FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

LTE PHONE BLUETOOTH AND WLAN

MODEL NUMBER: LG-MS659

FCC ID: ZNFMS659

REPORT NUMBER: 13U14916-6

ISSUE DATE: MARCH 30, 2013

Prepared for

LG ELECTRONICS MOBILECOMM U.S.A., INC.
1000 SYLVAN AVENUE
ENGLEWOOD CLIFFS, NEW JERSEY 07632

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/30/13	Original	T. LEE

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC.
1000 SYLVAN AVENUE
ENGLEWOOD CLIFFS, NEW JERSEY 07632

EUT DESCRIPTION: LTE PHONE BLUETOOTH AND WLAN

MODEL: LG-MS659

SERIAL NUMBER: 302KPTM334913

DATE TESTED: MARCH 13, 2013

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

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:

TIM LEE
WISE PROGRAM MANAGER
UL CCS

Tested By:

ROY ZHENG
WISE LAB TECH III
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, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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 LTE Phone with Bluetooth and WLAN capability that is manufactured by LG Electronics.

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)
2402 - 2480	Basic GFSK	11.18	13.12
2402 - 2480	Enhanced 8PSK	11.43	13.90

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an INTEGRATED antenna, with a maximum gain of -0.5 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was MS795_LAP8930JR130304.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, and Z. It was determined that Y-orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y-orientation with AC adapter and headset.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	LG	MCS-01WR	RB310020452	DoC
Headset	Cresyn	EAB62410801	NA	NA

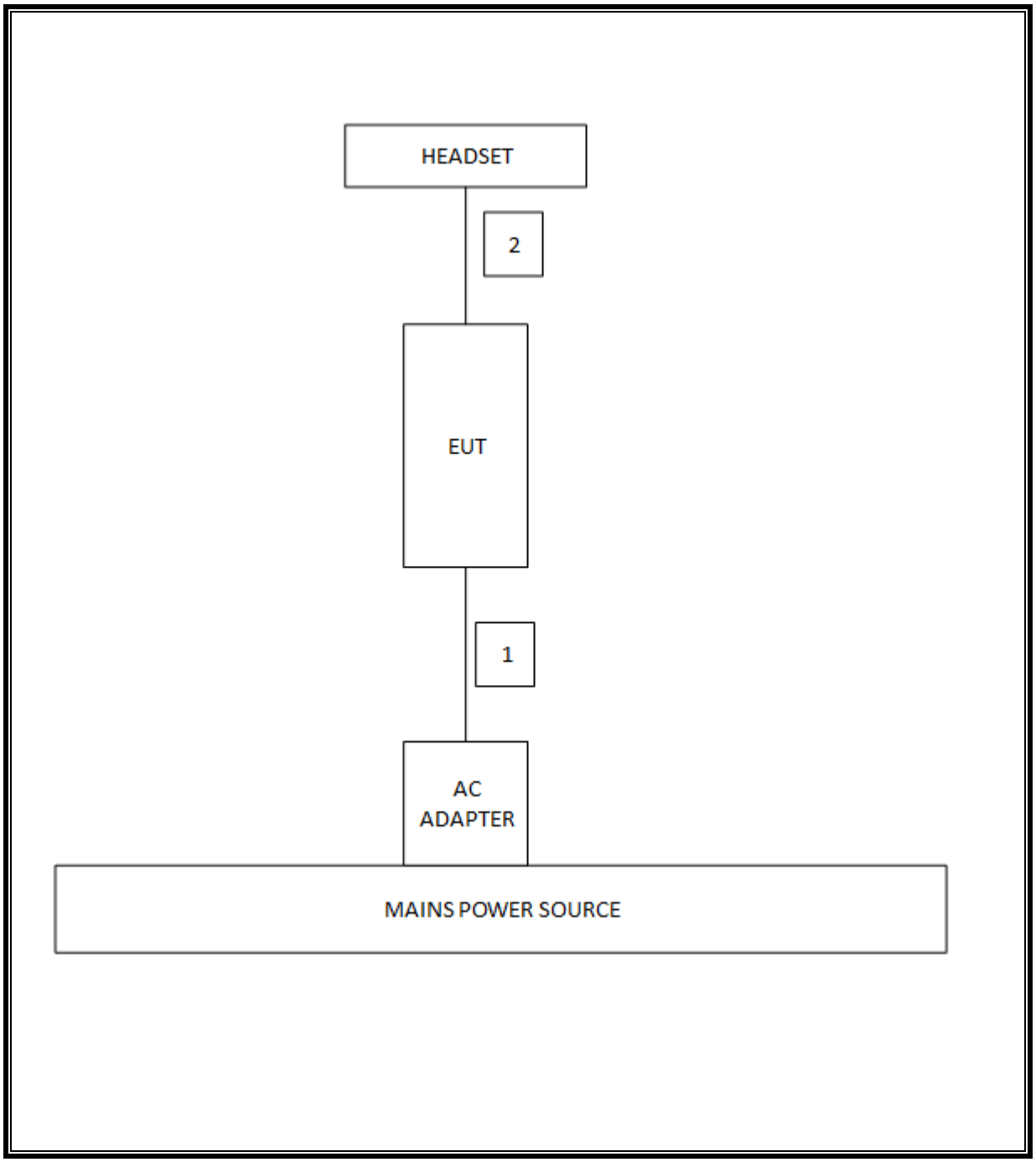
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	Mini-USB	Shielded	1.2m	N/A
2	Headset	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.
EUT was set in the Hidden menu mode to enable BT communications.

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**
Power Meter	Agilent / HP	N1911A	MY45100242	7/27/2013
Peak / Average Power Sensor	Agilent / HP	E9323A	US40411556	7/26/2013
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	5/11/2013
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/8/2013
LISN, 30 MHz	FCC	50/250-25-2	C00626	1/14/2014
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	5/11/2013
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/12/2013
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/2013
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	4/23/2013
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	1/14/2014
Antenna, Horn, 18 GHz	ETS	3117	C01005	4/23/2013
CBT Bluetooth Tester	R & S	CBT	None	5/15/2013

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

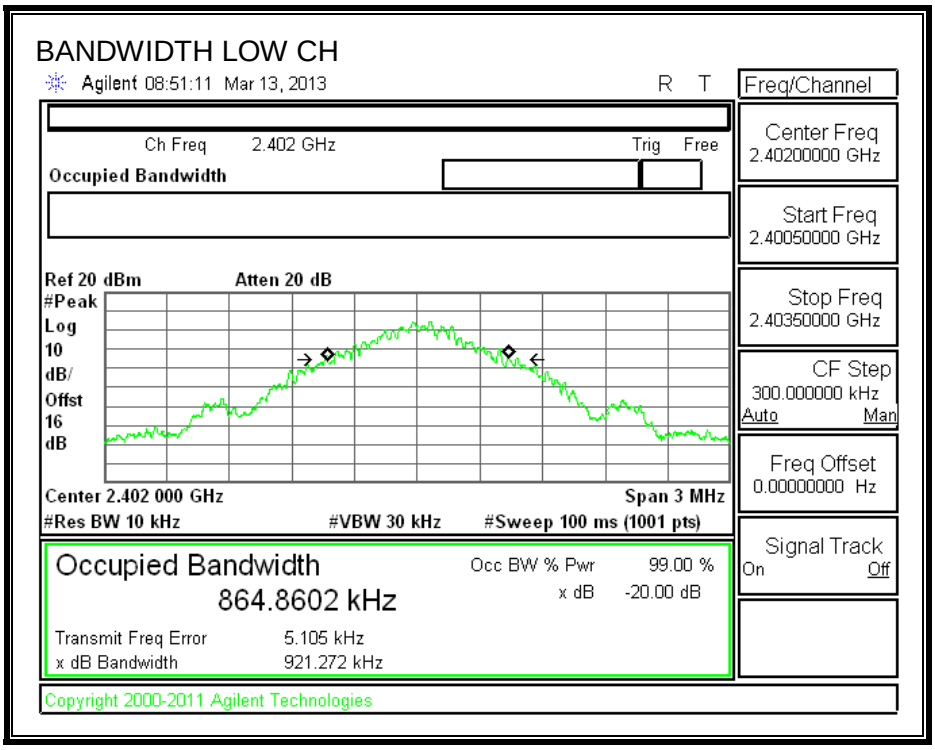
TEST PROCEDURE

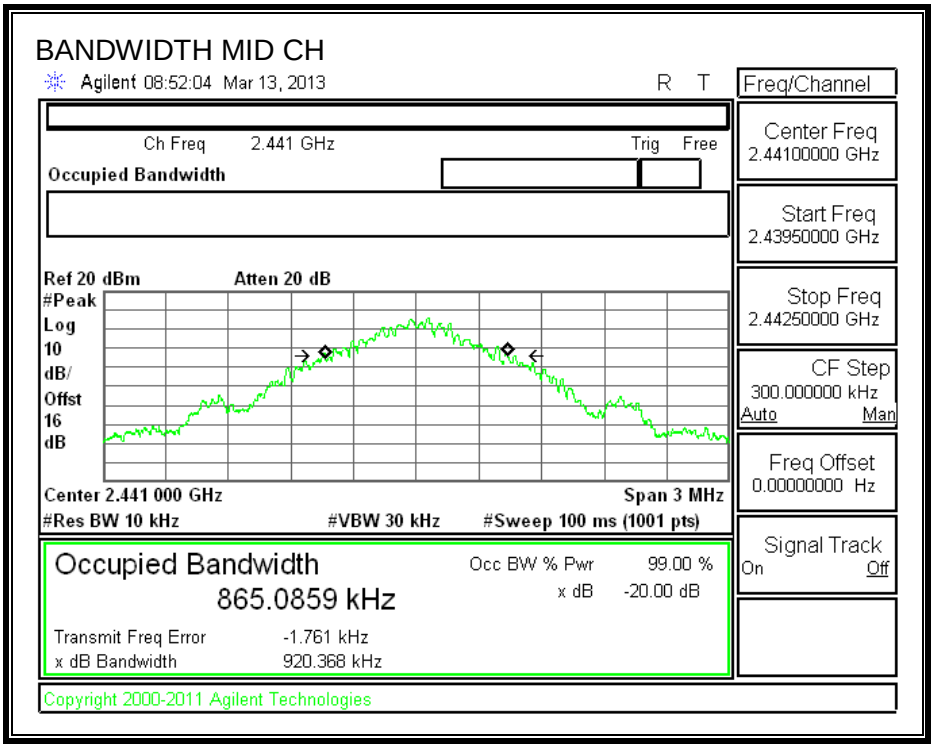
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

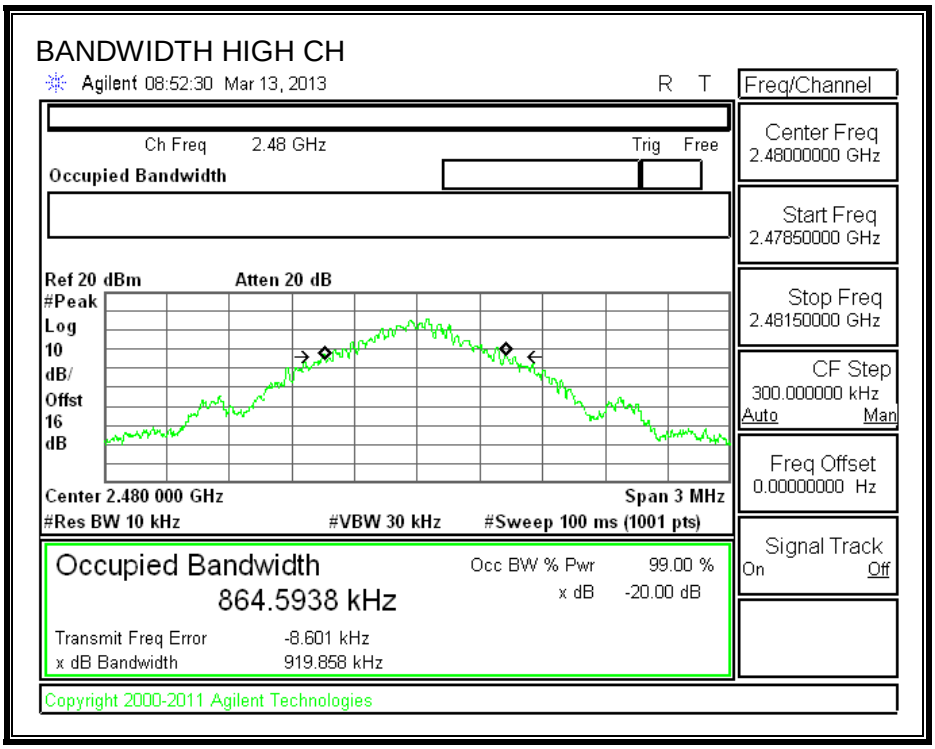
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	921.272	883.1144
Middle	2441	920.368	881.0421
High	2480	919.858	873.7727

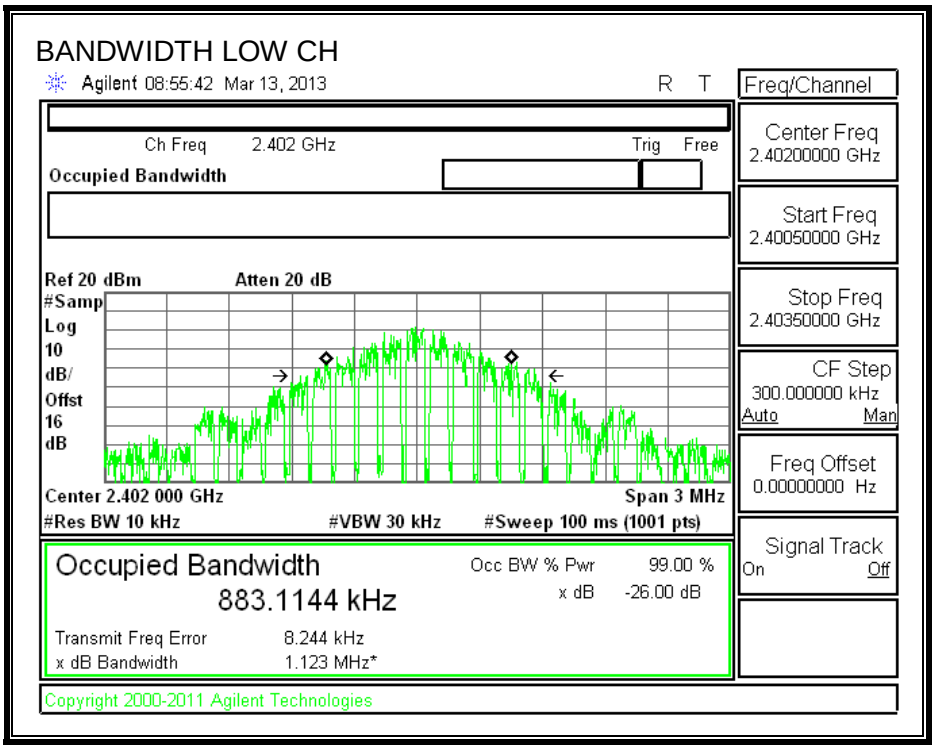
20 dB BANDWIDTH

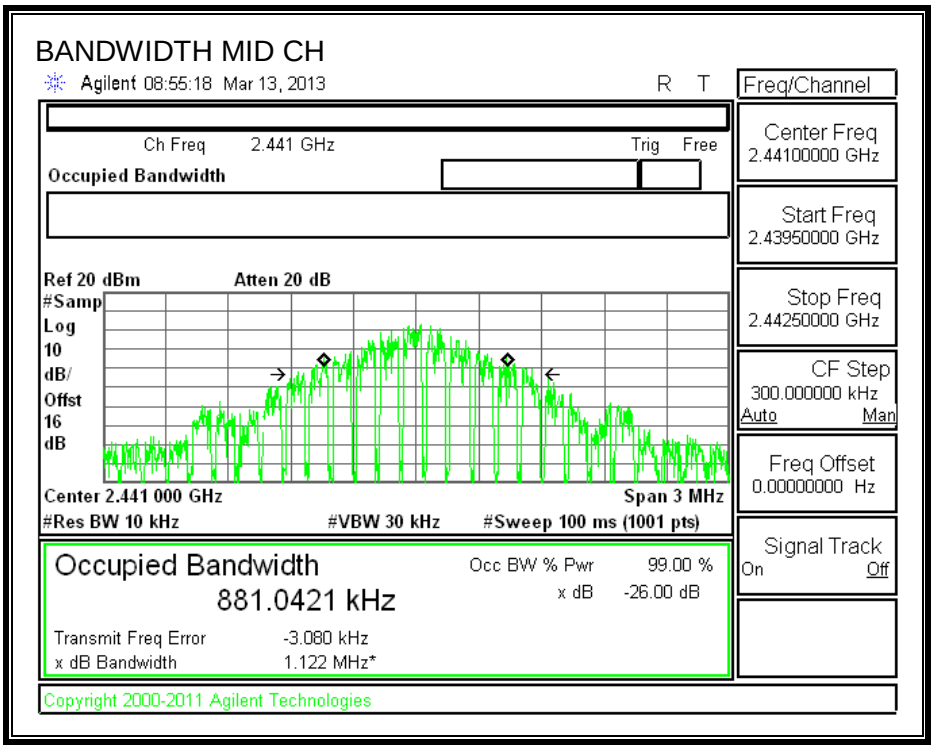


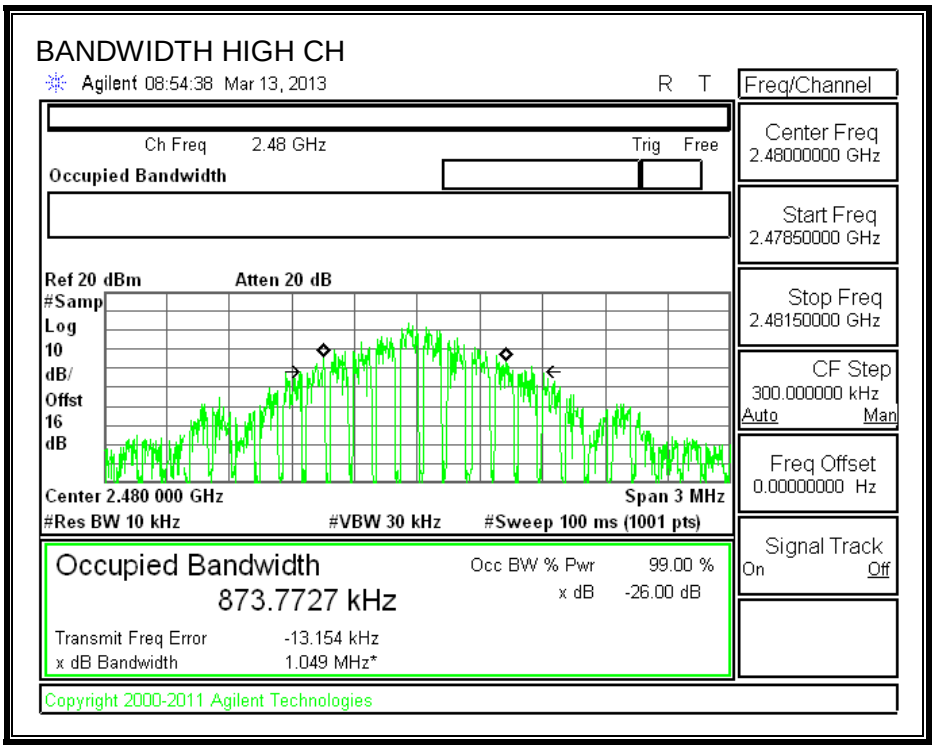




99%dB BANDWIDTH







7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

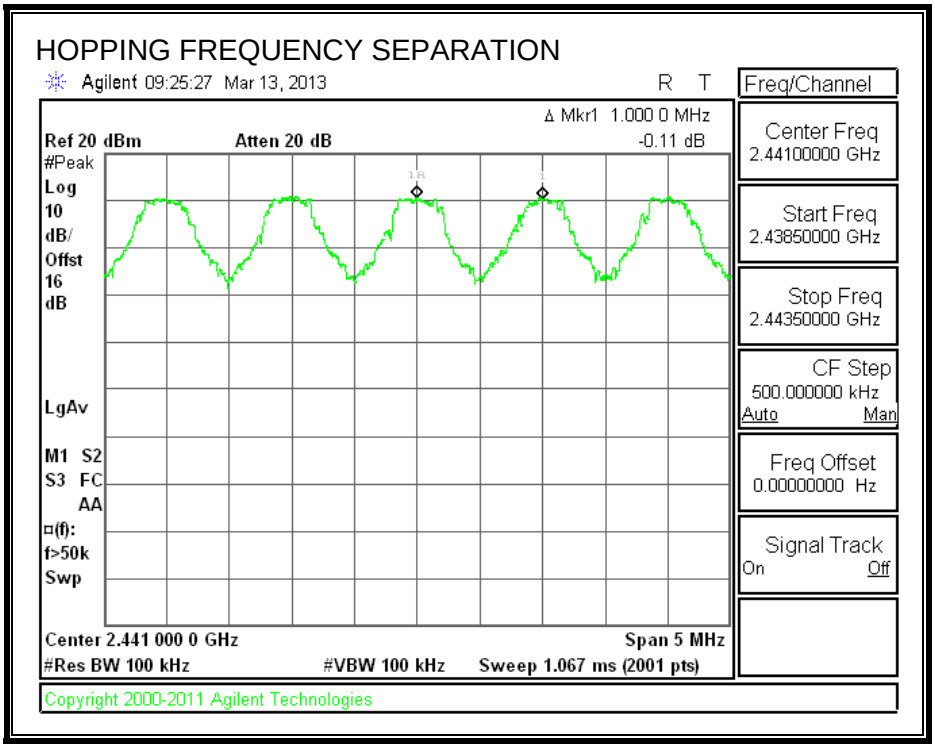
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

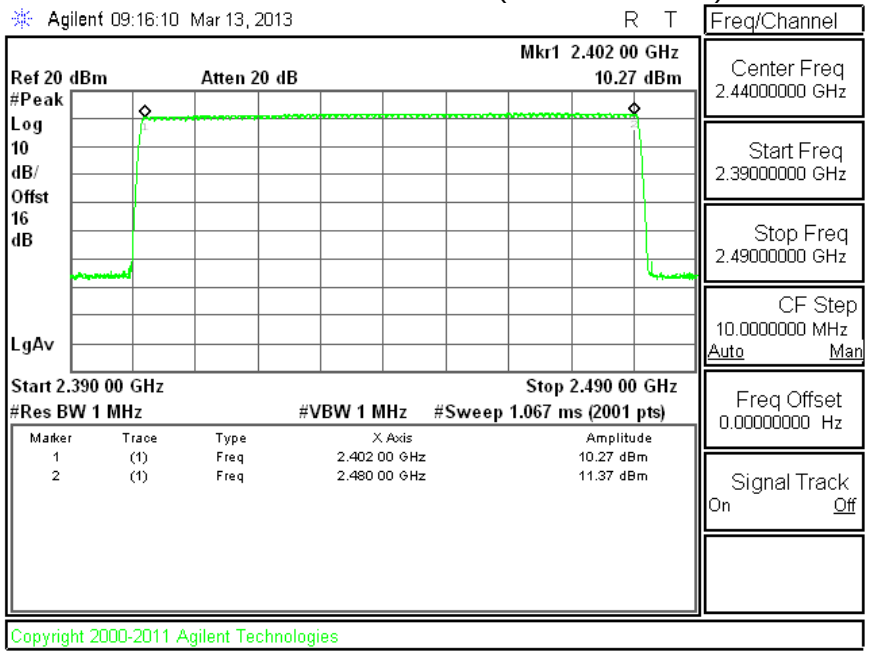
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

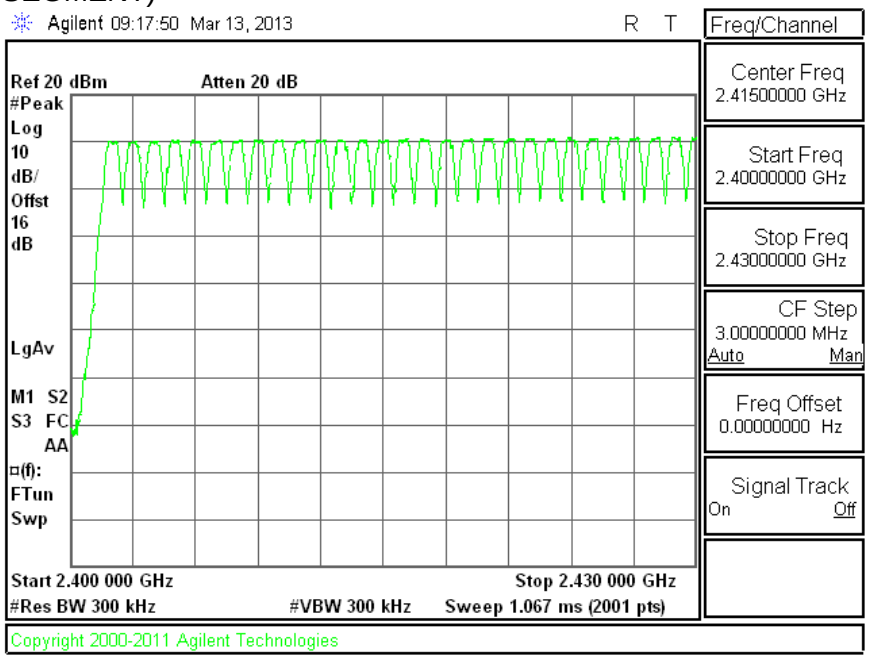
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

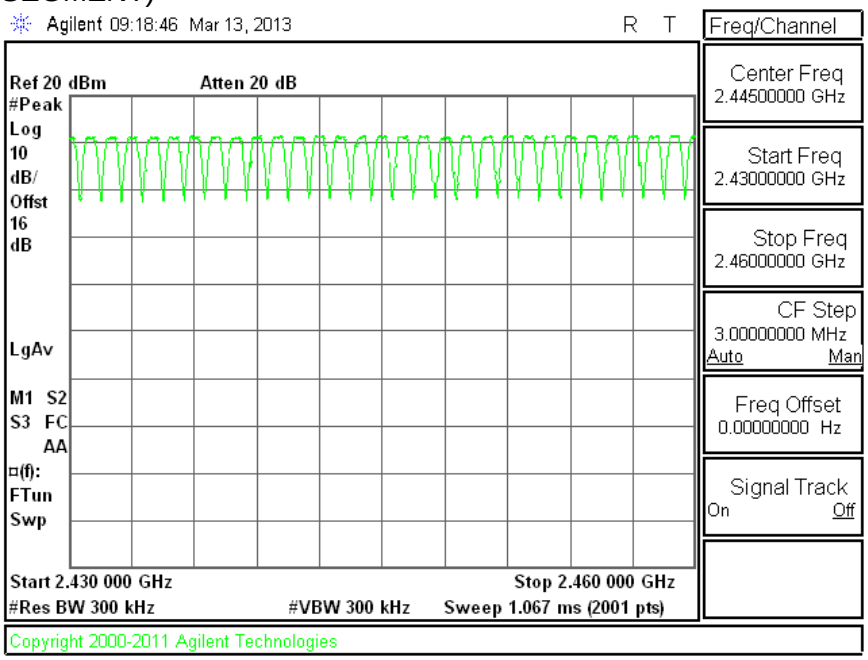
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



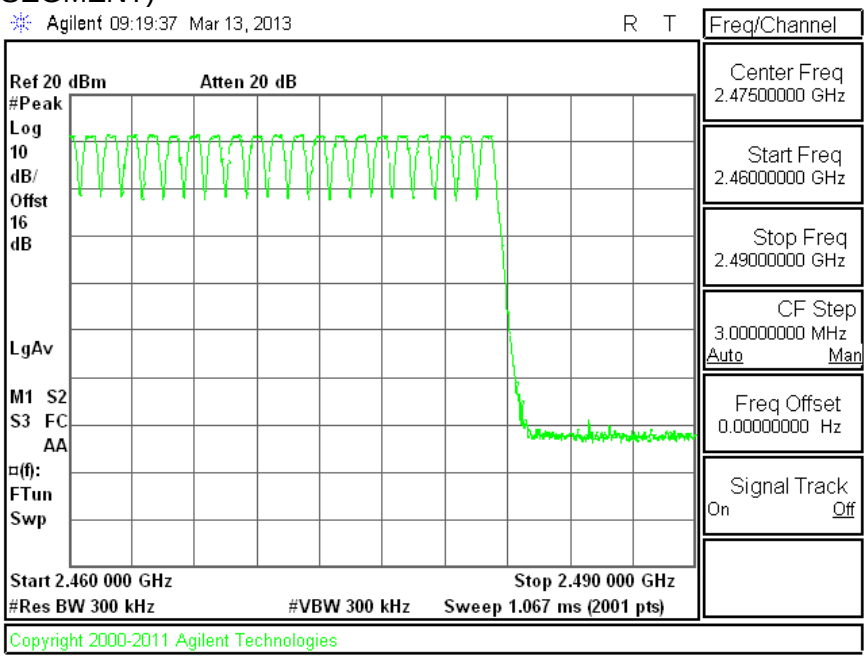
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

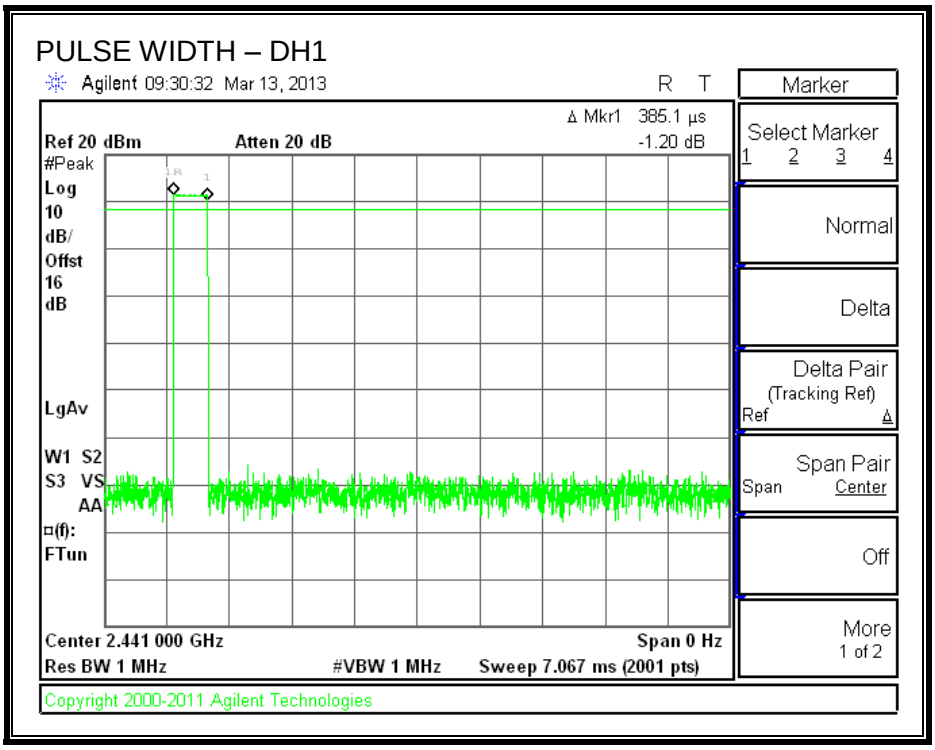
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

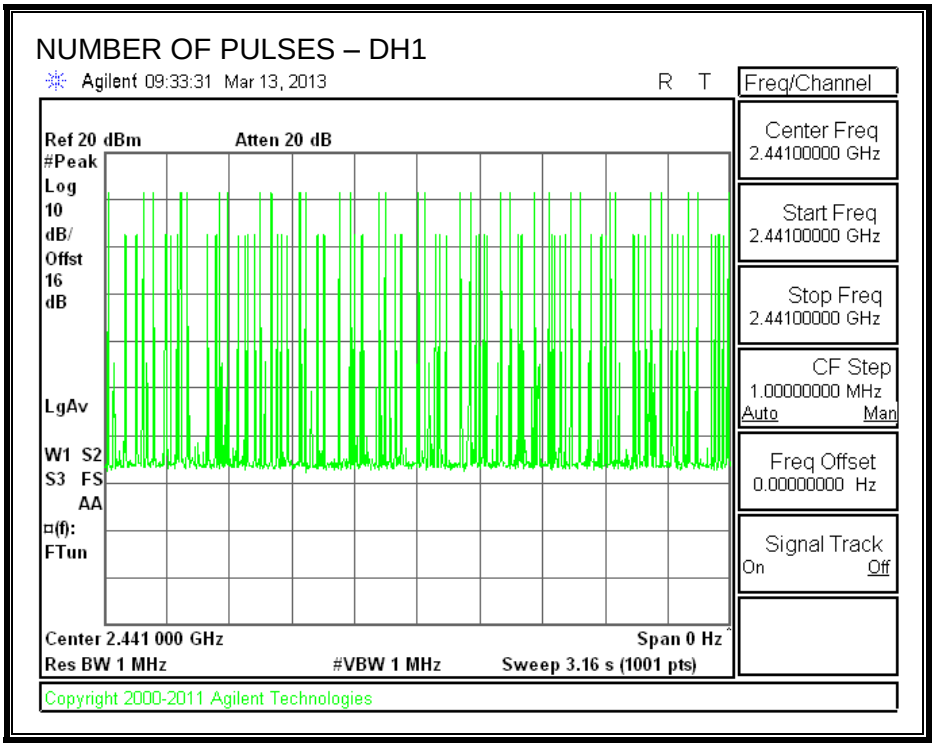
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3851	32	0.123	0.4	-0.277
DH3	1.639	17	0.279	0.4	-0.121
DH5	2.883	10	0.288	0.4	-0.112

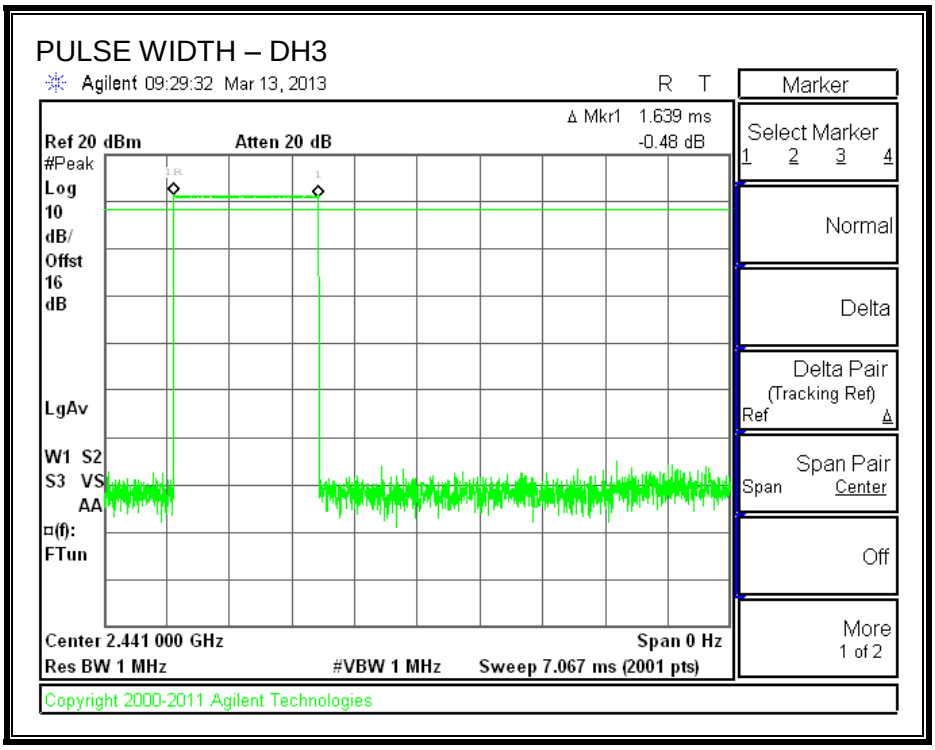
PULSE WIDTH - DH1



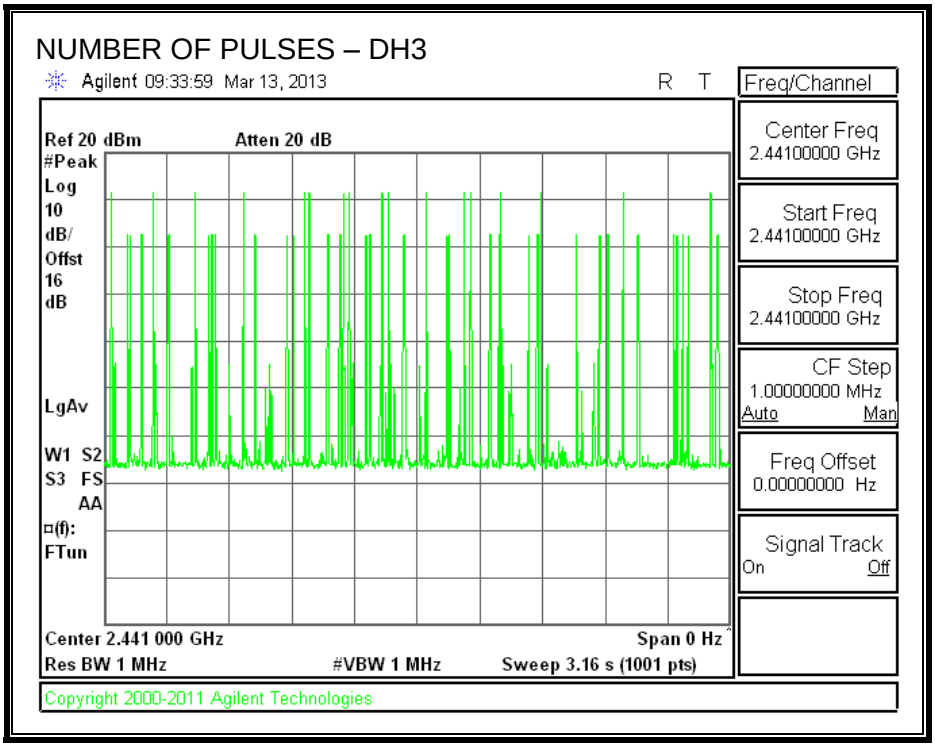
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



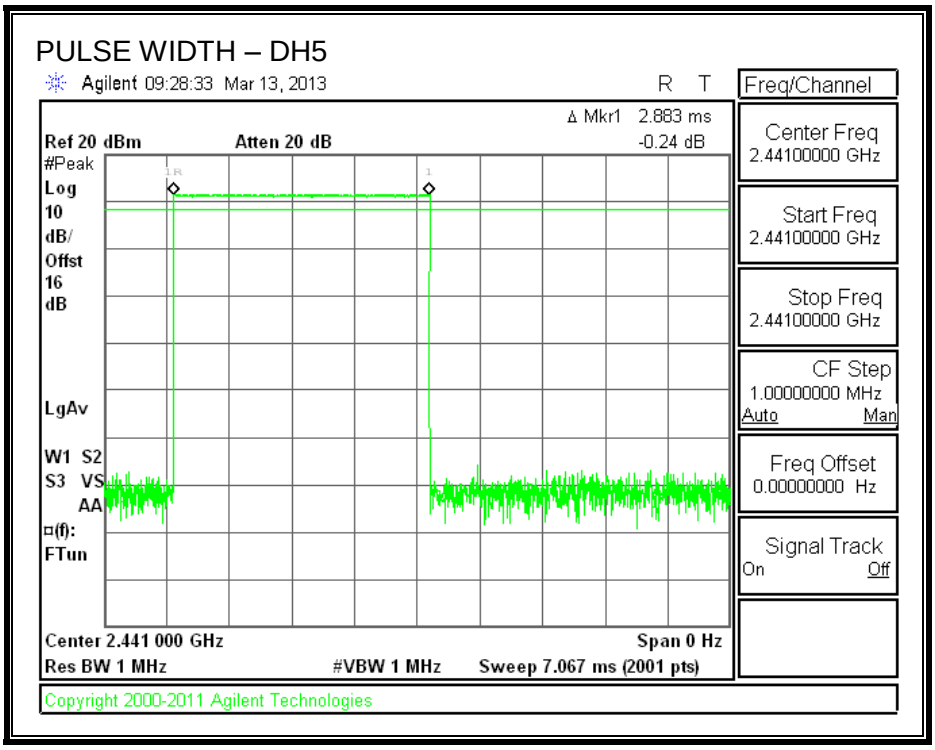
PULSE WIDTH – DH3



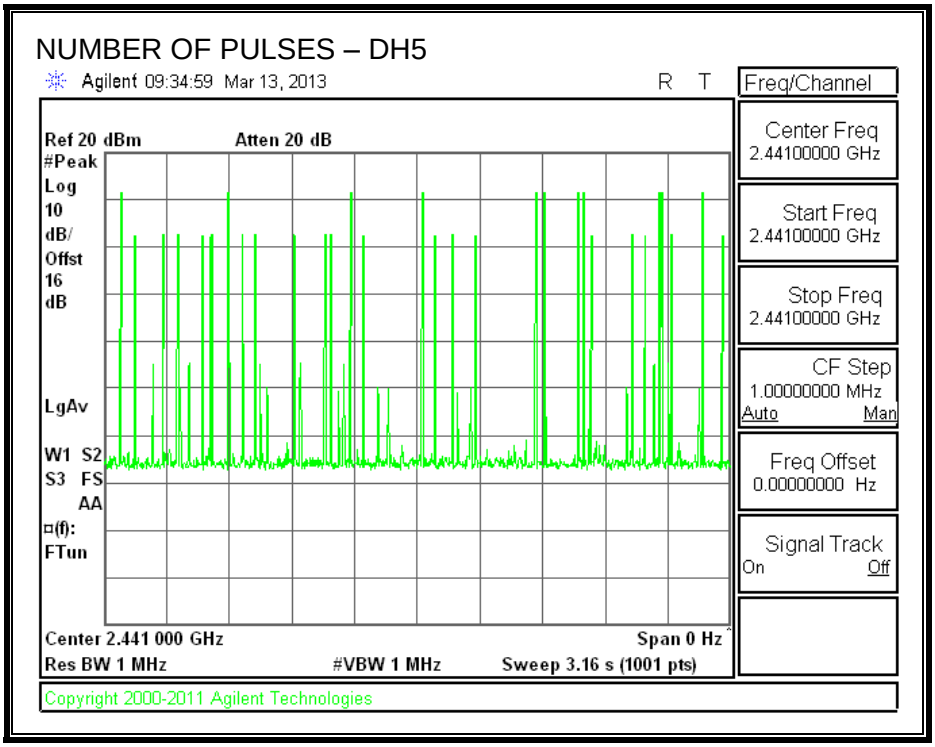
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

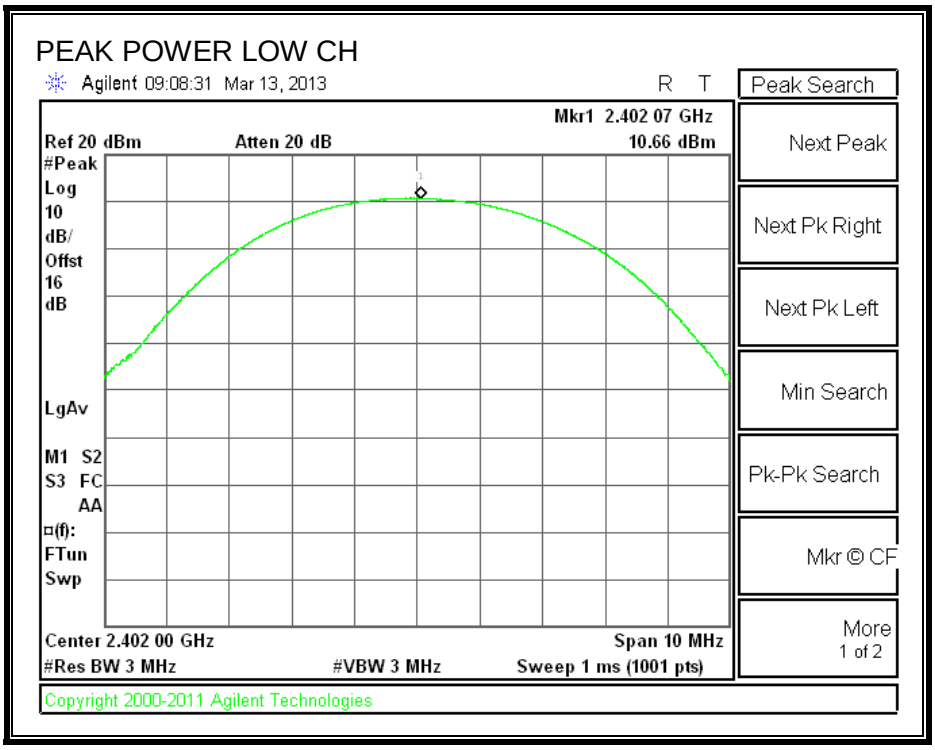
TEST PROCEDURE

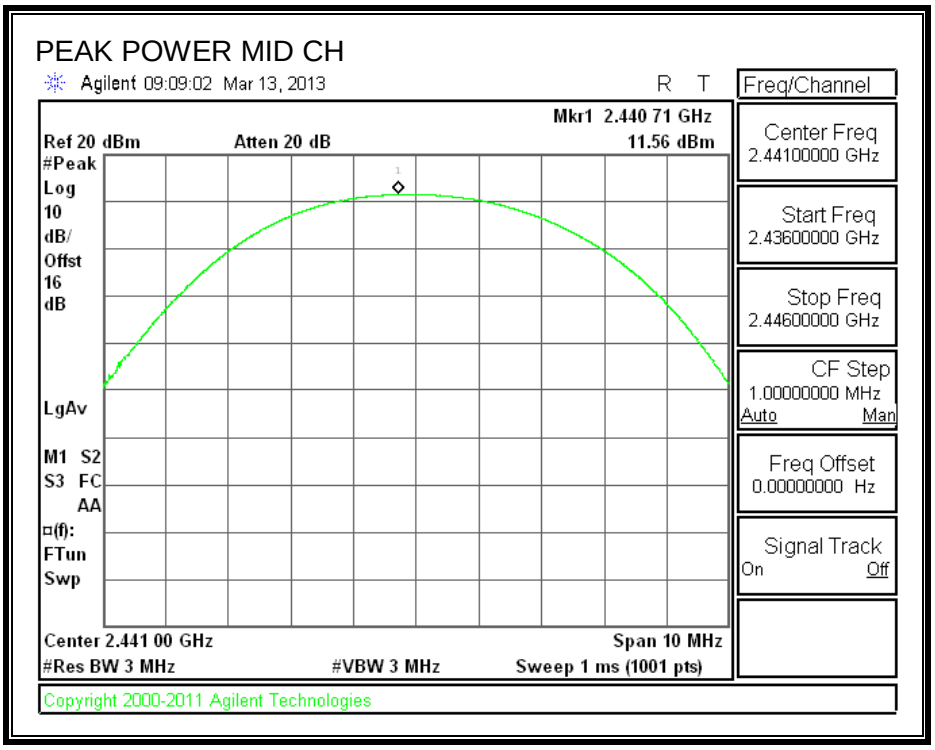
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

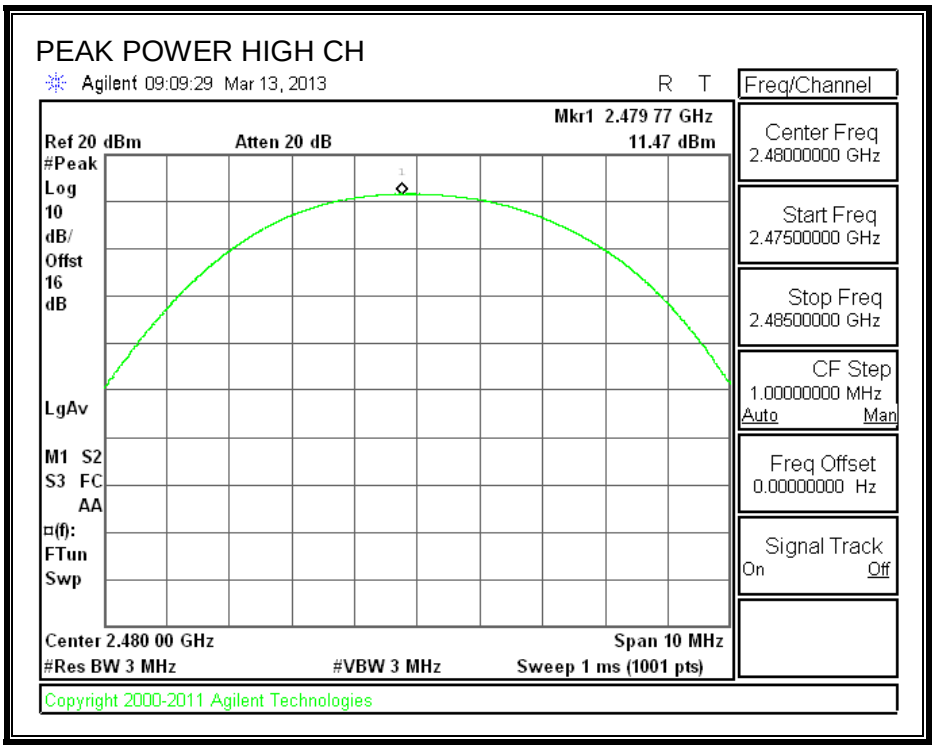
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.66	30	-19.34
Middle	2441	11.56	30	-18.44
High	2480	11.47	30	-18.53

OUTPUT POWER







7.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 16.7 dB (including 16dB directional pad and 0.68 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.70
Middle	2441	10.50
High	2480	10.60

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

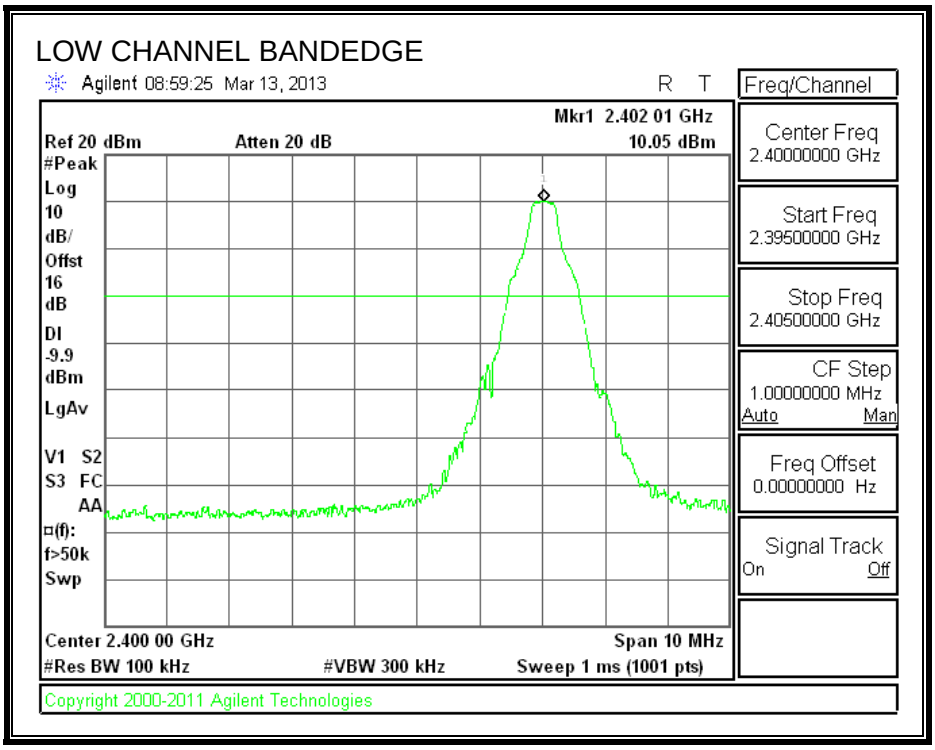
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

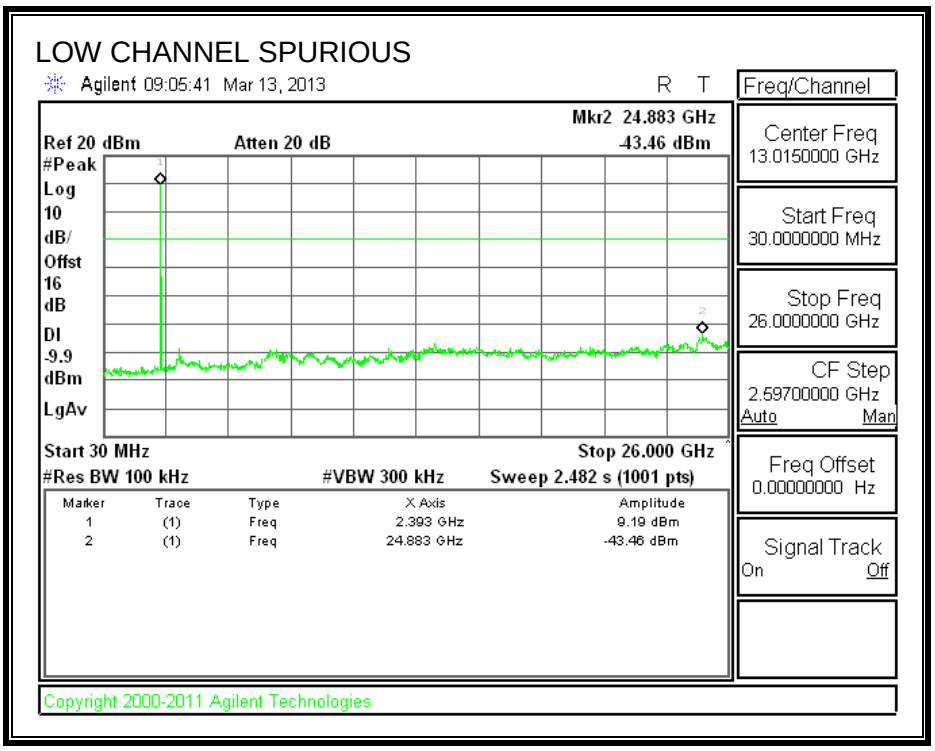
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

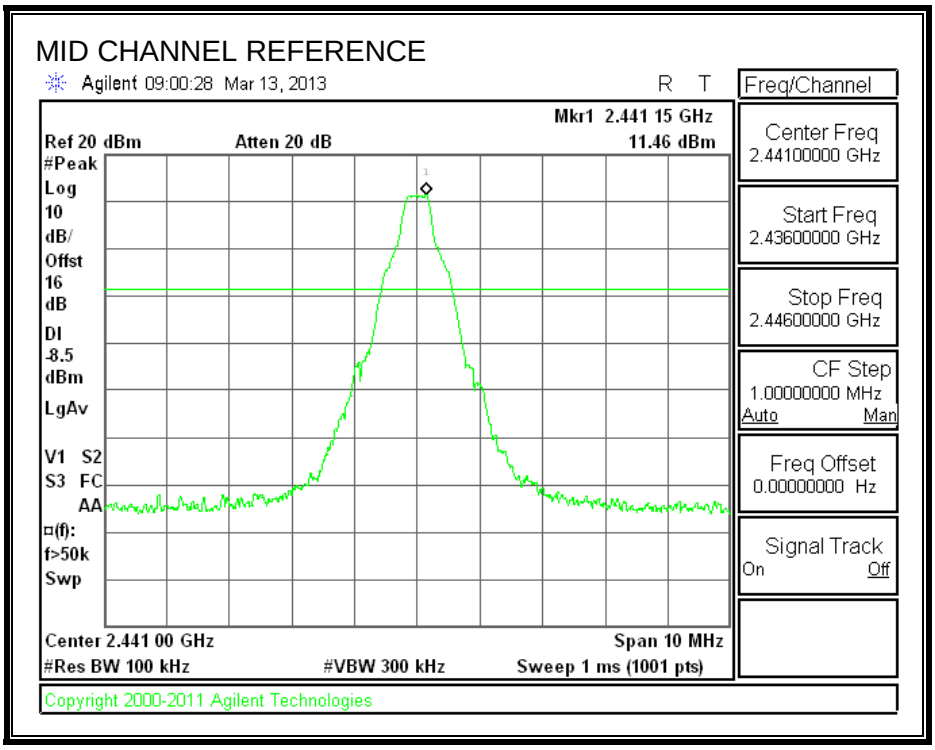
RESULTS

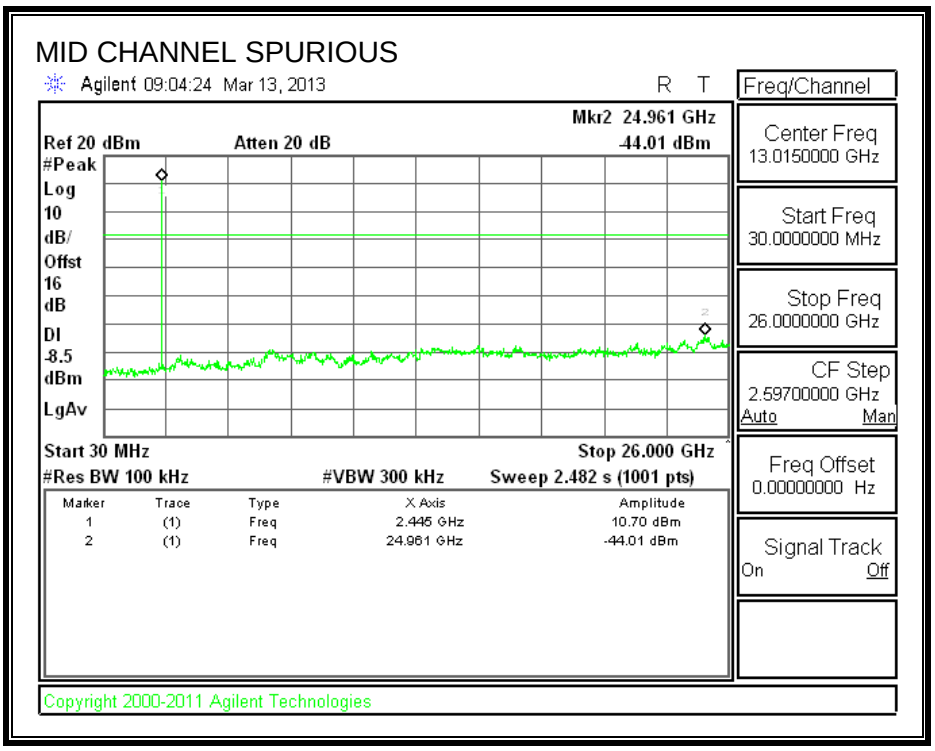
SPURIOUS EMISSIONS, LOW CHANNEL



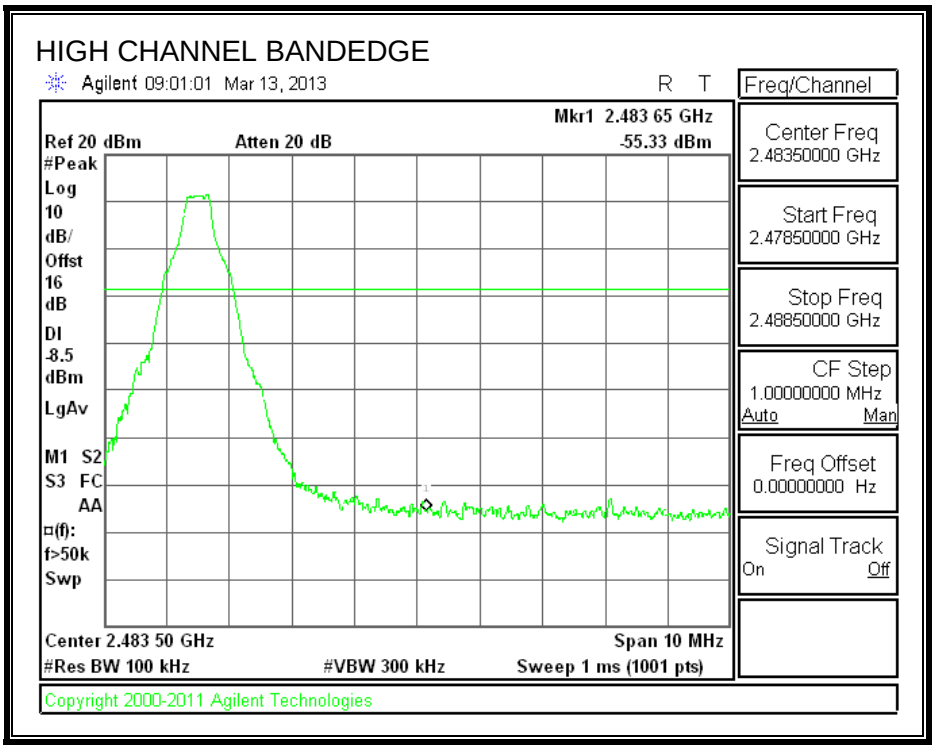


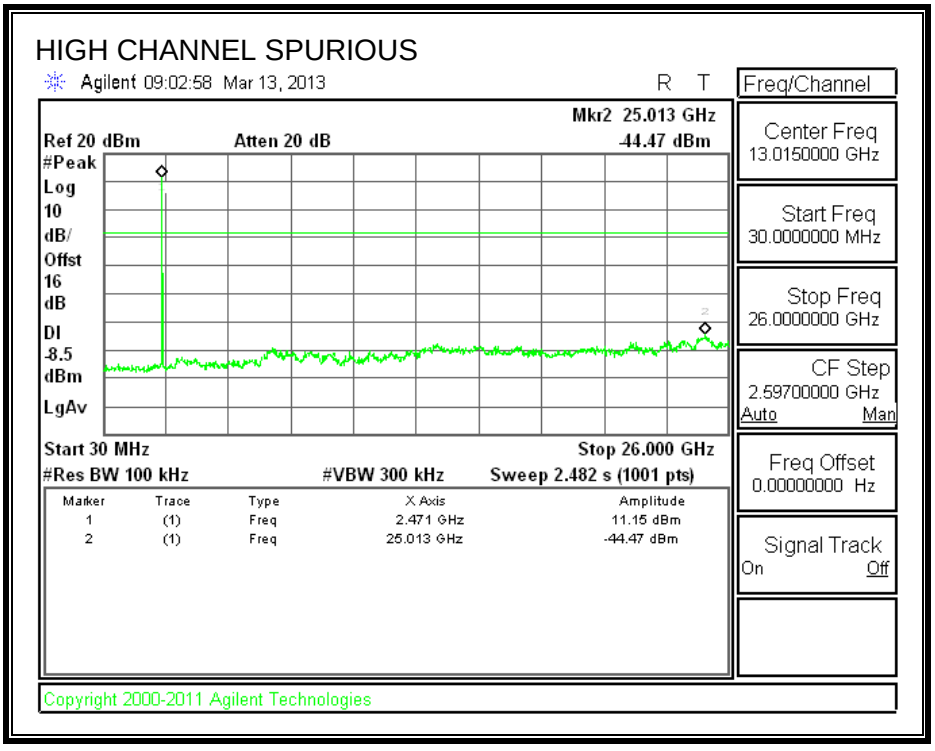
SPURIOUS EMISSIONS, MID CHANNEL



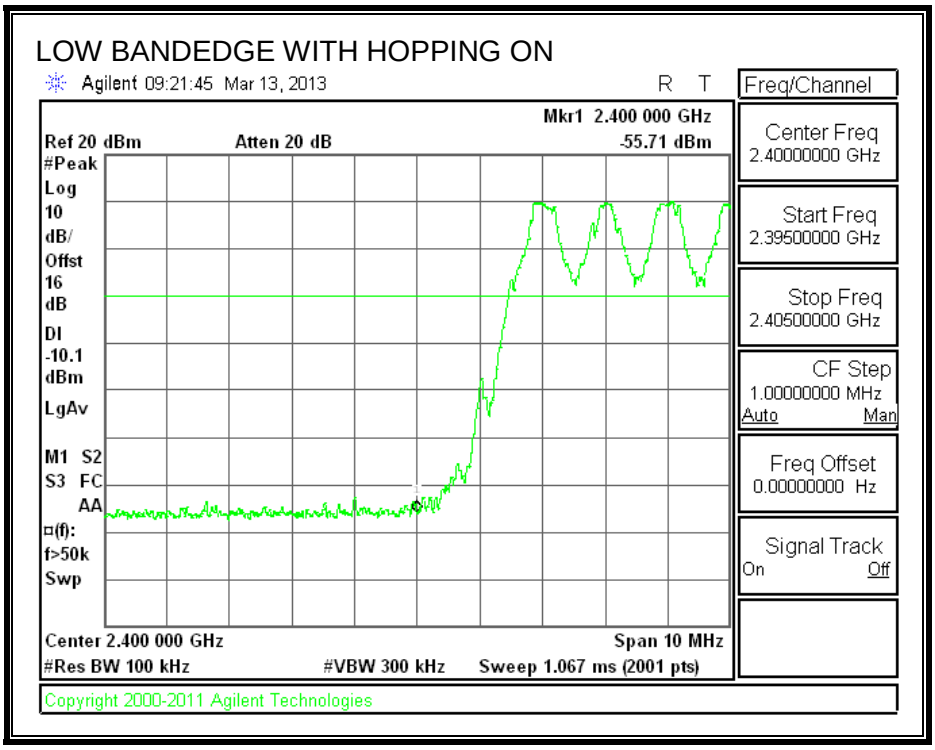


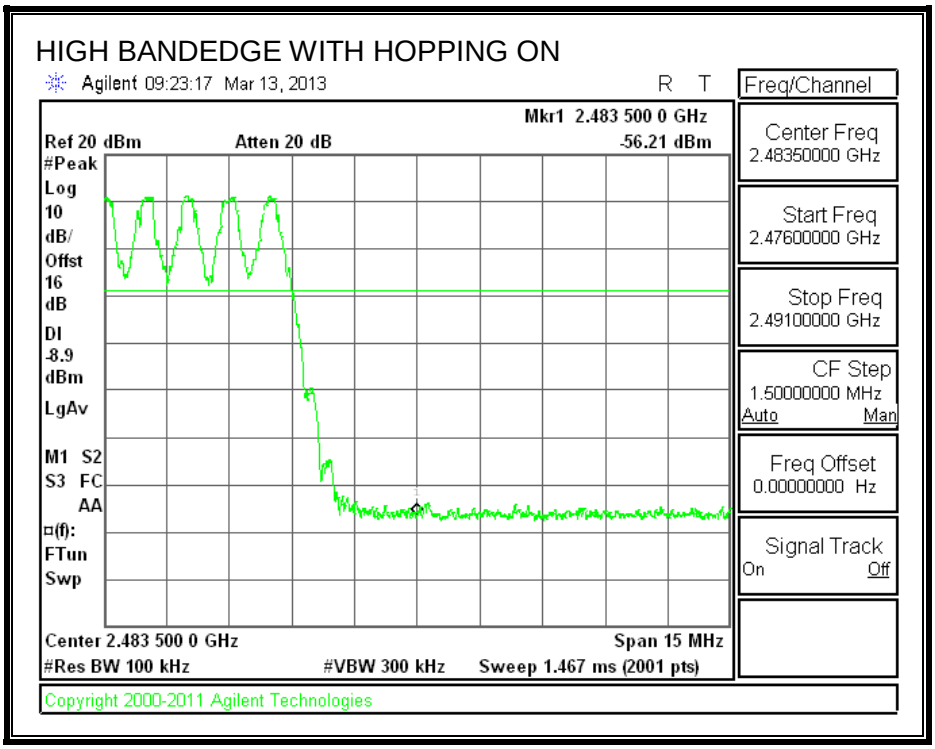
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

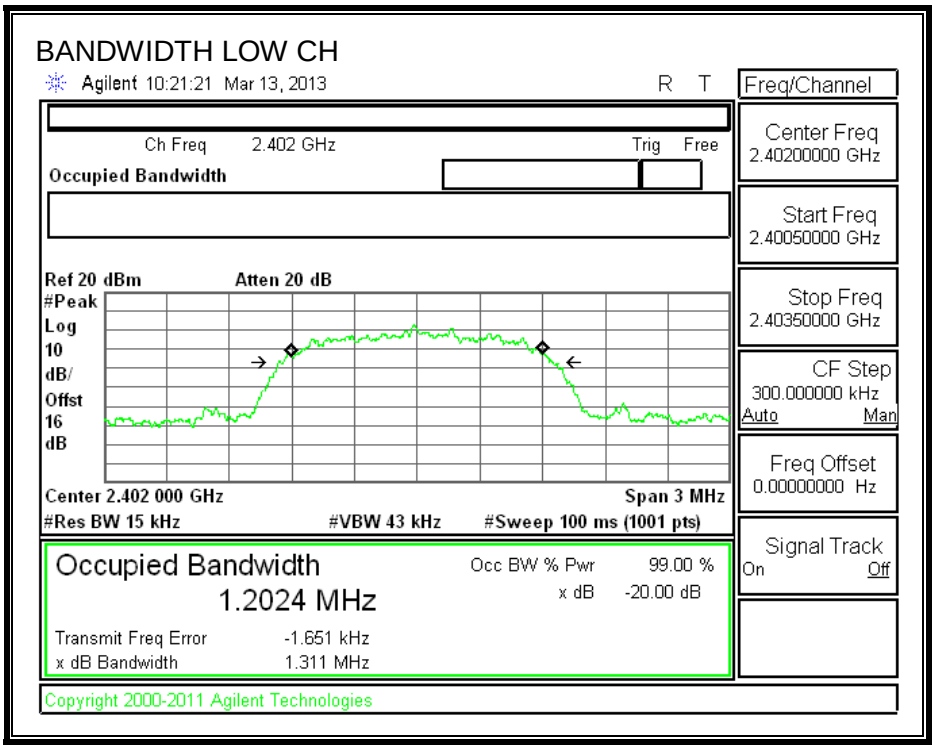
TEST PROCEDURE

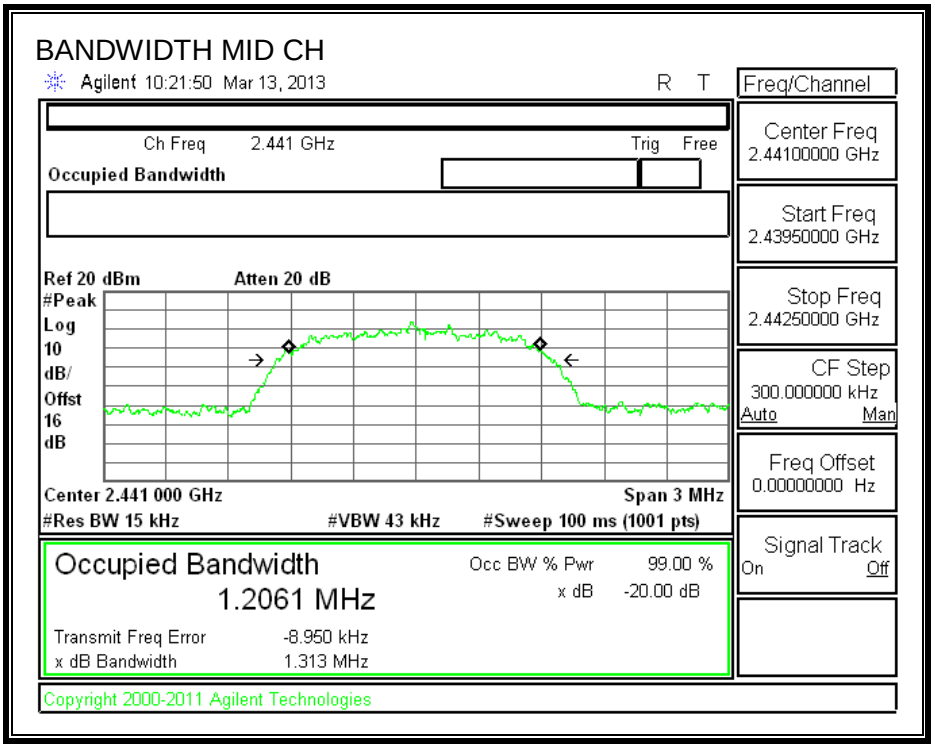
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

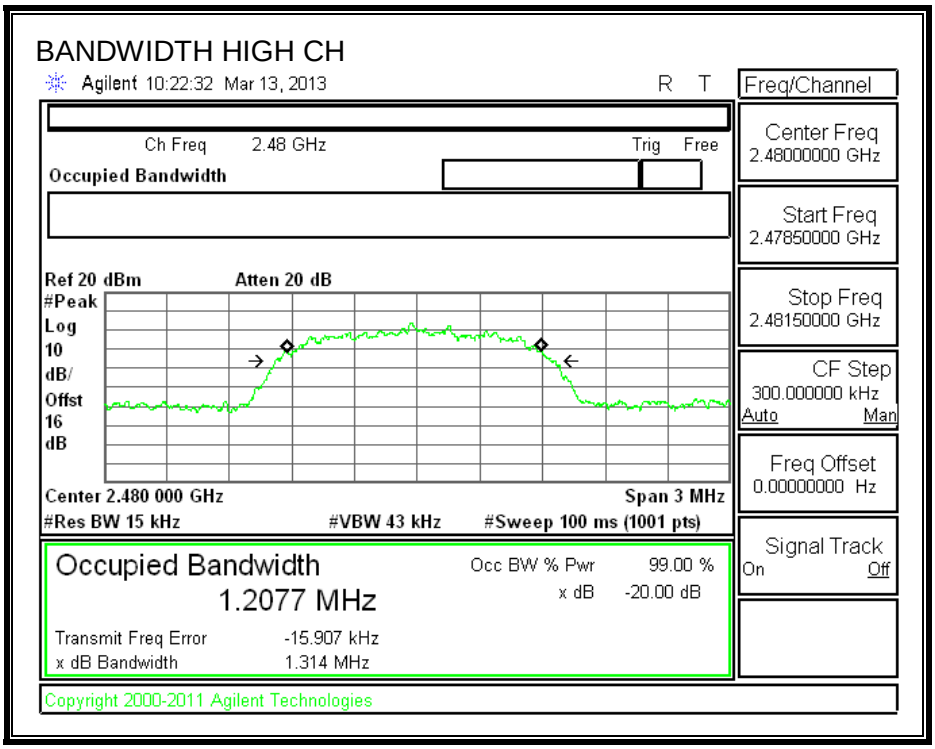
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1311	1216.1
Middle	2441	1313	1225.7
High	2480	1314	1228.9

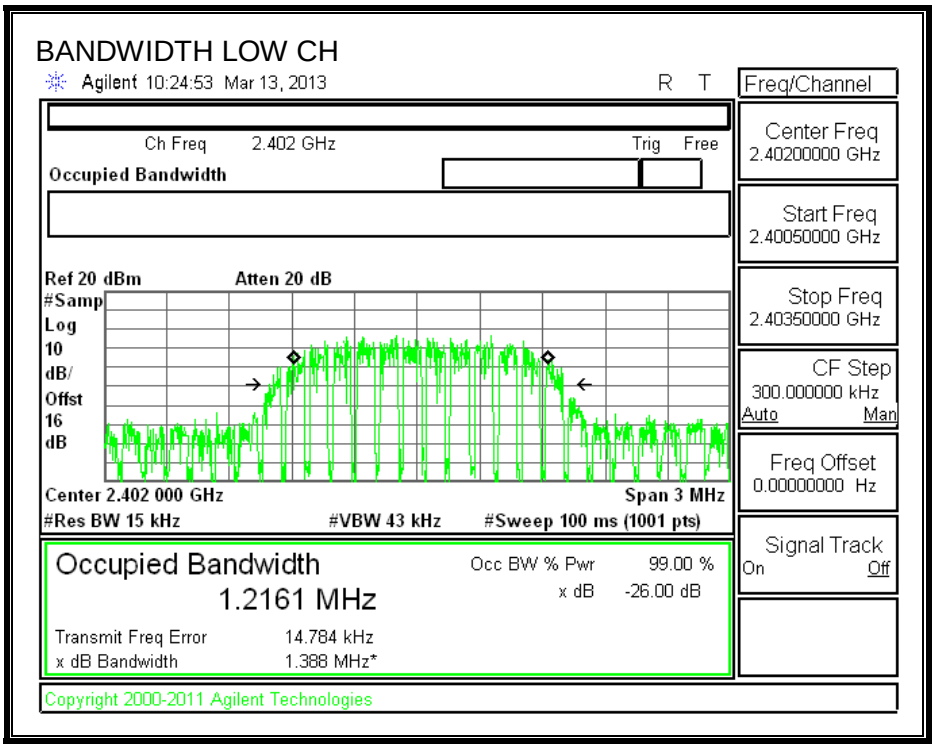
20 dB AND 99% BANDWIDTH

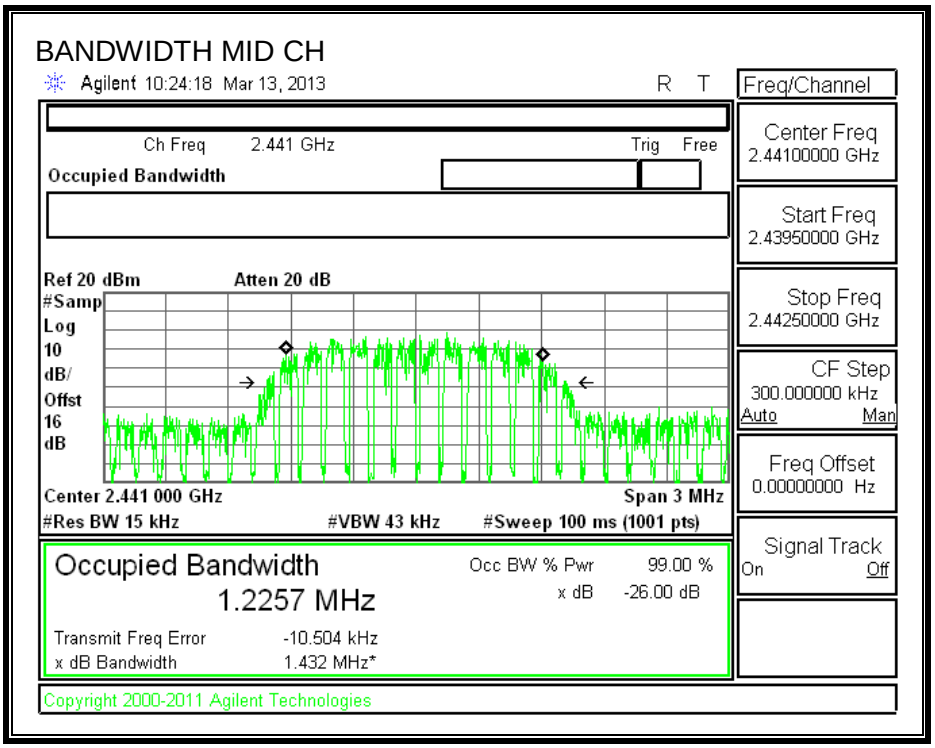


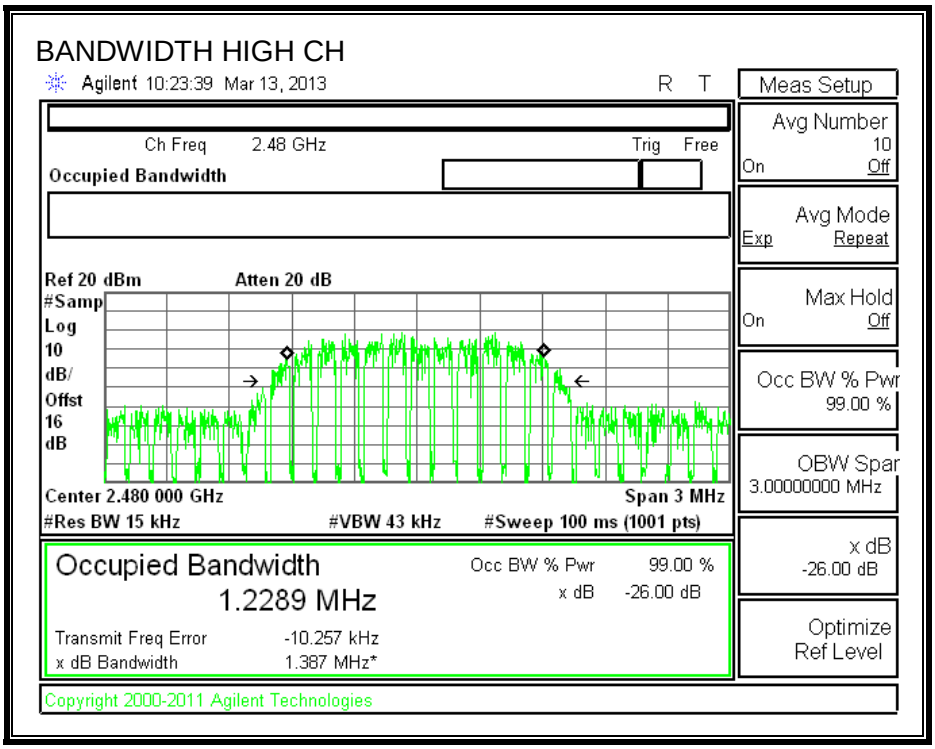




99% BANDWIDTH







7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

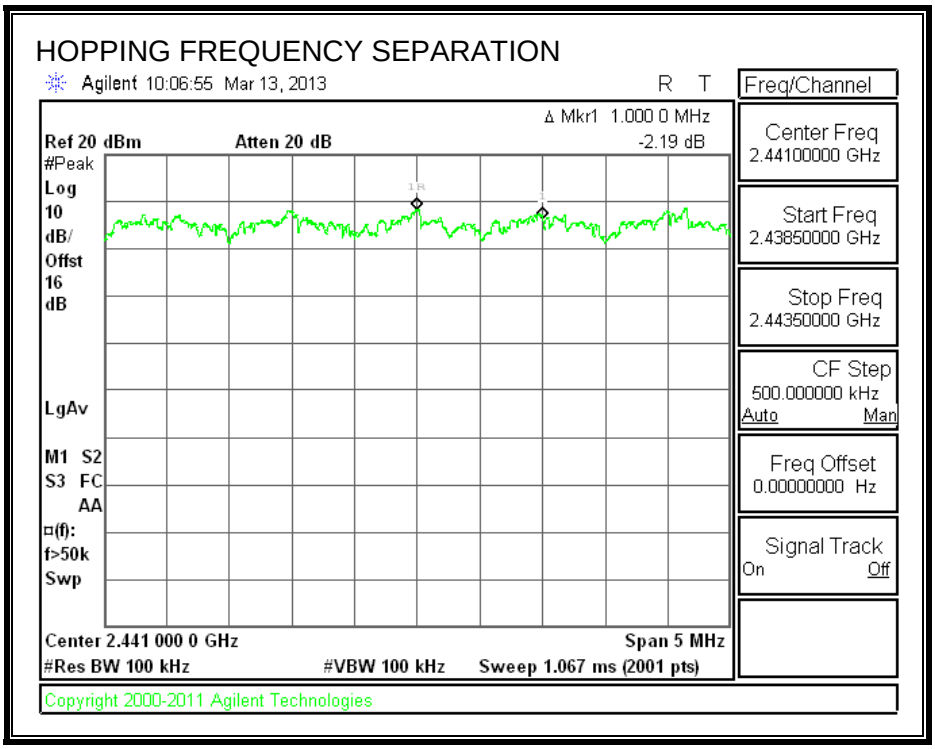
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

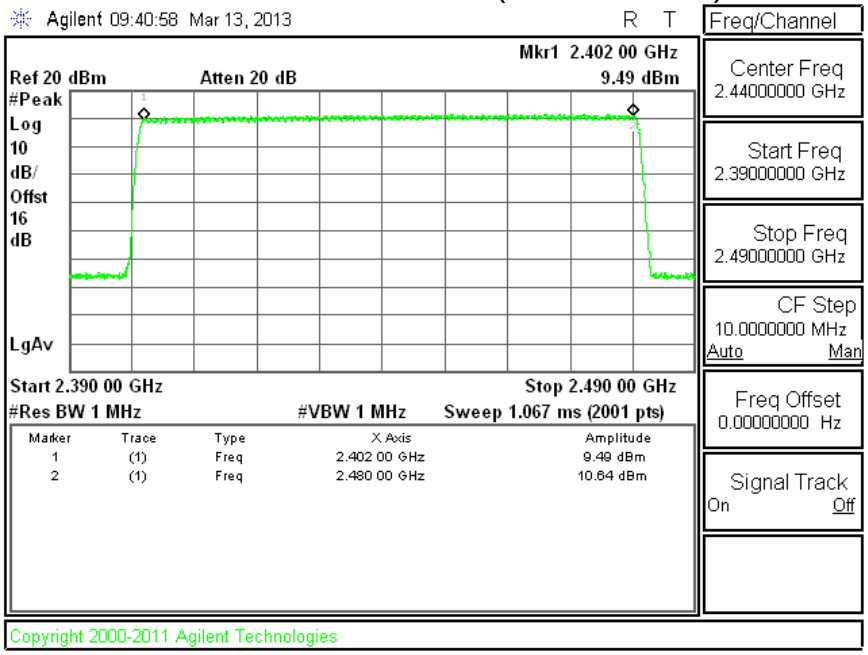
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

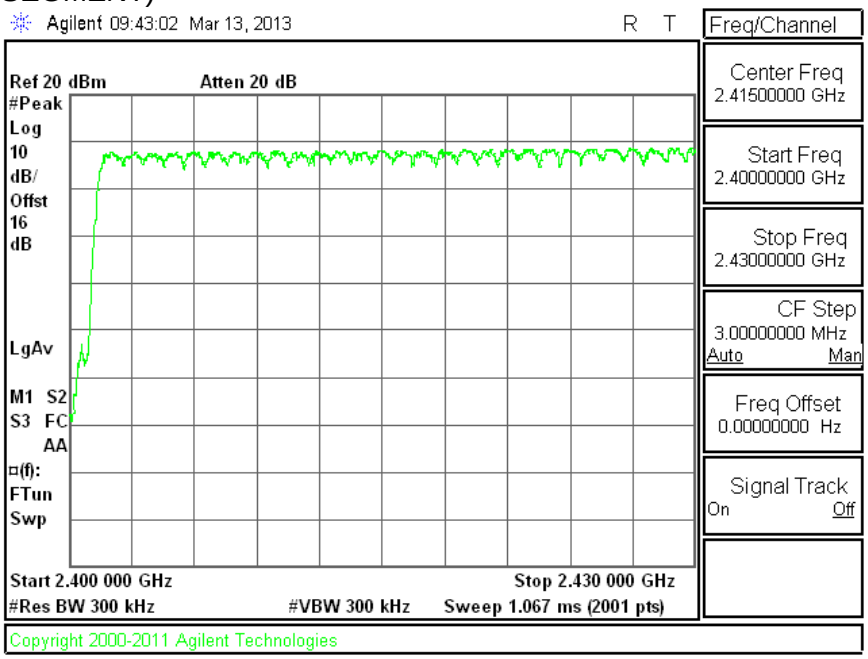
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

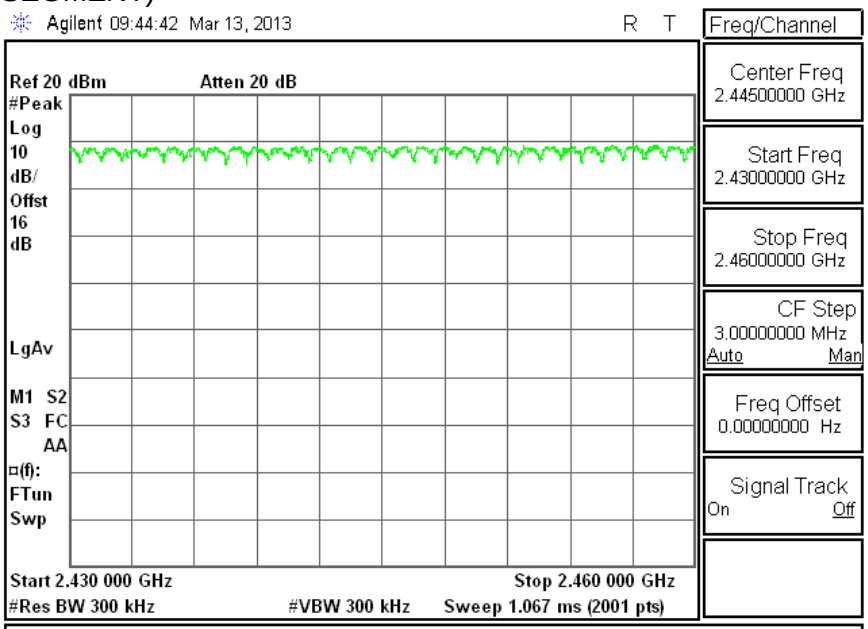
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



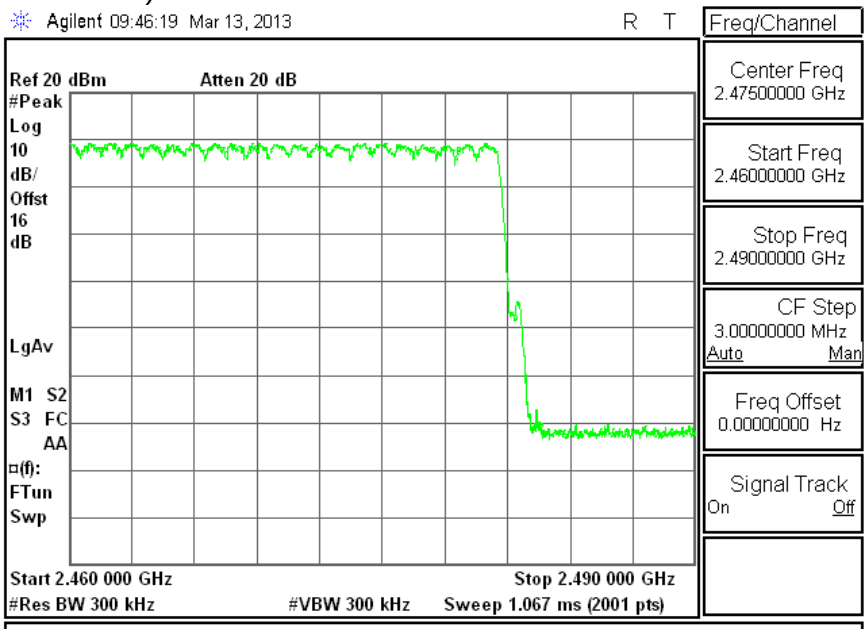
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

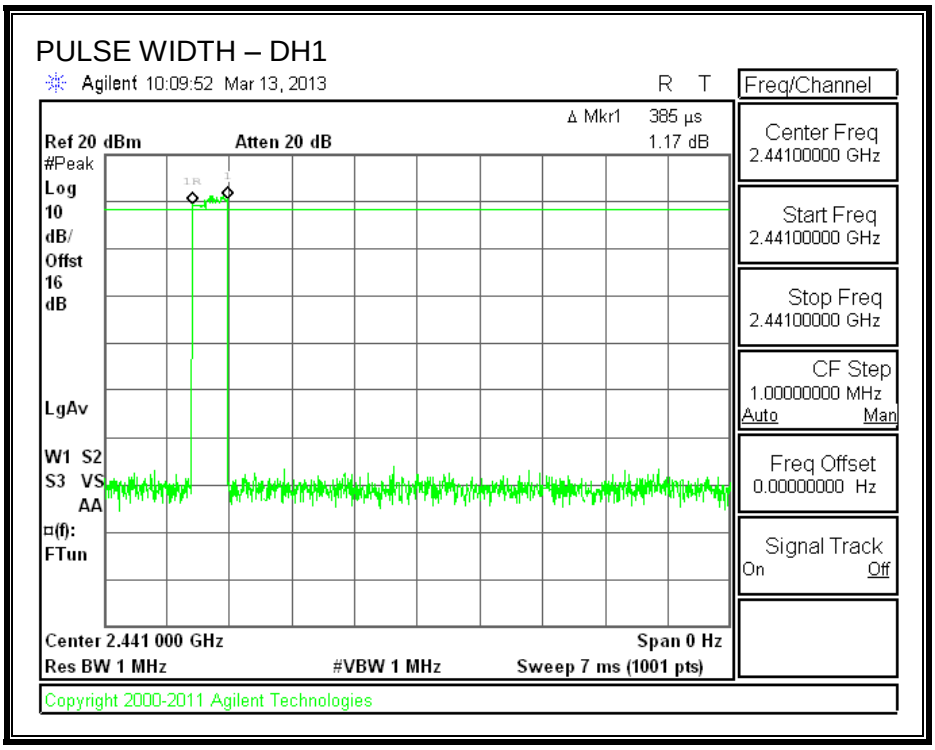
RESULTS

Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

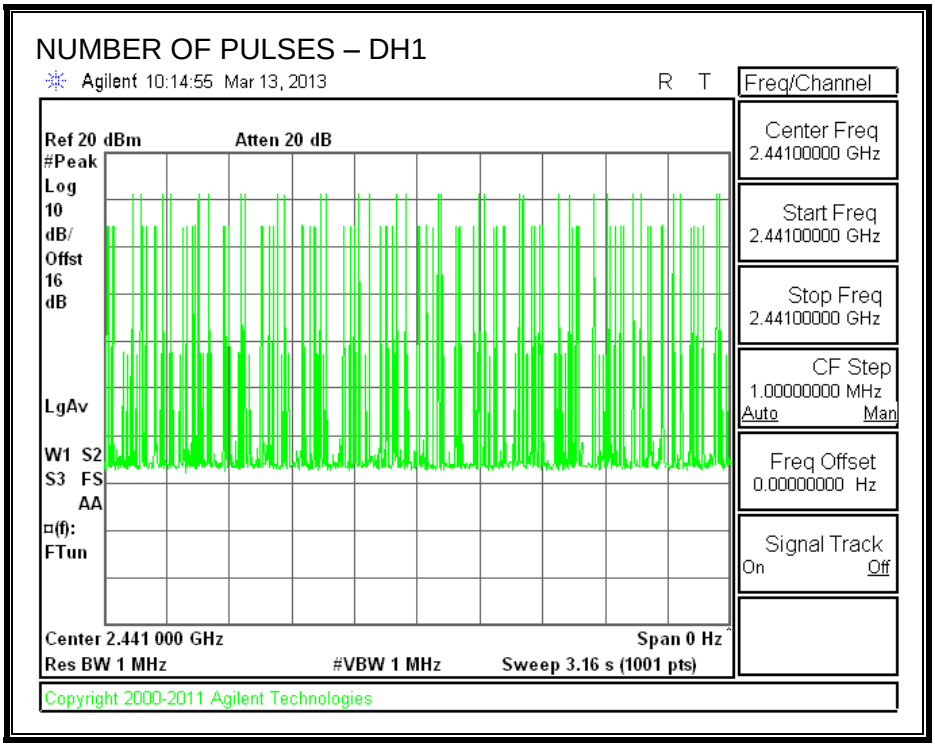
8PSK (EDR) Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.385	32	0.123	0.4	-0.277
DH3	1.645	15	0.247	0.4	-0.153
DH5	2.891	10	0.289	0.4	-0.111

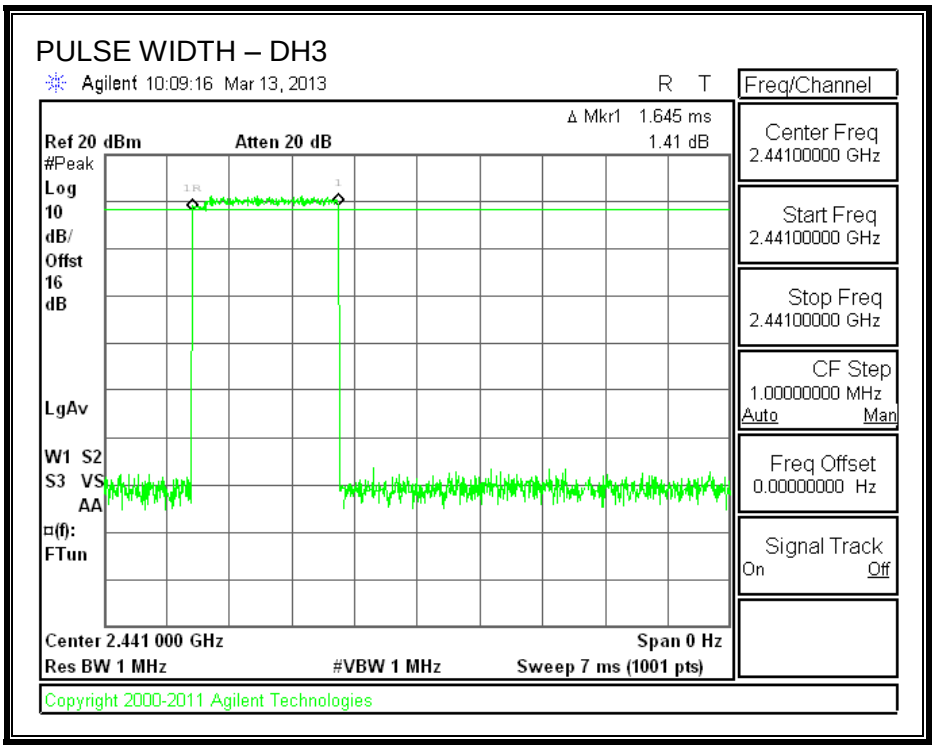
PULSE WIDTH - DH1



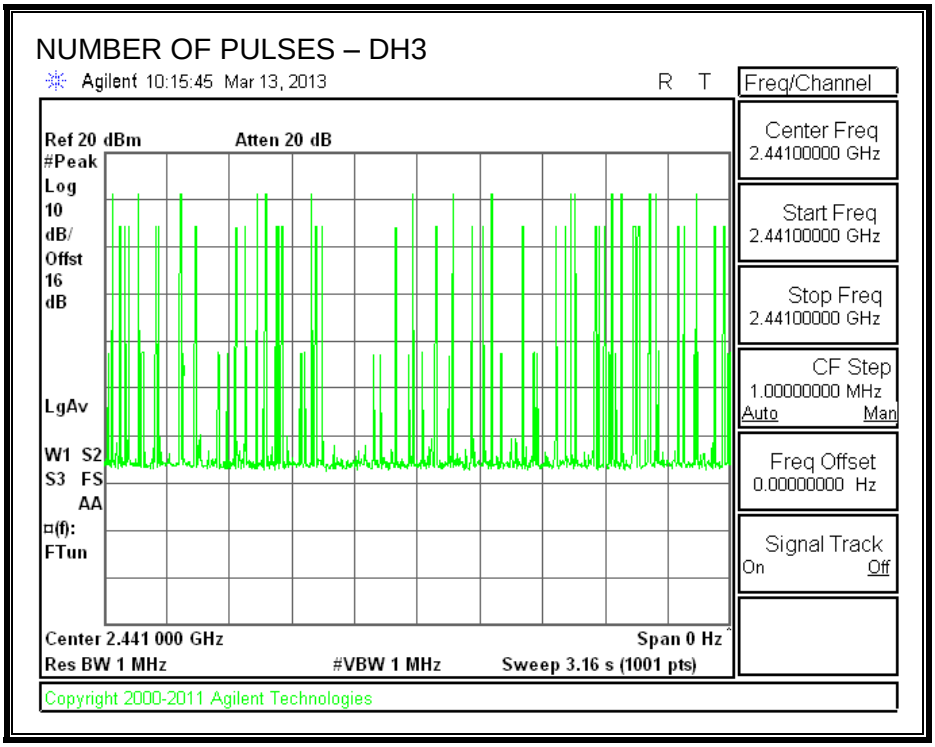
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



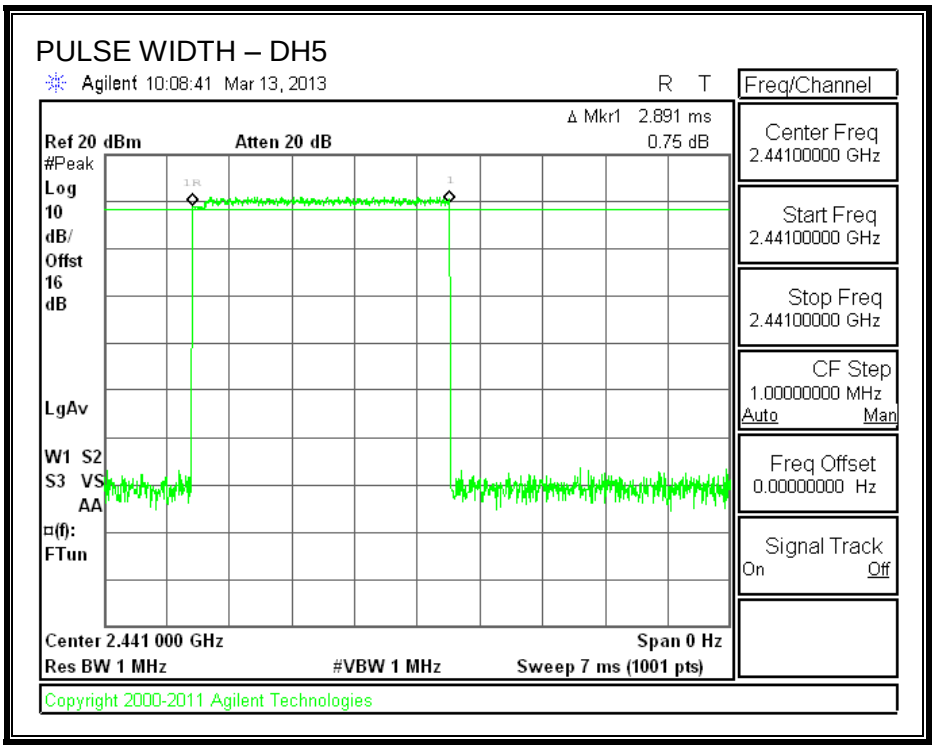
PULSE WIDTH – DH3



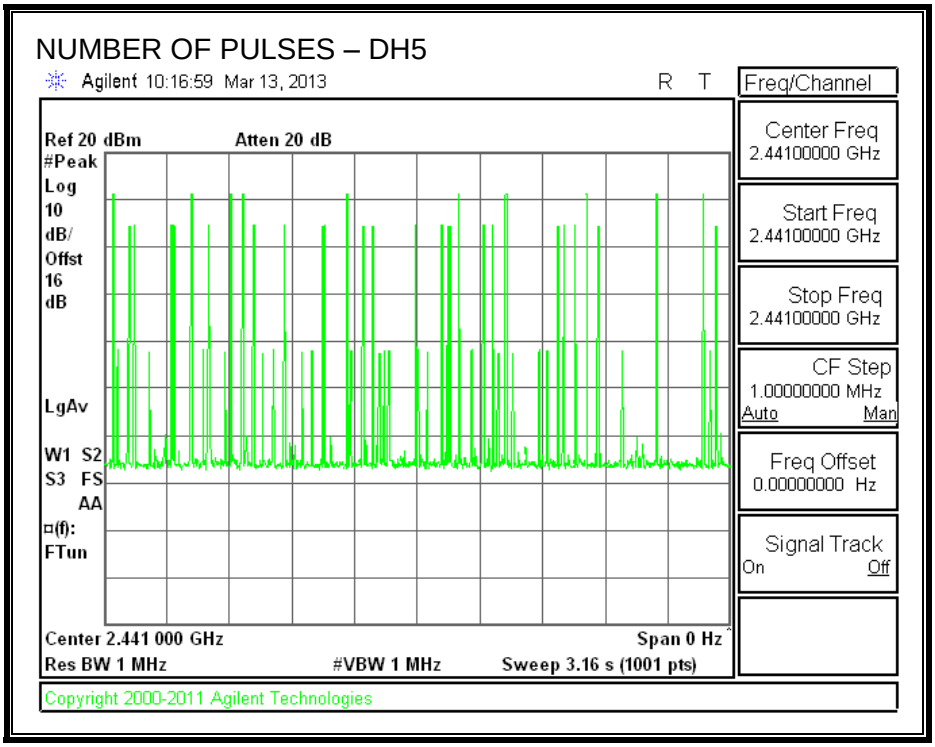
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

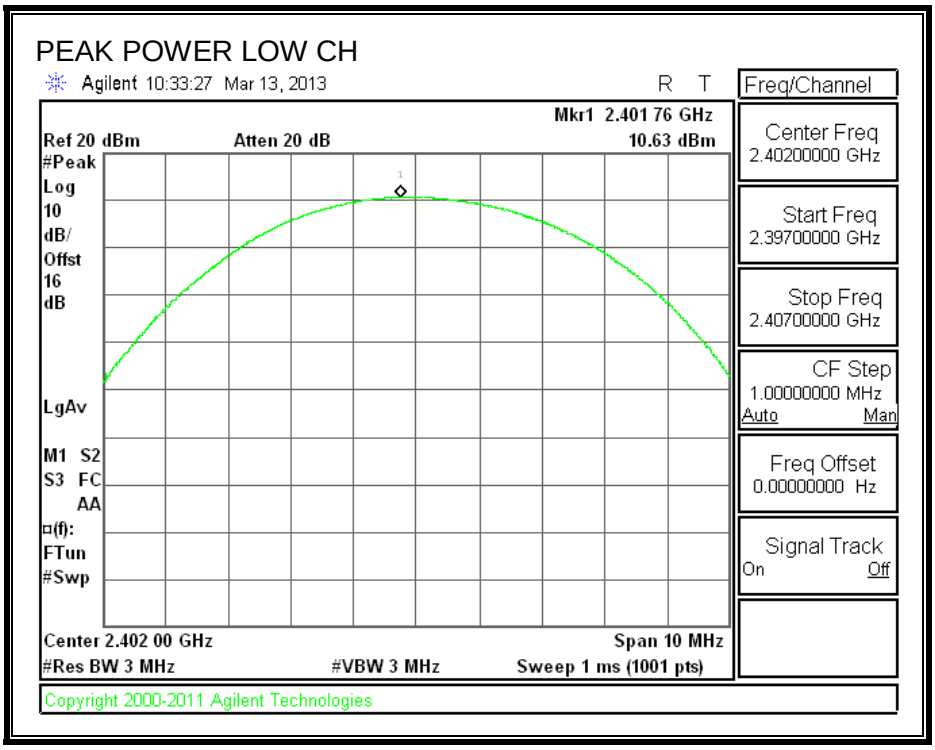
TEST PROCEDURE

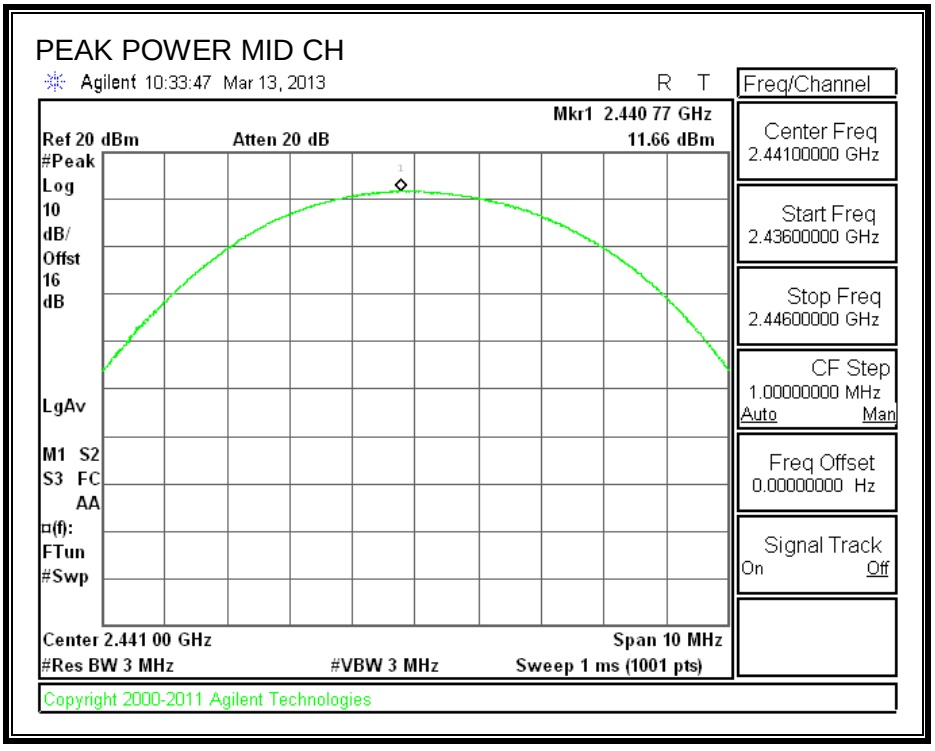
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

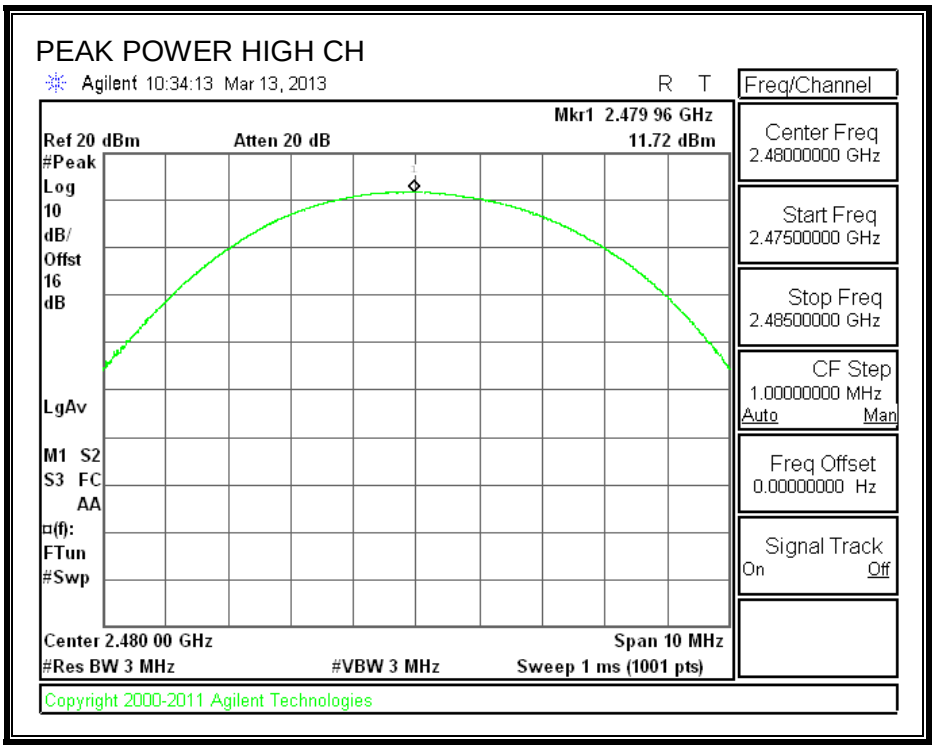
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.63	30	-19.37
Middle	2441	11.66	30	-18.34
High	2480	11.72	30	-18.28

OUTPUT POWER







7.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17.1 dB (including 16.4dB directional pad and .7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.30
Middle	2441	8.30
High	2480	8.50

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

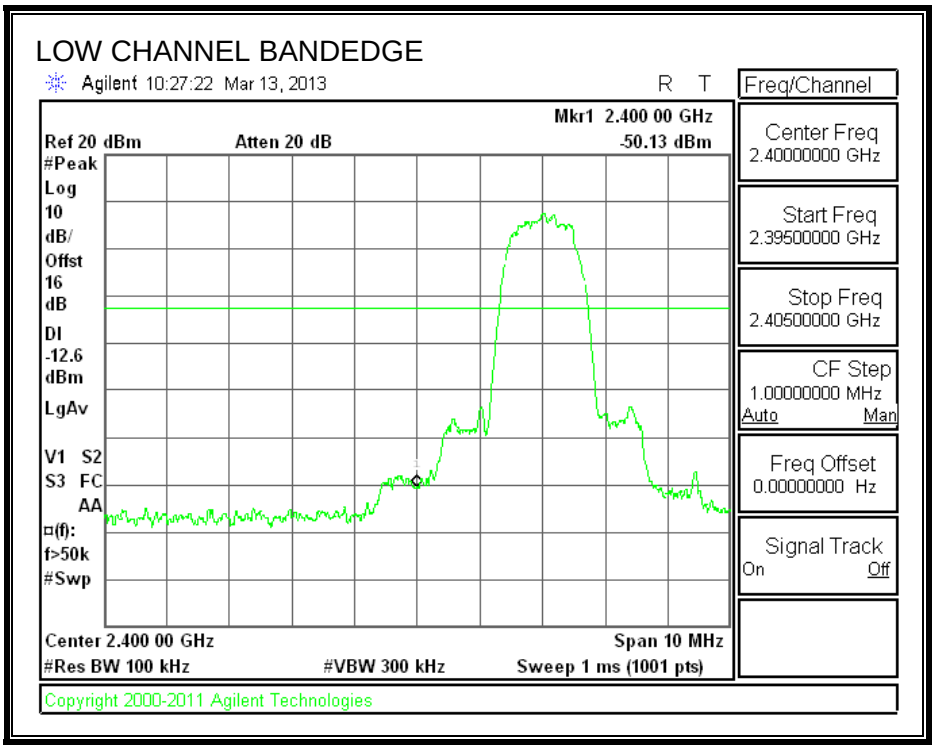
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

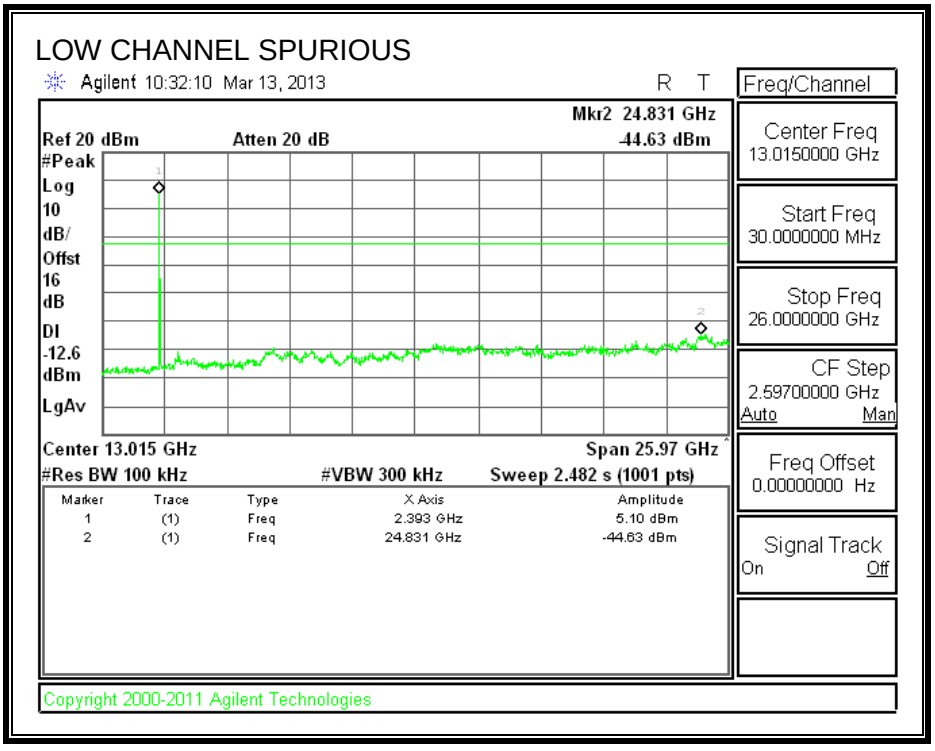
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

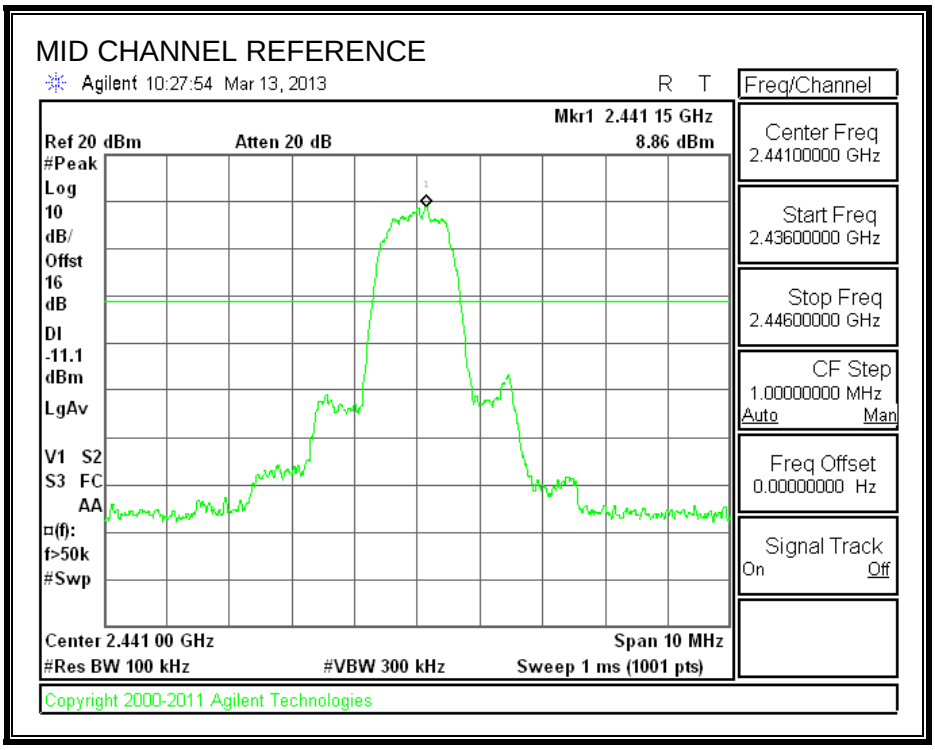
RESULTS

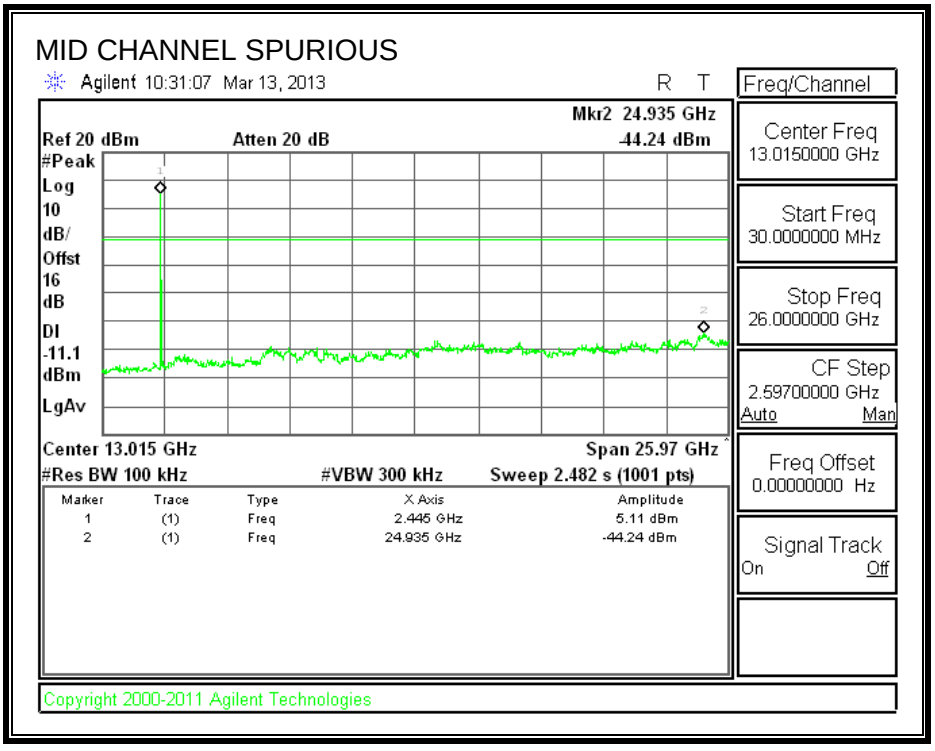
SPURIOUS EMISSIONS, LOW CHANNEL



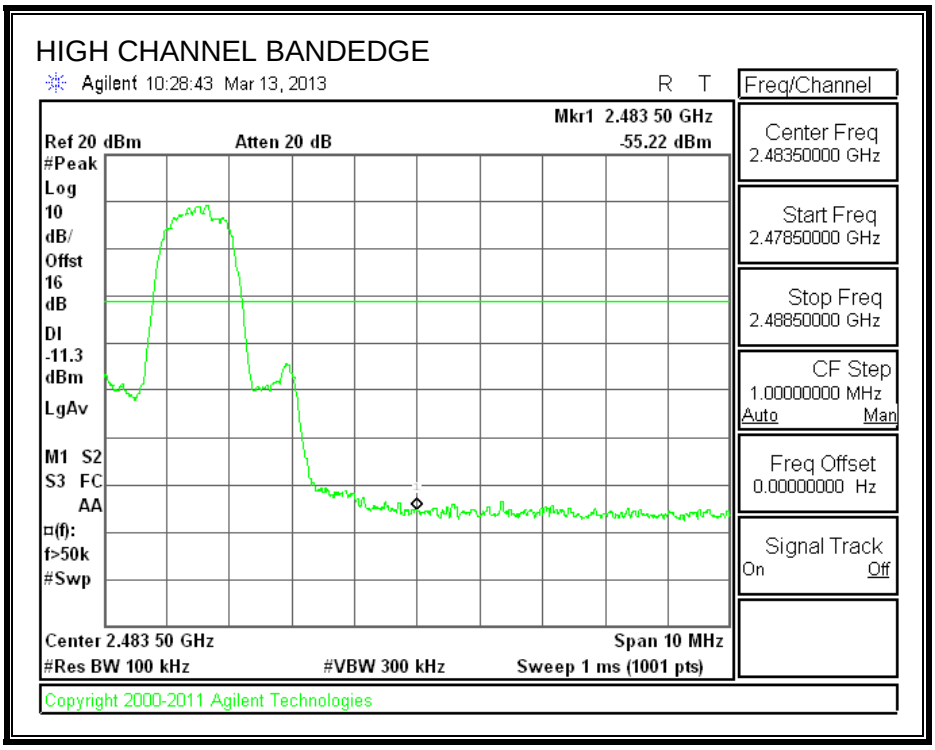


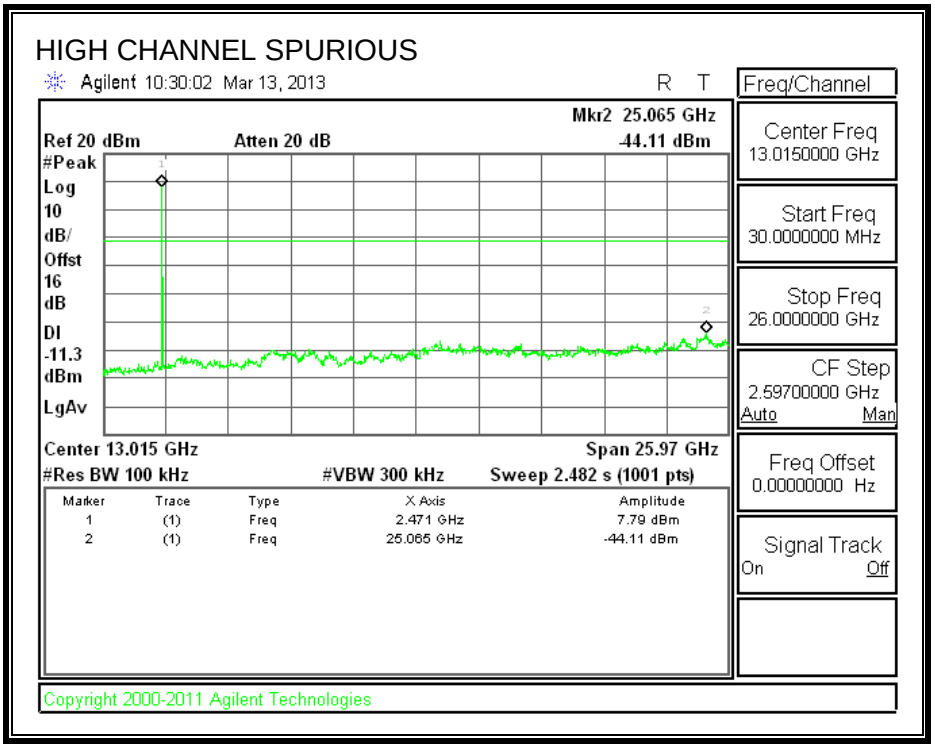
SPURIOUS EMISSIONS, MID CHANNEL





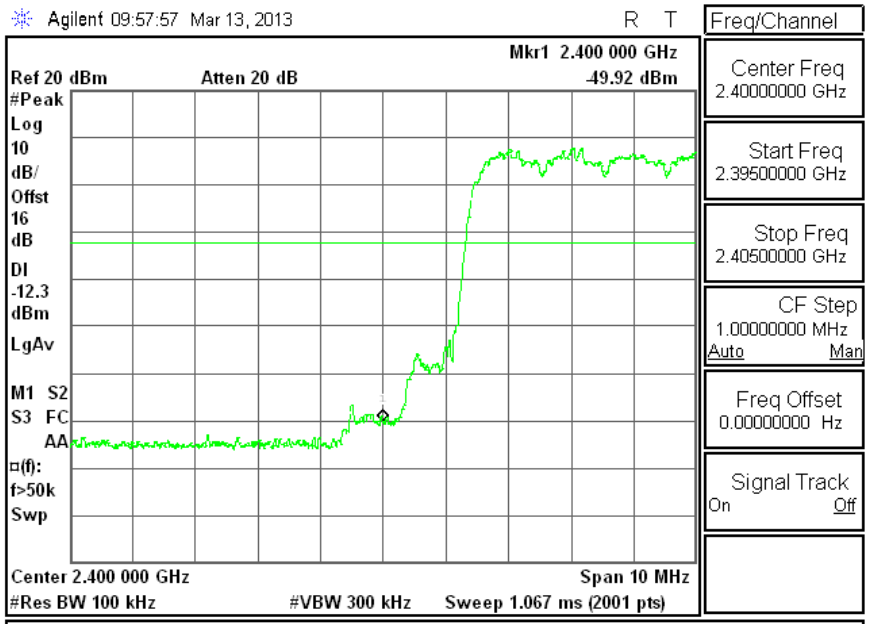
SPURIOUS EMISSIONS, HIGH CHANNEL



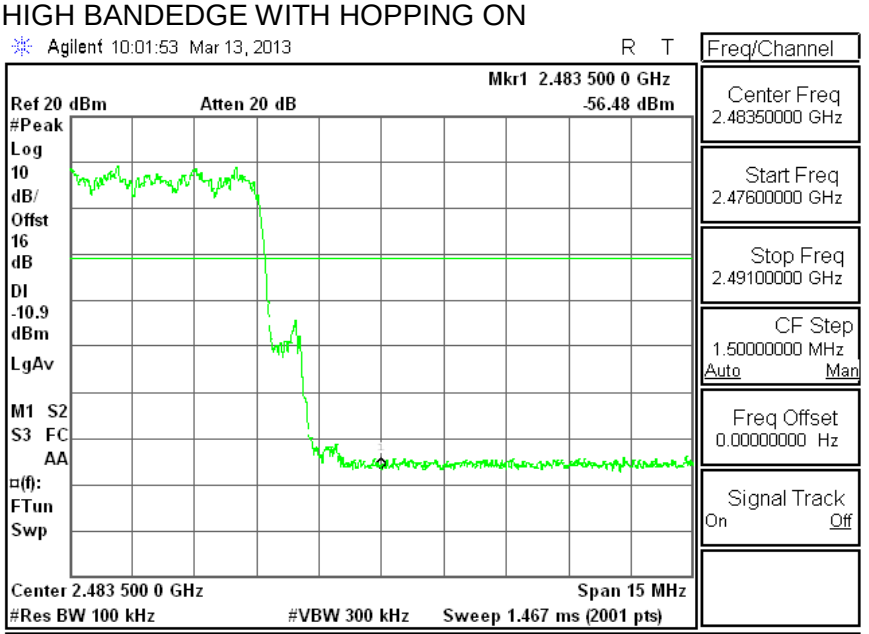


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



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

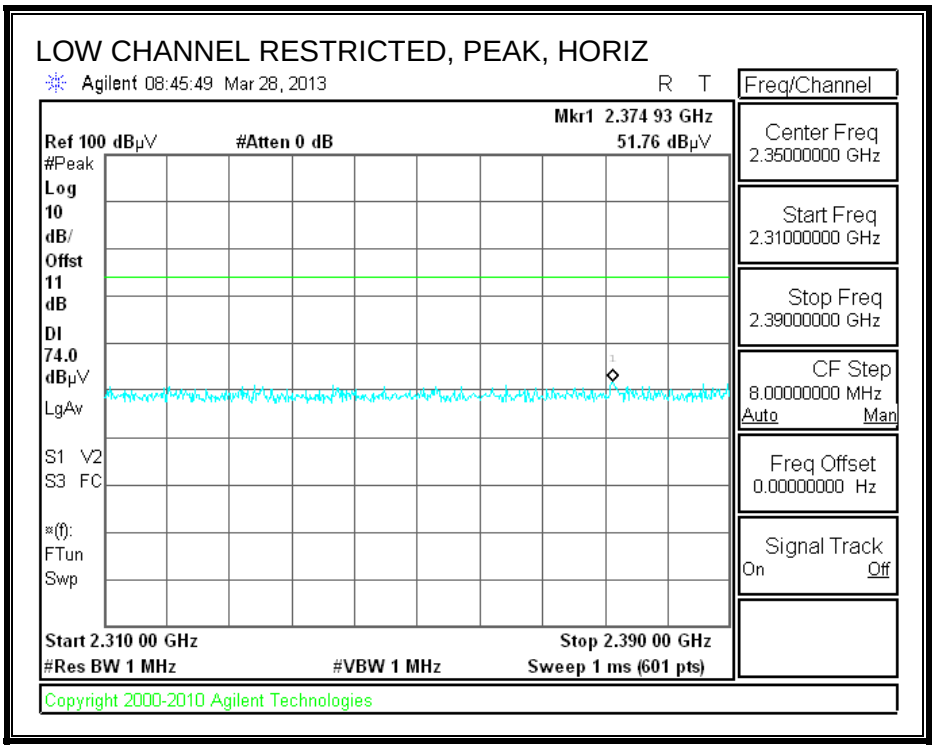
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

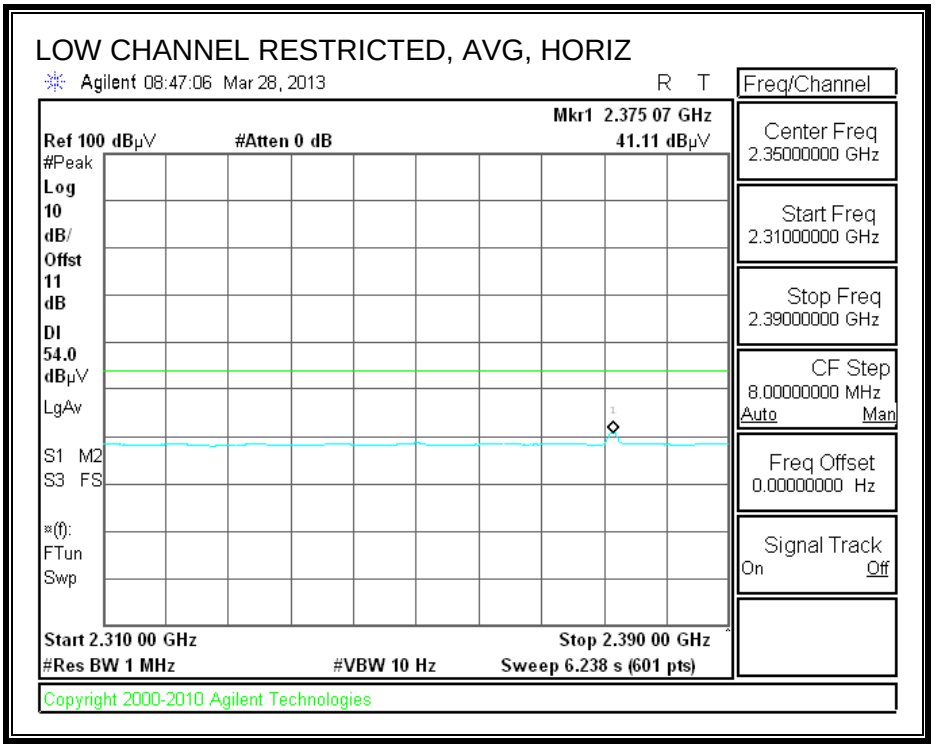
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

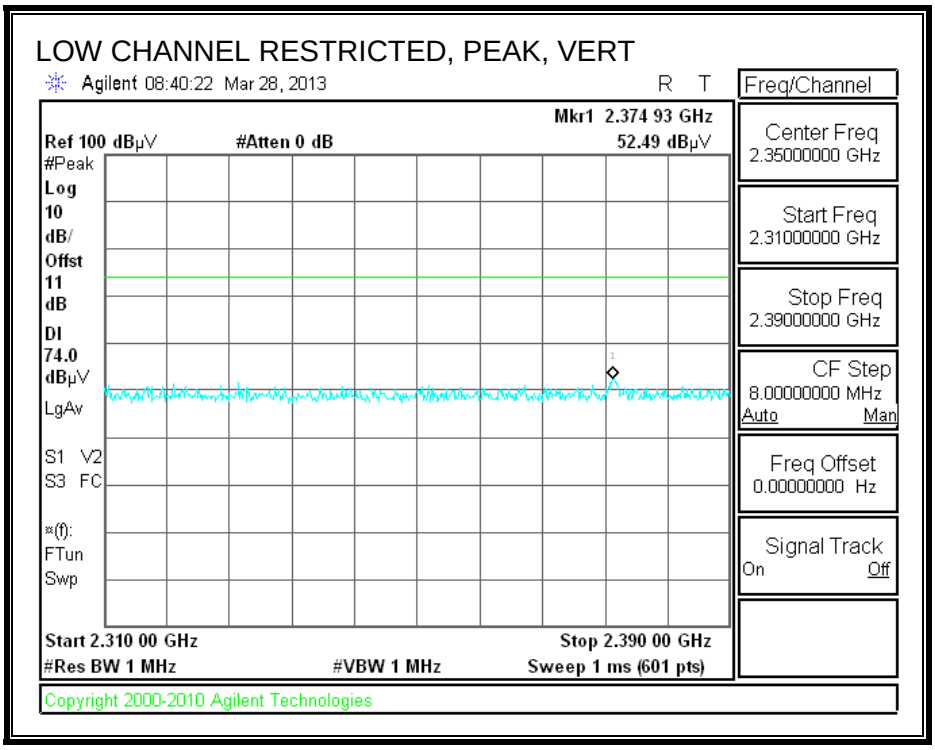
8.2.1. BASIC DATA RATE GFSK MODULATION

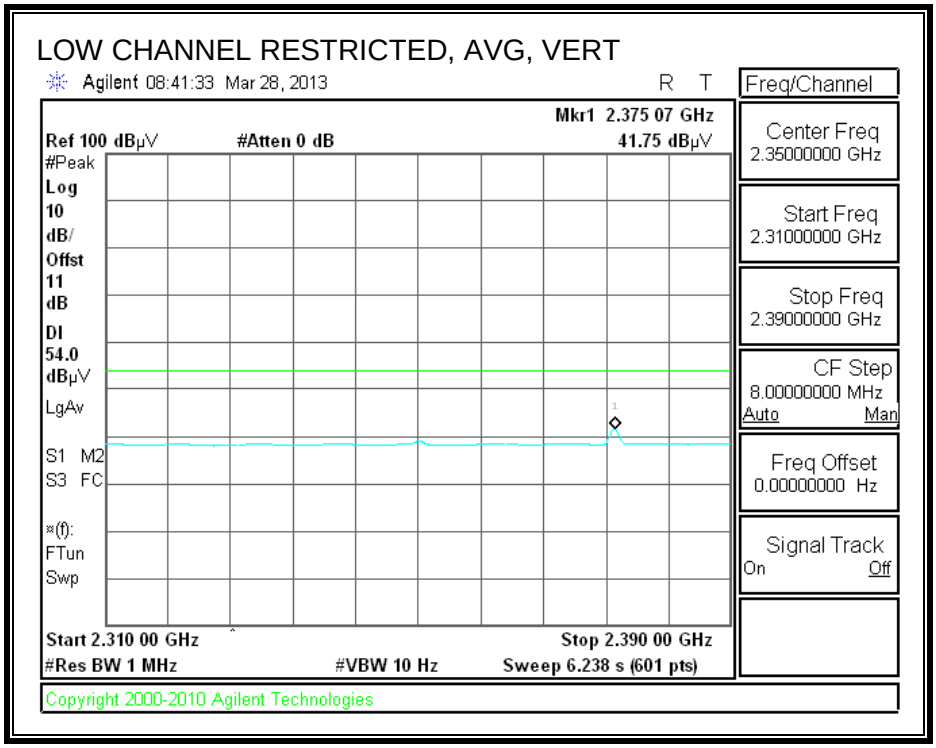
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



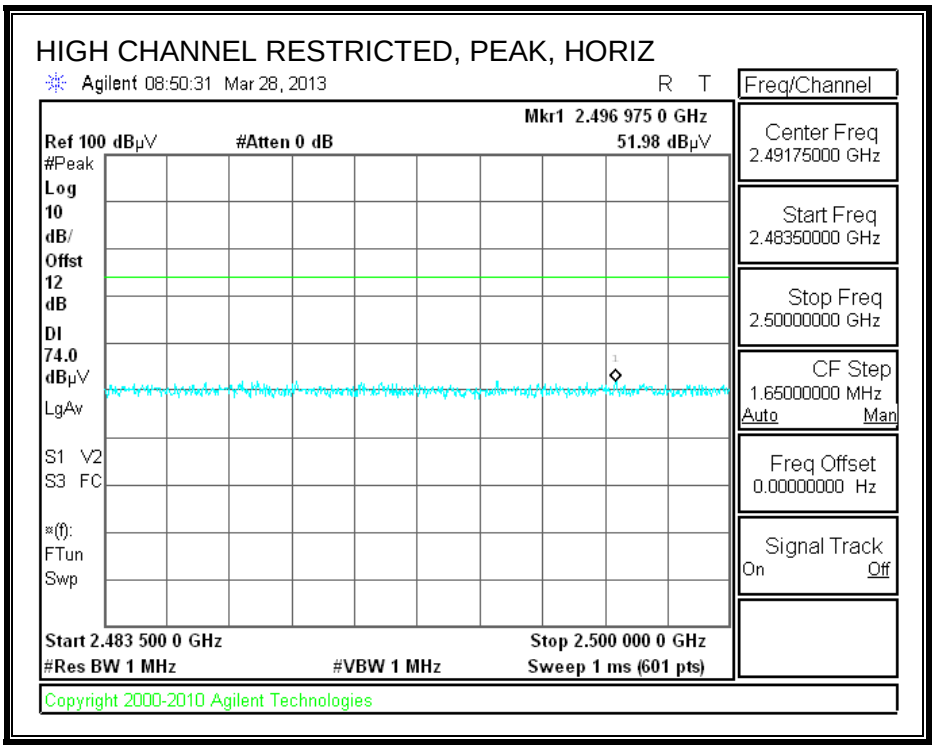


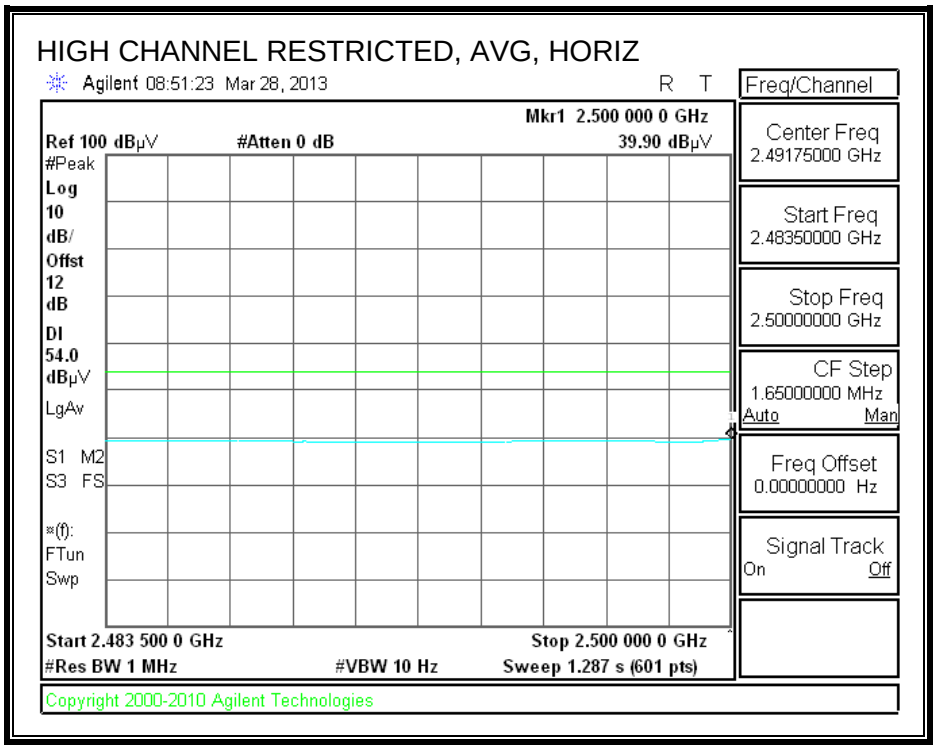
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



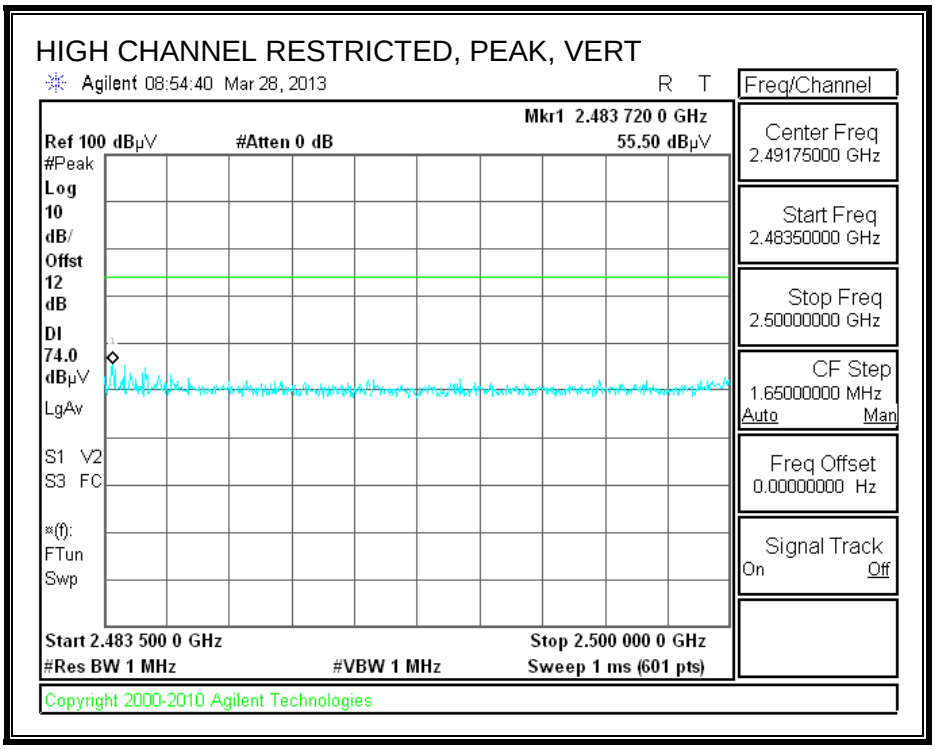


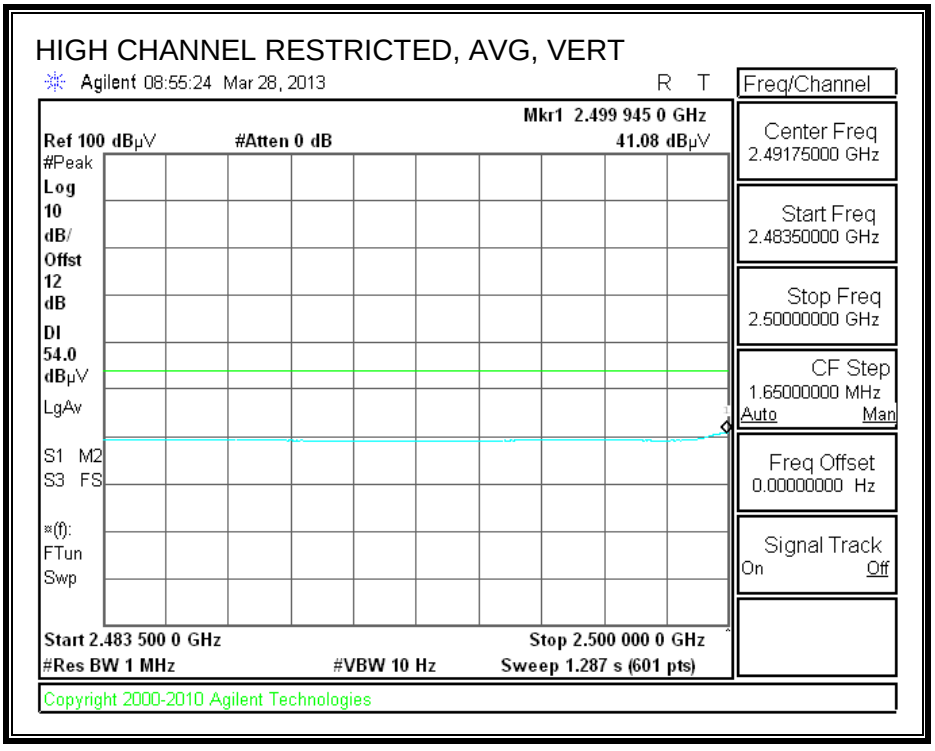
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





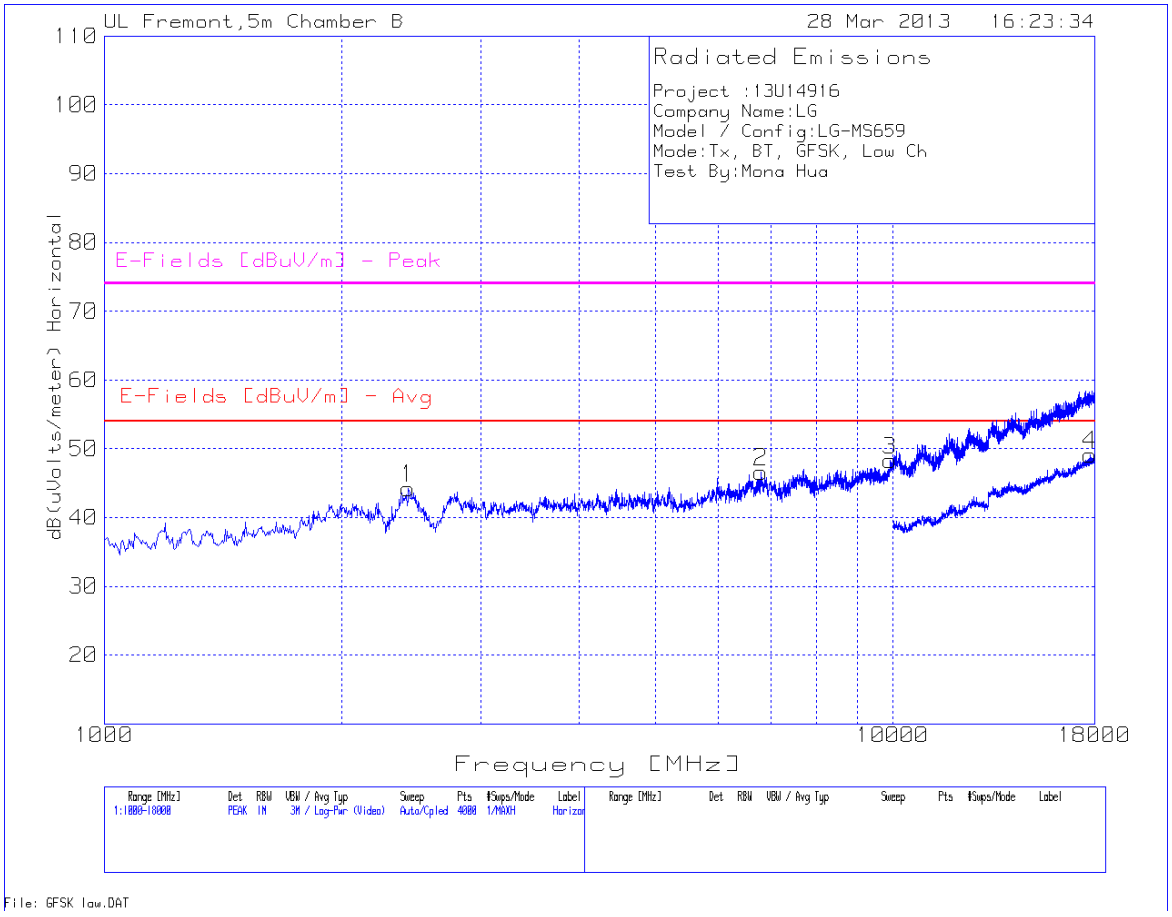
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

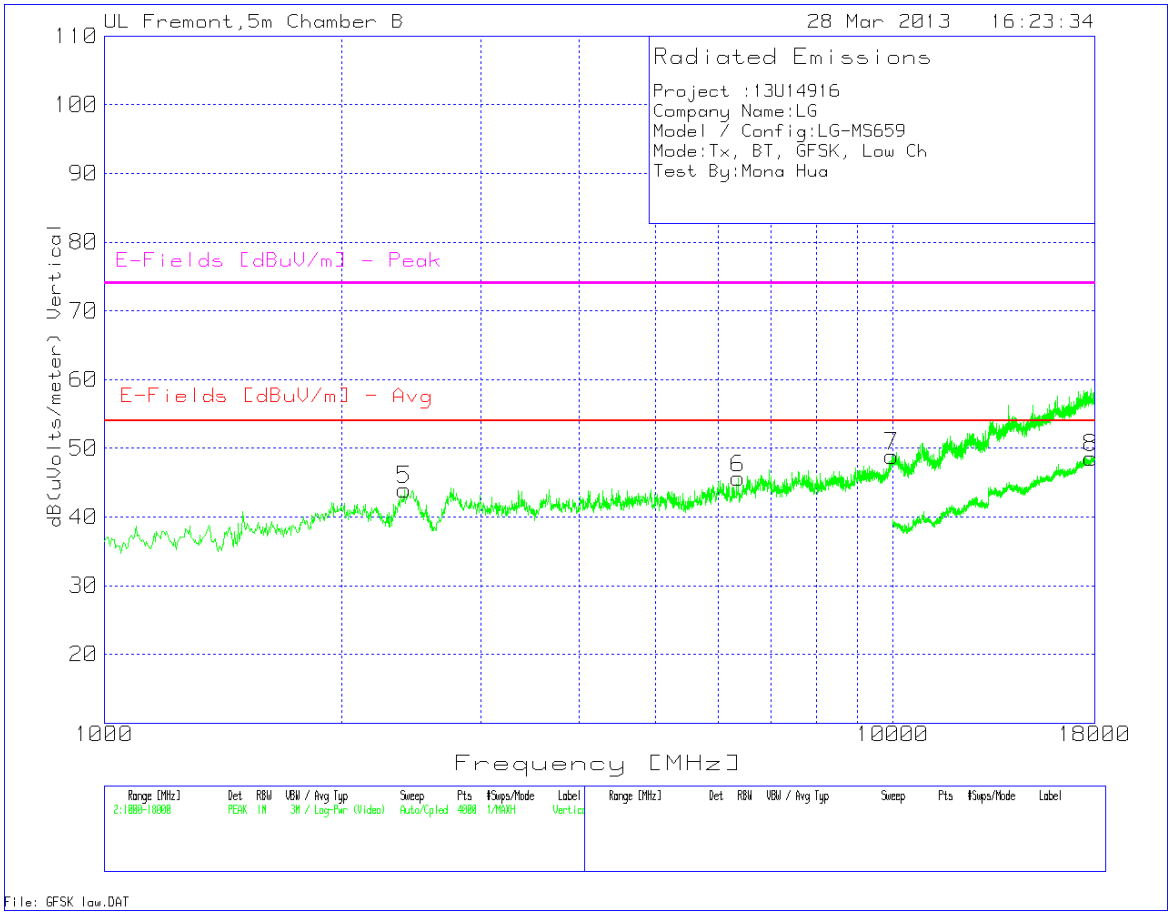
LOW HORIZONTAL



Horizontal 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2431.177	41.28	PK	32.4	-35	4.7	0.9	44.28	74	-29.72	100	Horz
2	6792.656	37.05	PK	35.8	-35	8.5	0.3	46.65	74	-27.35	200	Horz
3	9926.805	34.67	PK	37.7	-34.9	10.4	0.4	48.27	74	-25.73	100	Horz

Horizontal 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
4	17784.108	23.04	PK	42.2	-31.4	14.7	0.6	49.14	74	-24.86	100	Horz

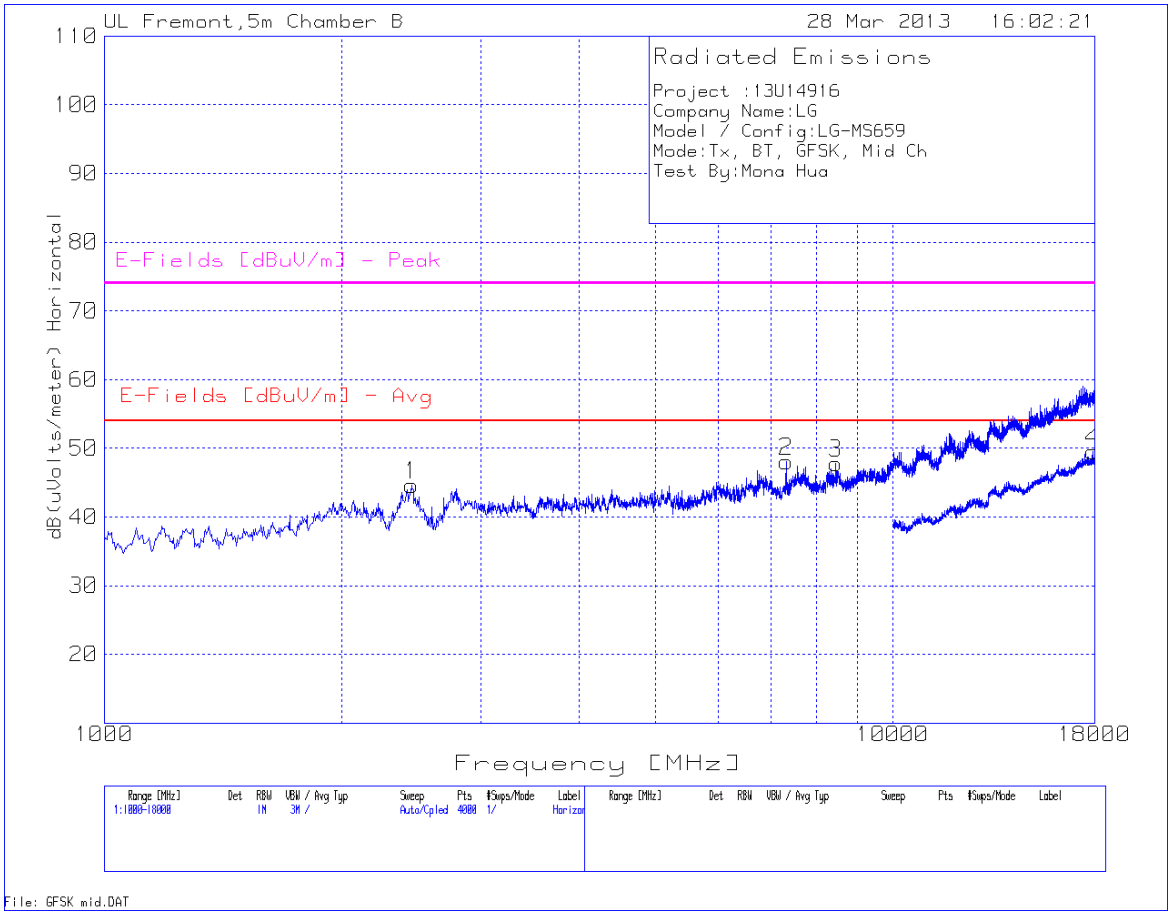
LOW VERTICAL



Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	2401.449	41.15	PK	32.3	-35	4.6	0.9	43.95	74	-30.05	200	Vert
6	6363.727	36.22	PK	36	-35	8.2	0.2	45.62	74	-28.38	100	Vert
7	9977.767	34.95	PK	37.8	-34.9	10.4	0.6	48.85	74	-25.15	100	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
8	17828.086	22.38	PK	42.2	-31.3	14.7	0.6	48.58	74	-25.42	200	Vert

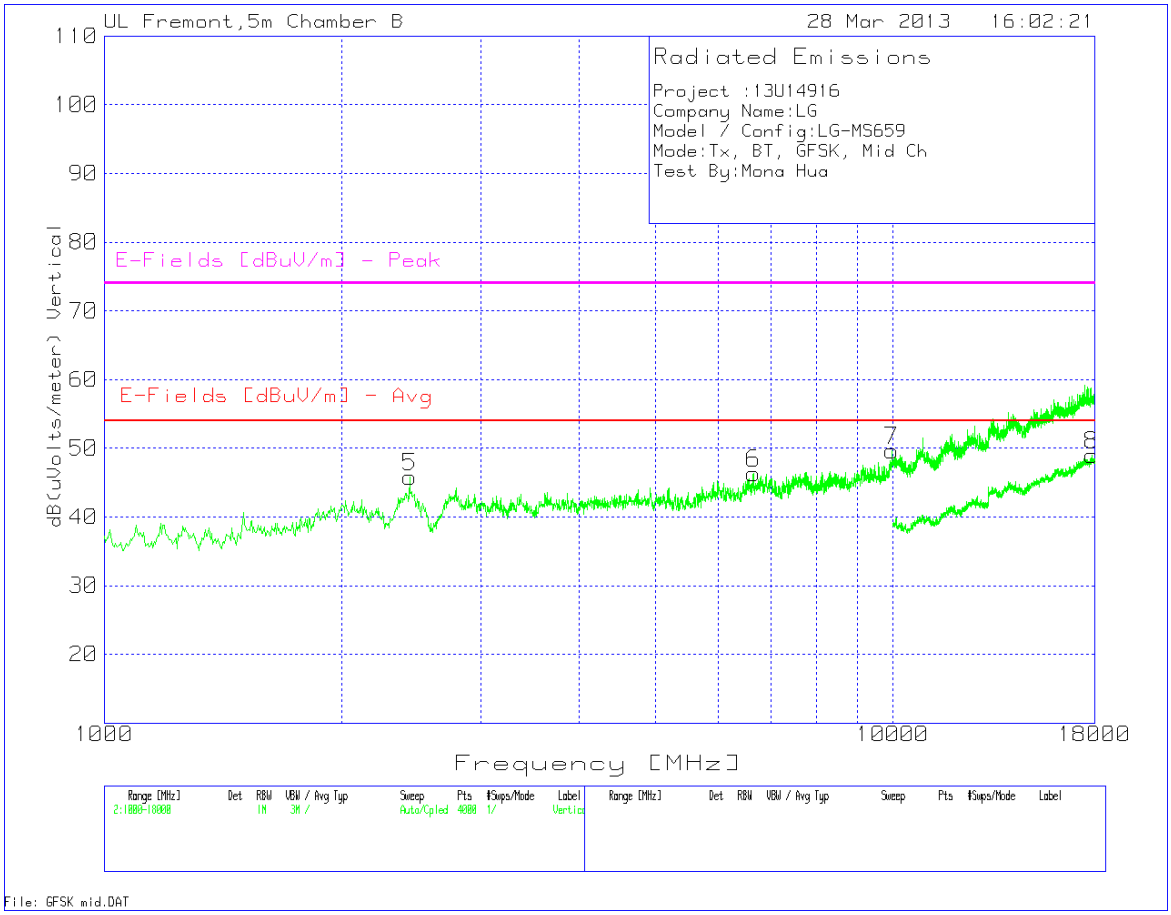
MID HORIZONTAL



Horizontal 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2452.411	41.61	PK	32.4	-35	4.7	0.9	44.61	74	-29.39	200	Horz
2	7323.507	38.12	PK	35.9	-35	8.9	0.2	48.12	74	-25.88	100	Horz
3	8465.901	36.93	PK	36.2	-35.2	9.6	0.3	47.83	74	-26.17	200	Horz

Horizontal 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
4	17928.036	23.17	PK	42.2	-31.3	14.8	0.6	49.47	74	-24.53	200	Horz

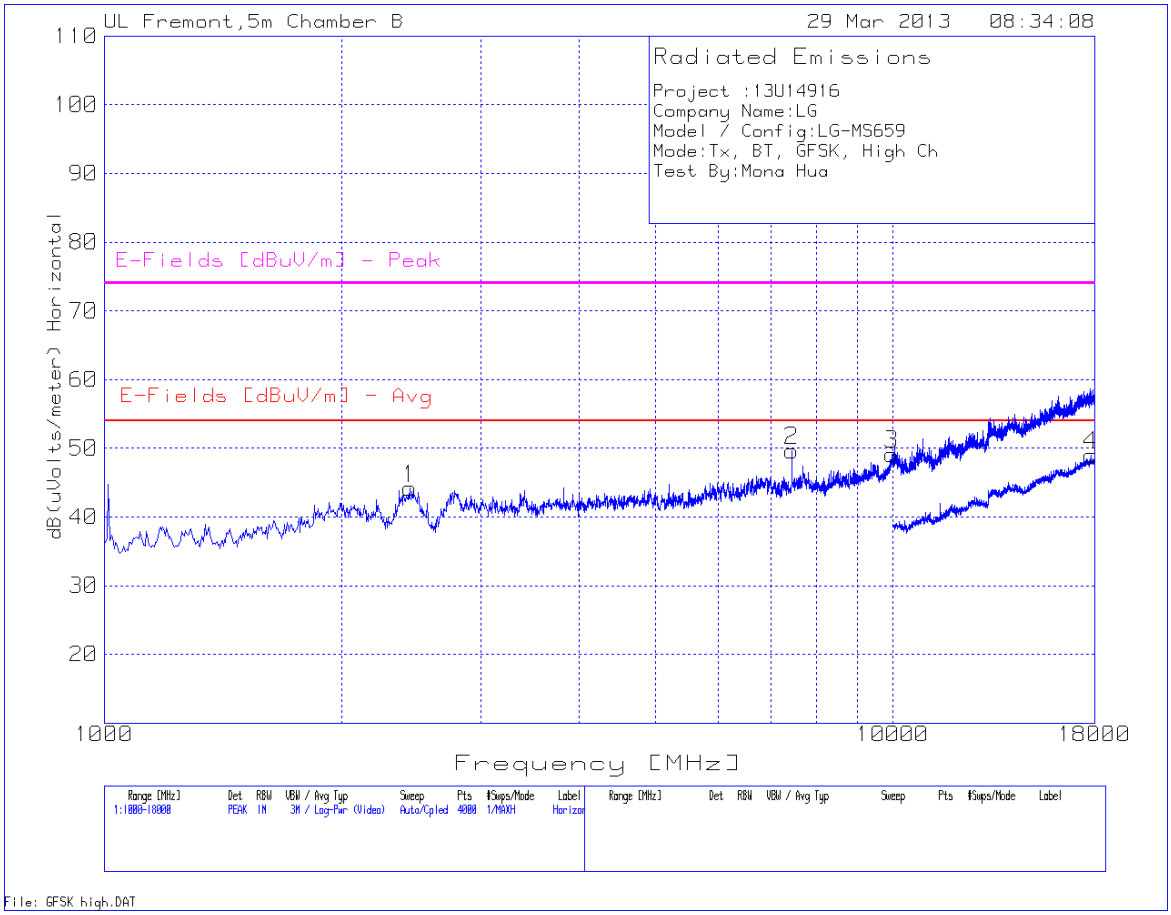
MID VERTICAL



Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	2439.67	42.81	PK	32.4	-35	4.7	0.9	45.81	74	-28.19	200	Vert
6	6652.511	36.82	PK	35.8	-35	8.4	0.3	46.32	74	-27.68	200	Vert
7	9973.52	35.76	PK	37.8	-34.9	10.4	0.6	49.66	74	-24.34	200	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
8	17864.068	22.72	PK	42.2	-31.3	14.8	0.6	49.02	74	-24.98	200	Vert

HIGH HORIZONTAL



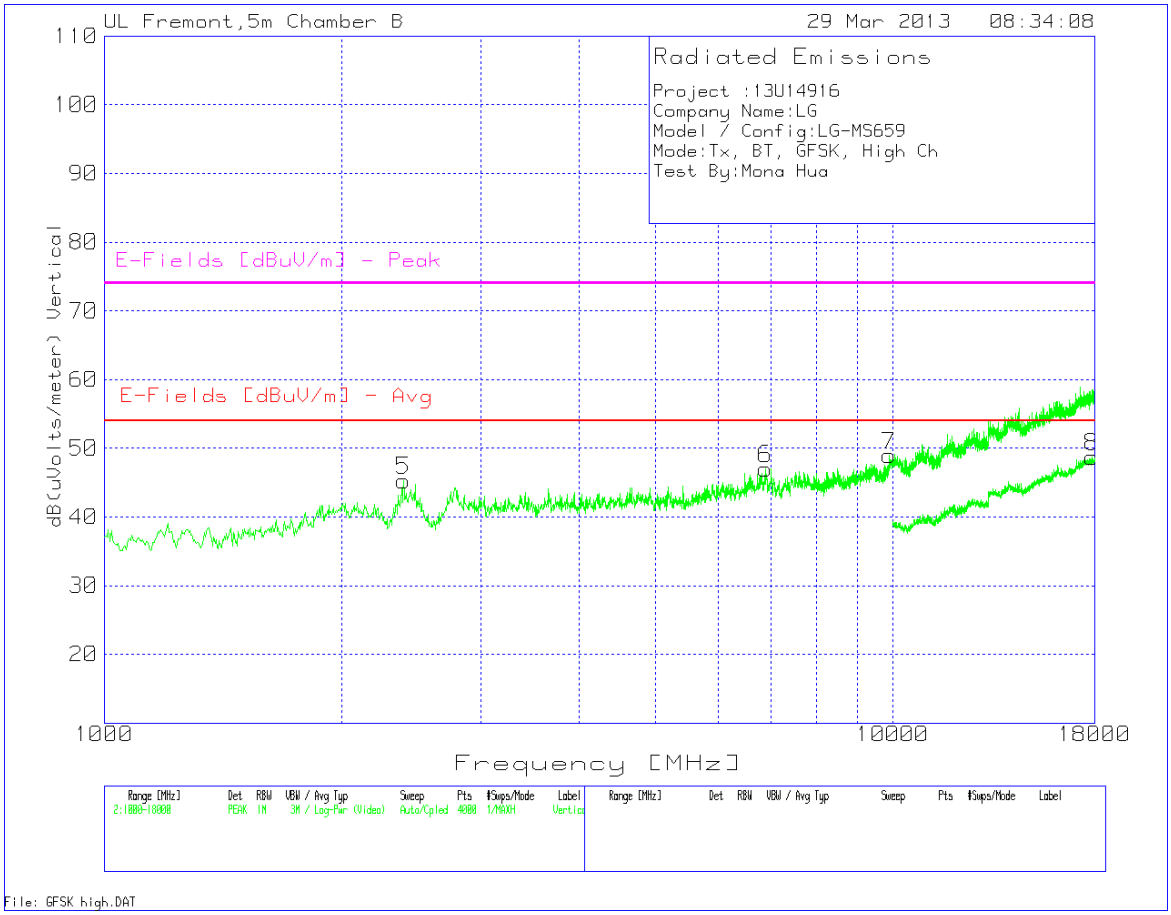
Horizontal 1000 - 18000MHz

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2439.67	41.16	PK	32.4	-35	4.7	0.9	44.16	74	-29.84	131	Horz
2	7438.171	39.41	PK	36	-35	8.9	0.3	49.61	74	-24.39	131	Horz
3	9960.779	35.36	PK	37.8	-34.9	10.4	0.5	49.16	74	-24.84	200	Horz

Horizontal 10000 - 18000MHz

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
4	17820.09	22.94	PK	42.2	-31.4	14.7	0.6	49.04	74	-24.96	100	Horz

HIGH VERTICAL

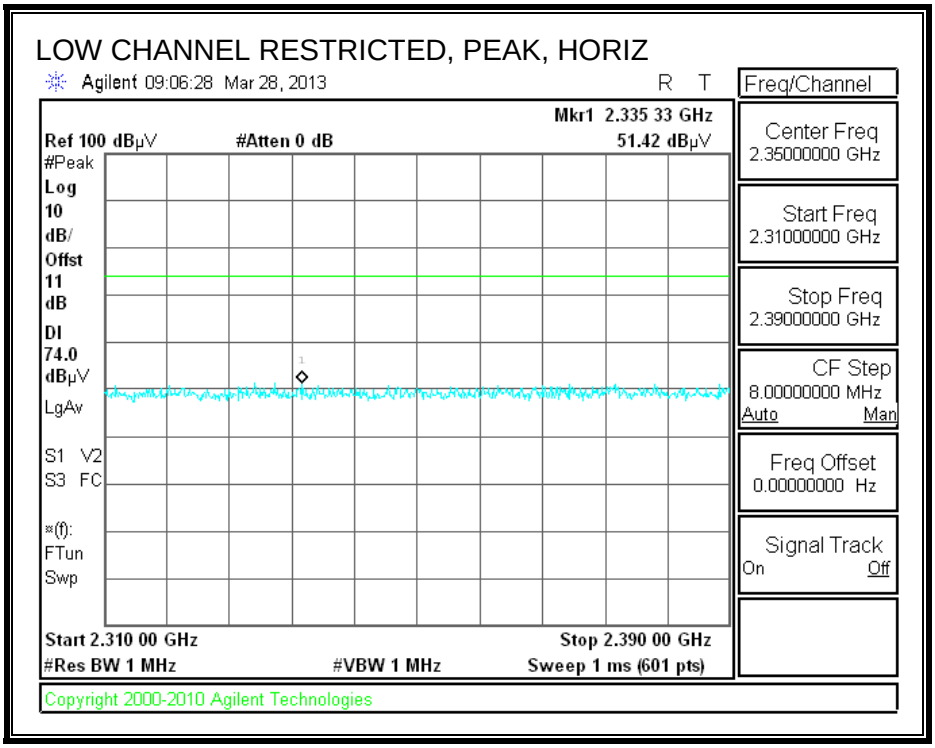


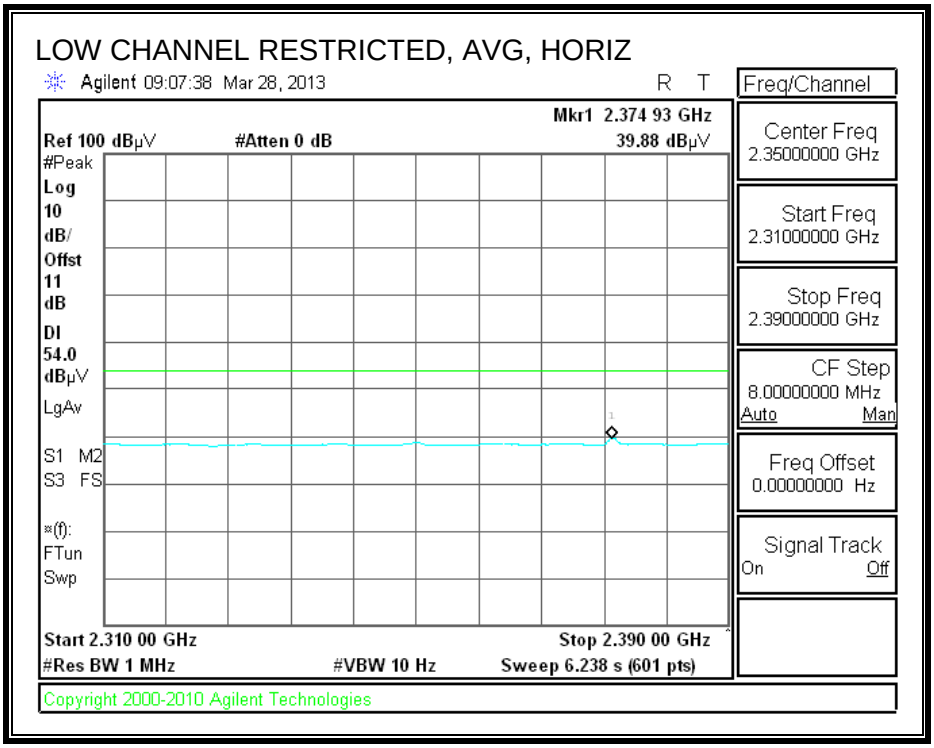
Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	2397.202	42.51	PK	32.3	-35	4.6	0.9	45.31	74	-28.69	200	Vert
6	6898.826	37.33	PK	35.9	-35	8.6	0.2	47.03	74	-26.97	200	Vert
7	9892.83	35.33	PK	37.7	-34.9	10.4	0.4	48.93	74	-25.07	100	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
8	17872.064	22.42	PK	42.2	-31.3	14.8	0.6	48.72	74	-25.28	200	Vert

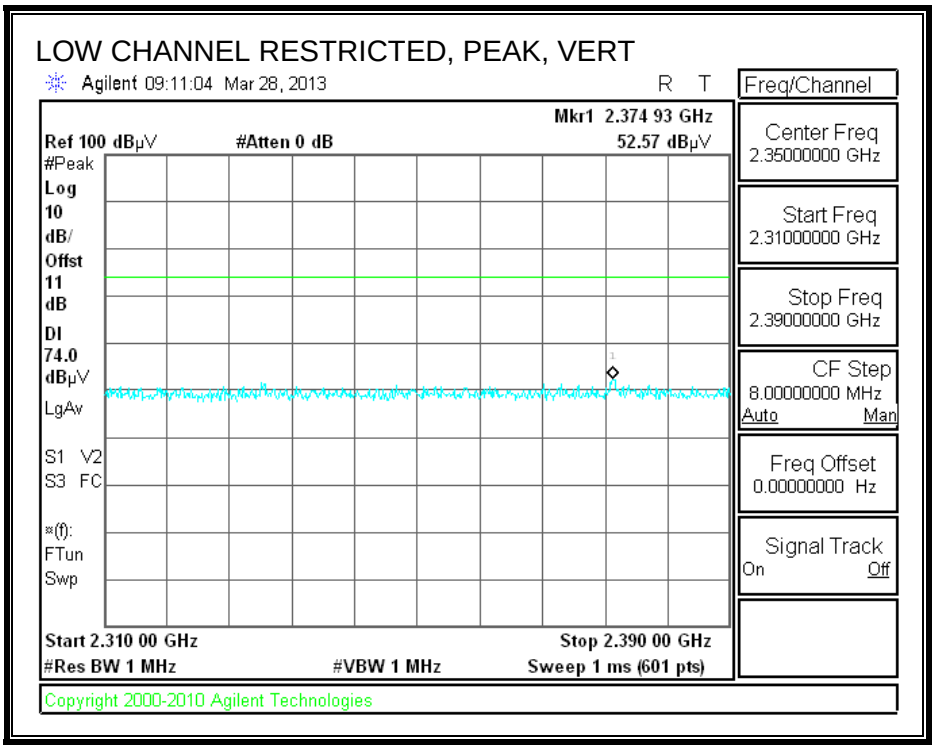
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

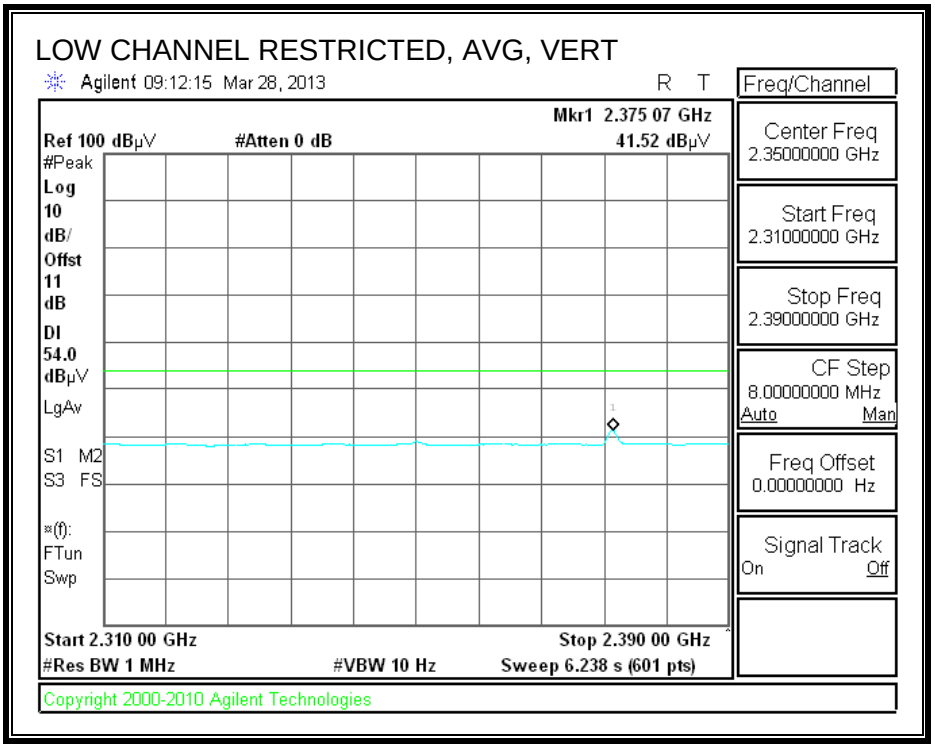
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



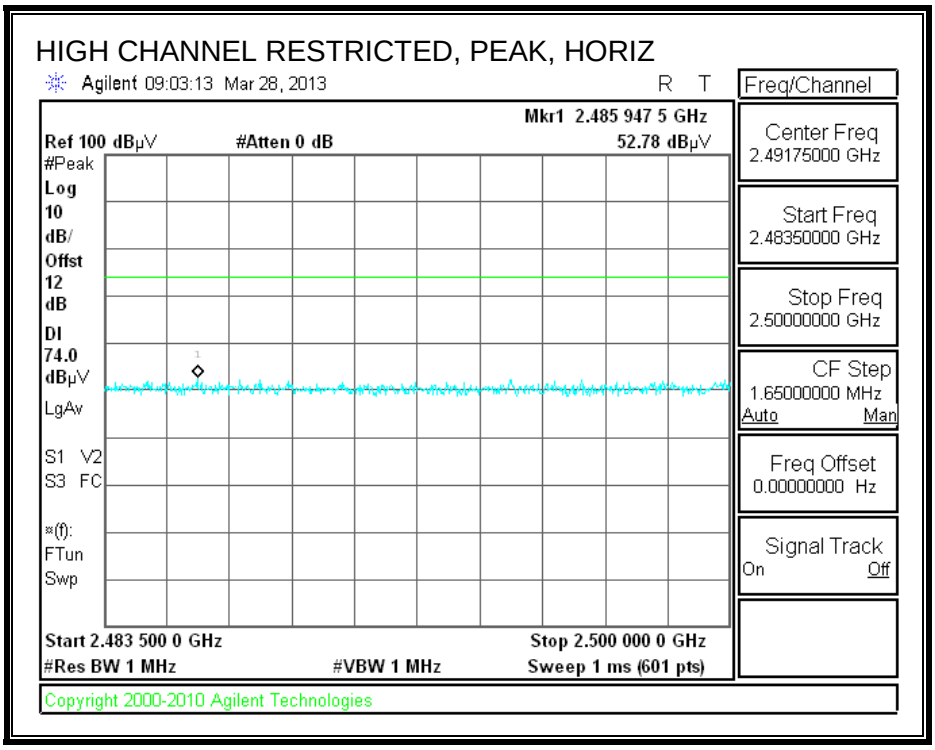


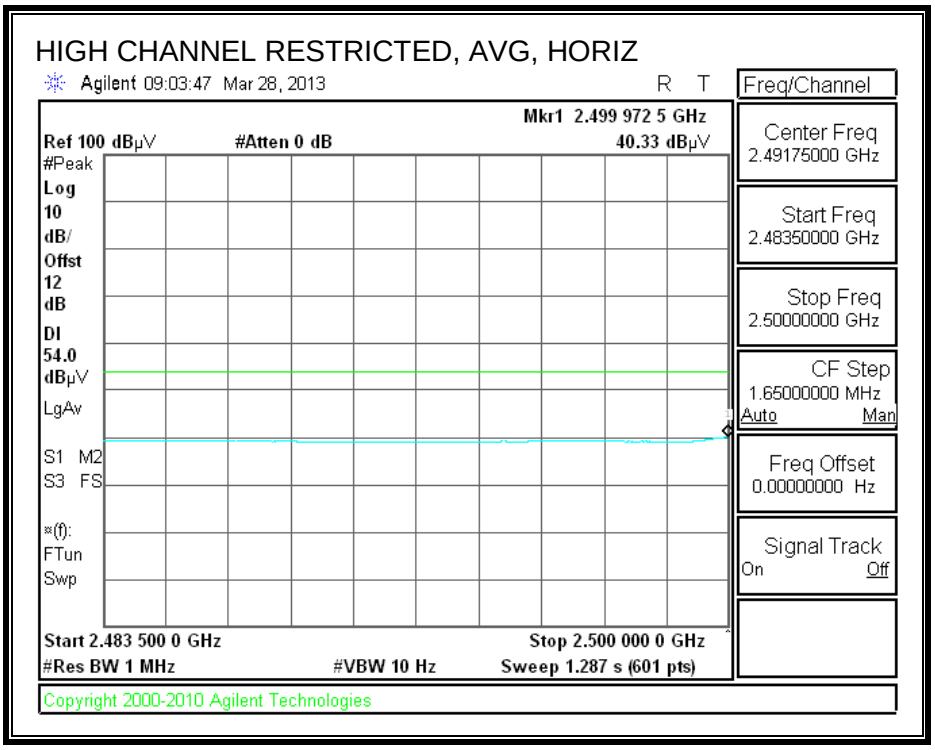
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



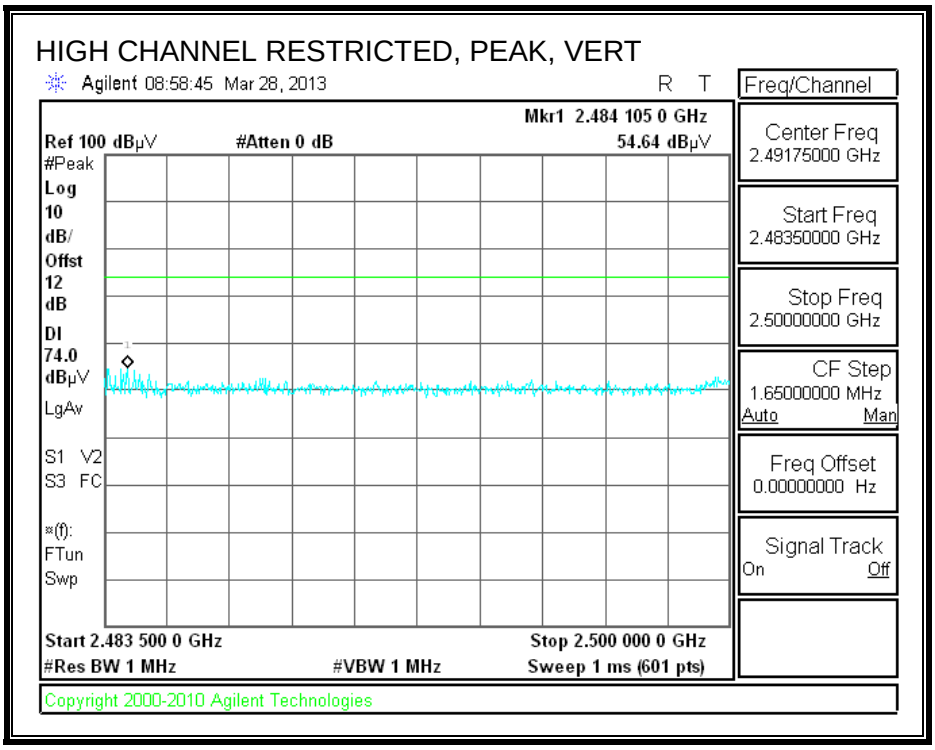


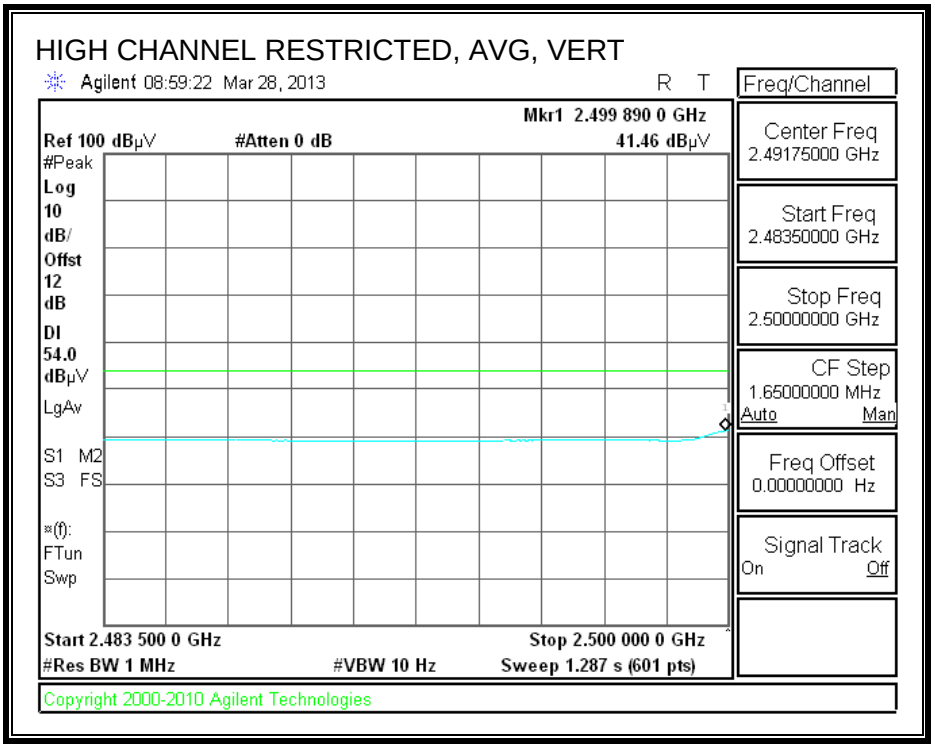
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





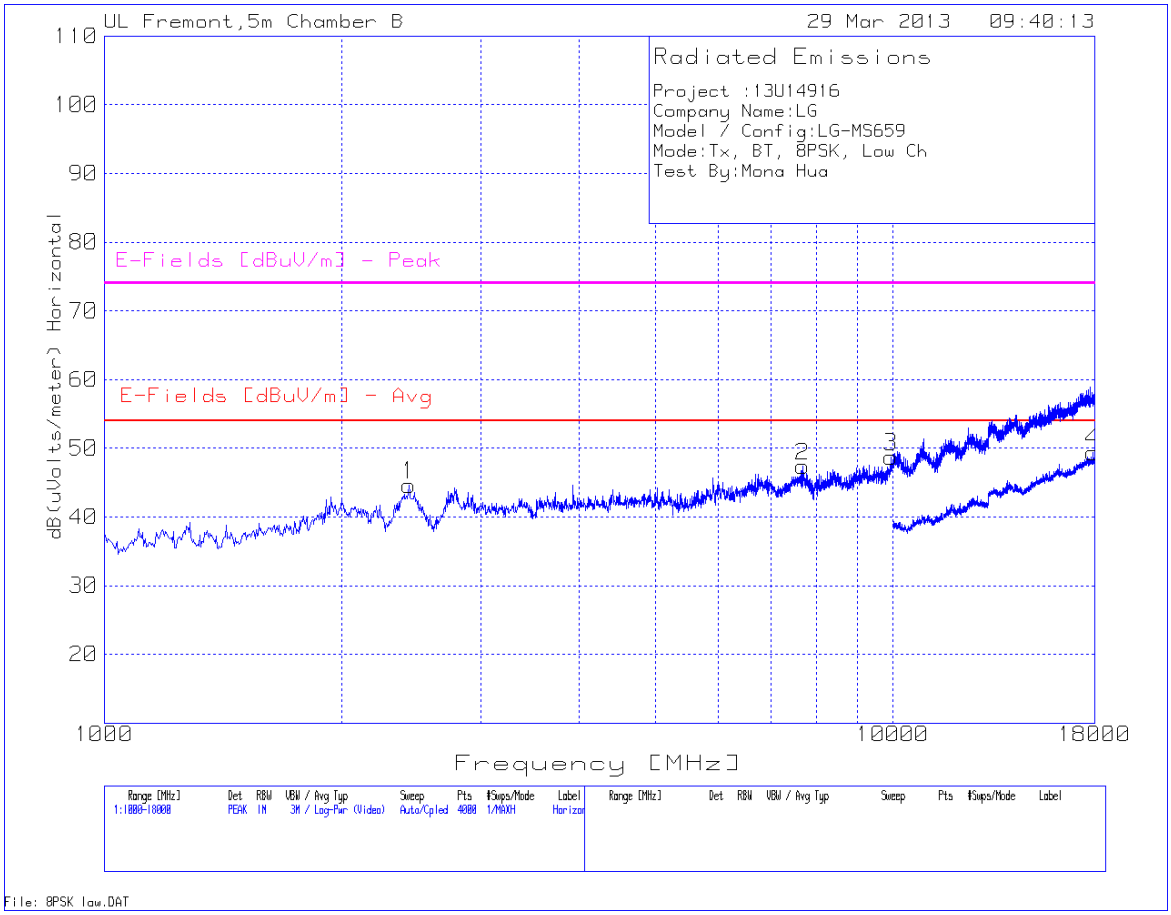
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

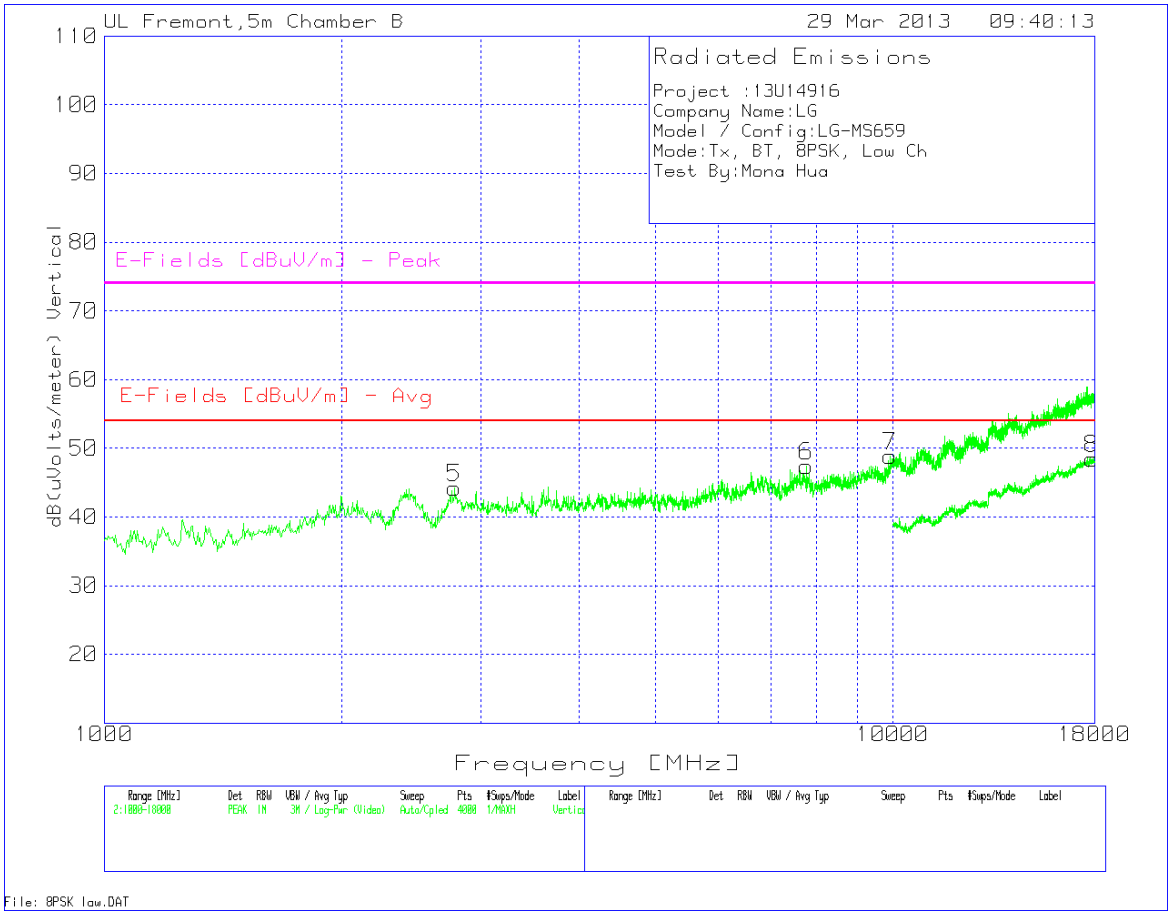
LOW HORIZONTAL



Horizontal 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2435.423	41.67	PK	32.4	-35	4.7	0.9	44.67	74	-29.33	100	Horz
2	7688.733	36.84	PK	36.2	-35.1	9.1	0.3	47.34	74	-26.66	100	Horz
3	9948.039	34.98	PK	37.7	-34.9	10.4	0.5	48.68	74	-25.32	200	Horz

Horizontal 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
4	17912.044	23.1	PK	42.2	-31.3	14.8	0.6	49.4	74	-24.6	100	Horz

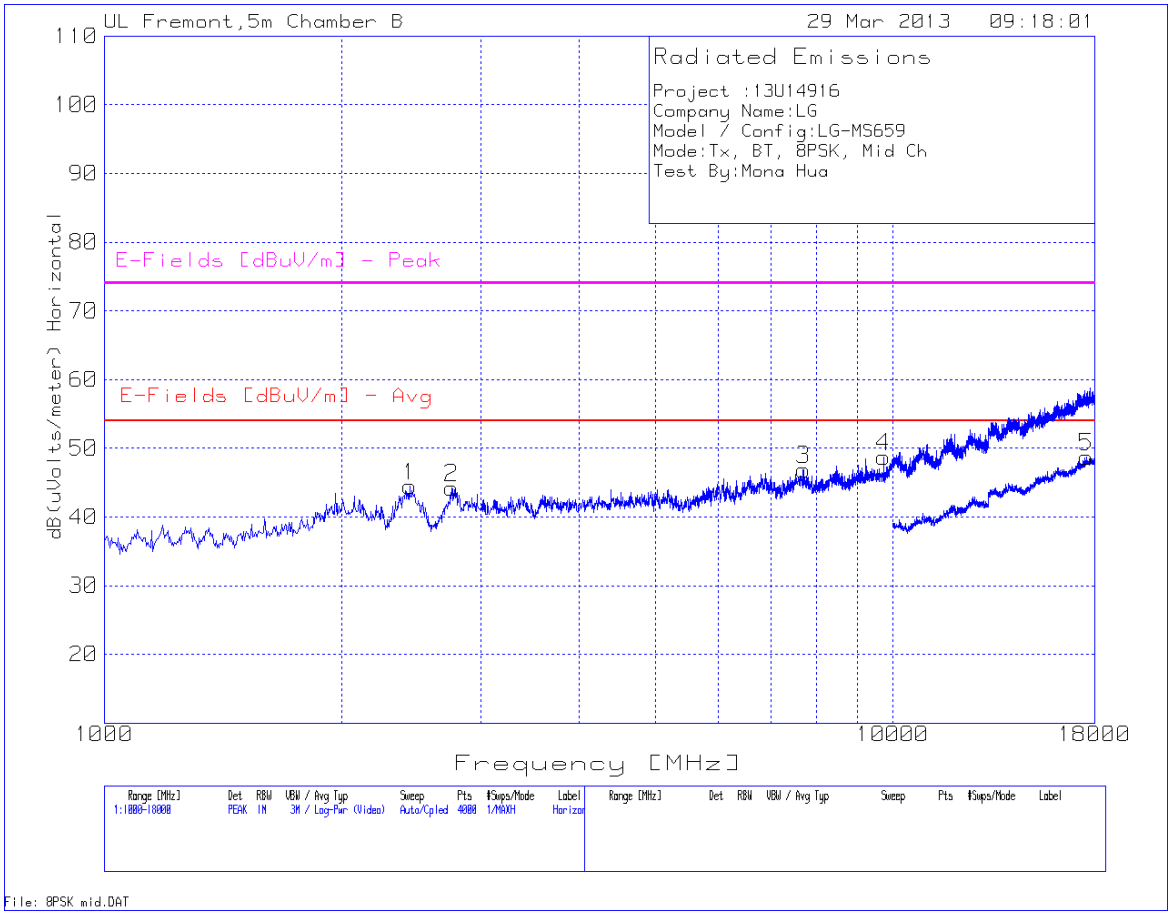
LOW VERTICAL



Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	2783.662	40.57	PK	32.8	-35.1	5	0.9	44.17	74	-29.83	100	Vert
6	7760.929	36.99	PK	36.2	-35.1	9.1	0.2	47.39	74	-26.61	200	Vert
7	9909.818	35.17	PK	37.7	-34.9	10.4	0.5	48.87	74	-25.13	200	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
8	17868.066	22.21	PK	42.2	-31.3	14.8	0.6	48.51	74	-25.49	200	Vert

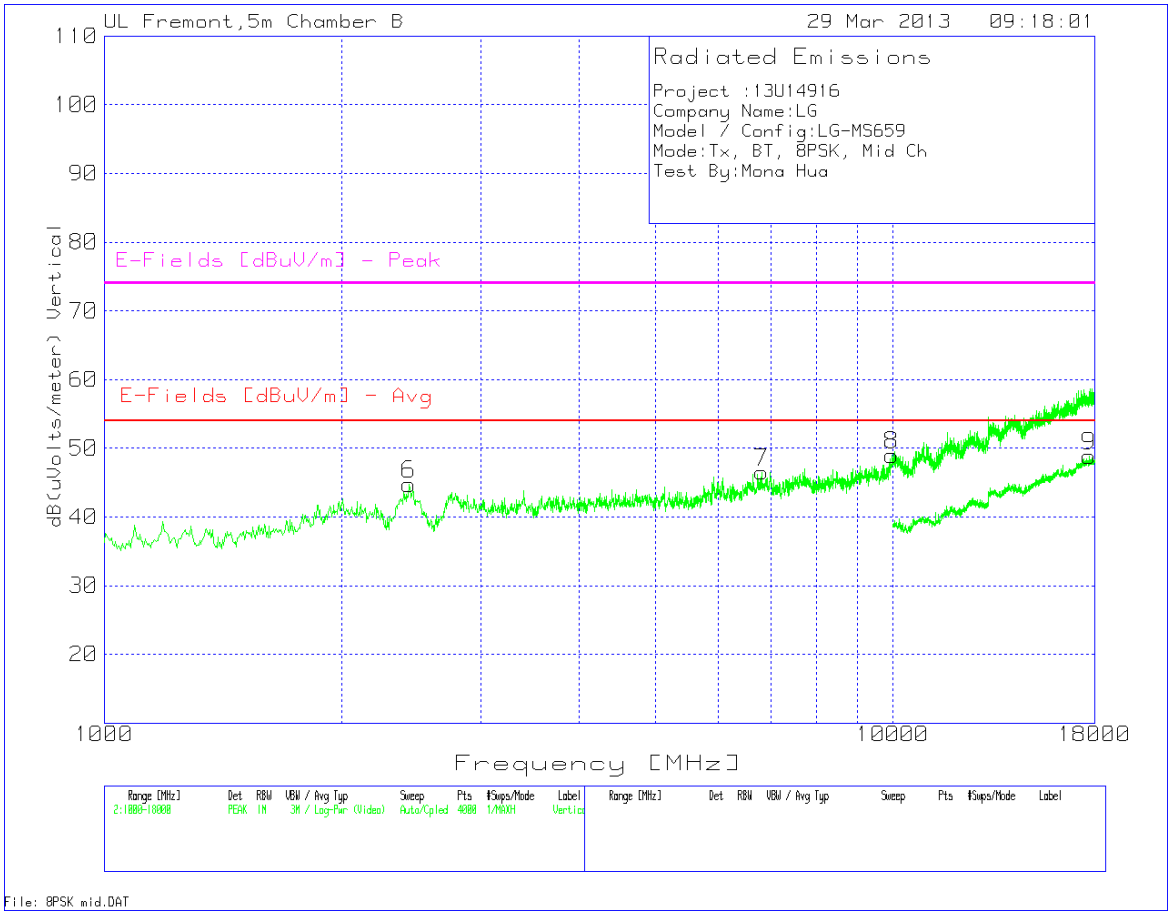
MID HORIZONTAL



Horizontal 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2439.67	41.43	PK	32.4	-35	4.7	0.9	44.43	74	-29.57	200	Horz
2	2758.181	40.66	PK	32.8	-35.1	5	0.9	44.26	74	-29.74	200	Horz
3	7705.721	36.38	PK	36.2	-35.1	9.1	0.3	46.88	74	-27.12	100	Horz
4	9731.451	35.35	PK	37.5	-35	10.3	0.6	48.75	74	-25.25	100	Horz

Horizontal 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	17600.2	23	PK	42.1	-31.5	14.6	0.5	48.7	74	-25.3	100	Horz

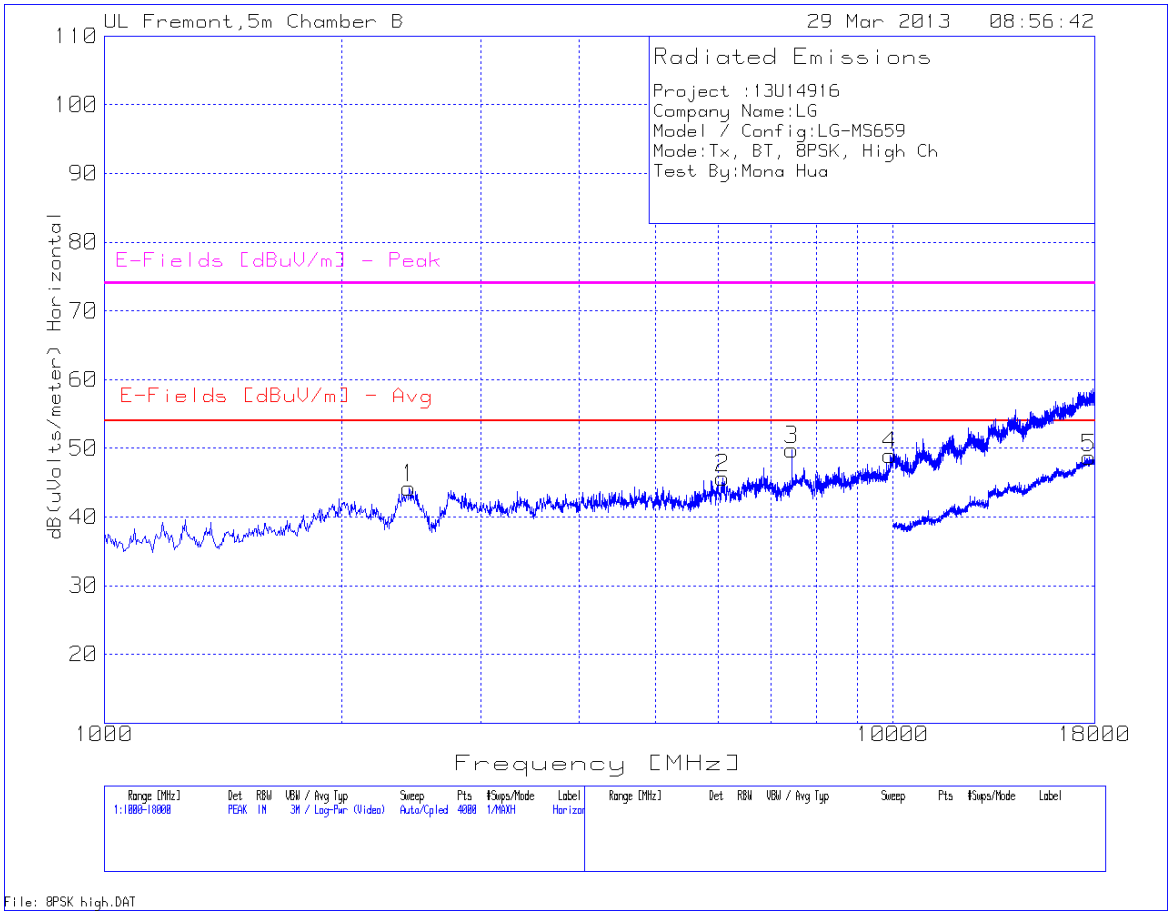
MID VERTICAL



Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
6	2435.423	41.79	PK	32.4	-35	4.7	0.9	44.79	74	-29.21	100	Vert
7	6822.383	36.94	PK	35.8	-35	8.5	0.3	46.54	74	-27.46	200	Vert
8	9965.026	35.23	PK	37.8	-34.9	10.4	0.5	49.03	74	-24.97	100	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
9	17744.128	22.81	PK	42.2	-31.4	14.7	0.5	48.81	74	-25.19	200	Vert

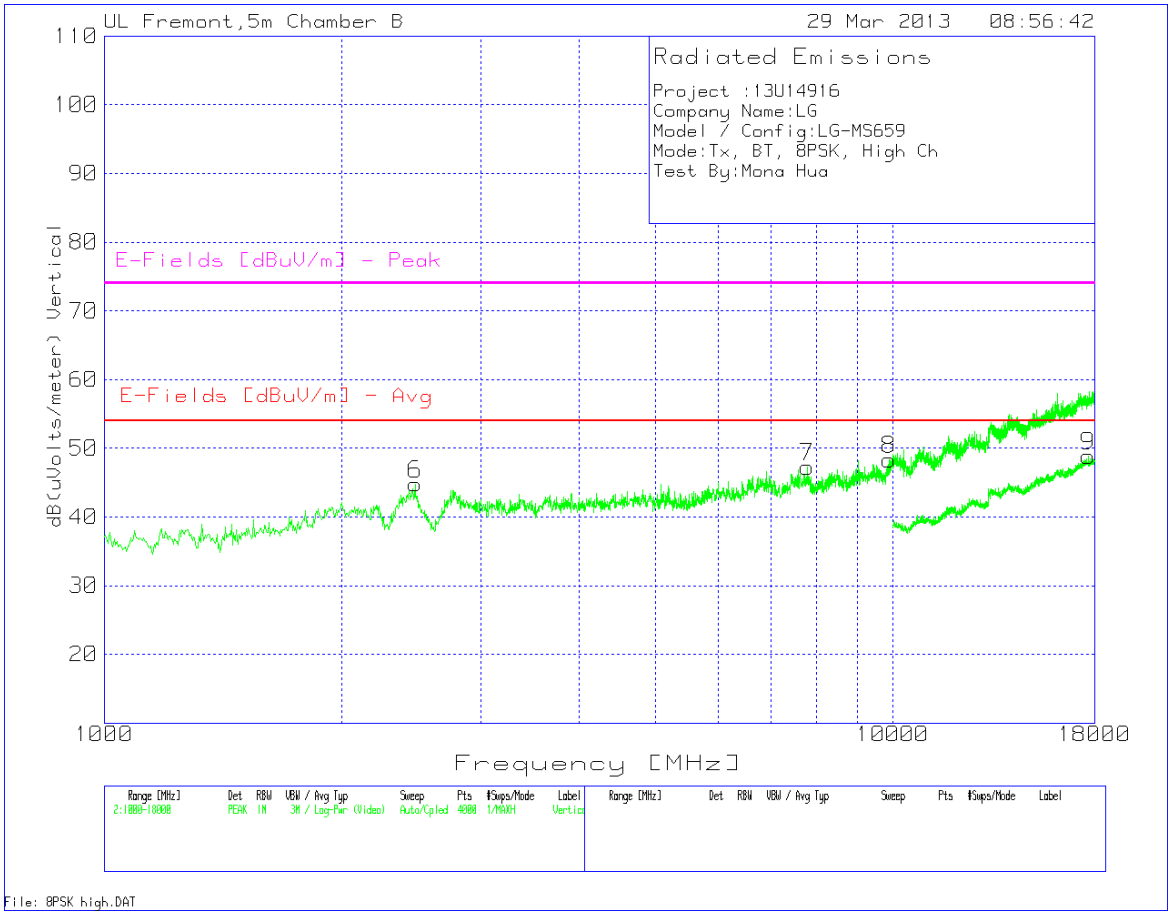
HIGH HORIZONTAL



Horizontal 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	2435.423	41.17	PK	32.4	-35	4.7	0.9	44.17	74	-29.83	200	Horz
2	6087.684	36.53	PK	35.9	-34.9	8	0.2	45.73	74	-28.27	100	Horz
3	7438.171	39.61	PK	36	-35	8.9	0.3	49.81	74	-24.19	100	Horz
4	9926.805	35.43	PK	37.7	-34.9	10.4	0.4	49.03	74	-24.97	200	Horz

Horizontal 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
5	17744.128	22.66	PK	42.2	-31.4	14.7	0.5	48.66	74	-25.34	100	Horz

HIGH VERTICAL



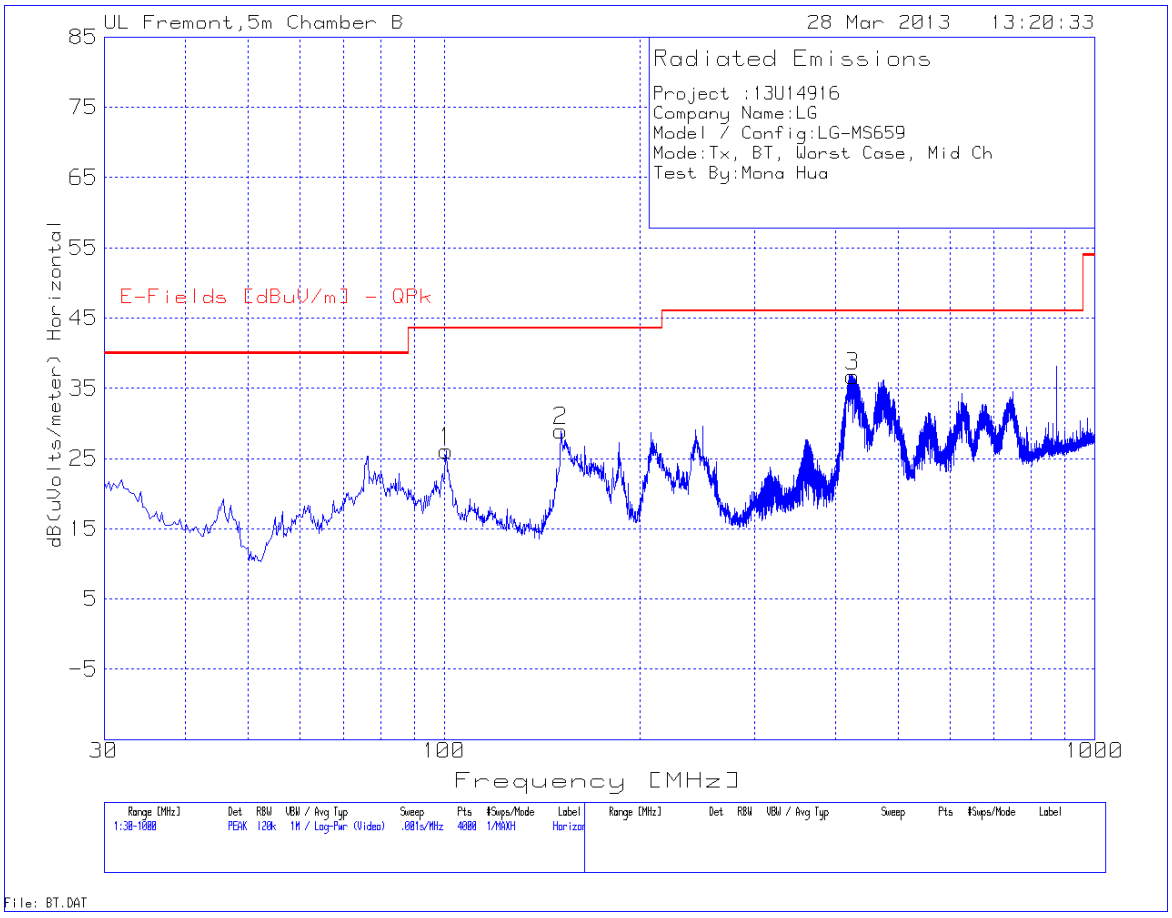
Vertical 1000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
6	2477.892	41.72	PK	32.5	-35	4.7	0.9	44.82	74	-29.18	100	Vert
7	7794.904	36.66	PK	36.2	-35.1	9.2	0.3	47.26	74	-26.74	100	Vert
8	9888.584	34.78	PK	37.7	-34.9	10.4	0.4	48.38	74	-25.62	200	Vert

Vertical 10000 - 18000MHz												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Ant Factor [dB/m]	Preamp Gain [dB]	Cable Factor [dB]	T160 BRF [dB]	dB(uVolts/ meter)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
9	17680.16	22.95	PK	42.1	-31.4	14.7	0.5	48.85	74	-25.15	200	Vert

8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT

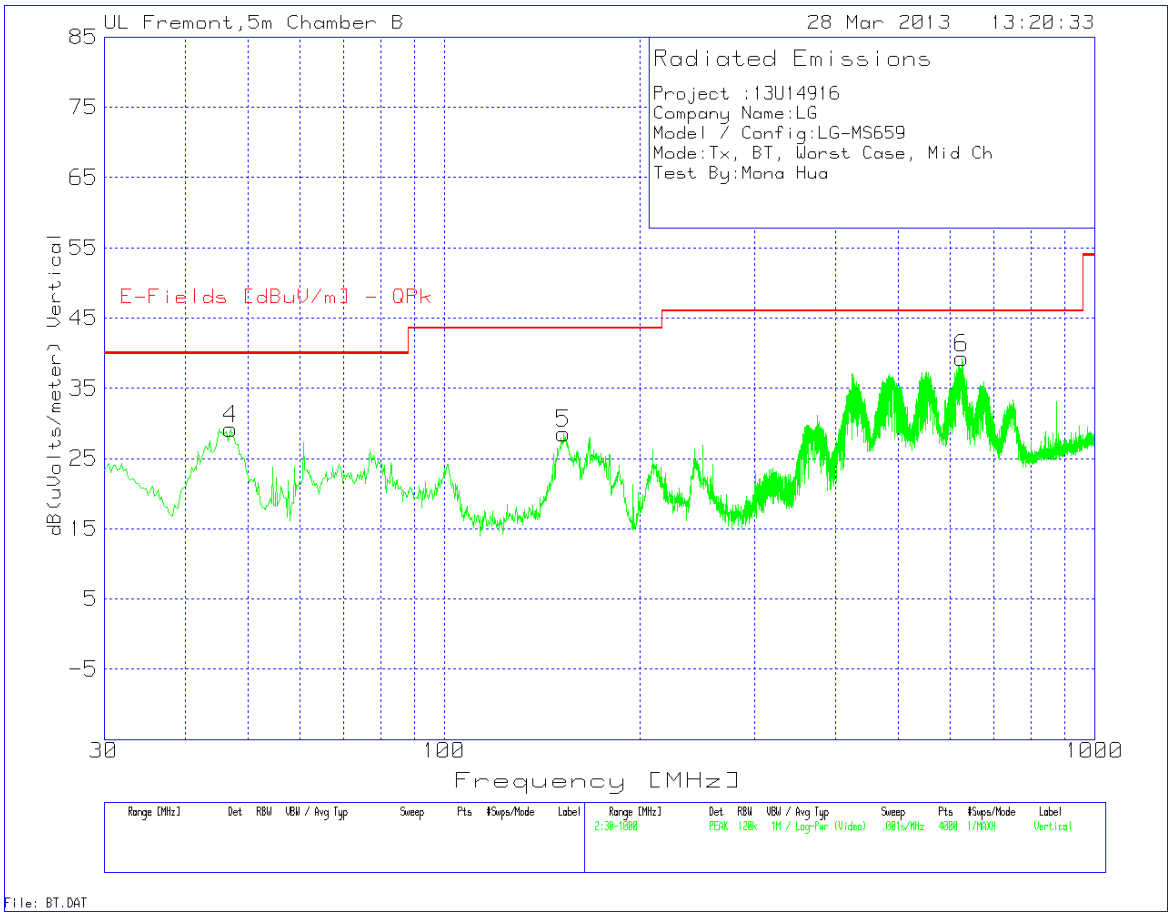


Horizontal 30 - 1000MHz

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Preamp/Cable loss [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - QPk	Margin (dB)	Height [cm]	Polarity
1	100.7569	44.15	PK	10.3	-28.3	26.15	43.52	-17.37	300	Horz
2	151.4014	44.37	PK	12.3	-27.7	28.97	43.52	-14.55	200	Horz
3	424.7364	46.84	PK	16.4	-26.5	36.74	46.02	-9.28	200	Horz

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

VERTICAL PLOT



Vertical 30 - 1000MHz										
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Preamp/Cable loss [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - QPk	Margin (dB)	Height [cm]	Polarity
4	46.9623	49.14	PK	8.9	-28.8	29.24	40	-10.76	200	Vert
5	152.8554	44.1	PK	12.2	-27.7	28.6	43.52	-14.92	200	Vert
6	625.1337	46	PK	19.2	-25.9	39.3	46.02	-6.72	200	Vert

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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

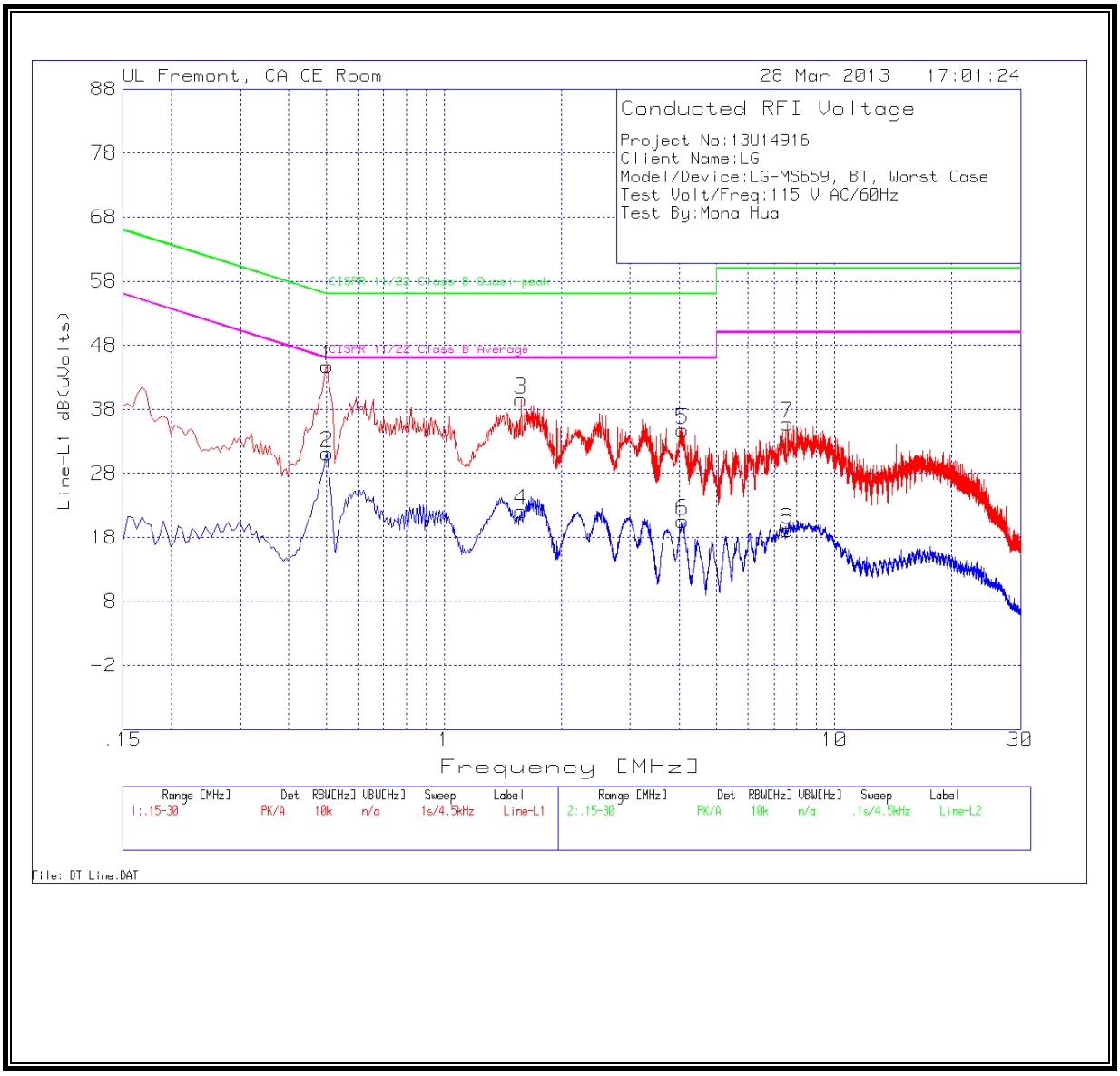
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

Project No:13U14916									
Client Name:LG									
Model/Device:LG-MS659, BT, Worst Case									
Test Volt/Freq:115 V AC/60Hz									
Test By:Mona Hua									
Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
0.501	44.64	PK	0.1	0	44.74	56	-11.26	-	-
0.501	31	Av	0.1	0	31.1	-	-	46	-14.9
1.572	39.36	PK	0.1	0.1	39.56	56	-16.44	-	-
1.572	21.87	Av	0.1	0.1	22.07	-	-	46	-23.93
4.0875	34.55	PK	0.1	0.1	34.75	56	-21.25	-	-
4.0875	20.34	Av	0.1	0.1	20.54	-	-	46	-25.46
7.5885	35.56	PK	0.1	0.1	35.76	60	-24.24	-	-
7.5885	18.97	Av	0.1	0.1	19.17	-	-	50	-30.83
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L2.TXT (dB)	LC Cables 2&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
0.4965	40.56	PK	0.1	0	40.66	56.1	-15.44	-	-
0.4965	26.34	Av	0.1	0	26.44	-	-	46.1	-19.66
1.7115	35.44	PK	0.1	0.1	35.64	56	-20.36	-	-
1.7115	17	Av	0.1	0.1	17.2	-	-	46	-28.8
2.445	35.27	PK	0.1	0.1	35.47	56	-20.53	-	-
2.445	16.64	Av	0.1	0.1	16.84	-	-	46	-29.16
22.137	35.96	PK	0.3	0.2	36.46	60	-23.54	-	-
22.137	15.01	Av	0.3	0.2	15.51	-	-	50	-34.49
PK - Peak detector									
QP - Quasi-Peak detector									
Av - Average detector									

LINE 1 RESULTS



LINE 2 RESULTS