



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

CELLULAR/PCS/AWS CDMA AND AWS LTE WITH BLUETOOTH AND WLAN

MODEL NUMBERS: MS840, LG-MS840, LGMS840

FCC ID: ZNFMS840

REPORT NUMBER: 11U13993-2

ISSUE DATE: SEPTEMBER 20, 2011

Prepared for
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*The models covered by this report are identical



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	09/20/11	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC.
10101 OLD GROVE ROAD
SAN DIEGO, CA 92131

EUT DESCRIPTION: Cellular/PCS/AWS CDMA and AWS LTE with Bluetooth and WLAN

MODEL: LG-MS840

SERIAL NUMBER: 99000073000185

DATE TESTED: SEPTEMBER 13 to 15, 2011

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

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

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

Approved & Released For UL CCS By:



FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:



VIEN TRAN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a smart-phone that features Cellular/PCS/AWS CDMA and AWS LTE with Bluetooth and WLAN.

The radio module is manufactured by Broadcom Co.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412-2462	802.11b	16.36	61.80
2412-2462	802.11g	20.44	161.81
2412-2462	802.11n HT20	19.77	123.03

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio uses a PIFA (Planar Inverted F Antenna) with a maximum peak gain of -4.0dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT software installed during testing was MS840C01.

The test utility software used during testing was WiFi Test.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1 GHz and power line conducted emissions were performed with the EUT set to the channel with highest output power.

The EUT is a portable device that may be used in any orientation. The EUT may or may not be connected to its AC power adapter and earphones during use. The EUT was initially assessed in each of three axes of operation (X, Y and Z) without the AC adaptor and earphones connected to determine the worst-case condition. This was found to be with the EUT in the Y orientation with its AC power adapter and earphones connected. See the setup photographs for an indication of the EUT orientations.

Worst-case data rates used based on input from the client were as follows:

802.11b mode: 1 Mbps

802.11g mode: 6 Mbps

802.11n mode: MCS0

5.6. DESCRIPTION OF TEST SETUP**SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG Electronics	STA-U13WV	VA 11020005999	N/A
Ear Phone	LG Electronics	N/A	N/A	N/A

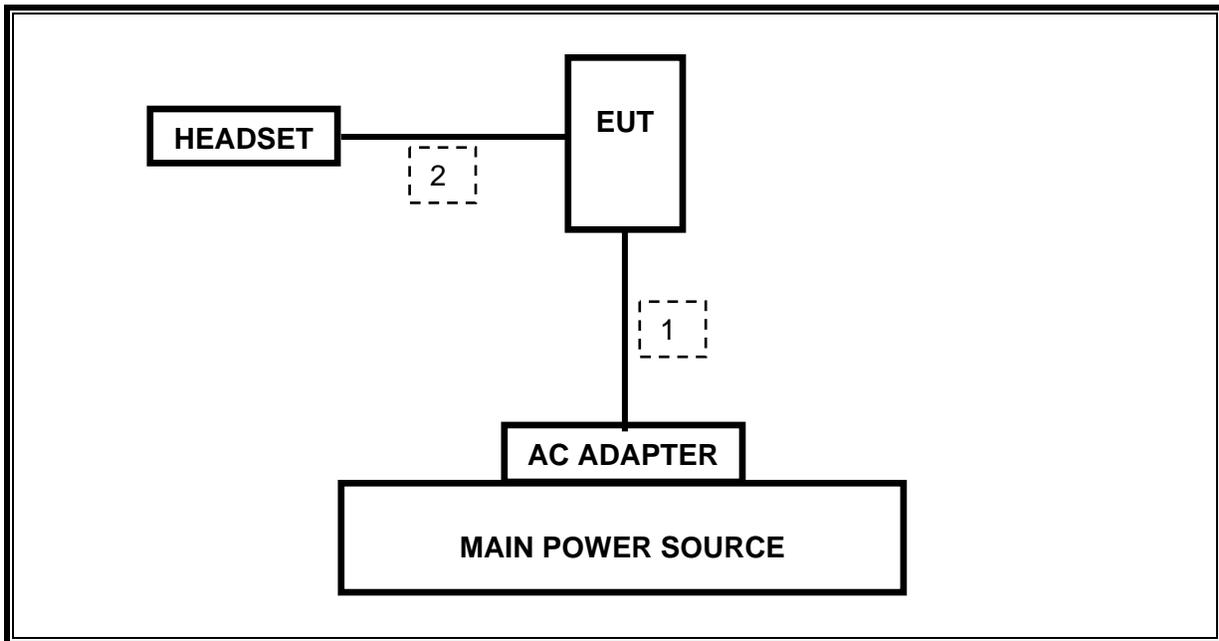
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	#of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	MINI USB	Un-Shielded	1.0m	
2	AUDIO	1	MINI JACK	Un-Shielded	1.0m	Volume control on cable

TEST SETUP

The EUT is a stand-alone device and was tested with AC/USB adapter and earphone.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4440A	C01178	09/12/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/08/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/12
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/12
Antenna, Horn, 26.5 GHz	ARA	MMH-1826/B	C00980	07/29/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/16/12
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01098	04/30/12
Power Meter	Agilent / HP	437B	N02778	08/11/12
Power Sensor, 18 GHz	Agilent / HP	8481A	N02784	08/01/13
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11

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)

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

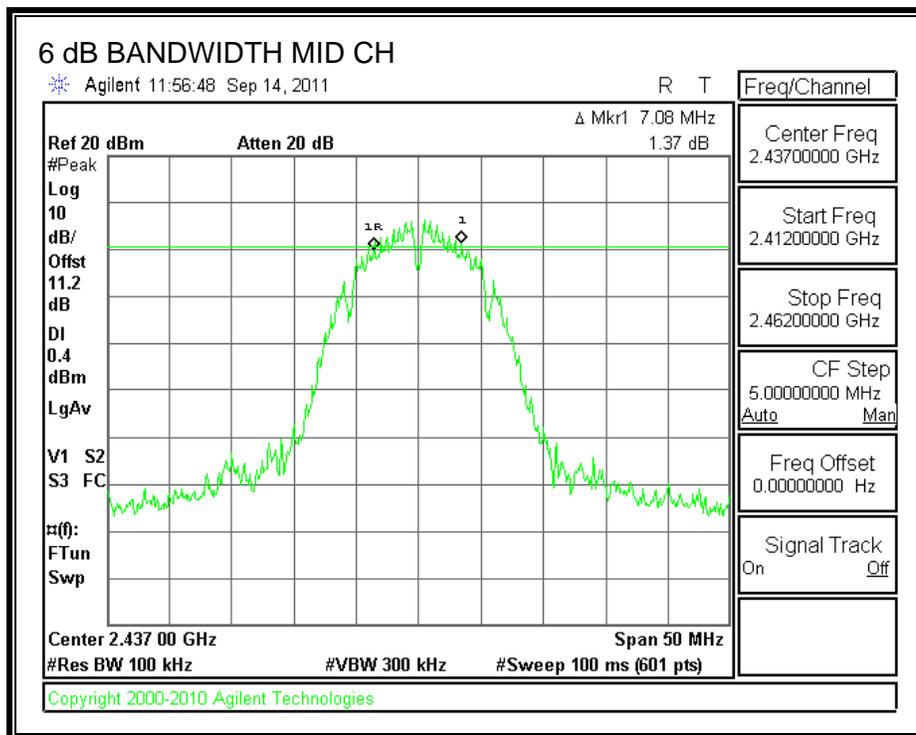
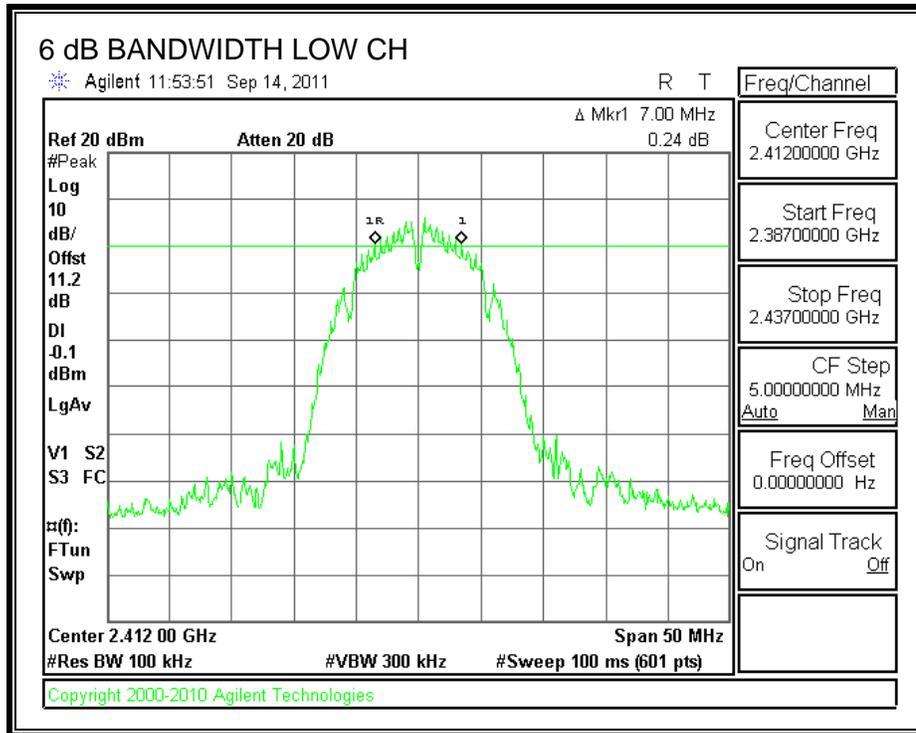
TEST PROCEDURE

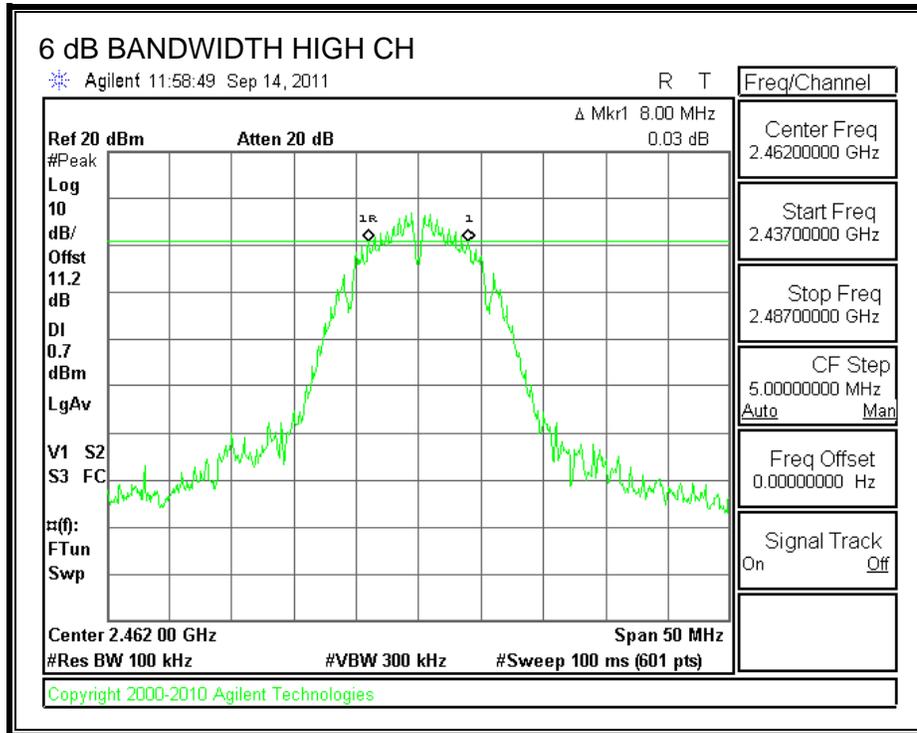
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	7.00	0.5
Middle	2437	7.08	0.5
High	2462	8.00	0.5

6 dB BANDWIDTH





7.1.2. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

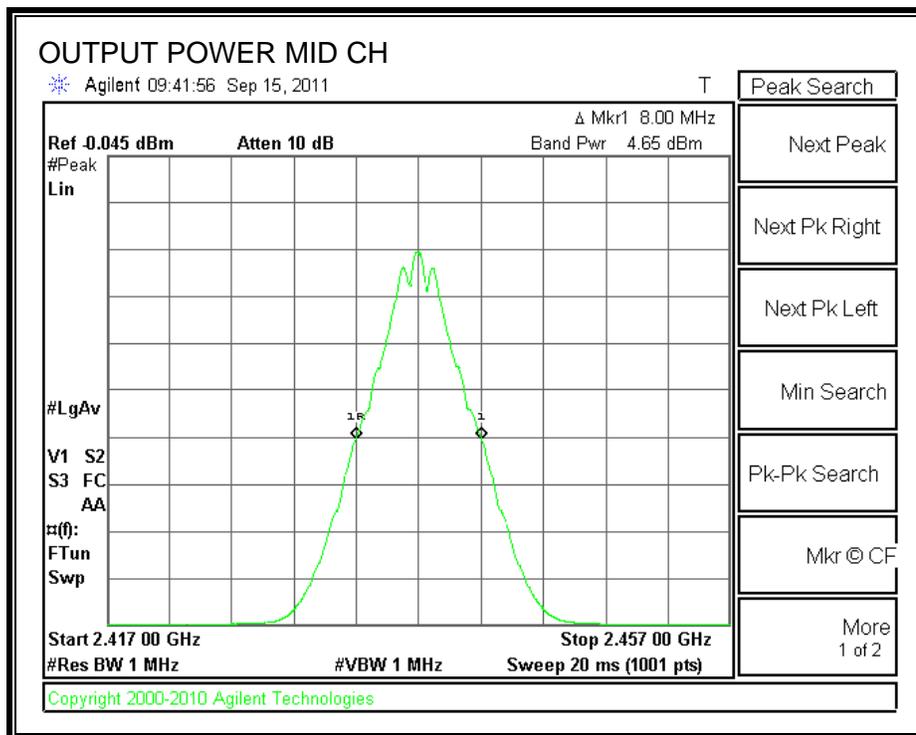
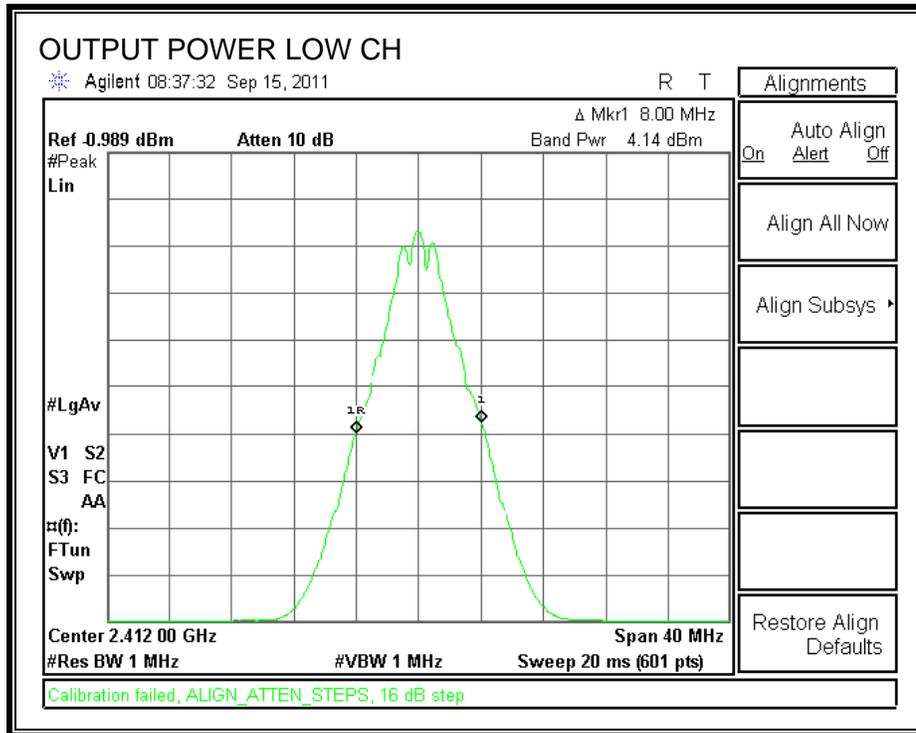
TEST PROCEDURE

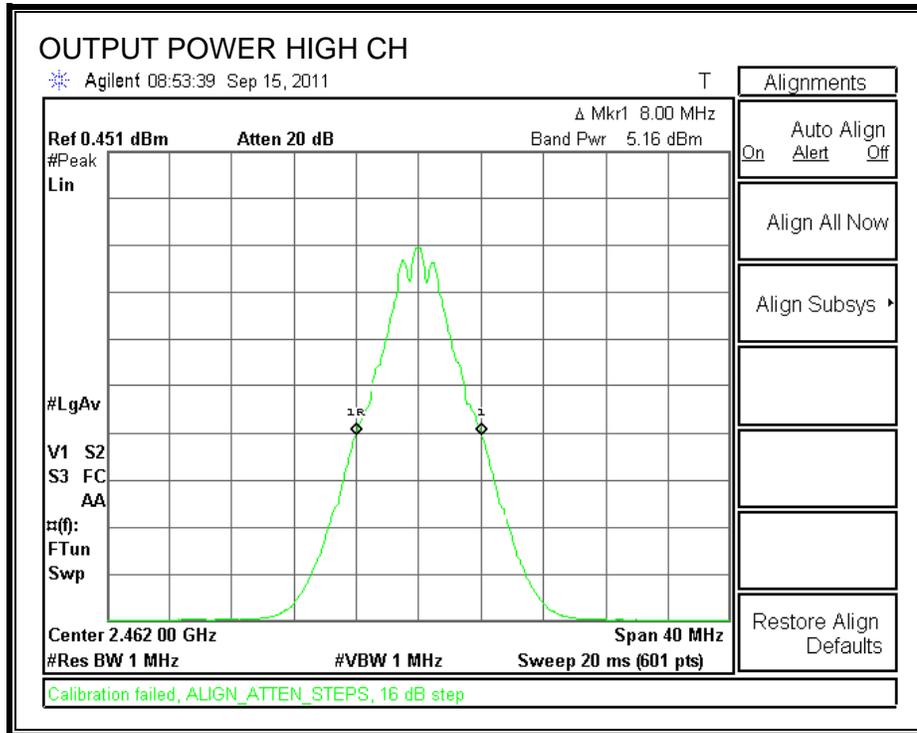
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	4.14	11.2	15.34	30	-14.66
Middle	2437	4.65	11.2	15.85	30	-14.15
High	2462	5.16	11.2	16.36	30	-13.64

OUTPUT POWER





7.1.3. AVERAGE POWER

LIMITS

None - for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 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)	Power (dBm)
Low	2412	12.60
Middle	2437	13.60
High	2462	13.90

7.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

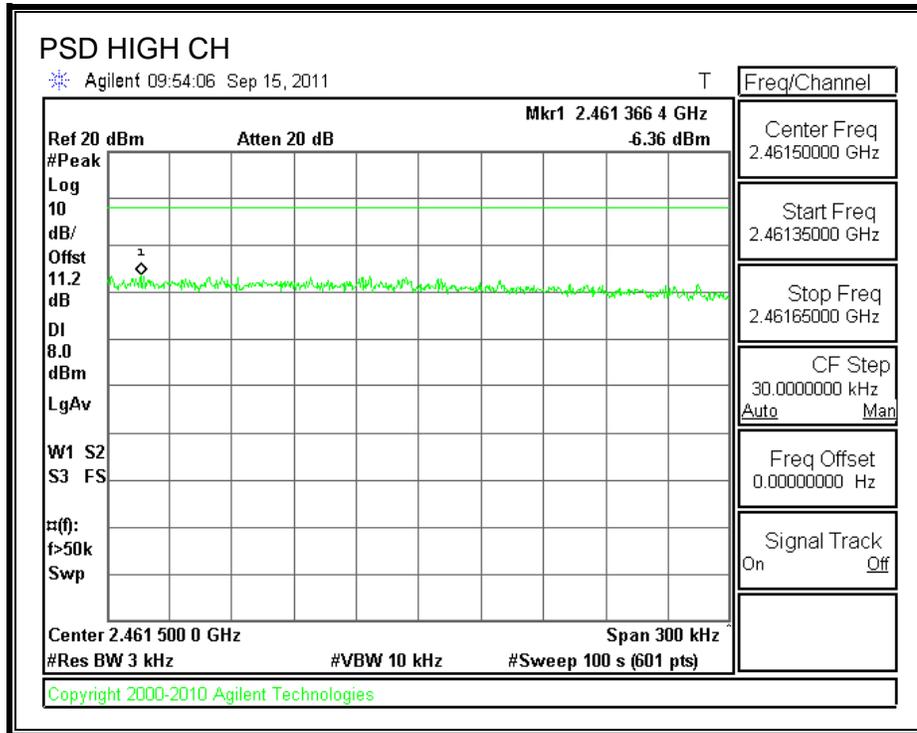
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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	-7.80	8	-15.80
Middle	2437	-5.25	8	-13.25
High	2462	-6.36	8	-14.36



7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

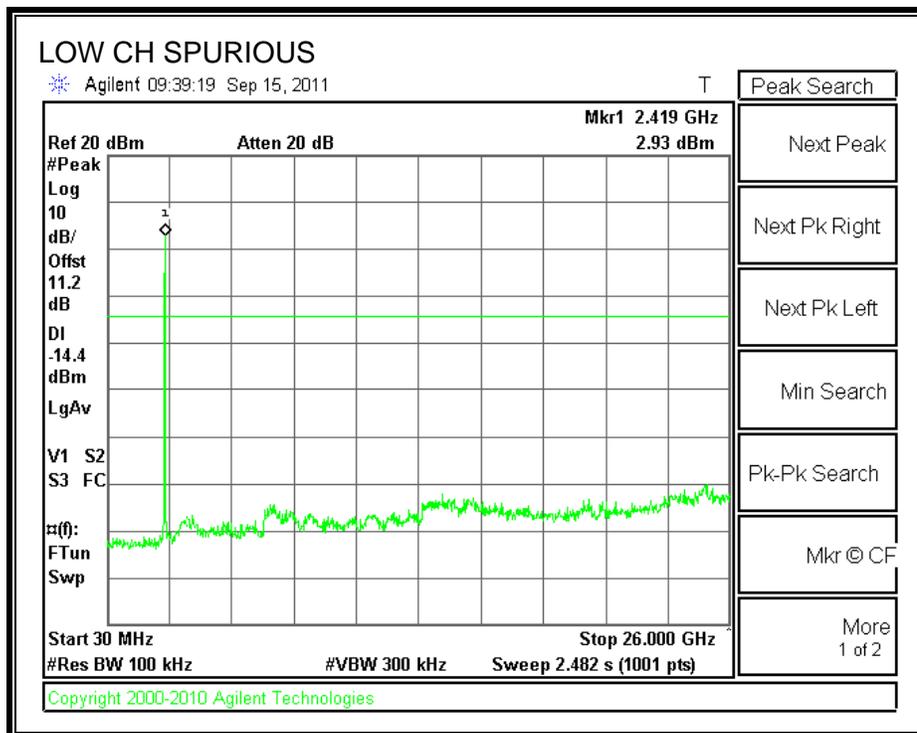
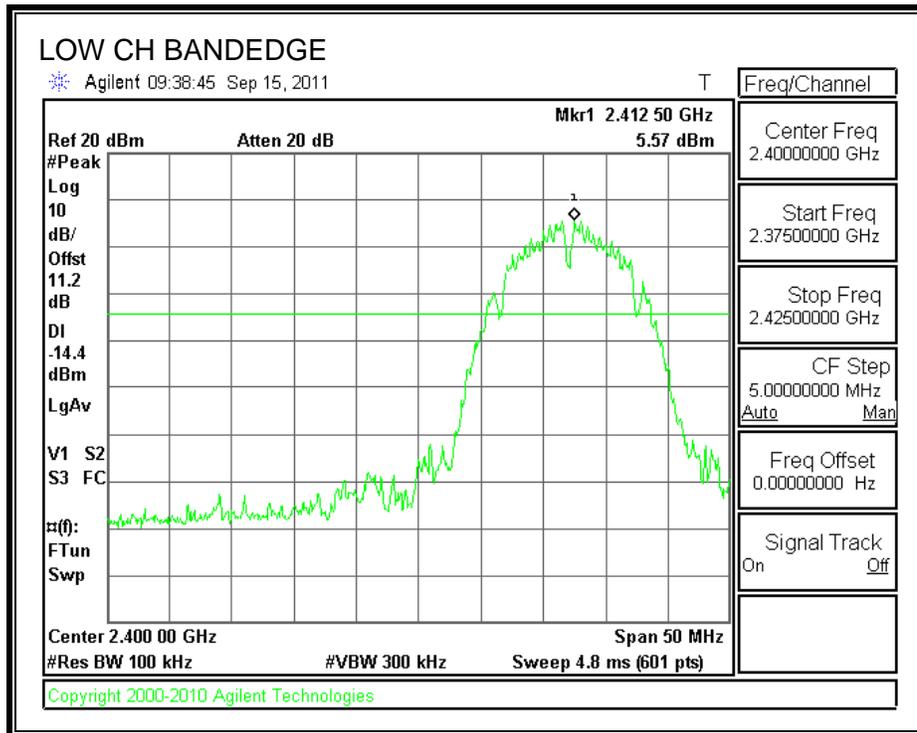
TEST PROCEDURE

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.

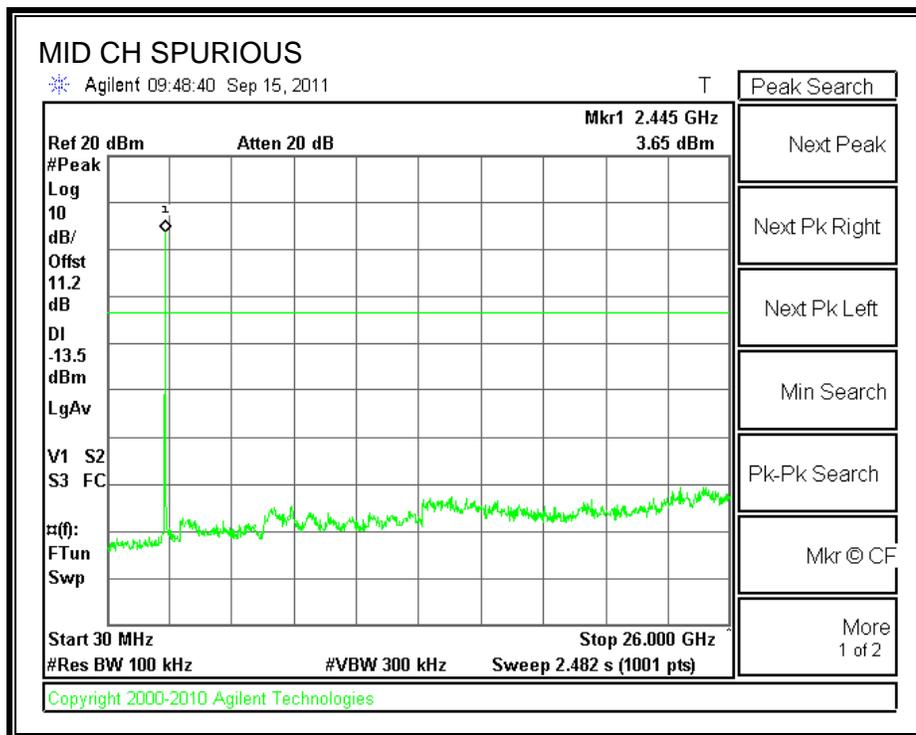
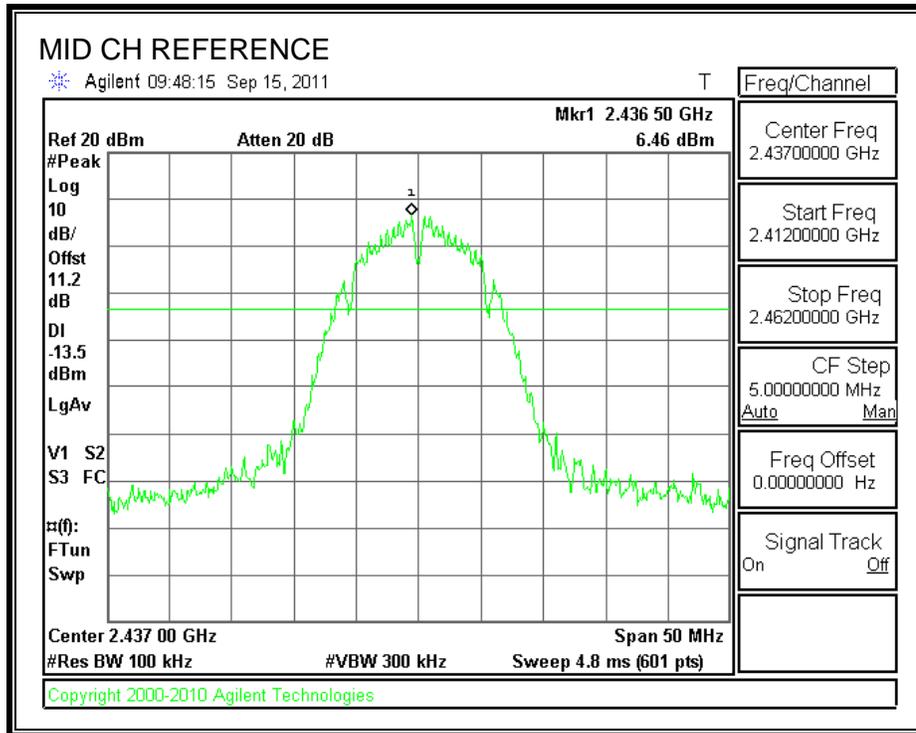
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

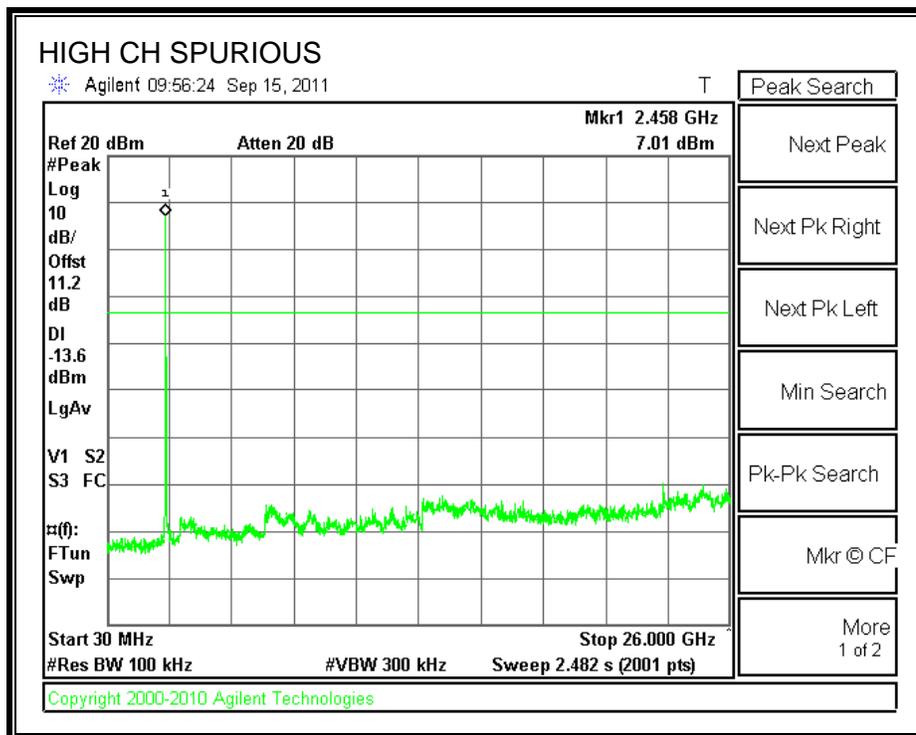
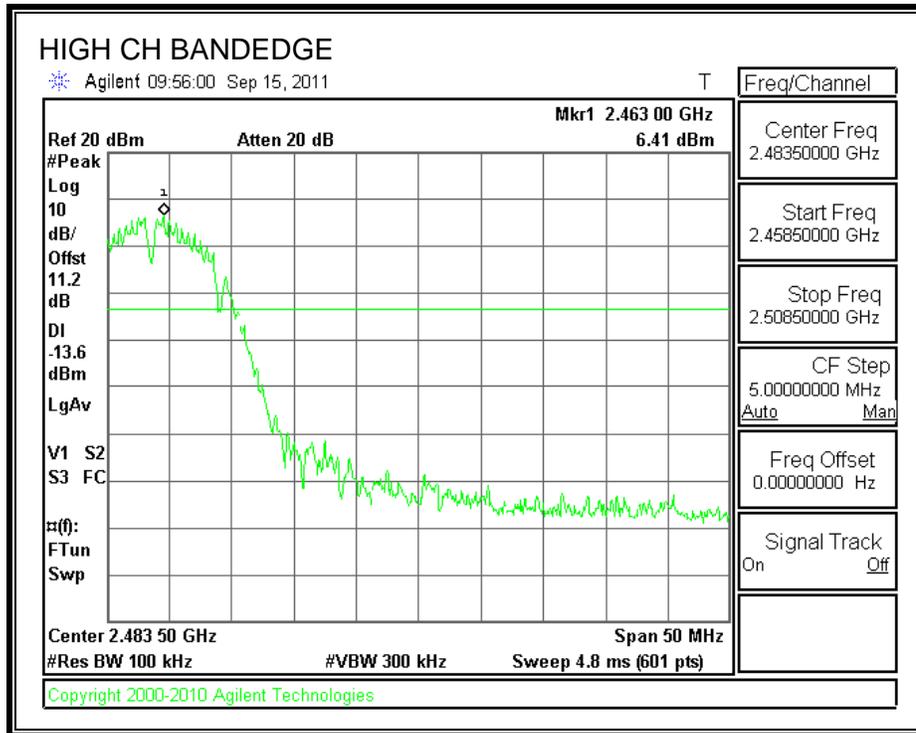
SPURIOUS EMISSIONS, LOW CHANNEL



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)

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

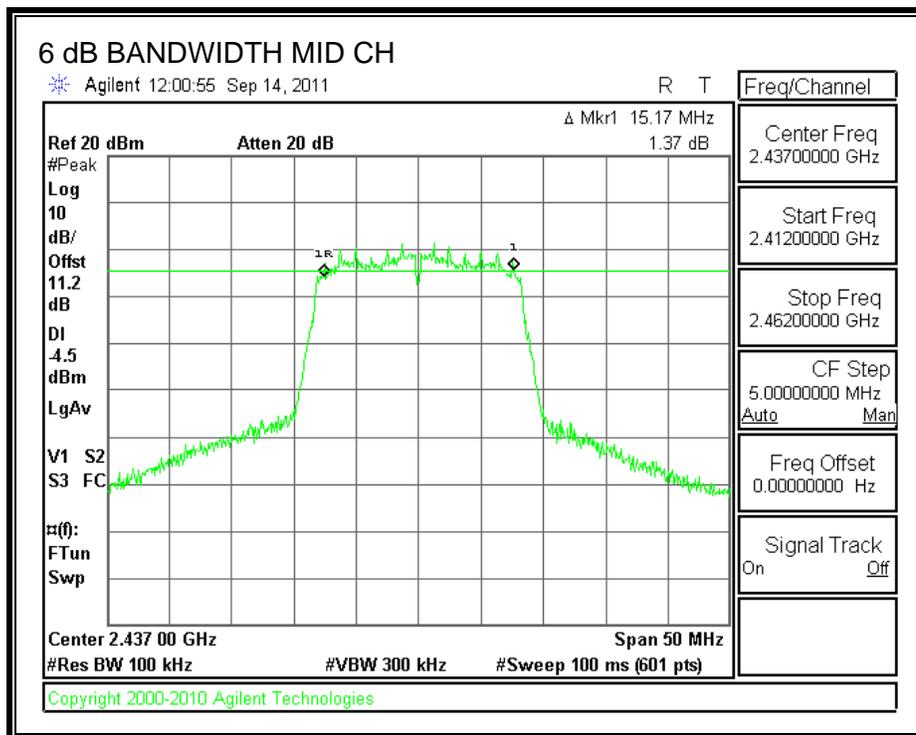
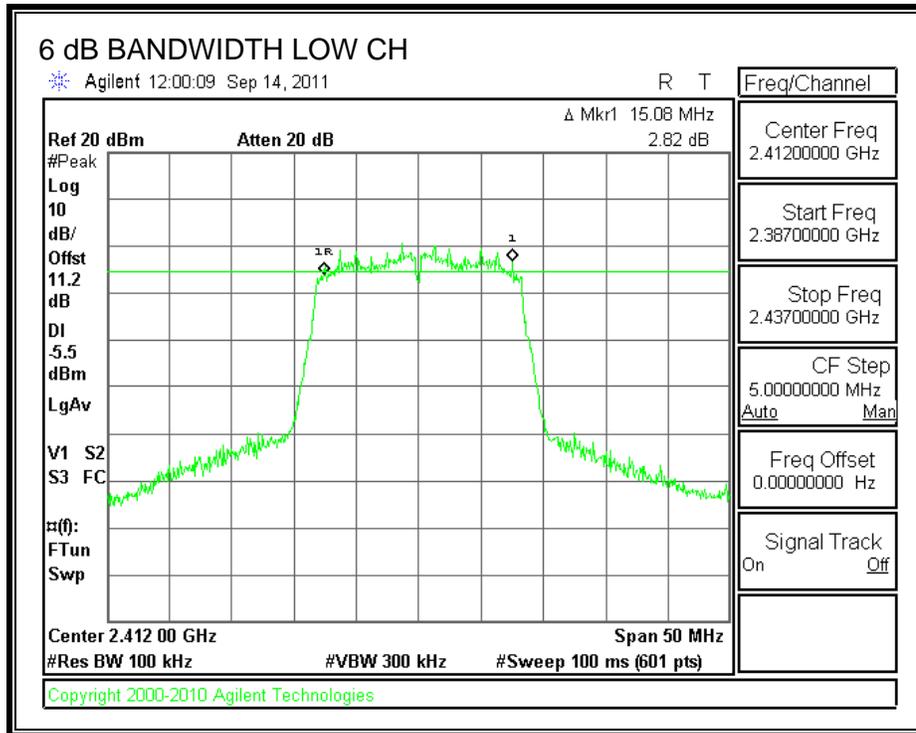
TEST PROCEDURE

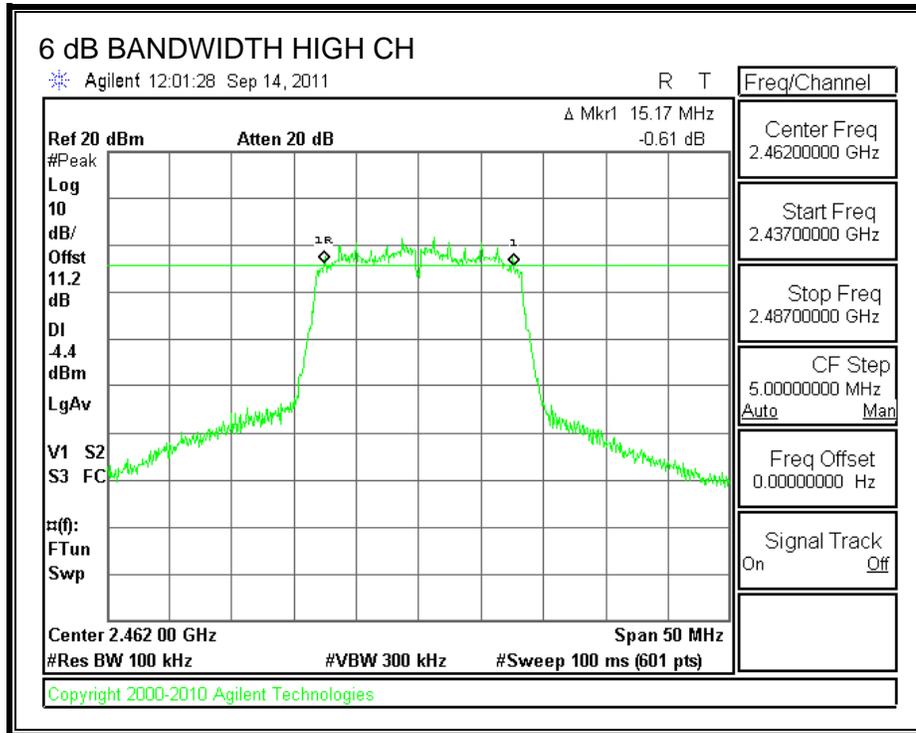
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.08	0.5
Middle	2437	15.17	0.5
High	2462	15.17	0.5

6 dB BANDWIDTH





7.2.2. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

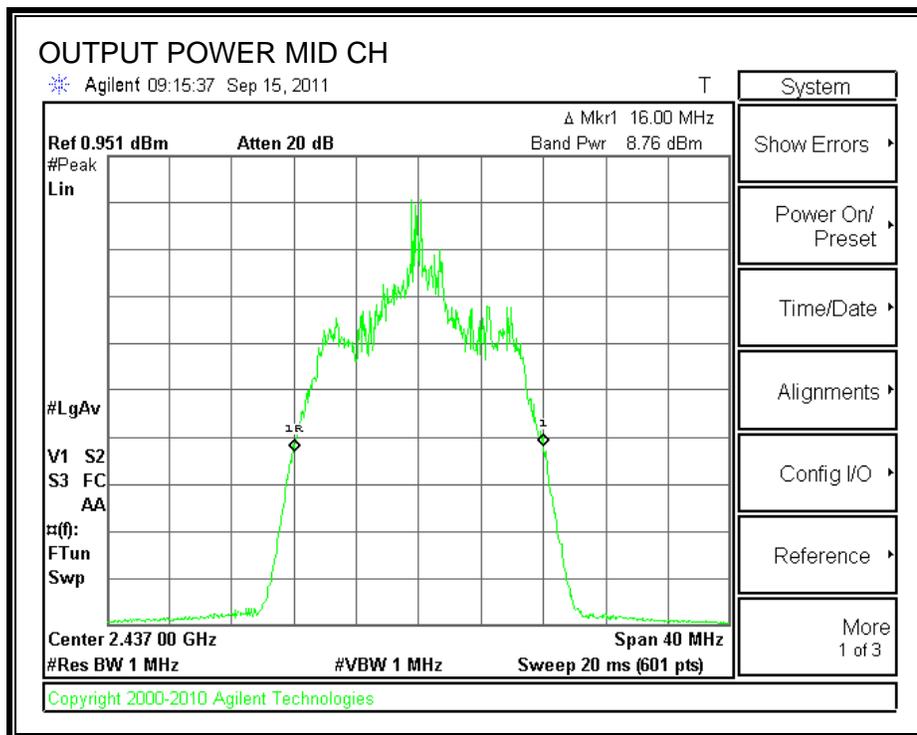
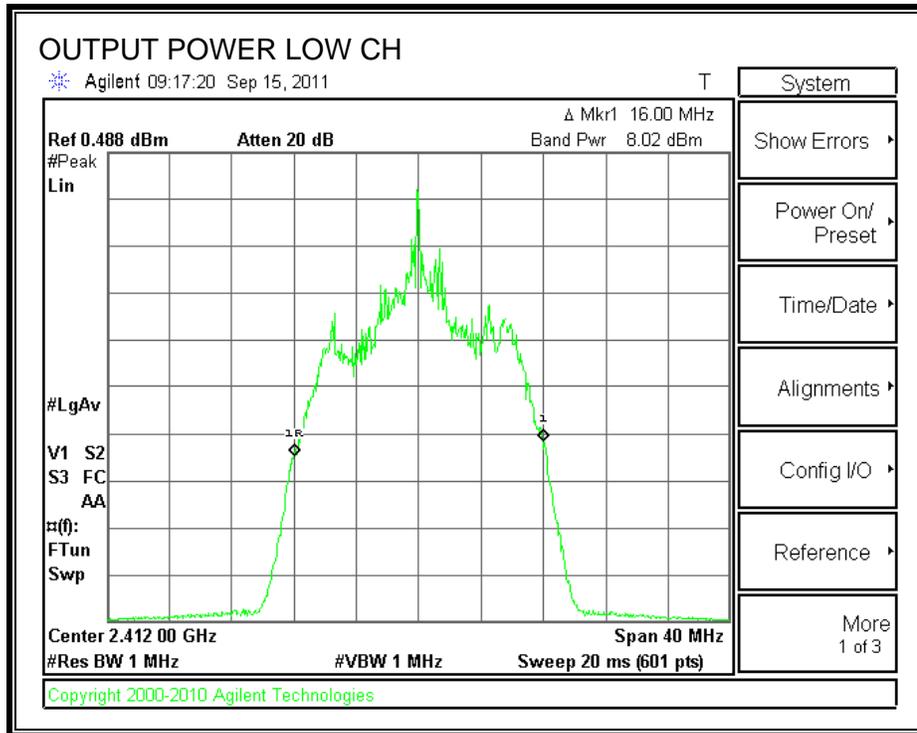
TEST PROCEDURE

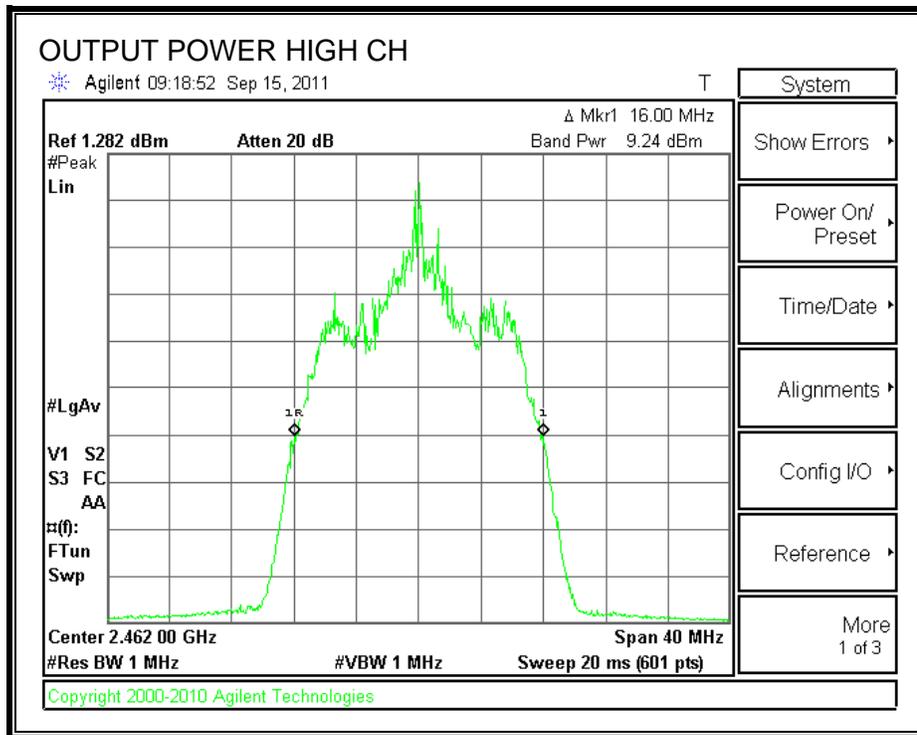
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	8.02	11.2	19.22	30	-10.78
Middle	2437	8.76	11.2	19.96	30	-10.04
High	2462	9.24	11.2	20.44	30	-9.56

OUTPUT POWER





7.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 dB (including 10.0 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)	Power (dBm)
Low	2412	10.80
Middle	2437	11.40
High	2462	11.90

7.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

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.

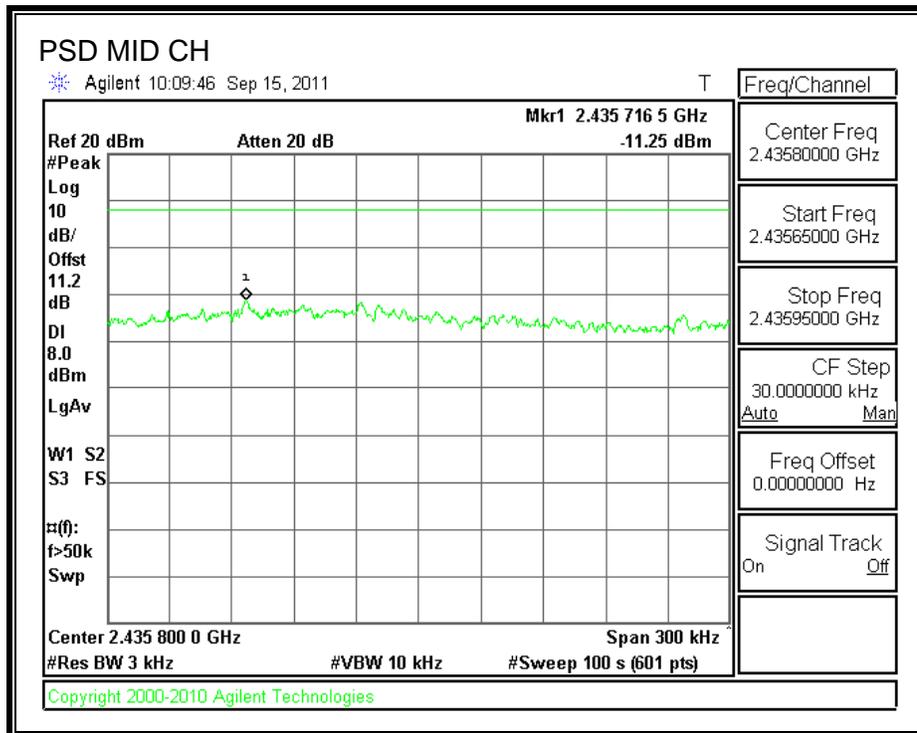
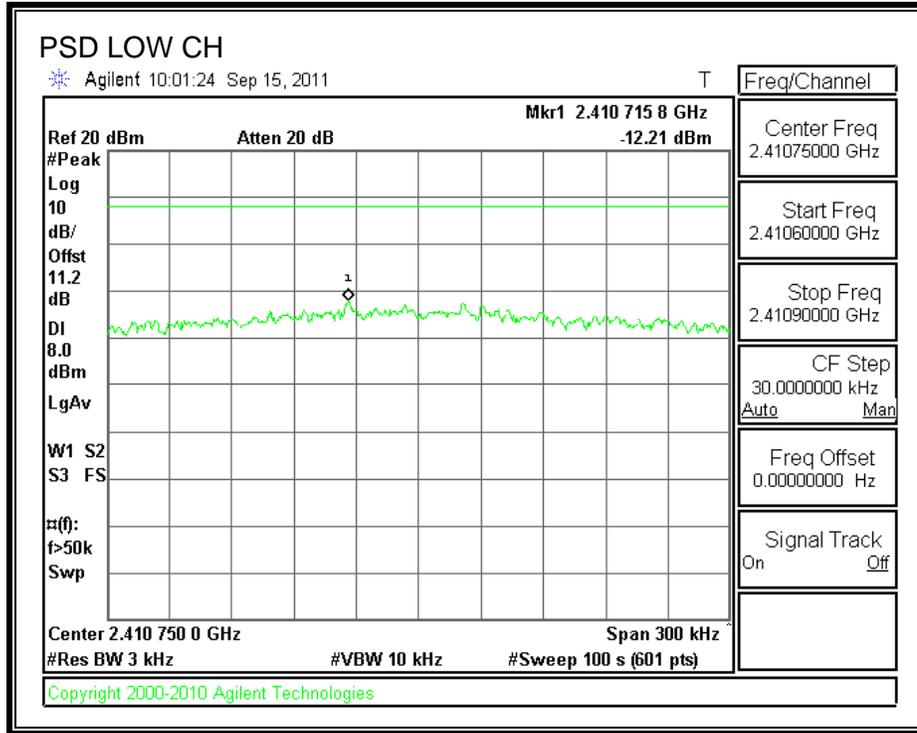
TEST PROCEDURE

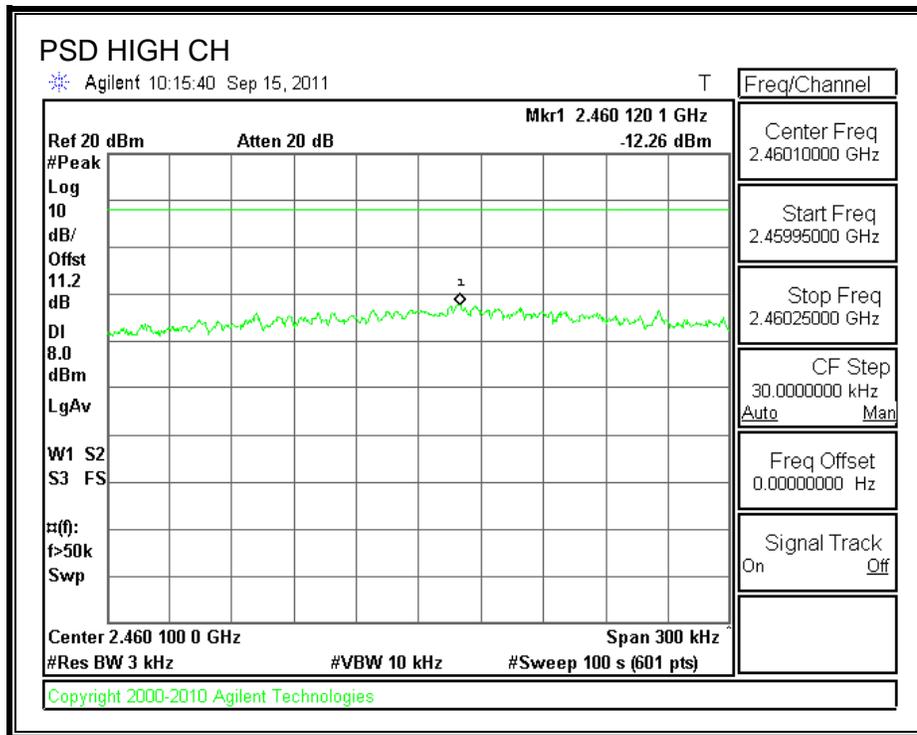
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-12.21	8	-20.21
Middle	2437	-11.25	8	-19.25
High	2462	-12.26	8	-20.26

POWER SPECTRAL DENSITY





7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

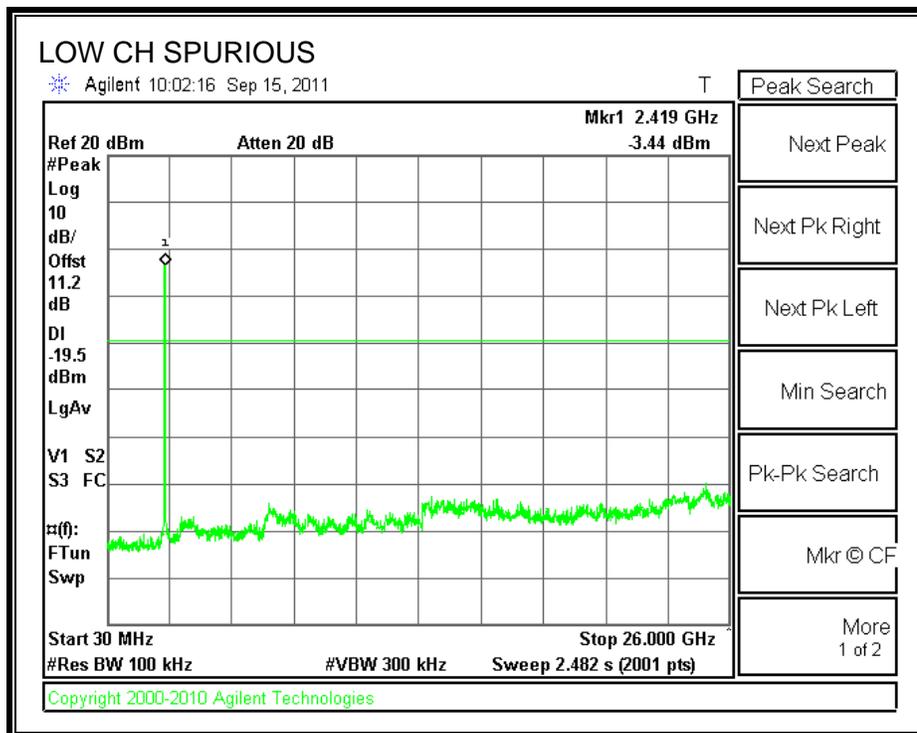
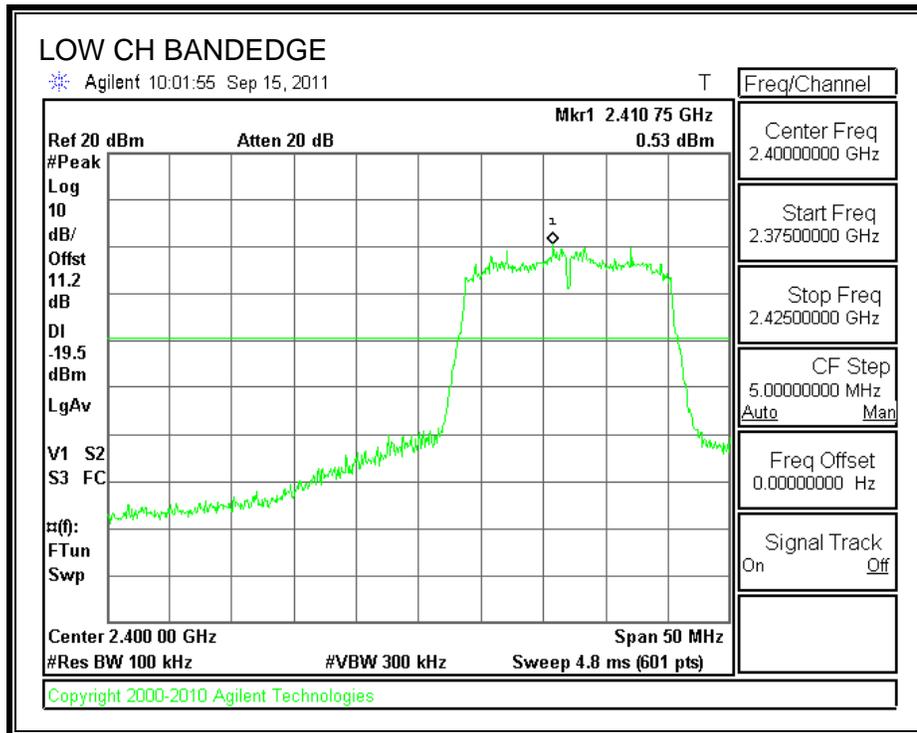
TEST PROCEDURE

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.

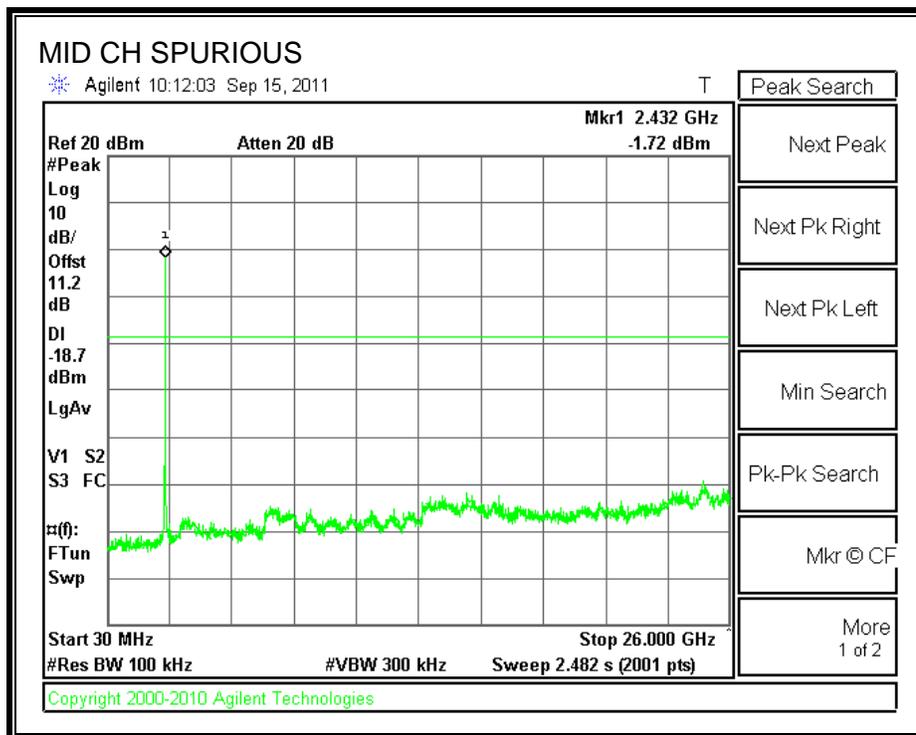
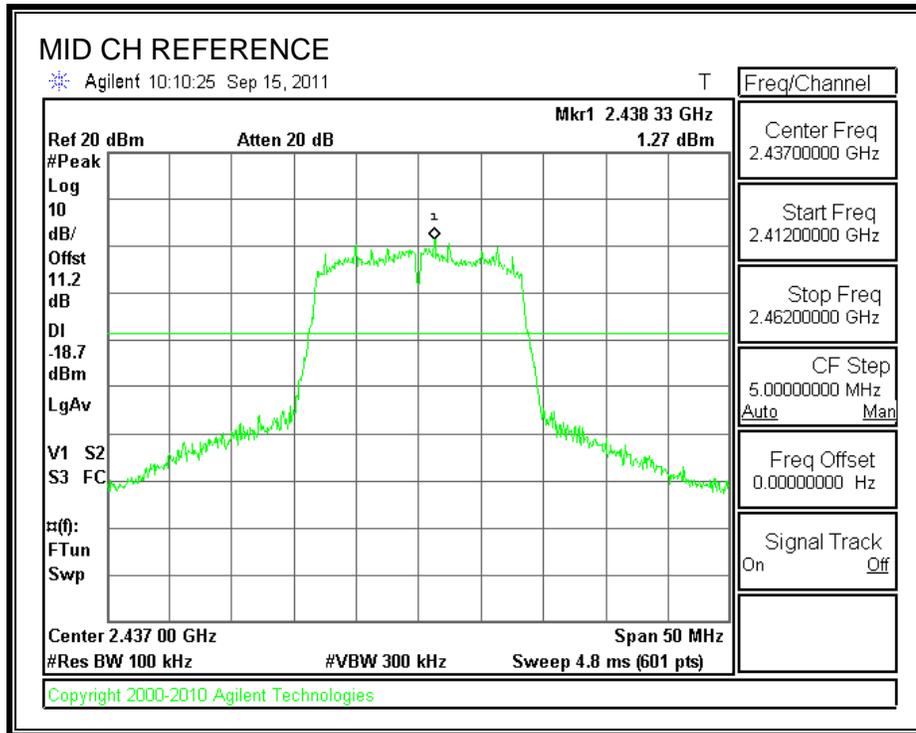
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

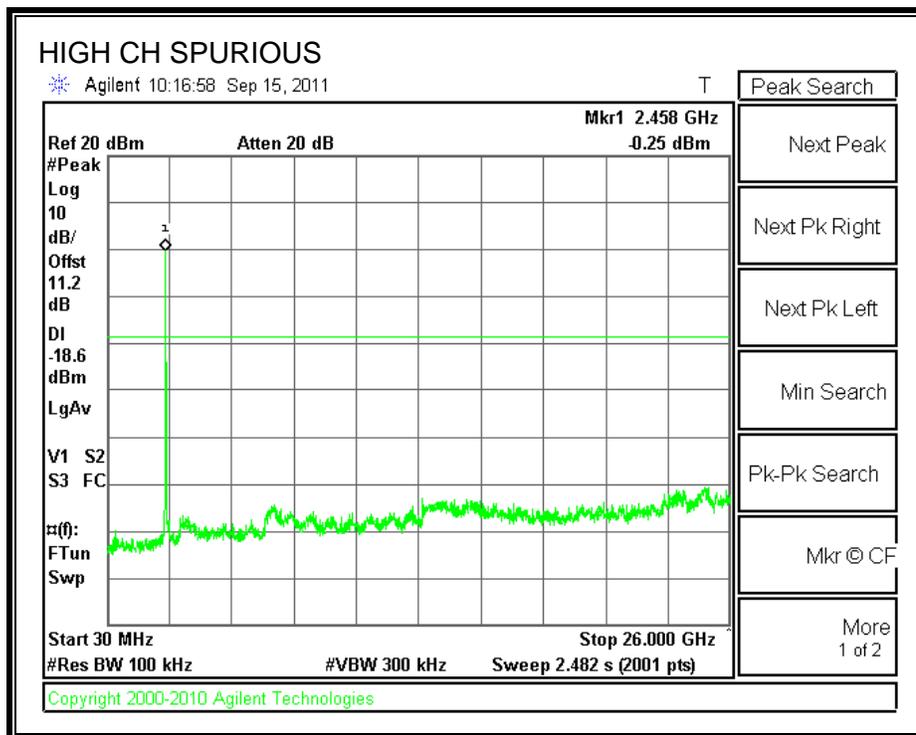
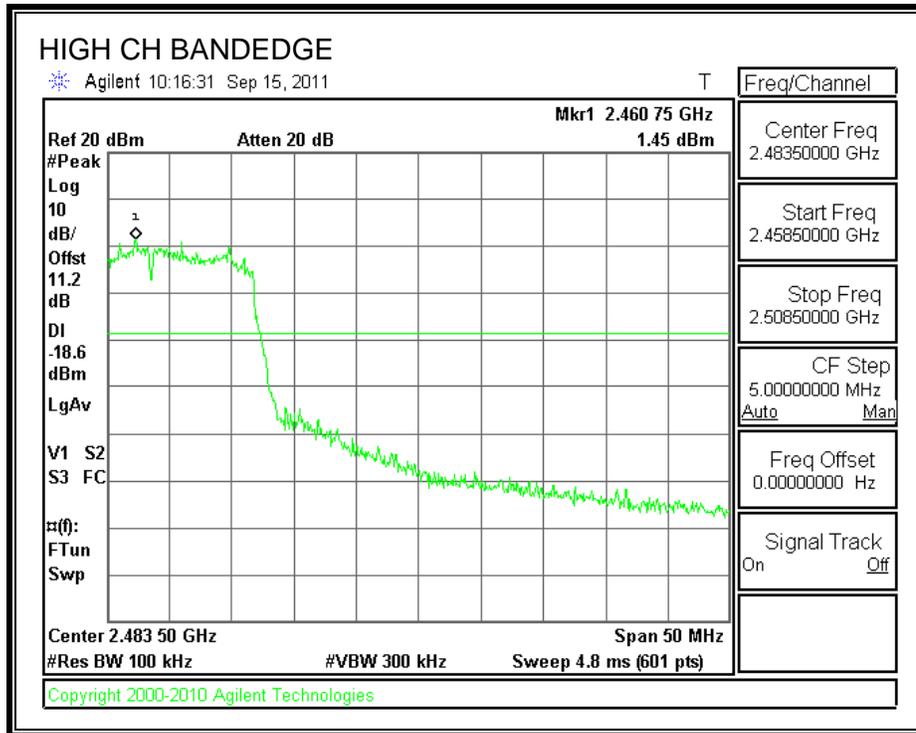
SPURIOUS EMISSIONS, LOW CHANNEL



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)

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

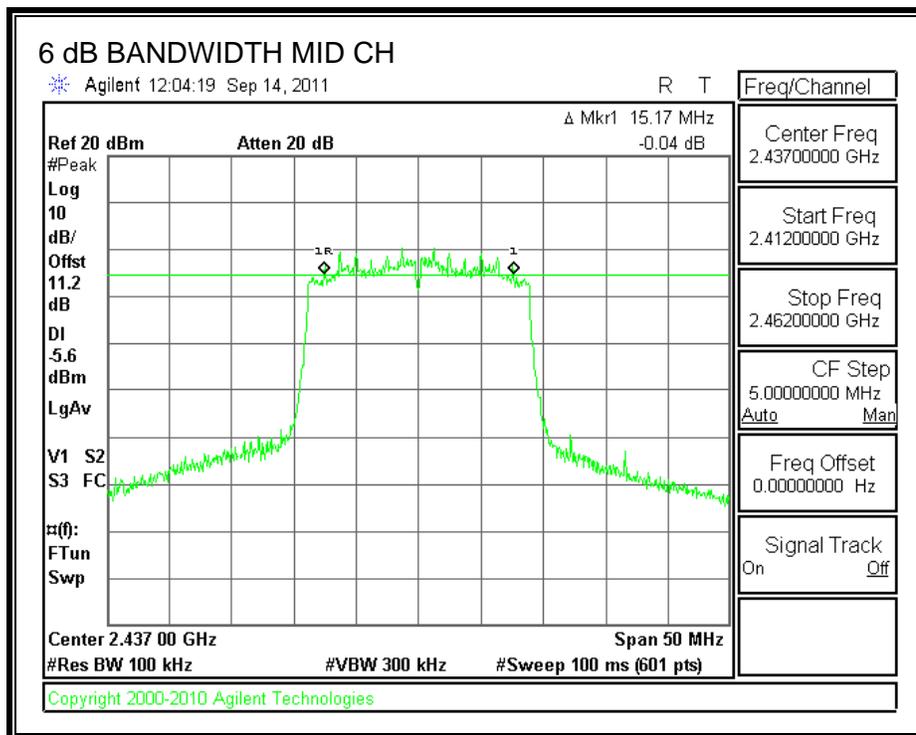
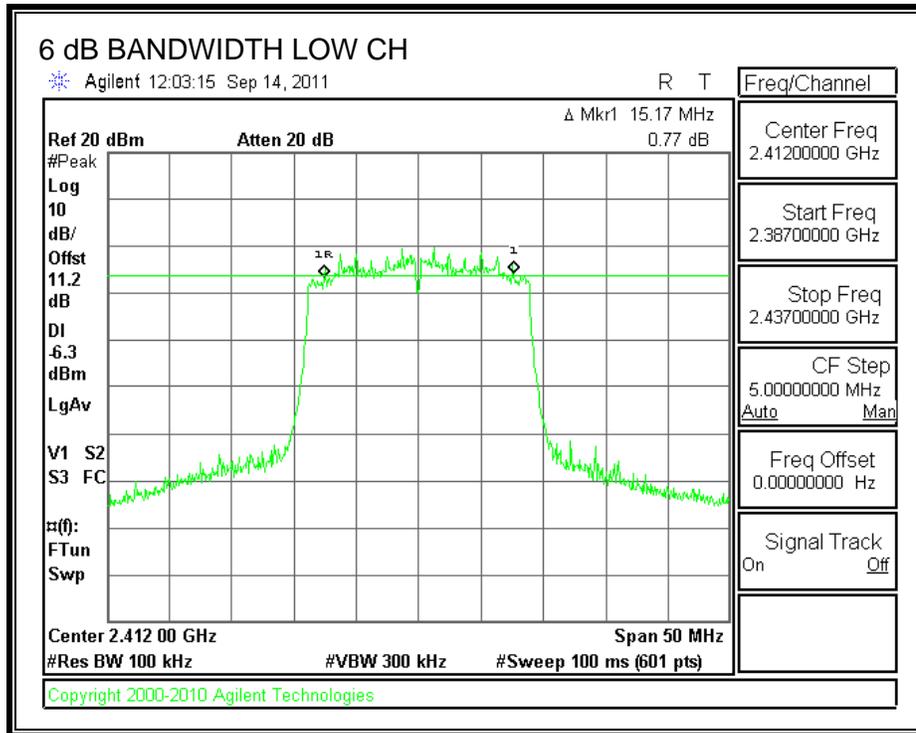
TEST PROCEDURE

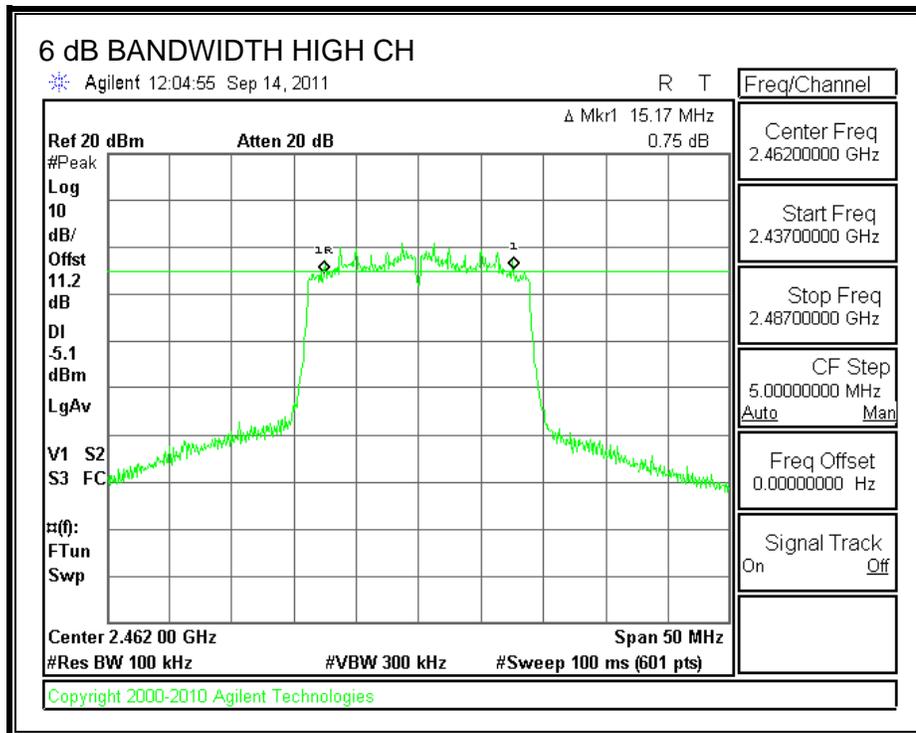
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.17	0.5
Middle	2437	15.17	0.5
High	2462	15.17	0.5

6 dB BANDWIDTH





7.3.2. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

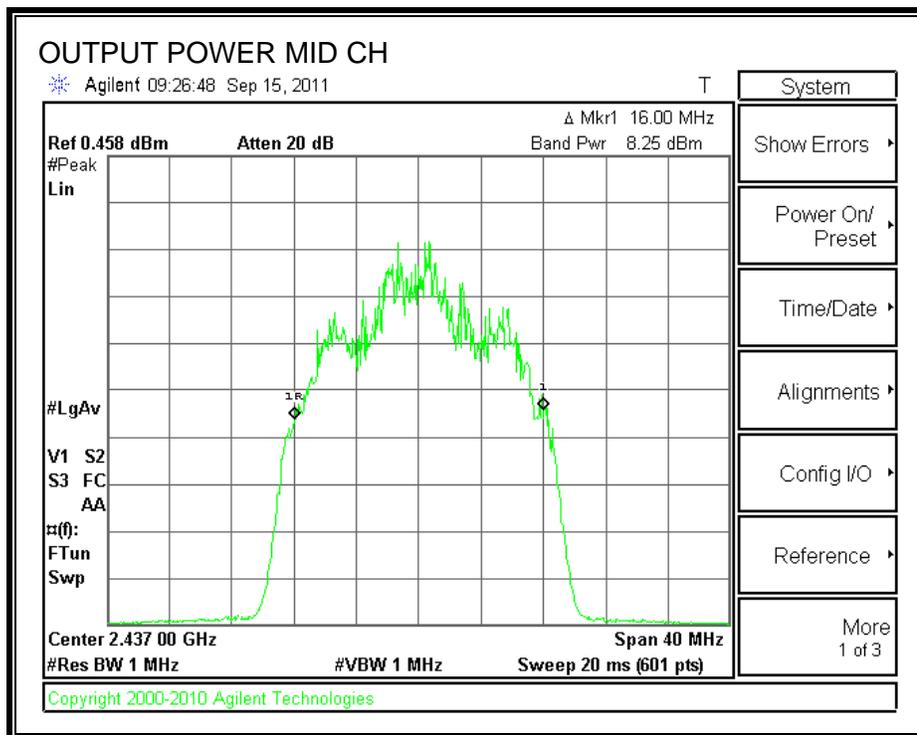
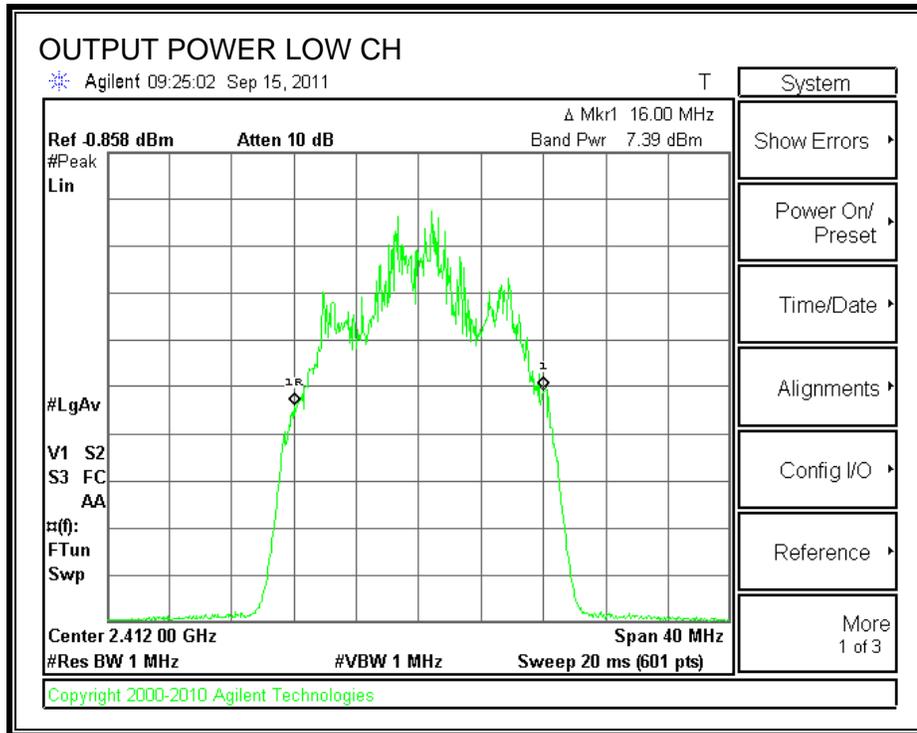
TEST PROCEDURE

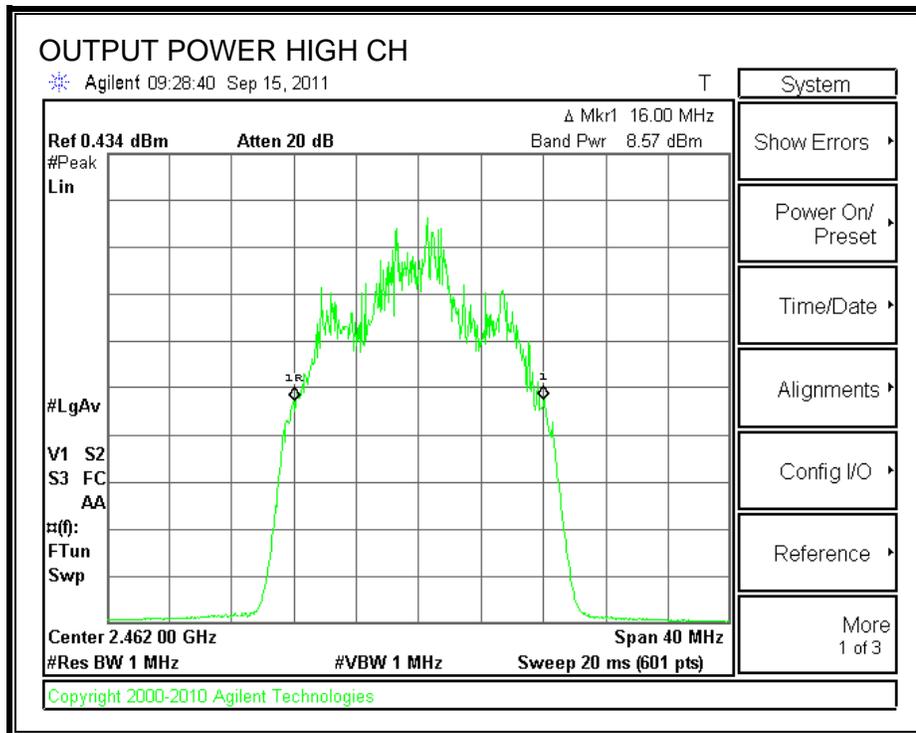
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	7.39	11.2	18.59	30	-11.41
Middle	2437	8.25	11.2	19.45	30	-10.55
High	2462	8.57	11.2	19.77	30	-10.23

OUTPUT POWER





7.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.2 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)	Power (dBm)
Low	2412	9.30
Middle	2437	10.00
High	2462	10.40

7.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

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.

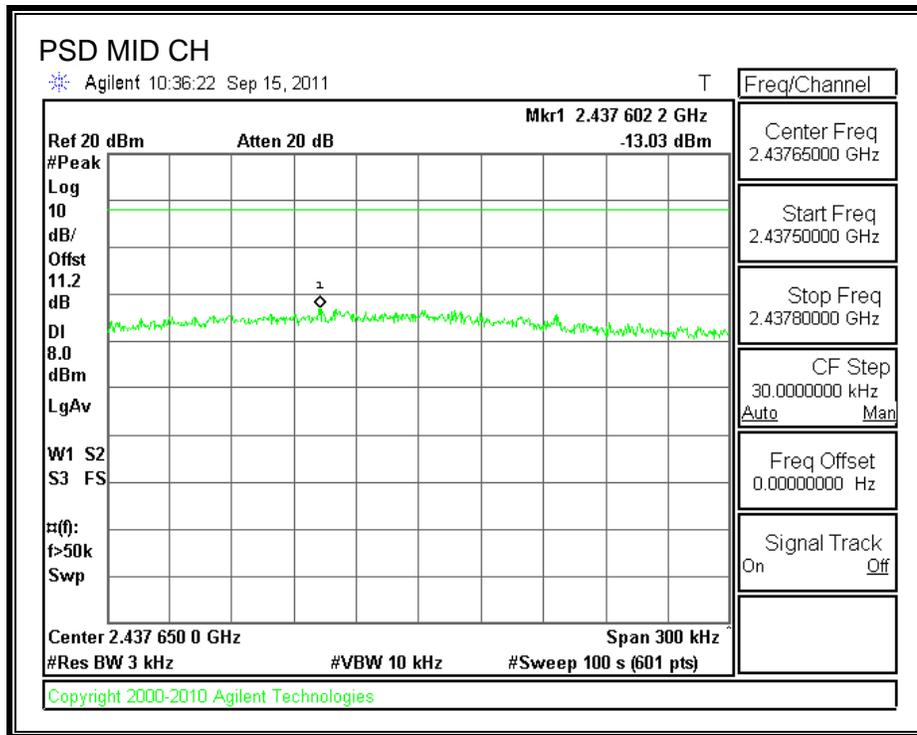
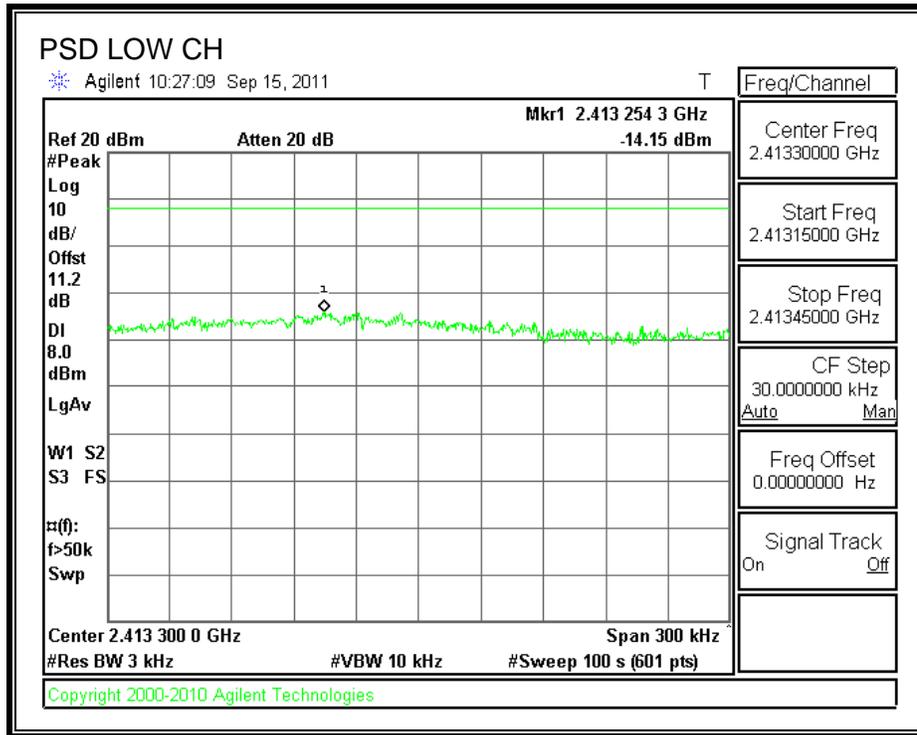
TEST PROCEDURE

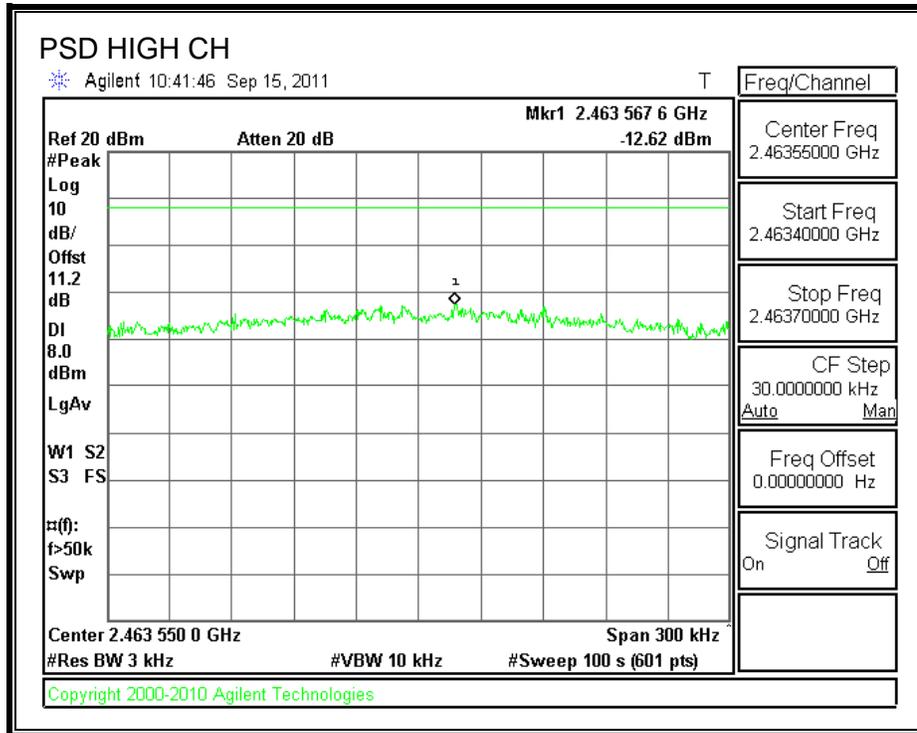
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-14.15	8	-22.15
Middle	2437	-13.03	8	-21.03
High	2462	-12.62	8	-20.62

POWER SPECTRAL DENSITY





7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

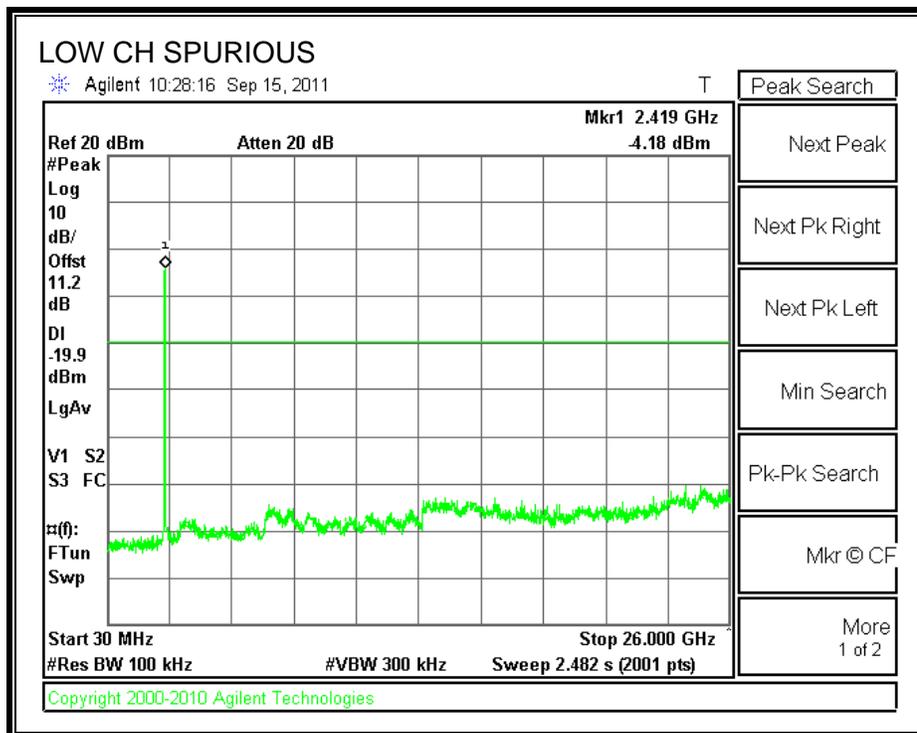
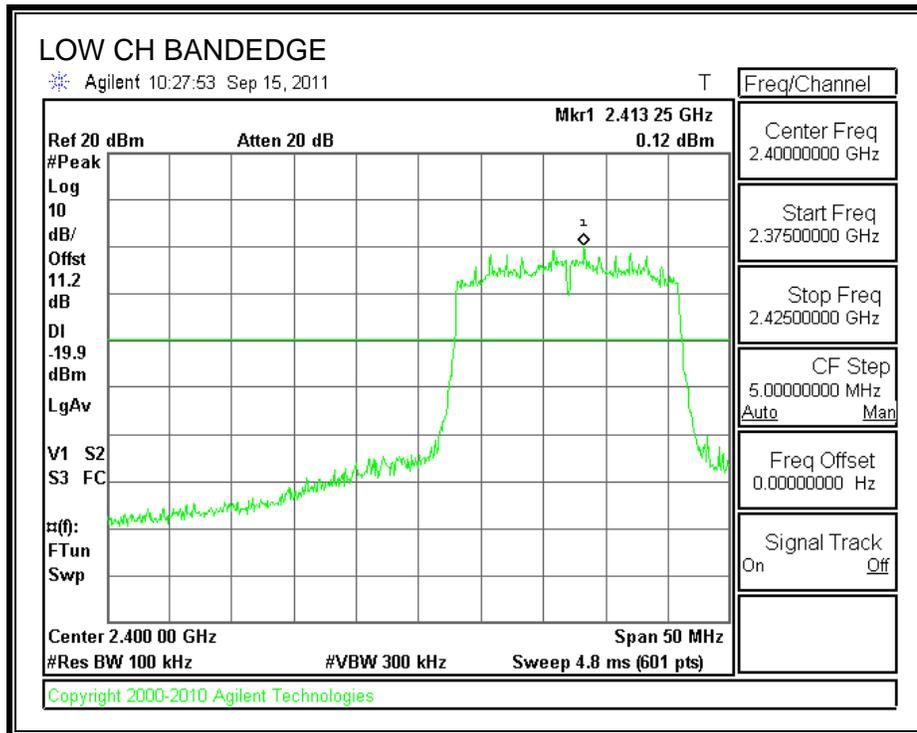
TEST PROCEDURE

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

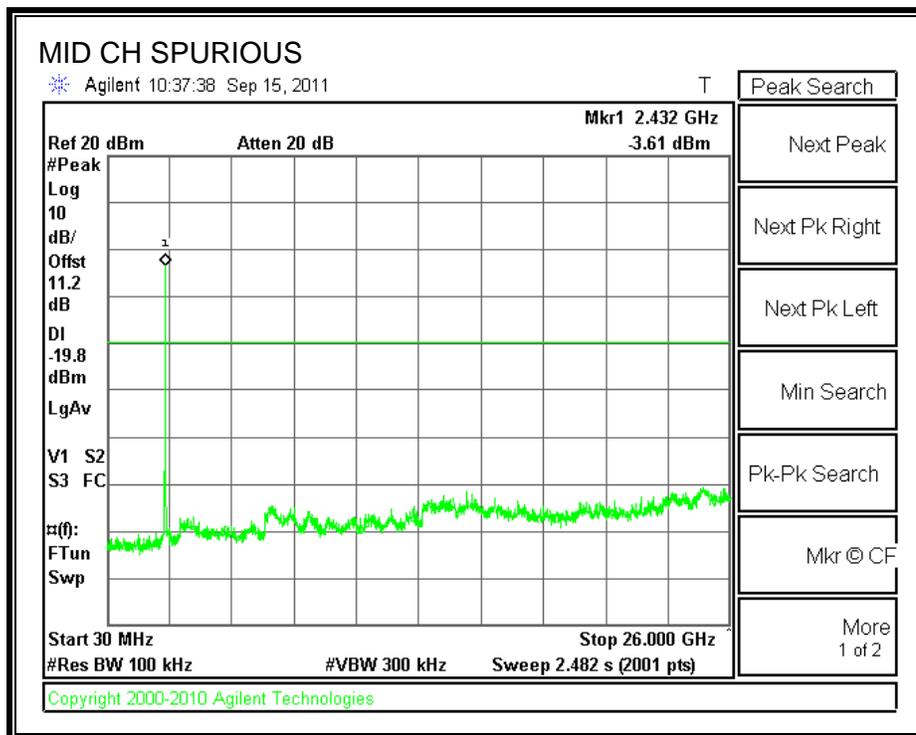
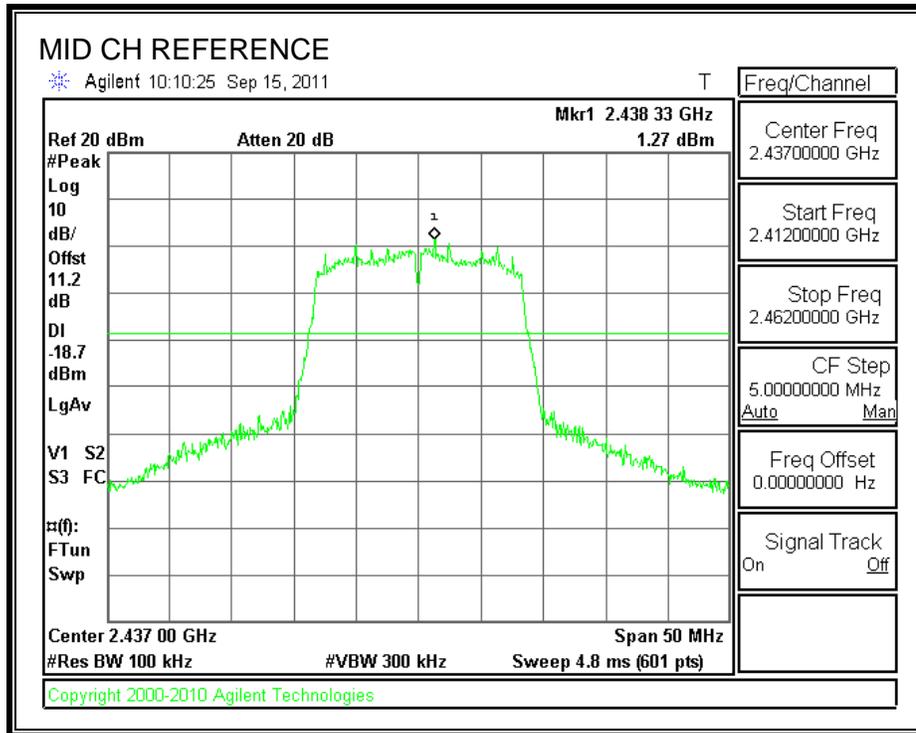
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

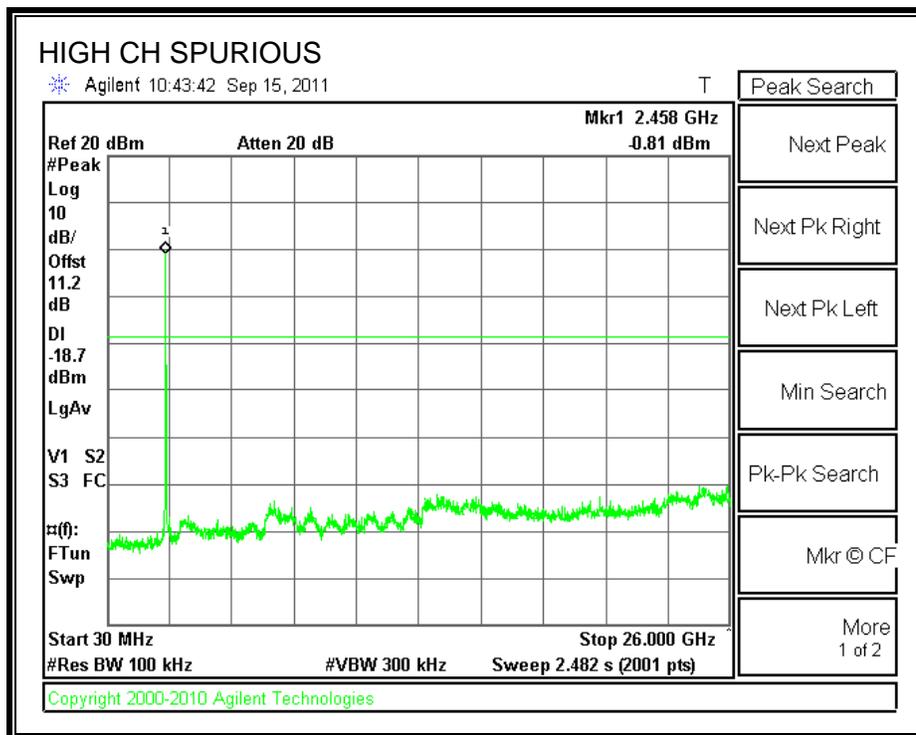
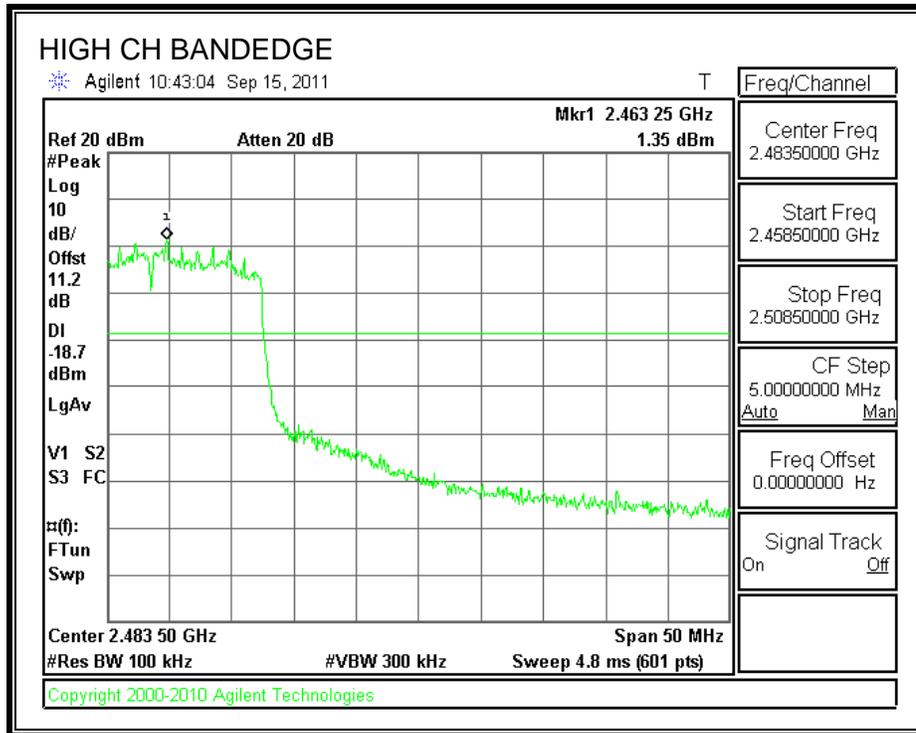
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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, the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

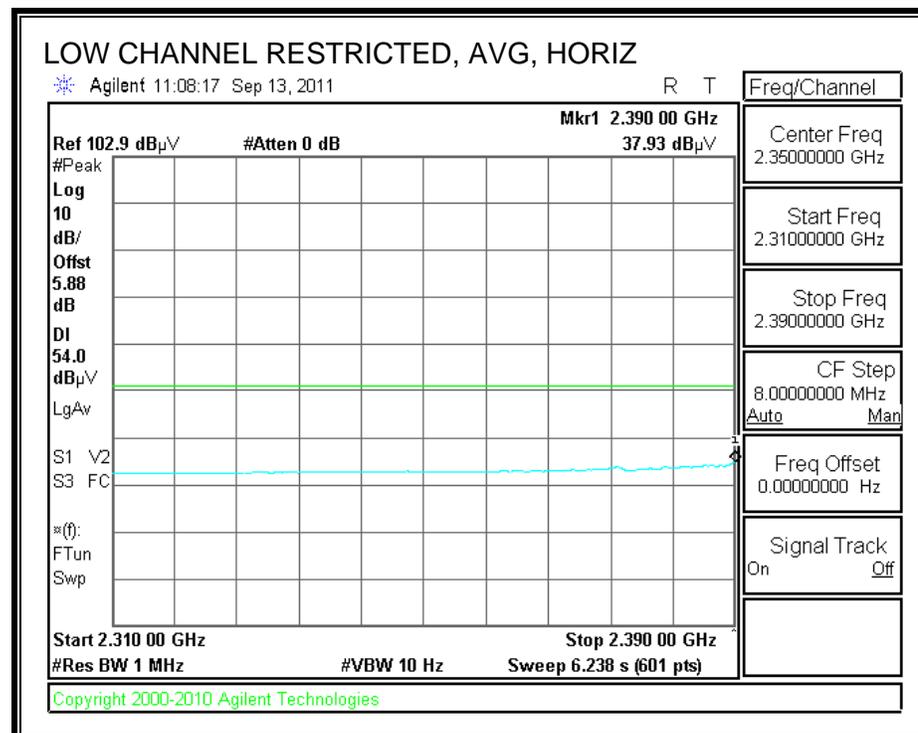
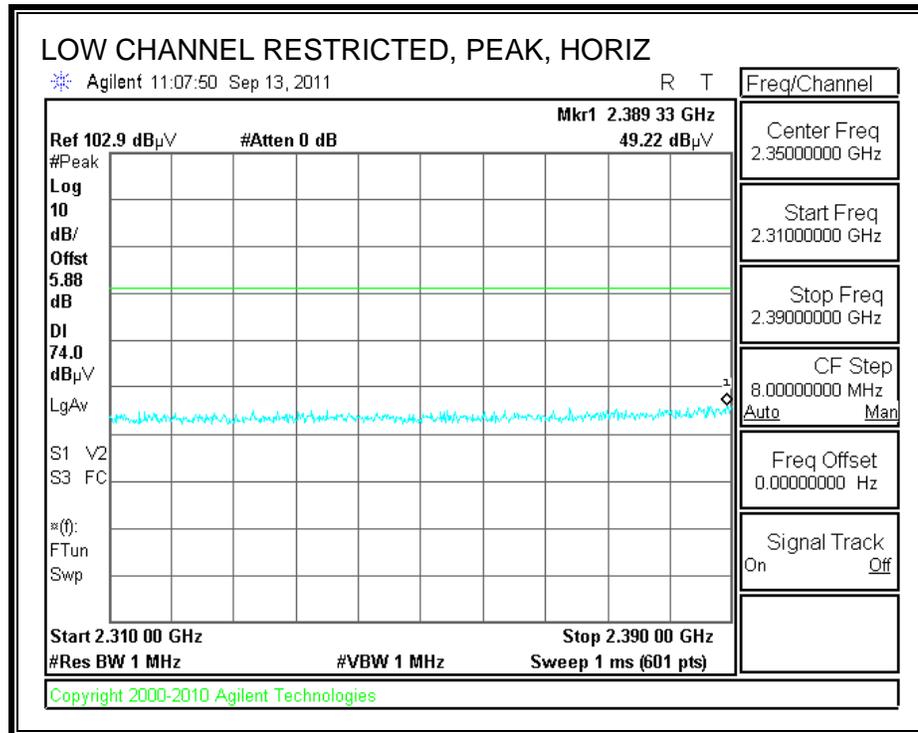
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The 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.

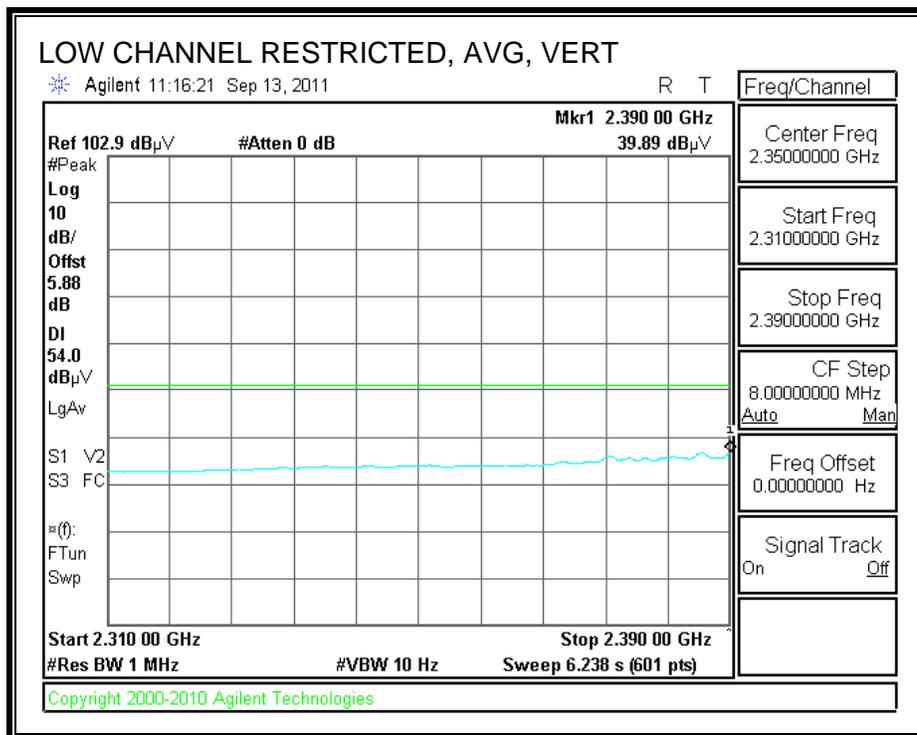
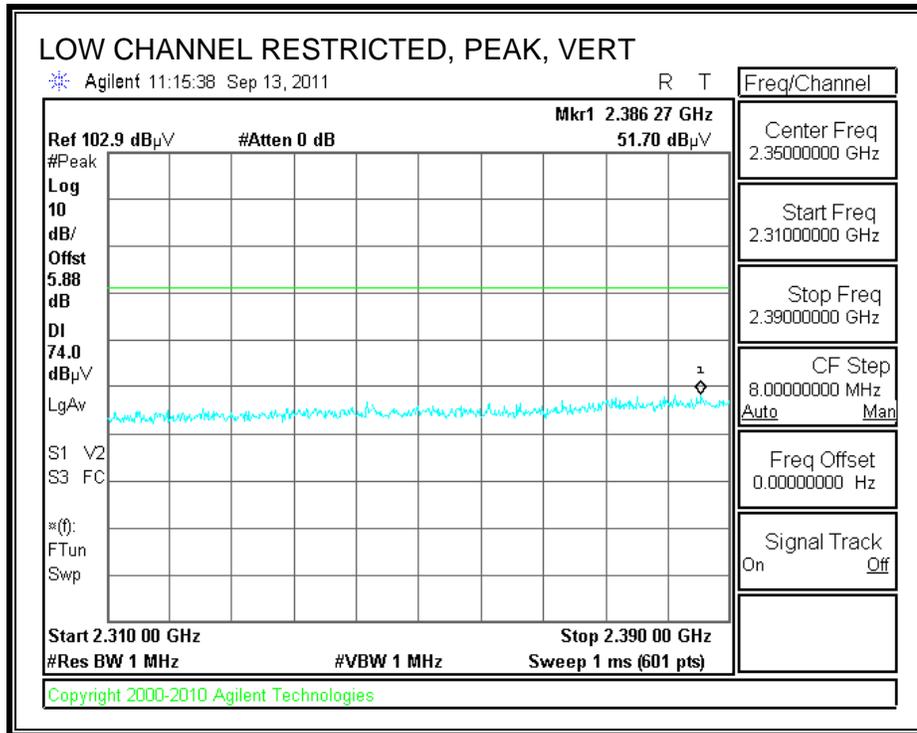
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. 802.11b MODE IN THE 2.4 GHz BAND

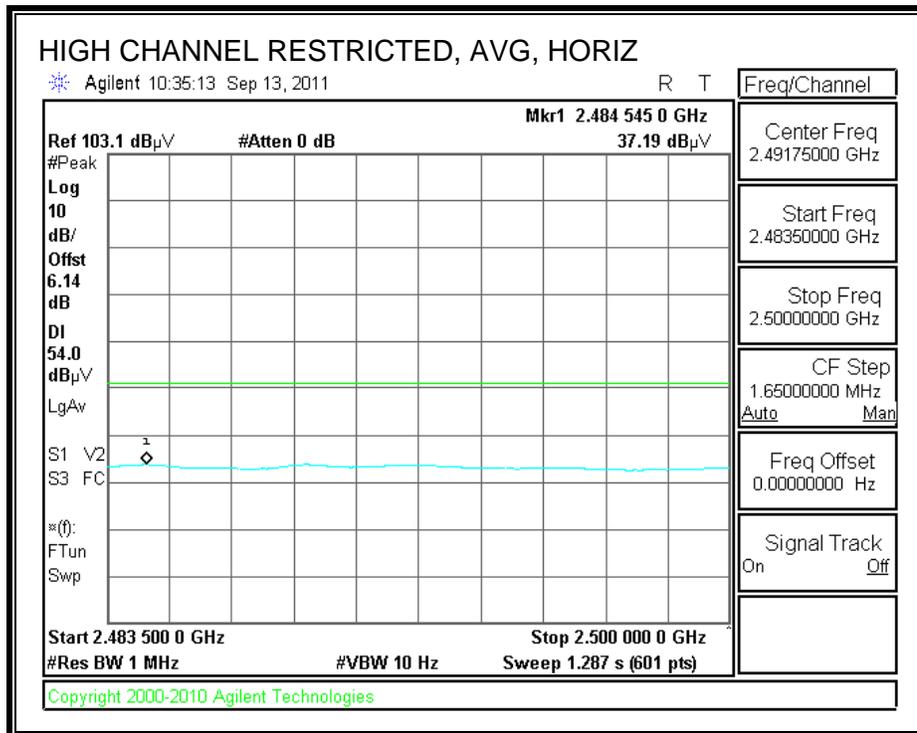
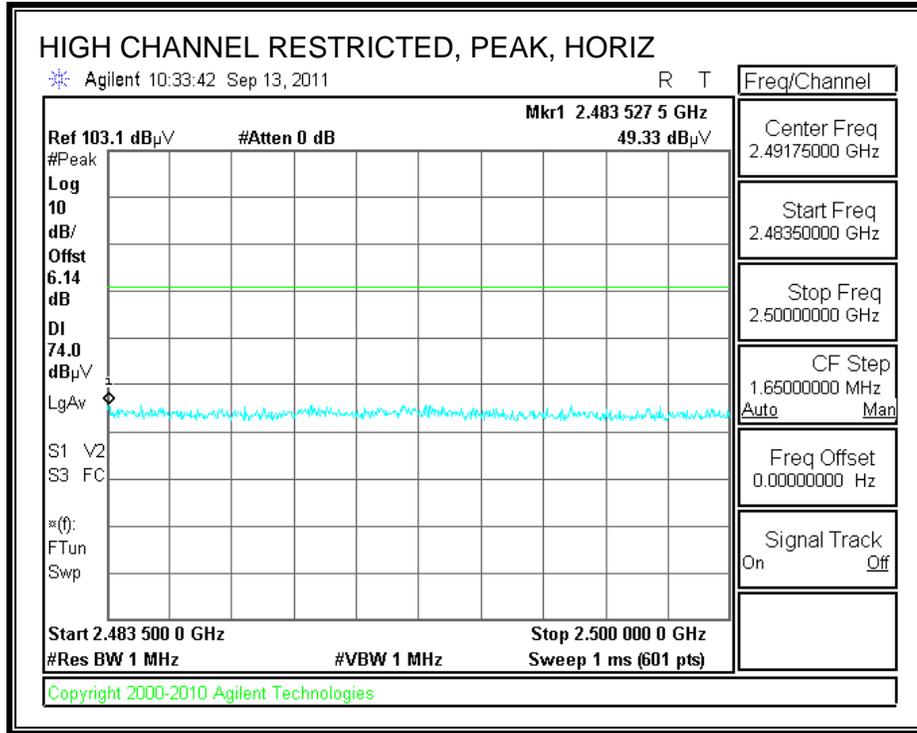
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



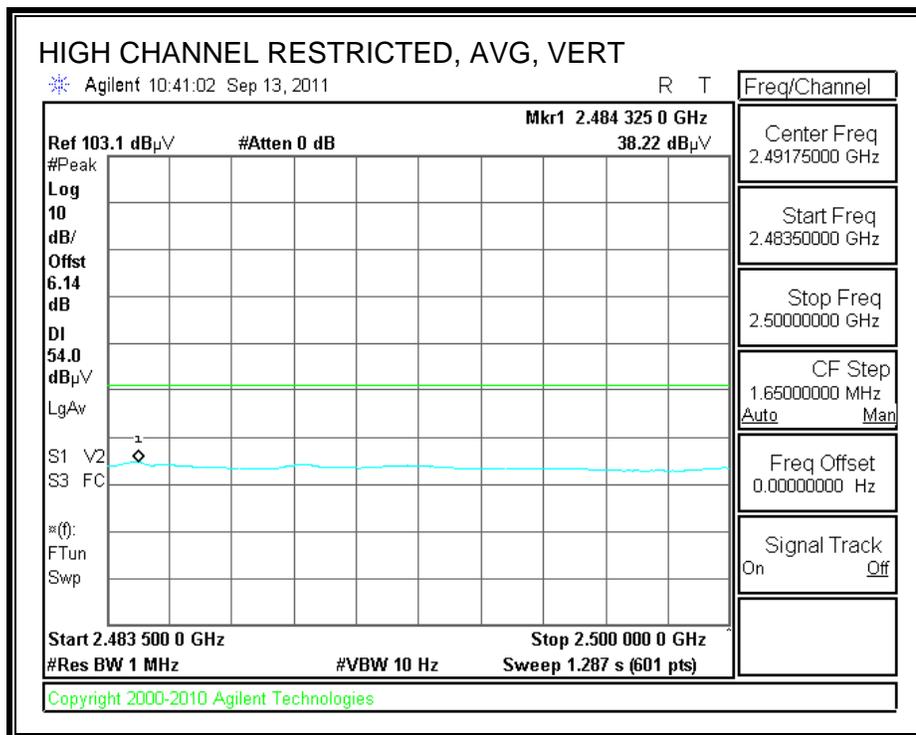
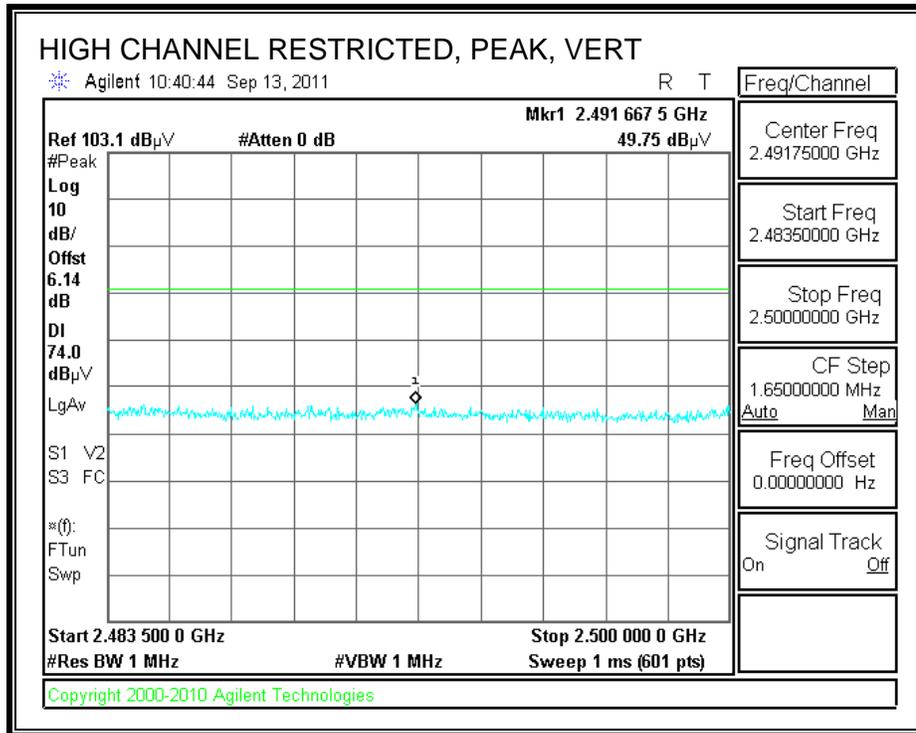
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

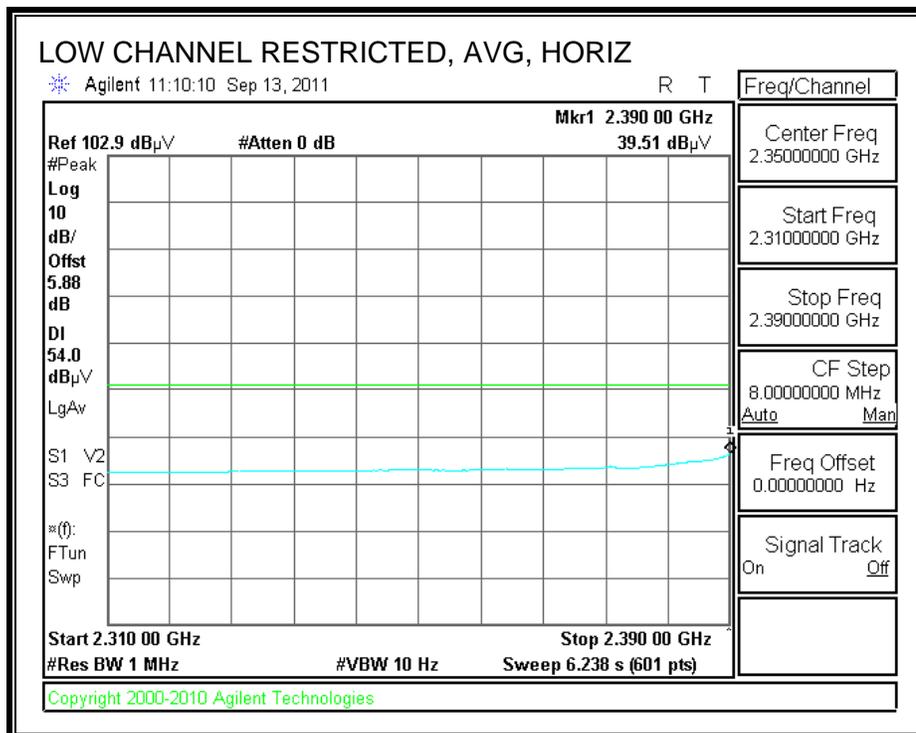
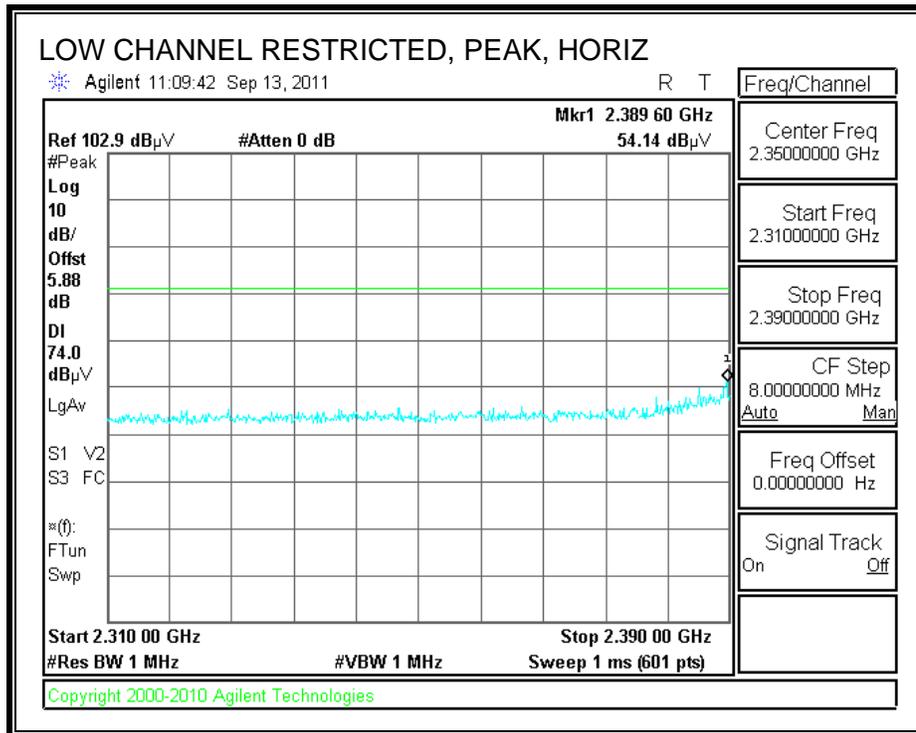


HARMONICS AND SPURIOUS EMISSIONS

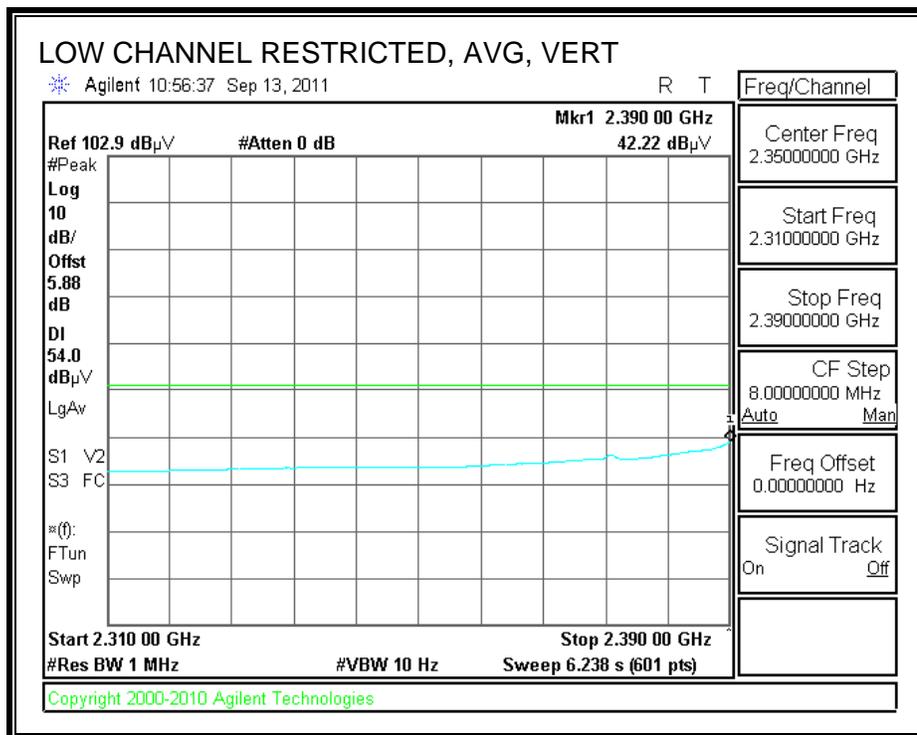
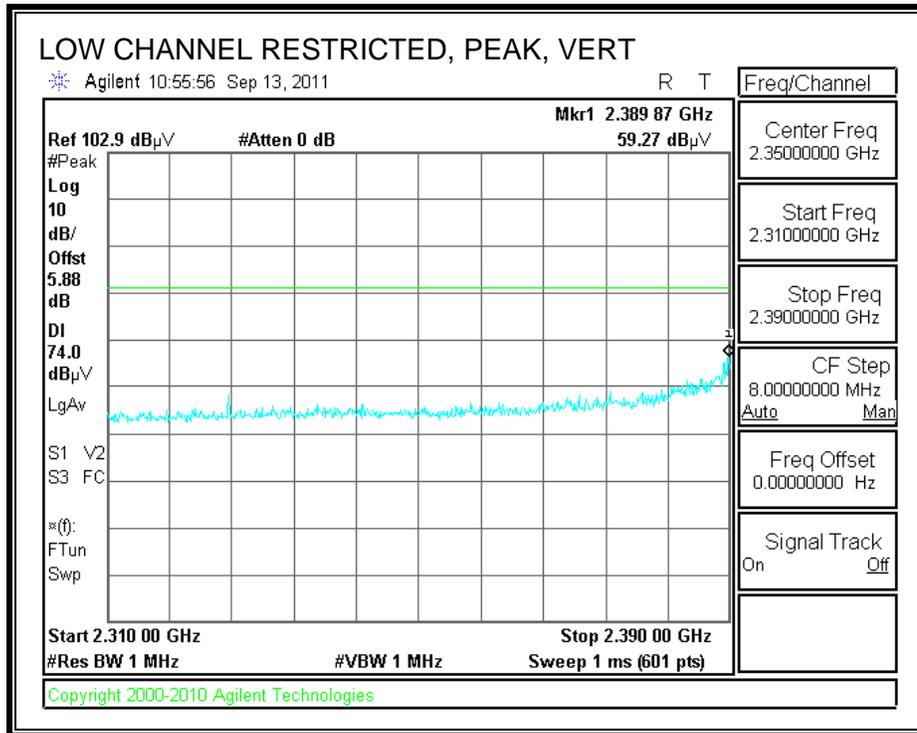
High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		David Garcia											
Date:		09/13/11											
Project #:		11U13993											
Company:		LG											
Test Target:		FCC 15.247											
Mode Oper:		TX, 11b											
f	Measurement 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. dB	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 2412 MHz													
4.824	3.0	38.5	34.6	6.2	-35.5	0.0	0.0	43.8	74.0	-30.2	H	P	
4.824	3.0	28.3	34.6	6.2	-35.5	0.0	0.0	33.7	54.0	-20.3	H	A	
7.236	3.0	40.7	36.1	8.4	-35.4	0.0	0.0	49.7	74.0	-24.3	H	P	
7.236	3.0	31.7	36.1	8.4	-35.4	0.0	0.0	40.8	54.0	-13.2	H	A	
9.648	3.0	36.7	38.5	9.0	-35.8	0.0	0.0	48.3	74.0	-25.7	H	P	
9.648	3.0	24.4	38.5	9.0	-35.8	0.0	0.0	36.0	54.0	-18.0	H	A	
4.824	3.0	39.2	34.6	6.2	-35.5	0.0	0.0	44.5	74.0	-29.5	V	P	
4.824	3.0	30.2	34.6	6.2	-35.5	0.0	0.0	35.5	54.0	-18.5	V	A	
7.236	3.0	38.3	36.1	8.4	-35.4	0.0	0.0	47.3	74.0	-26.7	V	P	
7.236	3.0	28.8	36.1	8.4	-35.4	0.0	0.0	37.8	54.0	-16.2	V	A	
9.648	3.0	36.4	38.5	9.0	-35.8	0.0	0.0	48.1	74.0	-25.9	V	P	
9.648	3.0	24.3	38.5	9.0	-35.8	0.0	0.0	36.0	54.0	-18.0	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	37.7	34.7	6.2	-35.5	0.0	0.0	43.1	74.0	-30.9	H	P	
4.874	3.0	25.5	34.7	6.2	-35.5	0.0	0.0	30.9	54.0	-23.1	H	A	
7.311	3.0	40.9	36.2	8.4	-35.4	0.0	0.0	50.0	74.0	-24.0	H	P	
7.311	3.0	33.6	36.2	8.4	-35.4	0.0	0.0	42.7	54.0	-11.3	H	A	
9.748	3.0	36.3	38.5	9.0	-35.8	0.0	0.0	48.0	74.0	-26.0	H	P	
9.748	3.0	24.3	38.5	9.0	-35.8	0.0	0.0	36.0	54.0	-18.0	H	A	
4.874	3.0	39.9	34.7	6.2	-35.5	0.0	0.0	45.4	74.0	-28.6	V	P	
4.874	3.0	30.3	34.7	6.2	-35.5	0.0	0.0	35.8	54.0	-18.2	V	A	
7.311	3.0	38.8	36.2	8.4	-35.4	0.0	0.0	48.0	74.0	-26.0	V	P	
7.311	3.0	26.0	36.2	8.4	-35.4	0.0	0.0	35.1	54.0	-18.9	V	A	
9.748	3.0	36.0	38.5	9.0	-35.8	0.0	0.0	47.7	74.0	-26.3	V	P	
9.748	3.0	24.3	38.5	9.0	-35.8	0.0	0.0	36.0	54.0	-18.0	V	A	
High Channel: 2462 MHz													
4.924	3.0	38.4	34.8	6.3	-35.5	0.0	0.0	43.9	74.0	-30.1	H	P	
4.924	3.0	26.0	34.8	6.3	-35.5	0.0	0.0	31.6	54.0	-22.4	H	A	
7.386	3.0	40.2	36.3	8.4	-35.5	0.0	0.0	49.5	74.0	-24.5	H	P	
7.386	3.0	31.8	36.3	8.4	-35.5	0.0	0.0	41.1	54.0	-12.9	H	A	
9.848	3.0	36.9	38.5	9.0	-35.8	0.0	0.0	48.6	74.0	-25.4	H	P	
9.848	3.0	24.4	38.5	9.0	-35.8	0.0	0.0	36.1	54.0	-17.9	H	A	
4.924	3.0	38.8	34.8	6.3	-35.5	0.0	0.0	44.3	74.0	-29.7	V	P	
4.924	3.0	26.6	34.8	6.3	-35.5	0.0	0.0	32.2	54.0	-21.8	V	A	
7.386	3.0	38.0	36.3	8.4	-35.5	0.0	0.0	47.2	74.0	-26.8	V	P	
7.386	3.0	25.7	36.3	8.4	-35.5	0.0	0.0	35.0	54.0	-19.0	V	A	
9.848	3.0	36.4	38.5	9.0	-35.8	0.0	0.0	48.1	74.0	-25.9	V	P	
9.848	3.0	24.4	38.5	9.0	-35.8	0.0	0.0	36.1	54.0	-17.9	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.2.2. 802.11g MODE IN THE 2.4 GHz BAND

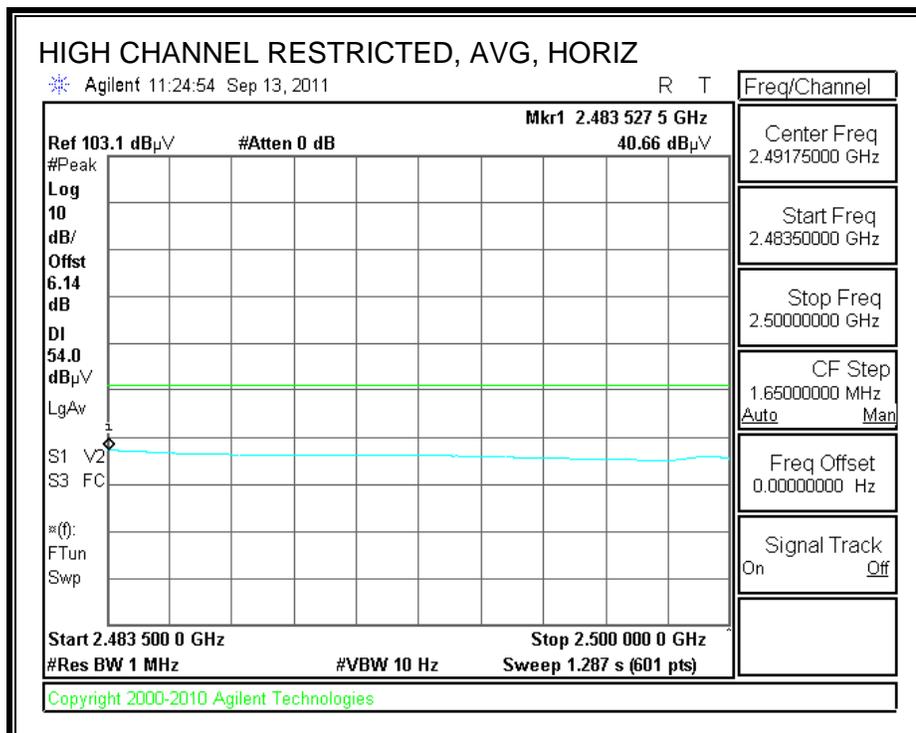
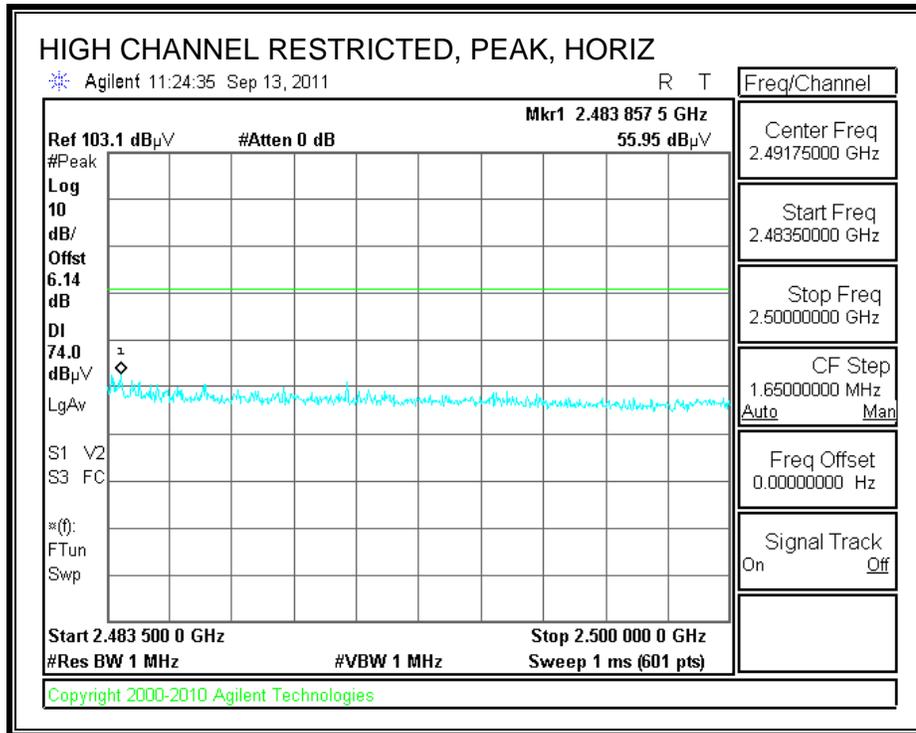
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



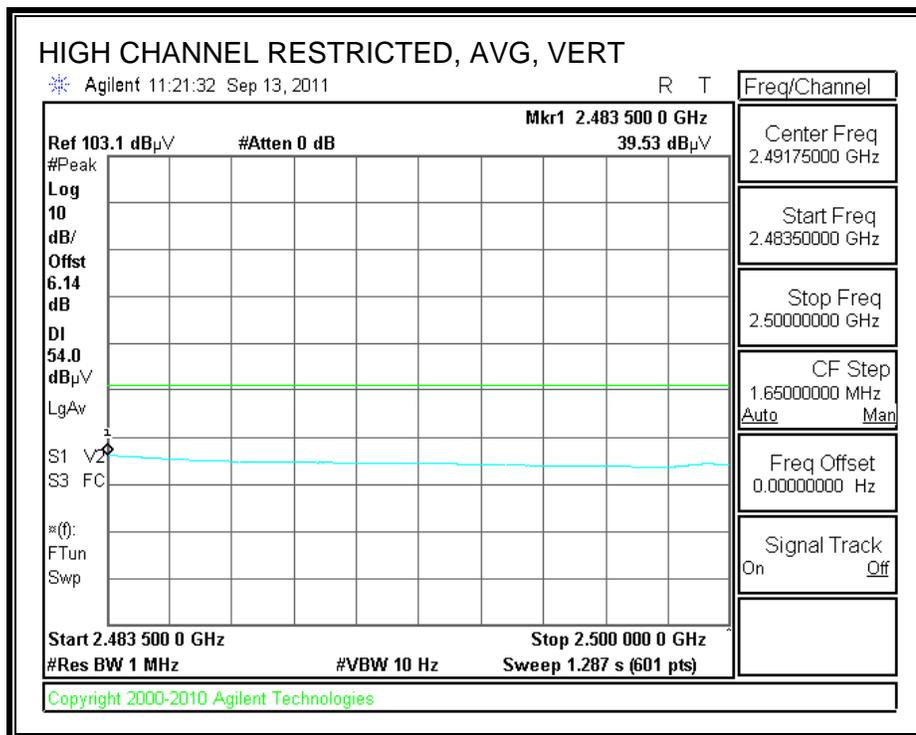
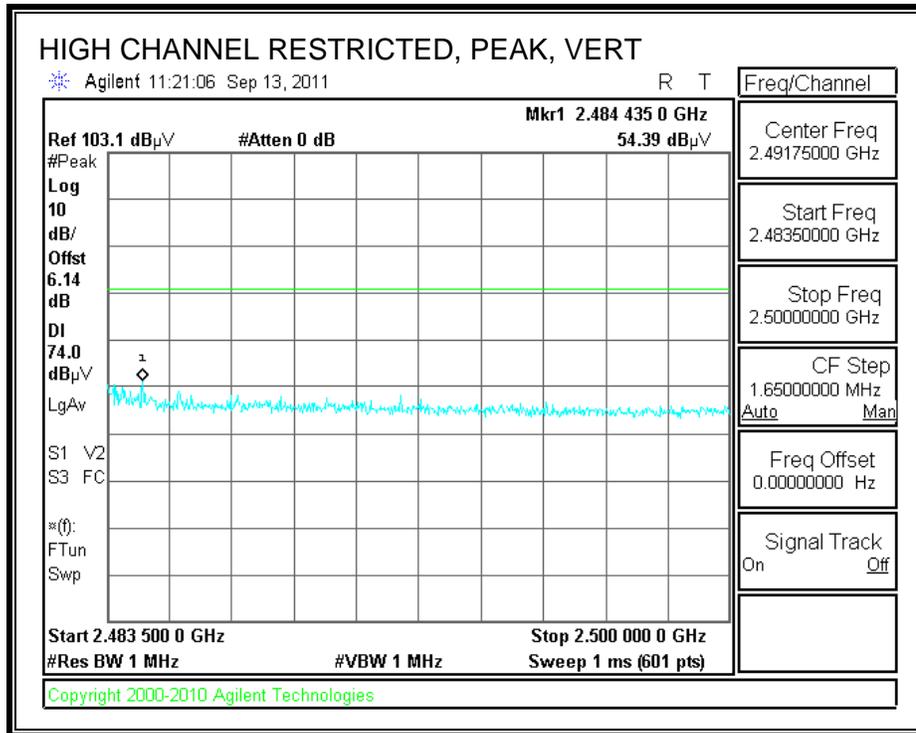
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

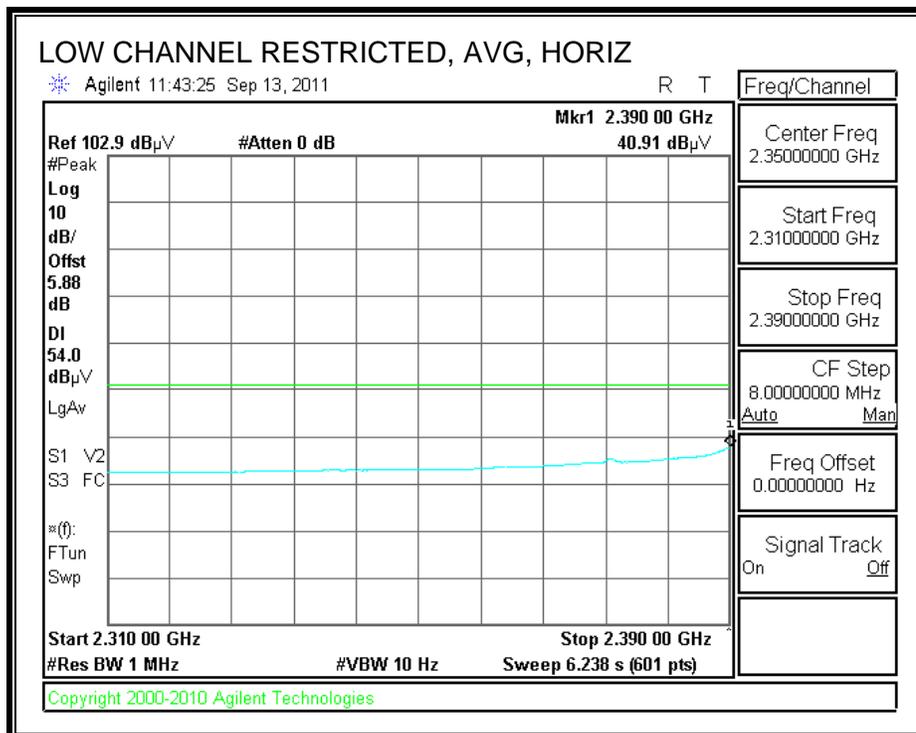
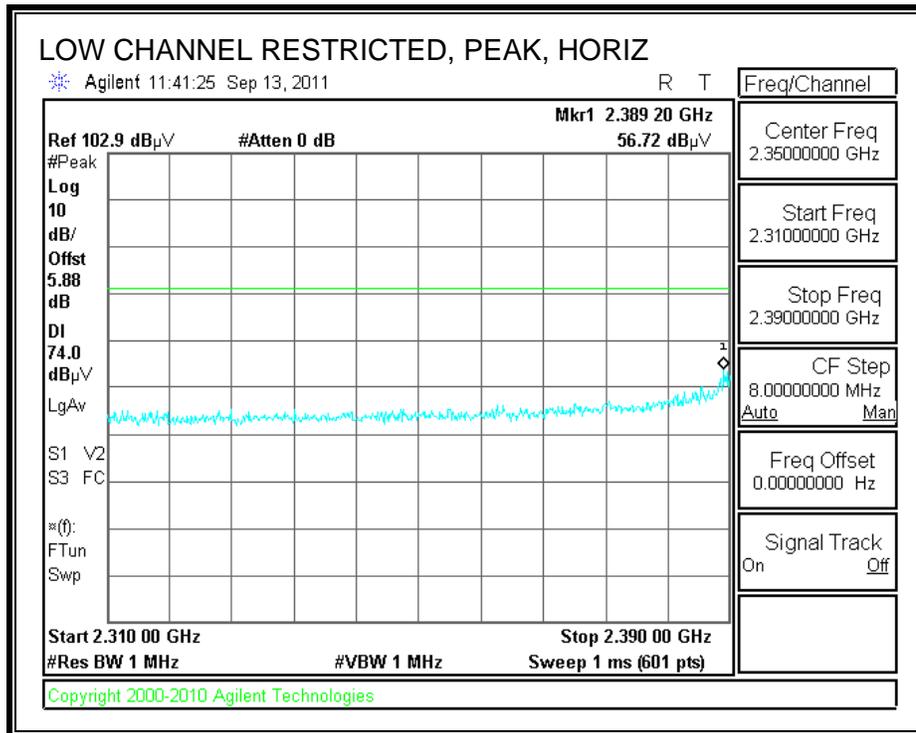


HARMONICS AND SPURIOUS EMISSIONS

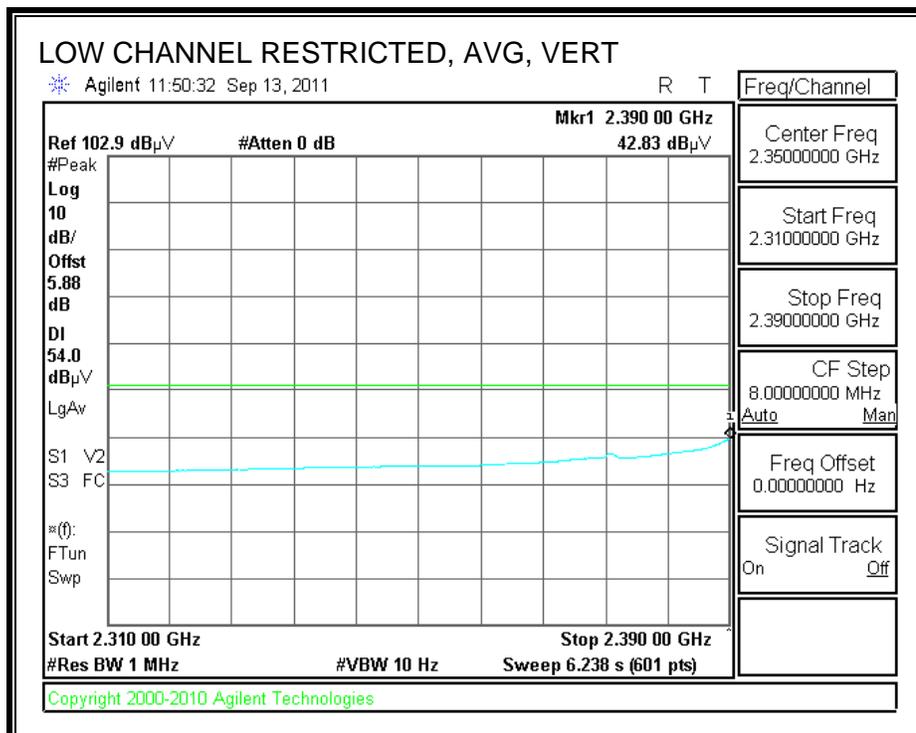
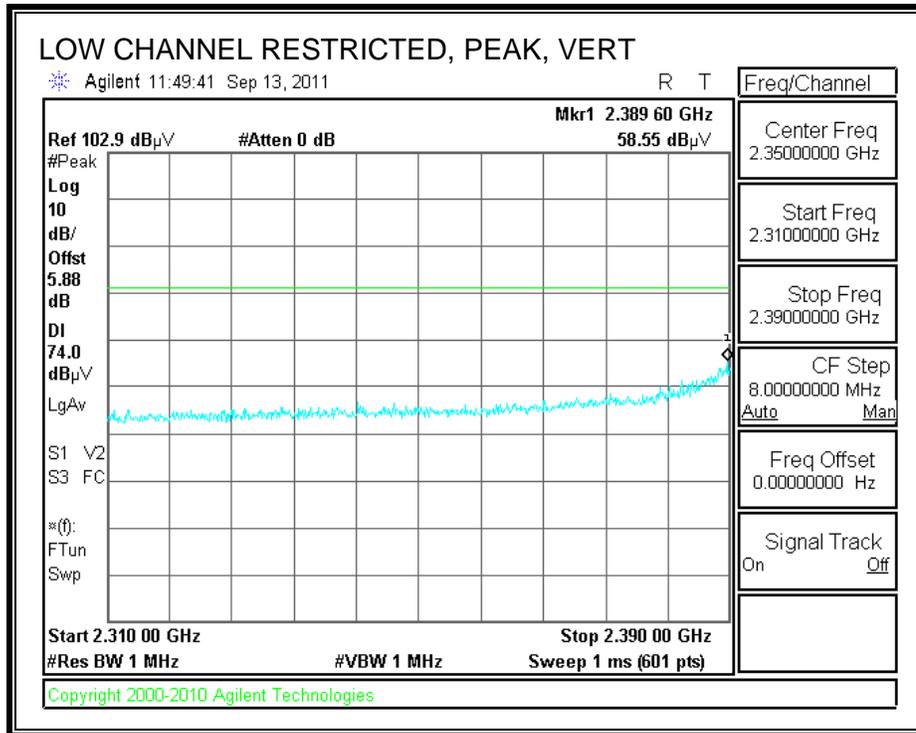
High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		David Garcia											
Date:		09/13/11											
Project #:		11U13993											
Company:		LG											
Test Target:		FCC 15.247											
Mode Oper:		TX, 11g											
f	Measurement 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	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low Channel: 2412 MHz													
4.824	3.0	38.3	34.6	6.2	-35.5	0.0	0.0	43.6	74.0	-30.4	H	P	
4.824	3.0	26.0	34.6	6.2	-35.5	0.0	0.0	31.3	54.0	-22.7	H	A	
7.236	3.0	41.5	36.1	8.4	-35.4	0.0	0.0	50.6	74.0	-23.4	H	P	
7.236	3.0	28.5	36.1	8.4	-35.4	0.0	0.0	37.6	54.0	-16.4	H	A	
9.648	3.0	36.7	38.5	9.0	-35.8	0.0	0.0	48.3	74.0	-25.7	H	P	
9.648	3.0	24.2	38.5	9.0	-35.8	0.0	0.0	35.9	54.0	-18.1	H	A	
4.824	3.0	38.7	34.6	6.2	-35.5	0.0	0.0	44.1	74.0	-29.9	V	P	
4.824	3.0	26.0	34.6	6.2	-35.5	0.0	0.0	31.3	54.0	-22.7	V	A	
7.236	3.0	37.8	36.1	8.4	-35.4	0.0	0.0	46.8	74.0	-27.2	V	P	
7.236	3.0	25.0	36.1	8.4	-35.4	0.0	0.0	34.0	54.0	-20.0	V	A	
9.648	3.0	36.7	38.5	9.0	-35.8	0.0	0.0	48.4	74.0	-25.6	V	P	
9.648	3.0	24.2	38.5	9.0	-35.8	0.0	0.0	35.9	54.0	-18.1	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	37.8	34.7	6.2	-35.5	0.0	0.0	43.3	74.0	-30.8	H	P	
4.874	3.0	25.5	34.7	6.2	-35.5	0.0	0.0	30.9	54.0	-23.1	H	A	
7.311	3.0	40.1	36.2	8.4	-35.4	0.0	0.0	49.2	74.0	-24.8	H	P	
7.311	3.0	26.6	36.2	8.4	-35.4	0.0	0.0	35.8	54.0	-18.2	H	A	
9.748	3.0	36.6	38.5	9.0	-35.8	0.0	0.0	48.2	74.0	-25.8	H	P	
9.748	3.0	24.3	38.5	9.0	-35.8	0.0	0.0	36.0	54.0	-18.0	H	A	
4.874	3.0	37.9	34.7	6.2	-35.5	0.0	0.0	43.3	74.0	-30.7	V	P	
4.874	3.0	25.5	34.7	6.2	-35.5	0.0	0.0	30.9	54.0	-23.1	V	A	
7.311	3.0	37.9	36.2	8.4	-35.4	0.0	0.0	47.0	74.0	-27.0	V	P	
7.311	3.0	25.3	36.2	8.4	-35.4	0.0	0.0	34.4	54.0	-19.6	V	A	
9.748	3.0	36.5	38.5	9.0	-35.8	0.0	0.0	48.1	74.0	-25.9	V	P	
9.748	3.0	24.3	38.5	9.0	-35.8	0.0	0.0	35.9	54.0	-18.1	V	A	
High Channel: 2462 MHz													
4.924	3.0	38.3	34.8	6.3	-35.5	0.0	0.0	43.8	74.0	-30.2	H	P	
4.924	3.0	26.0	34.8	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	H	A	
7.386	3.0	40.1	36.3	8.4	-35.5	0.0	0.0	49.4	74.0	-24.6	H	P	
7.386	3.0	27.2	36.3	8.4	-35.5	0.0	0.0	36.5	54.0	-17.5	H	A	
9.848	3.0	36.4	38.5	9.0	-35.8	0.0	0.0	48.1	74.0	-25.9	H	P	
4.924	3.0	38.6	34.8	6.3	-35.5	0.0	0.0	44.2	74.0	-29.8	V	P	
4.924	3.0	25.9	34.8	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	V	A	
7.386	3.0	37.3	36.3	8.4	-35.5	0.0	0.0	46.6	74.0	-27.4	V	P	
7.386	3.0	25.2	36.3	8.4	-35.5	0.0	0.0	34.5	54.0	-19.5	V	A	
9.848	3.0	36.6	38.5	9.0	-35.8	0.0	0.0	48.3	74.0	-25.7	V	P	
9.848	3.0	24.4	38.5	9.0	-35.8	0.0	0.0	36.1	54.0	-17.9	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.2.3. 802.11n HT20 SISO MODE IN THE 2.4 GHz BAND

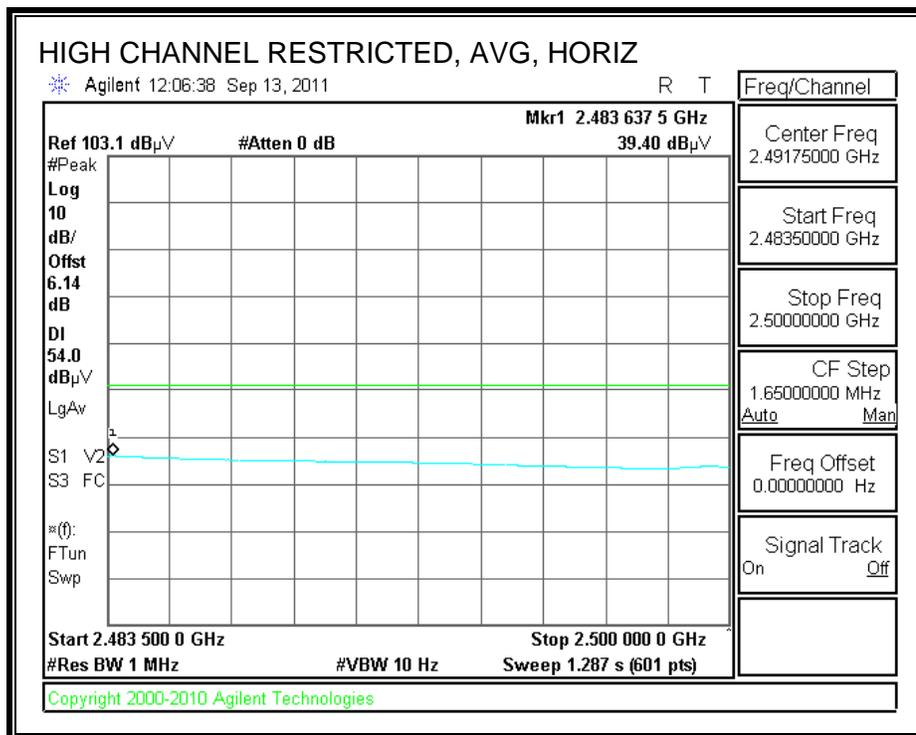
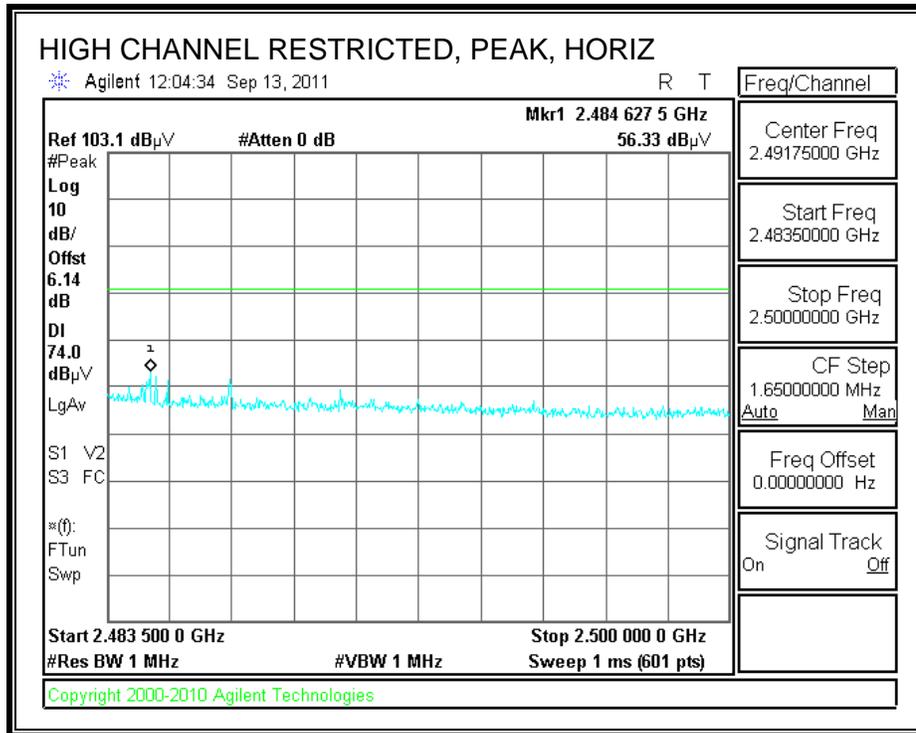
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



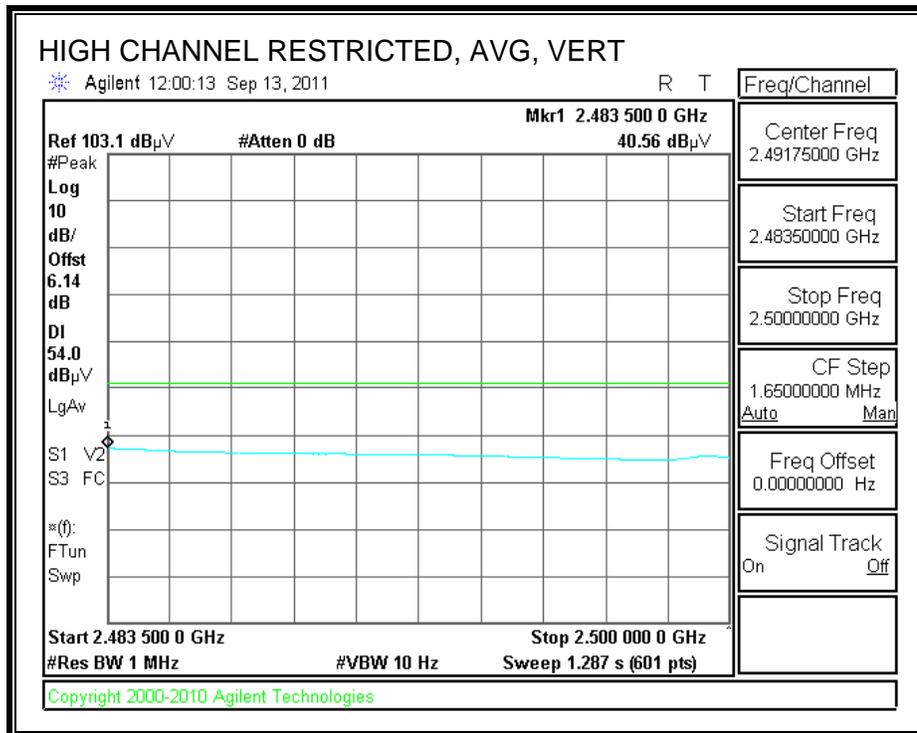
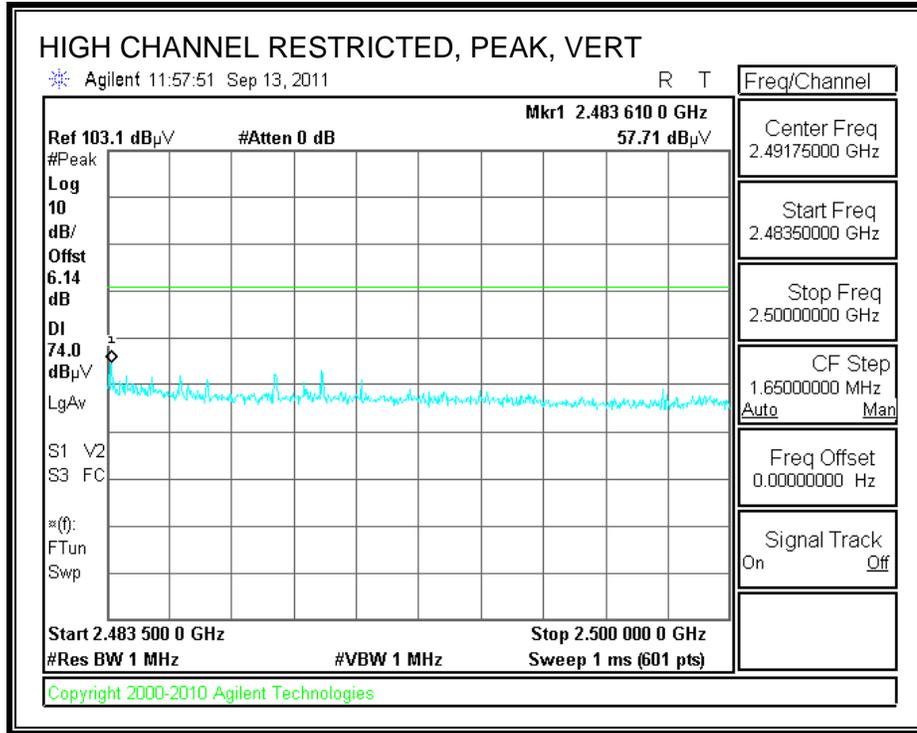
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

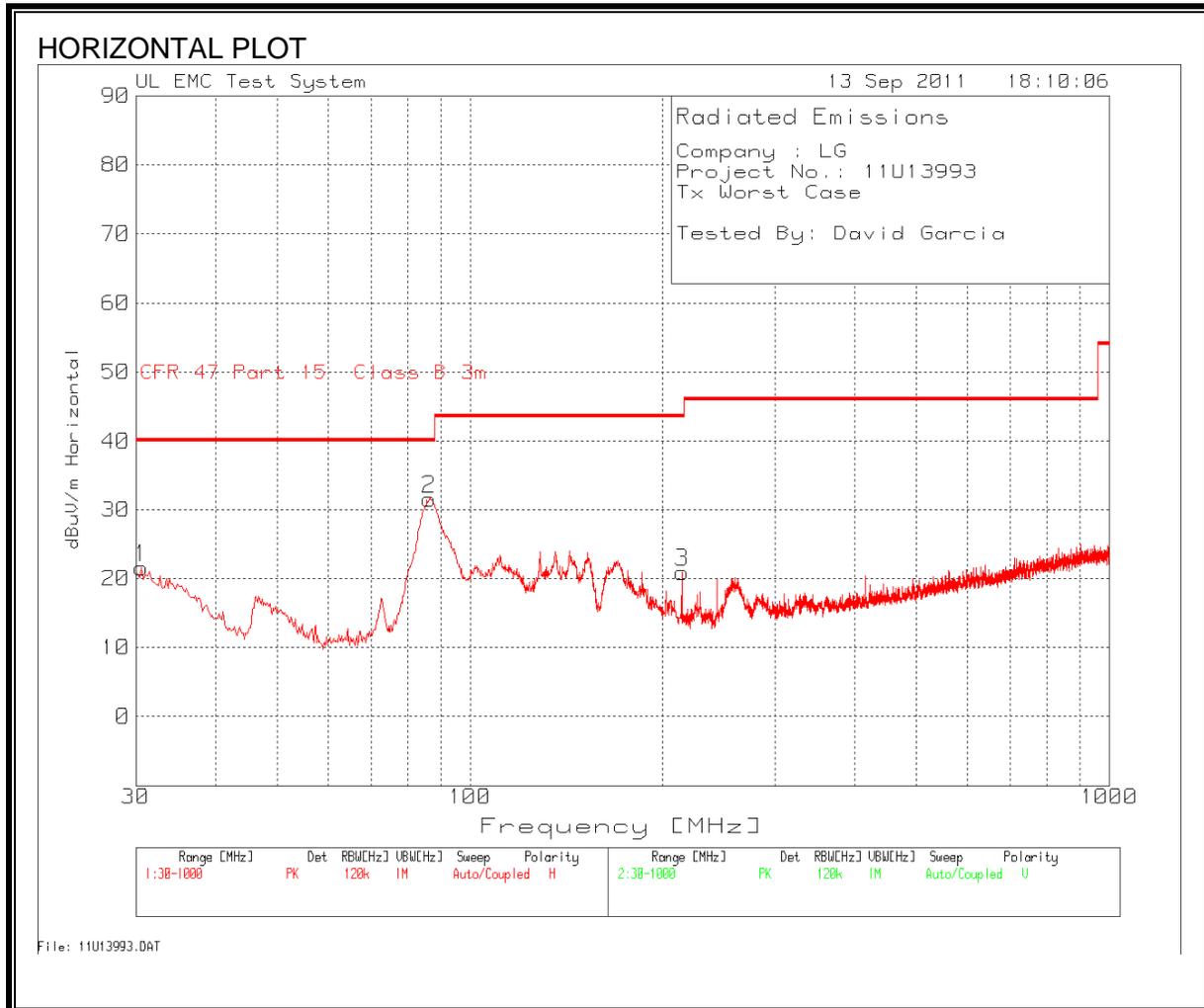


HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		David Garcia											
Date:		09/13/11											
Project #:		11U13993											
Company:		LG											
Test Target:		FCC 15.247											
Mode Oper:		TX, 11n											
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	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low Channel: 2412 MHz													
4.824	3.0	38.9	34.6	6.2	-35.5	0.0	0.0	44.2	74.0	-29.8	H	P	
4.824	3.0	26.0	34.6	6.2	-35.5	0.0	0.0	31.3	54.0	-22.7	H	A	
7.236	3.0	38.7	36.1	8.4	-35.4	0.0	0.0	47.8	74.0	-26.2	H	P	
7.236	3.0	26.4	36.1	8.4	-35.4	0.0	0.0	35.4	54.0	-18.6	H	A	
4.824	3.0	38.5	34.6	6.2	-35.5	0.0	0.0	43.8	74.0	-30.2	V	P	
4.824	3.0	25.9	34.6	6.2	-35.5	0.0	0.0	31.3	54.0	-22.7	V	A	
7.236	3.0	37.2	36.1	8.4	-35.4	0.0	0.0	46.3	74.0	-27.7	V	P	
7.236	3.0	25.0	36.1	8.4	-35.4	0.0	0.0	34.0	54.0	-20.0	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	38.3	34.7	6.2	-35.5	0.0	0.0	43.8	74.0	-30.2	H	P	
4.874	3.0	25.4	34.7	6.2	-35.5	0.0	0.0	30.9	54.0	-23.2	H	A	
7.311	3.0	38.5	36.2	8.4	-35.4	0.0	0.0	47.6	74.0	-26.4	H	P	
7.311	3.0	25.4	36.2	8.4	-35.4	0.0	0.0	34.5	54.0	-19.5	H	A	
4.874	3.0	37.5	34.7	6.2	-35.5	0.0	0.0	43.0	74.0	-31.0	V	P	
4.874	3.0	25.4	34.7	6.2	-35.5	0.0	0.0	30.8	54.0	-23.2	V	A	
7.311	3.0	37.0	36.2	8.4	-35.4	0.0	0.0	46.1	74.0	-27.9	V	P	
7.311	3.0	25.3	36.2	8.4	-35.4	0.0	0.0	34.5	54.0	-19.5	V	A	
High Channel: 2462 MHz													
4.924	3.0	39.1	34.8	6.3	-35.5	0.0	0.0	44.7	74.0	-29.3	H	P	
4.924	3.0	26.0	34.8	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	H	A	
7.386	3.0	39.0	36.3	8.4	-35.5	0.0	0.0	48.3	74.0	-25.7	H	P	
7.386	3.0	26.6	36.3	8.4	-35.5	0.0	0.0	35.9	54.0	-18.1	H	A	
4.924	3.0	38.3	34.8	6.3	-35.5	0.0	0.0	43.9	74.0	-30.1	V	P	
4.924	3.0	25.9	34.8	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	V	A	
7.386	3.0	37.8	36.3	8.4	-35.5	0.0	0.0	47.1	74.0	-26.9	V	P	
7.386	3.0	25.1	36.3	8.4	-35.5	0.0	0.0	34.4	54.0	-19.6	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

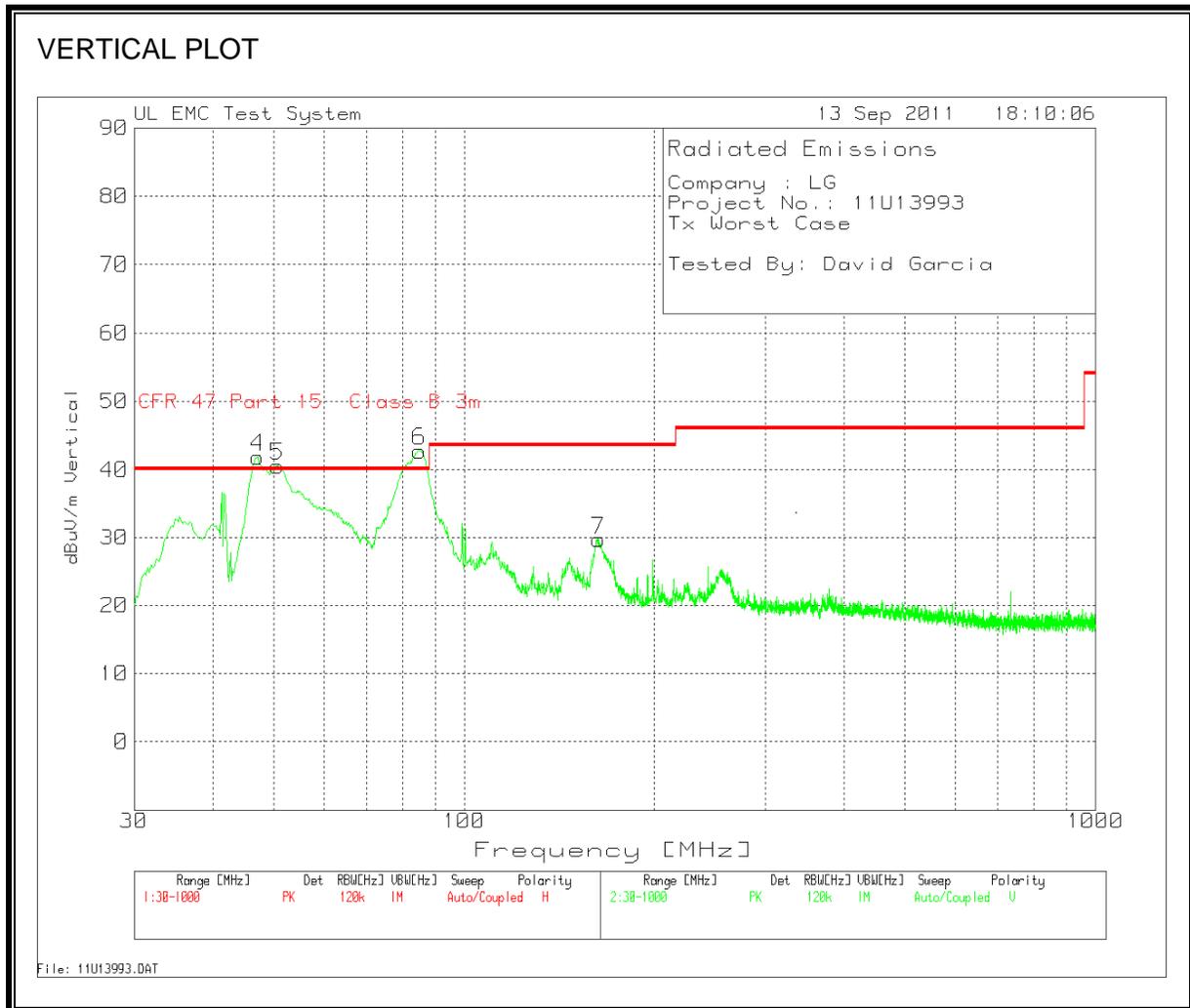
8.1. WORST-CASE BELOW 1 GHz

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



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

(See QP detector for passing margin in table below)



HORIZONTAL AND VERTICAL DATA

Company: LG Electronics Inc.							Tested By: David Garcia			
Project: 11U13993							Data: 09/13/2011			

30 - 1000MHz - HORIZONTAL

Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TXT [dB]	3m T15 PreAmp below 1GHz.TXT [dB]	3m Bilog T185 below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
30.5815	29.45	PK	0.6	-28.3	19.8	21.55	40.0	-18.45	100	Horz
86.4089	51.32	PK	1	-28.2	7.5	31.62	40.0	-8.38	200	Horz
214.5404	35.43	PK	1.6	-28.1	11.9	20.83	43.5	-22.67	100	Horz

30 - 1000MHz - VERTICAL

Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TXT [dB]	3m T15 PreAmp below 1GHz.TXT [dB]	3m Bilog T185 below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
47.0584	43.94	QP	0.8	-28.3	9.8	26.24	40.0	-13.76	0	Vert
50.5476	44.73	QP	0.8	-28.3	8.4	25.63	40.0	-14.37	10	Vert
84.86	48.36	QP	1.0	-28.2	7.4	28.56	40.0	-11.44	270	Vert

PK - Peak detector
 QP - Quasi-Peak detector
 LnAv - Linear Average detector
 LgAv - Log Average detector
 Av - Average detector
 CAV - CISPR Average detector
 RMS - RMS detection
 CRMS - CISPR RMS detection
 Text File: Tx below 1GHz_EUT_Vert 1.TXT
 File: RE 30-1000 MHz 3m FCC Class B Full Scan.TST

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

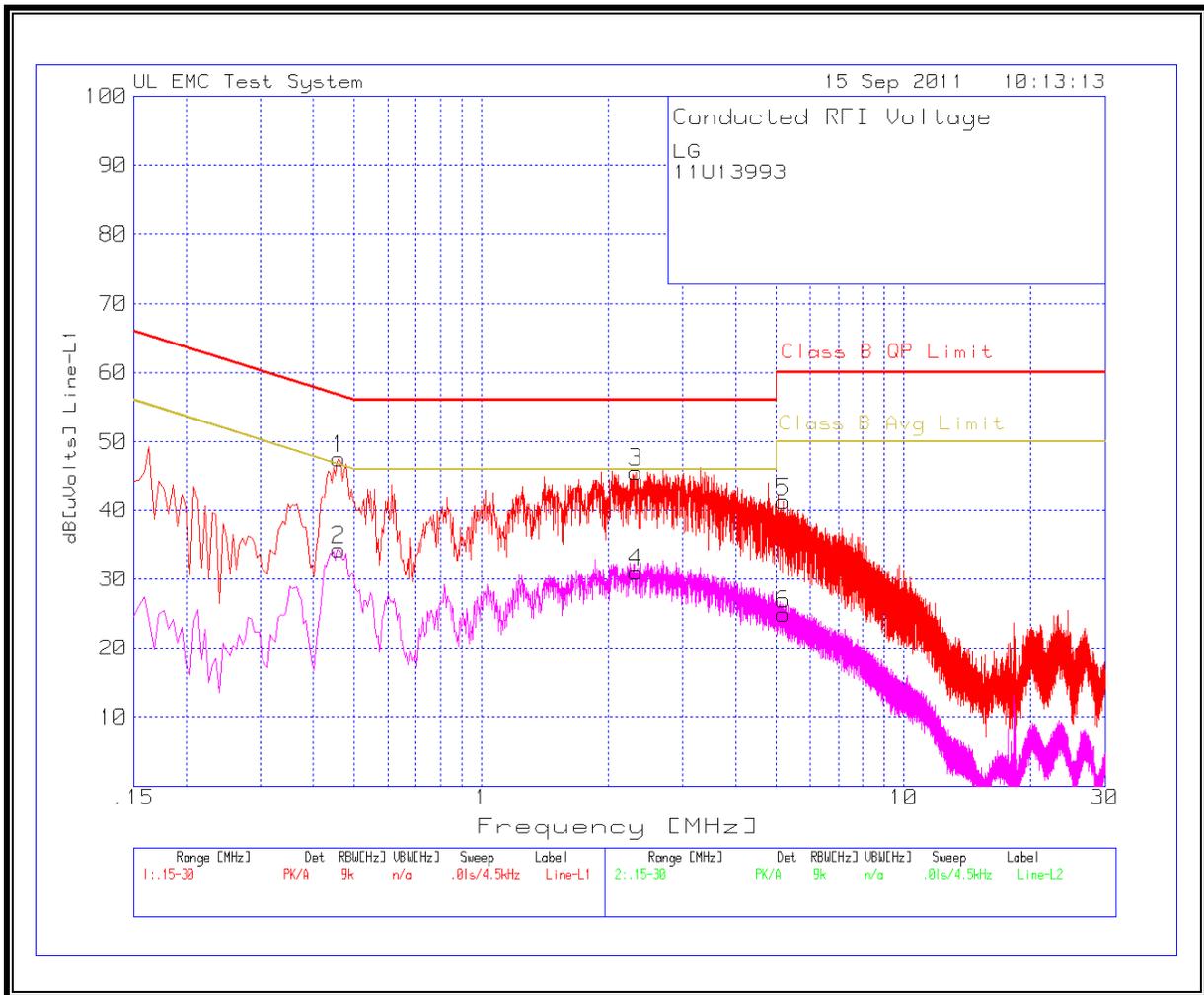
ANSI C63.4

RESULTS

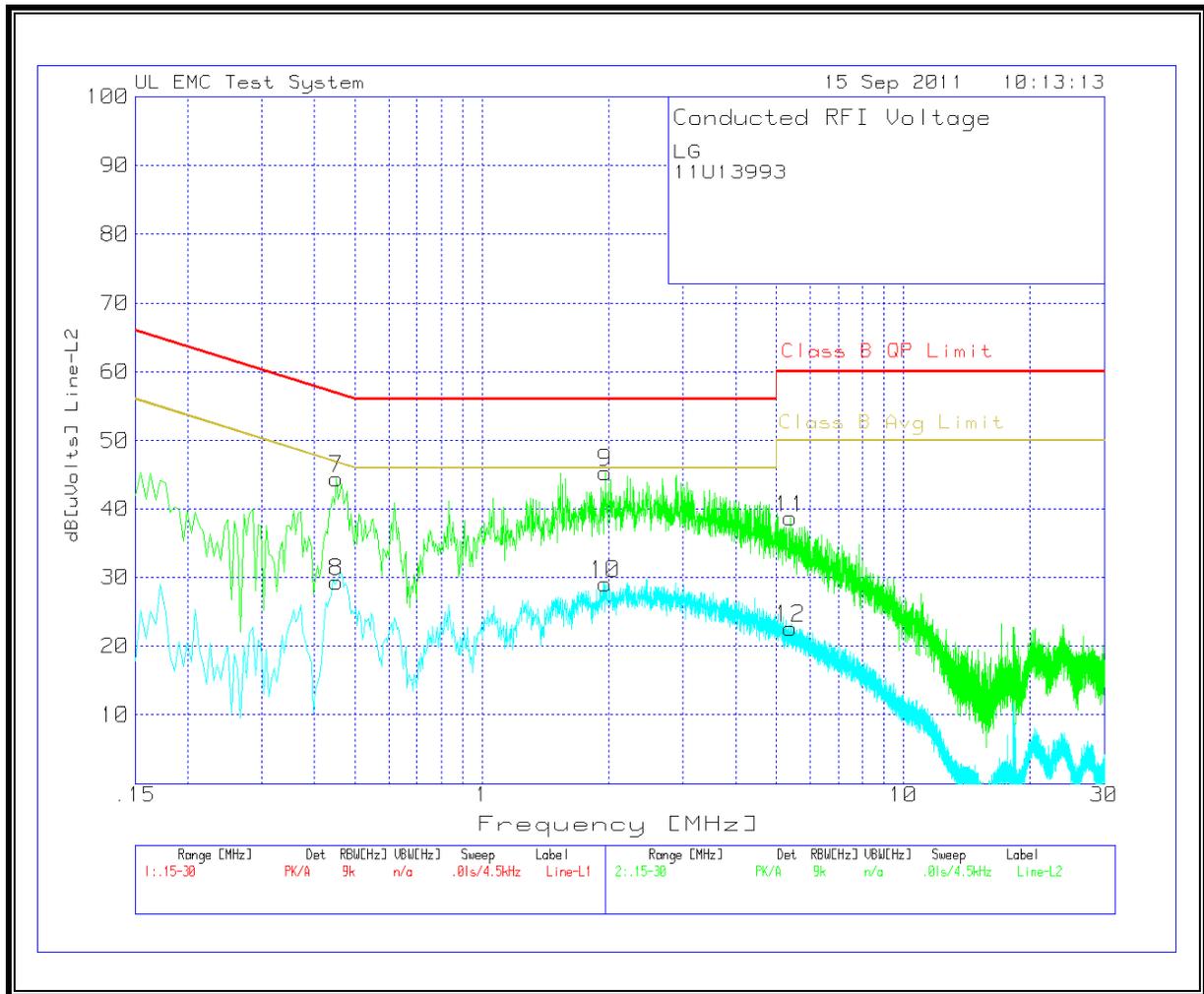
6 WORST EMISSIONS

Company: LG Electronics Inc.						Test Engineer: Vien Tran			
Project: 11U13993						Date: 09/15/11			
Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	dB[uVolts]	Class B QP Limit	Margin	Class B Avg Limit	Margin
0.4605	47.60	PK	0	0	47.60	56.70	-9.10	46.70	0.90
0.4605	34.30	Av	0	0	34.30	56.70	-22.40	46.70	-12.40
2.328	45.68	PK	0	0	45.68	56.00	-10.32	46.00	-0.32
2.328	30.99	Av	0	0	30.99	56.00	-25.01	46.00	-15.01
5.199	41.38	PK	0	0	41.38	60.00	-18.62	50.00	-8.62
5.199	24.98	Av	0	0	24.98	60.00	-35.02	50.00	-25.02
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	dB[uVolts]	Class B QP Limit	Margin	Class B Avg Limit	Margin
0.4515	44.45	PK	0	0	44.45	56.80	-12.35	46.80	-2.35
0.4515	29.28	Av	0	0	29.28	56.80	-27.52	46.80	-17.52
1.9635	45.39	PK	0	0	45.39	56.00	-10.61	46.00	-0.61
1.9635	29.11	Av	0	0	29.11	56.00	-26.89	46.00	-16.89
5.3835	38.66	PK	0	0	38.66	60.00	-21.34	50.00	-11.34
5.3835	22.56	Av	0	0	22.56	60.00	-37.44	50.00	-27.44
PK - Peak detector QP - Quasi-Peak detector LnAv - Linear Average detector LgAv - Log Average detector Av - Average detector CAV - CISPR Average detector RMS - RMS detection CRMS - CISPR RMS detection Text File: LC3.TXT									

LINE 1 RESULTS



LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

* = Plane-wave equivalent power density

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

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

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/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{1.2}

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

- Notes:**
1. Frequency, *f*, is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

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

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

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

Distance is given by:

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

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

For multiple chain devices, and collocated 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.

$$\text{Total EIRP} = (P_1 * G_1) + (P_2 * G_2) + \dots + (P_n * G_n)$$

where

P_x = Power of transmitter x

G_x = Numeric gain of antenna x

For multiple collocated transmitters operating simultaneously in frequency bands where different limits apply, a fraction of the exposure limit is established for each band, such that the sum of the fractions is less than or equal to one.

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

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency, as $824 \text{ MHz} / 1500 = 0.55 \text{ mW/cm}^2$ (FCC) and $824 \text{ MHz} / 150 = 5.5 \text{ W/m}^2$ (IC).

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

RESULTS

Single Chain and non-collocated transmitters							
Band	Mode	Separation Distance (m)	Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	FCC Power Density (mW/cm ²)
2.4 GHz	WLAN	0.20	13.90	-4.00	9.90	0.01	0.002