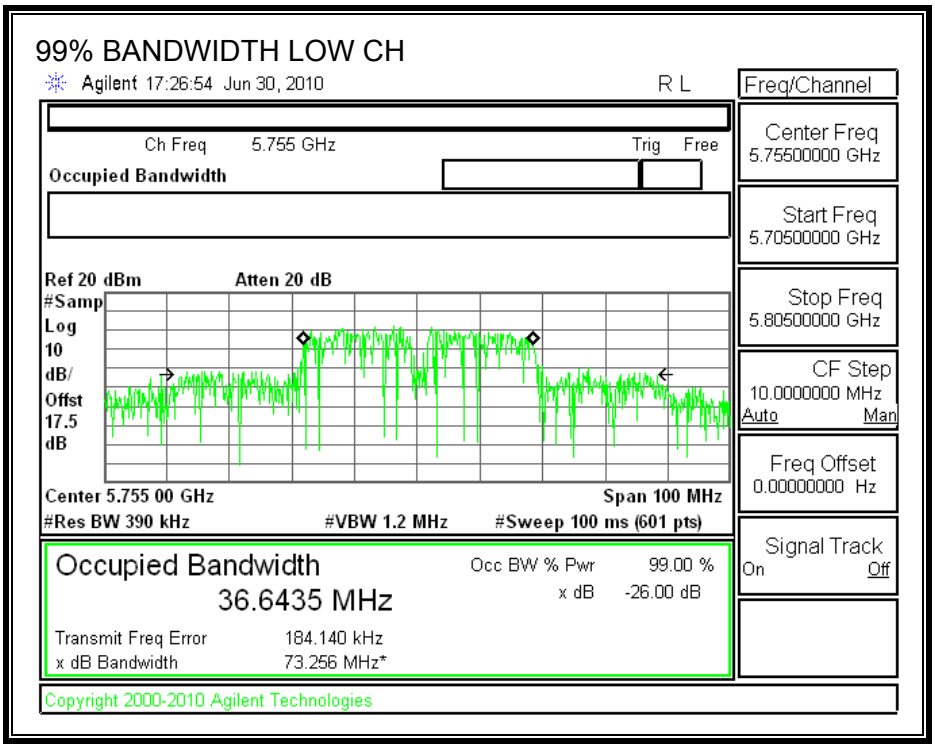
TEST PROCEDURE

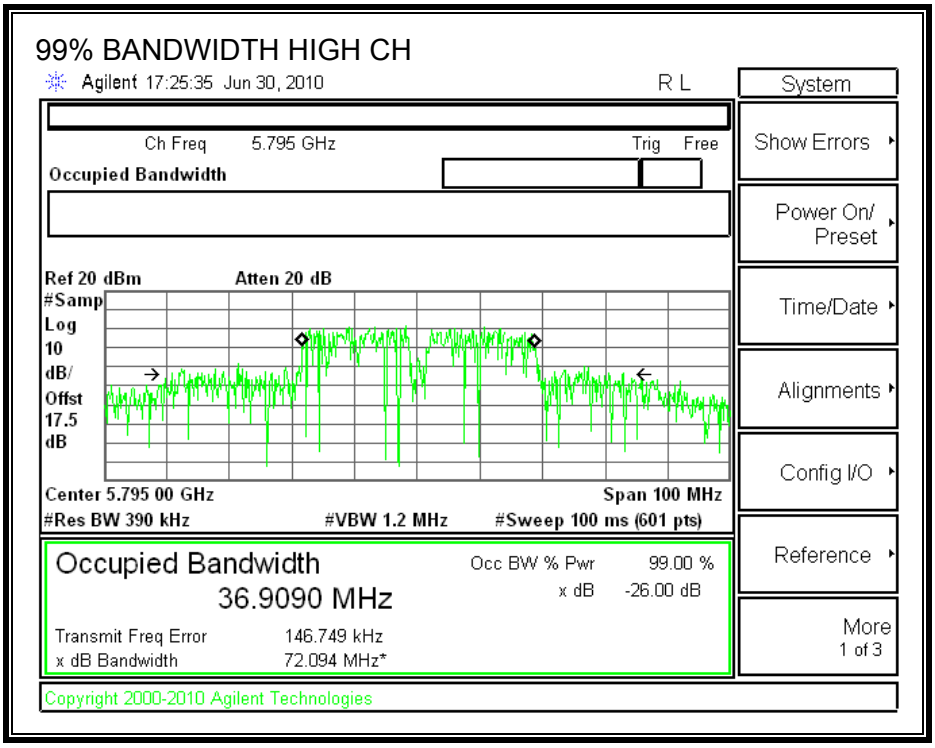
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

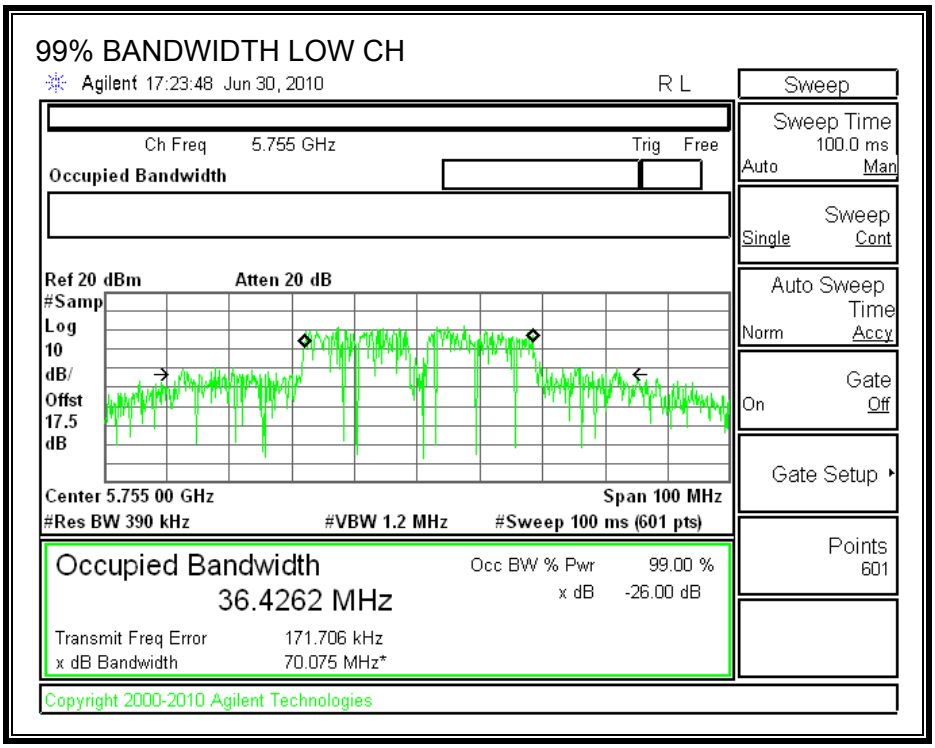
Channel	Frequency (MHz)	Chain 0 (MHz)	Chain 1 (MHz)
Low	5755	36.6435	36.4262
High	5795	36.9090	36.6700

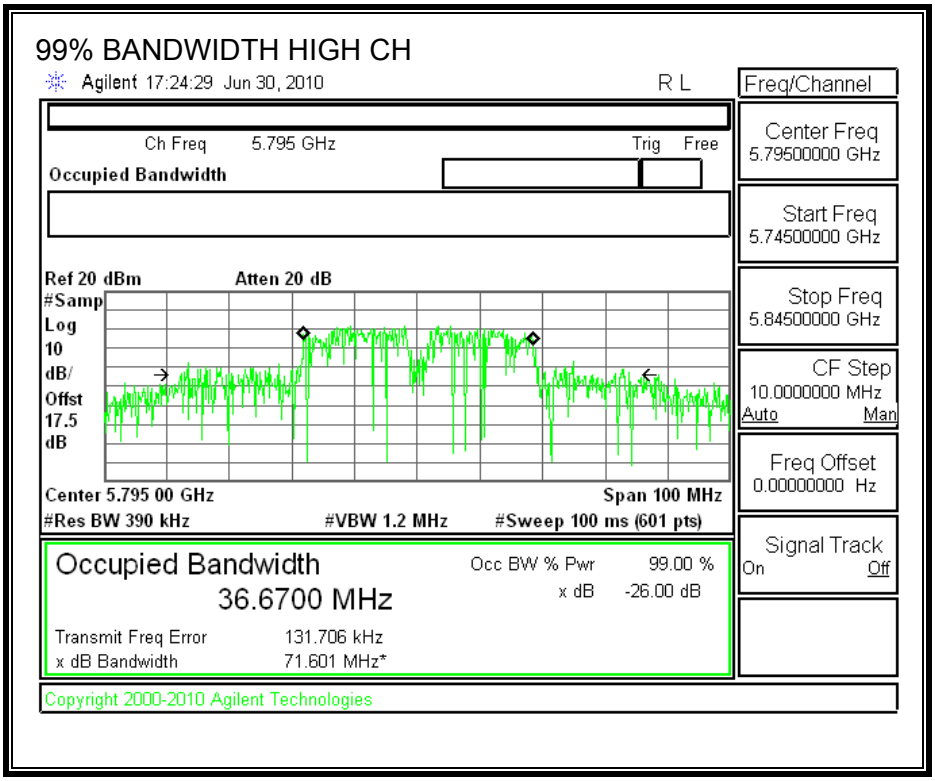
99% BANDWIDTH, CHAIN 0





99% BANDWIDTH, CHAIN 1





7.7.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 8.65 dBi, therefore the limit is 27.35 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Limit (dBm)	Chain 0 (dBm)	Chain 1 (dBm)	Total (dBm)	Margin (dB)
Low	5755	27.35	21.20	20.40	23.83	-3.52
High	5795	27.35	20.80	20.30	23.57	-3.78

7.7.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

The highest combination of antenna gains is equal to 8.65 dBi, therefore the limit is 7.35 dBm.

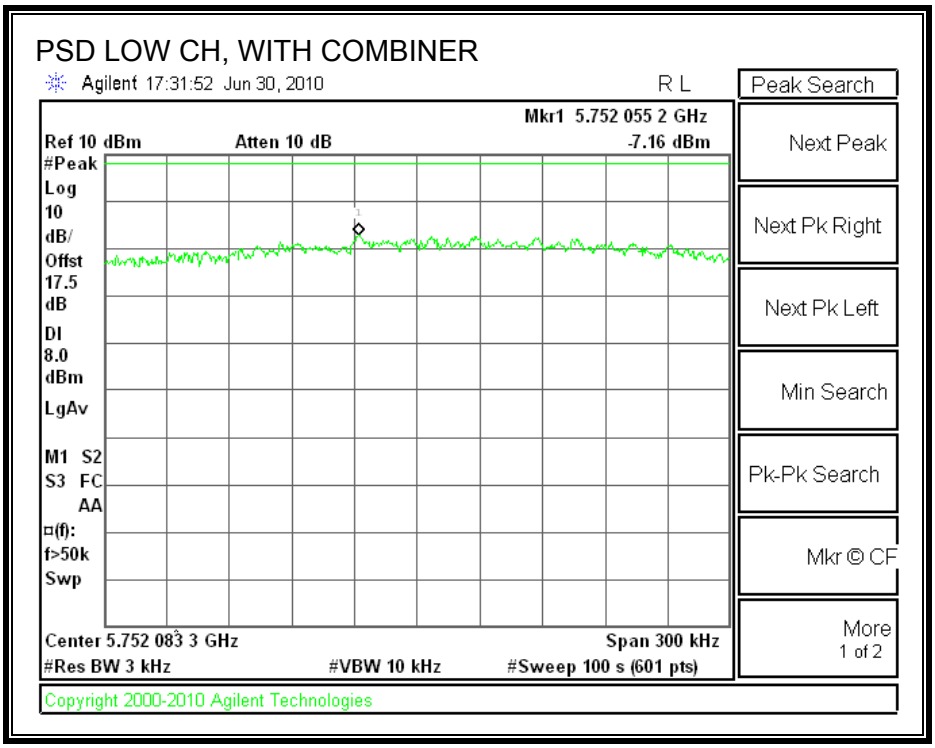
TEST PROCEDURE

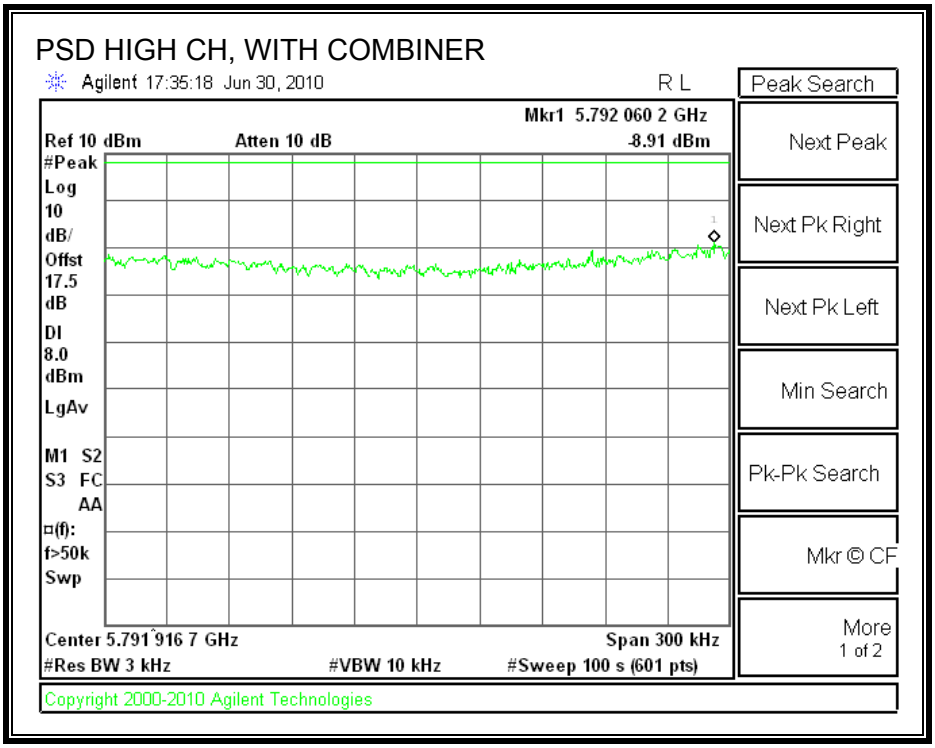
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS:

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-7.16	7.35	-14.51
High	5795	-8.91	7.35	-16.26

POWER SPECTRAL DENSITY, WITH COMBINER





7.7.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

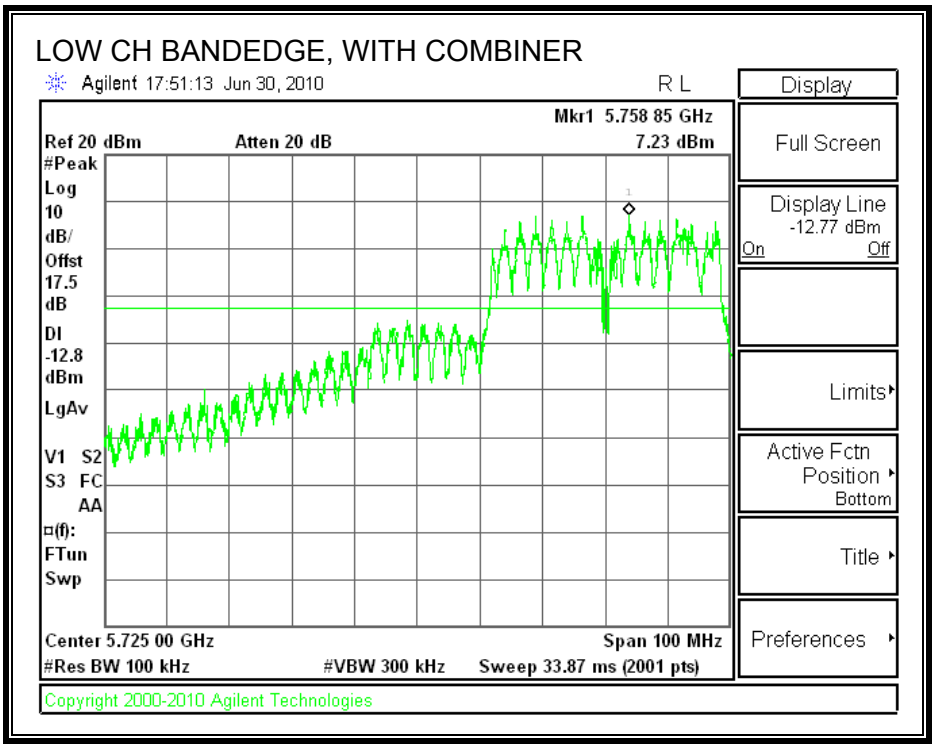
TEST PROCEDURE

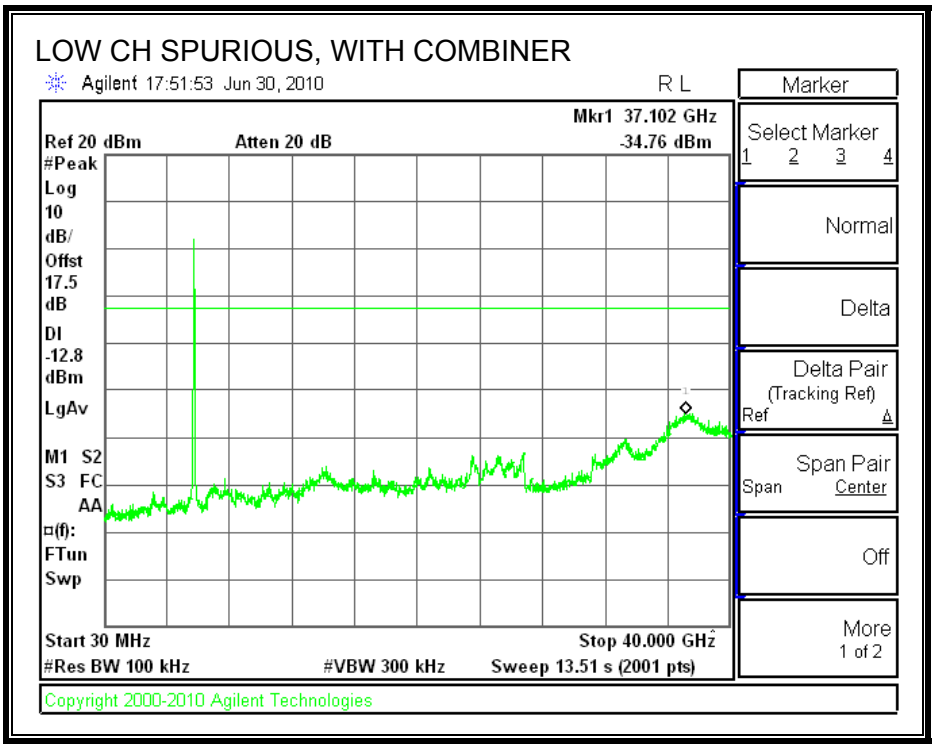
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

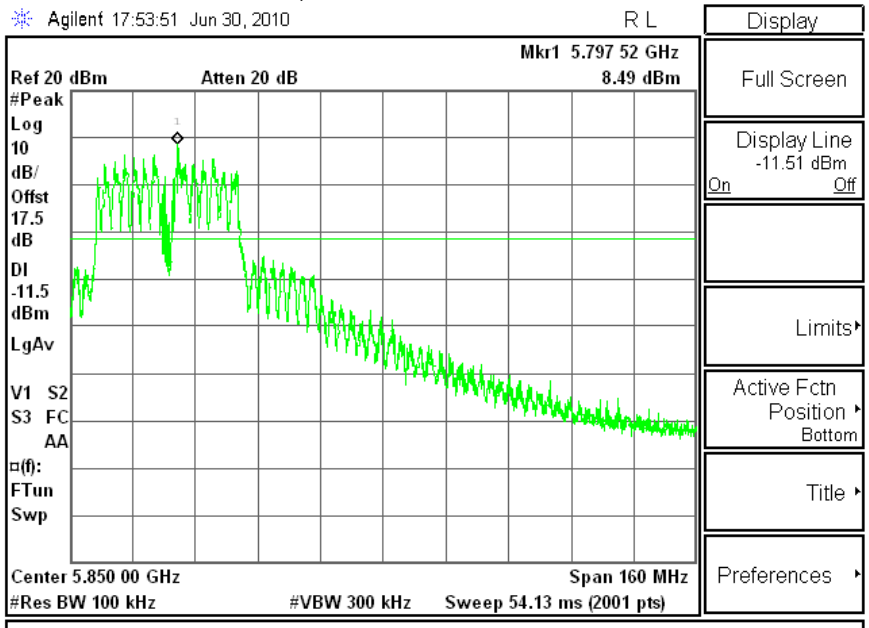
RESULTS

SPURIOUS EMISSIONS WITH COMBINER

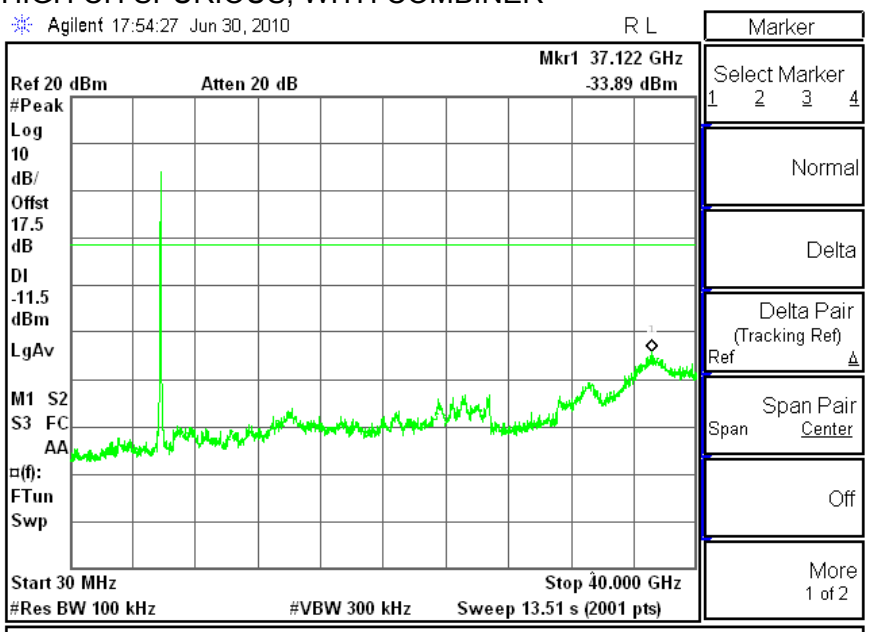




HIGH CH BANDEDGE, WITH COMBINER



HIGH CH SPURIOUS, 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.

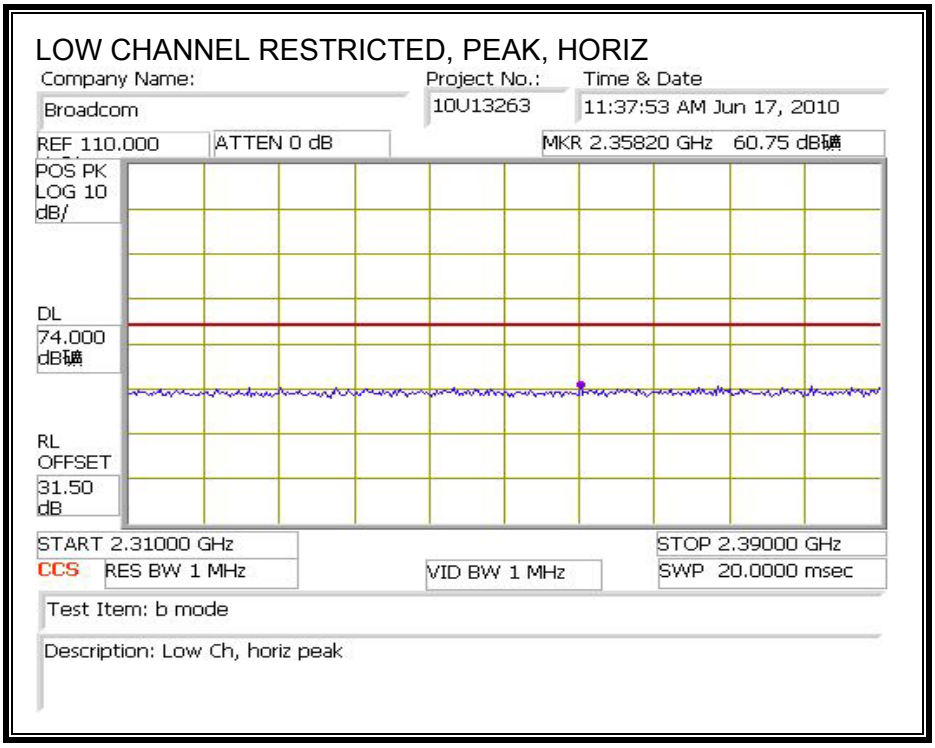
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

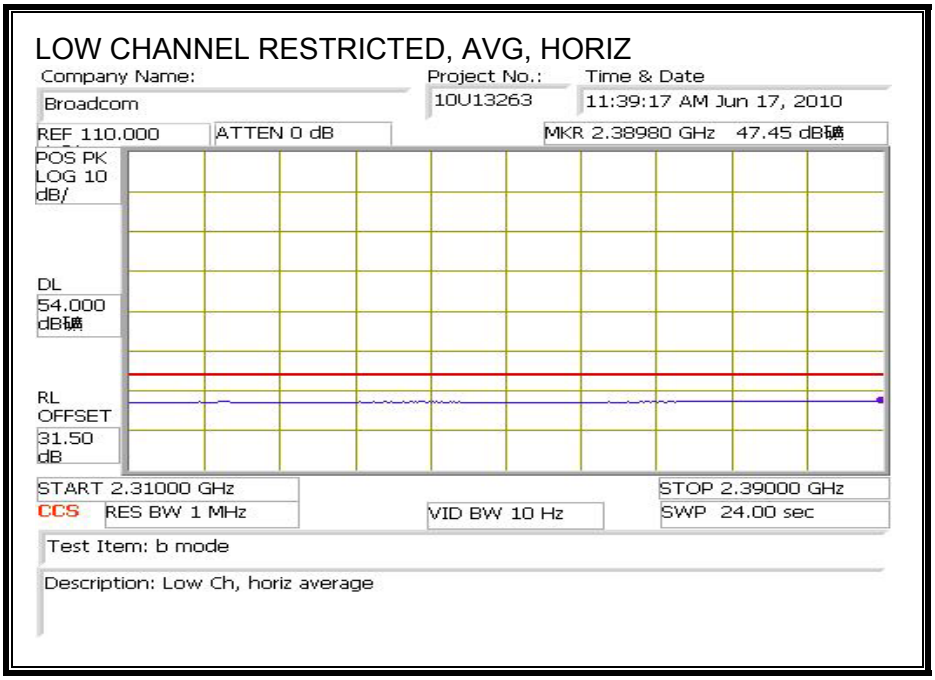
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

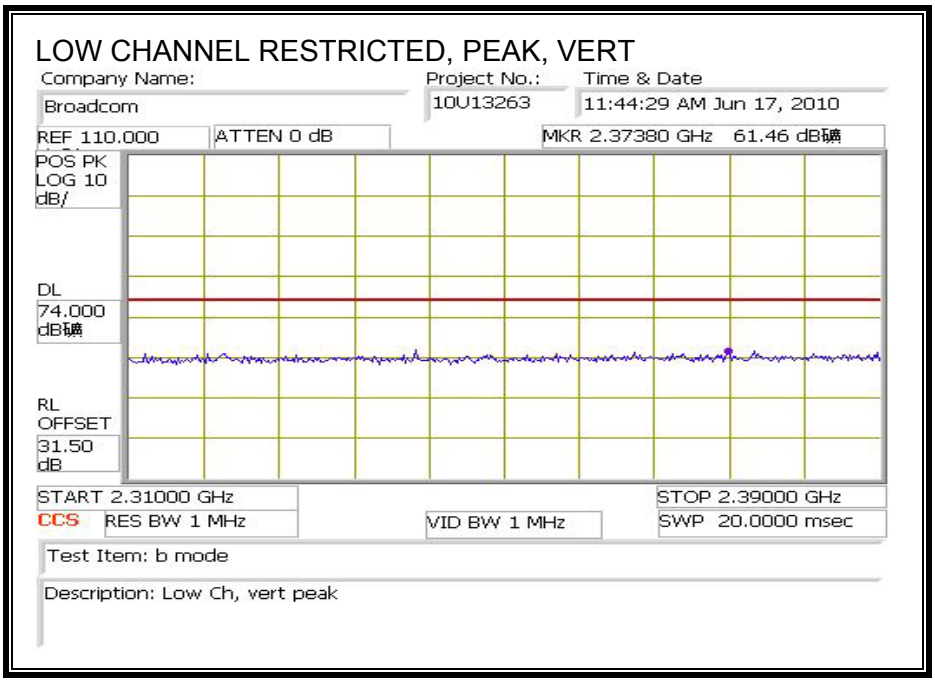
8.2.1. 802.11b MODE IN THE 2.4 GHz BAND

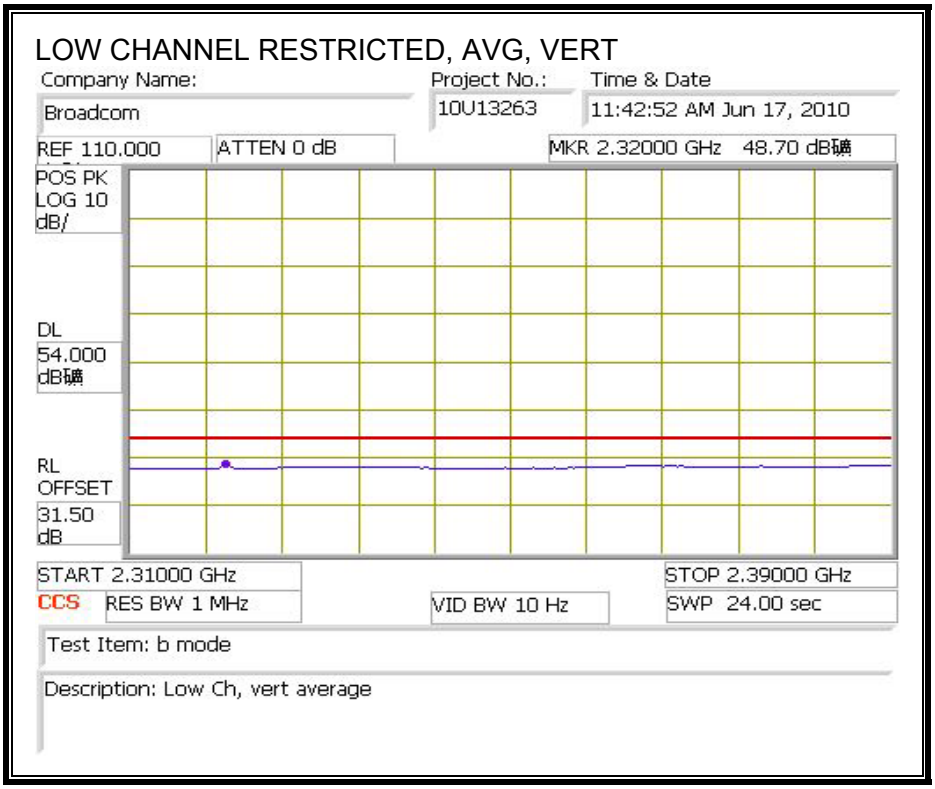
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



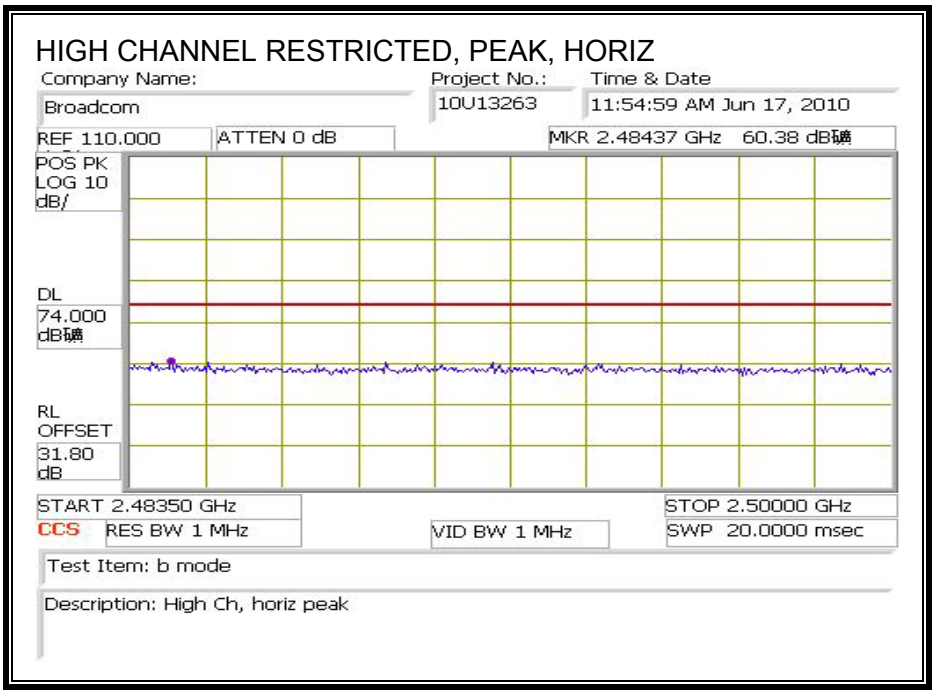


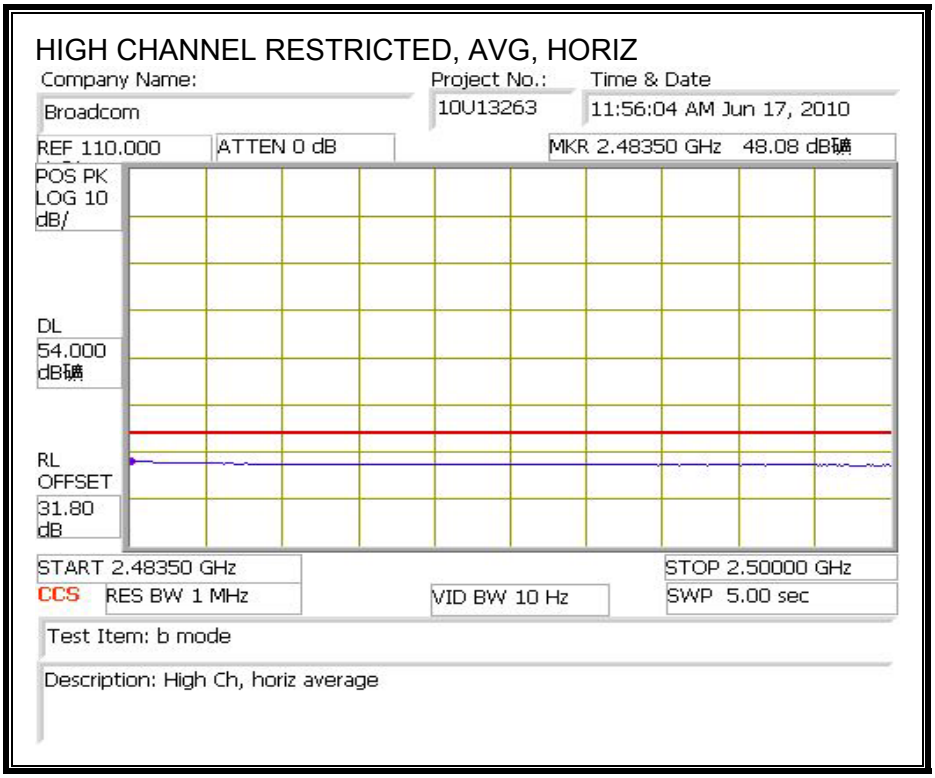
RESTRICTED BANDEDGE (LOW CH CHANNEL, VERTICAL)



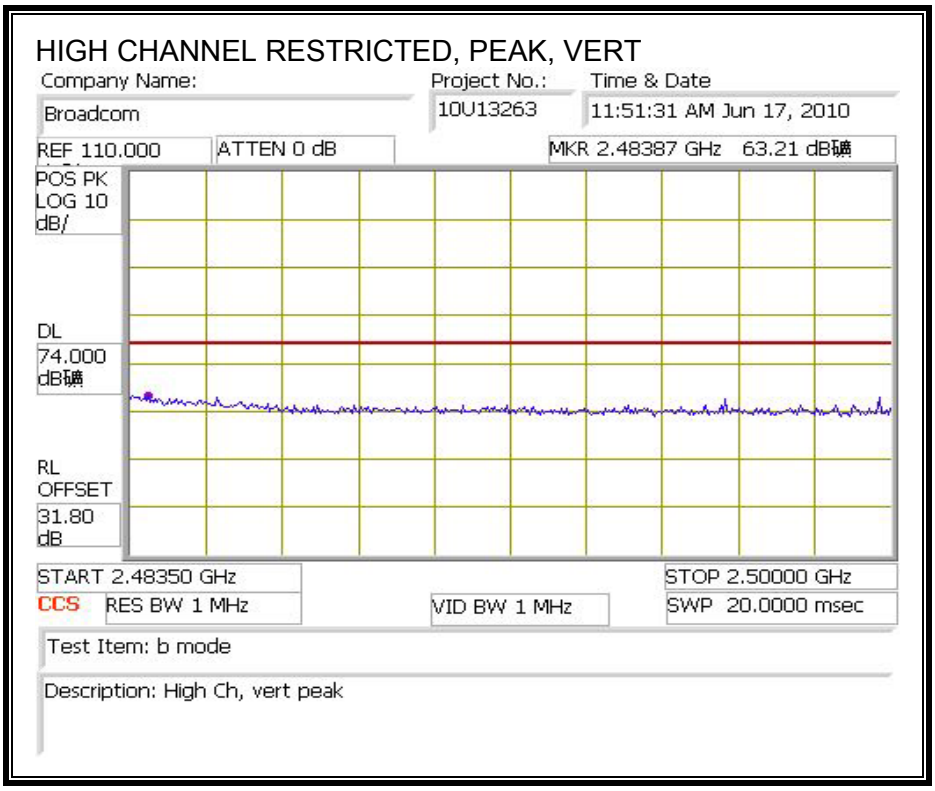


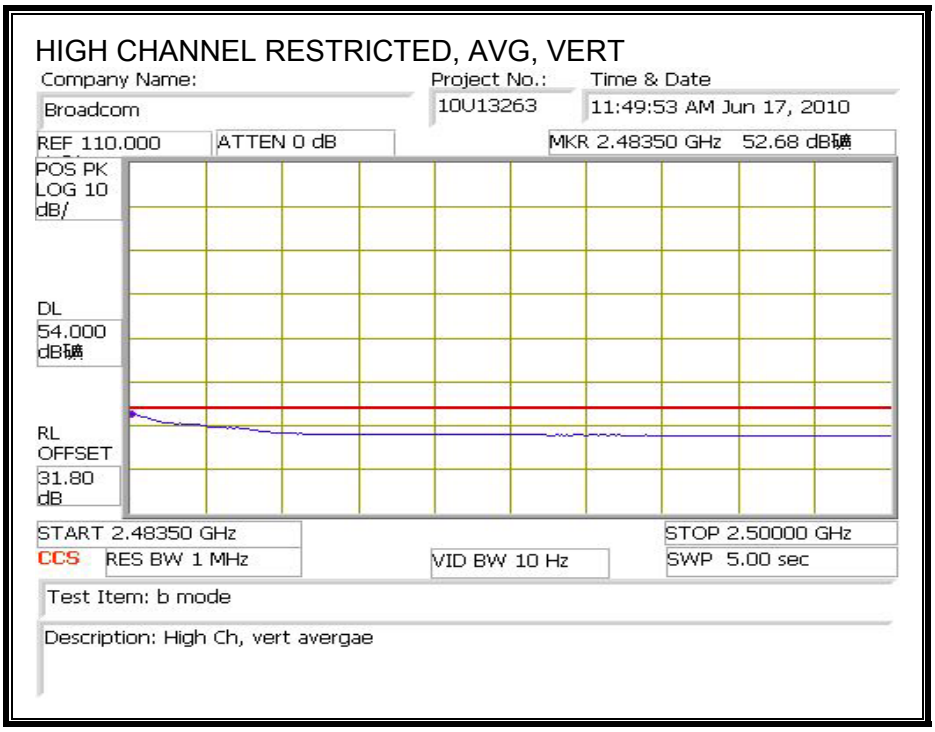
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 06/17/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11abgn Wlan + bluetooth PCI-E mini card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, b mode

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

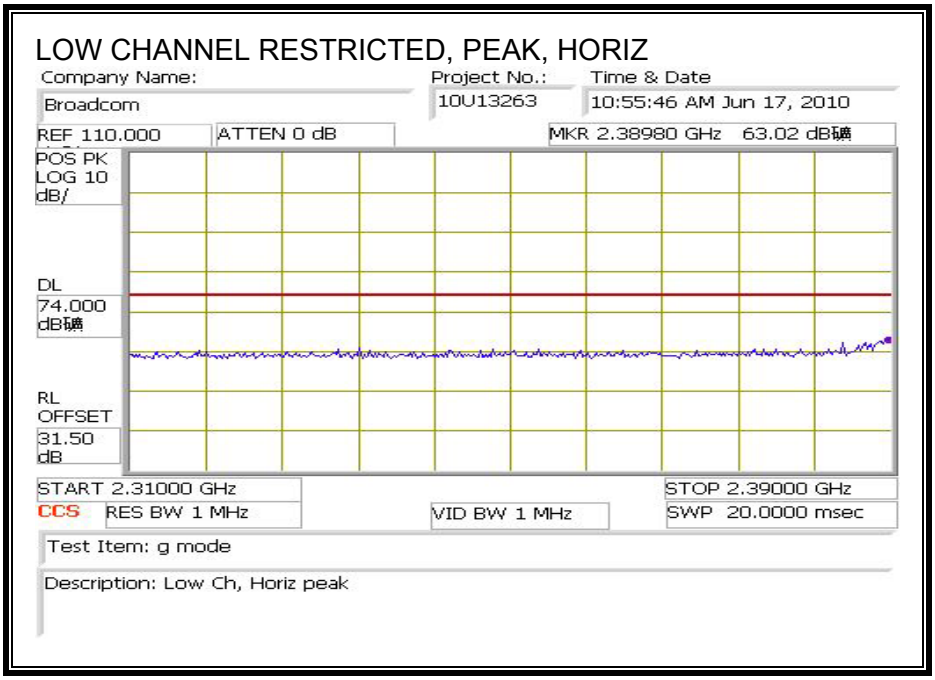
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

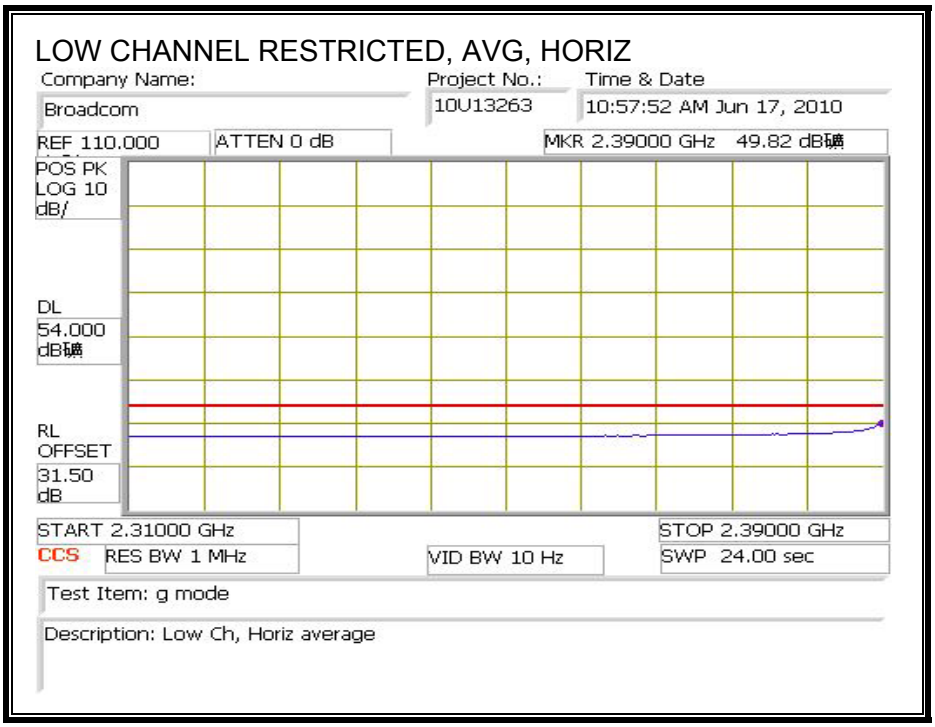
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	44.2	32.7	5.8	-34.8	0.0	0.0	47.8	74.0	-26.2	H	P	
4.824	3.0	40.6	32.7	5.8	-34.8	0.0	0.0	44.2	54.0	-9.8	H	A	
4.824	3.0	48.0	32.7	5.8	-34.8	0.0	0.0	51.6	74.0	-22.4	V	P	
4.824	3.0	45.2	32.7	5.8	-34.8	0.0	0.0	48.8	54.0	-5.2	V	A	
Mid Ch, 2437MHz													
4.874	3.0	50.1	32.7	5.8	-34.8	0.0	0.0	53.8	74.0	-20.2	H	P	
4.874	3.0	47.3	32.7	5.8	-34.8	0.0	0.0	51.1	54.0	-2.9	H	A	
7.311	3.0	39.7	35.5	7.3	-34.1	0.0	0.0	48.3	74.0	-25.7	H	P	
7.311	3.0	32.3	35.5	7.3	-34.1	0.0	0.0	40.9	54.0	-13.1	H	A	
4.874	3.0	51.7	32.7	5.8	-34.8	0.0	0.0	55.4	74.0	-18.6	V	P	
4.874	3.0	48.9	32.7	5.8	-34.8	0.0	0.0	52.7	54.0	-1.3	V	A	
7.311	3.0	39.8	35.5	7.3	-34.1	0.0	0.0	48.4	74.0	-25.6	V	P	
7.311	3.0	32.4	35.5	7.3	-34.1	0.0	0.0	41.1	54.0	-12.9	V	A	
High CH, 2462MHz													
4.924	3.0	45.7	32.7	5.9	-34.8	0.0	0.6	50.1	74.0	-23.9	H	P	
4.924	3.0	42.2	32.7	5.9	-34.8	0.0	0.6	46.7	54.0	-7.3	H	A	
7.386	3.0	37.3	35.6	7.3	-34.1	0.0	0.6	46.7	74.0	-27.3	H	P	
7.386	3.0	28.1	35.6	7.3	-34.1	0.0	0.6	37.5	54.0	-16.5	H	A	
4.924	3.0	50.6	32.7	5.9	-34.8	0.0	0.6	55.0	74.0	-19.0	V	P	
4.924	3.0	47.8	32.7	5.9	-34.8	0.0	0.6	52.2	54.0	-1.8	V	A	
7.386	3.0	39.8	35.6	7.3	-34.1	0.0	0.6	49.3	74.0	-24.7	V	P	
7.386	3.0	32.1	35.6	7.3	-34.1	0.0	0.6	41.5	54.0	-12.5	V	A	

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

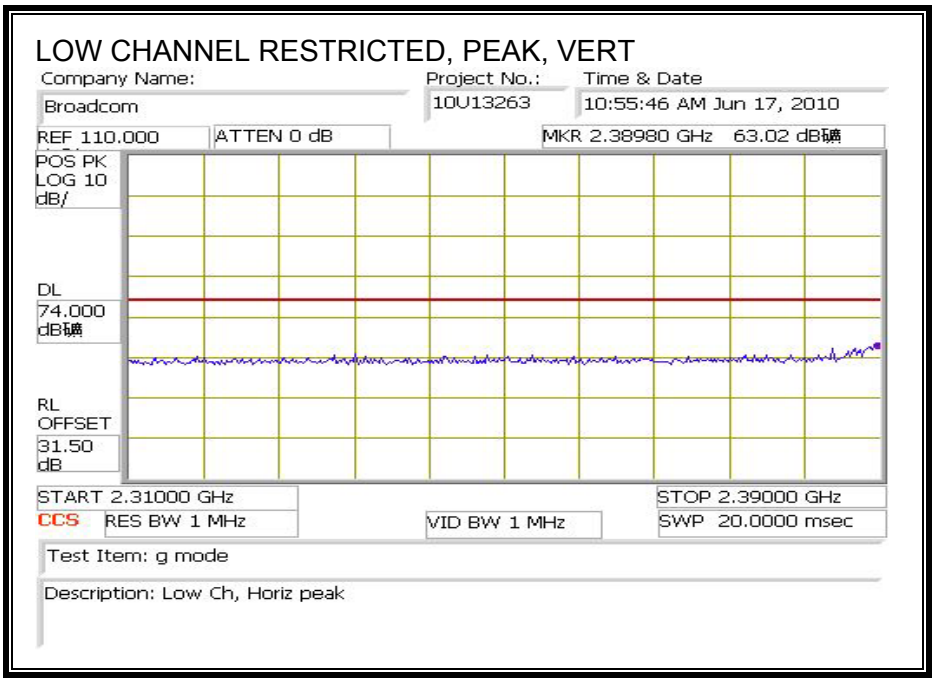
8.2.2. 802.11g MODE IN THE 2.4 GHz BAND

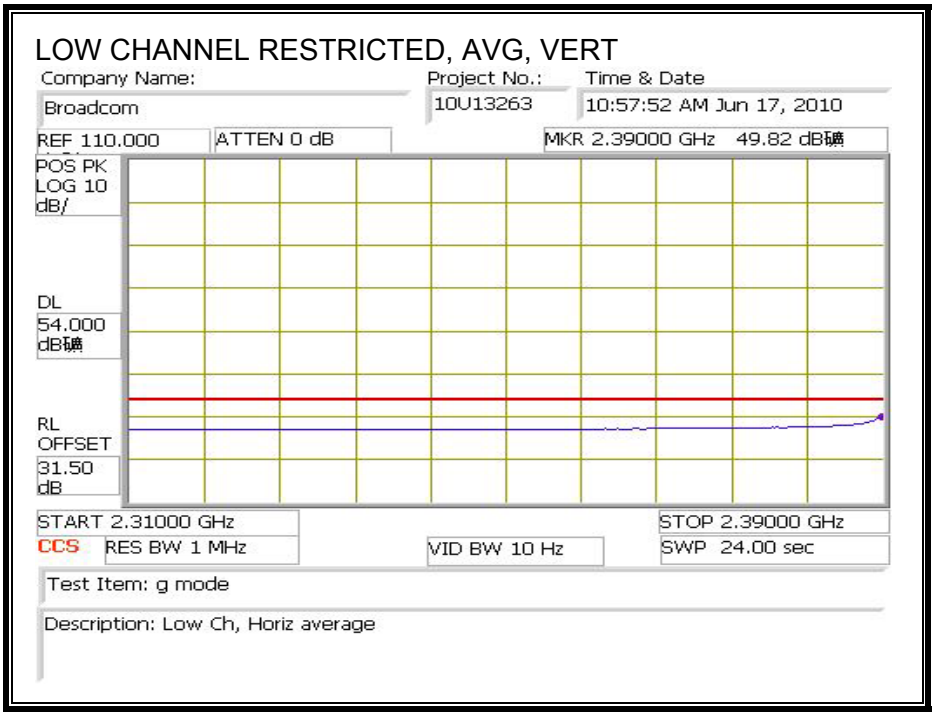
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



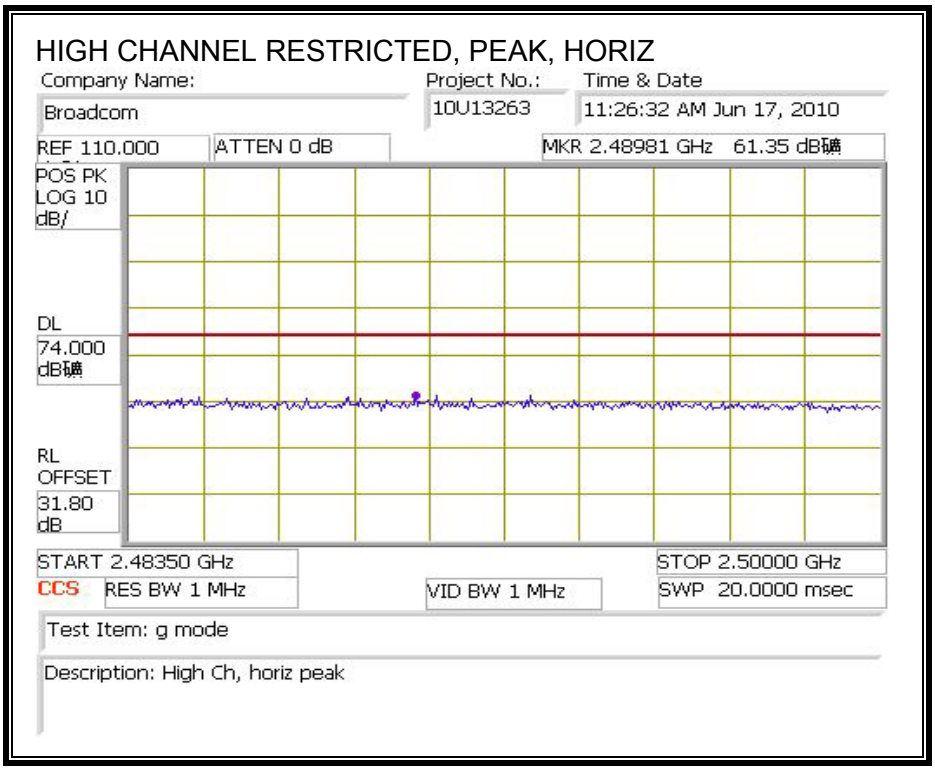


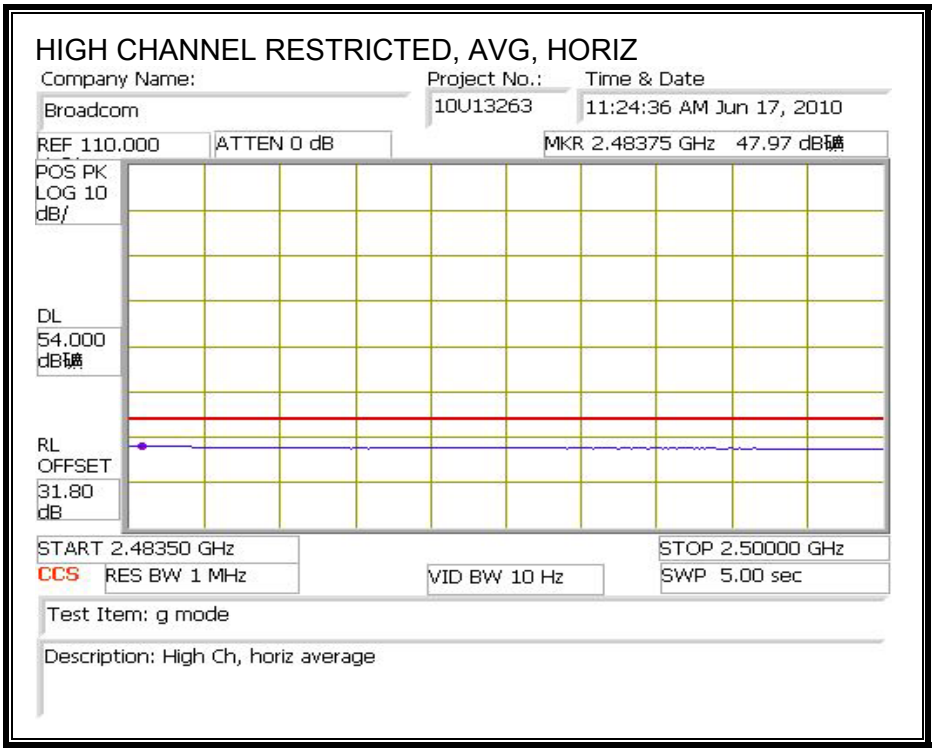
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



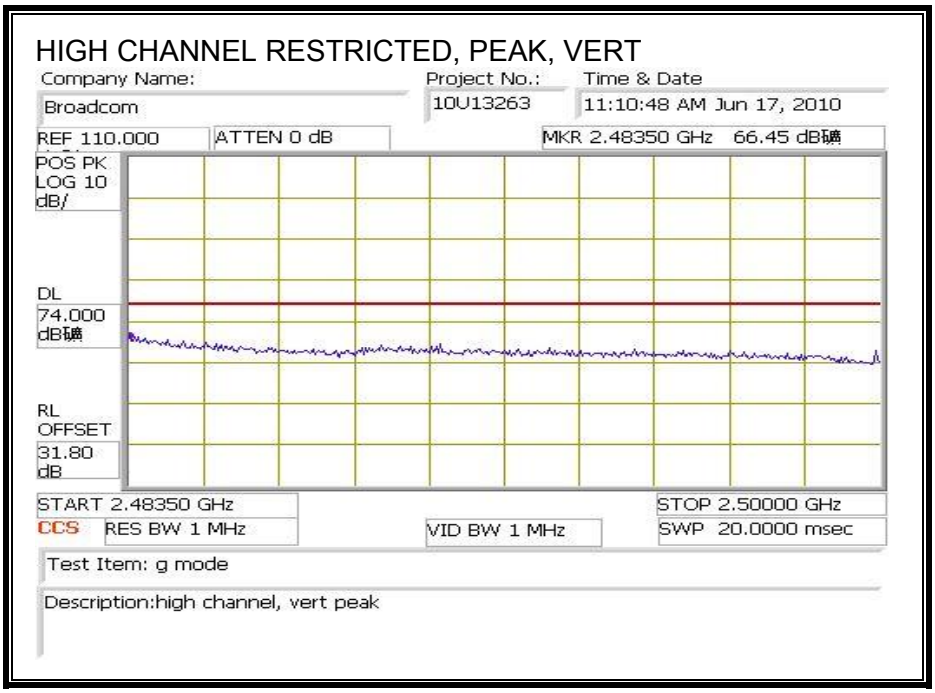


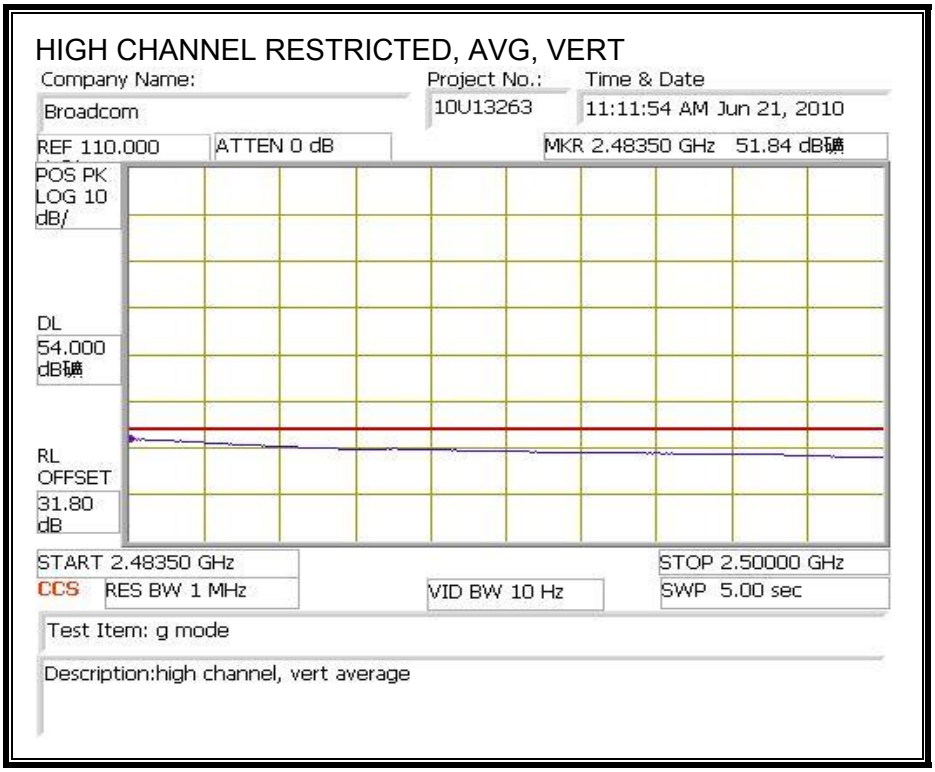
RESTRICTED BANDEDGE HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 06/17/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11abgn Wlan + bluetooth PCI-E mini card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, g mode

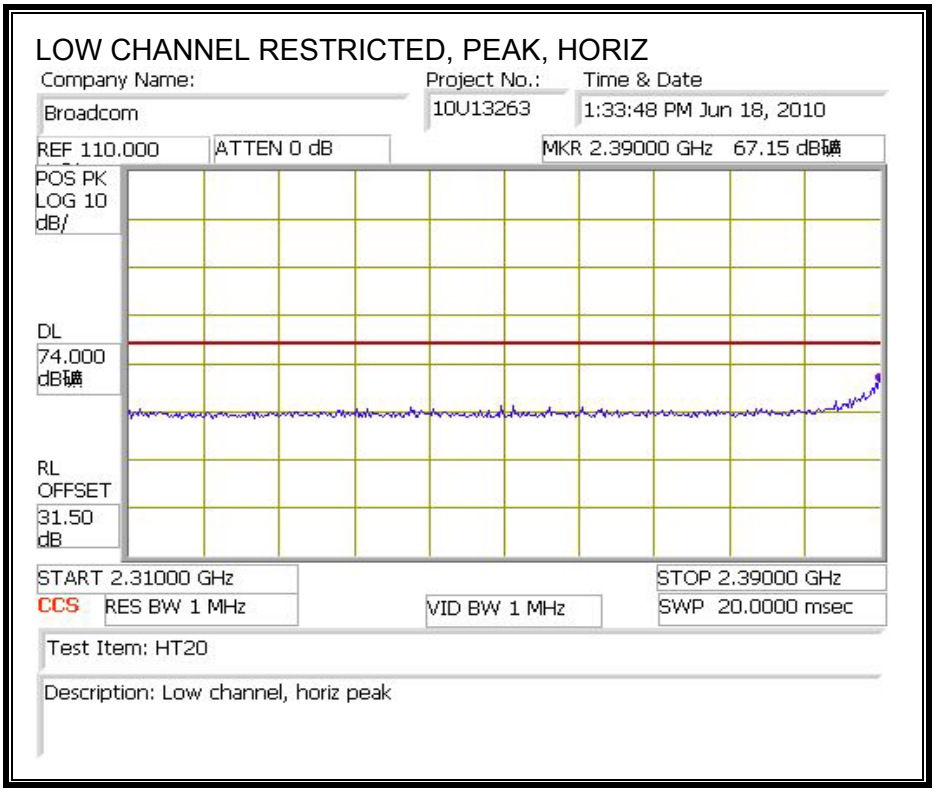
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

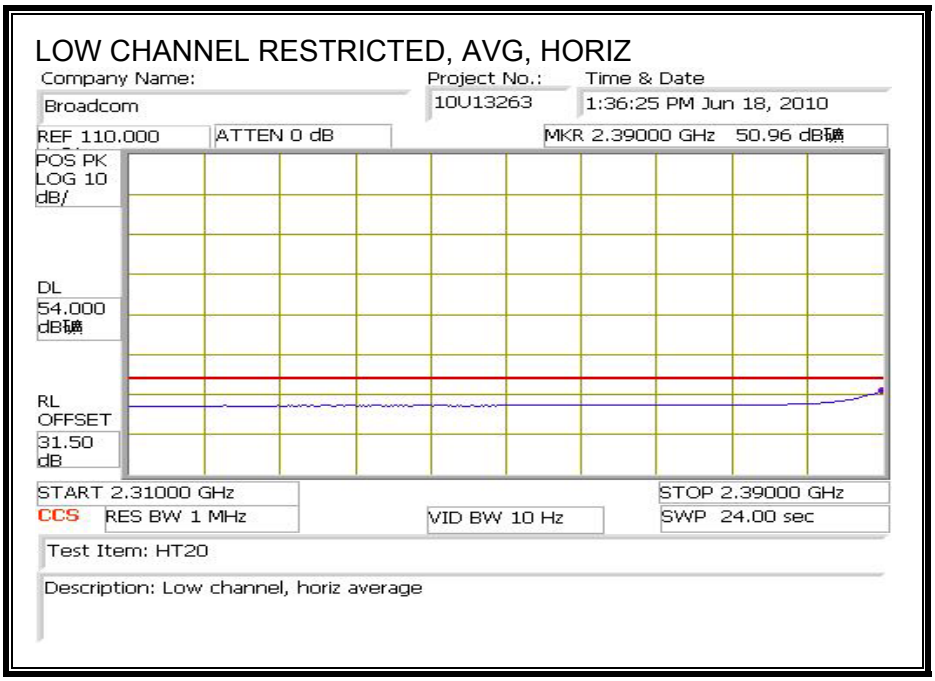
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	43.3	32.7	5.8	-34.8	0.0	0.6	47.5	74.0	-26.5	V	P	
4.824	3.0	29.8	32.7	5.8	-34.8	0.0	0.6	34.0	54.0	-20.0	V	A	
4.824	3.0	39.3	32.7	5.8	-34.8	0.0	0.6	43.6	74.0	-30.4	H	P	
4.824	3.0	26.6	32.7	5.8	-34.8	0.0	0.6	30.9	54.0	-23.1	H	A	
Mid Ch, 2437MHz													
4.874	3.0	48.0	32.7	5.8	-34.8	0.0	0.6	52.4	74.0	-21.6	V	P	
4.874	3.0	33.2	32.7	5.8	-34.8	0.0	0.6	37.6	54.0	-16.4	V	A	
7.311	3.0	40.3	35.5	7.3	-34.1	0.0	0.6	49.6	74.0	-24.4	V	P	
7.311	3.0	26.9	35.5	7.3	-34.1	0.0	0.6	36.1	54.0	-17.9	V	A	
4.874	3.0	47.5	32.7	5.8	-34.8	0.0	0.6	51.8	74.0	-22.2	H	P	
4.874	3.0	32.9	32.7	5.8	-34.8	0.0	0.6	37.2	54.0	-16.8	H	A	
7.311	3.0	35.7	35.5	7.3	-34.1	0.0	0.6	45.0	74.0	-29.0	H	P	
7.311	3.0	23.4	35.5	7.3	-34.1	0.0	0.6	32.7	54.0	-21.3	H	A	
High Ch, 2462MHz													
4.924	3.0	41.5	32.7	5.9	-34.8	0.0	0.6	46.0	74.0	-28.0	V	P	
4.924	3.0	27.2	32.7	5.9	-34.8	0.0	0.6	31.6	54.0	-22.4	V	A	
7.386	3.0	35.3	35.6	7.3	-34.1	0.0	0.6	44.7	74.0	-29.3	V	P	
7.386	3.0	23.0	35.6	7.3	-34.1	0.0	0.6	32.5	54.0	-21.5	V	A	
4.924	3.0	36.8	32.7	5.9	-34.8	0.0	0.6	41.3	74.0	-32.7	H	P	
4.924	3.0	24.7	32.7	5.9	-34.8	0.0	0.6	29.1	54.0	-24.9	H	A	
7.386	3.0	35.7	35.6	7.3	-34.1	0.0	0.6	45.1	74.0	-28.9	H	P	
7.386	3.0	23.0	35.6	7.3	-34.1	0.0	0.6	32.5	54.0	-21.5	H	A	

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

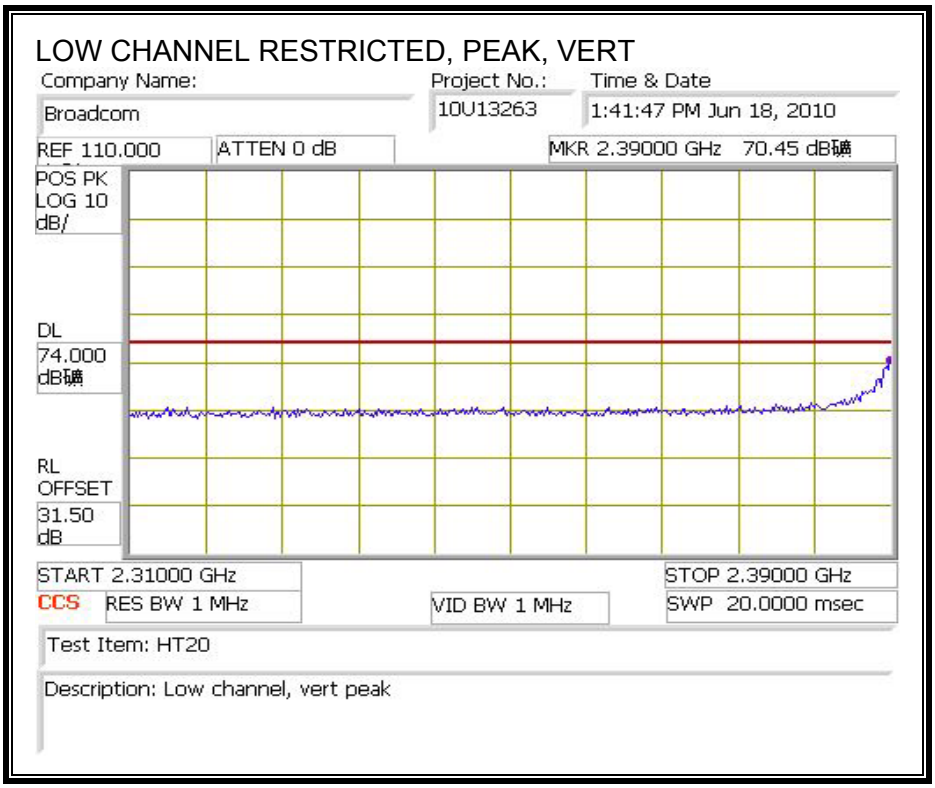
8.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

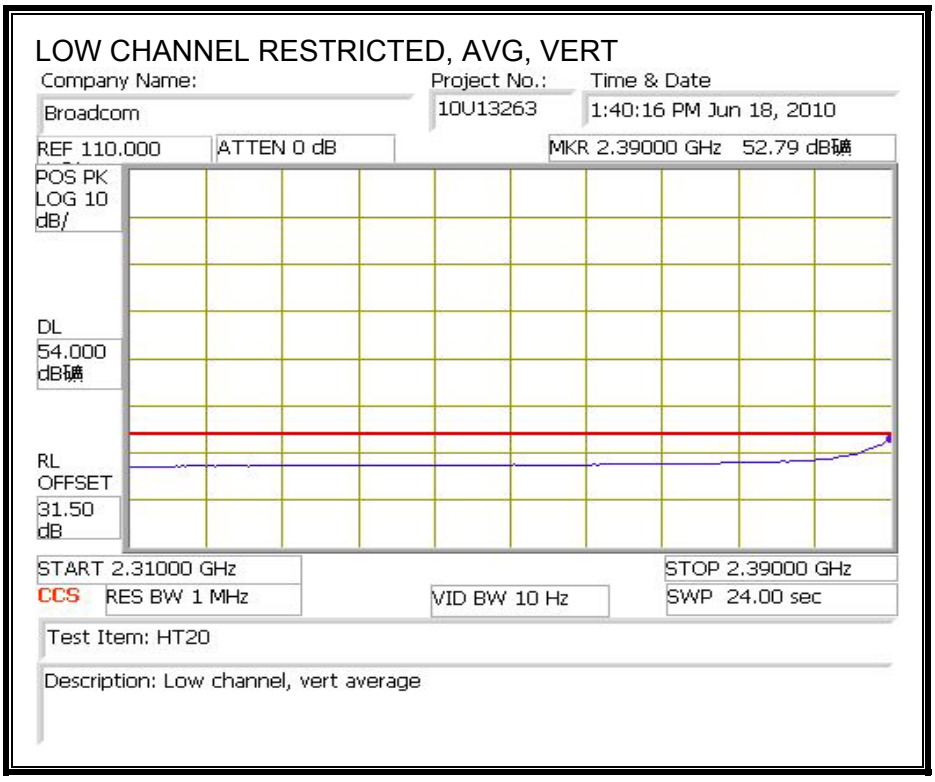
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



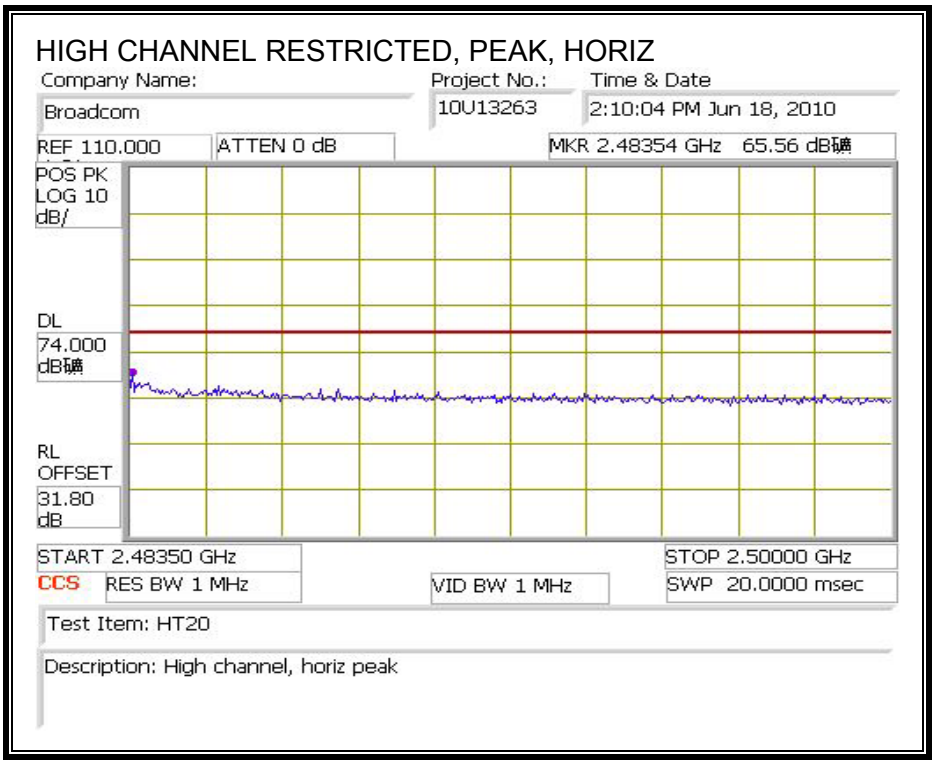


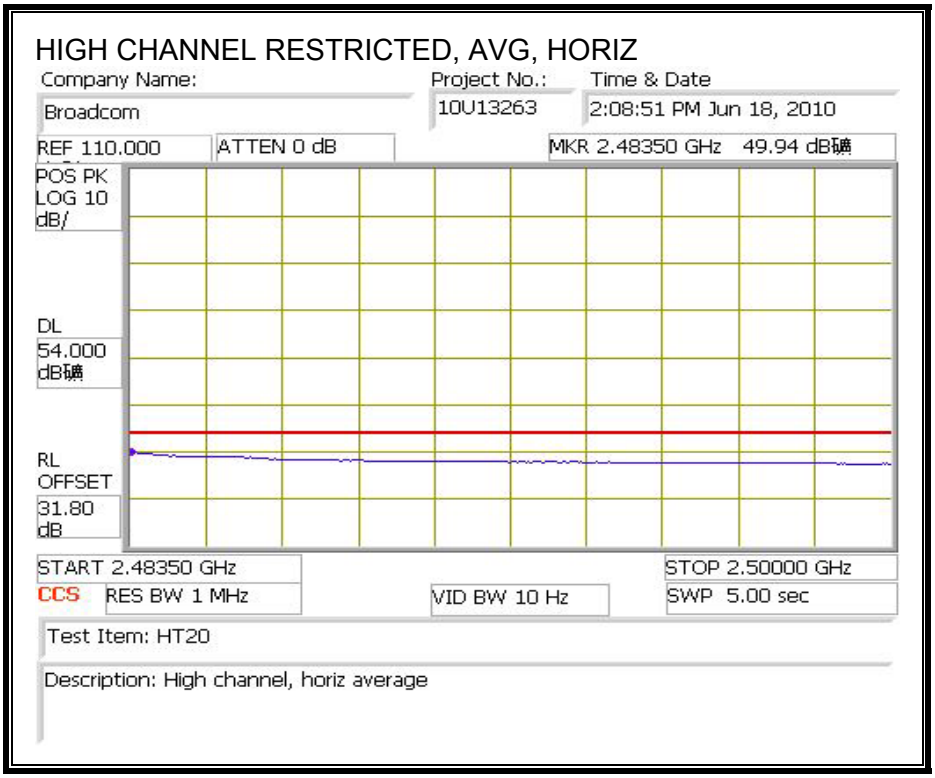
RESTRICTED BANDEDGE LOW CHANNEL, VERTICAL)



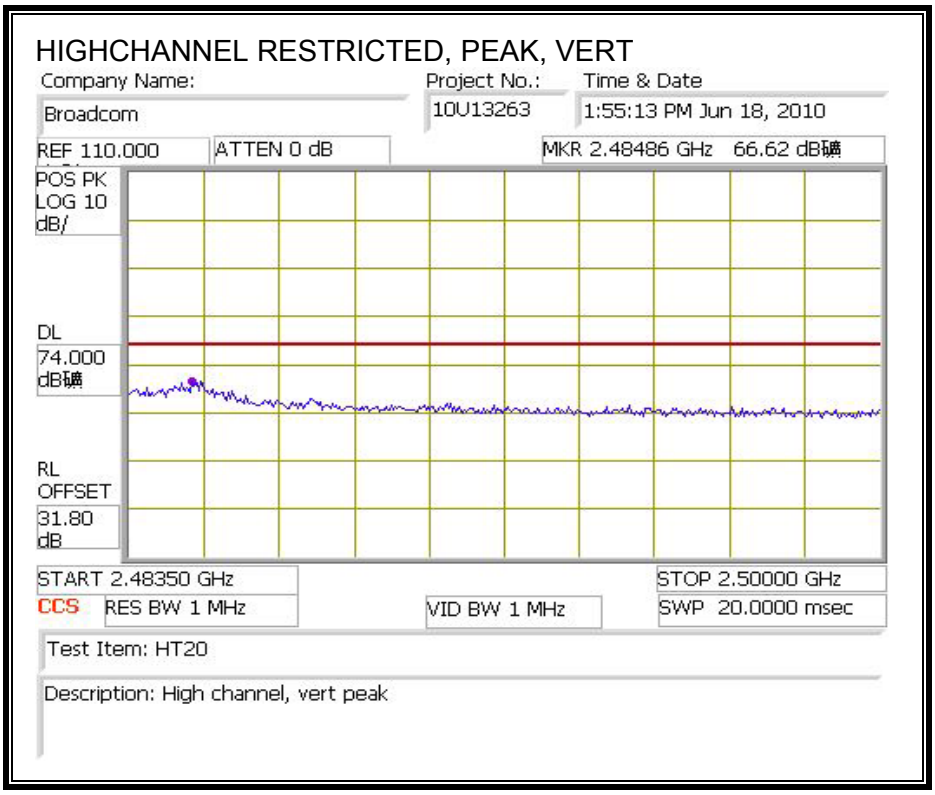


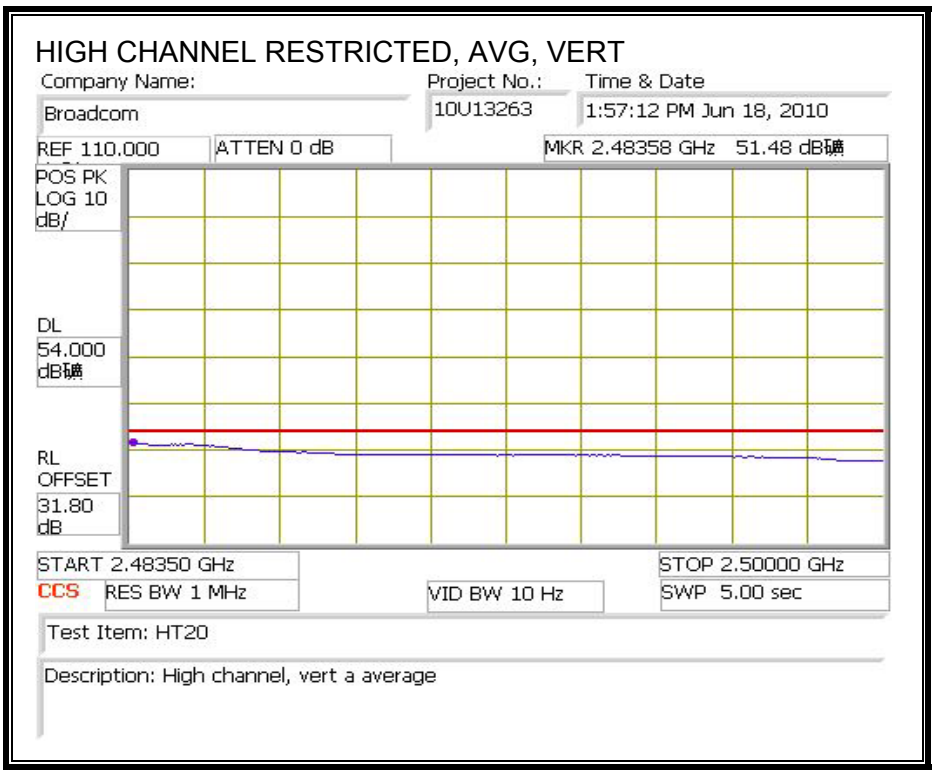
RESTRICTED BANDEDGE HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 06/18/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11abgn Wlan + bluetooth PCI-E mini card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: 802.11n mode (20MHz CDD/SDM)

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	39.0	32.7	5.8	-34.8	0.0	0.0	42.7	74.0	-31.3	H	P	
4.824	3.0	27.0	32.7	5.8	-34.8	0.0	0.0	30.7	54.0	-23.3	H	A	
4.824	3.0	39.4	32.7	5.8	-34.8	0.0	0.0	43.0	74.0	-31.0	V	P	
4.824	3.0	27.0	32.7	5.8	-34.8	0.0	0.0	30.6	54.0	-23.4	V	A	
Mid Ch, 2437MHz													
4.874	3.0	49.5	32.7	5.8	-34.8	0.0	0.0	53.2	74.0	-20.8	H	P	
4.874	3.0	35.6	32.7	5.8	-34.8	0.0	0.0	39.3	54.0	-14.7	H	A	
7.311	3.0	41.1	35.5	7.3	-34.1	0.0	0.0	49.7	74.0	-24.3	H	P	
7.311	3.0	27.9	35.5	7.3	-34.1	0.0	0.0	36.5	54.0	-17.5	H	A	
4.874	3.0	50.8	32.7	5.8	-34.8	0.0	0.0	54.5	74.0	-19.5	V	P	
4.874	3.0	37.8	32.7	5.8	-34.8	0.0	0.0	41.5	54.0	-12.5	V	A	
7.311	3.0	39.2	35.5	7.3	-34.1	0.0	0.0	47.8	74.0	-26.2	V	P	
7.311	3.0	26.7	35.5	7.3	-34.1	0.0	0.0	35.3	54.0	-18.7	V	A	
High Ch, 2462MHz													
4.924	3.0	37.0	32.7	5.9	-34.8	0.0	0.0	40.8	74.0	-33.2	H	P	
4.924	3.0	24.1	32.7	5.9	-34.8	0.0	0.0	27.9	54.0	-26.1	H	A	
7.386	3.0	35.0	35.6	7.3	-34.1	0.0	0.0	43.8	74.0	-30.2	H	P	
7.386	3.0	23.0	35.6	7.3	-34.1	0.0	0.0	31.8	54.0	-22.2	H	A	
4.924	3.0	37.2	32.7	5.9	-34.8	0.0	0.0	41.0	74.0	-33.0	V	P	
4.924	3.0	24.6	32.7	5.9	-34.8	0.0	0.0	28.4	54.0	-25.6	V	A	
7.386	3.0	35.5	35.6	7.3	-34.1	0.0	0.0	44.3	74.0	-29.7	V	P	
7.386	3.0	23.0	35.6	7.3	-34.1	0.0	0.0	31.7	54.0	-22.3	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: 06/23/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11 abgn Wlan + Bluetooth PCI-E Mini Card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz 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	47.2	38.0	9.5	-32.5	0.0	0.7	62.9	74.0	-11.1	V	P	
11.490	3.0	33.8	38.0	9.5	-32.5	0.0	0.7	49.5	54.0	-4.5	V	A	
11.490	3.0	43.6	38.0	9.5	-32.5	0.0	0.7	59.3	74.0	-14.7	H	P	
11.490	3.0	30.8	38.0	9.5	-32.5	0.0	0.7	46.5	54.0	-7.5	H	A	
low													
11.570	3.0	46.0	38.1	9.5	-32.5	0.0	0.7	61.8	74.0	-12.2	V	P	
11.570	3.0	32.1	38.1	9.5	-32.5	0.0	0.7	47.9	54.0	-6.1	V	A	
11.570	3.0	42.8	38.1	9.5	-32.5	0.0	0.7	58.6	74.0	-15.4	H	P	
11.570	3.0	28.9	38.1	9.5	-32.5	0.0	0.7	44.7	54.0	-9.3	H	A	
High Ch, 5825MHz													
11.650	3.0	42.9	38.2	9.6	-32.5	0.0	0.7	58.8	74.0	-15.2	V	P	
11.650	3.0	29.9	38.2	9.6	-32.5	0.0	0.7	45.8	54.0	-8.2	V	A	
11.650	3.0	40.6	38.2	9.6	-32.5	0.0	0.7	56.5	74.0	-17.5	H	P	
11.650	3.0	27.4	38.2	9.6	-32.5	0.0	0.7	43.3	54.0	-10.7	H	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: 06/25/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11 abgn Wlan + Bluetooth PCI-E Mini Card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz HT20

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	43.7	38.0	9.5	-32.5	0.0	0.7	59.4	74.0	-14.6	V	P	
11.490	3.0	30.7	38.0	9.5	-32.5	0.0	0.7	46.4	54.0	-7.6	V	A	
11.490	3.0	40.8	38.0	9.5	-32.5	0.0	0.7	56.5	74.0	-17.5	H	P	
11.490	3.0	28.0	38.0	9.5	-32.5	0.0	0.7	43.6	54.0	-10.4	H	A	
Mid Ch, 5785MHz													
11.570	3.0	38.6	38.1	9.5	-32.5	0.0	0.7	54.4	74.0	-19.6	H	P	
11.570	3.0	26.6	38.1	9.5	-32.5	0.0	0.7	42.4	54.0	-11.6	H	A	
11.570	3.0	41.5	38.1	9.5	-32.5	0.0	0.7	57.3	74.0	-16.7	V	P	
11.570	3.0	29.3	38.1	9.5	-32.5	0.0	0.7	45.1	54.0	-8.9	V	A	
High Ch, 5825MHz													
11.650	3.0	43.4	38.2	9.6	-32.5	0.0	0.7	59.3	74.0	-14.7	V	P	
11.650	3.0	30.9	38.2	9.6	-32.5	0.0	0.7	46.8	54.0	-7.2	V	A	
11.650	3.0	36.6	38.2	9.6	-32.5	0.0	0.7	52.5	74.0	-21.5	H	P	
11.650	3.0	24.4	38.2	9.6	-32.5	0.0	0.7	40.3	54.0	-13.7	H	A	

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

8.2.6. 802.11n HT40 SISO 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: 06/29/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11 abgn Wlan + Bluetooth PCI-E Mini Card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz HT40 SISO

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, 5755MHz													
11.510	3.0	38.7	38.1	9.5	-32.5	0.0	0.7	54.4	74.0	-19.6	V	P	
11.510	3.0	25.5	38.1	9.5	-32.5	0.0	0.7	41.2	54.0	-12.8	V	A	
11.510	3.0	35.7	38.1	9.5	-32.5	0.0	0.7	51.4	74.0	-22.6	H	P	
11.510	3.0	23.5	38.1	9.5	-32.5	0.0	0.7	39.2	54.0	-14.8	H	A	
High Ch, 5795MHz													
11.590	3.0	38.4	38.1	9.5	-32.5	0.0	0.7	54.2	74.0	-19.8	V	P	
11.590	3.0	25.3	38.1	9.5	-32.5	0.0	0.7	41.2	54.0	-12.8	V	A	
11.590	3.0	35.1	38.1	9.5	-32.5	0.0	0.7	51.0	74.0	-23.0	H	P	
11.590	3.0	22.6	38.1	9.5	-32.5	0.0	0.7	38.4	54.0	-15.6	H	A	

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

8.2.7. 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: 06/29/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11 abgn Wlan + Bluetooth PCI-E Mini Card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15.247
Mode Oper: TX, 5.8GHz HT40 MIMO

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

Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
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	39.0	38.1	9.5	-32.5	0.0	0.7	54.7	74.0	-19.3	V	P	
11.510	3.0	26.0	38.1	9.5	-32.5	0.0	0.7	41.7	54.0	-12.3	V	A	
11.510	3.0	33.5	38.1	9.5	-32.5	0.0	0.7	49.2	74.0	-24.8	H	P	
11.510	3.0	21.8	38.1	9.5	-32.5	0.0	0.7	37.5	54.0	-16.5	H	A	
High Ch, 5795MHz													
11.590	3.0	35.8	38.1	9.5	-32.5	0.0	0.7	51.6	74.0	-22.4	V	P	
11.590	3.0	23.6	38.1	9.5	-32.5	0.0	0.7	39.4	54.0	-14.6	V	A	
11.590	3.0	33.9	38.1	9.5	-32.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.590	3.0	22.3	38.1	9.5	-32.5	0.0	0.7	38.1	54.0	-15.9	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 IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 10U13263
Date: 06/21/10
Test Engineer: Chin Pang
Configuration: EUT / Test JIG / Laptop
Mode: Rx Mode_2.4GHz Band_20MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.200	3.0	56.0	49.3	25.1	2.6	-38.0	0.0	0.0	45.7	39.0	74	54	-28.3	-15.0	V
1.330	3.0	52.0	37.0	25.6	2.7	-37.8	0.0	0.0	42.5	27.5	74	54	-31.5	-26.5	V
2.000	3.0	50.2	38.3	27.8	3.5	-36.9	0.0	0.0	44.6	32.7	74	54	-29.4	-21.3	V
2.497	3.0	61.4	34.4	28.3	3.9	-36.3	0.0	0.0	57.4	30.4	74	54	-16.6	-23.6	V
1.333	3.0	53.2	46.8	25.6	2.8	-37.8	0.0	0.0	43.7	37.3	74	54	-30.3	-16.7	H
1.498	3.0	50.5	33.0	26.1	2.9	-37.6	0.0	0.0	42.0	24.5	74	54	-32.0	-29.5	H
2.490	3.0	58.0	36.2	28.3	3.9	-36.3	0.0	0.0	53.9	32.1	74	54	-20.1	-21.9	H
No other emissions were detected above system noise floor															

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 20 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 10U13263
Date: 06/24/10
Test Engineer: Chin Pang
Configuration: EUT / Test JIG / Laptop
Mode: Rx Mode_5.8 GHz Band_20MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.096	3.0	56.5	37.2	24.8	2.5	-38.1	0.0	0.0	45.6	26.3	74	54	-28.4	-27.7	V
1.333	3.0	54.9	50.1	25.6	2.8	-37.8	0.0	0.0	45.4	40.6	74	54	-28.6	-13.4	V
1.498	3.0	54.0	35.2	26.1	2.9	-37.6	0.0	0.0	45.5	26.7	74	54	-28.5	-27.3	V
2.493	3.0	62.0	40.5	28.3	3.9	-36.3	0.0	0.0	58.0	36.5	74	54	-16.0	-17.5	V
1.098	3.0	52.3	38.0	24.8	2.5	-38.1	0.0	0.0	41.4	27.1	74	54	-32.6	-26.9	H
1.333	3.0	50.0	44.3	25.6	2.8	-37.8	0.0	0.0	40.5	34.8	74	54	-33.5	-19.2	H
1.397	3.0	50.0	36.5	25.8	2.8	-37.7	0.0	0.0	40.9	27.4	74	54	-33.1	-26.6	H
2.490	3.0	57.5	36.3	28.3	3.9	-36.3	0.0	0.0	53.4	32.2	74	54	-20.6	-21.8	H
No other emissions were detected above system noise floor															

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		

8.3.3. FOR 40 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 10U13263
Date: 06/24/10
Test Engineer: Chin Pang
Configuration: EUT / Test JIG / Laptop
Mode: Rx Mode_5.8 GHz Band_40MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.333	3.0	56.0	51.2	25.6	2.8	-37.8	0.0	0.0	46.6	41.8	74	54	-27.4	-12.2	V
1.498	3.0	55.1	36.3	26.1	2.9	-37.6	0.0	0.0	46.6	27.8	74	54	-27.4	-26.2	V
2.493	3.0	63.1	41.6	28.3	3.9	-36.3	0.0	0.0	59.1	37.6	74	54	-14.9	-16.4	V
1.098	3.0	53.4	39.1	24.8	2.5	-38.1	0.0	0.0	42.6	28.3	74	54	-31.4	-25.7	H
1.333	3.0	51.1	45.4	25.6	2.8	-37.8	0.0	0.0	41.7	36.0	74	54	-32.3	-18.0	H
2.490	3.0	58.6	37.4	28.3	3.9	-36.3	0.0	0.0	54.6	33.4	74	54	-19.4	-20.6	H
No other emissions were detected above system noise floor															

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

8.4. WORST-CASE BELOW 1 GHz

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

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

Test Engr: Chin Pang
Date: 06/21/10
Project #: 10U13263
Company: Broadcom
EUT Description: 802.11abgn Wlan + Bluetooth PCI-E mini card
EUT M/N: BCM943224PCIEBT2
Test Target: FCC 15B
Mode Oper: 2.4GHz, TX (Worst Case)

f	Measurement Frequency	Amp	Preamp Gain
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

Margin Margin vs. Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
vert													
299.651	3.0	47.7	13.5	1.5	27.4	0.0	0.0	35.3	46.0	-10.7	V	P	
336.013	3.0	50.7	14.0	1.6	27.6	0.0	0.0	38.7	46.0	-7.3	V	P	
368.894	3.0	50.2	14.5	1.7	27.8	0.0	0.0	38.5	46.0	-7.5	V	P	
597.383	3.0	46.7	18.4	2.2	28.6	0.0	0.0	38.7	46.0	-7.3	V	P	
899.316	3.0	40.3	22.1	2.7	27.9	0.0	0.0	37.2	46.0	-8.8	V	P	
99.603	3.0	53.5	9.3	0.8	28.2	0.0	0.0	35.4	43.5	-8.1	H	P	
230.408	3.0	54.1	11.8	1.3	27.4	0.0	0.0	39.8	46.0	-6.2	H	P	
369.134	3.0	51.7	14.5	1.7	27.8	0.0	0.0	40.1	46.0	-5.9	H	P	
432.017	3.0	50.2	15.6	1.8	28.2	0.0	0.0	39.5	46.0	-6.5	H	P	
697.468	3.0	41.9	18.9	2.4	28.5	0.0	0.0	34.7	46.0	-11.3	H	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

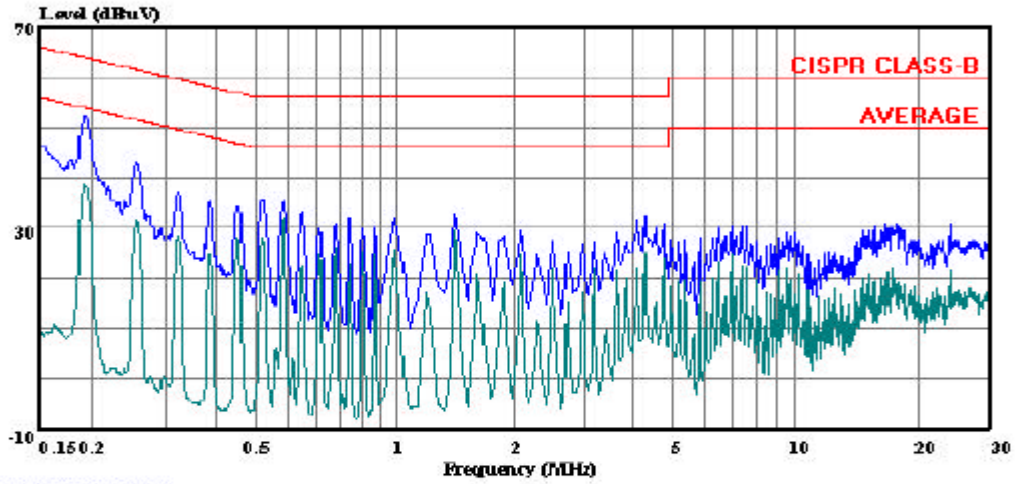
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.19	52.23	--	38.55	0.00	63.91	53.91	-11.68	-15.36	L1
0.59	35.27	--	30.22	0.00	56.00	46.00	-20.73	-15.78	L1
1.52	32.77	--	29.47	0.00	56.00	46.00	-23.23	-16.53	L1
0.19	51.53	--	38.25	0.00	63.91	53.91	-12.38	-15.66	L2
0.58	35.07	--	31.50	0.00	56.00	46.00	-20.93	-14.50	L2
1.52	33.50	--	29.38	0.00	56.00	46.00	-22.50	-16.62	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 7 File#: 10U13263.EMI Date: 06-21-2010 Time: 13:21:45



(Line Conduction)

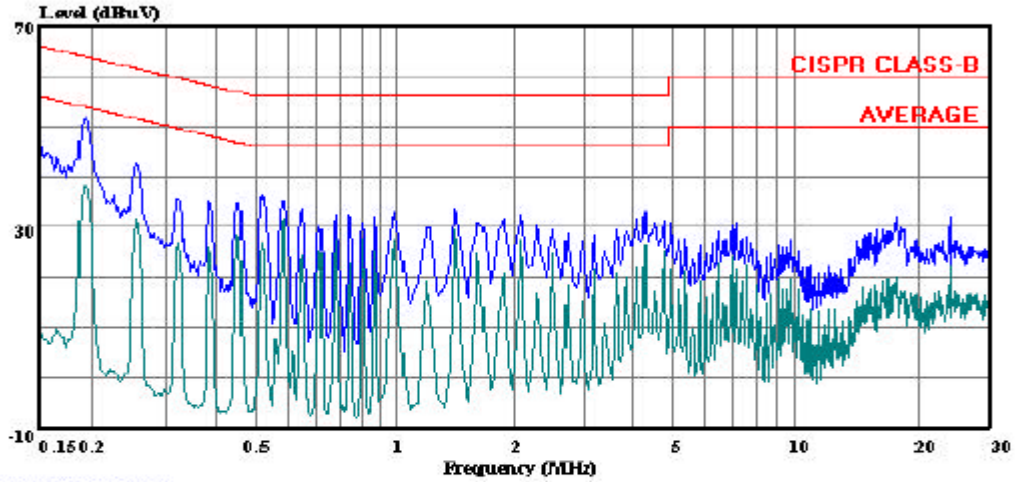
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Chin Pang
Project #: : 10U13263
Company: : Broadcom
EUT Description:: 802.11 abgn Wlan + Bluetooth PCI-E
: Mini card
Model: : BCM943224PCIEBT2
Configuration: : EUT and Laptop
Mode: : TX Worst Case
Target: : FCC Class B
Voltage: : 115VAC 50Hz
: Line 1: QP (Blue), Average (Green)

LINE 2 RESULTS

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

Data#: 14 File#: 10U13263.EMI Date: 06-21-2010 Time: 13:30:51



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Chin Pang
Project #: : 10U13263
Company: : Broadcom
EUT Description:: 802.11 abgn Wlan + Bluetooth PCI-E
: Mini Card
Model: : BCM943224PCIEBT2
Configuration: : EUT and Laptop
Mode: : TX Worst Case
Target: : FCC Class B
Voltage: : 115VAC 50Hz
: Line 2: QP (Blue), Average (Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

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

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

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 Legacy	0.20	23.00	5.98	1.57	0.157
2412 - 2462	g-mode Legacy	0.20	24.20	5.98	2.07	0.207
2412 - 2462	HT20	0.20	26.40	7.93	5.39	0.539
5725 to 5850 MHz Authorized Band						
5745 - 5825	a-mode Legacy	0.20	22.00	6.28	1.34	0.134
5745 - 5825	HT20	0.20	24.40	8.65	4.02	0.402
5755 - 5795	HT40 SISO	0.20	22.60	6.28	1.54	0.154
5755 - 5795	HT40	0.20	23.83	8.65	3.52	0.352